

RD-E3

Embedded thermal printers specification of Development



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Chapter 1: Overview

The printing paper width of RD-E3 THERMAL PRINTER is 80mm. Completely closed design and easy paper loading structure. And low-voltage and low-power design.

Appearance: fashion, delicacy, small volume, light weight.

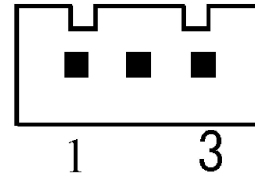
It can be easily integrated into customer system equipment. And high printing speed, and print clearly and smoothly.

RD-E3 micro thermal printer are widely used in medical, fire fighting, electric power, weighing apparatus, GPS navigation and other industries.

1.1 Power connector

Power Interface is the 3PIN, which is 2.54mm at equal distance and perpendicular.

pin	name	description
1	VCC	VCC8.5V
2	--	NC
3	GND	Negative power



1.2 Performance indicators

printing method	thermal line printing
Printing speed	50mm/s (MAX)
Resolution ration	203dpi (8dots per millimeter) , 576 dots per line
Effective print width	72mm
Paper feed step	0.125mm
Foreign language characters	1. Support extended ASCII characters (352): 6×8, 2. Support ASCII character (224) : 12×24. 3. Support ASCII character (224) : 8×16

Chinese characters	Equip with the GBK character library
lack of paper detection	Yes
Black Label positioning	User option
Out Interface	1.standard parallel interface(P): 26 wire double row needle socket 2.Standard serial interface (S): 5PIN white socket (RS232&TTL) 3.485interface (S5): 5PIN white socket
buffer	16k
instruction system	print command: ESC/POS (Compatible with IBM/EPSON and ESC/P)
Print drivers	WIN2000/NT/XP parallel interface \ serial interface
Power Supply	DC8.5V/4A
print head life	50km
Paper type	Ordinary thermal Paper (width: $80 \pm 0.5\text{mm}$, $\varnothing \leq 30\text{mm}$)
paper loading way	easy paper loading
Cut type	tearing paper manually
Operating temperature humidity	/ $-10 \sim 55^{\circ}\text{C} / 10 \sim 80\% \text{RH}$

Storage temperature / humidity	-20~60℃ / 10~90%RH
weight (do not include printing paper)	approximately 300g
Installation dimension (mm)	98.0mm*73.5mm (L x W)
outline dimension (mm)	105.5mm*80.5mm*42.1mm (L x W x H)

1.3operating

1.3.1key

There is a key on the printer, and we can realize self-test and paper feed according to the key.

1.3.2self-test

Step 1: Load the printing paper

Step 2: In the case of no charging the printer, please hold down the key, then charge the printer and hold down the key for 2 second, and the printer starts the self-test. (the self-test can print the model of the machine, company telephone, company name, interface parameters and other basic information)

1.3.3loading paper

Step 1: Open the paper storehouse door

Step 2: Directly put the thermal roll paper into the paper store house in the proper direction and the smooth side up

Step 3: Place the paper to the extent that it can be exposed from the printer and close the paper storehouse cover and press the paper's exposed end

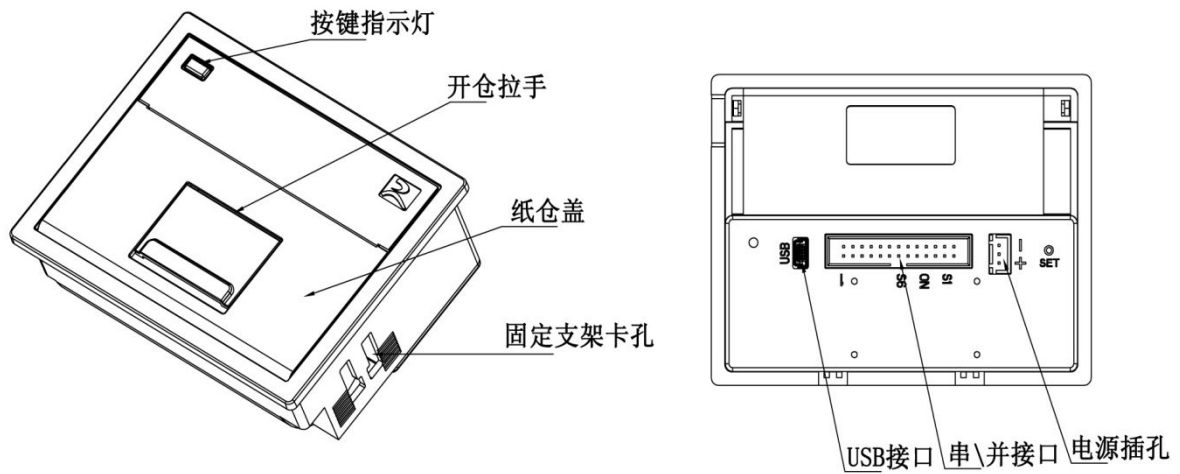
1.3.4 Paper feed

Under the printer charged state, hit the key on the left, and the printing paper starts feeding, and loosen the button, the printing paper stops feeding.

1.3.5Indicator light

RD-E3 printer has an indicator light, which is green and has two functions. When the printer lacks the paper, the indicator light will be go out for long. When the print is online, it will be bright for long. When the printer buffer is full or printer is busy, the green indicator light will go out or be in a state of continuous glint.

1.3 Structure of the printer



Chapter 2: communication interface

2.1 serial interface

2.1.1 Define of Interface

Data transfer: Serial

Synchronization way: Asynchronous

Handshake signals: CTS / RTS, DTR / DSR or XON / XOFF

Baud rate: 150, 300, 600, 1200, 2400, 4800, 9600, 19200 bps (can select the baud rate according to the DIP switches)

Data Length: 8 Bit

Parity: None

Stopping bit: 1 bit

Interface: 5 core socket (figure2-1)

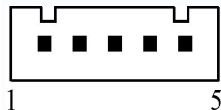


figure2-1



figure2-2

5 core single row socket	Signal name	signal source	direction	Illustration

(Pin No.)				
2	TXD	Printer	Export(ou t)	The printer receives the data from the main computer. (TRANSMIT DATA)
3	RXD	Host	Import(in)	When using the 'X-ON/X-OFF' Handshake Protocol, the printer sends control code 'X-ON/X-OFF' to the computer. (RECEIVE DATA)
5	GND	—	—	Signal ground
4	CTS	Printer	Export(o ut)	When the signal is in a state of 'MARK', it means that the printer is busy and can't receive data. But when the signal is in a state of 'SPACE', it means that the printer is ready to receive data.
1	NC	—	—	no connection

2.1.2 Baud rate select bit

SW NO.		960	480	240	120	600	300	150
	19200	0	0	0	0			
1	off	on	off	on	off	on	off	on
2	off	off	on	on	off	off	on	on
3	off	off	off	off	on	on	on	on

2.1.3handshake method select bit

The handshake methods can be selected by the DIP switch SW4 in the machine. When the machines leave factory, the location of the sw4 is 'ON' (Default).

SW4	Handshake method	Data direction	RS-232 interface signal
ON	Mark control	Data can enter	The signal line '4' is in a state of 'SPACE'
		Data can't enter	The signal line '4' is in a state of 'mark'

OFF	X-ON/X-OFF control	Data can enter	The signal line '2'send out the X-ON code '11H'
		Data can't enter	The signal line '2'send out the X-OFF code '13H'

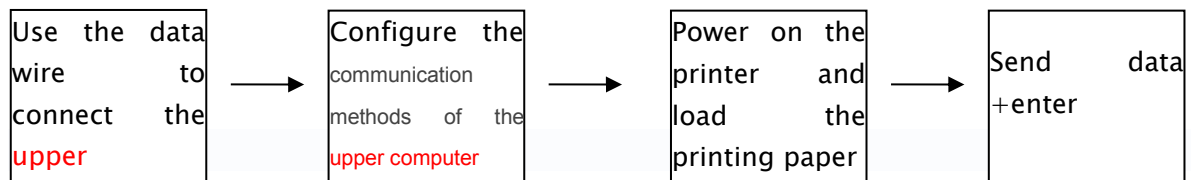
2.1.4 Checking the lack of paper select bit

SW5	direction
ON	When it is ON, the printer stops printing when it is the lack of paper. When it is online, the printer will be in a state of continuous glint to prompt the lack of paper.
OFF	When it is OFF, the printer will not respond to the lack of paper.

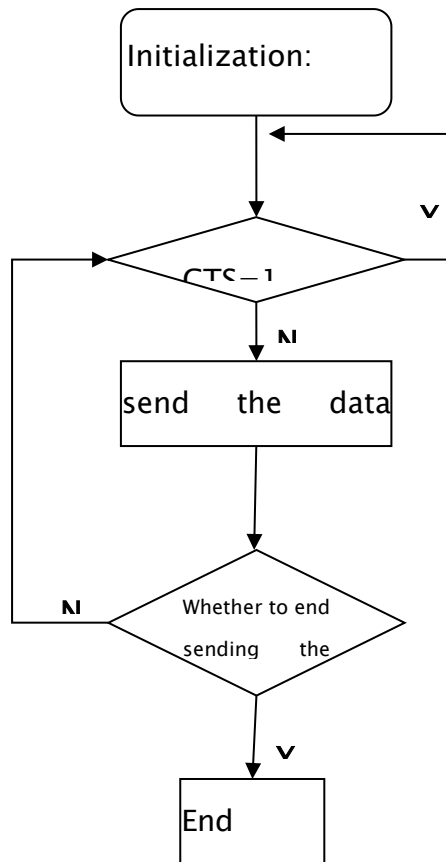
2.1.5 Data transmission method of serial interface

The receiving buffer of the printer is 16K

- (1) When the number of sending data once is less than 16K, the data can be directly sent. And the sending method is as follows:



- (2) If large amounts of data once is sent, need to judge the mark 'CTS' when sending the data. When the mark is '1', the data can't be sent. When the mark is '0', the data can be sent. Data can be sent in the form of packets or byte. When the data is sent in the form of packets, each data packet can't exceed 256 bytes, and the sending flowchart is as follows:



2.2 Parallel interface

The RD-DG system thermal parallel interface printer uses **26pin socket** as the communication interface. The spacing between the needle and the needle is 2.54mm. Figure 2-4 is the parallel interface figure.

