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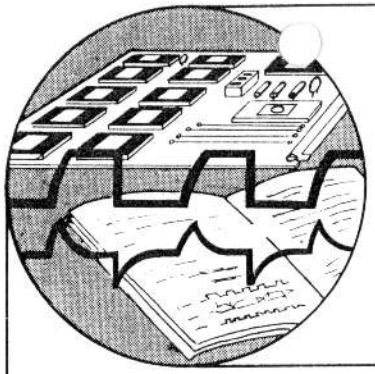

APPLICATION NOTE

NOVEMBER 1982

NA-028A

Basic routines for EF9365 and EF9366 graphic display processors

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INTRODUCTION

Programmers, using Assembly Language, will find in this Application Note, some software tools, allowing them to build more powerful programs.
Routines developped thereafter have been choosen because they are very commonly used.
All software has been written in EF6800 Assembly language.
Fully optimized routines are often very hard to understand and always hard to modify.
We tried to follow algorithms closely so as to make programs as clear as possible.

SOFTWARE CHARACTER GENERATOR

EF9365 users often think they have a restricted character set : the 96 on-chip character set.
This routine shows that any character set is possible, in any type of matrix.
A scaling factor, in CSIZE register, can be applied to the 8 x 10 matrix choosen in our program (cf fig. 1) on both X and Y sizes independently.
Program reads the matrix and writes corresponding dots on the screen as shown in the algorithm (cf fig. 2), space between characters is included in the 8 x 10 matrix.

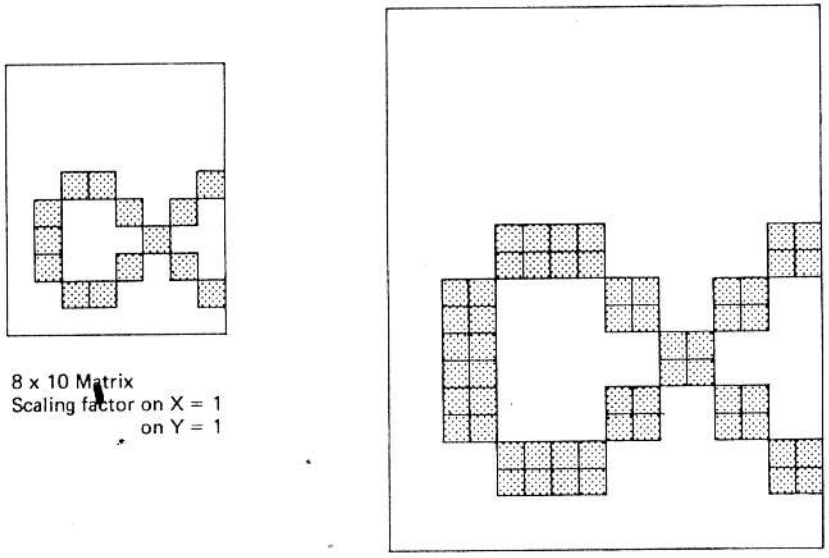


FIGURE 1 – SCALING FACTOR EFFECT ON 8 x 10 MATRIX

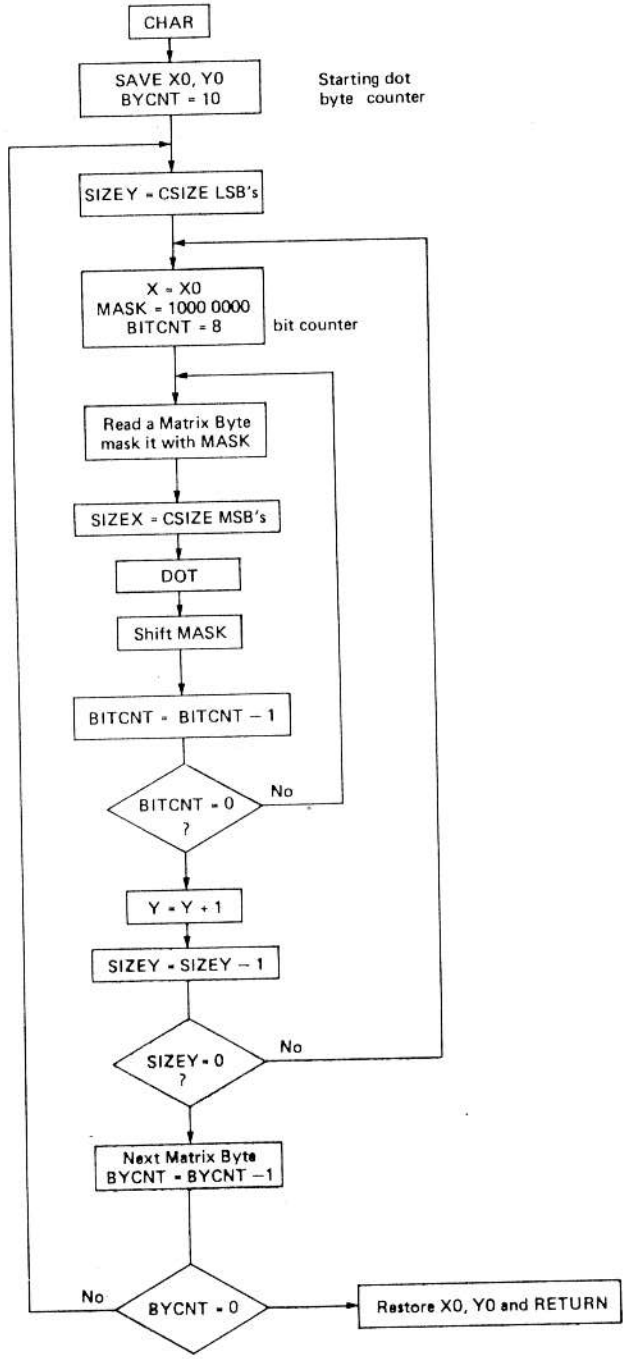


FIGURE 2 – SOFTWARE CHARACTER GENERATOR ALGORITHM

```
PAGE  001  CHARGEN .SA:0

*************************************************************************
*   ------CHARACTER     GENERATION      SUBROUTINE-------              *
*************************************************************************
*
*
*       This subroutine can be used to write any character defined
*     by software.
*     Each character is defined by 10 bytes,allowing a 8 x 10 matrix.
*     First byte is always the image of the character
*     bottom.Last byte is always the image of the character top.
*       Left side of the character is described by MSB's.Right side by
*     LSB's.
*       This subroutine is called on address CHAR by the mean of a
*                 JSR CHAR    instruction
*       Before you call this subroutine,some actions are to be taken
*                   1- The character matrix is defined somewhere in
*     memory by 10 byte table.
*                   2- EF9365 or EF9366 registers are correctly
*     initialized.
*                   3- X index register of EF6800 processor points to
*     the character matrix.
*************************************************************************
*
* this subroutine is non-reentrant.
* all registers are modified by this subroutine.
*
*************************************************************************
*
*    EXTERNAL CONDITIONS :
*    *******************
*
*       INPUT: A and B - no condition
*              X contains the address of the matrix description table
*       OUTPUT:All registers changed
*
*************************************************************************
*
*  Subroutine features:
*  ********************
*
*     this subroutine executes any character writing .
*     this subroutine takes care of GDP register CSIZE to write.
*     this means that all sizes are available between 1 and 16,on
*     both X and Y directions.
*     X register is automatically incremented and updated so as to
*     point to the next character when subroutine has ended.
*
*     the following features are not implemented:
*     writing along Y axis
*     writing slanted characters.
*
*************************************************************************
```



```
PAGE  002  CHARGEN .SA:0

                    *
                          OPT     REL
                    *
                          XREF    CCOLOR,CTRL1,CTRL2,CSIZE,MSBX,MSBY,CMD
                    *
                          XDEF    CHAR
                    *
                    ********
                    *MACRO*
                    ********
                    * THIS MACRO IS USED TO TEST IF GDP IS READY FOR A NEW COMMAND
                    *
                    TEST    MACR
                        LDAB CMD
                        BITB #$04
                        BEQ *-5
                        ENDM
                    *
                    *************
                    *
0000                      DSCT
                    *
0000    0002  A MSAVX   RMB     2         X POSITION SAFEGUARD
0002    0002  A MSAVY   RMB     2         Y POSITION SAFEGUARD
0004    0001  A LITDOT  RMB     1         DOT IMAGE
0005    0001  A SIZEX   RMB     1         X SCALING FACTOR
0006    0001  A SIZEY   RMB     1         Y SCALING FACTOR
0007    0001  A MASK    RMB     1         MASK
0008    0001  A BITCNT  RMB     1         BIT COUNTER
0009    0001  A BYTCNT  RMB     1         BYTE COUNTER
                    *
```

```
   PAGE  003  CHARGEN .SA:O

0000                    PSCT
                        *
                        ************************************************************
                        * SUBROUTINE USED TO LIGHT OR SWITCH OFF A DOT             *
                        ************************************************************
                        *
                        *  THIS SUBROUTINE WRITES A DOT (LIGHTED OR SWITCHED OFF)
                        *  ACCORDING TO THE X SCALING FACTOR.
                        *  EACH DOT IS REPEATED AS MANY TIMES AS SPECIFIED BY
                        * X SCALING FACTOR. THIS REPRODUCES THE GDP INTERNAL FUNCTION.
                        ************************************************************************
                        *
0000 B6 0004  D DOT     LDAA    LITDOT    IN LITDOT: O IF DOT TO BE SWITCHED OFF
                        *                           1 IF DOT TO BE LIGHTED
0003 81 00    A         CMPA    #$00      O?
0005 27 0C 0013         BEQ     SWIOFF    IF O DOT UNCHANGED
0007 86 80    A         LDAA    #$80      IF 1,LIGHT ONE DOT COMMAND (SHORT VECTOR CMD)
0009 B7 0000  A         STAA    CMD
000C                    TEST
0013 7C 0001  A SWIOFF  INC     MSBX+1    X  INCREMENTATION
0016 26 03 0013         BNE     DECSIZ    IF #O NO MSB UPDATING
0018 7C 0000  A         INC     MSBX      IF =O BORROW ON MSB
001B 7A 0005  D DECSIZ  DEC     SIZEX     X SCALING FACTOR DECREMENTATION
001E 26 E0 0000         BNE     DOT       IF #O  SAME DOT IS WRITTEN AGAIN
0020 39                 RTS
                        *
                        ************************************************************
                        * SUBROUTINE USED TO READ X SCALING FACTOR IN CSIZE REGISTER *
                        ************************************************************
                        *
0021 F6 0000  A READSX  LDAB    CSIZE     4 MSB's OF CSIZE
0024 0C                 CLC               GIVE THE X SCALING FACTOR
0025 56                 RORB              FOUR RIGHT SHIFTS GIVE IT
0026 57                 ASRB
0027 57                 ASRB
0028 57                 ASRB
0029 F7 0005  D         STAB    SIZEX     AND WE CAN SAVE IT IN SIZEX VARIABLE
002C 39                 RTS
                        *
                        ************************************************************
                        * SUBROUTINE USED TO READ Y SCALING FACTOR IN CSIZE REGISTER *
                        ************************************************************
                        *
002D F6 0000  A READSY  LDAB    CSIZE
0030 C4 0F    A         ANDB    #$0F      CLEAR 4 MSB's OF CSIZE
0032 F7 0006  D         STAB    SIZEY     BEFORE SAVING IT IN SIZEY VARIABLE
0035 39                 RTS
```



```
   PAGE  004  CHARGEN .SA:O

                        ************************************************************************
                        *  ------MAIN  SUBROUTINE-------                                       *
                        ************************************************************************
                        *
                        *  THIS IS THE ENTRY POINT OF THE CHARACTER GENERATOR
                        *
                        ************************************************************************
                        *
       0036  P CHAR     EQU     *
0036 B6 0001  A         LDAA    MSBY+1    Y POSITION SAFEGUARD IN MSAVY
0039 B7 0003  D         STAA    MSAVY+1
003C B6 0000  A         LDAA    MSBY
003F B7 0002  D         STAA    MSAVY
0042 B6 0000  A         LDAA    MSBX      X POSITION SAFEGUARD
0045 B7 0000  D         STAA    MSAVX
0048 B6 0001  A         LDAA    MSBX+1
004B B7 0001  D         STAA    MSAVX+1
004E 86 0A    A         LDAA    #$0A      10 BYTES COUNTER
0050 B7 0009  D         STAA    BYTCNT    INITIALISATION
       0053  P LOOP1    EQU     *         ALL MATRIX BYTES WILL BE WRITTEN
                        *                 AS SPECIFIED BY CSIZE REGISTER
0053 BD 002D  P         JSR     READSY    Y SCALING FACTOR INITIALISATION
       0056  P LOOP2    EQU     *         EACH BYTE IS WRITTEN AS MANY TIMES
                        *                 AS SPECIFIED IN SIZEY
0056 B6 0000  D         LDAA    MSAVX     X POSITION INITIALISATION
0059 B7 0000  A         STAA    MSBX
005C B6 0001  D         LDAA    MSAVX+1
005F B7 0001  A         STAA    MSBX+1
0062 86 80    A         LDAA    #$80      MASK:10000000 THIS BYTE IS USED
0064 B7 0007  D         STAA    MASK      TO TEST EACH BIT OF A MATRIX BYTE
0067 86 08    A         LDAA    #$08      8 BIT COUNTER INITIALISATION
0069 B7 0008  D         STAA    BITCNT
       006C  P LOOP3    EQU     *         EACH BIT IS WRITTEN AS MANY TIMES
                        *                 AS SPECIFIED IN SIZEX
006C A6 00    A         LDAA    O,X       MATRIX BYTE
006E B4 0007  D         ANDA    MASK      BIT TEST
0071 B7 0004  D         STAA    LITDOT    COMMAND BIT SETTING
0074 BD 0021  P         JSR     READSX    X SCALING FACTOR READING
0077 BD 0000  P         JSR     DOT       DOT ON OR OFF ACCORDING TO LITDOT
007A 0C                 CLC
007B 76 0007  D         ROR     MASK      MASK BYTE UPDATING TO ACCESS NEXT DOT
007E 7A 0008  D         DEC     BITCNT    IF #O NEXT BIT
0081 26 E9 006C         BNE     LOOP3     IF =O EXIT FROM LOOP3
0083 7C 0001  A         INC     MSBY+1    UPDATES Y POSITION
0086 7A 0006  D         DEC     SIZEY
0089 26 CB 0056         BNE     LOOP2     IF #O SAME BYTE IS WRITTEN AGAIN
008B 08                 INX               IF =O EXIT FROM LOOP2 AND TAKE NEXT BYTE
008C 7A 0009  D         DEC     BYTCNT    UPDATES BYTE COUNTER
008F 26 C2 0053         BNE     LOOP1     IF #O CONTINUE
0091 B6 0002  D         LDAA    MSAVY     IF =O CHARACTER GENERATION IS DONE,EXIT
0094 B7 0000  A         STAA    MSBY      RESTORE Y POSITION
0097 B6 0003  D         LDAA    MSAVY+1
009A B7 0001  A         STAA    MSBY+1
009D 39                 RTS
```

