

# Introduction

**SP-MDEF** series thermal printers are a series of micro intellectual printer that our company developed in order to face the current century. The series of printer adopt imported print head, and their remarkable features are: delicate dimension, complete function, high speeds and definition, elegant in appearance, simple operation, convenient connection and so on. Especially the working environment, ribbons, ribbon lubricant etc. are incomparable in the aspects of working environment protection and cost saving. The model of our thermal printer is complete, and the printers are installed in standard size, they are the most ideal products for the update of medical equipments, fire alarm control, industrial control and other instruments and meters.

**SP-MDEF** series thermal printers not only can print ASCII characters, but also can print English, Greek, German, French, Russian and Japanese Katakana, moreover, they can print  $16 \times 16$ ,  $24 \times 24$  dots Chinese characters and a large number of graphic and curving symbols. They also have the functions of setting character line spacing and character size, defining partial code characters and self-testing.

**SP-MDEF** printers have WINDOWS driver programs, can directly print all kinds of characters, Chinese characters and graphics under PC.

## Chapter 1 Feature and performance

### 1.1 Features

- Adopt thermal print method.
- Integrates the print head circuit, can be installed on the horizontal or vertical panel of the instrument or equipment conveniently.
- Self installed one-chip computer, have standard parallel or serial interface, can conveniently be used with all kinds of PC or intellectual instruments, meters together.
- Have latest print commands of Chinese characters, graphics etc, can print all standard ASCII characters of  $5 \times 7$  dots and Chinese characters of  $16 \times 16$ ,  $24 \times 24$  dots. Command set is compatible with traditional printer.
- Print speed: 27mm/sec.
- Have self-test function, can print all of the code characters with high definition and elegant font.
- Have enough print buffer area. (8K~32K)
- Print paper: thermal paper with 50mm width.
- Power supply: DC +5V, average current 2A, peak value current 5A.
- Working temperature:  $0 \sim 50^{\circ}\text{C}$ .
- Installation size (mm):  $137 \times 57 \times 82$
- Can be used under DOS and WINDOWS.
- GB Chinese character library level I, II.
- 8 dots/mm 384 dots/line
- Can be assembled with auto paper cutter.

## 1.2 Performance index

- Print Method: thermal dot-matrix print
- GB Chinese character library level I, II.
- Print font: total 448 characters, including 96 ASCII characters, Greek, German, French, Russian etc. letters, Japanese katakana and partial Chinese characters, mathematics symbols, print symbols and graphic characters.
- Character structure: standard characters:  $5 \times 7$  dots       $8 \times 16$  dots  
graphic characters:  $6 \times 8$  dots
- Interface: parallel interface (compatible with CENTRONICS) or serial interface (compatible with RS-232C).
- Interface connector: parallel port: 26-pin flat socket (male); serial port: D model 9-pin flat cable socket

(male)

- Control code: common ESC control codes.
- Print buffer size : 8K–32K.
- Buttons:
  - A series: SEL (on/off line selection); LF (paper feeding)
  - DN/C series: LF (paper feeding); red light is printer on/off line indicator, green light is power indicator.
- Self-test: hold down SEL button when power on.
- DIP switch (only available to serial interface, internal set)
  - Baud rate selection: 19200, 9600, 4800, 2400, 1200, 600, 300, 150.
  - Parity checking sektion: even parity, odd parity, or no parity. For 7-bit data only even parity is allowed.
  - Handshaking mode: mark control, or XON/XOFF protocol.
  - Data structure: 7/8 data bits, 1 stop bit.
- Print paper: thermal paper, width:  $57.5 \pm 0.5$  mm, if installed inside, the diameter of paper roll should not be larger than 40 mm; if installed outside, should not be larger than 80 mm.
- Reliability: MCBF:  $(5 \sim 15) \times 10^6$
- Power supply: DC5V  $\pm$  5%, average current 2A, peak value current 5A.
- Operation environment: temperature: 0~50°C; relative humidity: 0~80%.

## Chapter 2 Installation

### 2.1 Installation of SP-M series panel mounting micro-printer

#### 2.1.1 Size of the mounting hole:

The appearance of the micro-printer is shown in Fig 2-1. A mounting hole should be made before installation of the micro-printer, the size of the hole is given in Fig 2-2.

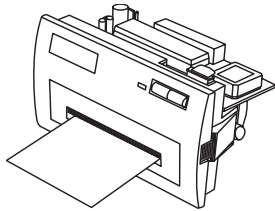


Fig 2-1 appearance of the M series printer

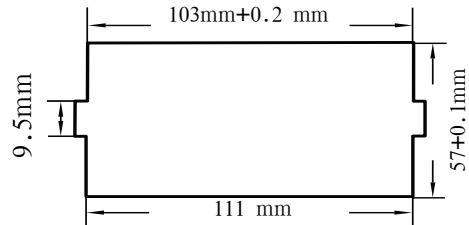


Fig 2-2. size of the mounting hole

#### 2.1.2 Fixation of the micro-printer:

Hold the flexible slice on both sides of the printer and push it into the mounting hole completely and keep the micro-printer fixed tightly (See Fig 2-3). It is recommended that the thickness of the metal or plastic panel in 0.8 – 1.2 mm.