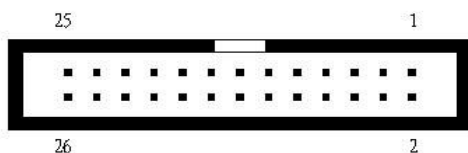


Figure 2-4

2.2.1 data interface

26pin row socket (pin NO.)	Signal name	Signal direction	Illustration	DB25 parallel interface wire on the PC (pin NO.)
1	STB/	in	数据选通触发脉冲，上升沿时读入数据	1
3	DATA1	In	8 data pins, the logic '0' indicates low, '1' indicates high	2
5	DATA2	In		3
7	DATA3	In		4
9	DATA4	In		5
11	DATA5	in		6
13	DATA6	In		7
15	DATA7	In		8
17	DATA8	In		9
19	ACK/	Out	Answer pulse, and "Low" level indicates that the data has been accepted	10
21	BUSY	Out	"High" level indicates that the printer is busy and can't receive data	11
23	PE	— —	Grounding (PERROR)	--
25	SEL	Out	经电阻上拉“高”表示打印机在线	13
4	ERR/	Out	经电阻上拉“高”电平表示无故障	15
2, 6, 8	NC	— —	no connection	--
10~24	GND	— —	Signal ground	12, 25

Matters need attention: ①The mainframe and printer in the item 'signal source' means the source

of the signal sending out

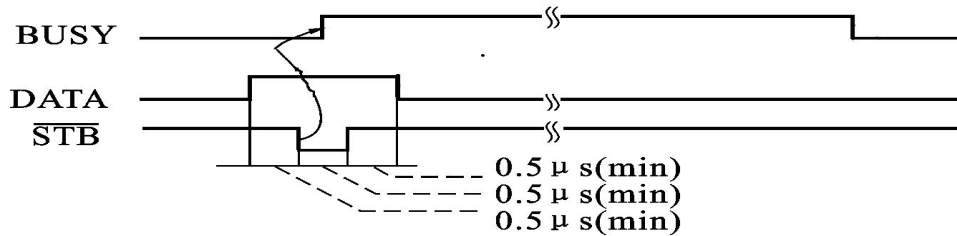
②The signal logic level is EIA level.

2.2.2 Parallel interface data transmission method

Using parallel interface to send data is relatively more trouble than using serial interface,

[HTTP://WWW.RD-CN.COM](http://www.rd-cn.com)

because using parallel interface to send data need the cooperation of the 'STB','BUSY' AND 'DATA' data wires.

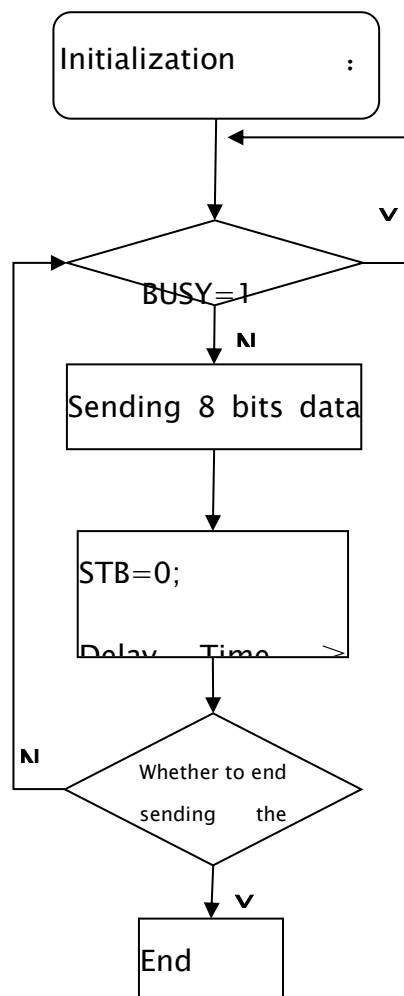


Sending step:

step1: using the appropriate data wire connects the printer to PC

step2: power on the printer and load the printing paper

step3:Begin to transmit data, and flow chart is as follows:



Chapter 3: Command system

3.1 Command list

RD-DG Series thermal printers use the ESC / POS compatible command, and add to some functions such as the Chinese characters printing, Character and Chinese characters rotation, word spacing adjustment, printing barcodes and other functions.

Command	Function
ESC c	To allow/ban reverse printing
FF	Print and feed paper to the top of the next page (only the models with the black mark detection function)
HT	To execute horizontal tab
LF	To print and line feed
CR	To print and carriage return
ESC SP	To set the character spacing
ESC \$	To set printing absolute position
ESC ‘	To print curve
ESC v	Send the printer’s status to the host
FS &	Select the Kanji mode
FS .	Cancel the Kanji mode

ESC +	To allow/ban the overline printing
ESC -	To allow/ban the underline printing (to set/clear the underline mode)
ESC 1	To set the line spacing
ESC 6	To select Character Set 1 (6X8)
ESC 7	To select Character Set 2 (6X8)
ESC a	Select alignment methods
ESC @	To initialize the printer
ESC D	To set the position of horizontal tab
GS k	To print the bar code
ESC J	To print and feed paper
ESC d	To print and feed paper n lines
ESC K	Printing graphics command ①
ESC *	Printing graphics command ②
ESC Q	To set the right margin width
ESC U	Horizontally magnify character
ESC V	Vertically magnify character
GS H	Select the printing position for bar code character
GS Q	Set horizontal printing position for the bar code
GS k	Print the bar code(s)
ESC X	Magnify characters
GS h	Select bar code's height

GS w	Select bar code's width
GS B	To allow/ban white reverse printing mode
ESC !	Select printing modes
FS U	Send data to print according to the Unicode code
GS * x y	Define downloaded bit image
FS p n m	Print the NV bit image
FS q n	Define NV bit image
GS / m	Print downloaded bit image
ESC I	To set the printing position
FS 2	To set character rotation Printing
FS r	To select the superscript and subscript

This chapter describes the commands of controlling the printer to print. Format specification is as follows:

【COMMAND】 + **【*parameter*】**

- 1) **【COMMAND】** is the command, and consists of the escape character and command characters. But a small number of single-byte commands don't have the escape character.
- 2) **【*parameter*】** is the parameter, which is in italics. And the parameters are not numeric characters, but the value of the character.

All the examples in this chapter are compiled in C language. The 'SendDataToPrinter' function is a virtual functions. And require developers to write according to the actual situation of the mainframe.

This function is defined as follows:

```
SendDataToPrinter(unsigned char *buffer, unsigned int len) // Sending data to the printer
```

```
Unsigned char *buf // Print data command
```

```
Unsigned int len// Data length. Unit: byte.
```

3.2 Command Details

ESC @

[Name] To initialize the printer

[Type]	ASCII:	ESC	@
	Decimal:	27	64
	Hex:	1B	40

[Explanation] Clear the data in the print buffer, and reset the printing parameters to the current printer default parameters.

[Note]

- The data in the receive buffer is not cleared.

[Example] unsigned char str[2];

```
str[0] = 0x1B;  
str[1] = 0x40;  
SendDataToPrinter(str,2);
```

FF

[Name] Print and feed paper to the top of the next page

[Type]	ASCII:	FF
	Decimal:	12
	Hex:	0C

[Explanation] Print all data in the printing buffer and return to the standard mode

[Note] If the paper has pre-printed black mark, take the paper to the black mark after printing the data in the data buffer. if the paper does not have black mark, feed paper 30cm. Pre-printed black mark specifications, see Appendix C. Pre-black Label printing instructions.

[Example] unsigned char str[2];

[HTTP://WWW.RD-CN.COM](http://www.rd-cn.com)

```
str[0] = 0x0C;  
SendDataToPrinter(str, 1);
```

LF

[Name] print and feed line

[Type] ASCII: LF

Decimal: 10

Hex: 0A

[Explanation] Print the data in the print buffer and feed one line

[Note] The command sets the print position to the beginning of the line

[Example] unsigned char str[2];

```
str[0] = 0x0A;//或str[0] = '\n'  
SendDataToPrinter(str, 1);
```

CR

[Name] print and carriage return

[Type] ASCII: CR

Decimal: 13

Hex: 0D

[Explanation] Print the data in the print buffer and carriage return

[Reference] LF

[Example] unsigned char str[2];

```
str[0] = 0x0D;//或str[0] = '\r'  
SendDataToPrinter(str, 1);
```

ESC J

[Name] print and feed paper

[Type] ASCII: ESC J n

Decimal: 27 74 n

Hex: 1B 4A n

[Explanation] Print the data in the print buffer and feeds forward paper [$n \times 0.125\text{mm}(0.0049\text{'})$].

[Comment]

- After printing is finished, the command sets the print starting position to the beginning of the line.

[Scope] $0 \leq n \leq 255$

[Example] unsigned char str[3];

 str[0] = 0x1B;

 str[1] = 0x4A;

 str[2] = 0x4;

 SendDataToPrinter(str,3);// feeds forward paper 0.5mm

ESC d n

[Name] print and feed paper n lines

[Type] ASCII: ESC d n

 Decimal: 27 100 n

 Hex: 1B 64 n

[Scope] $0 \leq n \leq 255$

[Explanation] Print the data in the print buffer and feed paper n lines

[Comment]

- After finishing the printing, this command sets the print starting position to the beginning of the line.

- One line distance is 24 vertical pitch (0.125mm)

[Example] unsigned char str[3];

str[0] = 0x1B;

str[1] = 0x64;

str[2] = 0x4;

SendDataToPrinter(str,3);// feed forward paper 4 lines

ESC c

[Name] To allow/ban reverse printing

[Type] ASCII: ESC C n

Decimal: 27 99 n

Hex: 1B 63 n

[Scope] $0 \leq n \leq 1$

[Explanation]

When $n=1$, allow the reverse printing and the printing direction is from left to right.

When $n=0$, ban the reverse printing and the printing direction is from right to left.

[Comment]

When the printer is vertically installed, the printer uses the reverse printing way.

Reversely printing not only supports character mode, and also supports graphical mode.

When reversely printing graphics, we should note the printing order of graphics unit. (See the

ESC K command)

[Example] unsigned char str[3];

str[0] = 0x1B;

str[1] = 0x63;

str[2] = 0x1

SendDataToPrinter(str,3);// reverse printing

HT

[Name] horizontal tab

[Type] ASCII: HT

Decimal: 9

Hex: 09

[Explanation] Move the print position to the next horizontal tab position

[Note] • The command is ignored unless the next horizontal tab position has been set.

- Horizontal tab positions are set with the 'ESC D'.

[Reference] ESC D

ESC D n1 n2 ... nk NULL

[Name] To set the position of horizontal tab

[Type] ASCII: ESC D *n1...nk NULL*

Decimal: 27 68 *n1...nk 0*

Hex: 1B 44 *n1...nk 00*

[Scope] $1 \leq n \leq 255$ $0 \leq k \leq 20$

[Explanation] Set the position of horizontal tab

n specifies the column number for setting a horizontal tab position from the beginning of a line.

k indicates the total number of horizontal tab positions to be set.

