

SIDEWAYS PRINTING

Elizabeth Wald's ingenious program sidesteps the Epson HX-20's internal microprinter.

Slipping sideways

The internal microprinter on the Epson HX-20 is a useful device for listing programs and printing results. But it is limited to a maximum of 24 characters per line, which means that program listings are difficult to read and wide program print-out is impossible.

The sideways printing program given in Figure 1 creates the 'sideways printer', which has the device name 'SPT0:' when used in Basic. This uses the microprinter to print out blocks of 16 lines of 80 characters sideways down the paper. A 'cutting line' is printed either side of the text, so that blocks of text may be cut up and pasted together.

The sideways printer is used in Basic by extending the interpreter to include subroutines which control it. Other items, for example disks or a bar-code reader, could also be added in the same way. The collection of subroutines required to control a particular device is known as a device driver.

This actually contains a table known as the device control block. This specifies the addresses of the control subroutines, the device name, and other essential information. The driver is linked to the interpreter via a second table containing the addresses of all the device control blocks. This second table has space for 16 entries of which seven are already defined.

To add any device driver to Basic it is loaded into the lowest end of memory, below MEMSET, and a small loader routine is executed. This loader routine moves all Basic programs and application files down, and copies the device driver into the resulting space at the top end of memory.

Application files are machine code programs permanently linked to the system and are normally linked to the menu. The loader routine then updates various system pointers to protect the driver from being overwritten by Basic, and finally executes a Basic warm start into program area 1. The computer is now in the same state as if Basic had been entered directly from the menu.

When Basic is entered via a warm start it executes an initialisation routine for each linked device in turn. This is contained within the driver, and ensures that the device is marked as being closed, and is also responsible for producing a new 'LOGIN' message. If the sideways printer cannot be initialised, for example if the user attempts to link in more than 16 devices, the normal 'LOGIN' message will be displayed.

Driver subroutines

The sideways printer driver contains subroutines to open and close 'SPT0:' and to transfer a single character to the device from Basic.

