

Receipt Printer
BTP-R580II

Programming Manual

Shandong New Beiyang Information Technology Co., Ltd.

REVISION HISTORY

[illegible]

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1 Overview

This manual classifies the printer commands into several kinds based on its functions, and also describes the applications of relative commands in detail depending on its sorts. Hopefully, it can help the programmers to get known of those commands.

1.1 Command classification

The commands of this receipt printer are classified as below:

Print commands: used for printing and feeding paper;

Position commands: to control the print position;

Character commands: to set character property;

Bitmap commands: to download and print bitmaps, including NV and RAM bitmap;

Status commands: used for printer status query;

Barcode commands: barcode print and property settings;

Other commands: used for periphery control, Macro-definition and initialization, etc.;

For command description, please refer to the detailed function of relative commands.

1.2 Key terms

Immediate commands: These commands are acted on immediately upon being received by the printer;

Print buffers: used to store figure data to be printed;

Page mode: Under this mode, the printer stores all data in a specified memory and thinks of this as a virtual page. The page is printed only when the printer receives print command either FF or ESC FF;

Standard mode: Standard mode is the default mode of printer, namely line mode. Under this mode, the printer prints and feeds paper upon printer line buffer full (data is enough for one print line) or receiving print command like LF;

HRI character: Barcode note character.

NV memory: Non-volatile memory in which data stored does not lose when power-down.
NV: Non-volatile;

RAM: Random Access Memory;

DPI: Print dots per inch (one inch equals to 25.4mm). It is used to identify the resolution of printer. Example, 203DPI means 203 print dots per inch. DPI: Dot Per Inch

Baseline: The standard position where character data in print buffers are stored. The figure below shows the position of ordinary characters in standard mode and page mode:



* When font A (12 x 24 dots) is selected, the height is 24 dots;

* When font B (9 x 17 dots) is selected, the height is 17 dots;

1.3 Command format

[Function] The name and function summary of commands;

[Format] The format of command data, such as ASCII, Hex and Decimal;

[Range] The value range of parameter in the command;

[Note] Explain the main features and application notices of commands;

[Default] The initial value used after the printer initialized;

[Relative] Other commands related to current command;

[Example] Example used for current or relative commands.

All command data in programming Demo use HEX. All normal fonts/characters are data. There is no explanation for the data of command such as 42 43, which is data. The font/character underlined and bold is a command, such as **1B 40**. All the data inside parentheses after all commands in Demo is used to explain the meanings of this command. The parentheses and data inside it are not the command to be transmitted to the printer.

2 Command description

2.1 Print commands

LF Print and feed one line

[Function]	Print the data in buffer and feed one line		
[Format]	ASCII	LF	
	Hex	0A	
	Decimal	10	
[Note]	This command sets the current position to the beginning of the line.		
[Relative]	ESC 2, ESC 3		

FF Print and feed paper

[Function]	Print all data in the buffer and return to the standard mode.		
[Format]	ASCII	FF	
	Hex	0C	
	Decimal	12	
[Notes]	This command is valid only in page mode.		
	The buffer data is cleared after being printed.		
	The printer does not execute paper cutting.		
	This command sets the current position to the beginning of the line.		
[Relative]	ESC FF, ESC L, ESC S		

CR Print and carriage return

[Function]	When the command is enabled, it equals to LF; it is ignored when disabled.		
[Format]	ASCII	CR	
	Hex	0D	
	Decimal	13	
[Notes]	• Set the print position to the beginning of the line.		
	• This command is set according to the printer configuration.		
[Relative]	LF		

ESC FF Print in page mode

[Function]	Print all the data in buffer in page mode		
[Format]	ASCII	ESC	FF
	Hex	1B	0C
	Decimal	27	12
[Notes]	• This command is enabled only in page mode.		
	• After printing, the printer does not clear the buffered data, setting values for ESC T and ESC W , and character position, etc..		
[Relative]	FF, ESC L, ESC S		

ESC J n Print and feed paper

[Function]	Print the data in buffer and feed paper [n × vertical/horizontal motion unit] inch.
[Format]	ASCII ESC J n Hex 1B 4A n Decimal 27 74 n
[Range]	0 ≤ n ≤ 255
[Notes]	<ul style="list-style-type: none"> • After printing is completed, this command sets the current print position to the beginning of the line. • The paper feed amount set by this command is not affected by the values set by ESC 2 or ESC 3. • The horizontal and vertical motion unit is specified by GS P. • In standard mode, the printer uses the vertical motion unit (y). • In page mode, this command functions as follows, depending on the direction and print starting position of the print area: <ol style="list-style-type: none"> ① When the print starting position is set to the upper left or lower right of the print area by ESC T, the vertical motion unit (y) is used; ② When the starting position is set to the upper right or lower left of the print area by ESC T, the horizontal motion unit (x) is used; • The maximum paper feed amount is 1016mm (40 inches). When the setting value exceeds the maximum, it is converted to the maximum automatically.
[Relative]	GS P
[Example]	1B 40 (Initialize the printer) 1D 50 CB CB (set the resolution to 203×203) 41 41 41 41 41 41 41 41 (data to be printed) 1B 4A 50 (print and feed paper 80/203 inch) 42 42 42 42 42 42 42 0A (data to be printed)

Result:

AAAAAAA

 80/203 Inch

 BBBBBBB

ESC d n Print and feed n lines

[Function]	Print the data in buffer and feed n lines (character line).
[Format]	ASCII ESC d n Hex 1B 64 n Decimal 27 100 n
[Range]	0 ≤ n ≤ 255
[Notes]	<ul style="list-style-type: none"> • This command sets the print starting position to the beginning of the line. • This command does not affect the line spacing set by ESC 2 or ESC 3.

- The maximum paper feed amount is 1016 mm. If the paper feed amount is more than 1016 mm, the printer feeds paper only 1016 mm.

[Relative] **ESC 2, ESC 3**

[Example] 1B 40 (Initialize the printer)


41 41 41 41 41 41 41 (data to be printed)

1B 64 02 (print and feed 2 character lines, 2/6 inch)

42 42 42 42 42 42 0A (data to be printed)

Result:

AAAAA
BBBBB



2.2 Location commands

HT Horizontal tab

[Function] Move the current position to the next tab position.

[Format] ASCII HT

Hex 09

Decimal 9

- [Notes]**
- This command is ignored unless the next horizontal tab position has been set.
 - If the next horizontal tab position exceeds the print area, the printer sets the current position to [Print width + 1].
 - Horizontal tab positions are set by **ESC D**.
 - If this command is received when the current position is at [print width + 1], the printer executes buffer-full action of the current line and move the print position to the beginning of the next line.
 - The default setting of the tab position is 8 ASCII characters (12×24).
 - When buffer of current line is full, the printer executes the actions as below:
 - ① In standard mode, the printer will print current line and set the print position to the beginning of next line;
 - ② In page mode, the printer will shift the line and set the print position to the beginning of next line.

[Relative] **ESC D**

[Example] 0A (set print position to the beginning of the line)

1B 40 (initialize the printer)

1B 53 (enter standard mode)

33 33 33 33 33 33

1B 44 08 10 1C 00 (set the horizontal tab position)

09 (move the print position to the next tab)

33 33 33 33

09 (the same as above)

33 33 33 33

09 (the same as above)

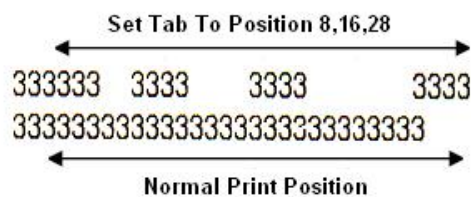
33 33 33 33

0A (print)

[illegible]

0A (print)

Result:



ESC \$ nL nH Set absolute horizontal print position

[Function] The distance from the beginning of the line to the current position is $(nL + nH \times 256) \times (\text{vertical or horizontal motion unit})$.

[Format]	ASCII	ESC	\$	nL	nH
	Hex	1B	24	nL	nH
	Decimal	27	36	nL	nH

[Range] $0 \leq nL \leq 255$
 $0 \leq nH \leq 255$

[Notes]

- Settings outside the specified print area are ignored.
- The horizontal and vertical motion units are specified by GS P.
- In standard mode, the horizontal motion unit (x) is used.
- In page mode, this command functions as follows, depending on the direction and print starting position of the print area:
 - ① When the starting position is set to the upper left or lower right of the print area by ESC T, the horizontal motion unit (x) is used;
 - ② When the starting position is set to the upper right or lower left of the print area by ESC T, the vertical motion unit (y) is used.

[Relative] ESC \, GS \$, GS \, GS P

[Example] Refer to ESC W.

ESC D n1...nk NUL **Set horizontal tab positions**

[Function]

- Set horizontal tab positions.
- Set a tab position at the nth column from the beginning of the line.
- There are k tab positions in all.

[Format]	ASCII	ESC	D	n1	nk	NUL
	Hex	1B	44	n1	nk	00
	Decimal	27	68	n1	nk	0

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

$0 \leq k \leq 32$

- [Notes]**
- The horizontal tab position is stored as a value of [character width × n]. The character width includes the right-side character spacing, and the double-width characters are set with twice the width of normal characters.
 - This command cancels the previous tab settings.
 - When $n = 8$, the current position is moved to column 9.
 - Up to 32 tab positions ($k = 32$) can be set. Data exceeding 32 tab positions is processed as normal data.
 - Tab positions are in ascending order and place a NUL code at the end.
 - When [n] k is less than or equal to the preceding value [n] k-1, tab setting is finished and the following data is processed as normal data.
 - **ESC D NUL** cancels all horizontal tab positions settings.
 - The previously specified tab positions do not change, even if the character width changes.
 - The character width is independent in standard and page mode.

[Default] The default tab positions are at intervals of 8 standard ASCII characters (12 × 24).

[Relative] HT

[Example] Refer to HT

ESC T n Select print area direction in page mode

[Function] Select the direction and starting position of print area in page mode.

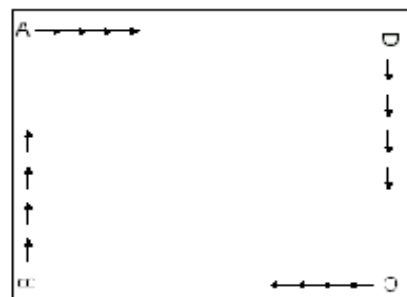
[Format]

ASCII	ESC	T	n
Hex	1B	54	n
Decimal	27	84	n

[Range] $0 \leq n \leq 3$ $48 \leq n \leq 51$

n specifies print direction and starting position of print area:

n	Print direction	Starting position
0,48	Left to right	Upper left (A in the figure)
1,49	Bottom to top	Lower left (B in the figure)
2,50	Right to left	Lower right (C in the figure)
3,51	Top to bottom	Upper right (D in the figure)



- [Notes]**
- When the command is input in standard mode, the printer executes only internal flag operation. This command does not affect printing in standard mode.
 - This command sets the starting position of the print data within the print area.
 - Parameters for horizontal or vertical motion unit (x or y) differ as follows, depending on the starting position of the print area:
 - ① If the print starting position is the upper left or lower right of the print area, data is buffered in the direction perpendicular to the paper feed direction:

Commands using horizontal motion unit: **ESC SP**, **ESC \$**, **ESC **

Commands using vertical motion unit: **ESC 3**, **ESC J**, **GS \$**, **GS **

- ② If the starting position is the upper right or lower left of the print area, data is buffered in the paper feed direction:

Commands using horizontal motion unit: **ESC 3**, **ESC J**, **GS \$**, **GS **

Commands using vertical motion unit: **ESC SP**, **ESC \$**, **ESC **

[Default] $n = 0$

[Relative] **ESC \$, ESC L, ESC W, ESC \, GS \$, GS P, GS **

[Example] **1B 4C** (enter page mode)

1D 50 CB CB (set the resolution)

1B 57 20 00 00 00 40 02 90 02 (set print area in page mode)

1B 54 00 (select print direction in page mode)

[illegible]

1B 54 01 (select print direction in page mode)

0A

1B 54 02 (select print direction in page mode)

0A

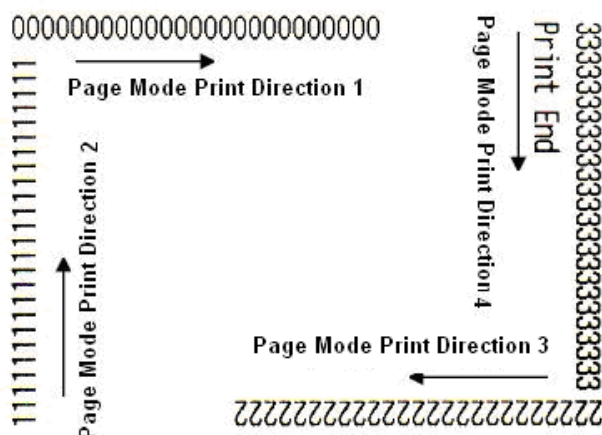
1B 54 03 (select print direction in page mode)

[illegible]

50 72 69 6E 74 20 45 6E 64

0C (print)

Result:



ESC W xL xH yL yH dxL dxH dyL dyH Set print area in page mode

[Function]	<ul style="list-style-type: none"> Define the horizontal starting position, vertical starting position, print area width, and print area height as follows:
-------------------	--

Horizontal starting position: $x0 = [(xL + xH \times 256) \times (\text{horizontal motion unit})]$

Vertical starting position: $y0 = [(yL + yH \times 256) \times (\text{vertical motion unit})]$

Print area width: $dx = [(dxL + dxH \times 256) \times (\text{horizontal motion unit})]$

Print area height: $dy = [(dyL + dyH \times 256) \times (\text{vertical motion unit})]$

[Format]

ASCII ESC W xL xH yL yH dxL dxH dyL dyH

Hex 1B 57 xL xH yL yH dxL dxH dyL dyH

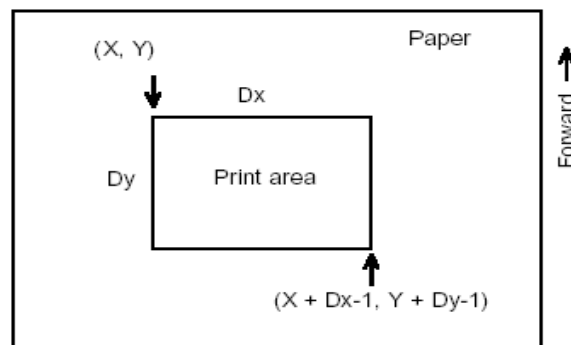
Decimal 27 87 xL xH yL yH dxL dxH dyL dyH

[Range]

$0 \leq xL, xH, yL, yH, dxL, dxH, dyL, dyH \leq 255$ (except $dxL = dxH = 0$ or $dyL = dyH = 0$)

[Notes]

- If this command is input in standard mode, the printer executes only internal flag operation. This command does not affect printing in standard mode.
- If the horizontal or vertical starting position is set outside the print area, the printer stops command processing and processes the following data as normal data.
- If the print area width or height is set to 0, the printer stops command processing and processes the following data as normal data.
- This command and **ESC T** together set the current print position.
- If (horizontal starting position + print area width) exceeds the printable area, the printable width is automatically set to (horizontal width — horizontal starting position).
- If (vertical starting position + print area height) exceeds the printable area, the printing height is automatically set to (vertical printable height — vertical starting position).
- The horizontal and vertical motion units are specified by **GS P**. Changing horizontal or vertical motion unit does not affect the current print area.
- Use the horizontal motion unit (x) to set the horizontal starting position and area width, and use the vertical motion unit (y) to set the vertical starting position and area height.
- When the horizontal starting position, vertical starting position, print area width, and print area height are defined as X, Y, Dx, and Dy respectively, the print area is set as shown in the figure below.



[Default]

Decided by printer configuration

[Relative]

CAN, ESC L, ESC T, GS P

[Example]

0A

1D 50 CB CB (set printer resolution to 203×203)

1B 4C (enter page mode)

1B 57 20 00 00 00 40 01 90 01 (set print area in page mode)

1B 24 00 00 (set absolute horizontal starting position to be starting point)

41

1B 24 32 00 (set absolute horizontal starting position to be 50/203 inch)

42

1B 24 64 00 (set absolute horizontal starting position to be 100/203 inch)

43

0A (new line)

1B 24 00 00 (set absolute horizontal starting position to be starting point)

41

1B 5C 32 00 (set relative horizontal starting position to be 50/203 inch)

42

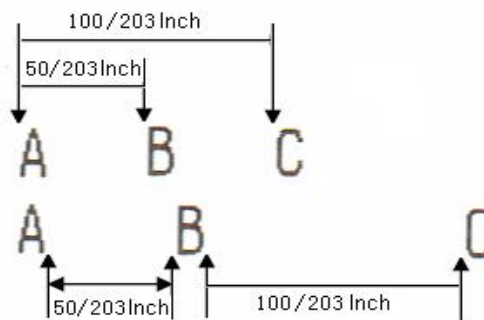
1B 5C 64 00 (set relative horizontal starting position to be 100/203 inch)

43

0A (new line)

0C (print in page mode)

Result:



ESC \ nL nH Set relative horizontal printing position

[Function] Set the print starting position based on the current position by using the horizontal or vertical motion unit.

