AN ARGUS SPECIALIST PUBLICATION

NOVEMBER 1984
85p

Personal Computing Today



Special Supplement

Stunning Graphic Design PLUS Competition-win an ATARI 600XL

Stimulating simulations, arcade capers and utilities for BBC, Spectrum, VIC20

Tatung Einstein – theory put to the test

As seen in the national press

WIN a DREAM HOLIDAY in our GREAT COMPETITION

Artificial Intelligence – can it reside in RAM?

Prize Fighter Rocky game for CBM64



Choosing a printer is a lot easier than choosing a computer.

THERE are dozens of quality printers from which to choose. With quality price tags of around £250.

The Brother M-1009, however, breaks all the rules.

Stays defiantly below the £200 barrier.

Though it has far more than its fair share of features, it maintains the extraordinarily low price of £199.95.

Travels at a steady fifty.

In the speed stakes, the M-1009 is certainly no slouch, being fully capable of up to 50 characters per second.

Providing bi-directional and logic seeking printing for normal characters and uni-directional printing for super and sub script and graphics.

Prints on any paper.

Being an impact printer, the M-1009 will print on virtually any paper, including letter headings, invoices and standard office stationery.

It will even print two copies together with your original.

A superb character recommendation.

In its price range, the M-1009 has a great deal more character than many printers.

96 no less, plus international type and graphic characters.

Reliability comes as standard.

Built to the same exacting standards as Brother's elite office printers, the Brother M-1009 already has faultless credentials for reliability.

Its 9 x 9 dot matrix head, for example, has an astonishing 20 million character service life.

One printer that doesn't block out the light.

Many home computers tend to be a little on the large side.

In contrast, the compact M-1009, at only 7 cm high, keeps a discreet profile.

Well designed, reliable – and conscientious.

The Brother M-1009.

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The future at your fingertips.

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BROTHER INDUSTRIES LIMITED, NAGOYA, JAPAN.

Personal Computing Today

VOLUME 3 NUMBER 4
NOVEMBER 1984

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Argus Specialist Publications Ltd.
1 Golden Square, London W1R 3AB
01-437 0626
Printed by:
Alabaster Passmore & Sons Ltd.
London and Maidstone
Distributed by:
Argus Press, Sales & Distribution Ltd, 12-18 Paul Street, London EC2A 4JS

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Subscription Rates. UK £14.00 including postage. Airmail and other rates upon application to Personal Computing Today, Infonet Ltd., Times House, 179 The Marlowes, Hemel Hempstead, Herts HP1 1BB.

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

November days are notoriously cold, damp and miserable. What you need is something to lift the spirits and inject colour and life, and this issue of PCT goes a long way to doing just that!

Our special *graphics supplement* this month is in glorious full technicolour. A splurge of cheeriness to brighten up the month.

It contains an article based on three London Design Studios, who have had the foresight to see the artistic potential of the computer. The kind of graphics which are used to produce spectacular effects in films such as Star Wars and Electronic Dreams can now be transferred onto the printed page.

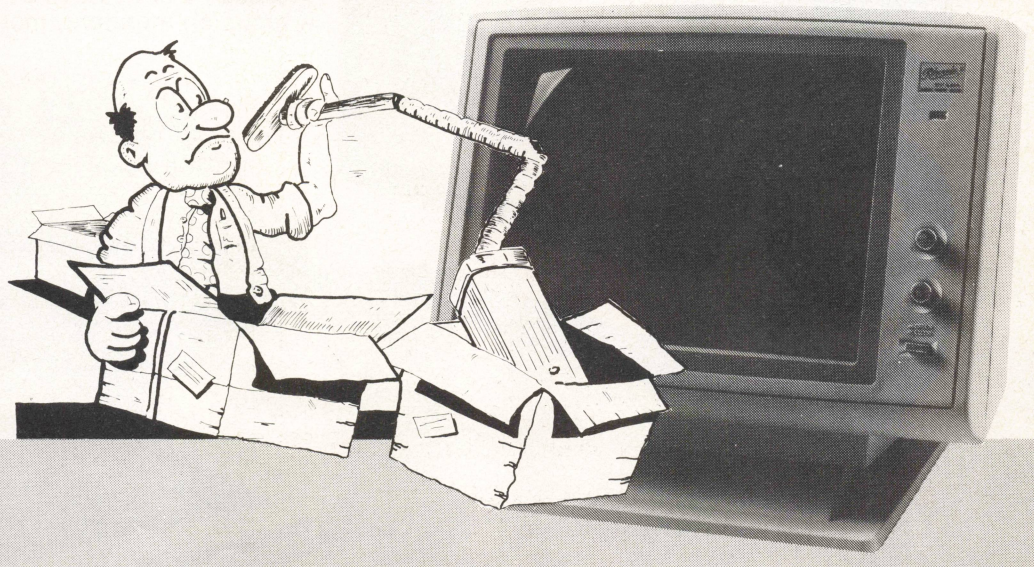
So computers have an exciting and fascinating role to play in the design field, whether in advertising or publishing, not to mention film, video and television work.

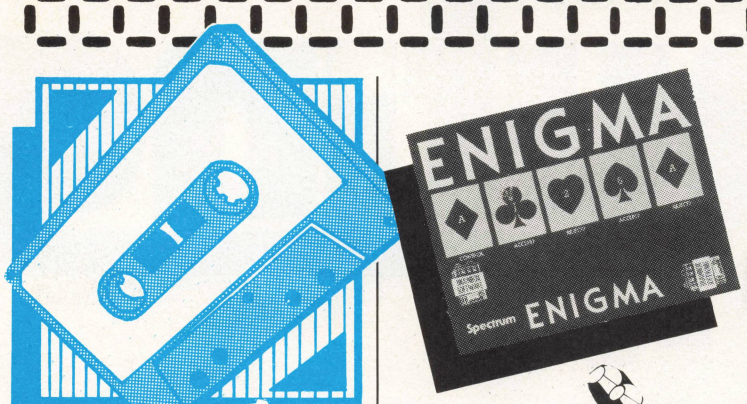
In association with this article, there is a very worthwhile *competition.* The actual identification sequence was produced by one of the featured design studios, I.M.A.G.I.N.E. They have done wonderful things with five black and white prints of computers. I won't labour the subject, see for yourselves by turning to the competition page, and get your thinking caps on to win yourself an Atari 600XL computer.

If you're thinking of buying a computer and have got £500 to spare, you will be interested in our computer review this month which is of the Tatung Einstein. A little expensive, but it has so many interesting features that it is worth a look.

What does A.I. mean to you? A scientific approach to pig breeding, or a branch of computer science? All is revealed in our very readable article in this issue. It is at the forefront of the government's thrust for new technology, so don't be left behind, read up on this fascinating subject now.

Also in this issue, lots of stunning games and utilities for a variety of computers and remember, all the programs contain detailed documentation and hints on conversion, so practice your programming and see if you can get them to run on your computer.







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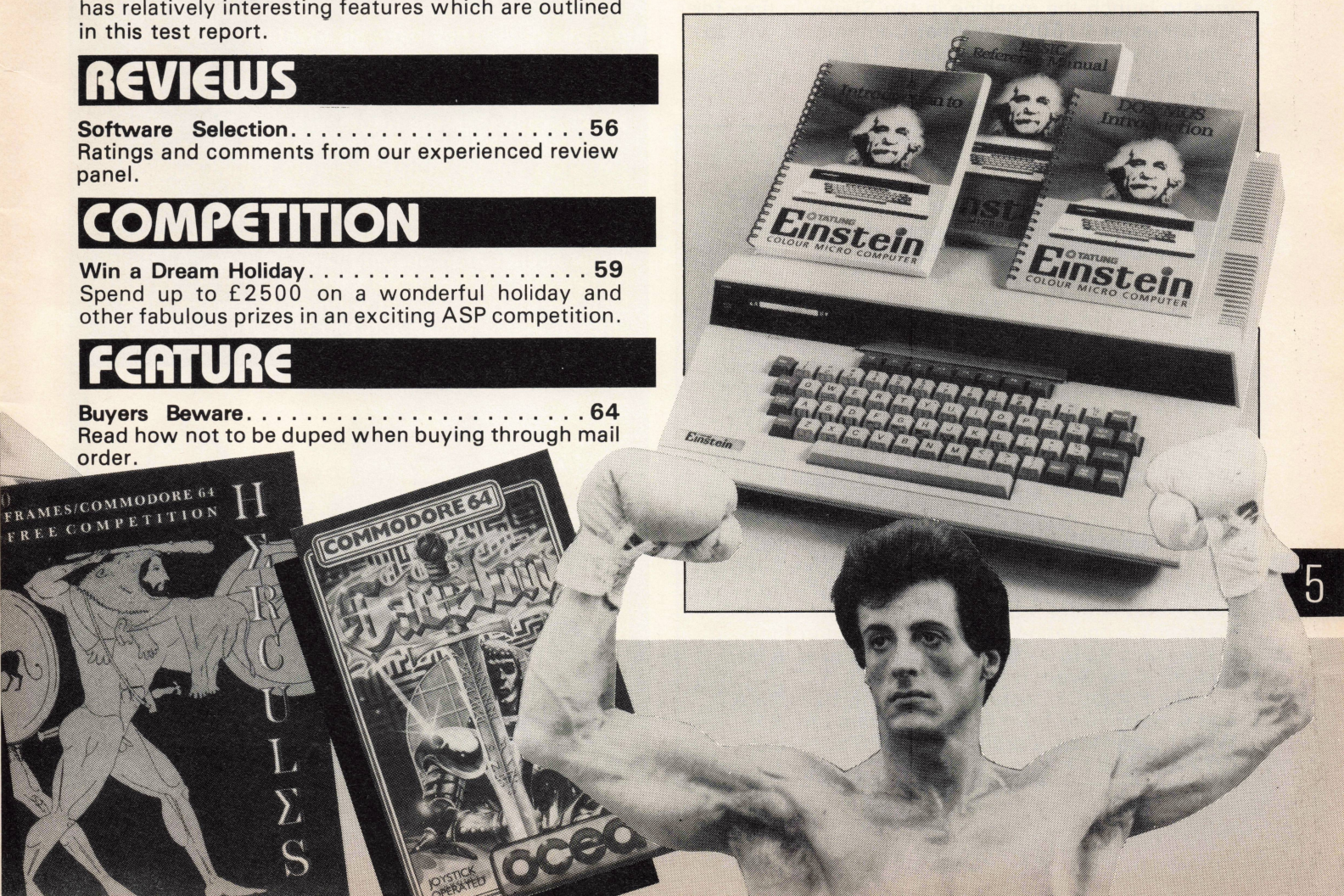
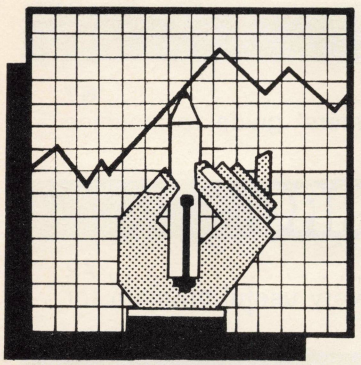




News

COMMODORE BUY QL BEATER

New computer companies which proclaim to have produced the latest and greatest machine are quite common. One such machine was quietly shown at a sneak preview in America and none of the British press seemed to notice!

Commodore were very impressed and have bought the company. The name of this wonder machine is the Amiga Lorraine and it sounds a world beater. The central processor is a Motorola 68000, it has super high resolution graphics of 640 by 200, a built in modem, eight sprites, each using up to 16 colours, 4096 colours, a single 320K disk drive with provision for a second external drive, speech synthesis and 80 column text, all wrapped up with 128K RAM as standard, expandable to many Megabytes. Amiga's intention was to launch the machine in the States in time for Christmas at $1500 but what Commodore will do about this has not been decided. This new machine sounds very exciting but all we can do is wait, cheque book at the ready!

PRINTSTICK FOR ELECTRON

A new add-on from SIR Computers promises complete compatability between joysticks and printers and the Acorn Electron.

Their printer/joystick interface allows two 'Atari' type joysticks and any parallel printer with centronics port to be added on to the Electron. It is compatible with 99% of software for this micro and full colour screen dumps on Epson-compatible printers are possible via its own built-in firmware. This feature is available even while a game is in play.

For software not offering joystick facilities (or written for use with a non-standard joystick interface) a special ROM based routine is provided which permits the joysticks to be defined as any combination of control keys the user requires.

SIR also claim full compatability with all current and future expansion devices since only Acorn approved memory addresses have been used. All Printstick's operating software is held internally in a sideways ROM so there is no need to load any additional software from cassette.

The Printstick costs £44.95 inclusive of VAT and is obtainable from **SIR Computers Ltd, 91 Whitchurch Road, Cardiff CF4 3JP Telephone (0222) 621813.**

TOP AMERICAN GAMES SOFTWARE FOR U.K.

Centre Soft and Ocean have combined forces to bring top-selling American Software to the U.K. at a third of its usual price. The company which they have formed is called 'U.S.Gold' and not only will it distribute the software, but will manufacture it over here.

American software has previously been outside the pockets of British games players, but because U.S.Gold are producing the games in this country, they get around the problems and expense of importation.

The directors of the company had a hard time persuading the Americans to part with their publishing rights to the programs but the high sales of the Commodore 64 machine over here, provided a vital lever in their successful negotiations. They have also reached an agreement to program the American Commodore titles for Britain's other popular home computer, the Sinclair Spectrum and there are plans for Amstrad and MSX products in the future.

If all goes to plan the best of American software will be launched on the British public before Christmas, costing around £10.
But U.S.Gold are not alone in this venture. Statesoft is also producing American software under licence from leading U.S. sources. All their games are for the CBM64 and cost £8.95 on tape £10.95 on disk. Award winning American titles such as **Astro Chase** and **Flip Flop** will head the releases.



ATARI PRICES SLASHED

Following the recent acquisition of Atari by Jack Tramiel the U.K. division has announced drastic price reductions for their XL range of micros. The 600XL is down £60 to £99.99, its big brother, the 800XL, will be on sale at £199.99. The new pricing structure represents the new-look Atari's competetive and aggressive stance in the U.K.

Club Contacts

The following clubs have made some changes to their details:

Bedford Amateur Computer Club has two new meeting times. They will get together on the 1st and 3rd Monday in each month from 7.30 p.m. at the Star Club in Bedford. Further details can be obtained from Mrs J Thompson, 2 Sandon Close, Sandy, Beds, SG19 1QT or telephone Sandy 82365.

Gravesend Computer Club now meets at The Council Tenants Club, Whitehill Lane, Gravesend, Kent every Thursday evening at 7.00 p.m. Contact Steve Janday c/o 58 Apsledene, Hever Farm Estate, Singlewell, Gravesend, Kent, DA12 5EE.

Blackburn Computer Club is a non-machine specific group which meets on alternate Monday evenings at 7.30 p.m. at the Fernhurst Hotel, Bolton Road, Ewood. For further details contact John Schofield on (0254) 60033 during office hours.

The FORTH interest group meets on the first Thursday in each month in Room 307 of the Polytechnic of the South Bank at 7p.m. The secretary is Douglas Neale who can be contacted at 58 Woodland Way, Morden, Surrey.

The group now has over 700 members and proposes to organise local chapters in some regional centres.

APOLOGIES

We have received several agitated calls from readers having problems with Son et Lumière from the September issue of PCT. This program will only work on the **16K Atari** and not on micros with larger memories.



SOFTWARE SNIPPETS

There are lots of new software releases this month with companies starting their battle for Christmas sales.

Audiogenic has launched a new range of disk based products for Commodore 64. In their words 'not quite traditional computer games nor adventure games, they combine the visual capabilities of the arcade with the interaction of good traditional adventure games'.

Alice in Videoland is a computerised version of the much loved classic 'Alice in Wonderland' and includes key characters such as the Red Queen and scenes from the book. There are several screens and good graphics and sound. On disk only for the CBM64, the game costs £12.95.

Moving further back into classical times, **Pegasis** is a game of the Gods played out on winged horses. The game features aerodynamic control such as thrust, direction and gliding and must provide a viable alternative to games of the air traffic control variety. Again on disk, Pegasis costs £12.95.

Micropower has also been putting their software on disk. Their complete range of BBC programs are now available in this format for £7.95 and they have been considerate enough to offer an upgrade scheme for people who already have the games on cassette. By sending in the tape and £4.95, you can receive the disk version.

Software manager, Alan Butcher, has researched a method which enables each disk to run on both 40 and 80 track drives as well as single and double density formats. All of the disk versions are identical to their tape counterparts except **'Jet Power Jack'** which incorporates hi-res pictures,more tunes, detailed instructions, display of adversaries and extra character definitions which are loaded at random.

Electron and CMB64 versions of **Ghouls** are now available and the **'Felix'** range of programs have also been converted for the Memotech and CBM64.

Bourne Educational Software are branching out from their purely educational base with a new 'discovery' program. **Osprey!** has been developed in conjunction with the RSPB and is set in the highlands of Scotland with colourful and fast moving 3D graphics screens. Given the responsibility of protecting the precariously small Osprey population, you have to use your wardens to keep egg stealers at bay, prevent huntsmen from shooting the birds and control the ever inquisitive tourists from disturbing the nests.

This new type of game is hoped to stimulate awareness in nature and in protection of our natural heritage. The purchase prices of £9.95 for the cassette version for the BBC, Electron and Amstrad, and £11.95 and £15.95 for the respective BBC 5¼" or 3" version include a contribution, to the RSPB.

Anirog are providing the means to stretch your CBM64 to its limits of graphics and sound by an all in one package costing only £14.95. The three utilities included on **Gas Kit 64** give you an astounding extension of the CBM BASIC by 23 commands, allowing you to use the monitor as a canvas to generate high resolution pictures, and the keyboard to compose music for your own programs and entertainment.

COULD THIS BE YOUR PROGRAM?



Is your program good enough to fill this spot?

Will your game be the next No. 1 hit?

Are you looking for **worldwide** marketing and **top** royalties?

Are you writing for leading computers such as Spectrum, CMB-64, Vic 20, ZX81, Amstrad, BBC etc?

Answer yes to any of these questions and we would like to hear from you.

Send your program on tape together with full instructions for fast evaluation. Be sure to include computer type, memory, peripherals used and your name, address and telephone number.

R&R SOFTWARE

R&R Software Ltd. 5 Russell Street Gloucester GL1 1NE
Tel (0452) 502819

ON SALE FROM 2 NOVEMBER

Next Month



By this time next month your thoughts will be turning to Christmas and what presents you will be giving, or better still, hoping to receive. With this in mind the December issue of *PCT* will be bursting with news and reviews of computer products to give you some ideas.

The most expensive item on most peoples' list will be a computer. Either your first or an upgrade. We have just the article to help you decide which micro, from the many on offer, will suit your requirements (and pocket) best. In addition to this there will be an extended Micro Factfile which will give a summary of our previously published benchtests on each of the micros. All the information you require will be there so make sure of your December issue.

Ideas for other presents might be a versatile printer or modem to make your system more complete and exciting, or at the other end of the price scale, a joystick. The December issue will be packed with reviews of all of these products.

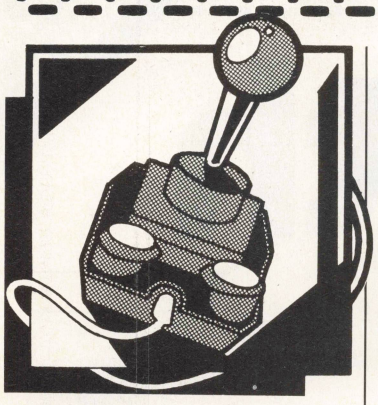
Cheaper still are computer software and books to aid you in your quest for better programming and understanding of your system. In the December issue, there will be extra pages of software reviews and also lots of book reviews.

Of general interest to all readers will be a feature on the Lotus in-car computer. Lotus cars have a world reputation for speed and incomparable road handling. Their latest development is a computer fitted into the engine which actually works out the compensation required on the suspension to stop 'rolling' on cornering at speed or braking hard. Read how it works in the December issue.



The Artificial Intelligence article in this issue explains all about the subject and just in case you feel it's too academic for you, the follow on article in the December issue, shows you how it is relevant to computer games.

There will be all the usual games and utilities for a range of micros and programming pointers for BBC, VIC-20 and Oric owners. So, place an order for your December issue today or you may find you miss out on a great deal!



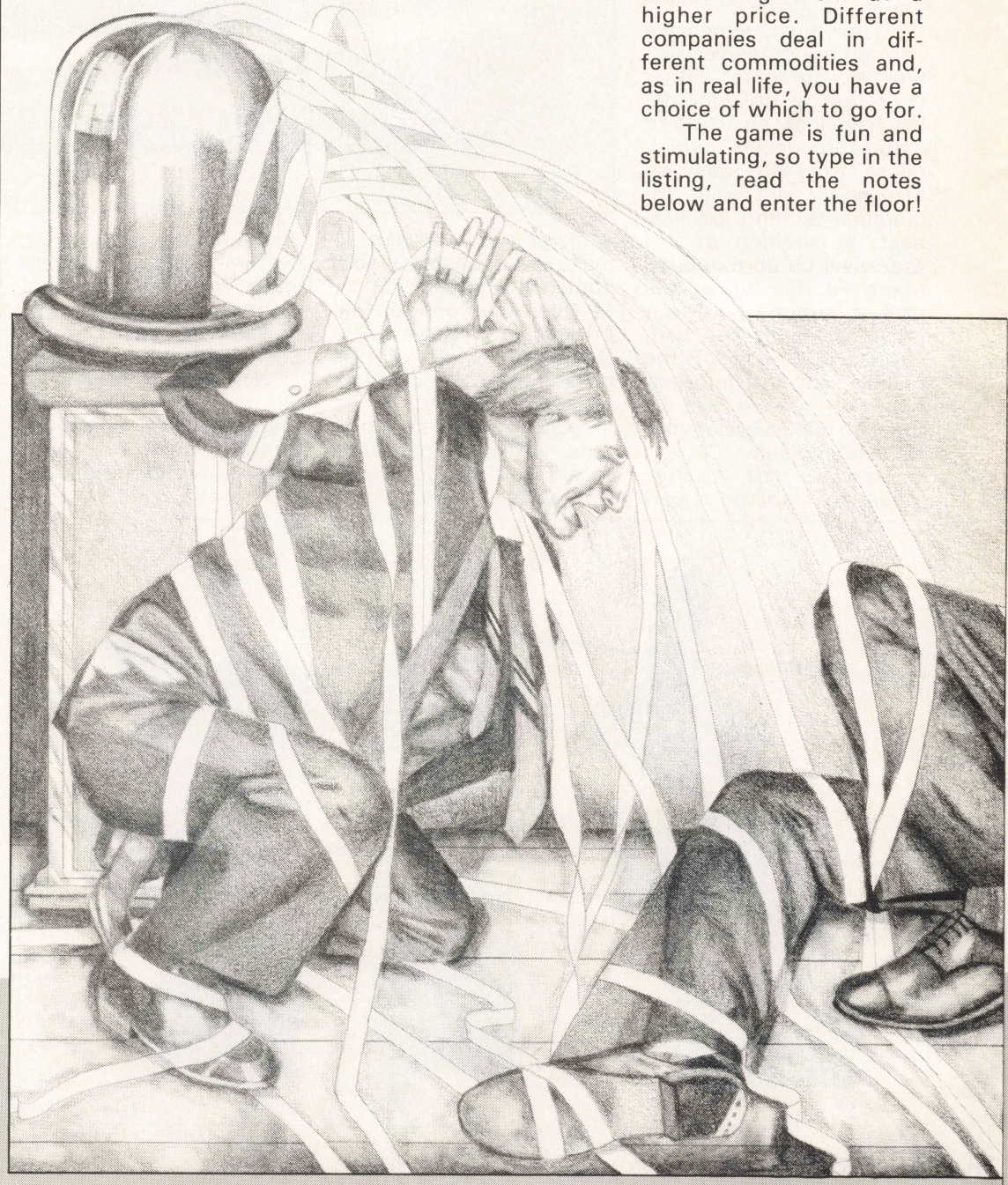
Stockmarket

Indulge your fantasies of controlling vast wealth with this simulation game by John Fletcher.

This is a simulation game in which you play the part of a stockbroker. Not many of us will ever have that opportunity in real life but if you have a BBC micro and this listing, you too can make (or lose) a million.

Playing the stock-market is a complex (and dangerous) hobby, the aim of which is to make a profit by buying shares in companies at one price and selling them at a higher price. Different companies deal in different commodities and, as in real life, you have a choice of which to go for.

The game is fun and stimulating, so type in the listing, read the notes below and enter the floor!



BBC A/B

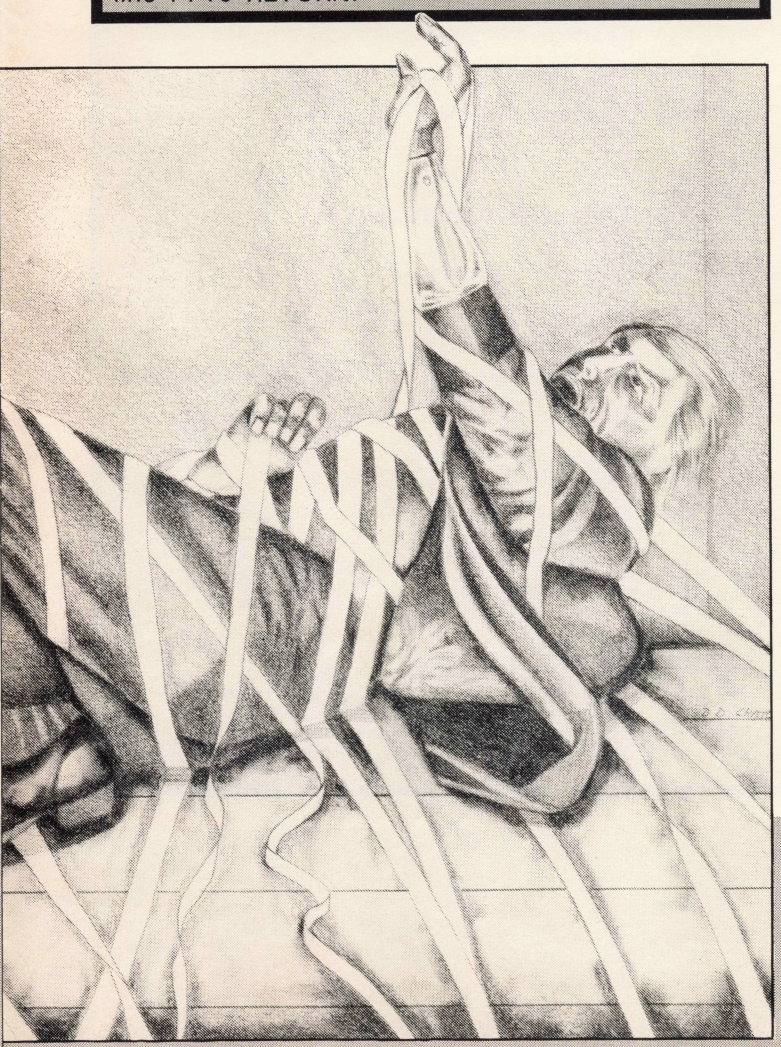
Due to the character set of the printer used to obtain the listing, the apostrophe (') in certain lines should be read as '£'. Thus, line 240 should read:

£ % = RND(2500) +2500, and NOT '% etc. However, this rule only applies where the apostrophe is followed by the % symbol. Therefore, line 1250, for example, should be typed in as it is listed.

hints on conversion

To convert the program to run on an Electron simply remove all the MODE7 CHR$ codes at the start of lines.

Conversion to other micros is harder, although not impossible. Firstly take out lines 40 and 50. Then change the function keys to suit your machine. If you don't have any on your micro then you will have to omit lines 60-160, and delete or alter lines 300 and 310. The major task will be in changing all the PROCs, DEFPROCs and ENDPROCs to GOSUBs and RETURNs. This is fairly easily done as follows. When you come across a PROC, find the corresponding DEFPROC and note the line number. Then replace the PROC with a GOSUB to the line number, replace the DEFPROC with a REM statement and the ENDPROC with a RETURN. Thus line 590 would become GOSUB 1100, line 1100 REM GAIN and line 1140 RETURN.



variables used

C%	Price of coal shares		price variable followed by H represents the number of each share held e.g. CH% is the number of coal shares held.
S%	Price of steel shares		
V%	Price of car shares		
A%	Price of airline shares		
M%	Price of computer shares	£%	How much money player has
SUS%	Decides if share tradings are suspended. The	N%	Number of shares bought or sold

how it runs

Line	Effect
40	Moves T.V. display down one line
50	Disables the ESCape key
60-160	Define the function keys
170-240	Set up the variables
250-290	Set up a string array. Line 310 stops the cursor flashing
300-530	Set up the screen mode, display the menu and ask for one of three options
540-1090	PROCview displays the share prices, checks if the shares are bankrupt and if they are, resets the value of the shares and take all the holdings in that share of equal zero (i.e. AH% = 0)
1100-1140	PROCgain — decides whether a share goes up or down
1150-1270	PROCdisas — randomly decides on events which will cause price fluctuation
1280-1630	PROCtrade — displays prices and also tells the player how many of each share are owned
1640-2330	PROCC/PROCA/PROCS/PROCV — these ask whether player wishes to buy or sell and how many shares involved. They also re-adjust the value of £% and how many shares held
2340-2510	PROCbank — this shows player how many shares held and balance of account

The program should now run but omit CHR$ control codes at the start of some lines. Some Oric micros have a Teletext (MODE7) display and if the control codes are the same as for the BBC leave them in. You may also have to alter the random number generator to suit your machine.

Stockmarket

program listing

```
  10 REM**STOCKMARKET
  20 REM**  BY JOHN C FLETCHER
  30 REM**    1984
  40 *TV 255,1
  50 *FX200,1
  60 *KEY10 OLD|M RUN|M
  70 *KEYOW|M
  80 *KEY1"1 |M"
  90 *KEY2"2 |M"
 100 *KEY3"3 |M"
 110 *KEY4"4 |M"
 120 *KEY5"5 |M"
 130 *KEY6"B|M"
 140 *KEY7"S|M"
 150 *KEY8"Y|M"
 160 *KEY9"N|M"
 170 SUS%=FALSE
 180 C%=RND(20)*10
 190 S%=RND(20)*10
 200 V%=RND(20)*10
 210 A%=RND(20)*10
 220 M%=RND(20)*10
 230 AH%=0:VH%=0:MH%=0:SH%=0:CH%=0
 240 `%=RND(2500)+2500
 250 DIM D$(4)
 260 D$(1)="Your broker has eloped to South America wi
th his secretary AND taken all your   shares with him.E
asy come,easy go...."
 270 D$(2)="National Miners' Strike.Coal Industry   Ba
dly Crippled.The Daily Mail wants to  offer Arthur Scar
gill `200,000 and SouthAfrican citizenship if he calls
it off."
 280 D$(3)="Ambulances made by British Motors are   fa
lling apart on motorways,and the firm is being sued by
bereaved relatives. Shares drop `25"
 290 D$(4)="Following England's worst ever test     de
feat at the hands of Australia,the PM decided to nation
alise industry to boostthe country's morale.This means
that    they've taken all your sharesHA!HA!HA!"
 300 MODE 7
 310 VDU23;8202;0;0;0;0;
 320 PRINT
 330 PRINTCHR$131;CHR$157;CHR$132;CHR$141"         STO
CKMARKET"
 340 PRINTCHR$131;CHR$157;CHR$132;CHR$141"         STO
CKMARKET"
 350 A$="************************************"
 360 PRINT
 370 PRINTCHR$129+A$
 380 PRINTCHR$129"*        ";CHR$130"1)View prices";CH
R$129;"                *"
 390 PRINTCHR$129"*
 *"
 400 PRINTCHR$129"*        ";CHR$131"2)Trade shares ";
CHR$129;"             *"
 410 PRINTCHR$129"*
 *"
 420 PRINTCHR$129"*        ";CHR$133"3)Account stateme
nt";CHR$129;"        *"
 430 PRINTCHR$129+A$
 440 PRINT''
 450 PRINTCHR$130"You have `";`%
 460 IF `%<0 AND CH%<0 AND SH%<0 AND VH%<0 AND MH%<0 A
ND AH%<0 THEN PRINT"GAME OVER":END
 470 PRINT
 480 PRINTCHR$134"Enter option"
 490 INPUT K%
 500 IF K%=1 PROCview
 510 IF K%=2 PROCtrade
 520 IF K%=3 PROCbank
 530 GOTO300
 540 DEFPROCview
 550 PROCgain
 560 A%=A%+(RND(10)*F)
 570 PROCgain
 580 V%=V%+(RND(10)*F)
 590 PROCgain
 600 M%=M%+(RND(10)*F)
 610 PROCgain
 620 C%=C%+(RND(10)*F)
 630 PROCgain
 640 S%=S%+(RND(10)*F)
 650 CLS
 660 PRINT
 670 PRINTCHR$141;CHR$132;CHR$157;CHR$131;"        Toda
y's prices"
 680 PRINTCHR$141;CHR$132;CHR$157;CHR$131;"        Toda
y's prices"
 690 PRINT
 700 IFC%>0 THEN 750
 710 PRINTCHR$129+CHR$136"BANKRUPT"
 720 C%=RND(20)*10
 730 CH%=0
 740 GOTO760
 750 PRINTCHR$130"1) British Coal                ";C%

 760 PRINT
 770 IFV%>0 THEN 810
 780 PRINTCHR$129+CHR$136"BANKRUPT"
 790 V%=RND(20)*10
 800 VH%=0
 810 PRINTCHR$131"2) British Cars                ";V%

 820 PRINT
 830 IFM%>0 THEN 880
 840 PRINTCHR$129+CHR$136"BANKRUPT"
 850 M%=RND(20)*10
 860 MH%=0
 870 GOTO910
 880 PRINTCHR$132"3) Computers International    ";M%
 890 PRINT
 900 IFA%>0 THEN 950
 910 PRINTCHR$129+CHR$136"BANKRUPT"
 920 A%=RND(20)*10
 930 AH%=0
 940 GOTO970
 950 PRINTCHR$133"4) United Airways              ";A%

 960 PRINT
 970 IFS%>0 THEN 1020
 980 SH%=0
 990 PRINTCHR$129+CHR$136"BANKRUPT"
1000 S%=RND(20)*10
1010 GOTO1040
1020 PRINTCHR$134"5) Acme Steel                 ";S%

1030 PROCdisas
1040 PRINT
1050 PRINT
1060 PRINTCHR$136+CHR$141"    (W)ait or (R)eturn to men
u?"
1070 PRINTCHR$136+CHR$141"    (W)ait or (R)eturn to men
u?"
1080 INPUT Z$
1090 IF Z$="W" THEN 550 ELSE ENDPROC
1100 DEFPROCgain
1110 X=RND(50)
1120 IF X<25 THEN F=-1
1130 IF X>25 THEN F=1
1140 ENDPROC
1150 DEFPROCdisas
1160 X=RND(90)
1170 Y=RND(10)
1180 Z=RND(20)+15
1190 IFX<>Y AND X<>Z AND Y<>Z THEN 1270
1200 IFX=Y THEN A$=D$(1):VH%=0:SH%=0:AH%=0:MH%=0:CH%=0
1210 IFX=Z THEN A$=D$(2):C%=C%+25:S%=S%-5
1220 IFY=Z THEN A$=D$(3):V%=V%-25
1230 IFX=Y AND X=Z THEN A$=D$(4):VH%=0:SH%=0:AH%=0:MH%
=0:CH%=0
```

program listing

```
 1240 CLS
 1250 PRINT'''
 1260 PRINTA$
 1270 ENDPROC
 1280 DEFPROCtrade
 1290 X=25:Y=RND(1000):IF X=Y SUS%=TRUE
 1300 CLS
 1310 IF SUS%=TRUE THEN PRINTTAB(10,10);"ALL TRADING SU
SPENDED":TIME=0:REPEAT UNTIL TIME>300:SUS%=FALSE:ENDPRO
C
 1320 PRINT
 1330 PRINTCHR$141"SHARE            PRICE       YOU HOLD
:"
 1340 PRINTCHR$141"SHARE            PRICE       YOU HOLD
:"
 1350 PRINTCHR$129"1) British"
 1360 PRINTCHR$129"   Coal ":PRINTTAB(18,3)CHR$129;C%:P
RINTTAB(31,3)CHR$129;CH%
 1370 PRINT
 1380 PRINTTAB(0,6)CHR$130"2) British"
 1390 PRINTTAB(0)CHR$130"   Cars ":PRINTTAB(18,7)CHR$13
0;V%:PRINTTAB(31,7)CHR$130;VH%
 1400 PRINT
 1410 PRINTTAB(0,9)CHR$131"3) Computers "
 1420 PRINTTAB(0,10)CHR$131"   International":PRINTTAB(
18,10)CHR$131;M%:PRINTTAB(32,10);MH%
 1430 PRINT
 1440 PRINTTAB(0,12)CHR$132"4) United"
 1450 PRINTTAB(0,13)CHR$132"   Airlines":PRINTTAB(19,13
);A%:PRINTTAB(32,13);AH%
 1460 PRINT
 1470 PRINTTAB(0,15)CHR$133"5) Acme"
 1480 PRINTTAB(0,16)CHR$133"   Steel":PRINTTAB(19,16);S
%:PRINTTAB(32,16);SH%
 1490 PRINT''
 1500 PRINTCHR$130"You have `";`%
 1510 PRINT
 1520 PRINTCHR$132"Enter share number"
 1530 INPUTL%
 1540 IF L%<0 OR L%>5 THEN 1510
 1550 IF L%=1 PROCC
 1560 IF L%=2 PROCV
 1570 IF L%=3 PROCM
 1580 IF L%=4 PROCA
 1590 IF L%=5 PROCS
 1600 CLS
 1610 PRINTCHR$130"ANY MORE BUSINESS?"
 1620 INPUT B$
 1630 IF B$="YES" OR B$="Y" THEN PROCtrade ELSE ENDPROC
 1640 DEFPROCS
 1650 CLS
 1660 PRINTCHR$129"(B)uy or (S)ell":INPUT T$
 1670 IF T$="S" THEN 1730
 1680 PRINT
 1690 PRINTCHR$129"How many shares":INPUT N%
 1700 IF N%*S%>`% THEN PRINTCHR$136"Too many!!":GOTO169
0
 1710 SH%=SH%+N%:`%=`%-(S%*N%)
 1720 ENDPROC
 1730 PRINT
 1740 PRINTCHR$129"How many shares":INPUT N%

 1750 IF N%>SH% THEN PRINTCHR$136"Too many!!":GOTO1750
 1760 SH%=SH%-N%:`%=`%+(S%*N%)
 1770 ENDPROC
 1780 DEFPROCC
 1790 CLS
 1800 PRINTCHR$129"(B)uy or (S)ell":INPUT T$

 1810  IF T$="S" THEN 1880
 1820 PRINT
 1830 PRINTCHR$129"How many shares":INPUT N%
 1840  IF N%*C%>`% THEN PRINTCHR$136"Too many!!":GOTO18
30
 1850 CH%=CH%+N%:`%=`%-(C%*N%)
 1860 ENDPROC
 1870 PRINT
 1880 PRINTCHR$129"How many shares":INPUT N%

 1890  IF N%>CH% THEN PRINTCHR$136"Too many!!":GOTO1880
 1900 CH%=CH%-N%:`%=`%+(C%*N%)
 1910 ENDPROC
 1920 DEFPROCV
 1930 CLS
 1940 PRINTCHR$129"(B)uy or (S)ell":INPUT T$
 1950 IF T$="S" THEN 2010
 1960 PRINT
 1970 PRINTCHR$129"How many shares":INPUT N%
 1980 IF N%*V%>`% THEN PRINTCHR$136"Too many!!":GOTO197
0

 1990 VH%=VH%+N%:`%=`%-(V%*N%)
 2000 ENDPROC
 2010 PRINT
 2020 PRINTCHR$129"How many shares":INPUT N%
 2030 IF N%>VH% THEN PRINTCHR$136"Too many!!":GOTO 2020
 2040 VH%=VH%-N%:`%=`%+(V%*N%)
 2050 ENDPROC
 2060 DEFPROCM
 2070 CLS
 2080 PRINTCHR$129"(B)uy or (S)ell":INPUT T$
 2090 IF T$="S" THEN 2150
 2100 PRINT
 2110 PRINTCHR$129"How many shares":INPUT N%
 2120 IF N%*M%>`% THEN PRINTCHR$136"Too many!!":GOTO211
0

 2130 MH%=MH%+N%:`%=`%-(M%*N%)
 2140 ENDPROC
 2150 PRINT
 2160 PRINTCHR$129"How many shares":INPUT N%
 2170 IF N%>MH% THEN PRINTCHR$136"Too many!!":GOTO 2160
 2180 MH%=MH%-N%:`%=`%+(M%*N%)
 2190 ENDPROC
 2200 DEFPROCA
 2210 CLS
 2220 PRINTCHR$129"(B)uy or (S)ell":INPUT T$
 2230 IF T$="S" THEN 2290
 2240 PRINT
 2250 PRINTCHR$129"How many shares":INPUT N%
 2260 IF N%*A%>`% THEN PRINTCHR$136"Too many!!":GOTO225
0

 2270 AH%=AH%+N%:`%=`%-(A%*N%)
 2280 ENDPROC
 2290 PRINT
 2300 PRINTCHR$129"How many shares":INPUT N%
 2310 IF N%>AH% THEN PRINTCHR$136"Too many!!":GOTO 2300
 2320 AH%=AH%-N%:`%=`%+(A%*N%)
 2330 ENDPROC
 2340 DEFPROCbank
 2350 CLS
 2360 PRINTCHR$141;CHR$132;CHR$157;CHR$131"     STATEME
NT OF ACCOUNT"
 2370 PRINTCHR$141;CHR$132;CHR$157;CHR$131"     STATEME
NT OF ACCOUNT"
 2380 PRINTCHR$136" YOU HAVE:"
 2390 PRINTCHR$129"          ";CH%;" Coal shares"
 2400 PRINTCHR$130"          ";VH%;" Car  shares"
 2410 PRINTCHR$131"          ";MH%;" Computer shares"
 2420 PRINTCHR$132"          ";AH%;" Airline shares"
 2430 PRINTCHR$133"          ";SH%;" Steel shares"
 2440 PRINT
 2450 PRINTCHR$130"          You have `";`%
 2460 T%=((A%*AH%)+(C%*CH%)+(VH%*V%)+(MH%*M%)+(SH%*S%)+
`%)
 2470 PRINT'''
 2480 PRINTCHR$141+CHR$132"You are worth `";T%
 2490 PRINTCHR$141+CHR$132"You are worth `";T%
 2500 K=GET
 2510 ENDPROC
```

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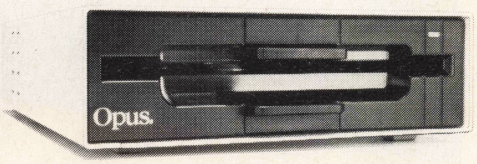

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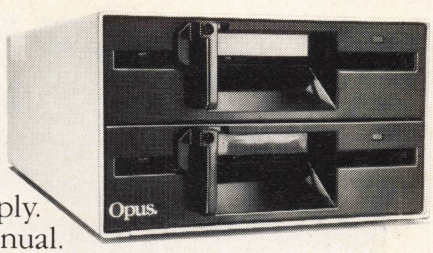

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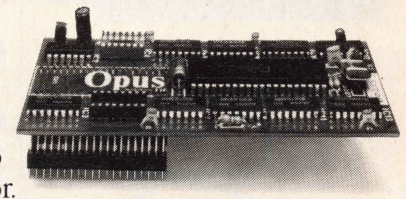

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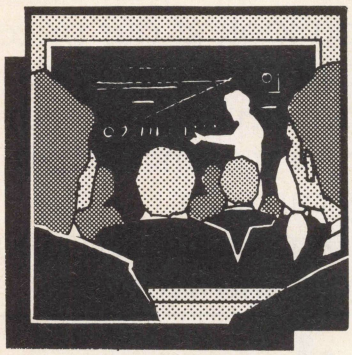

BBC/ELECTRON

Graphic Animation

Learn about high resolution screens and colour switching on the Acorn machines. Also included is an amazing graphic display program.

