

RD-DH32

Embedded thermal printers specification of Development



**Copyright: Beijing Rongda innovation
Technology Limited**

目录

Chapter 1: Overview.....	5
1.1 Power connector	5
1.2 Performance indicators	5
1.3 operating.....	6
1.3.1 key	6
1.3.2 self-test	6
1.3.3 loading paper	7
1.3.4 Paper feed	7
1.3.5 Indicator light	7
2.1 serial interface	8
2.1.1 Define of Interface	8
2.1.2 Baud rate select bit	8
2.1.3 handshake method select bit	9
2.1.4 Checking select bit	9
2.1.5 Data transmission method of serial interface	9
2.2 Parallel interface.....	10
2.2.1 data interface	11
2.2.2 Parallel interface data transmission method	12
Chapter 3: Command system	13
3.1 Command list.....	13
3.2 Command Details.....	15
3.2.1 Chinese characters printing command	15
3.2.2 paper feed command	16
3.2.3 Formatting command	17
3.2.4 Character setting command	20
3.2.5 the user-defined characters command	27
3.2.6 the graphic print command	28
3.2.7 Initialization Commands	32



Chapter 4: Installation	33
4.1 Installation dimension (Unit: mm)	33
4.2 Installation methods	33
Chapter5: Maintenance and Troubleshooting	34
APPENDIX.....	35
A : printing character set.....	35
A.1 ASCII character set	35
A.2 character set 1	36
A.3 character set 2	37



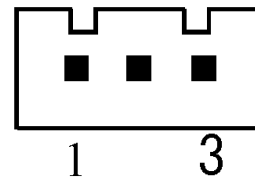
Chapter 1: Overview

The printing paper width of RD-DH32 THERMAL PRINTER is 57mm. Completely closed design and easy paper loading structure. Unique patent of the lock control device, which can effectively prevent paper storehouse door open by mistake and protect the printer work safely and reliably.

1.1 Power connector

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

pin	name	description
1	VCC	VCC5V
2	--	NC
3	GND	GND



Matters need attention: The users can choose to use DC12V~36V to supply electricity according to their own requirements. When using 12V to 36V power supply model, power supply socket 'PIN NO.1' will be NONE, the 'PIN NO.2' is VCC and 'PIN NO.3' is GND.

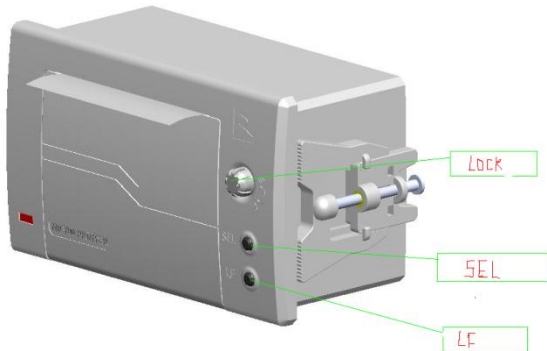
1.2 Performance indicators

printing method	thermal line printing
Printing speed	50mm/s (MAX)
Resolution ration	203dpi(8dots per millimeter), 384dots per line
Effective print width	48mm
Paper feed step	0.125mm
Foreign language characters	1.Support standard ASCII characters (96): 5×7, 2.Support extended ASCII characters (352): 6×8, 3. Support the User-defined character: 6×8.
Chinese characters	Equip with GB2312 of 24×24 dot array (user option:16×16 dot array or 12×12dot array)
lack of paper detection	Yes
Out Interface	1.standard parallel interface (P) : 26 wire double row needle 2.Standard serial interface (S) : 10 wire double row needle (RS232 or TTL) or 5PIN white base (RS232&TTL) 3.485interface (S5) : 10 wire double row needle (RS232

	or TTL) or 5PIN white base (RS232&TTL)
buffer	32k
instruction system	print command: ESC/P (Compatible with IBM/EPSON and ESC/P)
Print drivers	WIN2000/NT/XP、parallel interface \serial interfacedrive
operating voltage	DC8.5V±5%, 4A
working current	greater than 3A (power consumption can be adjusted according to customer requirements.)
print head life	50km
Paper type	Ordinary thermal Paper (width: 58±0.5mm, $\phi \leq 33\text{mm}$)
paper loading way	easy paper loading
Cut type	tearing paper manually
Operating temperature / humidity	0~55°C/10~80%RH (RH)
Storage temperature / humidity	-20~60°C/10~90%RH (RH)
weight(include print paper)	approximately 180g
Installation dimension (mm)	103 x 57 (W x H)
outline dimension (mm)	114x70x64 (W x H x D)

1.3operating

1.3.1key



By operating the two buttons we can realize self-test, paper feed and other operating functions.

1.3.2self-test

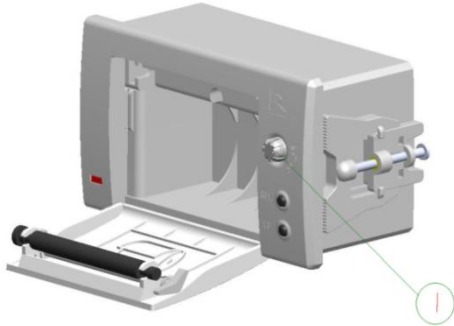
Step 1: charge the printer and load the printing paper

Step 2:click the SEL button, the green indicator light which is Located in the lower left corner goes out

Step 3:Hold down the LF key, then click SEL key (At the same time hold down the two keys), 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: turn the lock button to the position of open the lock, and Press the button to open the paper storehouse door



Step 2: Directly put the thermal roll paper into the paper store house in the proper direction.

Step 3: Place the paper to the extent that it can be exposed from the printer and close the paper storehouse cover.



Step 4: Power on the printer.

1.3.4 Paper feed

Under the printer charged state, hit the SEL key points, the green lights go out, then hold down the LF buttons, the printing paper starts feeding, and loosen the button, the printing paper stops feeding.

1.3.5Indicator light

RD-DH32 printer has an Indicator light, which is green and has two functions. When the printer lacks the paper, the indicator light will be in a state of continuous glint. When the printer buffer is full or printer is busy, the green indicator light will go out and the printer will not receive data and instructions.