- This command sets the distance from the current position to the print position to be $[(nL + nH \times 256) \times \text{horizontal or vertical motion unit}]$.

[Format]

ASCII	ESC	\	nL nH
Hex	1B	5C	nL nH
Decimal	27	92	nL nH

[Range]

$0 \leq nL \leq 255$
 $0 \leq nH \leq 255$

- [Notes]**
- Any setting that exceeds the printable area is ignored.
 - When pitch N is specified to the right: $nL + nH \times 256 = N$.
 - When pitch N is specified to the left, use the complement code: $nL + nH \times 256 = 65536 - N$.
 - The print starting position moves from the current position to $[N \times \text{horizontal or vertical motion unit}]$.

- The horizontal and vertical motion units are specified by **GS P**.
- In standard mode, the horizontal motion unit is used.
- In page mode, the horizontal or vertical motion unit differs as follows, depending on the direction and starting position of the print area:
 - ① When the starting position is set to the upper left or lower right of the print area using **ESC T**, the horizontal motion unit is used.
 - ② When the starting position is set to the upper right or lower left of the print area using **ESC T**, the vertical motion unit is used;

[Relative] **ESC \$, GS P**

ESC a n Select character align mode

[Function] Align all the print data in some specified align mode.

[Format] ASCII ESC a n
 Hex 1B 61 n
 Decimal 27 97 n

[Range] $0 \leq n \leq 2, 48 \leq n \leq 50$

Relationship between value of n and align mode:

n	Justification
0, 48	Left justification
1, 49	Centering
2, 50	Right justification

- [Notes]**
- This command is enabled only when processed at the beginning of the line in standard mode.
 - If this command is input in page mode, the printer performs only internal flag operations.
 - This command adjusts the space area according to commands **HT**, **ESC \$** or **ESC**.

[Default] n = 0

[Example] **0A**(Entering line mode)

1B 40(Initialization)

1B 61 00(Set left justification)

41 42 43 **0A**

41 42 43 44 **0A**

41 42 43 44 45 **0A**

1B 61 01(Setting centering)

41 42 43 **0A**

41 42 43 44 **0A**

41 42 43 44 45 **0A**

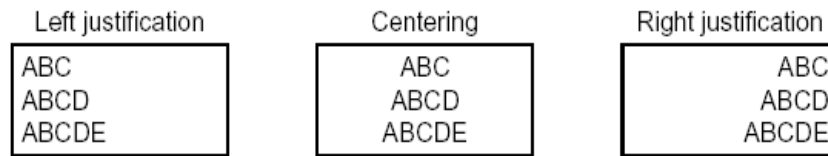
1B 61 02(Set right justification)

41 42 43 **0A**

41 42 43 44 **0A**

41 42 43 44 45 **0A**

Result:

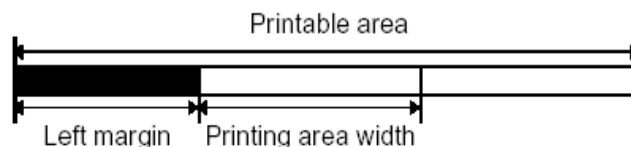


GS \$ nL nH Set the absolute vertical position in page mode

[Function]	This command sets the absolute vertical position in page mode.
[Format]	ASCII GS \$ nL nH Hex 1D 24 nL nH Decimal 29 36 nL nH
[Range]	$0 \leq nL \leq 255, 0 \leq nH \leq 255$
[Notes]	<ul style="list-style-type: none"> This command is enabled only in page mode. If the $[(nL + nH \times 256) \times (\text{vertical or horizontal motion unit})]$ exceeds the specified print area, this command is ignored. The horizontal position does not move after executing this command. The positions of relative commands are specified by ESC T. Depending on the print area direction and starting position specified by ESC T, this command operates as following: <ol style="list-style-type: none"> When the starting position is set to the upper left or lower right, this command sets the absolute position in the direction which is parallel to the paper feed direction. When the starting position is set to the upper right or lower left, this command sets the absolute position in the direction which is perpendicular to the paper feed direction. The horizontal and vertical motion units are specified by GS P.
[Relative]	ESC \$, ESC T, ESC W, ESC \, GS P, GS \
[Example]	Refer to ESC W.

GS L nL nH Set left margin

[Function]	Set left margin to $[(nL + nH \times 256) \times \text{horizontal motion unit}]$ inches.
[Format]	ASCII GS L nL nH Hex 1D 4C nL nH Decimal 29 76 nL nH
[Range]	$0 \leq nL \leq 255$ $0 \leq nH \leq 255$



- [Notes]**
- In standard mode, this command is enabled only when processed at the beginning of the line.
 - If this command is input in page mode, it is disabled. The printer will process the command as normal character.

- This command does not affect printing in page mode.
- If the setting exceeds the maximum printable width, the maximum printable width will be used.
- The horizontal and vertical motion units are specified by **GS P**. Changing horizontal and vertical motion unit does not affect the current left margin.

[Default] nL = 0, nH = 0

[Relative] **GS P, GS W**

[Example] **0A**(Set printing position to the beginning of the line)

1B 40(Initialization)

30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36
37 38 39 **0A**

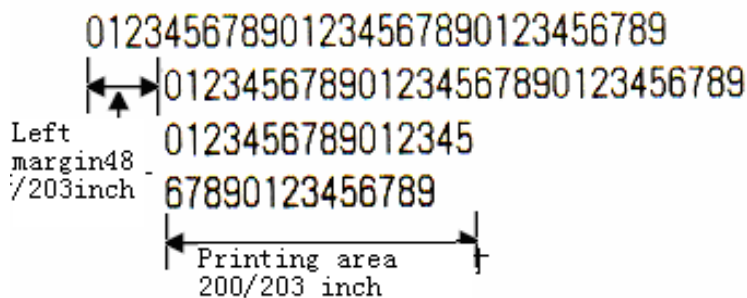
1D 4C 30 00(Set left margin to 48/203 inch)

30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36
37 38 39 **0A**

1D 57 C8 00(Set printing width to 200/203 inch)

30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 36
37 38 39 **0A**

Result:



GS P x y Set the horizontal and vertical motion units

[Function] Set the horizontal and vertical motion units to approximately 25.4/ x mm (1/ x inches) and approximately 25.4/ y mm {1/ y inches}, respectively.

[Format]

ASCII	GS	P	x	y
Hex	1D	50	x	y
Decimal	29	80	x	y

[Range]

$0 \leq x \leq 255$

$0 \leq y \leq 255$

- [Notes]**
- When x and y are 0, the x and y are set to be default settings.
 - The horizontal direction is perpendicular to the paper feed direction and the vertical direction is the paper feed direction.
 - In standard mode, the following commands use x or y, regardless of character rotation (upside-down or 90° clockwise rotation):
 - ① Commands using x: **ESC SP, ESC \$, ESC \, FS S, GS L, GS W**
 - ② Commands using y: **ESC 3, ESC J, GS V**
 - In page mode, the following commands use x or y, depending on the direction and

starting position of print area:

- ① When the print starting position is set to the upper left (Print direction from left to right) or lower right (Print direction from right to left) of the print area by **ESC T**:

Commands using x: ESC SP, ESC \$, ESC W, ESC \, FS S

Commands using y: ESC 3, ESC J, ESC W, GS \$, GS \, GS V

- ② When the print starting position is set to the upper right (print direction from top to bottom) or lower left (print direction from bottom to top) of the print area by **ESC T**:

Commands using x: ESC 3, ESC J, ESC W, GS \$, GS \

Commands using y: ESC SP, ESC \$, ESC W, ESC \, FS S, GS V

- The command does not affect the previously specified values.
- The minimum motion unit is the compositive result of this command and other commands.
- 1 inch=25.4mm.

[Default] x = 203, y =203, at this time, one motion unit is a printing dot. The horizontal distance is about 1/8mm and the vertical distance is about 1/8mm.

[Relative] **ESC SP, ESC \$, ESC 3, ESC J, ESC W, ESC \, GS \$, GS L, GS V, GS W, GS **

GS W nL nH Set print area width

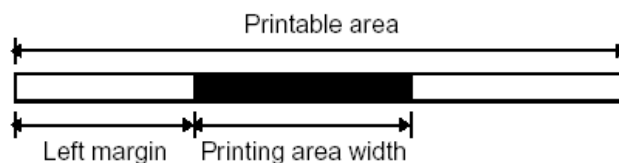
[Function] Set print area width.

[Format]	ASCII	GS	W	nL nH
	Hex	1D	57	nL nH
	Decimal	29	87	nL nH

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

$0 \leq nH \leq 255$

[Notes] • Set print area width to [(nL + nH × 256) ×horizontal motion unit)] inches.



- In standard mode, this command is enabled only when processed at the beginning of the line.
- In page mode, this command is disabled.
- This command does not affect printing in page mode.
- If the [left margin + print area width] exceeds the printable area, the print area width is [printable area width - left margin].
- The horizontal and vertical motion units are specified by **GS P**. Changing the horizontal and vertical motion units does not affect the current left margin or print area width.
- The horizontal motion unit is used for calculating the print area width.

[Default] nL = 76, nH = 2

[Relative] GS L, GS P

[Example] Refer to GS L

GS \ nL nH Set relative vertical position in page mode

[Function] Set relative vertical print position in page mode.

[Format]

ASCII	GS	\	nL	nH
Hex	1D	5C	nL	nH
Decimal	29	92	nL	nH

[Range]

$0 \leq nL \leq 255$
 $0 \leq nH \leq 255$

[Notes]

- This command sets the distance from the current position to $[(nL + nH \times 256) \times \text{vertical or horizontal motion unit}]$ inches.
- This command is ignored unless page mode is selected.
- When pitch N is specified to the movement downward: $nL + nH \times 256 = N$
When pitch N is specified to the movement upward, use the complement code: $nL + nH \times 256 = 65536 - N$.
- Any setting that exceeds the specified print area is ignored.
- This command decides motion unit, depending on the print area direction set by **ESC T** command:
 - ① When the starting position is set to the upper left (printing from left to right) or lower right (printing from right to left) of the print area, the vertical motion unit is used.
 - ② When the starting position is set to the upper right (printing from top to bottom) or lower left (printing from bottom to top) of the print area, the horizontal motion unit is used.
- The horizontal and vertical motion units are specified by **GS P**.
- The horizontal and vertical motion units can be changed by **GS P**.

[Relative] **ESC \$, ESC T, ESC W, ESC \, GS \$, GS P**

2.3 Character commands

CAN Delete data in print buffer in page mode

[Function] Delete data in current area in page mode.

[Format]

ASCII	CAN
Hex	18
Decimal	24

[Notes]

- This command is enabled only in page mode.
- If data that existed in the previously specified area also exists in the current area, it is also deleted.

[Relative] **ESC L, ESC W**

[Example] **1B 40** (initialize the printer)
1D 50 CB CB (Set printer resolution to 203×203)

1B 4C (Enter page mode)

1B 57 00 00 00 00 20 02 E8 00 (Set printing width and height in page mode)

31 32 33 34 35 36 37 38 39 30 61 62 63 64 65 64 66 67 68 69 6A 6B 6C 6D 6E 6F 70
71 72 73 74 75 76 77 78 79 7A 31 32 33 34 35 36 37 38 39 30 61 62 63 64 65 64 66
67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 31 32 33 34 35 36 37
38 39 30 61 62 63 64 65 64 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77
78 79 7A 31 32 33 34 35 36 37 38 39 30 61 62 63 64 65 64 66 67 68 69 6A 6B 6C 6D
6E 6F 70 71 72 73 74 75 76 77 78 79 7A 31 32 33 34 35 36 37 38 39 30 61 62 63 64
65 64 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 31 32 33 34
35 36 37 38 39 30 61 62 63 64 65 64 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74
75 76 77 78 79 7A 31 32 33 34 35 36 37 38 39 30 61 62 63 64 65 64 66 67 68 69 6A
6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 31 32 33 34 35 36 37 38 39 30 61 62
63 64 65 64 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79

1B 57 44 00 10 00 7C 01 AA 00 (Set the size of page needed to be deleted)

18 (Delete data in page buffer)

1B 24 64 00 (Set absolute horizontal print position as 100 dots)

1D 24 60 00 (Set absolute vertical print position as 96 dots)

43 61 6E 63 65 6C 20 74 68 65 20 64 61 74 61 20

0A 0C (print)

Result:

1234567890ahcededfghijklmnopqrstuvwxyz12345
67890a37890
abcdecabcde
dfghijCancel the datajfgghi
jklmncjklmn
opqrstuvwxy1234567890abcdefghijklmnopqrstuvwxyz
opqrstuvwxy

ESC SP n Set right-side character spacing

[Function] Set right-side character spacing.

[Format] ASCII ESC SP n

Hex 1B 20 n

Decimal 27 32 n

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

- [Notes]**
- Set the character spacing for the right side of the character to [n×horizontal or vertical motion unit] inch.
 - When characters are enlarged, the right-side character spacing is enlarged the same times.
 - This command sets values independently in standard mode and page mode.
 - The horizontal and vertical motion units are specified by **GS P**. Changing the horizontal or vertical motion unit does not affect the current right-side spacing.
 - In standard mode, the horizontal motion unit is used.
 - In page mode, the horizontal or vertical motion unit is selected depending on the print

area direction and starting position as follows:

- ① When the starting position is set to the upper left or lower right of the print area by **ESC T**, the horizontal motion unit is used.
 - ② When the starting position is set to the upper right or lower left of the print area by **ESC T**, the vertical motion unit is used.
- The maximum right-side spacing is 255/203 inches. Any setting exceeding the maximum is converted to the maximum automatically.

[Default] n = 0

[Example] **1B 40**

1B 20 00 (Set character spacing to 0)

41 41 41 41 41 **0A**

1B 20 06 (Set character spacing to 6/203 inch)

42 42 42 42 42 **0A**

1B 20 0C (Set character spacing to 12/203 inch)

43 43 43 43 43 **0A**

Result:

AAAAA ← Without Character Spacing
 BBBBB ← Character Spacing is 6/203 Inch
 CCCCC ← Character Spacing is 12/203 Inch

ESC ! n Select print mode

[Function] Select print mode.

[Format] ASCII ESC ! n
 Hex 1B 21 n
 Decimal 27 33 n

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

[Notes] • Select print mode according to n as follows:

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

- When both double-height and double-width modes are selected, characters will be enlarged two times in horizontal and vertical directions respectively.
- All the characters can be underlined, except for the space set by **HT** and 90° clockwise rotated characters.
- The thickness of the underline is defined by **ESC -**, regardless of the character.
- When some characters in a line are double or higher, all the characters in the line are aligned at the baseline.
- **ESC E** can also select or cancel emphasized mode. However, the setting of the last received command is valid.
- **ESC -** can also select or cancel underline mode. The setting of the last received command is valid.
- **GS !** can also set character size. The setting of the last received command is valid.

