



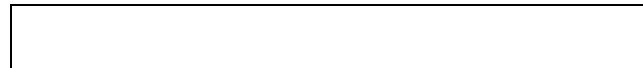
TP UP-PH

Portable Thermal

Printer

User's Manual

(Beta version)



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## Breif Introduction

TP UP-PH portable thermal printer features as following:

- Structure for easy paper loading
- Rechargeable battery pack for quick replacing and portability
- IrDA infrared interface for easy interfacing and communication wireless
- Built-in Chinese font level 1 & 2 for quick and nice printing Chinese character
- Black mark sensor for implement of printing pre-printed bill on position
- Small size for easy hold by hand or hang by waist

TP UP-PH portable thermal printer is suitable for application of mobile instrument or such as PDA device

## Chapter 1 Features

### 1.1 Printing Features

- Printing method : direct thermal line printing
- Print paper width: 58 +/-1 mm
- Print density: 8 dot/mm, 384 dot/line
- Valid print width: 48mm
- Print Speed: 30mm/s(with full charged battery)

### 1.2 Print Paper

- Thermal paper roll with width 58mm
- Paper roll diameter: 45mm(OD),10mm(ID)
- Paper thickness: 0.065 μ m,53~64g/m<sup>2</sup>

### 1.3 Print Character

- IBM Character Set II: 12×24 dot,1.5(w)×3.0(h)mm
- Chinese Character(GB 2312): 24×24 dot,3.0(w)×3.0(h)mm

### 1.4 Data Receiving Buffer

- 14K bytes

### 1.5 Print Control Command

- Command set: EPSON ESC/POS compatible
- FS commands for Chinese printing

Command	Description
LF	Line feed
ESC ! n	Set character print mode
ESC 2	Set 1/6" line space
ESC 3 n	Set n dot-line space
ESC *	Set bit-map graphics

ESC % n	Select user-defined character
ESC & s n m [a[p]sxa]m-n+1	Define user-defined character
ESC ' k n1 n1'..nk nk' CR	Print curve graphics
ESC c 7 n	On/off curves compensation
ESC @	Initialize printer
ESC J n	Print and feed n dot
ESC c 5 n	On/off panel buttons function
ESC R n	Select international character set
GS * n1 n2 [d]k	Set down-load bit-map graphics
GS / n	Print down-load bit-map graphics
GS FF	Detect black mark and feed to next page top
GS h	Set bar code height
GS k	Print bar code
GS w	Set bar code stripe width
FS &	Enter Chinese mode
FS .	Exit Chinese mode

### 1.6 Working Mode

- Print text, bit-map graphics, Chinese character and bar code
- Self-test print
- Paper feeding

### 1.7 Printhead Protection

- Stop printing while paper end
- Pause printing while out of temperature range of printhead

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## 1.8 Interface

TP UP-PH provides both interfaces of RS-232 serial port and IrDA infrared port

- RS-232 Serial port
  - Baud rate: 9600bps
  - Handshaking: RTS/CTS
  - Data format: 8-bit data, none parity, 1-bit stop
  - Connector: 6 pin RJ-11 modular jack
  - Signal level: EIA level +/- (3 – 15V)
- IrDA infrared port
  - Communication distance: 0.6m(max.)
  - Communication angle: 30

## 1.9 Black Mark Detecting

- Black mark should be printed on printing side close edge left or right with a height 5mm and width 15mm;
- Reflectivity of black mark should be less than 10% and the others should be more than 90%.

## 1.10 Power Supply

- DC 6V 1500mAh rechargeable battery pack.
- Battery slowly charging on printer with external DC12V/600mA adaptor
- Battery fast charging on CX-101 quick charger(option)

## 1.11 Power On and Off Automatically

- Press button “On” for printer power on
- Power off automatically for 20 seconds no operations

## 1.12 Operation Environment

- Temperature: 5~50°C
- Humidity: 10~80%RH

## 1.13 Outline Size

- 153(L) × 116(W) × 65(H)mm

## 1.14 Weight

- 500g(excluding paper roll)

## Chapter 2 Installation and Operation

### 2.1 Installation

TP UP-PH portable thermal printer has an outline as shown figure 2-1:

Battery installation: put the battery into the battery house in the bottom of the printer. Please notice the polarity of the battery fitting to the electrode in the battery house. When heard a sound of “peng” the battery has installed and locked into the house. For taking out the battery push the release bar(see figure 2-2) to the battery.