Chapter 2:communication interface

2.1 serial interface

2.1.1 Define of Interface

The RD-DH32 system thermal printer uses the standard **DB-9 hole socket**, which can directly connect with the PC machine. The printer is equipped with six DIP switches at the same time and through the combination of the DIP switches, the users can set the printer communication baud rate and **flow control way** etc. (Figure 2-1 is the 5P communication interface, Figure 2-2 is the 10P communication interface and Figure 2-3 is the DIP switch figure)

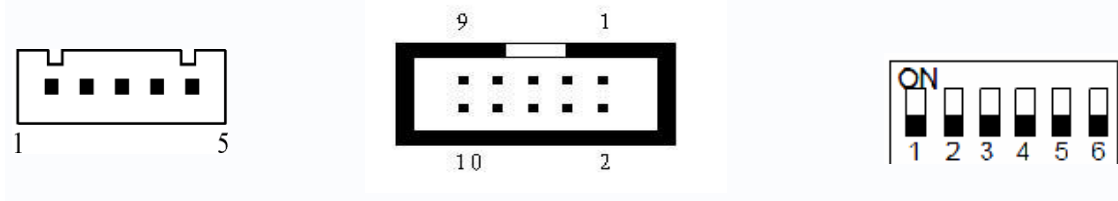


figure2-1

figure2-2

figure2-3

5 core single row socket (Pin No.)	10 core double row socket (Pin No.)	Signal name	signal source	direction	Illustration	PC machine DB-9 core (Pin No.)
3	3	TXD	mainframe	Import(in)	The printer receives the data from the main computer. (TRANSMIT DATA)	3
2	2	RXD	printer	Export(out)	When using the 'X-ON/X-OFF' Handshake Protocol, the printer sends control code 'X-ON/X-OFF' to the computer. (RECEIVE DATA)	2
—	8	CTS	printer	Export(out)	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.	8
—	6	DSR	printer	Export(out)	When the signal is in a state of 'SPACE', it means that the printer is on line	6
5	5	GND	—	—	Signal ground	5
4	4	DCD	printer	Export(out)	The same as the signal 'CTS'.	1
1	7、9	NC	—	—	no connection	4、7、9

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 RS232 level.

2.1.2 Baud rate select bit

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

SW NO.	19200	9600	4800	2400	1200	600	300	150
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

2.1.3 handshake 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'

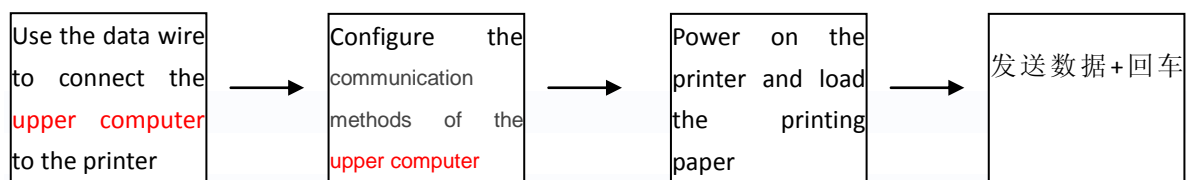
2.1.4 Checking select bit

SW	8-NONE	8-ODD	8-EVEN	7-EVEN
5	ON	ON	OFF	OFF
6	ON	OFF	ON	OFF

2.1.5 Data transmission method of serial interface

The receiving buffer of the printer is 20K

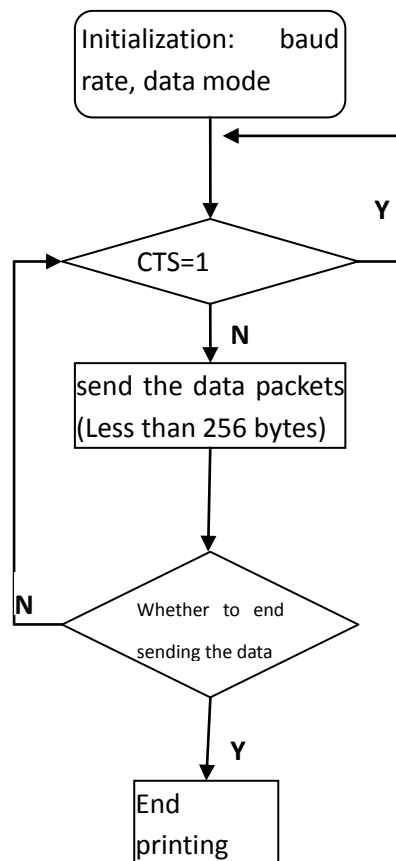
- (1) When the number of sending data once is less than 20K, the data can be directly sent. And the sending method is as follows:



- (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-DH32 system thermal parallel interface printer uses **DB-25pin socket** as the communication interface, which is compatible with PC parallel interface. Figure 2-4 is the parallel interface figure.

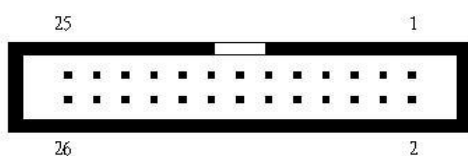


Figure 2-4

2.2.1 data interface

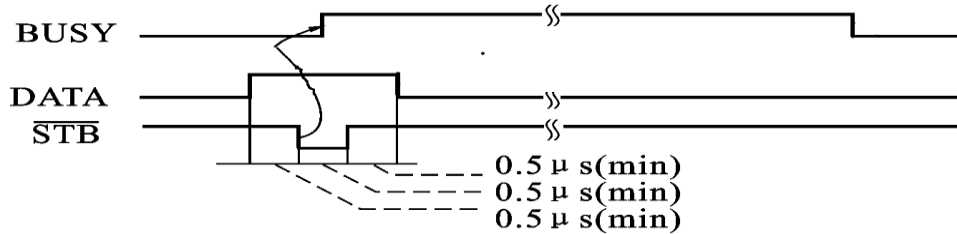
DB-25pin socket (pin NO.)	Signal name	Signal direction	Illustration	DB25 parallel interface wire on the PC (pin NO.)
1	STB/	in	数据选通触发脉冲，上升沿时读入数据	1
2	DATA1	In	8 data pins, the logic '0' indicates low, '1' indicates high	2
3	DATA2	In		3
4	DATA3	In		4
5	DATA4	In		5
6	DATA5	in		6
7	DATA6	In		7
8	DATA7	In		8
9	DATA8	In		9
10	ACK/	Out	Answer pulse, and "Low" level indicates that the data has been accepted	10
11	BUSY	Out	"High" level indicates that the printer is busy and can't receive data	11
12	PE	— —	Grounding (PERROR)	12
13	SEL	Out	经电阻上拉“高”表示打印机在线	13
15	ERR/	Out	经电阻上拉“高”电平表示无故障	15
14, 16, 17	NC	— —	no connection	14, 16, 17
18~25	GND	— —	Signal ground	18~25