[Default]

n = 0

[Relative]

ESC -, **ESC E**, **GS !**

[Example]

1B 40 (Initialize the printer)

1B 21 00 (Select normal print mode)

48

1B 21 01 (Select compressed font mode)

48

1B 21 08 (Select emphasized mode)

48

1B 21 10 (Select double-height mode)

48

1B 21 20 (Select double-width mode)

48

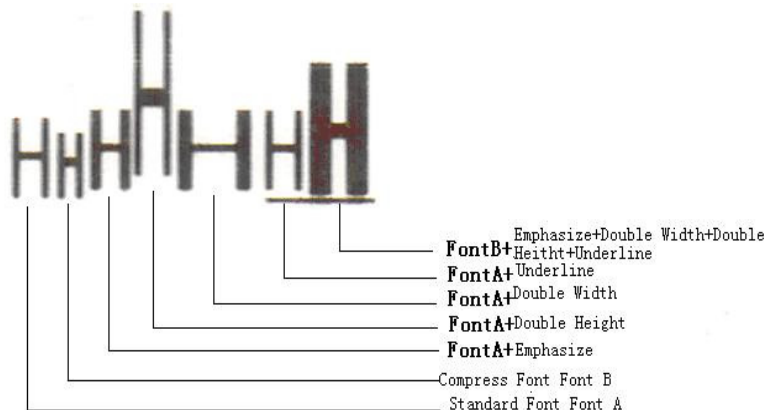
1B 21 80 (Select underline mode)

48

1B 21 B9 (Select compressed, emphasized, double-width, double-height and underline mode)

48 **0A**

Result:

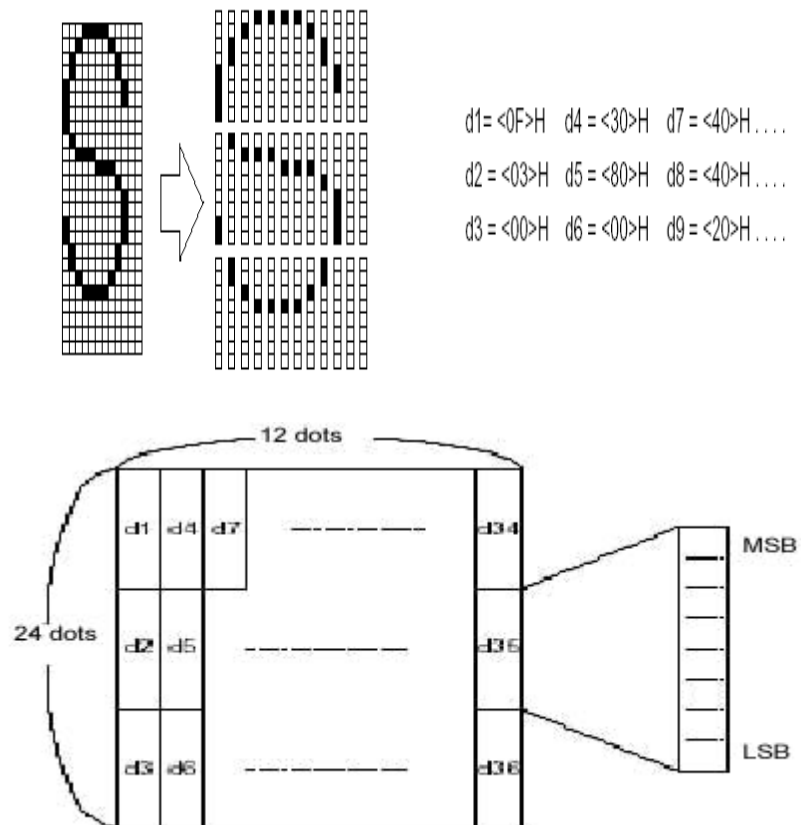


ESC % n Select/Cancel user-defined characters

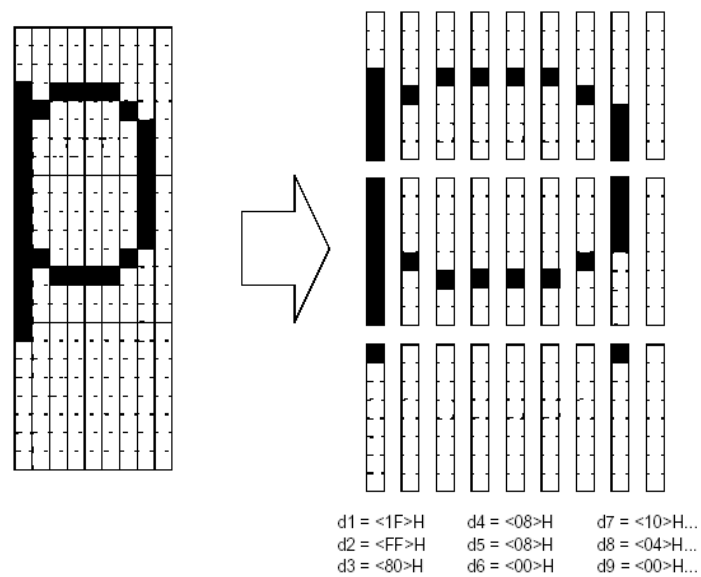
[Function]	Select/cancel user-defined characters.
[Format]	<div>ASCII ESC % n</div> <div>Hex 1B 25 n</div> <div>Decimal 27 37 n</div>
[Range]	$0 \leq n \leq 255$
[Notes]	<ul style="list-style-type: none"> • When the least significant bit of n is 0, the user-defined characters are not used. • When the least significant bit of n is 1, the user-defined characters are used. • When the user-defined characters are canceled, the internal character set is automatically selected. • Only the least significant bit of n is valid.
[Default]	n = 0
[Relative]	ESC &, ESC ?

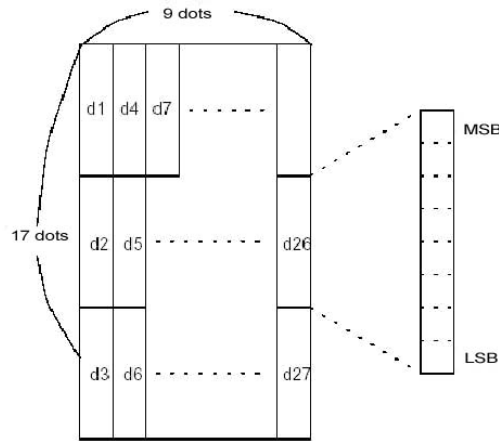
ESC & y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)] Define user-defined characters

[Function]	Define user-defined characters.
[Format]	<div>ASCII ESC & y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]</div> <div>Hex 1B 26 y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]</div> <div>Decimal 27 38 y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]</div>
[Range]	<div>y = 3</div> <div>$32 \leq c1 \leq c2 \leq 127$</div> <div>$0 \leq x \leq 12$ Standard ASCII font (12 × 24)</div> <div>$0 \leq x \leq 9$ Compressed ASCII font (9 × 17)</div> <div>$0 \leq d1 \dots d(y \times xk) \leq 255$</div> <ul style="list-style-type: none"> • y specifies the number of bytes in the vertical direction. • c1 specifies the beginning character code, and c2 specifies the final code. • x specifies the number of dots in the horizontal direction.
[Notes]	<ul style="list-style-type: none"> • The allowable character code range is from ASCII code <20>H to <7F>H (96 characters). • It is possible to define multiple characters for consecutive character codes. If only one character is desired, use c1 = c2. • d is the data for downloaded characters. The data of dot starts from the left side. • The size of user-defined character is (y × x) byte. • Set a corresponding bit to be 1 for printing a dot, or to be 0 for not printing a dot. • The user-defined character definition is cleared under following situations: <ul style="list-style-type: none"> ① ESC ? is executed. ② The power is turned off.
[Default]	Settings of internal character set
[Relative]	ESC %, ESC ?
[Example]	<ul style="list-style-type: none"> • When standard ASCII font (12 × 24) is selected:



- When compressed ASCII font (9 × 17) is selected:





ESC – n Select/Cancel underline mode

[Function] Select/Cancel underline mode.

[Format] ASCII ESC - n
 Hex 1B 2D n
 Decimal 27 45 n

[Range] $0 \leq n \leq 2, 48 \leq n \leq 50$

[Notes] Select/Cancel underline mode based on the value of n:

n	Function
0, 48	Cancel underline mode
1, 49	Select underline mode (1-dot thick)
2, 50	Select underline mode (2-dot thick)

- All characters (including right-side character spacing) can be underlined, except for the spacing set by **HT** command.
- The printer cannot underline 90° clockwise rotated characters and white/black reverse characters.
- When underline mode is cancelled, the following data is not underlined, and the underline thickness set before the mode is cancelled does not change. The default underline thickness is 1 dot.
- Character size change does not affect the current underline thickness.
- Underline mode can also be selected/cancelled via using **ESC !**. The last received command is valid.

[Default] n = 0

[Relative] ESC !

[Example] **1B 40**

1B 2D 02 (2-dot thick underline)

41 41 41 41 41 41 **0A**

1B 2D 01 (1-dot thick underline)

42 42 42 42 42 42 **0A**

1B 2D 00 (no underline)

43 43 43 43 43 43 **0A**

Result:

AAAAAA → 2-dot thick underline
 BBBBBB → 1-dot thick underline
 CCCCCC → Turn off underline

ESC ? n Cancel user-defined characters

[Function]	Cancel user-defined characters.
[Format]	ASCII ESC ? n Hex 1B 3F n Decimal 27 63 n
[Range]	$32 \leq n < 127$
[Notes]	<ul style="list-style-type: none"> Cancel the character with n as code in user-defined characters. After canceling the character, the corresponding character in the internal character set will be used. If there is no character with n as code in the user-defined characters, the command will be ignored.
[Relative]	ESC &, ESC %

ESC E n Select/Cancel emphasized mode

[Function]	Select/Cancel emphasized mode.
[Format]	ASCII ESC E n Hex 1B 45 n Decimal 27 69 n
[Range]	$0 \leq n \leq 255$
[Notes]	<ul style="list-style-type: none"> When the least significant bit of n is 0, emphasized mode is cancelled. When the least significant bit of n is 1, emphasized mode is selected. Only the least significant bit of n is enabled. Emphasized mode can also be selected/cancelled via using ESC !. The last received command is enabled.
[Default]	n = 0
[Relative]	ESC !
[Example]	1B 40 1B 45 01 (Emphasized mode is selected) 41 41 41 41 41 0A 1B 45 00 (Emphasized mode is not selected) 42 42 42 42 42 0A Result:

AAAAA ← Select emphasized mode
 BBBBB ← Cancel emphasized mode

ESC G n Select/Cancel double-strike mode

[Function]	Select/Cancel double-strike mode.
[Format]	ASCII ESC G n

Hex 1B 47 n
Decimal 27 71 n

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

[Notes]

- When the LSB of n is 0, double-strike mode is cancelled.
- When the LSB of n is 1, double-strike mode is selected.
- Only the least significant bit of n is valid.
- This command has same printing effect with emphasized.

[Default] n = 0

[Relative] ESC E

[Example] Refer to ESC E

ESC M n Select character font

[Function] Select character font

[Format]

ASCII ESC M n

Hex 1B 4D n

Decimal 27 77 n

[Range] $0 \leq n \leq 3, 48 \leq n \leq 51$

n	Function
0,48	Select standard ASCII font (12 × 24)
1,49	Select compressed ASCII font (9 × 17)
2,50	Select user-defined character
3,51	Select Chinese font (24 × 24)

[Example] **1B 40**

1B 4D 01 (Compressed font is selected)

41 41 41 42 42 42 30 30 30 31 31 31 **0A**

1B 4D 00 (Standard font is selected)

41 41 41 42 42 42 30 30 30 31 31 31 **0A**

Result:

AAABBB000111 → Compress Font Font B 9X17

AAABBB000111 → Standard Font Font A 12X24

ESC R n Select an international character set

[Function] Select an international character set

[Format]

ASCII ESC R n

Hex 1B 52 n

Decimal 27 82 n

[Range] $0 \leq n \leq 13$

[Notes] Select the corresponding international character set of n from the following table:

n	Character set
0	U.S.A.
1	France

2	Germany
3	U.K.
4	Denmark I
5	Sweden
6	Italy
7	Spain I
8	Japan
9	Norway
10	Denmark II
11	Spain II
12	Latin America
13	Korea

[Default] n = 0

ESC V n Select/Cancel 90° clockwise rotation

[Function] Select/Cancel 90° clockwise rotation

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

[Range] $0 \leq n \leq 1$, $48 \leq n \leq 49$

[Notes] Value of n is as follows:

n	Function
0, 48	Cancel the 90° clockwise rotation mode
1, 49	Select the 90° clockwise rotation mode

- This command is enabled only in standard mode.
- When selecting underline mode, the underline can not be 90° clockwise-rotated.
- Double-width and double-height commands in 90° clockwise rotation mode enlarge characters in the opposite directions from double-height and double-width commands in normal mode.

[Default] n = 0

[Relative] ESC !, ESC

[Example] **1B 40**

1B 56 01 (Select the 90° clockwise rotation mode)

41 41 41 42 42 42 **0A**

1B 56 00 (Cancel the 90° clockwise rotation mode)

41 41 41 42 42 42 **0A**

Result:

ESC t n Set code page

[Function] Set code page

[Format] ASCII ESC t n

Hex 1B 74 n

Decimal 27 116 n

[Range] $0 \leq n \leq 5$, $13 \leq n \leq 24$, $26 \leq n \leq 29$, $45 \leq n \leq 51$ $64 \leq n \leq 81$

$n=11,33,34,36,37,38, 41,43,54,56$.

n	Code page
0	PC437
1	Katakana
2	PC850
3	PC860
4	PC863
5	PC865
11	851[Greek]
13	PC857
14	737[Greek]
15	928[Greek]
16	WPC1252
17	PC866
18	PC852
19	PC858
20	Thai Tis42(Thai3)
21	Thai Tis11(Thai5)
22	Thai Tis(Thai2)
23	Thai Ku(Thai1)
24	Thai Tis14(Thai4)
26	Thai Tis18(Thai6)
27	Hebrew1
28	Hebrew2
29	Hebrew3
33	775[Baltic]
34	855[Cyrillic]
36	862[hebrew]
37	864[Arabic]
38	869[Greek]
41	Farsi
43	772[Lithuanian]
45	1250[Latin-2]
46	1251[Cyrillic]
47	1253[Greek]
48	1254[Turkish]
49	1255[Hebrew]
50	1256[Arabic]

51	1257[Baltic]
54	771
56	774[Lithuanian]
64	3840 (IBM-Russian)
65	3841 (Gost)
66	3843 (Polish)
67	3844 (CS2)
68	3845 (Hungarian)
69	3846 (Turkish)
70	3847 (Brazil-ABNT)
71	3848 (Brazil-ABICOMP)
72	1001
73	2001
74	3001 (Estonian-1)
75	3002 (Estonian-2)
76	3011 (Latvian-1)
77	3012 (Latvian-2)
78	3021 (Bulgarian)
79	3041 (Maltese)
80	8859
81	Persia

[Notes]

- This command is disabled in Chinese font.
- The range above applies to printers with universal configuration, depending on printer configuration.

[Default]

PC437 code (depending on printer configuration)

ESC { n Select/Cancel upside-down print mode
[Function]

Select/Cancel upside-down print mode

[Format]

ASCII ESC { n

Hex 1B 7B n

Decimal 27 123 n

[Range]
 $0 \leq n \leq 255$
[Notes]

- When the LSB of n is 0, upside-down print mode is cancelled.
- When the LSB of n is 1, upside-down print mode is selected.
- Only the LSB of n is valid;
- This command is enabled only when processed at the beginning of a line in standard mode.
- When this command is input in page mode, the printer performs only internal flag operations.
- This command does not affect printing in page mode.
- In upside-down print mode, the printer rotates the line to be printed by 180° and then prints it.

[Default]

n = 0

[Example]

1B 40

1B 7B 01 (Select upside-down print mode)

41 42 43 44 45 46 **0A**

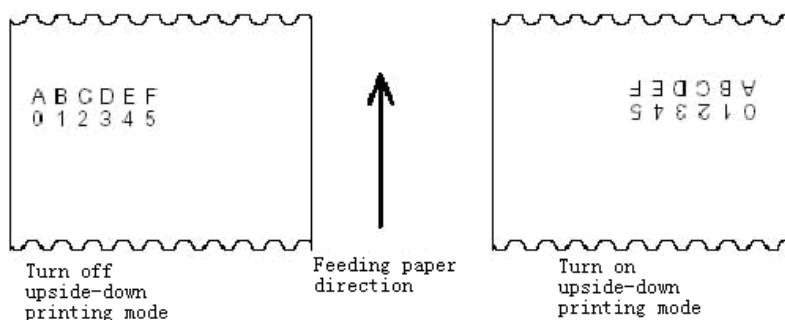
30 31 32 33 34 35 **0A**

1B 7B 00 (Cancel upside-down print mode)

41 42 43 44 45 46 **0A**

30 31 32 33 34 35 **0A**

Result:



GS ! n Select character size

[Function]

Select character size

[Format]

ASCII GS ! n

Hex 1D 21 n

Decimal 29 33 n

[Range]

$0 \leq n \leq 255$ ($1 \leq \text{enlargement times in vertical direction} \leq 6$, $1 \leq \text{enlargement times in horizontal direction} \leq 6$)

[Notes]

Select the character height using bit 0 to 3 and select the character width using bit 4 to 7 as follows:

Character width selection			Character height selection		
Hex	Decimal	Horizontal enlargement	Hex	Decimal	Vertical enlargement
00	0	1(normal)	00	0	1(normal)
10	16	2 (double Width)	01	1	2 (double height)
20	32	3	02	2	3
30	48	4	03	3	4
40	64	5	04	4	5
50	80	6	05	5	6

- This command is effective to all characters (ASCII characters and Chinese), except for HRI characters.
- If n is outside of the defined range, this command will be ignored.
- In standard mode, the vertical direction is the paper feed direction, and the horizontal direction is perpendicular to the paper feed direction. However, when character orientation changes in 90° clockwise-rotation, the relationship between vertical and horizontal directions is reversed.
- In page mode, vertical and horizontal directions are based on the direction of print

area.

- When characters in one line are enlarged to different sizes, all the characters are aligned at the baseline.
- The ESC ! command can also select or cancel double-width and double-height modes. The last received command is effective.

[Default] n = 0

[Relative] ESC !

[Example] Refer to ESC !

