



 **M120/10**  
**OWNERS MANUAL**

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“WARNING” — This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.”

NOTE: Please, remove the shipping screw, see Figure 2.

## SECTION A GENERAL INFORMATIONS

This printer is an attractive, efficient, and versatile printer. The wide variation of character sets and its sufficient function capability allows you to print text and graphic in a wide range of different print styles. The printer is designed to operate through software control, supplied from the any general purpose micro-computer, personal computer, office computer, etc. that has provision of printing data out-put that should conform with this specification.

### Specifications

#### 1. Functional specifications

Printing method:	Serial impact dot matrix.
Printing format:	Alpha-numeric — 7×8 in 8×9 dot matrix field. Semi-graphic (character graphic) — 8×8 dot matrix. Bit image graphic — Vertical 8 or 9 dots parallel, horizontal 640 dots serial/line.
Character size:	Normal size — 2.22 (W) × 2.8 (H) mm = 0.087" × 0.11". Condensed size — 1.11 (W) × 2.8 (H) mm = 0.044" × 0.11". Enlarged size — 4.44 (W) × 2.8 (H) mm = 0.175" × 0.11". ‘ELITE’ size — 1.8 (W) × 2.8 (H) mm = 0.07" × 0.11". Enlarged ‘ELITE’ — 3.6 (W) × 2.8 (H) mm = 0.14" × 0.11". Super/subscript — 2.22 (W) × 1.4 (H) mm = 0.087" × 0.055". Semi-graphic unit — 2.54 (W) × 2.8 (H) mm = 0.1" × 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. Enlarged — 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. (programable)

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 (0.002") 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) × 315 (D) × 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

On Model **Parallel**  
 (P) With 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.

On Model **Serial**  
 (S) With serial RS232C/Current Loop interface.  
 Data transfer rate — 75, 110, 134.5, 150, 200, 300,  
 600, 1200, 1800, 2400 and 4800 B.P.S. — programable.  
 Synchronization — A. Synchronous.  
 Handshaking — Flag control.  
 X-on/X-off protocol.  
 Logic level — EIA Level (RS232C)  
 20ma current loop.

Note: The models can be converted to the type with the other interfaces by  
 replacing the interface board, inside of the unit. You can check with your  
 dealer for provision of the various type of interface boards. For how to  
 open the case to reach the interface board — refer to **Figure 5**.

## 4. Others

Expandable RAM buffer: 2 kilobytes or 4 kilobytes — Option.

8 bits Hex. dump mode: Refer to SECTION C.

Self test modes: 2 types of test modes — refer to SECTION B,  
 par. 9.

## SECTION B PREPARATION FOR USE

### 1. Unpacking, counting the parts.

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

1. This user's manual
2. Printer unit
3. Ribbon cartridge
4. Paper guide wire rack
5. Miscellaneous informational literature

If any of the first 4 is missing or damaged notify your dealer immediately.

**Note:** You should obtain from your dealer the appropriate cable which is suitable to connect your printer to your computer.

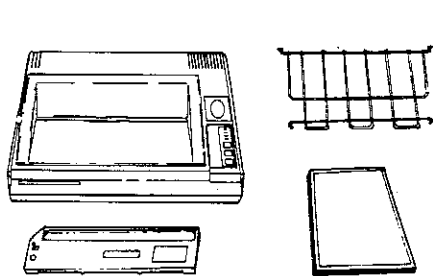
If you use a non-standard type cable, make sure it is wired properly referring **Appendix F** for **Parallel (P)** and **Appendix G (Table G-6)** for **Serial (S)**.

### 2. Setting up

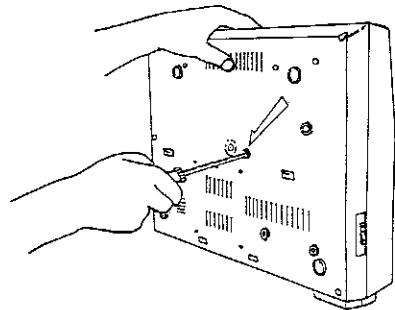
Before starting to use your printer, you should make sure that it is in working properly. This procedure includes checking for obstructions in the path of the printer head or paper feed and that the printer ribbon is properly in place. Follow this procedure.

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.

**Figure 1**  
Checking contents of carton.



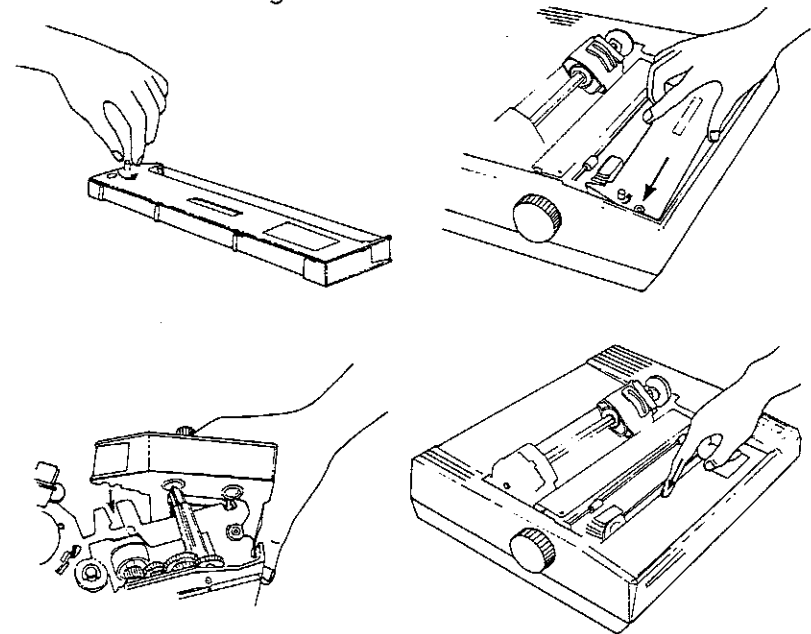
**Figure 2**  
Remove shipping screw(s)



### 3. Install the ribbon cartridge in the manner of followings — see **Figure 3**

- a. Remove the ribbon cartridge from its box and turn the plastic knob counterclockwise so the ribbon is tight.
- b. Move the printer head to the left by finger if it is located not at home position that is the far left.
- c. Hold the cartridge with the plastic knob be at left and top side, then set it on the two side frames of printer mechanism with tilting the cartridge so the two front hooks on the side frames be engaged with two catches on both left and right sides of bottom of cartridge, then steer down with pressing the ribbon side so the two side tabs of cartridge be slid into the slits on the side frames of printer mechanism.
- d. Turn the plastic knob on cartridge again to tighten the ribbon up so the ribbon slips into front of printer head by itself.

**Figure 3**  
Installation of ribbon cartridge



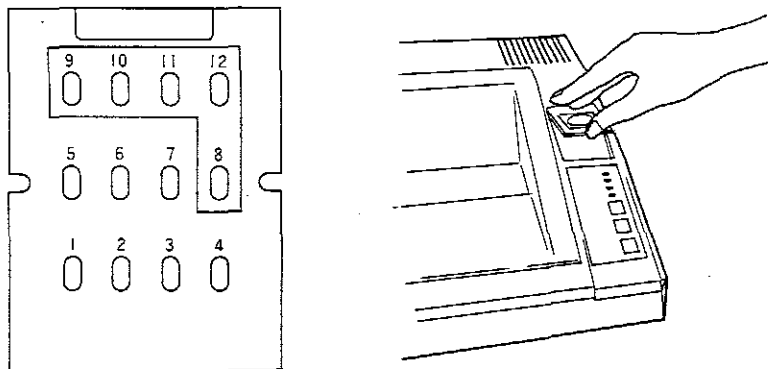
### 4. Function selector switch board

There are the 12 selector switches on board, they can be set to make the printer functions wide variety of print features — see **Appendix E**.

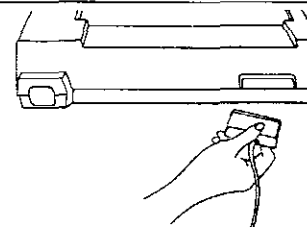
This switch board is located right under the small lid which has the model name logo is on it, on the top and right side of the cabinet, next of key board — see **Figure 4**.

On Model **Serial (S)** — serial interface model, beside of the above selector switches, the additional selector dip switches are equipped on the interface board — see **Appendix G**, Selection for serial interface functions. To set those dip switches, open the back of case refering **Figure 5**.

**Figure 4.**  
Function Selector Switches



**Figure 6**  
Conector and Cable



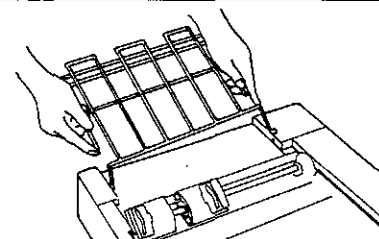
### 5. Cable connection.

Before connect 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.
- Be sure you have the right cable and connect it on to the receptacle of connector on back of printer unit. Double-check to ensure that the cable is in place and locked. It may take a firm push on the connector to secure the clips.

The other end of cable should not yet be connected to your computer at this stage.

**Figure 7**  
Wire rack



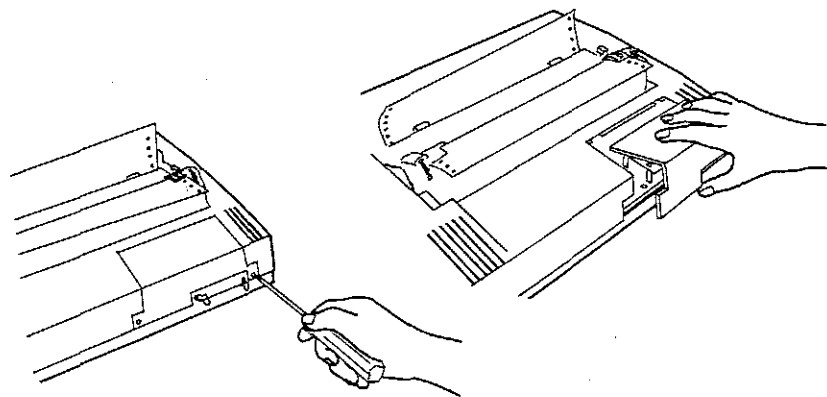
### 6. Set the wire rack.

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

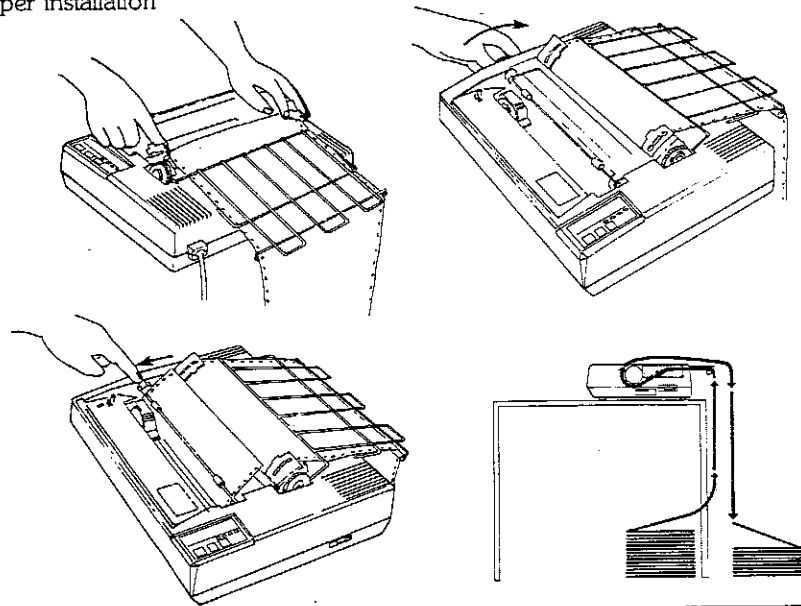
### 7. Installing the paper — see **Figure 8**.

- 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 tractors as necessary to match the paper hole spacing. Open both 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.
- Feed the paper forward with the platen knob.
- Set the paper so a perforation between sheets is positioned just slightly below the top of the ribbon.
- After print test, if necessary, print impression can be adjusted by the head adjusting lever, but at this stage just acknowledge the location of lever and should not change the factory adjustment — see **Figure 9**.

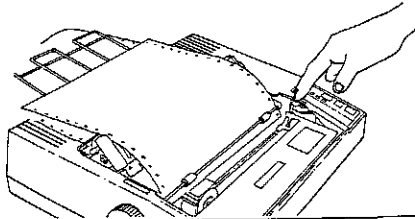
**Figure 5.**  
Open Back to Interface Board



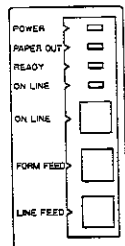
**Figure 8**  
Paper installation



**Figure 9**  
Positioning of printer head



**Figure 10**  
Keyboard layout



**8. Test** — see Keyboard Layout **Figure 10**.

- Plug the power cord IN.
- Turn the power switch ON.
- POWER, READY and ON LINE lights should be lit. If the paper is not correctly inserted PAPER OUT light will also lit, then re-install the paper.
- Press the ON LINE button several times, it toggle the ON LINE and READY lights. When those lights are ON, your printer is ready to accept datas from the host computer.
- 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).

**9. Connect the cable to your computer for start.**

## 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. Acknowledge its locations to become familiar with operation of printer.

- Power switch:** Controls primary AC power to the printer. Check the paper is properly set in the printer before turning this switch.
- ON LINE switch:** When the power switch is turned ON, the printer enters the On-line mode and can be utilized in conjunction with a host computer.

Depressing the On-line switch will set the printer in the Off-line mode and cause the green light to go out, it toggle the mode from On-line to Off-line to On-line alternatively.

