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FEBRUARY 1985

Personal Computing Today

Brush up your computer art



Commodore Plus 4—a case of overkill?

Programming for novices:

Game tricks on the CPC464

Basic kit

Class of '64

Facing up to it—Interfacing explored

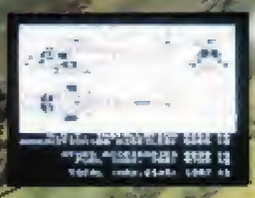
Gripping games for BBC, Oric, Spectrum, Texas

COMBAT LYNX

From DURELL
(Technical Support from Westland Helicopters)

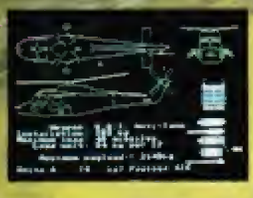
SPECTRUM 48k – COMMODORE 64 – BBC – AMSTRAD (soon)

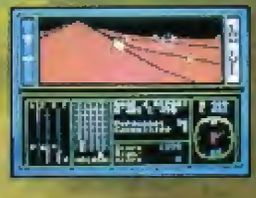






SPECTRUM



COMMODORE 64

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ABC

A lot of people picking up this magazine will be newcomers to computing, having received their much longed for micro from a generous Santa.

Well, you've unwrapped it, set it up, played a few games, impressed your family and could now be thinking 'great. . but what can I *do* with it?' The answer is in PCT!

This month and for the rest of the year, PCT will be publishing easy to follow instruction courses on all aspects of home computing, from detailed explanations of BASIC, the language understood by your computer, to creating complex and exciting graphics on the Commodore 64. The articles on games writing on the Amstrad CPC464 is full of hints for owners of all micros. They explain how to structure programs and give explicit details on each aspect of that breakdown. Like how to create the illusion of character movement and colour, or how to incorporate a high score routine into your programs.

You won't be satisfied with an isolated computer for long. You will want to expand your system to include extra memory, printers, disk drives, joysticks, modems or whatever. But before you invest huge amounts of money in peripherals, you'll need sound advice on what to buy.

Here again, the solution lies in PCT. Each month we have several sections of hardware reviews, from speech synthesisers for the Spectrum to the latest four colour printer plotter for the BBC. Throughout the months they build up to a very useful library of specifications and test reports — hang on to them, you don't know when you might have a windfall!

PCT aims to help *you* so if there's something you want to see, or even (dare we say it) something you don't like in the magazine, get in touch! Any suggestions (polite ones only please) will be considered and acted upon.

We look forward to hearing from you!



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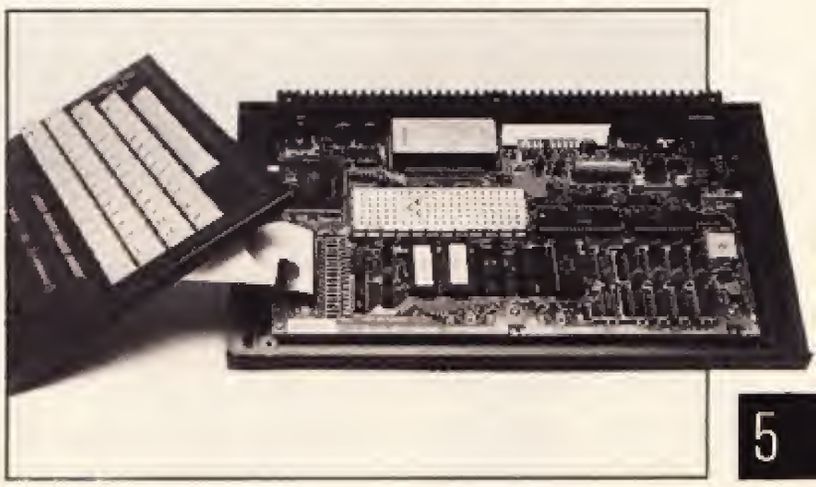
Game Tricks on the CPC464 64
Overcome the limited software availability by writing your own, and learn something while you're about it!

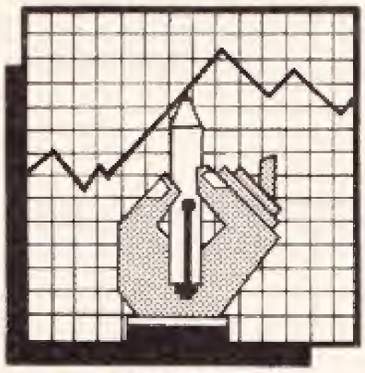
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News



ORIC'S NEW COMPUTER OUT IN JANUARY

Oric Products International are hoping to increase their current 2 per cent share of the UK market with a new 64K micro launched here in January.

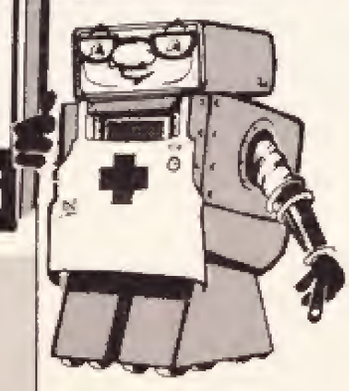
Code-named the IQ164, the micro was to have been known as the 'Stratos' which would have tied in nicely with its predecessor, the Atmos. However, copyright problems over the use of this name, have left Oric with the difficult task of finding a new one.

The IQ164 resembles the Atmos in looks but is a very much meatier machine. Although driven by the same 6502 processor it has room for two ROM cartridges, one of which holds the language (48K) and the other the application (64K). In addition there is 64K RAM on board and over 40K of BASIC, which is much improved and said to give much better graphics. The sound has also been improved.

The keyboard has a function key which, when held down, allows single-key entry of BASIC keywords. These are predefined but can be changed by the user. The IQ164 has built-in RS232 interface, disk controller, and modem driver and two joystick ports.

The machine will be supplied with SuperBASIC and one ROM cartridge and Tansoft have produced some very innovative software. The price has not yet been fixed and will depend on what happens to the dollar and to chip prices.

NATIONAL NETWORK Computer-fix



BREAKDOWN RECOVERY FOR HOME MICROS

A British Company is set to resolve the headaches of thousands of micro owners when their machines break down.

Using a rapid new diagnostic system, **Computer-Fix** are able to offer a repair service for most makes of home micro through a nationwide dealer service. The repairs are carried out within 48 hours of the company receiving the machine via the dealer. Costs are kept low because of the revolutionary design of the testing system which has been developed for a fraction of the cost of alternative fault finding equipment.

Thousands of micros are now nearing the end of their warranty periods and users are often deterred from having their machines repaired because of the expense and inconvenience involved in returning them to the manufacturers.

With the Computer-Fix system, owners take their micro to their nearest dealer involved in the scheme and pay a sum which is fixed for each type of micro. Prices start at £19.55 for the Spectrum and rise to £40.25 for the BBC. Every micro repaired by the company is covered by a 3 month guarantee on parts and labour.

Full details are available from Laurence Fretwell, Albany Park Estate, Frimley Park, Camberly GU15 2PL or by telephoning (0276) 66266.



ELECTRONIC MAIL NETWORK FOR SCHOOLS

The launch of The Times Network for Schools promises to open up the range of activities available to educational users of microcomputers.

With TTNS, schools throughout the country will be able to exchange information at a fraction of the cost incurred through using commerical networks such as Prestel. It will also provide vital links between education, industry, commerce and the professions by helping young people understand the requirements of their future employers and, at the same time, making them familiar with new technology.

The system is based on the public electronic mail and bulletin board service offered by Telecom Gold. There is a central database of information built up from educational and outside resources. Sponsorship from all spheres of business, the sponsors contributing worthwhile information of relevance to education, will help keep down the costs of the service.

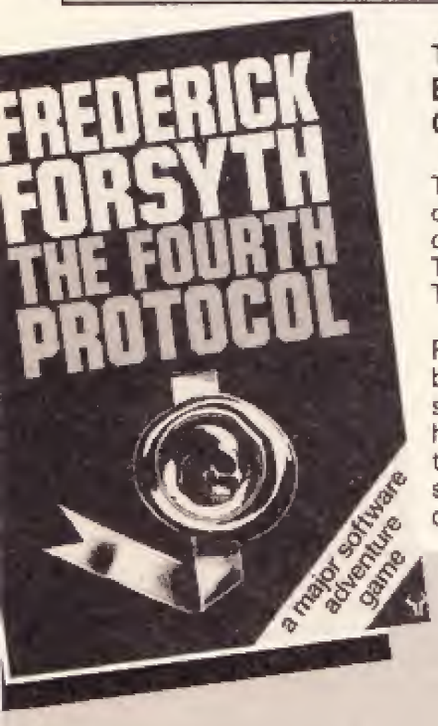
One such sponsor is the newly formed National Computer Club which is offering a countrywide scheme to schools and home users of micros, providing software and newsletters to members.

TTNS' database, under the supervision of educational advisors, will contain a vast library of information relating to both curricular and extra-curricular activities. The pooling of resources in this way expands the capabilities of every school participating in the network.

As well as having access to topical data, such as lectures, exhibitions or press articles, teachers will be able to pool schools' equipment to maximise resources. Sports fixtures etc can be fixed much quicker and more economically than at present. The possibilities are endless and include the transfer of administrative material at high speed and in confidence through the use of passwords.

The TTNS will supply a combined hardware and software package to adapt the micro for linking to the Network at the subsidised price of £152. This is a one-off charge with a further nominal subscription of £69 per term on each mailbox to cover unlimited access to TTNS.

The scheme will be extended to include the country's 27,000 primary schools late in 1985. For further information contact The Times Network for Schools, News International plc, PO Box 7, 200 Grays Inn Road, London WC1X 8EZ (Tel: 01-837 1234 ext. 7924).



TOP COMPUTER ESPIONAGE — THE GAME!

The latest in the long line of computer conversions of top selling books is The Fourth Protocol — The Game.

Based on Frederick Forsyth's international best selling book of the same name, the game has all the excitement of the author's famous suspense, mastery of chilling detail and a very clear insight into the workings of international espionage agencies.

In the game you are in control of MI5 operations, receiving a constant flow of reports from agents, accessing records and controlling all the facilities of the agency such as foreign agents, bugging devices and a hotline to the SAS.

Your brief is to seek out and destroy a deadly enemy at large somewhere in England, foiling his attempts to undermine and damage our society.

The Fourth Protocol — The Game has been developed by leading game designers and programmed by the Electronic Pencil Company. It will be available through Hutchinson Computer Publishing in the late spring, initially for the Spectrum 48K and Commodore 64 (also on disk) but other versions should follow shortly after.



MAGIC SOFTWARE FROM ACORNSOFT

Turn your BBC into a magician's assistant by loading it with the Paul Daniels' Magic Show by Acornsoft. It won't be possible to saw anyone in half but it's good enough to impress your friends with a few simple card tricks and detective work!

The program contains ten tricks graded in order of complexity. In one of the card tricks the computer, with your help, reads the mind of a participant who has chosen the card. Clue involves your audience plotting a murder and allows you to 'guess' the victim, weapon used and scene of the crime! The tape version costs £9.95 and it will be available on disk for £11.50.

On a more epicurian note, the Complete Cocktail Maker mixes up some wonderful beverages. You simply input the ingredients you would like and it comes up with a recipe! Same prices as above.

BOOKS FOR BAFFLED USERS

The enterprising ones amongst us who brave the fresh pastures of new computers are often left floundering in the wilderness for a time before book and software publishers catch up and produce helpful guides.

Well, Sunshine Books are quick off the mark as always and have new books out for the Commodore Plus 4 and C16, as well as the Amstrad.

The Working Plus 4 contains practical routines to make use of your micro and a companion book deals with similar aspects of the C16. A combination book, The Commodore C16/Plus 4 Companion is a comprehensive beginners' guide to programming these two micros and expands the information given in the user manuals. Sunshine have also brought out a similar book for the Amstrad.

For game addicts, the Commodore Plus 4 Adventures book will provide helpful information and listings of adventure games. It sets out to teach you how to create adventures and because both the Plus 4 and C16 employ the same BASIC, it is also applicable to the latter machine.

The Working Plus 4 and C16 cost £6.95 each and the other books retail at only £5.95.



MSX EDUCATIONAL SOFTWARE

Plenty of software houses are busy converting and producing new games for the MSX family of computers, but CDS are one of the first to launch educational programs. They have converted their Language is Fun series of programs which will retail at £7.95 each.

COMBAT LYNX FOR THE CBM64

Durell Software's exciting air game, Combat Lynx, which has proved so popular with Spectrum owners, has now been converted to the CBM64 and BBC computers.

These versions retain the technical sophistication of the original with the added bonus of two joystick usage. All the versions retail for £8.95.

PRISM'S VIEWDATA SYSTEM IS OFFICIAL MICRONET DOWNLOADER

Prism Microproducts have launched the only modem which has the necessary official software to successfully download programs or pages from Micronet 800 into the Commodore 64.

Based on their Modem 1000, the Commodore 64 version comes complete with software on a plug-in cartridge which connects to the 64's expansion port. All necessary cables and instructions are included in the package.

The system will allow Commodore 64 users to access Prestel, Micronet 800, Viewfax 258 and other viewdata systems. Contact with BBC and Spectrum users is also possible via the 'chat mode'. The system retails at £129.95.

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Oric Intelligence

A trick program which draws its theme from Artificial Intelligence. You can make your Oric appear to 'talk' to you. By N Emerson.

ORIC 48K

This program is for the 48K Oric, 16K owners will need to make some modifications (see hints on conversion).

Artificial intelligence is a subject which has always fascinated me and I have taken its theme to write this program. It does not fulfil the scientific criteria of A.I. (see article elsewhere in this issue) but it is jolly good fun!

The program works by hunting through the input for key-phrases and keywords and replacing them with built in responses from the program. It comes with data for normal conversation but this can be changed to perform any task (e.g. teacher, politician etc). The beauty of it is that it can reflect the user's own input and so takes on his/her personaltiy. The response time is rather slow I'm afraid but you might learn a lot about AI!

Program notes

I would suggest that you omit all REM statements when typing in the program as this will increase the speed a little. I have included POKEs and CALLs which speed it up further, but they turn off the keyboard so don't enter them until the program is error-free.

variables used

AB	Number of keyphrases to be read. This will need changing if you add your own data.
AC	Ditto for keywords
A	String-user input
k	Length of A string
w	Word number in keyphrase loops
WW	Permanent store for W
X	X position in input of search loop
zx	String — direct reply
ZX	Length of ZX string
J$	Left of input from keyword
z	Difference between input and output
z2$	Complete reply with keyphrases and words
cv	Right of input
mm,zz,	Random numbers
XX	Line of data for restore routine
B$	Keyphrase in input
C$	Keyphrase in output
F$	Keyword in input
G$	Keyword in output

how it runs

Line	Effect
10-200	Set up screen and instructions
210-250	Main control routine
280-380	Find Keyphrase
430	Check for low ASCII values
450-520	Adjust input for further processing
550-660	Find keyword
750-800	Print loop for direct reply
1060-1100	Calculate input and swop keywords
1180-1230	Print loop for full reply
1290-1430	Random replies
1450-1630	Input routine
1670-1850	Initialise the arrays
1890-2380	Keyphrase data
2420-2720	Keyword data
2770-2840	Restore routine

hints on conversion

Notes for 16K users
You will see that Line 60 releases the HIRES RAM although the program operates in the text mode. This is because the program uses arrays and stack handling facilities which appear to crash into the character set and corrupt it. Thus, it is better to keep 8K between the program and the rest of the RAM. If you remove all the REMs and cut down on text and data, it should fit in perfectly.

For other machines
Unfortunately this program commits an unforgivable crime! At Lines 340 and 630 it jumps out of a loop. This leaves two repeat addresses on the stack and within a few minutes, the program would crash with an 'out of memory' error.

Luckily Oric BASIC possesses a set of commands which allow the user to remove certain types of addresses from the stack and if you look at these lines, you will see two PULL commands which remove the return addresses. I know of no other BASIC which can do this so you have three choices:

1. Restructure the program using GOTOs.
2. Use two UNTIL statements (i.e. UNTIL TRUE or UNTIL 2 = 2).
3. Write your own stack clearing routine. Find how repeat addresses are stored in your own stack and write a loop to POKE them over with the normal value held in an empty stack.

Special Oric commands

RELEASE	Assigns HIRES RAM to user RAM
TEXT	Sets up text screen
PING	Ping noise
ZAP	Zap noise
PULL	Takes one repeat address from stack
PLOT	Plot at X,Y

POKEs and CALLs

48035	CAPS sign on Oric's screen
618	Cursor, keyclick etc.
616	Cursor position (vertical)
775	Computer speed and key repeat
e804	Keyboard on
E6ca	Keyboard off
62510	Reset to default screen

program listing

```
10 REM ------------------------------
20 REM |    AUNTIE ORIC               |
30 REM |      by NEWTON EMERSON       |
40 REM ------------------------------
50 :
60 RELEASE:TEXT
70 PAPER0:INK7
80 POKE48035,0:POKE618,10
90 GOSUB1650'  INITIALISE
100 :
110 PRINTCHR$(17):POKE618,03
120 CLS:PRINT:PRINT"HELLO - MY NAME IS AUNTIE ORIC.
WHAT'S YOURS":IN
PUTZ$
130 PRINT:PRINT"HELLO ";Z$
140 PRINT:PRINT"A FEW THINGS TO REMEMBER DURING
CONVERSATION.
"
150 PRINT:PRINT"PLEASE DON'T USE COMMAS,EVERYTHING"
160 PRINT"ELSE IS FINE.NATURALLY I WILL HAVE TO"
170 PRINT"ANYLISE YOUR SENTENCES,SO THE SHORTER"
180 PRINT"THEY ARE,THE QUICKER I CAN RESPOND"
190 PRINT:PRINT"PLEASE TALK TO ME"
200 :
210 GOSUB1470 ' INPUT ROUTINE
220 PRINT
230 GOTO 260
240 PRINT:PING
250 PRINT:PING:GOTO210' BACK TO INPUT
260 POKE775,255' SPEED UP
270 :
280 REM     Locate key PHRASES
290 :
300 :REPEAT
310 :W=W+1
320 : REPEAT
330 :  X=X+1
340 :  IFMID$(A$,X,LEN(B$(W))+1)=B$(W)+" "    THENPULL:PU
LL:GOTO430'P
ROCESS
350 :  UNTILX>LEN(A$)-1
360 :X=0
370 :UNTILW>AB-2
380 :
390 GOTO1290       RANDOM REPLIES
400 :
410 REM  DIRECT REPLY ON LOW ASCII                VALUES
#g ?.,!
420 :
430 IFRIGHT$(C$(W),1)<"A"ANDRIGHT$(C$(W),1)<>" "ORC$(W)
=K$THENWW=W:
GOTO700
440 :
450 REM  STRIP OFF SPACES
460 :
470 IFRIGHT$(A$,1)=" "THENA$=LEFT$(A$,LEN(A$)-1)
480 :
490 REM  ADJUST A$ ACCORDING TO DATA              LENGTH
500 :
510 IFLEN(A$)=LEN(B$(W))+1THENA$=RIGHT$(A$,(LEN(A$)-X+1
)-LEN(B$(W))
):GOTO540
520 A$=RIGHT$(A$,(LEN(A$)-(X+LEN(B$(W)))))
530 WW=W
540 A$=A$+" "
550 W=0:X=0:A1$=A$:J$="":ZX$="":Z2$=""
560 :
```

program listing

```
570 REM   locate key WORDS
580 :
590 :REPEAT
600 :W=W+1
610 : REPEAT
620 : X=X+1
630 : IFMID$(A$,X,LEN(F$(W)+" "))=F$(W)+" "THENPULL:
PULL:GOTO860'PR
OCESS
640 : UNTILX>LEN(A$)-2
650 :X=0
660 :UNTILW>AC-1
670 :
680 REM  CHECK AGAIN FOR LOW ASCII
690 :
700 IFRIGHT$(C$(WW),1)<"A"ANDRIGHT$(C$(WW),1)<>"
"THENZX$=C$(WW):RR
=0:GOTO760
710 IFRIGHT$(C$(WW),1)=" "THENC$(WW)=LEFT$(C$(WW),
LEN(C$(WW))-1):PI
NG
720 :
730 REM  DIRECT PRINT ROUTINE FOR
NO KEYWORD REPLIES
740 :
750 ZX$=C$(WW)+" "+A$:RR=0
760 ZX=LEN(ZX$):PING
770 FORR=1TOZX:RR=RR+1
780 PRINTMID$(ZX$,R,1);
790 IFR>30ANDMID$(ZX$,R,1)=" "ANDRR>30THENPRINT:RR=0
800 NEXTR
810 :
820 GOTO250'  RETURN FOR INPUT
830 :
840 REM  CALCULATE J$ (INPUT-REPLY)
+ Z (REPLY-INPUT)
850 :
860 J$=LEFT$(A$,(X-1))+B$(W)
870 Z=LEN(A$)-LEN(LEFT$(A$,(X-1)))-LEN(B$(W))
880 :
890 REM  REMOVE LEADING SPACES
900 :
910 :REPEAT
920 :IFJ$<>""ANDASC(LEFT$(J$,1))<65THENJ$=MID$(J$,2)
930 :UNTILASC(LEFT$(J$,1))<>32
940 :
950 REM  ADJUST END OF REPLY ON
LENGHTS OF F$(W) AND
 B$(W)
960 :
970 IFLEN(B$(W))<LEN(F$(W))THENZ=LEN(A$)-LEN(LEFT$
(A$,(X+1)))-LEN(B
$(W))
980 DD=RND(1)*10+1
990 :
1000 REM    BE NASTY AT RANDOM
1010 :
1020 IFDD>7ANDWW=5THENC$(WW)="NO,I DON'T"
1030 :
1040 REM  ADJUST REPLY ON DATA LENGTH
1050 :
1060 Z2$=C$(WW)+" "+J$+" "
1070 IFLEN(B$(W))<LEN(F$(W))THENZ2$=C$(WW)+" "+J$
1080 IFLEN(B$(W))<LEN(F$(W))THENCV=ABS(LEN(F$(W))
-LEN(F$(W)))+1:GOT
O1100
1090 CV=ABS(LEN(B$(W))-LEN(F$(W)))
1100 IFZ>2THENZ2$=Z2$+RIGHT$(A$,Z-1+CV)
1110 :
1120 REM  ADD USER NAME AT RANDOM
1130 :
1140 MM=RND(1)*10+1:IFMM>5THENZ2$=Z2$+", "+Z$
1150 :
1160 REM  PRINT REPLY WITH KEYWORDS                AND KEY
PHRASES
1170 :
1180 ZX=LEN(Z2$):PING
1190 FORR=1TOZX
1200 RR=RR+1
1210 PRINTMID$(Z2$,R,1);
1220 IFR>30ANDMID$(Z2$,R,1)=" "ANDRR>30THENPRINT:RR=0
1230 NEXTR
1240 :
1250 GOTO250' RETURN FOR INPUT
1260 :
1270 REM  RANDOM REPLIES
1280 :
1290 ZZ=RND(1)*11+1
1300 ONZZGOSUB1320,1330,1350,1360,1370,1380,1390,1400,1
410,1420,143
0
1310 GOTO250
1320 PRINT"WHAT DOES THAT SUGGEST TO YOU?":RETURN
1330 PRINT"I SEE....":RETURN
1340 RETURN
1350 PRINT"I'M NOT SURE I UNDERSTAND YOU FULLY":RETURN
1360 PRINT"CAN YOU ELABORATE ON THAT":RETURN
1370 PRINT"THAT IS QUITE INTERESTING":RETURN
1380 PRINT"THAT'S SO...PLEASE CONTINUE":RETURN
1390 PRINT"I UNDERSTAND":RETURN
1400 PRINT"WELL WELL...DO GO ON":RETURN
1410 PRINT"WHY ARE YOU SAYING THAT?":RETURN
1420 PRINT"PLEASE EXPLAIN THE BACKGROUND TO THAT":RETUR
N
1430 PRINT"COULD YOU SAY THAT AGAIN,IN A DIFFERENT WAY"
:RETURN
1440 :
1450 REM  INPUT ROUTINES
1460 :
1470 C$(5)="YES,I"
1480 POKE775,39
1490 W=0:H=0:Z=0:X=0:RR=0'CLEAR
1500 CALL#E804' KEYBOARD ON
1510 Z2$="":J$="":ZX$="":ZX=0
1520 PRINT:INPUTA$:K$=A$
1530 IFRIGHT$(A$,1)=")"THEN1550
1540 IFRIGHT$(A$,1)<"A"ANDRIGHT$(A$,1)>"9"THENA$=LEFT$(
A$,LEN(A$)-1
)
1550 CALL#E6CA'KEYBOARD OFF
1560 IFPEEK(616)>24THENCLS:PRINT"? ";K$:REM    CLEAR SC
REEN
1570 POKE48035,0' CAPS SIGN OFF
1580 IFLEFT$(A$,3)="BYE"THENCALL62510
1590 IFLEFT$(A$,5)="HELLO"THENPRINT:PRINT"HELLO ";Z$;",
PLEASE TALK
TO ME":GOTO1470
1600 K=LEN(A$)
1610 IFLEFT$(A$,7)="BECAUSE"THENA$=RIGHT$(A$,(K-7)):K=K
-7
1620 A$=" "+A$+" "
1630 RETURN
1640 :
1650 REM  INITIALISE
1660 :
1670 CLS:PRINT:N=0
1680 DIMB$(100),C$(100),F$(050),G$(050)
1690 PRINTCHR$(4);CHR$(27);"J     INITIALISING";CHR$(4)
1700 PRINT
1710 FORAB=1TO51
1720 READB$(AB),C$(AB)
1730 PRINT".";:SOUND1,AB,10:PLOT3,1,RND(1)*7 +1:PLOT3,2
,RND(1)*7+1
1740 NEXTAB
1750 XX=2420:GOSUB2770'RESTORE
1760 FORAC=1TO31
```

program listing

```
1770 READF$(AC):READG$(AC)
1780 PRINT".";:SOUND1,AB+NXT+AC,10:PLOT3,1,RND(1)*7
+1: PLOT3,2,RND(
1)*7+1
1790 NEXTAC
1800 PLOT3,1,14:PLOT3,2,14
1810 PLOT7,12,"Press SPACE to start"
1820 PING
1830 REPEAT:UNTILKEY$=" "
1840 ZAP
1850 RETURN
1860 :
1870 REM  key PHRASE data
1880 :
1890 DATA"PROBLEM","MOST PEOPLE DO,TELL ME ABOUT IT."
1900 DATA"CAN YOU","I CAN DO ANYTHING,BUT CAN YOU
MAKE A PROGRAM TO
"
1910 DATA"ORIC"
1920 DATA"PLEASE DON'T USE MY NAME.IT CONFUSES MY
STRING PROCESSING
."
1930 DATA"AM I","YOU PROPABLY ARE"
1940 DATA"DO YOU","YES,I"
1950 DATA "CAN I",PERHAPS YOU DON'T WANT TO BE ABLE TO
1960 DATA"ARE YOU","I PROPABLY AM"
1970 DATA "YOU ARE",WHAT MAKES YOU THINK I AM
1980 DATA"I WAS","WHY DO YOU THINK YOU WERE"
1990 DATA"I DON'T","WHY DON'T YOU"
2000 DATA"DON'T BE","WHY SHOULD'NT I BE"
2010 DATA "I FEEL","TELL ME MORE ABOUT FEELING"
2020 DATA "WHY DON'T YOU","WHY SHOULD YOU WANT ME TO"
2030 DATA "WHY CAN'T I","WHAT MAKES YOU THINK YOU
CAN'T "
2040 DATA "ARE YOU",WHY SHOULD YOU BE INTERESTED IN
WETHER OR NOT I
 AM
2050 DATA "I CAN'T",PERHAPS YOU SHOULD TRY HARDER TO
2060 DATA"SINCE","REALLY,IT MUST BE QUITE A WHILE
SINCE "
2070 DATA"SEX","MY INTERFACES ARE INCABABLY OF SEX,
TALK  TO A HUMAN
INSTEAD."
2080 DATA "I AM","HOW LONG HAVE YOU BEEN"
2090 DATA"I'M","HOW LONG HAVE YOU BEEN"
2100 DATA"I DID'NT","WHY ON EARTH DID'NT YOU"
2110 DATA"I HAD","DO YOU THINK YOU SHOULD HAVE HAD"
2120 DATA"I DID","WHY DID YOU DO"
2130 DATA "I WANT",WHY DO YOU WANT
2140 DATA "WHAT",WHAT DO YOU THINK?
2150 DATA "HOW",WHAT ANSWER WOULD PLEASE YOU THE MOST?
2160 DATA "WHO",MY PERSONALITY FILES ARE LIMITED IN
THE  INTERESTS O
F ARRAYS.
2170 DATA "WHERE","MY GEOGRAPHICAL KNOWLEDGE IS
LIMITED  TO MY OWN C
IRCUITS."
2180 DATA "WHEN",TIME IS A PROBLEM FOR ME - I
OPERATE I N MICROSECON
DS.
2190 DATA "WHY","I HAVE INSUFFICIENT DATA TO ANSWER
THAT QUESTION."
2200 DATA "PERHAPS",YOU'RE NOT VERY CERTAIN ON THAT!
2210 DATA "YOU'RE","WHAT IS YOUR REACTION TO ME BEING"
2220 DATA "DRINK","LIQIUDS ARE BAD FOR MY CIRCUITS
AND YOUR LIVER !
!"
2230 DATA "SORRY",NO NEED TO APOPOGISE - COMPUTERS
ARE INSENSITIVE.
2240 DATA "DREAM","I NEVER DREAM,I MUST BE FULLY
AWAKE AT ALL TIMES
."
2250 DATA "I LIKE","DO YOU THINK ITS GOOD TO LIKE"
2260 DATA "MAYBE",AND MAYBE I'LL TURN MYSELF OFF IF
 YOU DON'T BE MO
RE PRECISE!
2270 DATA"NO","WHY ARE YOU BEING SO NEGATIVE?"
2280 DATA"YOUR","WHY ARE YOU CONCERNED ABOUT MY
2290 DATA"ALWAYS",CAN YOU THINK OF A SPECIFIC EXAMPLE?
2300 DATA"THINK",DO YOU DOUBT
2310 DATA YES,"YOU SEEM QUITE CERTAIN,HOW CAN YOU BE SU
RE?"
2320 DATA FRIEND,WHY DO YOU BRING UP THE SUBJECT OF FRI
ENDS?
2330 DATA COMPUTER,"WHY SHOULD YOU MENTION COMPUTERS TO
 ME,OF ALL T
HINGS?"
2340 DATA AM I,YOU ARE
2350 DATA"THOUGHT YOU","DID YOU DOUBT I"
2360 DATA"THOUGHT",DID YOU DOUBT
2370 DATA"LOVE","THAT'S CUTE,ITS NICE TO HEAR THAT YOU
LOVE"
2380 DATA"TELEVISION","I LIKE TELEVISION,I CAN MONITER
MINE ALL THE
 TIME."
2390 :
2400 REM  key WORD data
2410 :
2420 DATA"I AM","YOU ARE"
2430 DATA"I'M","YOU'RE"
2440 DATA"YOU'RE","I'M"
2450 DATA"MY","YOUR"
2460 DATA"I","YOU"
2470 DATA"WERE","WAS"
2480 DATA"YOU","I"
2490 DATA"YOUR","MY"
2500 DATA"I'VE","YOU'VE"
2510 DATA"ARE","AM"
2520 DATA"ME","YOU"
2530 DATA"I AM","YOU ARE"
2540 DATA"US","YOU"
2550 DATA"I'LL","YOU WILL"
2560 DATA"YOU'LL","I WILL"
2570 DATA"MY","YOUR"
2580 DATA"WE'RE","YOU'RE"
2590 DATA"WE ARE","YOU ARE"
2600 DATA"AM I","ARE YOU"
2610 DATA"MYSELF","YOURSELF"
2620 DATA"MINE","YOURS"
2630 DATA"YOURS","MINE"
2640 DATA"YOURSELF","MYSELF"
2650 DATA"WAS","WERE"
2660 DATA"WERE","WAS"
2670 DATA"MUM","MOTHER"
2680 DATA"DAD","FATHER"
2690 DATA"BROTHER","BRAT"
2700 DATA"BROTHERS","BRATS"
2710 DATA"SICK","ILL"
2720 DATA"TV","TELEVISION"
2730 END
2740 :
2750 REM  RESTORE ROUTINE
2760 :
2770 L=1281
2780 NXT=DEEK(L):IFNXT=0THENRETURN
2790 PRINT".";:SOUND1,ABS(XX-(NXT*2)),10:PLOT3,1,RND(1)
*7+1:PLOT3,2
,RND(1)*7+1
2800 IFDEEK(L+2)=XXTHEN2830
2810 IFDEEK(L+2)>XXTHENRETURN
2820 L=NXT:GOTO2780
2830 IFPEEK(L+4)=145THENDOKE176,L-1
2840 RETURN
2850 :
2860 ROUTINE TAKEN FROM 'ORIC OWNER'
2870 :
2880 :                    END
```



Spy from the North

Top class espionage is the name of the game. See if you make the grade as Steve Lucas' foreign connection.

CPC 464

I have been chosen by 'M' for a secret and probably dangerous mission. The secret plans for the Nuclear Submarine 'Lobinar' have been stolen by the evil Xoltan who is threatening to build an exact replica and hold the world to ransom. My task is to find him and prevent him from carrying out any more evil deeds.

Please help me by giving me instructions in the form of one or two word sentences such as 'CUT WIRE'. Here is a list of some words I understand:

GO,IN,OUT,DOWN, CLIMB,N,S,E,W,PRAY, HELP,SCORE,GET,TAKE, GRAB,DROP,INVENTORY,SAY,WAITDRIVE, FLY,USE,INSERT,REPAIR,MEND,SHOOT, KILL,STAB.

There are over 150 locations to visit in this game and it should prove quite a challenge to solve. If you really get stuck, the following hints may help, but I wouldn't advise you to read them except in desperation!

Hints

1. You'll need something to cut the wire fence with. . .and you never know what ordinary objects can conceal unless they are examined carefully!

2. Getting over a fence shouldn't prove too difficult if there's a tree nearby.

3. The fisherman is a little unpredictable and I'd shoot first and ask questions later.

4. Xoltan is wearing a bullet proof vest, but he is vulnerable to attack!

5. Some of the other characters are not all they appear to be and I'd watch out for dangerous drivers and female spies.

6. The taxi driver won't let you go without paying.

7. A key would come in useful for something!

8. Don't fly without a helmet!

9. If you really get stuck, your jet pack may just help!

I'm not giving any more away!

how it runs

Line	Effect
10-100	Titles and instructions
110-150	Initialise and fill arrays
160-600	Main control loop
160-170	Describe locations
180-260	Describe directions
270-320	Describe objects
330	Input actions
340-590	Call subroutines
600-1520	Subroutines for actions
1530	Data for game





hints on conversion

1. The main loop is a WHILE WEND loop, this can be replaced by either a REPEAT UNTIL loop or simply a conditional GOTO.
2. Colour is selected by BORDER, INK and PEN and-can be replaced with the appropriate command available on your machine.
3. LOWER$ converts the input sentence into lower case. This is not available on most BASICs and can be left out provided you only type in lower case responses.

