

IBM GRAPHICS PRINTER EMULATION

The control codes are grouped according to the performed functions, as follows:

- Graphics layout
- Vertical spacing setting
- Paper feed
- Format control
- Miscellaneous
- Graphics printing.



The symbol “n” (or “n₁”, etc.) used in some places, is referred to the character which decimal code is n (n₁, and so on).

Graphics Layout

ESC G Sets the “Double Strike“ print mode. Printing is performed in two passes: after the first pass, the paper is fed of one elementary spacing (1/216“).

```
LPRINT CHR$(27);CHR$(71);
```

ESC H Clears the “Double Strike“ print mode, restoring the normal print mode.

```
LPRINT CHR$(27);CHR$(72);
```

ESC I n Same as IBM Proprinter emulation, Chapter 14.

SO Same as IBM Proprinter emulation, Chapter 14.

ESC SO Same function as code SO.

```
LPRINT CHR$(27);CHR$(14);
```

DC4 Same as IBM Proprinter emulation, Chapter 14.

ESC W 1 Same as IBM Proprinter emulation, Chapter 14.

ESC W SOH Same function as code ESC W 1

```
LPRINT CHR$(27);CHR$(87);CHR$(1);
```

ESC W 0 Same as IBM Proprinter emulation, Chapter 14.

ESC W NUL Same function as code ESC W 0.

```
LPRINT CHR$(27);CHR$(87);CHR$(0);
```

SI Same as IBM Proprinter emulation, Chapter 14.
 DC2 Same as IBM Proprinter emulation, Chapter 14.
 ESC - 1 Same as IBM Proprinter emulation, Chapter 14.
 ESC - SOH Same as IBM Proprinter emulation, Chapter 14.
 ESC - 0 Same as IBM Proprinter emulation, Chapter 14.
 ESC - NUL Same as IBM Proprinter emulation, Chapter 14.
 ESC E Same as IBM Proprinter emulation, Chapter 14.
 ESC F Same as IBM Proprinter emulation, Chapter 14.
 ESC S 0 Same as IBM Proprinter emulation, Chapter 14.

ESC S NUL Same function as code ESC S 0.

LPRINT CHR\$(27);CHR\$(83);CHR\$(0);

ESC S 1 Same as IBM Proprinter emulation, Chapter 14.

ESC S SOH Same function as code ESC S 1.

LPRINT CHR\$(27);CHR\$(83);CHR\$(1);

ESC T Same as IBM Proprinter emulation, Chapter 14.

ESC x n If n = 0, selects the Draft print mode
 If n = 1, selects the NLQ print mode

LPRINT CHR\$(27);CHR\$(120);CHR\$(0 ÷ 1);

ESC M Sets the horizontal spacing at 12 chars/inch.

LPRINT CHR\$(27);CHR\$(77);

ESC [n Selects the horizontal spacing according to parameter “n”:

n = 0 or 48	10	chars/inch
n = 1 or 49	12	chars/inch
n = 2 or 50	15	chars/inch
n = 3 or 51	17.1	chars/inch
n = 4 or 52	20	chars/inch
n = 5 or 53	24	chars/inch
n = 6 or 54	30	chars/inch

LPRINT CHR\$(27);CHR\$(91);CHR\$(n);

Vertical Spacing Setting

ESC 0	Same as IBM Proprinter emulation, Chapter 14.
ESC 1	Same as IBM Proprinter emulation, Chapter 14.
ESC 2	Same as IBM Proprinter emulation, Chapter 14.
ESC 3 n	Same as IBM Proprinter emulation, Chapter 14.
ESC A n	Same as IBM Proprinter emulation, Chapter 14.
ESC 2	

Paper Feed

LF	Same as IBM Proprinter emulation, Chapter 14.
FF	Same as IBM Proprinter emulation, Chapter 14.

Horizontal and Vertical Format Control

BS	Same as IBM Proprinter emulation, Chapter 14.
HT	Same as IBM Proprinter emulation, Chapter 14.

ESC D n ₁ n ₂ .. n _k NUL	Same as IBM Proprinter emulation, Chapter 14.
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VT Causes the printout of the buffer and advances the paper one vertical spacing, like the LF code.

LPRINT CHR\$(11);

ESC C n	Same as IBM Proprinter emulation, Chapter 14.
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ESC C NUL n	Same as IBM Proprinter emulation, Chapter 14.
----------------	---

ESC N n	Same as IBM Proprinter emulation, Chapter 14.
ESC O	Same as IBM Proprinter emulation, Chapter 14.

Miscellaneous

NUL	Same as IBM Proprinter emulation, Chapter 14.
CR	Same as IBM Proprinter emulation, Chapter 14.
CAN	Same as IBM Proprinter emulation, Chapter 14.
ESC 6	Same as IBM Proprinter emulation, Chapter 14.
ESC 7	Same as IBM Proprinter emulation, Chapter 14.
ESC 8	Disables the out-of-paper control (printing goes on until the last line of the form is reached). LPRINT CHR\$(27);CHR\$(56);
ESC 9	Re-enables the out-of-paper control, clearing the ESC 8 command. LPRINT CHR\$(27);CHR\$(57);
ESC J n	Same as IBM Proprinter emulation, Chapter 14.
ESC U n	Same as IBM Propinter emulation, Chapter 14. This command is recognized by the printer but it is not executed.

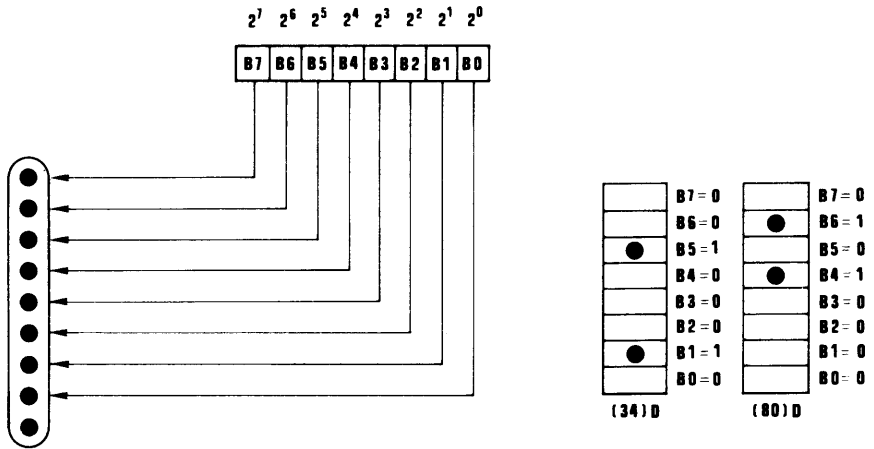
Down Line Loading Of Special Characters

ESC =	Same as IBM Proprinter emulation, Chapter 14.
-------	---

Graphics Printing

The printer can operate in graphics mode according to the Bit Image Mode (BIM). In this mode, the printing is performed with dots in horizontal strips 8 dots high. A dot is printed if the corresponding bit in the received byte is at logic 1. If the corresponding bit is at logic 0, the dot is not printed.