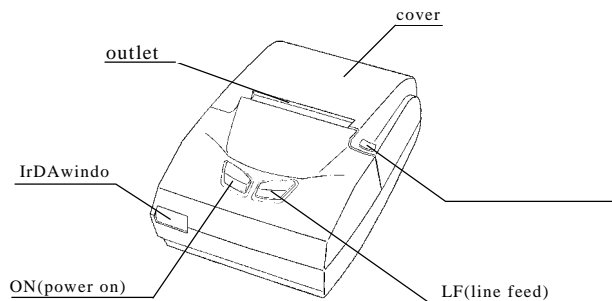


Figure 2-1 TP UP-PH outline

### 2.2 Power Connection

A rechargeable battery is packed with TP UP-PH printer. It can be installed and locked on the bottom of the printer. Slow charging is used by a DC12V/600mA adaptor packed. When the plug of the adaptor is inserted into the DC jack on the bottom of the printer, trickle charging started. Full charging need 14

hours. Fast charging need take off the battery and put it on the optional quick charger CX-101. Full charging need only 4 hours.

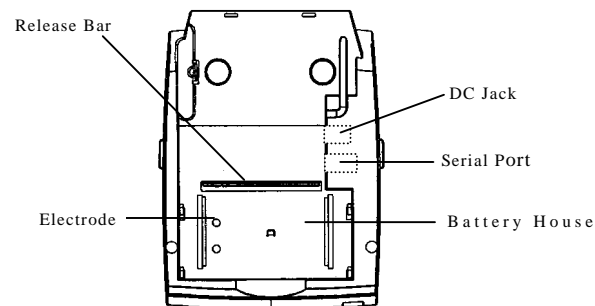


Figure 2-2 Battery installation

### 2.3 Loading Paper

TP UP-PH portable thermal printer provides a method of easy paper loading:

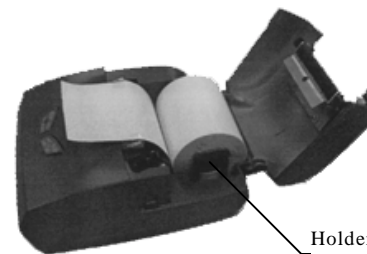


Figure 2-3 Loading paper

(1) Open the cover of the printer;

- (2) Put a paper roll into the printer shown as figure 2-3. The core of the roll should be put on the paper holder and paper edge should be pull out;
- (3) Close the cover and let paper edge locate outside.

#### 2.4 Interface Selection

TP UP-PH printer allows to select using RS-232 serial port or IrDA infrared port.

##### 1). RS-232 serial interface:

Connect the RS-232 serial interface cable specified with the printer, the printer will set to use RS-232 serial interface.

##### 2). IrDA infrared interface:

If there is no RS-232 serial interface cable connected with the printer, the printer will set ot use IrDA infrared interface.

#### 2.5 Interface Connection

##### 2.5.1 Serial Interface Connection

TP UP-PH portable printer provides a RS-232 serial port socket: 6PIN RJ-11 modular jack.

##### 1). RJ-11 Pin Alignment



Figure 2-4 RJ-11 Pin Alignment

#### 2). Serial Port Signal Definition

Pin	Signal	Source	Description
1	GND	Printer	Connect with Pin6,set to RS-232C serial interface mode
2	RXD	Host	Printer receiving data sent by host
3	TXD	Printer	Printer sent data to host
4	GND	Printer	Signal ground
5	RTS	Printer	“Mark” indicates printer is busy and can’t receive data; “Space” indicates printer is reday.
6	CON	Printer	Connect with Pin1,set to RS-232C serial interface mode

Mark=logic “1” (EIA level -3V~-15V)

Space=logic “0” (EIA level +3V~+15V)

#### 3). Conneting with Personal Computer

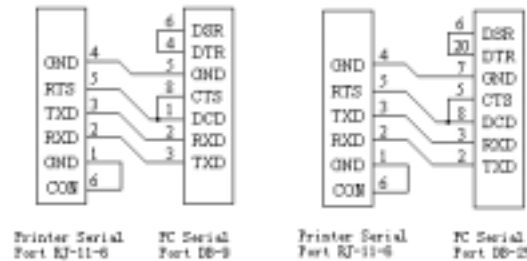


Figure 2-5 Connecting with PC

#### 4). Communication Parameters:

- Buad rate : 9600bps
- Handshaking: RTS/CTS
- Data Bit : 8
- Parity : none

### 2.5.2 IrDA Infrared Interface:

IrDA works in semiduplex mode wireless. To communicate the IrDA infrared transmitter and receiver of the host should aim at the infrared window of the printer.