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 switches are effective only while the printer is Off-line mode.

- FF switch: (form feed)** When this switch 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 @ code is input. Therefore, before turning the power switch on to start operation, set the paper at the appropriate top of form position.

- LF switch: (line feed)** The paper advances while this switch is being depressed. The line spacing is determined by ESC A + (n) D code.

The line feed operation is prohibited while the printer is actively engaged in printing.

- 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 its end.

### 2. Buzzer.

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



### 7. 16Bits HEX. dump mode

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

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

**[PROGRAM EX.]**

```
10 '----- Sample for HEX DUMP MODE -----
20 ' Open Printer Device.
30 OPEN "O",1,"LPT0:"
40 ' Program
50 FOR I=32 TO 126:PRINT #1,CHR$(I);NEXT I
60 PRINT #1
70 PRINT #1,CHR$(27);"M";"THIS PRINTING IS 'ELITE SIZE'."
80 PRINT #1,CHR$(27);"P";"This Printing is 'PAICA SIZE'."
90 PRINT #1,CHR$(27);"p";CHR$(1);"This Printing is 'PROPORTIONAL'."
100 PRINT #1,CHR$(27);"p";CHR$(0);
110 CLOSE #1
120 END
```

**[EXECUTIVE PRINT]**

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

**[16BITS 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	48	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 and in less time. They are:

- ASCII code.
  - Escape codes
  - "+" symbol
  - 2 (Binary), D (Decimal) and H (Hexadecimal)
- 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 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 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 the graphic drawing by using codes — see **Appendix A**, those characters are put in some addresses of the ASCII code table instead of the standard characters.

All those can be accessed by a particular control code (or the Dip switch). The selection of which one to use is up to you if your host computer has an 8-bit data bus line.

Escape codes.  
In a lot of control codes that the Printer has, you might be confused by the word "Escape". Some alphabetical letters and some numbers follow it. Each of them causes a special function to the printer i.e.

- To format a sentence.
- To do emphasized printing.
- To select paper end detector programmably.
- To set column length.
- To underline characters.
- To print superscript/subscript characters.
- To do bit image printing.
- Others.

Generally, printer control codes, especially like "Escape" i.e. CHR\$(27) are not standardized. Every computer and printer manufacturer applies its own meaning to such codes.



The "Escape" codes used in the printer should not be confused with the "Escape" key which some computers have — 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 may not be input in your actual program. 2. D (or Dec.) and H (or Hex.)

( ) 2. ( ) D and < H respectively represent binary, decimal and hexadecimal 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 the Bit Image.

#### a. Print action codes.

CR ..... Carriage return  
 LF ..... Line feed  
 FF ..... Form feed  
 VT ..... Vertical tabulation

#### b. Paper formatting control codes.

ESC 3n ..... Sets line spacing to n/216"  
 ESC An ..... Sets line spacing to n/72"  
 ESC 1 ..... Sets line spacing to 7/72"  
 ESC ϕ ..... Sets line spacing to 1/8" (8 LPI, 3.18mm)  
 ESC 2 ..... Sets line spacing to 1/6" (6 LPI, 4.23mm)  
 ESC J n ..... Print and paper forward feed  
 ESC j n ..... Print and paper reverse feed  
 ESC Q n ..... Sets column length (right margin)  
 ESC l n ..... Sets column length (left margin)  
 ESC C n ..... Sets form length by number of lines  
 ESC C ϕ m ..... Sets form length by value of inch  
 FF ..... Form feed execution  
 ESC N n ..... Sets skip-over perforation  
 ESC O ..... Cancels skip-over perforation  
 ESC B n<sub>1</sub> n<sub>2</sub> — n<sub>k</sub>NUL ..... Sets vertical tabulation value

VT ..... Vertical tabulation execution  
 ESC b n<sub>m1</sub> n<sub>m2</sub> — n<sub>k</sub>NUL ..... Sets vertical format units value (VFU)  
 ESC/n ..... Selects VFU  
 ESC D n<sub>1</sub> n<sub>2</sub> — n<sub>k</sub>NUL ..... 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  
 DC 2 ..... Cancels condensed mode  
 ESC E ..... Sets emphasized mode  
 ESC F ..... Cancels emphasized mode  
 ESC G ..... Sets double-strike mode  
 ESC H ..... Cancels double-strike mode  
 ESC M ..... Sets "ELITE" print mode  
 ESC P ..... Sets "PICA" print mode  
 ESC S ϕ ..... 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 — ϕ ..... 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 & n m a p<sub>1</sub> p<sub>2</sub> — p<sub>8</sub> ..... 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 leftmost 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<sub>1</sub> n<sub>2</sub> ..... Normal density bit image (8 bits) mode
- ESC L n<sub>1</sub> n<sub>2</sub> ..... Double density bit image (8 bits) mode
- ESC ^ m n<sub>1</sub> n<sub>2</sub> ..... Selects 9 dots bit image mode

**2. Print action codes.**

**a. 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 printing.)
- (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 carried out 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 LF code. This code cancels the enlarged mode set by the SO code. Even if 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 ≤ n ≤ 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 = 2, 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.]**

```

2 'Control Command: ESC 3 n
5 'Open Printer Device.
10 OPEN "0",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):ESC#=CHR$(27):HT#=CHR$(9):LF#=CHR$(10)
410 PRINT #1,SO#;"ESC 3 n"
420 FOR I=10 TO 40 STEP 10
430 PRINT #1,ESC#;"3";CHR$(I);
440 PRINT #1,HT#;"Line spacing ";I;"/216 inch -----"
450 NEXT I
460 PRINT #1,ESC#;"2";LF#
    
```

**[PRINT]**

```

ESC 3 n
Line spacing 10 /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 line spacing in the Line Feed, provided that (n)D must satisfy the condition: 1 ≤ (n)D ≤ 85 (Decimal). "n" = 1 is equivalent to 1/72 inch paper advancement. Since the distance between any two dot plates of the print head is 1/72 inch, any line spacing in increments proportional to the distance between the dot plates 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 ESC A + (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 set.

[PROGRAM EX]

```

2 'Control Command: ESC A n
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):ESC#=CHR$(27):HT#=CHR$(9):LF#=CHR$(10)
510 PRINT #1,SO#;"ESC A n"
520 FOR I=2 TO 8 STEP 2
530 PRINT #1,ESC#;"A";CHR$(I);
540 PRINT #1,HT#;"Line spacing ";I;"/72 inch -----"
550 NEXT I
560 PRINT #1,ESC#;"2";LF#

```

[PRINT]

```

ESC A n
Line spacing 2 /72 inch -----
Line spacing 4 /72 inch -----
Line spacing 6 /72 inch -----
Line spacing 8 /72 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.

•Example: Input from the keyboard of the TRS-80 personal computer.  
[PRINT CHR\$(27); CHR\$(65); CHR\$(24)]

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.]

```

2 'Control Command: ESC 1
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):ESC#=CHR$(27):HT#=CHR$(9):LF#=CHR$(10)
210 PRINT #1,SO#;"ESC 1"
220 PRINT #1,ESC#;"1";
230 FOR I=1 TO 4
240 PRINT #1,HT#;"Line spacing 7/72 inch -----"
250 NEXT I
260 PRINT #1,ESC#;"2";LF#

```

[PRINT]

```

ESC 1
Line spacing 7/72 inch -----
Line spacing 7/72 inch -----
Line spacing 7/72 inch -----
Line spacing 7/72 inch -----

```

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

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

[PROGRAM EX.]

```

2 'Control Command: ESC 0
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):ESC#=CHR$(27):HT#=CHR$(9):LF#=CHR$(10)
110 PRINT #1,SO#;"ESC 0"
120 PRINT #1,ESC#;"0";
130 FOR I=1 TO 4
140 PRINT #1,HT#;"Line spacing 1/8 inch -----"
150 NEXT I
160 PRINT #1,ESC#;"2";LF#

```

[PRINT]

```

ESC 0
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.

[PROGRAM EX.]

```

2 'Control Command: ESC 2
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):ESC#=CHR$(27):HT#=CHR$(9):LF#=CHR$(10)
320 PRINT #1,ESC#;"2";
330 FOR I=1 TO 4
340 PRINT #1,HT#;"Line spacing 1/6 inch -----"
350 NEXT I
360 PRINT #1,LF#

```

[PRINT]

```

ESC 2
Line spacing 1/6 inch -----
Line spacing 1/6 inch -----
Line spacing 1/6 inch -----
Line spacing 1/6 inch -----

```

f. ESC J + (n)D (Paper Feed Execution Command) (1 ≤ n ≤ 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 φ. no

paper feeding will be executed. In any case, the set value of n will not return in the memory.

**[PROGRAM EX]**

```
2 'Control Command: ESC J n
5 'Open Printer Device.
10 OPEN "0",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO$=CHR$(14):ESC$=CHR$(27):LF$=CHR$(10)
910 PRINT #1,SO$;"ESC J n"
920 FOR I=10 TO 40 STEP 10
930 PRINT #1,I;"/216 inch -----";
940 PRINT #1,ESC$;"J";CHR$(I);
950 NEXT I
960 PRINT #1,LF$
```

**[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.

**[PROGRAM EX.]**

```
2 'Control Command: ESC j n
5 'Open Printer Device.
10 OPEN "0",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO$=CHR$(14):HT$=CHR$(9):ESC$=CHR$(27)
1010 PRINT #1,SO$;"ESC j n"
1015 PRINT #1,HT$;"Line spacing n/216 inch for reverse (ACTION)"
1020 PRINT #1,HT$;"--- sine wave plot ---"
1030 FOR I=1 TO 3:PRINT #1:NEXT I
1040 MAX=99
1045 PRINT #1,HT$;
1050 FOR I=-2 TO 6.38*2 STEP .4
1060 Y=FIX(100*SIN(I)+100)
1070 IF Y>MAX THEN YO=Y-MAX:MAX=Y:PRINT #1,"*";ESC$;"J";CHR$(YO);:GOTO 1090
1080 YO=MAX-Y:MAX=Y:PRINT #1,"$";ESC$;"J";CHR$(YO);
1090 NEXT I
1092 FOR I=1 TO 6:PRINT #1:NEXT I
```

**[PRINT]**

```
ESC j n
Line spacing n/216 inch for reverse (ACTION)
--- sine wave plot ---
```



**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.]**

```
2 'Control Command: ESC Q n
5 'Open Printer Device.
10 OPEN "0",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO$=CHR$(14):HT$=CHR$(9):ESC$=CHR$(27):LF$=CHR$(10)
1810 PRINT #1,SO$;"ESC Q n"
1820 PRINT #1,HT$;"Case of right margin 70 characters"
1830 PRINT #1,ESC$;"Q";CHR$(70);
1840 FOR I=32 TO 126:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$;LF$
1850 PRINT #1,ESC$;"Q";CHR$(80);
```

**[PRINT]**

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

**i. ESC I + (n)D (left margin setting) CHR\$(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.]**

```
2 'Control Command: ESC I n
5 'Open Printer Device.
10 OPEN "0",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO$=CHR$(14):HT$=CHR$(9):ESC$=CHR$(27):LF$=CHR$(10)
1910 PRINT #1,SO$;"ESC I n"
1920 PRINT #1,HT$;"Case of left margin 10 characters"
1930 PRINT #1,ESC$;"I";CHR$(10);
1940 FOR I=32 TO 126:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$;LF$
1950 PRINT #1,ESC$;"I";CHR$(0);
```

**[PRINT]**

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

**j. ESC C + (n)D (form length setting) CHR\$(27); "C"; CHR\$(n);**

The "ESC C + (n)D" code specifies the form length which is determined by the number of lines (n: 1 ≤ n ≤ 127) where the value of "n" is a positive number and must not exceed 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 + ( $\phi$ )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 of 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  $\phi$ , this setting is ignored and the value of m set immediately before it becomes valid.

#### [PROGRAM EX.]

```
2 'Control Command: ESC C n
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):ESC#=CHR$(27):FF#=CHR$(12):LF#=CHR$(10)
1110 PRINT #1,SO#;"ESC C n"
1120 PRINT #1,HT#;"Case of sets form length to 4 lines"
1130 PRINT #1,ESC#;"C";CHR$(4);FF#;
1140 PRINT #1,HT#;"Next top of form"
1150 PRINT #1,ESC#;"C";CHR$(66);LF#
```

#### [PRINT]

```
ESC C n
Case of sets form length to 4 lines
```

Next top of form

#### [PROGRAM EX. 2]

```
2 'Control Command: ESC C 0 n
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):ESC#=CHR$(27):FF#=CHR$(12):LF#=CHR$(10)
1210 PRINT #1,SO#;"ESC C 0 n"
1220 PRINT #1,HT#;"Case of sets form length to 1 inch"
1230 PRINT #1,ESC#;"C";CHR$(0);CHR$(1);FF#;
1240 PRINT #1,HT#;"Next top of form"
1250 PRINT #1,ESC#;"C";CHR$(66);LF#
```

#### [PRINT]

```
ESC C 0 n
Case of sets form length 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  $\phi$ , 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 ESC C + ( $n$ )D + m code again, the amount of skip-over perforation previously 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.]

```
2 'Control Command: ESC N n ; ESC 0
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):ESC#=CHR$(27):HT#=CHR$(9):LF#=CHR$(10)
1325 PRINT #1,SO#;"ESC 0"
1330 PRINT #1,ESC#;"C";CHR$(5);
1340 PRINT #1,ESC#;"N";CHR$(2);
1350 FOR I=1 TO 6
1360 PRINT #1,HT#;"2 Lines skip over perforation"
1370 NEXT I
1380 PRINT #1,ESC#;"C";CHR$(66);
1390 PRINT #1,ESC#;"0";LF#
```

#### [PRINT]

```
ESC N n
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
2 Lines skip over perforation
```

#### l. ESC 0

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\$( $n_1$ ); ..., CHR\$( $n_k$ ); CHR\$( $\phi$ ); ( $1 \leq n \leq 255$ ) ( $1 \leq k \leq 16$ )

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 inputing 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  $\phi$ .