In this month's article, the last of the series, we will discuss the use of the beeb's high resolution commands. They are used in conjunction with common mathematical transformations and intelligent colour switching techniques.

One of the more useful commands on the BBC Micro is the DRAW X,Y command. This draws a straight line between the old graphics cursor position to the given co-ordinate (X,Y). The line is drawn in the current graphics foreground colour, in the specified format (the way the colour is placed on the screen, ie EOR). As with character plotting, line drawing can be used for animation purposes. Again one major problem is the extremely slow execution speed of these commands.



Colour switching

For some applications colour switching can be used to give seemingly

fast animation of large objects. When you are using screen MODE 2 there are 16 colours available including black. Each colour can be redefined to any other available colour. For example, if there is a certain colour on the screen which needs to be temporarily cleared, then this colour can be redefined to match the background colour. Type the following lines directly into your machine:

```
MODE 2
VDU 19,7,0,0,0,0
```

You will have noticed that the text disappears, and all that is left is the flashing cursor. The VDU 19 command changed logical colour 7, to physical colour 0 (the background colour). To return to normal, colour 7 hs to be defined as colour 7, as below:

```
VDU 19,7,7,0,0,0
```

The format for the command is: VDU 19, logical colour, physical colour, 0,0,0.

The logical colour is the normal number associated with the colour, although it may not appear on the screen as that colour. The physical colour is the actual colour displayed for the given colour number. The VDU 19 is the actual command, while the training zeros are not used as standard and are only there for future expansion. Therefore this can be simplified to:

VDU 19, logical colour, physical colour;0;

Note the two ";" (semicolons).

See the program below:

```
10    MODE 2
20    GCOL 0,3
30    VDU 19,3,1;0;
40    VDU 19,2,0;0;
50    GCOL 3,1
60    MOVE 0,1023
70    PLOT
      85,800,512
80    GCOL 3,2
90    MOVE 1279,0
100   MOVE
      1279,1023
110   PLOT 85,40,512
120   REPEAT
130   VDU
      19,1,1;0;19,
      2,0;0;
140   dummy$ = GET$
150   VDU 19,1,0;0;
      19,2,1;0;
160   dummy$ = GET$
170   UNTIL FALSE
```

This program draws two triangles on the screen, one to the left and the other to the right. The area where they overlap will remain the same colour. This happens when the two triangle colours EOR together to form colour 3. Therefore colour three will always be displayed (line 30). The other two colours are then switched ON and OFF alternately when any key is pressed (lines 130-180).

Demo program

This principle is used in the Program 1 to give a very dramatic affect. The program takes a few minutes to generate the original screen, then the colours are switched to give 15 individual frames. The word 'PCT' is drawn 15 times after being shrunk and rotated repeatedly.

The routines most difficult to understand are the PROCrotate and PROC expand, and these are explained later. All the data statements give co-ordinates relative to an origin in the middle of the screen, line 120 achieves this. The data take the format of X1,Y1,X2,Y2, where the line is drawn from X1,Y1 to X2,Y2. The first data statement informs the program of the number of lines to follow.

PROCexpand (mag)

To shrink or enlarge a point it must be multiplied by a magnification constant. If the constant is below 1 then the shape will shrink, if above 1 then the shape will be enlarged. If a point is at 100,100 then to shrink it by half we have to multiply both co-ordinates by 0.5. This action is applied to every point in the shape and is reasonably straight forward (lines 430-460).

PROCrotate (angle)

This routine rotates all the co-ordinates within the shape around the origin by the given angle. When using angles the BBC Micro uses radiens, so the angle (0 to 359) has to be converted to radiens first (line 520). After which the following formula will determine the new co-ordinates (lines 540-590):

```
X' = X * COS(angle) - y
* SIN(angle)
Y' = X * SIN(angle) + Y
* COS(angle)
```

'O' level mathematical knowledge is required to understand this, so accept this as being correct. This has to be repeated for every co-ordinate pair, and takes a fair while before all the variations are drawn.

After the screen has been set up, then each colour will be displayed as red one by one, with all the others being left as black (the background colour). This permits you to have a maximum of 15 frames which usually suffices.

The bad aspect of this demonstration is that the letters PCT tend to be corrupted. This is due to the way the frames are placed on the screen, as when any frames overlap a notch will be left in the previous and, in this case, the next largest frame. This means that only the last frame drawn (which is the smallest in colour 15) will remain perfect. If fewer frames were used then the EORing method (as used in the triangle program) could be used as the overlapped areas could be foreseen and changed. With efficient and well thought out programming, amazing effects can be generated.

I hope these articles have helped to give a greater understanding of computer graphics. The only way to improve is to practice the illustrated techniques and examine other peoples' programs. Not all variations of computer graphics can be covered and even then none can be fully revealed in such short articles. The best thing is to keep at it and be amazed with your own graphics demos and games.

program listing

Program 1 Demonstration

```
 10 REM ************************
 20 REM *                      *
 30 REM *  Enlargement &       *
 40 REM *  Rotation    &       *
 50 REM *  Colour switching    *
 60 REM *  demo, by :          *
 70 REM *                      *
 80 REM *  Fouad Katan.        *
 90 REM *                      *
100 REM ************************
110 MODE 2
120 VDU 29,640;512;     :REM origin at centre of screen.
130 PROCread
140
150 REM Draw 15 possible positions.
160 GCOL 0,1
170 PROCdraw
180 FOR loop=2 TO 15
190   GCOL 0,loop
200   PROCrotate(24)
210   PROCexpand(0.9)
220   PROCdraw
230   NEXT
240
250 REM Switch all colours to 0 (background).
260 FOR X%=1 TO 15
270   VDU 19,X%,0;0;
280   NEXT
290
300 REM Now colour switch the shapes.
310 FOR X%=15 TO 1 STEP -1
320   VDU 19,X%+1,0;0;
330   VDU 19,X%,1;0;
340   dummy$=INKEY$(8)
350   NEXT
360 dummy$=INKEY$(300)
370 GOTO 260
380 END
390
400 REM Shrink/Magnify shape using mag.
410 DEF PROCexpand(mag)
420 FOR X%=1 TO NL%
430   X1(X%)=X1(X%) * mag
440   X2(X%)=X2(X%) * mag
450   Y1(X%)=Y1(X%) * mag
460   Y2(X%)=Y2(X%) * mag
470   NEXT
480 ENDPROC
490
500 REM Rotate shape by an angle.
510 DEF PROCrotate(angle)
520 angle=RAD(angle)
530 FOR X%=1 TO NL%
540   tempx=X1(X%) * COS(angle) - Y1(X%) * SIN(angle)
550   Y1(X%)=X1(X%) * SIN(angle) + Y1(X%) * COS(angle)
560   X1(X%)=tempx
570   tempx=X2(X%) * COS(angle) - Y2(X%) * SIN(angle)
580   Y2(X%)=X2(X%) * SIN(angle) + Y2(X%) * COS(angle)
590   X2(X%)=tempx
600   NEXT
610 ENDPROC
620
630 REM Read shape definitions.
640 DEF PROCread
650 READ NL%
660 DIM X1(NL%),X2(NL%),Y1(NL%),Y2(NL%)
670 FOR X%=1 TO NL%
680   READ X1(X%),Y1(X%),X2(X%),Y2(X%)
690   NEXT
700 ENDPROC
710
720 REM Draw the shape.
730 DEF PROCdraw
740 FOR X%=1 TO NL%
750   MOVE X1(X%),Y1(X%)
760   DRAW X2(X%),Y2(X%)
770   NEXT
780 ENDPROC
790
800 REM The number of lines.
810 DATA 26
820
830 REM The letter "P"
840 DATA -550,200,-250,200
850 DATA -250,200,-250,-50
860 DATA -250,-50,-450,-50
870 DATA -450,-50,-450,-200
880 DATA -450,-200,-550,-200
890 DATA -550,-200,-550,200
900 DATA -450,150,-300,150
910 DATA -300,150,-300,0
920 DATA -300,0,-450,0
930 DATA -450,0,-450,150
940
950 REM The letter "C"
960 DATA -150,200,150,200
970 DATA 150,200,150,100
980 DATA 150,100,-50,100
990 DATA -50,100,-50,-100
1000 DATA -50,-100,150,-100
1010 DATA 150,-100,150,-200
1020 DATA 150,-200,-150,-200
1030 DATA -150,-200,-150,200
1040
1050 REM The letter "T"
1060 DATA 250,200,550,200
1070 DATA 550,200,550,100
1080 DATA 550,100,450,100
1090 DATA 450,100,450,-200
1100 DATA 450,-200,350,-200
1110 DATA 350,-200,350,100
1120 DATA 350,100,250,100
1130 DATA 250,100,250,200
```

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Artificial Intelligence

Fifth Generation computers will rely heavily on artificial intelligence. But what is it? Richard Bartle explains.

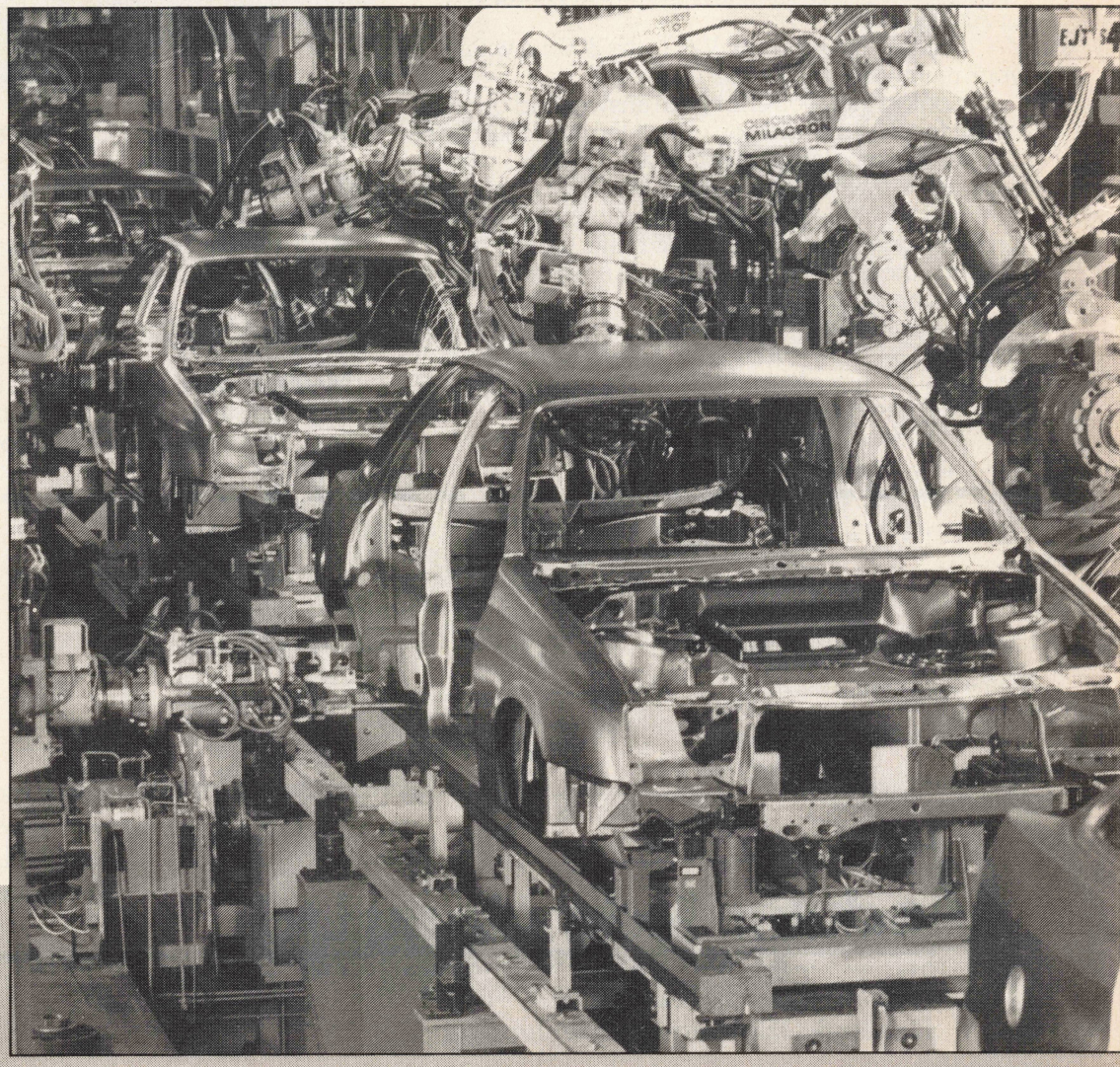
A new disciplne has appeared with a blaze of publicity in the scientific world. Its very name, Artificial Intelligence, conjures up visions of a subject right at the forefront of mankind's quest for knowledge. Governments worldwide are ploughing millions of pounds into research in the area, the media are showing a consequent interest, and universities are setting up new courses almost daily in the 'subject of the future'. But outside the academic and technological spheres, it remains a mystery (except to pig farmers, and to them it means 'artificial insemination'!). So what is all the fuss about?

Essentially, AI is concerned with ways to make the computer intelligent. Intelligence, of course, is a rather ill-defined term, and most programmers would be pleased if they could merely get their programs to *look* intelligent, never mind *be* intelligent (if indeed the two aren't the same!). AI has been studied for 30 years already, but even now there isn't a universally accepted definition of what it is.

AI is rather a woolly area of computer science, researched on the whole by a conglomeration of people with different backgrounds and different ideas on what they're supposed to be doing in all but the vaguest sense. It also hasn't produced anything particularly useful since its inception. So why has it suddenly emerged from its chrysalis to attain a startling prominance? The answer is that when it *does* come up with something, and that time is close at hand, it will revolutionise technology as we know it.

Subjects within a subject

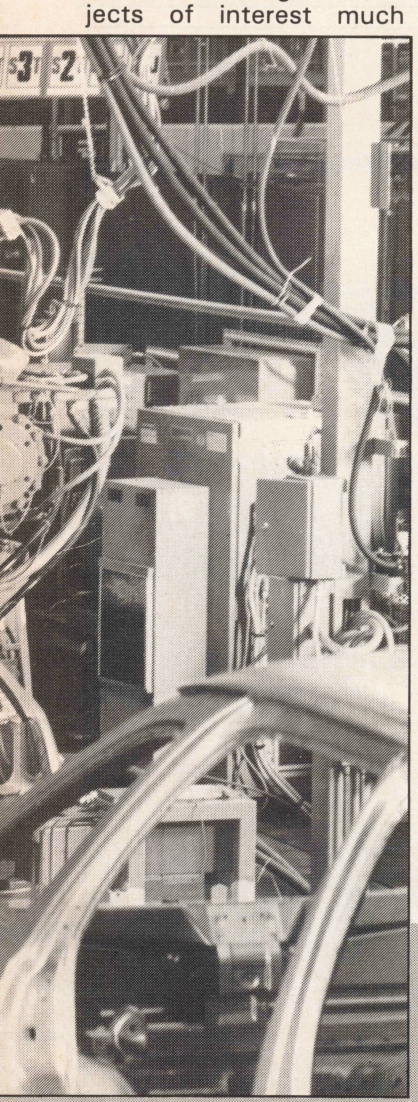
If we take a look at some of the subdivisions of AI, the enormous potential of the area can be seen. Take computer vision, for example. If computers could readily recognise even some of the most mundane objects around us, the effects would be tremendous. Robots would be able to avoid accidental contact with other objects



which would lift restrictions on where they could move.

Manufacturing would be improved if the current accuracy requirements of automatic assembly were reduced so that machines could see where something is, rather than being told where it should be. People could be identified by the way they look rather than by which little plastic cards they carry — ideal for security.

By using light outside the visible range and lenses more powerful than those in the human eye, computers could see things that people find impossible without the aid of slow-to-focus devices such as microscopes. The computer's ability to search the image for objects of interest much quicker than people can would help in areas as diverse as navigation, astronomy and sub-atomic physics.



There are more sinister uses, of course, for example missiles would be able to see their targets and dodge any counter-fire, although a benefit would be that at least they wouldn't hit anything they weren't supposed to! The biggest advantage of having machines which can see (and know what they're seeing) is that computers would be able to take in information from the outside world by observation (eg reading), rather than by being programmed.

Limitless applications

Other parts of AI promise to be of similar utility. Language translation alone costs the EEC hundreds of millions of pounds every year; wouldn't it be useful if it could be automated? Well, for everyone except the linguists who do it at the moment, perhaps! Anything enabling computers to understand voice input on their own, rather than making some poor human slave over a hot keyboard typing things in, is another decidedly useful feature.

Computer planning and problem-solving would save a lot of effort, too, especially in dealing quickly with unexpected situations. If a remote space probe was about to be hit by interstellar debris, it could survive if it could recognise what was going to happen and take evasive action all by itself. Had it instead to be controlled from Earth, then it may be half an hour before the radio signals asking for instructions even reached the base, by which time all there would be left to receive it would be a bit more interstellar debris!

Many of these aspects of AI are incidental to producing something which can think on its own two feet/wheels and researchers are now getting close to achieving them as subgoals. Already programs can be written which can parse up to 90% of everyday English sentences; certainly good enough for most requirements. Some of the knowledge gained from work in vision is being used to help blind people to 'see' by means of vibrating rods acting on their backs.

Translation of newspaper stories from one language to another has been possible for some time and there are programs around which have developed useful new mathematical theories (and which have also won national wargame competitions against human opponents, using human-like reasoning rather than brute force and ignorance). Although the construction of an artificial intelligence itself is a long way off, some of the techniques already developed are of significant use to the computer industry.

The excitement of being able to build something which might think is attracting many students to AI at universities, and the prospect of another country getting a lead on them is prompting the governments to stump up cash for research.

This latter trend was started by the Japanese 5th generation initiative. The U.K.'s answer to this is the Alvey Project, named after the government committee set up to look into the whole business.

Industrial interest

There is a feeling, however, that the current surge of interest is a passing phase. AI's attempt to woo industry is the Expert System class of program. The idea here is that if you want to do something but you don't know how, or if you want to learn something, then you ask an expert. Ah, but experts are few and far between and they often have more deserving things in which to invest their time. So, if you could arrange for a computer program to give you the required information it would save time and money.

This notion has captured the imagination of the larger industrial companies and a good deal of work has been put into expert systems to come up with something impressive. However, it is obvious that the classic type of Expert System is not up to this task. They have to be hardwired to a particular field to be of any use because the general 'shell' systems designed to cover several domains have turned out to be jacks of all trades but masters of none.

Only a few hundred pieces of expert knowledge can be encoded before the systems get bogged down, whereas the typical human expert has many thousands of them. The fact that they don't work convincingly in a human-like manner means it's hard to transform human-like know-

ledge into something that they can accept. Worst of all, it's tremendously difficult to get even willing experts to express their skills in any coherent form whatsoever!

This is not to say that all expert systems aren't worth the bits they're stored in, but the term has become such a buzz-word these days that small software houses are bringing out feeble packages which they call 'expert systems'. There's only a limited number of times they can do this before the world realises they're being taken for a ride. They detract from the genuinely good expert systems which quite rightly got the bandwagon rolling in the first place.

The danger is that once the term 'Expert System' has been milked for all it's worth, people will bring out 'Artificial Intelligence' programs, meaning they were written in LISP or PROLOG (the main AI languages), and which may not have anything to do with A1 at all.

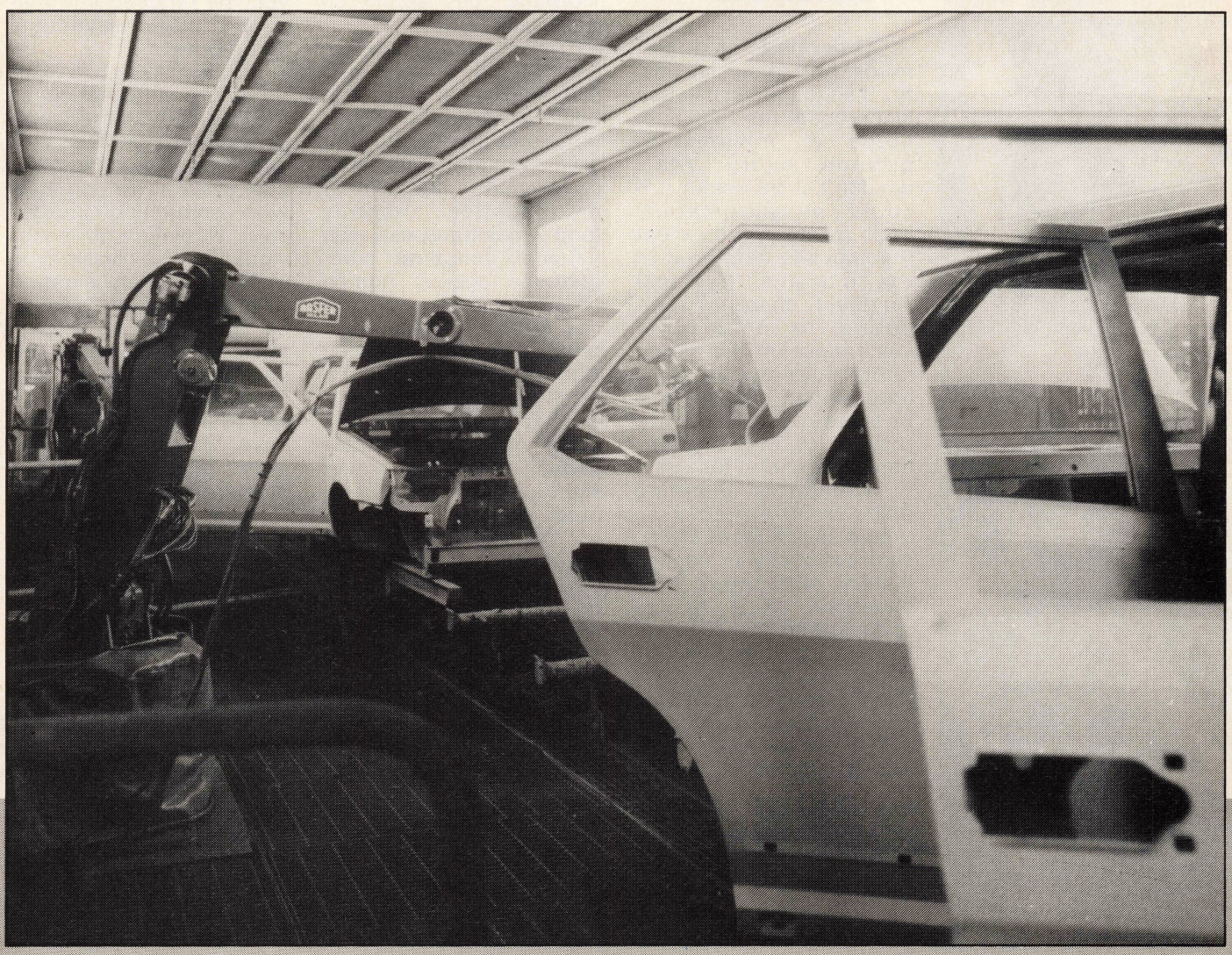
If expert systems prove to be a bit of a letdown, AI is still here to stay because companies have seen the other gems at which researchers have been beavering away for the past few years, and are taking some of their programming technology on board. However, the warning is there and the euphoria which accompanied initial successes in the relationship between AI and industry is likely to disappear, to be replaced by a more realistic arrangement with more clearly-defined goals. the Alvey Project is proving to be useful in forging links between the two and many collaborative programmes are now under way.

Future developments

Sceptics look on all this and say it's a waste of time. At the moment AI is on the up and up but the Alvey committee isn't the only government quango set up to look at developments. AI in Britain was nearly wiped out a decade ago when a similar group produced the Lighthill Report and unless AI delivers the goods it promises the same thing could happen again.

Fortunately, we are getting closer to our goals. the Lighthill report, however, still has its fair share of vociferous advocates, even though it contains some rather lopsided observations. The strangest of them was in noting that most AI workers are male, suggesting that perhaps the reason for wanting to create an artificial intelligence was to compensate for not having the female ability to bear children! Perhaps it's the the pig farmers who have the right definition of AI after all?!

Richard Bartle is a researcher in the Department of Computer Studies at Essex University. A further article by him, relating AI to computer games will be publsihed in a future issue of PCT.



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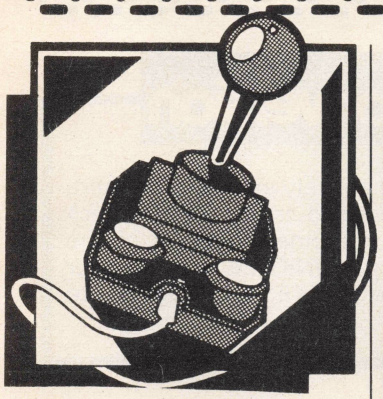
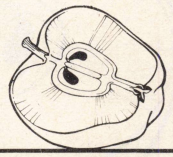
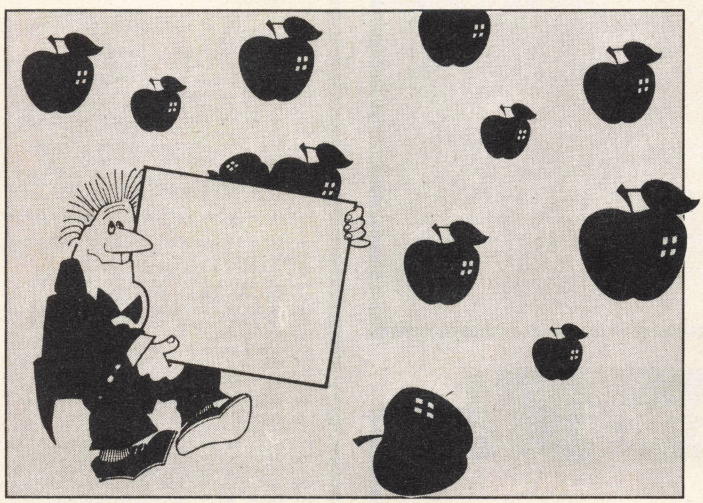


Ambridge Antics



SPECTRUM 16K

Escape Walter Gabriel's fury by collecting a harvest of apples before he catches you! A fast and furious game by Jack Knight.



The setting for the game is Walter Gabriel's orchard. You have a basket for catching his apples as they fall from the trees. They do not fall singly. If they did you would be earning your wages too easily. And that is not all...

Some of the apples are bad but you cannot recognise a rotten apple until the very last moment, just before it is about to enter your basket. Instant action is needed. Catch it and Walter will make a furious appearance.

As he will too if you miss 50 sound apples. So you cannot play it safe. You have to go for every apple, and with nerves on edge be ready to jerk the basket out of the way of a bad one. See how much you can earn in wages. There is on-screen scoring, and a high score to beat.

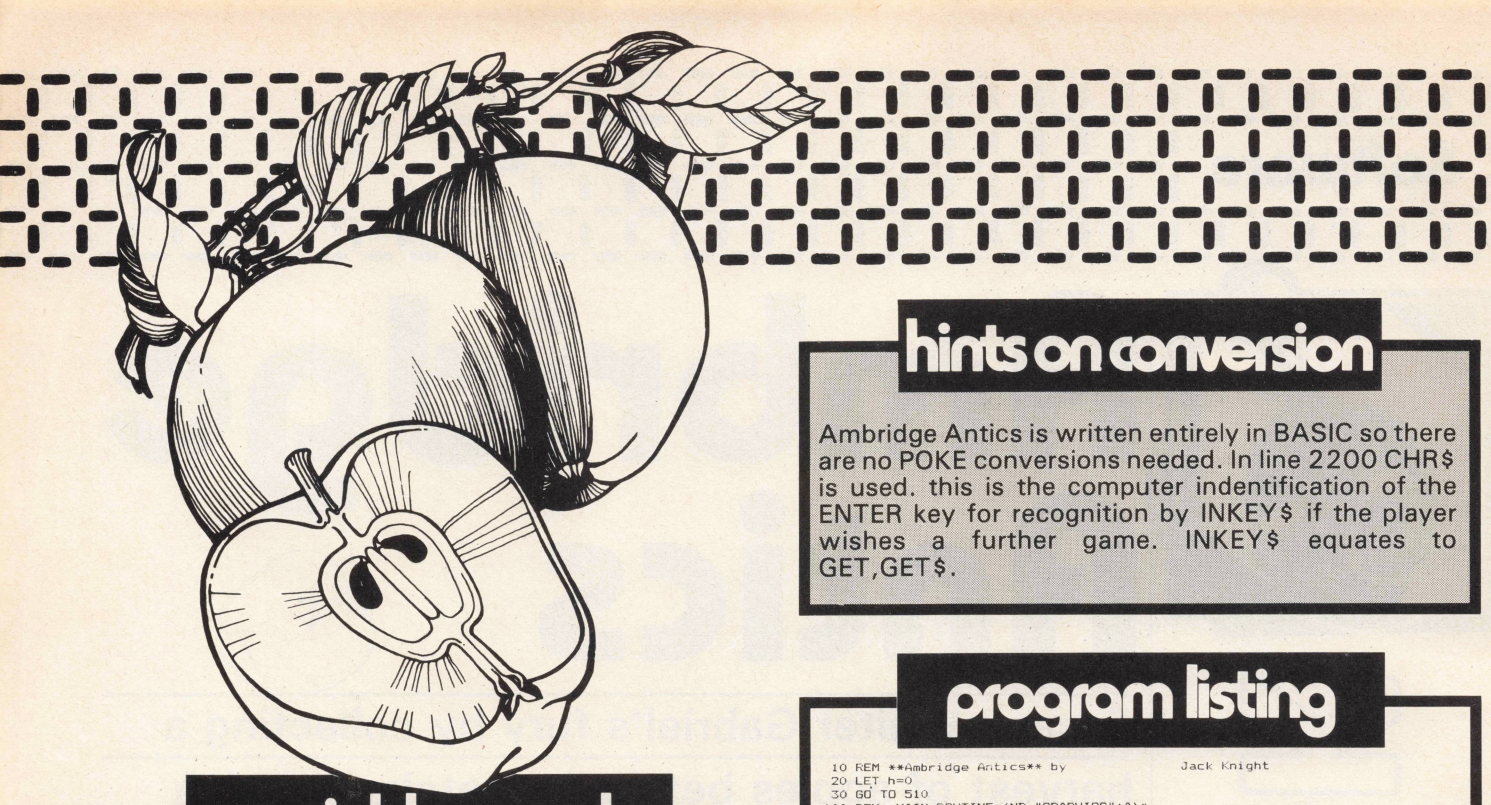
Walter has two positions. By flashing from one to the other the illusion is created of his leaping up and down in rage. BEEPs simulate his angry shouts (and deliberately slow the computer so that Walter is not reduced to a blur).

If two apples were to arrive together, the game would be impossible, so the next apple is set off when the first is about half way down the screen. A switch 'y'/'n' allows for the second apple to be printed independently of the first.

For speed of movement, the basket is two characters wide. The print column number is increased (or decreased) by two (hence the * 2 in the program).

The basket is moved by the left and right cursor movement keys. These are the only operating keys needed to play the game.

Instructions on how to play are given on-screen at the start. However, on accepting the invitation to try and better your score by replaying, the game goes (through re-setting of variables) straight to the action, missing out the opening screen.



variables used

d,a : Down and across print position for apple 1.

dd,aa: Down and across print position for apple 2.

g : Across print position for basket.

gg : Across print position for basket eraser.

x$: 'y'/'n' switch to start ('y') second apple and to allow its independent printing ('n').

f : Randomiser for apple's final colour.

i1,i2 : Ink colour for apples 1 and 2.

s,h,m: Score ('Wages'), high-score, misses.

a,b,j : FOR-NEXT loop controllers.

how it runs

Line	Effect
110-156	Print a) apple 1, b) apple 2, c) basket eraser, d) basket.
160-170	If condition fulfilled send to sub-routine.
210	Turns off apple 2 starter.
310-340	Decide whether apple shall be black.
410-499	Check if a) sacked, b) apple caught, c) apple missed; up-date wages or misses; go to end, or main loop with randomised apple across print positions.
510-610	Create graphics.
700-740	Instruct (by use of the graphics) how to play the game, mask reading-time by cords, warn of game start.
810-930	Initialise main variables; set-up on-screen scoring.
1100-1700	Print angry Walter Gabriel with accompanying 'shouts', and the sacked message.
2100-2300	Instruct how to re-play; if score higher, increase high-score; re-set variables and go direct (missing out opening instructions) to play loop.

hints on conversion

Ambridge Antics is written entirely in BASIC so there are no POKE conversions needed. In line 2200 CHR$ is used. this is the computer indentification of the ENTER key for recognition by INKEY$ if the player wishes a further game. INKEY$ equates to GET,GET$.

program listing

```
 10 REM **Ambridge Antics** by                Jack Knight
 20 LET h=0
 30 GO TO 510
100 REM *MAIN ROUTINE (NB "GRAPHICS"+A)*
110 PRINT AT d,a;" ";AT d+1,a; INK i1;"A": LET d=d+1
120 IF d>=10 AND x$="y" OR x$="n" THEN  PRINT AT dd,aa;" ";AT dd+1,aa; INK i2;"
A": LET dd=dd+1
140 LET g=g+((INKEY$="8" AND g<=28)*2)-((INKEY$="5" AND g>=2)*2)
145 IF g<>gg THEN  PRINT AT 20,gg;"  "
150 PRINT ; PAPER 6;AT 20,g;"XX"
156 LET gg=g
160 IF d=15 OR dd=15 THEN  GO TO 210
170 IF d=19 OR dd=19 THEN  GO TO 410
180 GO TO 110
200 REM *TURNS OFF dd STARTER
210 IF x$="y" THEN  LET x$="n"
300 REM *RANDOM BLACK APPLE*
310 LET f=INT (RND*6)
320 IF d=15 AND f=5 THEN  LET i1=0
330 IF dd=15 AND f=5 THEN  LET i2=0
340 GO TO 110
400 REM *DECIDES LOSE,WAGES & MISSES (NB "GRAPHICS"+A)* 410 IF SCREEN$ (d+1,a)=
"X" AND i1=0 THEN  GO TO 1100
420 IF SCREEN$ (dd+1,aa)="X" AND i2=0 THEN  GO TO 1100
425 IF SCREEN$ (dd+1,aa)="X" THEN  LET s=s+1: PRINT ; PAPER 7;AT 21,7;s: GO TO
460
430 IF SCREEN$ (d+1,a)="X" THEN  LET s=s+1: PRINT ; PAPER 7;AT 21,7;s: GO TO 45
0
440 IF d=19 AND i1=4 OR dd=19 AND i2=4 THEN  LET m=m+1: PRINT ; PAPER 7; FLASH
(m>=45);AT 21,28;m
450 IF d=19 THEN  PRINT AT d,a;" "
460 IF dd=19 THEN  PRINT AT dd,aa;" "
470 IF m=50 THEN  GO TO 1100
480 IF d=19 THEN  LET d=0: LET a=INT (RND*21+5): LET i1=4
490 IF dd=19 THEN  LET dd=0: LET aa=INT (RND*21+5): LET i2=4
499 GO TO 110
500 REM *CREATES THE GRAPHICS*
510 FOR a=0 TO 4
520 READ a$
530 FOR b=0 TO 7
540 READ c: POKE USR a$+b,c
550 NEXT b
560 NEXT a
570 DATA "a",8,126,255,255,255,255,126,60
580 DATA "b",0,0,0,0,56,186,146,254
590 DATA "c",56,56,56,56,68,130,68,40
600 DATA "d",56,186,146,254,56,56,56,56
610 DATA "e",40,40,40,40,40,0,0,0
700 REM *OPENING ROUTINE (NB "GRAPHICS"+A)*
710 BORDER 0: PAPER 5: CLS : INK 0
711 PRINT AT 3,4; INK 4;"AAA "; INK 1; INVERSE 1;"Ambridge Antics"; INVERSE 0;
INK 0;" AAA"
720 PRINT AT 7,1;"Catch ALL the  "; INK 4;"A";;AT 9,1; INK 0; "But not the    "
;"A";AT 11,1;"Use <- or ->" ;AT 12,3;"to move the  "; PAPER 6;"XX"
730 FOR j=1 TO 15: BEEP .1,j: BEEP .1,15-j: NEXT j: CLS
740 PRINT AT 13,9; INK 2; PAPER 6; FLASH 1;"YOU'RE OFF!": PAUSE 25: BEEP .1,0:
CLS
800 REM *SETS VARIABLES ETC*
810 LET d=0
820 LET dd=0
830 LET a=INT (RND*21+5)
840 LET aa=INT (RND*21+5)
860 PRINT ; INK 7; PAPER 0;AT 21,0;" WAGES:     HIGH:      MISS:    "
870 PRINT ; PAPER 7;AT 21,17;h
880 LET x$="y"
890 LET g=14
895 LET gg=g
900 LET i1=4: LET i2=4
910 LET s=0
920 LET m=0
930 GO TO 110
1000 REM *END ROUTINE (NB "GRAPHICS"+B,C,D,E)*
1100 FOR j=1 TO 7
1200 PRINT AT 14,26;"B";TAB 26;"C"
1300 BEEP.1,-15
1400 PRINT AT 14,26;"D";TAB 26;"E"
1500 BEEP .05,-17
1600 NEXT j
1700 PRINT ; INK 2; PAPER 6; FLASH 1;AT 5,6;"YOU'RE SACKED!!!!!"
2000 REM *NEW GAME ROUTINE*
2100 PRINT AT 10,1;"FOR ANOTHER TRY-PRESS *ENTER*"
2150 IF s>h THEN  LET h=s
2200 IF INKEY$=CHR$ 13 THEN  CLS : PAUSE 50: GO TO 810
2300 GO TO 2200
```

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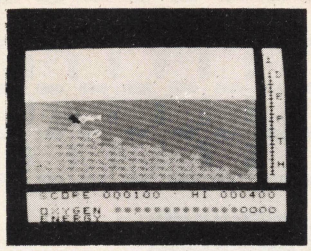

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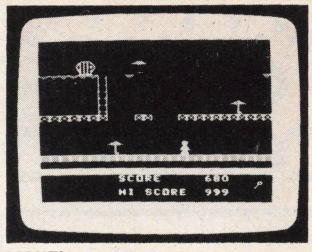

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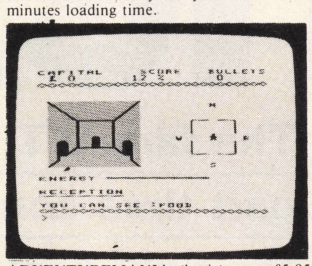

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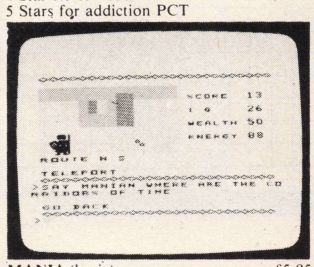

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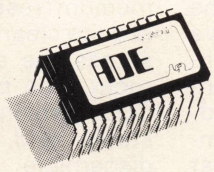

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The DEBUGGER is instantly accessible for inspecting, modifying and disassembling machine code programs. Features include full 64 byte display in hex, ASCII and disassembled format; registers; stack; single step; breakpoints; memory search and much more.

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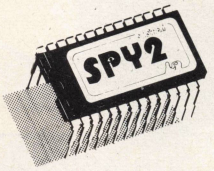


SPY2 is a front panel debugging monitor, disassembler and disc utility ROM. SPY2 is instantly accessible to the programmer for inspecting, modifying, debugging and disassembling machine code programs. SPY2 also features a relocator and program trace facilities. SPY2 will access any ROM either in the sideways ROM sockets or on an extension board. ROM memory may be displayed, single-stepped through or disassembled.

SPY2 includes a set of powerful disc recovery commands for interrogating, editing and retrieving data stored on a floppy disc. SPY2 also includes a disc formatter as well as a non-destructive single track reformatter.

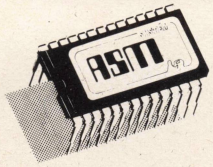
In all SPY2 has a comprehensive set of 23 utility commands. These are supported by an excellent Reference Manual.

