CORTEX USER GROUP

NEWSLETTER III SEPTEMBER 1985

Welcome to the first of the new quarterly newsletters We apologise for the delay in publication of this issue.

Once again the number of letters we have received has increased. Thank you for your continued interest and support. We are sure that almost any subject (relating to the Cortex) which you wish to write about will be of interest to other users, so please keep those letters coming.

You may notice a change in the format of the newsletter, as all of the articles are now arranged in relevant sections. We hope that this will make the newsletter easier to follow. It would also be helpful if people writing in were to keep different items roughly separated (e.g keep programs separate from tips).

Further to the notice in the Newsletter II, referring to the discontinued Texas 9909 (Floppy disc control chip), we now bring you more news on this subject.

The chip is now replaceable by a module which uses a different chip.

Due to the prohibitive cost of producing this module, we have decided it was better to simple make the circuit diagram available (see enclosed sheet). The module takes its inputs from the 9909 socket, and outputs directly to the floppy disc control. The circuit has, of course, been built, and was found to work well.

The following letters, and programs have been submitted by Cortex Users. Powertran Cybernetics Limited cannot accept liability for their content.

CORTEX TIPS

This is your chance to pass on any amazing (or just plain useful) discoveries, that you have made about the workings of the CORTEX.

Mr S Pratt
Cleveland

Stephen has kindly sent in a couple of useful notes.

S
it might be of some help.

1. The protected memory, mentioned by Robert Lee is fine as long as you do not attempt to define characters greater than 215 using "CHAR" since this is where they are stored.

2. The character set is stored in memory from 5BAEH to 60ECH inclusive, lower case is from 5D34H to 60DDH inclusive.

Hope this is useful.

- - - x x x - - -

Julian Terry
Rainham
Kent

Julian has been trying to confuse his Cortex with negative line numbers, and has also sent some information about XOP's.

In the first issue of the Users Group Magazine someone mentioned that one could renumber backwards, well you can also renumber over 32767. This is not adviseable since one ends up with negative line numbers and the program will not run.

```
XOP0      moves  *R11 → R0
                 *R11+2 → R1
                 *R11+4 → R2

XOP1      moves  R0 → *R11
                 R1 → *R11+2
                 R2 → *R11+4
```

XOP8 Sets registers 0 to 2 (inc) to zero.

XOP9 If R0 <> 0 then R0 = R0 + 8000H

XOP11 This is a very useful routine. R8 points to the start of an arithmetic expression in internal condensed form (not as in a listing).
When the command is executed the integer value of the expression is returned in the argument of XOP11. This will perform all error checking and includes all system functions. R8 after execution will point to the byte after the expression.

XOP 14 is used with the following format
XOP @>n, 14
Where n is an error number. The appropriate error message will be displayed and correct action taken (e.g. call to ERROR line).
n is in the range 0 - 63
At present any error >49 will return "SYSTEM ERROR".
There are two more error messages not mentioned in the Cortex manual. These are 41-Expansion Eprom not found, 0-FATAL SYSTEM ERROR (the computer locks up when this is executed.) Personalized errors may be added by putting "BL@> routine address" at location 1DFCH.
R1 will hold the error number
R2 should be set to 5732H and RT executed if it is not your error. If it is your error then the routine should finish with B@> 1E14.
SYS[1] will be set as required.
Errors with numbers greater than 31H will be trapped.

XOP15 is spare.

- - - x x x - - -

Chris Young
Lossiemouth
Morayshire

Chris makes another appearance with his list of MID instructions which are not otherwise documented.

```
0001      = WRIT R0
0002      = Prints CRLF
0003      = Reprints last message
0004      = WRIT R1
0005      = WRIT R1
0006 xxxx = MSG @>xxxx
0007 xxxx = MSG @>xxxx
0008      =
0009      = WRIT > (write immediate)
000A      =
```

```
000B      = Retrieve Character from keyboard buffer.
xxxx        if null then execute xxxx
yyyy        if not null execute yyyy
zzzz        if ESC then execute zzzz
              xxxx,yyyy & zzzz should be JMP's
000C      = READ R0 (used to get characters from Cassette when
              keyboard is disabled)
000D      = READ R0
xxxx        if nul execute xxxx
yyyy        if not null execute yyyy
000E      = Wait until >EDAA is zero
000F      = TEXT (as in BASIC)
0010      = GRAPH (as in BASIC)
0011      = TEXT (if not in TEXT mode
0012      = GRAPH (if not in GRAPH mode)
0013      = Clears keyboard buffer
0014      = cassette !
0015      = cassette !
```

- - - x x x - - -

Tim Gray
Wolverhampton
West Midlands

Here are some more tips from Tim.

CDOS Modifications

The program FILECOPY has no facility for choosing the files to be copied from one disc to another. If the following lines are added to the program it allows you to go through the directory, but only copy the selected files. The program prints the filenames found, and then asks if you want to copy it or not, answer Y or N, if yes the file is copied, if no the next directory entry is found.

```
361  PRINT
362  INPUT " do you want to copy it Y/N "$ANS
363  IF $ANS = "Y" THEN GOTO 370
364  IF $ANS = "N" THEN GOTO 790
365  GOTO 362
```

After adding the extra lines save the program with the new name COPYFILE so that you still have the choice of which program you use.

To allow the use of the * command to load program from drive 0 assemble the following code at 69A4.

```
69A4  MOV  R8,R2
69A6  JMP       >69AC
69A8  LI   R2   >69B6
69AC  CLR  R1
69AE  LI   R11  >0080
69B2  B         @>659C
```

and change the following memory locations

699A	from	0D0A	to	4344
699C	"	434F	"	4F53
699E	"	5254	"	2031
69A0	"	4558	"	0D0A
69A2	"	2044	"	0000
69F0	"	0000	"	4056
69F2	"	0000	"	69A4

To make the routine auto load a program from the BOOT command change the following memory locations:-

6996 from 021C to 69A8

And from 69B6 onwards add the ascii codes for the filename required (maximum of 8 characters) terminating with 0000.

After making the required changes re-save the SYSTEM$ file from the monitor using the D command:-

start addr 6900 end addr 6EFE entry point 6980, IDT - SYSTEM$, auto run - Y.

The * command works by simply typing *<filename> with no delimiters or quotes.

To load program files from a machine code routine use the following:-

```
LI   R1   ><drive number>
LI   R2   ><start of filename>
LI   R11  >0080
B         @>659C
```

And finally a hardware modification for those of you who are brave enough to venture within the Cortex case.

If pin 4 of the keyboard socket is connected to pin 4 (DØ) of IC63 the keyboard can be read directly in basic without the problem of random values being returned or having to press the repeat key, use the following line:-

```
BASE 16:K=KEY[0]:IF CRB [-8]=1 THEN K=CRF[8]
```

- - - x x x - - -

PROGRAMS

Written any good programs? Then send them in for us to print! All the following have been sent in by Cortex Users. Each listing has been thoroughly checked against the original.

Helge A Larsen
Stathelle
NORWAY

Our apologies to Mr Larsen for the assumption that Helge was a female name (Ref Newsletter II). He has written in to correct us on this point, and has sent two useful routines.

Obviously my name is unknown in England since I've been a female in the last newsletter. Helge is in Norway a male's name, Helga is as female name.

I've found a short routine to read the keyboard, and written a routine for scrolling one or more lines right pixel by pixel such that characters leaving the right side will enter at the left side.