**[PROGRAM EX.]**

```

2 'Control Command: ESC B n1..nk NUL
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO$=CHR$(14):ESC$=CHR$(27):VT$=CHR$(11):HT$=CHR$(9):LF$=CHR$(10)
1410 PRINT #1,SO$;"ESC B n1..nk NUL";DC4$;LF$;HT$;"Case of step 8 lines"
1420 PRINT #1,ESC$;"B";
1422 FOR I=1 TO 8
1424 PRINT #1,CHR$(I*8);
1426 NEXT I
1428 PRINT #1,CHR$(0);
1430 FOR I=1 TO 3
1440 PRINT #1,VT$;HT$;"-----Vtab"
1450 NEXT I
1460 PRINT #1,LF$;LF$

```

**[PRINT]**

```

ESC B n1..nk NUL
Case of step 8 lines

```

-----Vtab

-----Vtab

-----Vtab

**n.** ESC b (VFU position setting)

CHR\$(27); "b"; CHR\$(n); CHR\$(m<sub>1</sub>); ....; CHR\$(m<sub>k</sub>); CHR\$( $\phi$ ); ( $\phi \leq n \leq 7$ )  
 ( $1 \leq k \leq 16$ ) ( $1 \leq m \leq 255$ )

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" - ( $\phi$  to 7), and for each channel, up to 16 positions — refer as "m" — can be set within the page length.

The channel is set to  $\phi$  at power ON.

**Note:** TAB positions in channel  $\phi$  can be set by ESC B.

**o.** ESC/ + (n)D (VFU channel selection) CHR\$(27); "/" ; CHR\$(n); On the standard model —  $n = \phi$  only; with option RAM(s) —  $\phi \leq n \leq 7$ :

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 shnnels within which vertical TABs can be independently set. For example, channel can be set for vertical TABs at the 3rd, 5th and 15th lines and channel 2 for the 6th, 10th and 3 $\phi$  the lines.

**[PROGRAM EX.]**

```

2 'Control Command: ESC b n m1..mk NUL ; ESC / n
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO$=CHR$(14):HT$=CHR$(9):ESC$=CHR$(27):VT$=CHR$(11):LF$=CHR$(10)
1510 PRINT #1,SO$;"ESC b n m1..mk NUL"
1515 PRINT #1,SO$;"ESC / n"
1520 PRINT #1,HT$;"n=VFU: Case of step 6 lines, and n=1"
1530 PRINT #1,ESC$;"b";CHR$(1);
1532 FOR I=1 TO 10
1534 PRINT #1,CHR$(I*6);
1536 NEXT I
1538 PRINT #1,CHR$(0);
1540 PRINT #1,ESC$;"/";CHR$(1);
1550 FOR I=1 TO 3
1560 PRINT #1,VT$;HT$;"-----Vtab"
1570 NEXT I
1580 PRINT #1,ESC$;"/";CHR$(0);
1590 PRINT #1,LF$;LF$

```

**[PRINT]**

```

ESC b n m1..mk NUL
ESC / n
n=VFU: Case of step 6 lines, and n=1

```

-----Vtab

-----Vtab

-----Vtab

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 of ESC I.

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

```
2 'Control Command: ESC D n1..nk NUL
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):ESC#=CHR$(27):LF#=CHR$(10)
1610 PRINT #1,SO#;"ESC D n1..nk NUL"
1630 PRINT #1,HT#;"Case of step 10 characters"
1640 PRINT #1,ESC#;"D";
1650 FOR I=1 TO 8: PRINT #1,CHR*(I*10);:NEXT I: PRINT #1,CHR$(0);
1660 FOR I=1 TO 3: PRINT #1,HT#;"Htab";:NEXT I: PRINT #1,LF#;LF#
```

[PRINT]

```
ESC D n1..nk NUL
Case of step 10 characters
'Htab 'Htab 'Htab
```

r. ESC i + (n)D (incremental print) CHR\$(27); "i"; CHR\$(n); (n = φ or 1) ESC i + (1)D code causes the printer to print each character every time it is input — incremental mode.

ESC i + (φ)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 the bidirectional printing.

[PROGRAM EX.]

```
2 'Control Command: ESC i n
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):ESC#=CHR$(27):LF#=CHR$(10)
4950 PRINT #1,SO#;"ESC i n"
4960 PRINT #1,HT#;"Incremental & View Mode:"
4962 PRINT #1,HT#;"OPEN:";LF#;
4964 PRINT #1,ESC#;"i";CHR$(1);
4966 AS="This is Incremental & View Mode:= The Software's Typewriter."
4968 FOR I=1 TO 60
4970 FOR J=1 TO 150:NEXT J:PRINT #1,MID$(AS,I,1);
4972 NEXT I:PRINT #1
4976 PRINT #1,ESC#;"i";CHR$(0);HT#;"CLOSE:";LF#;LF#
```

[PRINT]

```
ESC i n
Incremental & View Mode:
OPEN:
This is Incremental & View Mode:= The Software's Typewriter.
CLOSE:
```

4. Character designation codes

a. SO (Shift Out) (enlarged characters) CHR\$(14);

When the SO code is input, all data that follows 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).

**[PROGRAM EX.]**

```

2 'Control Command: ESC SO ; SO ; DC4
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):DC4#=CHR$(20):LF#=CHR$(10)
2010 PRINT #1,SO#;"ESC SO"
2020 PRINT #1,SO#;"SO"
2030 PRINT #1,SO#;"DC4"
2040 PRINT #1,HT#;"With to cancelled by end of line unless DC4"
2060 PRINT #1,HT#;"NORMAL: ";SO#;"ENLARGEMENT: ";DC4#;"NORMAL."
2065 PRINT #1,SO#;
2070 FOR I=1 TO 6: PRINT #1,"ENLARGEMENT: ";NEXT I: PRINT #1,LF#;LF#

```

**[PRINT]**

```

ESC SO
SO
DC4
      With to cancelled by end of line unless DC4
      NORMAL: ENLARGEMENT: NORMAL.
ENLARGEMENT: ENLARGEMENT: ENLARGEMENT: ENLARGEMENT: E
ENLARGEMENT: ENLARGEMENT: ENLARGEMENT:

```

- 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 "LF" 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 DC4 code cancels the SO mode (enlarged character printing function.)

**[PROGRAM EX.]**

```

2 'Control Command: ESC W n
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):LF#=CHR$(10)
2105 PRINT #1,SO#;"ESC W n"
2160 PRINT #1,HT#;"NORMAL: ";ESC#;"W";CHR$(1);
2170 FOR I=1 TO 5: PRINT #1,"ENLARGEMENT: ";NEXT I: PRINT #1,LF#;LF#
2180 PRINT #1,ESC#;"W";CHR$(0);

```

**[PRINT]**

```

ESC W n
      NORMAL: ENLARGEMENT: ENLARGEMENT: ENLARGEMENT: ENLARGEMENT:
ENLARGEMENT: ENLARGEMENT: ENLARGEMENT:

```

- 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.]**

```

2 'Control Command: ESC SI ; SI ; DC2
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):SI#=CHR$(15):DC2#=CHR$(18):LF#=CHR$(10)
2210 PRINT #1,SO#;"ESC SI"
2220 PRINT #1,SO#;"SI"
2230 PRINT #1,SO#;"DC2"
2260 PRINT #1,HT#;"NORMAL: ";SI#;
2270 FOR I=1 TO 3:PRINT #1,"REDUCTION: ";NEXT I
2280 PRINT #1,DC2#;"NORMAL.";LF#

```

**[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 over-ride 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.

**[PROGRAM EX.]**

```

2 'Control Command: ESC E ; ESC F
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):ESC#=CHR$(27):DC4#=CHR$(20):LF#=CHR$(10)
2310 PRINT #1,SO#;"ESC E"
2320 PRINT #1,SO#;"ESC F"
2330 PRINT #1,HT#;"NORMAL: ";ESC#;"E";"EMPHASIZED: ";SO#;"EMPHASIZED-ENLARGEMENT: ";DC4#;"ESC#;"F";"NORMAL.";LF#;LF#

```

**[PRINT]**

```

ESC E
ESC F
      NORMAL: EMPHASIZED: EMPHASIZED-ENLARGEMENT: NORMAL.

```

- 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 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.



[PROGRAM EX.]

```

2 'Control Command: ESC G ; ESC H
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):ESC#=CHR$(27):HT#=CHR$(9):LF#=CHR$(10)
2410 PRINT #1,SO#;"ESC G"
2420 PRINT #1,SO#;"ESC H"
2430 PRINT #1,ESC#;"G";
2440 PRINT #1,HT#;"Duble strike print/ DUBLE STRIKE PRINT."
2450 PRINT #1,ESC#;"H";LF#;LF#

```

[PRINT]

```

ESC G
ESC H
Duble strike print/ DUBLE STRIKE PRINT.

```

- j. ESC M ("ELITE" sized mode setting) CHR\$(27); "M";  
Input of ESC M code causes the data followint his code to be printed in "ELITE" size (12 characters per inch). Emphasized on condensed mode setting is ignored in this "ELITE" mode.

[PROGRAM EX.]

```

2 'Control Command: ESC M
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):ESC#=CHR$(27):LF#=CHR$(10)
2590 PRINT #1,SO#;"ESC M"
2600 PRINT #1,HT#;"Select Elite Size"
2610 PRINT #1,ESC#;"M";
2620 FOR I=32 TO 126
2640 PRINT #1,CHR$(I);
2650 NEXT I:PRINT #1,ESC#;"P";LF#

```

[PRINT]

```

ESC M
Select Elite Size
!##%&'()*+,-./0123456789;:<=>?@ABCDEFGHIJKLMNQRSTUUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

```

- 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 + (φ)D and ESC S + (1)D (superscript and subscript setting)  
CHR\$(27); "S";CHR\$(φ); 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.

[PROGRAM EX.]

```

2 'Control Command: ESC S n ; ESC T
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):ESC#=CHR$(27):LF#=CHR$(10)
2510 PRINT #1,SO#;"ESC S n"
2520 PRINT #1,SO#;"ESC T"
2540 PRINT #1,HT#;"NORMAL:";ESC#;"S";CHR$(0);"SUPER-SCRIPT:";ESC#;"T";"NORMAL:";ESC#;"S";CHR$(1);"SUB-SCRIPT:";ESC#;"T";"NORMAL.";LF#;LF#

```

[PRINT]

```

ESC S n
ESC T
NORMAL: SUPER-SCRIPT: NORMAL: SUB-SCRIPT: NORMAL.

```

- n. ESC ! + (n)D (print mode selection) CHR\$(27); "!" ; CHR\$(n);  
This code specifies the print mode.  
Each print mode is determined by the value of n as follows.

n = φ — "PICA" mode	n = 32 — enlarged mode
n = 1 — "ELITE" mode	n = 33 — "ELITE"/enlarged mode
n = 4 — condensed mode	n = 36 — condensed/enlarged mode
n = 8 — emphasized mode	n = 40 — emphasized/enlarged mode
n = 16 — double strike mode	n = 48 — double strike/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

[PROGRAM EX.]

```

2 'Control Command: ESC ! n
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14):HT#=CHR$(9):ESC#=CHR$(27):LF#=CHR$(10)
2610 PRINT #1,SO#;"ESC ! n"
2630 FOR I=0 TO 64
2640 PRINT #1,HT#;ESC#;"!";CHR$(I);"PRINTING MODE ";I:NEXT I
2650 PRINT #1,ESC#;"!";CHR$(0);LF#;LF#

```

[PRINT]

ESC	!	n	PRINTING MODE 32
			PRINTING MODE 33
			PRINTING MODE 34
			PRINTING MODE 35
			PRINTING MODE 36
			PRINTING MODE 37
			PRINTING MODE 38
			PRINTING MODE 39
			PRINTING MODE 40
			PRINTING MODE 41
			PRINTING MODE 42
			PRINTING MODE 43
			PRINTING MODE 44
			PRINTING MODE 45
			PRINTING MODE 46
			PRINTING MODE 47
			PRINTING MODE 48
			PRINTING MODE 49
			PRINTING MODE 50
			PRINTING MODE 51
			PRINTING MODE 52
			PRINTING MODE 53
			PRINTING MODE 54
			PRINTING MODE 55
			PRINTING MODE 56
			PRINTING MODE 57
			PRINTING MODE 58
			PRINTING MODE 59
			PRINTING MODE 60
			PRINTING MODE 61
			PRINTING MODE 62
			PRINTING MODE 63
			PRINTING MODE 64

o. ESC p + (n)D (proportional spacing mode) CHR\$(27); "p"; CHR\$(n);  
(n = φ or 1)

This code is used to select proportional spacing print.