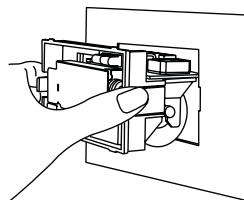


Fig 2-3 installation of M series printer

### 2.1.3 Replacment of the ribbon cassette:(not applicable for the thermal printer)

The ribbon cassette has been installed inside the printer before packing, When the printing goes faint, replace the original with a new one as following:

- Remove the front cover as shown in Fig 2-4.
- Take off the ribbon cassette (See Fig 2-5) : take off the ribbon cassette lightly, uplift the left side of the ribbon cassette and then uplift the other side.
- Installation of a new ribbon cassette:  
First,to put the right side of the ribbon cassette on the gear axile at the same side of the printer head, lift the left side of the cassette a little bit and keep it up. In case the right side of the cassette is not set down to the bottom, press the knob on the cassette and turn it clock wise slightly until it is set down to the bottom properly and then release the left side of the cassette. Turn the knob on the cassette to keep the ribbon drawn straight and tight. It is easier to replace the ribbon cassette if there is no paper in the printer head.
- Put on the front cover of the printer (See Fig 2-4).

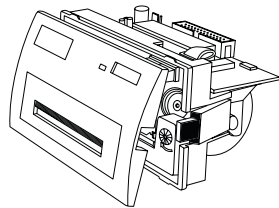


Fig 2-4 Remove the front cover

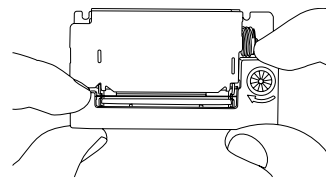


Fig 2-5 Remove the ribbon cassette

### 2.1.4 Loading Paper

Before using the printer, please pay attention to putting the begining end of the paper into the printer head.

**The operation procedure of changing paper roll is shown as the following:**

- Turn off the power.
- Take off the front cover.
- Take out the printer: hold the flexible slice on both sides of the printer, pull out the printer from the panel of device.
- Take down the paper shaft as shown in Fig 2-6, press the both ends of paper shaft then it can be taken down..
- Load the new paper roll: put shaft through the paper roll, press the both ends of paper shaft, replace the shaft to its position. As Fig 2-7.
- Cut the begining end of paper as shown in Fig 2-8.

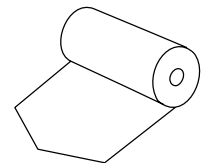
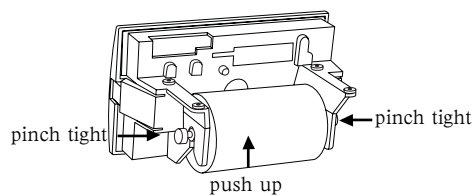
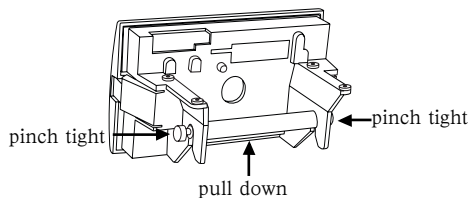


Fig 2-6 take down paper shaft    Fig 2-7 load new paper roll    Fig 2-8 Cut the beginning end of paper

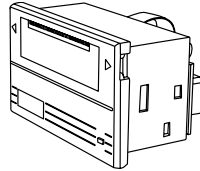
- Turn on 5V power supply, after the paper feed three point lines, the printer enters On-Line mode and the green LED is on. Press the SEL button, green LED goes off, then press LF button and release it, the printer head begins to run. Feed in paper, the paper enters the printer head and comes out from the front part of the printer head. To stop paper feeding press and release LF of SEL button. Put paper through the slot on the front cover, then install the front cover.
- Reinstall the whole printer to mounting hole on the panel of the associated device.

## 2.2 Installation of SP-D, E and F series front loading paper micro printer

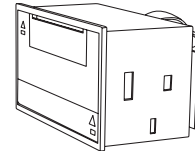
SP-D, SP-E and SP-F series micro printers are same in structure and slightly different from each other in outline dimensions. Therefore, all the installation, the process of replacement of ribbon cassette and loading paper of the above mentioned printers are exactly same, except for the dimensions of mounting holes on the associated panels.

### 2.2.1 Dimensions of mounting hole on the panel.

The appearance of the SP-D, E and F series micro printer is shown in Fig 2-9. The dimension of mounting holes on the panel is shown in Fig2-10.

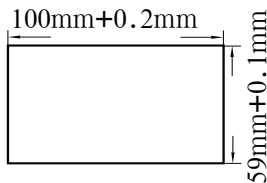


Appearance of SP-D & E series of printer

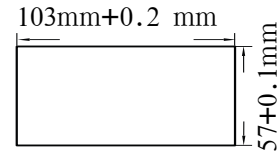


Appearance of SP-F series of printer

Fig 2-9



Dimension of mounting hole for D series



Dimension of mounting hole for E & F series

Fig 2-10

### 2.2.2 Location of the micro-printer.

Locate the printer into the mounting hole from front of the panel and push in completely.

Locate the fasteners (to be provided in the package) at both right and left sides of the printer from back of the panel so as to fix the printer onto the panel. Then tighten up the screws in the fasteners to keep the printer firmly fastened to the panel. See Fig 2-11.

