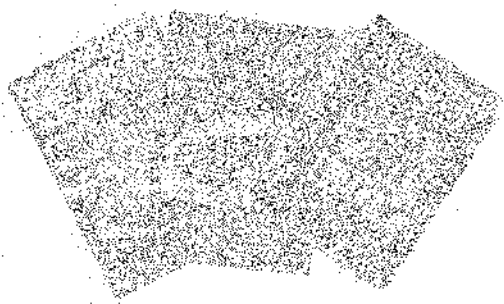


BEEBUG

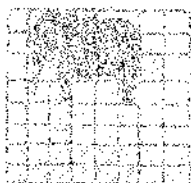
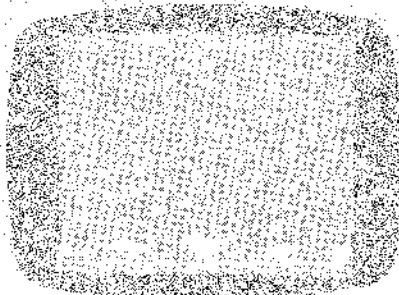
FOR THE BBC MICRO

Vol 2 No 6 November 1983

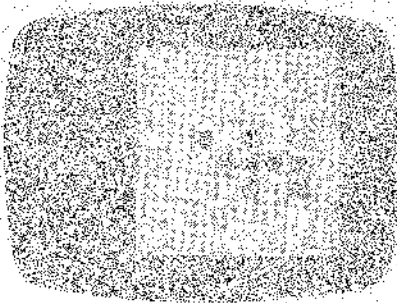


New Books Reviewed

JUMBO CHARACTER DEFINER



LUNAR ESCAPE



Reversi

PLUS

- * DISC RECOVERY
- * MODE 8
- * ROM BOARDS
REVIEWED
- * INTERRUPT
PROGRAMMING
- * GAMES REVIEWED
- * SLOW MOTION BEEB
- * CLOCK DISPLAY
- * TORCH BASIC
REVIEWED

BRITAIN'S LARGEST COMPUTER USER GROUP
MEMBERSHIP EXCEEDS 20,000

You will see that BEEBUG has acquired a new editor. This does not imply any immediate or major changes nor does it signify any kind of palace revolution, but is just a consequence of the growth and success of BEEBUG and the launch of our new magazine for the Electron. I am also in no way related to Sheridan Williams, though our common surname does occasionally cause confusion in the office.

COMPUTER SHOWS

We would like to thank all those members who took the trouble to visit us on our stand at the PCW show. We shall also be at the 'Your Computer' Christmas Fair (see Events in the supplement) in December and hope to see as many as possible of you there. We shall be launching a range of software for Christmas at the show.

1.2 OPERATING SYSTEM ROM

For some time now, all BBC micros sold have come with O.S. 1.2 and many earlier models have been upgraded to take advantage of the extra features of the newer version. Since a very large majority of members must now be using O.S. 1.2 we have decided that from the start of 1984 we shall only use O.S. 1.2 to develop and test programs for the magazine. This enables us to use more of the features of the 1.2 operating system to the general benefit of programs, without the worry of incompatibility. In any case, more and more software suppliers will cease to cater for O.S. 0.1, if they haven't already done so.

EXPANSION ROM BOARDS

Many BEEBUG members have expressed interest in expansion ROM boards for the Beeb and we have reviewed three in this issue. Acorn themselves do not make an expansion board for the BBC micro and have no immediate plans to do so.

However, it is quite likely that it will be difficult to fit both an expansion ROM board and one of the new double density disc controller boards (such as those from Microware and LVL) at the same time. We hope to be able to review double density disc controllers for the next issue of BEEBUG and will report then on any problems we find.

Mike Williams

HINT WINNERS

This month's hint winners are G.M.Abernethy who wins the £10 prize, and Paul Beverley and J.L.Ward who both win a £5 prize.

MAGAZINE CASSETTE

This month the magazine cassette contains two extra items. The first is the winning program in our Sort Competition (see BEEBUG Vol.2 No.4) by J.B.Simpson. This is in assembler and is able to sort rapidly, data contained in numeric or string arrays. We are also including on the cassette full details on how to use the program. We have also included a demonstration of Swarmers' Revenge, BEEBUG's new game.

For those not wishing to purchase the whole tape, we are continuing our photocopy service (introduced last month) for the additional items on the magazine cassette (except for Swarmers' Revenge). Send 50p per item required, plus s.a.e. to: Photocopies, BEEBUG, PO Box 50, St Albans, Herts. Please give your membership number.

BEEBUG POST

BEEBUG still requires a young technical assistant with software expertise on the Beeb. See the supplement for details.

NOTE - in this issue l and I are in some listings printed the same - there are no lower case Ls used on there own.

BEEBUG MAGAZINE

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ADDITIONAL ITEMS ON MAGAZINE CASSETTE

- Fast Sort Routine
- Swarms' Revenge Game Demo

NEWS

BEEBUG ON TV

Those of you who were able to watch the Thames Television programme "Database" on the evening of Wednesday 28th September will have seen copies of BEEBUG magazine being shown by Guy Kewney as examples of the best kind of magazine for the home and personal computer user. This occurred during an item on the recent PCW Show at the Barbican Centre, London at which BEEBUG had a stand. We noticed that many of you took time to visit us and we hope that your visit to the show was worthwhile.

COMPUTER AIDED DESIGN

Ibbotsons Design Software has recently released a CAD system, available on cassette, disc or EPROM called DIGITAL DRAWINGS. Some of the facilities offered are: 19 shading patterns, single key commands, reference scales and grids, 32 pre-defined graphics symbols, rubber banding and zoom. The package is designed to work with an EPSON FX-80 printer. The price will be below £100 for all the systems.

For further details contact Ibbotsons Design Software, The Byre, Ecclesbourne Lane, Idridgehay, Derbyshire, DE4 4JB.

BBC MICRO FOR THE US AND CHINA

The Wong Electronics Company of Hong Kong have won a US\$45 million order to manufacture BBC micros for the US market. Shipping is scheduled to begin this autumn with 50,000 being produced in the next 12 months. Wong's already manufacture Acorn products for the Far East and Australia and negotiations are now in progress with China.

The US version of the micro will include disc drive, voice synthesis and Eonnet interface in the US\$995 price. The machine will be aimed very strongly at the US educational market.

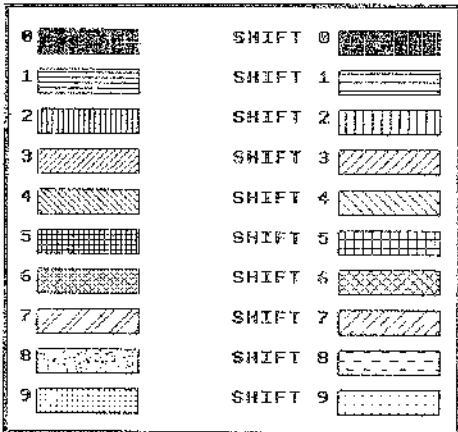
DISC EXECUTOR

Vision Software have just announced their software package called DISC EXECUTOR. It allows you to transfer any tape software to disc (including 'locked' programs), and allows games up to 64K blocks to be loaded and run from disc.

DISC EXECUTOR costs £11.00 from: Vision Software, 1 Allington Street, Liverpool, L17 7AD.

ACORN SHARES FOR SALE

Acorn Computers have recently announced that they are offering 10% of their shares for sale on the Unlisted Securities Market. So if you fancy a flutter in the stock market and a chance to get a stake in one of the top five computer manufacturers of this country, then see your stockbroker immediately.



MONITOR/TV STAND AND SOUND CONTROL

Microsupport are marketing a steel support for your monitor/TV. The BBC micro will slide underneath when not in use. It costs £16.99 inc. VAT and postage.

They also make an external volume control which allows you to connect your Beeb to another speaker, or from another socket, to an external amplifier. Cost is £4.00 inc VAT and post, from:

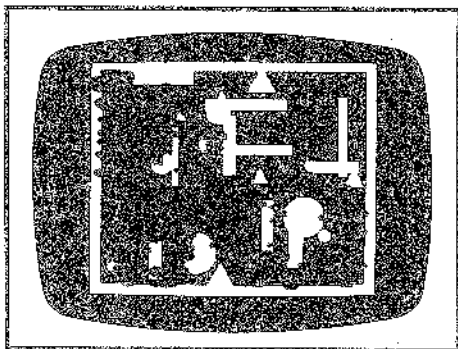
Microsupport, 104 Reddown Road, Coulsden, Surrey, CR3 1AL.

Tested on O.S. 0.1 and 1.2
and on Basics I and II

DEMOLITION (32k)

by D D Harriman

All at BEEBUG found this program highly entertaining when we first saw it in action. The colourful graphics, fast action and sizzling sound effects are all combined in a highly pyrotechnic display.



The program starts with a colourful display on the screen, consisting of randomly positioned shapes of various colours surrounded by a border. The computer then places somewhere on the screen, a small 'ball' which is then sent shooting across the display. Whenever it collides with a shape, or the border, an 'explosion' occurs, and part of the shape is destroyed. The ball bounces off and continues its destructive rampage around the screen, gradually eroding away every object in the display. Every collision is followed by a colour change on the screen. At times, everything seems to go berserk with a riot of flashing colours and explosive noises. The kaleidoscope of sound and colour continues for 5 minutes before a new screen is set up and the action starts all over again.

The sound effects are particularly effective, giving the impression of underground explosions. If you look carefully you will also see that the ball has a curved path ensuring, that it will never get caught in a repetitive sequence, unlike the old BREAKOUT game. This very modest program will well repay the small effort of typing it into your micro.

```
10 REM Program DEMOLITION
20 REM Version B1.0
30 REM Author D.D.Harriman
40 REM BEEBUG November 1983
50 REM Program subject to Copyright
60 *FX9,12
70 *FX10,12
80 ENVELOPE 1,0,0,0,0,0,0,0,-1,-1,
-1,126,0
90 MODE 2
100 VDU 23,224,&5410;&BC7E;&7CFF;&104
E;
110 VDU 23;8202;0;0;0;
120 FOR Q%=1 TO 10
130 H%=RND(300)+100
140 V%=RND(300)+100
150 IF H%<V% H%=30+RND(40) ELSE V%=30
+RND(40)
160 X%=RND(1280-H%)-1
170 Y%=RND(1024-V%)-1
180 REPEAT N%=RND(15)
190 UNTIL N%<>7
200 GCOL 0,128+N%
210 VDU 24,X%;Y%;X%+H%;Y%+V%;16,26
220 GCOL 0,RND(6)
230 X%=RND(1280)
240 Y%=RND(1024)
250 Z%=RND(100)
260 MOVE X%,Y%
270 MOVE X%+2*Z%,Y%
280 PLOT 85,X%+Z%,Y%+2*Z%
290 GCOL 0,RND(6)
300 X%=RND(1280)
310 Y%=RND(1024)
320 Z%=RND(100)
330 FOR F%=0 TO Z% STEP 4
340 K%=SQR(Z%-F%-F%*F%)
350 MOVE X%-K%,Y%+F%
360 DRAW X%+K%,Y%+F%
370 MOVE X%-K%,Y%-F%
380 DRAW X%+K%,Y%-F%
390 NEXT
400 NEXT
410 GCOL 0,132
420 VDU 24,0;0;50;1023;16
430 VDU 24,0;0;1279;50;16
440 VDU 24,1230;0;1279;1023;16
450 VDU 24,0;974;1279;1023;16
460 VDU 20,26
```

```

470 X%=100
480 Y%=900
490 X=8
500 Y=1
510 TIME=0
520 REPEAT Y=Y*.999-.1
530 X=X*.999
540 P%=POINT(X%+X,Y%)
550 IF P%<>7 AND P%<>0 X=-X:PROCZ ELSE
E P%=POINT(X%,Y%+Y):IF P%<>7 AND P%<>0
Y=-Y:PROCZ
560 PLOT 71,X%,Y%
570 X%=X%+X
580 Y%=Y%+Y
590 PLOT 69,X%,Y%
600 UNTIL TIME>30000:RUN

610 DEF PROCZ
620 VDU 19,P%,RND(6);0;
630 X=X*1.03
640 Y=Y*(1.03-.1*(Y>0 AND Y<500))
650 MOVE X%-32+RND MOD 9,Y%+12+RND MO
D 5
660 GCOL 0,0
670 VDU 5,224,4
680 GCOL 0,7
690 SOUND 16,1,3+RND(3),1
700 IF X%<50X=8 ELSE IF X%>1230 X=-8
710 IF Y%<50 Y=8 ELSE IF Y%>974 Y=-8
720 IF ABS X>16 X=16*SGN(X)
730 IF ABS Y>16 Y=16*SGN(Y)
740 ENDPROC

```

This will work on
O.S. 1.2 and
Bases 1 and II

MODE 8 SCREEN DISPLAY (16k)

As an example of the detailed information contained in the Advanced User Guide (reviewed elsewhere in this issue), the publishers have given us permission to print this extract in BEEBUG.

This example program will set up a brand new mode which has been nominated as 'MODE 8'. It is achieved by directly accessing the video ULA. 'MODE 8' is a full 16 colour mode and can be implemented on a Model A as well as a Model B since only 10k of RAM is used. There will only be 10 characters across the screen, but printing and plotting will operate properly. One word of warning however. Do not try to redefine the text window when this mode is in use because it will not work! All error checking on window bounds will be ineffective in this mode since the operating system does not expect mode 8 to exist.

```

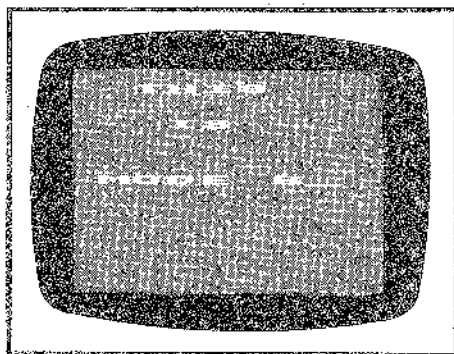
10 REM CREATE 'MODE 8'-
20 REM NOTE: NO WINDOWING ALLOWED
30 REM
40 REM NOTE: FOKING VDU VARIABLES
50 REM IS GENERALLY ILL ADVISED.
60 MODE 5:REM BASIC MODE
70 REM CONFIGURE VIDEO ULA FOR 10 CO
LUMN, 16 CHARACTER
80 *FX 154,224
90 ?&360=&F:REM COLOUR MASK

```

```

100 ?&361=1:REM PIXELS PER BYTE-1
110 ?&34F=&20:REM BYTES PER CHARACTER
(4 WIDE x 8 HIGH)
120 ?&363=&55:REM GRAPHICS RIGHT MASK
130 ?&362=&AA:REM GRAPHICS LEFT MASK
140 ?&30A=9:REM No. OF CHARS PER LINE
150 VDU 20
160 REM DEMO
170 MOVE 0,0:DRAW 640,512:DRAW 1279,0
180 PRINT TAB(1,2);
190 A$="***HelloThere***"
200 COLOUR 129
210 FOR A%=1 TO 16
220 IF A%=9 THEN PRINT TAB(1,8);
230 COLOUR A%-1
240 PRINT MIDS(A$,A%,1);
250 NEXT A%
260 PRINT

```



Tested on O.S. 0.1 and 1.2
and on Basics 1 and II

MULTIPLE CHARACTER DEFINER (32k)

by Ian McEwen

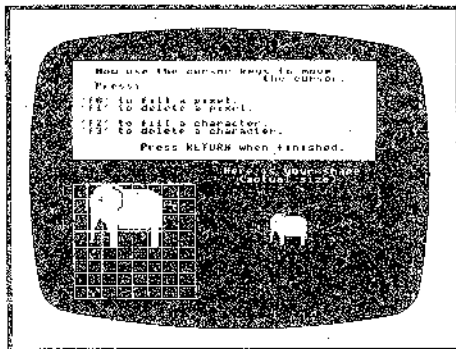
The ability to define your own characters is one of the most useful features of the Beeb. Many games programs make considerable use of this facility. Here we present a program which not only makes this task easy but enables you to build larger shapes using multiple user defined characters.

SHAPER is a useful utility program that allows you to build up multiple user defined characters that you can then incorporate into other programs. You are presented with a grid of 64 empty characters on the screen which you can then use to design your own shapes, moving about by means of the cursor keys. As you define the characters on this grid, the same characters, actual size, are displayed at the right hand side of the screen. A significant advantage of this utility is the ability to define a large shape comprised of several individual characters as a whole, instead of having to define each character individually.

When you have finished creating the shape of your choice, the parameters for each defined character are listed on the screen and, optionally, on a printer. The eight parameters listed for each character can then be used to define the same character in another program using the VDU23 command (see pages 170 to 179 and page 384 of the User Guide for further information).

To use the SHAPER program, you will need first to type it in and save it on tape or disc. Disc users will need to set PAGE lower than the default. £1900 (£1200 is recommended) in order to use the program. Ideally, a move down routine should be used which avoids any problems of program corruption by the DFS. Otherwise, load and run the SHAPER as for any Basic program.

Detailed instructions for using SHAPER are contained in the screen displays. When using the cursor keys, keep any key continually pressed to move quickly across the grid. In any cursor position, pressing 'f0' will display a single pixel in that position, and pressing 'f1' will delete a pixel. Trying to insert a pixel where



one already exists or to delete a non-existent pixel will produce a warning beep. The function keys f2 and f3 can be used to display, or delete, all the 64 pixels comprising a complete character. This feature can also be used to define black shapes on a white background. Experimenting with the cursor and function keys will soon demonstrate the power and convenience of this program. Using SHAPER, any shape can be rapidly drawn as a set of user defined characters.