n = 1 ... proportional spacing select

n = φ ... normal spacing

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

[PROGRAM EX.]

```

2 'Control Command: ESC p n
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO$=CHR$(14):HT$=CHR$(9):ESC$=CHR$(27):LF$=CHR$(10)
4700 PRINT #1,SO$;"ESC p n"
4710 PRINT #1,HT$;"Select Proportional Spacing";LF$
4720 PRINT #1,ESC$;"p";CHR$(1);
4730 PRINT #1,HT$;"Case of NORMAL Characters"
4740 PRINT #1,HT$;"n=0 -- 8,10 -- 18,20 -- 23: Code=32 -- 126"
4750 PRINT #1,HT$;"Case of ASCII CODE"
4760 PRINT #1,ESC$;"R";CHR$(0);
4770 FOR I=32 TO 126:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$
4780 PRINT #1,HT$;"Case of Kana+Semi-graphic Characters"
4790 PRINT #1,HT$;"n=0 -- 9: Code=128 -- 254"
4800 PRINT #1,ESC$;"R";CHR$(0);
4810 FOR I=128 TO 254:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$
4820 PRINT #1,HT$;"Case of Semi-graphic Characters"
4830 PRINT #1,HT$;"n=10 -- 19: Code=160 -- 254"
4840 PRINT #1,ESC$;"R";CHR$(10);
4850 FOR I=160 TO 254:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$
4860 PRINT #1,HT$;"Case of Italic Characters"
4870 PRINT #1,HT$;"n=20: Code=160 -- 254"
4880 PRINT #1,HT$;"n=9 or 19: Code=32 -- 126"
4890 PRINT #1,ESC$;"R";CHR$(20);
4900 FOR I=160 TO 254:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$
4910 PRINT #1,HT$;"Case of Greece Characters"
4920 PRINT #1,HT$;"n=21 or 23: Code=160 -- 254"
4930 PRINT #1,ESC$;"R";CHR$(21);
4940 FOR I=160 TO 254:PRINT #1,CHR$(I);:NEXT I:PRINT #1
4950 PRINT #1,ESC$;"p";CHR$(0)
    
```

[PRINT]

```

ESC p n
Select Proportional Spacing

Case of NORMAL Characters
n=0 -- 8,10 -- 18,20 -- 23: Code=32 -- 126
Case of ASCII CODE
!""%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
{|}~

Case of Kana+Semi-graphic Characters
n=0 -- 9: Code=128 -- 254
!""%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
{|}~

Case of Semi-graphic Characters
n=10 -- 19: Code=160 -- 254
!""%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
{|}~

Case of Italic Characters
n=20: Code=160 -- 254
n=9 or 19: Code=32 -- 126
!""%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
{|}~

Case of Greece Characters
n=21 or 23: Code=160 -- 254
!""%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNQRSTUUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
{|}~
    
```

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.]

```

2 'Control Command: ESC - n
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO$=CHR$(14):HT$=CHR$(9):ESC$=CHR$(27):LF$=CHR$(10)
2710 PRINT #1,SO$;"ESC - n"
2720 PRINT #1,HT$;"Normal ";ESC$;"-";CHR$(1);"Underlined printing";ESC$;"-";CHR$(0);" Normal. ";LF$;LF$
    
```

[PRINT]

```

ESC - n
Normal Underlined printing Normal.
    
```

q. ESC R + (n) (selection of character generation sets) (φ ≤ n ≤ 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 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 character generator 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
φ thru 9 and 22	Types of C.G. with Katakana (Japanese)

As for the specific code tables, refer to **Appendix A.**

**[PROGRAM EX.]**

```

2 'Control Command: ESC R n (International character set)
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 S0$=CHR$(14):HT$=CHR$(9):ESC$=CHR$(27):LF$=CHR$(10)
3100 PRINT #1,S0$;"ESC R n"
3110 PRINT #1,HT$;"International character set:"
3115 PRINT #1,HT$;"      35 36 64 91 92 93 94 96 123 124 125 126"
3120 FOR K=0 TO 8
3130 PRINT #1,ESC$;"R";CHR$(K);
3140 DN K+1 GOTO 3141,3142,3143,3144,3145,3146,3147,3148,3149
3141 PRINT #1,HT$;"U.S.A";HT$;:GOTO 3160
3142 PRINT #1,HT$;"FRANCE";HT$;:GOTO 3160
3143 PRINT #1,HT$;"GERMANY";HT$;:GOTO 3160
3144 PRINT #1,HT$;"ENGRAND";HT$;:GOTO 3160
3145 PRINT #1,HT$;"DENMARK";HT$;:GOTO 3160
3146 PRINT #1,HT$;"SWEDEN";HT$;:GOTO 3160
3147 PRINT #1,HT$;"ITALY";HT$;:GOTO 3160
3148 PRINT #1,HT$;"SPAIN";HT$;:GOTO 3160
3149 PRINT #1,HT$;"JAPAN";HT$;:GOTO 3160
3160 RESTORE 3250
3170 FOR I=1 TO 12
3180 READ D: PRINT #1,"      ";CHR$(D);
3190 NEXT I: PRINT #1,LF$;
3200 NEXT K: PRINT #1,LF$;LF$
3210 PRINT #1,ESC$;"R";CHR$(0);
3250 DATA 35,36,64,91,92,93,94,96,123,124,125,126

```

**[PRINT]**

```

ESC R n
International character set:
      35 36 64 91 92 93 94 96 123 124 125 126
U.S.A  #  $  @  [  \  ]  ^  '  (  )  ~
FRANCE #  $  a  '  s  ^  '  e  u  e  e
GERMANY #  $  s  z  o  u  ^  '  k  o  u  e  e
ENGRAND £  $  e  [  \  ]  ^  '  (  )  ~
DENMARK #  $  e  e  A  ^  '  e  s  a  ~  ~
SWEDEN #  $  e  z  o  u  ^  '  k  o  e  a  u
ITALY  #  $  e  '  \  e  ^  '  a  o  e  i
SPAIN  #  $  e  ;  z  ^  '  '  e  }  ~  ~
JAPAN  #  $  e  [  k  ]  ^  '  (  )  ~

```

**[PROGRAM EX. 2]**

```

2 'Control Command: ESC R n (Select character SET)
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 S0$=CHR$(14):HT$=CHR$(9):ESC$=CHR$(27):LF$=CHR$(10)
2770 PRINT #1,S0$;"ESC R n";DC4$;" (Case of Select Character SET)";LF$
2780 PRINT #1,HT$;"Case of NORMAL Characters"
2790 PRINT #1,HT$;"n=0 -- 8,10 -- 18,20 -- 23: Code=32 -- 126"
2800 PRINT #1,HT$;"Case of ASCII CODE"
2810 PRINT #1,ESC$;"R";CHR$(0);
2820 FOR I=32 TO 126:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$
2830 PRINT #1,HT$;"Case of Kana+Semi-graphic Characters"
2840 PRINT #1,HT$;"n=0 -- 9: Code=128 -- 254"
2850 PRINT #1,ESC$;"R";CHR$(0);
2860 FOR I=128 TO 254:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$
2870 PRINT #1,HT$;"Case of Semi-graphic Characters"
2880 PRINT #1,HT$;"n=10 -- 19: Code=160 -- 254"
2890 PRINT #1,ESC$;"R";CHR$(10);
2900 FOR I=160 TO 254:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$
2910 PRINT #1,HT$;"Case of Italic Characters"
2920 PRINT #1,HT$;"n=20: Code=160 -- 254"
2930 PRINT #1,HT$;"n=9 or 19: Code=32 -- 126"
2940 PRINT #1,ESC$;"R";CHR$(20);
2950 FOR I=160 TO 254:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$
2960 PRINT #1,HT$;"Case of Greece Characters"
2970 PRINT #1,HT$;"n=21 or 23: Code=160 -- 254"
2980 PRINT #1,ESC$;"R";CHR$(21);
2990 FOR I=160 TO 254:PRINT #1,CHR$(I);:NEXT I:PRINT #1,LF$

```

**[PRINT]**

```

ESC R n (Case of Select Character SET)

Case of NORMAL Characters
n=0 -- 8,10 -- 18,20 -- 23: Code=32 -- 126
Case of ASCII CODE
!""#$%&'()*+,-./0123456789;:<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~

Case of Kana+Semi-graphic Characters
n=0 -- 9: Code=128 -- 254
!""#$%&'()*+,-./0123456789;:<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
αβγδεζηηθικλμνξοπρστυφω

Case of Semi-graphic Characters
n=10 -- 19: Code=160 -- 254
!""#$%&'()*+,-./0123456789;:<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
αβγδεζηηθικλμνξοπρστυφω

Case of Italic Characters
n=20: Code=160 -- 254
n=9 or 19: Code=32 -- 126
!""#$%&'()*+,-./0123456789;:<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
αβγδεζηηθικλμνξοπρστυφω

Case of Greece Characters
n=21 or 23: Code=160 -- 254
!""#$%&'()*+,-./0123456789;:<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`αβγδεζηηθικλμνξοπρστυφω

```

r. ESC & + (n)D + (m)D + (a)D + (p<sub>1</sub>)D + (p<sub>2</sub>)D + (p<sub>3</sub>)D + ... + (p<sub>8</sub>)D  
(download character definition)  
CHR\$(27); "&"; CHR\$(n); CHR\$(m); CHR\$(a); CHR\$(p<sub>1</sub>); CHR\$(p<sub>2</sub>);  
CHR\$(p<sub>3</sub>); ... CHR\$(p<sub>8</sub>);  
This code is only effective on the unit, provided with the expanded RAM option.  
This code defines a download character into character 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

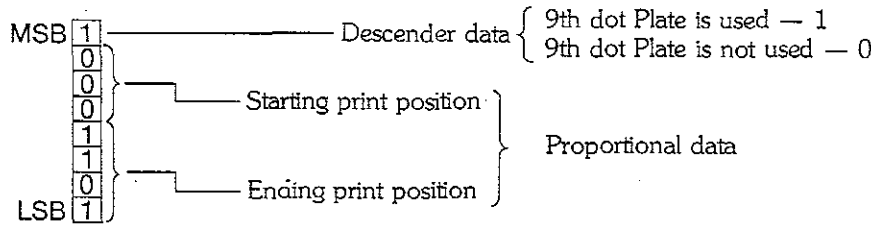
right as P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub>, ... P<sub>8</sub>/character matrix.

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

(a)D should be φ or 1 as follows.

a = φ ..... No attribute information, the all P<sub>1</sub> thru P<sub>8</sub> can be used for forming the character.

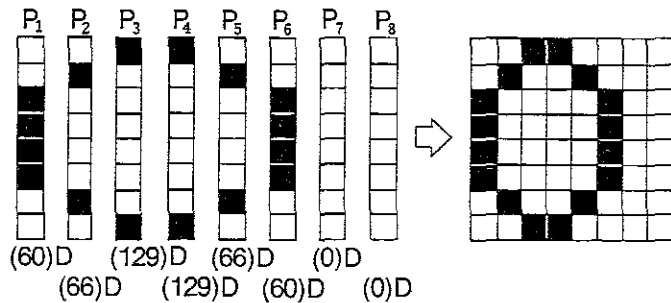
a = 1 ..... P<sub>8</sub> should be defined as the attribute information byte, therefore the character font should be formed in the area of P<sub>1</sub> thru P<sub>7</sub>.  
On this case P<sub>8</sub> (attribute information byte) should be specified in the manner of following.



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<sub>8</sub> (attribute info. byte) is (141)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 = φ) or 7 horizontal positions (with a = 1) in a download character.



s. ESC % + (1)D (Download C.S. selection) CHR\$(27); "%"; CHR\$(1);  
This code is effective for only the unit, provided with the expanded RAM option. The selector switch SW-1 on the function selector switch board should be ON — see **Figure 4.** and **Appendix E.**

This code selects the download charctor-set which has been previously defined in the expanded RAM (s).

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

### [PROGRAM EX.]

```

2 'Control Command: ESC & n m a pl..p8 , ESC % 1
5 'Open Printer Device.
10 OPEN "0",1,"LPT0:(W)"
15 'Define Control Codes.
20 SO#=CHR$(14);HT#=CHR$(9);ESC#=CHR$(27);LF#=CHR$(10)
3160 PRINT #1,SO#;"ESC & n m a"
3170 PRINT #1,SO#;"ESC % 1"
3180 PRINT #1,HT#;"Define Download Character Pattern"
3190 PRINT #1,ESC#;"&";CHR$(33);CHR$(35);
3200 ' Define character 33
3210 PRINT #1,CHR$(0);
3220 PRINT #1,CHR$(255);
3230 FOR I=2 TO 7
3240 PRINT #1,CHR$(129);
3250 NEXT I
3260 PRINT #1,CHR$(255);
3270 ' Define character 34
3280 PRINT #1,CHR$(1);
3290 PRINT #1,CHR$(255);
3300 FOR I=2 TO 7
3310 PRINT #1,CHR$(129);
3320 NEXT I
3330 PRINT #1,CHR$(128+3*16+9);
3340 ' Define character 35
3350 PRINT #1,CHR$(1);
3360 PRINT #1,CHR$(255);
3370 FOR I=2 TO 7
3380 PRINT #1,CHR$(129);
3390 NEXT I
3400 PRINT #1,CHR$(3*16+9);
3410 PRINT #1,HT#;"Print Download Characters"
3420 PRINT #1,ESC#;"R";CHR$(0);HT#;"Download Character (33)D has not an ATTRIBU
TE -----> ";ESC#;"%";CHR$(1);CHR$(33)
3430 PRINT #1,ESC#;"R";CHR$(0);HT#;"Download Character (34)D has an ATTRIBUTE(W
ith Descender) ----> ";ESC#;"p";CHR$(1);ESC#;"%";CHR$(1);CHR$(34)
3440 PRINT #1,ESC#;"p";CHR$(0);ESC#;"R";CHR$(0);HT#;"Download Character (35)D h
as an ATTRIBUTE(No Descender) -----> ";ESC#;"p";CHR$(1);ESC#;"%";CHR$(1);CHR$(3
5);LF#
3450 PRINT #1,HT#;ESC#;"R";CHR$(0);"*** Proportional spacing ***"
3460 GOSUB 3520
3470 PRINT #1,HT#;ESC#;"p";CHR$(0);ESC#;"R";CHR$(0);"*** No Proportional spacing
***"
3480 GOSUB 3520
3490 PRINT #1,ESC#;"R";CHR$(0);
3500 STOP
3510 ' subroutine
3520 PRINT #1,HT#;"Case of Character (33)D & (34)D"
3530 PRINT #1,ESC#;"%";CHR$(1);:FOR I=1 TO 20:PRINT #1,CHR$(33);CHR$(34);:NEXT I
:PRINT #1
3540 PRINT #1,HT#;ESC#;"R";CHR$(0);"Case of Character (33)D & (35)D"
3550 PRINT #1,ESC#;"%";CHR$(1);:FOR I=1 TO 20:PRINT #1,CHR$(33);CHR$(35);:NEXT I
:PRINT #1,LF#
3560 RETURN