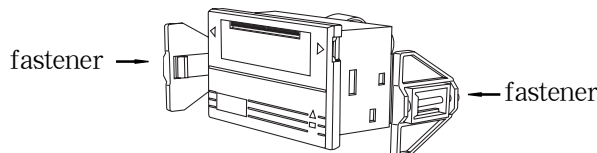


Fig 2-11

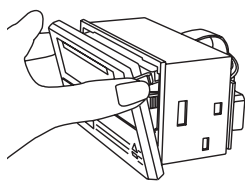
### 2.2.3 Replacement of ribbon cassette: (not applicable for the thermo printer)

The ribbon cassette has been installed inside the printer before packing, when the printing goes faint, replace the used one with a new one as following:

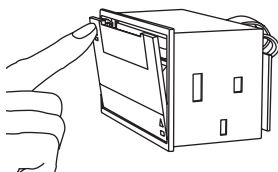
- Open the front cover of the printer (see Fig2-12)
- Pull out the printer head: hold the elastic stoppers at both left & right sides of the printer with fingers and pull out the supporting board until the ribbon cassette is fully revealed outside the printer. See Fig 2-13
- Take off ribbon cassette: Lift up the left side of the cassette, then lift up the other side and then take off the cassette gently.
- Installation of a new ribbon cassette: Firstly, to put the right side of the ribbon cassette on the gear axils at the same side of the printer head, lift the left side of the cassette a little bit and keep it up. In case the right side of the cassette is not set down to the bottom, press the knob on the cassette and turn it clockwise slightly until it is set down to the bottom properly and then push down the left side

of the cassette. Turn the knob on the cassette to keep the ribbon drawn straight and tight. It is easier to replace the ribbon cassette if there is no paper in the printer head.

- Push forward to replace the supporting board of printer head and close the front cover.

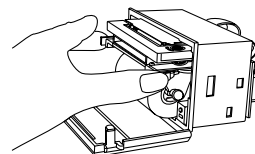


D & E series



F series

Fig 2-12 open front cover



Pull out supporting board of printer head

Fig 2-13

#### 2.2.4 Loading paper (patent function):

Operation of loadings paper for SP-D, E & F series printer is very easy. It is not necessary to take off the printer from the panel. Open the front cover of printer and pull out the supporting board of printer head. Operation of loading paper can be completed easily as follows.

- Open the front cover of printer (see Fig2-12)
- Pull out the printer head: Hold the elastic stoppers at both left & right sides of the printer with fingers and pull out the supporting board until the ribbon cassette is fully revealed out side the printer. See Fig 2-13
- Take off the paper axle: Hold two ends of elastic axle of paper roll tightly to take off the paper axle from the printer. See Fig 2-14
- Loading new paper roll: Put the axle into the center of the new paper roll, hold two ends of elastic axle to replace a new one and then release your hand, ensure the paper roll is firmly fixed to its bracket.
- Cut the beginning end of the paper as shown in Fig2-8.
- Turn on power supply after the paper feeds 3 dot lines ,the printer enters on-line mode and the LED is on, press the button (last more than 1 sec), printer starts automatically. Insert the beginning end of paper into the entrance to the printer head from its bottom part, the paper is fed into printer head and runs continuously. Press LF(line feed) button to stop feeding when paper is revealed about 10cm from the outgoing slot of printer head. Push and replace the supporting board. Insert the beginning end of paper into the paper exit on the front cover.

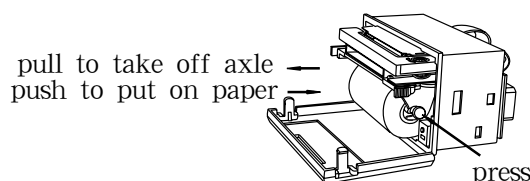


Fig 2-14 Take off paper axle and put on paper roll

#### 2.3 Power connection

Power supply for Sp series printer:

Voltage:  $5 \pm 0.25$  V .DC

Capacity: 1.5~2A for dot matrix printer

> 2A for thermal printer

2-wire cable with plug is provided in the package. It can be inserted in the 3 pin socked located on the control panel of printer. Red wire is positive (+), white wire is negative (-).

**Caution: polarity of power must be connected correctly, voltage of power must be within the range of  $5 \pm 0.25$  V. DC. Otherwise it will cause permanent damages for the printer.**

## Chapter 3 Operation Specification

### 3.1 Parallel Interface Connection (A, C, DN, DII Series)

SP printers adopt parallel interface, which is compatible with CENTRONICS standard, and the interface socket is 26-pin flat cable socket, or its substitute for connecting with it, the pin order of parallel port is as Fig. 3-1 shows:

25	23	21	19	17	15	13	11	9	7	5	3	1
26	24	22	20	18	16	14	12	10	8	6	4	2

Fig.3-1 Pin Order of Parallel Port

The pin assignment of parallel interface is shown in Fig.-32:

Pin No.	Signal	Direction	Description
1	/STB	In	Strobe pulse to latch data, reading occurs at falling edge.
3	DATA1	In	These signals represent the 1 <sup>st</sup> bit to 8 <sup>th</sup> bit of the parallel data representatively, each signal is at HIGH level when data is logic 1, and LOW when data is logic 0.
5	DATA2	In	
7	DATA3	In	
9	DATA4	In	
11	DATA5	In	
13	DATA6	In	
15	DATA7	In	
17	DATA8	In	
19	/ACK	Out	Answering pulse, LOW level signal indicates that data have already been received and the printer gets ready to receive the next data.
21	BUSY	Out	HIGH level signal indicates that the printer is BUSY and can not receive data.
23	PE	Out	Paper out indicator, HIGH level signal indicates that paper is end, LOW indicates that paper is available.
25	SEL	Out	Pulling up to HIGH level signal by a resistor indicates the printer is on-line.
4	/ERR	Out	Pulling up to HIGH level signal by a resistor indicates that there is no error.
2,6,8,26	NC	--	No connection
10-24	GND	--	Grounding logical 0 level

Fig.3-2 Pin Assignment of Parallel Interface

Notice: (1)“In” denotes input to the printer,“Out” denotes output from the printer.  
(2) Signal level is TTL standard.