Communication parameters are following as:

Baud rate: 9600bps

Data bit: 8

Parity: none

Handshaking: none

Distance: 0.6m(max.)

View angle: 30°

### 2.6 Operation of Indicators and Buttons

TP UP-PH has two indicators: green one is a power indicator, and lights while power on; red one is a error indicator, and lights or flash when the printer is in following cases:

- 1) Paper end;
- 2) Head lever lift up;
- 3) Head temperature is out of the range;
- 4) Not found black mark.

Error indicator flashes as shown as figure 2-7.

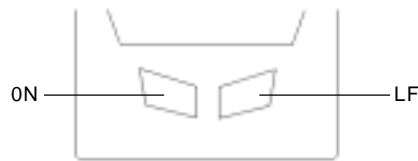


Figure 2-6 Indicators and Buttons

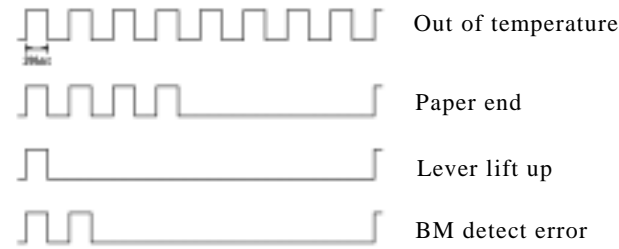


Figure 2-7 Error indicator flash mode

TP UP-PH has two buttons: ON and LF. Their functions are following:

- 1) Power on: press button ON and release it until green indicator lights. That means power is ON;
- 2) Power off: press button ON more than 5 seconds until red indicator on and all indicators off. That means power is Off;
- 3) Self Test: when power off, press and hold button LF, and then press button ON, both indicators light, then release button LF and button ON, printer will print out self-test list;
- 4) Paper feed: when power on, press button LF and paper feed until release the button;
- 5) Battery discharging: when power off, press button ON more than 10 seconds, both indicators light, printer enters battery discharging status, and no normal operations can be made. When the battery dsicharged to empty, printer power off automatically.

## Chapter 3 Print Control Command

### 3.1 Command Introduction

TP UP-PH portable thermal printer provides a set of print control commands compatible ESC/POS.

The format of command description is following:

Control Code	Function
Format: ASCII: ASCII character sequence	
Decimal: Decimal number sequence	
Hexadecimal: Hexadecimal number sequence	

Explanation:

Explain the function and of the command and method of usage.

Example: list some program example for understanding the command usage more easily.

### 3.2 Paper Feed

LF	Print and line feed
Format: ASCII: LF	
Decimal: 10	
Hexadecimal: 0A	

Explanation:

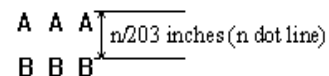
Print content in line buffer and feed paper one line. If line buffer is empty, feed one line only.

ESC J	Print and feed paper n dotline
Format: ASCII: ESC J n	
Decimal: 27 74 n	
Hexadecimal: 1B 4A n	

Explanation:

Print content in line buffer and feed paper n dotline(1/203 inch) as shown as following figure.

The function of the command is valid only in current line.



### 3.3 Line Space Setting

ESC 2	Set line space in default value
Format: ASCII: ESC 2	
Decimal: 27 50	
Hexadecimal: 1B 32	

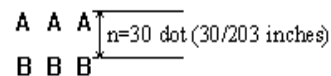
Explanation:

Set line space in 30 dotline(default value).

ESC 3	Set line space in n dotline(1/203 inch)
Format: ASCII: ESC 3 n	
Decimal: 27 51 n	
Hexadecimal: 1B 33 n	

Explanation:

Set line space in n dotline(1/203 inch) as shown as following figure. n=0-255. Default n=30.



### 3.4 Character Control

**ESC R**                      Select international character set  
 Format:    ASCII: ESC R n  
           Decimal: 27 82 n  
           Hexadecimal: 1B 52 n

Explanation:

The command selects one set of 11 different countries as shown as following table. n=0-10, default n=0.