Keyboard reading routine

```
6000  020C  LI    R12,0010
6004  3601  STCR  R1,8
6006  3602  STCR  R2,8
6008  3603  STCR  R3,8
600A  3604  STCR  R4,8
600C  9081  CB    R1,R2
600E  1608  JNE   6020
6010  90C2  CB    R2,R3
6012  1606  JNE   6020
6014  9103  CB    R3,R4
6016  1604  JNE   6020
6018  05C0  INCT  R0
601A  0580  INC   R0
601C  D401  MOVB  R1,+R0
601E  0380  RTWP
6020  05C0  INCT  R0
6022  04D0  CLR   +R0
6024  0380  RTWP
```

Use of routine:

```
10 K=0
20 CALL 6000H,ADR(K)
30 PRINT K: GOTO 20
```

Scroll Routine

```
6000  06C0  SWPB  R0
6002  C200  MOV   R0,R8
6004  C181  MOV   R1,R6
6006  0201  LI    R1,>C000
600A  06A0  BL    @>05F2
```

```
600E  DC60  MOVB  @>F120,*R1+
6012  0281  CI    R1,>C100
6016  16FB  JNE   >600E
6018  0201  LI    R1,>C0F8
601C  0202  LI    R2,BFF0
6020  0203  LI    R3,0008
6024  D131  MOVB  +R1+,R4
6026  0994  SRL   R4,9
6028  1802  JOC   >602E
602A  04C5  CLR   R5
602C  1001  JMP   >6030
602E  0705  SETO  R5
6030  CC85  MOV   R5,*R2+
6032  0603  DEC   R3
6034  16F7  JNE   >6024
6036  0201  LI    R1,>C000
603A  0202  LI    R2,>BFFO
603E  0203  LI    R3,>0008
6042  C152  MOV   *R2,R5
6044  1606  JNE   >6052
6046  D111  MOVB  *R1,R4
6048  0994  SRL   R4,9
604A  181D  JOC   >6086
604C  04C5  CLR   R5
604E  06C4  SWPB  R4
6050  1007  JMP   >6060
6052  D111  MOVB  *R1,R4
6054  0994  SRL   R4,9
6056  1819  JOC   >608A
6058  04C5  CLR   R5
605A  06C4  SWPB  R4
605C  0264  ORI   R1,>8000
6060  DC44  MOVB  R4,*R1+
6062  CC85  MOV   R5,*R2+
6064  0603  DEC   R3
6066  13E9  JEQ   >603A
6068  0281  CI    R1,>C100
606C  11EA  JLT   >6042
606E  0201  LI    R1,>C000
6072  0268  ORI   R8,>4000
6076  06A0  BL    @>05F2
607A  D831  MOVB  +R1+,@>F120
607E  0281  CI    R1,>C100
6082  16FB  JNE   >607A
6084  1004  JMP   >608E
6086  0705  SETO  R5
6088  10E2  JMP   >604E
608A  0705  SETO  R5
608C  10E6  JMP   >605A
608E  0248  ANDI  R8,>BFFF
6092  0228  AI    R8,>0100
6096  0606  DEC   R6
6098  16B6  JNE   >6006
609A  0380  RTWP
```

CALL 6000H,L,N

L = first line to be scrolled (upper 0)

N = number of lines to be scrolled.

Mr R M Lee
Eastbourne
Sussex

Robert not only solves other users problems (see bug byte section), but is also a keen programmer himself.

FLASHING CURSOR

This program simply makes the cursor flash on the screen, but only when the computer is not accessing the screen i.e. in IDLE state. The entry point when saving is 6064H. The routine is called every 10ms by the clock routine so do not overwrite it before removing the vector jump.

```
6000=EEA0
6002=6004
6004 0587 INC   R7
6006 0287 CI    R7,>0032
600A 1A26 JL    >6058
600C C1AD MOV   @>001C(R13),R6
6010 0286 CI    R6,>046C
6014 1621 JNE   >6058
6016 04C7 CLR   R7
6018 0201 LI    R1,>F120
601C 0200 LI    R0,>F121
6020 0202 LI    R2,>0008
6024 C0C2 MOV   R2,R3
6026 0208 LI    R8,>0BF8
602A 0205 LI    R5,>EEC0
602E 06A0 BL    @>05F2
6032 DD51 MOVB  *R1,*R5+
6034 0602 DEC   R2
6036 16FD JNE   >6032
6038 0202 LI    R2,>0004
603C 0205 LI    R5,>EEC0
6040 0575 INV   *R5+
6042 0602 DEC   R2
6044 16FD JNE   >6040
6046 0208 LI    R8,>4BF8
604A 0205 LI    R5,>EEC0
604E 06A0 BL    @>05F2
6052 D475 MOVB  *R5+,*R1
6054 0603 DEC   R3
6056 16FD JNE   >6052
6058 0380 RTWP
605A 0420 BLWP  @>6000
605E 0300 LIMI  >0000
6062 C820 MOV   @>605A,@>010E
6068 C820 MOV   @>605C,@>0110
606E 0300 LIMI  >000F
6072 0460 B     @>021C
```

Here is a program that enables GRAPH mode screen to printer dumps for an RX-80 printer, but there is no reason why it should not work for any other new EPSON printer. The program is written for a centronics printer with UNIT 4,

but to change to RS232 UNIT 2, change location 6024H to 2H. The entry point when saving the program is 60EAH. This routine sets up the word "DUMP" in the computer's symbol table and allows the statement "DUMP" to be used whenever the program is needed e.g.

```
10  GRAPH

20  DUMP

30  END
```

Some problems may occur if the BASIC program is very large, as the DUMP program uses some 6K of memory just above the users BASIC program.

SCREEN TO PRINTER DUMP

```
6000  0202  LI    R2,>F120
6004  0203  LI    R3,>F121
6008  0204  LI    R4,>1800
600C  0208  LI    R8,>0000
6010  C1A0  MOV   @>EFC0,R6
6014  06A0  BL    @>05F2
6018  DD92  MOVB  *R2,*R6+
601A  0604  DEC   R4
601C  16FD  JNE   >6018
601E  020A  LI    R10,>0018
6022  0200  LI    R0,>0008
6026  C800  MOV   R0,@>001E
602A  0200  LI    R0,>0A00
602E  0F00  WRIT  R0
6030  0200  LI    R0,>1B00
6034  0F00  WRIT  R0
6036  0200  LI    R0,>4100
603A  0F00  WRIT  R0
603C  0200  LI    R0,>0800
6040  0F00  WRIT  R0
6042  0200  LI    R0,>1B00
6046  0F00  WRIT  R0
6048  0200  LI    R0,>6C00
604C  0F00  WRIT  R0
604E  0200  LI    R0,>1300
6052  0F00  WRIT  R0
6054  0200  LI    R0,>0008
6058  C060  MOV   @>EFC0,R1
605C  0202  LI    R2,>1800
6060  0203  LI    R3,>1B00
6064  0F03  WRIT  R3
6066  0203  LI    R3,>4B00
606A  0F03  WRIT  R3
606C  0203  LI    R3,>0000
6070  0F03  WRIT  R3
6072  0203  LI    R3,>0100
6076  0F03  WRIT  R3
6078  0203  LI    R3,>0018
```

```
607C  0204  LI    R4,>0020
6080  0205  LI    R5,>0008
6084  C185  MOV   R5,R6
6086  C1C1  MOV   R1,R7
6088  C005  MOV   R5,R0
608A  04C9  CLR   R9
608C  0A19  SLA   R9,1
608E  D231  MOVB  *R1+,R8
6090  06C8  SWPB  R8
6092  0908  SRL   R8,0
6094  1701  JNC   >6098
6096  0589  INC   R9
6098  0606  DEC   R6
609A  16F8  JNE   >608C
609C  0A89  SLA   R9,8
609E  0F09  WRIT  R9
60A0  C185  MOV   R5,R6
60A2  C047  MOV   R7,R1
60A4  0600  DEC   R0
60A6  16F2  JNE   >608C
60A8  A045  A     R5,R1
60AA  6085  S     R5,R2
60AC  0604  DEC   R4
60AE  16EB  JNE   >6086
60B0  0200  LI    R0,>0A00
60B4  0F00  WRIT  R0
60B6  060A  DEC   R10
60B8  16D3  JNE   >6060
60BA  0200  LI    R0,>1B00
60BE  0F00  WRIT  R0
60C0  0200  LI    R0,>6C00
60C4  0F00  WRIT  R0
60C6  0200  LI    R0,>0000
60CA  0F00  WRIT  R0
60CC  0200  LI    R0,>1B00
60D0  0F00  WRIT  R0
60D2  0200  LI    R0,>3200
60D6  0F00  WRIT  R0
60D8  0200  LI    R0,>0001
60DC  C800  MOV   R0,@>001E
60E0  0460  B     @>3F30
60E4  6D49  S     R9,*R5+
60E6  0020  DATA  >0020
60E8  6000  S     R0,R0
60EA  C820  MOV   @>60E4,@>3A88
60F0  C820  MOV   @>60E6,@>3B34
60F6  C820  MOV   @>60E8,@>4026
60FC  0460  B     @>021C
```