```

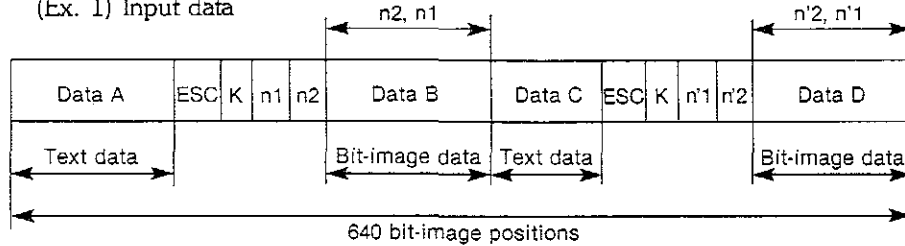




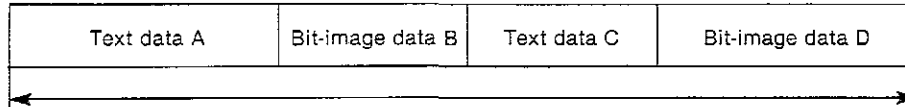
Text (20 characters)	ESC K	n = 640 Bit-image data	Next data
----------------------	-------	------------------------	-----------

20 characters in text mode correspond to 160 bit-image positions ( $20 \times 8 = 160$ ). 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



(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.]**

```

4000 LPRINT CHR$(27);"2"
4010 LPRINT "GRAPHIC MODE (ESC +K)"
4020 LPRINT CHR$(27);"A";
4030 LPRINT CHR$(8);
4040 FOR K=1 TO 5
4050 LPRINT CHR$(27);"K";CHR$(120);CHR$(0);
4070 FOR K0=1 TO 15:FOR K1=0 TO 7
4080 LPRINT CHR$(2^K1);
4090 NEXT K1:NEXT K0
4100 LPRINT
4110 NEXT K:LPRINT CHR$(27);"2";

```

**[PRINT]**

GRAPHIC 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 128' dot position per line, thus permitting to produce denser graphic data.

**[PROGRAM EX.]**

```

4200 LPRINT CHR$(27);"2"
4210 LPRINT "GRAPHIC MODE (ESC +L)"
4220 LPRINT CHR$(27);"A";
4230 LPRINT CHR$(8);
4240 FOR L=1 TO 5
4250 LPRINT CHR$(27);"L";
4260 LPRINT CHR$(120);CHR$(0);
4270 FOR L0=1 TO 15:FOR L1=0 TO 7
4280 LPRINT CHR$(2^L1);
4290 NEXT L1:NEXT L0
4292 LPRINT
4294 NEXT L:LPRINT CHR$(27);"2";

```

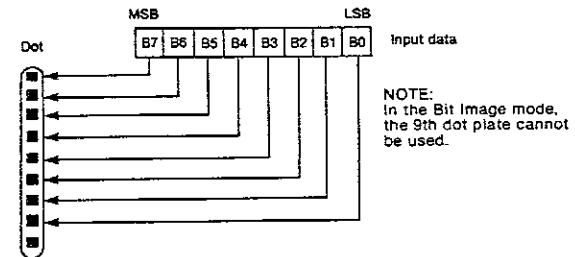
**[PRINT]**

GRAPHIC MODE (ESC +L)



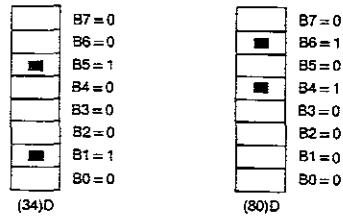
**c. Relationship between data and dot wires**

Fig. 13 shows the relationship between the Bit Image data and the dot tips in the print head. You can control arbitrary 8 dot tips in the print head.



**Fig. 13 Relationship between Data and Dot Tips**

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



Where a box with "■" denotes the bit 1 and a blank box denotes the bit 0. According to **Appendix A** Code Table, you can define (00100010)<sub>2</sub> as (34)D and (01010000)<sub>2</sub> as (80)D.

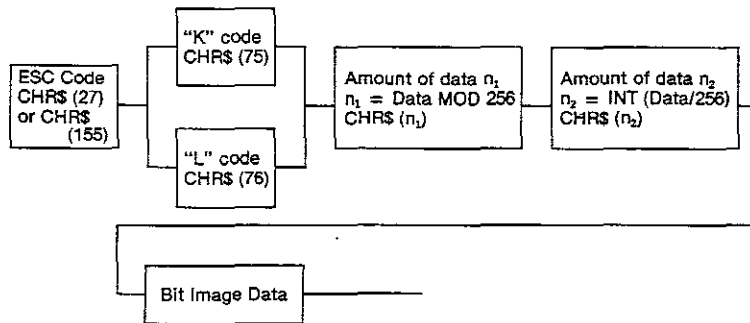
As you can see the first 4 bits are defined from column and the second 4 bits are defined from row. Namely, (0101)<sub>2</sub>=(5)D and (0000)<sub>2</sub>=(0)D.

**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:

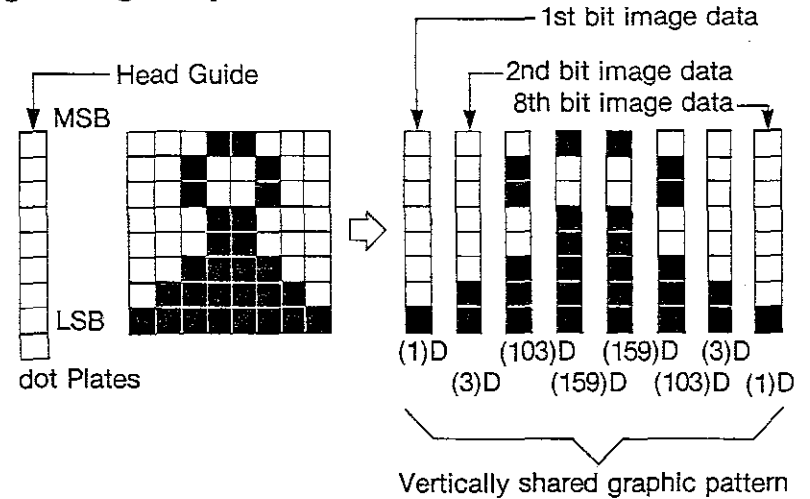
$$\begin{aligned}
 n1 &= (\text{Number of data}) \text{ MOD } 256 \\
 &= 300 \text{ mod } 256 \\
 &= (44)\text{D} \\
 &= <2C> \text{ H} \\
 n2 &= \text{INT} (\text{Number of data}/256) \\
 &= \text{INT} (300/256) \\
 &= (1)\text{D} \\
 &= <01> \text{ H}
 \end{aligned}$$

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

**e. programming examples**



**Fig. 15** Example of Graphic Pattern Formation

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

for example, to print a graphic data as shown in **Fig. 15** a program such as shown in the following pages must be executed. However, this program has been developed using standard BASIC language. If extended BASIC, etc., the data transfer rate is extremely slow. In such a case, it is recommended to effect the data transfer through machine language, etc.

**[PROGRAM EX.]**

```

2 'Control Command: ESC K n1 n2
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 S0$=CHR$(14):ESC$=CHR$(27):HT$=CHR$(9):LF$=CHR$(10)
2810 PRINT #1,S0$;"ESC K n1 n2"
2838 PRINT #1,ESC$;"A";CHR$(8);
2840 PRINT #1,HT$;"Normal-density bit image: Esc K command.";LF$
2845 FOR J=1 TO 4
2850 PRINT #1,HT$;ESC$;"K";CHR$(160);CHR$(0);
2860 FOR I=1 TO 20
2870 PRINT #1,CHR$(1);CHR$(3);CHR$(103);CHR$(159);CHR$(159);CHR$(103);CHR$(3);CHR$(1);
2880 NEXT I: PRINT #1,LF$;: NEXT J
2890 PRINT #1,ESC$;"2";LF$

```

**[PRINT]**

ESC K n1 n2  
Normal-density bit image: Esc K command.





**[PROGRAM EX.]**

```

2 'Control Command: ESC L n1 n2
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 S0$=CHR$(14);ESC$=CHR$(27);HT$=CHR$(9);LF$=CHR$(10)
2895 PRINT #1,S0$;"ESC L n1 n2"
2898 PRINT #1,ESC$;"A";CHR$(8);
2900 PRINT #1,HT$;"Dual-density bit image: Esc L command.";LF$
2910 FOR J=1 TO 4
2920 PRINT #1,HT$;ESC$;"L";CHR$(160);CHR$(0);
2930 FOR I=1 TO 20
2940 PRINT #1,CHR$(1);CHR$(3);CHR$(103);CHR$(159);CHR$(159);CHR$(103);CHR$(3);CHR$(1);
2950 NEXT I: PRINT #1,LF$; NEXT J
2960 PRINT #1,ESC$;"2";LF$
    
```

**[PRINT]**

**ESC L n1 n2**  
Dual-density bit image: Esc L command.



**f. ESC ^ + (m)D (n1) + (n2) (9-pins bit image mode)**

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

This code sets 9-pins bit image mode.

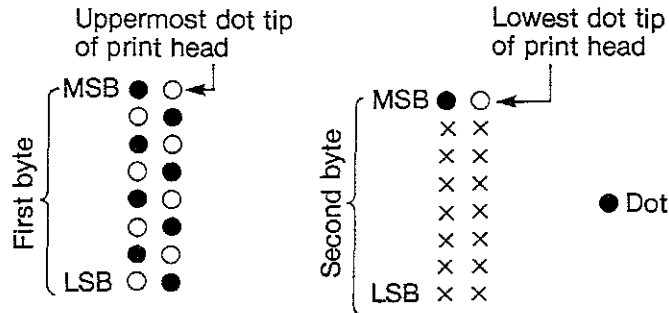
m value should be defined as follows.

m = 0 — normal density, 640 dots/line

m = 1 — dual density, 1280 dots/line

Refer to Paragraph d. for how to obtain n1 and n2 values—same as for ESC K or ESC L.

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 sent after n1 and n2.

**[PROGRAM EX.]**

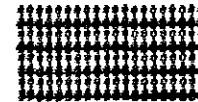
```

2 'Control Command: ESC ^ m n1 n2
5 'Open Printer Device.
10 OPEN "O",1,"LPT0:(W)"
15 'Define Control Codes.
20 S0$=CHR$(14);ESC$=CHR$(27);HT$=CHR$(9);LF$=CHR$(10)
2965 PRINT #1,S0$;"ESC ^ m n1 n2"
2968 PRINT #1,ESC$;"A";CHR$(9);
3000 PRINT #1,HT$;"9 Pins bit image: Esc ^ command.";LF$
3005 PRINT #1,ESC$;"A";CHR$(9);
3010 FOR K=1 TO 0 STEP -1
3012 IF K=0 THEN PRINT #1,HT$;"Case of m=0: Normal-density ";LF$;GOTO 3020 ELSE
PRINT #1,HT$;"Case of m=1: Dual-Density ";LF$
3020 FOR J=1 TO 4
3030 PRINT #1,HT$;ESC$;"^";CHR$(K);CHR$(160 MOD 256);CHR$(INT(160/256));
3040 FOR I=1 TO 20
3050 PRINT #1,CHR$(1);CHR$(0);CHR$(3);CHR$(0);CHR$(103);CHR$(128);CHR$(159);CHR$(128);CHR$(159);CHR$(128);CHR$(103);CHR$(103);CHR$(128);CHR$(3);CHR$(0);CHR$(1);CHR$(0);
3060 NEXT I: PRINT #1,LF$; NEXT J
3065 PRINT #1,LF$;NEXT K
3070 PRINT #1,LF$
3080 PRINT #1,ESC$;"2";LF$;LF$
    
```

**[PRINT]**

**ESC ^ m n1 n2**  
9 Pins bit image: Esc ^ command.

Case of m=1: Dual-Density



Case of m=0: Normal-density



# 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 SUTO FEED XT signal) (Table F-2) on the parallel interface board.

## Serial Interface of (S) Printer

### 1. General information

RS-232C/Current Loop Interface Board is an optional interface that fits inside of the **Serial (S)** Printer

With provision of this interface, the **Serial (S)** can be used for RS-232C or 20mA neutral current loop interfacing for asynchronous serial data transmission as speeds of 75 to 4800 bits per second (BPS)

Since this interface is equipped with 112, 1792, 2048 or 3840 byte buffer memory, data transmission can be received at any allowed bit rate with buffering up to its capacity, it makes **Serial (S)** possible to receive serial data transmission in real time.