The SPY2 front panel encompasses all the superb, easy-to-use facilities of the renowned SPY debugging monitor PLUS additional commands for toggling and finding breakpoints; relocating machine code programs; single stepping through subroutines in one go and facilities for accessing the front panel from programs in RAM or ROM with breakpoints, OSBYTE or CTR-F.

SPY2 features a versatile disassembler with hex dump, full and intelligent disassembly. This identifies data areas in the program; these being displayed as a hex/ASCII dump. Operating system calls are labelled creating very readable code. The powerful trace facilities enable program instructions and register contents to be traced to printer whilst the program is running. Indispensable for graphics programs as they can be stepped through whilst observing the effects on the screen.

SPY2 features a disc sector editor displaying the contents of a whole sector; disc search facilities for finding byte patterns or strings and free disc space. Files may be recovered by creating a directory entry with all the data concerning the deleted file. Directory entries can be easily amended using the *AMEND command. The *FORMAT command formats discs with any number of tracks. A verify command checks discs. The *REFORMAT command is extremely useful for recovering information from a bad track, reformatting it and restoring the data. Commands are included for loading files at &1900 and automatically downloading (and running) them.

The most comprehensive of all debugging/disc utility ROMs. **Price £30 inc vat.**



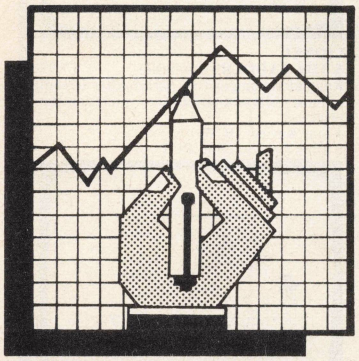
ASM provides all the superb features of the ADE macro assembler on its own ROM.

The program source file may be written using any editor (even Wordwise or View!). Complete with reference manual and utility/macro library disc. Use the assembler that professional software writers use.

Price £35 inc vat. Please specify 40 or 80T utility disc.

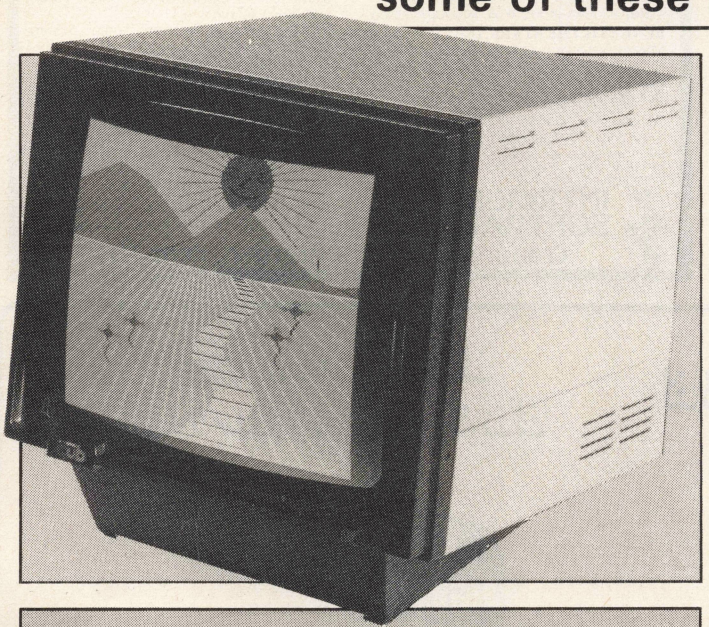
Buy it with Access VISA

SYSTEM Dept T 12 Collegiate Crescent, Sheffield S10 2BA (0742) 682321



Testbed

The family T.V. is all very well if you are a part time computer user, but if you want the right tool for the job, take a look at some of these monitors.



MODEL:	CUB 452 14" Medium Resolution, Colour
MANUFACTURER:	Microvitec
PRICE:	£340 with metal case ex. VAT

Why buy a monitor when everyone already has a colour television and many have a portable in the kitchen or bedroom.

Perhaps if you are a part-time computer user, plugging in for the odd game at weekends, you can get away with this thinking. If you use your computer for any serious business or educational application you can't. Nor if you turn on most nights and weekends. Then, to get full value out of your computer display, a monitor becomes an important peripheral.

The nice thing about Microvitec is that they offer a complete range of monitors so that you can choose just the unit for your application, pocket and to match your computer. With a nod in the direction of compromise, we will look at the medium resolution CUB monitor, colour of course — if you want a black and white computer, go buy a Macintosh!

The CUB has a "blue tube" which can best be observed with the monitor switched on but the computer disconnected. The screen is a hue of deep blue. This background has a calming effect on the eyes and appears to give depth to the two dimensional image. For continuous use, say word-processing, a restful image is important. Most commercial database and wordprocessing packages use colour to good effect so a colour CUB scores over the green phosphor screen, and then of course there are the games.

Some of the current Spectrum adventures use stunning full screen graphics and come alive on a monitor screen. The medium resolution is quite enough, giving a sharp picture with consistent colours. The eight colours of the BBC palette look very bright and solid with no fuzzing at the edges.

Most televisons blur the finest colour mixing but not this monitor. Each pixel can be clearly made out. High resolution graphics, graphic envelopes and Moiré patterns become sensational. The next step up to high resolution should prove unnecessary unless technical graphs or data have to be displayed to the greatest possible degree of accuracy. The medium resolution image is quite clearly visible from across the average living room. The picture on the CUB remains completely stable and there is no discernible distortion of the picture.

When you have invested so much in a peripheral like the Microvitec CUB, it pays to look after it. The screen attracts dust and dirt and needs regular cleaning. Anti-static cleaners are available. Don't rest any other devices on the monitor especially an additional speaker or speech synthesis unit. The Microvitec CUB is worth taking care of and you can use it with your video recorder. Who needs a television?

MODEL:	MAM III, 14" Low Resolution, Colour
MANUFACTURER:	Advanced Datum Information Corp. Sole U.K. Distributors, Microage
PRICE:	£319.70 inc. VAT

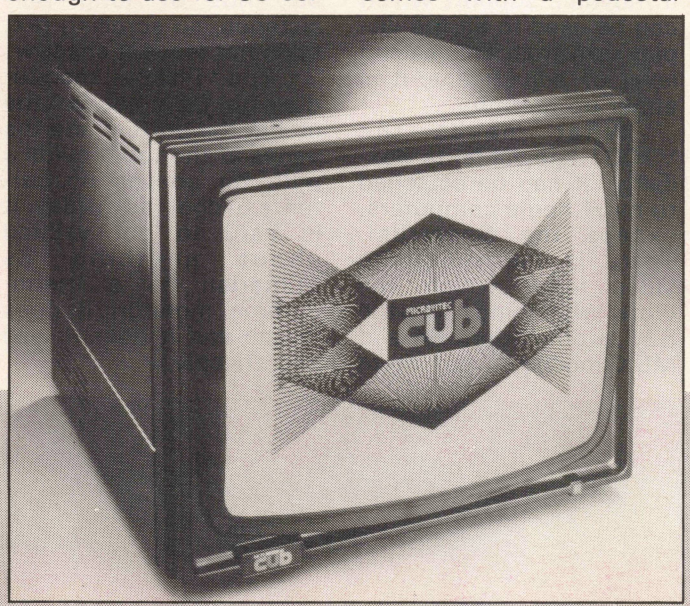
The MAM III is a good quality general purpose monitor and compared to its rivals it has a lot going for it. Most monitors have only a couple of controls on the outer casing but the MAM III has in addition, vertical and horizontal hold, synchronisation control and a few quite novel adjustments.

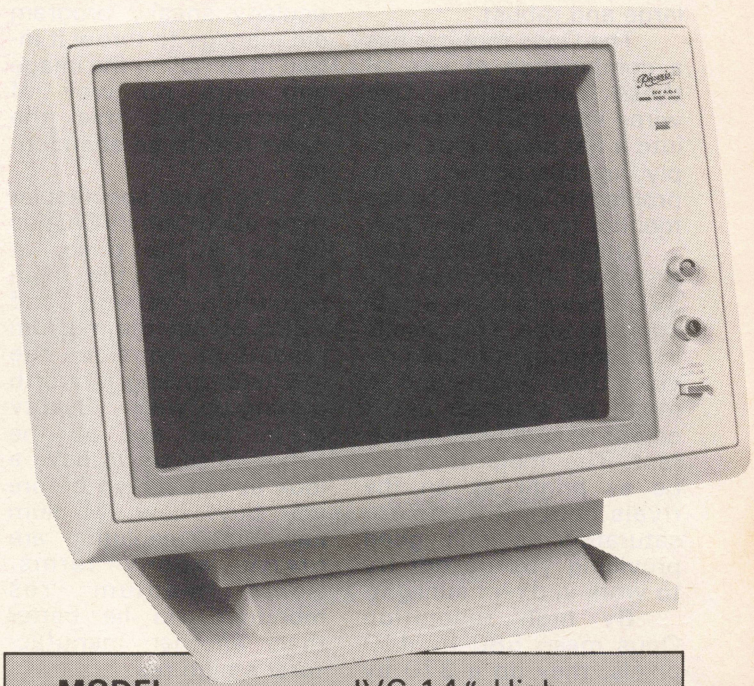
The most obvious of these is the 'green switch'. This is a rectangular button on the front of the case which switches off one electron gun to produce a green (black and white) screen display. Unlike a "proper" green screen there are no levels of intensity, no light and dark greens. This is fine for monochrome wordprocessors like Acornsoft's View but may mean that you cannot read prompts with software which uses colour, such as Wordwise. This is not as critical as it sounds since editing under Wordwise is done in a 40 column mode and this is very readable with the monitor set to colour.

The monitor is good enough to use for 80 column colour display as in most non-wordprocessing work. Other controls affect the size and positioning of the text on the screen. This would not cure the problem of the QL's display which overscans and falls off the edges of the picture in monitor mode but it will help to centre a picture which goes off the top or bottom of the screen.

Some of the effects which can be produced simply by knob twiddling are stunning if a little limited in usefulness. The sync control allows the MAM III to be used as a general purpose monitor; it can be set up to work with most machines that use RGB, even the particularly difficult IBM PC. The disadvantage of this is that the sync has to be very carefully set up. When used with a BBC Micro different modes require different settings but with a lot of patience a perfect setting can be found. Nonetheless this is annoying.

The monitor provides good value for money and comes with a pedestal and turntable to allow it to tilt and swivel. The case is smart and robust in neutral beige. When it comes to the nitty gritty, the MAM III has a very good low/medium resolution high contrast screen, and is a worthwhile alternative to the Microvitec. The MAM III is made in Japan and sold there under the name Phoenix. It is imported and sold in the UK by Microage Distribution. There are two more expensive models in the range, the medium resolution MAM II at £365 and the high resolution MAM IV at £458. Fine for serious use but a bit pricey for alien zapping.





MODEL:	JVC 14" High Resolution, Colour
MANUFACTURER:	JVC. Distributors, Opus Supplies Ltd.
PRICE:	£264.50

The Opus Supplies' JVC monitor has been in constant use in the office for months and has always proved reliable, taking very little time to warm up. Unlike the other monitors in this review the JVC monitor is not particularly attractive, but then what matters is the screen quality.

The best test of a monitor is a row of letter M's. If you are comparing monitors in a dealers use a computer capable of displaying eighty columns and hold down the "M" key for a few seconds, trying both upper and lower case. If you can distinguish each letter then you are looking at a high resolution monitor. The JVC passes this test, just. Even if you cannot make out all the M's do not write off the monitor as useless.

In eighty column mode this is a tough test and there is no point in paying over the odds for a

feature which you are not going to use.

The connections to the back of the monitor are very odd. Most monitors have some kind of DIN plug, some have a 9 pin D-type connector and a few have a long flat pin connector. This last type is popular with television crews because it is large and robust.

The Opus monitor has a combination of two of these connectors, two wires into a DIN and one into a flat plug. Opus supply the cable so there is no problem in connecting the monitor to your computer.

Unlike the Microvitec or MAM III monitors the JVC does not have a high contrast tube. This results in a lighter picture but provides truer colours and so might be a better bet if colour accuracy is important. The image may not be as bright as on the rivals but the colour saturation is still good providing you do not try to work in direct sunlight.

By high resolution Opus mean 580 by 470 pixels, they do a 370 by 470 medium res version which is a bit easier on the pocket. The controls are very sparse, only an on/off switch and a brightness control. However, all the other settings are fine, there being no need to tweak anything to produce a good sharp image in the centre of the screen. One particularly sneaky program did manage to throw it into a fit of rolling the image and with no way of counteracting this the game had to be abandoned.

The most spectacular thing about the JVC/Opus device is the price, at £264.50 for the high resolution version and £206.95 for the medium resolution version the low-tech styling is worth putting up with. Beauty is in the eye of the beholder so try to have a look at the screen before you buy. Low, Medium and High resolution are pretty woolly terms. Some medium res monitors can be better than another manufacturer's high res.

MODEL: V7001, 12½" Mono
MANUFACTURER: Philips
PRICE: £69.95 inc VAT

There are times when it is preferable to use a green screen monitor. Colour may be nice but it is expensive. Red, green and blue are produced by separate bits of the set and are mixed on the screen. This means that the electron guns have to be very carefully set up to produce a sharp picture. When you bear this in mind it is not surprising that a colour display costs three times as much as a green screen one.

Cost is not everything, some of the best word processors use green screens because they are so easy on the eye. Many games programmers use two screens for programming, a green tube for writing the actual code on and a colour display for testing. If you have to sit in front of the screen for a while then something like the Philips V7001 may be worth buying in addition to a colour monitor.

Philips are one of the biggest manufacturers of electrical goods with manufacturing capacity worldwide, this monitor is made in Taiwan. Physically it is, well, very monitorish, square, with three controls and a ventilation grill along the bottom edge. The controls allow the user to adjust brightness, contrast and volume.



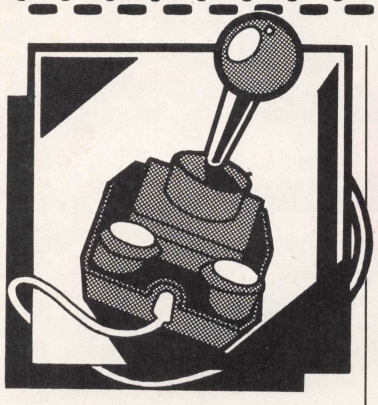
Underneath the set is a movable support which can be used to tilt the display upwards. This has no level of adjustment, it is either up or down.

What makes the V7001 special is its flexibility, it can be attached to most home computers, except the Spectrum. There is the composite video input which will work with things like the BBC, Commodore 64 and MSX machines but there is also an RGB socket. This does not mean that there is an RGB display. simply that it can pretend to be colour and convert the signals into brightnesses of green. This allows the monitor to be used with things like the Sinclair QL and the Oric.

For a QL owner using a TV set this monitor would be a wise choice. The monitor mode still causes the display to fall off the edges but that can be corrected by using a window command. The image is good and sharp, but not of long persistence, so scrolling text does not leave a shadow.

The Philips monitor does get fairly hot, but the grill at the bottom and the vanes at the top provide a path for convection currents to cool the insides. It is hard to get excited about anything as utilitarian as a monochrome monitor, it does its job and it does it well and cheaply.

MICROPOWER MICROPOWER MICROPOWER



Rocky IV

Have a good punch up without lifting your gloves! A 'smacking good' program by William Fong.

Everyone will have heard of the boxing superstar 'Rocky' played so realistically by Sylvester Stallone in three record breaking films. Now you have the chance to play the role on your full width technicolour computer screen!

Your opponent in this prize fight is Apollo, the greatest fighter of all time. He's been trained by a computer and has never



CBM 64

been beaten before. As Rocky IV, your aim is to break his record and take the title.

Your controls in the ring are @ to move forward; (to punch with your left arm;) to punch with your right arm and ? to step back. You have 15 rounds of 20 seconds duration to knock Apollo to the ground.

Program notes

When you type in the program, make sure you SAVE a copy before RUNning it or one silly mistake in the data could produce a crash. When all is ready and you do RUN the program the screen should go black and the message 'Please wait' appear. Then the screen turns green and the tune 'Eye of the Tiger' is played. Now you can begin.

The bell will ring to signify the start of round one. The time and the number of rounds are displayed near the top of the screen in addition to the points awarded to yourself and Apollo. The energy you use is very important to keep track of since if you expend more than 500 points worth, you will be so weak that there is a chance you'll be knocked out. The game continues until someone wins on points or a knock out.



variables used

HI	High value of note	C	Collision between sprites
LO	Low value of note	R	Score for Rocky
V	Beginning of VIC-chip	P	Score for Apollo
VL	Volume address	K	Whether Apollo punches or walks backwards or forwards.
H	High address for voice 1	T1	Energy for Rocky
L	Low address for voice 1	T2	Energy for Apollo
W	Waveform address for voice 1	X,Y	Positions of Rocky
AT	Attack/Decay address for voice 1	X1	X position of Apollo
TI$	Time string	U	Whether Rocky or Apollo is knocked down
A	Value of depressed key	Q	Number of rounds

There are many REM statements to tell you what is happening but for those beginners among you here's some more details:

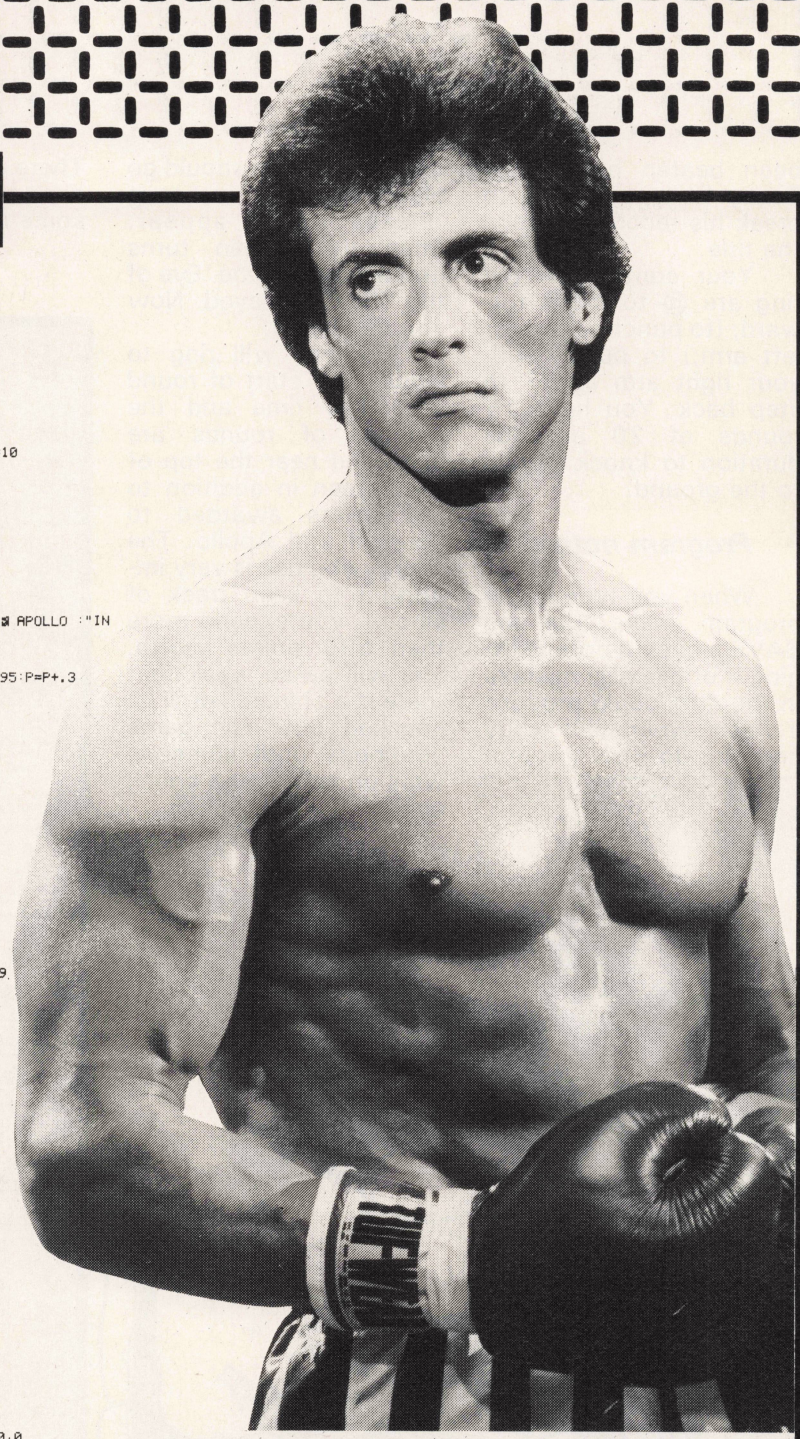
how it runs

Line	Effect
1	Turns the screen black and prints message.
2 - 11	Dimension arrays HI and LO: also pokes data into memory for sprites.
12	Sets values for HI and LO for tune.
13 - 14	Set up variables.
15 - 17	Set up sprite points and multi-colour mode, define the colours and enlarge all sprites.
18 - 21	Clear screen, print title and ring, and display sprites.
23 - 24	Set up values for A, C, U, K, and set volume.
25 - 27	Print information; Scores, Time etc.
28	Sets sprite pointer to normal Rocky and Apollo. No punching.
29	Plays punching sound if hit.
36 - 41	Use values A and K to move and punch.
42	Checks if time is up.
43 - 44	Check if there is likely to be a knock out.
45 - 46	Make Rocky and Apollo jump up and down.
47	Repeats main routine again.
51 - 55	Move Rocky and Apollo to their corners as it is the end of the round.
56 - 60	Move the fighters out to the centre and starts the next round.
61	Checks if Rocky has been hit as this is a knock out.
62 - 63	Count for Rocky.
67 - 68	If enough energy is left, get up and fight.
69 - 76	Apollo knocked out. Same process as Rocky knock out.
77 - 122	Data for sprites : Memory start at 832 to 12798. Also data for tune.
124	POKE sprites to their positions.
125 - 127	Play the tune ''Eye of The Tiger''.
128 - 130	Start the game.
133 - 138	POKE the winner's sprite pointer to the winner's data and print a message.

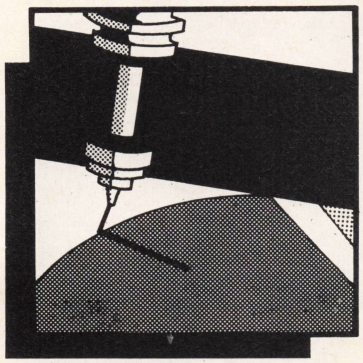
This program uses the sprites to the full and trying to convert this program to a computer which does not support sprites is near impossible.

Rocky IV

program listing



```
0 REM *** ROCKY IV : WILLIAM FONG    **
1 POKE53281,0:POKE53280,0:PRINT"■■"TAB(14)"PLEASE WAIT"
2 DIMHI(100),LO(100):FORN=0TO62:READA:POKE12288+N,A:NEXT
3 REM **** POKES DATA FOR SPRITES ***
4 FORN=0TO62:READA:POKE12352+N,A:NEXT
5 FORN=0TO62:READA:POKE12416+N,A:NEXT
6 FORN=0TO62:READA:POKE12480+N,A:NEXT
7 FORN=0TO62:READA:POKE12544+N,A:NEXT
8 FORN=0TO62:READA:POKE12608+N,A:NEXT
9 FORN=0TO62:READA:POKE12672+N,A:NEXT
10 FORN=0TO62:READA:POKE12736+N,A:NEXT
11 FORN=0TO62:READA:POKE832+N,A:NEXT
12 FORN=0TO98:READHI(N),LO(N):NEXT
13 PRINT"■":VL=54296:H=54273:L=54272:W=54276:AT=54277:Q=0:T1=10:T2=10
14 V=53248:X=170:Y=160:X1=120:TI$="000000"
15 POKEV+21,7:POKEV+23,7:POKEV+29,7:POKEV+32,13:POKEV+33,13
16 POKE2040,192:POKEV+27,7:POKE2041,195:POKEV+40,9
17 POKEV+39,8:POKEV+28,7:POKEV+37,1:POKEV+38,0
18 PRINT"■■■        ROCKY IV : BY WILLIAM FONG          ■■■■■■■■■■■■■■■"
19 FORN=1TO4:PRINT"■          ■■■■■■■■■■■■■■■
```



Toolbox

Get the most from your micro by delving into our toolbox of utility programs.

VARIOUS

Program effect: Colour and character borders
Machine: Aquarius
Programmer: D. Hancock

```
 5    REM PROGRAM CONTAINS TWO
      INSTRUCTIONS
 6    REM ONE FOR COLOUR BORDER
 7    REM ONE FOR CHARACTER BORDER
20    POKE13312,3
25    REM YELLOW BORDER
30    POKE12288,5
35    REM CHARACTER BORDER
40    FORP=13313TO14311
45    REM START ADR. @ 13313 FOR PAPER
50    POKEP,9
60    NEXTP
```

Program effect: Changes screen colour
Machine: Atari
Programmer: T. Peart-Jackson

Either the BASIC or assembler editor source code may be used to create the autorun file. The program looks to the consol keys every VBI and checks to see if either the option or select screen colour will change. The option key will increase the value POKEd to location 710. The select key will decrease this value.

The program is intended to be stored as an AUTORUN.SYS file on disk, although the BASIC listing can be run from cassette. To create the AUTORUN.SYS file, type in and run the BASIC program. Call DOS and select the K-BINARY SAVE option. In response to K, type "AUTORUN. SYS, 0600,062A,,0600".

Your file will now be created and will autoboot whenever you boot the disk.

You may also type in and assemble the source listing. Call DOS and use the K option as above. The BASIC program will POKE the m.l. routine into page six, call up the routine and self delete.

BASIC PROGRAM

```
 10 FOR T=1536 TO
    1578
 20 READ A
 30 POKE T,A
 40 NEXT T
 50 TRAP 70
 60 X=USR(1536)
 70 NEW
100 DATA 72,169,13,
    141,36,2,169,6,
    141,37,2,104,96,
    8,72,173,31,208,
    201,3,240
110 DATA 7,201,5,
    240,9,76,38,6,
    238,198,2,76,38,
    6,206,198,2,104,
    40,76,62,233
```

ASSEMBLER LISTING

```
02C6          10 COLSCRN  =     $2C6
D01F          20 CONSOL   =     $D01F
E93E          30 SETVBL   =     $E93E
0224          40 VVBLKD   =     $224
0000          50            *=  $600
0600 48       60            PHA
0601 A90D     70            LDA  #COLOUR&$FF
0603 8D2402   80            STA  VVBLKD
0606 A906     90            LDA  #COLOUR/256
0608 8D2502   0100          STA  VVBLKD+1
060B 68       0110          PLA
060C 60       0120          RTS
;START OF INTERUPT PROGRAM TO BE RUN
060D 08       0130 COLOUR   PHP
060E 48       0140          PHA
060F AD1FD0   0150          LDA  CONSOL
0612 C903     0160          CMP  #3        ;OPTION
0614 F007     0170          BEQ  UP
0616 C905     0180          CMP  #5        ;SELECT
0618 F009     0190          BEQ  DOWN
061A 4C2606   0200          JMP  BACK
061D EEC602   0210 UP       INC  COLSCRN
0620 4C2606   0220          JMP  BACK
0623 CEC602   0230 DOWN     DEC  COLSCRN
0626 68       0240 BACK     PLA
0627 28       0250          PLP
0628 4C3EE9   0260          JMP  SETVBL
```

Program effect: Produces double height characters
Machine: VIC 20
Programmer: P. Burke

The number of characters you may use will depend on how much memory your VIC has. For the unexpanded VIC, type in the program and add the following line:

20 POKE 644,24:SYS 830

Save the program before you run it. When it is run, all the characters on the screen will be displayed in double height.

For a VIC with 8 or 16K expansion, enter line 20 as follows:

20 POKE 648, 30:POKE 36866, 150:POKE 642, 32:POKE 831, 16: POKE882, 252: SYS830

PROGRAM LISTING

```
 10  FORT=830 TO 893 :READA : POKET,A :
     NEXT
100  DATA 169,24,133,252,169,128,133,
     254,169,0,133,251,133,253,160,0,177,
     253,145,251
110  DATA 200,145,251,230,253,208,2,230,
     254,165,251,24,105,2,133,251,165,
     252,105,0,133
120  DATA 252,201,30,208,224,169,15,
     141,1,144,169,254,141,5,144,169,171,
     141,3,144
130  DATA 108,0,192
```

Program effect: Redefines characters
Machine: Spectrum 48K
Programmer: D. Robinson

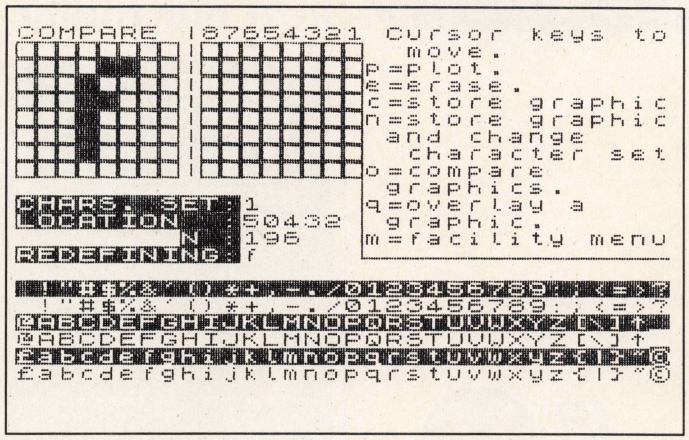
This program allows you to redefine 1152 graphics in blocks of 96 for use in your own programs. The data can be stored on tape and re-loaded whenever you require them. The graphics can be called up by POKEing the CHARS. system variable 23607.

The data for the standard character set are POKEd into RAM and are then read from ROM locations 15616 to 16383. The character set can then be redefined in RAM and called into the program by POKE23607, N where N is the start address of the newly defined set minus 256 and divided by 256. The first address of the graphics is 50432 leaving more than 27K of RAM for your own program plus the user defined graphics area.

There are four facilities: character redefiner, with complete instructions and two grids so that one graphic can be compared with another; loader; saver and set call up. In the latter the redefined set appears in the program itself. Instructions are given in the program.

PROGRAM CONSTRUCTION

Lines	
1-200	Explanation
200-230	Character set read from ROM to RAM
240-260	Facility menu
1000-1730	Define mode
2000-2070	Load mode
3000-3050	Save mode
4000-4030	Set call-up



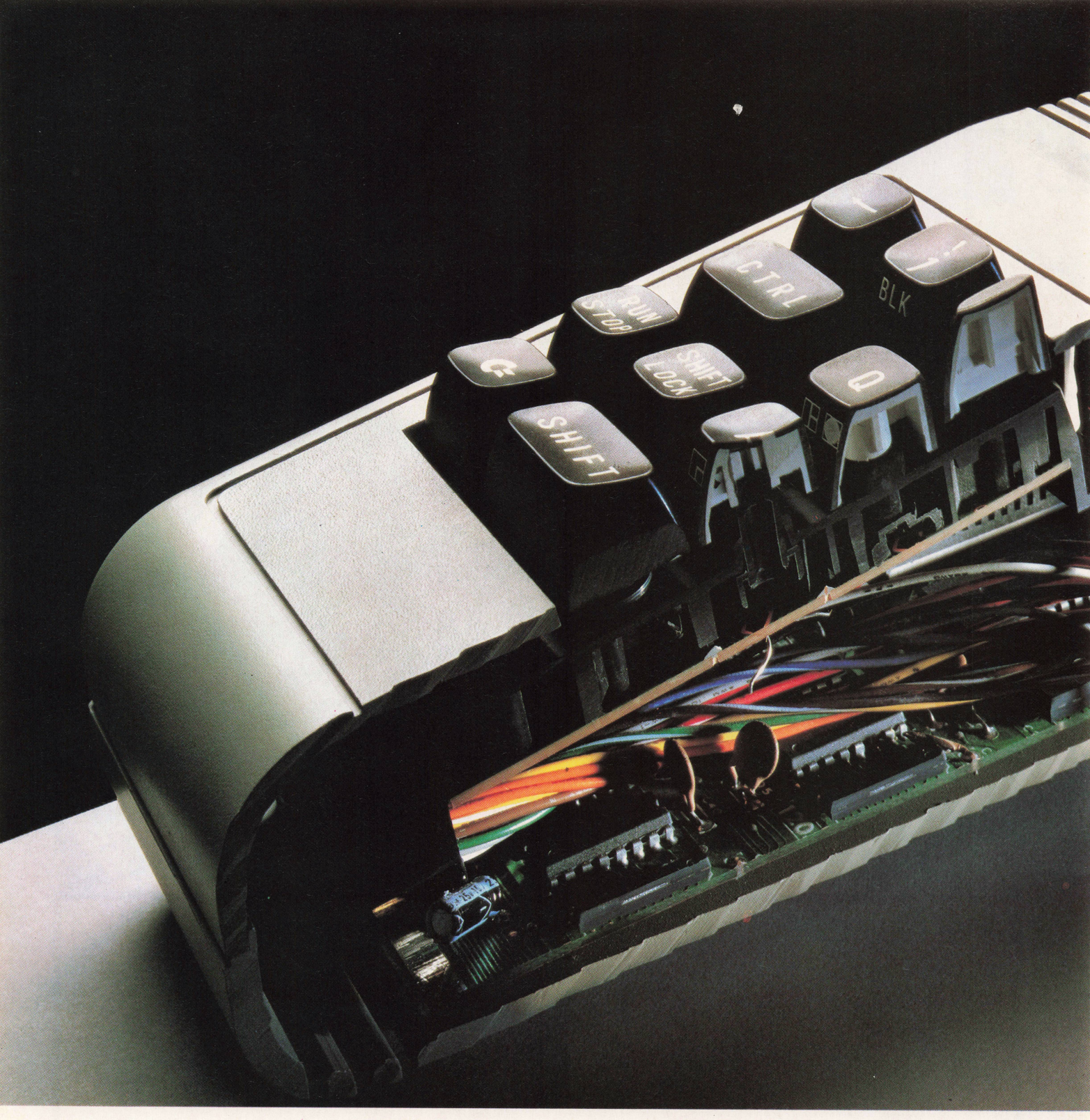
program listing

```
  1 REM XYGESOFT Jan-Mar '84          D C R
 100 POKE 23658,0: POKE 23607,60: CLEAR 5e4: BORDER 0: PAPER 0: INK 7: OVER 0: C
LS
 102 LET j$=" !""#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_#
abcdefghijklmnopqrstuvwxyz{|}"
 105 INPUT "Do you want an explanation ? ": LINE y$: IF y$="" THEN  GO TO 105
 107 IF y$(1)<>"Y" AND y$(1)<>"y" THEN  GO TO 210
 110 LET a$="   This program allows you to   design 1152 graphics in blocks  of
96 at a time for use in your own programs.                    This is achieved
 by firstly  POKEing the data for the charac-ter set from ROM(locations 15616 to
 16383)into RAM.Any amount ofsymbols,letters & numbers can   then be redefined i
n RAM."
 120 GO SUB 200
 130 LET a$="  This new character set can    then be adopted by:
                              POKE 23607,N
          N is the start address of the new character set minus 256 and div
ided by 256"
 132 LET a$=a$+"                                  23607 is the CHARS system var-i
able which is POKEd to point tothe new character sets in RAM."
 135 GO SUB 200
 140 LET a$="  For example,if 50432 was the  start address,then N would be:
   (50432-256)/256 = 196        Therefore,to use this new set located at 50432, P
OKE 23607,196  Any redefined graphics in thisset would then appear in the    pro
gram listing.                "
 142 LET a$=a$+"  50432 is in fact the first    address where the new character
sets are to be stored.This meansyou still have 27K+ for the restof your own prog
ram."
 145 GO SUB 200
 150 LET a$="  If you wanted to return to thenormal set(located at 15616),   the
n N would be :                (15616-256)/256 = 60        So,to return to t
he normal    character set, POKE 23607,60"
 155 GO SUB 200
 160 LET a$="  <NOTES ON THE DEFINE MODE>                                    I
f you choose the character  definer mode,four statements in INVERSE VIDEO will
appear:        CHARS. SET;this is the char-  acter set you are defining.       L
OCATION;this is the address  of the first byte in this char- set.
                "
 165 LET a$=a$+"  N;this is the number to be    POKEd into 23607 when you want
to use your set.                REDEFINING;this is the charac-ter you are rede
fining."
 170 GO SUB 200
 180 LET a$="  <NOTES ON THE DEFINE MODE>                                    F
inally-                "
 184 LET a$=a$+"2 character sets,one in INVERSE VIDEO,will appear at the bottom
of the screen.The inverse one isto be used for reference.In the other set,any re
defined chars.  will appear."
 190 GO SUB 200
 199 GO TO 210
 200 CLS : PRINT AT 0,5; PAPER 1; INK 6;"Character Redefinition"'': FOR f=1 TO L
EN a$: PRINT a$(f);: IF a$(f)<>" " THEN  BEEP .01,40
 202 NEXT f: PRINT #0;"PRESS A KEY...": PAUSE 0: BEEP .5,20: RETURN
 210 CLS : INPUT "How many character sets do you  want to redefine ? "; LINE b$:
 IF b$="" OR CODE b$<48 OR CODE b$>57 THEN  GO TO 210
 211 LET b=VAL b$: IF b<1 OR b>12 THEN  GO TO 210
 215 LET po=60: BEEP .5,22
 220 PRINT AT 0,0; FLASH 1; BRIGHT 1;"Please wait...";''''';"I'm POKEing at the m
oment..."
 225 DIM c(12): DIM h(8)
 226 LET h(1)=128: FOR f=2 TO 8: LET h(f)=h(f-1)/2: NEXT f
 230 FOR f=196 TO 196+(b-1)*4 STEP 4: LET c(f/4-48)=1: FOR g=15616 TO 16383: POK
E f*256+256+g-15616,PEEK g: NEXT g: NEXT f
 240: BORDER 0: PAPER 0: INK 7: CLS : PRINT TAB 9;"Facility Menu-": PRINT AT 2,0
;"1 > Define a new set";AT 4,0;"2 > Load a set";AT 6,0;"3 > Save a set";AT 8,0;"
4 > Call up a set"
 250 LET i$=INKEY$: IF i$<"1" OR i$>"4" THEN  GO TO 250
 260 GO TO 1000*VAL I$
1000 BEEP .5,20: BEEP .3,24: PAPER 6: OVER 0: BORDER 7: INK 1: CLS : PRINT AT 0,
0;"1 > DEFINER"
```



program listing

```
1002 FOR f=1 TO 6: POKE USR "a"+f,129: NEXT f: POKE USR "a",255: POKE USR "a"+7,'
255
1005 POKE 23607,60: PRINT AT 15,0; INVERSE 1;j$(1 TO 32);''j$(33 TO 64)''j$(65 T
O 96)
1010 INPUT "Which set to be defined ?"; LINE z$: IF z$="" OR CODE z$<48 OR CODE
z$>57 THEN  GO TO 1010
1011 LET ch=VAL z$: IF ch>12 OR ch<1 THEN  BEEP .5,-30: GO TO 1010
1012 IF NOT c(ch) THEN  BEEP .5,-30: GO TO 1010
1015 PRINT AT 10,0;"CHARS. SET:";ch
1016 LET ch=196+(ch-1)*4
1018 PRINT AT 11,0;"LOCATION  :";ch*256+256
1022 POKE 23607,ch: PRINT AT 16,0;j$(1 TO 32)''j$(33 TO 64)''j$(65 TO 96)
1033 POKE 23607,po: INPUT AT 0,0;"Character to be redefined ?"; LINE c$: IF COD
E c$>127 OR CODE c$<32 OR LEN c$>1 THEN  BEEP .5,-20: GO TO 1033
1034 PRINT AT 13,0;"REDEFINING:";c$;AT 12,8;"N ";ch
1035 FOR f=1 TO 8: PRINT AT f,0;"□□□□□□□□K□□□□□□□□": NEXT f
1036 PRINT AT 0,0: INK 3: PAPER 7;"COMPARE !87654321"
1037 LET x=1: LET y=9: DIM a(8)
1038 DIM b$(8,8): LET k=(CODE c$-32)*8
1040 PRINT AT 0,18;"Cursor keys to";AT 1,19;"move.";AT 2,17;"p=plot.";AT 3,17;"e
=erase.";AT 4,17;"c=store graphic"
1041 PRINT AT 5,17;"n=store graphic";AT 6,18;"and change";AT 7,19;"character set
";AT 8,17;"o=compare";AT 9,18;"graphics.";AT 10,17;"q=overlay a";AT 11,18;"graph
ic.";AT 12,17;"m=facility menu"
1042 PLOT 135,104: DRAW 0,-38: DRAW 120,0
1045 OVER 1: INK 1: PRINT AT x,y;"■": BEEP .003,x+y: PRINT AT x,y;"■"
1046 LET i$=INKEY$
1050 LET y=y+(i$="8" AND y<16)-(i$="5" AND y>9): LET x=x-(i$="7" AND x>1)+(i$="6
" AND x<8)
1060 IF i$="p" AND b$(x,y-8)=" " THEN  PRINT AT x,y; OVER 0;"■": LET b$(x,y-8)=
"
■": LET a(x)=a(x)+2^16-y)
1065 IF i$="e" AND b$(x,y-8)="■" THEN  PRINT AT x,y; OVER 0;"□": LET b$(x,y-8)=
"
 ": LET a(x)=a(x)-2^(16-y)
1070 IF i$="o" THEN  GO SUB 1500
1075 IF i$="c" THEN  GO SUB 1200: GO SUB 1700: GO TO 1030
1080 IF i$="n" THEN  GO SUB 1200: GO SUB 1700: GO TO 1010
1085 IF i$="q" THEN  GO SUB 1600
1090 IF i$="m" THEN  CLS : BORDER 0: PAPER 0: OVER 0: INK 7: GO TO 240
1100 GO TO 1045
1200 OVER 0: FOR f=1 TO 8: POKE ch*256+256+k+f-1,a(f): NEXT f: RETURN
1500 INPUT "Graphic to be compared ?"; LINE q$: IF CODE q$<32 OR CODE q$>127 OR
LEN q$>1 THEN  BEEP .5,-20: GO TO 1500
1505 FOR f=1 TO 8: PRINT AT f,0; OVER 0;"□□□□□□□□": NEXT f
1510 FOR f=0 TO 7: LET qr=PEEK (ch*256+256+((CODE q$-32)*8)+f)
1515 FOR q=1 TO 8
1520 IF qr>=h(q) THEN  PRINT AT 1+f,q-1; OVER 0;"■": LET qr=qr-h(q)
1530 NEXT q: NEXT f
1540 RETURN
1600 INPUT "Graphic to be overlaid ?"; LINE q$: IF CODE q$<32 OR CODE q$>127 OR
LEN q$>1 THEN  BEEP .5,-20: GO TO 1600
1605 FOR f=1 TO 8: PRINT AT f,9; OVER 0;"□□□□□□□□": NEXT f
1607 DIM a(8)
1610 FOR f=0 TO 7: LET qr=PEEK (ch*256+256+((CODE q$-32)*8)+f)
1615 FOR q=1 TO 8
1620 IF qr>=h(q) THEN  PRINT AT 1+f,q+8; OVER 0;"■": LET qr=qr-h(q): LET a(f+1)
=
a(f+1)+h(q): LET b$(f+1,q)="■"
1630 NEXT q: NEXT f: RETURN
1700 LET k=CODE c$-32: IF k<32 THEN  LET xx=16: GO TO 1730
1710 IF k<64 THEN  LET xx=18: LET k=k-32: GO TO 1730
1720 IF k<96 THEN  LET xx=20: LET k=k-64
1730 POKE 23607,ch: PRINT AT xx,k;c$: POKE 23607,po: RETURN
2000 BEEP 1,10: BORDER 6: PAPER 6: INK 0: OVER 0: CLS : PRINT AT 0,0;"2 > LOADER
"
2010 PRINT AT 4,1;"What is the set's name ?          (ENTER if name not known)"
2020 INPUT d$
2030 PRINT AT 7,0;: LOAD d$CODE
2040 FOR f=196 TO 244 STEP 4: IF NOT PEEK (f*256+255) THEN  NEXT f
2045 POKE f*256+255,0
2050 PRINT AT 8,0;"You have LOADed character set ";f/4-48;AT 10,0;"  To call thi
s up in your own   program,use POKE 23607,";f;AT 13,0;"  This set is located at
";f*256+256
2055 LET c(f/4-48)=1
2060 PRINT AT 16,0;"CHARACTER SET:";f/4-48: POKE 23607,f: PRINT j$: POKE 23607,p
o
2070 PRINT #0;"ANY KEY FOR FACILITY MENU...": PAUSE 0: BEEP .2,13: BEEP .3,11: G
O TO 240
3000 BEEP 1,12: BORDER 4: PAPER 6: INK 0: OVER 0: CLS : PRINT AT 0,0;"3 > SAVE A
 SET"
3010 INPUT "Which character set do you want to save ? "; LINE c$: IF CODE c$<48
OR CODE c$>57 THEN  BEEP .5,-30: GO TO 3010
3012 LET c=VAL c$: IF c<1 OR c>12 THEN  BEEP .5,-40: GO TO 3010
3013 IF NOT c(c) THEN  BEEP .6,-22: GO TO 3010
3020 PRINT AT 2,0;"Saving set ";c
3025 LET s$="Chars. "+STR$ c
3027 LET c=(c+48)*4
3030 POKE c*256+255,1: SAVE s$CODE c*256+255,769:
3040 BEEP .6,2: PRINT AT 4,0;"Verifying...": PRINT AT 6,0;: VERIFY s$CODE : BEEP
 .8,5: PRINT AT 7,0;"Code has verified     "
3045 PRINT AT 10,0;"Do you want to save it again ?": INPUT y$: IF y$(1)="y" THEN
  GO TO 3027
3048 PRINT AT 10,0;"Do you want to SAVE another      character set ?": INPUT y$:
IF y$(1)="y" THEN  GO TO 3e3
3050 GO TO 2070
4000 BEEP 1,22: PAPER 5: BORDER 6: INK 0: OVER 0: CLS : PRINT AT 0,0;"4 > SET DA
LL-UP"
4010 INPUT "Which set do you want to work   with ?"; LINE c$: IF CODE c$<48 OR C
ODE c$>57 THEN  BEEP .5,-35: GO TO 4010
4012 LET b=VAL c$: IF b=0 THEN  LET po=60: POKE 23607,po: GO TO 2070
4015 IF b<1 OR b>12 THEN  BEEP .5,-22: GO TO 4010
4016 IF NOT c(b) THEN  GO TO 4010
4020 PRINT AT 2,0;"  If at any time you want to     return to the standard charac
terset,choose this facility and askto work with set 0.                Don't forge
t redefined chars. will appear in the program      listing !!!"
4030 LET po=(b+48)*4: POKE 23607,po: GO TO 2070
```



Are you only using

To play only games on a Commodore computer is like asking Albert Einstein to work out the square root of four.