GS B n Select/Cancel white/black reverse print mode

[Function] Select/Cancel white/black reverse print mode

[Format] ASCII GS B n

Hex 1D 42 n

Decimal 29 66 n

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

- [Notes]
- When the LSB of n is 0, white/black reverse mode is cancelled.
 - When the LSB of n is 1, white/black reverse mode is selected.
 - Only the least significant bit of n is valid.
 - This command is effective for all characters (except for HRI character).
 - When white/black reverse print mode is selected, it also applies to character spacing set by ESC SP.
 - This command does not affect bitmap, user-defined bitmap, barcode, HRI characters, and spacing set by HT, ESC \$, and ESC \.
 - This command does not affect the space between lines.
 - White/black reverse mode has a higher priority than underline mode. When white/black reverse mode is selected, the underline mode is disabled, and the underline mode only enables after the white/black reverse mode is cancelled.

[Default] n = 0

[Example] **1B 40**

1D 42 01 (Select white/black reverse print mode)

41 41 41 42 42 42 **0A**

1D 42 00 (Cancel white/black reverse print mode)

41 41 41 42 42 42 **0A**

Result:

AAABBB → Select white/black reverse printing mode
AAABBB → Cancel white/black reverse printing mode

FS ! n Set Chinese character mode

[Function] Set Chinese character mode

[Format] ASCII FS ! n

Hex 1C 21 n

Decimal 28 33 n

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

[Notes] n specifies the print mode of Chinese:

Bit	0/1	Hex	Decimal	Function
0, 1				Undefined
2	0	00	0	Cancel double-width mode
	1	04	4	Select double-width mode
3	0	00	0	Cancel double-height mode
	1	08	8	Select double-height mode
4-6				Undefined
7	0	00	0	Cancel underline mode
	1	80	128	Select underline mode

- When both double-width and double-height modes are set (including right and left character spacing), quadruple-size characters are printed.
- The printer can underline all characters (including right and left character spacing), but cannot underline the space set by HT command (horizontal tab) and 90° clockwise-rotated characters.
- The thickness of the underline is specified by FS -, regardless of the character size.
- When characters in a line have different height, all the characters in the line are aligned at the baseline.
- It is possible to emphasize characters using FS W or GS!. The setting of the last received command is effective.
- It is possible to select or cancel the underline mode using FS -, and the setting of the last received command is effective.

[Default] n = 0

[Relative] FS -, FS W, GS !

[Example] See ESC !

FS & Select Chinese mode

[Function] Select Chinese mode.

[Format] ASCII FS &

Hex 1C 26

Decimal 28 38

[Notes] • When Chinese mode is selected, the printer checks whether the character is Chinese internal code or not. If it is Chinese internal code, printer will firstly process the first byte; then printer will check if the second byte is Chinese internal code or not.

- Chinese mode is selected automatically when the power of printer is turned on;

[Relative] FS ., FS C

FS – n Select/Cancel underline mode for Chinese characters

[Function] Select/Cancel underline mode for Chinese characters

[Format] ASCII FS - n

Hex 1C 2D n

Decimal 28 45 n

[Range] $0 \leq n \leq 2, 48 \leq n \leq 50$

[Notes] Select or cancel the underline for Chinese characters, based on the value of n:

n	Function
0, 48	cancel the underline for Chinese characters
1, 49	Select the underline for Chinese characters(1-dot thick)
2, 50	Select the underline for Chinese characters(2-dot thick)

- The printer can underline all characters (including right and left character spacing), but cannot underline the space set by HT and 90° clockwise-rotated characters.
- After the underline mode is cancelled, underline printing is no longer performed, but the previously specified underline thickness is not changed. The default underline thickness is 1 dot.
- The specified underline thickness does not change even when the character size changes.
- It is possible to select or cancel underline mode using FS ! command. The setting of last received command is effective.

[Default] n = 0

[Relative] FS !

[Example] See ESC _

FS . Cancel Chinese mode

[Function] Cancel Chinese mode.

[Format] ASCII FS .

Hex 1C 2E

Decimal 28 46

- [Notes]**
- When Chinese mode is cancelled, all characters are processed as ASCII characters, one byte at a time.
 - Chinese character mode is selected automatically when the power is turned on.

[Relative] FS &, FS C

FS 2 c1 c2 d1...dk Define user-defined Chinese characters

[Function] Define user-defined Chinese characters

[Format] ASCII FS 2 c1 c2 d1...dk

Hex 1C 32 c1 c2 d1...dk

Decimal 28 50 c1 c2 d1...dk

[Range] c1 and c2 indicate character codes for the defined characters
c1 = FEH

$A1H \leq c2 \leq FEH$

$0 \leq d \leq 255$

$k = 72$

[Notes]

c1 and c2 indicate character codes for the user-defined Chinese characters. c1 specifies the first byte, and c2 specifies the second byte..

d indicates the dot data. Set a corresponding bit to 1 for printing a dot or to 0 for not printing a dot.

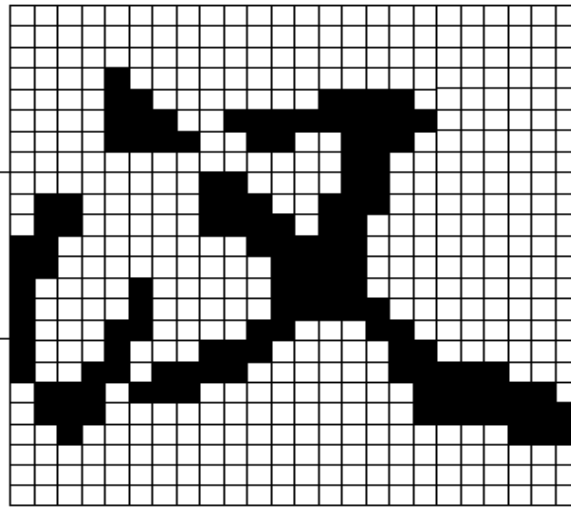
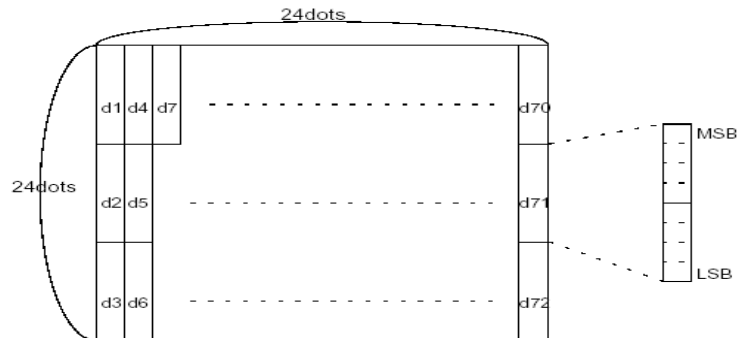
[Default]

No user-defined Chinese characters.

[Relative]

FS C

The relationship between user-defined Chinese font and data:



D1=00H, D4=00H, D7=00H, D10=00H.
D2=1FH, D5=78H, D8=60H, D11=00H.
D3=COH, D6=30H, D9=38H, D12=70H.

FS C n

[Function]

Select Japanese character mode.

[Format]

ASCII FS C n
Hex 1C 43 n
Decimal 28 67 n

[Range]

$0 \leq n \leq 1, 48 \leq n \leq 49$

[Notes]

Select Japanese character mode according to the values of n:

n	Code mode
0,48	JIS code
1,49	SHIFT JIS code

- This command is enabled only in Japanese character mode.
- In JIS code mode, the following character codes are enabled:
First byte: <21>H to <7E>H
Second byte: <21>H to <7E>H
- In SHIFT JIS code mode, the following character codes are enabled:
First byte : <81>H to <9F>H 和 <E0>H to <EF>H
Second byte: <40>H to <7E>H 和 <80>H to <FC>H

[Default] n = 0

FS S n1 n2 Set left-side and right-side Chinese character spacing

[Function] Set left-side and right-side Chinese character spacing.

[Format]

ASCII	FS	S	n1	n2
Hex	1C	53	n1	n2
Decimal	28	83	n1	n2

[Range]

0 ≤ n1 ≤ 255
0 ≤ n2 ≤ 255

- [Notes]
- Set left-side and right-side Chinese character spacing to n1 and n2 respectively.
- When the printer supports **GS P** command, the left-side character spacing is [n1 × horizontal or vertical motion unit] inches, and the right-side character spacing is [n2 × horizontal or vertical motion units] inches.
 - When double-width mode is selected, the left- and right-side character spacing is twice the normal value.
 - The horizontal and vertical motion units are set by **GS P**. The previously specified character spacing does not change even if the horizontal or vertical motion unit is changed by **GS P**.
 - In standard mode, the horizontal motion unit is used.
 - In page mode, the horizontal or vertical motion unit differs, depending on the starting position of the printable area as follows:
 - ① When the starting position is set to the upper left or lower right of the print area, the horizontal motion unit is used;
 - ② When the starting position is set to the upper right or lower left of the print area, the vertical motion unit is used.
 - The maximum right-side Chinese character spacing is approximately 36 mm. Any setting exceeding the maximum is converted to the maximum automatically.

[Default] n1 = 0, n2 = 0

[Relative] **GS P**

[Example] Refer to **ESC SP**

FS W n Select/Cancel quadruple-size mode for Chinese characters

[Function] Select/Cancel quadruple-size mode for Chinese characters.

[Format]	ASCII	FS	W	n
	Hex	1C	57	n
	Decimal	28	87	n

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

- [Notes]**
- When the LSB of n is 0, quadruple-size mode for Chinese characters is cancelled.
 - When the LSB of n is 1, quadruple-size mode for Chinese characters is selected.
 - Only the least significant bit of n is valid.
 - In quadruple-size mode, the size of the characters is the same as when double-width and double-height modes are both selected.
 - When quadruple-size mode is cancelled, the following printed characters are in normal size.
 - When some of the characters in one line are different in height, all the characters in the line are aligned at the baseline.
 - **FS !** or **GS !** (select double-height and double-width modes) can also select or cancel quadruple-size mode, and the setting of the last received command is effective.

[Default] n = 0

[Relative] **FS !**, **GS !**

2.4 Bitmap Commands

ESC * m nL nH d1... dk Select bitmap mode

[Function] Select bitmap mode.

[Format]	ASCII	ESC	*	m nL nH d1...dk
	Hex	1B	2A	m nL nH d1...dk
	Decimal	27	42	m nL nH d1...dk

[Range] $0 \leq m \leq 1, 48 \leq m \leq 49$

$0 \leq nL \leq 255$

$0 \leq nH \leq 3$

$0 \leq d \leq 255$

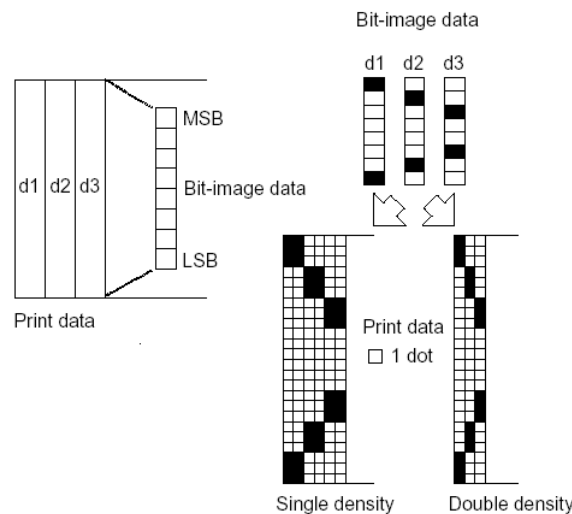
[Notes] Select a bitmap mode specified by m with the number of dots specified by nL and nH, as follows:

m	Mode	Vertical Direction		Horizontal Direction	
		Number of Dots	Resolution	Resolution	Number of Data (K)
0	8-dot single-density	8	203/3 DPI	101 DPI	$nL + nH \times 256$
1	8-dot double-density	8	203/3 DPI	203 DPI	$nL + nH \times 256$
32	24-dot single-density	24	203 DPI	101 DPI	$(nL + nH \times 256) \times 3$
33	24-dot double-density	24	203 DP	203 DPI	$(nL + nH \times 256) \times 3$

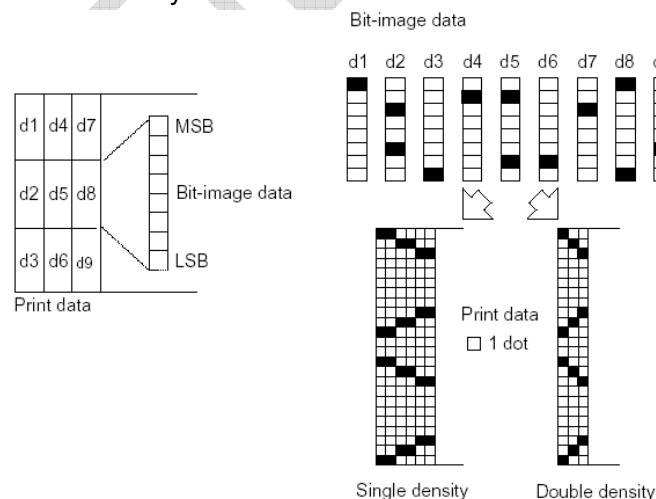
- If the value of m is outside the specified range, nL and the following data are processed as normal data.
- nL and nH specify the number of print dots in horizontal direction. The total number of dots is $nL + nH \times 256$.

- Data of the bitmap exceeding the current area will be ignored.
- d indicates the bitmap data. Set a corresponding bit to 1 to print a dot, or to 0 not to print a dot.
- After completing the transmission of bitmap data, the printer returns to normal data processing mode.
- This command is not affected by other print modes (emphasized, double-strike, underline, character enlargement and white/black reverse printing), except for upside-down print mode.
- The relationship between the data and the dots to be printed is as follows:

When 8-dot density is selected:



When 24-dot density is selected:



GS # n Define current downloaded bitmap number

[Function]	Specify a number for the bitmap to be downloaded. This number is to be used when downloading and printing this bitmap.			
[Format]	ASCII	GS	#	n
	Hex	1D	23	n
	Decimal	29	33	n
[Range]	$0 \leq n \leq 7$			

- [Notes]**
- The command is only enabled for bitmaps in RAM and the settings are erased when power down.
 - The number does not apply to the bitmap downloaded in FLASH.

GS * x y d1...d(x × y × 8) Define downloaded bitmap

[Function] Define downloaded bitmap.

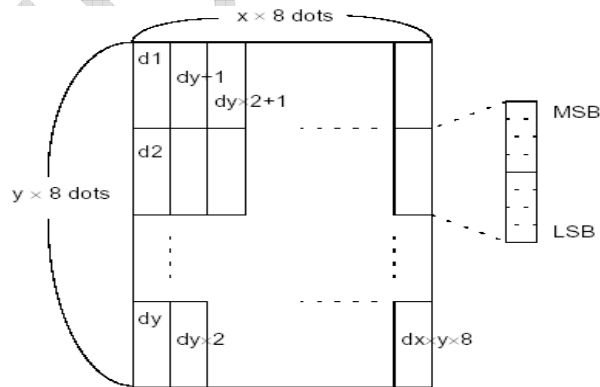
[Format]

ASCII	GS	*	x y d1...d(x × y × 8)
Hex	1D	2A	x y d1...d(x × y × 8)
Decimal	29	42	x y d1...d(x × y × 8)

[Range]

$1 \leq x \leq 255$, $1 \leq y \leq 48$
 $x \times y \leq 912$
 $0 \leq d \leq 255$

- [Notes]**
- x specifies the horizontal byte number of the bitmap.
 - y specifies the vertical byte number of the bitmap.
 - The number of dots in the horizontal direction is $x \times 8$, and in the vertical direction is $y \times 8$.
 - If $x \times y$ is out of the specified range, this command is disabled.
 - The d indicates bitmap data. Set a corresponding bit of data to be 1 for printing a dot, or to be 0 for not printing a dot.
 - The downloaded bitmap is cleared when the power of printer is turned off.
 - The following figure shows the relationship between the downloaded bitmap and the printed data:



[Relative] GS /

GS / m Print downloaded bitmap

[Function] Print downloaded bitmap.

[Format]

ASCII	GS	/	m
Hex	1D	2F	m
Decimal	29	47	m

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

[Notes] Print a downloaded bitmap in the print mode specified by m.

Set print mode based on the value of m:

m	Mode	Vertical resolution (DPI)	Horizontal resolution (DPI)
---	------	---------------------------	-----------------------------

0, 48	Normal	203	203
1, 49	Double-width	203	101
2, 50	Double-height	101	203
3, 51	Quadruple	101	101

- This command is ignored if a downloaded bitmap has not been defined.
- This command has no effect in the print modes (including emphasized, double-strike, underline, character enlargement, and white/black reverse printing), except for upside-down print mode.
- If the downloaded bitmap to be printed exceeds the print area, the excess data will not be printed.
- This command is used to print bitmaps downloaded in RAM, not bitmaps downloaded in FLASH. The corresponding bitmap number is the number set by GS # command.