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

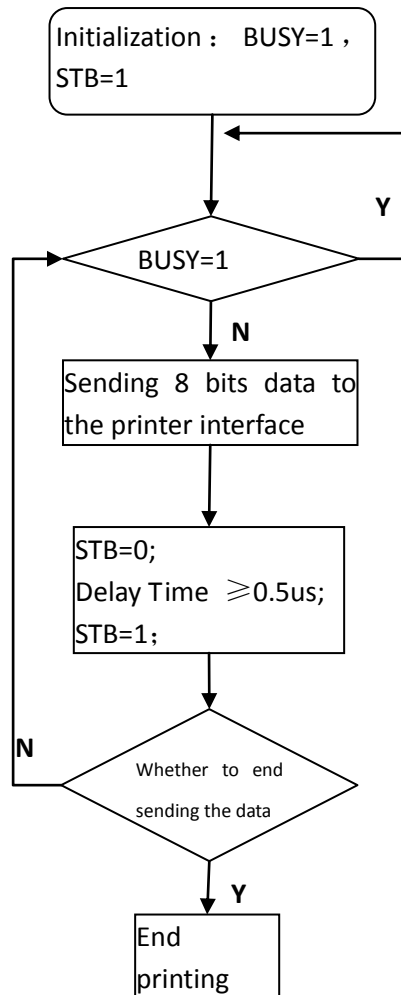


Sending step:

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-DH32 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, and word spacing adjustment.

Command	Function
NUL	end mark
HT	To execute horizontal tab
LF	To print and line feed
CR	To print and carriage return
ESC SP n	To set the character spacing
ESC %	To replace user-defined characters
ESC &	To select user-defined characters
ESC ' M	To print 'M' curve points (M means the quantity)
ESC + n	To allow/ban the overline printing
ESC - n	To allow/ban the underline printing (to set/clear the underline mode)
ESC 1 n	To set the line spacing to n-point lines
ESC 6	To select Character Set 1
ESC 7	To select Character Set 2
ESC 8 n	To select different dot matrix Chinese characters and print
ESC :	To recover the character in the character set
ESC @	To initialize the printer
ESC D	To set the position of horizontal tab

ESC E	To print the bar code
ESC J n	To execute paper feed of n-point lines
ESC K	To print the 'n1×8' lattice graphics
ESC Q n	To set the right margin width
ESC U n	Laterally magnify n times
ESC V n	Longitudinally magnify n times
ESC W n	Laterally and Longitudinally magnify n times
ESC X n1 n2	Laterally and Longitudinally magnify different times
ESC C n	To allow/ban reverse printing
ESC f M n	To Print Space or line feed
ESC i n	To allow/ban white reverse printing mode
ESC l n	To set the left margin width
ESC r 2B/2D n	To adjust the depth of thermal printing
FS 2 n	To set character rotation Printing
FS J	To Set Longitudinal printing
FS K	To Set Lateral printing
FS r n	To select the superscript and subscript
FS 8	To select '12X24' ASCII code

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 'print ()' and 'print_chs ()' function are two virtual functions. And require developers to write according to the actual situation of the mainframe.

This function is defined as follows:

```
Void print(unsigned char ch) //Single-byte transmit function
```

```
Void print_chs(unsigned char ch[]) //Multi-byte transmit function
```

3.2 Command Details

3.2.1 Chinese characters printing command

ESC 8 n

[Name] Select different dot matrix Chinese characters and print

[Type] ASCII: ESC8n
 Decimal: 27 56 n
 Hex: 1B 38 n

[Scope] $0 \leq n \leq 7$

[Explanation] After receiving the printing command, the printer will select different dot matrix Chinese characters according to the value of 'n'. In the Chinese character printing mode, Chinese characters code, which the printer receives, is the standard machine Internal Code of 2 byte corresponding to one Chinese character. When receiving 2 bytes machine internal code, the printer can bring up a Chinese character. The printer first receives the high bit byte of the machine code, and then receives the low bit byte.

the value of 'n'	Select dot matrix Chinese characters
n=0	16×16 dot matrix Chinese characters
n=1	8×16 dot matrix Chinese characters
n=2	16×8 dot matrix Chinese characters
n=3	8×8 dot matrix Chinese characters
n=4	12×12 dot matrix Chinese characters
n=5	6×12 dot matrix Chinese characters
n=6	8×16 dot matrix ASCII characters
n=7	8×16 dot matrix ASCII characters

Chinese character code is a standard Chinese character internal code, can be downloaded character code table to find characters in the code. Look up the Chinese character internal code by downloading the Chinese character internal code from the Internet.

	The range of values	corresponding characters	Calculation Method
High byte	A1H-F7H	1-87 Area	Area Code + A0H
Low byte	A1H-FEH	1-94 Chinese-bit code	Area Code + A0H

EX: The area bit code of '荣' is 4057, which means that it is the 57th words in Area 40, and its machine internal code is C8D9.

Convert 40 (decimal) into 28 (hexadecimal), 28H + A0H = C8H

Convert 57 (decimal) into 39 (hexadecimal), 28H + A0H = C8H

When the input code is 20H-A0H, it automatically selects the character set (see Appendix 1)

When the input code is more than A0H, it selects the ASCII code if the next byte is less than A1H, or it will print the Chinese character.

[Note]

- 1) In the printer of 24 dot matrix Chinese characters library **n** has no the 1 ~ 7 options, and the character is 12 * 24 dot matrix characters ASCII code. The Chinese characters command: 1B 38 or 1B 380.
- 2) The default value of **n** in the printer of 24 dot matrix Chinese characters library is 0.