	Country	ASCII codes (hexadecimal)										
		23	24	40	5B	5C	5D	5E	60	7B	7C	7D
0	U.S.A.	#	\$	@	[	\	]	^	~			-
1	France	#	\$	á	¢	§	¨	ª	«	¬	®	°
2	Germany	#	\$	§	¨	ª	«	¬	®	°	±	²
3	U.K.	£	\$	@	[	\	]	^	~			-
4	Denmark I	#	\$	@	Æ	Ø	Å	^	~			-
5	Sweden	#	¤	É	Æ	Ø	Å	Ü	é	ë	ä	å
6	Italy	#	\$	@	^	\	é	ª	«	¬	®	°
7	Spain	¢	\$	@	¡	ñ	¿	~	-	ñ		-
8	Japan	#	\$	@	[	¥	]	^	~			-
9	Norway	#	¤	É	Æ	Ø	Å	Ü	é	ë	ä	å
10	Denmark II	#	\$	É	Æ	Ø	Å	Ü	é	ë	ä	å

**ESC !**                      Set character printing mode  
 Format:    ASCII: ESC ! n  
           Decimal: 27 33 n  
           Hexadecimal: 1B 21 n

Explanation:

This command selects the size of the character to be printed. Parameter n is a byte, and the definition of each bit is as following:

Bit	Function	0	1
0	Not defined		
1	Not defined		
2	Not defined		
3	Not defined		
4	Double height	Off	On
5	Double width	Off	On
6	Not defined		
7	Not defined		

Default n=0, i.e. normal character size.

### 3.5 User-Defined Character

**ESC %**                      On/off user-defined character  
 Format:    ASCII: ESC % n  
           Decimal: 27 37 n  
           Hexadecimal: 1B 25 n

Explanation:

n=1 to select user-defined character set; n=0 to select internal character set. Default n=0.

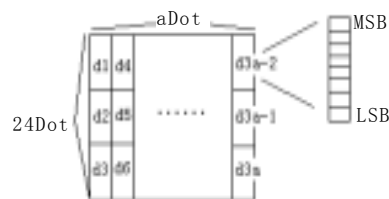
**ESC &**                      Set user-defined character  
 Format:    ASCII: ESC & S n m [a[p]s×a]m-n+1  
           Decimal: 27 38 S n m [a[p]s×a]m-n+1  
           Hexadecimal: 1B 26 S n m [a[p]s×a]m-n+1

Explanation:

ESC & defines several user-defined characters.  $S=3, 32 \leq n \leq m \leq 126, 0 \leq a \leq 12, 0 \leq p \leq 225$ .

◆ S is the number of bytes arranged vertically. Here  $S \equiv 3$ .

- ◆ n is the beginning ASCII code of the user-defined characters.
- ◆ m is the ending ASCII code of the user-defined characters. When only one user-defined character is defined, n=m. The maximum number of the user-defined characters can be defined in each character set.
- ◆ a is the number of the horizontal dots for the user-defined character.



- ◆ p means the data of the user-defined character. Each character consists of bytes in  $s \times a$ . Total number of the characters to be defined is  $m-n+1$ .
- ◆ The user-defined characters are valid until re-defining, initializing printer, or power off.

### 3.6 Bit-map Graphics Setting

ESC \* Set printing mode of bit-map graphics

Format: ASCII: ESC \* m n1 n2 [d]k  
 Decimal: 27 42 m n1 n2 [d]k  
 Hexadecimal: 1B 2A m n1 n2 [d]k

Explanation:

This command is used to set the graphics and its printing mode.

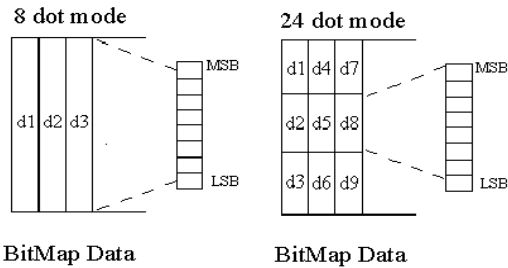
$m=0,1,32, \text{ or } 33$ .  $n1=0\sim 255, n2=0\sim 1$ .  $d=0\sim 255$ .

$k=n1+256 \times n2$  ( $m=0, 1$ )

$$k = (n1 + 256 \times n2) \times 3 \quad (m=32, 33)$$

- ◆ The number of the horizontal dots is  $n1+256 \times n2$ . The maximum number of the horizontal dots is shown as below table.
- ◆ When the bit-map data exceed the width of the line, the exceeded part will be ignored.
- ◆ d is the data byte of the graphic. The bit of the byte is corresponding to the dot of the graphic. The bit=1 means the dot will be printed, otherwise the dot not printed.
- ◆ m is used for selecting the printing mode.
- ◆ When executed command LF, ESC J, or the bit-map data of next line is received after the current line is full, the bit-map graphics in the current line will be printed out. The command allows mixed printing in characters and graphics.