Fig. 15-1
Correspondance between Bits and Print Head Needles



On the same line, alphanumeric characters and BIM data can be printed. The graphics features are obtained by means of the four commands listed below.

ESC K Same as IBM Proprinter emulation, Chapter 14.

$n_1 n_2$ data

ESC L Same as IBM Proprinter emulation, Chapter 14.

$n_1 n_2$ data

ESC Y Same as IBM Proprinter emulation, Chapter 14.

$n_1 n_2$ data

ESC Z Same as IBM Proprinter emulation, Chapter 14.

$n_1 n_2$ data

EPSON FX 80 EMULATION

The control codes are grouped according to the performed functions, as follows:

- Graphics layout
- Vertical spacing setting
- Paper feed
- Format control
- National characters
- Miscellaneous
- Graphics printing
- Down Line Loading of special characters (DLL).



The symbol “n” (or “n₁”, etc.) used in some places, is referred to the character which decimal code is n (n₁, and so on).

Graphics Layout

ESC 4	Sets the Italic characters print mode. Printing is possible only in DRAFT mode. LPRINT CHR\$(27);CHR\$(52);
ESC 5	Clears the Italic characters print mode, possible only in DRAFT mode. LPRINT CHR\$(27);CHR\$(53);
ESC G	Sets the “Double Strike“ print mode. The command is ignored when in NLQ mode. LPRINT CHR\$(27);CHR\$(71);
ESC H	Clears the “Double Strike“ print mode, started by ESC G. LPRINT CHR\$(27);CHR\$(72);
SO	Sets the Double Width print mode. Cleared by DC4, CAN and LF. LPRINT CHR\$(14)
ESC SO	Same function as code SO. LPRINT CHR\$(27);CHR\$(14);
DC4	Same as IBM Proprinter emulation, Chapter 14.
ESC W 1	Same as IBM Proprinter emulation, Chapter 14.
ESC W 0	Same as IBM Proprinter emulation, Chapter 14.
SI	Same as IBM Proprinter emulation, Chapter 14.

ESC SI Same function as code SI.
 LPRINT CHR\$(27);CHR\$(15);

DC2 Same as IBM Proprinter emulation, Chapter 14.
 ESC - 1 Same as IBM Proprinter emulation, Chapter 14.
 ESC - 0 Same as IBM Proprinter emulation, Chapter 14.

ESC E Sets the “Emphasized“ print mode. It remains active until the ESC F code is received.



The “Emphasized“ print mode halves the print speed and, if the command is sent during the “Condensed“ mode printing, the print pitch is changed to the normal value.

LPRINT CHR\$(27);CHR\$(69);

ESC F Same as IBM Proprinter emulation, Chapter 14.

ESC x 0 Sets the DRAFT print mode (normal definition)

LPRINT CHR\$(27);CHR\$(120);CHR\$(48);

ESC x 1 Sets the NLQ print mode (high definition)

LPRINT CHR\$(27);CHR\$(120);CHR\$(49);

ESC M Sets the “Elite“ print pitch (12 chars/inch). Cleared by ESC P.

LPRINT CHR\$(27);CHR\$(77);

ESC P Clears the “Elite“ print pitch (12 chars/inch), restoring the “Pica“ print pitch (10 chars/inch). ESC P does not clear the Double Width, Condensed, etc., print modes.

LPRINT CHR\$(27);CHR\$(80);

ESC p 1 Sets the character proportional print pitch. It is cleared by ESC p 0.

```
LPRINT CHR$(27);CHR$(112);CHR$(49);
```

ESC p 0 Clears the character proportional print pitch, restoring the normal spacing.

```
LPRINT CHR$(27);CHR$(112);CHR$(48);
```

ESC ! n Selects various combinations of graphics layout that can be performed simultaneously, according to the value of parameter “n“, as by the following table.



The ESC ! n command has higher priority with respect to the other setting commands for graphics layout (ESC 4, ESC 5, etc.). If n = 0, any previously set print mode is cleared.

```
LPRINT CHR$(27);CHR$(33);CHR$(0-63);
```

ESC S 0 Same as IBM Proprinter emulation, Chapter 14.

ESC S 1 Same as IBM Proprinter emulation, Chapter 14.

ESC T Same as IBM Proprinter emulation, Chapter 14.

Fig. 15-2
ESC ! n Command

n(dec.)	DW	D	Em	C	El
0					
1					o
2					
3					o
4				o	
5					o
6				o	
7					o
8			o		
9					o
10			o		
11					o
12			o		
13					o
14			o		
15					o
16		o			
17		o			o
18		o			
19		o			o
20		o		o	
21		o			o
22		o		o	
23		o			o
24		o	o		
25		o			o
26		o	o		
27		o			o
28		o	o		
29		o			o
30		o	o		
31		o			o
32	o				
33	o				o
34	o				
35	o				o
36	o			o	
37	o				o
38	o			o	
39	o				o
40	o		o		
41	o				o
42	o		o		
43	o				o
44	o		o		
45	o				o
46	o		o		
47	o				o
48	o	o			
49	o	o			o
50	o	o			
51	o	o			o
52	o	o		o	
53	o	o			o
54	o	o		o	
55	o	o			o
56	o	o	o		
57	o	o			o
58	o	o	o		
59	o	o			o
60	o	o	o		
61	o	o			o
62	o	o	o		
63	o	o			o

DW = Double Width
D = Double Strike
Em = Emphasized
C = Condensed - 17.1 chars/inch
El = Elite - 12 chars/inch

Vertical Spacing Setting

- ESC 0 Same as IBM Proprinter emulation, Chapter 14.
ESC 1 Same as IBM Proprinter emulation, Chapter 14.
ESC 2 Sets the vertical spacing at 4.23 mm (1/6").
LPRINT CHR\$(27);CHR\$(50);
ESC 3 n Same as IBM Proprinter emulation, Chapter 14.
ESC A n Sets the vertical spacing to 0.3528 mm x n (n/72").
LPRINT CHR\$(27);CHR\$(65);CHR\$(0-85);



During the printer initial programming phase performed by the operator, the vertical spacing line can be chosen among the following values: 3.175 mm (1/8"), 2.47 mm (7/72") and 4.23 mm (1/6").