[Example]

Send data to the printer as follows:

```
print(0x1b);print(0x38);print(0x00); // Call the 16 * 16 font
print(0xc8);print(0xd9);           //print the '荣' internal code
print(0x0d);                        //enter
```

The printer can print the character '荣'.

3.2.2 paper feed command

LF

[Name] line feed

[Type] ASCII:	LF
Decimal:	10
Hex:	0A

[Explanation] The printer prints the current data in the printer buffer and feed paper one line. If there is no data in the buffer, the printer only executes feeding forward paper one line. One line of the impact dot matrix printers is '8+ line spacing'. One line of the thermal printer is '16+ line spacing'.

ESC J

[Name] execute paper feed of **n-point lines**

[Type] ASCII:	ESC	J	n
Decimal:	27	74	n
Hex:	1B	4A	n

[Explanation] If the printer feeds forward paper **n-point lines**, the value of 'n' is between 1 to 255 dots. This command doesn't occur carriage return line feed and doesn't affect the line feed command behind. If you need the printer to immediately take the paper-feed rather than carriage return, you can use this command. If the data in the printer buffer is not printed, the printer first prints these data before feeding paper

ESC 1

[Name] set the line spacing to **n-point lines**

[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)

[Explanation] Set the line spacing to **n-point lines** to execute the line feed command

[Example] C program of observing the effect of this command is as follows:

```
for(i=1;i<11;i=i+2)
{
    print(0x1b);print(0x31);print(i);           //ESC 1, Set line spacing
print_chs("LINE SPACING");                    // print character string
    print(0x0a);                               // line feed
}
```

[Print results]

```
LINE SPACING
LINE SPACING
LINE SPACING
LINE SPACING
LINE SPACING
LINE SPACING
```

ESC SP

[Name] set the character spacing

[Type] ASCII: ESC SP n
 Decimal: 27 32 n
 Hex: 1B 20 n

[Scope] $0 \leq n \leq 128$ (The default value of 'n' is 0)

[Explanation] After printing one character, the printer automatically adds the amount of space on the character's right side, that is, set the amount of blank dots between the two characters.

3.2.3 Formatting command

ESC D

[Name] set the position of horizontal tab

[Type] ASCII: ESC D n1 n2 NUL
 Decimal: 27 68 n1 n2 0
 Hex: 1B 44 n1 n2 00

[Explanation] Enter the horizontal tab position n1, n2, etc., all of which should be within the line width of the model printer. The character 'NUL' added at the end, which means the end of the command. All of the setting horizontal tab positions can be removed with the ESC D NUL format of the command. The HT command can execute horizontal tab.

[Note] Horizontal tab position is defined as referring to the character position to be printed within one line. But each character is as follows:

impact dot matrix printer	24 lattice thermal printer	16 lattice thermal printer
6+ character spacing	8+ character spacing	12+ character spacing

[Example] Set three horizontal tab positions in the position of the second, ninth and fourteenth characters in one line, you can send the following commands: (C program)

```
print_chs("1234567890123456");// 'scaleplate
print(0x0d);
print(0x1b);print(0x44);print(2);print(9);print(14);print(0);//ESC D
print(9); //HT command
print_chs("HT1"); // print character string
print(9); // HT command
print_chs("HT2"); // print character string
print(9); // HT command
print_chs("HT3"); // print character string
print(0x0d);
```

[Print results]

```
HT1 HT2 HT3
1234567890123456
```

HT

[Name] execute horizontal tab

[Type] ASCII:	HT
Decimal:	9
Hex:	09

[Explanation]Set the horizontal tab if you want to use the print position. Print position to the next horizontal tab position set by the ESC D command. If you do not set the horizontal tab value or the current print position is equal to or more than the last one horizontal tab, HT command will not be executed.

ESC f

[Name]Print Space or blank line

[Type] ASCII:	ESC	f	M	n
Decimal:	27	102	M	n
Hex:	1B	66	M	n

[Explanation]

If M = 0, the 'ESC f NUL n' command will print n spaces. The width of each space is '6 +character spacing'. (Thermal Printer: '12+ character spacing'). The value of n should be within the line width of the model printer. If M = 1, the 'ESC f SOH n' command will print n blank lines. The height of each blank line in the dot matrix printer is '8+ line spacing'. The height of each blank line in the thermal printer is '16+ line spacing'. The value of n should be between 0 and 255

[Example]

(1) Print six space characters in a line, the command is as follows:

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

```
Decimal:      27  102  0   6
Hex:          1B   66  00  06
print_chs("TE");                // print character string
print(0x1b);print(0x66);print(0);print(0x06);    // Six spaces
print_chs("ST");                // print character string      print(0x0d);
                                // carriage return/enter
```

(2) Print 6 blank lines, the command is as follows:

```
ASCII:        ESC   f   SOH   ACK
Decimal:      27   102  1    6
Hex:          1B   66  01   06
print_chs("TE");                // print character string
print(0x1b);print(0x66);print(0x01);print(0x06); //6 enter
print_chs("ST");                // print character string      print(0x0d);
                                //enter
```

ESC Q

[Name] set the right margin

```
[Type] ASCII:      ESC      Q   n
          Decimal:   27      81  n
          Hex:       1B      51  n
```

[Explanation] The right margin is the number of characters, which isn't printed on the right side of the printing paper. The width of each character is '6 +character spacing'. (Thermal Printer: '12+ character spacing'). The value of **n** should be within the line width of the model printer. (Default value: n=0. When n=0, there is no the right margin)

This command sets the absolute position, and is not affected by the characters enlargement command ESCU and ESCW. After setting this command, as long as it reaches to the right margin position, the printer will automatically carriage return line feed.

[Example]

Set the right margin to 6, the command is as follows:

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

C program is as follows:

```
print_chs("1234567890123456");    // print character string
print(0x1b);print(0x51);print(0x06); // Set the right margin to 6
print_chs("12345678901234567890"); // print character string
print(0x0d);                       //enter
```

[Print results]

```
1234567890
1234567890
1234567890123456
```

ESC I

[Name] set the left margin

[Type] ASCII:	ESC	1	n
Decimal:	27	108	n
Hex:	1B	6C	n

[Explanation] The left margin is the number of characters, which isn't printed on the left side of the printing paper. The width of each character is '6 +character spacing'. (Thermal Printer: '12+ character spacing'). The value of **n** should be within the line width of the model printer. (Default value: n=0. When n=0, there is no the left margin). This command sets the absolute position, and is not affected by the characters enlargement command ESCU and ESCW.