Pressing Return will terminate character editing and the corresponding VDU 23 codes for each defined character are then listed on the screen, and copied to a printer if required. The codes for each character can then be used as the parameters of VDU 23 commands to define the same characters in other programs. Normally ASCII codes in the range 224 to 255 are used for this purpose (see pages 170 to 179 and page 384 of the User Guide for further information). You will also need to note the relative positions of several characters that are to be combined together in order to preserve this relationship in future use. This information is also displayed on the screen along with the character definitions.



NOTES FOR MORE ADVANCED USERS.

Although the SHAPER program allows up to 64 new characters to be defined at any one time you will normally be limited to using only 32 characters with ASCII codes 224 to 255. However, under version 1.0 and later of the operating system, you can define more than 32 characters.

In addition to ASCII codes 224 to 255 it is also possible to redefine the characters with ASCII codes 128 to 159 while, if additional memory is reserved for the purpose, all ASCII codes in the range 32 to 255 can be redefined. For further information see pages 427 and 428 of the User Guide.

```
*****
10 REM Program SHAPER
20 REM Version B1.9
30 REM Author I.McEwan
40 REM BEEBUG November 1983
50 REM Program Subject to Copyright
60 :
100 MODE7
110 ON ERROR GOTO 1740
120 *FX15,1
130 PROCfrontpage
140 :
150 MODEL
160 PROCinit:PROCtextwindow(0,12,39,0)
170 PROCgraphwindow(0,0,1279,576)
180 PROCframe(0,0,ht,(wt-h),nh,nv)
190 PROCdraw
200 *FX15,1
210 *FX4
220 *FX12,0
230 PRINT""Press any key to exit." :X
=GET
240 MODE7
250 END
260 :
1000 DEFPROCinit
1010 *FX225,128
1020 sq=224:cur=225:@%=0:nh=8:nv=8:ht=
512:wt=512:Pflag%=FALSE
1030 VDU23,sq,192,0,0,0,0,0,0,0
1040 VDU23,cur,0,192,0,0,0,0,0,0
1050 VDU19,2,7,0,0,0
1060 DIMpos%(64),defchr%(64,8):ENDPROC
1070 :
1080 DEFPROCgraphwindow(a,b,c,d)
1090 VDU24,a,b;c;d;:ENDPROC
1100 :
1110 DEFPROCtextwindow(a,b,c,d)
1120 VDU28,a,b,c,d:ENDPROC
1130 :
1140 DEFPROCframe(x,y,s,r,h,v)
1150 LOCAL K%
```

```
1160 VDU5:GCOL3,1:MOVE x,y
1170 DRAW x,y+s:DRAW x+s+r,y+s:DRAW x+
s+r,y:DRAW x,y
1180 FORK%=1TO(v-1):MOVE x,y+(s/v)*K%:
DRAW x+s+r,y+(s/v)*K%:NEXT
1190 FOR K%=1TO(h-1):MOVE x+((s+r)/h)*
K%,y:DRAW x+((s+r)/h)*K%,y+s:NEXT
1200 GCOL0,3:VDU4:ENDPROC
1210 :
1220 DEFPROCdraw
1230 LOCAL H,V,m%,n%
1240 COLOUR 131:COLOUR 0:CLS
1250 PRINT"TAB(3);""Now use the cursor
keys to move"
1260 PRINT"TAB(25);""the cursor.""TAB(3)
;"Press:"
1270 PRINT" 'f0' to fill a pixel."
1280 PRINT" 'f1' to delete a pixel."
1290 PRINT" 'f2' to fill a character."
"
1300 PRINT" 'f3' to delete a character
."
1310 PRINT"TAB(9);""Press RETURN when f
inished."
1320 *FX4,1
1330 *FX12,2
1340 VDU5 :GCOL0,3:MOVE 640,576:PRINT"
Here is your shape":MOVE 704,544:PRINT"
(actual size)"
1350 H1=32:V1=480
1360 H=H1-32:V=V1+32:h=1:v=1:GCOL 3,2
1370 REPEAT
1380 *FX15,1
1390 MOVE H,V:VDUcur:m%=GET:MOVE H,V:V
DUcur
1400 IF m%= 136 THENh=h-1:h=h-8:IFh<1
THEN h=8:H1=h1-64:IF H1<0 THEN h=1:H=H+
8:H1=H1+64
1410 IF m%=137 THENh=h+1:h=h+8:IFh>8TH
EN h=1:H1=H1+64:IF H1>wt THEN h=8:H=H-8
:H1=H1-64
1420 IF m%=138 THEN v=v+1:V=V+8:IF v>8
THEN v=1:V1=V1-64:IF V1<0 THEN v=8:V=V
+8:V1=V1+64
1430 IF m%= 139 THEN v=v-1:V=V+8:IF v<
1 THEN v=8:V1=V1+64:IF V1>ht THEN v=1:V
=V-8:V1=V1-64
1440 h%=(H1+32)/64:v%=(V1+32)/64
1450 n%=h%+(8-v%)*8
1460 IF m%=128 THEN PROCcheck(3,h,v):I
F cancel%=1 THEN GCOL3,2:GOTO 1520
1470 IF m%=128 THEN PROCplace
1480 IF m%=129 THEN PROCcheck(0,h,v):I
F cancel%=1 THEN GCOL3,2:GOTO 1520
1490 IF m%=129 THEN PROCdelete
1500 IF m%=130 THEN PROCchange(3)
1510 IF m%=131 THEN PROCchange(0)
1520 UNTIL m%=13
1530 PROCcfr:ENDPROC
1540 :
```

```

1550 DEFPROCchr
1560 LOCAL K%,X,X$
1570 GCOL0,3:VDU4:PROCtextwindow(0,12
,39,0)
1580 CLS:PRINTTAB(3,7);"Press 'P' for
a print-out"
1590 PRINTTAB(3);"else the SPACE BAR.
";X$=GET$
1600 IF X$="P" OR X$="p" THEN CLS:PRIN
T"'"TAB(5);"Switch your printer on.":
PRINT"'"TAB(12);"Press Space Bar when
ready.":X=GET:PElag%=TRUE
1610 PROCtextwindow(0,22,39,0)
1620 COLOUR 128:COLOUR 3
1630 CLG:CLS:PROCframe(0,0,256,256,nh,
nv):VDU14:IF Pflag% THEN VDU2
1640 PRINTTAB(5);"Here are your defini
tions:="
1650 FORK%=1 TO nh*nv
1660 IF pos%(K%)>0 THEN PROCdefprint
1670 NEXT K%
1680 PRINT:VDU5,3:K%=1:REPEAT
1690 IF pos%(K%)>0 THENMOVE((K%-1)MOD8
)*64,254-((K%-1)DIV8)*32:PRINTK%
1700 K%=K%+1:UNTIL K%>nh*nv
1710 MOVE 550,200:PRINT"The arrangemen
t of":MOVE 550,136:PRINT"your character
s is":MOVE 550,76:PRINT"shown in this f
rame.":VDU4
1720 ENDPROC
1730 :
1740 ON ERROR OFF
1750 MODE7
1760 VDU26,4,30
1770 *FX4
1780 *FX12,0
1790 IF ERR<17 THEN REPORT:PRINT" at
line ";ERL
1800 END
1810 :
1820 DEFPROCcheck(clr%,h,v)
1830 LOCAL h%,v%:cancel%=0
1840 h%=787+4*h+H1/2:v%=160-4*v+V1/2:I
F POINT(h%,v%)=clr% THEN cancel%=1:IF m
%=129 THEN VDU7
1850 ENDPROC
1860 :
1870 DEFPROCfrontpage
1880 LOCAL K%
1890 FOR K%=1 TO 2
1900 PRINTTAB(5,K%);CHR$132CHR$157CHR$
131CHR$141;TAB(10);"S H A P E R";TAB(30
);CHR$156
1910 NEXT
1920 PRINT"TAB(10);"This program help
s in"
1930 PRINTTAB(5)"the composition of S
HAPES using"
1940 PRINTTAB(4)"multiple user-define
d characters."
1950 PRINTTAB(7);"(User Guide pages 3
84-385)"
1960 PRINT"'"
1970 PRINTSPC(8);CHR$157;CHR$135;CHR$1
32;"Press the SPACE BAR";SPC(2);CHR$156
:X=GET
1980 ENDPROC
1990 :
2000 DEFPROCdefprint
2010 LOCAL J%,K%
2020 K%=STR$(K%):IF K%<10 THEN K%=CHR$
32+K%
2030 PRINT"'"No."+K$+":- ";
2040 FORJ%=1TO8:PRINT defchr%(K%,J%);
2050 IF J%<8 THEN PRINT",";
2060 NEXTJ%
2070 ENDPROC
2080 :
2090 DEF PROCplace
2100 pos%(n%)=pos%(n%)+2*v:defchr%(n%,
v)=defchr%(n%,v)+2*(8-h):P%=1:MOVE H,V:
GCOL3,3:VDUsq:GCOL0,3:PLOT69,787+4*h+H1
/2,160-4*v+V1/2:GCOL 3,2
2110 ENDPROC
2120 :
2130 DEF PROCdelete
2140 pos%(n%)=pos%(n%)-2*v:defchr%(n%,
v)=defchr%(n%,v)-2*(8-h):D%=1:MOVE H,V:
GCOL3,3:VDU sq:PLOT69,787+4*h+H1/2,160-
4*v+V1/2:GCOL3,2
2150 ENDPROC
2160 :
2170 DEF PROCchange(X)
2180 LOCAL h,v,H,V
2190 FOR h=1 TO 8:FORv=1 TO 8
2200 PROCcheck(X,h,v)
2210 H=H1+8*(h-1)-32:V=V1-8*(v-1)+32
2220 IF cancel%=0 THEN PROCcng(X)
2230 NEXT v,h
2240 ENDPROC
2250 DEF PROCcng(X)
2260 IF X=3 THEN PROCplace ELSE PROCde
lete
2270 ENDPROC

```



HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

600 BAUD RS423 - Nick Porter

The Tandy CGP-115 runs at 600 baud. To run the Beeb's RS423 interface at 600 baud requires a simple trick. Set up the baud rate at 150 baud and then alter the clock division ratio in the 6850 ACIA chip with:

```
*FX156,1,253
```

NINE COMPUTER GAMES REVIEWED

BY Robert Barnes & Alan Webster

Program : Bandits at 3 O'Clock

Supplier: Program Power

Price : £6.95

Rating : ***

Bandits at 3 o'clock is a new game for one or two players in which you control a bi-plane. You will need joysticks, as this is the only form of input allowed by this program, but controlling a plane is much easier this way than using the standard keyboard.

The display consists of a church and grave yard at the bottom centre of the screen, and two runways at the extreme edges of the screen. The idea of the game is to try to destroy your enemy using a machine gun mounted in your plane.

The game has many options including choice of day or night and additional problems in the form of clouds, flak and airships. This is a simple but entertaining game, which makes a change from the pressures of the normal arcade games.

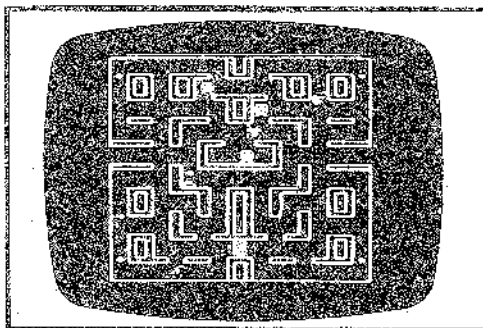
Program : Attack on Alpha Centauri

Supplier: Software Invasion

Price : £7.95

Rating : ****

Attack on Alpha Centauri is a new game from Software Invasion, who specialise in producing high quality three dimensional graphical games. The game features some of the best and



most unusual graphics yet for the BBC micro.

This is a version of Galaxians the like of which you've never seen before. An alien landscape is displayed which has been very well designed using the technique of overlaying colours to produce many different shades. When the game starts, one of several volcanos erupts and impressive looking insects fly out which you then have to shoot down. As the insects come for you they actually increase in size until they disappear over the horizon. Some of these effects are really very impressive.

This game, like the others so far produced by Software Invasion, is an excellent example of what can be achieved on the BBC and is highly recommended.

Program : Felix and the Fruit Monsters

Supplier: Program Power

Price : £7.95

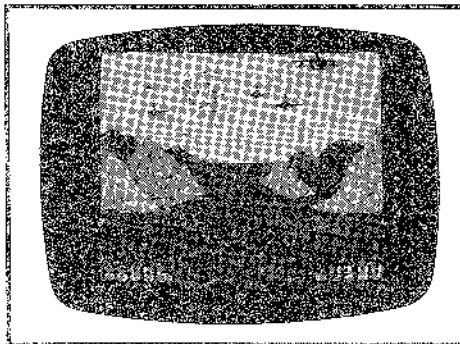
Rating : **

Felix and the fruit monsters is yet another program based on the Snapper type of maze game. This one does have a difference in that you have to protect a fruit from marauding monsters until the on-screen timer reaches zero.

In my view, this game lacks the originality to make it as worthwhile as some of the other programs on the market, even though the game does get slightly better as it progresses through its different stages. The sound soon becomes quite irritating but fortunately this can be turned off. This is not, as far as I am concerned, one of Program Power's better games, and does not come close to chef d'oeuvres like Killer Gorilla.

FELIX AND THE FRUIT MONSTERS

Program : 3D Bomb Alley
 Supplier: Software Invasion
 Price : £7.95
 Rating : ****



3D Bomb Alley is another 3 dimensional program from Software Invasion, with graphics almost as good as those of Attack on Alpha Centauri.

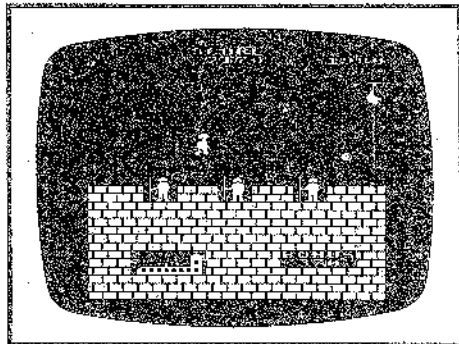
Your task in this game is to protect a fleet of ships from attacks by a number of relentless fighter aircraft. You control a battery of ground to air missiles, using either joysticks or the keyboard. This might sound easy, but wait until there are four or five bombers coming at you at once. This is a very addictive game and is good value for money.

Program : Painter
 Supplier: A and F Software
 Price : £8.00
 Rating : ***

In this game you are a painter whose job is to fill in boxes by completing the lines surrounding them. At the same time you are being hunted by 'chasers' which you must avoid. Your only protection, other than speed and cunning, is the ability to insert 3 gaps in the lines, which the Chasers cannot cross. When you complete the lines the boxes change colour, and slowly a character is built up. For example a space invader character and the A & F logo are formed.

I didn't find this game very fast even though it is written in machine code and it doesn't stand out in this highly competitive market.

Program : Hunchback
 Supplier: Superior Software
 Price : £7.95
 Rating : ****



Hunchback is one of two new releases from Superior Software. It is an extremely good version of the arcade game where Quasimodo has to cross a series of walls in order to rescue his beloved Esmerelda. There are bonus points for completing each wall as quickly as possible, but you have to concentrate on the game so much that you forget about the bonus.

There are 12 walls to navigate, and once you have done this, you go back to the first wall and the game gets quicker (much quicker!).

This game makes a nice change from the "Blast-'em-out-of-the-sky" type games and is thoroughly recommended.

Program : Felix in the Factory
 Supplier: Program Power
 Price : £7.95
 Rating : ****

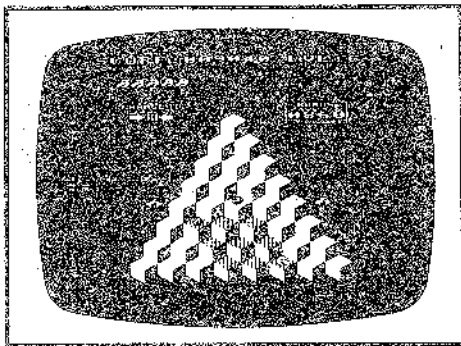
Felix in the factory is one of the new games on the market which takes its origins from the Monsters / Krazy Kong type games which involve ladders and walkways.

The idea for this game is very novel and the graphics are good. You take the part of Felix who has to run around the conveyor belts, up the ladders and along the walkways to get a can of oil with which he can re-fuel the generator. As time goes by, the generator slowly runs out of oil, and once run out, Felix dies.

Rats, and monsters of all kind

hamper you in your quest to keep the generator going. All in all, this is a very good game, but the key layout left me with a sore hand.

Program : Q*bert
Supplier: Superior Software
Price : £7.95
Rating : ****



Q*bert is the other new release from Superior Software and it is as every bit as good as Hunchback.

The game is difficult to explain, but in principle you (with a very long nose indeed) move over a 3D pyramid, changing the colour of the slab that you are on. Once all of the slabs have changed colour, you proceed to the next level. Sounds easy? Well there are a few snakes which are out to get you. If this still sounds easy then buy the game and find out!

As with all Superior Software games, you can choose the starting level and there is also a high score table. This is very good value for money indeed.

Program : Bug Blaster
Supplier: Alligata
Price : £7.95
Value : *****

Bug Blaster is one of the best games around for the BBC micro. It is fast, colourful and fun to play. It is one of the most addictive games I have ever played (and the most addictive one that our editor has played!).

It is a very good version of the arcade game 'Centipede' in which you are on patrol in a field full of mushrooms. Your aim is to avoid all of the creatures that roam around, and score as many points as possible.

There is a centipede which gradually makes it way down the screen, a spider which moves across the bottom of the screen, fleas which fall from top to bottom and a scorpion, which if it touches a mushroom poisons it. If a centipede hits a poisoned mushroom it heads straight down the screen towards you. This is another program which is excellent value for money.

