

APPLE UTILITIES

Silentype Double Hi-Res Printing

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The Silentype printer from Apple has the ability to print the high resolution screen, but the picture it produces is too small. The program discussed in this article produces a picture twice the width and twice the height of the original. The program only requires a Silentype printer and enough memory to have the high resolution screen available to the user. This article assumes that your printer is in slot number one.

LOADING THE PROGRAM

To load the program into the computer, you must first enter the monitor by typing CALL -151. Now type the object code in as you see it in figure 2, except substitute colons for all dashes. Be sure to hit the RETURN key after each line.

The program can be saved once it has been typed in. Save it to tape by typing 806.95DW. Then put the tape recorder in record mode and then hit the RETURN key. Stop the recorder after the Apple beeps and flashes its cursor. The program may also be saved to disk by entering BASIC again and typing BSAVE HIRES, A\$806, L\$157.

The program can be brought back into memory from tape by typing 806.95DR and then starting the recorder in play mode. Then hit the RETURN key. All of this must be done while in the monitor. The program may be loaded from disk in BASIC by typing BLOAD HIRES.

After the program is loaded into memory, it must be protected from any BASIC program that may be loaded in afterwards. Do this in BASIC by typing LOMEM:2398 and hitting the RETURN key.

After this has been done, a picture must be loaded onto the high resolution screen. This can be done by loading a picture from tape or disk into the memory starting at \$2000 (\$192). A BASIC program can also be used to generate a picture.

PRINTING THE HGR SCREEN

To get the printer to print the picture type PR#1. Then type CALL 2170. The printer will now print the picture. When it is finished, the computer will be back in BASIC, but the printer will still be on. Type PR#0 to turn it off.

Besides simply printing the picture stored on the high resolution screen, you may change the screen you are printing from screen one to screen two, change from normal to inverse, and change the left margin. POKE 2060,64 will change the screen being printed to from one to two. Poking 32 into the same location will change it back to screen one. Inverse graphics can be achieved by using POKE 2232,0 and POKE 2327,0. Poking 127 into these two locations will change the graphics mode from inverse to normal. The poke to move the left margin is POKE -12527,(value). The value poked in should not be too high or the picture will run off the page. Value twelve will center the picture nicely.

HOW IT WORKS

The rest of this article is devoted to a detailed explanation of how the program works. Understanding the program is not required in order to use it, but understanding it will allow you to change it to meet your specific needs. You should follow the listing in figure one while you are reading the rest of this article.

The location subroutine found at the beginning of the listing was used to find the address of the high resolution byte to be

printed. The subroutine is a translation of this formula: LOCATION = BASE + (Y/8)*128 + (Y MOD 8)*1024 + XBYTE. BASE is found by looking at the number stored in YPART. If this number is less than 64, then BASE is \$2000. If the number is between 64 and 127, then BASE is \$2028. If YPART is greater than 127, then BASE contains \$2050. YPART is then reduced to a top third of the screen value for the rest of the calculations. The multiplications in the formula are achieved by arithmetic shifts left. Divisions are carried out by logical shifts right. Y MOD 8 is done by adding YPART with \$#07. After all the calculations have been completed, the results are stored in BASE.

The rest of the program following the location subroutine prints the picture. The program prints the picture sideways. It starts with the left side of the screen and prints the column 192 bytes horizontally. First the high order nibble of each byte is doubled and printed twice as seven bits. Then the printer returns to the left margin and prints the doubled low order nibble of each byte twice. Now the next column of 192 bytes is printed just as the last column of bytes was. After the program is finished printing the picture, it advances the paper so that it may be torn off.

The subroutines related to the printer are found on page 43 of the Winter 1980-81 edition of APPLE ORCHARD magazine.

This program is only one example of what can be done with the Silentype printer. With a little work you will come up with others. Good luck and have fun.



HI-RES PRINT MEMORY LISTING

#806.95D

```
0806- A9 00
0808- 80 00 08 A9 40 85 07 A0
0810- 02 08 09 40 90 08 09 80
0818- 90 0E 09 00 90 1A A9 00
0820- 85 06 A0 02 08 4C 45 08
0828- A9 28 85 06 38 A0 02 08
0830- E9 40 80 02 08 4C 45 08
0838- A9 50 85 06 38 A0 02 08
0840- E9 80 80 02 08 4A 4A 4A
0848- 0A 0A 0A 0A 0A 0A 2E 00
0850- 08 0A 2E 00 08 18 65 06
0858- 85 06 A0 00 08 65 07 85
0860- 07 A0 02 08 29 07 0A 0A
0868- 18 65 07 85 07 18 A0 01
0870- 08 65 06 85 06 A9 00 65
0878- 07 69 A9 00 80 01 08 A9
```

```
0880- BF 8D 02 08 8D 05 08 A0
0888- FF CF A0 00 C1 20 02 C0
0890- 20 06 08 A0 00 B1 06 A2
0898- 93 4A B0 0A 2E 03 08 18
08A0- 2E 03 08 4C A0 08 2E 03
08A8- 08 38 2E 03 08 DA 00 E9
08B0- 4A 2E 03 08 A0 03 08 49
08B8- 00 8D 03 08 8D 28 CF 20
08C0- 08 CB AD 03 08 8D 28 CF
08C8- 20 08 CB AD 95 08 F0 0C
08D0- CE 05 08 AD 05 08 8D 02
08D8- 08 4C 90 08 A9 BF 8D 05
08E0- 08 8D 02 08 A9 04 20 AB
08E8- CC 20 02 C0 20 06 08 A9
```

```
08F0- 00 B1 06 4A 4A 4A 4A 2E
08F8- 03 08 A2 03 4A B0 0A 2E
0900- 03 08 18 2E 03 08 4C 10
0908- 09 2E 03 08 38 2E 03 08
0910- CA 00 E9 A0 03 08 49 00
0918- 8D 03 08 8D 28 CF 20 08
0920- CB AD 03 08 8D 28 CF 20
0928- 08 CB AD 05 08 D9 10 A9
0930- BF 8D 02 08 8D 05 08 EE
0938- 01 08 AD 01 08 C9 28 F0
0940- 17 A9 04 20 AB CC 20 02
0948- CD 4C 90 08 CE 05 08 AD
0950- 05 08 8D 02 08 4C ED 08
0958- A9 0F 20 AB CC 60
```

```

;DOUBLE HIRES
;FOR SILENTYPE PRINTER
;BY JENNY SCHMIDT

.OPT LIS,NOS,HEH,ERR
.OPT OBJ/HIRES/
**=#006
LOH=#06
HIGH=#07
BASE=#06
ADHIGH=#000
XPART=#001
YPART=#002
COLUMN=#003
YCOUNT=#005
PATTRN=#CF2B
PRINT=#CB06
ADVANCE=#00AB
LEFT=#0D02