The program uses fairly standard BASIC, and should run on most machines provided you have over 28K of RAM free.

variables used

P%	Current location
V$(x)	Hold inventory
Q$(X)	Hold descriptions of locations
S%(x,y)	Holds map
G$(x)	Holds description of objects
R	Pointer to object
N$(x)	Words understood
N%(x)	Pointer to words
B%(x)	Pointer to objects
A%-Z%	Flags
sc%	Score
score%	Checks score
Z$	Input sentence
C$,D$,B$	First few letters of input sentence
L$	Second word input

program listing

```
10 REM ** The Spy from the North **
20 REM ** An adventure for the Amstrad CPC464 **
30 REM ** (C) Steve Lucas  November 1984 **
40 MODE 1:BORDER 0:INK 0,1:INK 1,24:INK 2,20:INK 3,6
50 DIM n$(30),b%(30),g$(29),x$(45),q$(158),s%(158,4),v$(5
)
60 PEN 1:LOCATE 9,2:PRINT"The Spy from the North"
70 PEN 2:LOCATE 5,8:PRINT"(C)  Steve Lucas  November 198
4 "
80 PRINT:PRINT:PRINT"I have been chosen by 'M' for a secr
et  and probably dangerous mission."
90 PRINT:PRINT"The secret plans for the Nuclear        Su
bmarine 'Lobinar' have been stolen by that dangerous terr
orist 'XOLTAN'."
100 PRINT:PRINT"My task is to find and destroy him      b
efore he can threaten the world."
110 RESTORE
120 FOR x=1 TO 158: FOR y=1 TO 4: READ s%(x,y): NEXT: REA
D q$(x): NEXT
130 FOR x=1 TO 4: READ x$(x): NEXT:FOR x=1 TO 29: READ
g$(x),b%(x),n$(x): NEXT
140 sc%=0:p%=2:x$="":score%=0
150 CLS
160 WHILE p%<158
170 PEN 1:PRINT:PRINT "I am :-":PEN 2:PRINT q$(p%):PEN 1:
PRINT:a$="":IF s%(p%,1)>0 THEN a$="North"
180 IF p%=27 AND j1=1 THEN PEN 3:PRINT"There is a lever b
ehind an oil drum":PEN 1:PRINT
190 IF p%=2 THEN MOVE 0,0:DRAW 1000,0
200 IF s%(p%,2)>0 AND LEN(a$)>0 THEN a$=a$+",South" ELSE
IF s%(p%,2)>0 THEN a$="South"
210 IF s%(p%,3)>0 AND LEN(a$)>0 THEN a$=a$+",East" ELSE I
F s%(p%,3)>0 THEN a$="East"
220 IF s%(p%,4)>0 AND LEN(a$)>0 THEN a$=a$+",West" ELSE I
F s%(p%,4)>0 THEN a$="West"
230 IF p%=124 OR p%=141 OR p%=17 THEN a$=a$+",Down"
240 IF p%=12 OR p%=1 OR p%=21 OR p%=140 OR p%=122 OR p%=9
0 OR p%=99 OR p%=122 THEN a$=a$+",Up"
250 IF p%=101 THEN a$="Down" ELSE IF a$="" THEN a$="Nowhe
re obvious!"
260 PRINT x$(19);" :-";PEN 3:PRINT a$:PEN 1:PRINT
270 e=0:FOR t=1 TO 29:pp%=0:IF b%(t)=p% THEN pp%=1
280 IF pp%=1 THEN 310
290 NEXT:IF e=0 THEN PEN 2:PRINT "I see nothing special":
PEN 1
300 GOTO 330
310 PEN 1:PRINT "I can see :-":PEN 2
320 PRINT g$(t):e=1:GOTO 290
330 PEN 1:PRINT:PRINT x$(18);:PEN 3:INPUT z$
340 z$=LOWER$(z$):b$=LEFT$(z$,2):c$=LEFT$(z$,3):d$=LEFT$(
z$,4):PEN 1:CLS
350 sc%=INT(p%/158*100):IF sc%>score% THEN score%=sc%
360 k=0
370 PRINT CHR$(7)
```




Spy from the North

program listing

```
390 IF c$="sco" THEN PRINT"You have scored ";score%;"%":k
=1 ELSE IF c$="loo" THEN PRINT"I can't see anything spec
ial":k=1 ELSE IF c$
="eat" THEN PRINT x$(26):k=1 ELSE IF  d$="drin" THEN PRIN
T x$(27):k=1
400 IF (b$="n" OR d$="go n") AND s%(p%,1)>0 THEN p%=s%(p%
,1):k=1
410 IF (b$="s" OR d$="go s") AND s%(p%,2)>0 THEN p%=s%(p%
,2):k=1
420 IF (b$="e" OR d$="go e") AND s%(p%,3)>0 THEN p%=s%(p%
,3):k=1
430 IF (b$="w" OR d$="go w") AND s%(p%,4)>0 THEN p%=s%(p%
,4):k=1
440 IF (b$="n" OR b$="s" OR b$="e" OR b$="w") AND k=0 THE
N k=1:PRINT"I can't go that way!"
450 IF b$="fu" OR b$="pi" THEN PRINT x$(30):k=1 ELSE IF b
$="up" OR b$="cl" OR d$="go u" THEN k=1:GOSUB 620
460 IF b$="do" OR d$="go d" THEN k=1:GOSUB 650 ELSE IF b$
="ju" THEN k=1:GOSUB 670
470 IF b$="wa" THEN k=1:GOSUB 770 ELSE IF c$="in" OR d$="
go i" THEN k=1:GOSUB 690 ELSE IF c$="out" OR d$="go o" TH
EN k=1:GOSUB 720 E
LSE IF c$="cut" THEN k=1:GOSUB 1280
480 IF c$="get" OR c$="tak" OR c$="gra" THEN k=1:GOSUB 81
0 ELSE IF c$="dro" OR c$="lea" THEN k=1:GOSUB 970
490 IF d$="driv" THEN k=1:GOSUB 1300 ELSE IF c$="inv" THE
N k=1:GOSUB 930 ELSE IF c$="swi" THEN k=1:GOSUB 1010
500 IF c$="exa" THEN GOSUB 1030 ELSE IF c$="sea" THEN k=1
:GOSUB 1340 ELSE IF c$="rid" OR d$="go t" THEN k=1:GOSUB
1080 ELSE IF c$="p
ay" THEN k=1:GOSUB 1100
510 IF c$="hel" THEN k=1:GOSUB 1150 ELSE IF c$="pra" THEN
 k=1:PRINT"That made me feel better but it didn't  solve
the problem!"
520 IF c$="use" OR c$="ins" OR c$="unl" THEN k=1:GOSUB 13
80 ELSE IF c$="fly" THEN k=1:GOSUB 1180 ELSE IF c$="lan"
THEN k=1:GOSUB 121
0
530 IF c$="put" THEN k=1:GOSUB 1350 ELSE IF c$="kil" THEN
 PRINT"By what means":k=1 ELSE IF c$="sho" THEN GOSUB 143
0:k=1 ELSE IF c$="
sta" THEN x=1:GOSUB 1400
540 IF p%=32 AND o%<>1 THEN j%=j%+1:IF j%>2 THEN x$="Aaag
ghhh he stabbed me":GOSUB 750
550 IF c$="say" THEN GOSUB 1390:k=1 ELSE IF p%=77 THEN s%
=s%+1:IF s%>1 THEN x$="He attacks me!":GOSUB 750
560 IF p%=148 THEN t%=t%+1:IF t%>2 THEN x$="She stabs me.
":GOSUB 750
570 IF c$="wen" OR c$="rep" THEN k=1:GOSUB 1490
580 IF c$="pus" OR c$="pre" THEN k=1:GOSUB 1520 ELSE IF c
$="rea" THEN PRINT"I forgot my glasses!":k=1
590 IF p%=84 THEN u%=u%+1:IF u%>2 THEN x$="It drives stra
ight at me":GOSUB 750
600 IF k=0 THEN PRINT"I'm sorry I can't do that here!"
610 WEND
620 CLS:PEN 1:PRINT"Well done. You have solved this
   adventure and killed Xoltan. The world  is a safer pla
ce to live!":END
630 x$=x$(3):IF p%=99 THEN p%=101:x$=x$(10) ELSE IF p%=12
 THEN p%=17:x$=x$(10) ELSE IF p%=1 THEN p%=21:x$="I climb
 over" ELSE IF p%=
21 THEN p%=1:x$="I climb over" ELSE IF p%=140 THEN p%=141
:x$=x$(10) ELSE IF p%=122 THEN p%=124:x$=x$(10)
640 IF p%=90 THEN p%=91:x$=x$(10)
650 PRINT x$:RETURN
660 x$=x$(3):IF p%=124 THEN p%=122:x$=x$(10) ELSE IF p%=1
01 THEN p%=99:x$=x$(10) ELSE IF p%=141 THEN p%=140:x$=x$(
10) ELSE IF p%=17
THEN p%=12:x$=x$(10)
670 PRINT x$:RETURN
680 x$=x$(3):IF p%=147 THEN p%=148:x$="Splash" ELSE IF p%
=91 THEN p%=90:x$=x$(10) ELSE IF p%=92 THEN p%=93:x$=x$(1
0) ELSE IF p%=14
THEN x$=x$(39):GOSUB 750
690 PRINT x$:RETURN
700 x$=x$(3):IF p%=9 THEN p%=10:x$=x$(10) ELSE IF p%=102
THEN p%=105:x$=x$(10) ELSE IF p%=121 THEN p%=120:x$=x$(10
) ELSE IF p%=55 TH
EN p%=59:x$=x$(9)
710 PRINT x$:RETURN
720 x$=x$(5):IF p%=10 THEN p%=9:x$=x$(10) ELSE IF p%=34 T
HEN p%=25:x$=x$(10) ELSE IF p%=105 THEN p%=102:x$=x$(10)
ELSE IF p%=120 THE
N p%=121:x$=x$(10)
730 IF p%=59 THEN p%=55:x$=x$(10) ELSE IF p%=61 THEN p%=6
2:x$=x$(10)
740 PRINT x$:RETURN
750 CLS:PEN 3:LOCATE 15,1:PRINT"Oh Dear":PEN 2:LOCATE 1,5
:PRINT x$:PEN 1:LOCATE 1,20:PRINT x$(16)
760 f$=INKEY$:f$=LOWER$(f$):IF f$="y" THEN RUN ELSE IF f$
="n" THEN CLS:LOCATE 1,15:PEN 3:PRINT"Goodbye. Thank you
for playing.":END
ELSE GOTO 760
770 PRINT x$(10):FOR f=1 TO 1000:NEXT: IF (p%>39 AND p%<4
7) THEN PRINT"The submarine docks":p%=47
780 IF p%=33 THEN p%=40:PRINT"The submarine submerges" EL
SE IF p%=86 THEN PRINT"The driver holds his hand out and
      mutters some
thing!":p%=87
790 IF p%=139 THEN p%=143:PRINT"Going up!" ELSE IF p%=129
 THEN p%=130:PRINT"The train stops and everyone gets off!
"
800 RETURN
810 GOSUB 890:IF i%<>1 THEN RETURN
820 e%=0:FOR h=1 TO 29:IF b%(h)=p% AND b%(r)=p% THEN e%=1
830 NEXT:IF e%=0 THEN PRINT"It's not here!":RETURN
840 IF r=6 OR r=10 OR r=12 OR r=14 OR r=16 OR r=19 OR r=2
2 OR r=25 OR r=23 THEN PRINT x$(32):RETURN
850 IF r=21 AND p%=142 AND o%<>1 THEN PRINT"It's in a loc
ked case!":RETURN ELSE IF r=27 AND o%<>1 THEN PRINT x$(32
):RETURN
860 e%=0:FOR d=1 TO 5:IF v$(d)="" THEN v$(d)=g$(r):p%=1:d
=9
870 NEXT:IF e%=0 THEN PRINT"Sorry. My hands are full!":RE
TURN
880 b%(r)=0:RETURN
890 i$="":FOR h=1 TO LEN(z$):IF MID$(z$,h,1)=" " THEN i$=
RIGHT$(z$,(LEN(z$)-h)):h=200
900 NEXT:r=0:i%=0:IF LEN(i$)<2 THEN RETURN
910 FOR h=1 TO 29:IF LEFT$(n$(h),LEN(i$))=i$ THEN i%=1:r=
h
920 NEXT:RETURN
930 x$="":f%=0:PEN 1:PRINT"I have :-":PEN 2:PRINT"A jet p
ack strapped to my back. To use  it I must say 'FIRE' int
o my radio/watchan
d :-"
940 PEN 3:FOR x=1 TO 5:IF v$(x)<>"" THEN PRINT v$(x):f%=1
950 NEXT:IF f%=0 THEN PRINT"Nothing else"
960 RETURN
970 GOSUB 890:IF i%<>1 THEN PRINT"I don't see a ";i$:RETU
RN
980 e%=0:FOR d=1 TO 5:IF v$(d)=g$(r) THEN v$(d)="":e%=1
990 NEXT:IF e%=0 THEN PRINT"I'm not carrying it!":RETURN
1000 b%(r)=p%:RETURN
1010 IF p%=48 OR p%=49 OR p%=148 THEN PRINT x$(36) ELSE I
F p%=52 THEN PRINT x$(6) ELSE IF p%=147 THEN p%=148:PRINT
 x$(10) ELSE PRINT
 x$(32)
1020 RETURN
1030 IF p%=48 THEN PRINT"Wow!!!":k=1 ELSE IF p%=32 THEN
PRINT"The fisherman is carrying a sharp knife!":k=1 ELSE
IF p%=10 THEN PRI
NT"It looks like an EPROM has blown!!":k=1
1040 GOSUB 890:IF r=2 THEN jj=2:GOSUB 1260:IF e%=1 THEN P
RINT"This is no ordinary brush. It's one of  O's patent w
ire cutters!":k=1
1050 IF r=2 AND e%=0 THEN PRINT"I'm not carrying it!":k=1
1060 IF i=0 THEN PRINT x$(9)
1070 RETURN
1080 x$=x$(5):IF p%=83 THEN p%=86:x$=x$(10) ELSE IF p%=12
7 THEN p%=129:x$=x$(10)
1090 PRINT x$:RETURN
1100 IF p%=97 OR p%=72 OR p%=71 OR p%=70 THEN 1110 ELSE P
RINT x$(32):RETURN
1110 e%=0:FOR x=1 TO 5:IF v$(x)=g$(26) THEN e%=1
```




program listing

```
1120 NEXT:IF e%=0 THEN PRINT"But I have no money!!!!":RET
URN
1130 IF p%=87 THEN p%=88:PRINT"The driver thanks me ":RET
URN
1140 PRINT x$(10):RETURN
1150 IF p%=69 THEN PRINT"You are a qualified pilot, but t
his     plane is a little before your time!":RETURN
1160 IF p%=91 THEN PRINT"I think you could jump!":RETURN
ELSE IF p%=24 THEN PRINT"Wire cutters could be useful!":R
ETURN
1170 PRINT"I'm sorry I haven't a clue!":RETURN
1180 IF p%=69 OR p%=73 THEN 1190 ELSE PRINT x$(7):RETURN
1190 IF p%=73 THEN PRINT x$(10):PRINT"I'd try landing it'
":RETURN ELSE jj=7:GOSUB 1260:IF e%<>1 THEN PRINT"I need
a helmet!":RETURN
1200 p%=73:PRINT x$(10):RETURN
1210 IF p%<>73 THEN PRINT x$(7):RETURN ELSE PRINT"I see t
hree levers":PRINT"RED","GREEN","BLUE":PRINT"They aren't
labelled"
1220 PRINT"Which one should I pull ?"
1230 aa$=INKEY$:aa$=LOWER$(aa$):IF aa$="r" OR aa$="g" OR
aa$="b" THEN 1240 ELSE 1230
1240 IF aa$<>"b" THEN x$="The engine explodes in a ball o
f flames!":GOSUB 750
1250 CLS:p%=74:PRINT"Good choice....I landed safely":RETU
RN
1260 e%=0:FOR x=1 TO 5:IF v$(x)=g$(jj) THEN e%=1
1270 NEXT:RETURN
1280 IF p%<>24 THEN PRINT x$(1):RETURN ELSE jj=2:GOSUB 12
60
1290 IF e%<>1 THEN PRINT x$(3):RETURN ELSE PRINT x$(10):s
%(24,2)=26:g$(24)="by a broken fence":RETURN
1300 IF p%<59 OR p%>61 THEN PRINT x$(32):RETURN ELSE IF p
%=60 THEN m%=m%+1:IF m%>2 THEN p%=61:m%=0:PRINT"Out of ga
s!":RETURN
1310 jj=1:GOSUB 1260: IF e%<>1 THEN PRINT"I haven't got t
he car key!":RETURN
1320 IF p%=59 THEN PRINT"The car starts!":p%=60:RETURN
1330 RETURN
1340 IF p%<>27 THEN PRINT"There's nothing here!":RETURN E
LSE PRINT"I have found something!":jl=1:RETURN
1350 GOSUB 890: IF p%=27 AND r=15 THEN x$="AAAGGGGHHHH. A
  hole opens beneath my   feet and I fall into a pool of
sharks":GOSUB 750
1360 IF p%=105 THEN p%=106:PRINT"The engine starts":RETUR
N
1370 PRINT x$(3):RETURN
1380 jj=1:GOSUB 1260:IF e%<>1 THEN PRINT"I have no key!":
RETURN ELSE IF p%<>142 THEN PRINT x$(7):RETURN ELSE n%=1:
PRINT x$(10):RETUR
N
1390 GOSUB 890:IF 1$="fire" OR 1$="FIRE" THEN PRINT"The j
etpack transports me":p%=INT(RND(1)*120)+1: RETURN ELSE P
RINT x$(10):RETURN
1400 jj=27:GOSUB 1260: IF e%<>1 THEN PRINT"I have no knif
e!":RETURN
1410 IF p%=108 OR p%=144 OR p%=54 OR p%=77 THEN x$="He at
tacks me":GOSUB 750 ELSE IF p%<>157 THEN PRINT x$(7):RETU
RN
1420 p%=158:RETURN
1430 jj=18:GOSUB 1260:IF e%=0 THEN PRINT"I have no gun!":
RETURN
1440 jj=21:GOSUB 1260:IF e%=0 THEN PRINT"I have no bullet
!":RETURN
1450 IF p%=157 THEN x$="Too slow. He attacks first!":GOSU
B 750
1460 IF p%<>32 THEN PRINT x$(41):RETURN
1470 IF o%=0 THEN PRINT"He's dead. A knife falls to the f
loor.":o%=1:g$(27)="a knife":n$(27)="knife":RETURN
1480 RETURN
1490 jj=1:GOSUB 1260:IF e%<>1 THEN PRINT"I forgot the man
ual!":RETURN
1500 IF p%<>101 THEN PRINT x$(7):RETURN
1510 PRINT"I repair the computer and a message     appear
s on the screen..Kill Xoltan!":RETURN
1520 IF p%<>41 THEN PRINT x$(7):RETURN ELSE x$="There is
an explosion!":GOSUB 750
1530 DATA 2,0,0,0,standing next to an enormous metal gate
.It is locked,0,1,3,0,in a small clearing in the middle o
f a  dense forest,
5,0,4,2,in a dark and gloomy forest,6,0,0,3
1540 DATA in the middle of the forest. A large    boulder
 prevents me going east,7,3,6,0,in a dark forest. I hear
the sound of   wol
ves in the distance,0,4,0,5,in a dense forest. There is a
 small     stream nearby
1550 DATA 0,5,0,8,on a narrow footpath. There is an open
 garden gate here,0,0,7,9,in a small but well tended gard
en. A     dog snore
s loudly as it basks in the     sunshine
1560 DATA 0,0,8,0,standing in the doorway of an old house
.There's a large brass knocker on the oakdoor,0,0,11,0,by
 the front door,0,
0,12,10,in a long narrow hallway. The wallpaper hangs in
shreds from the walls
1570 DATA 0,0,13,11,at the bottom of a flight of stairs,1
4,15,16,12,at the end of the hallway. There are    doors
on either side,0,1
3,0,0,in a large library. The furniture is    covered in
dust. A book lies open on theside of a chair
1580 DATA 13,0,0,0,in a large empty room. A bare light bu
lbhangs from the ceiling,0,0,0,13,in a small broom cupboa
rd,20,0,18,19,at t
he top of the stairs. There are     three doors here,0,0,
0,17,in a small bathroom. An empty cabinet isfastened to
the wall
1590 DATA 0,0,17,0,in a small bedroom. A pile of dirty
  clothes lies on the floor,0,17,0,0,in the master bedroo
m. I can hear
  snoring coming from the four poster bed,0,24,22,23
1600 DATA by a locked gate. A sign here reads     'Trespa
ssers will be Prosecuted',0,0,0,21,by the main entrance t
o a large chemical
plant,0,25,21,0,near to the perimeter fence of the     c
hemical plant. There is a small hut    here but it is loc
ked,21,0,
1610 DATA standing next to a barbed wire fence,23,0,0,0,b
y the main entrance to an office block.The steel door is
firmly locked,24,2
8,27,0,standing on a footpath at the side of a barbed wir
e fence,0,0,29,26
1620 DATA on a narrow footpath between two tall   brick b
uildings,26,0,0,0,in an enormous timber yard,30,32,31,27,
in a top security
naval dockyard,0,29,0,0,in a dockyard. There is a tall cr
ane    here,0,0,33,29
1630 DATA standing next to a nuclear submarine,29,0,0,0,o
n the quayside,0,0,0,0,in a submarine hatch,25,35,0,0,ins
ide a disused fact
ory. A pile of     empty cardboard boxes is piled up
  against the wall,34,0,0,36
1640 DATA next to a large machine. I hear a loud  noise,0
,37,35,0,in a wide passageway. The walls are     covered
in calendars,36,39
,0,0,standing next to some enormous pipes
1650 DATA 0,0,0,39,in a small control room. A large dial
  points to red,37,0,38,0,in a narrow corridor lit by flu
orescent tubes,0,4
1,0,0,in the hatch of a submerged submarine,40,0,42,0,by
a control panel full of buttons and  dials,0,43,0,41,by a
 torpedo
1660 DATA 42,0,44,0,standing next to a ballast tank,0,46,
45,43,in the engine room,0,0,0,44,in the cargo hold. It's
 full of boxes ofa
mmunition,44,0,0,0,by some strange looking machinery,0,48
,0,0,standing next to an open hatch,47,0,49,50
1670 DATA standing on a sandy beach. There is a   submari
ne to the north,0,51,0,48,on a sandy beach. An icy wind b
lows fromthe north
 and there is nobody to be seen,0,52,48,53,standing outsi
de a small beach hut
1680 DATA 49,0,54,0,walking across some sand dunes. The w
indblows sand into my eyes,50,0,0,0,inside a beach hut. A
n old newspaper
 lies on the small table,0,0,50,0,by a small cafe selling
 ice cream. They aren't doing much business today
1690 DATA 0,55,56,51,on a garage forecourt,54,0,0,0,by a
parked car. The door is unlocked,57,0,0,54,by some petrol
```

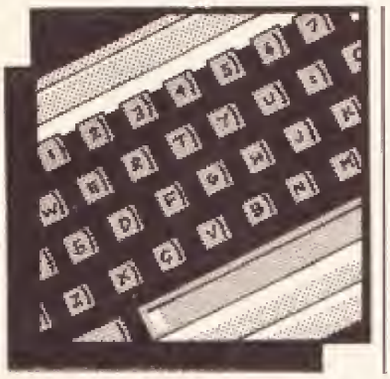


Spy from the North

program listing

```
 pumps,0,56,58,0,o
n a long straight road,0,0,58,57,on a long road stretchin
g east,0,0,0,0,sat in a parked car,0,0,0,0
1700 DATA driving the car along a narrow winding  road.0,
0,0,0,at a set of traffic lights. I see a townto the east
,0,63,64,0,on the
outskirts of a town. There is a  car here,62,63,0,0,on a
long road,0,65,66,62,by a set of traffic lights,64,67,0,0
1710 DATA outside a small airfield,0,0,68,64,outside a sh
opping arcade,65,0,69,0,on a grass runway. There is a Tig
er Mothplane to th
e east,72,70,71,66,in a small shopping arcade,0,0,0,67,sa
t in the Tiger Moth plane,68,0,0,0
1720 DATA in a small shop selling motorbike spares,0,0,0,
68,in a cake shop. They seem to have almostsold out of ca
kes.0,68,0,0,in a
shoe shop. The assistant asks me  what I want,0,0,0,0,fl
ying high above the clouds....help!!!,0,79,0,0
1730 DATA in the cockpit of the plane,0,0,0,79,by a locke
d hanger,79,0,77,0,in the airport building. It is very bu
sy,0,78,80,76,in t
he customs hall. A notice reads      'nothing to declare..
East',77,81,0,0
1740 DATA by a desk. The customs officer knows me and let
s me through,74,76,75,0,on a runway at the side of a Tige
r Moth,0,0,0,0,loc
ked in a cell. A customs officer has arrested me for atte
mpted smuggling,78,82,0,0,by an airport bookstall,81,83,0
,0
1750 DATA in the airport foyer,82,0,84,85,at a taxi rank.
 A driver walks over and asks me something but I don't re
cognise the langua
ge,0,0,0,83,in a vast carpark,0,0,83,0,by a locked barrie
r,0,0,0,0,riding in a taxi,0,0,0,0,in a stationary taxi,0
,0,89,0
1760 DATA in a taxi. The driver has opened the     door,0,
0,90,88,outside a military base. The gate is     locked,0,
0,0,89,by the peri
meter fence. There is a tall tree here,0,0,0,92,in the br
anches of a tall tree,0,0,91,0
1770 DATA on a branch which overhangs the militarybase,0,
0,95,94,inside the perimeter fence of the base,0,0,93,0,b
y a locked gate. I
 see soldiers in the distance
1780 DATA 0,96,0,93,by some large fuel tanks,95,0,97,0,at
 the entrance to a large building,0,98,0,0,in a large sto
reroom full of bot
tles of stange liquids,97,99,100,0,in a large room full o
f boxes labelled  'Made in Japan',98,0,0,0
1790 DATA at the bottom of a flight of stairs,0,0,102,98,
in an open doorway,0,0,0,0,in a small office. The door sl
ams shut  behind m
e,0,0,103,100,by a small amphibious vehicle,0,0,104,102,o
n a narrow road,0,0,0,103,at the side of a deep dark lake
,0,0,0,0
1800 DATA sat at the controls of an amphibious     vehicle
,0,107,108,0,driving the vehicle across a large yard,106,
0,0,0,by a brick w
all. I think I'll have to goback,0,0,109,106,driving alon
g a road,0,0,110,108,driving into a deep lake,0,112,111,1
09
1810 DATA in the dark depths of the lake,0,113,0,110,in t
he deep lake,110,0,113,0,in the deep lake. A strange fish
 swims  around my
craft,111,114,113,112,in the deep lake. There is a large
rock below me,113,115,114,118,in the deep lake
1820 DATA 114,116,115,117,in the deep lake,115,119,0,0,at
 the entrance to a gloomy underwater  cavern,118,117,115,
117,in the deep la
ke,0,117,114,0,next to a large boulder which bears the st
range inscription 'folnia',116,120,0,0
1830 DATA driving between two large columns in thecave en
trance,0,0,0,0,parked in a small airlock. The steel     do
ors have closed be
hind me and it has  filled with air,0,123,0,122,in an air
lock. A small amphibious craft is parked here
1840 DATA 0,0,121,0,in a small glass cage. Stairs lead up
    from here,121,0,0,0,in a room full of dials and switch
es,0,0,0,125,at th
e top of a flight of stairs. A     narrow glass passage l
eads west across  an enormous workshop,126,128,124,0
1850 DATA at a junction in the glass corridor,0,125,127,0
,in a glass corridor. There is a small    door here,0,0,12
7,126,on a small r
ailway platform. A train is here with its doors open. Peo
ple are     getting on,125,0,0,0,at the top of a deep well
1860 DATA 0,0,0,0,riding in a small compartment on the
 train. The man in the corner is carryinga revolver,0,0,0
,131,in a stationa
ry carriage. The door is     open,0,132,130,0,on a wide pla
tform. The train is still  here but its doors are closed
1870 DATA 131,133,0,0,on a narrow staircase,132,134,0,0,a
t the top of a flight of stairs,133,0,135,0,at the west e
nd of a vast chamb
er,0,136,0,134,at the east end of a vast chamber,135,137,
0,0,in a low passageway lit by torches in     alcoves,136,1
38,0,0
1880 DATA in a wide passage,137,140,139,0,in a brightly l
it cavern full of men in uniforms,0,0,0,138,in a crowded
 lift. The doors ar
e open     and a man stands next to the buttons,138,0,0,0,b
y a sheer rock face. A rope hangs from above,0,0,142,0
1890 DATA in a small cavern. There is a sheer dropto the
north. A rope is attached to a     ring in the wall,0,0,0,1
41,in a laboratory
. A flask of blue liquid boils over a low heat,0,144,0,0,
in a crowded lift,143,145,146,0,in a hotel foyer
1900 DATA 144,147,0,0,in a crowded bar. The barman is bus
y     serving a group of workmen,0,0,149,144,by the hotel
 reception desk,145
,0,0,0,by a swimming pool. There is a small     queue wait
ing at an ice cream kiosk,147,148,148,148,swimming in the
 pool
1910 DATA 0,150,0,146,at the rear entrance to the hotel.
A     path leads south through some bushes,149,151,0,0,at
 the entance to a c
ampsite,150,153,152,0,by the camp shop,0,0,0,151,inside a
 busy campshop. There is a largequeue waiting at the chec
kout
1920 DATA 151,154,0,0,on a narrow footpath between rows o
f     tents,153,0,155,0,on a narrow footpath. There is a l
arge  gloomy fores
t to the east,0,156,0,154,in a dark and menacing forest,1
55,0,0,157,in a forest. There is a cave to the east,0,0,1
56,0
1930 DATA in the secret headquarters of Xoltan,0,0,0,0,at
 journey's end,Not likely!,Sorry !, How ?,No !,I would if
 I could,That's fa
r too dangerous',Not here',Nothing happens,I can't see an
ything special,O.K.,I see something,I haven't got it'
1940 DATA I fire the gun',It is dead,He shoots first',I a
m dead. Would you like another game ?,It glistens,What do
 I do now,I can go
, North,South,East,West,I can see,I forgot my glasses!,I
 am not hungry!,I never drink alcohol !
1950 DATA That's not much use !,I'm sorry I haven't a clu
e,Don't swear at me !!,H E L P,Don't be such a silly bill
y',He refuses,She
doesn't like that,I've never done this before',This is fu
n !,Whoops',I slipped and broke my neck!,SPLAT,ZAP,BANG
1960 DATA a small key,20,key,a stiff brush,16,brush,some
mushrooms,6,mushrooms,an oil drum,27,drum,a computer repa
ir manual,38,manua
l,an armed guard,77,guard,a crash helmet,70,helmet,a pair
 of shoes,72,shoes,a cake,71,cake,a torpedo,43,torpedo
1970 DATA a can of soup,45,soup,some sunbathers,48,sunbat
hers,a bath towel,52,towel,an attendant,54,attendant,a re
d lever,105,lever,
an old tramp,108,tramp,a small fish,112,fish,a revolver,9
7,revolver,Xoltan himself.137,xoltan,some firelighters,15
2
1980 DATA firelighter,a golden bullet,142,bullet,a beauti
ful lady who is swimming,148,lady,a blue button,41,button
,a magazine,81,mag
azine,a Rolls Royce,84,rolls,a credit card,14,card,a fish
erman,32,fisherman,a waiter,144,waiter,a broken computer,
101
1990 DATA computer
```



Facing up to it

Pete Green explains all about interfacing — what it is and why you need to 'get in the know' to enhance your computing power.



'Interface' is a word that crops up so often in the computer press that its importance may have ceased to register with readers. Without interfaces of various kinds, it would be impossible for a computer, however complex, to interact with the outside world. Without interfaces, a computer is useless. In this article we'll look at some common types of interface and the problems that can arise.

Back to basics

Before we consider why an interface is necessary, we have to look at the parts which make up the heart of a computer. The brain of the system is the CPU (central processing unit), of which there are two main types in home micros — the Z80 (Amstrad, Spectrum, MSX) and the 6502 (Commodore, BBC, Atari, Oric). Inside the chip there are a number of registers (storage 'boxes' for numbers), and the CPU can do various things with these numbers such as logical operations (AND, OR etc), arithmetic (add and subtract), moving the numbers between registers and moving them between registers and memory. Memory, whether it is ROM or RAM, is just a whole load of other 'boxes' to store numbers. In ROM the numbers are fixed; in RAM the CPU can change them as required by the program it is running.

So, as far as the CPU is concerned the whole of its world can be described by numbers, and only numbers. It uses numbers for data, the instructions for manipulating the data are numbers, and its results are given as numbers. This isn't very useful in the real world.

Humans communicate using words made up of letters. They respond to coloured patterns and sounds. They can press buttons and operate joysticks, mice and trackballs. For the CPU to interact with these types of input and output, it requires specially designed peripherals. These need to send and receive informa-



tion from the CPU and its memory (which only handle numbers in the form of fixed voltage levels on the electronic circuitry). The circuits which act as translaters between the CPU and its peripheral devices are known as interfaces.

The key facts

Peripherals are often called add-ons, which implies that they're extra, but in fact you get at least two interfaces with every computer sold. These are the keyboard, so you can instruct the computer, and the TV output, so that it can tell you what it's doing. The keyboard is simplest, so we'll look at that first.

As we've said, the computer understands numbers but we use letters. The standard conversion is called the ASCII code (American Standard Code for Information Interchange) and is used by just about every micro except the ZX81. One minor problem is that the original standard didn't include the £ sign, and different manufacturers put it in different places. For example, its code is 163 on the Amstrad, 96 on the BBC Micro, and 35 on the Epson printer. A financial game listed from the BBC to the Epson gives reverse apostrophes instead of £s.

Under the keyboard there is a printed circuit board with rows and columns of conducting tracks, and a key at each junction. Pressing a key links one particular row/column pair. The CPU sends numbers to a latch (another sort of storage box) so that each column has a high voltage put on it in turn. Then it looks at the number formed by the voltages on the rows, which is normally zero. If it does detect a voltage it knows that a key has been pressed, and the row and column numbers tell it which key. The software will then convert this into the correct ASCII code for further use by the program. Obviously joysticks can use a similar principle if they are of the Atari (switched) type.

While the CPU is servicing the keyboard in this way, it cannot perform other tasks. Many business computers use a second CPU just to drive the keyboard, freeing the main unit for more productive work.

Sight and sound

The generation of a TV picture is a good deal more complicated. Essentially the computer reserves a block of memory for the screen information — to change the colour or symbol at a particular point on the TV screen, the CPU places the right number(s) into the right place in screen memory. The memory is either a separate block (computers using the Texas Instruments video display processor such as the Memotech and MSX machines) or part of the main RAM (practically every other home micro).

The job of the video interface is to translate the numbers in screen memory into the right voltage signals to drive the TV display, add the correct synchronisation pulses and modulate the whole lot into a high frequency radio signal so that it can be sent to the aerial of the TV like ordinary programmes. In effect, every computer contains a small, very low power TV station.

Fortunately the encoder chips and modulators are readily obtainable and quite cheap. The best example of an add-on TV interface is Premier Microsystem's system for the Dragon 32, which uses the TI chip to give a sprite capability.

Sound generation is also very complicated and home computers make use of special sound chips, either off-the-shelf (the GIAY-3-8910 series is very popular) or custom-designed (the CBM64 SID chip and the Dave chip of the Enterprise computers). With all the hard work done inside the chip, operation is a simple matter of feeding in the right numbers for the pitch, duration and waveform required. Some computers modulate the sound signal into the video signal in the same way that a soundtrack ac-





companies a TV programme. In this case the sound comes out of the TV loudspeaker. Otherwise the sound interface needs a small amplifier and a speaker built into the computer.

Hard copy

For a permanent record of your listings or any type of text-based programming, a printer is essential. Here we need an interface that can take the numbers representing the text and send them down a cable into the printer, which recognises them and makes the right marks on the paper. There are two main standards for printer interfaces — RS232 and Centronics.

The RS232 is a serial interface. This means that the numbers (bytes) are broken down into their individual bits (BInary digiTs) which are sent one at a time. At the other end the bits are built up back into the numbers.

The main problem with RS232 is that the standard connector has a lot of spare pins, different manufacturers have put different extras on different pins, and so the 'standard' isn't! Trying to link different pieces of equipment with RS232 has driven many a poor engineer to near-insanity. Another thing to watch is that both the transmitting and receiving equipment is working at the same baud rate (speed of transfer).

Centronics is a parallel interface, with the eight bits in a byte being transmitted at once (in parallel). Naturally this means you need eight wires instead of one, but the system is also faster and simpler.

A slight complication is added to the interface by the fact that printers print data much slower than computers can send it out. An additional line is needed so that the printer can signal to the computer that it is busy and to wait until it has caught up before sending more characters. This is, of course, called the BUSY signal.

Many computers have their printer interfaces built-in these days, but one notable add-on interface is the ZX Lprint III for the Spectrum from Euro-electronics. This small device allows the Spectrum to drive a Centronics printer, and it works by taking over the Spectrum when it detects that a printer command such as LLIST has been typed and using its own routines.

What's in store

Computer programs consist of numbers stored in memory, and are lost when the power is turned off. Long term data storage can be done two ways on most home micros: with cassette tape or floppy disks.

The cassette interface is a two-way device, and works serially (one bit at a time, like RS232). When you save a program, the computer scans through the program changing the bytes into eight bit groups and sending audio tones to the tape corresponding to the bits. Coding systems may send a high tone for a 1 and a low tone for a 0, or use different length pulses for each type. Naturally every manufacturer has its own 'standard', so you can't load programs into different computers even if they use a similar BASIC.

The reverse takes place when loading data: the interface reads the audio tones from the cassette tape, converts them into 1s and 0s, then stores the bytes back in memory.

The disk drive is the 'record player' of the interface world. Inside the square sleeve there is a disk of plastic with a magnetic surface, and the read/write head can be moved immediately to any part of the disk, so access times are much faster than cassettes. Also data are usually transferred as bytes, not bits, and the precision engineering allows a much faster transfer rate. So disk drives are faster, more reliable — and more expensive! Many companies offer add-on disk interfaces: for example, Kuma, Sharpsoft and Solo Software all sell disks for the Sharp MZ-700, and add-on disks are now appearing for the QL from companies like Quest.

What's volts?

In the real world many physical phenomena can cause a change in voltage to occur in a piece of electronic circuitry. An analogue-to-digital converter (ADC) is an interface which changes voltages into numbers, allowing the computer to be used as a measuring or data collection instrument for scientific applications.

