

ENTERPRISE

C O M P U T E R S

THE
ENTERPRISE EP 80+
Dot matrix Printer

OPERATION MANUAL

Please read this manual carefully *before*
using the Enterprise EP 80+ printer.

TABLE OF CONTENTS

SECTION A	:	GENERAL INFORMATION	Page
	1	Functional specification.	1
	2	Mechanical specification.	2
	3	Interface specification.	2
SECTION B	:	PREPARATION FOR USE	
	1	Unpacking, checking the parts.	3
	2	Setting up.	3
	3	Installing the ribbon.	4
	4	Function selector switch board.	5
	5	Cable connections.	5
	6	Installing the wire separator.	5
	7	Loading the paper.	5
	8	Self test mode.	6
SECTION C	:	OPERATION	
	1	Switches and indicators.	8
	2	Buzzer.	8
	3	Paper end detector.	9
	4	Printer initialisation.	10
	5	Setting the function selector switches.	10
	6	Hex dump mode.	11
SECTION D	:	CONTROL CODES	
		What are control codes?	12
	1	Control codes in text mode.	13
	2	Print action codes.	15
	3	Paper formatting codes.	15
	4	Character designation codes.	24
	5	Other codes.	29
	6	Control codes in the bit-image mode.	30
APPENDIX A	:	International character sets.	36
APPENDIX B	:	Control codes.	43
APPENDIX C	:	Control key table.	46
APPENDIX D	:	Printing examples.	47
APPENDIX E	:	Setting of selector switches.	49
APPENDIX F	:	Interface details.	50
APPENDIX H	:	Character fonts.	52

SECTION A

GENERAL INFORMATION

The EP80+ dot matrix printer is an ideal addition to your Enterprise computer system. It provides facilities for printing out text and listing programs by using the simple LPRINT and LLIST commands from IS-BASIC or from the Enterprise's built in word processor. By the use of the appropriate control codes, different print styles and sizes can be obtained and bit-image graphics produced. In order to copy an Enterprise Enterprise screen in bit-image mode, a 'screen dump' program written in either IS-BASIC or in machine code would be required. The EP80+ can be used with other computers having a 'parallel' interface providing a suitable cable is obtained.

Specifications

1. Functional specification

Printing method:	Serial impact dot matrix.
Printing format:	Alpha-numeric — 7 x 8 in 8 x 9 dot matrix field. Semi-graphic (character graphic) — 8 x 8 dot matrix. Bit image graphic — Vertical 8 or 9 dots parallel, horizontal 640 dots serial/line.
Character size:	Normal size — 2.22 (W) x 2.8 (H) mm = 0.087" x 0.11". condensed size — 1.11 (W) x 2.8 (H) mm = 0.044" x 0.11". 'ELITE' size — 1.8 (W) x 2.8 (H) mm = 0.07" x 0.11". Enlarged 'ELITE' — 3.6 (W) x 2.8 (H) mm = 0.14" x 0.11". Super/subscript — 2.22 (W) x 1.4 (H) mm = 0.087" x 0.055". Semi-graphic unit — 2.54 (W) x 2.8 (H) mm = 0.1" x 0.11".
Character sets:	ASCII characters — 192 (96 normals and 96 italic). JIS characters — 160 (64 katakanas and 96 alpha- numerics). Semi-graphic units — 103. International Specials — 2 for U.S.A., 1 for UK, 8 for German, 8 for French, 6 for Swedish, 2 for Italian, 6 for Spanish, 48 for Greek, 6 for Danish and 2 for Japan.
Printing Speed:	100 C.P.S. for normal size print. 200ms for line feed.
Columns/line:	Normal — 80 columns. Condensed — 142 columns. Enlarge — 40 columns. Condensed/double width — 71 columns. 'ELITE' — 96 columns. Enlarged 'ELITE' — 48 columns.

Printing direction:	Text and semi-graphic — Bidirectional, logic seeking. Super/subscript and bit image graphic — Unidirectional, left to right. (programmable)
Line spacing:	6 L.P.I — 4.23mm. 8 L.P.I. — 3.18mm. Programable in increments of 0.35mm (1/72") and 0.118mm (1/216").
Paper feed:	Adjustable sprocket feed and friction feed.
Paper type:	Fanfold. Single sheet. Roll paper. Thickness — 0.05mm (0.05mm (0.002") to 0.25mm (0.01"). Paper width — 101.6mm (4") to 254mm (10").
Number of copies:	Original plus 2 copies by normal thickness paper.

2. Mechanical Specifications

Ribbon:	Cartridge ribbon (exclusive use), black.
Dimensions:	384 (W) x 315 (D) x 125 (H) mm without Knob and Connectors.
Weight:	Approximately 5.0kg
Power requirement:	40W
Temperature:	Operating — 5 to 35 degree C. = 41 to 95 degree F. Storage — minus 30 to 70 degree C. = minus 20 to 158 degree F.
Humidity:	Operating — 10 to 80 percent RH, no condensation. Storage — 5 to 85 percent RH, no condensation.
Shock:	Operating — 1G (less than 1 msec.)
Vibration:	Operating — 0-25G, 55Hz max. Storage — 0.5G, 55Hz max.
MTBF:	8 million lines (excluding printer head life).
Printer head life:	Approximately 30 million characters (replaceable).

3. Interface Specifications

Standard "Centronics" parallel interface.
 Data transfer rate — 4,500 CPS max.
 Synchronization — By external supplied STROBE pulses.
 Handshaking — By ACKNLG or BUSY signals.
 Logic level — Input data and all interface control signals are TTL level.
 2K of internal RAM for use as buffer or for download character sets.

SECTION B

PREPARATION FOR USE

1. Unpacking, counting the parts.

Before you unpack your printer, inspect the carton for sign of damage. If it appears to be damaged, be especially careful when you inspect its contents. The package should contain the following — Ref. **Figure 1**.

1. This user's manual
2. Printer unit.
3. Ribbon cartridge
4. Paper guide wire rack
5. Enterprise printer cable

If any of these items missing or damaged notify your dealer immediately.

2. Setting up

Before starting to use your printer, you should make sure that it is working properly. The procedure includes checking for obstructions in the path of the printer head or paper feed and that the printer ribbon is properly in place.

1. Lift and remove the plastic top cover to expose print head and mechanism.
2. Remove shipping screw(s).

Carefully stand the printer on its right side with holding by one of your hand — see **Figure 2**. Then, remove with a screwdriver, the shipping screw(s) visible on the underside of the lower case. Remove the foam block that is taped to the mechanism and carriage.

Figure 1
Checking contents of carton.

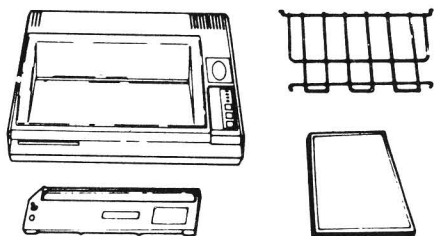
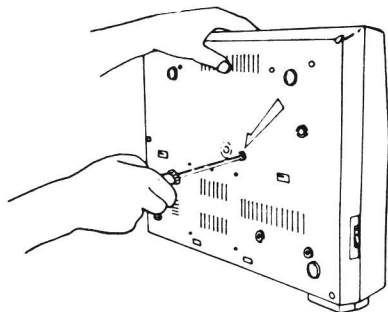


Figure 2
Remove shipping screw(s)



3. Installation of ribbon cartridge

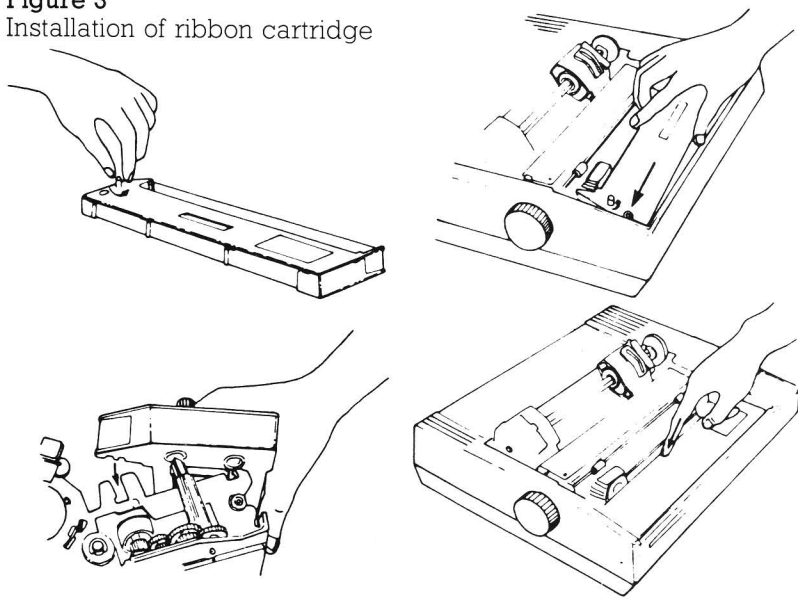
The EP80+ uses replaceable ribbon cartridges. On the bottom of the cartridge you'll see catches (on the left and right) where the cartridge locates onto hooks in the printer.

Refer to figure 3 —

- a. using your forefinger, slide the print head as far to the left as possible.
- b. If you are replacing a used cartridge, gently lift the left side, then the right side of the old cartridge. Discard the old cartridge.
- c. Remove the new ribbon cartridge from it's box.
- d. Holding the cartridge so that the ribbon tension knob is on the left, turn the knob counter clockwise until the ribbon is taut.
- e. With the ribbon facing the printer, tilt the cartridge back slightly, so that the ribbon side is higher.
- f. Starting with the left hand side of the cartridge, set the tilted ribbon over the frame inside the printer. At this point the two catches under the carriage should be over the two hooks at the front of the inside printer frame and the ribbon tension knob should be directly over the ribbon drive shaft. The side tabs in the cartridge should be over the slots in the printer frame.
- g. Press down gently until the hooks engage the catches.
- h. Lower and press down the ribbon side of the cartridges so that the two side tabs locate into the slots in the printer frame.
- i. Turn the ribbon tension knob counter clockwise until the ribbon tightens and slips in front of the print head.
- j. Replace the top cover.

Figure 3

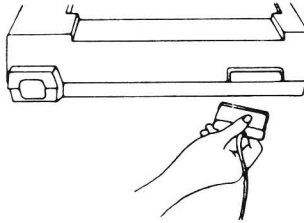
Installation of ribbon cartridge



4. Function selector switch board

The default printer settings can be changed by gaining access to the switches mounted on the circuit board inside the printer case. See **Appendix E** for details.

Figure 6
Connector and Cable

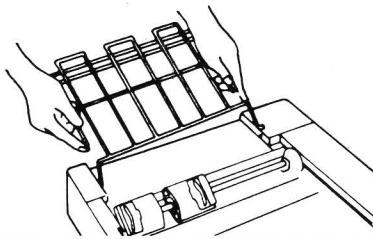


5. Cable connection.

Before connecting the cable, be sure the computer and the printer are turned OFF. Follow these steps to connect your printer to your computer — see **Figure 6**.

- Place the printer in a convenient location close to the computer.
- Insert the black moulded connector into the outlet marked 'PRINTER' on the back of your Enterprise computer. The moulded pip on the Enterprise case prevents wrong insertion.
- Connect the other end of the lead to your EP80+ printer as shown in figure 6.

Figure 7
Wire rack



6. Installing the paper separator

As shown on **Figure 7**, install wire rack which is a paper separator, it allows the paper to feed smoothly into and out of the printer.

7. Installing the paper — see **Figure 8**.

- Position the paper on the floor behind and below the printer.
- Pull the paper release lever and paper bail toward you.
- Feed the paper from back through the paper guide square on down side of wire rack then below the wire frames to the back of tractors. Move the tractor covers.
- Position the paper holes on top of the tractor teeth and close the covers. Adjust one or both tractors so the paper is entered as you

- wish it, and is hold firmly in place.
- e. Feed the paper forward with the platen knob.
 - f. Set the paper so a perforation between sheets is positioned just slightly below the top of the ribbon.
 - g. After print test, if necessary, print impression can be adjusted by the head adjusting lever, at this stage take note of the location of lever and do not change the factory adjustment — see **Figure 9**.

Figure 8
Paper installation

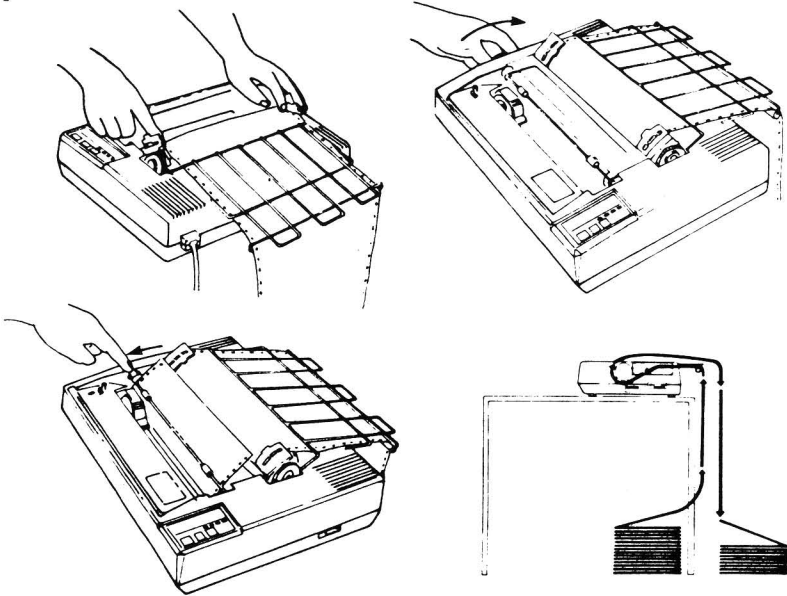
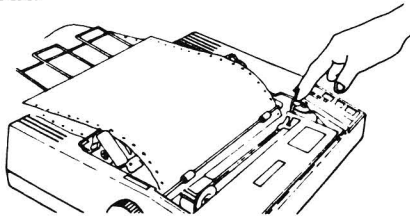


Figure 9
Positioning of printer head



8. Test

- a. Plug the power cord in.
- b. Turn the power switch ON.
- c. The POWER, READY and ON LINE indicators should be lit. If the paper is not correctly inserted the PAPER OUT indicator may also be

- lit, it so, re-insert the paper to remedy this.
- d. Press the ON LINE button several times, it toggles the ON LINE and READY lights. When those lights are ON, your printer is ready to accept data from your Enterprise computer.
 - e. Try press the FF (form feed) and LF (line feed) buttons, those are in active only when the printer is OFF-LINE condition (ON LINE light is not lit).

SECTION C

OPERATION

1. Switches and indicators.

There are three switches and four indicators on the control panel and one power switch on the right side of the printer case.

- a. Power switch: Controls primary AC power to the printer. Check the paper is properly loaded into the printer before turning this switch.
- b. ON LINE button: When the power switch is turned ON, the printer enters the On-line mode and can accept data from the Enterprise.
Depressing the On-line button will set the printer in the Off-line mode and cause the green light to go out. It cannot accept data in this condition, the button must be depressed again to enable printing.
The switch does not function while the printer is actively engaged in printing.
The printer is automatically placed Off-line if the paper supply is exhausted or if a mechanical error occurs in the printer.
The operation of the line feed and form feed buttons are effective only while the printer is Off-line mode.
- c. FF button: (form feed)
When this button is depressed once, the paper is advanced vertically to the next top of form position. This switch must be depressed while the printer is Off-line mode.
The top of form position is initialized when the power switch is turned on, when **INIT** signal is applied to the interface connector, or when the **ESC A + (n) D** code.
The line feed operation is prohibited while the printer is actively engaged in printing.
- e. Indicators:
POWER — Illuminates while the AC power is on.
READY — Illuminates when the printer is ready to accept data.
ON LINE — Illuminates when the printer is in the On-line mode.
PAPER OUT — Illuminates when the paper supply is near it end.

2. Buzzer.

The buzzer is located inside the printer, and sounds for about 0.3 second when the printer receives the **BEL** code (**CHR\$(7)**), and also when the paper supply is near its end.

3. Paper end detector.

- a. When the paper and detector (sensing switch located on the paper guide) detects that the paper is nearly exhausted, the signals on the interface connector change to the following status, and the printing operation stops.

Signal	Pin No.	Status
ERROR	32	"LOW" level
PE(paper end)	12	"HIGH" level
BUSY	11	"HIGH" level
ACKNLG	10	No signal is output

The Enterprise will only recognize the BUSY signal as the other control lines are not connected. The information on the other control lines will be useful when using your EP80+ with other makes of computer.