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P Edwards
Cochrane Park
Newcastle-upon-Tyne
NE7 7LL

Paul is obviously not content with just writing programs. He has found a way of adding new commands.

Here is the assembler listing for a 'FIND' command to be added to the CORTEX dictionary. To relocate the program to another address, the absolute addresses at lines 15, 28, 31, 47 and 63 will need to be changed accordingly.

If any CDOS users would like to add this, or M/Code routine to their BOOT file, I would be happy to supply details of how I have done it.

Has any CDOS user got a 2 pass assembler written for sharing?

```
1  ;       The 'FIND' command is entered into the command
2  ;       table by a call to 'INIT' at the end of this
3  ;       listing, and the command can then be used at any
4  ;       time.
5  ;       The syntax is
6  ;                       FIND STRING<CR>
7  ;
8  ;       This will search the program and print out any
9  ;       program line containing STRING.
10
11                 section find
12       6200              org     6200h
13
14   6200 0200EB09         li      r0,0eb09h     ;start of string to be found
15   6204 02016286         li      r1,store      ;temp. store for string
16   6208 DC70      fin10  movb    *r0+,*r1+     ;store byte
17   620A 16FE             jne     fin10
18   620C 0FA0556F         msg     556fh         ;new line
19   6210 04C1             clr     r1
20   6212 0706             seto    r6
21   6214 C220EFBC         mov     0efbch,r8     ;pointer into basic tables
22   6218 0648             dect    r8
23   621A 8808EFBA  fin20  c       r8,0efbah     ;end of table ?
24   621E 1227             jle     out           ;out
25   6220 0228FFFC         ai      r8,0fffch     ;r8 = r8-4
26   6224 8601             c       r1,*r8
27   6226 15F9             jgt     fin20         ;fin20
28   6228 06A06250  fin30  bl      decode        ;get prog. line in ascii
29
30   622C 0202EB04         li      r2,0eb04h     ;start of line of program
31   6230 02016286  fin35  li      r1,store      ;point to search string
32   6234 D492      fin40  movb    *r2,*r2       ;end of line ?
33   6236 13F8             jeq     fin30
34   6238 9C91             cb      *r1,*r2+      ;match ?
35   623A 16FC             jne     fin40         ;no, try next one
36   623C 0581      fin50  inc     r1
37   623E D451             movb    *r1,*r1       ;end of search string ?
38   6240 1303             jeq     found         ;yes
39   6242 9C91             cb      *r1,*r2+      ;match ?
40   6244 16F5             jne     fin35
41   6246 10FA             jmp     fin50
42   6248 000A      found  word    10            ;write line
43   624A 0FA0556F         msg     556fh         ;new line
44   624E 10EC             jmp     fin30
```

```
45
46                                  ; **** subroutine to decode basic line ****
47   6250 C80B62EA   decode  mov     r11,store2      ;save return vector
48   6254 8808EFBA           c       r8,0efbah       ;end of table ?
49   6258 1A0A               jl      out             ;out
50   625A C078               mov     *r8+,r1
51   625C 8181               c       r1,r6
52   625E 1B07               jh      out             ;out
53   6260 06A03C80           bl      3c80h           ;decode line
54
55   6264 0228FFFA           ai      r8,0fffah
56   6268 C2E062EA           mov     store2,r11      ;regain return vector
57   626C 045B               rt                      ;return
58
59   626E 0460021C   out     b       21ch            ;back to basic 'Ready'
60
61   6272 0201724C   INIT    li      r1,724ch        ;'FIND' coded
62   6276 C8013A20           mov     r1,3a20h        ;put it into table
63   627A 02016200           li      r1,find         ;start of prog
64   627E C8013ACC           mov     r1,3acch        ;into table
65   6282 0460021C           b       21ch            ;back to Basic
66
67   6286   64 .    store   block   100
68   62EA 0000       store2  word    0
69                   nolist  sym
70                   end
```

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Mr R A Green
Rotherham
South Yorkshire

Mr Green has sent us two programs, both with a view to the stock exchange.

