

Technical Manual

(Model : HP-500)



CAUTION



- Please do not disassemble / reorganize the product.
- Please do not the remove the paper jam during power on.
- Pleased do not exceed the standard power voltage.
- Please do not wash off the product.
- Please do not press / shock the product.
- Please do not put the product at the moist (humid) condition.



- Please contact us if there is any problem.
- Please power off once remove the paper jam.
- Please clear the air / open the disclosed place.
- Please set the product without damage enviornment.
- Please set the product at the stable place.
- Pleaes keep the requires as necessary as general electrics.

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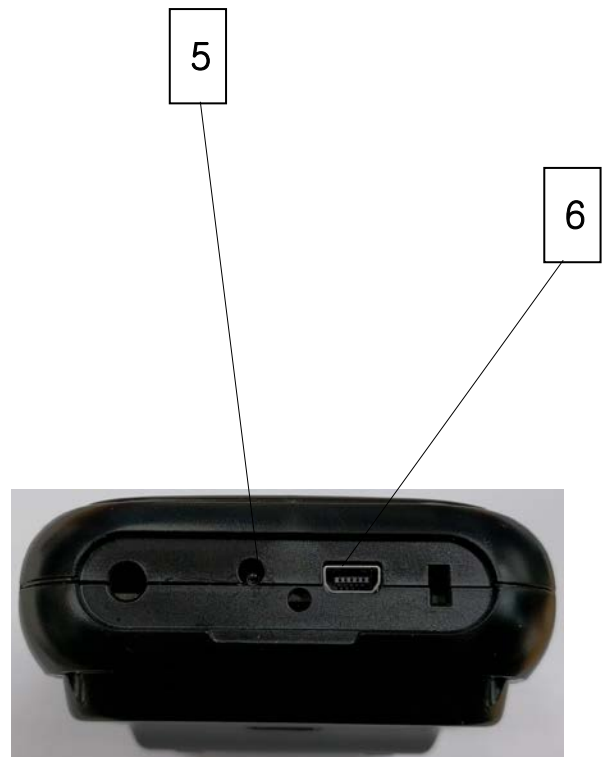
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1. Printer features & External Dimension

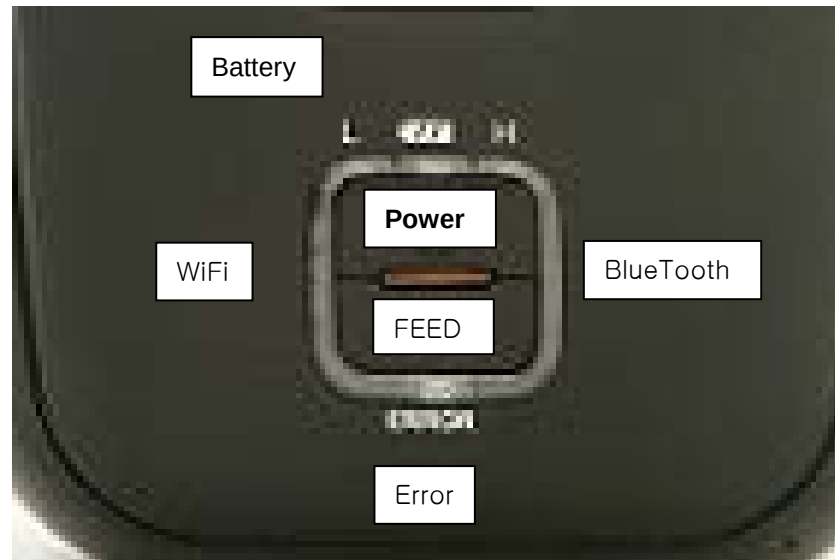
1-1) Name of each parts



- 1. Button and LED
- 2. Open Lever
- 3. Manual Cutter
- 4. Battery
- 5. DC Connect
- 6. USB/RS232C Interface



1-2) Operation Parts



* Battery State

3 light is " Full " charged.

2 light is " Middle " Charged

1 light is " Low " it needed to be charged.

If the light in Error LED is " Very Low " in a battery

* Power

Power on : Please press the button for 1 sec more.

Power off : Please press the button for 1 sec more.

* FEED

Paper feeding .

* Error

If there is something wrong, it will be light as Red when there is no paper or out of battery

* WiFi and Bluetooth

When operating WiFi or Bluetooth, the LED indicator will be lighting.

* Setting the Label.

You can use the label paper after setting label option.

- ① Power on the printer
 - ② Open the paper cover and Press the FEED button for 2 seconds.
 - ③ When Melody is alaming, Put the paper of label in the printer and close the paper cover.
- When it comes back to Receipt Option, Please follow this step again.

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2. Operation

2-1) Replacing the roll of paper.

The paper setting up is as below.

① Open the cover in Mobile Printer by Lever



② Please insert the paper, till the paper comes out from the cover.



③ Close the cover and cut the extra paper.



2-2) Selftest

Please turn off and on the power, while you press down the feed button.
And you can see the Error Led light kept then the following informations are being feeded.

```
*****
HP-500 Control Board
Firmware   : Ver0 .45
Create     : 20XX/XX/XX
*****

Printer Information
=====
Battery Volt : 7.7(V)
Hex Dump Mode : OFF
Print Density : Normal
Melody Sound : ON
Paper Type : Receipt
Wireless Type : WiFi / BlueTooth
Power off time : 10 Minute
Tear Bar : 5 Pitch
```

- Model.
- Firmware version / create date.
- Printer information.
- Serial I/F information
- WiFi information

```
Serial I/F Information
=====
Baud Rate : 9600
Date Bit : 8 bit
Partiy : None
Stop Bit : 1 or 2
Flow Control : RTS-CTS(DTR-DSR)

WiFi Information
=====
WiFi Mode : AP Mode
IP Address : 192.168.012.101
Gateway : 192.168.012.001
SSID : HWASUNG_4E:8E:EE
SECURITY KEY : 12345678
```

2-3) Communication setting

Set the printer function and communication condition between host by memory switch utility program.

※ Note : Setting erases all contents in memory switch, so code page and print options shall be set again.

1) Manual setting

Turn on the printer at initial setting mode.

※ Method to go initial setting mode

[Press and hold FEED button and then turn on power pressing 2 or more seconds, then PE LED and ERROR LED blinks by turns and it is switched to initial setting mode (9600 BPS, PARITY NONE, HARDWARE HANDSHAKE).]

In manual setting, considering of communication condition is not required.

2) After switched to initial setting mode, followings will be printed.

```
[Menu]
1.Print Density
2.Melody Sound
3.Paper Type
4.Hex Dump Mode
5.Wireless Type
6.WiFi Mode
7.IP Mode
Select and then Enter...

Enter : Press the feed button once for
        more than 1second.
Select: Press the feed button many times
        less than 1second as menu number.
Exit  : Turn power off then on.
```

Pressing FEED button for more than 1second, it is fixed (press enter), and less than 1 second, item is selected.

For example, if you want to change the Wifi Mode of #6 menu, press #6 less than 1 second, and press more than 1 second. To exit, turn off the power and turn on again.

3) Successively, select from printed items and confirm.

```
Ex) [Wireless Type]
    1.WiFi
    -> 2.Bluetooth

    -> : Indicate current set status
    Select and then Enter...
```

Ex) In here, arrow((->) indicates current settings. To change, select item and enter. TO move to

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2-5) Onboard update

Please conduct the updates, after refering the following steps.

1) Please switch off and on

2) Please check the connection between the printer and the data cable.

* Please make sure about if it is the right cable.

* If use USB cable, save the time to update the firmware

3) Please conduct the provided program , then set up the model and Interface port

If the error LED is turned off and is lighted on slightly after 4 seconds,
then the updated is being started.

* Please do not switch off the printer power, till the update is complete.

4) The update will be complete, once the update indicates complete.

* If the error LED keeps the light goes in and out, it's error.

Please stop the update program and make sure the cable and other connections.

Please return the process "1." and follow the step again.

5) After update, automatically the printer will be reset for using and use the printer.