[Note]

- The horizontal position is stored as a value of [character width × n] measured from the beginning of the line. The character width includes the default width of the characters' spacing.

- This command deletes the previously set level positioning location.
- When $n = 8$, the printing position is moved to the 9th column by sending HT.
- The command is not affected by the ESC X command.
- This command cancels the previous tabulator position settings.
- The character printing position ,which exceeds the positioning location, will be processed as normal data.
- Transmit [n] k in ascending order and place a NULL code 0 at the end.
- When nk is less than or equal to the preceding value n (k-1),tab setting is finished and the following data is processed as normal data.
- ESC D NULL cancels all horizontal tab position.
- Even if the character width changes, previously specified horizontal tab positions don't also change.

[Default]The default tab positions are Font A (12*24).

[Example] unsigned str[8];

```
unsigned char Order = 9;
str[0] = 0x1B;
str[1] = 0x44;

str[2] = 2;// one character spacing from the first column

str[3] = 9;// eight character spacing from the first column

str[4] = 14;// thirteen character spacing from the first column

str[5] = 0; // end
SendDataToPrinter (str,6)
SendDataToPrinter (&Order,1);
SendDataToPrinter ("HT1",3);
SendDataToPrinter (&Order,1);
SendDataToPrinter ("HT2",3);
```



```
SendDataToPrinter (&Order,1);  
SendDataToPrinter ("HT3",3);  
Order = 0x0D;  
SendDataToPrinter (&Order,1);  
SendDataToPrinter ("1234567890123456\r",17)
```

```
HT1 HT2 HT3  
1234567890123456
```

ESC - n

[Name] To select/cancel the underline mode

[Type] ASCII: ESC - *n*

Decimal: 27 45 *n*

Hex: 1B 2D *n*

[Explanation] *n* = 1, select the underline mode

n = 0, cancel the underline mode

[Note]

- Underline can't act in the rotation and reverse characters.
- This command only affects the English and Kanji characters.

[Default] *n* = 0.

[Example] unsigned char str[3];

```
str[0] = 0x1B;  
str[1] = 0x2D;  
str[2] = 0x1;  
SendDataToPrinter (str,3); // set the underline
```

ESC +

[Name] allow/ban the overline printing

[Type] ASCII: ESC + *n*

Decimal: 27 43 *n*

Hex: 1B 2B n

[Explanation] When $n=1$, allow the overline printing

When $n=0$, ban the overline printing

[Note]

- Overline can't act in the rotation and reverse characters.
- This command only affects the English and Kanji characters.

[Default] $n = 0$

[Example]

```
unsigned char str[3];
str[0] = 0x1B;
str[1] = 0x2B;
str[2] = 0x1;
SendDataToPrinter (str,3);// set the overline
```

GS B n

[Name] select/cancel white reverse printing mode

[Type] ASCII: GS B n

Decimal: 29 66 n

Hex: 1D 42 n

[Scope] $0 \leq n \leq 255$

[Explanation] select/cancel white reverse printing mode

- When the LSB of n is 0, cancel white/black reverse printing mode.
- When the LSB of n is 1, select white/black reverse printing mode.

[Comment]

- Only the lowest bit of n is valid.
- The command is valid for the built-in and user-defined characters.
- This command only affects the English and Kanji characters.

[Default] $n=0$

[Example] unsigned char str[3];

```
str[0] = 0x1D;  
str[1] = 0x42;  
str[2] = 1;// set the white reverse printing mode  
SendDataToPrinter(str, 3);
```

FS 2 n

[Name] set character rotation Printing

[Type] ASCII: FS 2 n

Decimal: 28 73 n

Hex: 1C 49 n

[Scope] $0 \leq n \leq 3$

[Explanation] The command can rotate the character. The value of **n** is as follows:

n (Decimal)	Counterclockwise rotation
0	Does not rotate
1	90 degrees (Counterclockwise rotation)
2	180 degrees (Counterclockwise rotation)
3	270 degrees (Counterclockwise rotation)

[Note] Under the 90 degrees or 270 degrees rotation mode, the character width and height magnification direction is opposite to the magnification direction of the general mode.

[Default] n=0

[Example] unsigned char str[3];

```
str[0] = 0x1C;  
str[1] = 0x49;
```

```
    str[2] = 1; // set 90 degrees rotation
    SendDataToPrinter(str, 3);
ESC $ nL nH
```

[Name] Set absolute print position

[Type] ASCII: ESC \$ nL nH

Decimal: 27 36 nL nH

Hex: 1B 24 nL nH

[Scope] $0 \leq nL + (nH \times 256) < 384$

[Explanation] Set the distance from the beginning of the line to the position at which subsequent characters are to be printed.

The distance from the beginning of the line to the printing position is N horizontal dot pitch

The nL and nH are the low and high bit of double-byte unsigned integer N . $N = nL + nH \times 256$

[Comment]

- Settings outside the specified printable area are ignored.
- In mode 1, $n \leq 372$; In mode 2, $n \leq 420$

[Example] unsigned char str[4];

```
    str[0] = 0x1B;
```

```
    str[1] = 0x24;
```

```
    str[2] = 32; //
```

```
    SendDataToPrinter (str, 3); // Set the absolute position to 32 horizontal dot pitch from the left
```

margin

ESC I n

[Name] set the left margin

[Type] ASCII: ESC I n

Decimal: 27 108 n

Hex: 1B 6C n

[Scope] $0 \leq n \leq 32$

[Explanation]

The left margin is the number of characters, which isn't printed on the left side of the printing paper.

The distance from the beginning of the line to the printing position is the width of n English characters.

[Comment]

- If the printing position is outside the printable area, the command is ignored.
- The width of the character includes the default character width of the character spacing

[Example] unsigned char str[4];

```
str[0] = 0x1B;  
str[1] = 0x6C;  
str[2] = 3;//
```

```
SendDataToPrinter (str, 3); // the left position is set to the width of 3 English characters from the  
left margin
```

ESC Q n

[Name] set the right margin

[Type] ASCII: ESC Q n

 Decimal: 27 81 n

 Hex: 1B 51 n

[Scope] $0 \leq n \leq 32$

[Explanation] The right margin is the number of characters, which isn't printed on the right side of the printing paper.

[Comment]

- If the printing position is outside the printable area, the command is ignored.
- The width of the character includes the default character width of the character spacing

[Example] unsigned char str[4];

```
str[0] = 0x1B;  
str[1] = 0x51;  
str[2] = 3;//
```

```
SendDataToPrinter (str, 3); // set the area of three characters' width to the unprintable
```

area on the right side

ESC 1 n

[Name] set the line spacing

[Type] ASCII:	ESC	1	n
Decimal:	27	49	n
Hex:	1B	31	n

[Scope] $0 \leq n \leq 255$ (The default value of 'n' is 3)

[Default] n=3

[Explanation] Set the line spacing to n vertical dot pitch

[Example] unsigned char str[4];

```
str[0] = 0x1B;  
str[1] = 0x31;  
str[2] = 8;
```

```
SendDataToPrinter(str,3);// Set the line spacing to 8 vertical dot pitch
```

ESC SP n

[Name] set the character spacing

[Type] ASCII:	ESC	SP	n
Decimal:	27	32	n

Hex: 1B 20 n

[Scope] $0 \leq n \leq 255$ (The default value of 'n' is 0)

[Explanation] Set the character spacing to n horizontal dot pitch

[Example] unsigned char str[4];

 str[0] = 0x1B;

 str[1] = 0x20;

 str[2] = 8;

 SendDataToPrinter(str,3);// Set the character spacing to 8 horizontal dot pitch

ESC a n

[Name]Select justification methods

[Type] ASCII: ESC a n

 Decimal: 27 97 n

 Hex: 1B 61 n

[Scope] $0 \leq n \leq 2$

[Explanation] Aligns all the data in one line to the specified position.

n selects the justification as follows:

n	justification methods
0	Left justification
1	Centering
2	Right justification

[Comment]

- This command is only valid at the beginning of the line.

[Default] n=0

[Example]

```
unsigned char str[4];
str[0] = 0x1B;
str[1] = 0x61;
str[2] = 1;
SendDataToPrinter(str,3);// select the centering to print
```

FS r n

[Name] select the superscript and subscript**[Type]** ASCII: FS r n

Decimal: 28114 n

Hex: 1C 72 n

[Scope] $0 \leq n \leq 1$ **[Explanation]**

The value of n	Result
n=0	superscript
n=1	subscript

[Comment]

The command is effective for all characters (including English characters and Kanji)

The command is ignored if n is outside the defined scope

[Example] unsigned char str[3];

```
str[0] = 0x1C;
str[1] = 0x72;
str[2] = 0;
SendDataToPrinter(str,3);//
```

ESC U

[Name] Horizontally magnify characters

[Type] ASCII: ESC U n

 Decimal: 27 85 n

 Hex: 1B 55 n

[Scope] $0 \leq n \leq 8$

[Comment]

The command is effective for all characters (including English characters and Kanji)

The command is ignored if n is outside the defined scope

[Reference] ESC X

[Example] unsigned char str[4];

 str[0] = 0x1B;

 str[1] = 0x55;

 str[2] = 2;

 SendDataToPrinter(str,3);// Horizontally magnify 2 times

ESC V

[Name]Vertically magnify characters

[Type] ASCII: ESC V n

 Decimal: 27 86 n

 Hex: 1B 56 n

[Scope] $0 \leq n \leq 8$

[Comment]

The command is effective for all characters (including English characters and Kanji)

The command is ignored if n is outside the defined scope

[Reference] ESC X

[Example] unsigned char str[4];

```
str[0] = 0x1B;
```

```
str[1] = 0x56;
```

```
str[2] = 2;
```

```
SendDataToPrinter(str,3);// Vertically magnify 2 times
```

ESC X

[Name] Magnify characters

[Type] ASCII: ESC X n1 n2

Decimal: 27 88 n1 n2

Hex: 1B 58 n1 n2

[Scope] $0 \leq n \leq 8$ ($1 \leq n1$ horizontal times ≤ 8 , $1 \leq n2$ vertical times ≤ 8)

[Comment]

The command is effective for all characters (including English characters and Kanji), except barcode reading characters.

The command is ignored if n is outside the defined scope.