The timing chart for interface signal of parallel interface is as Fig.3-3 shows:

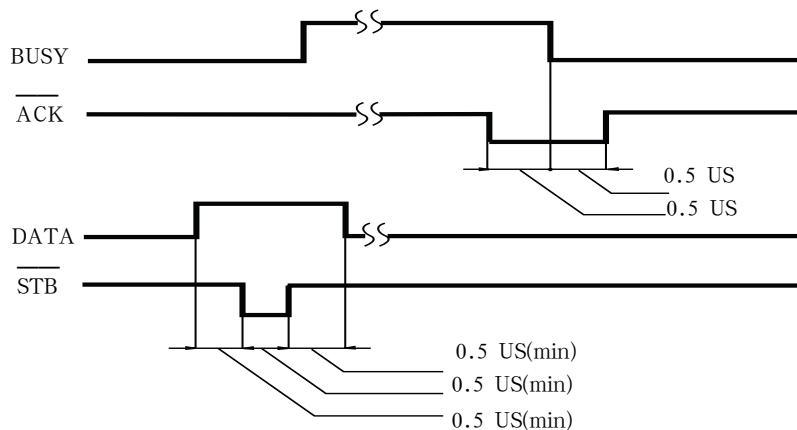


Fig.3-3 Signal Timing Chart of Parallel Interface

### 3.2 Serial Interface Connection (A,C,DN,DII Series)

The serial interface of SPRM printers are compatible with RS-232C standard, the interface socket is rectangle 5-pin female socket, can adopt rectangle 10-pin male socket to match it. The pin order of serial port is as rectangle 5-pin male socket to match it.

The pin assignment of serial interface is shown in Fig.3-4:

Pin No.	Signal Name	Source	Description
1	+5V	---	Select connection
2	RXD	Printer	Printer transmits control code X-ON/X-OFF and data to host when using X-ON/X-OFF handshaking protocol.
3	TXD	Host	Printer receives data from host.
4	CTS	Printer	Signal "MARK" indicates that the printer is "BUSY" and unable to receive data; "SPACE" indicates that the printer is "READY" for receiving data.
5	GND	---	Signal Ground

Fig.3-4 Pin Assignment of Serial Interface

Notice: (1) The "Printer" and "Host" in "Source" denote the source that signal come from;  
 (2) Logical signal level is EIA.

The baud rate in serial interface mode is optional in the range of 150, 300, 1200, 2400, 4800, 9600 and 19200bps and it is set by DIP switch on the control panel. You can do some adjustments according your demands. Also you can select suitable baud rate according to Fig.3-5, the white-dot place is K1. It has set the baud rate to 9600bps at ex-factory.

DIP Switch	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
Baud Rate	150	300	600	1200	2400	4800	9600	19200

DIP Switch	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
	8-Non	8-Odd	8-Even	7-Bven

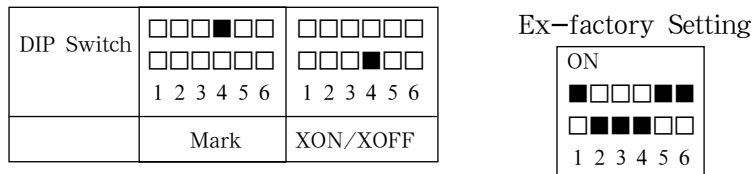


Fig.3-5 DIP Switch Setting

The data structure of serial interface is as Fig.3-6 shows:

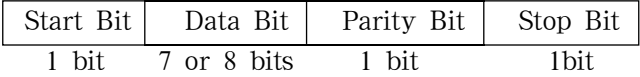


Fig.3-6 Data Structure of Serial Interface

There of the start bit and stop bit are both 1 bit. Data bit is 7 or 8 bits. Only even parity is allowed when the data is 7 bits. The checking mode can be selected through DIP switch K5 and K6, as Fig.3-5 shows. It has set no parity at ex-factory, that is, K5, K6=ON, ON

The polarity of RS-232 signal in serial interface mode is:

MARK=logic “1” (EIA-3V to -27V low signal level)

SPACE=logic “0” (ELA+3V to +27V high signal level)

There are two kinds of handshaking mode for selection, one is mark control mode, another is X-ON/X-OFF protocol mode, they can be selected by DIP switch K4, as Fig.3-5 shows. It isK4=OFF at ex-factory, the description for the two kinds of handshaking mode is as Fig.3-7 shows.

Handshaking	Data Direction	RS-323 Interface' s Signal
Flag Control	Can accept data	Line 4 are SPACE state
	Can' t accept data	Line 4 are MARK state
X-ON/X-OFF Control	Can accept data	Send X-ON code (11H) on line 2
	Can' t accept data	Send X-OFF code (13H) on line 2

Fig.3-7 Two kinds of Handshaking Mode

The operation steps for serial interface mode are as below:

- (1)Select baud rate with DIP switch K1-K3;
- (2)Select parity checking with DIP switch K5,K6;
- (3)Select mark control or X-ON.X-OFF control handshaking mode with Dip switch K4;
- (4)When remaining 32 bytes in the data duffer, signal line DCD (1st signal line) and CTS (8th signal line) will be set to BUSY status by the printer, namely MARK status. Otherwise set to READY status, namely SPACE status;
- (5)When it is BUSY status under X-ON/X-OFF control, the printer sends X-OFF(13H) code. When READY status, it sends X-ON(11H) code;
- (6)When it is under mark control, the host sends or stops sending code string according to DCD and CTS. DCD and CTS denote READY status or BUSY status representively.