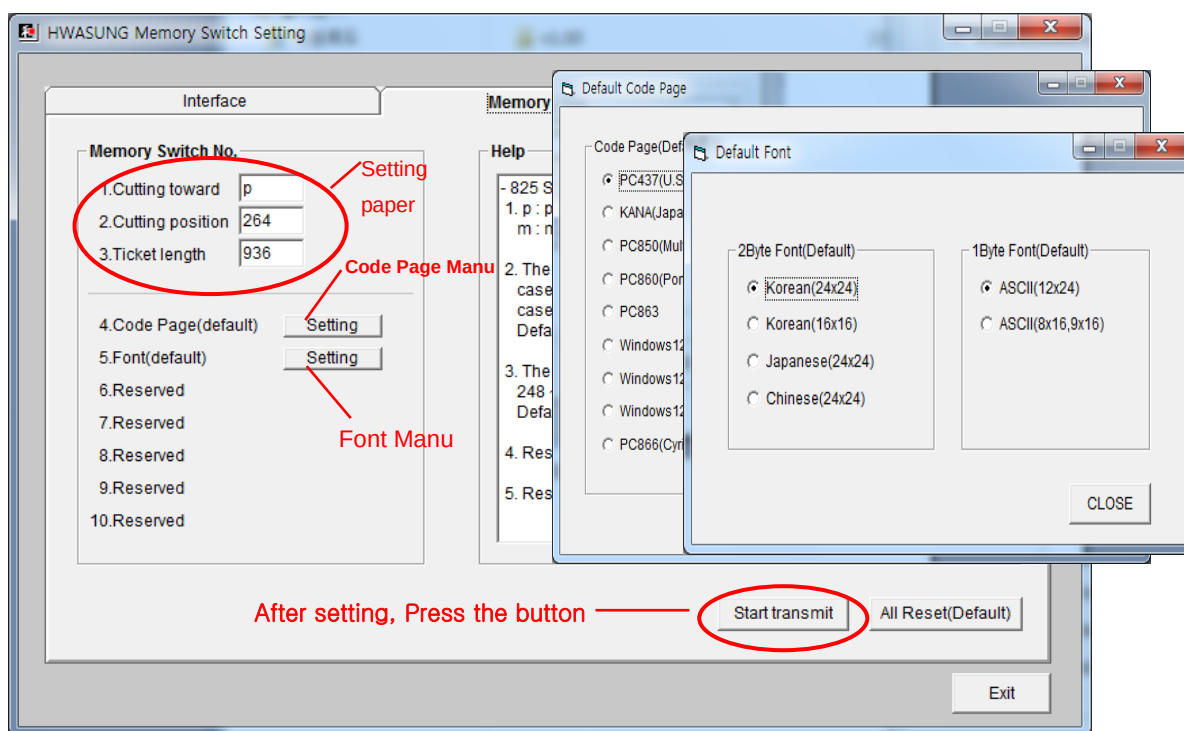
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2-6) Memory switch

Please set the function of internal memory.

- ※ Please use the provided program - 'memory switch setting utility program'.
- ※ The value is not deleted until the next value is changed, even though power off.

Memory SW	Setting Value	Descreption
SW1	Reservation	
SW2	0~1200 or 0~136	
SW3	248-4000	
SW4	Base Code Page	Setting one default value for each country
SW5	Base Font	Setting one of 1) 2byte codes : korean(24 x 24), korean(16 x 16), Japenes(24x24), Chinese(24x24). 2).1byte codes : ASCII(12x24), ASCII(8x16,9x16)
SW6	Reservation	
SW7	Reservation	
SW8	Reservation	



[Memory Switch information]	
=====	
Code Page = PC437(U.S)	←
2Byte Font = Korean(24x24)	└─┘ ←
1Byte Font = ASCII(12x24)	└─┘ ←
Mem1:FFh	
Mem2:FFh,FFh	
Mem3:FFh,FFh	
Mem4:00h	←
Mem5:00h	←
Mem6:FFh	
Mem7:FFh	
Mem8:FFh	
Mem9:FFh	
Mem10:FFh	
Mem11:40h	
Mem12:F9h	

(Ex) Sample of printing by selftest

2-7) The way to connect the RF interface.

1) BlueTooth

BlueTooth inteferface can be set up by simple control

- ① Please refer to 2-3P and set up from Wireless moder to Bluetooth
- ② When the Error LED is not lighting, Pressing power button and FEED button together for 1second then take off.
- ③ And searching for Bluetooth device in Mobile Phone or PC
- ④ When finding "HWASUNG_XX:XX:XX" on PC or Smart Phone and choosing it and it will be pairing automatically.
- ⑤ the pairing is complete ordinarily, the light in LED bluetooth will be stopped.

2) WiFi

There are two of modes

Station Mode : Printer will be connected with Wireless directly.(SSID and others Setting necessary)

AP Mode : Printer will be connected with other devices(Not setting necessary)

- ① Please refer to 2-3 and Set up " Wireless Mode "
- ② Please refer to 2-3 and Set up " Station Mode " or " AP Mode " according to where you use.

When choose the mode is "AP Mode "

- ③ Turn on the printer and atfer 3 second automatically IP Address and SSID and Password will be printed.
- ④ And please connect with PC or Smart Phone then put in the SSID and Password.
- ⑤ When the connection is complete, using IP address printed.

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3. General Specification

3-1) Specification

- 1) Printing : Direct thermal printer
- 2) Resolution and Dot : 203dpi, 1dot=0.125mm, 8dot/mm, Total 384 dot
- 3) Printing speed (Max) : 90mm/sec(Max)
- 4) Printing Width : 48mm
- 5) Paper Width : 58mm
- 6) Paper Diameter : 40 Diameter (Max)
- 7) Character (MAX) a line : 32fonts (ASCII 12 x 24),16fonts (Korean 24 x 24)

3-2) Font

- 1) English / Number FONT A(8 x 24) 95, FONT B(8 x 16) 95
- 2) Graphic FONT A(8 x 24) 128, FONT B(8 x 20) 95
- 3) International 14types 37fonts
(Korean,English,France,Germany,England,Denmark1,Swden,Italy,Spain1,Japan,Norway,Denmark2,Spain2,Latin America)
- 4) Korean FONT A Gothic (24 x 24), FONT B Gothic (16 x 16,option)

3-3) Internal Buffer

Receiver buffer : 4KByte

3-4) Electrical Spec

- 1) Operating Voltage

Insert Voltage	7.4V Li-ion Battery	
Operation voltage	5V	Motor,Thermal print head
Logic voltage	5V±5%	Logic circuit

- 2) Consumption current
Average : 1.5A(Printing percentage 12.5%))
Peak : 3.7A

3-5) Operation condition (temperature / Humid)

- 1) Temperature : 0 ~ 40℃
- 2) Humidity : 40 ~ 90%RH(in not dew condensation)

Notice : The printing is subject to the operation condition.

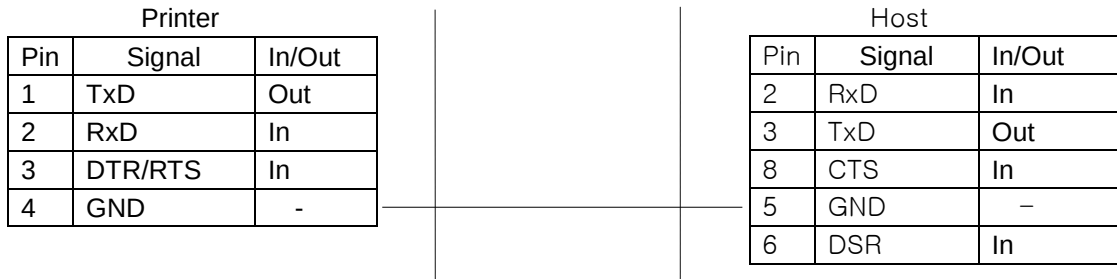
3-6) MCBF

- 1) Mechanism : 15,000,000 Lines.
- 2) Thermal Print Head 50Km, 1 pulse.

4. Interface specification

4-1) RS-232C

- 1) Data Transmission : Serial
- 2) Hand shake : Hardware (RTS/CTS or DTR/DSR)
- 3) Baud Rate : 9600, 19200, 38400, 57600 BPS
- 4) Data Bit : 8bit
- 5) Parity : None, Odd, Even
- 6) Stop Bit : 1 or 1.5 or 2 bit
- 7) Connector : 10 pin Mini-B(Dedicated Cable)



-----> (Dotted line) : Connect to host.