Please try my Shares programs, they may not make money but do show where it went. The Histogram program can be altered very easily by anyone to show any data in histogram form.

```
10   ; TAB (10)"Shares Program."
20   ;
30   ; TAB (10)"Enter Latest Prices."
33   ;
35   ; TAB (10)"In Pounds."
40   ;
50   INPUT " Example Are"A4
60   ;
161  INPUT " British Telecom are"G4
162  ;
164  ;
170  DIM $X[2]
180  INPUT "Prices are for  "$X[0]
190  DIM $A[4],$B[4],$C[4],$D[4]
200  DIM $L[4],$R[4],$S[4]
210  DIM Z1[3],Z2[3],Z3[3],Z4[3].Z5[3],Z6[3],Z7[3],Z8[3],Z9[3]
```

```
220  $R[0]="SS,SSS"
230  $S[0]="SS,SSS.99"
240  DATA "EXAMPLE",500,"B1234","22/2/83",124,630,A4
245  DATA '  " " ' ,100,"BB123","2/1/85",0,0,A4
375  DATA "BRITISH TELECOM",800,"XXXXXXXX","23/11/84",50,400,G4
380  DATA "END",0,"END","END",0,0,0
390  T1=18: T2=28: T3=38: T4=48: T5=58: T6=68: T7=78: T8=88
400  UNIT 2: ; "<1B><75><14>"
410  PRINT TAB (40)"FINANCIAL REVIEW"; TAB (80)$X[0]
420  PRINT
430  ;  TAB (T1)"SHARE" TAB (T2)"CERT"; TAB (T3)"DATE"; TAB (T4)
     "BOUGHT"; TAB(T5)"TOTAL";
440  ;  TAB (T6)"CURRENT"; TAB (T7)"PRESENT"; TAB (T8)"GROSS"
450  ;  TAB (T1)"HOLDING"; TAB (T2)"NUMBER"; TAB (T3)"BOUGHT";
     TAB (T4)"PRICE";TAB (T5)"COST";
460  ;  TAB (T6)"PRICE"; TAB (T7)"VALUE"; TAB (T8)"PROFIT"
470  Z5=0: Z6=0
480  READ $A[0],Z1,$B[0],$C[0],Z2,Z3,Z4
490  IF $A[0]="END" THEN GOTO 560
500  ;
510  ; #$R[0];$A[0]; TAB (T1);Z1; TAB (T2)$B[0]; TAB (T3)$C[0];
     TAB (T4);Z2; TAB (T5):Z3;
520  ; #$S[0]; TAB (T6-2);Z4; TAB (T7-2); Z4*Z1; TAB (T8-2);
     TAB (T8-2);(Z4*Z1)-Z3
530  Z5=(Z4*Z1)+Z5
540  Z6=(Z4*Z1)-Z3+Z6
550  GOTO 480
560  ; "<1B><75><1>"
570  ;
580  ; #$R[0]; TAB (30);"TOTAL VALUE IS"Z5
590  ;
600  ; #$R[0]; TAB (30);"TOTAL PROFIT IS"Z6
610  UNIT -2
620  INPUT " ANOTHER PRINT Y/N?"$D[0]
630  IF $D[0]="N" THEN END
640  IF $D[0]="Y" THEN RESTOR
645  GOTO 400
650  STOP

670   ; "Further shares may be added as"
675   ; "in the example by inserting one"
680   ; "INPUT line and one line of"
685   ; "appropriate DATA."
690   ; "Scrip issues are dealt with as"
695   ; "shown by adding one line of DATA.""700;"Line 400 changes
        my printer to"
705   ; "96 columns."
710   ; "Line 560 changes it back to 80."
```

```
10   REM HISTOGRAM PROGRAM
20   DIM $D[4],$[2],S[12]
30   INPUT "  Name Of Share Is "$D[0]
40   INPUT "  Present Year Is 198"P
50   INPUT "  Present Month Is "$C[0]
60   ; "  Input Previous 12 Months Prices In"
70   ; "  Pounds Starting With 12 Months Ago"
```

```
80    INPUT S[0],S[1],S[2],S[3],S[4],S[5],S[6],S[7],S[8],S[9],
      S[10],S[11]
90    UNIT 2
100    ; TAB (20)$D[0]
101    ;
110    ; TAB (15)"SHARE PRICE FOR LAST TWELVE MONTHS"
120    ; TAB (15)"-----------------------------------"
130   REM FIND MAX VALUE OF Y AXIS
140   M=S[0]
150   FOR J=0 TO 11  !REM NO OF VALUES TO PLOT
160   IF S[J]<M THEN GOTO 180
170   ELSE M=S[J]
180   NEXT J
190   REM MIN VALUE TO PLOT
200   X=S[0]
210   FOR J=0 TO 11
220   IF S[J]>X THEN GOTO 240
230   ELSE X=S[J]
240   NEXT J
250   X=X-0.15
260   ; "POUNDS"
270   ;
280   Y=(M-X)/20
290   FOR I=M TO X STEP -Y
300    ; #"9.99"I; TAB (5)":";
310   B=2
320   REM PRINT HISTOGRAM
330   FOR J=0 TO 11
340   B=B+5  !REM SPACING FOR COLUMNS
350   IF S[J]<I THEN GOTO 380
360   ; TAB (B) "####";
370   GOTO 390
380   ; "    ";
390   NEXT J
400   ; TAB (66)":"
410   NEXT I
420   ; "-----:-------------------------------------------------
      ------------:"
452   Z=1980+P
430   ; TAB (30)"MONTHS";TAB (61)$C[0];"  "Z
431   ;
440   T=2
450   FOR J=0 TO 11
460   T=T+5
470   ; #"9.99"; TAB (T);S[J];
475   S[J]=0
480   NEXT J
490   ;
500   UNIT -2
510   END
```

- - - x x x - - -

C J Young
Lossiemouth
Morayshire

Chris has been very busy on his Cortex. Here is his version of a multicolour mode. It is relocatable, and is stored in an array. This means that you do not have to use the NEW function, and it also works with

```
 10  REM **********************
 20  REM *                    *
 30  REM *  Multicolour Mode  *
 40  REM * (Fully Reloctable  *
 50  REM *    Machine Code)   *
 60  REM *         by         *
 70  REM *    Chris Young     *
 80  REM *                    *
 90  REM **********************
100  REM
110  REM * Sprites Can Also Be used in
120  REM * multicolour mode
130  REM
140  DIM MC[30]
150  MLT=ADR[MC[0]]  !Set up Address
160  MTP=MLT+046H  !Pixel Address
170  REM
180  REM **********************
190  REM * Read Machine Code  *
200  REM **********************
210  REM
220  FOR X=MLT TO MLT+0ACH STEP 2
230  READ A
240  MWD[X]=A
250  NEXT X
260  CALL MLT  !Set Up Screen
270  REM
280  REM ****************************
290  REM * Randomize Pixel Colours  *
300  REM ****************************
310  REM
320  FOR Y=0 TO 47
330  FOR X=0 TO 63
340  CALL MTP,X,Y,INT[RND*16]
350  NEXT X
360  NEXT Y
370  GOTO 320
380  REM
390  REM * Set up Screen Data *
400  REM
410  DATA 010H,0200H,0C800H,0D800H
420  DATA 0F121H,0201H,08100H
430  DATA 0D801H,0F121H,04C2H,0C202H
440  DATA 0228H,01800H,0Co42H,0241H
450  DATA 01FH,0C0C2H,0973H,0A53H
460  DATA 0A043H,0268H,04000H,06A0H
470  DATA 05F2H,06C1H,0D801H,0F120H
480  DATA 06C1H,0248H,03FFFH,0582H
490  DATA 0282H,0300H,011E8H,0380H
500  REM
510  REM * Set Pixel *
520  REM
530  DATA 0C200H,0281H,0FH
540  DATA 01501H,01008H,0281H,01FH
```

```
550  DATA 01503H,0221H,040H,01002H
560  DATA 0221H,080H,0C148H,0245H,01H
570  DATA 0C0C8H,0913H,0C101H,0934H
580  DATA 0A54H,0C1C4H,0A33H,0A37H
590  DATA 0A1C3H,0C181H,0246H,07H
600  DATA 0A1C6H,0C207H,06A0H,05F2H
610  DATA 0D060H,0F120H,06C1H,0C145H
620  DATA 0150CH,0A42H,0241H,0FH
630  DATA 0A042H,0268H,04000H,06A0H
640  DATA 05F2H,06C1H,0D801H,0F120H
650  DATA 0380H,0241H,0F0H,010F4H
```

Use of multicolour mode:

MLT machine code call sets up the multicolour mode

MTP requires 3 parameters X,Y,Colour
X has the range 0 to 63
Y has the range 0 to 47
Colour is from 0 to 15

- - - x x x - - -

Mr M D Rudnicki
Bognor Regis
Sussex

Mark is the author of one of our best selling games - 'Burglar'. However, he is obviously keen to help the rest to us with further extensions to his graphics commands, which were included in Newsletter II.

Here are extensions to my graphics commands, and a basic loader for them, as requested by several people who wrote to me following the appearance in the last newsletter of the first commands.