### 3.3 Buttons and Indicators

There is one indicator and two buttons (SEL and LF) on the control panel of **SP-M** printers. The indicate the printer is on line, other wise is off line.

When DN/C series are powered on, they are in on-line status.

- (1) Seif-test mode:  
Hold down SEL button and turn it on, the printer will print out the self-test receipt.
- (2) Paper feeding mode:  
Hold down LF button, the printer will feed paper emptily, hold down LF button again, the print will stop feeding paper.



### 3.4 Self-test

The self-test will check the condition of printer, if the printer prints out the self-test receipt correctly, it means the printer works normally. Otherwise it needs to repair. After self-test, the printer is in the on-line status and can receive the data from the host. Sometimes the self-test may be incorrect, but in fact, there is no matter with the printer, in this instance, please check whether the power supply adopted is qualified.

### 3.5 Printer initialization

There are three kinds of ways for printer initialization. The first one is that the host sends command to the printer with control code ESC @, realizing initialization through software. The second one is that realizing initialization through self-test. The third one is that power on initialization.

The contents of initialization include: select default of each control code, namely the dot number of line spacing is 3, no binding length, vertical and horizontal tab value are both 0, left and right margin width are both 0, enlarging multiple is 2, cancel all the user-defined characters or graphics characters, select character set I, and select non reverse white print etc.

## Chapter 4. Printing Commands

### 4.1 Summary

SP series offer 40 kinds of print commands, they are fully compatible with traditional ESC print command. Each command is described in following format:

Code Sequence	Function
Format: ASCII	: Sequence in standard ASCII character.
Decimal	: Sequence in decimal numbers.
Hexadecimal	: Sequence in hexadecimal numbers.

Explanation:

What the command does and how to use it.

Example:

Some examples are listed to illustrate the command for better understanding.

### 4.2 Paper Feed Commands

LF	Line Feed
Format: ASCII	: LF
Decimal	: 10
Hexadecimal	: 0A

Explanation:

Print the data in the buffer and feed paper one line. Only feed paper one line if buffer is empty.

ESC J	Perform Dot-Line Feed
Format: ASCII	: ESC J n
Decimal	: 27 74 n
Hexadecimal	: 1B 4A n

Explanation:

Immediate Line Feed for n dot lines without Carriage Return.

The value of n should be in the range 1 to 255.

Enlarge Character Command ESC V or ESC W(refer to Section 4.1.4) enlarges line spacing and consequently changes the value of any following ESC J command.

## **ESC 1** **Set line spacing**

Format:	ASCII	:	ESC	1	n
	Decimal	:	27	49	n
	Hexadecimal	:	1B	31	n

Explanation:

The line spacing is set to n dot-lines for future Line Feed commands.

The value of n should be within the range 0 to 255. Normal settings are n=0 for ESC Kbit image printing mode and n=3 for text printing mode.

## **FF** **Form Feed**

Format:	ASCII	:	FF
	Decimal	:	12
	Hexadecimal	:	0C

Explanation:

Feed paper to beginning position of next page.

### **4.3 Formatting Commands**

## **ESC C** **Set page length in lines**

Format:	ASCII	:	ESC	C	n
	Decimal	:	27	67	n
	Hexadecimal	:	1B	43	n

Explanation:

The page length is set to n lines. The value of n should be within the range 0 to 255. If n=0, the page length will be 256 lines. Default value n=40.

## **ESC N** **Set bottom margin**

Format:	ASCII	:	ESC	N	n
	Decimal	:	27	78	n
	Hexadecimal	:	1B	43	n

Explanation:

The bottom margin is set to n lines. The value of n should be within the range 0 to 255. Default value n=0. In SP. The bottom margin is the spacing between the last line of one page and the first line of the next page. There is no top margin.

For example, to set the bottom margin to 3 lines, send the following sequence:

ASCII	:	ESC	N	ETX
Decimal	:	27	78	3
Hexadecimal	:	1B	4E	03

## **ESC O** **Cancel bottom margin**

Format:	ASCII	:	ESC	O
	Decimal	:	27	79
	Hexadecimal	:	1B	4F

Explanation:

The bottom margin is set to zero lines. This means the printer will print line by line without page breaks.

## **ESC B** **Set vertical tabs**

Format:	ASCII	:	ESC	B	n1	n2	n3	...	NUL
	Decimal	:	27	66	n1	n2	n3	...	0
	Hexadecimal	:	1B	42	n1	n2	n3	...	00

Explanation:

Tab positions are entered as n1, n1, and so on. These n1, n2, ... are within the page length set by ESC C command.

All vertical tab settings can be cleared by using this command in the format ESC B NUL.

VT command executes Vertical Tab, and feeds paper to the next tab position.

<b>TV</b>			<b>Vertical tab</b>
Format:	ASCII	: VT	
	Decimal	: 11	
	Hexadecimal	: 0B	

Explanation:

Feed paper next vertical tab set by ESC B command.

Note: If no vertical tab setting or current position equals or exceeds the last vertical tab, command VT feeds paper one line (same as LF command).

<b>ESC D</b>			<b>Set horizontal tabs</b>
Format:	ASCII	: ESC D n1 n2 ... NUL	
	Decimal	: 27 68 n1 n2 ... 0	
	Hexadecimal	: 1B 44 n1 n2 ... 00	

Explanation:

The tab positions are entered as n1, n2 and so on. These n1, n2, ... are within the line width of the printer. This line width differs from one printer to another, according to the model.

The NUL character is added to indicate the end of the command.

All horizontal tab settings can be cleared by using this command in the format ESC D NUL.