4-2) USB

- 1) Standard : USB 2.0 Compatibility, Full Speed(12Mb)
- 2) Connector : Type MINI-B
- 3) Cable : USB2.0 Standard Cable
- 4) Data : Bulk IN, Bulk OUT
 - Bulk IN : End point 6
 - Bulk OUT : End point 2
 - Full Speed : Max Packet Size 64 Byte(Bulk OUT), 64 Byte(Bulk IN)

4-3) WiFi

- 1) Standard : IEEE 802.11b/g/n,
- 2) Frequency : 2.400 GHz ~ 2.484 GHz
- 3) Channel : CH1 ~ CH11
- 4) Security : WEP, WPA/WPA2PSK

4-4) BlueTooth

- 1) Standard : Bluetooth 3.0 Class2

5. Command

Command	Function	PAGE
CR	Print and carriage return	17
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CAN	Cancel the print data	17
HT	Horizontal tab	17
FF	Print the page mode / return to the standard mode	17
SUB x	Extended graphic mode	18
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SUB R	Outline Character (Tetragon)	18
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SUB 1	Line 1 (Vertical, Horizontal)	19
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SUB W	Write (line data)	19
SUB C	Clear (line data)	19
SUB O	Line ON	20
SUB F	Line OFF	20
SUB P	Print line 1 dot line (Vertical, Horizontal)	20
ESC D	Horizontal tab position	20
ESC SP	Spacing the character of ASCII	20
ESC !	Font decoration	21
ESC \$	Absolute position of printing	21
ESC *	Bit image (vertical)	21
ESC -	Underline the character of ASCII	23
ESC 2	Initial row pitch	23
ESC 3	Row pitch	24
ESC @	Printer reset	24
ESC E	Emphasize	24
ESC G	Double	24
ESC J	FEED	24
ESC j	BACK FEED	24
ESC M	Font (ASCII)	25
ESC R	International character	25
ESC a	Align the printing	26
ESC d	Printing and row FEED	26
ESC {	180° rotation	26
ESC t	Code page (International)	26
ESC S	Standard mode / Clear the area of page	27
ESC L	Page mode	27
ESC FF	Printing of page area	27

Command	Function	PAGE
ESC T	Page mode (Direction of printing)	28
ESC W	Page mode (Area of printing)	29
FS !	Korean font decoration	30
FS &	Korean extended graphic mode (set up)	30
FS .	Korean extended graphic mode (cancel)	30
FS -	Underline Korean	31
FS S	Space Korean	31
FS W	Size Korean	31
FS q	Register Non Volatile logo (bit image)	32
FS p	Non Volatile logo print	32
GS !	Extension of character	33
GS (K (fn=49)	Density of printing	33
GS (K (fn=97)	Operating Thermal Head Partially	34
GS B	Reverse printing in black / white	34
GS H	Barcode	34
GS L	Left space	35
GS W	Area of printing	35
GS h	Barcode (Height)	35
GS k	Barcode (Printing)	35
GS w	Barcode (Extension / Reduction)	36
GS r	Status check	37
GS a	Status check (Auto reply)	37
GS v	Laster bit image (Horizontal)	38
DLE ENQ	Buffer clear (real time)	38
DLE EOT	Status transmission (real time)	39

CR

[Name]	Print and carriage return	
[Format]	ASCII	CR
	Hex	0Dh
	Decimal	13
[Range]	-	
[Descript]	equal LF	

LF

[Name]	Print and line feed	
[Format]	ASCII	LF
	Hex	0Ah
	Decimal	10
[Range]	-	
[Descript]	① STANDARD MODE:	
	After printing the data and go to return according as the fixed data.	
	② PAGE MODE:	
	The fixed data can be only conduted, according as the fixed data.	
[Caution]	The LF is ignored behind of CR	

CAN

[Name]	Cancel print data in page mode	
[Format]	ASCII	CAN
	Hex	18h
	Decimal	24
[Range]	-	
[Dsecirpt]	The data is deleted within the area of printing.	

HT

[Name]	Horizontal tab	
[Format]	ASCII	HT
	Hex	09h
	Decimal	9
[Range]	-	
[Descript]	Moves the print position to the next tab poission	
[Caution]	Horizontal tab position are to set in ESC+'D'+n.	

FF

[Name]	Print and return to standard mode in page mode	
[Format]	ASCII	FF
	Hex	0Ch
	Decimal	12
[Range]	-	
[Descript]	Print the data in the print buffer and returns to standard mode	
[Caution]	Use the command ESC+FF , in order not to return the standard mode.	
	The data is not deleted in the area of page.	

SUB+'x'+n

[Name]	Extension Graphic Mode, Korean Mode			
[Format]	ASCII	SUB	x	n
Hex	1A	78h	n	
Decimal	26	120	n	
[Range]	0≤n≤1			
[Initial Value]	n=0			
[Descript]	n=0 : Korean Mode, First code is A1h more, automatically transfer Korean in 2 bytes n=1 : Extension Graphic Mode, Every code is setting in 1 byte Extension Graphic font will be printed			

SUB+'p'+n

[Name]	Off line printing in paper detection			
[Format]	ASCII	SUB	p	n
Hex	1A	70h	n	
Decimal	26	112	n	
[Range]	0≤n≤1			
[Initial Value]	n=1			
[Descript]	n=0 : Not transition to offline once paper empty (data communication available) n=1 : Transition to offline once paper empty (data communication not available)			

SUB+'R'+n

[Name]	Set the character outline			
[Format]	ASCII	SUB	b	n
Hex	1A	52h	n	
Decimal	26	82	n	
[Range]	0≤n≤1			
[Descript]	n=0 : cancel character outline (tetragon) n=1 : Set character outline (tetragon).			
[Caution]	The horizontal extension is valid as eight times. The vertical extension is valid as two times			

SUB+'B'+n1+n2+n3+d1.....dk

[Name]	2D Barcode.						
[Format]	ASCII	SUB	B	n1	n2	n3	d1.....dk
	Hex	1A	42h	n1	n2	n3	d1.....dk
	Decimal	26	66	n1	n2	n3	d1.....dk
[Range]	Please refer the table below.						
[Descript]	Please choose the barcode by the data of barcode.						
	n1 : two dimension of barcode n2 : the number of data of barcode n3 : size of barcode d1... dk : the data of barccode						

n1	Barcode
1	PDF417
2	QR code

1) PDF417

n2	Number of data
	$1 < n2 \leq 255$

n3	Size of data
3	Horizontal 3
4	Horizontal 4
5	Horizontal 5
6	Horizontal 6
7	Horizontal 7
8	Horizontal 8
9	Horizontal 9

2) QR code

n2	Number of data
n3=1	$1 < n2 \leq 17$
n3=3	$1 < n2 \leq 53$
n3=5	$1 < n2 \leq 106$
n3=9	$1 < n2 \leq 230$

n3	Size of data
1	Version 1
3	Version 3
5	Version 5
9	Version 9

※ Vertical is set automatically.

SUB+'1'

[Name]	Line 1 (Vertical, Horizontal)		
[Format]	ASCII	SUB	1
	Hex	1A	31h
	Decimal	26	49
[Description]	Line of Vertical Horizontal.		

SUB+'2'

[Name]	Line 2 (Vertical, Horizontal)		
[Format]	ASCII	SUB	1
	Hex	1A	32h
	Decimal	26	50
[Description]	Line of Vertical Horizontal		

SUB+'W'+nL+nH+kL+kH

[Name]	Write (line data)						
[Format]	ASCII	SUB	W	nL	nH	kL	kH
	Hex	1A	57h	nL	nH	kL	kH
	Decimal	26	87	nL	nH	kL	kH
[Range]	$0 \leq nL + (nH \times 256) \leq 512$, ($0 \leq nL \leq 255$, $0 \leq nH \leq 3$) $0 \leq kL + (kH \times 256) \leq 512$, ($0 \leq kL \leq 255$, $0 \leq kH \leq 3$)						
[Description]	It writes 1 from $nL + nH \times 256$ to $kL + kH \times 256$.						
[Caution]	It is not deleted, till you power off, or you clear the command.						

SUB+'C'

[Name]	Clear (line data)		
[Format]	ASCII	SUB	C
	Hex	1A	43h
	Decimal	26	67
[Description]	It clears all of line zero (0).		
[Caution]	Please use this command to write the line again.		
	Please use the command line ON/ line OFF to write line 1 to speed up the progress.		

SUB+'O'

[Name]	Line ON		
[Format]	ASCII	SUB	O
	Hex	1A	4Fh
	Decimal	26	79
[Description]	The line data is valid ON. The line prints together, when you print the character.		

SUB+'F'

[Name]	Line OFF		
[Format]	ASCII	SUB	F
	Hex	1A	46h
	Decimal	26	70
[Description]	The line is valid OFF. The line data is preserved.		

SUB+'P'

[Name]	Print line 1 dot line (Vertical,Horizontal)		
[Format]	ASCII	SUB	P
	Hex	1A	50h
	Decimal	26	80
[Description]	It prints line 1 dot line.		

[**Caution**] Please do not use this command, when you print any character, or any graphic.
Please use the command Line ON.
Please use this command, when you print the line at the space.

ESC+'D'+n1...nk+NUL

[Name]	Set the horizontal position				
[Format]	ASCII	ESC	D	n1...nk	NUL
	Hex	1B	44h	n1...nk	00
	Decimal	27	68	n1...nk	0
[Range]	$1 \leq n \leq 255, 0 \leq k \leq 32$				
[Descript]	Set the horizontal tab position				
[Caution]	n : Indicating the figures from the start position of line to set position				
	K : indicating the total tabs a line				

ESC+SP+n

[Name]	Set the space amount on the right of ASCII character			
[Format]	ASCII	ESC	SP	n
	Hex	1B	20h	n
	Decimal	27	32	n
[Range]	$0 \leq n \leq 255$			
[Initial Value]	n=0			
[Descript]	Set in n x 0.125mm the space amount on the right of ASCII character			
[Caution]	Set the Korean space in FS+'S'+n			

ESC+'!' +n

[Name]	Font decoration			
[Format]	ASCII	ESC	!	n
	Hex	1B	21h	n
	Decimal	27	33	n
[Range]	0≤n≤255			
[Initial]	n=0			
[Description]	It sets the font decoration in the same time.			