FULL MACHINE CODE LOADER FOR GRAPHICS ROUTINES.

```
10000  RESTOR 10070
10010  T=0
10020  FOR I=06200H TO 06430H STEP 2
10030  READ A: MWD(I)=A: T=T+A
10040  NEXT I
10050  IF T=-133059 THEN RETURN
10060  PRINT"ERROR IN MACHINE CODE":END
10070  DATA 512,88,-10240,-3807,1728,-10240,-3807,-15344
10080  DATA 512,768,513,8224,-10239,-3808,-15279,1536
10090  DATA 7163,896,4096,-10230,-3808,1738,-14694
10100  DATA -10230,-3808,-14694,1115,1728,-10240,-3807,1728
10110  DATA -10240,-3807,-15344,1115,576,255,2608,608
10120  DATA 16384,521,3,1696,25144,-15743,1696,25128
10130  DATA -15742,1696,25128,-15741,1696,25128,-15740,1696
10140  DATA 25128,544,2048,1545,7150,544,2048,521
10150  DATA 3,1696,25144,-15739,1696,25128,-15738,1696
10160  DATA 25128,-15737,1696,25128,-15736,1696,25128,544
10170  DATA 2048,1545,7150,896,544,6144,608,16384
```

```
10180  DATA 1696,25144,-15344,1729,-10239,-3808,1729,896
10190  DATA 544,6144,1696,25144,1473,1409,-11168,-3808
10200  DATA 896,0,0,0,576,255,2608,544
10210  DATA 30720,1696,25144,-15743,1696,25128,-15742,1696
10220  DATA 25128,-15741,1696,25128,-15740,1696,25128,896
10230  DATA 576,31,2592,544,23296,1696,25144,577
10240  DATA 255,1730,578,-256,-24510,-15743,1696,25128
10250  DATA 1731,579,-256,580,15,-24317,-15740,1696
10260  DATA 25128,896,0,0,576,31,2592,544
10270  DATA 23296,1696,25144,577,255,1730,578,-256
10280  DATA -24510,-15743,1696,25128,896,0,0,0
10290  DATA -14335,-4064,-14334,-4054,-14333,-4052,-14332,-4050
10300  DATA -14331,-4048,576,255,2576,-16320,2576,-24512
10310  DATA 545,23278,-16207,-16143,-16111,1221,1222,1223
10320  DATA 1224,-16382,576,-1024,-16064,-16382,576,1008
10330  DATA 2336,-24256,578,15,2754,-15998,-16381,576
10340  DATA -16384,2368,-24192,-16381,576,16128,2400,-24192
10350  DATA -15933,583,252,2695,579,3,2659,-24125
10360  DATA -16380,576,-4096,2464,-24128,-15868,584,4032
10370  DATA 2632,580,63,2596,-24060,-14331,-4062,-14330
10380  DATA -4060,-14329,-4058,-14328,-4056,1056,25600,896
10390  DATA -4064,25160,-4064,25256,0,0,0,0
10400  DATA -14336,-4064,1218,-12111,5633,896,1730,-14334
10410  DATA -4062,1056,25604,1408,4339,0,0,0
10420  DATA 0,0,0,0,0,0,0,0
```

The commands these routines support are as follows:

1. Initialise CALL 06200H as in the last Newsletter.

2. Set char. CALL 06248H,Chr,S1,S2,S3,S4,C1,C2,C3,C4

3. Put char. CALL 062A8H,Pos,Chr

4. Get char. CALL 062C0H,Pos,ADR(var)

5. Shape. CALL 062D8H,Shape number,S1,S2,S3,S4
   This is like the SHAPE command,and is used to define a sprite pattern from machine code.

6. Sprite. CALL 06300H,No,X,Y,Shape,Col.
   This is like the SPRITE command, and follows exactly the same syntax,for sprite movement in machine code.

7. Move Sprite CALL 6338H,No,X,Y
   This just sets new co-ords for a sprite, from machine code.

8. Character. CALL 6360H,N1,N2,C1,C2,C3,C4
   This defines a character N2 from the Cortex character set, number N1, with colours C1-4.

9. Text CALL 6410H,Pos,ADE($string)
   Prints out the contents of $string in the new mode,provided all the necessary characters have been predefined e.g. using the Character command.

Tim Gray
Wolverhampton
West Midlands

Tim is rapidly threatening to take over these newsletters with the flood of articles and information he has been sending.

Here is a sample of

SHAPE is a shape design programme that allows you to design up to 9 shapes at a time and also writes its own DATA lines to save you having to make notes. All that is then required is to PURGE the main program lines and use the data lines for your next programme.

On running the shape generation programme 9 8x8 blocks are displayed on the screen, use the cursor arrows to select a pixel and INS/DEL to set or reset it after all 9 shapes have been designed press RETURN and the programme displays the numbers of the data lines generated for each shape and restarts with a clean block of 9.

```
5     LNO=6001: KL=0
10    COLOUR 15,12: GRAPH:X1=64: Y1=-1
13    DIM A[9,4]
18    DIM $Q[9,4,2]: DIM $LIN[20]: DIM $S[2]
19    REM ***PLOT GRAPHICS***
20    SHAPE 255, 0FF81H,08181H,08181H,081FFH
30    A=4: COLOUR 1,9: GOSUB 1300
40    A=12: COLOUR 1,6: GOSUB 1300
50    A=20: COLOUR 1,9: GOSUB 1300
60    A=260: COLOUR 1,6: GOSUB 1300
70    A=268: COLOUR 1,9: GOSUB 1300
80    A=276: COLOUR 1,6: GOSUB 1300
90    A=516: COLOUR 1,9: GOSUB 1300
100   A=524: COLOUR 1,6: GOSUB 1300
110   A=532: COLOUR 1,9: GOSUB 1300
130   COLOUR 1,12: PRINT @(0,0);"DATA": PRINT "LINE":PRINT
      No's": PRINT:PRINT
140   FOR N=1 TO 9: FOR M=1 TO 4: A[N,M]=0:NEXT M: NEXT N
149   REM ***GOTO CURSER***
150   GOSUB 2000
155   REM *** ENTER THE DATA ***
160   LNO=LNO+10
170   KL=LNO
190   FOR N=1 TO 9
195   LET $S[0]=KL
200   FOR M=1 TO 4
210   $Q[N,M,1]=A[N,M]
220   NEXT M
230   $LIN[0]=$S[0]+"DATA"+$Q[N,1,1]+","+$Q[N,2,2]+","
      +$Q[N,3,1]+","+$Q[N,4,1]
235   ENTER $LIN[0]
236   COLOUR 1,12: PRINT "   "$S[0]
240   KL=KL+1
255   NEXT N
```

```
260   PRINT : ; : ; " PRESS ": ; " ANY": ; " KEY"
270   K=KEY[0]
280   IF K=0 THEN GOTO 270
290   REM ***BACK TO START AGAIN***
300   GOTO 10
1190  REM ***STOP***
1200  STOP
1300  REM ***GRID SUBROUTINE***
1330  FOR Y=A+4 TO A+228 STEP 32
1340  FOR X=0 TO 7
1350  SPUT Y+X,255
1360  NEXT X
1370  NEXT Y
1380  RETURN

2000  REM *** CURSER CONTROL ***
2010  K=KEY[0]
2020  IF K=8 THEN X1=X1-8: IF X1<64 THEN X1=64
2030  IF K=9 THEN X1=X1+8: IF X1>248 THEN X1=248
2040  IF K=10 THEN Y1=Y1+8: IF Y1>183 THEN Y1=183
2045  IF K=11 THEN Y1=Y1-8: IF Y1<-1 THEN Y1=-1
2049  REM *** CURSER ***
2050  SPRITE 0,X1,Y1,255,14
2052  REM *** BIT POSITION CALCULATE ***
2055  C1=INT[(X1/8+4)+(Y1/8*32)]
2080  CA=X1/64
2090  CB=(Y1+65)/64
2100  CC=((INT[CA]*3)-3+(INT[CB]
2110  CD=(FRA[CA])*8
2120  CE=(FAC[CB])*8
2130  CF=INT[(CE+2)/2]
2140  CG=FRA[(CE)/2]*16
2150  CH=CG+CD+16
2155  REM *** SET BIT ***
2160  IF K=22 THEN COLOUR 1,15: SPUT C1,255: COLOUR 15,12:
      BIT[A[CC,CF],CH]=1
2165  REM *** POP BIT ***
2170  IF K=23 THEN COLOUR 1,6: SPUT C1,255: COLOUR 15,12:
      BIT[A[CC,CF],CH]=0
2175  REM *** RETURN TO ENTER DATA ***
2180  IF K=13 THEN RETURN
2190  GOTO 2010
2200  REM ***** DATA LINES *****
```

FILL 2 is a machine code fill routine slightly different to most because it first looks to see if the pixel at the starting point is set and then uses PLOT to fill the shape. if it is or UNPLOT to unfill the shape if it is not.