Paper Feed

- LF Causes the buffer printout and advances the paper of one vertical spacing. The vertical spacing width can be programmed via console or ESC sequence.
LPRINT CHR\$(10);
ESC j n Causes the buffer printout and takes the paper backwards of n/216" (Reverse Line Feed). It DOES NOT change the vertical spacing value.



In case an out of paper condition is detected, the ESC j command is not performed. The same command is not performed when the Sprocket device is installed.

LPRINT CHR\$(27);CHR\$(106);CHR\$(0 ÷ 255);

ESC J n Performs a vertical spacing of $n/216''$. This command does not cause the carriage return (CR).

LPRINT CHR\$(27);CHR\$(74);CHR\$(0-255);

FF Same as IBM Proprinter emulation, Chapter 14.

Horizontal and Vertical Format Control

Horizontal Format

HT Same as IBM Proprinter emulation, Chapter 14.

ESC D
 $n_1 n_2 \dots n_k$ Sets up to 32 horizontal tab stops ($k = 32$). Parameters $n_1 \dots n_k$ must be issued in ascending order, and indicate the number of columns with the tab stops (the first print column to the left is column 1) according to the following limits:

for 10 chars/inch printing: $n_1 \dots n_k$, in the range 1-79

for 12 chars/inch printing: $n_1 \dots n_k$, in the range 1-95

for 17.1 chars/inch printing: $n_1 \dots n_k$, in the range 1-136

At power on, the stops are located at 8 columns from each other.

ESC D: LPRINT CHR\$(27);CHR\$(68);

$n_1 n_2 \dots n_k$: LPRINT CHR\$(n_1);CHR\$(n_2);..CHR\$(n_k);

NUL: LPRINT CHR\$(0);

ESC Q n Sets the right margin position:
for 10 chars/inch printing: $n = 2-80$
for 12 chars/inch printing: $n = 3-96$
for 17.1 chars/inch printing: $n = 4-137$

LPRINT CHR\$(27);CHR\$(81);CHR\$(n);

ESC I n Sets the left margin position:
for 10 chars/inch printing: $n = 0-78$
for 12 chars/inch printing: $n = 0-93$
for 17.1 chars/inch printing: $n = 0-133$

LPRINT CHR\$(27);CHR\$(108);CHR\$(n);

Vertical Format

VT Causes the printout of the buffer and advances the paper one vertical spacing. Tab stops are programmed by **ESC B** or **ESC b**.



If no vertical tab stops program has been set, this command advances the paper of one vertical spacing, like the LF code.

```
LPRINT CHR$(11);
```

ESC B
 $n_1 n_2 \dots n_k$ Sets up to 16 vertical tab stops (1-16). Parameters $n_1 \dots n_k$, from 1D to 255D, must be issued in ascending order, and indicate the number of the form row with the tab stops. The first form line (Top of Form), corresponds to line 0.

```
ESC B: LPRINT CHR$(27);CHR$(66);  
 $n_1 n_2 \dots n_k$ : LPRINT CHR$( $n_1$ );CHR$( $n_2$ );..CHR$( $n_k$ );  
NUL: LPRINT CHR$(0);
```

ESC b
 $n m_1 \dots m_k$
NUL Sets up to 8 vertical tab stops programs (0-7). Each program can have a maximum of 16 tab stops (1-16).



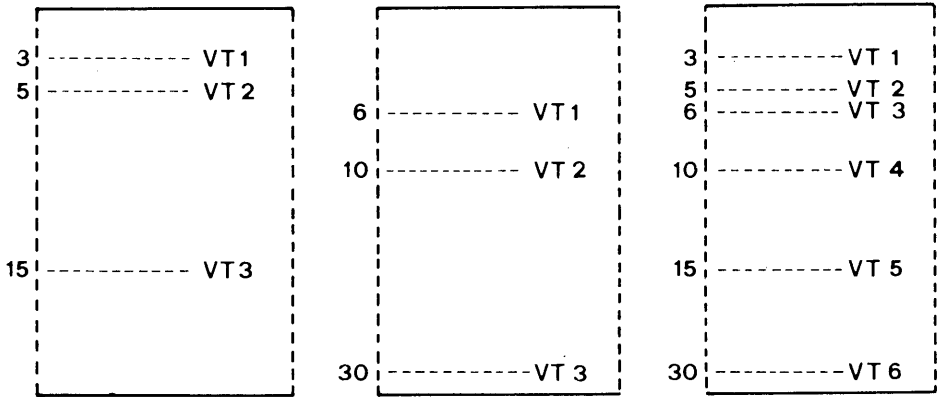
Tab stops programmed by ESC b 0 are the same as the ones programmed by ESC B.

```
ESC b: LPRINT CHR$(27);CHR$(98);  
 $n m_1 \dots m_k$ : LPRINT CHR$( $n$ );CHR$( $m_1$ );..CHR$( $m_k$ );  
NUL: LPRINT CHR$(0);
```

ESC / n Sets the vertical tab stops according to the following table, and to the tab stops programmed by **ESC b** on the tab stop program selected by parameter n .

Fig. 15-3

Example of tab stops programmed with the ESC / code



ESC C n Same as IBM Proprinter emulation, Chapter 14.

ESC C Sets the form length in number of inches ($1 \div 22$). The page skip is performed according to this value. It also selects the current line as first print line (TOF).

NUL n

```
LPRINT CHR$(27);CHR$(67);CHR$(0);
```

ESC N n Same as IBM Proprinter emulation, Chapter 14.

ESC O Same as IBM Proprinter emulation, Chapter 14.