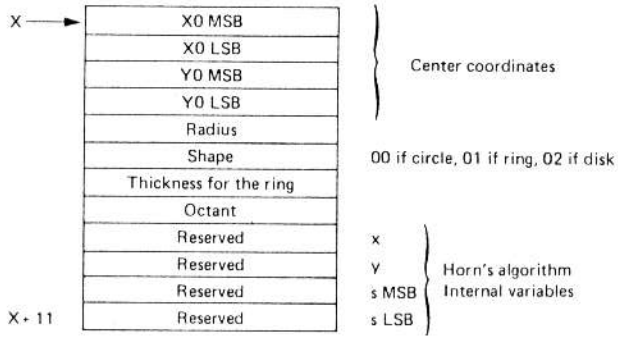
```
*****************************************
*     EXAMPLE FOR MATRIX PROGRAMMING    *
*****************************************
* WE GIVE HERE ALL GREEK LETTERS DEFINED AS NECESSARY
* TO SUIT WITH CHARGEN SUBROUTINE.
* NB:OMEGA IS GIVEN IN BOTH LOWER AND UPPER CASE
*****************************************
ALPHA FDB $0031,$4A44,$4A31,$0000,$0000
*
BETA FDB $0040,$2020,$3C22,$223C,$223C
*
GAMA FDB $0030,$3030,$1018,$1412,$6100
*
DELTA FDB $0030,$4848,$3020,$4040,$4830
*
EPSILO FDB $0018,$2040,$7840,$2018,$0000
*
DZETA FDB $0018,$0438,$4040,$2010,$0E16
*
TETA FDB $0018,$2442,$427E,$4242,$2418
*
ETA FDB $0002,$0202,$1212,$1252,$2C00
*
IOTA FDB $0030,$4840,$4040,$4000,$0000
*
KAPPA FDB $0044,$4A50,$6050,$4840,$0000
*
LANDA FDB $0042,$2418,$1010,$1010,$2040
*
MU FDB $0040,$4040,$7448,$4848,$4800
*
NU FDB $0020,$3028,$2422,$6200,$0000
*
KSI FDB $000C,$023C,$4020,$1820,$1C08
*
OMICRO FDB $0018,$2442,$4224,$1800,$0000
*
PI FDB $0014,$1414,$1454,$3F00,$0000
*
RO FDB $0040,$4040,$5864,$4224,$1800
*
SIGMA FDB $0000,$1824,$4224,$1F00,$0000
*
TH0 FDB $0008,$0808,$0848,$3F00,$0000
*
UMICRO FDB $0018,$2424,$2424,$6200,$0000
*
PHI FDB $0010,$1038,$5454,$5438,$1010
*
KI FDB $0023,$1408,$1462,$0000,$0000
*
PSI FDB $0008,$0808,$1C2A,$2A2A,$4908
*
OMEGA FDB $0036,$4949,$4941,$2200,$0000
*
OMEGAM FDB $0063,$2222,$4141,$4122,$1C00
*
```


SOFTWARE CIRCLE, RING, AND DISK GENERATOR

The following program is based on Horn's algorithm (see figure 3). It allows radius values from 0 to FF (hexadecimal). The center of the circles, disks or rings can be placed anywhere within the 12 bits computing space of the GDP.

Two versions are given : the first is working with the EF9365 (square pixel), the second is working with the EF9366 (Pixel Height is twice Pixel width). Only one subroutine changes : PL0365 becomes PL0366 subroutine.

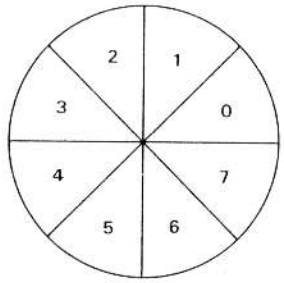
In the program, the three algorithms, which are very similar, are mixed and a test is done each time an operation is particular to one type of drawing.
The circle, ring and disk generator needs a list of parameters given in a 12 bytes RAM table : pointed by X register (of EF6800) for calling sequence.

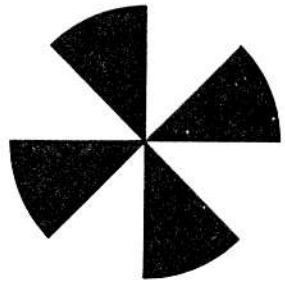


In byte "octant" are given octants to be lighted :
b0 = 0 octant 0 switched off, b0 = 1 lighted
b1 = 0 octant 1 switched off, b1 = 1 lighted.
⋮ ⋮

See figure 4 for octant localization.

Octant configuration





Example : Octant = 55 hexadecimal
Shape = 02 (disk).

FIGURE 4

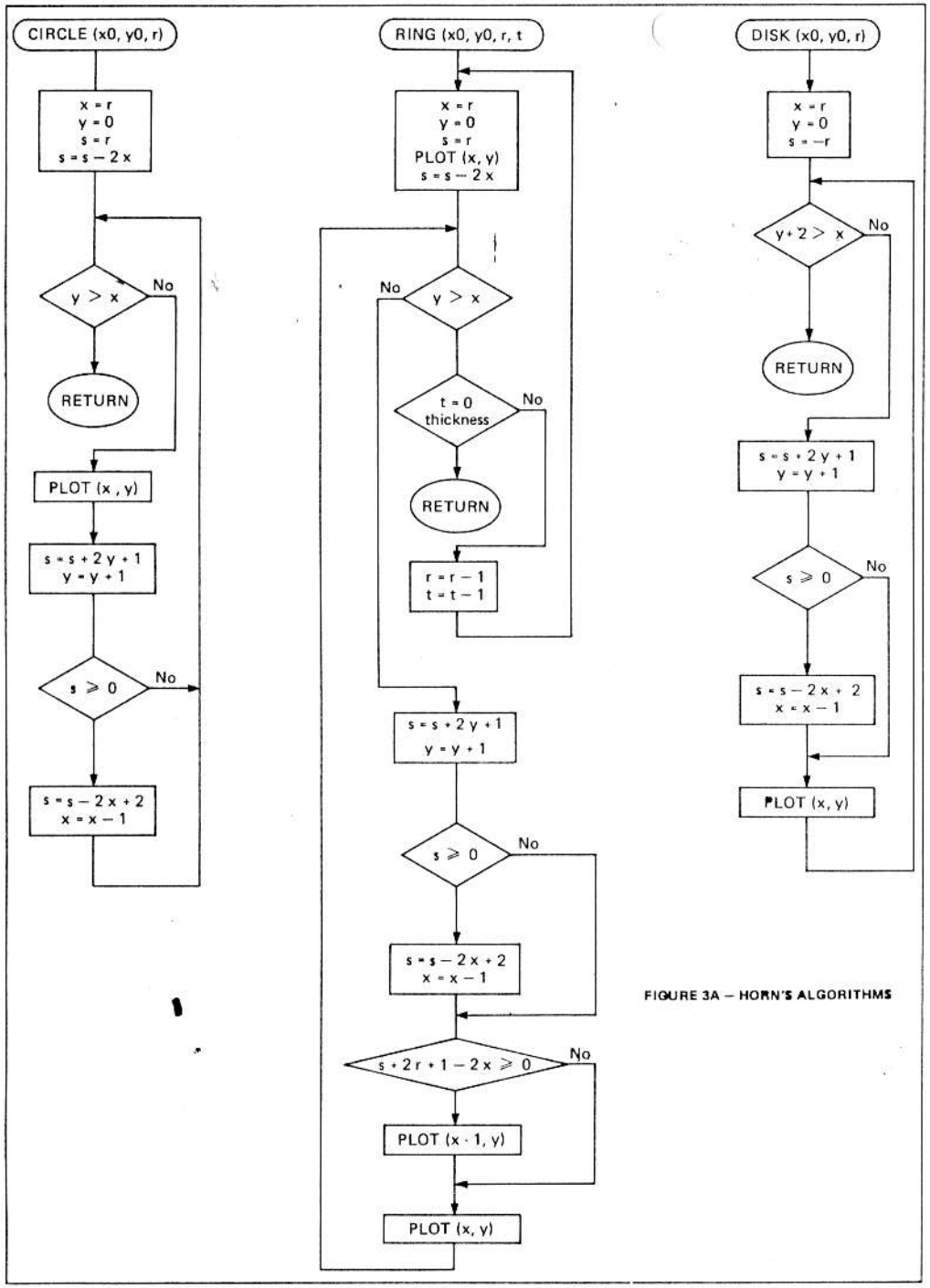
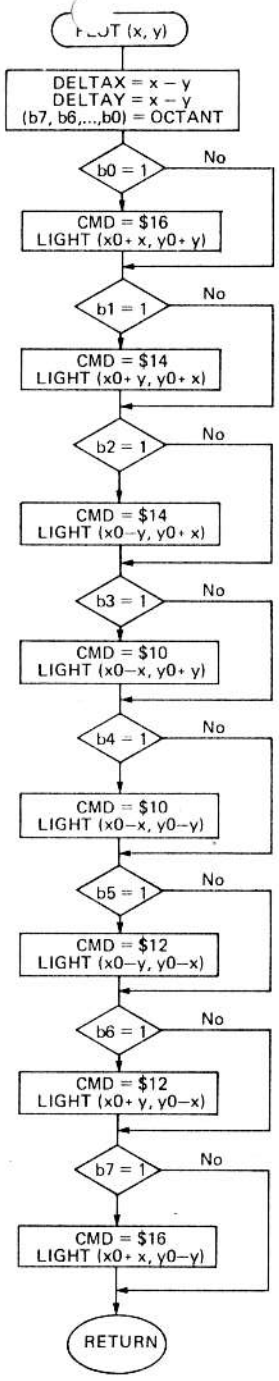