SPECIAL OFFER

We have again arranged special offers for BEEBUG members on the best of the software reviewed in this issue. Details of this month's offer will be found in the magazine supplement under 'Software Club'.

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

IMPROVED ERROR HANDLING - G.M.Abernethy

The routine given does the usual printing of the error message and line number but follows this by listing the line where the error occurred automatically. This is achieved through the clever use of *FX138. To use it insert:

10 ON ERROR PROCerrorhandler:END

with the error handling procedure at the end of the program

```
1000DEF PROCerrorhandler
1010ON ERROR OFF
1020REPORT
1030PRINT " at line ";ERL
1040*FX138,0,76
1050*FX138,0,73
1060*FX138,0,83
1070*FX138,0,84
1080A$=STR$(ERL)
```

```
1090FOR K%=1 TO LEN(A$)
1100A%=L38
1110X%=0
1120Y%=ASC(MID$(A$,K%,1))
1130CALL&FFF4
1140NEXT K%
1150*FX138,0,13
1160ENDPROC
```

Time : 21.57
Time : 21.58
Time : 21.59
Time : 22.00
Time : 22.01
Time : 22.02

Tested on O.S. 1-2 and
Basics I and II

13

MODE 7 CLOCK DISPLAY (16k)

by D P Wright

This program displays a continuously updated digital clock at the top of the screen in mode 7. However, it is quite invisible to Basic, and you can run Basic programs in mode 7, or perform program editing etc without affecting the clock display.

If you would like to have a digital clock displayed on the screen, just type in the program and save it on tape or disc. Then try running it and see what happens. With machine code programs it is always worth saving the first version before trying it out, just in case you have made a typing mistake. To save time, you can omit all lines where \ is the first character after the line number, as these are just comments. When the program is run it will prompt for the current time in hours, minutes and then seconds. Enter these in standard 24 hour clock format. When Return is pressed after entering the seconds, the clock is activated. This results in the screen clearing and the time being displayed in white on blue in a stripe at the top of the screen in mode 7. This is updated once every second.

Once the program is working (when all typing errors have been cured), it is possible just to save the piece of machine code that displays the time. To do this you should first save the original program listing for safety, and then run it to assemble the code into memory. When this has finished press Escape in response to the 'hours' prompt and type:

```
*SAVE TIMER C00 +DF
```

This will save the code on its own. To use the clock at some other time all you need to do is *LOAD the program into memory. Set the variables A%, X% and Y% to the hours, minutes and seconds respectively and then type:

```
CALL &C00
```

to set the timer. Having initiated the timer, you can ignore its operation and other programs can be run independently. The only rules you must follow are not to change mode and not to use the user defined graphics characters as these are stored in the memory space where the machine code is executing. Since these are not effective in mode 7 there should be no conflict here. Note too, that you only have 24 lines to use on the screen and not 25, as the top line is now reserved for displaying the clock.

When the timer is running, operation of the cassette and disc systems etc. are unaffected. However, should you wish to disable the clock, simply type *FX13,5. It can be restarted, as described before, with CALL&C00, after setting A%, X% and Y% to the hours, minutes and seconds as required.

For the more technically minded, we provide an explanation of the operation of the program.

Essentially, the program sets up the Beep's interval timer to generate an event every second. This event is then used to display the time. The actual time display is done through direct pokes into the video display as OSWRCH is a non re-entrant routine and thus gets confused if this call is used whilst the foreground process (your program) is printing a character as well. This method can lead to other problems if trying to display characters in a scrolling area of the screen. In this program the text window is redefined so that the top line does not scroll.

When the program is called (START at line 860) it jumps to the initialisation routine. This sets up the time stores and then selects mode 7 with the appropriate text window to protect the display. The event vector is then set up at &220 before initialising the interval timer and enabling the event.

In operation the time is displayed on the screen and the interval timer is set going. One second later the interval timer crosses zero and an event is generated. When this occurs control is passed to the interrupt routine (ROUTINE at line 170) pointed to by the vector. The interval timer is set back to 1 second before zero. The clock value is then incremented in its internal version, with checking for the correct bounds for minutes and seconds. These values are then converted to BCD and then ASCII before being poked straight into the screen memory.

The generation of an event is of much more general application. With this it would be possible to poll devices like thermometers, pumps and so on, once every second to run the central heating, and this would again be performed completely invisibly.

```

10 REM Program TIME
20 REM Version B1.0
30 REM Author D.P.Wright
40 REM BEEBUG November 1983
50 REM Program subject to copyright
60 :
70 REM Disable event for re-assembly
80 *FX13,5
90 OSBYTE=&FFF4
100 OSWRCH=&FFEE
110 OSWORD=&FFF1
120 FORI%=0TO1
130 P%=&C00
140 [OPTI%*3
150 JMP START
160 :
170 .ROUTINE
180 \--clock int. service routine--
190 \--Save contents of all regs.--
200 PHP:PHA
210 TYA:PHA:TYA:PHA
220 \---reset clock---
230 LDX #CLOCK MOD 256
240 LDY #CLOCK DIV 256
250 LDA #4
260 JSR OSWORD

```

```

270 \---increment time---
280 INC SECOND
290 LDA SECOND:CMP #60:BNE a
300 LDA #00:STA SECOND
310 INC MINUTE
320 LDA MINUTE:CMP #60:BNE a
330 LDA #00:STA MINUTE
340 INC HOUR
350 LDA HOUR:CMP #24:BNE a
360 LDA #00:STA HOUR
370 :
380 .a
390 \---display clock on screen---
400 \--Set back/foreground colours--
410 LDA #132:STA HIMEM+40
420 LDA #157:STA HIMEM+41
430 LDA #135:STA HIMEM+42
440 LDY#57
450 LDA HOUR:JSR OUTPUT
460 LDA #58:STA HIMEM,Y:INY
470 LDA MINUTE:JSR OUTPUT
480 LDA #58:STA HIMEM,Y:INY
490 LDA SECOND:JSR OUTPUT
500 \---restore contents of regs.---
510 PLA:TAY:PLA:TAX:PLA:PLP
520 RTS
530 :
540 \----splits value in Acc.----
550 \----into 2 BCD numbers ----
560 \----and outputs ASCII ----
570 \---values on screen. ----
580 .OUTPUT
590 LDX #0
600 SEC
610 .loop SBC #10
620 BMI b
630 INX:JMP loop
640 .b DEX
650 CLC
660 ADC #58
670 PHA
680 TXA:ADC #48
690 STA HIMEM,Y: \--MSB--
700 INY:PLA
710 STA HIMEM,Y: \--LSB--
720 INY:RTS
730 ]
740 :
750 REM---data for clock and time---
760 CLOCK=P%
770 !CLOCK=&FFFFFFF9C
780 ?(CLOCK+4)=&FF
790 P%=P%+5
800 HOUR=P%
810 MINUTE=P%+1
820 SECOND=P%+2
830 P%=P%+3
840 [OPTI%*3
850 :

```

```

860 .START
870 \---Initialisation routine---
880 \---Initialise time---
890 STA HOUR:STX MINUTE:STY SECOND
900 \---Mode7---
910 LDA #22:JSR OSWRCH
920 LDA #7:JSR OSWRCH
930 \---Change text window---
940 LDA #28:JSR OSWRCH
950 LDA #0:JSR OSWRCH
960 LDA #24:JSR OSWRCH
970 LDA #39:JSR OSWRCH
980 LDA #2:JSR OSWRCH
990 :
1000 \---Set add. of int.service rout.-
-
1010 LDA #ROUTINE MOD 256

```

M-TEC BBC BASIC (Z80) REVIEW

By Colin Oprea

In BEEBUG Vol.2 No.1 we reviewed the Torch Z80 Disc Pack. A complete Z80 version of BBC BASIC is now available for the Torch system and your Torch second processor can now have BBC BASIC together with a full use of sound, graphics, and in-line Z80 assembler, and this combination provides you with at least 17k of user memory.

The new version is indeed a complete BBC BASIC. It is difficult to say whether it is BASIC-I or BASIC-A1 because, for example, it has the new OSCILL statement but not OPENIN. This aside, the upgrade is extremely good. In the few cases where statement syntax is not completely identical, it is usually because the Z80 version is providing a more relaxed or versatile format.

BBCBASIC(Z80) comes with a number of utilities. The most useful of these are a CONVERT program for converting to internal format Basic files from ASCII files and vice versa, a RUN utility for getting back into your program after a break to CPN (CPN is the Torch disc operating system), an UNLIST utility for creating unlistable programs, a MERGE program for merging Basic programs, and a series of HELP text files. A well-written and thorough manual accompanies the software.

FIRST THOUGHTS

To get a feeling for how good the system was I transferred a number of Graphics and Sound programs from Acorn DFS discs onto a Torch CPN disc using

the TORCH RDACTION utility. I then used the CONVERT utility to obtain the equivalent internal format Basic files. Hint: the CONVERT utility will create lines for the LIST and *SPOOL commands used initially to create and close off the spooled file used by RDACTION. It is therefore a good idea to start your programs from some line number greater than one). I then loaded BBCBASIC(Z80) and, after deleting the two redundant lines, proceeded to run each of the Basic programs - with no problems whatsoever!

COMPARISONS

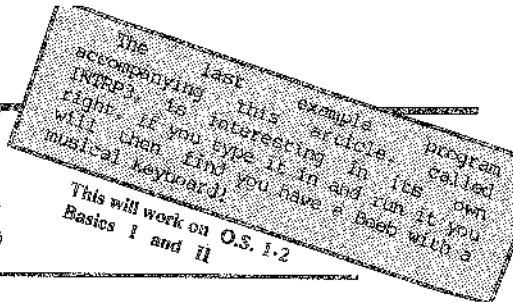
In BBCBASIC(Z80) the DELETE, RENUMBER, and LIST statements will accept either a comma or a hyphen between arguments. This is good news for those of us who have used a number of other Basics. LISTO? actually indicates the FOR, NEXT and REPEAT UNTIL loops correctly, so that the two statements come into line.

The built-in Z80 assembler uses the same format for creating in-line assembly code (eg. in the way square

Continued on p. 23

AN INTRODUCTION TO INTERRUPT PROGRAMMING

by Trevor Pullen (16k)



Interrupt programming is a subject which is often avoided, and is treated by many with much uncertainty - an unfortunate state of affairs since the use of interrupts is fundamental to many forms of interactive and real-time computing applications. In this article, which introduces the subject, Trevor Pullen explains what interrupts are, how they may be generated and shows you how to write simple programs using them. Although the interrupt handling routines have to be in machine code, they are quite short and can easily be incorporated into any Basic program as we show here.

WHAT ARE INTERRUPTS?

As their name suggests, their purpose is to interrupt or alert the processor to a particular event having occurred. The event causing the interrupt may be either internally or externally generated and need have no bearing or relation to the current status of the processor. The important point is that on receipt of the interrupt, the processor will leave its current task, service the interrupt, and then resume computation where it last left off. Hardware interrupts on the Beeb are of two kinds called IRQ and NMI. These are very similar except that NMIs (Non Maskable Interrupts) cannot be ignored whereas IRQs (Interrupt Requests) can be disabled by software. The BBC micro also provides a 'packaged' set of interrupts called events, which are much easier to use.

A computer that uses interrupts will often give the appearance of being able to carry out several tasks simultaneously. The BBC micro, for example, can still accept input from the keyboard even when it is busy doing something else, like listing a program on the screen. The information you type in is not lost, but carefully stored away for use later on. The example programs in this article will illustrate this point even more effectively. Hopefully, even from this brief introduction, the potential offered by the interrupt facility can readily be seen.

Before we consider any programs in detail, there are a number of general points that need to be made.

(a) There are limits to the time that can elapse between the generation of an interrupt and the return of control to the main user program. In the BBC User Guide, page 465, a maximum time of less than 1 millisecond is recommended. It should be remembered though, that since the 6502 processor runs at 2MHz, this gives time for at least 600 instructions to be executed, which should be sufficient for most applications!

(b) On entering the interrupt handling routine, the current values of the A, X and Y registers, together with the processor status byte, must be saved, to be restored to their original values once the interrupt has been serviced.

(c) It is a characteristic of the BBC machine that 'interrupts' and 'events' indirect via locations in page 2 of memory. It is thus necessary to make the relevant location (vector) point to the beginning of the user routine. Further, before enabling any events, the computer must be set in the binary mode (and not BCD - Binary Coded Decimal - mode).

(d) At this stage do not worry about implementing the points (b) and (c) since these will be covered in the core program, to be given later.

HOW MAY INTERRUPTS BE GENERATED?

There are two major types of interrupt available to the user, namely internally and externally generated.

The internally generated interrupts, on which this article will concentrate,

may then be subdivided into those generated by the user 6522 Versatile Interface Adaptor (VIA) and those generated by other 'events' within the micro.

Interrupts from the 'outside world' are also handled by the user 6522 VIA but will not be covered in this article.

To start with it is the interrupts generated by the occurrence of a particular event, which will be considered. These events are summarised below, but for further details see pages 426 and 465 in the BBC User Guide.

Event Code	Event Enabled
0	O/P buffer empty
1	I/P buffer full
2	Character entering buffer
3	ADC conversion complete
4	Start of Vertical sync pulse
5	Interval timer crossing zero
6	Escape pressed

The event code is the number which will be entered into the core program and governs which particular event is enabled. Only events which have been enabled can cause an interrupt. Such events can be enabled and disabled by means of *FX calls (see User Guide as above) as an alternative to the machine code which we shall use. This again will be covered and explained when the core program is set up.

At this stage, we shall not develop our ideas on interrupts further, but simply say that an interrupt is generated upon any of the above 'event' conditions being fulfilled, assuming that the 'event' has been enabled. How to cope with all this is the subject of the next section.

EXAMPLES OF INTERRUPT HANDLING

Before we look at any specific examples, we will look at a skeleton program (the 'core' program) that we can then use as a simple pattern for our programs. The core program, written in 6502 assembler, is in fact presented as a procedure so that it can

be used readily in any Basic program. The procedure is called PROCASSEMBLE and is contained in lines 1000 to 1540. The purpose of the procedure is to assemble the machine code into the area of memory reserved by the DIM instruction in line 1010. This is done by calling the procedure in the main program at line 110. Nothing happens until we call the assembled code in line 120.

The core program:

```

10 REM Program INTRP1
20 REM Version B1.1
30 REM Author Trevor Pullen
40 REM BEEBUG November 1983
50 REM Program subject to Copyright
100 MODE: 7
110 PROCAssemble(4)
120 CALL start
130 END
1000 DEF PROCAssemble(ECODE)
1010 DIM EVENTS 200
1020 FOR PASS=0 TO 3 STEP 3
1030 P=EVENTS
1040 [
1050 OPT PASS
1060 .start
1070 CLD
1080 LDX #(ECODE)           ;event code
1090 LDA #14
1100 JSR &FFF4             ;enable event
1110 LDA #(entry MOD 256)
1120 STA &220              ;lo byte
1130 LDA #(entry DIV 256)
1140 STA &221              ;hi byte
1150 RTS
1160 .entry
1170 PHA:TXA:PHA:TYA:PHA:PHP
1500 PLP:PLA:TAY:PLA:TAX:PLA
1510 RTS
1520 ]
1530 NEXT PASS
1540 ENDPROC

```

Explanation:

There are two separate routines contained in the core program. One, identified by the label START, enables the event specified (depending on the value assigned to the variable ECODE when calling the procedure PROCASSEMBLE) and sets the indirection vector to point to the start of the interrupt routine, identified by the label ENTRY. The START routine could be in Basic using *FX14 to enable the required event (in this case *FX14,4)

and the '?' indirection operator to set the vectored address (see User Guide pages 426 and 409).

The interrupt handling routine at ENTRY simply contains, at line 1170, the instructions to save registers A, X and Y together with the processor status byte, and at line 1500, the corresponding instructions which restore all the registers again before returning to the main program. The interrupt handling routine itself is inserted between these two lines. All our examples will be based on this outline program.

PROGRAM 1

Task: To provide a continuously incrementing counter on the screen.

Method: Since a regularly recurring interrupt is required the 'start of vertical sync pulse' seems a logical choice. Thus call PROCASSEMBLE with ECODE set to 4 in the core program. Note that this program may easily be extended, by the addition of a few more counters, to provide a real time clock (see article on Mode 7 Timer in this issue of BEEBUG).

Program:

```

100 MODE7:??&71=0:VDU28,0,24,39,1

1180 INC &70      ;increment 1st counter
1190 LDA #50      ;interval
1200 CMP &70      ;interval reached?
1210 BNE finish   ;no - exit
1220 LDA #0        ;reset
1230 STA &70      ;first counter
1240 INC &71      ;increment 2nd counter
1250 LDA #10       ;2nd counter counts to
10
1260 CMP &71      ;counter reached 10
1270 BNE display;not yet
1280 LDA #0        ;reset
1290 STA &71      ;2nd counter
1300 .display
1310 LDA &71       ;get 2nd counter
1320 ADC #47       ;convert to ASCII
1330 STA &7C15     ;display on screen
1340 .finish

```

We have shown above only those lines that are additional to the core program already listed.

Explanation: Upon receipt of each interrupt, and they occur every 1/50th of a second, a counter is incremented. When the value set by "interval" (in the example 50) is reached, a second counter is then incremented. In each case when the limiting count value is reached, either 'interval' or '10', the appropriate counter is zeroed. The final section of the program converts the value in &71 to ASCII and displays it. In the main program, the memory location &71 is initialised to zero (in line 100) before assembling and calling the interrupt routine.

PROGRAM 2

Task: To provide audio feed back upon each keypress.

Method: This time 'event' 2 is being used, so set the 'event code' to 2. There are two additions to the program since a data block to execute a sound command needs to be set up as well.