National Characters

ESC 7 Selects the basic national characters table (see Appendix).

```
LPRINT CHR$(27);CHR$(55);
```

ESC R n Selects the national characters table according to the value of parameter n:

n = 0 USA	n = 6 Italy
n = 1 France	n = 7 Spain
n = 2 Germany	n = 8 Japan
n = 3 UK	n = 9 Norway
n = 4 Denmark 1	n = 10 Denmark 2
n = 5 Sweden	

LPRINT CHR\$(27);CHR\$(82);CHR\$(0-10);

ESC I 1 Performs character printing according to the following table.

Fig. 15-4
Printable Characters by means of ESC I 1 Code

DECIMAL CODE	CAR.	DECIMAL CODE	CAR.	DECIMAL CODE	CAR.	DECIMAL CODE	CAR.
0	à	22	.	128	á	150	·
1	é	23	A	129	ê	151	À
2	ù	24	Ö	130	û	152	Ó
3	ô	25	Û	131	ô	153	Ü
4	ì	26	a	132	í	154	à
5	ó	28	u	133	º	156	ú
6	£	29	È	134	£	157	É
16	§	30	é	144	§	158	ê
17	ß	31	¥	145	ß	159	¥
21	ø			149	ø		

LPRINT CHR\$(27);CHR\$(73);CHR\$(49);

ESC I 0 Clears the function of command ESC I 1

LPRINT CHR\$(27);CHR\$(73);CHR\$(48);

ESC 6

Sets the Italic print mode for the characters listed in the following table.

Fig. 15-5
Printable Characters by means of ESC 6

DECIMAL CODE	CAR.	DECIMAL CODE	CAR.	DECIMAL CODE	CAR.	DECIMAL CODE	CAR.
128	<i>à</i>	137	<i>Ñ</i>	145	<i>ß</i>	153	<i>ù</i>
129	<i>è</i>	136	<i>ñ</i>	146	<i>Æ</i>	154	<i>á</i>
130	<i>ù</i>	139	<i>Ÿ</i>	147	<i>æ</i>	156	<i>ó</i>
131	<i>ó</i>	140	<i>Þ</i>	148	<i>Ø</i>	156	<i>ü</i>
132	<i>í</i>	141	<i>À</i>	149	<i>ø</i>	157	<i>É</i>
133	<i>é</i>	142	<i>á</i>	150	<i>ó</i>	158	<i>è</i>
134	<i>£</i>	143	<i>ç</i>	151	<i>À</i>	159	<i>ý</i>
135	<i>í</i>	144	<i>§</i>	152	<i>O</i>	255	<i>ø</i>
136	<i>è</i>						

LPRINT CHR\$(27);CHR\$(54);

Miscellaneous

- NUL Same as IBM Propinter emulation, Chapter 14.
- BS Causes the buffer printout and takes the carriage one character back (Backspace).
LPRINT CHR\$(8);
- CR Causes the buffer printout and takes the carriage back to the first column (Carriage Return). During the printer initialization phase, performed by the operator, the paper can be advanced of one vertical spacing (CR = CR + LF).
LPRINT CHR\$(13);
- DC1 Sets the printer to receive data from the host computer (Device Control 1).
LPRINT CHR\$(17);
- DC3 Deselects the printer (Device Control 3).
LPRINT CHR\$(19);
- CAN Clears the print buffer contents (buffer data are lost).
LPRINT CHR\$(24);
- ESC # Clears the forcing to “0” (by ESC =) or to 1 (by ESC >) of the most significant bit (MSB) of the 8 bit code.
LPRINT CHR\$(27);CHR\$(35);
- ESC = Sets to “0” the most significant bit (2⁷) limiting the code range to 0 ÷ 127D. (See also ESC # and ESC >).
LPRINT CHR\$(27);CHR\$(61);
- ESC > Sets to “1” the most significant bit (2⁷) limiting the code range to 128 ÷ 255D. (See also ESC # and ESC =).
LPRINT CHR\$(27);CHR\$(62);

ESC @ Initializes the printer, setting the power on conditions (see the chapter “Printer Initialization”). All data stored in the print buffer are lost (text and settings).

```
LPRINT CHR$(27);CHR$(64);
```

ESC 8 Disables the end of paper control (printing goes on up to the bottom of the last sheet), data transmission is not interrupted).

```
LPRINT CHR$(27);CHR$(56);
```

ESC 9 Re-enables the out-of-paper control, clearing the ESC 8 command. Printing is stopped before the out of paper condition occurs and the printer is set in the Local mode.

```
LPRINT CHR$(27);CHR$(57);
```

ESC < Enables monodirectional printing, of one print line (from left to right).

```
LPRINT CHR$(27);CHR$(60);
```

ESC U 1 Enables monodirectional printing (from left to right) to ensure better text alignment.

```
LPRINT CHR$(27);CHR$(85);CHR$(49);
```

ESC U 0 Enables bidirectional printing (faster).

```
LPRINT CHR$(27);CHR$(85);CHR$(48);
```

ESC i 1 Sets the printer to print the just received character not waiting for the appropriate print command (just like a typewriter).



The ESC i 1 command cannot be performed if the Sprocket device is installed.

```
LPRINT CHR$(27);CHR$(105);CHR$(49);
```

ESC i 0 Clears the print mode set by ESC i 1, restoring the normal print mode.
LPRINT CHR\$(27);CHR\$(105);CHR\$(48);

ESC s.1 Halves the print speed that results quieter.
LPRINT CHR\$(27);CHR\$(115);CHR\$(49);

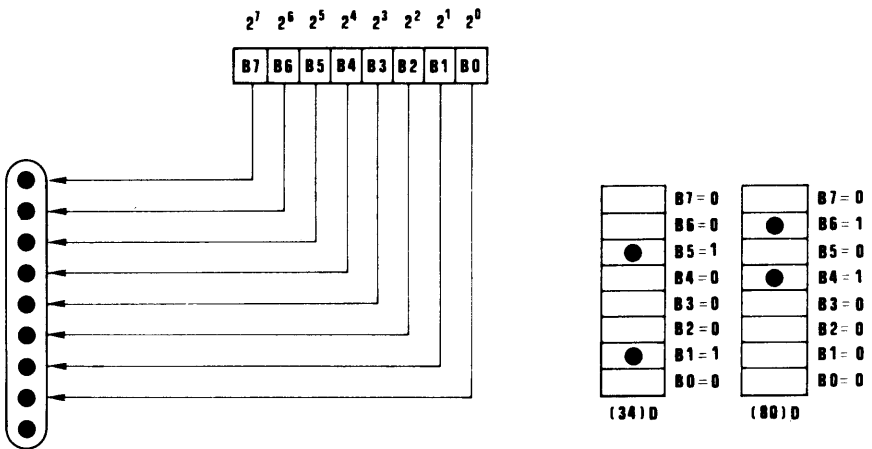
ESC s 0 Clears the halved print speed, restoring the normal print speed.
LPRINT CHR\$(27);CHR\$(115);CHR\$(48);