FIGURE 3A – HORN'S ALGORITHMS



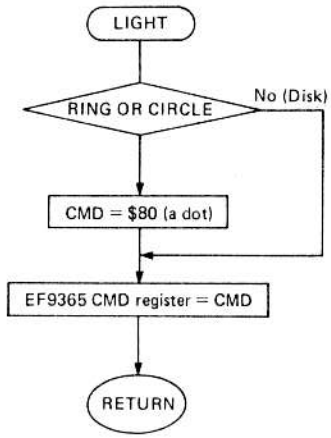


FIGURE 3B

```
PAGE  001  CERGDP  .SA:0


                      OPT    REL      SUBROUTINE GIVEN IN RELOCATABLE FORMAT
                    ************************************************************
                      XDEF   PCIRCL   ENTRY POINT
                    ************************************************************
                      XREF   CMD,MSBX,MSBY,DELTAX,DELTAY
                    ************************************************************
                    * EF9365 OR EF9366 REGISTERS ADDRESSES ARE DEFINED IN THE  *
                    * CALLING PROGRAM                                          *
                    ************************************************************
0000                  DSCT
                    ************************************************************
                    * 2 RAM BYTES ARE RESERVED IN SUBROUTINE AREA SO AS TO SAVE X
                    * X INITIAL VALUE IS PRESERVED USING THIS RAM LOCATION.
                    * BECAUSE OF THAT,CIRCLE SUBROUTINE IS NOT REENTRANT.
                    ************************************************************
0000    0002  A SAVX  RMB    2
                    ******************************************************
0000                  PSCT
                    *
                    *
                    *USEFUL SUBROUTINES*
                    ********************
                    *
        0000  P ADD16  EQU    *
                    ***********
                    *THIS SUBROUTINE ADDS P1 AND P2.
                    *16 BITS SIGNED PARAMETERS.
                    *INPUT STACK STATE (BEFORE ADD16 CALLING)
                    *       SP-(     )
                    *          ( P1H )
                    *          ( P1L )
                    *          ( P2H )
                    *          ( P2L )
                    *
                    *OUTPUT STACK STATE (AFTER RTS)
                    *          (     )
                    *          ( P1H )
                    *          ( P1L )
                    *          ( P2H )
                    *       SP-( P2L )
                    *WITH RESULT (P1+P2) LSB IN A,AND MSB IN B
                    *
                    ************************************************************
                    * NO INPUT CONDITION ON A,B,X REGISTERS.X REGISTER MODIFIED *
                    * OUTPUT CONDITION:A CONTAINS P1+P2 LSB.B CONTAINS P1+P2 MSB*
                    ************************************************************
0000 30               TSX
0001 A6 03    A       LDAA   3,X      P1L IN A
0003 AB 05    A       ADDA   5,X      P1L+P2L IN A
0005 E6 04    A       LDAB   4,X      P2H IN B
0007 C9 00    A       ADCB   £$0      P2H+C IN B
0009 EB 02    A       ADDB   2,X      P1H+P2H
```



```
PAGE  002  CERGDP  .SA:0
000B EE 00    A       LDX    0,X      RETURN ADDRESS
000D 31               INS
000E 31               INS
000F 31               INS
0010 31               INS
0011 31               INS
0012 31               INS             STACK RESTORED
0013 6E 00    A       JMP    0,X      RETURN FROM SUBROUTINE
                    ***********
        0015  P SUB16  EQU    *
                    ***********
                    *THIS SUBROUTINES SUBSTRACTS P2 AND P1
                    *16 BITS SIGNED PARAMETERS.
                    *INPUT:STACK STATE IS THE SAME AS
                    *      INPUT STACK STATE OF ADD16.
                    *OUTPUT:STACK STATE IS THE SAME AS
                    *       OUTPUT STACK STATE OF ADD16
                    *       WITH RESULT=P2-P1.
                    ************************************************************
                    * NO INPUT CONDITIONS ON A,B,X REGISTERS. X REGISTER MODIFIED*
                    * OUTPUT CONDITION:A CONTAINS P2-P1  LSB.B CONTAINS P2-P1 MSB*
                    ************************************************************
0015 30               TSX
0016 A6 05    A       LDAA   5,X      P2L IN A
0018 A0 03    A       SUBA   3,X      P2L-P1L IN A
001A E6 04    A       LDAB   4,X      P2H IN B
001C C2 00    A       SBCB   £$0      P2H-C=P2H
001E E0 02    A       SUBB   2,X      P2H-P1H IN B
0020 EE 00    A       LDX    0,X
0022 31               INS
0023 31               INS
0024 31               INS
0025 31               INS
0026 31               INS
0027 31               INS             STACK RESTORED
0028 6E 00    A       JMP    0,X      RETURN FROM SUBROUTINE
        002A  P ADDIT  EQU    *        THIS SUBROUTINE ADDS 1 TO s PARAMETER
                    ***********
002A 6C 0B    A       INC    11,X     sL
002C 26 02 0030       BNE    STOP
002E 6C 0A    A       INC    10,X
0030 39         STOP  RTS
        0031  P ADXCOO EQU    *
                    ***********
                    *THIS SUBROUTINE CALCULATES G.D.P X COORDINATE
                    *REGISTER IN ADDING x OR y WITH x0.
                    *INPUT PARAMETERS: IN A x OR y
0031 5F               CLRB
0032 36               PSHA            x or y IN STACK
0033 37               PSHB            0 IN STACK
0034 A6 01    A       LDAA   1,X      x0L
0036 E6 00    A       LDAB   0,X      x0H
0038 36               PSHA
0039 37               PSHB
003A BD 0000  P       JSR    ADD16    x0+x LSB IN A,x0+x MSB IN B
003D FE 0000  D       LDX    SAVX
0040 F7 0000  A       STAB   MSBX
0043 B7 0001  A       STAA   MSBX+1
0046 39               RTS
```

```
PAGE  003  CERGDP  .SA:0

                        ************
                0047  P ADYCOO EQU    *
                        ************
                        *THIS SUBROUTINE CALCULATES G.D.P COORDINATE
                        *REGISTER IN ADDING x OR y WITH yOL.
                        *INPUT PARAMETERS:IN A x OR y.
0047 5F                 CLRB
0048 36                 PSHA            x or y IN STACK
0049 37                 PSHB
004A A6 03      A       LDAA    3,X     yOL
004C E6 02      A       LDAB    2,X     yOH
004E 36                 PSHA
004F 37                 PSHB
0050 BD 0000    P       JSR     ADD16
0053 FE 0000    D       LDX     SAVX
0056 F7 0000    A       STAB    MSBY
0059 B7 0001    A       STAA    MSBY+1
005C 39                 RTS
                        ************
                005D  P SUXCOO EQU    *
                        ************
                        *THIS SUBROUTINE CALCULATES G.D.P X COORDINATE
                        *REGISTER IN SUBSTRACTING xO WITH x OR y.
                        *INPUT PARAMETERS:IN A x OR y.
005D E6 01      A       LDAB    1,X     xOL
005F 37                 PSHB
0060 E6 00      A       LDAB    0,X     xOH
0062 37                 PSHB
0063 5F                 CLRB
0064 36                 PSHA            x or y in STACK
0065 37                 PSHB
0066 BD 0015    P       JSR     SUB16
0069 FE 0000    D       LDX     SAVX
006C F7 0000    A       STAB    MSBX
006F B7 0001    A       STAA    MSBX+1
0072 39                 RTS
                        ************
                0073  P SUYCOO EQU    *
                        ************
                        *THIS SUBROUTINE CALCULATES G.D.P Y COORDINATE
                        *REGISTER IN SUBSTRACTING yO WITH x OR y.
                        *INPUT PARAMETERS:x OR y.
                        *               X IS PRESERVED.
0073 E6 03      A       LDAB    3,X     yOL
0075 37                 PSHB
0076 E6 02      A       LDAB    2,X     yOH
0078 37                 PSHB
0079 5F                 CLRB
007A 36                 PSHA            x or y
007B 37                 PSHB
007C BD 0015    P       JSR     SUB16
007F FE 0000    D       LDX     SAVX
0082 F7 0000    A       STAB    MSBY
0085 B7 0001    A       STAA    MSBY+1
0088 39                 RTS
```



```
PAGE  004  CERGDP  .SA:0

                        ************
                0089  P PL0365 EQU    *
                        ************
                        * THIS SUBROUTINE IS USED BY ALL CIRCLE,RING AND DISK MODES
                        * ONCE A DOT IS COMPUTED(x AND y),THIS SUBROUTINE LIGHTS
                        * DOTS ACCORDING TO THE COORDINATES OF THE CIRCLE CENTER.
                        * 8 DOTS ARE PLOTTED EACH TIME ONE DOT IS COMPUTED.
                        * DEDUCTION IS DONE BY SYMETRY.
                        * THIS SUBROUTINE TAKES CARE OF OCT INDICATOR TO KNOW WHICH
                        * OCTANTS ARE TO BE LIGHTED.
                        * NO INPUT CONDITION ON A,B REGISTERS
                        * X REGISTERS MUST CONTAIN THE ADDRESS OF THE PARAMETERS TABLE.
                        * X IS NOT MODIFIED ON OUTPUT,ALL OTHERS REGISTERS LOST.
                        ********************************************************************
0089 A6 08      A       LDAA    8,X     x
008B A0 09      A       SUBA    9,X     y x-y
008D B7 0000    A       STAA    DELTAX
0090 B7 0000    A       STAA    DELTAY
0093 A6 07      A       LDAA    7,X     OCTANT
0095 85 01      A       BITA    £$1
0097 27 0F 00A8         BEQ     OCT2
                ******FIRST OCTANT******
0099 A6 08      A       LDAA    8,X     x
009B BD 0031    P       JSR     ADXCOO  x+xO
009E A6 09      A       LDAA    9,X     y
00A0 BD 0047    P       JSR     ADYCOO  y+yO
00A3 86 16      A       LDAA    £$16
00A5 BD 013C    P       JSR     LIGHT
00A8 A6 07      A OCT2  LDAA    7,X
00AA 85 02      A       BITA    £$2
00AC 27 0F 00BD         BEQ     OCT3
                ******SECOND OCTANT******
00AE A6 09      A       LDAA    9,X     y
00B0 BD 0031    P       JSR     ADXCOO  y+xO
00B3 A6 08      A       LDAA    8,X     x
00B5 BD 0047    P       JSR     ADYCOO  x+yO
00B8 86 14      A       LDAA    £$14
00BA BD 013C    P       JSR     LIGHT
00BD A6 07      A OCT3  LDAA    7,X
00BF 85 04      A       BITA    £$4
00C1 27 0F 00D2         BEQ     OCT4
                *******THIRD OCTANT*******
00C3 A6 09      A       LDAA    9,X     y
00C5 BD 005D    P       JSR     SUXCOO  xO-y
00C8 A6 08      A       LDAA    8,X     x
00CA BD 0047    P       JSR     ADYCOO  x+yO
00CD 86 14      A       LDAA    £$14
00CF BD 013C    P       JSR     LIGHT
```

```
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00D2 A6 07    A OCT4   LDAA   7,X
00D4 85 08    A        BITA   £$8
00D6 27 0F 00E7        BEQ    OCT5
                *******FOURTH OCTANT*******
00D8 A6 08    A        LDAA   8,X       x
00DA BD 005D  P        JSR    SUXCOO    x0-x
00DD A6 09    A        LDAA   9,X       y
00DF BD 0047  P        JSR    ADYCOO    y+y0
00E2 86 10    A        LDAA   £$10
00E4 BD 013C  P        JSR    LIGHT
00E7 A6 07    A OCT5   LDAA   7,X
00E9 85 10    A        BITA   £$10
00EB 27 0F 00FC        BEQ    OCT6
                *******FIFTH OCTANT*******
00ED A6 08    A        LDAA   8,X       x
00EF BD 005D  P        JSR    SUXCOO    x0-x
00F2 A6 09    A        LDAA   9,X       y
00F4 BD 0073  P        JSR    SUYCOO    y0-y
00F7 86 10    A        LDAA   £$10
00F9 BD 013C  P        JSR    LIGHT
00FC A6 07    A OCT6   LDAA   7,X
00FE 85 20    A        BITA   £$20
0100 27 0F 0111        BEQ    OCT7
                ********SIXTH OCTANT********
0102 A6 09    A        LDAA   9,X       y
0104 BD 005D  P        JSR    SUXCOO    x0-y
0107 A6 08    A        LDAA   8,X       x
0109 BD 0073  P        JSR    SUYCOO    y0-x
010C 86 12    A        LDAA   £$12
010E BD 013C  P        JSR    LIGHT
0111 A6 07    A OCT7   LDAA   7,X
0113 85 40    A        BITA   £$40
0115 27 0F 0126        BEQ    OCT8
                ********SEVENTH OCTANT********
0117 A6 09    A        LDAA   9,X       y
0119 BD 0031  P        JSR    ADXCOO    x0+y
011C A6 08    A        LDAA   8,X       x
011E BD 0073  P        JSR    SUYCOO    y0-x
0121 86 12    A        LDAA   £$12
0123 BD 013C  P        JSR    LIGHT
0126 A6 07    A OCT8   LDAA   7,X
0128 85 80    A        BITA   £$80
012A 27 0F 013B        BEQ    ENDPLO
                *******EIGHTH OCTANT*******
012C A6 08    A        LDAA   8,X
012E BD 0031  P        JSR    ADXCOO    x0+x
0131 A6 09    A        LDAA   9,X       y
0133 BD 0073  P        JSR    SUYCOO    y0-y
0136 86 16    A        LDAA   £$16
0138 BD 013C  P        JSR    LIGHT
013B 39          ENDPLO RTS
```



```
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      013C  P LIGHT  EQU    *
              ***********
              * LIGHT SUBROUTINE LIGHTS A DOT IF IN CERCLE OR RING MODES,
              * AND WRITES A SEGMENT WHEN IN DISK MODE.
              * INPUT PARAMETERS: A REGISTER CONTAINS VECTOR CODE FOR DISK SEGMENT
              *           NO CONDITION ON B AND X REGISTERS
              *          DELTAX AND DELTAY REGISTERS MUST BE POSITONNED FOR DISKS
              *          X AND Y GDP REGISTERS MUST BE CORRECTLY POSITIONNED.
              * OUTPUT CONDITIONS:A,B REGISTERS MODIFIED,X PRESERVED
              ********************************************************************
013C E6 05    A        LDAB   5,X
013E C5 02    A        BITB   £$02      DISK?
0140 26 02 0144        BNE    DISK
0142 86 80    A        LDAA   £$80      COMMAND TO LIGHT A POINT
0144 B7 0000  A DISK   STAA   CMD       COMMAND REGISTER
0147 B6 0000  A TESTSR LDAA   CMD       STATUS REGISTER
014A 85 04    A        BITA   £$4
014C 27 F9 0147        BEQ    TESTSR
014E 39                RTS
              ********************************************************************
      014F  P PCIRCL EQU    *          CIRCLE ROUTINE ENTRY POINT
              ********************************************************************
              *THIS SUBROUTINE ALLOWS TO DRAW CIRCLE,RING,DISK OR
              *JUST SOME OCTANT OF THOSE ONE.
              *IT CALLS PL0365,LIGHT,ADDIT,SUXCOO,SUYCOO,ADXCOO,ADYCOO,
              *ADD16 AND SUB16 SUBROUTINES.
              *CIRCLE RING AND DISK ARE GENERATED WITH THE PRINCIPLE
              *OF HORN'S ALGORITHM.
              *INPUT PARAMETERS:NO CONDITION ON A,B REGISTERS
              *                 X HAS TO CONTAIN THE ADDRESS OF A 12
              *BYTES MEMORY LOCATION (TABLE):
              *TABLE-0,X ( x0H )
              *       1,X ( x0L )
              *       2,X ( y0H ) (x0,y0)CIRCLE,RING OR DISK
              *       3,X ( y0L ) CENTER COORDINATE.
              *       4,X (  r  ) CIRCLE,RING OR DISK RADIUS.
              *       5,X (SHAPE) 00:CIRCLE,01:RING,02:DISK.
              *       6,X (     ) RING'S THICKNESS.
              *       7,X ( OCT )
              *       8,X (  x  )
              *       9,X (  y  ) x,y,s ARE REQUISITE VARIABLES
              *      10,X ( sH  ) FOR HORN 'S ALGORITHM.
              *      11,X ( sL  )
              *IN BYTE ( OCT ) b0=0 OCTANTO LIGHT OFF,b0=1 OCTANTO LIGHT ON.
              *                b1=0       1          b1=1       1
              *                  .                     .
              *                  .                     .
              ********************************************************************
```