Vertical direction is the paper feeding direction, and horizontal direction is vertical with the paper feeding direction. When character clockwise rotate 90 °, the relationship between the vertical direction and horizontal direction is reversed, that is to say, this command's priority is lower than the FS 2. And when two commands is effective at the same time, the characters firstly rotate, then enlarge.

[Example] unsigned char str[4];

```
str[0] = 0x1B;
```

```
str[1] = 0x58;
```

```
str[2] = 2;
```

```
str[3] = 2;
```

```
SendDataToPrinter(str,4);// Vertically and horizontally magnify 2 times
```

ESC K nL nH d1 d2dk

[Name] Printing graphics command ①

[Type] ASCII ESC K nL nH d1...dk

Decimal: 27 75 nL nH d1...dk

Hex: 1B 4B nL nH d1...dk

[Scope] $0 \leq nL \leq 255$

$0 \leq nH \leq 1$

$0 \leq d \leq 255$

[Explanation]

This command can only print the black/white bit-image whose height is 8 dots and width does not exceed the printable area.

The nL and nH are the low and high bit of double-byte unsigned integer N. They express the number of the dots of the bit-image on the horizontal direction.

[Reference] ESC *

[Comment]

- The graphics command is influenced by the character enlargement command.
- When using reverse printing mode, successively print each graphics unit according to the order of the graphics from bottom to up.

[Example] unsigned char str[30];

```
unsigned char i=0;
```

```
str[i++] = 0x1B; str[i++] = 0x4B;
```

```
str[i++] = 15; //print the graphics whose width is 15 dots
```

```
str[i++] = 0x7C; str[i++] = 0x44; str[i++] = 0x44; str[i++] = 0xFF;
```

```
str[i++] = 0x44; str[i++] = 0x44; str[i++] = 0x7C; str[i++] = 0x00;  
str[i++] = 0x41; str[i++] = 0x62; str[i++] = 0x54; str[i++] = 0xC8;  
str[i++] = 0x54; str[i++] = 0x62; str[i++] = 0x41; str[i++] = 0x0D;  
SendDataToPrinter(str,i);//send the printing graphics command.
```

ESC * m nL nH d1...dk

[Name] Printing graphics command ②

[Type] ASCII ESC * m nL nH d1...dk

Decimal: 27 42 m nL nH d1...dk

Hex: 1B 2A m nL nH d1...dk

[Scope] m = 0, 1, 32, 33

$0 \leq nL \leq 255$

$0 \leq nH \leq 1$

$0 \leq d \leq 255$

[Explanation]

This command can only print the black/white bit-image whose height is 8 dots or 24 dots and width does not exceed the printable area.

The parameter meaning is as follows:

Using the m to select the bit image modes, and the dots of the bit image in the horizontal direction are specified by the nL and nH.

m	The number of vertical dots (height)	Double-width mode
0	8	Twice as width
1	8	single-width
32	24	Twice as width
33	24	single-width

The nL and nH are the low and high bit of double-byte unsigned integer N. They express the number of the dots of the bit-image on the horizontal direction.

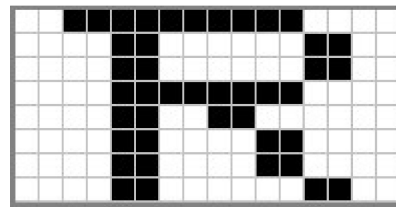
Mode 1: When the double-width mode is single-width, its maximum is 384. When the double-width mode is twice as width, its maximum is 192.

Mode 2: When the double-width mode is single-width, its maximum is 432. When the double-width mode is twice as width, its maximum is 216.

d1.....dk express the bit-image data. And the specific format is as follows:

[Example 1] m =0 (8 dots, twice as width), d1 represents the data to be printed in the first and second column. And dk represents the data to be printed in the 2kth and (2k-1)th column. The bn represents the nth bit of the byte.

d1	d2	d3	d4	d5	d6	d7	d8	
0	1	1	1	1	1	0	0	b7
0	0	1	0	0	0	1	0	b6
0	0	1	0	0	0	1	0	b5
0	0	1	1	1	1	0	0	b4
0	0	1	0	1	0	0	0	b3
0	0	1	0	0	1	0	0	b2
0	0	1	0	0	1	0	0	b1
0	0	1	0	0	0	1	0	b0



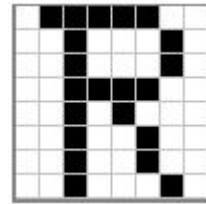
Program code is as follows:

```

unsigned char str[100];
j=0;
str[j++] = 0x1B;   str[j++] = 0x2A;
str[j++] = 0; //m=0 (height is 8 dots, twice as width)
str[j++] = 8; //the width of the graphic is 8dots
str[j++] = 0; //the bit image data
str[j++] = 0x00;str[j++] = 0x80;str[j++] = 0xFF;str[j++] = 0x90;str[j++] = 0x98;
str[j++] = 0x96;str[j++] = 0x61;str[j++] = 0x00;str[j++] = 0x0D; //print the graphic
SendDataToPrinter(str,j);
    
```

[Example 2] m =1 (8 dots, single-width), d1 represents the data to be printed in the first column. And dk represents the data to be printed in the kth column. The bn represents the nth bit of the byte.

d	d	d	d	d	d	d	d	
1	2	3	4	5	6	7	8	
0	1	1	1	1	1	0	0	b7
0	0	1	0	0	0	1	0	b6
0	0	1	0	0	0	1	0	b5
0	0	1	1	1	1	0	0	b4
0	0	1	0	1	0	0	0	b3
0	0	1	0	0	1	0	0	b2
0	0	1	0	0	1	0	0	b1
0	0	1	0	0	0	1	0	b0



Program code is as follows:

```

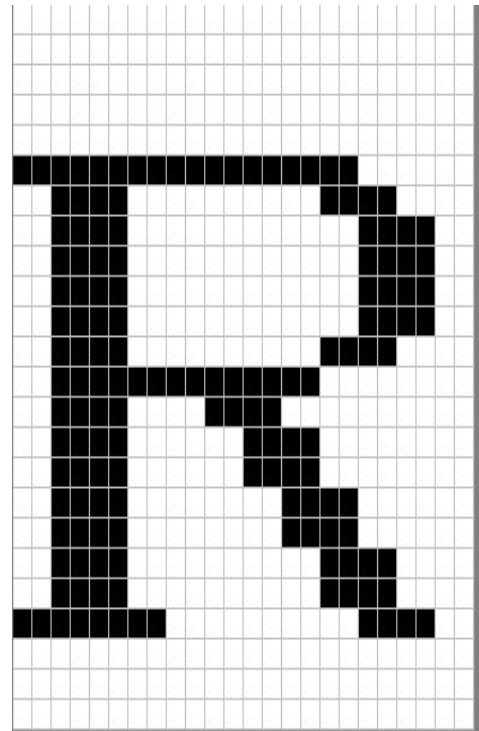
unsigned char str[100];
j=0;
str[j++] = 0x1B;
str[j++] = 0x2A;
str[j++] = 1; //m=1(height is 8 dots, don't enlarge)
str [j++] = 8; //the graphic width is 8dots
str [j++] = 0;//bit image data
str[j++] = 0x00;str[j++] = 0x80;str [j++] = 0xFF;str[j++] = 0x90;str[j++] = 0x98;
strr[j++] = 0x96;str[j++] = 0x61;str[j++] = 0x00;str[j++] = 0x0D; ;//print the graphic
SendDataToPrinter(str,j);
    
```

[Example 3] $m = 32$ (24 dots, twice as width), d_1, d_2 and d_3 represent the data to be printed in the first, second and third column. And d_k represents the data to be printed in the k^{th} column. The b_n represents the n^{th} bit of the byte.



d4	d7										D	d49
0	0	0	0	0	0	0	0	0	0	0	0	b7
0	0	0	0	0	0	0	0	0	0	0	0	b6
0	0	0	0	0	0	0	0	0	0	0	0	b5
1	1	1	1	1	1	1	1	1	0	0	0	b4
0	1	1	0	0	0	0	0	1	1	0	0	b3
0	1	1	0	0	0	0	0	0	1	1	0	b2
0	1	1	0	0	0	0	0	0	1	1	0	b1
0	1	1	0	0	0	0	0	0	1	1	0	b0
0	1	1	0	0	0	0	0	0	1	1	0	b7
0	1	1	0	0	0	0	0	1	1	0	0	b6
0	1	1	1	1	1	1	1	0	0	0	0	b5
0	1	1	0	0	1	1	0	0	0	0	0	b4
0	1	1	0	0	0	1	1	0	0	0	0	b3
0	1	1	0	0	0	1	1	0	0	0	0	b2
0	1	1	0	0	0	0	1	1	0	0	0	b1
0	1	1	0	0	0	0	1	1	0	0	0	b0
0	1	1	0	0	0	0	0	1	1	0	0	b7

d1	0	1	1	0	0	0	0	0	1	1	0	0	b6
	1	1	1	1	0	0	0	0	0	1	1	1	b5
	0	0	0	0	0	0	0	0	0	0	0	0	b4
	0	0	0	0	0	0	0	0	0	0	0	0	b3
	0	0	0	0	0	0	0	0	0	0	0	0	b2
	0	0	0	0	0	0	0	0	0	0	0	0	b1
	0	0	0	0	0	0	0	0	0	0	0	0	b0
d2													
d3													



Program code is as follows:

```
unsigned char str[200];
```

```
j=0;
```

```
str[j++] = 0x1B;
```

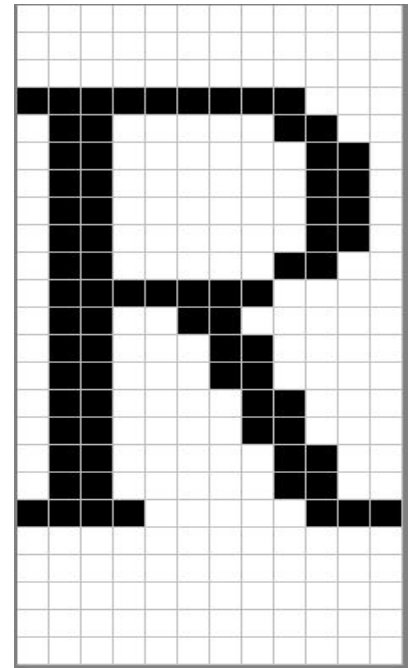
[HTTP://WWW.RD-CN.COM](http://www.rd-cn.com)


```

str[j++] = 0x2A;
str[j++] = 32; //m=32(height is 24 dots, double-width)
str[j++] = 12; //graphic width is 12dots
str[j++] = 0; //bit image data
str[j++] = 0x10;str[j++] = 0x00;str[j++] = 0x20;str[j++] = 0x1F;str[j++] = 0xFF;str[j++] = 0xE0;
str[j++] = 0x1F;str[j++] = 0xFF;str[j++] = 0xE0;str[j++] = 0x10;str[j++] = 0x20;str[j++] = 0x20;
str[j++] = 0x10;str[j++] = 0x20;str[j++] = 0x00;str[j++] = 0x10;str[j++] = 0x30;str[j++] = 0x00;
str[j++] = 0x10;str[j++] = 0x3C;str[j++] = 0x00;str[j++] = 0x10;str[j++] = 0x2f;str[j++] = 0x00;
str[j++] = 0x18;str[j++] = 0x43;str[j++] = 0xC0;str[j++] = 0x0F;str[j++] = 0xC0;str[j++] = 0xE0;
str[j++] = 0x07;str[j++] = 0x80;str[j++] = 0x20;str[j++] = 0x00;str[j++] = 0x00;str[j++] = 0x20;
str[j++] = 0x0D; // Print out the current graphics
SendDataToPrinter(str,i);
    
```