This interface has two handshakings, which are flag and X ON-X OFF controls.

### 2. Basic specifications

- (1) Synchronization: Asynchronous.
- (2) Bit Rate: 75, 110, 134.5, 150, 200, 600, 1200, 2400, and 4800 BPS. Programmable.
- (3) Word Length:
  - a. Start bit — 1 bit
  - b. Data bits — 7 or 8 bits, programmable.
  - c. Parity bit — Even, odd or omission, programmable.
  - d. Stop bit — More than one or two bits, programmable.
- (4) Signal Polarity:
  - a. RS232C — Mark=Logical "1" (-3V. to -27V.)  
RS323C — Space=Logical "0" (+3V. to +27V.)
  - b. Current loop — Mark=Logical "1" (current on)  
Space=Logical "0" (current off)
- (5) Handshaking: Handshaking is controlled by a flag or control codes. The interface formats and handshaking methods are listed below.

Handshake	Interface	RS232C	Current Loop
Flag Control	Data entry possible	Mark status on Pins 4 & 20 of connector	Low impedance on Pins 17 thru 24 of connector
	Data entry impossible	Space status on Pins 4 & 20 of connector	High impedance on Pins 17 thru 24 of connector
X ON-X OFF Control	Data entry possible	Transmission X ON code (11H) on Pin 2 of connector.	Transmission X ON code (11H) on Pins 17 thru 24 of connector
	Data entry impossible	Transmission X OFF code (13H) on Pin 2 of connector	Transmission X OFF code (13H) on Pins 17 thru 24 of connector

**Notes:** Relate to handshaking, setting of Jumper Wires control followings:

\*RS232C—flac switching of RS232C signals.

\*Current Loop—Polarity switching of current loop signals.

Meanings of Low and High impedance:

Pins 17 and 24 are connected through a phototransistor of photocoupler, and the interface is the output of the phototransistor as follows

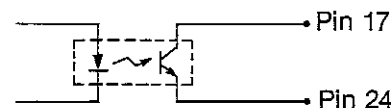


Fig F1

\*Low impedance means that the phototransistor is ON.

\*High impedance means that the phototransistor is OFF.

- (6) Interface Pin Assignment: See **Appendix G** (Table G-6)

### 3. Operation

- (1) Data Entry.
 

Before the printer be used, the computer must first set the serial data transmission. If parity checking is specified and a parity error is detected, '?' mark is printed instead of the expected character.

If framing or overrun error is detected, invalid character is printed character is printed instead of the expected character.
- (2) Input Buffer
 

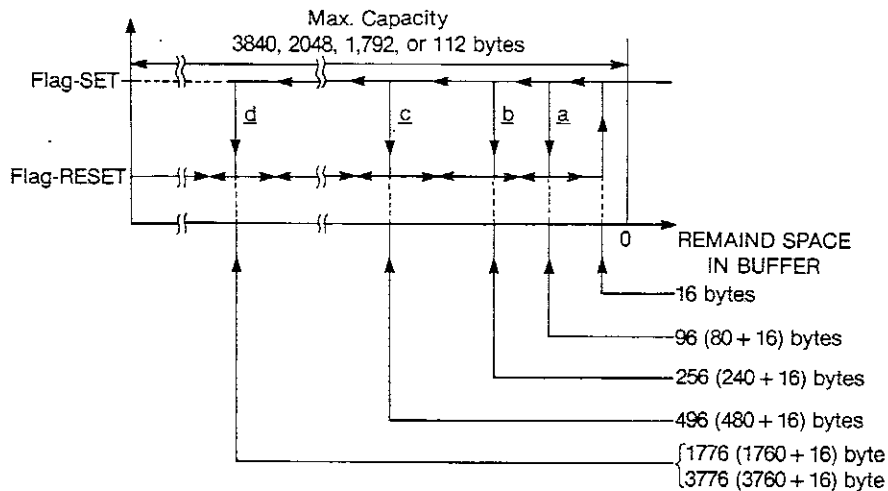
Four maximum size the input buffer (112, 1792, 2048, or 3840 bytes are provided by detting of RAM (S) and choice the status of slide switch 1 on the function selector switch board. See appendix E (Table E-2).
- (3) Setting of buffer full flag
 

Flags are used during handshaking and it indicates whether the data can be entered to the printer. The flag is set or reset in the rule of followings.

  - a. The maximum size of the buffer is 112, 1792, 2048, or 3840 bytes.
  - b. If the speed of data entry exceeds the speed that the printer can process, those non-processed entered datas be stored in the buffer, however, the flag will set at the time the remained space of buffer became to 16 bytes.

- c. Even after this flag is set, data entry still possible until the buffer be filled up. After the buffer is filled, the overflowed data will be ignored.
- d. Once the flag is set, and consumption of the datas in buffer by print out caused for space in buffer, the flag will be reset. Refer to the Fig. F2.

**Fig. F2** Action of the Data Buffer



- As shown in this figure, when the data buffer has bytes of remaining data space, the flag is set and block farther data input. However, data entry to buffer is possible as long as the space in buffer is remain.
- After data input is blocked, as the datas in buffer are processed, the space in buffer be increased, then the flag is reset at the point of a, b, c or d which ever the DIP switch specifys.
  - If a is selected, the flag is reset when there are 96 bytes space.
  - If b is selected, the flag is reset when there are 256 bytes space.
  - If c is selected, the flag if reset when there are 496 bytes space.
  - If d is selected, the flag is reset when there are 1776/3776 bytes space.
- After the buffer flag sets (resets), DTR and RTS' are busy (reasy)-status, for flag control and X OFF code is transmitted for X ON-X OFF protocol.
- Relationships between maximum RAM capacity, recovery RAM point for buffer full flag, setting of slide switches 1 on the function selector switch board and DIG. Switches 9 and 10 on the sereal interface board are shown in
  - Appendix E** (Table E-1, E-2)
  - Appendix G** (Table G-1)

- (4) Handshaking Sequence for Flag Control  
For this handshaking, both status of ready/busy (data entry possible/impossible) on DTR and RTS are determined by setting or resetting of the buffer full flag in the rule of before, paragraph (3). PTR and RTS (on pin 20 and 4 of RS232C connector) are same signal. Pin 4 and 20 are connected by hard ware on interface board.
  - (5) Hand Shaking Sequence for X ON-X OFF Control.  
Data entry sequence is fundermentaly same as flag control sequence. For this handshaking is completed by two control codes (X ON (11H), X OFF (13H)), which are transmitted from printer according to changing of buffer full flag.
    - a. Transmissible timing of X OFF code.  
X OFF is transmitted, when the data buffer has from 16 to 8 bytes of remaining data space. Transmissible interval times is shown in **Appendix G**. (Table G-5), (Fig. G-1)
    - b. Transmissible timing of X ON code.  
X ON code is transmitted with intervac times according to **Appendix G** (Table G-5), (Fig. G-1) when the data buffer has remaining space or just empties in such the default condition.
- Caution:** In this protocol, the host computer should ignore the flag-status of this interface's DTR or RTS signal. If not so, this signal line should be disconnected and the signal of the host side against DTR or RTS of the interface board should be always in ready status.
- (6) Printer Status Error.  
Beside of the buffer conditions in panagraph (3), in case of Printer Status Error (in such the case of paper out) occurs, the flag is set also.
  - (7) Printer Status Error Conditions  
The printer status error conditions (I/F signal ERROR=LOW) are as follows.
    - Paper Out.
    - Printer Off-line.
  - (8) Loop Back Check  
The characters ((20)H-(7E)H codes) are transmitting and received, and strings of these characters are printed out. This test procedures are as follows.
    - STEP 1 Set DIP switch & jumpers on this interface board in following condition.
 

DIP SW-11	ON	See Appendix G (Table G-4)
JP-1	ON	
JP-7	ON	
    - STEP 2 Connect between pin 2 (TXD) and pin 3 (RXD) of connector.
    - STEP 3 Turn power switch of the printer ON.
- Note:** This test can complete for RS232C interface only.

# APPENDIX A

## Selection of International Character Set

ESC R n n: Selection of interal 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

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

# APPENDIX A

n = 11 : FRENCH +Graphic

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

n = 12 : GERMAN +Graphic

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

n = 14 : DANISH +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	NUL	SP	O	@	P	r	p	NUL	-160	-176	=	X	-	-	-	-
0001	DC1	1	33	49	A	G	a	q	113	129	DC1	-161	-177	193	209	224
0010	DC2	2	34	50	B	R	b	r	114	130	DC2	-162	-178	194	210	225
0011	DC3	3	35	51	C	S	c	s	115	131	DC3	-163	-179	195	211	227
0100	DC4	4	36	52	D	T	d	t	116	132	DC4	-164	-180	196	212	228
0101	5	21	37	53	E	U	e	u	117	133	149	-165	-181	197	213	229
0110	6	22	38	54	F	V	f	v	118	134	150	-166	-182	198	214	230
0111	BEL	7	39	55	G	W	g	w	119	135	BEL	151	-167	-183	199	215
1000	BS	CAN	8	40	H	X	h	x	120	136	BS	152	-168	-184	200	216
1001	HT	9	41	57	I	Y	i	y	121	137	HT	153	-169	-185	201	217
1010	LF	10	42	58	J	Z	j	z	122	138	LF	154	-170	-186	202	218
1011	VT	ESC	11	43	K	^	k	^	123	139	VT	ESC	155	-171	-187	203
1100	FF	12	44	60	L	^	l	^	124	140	FF	156	-172	-188	204	220
1101	CR	13	45	61	M	^	m	^	125	141	CR	157	-173	-189	205	221
1110	SO	14	46	62	N	^	n	^	126	142	SO	158	-174	-190	206	222
1111	SI	15	47	63	O	^	o	^	127	143	DEL	SI	159	-175	-191	207

APPENDIX A

n = 15 : SWEDISH +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	NUL	SP	O	@	P	r	p	NUL	-160	-176	=	X	-	-	-	-
0001	DC1	1	33	49	A	G	a	q	113	129	DC1	-161	-177	193	209	224
0010	DC2	2	34	50	B	R	b	r	114	130	DC2	-162	-178	194	210	225
0011	DC3	3	35	51	C	S	c	s	115	131	DC3	-163	-179	195	211	227
0100	DC4	4	36	52	D	T	d	t	116	132	DC4	-164	-180	196	212	228
0101	5	21	37	53	E	U	e	u	117	133	149	-165	-181	197	213	229
0110	6	22	38	54	F	V	f	v	118	134	150	-166	-182	198	214	230
0111	BEL	7	39	55	G	W	g	w	119	135	BEL	151	-167	-183	199	215
1000	BS	CAN	8	40	H	X	h	x	120	136	BS	152	-168	-184	200	216
1001	HT	9	41	57	I	Y	i	y	121	137	HT	153	-169	-185	201	217
1010	LF	10	42	58	J	Z	j	z	122	138	LF	154	-170	-186	202	218
1011	VT	ESC	11	43	K	^	k	^	123	139	VT	ESC	155	-171	-187	203
1100	FF	12	44	60	L	^	l	^	124	140	FF	156	-172	-188	204	220
1101	CR	13	45	61	M	^	m	^	125	141	CR	157	-173	-189	205	221
1110	SO	14	46	62	N	^	n	^	126	142	SO	158	-174	-190	206	222
1111	SI	15	47	63	O	^	o	^	127	143	DEL	SI	159	-175	-191	207

n = 16 : ITALIAN +Graphic

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	NUL	SP	O	@	P	r	p	NUL	-160	-176	=	X	-	-	-	-
0001	DC1	1	33	49	A	G	a	q	113	129	DC1	-161	-177	193	209	224
0010	DC2	2	34	50	B	R	b	r	114	130	DC2	-162	-178	194	210	225
0011	DC3	3	35	51	C	S	c	s	115	131	DC3	-163	-179	195	211	227
0100	DC4	4	36	52	D	T	d	t	116	132	DC4	-164	-180	196	212	228
0101	5	21	37	53	E	U	e	u	117	133	149	-165	-181	197	213	229
0110	6	22	38	54	F	V	f	v	118	134	150	-166	-182	198	214	230
0111	BEL	7	39	55	G	W	g	w	119	135	BEL	151	-167	-183	199	215
1000	BS	CAN	8	40	H	X	h	x	120	136	BS	152	-168	-184	200	216
1001	HT	9	41	57	I	Y	i	y	121	137	HT	153	-169	-185	201	217
1010	LF	10	42	58	J	Z	j	z	122	138	LF	154	-170	-186	202	218
1011	VT	ESC	11	43	K	^	k	^	123	139	VT	ESC	155	-171	-187	203
1100	FF	12	44	60	L	^	l	^	124	140	FF	156	-172	-188	204	220
1101	CR	13	45	61	M	^	m	^	125	141	CR	157	-173	-189	205	221
1110	SO	14	46	62	N	^	n	^	126	142	SO	158	-174	-190	206	222
1111	SI	15	47	63	O	^	o	^	127	143	DEL	SI	159	-175	-191	207

# APPENDIX A

n = 17 : SPANISH +Graphic

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

n = 18 : JIS +Graphic

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

# 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

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

(Note 1)

n = 20 : ASCII(Normal +Italic)