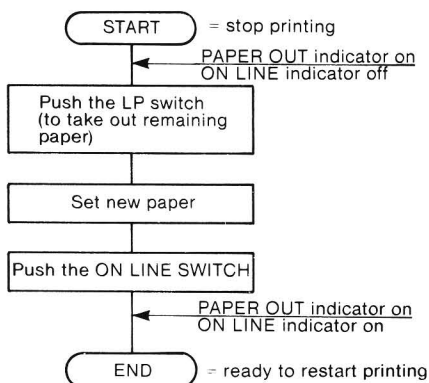


Figure 11. Flowchart of paper out status release procedure.

- b. When the printer falls into paper-out status, it is automatically put into the OFF-LINE state and paper advancement can be performed by depressing the **LF** switch. After loading new paper into the printer, depress the ON LINE switch so that the printer may resume operation.
- c. The printer may also be re-started by turning the power switch OFF and then ON again.
- d. The paper end detector may disabled (for use with single sheets for instance) by sending control code ESC 8 to the printer.

4. Self test

The printer has a self test function to the check the print head operation, mechanism actions and also its print quality.

Test print 1. — See **Figure 12**.

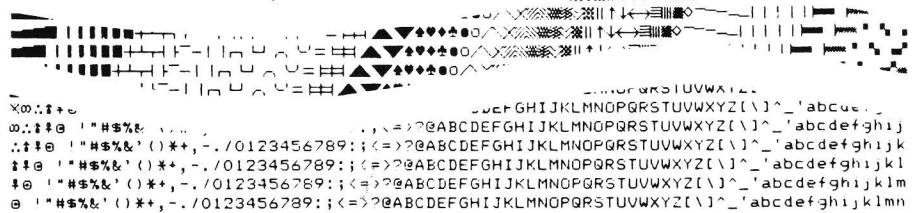
- a. Turn the power switch OFF.
- b. Hold the **LP** button down and turn the power switch back to ON at same time. It prints the content of character set and it will continue as long as you hold the **LP** button down.

a. Turn the power switch OFF.

- Figure 12

! " # \$ % & ' () * + , - . / 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 « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾ ¿ À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ à á â ã

```
"#%&'()*+,-./0123456789;(<=>?@ABCDEFGHIJKLMNopQRSTUVWXYZ\|^_`abcdefghijklmnopqrstuvwxyz  
!"#$%&'()*+,-./0123456789;(<=>?@ABCDEFGHIJKLMNopQRSTUVWXYZ\|^_`abcdefghijklmnopqrstuvwxyz  
"#%&'()*+,-./0123456789;(<=>?@ABCDEFGHIJKLMNopQRSTUVWXYZ\|^_`abcdefghijklmnopqrstuvwxyz  
"%&'()*+,-./0123456789;(<=>?@ABCDEFGHIJKLMNopQRSTUVWXYZ\|^_`abcdefghijklmnopqrstuvwxyz  
"&'()*+,-./0123456789;(<=>?@ABCDEFGHIJKLMNopQRSTUVWXYZ\|^_`abcdefghijklmnopqrstuvwxyz
```



Printer initialization may be accomplished in one of three ways, only a. and c. will operate with the Enterprise computer.

- ## 6. Function selector switch settings.

10

7. 16 Bits HEX. dump mode

The printer has the function of converting all received commands and data to 16 bits HEX. code for printing out the dump list.

- Turn the power switch OFF
- Turn the power switch ON while depressing the **LP** and **FF** keys.
- The printer changes in the 16 bits HEX dump mode and waits to receive commands and data.
- The printing is only performed when the line is buffer full.
- The remain data in the line buffer are printed out at switching from ON LINE to OFF LINE by depressing the ON LINE button.
- Turn the power switch OFF and on again to cancel this mode.

[PROGRAM EX.]

```
100 PROGRAM "HEX_DUMP"
110 FOR I=32 TO 126
120   LPRINT CHR$(I);
130 NEXT I
140 LPRINT
150 LPRINT CHR$(27);"M";"This printing is ELITE size."
160 LPRINT CHR$(27);"P";"This printing is PICA size."
170 LPRINT CHR$(27);"p";CHR$(1);"This printing is PROPORTIONAL."
180 LPRINT CHR$(27);"p";CHR$(0)
190 END
```

[EXECUTIVE PRINT]

```
'*#%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz~
pqrstuvwxyz{|}~
THIS PRINTING IS 'ELITE SIZE'.
This Printing is 'PAICA SIZE'.
This Printing is 'PROPORTIONAL'.
```

[16 BITS HEX DUMP HST]

20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33
34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	40	41	42	43	44	45	46	47
48	49	4A	4B	4C	4D	4E	4F	50	51	52	53	54	55	56	57	58	59	5A	5B
5C	5D	5E	5F	60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
0A	70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	0A	1B	4D	54
48	49	53	20	50	52	49	4E	54	49	4E	47	20	49	53	20	27	45	4C	49
54	45	20	53	49	5A	45	27	2E	0A	1B	50	54	68	69	73	20	50	72	69
6E	74	69	6E	67	20	69	73	20	27	50	41	49	43	41	20	53	49	5A	45
27	2E	0A	1B	70	01	54	68	69	73	20	50	72	69	6E	74	69	6E	67	20
69	73	20	27	50	52	4F	50	4F	52	54	49	4F	4E	41	4C	27	2E	0A	1B
70	00	0A																	

SECTION D

CONTROL CODES

Before looking at the printer in detail, some terms should be defined first so that you can understand them more easily, they are:

ASCII code.

Escape codes

"+" symbol

2 (Binary), **D**. (Decimal) and **H** (Hexdecimal)

If you are already familiar with the above terms, skip the following.

ASCII code.

Characters in computer systems are represented by groups of bits. The various groups of bits that represent the set of characters that are the "alphabet" of any given system are called a "coding system," or simply "code". Codes for representing the information vary in relation to both the number of bits used to define a single character and in the assignment of bit patterns to each particular character.

The sending and receiving equipment must be programmed to acknowledge the code used in computer systems.

The printer has a character set of 96 in normal font, 96 in italic font, 87 international special character fonts and control codes. In addition it has 103 semi-graphic fonts so you can assemble graphic drawings by using codes — see **Appendix A**, those characters are put in some addresses the ASCII code table instead of the standard characters and these can be accessed by a particular control code (or the Dip switch).

Escape codes.

In this section on Control codes, and elsewhere in this manual, you will see references to ESCAPE codes. These should not be confused with the "ESC" key on your Enterprise keyboard. These codes perform special functions, the ESCAPE character (CHR\$(27) sent to the printer followed by further characters to define the particular function required.

The functions could be as follows:—

- (1) To format a sentence.
- (2) To do emphasized printing.
- (3) To program the paper end detector.
- (4) To set column length.
- (5) To underline characters.
- (6) To print superscript/subscript characters.
- (7) To do bit image printing.
- (8) Others.

Generally, printer control codes, are not standardized between printers of different makes.

The "Escape" codes used in the printer should not be confused with the "Escape" key on your Enterprise keyboard — so familiarize yourself with these control codes.

"+" **symbol**

You will often see "+" symbol in the explanation or description of control

codes in this manual.

This symbol is used for legibility only and should not be typed into your actual program.

2. D (or Dec.) and H (or Hex.)

() 2. () D and < H respectively represent binary, decimal and hexademical numbers.

1. Control codes in the text mode.

With the **Printer** two standard operation modes are available. One is the Text Mode which prints corresponding characters on normal **ASCII** coded, inputs, and the other, the Bit Image Mode which permits printing of pictures and images in dot configurations. The Text Mode is described in this section while the Bit Image Mode is covered in the following section.

This printer has been designed as a terminal unit capable of various software controls. When control codes are transferred to the printer, respective functions governed by these codes such as form feed, line feed, etc. are executed immediately. In order to permit the printer to fully exhibit these functions, careful reading and thorough understanding of the following control codes are recommended. In this section, first the control codes in text mode are classified into groups. These two modes are not fully independent of each other in that parameters set in the Text Mode are also effective in Bit Image.

a. Print action codes.

CR	Carriage return
LF	Line feed
FF	Form feed
VT	Vertical tablation

b. Paper formatting control codes.

ESC 3n	Set line spacing to n/216"
ESC An	Set line spacing 7/72"
ESC 1	Sets line spacing to 7/72"
ESC ø	Sets line spacing to 1/8" 8LPI, 3.18mm)
ESC 2	Sets line spacing 1/6" (6 LPI, 4.23mm)
ESCJ n	Print and paper forward feed
ESC j n	Print and paper reverse feed
ESC Q n	Sets column length (right margin)
ESC I n	Sets column length (left margin)
ESC C n	Sets form length by number of lines
ESC C øm	Sets form length by value of inch
FF	Form feed execution
ESC O	Cancels skip-over perforation
ESC B n ₁ — n _k NUL	Sets vertical tablation value
VT	Vertical tabulation execution
ESC b nm ₁ m ₂ — m _k NUI	Sets vertical format units value (VFU)
ESC/n	Selects VFU
ESC D n ₁ n ₂₀₀ n _k NUI	Sets horizontal tab value
HT	Horizontal tabulation execution
ESC i n	Increment print (typewriting)

c. Character designation codes.

SO	Shift out, enlarged character setting
ESC W n	Enlarged mode setting
DC 4	Cancels enlarged mode
SI	Shift in, condensed character print
DEC 2	Cancels condensed mode
ESC E	Sets emphasized mode
ESC F	Cancels emphasized mode
ESC G	Sets double-stroke mode
ESC H	Cancels double-stroke mode
ESC M	Sets "ELITE" print mode
ESC P	Sets "PICA" print mode
ESC S ø	Sets superscript mode
ESC S 1	Sets subscript mode
ESC T	Cancels super/subscript mode
ESC ! n	Print mode selection
ESC p n	Proportional print selection
ESC — ø	Cancels underlined printing mode
ESC — 1	Sets underlined printing mode
ESC R n	International character set selection
ESC % 1	Download CG selection
ESC : n 1	Copy the character of internal CG to download CG
ESC & nmap ₁ p ₂ — p ₈	Download character definition
ESC ? O	Selects SO at 7 bits code
ESC ? I	Selects SI at 7 bits code
ESC SO	Same as SO
ESC SI	Same as SI

d. other codes.

ESC@	Printer initialization
ESC 8, ESC 9	Deselection and selection of paper end sense
BEL	Buzzer
BS	Back space
CAN	Cancel
DEL	Delete
NUL	Null
ESC <	Printing from left to right for one line
ESC U n	Sets and resets unidirectional printing
DC 1	Selection of the printer (ON LINE)
DC 3	Deselection of the printer (OFF LINE)

e. Access codes to Bit Image mode — see Paragraph 6.

ESC K n ₁ n ₂	Normal density bit image (8 bits) mode
ESC L n ₁ n ₂	Double density bit image (8 bits) mode
ESC L n ₁ n ₂	Double density bit image (8 bits) mode
ESC ^ m n ₁ n ₂	Selects 9 dots bit image mode

2. Print action codes.

b. CR (carriage return) CHR\$ (13);

When the **CR** code is transmitted to the print buffer, all data stored in the print buffer is printed. When **AUTO FEED XT** (pin No. 14 of the interface connector) is at "LOW" level, the paper is advanced one line automatically after the execution of printing by the **CR** code.

- Notes: (1) When 80 columns of print data (including spaces) are continuously received and the following data is valid and printable, the printer automatically begins to print the data stored in the print buffer. (In this case, if **AUTO FEED XT** is at "LOW" level, the paper is advanced one line after printer.)
- (2) If no data precedes the **CR** code, or if all preceding data is **SPACE**, the carriage assembly does not operate. Under this condition, if **AUTO FEED XT** is at "LOW" level, only the paper is advanced one line.
- (3) When all 80 columns of data are **SPACE**, the carriage assembly does not operate. Under this condition, if **AUTO FEED XT** is at "LOW" level, only paper feeding is performed.

b. LF (line feed) CHR\$ (10);

When the **LF** code is input, all data in the print buffer is printed and the paper is advanced one line if no data precedes the **LF** code, or if all preceding data is **SPACE**, only paper feeding is performed. For example, if the data is transferred in the order of **DATA — Cr — LF**, data will be printed by the **CR** code, and when the printer receives **LF** code, it only carries out one line feed, because no print data precedes the **LF** code. **LF** cancels enlarged mode, set by **SO**.

c. FF (form feed) CHR\$ (12);

The **FF** code causes the printer to execute the printing of all data stored in the print buffer and advances the paper to the next predetermined top of form position.

- Notes: (1) The top of form is determined when the power switch is turned on or the **INIT** signal is applied, or when the **ESC@** code is input.
- (2) If the form length per page is not set, one page length of form is regarded as 66 lines set in the **ON** position.
- (3) The form length can be set by **ESC C + (n)D** or **ESC C + (0)D + m** as described in this manual.

d. VT (vertical tabulation) CHR\$ (11);

When this code is input, all the data stored in the print buffer is printed out and then rapid line feed is performed to the predetermined vertical **TAB** position set by **ESC B** or **ESC b**.

If the vertical **TAB** position is not predetermined, this code functions the same as **LP** code. This code cancels the enlarged mode set by the **SO** code. If only one vertical **TAB** position is set line feed will be performed to this position or to the top of form position.

3. Paper formatting codes.

a. ESC 3 + (n)D (N/216 inch line spacing) CHR\$ (27); "3"; CHR\$ (n);

($0 \leq n \leq 255$)

Input of the **ESC 3 + (n)D** code causes the subsequent line spacing to be set at $n/216$ inch.

With $n = 1$ and $n =$, paper feeding accuracy is not guaranteed. If the value of n is set at 0, this setting is ignored and the value of n set immediately before this code becomes valid.

[PROGRAM EX.]

```
100 PROGRAM "ESC_3_n"
110 ! Define Control Codes
120 LET SO$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LPRINT SO$;"ESC 3 n"
140 FOR I=10 TO 40 STEP 10
150   LPRINT ESC$;"3";CHR$(I);
160   LPRINT HT$;"Line spacing ";I;"/216 inch_____"
170 NEXT I
180 LPRINT ESC$;"2";LF$
190 END
```

[PRINT]

ESC 3 n

```
Line spacing  20 /216 inch =====
Line spacing  30 /216 inch -----
Line spacing  40 /216 inch -----
```

- b. **ESC A + (n)D** (setting amount of line spacing) **CHR\$(27); "A", CHR\$(n)**; This code specified the amount of the line spacing in the Line Feed, provided that **(n)D** must satisfy the condition: $1 \leq (n)D \leq 85$ (Decimal). " $n = 1$ " is equivalent to $1/72$ inch paper advancement. Since the distance between any two dot positions of the print head is $1/72$ inch, any line spacing in increments proportional to the distance between the dot positions can be established.

- Notes:** (1) When the **POWER** switch is turned on or **INIT** signal is applied to the pin No. 31 of the interface connector, the line spacing is set at $1/6$ inch.
- (2) The **ESCA + (n)D** code may be input at any position on a line. However, once the code is input, the specified amount of line spacing will remain unchanged until a code for new line spacing is sent.

[PROGRAM EX.]

```
100 PROGRAM "ESC_A_n"
110 ! Define Control Codes
120 LET SO$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LPRINT SO$;"ESC A n"
140 FOR I=1 TO 8 STEP 2
150   LPRINT ESC$;"A";CHR$(I);
160   LPRINT HT$;"Line spacing ";I;"/72 inch_____"
170 NEXT I
180 LPRINT ESC$;"2";LF$
190 END
```

[PRINT]

ESC A n

Line spacing 2 1/32 inch =====
Line spacing 8 1/32 inch =====

Note: <How to input "n">

When "n" is actually transferred to the Printer as data, it is transferred in the form of a 7-bit binary number. In case of "ESC A + (24)D" to specify the amount of line spacing at $24/72 = 1/3$ inch ($24 = (00011000)_2$), actual output to the Printer is performed as (27)D (65)D(24)D in Decimal code. Keep in mind that the method of input from the keyboard of a host computer is different, for which refer to the specifications of your host computer.

c. ESC 1 (7/72 inch line spacing) CHR\$(27); "1";

Input of the ESC 1 code causes the subsequent line spacing to be set at 7/72 inch.