```

;LOCATE HIRES BYTE

```

LOCATE LDA #000 ;FIND BASE
      STA ADHIGH
      LDA #020
      STA HIGH
      LDA YPART
      CMP #040
      AND FTRST
      CMP #080
      BCC SECOND
      CMP #0C0
      BCC THIRD
FIRST  LDA #000
      STA LOH
      LDA YPART
      JMP CALC
SECOND LDA #028
      STA LOH
      SEC
      LDA YPART
      SEC #040
      STA YPART
      JMP CALC
THIRD  LDA #058
      STA LOH
      SEC
      LDA YPART
      SEC #080
      STA YPART
CALC   LSR A ;DIVIDE BY 8
      LSR A
      LSR A
      ASL A ;MULTIPLY BY 128
      ASL A
      ASL A
      ASL A
      ASL A
      ASL A
      ASL A
      ASL A
      ASL A
      ROL ADHIGH
      ASL A
      ROL ADHIGH
      CLC ;ADD TO BASE
      ADC LOH
      STA LOH
      LDA ADHIGH
      ADC HIGH
      STA HIGH
      LDA YPART
      AND #07
      ASL A ;MOD 8
      ASL A ;MULTIPLY BY 1024
      CLC ;ADD TO BASE
      ADC HIGH
      STA HIGH
      CLC ;ADD X TO BASE
      LDA XPART
      ADC LOH
      STA LOH
      LDA #000
      ADC HIGH
      RTS
      LDA #000
      STA XPART
      LDA #0BF
      STA YPART
      STA YCOUNT

```

```

LDA #0FFF ;ENABLE PRINTER ROMS
LDA #C100
JSR LEFT ;MOVE PRINT HEAD TO LEFT
UP     JSR LOCATE
      LDY #000
      LDA (BASE),Y
      LDX #003 ;DOUBLE FIRST HALF
TRANSF LSR A ;ORDER IT FOR PRINTING
      BCS DOWN
      ROL COLUMN ;TWO ZEROS IN COLUMN
      CLC
      ROL COLUMN
      JMP DCRS
DOWN   ROL COLUMN ;TWO ONES IN COLUMN
      SEC
      ROL COLUMN
      DCRS
      DEX
      BNE TRANSF
      LSR A
      ROL COLUMN
      LDA COLUMN
      EOR #07F ;INVERSE
      STA COLUMN
      STA PATTRN ;PRINT COLUMN
      JSR PRINT
      LDA COLUMN
      STA PATTRN ;PRINT COLUMN AGAIN
      JSR PRINT
      LDA YCOUNT
      BEQ SOUTH ;FINISHED WITH ROW?
      DEC YCOUNT
      LDA YCOUNT
      STA YPART ;NO
      JMP UP
SOUTH  LDA #0BF ;YES
      STA YCOUNT
      STA YPART
      LDA #004 ;ADVANCE PRINT HEAD
      JSR ADVANCE
      JSR LEFT ;MOVE PRINT HEAD LEFT
      JSR LOCATE ;SECOND HALF
      LDY #000
      LDA (BASE),Y
      LSR A ;MOVE PAST FRIST HALF
      LSR A
      LSR A
      ROL COLUMN ;DOUBLE SECOND HALF
      LDX #003 ;ORDER IT FOR PRINTING
CONTNU LSR A ;TWO ZEROS IN COLUMN
      BCS CARSET
      ROL COLUMN
      CLC
      ROL COLUMN
      JMP PAST
CARSET ROL COLUMN ;TWO ONES IN COLUMN
      SEC
      ROL COLUMN
PAST   DEX
      BNE CONTNU
      LDA COLUMN
      EOR #07F ;INVERSE
      STA COLUMN
      STA PATTRN ;PRINT COLUMN
      JSR PRINT
      LDA COLUMN
      STA PATTRN ;PRINT COLUMN AGAIN
      JSR PRINT
      LDA YCOUNT
      BNE FURTHR ;FINISHED WITH ROW?
      LDA #0BF ;YES
      STA YPART
      STA YCOUNT
      INC XPART
      LDA XPART
      CMP #02B
      BEQ RTURN ;FINISHED WITH PICTURE?
      LDA #004 ;NO
      JSR ADVANCE ;ADVANCE PAPER
      JSR LEFT ;MOVE PRINT HEAD LEFT
      JMP UP
FURTHR DEC YCOUNT ;NOT FINISHED WITH ROW
      LDA YCOUNT
      STA YPART
      JMP AGAIN
RTURN  LDA #00F ;FINISHED PRINTING
      JSR ADVANCE ;ADVANCE PAPER
      RTS
.END

```