[Example]

Set the right margin to 6, the command is as follows:

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

C program is as follows:

```
print_chs("1234567890123456");           // print character string
print(0x1b);print(0x6c);print(0x06);      // Set the right margin to 6
print_chs("12345678901234567890");      // print character string      print(0x0d);
                                           //enter
```

[Print results]

```
1234567890
1234567890
1234567890123456
```

3.2.4 Character setting command

ESC 6

[Name] select Character Set 1

[Type] ASCII:	ESC	6
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 1). 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).

ESC 7

[Name] select Character Set 2

[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 1). 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).

[Note]The thermal printers of '24 dot matrix' don't have the character set 2.

FS 8

[Name] select the ASCII Set of '12 x 24'

[Type] ASCII: FS 8
Decimal: 28 56
Hex: 1C 38

[Explanation] This command is only applicable to the thermal printer of 24 dot lattice. After inputting this command, the printers will print the ASCII character set of 12X24 dot matrix (see appendix 1). The range of code is 20H ~ FFH (32 ~ 255).

ESC U

[Name] Laterally magnify

[Type] ASCII: ESC U n
Decimal: 27 85 n
Hex: 1B 55 n

[Explanation]After inputting the command, the characters will be print at **n** times of the normal characters width.

- (1) The range of **n** (Dot matrix printer) is between 1 and 8 (Default value: n=1. When n=1, the characters will be normally print, and there is no enlargement)
- (2) The range of **n** (thermal printer) is between 0 and 8 (Default value: n=1. When n=1, the printer will laterally magnify one time to print)

In order to observe the enlargement effect of the ESC U command, please see the following C program:

```
for(i=1;i<4;i++) //1~3 times
{
    print(0x1b);print(0x55);print(i); // ESC U command
    print_chs("RD"); //print characters
}
print(0x0d); //enter command
```

[Print results]



ESC V

[Name]Longitudinally magnify

[Type] ASCII: ESC V n
Decimal: 27 86 n
Hex: 1B 56 n

[Explanation]After inputting the command, the characters will be print at **n** times of the normal characters height.

- (1)The range of **n** (Dot matrix printer) is between 1 and 8 (Default value: n=1. When n=1, the characters will be normally print, and there is no longitudinal enlargement)
- (2)The range of **n** (thermal printer) is between 0 and 8 (Default value: n=1. When n=1, the printer will

longitudinally magnify one time to print)

This command should be sent at the beginning of the line.

[Example]

```
for(i=1;i<4;i++) //1~3 times
{
    print (0x1b);print(0x56);print(i); // ESC V command
    print_chs("RD"); // print characters
    print(0x0d); //enter
}
```

[Print results]

```
RD
RD
RD
```

ESC W

[Name] Laterally and Longitudinally magnify

[Type] ASCII:	ESC	W	n
Decimal:	27	87	n
Hex:	1B	57	n

[Explanation] After inputting the command, the characters will be print at **n** times of the normal characters width and height.

(1)The range of **n** (Dot matrix printer) is between 1 and 8 (Default value: n=1. When n=1, the characters will be normally print, and there is no lateral and longitudinal enlargement)

(2)The range of **n** (thermal printer) is between 0 and 8 (Default value: n=1. When n=1, the printer will laterally and longitudinally magnify one time to print)

[Example]

```
for(i=1;i<4;i++) //1~3 times
{
    print (0x1b);print(0x57);print(i); // ESC W command
    print_chs("RD"); // print characters
    print(0x0d); //enter
}
```

[Print results]

```
RD
RD
RD
```

ESC X

[Name] Laterally and Longitudinally magnify different times

[Type] ASCII: ESC X n1 n2
 Decimal: 27 88 n1 n2
 Hex: 1B 58 n1 n2

[Explanation] After inputting the command, the characters will be print at **n1** times of the normal characters width and **n2** times of the normal characters height. The range of **n1** and **n2** is between 1 and 8. (Default value: **n1=n2=1**. When **n1=n2=1**, there is no enlargement)

ESC r

[Name] adjust the depth of thermal printing

[Type] ASCII: ESC r 2B/2D n
 Decimal: 27 114 43/45 n
 Hex: 1B 72 2B/2D n

[Explanation] The range of **n** is between 0 and 15

(1)When using '1B 72 2B n' to enhance depth adjustment, the greater the n value, the deeper the depth of printing.

(2)When using '1B 72 2D n' to reduce depth adjustment, the greater the n value, the lighter the depth of printing.

The recovery command is '1B 72 2D 0' or '1B 72 2B 0'

[Note] The users can adjust the depth of thermal printing according to the actual situation. When you reduce depth, you will reduce the power consumption of the printer. When you increase depth, you will increase the power consumption of the printer.

ESC —

[Name] allow/ban the underline printing

[Type] ASCII: ESC — n
 Decimal: 27 45 n
 Hex: 1B 2D n

[Explanation]When n=1, allow the underline printing

 When n=0, ban the underline printing

After energizing or initialization, n=0. After allowing the underline printing, all characters and Chinese characters including spaces will be printed with the underline.

[Example]

```
print(0x1b);print(0x57);print(2);       // magnify two times
print_chs("RD");                        // print character string
print(0x1b);print(0x2d);print(1);       // allow the underline printing
print_chs("UPT");                        //UPT is printed with the underline
print(0x1b);print(0x2d);print(0);       // ban the underline printing
print_chs("RD");print(0x0d);            // print character string
print(0x0d);                             //enter
```

[Print results]

RDUPTRD

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

After energizing or initialization, n=0. After allowing the overline printing, all characters and Chinese characters including spaces will be printed with the overline.