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

APPENDIX A

n= 21 : ASCII +Greece

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
1	0000	NUL	SP	0	@	P	'	p	NUL	SP	0	@	π	'	χ	240
2	0001	1	DC1	1	A	G	a	q	DC1	1	A	G	π	'	χ	241
3	0010	2	DC2	2	B	R	b	r	DC2	2	B	R	Σ	β	σ	242
4	0011	3	DC3	3	C	S	c	s	DC3	3	C	S	Γ	τ	τ	243
5	0100	4	DC4	4	D	T	d	t	DC4	4	D	T	Δ	δ	υ	244
6	0101	5	%	5	E	U	e	u	%	5	E	U	β	ε	σ	245
7	0110	6	&	6	F	V	f	v	&	6	F	V	X	ξ	246	
8	0111	7	BEL	7	G	W	g	w	BEL	7	G	W	H	η	247	
9	1000	BS	CAN	(	H	X	h	x	BS	CAN	(	H	X	η	248	
A	1001	HT	)	5	I	Y	i	y	HT	)	5	I	Y	λ	249	
B	1010	LF	*	4	J	Z	j	z	LF	*	4	J	Z	κ	250	
C	1011	VT	+	4	K	L	k	l	VT	ESC	+	4	K	L	λ	251
D	1100	FF	2	4	L	7	l	7	FF	2	4	L	7	μ	252	
E	1101	CR	2	4	M	J	m	j	CR	2	4	M	J	ν	253	
F	1110	SO	14	30	44	62	N	n	SO	14	30	44	62	238	254	
	1111	SI	15	31	47	63	O	o	DEL	SI	15	31	47	239	255	

n= 23 : JIS +Greece

UPPER BIT	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
1	0000	NUL	SP	0	@	P	'	p	NUL	SP	0	@	π	'	χ	240
2	0001	1	DC1	1	A	G	a	q	DC1	1	A	G	π	'	χ	241
3	0010	2	DC2	2	B	R	b	r	DC2	2	B	R	Σ	β	σ	242
4	0011	3	DC3	3	C	S	c	s	DC3	3	C	S	Γ	τ	τ	243
5	0100	4	DC4	4	D	T	d	t	DC4	4	D	T	Δ	δ	υ	244
6	0101	5	%	5	E	U	e	u	%	5	E	U	β	ε	σ	245
7	0110	6	&	6	F	V	f	v	&	6	F	V	X	ξ	246	
8	0111	7	BEL	7	G	W	g	w	BEL	7	G	W	H	η	247	
9	1000	BS	CAN	(	H	X	h	x	BS	CAN	(	H	X	η	248	
A	1001	HT	)	5	I	Y	i	y	HT	)	5	I	Y	λ	249	
B	1010	LF	*	4	J	Z	j	z	LF	*	4	J	Z	κ	250	
C	1011	VT	+	4	K	L	k	l	VT	ESC	+	4	K	L	λ	251
D	1100	FF	2	4	L	7	l	7	FF	2	4	L	7	μ	252	
E	1101	CR	2	4	M	J	m	j	CR	2	4	M	J	ν	253	
F	1110	SO	14	30	44	62	N	n	SO	14	30	44	62	238	254	
	1111	SI	15	31	47	63	O	o	DEL	SI	15	31	47	239	255	

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.		
8	08	BS	Paper out rings for 3 seconds .....	39	
9	09	HT	Backspaces print head one space .....	39	
			Horizontal Tabulation.		
10	0A	LF	Print head moves to next tab stop .....	26	
			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	resets buffer character count to zero .....	16	
			Carriage Return. Prints buffer contents and		
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	Turns on condensed character mode.	40	
18	12	DC2	Does not work with emphasized mode. Sets the printer to SELECT .....	28	
19	13	DC3	Turns off condensed characters and empties buffer .....	28	
20	14	DC4	Turns off enlarged mode(SO only) .....	40	
24	18	CAN	Turns off enlarged mode(SO only) .....	28	
27	1B	ESC	Cancels all characters in printer buffer .....	39	
			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 p1...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	:	Copys 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	23
<ESC>	67	43	C Terminate Tabs sequence with zero Sets form length, and resets Top of Form. Format: <ESC> 'C' n, Sets to n lines. 1<n<=127	21
<ESC>	68	44	D Sets horizontal tabs and resets current tabs. Format: <ESC> 'D' n1...nk NUL 1<n<=142, 1<k<=32	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	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	43
<ESC>	77	4D	M Sets ELITE size printing mode.	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	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	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	4	01	EOT
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: This is the standard on most keyboards that have the control key.