The simplest form of ADC generates a ramp voltage (steadily increasing voltage) and compares it to the input voltage. All the time the the voltage is increasing, the computer is counting. The count stops when the ramp voltage equals the input voltage, so the higher the input, the larger the number — a direct conversion.

The BBC Microcomputer has a built-in ADC; one of the reasons it is a popular computer for laboratories. The ADC is also used as a joystick port, using potentiometer sticks which generate a variable voltage rather than a switched Atari-type output.

While on the subject of scientific applications, there is a standard interface system known as IEEE 4888 which allows computers to be connected to all sorts of scientific apparatus, and other peripherals. However, the only home micro which offers IEEE is the Commodore 64.

BASIC kit Pt 2

David Ellis dispels some of the mystique of subroutines in his second article on BASIC programming.

Last month's article looked briefly at the use of flowcharts and the ideal program structure i.e. a list of subroutine procedures, each subroutine performing a certain operation. In addition, there must be a program that controls the order in which the subroutines are called. This would take the form:

```
 10   GOSUB 1000
 20   GOSUB 2000
 30   GOSUB 3000
 99   END
1000  SUBROUTINE 1
2000  SUBROUTINE 2
3000  SUBROUTINE 2
```

Taking turns

Each of the three subroutines would be called in turn. Each one should contain a RETURN statement which will cause the program to continue from where it was when the subroutine was called. The END statement is needed in line 99 to stop the program from 'running into' the subroutines.

Ideally a subroutine should have only one *entry* point and one *exit*. I say ideally as it is sometimes useful to enter a subroutine at a different position to normal. There should only be one exit though, except for a call to another subroutine, which is after all a type of exit. Never jump out of a subroutine by using GOTO. Some clever programmers may use this trick to divert the flow of a program but don't. It's not clever at all — merely a cover up for a sloppy programming technique. To demonstrate what can go wrong if you are careless, try the following on your computer:

```
 10   GOSUB 1000
1000  LET X = 1
1010  IF X = 1 THEN
      GOTO 10
1020  RETURN
```

The variable X will obviously be 1 when line 1010 is reached and the program will therefore jump out of the subroutine back to line 10. The RETURN statement is never reached! Run the program and after a short while you should get the message STACK OVERFLOW. . . OUT OF MEMORY. . . MEMORY FULL IN 1010. . . or something similar. Why? Quite simple, when a subroutine is called the program will need to know where to return to when the RETURN statement is reached. The current line number is therefore 'pushed' onto a STACK, which is a temporary storage area somewhere in RAM. Several other values needed by the program are also pushed onto this stack.

When the RETURN statement is reached these values will be pulled off the stack to enable the program to continue from its original position, and with its original values. If no RETURN statement is found, as in our example, then the numbers will remain on the stack. Each time the subroutine is called another set of numbers will be pushed to the stack. Naturally the size of the stack will continue to grow but it is limited (especially in a 6502 based micro) and sooner or later it will become 'full up'. The result will be the STACK OVERFLOW etc. The previous example will fill up the stack almost immediately, as you have no doubt discovered. Consider the following though:

```
 10   GOSUB 1000
 20   GOSUB 2000
 99   END
1000  SUBROUTINE 1
2000  INPUT "PRESS
      'Y' FOR
      ANOTHER
      GAME"; KEY$
2010  IF KEY$ = "Y"
      THEN GOTO 10
2020  RETURN
```

If you imagine that subroutine 1000 is some sort of game, then subroutine 2000 asks you whether you want another game. Enter 'Y' and the program jumps back to line 10 by using GOTO. Subroutine 2000 contains two exit paths but there should only be one. Each time a new game is played the values will be pushed onto the stack. It may take hours before the stack overflows and in a games program no harm would have been done. In a business program, however, it could be disastrous — several days, or even weeks may pass before the fault occurs. This is one type of 'bug' that can be very difficult to detect. The Program 1 shows how this mistake should be avoided.

When subroutine 2000 is called the variable FLAG is first set to zero. Line 2040 will keep looping on itself until a key is pressed. INKEY$ or GET etc. may be used depending upon which dialect of BASIC you have. The flag is set to 1 if the "Y" key is pressed otherwise it will remain at zero. On return from subroutine 2000 FLAG is checked for the value of 1. If it is a 1 then the program will GOTO 10, else the program will fall

program listing 1

```
 10   GOSUB 1000
 20   GOSUB 2000
 30   IF FLAG=1 THEN GOTO 10
 99   END
1000  SUBROUTINE 1
2000  REM CHECK FOR KEYBOARD INPUT
2010  LET FLAG=0
2020  PRINT "PRESS 'Y' FOR ANOTHER GAME"
2030  PRINT "OR ANY OTHER KEY TO END"
2040  KEY$=INKEY$: IF KEY$="" THEN 2040
2050  IF KEY$="Y" THEN FLAG = 1
2060  RETURN
```

through to line 99 — END. There will be no danger of overfilling the stack if this approach is used.

Layout of subroutines

The original use of the subroutine was to save memory by placing identical blocks of code into just one block and then calling this 'block' when required. However, subroutines are also used to produce a better structured program. The subroutine itself may only be called once during the whole of the program, which is the exact opposite of its original intention!

The only drawback to this approach is that a structured program may run more slowly, but in most cases the time difference is insignificant. The first subroutine in a program should ideally be used for setting up variables (numeric and string) to be used in the program. Lists of DATA to be READ can also be placed in their own subroutine, as can a list of any special POKEs. The number of lines to each subroutine may vary — up to about 30 lines being about normal. Over 30 lines and you should consider splitting it up into further subroutines.

The actual numbering of the start of each subroutine is best done in increments of 1000. If you intend to build up a large 'library' of subroutines then you may wish to start them in increments of 100 instead.

An example of a 'library' subroutine is one that will create a pause in a program — to enable you to read a message on the screen maybe. Some micros have this as a built-in facility, but if yours does not then it would be useful to specify the pause time in seconds. The following subroutine could be used:

```
9000  REM WAIT FOR
      'PAUSE'
      SECONDS
9010  FOR COUNT=1
      TO PAUSE * 100
9020  NEXT COUNT
9030  RETURN
```

To call the subroutine, the variable PAUSE would be set to the number of seconds required for the delay. For 10 seconds this would be:

```
<line number> PAUSE=
10: GOSUB 9000
```

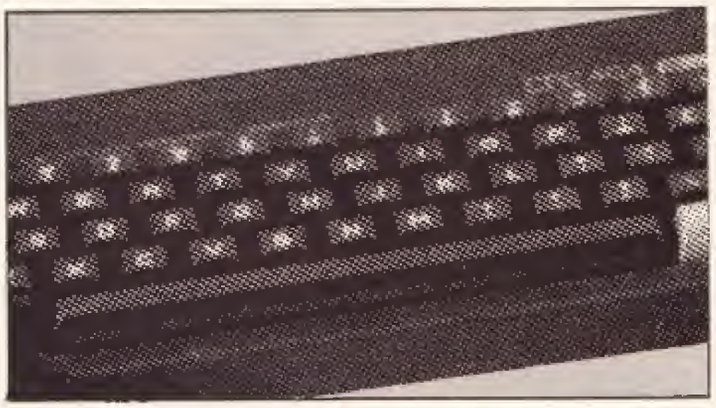
Line 9010 of the subroutine sets the COUNT number (PAUSE * 100) and this would need setting in the first instance by trial and error to suit your own micro. Simply change the value of 100 until the delay is about 10 seconds.

Only one way out

As stated previously there should only be one exit from a subroutine, not counting calls to other subroutines. Try and avoid the following:

```
6000  REM TO MANY
      RETURNS!
6010  IF K=65 THEN
      B=2: RETURN
6020  IF K=66 THEN B
      =7: RETURN
6030  IF K=67 THEN
      B=9: RETURN
6040  B=6: RETURN
```

The subroutine checks the value of K (which is perhaps an input from the keyboard) and sets the value of B accordingly. There are four RETURNs but there should only be one. The following subroutine could be used instead:



```
6000  REM TO MANY
      GOTOS!
6010  IF K=65 THEN B
      =2: GOTO 6050
6020  IF K=66 THEN
      B=7: GOTO
      6050
6030  IF K=67 THEN
      B=9: GOTO
      6050
6040  B=6
6050  RETURN
```

Once again the subroutine will work OK and there is only one exit — but all those GOTOs !!?? These could be avoided by the following:

```
6000  REM GETTING
      BETTER!
6010  LET FLAG=0
6020  IF K=65 THEN
      B=2: FLAG=1
6030  IF K=66 THEN
      B=7: FLAG=1
6040  IF K=67 THEN
      B=9: FLAG=1
6050  IF FLAG=0 THEN
      B=6
6060  RETURN
```

This approach avoids the use of GOTOs and there is only one exit. The price to pay for this correct method is that it is also the most time and memory consuming of the three subroutines. None of the subroutines could be described as elegant.

What method would I use for this algorithm? I may use the following:

```
6000  REM USE A
      TOUCH OF
      LOGIC!
6010  B=-2*(K=
      65)-7*(K=
      66)-9*(K=
      67)-6*(K  65
      OR K  67)
6020  RETURN
```

Try entering the various values for K and you will find that the above routine does work. If you cannot fathom out how it is done then all will be revealed in a few months time when I take a look at LOGIC and FUNCTIONS.

BASIC was, and still is, criticised for the way that it produces poorly structured programs and sloppy programming habits. Proper control structures such as REPEAT...UNTIL, WHILE... WEND, CASE...ENDCASE, DO...LOOP etc. as used in FORTH and Pascal are slowly finding their way into some of the better BASICs. It may not be long before some BASICs can compete with these languages in terms of proper program structuring, although what could be termed 'proper' is open to much debate.

A Brush with Art

There's a great deal of fun to be had with DRAWING programs. Phil South casts his eyes around some of the best commercial programs.

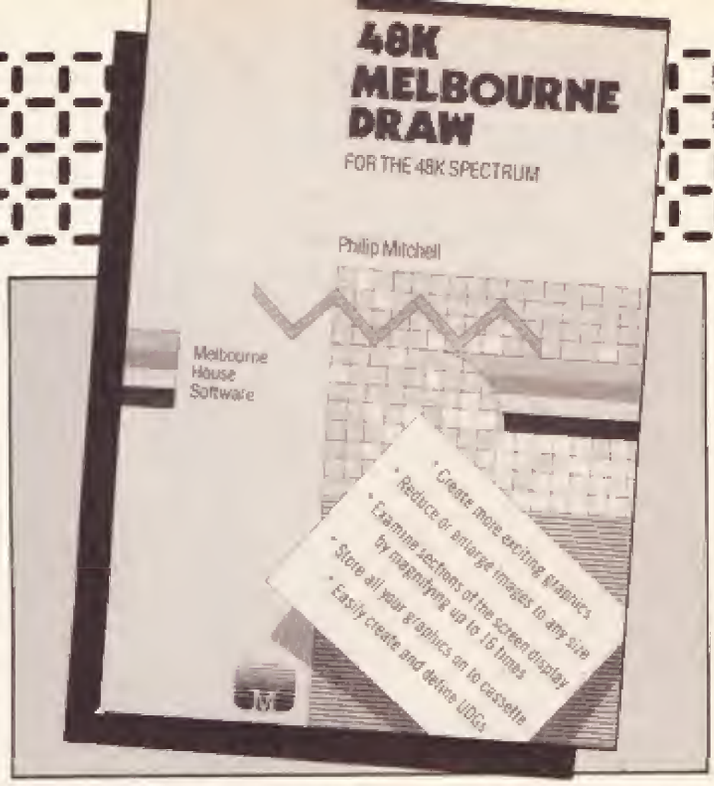
Since Walt Disney Productions produced Tron computer graphics have been very fashionable. More and more people are getting into the idea of computer graphics as a hobby and more importantly as a job, so it follows that this type of person need hands-on experience of graphics on their own computer. It is a surprising fact that the principles used in home computer graphics in fact carry on into professional computer graphics — O.K. so the resolution is about a thousand times better, but the principle is the same!

Graphics for fun

For your first foray into computer graphics, I suggest you try something simple. Tell you what, get something for your kids, and use it yourself when they've gone to bed. **Electronic Colouring Book** by Addison Wesley is great! A computerised colouring book and sketchpad, with a library of pictures, and the ability to change colours at will and save the results. The quality of the picture liabrary is good; snakes, clowns, trains, vases of flowers, bowls of fruit, etc. Educational too, if you ask young children questions about the objects depicted and test their knowledge day-to-day. The enormous range of colours available is displayed at the edge of the screen and you can select the colours you wish to apply, or change colours that are already there on the screen. A good piece of software and at a reasonable price.



Another simple draw program is **Painting** by BBC SOFT. Like all BBC SOFT products it's nicely printed and packaged, but a trifle flimsy in the software department. This is a very basic draw package, using only the BBC's MODE 2 graphics. Not very high definition, but good enough for older children. Mind you, you'd be surprised at how many kids are fussy about resolution!



BBC SOFT's new graphic package, **Drawstick**, makes excellent use of all the BBC B's facilities and is a much meatier product.

A good alternative for children is **Giant's Dinner** and **Draw 15** by Fowler Software, quite the most surreal things I've seen on a computer. These two packages feature something called ''cartoon animation'', a very advanced concept for home micros depicting ways of moving cartoon drawings to tell a story. The principles of cartoon animation on the Spectrum are fully explained in the manual, and very neat it is too, with small machine code routines for you to slot into your own programs.

There are several games in the package, as well as the title game, all of which hinge on responses from the child. The graphics they use to tell the stories are superb. I spent about an hour playing with the Giant's Dinner games, and I'm about five times older than its projected age group, so I'm sure kids will love it.

Graphics for art

Graphics for art's sake are really the name of the game, though. The kind of graphics you see on the movies are possible on your micro, with the help of the best software, of course. The best software, if you have a Sinclair Spectrum, and who hasn't, is **48k Melbourne Draw** by Melbourne House. Most Sinclair owners should have a copy of this, as it is one of the best reasons for buying a Spectrum in the first place, but in case you haven't got it yet allow me to explain.

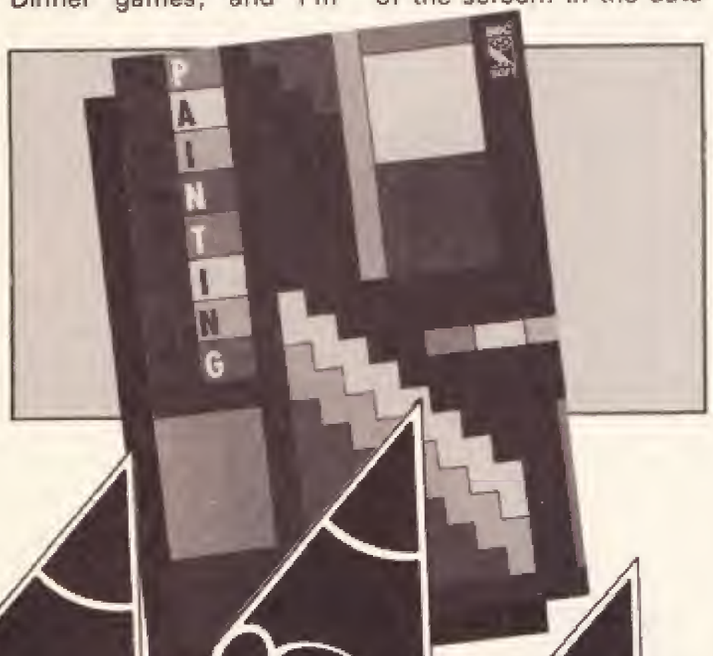
Melbourne Draw is a draw program and what you have when you boot it up is a blank screen, with a data window at the bottom. You can shift this window up to the top of the screen if you like, to draw on the very bottom of the screen. In the data window, the position of the cursor is given in co-ordinates, for those masochists who like to generate their graphics manually in their own programs.

Also, there is the magnification monitor, a square which depicts the size and position of the working area when you magnify a small area of the screen. The magnifications available are x4 and x16, very handy for the manipulation of individual pixels. The cursor is visible as a tiny flashing pixel, and is manipulated by the keys w,x,a and d for up, down, left and right respectively. You can also move diagonally, using the keys q,e,z and c.

The layout of the keys is very logical and although Melbourne Draw doesn't support a joystick, it is very precise and even fun to use. Additional functions include the ability to mirror the screen, shrink it, enlarge it, or change the screen colours instantly. Melbourne. Draw is a very workmanlike piece of kit, and no less than we've come to expect from the excellent team at Melbourne House.

If you've got a BBC, then the thing you want is called **Goldstar Sketchpad**. It contains a lot of the facilities of Melbourne's package, but not quite as skilfully carried out. It always amazes me, how a computer of the BBC's obvious quality only gets half-finished software, whereas a half-finished computer like my Spectrum gets state-of-the-art software.

Sketchpad, though, is an admirable attempt at making something slightly ahead of the pack. It contains icons, something new in all kinds of software today and something you'd normally have to buy a Macintosh to



use. You can select pen points, even design your own and enlarge a small area to work on individual pixels.

This facility isn't anywhere near as precise as Melbourne Draw, but is a nice try. The only way that Sketchpad wins out over any other top package, is in it's multicolour mode. This means that, unlike on the Spectrum, you can draw lines of different colours, pixels even, right next to each other on yet another colour backgrond.

In spite of this bonus, I think that the graphics available on Sketchpad are a little too chunky for my taste. That, and the aliasing, (where lines go all jagged when they cross the scan lines of your TV) conspire to make anything you draw look less than artistic. All in all, though, it's a good package, and certainly one of the best for the Beeb.

Now, the big stuff. I took my copy of disk based **Doodle!**, by Quicksilva, down to my local college computer room to show some colleagues what a good package it is. They use mostly Commodore 64's and have about 20 of them. I thought to myself as I trudged down the road, I can just see their faces when they see this; every time I show these guys something I like, they hate it. They went bananas! "This is amazing!" said the first, tapping frenetically. "Where did you get this?" said a second, grasping my lapel.



They loved it, bearing out my addage that serious computer people are unpredictable and occasionally violent. Doodle! is a very well made package, actually and is so user-friendly as to render the supplied instruction book totally redundant. It is the closest thing to a combination of the best things about Melbourne draw and Goldstar Sketchpad available. It also contains some very impressive and modern demo screens, like the record cover of the Ghostbusters LP, and a picture of Tolkein's Middle Earth.

The ways you can use these draw programs vary enormously. You can make movies, drawing a screen on your computer and photographing it on single frames with a movie camera. You can make videos, by compressing screens in memory and sequencing them together with a graphics compression program like **Screen Machine**. You can design clothing and print them onto graph paper for enlargement into patterns. The uses are really only limited to your ingenuity and imagination and of course, buying the right software.

Graphics for real

If you become really good on all the simple packages, then you'll start to want your own tailor made graphics packages. The only way to do this is by way of a language package. For the Spectrum **Abersoft FORTH** or **White Lightning** are the obvious choice. FORTH, in case you don't know it, is an excellent language which "learns" as you use it. Like an artificial intelligence it takes on the characteristics you give it, so that it can become an expert in whatever you choose. The biggest bonus of all, though, is in its speed of execution, which approaches that of machine code.

For the good old '64, you will be able to get FORTH soon, but until you can, there is a good alternative, **UltraBASIC 64**. This is a supercharged version of BASIC, specially designed for the bored Commodore user. It's a real shame, but when Commodore made the 64 they put an old fashioned BASIC in it. They had to. They had a high specification computer on their hands and they wanted to be the first to get such a micro on the market. So, they had to forget writing a new hi-spec BASIC, and just used an old BASIC.

Thanks to UltraBASIC you now have turtle commands, circle, colour and many other short cuts, past the lengthy POKE commands and the SYS locations.

The future

You can expect to hear, or rather see, a lot more of computer





graphics. Even at the moment it's getting hard to tell what's computer created and what isn't! More so in the next five years. Clive Sinclair was quoted recently as saying the new Fifth Generation of computers need a "face" for people to look at; people need to anthropomorphise computers to justify to themselves how intelligent they seem.

Now, we know that computers are dumb as hell, (at least the Apple IIc I'm typing this on is), but the average Joe Public, getting his money out of the cashpoint, doesn't. Computer graphics are going to be very important, very soon. You don't have to keep up with the kids by learning about computers, at least not as much as computer advertising would like you to think.

Computer graphics are making computers easier and more friendly to use. By all means keep abreast of new developments, because some exciting and important things are about to happen, but don't get paranoid that you're being left behind! There's no need. This is the happy, smiling, anthropomorphic face of computing signing off.

Next month Phil South will be writing about game creation software.

Products Details

Electronic Colouring Book
Made by: Addison Wesley Publishers Ltd., Finchampstead Road, Workingham, Berks RG11 2NZ
Price: £9.95

Painting and Drawstick
Made by: BBC SOFT, 35 Marylebone High Street, London WIM 4AA
Price: £10, £9.95

Giant's Dinner and Draw 15
Made by: Fowler Software, Hendon Mill, Nelson, Lancs BB9 8AD
Price: £6.95

Melbourne Draw
Made by: Melbourne House, Castle Yard, Richmond TW10 6TF
Price: £9.95

Doodle!
Made by: Quicksilva Ltd., Palmerston Park Hse., 13 Palmerston Road, Southampton SO1 1LL
Price: £14.95 (disk only, CBM64)

Screen Machine
Made by: Codewriter Ltd., PO Box 3 Basingstoke, Hampshire RG24 0UG
Price: T.B.A.

FORTH
Made by: Melbourne Hse (see address above)
Price: £14.95 (Spectrum, CBM64) Available for Amstrad CPC 464 from Amsoft and for the BBC from Acornsoft

White Lightening
Made by: Oasis Softwre, Alexandra Terrace, Weston Super Mare, Avon BS23 1QT
Price: £14.95, £19.95 (Spectrum tape, Microdrive) and available in three versions for the CBM64 on tape or disk from £14.95 to £39.95





Commodore Plus 4



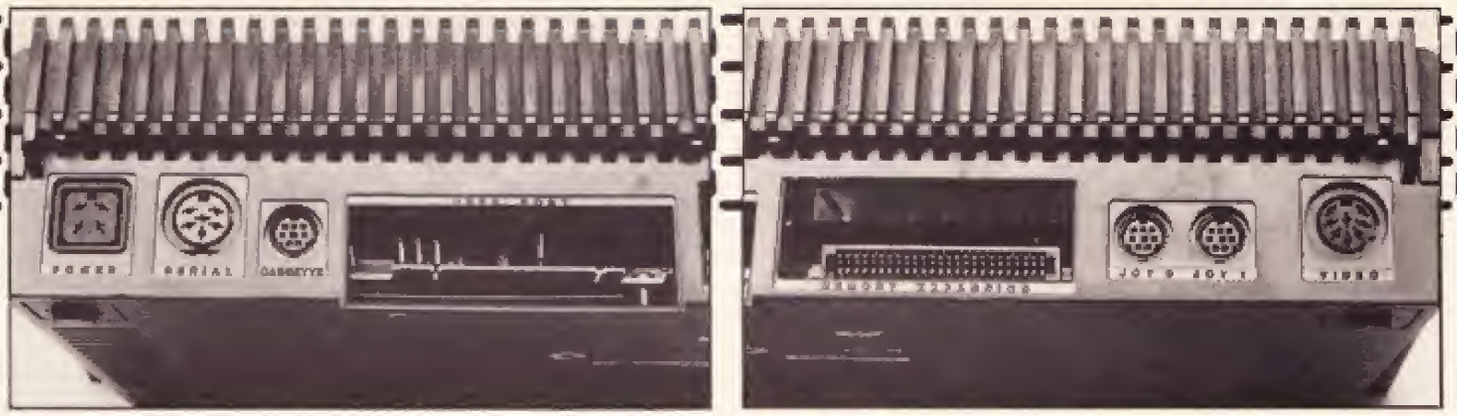
Bob Wallace investigates Commodore's most expensive home micro.

Towards the end of last year Commodore went into overdrive, simultaneously launching the C16 and Plus 4. In the light of the similarities both between these micros and their existing range, the question might be posed, have Commodore gone in for an overkill of the market?

Commodore always had a very tightly defined marketing strategy, the micros they produced fitting into neat consumer slots. At £150 the VIC20 was an ideal entry point computer with professional keyboard, good BASIC and lots of software support. O.K. so it only had 3.5K of RAM, but for someone who didn't know a byte from a REM, this was not of major importance. As these novices became more expert at the game they had the choice of expanding their system with extra RAM, or moving on to the VIC's big brother, the CBM64.

This has everything 'junior' was lacking and although launched by Commodore as a small business micro, it soon found its niche as the best selling games machine of

PLUS 4



Rear of Plus 4 with new style joystick, cassette and power supply ports. Also audio/visual port and serial bus and RS232 connectors.

all time. Software houses were quick to exploit the superb graphics potential, although business, utility and educational programs were never far behind. For someone who requires a reasonably priced, flexible home computer with vast software and hardware support, the CBM64 is a very tempting choice.

Commodore have said that their new up-market micro, the Plus 4, is not designed to be either a business machine nor a replacement for the CBM64. It is for the serious home enthusiast who wants to put their micro to use at times, for dealing with household accounts etc.

To this end, they have included four programs which reside in ROM. These are a word processor, database, spreadsheet and business graphics package. The logic of their choice of bundled software is very much open to criticism in the light of where they see the Plus 4 to be aimed. Add to this the fact that the Plus 4 is the same machine as the C16 with extra memory, which appears to be competing with the CBM64, and you have a conundrum. Are Commodore losing their grasp of the market?

Pricewise the Plus 4 is very much a business machine when you consider that to make full use of it, you will have to buy a printer and disk drives, bringing the cost of the system to about £700 — a high price to pay for the occasional household accounts! This is not to say that the Plus 4 is not a worthy machine but it poses the question, 'too high, too low, too late?'

Design detour

The Plus 4 is a totally new design concept for Commodore. It is housed in a neat charcoal grey case of quite small dimensions. Protruding through the upper casing is the keyboard, which has a slightly different arrangement to the VIC20 and CBM64.

The functions keys now reside above the QWERTY keyboard rather than to the right and they are much smaller. The cursor keys have been separated from the rest of the keyboard and are in a small area in the bottom right hand corner. They are not shifted as on the VIC and each key is arrow shaped to indicate the direction of cursor movement.

The keyboard is quite pleasant to use apart from its rather plastic sound and method of operation. The minor cosmetic surgery carried out on the keyboard is far outstripped by the major redesign of some of the peripheral sockets.

Commodore seem to have done their best to make the Plus 4 incompatible with existing CBM64 and VIC20 joysticks and cassette recorders! The normal nine pin 'D' sockets have been replaced by somewhat flimsy-looking circular sockets. The 'old' edge connector for the cassette has been replaced by a similar socket. The power supply input has been changed to a four pin square socket.

So anyone considering upgrading from a VIC or a CBM64 will have to totally restock their supply of peripherals. Fortunately, the video and serial ports remain unchanged and will support existing accessories.

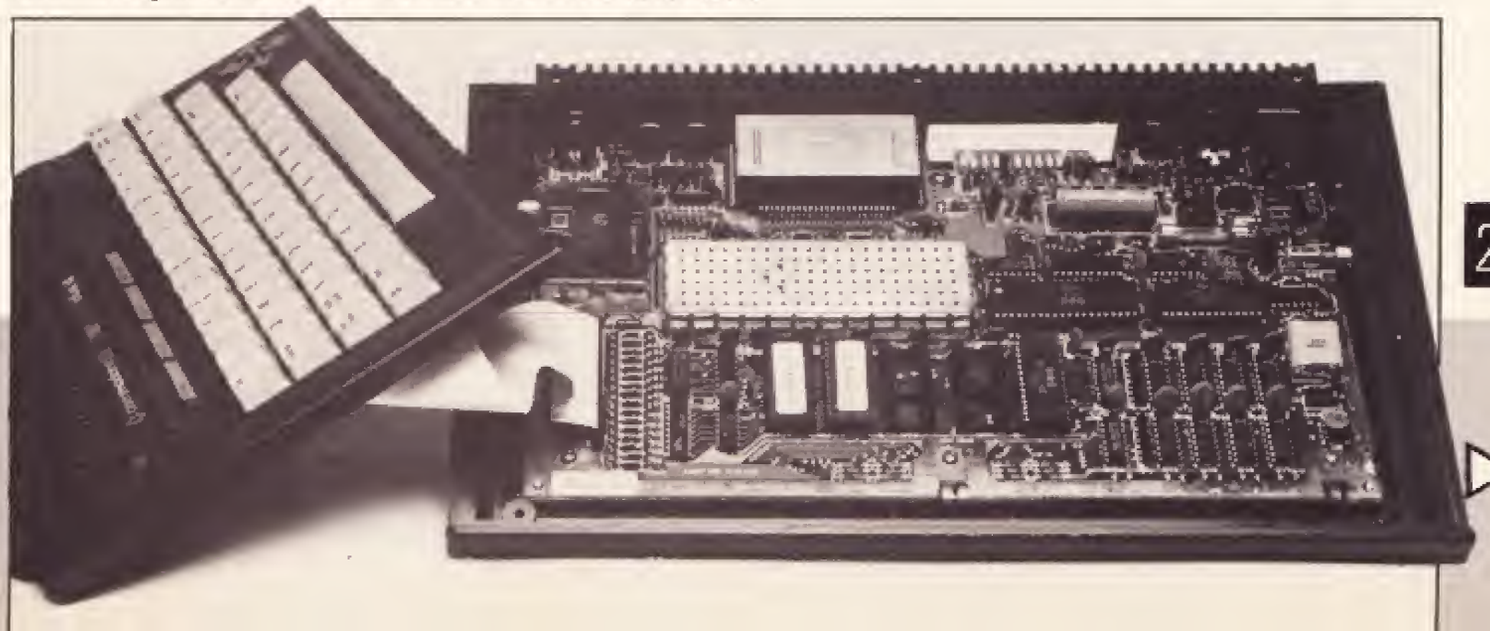
The User Port also remains unchanged but I found it rather unnerving to see that with very little effort one could easily poke fingers into the port and touch some of the components on the circuit board. For the sake of a few extra pence, Commodore could have included a small baffle to prevent this occurring.

Hedging bets?

Housed within the plastic case is the suite of bundled software aimed at the businessman(?). The programs come with a fairly comprehensive manual to guide the newcomer.

It takes him step by step in tutorial fashion through each of the integral programs, giving good, clear examples at each stage. What does seem strange is that there is very little mention of the fact that you will have to shell out £400 plus on a printer and disk drive if

The housing is much smaller than Commodore's usual scale.



you wish to make full use of the programs.

Having said this, however, the programs do function quite well and can be used to produce meaningful business documents.

Back to BASIC

As well as incorporating a useful suite of programs, Commodore have added an updated version of BASIC to enable the user to cope with graphics and sound.

Both the VIC20 and the CBM64 ran BASIC 2.0 and, as any user of these machines will tell you, producing sound on the latter machine is probably the most convoluted process ever designed by man. To get even the most simple sound on the CBM64 requires a number of POKEs.

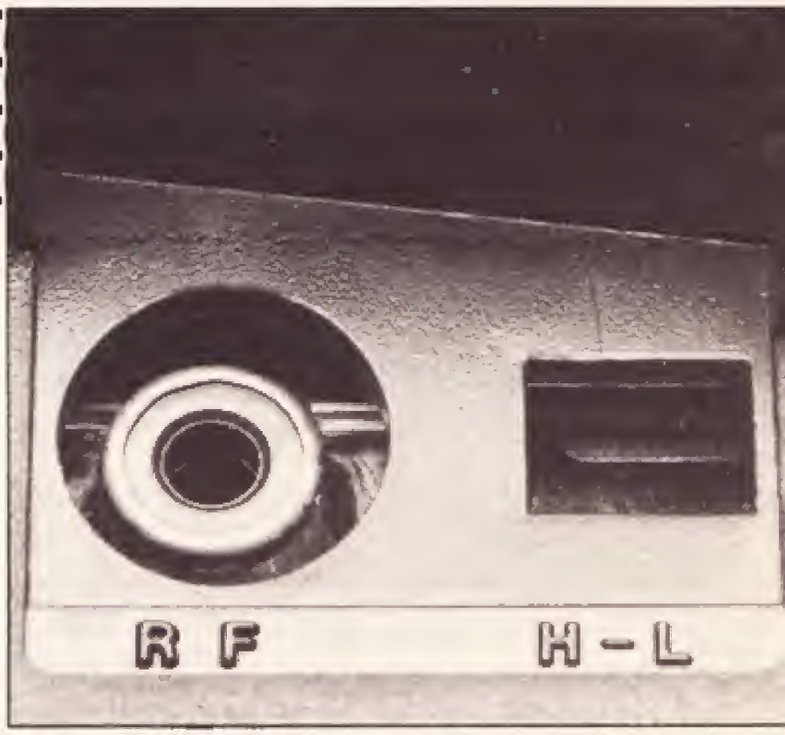
On the Plus 4, sound couldn't be simpler.A one liner such as 10 VOLT7: SOUND 1,500,30 can be used. As well as this, the Plus 4 handles hi-res graphics in a simple and fairly straight forward manner. The speed with which the graphics commands are executed is not as fast as found with the BBC Micro, but is certainly faster than on the CBM64, from BASIC with no add-ons.

Extra BASIC keywords have been added. The complete list can be seen in Table 1. Not only have Commodore incorporated a good BASIC in their new machine, but they have also added a Toolkit to help the novice programmer. Functions include TRACE, RENUMBER, AUTO and TRAP. For the machine code enthusiasts, there is also a Monitor/assembler — not the most elaborate in the world, but a simple one is better than none at all.

In conclusion

Commodore have been producing machines for a good many years now and they seem to have learnt a few lessons. The VIC had lots to offer but initially carried a hefty price tag for a very small memory. The CBM64 has a large memory at a low price, but is lumbered with a relatively restrictive BASIC.

The Plus 4 is packed with useful programs and has a large memory which will suit the small businessman. The BASIC is powerful and makes structured programming easy. I think the Plus 4 is a worthy machine to own, but at a high cost.



Modulator (TV) output.

Main Specifications

Processor
7501 (6502 compatible) at between 0.89 and 1.78 MHz depending on graphic mode.

RAM
64K with 60K or 50K free from BASIC depending on screen mode.

Graphics Resolution
Three modes from BASIC:
320 × 200 and 160 × 200 graphics
320 × 160 and 160 × 160 with five lines of text
40 × 20 text

128 colours and flashing all available simultaneously

Outside BASIC, there are another three modes and UDGs accessed by POKEing

Sound
Two channels of sound, or one of sound and one of noise

Languages
Commodore BASIC 3.5

Speed
Fast to medium

Software
Four built-in home/business programs: word processor, database, spreadsheet and business graphics. Games software will appear as machine is compatible with C16.

Price
£299

On/Off and Reset switches.



BASIC keywords

END FOR NEXT DATA INPUT# INPUT DIM READ LET GOTO RUN RESTORE GOSUB RETURN REM STOP ON WAIT LOAD SAVE VERIFY DEF POKE PRINT PRINT # CONT LIST CLR CMD SYS IF OPEN CLOSE GET NEW TAB SPC THEN NOT STEP AND OR SGN INT ABS USR FRE POS SQR RND LOG EXP COS SIN PEEK LEN STR$ VAL ASC CHR$ LEFT$ RIGHT$ MID$ JOY HEX$ ERR$ INSTR ELSE RESUME TRON TROFF VOL

SOUND GRAPHIC PUDEF CHAR BOX CIRCLE SHAPES SHAPE DRAW LOCATE COLOUR SCNCLR SCALE HELP MONITOR DO LOOP EXIT DIRECTORY DSAVE TAN DLOAD HEADER SCRATCH COPY RENAME KEY USING UNTIL KEY BACKUP PAINT COLOUR DEC WHILE DOPEN GETKEY



Software Reviews

REVIEWS

Title:	Eureka
Format:	Tape
Software House:	Domark Ltd, 288, Minster Road, London SW6
Price:	£14.95
Machine:	**CBM 64 & Spectrum 48K**

The Temporal Talisman is an ancient artefact found on the Moon by the Apollo XVII mission, but whose existance was a closely guarded secret. The Talisman, a cube of crystal 15" on each side, resisted all attempts at analysis until it was subjected to the intense beams of the SHIVA Fusion Project lasers. The Talisman shattered under the beams and each of its corners vanished. Three of the missing pieces were found several days later — one in Australia, one in Greenland and the last in Outer Mongolia.

Each of the other five pieces were catapulted into TIME and have been traced to various time zones and geographical areas. With the help of an experimental device you are sent back in time to retrieve the first piece. When this is done, the mixing of the force fields should catapult the piece to the present whilst you pass through the void in search of the next piece. When the last piece of the Talisman has been found you can ring the secret telephone Hot Line and tell the British Prime Minister that you have saved the world, or in reality to claim your £25,000 for being the first to complete 'Eureka'.