Bit	Function	Hex	Decimal
0	0: Font 12x24, 24x24	00h	0
	1: Font 8x16, 16x16	01h	1
1	-	-	-
2	-	-	-
3	0: Cancel the highlight	00h	0
	1: Set the highlight	08h	8
4	0: Cancel the extension in Vertical	00h	0
	1: Set the extension in Vertical	10h	16
5	0: Cancel the extension in Horizontal	00h	0
	1: Set the extension in Horizontal	20h	32
6	-	-	-
7	0: Cancel the underline	00h	0
	1: Set the underline	80h	128

ESC+'\$'+nL+nH

[Name]	Set absolute poision				
[Format]	ASCII	ESC	\$	nL	nH
	Hex	1B	24h	nL	nH
	Decimal	27	36	nL	nH
[Range]	0≤nL+nH×256≤65535, 0≤nL≤255, 0≤nH≤255				
[Initial Value]	nL=0, nH=0				
[Descript]					

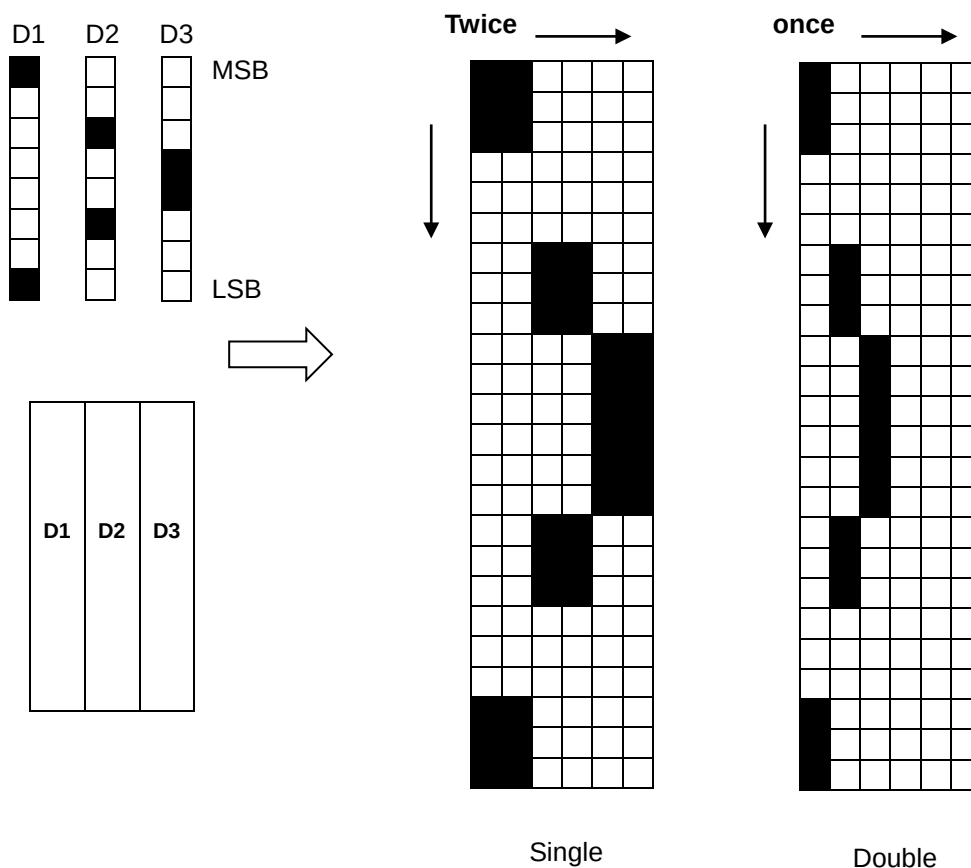
Move the printing position from left ending space to (nL+nH×256)×0.125mm
Move the printing position in left ending once printing position is over.

ESC+'*'+m+nL+nH+d1+...+dk

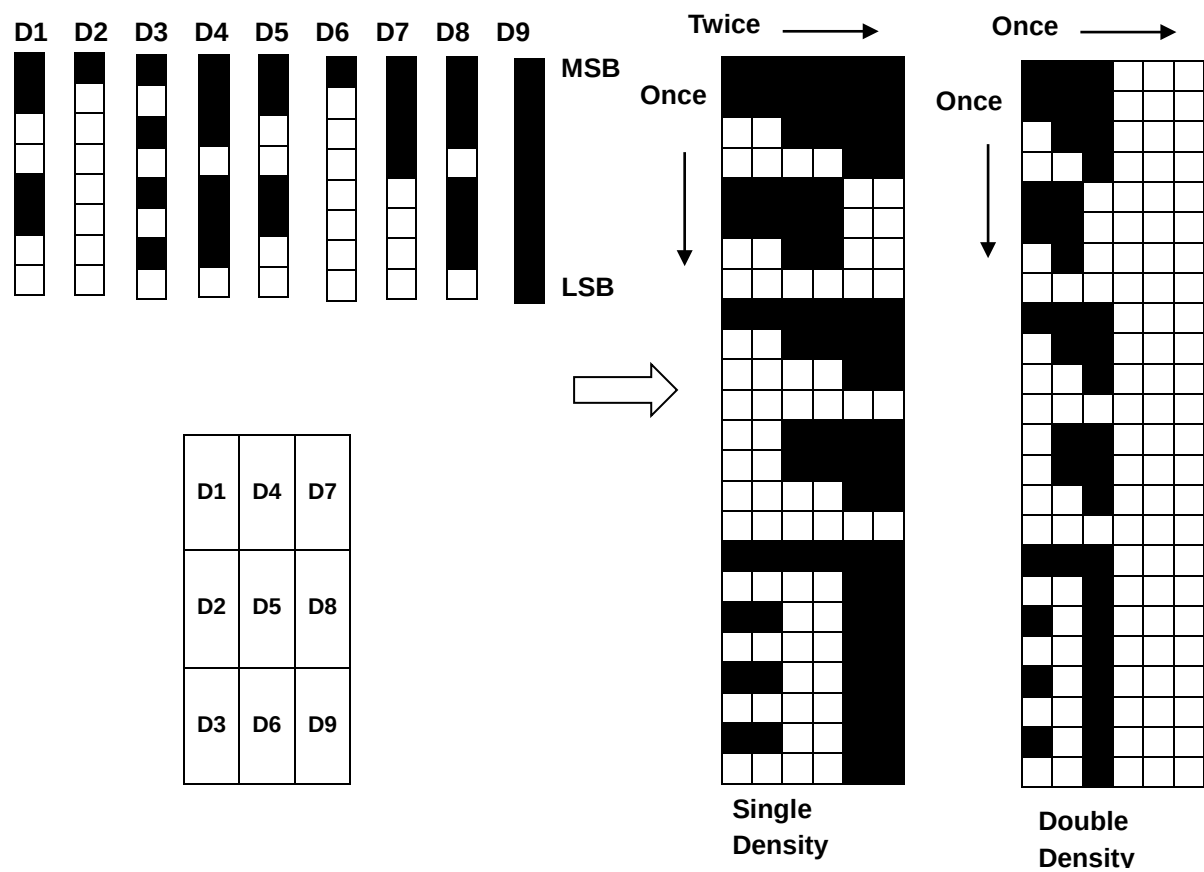
[Name]	Set the bitmap image						
[Format]	ASCII	ESC	*	m	nL	nH	d1...dk
	Hex	1B	2Ah	m	nL	nH	d1...dk
	Decimal	27	42	m	nL	nH	d1...dk
[Range]	m=0,1,32,33						
	1≤nL+nH×256≤1023, 0≤nL≤255, 0≤nH≤3, 0≤d≤255						
[Descirpt]	Due to fixing nL+nHx256, Printing from bit data to graphic data in Mode m						

m	Mode	Dots in vertical	Dots in horizontal	Data (k)
0	8dots Single Density	8	224	$nL+nH \times 256$
1	8dots Double Density	8	448	$nL+nH \times 256$
32	24dots Single Density	24	224	$(nL+nH \times 256) \times 3$
33	24dots Double Density	24	448	$(nL+nH \times 256) \times 3$