DEL Causes the clearing of the last printable character from the print
buffer.
LPRINT CHR\$(127);

Graphics Printing

The printer can operate in graphics mode according to the Bit Image Mode (BIM). In this mode, the printing is performed with dots in horizontal strips 8 dots high. A dot is printed if the corresponding bit in the received byte is at logic 1.

Fig. 15-6
Correspondance between Bits and Print Head Needles



On the same line, alphanumeric characters and BIM data can be printed. The graphics features are obtained by means of the four commands listed below.

ESC K Sets the BIM graphics printing with normal density. Parameters n_1 and n_2 indicate the number of BIM data that follow. To obtain n_1 and n_2 values, operate as for the following example.

$n_2 =$ INTEGRAL quotient obtained dividing the data number by 256

$n_1 =$ Data number - ($n_2 \times 256$)

Ex.: To print 263 data:

$n_2 = 1$ ($263/256 = 1.02734375$; the INTEGRAL number is therefore 1)

$n_1 = 263 - (1 \times 256) = 7$

The maximum number of BIM data printable on one line is 480. If n_1 and n_2 define a number of data that exceed the limit, the exceeding part is ignored.

If on a line, alphanumeric characters are also printed, the maximum number of BIM data decreases as by the following table.

PRINT PITCH		BIM COLUMNS PER CHARACTER
NORMAL	10 Chars/Inch	6
ELITE	12 Chars/Inch	5
CONDENSED	17.1 Chars/Inch	3.5

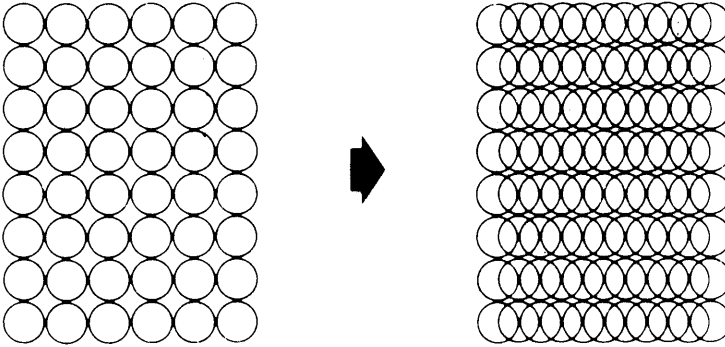
ESC K: LPRINT CHR\$(27);CHR\$(75);
 n_1 n_2 Data: LPRINT CHR\$(n_1);CHR\$(n_2);Data

ESC L
 n_1 n_2 data

Sets the BIM graphics printing with double density and halved speed. The maximum number of BIM data per row is doubled (as well as the BIM values listed in the above table). For the other features, the same rules as ESC K apply.

ESC L: LPRINT CHR\$(27);CHR\$(76);
 n_1 n_2 Data: LPRINT CHR\$(n_1);CHR\$(n_2);Data

Fig. 15-7
Double Density



ESC Y
 $n_1 n_2$ data

Sets the graphics printing at double density and normal print speed. The maximum number of BIM data per row is 960. For the other features, the same rules as ESC K apply.

ESC Y: LPRINT CHR\$(27);CHR\$(89);
 $n_1 n_2$ Data: LPRINT CHR\$(n_1);CHR\$(n_2);Data

ESC Z
 $n_1 n_2$ data

Sets the BIM graphics printing with four times density. The maximum number of BIM data per row is 1920. For the other features, the same rules as ESC K apply.

ESC Z: LPRINT CHR\$(27);CHR\$(90);
 $n_1 n_2$ Data: LPRINT CHR\$(n_1);CHR\$(n_2);Data

ESC * m
n₁ n₂ data

Sets the graphics printing in the various density and speed combinations according to parameter "m", as by the table below:

m	MODE	Dot/Inch	Dot/Row
0	Normal density	60	480
1	Double density, half speed	120	960
2	Double density, normal speed	120	960
3	Four times density	240	1920
4	Graphics Video I	80	640
5	Plotter graphics (x:y = 1:1)	72	576
6	Graphics Video II	90	720

For the other features, the same rules as ESC K apply.

ESC * M: LPRINT CHR\$(27);CHR\$(42);CHR\$(m);
n₁ n₂ Data: LPRINT CHR\$(n₁);CHR\$(n₂);Data

ESC ? n m

Modifies the BIM commands. Parameter "m" varies in the range 0 ÷ 6, while n = K, L, Y or Z. In BIM mode, the printer can operate at seven different print densities, assigned by commands ESC K, ESC L, ESC Y, ESC Z or ESC * m. The ESC ? command allows to vary the selected density. For instance, to change the ESC K density from 60 dots/inch to 72 dots/inch, the following BASIC sequence is to be issued:

```
LPRINT CHR$(27);"?";"K";CHR$(5);
```

ESC ^ a
n₁ n₂ data

Sets the BIM graphics printing (with normal or double density) in horizontal strips 9 dots high, defined by 2 bytes. This BIM print mode allows to use all the 9 print needles of the print head.

a

a = 0 for 60 dots/inch density
a = 1 for 120 dots/inch density

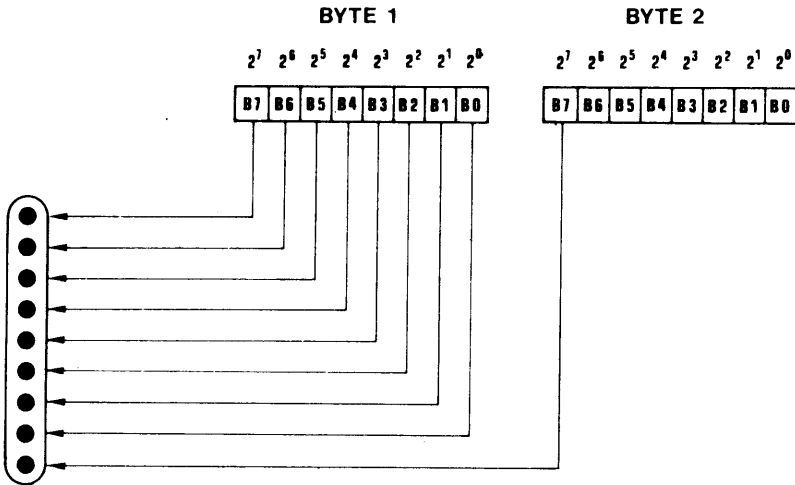
n_1 n_2

Refer to ESC K to define the strip length.