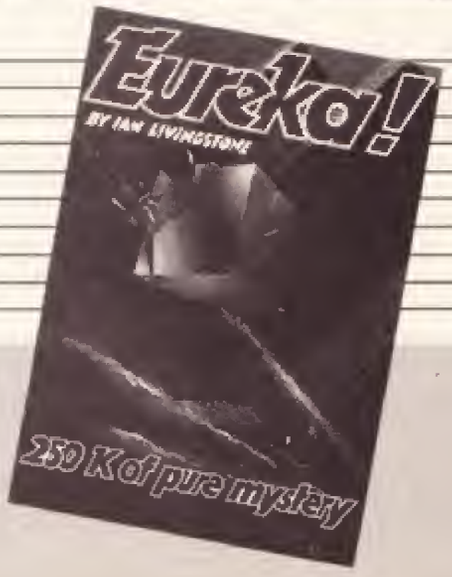
Well you've seen it advertised, and now you can buy it, but is it all it is made out to be?

The arcade games that preceed the adventures are boring, and irritating. They take on a maze game format. The character control is extremely difficult, especially with joystick, the graphics although colourful are really quite poor compared with todays high standards.

The adventure games are full of baffling clues and riddles, both in the manual and on screen, typical of Ian Livingstone. The adventures take on a strange format that takes a while to adjust to after playing conventional adventures. The graphics are quite stunning, some animated, and the musical interludes are in keeping with each era. By the way, when I ate the chocolate in Colditz the game crashed!

Taken as a multiple part adventure Eureka is very good, the 'arcade' games let the package down as a whole, but with the £25,000 'carrot' who cares? **A.O.**

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





Title:	**Tarzan**
Format:	Tape
Software House:	Alligata, 178 West St., Sheffield S1 4ET
Price:	£7.95
Machine:	BBC 'B'

The first thing that really hits you in this game is the fantastic tune that is played while the main program is found — stop the tape for a while and listen to it, it's great! The game itself is equally brilliant and is written by Chris Butler, author of Transistor's Revenge.

You play the part of Tarzan, and your task is to fight your way through four amazingly tricky screens to rescue Jane from an 'awesome fate'. The on screen character is resplendent in his purple (?) loincloth and he really looks as if he's putting some effort into the game with legs and arms pumping wildly.

Screen one is hard and if you ever complete it, screen two is harder still. A friend of mine even got to screen three but he didn't last long!

Everything about this game is a joy to behold, the beautifully animated nasties, the great sound effects and the sheer inaccessibility of it. This has to be one of the best Beeb games yet, better graphics than Blagger, more addictive than Fortress, and cheaper than Elite. If you see it — buy it!

A.B.

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	100%

Title:	**Chartbusters**
Format:	Tape
Software House:	Alligata Software Ltd., 178 West St. Sheffield S1 4ET
Price:	£9.95
Machine:	CBM 64

This is the finest collection of games in one package I've ever seen for the Commodore 64, the titles read like a Who's Who of Alligata's best selling games and is very aptly called "Chartbuster". The games are Blagger, Eagle Empire, Killer Watt, Panic Planet and Bugblaster, each of which is worth five pounds of anybody's money but when all these are on one tape for less than two pounds each it could easily claim to be one of the best buys around today. Each game uses Superfast loading and is recorded on both sides of the tape to ensure a satisfactory load.

The descriptions that follow can't give the full potential as it is like reviewing five games in one.

BLAGGER — collect the golden keys, rob the safe and move onto the next level, which sounds easy but in fact is very difficult. A very addictive game.

EAGLE EMPIRE — single, double and multishot action killing everything that moves — phoenix, eagles and finally the Empire. This is the computer equivalent to The Phoenix in the arcades and can be classed as a very good representation of this very enjoyable shoot 'em up game.

KILLER WATT — smash the light bulbs in moving to the magical gateway and blast a way through to the next level. Fortunately this game has no time limit as you are required to do some very skilful manoeuvring with your ship in this maze type game during which very good music and screen scrolling takes place. Again you will become addicted to it.

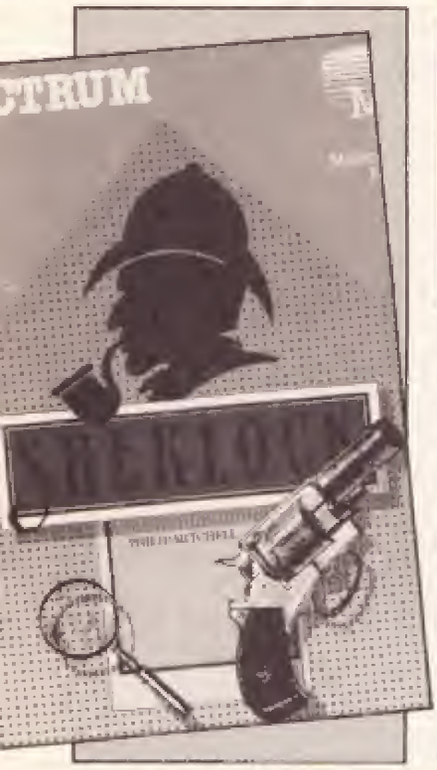
PANIC PLANET — dig the monsters through the earth levels as they get stronger with each attack. Worst of the bunch, difficult to move and does not always dig or fill the hole when you want to in this standard "Panic" game.

BUGBLASTER — shoot everything that moves to collect points — spiders, mushrooms, centipedes, scorpions, dragonflies and snails. As you expect from an A. Crowther program the graphics far exceed anybody elses' for this centipede type game with music to match.

Overall this tape is exceptional value for money and should be bought by anyone who hasn't got any two or more of the five.

P.O.

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



Title:	**Sherlock**
Format:	**Tape**
Software House:	**Melbourne House, Castle Yard House, Castle Yard, Richmond TW10 6TF**
Price:	**£14.95**
Machine:	**CBM 64**

Fabulous, great, beautiful, at last an adventure to fill the void that the 'Hobbit' left when I completed it several months ago.

Assuming the role of Sherlock, the most famous detective of all time, you must work against time to solve a complex mystery as he travels about Victorian England. The game is a thrilling adventure full of intrigue, suspense and danger, requiring the use of Sherlock's extraordinary genius for observation and deduction, together with his remarkable knowledge of the history of crime. With our ever faithful friend Watson, you can roam freely through the gaslit streets of London and explore Victorian England in a quest to solve inexplicable crimes.

The use of a real time clock means that time passes naturally and day turns into night and you must ensure sufficient time for sleeping and travel. You must also carry enough money to pay for travel and other necessities. As in the 'Hobbit' the characters live out their own lives in a realistic manner.

Sherlock is an adventure game for the Advanced Adventurer, not really a game to start with as it is very complex. Well Philip Mitchell has done it again, and with music, another computer classic. Do not forget. . . . . Nobody is above suspicion. **A.O.**

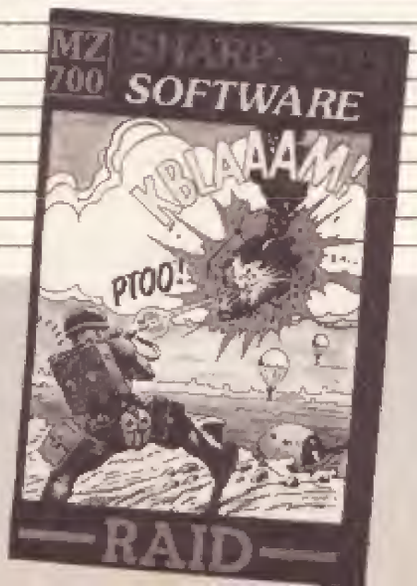
STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	100%

Title:	**Raid**
Format:	**Tape**
Software House:	**Sharpsoft Ltd, 86-89 Paul ST., London EC2A 4NE**
Price:	**£7.95**
Machine:	**Sharp MZ-700**

I was truly impressed with this game, continually saying to myself 'just one more go!'' As with most games the degree of difficulty increases as you progress. You start off with 25 shots and as the difficulty increases you are given more shots to cope with the extra parachutists and helicopters.

Shooting down the choppers gains you more shots but you also have to shoot the parachutists before they land and overrun your defensive position. **R.G.C.**

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

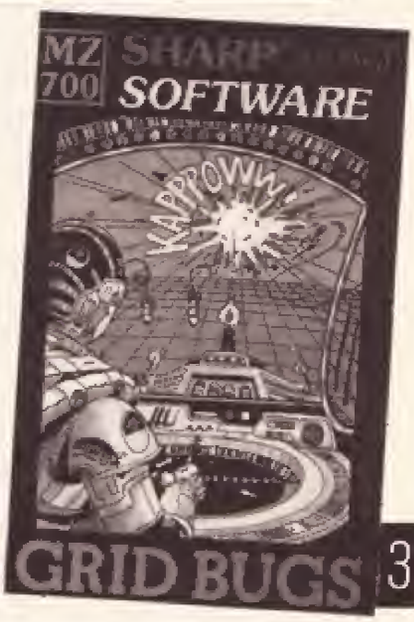


Title:	**Grid Bugs**
Format:	**Tape**
Software House:	**Sharpsoft Ltd, 86-90 Paul St., London EC2A 4NE**
Price:	**£7.95**
Machine:	**Sharp MZ-700**

This is another excellent game from Sharpsoft. An unusual feature of it (and very useful) is the facility to define your own choice of keys for moving about the grid and firing your laser.

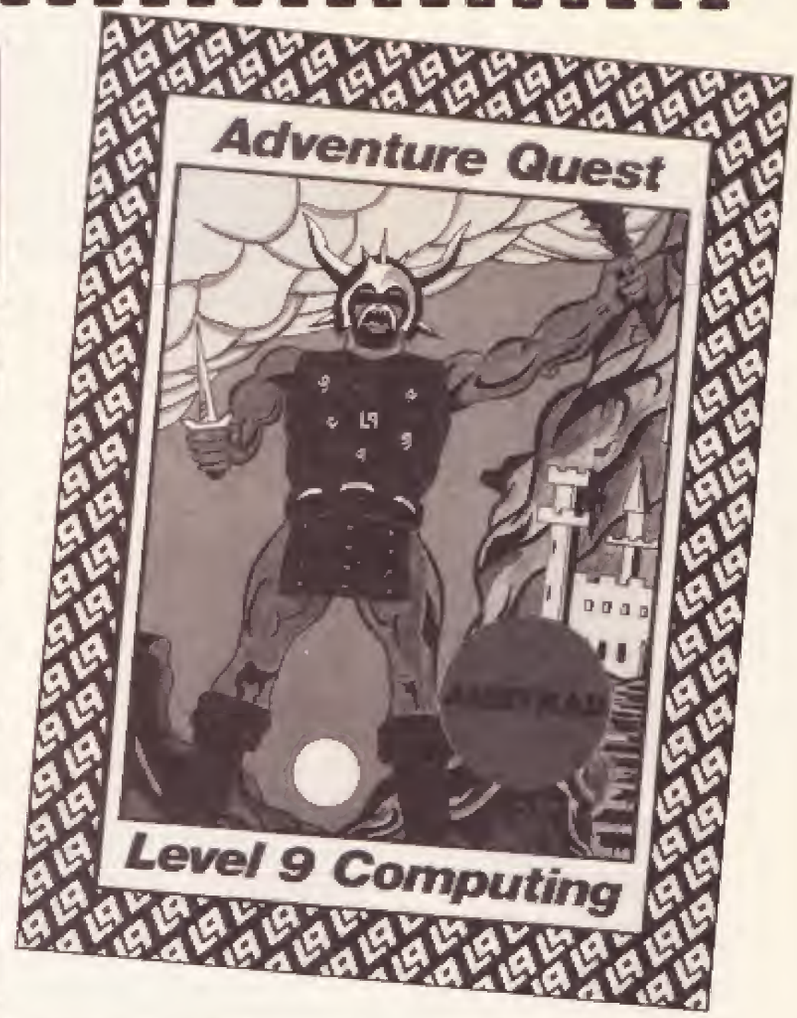
The game is a very simple idea but unbelievably difficult to play which in turn makes it very addictive. All in all, very good value. **R.G.C.**

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



Software Reviews

Title:	Adventure Quest
Format:	Tape
Software House:	Level 9 Computing, 229 Hughenden Road, High Wycombe, Bucks.
Price:	£9.90
Machine:	**CPC 464**



Adventure Quest is a follow up to the highly acclaimed Colossal Adventure, only set in a different time. As an apprentice magician, you must seek out and destroy the Demon Lord Agaliarept (I don't now how to pronounce it either) who is now resident in the Black Tower, situated about 200 locations from the start!

Once loaded, the game presents you with a shortened version of the instructions and the details of the first location, all in a new character set which is a little difficult to read at first but quite acceptable. The locations are described in a humorous and detailed fashion. One annoying point is the fact that the exits are not disclosed and you must discover them for yourself, wasting time and energy. The problems encountered are original and difficult to solve and should keep anyone busy for a few weeks at least.

In conclusion an addictive, text only adventure, offering some original, tricky and humorous problems to solve. **B.L.**

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

Title:	Rainbow Writer
Format:	Tape
Software House:	Microdeal, 41 Truro Road, St. Austell, Cornwall PL25 5JE
Price:	£19.95
Machine:	**Dragon 32/64**

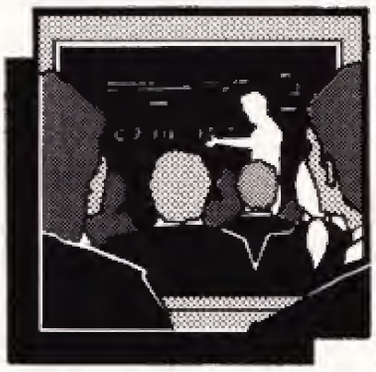
One of the major drawbacks of the Dragon must be its screen display and it is this problem which Microdeal has set out to remedy with their excellent utility program. It gives you 224 user-definable graphics, and a choice of four character densities (32×16, 42×24, 50×24, and 64×24), with the added feature of double-width in PMODE 4.

These extra character types are in addition to the normal text mode and all work in any of the PMODEs. When you load Rainbow Writer it automatically switches to PMODE 4, and apart from this fact, and the 4.5-4.9K of memory which is taken up, there are no differences to BASIC, in that normal BASIC programs will work. There are, however, extra 'commands' which allow you to switch between character densities, scroll protect as many of the top or bottom lines as you require, turn automatic subscript and superscript on and off and choose which colour you want the text printed in.

Full details are given on how to copy the program onto tape or disk (for your own backups only, of course!) and demonstration programs are included to show just what Rainbow Writer can do. These include a user-definable graphics generator, which lets you define your own characters and save them on tape.

With the help of Rainbow Writer, most of the drawbacks of the Dragon's display are taken care of. This is definitely a program which no serious programmer should be without. **B.D.L.**

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use/ documentation	★★★★★
Overall	100%



Book List

SPECTRUM MACHINE CODE MADE EASY –
Author: Paul Holmes.
Publisher: Interface Publications.
Price: £6.95

If you consider yourself one of the many who know a little about machine code and would like to know more, then this is the book for you.

It aims to teach a full understanding of the Z80 instruction set from first principles. This is achieved very satisfactorily, as each new instruction is explained fully in its method of use, and the consequences it will have on the rest of the system are detailed. To prove the point the newly understood idea is subsequently placed in a short machine code program which gives 'hands on' experience as to its usefulness.

The way in which the machine code is entered is also very cleverly done in that throughout the entire book all that is used is one simple basic loader. This really does make the process of discovery very simple and much more fun than using an assembler (although you can use one of those instead if you like). A multitude of techniques are explained and even if some of them seem a little ambiguous at first, such as the rotating instructions, others are quite straight forward, like the printing procedure. However, no matter how difficult the going may seem at times, those who persevere will be well rewarded in the end.

The actual content of the book seems to cover a reasonable range of commands and their uses, as well as various lists of valuable information. The appendices divulge mountains of handy-to-have information, with most of it referring to the Z80 instruction set. Everything from HEX/DEC to the meaning of life (sorry the meaning of Z80 mnemonics) are included. The author also manages to convey the art of machine code programming with a pleasant, easy to read style, which makes learning that bit (or should it be byte) easier. So if you want to learn machine code you could do a lot worse than buy this book. **G.W.**

WRITING SOFTWARE FOR PROFIT
Author: A.J. Harding
Publisher: Virgin Books Ltd.
Price: £4.95

As the title suggests this book is aimed at the numerous people who have, at one time or another, thought about writing some form of software with the idea of selling it to a publisher.

Written, as the book is, by an established publishing house, there are many facts included which could only be known by someone with an intimate knowledge of the procedures involved. Added to this, the fact that the author has been an active participant in the computer world for several years, it can be seen that his credentials are ample to tackle such a subject.

The whole process of writing commercial software has been broken down into several sections. These cover everything from choosing a computer (based on the type of software to be written and the field at which it is aimed), to dealing with VAT. Each section fully explains why a particular course should be chosen and gives the reader all the information he or she needs to be able to make his or her own decision.

If the budding software author has been held back only by a lack of knowledge about publishing his wares, then this book could be the answer to all his or her prayers. The content of the book is so helpful in clarifying the situation of software authorship, that by the end, the reader will be able to make his or her choice, with a minimum of effort.

Although, as the author says, it is not a venture to be entered into lightly, but for those who feel they are able to offer something new (or revamped) and worthwhile, it could be the start of something very big. Considering how cheap the book is, it surely must be worth the effort of reading it to find out. **G.W.**

Book List

MASTERING THE TI-99
Author: Peter Brooks
Publisher: Micro Press Ltd.
Price: £5.95

As every TI owner who has tried their hand at programming is aware, the User Manual falls far short of providing readily comprehensible information. There is very little alternative literature available, and it is pricey. This book, therefore, makes a most welcome appearance. It contains helpful, sometimes humourously illustrated advice, yet remains reasonably priced.

The 116 pages are crammed with information on topics such as translation. file handling — with particular reference to tape, high resolution plotting and animated graphics. The author, has drawn on his experience as a software reviewer and area contact for the TI User's Group to demonstrate more efficient ways of programming and debugging on the TI-99 computers. He includes hints and tips and even how to track down faults arising from printing errors in listings from magazines or books.

My only minor criticism concerns the arrangement of the chapters in the book. After a brief introduction the author launches into the subject of translation — how to convert programs for other machines into TI BASIC. This would have more aptly concluded the book, not begun it, particularly as there are several references to chapters not yet read. Indeed, the third chapter would seem a more obvious starting point since this deals with computer jargon and the BASIC language.

Throughout the text, the author apologises for not enlarging on some details due to their being beyond the scope of the book. He does, however, very generously offer to discuss problems or answer questions from his readers. Unlike some books, therefore, you have a guarantee that this one won't be flung aside in frustration, as you may consult its author for further enlightenment.

J.V.W.

DEST TOP COMPUTING WITH THE SINCLAIR QL (The Sinclair QL Series)
Author: Barry Miles
Editor: Robin Bradbeer
Publisher: Hutchinson Computer Publishing Co. Ltd
Price: £6.95

The rather grand title of this book hides the fact that it deals only with the four Psion programs supplied with the QL, so, at first glance could be dismissed as a variant on the QL manual. However, on close examination, the book reveals that the QL user could gain something by reading both the manual and this book.

The book assumes that its reader is concerned only with applications, so a short introductory chapter provides a simpler user guide into setting up and using the QL than does the manual. It is a chapter which looks and feels the same as the introductory chapters in most of the other books in the 'QL series'.

Four chapters then follow, which deal, in turn with Quill, Abacus, Archive, and Easel. These are not comprehensive guides, but deal with the general features of each program and provide some additional tips in using the programs. It is obvious that the author has spent some time using each of these programs and he tries to clarify some of the aspects of the software which are not well covered in the manual. There is a useful section at the end of each chapter which covers the strengths and weaknesses of the Psion programs, which Psion themselves should read before producing new versions of their software.

One disappointment in the book was the inclusion of a long section on SuperBASIC keywords. It occupies 48 of the book's 189 pages and it is inappropriate for the user (rather than programmer) book. It is obviously there as a filler, as, in the same way, it 'fills' other books in the series. It would have been better to either expand the earlier chapters, or produce a smaller (and cheaper?) book. **D.N.**

WORD PROCESSING WITH THE SINCLAIR QL (The Sinclair QL Series)
Author: Mike O'Reilly
Series Editor: Robin Bradbeer
Publisher: Hutchinson Computer Publishing Co. Ltd.
Price: £6.95

One of the main attractions of the Sinclair QL to potential buyers must be the four Psion business programs supplied free with the QL. Of these, it is likely that word processing will be the most used by QL owners. It is not surprising, therefore, to see a book dedicated to word processing on the QL, providing a simple introduction and reference test to 'Quill'.

The book, from its rapid appearance after the launch of the QL, was produced at great speed on an early version of the QL. It is not surprising therefore, that it contains no additional information over that presented in the QL manual. So, it will only really be of use to those who may have found the manual hard to follow, or those wanting a reasonable reference book; one that is a manageable size and has an index, so you can actually find what you are looking for.

An early chapter in the book deals with printers. As many QL users are likely to be on their own when setting up their word processing facilities, connection of a printer is likely to be one of the biggest problem areas. It was for me, so I was particularly interested in what this chapter had to say. Unfortunately, it didn't say enough — while it mentions things like baud rates and parity bits, not enough practical advice is given to help users to get their printers connected successfully. Nor was there much help on the use of the 'instal printer' program for non-Epson users — a shortcoming copied from the manual.

I have been impressed with the other titles in this series; this volume, by comparison, was rather disappointing.

D.N.

ADVANCED PROGRAMMING WITH THE SINCLAIR QL (The Sinclair QL Series)
Author: Martin Gandoff
Series Editor: Robin Bradbeer
Publisher: Hutchinson Computer Publishing Co. Ltd.
Price: £6.95

This book takes the role of a follow up to an earlier book in the series "Introduction to SuperBASIC on the Sinclair QL". However, the book is not a copy of that one. It tries (and succeeds) to teach the processes which go into the development of BASIC programs on the QL.

One of the first chapters describes what programming is all about. Here you are shown the logical build-up of a program and introduced to the concept of flowcharts for the careful design of programs. The two chapters that follow this introduction deal swiftly with SuperBASIC. This is not a beginner's introduction (the earlier book sees to that), but there is a lot of overlap with the "Introduction" book.

Next in the book are two useful advice chapters on dealing with errors and program development. Both chapters are rather too short, but still contains lots of useful information. But it is the final chapter which, I feel, really makes the book a must.

The chapter is called 'Case Studies' and it shows you how to tackle programming problems through examples. The content is for business users, dealing with stock control, invoices, etc, but the principles shown for the analysis of a problem and for writing a program from that analysis can be applied to most 'serious' home uses. **D.N.**

SENSATIONAL GAMES FOR THE AMSTRAD
Author: Jim Gregory
Publisher: Granada Technical Books Ltd.
Price: £5.95

This book, written by the Managing Director of Mr Micro, a games software house, contains 27 programs totalling over 200K of used memory (which should keep any keyboard basher happy).

The wide range of programs include such games as: Star Trek, Breakout, Marie Celeste (a text nautical adventure), Dice games, Card games, Pick Man (Pac Man), Skippy (Frogger), and Kinky Dong (guess what this might be). Also covered are programs such as: I Accuse (a detective game), Hangman, Maths and Geographical quizzes etc.

There is also character builder to re-define characters, a picture builder for on screen drawing, a monitor to examine and modify the memory of the Amstrad and several subroutines including a High Score listing and an Inkeys/-Joystick routine etc. for use within the programs in the book as well as being useful within your own programs. All of which, including appendices of character codes, screen layouts, memory map etc., is designed to appeal to all age groups — beginners and experts alike.

As regards the quality of the programs, I found that most of the games tended to use screen mode 0, which gave them a chunky and jerky appearance and personally I found most of them not really worth the effort of typing them in. Also there were the odd bugs in the listings ie. GOSUB 11100 — no such line existed. I would also have liked to have seen a better breakdown of which section of a program did what and why, rather than just the odd REM statement.

However, some of the games did appeal to young children of some friends of mine, mainly the hangman type games, and, with some amendments by the dedicated keyboard basher, these programs could be improved.

On the whole I would say that this book is probably worth the asking price of £5.95 — so long as you would be prepared to make improvements to the listings yourself. **P.S.**

FIRST STEPS IN BASIC
Authors: Susan Curran and Ray Curnow
Publisher: Windward
Price: £4.95

Many years ago I had a book on servicing motor cars which described general principles but when I tried to put them into practice I found that the information was never quite specific enough to meet the particular need that I had. This book in the 'Clear and Simple Home Computer series" runs dangerously close to being a manual of generalities which takes you step by step through the fundamental principles of programming in BASIC but fails to provide sufficient detail to complete a job satisfactorily.

The declared aim of the book is not to replace the computer manual but to supplement it and particularly to concentrate on the aspects of planning and writing your own programs. However, the question in my mind is whether a need exists for a book of this kind.

Most book shops now include a comprehensive section on home computing and browsing through the shelves one soon discovers a host of publications specific to many, if not most, of the popular machines. So why produce a basic book about BASIC which is not specifically aimed at any one machine and as a consequence is unlikely to provide answers to specific programming problems?

Perhaps the answer is that the authors and publishers believe there is a need for simple explanations of general technique for structuring programs and for anyone who has such a need then this book may provide some help, especially with the techniques of constructing and interpreting flowcharts and developing program structure through the use of subroutines as in these areas the book provides useful guidance to those who may be unfamiliar with such techniques.

Even so, I believe that the potential market is limited and there is plenty of competition from other books or magazine articles that provide similar guidance and, by virtue of their dedication to a particular machine, represent better value than this volume.


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Class of '64

Join our class for a complete tuition course on hi-res graphics on the Commodore 64. Your teacher is Bob Harwood.

With the total absence of any hi-res BASIC commands on the Commodore 64 you could be forgiven for believing that hi-resolution screens are hard to get to. In fact, once you have grasped the principles of hi-res graphics the whole thing becomes very simple to use. Unfortunately you are not helped by the skimpy explanation of the bit-mapping mode in the handbooks.

In the next few issues of PCT we are going to create a graphics package, written almost entirely in BASIC. It will feature most of the facilities that you would expect to find in a commercial program, and a few more besides, *and* the whole thing will fit into 6K of memory.

Before we get into the program though, it's going to be necessary for you to understand the nuts and bolts of hi-res operations and to do that, we are going to have to take a close look at the more familiar text screen.

Screens and screen locations

The character memory for the *text* screen occupies one thousand locations in memory, between 1024 and 2023. By simply poking a value from 0 to 255 into one of these locations, we can make any one of the 256 characters available in the character set, appear at any location on the screen. This is because the screen memory controls what we might call 'character squares', arranged into 25 rows and 40 columns.

Colour information is handled in a similar way. The colour memory is found between locations 55296 and 56295. Again, each of these controls a corresponding square, but this time, for colour. In this case the memory locations are unusual, in that each location will accept, not an eight-bit byte, but a four bit nybble. If a number higher than 15 is poked to one of these locations (ie a number greater than the colour codes 0-15) then the upper four bits are ignored.

We all know that if we poke a value of 1 into any of these screen locations then an A will appear in the corresponding character square on the screen. But how does it get there?

program listing 1

```
1000  R=INT(Y/8): REM R=Row: THERE ARE 8 LINES IN EACH SQUARE
1010  C=INT(X/8): REM C=COLUMN: AND 8 PIXELS TO EACH LINE
1020  L=Y AND 7: REM L=LINE: DIVIDE BY 8 AND FIND THE
      REMAINDER
1030  B=8192+R*320+C*8+L: REM B=BYTE
1040  T=7-(X AND 7): REM T=BIT
1050  RETURN
```

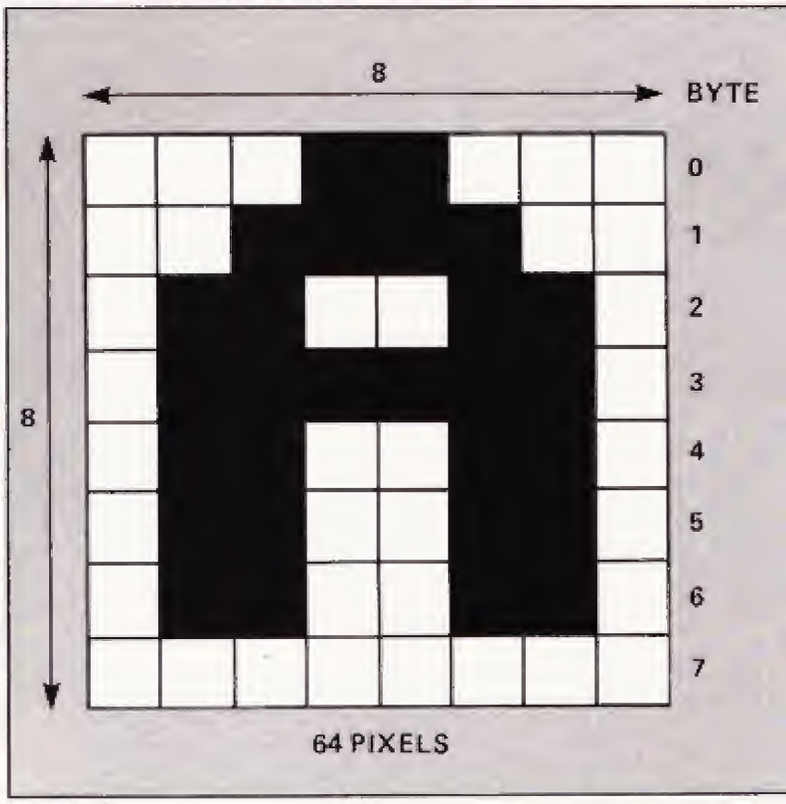


Figure 1



Table 1 Values stored in C.G.ROM

Binary	Decimal	
00011000	24	
00111100	60	
01100110	102	
01111110	126	Response to
01100110	102	POKE 1024,1
01100110	102	
01100110	102	
00000000	0	

Each of the squares on the screen is made up of sixty-four dots, or pixels. These are arranged in eight rows of eight, and any of them can be turned either on or off. Turned off, they are the same colour as the background colour of the screen. Turned on, they adopt the colour selected for the square in colour memory.

In Figure 1 you can see how the letter A is created from this pattern of dots. You will remember that a byte consists of eight binary digits, or bits. A bit can be either turned on, i.e. changed to a one; or turned off — set to zero. If we stacked eight of these bytes one on top of another inside one of these character squares, then you can see that each bit of those eight bytes could represent one of the sixty-four pixels in that square. Each byte would represent one row of pixels. And this is exactly how it is done.

Any character in the character set can be represented by the bit-patterns of eight bytes. Table 1 shows how an A is represented in this way. These bytes are stored in sequence in a chip called the *Character Generator (CG) ROM*. Because there are eight bytes for each character and 256 characters, the capacity of the chip is 2048 bytes, or 2K.

When we poke a value to one of the screen memory locations, the computer uses the character code to select the correct eight bytes from the CG ROM to create the required character. These are passed to the Video Interface Chip (VIC II) which assembles the image in the correct place on the screen. Its colour is then set from colour memory.

The text screen then, is controlled by 1000 bytes, with a little help from the CG ROM. To create a hi-res screen we must bypass this system and take control of each one of the eight thousand bytes that control all 64,000 pixels on the screen. In this way, by changing the bit-patterns, we can draw any image we choose, overcoming the limitations of the character set.

If we are to do this, however, we are going to need a screen memory that is eight times larger than that of the text screen and will have to find somewhere to put it. We will also have to tell the computer where to find it.

Locating the hi-res screen

Before we can turn on the hi-res mode (or the Standard Bit-Mapped Mode, as Commodore call it) we must set aside an area of memory for the screen. And if the VIC II chip is going to recognise it, it must start at one of the eight specified locations in each 16K bank of memory.

I should explain that the VIC II chip can only 'see' 16K of memory at a time. Unless told otherwise it will look at Bank 0 to find its screen data, but it can be switched, through the Complex Interface Adaptor, to look at the other three banks; but only one bank at a time.

In theory the screen can be located almost anywhere in memory, but bank switching can cause some problems and is best avoided. So let's try to keep the screen in the first bank of memory — from 0 to 16384.

An additional problem that must be taken into account is that the VIC II chip will only recognise a screen that starts at one of eight specific locations in each bank. These are at the start of each 2K block, so in bank 0 we have 0, 2048, 4096 and so on, as possible start points. The locations are the same as those used to identify a user-defined character set.

In fact, only half of the locations given can be used to start a hi-res screen. Any start point higher than 8192 for example, would result in part of the screen overhanging the end of a video bank. In which case, the VIC II chip would not see part of it. And in bank 0 of course, part of the memory, from 0 to 2048, is occupied by systems workspace and page 0 registers. Then Basic Text starts at 2048, just to complicate matters further.

Basically (sorry) there are two possible alternatives.

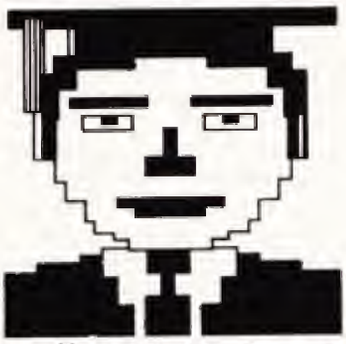
- You lift BASIC to start at 10240, and then place the screen underneath it, starting at 2048.
- The screen goes in at 8192, leaving 6K RAM for your BASIC program.

Both solutions have their advantages and disadvantages, and the choice of location will depend on the task in hand. But 8192 presents fewer problems to the beginner and all of the following examples use this as the

start point.

Having made the decision, all that remains to be done is to tell the computer where to find its screen data. To do this we simply set the pointer in the lower four bits of the register at location 53272. You must be careful not to disturb the upper four bits though, and should use:

```
POKE 53272,PEEK(53272) OR 8 (Or the appropriate value for A from the UDG start table.)
```



Now we can turn on hi-res by changing bit 5 of the register at 53265 to a one. Again avoiding disturbing the other bits:

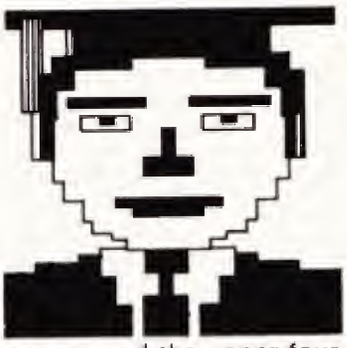
```
POKE 53265,PEEK (53265) OR 32
```

When you run this you will find that the screen is filled with rubbish. The effect is caused by random bytes occupying your selected screen memory and these must be cleared out. To do this you simply fill the screen memory with zeroes. FOR X=8192 TO 16191: POKE X,0:NEXT will do the trick, if somewhat slowly. Now we have to sort out colour.

Colour control

On our text screen colour is no great problem. The screen has a universal background colour controlled by a single byte at 53281 and the ink colour of every square is controlled by the colour memory from 55296 to 56295. On the hi-res screen it would be nice if we could change the background colour of each character square as well, allowing any two colours in any square.

This has been allowed for in the system. On the hi-res screen the lower four bits of a byte in colour memory hold the background colour for its



square and the upper four bits hold the foreground colours. So in any square, the upper four bits hold the colour of the bits turned on and the lower four, the colour of bits turned off.

The standard colour codes (0-15) are used and to push the foreground colour code into the upper four bits you simply multiply it by 16. So:

```
New colour code = Backgrd + Foregrd * 16
```

To colour a square red and any pixels turned on in that square light red, we poke 162 into the colour memory.

```
POKE xxx, (red) 2 + (lt red) 10 * 16 = 162
```

But if you remember, the colour memory can only accept a nybble not a full byte and it is impossible to poke in a value higher than 15. What we need is a new area for colour, which will hold one thousand full bytes. As luck would have it the old text memory is currently redundant, so in keeping with the government's policy of jobs for all, let's use that instead. In fact it is used automatically when you turn on hi-res mode.

To clear out the colour memory you simply use a short loop to fill the area with the new colour



codes; such as:

```
FOR X=1024 TO 2023: POKE X,DC: NEXT
```

Where DC is the two-part code. All we have to do now is locate the right bit, in the right byte of screen memory, and turn it on.

Turning it on

Whilst the screen organisation of one thousand blocks of eight bytes in twenty five rows of forty, may be tremendous for the CG ROM, it's not all that bright for we mere humans. It would make life a lot easier if we could locate a pixel by its X and Y coordinates.

What we need is an algorithm placed into a subroutine that will accept the X and Y coordinates and output the correct bit of the correct byte. In Program 1 you will find just that.

Every time you change either X or Y you simply push the new values through the subroutine and output a value for B (byte) and T (bit). The REM statements can be left out.

Now, to turn on a bit use:

```
POKE B,PEEK (B) OR 2  T
```

To turn OFF a bit you use:

```
POKE B, PEEK (B) AND (255-2  T)
```



The program below will draw a filled in block on the screen. Not the most exciting program in the world perhaps, but the program proper starts next month and that should be enough for anyone. And this does demonstrate the principles involved.

Type in the lines already given. Select a colour and fill the colour memory with it. Add Program 1 and then these lines.

```
200  FOR X=100 TO 200
210  FOR Y=80 TO 120
220  GOSUB 1000
230  POKE B,PEEK (B) OR 2 T
240  NEXT
```

See you next month!