m	Mode	Vertical		Horizontal	
		Dots	density	density	Max.dots
0	8-dot single density	8	68DPI	101DPI	192
1	8-dot double density	8	68DPI	203DPI	384
32	24-dot single density	24	203DPI	101DPI	192
33	24-dot double density	24	203DPI	203DPI	384



```

FOR J=0 TO 7
PRINT #1,CHR$(2^J);CHR$(2^J);CHR$(2^J);
NEXT J
NEXT I
PRINT #1,CHR$(10);
NEXT K

```

The printout after executed the program is shown as below:



BASIC program example 1:

```

FOR K=0 TO 1
PRINT #1,ESC;"*";CHR$(K);CHR$(128);CHR$(1);
FOR I=1 TO 24
FOR J=7 TO 0 STEP -1:PRINT #1,CHR$(2^J);:NEXT J
FOR J=0 TO 7 :PRINT #1,CHR$(2^J);:NEXT J
NEXT I
PRINT #1,CHR$(10);
NEXT K

```

The printout is shown as below:



BASIC program example 2:

```

FOR K=32 TO 33
PRINT #1,ESC;"*";CHR$(K);CHR$(128);CHR$(1);
FOR I=1 TO 24
FOR J=7 TO 0 STEP -1
PRINT #1,CHR$(2^J);CHR$(2^J);CHR$(2^J);
NEXT J

```

GS *	Set download bit-map graphic			
Format:	ASCII:	GS	*	n1 n2 [d]k
	Decimal:	29	42	n1 n2 [d]k
	Hexadecimal:	1D	2A	n1 n2 [d]k

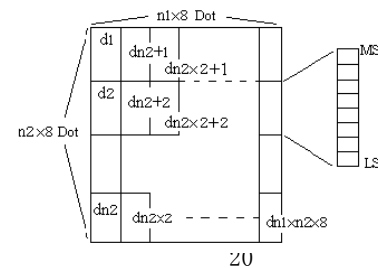
Explanation:

The command is used to set a download bit-map graphic.

$n1=1\sim 48, n2=1\sim 255, n1 \times n2 \leq 1200, k=n1 \times n2 \times 8$

- ◆ d is bit-map graphic data.
- ◆ Horizontal  $n1 \times 8$  dots, vertical  $n2 \times 8$  dots.
- ◆ Defined the download bit-map graphic is valid until redefined, or power off.

The format of dowload bit-map graphic is shown as below:



---

**GS /** Print download bit-map graphic

Format: ASCII: GS / n  
 Decimal: 29 47 n  
 Hexadecimal: 1D 2F n

**Explanation:**

The command is used to print the download bit-map graphic.

- ◆ n selects the mode of bit-map graphic. n=0~3.
- ◆ Use command GS \* to define the download bit-map graphic.

n	Graphic mode	Vertical density	Horizontal density
0	Normal	203DPI	203DPI
1	Double width	203DPI	101DPI
2	Double height	101DPI	203DPI
3	Double width and height	101DPI	101DPI

**BASIC program example:**

```
N1=36:N2=3
PRINT #1,GS;"*";CHR$(N1);CHR$(N2);
FOR I=1 TO N1/2
FOR J=7 TO 0 STEP -1
FOR K=1 TO N2:PRINT #1,CHR$(2^J);:NEXT K
NEXT J
FOR J=0 TO 7
FOR K=1 TO N2:PRINT #1,CHR$(2^J);:NEXT K
NEXT J
NEXT I
FOR n=0 TO 3:print #1,GS;"*";CHR$(n);:NEXT n
```

The printout after executed the program on TP UP-PH is shown as below:




---

**ESC '** Print curving graphic

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

**Explanation:**

The command is used to print curving graphics. The value of k is the number of curves to be printed.

K=1~255.

In a horizontal dotline there are k curve dots. n1,n1',n2,n2' ...nk,nk' are the positions of the k lines of curving graphics, n1 is the low byte of the position, and n1' is the high byte. n1+n1'\*256 should be less than the valid printing width (384 dots). CR is the end code of the command. The k lines of the curving graphics are composed of these horizontal curve-dots n1,n1', n2,n2',...,nk,nk'.

Print a curving graphic in one group of 24 dotlines. Printer continuously execute command ESC ' 24 times and print the curving graphic of 24 dotlines. As less than 24 dotlines the printer will wait for next command ESC '. But if a command except command ESC ' is received, the printer will print the curving graphic already treated and then enters the other command treatment.