[Relative] GS * GS #

GS v 0 m xL xH yL yH d1....dk Print raster bitmap

[Function] Print raster bitmap.

[Format] ASCII GS v 0 m xL xH yL yH d1....dk
Hex 1D 76 30 m xL xH yL yH d1....dk
Decimal 29 118 48 m xL xH yL yH d1....dk

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

$0 \leq xL \leq 255$

$0 \leq xH \leq 255$

$0 \leq yL \leq 255$

$0 \leq d \leq 255$

$k = (xL + xH \times 256) \times (yL + yH \times 256) (k \neq 0)$

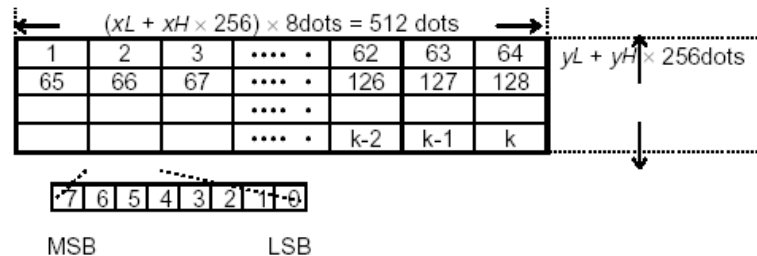
[Notes] Print raster bitmap and select the raster bitmap mode via the value of m:

m	Mode	Vertical resolution (DPI)	Horizontal resolution (DPI)
0, 48	Normal	203 DPI	203 DPI
1, 49	Double-width	203 DPI	101 DPI
2, 50	Double-height	101 DPI	203 DPI
3, 51	Quadruple	101 DPI	101 DPI

- xL and xH indicate the byte number ($xL + xH \times 256$) in the horizontal direction for the bitmap.
- yL and yH indicate the byte number ($yL + yH \times 256$) in the vertical direction for the bitmap.
- In standard mode, this command is effective only when there is no data in the print buffer.
- This command has no effect in the print modes of character enlargement, emphasized, double-strike, underline, white/black reverse printing, etc..
- Bitmap outside the print area is not printed.
- The **ESC a** (select alignment mode) setting is effective to raster bitmap.

- If this command is received during macro definition, the printer will stop macro definition and begin performing this command. This command is not part of the macro definition.
- d indicates the bitmap data. When the corresponding bit is 1, the printer prints a dot; when corresponding bit is 0, the printer does not print a dot.

Example is as below: when $xL + xH \times 256 = 64$



FS p n m Print bitmap downloaded in FLASH

[Function] Print bitmap downloaded in FLASH.

[Format]

ASCII	FS	p	n	m
Hex	1C	70	n	m
Decimal	28	112	n	m

[Range]

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

[Notes] Print the bitmap downloaded in FLASH in the mode specified by m.

m	Mode	Vertical resolution (DPI)	Horizontal resolution (DPI)
0,48	Normal	203	203
1,49	Double-width	203	101
2,50	Double-height	101	203
3,51	Quadruple	101	101

- n is the number of bitmap (defined by the **FS q** command).
- m specifies the bitmap print mode.
- NV bitmap is the bitmap which is defined by **FS q**, stored in FLASH memory, and printed by **FS p**.
- FLASH gray scale bitmap is the gray scale bitmap which is defined by **FS r**, stored in FLASH memory and printed by **FS p**.
- This command is disabled when the NV bitmap has not been defined.
- This command is not affected by other print modes (such as double-height, double-width, underline, character enlargement, white/black reverse printing, or 90° clockwise rotation, etc.), except for upside-down print mode.
- If the downloaded bitmap to be printed exceeds current print area, the excess data will not be printed.
- After completing the bitmap printing, printer will shift the line and process the following data in normal mode.

[Relative] ESC *, **FS q**, **GS /**, **GS v 0**

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

[Function] Define NV bitmap.

[Format]

ASCII	FS	q	n [xL xH yL yH d1...dk]	[xL xH yL yH d1...dk]
Hex	1C	71	n [xL xH yL yH d1...dk]	[xL xH yL yH d1...dk]
Decimal	28	113	n [xL xH yL yH d1...dk]	[xL xH yL yH d1...dk]

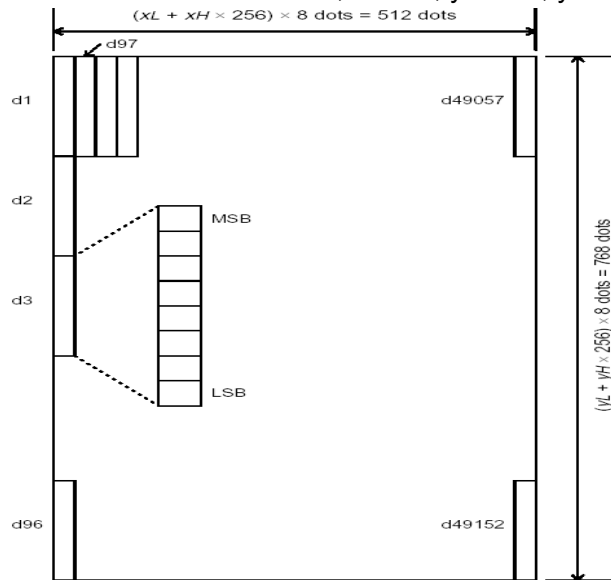
[Range]

$1 \leq n \leq 255$
 $0 \leq xL \leq 255$
 $1 \leq (xL + xH \times 256) \leq 1023$
 $1 \leq (yL + yH \times 256) \leq 8190$
 $0 \leq d \leq 255$

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

- [Notes]**
- The maximum capacity of Flash depends on printer configuration. The FLASH download capacity supported by printer can be checked by printing self-test page.
 - n specifies the number of NV bitmap to be defined.
 - xL and xH specify $(xL + xH \times 256) \times 8$ dots in the horizontal direction for the NV bitmap.
 - yL and yH specify $(yL + yH \times 256) \times 8$ dots in the vertical direction for the NV bitmap.
 - Frequent execution of this command may cause damage to the Flash memory. Therefore, it is recommended to write the Flash 10 times or less a day.
 - This command cancels all NV bitmaps that have already been defined by this command. The printer can not redefine one of the several bitmaps previously defined, and in this case, all data needs to be sent again.
 - Because printer is in busy status when processing this command, it writes data to FLASH and stops receiving other commands. Thus, when executing this command, sending other commands including immediate commands is forbidden.
 - NV bitmap is the bitmap which is defined by **FS q**, stored in a Flash memory and printed by command **FS p**.
 - In standard mode, this command is enabled only when processed at the beginning of the line.
 - The 7 bytes <from FS~yH> are processed as command data, not data of graphics.
 - When the amount of bitmap data exceeds the range defined by the left xL, xH, yL, yH, printer only processes data in the range defined by xL, xH, yL, yH.
 - In the first group of NV bitmaps, when any parameter of the xL, xH, yL, yH is out of the defined range, this command is disabled.
 - When downloading several bitmaps, if the printer processes xL, xH, yL, yH out of the defined range, it stops processing this command. At this time, bitmaps that haven't been defined are disabled (undefined), but bitmaps before that are enabled.
 - d indicates the defined bitmap data. Set a corresponding bit to be 1 for printing a dot, or to be 0 for not printing a dot.

- This command defines n as the number of NV bitmaps. Numbers rise in order from NV bitmap 1. Therefore, the first data group $[xL \ xH \ yL \ yH \ d1...dk]$ is NV bitmap 1, and the last data group $[xL \ xH \ yL \ yH \ d1...dk]$ is NV bitmap n . It is the same when printing bitmap using command **FS p**.
- Define a NV bitmap consisting of $[xL \ xH \ yL \ yH \ d1...dk]$. Therefore, when only one NV bitmap, $n=1$. The printer uses bytes of Flash memory as follows:
([byte number of bitmap data: $(xL + xH \times 256) \times (yL + yH \times 256) \times 8$] + [header: 4]).
Example is as below: when $xL = 64$, $xH = 0$, $yL = 96$, $yH = 0$



- Maximum download capacity of Flash is 64K bits (8K bytes). This command can define several NV bitmaps, but cannot define a bitmap that exceeds 64K bits (Different printer has different download capacity. Please refer to printer configuration information).
- When processing this command, printer does not process other commands.
- If this command is received during macro definition, the printer will end macro definition and begin executing this command.
- Once a NV bitmap is defined, it can not be erased by executing **ESC @**, reset, and power off commands.
- This command only defines NV bitmap and does not execute printing. NV bitmap printing is executed by the **FS p** command.

[Relative] **FS p**

2.5 Status commands

DLE EOT n Real-time status transmission

[Function]	Real-time status transmission			
[Format]	ASCII	DLE	EOT	n
	Hex	10	04	n
	Decimal	16	4	n
[Range]	$1 \leq n \leq 4$			

- n = 1: Transmit printer status
- n = 2: Transmit off-line status
- n = 3: Transmit error status
- n = 4: Transmit paper sensor status

[Notes]

- When the printer receives the command, it returns relative status immediately.
- Even if the printer is set to be disabled by command ESC = (select peripheral device), this command is still enabled.
- The printer transmits the current status. Each status is represented by one-byte data.
- The printer transmits the status without confirming whether the host computer can receive data or not.
- The printer executes this command immediately upon receiving it.
- This command is effective to printers with serial interface, nibble parallel interface or USB interface.
- Printer will execute this command immediately in any status.

n = 1: Printer status

Bit	0/1	HEX	Decimal	Function
0	0	00	0	Fixed to 0.
1	1	02	2	Fixed to 1.
2	0	00	0	1 or 2 cash drawers are open.
	1	04	4	2 drawers are closed.
3	0	00	0	On-line.
	1	08	8	Off-line.
4	1	10	16	Fixed to 1.
5,6	-	-	-	Undefined.
7	0	00	00	Fixed to 0.

n = 2: Off-line status

Bit	0/1	HEX	Decimal	Function
0	0	00	0	Fixed to 0.
1	1	02	2	Fixed to 1.
2	0	00	0	Top cover is closed.
	1	04	4	Top cover is open.
3	0	00	0	FEED button is not pressed.
	1	08	8	FEED button is pressed down.
4	1	10	16	Fixed to 1.
5	0	00	0	Paper is not end.
	1	20	32	Paper is end.
6	0	00	0	No error occurs.
	1	40	64	Error occurs.
7	0	00	0	Fixed to 0.

n = 3: Error status

Bit	0/1	HEX	Decimal	Function
-----	-----	-----	---------	----------

0	0	00	0	Fixed to 0.
1	1	02	2	Fixed to 1.
2	-	-	-	Undefined.
3	0	00	0	No cutter error.
	1	08	8	Cutter error occurs.
4	1	10	16	Fixed to 1.
5	0	00	0	Fixed to 0.
6	0	00	0	Print head temperature is normal.
	1	40	64	Print head temperature is out of range.
7	0	00	0	Fixed to 0.

n = 4: Paper feeding status

Bit	1/0	HEX	Decimal	Function
0	0	00	0	Fixed to 0.
1	1	02	2	Fixed to 1.
2,3	0	00	0	Not in paper near end status.
	1	0C	12	In paper near end status.
4	1	10	16	Fixed to 1.
5,6	0	00	0	Paper presence.
	1	60	96	Paper end.
7	0	00	0	Fixed to 0.

Please avoid inserting this command between 2 or more bytes command.

For example:

In the process of sending **ESC 3 n** to printer, **DTR** turns into **MARK** (**DSR** is used for host computer) before sending n, and **DLE EOT 3** is interrupted before receiving n, then **<10>H**, the code of **DLE EOT 3**, is processed as the code of **ESC 3 <10>H**.

[Relative] **DLE ENQ, GS a, GS r**

GS a n Automatic Status Back (ASB)

[Function] Automatic Status Back (ASB)

[Format] ASCII GS a n

Hex 1D 61 n

Decimal 29 97 n

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

[Notes] Decide the content of ASB. The meaning of parameter n is as follows:

- When n is not equal to 0, the printer automatically returns 4-byte printer status whenever the enabled status item changes.
- When n is equal to 0, the ASB function is disabled.
- When printer automatically returns status bytes, the host is not confirmed ready or not to receive the data.
- Since this command is executed with other commands in sequence, there may be a time lag between data transmission and ASB setting enabled.

- Even if the printer is disabled by **ESC =**, the printer still performs ASB according to the settings set by this command.
- The returned status information is as follows:

First byte (Printer information)

Bit	Off/On	Hex	Decimal	Printer status
0	Off	00	0	Not used, fixed to 0.
1	Off	00	0	Not used, fixed to 0.
2	Off	00	0	Drawer kick-out connector pin 3 is LOW.
	On	04	4	Drawer kick-out connector pin 3 is HIGH.
3	Off	00	0	On-line.
	On	08	8	Off-line.
4	On	10	16	Not used, fixed to 1.
5	Off	00	0	Top cover is closed.
	On	20	32	Top cover is open.
6	Off	00	0	Paper is not being fed by using the PAPER FEED button.
	On	40	64	Paper is being fed by using the PAPER FEED button.
7	Off	00	0	Not used, fixed to 0.

Second byte (printer information)

Bit	Off/On	Hex	Decimal	Printer Status
0	-	-	-	Undefined.
1	-	-	-	Undefined.
2	-	-	-	Undefined.
3	Off	00	0	No cutter error.
	On	08	8	Cutter error occurs.
4	Off	00	0	Not used, fixed to 0.
5	Off	00	0	No recoverable error.
	On	20	32	Recoverable error occurs.
6	Off	00	0	No automatically recoverable error.
	On	40	64	Automatically recoverable error occurs.
7	Off	00	0	Not used, fixed to 0.

Bit 5: Errors like paper jam are recoverable errors. These errors can be eliminated and the printer can return to normal by using DLE ENQ n ($1 \leq n \leq 2$). Errors like control board damage are irrecoverable errors.

Bit 6: Errors like print head overheating are automatically recoverable errors. When printing is stopped due to these errors, the printer can return to normal automatically.

Third byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Printer Status
0,1	Off	00	0	Paper is not near end.
	On	03	3	Paper near end.
2,3	Off	00	0	Paper presence.
	On	0C	12	Paper end.

4	Off	00	0	Not used, fixed to 0.
5,6	-	-	-	Undefined.
7	Off	00	0	Not used, fixed to 0.

Fourth byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Printer Status
0-3	-	-	-	Undefined.
4	Off	00	0	Not used, fixed to 0.
5,6	-	-	-	Undefined.
7	Off	00	0	Not used, fixed to 0.

GS r n Return status

[Function] Return status.

[Format] ASCII GS r n

Hex 1D 72 n

Decimal 29 114 n

[Range] $1 \leq n \leq 2, 49 \leq n \leq 50$

[Notes] Return the status specified by n:

n	Function
1,49	Return paper sensor status
2,50	Return cash drawer status

- This command is effective to printers with serial interface, nibble parallel interface or USB interface.
- This command is executed after the data in the receive buffer is processed. Therefore, there may be a time lag between sending this command and receiving the return status.
- The corresponding relationship between different bits of status bytes is shown as below:

Paper sensor status (n = 1, 49):

Bit	0/1	Hex	Decimal	Status
0, 1	0	00	0	Paper near end sensor: paper adequate.
	1	03	3	Paper near end sensor: paper near end.
2, 3	0	00	0	Paper end sensor: paper adequate.
	1	0c	12	Paper end sensor: paper end.
4	0	00	0	Not used, fixed to 0
5, 6				Undefined.
7	0f	00	0	Not used, fixed to 0.

Cash drawer status (n=2, 50):

Bit	0/1	Hex	Decimal	Status
0	0	00	0	There is open cash drawer.
	1	01	1	There is no open cash drawer.
1- 3				Undefined.
4	0	00	0	Not used, fixed to 0.

5, 6				Undefined.
7	0	00	0	Not used, fixed to 0.

[Relative] **DLE EOT, GS a**

2.6 Barcode commands

GS H n Select print position for HRI characters

[Function] Select the print position for HRI characters when printing a barcode.

[Format] ASCII GS H n
Hex 1D 48 n
Decimal 29 72 n

[Range] $0 \leq n \leq 3, 48 \leq n \leq 51$

[Notes] n specifies the print position for HRI characters as follows:

n	Print position
0, 48	Not printed
1, 49	Above the barcode
2, 50	Below the barcode
3, 51	Both above and below the barcode

- HRI characters are the characters used to make notes for barcode.
- The font of HRI characters is specified by **GS f** command.

[Default] n = 0

[Relative] **GS f, GS k**

GS f n Select font for HRI characters

[Function] Select a font for HRI characters when printing a barcode.

[Format] ASCII GS f n
Hex 1D 66 n
Decimal 29 102 n

[Range] $0 \leq n \leq 1, 48 \leq n \leq 49$

[Notes] Use n to select a font as follows:

n	Font
0,48	Standard ASCII characters (12 × 24)
1,49	Compressed ASCII characters (9 × 17)

- HRI characters are the character used to make notes for barcode.
- HRI characters are printed at the position specified by **GS H**.