[PROGRAM EX.]

```
100 PROGRAM "ESC_1"
110 ! Define Control Codes
120 LET SO$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LPRINT SO$;"ESC 1 "
140 FOR I=1 TO 4
150   LPRINT ESC$;"1";CHR$(I);
160   LPRINT HT$;"Line spacing 7/72 inch_____"
170 NEXT I
180 LPRINT ESC$;"2";LF$
190 END
```

[PRINT]

ESC 1

Line spacing 2 1/32 inch -----
Line spacing 2 1/32 inch -----
Line spacing 2 1/32 inch -----
Line spacing 7 1/72 inch -----

d. ESC 0 (1/8 inch line spacing) CHR\$(27); "0";

Input of the ESC 0 code causes the subsequent line spacing to be set at 1/8 inch.

[PROGRAM EX.]

```
100 PROGRAM "ESC_0"
110 ! Define Control Codes
120 LET SO$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LPRINT SO$;"ESC 0 "
140 FOR I=1 TO 4
150   LPRINT ESC$;"0";CHR$(I);
160   LPRINT HT$;"Line spacing 1/8 inch_____"
170 NEXT I
180 LPRINT ESC$;"2";LF$
190 END
```


[PRINT]

ESC O

```
Line spacing 1/8 inch -----  
Line spacing 1/8 inch -----  
Line spacing 1/8 inch -----  
Line spacing 1/8 inch -----
```

- e. ESC 2 (1/6 inch line spacing) CHR\$(27); "2";
Input of the ESC 2 code causes the subsequent line spacing to be set at 1/6 inch.
- f. ESC J + (n)D (Paper Feed Execution Command) ($1 \leq n \leq 255$)
CHR\$(27); "J"; CHR\$(n);
This code causes the printer to execute paper feeding by $n/216$ inch. With $n=1$ and $n=2$ paper feeding accuracy is not guaranteed. If the value of n is set as 0, no paper feeding will be executed. In any case, the set value of n will not return in the memory.

[PROGRAM EX.]

```
100 PROGRAM "ESC_J_n"  
110 ! Define Control Codes  
120 LET S0$=CHR$(14):LET ESC$=CHR$(27):LET LF$=CHR$(10)  
130 LPRINT S0$;"ESC J n"  
140 FOR I=10 TO 40 STEP 10  
150   LPRINT I;"/216 inch-----";  
160   LPRINT ESC$;"J";CHR$(I);  
170 NEXT I  
180 LPRINT ESC$;"2";LF$  
190 END
```

[PRINT]

```
ESC J n  
10 /216 inch ----- 20 /216 inch ----- 30 /216 inch ----- 40 /216 inch -----
```

- g. ESC j
CHR\$(27); "j"; CHR\$(n);
When this code is input, $n/216$ inch line spacing is executed in the reverse direction after the data in the print buffer has been printed out. The set value of n will be cancelled by line feed. The accuracy of paper feed is not guaranteed.
- h. ESC Q + (n)D (right margin setting) CHR\$(27); "Q"; CHR\$(n);
The print column width can be specified by inputting ESC Q + (n)D code, "n" represents the print column width to be specified in each character size. The Printer will ignore the improper setting of n value. See **Appendix B** in relation to the value of n .
If data greater than the value set in this code is input, the printer will automatically perform a line feed.
In proportional mode, the print column width is set in "PICA" size.

[PROGRAM EX.]

```
100 PROGRAM "ESC_Q_n"
110 ! Define Control Codes
120 LET S0$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LPRINT S0$;"ESC Q n"
140 LPRINT HT$;"The right margin is at 70 characters"
150 LPRINT ESC$;"Q";CHR$(70);
160 FOR I=32 TO 126
170   LPRINT CHR$(I);
180 NEXT I
185 LPRINT LF$;LF$
190 LPRINT ESC$;"Q";CHR$(80)
200 END
```

[PRINT]

```
ESC Q n
      The right margin is at 70 characters
!"!$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcde
fghijklmnopqrstuvwxyz{|}~
```

- i. **ESC I + (n)D** (left margin setting) **CHRS\$(27); "I"; CHR\$(n);**
The difference between the functions of **ESC Q** and **ESC I** is that **ESC Q** sets the column end and **ESC I** sets the column head.
This code cancels HT, previously set.
See **Appendix B** in relation to the value of n.

[PROGRAM EX.]

```
100 PROGRAM "ESC_I_n"
110 ! Define Control Codes
120 LET S0$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LPRINT S0$;"ESC I n"
140 LPRINT HT$;"The left margin is at 10 characters"
150 LPRINT ESC$;"I";CHR$(10);
160 FOR I=32 TO 126
170   LPRINT CHR$(I);
180 NEXT I
185 LPRINT LF$;LF$
190 LPRINT ESC$;"I";CHR$(10)
200 END
```

[PRINT]

```
ESC I n
      The left margin is at 10 characters
!"!$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcde
fghijklmnopqrstuvwxyz{|}~
```

- j. **ESC C + (n)D** (form length setting) **CHRS\$(27); "C"; CHR\$(n);**
The "**ESC C + (n)D**" code specifies the form length which is determined by the number of line (n: $1 \leq n \leq 127$) where the value of "n" is a positive number and must not exceed 127 lines. In other words, the maximum form length is 127 lines.
Form feed, skip-over perforation, etc., are carried out in accordance with the form length specified by this code.
The form length will be stored as an absolute length with the amount of line spacing multiplied by the specified number of lines. Therefore,

the specified form length will not change after it has once been set even if the amount of line spacing is changed.

The **ESC C + (Ø)D + (m)D** code specifies the absolute quantity of form length in units of inches ($1 \leq m \leq 22$). Therefore, even if the amount of line spacing units is changed on the page, the absolute quantity of form length remains unchanged. "m" denotes the form length in inches. If the value of m is set as 0, this setting is ignored and the value of m set immediately before it becomes valid.

[PROGRAM EX.]

```
100 PROGRAM "ESC_C_n"
110 ! Define Control Codes
120 LET SO#=CHR$(14):LET ESC#=CHR$(27):LET HT#=CHR$(9):LET LF#=CHR$(10)
130 LET FF#=CHR$(12)
140 LPRINT SO#;"ESC C n"
150 LPRINT HT#;"The form length is set to 4 lines."
160 LPRINT ESC#;"C";CHR$(4);FF#;
170 LPRINT "Next top of form."
180 LPRINT ESC#;"C";CHR$(66);LF#
190 END
```

[PRINT]

```
ESC C n
    The form length is set to 4 lines.
```

Next top of form.

[PROGRAM EX.]

```
100 PROGRAM "ESC_C_0_n"
110 ! Define Control Codes
120 LET SO#=CHR$(14):LET ESC#=CHR$(27):LET HT#=CHR$(9):LET LF#=CHR$(10)
130 LET FF#=CHR$(12)
140 LPRINT SO#;"ESC C 0 n"
150 LPRINT HT#;"The form length is set to 1 inch."
160 LPRINT ESC#;"C";CHR$(0);CHR$(1);FF#;
170 LPRINT "Next top of form."
180 LPRINT ESC#;"C";CHR$(66);LF#
190 END
```

[PRINT]

```
ESC C 0 n
    The form length is set to 1 inch.
```

Next top of form.

- k. **ESC N + (n)D** (setting skip-over perforation) **CHR\$(27); "N"; CHR\$(n);**

The **ESC N + (n)D** code is used to set the skip-over perforation function, which specifies the number of lines “n” to be skipped at the bottom of a page $1 \leq n \leq 127$ where the value of n is positive number. For example, if the last three lines of a page is to be skipped, the value of n must be entered as “3”. If the value of n set is greater than the form length specified by the **ESC C + (n)D** code, skip-over perforation is executed up to the first line of the next page after one line printing. If the value of n is set as 0, this setting is ignored and the value of n set immediately before it becomes valid.

When the current form length is changed by the input of the **ESC C + (n)D** or set is cancelled. In this case, therefore, the **ESC N + (n)D** code must be input again to set the amount of skip-over perforation.

When the SW-6 on Function Selector — Ref. SEC. B, 4, — is ON, skip-over perforation for 1 inch is executed.

(Example) -line skip-over perforation

[PROGRAM EX.]

```
100 PROGRAM "ESC_N_n_ESC_0"
110 ! Define Control Codes
120 LET SO$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
140 LPRINT SO$;"ESC 0 "
145 LPRINT ESC$;"C";CHR$(5)
146 LPRINT ESC$;"N";CHR$(2)
147 FOR I=1 TO 5
150 LPRINT HT$;"2 lines skip over perforation."
151 NEXT I
180 LPRINT ESC$;"C";CHR$(66);
185 LPRINT ESC$;"O";LF$
190 END
```

[PRINT]

ESC 0

2 lines skip over perforation.

2 lines skip over perforation.
2 lines skip over perforation.
2 lines skip over perforation.

2 lines skip over perforation.

L. ESC O

This code cancels the skip-over perforation set by the **ESC N « (n)D** code.

m. ESC B (vertical TAB setting) CHR\$(27); "B"; CHR\$(n₁); ...; CHR\$(n_k); CHR\$(0); ($1 \leq n \leq 255$) ($1 \leq k \leq 16$)

This code sets the vertical TAB position on the specified lines.

Since the current line spacing multiplied by the number of lines is stored as an absolute value for the TAB stop position, the vertical TAB setting will be performed as it has been set in this code even if the amount of the line spacing is changed.

Vertical TAB setting should be terminated by inputting a **NUL** code.

Note: If TAB positions are not set in an orderly manner, the TAB execution is terminated. TAB positions set by **ESC B** are the same as those set by **ESC b 0**.

[PROGRAM EX.]

```
100 PROGRAM "ESC_B_n1____nK_NUL"
110 ! Define Control Codes
120 LET SO$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LET VT$=CHR$(11):LET DC4$=CHR$(20)
140 LPRINT SO$;"ESC B n1____nK NUL";
150 LPRINT DC4$;LF$;HT$;"with step of 8 lines."
160 LPRINT ESC$;"B";
170 FOR I=1 TO 8
180   LPRINT CHR$(I*8);
190 NEXT I
200 LPRINT CHR$(0);
210 FOR I=1 TO 3
220   LPRINT VT$;HT$;"____Vtab."
230 NEXT I
240 LPRINT LF$;LF$
250 END
```

[PRINT]

```
ESC B n1____nK NUL
with step of 8 lines.
```

```
-----Vtab
```

```
-----Vtab
```

```
-----Vtab
```

n. ESC b (VFU position setting)

CHR\$(27); "b"; CHR\$(n); CHR\$(m₁); ...; CHR\$(m_k); CHR\$(0);
(0 ≤ n ≤ 7) (1 ≤ k ≤ 16) (1 ≤ m ≤ 255)

This code sets the VFU (vertical format unit) position for channel n. For details of VFU, refer to **ESC/code**.

The specified TAB positions must be terminated with NUL code.

The VFU has 8 channels — refer as "n" - (0 to 7), and for each channel, up to 16 positions — refer as "m" — can be within the page length.

The channel is set to 0 at power ON.

Note: TAB positions in channel 0 can be set by **ESC B**.

o. ESC/ + (n)D (VFU channel selection) **CHR\$(27); "/" ; CHR\$(n); 0 ≤ n ≤ 7:**

Input of this code causes the printer to execute subsequent vertical

TABs in accordance with the format specified by the channel n of VFU.

Under VFU control, a page can be divided into channels within which vertical TABs can be independently set. For example, can be set for vertical TABs at the 3rd, 5th and 15th lines and channel 2 for the 6th, 10th and 30th lines.

p. HT (horizontal tabulation) CHR\$(9);

The **HT** code carries out the horizontal tabulation to a predetermined position set by "**ESC D**" (up to 32 positions). In the absence of any predetermined **HT** position, the **HT** code will be ignored. In enlarged character mode, two non-enlarged characters correspond to one enlarged character.

When the power is turned ON, TAB is automatically set every 8 characters.

The **HT** code will be ignored if no TAB position has been set previously by the **ESC D** code.

Since the TAB set position is stored as an absolute position, this position will not change even if you change the print mode. Horizontal TAB will be cancelled upon input in **ESC I**.

q. ESC D + n₁ + n₂ + ... + n_k + NUL (horizontal TAB setting) (1 ≤ (n₁ + n₂ + ... + n_k) ≤ 142, k ≤ 32) CHR\$(27); "D"; CHR\$(n₁); CHR\$(n_k); CHR\$(0);

This code specifies the horizontal tab stop position. "n" denotes column position where the print head stops. The first tab stops per line are recognized in the printer, and subsequent tab stops are ignored. The tab stop positions can be specified up to 80 columns in normal character mode and 142 columns in condensed character mode. The excess tab positions set by this code will be ignored.

In enlarged character mode, two non-enlarged character must be set as one character. The NUL code should be input as the command for the termination of the tab set sequence, and the lack of this code will cause incorrect data printout.

[PROGRAM EX.]

```
100 PROGRAM "ESC_D_n1____nK_NUL"
110 ! Define Control Codes
120 LET SO$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LPRINT SO$;"ESC D n1____nK NUL"
140 LPRINT HT$;"with step of 10 characters."
150 LPRINT ESC$;"D";
160 FOR I=1 TO 8
170   LPRINT CHR$(I*10);
180 NEXT I
190 LPRINT CHR$(0);
200 FOR I=1 TO 3
210   LPRINT HT$;"'Htab";
220 NEXT I
230 LPRINT LF$;LF$
240 END
```

[PRINT]

```
ESC D n1____nK NUL
with step of 10 characters.
'Htab 'Htab 'Htab
```

- r. **ESC i + (n)D** (incremental print) **CHR\$(27); "i"; CHR\$(n); (n = 0 or 1)**
ESC i + (1)D code causes the printer to print each character every time it is input — incremental mode.
ESC i + (0)D code causes the printer return to normal operation. Printing is unidirectional in the incremental mode. When the incremental mode is cancelled, the printer will return to bidirectional printing.

4. Character designation codes

- a. **SO** (Shift Out) (enlarged characters) **CHR\$(14);**
 When the **SO** code is input, all data that follow this code on the same line will be printed out in double-width enlarged characters. This code is cancelled by the line feed or the input of "**DC 4**" **ESC !** or **ESC W** code and can be input at any column position on a line. Therefore, normal size and enlarged characters can be mixed on the same line.
Note: With normal size and enlarged characters mixed on the same line, when any enlarged character is at the 80th column position in terms of normal size character, this position becomes the end position of the line (i.e., "Print Buffer Full" position).
- b. **ESC W + (n)D** (enlarged mode setting) **CHR\$(27); "W"; CHR\$(n); (n = 0 or 1)**
 When the **ESC W + (1)D** code is input, all the data following this code will be printed out in double-width enlarged characters. This code is cancelled upon input of the **ESC W + (0)D** (but cannot be cancelled by "**DC 4**" code or "**LP**" code).
 The **ESC W + (0)D** code cancels the double-width enlarged character mode set by the **ESC W + (1)D** code. However, this does not cancel the enlarged character mode set by the **SO** code.
- c. **DC 4** (enlarged mode cancel) **CHR\$(20);**
 The **DC 4** code cancels the **SO** mode (enlarged character printing function.)
- d. **SI** (Shift In) (condensed characters) **CHR\$(15);**
 When the **SI** code is input, all data stored in the buffer is printed and the following data will be printed out in condensed characters. This code is cancelled by the input of "**DC 2**" or **ESC !** code. The **SI** code can be input at any column position on a line. When printing condensed characters, the data capacity of the print buffer will become 142 columns per line (in terms of condensed size character). When the **SO** code is received after the input of the **SI** code, condensed enlarged characters (double width of condensed characters) can be printed.
- e. **DC 2** (condensed mode cancel) **CHR\$(18);**
 The **DC 2** code cancels the condensed mode set by the **SI** code.