<b>HT</b>			<b>Horizontal Tab</b>
Format:	ASCII	: HT	
	Decimal	: 9	
	Hexadecimal	: 09	

Explanation:

The printing position is advanced to the next horizontal tab set by ESC D command.

If no Horizontal Tab setting or if the current printing position equals or exceeds the last Horizontal Tab, HT command does not execute.

<b>ESC f</b>			<b>Print blank characters or lines</b>
Format:	ASCII	: ESC f m n	
	Decimal	: 27 102 m n	
	Hexadecimal	: 1B 66 m n	

Explanation:

If m=0, command ESC f NUL n will print n blank characters. The value n should be within the line width of the printer.

If m=1, command ESC f SOH n will print n blank lines. The value n should be within the range 0 to 255.

For example, to print 6 space characters in the line, send the following command :

ASCII	: ESC f NUL ACK
Decimal	: 27 102 0 6
Hexadecimal	: 1B 66 00 06

To print 6 blank lines:

ASCII	: ESC f NUL ACK
-------	-----------------

Decimal	:	27	102	1	6
Hexadecimal	:	1B	66	01	06

## ESC Q

## Set right margin

Format:	ASCII	:	ESC	Q	n
	Decimal	:	27	81	n
	Hexadecimal	:	1B	51	n

Explanation:

The value n should be within the line width of the printer.

Default value n=0. No right margin.

The command sets an absolute position and is not affected by character enlarge command ESC U or ESC W.

When the right hand margin is reached, a carriage return and line feed is added.

For example, to set the Right Margin to 6 columns, send:

ASCII	:	ESC	Q	ACK
Decimal	:	27	81	6
Hexadecimal	:	1B	51	06

## ESC I

## Set left margin

Format:	ASCII	:	ESC	I	n
	Decimal	:	27	108	n
	Hexadecimal	:	1B	6C	n

Explanation:

The value n should be within the line width. Default value n=0. This means no left margin.

The command sets an absolute position and is not affected by character enlarge command ESC U or ESC W.

The example, to set the left margin to 6, you would send:

ASCII	:	ESC	I	ACK
Decimal	:	27	108	6
Hexadecimal	:	1B	6C	06

## 4.4 Character Setting Commands

### ESC U

### Enlarge width

Format:	ASCII	:	ESC	U	n
	Decimal	:	27	85	n
	Hexadecimal	:	1B	55	n

Explanation

Characters or graphics following this command are printed at n times normal width. The value n should be in the range 1 to 4. Default value n=1. This means normal width.

### ESC V

### Enlarge height

Format:	ASCII	:	ESC	V	n
	Decimal	:	27	86	n
	Hexadecimal	:	1B	56	n

Explanation:

Characters or graphics following this command are printed at n times normal height. The value n should be within the range 1 to 4. Default value n=1.

This command can only be set at the beginning of a line. The whole line is then enlarged.

---

**ESC W**

---

**Enlarge width & height**

Format:	ASCII	:	ESC	W	n
	Decimal	:	27	87	n
	Hexadecimal	:	1B	57	n

---

Explanation:

Characters or graphics following this command are printed at n times normal width and height. The value of n should be in the range 1 to 4. Default value n=1.

---

**ESC -**

---

**Turn underline on/off**

Format:	ASCII	:	ESC	-	n
	Decimal	:	27	45	n
	Hexadecimal	:	1B	2D	n

---

Explanation:

Underlining is turned on if n=1 or turned off if n=0. All characters are underscored including spaces.

---

**ESC +**

---

**Turn overscore on/off**

Format:	ASCII	:	ESC	+	n
	Decimal	:	27	43	n
	Hexadecimal	:	1B	2B	n

---

Explanation:

Overscoring is turned on if n=1 and turned off if n=0. All characters are overscored including spaces.

---

**ESC 6**

---

**Select font 1**

Format:	ASCII	:	ESC	6
	Decimal	:	27	54
	Hexadecimal	:	1B	36

---

Explanation:

Characters following this command are printed using Font 1 (See Appendix C).

---

**ESC 7**

---

**Select font 2**

Format:	ASCII	:	ESC	7
	Decimal	:	27	55
	Hexadecimal	:	1B	37

---

Explanation:

Characters following this command are printed using Font 2 (See Appendix C).

---

**SO**

---

**Select double-width printing for one line**

Format:	ASCII	:	SO
	Decimal	:	14
	Hexadecimal	:	0E

---

Explanation:

Characters following this command on the same line in the print buffer are printed at twice their normal width. The command is cancelled by a Carriage Return or using DC4.

Normal and enlarged characters can be mixed on the same line, using SO-on ... DC4-off.

---

**DC4**

---

**Cancel double-width**

Format:	ASCII	:	DC4
	Decimal	:	20
	Hexadecimal	:	14

---

Explanation:

Double-width printing is cancelled if it has been set using SO. This command does not cancel enlarge width printing selected using ESC U or ESC W.

<b>ESC i</b>		<b>Turn reverse printing on/off</b>		
Format:	ASCII	:	ESC i n	
	Decimal	:	27 105 n	
	Hexadecimal	:	1B 69 n	

Explanation:

Reverse printing is turned on if n=1 or turned off if n=0. Reverse printing is white characters on a black background, as in a photographic negative.