The computer's brain barely ticks over.

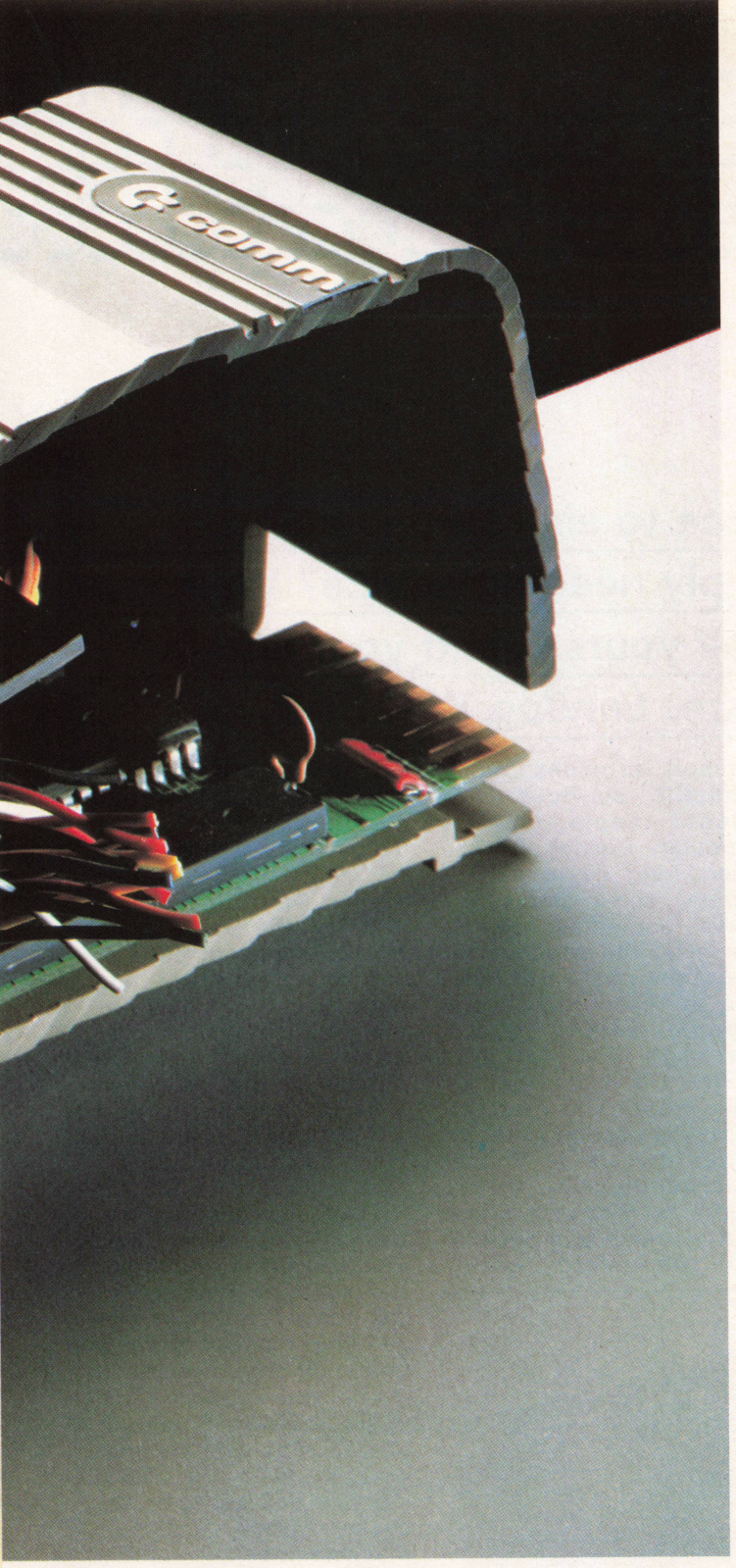
To really stretch it, you need more interesting software programs. For example, record keeping, interactive education, stimulating adventure games or word processing.

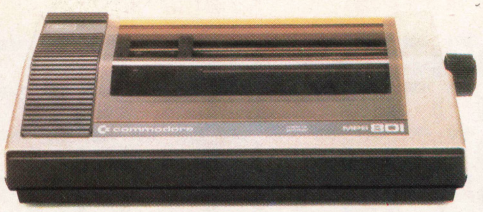
And for these you need peripherals.

Like a Commodore disk drive, a really fast storage and retrieval system with a vast memory.

Or a Commodore cassette unit, the inexpensive way of loading and storing programs.

For those who like the idea of text and graphics being more alive and having greater clarity than on a TV, there's the Commodore colour monitor.





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Tractor feed. Print speed:
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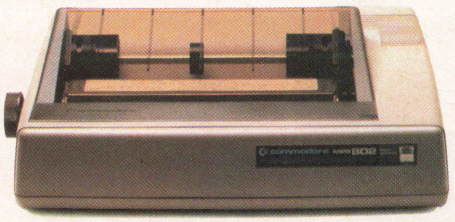

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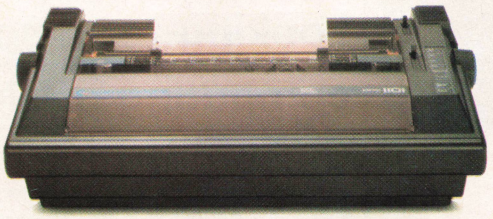
60 characters per second.



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Daisy wheel printer. £399.99.
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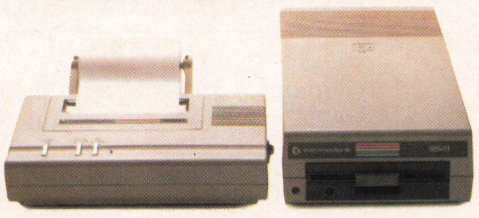

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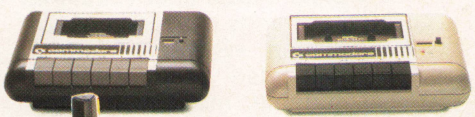

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FOR FURTHER INFORMATION, TICK ONE (OR MORE) OF THE BOXES ABOVE AND SEND TO THE COMMODORE INFORMATION CENTRE, 1 HUNTERS ROAD, WELDON, CORBY, NORTHAMPTON NN17 1QX. TEL: CORBY (0536) 205252.

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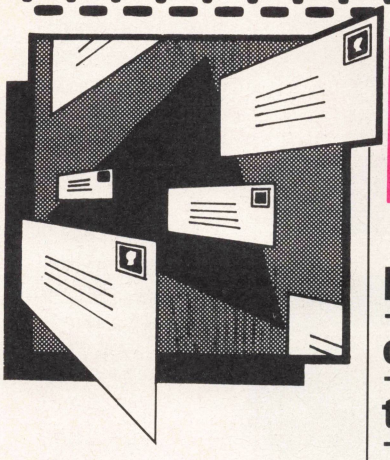


Input

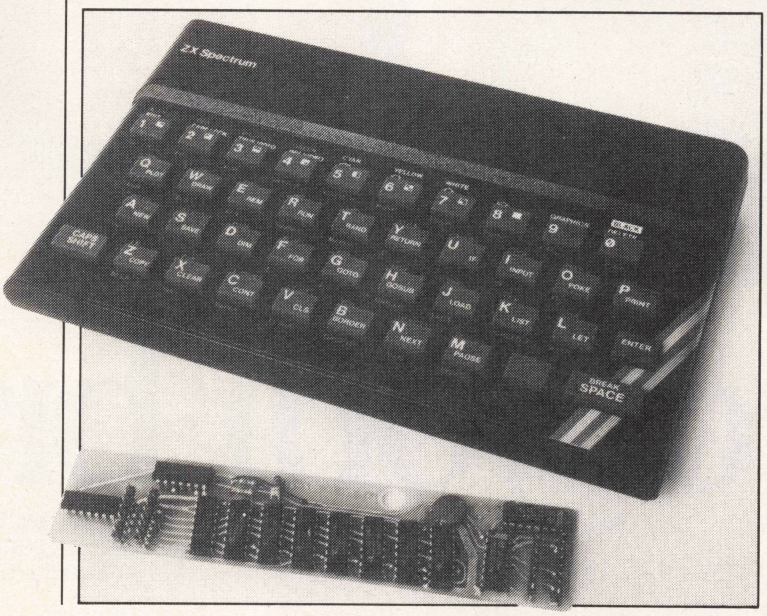
Looking for a space to air your views on computing or simply needing advice? Well, these pages are all yours. Send your letters to 1 Golden Square, London WIR 3AB.

LETTERS

Dear PCT
I own a 48K ZX Spectrum and I am contemplating buying a modem for it, and joining the Prestel service. Could you please explain a little about Prestel, i.e. things it offers, cost of joining, where to contact and also recommend a suitable modem for the service.

Also, I have heard that it is possible to expand a 16K Spectrum to 64K. Is it possible to expand my 48K Spectrum to 64K?
Your faithfully
M. Cooper
Sandbach

Prestel provides many specific services. For most people looking through Prestel is like wandering down a high street, some shops will have something of interest in the window but most are not worth looking at. There are several people selling goods through Prestel but delivery is limited to certain areas. The most interesting section for computer owners is Prestel Microcomputing. This contains the very latest (daily) news and scandal on the micro world, spread across two databases Micronet and Viewfax.
To use Prestel there is only really one Spectrum modem worth looking at. This is the Prism VTX 5000. It replaces parts of the Spectrum ROM and gives you a viewdata format 40 column display and allows you to download the programs which Micronet and Viewfax sell. There is a standing charge of £5.00 plus an extra £8.00 for Prestel microcomputing. Usage is free after 6pm. The best place to contact is Freephone Prestel and ask for a form. You can get the modem from a good computer dealer.
It is not possible to upgrade a 48K Spectrum to 64K. The upgrade only works with a 16K machine and has to be accessed from Forth or machine code.



Dear PCT
I have a 16K Spectrum which I wish to upgrade to 48K. I am not sure of the best way to do this, so could you advise me.

Is it better to buy an add-on 32K RAM pack or to send the computer back to Sinclair for a pro-

per internal upgrade? If I choose the latter route, how long can I expect to wait?

Are the RAM packs reliable and will I be able to play 48K games just as well with one as if I had a 48K machine? If you have ever compared RAM packs, which in your opinion is the best? I am eleven years old and learning how to program, although I still enjoy playing games.

Yours faithfully
Neil Roper
Bushey

It would be very difficult to say which of the add-on Spectrum RAM packs is best. They are all reliable and will allow you to play 48K games in the same way as if you had a 48K machine. However, some RAM packs do not allow you to plug anything into them so you cannot use a joystick or printer with them.

The best option is to return your machine to Sinclair. The upgrade should only take a few weeks and you may even get a new machine in place of the old one.

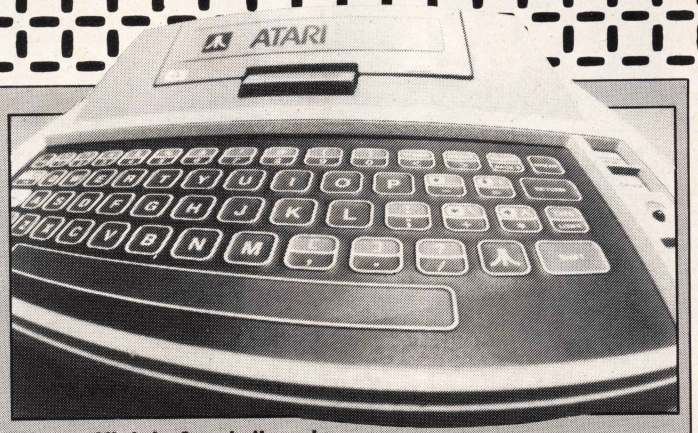
Dear PCT

I have read that the Atari 400 is compatible with a disk drive but there is no mention of drives in the Atari manual, nor is there any port capable of interfacing to one, except the cassette interface. Could you please tell me if one can add disk drives to this micro and what hardware one would need to run them?

Also, is there any other cassette unit compatible with the 400 apart from the Atari one, which retails here for the exorbitant price of IR£81!

I enjoy the magazine — keep up the good work.

Yours faithfully
John Burns
Templeogue
Dublin



The official Atari line is that you cannot add on a disk drive to the 400 model. In practice it is possible to add a system to a 48K machine. The drives connect to the same serial connector as the tape deck and there is a second socket so that you can 'daisy-chain' the tape into the disk. There is no special hardware needed, just a memory upgrade.

The Atari tape deck contains special circuitry which means that it is the only type of recorder which can be used with an Atari computer. Even if you do buy a disk drive it is probably still worth buying the tape unit in addition, since so much software is available in this format.

Dear PCT

We have just bought an Electron computer but, try as we might, we cannot make the User Programmable keys work. We have followed the instructions in the User Guide but with no results.



On pressing the FUNC key simultaneously with the appropriate function key, nothing appears on the screen. On pressing the FUNC key followed by the appropriate key, the number of that key is printed on the screen.

I should be grateful if you could advise me as to what I may be doing wrong, or whether you think the machine is defective.

Yours faithfully
M.M. Bonilla
South Ockendon

The lines defining a key need to be RUN before you can use that key. Try this:

***KEY 2 "NEXT I"**
10 FOR I=1 TO 10

The *KEY needs to be executed before it is used. You can't expect the computer to define things in retrospect.

CALLING ALL AMSTRAD OWNERS!

We have had several enquiries from readers who are experiencing problems getting cables to connect up printers to the Amstrad micro. The Amstrad is compatible with all centronics printers and the edge connector on the back of the micro is the same as the one on the back of the old Tandy TRS80 Model I.

Your local Tandy Shop should be able to sell you the correct lead which is a Model I expansion box to amphenol ribbon cable. The next problem you may encounter is that of unwanted line feeds. The Amstrad sets pin 14 high, so just cut the wire to pin 14 and it will work. Simple really!

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★ Warning: Beware of (inferior) imitations of ZERO-products!

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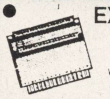

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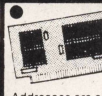

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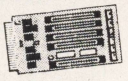

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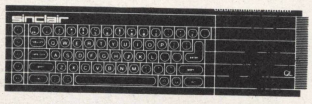

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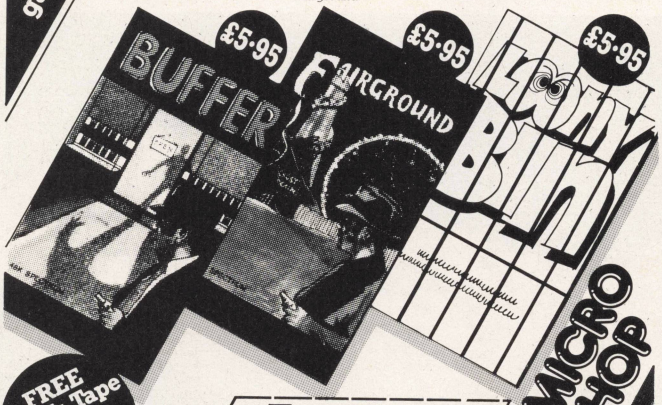

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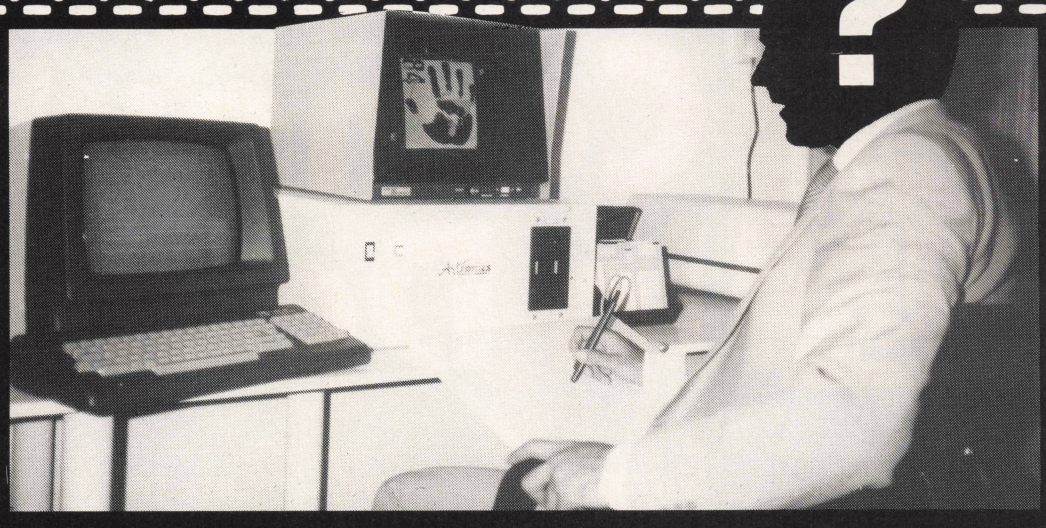
FEATURE



Graphics Supplement

Computers are hot property in the field of art and design — not your everyday home micro but well developed business systems costing thousands of pounds.

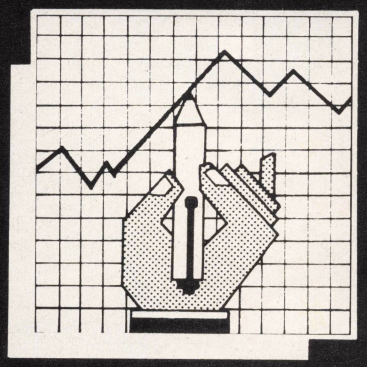
Take a look at the photograph. That person exploring the fantastic potential of the Artronics 2000 art computer could be you!

The chance to investigate the wonderful effects of this system is just one of the prizes on offer in our special graphics competition on the following pages. The other prizes are just as thrilling and the competition should provide a not too daunting challenge to those of you who know a little bit about home computers.

Computer aided design and art is an exciting new implementation of silicon technology producing the visually stunning effects in evidence on advertising hoardings and on the TV screen.

The following article explains how these effects are achieved and results from interviews with the leaders in the field. It is an exciting subject which will be of interest to every reader of PCT. There are examples of some of the work which has been prepared on the Artronics and on similar computer systems — all in *full colour*.

A true feast for the eyes follows, not to mention the chance to win some time at a design studio *and* an Atari 600XL computer, so turn over for a visually stunning experience!



Computers in Design

Simon Rockman's been taking a look at some London Design Studios and learning a lot about computer aided design.

FEATURE

Computer graphics are fun. I was never any good at art but when a computer is introduced to a subject, my interest and accomplishments soar! A computer can be to an artist/designer what a word processor is to an author or a synthesiser is to a musician. It is still only a tool, but like a new type of canvas it has properties all of its own.

I visited three studios which work with computer graphics. All of them produce art work for advertisements and films and I became quite knowledgeable in how such work is produced. The studios are all very different except in their total commitment to using computers to aid their design.

I.M.A.G.I.N.E.

This was the smallest company I visited, having only recently begun work in this field, but their obvious enthusiasm and dedication has already paid off in terms of customer satisfaction and workload. The staff at I.M.A.G.I.N.E., Alan Seekers, who has a great deal of experience of producing films, Mark Norton and Roger Lewis, keep their computer (and themselves) going 20 hours a day.

The computer they use is an Artronics 2000, a superb dedicated graphics system. At around £36,000, its value can be compared with a yacht, a house or a Ferrari, but it is worth every penny. The Artronics can take a colour or mono photograph and manipulate it to an extent one would consider impossible.

The cover insert was generated by I.M.A.G.I.N.E. for Jules Barnes for Ten Records for Gary Moore.

Take a look at the competition montage in this supplement. this started life as five mono prints which, by skilled manipulation of the computer, was transformed into the full colour image you see on the page.

Watching the I.M.A.G.I.N.E. designers is a pleasure. The company who wrote the software for the Artronics were aiming it at designers, not programmers. Consequently, every operation is simple and easy to perform. Most of the work is done on a touch tablet, which is a digitiser about 50cm square. It works in conjunction with a special wired 'pen' translating movements into lines on the screen.

To the side of the main unit is a terminal with a green screen and a little used keyboard. Most of the communication between the designer and the computer is via the pen, by selection of options. The keyboard is only used for things like file names. The green screen displays information about the section of the program which the designer is using. This is probably only of any real use in learning about the system. Some of the prompts are quite funny proving that business systems do not have to be



Weekend World Title designed by Robinson Lombie Naim Ltd. (Dig. Pics.)

dull all the time.

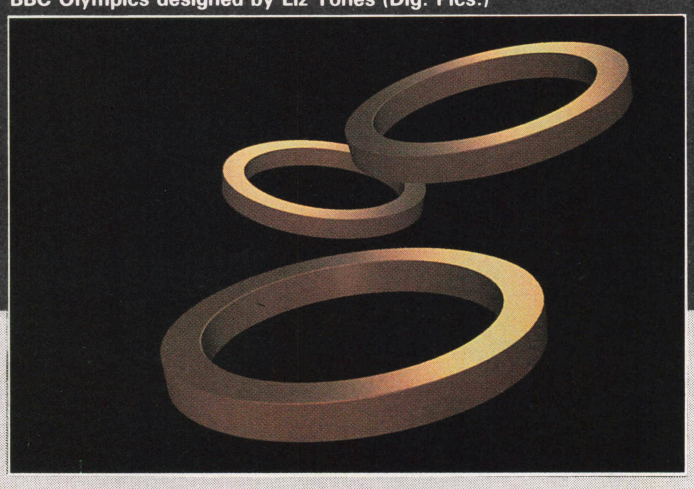
The main screen has a resolution of 512 x 512 pixels with up to 256 colours on screen at any one time. This is significantly greater than present home computers can manage and the results show. The computer is capable of displaying images which look like photographs. That's only the beginning! Each image has an associated palette which stores the range of colours used by that shape, colour saturation and brightness of each colour. It is quite possible to start with a mono print and to produce a rainbow patterned montage, as our competition picture shows.

The photographs are not 're-drawn' on the screen by the designer, but are 'frame grabbed', by placing the pictuire under a video camera which is sensitive to different levels of brightness. The picture is then transferred to the computer, one pixel at a time and the resultant image is displayed on screen. The camera is only mono but can cope with colour prints by using red, green and blue filters. Once the picture is in the computer, the fun really begins.

The colours can be changed to any one of 16.7 million in its palette (and I thought the Amstrad did well with 27!). The operator can draw lines around the subject to be manipulated and the corners of the resulting outline can then be moved to distort the shape. Thus, a rectangle could be changed to a trapezium to give some depth to a flat image and to add perspective. It is even possible to move one point through the boundary of the shape. This technique is similar to drawing a shape on a piece of paper and then 'twisting' the paper.

One process which is very popular in the field of computer graphics is anti-aliasing. This relies on tricking the brain to see a ragged edge as a smooth line. Imagine a white line on a black background. If you are used to computers, you will know that unless the line is horizontal or vertical, there will be a staircase effect caused by the size of the screen pixels. If a grey line is drawn between the white line and the background, it is possible to blur the 'staircase' to give a smoother effect.

BBC Olympics designed by Liz Tones (Dig. Pics.)



The effects produced by the Artronics are so stunning that I was convinced that the ugly metal box contained the latest in hi-tech hardware with loads of custom chips. When I read the technical documentation I was surprised to see that it is very similar to a medium sized business computer such as the IBM PC or Apricot. The central processing unit is an Intel 8086 running CPM86. There is 128K RAM and two 780K disk drives.



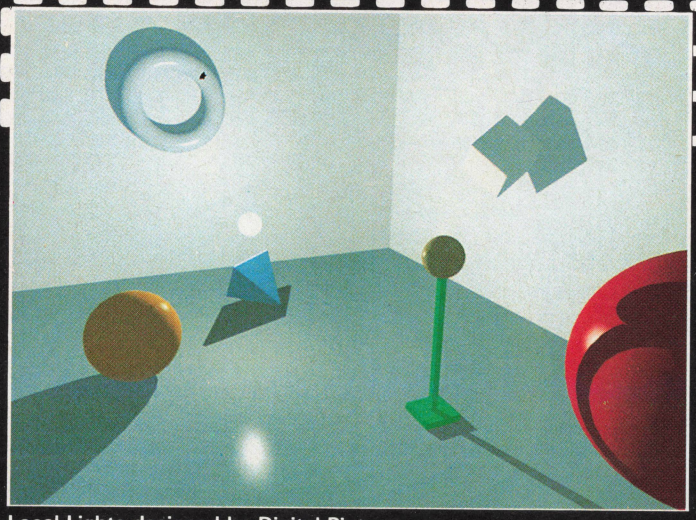
Weekend World Title

This can be improved by putting a light grey line between the white and grey and a dark grey line between the black and the grey. Each additional layer sharpens the image further.

The Artronics computer can produce both anti-aliased and normal images. As home computers develop, you can expect to see anti-aliased character sets introduced. These are very easy to read and take up only about twice the memory as the standard. A facility such as this takes the perceived resolution up to 4000 lines.

This may be much more powerful than a Spectrum but it is not far removed. Indeed, the Artronics could be running the common business packages found around the world, but I.M.A.G.I.N.E. have a BBC and second processor for their administrative chores.

The crux of the Artonics' power is the software which is written in 'C', a powerful and fashionable language. It provides the sort of facilities an artist wants rather that what the programmer thinks an artist wants. As I have mention-



Local Lights designed by Digital Pictures

ed, options are selected from menus with a light pen so that the bulk of the artist's time will be spent drawing. Because of this, the menus disappear when they are not being used and reappear when called. In the end it is still the skill of the designer or artist which creates the image. The Artronics simply makes it easier for them and saves their valuable time.

Digital Pictures

This name sums up the company very well. The output from the two Data General 330s sitting in Drury Lane, London is visible throughout the world, winning appreciative comments wherever it is seen.

I had previously met the Director, Paul Brown at the Commodore International Art Challenge and had heard him talk at a conference on computer graphics a year before that. At both of these functions he had been wearing a business suit, so when I walked into his office to find him wearing denims and a T-shirt emblazoned with the words 'Space Captain', I hardly recognised him.

The whole atmosphere at Digital Pictures is very relaxed in the best possible way. When you are a leader in the field of computer graphics it is not necessary to have Regency furnishings to impress prospective clients — your work speaks for you. This was the starting point of my visit. I was privileged to be given a private viewing of their past work.

Unlike the other companies I visited, Digital Pictures produce animated work, computer cartoons if you like. They have some very important clients. The BBC logo for the Olympics was done by them and is a mixture of models and computer animation. The burning torch was built and filmed by the BBC but the spinning rings only existed in the memory of the Digital Picture's computer.

Each shape is a mathematical model, constructed using some very heavy formulae. Because of this I expected Paul Brown to have been trained in physics or maths but his is an artistic background. In common with a growing number of artists he has realised the potential of the computer as an artistic tool.

Much of the software used is written in house. In much the same way that a programmer using a home computer might have a set of utilities on tape to renumber a program, Digital Pictures have their own set of standard routines to draw boxes and balls. Then in a way more akin to a sculptor than a painter, the formulae are trimmed to produce the desired effects. One of the most screened films from Digital Pictures has been the advertisement for Michelin MX tyres. The Michelin man was constructed in the memory of the computer out of octagonal blocks. His arms and head were designed to be manipulated and the shadows all calculated from a specific light source.

Artists know just how important light sources are and the computer can calculate shadows perfectly. Writing the software to do this, however, is exceptionally difficult and the execution takes a lot of processing time. For this reason Digital Pictures are justifiably proud of the 'Local Lights' sequence which incorporates not only shadows but also a light source in the middle of the picture.

One of the longer sequences of animation that is worth looking out for is the new Weekend World title screen. This took three months to do, with six men working 24 hours a day! It shows different scenes from towns across the world and the final result is very impressive.

The hardware used by Digital Pictures makes even the Artronics look like a toy. They have two Data General Eclipse C330s, each with one Megabyte of memory, a dedicated floating point second processor and 92 Megabytes of disks. Each frame can be up to 9 Megabytes in size and Digital Pictures have never found this to be a limitation.

The biggest problem is one of speed. Digital Pictures are considering buying a third Eclipse C330 or building custom hardware. One of the ideas in the air is of a system of 64 Motorola 68000 processors all working together. If you consider that the optimum time for building a picture is 3¾ minutes and that all this hardware takes longer than that, you will appreciate the amount of byte shunting involved. The time limit is imposed by the camera which works the same way as the Dicomed Colour Image Recorder mentioned later. At the moment the costs of getting Digital Pictures to do some work for you are very high, so cartoon strip work is out of the question. As the hardware improves we can hope to see Roland Rat usurped by RAM, bits, bytes and nibbles!

Michelin MX designed by Lodge Cleesman (Dig. Pics.)



Clicks

Clicks produces very high quality artwork for

use in presentations. They mix 'n' match hardware starting with an Apple containing a special card. From this, you can move up to an IBM PC or an Apple with a colour monitor. These systems are all a little limited, only capable of producing simple bar and pie charts in a similar way to the QL Easel program.

The next system is the Dicomed D38 and this allows a designer to draw shapes with smooth curved edges, use step zoom, interpolation (a kind of multi-coloured shadows) and mirror images. Top of the range of computer tools is the Imaginator which can produce stipple effects and use a digitising camera. Up to 124 colours can be selected from a palette of 16.7 million.

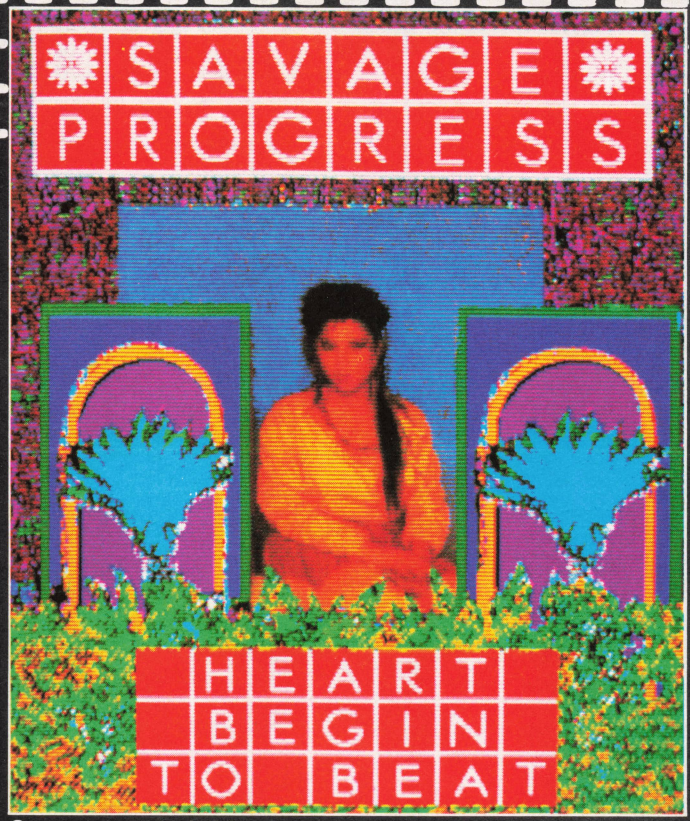
On the whole the Dicomed system is not as impressive as the Artronics 2000, but where it does come up trumps is in the area of qualtiy and speed in producing simple slides. The kind of artwork which would take a skilled technical illustrator a whole day to do, can be done in twenty minutes by a skilled operator.

Many companies have Apples with modems which they can use to link up to Clicks' and send the precious data direct to the hub of the system. The central core in this process is the 'Colour Image Recorder' which is basically a camera pointing at a TV tube. This final bit of kit is worth £500,000 and looks like a computer out of the mid 70's Dr Who adventure.

The CIR is about 2½ metres high, 5 metres wide and has all the 'standard' computer bits — including a magnetic tape drive, hard disk, floppy disk and a host of flashing light and switches. It looks too stereotyped to be real. Inside it lurks a small very high resolution black and white TV tube. Unlike domestic TV's this one is perfectly flat. The image is built up on the screen and is then snapped by a 35mm camera with a very high quality lens. The end result is a resolution of about 8000 lines in each direction which is as good as the grain size of the film can cope with. Each slide produced in this way costs £6 but there is a library of images that can be reused on the D38 and Imaginator machines.

Whenever Clicks have a new picture for their collection it is distributed by the machine's manufacturers to owners of their systems and, in return, the owners of these systems, send their slides for re-distribution.

There are examples of Clicks work in this article. See how difficult it would be to tell whether they had been produced by man or machine, if you didn't know better!



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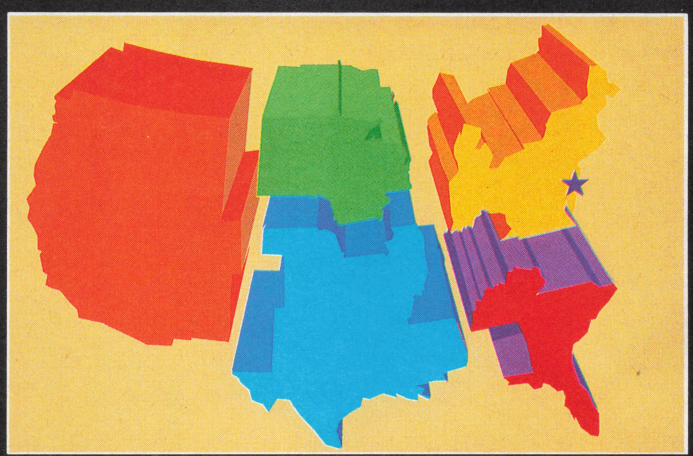
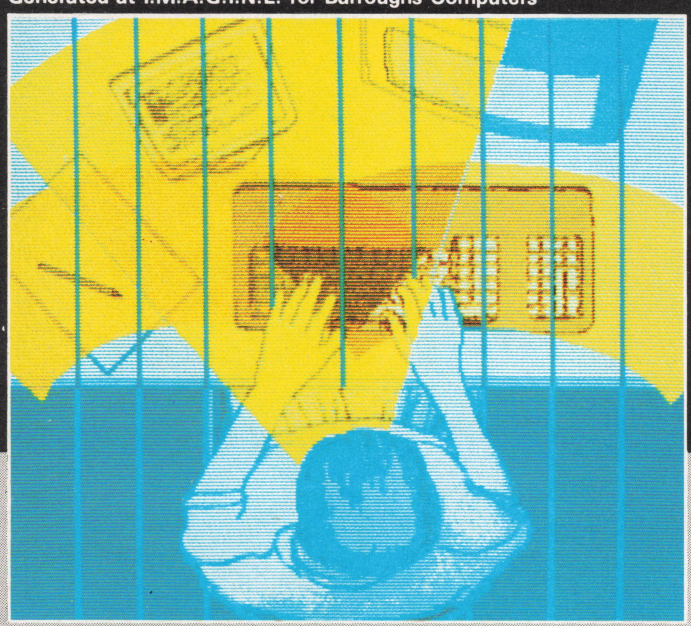


Produced by Dycomed system

Generated at I.M.A.G.I.N.E. for Burroughs Computers



PCT would like to thank the companies featured in this article for all their help in its preparation, and in particular, for the loan of their work.

I.M.A.G.I.N.E. are based at 11 Lower John St., London W1R. Clicks are at 35 King St., London WC2 and Digital Pictures at 185 Drury Lane.

Competition

A keen eye and a pen are all you need to be in with a chance of winning a day at a London Design Studio and an Atari 600XL!

1984 is the Year of Graphics and even home computers now have the capability of producing wonderful full colour graphic images on screen. If you have a computer which has limited potential in this area or if you are in need of software or lightpens to turn your computer into a drawing tool, then this competition is for you. You also have a chance of winning a *bonus* prize of spending some time playing on a multi-thousand pound computer designed specifically for producing and transforming images into the type of art commonly seen in advertising and films!