[Example]

```
print(0x1b);print(0x57);print(2);
print_chs("RD");
print(0x1b);print(0x2b);print(1); // allow the overline printing
print_chs("UPT");                //UPT is printed with the overline
print(0x1b);print(0x2b);print(0); // ban the overline printing
print_chs("RD");print(0x0d);
```

[Print results]

RD^{UPT}RD

FS r

[Name] select the superscript and subscript

[Type] ASCII: FS r n
 Decimal: 28 114 n
 Hex: 1C 72 n

[Explanation] The command can select the superscript and subscript. The superscript and subscript mean that the character with the biggest character is upper (lower) aligned when the height of some character is less than the height of the biggest characters in the line

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

[Example]

```
print(0x1b);print(0x57);print(0x02); // magnify two times
print('M');                          //print 'M'
print(0x1b);print(0x57);print(0x01); // the original time
print(0x1c);print(0x72);print(0);    // subscript command
print('2');                          //print '2'
print(0x0d);                          //enter
print(0x1b);print(0x57);print(0x01); // the original time
print(0x1b);print(0x57);print(0x02); // magnify two times
print('M');                          //print 'M'
```



```

print(0x1c);print(0x72);print(1);      // superscript command
print(0x1b);print(0x57);print(0x01);  // the original time
print('2');                            //print '2'
print(0x0d);                            //enter
    
```

[Print results]



ESC i

[Name] To allow/ban the white reverse printing mode

[Type] ASCII:	ESC	i	n
Decimal:	27	105	n
Hex:	1B	69	n

[Explanation]When n=1, allow the white reverse printing. When n=0, ban the white reverse printing. The white reverse printing mode is that the printer prints the white character in the black background. Normal printing is that the printer prints the black character in the black background. When the last character in one line is the white reverse printing character, the space between the line and the next line is filled by the black. After powering on the printer and initializing, n=0.

[Example]

```

print(0x1b);print(0x69);print(1);      //allow the white reverse printing
print_chs("ABCDEFGHJKLMNO"); //print character string
print(0x0d);                            //enter
    
```

[Print results]



ESC C

[Name] To allow/ban reverse printing

[Type] ASCII:	ESC	C	n
Decimal:	27	99	n
Hex:	1B	63	n

[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. When the printer is vertically installed, the printer uses the reverse printing way in order to observe the printing results. After the Embedded printers power on the printer and initializing, n=1, while the portable printers are opposite. 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 1]

```

print(0x1b);print(0x63);print(1);      //allow the reverse printing
print_chs("RONGDA");                  //print character
    
```

```
print(0x0d); //enter
```

[Print results]

RONGDA

[Example 2]

```
print(0x1b);print(0x63);print(0); //ban the reverse printing
print_chs("RONGDA"); //print character
print(0x0d); //enter
```

[Print results]

RONGDA

FS J

[Name] Set Longitudinal printing

[Type] ASCII: FS J
Decimal: 28 74
Hex: 1C 4A

[Explanation]The command set the character to left-handed character, that is , longitudinal printing. The printing direction is from left to right.

[Example]

```
print(0x1c);print(0x4a); //Set Longitudinal printing
print_chs("RONGDA"); //print character
print(0x0d); //enter
```

[Print results]

ЯOZUαC

FS K

[Name] Set Lateral printing

[Type] ASCII: FS K
Decimal: 28 75
Hex: 1C 4B

[Explanation]The command set the character to forward character, that is , lateral printing. The printing direction is from left to right.

[Example]

```
print(0x1c);print(0x4b); //Set Lateral printing
print_chs("RONGDA"); //print character
print(0x0d); //enter
```

[Print results]

RONGDA

FS 2

[Name] set character rotation Printing

[Type] ASCII: FS 2 n
 Decimal: 28 73 n
 Hex: 1C 49 n

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

n	Counterclockwise rotation	printing direction
0	0 degrees (forward)	from left to right
1	90 degrees (left-handed)	from left to right
2	180 degrees (reverse)	From right to left
3	270 degrees (left-handed)	From right to left

[Note] Only select one type of the above ways to print in one line.

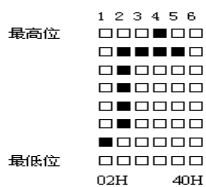
3.2.5 the user-defined characters command

ESC &

[Name] define the user-defined characters

[Type] ASCII: ESC & m n1 n2...n6
 Decimal: 27 38 m n1 n2...n6
 Hex: 1B 26 m n1 n2...n6

[Explanation] The command allow the users to define one character. The **m** is the user-defined characters code. And the value of **m** is between 32 and 255. The **n1, n2, ...n6** are the structure code to define the character. The character consist of the 6×8 dot matrix, which means having 6 columns and each column has 8 dots. And the data of a character indicates each column and the highest bit is upper.



n1=02H, n2=7CH, n3=40H, n4=COH, n5=40H, n6=0H

The user-defined characters are stored in the RAM, and they will be lost after interruption of power supply.

If many ESC U commands use the same value of **m**, only the last one is effective. The users can most define 32 user-defined characters.

ESC %

[Name] replace/select user-defined characters

[Type] ASCII: ESC % m1 n1 m2 n2...mk nk NUL

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

```

Decimal:   27   37   m1  n1  m 2  n2...mk  nk  0
Hex:      1B   25   m1  n1  m2  n2...mk  nk  0
    
```

[Explanation] the command can replace the current characters **n** to the user-defined characters **m**. After implementing the command, the printer will print the user-defined characters **m**.

The **m1**, **m2...mk** are the user-defined character codes.

The **n1**, **n2...nk** are the current character codes, which will be replaced.

The value of **m** and **n** should be between 32 and 255.

The value of the subscript **k** should be between 1 and 32. The number of the characters which can be most replaced is 32.

That the character 'NUL' is placed at the end means the end of the command.

ESC :

[Name] recover the character in the character set

```

[Type] ASCII:   ESC  :
        Decimal: 27  58
        Hex:    1B  3A
    
```

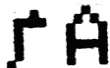
[Explanation] The command is used to restore the original character in the characters set. Before the command, the characters have been replaced for the user-defined characters by this command ESC%. However, the user-defined characters are not removed from the RAM, and it can be used through the use of command ESC%.