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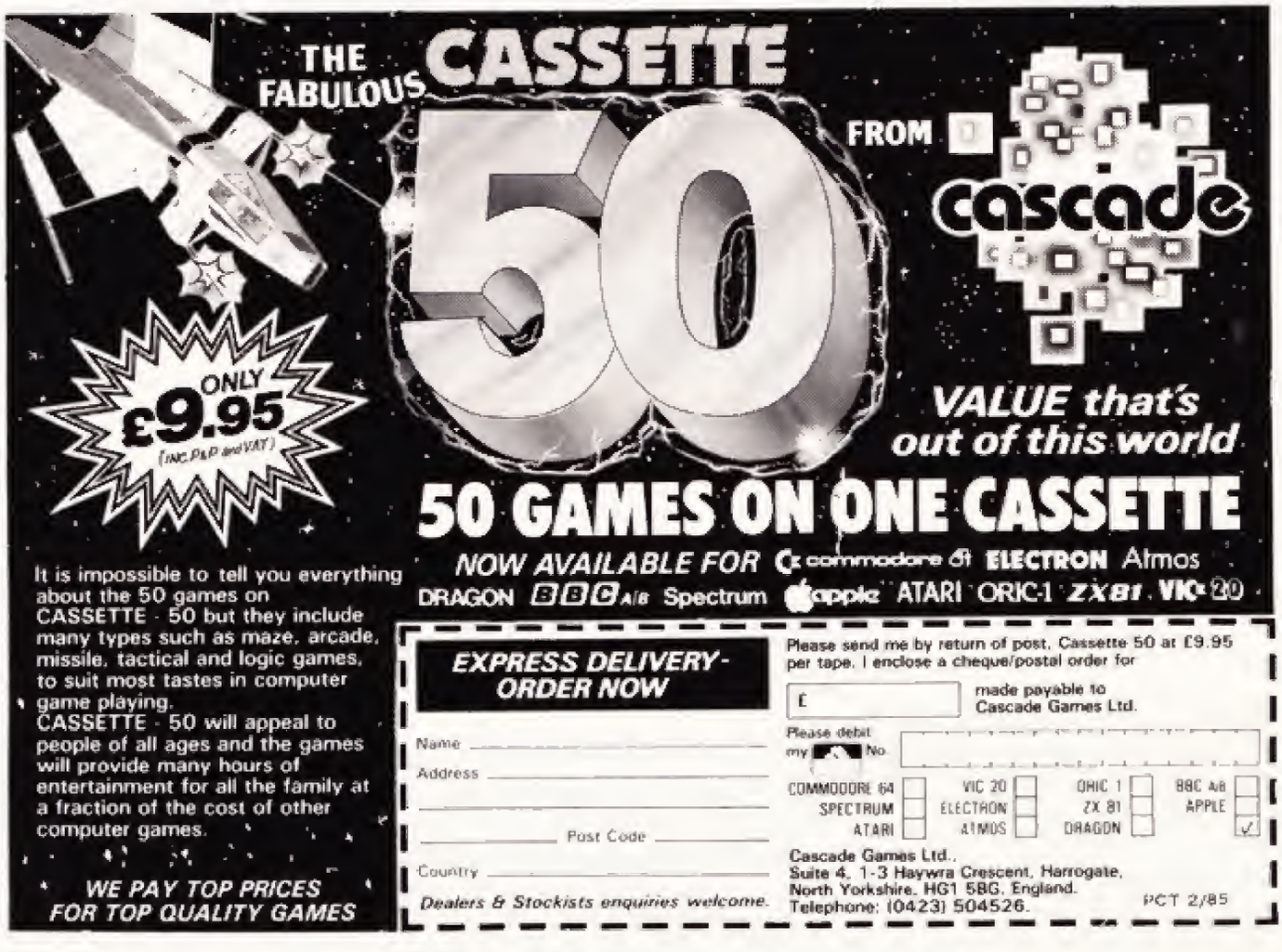
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PCT 2/85



VIC20 Basics

Machine code programmers need to know their decimal from hexadecimal. Read on to find out more. By Bob Wallace.

In my last article, we found out that in order to program in machine code or assembler, we had to use another number system which we called base 16 or Hexadecimal.

What we must learn now is how to convert from base 10 to base 16 and back again. It may well be a little confusing if you have not done any work on number bases before, but with a little practice, you will soon start to think in base 16.

Firstly let us look at a normal decimal number and see how it is made up. Consider the number 45657 (decimal). If we break this number down, we can see that it consists of the following:

4 lots of 1000 or $4 \times 10^3 = 4000$
5 lots of 100 or $5 \times 10^2 = 500$
6 lots of 10 or $6 \times 10 = 60$
7 lots of 10^0 or $7 \times 1 = 7$

If we now look at a HEX number, we should be able to draw some conclusions about the way it is constructed. Consider the number 11D7 (hex). It can be broken down into powers of 16 (since it is hex) as follows:

1 lot of 4096 or $16^3 = 4096$
1 lot of 256 or $16^2 = 256$
13 lots of 16 or $13 \times 16 = 208$
1 lot of 7 or $7 \times 1 = 7$

Thus we can see that 4567 (decimal) is equal to 11D7 (hex).

Now if we want to convert a much larger number from decimal to hex, it should be quite simple. Consider the number 36879 (dec) and let's convert it to hex by following these instructions carefully:
Divide the number by 16^3 or 4096 and keep a note of the remainder.
36876/4096 = 9 (DEC 9 = HEX 9) rem 15
Now divide the remainder by 16^2 and again keep note of the remainder.
15/256 = 0 (DEC 0 = HEX 0) rem 15
Now divide the remainder by 16 and keep note of the remainder.
15/16 = 0 (DEC 0 = HEX 0) rem 15

Since we cannot divide by a lower power of 16, 15 must be our final number in our hex number, 15 (dec) = F(hex). Thus 36879 (dec) = 900F (hex).

If you are still a little confused, go back and look at the examples again, and if you follow them through slowly, it should become clear.

Now for a little routine for you to type in called 'Beep'. It is written in BASIC and POKEs the machine code data into the cassette buffer. To start the routine type SYS828 and everytime you press a key, a 'BEEP' will be produced. This does not affect any BASIC program which is running in memory but it may affect loading and saving of programs.

program listing

```
10 LOC=828
15 READ A
20 IF A=-1 THEN PRINT "♥TYPE SYS 828 AND
   RETURN" : END
25 POKELOC,A:LOC=LOC+1:GOTO 15
30 DATA 120,169,221,141,20,3,169,27,141,
   21,3,88
40 DATA 96,169,0,141,14,144,141,12,144,
   165,203,197
50 DATA 150,133,150,240,14,201,64,240,10,
   169,200,141
60 DATA 12,144,169,15,141,14,144,76,191,
   234,-1

READY
```

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The March issue is overflowing with excellent programming articles:

CLASS OF '64 continues with an in-depth look at the CBM64's hi-res screen.

BASIC KIT is for owners of all home computers who feel the need for a helping hand while getting to grips with BASIC.

GAME TRICKS teaches you how to write your own gripping games on the Amstrad CPC464.

ENTERPRISING PCT!

The hardware review in the March issue is of the long-awaited ***Enterprise*** micro, which has been the subject of months of speculation. The 64K or 128K machines have a full travel contoured keyboard, which combined with the built-in word processing software, make it an ideal text manipulation micro. Graphics and handling are said to be excellent. Read more in the March issue.

MONITORING MACHINE CODE

A major feature in the March issue will be an article on machine code monitor ROMs for the BBC. A whole range is tested and the results reported.

GAMES CREATION

Another article will feature reports of games creation software packages.

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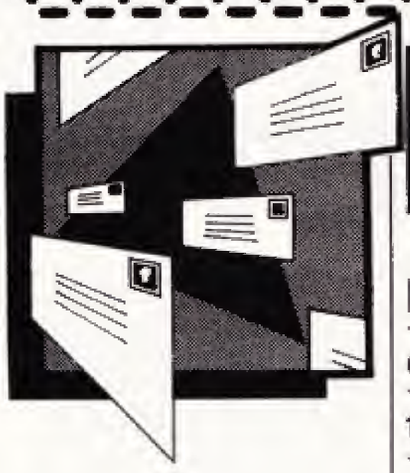
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Input

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.

Dear PCT
I would very much like to hear from any Atmos owners who have successful loads from cassette recorders. I have not been able to manage this yet!
Yours faithfully
Austin Meeson
41 Roebuck Road
Walsall WS3 1AH

We sympathise with you! It is very difficult to get good loads into an Atmos micro. The only advice we can give you is to fiddle with the volume control on the cassette recorder until you have a successful load. Once it is set up, you should have no problems. If any readers have any hints for Mr Meeson, drop him a line.



LETTERS

Dear PCT
I am writing for information on home micros. I am actively involved with the 'Disability Aid Fund', the aims of which are to assist severely handicapped persons to regain/retain some degree of independence by providing electronic aids.

The charity has asked me if a microcomputer would be of any help to me as a filing system/word processor/tuition medium and I have been given the task of finding the most suitable machine!

I have used a ZX81 which can hardly be classed as 'user friendly' and I am not too keen on the Spectrum's spaghetti-like interconnecting leads and wires as I have difficulties with balance and walking. The BBC Micro is a bit pricey (software as well!) and I don't really need MSX capability.

I have in mind, the Amstrad CPC464 colour computer as it appears to meet all my requirements. I have found your equipment reviews to be very helpful and well worth the



cost of the magazine on their own. What would you advise?
Yours faithfully
Chris Moore
Walsall Wood

As we've said many times before the final choice is up to the user but, again as we have said, the Amstrad CPC464 is an excellent machine for both the practical user and the fledging programming enthusiast and offers excellent value for money. At £349 for the colour system, it is definitely the cheapest on the market when you take into account the fact that it is a complete system of computer, monitor and cassette deck, which you can take home and RUN immediately.

There is already a word processor available for it and other utility, business and games programs are appearing all the time. In our opinion, taking into account your needs, the CPC464 is the ideal choice.

Dear PCT
In this high tech age we live in it is a pleasure to come across a firm that really cares. The firm in question is Memotech. I purchased a MTX512 almost twelve months ago and purchased the NewWord PCB for word processing.

While fitting the ROM into the MTX I must have either broken or disturbed something and I found that the reset keys would not work. I rang Memotech for advice and they asked if it would be convenient for them to send for the computer for repair and at no expense carry out any modifications necessary to bring the computer up to today's specifications. It is, as I say, nice to know I have this backing. Thanks again all the staff at Memotech.
Yours faithfully
B. Moss
Chesterfield

This is only one of the very complimentary letters we have received from very happy owners of Memotech machines. It is somewhat refreshing to find a company who takes so much trouble over owner enquiries. Well done, Memotech!

Dear PCT
I am being driven crazy by the game 'Valhalla' (Legend Productions). Out here not many people own home computers and I therefore have no one to go to for help except readers of *PCT*.

If any of you could give me some tips and hints on how to play the game, you could do your good deed for the day by writing to me at the following address. I long to hear from you!
Yours faithfully
Alexander Gromow
PO Box 18507
01000 Sao Paulo — SP
Brazil

Someone put poor Alex out of his misery!



Dear PCT
As an Einstein owner, I read your November 1984 Test with interest and found it on the whole fair comment. Possibly you could have elaborated a little more on the flexible screen editing (far superior to the BBC), the ability to re-number separate parts of a program independently, the file handling capabilities and the excellent fully programmable sound generator. However, to crib at the price seems a little unjustified considering the disk drive with 190K (formatted) per side.

As you say, the Spectrum to the same specifications would be much more, and the BBC with disk interface and formatter is in fact the same price as the Einstein, before adding the considerable cost of a disk drive.

As a matter of interest, the ease of running, saving and verifying programs in a matter of seconds with a built in disk, compared with many minutes on a spaghetti-layout tape drive (with often uncertain results) has to be experienced to be believed, and is worth the money alone.

I understand that an 80 Column board will be available soon, and a BBC emulator disk (to enable the Einstein to function as a BBC computer) is currently on sale at about £60.

Although there are some irritating features about the Einstein — the poor scrolling arrangement is one — I find it very easy to use and think it ideal for the small time but serious user. By the way, I believe Tatung do make larger computers, and their monitor (the TMO1) can be used with other computers. The Einstein also comes with a free LOGO language software package.
Yours faithfully
R.F. Hutchinson
Leeds





Pontoon Party

O.K. card sharps, get ready for a heavy game against the computer. Your casino boss is Tony Woollard.

Pontoon or *vingt-et-un* is a popular card game in homes and casinos around the world. Professional card players are hard to beat, but wait 'till you've tried playing with a computer.

In this version, you are the banker dealing to the computer. When you have 'dealt' two cards, the computer must decide whether to 'stick' or 'twist' in an attempt to reach the magic total of 21. Once the computer has made his choice, it is your turn to try to beat it without 'busting' i.e. getting a total higher than 21.

The winner of each round collects points to add to his score. The backcloth of the 'card table' can be selected according to the colour rendering of your T.V. set. So, visors on and settle down to a nail biting battle with your beeb!

procedures

PROCSELECT	Chooses random suit and pip value.
PROCCHECK	Uses a loop to check if selected card has been dealt already.
PROCSUM	Adds selected card value to total (ace = 1;computer: (ace = 11;you)
PROCSTORE	Stores value and suit into an array.
PROCTWIST	Prints "TWIST" in column format.
PROCFACE	White TEXT WINDOW with black edging.
PROCCARD	Prints suit and value onto face.
PROCSTICK	Prints "STICK".
PROCBUST	Prints "BUST".
PROCACE	Checks for any aces and adjusts score as appropriate.
PROCSC1	Amends scores based on win/lose.
PROCSC2	Amends scores based on win/lose.

BBC

how it runs

20-40	Generate a new random sequence to avoid identical patterns of first-hand deals when the micro is switched on.
50	Escapes from program into MODE 7 and AUTO-REPEAT normalised.
60	AUTO-REPEAT off.
70-150	Rules of the game.
160-200	Allow you to choose colour of background (E%)
220	Returns to the rules on ESCAPE.
230-280	Initialise arrays.
290-310	User-defined Characters (SUITS), and PIP value 10 (char.228).
330	Sets up screen for play.
340	Shuffles the pack when all cards have been dealt. (C% must not exceed 52 or else PROCCHECK will fail).
350-360	Initialise variables.
370-600	Place each player's first two cards FACE DOWN, check for repetition and decide whether to STICK or TWIST.
620-640	Your first two cards exposed.
650-790	Plays according to your commands.
800-860	Decides who has won, taking into account ACE being 1 or 11.
880-900	Expose the computer's first two cards, prints TOTALS and declares the winner of that hand.
910-930	New game when either player has lost all 50 tokens.

variables used

E%	Colour of backcloth in VDU19,0,E%,0,0,0
G%	Reserved for G% = GET statements
N%,S%	Number (1-13), suit (1-4) in loops
P%	Player (1 = computer, 2 = player)
R%,H%	Grid positions for cards on screen (horizontal)
V%	Value of NUM$ (N%)
TL%,A%, PONT%(z)	To cope with aces being 1 or 11
BUST%	0 = 21 or less, 1 = over 21
ME$(2,5), YOU$(2,5)	Suit and numbers of up to 5 cards in current deal, ME$ = computer, YOU$ = player
NUM%(65), SUIT%(65)	To hold details of all cards dealt in current shuffle
NUM$(13), SUITS(4)	Details of suit and number (including picture cards) of randomly selected cards
TWIST %	0 = No, 1 = Yes
WIN%	0 = player wins, 1 = computer wins

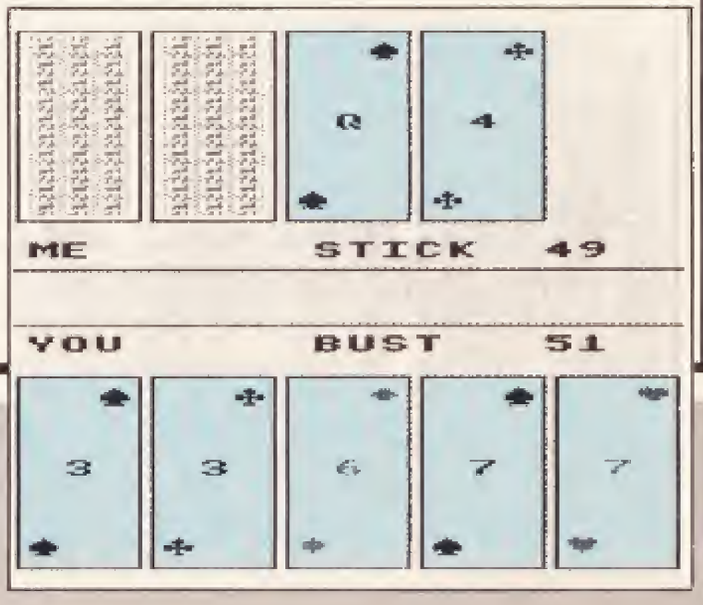
program listing

```
L.
   10 REM *** PONTOON A.A.WOOLLARD ***
   20 REM TO SET UP NON-REPEATED RANDOM SEQUENCE
   30 MODE7:PRINTTAB(5,10)"Press SPACE BAR to start ";
   40 REPEAT:Z%=RND(2):UNTIL INKEY$(0)=" "
   50  ONERRORGOTO940
   60 MODE4:VDU19,0,4,0,0,0:*FX11 0
   70 PRINTTAB(14)"**********"'TAB(14)"*          *" TA
B(14)"* PONTOON *"'TAB(14)"*          *"'TAB(14)"********
****"
   80 PRINT'" You are the BANKER and we both start" TA
B(12)"with 50 tokens"''"RULES:1.Aces count 1 or 11 -- w
e choose."'"       2.J,Q,K count 10; 2-10 face value."
   90 PRINT"       3.Players lose (BUST) if the score"'"
 with 2,3,4 or 5 cards is more than 21."'"       4.My s
core will always be over 15."'"       5.As you are banke
r I go first,and"'" must score MORE than you to win,so,
if"
  100 PRINT" you win you gain 1, but if I win I get" '
 for:    (a) PONTOON - Ace + 10    2"'"          (b) 5-CA
RD TRICK          2"'"          (c) ROYAL   ( 7+7+7 )
  5"'
  110 PRINTTAB(13)"Press any key  ";:G=GET:CLS
  120 PRINT'"       6.If you have 3-7 s ;t only counts'
" as 21,but if you have a 5-card trick"' " I collect 2
 tokens ONLY if I have a"'" Pontoon. If you have a Pont
oon I can"'" only win with a Royal,"'
  130 PRINTTAB(6)"7.The pack is shuffled when 40-50'
 cards have been dealt."'TAB(6)"I do not peep at your
 cards !"''
  140 PRINTTAB(7)"USE :"'" KEY T      .  Twist Another
 Card"'" KEY S      :  Stick ( when YOU play )"'" SPACE
 BAR :  Next Game"'" ESCAPE     :  Finish"
  150 PRINT" RETURN     :  Page One of these Rules"''TAB
(14)"Press any key  ";:G%=GET:IFG%=&0D GOTO660 ELSECLS
  160 PRINTTAB(6,6)"You can choose the backcloth :"   T
AB(6)"KEY     COLOUR"''TAB(7)"1      Red"''TAB(7)"2
Green"''TAB(7)"3      Yellow"''TAB(7)"4      Blue"''TAB(7
)"5      Magenta"''TAB(7)"6      Cyan"''
  170 PRINTTAB(6)"Select your colour ";
  180 G%=GET:IFG%<&21 ORG%>&36 OR(G%<&31 ANDG%>&26) VDU
7:GOTO180
  190 IFG%<&31 G%=G%+&10
  200 E%=G%-&30:PRINTE%''
  210 PRINTTAB(9)"Press any key  ";:F%=GET
  220 ONERROR CLEAR:GOTO50
  230 DIMNUM%(13),SUIT$(4),SUIT%(65),NUM%(65),ME$(2,5),
YOU$(2,5),TL%(2),A%(2),PONT%(2)
  240 SC1%=50:SC2%=50:C%=1
  250 A$="TWIST":B$="PLEASE":F$="STICK":H$="BUST"
  260 FORS%=1TO4:SUIT$(S%)=CHR$(223+S%):NEXT
  270 FORN%=1TO13:READNUM$(N%):NEXT
  280 DATA A,2,3,4,5,6,7,8,9,Z,J,Q,K
  290 VDU23,228,70,207,73,73,73,73,79,230,23,229,174,4
,132,61,188,37,148,117
  300 NUM$(10)=CHR$228
  310 VDU23,224,8,28,28,107,127,107,8,28,23,225,8,28,62
,127,62,28,8,0,23,226,54,127,127,127,62,28,8,0,23,227,8
,28,62,127,127,127,28,62
  320 MODE5:VDU19,2,6,0,0,0,19,0,7,0,0,0,17,130,12
  330 VDU5,18,0,3,25,4,0;560;25,5,1279;560;25,4,0;460;2
5,5,1279;460;25,4,30;610;:PRINT"ME":VDU25,4,30;440;:PRI
NT"YOU"
  340 IFC%>40 C%=1:SOUND1,-10,200,10:SOUND2,-10,140,10:
SOUND3,-10,170,10
  350 TL%(1)=0:TL%(2)=0:H%=570:M%=1:Y%=1:A%(1)=11:A%(2)
=11:PONT%(1)=0:PONT%(2)=0:T7%=0:W%=1
  360 VDU25,4,1000;0;0;:PRINT;SC1%:VDU25,4,1000;440;:PR
INT;SC2%:VDU18,0,0,25,4,800;525;
  370 FORI%=0TO256STEP256:P%=I
  380 FORJ%=65OTO305STEP=o20
  390 VDU26
  400 VDU24,10+I%;J%;240+I%;J%+340;16
  410 VDU19,3,0,0,0,0,18,0,3
  420 VDU29,10+I%;J%;
  430 VDU25,4,0;0;25,5,0;340;25,5,235;340;25,5,235;0;25
,5,0;0;
  440 IFC%>1 PROCSELECT:PROCCHECK:PROCSUM:PROCSTORE(P%)
 ELSEPROCSELECT:PROCSUM:PROCSTORE(P%)
```

Pontoon Party

program listing

```
  450 VDU18,0,1:FORR%=40TO330STEP32:VDU25,4,24:R%;229,2
29,229:NEXT
  460 IFP%=1 H%=610:M%=M%+1 ELSEH%=440:Y%=Y%+1
  470 IFTL%(P%)=21 PONT%(P%)=2
  480 IFP%=1 ANDV%=7 T7%=T7%+1
  490 P%=2:VDU18,0,128:C%=C%+1
  500 NEXT,
  510 VDU26,5:I%=512:J%=650:P%=1:H%=610:TWIST%=0:BUST%=
0:REPEAT
  520 IFTL%(1)<16 TWIST%=1
  530 IFTL%(1)>21 TWIST%=0:BUST%=1
  540 IFTL%(1)=16 ORTL%(1)=17 ANDRND(13)<20-TL%(1) TWIS
T%=1
  550 IFTL%(1)>17 ANDTL%(1)<22 TWIST%=0
  560 IFTWIST%=1 THEN PROCTWIST:REPEAT:G%=GET:UNTILG%=&
54 ORG%=&74 ELSE G%=0
  570 IFG%=&54 ORG%=&74 PROCFACE:PROCSELECT:PROCCHECK:P
ROCSUM:PROCSTORE(P%):PROCCARD:I%=I%+256:C%=C%+1
  580 IFM%>5TWIST%=0:IFTL%(P%)>21 BUST%=1
  590 UNTILTWIST%=0 ORM%>5
  600 IFBUST%=1 PROCBUST:GOTO750 ELSEPROCSTICK
  610 VDU26,5,18,0,128:P%=2:J%=30:y%=1
  620 FORI%=0TO256STEP256:PROCFACE
  630 IFYOU$(2,y%)=CHR$224 ORYOU$(2,y%)=CHR$227 VDU18,0
,3 ELSEVDU18,0,1
  640 VDU25,4,150;320;:PRINTYOU$(2,y%);:VDU25,4,86;190;
:PRINTYOU$(1,y%):VDU25,4,18;50;:PRINTYOU$(2,y%):y%=2:VD
U26:NEXT
  650 H%=440:I%=512:TWIST%=0:BUST%=0:REPEAT
  660 VDU18,0,3,25,4,I%+120;250;63
  670 G%=GET:IFG%<>&54 ANDG%<>&74 ANDG%<>&53 ANDG%<>&73
 THENVDU7:GOTO670
  680 IFG%=&54 ORG%=&74 PROCFACE:PROCSELECT:PROCCHECK:P
ROCSUM:PROCSTORE(P%):PROCCARD:I%=I%+256:C%=C%+1
  690 VDU26,18,0,3,18,0,130
  700 IFA%(2)=11 ANDTL%(2)>21 PROCBUST:G%=&73:GOTO720 E
LSEIFA%(2)=1 ANDTL%(2)>21 PROCACE:IFTL%(2)>21 PROCBUST:
G%=&73:GOTO720
  710 IFG%=&53 ORG%=&73 PROCSTICK:VDU26,5,25,4,I%+184;2
50;127
  720 UNTILG%=&53 ORG%=&73 ORY%>5
  730 IFTL%(2)>21 PROCACE
  740 IFTL%(2)<22 PROCSTICK ELSEPROCBUST
  750 VDU26,18,0,0,18,0,130,25,4,150;525;:W%=0
  760 IFM%=6 ANDTL%(1)<22 PONT%(1)=1
  770 IFY%=6 ANDTL%(2)<22 PONT%(2)=1
  780 IFPONT%(1)>0 W%=2
  790 IFT7%=2 ANDTL%(1)=21 W%=3:PONT%(1)=3
  800 WIN%=0:IFTL%(1)<22 ANDTL%(2)<22 ANDPONT%(1)>PONT%
(2) WIN%=1 ELSEIFTL%(1)<22 ANDTL%(2)<22 ANDTL%(1)>TL%(2
) WIN%=1
  810 IFTL%(1)<22 ANDTL%(2)>21 W%=1
  820 IFTL%(1)<22 ANDTL%(2)<22 ANDPONT%(2)>PONT%(1) WIN
%=0
  830 IFWIN%=1 PRINT"I WIN ";W%;" Token":W%=1:PROCSC1 E
LSEPRINT"YOU WIN 1 Token":PROCSC2
  840 G%=0:IFW%=1 ANDW%>1 VDU25,4,962;525;:PRINT"s"
  850 IFTL%(1)>21 GOTO910
  860 P%=2:FORH%=440TO610STEP70:VDU26,18,0,0,18,0,130,
25,4,290;H%;:PRINT;TL%(P%);:P%=1:NEXT
  870 VDU26,5,18,0,128:P%=1:J%=650:m%=1
  880 FORI%=0TO256STEP256:PROCFACE
  890 IFME$(2,m%)=CHR$224 ORME$(2,m%)=CHR$227 VDU18,0,3
 ELSEVDU18,0,1
  900 VDU25,4,150;320;:PRINTME$(2,m%);:VDU25,4,86;190;:
PRINTME$(1,m%):VDU25,4,18;50;:PRINTME$(2,m%):m%=2:VDU26
;NEXT
  910 IFSC1%<=0 ORSC1%>=100 VDU19,0,3,25,4,85;750;7:PRI
NT"Press RETURN for a new game":G%=GET:IFG%<>&0D GOTO910
  920 IFG%=&0D SC1%=50:SC2%=50:C%=1:GOTO320
  930 G$=GET$:IFG$<>" "VDU7:GOTO930 ELSEGOTO320
  940 *FX12 0
  950 MODE7:END
  960 DEFPROCCHECK
  970 FORZ%=1TOC%-1:IFSUIT%(Z%)=SUIT%(C%) ANDNUM%(Z%)=N
UM%(C%) Z%=0:PROCSELECT:NEXT ELSE NEXT
  980 ENDPROC
  990 DEFPROCSELECT
 1000 S%=RND(4):SUIT%(C%)=S%:N%=RND(13):NUM%(C%)=N%:IFS
UIT%(C%)=1 ORSUIT%(C%)=4 VDU18,0,3 ELSEVDU18,0,1
 1010 ENDPROC
 1020 DEFPROCSUM
 1030 V%=VAL(NUM$(N%)):IFV%=0 V%=10:IFNUM$(N%)="A"ANDP%
=1 V%=1:A%(1)=1
 1040 IFNUM$(N%)="A"ANDP%=2 V%=11:A%(2)=1
 1050 IFP%=1 ANDTL%(1)=1 ANDV%>6 TL%(1)=11
 1060 IFTL%(1)<11 ANDA%(1)=1 ANDTL%(1)+V%>8 ANDTL%(1)+V
%<12 ANDP%=1 ANDM%=2 TL%(1)=TL%(1)+10
 1070 ENDPROC
 1080 DEFPROCSTORE(P%)
 1090 IFP%=1 ME$(1,M%)=NUM$(N%):ME$(2,M%)=SUIT$(S%):TL%
(P%)=TL%(P%)+V% ELSEYOU$(1,Y%)=NUM$(N%):YOU$(2,Y%)=SUIT
$(S%):TL%(P%)=TL%(P%)+V%
 1100 ENDPROC
 1110 DEFPROCTWIST
 1120 VDU26,18,0,0,25,4,I%+36;950;:FORO%=1TO5:A$=MID$(A
$,0%,1):PRINTB$;:VDU25,0,-64;-50;:NEXT:VDU25,4,I%+120;9
50;:FORD%=1TO6:C$=MID$(D$,0%,1):PRINTC$;:VDU25,0,-64;-5
0;:NEXT
 1130 ENDPROC
 1140 DEFPROCFACE
 1150 VDU18,0,128,24,10+I%;J%;240+I%;J%+340;16,18,0,3,2
9,10+I%;J%;25,4,0;0;25,5,0;340;25,5,235;340;25,5,255;0;
25,5,0;0;
 1160 ENDPROC
 1170 DEFPROCCARD
 1180 IFSUIT%(C%)=1 ORSUIT%(C%)=4 VDU18,0,3 ELSEVDU18,0
,1
 1190 VDU25,4,150;320;:IF P%=1 PRINTME$(2,M%);:VDU25,4,
86;190;:PRINTME$(1,M%);:VDU25,4,18;50;:PRINTME$(2,M%):M
%=M%+1 ELSEPRINTYOU$(2,Y%);:VDU25,4,86;190;:PRINTYOU$(1
,Y%);:VDU25,4,18;50;:PRINTYOU$(2,Y%):Y%=Y%+1
 1200 ENDPROC
 1210 DEFPROCSTICK
 1220 VDU26,18,0,3,25,4,570;H%;:PRINTF$
 1230 ENDPROC
 1240 DEFPROCBUST
 1250 VDU26,18,0,3,25,4,570;H%;:PRINTH$
 1260 ENDPROC
 1270 DEFPROCACE
 1280 FORZ%=1TOY%-1:IFTL%(2)>21 ANDYOU$(1,Z%)="A" TL%(2
)=TL%(2)-10:YOU$(1,Z%)=""
 1290 IFTL%(2)>22 Z%=Y%-1
 1300 NEXT
 1310 ENDPROC
 1320 DEFPROCSC1
 1330 SOUND0,-15,3,10:SOUND1,-15,200,10:SOUND2,-15,250,
10
 1340 SC1%=SC1%+W%:SC2%=SC2%-W%:VDU25,4,1200;610;127,127
,127:PRINT;SC1%:VDU25,4,1200;940;127,127,127:PRINT;SC2
%:ENDPROC
 1350 DEFPROCSC2
 1360 SOUND1,-15 250,15:SOUND2,-15,200,10:SOUND3,-15,15
0,5
 1370 SC2%=SC2%+1:SC1%=SC1%-1:VDU25,4,1200;610;127,127,
127:PRINT;SC1%:VDU25,4,1200;440;127,127,127:PRINT;SC2%:
ENDPROC
```





Testbed

Simon Rockman has been having fun testing some of the more adventurous add-ons for the Commodore 64.

ADD-ONS

SPEECH 64 SPEECH SYNTHESISER
Currah, Graythorp Ind. Est., Hartlepool, Cleveland TS25 2DF
Price: £29.95 inc. pp.

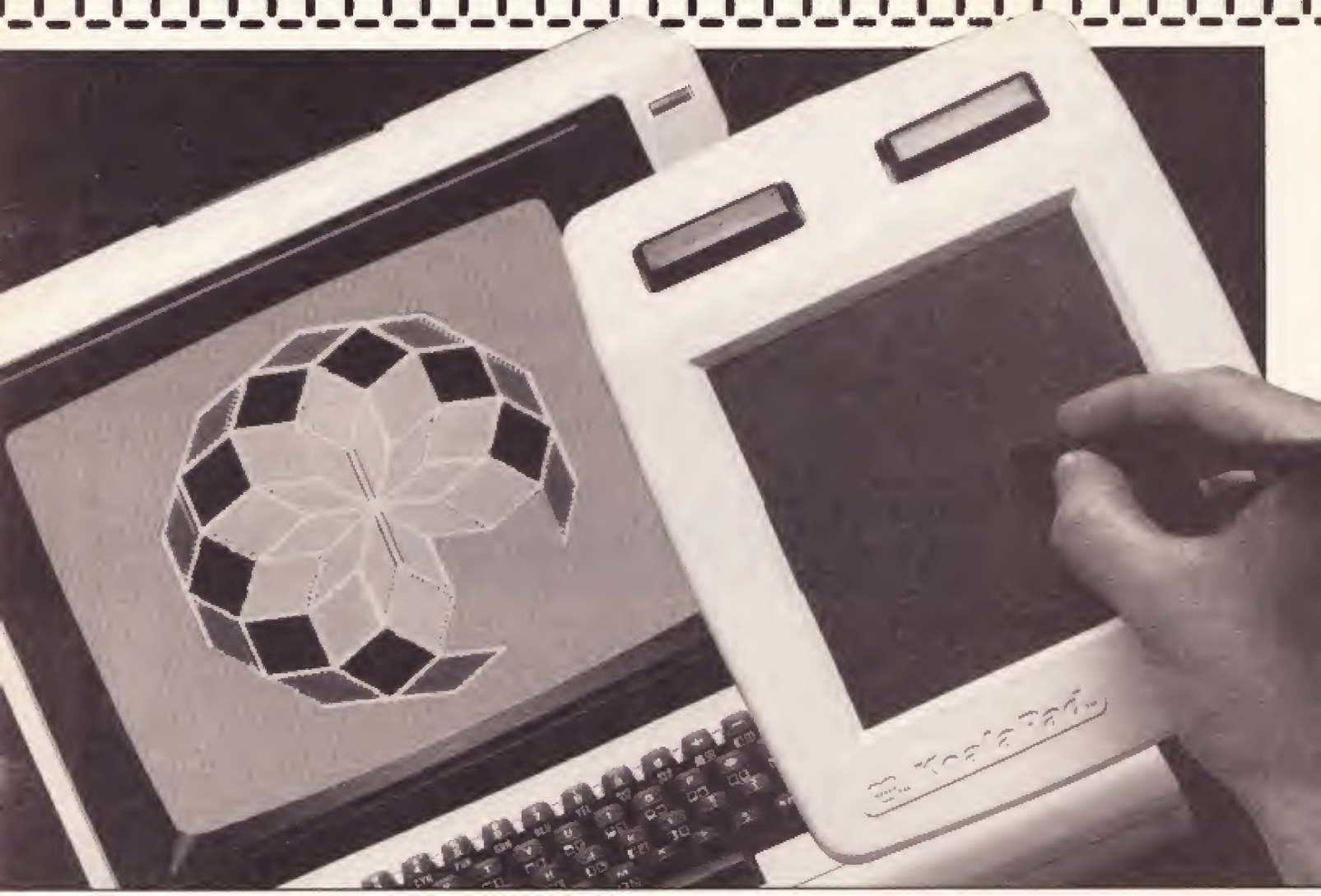
Before Commodore changed the name of its new computer from the 264 to the Plus 4 it was envisaged that it would have the option for speech.

Until I saw a demonstration of this I thought that speech synthesis was a gimmick. A prototype 264 proved me wrong. It was running "Talking Easyscript". All the prompts were supplemented by a clear voice. So if the printer had not been plugged in, the computer would say "I cannot see the printer," Instead of just printing '?Device not present' error.

Speech can be useful. It is also great fun. Anyone who has spent some time in amusement arcades will know the way the pulse races when a machine warns you with "Prepare to die Earthling". If the voice is clear enough it can add a lot to a game.

The Currah unit for the 64 is an excellent implementation of a speech synthesiser. It plugs into the cartridge and video ports but does not need to be connected to the television. The Spectrum version has sold very well and has been supported by many software houses. The 64 version is





much more advanced, being easier to use, understand and program.

In the cartridge's memory is a set or rules for putting together a word from its basic sounds. Most exceptions are stored in a table so that things like "knife" are pronounced correctly. This cannot cope with names but these can be produced phonetically.

The manual is clear and brief. A full list of sounds is given and with the help of the examples it should be possible to make the synthesiser say almost anything.