How to enter

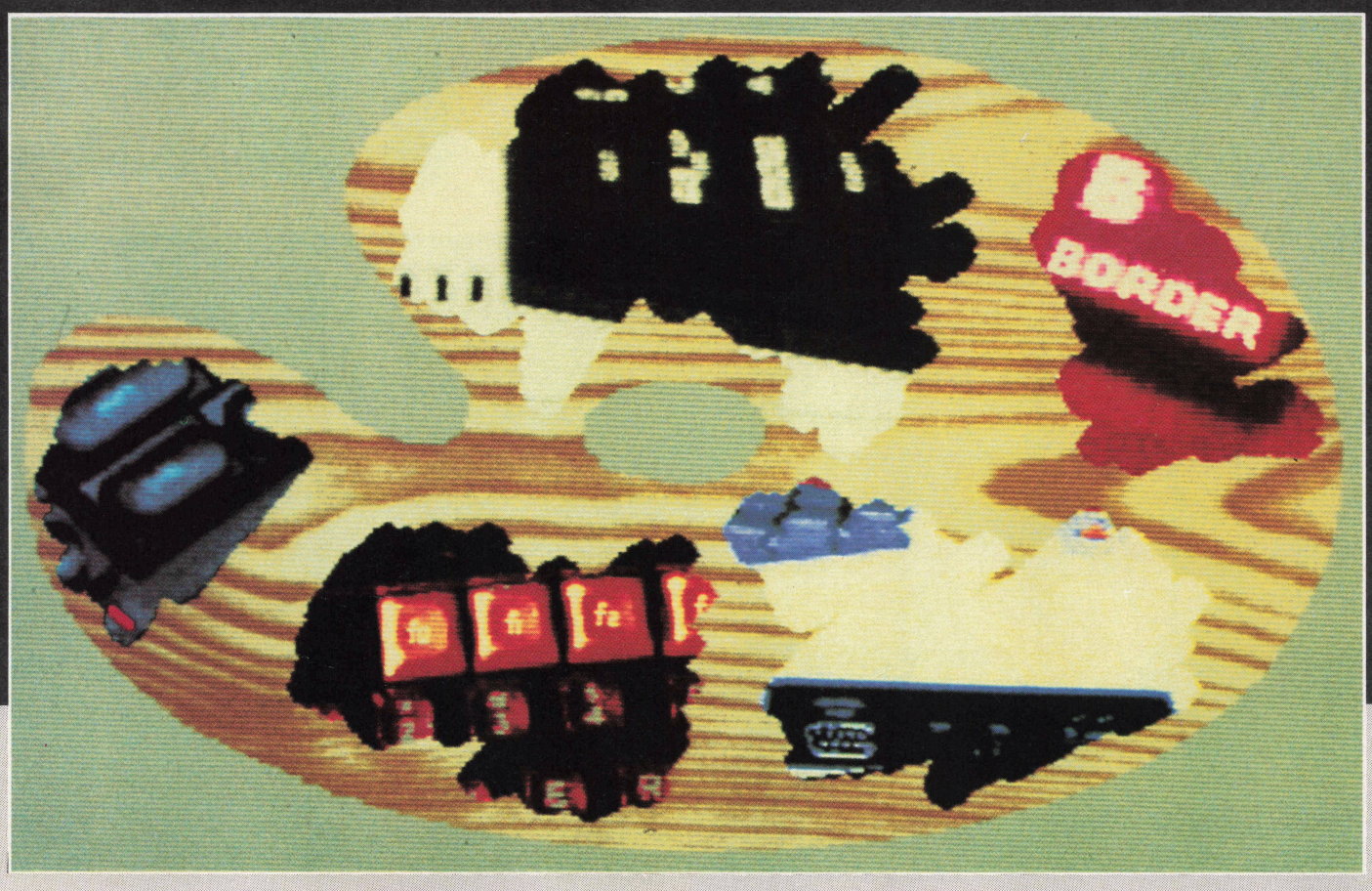
We took advantage of the system used by the *I.M.A.G.I.N.E.* studio featured in the 'Computers In Design' article, who produced for us, the unusual competition montage of computers. All you have to do is identify the five computers on the artist's palette. All of the components have been changed in some way, either by colour, pixellation or distortion, but the basic identifying points are still clear. No computer appears twice and all of them are common home computers.

Take care when deciding what is there though, as some of them are a little tricky. When you have made up your mind, enter the names of the five computers on the entry form *in any order* and send it to: Graphic Competition. Personal Computing Today, 1 Golden Square, London W1R 3AB to arrive, *before* 30th November, 1984.

Prizes

There are lots of lovely prizes for you to win. The FIRST prize of an ***Atari 600XL*** computer will get you started on your graphic trail.

This micro has fan-



TITION-COMPETITION-COMPETITION-

tastic graphic potential with 256 colours and a high resolution screen. It has player/missile graphics which are like sprites and make possible animation and 3D effects. The display list function allows you to mix screen resolutions on the screen! We will also be giving the first prize winner an Atari Touch Tablet which comes with very exciting software.

And that's not all. The lucky winner will have the opportunity of spending an afternoon at the ***I.M.A.G.I.N.E. Design Studio*** in London. Not only will you see the imaginative design team in action, but you will also be given the chance to do your own designing using the Artronics 2000 computer. An opportunity not to be missed!

Only one person can win the first prize, but there are 10 runner up prizes to console the rest of you. Each of these ten will receive either a lightpen or graphics software.

Datapen Technology Limited are providing lightpens for a whole range of computers. Their Datapen is one of the best around and comes with its own software to enable you to create user-defined graphics on the computer. Filling in the grid is very simple and deletion and changes are also easy.

Graphic software comes from Kuma, Commodore, Melbourne House and Acornsoft. All of the programs are leaders in the field of computer graphics.

Melbourne House Draw for the Spectrum enables the user to create pictures on the screen with the minimum of fuss.



Kuma's ***Paint Pic*** for the CBM64 comes supplied with an excellent 50 page manual which leaves no detail to the user's imagination — except designing the graphics that is!

RULES AND REGULATIONS

1. The competition is open to all UK and Northern Ireland readers of *Personal Computing Today* except employees of Argus Specialist Publications Ltd., their printers and distributors, I.M.A.G.I.N.E. Design Studio, or anyone connected with them.
2. All entries must be written legibly and submitted on the entry form from the magazine — PHOTOCOPIES WILL NOT BE ACCEPTED.
3. As long as the correct form is used, there is no limit to the number of entries you may submit.
4. The prizes will be awarded to the first 11 correct entries opened on the closing date. No correspondence will be entered into with regard to the competition results and it is a condition of entry that the editor's decision is final.
5. The closing date for the competition is 30th November 1984 and entries will be accepted with a postmark of that date.

The ***Commodore drawing package***, designed by the famous illustrator, Tony Hart, is very new and as you would expect from a merging of Commodore's software experience and Tony Hart's drawing expertise, provides the user with a very worthwhile graphic utility.

Acornsoft's Creative Graphics Package comes complete with a book and is an excellent starting package for the would be graphic designer!

So there are lots of goodies to win and all you have to do is fill in the entry form, send it off and await the results with bated breath. Good luck!

PCT gratefully acknowledges the help and generosity of I.M.A.G.I.N.E., Acornsoft, Commodore U.K., Datapen Technology Ltd., Kuma and Melbourne House in organising this competition.

GRAPHIC DESIGN ENTRY FORM

Print the names of the computers featured on the artist's palette in the spaces below. The order is unimportant.

. . . . . .

. . . . . .

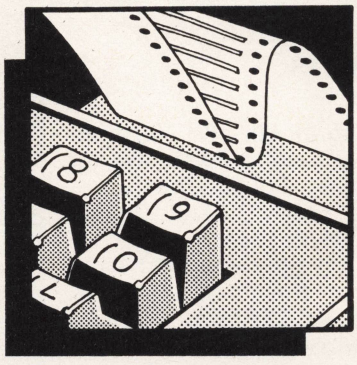
. . . . . .

NAME . . . . . .

ADDRESS . . . . . .

. . . . . POSTCODE . . . . . .

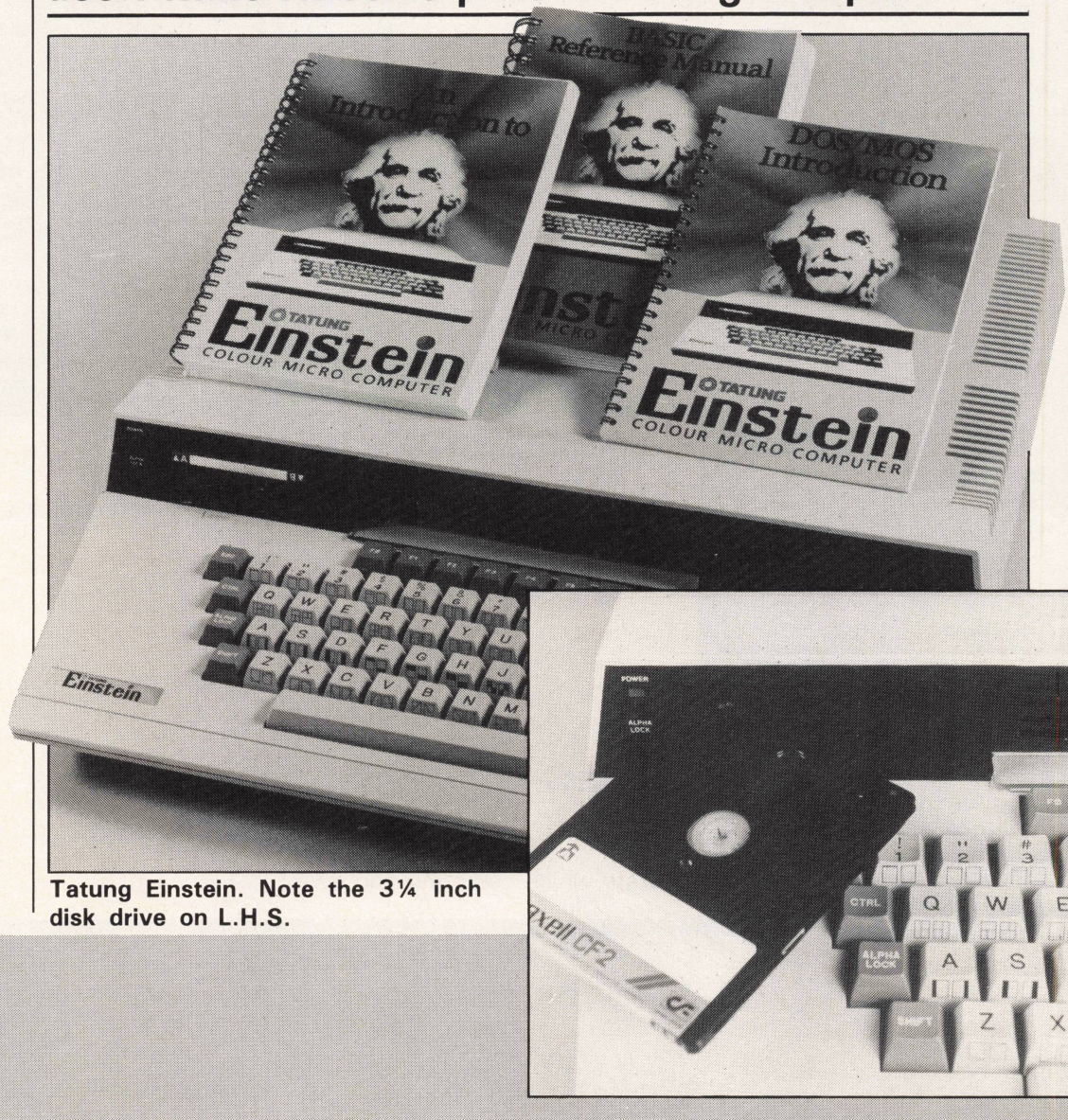
State which computer you own . . . . . .



Tatung Einstein

This recently released micro has many features of interest to the home computer user. Mike Roberts puts it through its paces.

TATUNG



Tatung Einstein. Note the 3¼ inch disk drive on L.H.S.

The Einstein is the first attempt at producing a computer by the Tai electronics firm Tatung. However, the micro is not a foreign import but a thoroughbred British machine designed and built in this country. The concept behind the machine is the 'package' system that is currently favoured by a lot of computer manufacturers like CBS Adam with printer and tape drive, and Amstrad with its tape and monitor. The Einstein's in-built extra is a disk drive of the Hitachi 3" variety. this stores about 190K of information.

This built in disk drive makes any tape interface redundant but creates one small problem — Hitachi disks cost around £5 when blank, so don't hold your breath waiting for cheap games.

Sleek lines

The external appearance of the computer is very functional, with a flat top designed to carry a monitor and the keyboard extending from the front.

The keyboard is very good and has eight BBC-like function keys at the top. Pre-programmed graphics symbols are on the front of the keys similar to Commodore machines and are accessed around the outer edges of the keyboard and are a different colour. The Alpha Lock key is soft, but there is an indicator light to show what state it's in.

Just above the function keys is a hinged plastic panel to put labels for the function keys behind. This is one of the little touches that makes the Einstein so easy to use. Above this is the front panel which contains the disk drive, a blank for another disk drive, and the seven inch speaker. The speaker is the only adequately sized internal speaker that I have ever seen in a computer. To go with this is a volume knob on the side of the box. Even at its lowest volume the sound is deafening!

Peripheral connections

Arranged around the right hand side and back are the peripheral ports. On the right is a bi-directional RS 232C port that is fully supported from software and two A to D sockets with two converters in each. These will take joysticks or any other A to D device.

Around the back of the machine is the Centonics printer port, a slot for adding two extra disk drives, an eight bit user port and an expansion bus called the Tatung pipe. The pipe is what any add-ons will be chained to.

Operating system

Internally the computer has 64K of RAM plus 16K of video RAM for the video processor chip which is the same as is used in the TI 99/4A. There is also 8K of ROM for the MOS (machine operating system).

When the machine is first switched on it goes into the MOS mode. The MOS is like a very complicated machine code monitor program. This can also load in the Disk Operating System (DOS) which in this case is Tatung/Xtal DOS.

Tatung/Xtal DOS is to all intents and purposes CP/M. CP/M is unfortunately the de-facto standard for Z80 based business machines. I say unfortunately because it was never designed as an operating system, so it does its job poorly.

Tatung/Xtal DOS, however, is a vast improvement on CP/M whilst retaining compatibility with it. Full error messages are implemented instead of CP/M's cryptic 'BDOS error on A' preceding a total system crash.

At this point it may be worth noting that the Einstein is a totally soft machine. There is no BASIC or other language built-in — even the OS needs to be loaded in by disk. Once in the Operating System you have access to all sorts of very powerful commands for manipulating disks and other input/output processing. You can also call up the directory to see what's on a disk.

Complete software

The Einstein comes with a system disk that holds the disk formatter, disk copier, and BASIC language along with a set of demo programs. The formatter can format disk and backup disks between drives or between disks in a single drive. The copy program is very powerful and can do more than copy files between disks. There are a lot of options available when copying, one of the most useful is the ability to tack line numbers onto the beginning of every line in a word processor file. This means that you could write and edit a program using a word processor and then dump it on a disk complete with line numbers.

Typing 'XBAS' calls up Xtal research's extended BASIC interpreter. This BASIC is very powerful and is one of the easiest to use that I have come across. The number of options and ways of doing thing is amazing. The POKE command is nearly redundant.

The two main commands for altering the way the BASIC works are PTR and IOM. PTR stands for pointer and can be used to check and alter various functions of the machine. IOM stands for Input Output Mode and controls all things in and out of the machine. One function of IOM is to switch between editing modes. One mode is a screen editor that is very similar to Commodore machines. Screen editors are the only editors that are any good on computers as they were designed for them.

The other editing mode is a line editor. Line editors are throwbacks from when computers were huge great beasts with flashing lights all over them and teletype machines were the only means of communicating

Comparison chart

Machine	Mem	Cols	Graphics	Text	I/O	Price
Einstein	80K	15	256×192	40×24	★★★★	£499
BBC	32K	8	varies	varies	★★★★★	£399
Spectrum	48K	8	256×176	32×24	none	£129
CBM 64	64K	16	320×200	40×25	★★★★	£199
Atmos	64K	8	240×200	40×28	★★	£189
Electron	32K	8	varies	varies	★	£199
Amstrad	64K	16	varies	varies	★★★	£229/329

with them. On a teletype machine line editing was the only way of changing anything. In the modern computer age line editing is equivalent to a dinosaur roaming around Dartmoor. Even so, it is good of Xtal research to include a line editor so that people who are converting from Dragons and Sinclairs can get the hang of the proper screen slowly.

Good graphics

The graphics capability of the Einstein is as impressive as it is strange. The computer uses the well worn Texas TMS 9918 video processor which can generate 256 by 192 graphics in 15 colours. Colour is handled in a very strange manner. With BBC and Lynx graphics each dot can be a different colour. On the Spectrum colour is selectable only in each character square so that you can only have two colours in every character square at one time. The Einstein has a mixture of the two. Colour is definable in each horizontal block of eight pixels.

Graphics handling from BASIC is all that anyone could wish for. Commands supported are elipses, line drawing and a fast fill command that can fill any irregular enclosed shape.

Sprite movement

One other feature that the TI chip has is sprites. Most people will know what a sprite is by now, but for those who don't I will explain. When moving an object around the screen normally you are just changing memory locations. You have to be careful that what you remove when putting your object there can be put back later. This is slow, but quite satisfactory for simple shapes and movement. If you have more than one object on the screen at once it can get very sticky indeed. Another problem with this method is that movement is very 'jerky'.

Sprites are the answer to everybody's problems. A sprite is a graphic shape that doesn't exist in screen memory so that you don't have to worry about what it's writing over. The sprite is defined elsewhere and the video chip is clever enough to display this shape, just like it was in normal screen memory, exactly where you want it. To position a sprite all you have to do is to give it co-ordinates and, lo and behold, there it appears.

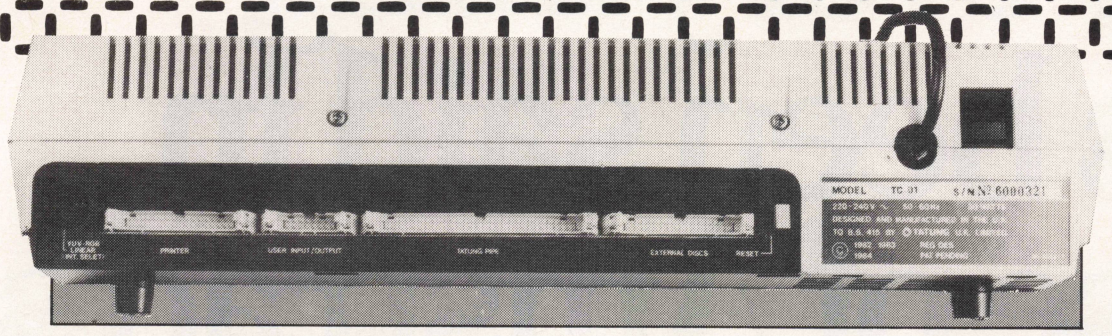
Currently the only computers that can use this very advanced graphics feature are Ataris, Commodore 64 and computers using this video chip. The Texas chip was the first to have sprites so they are the crudest of the three. The Commodore 64 is the latest and its sprites are fantastic.

The Einstein can display up to 32 sprites on the screen at one time but only four at a time on one horizontal line. So if you put five sprites next to each other the fifth would just disappear. Xtal BASIC supports sprites fully.

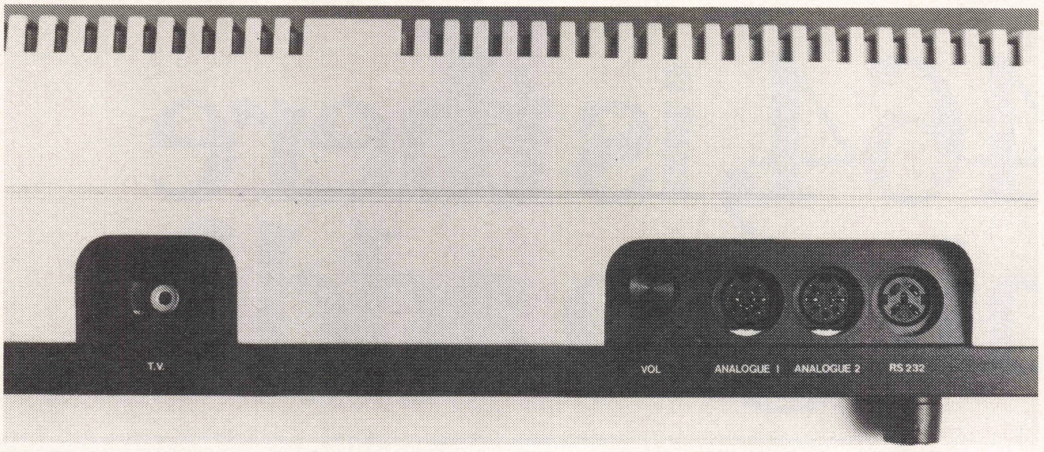


Quirky text handling

Text handling on the Einstein is very odd. The TI video chip has a number of different modes, some of which are text modes. All of its text modes are totally useless. Xtal Research's screen handler uses the top graphics mode to display both text and graphics like a Spectrum or an Electron. Text can be displayed as 40 columns



Rear view of Einstein showing connector ports



Side view of Einstein showing volume control and connections

of 24 lines or 32 columns of 24 lines. A problem is posed in the 40 column mode. When I mentioned the colour earlier I said that you could define a colour area down to a horizontal block of eight pixels. In 40 column mode a character is six pixels wide. This causes problems with coloured text but can be overcome in 32 column mode or careful planning of text layouts.

Detailed documentation

The documentation for the Einstein is superb and should be a lesson to other computer manufacturers. There are three manuals of varying thickness. The first is the 230 page Introductory Manual, this will teach any newcomer to computers the rudiments of BASIC with little trouble.

The second book is the 320 page BASIC Reference Guide. This is an excellent work and will guide any expert around the most interesting parts of the machine in great detail. This guide is much better than the one that Amstrad sell for £20 for their computer. Both books do the same job, but the Einstein one is included in the package.

The last manual is the slim 60 page DOS/MOS introduction, this gives a fairly detailed overview of the MOS, the DOS and the utility programs supplied. This book is a must for anybody considering using the machine seriously. Hats off to Tatung!

Future plans

Tatung are promising a dedicated monitor to use with the system. This will fit in the dent in the top of the machine. At the moment you can use a normal RGB monitor through the monitor port but some switches need to be set inside the machine. This process is quite simple and well explained and anyone of average intelligence and sense should be able to make the change.

Opening up the computer to make the changes is simpler than opening a BBC and even the most inexperienced users of that machine are doing it all the time. The Einstein has definitely been designed to be opened — undo two large screws and the top just slides off. This is good news for add-on hardware manufacturers.

Currently the monitor socket is set up for YUV video, this is a non-standard protocol in as much as it is not used very much for monitors, so if you get a Tatung monitor you will not be able to use any other computer on it.

When I first came into contact with the Einstein I was shocked at the level of technology that went into it. Most of the hardware was obsolete years ago. But when I started to use it I found that the software and documentation more than made up for it. Tatung have definitely been clever with this one.

Drawbacks

There are only a few drawbacks with the machine. The first is its price — £499, but this does include a disk drive and lots of features normally found only as extras on a lot of computers. To expand a Spectrum to this level of ability would cost you a lot more than that.

The 40 column screen is a bit of a shame. If it had an 80 column screen it would be able to run all the available CP/M business software but as it is, it can only run the 40 column stuff. There is some around but not as much as the 80 column software. At £499 with a built in disk, CP/M and 80 columns it would have wiped the 8 bit business computer market clean. I have seen one bit of software for the Einstein. It's WDPRO by Kuma. WDPRO is a word-processor that is on almost every Z80 machine that I can think of and is quite reasonable.

In conclusion, I think that if this machine was £50-£100 cheaper it would take off in a big way and give the Amstrad a run for its money. As it stands it is still a very good machine, not outstanding, just very good.

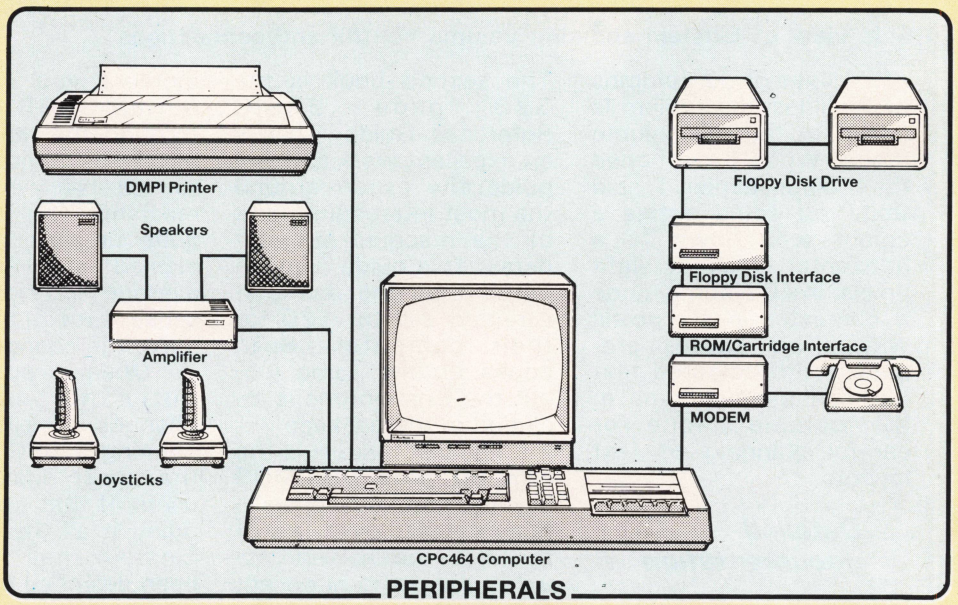
After everything that's been said in praise of Amstrad's CPC464, is there anything to add?

Plenty.

The CPC464 is an enthusiast's dream come true.

Few applications are beyond its capabilities, with its sophisticated features, complete expansion bus connector for sideways ROMs, serial interfaces, disk drives and modems.

No wonder the press is in raptures over it.



The CPC464 system.

It comes complete and ready-to-go. Here's what you get for that incredibly low price.

64K of RAM (42K available), 32K of ROM, colour monitor or green screen VDU, typewriter style keyboard, integral cassette data recorder and a very fast extended BASIC.

The CPC464 offers you high resolution graphics, 80 column text display, up to 8 text windows plus a graphics window and a palette of 27 colours.

Not to mention a 3-voice, 7-octave stereo output you can feed through a hi-fi amplifier and speakers.

Now we think you'll agree, that's some system.



CPC464 green screen VDU (GT64)

Low cost disk drive.

An inexpensive floppy disk system is available which includes CP/M* (giving you the option to access 3000 proven programs) and LOGO with its famous educational applications.



Optional disk drive DDI-1 including interface CP/M* and LOGO £199.95

£239
Computer complete with green screen VDU (GT64)

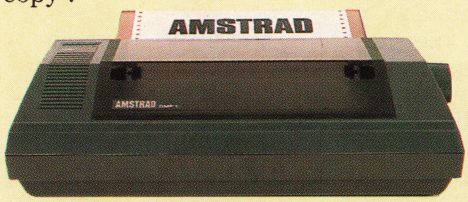
£349
Computer complete with colour monitor (CTM640)

CPC 464 complete with monitor and datacorder



Printer port.

The CPC464 has a built-in standard parallel printer interface which offers you the facility to provide permanent reference of program listings, letters, invoices, anything that requires 'hard copy'.



Optional 80 column dot matrix printer DMP-1 operates at up to 50 characters per second. Combined with the CPC464, it offers a high performance text processing system for only £199.95.

Joysticks. Power supply modulator.

You can bring those arcade games stunningly to life with the optional joystick controller which has a socket for a second stick.

The optional power supply and modulator enables the CPC464 to be connected to any home colour TV.

Amsoft. Fast growing software.

The high quality software takes full advantage of the CPC464's high specification and speedloading capability. Which means even complex programs can be loaded quickly.

A range of software is already available. And it's growing rapidly.

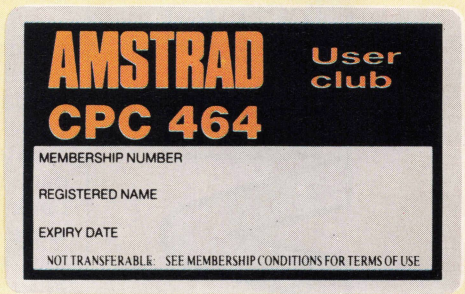
Educational programs, business applications and arcade games are all designed to utilise the CPC464's impressive graphics, sound and processing abilities.



Amstrad Club Membership.

Whether you're interested in commercial applications or you're a games fanatic, you'll want to join the Club.

Members enjoy immediate benefits like the privilege card, Club binder, regular magazine, competitions for valuable prizes and contact with other Amstrad users.



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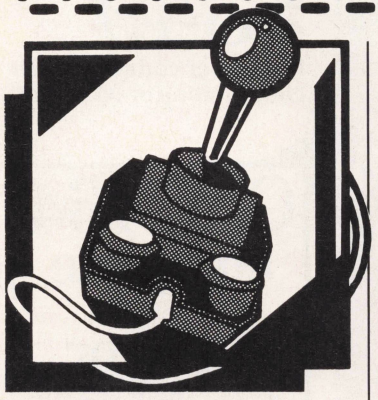


Software Reviews

REVIEWS

Title: Enigma
Format: Tape
Software House: Brainbox Software Ltd. 20 Orange St.. London
Price: £5.95

Machine: BBC Model B



I find playing games against computers trying at the best of times but when I don't even know the rules it becomes near impossible. The idea of Enigma is not to play the game but to discover the rules by which it is played. A bit like code-breaking really. The game is reasonably well presented with clear instructions and probably well worth the money of anyone who likes tying their brains in knots.

The game has five separate 'enigmas' to solve and each seems harder than the last. If you solve all five and still feel mentally masochistic you can send your cassette back to Brainbox Software with a cheque for £4 and get yet another five enigmas. I personally think it should have been called 'Frustration'.

D.H.

STAR TABLE	
Screen display	★★★
Addictiveness	★★★
Ease of use	★★★★
Overall	75%

Title: Mined Out
Format: Tape
Software House: Quicksilva, 13 Palmerston Road, Southampton.
Price: £7.95

Machine: Oric 1/Atmos 48K

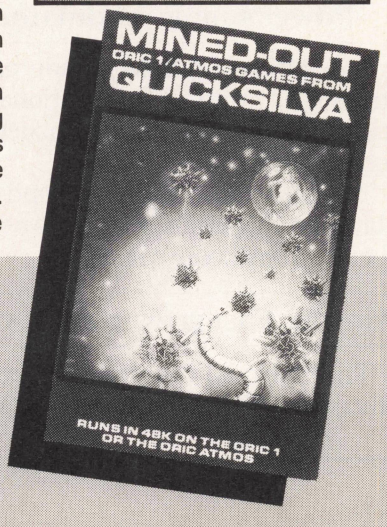
Bill the Worm, megastar extraordinaire has managed to get himself trapped in a minefield. Your mission, should you accept it, is to rescue Bill and as many of his leading ladies as you can without blowing yourself to kingdom come. Your only means of assistance are a piece of string and a friendly little minespreader who clears away invisible mines.

The computer tells you when you are next to a mine but not in which direction it lies. Each screen is harder than the last and eventually when you've run out of string and the crazy mine bug is chasing you things are well nigh impossible. Although I'm not sure how many screens there are since I've yet to get past screen six.

An excellent example of what can be done with BASIC which should keep us sweating over the keyboards for many hours. Nice one lads!

D.H.

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	95%





Title: Cavelon
Format: Tape
Software House: Ocean Software Ltd. Ocean House, 6 Central Street, Manchester 2.
Price: £6.90

Machine: CBM 64

Cavelon is an excellent fast loading graphic adventure game. The object is to rescue Guinevere with the aid of the Magic Excalibur and as you may have gathered, the scene is set in Ye Days of Olde when Knights were bold and fair Maidens needed rescue.

You pit your wits (sword and bow) against the guards of the castle in which Guinevere is held captive. You kill the guards by firing at them and to progress through the six levels of the castle you must collect parts of the door which has been scattered around before leaving at the far end of the maze type scene. Needless to say, being hit or making contact with any of the evil Knights will ensure your immediate demise.

Further bonuses can be gained by collecting other objects on your travels to the next exit and if things really get hot you can call on the assistance of Excalibur itself which renders you immune for a short period of time. This will enable a quick exit from what would otherwise be a quick demise. However, your sword of immunity should be used wisely as you only have three chances unless you are quick enough to pick up the bonus swords which occasionally appear.

The top levels are either very difficult or your Reviewer is just incapable of getting further than the fourth screen. At the sixth you are supposed to meet the Black Knight who imprisoned the young lady and where you will require all of your saved Excalibur bonuses.

The f5 key is used to call Excalibur, which I found to be the only disadvantage because I couldn't think of a way to get round it and that is why I have not given this otherwise excellent program full marks.

P.O.

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★
Ease of use	★★★★
Overall	85%

Title: LOGO Graphics Interpreter
Format: Tape
Software House: Kuma Computers Ltd., Pangbourne, Berks.
Price: £9.95

Machine: Spectrum 48K

Turtle graphics are regarded by some as nothing more than a plaything for children, but this program from Kuma will dispel such thoughts.

Contained within the interpreter is an impressive selection of commands which can be used to obtain a workable understanding of the operation of LOGO. These commands can also be linked together to create new procedures of a much more complex nature which themselves can be used to form even more procedures. Thus from a simple grasp of the basics a complex relationship can be formed at the user's own speed of understanding. As well as learning the rudiments of programming, this program also stimulates an awareness of shape and geometrical form.

An informative little booklet accompanies the tape which gives sufficient information and examples to enable competent use of the interpreter, this combines to make the package a worthwhile investment for anyone.

G.W.

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★★
Ease of use	★★★★
Overall	80%

Title: SCOPE 64 The Games Designer
Format: Tape
Software House: ISP, Hampstead House, Basingstoke.
Price: £17.95

Machine: CBM 64

Machine code programming made easy! Possibly an over-reaction, but SCOPE 64 is a package of 46 commands for handling graphics, sprites and sound. Without any knowledge of Assembler or 6502 machine code, fast and powerful graphics and sound routines can be written. These can either be stand-alone programs or incorporated into standard BASIC programs. The 'language' allows programs to be structured with the inclusion of both testing and branching commands.

The SCOPE commands are entered in BASIC REM statements and then 'compiled' with the SCOPE program which resides in high memory. Before compiling

you must reserve areas of memory for the compiled program and any other routines to be stored. The compiled routines and programs are then run by issuing a SYS call to the previously reserved area.

The program comes well packaged with an extensive 60 page User Manual. Also provided on the tape are seven demonstration programs whose listings are included in the manual for reference.

D.W.

STAR TABLE	
Screen display	★★★
Addictiveness	★★★★★
Ease of use	★★★★
Overall	80%

Title: Flight Path 737 (Advanced Pilot Trainer)
Format: Tape
Software House: Anirog Software, 29 West Hill, Dartford, Kent.
Price: £7.95

Machine: CBM 64

As the pilot of this high performance jet airline, you must take off from an airfield surrounded by high mountains and, having climbed your aircraft safely over them, prepare yourself for a landing at an airfield in the valleys below.

When the menu appears, a nicely arranged little tune is played while you choose between First Solo, through six levels of difficulty, to Test Pilot. In First Solo the mountains are 5,000ft. and the runway 3 miles long and no in-flight hazards.

In Test Pilot the mountains are 9,200ft. and the runway one and a half miles long with crosswinds and a chance of engine fires.

Because of the need for mathematical calculations by the computer, the program is in compiled BASIC, slowing down reaction time a little. For added interest the inclusion of a navigation map, would for me, enhance this otherwise very good simulator. I have seen better flight simulators but not for the 64.

'Turbo Loader' loading time is 65 seconds.

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★
Ease of use	★★★★
Overall	80%

Title: Hercules
Format: Tape
Software House: Interdisc, 249-251 Kensal Road, London W10 5DB
Price: £6.95

Machine: CBM 64

This game consists of 12 different randomly generated screens depicting the Twelve Labours of Hercules. Your task is to guide Hercules from platform to platform and up and down ropes to the goal of each particular labour.

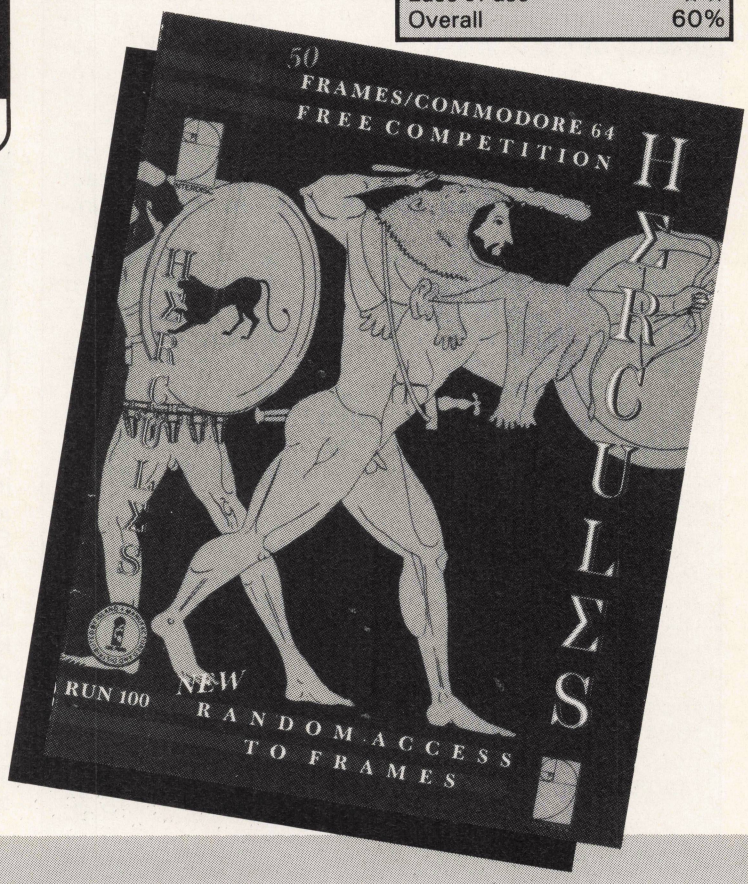
However, to thwart you in this task, you will find that platforms suddenly burst into flames whilst Hercules is standing on them, thus losing you a life. They also sometimes disappear without warning once more costing you a life. On the other hand, both ropes and platforms sometimes miraculously appear where there were none before. But this is a rare and equally random occurrence. This leaves you quite unsure of how to form any strategy for playing the game at all.

There is a rather splendid title screen with animated Greek mythological figures with an equally splendid tune but this is unfortunately only displayed when you abort a game.

I must admit that I was very frustrated and consequently very disappointed with this game. I am sure it has got potential to be a Top Ten hit, but has failed for rather silly reasons.

D.W.

STAR TABLE	
Screen display	★★★★
Addictiveness	★★★
Ease of use	★★
Overall	60%



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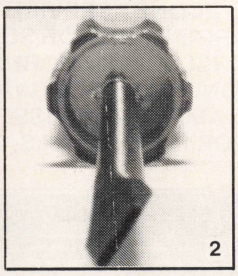
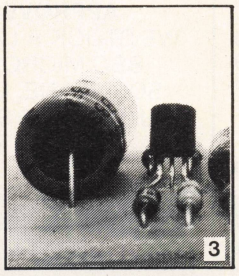
Third prize — a BBC Model B micro computer plus software worth £450.

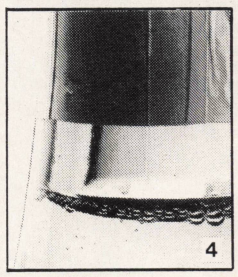
Fourth prize — Minolta X700 camera with a 50mm lens and flashgun, worth £280.



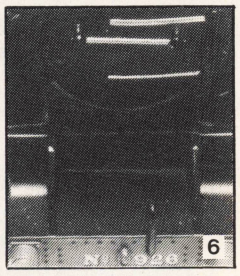


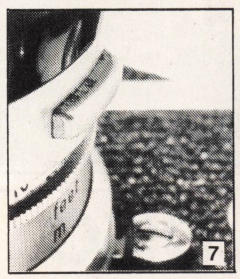


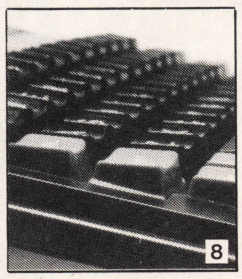


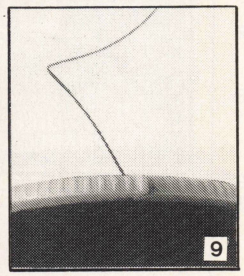


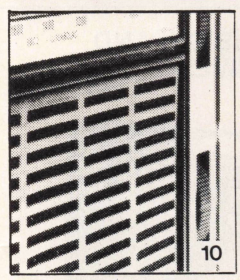


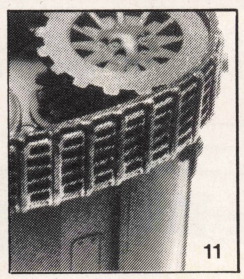














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Just identify the twelve objects pictured opposite....

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Photoplay Movies and Video
ZX Computing
Military Modelling
Hi-Fi Now!
Winemaker
Citizens' Band
Model Boats
Video Today
Popular Crafts
Which Video?
Your Commodore

and write your (one-word) answers in the spaces provided on the coupon. For instance, if you think that number 9 is a record, write 'record' in the space next to 9 on the coupon and so on. Then tell us in up to 20 words why **MAGAZINES MAKE IDEAL HOLIDAY READING.** Complete the coupon in BLOCK LETTERS, and send it to: *DREAM HOLIDAY COMPETITION, Argus Specialist Publications Ltd., No 1 Golden Square, London W1R 3AB,* to reach us no later than 31st December 1984.

Competition rules

1 The competition is open to all UK and Eire readers except employees of Argus Specialist Publications Ltd., their printers and distributors.

2 As long as an original coupon from the magazine(s) of your choice is used for each entry there is no limit to the number of entries per person. Photocopied coupons will not be accepted.

3 All entries must be postmarked before 31st December 1984.

4 The prizes will be awarded to the first four entrants who identify the twelve objects correctly and whose completed sentence is judged the most apt and original.

5 No correspondence will be entered into about the competition results; the judges' decision is final.

6 Winners will be notified by post and the results will be published in a future issue of this magazine.

The 12 objects are

1. . . . . 2. . . . . 3. . . . . .

4. . . . . 5. . . . . 6. . . . . .

7. . . . . 8. . . . . 9. . . . . .

10. . . . . 11. . . . . 12. . . . . .

Magazines make ideal holiday reading because *(up to 20 words)* . . . . . .

. . . . . .

NAME *(BLOCK LETTERS)* _____ AGE *(if under 18)* _____

ADDRESS _____

Send to **DREAM HOLIDAY COMPETITION,** Argus Specialist Publications, No 1 Golden Square, London W1R 3AB.

PRINTERS

DOT MATRIX

All printers have centronic parallel interface unless otherwise stated. All printers have hi res dot addressable graphic mode. Please send SAE for full details.