•8 dots Mode



•24 dots Mode



ESC+'-' +n

[Name] Set / Cancel underline
[Format] ASCII ESC - n
Hex 1B 2Dh n
Decimal 27 45 n
[Range] 0≤n≤255,
[Invital Value] n=0,
[Descript] Set / Cancel underline

n	Function
0	Cancel underline
1	Set underline in thick 0.125mm
2	Set underline in thick 0.25mm
3	Set underline in thick 0.375mm
4	Set underline in thick 0.5mm
5	Set underline in thick 0.625mm
6	Set underline in thick 0.75mm
7	Set underline in thick 0.875mm

ESC+'2'

[Name] Set the interval of initial line
[Format] ASCII ESC 2
Hex 1B 32h
Decimal 27 50
[Range] 0≤n≤255,
[Initial Value] n=0
[Descirpt] Set the interval of initial value in 4mm

ESC+'3'+n

[Name]	Set the interval of line			
[Format]	ASCII	ESC	3	n
	Hex	1B	33h	n
	Decimal	27	51	n
[Range]	0≤n≤255,			
[Initial Value]	n=0			
[Descript]	Set the interval of line in n x 0.125mm			

ESC+'@'

[Name]	Rest printer			
[Format]	ASCII	ESC	@	
	Hex	1B	40h	
	Decimal	27	64	
[Range]	0≤n≤255,			
[Descript]	Clear buffer & Initialize all parameter			

ESC+'E'+n

[Name]	Set the font in thick			
[Format]	ASCII	ESC	E	n
	Hex	1B	45h	n
	Decimal	27	69	n
[Range]	0≤n≤255,			
[Initial Value]	n=0			
[Descript]	n=0, cancel the font in thick			
	n=1, set the font in thick			

ESC+'G'+n

Name]	Set the printing double for font thickness			
[Format]	ASCII	ESC	G	n
	Hex	1B	47h	n
	Decimal	27	71	n
[Range]	0≤n≤255,			
[Initial Value]	n=0.			
[Descript]	n=0. cancel the printing twice for font thickness.			
	n=1. set the printing twice for font thickness.			

ESC+'J'+n

[Name]	Feeding			
[Format]	ASCII	ESC	J	n
	Hex	1B	4Ah	n
	Decimal	27	74	n
[Range]	0≤n≤255			
[Descript]	Printing the data inner buffer, feeding in n x 0.125mm			

ESC+'j'+n

[Name]	Back Feeding			
[Format]	ASCII	ESC	j	n
	Hex	1B	6Ah	n
	Decimal	27	106	n
[Range]	0≤n≤255			
[Descript]	Printing the data inner buffer and back feeding in n x 0.125mm			

ESC+'M'+n

[Name]	Select font			
[Format]	ASCII	ESC	M	n
	Hex	1B	4Dh	n
	Decimal	27	77	n
[Range]	0≤n≤2			
[Initial Value]	n=0			
[Descript]	Select printer font			

n			
Precedence 4bits(Korean fonts)		Subordinate 4bits (ASCII)	
0000	Korean 24x24 Gothic	0000	Korean 24x24 Gothic
0001	Korean 16 x 16 General	0001	Korean 16 x 16 General
0010	Japanese 24 x 24 Bodoni	0010	Japanese 24 x 24 Bodoni
0011	Chinese 24 x 24 Gothic	0011	Chinese 24 x 24 Gothic

Notice : When you set up one of fonts, you can use “Memory Switch Setting program “ without commend. If you need any more information, please refer to How to use Memory Switch Setting Program.

* **Caution** : In case of Big Font as 56x88, it would be possible to extend font size as much as Double(Width and Length) and other fonts would be possible to extend the font size as Octuple

ESC+'R'+n

[Name]	Select the International character			
[Format]	ASCII	ESC	R	n
	Hex	1B	52h	n
	Decimal	27	82	n
[Range]	0≤n≤13			
[Initial Value]	n=13			
[Descript]	Select the international character as follows:-			

n	Country Name
0	USA
1	France
2	Germany
3	England
4	Denmark1
5	Sweden
6	Italian
7	Spain1
8	Japanese
9	Norway
10	Denmark2
11	Spain2
12	Latin America
13	Korea

ESC+'a'+n

[Name]	Align the printing			
[Format]	ASCII	ESC	a	n
	Hex	1B	61h	n
	Decimal	27	97	n
[Range]	0≤n≤2			
[Initial Value]	n=0			
[Descript]	Align the printing position			

n	Printing Position
0	Left
1	Middle
2	Right

ESC+'d'+n

[Name]	Printing and feeding 'n' line			
[Format]	ASCII	ESC	d	n
	Hex	1B	64h	n
	Decimal	27	100	n
[Range]	0≤n≤255			
[Descript]	Printing the date & feeding 'n' line			

ESC+'{' +n

[Name]	Turning 180°			
[Format]	ASCII	ESC	d	n
	Hex	1B	7Bh	n
	Decimal	27	123	n
[Range]	0≤n≤255			
[Initial Value]	n=0			
[Descript]	Set the reverse image			
[Caution]	Move the standard from the left to the right			

n	Function
0	Cancel 180°
1	Set 180°

ESC+'t'+n

[Name]	International code page			
[Format]	ASCII	ESC	t	n
	Hex	1B	74h	n
	Decimal	27	116	n
[Range]	0≤n≤5 14≤n≤17			
[Initial Value]	n=0			
[Descript]	You can see the following table of the international code page.			
[Caution]	It is valid, if you direct the command SUB+"x" for 1 byte.			
	It is not valid, if you direct the command SUB+"x" for 2 bytes.			

n	code page	n	code page
0	PC437(US)	6	PC850((Multilingual)
1	KANA(JAPAN)	7	PC860(Portugal)
2	GREEK	8	Windows1252
3	Windows1251	9	Iran System Encoding Standard
4	PC866(Cyrillic #2)	10	PC857(Turkish)
5	Windows1250 (Poland)		

ESC+'S'

[Name] Set the Standard mode

[Format] ASCII ESC S
 Hex 1B 53h
 Decimal 27 83

[Descript] Switches from page mode to standard mode and the data is deleted at the page.

ESC+'L'

[Name] Select page mode

[Format] ASCII ESC L
 Hex 1B 4Ch
 Decimal 27 76

[Range] 0≤n≤255

[Initial Value] n=0

[Descript] Switches from standard mode to page mode

ESC+FF

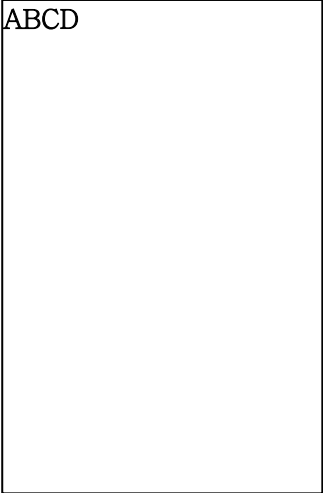
[Name] Printing as the page mode

[Format] ASCII ESC FF
 Hex 1B 0Ch
 Decimal 27 12

[Descript] It prints the data at the page mode.
 (The data is NOT deleted at the page.)

[Name]	Select print direction in page mode			
[Format]	ASCII	ESC	T	n
	Hex	1B	54h	n
	Decimal	27	84	n
[Range]	0≤n≤3			
[Initial Value]	n=0			
[Descript]	Select the print direction & start position in page mode			