[Example 4] $m = 33$ (24 dots, don't enlarge), d_1, d_2 and d_3 represent the data to be printed in the first, second and third column. And d_k represents the data to be printed in the k^{th} column. The b_n represents the n^{th} bit of the byte.

	d4	d7									D	d49
d1	0	0	0	0	0	0	0	0	0	0	0	b7
	0	0	0	0	0	0	0	0	0	0	0	b6
	0	0	0	0	0	0	0	0	0	0	0	b5
	1	1	1	1	1	1	1	1	1	0	0	b4
	0	1	1	0	0	0	0	0	1	1	0	b3
	0	1	1	0	0	0	0	0	0	1	1	b2
	0	1	1	0	0	0	0	0	0	1	1	b1
d2	0	1	1	0	0	0	0	0	1	1	0	b7
	0	1	1	0	0	0	0	0	1	1	0	b6
	0	1	1	1	1	1	1	1	0	0	0	b5
	0	1	1	0	0	1	1	0	0	0	0	b4
	0	1	1	0	0	0	1	1	0	0	0	b3
	0	1	1	0	0	0	1	1	0	0	0	b2
	0	1	1	0	0	0	0	1	1	0	0	b1
d3	0	1	1	0	0	0	0	0	1	1	0	b7
	0	1	1	0	0	0	0	0	1	1	0	b6
	1	1	1	1	0	0	0	0	0	1	1	b5
	0	0	0	0	0	0	0	0	0	0	0	b4
	0	0	0	0	0	0	0	0	0	0	0	b3
	0	0	0	0	0	0	0	0	0	0	0	b2
	0	0	0	0	0	0	0	0	0	0	0	b1
	0	0	0	0	0	0	0	0	0	0	0	b0



Program code is as follows:

```
unsigned char str[200];
j=0;
str[j++] = 0x1B;
str[j++] = 0x2A;
str[j++] = 32; //m=33 (height is 24 dots, don't enlarge)
str[j++] = 12; // graphic width is 12dots
str[j++] = 0;
// bit image data
str[j++] = 0x10;str[j++] = 0x00;str[j++] = 0x20;str[j++] = 0x1F;str[j++] = 0xFF;str[j++] = 0xE0;
str[j++] = 0x1F;str[j++] = 0xFF;str[j++] = 0xE0;str[j++] = 0x10;str[j++] = 0x20;str[j++] = 0x20;
str[j++] = 0x10;str[j++] = 0x20;str[j++] = 0x00;str[j++] = 0x10;str[j++] = 0x30;str[j++] = 0x00;
str[j++] = 0x10;str[j++] = 0x3C;str[j++] = 0x00;str[j++] = 0x10;str[j++] = 0x2f;str[j++] = 0x00;
str[j++] = 0x18;str[j++] = 0x43;str[j++] = 0xC0;str[j++] = 0x0F;str[j++] = 0xC0;str[j++] = 0xE0;
str[j++] = 0x07;str[j++] = 0x80;str[j++] = 0x20;str[j++] = 0x00;str[j++] = 0x00;str[j++] = 0x20;
str[j++] = 0x0D;// Print out the current graphics
SendDataToPrinter(str,j);
```

GS h n

[Name] Select bar code height

[Type] ASCII: GS h n

Decimal: 29 104 n

Hex: 1D 68 n

[Scope] $1 \leq n \leq 255$

[Explanation] Select bar code height. And N is the number of dots on the vertical direction.

[Default] n=48

[Example] unsigned char str[4];

```
str[0] = 0x1D;
```

```
str[1] = 0x68;
```

```
str[2] = 30;
```

```
SendDataToPrinter(str,3);//Set the bar code height to 30 vertical dot pitch
```

GS w n

[Name] Select bar code width

[Type] ASCII: GS w n

Decimal: 29 119 n

Hex: 1D 77 n

[Scope] $1 \leq n \leq 4$

[Explanation] Set the horizontal width of the bar code.

And n specifies the bar code width as follows:

n	Module width for multi-level bar code (mm)	Binary-level bar code	
		Thin element width (mm)	Thick element width (mm)
1	0.125	0.125	0.25
2	0.25	0.25	0.50
3	0.375	0.375	0.75
4	0.50	0.50	1.0

[Example] unsigned char str[4];

str[0] = 0x1D;

str[1] = 0x77;

str[2] = 3;

SendDataToPrinter(str,3);//Set the bar code width

GS H n

[Name] Select the printing position for bar code character

[Type] ASCII: GS H n

Decimal: 29 72 n

Hex: 1D 48 n

[Scope] $0 \leq n \leq 2$

[Explanation] Selects a font for the HRI characters used when printing a bar code.

Use n to specify the printing position of HRI:

n	printing position
---	-------------------

0	Do not print
1	Above the bar code
2	Below the bar code

[Default] $n=0$

[Example] unsigned char str[4];

```
str[0] = 0x1D;
```

```
str[1] = 0x48;
```

```
str[2] = 2;
```

```
SendDataToPrinter(str,3);// The HRI is printed below the bar code
```

GS Q n

[Name] Set the printing position of the bar code on the horizontal direction

[Type] ASCII: GS Q n

Decimal: 29 81 n

Hex: 1D 51 n

[Scope] $0 \leq n \leq 255$

[Explanation] Set the distance from the beginning of one line to the position of printing bar code to N horizontal dot pitch.

[Default] $n=0$

[Example] unsigned char str[4];

```
str[0] = 0x1D;
```

```
str[1] = 0x51;
```

```
str[2] = 32;
```

```
SendDataToPrinter(str,3);//
```

GS k

[Name] Print bar code

[Type] ASCII: ① GS k m d1...dk NUL ② GS k m n d1... dn

Decimal: 29 107 m d1...dk 0 29 107 m n d1... dn

Hex: 1D 6B m d1...dk 00 1D 6B m n d1... dn

[Scope] ① $0 \leq m \leq 6$ ② $65 \leq m \leq 73$

The range of k and d are determined by the type of bar code used.

The range of n and d are determined by the type of bar code used.

The n is the data length of the bar code to be printed.

[Explanation] Select a bar code system and print the bar code.

Use m to select a bar code system as follows:

m		Bar code system	length	scope
Format 1	0	UPC-A	11 k 12	48 d 57
	1	UPC-E	K	48 d 57
	2	JAN13 (EAN13)	12 k 13	48 d 57
	3	JAN 8 (EAN8)	7 k 8	48 d 57
	4	CODE39	1 k	48 d 57, 65 d 90, 32, 36, 37, 43, 45, 46, 47
	5	ITF	1 k (even number)	48 d 57
	6	CODABAR	1 k	48 d 57, 65 d 68, 36, 43, 45, 46, 47, 58
Format 2	65	UPC-A	11 n 12	48 d 57
	66	UPC-E	n=8	48 d 57
	67	JAN13 (EAN13)	12 n 13	48 d 57
	68	JAN 8 (EAN8)	7 n 8	48 d 57
	69	CODE39	1 n 255	48 d 57, 65 d 90, 32, 36, 37, 43, 45, 46, 47
	70	ITF	1 n 255 (even number)	48 d 57
	71	CODABAR	1 n 255	48 d 57, 65 d 68, 36, 43, 45, 46, 47, 58
	72	CODE93	1 n 255	0 d 127
	73	CODE128	2 n 255	0 d 127

[Note]

- When using the format 1 command, if the bar code type specifies the data length of the bar code, k (the barcode data length received by the printer) should be equal to the specified data length, and if not equal to the specified data length, the instruction is invalid . See the related barcode data bit length [Appendix B].

- The barcode data received by the printer should be included in the character set specified by the bar code, if some characters of the bar code data characters are outside the character set, the command is invalid. See the related barcode character set [Appendix B].
- When using the format 2 command, the value of n should be equal to the specified data length (if the kind of bar code specifies the data bit length). And if the value of n is not equal to the specified data bit length, the command is invalid. See the related barcode data bit length [Appendix B].
- The number of ITF code data length must be even numbers. If using the format 1 to print ITF bar code, the value of k should be even numbers, but if it is odd number, the last one bit data will be ignored. If using the format 2 to print ITF bar code, the value of n should be even numbers, but if it is odd number, the last one bit data will be ignored.
- If the bar code on the horizontal direction exceeds the printable area, it is invalid.
- The command is not affected by the print modes (Eg: emphasized, double-strike print, underline, character size, or white/black reverse printing, etc.)
- Printing barcode need obey the barcode specifications, or will cause that the bar code cannot be scanned.
- The printer does not calculate the checksum, but if barcode needs the checksum, the checksum should be included in the bar code data, and the printer is not responsible for checking whether the checksum is wrong or right. The user calculates the checksum, and if it is wrong, it will cause that the bar code cannot be scanned.

- CODE39 code does not include the extended CODE39 code (EXTERN CODE 93).
- CODE93 code does not include the extended CODE93 code (EXTERN CODE 93).
- When using the CODE128, must first select the character set (CODE A, CODE B or CODE C) before the barcode data. Select the character set through sending the character "{" and another character; the ASCII code characters "{" is defined by sending "{" twice consecutively.