Program:

```

60 FOR I=1 TO 8:READ A:?(%6F+I)=A:NE
XT
70 DATA 1,0,&F1,&FF,&C8,0,1,0
110 PROCassemble(2)
1180 ROL A      ;double range
1190 STA &74     ;save value
1200 LDX #&70
1210 LDY #0     ;execute
1220 LDA #7     ;SOUND
1230 JSR &FFF1 ;instruction

```

Again, only lines additional to the core program are given above.

Explanation: The data block set up by lines 60 and 70 provides the necessary information for a SOUND command to be executed. In the interrupt routine lines 1180 and 1190 then take the ASCII value of the key pressed, double it to increase the resulting frequency range, and store the result into the 10-byte of the frequency data so that the sound generated will partly depend on the key pressed. Lines 1200-1230 then execute the sound command (see also page 461 in the User Guide). Once you have run this program, you will have a musical keyboard for your BBC micro, regardless of what you do, until you press Break (or switch the machine off).

CONCLUSIONS

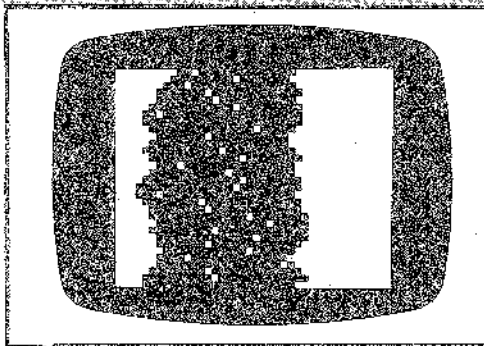
This article has given a fairly elementary introduction to the concepts and application of interrupts. The main problems in using and applying interrupts are really knowing how to

enable the relevant event and then remembering to redirect the required vectors. In a second article, I will explain the use of the 6522 VIA in dealing with both internal and external interrupts.

WRITING A GAME PROGRAM - RAPIDS (16K)

by Alan Webster & Mike Williams

The program listed here is a simple but interesting game of skill which we have called RAPIDS. You have to steer a boat (rather crudely represented, and controlled by the usual keys of Z for left and X for right) along a fast flowing river, avoiding the many half submerged rocks as you do so. The river also widens and narrows as you proceed.



The point of this program is to show that an acceptable game can be written in a relative few lines of code. The program, as listed, contains comment lines to describe the function of each part of the program plus other lines to space out the program and make it more readable. Our original working version was only 19 lines in length so you don't have to be able to write a long program before you can start producing games.

Of course, the game could be improved by adding to the existing program. You could define another character to represent the boat, and similarly make the rocks, and maybe the banks, more realistic. You could also try putting in a choice of delay times to provide a range from easy (slow) to hard (fast) games. Another feature

missing at the moment is any form of scoring, and records of high scores. No doubt there are many other changes and amendments you can think of.

We have listed the program in a form which should make it easy to follow if you want to try and improve it. On the other hand you might like to see how about a program you can write that still produces a reasonable game of some kind. Now there's a challenge!

```

10 REM Program RAPIDS
20 REM version 01.0
30 REM Author: Alan Webster
40 REM BEEBUG November 1983
50 REM Program subject to Copyright
60 :
70 MOVB4
80 PROCsetupgame
90 PROCplaygame
100 END
110 :
120 DEF PROCsetupgame
130 width:=255,height:=255,255,255,255,255,255
140 leftbank:=RND(5):rightbank:=40-RND(5)
150 position:=20
160 ENDPROC
170 :
180 DEF PROCplaygame
190 gameover:=FALSE
200 REPEAT
210 :
220 REM Display river
230 width:=rightbank%-leftbank%
240 25$=STRINGS(leftbank%,CHR$(255)+STR$(width%,CHR$(32))+STRINGS(40%-leftbank%,CHR$(35))
250 PRINT TAB(0,0);$
260 :
270 REM Place a rock
280 ifwidth%10 PRINTTAB(RND(width%)-leftbank%,0)CHR$(35)

```

Continued on p. 41

ROM EXTENSION BOARDS REVIEWED

by Philip Le Grand

Many members have expressed interest in ROM expansion boards for the Beeb. We have tested three of the boards now available and present our report to guide you in your choice. Fitting and using all three ROM boards gave our reviewer some unexpected surprises. Now see what we think of these products.

Supplier: WATFORD ELECTRONICS, Cardiff Rd, Watford, Herts.

Price : £35 + VAT + p.& p. (£41.40)

SUPPLIER: SIR COMPUTERS LTD., 91

Whitchurch Rd., Cardiff, S.Glamorgan.

Price : £35 + VAT + p.& p. (£41.40)

SUPPLIER: ATPL LTD., Station Road, Chesterfield, Derby.

Price : £38 + VAT + p.& p. (£44.85)

WHAT IS A ROM BOARD?

As you may know, the BBC micro has a facility for using so-called 'Paged ROMs'. This means that you can 'page out' or de-select the Basic ROM in your machine and select any one of 3 other ROMs or EPROMs plugged into the sockets provided under the keyboard. Both EXMON and WORDWISE operate in this way. An EPROM is plugged in, and called up as an alternative to Basic with commands like *EXMON (or *E) and *WORDWISE (or *W.).

As time goes by, more and more utilities and alternative languages are being offered in ROM or EPROM, and the 3 spare sockets are soon filled - especially since the disc filing system (DFS) occupies one of these sockets. In practice, the BBC micro's operating system can cope with up to 16 paged ROMs, and a number of manufacturers have produced add-on boards to extend the number of physical sockets to that number. Some also allow you to locate RAM (read/write random access memory) as an aid to EPROM development. It should be noted that RAM placed in the paged ROM sockets cannot generally be used for storing Basic programs.

GENERAL COMMENTS

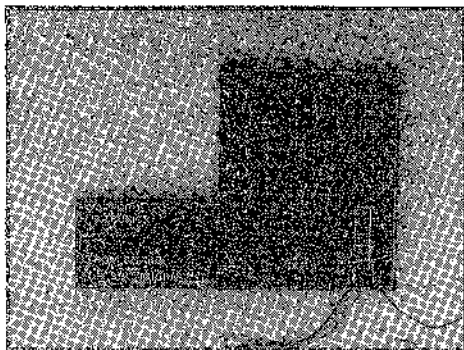
All of the ROM extension boards reviewed were a standard double sided, fibreglass printed circuit board. They all plugged in, and were not screwed

down, which may necessitate removing the board for transit of the micro. The board from Sir Computers was the only one without printed identification of the sockets. This identification is useful in determining the order of the sockets, although the markings on the ATPL board were partially obscured by the ROM sockets themselves. They all had header pins on the under-side of the boards, allowing them to stand in the Beeb's ROM, CPU (Central Processor Unit) or ADC (Analogue to Digital Converter) sockets. On two boards, these pins were a thin type, so that inserting them into the Beeb's own sockets, does not over enlarge the holes of the sockets if you want to remove the board at a later date, and replace the original chip - useful if your machine goes wrong under guarantee. The ATPL version supplied, however, had large pins, although we understand that smaller pins will be used on later production models.

For all of our tests, we inserted relevant DIL sockets in the Beeb and put the boards into these, to prevent widening of the holes in the case of the ATPL and also to help raise the boards clear of any power leads or components that were in the way. It was found that all of the boards clashed with the power leads of our Beeb and would not fit properly unless the leads were bent over! This is a delicate operation, since the power lead connectors are easily broken. All of the boards carry between 5 and 10 extra chips for buffering and decoding, and, in ATPL's case, there is a small battery charger option for the battery back-up circuit. The price differences between the boards are small and insignificant.

WATFORD ELECTRONICS

The Watford board is the lightest one reviewed here, and the thinnest. To



fit it, you must be prepared to do some very fine soldering inside your BBC micro. The ROM sockets are arranged in a 2 by 7 layout enabling easy removal of any of the ROMs at any time, should you wish to change any. The board can take up to 13 ROMs and, in two of the sockets on the board, you can mix ROM and RAM, allowing a particular ROM to have its own work space. There are link options on the board allowing you to select which type of ROM or RAM you wish to use. The board plugs into the ROM socket labelled IC 100, and any ROM that was occupying that space must be moved out onto the new board. Next, 5 wires from the board must be soldered to IC 76 and IC 14 on the main BBC board. For this job you need a fine tipped, low power (about 18W or lower) soldering iron, 22 SWG solder, and a steady hand. Finally, a socket with two wires on, for enable in and enable out, is plugged in place of link S21. Pushing the board into the vacated ROM socket is quite unnerving since the whole board flexes very easily, and when fitted, it stays curved. The instructions say this is correct, and not to worry!

The board has small mounting pillars, although in our machine, it rested on the cassette interface socket with the other supports floating in mid air. When you insert any extra ROMs, the board bends greatly, since the sockets require the ROMs to be pushed home with a substantial force.

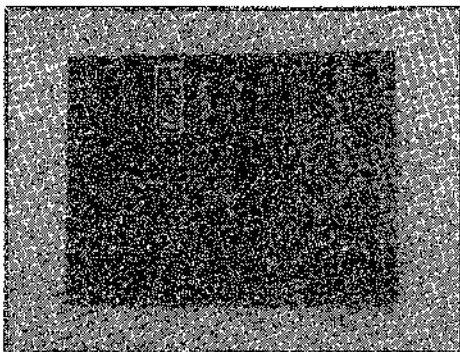
In use, the board covers the RAM and video areas which led to over-heating, causing some systems to crash after a few hours of use. The

instructions also recommend fitting a fan to the Beeb, although this would mean extensive modification of the case or using it with the lid off.

The documentation supplied consists of a single sheet of instructions and diagrams, which are very clear and concise.

SIR COMPUTERS LTD.

This board is made of thick fibre-glass which will not bend easily, and provides quite substantial support when inserting ROMs. The sockets are arranged in a 3 by 4 layout, allowing 12 extra ROMs to be used, but no RAM, together with the 4 ROM sockets already in the BBC micro. This layout makes it hard to remove a ROM in one of the middle row of sockets if the outer rows are filled unless you have an I.C. insertion tool. We believe that future issues may have a RAM option as well.



To fit this board, no soldering is required. Once again the power connectors inside the Beeb must be bent over to give the new board clearance. Then the CPU must be removed, but to do this, you may find it easier to remove the user 6522 first, then the CPU and finally, the 6522 replaced. The CPU then plugs into the socket on the ROM board. In our tests we plugged the board into an extra 40 pin socket, placed in the Beeb's CPU socket, to prevent any hole enlargement. Finally, link S21 is replaced with a flying lead connector to the ROM board.

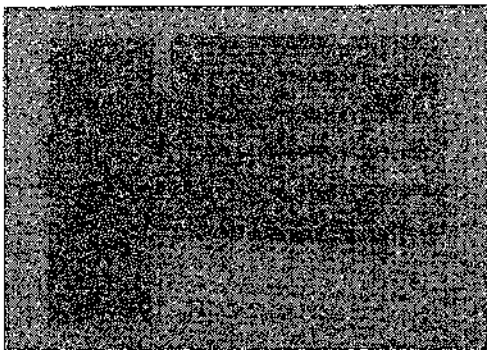
The sockets used are the same type as used on the Watford board, however

insertion of ROMs now does not flex the board, but puts a heavy strain on the CPU socket and could possibly cause damage to the socket and main board if any force was applied. There is no other form of support.

The documentation consisted of a single sheet with no diagrams, although the instructions were clear. This board worked well, but it would have been nice to see some extra support, to take the strain off of the CPU socket.

ATPL LTD.

The layout of the sockets on this board also makes it difficult to remove any ROMs in the centre but they are generally easier to get at than on the Sir board. This board is also made from a thick fibreglass which does not flex easily, and was the heaviest of all the boards tested.



To fit the board it is necessary to remove the operating system ROM and the analogue to digital converter chip, which plug into corresponding sockets on the ROM board, and plug the board into the two vacant sockets. This arrangement leads to a very stable board, with the weight evenly distributed. A flying lead is connected to link 821. If during manufacture the solder resist does not cover the board correctly, or for some reason it comes off just above the O.S. ROM socket, then the board could short out on the two diodes immediately above this socket in the Beeb. We used extra mounting sockets to raise the board to gain sufficient clearance. When fitting this board, it was also found necessary to bend a couple of its capacitors flat, so that the keyboard would fit

back properly again, though this should not prove necessary as current production versions (issue 3) use much smaller capacitors.

The sockets used are an older type which make it easier to insert and remove the ROMs. The board will accept ROM and RAM chips in various combinations, depending on your selection of the links at the top of the board. The CMOS type RAMs are usable on these boards, enabling the optional battery back-up kit to be added, (thus allowing the memory contents to remain in the RAM even after the Beeb has been switched off). The use of RAM is to allow a program in another ROM to use this as work space or, if you are developing your own programs to be blown into EPROM, you can test it out in its correct operating position and alter it if necessary before committing it to EPROM. No overheating problems occurred, since the board covers the two 6522s, and the serial and video chips, which do not appear to generate as much heat as the Beeb's RAM

The documentation supplied is excellent, consisting of a file of 11 pages of instructions and diagrams, and all the information you need for the various link options. This board was, in our opinion, the best of the three tested, but still not without its faults.

CONCLUSIONS

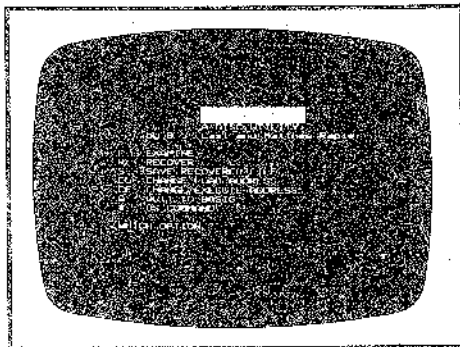
One major difficulty that these and any other expansion boards face is that the Beeb was not designed to accommodate additional boards, although able to cope with up to 16 paged ROMs. These three boards have all adopted slightly different solutions, with varying degrees of success. We believe, from our tests, that the major factors to consider when choosing a ROM board are ease of installation, reliability in operation and the stability of the installed board (particularly important for those who expect to insert and remove ROMs quite frequently). As a general comment, it would appear that most of the problems encountered with these boards would be resolved if they were firmly mounted in a box of their own. Replacing ROMs would then be much easier, and would not involve removing the lid of the Beeb on each occasion.

DISC SNARFER (32k)

by B J Last and Mathew Rapier

This will work on
O.S. 1-2 and Basics 1 and II

SNARFER is a disc utility which amongst other things will allow corrupted or lost files to be retrieved. It makes a useful companion to our recently published Disc Sector Editor, and Disc Sector String Search.



SNARFER is in fact a suite of utility procedures all put together in one program to provide a set of extremely useful commands not available directly in the DFS itself. These commands are roughly equivalent to those available in the new disc utility ROMs appearing on the market. Whilst not as comprehensive as the ROM versions, this program has the same basic capabilities, and is easy to use.

The functions of SNARFER and corresponding commands are:

E - Examine disc sectors
R - Recover disc sectors
S - Save recovered file
CL- Change load address
CE- Change execute address
Q - Quit to Basic
* - OS Command

The program is menu-driven for ease of use, with Escape returning the user to the menu. SNARFER is very useful in file recovery. The Examine option may be used to find a deleted file on the disc and decide on its length. To do this, you need to specify a track number (0-39 or 0-79 depending on disc being used) and a sector number (0-9) whereupon the constants of that sector will be displayed on the screen. To

recover a file, you will need to locate the beginning and end of the file on disc and calculate the length of the file in bytes (usually number of sectors multiplied by 256). SNARFER requires this to be performed manually, but by using our Disc Sector Editor (BEEBUG Vol2 No3 p27) and Disc Sector String Search (BEEBUG Vol2 No5 p31), this can become a fairly automated process.

With this information you can then proceed to use the Recover routine to load all the sectors belonging to the file into memory (from address &3000 onwards). Having recovered the disc sectors belonging to the file into memory, the file can now be resaved onto disc using the SAVE command. It is still possible that the file may be incomplete or corrupt in some way, but at least it is now accessible in the normal way.

In SNARFER all the * commands can be entered, as in Wordwise, and are passed to the operating system for execution. For example, you can use *DRIVE as normal to select the default drive as the procedures read the current drive number through an OSGBPS call and use this drive for loading sectors.

The commands to change the load and execution addresses of files are also very useful as the normal DFS save file option sets these to zero by default. You can set these values for any file, so that you can alter the load address for *LOAD etc. This is often needed with intelligent file moving programs that will move a file to its load address rather than assuming &E00 (like Watford Electronics DFS *MLOAD). These commands are particularly simple to implement with OSFILE (a routine at &FFDD in the O.S.), as can be seen from the procedures PROCRELOAD and PROCREEXEC in the program listing.