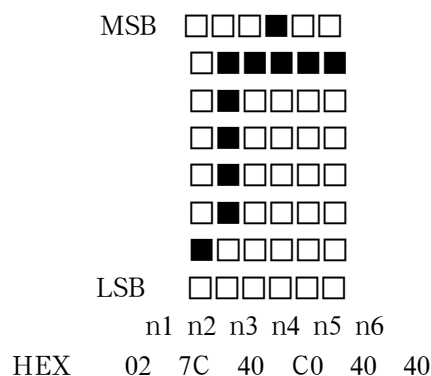
#### 4.5 Setting User-Defined Characters

<b>ESC &amp;</b>		<b>Define user-defined character</b>				
Format:	ASCII	:	ESC & m n1 n2 ... n6			
	Decimal	:	27 38 m n1 n2 ... n6			
	Hexadecimal	:	1B 26 m n1 n2 ... n6			

Explanation:

This command allows a character to be defined. The value m is the code of this user-defined character, ranges from 32 to 255.

The values n1, n2, ..., n6 are code for structure defined characters. Character size is 6×8 dot matrix. The relation of the structure and codes n1, n2, ..., n6 is shown below:



User-defined characters are stored in RAM until power off.

If many ESC & commands use same m value, only the last one is effective. The maximum number of user-defined characters is 32.

<b>ESC %</b>		<b>Mount user defined characters in place of characters in font</b>							
Format:	ASCII	:	ESC % m1 n1 m2 n2 ... mk nk NUL						
	Decimal	:	27 37 m1 n1 m2 n2 ... mk nk 0						
	Hexadecimal	:	1B 25 m1 n1 m2 n2 ... mk nk 00						

Explanation:

This command is used to replace Font characters with user defined characters.

m1, m2, ..., mk are codes of user-defined characters.

n1, n2, ..., nk are codes of characters in the current font – the replaced characters.

The values m and n should be in the range 32 to 255.

The subscript k ranges from 1 to 32. The maximum number of replaced characters is 32.

The NUL character is added to indicate the end of the command.

## ESC : Reinstates the Font characters

Format:	ASCII	:	ESC	:
	Decimal	:	27	58
	Hexadecimal	:	1B	3A

Explanation:

This command reinstates the original characters in the font replaced by user-defined characters using ESC % command. User-defined characters, however, are not deleted from RAM and may be brought back again with ESC %.

### 4.6 Printing Graphics

#### ESC K Bit image printing

Format:	ASCII	:	ESC	K	n1	n2	data	...
	Decimal	:	27	75	n1	n2	data	...
	Hexadecimal	:	1B	4B	n1	n2	data	...

Explanation:

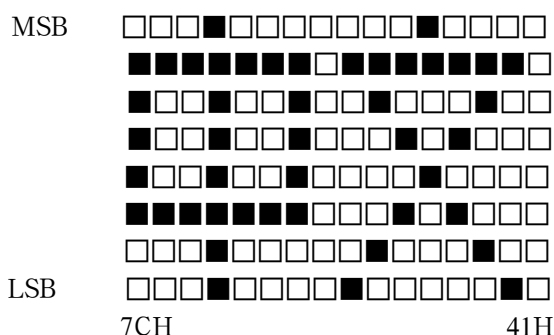
This command prints graphics with  $n1 \times 8$  dot matrix. The width of such graphics is  $n1$  dots, and the height is 8 dots. Each column has 8 dots and can be represented by a byte (8 bits).

The values  $n1$  and  $n2$  represent a 16-bit number with  $n1$  as the low byte and  $n2$  as the high byte.  $n2$  must be zero in SP.  $n1$  should be in the range 1 to the maximum number used.

The data are the bytes of relative columns in the graphics. The number of the bytes should equal  $n1$ .

For example, you want to print two chinese characters “中文” using ESC K. The dot matrix of these two characters is shown. Each character is printed in  $7 \times 8$  dot matrix (7 columns and 8 rows). Characters are divided by one column of spacing. Two characters occupy 15 bytes of data. Data in hexadecimal is :

7C, 44, 44, FF, 44, 44, 7C, 00, 41, 62, 54, C8, 54, 62, 41.



#### ESC ' Print curving graph lines

Format:	ASCII	:	ESC	'	m	n1	n2	...	nk	CR
	Decimal	:	27	39	m	n1	n2	...	nk	13
	Hexadecimal	:	1B	27	m	n1	n2	...	nk	0D

Explanation:

This command is designed to print curving graph lines along the paper feed (vertically). The value  $m$  is the maximum number of the dots per line.

In a horizontal dot line, there are  $m$  intersections of  $m$  curving graph lines. The value  $n1, n2, \dots, nk$  represent the position of these  $m$  intersections. The number of  $nk$  must be equal to  $m$ . Each  $nk$  must fall within the number of dots per line. The last CR (Carriage Return) lets printer print one dot line. As all horizontal lines of the whole graphics are printed out with respective  $nk$  values,  $m$  curves will appear in the printout.

## 4.7 Initialization

### ESC @ Initialize printer

Format:	ASCII	:	ESC	@
	Decimal	:	27	64
	Hexadecimal	:	1B	40

Explanation:

Reset printer to:

- clear print buffer
- restore default values
- select Font 1
- deselect user-defined characters

## 4.8 Data Control Commands

### CR Carriage return

Format:	ASCII	:	CR
	Decimal	:	27
	Hexadecimal	:	0D

Explanation:

When a carriage return is sent to the printer, any data in the buffer is printed and paper is fed one line.

### CAN Cancel line

Format:	ASCII	:	CAN
	Decimal	:	24
	Hexadecimal	:	18

Explanation:

Cancels all text to be printed in the print line buffer preceding this code back to the previous carriage return. It does not cancel any control code sequences issued in that line.

### DEL Delete character

Format:	ASCII	:	DEL
	Decimal	:	127
	Hexadecimal	:	7F

Explanation:

The previous character in the buffer is deleted unless that character has already been printed. This command will not remove control codes.