Figure 1: Disassembled Machine Code listing

0A40 8E LDS #04AF	0A00 D3 ADD D #6E	0B5E 08 45 78 74 Ext
0A43 7B TIM #4078	0A0F 18 XDX	0B62 65 6E 64 65 ende
0A46 27 BEQ 0A50	0AE0 A6 LDA A #01	0B66 64 20 45 70 d Ep
0A48 FE LDX 0138	0AE2 81 CMP A #45	0B6A 73 6F 6E 20 son
0A48 AD JSR X00	0AE4 27 BEQ 0AF1	0B6E 42 41 53 49 BASI
0A4D 71 AIM #BF78	0AE6 4D TST A	0B72 43 00 0A 77 C w
0A50 8D BSR 0A52	0AE7 2B BMI 0AEF	0B76 69 74 68 20 ith
0A52 32 PUL A	0AE9 EC LDA D X04	0B7A 53 50 54 30 SPT0
0A53 33 PUL B	0AEB 93 SUB D #68	0B7E 3A 20 62 79 : by
0A54 C3 ADD D #00CE	0AED ED STA D X04	0B82 20 45 20 57 E W
0A57 DD STA D #6A	0AEF 2B BRA 0AC2	0B86 61 6C 64 00 ald
0A59 CC LDA D #07A0	0AF1 FE LDX 0134	0B8A 0A 00 25 2C %
0A5C DD STA D #68	0AF4 FC LDA D 02CE	0B8E FF 8F 53 50 %SP
0A5E D3 ADD D #6A	0AF7 ED STA D X0A	0B92 54 30 20 00 T0
0A60 DD STA D #6C	0AF9 0E CLI	0B96 00 00 00 8C
0A62 FC LDA D 012C	0AFA 4F CLR A	0B9A 70 00 00 8C P
0A65 DD STA D #62	0AFB FE LDX 0004	0B9E 70 8C 70 00 P D
0A67 FC LDA D 0134	0AFE 6E JMP X00	0BA2 00 00 00 00
0A6A DD STA D #60	0B00 DE LDX #60	0BA6 50 0E 46 80 P Ft
0A6C 93 SUB D #68	0B02 9C CPX #62	0BA8 00 00 00 00
0A6E DD STA D #64	0B04 27 BEQ 0B14	0BAE 00 00
0A70 18 XDX	0B06 A6 LDA A X00	
0A71 9C CPX #6C	0B08 08 INX	0BB0 B6 LDA A 068A
0A73 24 BCC 0A7D	0B09 DF STX #60	0BB3 81 CMP A #20
0A75 CC LDA D #0605	0B0B DE LDX #64	0BB5 27 BEQ 0BB8
0A78 BD JSR FF64	0B0D A7 STA A X00	0BB7 C6 LDA B #33
0A7B 2B BRA 0AF9	0B0F 08 INX	0BB9 7E JMP 8433
0A7D 0F SEI #64	0B10 DF STX 0B00	0BB8 8D BSR 0C20
0A7E FF STX 0134		0BBE 6D TST X13
0A81 FC LDA D 0136	0B12 2B BRA	0BC0 2B BMI 0BC7
0A84 93 SUB D #68	0B14 39 RTS	0BC2 62 OIM X8013
0A86 FD STA D 0136	0B15 01 NOP	0BC5 20 BRA X8C19
0A89 8D BSR 0B00	0B16 01 NOP	0BC7 39 RTS
0A8B DC LDA D #6A	0B17 01 NOP	0BC8 00 ***
0A8D DD STA D #60	0B18 01 NOP	0BC9 8D BSR 0BB0
0A8F DC LDA D #6C	0B19 01 NOP	0BCB 32 PUL A
0A91 DD STA D #62	0B1A 01 NOP	0BCC 8D BSR 0C20
0A93 DC LDA D #64	0B1B 01 NOP	0BCE 36 PSH A
0A95 FD STA D 012C	0B1C 01 NOP	0BCF 6D TST X13
0A98 8D BSR 0B00	0B1D 01 NOP	0BD1 27 BEQ 0BC9
0A9A FE LDX 0134	0B1E 01 NOP	0BD3 32 PUL A
0A9D 08 INX	0B1F 01 NOP	0BD4 81 CMP A #00
0A9E 08 INX	0B20 39 RTS	0BD6 27 BEQ 0C09
0A9F 08 INX	0B21 00 ***	0BD8 81 CMP A #0A
0AA0 A6 LDA A X00	0B22 00 ***	0BDA 27 BEQ 0C09
0AA2 81 CMP A #39	0B23 3C PSH X	0BDC 81 CMP A #20
0AA4 27 BEQ 0AAD	0B24 8D BSR 0B26	0BDE 25 BCS 0C1D
0AA6 EE LDX X01	0B26 38 PUL X	0BE0 36 PSH A
0AA8 09 DEX	0B27 3C PSH X	0BE1 A6 LDA A X14
0AA9 09 DEX	0B28 18 XDX	0BE3 C6 LDA B #50
0AAA 09 DEX	0B29 C3 ADD D #006A	0BE5 3D MUL
0AAB 2B BRA 0AA0	0B2C 37 PSH B	0BE6 36 PSH A
0AAD 86 LDA A #7E	0B2D 36 PSH A	0BE7 A6 LDA A X15
0AAE 47 STA A X00	0B2E 38 PUL X	0BE9 1B ABA
0AB1 FC LDA D 012C	0B2F C3 ADD D #0020	0BEA 16 TAB
0AB4 C3 ADD D #0003	0B32 ED STA D X05	0BEB 32 PUL A
0AB7 ED STA D X01	0B34 C3 ADD D #007C	0BEC 09 ADC A #00
0AB9 CE LDX #013C	0B37 ED STA D X07	0BEE 3C PSH X
0ABE A6 LDA A X01	0B39 C3 ADD D #FFA0	0BEF 30 TSX
0ABE 81 CMP A #45	0B3C ED STA D X0B	0BF0 E3 ADD D X00
0AC0 27 BEQ 0AF1	0B3E 6F CLR X13	0BF2 C3 ADD D #0100
0AC2 DF STX #6E	0B40 18 XDX	0BF5 37 PSH B
0AC4 A6 LDA A X01	0B41 CE LDX #0665	0BF6 36 PSH A
0AC6 EE LDX X02	0B44 6D TST X00	0BF7 30 TSX
0AC8 8C CPX #FFFF	0B46 27 BEQ 0B53	0BF8 A6 LDA A X04
0ACB 27 BEQ 0AF1	0B48 08 INX	0BFA EE LDX X00
0ACD 4D TST A	0B49 08 INX	0BFC A7 STA A X00
0ACE 2B BMI 0AD4	0B4A 8C CPX #0677	0BFE 38 PUL X
0AD0 18 XDX	0B4D 26 BNE 0B44	0BFF 38 PUL X
0AD1 93 SUB D #68	0B4F 38 PUL X	0C00 31 INS
0AD3 18 XDX	0B50 38 PUL X	0C01 6C INC X15
0AD4 18 XDX	0B51 2B BRA 0B5C	0C03 E6 LDA B X15
0AD5 DE LDX #6E	0B53 ED STA D X00	0C05 C1 CMP B #50
0AD7 ED STA D X02	0B55 32 PUL A	0C07 26 BNE 0C1D
0AD9 6D TST X01	0B56 33 PUL B	0C09 6F CLR X15
0ADB 2A BPL 0ADF	0B57 38 PUL X	0C0B 81 CMP A #00
	0B58 C3 ADD D #0038	0C0D 27 BEQ 0C1D
	0B5B 18 XDX	
	0B5C 2B BRA 0B20	