EPSON

FX80 160CPS 10″ wide friction & pin feed	£324 + VAT	**£373**
FX100 160 CPS 15″ wide friction & tractor feed	£499 + VAT	**£574**
RX80 F/T 100 CPS 10″ wide friction & tractor feed	£239 + VAT	**£275**
RX80 100 CPS 10″ wide tractor feed	£199 + VAT	**£229**
RX100 F/T 100 CPS friction & tractor feed	£385 + VAT	**£443**
8143 RS 23 Interface for FX and RX printers	£39 + VAT	**£45**
8148 RS 232 Interface with 2K buffer x on x off	£60 + VAT	**£69**
Ribbon Cartridge for RX80 FX80 & MX80	£5 + VAT	**£6**
Ribbon Cartridge for FX100 & MX100	£7 + VAT	**£8**

STAR

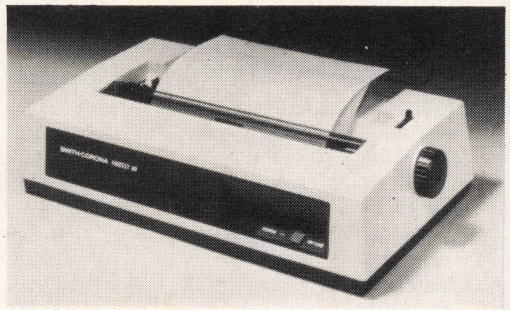
Gemini 10X120 CPS 10″ wide friction & tractor feed	£200 + VAT	**£229**
Gemini 15X120 CPS 15″ wide friction & tractor feed	£295 + VAT	**£339**
Gemini Ribbon	£3 + VAT	**£3**

SEIKOSHA

BP 420 designed for the business world, 420CPS in draft mode, 110CPS in NLQ mode. £1095 + VAT **£1259**

SMITH CORONA

Fastext 80: 80 col, 80CPS. Friction feed standard
£149 + VAT **£171**



ENSIGN

1650 Standard, Correspondance and Graphics Modes; friction and tractor feed; 165 CPS; bi-directional logic seeking £269 + VAT **£309**

TAXAN KAGA

160CPS 10″ wide 27CPS NLQ 24 x 16 matrix	£259 + VAT	**£298**
160CPS 15″ wide 27CPS NLQ 24 x 16 matrix	£349 + VAT	**£401**

COLOUR PRINTERS

Seikosha GP700A 7 colour 50CPS printer	£347 + VAT	**£399**
Canon PJ1080A 7 colour 40CPS ink jot printer	£391 + VAT	**£449**

All our printers have 1 year warranty

DAISYWHEEL

JUKI 6100/I PRINT

20 CPS Bi-Directional Logic seeking 10 12 15 CP1 + PS spacing 2K buffer best selling Daisywheel	£299 + VAT	**£344**
Singer sheet feeder unit	£217 + VAT	**£249**
Tractor Unit	£95 + VAT	**£109**
RS 232 Interface	£52 + VAT	**£59**
Spare Daisywheel	£14 + VAT	**£16**



BROTHER HR-15

13 CPS Bi-directional 10, 12, 15 CP1 + PS	£344 + VAT	**£395**
Keyboard Unit	£139 + VAT	**£159**
Single Sheet Feeder Unit	£217 + VAT	**£249**
Tractor Unit	£95 + VAT	**£109**

QUENDATA

20 CPS Unidirectional 10 12 15 CP1 £217 + VAT **£250**

ACORN

BBC MICROCOMPUTER SYSTEM

WE ARE AN OFFICIAL BBC COMPUTER DISTRIBUTOR

DEALER ENQUIRIES ARE WELCOMED

Acorn Electron £199 INC VAT

Free Cassette Recorder with every Electron

BBC is the best microcomputer currently on the market 32K RAM
32K ROM 8 modes of operation full colour full-size keyboard internal expansions such as disc interface speech synthesizer Econet interface — in short it is a personal computer capable of expanding into a small business system.

APPROVED ECONET SERVICE CENTRE
WE STOCK A LARGE RANGE OF SOFTWARE FOR BBC MICRO INCLUDING ACORNSOFT, BBC SOFTWARE, LONGMANS SOFTWARE, PLEASE SEND LARGE STAMPED ADDRESSED ENVELOPE FOR FULL DETAILS.

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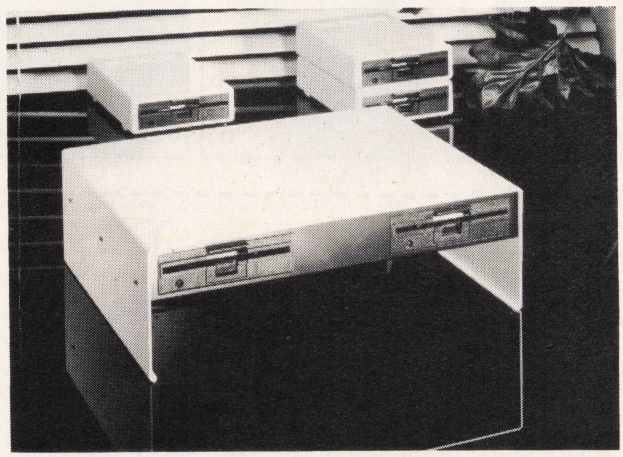
COMPUTER GROUP

28/29 BURNT MILL HARLOW, ESSEX CM20 2HU U.K.
Tel. HARLOW (0279) 443521 Telex: 818894 AKHTER G

DISC

100% BBC COMPATIBLE MITSUBISHI AND TEAC SLIMLINE DISK DRIVES



These drives are supplied ready cased with all the necessary cables formatting program and User Guide
There are some very useful utilities included on formating disc e.g.

* DISASSEMBLER: This is 6502 machine code disassembler
* DUP: To copy and rename a file on disc
* FORMAT: Formating progam for 40 & 80 tracks

PRODUCTS

BBC Microcomputer Model B	£348	+ VAT	**£399**
BBC Mod B - disk interface	£409	+ VAT	**£469**
BBC Mod B - Econet interface	£389	+ VAT	**£447**
BBC Mod B - disk and Econet interfaces	£450	+ VAT	**£517**
BBC Compatible 100K disk drive	£86	+ VAT	**£99**
BBC Compatible dual 800K disk drive	£312	+ VAT	**£359**
Acorn Z80	£347	+ VAT	**£399**
Acorn 6502 Second Processor	£173	+ VAT	**£199**
Acorn Bit stick	£327	+ VAT	**£375**
Acorn IEE Interface	£282	+ VAT	**£325**
Acorn Electron plus 1 interface	£52	+ VAT	**£60**
BBC Prestel Adaptor	£115	+ VAT	**£132**
BBC Telext receiver (Aug)	£196	+ VAT	**£225**
BBC cassette recorder and lead	£30	+ VAT	**£35**
Disk interface kit (free fitting)	£84	+ VAT	**£96**
Mod A to Mod B upgrade kit	£70	+ VAT	**£80**
Fitting charge for A to B upgrade kit	£20	+ VAT	**£23**
16K memory upgrade kit	£30	+ VAT	**£34**
Games paddles	£16	+ VAT	**£19**
User Guide	£10		
Advanced User Guide	£12.95		
Econet Guide	£7.50		
Econet interface (free fitting)	£60	+ VAT	**£69**
Speech interface (free fitting)	£47	+ VAT	**£54**
BBC disk manual - formating disk	£30	+ VAT	**£34**
Parallel printer cable	£10	+ VAT	**£11**
BBC word processor (view)	£52	+ VAT	**£59**
BBC Fourth language cassette	£15	+ VAT	**£17**
BBC Lisp language cassette	£15	+ VAT	**£17**

YOUR CONTACT AT AKHTER
Tel: 0279 443521 (12 lines)

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EXPORT ENQUIRIES	MOHAMAD EDIB	201
TECHNICAL SUPPORT	ALAN LAFFOLEY	207
ACCOUNTS	JULIE AMBLER	211
LITERATURE REQUEST	JOHN MAULE	201

ORDERING INFORMATION

We accept official orders from UK Government and Education establishments. Carriage is £2.50 + VAT (UK only) for normal delivery. If express delivery is required please add £8.00 + VAT per parcel. We accept telephone orders on Barclay and Access card please ring (0279) 443521 (10 lines). all cheques made payable to "AKHTER INSTRUMENTS".

BARCLAYCARD VISA

Buy it with Access

N.B. All prices are subject to change without notice and are rounded up to the nearest pound

OPENING HOURS: MON-FRI 9am-6.30pm, SAT 10am-5pm. We welcome callers, no parking problems.

DRIVES

* FREE: This utility provides a disk usage analysis
* MDUMP: Enables you to display and modify any part of BBC memory
* MERGE: Merge a number of text files into one file
* RELOCATE: Downloads a basic program to &E00
* SDUMP: Screen dump for EPSON In all graphic modes
* VERIFY: Verifies every sector on a disk
* MENU: A flexible menu program

Single drive 100K 40 trks single sided	£86	+ VAT	**£99**
Dual drive 200K 40 trks single sided	£164	+ VAT	**£189**
Single drive 200K 40 trks double sided	£138	+ VAT	**£159**
Dual drive 400K 40 trks double sided	£260	+ VAT	**£299**
Single drive 400K 80 trks double sided	£152	+ VAT	**£175**
Single drive 400K 40 80 trks switchable DS	£155	+ VAT	**£179**
Dual drive 800K 80 trks double sided	£303	+ VAT	**£349**
Dual drive 800K 40 80 trks switchable DS	£312	+ VAT	**£359**
Dual Drive 800K 40 80 trks + PSU + built in monitor stand	£373	+ VAT	**£429**

All above drives are low power slimline (0 3 A typ at + 12v and 0 4 at + 5v per drive) Normally extra power supply is not required. The BBC Computer power supply is designed to drive to low power drive (IT IS NOT DESIGNED TO DRIVE INTERNAL ROM BOARD)

40 Track SS DD disketts (10 Box)	£18	+ VAT	**£20**
40 Track DS DD disketts (10 Box)	£23	+ VAT	**£26**
80 Track SS DD disketts (10 Box	£28	+ VAT	**£32**
80 Track DS DD disketts (10 Box)	£30	+ VAT	**£34**

ALL ABOVE DISKETTES ARE CERTIFIED 3M

BUSINESS SYSTEMS

COMPLETE BUSINESS PACKAGE

This system is based on 16 Bit 8088 Processor 128K RAM, 2X730K Floppy Disc Drives, High Res Monitor, fast (160cps) Dot Matrix Printer, Wordstar Wordprocessor, Calcstar Spreadsheet Program, complete integrated Accounts package consisting of Sales Ledger, Purchase Ledger, Nominal Ledger, Invoicing, Stock Control, Payroll and Pro-mail.
Complete turnkey system at an unbelievable price.
Delivered Only £1495 + VAT **£1719**
Delivered and Installed plus ½ day training £1595 + VAT **£1834**

APRICOT PC

"Portable Executive Computer" 16 Bit Micro. 256K RAM up to 1.44 megabytes flopy disk storage. 3½" Sony disks. Portable brief case styling. Modem with auto dialler (optional) hard disk optional. Vast software library (compatible with Sirius 1).
Apricot with Double Drive, Monitor and ***Free Printer*** £1790 + VAT **£2059**

APRICOT XI

As above but with 10MB Winchester Drive and Single 315K Drive plus Superwriter, Supercalc and ***FREE JUKI 6100 Printer***
£2995 + VAT **£3444**



SANYO PROFESSIONAL COMPUTER

SANYO 550

16 Bit Micro 128K RAM expandable to 256K. Single or Double Disk drive built in full colour graphics (640 x 200 pixels in 8 colours) IBM compatible. Free software. Sanyo MBC 550 128K RAM single drive and free software including Wordstar and Calcstar **£749 + VAT £862**

SANYO 550-2

As 550 but with Dual Drive 2 x 160K
£849 + VAT **£976**

SANYO 550-360

As 550 but with 2 x 360K Drives
£999 + VAT **£1149**

SANYO 550-730

As 550 but with 2 x 730K Drives
£1049 + VAT **£1206**

SANYO 555

Sanyo MBC555 128K double drive and free software including Wordstar, Calcstar, Inforstar, Datastar etc. **£999 + VAT £1149**

SANYO 555-360

As 555 but with 2 x 360K Drives
£1249 + VAT **£1436**

SANYO 555-730

As 555 but with 2 x 730K Drives
£1299 + VAT **£1494**

SANYO SYSTEMS INCLUDE FREE HIGH RES GREEN MONITOR

WORD PROCESSING

COMPLETE SYSTEMS FROM £650 + VAT

BBC 1: BBC Micro Model B, View (or Wordwise) Wordprocessor, Quendata 20 CPS Daisywheel Printer, High Res Green Monitor, Cassette Recorder plus 10 cassettes and all the necessary cables £650 + VAT = **£747.50**

BBC 2: BBC Micro Model B + Disk Interface, View (or Wordwise) Wordprocessor, 100K Disk Drive, High Res Green Monitor, Quendata 20 CPS Daisywheel Printer, 1 Box of Disks and all the necessary cables
£799 + VAT = **£803.35**

BBC 3: Same as System BBC2 but with 400K Drive £875 + VAT = **£1006.25**

BBC 4: Same as System BBC 2 but with 400K Drive and JUKI 6100 Daisywheel Printer
£975 + VAT = **£1121.25.**

BBC 5: BBC Model B + Disk Interface, View (or Wordwise) Wordprocessor, 800K Dual Disk Drive (Mitsubishi), High Res Green Monitor, JUKI 6100 Daisywheel Printer, 1 Box (10) of 80 Track DS discs and all necessary cables £1145 + VAT = **£1316.75.**

SAN 1: Sanyo MBC 550 Series 16 Bit Microcomputer, 128K Ram, Dual 160K drives (2 x 160K), High Res Graphics (600 x 200 pixels in 8 colours), JUKI 6100 Daisywheel Printer, High Res Green Monitor, 1 Box of 10 discs, Wordstar Wordprocessor, Calcstar spreadsheet and all the necessary cables
£1175 + VAT = **£1351.25**
SAN 2: Same as SAN 1 but with Dual 360K Drives (2 x 360K) £1345 + VAT = **£1546.75**
SAN 3: Same as SAN 1 but with Dual 720K Drives £1395 + VAT = **£1604.25**
SAN 4: Sanyo MBC 555 Series 16 Bit Microcomputer, 128K Ram, Dual 160K Drives (2 x 160K), High Res Graphics (600 x 200 pixels in 8 colours) JUKI 6100 Daisywheel Printer, High Res Green Monitor, 1 Box of 10 discs, Wordstar, Wordprocessor, Calcstar spreadsheet, Mailmerge, Spellstar (dictionary), Datastar (database), Reportstar plus all the necessary cables £1295 + VAT = **£1489.25.**
SAN 5: Same as SAN 4 but with Dual 360K Drives £1475 + VAT = **£1696.25**
SAN 6: Same as SAN 4 but with Dual 730K Drives £1525 + VAT = **£1753.75**

If you require High Res Colour Monitor instead of High Res Green Monitor in Sanyo Systems please add £320 + VAT = £368 to the above prices.
*128K RAM Upgrade for all above Sanyo systems (makes a total of 256K RAM) £150 + VAT = £172.50 including fitting.

MONITORS

PHILIPS

7001 High Res Green Screen and sound input
£65 + VAT **£75**

GM1211

GM1211 18 MHZ High Res Monochrome Monitor with tilt and swivel stand available in green or amber etched antiglare screen (please specify colour £86 + VAT **£99**

SAMWOO

24MHZ High Res Monochrome etched antiglare green screen IBM/BBC Compatible
£86 + VAT **£99**

SANYO

DM8112 12" Green screeen 18MHZ Hi-Res
£86 + VAT **£99**
DM2112 12" Green screen 15MHZ
£66 + VAT **£75**

MICROVITEC CUB

1431 MS 14" RGB Normal Res Colour
£173 + VAT **£199**
1451 MS 14" RGB Medium Res Colour
£289 + VAT **£332**
1441 MS 14" RGB High Res Colour
£417 + VAT **£479**

MICROVITEC FOR QL

1451 14" Medium Res Colour.
Specially designed
for Sinclair QL
£239 + VAT **£275**

Warning: these gar



nes show no mercy.

Acornsoft have now unleashed eight more merciless games onto unsuspecting BBC micro owners.

Ranging from 'Gateway to Karos', where putting a foot wrong could mean instant death. To the relentless antics of Drogna which could have you dying with laughter.

Gateway to Karos.

An adventure game in which you'll need all your patience and ingenuity just to stay alive. Your objective is to find the Talisman of Khoronz but, whichever path you choose, you'll be beset by treachery. Serpents lie in wait and magical phenomenona are in abundance. Should you find the Talisman, you've still to find your way back.

Kingdom of Hamil.

As the rightful heir to the Kingdom of Hamil, you are in the unusual position of having to prove your claim to the throne. Evil people are trying to prevent you accomplishing your task by any means. An adventure game fraught with many dangers, puzzles and problems.

Tetrapod.

You're in an arena littered with dormant lizards, killer bees and other hostile creatures with whom you'll have to do battle to survive. But beware of your own laser bullets, as they bounce off the arena walls.

Drogna.

A game for two people – preferably with devious minds. There are two vaults containing diamonds and your job is to collect and transfer them to your home base. While your opponent is out collecting you could sneak in and steal his loot . . . but keep an eye out for him doing the same to you.

Crazy Tracer.

An arcade style game where you're in charge of a paint roller. Guide your roller around a maze of rectangles while evading monsters who are committed to destroying it. Gain extra rollers and bonus points by painting different objects. But you'll have to avoid running out of paint.

Volcano.

Mount Crona has erupted after 150 years of silence. And your mission as an Emergency Rescue Helicopter Pilot is to save sightseers stranded on the slopes. Time is of the essence as the lava approaches the sightseers. But you'll have to take time to evade – or shoot – the boulders being hurled from the volcano.

Carousel.

A re-creation of the fairground shooting gallery – with a difference. Shoot down all the ducks, owls and rabbits before you run out of ammunition. Watch out for the low-flying ducks. If you fail to shoot these, they'll steal your bullets and reduce your chances of success.

Meteor Mission.

On an alien planet are six stranded astronauts. Launch your capsule from the Mothership and by avoiding – or shooting – meteors and alien craft, pick up the astronauts one at a time and return them to the Mothership.

All games – with the exception of Gateway to Karos which is currently only available on cassette – can be bought direct in either cassette or disc form. You will find all these programs at your local Acorn stockist. To find out where they are simply call 01-200 0200. Credit card holders, phone 01-200 0200, anytime. Or 0933 79300, during office hours.

Alternatively, you can order the games by sending off the coupon below to: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL. Please allow 28 days for delivery.

To: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.
Please send me the following software games:

PROGRAM	QUANTITY	DISC/CASSETTE
Gateway to Karos		
Kingdom of Hamil		
Tetrapod		
Drogna		
Crazy Tracer		
Volcano		
Carousel		
Meteor Mission		
TOTAL		

Price Cassette: £9.95; Disc: £11.50

I enclose PO/Cheque payable to Acornsoft Ltd. Or charge my credit charge.

Card Number: _____
Barclaycard/Access (Delete)

Name _____

Address _____

_____ Postcode _____

Signature _____ PT11

Registered No. 1524763 VAT No. 215 8123 85

ACORNSOFT

Feature

Buyers Beware

Buying through mail order can be a risky business and in the long run could cost you money! Sue Bartlett points out the pitfalls and details the precautions you should take before posting off your money.

In Great Britain we spend more than £2,500 million a year on shopping by post. There are two main ways — buying through mail order catalogues or responding to an advertisement in a magazine or newspaper. 'Postal sales' is the name given to goods ordered by the second procedure, and this is the commonest postal method of ordering computers and computer equipment.

'Payment with order' is the general rule with this process, although some advertisements carry credit facilities. Through advertising, manufacturers and wholesalers can reach the consumer directly and as a consequence goods are generally cheaper because the retail layer is 'leapfrogged'.

Bonuses and pitfalls

Buying by mail order has certain advantages for the consumer. These include convenience since purchasing from home saves travelling time and expenses, not to mention the time you may spend waiting to be served. Also the advertiser may offer credit facilities and if money is tight for the purchaser, this may be the only method he can use to buy large items such as computers.

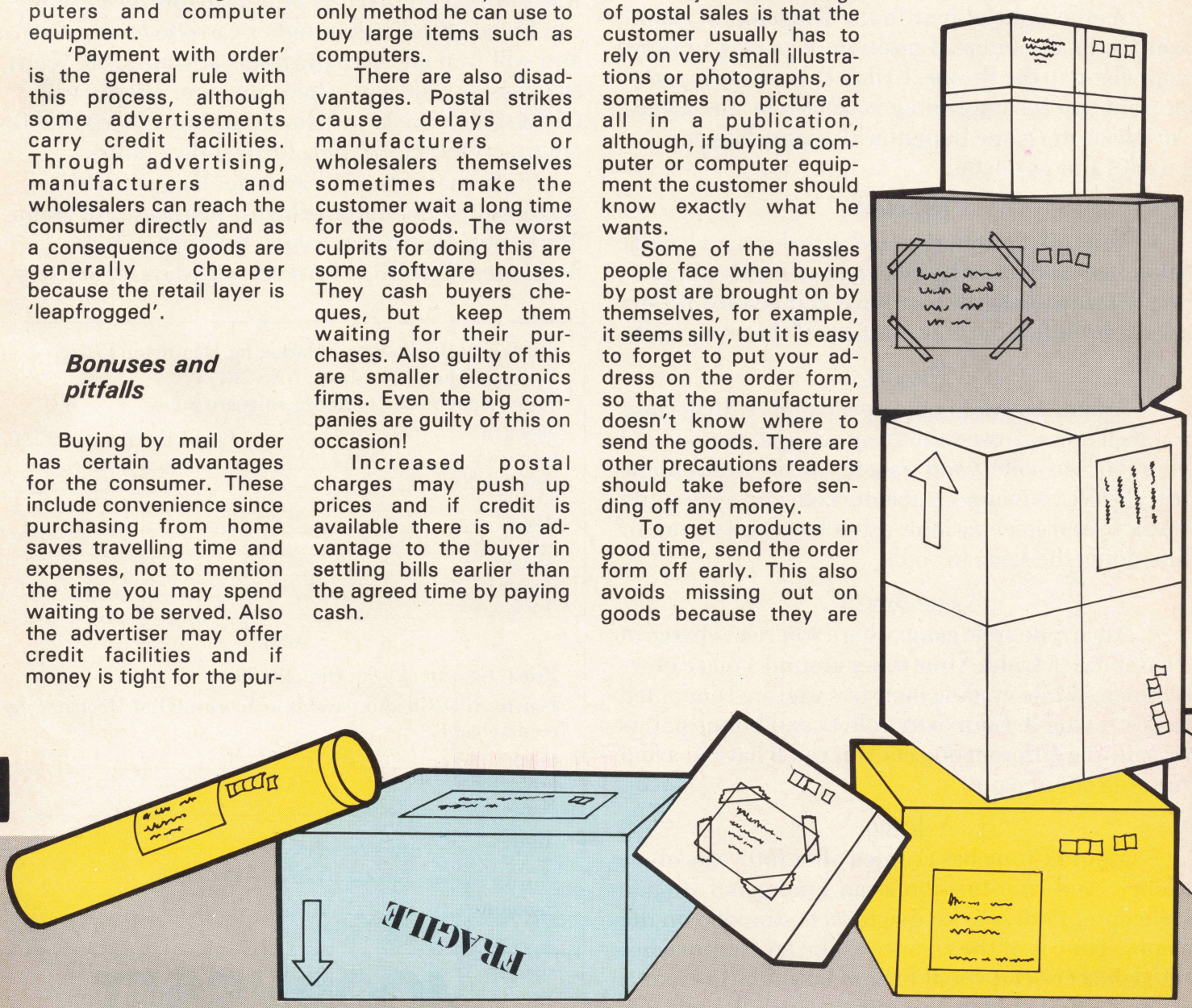
There are also disadvantages. Postal strikes cause delays and manufacturers or wholesalers themselves sometimes make the customer wait a long time for the goods. The worst culprits for doing this are some software houses. They cash buyers cheques, but keep them waiting for their purchases. Also guilty of this are smaller electronics firms. Even the big companies are guilty of this on occasion!

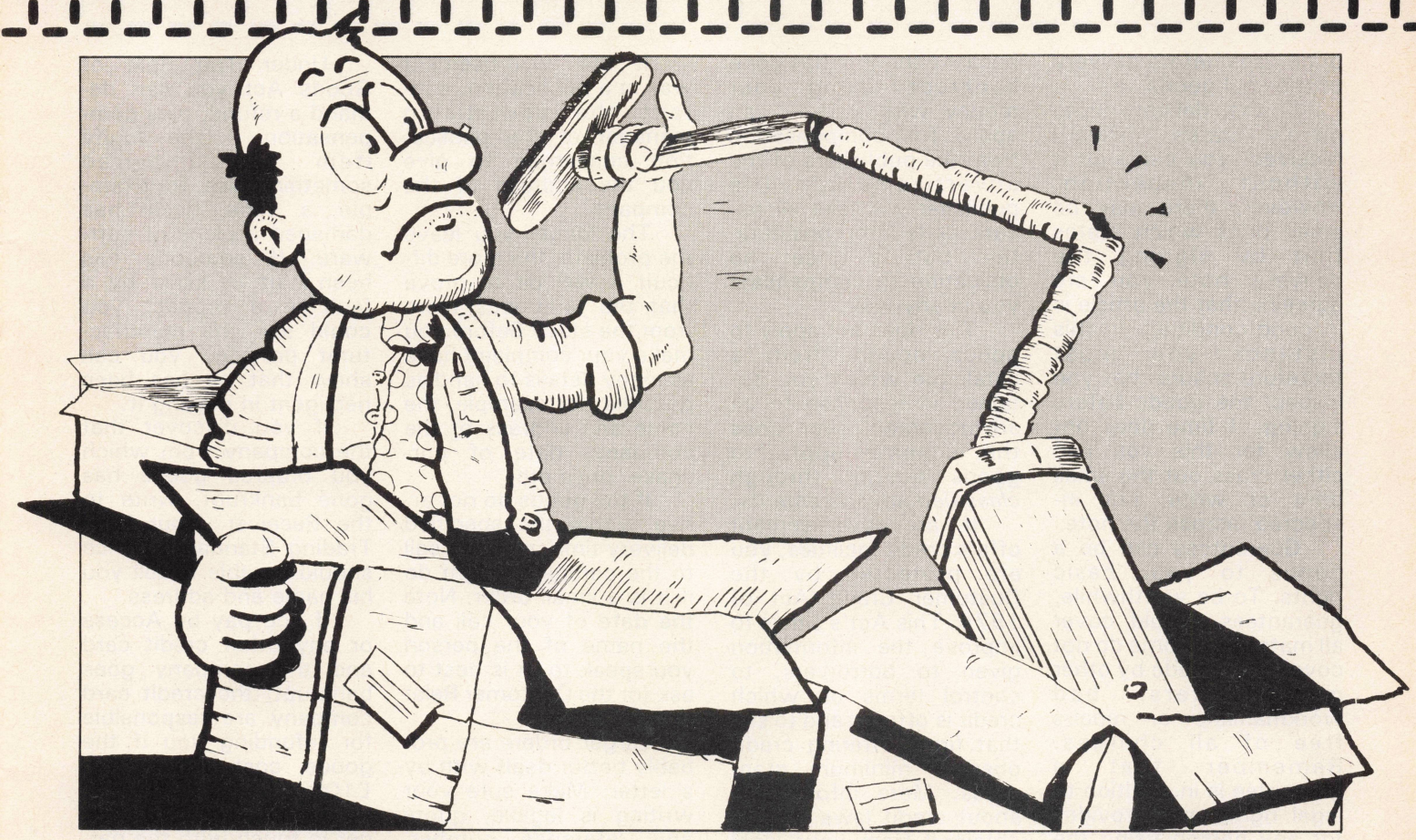
Increased postal charges may push up prices and if credit is available there is no advantage to the buyer in settling bills earlier than the agreed time by paying cash.

A major disadvantage of postal sales is that the customer usually has to rely on very small illustrations or photographs, or sometimes no picture at all in a publication, although, if buying a computer or computer equipment the customer should know exactly what he wants.

Some of the hassles people face when buying by post are brought on by themselves, for example, it seems silly, but it is easy to forget to put your address on the order form, so that the manufacturer doesn't know where to send the goods. There are other precautions readers should take before sending off any money.

To get products in good time, send the order form off early. This also avoids missing out on goods because they are





out of stock. To give yourself extra protection against delay write on the order form that if the goods do not arrive within a certain period you will want your money back.

Print information on order forms to avoid illegibility and read the description of goods very carefully before ordering.

Choose companies that offer 'money back' guarantees or offer goods 'on approval' if possible since some companies will automatically send another type of product when they are out of stock rather than refund you. There is legislation to protect you here, which is explained later in this article.

Keep the company's name and address, plus details of your order. Some traders do not help by printing their address only on the part you send off. Also keep a note of the newspaper or magazine's name when you order from an advertisement. Always keep copies of letters you send.

You could also check to keep prices down, that if the need arises you do not have to pay return carriage and that if you live in Northern Ireland or a remote part of the U.K. extra transport costs do not apply.

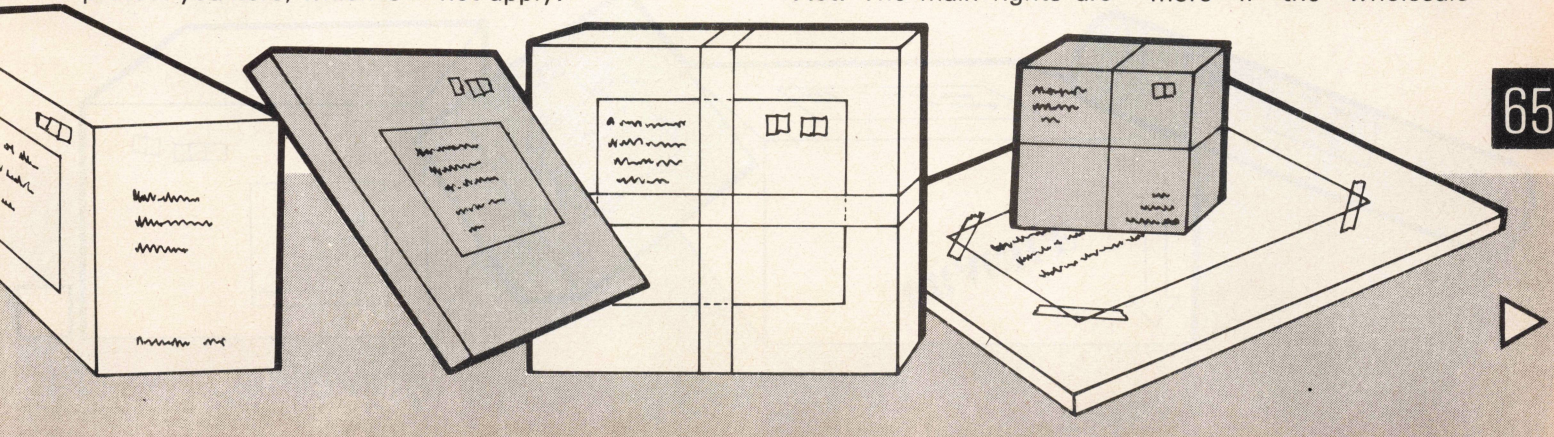
Protective Legislation

To know what to do if you are not satisied, for example if goods do not arrive or they are faulty, you need to know where you stand within the law. If you buy by mail order you have the same legal rights as personal shoppers.

If something goes wrong after you have bought the goods you have specific rights against the supplier. These rights are set out in two acts, the 1893 Sale of Goods Act and the 1973 Supply of Goods Act. The main rights are that goods must be of merchantable quality, fit for their purpose and matching their description. If goods do not fulfil these expectations, the Acts make it the responsibility of the retailer to repair or replace goods or to refund the customer's money.

You are within your rights to ask for your money back if you ordered a product for a specific date and the goods do not arrive on time.

Unless you sign an order form which states 'subject to prices at time of delivery', the supplier cannot insist that you pay more if the wholesale



Buyers Beware

price rises before delivery of the said goods.

If the delivery note merely states 'delivery received' you can sign it without inspection. However, there may be small print which states that by signing the delivery note you are agreeing that the article is in good condition. In this instance you must therefore ensure that you inspect the goods before signing. If time does not allow for this you can either cross out the small print or write 'not inspected' across the note.

Guarantees can be a bonus to your basic rights. To be worthwhile, guarantees should cover all materials. Some do not cover parts made by other manufacturers, bad workmanship or repairs free of all charges. Remember that a guarantee is in addition to legal rights and provides for any person using the goods for a reasonable period of time which should be at least a year.

Publishers' responsibility

Covering mail order advertisements in newspapers and magazines there is a Mail Order Protection Scheme. This applies to goods directly in response to an advertisement in a *publication taking part in the scheme and is purely at the discretion of the publisher. In such instances* if you send off cash with the order and the goods never arrive because the firm has gone bankrupt taking your money with it, you can apply for compensation from the publishers of the advertisement. The publisher will take all relvant facts into consideration but is under no obligation to compensate you in any way.

This does not apply to goods bought from a catalogue which you obtained in response to an advertisement, nor does the scheme apply to goods bought through *classified advertisements.*

If an advertisement offers credit facilities, you are protected by the Customer Credit Act of 1974. This Act's aim is to improve the information given to borrowers, to control terms on which credit is offered and to see that firms offering credit observe minimum standards. More information about credit laws can be obtained from your local Citizen's Advice Bureau.

Last resort

If it is too late to take precautions there are a number of steps that can be taken to get the goods replaced or your money back. If you lose the address of the company you could contact directory enquiries. They may help if you can remember the company's name and roughly where it is based. The Trading Standards Office and The Mail Order Traders Association (you can find their address at the CAB) may also be able to trace the company.

If the advertisement was in a publication, contact the advertising manager of the publication concerned to give you the address of the company.

The longer you leave the problem, the more difficult it will be to prove that the fault was there from the start. Before you make your complaint have as many details to hand as possible, for example, the name and address of the company, date of purchase, price etc.

If the goods do not arrive within the specified delivery time, a phone call to the company might do if it is a small order. Note the date of your call and the name of the person you speak to. It is best to ask for the Customer Relations Manager.

Larger orders are probably better dealt with by a letter. Make sure your writing is legible, quote any reference number, the date of your order, catalogue number and prices. Say whether you want a refund now, or, if you still want the goods, give them a further ten days in which to deliver them but state that after this date you will want a full refund. Send the letter by recorded delivery and keep a copy of it.

Goods that are damaged or faulty when delivered should be sent straight back. Send a covering letter (keep a copy) explaining why they have been returned and get a certificate of posting when sending the goods back.

Under The Sale of Goods Act you can demand a refund, plus compensation if the faulty item has impaired something else, for example a tape deck has damaged a piece of software. If someone has been hurt or killed by a fault in a product you could sue the manufacturer provided you can show that he has been negligent in making it.

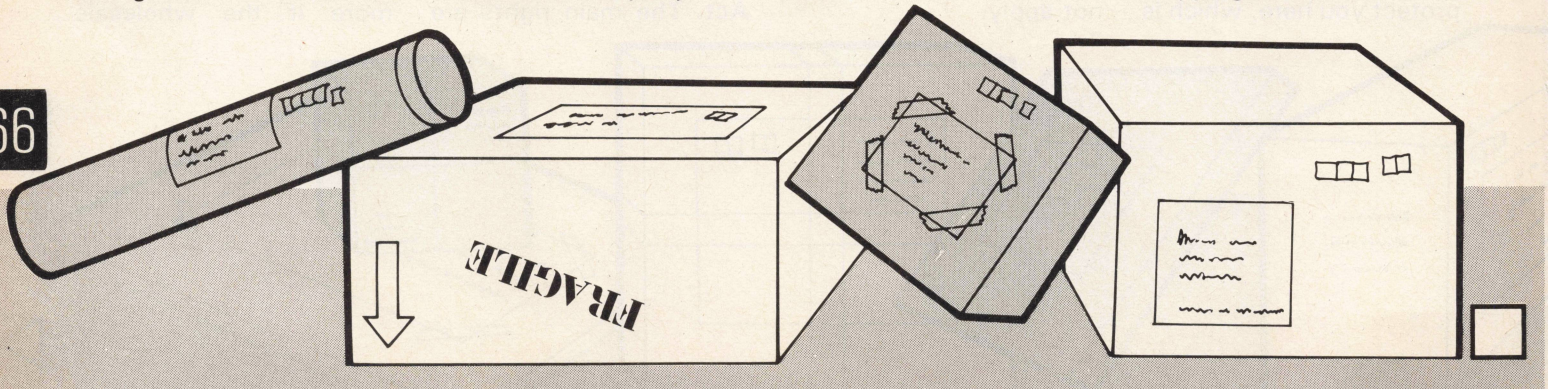
If you discover that the company from which you ordered goods has gone bankrupt, write to the Receiver. Your local Trading Standards Office should be able to tell you his name and address.

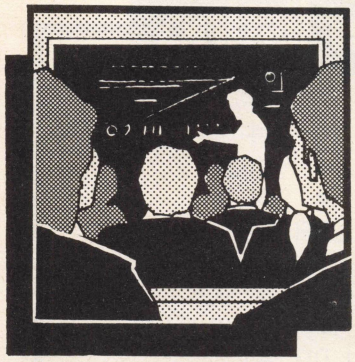
If you pay by Access or any other credit card and the company goes bankrupt, the credit card company are responsible for refunding you if the goods cost more than £100.

If your complaint fails, get in touch with the particular Trade Association to which the company belongs (their address will be in the yellow pages) or the Retail Trading Standards Association. These bodies will investigate your problem.

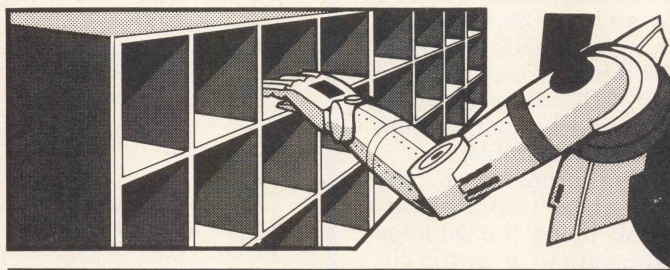
As a last resort, there is legal action. Local courts deal with claims under £2000. Their address will be in the telephone directory or at the CAB.

Mail order is a relatively new way of shopping and as long as you are aware of the pitfalls, it can be a cheaper and more convenient way of shopping, but beware!





Machine Code



64

To round off this instruction series, Simon Rockman explains how to use BASIC from machine code.

CBM64

Despite the fact that you are now a machine code wizard you must still realise the value of some BASIC programs. The Commodore 64 has some quite useful ROM routines which are most easily accessed from BASIC. Drawing a set of concentric circles on the text screen is quite simple. Type in and save the following program:

```
100  FORM=5TO12
110  FORA=0TO2
     *3.14159STEP.1
120  X=INT(M
     *SIN(A))
130  Y=40*INT(M
     *COS(A))
140  POKE1524+X
     +Y,160
150  POKE55796+
     X+Y,1
180  NEXT
200  NEXT
```

This program draws seven concentric circles of white squares. M controls the magnitude, the radius of the circle. A controls the angle, how far around the circle the line has been drawn. X and Y are the Cartesian positions for placing the blob.

In line 140 the value 1524 corresponds to the centre of the screen and the value 160 produces the reverse field square character. In line 150 the value 55796 corresponds to the centre of the colour map and the 1 at the end of the line produces a white character. If you change this one to the variable M then each ring will be produced in a different colour.

If we tried to rewrite this program in machine code we would run into trouble with the SIN and COS. It would be possible to access these routines from machine code but this would be fiddly and the results would be awkward floating point, positive and negative numbers. The best solution to this problem is to store a table of all the points that we want to plot and work through the table point by point.

This table is best set up by the BASIC program. If you have not done so already, load an assembler providing the one you have does not clash with BASIC. If it does you will need to load it in later.

Alter the program above to look like this:

```
100  FORM=5TO12
110  FORA=0TO2
     *3.14159STEP.1
120  X=INT
     (M*SIN(A))
130  Y=40*INT
     (M*COS(A))
140  N=INT(X+Y):
     IFN<0THENN
     =N+65536
150  H=INT(N/256):
     L=INT(N-(H*
     256))
160  POKE49152+Z,L
170  POKE49153+Z,H
180  Z=Z+2:NEXT
200  Z=Z+2:NEXT
```

Now you will see the reason for the odd line numbers earlier. Each square which has to be lit up is stored as a 16 bit location. This is because the screen is 1000 characters long and more than one byte is needed to store the position. Line 140 handles negative numbers. Line 150 splits the value up into high (H)

and low (L) byte so that the number can be POKEd.

The values are POKEd in the order low byte and then high byte (lo-hi) into the area of ''spare'' RAM at ($C000). There is 4K here so the odd K that it will take up is OK. Because the bytes are being POKEd two at a time the counter, Z, has to be updated in steps of two by line 180. Each circle takes 63 bytes; this is not for any reason but line 200 rounds this up to make the numbers neat.

Save this program and then run it. If you have a monitor program loaded, such as MIKRO's TIM it would be convenient to also save the block of data from $C000 to $C100 so that you don't have to rerun the BASIC. Now is the time to load any BASIC assemblers such as the Dr Watson one. Do not switch the computer off, you need the data which has been POKEd in at $C000. It will not be destroyed by just loading a BASIC assembler.