# 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
=====
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
=====
EMPHASIZED 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 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
=====

```



# APPENDIX F

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

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

Number of pins — 36

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

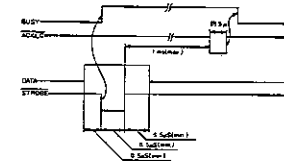
Plug (cable side) 57-30360 (amphenol or DDK) Female

Signal Pin No.	Return Pin No.	Signal	Direction	Description
1	19	STROBE	In	STROBE pulse of read data in. Pulse width must be more than 0.5 $\mu$ 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	ACKNLG	Out	Approx. 5 $\mu$ 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	—	AUTO FEED XT	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 $\mu$ 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 $\Omega$ resistance.
36		SLCT 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:**
- "Direction" refers to the direction of signal as viewed from the printer.
  - "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.
  - All interface conditions are based on TTL level. Both the rise and fall times of each signal must be less than 0.2 $\mu$ s.
  - 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 ACKNLG 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 G

## About Serial Interface

\*\*\* SETTING OF CONDITION-SWITCHES \*\*\*  
 \*\*\* ON THE SERIAL INTERFACE BOARD \*\*\*

DIP Switch	Functions and Conditions	ON	OFF	Factory set Condition
SW 1	BAUD RATE	See Table G-2		-----
SW 2				-----
SW 3				-----
SW 4				-----
SW 5	STOP BIT	2 bits	1 bit	ON
SW 6	PARITY BIT	EVEN	ODD	ON
SW 7	PARITY check	YES	NO	ON
SW 8	WORD LENGTH	8 bits	7 bits	ON
SW 9	Buffer full recovery	See Table G-3		OFF
SW 10		Table G-3		OFF
SW 11	Loop back check	Enable	Disable	OFF
SW 12	(Not use)	-----	-----	-----

(Table. G-1)

\*\*\* SETTING OF BAUD RATE-SWITCHES \*\*\*  
 \*\*\* ON THE SERIAL INTERFACE BOARD \*\*\*

NO.	DIP Switch				BAUD RATE(BPS)
	SW1	SW2	SW3	SW4	
0	--	--	--	--	-----
1	OFF	ON	OFF	OFF	4800
2	ON	ON	OFF	OFF	2400
3	OFF	OFF	ON	OFF	1800
4	ON	OFF	ON	OFF	1200
5	OFF	ON	ON	OFF	600
6	ON	ON	ON	OFF	300
7	OFF	OFF	OFF	ON	200
8	ON	OFF	OFF	ON	150
9	OFF	ON	OFF	ON	134.5
10	ON	ON	OFF	ON	110
11	OFF	OFF	ON	ON	75

(Table. G-2)

\*\*\*\* SETTING OF DIP SW9 AND SW10 \*\*\*\*  
 \*\*\*\* FOR BUFFER FULL RECOVERY \*\*\*\*

Buffer full recovery	DIP SW9	DIP SW10	Comments
96 bytes	OFF	OFF	
256 bytes	OFF	ON	4K-RAM or 2K-RAM, Slide SW1=OFF
496 bytes	ON	OFF	4K-RAM or 2K-RAM, Slide SW1=OFF
1776 bytes	ON	ON	2K-RAM or 4K-RAM, Slide SW1=OFF
3776 bytes	ON	ON	4K-RAM, Slide SW1=OFF

(Table. G-3)

# APPENDIX G

\*\*\* SETTING OF JUMPER WIRES ON THE SERIAL INTERFACE BOARD \*\*\*

Jumper NO.	FUNCTIONS AND CONDITIONS	Factory set Condition
JP 1	Receive Data from RS232C	ON
JP 2	Receive Data from CURRENT LOOP	OFF
JP 3	Neagitive Polarity for Flag Control	OFF
JP 4	Normal Polarity for Flag Control	ON
JP 5	Transemmit Flag Status for CURRENT LOOP	OFF
JP 6	Transemmit XON-XOFF for CURRENT LOOP	OFF
JP 7	Transemmit XON-XOFF for RS232C	OFF
JP 8	TTY RXD is pulled up to 10V. Thru 390 ohm Resister. (*1)	OFF
JP 9	Return of TTY RXD is connected to GND. (*1)	OFF
JP 10	TTY TXD is pulled up to 10V. Thru 390 ohm Resister. (*1)	OFF
JP 11	Return of TTY TXD is connected to GND. (*1)	OFF
JP 12	DSR is pilled up to 10V. Thru 4.7K ohm Resister. (*2)	ON
JP 13	DCD is pulled up to 10V. Thru 4.7K ohm Resister. (*2)	OFF

(Table. G-4)

(\*1) These Jumpers shold be selected ON, when CURRENT LOOP is chosen and The Host has not current source.

(\*2) JP-12 or JP-13 for using should be ON(EIA Level is Plus), If not so this interface can't receive Data from The Host.

### CAUTION:

The serial Data-receiving Line(RXD,TTY-RXD) of The Printer should be held in mark condition by The Serial Data-transmitting Line(TXD,TTY-TXD) of The Host Computer. While The Printer does not be receiving The Data from The Host.

Pin	Signal	Source	Function
1	GND		Protective GND, Printer chassis GND level.
2	Transmission Data (RXD)	Printer	Normally in Mark status.
3	Receiving Data (RXD)	Host	Serial input data.
6	Data Set Ready (DSR)	Host	Should be space status when transmitting data to printer
7	Signal Ground		Common ground
8	Carrier Detect (DCD)	Host	Must be in space status when transmitting data to printer
4	Request to Send (RTS)	Printer	Both signals indicate the printer is in busy status. When those are in space status (EIA level—positive), the printer can receive data. *Polarity is selectable by JP3 or JP4. (*1)
20	Data Terminal Ready (DTR)	Printer	
17	TTY TXD	Printer	The printer can receive data when Pins 17 thru 24 are Low Impedance.
24	TTY TXD Return		When Hich, indicate the printer is in busy status. Same as*
25	TTY RXD		Serial current loop input data
23	TTY RXD Return		

(Table G-6)

Note: Except for TTY-TXD and TTY-RXD, all signals are based on the EIA RS232C level.

(\*1) See Table G-4

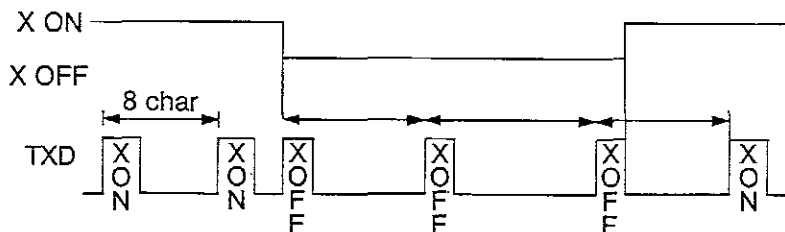
## APPENDIX G

\*\*\* INTERVAL TIMES \*\*\*  
 \*\*\* OF X-ON/X-OFF \*\*\*

BAUD RATE (BPS)	X-ON CODE	X-OFF CODE
75	1.06 sec	same as left
110	0.72 sec	" "
134.5	0.59 sec	" "
150	0.53 sec	" "
200	0.4 sec	" "
300	0.26 sec	" "
600	0.13 sec	" "
1200	66 msec	" "
1800	44 msec	" "
2400	33 msec	" "
4800	16.5 msec	" "

- Time of interval = (1 bit time) \* 80 -

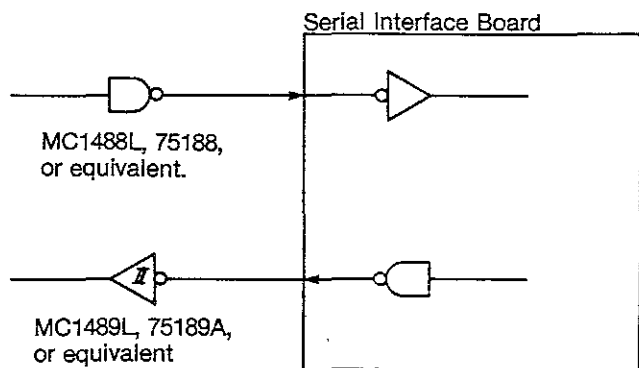
(Table. G-5)



Timing Chart of Transmitting X ON-X OFF (Fig. G-1)

### Recommended Circuits of Interfaces

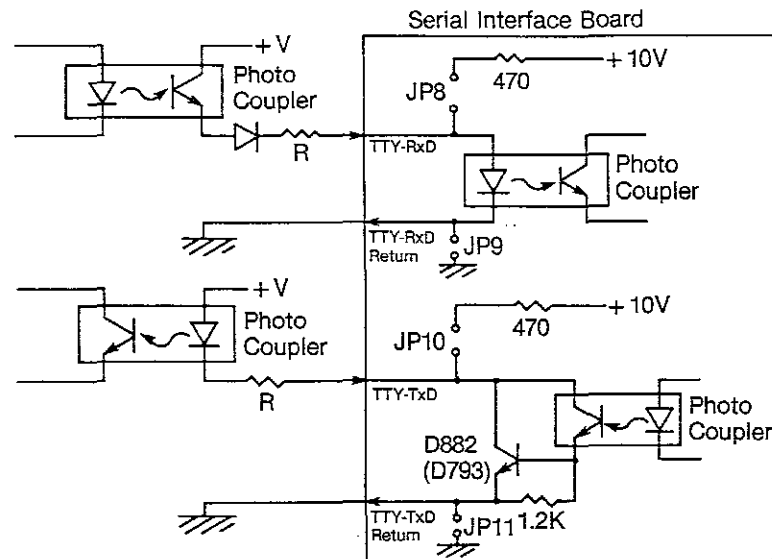
(1) Recommended line driver and receiver for RS232C interface. Fig. G-2



Note: The jumpers JP1, JP120R JP13, and JP4 (SP3) or JP7 should only be connected (ON). JP1, JP4 and JP12 are connected at delivery.

## APPENDIX G

(2) Recommended driving circuits for current loop interface. Fig. G-3

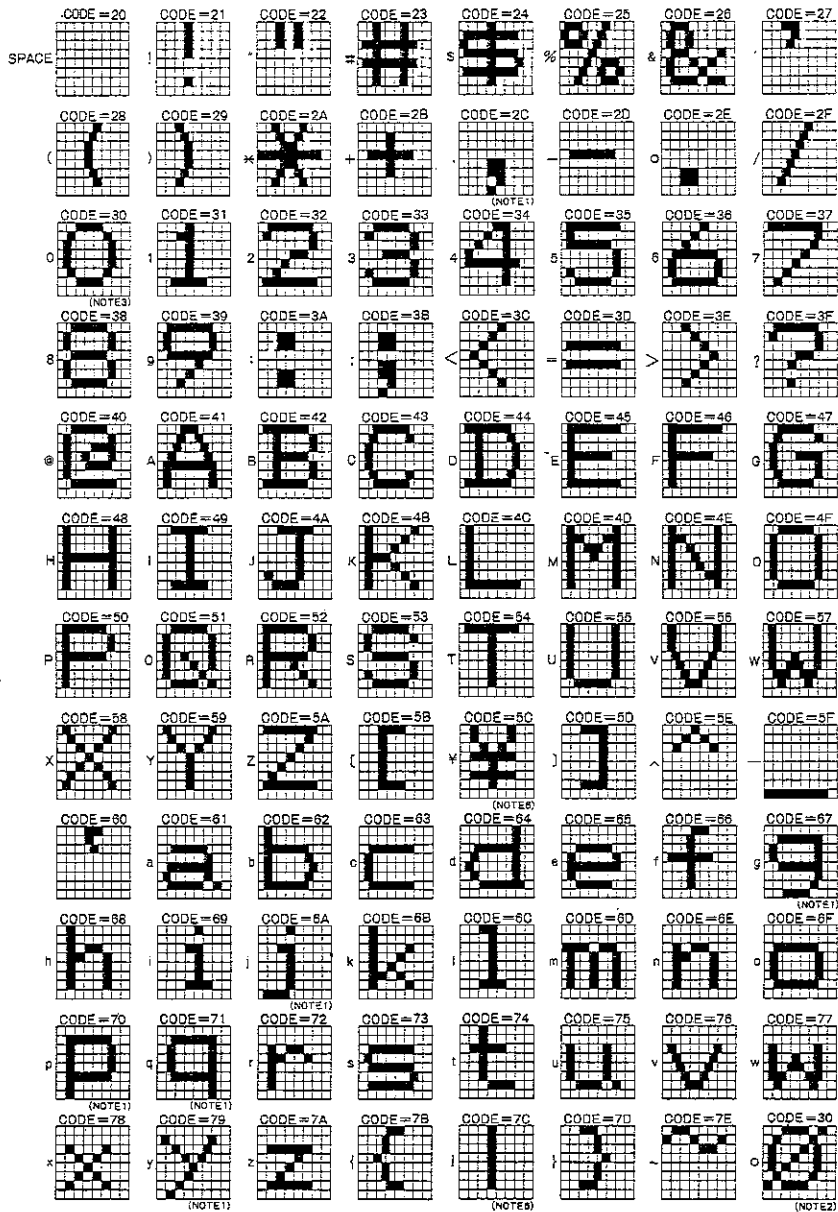


- Notes:**
- The value of resistor R should be selected to achieve the current value on loop be 10mA. to 20mA.
  - +V should be +3V. to +24V.
  - For this recommended circuits, jumper wires JP2, JP12 or JP13, and JP6 or (JP5 and JP4 (JP3)) without others should be connected. JP1, JP4 and JP12 are connected at delivery.
  - In case, interface circuit is not conform with above recommended circuit, require to selection of suitable jumper connections, careful judgment for however JP2 and JP12 or JP13 should always be connected.

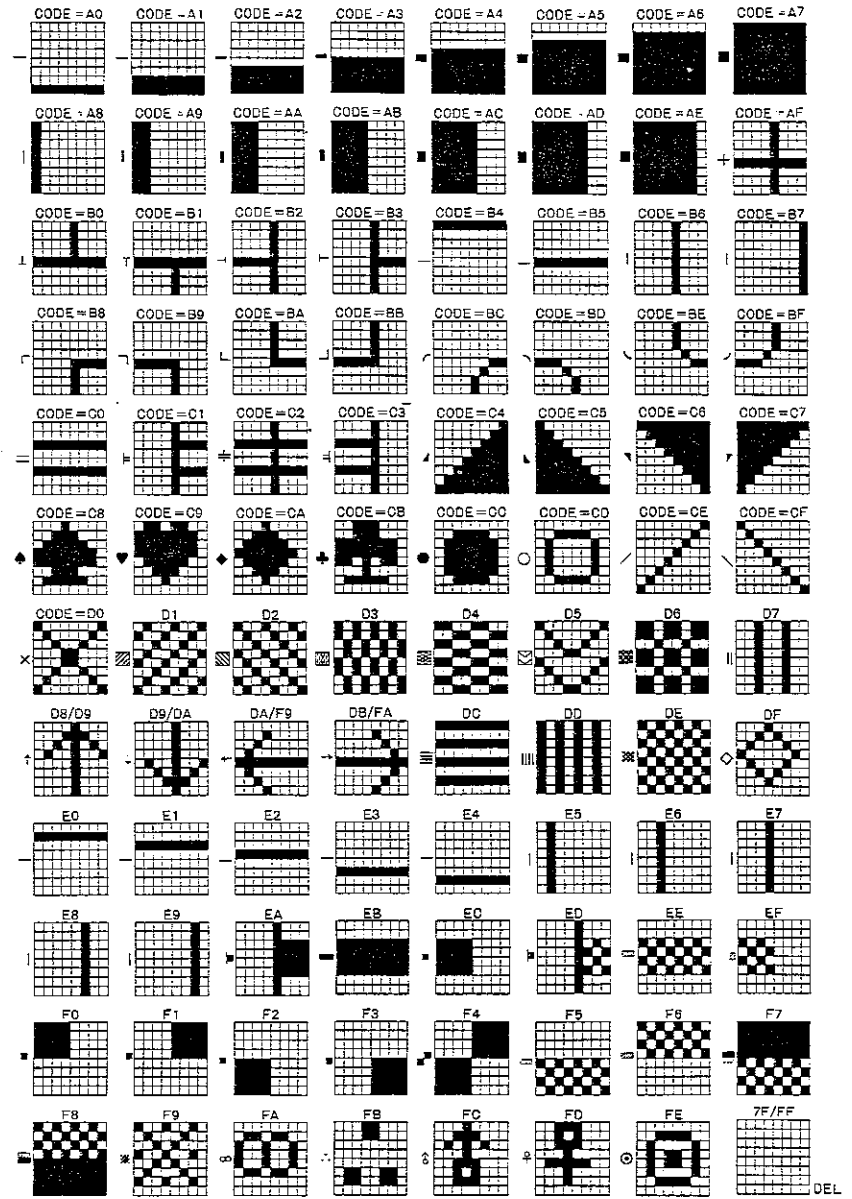
# APPENDIX H Character Fonts

## 1 Normal Character Fonts

### (1) Normal fonts



## APPENDIX H (2) Semi-graphic fonts



**APPENDIX H**  
(3) 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	30/80

ALTERNATE CODE (NOTE2)

**APPENDIX H**  
(4) Greece fonts

C1/41	C2/42	C3	C4	C5/45	C6/5A	C7/48
C8	C9/49	CA/4B	CB	CC/4D	CD/4E	CE
CF/4F	D0	D1/50	D2	D3/54	D4	D5
D6/58	D7	D8	E1	E2	E3	E4
E5	E6	E7	E8	E9	EA	EB
EC	ED	EE	EF/6F	F0	F1	F2
F3	F4	F5	F6	F7	F8	

**Notes**

- Note 1: These character fonts shift on the under side at the rate of one dot just before printing out.
- Note 2: Turn the slide switch 7 on the function selector switch board ON.
- Note 3: Turn the slide switch 7 OFF.
- Note 4: In case of JIS (Japan) character set.



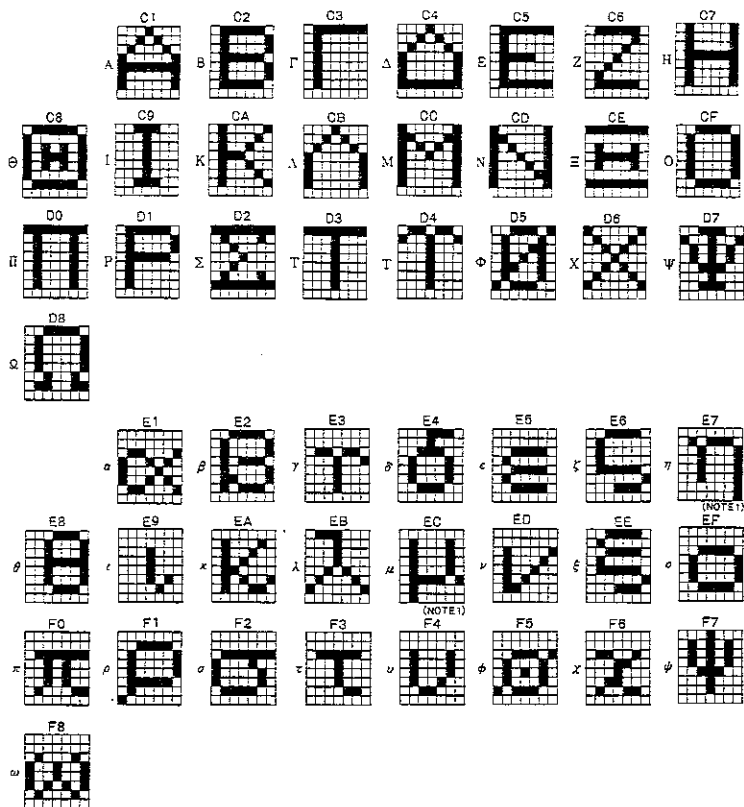


# APPENDIX H

## (2) Italic fonts

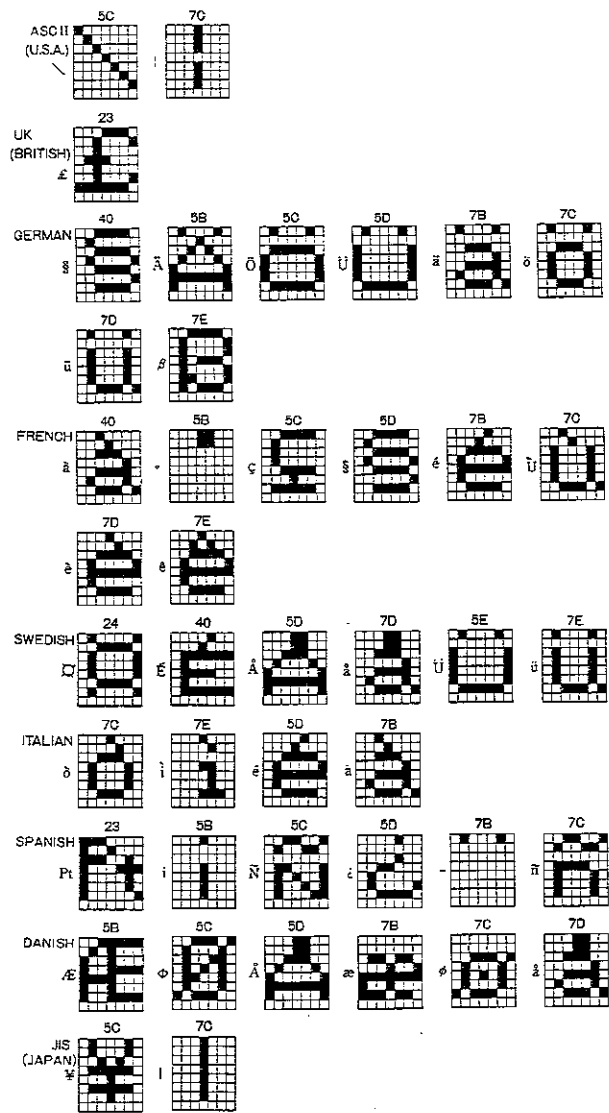
This don't be provided for down load characters

## (3) Greece fonts



# APPENDIX H

## (4) International fonts



**APPENDIX H**

**\*\*\* CODE TABLE OF INTERNATIONAL CHARACTERS \*\*\***

Code No.=	35	36	64	91	92	93	94	96	123	124	125	126
Country:												
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**CAUTION**

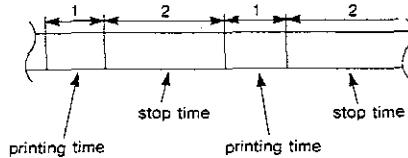
**PRINTING HEAD TEMPERATURE PROTECTION**

**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).



**PROHIBITION FOR REVERSE WINDING**

When printing with the copies or using thick paper, manual reverse winding of paper by the paper-feed-manual-knob may cause for clog of paper on the paper guide plate which is placed on the front of platen and may damage the guide plate.

When-ever the paper is hooked on the guide plate while attempting reverse wind of paper, should stop and not try to force the paper to backward. Please, refer to the specification on Operation Manual for type of paper, to be used.