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The sideways printer requires a 16x80 byte buffer to contain the ASCII codes for one block of text. The buffer is filled when characters are sent to 'SPT0:' from Basic.

The subroutine which opens 'SPT0:' fills the 16x80 character buffer with spaces and the device is marked as being open. A horizontal 'cutting line' is then printed. 'SPT0:' is closed by a subroutine which prints any characters remaining in the buffer and then marks the device as being closed.

The subroutine which transfers a character to 'SPT0:' places the ASCII code for the character in the buffer. When the buffer contains 16 lines of data, the contents of the buffer are printed out followed by a cutting line. The buffer is then filled with spaces ready for the next block of text.

To print the text block, the sideways printer routine extracts one column of characters at a time from the buffer and converts this to the equivalent 16x6 byte block of dot patterns. This dot information represents six lines of dots on the printer, and these are printed out using a routine in the Epson operating system.

Machine code routines

A listing of the machine code is provided in Figure 1. The program is totally relocatable, but for convenience is listed from location &H0A40 onwards. It is important to remember that when the driver loader routine is executed the machine code is copied to the top end of memory, and thus the addresses given will not be the correct ones. The device driver loader functions as follows:

0A40-0A7B Checks that space exists to link in extended Basic. If space exists then the program branches to 0A7D, otherwise it generates a beep and branches to 0AF9 to return to Basic.

0A7D-0A98 Copies all Basic programs and application files down and copies extended Basic into the space created at the top of memory.

0A9A-0AB7 Initialises the 'JMP' instruction to link the extended Basic into the interpreter (warm start hook).

0AB9-0AEF Updates the menu entries for the application files.

0AF1-0AF7 Resets MEMSET to the value before the Basic loader programs was run.

0AF9-0AFE Jumps to Basic warm start routine.

0B00-0B14 Block move subroutine.

The device driver functions as follows:

0B20-0B22 Warm start hook used to link in further extended Basics.

0B23-0B5C Device driver initialisation.

0BB0-0BC7 Opens the device.

0BC9-0C1D Transfers one byte from Basic to the device.

0C20-0C28 Calculates the address of the device control block.

0C2C-0C3C Closes the device.

0C40-0C50 Fills the character buffer with spaces.

Figure 1 (continued)