If you are writing a BASIC program and want to include speech then the Currah unit is for you. However, if you want to play games which talk to you, the choice is a shade limited. The new Anirog game — PC Fuzz uses the micro speech but there is a trend, especially with American software, to use speech generated by software. The sound in Activision's "Ghostbusters" is amazing. It is almost worth being killed to hear it say "He slimed me". If this can be done in software it may not be worth buying add-on hardware. Currah would argue that their system is more memory efficient. It is also more expensive.

KOALA PAD
Audiogenic Ltd, 39 Suttons Ind. Park, Reading, Berks
Price: £79.95

When your great aunt from Australia comes to visit there will be a time when she looks at your computer and asks the dreadful question "Yes, But what can it do?". This is always a tricky one. What use is stock control in a bedroom? You could show her Chess but that soon becomes a bore if you haven't the time to concentrate and play properly. Baffling her with NAN's and NOP's, flips and flops may work but it would be far better if you could impress her with your computer.

Here the Koala pad comes into its own. After a quick demonstration Aunt Mabel can be using it and will convince herself that she is the next Leonardo.

The Koala pad is really very easy to use, even setting it up is a doddle. Just plug it into the first joystick port and load the tape, disk or cartridge. Spend about three minutes scanning the manual, longer if you have to wait for the tape, and dive in.

The menu takes the form of a screen full of diagrams — not unlike the trendy Icon driven stuff on the latest business micros. The options are: Draw, Frame, Circle, Xcolour, Mirror, Line, Box, Disc, Copy, Swap, Rays, Fill, Zoom, Dump and Storge. Ooops and Erase allow you to correct and forget mistakes. Draw is probably the most useful of the commands, it allows you to move the stylus around on the Koala pad without restriction.

There are various pen styles and sizes which give anything from fine lines to paintbrush and stipple effects. There is no airbrush facility but on the Commodore 64's 160 by 200 multicolour bit mapped screen, I doubt that an airbrush would look right.

Most of the facilities are obvious from the name of the function. Frame draws an unfilled box, box a filled one. Circle and disc have a similar correlation. Xcolour allows you change the colour of an existing pattern. Copy allows you to replicate part of the screen; it is easy to turn one little man into a crowd.

Perhaps the nicest feature is Zoom. This is great for close-up, detailed work. One section of the screen shows the picture in its standard size, the other a magnified version of the section you are working on. As you move around the screen scrolls.

If you have written a simple, sprite based, game it would be improved greatly if you designed a high res back drop to go with it. The manual contains a program showing how to include screens in your own programs. All in all the Koala pad is a very nice package, your only problem may be getting it away from Aunt Mabel.

MODEM
Commodore Business Machines (UK) Ltd.
Price: £99.95 including 1 years free subscription to Compunet.

Warning! Commodore's little black box can seriously affect your 'phone bill. A modem is a device which allows you to connect a computer to the telephone line. This in turn enables two computers to exchange data. If they are the same type of computer they can even run each other's programs.

By itself a modem is about as useful as a telephone with no-one to call, and like all things computer-related it is necessary for you to have the correct software to run it. Commodore have solved all these problems by setting up Compunet and putting the software inside the modem. To use Compunet you have to register and once armed with a suitable identification code you can plug in and dial up.

Setting up is very simple. The modem plugs into the Commodore 64's cartridge port and has a wire coming out of it. This plugs into the new style BT telephone sockets — the type with the doors. If you have the old type of socket think about either having them changed or — if you plan to use the modem a lot — getting a second line.

Switch on and you will be greeted with a message telling you that the modem is plugged in. At this point disk owners would do well to format a disk as they will need it later. To connect to Compunet you press shifted 'c'. The computer will prompt you for a number. Depending on where you live there will be a local number for you to dial. The actual dialling is done by the modem, you simply type in the number.

When the connection is made the border colour changes. A simple title page lets you know that you are in. The two computers, yours and the host, then have a little chat behind your back. The job of this is to tell the host who is calling. It can do this because each Compunet modem has a code number inside it. This unique feature makes Compunet much more secure than Prestel, its British Telecom rival. It does mean that you can only log into Compunet with your own modem but this won't affect the majority of users. Once the host knows who you are supposed to be it asks you for your name and password. This prevents unauthorised people from using your modem.





Because Compunet is designed to make the most of the Commodore 64 it has to have a lot of software at the micro end. There is already 8K in the modem's ROM but another 5K is needed and this is sent down the 'phone line. This takes a while but the extra bit can be saved when you come off line and then reloaded before logging in again. The process of sending this 5K of code is known as linking.

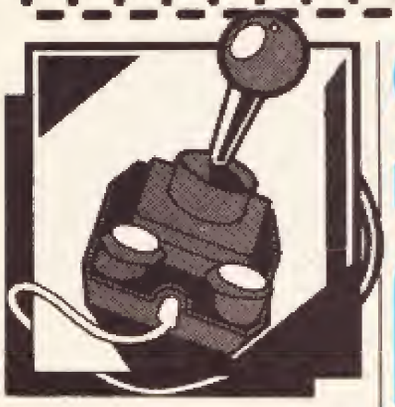
Compunet is user-friendly. The whole system is controlled by a set of menus. The up and down cursor keys select the page to be worked on and the left and right cursors select the operation to be performed. The options are DIR, SHOW, BUY, SAVE, EDITR, HELP, LEAVE, UCAT, ACCNT, UPLD, LIFE, PRINT, BACK, GOTO, MAIL and VOTE. If Compunet decide to add some commands at a later date they just need to link in an extra bit when you log in. Going through the commands illustrates the power of the system.

- **DIR** lists the set of pages in a section. You can get from page 0 to anywhere in the system by going from DIR to DIR.
- **SHOW** displays a page of free information. The page is read into the 64's memory for later recall.
- **BUY** reads pages for which there is a charge and it tells you how much it is going to cost. To read programs it is necessary for you to use BUY even if the program is free.
- **SAVE** copies a downloaded program to tape or disk.
- **HELP** provides a very brief page of information.
- **LEAVE** logs you off the system.
- **UCAT** lists all the pages you have left on the system.
- **ACCNT** shows how much you owe Compunet — or if you have sold some pages or programs — how much compunet owes you. They had a little bit of trouble when I was using the system and I found myself £158,000 in credit. Unfortunately this vanished the next day. All seems OK now.
- **UPLD** This is the command you use to send pages or programs to the system. It is very slow but makes Compunet what it is. UPLD asks you what type of file it is, how much you want to charge for it and how long you want to leave it there for.
- **LIFE** allows you to extend the amount of time an item is to be left on for.
- **PRINT** copies the current frame to a printer. This assumes that you have a dot matrix printer on device 4. So for all of us with 1520s — tough!
- **BACK** is the opposite of DIR. It will take you all the way back to the welcome page.
- **GOTO** takes you straight to a numbered page. It waves all the messing about with DIRs.
- **MAIL** allows you to send and receive private messages to and from other users.
- **VOTE** allows you to give a rating to other people's software.
- **EDITR** allows you to create your own frames for uploading or mailing. The EDTR has a comprehensive set of commands of its own.

Compunet is certainly a very nice service but to a very great extent it relies on the users to make or break it. There are some nice sections building up including the adventure game MUD (Multi-User Dungeon) but at the moment it is limited by cost and speed. When the user base builds up, and it is pretty rapidly, Compunet should be very important.

The modem does not limit you to Compunet. By downloading the appropriate software it is possible for you to access Prestel and other similar databases or to call other '64 owners direct with the user to user software and exchange data and programs. However, because the protection built into the modem can be used to tailor programs you download, it will not be possible for you to pirate them.

In this review there have been many areas which we have skimped on. Communications is a huge, and very exciting, topic to dive into head first and you won't regret it. At least not until the envelope with a little red warning lands on the doormat. Happy hacking.



Software Reviews

REVIEWS

Title:	Microgo 1
Format:	Tape
Software House:	Edge Computers Ltd, 3 Junction Rd, Reading, Berkshire
Price:	£9.95
Machine:	**BBC Model B and Electron**



I must confess that I have only played the Oriental game of Go! a few times before, although I quite enjoyed being soundly beaten by a player many years my junior! However, if this version is anything to go by, we could be seeing quite a bit of this strategic game around.

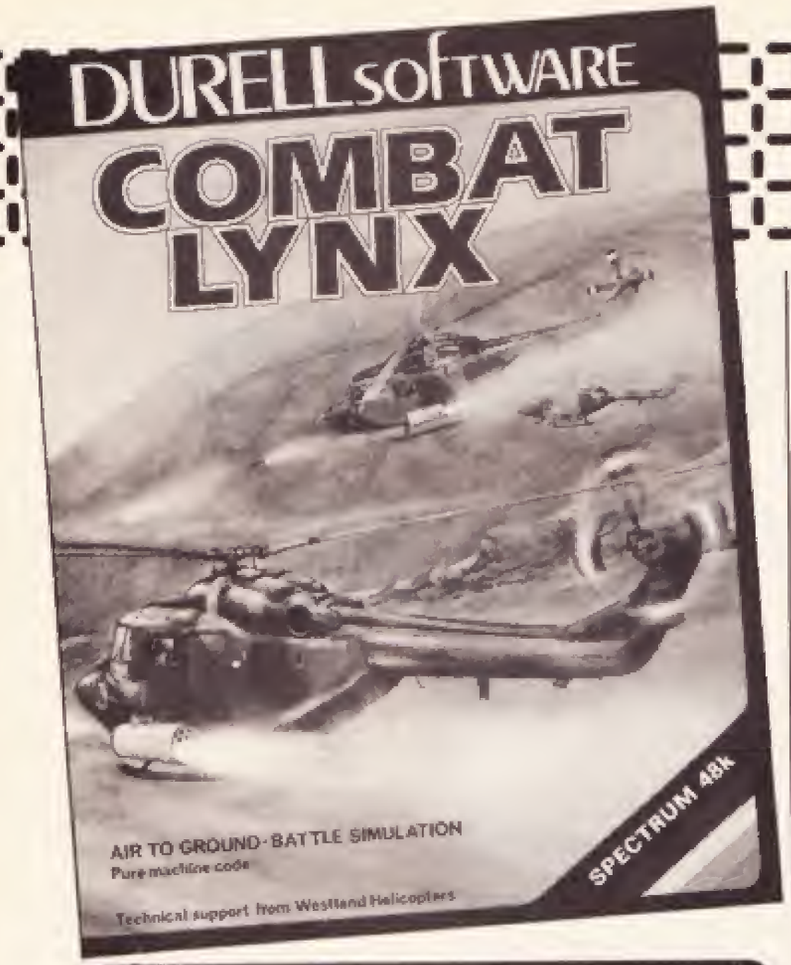
The game itself is exquisitely simple, having only three basic rules. Like Chess (which also originated in the East), it has a complexity of approach which prevents one ever reaching he stage of knowing it all. Territory is to be fought over, and the small army units are replaced by round counters of the player's colour. As in war, a surrounded army is defeated, and the counter is removed from the board as a method of scoring. Obviously pieces near the edges of corners of the board have fewer escape paths, or liberties, and when there remains only one avenue of escape, the cry of Atari! signals the imminent demise. There, I'm sure all you Atari owners have always wondered. . . . !

Playing the game shows evidence of the thought which has resulted in this complex game fitting into the meagre 32K memory, for placing a counter is simplicity itself, using the cursor and RETURN keys. Equally, there is an option to pass, or to resign. I kept to the beginner format chiefly, which gives helpful prompt and clues, although the game is clearly and simply demonstrated and explained first, if necessary.

Various options are available, including 10 skill levels, plus a beginner option, and a sound/silent choice. In addition, the micro can play itself or a human, or two mere mortals can battle it out. I feel that any Go! player will welcome this challenge and the keen beginner will also take well to this. However, the main problem facing this game is an acceptance of the game itself, which has never really caught on against Chess, Bridge etc. If this cassette starts a rash of other versions, we might all be playing it soon!

P.T.

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



Title:	Combat Lynx
Format:	Tape
Software House:	Durrell, Castle Lodge, Castle Green, Taunton TA4 1AB
Price:	£8.95
Machine:	**Spectrum 48K**

This is probably the most comprehensive "real time" battle simulation program ever written for a home computer. You are the pilot of a highly advanced Combat Lynx, with which you have to defend allied bases, by supplying troops and air cover. Before play commences, you have to load up your helicopter with the ammunition you wish to carry.

A booklet of instructions is given, which will tell you all you need to know, fortunately. The bottom half of the screen is a maze of indicators, such as temperature reading, navigation co-ordinates, arms status etc. The top half shows the landscape and your line of flight.

The choice of colour is excellent and the sound is quite acceptable. The 3D prospective used, takes a little time to get used to and although the helicopter itself is a little small for clear definition, it is still possible to see it banking left and right.

This game is one of the rare breed, that requires extensive playing time, before all its potential can be realized, but it is worth every minute taken. **G.W.**

STAR TABLE	
Screen display	★★★★★
Addictiveness	★★★★★
Ease of use	★★★★★
Overall	100%

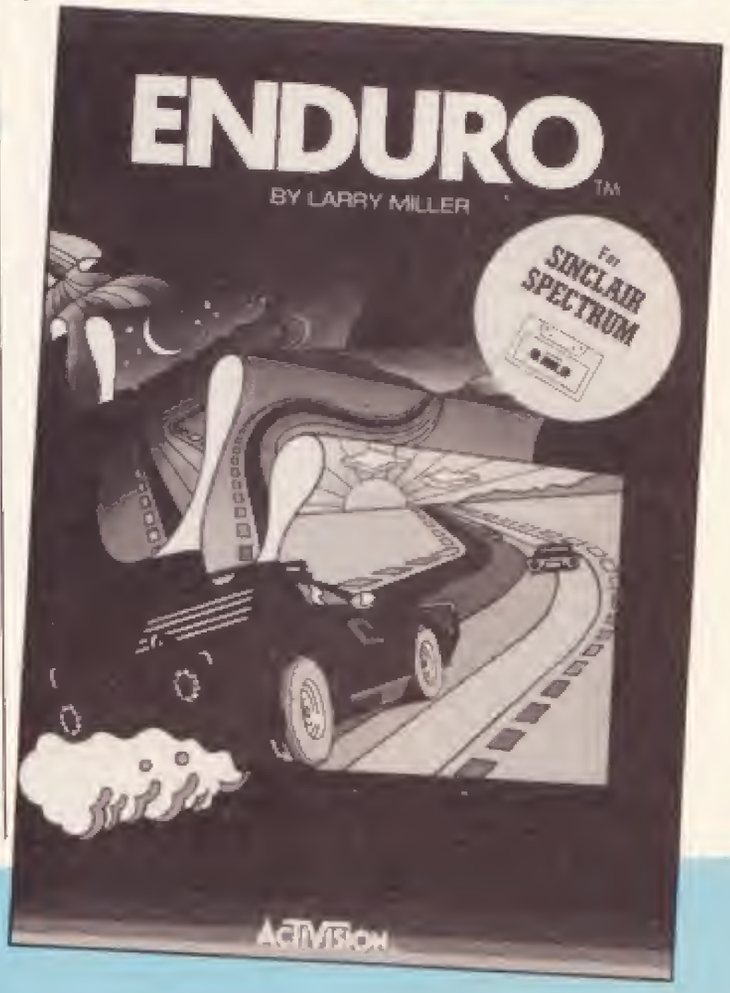
Title:	ENDURO
Format:	Tape
Software House:	Activision
Price:	£7.95
Machine:	**Spectrum 48K**

As the title suggests, Enduro, is an endurance racing car test, where you must pass a number of cars each day before being allowed to carry on, eg. first day 200 cars, and 300 thereafter.

A full set of instructions are given and a choice of keyboard, joystick, etc. Controls are simple, merely accelerate, brake, and move left or right. The screen display is reasonably good, with an excellent change of weather conditions, including ice and fog. The night driving is particularly difficult because only the tail lights of your fellow racers are visible. On screen is the number of kms covered the cars passed, also the number of days you have been racing are shown.

Quite a good game, but a disappointing ending to a days racing, as the display simply stops, with no notification of the race's finish **G.W.**

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



Title:	Peter Pan — The Adventure Game
Format:	Tape and book
Software House:	Hodder and Stoughton, 47 Bedford Square, London WC13 3DP
Price:	£9.95
Machine:	**Spectrum 48K**



This is a most friendly introduction to adventure gaming, being beautifully illustrated and not too difficult. You are Peter Pan, and your aim is to destroy Captain Hook and steal his ship, so that Wendy and the boys can return home.

Naturally if you fall in the mysterious river and get swept out to sea you will be eaten by sharks, and you can be marooned on an island in the Mermaids' Lagoon, too weak to swim to shore. However, if you have remembered to SAVE your progress before getting into that mess, you will be able to start again not too far back by using a LOAD.

Otherwise, you will have to begin at the beginning in the childrens' bedroom. There you must find your shadow and sew it on before finding Tinker Bell so as to fly away with the help of her fairy dust.

T.R.W.

STAR TABLE	
Screen display	★★★★
Fun Value	★★★★
Ease of use/ Documentation	★★★★
Overall	80%

Title:	Cash Controller
Format:	Disk
Software House:	Richard Shepherd Software, 23-25 Elmshott Lane, Cippenham, Berks
Price:	£14.95
Machine:	**CBM 64**

This is a potentially useful package for those who like to keep track of their expenditure. The routines are nicely written and crash-proof.

The package starts by presenting a Main Menu. First time users would then select from this the Budget Menu and set up their budget headings. You are allowed up to sixteen budget headings, e.g. Car, Heating, Phone etc. There is an option to change these headings at a later date if you have second thoughts. Having set up the budget headings you can then allocate a budget to each heading. Finally you can transfer to the Bank Account Menu and set up an opening balance. To cut out unnecessary repetition, you can even set up standing orders.

Having set up your budgeting system you would then subsequently update the situation via the Bank Account Menu. Entering transactions is very simple and the prompts are clear. First you enter the date, then a short (up to ten characters) description. Next you enter the budget heading to be debited (or credited) and the amount in question. That's all there is to it. The computer does the appropriate calculations and updating as necessary. You can then call up a number of reports, to the screen or the printer.

You can print out your budget headings, just for reference. More to the point you can print out details of your budgets and variances (the difference between what you allowed and what you spent). You can also print out a statement listing all transactions between two specified dates.

Your files can be saved and loaded from disk or tape. The tape version of this package being £9.95. Lastly there is an independent routine for loan calculations.

Owners of non-Commodore printers would need to check the package works with their interface as there are no printer options available in the package. It did not format correctly to my Epson but this is almost certainly because of the interface I'm using, a Vicsprint. I found the package foolproof. The only niggle being that there was not a quit option, which means turning the computer off at the end.

L.C.

STAR TABLE	
Instruction	★★★★
Ease of uses	★★★★
Display	★★★★
Value for money	80%

Title:	Nifty Lifty
Format:	Cassette
Software House:	Visions Software Ltd., 1 Feldgate Mews, Studland Street, London
Price:	£5.95
Machine:	**BBC Models A/B (32K)**

Perhaps the most superb tune I've heard since that marvellous Dr. Who theme on the BBC tape of that name! The trouble is that this tune, The Entertainer played in three part harmony, has to be selected at the very start of the main load and it gets a little wearying by the tenth game or so, there being no way to turn it off once the game is running! The trouble is that it's too good a tune not to listen to. . .

The idea of the game is very simple, with a shopper wandering through the store collecting as many goods as he can, moving from floor to floor through the shop. The trouble is, of course, in those maniacal lift operators who delight in squelching customers! On the first screen, the number of lifts allows you much more than a sporting chance, but with success come further problems for there are more lifts installed, and these are operated by even more erratic attendants who suddenly change direction as they feel the urge.

The controls are very simple, with only Z and X to alter lateral motion. Once started, the customer continues moving in one direction until the opposite button is touched, which takes a little getting used to, but which helps to show off the very smooth animation to good advantage.

Overall, this is a good game, with a fair degree of addictiveness. Like many good ideas, it is extremely simple — maybe too simple at times! **P.T.**

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

Title:	Return Of The Ring
Format:	Tape
Software House:	Wintersoft Software, 30 Uplands Park Road, Enfield, Middx. EN2 7PT
Price:	£9.95
Machine:	**Dragon 32**

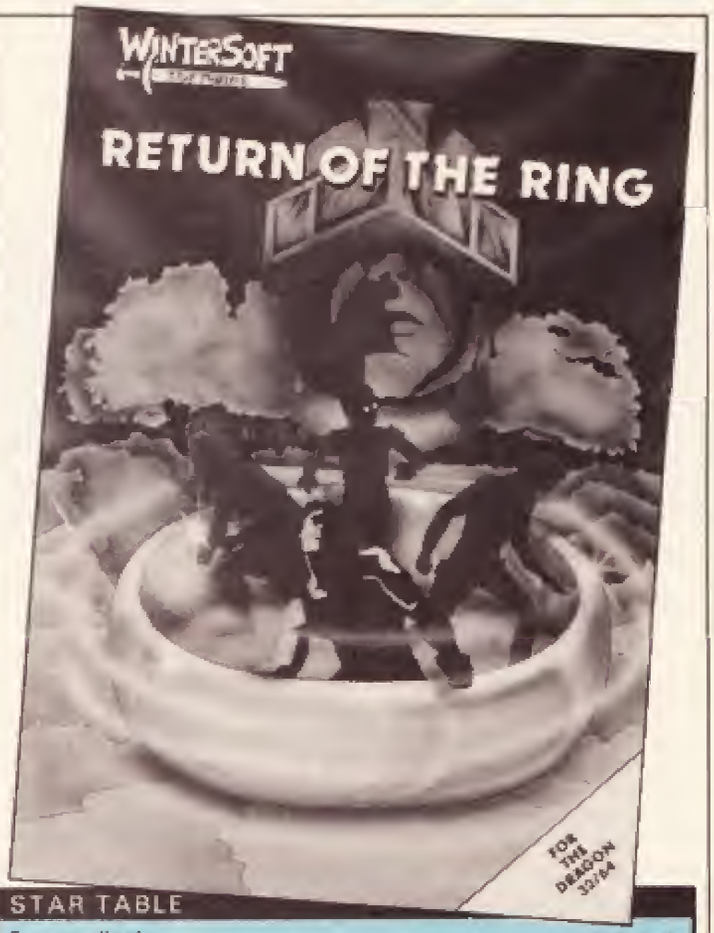
Return Of The Ring is the successor to The Ring of Darkness, although it is not necessary to have completed this adventure in order to attempt the second. Wintersoft call it 'the most sophisticated game program yet written for the Dragon 32', and although this may not be absolutely true, the game is definitely very good.

Now that you have the Dark Ring, Shadir, you must return it to its creators, the Masters of Ringworld. This involves roaming around a city inhabited by mutants and being transported to and from different villages and a moon.

The display is divided into two sections, the upper half shows you a picture of where you are, and the bottom half is used for messages between you and the computer. There are seventeen 'action commands', and although this may not be quite as many as in other adventures, you manage quite well.

Now and then you will meet 'Actel' characters. These friendly people play an important role in the adventure and you can tell them to fight, carry objects, give objects to you and do virtually anything that your own character can do.

Return Of The Ring must be one of the best adventures ever written for the Dragon, and will keep the compulsive adventurers of this world glued to their computer. **B.D.L.**



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



Diamond Dash

SPECTRUM 48K



You have to be quick to collect the jewels before the bomb explodes! Created by Christopher Sully.

The object of this game is to collect the ten shining diamonds which are scattered around the screen. Sounds easy? Well, don't judge too soon. To harden your labours there are monsters and bombs, popping up and exploding in your path. That's not all, time is running out for you, signalled by the 'beeper'. The higher the beep, the less time you have left and when the sand has run out, all the bombs explode killing you instantly.



variables used

hs	Highest score so far
m$	Name of highest scorer
v	If V = 0, the UDGs and machine code are set up
s	Score
l	Level
t	Time remaining
j	Number of crystals collected
a,b	Position of your man
mc	Activates machine code routines
r,r¹,rnd,rnd¹	Set up screen

hints on conversion

This program should be fairly easily converted to most micros. Leave out the machine code and machine code calls (SET MC = USR etc) and the POKEs.

how it runs

Line	Effect
1	Sets INK and PAPER, sets CAPS LOCK and keyboard beep. Sets up variables.
2	GOTO routine to set up UDGs if necessary
3-7	Print instructions if needed
8-10	Go to the routine which prints the bombs, crystals and monsters. Set up variables.
11	Sets up rest of screen
12-200	Main routine
400-450	Routine which sets up bombs, crystals an monsters
500,600,700	Death routine
1000-1020	Next level, bonus
2000-2080	Machine code
3000-3020	Find death routine. Ask question, 'Another go?'
4000	Instructions
5000-5020	Hi-score routine

controls

Q UP
A DOWN
O LEFT
P RIGHT

Diamond Dash



program listing

```
  1  INK 6: PAPER 0: BORDER 0: CLS : POKE 23609,100: POKE 2
3658,0: LET hs=0: LET a$="??????????????": LET u=0
  2 IF u=0 THEN  CLS : GO SUB 2000
  3 PRINT "Do you need instructions? (Y/N)"; FOR a=0 TO 50:
 NEXT a
  4 IF INKEY$="Y" THEN  GO TO 7
  5 IF INKEY$="N"THEN  CLS : GO TO 8
  6 GO TO 4
  7 GO SUB 4000
  8 LET s=0: LET l=1
  9 CLS : GO SUB 400: LET t=999: LET j=0
 10 LET a=1: LET b=0
 11 PRINT AT 0,0;"SCORE=";s;AT 0,11;"TIME=";t;AT 21,0;"HI-S
CORE=";hs;" by ";n$;AT 0,22;"JEWELS=";j
 12 PRINT AT a,b;;"□ ";AT a+1,b;"□□"
 15 LET t=t-4*l
 20 PRINT AT 0,16;t; BEEP .01,-t/40
 25 IF t<=0 THEN  GO SUB 500
 50 IF INKEY$="P" AND b<30 THEN  PRINT AT a,b;"  ";AT a+1,b
;"  "; LET b=b+2: LET mc=USR 32543
 60 IF INKEY$="O" AND b>0 THEN  PRINT AT a,b;"  ";AT a+1,b;
"  "; LET b=b-2: LET mc=USR 32543
 70 IF INKEY$="Q" AND a>1 THEN  PRINT AT a,b;"  ";AT a+1,b;
"  "; LET a=a-2: LET mc=USR 32543
 80 IF INKEY$="A" AND a<19 THEN  PRINT AT a,b;"  ";AT a+1,b
;"  "; LET a=a+2: LET mc=USR 32543
 90 IF ATTR (a,b)=3 AND ATTR (a+1,b)=3 AND ATTR (a,b+1)=3 A
ND ATTR (a+1,b+1)=3 THEN  GO SUB 600
 100 IF ATTR (a,b)=2 AND ATTR (a+1,b)=2 AND ATTR (a,b+1)=2 A
ND ATTR (a+1,b+1)=2 THEN  GO SUB 700
 110 IF ATTR (a,b)=7 AND ATTR (a+1,b)=7 AND ATTR (a+1,b)=7
 AND ATTR (a+1,b+1)=7 THEN  LET s=s+10: PRINT AT 0,6;s: LE
T mc=USR 32523: LET j=j+1: PRINT AT 0,29;j: IF j=10 THEN  GO
 TO 1000
 200 GO TO 12
 400 LET rnd=0: LET rnd1=0
 405 FOR a=1 TO 10
 408 LET r=INT (RND*9)*2+3: LET r1=INT (RND*15)*2: IF ATTR (
r,r1)<>6 OR ATTR (r+1,r1)<>6 OR ATTR (r,r1+1)<>6 OR ATTR (r+
1,r1+1)<>6 THEN  GO TO 408
 409 LET rnd1=r1: LET rnd=r
 410 PRINT AT rnd,rnd1; INK 7; BRIGHT 1;"□□";AT rnd+1,rnd1;"
□□": NEXT a
 415 FOR a=1 TO 10
 418 LET r=INT (RND*9)*2+3: LET r1=INT (RND*15)*2: IF ATTR (
r,r1)<>6 OR ATTR (r+1,r1)<>6 OR ATTR (r,r1+1)<>6 OR ATTR (r+
1,r1+1)<>6 THEN  GO TO 418
 419 LET rnd1=r1: LET rnd=r
 420 PRINT AT rnd,rnd1; INK 3; BRIGHT 0;"□□";AT rnd+1,rnd1;"
□□": NEXT a
 425 FOR a=1 TO 10
 428 LET r=INT (RND*9)*2+3: LET r1=INT (RND*15)*2: IF ATTR (
r,r1)<>6 OR ATTR (r+1,r1)<>6 OR ATTR (r,r1+1)<>6 OR ATTR (r+
1,r1+1)<>6 THEN  GO TO 428
 429 LET rnd1=r1: LET rnd=r
 430 PRINT AT rnd,rnd1; INK 2; BRIGHT 0;"□□";AT rnd+1,rnd1;"
□□": NEXT a
 450 RETURN
 500 PRINT AT 0,16; FLASH 1;"000": FOR a=0 TO 50: NEXT a: GO
 TO 3000
 600 PRINT AT a,b; FLASH 1; INK 7;"□□";AT a+1,b;"□□": GO TO
3000
 700 PRINT AT a,b; FLASH 1; INK 7;"□□";AT a+1,b;"□□": GO TO
3000
1000 CLS : LET l=l+1: PRINT AT 8,10; FLASH 1;"CONGRATULATION
S";AT 11,5;"You have reached level ";l: LET mc=USR 32568
1010 PRINT AT 13,12; FLASH 1;"TIME BONUS": FOR a=0 TO t STEP
 10: LET s=s+1: BEEP .005,a/20: PRINT AT 15,12;"SCORE=";s: N
EXT a
1020 GO TO 9
2000 FOR z=144 TO 163: FOR x=0 TO 7: READ a: POKE USR CHR$ z
+x,a: NEXT x: NEXT z
2050 DATA 0,0,63,127,255,255,255,127,0,0,252,254,255,255,255
,254,63,31,15,7,3,1,0,0,252,248,240,224,192,128,0,0
2050 DATA 7,15,25,25,15,27,60,63,224,248,152,152,240,216,60,
252,63,63,63,31,14,4,28,60,252,252,252,248,112,32,56,60
2060 DATA 7,31,31,57,57,63,29,7,224,248,248,156,156,252,184,
224,103,242,252,241,7,255,252,96,220,79,63,240,224,255,63,6
2070 DATA 1,3,15,63,119,99,247,244,128,192,240,252,238,198,2
39,47,245,245,117,127,63,15,3,0,175,175,174,254,252,240,192,
0
2080 DATA 60,126,119,3,15,31,51,123,60,126,238,192,240,248,2
04,222,31,15,63,124,251,255,127,63,240,240,252,62,222,255,25
4,252
2120 RESTORE 2130: FOR m=32505 TO 32639: READ x: POKE m,x: N
EXT m
2130 DATA 33,0,64,1,0,24,22,255,122,150,119,35,11,120,177,32
,247,201
2187 DATA 33,33,3,17,1,0,229,205,101,3,225,43,43,43,43,43,43
,16,240,201
2188 DATA 1,5,10,33,255,0,17,10,0,229,213,197,205,101,3,193,
209,225,125,145,111,16,242,251,201
2189 DATA 1,30,6,33,255,0,17,100,0,229,213,197,205,101,3,193
,209,225,125,145,111,16,242,201
2190 DATA 1,10,100,33,255,0,17,70,0,229,213,197,205,101,3,19
3,209,225,125,145,111,16,242,201
2191 DATA 1,10,75,33,255,11,17,1,0,229,213,197,205,101,3,193
,209,225,125,12,111,16,242,201
2200 LET u=1: RETURN
3000 LET mc=USR 32616: FOR a=1 TO 20: LET mc=USR 32505: NEXT
 a: IF s>hs THEN  GO SUB 5000
3005 CLS : PRINT "Do you want another go? (Y/N)"
3006 IF INKEY$="Y" THEN  GO TO 2
3007 IF INKEY$="N" THEN  STOP
3010 GO TO 3006
3020 STOP
4000 CLS : PRINT "The object of this game is to   collect 20
 of the crystals □□                                □□  that a
re scattered around the   screen as quickly as possible,  wh
ile also avoiding the monsters□□
   □□ and bombs □□                                □□";AT 10,6;
"TO MOVE YOURSELF □□                               □□";AT 12,
7;"PRESS O to move up";AT 14,7;"PRESS A to move down";AT 16,
7;"PRESS Q to move left";AT 18,7;"PRESS P to move right";AT
20,5;"PRESS ANY KEY TO CONTINUE": PAUSE 0: RETURN
5000 FOR a=0 TO 500: NEXT a: CLS : PRINT AT 10,0; FLASH 1;"Y
ou beat the high-score": LET mc=USR 32592: PRINT AT 12,0;"Pl
ease enter your name          (<13 letters)"
5005 INPUT n$; IF LEN n$>13 THEN  GO TO 5005
5010 CLS : LET hs=s: PRINT AT 5,10;"THE HI-SCORE IS:";AT 10,
0;hs;" by ";n$
5015 FOR a=0 TO 100: NEXT a
5020 RETURN
```

MM TOP SAVINGS

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TRACTOR	67.00	77.05
SHEETFEEDER	185.00	212.75
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COMMODORE C2N CASSETTE	32.00	36.80
INTFACE 64-PARALLEL	59.50	68.43
APRICOT 2*D+MON	1,395.00	1,604.25
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SANYO MBC555	795.00	914.25
EPSON QX10	1,600.00	1,840.00

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ORIC AND SINCLAIR COMPUTERS
Oric 1 computer 48K £95 (£92) £102. Oric Atmos computer 48K £171 (£158) £168. Oric colour printer £134 (£123) £140. Oric disc drive £304 (£278) £298. New Sinclair Flat screen TV £113 (£105) £115. New Sinclair Spectrum Plus Computer with 8 free programs while Sinclair make this offer £182 (£176) £187. New Sinclair QL Computer £405 (£395) £410. Sinclair Spectrum 48K (with 6 free programs while Sinclair's offer lasts) £131 (£131) £143. Microdrive £51 (£50) £60. RS232 interface 1 £51 (£50) £60. Limited period special offer:- Microdrive + interface 1 + 4 Blank cartridges £102 (£100) £120. Blank microdrive cartridges £5.50 (£6) £7. New standard floppy disc interface for Spectrum £102 (£92) £112. (See Cumana disc section for suitable disc drives). Interface 2 £20.45 (£20) £24. 32K memory upgrade kit for 16K Spectrum (issue 2 and 3 only) £31 (£28) £30. Spectrum printer interface with cables:- Centronics £51 (£46) £52. RS232 £35 (£33) £38. ZX printer has been replaced by the Alphacom 32 £71 (£69) £82. 5 printer rolls (State whether Sinclair or Alphacom) £13 (£16) £21. ZX81 computer £45 (£44) £54. 16K ram packs for ZX81 £28 (£25) £30.

COMMODORE COMPUTERS
Commodore C16 Starter Pack £145 (£142) £162. Commodore Plus/4 £305 (£281) £301. Commodore 64 £222 (£215) £235. Vic 20 starter pack £75 (£85) £115. Convertor to allow most ordinary mono cassette recorders to be used with the Vic 20 and the Commodore 64 £9.78 (£9) £11. Bargain package:- cassette convertor + compatible cassette recorder £37 (£39) £44. Commodore cassette recorder £43 (£44) £50. Printer interfaces for Vic20 and the Commodore 64:- Centronics £45 (£41) £46. RS232 £45 (£41) £46. Disc drive £233 (£209) £234. 1520 printer/plotter £165 (£149) £159. MPS801 Printer £235 (£220) £245. Light pen £29 (£29) £33.

ACORN COMPUTERS
Electron £203 (£209) £229. Electron joystick and printer interface £61 (£62) £69. BBC Model B £404 (£357) £387. BBC Light Pen £29 (£29) £33. 14" Colour Monitor £228 (£299) £319. Kenda double density disk interface system £149 (£131) £141. See Cumana disc section below for suitable disc drives.

CUMANA DISC DRIVES
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Game Tricks

While software for the CPC464 is thin on the ground, why not get stuck into this programming series which teaches you how to write your own games! Your tutor is Alan Rowley.

You have no doubt been having lots of fun over Christmas playing commercially produced games on your new Amstrad CPC 464. Well, how about having a go at writing some games of your own? I know that the games that you buy look very complicated, and in many cases are fine feats of programming, but if you think for a moment about arcade games you will realise that the number of distinct routines involved is not very great. Many games get by with the following operations:

- Moving characters about the screen in response to key presses or the joystick.
- Detecting collisions between objects; projectiles hitting flying saucers, for example.
- Routines for keeping score and recording highest scores.

What I aim to do in this series of articles is to introduce you to these and other techniques on the Amstrad, to show you how to set about planning a program, and to start you out on the road to becoming a confident BASIC programmer. Games programming is an excellent way to learn the craft.

Over the next few months we are going to develop a simple games program together. I assure you that it is not already written and you are really being privy to its actual birth.