CALL 7000H,x,y

Where x and y are the starting location within the shape.

The routine will fill the shape up until it finds a different colour but will return unfinished if it gets to an off screen location or runs out of stack memory.

FILL 2

FILL/UNFILL ROUTINE

```
7000  C0A0 MOV  @>0026,R2
7004  1602 JNE  >700A
7006  2FA0 XOP  @>0030,14
700A  C820 MOV  @>1CBB,@>F020
7010  C1E0 MOV  @>EFC0,R7
7014  020C L1   R12,>1EF0
7018  06A0 BL   @>70EE
701C  06A0 BL   @>7188
7020  C0C2 MOV  R2,R3
7022  C100 MOV  R0,R4
7024  C141 MOV  R1,R5
7026  1E01 SBZ  1
7028  1E02 SBZ  2
702A  0581 INC  R1
702C  06A0 BL   @>70EE
7030  80C2 C    R2,R3
7032  1606 JNE  >7040
7034  1F01 TB   1
7036  1305 JEQ  >7042
7038  06A0 BL   @>7174
703C  1D01 SBO  1
703E  1001 JMP  >7042
7040  1E01 SBZ  1
7042  0641 DECT R1
7044  06A0 BL   @>70EE
7048  80C2 C    R2,R3
704A  1606 JNE  >7058
704C  1F02 TB   2
704E  1305 JEQ  >705A
7050  06A0 BL   @>7174
7054  1D02 SBO  2
7056  1001 JMP  >705A
7058  1E02 SBZ  2
705A  0581 INC  R1
705C  0580 INC  R0
705E  06A0 BL   @>70EE
7062  80C2 C    R2,R3
7064  13E2 JEQ  >702A
7066  C180 MOV  R0,R6
7068  C004 MOV  R4,R0
706A  C045 MOV  R5,R1
706C  1E01 SBZ  1
706E  1E02 SBZ  2
7070  0600 DEC  R0
7072  06A0 BL   @>70EE
7076  80C2 C    R2,R3
7078  161E JNE  >70B6
707A  0581 INC  R1
707C  06A0 BL   @>70EE
7080  80C2 C    R2,R3
7082  1606 JNE  >7090
7084  1F01 TB   1
7086  1305 JEQ  >7092
7088  06A0 BL   @>7174
708C  1D01 SBO  1
708E  1001 JMP  >7092
7090  1E01 SBZ  1
7092  0641 DECT R1
7094  06A0 BL   @>70EE
7098  80C2 C    R2,R3
709A  1606 JNE  >70A8
709C  1F02 TB   2
709E  1305 JEQ  >70AA
70A0  06A0 BL   @>7174
70A4  1D02 SBO  2
70A6  1001 JMP  >70AA
70A8  1E02 SBZ  2
70AA  0581 INC  R1
70AC  0600 DEC  R0
70AE  06A0 BL   @>70EE
70B2  80C2 C    R2,R3
70B4  13E2 JEQ  >707A
70B6  0A80 SLA  R0,8
70B8  0A81 SLA  R1,8
70BA  0A86 SLA  R6,8
70BC  D800 MOVB R0,@>EE36
70C0  D806 MOVB R6,@>EE96
70C4  D801 MOVB R1,@>EE37
70C8  D801 MOVB R1,@>EE97
70CC  0420 BLWP @>51BE
70D0  0647 DECT R7
70D2  8807 D    R7,@>EFC0
70D6  1A07 JL   >70E6
70D8  04C0 CLR  R0
70DA  C057 MOV  *R7,R1
70DC  D001 MOVB R1,R0
70DE  0980 SRL  R0,8
70E0  0241 ANDI R1,>00FF
70E4  109E JMP  >7022
70E6  C820 MOV  @>F020,@>1CB8
70EC  0380 RTWP
70EE  0280 CI   R0,>0100
70F2  14F9 JHE  >70E6
70F4  0281 CI   R1,>00C0
70F8  14F6 JHE  >70E6
70FA  C241 MOV  R1,R9
70FC  C281 MOV  R1,R10
70FE  C200 MOV  R0,R8
7100  0939 SRL  R9,3
7102  0A89 SLA  R9,8
7104  024A ANDI R10,>0007
7108  A24A A    R10,R9
710A  0248 ANDI R8,>FFF8
710E  A209 A    R9,R8
7110  06C8 SWPB R8
7112  D808 MOVB R8,@>F121
7116  06C8 SWPB R8
7118  D808 MOVB R8,@>F121
```

```
711C  C280  MOV   R0,R10
711E  04C9  CLR   R9
7120  024A  ANDI  R10,>0007
7124  D0A0  MOVB  @>F120,R2
7128  D26A  MOVB  @>1D42(R10),R9
712C  2089  COC   R9,R2
712E  1310  JEQ   >7150
7130  04C2  CLR   R2
7132  0228  AI    R8,>2000
7136  06C8  SWPB  R8
7138  D808  MOVB  R8,@>F121
713C  06C8  SWPB  R8
713E  D808  MOVB  R8,@>F121
7142  C410  MOV   *R0,*R0
7144  D0A0  MOVB  @>F120,R2
7148  0242  ANDI  R2,>0F00
714C  0982  SRL   R2,8
714E  045B  RT
7150  04C2  CLR   R2
7152  0228  AI    R8,>2000
7156  06C8  SWPB  R8
7158  D808  MOVB  R8,@>F121
715C  06C8  SWPB  R8
715E  D808  MOVB  R8,@>F121
```

```
7162  C410  MOV   *R0,*R0
7164  D0A0  MOVB  @>F120,R2
7168  0242  ANDI  R2,>F000
716C  09C2  SRL   R2,12
716E  0262  ORI   R2,>8000
7172  045B  RT

7174  8807  C     R7,@>EFC2
7178  1306  JEQ   >7186
717A  0A80  SLA   R0,8
717C  D040  MOVB  R0,R1
717E  CDC1  MOV   R1,*R7+
7180  0241  ANDI  R1,>00FF
7184  0980  SRL   R0,8
7186  045B  RT
7188  0204  LI    R4,>8000
718C  2084  COC   R4,R2
718E  1305  JEQ   >719A
7190  0204  LI    R4,>F009
7194  C804  MOV   R4,@>1CB8
7198  045B  RT
719A  0204  LI    R4,>5009
719E  C804  MOV   R4,@>1CB8
71A2  045B  RT
```

OVERPLOT is a routine that allows plotting of forground colours only without effecting background colours.

It can be positioned anywhere in memory and is used by changing the word at 1D36 from 05F2 to the start address of this routine 5EBA in this case and back again for normal plotting.