[Default] n = 0

[Relative] **GS H, GS k**

GS h n Select barcode height

[Function] Select barcode height

[Format] ASCII GS h n
Hex 1D 68 n
Decimal 29 104 n

[Range]	$1 \leq n \leq 255$
[Notes]	The height of barcode is n dots.
[Default]	$n = 162$
[Relative]	GS k

①GS k m d1...dk NUL②GS k m n d1...dn Print barcode

[Function] Select a barcode type and print barcode.

[Format]

①ASCII GS k m d1...d k NUL
Hex 1D 6B m d1...d k 00
Decimal 29 107 m d1...d k 0

②ASCII GS k m n d1... dn
Hex 1D 6B m n d1... dn
Decimal 29 107 m n d1... dn

[Range]

① $0 \leq m \leq 6$ (The range of k and d depends on the barcode type)
② $65 \leq m \leq 73$ (The range of k and d depends on the barcode type)

[Notes] m is used to select barcode type as follows:

m	Barcode type	Number of Characters	d
① 0	UPC-A	$11 \leq k \leq 12$	$48 \leq d \leq 57$
1	UPC-E	$11 \leq k \leq 12$	$48 \leq d \leq 57, d1=48$
2	JAN13 (EAN13)	$12 \leq k \leq 13$	$48 \leq d \leq 57$
3	JAN 8 (EAN8)	$7 \leq k \leq 8$	$48 \leq d \leq 57$
4	CODE39	$1 \leq k \leq 255$	$45 \leq d \leq 57, 65 \leq d \leq 90, 32, 36, 37, 43$
5	ITF	$1 \leq k \leq 255$	$48 \leq d \leq 57$
6	CODABAR	$1 \leq k \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 68, 36, 43, 45, 46, 47, 58$
10	PDF417	$1 \leq k \leq 255$	$0 \leq d \leq 255$
11	QRCODE	$1 \leq k \leq 928$	$0 < d \leq 255$
12	MAXICODE	$1 \leq k \leq 84$	$48 \leq d \leq 57, 65 \leq d \leq 90, 97 \leq d \leq 122$
13	GS1	Not limited	Determined by the parameters of GS1
② 65	UPC-A	$11 \leq n \leq 12$	$48 \leq d \leq 57$
66	UPC-E	$11 \leq n \leq 12$	$48 \leq d \leq 57, d1=48$
67	JAN13 (EAN13)	$12 \leq n \leq 13$	$48 \leq d \leq 57$
68	JAN 8 (EAN8)	$7 \leq n \leq 8$	$48 \leq d \leq 57$
69	CODE39	$1 \leq n \leq 255$	$45 \leq d \leq 57, 65 \leq d \leq 90, 32, 36, 37, 43$
70	ITF	$1 \leq n \leq 255$	$48 \leq d \leq 57$
71	CODABAR	$1 \leq n \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 68, 36, 43, 45, 46, 47, 58$
72	CODE93	$1 \leq n \leq 255$	$0 \leq d \leq 127$
73	CODE128	$2 \leq n \leq 255$	$0 \leq d \leq 127$
75	PDF417	$1 \leq n \leq 255$	$0 \leq d \leq 255$
76	QRCODE	$1 \leq n \leq 255$	$0 \leq d \leq 255$
77	MAXICODE	$1 \leq n \leq 84$	$48 \leq d \leq 57, 65 \leq d \leq 90$

	78	GS1	$1 \leq n \leq 255$	Determined by the parameters of GS1
--	----	-----	---------------------	-------------------------------------

[Notes①]

- This command ends with a NUL code.
- When UPC-A or UPC-E is selected, the characters after the first 12 bytes will be processed as normal characters after receiving 12 bytes of barcode data.
- When JAN13 (EAN13) is selected, the characters after the first 13 bytes will be processed as normal characters after receiving 13 bytes of barcode data.
- When JAN8 (EAN8) is selected, the characters after the first 8 bytes will be processed as normal characters after receiving 8 bytes of barcode data.
- The number of data for ITF barcode must be even numbers. When an odd number of data is input, the printer ignores the last received data.
- The beginning code and the ending code of CODEBAR barcode must be one of A, B, C and D. The ending codes can be replaced with T, E, * and N.
- When QRCODE type is selected, d1...d k (d1...dn) consists of 5 parts, with format as follows:

1) Daabbcc,

D: Link structure mode, input specific mark symbol"D". This mode is optional and the following three parameters and separator should be assigned if this mode is selected.

aa: The position of the specific symbol, input 2 decimal numbers.

bb: The total number of the symbols, input 2 decimal numbers.

cc: The even and odd data, input 2 hexadecimal numbers.

, and : are fixed separator symbol.

2) E: Error correction grade, range: L, M, Q, H. The correction grade increases from L to H.

3) M: Mask image reference, range: Default is automatic mask.

4) M: Data input mode, range: A or M, A means automatic mode (Recommended). M means manual input mode. If A is selected, the character mode is not necessary to be assigned; if M selected, the character mode must be assigned. The default is A mode.

5) <Character mode><DATA1>,
< Character mode ><DATA2>,
< Character mode ><DATA3>,
.....
< Character mode ><DATA n>

Note: n>=200

Character input mode<N, A, B, K>

N: Numbers (0~9)

A: Mixed by alphabet and numbers (0~9)(A~Z)(SP,\$,%,*,+,-,.,/,,:)

Bxxxx: 8 bit byte mode (0x00~0xFF)

K: Kanji

The legal width of the bar: The ratio of the bar is not changeable.

Example:

1D 6B 0B 51 41 2C 30 31 32 33 34 35 36 37 38 39 41 42 43 44 20 32 44 20 63 6F
64 65 00 (Automatic mode is recommended and the character symbol A can be
omitted)

1D 6B 4c 12 48 4D 2C 4E 31 32 33 34 35 36 37 38 39 31 32 33 34 35

1D 6B 0B 4D 4D 2C 41 41 43 2D 34 32 00

1D 6B 0B 4C 4D 2C 4E 30 31 32 33 34 35 36 37 38 39 30 31 32 33 34 35 2C 41 41
42 43 2C 42 30 30 30 36 71 72 63 6F 64 65 00

1D 6B 0B 46 2C 4C 4D 2C 4E 30 31 32 33 34 35 36 37 38 39 2C 41 31 32 41 41 42
42 2C 42 30 30 30 36 71 72 63 6F 64 65 00

- When MAXICODE is selected, the length of d1...d k (d1...dn) should not exceed 84 characters and it consists of 5 parts. The format is shown as below:

- 1) The basic postal code in 5 numbers;
- 2) The second postal code in 4 numbers;
- 3) The country code in 3 numbers;
- 4) The service class in 3 numbers;
- 5) The character strings.

Legal character: alphabet and numbers;

Length of variable: changeable;

Legal width of barcode: The ratio of the wide and narrow bars is not changeable.

Example:

1D 6B 0C 33 32 37 38 39 35 35 35 35 38 34 30 36 36 36 54 48 49 53 20 50 41 43
4B 41 47 45 49 53 20 47 4F 49 4E 47 20 54 4F 20 44 41 54 41 4D 41 58 43 4F 52
50 2E 00

[Notes ②]

- n indicates the number of barcode data, and the printer processes n bytes from the next character data as barcode data.
- If n is outside the specified range, the printer stops command processing and processes the following data as normal data.

[Notes (standard mode)]

- If d is outside the specified range, the command is disabled.
- If the horizontal size of the barcode exceeds print area, the command is disabled.
- The printer feeds as much paper as the barcode height, regardless of the line spacing specified by **ESC 2** or **ESC 3**.
- This command is enabled only when no data exists in the print buffer. When data exists in the print buffer, the command is ignored.
- After printing barcode, this command sets the print position to the beginning of the line.
- This command is not affected by print modes (emphasized, double-strike, underline,

character size, white/black reverse printing, or 90° clockwise rotated character, etc.) , except for upside-down print mode.

[Notes (page mode)]

- This command develops barcode data in the print buffer, but does not print it. After processing barcode data, this command moves the print position to the right side of the barcode.
- If d is out of the specified range, this command is ignored.
- If barcode width exceeds the print area, this command is ignored.

When CODE128 (m = 73) is selected:

- Refer to Appendix A for the information about the CODE 128 and the code set.
- When using the CODE 128 in this printer, take the following points into account for data transmission:
 - ① Code set must be selected before the barcode data (choose one from CODE A, CODE B or CODE C).
 - ② Code set is selected by combining character "{" and another character. The ASCII "{" character is selected by transmitting "{" twice consecutively.

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

For example: print "No. 123456"

In this example, the printer first prints "No." using CODE B, then prints the following numbers using CODE C:

GS k 73 10 123 66 78 111 46 123 67 12 34 56



- If the top of the barcode data is not the code set selection, the printer stops command processing and processes the following data as normal data.
- If combination of "{" and the following character is not the specified combination above, the printer stops command processing and processes the following data as normal data.

- If the character received by the printer is not barcode code set data, the printer stops command processing and processes the following data as normal data.
- When printer prints HRI characters, it does not print shift character and code set selection data.
- HRI characters for the function characters are not printed.
- HRI characters for the control characters (<00>H to <1F>H and <7F>H) are not printed.
- The left- and right –side spacing which varies from one barcode type to another must be ensured.

[Relative]

GS H, GS f, GS h, GS w, GS s Appendix A

[Example]

1B 40 (Initialize the printer)

4A 41 4E 31 33 **0A**

1D 48 01 (Set the width of the barcode unit to 1)

1D 66 01 (HRI characters use compressed font)

1D 77 01 (Print HRI characters above the barcode)

1D 68 40 (Barcode height is 64/203 inch)

1D 6B 02 30 31 32 33 34 35 36 37 38 39 30 35 39 00 0A

1D 48 02 (Set the width of the barcode unit to 2)

1D 66 01 (HRI characters use compressed font)

1D 77 02 (Print HRI characters below the barcode)

1D 68 80 (Barcode height is 128/203 inch)

1D 6B 02 30 31 32 33 34 35 36 37 38 39 30 35 39 00 0A

1D 48 03 (Set the width of the barcode unit to 3)

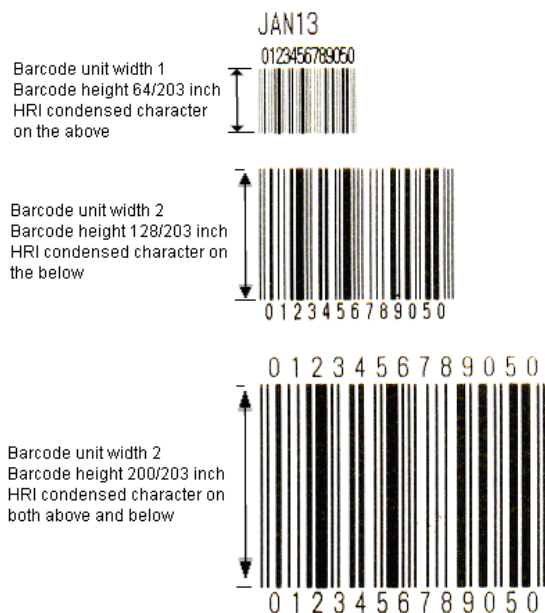
1D 66 00 (HRI characters use standard font)

1D 77 03 (print HRI characters both above and below the barcode)

1D 68 C8 (Barcode height is 162/203 inch)

1D 6B 02 30 31 32 33 34 35 36 37 38 39 30 35 39 00 0A

Result:



GS s n1 n2 n3 n4 n5 n6 n7 n8 Set parameters of GS1 barcode

[Function] Set parameters of GS1 barcode.

[Format] ASCII GS s n1 n2 n3 n4 n5 n6 n7 n8
Hex 1D 73 n1 n2 n3 n4 n5 n6 n7 n8
Decimal 29 115 n1 n2 n3 n4 n5 n6 n7 n8

[Range] $1 \leq n1 \leq 7$
 $1 \leq n2 \leq 6$
 $2 \leq n3 \leq 250$
 $1 \leq n4 \leq 10$
 $1 \leq n5 \leq 10$
 $2 \leq n6 \leq 20, 4 \leq n6 \leq 20$
 $1 \leq n7 \leq 4$
 $0 \leq n8 \leq 1$

[Notes] • Whether GS1 barcode is independent or composite barcode is distinguished by data separator "|". If there is "|" in the programmed data, it is composite barcode; otherwise, it is independent DataBar. The part before "|" is DataBar of the composite barcode and the part after it is the data of 2D barcode.

• n1 indicates barcode type and character set as below:

Parameter	Barcode type	Character set	Data length	Coding range
1	GS1DataBar Omnidirectional	Number 0-9	14 bits, 13 bits of numbers+1 bit of check characters	0000000000000 ~ 9999999999999
2	GS1DataBar Truncated	Number 0-9	14bits, 13 bits of numbers+1 bit of check characters	0000000000000 ~ 9999999999999
3	GS1 DataBar Stacked	Number 0-9	14 bits, 13 bits of numbers+1 bit of check characters	0000000000000 ~ 9999999999999
4	GS1 DataBar Stacked Omnidirectional	Number 0-9	14 bits, 13 bits of numbers+1 bit of check characters	0000000000000 ~ 9999999999999
5	GS1 DataBar Limited	Number 0-9	14 bits, 13 bits of numbers+1 bit of check characters	0000000000000 ~ 1999999999999
6	GS1 DataBar Expanded	0 ~ 9, A ~ Z, a ~ z ! " % & ' () * + , - . / : ; < = > ? _ space FNC1	Max 74 numbers or 41 letters	
7	GS1 DataBar ExpandedStacked	0 ~ 9, A ~ Z, a ~ z ! " % & ' () * + , - . / : ; < = > ? _ space FNC1	Max 74numbers or 41 letters	

• If the length is 13 bits, it will append the check character from the automatic calculation of the first 13 bits to the right of the data; If the length is 14 bits, replace the 14th character with the check character from the automatic calculation of the first 13 bits (the printed 14th bit may be different from the inputted character) ; if the length is less than 13 bits, add 0 to the left of the data, and if the length is more than 14 bits,

it will not be printed out.

- The character set of 2D barcode in composite barcode: 0 ~ 9, A ~ Z, a ~ z ! " % & ' () * + , - . / : ; < = > ? _ space FNC1 (FNC1 is indicated by "{1").
- n2 indicates width of basic element
- n3 indicates the height of the DataBar. Stacked, stacked omnidirectional, expanded stacked barcodes indicate the height of each line.
- n4 indicates the basic element height of the 2D barcode in the composite barcode.
- n5 indicates the height of the separator. This parameter should be set in DataBar composite barcode or independent stacked DataBar, stacked omnidirectional, expanded stacked barcodes.
- n6 indicates the number of segments of each line of barcode. Only in expanded stacked barcode should this parameter be set.
Range of independent expanded stacked barcodes: 2 ~ 20; range of composite expanded stacked barcodes: 4 ~ 20
- n7 indicates the content of the note characters.

Parameter	Note characters
1	Data of DataBar and 2D in composite barcode Data of DataBar only in independent barcode
2	Print data of DataBar in composite or independent barcode
3	Print data of 2D in composite barcode, no printing in independent barcode
4	No note character

- n8 indicates whether to use AI (Application Identifier) : 0 indicates not using AI; 1 indicates using AI.

[Relative] GS k

GS o n Set parameters of barcode QRCODE

[Function] Set parameters of barcode QRCODE

[Format] ASCII GS o m nA nB nC
Hex 1D 6F m nA nB nC
Decimal 29 111 m nA nB nC

[Range] m = 0
 $1 \leq nA \leq 255, 0 \leq nB \leq 1, 1 \leq nC \leq 2$

The meaning of parameter n is shown as below:

Parameter	Meaning
nA	Basic element width
nB	Language mode 0:Chinese 1:Japanese
nC	Symbol type 1:Original type 2:Enhanced type (Recommended)

[Notes] When the value of parameter is outside the specified range, the command is disabled.

GS p n Set size of barcode PDF417

[Function] Set size parameters used to define barcode PDF417

[Format] ASCII GS p nA nB nC nD nE nF
Hex 1D 70 nA nB nC nD nE nF
Decimal 29 112 nA nB nC nD nE nF

[Range] $1 \leq nA \leq 10$
 $1 \leq nB \leq 100$
 $3 \leq nC \leq 90$
 $1 \leq nD \leq 30$
 $1 \leq nE \leq 7$
 $2 \leq nF \leq 25$

The meaning of parameter n is shown as below:

Parameter	Meaning
nA	Appearance to height
nB	Appearance to width
nC	Lines limit
nD	Columns limit
nE	X size
nF	line spacing

GS q n Set correction grade of barcode PDF417

[Function] Set correction grade of barcode PDF417

[Format] ASCII GS q n
Hex 1D 71 n
Decimal 29 113 n

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

[Notes] Set correction grade of PDF417 barcode. The higher the correction grade is, the bigger the capacity of the barcode is.