•n=0(Left→Right),



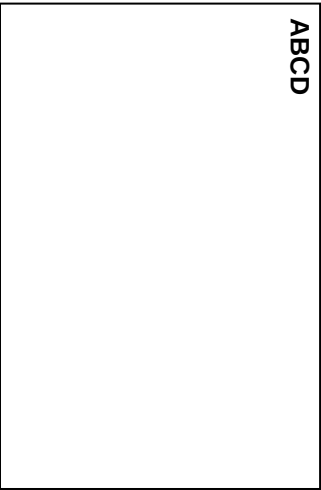
•n=1(Bottom→Top),



•n=2(Right→Left),



•n=3(Top→Bottom),



[Name] Set printing area in page mode

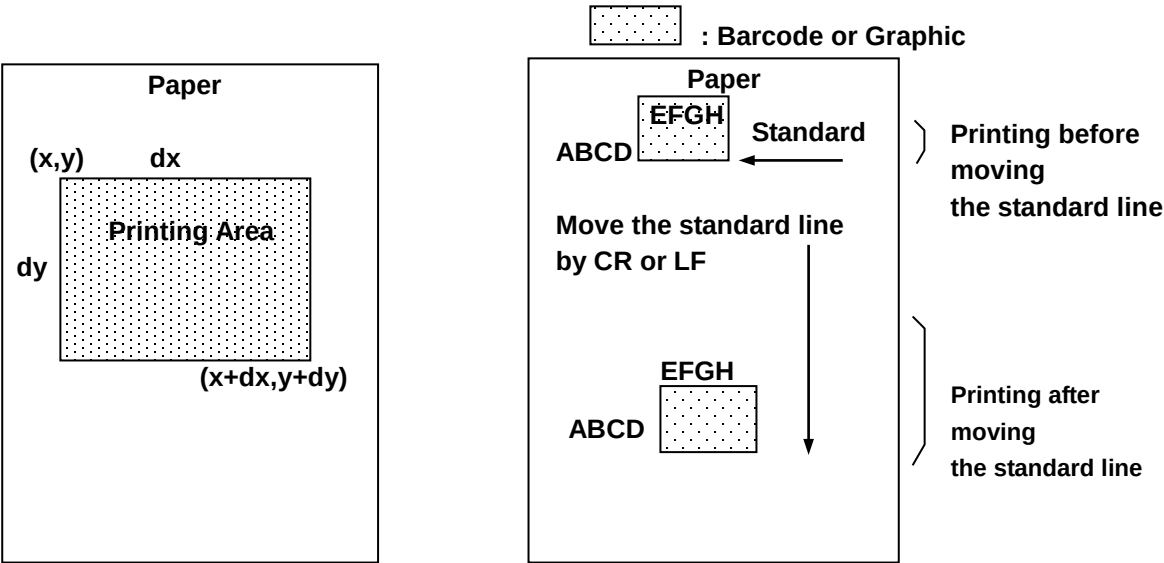
[Format] ASCII ESC W xL xH yL yH dxL dxH dyL dyH
Hex 1B 57h xL xH yL yH dxL dxH dyL dyH
Decimal 27 87 xL xH yL yH dxL dxH dyL dyH

[Range] $0 \leq xL + xH \times 256 \leq 65535$ ($0 \leq xL \leq 255$, $0 \leq xH \leq 255$)
 $0 \leq yL + yH \times 256 \leq 65535$ ($0 \leq yL \leq 255$, $0 \leq yH \leq 255$)
 $1 \leq dxL + dxH \times 256 \leq 65535$ ($0 \leq dxL \leq 255$, $0 \leq dxH \leq 255$)
 $1 \leq dyL + dyH \times 256 \leq 65535$ ($0 \leq dyL \leq 255$, $0 \leq dyH \leq 255$)

[Initial Value] $(xL + xH \times 256) = 0$ (0mm, $xL = 0$, $xH = 0$)
 $(yL + yH \times 256) = 0$ (0mm, $yL = 0$, $yH = 0$)
 $(dxL + dxH \times 256) = 448$ (56mm, $dxL = C0h$, $dxH = 01h$)
 $(dyL + dyH \times 256) = 1200$ (150mm, $dyL = B0h$, $dyH = 04h$)

[Descript] Set printing area & starting point
Horizontal starting point : $(xL + xH \times 256) \times 0.125\text{mm}$
Vertical starting point : $(yL + yH \times 256) \times 0.125\text{mm}$
Horizontal size : $(dxL + dxH \times 256) \times 0.125\text{mm}$
Vertical size : $(dyL + dyH \times 256) \times 0.125\text{mm}$

[Caution] The maximum page width is available 56mm
The maximum page length is available 150mm
Barcode & graphic data is executed as per standard line,
If the size exceed the standard line, move the standardline by CR or LF.



FS+'!' +n

[Name] Set the printing mode in Korean

[Format] ASCII FS ! n
Hex 1C 21h n
Decimal 28 33 n

[Range] 0≤n≤255

[Initial Value] n=0

[Descript] Set the printing mode in Korean

[**Caution**] Only valid in Koean

Bit	Function	Hex	Decimal
0	-	00h	0
1	-	00h	0
2	Cancel the horizontal extension	00h	0
	Set the horizontal extension	04h	4
3	Cancel the vertical extension	00h	0
	Set the vertical extension	08h	8
4	-	00h	0
5	-	00h	0
6	-	00h	0
7	Cancel the underline	00h	0
	Set the underline	80h	128

FS+'&'

[Name] Set to print Korean mode (2bytes Mode)

[Format] ASCII FS &
Hex 1C 26h
Decimal 28 38

[Descript] Set to print Korean mode (2bytes Mode)

[**Caution**] Set to print Korean mode in extended graphic mode
Appointment is not required in Korean mode, due to auto detection.
(Ref.SUB+'x'+n command)

FS+'.'

[Name] Cancel Korean mode (2Bytes mode)

[Format] ASCII FS .
Hex 1C 2Eh
Decimal 28 46

[Descript] Cancel Korean mode (2Bytes mode)

[**Caution**] In case of cancel 2 bytes mode in extended graphic mode
Appointment is not required due to auto detection in Korean mode
(Ref.SUB+'x'+n command)

FS+'-' +n

[Name]	Set the underline of Korean			
[Format]	ASCII	FS	-	n
	Hex	1C	2Dh	n
	Decimal	28	45	n
[Range]	0≤n≤2			
[Initial Value]	n=0			
[Descript]	Set the underline of Korea			

n	Function
0	Cancel the underline of Korean
1	Set the thickness of underline in 0.125mm
2	Set the thickness of underline in 0.25mm

FS+'S'+n1+n2

[Name]	Set the space between Korean characters				
[Format]	ASCII	FS	S	n1	n2
	Hex	1C	53h	n1	n2
	Decimal	28	83	n1	n2
[Range]	0≤n1≤255, 0≤n2≤255				
[Initial Value]	n=0				
[Descript]	Set the space between Korean characters				
	Set the left space in n1×0.125mm				
	Set the right space in n2×0.125mm				

FS+'W'+n

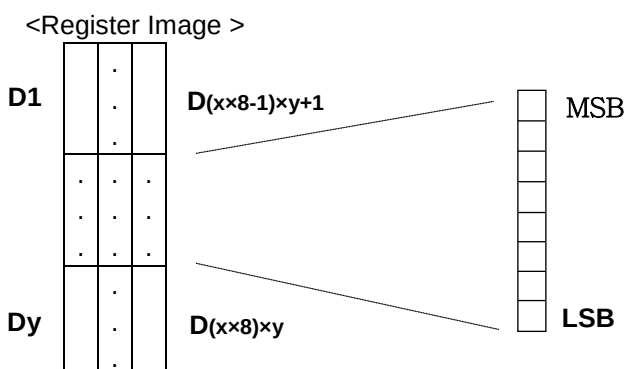
[Name]	Set the font size in Korean			
[Format]	ASCII	FS	W	n
	Hex	1C	57h	n
	Decimal	28	87	n
[Range]	0≤n1≤255			
[Initial Value]	n=0			
[Descript]	Set the Korean font size twice (Horizontal×Vertical) in Korean			
	n=0, Cancel the font size two times			
	n=1, Set the font size two times			

FS+'q'+n+(xL+xH+yL+yH+d1...dk)1.....+(xL+xH+yL+yH+d1...dk)n

[Name] Register logo (bitmap image) non volatilization
 [Format] ASCII FS q n (xL xH yL yH d1..dk)1...(xL xH yL yH d1..dk)n
 Hex 1C 71h n (xL xH yL yH d1..dk)1...(xL xH yL yH d1..dk)n
 Decimal 28 113 n (xL xH yL yH d1..dk)1...(xL xH yL yH d1..dk)n
 [Range] $1 \leq n \leq 255$
 $0 \leq xL + xH \times 256 \leq 65535$ ($0 \leq xL \leq 255$, $0 \leq xH \leq 255$)
 $0 \leq yL + yH \times 256 \leq 65535$ ($0 \leq yL \leq 255$, $0 \leq yH \leq 255$)
 $0 \leq d \leq 255$
 $k = (xL + xH \times 256) \times (yL + yH \times 256) \times 8$, Capable register : 64kbytes

[Descript.] Register the logo non-volatilization
 n : Total unit of N/V logo
 xL,xH : Set the horizontal dot in $(xL + xH \times 256) \times 8$
 yL,yH : Set the vertical dot in $(xL + xH \times 256) \times 8$
 k : Bitmap image of a N/V logo

[Caution] Register various as much as NV's capa.
 Required to delete all if (it is) registered again.
 Renewable registration / deletion at 100000 cycles,
 It's not recommended frequent registration / deletion,
 due to memory damage



FS+'p'+n+m

[Name] Printing N/ V logo
 [Format] ASCII FS p n m
 Hex 1C 70h n m
 Decimal 28 112 n m
 [Range] $1 \leq n \leq 255$, $0 \leq m \leq 3$
 [Initial Value] n=0
 [Descript.] m : printing the registered N/V in 'm' mode
 n : indicating the regisitered logo in the 'n'.

m	Printing mode
0	Standard
1	Horizontal extension
2	Vertical extension
3	Horizontal,vertical extension in the same time