See program 1, the assembler program. TABLE holds the address of the data to draw the circle. FROG is a temporary location for saving odd bits of information. ADDR is the address location on the screen to be POKEd. COLOUR is the address of the location on the colour map to be POKEd. See the 'How it runs' section.

how it runs

Lines 90-93	Initialise all these labels.
Lines 100-136	Set up the initial values in the locations.
Lines 140-150	Reset the off set for reading the data for each circle.
Lines 160-210	Move the position to be poked from the data area at $C000 to the zero page location ADDR.
Lines 220-390	Do the real work by poking the screen and colour map with the correct values.
Lines 400-410	Check to see if the whole circle has been drawn. If it hasn't the next block is drawn by jumping to the label LOOP.
Lines 420-480	Move all the pointers for the next circle by adding 128 to the location TABLE.
Line 490	Increments the colour used. Note that the COLOUR location is used to keep track of the ring being drawn in a similar way to the variable M in the second BASIC program we looked at.
Lines 510-520	Check to see if there are any more circles to be drawn and if so jump to MAINLOOP to draw them, if not
Line 530	returns from the subroutine, to BASIC if you have called it with a SYS.

assembler listing

```
 90 TABLE      =  $F7
 91 FROG       =  $F9
 92 ADDR       =  $FB
 93 COLOUR     =  $FD
100            LDA #0
110            STA TABLE
120            LDA #192
130            STA TABLE+1
135            LDA #1
136            STA COLOUR
140 MAINLOOP   LDY #0
150            LDX #0
160 LOOP       LDA (TABLE),Y
170            STA ADDR
180            INY
190            LDA (TABLE),Y
200            STA ADDR+1
210            INY
220            CLC
230            LDA ADDR
240            ADC #$F4
250            STA FROG
260            LDA ADDR+1
270            ADC #$05
280            STA FROG+1
290            LDA #160
300            STA (FROG,X)
310            CLC
320            LDA ADDR
330            ADC #$F4
340            STA FROG
350            LDA ADDR+1
360            ADC #$D9
370            STA FROG+1
380            LDA COLOUR
390            STA (FROG,X)
400            CPY #126
410            BNE LOOP
420            CLC
430            LDA TABLE
440            ADC #128
450            STA TABLE
460            LDA TABLE+1
470            ADC #0
480            STA TABLE+1
490            INC COLOUR
500            LDA COLOUR
510            CMP #8
520            BNE MAINLOOP
530            RTS
```

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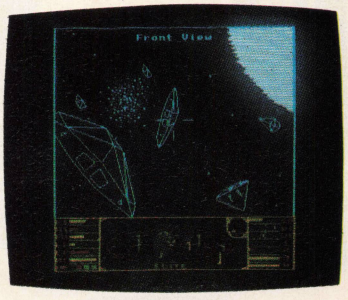

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BBC/ELECTRON

Sound Editor

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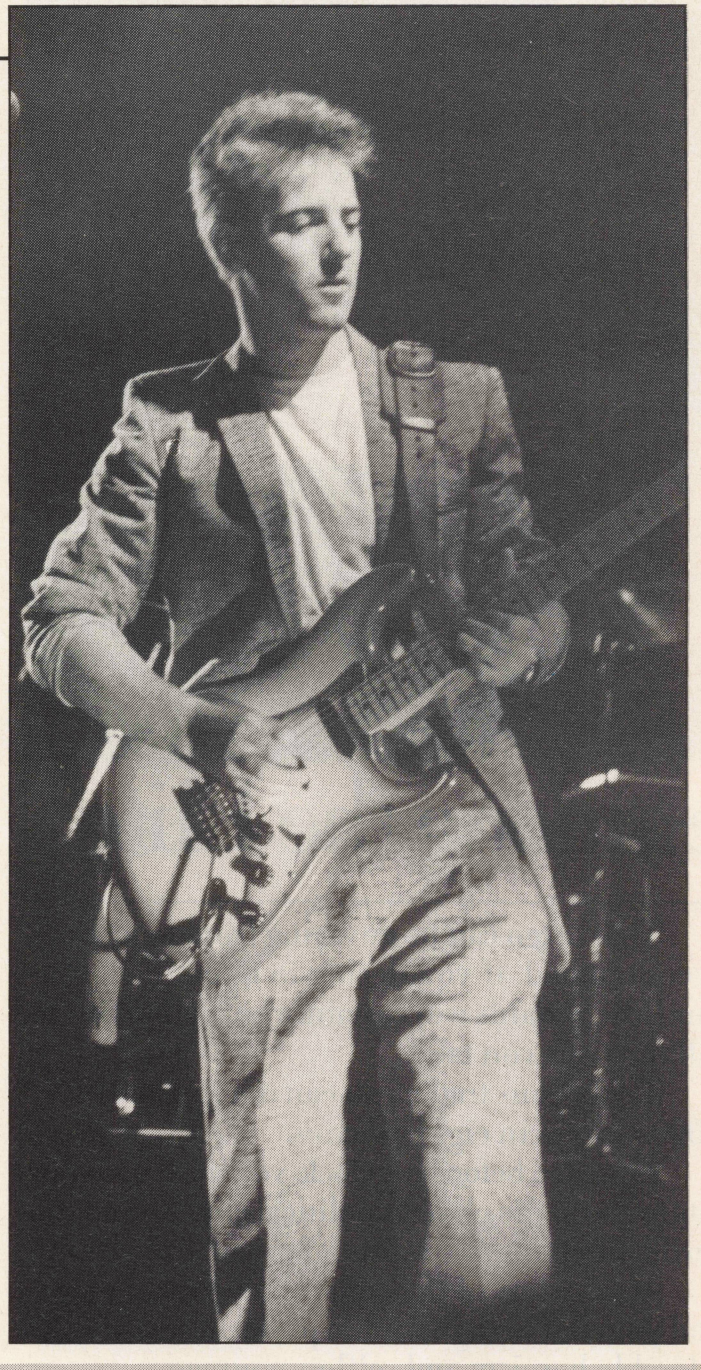


Although several programs have been written which exploit the sound capabilities of the BBC micro, few or none at all, have been written to produce sounds which can be reproduced or incorporated into a BASIC program. Realising this, and the difficulty involved in creating an envelope, I wrote the following program which is designed with the BASIC programmer in mind.

It is very difficult to imagine what a sound will be like when using the envelope command and it usually takes more hours with pencil, paper and keyboard to find the correct values for the fourteen parameters. Using this sound editor, the correct values can be selected in a matter of minutes, tested and even saved to tape. Due to the set out and the speed with which you can change and select any parameter, it is not really necessary to understand what "change of pitch in section 1" means or indeed any of the complex names, although I do still recommend reading the Envelope chapter in the User Guide.

When RUN, the user is presented with a title page and the option of going straight into the program or of viewing four pages of explanation and

instructions. The program proper displays a list of the parameters, their values (initially zero), and a key summary at the bottom. The cursor can be moved up or down to the required line using the cursor up/down keys. The left/right cursors are used to decrease/increase the values by 1, and the \ and ^ keys to inc./dec. by 5. Values outside the correct range cannot be entered. If a large negative or positive value is needed, you should increase or decrease by five to within say ten, and then use the left/right cursors to do the fine adjustment.

To play the sound at any time, press the space bar, and if the sound lasts too long for comfort, press Q to cut it short. It is possible to use the program even when a sound is playing. The parameter values can be saved to tape (or disk) by pressing S, and entering the name. Likewise, they can be loaded in again and further changes made. It is, of course, necessary to load the editing program before the stored sounds can be accessed.

The escape key has been turned off using an FX call, to prevent erasure of the data by accidentally pressing it. To stop the program, press break. It can be recovered using OLD, of course. I have used screen mode 7, as it provides colour and a good letter size, though any mode could be used. One further advantage of mode 7 is that the line being altered can easily be highlighted in colour. The program could easily be expanded, so that any number of sounds could be played in tandem, but I have found the program perfectly sufficient to create good sound effects in a short time.

how it runs

Line	Effect
10	Selects screen mode 7, a text only mode. Electron users should use MODE 6, or indeed any screen mode.
20	Selects the procedure which prints instructions and title page. This could be replaced by a GOSUB on other machines.
40-60	These branch to the respective routines. Proc init sets the variables, Proc print produces the main screen display, and Proc box prints a box of instructions.
70	This is the start of an endless loop.
90	This enables the escape key, to prevent it being pressed by accident. This line should be added only when you've fully de-bugged the program.
100	Prints the cursor, and highlights the parameter being altered by colouring it.
110-120	Check for a key press, move the cursor and erase the old cursor.
130	Pause.
140-170	Check for a key press, make sure that the max. or min. values have not been exceeded and place the new value in the array which holds the envelope parameters.



190-220	Check for key presses and take appropriate courses of action.
230	End of loop.
240	The beginning of the procedure called by Proc play.
250	Defines the sound envelope, with the values defined by the user.
260	Plays the sound.
290	Flushes the sound buffer, to stop the sound playing.
320	Turns off the flashing cursor.
330	Dimensions three arrays. A% holds the Envelope parameters, MAX% and MIN% hold the maximum and minimum values for each parameter.
370-380	Print a double height, coloured message.
410	Reads in the name of the parameters, and their max and min values, prints the name, and a row of dots for neatness.
450	Defines a text window, in which to input and print data, without disturbing the main screen display.
470-510	Open a file, with a name selected by the user, and ''print'' the data to tape.
520	Clears the text window, produces a short beep, and re-prints the instruction summary.
560-610	Opens a cassette file, and reads data into the computer.
650-690	Print title page.
700	Loops until Y or N keys pressed.
770-830	Print instructions. Parts preceded with CHR$ 134 are emphasised in colour.
890	Flushes the keyboard buffer.
900-1100	Print instructions.
1140	Waits for a key press.
1190-1200	Contain Data.

hints on conversion

The program was written on a BBC 'B' computer and uses just under 5K RAM, although missing out the instructions would save a few hundred bytes of memory. It will run on all operating systems (*HELP if you don't know which one you have), and on the BBC 'A'. Electron users should have little trouble converting the program, as the BASICs are the same, but a different screen mode will have to be used. The colour codes (CHR$ 129 etc) will have to be converted into standard COLOUR commands. As the Electron only has one sound channel, minor modifications to the array A% will have to be made as well.

As the program is designed to simplify the complex sound facilities available on the BBC, it is only really worth converting it to machines which have equally powerful sound commands. The Commodore 64 has probably the best sound facilities on the market, and so would be a good machine to convert the program to, especially as tedious POKEs are involved. The Video Genie, Dragon and Lynx are also possibilities.

BBC BASIC is closely related to Microsoft and Sinclair BASIC, and the string and array handling should present no problems. Procedures can be replaced with subroutines, with Endproc being replaced by Return. The *FX commands will be irrelevant to other machines, and need not be bothered with.

The command INKEY(-xx) tests for a key press, whose code, but not the ASCII code, is xx,GET$ or INKEY$ should be used instead.

The screen is a matrix of 40 columns by 25 rows and TAB(x,y) represents column x,row y.

Variables followed by % are integer only variables, used only to save memory and speed things up a little. If your machine does not support these do not bother with them. An array dimensioned as A%(15) will contain 16 elements, as A%(0) is valid. Although I have used three arrays-A%,MIN% and MAX%, one three dimension array could have been used instead. STRING$(x,''.'') is used to create a string containing x no. of whatever lies within the inverted brackets. Repeat. . . Until false could be replaced with a loop such as For a=1 to 1=9, or with a simple Goto command. The use of text windows to create a safe ''box'' to print in is handy but by no means vital. VDU 28 commands are used to create text windows, and VDU 26 to clear them. The other VDU commands, VDU 7, and VDU 23 are used to make a beep and to turn off the flashing cursor respectivly.

The cassette file system, using OPENOUT and OPENIN saves only data, not the whole program. CBM 64 users will have to replace them with their own file system. Disk users should be able to use the program without any changes, but remember that the files are very short. Some lines are printed twice, as the use of CHR$ 141 (double height text) requires this.

The major modifications will be in the name, range and number of the sound parameter and the way in which a sound is produced. The best thing is to refer to the relevant chapters in the manual or other books on your machine.

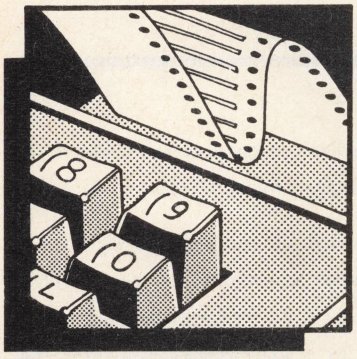
variables used

X%	Height of cursor.
A%	Contains values of parameters. These values are those saved to tape.
MIM%	Contains the minimum values for the parameters.
MAX%	Contains the maximum values for the parameters.
Y	Used in cassette filing system.
B%	General purpose counter.
C%,D%,E%	General purpose variables.
PROCinit	Sets variables, dimensions arrays.
PROCprint	Sets up main display.
PROCmenu	Prints title page.
PROCbox	Prints box containing key description.
PROCplay	Plays sound.
PROCstop	Cuts sound.
PROCcont	Waits for a key press.
PROCsave/PROCload	Save/load files.
PROCkeys	Prints instructions on keys.
PROCinfo	Prints information and explanations.

CHR$141 = double height, CHR$ 157 = background
CHR$ 135,129,131,132 = white,red,yellow,blue.
INKEY(-99),(-17),(-87),(-82) ≙ space,Q,L,S

program listing

```
  10  MODE7
  20  PROCmenu
  30  CLS
  40  PROCinit
  50  PROCprint
  60  PROCbox
  70  REPEAT
  80    REM **DO NOT TYPE IN LINE 90 UNTIL                FULLY
 DEBUGGED**
  90    *FX220,2
 100    PRINTTAB(33,X%)">";TAB(0,X%)CHR$129;TAB(0,X%+1);CHR
$135;TAB(0,X%-1);CHR$135
 110    IF INKEY(-58)AND(X%>3)THEN X%=X%-1:PRINTTAB(33,X%+1
)" "
 120    IF INKEY(-42)AND(X%<18)THEN X%=X%+1:PRINTTAB(33,X%-
1)" "
 130    B%=INKEY(20)
 140    IF INKEY(-26)ANDA%(X%-3)>MIN%(X%-3)THENA%(X%-3)=A%(
X%-3)-1
 150    IF INKEY(-25)ANDA%(X%-3)>MIN%(X%-3)THENA%(X%-3)=A%(
X%-3)-5
 160    IF INKEY(-122)ANDA%(X%-3)<MAX%(X%-3)THENA%(X%-3)=A%
(X%-3)+1
 170    IF INKEY(-121)ANDA%(X%-3)<MAX%(X%-3)THENA%(X%-3)=A%
(X%-3)+5
 180    PRINTTAB(28,X%);"    ";TAB(28,X%);A%(X%-3)
 190    IF INKEY(-99)THEN PROCplay
 200    IF INKEY(-17)THEN PROCstop
 210    IF INKEY(-87)THEN PROCload
 220    IF INKEY(-82)THEN PROCsave
 230    UNTIL FALSE
 240  DEFPROCplay
 250  ENVELOPE A%(0),A%(1),A%(2),A%(3),A%(4),A%(5),A%(6),A%
(7),A%(8),A%(9),A%(10),A%(11),A%(12),A%(13)
 260  SOUND 1,A%(0),A%(14),A%(15)
 270  ENDPROC
 280  DEFPROCstop
 290  *FX21,5
 300  ENDPROC
 310  DEFPROCinit
 320  VDU23;8202;0;0;0;
 330  DIM A%(15),MAX%(15),MIN%(15):X%=3
 340  *FX4,1
 350  ENDPROC
 360  DEFPROCprint
 370  PRINTTAB(0,0)CHR$157;CHR$135;CHR$134;CHR$141;"      S
OUND EDITOR"
 380  PRINTTAB(0,1)CHR$157;CHR$135;CHR$132;CHR$141;"      S
OUND EDITOR"
 390  RESTORE
 400  FOR B%=0TO15
 410    READA$,D%,E%:C%=LENA$:PRINTTAB(1,B%+3);A$;STRING$(2
7-C%,".");A%(B%):MIN%(B%)=D%:MAX%(B%)=E%
 420    NEXT
 430  ENDPROC
 440  DEFPROCsave
 450  VDU28,0,24,39,20
 460  INPUTTAB(0,22)"NAME OF FILE "A$
 470  Y=OPENOUT A$
 480  FORB%=0TO15
 490    PRINT#Y,A%(B%)
 500    NEXT
 510  CLOSE#Y
 520  CLS:VDU26:VDU7:PROCbox:ENDPROC
 530  DEFPROCload
 540  VDU28,0,24,39,20
 550  INPUTTAB(0,22)"NAME OF FILE "A$
 560  Y= A$
 570  FORB%=0TO15
 580    INPUT#Y,C%
 590    A%(B%)=C%
 600    NEXT
 610  CLOSE#Y
 620  CLS:VDU26:VDU7:PROCbox:PROCprint
 630  ENDPROC
 640  DEFPROCmenu
 650  PRINTCHR$157;CHR$135;CHR$129;CHR$141;"BBC MICRO SOUND
 EDITOR   (C) 1984"
 660  PRINTCHR$157;CHR$135;CHR$132;CHR$141;"BBC MICRO SOUND
 EDITOR   (C) 1984"
 670  PRINTCHR$131;TAB(3,4)"This program will help you to m
ake"'"better use of the ENVELOPE command"'"on the BBC MICR
O,allowing you to "'"produce complex and impressive sounds.
"
 680  PRINT'"   Pages 244 to 248 will provide extra "'"he
lp,but a brief summery of the sound"'"parameters is given h
ere."
 690  PRINTCHR$132;TAB(0,21)"WOULD YOU LIKE TO SEE THE SUMM
ERY ?(Y/N)"
 700  REPEAT:IF INKEY(-69) THEN PROCinfo:PROCkeys:ENDPROC:E
LSE IF INKEY(-86) THEN PROCkeys:ENDPROC
 710    UNTIL FALSE
 720  DEFPROCkeys
 730  CLS:PRINTCHR$157;CHR$131;CHR$129;CHR$141"KEYS AND INS
TRUCTIONS"
 740  PRINTCHR$157;CHR$131;CHR$132;CHR$141"KEYS AND INSTRUC
TIONS"
 750  *FX21,0
 760  PRINTTAB(3,3)"Move the cursor up and down to the " '"
parameter you wish to change."
 770  PRINTCHR$133;TAB(1,8)"CURSOR MOVED WITH UP/DOWN ";CHR
$134;"CURSOR KEYS"
 780  PRINTTAB(1,10)"DEC./INC. BY 1 WITH";CHR$134;"LEFT/RIG
HT CURSORS";CHR$133
 790  PRINTTAB(1,11)"DEC./INC. BY 5 WITH";CHR$134;CHR$94" A
ND ";CHR$126;CHR$133
 800  PRINTTAB(1,13)"TO TEST SOUND,"CHR$134;"SPACE BAR";CHR
$133
 810  PRINTTAB(1,14)"TO CUT SOUND,"CHR$134;"Q";CHR$133
 820  PRINTTAB(1,16)"TO SAVE (AS ASCII FILE)PARAMETERS,"CHR
$134"S";CHR$133
 830  PRINTTAB(1,17)"TO LOAD PARAMETERS,"CHR$134"L";CHR$133
 840  PROCcont:ENDPROC
 850  PROCcont
 860  DEFPROCinfo
 870  CLS:PRINTCHR$157;CHR$131;CHR$129;CHR$141"HOW TO USE T
HE EDITOR"
 880  PRINTCHR$157;CHR$131;CHR$129;CHR$141"HOW TO USE THE E
DITOR"
 890  *FX21,0
 900  PRINTCHR$131;TAB(0,3)"Here is a brief explanation of
the "'"envelope parameters."
 910  PRINT'"The"CHR$129"envelope number"CHR$135" (1 to 4)
 is simply"'"the identifying number."
 920  PRINT'"The"CHR$129"step length"CHR$135" (in 1/100 sec
s) is "'"really the overall 'speed' of the sound."'"At a hig
h value,the individual parts"'"of the sound can be heard."
 930  PRINT'"The"CHR$129"change of pitch"CHR$135"parameters
 govern   the pitch envelope."'"They may be from -128 to 127
.The value"'"is added to the pitch parameter in the"'"sound
statement."
 940  PROCcont
 950  CLS:PRINTCHR$157;CHR$131;CHR$129;CHR$141"HOW TO USE T
HE EDITOR"
 960  PRINTCHR$157;CHR$131;CHR$129;CHR$141"HOW TO USE THE E
DITOR"
 970  PRINT'
 980  PRINT"The"CHR$129"number of steps/section"CHR$135" va
lues are simply that,the sections being the pitchsections."
 990  PRINT"The speed at which the pitch changes is"'"given
 by all the pitch parameters."
1000  PRINT'"The"CHR$129"change of amplitude"CHR$135"values
 (the 1st two are from -127 to 127,the last two   from -127
to 0) govern the rate of"
1010  PRINT"amplitude (volume) change during the    attack,
decay,sustain and release phases."
1020  PRINT'"The"CHR$129"attack and decay targets"CHR$135"a
re simply the amplitude levels reached by those   phases."
1030  PROCcont
1040  CLS:PRINTCHR$157;CHR$131;CHR$129;CHR$141"HOW TO USE T
HE EDITOR"
1050  PRINTCHR$157;CHR$131;CHR$129;CHR$141"HOW TO USE THE E
DITOR"
1060  PRINT'
1070  PRINT"The"CHR$129"pitch and duration"CHR$135" values
are in   fact SOUND statement values."
1080  PRINT"Pitch is the starting point for the "'"pitch en
velope (0-255),and duration"'"(0-255) is the length of the s
ound."
1090  PRINT'"To"CHR$129"SAVE"CHR$135"the values which make
up the    sound,as an ASCII file,press S,and enterthe filena
me."
1100  PRINT'"To"CHR$129"LOAD"CHR$135"the values which make
up the    sound, press L and enter the filename."'"The sound
 may then be altered or played."
1110  PROCcont:ENDPROC
1120  DEFPROCcont
1130  PRINTCHR$136;TAB(1,23);CHR$129;"Press a key to contin
ue."
1140  REPEAT UNTIL GET$<>"":ENDPROC
1150  DEFPROCbox
1160  PRINTTAB(0,22);CHR$157;CHR$131;CHR$129;"L=LOAD,SPACE=
PLAY,Q=QUIT SOUND,S=SAVE"
1170  PRINTTAB(0,23);CHR$157;CHR$131;CHR$129;"CURSOR KEYS,"
CHR$94" AND "CHR$124" SELECT/ALTER."
1180  ENDPROC
1190  DATA Envelope no,1,4,Step length,0,127,Pitch change/s
tep (1),-128,127,Pitch change/step (2),-128,127,Pitch change
/step (3),-128,127,Steps in (1),0,255,Steps in (2),0,255,Ste
ps in (3),0,255,Amp.change/step (attack),-127,127
1200  DATA Amp.change/step (decay),-127,127,Amp.change/step
 (sustain),-127,0,Amp.change/step (release),-127,0,Attack ta
rget,0,126,Decay target,0,126,Pitch,0,255,Duration, -1,255
>
```



ROM Carousel

Jeremy San investigates and tests several of the most useful ROMs available for the BBC Micro.

ADD-ONS

In recent months there has been an explosion in the BBC ROM market. 'ROM' stands for 'Read Only Memory'. It is a way of holding a program in a permanent medium, similar in many ways to a magnetic audio cassette. There are programs available that will do almost anything; ranging from word-processing to graphics enhancement. These packages are sold in 'chip' form which can quite easily be inserted into a vacant socket in the BBC micro.

There are four sockets located underneath the micro's keyboard section. One of these sockets is habitually inhabited by BASIC, and another might be taken up by the DFS chip (Disk Filing System). The BASIC is our language environment, while the DFS is required by the machine so that the disk-drives know how to function. Without these chips, the machine would not be of much use, since lack of 'language' means that no program can be written. There will usually be two or three empty sockets remaining where extra plug-in ROMs can reside.

Word-processing

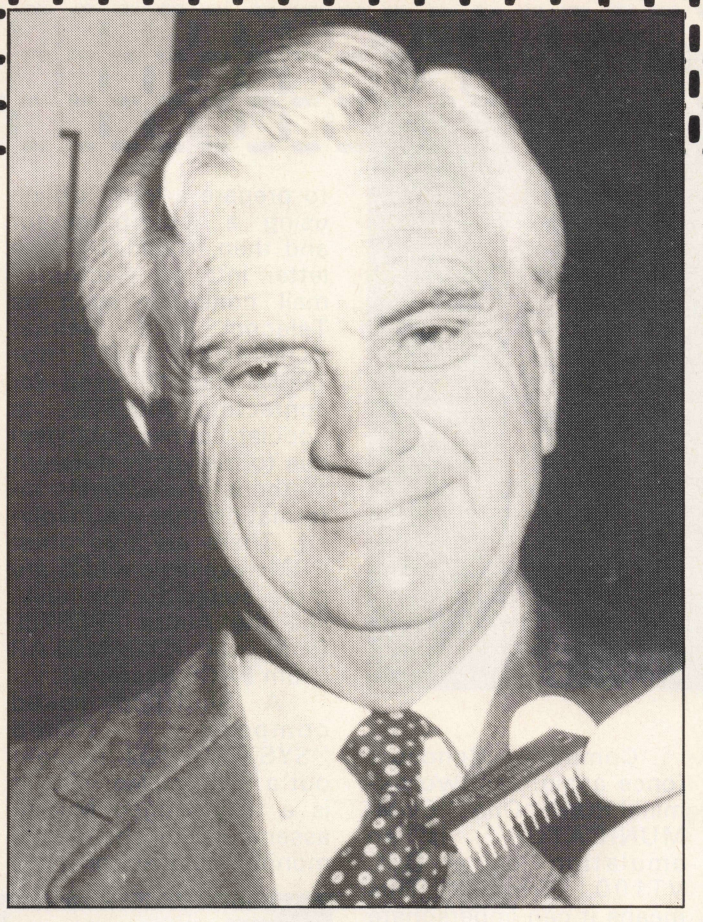
To most people, a word-processing ROM is a necessity. Some use it merely for household chores, such as letter-writing, others have even written entire books on their BBC Micros, at home.

There are currently only two 'popular' word processors available, although others do exist. The first is WORDWISE, sold by Computer Concepts — the other is VIEW from Acornsoft. Both are extremely worthy contenders for the market-place, but people have mixed opinions as to which is superior.

It is true that at half the price, WORDWISE is cheaper, but some say that the extra facilities that VIEW can provide are worth the extra cost. I have been using WORDWISE for some considerable time, and it is undoubtedly one of the easiest word-processors I have ever used.

The important commands are held in a small menu that is presented every time you press ESCAPE, and the editing commands are all available at the touch of a function-key. VIEW is far more complex to operate, and thus requires many more keystrokes to obtain similar effects. WORDWISE has a small limitation in that you EDIT your text in a 40 column display, but can preview it in 80 columns to see what it looks like. VIEW has the ability to display the text on the screen exactly in the way it will appear in your document. Out of the two, I would pick WORDWISE for ease of use, and VIEW for extra-power.

Computer Concepts are working on an advanced version of WORDWISE, known as 'WORDWISE PLUS'. If features 'forms processing' and a



special language that allows you to do 'mailmerging' and other such goodies. It should be available in the shops by the time this magazine is available.

Utility ROMs

The next category of ROMs is 'Utilities'. These are chips that add useful extra commands to BASIC to provide all the little things that Acorn forgot to include. There are quite a few ROMs in this category: notably GRAPHICS ROM, CARETAKER, DISK DOCTOR, and PRINTMASTER (Computer Concepts).

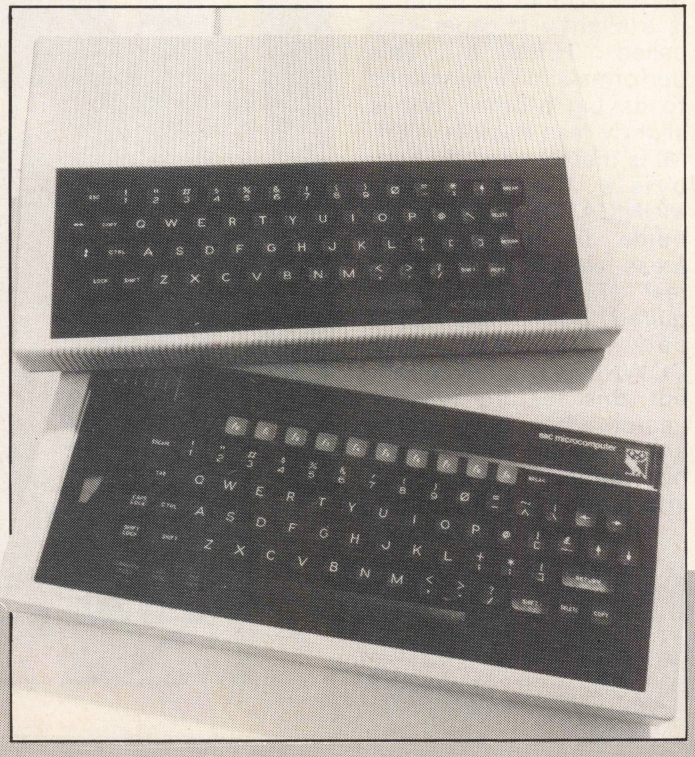
GRAPHICS ROM adds a whole host of extra facilities including SPRITES (user-defined shapes that can move independantly around the screen), circle drawing, and 3D-plotting. It can also draw text on the screen in all sorts of patterns and sizes.

One of the favourite features of this chip is its MODE 8 graphics. This is a special 10K long version of MODE 2. It allows 16 colours on the screen at the same time, while only consuming 10K of memory. Previously it required 20K to perform such a task. With all good things comes a catch: what you gain in colours, you lose in resolution. MODE 8 has only a puny 80 by 256 resolution. If you are into 'graphics' then this ROM is a most useful accessory for your programs.

Tidy up operation

The fifth law of computing states that 'Any given program will expand to fill all available memory.' Many people write programs and then find that they are getting a bit too big! This is especially true on the BBC since after you subtract the enormous memory taken by the 'graphics screen', there is not much left for the humbler user.

All is not lost, because there are ROMs like CARETAKER which will examine your program and take out unwanted spaces and REM statements. This can sometimes reduce the size of your program by a hefty amount thus allowing you to extend the program even further.



CARETAKER can do other things too, like the powerful-renumbering command which can move chunks of a program about. It also provides a single keyword entry feature. This allows you to type out long keywords, like "PRINT" via the use of simple double-key depressions, such as: TAB and A simultaneously.

Health restorers

DISK DOCTOR is an odd name for a utility. In fact, the ROM has such varied uses that I begin to wonder sometimes why it ever adopted that name. It probably started its life containing helpful aids for resurrecting damaged disks, and altering information. It graduated into an extremely useful tool that no programmer can do without.

Disk Doctor provides the necessary functions to disassemble 'memory', 'display memory' and even modify it. A disassembler will convert machine code into assembly code. This allows the internal workings of a program to be easier to understand, although some would say that assembly language is still rather difficult! The memory editor is an interesting idea, because it allows you to scroll back and forth on the screen while displaying the BBC's memory in a very similar way to editing text in WORDWISE.

Disk Doctor has a surprising number of cassette based utilities too, like * TAPEDISK and * DISKTAPE. These commands take the drudgery out of transferring programs between the two

```
EXMON by BEEBUG
A  X  Y  S  P  flags    PC    stack
00 00 00 FF 30   B      0000

General Commands:       Debugging Commands:
L List memory           @  Set PC
D Disassemble           A  Set accumulator
K Disassemble+save      X  Set X register
N Assemble              Y  Set Y register
E Edit (ESC ends,       P  Set PSW
  space goes back)      S  Set stack pointer
" ASCII to memory       GO Execute program
FS/FB Find string          (space) Simulate
M Move block            /  Step on one level
V Verify blocks         Z  Trace
I Fill                  B  Set breakpoint
T Change panel          U  Delete breakpoint
C Calculate             W  Delete all
OB/OW Osbyte/word       J  JSR
! Change paged ROM      ------------------
R Relocate program      ?  Help summary
H Print                 Q  Quit EXMON

?_
```

mediums. It is enough to say ''* DISKTAPE PROG1 PROG2 PROG3 etc.'' and you can sit back, relax, and enjoy your tea while the machine spends the next hour copying the programs from disk to tape. Disk Doctor also has commands for joining files together, and retrieving data from a disk that was given up for dead — I could never do without it!

Communication

Communication is something that is always close to a Beeb user's heart and this is proven by the large amount of 'Terminal software' that has recently become available. A 'terminal' is a program that allows a computer to 'talk' to another computer via the phoneline. You also require a modem to connect you to the outside world. This is a hardware device which connects the telephone to the computer, but you still need the appropriate software inside the computer before anything can be communicated.

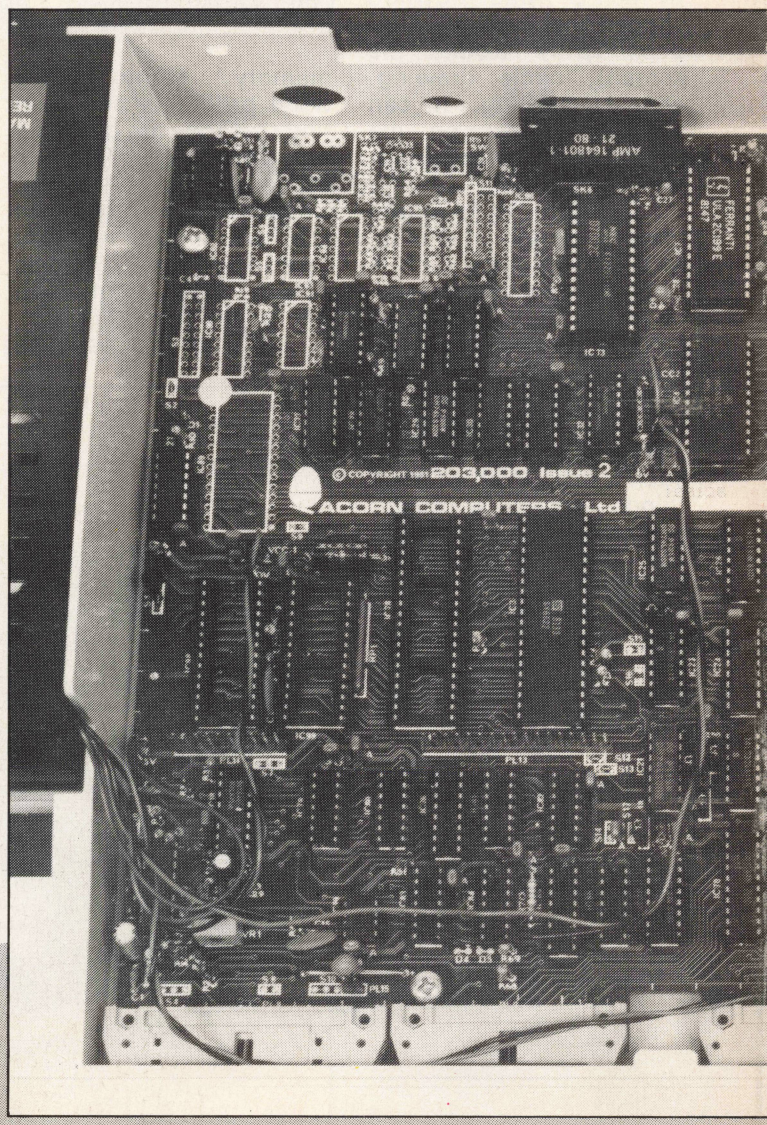
Computer Concepts (once again) sell two terminal ROMs. One, ''COMMUNICATOR'', is an emulation of a DEC VT100 terminal. This means it can impersonate a really 'professional' terminal that is sold by an important mainframe company. Communicator contains many different character sets and has such nicities as 'independant scrolling text windows'. Some of these functions are only available on extremely expensive purpose-built terminals. The other terminal is a slightly cheaper chip called ''TERMI II''. This performs similar functions to its big brother, but is slightly less flexible. TERMI is mainly used by hobbyists, and COMMUNICATOR is more at home in 'professional' areas espacially where a real VT100 system is required. Both these ROMs can UPLOAD and DOWNLOAD information, but this feature is only useful when disk drives are attached due to the high speed at which the information is transferred.

It is useful to be able to prepare a letter offline using a word-processor and then to UPLOAD the letter into an electronic-mail computer such as Telecom Gold. Neither COMMUNICATOR nor TERMI can be used for contacting PRESTEL (a popular public-database) due to the vastly different methods of displaying information that are involved. There are two other ROMs available which are more suited to this task, like the Acorn PRESTEL ROM, or COMMSTAR (from PACE Systems).

A Sheffield based company called ''SYSTEM'' has brought out a ROM called ADE. It is a fully-fledged Macro-assember, machine-code monitor, and editor all in one! Its main advantage lies in the fact that it uses 'virtual' file handling. This means that your assembly langauge source-code is always kept on disk and when assembled, the object file is stored directly onto disk too! When done in this fashion, you can have enormous amounts of source-code assembled in one huge chunk. This is extremely advantageous in terms of program development — and many companies are now using ADE for their program-design.

What of the future?

Computer Concepts are shortly to announce

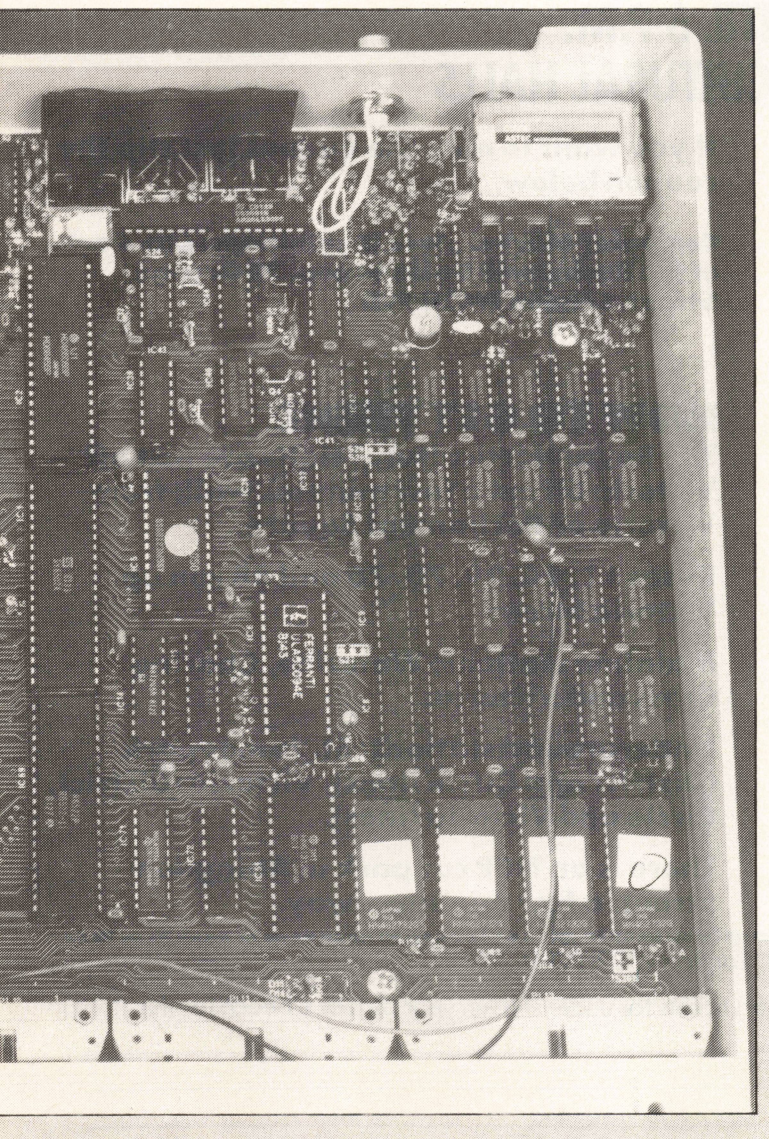


their new BASIC-compiler called ACCELERATOR. A 'compiler' is a special program which you can feed into a BASIC program and it converts it to machine code. The advantage in that seemingly pointless exercise is usually one of speed. There is a good chance that the program will run 2 or 3 times faster — now that *is* useful!

ACCELERATOR is a full BBC BASIC compiler, so naturally, the drawback is that the program grows in size, so very large programs are not really feasible for compilation. But this is not to stop you compiling them in smaller chunks. Also coming soon from Computer Concepts is an advanced 'Electronic Spreadsheet Program', called not surprisingly: 'ESP'. Rumours are about that it is one of the most comprehensive programs of its type.

Also coming soon — 'Admiral' — Advanced Data Management Information Retrieval Aplication Language. We will try and obtain copies of these ROMs for evaluation in the near future.

Due for release shortly is a Machine-code-monitor from Acornsoft. It is possibly the most user-friendly monitor yet devised, and so will find untold uses in both educational and programming circles.



```
EXMON by BEEBUG
A  X  Y  S  P  flags    PC    stack
00 00 00 FF 30   B     0000

0000 : 02 19 02 19 00 7C 00 7C  .....|.|
0008 : 00 30 01 0B 00 41 FF 57  .0...A.W
0010 : FF 7F 00 02 00 00 00 00  ........
0018 : 19 00 07 00 00 19 00 00  ........
0020 : 00 00 02 FF C3 07 00 00  ........
0028 : FF 04 0B 75 81 00 00 00  ...u....
0030 : 00 00 00 00 00 C3 07 00  ........
0038 : 07 EE 20 00 FF 75 21 00  ...  .u!.
0040 : 00 00 00 00 86 81 00 00  ........
0048 : 00 00 00 00 7B 00 00 FF  ....{...
0050 : FF FF FF FF FF FF FF FF  ........
0058 : FF FF FF FF FF FF FF FF  ........
0060 : FF FF FF FF FF FF FF FF  ........
0068 : FF FF FF FF FF FF FF FF  ........
0070 : FF FF FF FF FF FF FF FF  ........
0078 : FF FF FF FF FF FF FF FF  ........
Type ? for command list

?_
```

It has extensive 'help' menus and provides constant prompting and assistance in almost every section. It includes a labelling disassembler which allows you to discover the buried secrets of your best programs. It can also single-step through code, sending the traced output down a serial port to allow another BBC to monitor the output. This means you can debug programs in the BBC that might have otherwise corrupted the screen because of their graphical content.

It is interesting to note that Computer Concepts is a company which currently sells BBC ROM software, to the exclusion of all else. This explains the abundance of their software on the market, since they can concentrate on producing quality software.

Some of these ROMs may be used with an Acorn Electron providing the correct interface is added. Check with the relevant company before buying.