OVERPLOT ROUTINE

```
5EBA  0248  ANDI  R8,>BFFF
5EBE  06A0  BL    @>05F2
5EC2  8F3C  C     *R12+,*R12+
5EC4  D020  MOVB  @>F120,R0
5EC8  0940  SRL   R0,4
5ECA  D120  MOVB  @>EE95,R4
5ECE  0944  SRL   R4,4
5ED0  D00$  MOVB  R4,R0
5ED2  0A40  SLA   R0,4
5ED4  0268  ORI   R8,>4000
5ED8  06A0  BL    @>05F2
5EDC  8F3C  C     :R12+,*R12+
5EDE  D800  MOVB  R0,@>F120
5EE2  0380  RTWP
```

- - - x x x - - -

BUG BYTES

Your problems/solutions

Mr R M Lee
Eastbourne
Sussex

Robert has solved one of the problems posed in the last newsletter.

The solution to Gary Alexander's clicking problem is very simple. The cause is the 9995 internal decrementer which interrupts every 10ms causing funny clicks.

To solve this the clock has to be stopped. To do this in M/C requires R12=1EE0H and then SBZ 1 to stop the clock. SBO 1 re-enables it.

- - - x x x - - -

Julian Terry
Rainham
Kent

Julian has also written, at some length, about two points raised in the last newsletter.

With reference to C C Kuan's unrandom Random

As many User's will already know RND on a computer is generated by a pseudo random sequence. This is a mathematical expression which starting with a SEED will produce a new value and a new SEED.

e.g. RND = f(SEED)
new SEED = f(RND)

therefore anyone with the correct function f will be able to predict the next number in the sequence. However if the correct function is not chosen then RND will not be apparently random. This is the case with the Cortex. C C Kuam tried to make the sequence random by using the TIC counter and the RANDOM command. This is where I think his/her (?) error occured. RANDOM sets the first SEED in the sequence, but does not change the RND sequenceafter the first SEED - i.e. the sequence will be different each time the program is run but not subsequently and produces a cross latch since the RND function is not "Random enough"

The following functions produce very good pseudo random sequences for those interested.

a. SEED = (1509 x SEED + 41) mod 2^{16}

or

b. SEED = (69069 x SEED + 41) mod 2^{32}

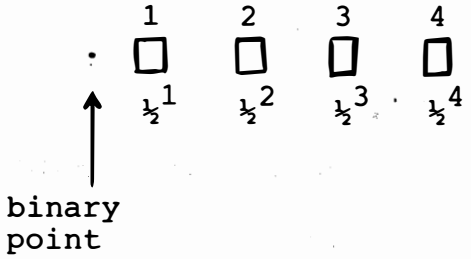
a. will produce a new SEED between 0 and 65535
b. will produce a new SEED between 0 and $(2^{32} - 1)$

I hope they are of use.

Andy Kendall of Bristol's N=62.4

For those who don't understand what is going on here I think it is only fair to tell them.

A decimal fraction in binary must be the sum of powers of 2 between $1/2^1$ to $1/2^n$ where n is the number of binary digits right of the binary point. E.g. for a four bit binary fraction:-



A 1/2 would be represented by .1000
1/4 " " " " " " " .0100
0.625 " " " " " " " .1010

0.4 cannot be exactly expressed as a binary fraction and is

≏ 0.25 + 0.125 + 0.0625 (in the above example)

ie. .0111

0.4 can never be reached but the more 1's added to the binary fraction the nearer it will get.

When printing the number to the display the computer prints the stored number not what it should be. Number formatting can be used to round the number off if desired.

- - - x x x - - -

Mr P N Paterson
Crewe

Mr Paterson has a tricky hardware problem. Maybe someone can suggest a solution.

My machine works satisfactorily except for one extremely annoying point and I was wondering whether anybody else had come across this. The fact is that I seem to have poor line sync for a period at the start of each TV field. Following the Frame Sync pulse. Although I have a locked picture (which is shifted slightly to the left) I have no colour. It appears that the inadequate line sync operates the TV colour killer circuit. I can acheive a colour picture by adjustment of the TV's line hold to he extreme of its range but the resulting picture is torn at the top. I have tried a number of different TV's and all are the same. Also, I have checked every component in the PAL encoder - even tried another VDP chip and voltages etc. are all correct. My oscilloscope shows that the line syncs for the first 40 or so lines are too small (measured at the modulator input)

I would be most grateful for any ideas concerning this as I feel I may have to resort to an RBG interface and monitor!!

Keep up the good work with the User Group.

- - - x x x - - -

M G Radford
Ashbourne
Derbyshire

Mr Radford has an interfacing problem, and would like some help in solving it.

I have recently experienced a problem with my Cortex for which I have so far been unable to find a solution.

I need to be able to send hexadecimal zero to a printer attached to the RS232 Interface or Centronics parallel interface. Whilst it is possible to send 01H to FFH by the means of -

PRINT "<01><02> .... <FF>"

it is not possible to send -

PRINT "<00>"

as this sends the hex data representing "<","0","0",">" which is not only incorrect data but also four characters instead of one.

The results of this also show on the monitor as <00>.

- - - x x x - - -

I M Austin
56 Harbury Road
Birmingham

The BASIC interpreter of my Cortex I functioned perfectly until recently, but now many of the words do not work properly.

To investigate this, I would like to make a comparison with the memory dump of another Cortex or visit another machine. (I live in Birmingham).

Can someone please help.

- - - x x x - - -

W D Eaves
Halkirk
Caithness

Mr Eaves has a problem with his screen display.

Using the TV, (I don't know whether or not a monitor would be affected) the screen is prone to jump occasionally, and becomes very unstable when using a black background. It appears to occur more in GRAPH Mode, but this may be just because I use black backgrounds more in GRAPH mode. I think this may be a hardware fault, but do not know where it could be - any ideas?

- - - x x x - - -

And finally in this section, a few words from your Editor.

Anyone who has purchased a copy of the '3D GRAPH' program from us, may have noticed that the option to type in your own function does not work. Mr A Lyall, the author of the program, has written to us to point out this fault. After studying the problem I have discovered that the following amendment should make the program work. Any further copies of this program sold will, of course, be the corrected version.

```
10  DIM  LIN (10), FUN(9)
760 PRINT "PLEASE TYPE IN YOUR FUNCTION"
770 PRINT " E G  1/(COS[X]*SIN[Y]+1.1)"
780 INPUT $FUN[0]
790 $LIN [0]="810 DEF FNA = "+$FUN[0]
800 ENTER $LIN[0]
810 DEF FNA =
820 GOTO 470
```

- - - x x x - - -

CORRECTIONS TO NEWSLETTER II

Unfortunately we have discovered that there were a few mistakes in the 2nd Newsletter. Thank you to anyone who wrote in to point these out.

A. In R.M Lee's letter on page 13, the memory address 18B2H should be 434H for 1200 baud. (Not 043H as shown).

B. On page 16, the assembly line 6054H should read LDCR @ > 6071 (R9),8.

C. In the assembly listing on page 21, the line 5FBAH should read A@>5FF4,*R10.

D. On page 25 the following lines should be altered to read:

```
10000 FOR I = 6200H TO 62EEH STEP 2
10400 DATA 1728,-10240,-3807,-15279, etc
10130 DATA 577,240,-24510,1696,etc
10180 DATA 25112, etc
```

CORTEX SOFTWARE SCENE

The following programs are available from us, at £6.50 each plus V.A.T (see order form). They have all been written by Cortex Users. If you have any good programs, then why not send them in. We provide a full marketing service, and pay £1.50 royalties per copy sold.