Data: The first, third and fifth byte determine the printing of the dots that correspond to the first 8 needles of the print head. The second, fourth and sixth byte (and so on), determine the printing of the dot corresponding to the ninth print head needle (as by the following figure).

ESC ^ a: LPRINT CHR\$(27);CHR\$(94);CHR\$(0-1);
 n_1 n_2 data: LPRINT CHR\$(n_1);CHR\$(n_2);Data

Fig. 15-8
Correspondance between Issued Bytes and Needles



Down Line Loading of Special Characters (DLL)

The user can create personalized characters; these characters can be printed in the place of the normal characters. The characters can cover the whole set of the ASCII table (256 characters maximum, defined by codes in the range 0D to 255D). As an alternative, only a few characters can be personalized, keeping the standard characters for the undefined ones. The thus defined new table is loaded into the printer.



Turning off the printer, the stored characters are lost.

ESC & 0 This code must be followed by the parameters m n a $P_0...P_{10}$. The code defines personalized characters and stores them in RAM. The parameter meaning is specified as follows.

Parameters $P_0...P_{10}$ determine the dot map of the character to be defined, as shown below. The a $P_0...P_{10}$ sequence must be repeated for each character to be personalized.

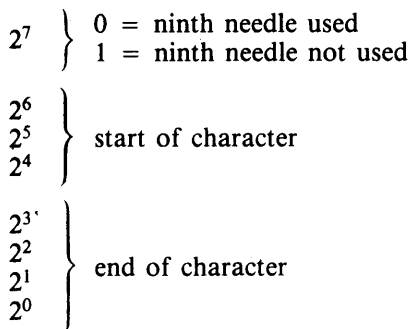
LPRINT CHR\$(27);CHR\$(38);CHR\$(48);parameters

n and m These parameters specify the start code and the end of field for the character range to be personalized, respectively. The value can vary in the range $0 \div 255$. In case "m" = "n", only one character is personalized. (The one specified by the two parameters m and n).

a This attribute precedes the 11 bytes $P_0...P_{10}$ defining the character to be personalized. Its meaning varies according to the defined character spacing (fixed or proportional).

- Fixed spacing: only the value of bit 2⁷ (MSB) is considered significant. This value is "0" if the ninth needle is used (and the first is not used) and is "1" if the first needle is used (and the ninth is not used).

- Proportional spacing: bit 2^7 has the same meaning described in the previous paragraph; the other 7 bits are also considered to define the (variable) length for the characters, as follows:



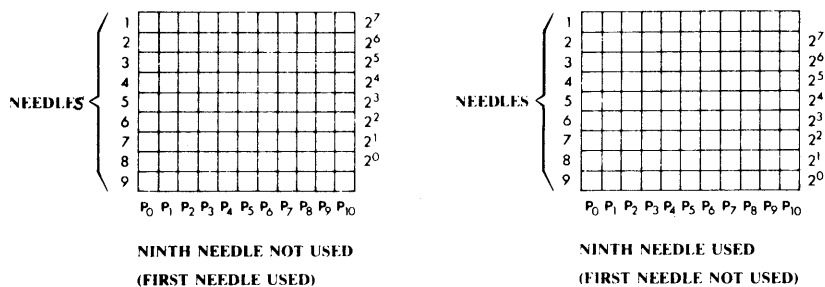
For the characters in proportional spacing, a print area for the matrix is therefore defined, starting from the beginning to the end of character, ignoring the bytes that come before the start of characters and the bytes that follow the end of character.

$P_0 \dots P_{10}$

The values for these parameters define the character shape according to the correspondance between the character design and the binary value of parameter P_i .

To draw each character, the user is provided of the following effective 8×11 matrix.:

Fig. 15-9
Print Matrix



The dot is printed if the corresponding bit in the received Byte “p” is 1.

On the 8×11 matrix, the user can mark the print dots required to draw the character, keeping in mind that, to guarantee the recycle of the print head, a needle activated in column “n” cannot be re-activated in column “n + 1”. If the configuration sent to the printer does not comply with this rule, the printer automatically makes the configuration acceptable. In this case, however, the issued character will differ from the printed character for all the dots that would inhibit needle recycle, had they been printed.