[PROGRAM EX.]

```
100 PROGRAM "ESC_SI;_SI;_DC2_"
110 ! Define Control Codes
120 LET S0$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LET DC2$=CHR$(18):LET SI$=CHR$(15)
140 LPRINT S0$;"ESC SI ; SI ; DC2 "
150 LPRINT HT$;"NORMAL: ";SI$;
160 FOR I=1 TO 3
170   LPRINT "REDUCTION ";
180 NEXT I
190 LPRINT DC2$;"NORMAL.";LF$
200 END
```

[PRINT]

```
ESC SI ; SI ; DC2
NORMAL: REDUCTION REDUCTION REDUCTION NORMAL.
```

- f. **ESC E** (emphasized characters) **CHR\$(27); "E";**
When the **ESC E** code is input, all the data stored in the print buffer will be printed out and the data following this code will be printed in emphasized characters. Emphasized character printing gives the character a stronger impression on the paper. This code is effective only on the "PICA" size print mode. Selection of this code can override the condensed mode, therefore selection and deselection of this code on the condensed mode will return the printer to condensed mode. **ESC F** or **ESC !** code cancels **ESC E**.
- g. **ESC F** (emphasized mode cancel) **CHR\$(27); "F";**
The **ESC F** code cancels the emphasized character printing mode.
- h. **ESC G** (double printed characters) **CHR\$(27); "G";**
When the **ESC G** code is input, all the data stored in the printer buffer will be printed out and the data following this code will be printed in double print character mode. In this mode, the printer will complete one line of printing by two passes of the print head while advancing the paper by about 1/215 inch between the first pass and second pass. For this reason, the printer performs paper feeding adjustment to maintain the absolute length and number of lines of a page.
- i. **ESC H** (double print mode cancel) **CHR\$(27); "H";**
The **ESC H** code cancels the double print character mode.
- j. **ESC M** ("ELITE" sized mode setting) **CHR\$(27); "M";**
Input of **ESC M** code causes the data following this code to be printed in "ELITE" size (12 characters per inch). Emphasized on condensed mode setting is ignored in this "ELITE" mode.
- k. **ESC P** ("PICA" sized mode setting) **CHR\$(27); "P";**
When the **ESC P** code is input, the all data following this code is printed out in "PICA" size characters.
This code cancels the "ELITE" sized mode.
- l. **ESC S + (0)D** and **ESC S + (1)D** (superscript and subscript setting) **CHR\$(27); "S", CHR\$(0);** and **CHR\$(27); "S"; CHR\$(1);**
When the **ESC S + (0)D** code is input, all the data stored in the print buffer will be printed out and the data following this code will be

printed in superscript character mode. In this mode, a character measuring 2.22 (W) x 1.4 (H) mm will be printed at the upper half of a line. When the **ESC S + (1)D** code is input, all the data stored in the print buffer will be printed out and the data following this code will be printed in subscript character mode. In this mode, a character will be printed at the lower half of a line.

In both the subscript and subscript character modes, the printer will perform unidirectional, double strike printing. After the first pass of the print head, the paper will be advanced by 1/216 inch and a character will be formed on completion of the second pass.

- m. **ESC T** (superscript/subscript mode cancel). **CHR\$(27); "T";**

The **ESC T** code cancels the superscript/subscript character mode, but leaves the double print mode. To reset the double print mode, the **ESC H** code must be input.

- n. **ESC ! + (n)D** (print mode selection) **CHR\$(27); "I"; CHR\$(n);**

This code specifies the print mode.

Each print mode is determined by the value of n as follows.

n = 0 - "PICA" mode	n = 32 - enlarged mode
n = 1 - "ELITE" mode	n = 33 - "ELITE"/enlarged mode
n = 4 - condensed mode	n = 36 - cond./enlarged mode
n = 8 - emphasized mode	n = 40 - empha./enlarged mode
n = 16 - double strike mode	n = 48 - double str./enlarged mode
n = 17 - "ELITE"/double strike mode	n = 49 - "ELITE"/double str./enlarged
n = 20 - condensed/double strike mode	n = 52 - cond./double str./enlarged
n = 24 - emphasized/double strike mode	n = 56 - empha./double str./enlarged

This code takes precedence over other commands which set the print mode.

The precedence of print mode is as shown below.

emphasized > condensed > normal
superscript/subscript > double strike

- o. **ESC p + (n)D** (proportional spacing mode) **CHR\$(27); "p"; CHR\$(n); (n @ 0 or 1)**

This code is used to select proportional spacing print.

n = 1 ... proportional spacing select

n = 0 ... normal spacing

In proportional spacing mode, BS and DEL are not accepted. Also, printing is always performed in emphasized mode.

- p. **ESC - (minus) + (n)D** (underline print mode set/reset) n = 0 or 1) **CHR\$(27); "-"; CHR\$(n);**

Input of the **ESC - (minus) + (1)D** code places the Printer in the underline print mode. All the data following this code will be printed with an underline. The **ESC - (minus) + (0)D** code cancels the underline print mode.

[PROGRAM EX.]

```

100 PROGRAM "ESC_-_n"
110 ! Define Control Codes
120 LET SO$=CHR$(14):LET ESC$=CHR$(27):LET HT$=CHR$(9):LET LF$=CHR$(10)
130 LET DC2$=CHR$(18):LET SI$=CHR$(15)
140 LPRINT SO$;"ESC - n"
160 LPRINT HT$;"Normal ";ESC$;"-";CHR$(1);"Underlined printing ";
170 LPRINT ESC$;"-";CHR$(0);" Normal.";LF$;LF$
180 END

```

[PRINT]

```

ESC - n
Normal Underlined printing Normal.

```

- q. ESC R + (n) (selection of character generation sets) ($0 \leq n \leq 23$)
 CHR\$(27); "R"; CHR\$(n);

When the ESC R (n) code is input, the all data following this code are printed out in the characters of the selected character set specified by n. This specified character set will be valid until selection is changed by the other ESC R (n) code.

"n" represents the one of the internal character sets as follows.

(n)D value	C.G. Set
10	ASCII (Normal) + Graphic
11	French + Graphic
12	German + Graphic
13	British + Graphic
14	Danish + Graphic
15	Swedish + Graphic
16	Italian + Graphic
17	Spanish + Graphic
18	Alpha-numeric (JIS) + Graphic
19	ASCII in italic font + Graphic
20	ASCII in italic and normal font
21	ASCII + Greek
23	JIS fonts + Greek

For the specific code tables, refer to **Appendix A**.

- r. ESC + (n)D + D + (a)D + (p₂)D + (p₃)D + (p₈)D

(download character definition)

CHR\$(27); "&"; CHR\$(n); CHR\$(m); CHR\$(a); CHR\$(p+);
 CHR\$(p-); CHR\$(x); ... CHR\$(p±);

This code defines a download character into ASCII codes (n)D to (m)D of the download C.S. in dot format patterns of 8 bits/byte in decimal values from left to right as P₁ P₂, P₃, ...P₈/character matrix.

(n)D & (m)D can be selected as $33 \leq n \leq m \leq 254$ but $126 \leq n \leq m \leq 127$ will be ignored. If download character is defined into ASCII n code only, $n = m$.

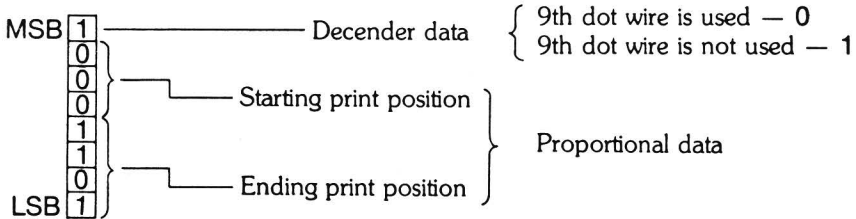
(a)D should be 0 or 1 as follows.

a = 0 No attribute information, the all P₁ thru P₈ can be used for

forming the character.

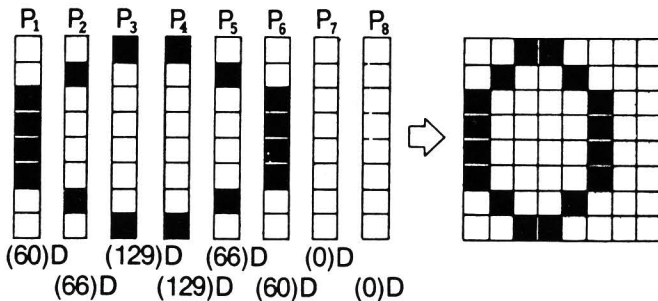
$a = 1$ P_8 should be defined as the attribute information byte, therefore the character font should be formed in the area of P_1 thru P_7 .

On this case P_8 (attribute information byte) should be specified in the following manner.



In the above figure, the high-order 3 bits of 7-bit proportional data represent the starting print position and the remaining 4 bits indicate the ending position. In this example, P_8 (attribute info. byte) is (139)D. For defining the down load character, the SW-1 on the function selector switch board should be ON.

Note: A maximum of 8 horizontal positions (with $a = 0$) or 7 horizontal positions (with $a = 1$) in a download character.



- s. **ESC % + (1)D** (download C.S. selection) **CHR\$ (27); "%"; CHR\$ (1);**

The selector switch SW-1 on the P.C. board should be ON.

This selects the download character set which has been previously defined in RAM.

Selection of the any internal C.S. by the **ESC R + (n)D** code cancels this code.

- t. **ESC : + (n)D + (1)D** (copy the internal C.S. to download C.S) **CHR\$ (27); ":"; CHR\$ (n); CHR\$ (1);**

(n)D value should represents the internal C.S. set which should be copied to download C.S. referring to the (n) value on the **ESC R (n)D** code.

The internal C.S. with italic font can not be copied to download C.S., the code will be ignored if specified.

- u. **ESC ? O** (Select Shift Out area of C.S. at 7 bit code)

CHR\$ (27); “?”; “O”;

This code defines the character selection be made from the Shift Out are of C.S. at designates the character (193)D for definition under 7 bit code.

- v. **ESC ? I** (Cancel **ESC ? O** code) **CHR\$ (27); “?”; “I”;**

This code cancels **ESC ? O** code.

- w. **ESC SO** Same as **SO**.

- x. **ESC SI** Same as **SI**.

5. Other codes

- a. **Esc @** (printer initialization) **CHR\$ (27); “@”;**

Input of the **ESC @** code causes the Printer to be initialized.

- b. **ESC 8** (deselection of the paper end detector) **CHR\$ (27); “8”;**

The **ESC 8** code makes it possible to transmit data even if there is no paper in the Printer. Since this code causes the **P.E.** signal to be ignored, data may be printed to the last page of the form without waste of paper.

- c. **ESC 9** (selection of paper end detector) **CHR\$ (27); “9”;**

This code cancels the **ESC 8** condition, and reinstates the **PE** signal. Therefore, the printer cannot receive data when there is no paper.

- d. **BEL** (Bell) **CHR\$ (7);**

When the **BEL** code is input, the buzzer sounds for about 0.3 second. Optional use of this code is recommended to arouse the attention of the operator.

- e. **BS** (Backspace) **CHR\$ (8);**

When the **BS** code is input, the data stored in the buffer is printed and the buffer pointed is decremented by 1. The next character will overstrike the last character printed. In the enlarged character mode, **BS** is effective only for the last byte.

- f. **CAN** (cancel) **CHR\$ (24);**

When this code is input, the all data previously stored in the print buffer on the same line is cancelled.

- g. **DEL** (Delete) **CHR\$ (127);**

Input of the **DEL** code causes the last byte stored in the print buffer to be cleared.

- h. **NUL** (Null) **CHR\$ (0);**

The **NUL** code is regarded as the termination for tabulation setting sequence inidirectional print mode and underline mode. The lack of the **NUL** code would cause incorrect data printout.

- i. **ESC <** (printing from left to right for one line) **CHR\$ (27); “<”;**

When this code is input, the print head returns to its left position and data is printer unidirectionally from left to right for one line.

- j. **ESC U + (n)D** (unidirectional print) **CHR\$ (27); “U”; CHR\$ (n); n = 0 or 1**

When the **ESC U « (1)D** code is input, printing of all the data following this code will be performed unidirectionally with the print head

moving from the left to the right.

The **ESC U + (Ø)D** code cancels the unidirectional printing mode. use of this code for printing graphs and charts in the unidirectional printing mode assures more accurate printing start position with better printing quality.

k. DC 1 (selection of the printer) CHR\$ (17);

The **DC 1** code places the printer in the Selected-state. It enables the printer to receive data — On-Line condition.

This code is applicable only for returning the state from Deselect-state (Off-line) which had defined by **DC 3** code.

l. DC3 (deselection of the printer) CHR\$ (19);

The **DC 3** code places the printer in the deselected-state (Off-line)

The relationship between the ON-LINE button, **SLCT IN** signal, **DC1/DC3** code and interface signals are shown in the table below.

relations among ON-LINE, SLCT IN, DC1/DC3 and Interface Signal

ON-LINE Switch	SLCT IN Signal	DC1/DC3	ERROR	BUSY	ACKNLG	DATA ENTRY
OFF-LINE	HIGH/LOW	DC1/DC3	LOW	HIGH	Not generated	Unable
ON-LINE	HIGH	DC1	HIGH	LOW/HIGH	Generated	Enable (Normal entry)
		DC3	HIGH	LOW/HIGH	Generated	Enable (See Note 2.)
	LOW	DC1/DC3	HIGH	LOW/HIGH	Generated	Enable (Normal entry)

- NOTES:**
1. In the above table, it is assumed that no **ERROR** status exists other than that attributable to the OFF-LINE Mode.
 2. Once **DC 3** is input and the printer enters the deselected state, it will remain in that state until **DC 1** is input. In other words, while the printer is in the deselected state, all input data will be invalid.

6. Control codes in the Bit Image Mode.

Most of the above mentioned control codes are normally used in the text mode.

The control code associate with the Bit Image Mode are **ESC K**, **ESC L** and **ESC** , described here under.

a. ESC K + (n₁)D + (n₂)D (normal density bit image — 8)

CHR\$ (27); "K"; CHR\$ (n₁); CHR\$ (n₂);

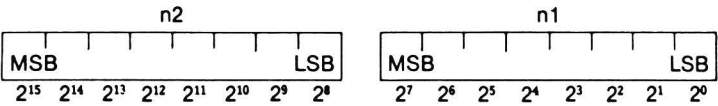
To convert the printer's operation mode from Text to Normal-density Bit Image, the "**ESC K + n₁ + n₂**" code must be input. (Here, the sign "+" is inserted for the purpose of legibility only and should not be input in actual operation.)

Namely when **ESC [(27)D or (155)D]** and **K [(75)D]** codes and data **n₁** and **n₂** are input, the Printer recognizes the data following the

“ESC K” as the bit image data. **n1** and **n2** are the decimal numbers each consisting of 2 digits which define the amount of the bit image data to be transferred. **n1** represents the low-order two digits while **n2** represents the high-order two digits.

In the normal-density bit image processing, the maximum number of dot positions printable per line is 640. Therefore, the values of **n1** and **n2** specified in excess of 640 dot positions are ignored and printing of the bit image data after the 640th dot position is not guaranteed. Mixing of text data and bit image data is possible on the same line.

Note: Assign values to **n1** and **n2**, respectively as follows.

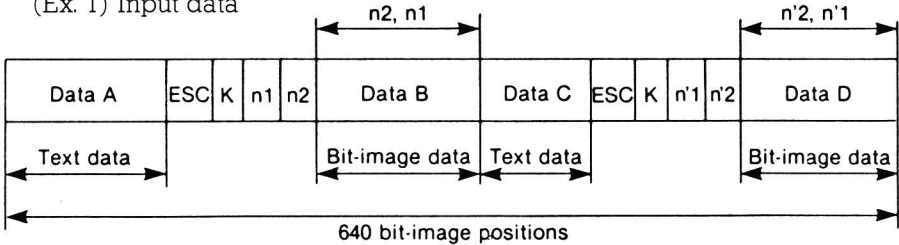


As shown above, **n1** is set decimally as low-order bytes and **n2** as high-order byte.

Text (20 characters)	ESC	K	n = 640 Bit-image data	Next data
----------------------	-----	---	------------------------	-----------

20 characters in text mode correspond to 160 bit-image positions (20 x 8 = 160). So the remaining printable positions in Bit-image mode are 480 (640 – 160 = 480). If 640 data are input as bit-image mode characters, the first 48' data can be printed but the remaining 160 data are ignored and thus not printed.

(Ex. 1) Input data



Printing

Text data A	Bit-image data B	Text data C	Bit-image data D
-------------	------------------	-------------	------------------

\longleftrightarrow

(Ex. 2) Bit image data transfer by standard **BASIC** program to check for proper conversion to the Normal-density Bit Image mode, execute the following program.

[PROGRAM EX.]

```
100 PROGRAM "Graphics_test_1"
110 LPRINT "Graphics mode (ESC +K)"
120 LPRINT CHR$(27);"A";
130 LPRINT CHR$(8);
140 FOR K=1 TO 5
150   LPRINT CHR$(27);"K";CHR$(120);CHR$(0);
160   FOR KO=1 TO 15
170     FOR KI=0 TO 7
180       LPRINT CHR$(2^KI);
190     NEXT KI
200   NEXT KO
210 LPRINT
220 NEXT K
230 LPRINT CHR$(27);"2";
240 END
```

[PRINT]

Graphics mode (ESC +K)



- b. ESC L + (n)D + (n)D (dual density bit image mode — 8 pins)

CHR\$(27); "L"; CHR\$(n); CHR\$(n)D;

When the [(27)D or (155)D] and [(76)D] codes followed by data n1 and n2 are input, the printer's operation mode is converted from Text to Dual-density Bit Image. The transfer sequence of bit image data is the same as with the ESC K (normal density bit image printing), but bit image printing can be performed in twice the dot density in the horizontal direction as with the ESC K. In other words, bit image data can be printed in 1280 dot position per line, thus permitting denser graphic data.