0C0F 6C INC X14	0C7B 39 RTS	0CEF 31 INS
0C11 E6 LDA B X14	0C7C 8D BSR 0C20	0CF0 7E JMP 8433
0C13 C1 CMP B #10	0C7E 18 XDX	0CF3 00 ***
0C15 25 BCS 0C1D	0C7F C3 ADD D #01D0	0CF4 00 ***
0C17 8D BSR 0C7C	0C82 DD STA D #6E	0CF5 00 ***
0C19 8D BSR 0C5B	0C84 C3 ADD D #0500	0CF6 00 ***
0C1B 8D BSR 0C40	0C87 DD STA D #6C	0CF7 00 ***
0C1D 39 RTS	0C89 5F CLR B	0CF8 37 PSH B
0C1E 00 ***	0C8A 37 PSH B	0CF9 36 PSH A
0C1F 00 ***	0C8B 5F CLR B	0CFA DE LDX #6E
0C20 8D BSR 0C22	0C8C 32 PUL A	0CFC 3C PSH X
0C22 38 PUL X	0C8D 36 PSH A	0CFD 30 TSX
0C23 18 XDX	0C8E 37 PSH B	0CFE A6 LDA A X03
0C24 83 SUB D #0092	0C8F 8D BSR 0CF8	0D00 C6 LDA B #50
0C27 18 XDX	0C91 DE LDX #6C	0D02 3D MUL
0C29 39 RTS	0C93 3A ABX	0D03 EB ADD B X02
0C29 00 ***	0C94 B6 LDA A 0190	0D05 89 ADC A #00
0C2A 00 ***	0C97 A7 STA A X00	0D07 E3 ADD D X00
0C2B 00 ***	0C99 B6 LDA A 0191	0D09 18 XDX
0C2C 8D BSR 0C20	0C9C A7 STA A X10	0D0A A6 LDA A X00
0C2E 6D TST X13	0C9E B6 LDA A 0192	0D0C 38 PUL X
0C30 27 BEQ 0C3C	0CA1 A7 STA A X20	0D0D CE LDX #0190
0C32 6F CLR X13	0CA3 B6 LDA A 0193	0D10 BD JSR FF67
0C34 6D TST X14	0CA6 A7 STA A X30	0D13 32 PUL A
0C36 26 BNE 0C17	0CA8 B6 LDA A 0194	0D14 33 PUL B
0C38 6D TST X15	0CAB A7 STA A X40	0D15 39 RTS
0C3A 26 BNE 0C17	0CAD B6 LDA A 0195	0D16 00 ***
0C3C 39 RTS	0CB0 A7 STA A X50	0D17 00 ***
0C3D 00 ***	0CB2 33 PUL B	0D18 3C PSH X
0C3E 00 ***	0CB3 5C INC B	0D19 A6 LDA A X00
0C3F 00 ***	0CB4 C1 CMP B #10	0D1B 36 PSH A
0C40 8D BSR 0C20	0CB6 26 BNE 0C8C	0D1C E6 LDA B X01
0C42 6F CLR X14	0CB8 5F CLR B	0D1E 37 PSH B
0C44 6F CLR X15	0CB9 37 PSH B	0D1F 30 TSX
0C46 18 XDX	0CBA 86 LDA A #10	0D20 54 LSR B
0C47 C3 ADD D #01D0	0CBC 3D MUL	0D21 54 LSR B
0C4A 18 XDX	0CBD D3 ADD D #6C	0D22 54 LSR B
0C4B CC LDA D #0500	0CBF C3 ADD D #000E	0D23 EE LDX X06
0C4E 36 PSH A	0CC2 FE LDX FFD2	0D25 E7 STA B X00
0C4F 86 LDA A #20	0CC5 08 INX	0D27 33 PUL B
0C51 A7 STA A X00	0CC6 3C PSH X	0D28 58 ASL B
0C53 08 INX	0CC7 3C PSH X	0D29 49 ROL A
0C54 32 PUL A	0CC8 18 XDX	0D2A 59 ROL B
0C55 83 SUB D #0001	0CC9 8D BSR 0D18	0D2B 49 ROL A
0C58 26 BNE 0C4E	0CCB 8D BSR 0D18	0D2C 59 ROL B
0C5A 39 RTS	0CCD 8D BSR 0D18	0D2D E7 STA B X01
0C5B 3C PSH X	0CCF 8D BSR 0D18	0D2F 32 PUL A
0C5C 37 PSH B	0CD1 8D BSR 0D18	0D30 A7 STA A X02
0C5D 36 PSH A	0CD3 8D BSR 0D18	0D32 8D BSR 0D40
0C5E 86 LDA A #85	0CD5 8D BSR 0D18	0D34 8D BSR 0D40
0C60 8D BSR 0C6D	0CD7 8D BSR 0D18	0D36 8D BSR 0D40
0C62 BD JSR FF94	0CD9 38 PUL X	0D38 18 XDX
0C65 86 LDA A #20	0CDA 38 PUL X	0D39 30 TSX
0C67 8D BSR 0C6D	0CDB BD JSR FF91	0D3A ED STA D X04
0C69 32 PUL A	0CDE 33 PUL B	0D3C 38 PUL X
0C6A 33 PUL B	0CDF 25 BCS 0CED	0D3D 09 DEX
0C6B 38 PUL X	0CE1 5C INC B	0D3E 09 DEX
0C6C 39 RTS	0CE2 C1 CMP B #06	0D3F 39 RTS
0C6D C6 LDA B #18	0CE4 26 BNE 0CB9	0D40 E6 LDA B X00
0C6F FE LDX FFD2	0CE6 33 PUL B	0D42 86 LDA A #20
0C72 08 INX	0CE7 5C INC B	0D44 97 STA A #68
0C73 3C PSH X	0CE8 C1 CMP B #50	0D46 4F CLR A
0C74 A7 STA A X00	0CEA 26 BNE 0C8A	0D47 54 LSR B
0C76 08 INX	0CEC 39 RTS	0D48 24 BCC 0D4C
0C77 5A DEC B	0CED C6 LDA B #35	0D4A 9A ORA A #68
0C78 26 BNE 0C74		0D4C 74 LSR 0068
0C7A 38 PUL X		0D4F 24 BCC 0D47
		0D51 A7 STA A X00
		0D53 08 INX
		0D54 39 RTS