FROGGER	Cortex version of favourite arcade game. Includes busy road, crocodiles, turtles etc.
BURGLAR	Guide your man around the screen, and collect the keys to open the safe. Avoid the animated obstacles, such as conveyors, and collapsing walkways. Can you complete all 16 screens each of which presents a new menace? (Similar to 'Manic Miner' or 'Jet Set Willy')
HUNCHBACK	Another arcade conversion. Guide Quasimodo along the top of the walls, jumping gaps avoiding arrows in order to ring the bells, and eventually rescue Esmerelda.
G DESIGN	Menu driven package to design your own shapes & characters. Draw on screen and then convert to data, or vice versa.
WALL	Bomb a wall, while your aircraft flies back & forth across the screen, losing height. Complete your task of demolishing the wall completely before you hit it or your time limit runs out, or you will be eliminated!
CORTELLO	Comprehensive adaptation of the classic Othello game. Play against the computer at one of two difficultly levels.
3D GRAPH	6 graphs to choose from, or the option to type in your own function.
ARCHIE	Another multilevel arcade game. Guide Archie (a prospective alcholic) along ledges, and up ladders to collect wine, whilst avoiding the snakes.
INVADERS & ASTEROIDS	Double package of two famous arcade originals Fast machine code 'shoot em up' action.

The next two packages are both formatted to output directly to a printer via the RS232C port, but could no doubt be adapted.

WINE & FORM 1	Home wine making utilities. Calculate acid mixtures etc. Print out a standard form on which to write your favourite recipes
SHARES & HISTOGRAM	Calculate profits/losses on shares, and print out histograms to show you where your money went.
MAZE	3D maze adventure, in which you have to find a food chest. 5 levels of difficulty, and very good graphics make this an enjoyable game.
NIGHT ATTACK	New York is under attack by a skyscraper destroying spaceship. Aim the Statue of Liberty's torch to shoot back, and save the city.

ORDER FORM

Please use this form to order your programs.

PROGRAM TITLE	PRICE EACH	QUANTITY	TOTAL
FROGGER	£6.50		
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HUNCHBACK	£6.50		
MUNCHER	£6.50		
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CORTELLO	£6.50		
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ARCHIE	£6.50		
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MOONBASE II	£6.50		
WINE & FORM1	£6.50		
SHARES & HISTOSHARE	£6.50		
MAZE	£6.50		
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JOSY-1 Joystick and Sound Module

FEATURES

* Joystick Port (Kempston, Atari etc. compatible)
* Sound Generator with 3 tones plus noise source
* 8 inputs and 8 outputs with 25 way connector option
* Double sided PCB, 100mm x 75mm, fits inside Cortex case
* Machine coded Joystick and Sound routines

DESCRIPTION

The MarkroSoft JOSY-1 module is designed to add a permanent joystick and sound effects capability to the Cortex computer.

It comprises a small PCB fitted with a 9 way D type plug, for the joystick and 6 IC's including the Texas Instruments SN76489 sound generator chip. An optional 25 way D plug can be added to give a full 8 bit plus strobe I/O capability. The sound output is used with an external audio system, or TV sound may be used if the TV modulator on the Cortex PCB is changed for a sound and vision version.

Two software routines are provided with the module, written in machine code and are callable from Basic. The joystick routine returns the same code as the Ascii code for the keypad arrows. A Basic call with tone number, volume and period is all that is needed to drive the sound chip. Three simultaneous tones and noise can be produced.

JOSY-1 is available as a blank PCB, a complete kit of parts or a fully assembled and tested module. An 18 page User Guide is provided together with a tape or disc containing the machine code routines, a Basic demonstration of sound effects and a FREE copy of the Spacebugs II game.

Constructors should be aware that this module is designed to fit permanently inside the Cortex case and some soldering is required on the Cortex PCB to connect it to the JOSY-1 module.

Ebus interface is not required for this module.

PRICES

PCB plus User Guide and Demo tape	£10-95
Complete kit of parts for module with 9w plug	£19-95
Assembled and tested module with 9w plug	£24-95
Optional 25 way D type PCB mounting connector	£3-25
Software on CDOS compatible disc (instead of tape)	£1-50
post and packing	75 p

Please allow 21 days for delivery

JL85-0309

MARKROSOFT SOFTWARE FOR THE CORTEX COMPUTER SYSTEM

The following programmes are now available for the Cortex. The JOSY-1 joystick and sound generator module may be used with any programme marked thus [J].

SPACEBUGS II- An updated version of one of the first games available for the Cortex now with joystick and sound effects added using the JOSY-1 module or keypad. [J]

CAPMAN - A variation on the Pacman theme. Written in Basic for keypad or joystick. It is a 7K programme with 10 screens and plenty of colourful action. [J]

SHAPES 'n' SPRITES - A graphics programme to help in defining shapes and sprites. Four planes of 1 to 4 shapes can be created, editted and overlayed on top of each other, in any colour, to build up a multi-coloured sprite. The shape data is displayed in hexadecimal format and may be saved on disc, paper or cassette.

SOUTH SEA ADVENTURE - A classical style adventure game. Direct your 'Man Thursday' to collect the treasure and escape the attention of the pirates.

COMMTEX - A communications package written for the Cortex to allow access to bulletin boards and Microlink. Any modem connected to the RS232 port and operating at the standard 300/300, 75/1200 and 1200/1200 baud rates is supported by the Commtex software. Utilities are provided for off line preparation and storage of messages. The receive buffer may be examined, editted, printed or dumped onto disc. The package is written in Basic with machine code I/O routines. A user guide and programme listing is supplied to allow extra features to be added if required.

GRAPHICS - Use this programme with the JOSY-1 joystick to create colourful scenes for games or just for the fun of it. The pictures are 'painted' using a joystick or the keypad and helped by functions such as Fill and Circle. The scenes may be stored on disc in named files and reloaded as required to edit or use in applications. A routine is given to add to user programmes which will put a stored picture on the screen using a Basic Call. This programme together with Shapes 'n Sprites makes a complete graphics 'toolkit' for most applications. [J]

RETURN TO THE DEJI - No prizes for guessing the origin of this one. Designed around the Starwars theme it has three interconnected battle scenes to give your joystick some exercise. [J]

The programmes are supplied on 5 1/4" single or double density CDOS compatible discs at £5-95 for one programme and £3-95 for each additional programme. Post and packing is included in the price.

SL85-3008

Tim Gray
1 Larkspur Drive
Featherstone
Wolverhampton
West Midlands
WV10 7TN

Mr Gray has now finished the design work on his external video board for the Cortex. It fully syncronises the VDP chip to an external video feed from camera or video tape and does the switching to provide a combined video output.

The board is available from him as an unpopulated PCB with circuits, component lists and construction notes for £30.00 or fully built and tested with fitting instructions for £100.00.

He has also written a menu driven graphics drawing package with lots of plotting commands including circle, polygon and a machine code fill command as well as sprite speed control shape design large character text and a fast screen dump to disk. Screens saved to disk can then be recalled for use in other programmes, games etc.

It is available for CDOS version 1.10. All enquiries to the above address.

FLOPPY DISC ELECTRONICS PARTS LIST

QUANTITY	PARTS
1	PCB as per circuit diagram
1	TMS2797NL
1	TMS9911
1	7406
3	7407
1	74LS02
1	74LS04
1	74LS08
1	74LS32
1	74LS38
1	74LS74
1	74LS138
1	74LS139
1	74LS163
2	74LS244
1	74LS259
1	74LS297
1	LM339
8	14 pin IC socket
8	16 pin IC socket
2	20 pin IC socket
3	40 pin IC socket
8	0.1µf cap 250v
1	0.22µ cap 100v
10	1/4w resistors
1	150R 6 pin SIL
1	1N4148 diode
1	33p ceramic