**BASIC program example:**

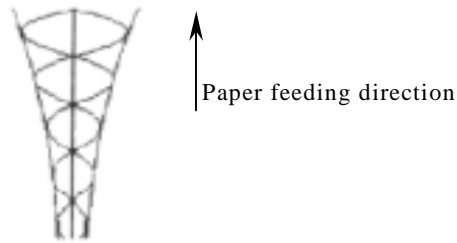
```
FOR I=1 TO 150
Y=INT(40*EXP(-0.01*I))
```

```

YY=INT(Y*SIN(I/10))
PRINT #1,ESC;CHR$(39);CHR$(5);
PRINT #1,CHR$(50+YY);CHR$(0);
PRINT #1,CHR$(50-YY);CHR$(0);
PRINT #1,CHR$(50);CHR$(0);
PRINT #1,CHR$(50+Y);CHR$(0);
PRINT #1,CHR$(50-Y);CHR$(0);
PRINT #1,CHR$(13);
NEXT I
PRINT #1,CHR$(10) ;

```

The printout on executed the program is shown as below:



ESC c 7	On/off curves compensation
Format: ASCII: ESC c 7 n	
Decimal: 27 99 7 n	
Hexadecimal: 1B 63 7 n	

Explanation:

The command is used to enable or disable the function of compensation on printing curving graphics. For single curve, the compensation means drawing a line between the last position and the current position if the offset of the both horizontal positions is more than 1. In this way the printed curving graphic looks more smooth.

n=1, enable the curves compensation; n=0, disable the compensation function. Default n=0.

### 3.7 Other Control Commands

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

Explanation:

The command is used to initialize the content of the printer as below:

- ◆ Clear print buffer;
- ◆ Restore default value of all commands;
- ◆ Delete user-defined characters.

ESC c 5	Enable/disable panel switch function
Format: ASCII: ESC c 5 n	
Decimal: 27 99 5 n	
Hexadecimal: 1B 63 5 n	

Explanation:

The command is used to enable or disable the function of the panel switches(buttons). n=0-255.

If n=<XXXXXB, disable the function of the panel switches(buttons);

If n=<XXXXX0>B, enable the function of the panel switches(buttons). Default n=0.

### 3.8 Chinese Print Commands

FS &	Enter Chinese printing mode
Format: ASCII: FS &	
Decimal: 28 38	
Hexadecimal: 1C 26	

Explanation:

The command is used to enter Chinese character printing mode. After received the command the printer allows receive



CODE 128 supports Code A, B and C, and conversion of them.

The example of printing CODE 128 is as below:

[Example] Print "UPPH32S OK" by using CODE 128 Code A, the ASCII code sequence and decimal data sequence are as below:

```
GS K 8  STARTA 'UPPH32S OK',NUL
29 107 8 168 85 80 80 72 51 50 81 32 79 75 00
```

CODE 128 does not need input stop character.

The detail explanation of CODE 128 barcode system is in Appendix 1.

GS w	Set barcode horizontal width	
Format:	ASCII: GS w n	
	Decimal: 29 119 n	
	Hexadecimal: 1D 77 n	

Explanation:

Set horizontal width of the barcode stripe to be printed by using n.

$$2 \leq n \leq 3$$

The width of the barcode stripe specified by n is shown as below table:

n	2-cell barcode stripe width	
	Narrow stripe(mm)	Wide stripe(mm)
2	0.250	0.625
3	0.375	1.000

CODE39, ITF, and CODE128 are 2-cell barcode system.

### 3.10 Black Mark Detecting

GS FF Detect black mark and feed to next page top

Format:	ASCII: GS FF
	Decimal: 29 12
	Hexadecimal: 1D 0C

Explanation:

This command is valid only on using the paper with pre-printed black mark.

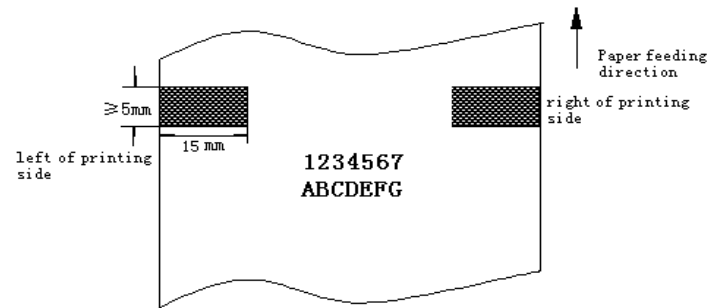
The printer will detect the black mark on the paper while paper feeding. When the black mark is detected the printer will feed the black mark to the paper tear bar. But if no black mark is detected on feeding paper 150mm long, the printer will stop the detecting and feeding, the red LED will flash to indicate no black mark is found out.

After power on, printer default the black mark has been at the paper tear bar. The content to be printed should be between two black marks in sequence.