ASCII	HEX	Function
{A	7B, 41	Select the code set A
{B	7B, 42	Select the code set B
{C	7B, 43	Select the code set C
{S	7B, 53	SHIFT
{1	7B, 31	FNC1
{2	7B, 32	FNC2
{3	7B, 33	FNC3
{4	7B, 34	FNC4

ESC ‘

[Name] Print curve

[Type] ASCII: ESC ‘ nL nH x1L x1H x21L x21H xkL xkH CR

Decimal: 29 39 nL nH x1L x1H x21L x21H xkL xkH 13

Hex: 1B 27 nL nH x1L x1H x21L x21H xkL xkH 0D

[Scope] $0 \leq nL \leq 255$

$0 \leq nHL \leq 1$

N is the number of the curve's dots and $N = nH \times 256 + nL$

The position of the curve's dots in one horizontal line: $X = xkH \times 256 + xkL$

[Explanation] Each curve consists of many dots. The command indicates that the printer prints n dots in one horizontal line, and continuously using the command can print out the

curve which the user needs.

[Note] This command is only applicable to impact dot matrix printer and some thermal models.

[Example]

Print curve graphic of below five equations:

$$Y1=50+40*\text{abs}(-0.01*X)*\sin(X/10)$$

$$Y2=50-40*\text{abs}(-0.01*X)*\sin(X/10)$$

$$Y3=50$$

$$Y4=50+40*\text{abs}(-0.1*X)$$

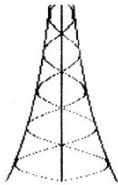
$$Y5=50-40*\text{abs}(-0.01*X)$$

C program is as follows:

```
unsigned char str[50];
float X;
unsigned int m_cur1,m_cur2,i;
for(X=0;X<150;X++) //print one line of 150 dots
{
    m_cur1= 40*exp(-0.01*X);
    YY= Y*sin(X/10);
    str[i++] = 0x1b;
    str[i++] = 0x27;
    str[i++] = 0x5; //打印5条曲线
    str[i++] = 0x0;
    str[i++] = 50+m_cur2;
    str[i++] = 0;
    str[i++] = 50-m_cur2;
    str[i++] = 0;
    str[i++] = 50;
    str[i++] = 0;
    str[i++] = 50+m_cur1;
    str[i++] = 0;
```



```
    str[i++] = 50-m_cur1;  
    str[i++] = 0;  
    str[i++] = 0x0D;  
    SendDataToPrinter(str,i);//  
}
```

[Print results]**ESC v**

[Name] Send the printer's status to the host

[Type] ASCII: ESCv

Decimal: 27 118

Hex: 1B 76

[Explanation] Send the printer's status to the host

[Note] It is only effective for the printer with serial interface

Bit	Function	Value	
		0	1
0	Paper detector	No paper	Have paper
1	Work status	Idle	Printing
2	Receiving buffer	No full	Full
3	printer's status	Normal	Error
4	Undefined	---	---
5	Undefined	---	---
6	Undefined	---	---
7	Undefined	---	---

[Example]

```
unsigned char str[4];  
str[0] = 0x1B;  
str[1] = 0x76;
```

```
SendDataToPrinter(str,2);//Send status query command to the print
```

FS &

[Name] Select the Kanji mode

[Type] ASCII: FS &

Decimal: 28 38

Hex: 1C 26

[Explanation] The printer enters Kanji printing mode

[Note] After powering on the printer, the printer defaults the Kanji printing mode

[Example]

```
unsigned char str[4];  
str[0] = 0x1C;  
str[1] = 0x26;  
  
SendDataToPrinter(str,2);// Enter Kanji printing mode
```

FS.

[Name] Cancel the Kanji mode

[Type] ASCII: FS .

Decimal: 28 46

Hex: 1C 2E

[Explanation] Cancel the Kanji characters mode

[Example] unsigned char str[4];

```
str[0] = 0x1C;  
str[1] = 0x2E;  
SendDataToPrinter(str,2);//Enter ASCII characters printing mode
```

ESC 6

[Name] To select Character Set 1 (6X8)

[Type] ASCII: ESC6

Decimal: 27 54

Hex: 1B 36

[Explanation] After inputting the command, all of printing characters use the characters in the character set 1 (see appendix D). The character set 1 has 224 '6 x 8 dot matrix' characters, including ASCII characters and all kinds of graphic marks, etc. The range of code is 20H~FFH(32~255).

[Example] unsigned char str[4];

```
str[0] = 0x1B;
```

```
str[1] = 0x36;
```

```
SendDataToPrinter(str,2);//Print '6X8' characters in the Character Set 1
```

ESC 7

[Name] To select Character Set 2 (6X8)

[Type] ASCII: ESC 7

Decimal: 27 55

Hex: 1B 37

[Explanation] After inputting the command, all of printing characters use the characters in the character set 2 (see appendix D). The character set 2 has 224 '6 x 8 dot matrix' characters, including German, French, Russian, Japanese Katakana, etc. The range of code is 20H~FFH(32~255).

[Example] unsigned char str[4];

```
str[0] = 0x1B;
```

```
str[1] = 0x37;
```

```
SendDataToPrinter(str,2);// Print '6X8' characters in the Character Set 2
```

ESC !

[Name] To set printing mode(s)

[Type] ASCII: ESC ! *n*

Decimal: 27 33 *n*

Hex: 1B 21 *n*

[Scope] $0 \leq n \leq 255$

[Explanation] Set the printing mode(s) according to the value of *n*

bit	0/1	Decimal	Hex	function
0	0	0	00	Standard ASCII code fonts (12×24)
	1	1	01	Compressed ASCII code fonts (9×17)
1,2	---	---	---	Undefined
3	0	0	00	Cancel the emphasized mode
	1	8	08	Select the emphasized mode
4	0	0	00	Cancel the double-height mode
	1	16	10	Select the double-height mode
5	0	0	0	Cancel the double-width mode
	1	32	20	Select the double-width mode
6	---	---	---	Undefined
7	0	0	00	Cancel the underline mode
	1	128	80	Select the underline mode

[Note] • When double-width and double-height modes are selected, the characters will be horizontally and vertically enlarged two times.

- In addition to the spaces set by the command 'HT' and characters of 90° clockwise rotation, the rest can be added underline.
- underline determined by the 'ESC -', and has nothing to do with the character.
- When some characters in a row is double-width or double-height, all the characters are aligned with the bottom.
- The 'ESC E' can also select or cancel the emphasized mode, and the command executed at last is effective.
- The 'ESC -' can also select or cancel the underline mode, and the command executed at last is effective.
- The 'GS!' can also set the character size, and the command executed at last is effective.
- The emphasized mode are valid for English and Chinese characters. In addition to the emphasized mode, all printing modes are only valid for the English and figure characters.

[Default] $n = 0$.

[Reference] ESC -, ESC E, GS !52

GS / m

[Name]Print downloaded bit image

[Type] ASCII: GS / m

Decimal: 29 47 m

Hex: 1D 2F m

[Scope] $0 \leq m \leq 3$, $48 \leq m \leq 51$

[Explanation] Print a downloaded bit image using the mode specified by m.

M selects a mode from the table below:

m	mode	Vertical dot density	Horizontal dot density
0,48	normal	200	200
1,49	Double-width	200	100
2,50	Double-height	100	200
3,51	Double-width, Double-height	100	100

[Detail]

- If downloaded bit image is not defined, the command is ignored.
- The command is valid only when there is no data in the print buffer.
- The command has no effect in the print mode (Eg: emphasized, double-strike print, underline, character size, white/black reverse printing, etc.), except for upside-down printing mode.
- If the downloaded bit-image to be printed exceeds the current print area, the excess data is not printed.
- The command prints a bit-image which is downloaded to the RAM and not downloaded to FLASH, the corresponding figure number is the figure number set by the GS * command

GS * x y d1...d(x × y × 8)

[Name] Define downloaded bit image

[Type] ASCII: GS * x y d1...d(x × y × 8)

Decimal: 29 42 x y d1...d(x × y × 8)

Hex: 1D 2A x y d1...d(x × y × 8)

[Scope] $1 \leq x \leq 255$, $1 \leq y \leq 48$

$x \times y \leq 912$

$0 \leq d \leq 255$

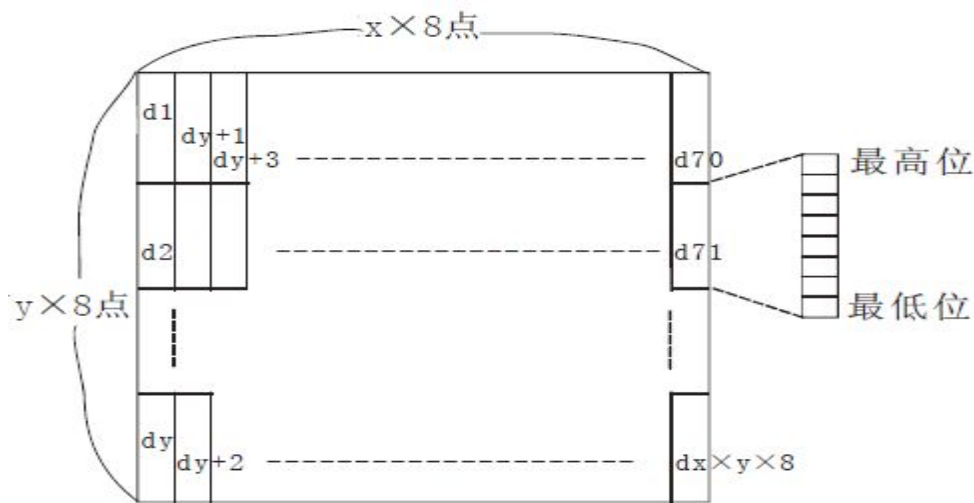
[Explanation] Define a downloaded bit image, and the number of dots specified by x and y.

X specifies the number of dots in the horizontal direction.

Y specifies the number of dots in the vertical direction.

[Detail]

- The number of dots in the horizontal direction is $x \times 8$, and the number of dots in the vertical direction is $y \times 8$.
- If $x \times y$ is out of the specified range, this command is disabled
- The d indicates bit-image data. Data (d) specifies a bit printed as 1 and not printed as 0.
- The downloaded bit image definition is cleared when:
 - A. ESC @ is executed.
 - B. ESC & is executed.
 - C. FS q is executed.
 - D. printer is reset or the power is turned off
- The following figure shows the relationship between the downloaded bit image and the printed data.



[Reference] GS /

FS q n [xL xH yL yH d1...dk]1...[xL xH yL yH d1...dk]n

[Name] Define NV bit image

[Type] ASCII: FS q n [xL xH yL yH d1...dk]... [xL xH yL yH d1...dk]

Decimal: 28 113 n [xL xH yL yH d1...dk]... [xL xH yL yH d1...dk]

Hex: 1C 71 n [xL xH yL yH d1...dk]... [xL xH yL yH d1...dk]

[Scope] $1 \leq n \leq 255$

$0 \leq xL \leq 255$

$1 \leq (xL + xH \times 256) \leq 1023$

$1 \leq (yL + yH \times 256) \leq 288$

$0 \leq d \leq 255$

$k = (xL + xH \times 256) \times (yL + yH \times 256) \times 8$

The maximum capacity for the Flash Download is 8096 bytes.