Fig. 15-10
Example of Personalized Character Definition in Fixed Spacing

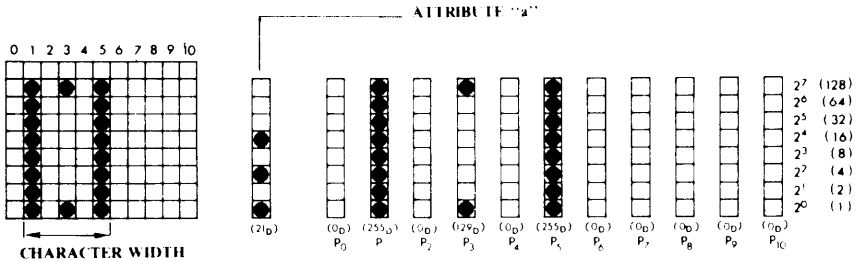
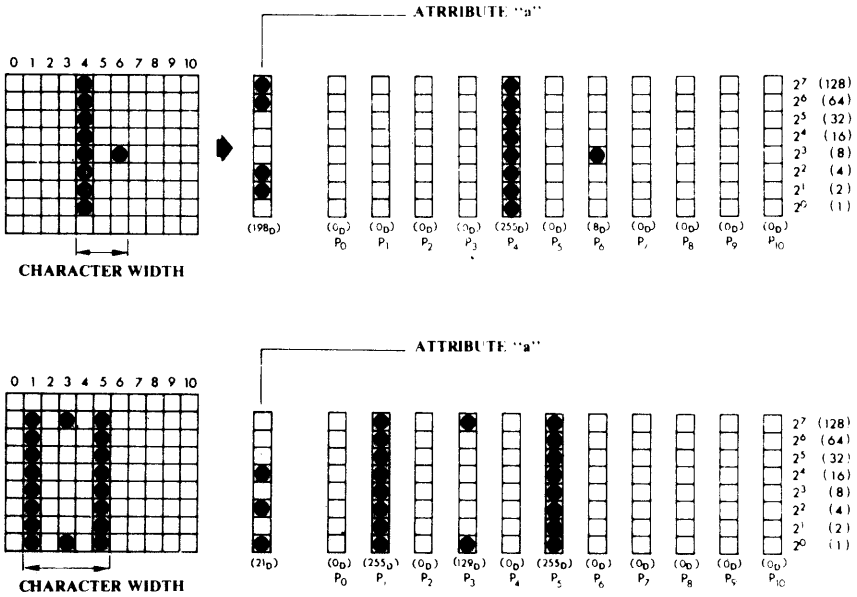


Fig. 15-11

Example of Personalized Character Definition in Proportional Spacing



ESC % 1 RAM selection (personalized characters previously defined by ESC &).

```
LPRINT CHR$(27);CHR$(37);CHR$(49);
```

ESC % 0 ROM selection (personalized characters permanently stored in the printer).

```
LPRINT CHR$(27);CHR$(37);CHR$(48);
```

ESC : 000 Copies the ROM character generator contents (normal characters), operational when the code is received, into the user RAM.

```
LPRINT CHR$(27);CHR$(58);CHR$(48);CHR$(48);CHR$(48);
```



b ₇	b ₆	b ₅	b ₄	b ₃	b ₂	b ₁	b ₀											
b ₇	o	o	o	o	o	o	o	i	i	i	i	i	i	i	i	i	i	i
b ₆	o	o	o	o	i	i	i	i	o	o	o	o	i	i	i	i	i	i
b ₅	o	o	i	i	o	i	o	i	o	o	i	o	i	c	o	i	i	i
b ₄	o	i	o	i	o	i	o	i	o	i	o	i	o	i	o	i	o	i
b ₃	o	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F		
b ₂	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
b ₁	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
b ₀	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
0	NUL	SP	0	@	P	`	p	Ç	É	á	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
1		!	1	A	Q	a	q	ü	æ	í	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
2	DC ₂	"	2	B	R	b	r	é	Æ	ó	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
3	♥	#	3	C	S	c	s	â	ô	ú	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
4	♦	DC ₄	\$	4	D	T	d	t	ä	ö	ñ	⋮	⋮	⋮	⋮	⋮	⋮	
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	⋮	⋮	⋮	⋮	⋮	⋮	
6	♠	&	&	6	F	V	f	v	å	û	ö	⋮	⋮	⋮	⋮	⋮	⋮	
7		'	'	7	G	W	g	w	ç	ù	Ö	⋮	⋮	⋮	⋮	⋮	⋮	
8	BS	CAN	(	8	H	X	h	x	ê	ÿ	ç	⋮	⋮	⋮	⋮	⋮	⋮
9	HT	)	)	9	I	Y	i	y	ë	Ö	ã	⋮	⋮	⋮	⋮	⋮	⋮
A	LF	*	:	J	Z	j	z	è	Ü	Ã	⋮	⋮	⋮	⋮	⋮	⋮	⋮	
B	VT	ESC	+	;	K	[	k	{	ï	ø	è	⋮	⋮	⋮	⋮	⋮	⋮
C	FF	,	<	L	\	l	;	;	ï	£	'n	⋮	⋮	⋮	⋮	⋮	⋮	
D	CR	-	=	M	]	m	}	}	i	Ø	i	⋮	⋮	⋮	⋮	⋮	⋮
E	SO	.	>	N	^	n	~	~	Ä	£	³	⋮	⋮	⋮	⋮	⋮	⋮	
F	SI	/	?	O	_	o			Â	í	α	⋮	⋮	⋮	⋮	⋮	⋮	

Fig. 16-3 IBM International 2 Table 2 (ESC 6)

				00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0000	00	NUL		SP	0	@	P	`	p	A	P	ι	⏏	⏏	⏏	⏏	⏏	⏏	⏏
0001	01			!	1	A	Q	a	q	B	Σ	κ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
0010	02		DC ₂	"	2	B	R	b	r	Γ	T	λ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
0011	03	♥		#	3	C	S	c	s	Δ	Υ	μ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
0100	04	♦	DC ₄	\$	4	D	T	d	t	E	Φ	ν	⏏	⏏	⏏	⏏	⏏	⏏	⏏
0101	05	♠	§	%	5	E	U	e	u	Z	X	ξ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
0110	06	♣		&	6	F	V	f	v	H	Ψ	ο	⏏	⏏	⏏	⏏	⏏	⏏	⏏
0111	07			'	7	G	W	g	w	Θ	Ω	π	⏏	⏏	⏏	⏏	⏏	⏏	⏏
1000	08	BS	CAN	(	8	H	X	h	x	ι	α	ρ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
1001	09	HT		)	9	I	Y	i	y	K	β	σ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
1010	10	LF		*	:	J	Z	j	z	Λ	Υ	ς	⏏	⏏	⏏	⏏	⏏	⏏	⏏
1011	11	VT	ESC	+	;	K	[	k	{	M	δ	τ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
1100	12	FF		,	<	L	\	l	!	N	ε	υ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
1101	13	CR		-	=	M	]	m	}	Ξ	ζ	φ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
1110	14	SO		.	>	N	^	n	~	O	η	χ	⏏	⏏	⏏	⏏	⏏	⏏	⏏
1111	15	SI		/	?	O	_	o		Π	θ	ψ	⏏	⏏	⏏	⏏	⏏	⏏	⏏

Fig. 16-5 IBM Greece Table 2 (ESC 6)