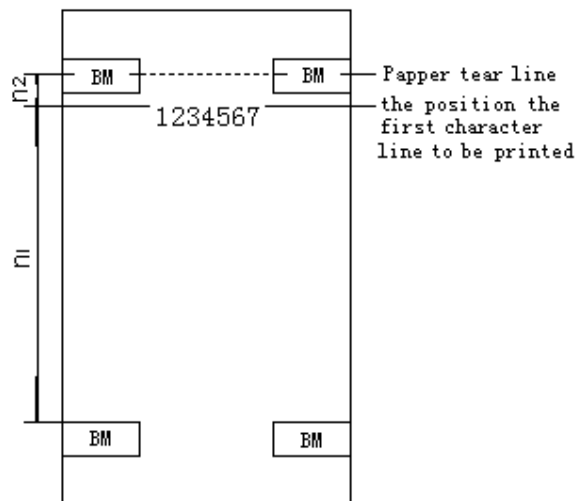
Notice for black mark printing:

The black mark should be printed on the printing side of the paper. The position of the black mark is the paper tearing line.

The position and size of the black mark printed are shown as below picture.



The reflectivity of the black mark printed should be less than 10%, and the others should be more than 90%.



Explanation for printing area:

Printing area is shown as above figure.

n1: valid printing area.

n2: distance from the first printing line to the paper tearing line. n2=15mm.

## Chapter 4 Cleaning Printhead

After the printer is used some duration, the character printed out might be not clear, this means the printhead need be cleaned according to following procedure:

- (1) Must take out the battery before cleaning.
- (2) Open the cover of the printer.
- (3) Use a cleaned tampon dipped a few alcohol to brush off the dirt on the surface of the printhead heating elements. **Must remember don't use sandpaper, knife, or screwdriver to scrape the printhead! Otherwise the printhead will be permanent damage.**
- (4) After cleaned printhead don't close the cover until the alcohol on the printhead is dry completely.
- (5) Install the battery and do self testing to inspect the printing effect.
- (6) If the printing effect is not good please contact with professional maintenance man.
- (7) Don't touch the printhead and motor while just finished printing to avoid hand is burned.

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## Chapter 5 Battery Charge and Discharge

5.1 Use a rechargeable battery with DC 6V 1500mAh.

### 5.2 Charging Method

Two charging methods are used for charging the battery: slow charging on the printer and external quick charging.

#### 1.Slow charging on printer

Connect an external adaptor of DC12V/600mA to the DC jack of the printer, and the battery is installed on the printer. The charging time need 12-16 hours.

#### 2.External quick charging

Take out the battery from the printer and put it on the optional CX-101 Quick Charger, connect the adaptor of DC12V/600mA to the Charger. The charging time need 4 hours. There are 4 indicators on the CX-101 quick charger for indicating the status of the charging. More indicators light, more power charged.

### 5.3 Discharging Method

When the printer can't work currently due to the battery low, there may be some power in the battery. To reduce the remember effect of the battery and keep the capacity of the battery, strongly recommend charging after discharging sufficiently.

#### 1.Discharging on printer

After power off, press and hold button ON more than 10 seconds until the both of red and green indicator light, the printer enters into discharging state and can't do any operations. When the both of indicators is off, the discharging finished.

#### 2.External quick discharging

CX-101quick charger has a quick discharging function. Put the battery on the charger, press the button located left and

down corner. The baatery enters quick discharging and then enters quick charging automatically after finished discharging.

### 5.4 Method of getting back the capacity

If the battery discharged not entirely (the printer can work or the battery is discharged not sufficiently before charging) and charged not entirely (the charging time is not enough) more times, the battery capacity will reduce due to Ni-Cd battery have some remembrance effect. To get back the capacity of the battery, 2 or 3 times of charging and discharging entirely are necessary. The method of discharging and charging the battery is same as descriptions of section 5.2 and 5.3.

<p><b>Notice:</b> The time of the battery discharging and the time of the battery working will be provided later. More testings for the parameters above on the batch production are necessary.</p>
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## Appendix 1 Code 128 Explanation

There are 3 code sets in Code 128. 128 ASCII characters and 00 – 99 total 100 digits of 2-digit numeric can be defined. Each code set defined the characters and numerics shown as below:

- Code A: ASCII character 00H - 5FH
- Code B: ASCII character 20H - 7FH
- Code C: one character expressed one 2-digit numeric(total 100 numerics from 00 to 99)
- SHIFT Character

In Code A,the characters followed SHIFT can be used as the corresponding characters in Code B. Alike, in Code B,the characters followed SHIFT can be used as the corresponding characters in Code A. There is no SHIFT character in Code C.