[PROGRAM EX.]

```
100 PROGRAM "Graphics_test_2"
110 LPRINT "Graphics mode (ESC +L)"
120 LPRINT CHR$(27);"A";
130 LPRINT CHR$(8);
140 FOR L=1 TO 5
150   LPRINT CHR$(27);"L";CHR$(120);CHR$(0);
160   FOR LO=1 TO 15
170     FOR LI=0 TO 7
180       LPRINT CHR$(2^LI);
190     NEXT LI
200   NEXT LO
210 LPRINT
220 NEXT L
230 LPRINT CHR$(27);"2";
240 END
```

[PRINT]

Graphics mode (ESC +L)



c. Relationship between data and dot wires

Fig. 13 shows the relationship between the Bit Image data and the needles in the print head. You can control 8 of the wires in the print head.

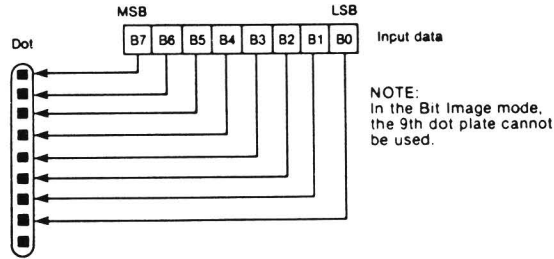
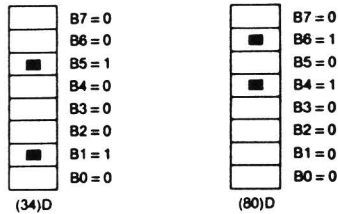


Fig. 13 Relationship between Data and Dot Tips

If a bit 1, the print head fires. If a bit is 0, the print head does not fire. For example, assume that data is given as follows:



Where a box with "■" denotes the bit as 1 and a blank box denotes the bit 0.

According to **Appendix A Code Table**, you can define (00100010)₂ as (34)_D and (01010000)₂ as (80)_D.

As you can see the first 4 bits are defined from column and the second 4 bits are defined from row. Namely, (0101)₂ + (5)_D and (0000)₂ + (0)_D.

d. How to obtain n1 and n2

In the Printer, you have to send the number of data by n1 + n2 in hexadecimal numbers following the **ESC K** or **ESC L**. If the number of bit image data is 300, then n1 and n2 may be derived as follows:

$$\begin{aligned}
 n1 &= (\text{Number of data}) \text{ MOD } 256 \\
 &= 300 \text{ mod } 256 \\
 &= (44)\text{D} \\
 &= <2C> \text{ H} \\
 n2 &= \text{INT} (\text{Number of data}/256) \\
 &= \text{INT} (300/256) \\
 &= (1)\text{D} \\
 &= <01> \text{ H}
 \end{aligned}$$

You can also use **Appendix B Code Table**, to find the corresponding hexadecimal numbers to the decimal numbers. The schematic of data transfer sequence in the Bit Image mode is shown in **Fig. 14**.

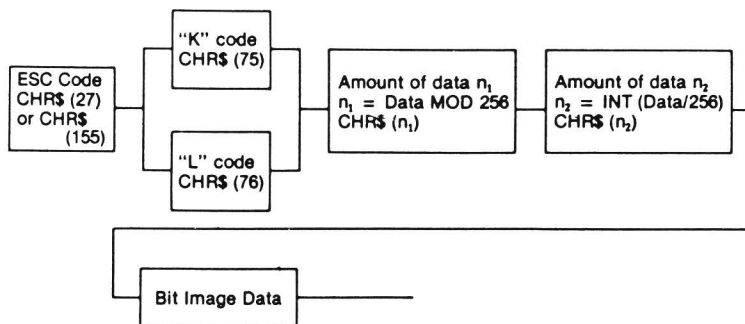


Fig. 14 Data Transfer Sequence in Bit Image Mode

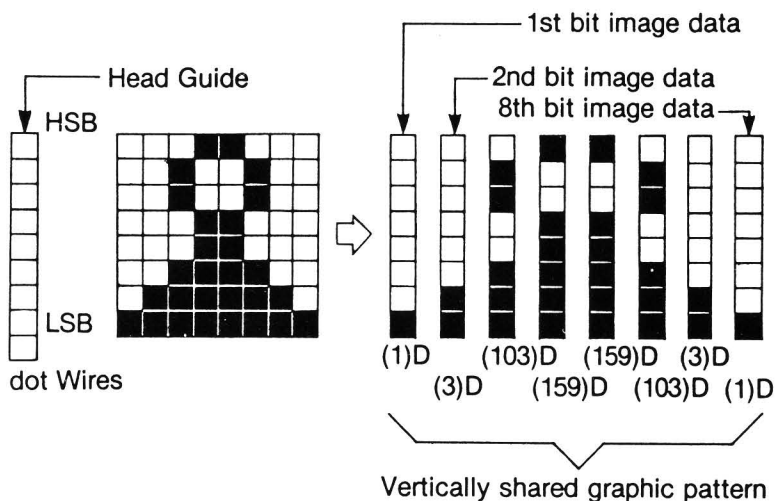


Fig. 15 Example of Graphic Pattern Formation

Note: The most significant bit (MSB) of the bit image data corresponds to the needle at the uppermost position.

- f. ESC + (m)D (n_1) + (n_2) (9-pin bit image mode)
CHR\$ (27); " "; CHR\$ (n_1); CHR\$ (n_2);

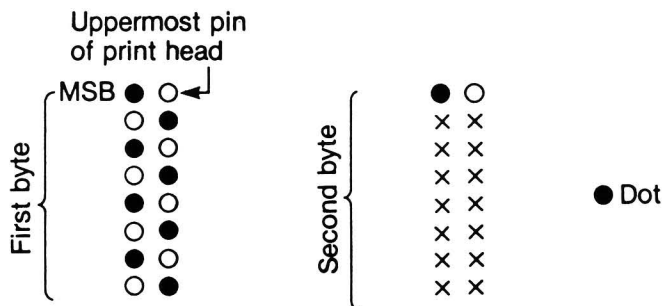
This code sets 9-pin bit image mode.

m value should be defined as follows.

m = 0 — normal dot density, 640 dots/line

m = 1 — normal dot density, 1280 dots/line

Refer to paragraph d. for how to obtain $n1$ and $n2$ values — same as for **ESC K**. As shown in the figure, the 9 pins in the head are divided into the upper 8 pins and the lowest pin, which print in the order of the first and second bytes. These two bytes together control the pattern for a single dot position.



In the figure, data will be sent in the following order.

CHR\$ (170); CHR\$ (128); CHR\$ (85); CHR\$ (0);

Differing from other bit image print codes, the number of dot positions to be printed becomes half of the total number of data bytes sent after $n1$ $n2$.

SECTION E INTERFACES

Parallel Interface of (P) Printer

See Appendix F, in relation to connector pin assignment (Table F-1) and jumpers for functions (SELECT IN and AUTO FEED XT signal) (Table F-2) on the parallel interface board.

APPENDIX A

Selection of International Character Set

ESC R n n: Selection of internal character generator.

Status of slide switch on the P.C. board is determined at default mode.

***** Settings of Slide Switch for Character SET *****

Command ESC R n	Slide Switch					Country	CHARACTER SET
	SW8	SW9	SW10	SW11	SW12		
n= 10	●	○	●	○	●	U.S.A.	A-N +Graphics
n= 11	○	○	●	○	●	France	A-N +Graphics
n= 12	●	●	○	○	○	Germany	A-N +Graphics
n= 13	○	●	○	○	●	Engrand	A-N +Graphics
n= 14	●	○	○	○	●	Denmark	A-N +Graphics
n= 15	○	○	○	○	○	Sweden	A-N +Graphics
n= 16	●	●	●	●	○	Italy	A-N +Graphics
n= 17	○	●	●	●	○	Spain	A-N +Graphics
n= 18	●	○	●	●	○	Japan	A-N +Graphics
n= 19	○	○	●	●	○	U.S.A.	A-N(Italic) +Graphics
n= 20	●	●	○	●	○	U.S.A.	A-N(Normal +Italic)
n= 21	○	●	○	○	○	U.S.A.	A-N +Greece
n= 23	○	○	○	●	○	Japan	A-N +Greece

(Comment: ○ =ON Slide Switch, ● =OFF Slide Switch)

n= 10 : ASCII +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
LOWER BIT	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	NUL	SP	0	1	2	3	4	5	6	7	8	9	A	B	C	D
1	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G
2	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
3	100	101	110	111	120	121	122	123	124	125	126	127	128	129	130	131
4	1000	1001	1010	1011	1100	1101	1110	1111	1200	1201	1210	1211	1220	1221	1230	1231
5	10000	10001	10010	10011	10100	10101	10110	10111	11000	11001	11010	11011	11100	11101	11110	11111
6	100000	100001	100010	100011	100100	100101	100110	100111	101000	101001	101010	101011	101100	101101	101110	101111
7	1000000	1000001	1000010	1000011	1000100	1000101	1000110	1000111	1001000	1001001	1001010	1001011	1001100	1001101	1001110	1001111
8	10000000	10000001	10000010	10000011	10000100	10000101	10000110	10000111	10001000	10001001	10001010	10001011	10001100	10001101	10001110	10001111
9	100000000	100000001	100000010	100000011	100000100	100000101	100000110	100000111	100001000	100001001	100001010	100001011	100001100	100001101	100001110	100001111
A	1000000000	1000000001	1000000010	1000000011	1000000100	1000000101	1000000110	1000000111	1000001000	1000001001	1000001010	1000001011	1000001100	1000001101	1000001110	1000001111
B	10000000000	10000000001	10000000010	10000000011	10000000100	10000000101	10000000110	10000000111	10000001000	10000001001	10000001010	10000001011	10000001100	10000001101	10000001110	10000001111
C	100000000000	100000000001	100000000010	100000000011	100000000100	100000000101	100000000110	100000000111	100000001000	100000001001	100000001010	100000001011	100000001100	100000001101	100000001110	100000001111
D	1000000000000	1000000000001	1000000000010	1000000000011	1000000000100	1000000000101	1000000000110	1000000000111	1000000001000	1000000001001	1000000001010	1000000001011	1000000001100	1000000001101	1000000001110	1000000001111
E	10000000000000	10000000000001	10000000000010	10000000000011	10000000000100	10000000000101	10000000000110	10000000000111	10000000001000	10000000001001	10000000001010	10000000001011	10000000001100	10000000001101	10000000001110	10000000001111
F	100000000000000	100000000000001	100000000000010	100000000000011	100000000000100	100000000000101	100000000000110	100000000000111	100000000001000	100000000001001	100000000001010	100000000001011	100000000001100	100000000001101	100000000001110	100000000001111

APPENDIX A

n = 11 : FRENCH +Graphic

	UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
LOWER BIT		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL 0	SP 16	0 32	À 48	Á 64	P 80	Q 96	P 112	NUL 128	144	160	176	= 192	× 208	224	240
1	0001		1 17	DC1 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	161	177	193	209	225	241
2	0010		2 18	DC2 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	162	178	194	210	226	242
3	0011		3 19	DC3 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	163	179	195	211	227	243
4	0100		4 20	DC4 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	164	180	196	212	228	244
5	0101		5 21	% 37	% 53	E 69	U 85	e 101	u 117	133	149	165	181	197	213	229	245
6	0110		6 22	% 38	% 54	F 70	V 86	f 102	v 118	134	150	166	182	198	214	230	246
7	0111	BEL 7	23	39	55	G 71	W 87	g 103	w 119	BEL 135	151	167	183	199	215	231	247
8	1000	BS 8	CAN 24	40	56	H 72	X 88	h 104	x 120	BS 136	CAN 152	168	184	200	216	232	248
9	1001	HT 9	25	41	57	I 73	Y 89	i 105	y 121	HT 137	153	169	185	201	217	233	249
A	1010	LF 10	26	42	58	J 74	Z 90	j 106	z 122	LF 138	154	170	186	202	218	234	250
B	1011	VT 11	27	43	59	K 75	1 91	k 107	1 123	VT 139	ESC 155	171	187	203	219	235	251
C	1100	FF 12	28	44	60	L 76	2 92	l 108	2 124	FF 140	156	172	188	204	220	236	252
D	1101	CR 13	29	45	61	M 77	3 93	m 109	3 125	CR 141	157	173	189	205	221	237	253
E	1110	SO 14	30	46	62	N 78	4 94	n 110	4 126	SO 142	158	174	190	206	222	238	254
F	1111	SI 15	31	47	63	O 79	5 95	o 111	5 127	DEL 143	159	175	191	207	223	239	255

n = 12 : GERMAN +Graphic

	UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
LOWER BIT		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL 0	SP 16	0 32	À 48	Á 64	P 80	Q 96	P 112	NUL 128	144	160	176	= 192	× 208	224	240
1	0001		1 17	DC1 33	1 49	A 65	Q 81	a 97	q 113	129	DC1 145	161	177	193	209	225	241
2	0010		2 18	DC2 34	2 50	B 66	R 82	b 98	r 114	130	DC2 146	162	178	194	210	226	242
3	0011		3 19	DC3 35	3 51	C 67	S 83	c 99	s 115	131	DC3 147	163	179	195	211	227	243
4	0100		4 20	DC4 36	4 52	D 68	T 84	d 100	t 116	132	DC4 148	164	180	196	212	228	244
5	0101		5 21	% 37	% 53	E 69	U 85	e 101	u 117	133	149	165	181	197	213	229	245
6	0110		6 22	% 38	% 54	F 70	V 86	f 102	v 118	134	150	166	182	198	214	230	246
7	0111	BEL 7	23	39	55	G 71	W 87	g 103	w 119	BEL 135	151	167	183	199	215	231	247
8	1000	BS 8	CAN 24	40	56	H 72	X 88	h 104	x 120	BS 136	CAN 152	168	184	200	216	232	248
9	1001	HT 9	25	41	57	I 73	Y 89	i 105	y 121	HT 137	153	169	185	201	217	233	249
A	1010	LF 10	26	42	58	J 74	Z 90	j 106	z 122	LF 138	154	170	186	202	218	234	250
B	1011	VT 11	27	43	59	K 75	1 91	k 107	1 123	VT 139	ESC 155	171	187	203	219	235	251
C	1100	FF 12	28	44	60	L 76	2 92	l 108	2 124	FF 140	156	172	188	204	220	236	252
D	1101	CR 13	29	45	61	M 77	3 93	m 109	3 125	CR 141	157	173	189	205	221	237	253
E	1110	SO 14	30	46	62	N 78	4 94	n 110	4 126	SO 142	158	174	190	206	222	238	254
F	1111	SI 15	31	47	63	O 79	5 95	o 111	5 127	DEL 143	159	175	191	207	223	239	255

APPENDIX A

n= 13 : BRITISH +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	SP	O	a	P	r	p	NUL	144	145	146	147	148	149	150
1	0001	1	DC1	!	A	G	a	q	DC1	145	146	147	148	149	150	151
2	0010	2	DC2	"	B	R	b	r	DC2	146	147	148	149	150	151	152
3	0011	3	DC3	#	C	S	c	s	DC3	147	148	149	150	151	152	153
4	0100	4	DC4	\$	D	T	d	t	DC4	148	149	150	151	152	153	154
5	0101	5	%	%	E	U	e	u	101	117	133	149	165	181	197	213
6	0110	6	^	^	F	V	f	v	102	118	134	150	166	182	198	214
7	0111	BEL	7	23	39	55	71	87	103	119	135	151	167	183	199	215
8	1000	BS	8	24	40	56	72	88	104	120	136	152	168	184	200	216
9	1001	HT	9	25	41	57	73	89	105	121	137	153	169	185	201	217
A	1010	LF	10	26	42	58	74	90	106	122	138	154	170	186	202	218
B	1011	VT	11	27	43	59	75	91	107	123	139	155	171	187	203	219
C	1100	FF	12	28	44	60	76	92	108	124	140	156	172	188	204	220
D	1101	CR	13	29	45	61	77	93	109	125	141	157	173	189	205	221
E	1110	SO	14	30	46	62	78	94	110	126	142	158	174	190	206	222
F	1111	SI	15	31	47	63	79	95	111	127	143	159	175	191	207	223

n= 14 : DANISH +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	SP	O	a	P	r	p	NUL	144	145	146	147	148	149	150
1	0001	1	DC1	!	A	G	a	q	DC1	145	146	147	148	149	150	151
2	0010	2	DC2	"	B	R	b	r	DC2	146	147	148	149	150	151	152
3	0011	3	DC3	#	C	S	c	s	DC3	147	148	149	150	151	152	153
4	0100	4	DC4	\$	D	T	d	t	DC4	148	149	150	151	152	153	154
5	0101	5	%	%	E	U	e	u	101	117	133	149	165	181	197	213
6	0110	6	^	^	F	V	f	v	102	118	134	150	166	182	198	214
7	0111	BEL	7	23	39	55	71	87	103	119	135	151	167	183	199	215
8	1000	BS	8	24	40	56	72	88	104	120	136	152	168	184	200	216
9	1001	HT	9	25	41	57	73	89	105	121	137	153	169	185	201	217
A	1010	LF	10	26	42	58	74	90	106	122	138	154	170	186	202	218
B	1011	VT	11	27	43	59	75	91	107	123	139	155	171	187	203	219
C	1100	FF	12	28	44	60	76	92	108	124	140	156	172	188	204	220
D	1101	CR	13	29	45	61	77	93	109	125	141	157	173	189	205	221
E	1110	SO	14	30	46	62	78	94	110	126	142	158	174	190	206	222
F	1111	SI	15	31	47	63	79	95	111	127	143	159	175	191	207	223