Product Details

Computer Concepts
Gaddesden Place
Hemel Hempstead
Herts HP2 6EX
(0442) 63933

Caretaker	£33.35
Communicator	£69.00
Disk Doctor	£33.35
Graphics ROM	£33.35
Termi 2	£33.35
Wordwise	£46.00

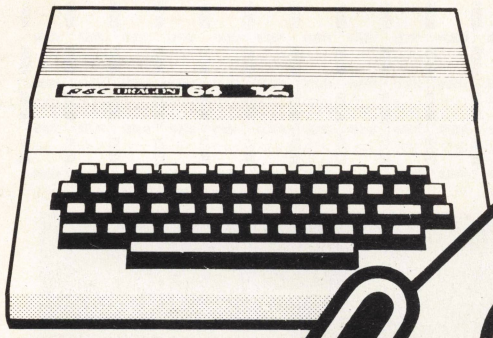
Acornsoft Ltd.
Betjemen House
104 Hills Road
Cambridge CB2 1LQ
(0223) 316039

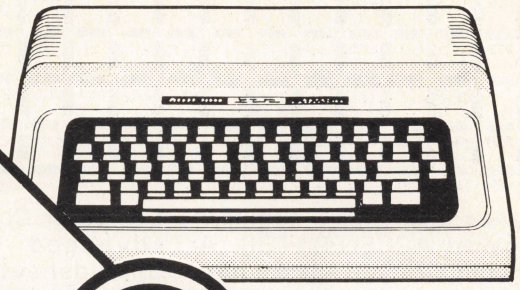
View	£59.80

SYSTEM
12 Collegiate Crescent
Sheffield S10 2BA
(0742) 682321

ADE (inc.SPY)	£60
SPY	£24.15

All prices are inclusive of VAT.





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Underground stations; St. James park (District and Circle lines), Victoria (District, Circle and Victoria lines).

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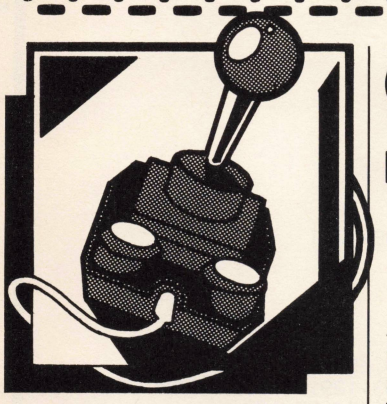


Space Mines



Mines, not of the underground variety, but out in space, are the targets in this fast reaction game by Kevin Hughes.

VIC 20

An urgent rescue mission is in hand. Your task as pilot of the space ship is to travel to the surface of the moon you pick up your colleague, who has very foolishly been left behind by a previous party!

His air is running out and so there is some urgency to your rescue attempt. But smooth running is not the order of the day and aliens have laced outer space with mines. For your mission to be successful, and so that you live to fight another day, you must manoeuvre your craft through the mines and land safely on the moon.

Every so often, there is a bonus section in the game, and when this is indicated you can take off again and try to reach the 'bonus' port of the mother ship at the top of the screen. Success in this gives you extra points.

Full colour graphics and sound are used throughout the game so type on and have a good time! Full instructions are included in the program.

There are two program listings. Program 1 sets up the graphics and prints the instructions and Program 2 is the main game. Type in and SAVE the first program, then do the same for Program 2. Now if you LOAD and RUN Program 1, it will automatically load Program 2 and the game is ready for play.

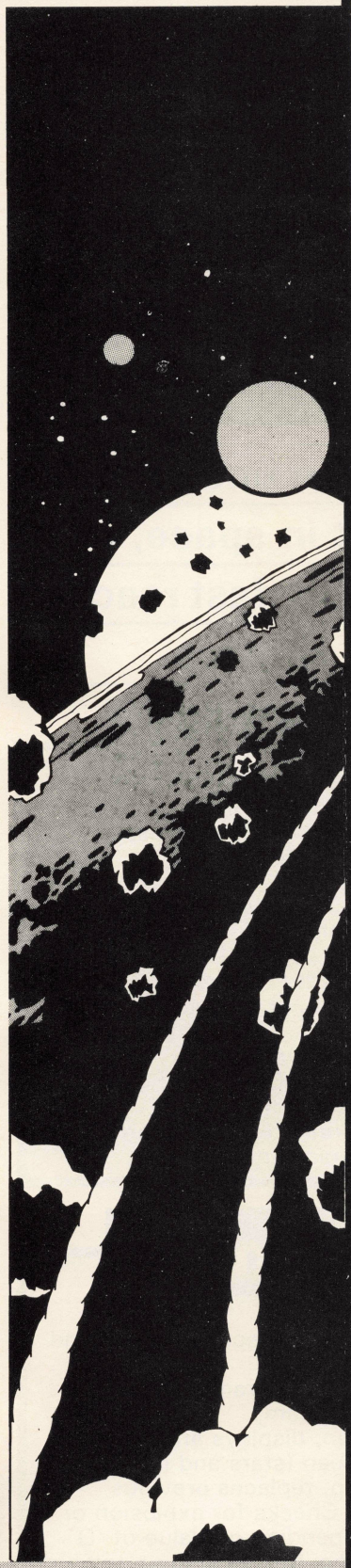
variables used

V4	Location 36877, noise
V2	Location 38675, tenor noise
V	Location 36878,volume
L	Number of lives
Y,U	Control ship's movement
D1,D2,RA,RB,	Joystick controls
SC	Score
L$	Laser character to give its movement
Q	Stored character, replaced after ship moves
P	Left or right control
O	Puts character Q where ship has moved from
A$	Character read from keyboard
F,E,R,D	Used in explosion routine

how it runs

Line	Effect
5-8	Set up variables, sound, colour and joystick.
60-60	Main loop of program.
100-120	Move laser beams.
500-630	Introduction, displays and controls.
2000-2160	Set up screen (stars and mines).
3000-3140	Moves ship, replaces previous character. Checks for explosion or landing depending on value of 'Q'.
4000-4160	Bonus game. Moves ship up towards the waiting mother ship. Bonus points for ramming the mines.
6100-6120	High score displayed and 'another go' routine.
6130-6270	Explosion routine and sound.
7000-7077	Joystick routine.

Space Mines



program listing

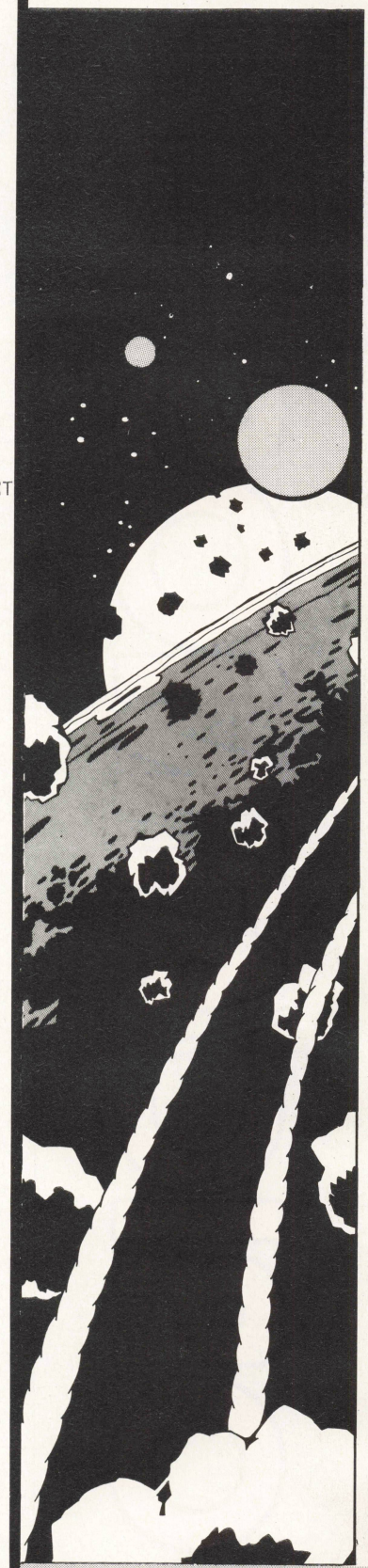
Program 1

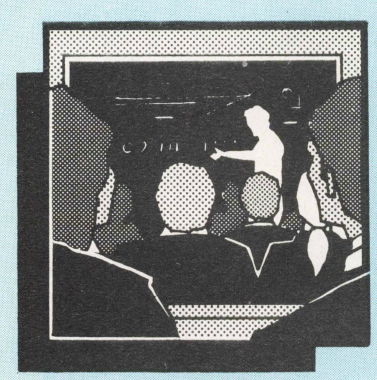
```
5 POKE36866,150:POKE36869,240
10 PRINT"■":POKE36879,104
15 PRINT:PRINT
20 PRINT"■ ▗▄▖ ▗▄▖ ▗▄▖ ▗▄▖"
25 PRINT" ▌ ▌ ▌▄▟ ▌ ▌ ▀▖"
30 PRINT" ▌ ▛▀▘ ▌ ▌ ▗▘"
35 PRINT" ▀ ▝▀▘ ▝▀▘ ▝▀▘"
40 PRINT"■■■■"
45 PRINT"      ▗▖▗▖INES"
50 PRINT"■■■■   BY KEVIN HUGHES"
60 PRINT"■■■ HIT A KEY WHEN READY"
70 FORI=125TO30STEP-1:N=N+1:POKE36865,I:FORJ=1TO20:NEXTJ,I
75 POKE36876,0
80 GETA$:IFA$=""THEN80
100 POKE36879,8
110 FORT=0TO1000:READA:IFA=-1THEN195
119 POKE7168+T,A:NEXTT:
150 DATA 16,24,20,18,255,80,48,16,0,0,44,127,255,255,255,255
160 DATA 0,0,0,0,0,32,0,0,24,36,126,255,129,189,0,153,129,90,126,24,24,255,24,60
170 DATA 219,126,66,126,195,231,155,255,0,0,248,96,48,24,55,127
180 DATA 0,0,0,0,8,60,254,254,8,24,40,72,255,10,12,8
190 DATA 0,24,24,60,255,126,255,255,-1,0,0,0,0,0,0,0,0
195 FORT=0TO7:READA:POKE7424+T,A:NEXT
200 PRINT"■":POKE36879,8:POKE36869,255
210 PRINT"■■■  GRAPHIC SYMBOLS    "
215 PRINT
220 PRINT"■ @  ■■LASER"
221 PRINT
225 PRINT"■ A  ■■PLANET SURFACE"
226 PRINT
230 PRINT"■ B  ■■STARS (HARMLESS)"
231 PRINT
235 PRINT"■ C  ■■LANDING CRAFT"
236 PRINT
240 PRINT"■ D  ■■MINES (DEADLY)
246 PRINT
250 PRINT"■ E  ■■LANDING PAD
256 PRINT
260 PRINT"■ FG ■■MOTHER SHIP
266 PRINT
270 PRINT"■ I  ■■LASER TOWER"
276 PRINT
277 PRINT"■■■■ HIT A KEY WHEN READY"
278 GETA$:IFA$=""THEN278
310 PRINT"■":POKE36879,26:POKE36869,240
320 PRINT"■■■■INSTRUCTIONS (Y/N)
330 GETA$:IFA$=""THEN330
340 IFA$="Y"THENPRINT"■":GOTO370
350 IFA$="N"THENPRINT"■":GOTO7000
360 GOTO330
370 PRINT"YOU ARE GUIDING YOUR  SHIP DOWN TO THE      SURFACE OF THE RED    PLAN
ET.
375 PRINT
380 PRINT"YOU HAVE TO MISS      THE MINES AND LAND    YOUR CRAFT SAFELY ON  LAND
ING PAD
385 PRINT
390 PRINT"FOR EACH SUCESSFUL    LANDING YOU GET 10    POINTS.
395 PRINT
400 PRINT"AFTER THREE           CONSECUTIVE LANDINGS  YOU GET A BONUS TAKE  OFF.
405 PRINT
410 PRINT"■ HIT A KEY WHEN READY"
420 GETA$:IFA$=""THEN420
430 PRINT"■"
440 PRINT
445 PRINT"HERE YOU SCORE BY     RAMMING THE MINES     (10 POINTS PER MINE)"
450 PRINT
455 PRINT"YOU MUST RETURN TO    YOUR WAITING MOTHER   SHIP TO AVOID LOSING  A LI
FE"
460 PRINT
465 PRINT"ALSO IF YOU DRIFT     INTO THE LASER RAYS   THEN YOU WILL AGAIN   PERI
SH"
470 PRINT
475 PRINT"BEWARE                                      THE BLACK MINE !"
480 PRINT"■■ HIT A KEY WHEN READY"
490 GETA$:IFA$=""THEN490
500 PRINT"■"
505 PRINT"■■■       CONTROLS"
510 PRINT"■■■  < > LEFT & RIGHT"
520 PRINT
525 PRINT"■    A FOR ABORT"
530 PRINT"■■■■■     OR JOYSTICK"
535 PRINT"■■■■ FIRE BUTTON TO ABORT"
540 PRINT"■■ HIT A KEY WHEN READY"
550 GETA$:IFA$=""THEN550
7000 PRINT"■"
7010 I=0
7011 READA:IFA=-1THEN7120
7112 POKE828+I,A:I=I+1:GOTO7011
7113 DATA 169,2,141,198,0,169,131,141,119,2,169,13,141,120,2,96,-1
7120 SYS828
```

program listing

Program 2 Main Game

```
5 POKE52,27:POKE56,27:POKE51,192:POKE55,192:CLR:PRINT"□"
6 V2=36875:V=V2+3:V4=V-1:POKEV+1,26:L=5
7 POKEV,15:Y=22:U=-22:POKE650,128:POKE198,0
8 D1=37139:D2=37154:RA=37137:RB=37152:POKED1,0:POKED2,127:GOTO500
50 POKEV2,0:POKEV4,0:POKEV,15:GOTO2000
60 GOTO3000
80 GOTO4000
100 PRINT"■□□□□□□□□□□□□□□□□□□□□□"
110 FORT=0TO17STEP1+SC/50:PRINT"□]■"L$TAB(19)L$:NEXT
120 RETURN
500 PRINT"□□□□□■ BY KEVIN HUGHES"
520 PRINT"■□□□□□□ < >  LEFT OR RIGHT"
525 PRINT"■   A  FOR ABORT"
530 PRINT"■□□   OR A JOYSTICK
610 PRINT"□□□□□■  HIT A KEY TO START"
620 GETA$:IFA$=""THEN620
630 GOTO2000
2000 POKE36869,255:IFI=3THENI=0:GOTO80
2001 IFL=0ORL<0THENPOKEV2,0:GOTO6100
2005 Q=32:O=0:P=44:POKEV+1,8:PRINT"□]■SCORE";SC" LIVES";L"
2010 FORT=0TO18:PRINT"■@□                              ■@":NEXT
2020 PRINT"■I■AAAAAAAAAAAAAAAAAAAA■I":R=INT(RND(1)*18)+1:PRINTTAB(R)"□]■E"
2040 PRINT"■□":FORA=0TO16:T=INT(RND(3)*17)+1
2060 PRINTTAB(T)"□B":NEXT
2080 PRINT"■□2──────────────────────";
2085 PRINT:PRINT:PRINT:FORA=0TO12:T=INT(RND(3)*18)+1:PRINTTAB(T)"■D":NEXT
2130 IFSC>100ANDB=0THENB=1:GOTO2080
2150 IFSC>200ANDC=0THENC=1:GOTO2080
2155 T=INT(RND(3)*19)+1
2160 PRINTTAB(T)"■D":B=0:C=0:GOTO60
3000 A$="":GETA$:IFA$="A"ANDY=-22THEN3020
3005 IFA$="A"THENY=-22:U=22:PRINT"■■■        ABORTING        ■";:SC=SC-10
3020 IFA$=","THENP=P-1:O=1
3030 IFA$="."THENP=P+1:O=-1
3031 IFA$=""THEN3035
3032 GOTO3040
3035 GOSUB7000
3040 P=P+Y:POKEV2,200:POKEV2,240
3050 POKE 7690+P+U+O,Q:O=PEEK(7690+P):IFQ=5THENP=P-22
3055 POKE7690+P,3:O=0
3060 POKEV2,200:POKEV2,240:POKEV2,0
3090 IFQ=4THENL=L-1:GOTO6200
3100 IFQ=5THENSC=SC+10:I=I+1:POKEV2,220:FORG=0TO100:NEXTG:POKEV2,0:GOTO50
3110 IFSC<0THENSC=0
3120 IFQ=1THENL=L-1:GOTO6200
3130 IFQ=0ORQ=9ORQ=8THENL=L-1:GOTO6200
3135 IFQ=192THEN:POKEV2,150:FORG=0TO100:NEXTG:Y=22:U=-22:GOTO50
3136 IFF=0THENL$="H":F=1:GOTO3140
3137 L$="@":F=0
3140 GOSUB100:GOTO60
4000 PRINT"■■2 BONUS GAME IN PLAY  "
4010 PRINT"2■──────────■■G■■──────────":Q=32
4020 A$="":GETA$:IFA$=","THENP=P-1:O=1
4040 IFA$="."THENP=P+1:O=-1
4041 IFA$=""THEN4045
4042 GOTO4050
4045 GOSUB7000
4050 P=P-22:POKEV2,200:POKEV2,240
4070 POKE 7690+P+22+O,Q:O=PEEK(7690+P):POKE7690+P,3:O=0
4110 IFQ=4THENSC=SC+10:POKEV2,170:FORG=0TO150:NEXTG:POKEV2,0:Q=32:GOTO4020
4120 IFQ=6ORQ=7THENPOKEV2,220:FORG=0TO100:NEXTG:POKEV2,0:GOTO2005
4140 IFQ=0ORQ=9ORQ=8THENL=L-1:GOTO6200
4150 IFQ=192THENL=L-1:GOTO6200
4156 IFF=0THENL$="@":F=1:GOTO4160
4157 L$="H":F=0
4160 GOSUB100:GOTO4020
6100 POKE36869,240:PRINT"□■□□□□□  YOUR SCORE WAS";SC:IFSC>HITHENHI=SC
6111 PRINT"■□  HIGH SCORE IS ";HI:PRINT"□□□□□□ PRESS 'Y' WHEN READY"
6119 GETA$:IFA$="Y"THEN6130
6120 GOTO6119
6130 L=5:SC=0:I=0:PRINT"□":GOTO2000
6200 E=0:R=0:D=0:F=0:POKEV2,0
6230 E=E-23:R=R-21:D=D+21:F=F+23
6240 POKE7690+P+O+E,205:POKE7690+P+O+R,206
6245 POKE7690+P+O+D,206:POKE7690+P+O+F,205
6250 POKE38410+P+O+E,4:POKE38410+P+O+R,4:POKE38410+P+O+D,4:POKE38410+P+O+F,4
6260 POKEV2,250:POKEV4,250:C=C+1:IFC>3THEN6280
6262 POKE7690+P+O+E+23,32:POKE7690+P+O+R+21,32
6263 POKE7690+P+O+D-21,32:POKE7690+P+O+F-23,32
6270 GOTO6230
6280 POKEV2,0:FORA=15TO0STEP-1:FORS=240TO200STEP-2:POKEV4,S:POKEV,A:NEXTS,A
6300 U=-22:Y=22:PRINT"■■■      HARD LUCK        ■";:FORT=0TO400:NEXTT:GOTO50
7000 POKED1,0:POKED2,127:J1=-((PEEK(RB)AND128)=0):POKED2,255:R=PEEK(RA)
7040 J3=-((RAND16)=0)
7050 FR=-((RAND32)=0)
7060 IFJ3=1THENP=P-1:O=1
7070 IFJ1=1THENP=P+1:O=-1
7075 IFFR=1ANDY=-22THEN
7076 IFFR=1ANDY=22THENY=-22:U=22:      PRINT"■■■        ABORTING        ■":SC=SC-10
7077 RETURN
```





ORIC/ATMOS

Oric Options Part 7

See how to get 36 colours on your Oric/Atmos! David Ellis explains.

Like the LORES mode on the ORIC, the HIRES mode uses the same system of serial attributes. The advantages of this are that there is no restriction on the number of colours available at one time and the memory requirements for the HIRES screen are quite modest. The disadvantages are that the *colour resolution* is restricted, and moving, multicoloured graphics are difficult to program.

Resolution

The resolution of the HIRES screen is 240 pixels across by 200 pixels down. In addition there are a useful three lines of text provided at the bottom of the screen. These can be used for entering programs, displaying instructions, or typing in HIRES commands in the immediate mode to see their effect. You may have found that it is not possible to list any part of the program as it will scroll off the bottom three lnes. A useful trick is to use EDIT instead of list and then the line number you specify will appear on the middle of the three lines.

The HIRES screen uses up just under 8K of memort, leaving a whopping 38.5K for programs (eat your hearts out BBC owners!). Add to this the fact that all of the 8 colours, both background and foreground, can be used at the same time, together with flashing attributes and ASCII characters and you can appreciate just how flexible the ORIC is.

I say 8 colours, but would you believe me if I told you that you can display another 28 colours, giving a grand total of 36! Seeing is believeing, so enter program i to prove it. Don't worry if you can't understand it — all will be revealed later.

```
 10 S=16:M=17:A=6:C=1:L=1
 20 HIRES
 30 CURSET A,10,0:REPEAT
 40 FOR X=1 TO 19
 50 FILL 1,1,S:FILL 1,1,M
 60 NEXT X:CURMOV 0,46,0
 70 M=M+1:IF M=24 THEN S=S+1:M=S+1
 80 C=C+1:UNTIL C=5 OR M>23
 90 L=L+1:IF L=8 OR M>23 THEN END
100 A=A+33:C=1:GOTO 30
```

Program 1 Demonstration of colours on Hires screen

If you RUN Program 1 you should see 28 colours displayed in the HIRES screen. Some of them will be more effective than others, but this will to some extent depend on the quality of your TV picture. None of the standard 8 colours are being displayed at the moment. If you type PAPER 1 the background colour will turn to RED. Notice that none of the 28 colours displayed match this 'standard' red. Try other PAPER values and you will see that none of the 'standard' colous are duplicated in the 28 on display.

If you look closely at some of the colours you may discover how these have been produced. It's just a simple case of mixing the standard colours on alternate lines. As the resolution is quite fine, some of the colours blend together perfectly, whilst some of the others are

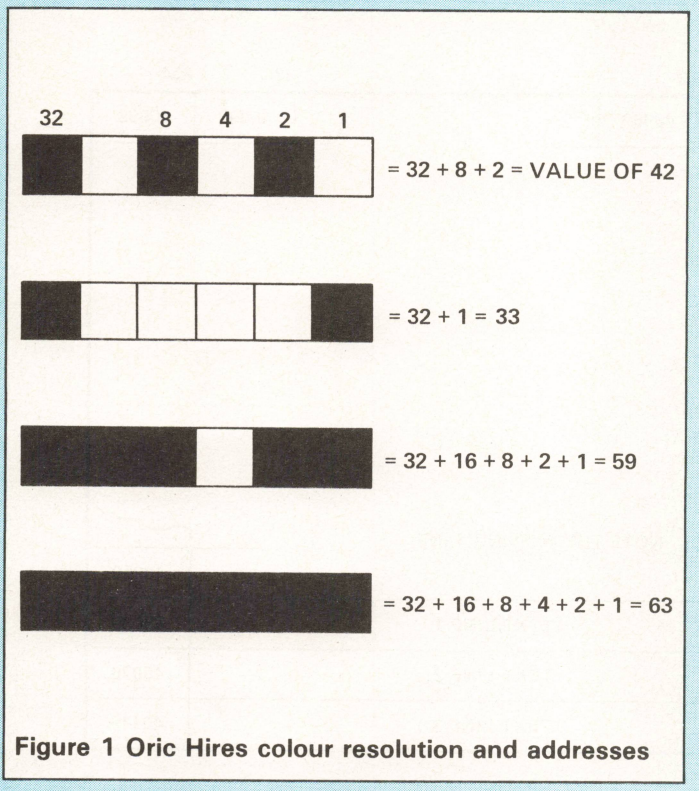


Figure 1 Oric Hires colour resolution and addresses



less successful. However, when displayed over the entire screen, most of these 'new' colours are very effective. All 8 possible colour combinations are used — a total of 28. The mixing of colours in this way is possible because the colour resolution on the Oric is 40 columns across by 200 lines down as shown in Figure 1. It can be seen that 40 memory locations are used for each line. Although each one holds eight bits, only the low order six bits are displayed on the screen. the unused two bits contain information as to what form the data in the byte will take. The position of each bit in a byte is as follows:

b7	b6	b5	b4	b3	b2	b1	b0

Bits 0 to 5 hold the pattern of he pixels displayed on the screen and bits 6 and 7 determine whether the byte is an attribute, a standard pattern of pixels, or an inverse pattern of pixels. When the HIRES screen is first displayed all the bytes contain the number 64. This is made up as shown.

Take a PEEK

It can be seen that the value 64 is bit 6 and therefore all the pixels are set to 0 (turned off). The 1 held in bit 6 shows that the byte is a pattern and not an attribute. Take a PEEK at the first location by entering PRINT PEEK (40960);. The semi-colon will stop the answer from scrolling off the bottom 3 lines. 64 should be returned. Change the colour of the screen by typing PAPER 1, which will turn the background colour to RED. If you take a PEEK at 40960 now, it will read 17, which is the attribute for background RED. Type INK 3 and then take a PEEK at 40961. The number 3 will be returned, the foregroundf attribute for YELLOW. As with the LORES or TEXT screen, the far left hand column (all 200) will hold the background colour and the next column the foreground colour. The following values will therefore affect the HIRES screen:

Number	Effect
0-7	Foreground colours
12-15	Flashing attributes
16-23	Background colours
24-31	Screen synchronisation. * DO NOT USE!

Numbers from 32 to 63 will display various pixels on the screen. A few examples are given in Figure 2.

Any pixel pattern with a value of 31 or less should have 64 added to it as otherwise it becomes an attribute. To avoid confusion it is better to add this value of 64 to any pixel pattern. All these values can be either POKEd directly to the HIRES screen or placed in a FILL command which we shall look at later. Ad-

Hires Screen make up

	b7	b6	b5	b4	b3	b2	b1	b0
	128	64	32	16	8	4	2	0
STATE	1	0	0	0	0	0	0	
			← PIXELS →					

ding 128 to these pixel values will create inverse colours. You will needto experiment with different values to see their effect as there are many possible combinations. Note that if 128 is added to the background colour value, that location will be in the inverse colour to the nearest background attribute to the left of it, but the colour to the right of this value will be in the normal background colour.

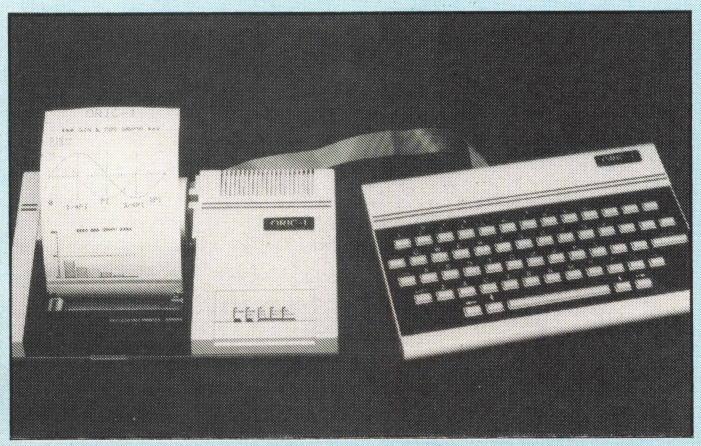
Foreground/ background (F/B) codes

Having looked at how the values are stored on the HIRES screen we will now take a look at some points not covered in much detail in the manual, as most of the HIRES commands are straightforward enough.

The F/B codes are:

0 background colour
1 foreground colour
2 invert background/foreground
3 no change

If the zero is used then the command used will take on the background colour, and therefore the line or pixel will be visible. Number 1 will diplay the line or pixel in the relevant foreground colour. Number 2 will *invert* the foreground/background value — it has nothing to do with inverse colours! This has the effect of displaying a pixel if there is no pixel at that position, or turning the pixel off if it is on. Number 3 will leave the particular pixel as it is which is useful if you do not know if the pixel at that position is on or off.



Cursor movement

Besides using CURMOV to move the cursor it is possible to do this by DOKEing location 16 with the required screen memory address. The only limitation is that the position will always be at the start of a row of six pixels. Some unusual side effects are now produced.

Try setting CURSET 100,100,1 and then draw a CIRCLE 10,1. Now move the cursor with DOKE 16,46000. Draw another circle with CIRCLE 20,1. The circle is drawn from the original cursor position. Try drawing a line with DRAW 20,20,1 and the line will be drawn from the left edge of the screen , location 46000 to be precise. In effect we now have two separate cursors. The one set by CIRCLE and FILL, whilst the one set by DOKEing 16 will be used by DRAW and CHAR. Odd, but it may prove useful. A CURMOV or CURSET command wil put things back to normal. CURMOV will be relative to the original cursor position — 100,100,1 in the above case.

In a subsequent article David Ellis will be explaining how to use the FILL command and printing characters to the HIRES screen.

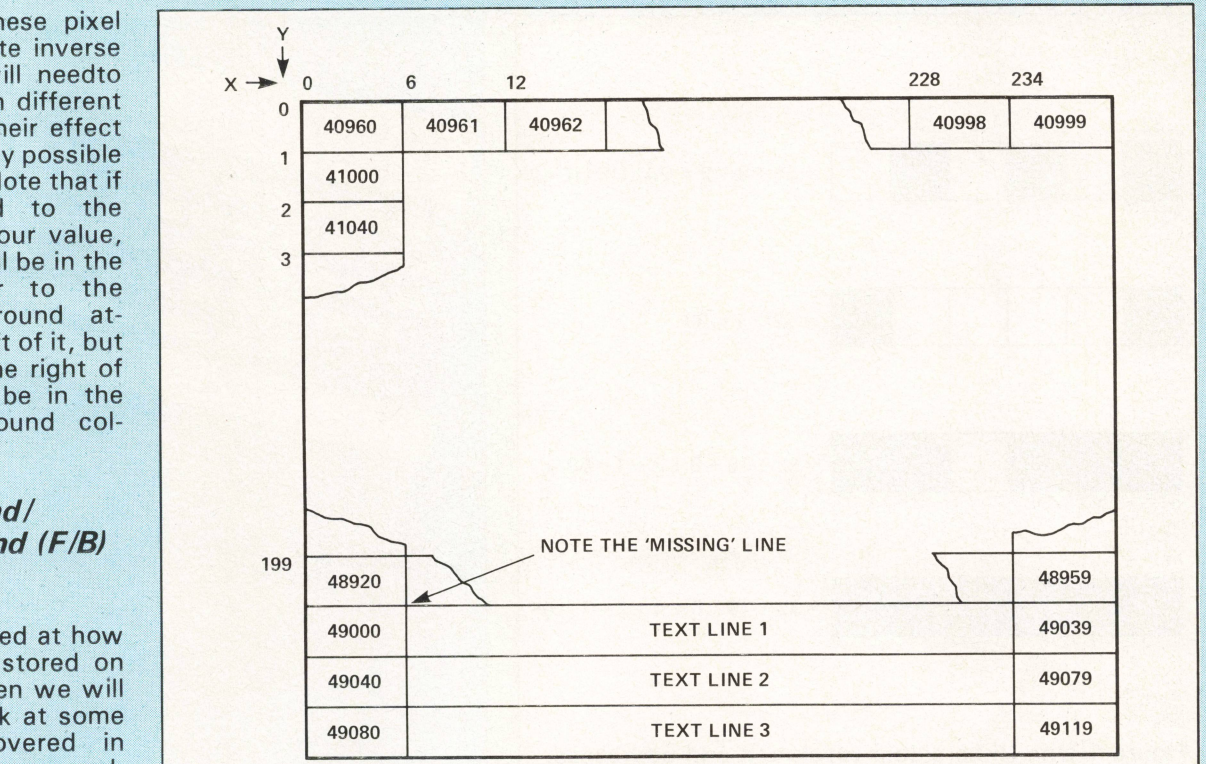


Figure 2 Examples of pixel displays

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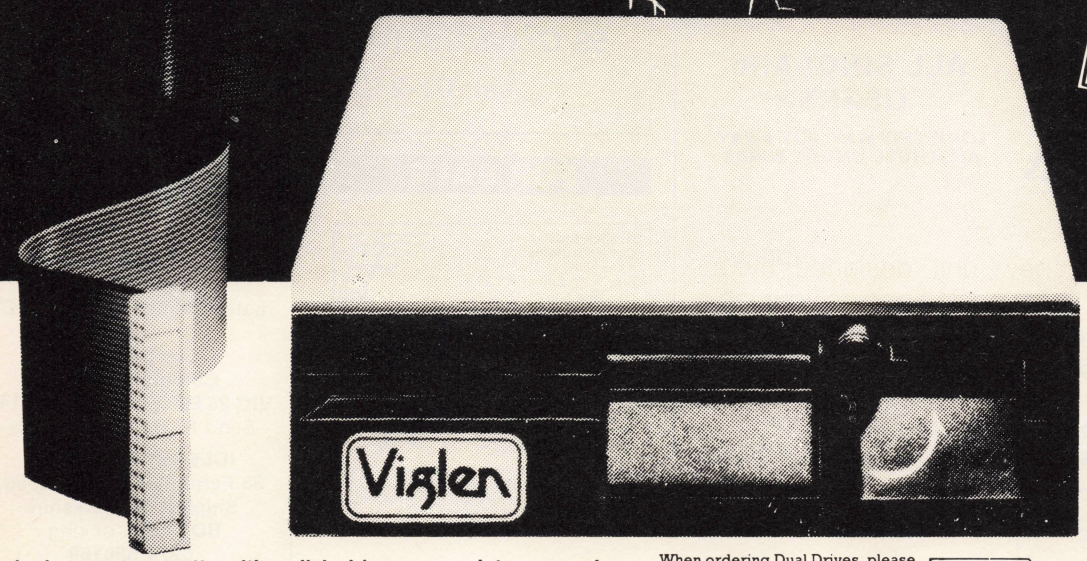



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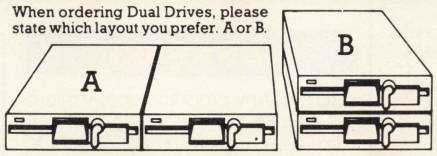

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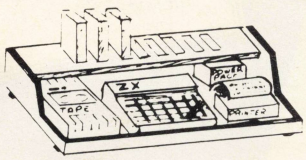

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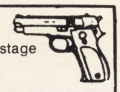

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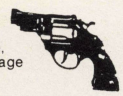

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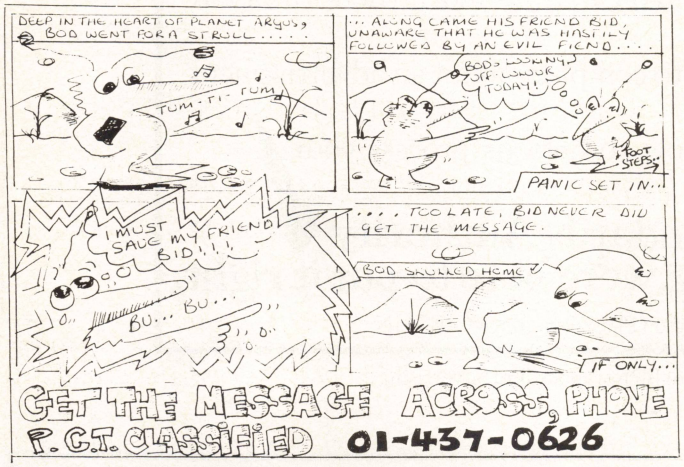

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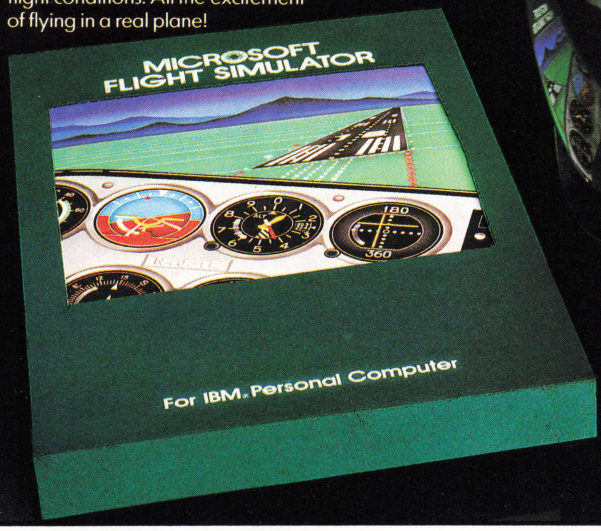

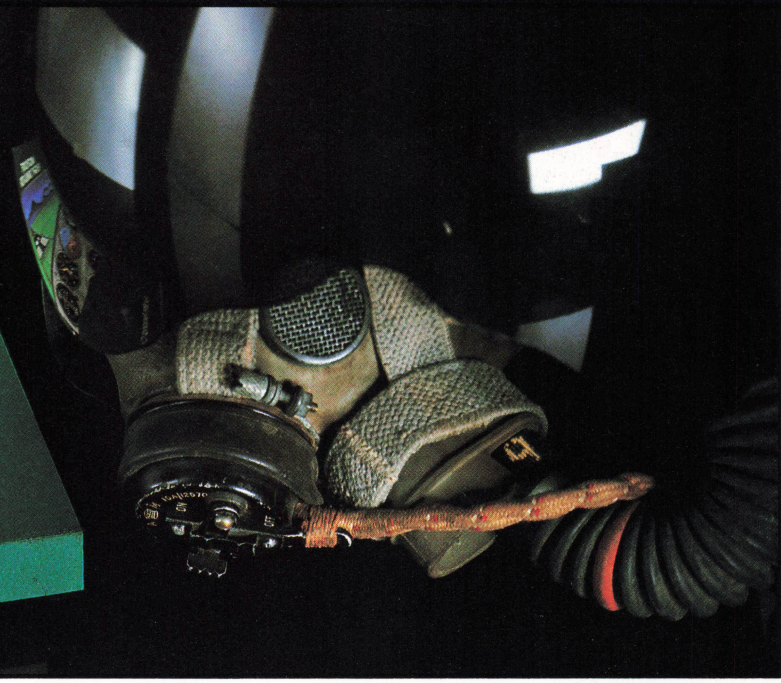

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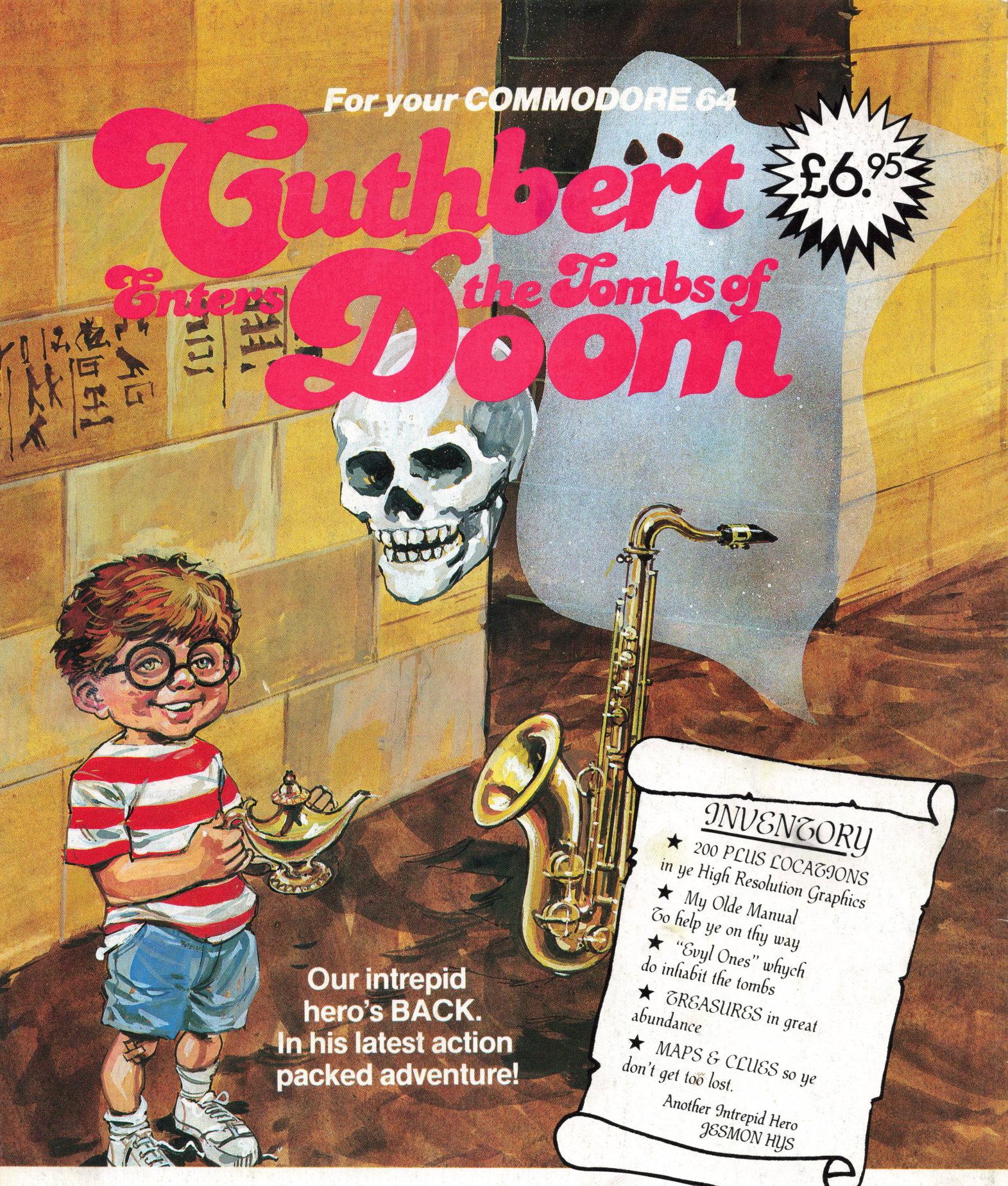

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