[Explanation] Define NV bit image specified by n

- n Specifies the number of Flash bit image to be defined .
- xL, xH specify $(xL + xH \times 256) \times 8$ dots in the horizontal direction for the NV bit image you are defining.
- yL, yH specify $(yL + yH \times 256) \times 8$ dots in the vertical direction for the NV bit image

you are defining.

[Comment]

- Frequently executing the command can damage the Flash memory . It is recommended to write the NV memory 10 times or less each day.
- This command deletes all NV bit images previously defined by this command , and the printer cannot redefine anyone of multiple bit images defined at the last time, in this case, you must re-send all the data.
- Since the printer is busy during the processing of this command , it writes the data in the Flash and stops receiving other commands. Therefore, during the processing of this command, prohibit sending other commands to the printer, including real-time command.
- Flash bitmap is defined by the 'FS q' to store in the Flash memory and use the command FS p to print bit image.
- In standard mode, this command is valid only at the beginning of the line.
- The command is effective when 7 bytes <FS-yH> of the command are processed normally.
- When the amount of data exceeds the capacity left in the range defined by xL, xH, yL, yH, the printer processes xL, xH, yL, yH out of the defined range.
- In the first group of NV bit images, when any of the parameters xL, xH, yL, yH is out of the defined range, the command is invalid.
- In groups of NV bit images other than the first one, when the printer encounters xL, xH,

yL, yH out of the defined scope, it stops executing this command and starts writing into the NV images. At this time, NV bit images that have not been defined are disabled (undefined), but any NV bit images before that are enabled.

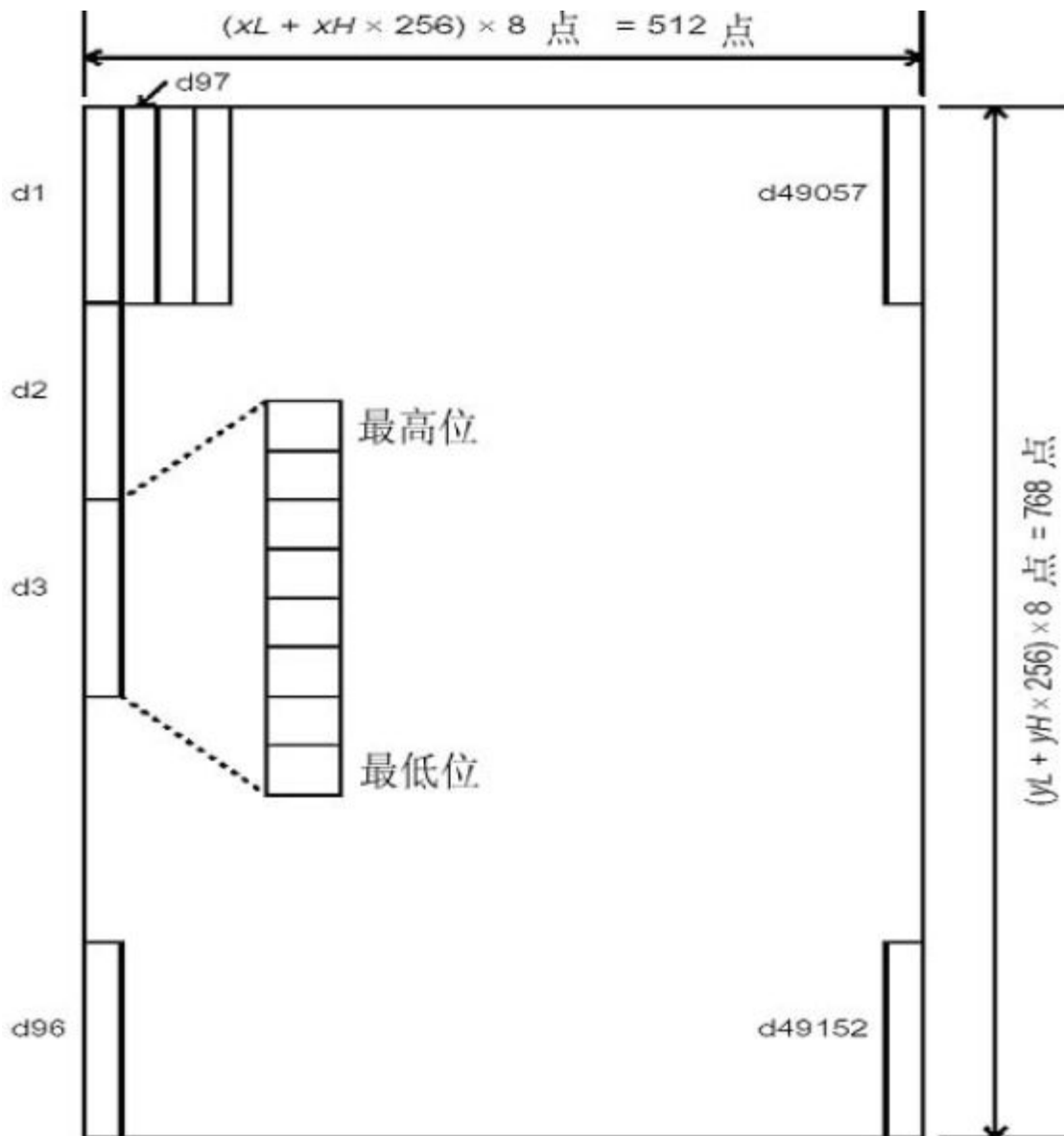
- d is the defined bit image data. In data (d) a 1 bit specifies a dot to be printed and a 0 bit specifies a dot not to be printed.
- This command defines n as the number of a NV bit image. Numbers rise in order from NV bit image 01H. Therefore, the first data group [xL xH yL yH d1 ... dk] is NV bit image 01H, and the last data group [xL xH yL yH d1 .. . dk] is NV bit image n. The total agrees with the number of NV bit images specified by the command FS p.
- The data to define a NV bit image consists of [xL xH yL yH d1 ... dk]. Therefore, when only a NV bit image is defined n = 1, the printer processes a data group [xL xH yL yH d1 ... dk] once. The printer uses ([data: (xL + xH × 256) × (yL + yH × 256) × 8] + [header : 4]) bytes of NV memory.
- The maximum amount of the flash download space in the printer is 64K bits (8K bytes), and this command can define multiple NV bit images, but you cannot define a bit image, whose size is more than 64K bits (different printers have different download space, and please refer to printer's configuration information).
- Before you write Flash, the printer is immediately busy.
- In the processing of the command, the printer does not transmit the status and doesn't execute status query.
- When this command is received during macro definition, the printer ends macro

definition , and begins executing the command .

- Once an NV bit image is defined , it is not erased by performing ESC @, reset and turn off the power.
- This command only defines NV bit image, and does not perform printing. Printing of NV bit image is performed by FS p command.

[Reference] FS p__

[Example] When $xL = 64$, $xH = 0$, $yL = 96$, $yH = 0$



FS p n m

[Name]Print NV bit image

[Type] ASCII: FS p n m

Decimal: 28 112 n m

Hex: 1C 70 n m

[Scope] $1 \leq n \leq 255$ $0 \leq m \leq 3$, $48 \leq m \leq 51$

[Explanation] Print NV bit image n using the mode specified by m.

m	mode	Vertical dot density	Horizontal dot density
0,48	normal	200	200
1,49	Double-width	200	100
2,50	Double-height	100	200
3,51	Double-width, Double-height	100	100

N is the number of the NV bit image (defined using the FS q command).

M specifies the bit image mode.

[Detail]

- NV bit image is a bit image defined in non-volatile memory by the FS q command and printed by FS p.
- When NV bit image is not defined, the command is invalid.
- The command is valid only when there is no data in the print buffer.
- The command is not affected by print mode (Eg: emphasized, double-strike print,

double-width, double-height, underline, character size, white/black reverse printing, or 90 degrees rotated (clockwise, etc.), except upside-down printing mode.

- If the downloaded bit-image to be printed exceeds the current print area, the excess data is not printed.
- In normal and double-width mode, the command feed n dots, and n is NV bit-image height. In the double-height and four times size mode, this command feed $n \times 2$ dots, and n is NV bit-image height, and it has nothing to do with the line spacing set by ESC 2 or ESC 3.
- After printing the bit-image, the printer feeds line and handles the next data according to the normal mode.

FS U nL nH

[Name] Send data to print according to the Unicode code

[Type] ASCII: FS U nL nH

Decimal: 28 85 nL nH

Hex: 1C 55 nL nH

[Scope] $1 \leq n \leq 255$ $0 \leq m \leq 3$, $48 \leq m \leq 51$

[Explanation] Print n Unicode characters. ($n=nL+nH*256$)

[Comment]

- Unicode is the double-byte code, and after this command $2 * n$ ($n = nL + nH * 256$) is treated as Unicode byte character to handle.
- The way to send the internal code is that high eight bits are in front and the low eight bits behind.