This utility together with the Disc Sector Editor and Disc Sector String Search, should be on everyone's utilities disc. This program provides a much simpler file recovery system than

the sector editor, together with many other useful routines, though the editor is still essential if you want to be able to modify the contents of a sector on disc.

```

10 REM Program SNARFER
20 REM Version B1.0
30 REM Author B.J. Last & BEEBUG
40 REM BEEBUG November 1983
50 REM Program subject to Copyright
60 ON ERROR GOTO 1290
70 HIMEM=&3000
80 *OPT1,2
90 0%=4
100 DIM CB%20
110 length=-1:drive=0
120 :
130 REPEAT
140 MODE7
150 FORA=0TO1:PRINTTAB(12);CHR$157;CHR$135;CHR$129;CHR$141;"SNARFER";SPC(4);CHR$156:NEXT
160 PRINTSPC(12);"A DISC UTILITY"
170 PRINTSPC(4);"by B.J. Last and Mat thew Rapiet"
180 PRINT"E - EXAMINE"
190 PRINT"R - RECOVER"
200 PRINT"S - SAVE RECOVERED FILE"
210 PRINT"CL- CHANGE LOAD ADDRESS"
220 PRINT"CE- CHANGE EXECUTE ADDRESS"
230 PRINT"Q - QUIT TO BASIC"
240 PRINT"* - OS COMMAND"
250 PRINT"WHICH OPTION ?";
260 A$=GET$
270 IF A$="E" THEN PROC EXAMINE
280 IF A$="R" THEN PROC RECOVER
290 IF A$="S" THEN PROC SAVE
300 IF A$="C" THEN PRINT"C";A$=GET$:IF A$="L" THEN PROC RELOAD:ELSE IF A$="E" THEN PROC REEXEC
310 IF A$="Q" THEN END
320 IF A$="*" THEN PROC OSCLI
330 UNTIL FALSE
340 :
350 DEF PROC EXAMINE
360 PRINT"EXAMINE"
370 REPEAT
380 PRINT"Track";:track=FNEVAL(0):PRINT"Sector";:sector=FNEVAL(0):PRINT"Length";:length=FNEVAL(0)
390 CLS:PRINTTAB(0,0);"track/sector"
400 address=&3000
410 FORN%=0TO255:A%=?(&3000+N%):PRINTTAB(0,2);track;TAB(6,2);sector;TAB(12,2);"ERROR #";FNREADSEC(address)
420 IF (N% MOD 32)=0 THEN PRINT";~N%";
430 :
440 VDUA%:NEXT
450 UNTIL FALSE
460 ENDPROC
470 :

```

```

480 DEF PROC RECOVER
490 PRINT"RECOVER"
500 PRINT"Please type start track, sector and filelength in bytes."
510 PRINT"Track";:track=FNEVAL(0):PRINT"Sector";:sector=FNEVAL(0):PRINT"Length";:length=FNEVAL(0)
520 CLS:PRINTTAB(0,0);"track/sector"
530 address=&3000
540 FORN%=0TOlength+256 STEP256
550 PRINTTAB(0,2);track;TAB(6,2);sector;TAB(12,2);"ERROR #";FNREADSEC(address)
560 sector=sector+1:IF sector=10 sector=0:track=track+1
570 address=address+256
580 NEXTN%
590 ENDPROC
600 :
610 DEF PROC SAVE
620 PRINT"SAVE RECOVERED FILE"
630 IF length=-1 THEN PRINT"No file recovered":PROC RECOVER
640 PRINT"Enter filename"
650 INPUT $&A00
660 X%=&70:Y%<0:A%<0
670 !&70=&A00
680 !&72=0
690 !&76=0
700 !&7A=&3000
710 !&7E=&3000+length
720 CALL&FFDD
730 ENDPROC
740 :
750 DEF FNEVAL(X)
760 LOCAL Y,A$
770 VDUA%,11
780 X=POS:Y=VPOS
790 INPUT A$
800 IF A$="" THEN PRINTTAB(X,Y);:GOTO 790
810 ON ERROR RUN
820 A=EVAL(A$)
830 ON ERROR GOTO 1290
840 =A
850 :
860 DEF FNREADSEC(address)
870 X%=&70:Y%<0:A%<0
880 ?&70=0:!?71=&A00:!?75=1:!?79=0
890 CALL&FFD1:drive=?&A01-48
900 ?CB%=drive:!(CB%+1)=address
910 ?(CB%+5)=3:?(CB%+6)=&53

```

```

920 ?(CB4+7)=track:?(CB4+8)=sector:?(
CB4+9)=&21
930 X3=CB%MOD256
940 Y3=CB%DIV256
950 A3=&7F
960 CALL&FFF1
970 =?(CB4+10)
980 :
990 DEFPROCOSCLI
1000 PRINT""OS COMMAND"
1010 REPEAT
1020 INPUT "*"S&A00
1030 X3=0:Y3=&A
1040 CALL&FFF7
1050 PRINT"PRESS A KEY":A$=GET$
1060 UNTILA$<>"*"
1070 ENDPROC
1080 :
1090 DEFPROCLOAD
1100 PRINT""CHANGE LOAD ADDRESS"
1110 INPUT "FILENAME ",S&A00
1120 PRINT"ADDRESS ";address=FNEVAL(0
)
1130 X3=&70:Y3=0:A3=2
1140 !&70=&A00
1150 !&72=address
1160 CALL&FFDD
1170 ENDPROC
1180 :
1190 DEFPROCREEXEC
1200 PRINT""CHANGE EXECUTE ADDRESS"
1210 INPUT "FILENAME ",S&A00
1220 PRINT"ADDRESS ";address=FNEVAL(0
)
1230 X3=&70:Y3=0:A3=3
1240 !&70=&A00
1250 !&76=address
1260 CALL&FFDD
1270 ENDPROC
1280 :
1290 IF ERR=17 THEN RUN
1300 PRINT":REPORT
1310 IF ERR<5BD THEN PRINT " at line "
;ERR:END
1320 PRINT""PRESS A KEY"
1330 A=GET
1340 RUN

```

Data from P. 15

Backslashes enclose the code, DIM statements, allocate space, the way P% is used, and so on). Comments may be delimited by a backslash or a semi-colon. When CALL is used, the integer variables A3, B3, C3, D3, E3, F3, H3, and I3 can be used to set up the appropriate Z80 registers in the same way that A3, X3, Y3 and I3 are used in BBC BASIC. No facility exists for setting the alternate Z80 register set on entry. Register I3 will contain the address of the CALL parameter table.

In BBC BASIC(Z80) it is still possible to use the indirection operators, and two extra statements exist for reading and writing to Z80 I/O port addresses. Reading ports is achieved through an extended version of GET (ie. GET(p) is used), and writing is performed by the PUT statement (ie. PUT(p,v) will write 'v' to port 'p'). These GET and PUT statements are not approved by Acorn and are not guaranteed to remain unchanged.

The major 'backward' points I found were in the disc I/O statements. The differences are in some sense justified because, let's face it, the two Disc

Operating Systems (Acorn DFS and Torch CP/M) are different. For example, to obtain a listing of the files on a disc in BBC BASIC(Z80) you have to use *DIR instead of *CAT. This is okay if the system warned you that ACAT (or *) was illegal - which it doesn't, the system just gets confused!

CONCLUSION

The software should be a welcome addition to those who have gone for the Torch Z80 Disc Pack option. I have certainly found it a delight to use. Its compatibility is excellent, currently permitting well over 47k of

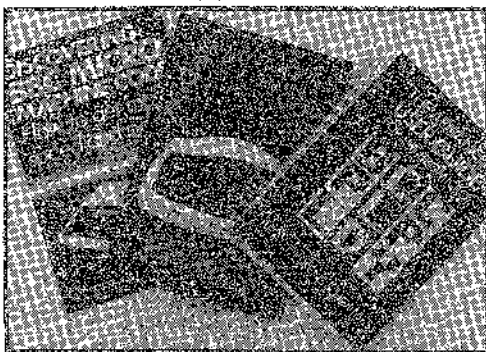
program space irrespective of graphics mode. BBC BASIC(Z80) is just what the Torch Disc Pack users need to keep their system compatible with BBC micro software. Its price will probably mean that it is used mainly by business users.

We are grateful to Mr G. Perry of M-TPL Computer Services for the loan of the review software. The price of BBC BASIC(Z80) is £119 + VAT (£126.50 inc.) from M-TPL Computer Services, 61 and 63, Reepham, Norwich, NR10 4BL. Tel: Norwich (0603) 870620.

ADVANCED USER GUIDE FOR THE BBC MICROCOMPUTER ASSEMBLY LANGUAGE PROGRAMMING ON THE BBC MICRO DISCOVERING BBC MICRO MACHINE CODE

Reviewed by Mike Williams

We review here three books for the more experienced user of the BBC Micro, particularly those who have progressed to the stage where they want to use machine code. Two of the books claim to introduce the subject of machine code for those new to this form of programming, but how well do they fulfill this task? To start with, we review a book that may well be a classic in the making - now read on.



The Advanced User Guide for the BBC Microcomputer, by A.C. Bray, A.C. Dickens and M.A. Holmes, published by the Cambridge Microcomputer Centre, 512 pages, price £12.95.

This book is surely destined to become the Bible of every dedicated user of the BBC micro. It covers very comprehensively and in considerable detail, every aspect of the machine's operation. It is not primarily intended as a book for the beginner, though there is much that the beginner would find interesting. The book is intended for the experienced user, and moreover one who has some familiarity with 6502 assembler. The purpose of this book is to supplement the BBC User Guide by providing a much more detailed and comprehensive description of 6502 assembly language programming, the operating system and the BBC microcomputer hardware. The book is spiral bound and matches very closely the appearance of the BBC User Guide.

The book begins by surveying the various operating system commands followed by a comprehensive description of the 6502 assembler language that is contained within BBC Basic.

A very substantial chapter provides a detailed description of all EX (OSBYTE) calls and a further chapter similarly covers all the OSWORD calls. One very useful section describes the vectoring mechanism of the Beeb and gives details of each vectored address.

Events and interrupts are clearly described with a number of program examples. There is also a very good section on paged ROMs with details of how to interface a ROM with the operating system.

The remainder of the book, some 90 pages, describes the hardware features of the Beeb, including the video 6845, the ULA, both 6522 VIAs and all the various interfaces. There are also 40 pages of appendices and even a main circuit diagram of the Beeb, courtesy of Acorn.

Many sections of the book are provided with example programs and there are also many clear and useful diagrams. This is a book which the experienced user will delight in dipping into as more and more information is revealed and explained. This book is a must, and is excellent value at the price of £12.95 for over 500 pages packed with facts.

Assembly Language Programming on the BBC Micro, by John Ferguson & Tony Shaw, published by Addison-Wesley, 200

pages, price £7.95.

This book provides an introduction to 6502 assembler programming on the BBC micro. Some knowledge and experience of programming in Basic is assumed but otherwise the book is clearly intended for the newcomer to this form of programming. The text is enlivened by many diagrams and cartoons in an obvious attempt to popularise what has often been considered a difficult subject. However, a lot of detailed information is presented very quickly, perhaps too quickly - the book quite rapidly introduces subroutines, use of the stack, parameter passing - and this before all but the simplest of addressing modes has been covered.

The presentation of information on the page is not as attractive as it might be. The book is printed on poor quality paper such that the printing on the reverse side of the page shows through and distracts from the current page. Some of the diagrams appear very black and heavy, and off-putting to the reader. There are many programs listed by way of example. Unfortunately, these are all reproduced from dot matrix printer originals and reproduction is sometimes less than clear.

The book is excellent in showing how assembler programs are integrated and used within the framework of BBC Basic and there is adequate coverage of operating system calls and other features of the BBC micro such as events and interrupts. Indeed the more advanced sections, shorn of the excesses of the early chapters, are very informative. There are various appendices including a systematic listing of all the assembler mnemonic codes.

This is basically a good book with much useful information, which is somewhat spoilt by poor quality presentation and printing. The attempt to produce a popular beginners book on machine code programming does not seem to have been wholly successful, but nevertheless this is a useful addition to the books on this subject.

Discovering BBC Micro Machine Code, by A.P. Stephenson, published by Granada, 155 pages, price £6.95.

This book is a straightforward introduction to programming in machine code using the 6502 assembler on the BBC micro. Indeed, the approach is rather serious and stolid, with much information presented in the early chapters, and yet little in the way of examples to show how that knowledge might be used. There is a useful description of how to use machine code from within Basic, followed by sections on number representation, registers and addressing modes. The program listings are again from a dot matrix printer but are quite clear as is the presentation of the whole book.

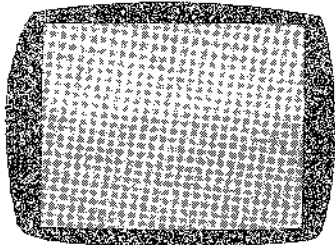
The book, sensibly, does not attempt to cover the more advanced features of machine code such as interfacing or interrupt handling. Instead, it concludes with a useful chapter on programming techniques and guidelines. This is a good book for the serious-minded student of machine code and reasonable value for money. For the complete beginner, the book by Birnbaum (reviewed in BEEBUG Vol.1 No.9) must still be the favourite, while the more experienced will need to look beyond these last two for coverage of more advanced topics and better, more informative examples.

We have been able to include, elsewhere in this issue, a short extract from the Advanced User Guide, reviewed above. This gives details of a new 'MODE 8', and is an example of the valuable information included in this book.

USING THE TELETEXT MODE (Part 2)

by Mike Williams

Last month we presented the first of a series of articles on the Teletext mode which started at the very beginning. We now continue with the second article in the series and introduce Teletext mode graphics.



Teletext Duck by Mike Williams

You should by now be fairly confident about displaying coloured text on the screen and in double height too, using control code 141. We also described how to colour in the background by specifying the colour followed by the control code 157. Hopefully, you also tried out for yourself, the control code 136 for flashing characters. If you're not sure, try typing this into your micro to see the effect produced:

```
PRINT CHR$129 CHR$136 "BEEBUG"
```

You should see 'BEEBUG', in flashing red characters, displayed on the screen. You can also make double height characters flash on and off, but you must include the 136 control code on both lines, just as for the 141 control code, unless of course you only want just the top or bottom half of the letters to flash. The control code 137 can be used to switch from flashing to steady colours, but only needs to be used if flashing characters are to be followed by steady characters on the same line. Try this little example:

```
PRINT CHR$129 CHR$136 "BEEBUG" CHR$137  
"MAGAZINE"
```

Notice too, how the 137 control code produces an apparent space between the two words so no extra space is needed.

VDU COMMANDS

At this stage it is helpful to introduce an alternative method of sending Teletext control codes to the screen, namely VDU commands. This avoids the need for the CHR\$ function, and can be a much more concise way of handling control codes and other characters. The following statements are, for example, completely equivalent:

```
PRINT CHR$134 CHR$157 CHR$131 CHR$136  
"HELLO"
```

and

```
VDU134,157,131,136:PRINT"HELLO"
```

or indeed

```
VDU134,157,131,136,72,69,76,76,79,13,10
```

The codes 72 to 79 are the ASCII codes for the letters in 'HELLO' and the 13 and 10 are the codes for <return><line feed>, which are produced automatically by the PRINT statement unless terminated by a ';' or a ','. To conclude this section, here is a short program which combines all the Teletext mode features we have covered so far.

```
100 REM Program BEEBUG5  
110 REM Version B1.1  
120 REM BEEBUG November 1983  
130 MODE 7  
140 ON ERROR GOTO 260  
150 FOR Y=0 TO 23  
160 VDU 131,157,132,141,13,10  
170 NEXT Y  
180 VDU28,4,24,39,0  
190 VDU23,1,0;0;0;0;  
200 PROCmsg2(CHR$(136)+"BEEBUG",12,4)  
210 PROCmsg2("for",14,8)  
220 PROCmsg2("the",14,12)  
230 PROCmsg2("BBC MICRO",11,16)  
240 REPEAT UNTIL FALSE  
250 END  
260 ON ERROR OFF:MODE7  
270 IF ERR<>17 THEN REPORT:PRINT" at  
line ";ERL  
280 END  
500 DEF PROCmsg2(M$,X%,Y%)  
510 PRINT TAB(X%,Y%);M$  
520 PRINT TAB(X%,Y%+1);M$  
530 ENDP
```

The first part of the program, lines 150 to 170, puts most of the control codes required at the beginning of each line on the screen. These control codes specify yellow (131) background (157), blue (132) double height (141) text. The VDU commands in line 180 and 190 redefine the text window to protect the control codes, and delete the flashing cursor from the screen. The instructions in lines 200 to 220 then display four lines of double height text on the screen, using for convenience, a procedure called PROCasg2 defined in lines 500 to 530. This just saves having to type every character twice when producing double height characters. The REPEAT UNTIL loop in line 240 avoids the program terminating and hence displaying a '>' character on the screen. The program can be stopped by pressing Escape.

TELETEXT GRAPHICS

Now let's look at Teletext graphics. In many ways this is similar to the text displays we have already seen, in that the effects are again determined by control codes. Try typing in the following instruction:

VDU 145,240,252,255,252,240,13,10

The value of 145 specifies red graphics, while the values of 240, 252 and 255 are the codes of three graphics characters which you should see displayed on the screen. The codes of 13 and 10 at the end of the line are simply <return> and <line feed>. The shape produced should look like this:



Other values in place of 145 produce different coloured graphics as shown in the table:

Code	Graphics Colour
145	red
146	green
147	yellow
148	blue
149	magenta
150	cyan
151	white

Each graphics character comprises a rectangle consisting of six small squares, coloured or blank. The full range of available graphics characters is listed in the User Guide on pages 488 and 489. You can also work out for yourself the code for any particular graphics character as follows.

1	2
4	8
16	64

Each cell that is coloured contributes a value towards a total to which should also be added $32 + 160$. Thus this character has a code of $1 + 8 + 16 + 32 + 160 = 237$.

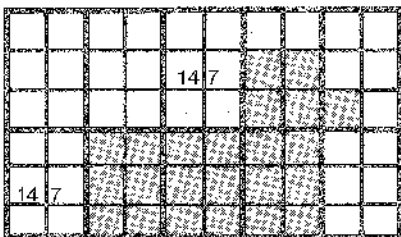


Be careful when referring to the User Guide as the characters are shown with white representing the coloured parts and black the blank parts of each character. It is easy to interpret this the wrong way round.

If you compare the table of graphics characters on pages 488 and 489 of the User Guide with the table of text characters on pages 486 and 487, you will notice that the codes of the graphics characters coincide with those for lower case letters and certain other characters. It is only the choice of control code - graphics or text - which determines what is displayed on the screen. It also means that all the alphanumeric characters (mostly upper case characters) shown in the table of graphics characters, can still be displayed on the screen, even when we are in graphics mode. One difficulty in dealing with graphics characters is that we cannot type them in directly from the keyboard as we can with alphanumeric characters, and this is where the VDU command can be useful.