- The character for selecting code set (CODE A, CODE B, and CODE C)

The character can implement conversion between Code A, B and C each other.

- Function character (FNC1, FNC2, FNC3, and FNC4)

The usage of the function character lie on the application software. In Code C only FNC1 is valid.

**Code 128 Character Code and Value Reference**

Code A Charc.	Code B Charc.	Code C Charc.	ASCII Location	Charc Value
SP	SP	00	'20'	0
!	!	01	'21'	1
"	"	02	'22'	2
#	#	03	'23'	3
\$	\$	04	'24'	'4
%	%	05	'25'	5
&	&	06	'26'	6
'	'	07	'27'	7
(	(	08	'28'	8
)	)	09	'29'	9
*	*	10	'2A'	10
+	+	11	'2B'	11
,	,	12	'2C'	12
-	-	13	'2D'	13
.	.	14	'2E'	14
/	/	15	'2F'	15
0	0	16	'30'	16
1	1	17	'31'	17
2	2	18	'32'	18
3	3	19	'33'	19
'4	'4	20	'34'	20
5	5	21	'35'	21
6	6	22	'36'	22
7	7	23	'37'	23
8	8	24	'38'	24
9	9	25	'39'	25
:	:	26	'3A'	26
;	;	27	'3B'	27

Code A Charc.	Code B Charc.	Code C Charc.	ASCII Location	Charc Value
<	<	28	'3C'	28
=	=	29	'3D'	29
>	>	30	'3E'	30
?	?	31	'3F'	31
@	@	32	'40'	32
A	A	33	'41'	33
B	B	34	'42'	34
C	C	35	'43'	35
D	D	36	'44'	36
E	E	37	'45'	37
F	F	38	'46'	38
G	G	39	'47'	39
H	H	40	'48'	40
I	I	41	'49'	41
J	J	42	'4A'	42
K	K	43	'4B'	43
L	L	44	'4C'	44
M	M	45	'4D'	45
N	N	46	'4E'	46
O	O	47	'4F'	47
P	P	48	'50'	48
Q	Q	49	'51'	49
R	R	50	'52'	50
S	S	51	'53'	51
T	T	52	'54'	52
U	U	53	'55'	53
V	V	54	'56'	54
W	W	55	'57'	55
X	X	56	'58'	56
Y	Y	57	'59'	57
Z	Z	58	'5A'	58

Code A Charc.	Code B Charc.	Code C Charc.	ASCII Location	Charc Value
[	[	59	'5B'	59
\	\	60	'5C'	60
]	]	61	'5D'	61
^	^	62	'5E'	62
_	_	63	'5F'	63
NUL	'	64	'60'	64
SOH	a	65	'61'	65
STX	b	66	'62'	66
ETX	c	67	'63'	67
EOT	d	68	'64'	68
ENQ	e	69	'65'	69
ACK	f	70	'66'	70
BEL	g	71	'67'	71
BS	h	72	'68'	72
HT	i	73	'69'	73
LF	j	74	'6A'	74
VT	k	75	'6B'	75
FF	l	76	'6C'	76
CR	m	77	'6D'	77
SO	n	78	'6E'	78
SI	o	79	'6F'	79
DEL	p	80	'70'	80
DC1	q	81	'71'	81
DC2	r	82	'72'	82
DC3	s	83	'73'	83
DC4	t	84	'74'	84
ZAK	u	85	'75'	85
SYN	v	86	'76'	86
ETB	w	87	'77'	87
CAN	x	88	'78'	88
EM	y	89	'79'	89

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Code A Charc.	Code B Charc.	Code C Charc.	ASCII Location	Charc Value
SUB	z	90	'7A'	90
ESC	{	91	'7B'	91
FS		92	'7C'	92
GS	}	93	'7D'	93
RS	~	94	'7E'	94
US	DEL	95	'7F'	95
FNC3	FNC3	96	'A1'	96
FNC2	FNC2	97	'A2'	97
SHIF	SHIF	98	'A3'	98
CODEC	CODEC	99	'A4'	99
CODEB	FNC4	CODEB	'A5'	100
FNC4	CODEA	CODEA	'A6'	101
FNC1	FNC1	FNC1	'A7'	102
STARTA	STARTA	STARTA	'A8'	103
STARTB	STARTB	STARTB	'A9'	104
STARTC	STARTC	STARTC	'AA'	105
STOP	STOP	STOP	'AB'	
EMPTY	EMPTY	EMPTY	'AC'	

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