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```
                    *VARIABLES INITIALISATION:
014F FF 0000  D          STX    SAVX
0152 A6 04    A          LDAA   4,X        r
0154 A7 08    A          STAA   8,X        x IS INITIALIZED WITH r.
0156 6F 09    A          CLR    9,X        y IS INITIALIZED WITH 0.
0158 6F 0A    A          CLR    10,X       sH
015A A7 0B    A          STAA   11,X       s IS INITIALISED WITH r.
015C A6 05    A          LDAA   5,X        FORME
015E 27 10 0170          BEQ    BOTH       IF CIRCLE
0160 85 02    A          BITA   £$2
0162 27 09 016D          BEQ    RING       IF RING
0164 60 0B    A          NEG    11,X
0166 86 FF    A          LDAA   £$FF
0168 A7 0A    A          STAA   10,X
016A 7E 022C  P          JMP    OUTDEF     IF DISK
016D BD 0089  P RING     JSR    PL0365     PLOT(x,y) WITH (x,y)=(r,0)
                    *****s=s-2x*****
0170 E6 0B    A BOTH     LDAB   11,X       sL
0172 37                  PSHB
0173 E6 0A    A          LDAB   10,X       sH
0175 37                  PSHB
0176 0C                  CLC
0177 5F                  CLRB
0178 A6 08    A          LDAA   8,X        x
017A 48                  ASLA              2xL IN A
017B C9 00    A          ADCB   £0         2xH IN B
017D 36                  PSHA
017E 37                  PSHB
017F BD 0015  P          JSR    SUB16
0182 FE 0000  D          LDX    SAVX
0185 E7 0A    A          STAB   10,X       s-2x MSB IN sH
0187 A7 0B    A          STAA   11,X       s-2x LSB IN sL
0189 A6 09    A TESTYX   LDAA   9,X        y IN A
018B E6 05    A          LDAB   5,X
018D C5 02    A          BITB   £$02
018F 27 02 0193          BEQ    SUITST
0191 8B 02    A          ADDA   £$2
0193 A1 08    A SUITST   CMPA   8,X        x
0195 23 03 019A          BLS    AFTER      IF y.LE.x AFTER
0197 7E 0232  P          JMP    ENDP       IF y.GT.x LAHAUT
019A A6 05    A AFTER    LDAA   5,X        FORME
019C 26 03 01A1          BNE    NOCIRC     RING
019E BD 0089  P          JSR    PL0365
```


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```
                    *****s=s+2y+1*****
01A1 0C          NOCIRC CLC
01A2 5F                 CLRB
01A3 A6 09    A         LDAA   9,X        y
01A5 48                 ASLA              2yL IN A
01A6 C9 00    A         ADCB   £0         2yH IN B
01A8 36                 PSHA
01A9 37                 PSHB
01AA A6 0B    A         LDAA   11,X       sL
01AC 36                 PSHA
01AD A6 0A    A         LDAA   10,X       sH
01AF 36                 PSHA
01B0 BD 0000  P         JSR    ADD16
01B3 FE 0000  D         LDX    SAVX
01B6 E7 0A    A         STAB   10,X       s+2y MSB IN sH
01B8 A7 0B    A         STAA   11,X       s+2y LSB IN sL
01BA BD 002A  P         JSR    ADDIT      s=s+1
                    *****y=y+1*****
01BD 6C 09    A         INC    9,X
01BF A6 0A    A         LDAA   10,X       sH
01C1 2B 27 01EA         BMI    TSFORM     IF s.LT.0 TESTYX
                    *****s=s-2x+2*****
01C3 A6 0B    A         LDAA   11,X       sL
01C5 36                 PSHA
01C6 A6 0A    A         LDAA   10,X       sH
01C8 36                 PSHA
01C9 0C                 CLC
01CA 5F                 CLRB
01CB A6 08    A         LDAA   8,X        x
01CD 48                 ASLA              2xL IN A
01CE C9 00    A         ADCB   £0         2xH IN B
01D0 36                 PSHA
01D1 37                 PSHB
01D2 BD 0015  P         JSR    SUB16
01D5 FE 0000  D         LDX    SAVX
01D8 E7 0A    A         STAB   10,X       s-2x MSB in sH
01DA A7 0B    A         STAA   11,X       s-2x LSB IN sL
01DC BD 002A  P         JSR    ADDIT      s=s+1
01DF BD 002A  P         JSR    ADDIT      s=s+1
                    *****x=x-1*****
01E2 A6 08    A         LDAA   8,X
01E4 80 01    A         SUBA   £1
01E6 A7 08    A         STAA   8,X
01E8 25 48 0232         BCS    ENDP
01EA A6 05    A TSFORM  LDAA   5,X
01EC 27 41 022F         BEQ    JUMP
```

```
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                        *****s-2x+2r+1*****
          01EE 85 01     A CIRCNO BITA   £$01
          01F0 27 3A 022C         BEQ    OUTDEF
          01F2 E6 0B     A        LDAB   11,X       sL
          01F4 37                 PSHB
          01F5 E6 0A     A        LDAB   10,X       sH
          01F7 37                 PSHB
          01F8 0C                 CLC
          01F9 5F                 CLRB
          01FA A6 08     A        LDAA   8,X        xL
          01FC 48                 ASLA              2xL IN A
          01FD C9 00     A        ADCB   £0         2xH IN B
          01FF 36                 PSHA
          0200 37                 PSHB
          0201 BD 0015   P        JSR    SUB16      s-2x
          0204 FE 0000   D        LDX    SAVX
          0207 36                 PSHA
          0208 37                 PSHB
          0209 5F                 CLRB
          020A A6 04     A        LDAA   4,X        r
          020C 48                 ASLA              2rL IN A
          020D C9 00     A        ADCB   £0         2rH IN B
          020F 36                 PSHA
          0210 37                 PSHB
          0211 BD 0000   P        JSR    ADD16      s-2x+2r
          0214 FE 0000   D        LDX    SAVX
          0217 8B 01     A        ADDA   £$1       s-2x+2r+1  LSB IN A
          0219 C9 00     A        ADCB   £0         s-2x+2r+1   MSB IN B
          021B C5 80     A        BITB   £$80
          021D 26 0D 022C         BNE    OUTDEF
          021F E6 08     A        LDAB   8,X
          0221 C0 01     A        SUBB   £1
          0223 E7 08     A        STAB   8,X
          0225 25 03 022A         BCS    IFNEG
          0227 BD 0089   P        JSR    PL0365     (x-1,y)
          022A 6C 08     A IFNEG  INC    8,X
          022C BD 0089   P OUTDEF JSR    PL0365     (x,y)
          022F 7E 0189   P JUMP   JMP    TESTYX
          0232 A6 06     A ENDP   LDAA   6,X        EPAISSEUR
          0234 27 11 0247         BEQ    ENDRIN
          0236 6A 06     A        DEC    6,X
          0238 6A 04     A        DEC    4,X        r-1
          023A A6 04     A        LDAA   4,X
          023C A7 08     A        STAA   8,X
          023E A7 0B     A        STAA   11,X
          0240 6F 09     A        CLR    9,X
          0242 6F 0A     A        CLR    10,X
          0244 7E 014F   P        JMP    PCIRCL
          0247 39          ENDRIN RTS
                                  END

TOTAL ERRORS 00000--00000
```



```
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                        ************
          00E5  P PL0366 EQU    *
                        ************
                        * THIS SUBROUTINE IS EQUIVALENT TO PL0365 SUBROUTINE BUT
                        * WORKS WITH EF9366 CIRCUIT.ALL Y COORDINATES ARE DIVIDED BY TWO
                        * BEFORE PLOTTING THE VECTOR SO AS TO GET A CIRCLE.
          00E5 A6 08     A        LDAA   8,X        x
          00E7 A0 09     A        SUBA   9,X        y x-y
          00E9 B7 F825   A        STAA   DELTAX
          00EC 0C                 CLC               DIVIDE BY 2
          00ED 44                 LSRA
          00EE B7 F827   A        STAA   DELTAY
          00F1 A6 07     A        LDAA   7,X        OCTANT
          00F3 85 01     A        BITA   £$1
          00F5 27 10 0107         BEQ    OCT2
                        ******FIRST OCTANT******
          00F7 A6 08     A        LDAA   8,X        x
          00F9 BD 0081   P        JSR    ADXC00     x+x0
          00FC A6 09     A        LDAA   9,X        Y
          00FE 44                 LSRA              y/2
          00FF BD 009A   P        JSR    ADYC00     y+y0
          0102 86 16     A        LDAA   £$16
          0104 BD 01A3   P        JSR    LIGHT
          0107 A6 07     A OCT2   LDAA   7,X
          0109 85 02     A        BITA   £$2
          010B 27 10 011D         BEQ    OCT3
                        ******SECOND OCTANT******
          010D A6 09     A        LDAA   9,X        y
          010F BD 0081   P        JSR    ADXC00     y+x0
          0112 A6 08     A        LDAA   8,X        x
          0114 44                 LSRA              x/2
          0115 BD 009A   P        JSR    ADYC00     x+y0
          0118 86 14     A        LDAA   £$14
          011A BD 01A3   P        JSR    LIGHT
          011D A6 07     A OCT3   LDAA   7,X
          011F 85 04     A        BITA   £$4
          0121 27 10 0133         BEQ    OCT4
                        ******THIRD OCTANT******
          0123 A6 09     A        LDAA   9,X        y
          0125 BD 00B3   P        JSR    SUXC00     x0-y
          0128 A6 08     A        LDAA   8,X        x
          012A 44                 LSRA              x/2
          012B BD 009A   P        JSR    ADYC00     x+y0
          012E 86 14     A        LDAA   £$14
          0130 BD 01A3   P        JSR    LIGHT
```

```
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0133 A6 07     A OCT4   LDAA   7,X
0135 85 08     A        BITA   £$8
0137 27 10 0149         BEQ    OCT5
                      ******FOURTH OCTANT******
0139 A6 08     A        LDAA   8,X       x
013B BD 00B3   P        JSR    SUXCOO    x0-x
013E A6 09     A        LDAA   9,X       y
0140 44                 LSRA              y/2
0141 BD 009A   P        JSR    ADYCOO    y+y0
0144 86 10     A        LDAA   £$10
0146 BD 01A3   P        JSR    LIGHT
0149 A6 07     A OCT5   LDAA   7,X
014B 85 10     A        BITA   £$10
014D 27 11 0160         BEQ    OCT6
                      ******FIFTH OCTANT******
014F A6 08     A        LDAA   8,X       x
0151 BD 00B3   P        JSR    SUXCOO    x0-x
0154 A6 09     A        LDAA   9,X       y
0156 0C                 CLC
0157 44                 LSRA              x/2
0158 BD 00CC   P        JSR    SUYCOO    y0-y
015B 86 10     A        LDAA   £$10
015D BD 01A3   P        JSR    LIGHT
0160 A6 07     A OCT6   LDAA   7,X
0162 85 20     A        BITA   £$20
0164 27 10 0176         BEQ    OCT7
                      ******SIXTH OCTANT******
0166 A6 09     A        LDAA   9,X       y
0168 BD 00B3   P        JSR    SUXCOO    x0-y
016B A6 08     A        LDAA   8,X       x
016D 44                 LSRA              x/2
016E BD 00CC   P        JSR    SUYCOO    y0-x
0171 86 12     A        LDAA   £$12
0173 BD 01A3   P        JSR    LIGHT
0176 A6 07     A OCT7   LDAA   7,X
0178 85 40     A        BITA   £$40
017A 27 10 018C         BEQ    OCT8
                      ******SEVENTH OCTANT******
017C A6 09     A        LDAA   9,X       y
017E BD 0081   P        JSR    ADXCOO    x0+y
0181 A6 08     A        LDAA   8,X       x
0183 44                 LSRA              x/2
0184 BD 00CC   P        JSR    SUYCOO    y0-x
0187 86 12     A        LDAA   £$12
0189 BD 01A3   P        JSR    LIGHT
018C A6 07     A OCT8   LDAA   7,X
018E 85 80     A        BITA   £$80
0190 27 10 01A2         BEQ    ENDPLO
                      ******EIGHT OCTANT******
0192 A6 08     A        LDAA   8,X       x
0194 BD 0081   P        JSR    ADXCOO    x0+x
0197 A6 09     A        LDAA   9,X       y
0199 44                 LSRA              y/2
019A BD 00CC   P        JSR    SUYCOO    y0-y
019D 86 16     A        LDAA   £$16
019F BD 01A3   P        JSR    LIGHT
01A2 39         ENDPLO  RTS
```