EXAMPLE OF TELETEXT GRAPHICS

We will now develop a program illustrating the use of teletext graphics, called DUCK1. We need to put together some graphics characters to form the approximate shape of a duck. This is easier to design if we have a grid to work with as shown;



We shall want our duck to be yellow, of course, so we will replace the space characters to the left of the duck by the correct control code for yellow graphics, namely 147. The reason for including the 147 control character here will become clearer later on. We will define our duck as a character string:

```
duck$ = CHR$(147) + CHR$(255) + CHR$(255) +
CHR$(255) + CHR$(11) + CHR$(8) + CHR$(8) +
CHR$(147) + CHR$(252) + CHR$(176)
```

The definition of our duck starts at the bottom left hand corner with the control code for yellow graphics (147). This is then followed by the codes for the bottom row of graphics characters, namely 255, 255 and 255. We then need to fill in the top row and so codes 11, 8 and 8 move up one line, and left two positions, so that the top line is in the right place (see list of codes on page 378 of the User Guide). The top row of our duck consists of the graphics codes 147, 252, 176.

If you type this line in immediate mode you can then display a yellow duck anywhere on the screen by typing, for example:

```
PRINT TAB(10,12);duck$
```

Unless you cleared the screen first, using CLS, then your duck may not be very clear. We want to display our duck against a background of a cyan sky

above a blue lake. Setting up background colours like this is most easily done by placing the appropriate control codes down the left side of the screen, a method we have used twice before in this series. The complete program looks like this:

```
100 REM Program DUCK1
110 REM Version B1.0
120 REM BEEBUG November 1983
130 MODE 7
140 ON ERROR GOTO 320
150 FOR Y%=0 TO 10
160 PRINT CHR$(150) CHR$(157)
170 NEXT Y%
180 FOR Y%=11 TO 23
190 PRINT CHR$(148) CHR$(157)
200 NEXT Y%
210 VDU 28,2,24,39,0
220 VDU 23,1,0;0;0;0;
230 duck$=CHR$(147)+CHR$(255)+CHR$(25
5)+CHR$(255)+CHR$(11)+CHR$(8)+CHR$(8)+C
HR$(147)+CHR$(252)+CHR$(176)
270 PRINT TAB(15,14);duck$
300 REPEAT UNTIL FALSE
310 END
320 ON ERROR OFF:MODE 7
330 IF ERR<>17 THEN REPORT:PRINT" at
line ";ERR
340 END
```

Lines 150 to 200 establish the background colours. Line 210 re-defines the text window to protect the control codes already set up (we have used this technique before too), while the duck is defined, as already described, in line 230 and displayed near the centre of the screen in line 270.

Now, although this looks nice, it's not really very exiting. Add these additional lines to the program, replacing any previous lines as necessary, and you should now find the duck swims across the screen from left to right!

```
240 REPEAT
250 CLS
260 FOR X%=0 TO 33
270 PRINT TAB(X%,14);duck$
280 Z=INKEY(30)
290 NEXT X%
300 UNTIL FALSE
```

The movement is achieved by the FOR NEXT loop in lines 260 to 290 which

print the duck in successive positions across the screen. Remember how, when we originally defined our duck, both lines started with the yellow graphics control code (147). These invisible control codes replace the visible graphics characters as the duck is moved across the screen, neatly overwriting part of the previous image of the duck. The INKEY instruction in

line 280 controls the speed at which the duck moves. You may like to try other modifications to the program, like adding some scenery or some more ducks.

Next month we will look at some of the more clever things we can do with Teletext graphics. In the meantime, go play with your duck!

THE BEEB IN SLOW MOTION

Basics I and II

O.S. 1.2 only

(16k)

by Alan Webster

If you'd like to know how to slow the BBC micro down, or maybe just see how it works (e.g. how it clears the screen) in slow motion, then try these two pokes to memory:

```
poke 7&FE46=0
```

```
poke 7&FE45=1
```

These both access the timers in the internal 6522 VIA, and in simple terms they make the Beeb think that time is going faster than it really is! The machine now spends much more of its time checking for keyboard input and other functions linked to the system VIA, and hence much less time on any user activity, which thus appears to take place much more slowly.

If you now print any text to the screen you will be able to see exactly how each character is formed. Likewise, if you try any graphics command, like the triangle filling routine PLOT 85,X,Y you will see just how this is performed. You may well be able to think of other instructions which would be interesting to view in this way. Try typing in this small program:

```
10 MODE 7
20 FOR A%=&7C00 TO &8000 STEP 4
30 !A%=RND(65535)
40 NEXT
50 7&FE45=1:7&FE46=0
60 MODE 2
70 PRINT "Finished"
80 RUN
```

This shows how the screen is cleared as a result of selecting mode 2, and then how the letters of the word "Finished" are formed. The instructions in lines 20 to 40 fill the memory mapped screen area with random characters so that there is something to clear when mode 2 is selected, not just a blank screen. Changing the value assigned to &FE46 (in the range 0 to 14) changes the apparent speed of operation.

The simplest way of restoring your Beeb to its normal speed is to press Break (anything else takes so long!). Unfortunately, we have not so far discovered any similar way of speeding up the Beeb, though it is quite fast anyway.

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

WORDWISE AND PROGRAM EDITING - W.C. Corbett

You can edit programs with WORDWISE using the option to save the program first, but sometimes on using *EXEC to reload the program after editing, various errors are reported. These are often caused by the line length setting, default 70, which sends a <return> to the computer before the line has been completed. The computer returns the prompt and continues accepting the spooled data, only to give an error when the next <return> is encountered.

It is, therefore, best to keep the program lines short, or set the line length in WORDWISE to a high value.

POSTBAG POSTBAG POSTBAG POSTBAG POSTBAG POSTBAG

CROSSWORD FRILLS

Dear Sir,

From the beginning I have been impressed by the no-frills approach of BEEBUG, keeping very close to the BBC. But now the CROSSWORD has got its toe in, and perhaps there are other peripheral diversions to follow. I see that it is not just a holiday special from the request for more. If this sort of activity is required by other members it will have to be, unless they can be persuaded to get it from the numerous other available sources.

There is a compromise which could also be extended to the rest of the editorial material. We now have the magazine plus a separate advertising supplement. Would it be possible to transfer to the supplement everything of a transient nature, or not applicable to the computer? This would improve the readability of the magazine, and increase the use of the supplement, thereby perhaps drawing more attention to the advertisements.

J.S.Chadwick

P.S. I haven't even managed to do the crossword yet.

Reply: To reassure Mr Chadwick and others who may have similar views, we certainly don't intend to turn BEEBUG into a puzzle magazine, and we do take the point about the supplement which is where any future crosswords will appear. On the other hand our readers have very varied tastes and our puzzles etc have always proved very popular.

COMPUTER WALLPAPER

Dear Sir,

I have a 12 year old son who is very interested in computers, and I am in the process of redecorating his bedroom, but as yet, have found nothing in the line of computer type wallpaper etc. He has his own BBC Microcomputer and I was wondering if you have anything in the way of posters, or advertising material that might be suitable.

Mrs C.E.Coombs

Reply: What an interesting idea - though the thought of walls and walls of computer printout makes the mind boggle! We hope that you can make use of the BEEBUG poster mailed to you; though these are in very short supply, and we cannot normally mail them out on request.

PRINTERS GO SLOW

Dear Sir,

A few weeks ago I became the proud owner of an EPSON FX-80 printer. Now, if you read the EPSON specification and all the laudable reviews one salient and outstanding feature is impressed upon you, its printing speed of 160 cps. Incredible I can hear you say. Read on and you will see that "gullible" would seem more appropriate.

Over a weekend I listed out one of my more ambitious programs. It took a mere 270 seconds to print some 350 lines of Basic, about 16753 characters. Now if you're numerate enough you may be seeing the point of my tale, as this is a rate of 62 cps. Suspicious - you bet I was. I then did a series of timed print runs and the best I could achieve was 97 cps.

"So where is the promised Eldorado of 160 cps?" I asked the marketing man at EPSON UK, reeling under the shock of his admission that my tests were producing perfectly normal results. "Ah well!", he said "It does print at 160 cps IN A STRAIGHT LINE." "If you print at 80 characters and DON'T PRINT A CARRIAGE RETURN OR LINEFEED, and time that, it will take half a second."

Now I realise that everybody else must be printing out just single lines of text at these fabulous speeds and then pasting them together. And here's me getting my kicks from seeing the printhead feeding paper and doing carriage returns.

John Richardson

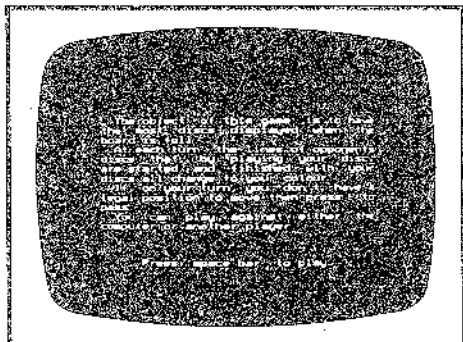
Reply: Although modern bi-directional logic-seeking printers help, many printer manufacturers do quote literally a printing speed rather than an overall throughput speed. Generally, the greater the number of characters per line, the nearer the overall speed will be to that quoted.

Tested on O.S. 0.1 and 1.2
and on Basics I and II

REVERSI (32k)

by John Webb

The game of REVERSI (sometimes known as OTHELLO) is played on a conventional Draughts board, with two players. This version is well written and allows you to play either against the computer or against another player, using the computer to record the moves. You can also choose one of two levels of skill when playing against the computer.



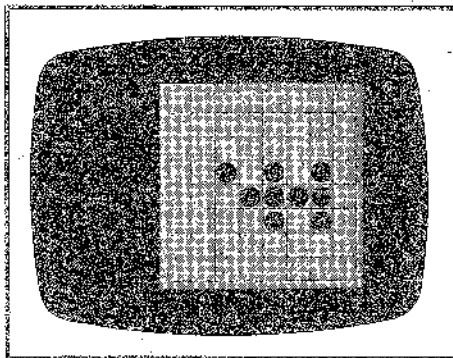
In this version of REVERSI the first two moves are always made for you. At the start, you have the choice of colour and whether to play first or second. From then on you must always place one of your counters on the board in such a way that a line of your opponent's counters then has one of your counters at both ends. The surrounded counters are now reversed so that they change to the colour of your own pieces. Of course, you may well be able to place a single counter that captures more than a just a single row of your opponent's pieces.

If on your turn, you are not able to move to a legal position, then you must pass, by pressing P. The game ends when nobody can place any more counters on the board (usually when the board is full), and the winner is the one who has the most counters. The program maintains the current score on the screen throughout the game.

Although a relatively simple game to understand, REVERSI is a game which requires considerable skill to play well. In this version you are able to choose one of two playing levels at the start of each game. Beginners will find even level one quite challenging.

We think you will enjoy playing this well constructed version of a popular game.

Note -- To use this program from disc you will need to set PAGE to 1100 before loading and running the program, or use our Disc Program Relocator from BEEBUG Vol.2 No.2. See also BEEBUG Vol.2 No.4 for further information on relocating large programs on disc systems.



```

10 REM Program REVERSI
20 REM Version B1.1
30 REM Author J.Webb
40 REM BEEBUG November 1983
50 REM Program subject to Copyright
70 MODE7
80 DIMposition%(100)
90 PROCcircles
100 PROCinstructions
110 REPEAT:PROCinit
120 MODEL
130 PROCsetupboard
140 PROCfindplayers
150 REPEAT
160 REPEAT:PROCgo
170 PROCcompute
180 PROClookatgo

```

```

190 UNTIL illegal%=2
200 PROC updatescore
210 turn%=turn%+1:UNTIL turn%=60
220 PROC win:UNTIL wait$<>CHR$(32)
230 *FX15,1
250 MODE 7:END
260 DEF PROC init
270 FOR pos%=1 TO 100:position$(pos%)=0:
NEXT
280 turn%=0:value%=1:comp%=0:go%=0:ed
ge%=0:miss%=1
290 ENDPROC
300 DEF PROC setupboard
310 COLOUR1:VDU28,0,31,10,0,23;8202;0
;0;0:
320 VDU4
330 VDU19,2,0,0,0,5:GCOL0,2
340 MOVE352,960:MOVE352,128:PLOT85,11
84,960:PLOT85,1184,128
350 MOVE416,96:PRINT "A B C D E F
G H"
360 FOR Y%=160 TO 928 STEP 96
370 GCOL0,0:MOVE384,Y%:DRAW1152,Y%:MO
VE1216,Y%+64:GCOL0,2:
380 IF Y%=928 THEN 390 ELSE PRINT; (Y%-160)
/96+1
390 NEXT
400 GCOL0,0:FOR X%=384 TO 1152 STEP 96
410 MOVE X%,160:DRAW X%,928:NEXT
420 VDU19,2,2,0,0,0
430 *FX15,1
440 RESTORE 2090
450 FOR position%=1 TO 4:READ pos%,val%,C
%:position$(pos%)=val%:GCOL0,C%:PROC fin
drow and col(pos%):PROC counter:NEXT
460 ENDPROC
470 DEF PROC findplayers
480 VDU4:PRINT TAB(0,10) "Do you want to
play the computer?" " (Y or N) "
490 *FX15
500 REPEAT:wait$=GET$:UNTIL INSTR("Yny
n",wait$)>0:SOUND 11,2,40,4:PROC clear(1
0)
510 IF wait$<>"Y" AND wait$<>"y" THEN ENDP
ROC
520 PRINT TAB(0,10) "Do you want a hard
oreasy game?" " (H or E) "
530 *FX15
540 REPEAT:wait$=GET$:UNTIL INSTR("HhE
e",wait$)>0:SOUND 11,2,40,4:PROC clear(1
0):IF wait$="H" OR wait$="h" THEN miss%=0
550 go%=1:PRINT TAB(0,10) "Do you want
o go first (Y or N)?"
560 *FX15
570 REPEAT:wait$=GET$:UNTIL INSTR("Yny
n",wait$)>0:SOUND 11,2,40,4:PROC clear(1
0)
580 IF wait$="Y" OR wait$="y" THEN ENDPROC
590 go%=2:ENDPROC
600 DEF PROC circles
610 VDU23,224,0,0,0,3,7,15,31,31,23,2
25,0,0,126,255,255,255,255,23,226,0
,0,0,192,224,240,248,248,23,227,31,63,6
3,63,63,63,31
620 VDU23,228,255,255,255,255,255,255
,255,255,23,229,248,252,252,252,252,252
,252,248,23,230,31,31,15,7,3,0,0,23,2
31,255,255,255,255,255,126,0,0
630 VDU23,232,248,248,240,224,192,0,0
,0
640 C1$=CHR$224+CHR$225+CHR$226:C2$=C
HR$227+CHR$228+CHR$229:C3$=CHR$230+CHR$
231+CHR$232
650 circle$=C1$+CHR$8+CHR$8+CHR$8+CHR
$10+C2$+CHR$8+CHR$8+CHR$8+CHR$10+C3$
660 ENVELOPE1,4,0,0,0,0,0,0,121,-10,-
5,-2,120,120:ENVELOPE2,16,4,-8,-4,16,16
,32,64,64,-64,-64,128,0
670 ENDPROC
680 DEF PROC clear(tab%):PRINT TAB(0,tab
%)SPC(42):ENDPROC
690 DEF PROC go
700 VDU4:pass%=0:COLOUR2
710 IF go%<2 THEN 740
720 PROC clear(4):go%=1:PRINT TAB(0,4) "
Computing":IF value%=1 THEN value%=2:GCOL0
,0:ELSE GCOL0,3:value%=1
730 ENDPROC
740 IF value%=1 THEN PRINT TAB(0,4) "Black
's go":value%=2:GCOL0,0:ELSE PRINT TAB(0
,4) "White's go":GCOL0,3:value%=1
750 IF go%>0 THEN go%=2
760 REPEAT:REPEAT:PROC clear(5):PRINTT
AB(0,5) "Column? ";
770 col%=GETAND 223:UNTIL (col%>64 AND co
l%<73) OR col%=80:PRINT CHR$(col%):col%=co
l%-64:IF col%=16 THEN 800
780 PRINT TAB(0,6) "Row? ";
790 row%=GET:row%=row%-48:PRINT;row%
800 UNTIL (row%>0 AND row%<9) OR col%=16
810 VDU5:pos%=col%*10+row%+1
820 ENDPROC
830 DEF PROC counter
840 SOUND 11,1,94,12
850 VDU5:MOVE 291+96*col%,159+96*row%:
PRINT;circle$
860 TIME=0:REPEAT UNTIL TIME>50
870 ENDPROC
880 DEF PROC illegal
890 VDU4:SOUND 10,2,70,25
900 PROC clear(5)
910 PRINT TAB(0,5) "illegal" " move"
920 IF value%=1 THEN value%=2 ELSE value%=
1
930 IF go%=2 THEN go%=1
940 TIME=0:REPEAT UNTIL TIME>200
950 ENDPROC
960 DEF PROC weigh
970 weight%=0:IF position$(pos%)>0 ENDP
ROC