Planning Ahead

The first thing to be done is to define clearly what we want the program to do. This may seem obvious but you would be surprised how many people just sit down at the keyboard and let the program grow in a totally undisciplined fashion. The result is invariably rambling code, often called 'spaghetti', which is difficult to understand if you want to modify it at a later date and very difficult to 'debug', that is to correct routines that do not perform as you intended.

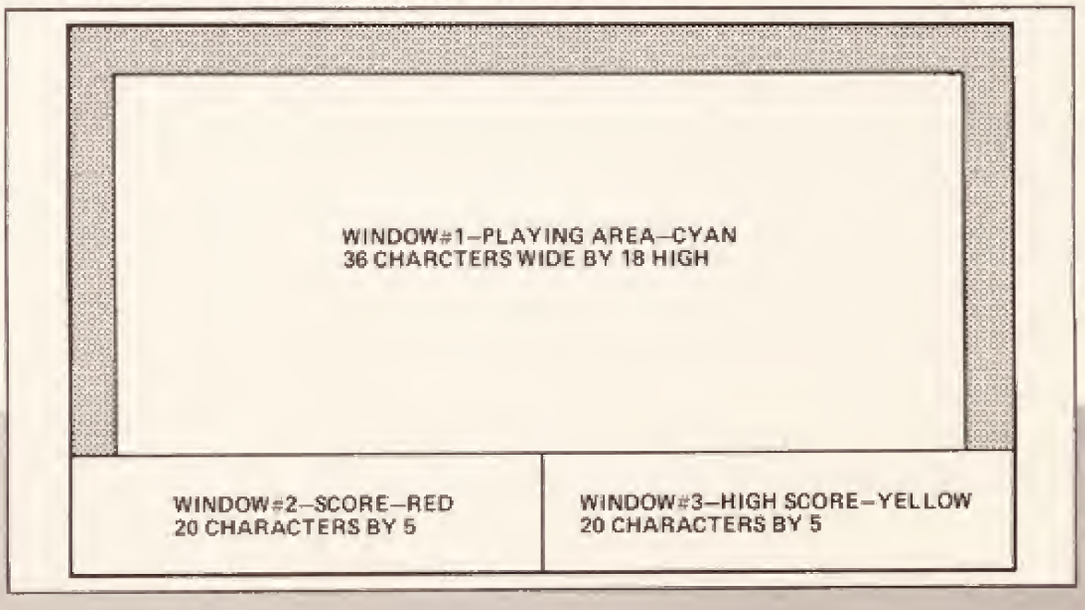
My initial working specification of our game is as follows. We will have a ball bouncing round the screen, hitting top and both sides and bouncing. The object of the game will be to keep the ball in the air and prevent it hitting the bottom of the screen by using a 'bat' which can be moved sideways across the screen from keyboard or joystick. I want to keep score of the number of successful bat/ball contacts and also to maintain a record of the highest scores. There will be appropriate sound effects for the bouncing ball.

Having defined the game we can identify specific tasks which the program will have to perform. These can be developed as separate 'subroutines', self contained segments of code, which can be called by the main program as required. The great advantage of this approach is that we can test each of the subroutines in isolation and get them working properly before including them in the main program.

We will need routines to carry out the following jobs:

- Set up the playing screen.
- Move the bat from side to side in response to the keyboard or joystick.
- Move the ball around and make appropriate adjustments to its motion on collision with the screen margins or the bat.
- Keep the score and the highest score records.

Figure 1 The 'window set up' The shaded area marks the blue border from the non-overwritten part of WINDOW #0. It is two characters wide.





- Start up the game by 'serving' the ball.
- Deal with you losing by missing the ball and offer you another game.

In this article we are going to tackle the setting up of the screen. **Next month** we will begin the task of moving the bat and ball. I propose to use the CPC 464's interrupt handling facility, 'EVERY', for the ball movement. This is one of the most exciting new departures in the Locomotive BASIC and well worth mastering.

Choosing the mode

The CPC 464 has three graphics modes although mode 2 is really only to be considered for applications where 80 column text or high graphics resolution are of paramount importance. It only has two colours and since, I am sure, you would like our game to be colourful we must make our choice from the 16 colour MODE 0 or the four colours of MODE 1. We also have to take into consideration the resolution available in the two modes.

I decided to use MODE 1 for the game. The main reason for this is that I want to animate the bat and ball by moving them from one character position to another and only in MODE 1 are the characters square; look at the WINDOW planners in Appendix VI of your manual. MODE 1 will therefore give equal resolution for movement in horizontal and vertical directions, anything else could be rather mind boggling. The four colours available are quite adequate as you will see, particularly bearing in mind the fact that we can have a fifth as the BORDER.

Designing the screen

Having decided on the mode the next job is to work out the screen layout and the colours to be used. I would always recommend that you plan your screen on a piece of squared paper first.

I decided to set up three separate windows for this game as shown in Figure 1. One window is used for the playing area, one for the score and one for the highest score.

The program listing shows the sub-routine which I then wrote to implement this layout; lines 10 and 20 were added on a temporary basis to let me run the subroutine for debugging. Line 20 just freezes execution until you press 'ESC' twice.

At line 2000 we select the mode and set up a green border. I then define the three WINDOWs, lines 2010 and 2030 and set their background colours to cyan, red and yellow, respectively, in line 2040. Just setting the colours does not actually do anything. We have to clear each window with the CLS command before the chosen colours appear, this is done in line 2060.

WINDOW #0 is not altered, this still covers the whole screen and so underlies the re-defined windows. Window 0 is automatically cleared to blue when the MODE 1 command is processed. When you run the program you will see that only some of the blue background colour of WINDOW #0 shows round three sides of the playing area. The rest gets overwritten when the CLS commands are issued in line 2060. It is always the case that, where windows overlap, the operations on the most recently used window, will take precedence.

In line 2050 we set the colours for the printing in each window using the PEN command. I decided to use blue (pen 0) for the bat and ball in WINDOW #1 and red (pen 3) on the yellow background of WINDOW #2 since I want to use yellow and this is already set by 'default', that is it is the colour used by the computer unless you tell it otherwise. The remainder of the subroutine prints labels in the various windows.

In order to print we must first move the 'cursor', which is in fact invisible when the program is running, to the place where we want to start by using the LOCATE command, remembering that the top left hand corner of any window is position 1,1. Each window is effectively a mini-screen, with its own colour control, cursor and co-ordinate system.

So, for example, in line 2080 we have moved the cursor in window 2 to a position 7 characters from the left of the window and 2 characters down from the window top before starting to print the message. See how the cursor positions are all relative to the top left of the window and we need not worry about where the window is on the screen as a whole once we have set it up.

Well now we have the screen layout, next month we will be getting into motion with bat and ball!



Electronic Foreheads

No zapping, not even any aliens feature in this innovative and amusing musical entertainment by William Fong.

Here is a program which is pure fun! Well, typing it in might take some time, but when it is running you can sit back and listen lazily, exerting yourself now and again to summon up a guffaw!

All the instructions, program structure and variables are stored in the REM statements above the main program. Don't type these in, they're there for information only. When you have typed in the program, make sure you save a copy to tape before running it. Prompts will appear every few seconds as the program is being processed. The entire loading time is about three minutes as it is a long and complex program.

We think you'll have lots of fun, so without more ado, get typing and have an enjoyable time!



CBM64

program listing

```
0 REM ********************************
1 REM ** THE ELECTRONIC FOREHEADS  **
2 REM **          IN CONCERT        **
3 REM ** SINGING THE ENTERTAINERS   **
4 REM **      THEIR FIRST ALBUM     **
5 REM **----------------------------**
6 REM **                            **
7 REM ********************************
9 REM
9 REM ----- PROGRAM STRUCTURE -------
10 REM 100   - 102   : SET SOUND VAR
11 REM 103   - 104   : PRINTS MESSAGE
12 REM 105   -       : TURNS SPRITES ON
13 REM 106   - 113   : SET VOLUME, READ
14 REM                 DATA FOR SPRITES,
15 REM                 POKES COLOUR FOR
16 REM                 SPRITES, ENLARGE
17 REM                 SPRITES,GET SPRITE
18 REM                 POINTERS.
19 REM 114   - 137   : DATA FOR SPRITES
20 REM 138   - 151   : THIS READS THE
21 REM                 NOTES FOR TUNES
22 REM                 AND CONVERTS THEM
23 REM                 INTO VALUES FOR
24 REM                 H(N,N) & L(N,N)
25 REM 152   - 172   : THIS PROMPTS UP
26 REM                 MESSAGES AS THE
27 REM                 CONVERTING PROCESS
28 REM                 CONTINUES.
30 REM 173   - 177   : PRINTS PLEASE WAIT
31 REM                 ON TOP AND POKES
32 REM                 SOME NOTES OUT TO
33 REM                 KEEP YOU AWAKE
34 REM 178   - 208   : DATA FOR FIRST
35 REM                 TUNE. VOICES REMED
36 REM 209   - 221   : BEGINNING OF TUNES
37 REM                 PRINTS THE GROUP
38 REM                 THEIR CLOTHES
39 REM 222   - 254   : THE BIT SETS UP
40 REM                 EACH DIFFERENT
41 REM                 TUNE TO BE PLAYED
42 REM                 AT A DIFFERENT
43 REM                 SPEED AND A
44 REM                 DIFFERENT ATTACK/
45 REM                 DECAY MAKING THE
46 REM                 TUNE SOUND GOOD(?)
47 REM                 THEN THERE IS THE
48 REM                 FOR,NEXT STATMENT
49 REM                 WHICH ACTUALLY
50 REM                 PLAYS EACH NOTE.
51 REM                 ALSO THIS AREA
52 REM                 MOVES THE LITTLE
53 REM                 ELECTRONIC HEADS
54 REM                 AND MOVES THEIR
55 REM                 BIG MOUTHS UP AND
56 REM                 DOWN
57 REM
58 REM 255   - 556   : THE DATA FOR THE
59 REM                 TUNES PLAYED. ALL
60 REM                 HAVE BEEN REMED
61 REM                 SO YOU KNOW WHICH
62 REM                 DATA IS FOR WHICH
63 REM                 TUNE AND WHICH
64 REM                 VOICE PLAYS WHICH
65 REM                 BLOCK OF DATA
66 REM
67 REM**********************************
68 REM**********************************
69 REM** THE WHOLE PROGRAM HAS BEEN ***
70 REM** HEAVYLY REMED SO YOU KNOW  ***
71 REM** WHATS GOING ON             ***
72 REM**********************************
73 REM
74 REM***** SOME USEFUL VARIBLES ******
75 REM
76 REM A1  : ATTACK/DECAY FOR VOICE 1
77 REM A2  : " " " " " 2
78 REM A3  : " " " " " 3
79 REM W1  : WAVEFORM ADDRESS VOICE 1
80 REM W2  : " " " " " 2
81 REM W3  : " " " " " 3
82 REM H1  : HIGH BYTE FOR VOICE 1
83 REM H2  : " " " " " 2
84 REM H3  : " " " " " 3
85 REM L1  : LOW BYTE FOR VOICE 1
86 REM L2  : " " " " " 2
87 REM L3  : " " " " " 3
88 REM D   : DURATION FOR TUNES
89 REM EN  : WHEN TO END TUNE
90 REM V1  : BEGINNING OF VIC CHIP
91 REM F1  : WAVEFORM 1
92 REM F2  : " " " " 2
93 REM F3  : " " " " 3
94 REM T1  : ATTACK / DECAY 1
95 REM T2  : " " " " 2
96 REM T3  : " " " " 3
97 REM H(N,N) : HIGH BYTE OF NOTE
98 REM L(N,N) : LOW  BYTE OF NOTE
99 REM ********** START *****************
100 W1=54276:A1=54277:H1=54273:L1=54272
101 W2=54283:A2=54284:H2=54280:L3=54279
102 W3=54290:A3=54291:H3=54287:L3=54286
102 REM CLR-WHT= 21*CRD   2*CRU   2*CRD
103 CL$="[CLR-WHT]":PRINTCL$TAB(14)"[2 CRD]PLEASE WAIT[2 CRU]"
104 PRINTTAB(7)"TURN THE VOLUME UP, UP, UP"
105 V=53248:AD=832:POKEV+21,255:POKE53281,4:POKE53280,4
106 POKE54296,2
107 FORN=1TO3:FORM=0TO62
108 READA:POKEAD+M,A:NEXTM:AD=AD+64:NEXTN
109 POKEV+28,255:POKEV+37,0:POKEV+38,10:FORN=0TO7:POKEV+38+N,1:NEXT
110 PX=30:FORN=0TO15:POKEV+N,PX:N=N+1:POKEV+N,81:PX=PX+75:NEXT
111 PX=38:FORN=0TO7:POKEV+N,PX:N=N+1:POKEV+N,123:PX=PX+75:NEXT
112 FORN=4TO7:POKE2040+N,13:NEXT:POKEV+23,255:POKEV+29,255
113 FORN=0TO3:POKE2040+N,15:NEXT
114 DATA 1, 85, 64, 1, 85, 64, 1, 85
115 DATA 64, 7, 247, 208, 7, 247, 208, 7
116 DATA 119, 208, 7, 87, 208, 31, 255, 244
117 DATA 31, 255, 244, 31, 255, 244, 31, 255
118 DATA 244, 31, 255, 244, 127, 85, 125, 127
119 DATA 255, 253, 119, 255, 221, 125, 85, 125
120 DATA 127, 255, 253, 127, 255, 253, 127, 255
121 DATA 253, 127, 255, 253, 127, 255, 253
122 DATA 245, 125, 95, 245, 125, 85, 254, 255
123 DATA 191, 255, 255, 255, 63, 247, 252, 63
124 DATA 247, 252, 63, 247, 252, 63, 117, 252
125 DATA 15, 255, 240, 15, 215, 240, 15, 85
126 DATA 240, 15, 85, 240, 15, 85, 240, 15
127 DATA 85, 240, 15, 85, 240, 15, 85, 240
128 DATA 15, 215, 240, 3, 255, 192, 3, 255
129 DATA 192, 0, 255, 0, 0, 255, 0
130 DATA 245, 125, 95, 245, 125, 95, 255, 255
131 DATA 255, 245, 125, 95, 255, 247, 255, 63
132 DATA 247, 252, 63, 247, 252, 63, 247, 252
133 DATA 63, 117, 252, 63, 255, 252, 15, 215
134 DATA 240, 15, 85, 240, 15, 215, 240, 3
135 DATA 255, 192, 0, 255, 0, 0, 0, 0
136 DATA 0, 0, 0, 0, 0, 0, 0, 0
137 DATA 0, 0, 0, 0, 0, 0, 0
138 V=1
139 DIMS(11),N$(11),L(22,100),H(22,100):V=1
140 FORN=0TO11:READS(N),N$(N):NEXTN:E=0
141 DATA34334,C,36377,C#,38539,D,40831,D#
142 DATA43258,E,45831,F,48557,F#,51444,G
143 DATA54502,G#,57743,A,61177,A#,64815,B
144 E=E+1:READC$:IFC$="X"THENV=V+1:GOSUB152:E=0
145 IFV>=23THEN209
146 IFC$="R"THENH=0:L=0:H(V,E)=0:L(V,E)=0:GOTO144
147 T$=LEFT$(C$,LEN(C$)-1):FORR=0TO11:IFT$=N$(R)THENT=R:GOTO148
148 NEXTR
149 O=VAL(RIGHT$(C$,1)):F=2↑(7-O):F=S(T)/F
150 H=INT(F/256):L=INT(F-256*H):H(V,E)=H:L(V,E)=L
151 GOTO144
152 IFV=2THENPRINTCL$TAB(9)"WILLIAM FONG PRESENTS"
153 IFV=3THENPRINTCL$TAB(8)"THE ELECTRONIC FOREHEADS"
154 IFV=4THENPRINTCL$TAB(15)"IN CONCERT"
155 IFV=5THENPRINTCL$TAB(13)"COPYRIGHT 1984"
156 IFV=6THENPRINTCL$"  THE ELECTRONIC FOREHEADS WILL SING":POKE2040,14
157 IFV=7THENPRINTCL$TAB(12)"THE ENTERTAINERS":POKE2040,15
158 IFV=8THENPRINTCL$TAB(12)"THEIR FIRST ALBUM"
159 IFV=9THENPRINTCL$TAB(12)"(C) WILLIAM FONG"
159 REM RVS OFF
160 IFV=10THENPRINTCL$TAB(12)"[RVS] YOUR PROGRAMME [RVS OFF]":POKE53281,
    2:POKE53280,2
161 IFV=11THENPRINTCL$TAB(13)"FRERE JACQUES":POKE2042,14
162 IFV=12THENPRINTCL$TAB(14)"JINGLE BELLS":POKE2042,15
163 IFV=13THENPRINTCL$TAB(11)"A LITTLE HUSH-SONG"
164 IFV=14THENPRINTCL$TAB(12)"THE BAND PLAYS ON"
165 IFV=15THENPRINTCL$TAB(14)"SLEEP, SLEEP"
166 IFV=16THENPRINTCL$TAB(12)"THE DANCING BEAR"
167 IFV=17THENPRINTCL$TAB(12)"THROUGH THE WOODS"
168 IFV=18THENPRINTCL$TAB(10)"THE PIPERS ARE COMING"
169 IFV=19THENPRINTCL$TAB(14)"PLEASE WAIT"
170 IFV=20THENPRINTCL$TAB(11)"JUST A LITTLE LONGER"
171 IFV=21THENPRINTCL$TAB(14)"NEARLY READY"
172 IFV=22THENPRINTCL$TAB(13)"ARE YOU READY ?"
172 REM HOM YEL
173 PRINT"[HOM]"TAB(14)"[YEL]PLEASE WAIT"
174 POKEW1,0:POKEW1,17:POKEH1,137:POKEL1,43:POKEA1,128
175 POKEW2,0:POKEW2,17:POKEH2,68:POKEL2,149:POKEA2,15
176 POKEW3,0:POKEW3,17:POKEH3,137:POKEL3,43:POKEA3,10
177 RETURN
178 REM -------- FRERE JACQUES --------
179 REM * VOICE 1 ***** 1
180 DATAG6,R,A6,R,B6,R,G6,R
```

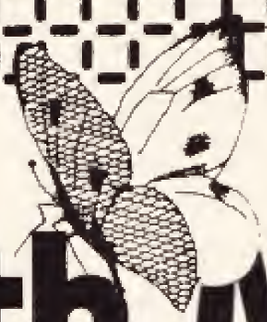
```
181 DATAG6,R,A6,R,B6,R,G6,R
182 DATAB6,R,C7,R,D7,R,R,R
183 DATAB6,R,C7,R,D7,R,R,R
184 DATAD7,E7,D7,C7,B6,R,G6,R
185 DATAD7,E7,D7,C7,B6,R,G6,R
186 DATAA6,R,D6,R,G6,R,R,R
187 DATAA6,R,D6,R,G6,X
188 REM ******* VOICE 2 ********** 2
189 DATAR,R,R,R,R,R,R,R
190 DATAG5,R,A5,R,B5,R,G5,R
191 DATAG5,R,A5,R,B5,R,G5,R
192 DATAB5,R,C6,R,D6,R,R,R
193 DATAB5,R,C6,R,D6,R,R,R
194 DATAD6,E6,D6,C6,B5,R,G5,R
195 DATAD6,E6,D6,C6,B5,R,G5,R
196 DATAA5,R,D5,R,G5,R,R,R
197 DATAA5,R,D5,R,G5,X
198 REM **** VOICE THREE ********** 3
199 DATAR,R,R,R,R,R,R,R
200 DATAR,R,R,R,R,R,R,R
201 DATAG4,R,A4,R,B4,R,G4,R
202 DATAG4,R,A4,R,B4,R,G4,R
203 DATAB4,R,C5,R,D5,R,R,R
204 DATAB4,R,C5,R,D5,R,R,R
205 DATAD5,E5,D5,C5,B4,R,G4,R
206 DATAD5,E5,D5,C5,B4,R,G4,R
207 DATAA4,R,D4,R,G4,R,R,R
208 DATAA4,R,D4,R,D4,X
209 REM ******* START ************
210 POKE54296,6:W=0:L=0:S=0:EN=0
210 REM   2*CRD-YEL
211 PRINTCL$"██MUSIC & PROGRAM BY WILLIAM FONG (C)1984"
211 REM HOM-CRD-CYN CRD
212 PRINT"██THE ELECTRONIC FOREHEADS : ENTERTAINERS█"
212 REM HOM- 13*CRD-WHT
213 PRINT"██████████████   ▛▜       ▛▜       ▛▜       ▛▜"
213 REM BLK RVS OFF GRN-RVS OFF YEL-RVS OFF LBL-RVS OFF
214 PRINT"█ █ :  █    ██ :  █   ██  :  █ ██   :   █"
214 REM BLK RVS OFF GRN-RVS OFF YEL-RVS OFF LBL-RVS OFF
215 PRINT"█ █| |█    ██|: |█   ██ |:|█ ██ |  : |█"
215 REM BLK RVS OFF GRN-RVS OFF YEL-RVS OFF LBL-RVS OFF
216 PRINT"█ █| |█    ██|| |█   ██ |:|█ ██ |  : |█"
215 REM LRD BLK-RVS OFF-LRD LRD YEL-RVS OFF-LRD LRD GRN-RVS
    OFF-LRD LRD WHT-
216 REM-RVS OFF-LRD
217 PRINT" █+██──██+    █+██───██+    █+██───██+  █+██─────██+"
217 REM BLK RVS OFF GR2-RVS OFF LGN-RVS OFF CYN-RVS OFF
218 PRINT"█  █|█      ██ | █     ██ | █   ██  |  █"
218 REM BLK RVS OFF GR2-RVS OFF LGN-RVS OFF CYN-RVS OFF
219 PRINT"█  █|█      ██ | █     ██ | █   ██  |  █"
219 REM BLK RVS OFF GR2-RVS OFF LGN-RVS OFF CYN-RVS OFF
220 PRINT"█  █|█      ██ | █     ██ | █   ██  |  █"
220 REM WHT
221 PRINT"█ ▀▀ ▀▀    ── ──   ── ── ─── ───"
222 REM ******** PLAY MUSIC ********
223 REM ******* PLAYS *************
224 FORW=0TO14
225 F1=33:F2=33:F3=33:T1=140:T2=140:T3=140
226 IFW=0THENU1=1:U2=2:U3=3:F1=17:F2=17:F3=17:T1=137:EN=80:D=20
227 IFW=1THENU1=1:U2=2:U3=3:EN=90:D=20
228 IFW=2THENU1=4:U2=5:U3=6:F1=17:T1=128:T3=139:EN=70:D=20
229 IFW=3THENU1=7:U2=8:U3=8:F2=17:F3=17:T2=190:T3=190:EN=96:D=60
230 IFW=4THENU1=7:U2=8:U3=8:EN=100:D=60:T1=190:T2=190:T3=190
231 IFW=5THENU1=9:U2=10:U3=11:T2=9:T3=8:F2=17:F3=17:F1=17:EN=96:D=50
232 IFW=6THENU1=9:U2=10:U3=11:T2=9:T3=9:EN=100:D=50
233 IFW=7THENU1=12:U2=12:U3=13:T1=10:T2=10:T3=15:EN=48:D=100
234 IFW=8THENU1=12:U2=12:U3=13:T3=15:EN=53:D=100
235 IFW=9THENU1=14:U2=15:U3=16:T1=9:T2=9:T3=15:EN=48:D=70
236 IFW=10THENU1=14:U2=15:U3=16:EN=53:D=100
237 IFW=11THENU1=19:U2=18:U3=17:T1=9:T2=10:EN=50:D=20
238 IFW=12THENU1=19:U2=18:U3=17:EN=50:D=20
239 IFW=13THENU1=20:U2=21:U3=22:F1=17:F2=17:F3=17:EN=68:D=10
240 IFW=14THENU1=20:U2=21:U3=22:EN=75:D=10
241 FORN=1TOEN
242 IFH(U1,N)=0THEN245
243 POKEW1,0:POKEW1,F1:POKEH1,H(U1,N):POKEL1,L(U1,N):POKEA1,T1
244 POKE2040,14
245 IFH(U2,N)=0THEN248
246 POKEW2,0:POKEW2,F2:POKEH2,H(U2,N):POKEL2,L(U2,N):POKEA2,T2
247 POKE2041,14
248 IFH(U3,N)=0THEN251
249 POKEW3,0:POKEW3,F3:POKEH3,H(U3,N):POKEL3,L(U3,N):POKEA3,T3
250 POKE2042,14:POKE2043,14
251 FORM=1TOD:NEXTM
252 FORI=0TO3:POKE2040+I,15:NEXTI
253 NEXTN,W
254 GOTO223
255 REM -------- JINGLE BELLS -------
256 REM ******* VOICE 1 ************ 4
257 DATAB6,B6,B6,R
258 DATAB6,B6,B6,R
259 DATAB6,D7,G6,A6
260 DATAB6,R,R,R
261 DATAC7,C7,C7,C7
262 DATAC7,B6,B6,B6
263 DATAB6,A6,A6,B6,A6,R,D7,R
264 DATAB6,B6,B6,R
265 DATAB6,B6,B6,R
266 DATAB6,D7,G6,A6
267 DATAB6,R,R,R
268 DATAC7,C7,C7,C7
269 DATAC7,B6,B6,B6
270 DATAD7,D7,C7,A6,G6,X
271 REM ******* VOICE 2 *********** 5
272 DATAB5,B5,B5,R
273 DATAB5,B5,B5,R
274 DATAB5,D6,G5,A5
275 DATAB5,R,R,R
276 DATAC6,C6,C6,C6
277 DATAC6,B5,B5,B5
278 DATAB5,A5,A5,B5,A5,R,D6,R
279 DATAB5,B5,B5,R
280 DATAB5,R,R,R
281 DATAB5,D6,G5,A5
282 DATAB5,B5,B5,B5
283 DATAC6,C6,C6,C6
284 DATAC6,B5,B5,B5
285 DATAD6,D6,C6,A5,G5,X
286 REM ****** VOICE 3 ************* 6
287 DATAB3,B3,B3,B3
288 DATAB3,B3,B3,B3
289 DATAB3,D4,G3,A3
290 DATAB3,B3,B3,B3
291 DATAC4,C4,C4,C4
292 DATAC4,B3,B3,B3
293 DATAB3,A3,A3,B3,A3,A3,D4,D4
294 DATAB3,B3,B3,B3
295 DATAB3,B3,B3,B3
296 DATAB3,D4,G3,A3
297 DATAB3,B3,B3,B3
298 DATAC4,C4,C4,C4
299 DATAC4,B3,B3,B3
300 DATAD4,D4,C4,A3,G3,G3,G3,G3,X
301 REM ****A LITTLE HUSH SONG ****
302 REM ****** VOICE 1 & 2***********7
303 DATAE5,R,R,D5,R,R
304 DATAC5,R,R,D5,R,R
305 DATAE5,R,G5,A5,R,B5
306 DATAC6,R,A5,G5,R,F5
307 DATAE5,R,R,D5,R,R
308 DATAC5,R,R,D5,R,R
309 DATAE5,F5,G5,A5,R,F5
310 DATAG5,R,R,R,R,R
311 DATAC6,R,E5,A5,R,G5
312 DATAF#5,R,R,G5,R,R
313 DATAC6,R,E5,A5,R,G5
314 DATAF#5,E5,F#5,G5,R,R
315 DATAE5,R,R,D5,R,R
316 DATAC5,R,R,D5,R,R
317 DATAE5,R,G5,A5,R,B5
318 DATAC6,X
319 REM ******* VOICE 3 **********  8
320 DATAC4,R,G3,B3,R,G3
321 DATAA3,R,G3,B3,R,G3
322 DATAC4,R,R,F4,R,R
323 DATAE4,R,R,B3,R,R
324 DATAC4,R,G3,B3,R,G3
325 DATAA3,R,R,F3,R,R
326 DATAC4,R,R,F3,R,R
327 DATAC4,R,D4,C4,R,B3
328 DATAA3,R,R,C4,R,R
329 DATAD4,R,C4,B3,R,G3
330 DATAA3,R,R,C4,R,R
331 DATAD4,R,R,B3,A3,B3
332 DATAC4,R,G3,B3,R,G3
333 DATAC4,R,G3,B3,R,G3
334 DATAC4,R,R,F4,R,R
335 DATAC3,X
336 REM ***** THE BAND PLAYS ON *****
337 REM ***** VOICE 1 ************ 9
338 DATAF6,A6,F6
339 DATAE6,A6,E6
340 DATAD6,A6,D6
341 DATAC6,D6,F6
342 DATAE6,R,R
343 DATAA#6,R,R
344 DATAA#6,R,R
345 DATAR,R,F6
346 DATAE6,G6,E6
347 DATAD6,C6,D6
348 DATAE6,G6,E6
349 DATAD6,C6,D6
350 DATAA6,R,R
351 DATAA6,R,R
```

```
352 DATAA6,R,R
353 DATAA6,D6,E6
354 DATAF6,F6,F6
355 DATAE6,E6,E6
356 DATAD#6,D#6,D#6
357 DATAD6,R,D6
358 DATAD6,D6,D6
359 DATAD6,G6,A6
360 DATAA#6,R,R
361 DATAR,R,D6
362 DATAD6,C#6,D6
363 DATAF6,E6,D6
364 DATAC6,D6,E6
365 DATAF6,G6,A6
366 DATAD6,R,R
367 DATAE6,R,R
368 DATAF6,X
369 REM **********
    VOICE 2 ***********10
370 DATAF3,F4,F4
371 DATAC3,F4,F4
372 DATAF3,F4,F4
373 DATAC3,F4,F4
374 DATAG3,A#4,A#4
375 DATAC3,A#4,A#4
376 DATAG3,A#4,A#4
377 DATAC3,A#4,A#4
378 DATAG3,A#4,A#4
379 DATAC3,A#4,A#4
380 DATAG3,A#4,A#4
381 DATAC3,A#4,A#4
382 DATAF3,F4,F4
383 DATAC3,F4,F4
384 DATAF3,F4,F4
385 DATAC3,F4,F4
386 DATAF3,F4,F4
387 DATAG3,A#4,A#4
388 DATAA3,C5,C5
389 DATAA#3,A#4,A#4
390 DATAA3,C5,C5
391 DATAD3,C5,C5
392 DATAG3,A#4,A#4
393 DATAG2,R,R
394 DATAA#3,A#4,A#4
395 DATAB3,G3,G3
396 DATAC4,A4,A4
397 DATAA3,C5,C5
398 DATAG3,B4,B4
399 DATAC3,A#4,A#4
400 DATAF3,A4,A4
401 DATAF3,X
402 REM ********
    VOICE 3 ***********11
403 DATAR,C4,C4
404 DATAR,C4,C4
405 DATAR,C4,C4
406 DATAR,C4,C4
407 DATAR,C4,C4
408 DATAR,C4,C4
409 DATAR,C4,C4
410 DATAR,C4,C4
411 DATAR,C4,C4
412 DATAR,C4,C4
413 DATAR,C4,C4
414 DATAR,C4,C4
415 DATAR,C4,C4
416 DATAR,C4,C4
417 DATAR,C4,C4
418 DATAR,C4,C4
419 DATAR,C4,C4
420 DATAR,C4,C4
421 DATAR,C4,C4
422 DATAR,C4,C4
423 DATAR,F#4,F#4
424 DATAR,C4,F#4
425 DATAR,A#4,A#4
426 DATAR,F4,F4
427 DATAR,F4,F4
428 DATAR,F4,F4
429 DATAR,F4,F4
430 DATAR,F4,F4
431 DATAR,F4,F4
432 DATAR,C4,C4
433 DATAR,C4,C4,X
434 REM ****** SLEEP, SLEEP **********
435 REM ****** VOICE 1 **************12
436 DATAE5,E5,E5,G5,G5,G5
437 DATAF5,F5,F5,D5,R,R,E5,E5,E5
438 DATAG5,G5,G5,F#5,E5,D5
439 DATAG5,R,F5,E5,F5,E5
440 DATAG5,G5,G5,F5,E5,F5
441 DATAD5,R,R,E5,C5,E5
442 DATAG5,G5,G5,F5,E5,D5
443 DATAC5,X
444 REM ****** VOICE 2 **************13
445 DATAC3,R,R,E3,R,R,D3,R,R
446 DATAG3,R,R,C3,R,R,E3,R,R
447 DATAD3,E3,F#3,G3,R,R,C3,R,R
448 DATAE3,R,R,D3,R,R,G3,R,R
449 DATAC3,R,R,E3,R,R,D3,G3,F3,E3,X
450 REM ****** THE DANCING BEAR *****
451 REM ****** VOICE 1 **************14
452 DATAR,G5,G5
453 DATAR,G5,G5
454 DATAR,G5,G5
455 DATAR,R,R
456 DATAR,G5,G5
457 DATAR,G5,G5
458 DATAR,G5,G5
459 DATAR,R,R
460 DATAR,G5,G5
461 DATAR,G5,G5
462 DATAR,F5,C6
463 DATAC6,R,R
464 DATAR,G5,G5
465 DATAR,G5,G5
466 DATAR,G5,G5
467 DATAG5,X
468 REM ****** VOICE 2 *************15
469 DATAR,E5,E5
470 DATAR,E5,E5
471 DATAR,F5,F5
472 DATAR,R,R
473 DATAR,E5,E5
474 DATAR,E5,E5
475 DATAR,F5,F5
476 DATAR,R,R
477 DATAR,E5,E5
478 DATAR,E5,E5
479 DATAR,F4,C4
480 DATAF#4,R,R
481 DATAR,E5,E5
482 DATAR,F5,F5
483 DATAR,E5,E5
484 DATAE5,X
485 REM ******** VOICE 3 ***********16
486 DATAC4,R,R
487 DATAA3,R,R
488 DATAB3,R,R
489 DATAG3,A3,B3
490 DATAC4,R,R
491 DATAA3,R,R
492 DATAB3,R,R
493 DATAB3,A3,B3
494 DATAC4,R,R
495 DATAA#3,R,R
496 DATAA3,R,R
497 DATAG#3,R,R
498 DATAA3,R,R
499 DATAD4,R,R
500 DATAC4,X
501 REM *** THROUGH THE WOODS ******
502 REM ***** VOICE 3 *************17
503 DATAG2,R,C3,R,E3,R,G3,F3
504 DATAE3,R,C3,R,C3,R
505 DATAD3,F3,E3,D3,C3
506 DATAB2,R,G2,R,G2,R
507 DATAC3,R,E3,D3,C3,B2
508 DATAA2,R,F2,R,A2
509 DATAG2,R,C3,R,B2
510 DATAC3,X
511 REM ***** VOICE 2 ************* 18
512 DATAG3,R,C4,R,E4,R,G4,F4
513 DATAE4,R,C4,R,C4,R
514 DATAD4,F4,E4,D4,C4
515 DATAB3,R,G3,R,G3,R
516 DATAC4,R,E4,D4,C4,B3
517 DATAA3,R,F3,R,A3
518 DATAG3,R,C4,R,B3
519 DATAC4,X
520 REM ***** VOICE 1 ************* 19
521 DATAG4,R,C5,R,E5,R,G5,F5
522 DATAE5,R,C5,R,C5,R
523 DATAD5,F5,E5,D5,C5
524 DATAB4,R,G4,R,G4,R
525 DATAC5,R,E5,D5,C5,B4
526 DATAA4,R,F4,R,A4
527 DATAG4,R,C5,R,B4
528 DATAC5,X
529 REM ***** PIPERS ARE COMING *****
530 REM ***** VOICE 1 **************20
531 DATAG5,R,R,R,F5,E5,D5,C5
532 DATAG5,R,R,R,F5,E5,D5,C5
533 DATAE5,F5,G5,R,F5,R,E5,R
534 DATAD5,R,G5,R,E5,C5,R
535 DATAG5,R,R,R,F5,E5,D5,C5
536 DATAG5,R,R,R,F5,E5,D5,C5
537 DATAE5,F5,G5,R,F5,R,E5,R
538 DATAD5,R,G5,R,C5,R,R,R,X
539 REM ***** VOICE 2 **************21
540 DATAG3,R,R,R,R,R,R,R
541 DATAG3,R,R,R,R,R,R,R
542 DATAG3,R,R,R,R,R,R,R
543 DATAG3,R,R,R,R,R,R,R
544 DATAG3,R,R,R,R,R,R,R
545 DATAG3,R,R,R,R,R,R,R
546 DATAG3,R,R,R,R,R,R,R
547 DATAG3,R,R,R,R,R,R,R,X
548 REM ****** VOICE 3 *************22
549 DATAC2,R,R,R,R,R,R,R
550 DATAC2,R,R,R,R,R,R,R
551 DATAC2,R,R,R,R,R,R,R
552 DATAC2,R,R,R,R,R,R,R
553 DATAC2,R,R,R,R,R,R,R
554 DATAC2,R,R,R,R,R,R,R
555 DATAC2,R,R,R,R,R,R,R
556 DATAC2,R,R,R,R,R,R,R,X
READY.
```









Moth Mania

An electrifying game written in EXTENDED BASIC by Barry Johns.