QUADRILATERAL GENERATOR

The following program may be used to generate any convex quadrilateral. This quadrilateral can be filled or not. The quadrilateral is described by giving its four apexes beginning from the lowest dot of the quadrilateral and going anti-clockwise(see figure 5).

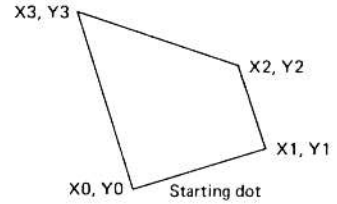

FIGURE 5

Because internal vector generator is able to draw vectors with only a 256 dots length, we choosed to draw the quadrilateral using software Bresenham Algorithm allowing X, Y, ΔX and ΔY to be 12 bits signed numbers.
Principle of the filling algorithm is as simple as possible.
The program draws from the starting dot in two direction from (X0, Y0) to (X1, Y1) (right side) and from (X0, Y0) to (X3, Y3) (left side). Each time a dot with a new Y coordinate is found on the right side, the dot with the same Y coordinate is computed on the left side.
Both dots are then bound together using internal vector generator. This principle is repeated until the highest dot is reached.

Figure 6 describes Bresenham algorithm
Figure 7 describes the detailed quadrilateral generator algorithm.

Calling sequence :

Before calling the QUADRI subroutine a 17 byte table must be positionned (figure 8).

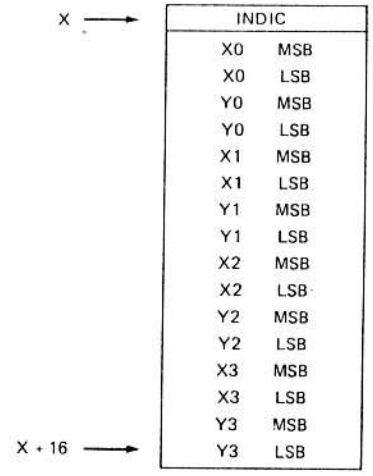

FIGURE 8 – PARAMETER TABLE

X register must point to the top of the table.

BRESENHAM ALGORITHM

The segment is defined by its origin X0, Y0 and its projections on x and y axis, ΔX, ΔY.
In order to make it clearer, we suppose X0 = Y0 = 0 and $\Delta X \geqslant \Delta Y \geqslant 0$.

```
BEGIN     X = 0 ; Y = 0 ; S = -ΔX/2

      WHILE     X < ΔX   DO

          BEGIN     BLACK (X, Y) ;
                    X = X + 1 ;
                    S = S + ΔY ;
                    if S ⩾ 0 THEN
                          BEGIN  Y = Y + 1 ;
                                 S = S – ΔX
                          END
          END
END.
```

BLACK (X, Y) plots the dot with X and Y coordinates.