APPENDIX A

n = 15 : SWEDISH +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
LOWER BIT	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	SP	0	16	32	48	64	80	96	112	128	144	160	176	192
1	0001	1	DC1	!	33	49	65	81	97	113	129	145	161	177	193	209
2	0010	2	DC2	"	34	50	66	82	98	114	130	146	162	178	194	210
3	0011	3	DC3	#	35	51	67	83	99	115	131	147	163	179	195	211
4	0100	4	DC4	\$	36	52	68	84	100	116	132	148	164	180	196	212
5	0101	5	%	37	53	69	85	101	117	133	149	165	181	197	213	229
6	0110	6	&	38	54	70	86	102	118	134	150	166	182	198	214	230
7	0111	BEL	'	39	55	71	87	103	119	135	151	167	183	199	215	231
8	1000	BS	(	40	56	72	88	104	120	136	152	168	184	200	216	232
9	1001	HT	)	41	57	73	89	105	121	137	153	169	185	201	217	233
A	1010	LF	*	42	58	74	90	106	122	138	154	170	186	202	218	234
B	1011	VT	ESC	+	43	59	75	91	107	123	139	155	171	187	203	219
C	1100	FF	^	44	60	76	92	108	124	140	156	172	188	204	220	236
D	1101	CR	-	45	61	77	93	109	125	141	157	173	189	205	221	237
E	1110	SO	.	46	62	78	94	110	126	142	158	174	190	206	222	238
F	1111	SI	/	47	63	79	95	111	127	143	159	175	191	207	223	239

n = 16 : ITALIAN +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
LOWER BIT	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	SP	0	16	32	48	64	80	96	112	128	144	160	176	192
1	0001	1	DC1	!	33	49	65	81	97	113	129	145	161	177	193	209
2	0010	2	DC2	"	34	50	66	82	98	114	130	146	162	178	194	210
3	0011	3	DC3	#	35	51	67	83	99	115	131	147	163	179	195	211
4	0100	4	DC4	\$	36	52	68	84	100	116	132	148	164	180	196	212
5	0101	5	%	37	53	69	85	101	117	133	149	165	181	197	213	229
6	0110	6	&	38	54	70	86	102	118	134	150	166	182	198	214	230
7	0111	BEL	'	39	55	71	87	103	119	135	151	167	183	199	215	231
8	1000	BS	(	40	56	72	88	104	120	136	152	168	184	200	216	232
9	1001	HT	)	41	57	73	89	105	121	137	153	169	185	201	217	233
A	1010	LF	*	42	58	74	90	106	122	138	154	170	186	202	218	234
B	1011	VT	ESC	+	43	59	75	91	107	123	139	155	171	187	203	219
C	1100	FF	^	44	60	76	92	108	124	140	156	172	188	204	220	236
D	1101	CR	-	45	61	77	93	109	125	141	157	173	189	205	221	237
E	1110	SO	.	46	62	78	94	110	126	142	158	174	190	206	222	238
F	1111	SI	/	47	63	79	95	111	127	143	159	175	191	207	223	239

APPENDIX A

n= 17 : SPANISH +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
UPPER BIT	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	0	16	32	48	64	80	96	112	NUL	128	144	160	176	192
1	0001	1	DC1	17	33	49	65	81	97	113	129	145	161	177	193	209
2	0010	2	DC2	18	34	50	66	82	98	114	130	146	162	178	194	210
3	0011	3	DC3	19	35	51	67	83	99	115	131	147	163	179	195	211
4	0100	4	DC4	20	36	52	68	84	100	116	132	148	164	180	196	212
5	0101	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229
6	0110	6	22	38	54	70	86	102	118	134	150	166	182	198	214	230
7	0111	BEL	7	23	39	55	71	87	103	119	135	151	167	183	199	215
8	1000	BS	CAN	24	40	56	72	88	104	120	136	152	168	184	200	216
9	1001	HT	9	25	41	57	73	89	105	121	137	153	169	185	201	217
A	1010	LF	10	26	42	58	74	90	106	122	138	154	170	186	202	218
B	1011	VT	ESC	27	43	59	75	91	107	123	139	155	171	187	203	219
C	1100	FF	12	28	44	60	76	92	108	124	140	156	172	188	204	220
D	1101	CR	13	29	45	61	77	93	109	125	141	157	173	189	205	221
E	1110	SO	14	30	46	62	78	94	110	126	142	158	174	190	206	222
F	1111	SI	15	31	47	63	79	95	111	127	143	159	175	191	207	223

n= 18 : JIS +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
UPPER BIT	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	0	16	32	48	64	80	96	112	NUL	128	144	160	176	192
1	0001	1	DC1	17	33	49	65	81	97	113	129	145	161	177	193	209
2	0010	2	DC2	18	34	50	66	82	98	114	130	146	162	178	194	210
3	0011	3	DC3	19	35	51	67	83	99	115	131	147	163	179	195	211
4	0100	4	DC4	20	36	52	68	84	100	116	132	148	164	180	196	212
5	0101	5	21	37	53	69	85	101	117	133	149	165	181	197	213	229
6	0110	6	22	38	54	70	86	102	118	134	150	166	182	198	214	230
7	0111	BEL	7	23	39	55	71	87	103	119	135	151	167	183	199	215
8	1000	BS	CAN	24	40	56	72	88	104	120	136	152	168	184	200	216
9	1001	HT	9	25	41	57	73	89	105	121	137	153	169	185	201	217
A	1010	LF	10	26	42	58	74	90	106	122	138	154	170	186	202	218
B	1011	VT	ESC	27	43	59	75	91	107	123	139	155	171	187	203	219
C	1100	FF	12	28	44	60	76	92	108	124	140	156	172	188	204	220
D	1101	CR	13	29	45	61	77	93	109	125	141	157	173	189	205	221
E	1110	SO	14	30	46	62	78	94	110	126	142	158	174	190	206	222
F	1111	SI	15	31	47	63	79	95	111	127	143	159	175	191	207	223

APPENDIX A

Note 1: These character set should not be copied into the down load RAM area by command (ESC n1).
After execution by value of n = 9, 19, 20, the character set by previous definable value of n is copied.

n = 19 : ASCII(Italic) +Graphic

(Note 1)

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
LOWER BIT	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	SP	0	@	P	0	p	NUL	128	144	160	176	=	X	240
1	0001	1	DC1	/	1	A	Q	a	q	113	129	145	161	177	193	209
2	0010	2	DC2	"	2	B	R	b	r	114	130	146	162	178	194	210
3	0011	3	DC3	#	3	C	S	c	s	115	131	147	163	179	195	211
4	0100	4	DC4	\$	4	D	T	d	t	116	132	148	164	180	196	212
5	0101	5	1	%	5	E	U	e	u	117	133	149	165	181	197	213
6	0110	6	2	&	6	F	V	f	v	118	134	150	166	182	198	214
7	0111	7	BEL	'	7	G	W	g	w	119	135	151	167	183	199	215
8	1000	8	BS	CAN	"	8	H	X	h	120	136	152	168	184	200	216
9	1001	9	HT	9	25	41	57	73	89	105	121	137	153	169	185	201
A	1010	A	LF	10	26	42	58	74	90	106	122	138	154	170	186	202
B	1011	B	VT	11	27	43	59	75	91	107	123	139	155	171	187	203
C	1100	C	FF	12	28	44	60	76	92	108	124	140	156	172	188	204
D	1101	D	CR	13	29	45	61	77	93	109	125	141	157	173	189	205
E	1110	E	SO	14	30	46	62	78	94	110	126	142	158	174	190	206
F	1111	F	SI	15	31	47	63	79	95	111	127	143	159	175	191	207

n = 20 : ASCII(Normal +Italic)

(Note 1)

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
LOWER BIT	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	SP	0	@	P	0	p	NUL	128	144	160	176	192	208	224
1	0001	1	DC1	!	1	A	Q	a	q	113	129	145	161	177	193	209
2	0010	2	DC2	"	2	B	R	b	r	114	130	146	162	178	194	210
3	0011	3	DC3	#	3	C	S	c	s	115	131	147	163	179	195	211
4	0100	4	DC4	\$	4	D	T	d	t	116	132	148	164	180	196	212
5	0101	5	1	%	5	E	U	e	u	117	133	149	165	181	197	213
6	0110	6	2	&	6	F	V	f	v	118	134	150	166	182	198	214
7	0111	7	BEL	'	7	G	W	g	w	119	135	151	167	183	199	215
8	1000	8	BS	CAN	"	8	H	X	h	120	136	152	168	184	200	216
9	1001	9	HT	9	25	41	57	73	89	105	121	137	153	169	185	201
A	1010	A	LF	10	26	42	58	74	90	106	122	138	154	170	186	202
B	1011	B	VT	11	27	43	59	75	91	107	123	139	155	171	187	203
C	1100	C	FF	12	28	44	60	76	92	108	124	140	156	172	188	204
D	1101	D	CR	13	29	45	61	77	93	109	125	141	157	173	189	205
E	1110	E	SO	14	30	46	62	78	94	110	126	142	158	174	190	206
F	1111	F	SI	15	31	47	63	79	95	111	127	143	159	175	191	207

APPENDIX A

n= 21 : ASCII +Greece

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
UNDER BIT	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	0	SP	0	α	π	ρ	NUL	120	144	SP	0	α	π	ρ
1	0001	1	DC1	!	33	1	49	A	Q	a	q	129	DC1	!	177	A
2	0010	2	DC2	"	34	2	50	B	R	b	r	130	DC2	"	178	B
3	0011	3	DC3	#	35	3	51	C	S	c	s	131	DC3	#	179	C
4	0100	4	DC4	\$	36	4	52	D	T	d	t	132	DC4	\$	180	D
5	0101	5	%	37	53	5	67	E	U	e	u	133	%	5	E	U
6	0110	6	&	38	54	6	68	F	V	f	v	134	&	6	F	V
7	0111	BEL	7	'	39	7	69	G	W	g	w	135	BEL	7	H	Y
8	1000	BS	8	(	40	8	70	X	H	x	h	136	BS	8	I	Z
9	1001	HT	9	)	41	9	71	Y	I	y	i	137	HT	9	J	[
A	1010	LF	10	*	42	10	72	Z	J	z	j	138	LF	10	K]
B	1011	VT	11	+	43	11	73	[	K	[	k	139	VT	11	L	^
C	1100	FF	12	<	44	12	74	\	L	\	l	140	FF	12	M	_
D	1101	CR	13	-	45	13	75	]	M	]	m	141	CR	13	N	`
E	1110	SO	14	~	46	14	76	^	N	^	n	142	SO	14	O	~
F	1111	SI	15	/	47	15	77	_	O	_	o	143	SI	15	P	DEL

n= 23 : JIS +Greece

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
UNDER BIT	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	0	SP	0	α	π	ρ	NUL	120	144	SP	0	α	π	ρ
1	0001	1	DC1	!	33	1	49	A	Q	a	q	129	DC1	!	177	A
2	0010	2	DC2	"	34	2	50	B	R	b	r	130	DC2	"	178	B
3	0011	3	DC3	#	35	3	51	C	S	c	s	131	DC3	#	179	C
4	0100	4	DC4	\$	36	4	52	D	T	d	t	132	DC4	\$	180	D
5	0101	5	%	37	53	5	67	E	U	e	u	133	%	5	E	U
6	0110	6	&	38	54	6	68	F	V	f	v	134	&	6	F	V
7	0111	BEL	7	'	39	7	69	G	W	g	w	135	BEL	7	H	Y
8	1000	BS	8	(	40	8	70	X	H	x	h	136	BS	8	I	Z
9	1001	HT	9	)	41	9	71	Y	I	y	i	137	HT	9	J	[
A	1010	LF	10	*	42	10	72	Z	J	z	j	138	LF	10	K]
B	1011	VT	11	+	43	11	73	[	K	[	k	139	VT	11	L	^
C	1100	FF	12	<	44	12	74	\	L	\	l	140	FF	12	M	_
D	1101	CR	13	-	45	13	75	]	M	]	m	141	CR	13	N	`
E	1110	SO	14	~	46	14	76	^	N	^	n	142	SO	14	O	~
F	1111	SI	15	/	47	15	77	_	O	_	o	143	SI	15	P	DEL

APPENDIX B

Control Codes

Dec	Hex	Symbol	Function	Page
0	00	NUL	Follows <ESC>'D' as terminator for TABS	39
7	07	BEL	Sounds buzzer for 0.3 second. Paper out rings for 3 seconds	39
8	08	BS	Backspaces print head one space	39
9	09	HT	Horizontal Tabulation. Print head moves to next tab stop	26
10	0A	LF	Line Feed. Printer empties its buffer and does line feed at-current line spacing and Resets buffer pointer to zero	16
11	0B	VT	Vertical Tab. or does single line feed	16
12	0C	FF	Advances paper to next logical Top of Form	16
13	0D	CR	Carriage Return. Prints buffer contents and resets buffer character count to zero	16
14	0E	SO	Turns on enlarged mode to end of line unless cancelled by DC4(20)	27
15	0F	SI	Turns on condensed character mode. Does not work with emphasized mode. Stays on until cancelled by DC2(18)	28
17	11	DC1	Sets the printer to SELECT	40
18	12	DC2	Turns off condensed characters and empties buffer	28
19	13	DC3	Sets the printer DESELECT	40
20	14	DC4	Turns off enlarged mode(SO only)	28
24	18	CAN	Cancels all characters in printer buffer	39
27	1B	ESC	ASCII code for ESCAPE. Prepares printer to receive control codes	13
<ESC>	14	0E	SO Same as SO(14)	38
<ESC>	15	0F	SI Same as SI(15)	38
<ESC>	33	21	! Selects print modes. Format: <ESC> '!' n, 0<=n<=63	31
<ESC>	37	25	% Selects download character SET. Format: <ESC> '%' (1)D	36
<ESC>	38	26	& Define download characters. Format: <ESC> '&' n m a pl...p8 33<=(n,m)<=254, but 126<=(n,m)<=127 will be ignored. a= (0)D or (1)D	35
<ESC>	45	2D	- Underline mode. Format: <ESC> '-' n, n=(1)D sets underline mode. n=(0)D clears underline mode	33
<ESC>	47	2F	/ Selects VFU(Vertical Format Unit) Format: <ESC> '/' n, 0<=n<=7	25
<ESC>	48	30	0 Sets line spacing to 1/8 inch	19
<ESC>	49	32	1 Sets line spacing to 7/72 inch	18
<ESC>	50	32	2 Sets line spacing to 1/6 inch	19
<ESC>	51	33	3 Sets line spacing to n/216 inch	17
<ESC>	56	38	8 Ignores PAPER END sensor	39
<ESC>	57	39	9 Enables PAPER END sensor	39
<ESC>	58	3A	: Copsys the internal character SET to download character area. Format: <ESC> ':' n (1)D, 0<=n<=23	38
<ESC>	60	3C	< One line unidirectional print. Prints current line only from left to right.....	39
<ESC>	63	3F	? Selects shift-in or shift-out at 7 bits mode Format: <ESC> '?' 'I' Selects shift-in. <ESC> '?' 'O' Selects shift-out	38