[Example]

```

print(0x1b);print(0x57);print(2);           // Laterally and Longitudinally magnify two times
print(0x1b);print(0x26);print(65);         //the ESC & command
print(0x02);print(0x7C);print(0x40);       // Font data
print(0xC0);print(0x40);print(0x00);      // Font data
print(0x1b);print(0x25);print(65);print(65);print(0); //ESC %
print(65);                                 //print the defined characters
print(0x1b);print(0x3a);                   //the ESC: command
print(65);                                 // recover the centralized characters
print(0x0d);
    
```

[Print results]



3.2.6 the graphic print command

ESC K

[Name] print lattice graphics/ density graphics

```

[Type] ASCII:   ESC    K    n1  n2 ...data...
        Decimal: 27    75  n1  n2 ...data...
    
```

Hex: 1B 4B n1 n2 ...data...

[Explanation] The command is used to print the 'n1×8' lattice graphics. The width of the graphics is **n1** dots and the height is 8 dots. 8 dots in each column can use an 8-bits byte to represent, and the highest bit is upper.

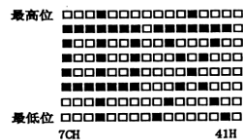
The value of **n1** and **n2** represents a 16-bit binary number. The **n1** represents low 8-bit bytes, and the **n2** represents the high 8-bit bytes, which means that the width of the graphics which will be printed is 'n2×256+n1'. The value of **n2** should be 0 or 1. The sum of dots is less than or equal to 384. If it exceeds the number, it automatically cleared. The value of **n1** should be between 1 and the maximum number of dots in each line of the printer model. The Data indicates that the lattice graphic's byte contents of each column from left to right, and the number of bytes should be equal to n1.

When the height of the graphics is more than 8 dots, a graphic can be divided into multiple units. When the height of the graphics is less than 8 dots, use the empty dots to supplement. Then in order each graphic unit uses the ESC K command to print, and finally form a complete graph.

[Note] When using a reverse printing method, the printer prints each graphic unit according to the order of the graphics from bottom to top.

[Example] Use the ESC K command to print two characters "中文", and the dot matrix of two Chinese characters is as shown below. Each character consists of 7 × 8 lattice, and there are seven columns. There is a space between the two characters, so there are 15 columns, and n1=15, n2=0. The data of 15 bytes using hexadecimal to represent is as follows:

7CH, 44H, 44H, FFH, 44H, 44H, 7CH, 00H, 41H, 62H, 54H, C8H, 54H, 62H, 41H



Procedure is as follows:

```
unsigned char code ch[15]={0x7c,0x44,0x44,0xff,0x44,0x44,
0x7c,0x00m,0x41,0x62,0x54,0xc8,0x54,0x62,0x41};
print(0x1b);print(0x57);print(2);           // Laterally and Longitudinally magnify two times
print(0x1b);print(0x4b);print(15);print(0); //the ESC K command
for(i=0;i<15;i++)                          //input the data of 15 bytes
    print(tch[i]);
print(0x0d);                                //enter
```

[Print results]

中文

ESC ' ①

[Name] Print curve I

[Type] ASCII:	ESC	'	m	n1	n2...nk	CR
Decimal:	27	39	m	n1	n2 ...nk	13

Hex: 1B 27 m n1 n2 ...nk 0D

[Explanation] This command is used to print the curve graphics along the paper feed direction. The value of **m** is the number of curves to be printed. The value of **m** should be between 1 and the maximum number of dots in each line of the printer model.

There are **m** Curve points in a horizontal line. The **n1, n2, ... nk** represent the position of the **m** curves. The number of **nk** should be equal to **m**. Each **Nk** should be less than the maximum number of points per line of the printer model. The final CR (carriage return) is to make the printer print this line. The entire graphic of **m** curves is printed through using these data of **n1, n2, ...nk**.

Continuously using this command can print out the curves of arbitrary length.

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

[Example]

Print curve graphic of below five equations:

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

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

$$Y3=50$$

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

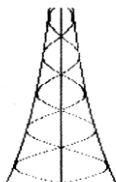
$$Y5=50-40*\text{abs}(-0.01*X)$$

C program is as follows:

```
#include <math.h>
float X;
unsigned int  Y,YY;
for(X=0;X<150;X++)                //print 150 lines
{
    Y= 40*exp(-0.01*X);
    YY= Y*sin(X/10);
    print(0x1b);print(39);print(5);    //the ESC command, M=5,0
    print(50+YY);print(50-YY);print(50); print(50+Y);print(50-Y);
    print(13);
}

```

[Print results]



ESC , @

[Name] Print curve II

[Type] ASCII: ESC ' m low m high n1 low n1 high.....nk low nk high CR

Decimal: 27 39 m low m high n1 low n1 high.....nk low nk high 13
Hex: 1B 27 m low m high n1 low n1 high.....nk low nk high 0D

[Explanation]The 'n1 low n1 high' represents the position of the **m** curves. The 'n1 low' means the low bit of the n1 dot. The 'n1 high' means the high bit of the n1 dot. The value of **m** is the number of curves to be printed. The value of **m** should be between 1 and the maximum number of dots in each line of the printer model.

There are **m** Curve points in a horizontal line. The n1, n2, ... nk represent the position of the **m** curves. The number of nk should be equal to **m**. Each Nk should be less than the maximum number of points per line of the printer model. The final CR (carriage return) is to make the printer print this line. The entire graphic of **m** curves is printed through using these data of n1, n2, ...nk.

Continuously using this command can print out the curves of arbitrary length.

[Example]

Print curve graphic of below five equations:

```
Y1=50+40*abs (-0.01*X) *sin (X/10)
Y2=50-40*abs (-0.01*X) *sin (X/10)
Y3=50
Y4=50+40*abs(-0.1*X)
Y5=50-40*abs(-0.01*X)
```

C program is as follows:

```
#include <math.h>
float X;
unsigned int   Y,YY;
for(X=0;X<150;X++)                                 // print 150 lines
{
    Y= 40*exp(-0.01*X);
    YY= Y*sin(X/10);
    print(0x1b);print(39);print(5);print(0);         // the ESC command, M=5,0
    print(50+YY);print(0);print(50-YY);print(0);print(50);print(0);
    print(50+Y);print(0);print(50-Y);print(0);print(13);
}
```

ESC E

[Name] print the bar code

[Type] ASCII:	ESC	E	nq	nc	n1	n2	n3...nk	NUL
Decimal:	27	69	nq	nc	n1	n2	n3...nk	0
Hex:	1B	45	nq	nc	n1	n2	n3...nk	00

[Explanation]

nq: the distance of first lines in the bar code from the side of the printing paper. The value of **N** should be

between 0 and 64.

nc: Barcode line vertical height (point). The value of **n** should be between 1 and 255.

nk: the parameters of the K-th bar code line:

the number of blank points between 4 high bits (D7~D4) and the previous bar code line. The value of **n** should be between 1 and 15.