FIGURE 6

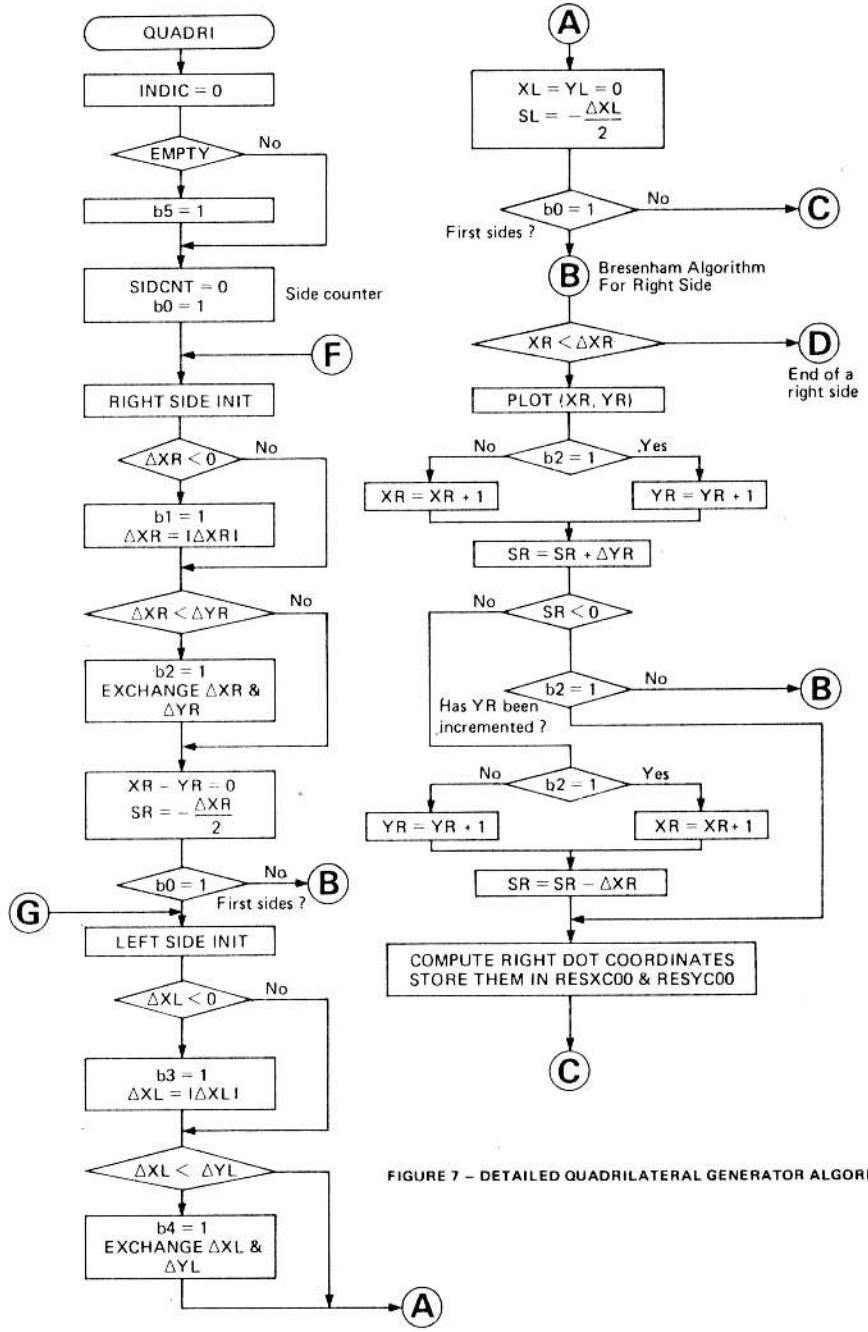

FIGURE 7 – DETAILED QUADRILATERAL GENERATOR ALGORITHM

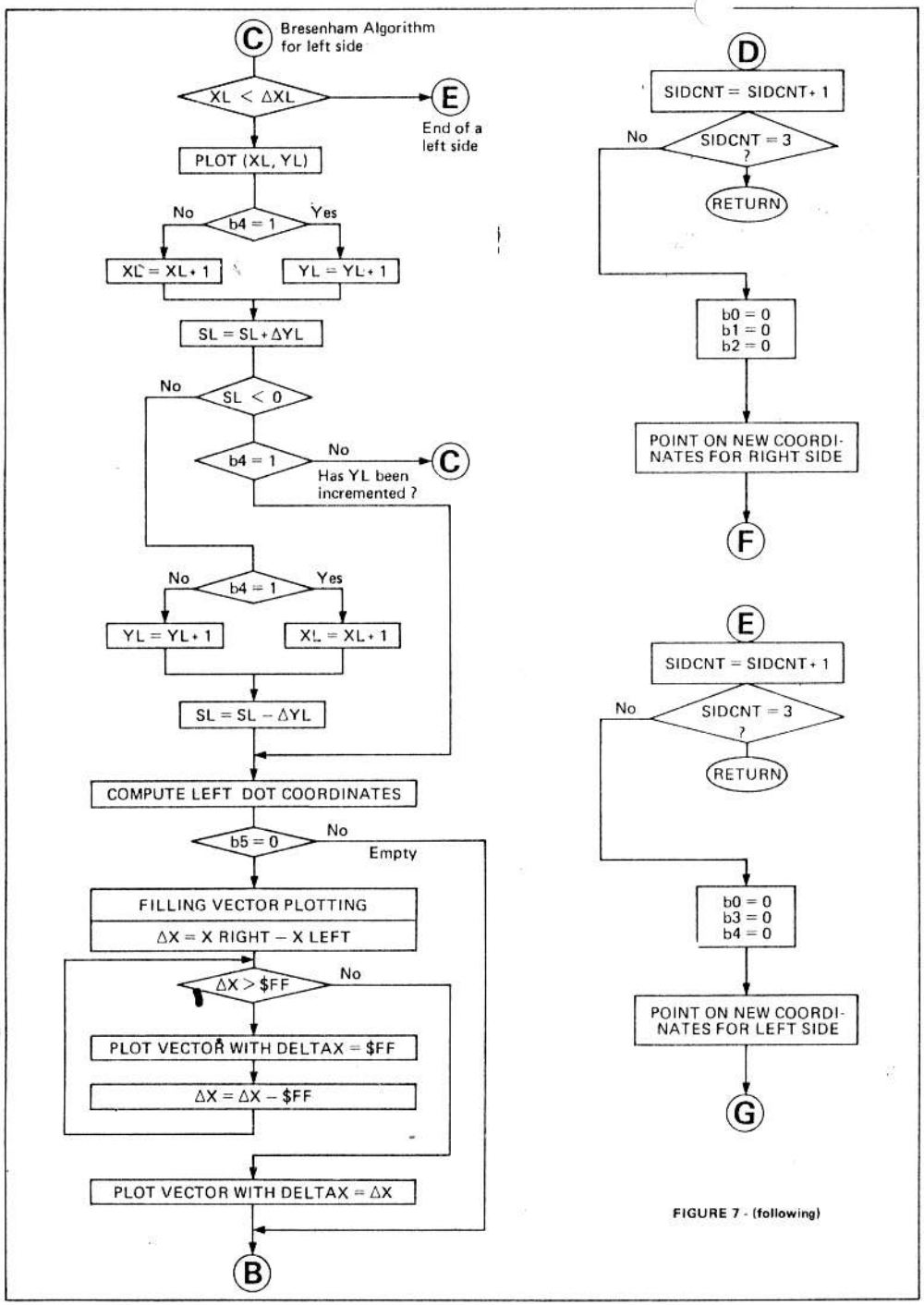

FIGURE 7 - (following)


```
001  QUADRO   .SA:0

                       OPT     REL       RELOCATABLE FORMAT
                       XREF    CMD,MSBX,MSBY,DELTAX,DELTAY EF9365 EXTERNALLY DEFINED
                       XDEF    QUADRI    ENTRY POINT
                       DSCT              THIS PROGRAM NEEDS THE FOLLOWING PARAMETERS
     0002  A SAVEX     RMB     2         X EF6800 REGISTER IS SAVED HERE
     0001  A SIDCNT    RMB     1         SIDE COUNTER
     0001  A INDIC     RMB     1         FLAGS REGISTER
     0002  A XR        RMB     2         BRESENHAM ALGORITHM PARAMETERS
     0002  A YR        RMB     2         FOR RIGHT SIDE
     0002  A SR        RMB     2
     0002  A DXR       RMB     2
     0002  A DYR       RMB     2
     0002  A XL        RMB     2         BRESENHAM ALGORITHM VARIABLES
     0002  A YL        RMB     2         FOR LEFT SIDE
     0002  A SL        RMB     2
     0002  A DXL       RMB     2
     0002  A DYL       RMB     2
     0002  A RESXCO    RMB     2         X AND Y COORDINATES FOR RSIDE DOT
     0002  A RESYCO    RMB     2         FOR TEMPORARY STORAGE
                       PSCT
                     *************************
                     *SOME USEFUL SUBROUTINES*
                     *************************
     0000  P TRACE     EQU     *         SEND COMMAND TO EF9365 AND TEST IF READY
                     *INPUT:A CONTAINS COMMAND TO BE SENT TO GDP
                     *OUTPUT:A MODIFIED,ALL OTHER REGISTERS UNCHANGED
B7 0000  A           STAA    CMD
B6 0000  A TEST      LDAA    CMD
85 04    A           BITA    £$04
27 F9 0003           BEQ     TEST
39                   RTS
     000B  P ADD16     EQU     *         16 BITS ADDITION.PARAMETERS IN STACK
                     *INPUT STACK STATE(BEFORE CALLING)
                     *        SP-(     )
                     *           ( P1H )
                     *           ( P1L )
                     *           ( P2H )
                     *           ( P2L )
                     * NO CONDITION ON A,B,X
                     *OUTPUT:A CONTAINS P1+P2 MSB
                     *       B CONTAINS P1+P2 LSB
                     *       X MODIFIED
30                   TSX
E6 03    A           LDAB    3,X       P1L
EB 05    A           ADDB    5,X       P1L+P2L IN B
A6 04    A           LDAA    4,X       P2H
89 00    A           ADCA    £$0       P2H+C
AB 02    A           ADDA    2,X       P1H+P2H IN A
31                   INS               RESTORE STACK POINTER
31                   INS
31                   INS
31                   INS
31                   INS
31                   INS
EE 00    A           LDX     0,X       RETURN ADDRESS
6E 00    A           JMP     0,X       RETURN FROM SUBROUTINE
```

```
002  QUADRO  .SA:0


   0020  P SUB16  EQU    *        16 BITS SUBSTRACTION
          *SAME METHOD AS ADD16.RESULT IS P2-P1
30                TSX
E6 05    A        LDAB   5,X      P2L
E0 03    A        SUBB   3,X      P2L-P1L IN B
A6 04    A        LDAA   4,X      P2H      }
82 00    A        SBCA   £$0      P2H-C    }
A0 02    A        SUBA   2,X      P2H-P1H IN A
31                INS              RESTORE STACK POINTER
31                INS
31                INS
31                INS
31                INS
31                INS
EE 00    A        LDX    0,X      RETURN ADDRESS
6E 00    A        JMP    0,X      RETURN FROM SUBROUTINE
   0035  P VALABS EQU    *        ABSOLUTE VALUE OF A 12 BITS NUMBER.
          *INPUT: A CONTAINS NUMBER MSB
          *       B ---------------- LSB
          *OUTPUT:A CONTAINS RESULT MSB
          *       B ---------------- LSB
43                COMA             1 COMPLEMENT
53                COMB             1 COMPLEMENT
5C                INCB             2 COMPLEMENT FOR LSB
26 01 003B        BNE    'VALEND   NO CARRY
4C                INCA             IF LSB =0
84 0F    A VALEND ANDA   £$0F      12 BITS RESULT
39                RTS
   003E  P CALCU0 EQU    *        DX AND DY CALCULATION
          *INPUT:NO CONDITION ON A,B
          *      X CONTAINS ADDRESS IN TABLE FOR THE END OF THE VECTOR.
          *      (X POINTS ON XH FOR DX CALCULATION,ON YH FOR DY CALCULATION)
          *OUTPUT:A CONTAINS RESULT MSB
          *       B ---------------- LSB
A6 05    A        LDAA   5,X      X1H OR Y1H (OR X2H,OR...)
E6 06    A        LDAB   6,X      X1L OR Y1L (OR X2L,OR...)
37                PSHB
36                PSHA
A6 01    A        LDAA   1,X      X0H OR Y0H (OR X1H,OR...)
E6 02    A        LDAB   2,X      X0L RO Y0L (OR X1L,OR...)
37                PSHB
36                PSHA
FF 0000  D        STX    SAVEX
BD 0020  P        JSR    SUB16    X1-X0(OR X2-X1,OR X3-X2)
FE 0000  D        LDX    SAVEX
84 0F    A        ANDA   £$0F     12 BITS RESULT
39                RTS
```



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003  QUADRO  .SA:0


   0056  P CALCU1 EQU    *        SAME AS CALCU0 FOR X3-X0 OR Y3-Y0 CALCULATION
A6 0D    A        LDAA   13,X     X3H OR Y3H
E6 0E    A        LDAB   14,X     X3L OR Y3L
37                PSHB
36                PSHA
A6 01    A        LDAA   1,X      X0H OR Y0H
E6 02    A        LDAB   2,X      X0L OR Y0L
37                PSHB
36                PSHA
FF 0000  D        STX    SAVEX
BD 0020  P        JSR    SUB16    X3-X0
FE 0000  D        LDX    SAVEX
84 0F    A        ANDA   £$0F     12 BITS RESULT
39                RTS
   006E  P CALCU2 EQU    *        SAME AS CALCU0 FOR X2-X3 OR Y2-Y3 CALCULATION
A6 09    A        LDAA   9,X      X2H OR Y2H
E6 0A    A        LDAB   10,X     X2L OR Y2L
37                PSHB
36                PSHA
A6 0D    A        LDAA   13,X     X3H OR Y3H
E6 0E    A        LDAB   14,X     X3L OR Y3L
37                PSHB
36                PSHA
FF 0000  D        STX    SAVEX
BD 0020  P        JSR    SUB16    X2-X3
FE 0000  D        LDX    SAVEX
84 0F    A        ANDA   £$0F     12 BITS RESULT
39                RTS
   0086  P ADDXR1 EQU    *        XR=XR+1 CALCULATION
7C 0005  D        INC    XR+1
26 03 008E        BNE    NOC
7C 0004  D        INC    XR
39          NOC   RTS
   008F  P ADDYR1 EQU    *        YR=YR+1 CALCULATION
7C 0007  D        INC    YR+1
26 03 0097        BNE    NOC1
7C 0006  D        INC    YR
39          NOC1  RTS
   0098  P ADDXL1 EQU    *        XL=XL+1 CALCULATION
7C 000F  D        INC    XL+1
26 03 00A0        BNE    NOC2
7C 000E  D        INC    XL
39          NOC2  RTS
   00A1  P ADDYL1 EQU    *        YL=YL+1 CALCULATION
7C 0011  D        INC    YL+1
26 03 00A9        BNE    NOC3
7C 0010  D        INC    YL
39          NOC3  RTS
```