GS w n Set barcode width

[Function] Set barcode width

[Format] ASCII GS w n
Hex 1D 77 n
Decimal 29 119 n

[Range] $1 \leq n \leq 6$

[Notes] Set the horizontal module width of the barcode.

n specifies the horizontal module width of the barcode:

n	Single basic module width (mm)	Double basic module width	
		Thin basic module (mm)	Thick basic module (mm)
2	0.25	0.25	0.625
3	0.375	0.375	1.0
4	0.5	0.5	1.25
5	0.625	0.625	1.625
6	0.75	0.75	1.875

• Barcode of single basic module is as follows:

UPC-A, UPC-E, JAN13 (EAN13), JAN8 (EAN8), CODE93, CODE128;

• Barcode of double basic module is as follows:

CODE39, ITF, CODABAR

[Default] n = 2

[Relative] **GS k**

2.7 Two-color commands

ESC r n Enter/Exit two-color print mode

[Function] Enter/exit two-colour print mode.

[Format] ASCII ESC r n
 Hex 1B 72 n
 Decimal 27 114 n

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

[Notes] • n=0, exit two-color mode.
 • n=1, enter two-color mode.

[Default] n = 1

[Relative] ESC C

[Example] **1B 40**
 1B 72 01 (enter two-color print mode)
 1D 21 11 (set double-height, double-width)
 1B 43 01 (select color 2)
 41
 1B 43 00 (select color 1)
 41
 1B 43 01 (select color 2)
 41
 1B 43 00 (select color 1)
 41
 0A (print)
 1B 72 01 (exit two-color print mode)
 Result:

A A A A

ESC C n Select print color

[Function] Select print color.

[Format] ASCII ESC C n
 Hex 1B 43 n
 Decimal 27 67 n

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

[Notes] • n=0, select color 1.
 • n=1, select color 2.

[Relative] ESC r

2.8 Upside-down print command

GS (z nL nH 0 S Enter upside-down mode

[Function] Enter upside-down print mode and start receiving upside-down data.

[Format] ASCII GS (z nL nH 0 S

Hex 1D 28 7A nL nH 30 53

Decimal 29 40 122 nL nH 48 83

[Range]

nL = 2 nH = 0

[Notes]

- The difference between upside-down command and ESC { n upside-down printing: this upside-down printing command can print the note in upside-down mode, while ESC { n can only print the character line in upside-down mode.
- This command is used at the beginning of the upside-down page. The part behind the command is to be printed. It cannot be printed out immediately, but it is stored in the buffer. When the printer receives the command to cut paper (GS V) or to exit upside-down print mode, the data will be printed out in upside-down mode.
- This command can only be used at the beginning of the line, otherwise it will be ignored.
- This command should cooperate with paper cutting command or exit upside-down print command; otherwise it will not be able to finish upside-down print.
- The data to be printed in upside-down mode must be smaller than the size of command buffer (the capacity of buffer can be checked by printing self-test pages).
For pages larger than the size of command buffer:
 - a) Printer ignores print data;
 - b) If the printer ends with exiting upside-down print mode, it will enter normal print mode with no action;
 - c) If the printer ends with paper cutting command, the printer will enter normal print mode after the action of cutting paper.

• Forbidden commands

The following commands are not supported in upside-down print mode. If sending the following commands in upside-down print mode, the printer may not perform the expected result.

Command	Function
GS :	Start / end macro definition
GS ^	Perform macro definition
ESC D	Set horizontal tab position
FS q	Define NV bitmap
ESC =	Select printer
GS (A	Perform testing print
ESC c 7	Gray scale print function

Note: Although **FS q** command is not supported in upside-down print mode, **FS p** command is supported. If NV bitmap is to be printed upside down, enter upside-down print mode by command. Before entering upside-down print mode, first send **FS q** command to define NV bitmap. Example is as follows:

1C 71 01 (define NV bitmap,stands for bitmap data)

1D 28 7A 02 00 30 53 (enter upside-down mode)

1C 70 01 00 (print the bitmap downloaded in FLASH)

1D 28 7A 02 00 30 45 (print NV bitmap and exit upside-down print mode)

- Perform the command immediately

In upside-down print mode, this kind of command will be performed before printing. Details are as follows:

Command	Function
GS a	Automatic status back
DLE ENQ n	Real-time request
DLE DC4	Generate cash drawer driver pulse at real time
GS r	Return status
ESC p	Produce cash drawer control pulse

- Steps to perform upside-down printing through command:
 - a) Send command of entering upside-down mode;
 - b) Send page;
 - c) Send command of exiting upside-down mode or cutting paper and print the page.

[Example]

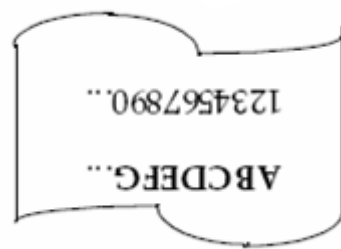
1D 28 7A 02 00 30 53 (enter upside-down mode)

41 42 43 44 45 46 47 2E 2E 2E **0A 0A**

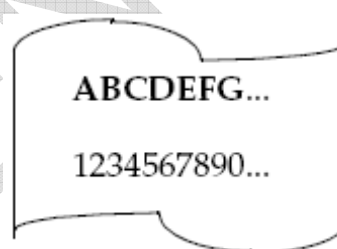
31 32 33 34 35 36 37 38 2E 2E 2E **0A** (print sample)

1D 56 42 00 (cut paper and exit upside-down mode)

Normal print and upside-down print:



Normal print page



Upside-down print page

GS (z nL nH 0 E Print page data and exit upside-down mode

[Function] Print page data and exit upside-down mode, then enter normal print mode.

[Format] ASCII GS (z nL nH 0 E
 Hex 1D 28 7A nL nH 30 45
 Decimal 29 40 122 nL nH 48 69

[Range] nL = 2
 nH = 0

- [Notes]
- This command should be used at the end of the upside-down page. After receiving the command, the printer will print out the page data in upside down mode.
 - This command can only be used at the beginning of the line, otherwise it will be ignored.
 - This command should be used together with the command of entering upside-down mode; otherwise upside-down printing cannot be realized.

2.9 Watermark commands

GS { w f n1 n2 n3 n4 n5 Set parameters of watermark bitmap

[Function] Set watermark bitmap parameters and enter watermark mode.

[Format] ASCII GS { w f n1 n2 n3 n4 n5

Hex 1D 7B 77 02 n1 n2 n3 n4 n5
 Decimal 29 123 119 02 n1 n2 n3 n4 n5

[Range]

$0 \leq n1 \leq 1$
 $0 \leq n2 \leq 2$
 n3 parameter selection can be found in the table below.
 $0 \leq n4 \leq 255$
 $1 \leq n5 \leq 255$

[Notes]

- n1 indicates watermark print mode:
 n1 = 0: print watermark bitmap when feeding paper
 n1 = 1: print watermark bitmap when printing
- n2 indicates watermark align mode
 n2 = 0: left justification
 n2 = 1: centering
 n2 = 2: right justification
- n3 indicates watermark enlargement mode selection, bit 0-3 selects height, bit 4-7 selects width, values are as below:

Width			Height		
Hex	Decimal	Horizontal enlargement	Hex	Decimal	Vertical enlargement
10	16	1 (normal)	01	1	1 (normal)
20	32	2 (double-width)	02	2	2 (double-height)
30	48	3	03	3	3
40	64	4	04	4	4
50	80	5	05	5	5
60	96	6	06	6	6

- n4 indicates watermark brightness adjustment, recommended value 0x20.
- n5 indicates the number of bitmap(defined by **FS q** command).
- This command is enabled only when used at the beginning of the line.
- This command is valid only in line mode, invalid in page mode.
- Before using this command, use **FS q** to define NV bitmap first.

[Example]

1D 7B 77 02 01 00 22 40 01

Explanation

n1=0x01: Watermark bitmap is printed only when there is a printing task.
 n2=0x00: watermark bitmap left justification.
 n3=0x22: watermark bitmap is enlarged twice horizontally and vertically respectively.
 n4=0x40: watermark brightness is 0x40.
 n5=0x01: regard the NV bitmap whose number is 1 as watermark bitmap.

GS { w n Enter\exit watermark mode

[Function]

Enter\exit watermark mode.

[Format]

ASCII GS { w n
 Hex 1D 7B 77 n
 Decimal 29 123 119 n

[Range]	$0 \leq n \leq 1$
[Notes]	<ul style="list-style-type: none"> • $n = 0$: exit watermark mode • $n = 1$: enter watermark mode • This command is enabled only when processed at the beginning of the line. • Before using this command, use watermark setting command to set watermark parameters first. • After exiting watermark mode using this command, the printer returns to normal print mode.

2.10 Gray scale print command

FS r n xL xH yL yH zL zH d1 d2 d3...d(k) Download Flash gray scale bitmap

[Function]	Download Flash gray scale bitmap.
[Format]	ASCII FS r n xL xH yL yH zL zH d1 d2 d3 ...d(k) Hex 1C 72 n xL xH yL yH zL zH d1 d2 d3 ...d(k) Decimal 28 114 n xL xH yL yH zL zH d1 d2 d3 ...d(k)
[Range]	$1 \leq n \leq 255$ $xL = 1, xH = 0$ $1 \leq (yL + yH \times 256) \leq 65536$ $1 \leq (zL + zH \times 256) \leq 8190$ $0 \leq d \leq 255$ $k = (yL + yH \times 256) \times (zL + zH \times 256) \times 8$
[Notes]	<ul style="list-style-type: none"> • The max download capacity of Flash is decided by the configuration of the printer, which can be checked through printing self-test page. The NV bitmap to be downloaded should be no larger than Flash download capacity; otherwise it will cause download failure. • n specifies the number of the NV bitmap to be defined. • yL and yH specifies $(yL + yH \times 256) \times 8$ dots in the horizontal direction for the NV bitmap. • zL and zH specifies $(zL + zH \times 256) \times 8$ dots in the vertical direction for the NV bitmap. • This command is disabled in upside-down mode. • Frequent execution of this command may cause damage to the Flash memory. Therefore, it is recommended to write the Flash 10 times or less a day. • This command cancels all NV bitmaps that have already been defined by this command. The printer can not redefine one of the several bitmaps previously defined, and in this case, all data needs to be sent again. • Because printer is in busy status when processing this command, it writes data to FLASH and stops receiving other commands. Thus, when executing this command, sending other commands including immediate commands is forbidden. • FLASH gray scale bitmap is the bitmap which is defined by FS r, stored in a Flash memory and printed by command FS p.

- In standard mode, this command is enabled only when processed at the beginning of the line.
- The 9 bytes <from FS~ zH > are processed as command data, not data of graphics.
- In the first group of NV bitmaps, when any parameter of the yL, yH, zL, zH is out of the defined range, this command is disabled.
- When downloading several bitmaps, if the printer processes yL, yH, zL, zH out of the defined range, it stops processing this command. At this time, bitmaps that haven't been defined are disabled (undefined), but bitmaps before that are enabled.
- d indicates the defined bitmap data. Set a corresponding bit to be 1 for printing a dot, or to be 0 for not printing a dot.
- This command defines n as the number of NV bitmaps. Numbers rise in order from NV bitmap 1. Therefore, the first data group [yL yH zL zH d1...dk] is NV bitmap 1, and the last data group [yLyH zL zHd1...dk] is NV bitmap n. It is the same when printing bitmap using command **FS p**.
- Define a NV bitmap consisting of [yL yH zL zH d1...dk]. Therefore, when only one NV bitmap, n=1. The printer uses bytes of Flash memory as follows:
([byte number of bitmap data: (yL + yH × 256)× (zL+ zH × 256)× 8] + [header: 4]).
- When processing this command, the printer does not process other commands.
- Once a NV bitmap is defined, it is not erased by performing **ESC @**, reset, or power off.
- This command only defines a NV bitmap, but does not perform printing. Printing of the NV bitmap is performed by the **FS p** command.
- Format of the gray scale bitmap: every dot line of gray scale image is indicated by four dot lines of data. The four dot lines of data form different levels of gray scale bitmaps. The table below shows the gray scale level of a dot and the data of this dot in the four dot lines of data. The corresponding relation is as below:

Actual gray scale level	Data of the first dot line	Data of the second dot line	Data of the third dot line	Data of the fourth dot line
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

[Relative]

FS p

ESC c 6 n yl yh zl zh d1 d2 d3 ...d(k) Download RAM gray scale bitmap

[Function] Download RAM gray scale bitmap.

[Format] ASCII ESC c 6 n yl yh zl zh d1 d2 d3 ...d(k)

Hex 1B 63 36 n yl yh zl zh d1 d2 d3 ...d(k)

Decimal 27 99 54 n yl yh zl zh d1 d2 d3 ...d(k)

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

$0 \leq d \leq 255$

$(yL + yJ \times 256) > 0$

$(zL + zJ \times 256) > 0$

$k = (yL + yH \times 256) \times (zL + zH \times 256) \times 8$

$k > 0$

[Notes]

- n specifies the bitmap number of RAM gray scale bitmap.
- yL and yH specify the number of dots in the horizontal direction for the Flash bitmap $(yL + yH \times 256) \times 8$.
- zL, zH specify the number of dots in the vertical direction for the Flash bitmap $(zL + zH \times 256) \times 8$.
- This command is disabled in upside-down mode.
- If the related parameter of this command exceeds the defined range, this command is disabled.
- If the RAM gray scale bitmap defined by this command exceeds the maximum download capacity of RAM 128kB, this command is disabled.
- The downloaded RAM gray scale bitmap is erased when the printer is turned off.
- Format of the gray scale bitmap: every dot line of gray scale image is indicated by four dot lines of data. The four dot lines of data form different levels of the gray scale bitmaps. The table below shows the gray scale level of a dot and the data of the dot in the four dot lines of data. The corresponding relation is as below:

Actual gray scale level	Data of the first dot line	Data of the second dot line	Data of the third dot line	Data of the fourth dot line
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

ESC c 7 n Print RAM gray scale bitmap

[Function] Print downloaded RAM gray scale bitmap.

[Format] ASCII ESC c 7 n

Hex 1B 63 37 n
 Decimal 27 99 55 n

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

- [Notes]
- This command is ignored if the downloaded bitmap has not been defined.
 - This command is disabled in upside-down print mode.
 - If the downloaded bitmap exceeds the print area, the excess data will not be printed.
 - This command prints bitmaps downloaded in RAM, but not bitmaps downloaded in Flash, and the corresponding bitmap number is specified by GS #.

2.11 Page control commands

ESC c : n Select paper saving mode

[Function] Select paper saving mode and reduce page length.

[Format]

ASCII	ESC	c	:	n
Hex	1B	63	3A	n
Decimal	27	99	58	n

[Range] $0 \leq n \leq 4$

- [Notes]
- Paper-saving function refers to vertical compression according to a proportionality factor set by user to reach the goal of saving paper.
 - The command only refers to vertical compression.
 - The command only works on compressible space. Compressible space includes: space between print data (except space caused by space characters); 1D barcode (The minimal height 1D barcode can be compressed is 30 dots).
 - The command compresses compressible space according to a certain proportionality factor, which is set as follows:

m	Proportionality factor setting
0	No compression
1	Compress 25%
2	Compress 50%
3	Compress 75%
4	Compress 100%

- The command only works on the ticket sending this command.
- This command is enabled only in standard mode.

[Default] n = 0

2.12 Other commands

DLE ENQ n Real-time request

[Function] Real-time request

[Format]

ASCII	DLE	ENQ	n
Hex	10	05	n
Decimal	16	5	n

[Range] $1 \leq n \leq 2$

[Notes] The meaning of n is as follows:

n	Request
1	Recover from an error and restart printing from the line where the error occurred
2	Recover from an error and clear the data in receive and print buffers

- This command is enabled only when cutter error or mark location failure occurs.
- The printer starts processing data upon receiving this command in serial mode.
- This command can not be executed when the printer is busy in parallel mode.
- When the printer is disabled by ESC = (Select peripheral device), the command is still valid.
- Do not insert the command into the command sequence of 2 or more bytes.

[Reference] **DLE EOT**

DLE DC4 n m t Generate pulse at real time to open cash drawer

[Function] Generate pulse at real time to open cash drawer.

[Format] ASCII DLE DC4 n m t
Hex 10 14 n m t
Decimal 16 20 n m t

[Range] $n = 1$
 $0 \leq m \leq 1$
 $1 \leq t \leq 6$

[Notes] m specifies the relevant pin:

m	Connector pin
0	Cash drawer kick-out connector pin 2
1	Drawer kick-out connector pin 5

- The high level time is $[t \times 100 \text{ ms}]$, and the low level time is $[2 \times t \times 100 \text{ ms}]$.
- This command is ignored when printer executes cash drawer open command (**ESC p** or **DEL DC4**).
- The printer starts processing data upon receiving this command in serial mode.
- This command can not be executed when the printer is busy in parallel mode.
- If print data includes the same data as this command, then those data will be performed as the command. User must consider this.
- When the printer is disabled by ESC = (Select peripheral device), the command is still valid.
- Do not insert the command into the command sequence of 2 or more bytes.