GS+'!' +n

[Name]	Set the proportion of character extension			
[Format]	ASCII	GS	!	n
	Hex	1D	21h	n
	Decimal	29	33	n
[Range]	0≤n1≤255 (horizontal / vertical portions is restricted maxim value 8)			
[Initial Value]	n=0			
[Descript.]	Set the proportion of character extension			
[Caution]	Caculate the numeric value,			
	if vertical & horizontal is extended in the same time			
	ex.) x3 (Horizontal Rate), x3(Vertical Rate) : n=32+2=34			

Bit	Function
0-3	Set the extension proportion in vertical
4-7	Set the extension proportion in horizontal

Extension in Horizontal

n(Hex)	n(Decimal)	Rate
00h	0	x1
10h	16	x2
20h	32	x3
30h	48	x4
40h	64	x5
50h	80	x6
60h	96	x7
70h	112	X8

Extension in Vertica

n(Hex)	n(DecimaL)	Rate
00h	0	x1
01h	1	x2
02h	2	x3
03h	3	x4
04h	4	x5
05h	5	x6
06h	6	x7
07h	7	X8

GS+'('+'K'+pL+pH+fn+m (fn=49)

[Name]	Set the printing density							
[Format]	ASCII	GS	(	K	pL	pH	fn	m
	Hex	1D	28h	4Bh	pL	pH	fn	m
	Decimal	29	40	75	pL	pH	fn	m
[Range]	pL=2, pH=0, fn=49 1≤m≤30							
[Initial Value]	It set up automatically as per the voltage. (Ref.Table below)							
[Descript]	Set the printing density							

Drive Voltage (Vp)	m
5 ~ 5.4V	26
5.5 ~ 5.9V	16
6 ~ 6.4V	10
6.5 ~ 6.9V	8
7.0 ~ 7.4V	7
7.5 ~ 7.9V	6
8.0 ~ 8.3V	5
8.4V ~ 8.5V	4

※ Once it is a power on reset, the density is set up automatically,
You can choose the density as per the conditions, such as power,printing quality.

GS+'('+'K'+pL+pH+fn+m (fn=97)

[Name]	Operating thermal head partially							
[Format]	ASCII	GS	(	K	pL	pH	fn	m
	Hex	1D	28h	4Bh	pL	pH	fn	m
	Decimal	29	40	75	pL	pH	fn	m
[Range]	pL=2, pH=0, fn=97 0≤m≤4							
[Initial Value]	m=2 (3 partition)							
[Descript]	Set the operation of partial thermal head							
[Caution]	This function is effective in case of power capa is short.							
	The current electric will be reduced as big as the partition.							

m	Thermal Head Partition operation
0	First Partition
1	Second Partition
2	Third Partition
3	Fourth Partition
4	Fifth Partition

GS+'B'+n

[Name]	Reverse printing in black			
[Format]	ASCII	GS	B	n
	Hex	1D	42h	n
	Decimal	29	66	n
[Range]	0≤n≤255			
[Initial Value]	n=0			
[Descript]	Reverse printing in black			
	n=0, standard printing			
	n=1, reverse printing in black			

GS+'H'+n

[Name]	Select the printing position of HRI characters (Barcode)			
[Format]	ASCII	GS	H	n
	Hex	1D	48h	n
	Decimal	29	72	n
[Range]	0≤n≤3			
[Initial Value]	n=0			
[Descript]	Select the printing positions of numerical value & characters			

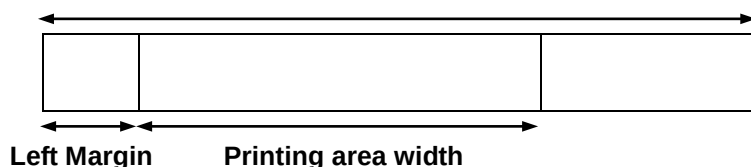
n	Printing Position
0	Non printing
1	Above the barcode
2	Below the barcode
3	Both above & below barcode

GS+'L'+nL+nH

[Name]	Select the left margin				
[Format]	ASCII	GS	L	nL	nH
	Hex	1D	4Ch	nL	nH
	Decimal	29	76	nL	nH
[Range]	$0 \leq nL \leq 255, 0 \leq nH \leq 255$				
[Initial Value]	$nL + nH \times 256 = 0$ (nL=0, nH=0)				
[Descript]	The left margin is set in $(nL + nH \times 256) \times 0.125\text{mm}$.				

GS+'W'+nL+nH

[Name]	Set printing area width				
[Format]	ASCII	GS	W	nL	nH
	Hex	1D	57h	nL	nH
	Decimal	29	87	nL	nH
[Range]	$0 \leq nL \leq 255, 0 \leq nH \leq 255$				
[Initial Value]	$nL + nH \times 256 = 448$ (56mm, nL=0, nH=0)				
[Descript]	Set printing area width from the left margin in $(nL + nH \times 256) \times 0.125\text{mm}$				

Printing area**GS+'h'+n**

[Name]	Select barcode height			
[Format]	ASCII	GS	h	n
	Hex	1D	68h	n
	Decimal	29	104	n
[Range]	$1 \leq n \leq 255$			
[Initial Value]	$n=162$ (20.25mm)			
[Descript]	Select barcode height by $n \times 0.125\text{mm}$			

GS+'k'+m+d1...dn+NUL

[Name]	Print barcode					
[Format]	ASCII	GS	k	m	d1...dn	NUL
	Hex	1D	6Bh	m	d1...dn	00h
	Decimal	29	107	m	d1...dn	0
[Range]	$1 \leq m \leq 7$, n & d depend on barcode system used					
[Descript]	Refer the table as below					

m	Barcode system	n (Barcode data numbers)	d (barcode data)
1	UPC-E	n=7 (check digit is automatically added)	48≤d≤57
2	EAN13	n=12 (check digit is automatically added)	48≤d≤57
3	EAN8	n=7 (check digit is automatically added)	48≤d≤57
4	CODE39	1≤n (Start & Stop characteres is automatically added)	48≤d≤57, 65≤d≤90 d=32,36,37,43,45,46,47
5	ITF(I of 2/5)	1≤n (Only even number)	48≤d≤57
6	CODABAR	1≤n	48≤d≤57, 65≤d≤68 d=36,43,45,46,47,58
7	CODE128	2≤n≤255 (Check digit , Stop character Is automatically added)	0≤d≤127

[Caution] In CODE128, set additional "{" in 2bytes when the special character as below

Special character	Barcode data		
	ASCII	Hex	Decimal
SHIFT	{S	7Bh, 53h	123, 83
CODE A	{A	7Bh, 41h	123, 65
CODE B	{B	7Bh, 42h	123, 66
CODE C	{C	7Bh, 43h	123, 67
FNC1	{1	7Bh, 31h	123, 49
FNC2	{2	7Bh, 32h	123, 50
FNC3	{3	7Bh, 33h	123, 51
FNC4	{4	7Bh, 34h	123, 52
"{"	{{	7Bh, 7Bh	123, 123

GS+'w'+n

[Name] Set the vertical size of barcode
 [Format] ASCII GS w n
 Hex 1D 77h n
 Decimal 29 119 n
 [Range] 1≤n≤4
 [Initial Value] n=2
 [Descript.] Set the horizontal size of barcode

n	Module barcode width	Two level barcode	
		Narrow	Wide
1	0.25mm	0.125mm	0.375mm
2	0.375mm	0.25mm	0.625mm
3	0.5mm	0.375mm	1mm
4	0.625mm	0.5mm	1.25mm

* Multi Level barcode : UPC-E, EAN13, EAN8

* 2 level barcode : CODE39, ITF, CODABAR

GS+'r'+n

[Name]	Transmit status			
[Format]	ASCII	GS	r	n
	Hex	1D	72h	n
	Decimal	29	114	n
[Range]	n=1			
[Descript]	Transmit current status of printer			
[Caution]	The status is not ready till the printer is offline, The command is executed when the data in receive buffer is developed Therefore automatic status function (GS+'a'+n) is to use better, It is used for re-confirm in on-line after automatic status is received			

GS+'a'+n

[Name]	Enable / Disable automatic status back (ASB)			
[Format]	ASCII	GS	a	n
	Hex	1D	61h	n
	Decimal	29	97	n
[Range]	0≤n≤1			
[Initial Value]	n=1			
[Descript]	Enable / Disable ASB			
	If the status is changed after checking the printer status, the status is automatically executed.			
	This command is executed to enable or disable.			

n	Function
0	Disable automatic status back
1	Enable automatic status back

<Status transmission data >

Bit	Satus	Hex	Decimal
0	0 : Paper	00h	0
	1 : No paper	01h	1
1	0 : Printer head down	00h	0
	1 : Printer head up	02h	2
2	0 : Paper w/o jamm	00h	0
	1 : Paper with jamm	04h	4
3	0 : Paper enough	00h	0
	1 : Paper Near End	08h	8
4	0 : Print complete	00h	0
	1 : Print or Feeding	10h	16
5	0	00h	0
6	0	00h	0
7	0	00h	0

※ the status of bit 4 is effective when the realtime conducts
the command DLE + EOT + n, The others are fixed '0'.