### NUL Null

Format:	ASCII	:	NUL
	Decimal	:	0
	Hexadecimal	:	00

Explanation:

NUL is used as the final code in some commands such as ESC B, ESC D, ESC % and ESC ' .

NUL command is ignored by printer when used alone.

## 4.9 Hexadecimal Dump Printing

### ESC " Turn hexadecimal dump printing on/off

Format:	ASCII	:	ESC	N	n
	Decimal	:	27	34	n
	Hexadecimal	:	1B	22	n



Explanation:

Hexadecimal dump printing mode is turned on if n=1, and turned off if n=0. If you execute programs or list programs in Hexadecimal Dump printing mode, all data sent from the host computer will be printed out in hexadecimal codes.

For example, when the following data is sent from the host computer.

#### 4.10 Chinese Character Print Commands

<b>FS    &amp;</b>		<b>Select Chinese Print Mode</b>	
Format:	ASCII	: FS	&
	Decimal	: 28	38
	Hexadecimal	: 1C	26

Explanation:

After printer received this command, it will switch from ASCII character print mode to Chinese character print mode to Chinese character print mode. Using GB Chinese character library level I,II.

<b>FS    .</b>		<b>Cancel Chinese Print Mode</b>	
Format:	ASCII	: FS	.
	Decimal	: 28	46
	Hexadecimal	: 1C	2E

Explanation:

After printer received this command, it will switch from Chinese character print mode to Chinese character print mode.

Notice: inputting FS Chinese character print mode to printer will be invalid.

<b>FS    SO</b>		<b>Set Chinese Double Width print</b>	
Format:	ASCII	: FS	SO
	Decimal	: 28	14
	Hexadecimal	: 1C	0E

Explanation:

Characters following this command are printed at twice their normal width, does not enlarge the height.

<b>FS    DC4</b>		<b>Cancel Chinese Double Width Print</b>	
Format:	ASCII	: FS	DC4
	Decimal	: 28	20
	Hexadecimal	: 1C	14

Explanation:

This command is to cancel FS SO command.

### Appendix C. Character Code Tables

There are two character code tables or sets in the printer. Code Range from 20H (Hexadecimal) to FFH (Hexadecimal). Code 00H to 1FH are control codes (See Appendix E). ESC 6 command is used to select Font 1 (Character code table 1), and ESC 7 to select Font 2 (Character code table 2).

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

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	西	千	万	五	十	元	角	分	厘	毫	秒	微	纳	皮	飞	阿
3	0	1	2	3	4	5	6	7	8	9	:	<	=	>	?	
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	
8	0	-	1	2	3	4	5	6	7	8	9	+	*	/		
9	0	1	2	3	4	5	6	7	8	9	+	*	/			
A	0	1	2	3	4	5	6	7	8	9	+	*	/			
B	0	1	2	3	4	5	6	7	8	9	+	*	/			
C	0	1	2	3	4	5	6	7	8	9	+	*	/			
D	0	1	2	3	4	5	6	7	8	9	+	*	/			
E	0	1	2	3	4	5	6	7	8	9	+	*	/			
F	0	1	2	3	4	5	6	7	8	9	+	*	/			

## Appenddix E. Printing Command Codes

Decimal	Hex.	Symbol Format	Function
0	00	NUL	Ending signal
9	09	HT	Horizontal tab
10	0A	LF	Line Feed
11	0B	VT	Vertical tab
12	0C	FF	Form Feed
13	0D	CR	Carriage Return
14	0E	SO	Double-width print
20	14	DC4	Cancel SO command
24	18	CAN	Delete line
27 34	1B 22	ESC " n	Hexadecimal Dump print
27 37	1B 25	ESC % m1 n1 ... NUL	Replace with user-defined characters
27 38	1B 26	ESC & m n1 ... n6	Define user-defined characters
27 39	1B 27	ESC ' m n1 ... nk CR	Print curving graph lines
27 45	1B 2D	ESC - n	Underline
27 49	1B 31	ESC l n	Set line spacing
27 54	1B 36	ESC 6	Select Font 1
27 55	1B 37	ESC 7	Select Font 2
27 58	1B 3A	ESC :	Reinstatae character in ROM
27 64	1B 40	ESC @	Initialize printer
27 66	1B 42	ESC B n1 n2 ... NUL	Set vertical tabs
27 67	1B 43	ESC C n	Set page lenfth
27 68	1B 44	ESC D n1 n2 .. NUL	Set horizontal tabs
27 74	1B 4A	ESC J n	Paper Feed
27 75	1B 4B	ESC K n1 n2 .data.	Bit Image printing
27 78	1B 4E	ESC N n	Set bottom margin
27 79	1B 4F	ESC O	Cancel bottom margin
27 81	1B 51	ESC Q n	Set right margin
27 85	1B 55	ESC U n	Enlarge in width
27 86	1B 56	ESC V n	Enlarge in height
27 87	1B 57	ESC W n	Enlarge in width & height
27 99	1B 63	ESC c n	Inverse printing
27 102	1B 66	ESC f m n	Print blank character or blank line
27 105	1B 69	ESC i n	Reverse printing (white in black)
27 108	1B 6C	ESC l n	Set left margin
127	7F	DEL	Delete last character
28 38	1C 26	FS &	Select Chinese Print Mode
28 46	1C 2E	FS .	Cancel Chinese Print Mode
28 14	1C 0E	FS SO	Set Chinese Double Wisth print
28 20	1C 14	FS DC4	Cancel Chinese Double Width Print