				00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0000	00	NUL		SP	0	@	P	`	p	Ç	É	á	␣	␣	␣	␣	␣	␣	␣
0001	01			!	1	A	Q	a	q	ü	æ	í	␣	␣	␣	␣	␣	␣	␣
0010	02		DC ₂	"	2	B	R	b	r	é	Æ	ó	␣	␣	␣	␣	␣	␣	␣
0011	03	♥		#	3	C	S	c	s	â	ô	ú	␣	␣	␣	␣	␣	␣	␣
0100	04	♦	DC ₄	\$	4	D	T	d	t	ä	ö	ñ	␣	␣	␣	␣	␣	␣	␣
0101	05	♣		%	5	E	U	e	u	à	ò	Ñ	␣	␣	␣	␣	␣	␣	␣
0110	06	♠		&	6	F	V	f	v	â	û	õ	␣	␣	␣	␣	␣	␣	␣
0111	07			'	7	G	W	g	w	ç	ù	Õ	␣	␣	␣	␣	␣	␣	␣
1000	08	BS	CAN	(	8	H	X	h	x	ê	ÿ	¿	␣	␣	␣	␣	␣	␣	␣
1001	09	HT		)	9	I	Y	i	y	ë	Ö	ã	␣	␣	␣	␣	␣	␣	␣
1010	10	LF		*	:	J	Z	j	z	è	Ü	Ä	␣	␣	␣	␣	␣	␣	␣
1011	11	VT	ESC	+	;	K	[	k	}	ï	Á	Ú	␣	␣	␣	␣	␣	␣	␣
1100	12	FF		,	<	L	\	l	|	î	É	í	␣	␣	␣	␣	␣	␣	␣
1101	13	CR		-	=	M	]	m	{	ï	À	ì	␣	␣	␣	␣	␣	␣	␣
1110	14	SO		.	>	N	^	n	~	Ã	Ê	³	␣	␣	␣	␣	␣	␣	␣
1111	15	SI		/	?	O	_	o	ˆ	Â	Ô	Ó	␣	␣	␣	␣	␣	␣	␣

Fig. 16-6 IBM Portugal Table 2 (ESC 6)

				00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
0	0	0	0	NUL		SP	0	@	P	`	p	Ç	É	á	␣	␣	␣	␣	
0	0	0	1			!	1	A	Q	a	q	ü	í	í	␣	␣	␣	␣	
0	0	1	0		DC ₂	"	2	B	R	b	r	é	Ó	ó	␣	␣	␣	␣	
0	0	1	1	♥		#	3	C	S	c	s	â	ô	ú	␣	␣	␣	␣	
0	1	0	0	♦	DC ₄	\$	4	D	T	d	t	ä	ö	ñ	␣	␣	␣	␣	
0	1	0	1	♣	§	%	5	E	U	e	u	ä	ò	Ñ	␣	␣	␣	␣	
0	1	1	0	♠		&	6	F	V	f	v	À	ò	á	␣	␣	␣	␣	
0	1	1	1			'	7	G	W	g	w	ç	ù	ó	␣	␣	␣	␣	
1	0	0	0	BS	CAN	(	8	H	X	h	x	è	Á	ç	␣	␣	␣	␣
1	0	0	1	HT		)	9	I	Y	i	y	è	Ö	è	␣	␣	␣	␣
1	0	1	0	LF		*	:	J	Z	j	z	è	Ü	è	␣	␣	␣	␣	
1	0	1	1	VT	ESC	+	;	K	[	k	;	ÿ	Ö	½	␣	␣	␣	␣
1	1	0	0	FF		,	<	L	\	l	;	î	£	¼	␣	␣	␣	␣	
1	1	0	1	CR		-	=	M	]	m	;	ï	Ú	í	␣	␣	␣	␣
1	1	1	0	SO		.	>	N	^	n	~	Ä	Þ	«	␣	␣	␣	␣	
1	1	1	1	SI		/	?	O	_	o		È	ÿ	»	␣	␣	␣	␣	

Fig. 16-7 IBM Spain Table 2 (ESC 6)

				0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
0	0	0	0			SP	0	@	P		p			SP	0	@	P		p	
0	0	0	1		DC ₁	!	1	A	Q	a	q		DC ₁	!	1	A	Q	a	q	
0	0	1	0		DC ₂	"	2	B	R	b	r		DC ₂	"	2	B	R	b	r	
0	0	1	1		DC ₃	#	3	C	S	c	s		DC ₃	#	3	C	S	c	s	
0	1	0	0		DC ₄	\$	4	D	T	d	t		DC ₄	\$	4	D	T	d	t	
0	1	0	1			%	5	E	U	e	u			%	5	E	U	e	u	
0	1	1	0			&	6	F	V	f	v			&	6	F	V	f	v	
0	1	1	1			'	7	G	W	g	w	BEL		'	7	G	W	g	w	
1	0	0	0		BS	CAN	(8	H	X	h	x	BS	CAN	(8	H	X	h	x
1	0	0	1		HT)	9	I	Y	i	y	HT)	9	I	Y	i	y
1	0	1	0		LF		*	:	J	Z	j	z	LF		*	:	J	Z	j	z
1	0	1	1		VT	ESC	+	;	K	[k	{	VT	ESC	+	;	K	[k	{
1	1	0	0		FF		,	'	L	/	l	!	FF		,	'	L	\	l	!
1	1	0	1		CR		-	=	M]	m	}	CR		-	=	M]	m	}
1	1	1	0		SO		.	>	N	^	n	~	SO		.	>	N	^	n	~
1	1	1	1		SI		/	?	O	-	o	DEL	SI		/	?	O	-	o	DEL

National Character Variations

Fig. 16-8 Basic National Characters (ESC 7)

NATIONAL CHARACTER VARIATIONS												
NATIONS	HEXADECIMAL CODE											
	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
U.S.A.	#	\$	@	[	\	\]	^	`	{	|	}	~
FRANCE	#	\$	à	°	ç	§	^	`	é	ù	è	·
GERMANY	#	\$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
ENGLAND	£	\$	@	[	\	\]	^	`	{	|	}	~
DENMARK	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
SWEDEN	#	Q	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	#	\$	@	°	\	é	^	`	à	ò	è	ì
SPAIN	Pt	\$	@	í	Ñ	¿	^	`	ñ	}	}	~
JAPAN	#	\$	@	[	¥	]	^	`	{	|	}	~

Fig. 16.9 National Character Variations (ESC R)