APPENDIX B

	Dec	Hex	Symbol	Function	Page
<ESC>	64	40	@	Resets all special modes to power up state	38
<ESC>	65	41	A	Sets line spacing to n/72 inch	17
<ESC>	66	42	B	Sets vertical tabs and resets current tabs. Format: <ESC> 'B' n1...nk NUL 1<n<=255, 1<k<=16 Terminate Tabs sequence with zero	23
<ESC>	67	43	C	Sets form length, and resets Top of Form. Format: <ESC> 'C' n, Sets to n lines. 1<n<=127 Format: <ESC> 'C' (0)D n, Sets to n inches. 1<n<=22	21
<ESC>	68	44	D	Sets horizontal tabs and resets current tabs. Format: <ESC> 'D' n1...nk NUL 1<n<=142, 1<k<=32 Tabs may range up to maximum width for character and printer size. e.g. Maximum Tabs for normal characters 800 is 80. Terminate Tabs sequence with zero	26
<ESC>	69	45	E	Turns on emphasized mode. Can't mix with super/subscript, or condensed modes	29
<ESC>	70	46	F	Turns off emphasized mode	29
<ESC>	71	47	G	Turns on double strike mode	29
<ESC>	72	48	H	Turns off double strike mode	29
<ESC>	74	4A	J	Sets line spacing to n/216 inch for one line only and when received causes contents of buffer to print. Format: <ESC> 'J' n, 1<n<=255	19
<ESC>	75	4B	K	Sets bit image(8 bits) mode to 640 dots/line. Format: <ESC> 'K' n1 n2 0<n1<=255, 0<n2<=255 n1 and n2 determine line length =n1+n2*256.....	41
<ESC>	76	4C	L	Sets bit image(8 bits) mode to 1280 dots/line. Format: <ESC> 'L' n1 n2 0<n1<=255, 0<n2<=255 n1 and n2 determine line length =n1+n2*256.....	43
<ESC>	77	4D	M	Sets ELITE size printing mode. 96 characters/8 inches	30
<ESC>	78	4E	N	Sets skip over perforation to n lines. Format: <ESC> 'N' n, 1<n<=127	23
<ESC>	79	4F	O	Resets skip over perforation to 0 lines	23
<ESC>	80	50	P	Sets PICA size printing mode. 80 characters/8 inches	30
<ESC>	81	51	Q	Sets column width (right margin) to n columns. Format: <ESC> 'Q' n 2<n<=80 normal, proportional and emphasized character. 4<n<=142 condensed character 1<n<=40 enlarged character 2<n<=71 enlarged-condensed character 3<n<=96 ELITE character 2<n<=48 enlarged-ELITE character	21
<ESC>	82	52	R	Selects international character SET. Format: <ESC> 'R' n, 0<n<=23	33
<ESC>	83	53	S	Sets superscript or subscript modes . Format: <ESC> 'S' n n=(0)D superscript, n=(1)D subscript	30

APPENDIX B

	Dec	Hex	Symbol	Function	Page
<ESC>	84	54	T	Resets superscript and subscript modes	31
<ESC>	85	55	U	Unidirectional printing mode. Format: <ESC> 'U' n n=(1)D ON, n=(0)D OFF	40
<ESC>	87	57	W	Enlarged printing mode. Stays ON until turned OFF Format: <ESC> 'W' n n=(1)D ON, n=(0)D OFF	28
<ESC>	94	5E	^	Sets 9 pins bit image mode. Format: <ESC> '^' m n1 n2 m=(0)D 640 dots/line bit image m=(1)D 1280 dots/line bit image 0<n1<=255, 0<n2<=255 n1 and n2 determine line length =n1+n2*256.....	46
<ESC>	98	62	b	Sets vertical Tabs with VFU. Format: <ESC> 'b' n m1...mk NUL n=VFU, 0<n<=7, 1<m<=255, 1<k<=16 Terminate Tabs sequence with zero	24
<ESC>	105	69	i	Sets incremental & view mode. Format: <ESC> 'i' n n=(1)D ON, n=(0)D OFF	27
<ESC>	106	6A	j	Sets reversed line spacing to n/216 inch for one line only and when received causes contents of buffer to print. Format: <ESC> 'j' n, 1<n<=255	20
<ESC>	108	6C	l	Sets column width(left margin) to n columns. Format: <ESC> 'l' n 0<n<=78 normal, proportional and emphasized character. 0<n<=138 condensed character 0<n<=39 enlarged character 0<n<=69 enlarged-condensed character 0<n<=93 ELITE character 0<n<=46 enlarged-ELITE character	21
<ESC>	112	70	p	Sets proportional spacing mode. Format: <ESC> 'p' n n=(1)D ON, n=(0)D OFF	32
127	7F	DEL		Deletes last character in printer buffer	39
128	80	NUL		Same as NUL(0)	
135	87	BEL		Same as BEL(7)	
136	88	BS		Same as BS(8)	
137	89	HT		Same as HT(9)	
138	8A	LF		Same as LF(10)	
139	8B	VT		Same as VT(11)	
140	8C	FF		Same as FF(12)	
141	8D	CR		Same as CR(13)	
142	8E	SO		Same as SO(14)	
143	8F	SI		Same as SI(15)	
145	91	DC1		Same as DC1(17)	
146	92	DC2		Same as DC2(18)	
147	93	DC3		Same as DC3(19)	
148	94	DC4		Same as DC4(20)	
152	98	CAN		Same as CAN(24)	
155	9B	ESC		Same as ESC(27)	
255	FF	DEL		Same as DEL(127)	

APPENDIX C

Control Key Table

What to Type	Dec	Hex	Char
ctrl @	0	00	NUL
CTRL A	1	01	SOH
ctrl B	2	02	STX
ctrl C	3	03	ETX
ctrl D	3	03	ETX
ctrl E	5	05	ENQ
ctrl F	6	06	ACK
ctrl G	7	07	BEL
ctrl H or ←	8	08	BS
ctrl I	9	09	HT
ctrl J	10	0A	LF
ctrl K	11	0B	VT
ctrl L	12	0C	FF
ctrl M or RETURN	13	0D	CR
ctrl N	14	0E	SO
ctrl O	15	0F	SI
ctrl P	16	10	DLE
ctrl Q	17	11	DC1
ctrl R	18	12	DC2
ctrl S	19	13	DC3
ctrl T	20	14	DC4
ctrl U or ←	21	15	NAK
ctrl V	22	16	SYN
ctrl W	23	17	ETB
ctrl X	24	18	CAN
ctrl Y	25	19	EM
ctrl Z	26	1A	SUB
ESC	27	1B	ESC
n/a	28	1C	FS
ctrl shift-M	29	1D	GS
ctrl	30	1E	RS
n/a	31	1F	US

Note: These codes are not all relevant to the Enterprise Computer.

APPENDIX D

Printing Samples

U.S.A. Character Print.

ENLARGEMENT ALL PRINT

! " # \$ % & ' () * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾
¿ À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã

REDUCTION ALL PRINT

! " # \$ % & ' () * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾
¿ À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã

ENLARGEMENT OF REDUCTION ALL PRINT

! " # \$ % & ' () * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾
¿ À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã

EMPHASIZED ALL PRINT

NORMAL ALL PRINT

! " # \$ % & ' () * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾
¿ À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã

ENLARGEMENT ALL PRINT

! " # \$ % & ' () * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾
¿ À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü Ý Þ ß à á â ã

APPENDIX D

=====

DOUBLE STRIKE ALL PRINT

NORMAL ALL PRINT

```
! " # $ % & ' ( ) * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾ ¿
```

ENLARGEMENT ALL PRINT

```
! " # $ % & ' ( ) * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾ ¿
```

REDUCTION ALL PRINT

```
! " # $ % & ' ( ) * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾ ¿
```

ENLARGEMENT OF REDUCTION ALL PRINT

```
! " # $ % & ' ( ) * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾ ¿
```

NORMAL ALL PRINT

```
! " # $ % & ' ( ) * + , - . / 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 { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾ ¿
```

* ENLARGEMENT *

! REDUCTION !

* ENLARGEMENT OF REDUCTION *

=====

VARIOUS PRINTING MODES CAN BE MIXED

NORMAL EMPHASIZED SUPER-SCRIPT & REDUCTION NORMAL SUPER-SCRIPT

APPENDIX E

Setting of Slide Switches

SETTING OF SLIDE SWITCHES ON THE P.C. BOARD

Slide Switch NO.	Functions/Conditions	ON	OFF	Factory set Condition
Switch 1	Download,ESC b (*1)	Invalid	Valid	OFF
Switch 2	Default printing mode	Emphasized	Normal	OFF
Switch 3	Default Form Length	12 inches	11 inches	OFF
Switch 4	Default Line Spacing	1/8 inch	1/6 inch	OFF
Switch 5	Default Column Length	142	80	OFF
Switch 6	linch skip over perforation	Fixed	Not fixed	OFF
Switch 7	ZERO option	Slashed ZERO	Regular ZERO	OFF
Switch 8	Character SET	See APPENDIX A		OFF
Switch 9	" "			OFF
Switch 10	" "			OFF
Switch 11	" "			OFF
Switch 12	" "			OFF

(*1) See Table E-2 in relation to capacity of Input Buffer and number of Down Load Characters.

(Table. E-1)

*** RELATIONSHIP OF MAXIMUM CAPACITY FOR ***
*** INPUT BUFFER AND DOWN LOAD CHARACTERS ***

Slide Switch 1	OFF		ON		REMARKS
	RAM AREAS	INPUT BUFFER	INPUT BUFFER	DOWN LOAD CHARACTER	
With out RAM	112 bytes	/	112 bytes	/	
With 2KB RAM	1792 bytes	/	112 bytes	221 char.(*)	RAM1(option)
With 4KB RAM	3840 bytes	/	2048 bytes	221 char.(*)	RAM1,RAM2(option)

(*) Should be with RAM and Slide Switch 1 ON.
/ Impossible.

(Table. E-2)

Note: 2K RAM is standard on the Enterprise EP80+

APPENDIX F

About Parallel Interface Connector Pin Chart (Table F-1)

Connector use — Data exchange between the **Printed (P)** and an external computer (parallel).

Number of pins — 36

Receptacle (printer side) 57-40360 (amphenol or DDK) Male

Plug (cable side) 57-30360 (amphenol or DDK) Female

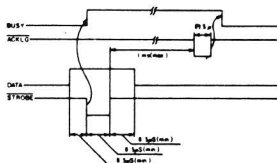
Signal Pin No.	Return Pin No.	Signal	Direction	Description
1	19	<u>STROBE</u>	In	STROBE pulse of read data in. Pulse width must be more than 0.5 μ s at receiving terminal. The signal level is normally "HIGH", read-in of data is performed at the "LOW" level of this signal.
2	20	DATA 1	In	These signals represent information of the 1st to 8th bits of parallel data respectively. Each signal is at "HIGH" level when data is logical "1" and "LOW" when logical "0".
3	21	DATA 2	In	
4	22	DATA 3	In	
5	23	DATA 4	In	
6	24	DATA 5	In	
7	25	DATA 6	In	
8	26	DATA 7	In	
9	27	DATA 8	In	
10	28	<u>ACKNLG</u>	Out	Approx. 5 μ s pulse. "LOW" indicates that data has been received and that the printer is ready to accept other data.
11	29	BUSY	Out	A "HIGH" signal indicates that the printer cannot receive data. The signal becomes "HIGH" in the following cases: 1. During data entry 2. During printing operation 3. In OFF-LINE state 4. During printer error status.
12	30	PE	Out	A "HIGH" signal indicates that the printer is out of paper.
13	—	SLCT	Out	This signal indicates that the printer is in the selected state.
14	—	<u>AUTO FEED XT</u>	In	With this signal being at "LOW" level, the paper is automatically fed one line after printing. (The signal level can be fixed to "LOW" with the DIP SW pin 2-3 provided on the control circuit board.)
15	—	NC	—	Not used.
16	—	CHASSIS-GND	—	Printer chassis GND. In the printer, the chassis GND and the logic GND are isolated from each other.
18	—	NC	—	Not used.
19 to 30	—	GND	—	TWISTED-PAIR RETURN signal GND level.

APPENDIX F

Signal Pin No.	Return Pin No.	Signal	Direction	Description
31		INIT	In	When the level of this signal becomes "LOW", the printer controller is reset to its initial state and the print buffer is cleared. This signal is normally at "HIGH" level, and its pulse width must be more than 50 μ s at the receiving terminal.
32		ERROR	Out	The level of this signal becomes "LOW" when the printer is in — 1. PAPER END state 2. OFF-LINE state 3. Error state
33		GND		Same as with Pin Nos. 19 to 30.
34		NC		Not used
35				Pulled up to +5V through 3.3k Ω resistance.
36		SELECT IN	In	Data entry to the printer is possible only when the level of this signal is "LOW". (Internal fixing can be carried out with DIP SW pin 1-8. The condition at the time of shipment is set "LOW" for this signal.)

Notes: 1. "Direction" refers to the direction of signal as viewed from the printer.

2. "Return" denotes "TWISTED PAIR RETURN" and is to be connected at signal ground level. As to the wiring for the interface, be sure to use a twisted-pair cable for each signal and never fail to complete connection on the Return side. To prevent noise effectively, these cables should be shielded and connected to the chassis of the host computer and the printer, respectively.
3. All interface conditions are based on TTL level. Both the rise and fall times of each signal must be less than 0.2 μ s.
4. Data transfer must not be carried out by ignoring the ACKNLG or BUSY signal. (Data transfer to this printer can be carried out only after confirming the ACKLG signal or when the level of the BUSY signal is "LOW".) Time chart is below.



**** FUNCTION IS SET BY JUMPERS ON THE PARALLEL INTERFACE BOARD ****

Jumper Wire	FUNCTION	ON	OFF	Factory set Condition
JP 1	SELECT IN SIGNAL Internally fixed or Not fixed	FIXED	NOT FIXED	ON
JP 2	AUTO FEED XT SIGNAL Internally fixed or Not fixed	FIXED	NOT FIXED	OFF

(Table. F-2)