```

```

980 RESTORE2100
990 FORB%=1TO8:READC%:A%=pos%
1000 IFedge%<>0THENC%=edge%:B%=8
1010 REPEAT:IFA%=pos%THEN1060
1020 IFposition%(A%)=0THENA%=199:GOTO1
060
1030 IFposition%(A%)=value%ANDposition
%(A%-C%)<>value%ANDposition%(A%-C%)>0TH
ENillegal%=1:weight%=weight%+ABS((pos%-
A%)/C%)-1:PROCCheckedge:PROCCedge:A%=199
:GOTO1050
1040 IFposition%(A%)=value%ANDposition
%(A%-C%)=0THENA%=199
1050 IFweight%>bestgo%THENbestgo%=weig
ht%:compgo%=pos%
1060 A%=A%+C%:UNTILA%>100ORA%<1
1070 IFillegal%=1ANDcomp%<2ANDcol%<1
6THENA%=pos%:PROCCchangecolour
1080 NEXT:ENDPROC
1090 DEFPROClookatgo
1100 black%=0:white%=0:IFcol%=16ANDpos
s%=0THEN1150
1110 IFpass%=1THENillegal%=2:turn%=tur
n%-1:GOTO1150
1120 illegal%=0
1130 IFposition%(pos%)>0THENPROCillega
l:ENDPROC
1140 PROCweigh
1150 FORA%=1TO100:IFposition%(A%)=3THE
Nposition%(A%)=value%
1160 IFposition%(A%)=2THENblack%=black
%+1
1170 IFposition%(A%)=1THENwhite%=white
%+1
1180 NEXT
1190 IFcol%=16ANDillegal%=0THENillegal
%=2:turn%=turn%-1
1200 IFillegal%<2THENPROCillegal
1210 IFblack%=0ORwhite%=0THENturn%=59
1220 ENDPROC
1230 DEFPROCfindrowandcol(posi%)
1240 col%=posi%DIV10
1250 row%=(posi%-1)MOD10
1260 ENDPROC
1270 DEFPROCchangecolour
1280 REPEAT:PROCfindrowandcol(A%)
1290 IFposition%(A%)<3THENPROCcounter
1300 position%(A%)=3:A%=A%+C%:UNTILpos
ition%(A%)=value%:illegal%=2
1310 ENDPROC
1320 DEFPROCupdatescore
1330 VDU4:PRINTAB(0,15)"Last go-";
1340 IFcol%=16THENPRINT"P ":K%=K%+1:EL
SEPROCfindrowandcol(pos%):PRINTCHR$(col
%+64);row%:K%=0
1350 col%=0:PRINTAB(0,16)"Black: ";bl
ack%;" "
1360 PRINTAB(0,17)"White: ";white%;"
":IFK%=2THENTurn%=59
1370 ENDPROC
1380 DEFPROCInstructions
1390 VDU23:8202;0;0;0;:SOUND&11,2,80,2
55
1400 PRINTAB(14,3);CHR$130;CHR$141;"R
EVERSI"
1410 PRINTAB(14,4);CHR$130;CHR$141;"R
EVERSI"
1420 PRINT"CHR$131;" The object of
this game is to have"CHR$131;"the mo
st discs displayed when the"CHR$13
1;"board is full."
1430 PRINTCHR$131;" After a disc is p
layed, all of your "CHR$131;"opponents
discs trapped between the"CHR$131;"di
sc just played and another disc of"CHR
$131;"yours are reversed to your colour
."
1440 PRINTCHR$131;" If, on your turn,
you don't have a"CHR$131;"legal pos
ition to move to then press"CHR$136;"P
";CHR$137;CHR$131;"to pass."
1450 PRINTCHR$131;" You can play a
gainst either the"CHR$131;"computer
or another player."
1460 PRINT""TAB(6);CHR$134;"Press 'sp
ace bar' to play."
1470 *FX15,1
1480 REPEAT:wait$=GET$:UNTILwait$=""
1490 ENDPROC
1500 DEFPROCwin
1510 VDU5:GCOL0,3:MOVE600,32:SOUND&11,
2,80,255
1520 IFblack%>white%PRINT"Black wins!"
:GOTO1540
1530 IFwhite%>black%PRINT"white wins!"
ELSEPRINT"Close game!"
1540 VDU4:COLOUR1:PRINTAB(0,23)"Press
spacebar to play again"
1550 *FX15
1560 wait$=GET$
1570 ENDPROC
1580 DEFPROCedge:IFC%<0THENENDPROC
1590 RESTORE2040:Q%=0:REPEAT:Q%=Q%+1:R
EADcheck%:UNTILcheck%=pos%
1600 RESTORE2040:FORP%=1TOQ%+1:READche
ck%
1610 IFP%=Q%-1ANDposition%(check%)>0AN
Dposition%(check%)<>value%THENweight%=0
1620 IFP%=Q%+1ANDposition%(check%)>0AN
Dposition%(check%)<>value%THENweight%=0
1630 NEXT
1640 ENDPROC
1650 DEFPROCcheckedge:IFedge%=0THENEND
PROC
1660 IFposition%(pos%-edge%)>0ANDposit
ion%(pos%-edge%)<>value%THENweight%=0
1670 IFposition%(A%+edge%)>0ANDpositio
n%(A%+edge%)<>value%THENweight%=0
1680 ENDPROC

```

```

1690 DEFPROCcorner:FORQ%=1TO3:READpos%
:PROCweigh:RESTORE2080:FORS%=@TOR%:Q%:R
EADT%:NEXT:NEXT:ENDPROC
1700 DEFPROCcompute
1710 G%=1:bestgo%=0:illegal%=0:IFcol%=
16THEN1740
1720 IFgo%<1THENENDPROC
1730 comp%=2
1740 RESTORE2000:FORR%=1TO4:READpos%:P
ROCweigh:RESTORE2000:FORS%=1TOR%:READT%
:NEXT:NEXT
1750 IFbestgo%>0THEN1950
1760 IFcol%=16THEN1830
1770 IFTurn%<50Rmiss%=1THEN1830
1780 FORedge%=-1TO1STEP2:RESTORE2010:F
ORR%=1TO12:READpos%:PROCweigh:RESTORE20
10:FORS%=1TOR%:READT%:NEXT:NEXT:NEXT
1790 FOREdge%=-1TO10STEP20:RESTORE202
0:FORR%=1TO12:READpos%:PROCweigh:RESTO
RE2020:FORS%=1TOR%:READT%:NEXT:NEXT:NEXT
1800 edge%=0:IFbestgo%>0THEN1950
1810 G%=0:RESTORE2030:FORR%=1TO16:READ
pos%:PROCweigh:RESTORE2030:FORS%=1TOR%:
READT%:NEXT:NEXT
1820 G%=1:IFbestgo%>0THEN1950
1830 RESTORE2050:FORR%=1TO12:READpos%:
PROCweigh:RESTORE2050:FORS%=1TOR%:READT%
:NEXT:NEXT
1840 IFbestgo%>0ANDmiss%=@THEN1950
1850 RESTORE2060:FORR%=1TO16:READpos%:
PROCweigh:RESTORE2060:FORS%=1TOR%:READT%
:NEXT:NEXT:IFbestgo%>0THEN1950
1860 RESTORE2070:FORR%=1TO16:READpos%:
PROCweigh:RESTORE2070:FORS%=1TOR%:READT%
:NEXT:NEXT:IFbestgo%>0THEN1950
1870 IEmiss%=1THEN1940
1880 RESTORE2080:FORR%=@TO12:READpos%
1890 IFR%MOD4=@ANDposition%(pos%)=valu
e%THENPROCcorner

```

```

1900 RESTORE2080:FORS%=@TOR%:READT%:NE
XT:NEXT:IFbestgo%>0THEN1950
1910 RESTORE2080:FORR%=@TO12:READpos%
1920 IFR%MOD4=@ANDposition%(pos%)>0THE
NPROCcorner
1930 RESTORE2080:FORS%=@TOR%:READT%:NE
XT:NEXT:IFbestgo%>0THEN1950
1940 RESTORE2080:FORR%=1TO16:READpos%:
PROCweigh:RESTORE2080:FORS%=1TOR%:READT%
:NEXT:NEXT
1950 IFcol%=16THENENDPROC
1960 comp%=1:IFbestgo%>0THENpos%=comp%
o%:ENDPROC
1970 SOUND&11,1,2,12:VDU4:PRINTTAB(0,5
);"Pass ~ no""legal move":TIME=@:REPEA
TUNTILTIME>200
1980 col%=16:pass%=1
1990 ENDPROC
2000 DATA12,19,89,82
2010 DATA14,15,16,17,84,85,86,87,13,18
,83,88
2020 DATA32,42,52,62,39,49,59,69,22,72
,29,79
2030 DATA14,17,39,69,87,84,62,32,15,16
,49,59,85,86,42,52
2040 DATA13,14,15,16,17,18,29,39,49,59
,69,79,88,87,86,85,84,83,72,62,52,42,32
,22
2050 DATA37,36,35,34,44,54,64,65,66,67
,57,47
2060 DATA24,25,26,27,38,48,58,68,77,76
,75,74,63,53,43,33
2070 DATA32,42,52,62,84,85,86,87,69,59
,49,39,17,16,15,14
2080 DATA19,18,28,29,89,79,78,88,82,83
,73,72,12,22,23,13
2090 DATA45,2,0,46,1,3,55,1,3,56,2,0
2100 DATA1,9,10,11,-1,-9,-10,-11

```

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

FX CALLS GREATER THAN 166 - C.Marshall

When using FX calls greater than 166, all calls go to the same routine in the O.S. This routine accesses the byte at \$190+call number. The format used is <old contents> AND Y EOR X

Y returns the original contents and X the contents of the next byte up.

When executing these OSBYTE calls you must set X=0 and Y=255 if you do not want to destroy the existing value of contents.

DELETING LINES - D.Fletcher

When deleting lines from the end of a program it is quickest to delete all but the last line in one go and delete the last line afterwards.

MINUTE PRINT ON AN EPSON - J.L.Ward

Use the following to produce truly minute print of excellent clarity on an Epson printer. It is achieved by engaging to Superscript mode.

VDU2,1,15,1,27,1,83,1,0,1,27,1,65,1,5

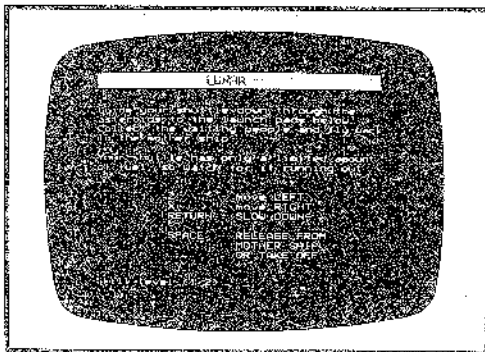
Use VDU1,27,1,84,1,27,1,65,1,12 to reset the printer

Tested on O.S. 0.1 and 1.2
and on Basics 1 and II

LUNAR ESCAPE (32k)

Program by C J Hall

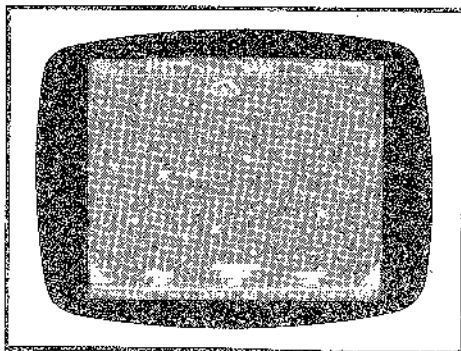
This is an implementation of the arcade game Lunar Rescue. It is entirely in Basic, but despite this is fast enough to be enjoyable. It is fun to play and very addictive.



You are in control of a space shuttle transferring men from the moon's surface. You start off in the main space craft at the top of the screen. You must press the space bar to release from the main craft and drop to the lunar surface. You then dodge the asteroid storm (which gets thicker as you complete each screen) with the use of your steering and the braking rocket. You land on one of the block shaped landing pads where you collect a passenger. You must then press the space bar to take off from the pad again. The landing pad is destroyed in the flame from your thrusters as you take off and, dodging the asteroids, you fly back to the ship. As you approach the ship, its cargo doors will open and you must fly in and disembark the man before loading some more fuel and departing to rescue another person. You repeatedly fly down to the surface until all the landing pads are destroyed.

The program is long and complicated. Take great care when entering the program as debugging is very difficult because of the complicated interactions between the various routines. All the important strings defined at the beginning have been altered in the program to avoid problems with spaces

etc. This game is well worth the effort of typing it in. Do not be put off by the concept of an arcade game in Basic, this program runs as fast as needed in all except the highest levels.



```

10 REM Program LUNAR ESCAPE
20 REM Version B1.26
30 REM Author C.J.Hall
40 REM and BEEBUG
50 REM BEEBUG November 1983
60 REM Program subject to Copyright
70 ON ERROR GOTO 3300
80 MODE7
90 PROCinst
100 PROCsetchars
110 *FX4,1
120 II%=RND(-TIME)
130 IFS%<>-1 I&80=1000
140 PRINT"CHR$136;"Skill level (1/2)
"
150 REPEAT:Z$=GET$:UNTIL Z$="1"ORZ$="
2"
160 IF Z$="1" G%=FALSE:AT%=5 ELSE G%=
TRUE:AT%=10
170 MODE4:VDU23;11,0;0;0;0,19,0,4;0;
180 *FX15,0
190 DOCK=20:LL%=1:S%=0:B%=17000:I%=B%
:FI%=400:F%=FI:X%=0:NS%=FALSE:U%=0:FLA
GI%=FALSE
200 NL%=3:IN%=FALSE:AN%=FALSE:D%=0:FT
%=TRUE:A%=981434236:SP$=CHR$(32)
210 W%=16777183:Y%=-66822:Y1%=-842972
9:H%=1&80:V%=FALSE:BBB%=V%:*FX11,0

```

```

220 CLS:DIMX%(41),Y%(41),IX%(41),IY%(
41):NG%=0
230 L$=STRING$(40,CHR$(238)):PRINTTAB(0
,0),"Score = 000000"
240 PRINTTAB(0,2);L$;:PRINTTAB(20,0)"
Hiscore = 000000"
250 PRINTTAB(0,1)"Landers : 00";TAB(1
4,1)"Fuel : 0000";TAB(29,1)"Level : 00"
;
260 PRINTTAB(0,31)"Landings: This lev
el 00 : This game 000";
270 SEAL$=STRING$(40,CHR$(253))
280 STMP$=STRING$(2,SP$)+CHR$(247)+CHR$(
245+CHR$(249+STRING$(2,SP$)+CHR$(10+STRIN
G$(7,CHR$(8))+SP$+CHR$(243+SP$
290 STM2$=SP$+CHR$(244+SP$+CHR$(10+STRI
NG$(7,CHR$(8))+STRING$(2,SP$)+STRING$(3,C
HR$(248))+SP$+SP$
300 SHIP$=STMP$+SP$+STM2$
310 Q$=SHIP$:ANY$=STRING$(3,CHR$(232))
320 WHT$=STRING$(2,CHR$(234))
330 FORI1%=0TOH$STEP(H$DIV100):PRINTT
AB(37-LEN(STR$(I1%)),0);I1%
340 SOUND0,-15,3,1:NEXT
350 PRINTTAB(37-LEN(STR$(H$)),0);H$
360 SOUND1,-15,150,4
370 FORI1%=1 TO 3:PRINTTAB(11,1);I1%:
SOUND0,-15,3,3:NEXT
380 FORI1%=20TOF$STEP20:PRINTTAB(25-L
EN(STR$(I1%)),1);I1%:SOUND0,-15,7,1:NEXT
390 SOUND1,-15,150,8:PRINTTAB(38,1)"L
"
400 MANSHIP$=STMP$+CHR$(255)+STM2$
410 ENTER$=STMP$+SP$+SP$+CHR$(244+SP$
420 PRINTTAB(0,30);SEAL$;
430 PRINTTAB(0,29);:VDU234,234,232:PR
INTSPC(34);:VDU233,234,234
440 PRINTTAB(0,28);:VDU234,232:PRINTS
PC(36);:VDU233,234
450 PRINTTAB(0,27);CHR$(232);SPC(38);CH
R$(233);
460 PRINTTAB(9,29);WHT$;SPC(8);WHT$;S
PC(8);WHT$;
470 PRINTTAB(8,28);WHT$;WHT$;SPC(6);W
HT$;WHT$;SPC(6);WHT$;WHT$;
480 PRINTTAB(17,27);WHT$;WHT$;WHT$;WHT$;
490 IF IN%=TRUE GOTO 1620
500 L%=RND(25)+5
510 M%=3
520 PRINTTAB(L%,M%);SHIP$
530 N%=RND(3)-2:IF N%=0 GOTO 530
540 J%=0:K%=0
550 TIME=0
560 PROCsetastros
570 PROCdispastros
575 BBB%=FALSE
580 REPEAT
590 PROCmaninship
600 PROCmoveastros
620 UNTIL V%=TRUE
630 REPEAT