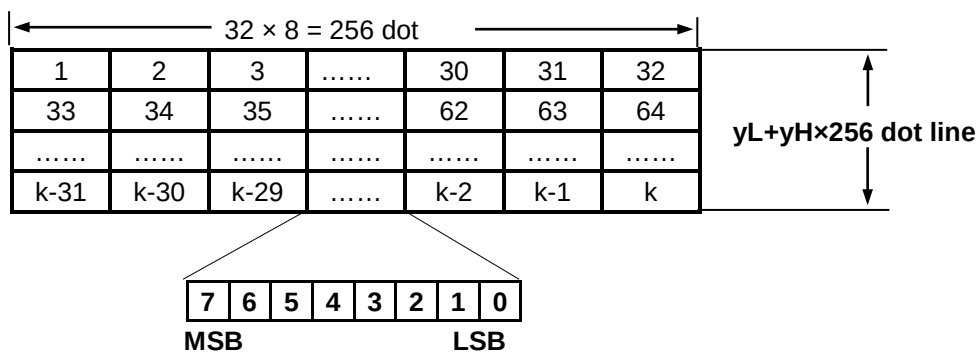
[Name]	Laster bit image									
[Format]	ASCII	GS	v	0	m	xL	xH	yL	yH	d1..dk
	Hex	1D	76h	30h	m	xL	xH	yL	yH	d1..dk
	Decimal	28	118	48	m	xL	xH	yL	yH	d1..dk
[Range]	$0 \leq m \leq 3$ or $48 \leq m \leq 51$,									
	$1 \leq (xL + xH \times 256) \leq 150$ ($0 \leq xL \leq 150$, $xH = 0$)									
	$1 \leq (yL + yH \times 256) \leq 436$ ($0 \leq yL \leq 255$, $0 \leq yH \leq 1$)									
	$0 \leq d \leq 255$ ($yL + yH \times 256$)									
[Descript]	K (All data) = $(xL + xH \times 256) \times (yL + yH \times 256)$									
	The laster bit image will be recognized in mode 'm'.									
	xL,xH appoint the data (byte) of horizontal at image data. yL,yH appoint the dta (dot line) of vertical at image data.									

* d is a data for laster bit.

m	Mode	Expansion
0, 48	Normal	x1
1, 49	Horizontal expansion	x2
2, 50	Vertical expansion	x2
3, 51	Horizontal,Vertical expansion	x2 (Horizontal & Vertical)

Ex) Expansion image

$xL + xH \times 256 = 32$ byte,



DLE+ENQ+n

[Name]	Realtime request the printer to be clear each buffer			
[Format]	ASCII	DLE	ENQ	n
	Hex	10h	05h	n
	Decimal	16	5	n
[Range]	n=2			
[Descript]	The realtime clear each buffer as soon as this command receive.			
[Caution]	It's only valid as you switch up '1' as 'ON'.			
	This command is only effective if the printer is off.			
	This command is only effective if it receives the data as same command.			
	This command is not effective if it's online.			

[Name]	Realtime status transmission			
[Format]	ASCII	DLE	EOT	n
	Hex	10h	04h	n
	Decimal	16	4	n
[Range]	n=2			
[Descript]	The real time transmits a byte as soon as this command receives.			
[Caution]	It's only valid as you switch up '1' as 'ON'.			
	Please refer status table at the page 29.			
	If the command is received same data, it could be same operation (Bit image data,etc)			

6. Widows Driver

6-1) Set up the function.

- 1) Please open the screen of printer / fax, and click the basic setting (I) of the general tap.
- 2) Please click (V).
- 3) Please refer to the following images, and set up each details.

6-2) Set up the paper.

Please set the form feeding after printing.

- 1) Please click the basic setting (I) of the general tap.
- 2) Please click the tap of paper /quality, and drop down paper providing.
- 3) Auto & Role Feeder : After printing, the form feeding is not conducted any more.
Please set up if the printing length is not regular.
You can't conduct the feeding, even you set up the space at the program Visual Basic.
We recommend you make the font size smaller, such as ".", and make the position the cutting.

Example)

'----- Example Dummy form feeding to cutting position -----

Printer.Print " " & vbLf

Printer.Print " " & vbLf

Printer.Print " " & vbLf

Printer.FontSize = 2

Printer.Print "."

' dummy print for form feeding

Printer.EndDoc

- 4) Page length Feeder : After printing, The form feeding will be conducted as long as the length is fixed. It is mostly used when the regular length is printed.

6-3) Set up the new paper.

You can make the size of paper you need.
Please refer the example of 60mm x 150mm as below.

- 1) Please open the screen of printer & fax, and click the server on file / menu.
- 2) Please choose the STANDARD(Size 80 x 400mm) as image.
- 3) Please tick 'new documentation (C)' as image.
- 4) Please type the width 6.0 cm / the height 15.0 cm as image.
- 5) Please click the 'form install' Ticket (Size 60 x 150mm) as image.
- 6) Please click the tap 'advanced' and set the paper Ticket(Size 60 x 150mm).

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. USB (User Interface)

Without using the Windows driver, you are able to check the printer status, and transmit / receive the data,

by using USB Interface DLL (HwaUSB.DLL) and OCX driver (HwaUSB.OCX).

7-1) DLL Interface

Please add the file HwaUSB.DLL at the folder System 32, or the folder SysWow64.

7-1-1) DLL function.

1) long UsbOpen(LPCTSTR SelPrinter);

Please open the port USB by the printer Model "HP-500"

- Parameters:
SelPrinter : Printer Model Name
- Return :
Open normal : 0
Open error : -3(minus)

2) long PrintStr(LPCTSTR data);

It prints the string.

- Parameters:
data : String datas
- Return :
Print normal : 1
Print error : 0

Notice : To prevent the loss of data for the print timeout ,
Please use the function 'NewRealRead' to check the status, and go to the next step,
when it's normal.

3) long PrintCmd(unsigned char data);

It prints the data one (1) byte.

Please use the 'PrintPackage function' as below, if there are a lot of datas to print.

Then you are able to increase the speed of the transmission.

- Parameters:
data : one (1) byte data (0~255)
- Return :
Print normal : 1
Print error : 0

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4)long NewRealRead(void);

It reads the printer status data as one (1) byte by the port USB.

- Parameters:
None
- Return :
Read normal : Printer status value.
Read error : -1(minus)

5)long PrintPacket(unsigned char *PacketBuf,unsigned long PacketLength);

It prints the data by the port USB, as much as the data at the transmission data buffer .

- Parameters:
PacketBuf : Transmission data buffer pointer.
PacketLength : Transmission data length

Notice : Please do not exceed more than 64 bytes max.

- Return :
Print normal : 1
Print error : 0

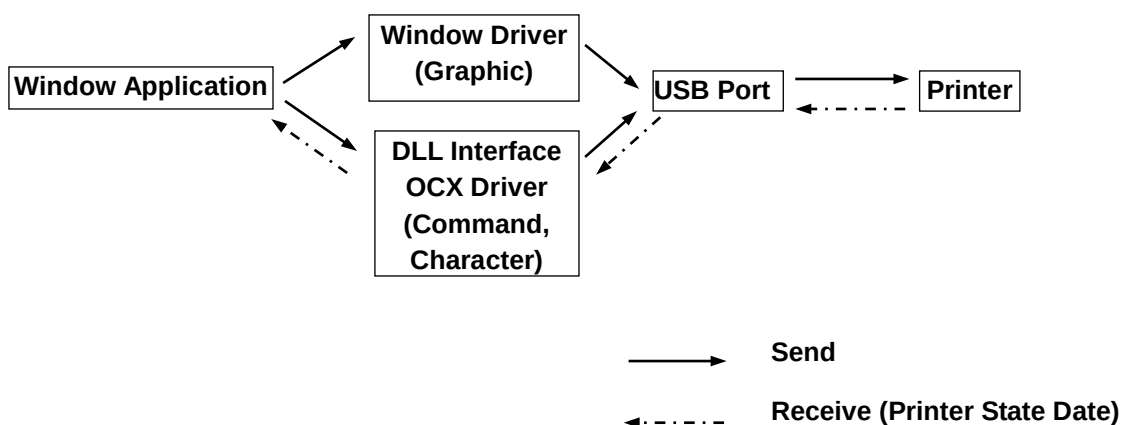
Notice Please do not use any function we don't provide, due to the debug usage.

Notice Please ask the sample program for more details.

7-2) Caution for using USB Interface

If you use the USB interface and windows drivers together, the data will not be printed in regular sequence. So please release the spool, when you wan to use the USB interface and window driver together. If you release the spool, the data receipt is only made by USB Interface.

※ The Data diafram of window application.



FCC Compliance Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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