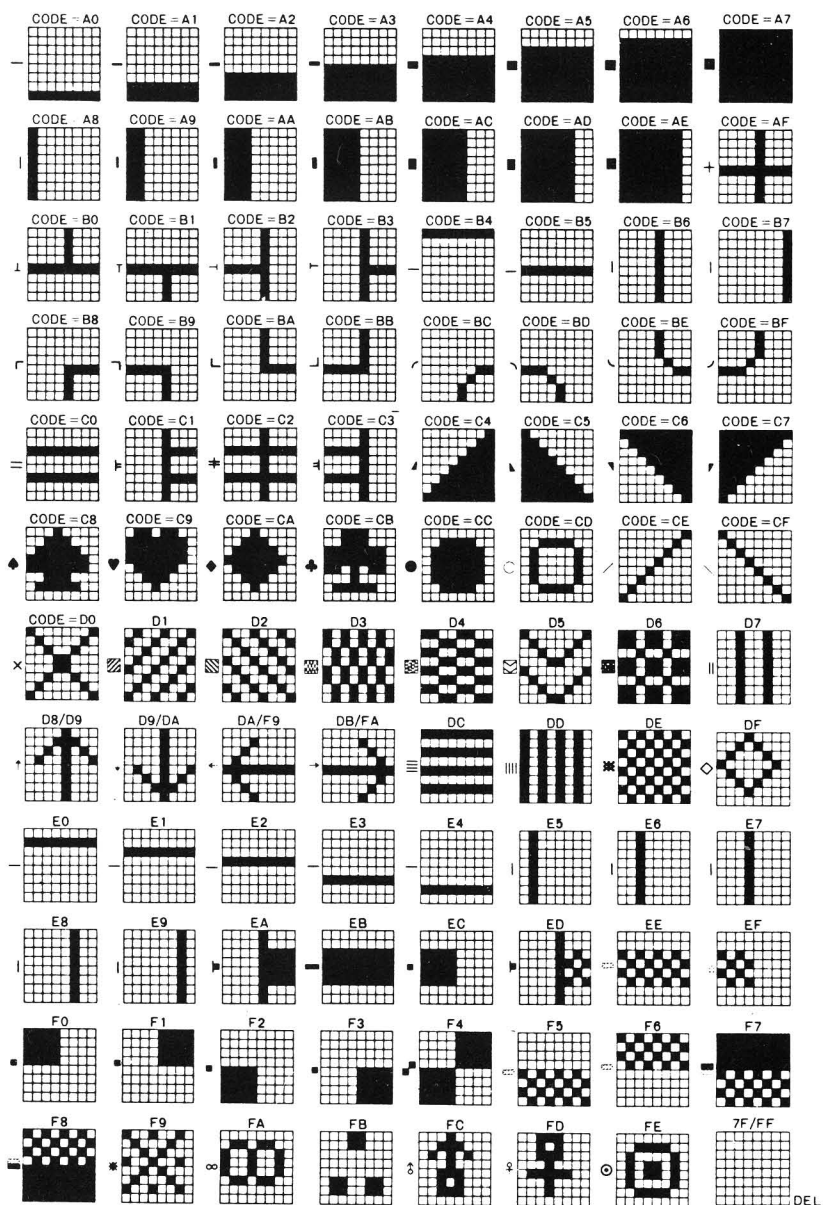
APPENDIX H Character Fonts

1 Normal Character Fonts

(1) Normal fonts

SPACE	CODE = 20 	CODE = 21 	CODE = 22 	CODE = 23 	CODE = 24 	CODE = 25 	CODE = 26 	CODE = 27
	CODE = 28 	CODE = 29 	CODE = 2A 	CODE = 2B 	CODE = 2C 	CODE = 2D 	CODE = 2E 	CODE = 2F
	CODE = 30 	CODE = 31 	CODE = 32 	CODE = 33 	CODE = 34 	CODE = 35 	CODE = 36 	CODE = 37
	CODE = 38 	CODE = 39 	CODE = 3A 	CODE = 3B 	CODE = 3C 	CODE = 3D 	CODE = 3E 	CODE = 3F
	CODE = 40 	CODE = 41 	CODE = 42 	CODE = 43 	CODE = 44 	CODE = 45 	CODE = 46 	CODE = 47
	CODE = 48 	CODE = 49 	CODE = 4A 	CODE = 4B 	CODE = 4C 	CODE = 4D 	CODE = 4E 	CODE = 4F
	CODE = 50 	CODE = 51 	CODE = 52 	CODE = 53 	CODE = 54 	CODE = 55 	CODE = 56 	CODE = 57
	CODE = 58 	CODE = 59 	CODE = 5A 	CODE = 5B 	CODE = 5C 	CODE = 5D 	CODE = 5E 	CODE = 5F
	CODE = 60 	CODE = 61 	CODE = 62 	CODE = 63 	CODE = 64 	CODE = 65 	CODE = 66 	CODE = 67
	CODE = 68 	CODE = 69 	CODE = 6A 	CODE = 6B 	CODE = 6C 	CODE = 6D 	CODE = 6E 	CODE = 6F
	CODE = 70 	CODE = 71 	CODE = 72 	CODE = 73 	CODE = 74 	CODE = 75 	CODE = 76 	CODE = 77
	CODE = 78 	CODE = 79 	CODE = 7A 	CODE = 7B 	CODE = 7C 	CODE = 7D 	CODE = 7E 	CODE = 30

APPENDIX H



APPENDIX H

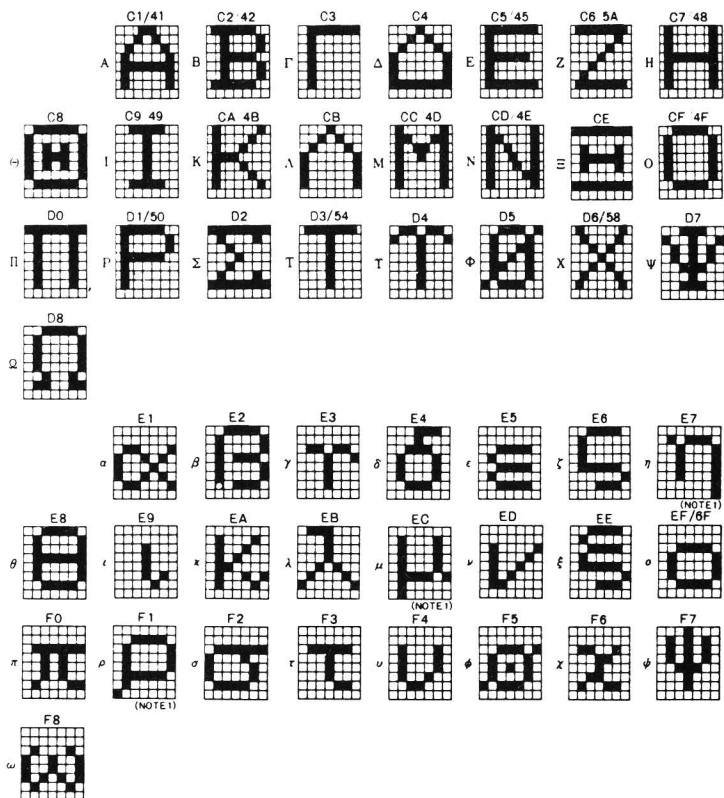
(2) Italic fonts

20/A0	21/A1	22/A2	23/A3	24/A4	25/A5	26/A6	27/A7
28/A8	29/A9	2A/AA	2B/AB	2C/AC	2D/AD	2E/AE	2F/AF
30/B0	31/B1	32/B2	33/B3	34/B4	35/B5	36/B6	37/B7
38/B8	39/B9	3A/BA	3B/BB	3C/BC	3D/BD	3E/BE	3F/BF
40/C0	41/C1	42/C2	43/C3	44/C4	45/C5	46/C6	47/C7
48/C8	49/C9	4A/CA	4B/CB	4C/CC	4D/CD	4E/CE	4F/CF
50/D0	51/D1	52/D2	53/D3	54/D4	55/D5	56/D6	57/D7
58/D8	59/D9	5A/DA	5B/DB	5C/DC	5D/DD	5E/DE	5F/DF
60/E0	61/E1	62/E2	63/E3	64/E4	65/E5	66/E6	67/E7
68/E8	69/E9	6A/EA	6B/EB	6C/EC	6D/ED	6E/EE	6F/EF
70/F0	71/F1	72/F2	73/F3	74/F4	75/F5	76/F6	77/F7
78/F8	79/F9	7A/FA	7B/FB	7C/FC	7D/FD	7E/FE	30/B0

ALTERNATE
CODE (NOTE2)

APPENDIX H

(3) Greek fonts



Notes

Note 1: These character fonts shift on the under side by one dot position prior to printing out.

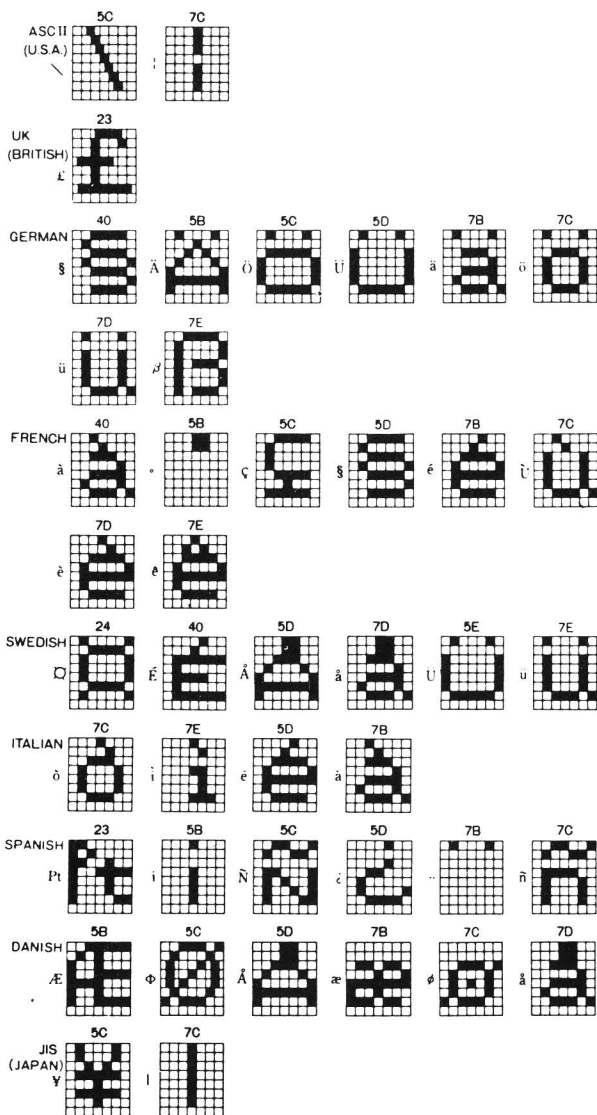
Note 2: Turn the slide switch 7 on the P.C. board on.

Note 3: Turn the slide switch 7 off.

Note 4: For JIS (Japan) character set.

APPENDIX H

(4) International fonts



APPENDIX H

2 Down Load Character Fonts from the Internal C.G.

(1) Normal fonts

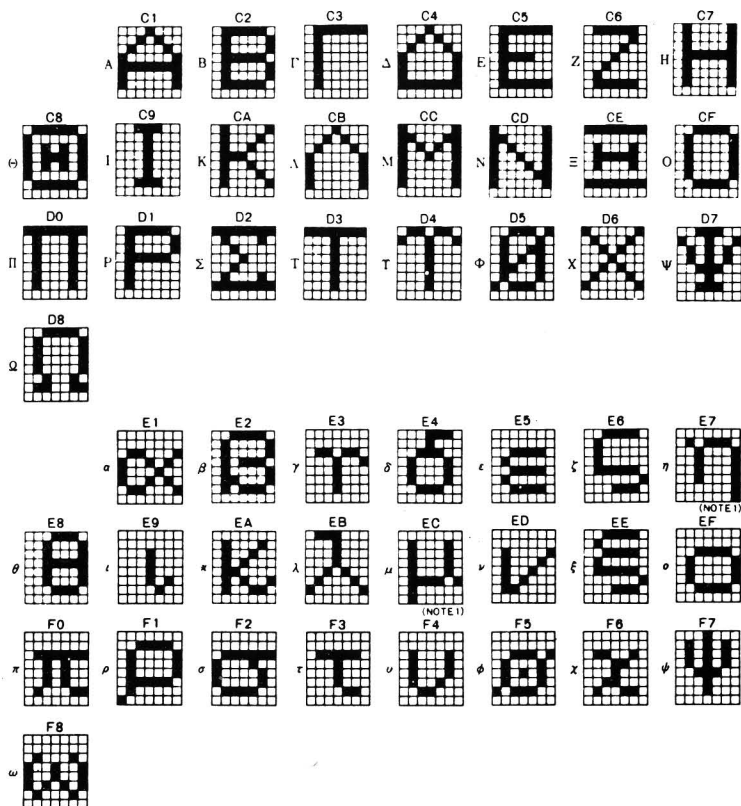
Fonts for 'graphic character are same as graphic fonts (AO-FE) in the normal character fonts – normal fonts (1-(1)).

CODE =20 SPACE	CODE =21 !	CODE =22 "	CODE =23 #	CODE =24 \$	CODE =25 %	CODE =26 &	CODE =27 '
CODE =28 (	CODE =29)	CODE =2A *	CODE =2B +	CODE =2C , (NOTE1)	CODE =2D -	CODE =2E .	CODE =2F /
CODE =30 0	CODE =31 1	CODE =32 2	CODE =33 3	CODE =34 4	CODE =35 5	CODE =36 6	CODE =37 7
CODE =38 8 (NOTE3)	CODE =39 9	CODE =3A :	CODE =3B ;	CODE =3C <	CODE =3D =	CODE =3E >	CODE =3F ?
CODE =40 [	CODE =41 A	CODE =42 B	CODE =43 C	CODE =44 D	CODE =45 E	CODE =46 F	CODE =47 G
CODE =48 H	CODE =49 I	CODE =4A J	CODE =4B K	CODE =4C L	CODE =4D M	CODE =4E N	CODE =4F O
CODE =50 P	CODE =51 Q	CODE =52 R	CODE =53 S	CODE =54 T	CODE =55 U	CODE =56 V	CODE =57 W
CODE =58 X	CODE =59 Y	CODE =5A Z	CODE =5B [	CODE =5C { (NOTE5)	CODE =5D]	CODE =5E ^	CODE =5F _
CODE =60 `	CODE =61 a	CODE =62 b	CODE =63 c	CODE =64 d	CODE =65 e	CODE =66 f	CODE =67 g
CODE =68 h	CODE =69 i	CODE =6A j (NOTE1)	CODE =6B k	CODE =6C l	CODE =6D m	CODE =6E n	CODE =6F o (NOTE1)
CODE =70 p (NOTE1)	CODE =71 q (NOTE1)	CODE =72 r	CODE =73 s	CODE =74 t	CODE =75 u	CODE =76 v	CODE =77 w
CODE =78 x (NOTE1)	CODE =79 y (NOTE1)	CODE =7A z	CODE =7B {	CODE =7C | (NOTE5)	CODE =7D }	CODE =7E ~	CODE =80 [(NOTE2)

APPENDIX H

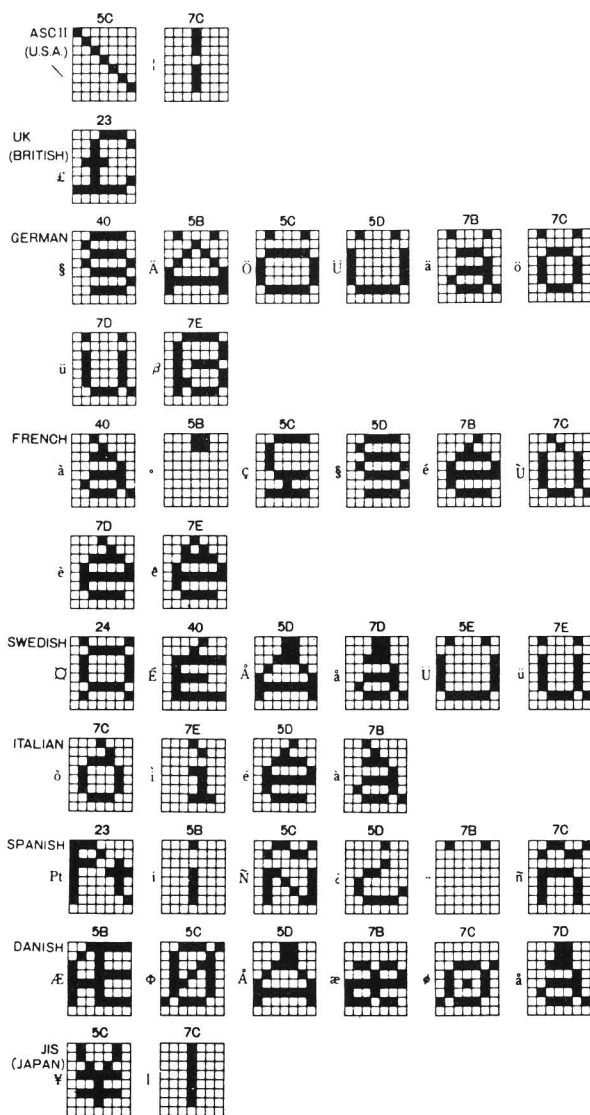
(2) Italic fonts

(3) Greek fonts



APPENDIX H

(4) International



APPENDIX H

*** CODE TABLE OF INTERNATIONAL CHARACTERS ***

Code No.= Country:	35	36	64	91	92	93	94	96	123	124	125	126
U.S.A.	#	\$	@	[	\	\]	^	'	{	|	}	~
FRANCE	#	\$	à	·	ç	ç	^	'	é	ù	è	é
GERMANY	#	\$	§	Ä	Ö	Ü	^	'	ä	ö	ü	ß
ENGRAND	£	\$	@	[	\	\]	^	'	{	|	}	~
DENMARK	#	\$	@	Æ	Ø	Å	^	'	æ	ø	å	~
SWEDEN	#	¤	£	Ä	Ö	Å	Ü	é	ä	ö	å	ü
ITALY	#	\$	@	·	\	é	^	'	à	ò	è	ì
SPAIN	ñ	\$	@	í	ñ	ç	^	'	ñ	ñ)	~
JAPAN	#	\$	@	[	¥	]	^	'	{	|	}	~

CAUTION

PRINTING HEAD TEMPERATURE PROTECTION

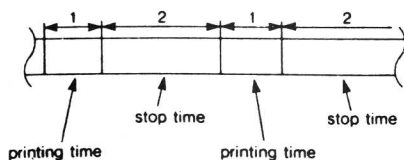
Continuous printing

When printing underlines, semi graphic or bit images continuously, bear the following points in mind in order to prevent the temperature of the printing head from rising.

(A) Keep continuous usage of the same pin to within 1 line (640 dots.)

(B) When continuous usage of the same pin spans more than 1 line, stop time should be provided by external operations between printouts.

A stop time which is double the length of the printing time must be provided after a printout (1 line).



ENTERPRISE

C O M P U T E R S