[Example]

```
char str[64];  
str[0]=0x1C; str[1]=0x55; str[2]=11; str[3]=0;  
str[4]=0x00;str[5]= 0x55; //'U'
```

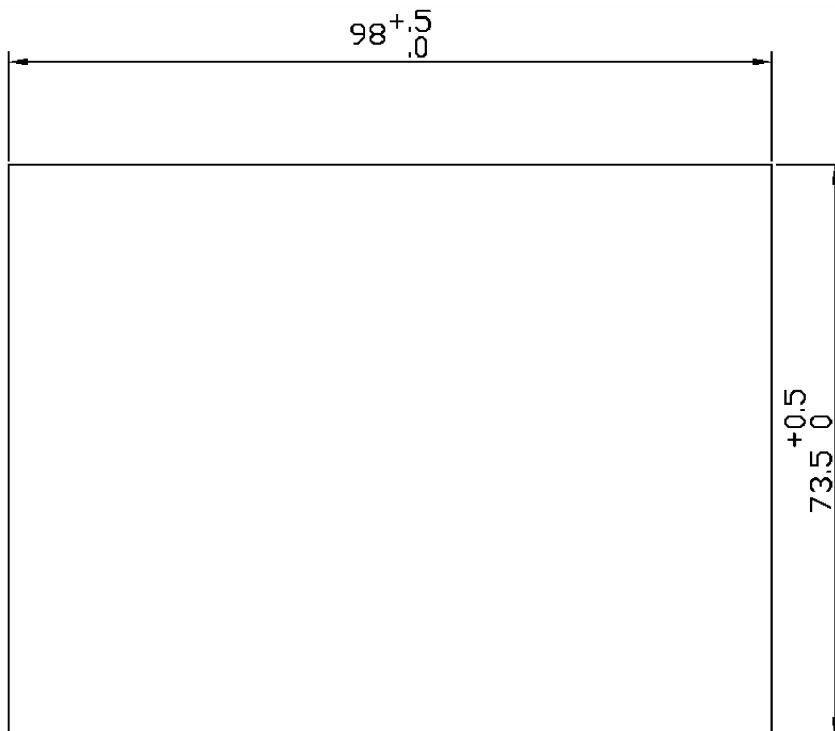
[HTTP://WWW.RD-CN.COM](http://www.rd-cn.com)

```
str[6]= 0x00;str[7]= 0x4E; //'N'  
str[8]= 0x00;str[9]= 0x49; //'I'  
str[10]= 0x00;str[11]= 0x43; //'C'  
str[12]= 0x00;str[13]= 0x4F; //'O'  
str[14]= 0x00;str[15]= 0x44; //'D'  
str[16]= 0x00;str[17]= 0x45; //'E'  
str[18]= 0x62;str[19]= 0x53; //'打'  
str[20]= 0x53;str[21]= 0x70; //'印'  
str[22]= 0x6D;str[23]= 0x4B; //'测'  
str[24]= 0x8B;str[25]= 0xD5; //'试'  
SendDataToPrinter (str,26);
```

Chapter 4: Installation

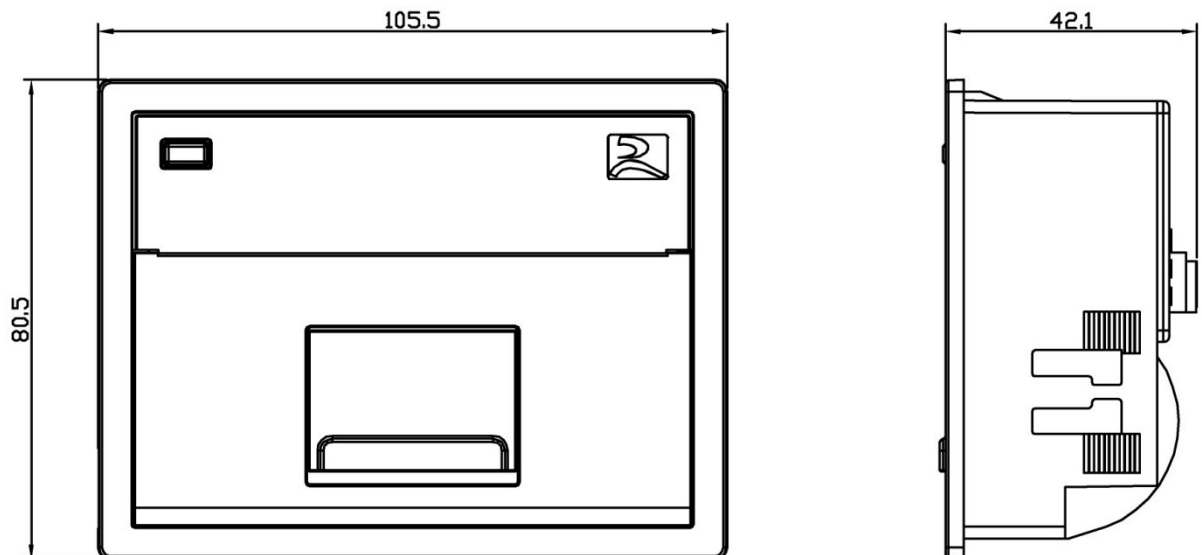
4.1 Installation dimension (Unit: mm)

Installation size: 98.0mm*73.5mm (W * H)



4.2 Installation methods

External dimension: 105.5mm*80.5mm*42.1mm (W * H * D)



Chapter5: Maintenance and Troubleshooting

To ensure the printer to work normally, particularly note that we don't optionally remove the print head and do not make changes to the printer through ourselves. For users not using the printer shell, more particularly note protecting the printing head.

1. If the printer is not used for a long time, we do not turn on the printer power.
2. If the printer is not working properly, please turn off the printer's power.
3. Power supply must meet the requirements, or it is unfavorable for the printing head, and even damages the printing head.
4. When replacing the paper roll, please note whether there are the paper scraps and dust on the printing head. If having paper scraps and dust, please gently remove. Note the thermal paper's obverse and reverse side, and if the reverse side is uncoated, the printer can't print out the handwriting.
5. When the printer is printing or paper feeding, we can't tear the paper, and can't more reversely drag the paper
6. Keep the printer control panel clean
7. When thermal printer prints unclearly, we can use the clean cotton ball soaked some alcohol to gently wipe the surface dirt on the print head chip heating element.
8. When we connect the printer to the host, we should connect the printer data cable, and then power on the printer.
9. To choose a good quality paper when we select the paper for the thermal printer can not only improve the printing quality, but also reduce the abrasion for thermal film.

APPENDIX

A : printing character set

A.1 ASCII character set

	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	{		}	~	Δ
8	Ç	ü	é	â	ä	à	å	ç	ê	ë	è	ï	î	ì	Ä	Å
9	É	æ	Æ	ô	ö	ò	û	ù	ÿ	ö	ü	ç	£	¥	℞	f
A	á	í	ó	ú	ñ	Ñ	ª	º	¿	Γ	γ	½	¼	¡	«	»
B	▤	▥	▦		┆	┆	▨	▩	┆	▭	▮	▯	▰	▱	▲	△
C	L	⊥	⊤	┆	-	┆	▨	▩	┆	▭	▮	▯	▰	▱	▲	△
D	▭	▮	▯	▰	▱	▲	△	▴	▵	▶	▷	▸	▹	►	▻	▼
E	α	β	Γ	π	Σ	σ	μ	γ	δ	θ	Ω	δ	ω	φ	€	Π
F	≡	±	≥	≤	∫	∫	÷	≈	°	.	.	√	n	2	■	

A.2 character set 1

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
3	Ø	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	-	=	≡	□	∩	∪	∩	∪	∩	∪	∩	∪	∩	∪	∩
9	£	§	↓	→	^	±	÷	∞	≈	...	0	0	2	3	2	3
A	α	β	γ	δ	ε	ζ	η	θ	ι	κ	λ	μ	ν	ξ	π	ρ
B	τ	φ	ψ	ω	Γ	Δ	Π	Σ	Ψ	Ω	Ξ	Θ	∂	∅	∫	∠
C	□	▭	□	▭	▬	▬			/	\	Γ	L	J	7	X	X
D	□	▭	□	▭	▬	▬			/	\	Γ	L	J	7	-	
E	┘	└	┌	┐	├	┤	┴	┬	┴	┬	┴	┬	┴	┬	┴	┬
F	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

A.3 character set 2



	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	百	千	万	Ⅱ	℃	¥	+	4	4	½	¼	¼	°	×	√	⊥
3	#		U	∩	⊕	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
4	∩	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡	≡
5	※	※	()	※	※	∩	∩	∩	∩	∩	∩	∩	∩	∩	∩
6	♣	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	サ	シ	ス	セ	ソ
7	夕	チ	ツ	テ	ト	ナ	ニ	ヌ	ネ	ノ	ハ	ヒ	フ	ヘ	ホ	マ
8	※	△	×	モ	ヤ	ユ	ヨ	ラ	リ	ル	レ	ロ	ワ	ヰ	ヱ	ヲ
9	ン	ア	ウ	エ	オ	カ	キ	ク	ケ	コ	サ	シ	ス	セ	ソ	タ
A	И	Й	Л	И	У	Ш	Щ	Ъ	Ы	Э	Ю	Я	Б	В	Г	Д
B	Ф	Ц	Ü	É	Æ	Ä	À	Á	Â	Ë	Ë	È	Ï	Î	Ì	Ï
C	À	É	Æ	Æ	Ô	Ö	Ò	Ù	ÿ	Ö	Ü	Ф	Р	ф	á	
D	í	ó	ú	ñ	Ñ	æ	ó	ú	ÿ	ö	ü	Ф	Р	ф	á	á
E	è	ë	è	ï	î	ì	Ä	Å	É	Æ	Æ	Ö	Ö	Ò	Ù	Ù
F	ÿ	ö	ü	Ф	Р	ф	á	á	ó	ú	ÿ	ö	ü	Ф	Р	ф

B: bar code

B.1 bar code coding rules

1. UPC-A: UPC-A coding should comply with the UCC Organization (<http://www.uccnet.org>) specification.
2. UPC-E: UPC-E coding should comply with the UCC Organization (<http://www.uccnet.org>) specification.
3. ENA8: ENA8 coding should comply with the ENA Organization (<http://www.uccnet.org>) specification.
4. ENA13: ENA13 coding should comply with the ENA Organization (<http://www.uccnet.org>) specification
5. CODE39: Also known as 39 codes, CODE39's starting bit and stopping bit characters must be the '*' character, and it cannot contain the characters '*' between the starting and stopping bits. And the printer's '*' is automatically given by the printer, and when programming the data need not be given, and the data can contain or cannot contain check code, and the check code have fixed algorithm.
6. ITF: Also known as INTERLEAVED 25, intersect 25 code, INTERLEAVED 2 of 5. The length for the data bit must be even number, and the data can contain or cannot contain check code, and the check code have fixed algorithm.
7. CODABAR: The starting bit and stopping bit must be anyone of A、B、C and D, and The starting bit character and stopping bit character can be different. The data can contain or cannot contain check code. The check code can be defined by the code man.
8. CODE93: CODE93's starting bit and stopping bit characters must be the '*' character, and it [HTTP://WWW.RD-CN.COM](http://www.rd-cn.com)

cannot contain the characters '*' between the starting and stopping bits. And the printer's '*' is automatically given by the printer, and when programming the data need not be given, and the CODE93 data must contain two characters' check code, and the check code have fixed algorithm.

B.2 barcode length character set

Barcode Type	Length	character set (ASCII)
UPC-A	12	0~9
UPC-E	8	0~9
EAN8	8	0~9
EAN13	13	0~9
CODE39	27	0~9 A~Z - . SP \$ / + % *
INTERLEAVED 25	even number 52	0~9
CODABAR	32	0~9 - : / % . A~D
CODE93	Unlimited	0~9 A~Z - . SP \$ / + % *
CODE128	33	