If you like to be driven crazy by the sort of game that teases you to have one more try to better your score then this is for you, but if your idea of bliss is eight straight hours of beauty sleep then say goodnight now.

This is an infuriatingly simple game based on the fascination that light bulbs seem to hold for our lepidopteran friends, moths to you. In this game you take the part of the light bulb for which the touch of a moth means 'Lights Out'. However, these must be longlife bulbs because you've been granted five chances.

Standard joysticks are used so don't forget to release the ALPHA LOCK key and if you're forced into a tight corner a press of the FIRE button will switch out your bulb so the moths pass harmlessly over you. Note that this may fuse the bulb so use it sparingly.

You move around a grid which changes colour as you progress and when all the grid is coloured correctly a fresh grid appears. The program runs in extended BASIC and REM statements may be omitted when keying in as none are referenced by GOSUB's etc.

hints on conversion

Conversion to other machines is not really practical due to the fact that the game relies heavily on sprite movement and anyone who has a machine with sprite capability would be better advised to study the 'How It Runs' section and then write their own routines to cover each section.

how it runs

Line	Effect
100-150	Initialisation and subroutines for intial game
160-190	Subroutines to reset variables for further games
200-570	Main move routine consisting of:
200-260	Off switch for light bulb
270-300	Accept light bulb movement input
310-340	First test for collision with moths
350-390	Restrict light bulb to limits of grid
400-430	Move image of light to next square
440-470	Second test for collision with moths
480-520	Colour squares as light moves
530-560	Third test for collision with moths
570	Return to start of main routine
580-620	Initialisation subroutine to redefine characters
630-670	Subroutine for colours in game
680-710	Subroutine to reset at start of fresh game
720-780	Subroutine to produce fresh grid
790-850	Subroutine to place sprites on grid
860-910	Subroutine to move and accelerate sprites
920-1110	End of routine consisting of:
920-980	Clear screen and print score
990-1060	Hall of Fame routine
1070-1110	Another game? routine
1120-1210	Title screen routine
1220-1320	Instruction page
1330-1440	Music subroutines and data

variables used

A,B	Current (ouch) position of light bulb	Q	Indicates sprite collision
A1,B1	Light bulb movement indicated by joystick	SC	Score from that particular grid
DIR	Value to alter moths' flight from horizontal to vertical	SP	Present speed of moths
L	Indicates number of lives lost	SW	Counter for number of times lightswitch used
N(x),NS(x), NAMES	Variables used in Hall of Fame	TOT	Total points accumulated in that game
		V,W,X,Y,Z	Counters for loops

program listing

```
100 REM *  INITIALIZE  *
110 REM
120 REM *  FIRST GAME  *
130 REM
140 DIM N(6),N$(6):: FOR X=1 TO
12 :: READ Y :: N$(1)=N$(1)&CHR$
(Y):: NEXT X :: N(1)=Y*6
150 CALL CLEAR :: GOSUB 610 :: G
OSUB 1150 :: GOSUB 1360 :: GOSUB
 1250
160 REM
170 REM *  OTHER GAMES  *
180 REM
190 CALL CLEAR :: GOSUB 670 :: G
OSUB 710
200 REM
210 REM *  MAIN MOVE  *
220 REM
230 REM * BULB ON/OFF *
240 REM
250 CALL KEY(1,K,S):: IF K=18 TH
EN CALL DELSPRITE(#28):: CALL SO
UND(100,-4,0):: SW=SW+1
260 IF SW=3 THEN SW=0 :: L=L+1 :
: CALL SOUND(100,-6,0):: IF L=5
THEN 970
270 REM
280 REM *  MOVE LIGHT  *
290 REM
300 CALL JOYST(1,A1,B1):: IF A1=
0 AND B1=0 THEN 560 :: A=A+A1*8
:: B=B-B1*8
310 REM
320 REM *  CRASH TEST 1  *
330 REM
340 CALL COINC(ALL,Q):: IF Q THE
N L=L+1 :: CALL SOUND(100,-6,0):
: IF L=5 THEN 970 ELSE CALL DELS
PRITE(ALL):: GOSUB 820 :: GOTO 2
50
350 REM
360 REM *  TEST LIMITS  *
370 REM
380 IF A>204 THEN A=204 ELSE IF
A<44 THEN A=44
390 IF B>172 THEN B=172 ELSE IF
B<12 THEN B=12
400 REM
410 REM *  PLACE LIGHT  *
420 REM
430 CALL LOCATE(#28,B,A):: CALL
SOUND(40,440,0,442,0,444,0)
440 REM
450 REM *  CRASH TEST 2  *
460 REM
470 CALL COINC(ALL,Q):: IF Q THE
N L=L+1 :: CALL SOUND(100,-6,0):
: IF L=5 THEN 970 ELSE CALL DELS
PRITE(ALL):: GOSUB 820 :: GOTO 2
50
480 REM
490 REM *  COLOUR SQUARE  *
500 REM
510 CALL GCHAR(B/8+1,A/8,Q):: IF
 Q=140 THEN 560
520 FOR Z=0 TO 2 :: CALL HCHAR(B
/8+Z,A/8,Q+8,3):: NEXT Z :: SC=S
C+1 :: IF SC=24 OR SC=48 THEN GO
SUB 890 ELSE IF SC=72 THEN GOSUB
 750
530 REM
540 REM *  CRASH TEST 3  *
```

program listing

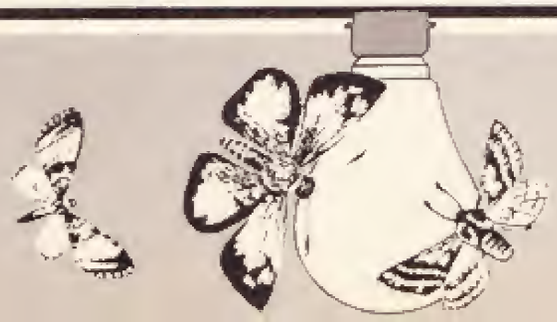
```
550 REM
560 CALL COINC(ALL,Q):: IF Q THE
N L=L+1 :: CALL SOUND(100,-6,0):
: IF L=5 THEN 970 ELSE CALL DELS
PRITE(ALL):: GOSUB 820
570 GOTO 250
580 REM
590 REM *  SET CHARS  *
600 REM
610 CALL CHAR(64,"",124,"",132,"
",140,"",76,"070F1F39393F3F383C1
F0F0704040201E0F0F83C3CFCFC1C3CF
8F0E02C204080")
620 CALL CHAR(80,"000064F2D9FD7F
7F3F0F1B1F0D010000000264F9BBFFE
FEFCF0D8F8B0800000")
630 RETURN
640 REM
650 REM *  SET COLOURS  *
660 REM
670 CALL CLEAR :: CALL SCREEN(2)
:: CALL COLOR(1,2,2,12,2,9,13,2,
12,14,2,13):: RETURN
680 REM
690 REM *  SET VARIABLES  *
700 REM
710 L,SC,SW,TOT=0 :: SP=10
720 REM
730 REM  *  SET SCREEN  *
740 REM
750 CALL DELSPRITE(ALL)
760 FOR Z=2 TO 22 STEP 4 :: FOR
Y=6 TO 26 STEP 4 :: FOR X=0 TO 2
 :: CALL HCHAR(Z+X,Y,124,3):: NE
XT X :: NEXT Y :: NEXT Z
770 TOT=TOT+SC :: SC=0
780 GOSUB 1380
790 REM
800 REM *  SET SPRITES  *
810 REM
820 DIR=DIR+1 :: ON DIR GOTO 830
,840
830 FOR X=1 TO 6 :: CALL SPRITE(
#X,80,2,204,(12+X*32)):: NEXT X
:: GOTO 850
840 FOR X=1 TO 6 :: CALL SPRITE(
#X,80,2,(12+(X*32-32)),236):: NE
XT X :: DIR=0
850 A=204 :: B=12 :: CALL SPRITE
(#28,76,16,B,A)
860 REM
870 REM *  MOVE SPRITES  *
880 REM
890 ON DIR+1 GOTO 900,910
900 SP=SP+2 :: CALL MOTION(#1,0,
SP-1,#2,0,-SP,#3,0,SP+1,#4,0,-SP
-1,#5,0,SP,#6,0,-SP+1):: RETURN
910 SP=SP+2 :: CALL MOTION(#1,SP
-1,0,#2,-SP,0,#3,SP+1,0,#4,-SP-1
,0,#5,SP,0,#6,-SP+1,0):: RETURN
920 REM
930 REM *  END ROUTINE  *
940 REM
950 REM *  PRINT SCORE  *
960 REM
970 CALL DELSPRITE(ALL):: CALL C
LEAR :: CALL SCREEN(5):: FOR X=1
 TO 14 :: CALL COLOR(X,16,5):: N
EXT X
980 DISPLAY AT(6,3):"ALL YOUR LI
VES ARE GONE" :: DISPLAY AT(7,3)
:"BUT YOUR SCORE WAS":TOT+SC
990 REM
1000 REM *  HALL OF FAME  *
1010 REM
1020 IF TOT+SC<=N(5)THEN 1060
1030 DISPLAY AT(8,3):"PLEASE ENT
ER YOUR NAME" :: INPUT NAME$
1040 FOR Z=5 TO 1 STEP -1 :: IF
(TOT+SC)>N(Z)THEN N(Z+1)=N(Z)::
N(Z)=(TOT+SC):: N$(Z+1)=N$(Z)::
N$(Z)=NAME$
1050 NEXT Z
1060 FOR Z=1 TO 5 :: DISPLAY AT(
Z+12,4):Z;N(Z):: DISPLAY AT(Z+12
,12):N$(Z):: NEXT Z
1070 REM
1080 REM *  ANOTHER GAME  *
1090 REM
1100 DISPLAY AT(22,3):"ANOTHER G
AME [Y/N]" :: CALL KEY(0,K,S)::
```

program listing

```
IF S=0 THEN 1100 :: IF K=121 THE
N 190 ELSE IF K<>110 THEN 1100
1110 CALL CLEAR :: END
1120 REM
1130 REM * TITLE SEQUENCE *
1140 REM
1150 CALL CLEAR :: CALL SCREEN(2
):: CALL COLOR(5,2,2):: CALL MAG
NIFY(3)
1160 PRINT "    @@@@@@  @@@@  @@@
 @ @         @ @ @  @ @    @    @ @
        @ @ @  @ @    @    @@@@"
1170 PRINT "    @ @ @  @ @    @
 @ @         @ @ @  @@@    @    @ @
":: : : : : : : : : : :
1180 PRINT "  @@@@@@  @@@@  @@@@  @
@@  @@@@    @ @ @  @ @  @ @    @
@ @    @ @ @  @@@  @ @    @    @@@@"
1190 PRINT "  @ @ @  @ @  @ @
@    @ @    @ @ @  @ @  @ @  @@@
@ @"

1200 CALL COLOR(5,11,11):: RETUR
N
1210 CALL COLOR(5,11,11):: FOR X
=1 TO 4 :: CALL SPRITE(#X+20,76,
11,96,X*64,0,-10):: NEXT X :: RE
TURN
1220 REM
1230 REM *  INSTRUCTIONS  *
1240 REM
1250 CALL DELSPRITE(ALL):: CALL
SCREEN(9):: FOR X=1 TO 14 :: CAL
L COLOR(X,9,9):: NEXT X
1260 PRINT "  THIS IS YOU   STAY
 BRIGHT   YOU'VE FIVE   LIVES ON
LY.":: :
1270 PRINT "  YOU MOVE ON A 6 BY
 6 GRID   USING A STANDARD JOYST
ICK   AS YOU MOVE OVER THE GRID
  THE SQUARES CHANGE COLOUR"
1280 PRINT "   RED-YELLOW YELLOW
-GREEN     GRID GREEN - NEW SCRE
EN    BUT DON'T TOUCH THE MOTHS"
: : : :
1290 PRINT "  PRESS THE FIRE BUT
TON AND   SWITCH YOUR LIGHT OFF
BUT   NOT TOO OFTEN OR YOU WILL
  FUSE IT. MOVE JOYSTICK TO   RE
START":: :
1300 PRINT "  *   RELEASE ALPHA
NOW   *   *   AND PRESS ANY KEY
  *"
1310 FOR X=1 TO 14 :: CALL COLOR
(X,2,9):: NEXT X :: FOR X=1 TO 4
 :: CALL SPRITE(#X,80,2,102,X*64
,0,10,#28,76,16,10,124):: NEXT X
1320 CALL KEY(0,K,S):: IF S=0 TH
EN 1320 ELSE RETURN
1330 REM
1340 REM *  MUSIC  *
1350 REM
1360 RESTORE 1400 :: CALL COLOR(
6,16,1):: FOR V=1 TO 6 :: FOR W=
1 TO 6 :: READ X,Y :: CALL SOUND
(X,Y,0,Y+1,0,Y+2,0):: NEXT W
1370 FOR Z=0 TO 2 STEP 2 :: CALL
 HCHAR(12,V*5+Z/2-1,76+Z):: CALL
 HCHAR(13,V*5+Z/2-1,77+Z):: NEXT
 Z :: NEXT V
1380 RESTORE 1430 :: FOR X=1 TO
9 :: READ Y,Z :: CALL SOUND(Y,Z,
0,Z+2,0,Z+4,0):: NEXT X :: RETUR
N
1390 DATA 119,101,110,100,121,32
,106,111,104,110,115,32
1400 DATA 240,196,120,196,120,19
6,240,196,240,220,960,196,240,24
7,120,247,120,247,240,247,240,22
0,960,196
1410 DATA 240,165,120,196,120,19
6,240,196,240,220,960,196,240,19
6,120,196,120,196,240,196,240,16
5,960,147
1420 DATA 240,165,120,196,120,19
6,240,196,240,220,960,196,240,24
7,120,247,120,247,240,247,240,22
0,600,196
1430 DATA 240,196,240,196,600,22
0,240,220,240,220,600,196,240,18
5,240,185,960,196
1440 END
```







Hardware Factfile

This extended FACTFILE gives all the specifications of home computers on the market with summaries gleaned from *PCT* hardware reviews.

FACTFILE PRICE INDEX

MICROS UNDER £500 (prices given in chart are recommended retail. For average selling prices see under machine)

less than £100
- Aquarius
- Atari 600XL
- Spectrum 16K

£100-200
- Atari 800 XL
- Atmos
- CGL/Sord M5
- Commodore 16
- Dragon 32
- Electron
- Enterprise 64K
- Spectrum 48K
- VIC 20

£200-300
- Amstrad (Green Monitor)
- Commodore 64
- Commodore Plus 4
- Enterprise 128K
- Spectravideo SV318

more than £300
- Advance 86
- Amstrad (Colour Monitor)
- BBC Model B
- Einstein
- Sinclair QL
- Spectravideo SV328

MICROS

ADVANCE 86A

W H Smith & Son Ltd
Strand House
10 New Fetter Lane
London EC4A 1AD



STANDARD PACKAGE

Memory Size (RAM)	128K
Screen Size	25 lines of 80 characters
Expansion Sockets	IBM compatible card slots x 3, RS232, analogue input
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	24K
R.R.P.	£399
Average Price	**£399**

As a home computer, it is somewhat expensive for what it offers. Features include a good keyboard, very large RAM, clear screen display, no RAM lost to screen memory, inbuilt BASIC. Perhaps its biggest plus point is that it can be easily and relatively cheaply upgraded to a fully fledged business machine, the 86B. Very little software though!

AMSTRAD CPC464

Amstrad Consumer Electronics
Brentwood House
169 Kings Road
Brentwood
Essex CM14 4EF



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 20,40 or 80characters
Expansion Sockets	Centronics Parallel printer port
Tape Included?	Yes
Monitor Included?	Yes — green or colour
Size of ROM	32K
R.R.P.	£299, £329 (extra with disk drives)
Average Price	**£239, £349**

Complete system of computer, cassette deck and monitor, representing excellent value. Disk drives available. Good keyboard but difficult BASIC a version of Microsoft, and fiddly screen editor.

Of interest to all home users, beginners and serious hobbyists. Well supported by software houses; games and utilities including word processing programs available. User Guide, Welcome tape and programming instructions in package. An excellent manual is available from Amsoft for £20.

ATARI 600XL

Atari Corp. U.K.
Atari Hse
Railway Terrace
Slough
Bucks.



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Size of ROM	20K
R.R.P.	£99.99
Average Price	**£99.99**

Atari have now stopped production of this model, although units are still available — look out for store price reductions.

Good keyboard and many improvements over earlier Atari models make it a worthy competitor to the Electron and Spectrum. Excellent graphics make it good value for money for anyone particularly interested in this area.

Minus points are that an Atari cassette deck is required and loading is erratic. Most software available is American and expensive. Disk drives and wide range of peripherals such as expansion packs, light pens, touch pads and printers available.

ATARI 800XL

Atari Corp. U.K.
Atari Hse
Railway Terrace
Slough
Bucks.



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Size of ROM	20K
R.R.P.	£129.99
Average Price	**£129.99**

Identical to 600XL except for extra 48K RAM.

Hardware Factfile

ATMOS

Oric Products Int.
Cowarth Mansion
Cowarth Park
London Road
Sunninghill
Ascot SL5 75E



STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	25 lines of 40 characters
Expansion Sockets	Centronics printer and Oric expansion connection
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	16K
R.R.P.	£189.95
Average Price	**£189.95**

A great improvement over the Oric 1 in terms of 'real' keyboard, new ROM minus Oric's bugs and extra commands added, Standard Microsoft BASIC, good colour and resolution.

Major drawback is lack of software, since few companies are supporting it. Disk drives, printers and other peripherals available but may take some finding!

BBC MICROCOMPUTER

Acorn Computers Ltd
Fulbourn Road
Cherry Hinton
Cambridge CB1 4JN



STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	32 lines of 80 characters
Expansion Sockets	Serial and parallel output, analogue input, printer BUS connection
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	32K
R.R.P.	£399
Average Price	**£399**

A well proven machine with over 200,000 units sold in the U.K.alone. Top of the home computing machines due to its almost limitless expandability to cover any application from games to small business usage.

Excellent operating system and BASIC language employing procedures. Good keyboard with user-definable function keys. Comprehensive software and firmware base covering games, education, utilities and business packages. Peripherals available from wide range of manufacturers leading to great choice of printers, disk drives etc. Can be expanded with second processor and hard disk system.

User manual is a little confusing but there is a wealth of printed matter available. A Welcome tape is included in the price.

AQUARIUS

Radofin
Hyde House
Colindale
London NW9



STANDARD PACKAGE

Memory Size (RAM)	4K
Screen Size	24 lines of 40 characters
Expansion Sockets	Yes
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	8K
R.R.P.	£54
Average Price	**£49.95**

Cheap but extremely limited in terms of performance, software and peripherals. May be a cheap buy for someone who wants to 'see' a computer but not for anyone with a real interest in the subject or who wants good games.

CGL M5

CGL
Computer Games Ltd,
CGL House,
Goldings Hill
Loughton,
Essex.



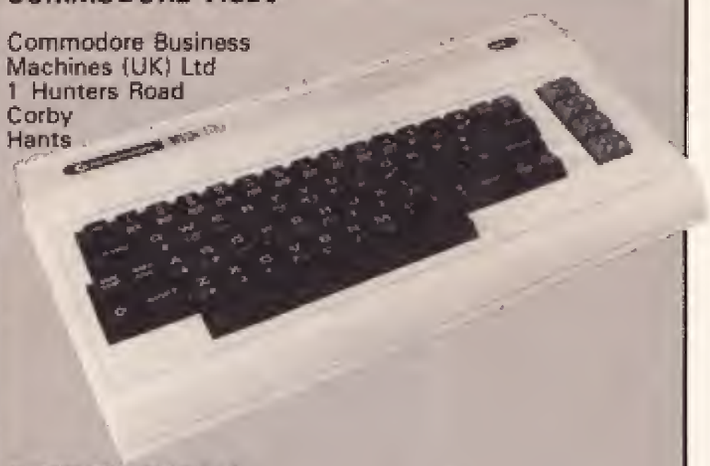
STANDARD PACKAGE

Memory Size (RAM)	20K
Screen Size	24 lines of 40 characters
Expansion Sockets	Parallel
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	8K
R.R.P.	£149.95
Average Price	**£149.95**

A low selling micro with consequent poor support base. Rubber keyboard, not suitable for beginners unless they are very keen. Standard Microsoft BASIC, graphics and sound give the Spectrum a run for its money. For the same price, one could buy a CBM16 which has a real keyboard, superb graphics and comprehensive software and peripheral support from all major manufacturers.

COMMODORE VIC20

Commodore Business
Machines (UK) Ltd
1 Hunters Road
Corby
Hants



STANDARD PACKAGE

Memory Size (RAM)	5K
Screen Size	23 lines of 22 characters
Expansion Sockets	BUS connection, Disc, Printer, Serial output, joystick
Tape Included?	Yes
Usable Domestic TV?	Yes
Size of ROM	20K
R.R.P.	£149.99
Average Price	**£100**

Though superseded by the new CBM16, Commodore are still making the VIC and will continue to support it with software and peripherals.

The starter pack, consisting of computer and tape deck, represents good value for the interested hobbyist though serious users should consider its big brother the CBM64 or one of the new machines. Look out for bargains, as stores lower prices in the run up to Christmas. Software support is dying out as more companies turn to the other Commodore machines.

COMMODORE 64

Commodore Business
Machines (UK) Ltd
1 Hunters Road
Corby
Hants



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS, Serial, Video
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	20K
R.R.P.	£229
Average Price	**£199**

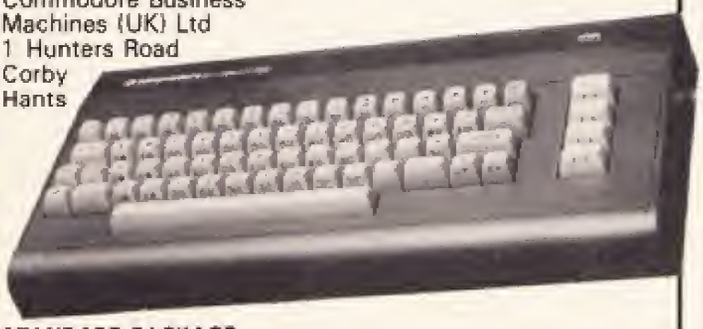
Sales of this micro represented 34% of all home computers sold in the U.K. in the first half of this year (Gallup survey), so it enjoys an enormous support base among manufacturers and home computer enthusiasts.

One of the most versatile of the home computers, the CBM64 is renowned for its graphics and sound, but these functions are not easy to use and require extensive use of the PEEK and POKE commands. Primarily a programmer's machine, the very extensive range of cheap and excellent games and utility software make it a game player's dream.

Supplied documentation leaves much to be desired but this is to be balanced against the extensive library of good books available. No problems with add-ons either although Commodore's own tape decks, disk drives and printers are necessary but these are cheaper than most other manufacturers' anyway.

COMMODORE 16

Commodore Business
Machines (UK) Ltd
1 Hunters Road
Corby
Hants



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	25 lines of 40 characters
Expansion Sockets	CBM Serial BUS
Tape Included?	Yes
Usable Domestic TV?	Yes
Size of ROM	32K
R.R.P.	£129.99
Average Price	**Available September '84**

It is Commodore's intention to replace the VIC 20 with this micro. Will be sold in a complete starter pack including tape deck. It is designed with today's first user in mind and has an advanced BASIC received favourably by software houses and educationalists. Has a unique help key which highlights errors in lines of programming right down to individual instructions.

COMMODORE PLUS 4

Commodore Business
Machines (UK) Ltd
1 Hunters Road
Corby
Hants



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 characters
Expansion Sockets	CBM Serial BUS
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	96K
R.R.P.	£249
Average Price	**Available September '84**

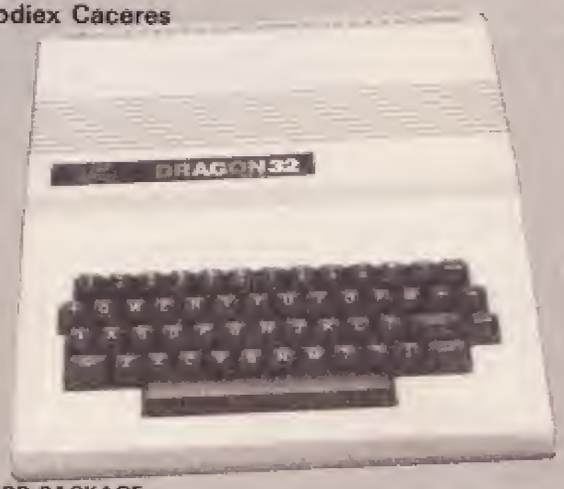
Still aimed at the home market, Commodore's new machine has built in practical software, operated at the touch of a button. The four integral programs are those most commonly used for professional applications — word processing, database, spreadsheet and business graphics but with only 64K of RAM, it does not hope to compete in the business market. Still, a machine to be considered by the serious home user who wants to use it for productive applications.

The omissions in the documentation for the earlier Commodore machines have been rectified. Usual Commodore software and peripherals support.

Hardware Factfile

DRAGON 32

Eurohard Communications
Dr. Maranon
No 2 Sodiex Caceres
Spain



STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of ROM	16K
R.R.P.	none available
Average Price	**£60**

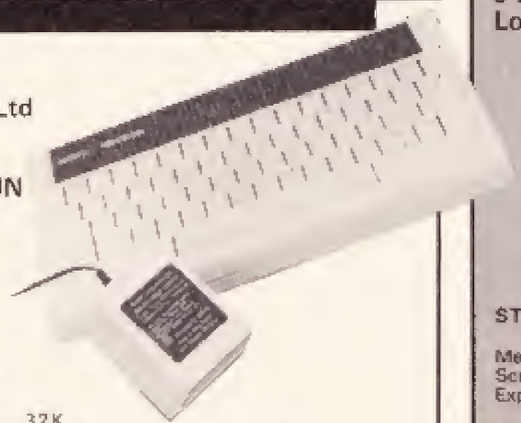
A micro whose parent company have had many problems this year. However, all that has been sorted out and the Dragons (32K and 64K) are back in business.

Never very popular, software and peripheral support is limited although disk drives and printers are available. Some good educational software.

Powerful processor (but limited screen display; no lower case letters) make it a bargain at the cheaper prices which were to be found earlier in the year (£60).

ELECTRON

Acorn Computers Ltd
Fulbourn Road
Cherry Hinton
Cambridge CB1 4JN



STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	32 lines of 80 characters (max)
Expansion Sockets	BUS connection
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	32K
R.R.P.	£199
Average Price	**£199**

Acorn's budget priced machine is lacking many of the features of the BBC. Notable amongst these are interfaces; none are found on the Electron making expansion difficult. Also one of the graphics modes is missing, making the graphics far inferior to the BBC. Operation of the processor is much slower and the BASIC is different.

Still, as a cheaper alternative to the BBC for someone not too serious about computing — there is an excellent supply of educational and games software — this might be the micro to buy.

EINSTEIN

Tatung UK Ltd.
Stafford Park 10
Telford
Shropshire
TF3 3AB.



STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	24 lines of 40 characters
Expansion Sockets	Tatung Pipe, analogue, Centronics RS232
Tape Included?	Disk Drive
Usable Domestic TV?	Yes
Size of ROM	8K
R.R.P.	£499
Average Price	**not available**

A computer for the serious home hobbyist with built in disk drive and very good, powerful BASIC. It overcomes hardware limitations of the graphic facility by good software drivers. Presently little software support though it is such a new machine that this may be rectified. Excellent documentation is provided.

ENTERPRISE 64

Enterprise Computers Ltd,
31-37 Hoxton Street,
London N1 6NJ.



STANDARD PACKAGE

Memory Size (RAM)	64K, 128K
Screen Size	84 lines of 56 characters
Expansion Sockets	BUS (64 way) ROM Socket RS423 Centronics monitor
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	—
R.R.P.	£199, £299
Average Price	**Not available**

As yet 'unseen' since its announcement last April, launch dates have been postponed again and again. Latest news is for availability in October but wait and see!



MSX FAMILY
First group of computers conforming to a standard making software and add-ons compatible across the range. Tremendous software support promised for when machines become available. All machines share the same common roots but vary in their final form. Prices will reflect these differences.

SINCLAIR QL

Sinclair Research,
Stanhope Road
Camberley GU15 3PS



STANDARD PACKAGE

Memory Size (RAM)	128K
Screen Size	32 lines of 84 characters (max)
Expansion Sockets	RS232 ports × 2
Tape Included?	Yes, Microdrives
Usable Domestic TV?	Yes
Size of ROM	32K
R.R.P.	£399 (mail order only)
Average Price	**£399**

Marketed for the serious home hobbyist with very advanced BASIC, extremely powerful 16 bit processor, the highest resolution graphics of any home micro and built-in microdrives. Supplied with four excellent utility programs, it is probably the best machine available for the serious machine code enthusiast. No arcade games as yet. Alternative operating system by GST available.

SINCLAIR ZX SPECTRUM

Sinclair Research,
Stanhope Road
Camberley, GU15 3PS



STANDARD PACKAGE

Memory Size	16K, 48K
Screen Size	24 lines of 32 characters
Expansion Sockets	ROM packs, Bus connector, joystick, socket
Tape Included?	No
Usable Domestic TV?	Yes
Size of ROM	16K
R.R.P.	£99.95, £129.95
Average Price	**£99.95, £129.95**

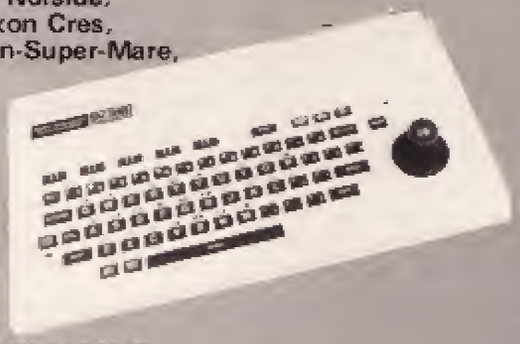
Launched as Sinclair's answer to the BBC Micro, the Spectrum has had phenomenal success in the U.K. and is still selling well.

It could never be a serious competitor to Acorn's micro but for its price the 48K Spectrum offers some excellent features such as large memory, built in speaker, reasonable graphics and a fast and reliable cassette interface.

It has the largest software base of any of the home micros and there are some excellent cheap programs around. This support is continued and is also evident in the large number of peripheral devices available. The microdrives provide a cheap mass storage medium. If games are your interest, look no further!

SPECTRAVIDEO SV-318 and 328

CK Supplies,
Unit 5 Norside,
Oldmixon Cres,
Weston-Super-Mare,



STANDARD PACKAGE

	318	328
Memory Size	32K	80K
Screen Size	40 lines of 24 char.	40 lines of 24 char.
Expansion Sockets		
Tape Included?	No	No
Usable Domestic TV?	No	No
Size of ROM	32K	32K
R.R.P.	£226	£305
Average Price	**£226**	**£305**

Reviewed earlier this year, PCT's hardware reviewer drew the following conclusions on the Spectravideo:
"Taking an overall view this is an excellent system at a reasonable price. The only flaw I could find was the keyboard, which in any case is a matter of personal taste. Providing software houses get busy in producing programs for it, I feel the Spectravideo has a bright future."

Well software houses are not showing much interest and there are few add-ons in the pipeline.



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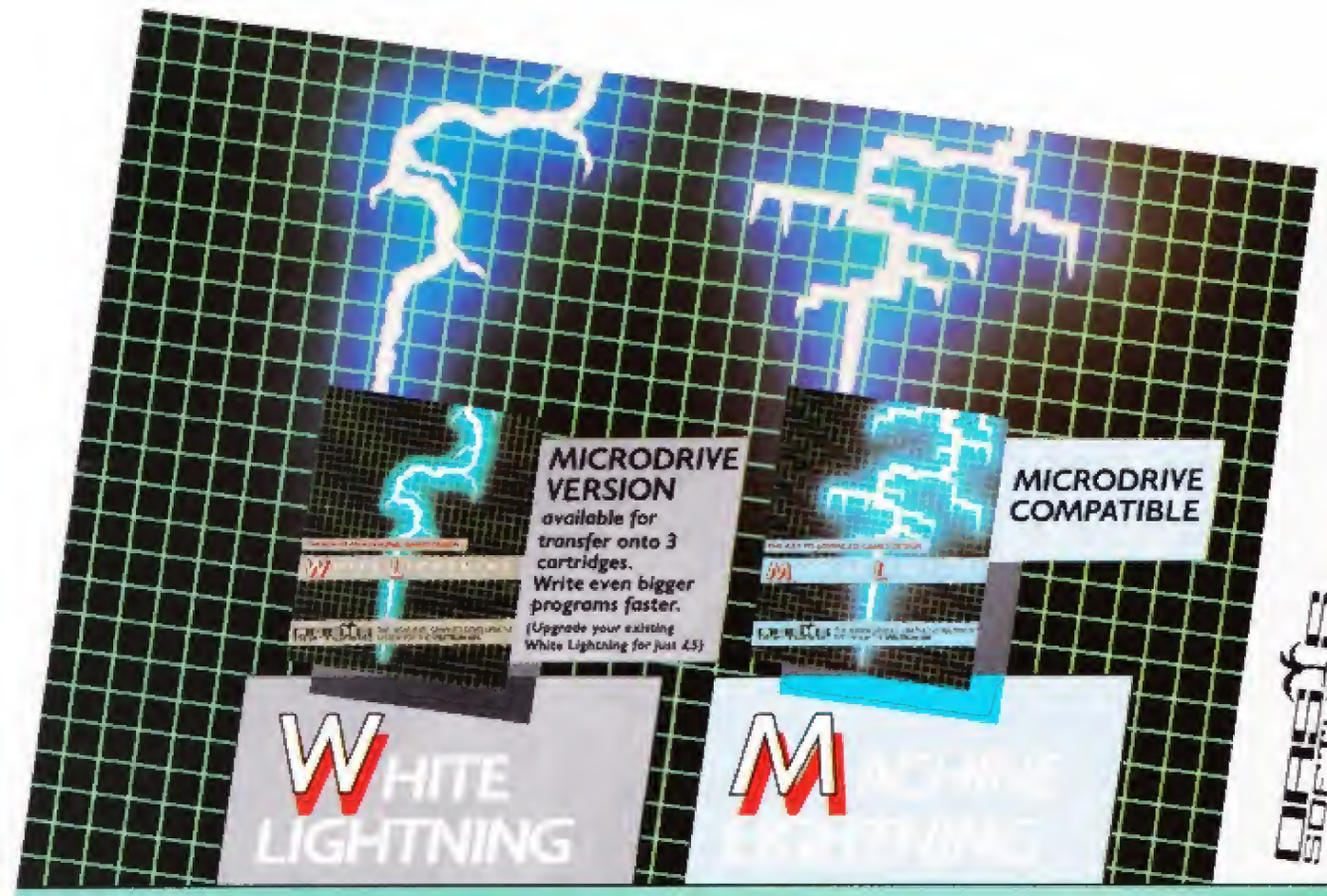
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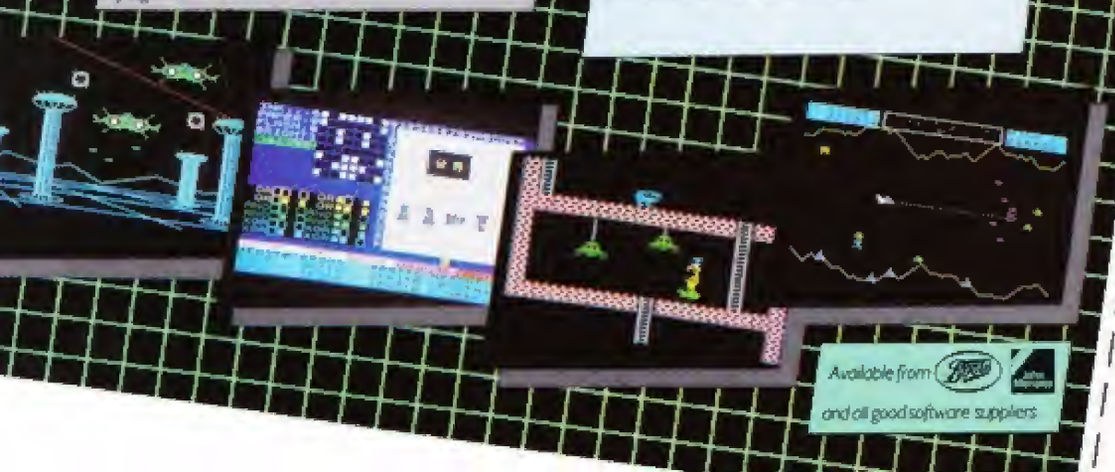
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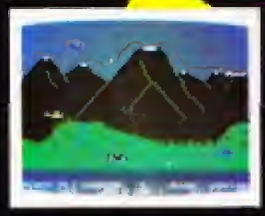
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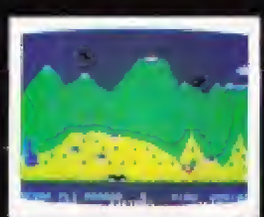
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