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- 429 0C5B-0C7B** Fills the printer buffer with a character.
- 0C7C-0CF0** Prints a text block sideways down the paper.
- 0CF8-0D15** Reads a character from the text buffer and obtains the corresponding dot patterns.
- 0D18-0D54** converts 16 bytes of dot data to the 24 bytes required by the printer subroutine.

The Basic program

To link device 'SPT0:' to Basic the program given in Figure 2 should be

entered in any program area. Before running the program it should be saved on tape, together with any other important programs already in the computer. This is necessary in case the computer crashes as a result of typing errors. Once the program has been saved it can be run. If the HX-20 crashes it is necessary to initialise the computer using 'CTRL/@' (Section 4.2.1 of the Operation Manual). The device is added to Basic and a new 'LOGIN' message is displayed provided there is sufficient memory available, otherwise the computer beeps. However, if there are

already 16 devices defined, 'SPT0:' is not available until another device is released.

Demonstration program

A program is provided (Figure 3) to demonstrate sideways printing. The program uses the PRINT# statement, the device being opened in line 100 and closed in line 190.

To run the program enter it in any program area, turn the printer switch on and type RUN. The printout produced is shown in Figure 4. Programs can be listed sideways using LIST "SPT0:".

Figure 2: Basic Loading program

```
100 REM "SPT0:" Initialization routine by E.J. Wald 1983
110 M1%=PEEK(&H136):M2%=PEEK(&H137):POKE &H2CE,M1%:POKE &H2CF,M2%
120 MEMSET 256*M1%+M2%+800
130 M2%=256*PEEK(&H2CE)+PEEK(&H2CF)
140 FOR I%=M1% TO M2%+799:READ A$:POKE I%,VAL("&H"+A$):NEXT I%
150 EXEC M2%
160 DATA 8E,4,AF,7B,40,78,27,8,FE,1,38,AD,0,71,BF,78,8D,0,32,33,C3,0,CE
170 DATA DD,6A,CC,7,A0,DD,68,D3,6A,DD,6C,FC,1,2C,DD,62,FC,1,34,DD,60,93,68
180 DATA DD,64,18,9C,6C,24,8,CC,6,5,BD,FF,64,20,7C,F,FF,1,34,FC,1,36,93
190 DATA 68,FD,1,36,8D,75,DC,6A,DD,68,DC,6C,DD,62,DC,64,FD,1,2C,8D,66,FE,1
200 DATA 34,8,8,8,A6,0,81,39,27,7,EE,1,9,9,9,20,F3,86,7E,A7,0,FC,1
210 DATA 2C,C3,0,3,ED,1,CE,1,3C,A6,1,81,45,27,2F,DF,6E,A6,1,EE,2,8C,FF
220 DATA FF,27,24,4D,2B,4,18,93,68,18,18,DE,6E,ED,2,6D,1,2A,2,D3,6E,18,A6
230 DATA 1,81,45,27,8,4D,2B,6,EC,4,93,68,ED,4,20,D1,FE,1,34,FC,2,CE,ED
240 DATA A,E,4F,FE,80,4,6E,0,DE,60,9C,62,27,E,A6,0,8,DF,60,DE,64,A7,0
250 DATA 8,DF,64,20,EC,39,1,1,1,1,1,1,1,1,1,1,39,0,0,3C,8D,0
260 DATA 38,3C,18,C3,0,6A,37,36,38,C3,0,20,ED,5,C3,0,7C,ED,7,C3,FF,A0,ED