```

```

640 PROCmovean
650 PROCmoveastros
660 PROCmoveship
670 UNTIL BBB% OR U%=1
680 IF BBB% THEN BBB%=FALSE:GOTO 580
690 X%=0
700 REPEAT
710 PROCmoveastros
720 PROCmoveship
730 UNTIL INKEY(-99)
740 PRINTTAB(QW%,K%+1)STRING$(6,SP$)
750 REPEAT
760 PROCmoveastros
770 PROCupwego
780 PROCmoveship
790 UNTIL BBB% OR DOCK<6:IF BBB% THEN
BBB%=FALSE:GOTO 580
810 PROCchavewedocked
820 *FX15,0
830 GOTO 580
840 DEFPROCmoveship:T%=L%+N%:IFT%=0 O
R T%=35 N%=-N%:T%=L%+N%
850 L%=T%:PRINTTAB(L%,M%);SHIP$:ENDPR
OC
860 DEFPROCmaninship:T%=L%+N%:IFT%=0
OR T%=35 N%=-N%:T%=L%+N%
870 L%=T%:PRINTTAB(L%,M%);MANSHIP$:IF
INKEY$(2)<>SP$ ENDPROC
880 V%=TRUE:PRINTTAB(L%,M%+2);SPC10:P
RINTTAB(L%+3,M%+1);SP$
890 SOUND1,-15,220,1:J%=L%+3:K%=M%+3
900 PRINTTAB(J%,K%);CHR$(255):PRINTTA
B(L%,M%);SHIP$:X%=0:ENDPROC
910 DEFPROCsetastros
920 FOR Q%=0 TO AT%+1
930 X%(Q%)=RND(37)+1
940 Y%(Q%)=RND(18)+6
950 IX%(Q%)=RND(5)-3:IF IX%(Q%)=0 GOT
O 950
960 IF G%=FALSE GOTO 980
970 IY%(Q%)=RND(3)-2
980 IF Q%MOD5=0 PROCmoveship
990 NEXT
1000 ENDPROC
1010 DEFPROCmoveastros
1020 IF AT%<10 BG%=1:E%=AT%:GOTO 1050
1030 IF FT%=TRUE BG%=1:U%=AT% DIV 2:FT
%=FALSE:GOTO 1050
1040 BG%=AT% DIV 2:E%=AT%:FT%=TRUE
1050 FOR Z%=BG% TO E%
1060 T%=X%(Z%)+IX%(Z%)
1070 R%=Y%(Z%)+IY%(Z%)
1080 IF T%<0 PRINTTAB(X%(Z%),Y%(Z%))SP
$;:T%=39:X%(Z%)=T%:GOTO1100
1090 IF T%>39 PRINTTAB(X%(Z%),Y%(Z%))S
P$;:T%=0:X%(Z%)=T%
1100 IF R%<7 PRINTTAB(X%(Z%),Y%(Z%))SP
$:R%=24:Y%(Z%)=R%:GOTO1140
1110 IF R%>24 PRINTTAB(X%(Z%),Y%(Z%))S
P$;:R%=7:Y%(Z%)=R%:GOTO1140
1120 PRINTTAB(X%(Z%),Y%(Z%))SP$;

```

```

1130 Y%(Z%)=Y%(Z%)+(Y%(Z%))
1140 X%(Z%)=X%(Z%)+IX%(Z%)
1150 PRINTTAB(X%(Z%),Y%(Z%));CHR$(254)
:
1160 NEXT
1170 P%=1/((K%*40*8)+4+5800+(J%*8))
1180 IF P%=A% BBB%=TRUE:PROCclosealife
1190 ENDPROC
1200 DEFPROCdispastros
1210 FOR I1%=1 TO AT%:PRINTTAB(X%(I1%),Y%(I1%));CHR$(254);:NEXT:ENDPROC
1220 DEFPROCupwego
1230 X%=-0
1240 IF INKEY(-98) X%=-1
1250 IF INKEY(-67) X%=1
1260 IF INKEY(-74) PROCwaitabit
1270 IF AN%=TRUE AN%=FALSE:ENDPROC
1280 PROClessenfuelbyone:J%=J%+X%
1290 IF BBB%=TRUE THEN ENDPROC
1300 IF J%<0 J%=0:X%=-0
1310 IF J%>39 J%=39:X%=0
1320 IF K%<6 DOCK=5:ENDPROC
1330 IF K%<9 SHIPS=ENTER$:PRINTTAB(L%,M%+2);SPC(7)
1340 K%=K%-1
1350 PRINTTAB(J%-X%,K%+1)SP$;
1360 P%=(K%*40*8)+4+5800+(J%*8))
1370 PRINTTAB(J%,K%);CHR$(255);
1380 IF P%=0 ENDPROC
1390 PROCclosealife:BBB%=TRUE:ENDPROC
1400 DEFPROCChavewedocked
1410 PRINTTAB(L%,M%+2)SPC6
1420 IF J%<L%+2 OR J%>L%+4 YES=FALSE ELSE YES=TRUE
1430 IF YES=FALSE J%=J%-X%:PROCclosealife:BBB%=TRUE:ENDPROC
1440 PRINTTAB(L%,M%);MANSHIPS
1450 SHIPS=Q$
1460 J%=L%+3:K%=M%+1
1470 IF NS%=FALSE oldfuel%=F%:F%=F%+100:IF F%>FI% THEN F%=FI%
1480 IF NS%=FALSE PROCdispfuel(oldfuel%)
1490 IF NS%=TRUE NS%=FALSE:PROCnewscreen
1500 V%=FALSE:U%=0:DOCK=20
1510 SHIPS=Q$
1520 ENDPROC
1530 DEFPROCnewscreen
1540 IN%=TRUE
1550 D%=0
1560 PROCclearastros
1570 PRINTTAB(0,12)"Well done ... you cleared a screen !!"
1580 PROCnoise:PROCnoise
1590 PROCbonuscount
1600 PRINTTAB(0,16)"You have a bonus of ":PRINTTAB(20,16);B%:PRINT" points !"
1610 GOTO420
1620 PROCaddbonus
1630 AT%=AT%+5
1640 IF AT% MOD 2=1 AT%=AT%+5
1650 IF AT%>40 AT%=40
1660 IF AT%>9 BG%=0:E%=AT% DIV 2
1670 PROCsetastros
1680 PROCclearastros
1690 PROCdispastros
1700 LL%=LL%+1
1710 IF LL%=3 NL%=NL%+1:PRINTTAB(12,LEN(STR$(NL%)),1);NL%:PROCnoise
1720 SOUND1,-15,150,26
1730 PRINTTAB(39-LEN(STR$(LL%)),1);LL%
1740 I%=I%+3000:B%=I%:TIME=0
1750 FI%=FI%+100
1760 oldfuel%=F%:F%=FI%
1770 PROCdispfuel(oldfuel%)
1780 I%=I%+4000
1790 B%=I%
1800 D%=0
1810 ENDPROC
1820 DEFPROCclearastros:VDU 28,0,24,39,7;CLS:VDU 28,0,31,39,0:ENDPROC
1830 DEFPROCdockingssofar
1840 PRINTTAB(39-LEN(STR$(TD%)),31);TD%:PRINTTAB(22,31);D%:ENDPROC
1850 DEFPROCmoveman
1860 X%=0
1870 IF INKEY(-98) X%=-1
1880 IF INKEY(-67) X%=1
1890 IF INKEY(-74) PROCwaitabit
1900 IF AN%=TRUE AN%=FALSE:ENDPROC
1910 J%=J%+X%:PROClessenfuelbyone
1920 IF BBB%=TRUE THEN ENDPROC
1930 IF J%<0 J%=0:X%=0
1940 IF J%>39 J%=39:X%=0
1950 K%=K%+1
1960 PRINTTAB(J%-X%,K%-1)SP$;
1970 P%=(K%*40*8)+4+5800+(J%*8))
1980 PRINTTAB(J%,K%-1);CHR$(255);
1990 IF P%=0 ENDPROC
2000 IF P%=A% OR P%=W% PROCclosealife:BBB%=TRUE:ENDPROC
2010 IF P%=Y% OR P%=Y1% FLAG1%=2+(P%=Y%):PROCclosealife:BBB%=TRUE:ENDPROC
2020 PROCblock
2030 U%=1
2040 ENDPROC
2050 DEFPROCblock
2060 IF J%<13 QW%=6
2070 IF J%<26 AND J%>12 QW%=17
2080 IF J%<39 AND J%>25 QW%=26
2090 PRINTTAB(J%,K%-1);CHR$(255)
2100 PRINTTAB(J%,K%);CHR$(234);
2110 IF K%=28 SC%=100 ELSE IF K%=29 SC%=200 ELSE SC%=50
2120 D%=D%+1
2130 IF D%=7 NS%=TRUE:D%=0
2140 TD%=TD%+1
2150 PROCdockingssofar
2160 PROCnoise
2170 S%=S%+SC%:PROCscore

```

```

2180 K%=K%-1
2190 ENDPROC
2200 DEFPROCclosealive
2210 SHIP%=Q$
2220 NL%=NL%-1
2230 PRINTTAB(12-LEN(STR$(NL%)),1);NL%
2240 PRINTTAB(J%,K%);CHR$242
2250 PROCcrash
2260 PRINTTAB(J%,K%)SP$
2270 IF FLAG1% THEN PRINTTAB(J%,K%);CH
R$(231+FLAG1%);:FLAG1%=FALSE
2280 IF NL%=0 PROCfinish:IF Z$<"Y" E
ND
2290 V%=FALSE:U%=0:DOCK=20
2300 PRINTTAB(0,30);SEAL$;
2310 J%=L%+3;K%=M%+2
2320 *FX15,0
2330 IF NS%=FALSE ENDPROC
2340 PROCnewscreen:DOCKS=0:NS%=FALSE:E
NDPROC
2350 DEFPROCfinish
2370 VDU28,0,31,39,3:CLS:*FX15,0
2380 PRINTTAB(9,12)"G A M E O V E R"
2390 PRINTTAB(0,25)"Do you want to pla
y again (Y/N)":VDU28,0,31,39,0
2400 IF S%>H% PRINTTAB(0,17)"You got t
he high-score : well done!":H%=S%:!&00
=H%
2410 S%=-1:Z$=GET$:IF Z$<"N" RUN
2420 *FX4
2430 VDU22,7:*FX11,40
2440 ENDPROC
2450 DEFPROCbonuscount
2460 B%=I%-TIME:B%=B% DIV 10:IF B%<0 B
%=0:ENDPROC ELSE ENDPROC
2470 DEFPROCaddbonus:S%=S%+B%:FOR II%=
S%-B% TO S% STEP 10
2480 PRINTTAB(14-LEN(STR$(II%)),0);II%
:SOUND0,-15,3,1:NEXT
2490 PRINTTAB(14-LEN(STR$(S%)),0);S%:P
ROCnoise:ENDPROC
2500 DEFPROClessenfuelbyone
2510 F%=F%-1
2520 IF F%=-1 F%=F%:PROCclosealive:PRO
Cdispfuel(10):BBB%=TRUE
2530 PRINTTAB(21,1)"0000"
2540 PRINTTAB(25-LEN(STR$(F%)),1);F%;
2550 ENDPROC
2560 DEFPROCdispfuel(oldfuel%):PRINTTA
B(21,1)"0000"
2570 FOR II%=oldfuel% TO F% STEP 10:PR
INTTAB(25-LEN(STR$(II%)),1);II%
2580 SOUND0,-15,3,3:NEXT:ENDPROC
2590 DEFPROCwaitabit
2600 IF F%<1.1 AN%=FALSE:ENDPROC
2610 F%=F%-10
2620 PRINTTAB(21,1)"0000"
2630 PRINTTAB(25-LEN(STR$(F%)),1);F%
2640 AN%=TRUE
2650 ENDPROC

```

```

2660 DEFPROCscore:FOR II%=S%-SC% TO S%
STEP 2
2670 PRINTTAB(14-LEN(STR$(II%)),0);II%
:SOUND0,-15,3,1:NEXT:ENDPROC
2680 DEFPROCnoise
2690 FOR II%=1 TO 6
2700 SOUND1,-15,5,3
2710 SOUND1,-15,20,3
2720 NEXT
2730 *FX15,1
2740 TIME =0:REPEAT UNTIL TIME>90
2750 ENDPROC
2760 DEFPROCcrash
2770 FOR II%=-15 TO 0
2780 SOUND0,II%,3+RND(3),5
2790 NEXT
2800 ENDPROC
2810 DEFPROCinst
2820 PRINTCHR$134;CHR$157;SPC(12);CHR$
129;CHR$141;"LUNAR ESCAPE"
2830 PRINTCHR$134;CHR$157;SPC(12);CHR$
129;CHR$141;"LUNAR ESCAPE"
2840 PRINT"" Guide your shuttle down
through the"
2850 PRINT" asteroids to the launch pa
ds below."
2860 PRINT" Collect the waiting people
and fly back";
2870 PRINT" to the mother ship."
2880 PRINT" Your shuttle has only a li
mited amount"
2890 PRINT" of fuel, so watch for it r
unning out.""
2900 PRINTSPC11;"Z" - move LEFT"
2910 PRINTSPC11;"X" - move RIGHT"
2920 PRINTSPC11;"RETURN - SLOW DOWN""
2930 PRINTSPC11;"SPACE - RELEASE FROM
"
2940 PRINTSPC20;"MOTHER SHIP"
2950 PRINTSPC20;"OR TAKE OFF"
2960 VDU28,0,24,39,0
2970 ENDPROC
3060 DEFPROCsetchars
3070 VDU23,255,24,60,189,255,102,60,66
,129
3080 VDU23;11,0;0;0;0
3090 VDU23,232,&60,&E8,&E8,&E8,&FA,&FA
,&FE,&FF
3100 VDU23,233,6,&17,&17,&17,&5F,&5F,&
7F,&FF
3110 VDU23,234,&FFFF,&FFFF,&FFFF,&FFFF
3120 VDU23,238,255;0;0;0
3130 VDU23,242,153,90,60,231,231,60,90
,153
3140 VDU23,254,&4E,&FF,&FF,&FC,&7C,&7F
,&7F,&3A
3150 VDU23,253,&90,&92,&D2,&DA,&DF,&FF
,&FF,0
3160 VDU23,243,1,3,3,7,3,3,1
3170 VDU23,244,&80,&C0,&C0,&E0,&E0,&C0
,&C0,&80

```

```

3180 VDU23,245,&3D,&FF,&FF,&C3,&81,0,0
,0
3190 VDU23,247,0,3,7,&1F,&3F,&7E,&7C,&
F8
3200 VDU23,248,&81,&7E,0,0,0,0,0
3210 VDU23,249,0,&C0,&E0,&F8,&FC,&7E,&
3E,&1F
3220 ENDPROC
3300 ON ERROR OFF
3310 IF ERR=17 THEN PROCfinish ELSE RE
PORT:PRINT" at line ";ERR
3320 *FX4
3330 *FX12
3340 VDU23;11,255;0;0;0
3350 END

```

ILLUSIONS - 19

```

290
300 REM Scroll screen down one line
310 VDU30;11
320
330 REM Randomly adjust banks
340 RA=RND(3)-2:R%#B%+leftbank%
350 IF J%#N AND J%#rightbank%+1 THEN
N:leftbank%#R%
360 R%#RND(3)-2:R%#F%+rightbank%
370 IF R%#7 AND R%#leftbank%+1 THEN
N:rightbank%#R%
380
390 REM Check for boat movement
400 positions=positions+(INKEY-98)-(1
NKEY-67)
410
420 REM Display Boat
430 PRINTTAB(positions,11);$PC1;TAB(
positions,30);" "
440
450 REM Check for crash
460 IF POINT1(positions)*32,16)>0 THEN
N:gameover%#TRUE
470 UNTIL gameover%
480 VDU37;*FX15,1
490 ENDPROC

```

POINTS ARISING

Illusions - Vol.2 No.5

If you encountered any difficulties in getting this program to work for you, check carefully that you have typed in 'l%' (lower case L) and 1 (figure one), both of which are used in the program and can cause confusion. For this very reason we normally try to avoid this possible source of confusion. In all respects however, as far as we are aware, the program is bug free.

HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS HINTS

THE FOUR WAYS OF USING FUNCTION KEYS - Paul Beverley

- 1) On their own either as normal *FX225,1 or disabled with *FX225,0 or to produce characters *FX225,n
- 2) With SHIFT *FX226,n
- 3) With CTRL *FX227,n
- 4) With CTRL and SHIFT *FX228,n

Where 'n' is the base number for the ASCII codes generated.

DOUBLE QUOTES - Alan Baker

To get a " mark inside a piece of text delimited by "..." use two together:
PRINT "THIS IS A "" DOUBLE QUOTE"

It gives:

THIS IS A " DOUBLE QUOTE

If you are going to put a double quote in the middle of a string then the string must be delimited with normal quotes and the quote marks entered inside with two together as above.

TAB in WORDWISE - A.W.Rowe

Pressing tab repeatedly at the beginning of the line will not give the correct indentation. Use Tab Space Tab instead.

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Editorial Address

BEEBUG
PO Box 50
St Albans
Herts
AL1 2AR

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BEEBUG NEW ROM OFFER

A special arrangement has been agreed between Acorn and BEEBUG whereby BEEBUG members may obtain the Series One Machine Operating System in ROM at the price of £5.85 including VAT and post and packing.

The ROM will be supplied with fitting instructions to enable members to install it in their machine.

If the computer does not subsequently operate correctly, members may take their machines to an Acorn dealer for the upgrade to be tested, which will be done at a charge of £6.00 plus VAT. This charge will be waived if the ROM is found to have been defective. If the computer has been damaged during the installation process, the dealer will make a repair charge.

Please note that we cannot accept EPROM-based operating systems (0.1 or 1.0) in lieu of payment. This can only be performed by Acorn dealers or by Acorn's service centre at Feltham, and applies only to users of the 0.1 O.S.

ADDRESS FOR 1.2 O.S. IF ORDERED ON ITS OWN:- ROM Offer, BEEBUG, PO Box 109, High Wycombe, Bucks, HP11 2TD. PLEASE ALLOW 28 DAYS FOR DELIVERY.

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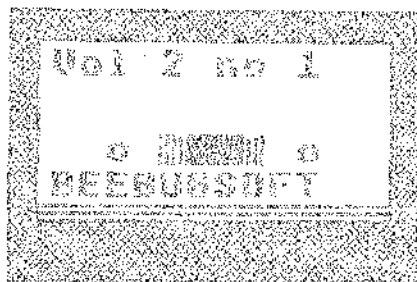
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AVAILABLE TO MEMBERS. FULL DETAILS
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To save wear and tear on fingers and brain, we will be offering each month a cassette of the programs featured in the latest edition of BEEBUG. The first program on each tape is a menu program, detailing the tape's contents, and allowing the selection of individual programs. The tapes are produced to a high technical standard by the process used for the BEEBUGSOFT range of titles. Ordering information, and details of currently available cassettes are given below.

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