4 low bits (D3~D0), the width of the bar code line. K is the number of bar code lines, and the value of k should be between 1 and 15.

[Note] This command is only applicable to the thermal models.

3.2.7 Initialization Commands

ESC @

[Name] initialize the printer

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

[Explanation] After executing this command, the printers restore the default value.

3.2.8 Data control commands

CR

[Name] carriage return

[Type]	ASCII:	CR
	Decimal:	13
	Hex:	0D

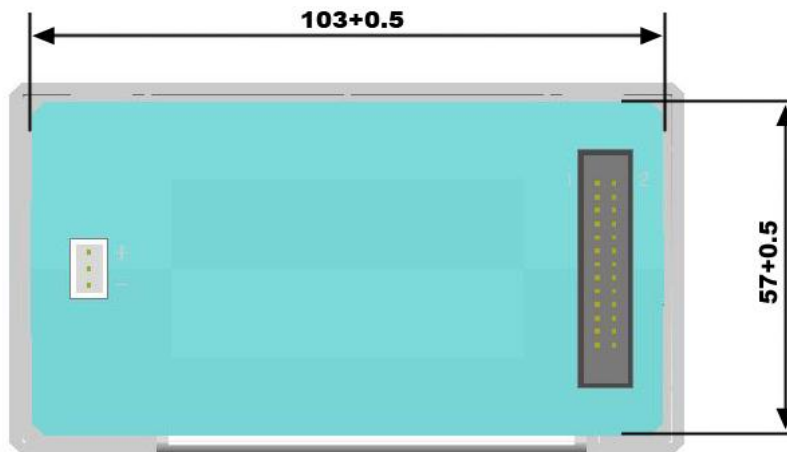
NUL

[Type]	ASCII:	NUL
	Decimal:	0
	Hex:	00

[Explanation] NUL commands and some commands, such as ESC B, ESC D, ESC%, ESC 'etc. are used together to indicate the end of these commands. NUL command does not work when used alone.

Chapter 4: Installation

4.1 Installation dimension (Unit: mm)

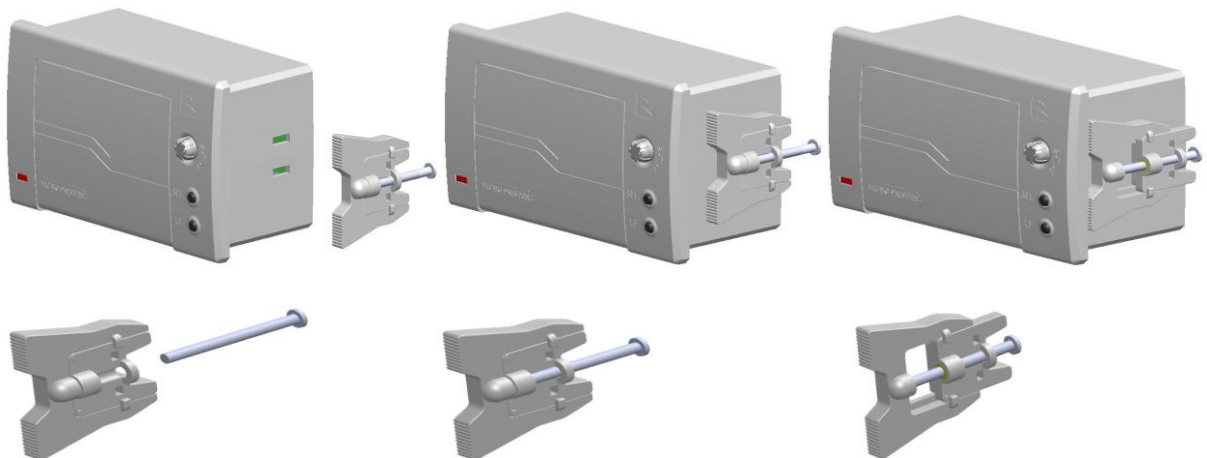


4.2 Installation methods

Step1: When we install the printer, we should put the printer from the front of the panel into the installation hole of the machine, and put to the end

Step2: Hang the plastic retaining tab bar on the left and right sides of the printer to get stuck the printer

Step3: Tighten the screws and install firmly the printer.



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 ourself. 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	£	¥	℞	ƒ
A	á	í	ó	ú	ñ	Ñ	ª	º	¿	Γ	γ	½	¼	¡	«	»
B	⋮	⋮	⋮													
C	L	⊥	T	└	-	┌		⊥	⊥	⊥	⊥	⊥	⊥	=	⊥	⊥
D	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	■	■	■	■	■
E	α	β	Γ	Π	Σ	σ	μ	γ	δ	θ	Ω	δ	ω	φ	€	Π
F	≡	±	≥	≤	∫	J	÷	≈	°	.	.	√	n	z	■	

A.2 character set 1

	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	-	=	□	五	六	七	八	九	十	元	肆	月	日	¥	
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	Α	Φ	Ψ	∠
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	℃	¥	←	↑	↓	¼	½	¾	°	×	√	⊥
3	∕	∥	∪	∩	⊕	⊖	⊗	⊘	⊙	⊚	⊛	⊜	⊝	⊞	⊟	⊠
4	∴	≡	≌	↔	≠	∝	∠	∞	∫	∑	∏	∑	∏	∑	∏	∑
5	※	※	()	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
6	●	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	サ	シ	ス	セ	ソ
7	タ	チ	ツ	テ	ト	ナ	ニ	ヌ	ネ	ノ	ハ	ヒ	フ	ヘ	ホ	マ
8	ミ	ム	メ	モ	ヤ	ユ	ヨ	ラ	リ	ル	レ	ロ	ワ	ヰ	ヱ	ヲ
9	ン	ア	ウ	エ	オ	カ	ユ	ヨ	ツ	ッ	°	°	°	°	°	°
A	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕
B	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕
C	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕
D	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕
E	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕
F	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕	∕