270 DATA B,6F,13,18,CE,6,65,6D,0,27,B,8,8,8C,6,77,26,F5,38,38,20,9,ED
280 DATA 0,32,33,38,C3,0,38,18,20,C2,D8,45,78,74,65,6E,64,65,64,20,45,70,73
290 DATA 6F,6E,20,42,41,53,49,43,D,A,77,69,74,68,20,53,50,54,30,3A,20,62,79
300 DATA 20,45,20,57,61,6C,64,D,A,0,25,2C,FF,8F,53,50,54,30,20,0,0,0,0
310 DATA 8C,70,0,0,8C,70,8C,70,0,0,0,0,0,50,E,46,80,0,0,0,0,0,0
320 DATA B6,6,8A,81,20,27,5,C6,33,7E,84,33,8D,62,6D,13,28,5,62,80,13,20,52
330 DATA 39,0,8D,E5,32,8D,52,36,6D,13,27,F6,32,81,0,27,31,81,A,27,20,81,20
340 DATA 25,3D,36,A6,14,C6,50,3D,36,A6,15,18,16,32,89,0,3C,30,E3,0,C3,1,00
350 DATA 37,36,30,A6,4,EE,0,A7,0,38,38,31,6C,15,E6,15,C1,50,26,14,6F,15,81
360 DATA D,27,E,6C,14,E6,14,C1,10,25,6,8D,63,8D,40,8D,23,39,0,0,8D,0,38
370 DATA 18,83,0,92,18,39,0,0,0,8D,F2,6D,13,27,A,6F,13,6D,14,26,DF,6D,15
380 DATA 26,DB,39,0,0,0,8D,DE,6F,14,6F,15,18,C3,1,D0,18,CC,5,0,36,86,20
390 DATA A7,0,8,32,83,0,1,26,F4,39,3C,37,36,86,85,8D,B,8D,FF,94,86,20,8D
400 DATA 4,32,33,38,39,C6,18,FE,FF,D2,8,3C,A7,0,8,5A,26,FA,38,39,8D,A2,18
410 DATA C3,1,D0,DD,6E,C3,5,0,DD,6C,5F,37,5F,32,36,37,8D,67,DE,6C,3A,B6,1
420 DATA 90,A7,0,B6,1,91,A7,10,B6,1,92,A7,20,B6,1,93,A7,30,B6,1,94,A7,40
430 DATA B6,1,95,A7,50,33,5C,C1,10,26,D4,5F,37,86,10,3D,D3,6C,C3,0,E,FE,FF
440 DATA D2,8,3C,3C,18,8D,4D,8D,4B,8D,49,8D,47,8D,45,8D,43,8D,41,8D,3F,38,38
450 DATA BD,FF,91,33,25,C,5C,C1,6,26,D3,33,5C,C1,50,26,9E,39,C6,33,31,7E,84
460 DATA 33,0,0,0,0,0,37,36,DE,6E,3C,30,A6,3,C6,50,3D,EB,2,89,0,E3,0
470 DATA 18,A6,0,38,CE,1,90,BD,FF,67,32,33,39,0,0,3C,A6,0,36,E6,1,37,30
480 DATA 54,54,54,EE,6,E7,0,33,58,49,59,49,59,E7,1,32,A7,2,8D,C,8D,A,8D
490 DATA 8,18,30,ED,4,38,9,9,39,E6,0,86,20,97,68,4F,54,24,2,9A,6B,74,0
500 DATA 6B,24,F6,A7,0,8,39,0,0,0,0,0,0,0,0,0,0,0,0,0,0
```

Figure 3: Demonstration program

```
100 OPEN "O",#1,"SPT0:"
110 PRINT#1:PRINT#1
120 PRINT#1,TAB(16);"r";STRING$(46,"-");"j"
130 GOSUB 200:GOSUB 200
140 PRINT#1,TAB(16);"I" Epson BASIC Sideways Print Demonstration |"
150 GOSUB 200
160 FOR I=32 TO 128 STEP 32:GOSUB 210:NEXT I
170 GOSUB 200:GOSUB 200
180 PRINT #1,TAB(16);"L";STRING$(46,"-");"J"
190 CLOSE#1:END
200 PRINT#1,TAB(16);"|"":TAB(63);"|"":RETURN
210 PRINT#1,TAB(16);"|"":
220 FOR J=1 TO I+31:PRINT#1,CHR$(J):NEXT J
230 PRINT#1,"|"
240 RETURN
```

Figure 4: Demonstration printout

```
Epson BASIC Sideways Print Demonstration
! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _
` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~
+ - ! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
```