```
004  QUADRO  .SA:0

00AA  P PLOT   EQU    *        COMPUTES X AND Y COORDINATES AND PUT THEM IN GDP
         * INPUT STACK STATE: SP-(      )
         *                     ( YOH )
         *                     ( YOL )  LEFT SIDE ORIGIN
         *                     ( XOH )
         *                     ( XOL )
         *                     (     ) |
         *                     (     ) |RIGHT SIDE  ORIGIN
         *                     (     )
         *                     (     )
30               TSX
B6 0003  D       LDAA   INDIC
85 80    A       BITA   £$80      IS IT A RSIDE ?
27 14 00C6       BEQ    RSIDE0
         *LSIDE COORDINATES. BEGIN XO+(OR -)XL CALCULATION*
E6 05    A       LDAB   5,X       XL LSB
37               PSHB
E6 04    A       LDAB   4,X       XL MSB
37               PSHB
F6 000F  D       LDAB   XL+1
37               PSHB
F6 000E  D       LDAB   XL
37               PSHB
85 08    A       BITA   £$08      DXL.LT.0 ?
26 19 00DD       BNE    ISSUB     IF DX.LT.0 THEN XO-XL CALCULATION
20 12 00D8       BRA    ISADD     IF DX.GE.0 THEN XO+XL CALCULATION
         *RSIDE COORDINATES. BEGIN XO+(OR -)XR CALCULATION*
E6 09    A RSIDE0 LDAB   9,X       RIGHT SIDE ORIGIN X LSB
37               PSHB
E6 08    A       LDAB   8,X       MSB
37               PSHB
F6 0005  D       LDAB   XR+1
37               PSHB
F6 0004  D       LDAB   XR
37               PSHB
85 02    A       BITA   £$02      DXR.LT.0 ?
26 05 00DD       BNE    ISSUB     IF DXR.LT.0 THEN XO-XR
BD 000B  P ISADD JSR    ADD16     IF DXR.GT.0 THEN XO+XR
20 03 00E0       BRA    EXIT
BD 0020  P ISSUB JSR    SUB16
B7 0000  A EXIT  STAA   MSBX
F7 0001  A       STAB   MSBX+1
30               TSX              UPDATING X
B6 0003  D       LDAA   INDIC
85 80    A       BITA   £$80      IS IT A RIGHT SIDE?
27 10 00FE       BEQ    RSIDE2
         *LSIDE Y COORDINATES.START YO+(OR -)Y CALCULATION
E6 03    A       LDAB   3,X       LEFT SIDE ORIGIN Y COORDINATE LSB
37               PSHB
E6 02    A       LDAB   2,X       MSB
37               PSHB
F6 0011  D       LDAB   YL+1
37               PSHB
F6 0010  D       LDAB   YL
37               PSHB
20 0E 010C       BRA    GOMSBY
```



```
005  QUADRO  .SA:0

         *RSIDE Y COORDINATES CALCULATION
E6 07    A RSIDE2 LDAB   7,X       RIGHT SIDE ORIGIN Y COORDINATE LSB
37               PSHB
E6 06    A       LDAB   6,X       MSB
37               PSHB
F6 0007  D       LDAB   YR+1
37               PSHB
F6 0006  D       LDAB   YR
37               PSHB
BD 000B  P GOMSBY JSR    ADD16     YO+Y
B7 0000  A       STAA   MSBY
F7 0001  A       STAB   MSBY+1
FE 0000  D       LDX    SAVEX     RESTORE X AFTER ADD16
39               RTS
         ************************************************************************
         * EMPTY OR FULL QUADRILATERAL GENERATOR *
         *****************************************
         * THIS SUBROUTINE MAY BE USED TO DRAW ANY QUADRILATERAL
         * EACH QUADRILATERAL IS DEFINED BY A 17 BYTE TABLE
         * WHICH MUST BE POINTED TO BY X EF6800 REGISTER BEFORE CALLING QUADRI
         * TABLE ORGANISATION: 0,X - ( FLAG )      9,X - ( X2H )
         *                     1,X - ( XOH )      10,X - ( X2L )
         *                     2,X - ( XOL )      11,X - ( Y2H )
         *                     3,X - ( YOH )      12,X - ( Y2L )
         *                     4,X - ( YOL )      13,X - ( X3H )
         *                     5,X - ( X1H )      14,X - ( X3L )
         *                     6,X - ( X1L )      15,X - ( Y3H )
         *                     7,X - ( Y1H )      16,X - ( Y3L )
         *                     8,X - ( Y1L )
         *
         * (XO,YO) IS THE STARTING DOT OF THE QUADRILATERAL DRAWING
         * IT MUST BE THE LOWEST DOT OF THE QUADRILATERAL.
         * THEN (X1,Y1),(X2,Y2),(X3,Y3) ARE GIVEN IN RETROGRAD CLOCK WISE.
         * QUADRILATERAL MUST BE CONVEX.
         * FLAG GIVES THE FULL/EMPTY PARAMETER: FLAG=0 FULL
         *                                      FLAG=1 EMPTY
         *
         * THIS PROGRAM USES A FLAG REGISTER FOR INTERNAL SERVICING
         * THIS BYTE IS CALLED INDIC AND IS DEFINED AS FOLLOWS:
         * B0=1 FIRST SIDE          B0=0 FOLLOWING SIDES
         * B1=0 DXR.GE.0            B1=1 DXR.LT.0
         * B2=0 /DXR/.GE.DYR        B2=1 /DXR/.LT.DYR
         * B3=0 DXL.GE.0            B3=1 DXL.LT.0
         * B4=0 /DXL/.GE.DYL        B4=1 /DXL.LT.DYL
         * B5=0 FULL QUADRILATERAL  B5=1 EMPTY QUADRILATERAL
         * B6 NOT USED
         * B7=0 RIGHT SIDE          B7=1 LEFT SIDE
         *
         ********************************************************
```

006 QUADRO .SA:0

```
    0119  P QUADRI EQU   *        ENTRY POINT
7F 0003  D        CLR   INDIC
A6 00    A        LDAA  0,X      TEST IF EMPTY OR FULL
27 08 0128        BEQ   FULL
F6 0003  D        LDAB  INDIC    |
CA 20    A        ORAB  £$20     SET B5 OF INDIC
F7 0003  D        STAB  INDIC
    0128  P FULL  EQU   *
7F 0002  D        CLR   SIDCNT   INIT SIDE COUNTER
7C 0003  D NEXT   INC   INDIC    B0=1 FIRST SIDES
             * RIGHT SIDE INIT *
A6 02    A GRIGHT LDAA  2,X      XOL
36                PSHA
A6 01    A        LDAA  1,X      XOH
36                PSHA
A6 04    A        LDAA  4,X      YOL
36                PSHA
A6 03    A        LDAA  3,X      YOH
36                PSHA
34                DES
34                DES
34                DES            DON'T CHANGE LSIDE STARTING DOT
34                DES
08                INX
08                INX
BD 003E  P        JSR   CALCUO   Y1-Y0 COMPUTATION
B7 000C  D        STAA  DYR
F7 000D  D        STAB  DYR+1
09                DEX            UPDATING X
09                DEX
BD 003E  P        JSR   CALCUO   X1-X0 COMPUTATION
F7 000B  D        STAB  DXR+1
B7 000A  D        STAA  DXR
```


007 QUADRO .SA:0

```
          *INDIC BYTE SETTING FOR RIGHT SIDE*
85 08    A RIGHTI BITA  £$08
27 14 016C        BEQ   POSIT    IF DXR.GE.0 NEXT TEST IN POSIT
F6 0003  D        LDAB  INDIC    IF DXR.LT.0 THEN SET B1=1
CA 02    A        ORAB  £$02
F7 0003  D        STAB  INDIC
F6 000B  D        LDAB  DXR+1
BD 0035  P        JSR   VALABS   COMPUTE /DXR/
B7 000A  D        STAA  DXR
F7 000B  D        STAB  DXR+1
B1 000C  D POSIT  CMPA  DYR
22 27 0198        BHI   XRYRSR   DXR.GT.DYR
26 05 0178        BNE   EXCH     DXR.LT.DYR
F1 000D  D        CMPB  DYR+1
22 20 0198        BHI   XRYRSR   DXR.GT.DYR
B6 0003  D EXCH   LDAA  INDIC    IF DXR.LT.DYR
8A 04    A        ORAA  £$04     THEN SET B2=1
B7 0003  D        STAA  INDIC
B6 000B  D        LDAA  DXR+1    EXCHANGE DXR AND DYR FOR BRESENHAM ALGORITHM
F6 000D  D        LDAB  DYR+1
B7 000D  D        STAA  DYR+1
F7 000B  D        STAB  DXR+1
B6 000A  D        LDAA  DXR
F6 000C  D        LDAB  DYR
B7 000C  D        STAA  DYR
F7 000A  D        STAB  DXR
7F 0004  D XRYRSR CLR   XR       XR=YR=0 INIT FOR BRESENHAM
7F 0005  D        CLR   XR+1
7F 0007  D        CLR   YR+1
7F 0006  D        CLR   YR
BD 00AA  P        JSR   PLOT     INIT GDP REGISTERS ON STARTING DOT
86 80    A        LDAA  £$80
BD 0000  P        JSR   TRACE    PLOT FIRST DOT .
B6 000B  D SRCOMP LDAA  DXR+1    COMPUTE SR=-DXR/2**************
0C                CLC
46                RORA
40                NEGA
B7 0009  D        STAA  SR+1
86 FF    A        LDAA  £$FF
B7 0008  D        STAA  SR
B6 0003  D        LDAA  INDIC
85 01    A        BITA  £$01     IS IT THE FIRST RIGHT SIDE?
26 03 01C4        BNE   FIRST    IF IT IS GOTO LEFT SIDE INIT
7E 0279  P        JMP   RSIDE    IF NOT GOTO BRESENHAM ALGORITHM FOR RIGHT SIDE
```

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008  QUADRO  .SA:0

08          FIRST  INX              LEFT SIDE INIT***************
08                 INX
BD 0056  P         JSR    CALCU1    Y3-Y0
B7 0016  D         STAA   DYL
F7 0017  D         STAB   DYL+1
09                 DEX               NEW X POINTER
09                 DEX
BD 0056  P         JSR    CALCU1    X3-X0
B7 0014  D         STAA   DXL
F7 0015  D         STAB   DXL+1
31                 INS               DON'T MODIFY RIGHT SIDE ORIGIN
31                 INS
31                 INS
31                 INS
A6 02    A         LDAA   2,X       X0L    STORE LEFT SIDE ORIGIN
36                 PSHA
A6 01    A         LDAA   1,X       X0H
36                 PSHA
A6 04    A         LDAA   4,X       Y0L
36                 PSHA
A6 03    A         LDAA   3,X       Y0H
36                 PSHA
20 22 020E         BRA    LEFTI       LEFT SIDE INIT IF NOT THE FIRST SIDE
08          GOLEFT INX
08                 INX
BD 006E  P         JSR    CALCU2    Y2-Y3 (IF 2ND SIDE),Y1-Y2 (IF THIRD)
B7 0016  D         STAA   DYL
F7 0017  D         STAB   DYL+1
09                 DEX               NEW X POINTER
09                 DEX
BD 006E  P         JSR    CALCU2    X2-X3(IF 2ND SIDE) , X1-X2 (IF THIRD)
B7 0014  D         STAA   DXL
F7 0015  D         STAB   DXL+1
A6 0E    A         LDAA   14,X      X3L (OR X2L)    STORE LEFT SIDE ORIGIN
36                 PSHA
A6 0D    A         LDAA   13,X      X3H (OR X2H)
36                 PSHA
A6 10    A         LDAA   16,X      Y3L (OR Y2L)
36                 PSHA
A6 0F    A         LDAA   15,X      Y3H (OR Y2H)
36                 PSHA
B6 0014  D LEFTI   LDAA   DXL
B5 08    A         BITA   £$08
27 14 0229         BEQ    POSITL    IF DX LEFT.GE.0 GOTO POSITL
F6 0003  D         LDAB   INDIC     IF DX.LT.0  THEN B3=1
CA 08    A         ORAB   £$08
F7 0003  D         STAB   INDIC
F6 0015  D         LDAB   DXL+1
BD 0035  P         JSR    VALABS    AND DX=/DX/
B7 0014  D         STAA   DXL
F7 0015  D         STAB   DXL+1
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009  QUADRO  .SA:0

B1 0016  D POSITL CMPA   DYL
22 27 0255        BHI    XLYLSL    IF DX.GT.DY NO EXCHANGE
26 05 0235        BNE    EXCHAN    IF DX.LT.DY EXCHANGE DX AND DY
F1 0017  D        CMPB   DYL+1
22 20 0255        BHI    XLYLSL
B6 0003  D EXCHAN LDAA   INDIC     AND SET B4=1
8A 10    A        ORAA   £$10
B7 0003  D        STAA   INDIC
B6 0015  D        LDAA   DXL+1      DX AND DY ARE EXCHANGED HERE
F6 0017  D        LDAB   DYL+1
B7 0017  D        STAA   DYL+1
F7 0015  D        STAB   DXL+1
B6 0014  D        LDAA   DXL
F6 0016  D        LDAB   DYL
F7 0014  D        STAB   DXL
B7 0016  D        STAA   DYL
7F 000E  D XLYLSL CLR    XL        XL=YL=0
7F 000F  D        CLR    XL+1
7F 0010  D        CLR    YL
7F 0011  D        CLR    YL+1
B6 0015  D SLCOMP LDAA   DXL+1     SL=-DXL/2 CALCULATION*******
0C                CLC
46                RORA
40                NEGA
B7 0013  D        STAA   SL+1
86 FF    A        LDAA   £$FF
B7 0012  D        STAA   SL
B6 0003  D        LDAA   INDIC
B5 01    A        BITA   £$01       FIRST SIDES ?
26 03 0279        BNE    RSIDE      IF B0=1 RIGHT SIDE BRESENHAM
7E 0326  P        JMP    LSIDE      IF B0=0 LEFT SIDE BRESENHAM
F6 0003  D RSIDE  LDAB   INDIC      RIGHT SIDE PLOTTING***********
C5 04    A        BITB   £$04       TEST B2
27 10 0290        BEQ    NOECH1     IF B2=0 DX.GE.DY;NO EXCHANGE
B6 0006  D        LDAA   YR         COMPARE YR AND DYR
B1 000A  D        CMPA   DXR
26 18 02A0        BNE    SAMER      IF YR.LT.DXR
B6 0007  D        LDAA   YR+1       COMPARE LSB
20 0E 029B        BRA    COMPA
7E 0413  P NEWR   JMP    TESTRI     END OF A RIGHT SIDE
B6 0004  D NOECH1 LDAA   XR         COMPARE XR AND DXR
B1 000A  D        CMPA   DXR
26 08 02A0        BNE    SAMER      XR.LT.DXR
B6 0005  D        LDAA   XR+1       COMPARE LSB
B1 000B  D COMPA  CMPA   DXR+1
27 ED 028D        BEQ    NEWR       IF XR.EQ.DXR
C4 7F    A SAMER  ANDB   £$7F       RIGHT SIDE INDICATOR
F7 0003  D        STAB   INDIC
BD 00AA  P        JSR    PLOT       COMPUTE DOT COORDINATES
86 80    A        LDAA   £$80       DOT COMMAND
BD 0000  P        JSR    TRACE      PLOT IT
B6 0003  D        LDAA   INDIC
85 04    A        BITA   £$04       TEST B2
26 05 02B9        BNE    INCYR      IF B2=1
BD 0086  P        JSR    ADDXR1     XR=XR+1
20 03 02BC        BRA    AFTINC
BD 008F  P INCYR  JSR    ADDYR1     YR=YR+1
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010  QUADRO  .SA:0


B6 0008  D AFTINC LDAA   SR       SR=SR+DYR CALCULATION***********
F6 0009  D        LDAB   SR+1
37                PSHB
36                PSHA
B6 000C  D        LDAA   DYR
F6 000D  D        LDAB   DYR+1
37                PSHB
36                PSHA
BD 000B  P        JSR    ADD16
F7 0009  D        STAB   SR+1
F6 0003  D        LDAB   INDIC
B7 0008  D        STAA   SR         SR IS A 16 BIT SIGNED NUMBER
2A 0A 02E4        BPL    IFSRGE
FE 0000  D        LDX    SAVEX
C5 04    A        BITB   £$04      TEST B2
26 28 0309        BNE    MEMXY      IF B2=1
7E 0279  P        JMP    RSIDE      IF B2=0  LOOP
C5 04    A IFSRGE BITB   £$04      IF SR.GE.0
26 05 02ED        BNE    INCXR      IF B2=1
BD 008F  P        JSR    ADDYR1     YR=YR+1
20 03 02F0        BRA    AFINCR
BD 0086  P INCXR  JSR    ADDXR1     XR=XR+1
B6 0008  D AFINCR LDAA   SR         SR=SR-DXR CALCULATION*********
F6 0009  D        LDAB   SR+1
37                PSHB
36                PSHA
B6 000A  D        LDAA   DXR
F6 000B  D        LDAB   DXR+1
37                PSHB
36                PSHA
BD 0020  P        JSR    SUB16
B7 0008  D        STAA   SR
F7 0009  D        STAB   SR+1
B6 0003  D MEMXY  LDAA   INDIC
84 7F    A        ANDA   £$7F       RIGHT SIDE
B7 0003  D        STAA   INDIC
BD 00AA  P        JSR    PLOT       DOT COORDINATES
B7 001A  D        STAA   RESYCO     STORE THEM
F7 001B  D        STAB   RESYCO+1
B6 0000  A        LDAA   MSBX
F6 0001  A        LDAB   MSBX+1
B7 0018  D        STAA   RESXCO
F7 0019  D        STAB   RESXCO+1
```



```
011  QUADRO  .SA:0


F6 0003  D LSIDE  LDAB   INDIC     LEFT SIDE BRESENHAM******
C5 10    A        BITB   £$10      DX.LT.DY ?
27 10 033D        BEQ    NOEXCH    IF DX.GE.DY NO EXCHANGE
B6 0010  D        LDAA   YL        IF EXCHANGE COMPARE YL WITH DXL
B1 0014  D        CMPA   DXL
26 18 034D        BNE    SAMEL     YL.LT.DYL CONTINUE
B6 0011  D        LDAA   YL+1      COMPARE LSB
20 0E 0348        BRA    COMPAR
7E 0437  P NEWL   JMP    TESTLE    IF XL.EQ.DXL END OF A LEFT SIDE
B6 000E  D NOEXCH LDAA   XL        IF NO EXCHANGE COMPARE XL WITH DXL
B1 0014  D        CMPA   DXL
26 08 034D        BNE    SAMEL     XL.LT.DXL CONTINUE
B6 000F  D        LDAA   XL+1      COMPARE LSB
B1 0015  D COMPAR CMPA   DXL+1
27 ED 033A        BEQ    NEWL
CA 80    A SAMEL  ORAB   £$80      B7=1 IT IS A LEFT SIDE
F7 0003  D        STAB   INDIC
BD 00AA  P        JSR    PLOT      COMPUTE DOT COORDINATES
86 80    A        LDAA   £$80      DOT COMMAND
BD 0000  P        JSR    TRACE     PLOT IT
B6 0003  D        LDAA   INDIC
85 10    A        BITA   £$10      TEST B4
26 05 0366        BNE    INCYL     IF B4=1 GOTO INCYL
BD 0098  P        JSR    ADDXL1    IF B4=0 XL=XL+1
20 03 0369        BRA    LNEXT
BD 00A1  P INCYL  JSR    ADDYL1    IF B4=1 YL=YL+1
B6 0012  D LNEXT  LDAA   SL        SL=SL+DYL CALCULATION*******
F6 0013  D        LDAB   SL+1
37                PSHB
36                PSHA
B6 0016  D        LDAA   DYL
F6 0017  D        LDAB   DYL+1
37                PSHB
36                PSHA
BD 000B  P        JSR    ADD16
F7 0013  D        STAB   SL+1
F6 0003  D        LDAB   INDIC
B7 0012  D        STAA   SL
2A 0A 0391        BPL    IFSLGE
FE 0000  D        LDX    SAVEX     IF SL.LT.0 TEST B4
C5 10    A        BITB   £$10
26 28 03B6        BNE    VECTOR    IF B4=1 COMPUTE X,Y COORDINATES FOR LEFT SIDE
7E 0326  P        JMP    LSIDE     IF B4=1 LOOP (YL HAS NOT BEEN INCREMENTED
C5 10    A IFSLGE BITB   £$10      IF SL.GE.0 CONTINUE
26 05 039A        BNE    INCXL     IF B4=1 GOTO INCXL
BD 00A1  P        JSR    ADDYL1    YL=YL+1
20 03 039D        BRA    FOLLOW
BD 0098  P INCXL  JSR    ADDXL1    XL=XL+1
```

```
012  QUADRO  .SA:0


B6 0012  D FOLLOW LDAA   SL       SL=SL-DXL CALCULATION******
F6 0013  D        LDAB   SL+1
37                PSHB
36                PSHA
B6 0014  D        LDAA   DXL
F6 0015  D        LDAB   DXL+1
37                PSHB
36                PSHA
BD 0020  P        JSR    SUB16
B7 0012  D        STAA   SL
F7 0013  D        STAB   SL+1
B6 0003  D VECTOR LDAA   INDIC    COMPUTE LEFT DOT COORDINATES
8A 80    A        ORAA   £$80
B7 0003  D        STAA   INDIC
BD 00AA  P        JSR    PLOT
B6 0003  D        LDAA   INDIC    IS IT AN EMPTY QUADRILATERAL
85 20    A        BITA   £$20
27 08 03D0        BEQ    FILL     IF IT IS TO BE FILLED
7F 0000  A        CLR    DELTAX
7F 0000  A        CLR    DELTAY
20 38 0408        BRA    LOOP3
B6 0019  D FILL   LDAA   RESXCO+1
F6 0018  D        LDAB   RESXCO
36                PSHA
37                PSHB
B6 0000  A        LDAA   MSBX     LEFT SIDE DOT X COORDINATE
F6 0001  A        LDAB   MSBX+1
37                PSHB
36                PSHA
BD 0020  P        JSR    SUB16    DELTAX OF THE FILLING VECTOR
F7 0000  A        STAB   DELTAX   LSB DIRECTLY IN DELTAX EF9365 REGISTER
84 0F    A        ANDA   £$0F     12 BIT NUMBER
B7 0000  A        STAA   DELTAY   DELTAY IS USED AS TEMPORARY STORAGE AREA
27 1B 0408 LOOP4  BEQ    LOOP3    IF DELTAX MSB =0 PLOT THE FILLING VECTOR
7A 0000  A        DEC    DELTAY   DELTAX - $FF CALCULATION
5C                INCB
26 03 03F6        BNE    NOCARR
7C 0000  A        INC    DELTAY
86 FF    A NOCARR LDAA   £$FF     A $FF LONG VECTOR IS PLOTTED
B7 0000  A        STAA   DELTAX
86 10    A        LDAA   £$10     HORIZONTAL VECTOR COMMAND
BD 0000  P        JSR    TRACE
F7 0000  A        STAB   DELTAX   STORE INTERMEDIATE RESULT
B6 0000  A        LDAA   DELTAY   TEST IF MSB=0
20 E3 03EB        BRA    LOOP4
FE 0000  D LOOP3  LDX    SAVEX
86 10    A        LDAA   £$10     PLOT THE REMAINING LENGTH
BD 0000  P        JSR    TRACE
7E 0279  P        JMP    RSIDE    BACK TO BRESENHAM ALGORITHM FOR RIGHT SIDE
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013  QUADRO  .SA:0


          ****** END OF A RIGHT SIDE ******
31        TESTRI INS              RESTORE STACK POINTER
31               INS
31               INS
31               INS
31               INS
31               INS
31               INS
31               INS
31               INS
7C 0002  D       INC    SIDCNT
B6 0002  D       LDAA   SIDCNT
81 03    A       CMPA   £$03     IS IT THE END ?
26 03 0428       BNE    NEXTSI
7E 045E  P       JMP    ENDQUA   IF Y=YMAX EXIT FROM SUBROUTINE
B6 0003  D NEXTSI LDAA  INDIC    IF Y.LT.YMAX NEXT SIDE
84 F8    A       ANDA   £$F8     INDIC INITIALISATION FOR NEXT RIGHT SIDE
B7 0003  D       STAA   INDIC
08               INX
08               INX             UPDATE X
08               INX
08               INX
7E 012E  P       JMP    GRIGHT
          ********* END OF A LEFT SIDE ********
7C 0002  D TESTLE INC   SIDCNT
B6 0002  D       LDAA   SIDCNT
81 03    A       CMPA   £$03
27 17 0458       BEQ    ENDLEF
B6 0003  D NEXTSL LDAA  INDIC
31               INS             UPDATING STACK POINTER
31               INS
31               INS
31               INS
85 01    A       BITA   £$01     WAS IT THE FIRST LEFT SIDE?
26 04 0450       BNE    NEWIND   IF IT WAS
09               DEX             IF IT WAS NOT
09               DEX
09               DEX
09               DEX             UPDATE X
84 E6    A NEWIND ANDA   £$E6     INDIC INIT
B7 0003  D       STAA   INDIC
7E 01EC  P       JMP    GOLEFT   START A NEW LEFT SIDE
86 08    A ENDLEF LDAA   £$8      RESTORE STACK POINTER
31          STAINI INS
4A               DECA
26 FC 045A       BNE    STAINI
39          ENDQUA RTS
                 END

ERRORS 00000--00000
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