[Relative] **ESC p**

ESC 2 Set default line spacing

[Function] Select default line spacing to 1/6 inch (about 4.23mm)

[Format] ASCII ESC 2
Hex 1B 32

Decimal 27 50

[Notes] The line spacing can be set independently in standard mode and in page mode.

[Relative] ESC 3

ESC 3 n Set line spacing

[Function] Set line spacing.

[Format]

ASCII	ESC	3	n
Hex	1B	33	n
Decimal	27	51	n

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

[Notes]

- The line spacing can be set independently in standard mode and in page mode.
- The horizontal and vertical motion units are specified by GS P. Changing the horizontal or vertical motion unit does not affect the current line spacing.
- In standard mode, the vertical motion unit is used.
- In page mode, the horizontal or vertical motion units are selected as follows, depending on the print direction and print starting position:
 - ① When the print starting position is set to the upper left or lower right of the print area by **ESC T**, the vertical motion unit is used;
 - ② When the print starting position is set to the upper right or lower left of the print area by **ESC T**, the horizontal motion unit is used;
- The maximum paper feed amount is 1016 mm (about 40 inches) . Even if a paper feed amount of more than 1016 mm (40 inches) is set, the printer feeds the paper only 1016 mm (40 inches).

[Default] The default line spacing is approximately 4.23mm (1/6 inch).

[Relative] ESC 2, GS P

ESC = n Select printer

[Function] Select printer and the selected printer can receive data sending from host computer.

[Format]

ASCII	ESC	=	n
Hex	1B	3D	n
Decimal	27	61	n

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

[Notes] The meaning of n is as follows:

Bit	1/0	Hex	Decimal	Function
0	0	00	0	Printer disabled
	1	01	1	Printer enabled
1-7				Undefined

- When the printer is disabled, it ignores all commands except for immediate commands (**DLE EOT**, **DLE ENQ**, **DLE DC4**).

[Default] n = 1

ESC @ Initialize the printer

[Function]	Initialize the printer, clear data in print buffer and set print mode to the default mode when powered on.		
[Format]	ASCII	ESC	@
	Hex	1B	40
	Decimal	27	64
[Notes]	<ul style="list-style-type: none"> • The data in the receive buffer is not erased. • The macro definition is not erased. • The NV bitmap data is not erased. 		

ESC L Select page mode

[Function]	Convert from standard mode to page mode.		
[Format]	ASCII	ESC	L
	Hex	1B	4C
	Decimal	27	76
[Notes]	<ul style="list-style-type: none"> • This command is enabled only when processed at the beginning of a line in standard mode. • This command is disabled in page mode. • After executing commands FF or ESC S, the printer returns to standard mode. • This command sets the print position to the position specified by commands ESC T and ESC W. • This command converts the settings of following commands to the values in page mode: <ul style="list-style-type: none"> ① Set right-side character spacing: ESC SP, FS S ② Set line spacing: ESC 2, ESC 3 • The following commands only change flag in page mode, and become effective after converted to standard mode: <ul style="list-style-type: none"> ① 90° clockwise rotation: ESC V ② Select character align mode: ESC a ③ Select upside-down mode: ESC { ④ Set left space: GS L ⑤ Set print area width: GS W • The printer returns to standard mode when power is turned off, the printer is reset, or ESC @ is performed. 		
[Relative]	FF , CAN , ESC FF , ESC S , ESC T , ESC W , GS \$, GS \		

ESC S Select standard mode

[Function]	Select standard mode.		
[Format]	ASCII	ESC	S
	Hex	1B	53
	Decimal	27	83

[Notes]

- This command is enabled only in page mode.
- This command clears print data in the buffer in page mode.
- This command sets the current position to the beginning of the line.
- The page mode area is initialized as default data.
- This command switches the settings of following commands to the values in standard mode:
 - ① Set right-side character spacing: **ESC SP, FS S**
 - ② Select line spacing: **ESC 2, ESC 3**
- The following commands can set relevant parameters in standard mode, but the settings are effective only in page mode:
 - ① Set print area in page mode: **ESC W**;
 - ② Select print direction in page mode: **ESC T**.
- The following commands are ignored in standard mode:
 - ① Set absolute vertical print position in page mode: **GS \$**;
 - ② Set relative print position in page mode: **GS **.
- Printer returns to standard mode when the printer hardware is reset or command **ESC @** is performed.

[Relative]

FF, ESC FF, ESC L

ESC c 3 n Select paper sensor to output paper end signals

[Function]

Select paper sensor to output paper end signals.

[Format]

ASCII ESC c 3 n
Hex 1B 63 33 n
Decimal 27 99 51 n

[Range]

$0 \leq n \leq 255$

[Notes]

Each bit of n is defined as follows:

Bit	0/1	Hex	Decimal	Function
0	0	00	0	Paper near end sensor is disabled.
	1	01	1	Paper near end sensor is enabled.
1	0	00	0	Paper near end sensor is disabled.
	1	02	2	Paper near end sensor is enabled.
2	0	00	00	Paper end sensor is disabled.
	1	04	4	Paper end sensor is enabled.
3	0	00	00	Paper end sensor is disabled.
	1	08	8	Paper end sensor is enabled.
4-7				Undefined.

- It is possible to select two sensors to output paper end signals. If any of the sensors detects paper end, paper end signal will be outputted.
- The command is enabled only in parallel mode and is ignored in serial mode.
- If either bit 0 or bit 1 of n is set to 1, the paper near end sensor is used to output paper end signal.
- If either bit 2 or bit 3 of n is set to 1, the paper end sensor is used to output paper end

signal.

- When both sensors are disabled, the paper end sensor is used to output paper end signal.

[Default] $n = 12$

ESC c 4 n Select paper near end sensor to stop printing

[Function] Select paper sensor to stop printing.

[Format] ASCII ESC c 4 n
Hex 1B 63 34 n
Decimal 27 99 52 n

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

[Notes] n is defined as below:

Bit	0/1	Hex	Decimal	Function
0	0	00	0	Paper near end sensor disabled.
	1	01	1	Paper near end sensor enabled.
1	0	00	0	Paper near end sensor disabled.
	1	02	2	Paper near end sensor enabled.
2-7				Undefined.

- When either bit 0 or bit 1 of n is 1, paper near end sensor is enabled, and when the printer detects paper near end, it stops printing after completing the current task.

[Default] $n = 0$

ESC c 5 n Enable/disable button

[Function] Enable/disable button.

[Format] ASCII ESC c 5 n
Hex 1B 63 35 n
Decimal 27 99 53 n

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

- [Notes]
- When the least significant bit of n is 0, the button is enabled.
 - When the least significant bit of n is 1, the button is disabled.
 - Only the least significant bit of n is effective.
 - When the button is disabled, it does not work when pressed.
 - When executing macro command, the button is always enabled.

[Default] $n = 0$

ESC p m t1 t2 Generate cash drawer control pulse

[Function] Generate cash drawer control pulse and output it to specified pin.

[Format] ASCII ESC p m t1 t2
Hex 1B 70 m t1 t2
Decimal 27 112 m t1 t2

[Range] $0 \leq m \leq 1, 48 \leq m \leq 49$
 $0 \leq t1 \leq 255, 0 \leq t2 \leq 255$

[Notes]

The corresponding relationship between the range of m and cash drawer connector pin:

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m	Connector pin
0, 48	Cash drawer kick-out connector pin 2
1, 49	Cash drawer kick-out connector pin 5

- The high level time is $[t1 \times 2 \text{ ms}]$ and the low level time is $[t2 \times 2 \text{ ms}]$.
- If $t2 < t1$, the low level time is $[t1 \times 2 \text{ ms}]$.

[Relative] DLE DC4

GS (A pL pH n m Execute test printing

[Function] Execute test printing.

[Format] ASCII GS (A pL pH n m
Hex 1D 28 41 pL pH n m
Decimal 29 40 65 pL pH n m

[Range] $(pL + (pH \times 56)) = 2$ ($pL=2$, $pH=0$)
 $0 \leq n \leq 2$, $48 \leq n \leq 50$
 $1 \leq m \leq 4$, $49 \leq m \leq 52$

[Notes] m decides printing data:

m	Printing data
1, 49	Print in dump mode
2, 50	Internal configuration information printing
3, 51	Cyclic character printing
4, 52	Paper calibration (effective in mark/label paper mode)

- This command is enabled only when processed at the beginning of the line in standard mode.
- This command is disabled in page mode.
- If this command is received in the process of macro definition, the printer will stop macro definition and execute this command.
- The printer resets automatically after executing this command.
- The printer will cut paper after completing executing this command.
- When executing this command, the printer is busy, so it does not receive other commands.
- When $m = 4$, the printer executes this command. After some paper feed amount, a diagnostic threshold is calculated, which is used for functions like page orientation.

GS : Start/End macro definition

[Function] Start/End macro definition.

[Format] ASCII GS :
Hex 1D 3A
Decimal 29 58

[Notes] • Macro definition starts when this command is received during normal operation.
Macro definition ends when this command is received during macro definition.

- When **GS ^** is received during macro definition, the printer ends macro definition and clears the definition.
- Macro is not defined when the power is turned on.
- The defined contents of the macro cannot be cleared by **ESC @**. Therefore, **ESC @** can be included in the contents of the macro definition.
- The contents of the macro can be defined up to 2048 bytes. If the macro definition exceeds 2048 bytes, excess data will be processed as normal data

[Relative] **GS ^**

①GS V m ②GS V m n Select paper cutting mode and cut paper

[Function] Select paper cutting mode and cut paper

[Format] ①ASCII GS V m
Hex 1D 56 m
Decimal 29 86 m
②ASCII GS V m n
Hex 1D 56 m n
Decimal 29 86 m n

[Range] ① $0 \leq m \leq 1, 48 \leq m \leq 49$
② $m = 66, 0 \leq n \leq 255$

[Notes] Paper cut mode is selected according to the value of m as follows:

m	m	Paper cutting mode
0, 48	0,48	Full cut
1, 49	1,49	Partial cut
66	66	Feed paper ([n × (vertical motion unit) inches] and partial cut.

[Notes①] • This command is enabled only when processed at the beginning of the line.

[Notes②] • This command is enabled only when processed at the beginning of the line.

- $m = 0, 48, 1, 49$, printer cuts paper directly.
- When $n = 66$, the printer feeds paper [distance between print position and cutter + $n \times (\text{vertical motion unit})$] and cut paper.
- The horizontal and vertical motion units are specified by **GS P**.
- Paper feed amount is calculated by vertical motion unit.

GS ^ r t m Execute macro command

[Function] Execute macro command.

[Format] ASCII GS ^ r tm
Hex 1D 5E r tm
Decimal 29 94 r tm

[Range] $0 \leq r \leq 255$
 $0 \leq t \leq 255$
 $0 \leq m \leq 1$

[Notes] • r specifies the times of executing the macro.
• t specifies the waiting time for executing the macro.

- m specifies macro executing mode.
- When the LSB of m is 0: The macro is executed r times continuously at the interval of $t \times 100$ ms.
- When the LSB of m is 1, the LED flashes after waiting for $t \times 100$ ms and the printer does not execute the macro until the FEED button is pressed down. The printer repeats the operation r times.
- The waiting time of every macro execution is $t \times 100$ ms.
- If this command is received in the process of macro definition, the macro definition is stopped and the macro being defined is cleared.
- If the macro is not defined or r is 0, the command is disabled.
- When the macro is executed ($m = 1$), paper cannot be fed by using the FEED button.

[Relative]

GS :

3 Programming process guide

Because the different printing status and errors can be returned by Auto Status Back (ASB) command, it is recommended that you can use ASB command to inquiry status. ASB command is enabled when the printer is powered on and can be directly sent to inquiry the status.

The recommended programming process is shown as below:

1) Inquire printer status

Make sure that the printer status is normal before sending data to print.

2) Initialize the printer

Make sure that the previous setting does not affect the current printing.

3) Set print data

Set the print data such as character attribute, bitmap attribute and barcode attribute, etc., in order to get the desired print effect.

4) Send the data to be printed (including the setup command before printing)

If the print data is bitmap data, please do not send the status inquiry command when sending print data.

5) Inquire the printer status after printing

If ASB command is enabled, the printer will return the printer status automatically.

Appendix

Appendix A: CODE128

A.1 Overview of CODE128

In CODE128 system, it is possible to represent 128 ASCII characters, 100 numbers from 00 to 99 and some special characters with three code sets: A, B and C. Each code set is used for representing the following characters:

- CODE A: ASCII characters 00H to 5FH
- CODE B: ASCII characters 20H to 7FH
- CODE C: 100 numbers from 00 to 99

CODE128 can also encode the following special characters:

- SHIFT characters

In CODE A, the character just after SHIFT is processed as a character for CODE B. In CODE B, the character just after SHIFT is processed as a character for CODE A. The second and the following characters recover to the code set used before SHIFT. SHIFT characters cannot be used in CODE C.

- Code set selection character (CODE A, CODE B, CODE C).

These characters can switch the following code characters to CODE A, B, or C.

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

The usage of function characters depends on the application software. In CODE C, only FNC1 is available.

A.2 Code set

Characters in CODE A:

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
NULL	00	0	(	28	40	P	50	80
SOH	01	1	)	29	41	Q	51	81
STX	02	2	*	2A	42	R	52	82
ETX	03	3	+	2B	43	S	53	83
EOT	04	4	,	2C	44	T	54	84
ENQ	05	5	-	2D	45	U	55	85
ACK	06	6	.	2E	46	V	56	86
BEL	07	7	/	2F	47	W	57	87
BS	08	8	0	30	48	X	58	88
HT	09	9	1	31	49	Y	59	89
LF	0A	10	2	32	50	Z	5A	90
VT	0B	11	3	33	51	[	5B	91
FF	0C	12	4	34	52	\	5C	92
CR	0D	13	5	35	53	]	5D	93
SO	0E	14	6	36	54	^	5E	94

SI	0F	15	7	37	55	—	5F	95
DLE	10	16	8	38	56	FNC1	7B,31	123,49
	11	17	9	39	57	FNC2	7B,32	123,50
	12	18	:	3A	58	FNC3	7B,33	123,51
	13	19	;	3B	59	FNC4	7B,34	123,52
	14	20	<	3C	60	SHIFT	7B,53	123,83
	15	21	=	3D	61	CODEB	7B,42	123,66
	16	22	>	3E	62	CODEC	7B,43	123,67
	17	23	?	3F	63			
	18	24	@	40	64			
	19	25	A	41	65			
	1A	26	B	42	66			
	1B	27	C	43	67			
	1C	28	D	44	68			
	1D	29	E	45	69			
	1E	30	F	46	70			
	1F	31	G	47	71			
NAK	20	32	H	48	72			
SYN	21	33	I	49	73			
ETB	22	34	J	4A	74			
CAN	23	35	K	4B	75			
EM	24	36	L	4C	76			
SUB	25	37	M	4D	77			
ESC	26	38	N	4E	78			
FS	27	39	O	4F	79			
GS								
RS								
US								
SP								
!								
"								
#								
\$								
%								
&								
'								

Characters in CODE B:

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
SP	20	32	H	48	72	p	70	112
!	21	33	I	49	73	q	71	113
"	22	34	J	4A	74	r	72	114
#	23	35	K	4B	75	s	73	115
\$	24	36	L	4C	76	t	74	116
%	25	37	M	4D	77	u	75	117
&	26	38	N	4E	78	v	76	118
'	27	39	O	4F	79	w	77	119
(	28	40	P	50	80	x	78	120
)	29	41	Q	51	81	y	79	121
*	2A	42	R	52	82	z	7A	122
+	2B	43	S	53	83	{	7B,7B	123,123
,	2C	44	T	54	84	|	7C	124
-	2D	45	U	55	85	}	7D	125
.	2E	46	V	56	86	—	7E	126
/	2F	47	W	57	87	DEL	7F	127
0	30	48	X	58	88	FNC1	7B,31	123,49
1	31	49	Y	59	89	FNC2	7B,32	123,50
2	32	50	Z	5A	90	FNC3	7B,33	123,51
3	33	51	[	5B	91	FNC4	7B,34	123,52
4	34	52	\	5C	92	SHIFT	7B,53	123,83
5	35	53	]	5D	93	CODEA	7B,41	123,65
6	36	54	^	5E	94	CODEC	7B,43	123,67
7	37	55	—	5F	95			
8	38	56	`	60	96			
9	39	57	a	61	97			
:	3A	58	b	62	98			
;	3B	59	c	63	99			
<	3C	60	d	64	100			
=	3D	61	e	65	101			
>	3E	62	f	66	102			
?	3F	63	g	67	103			
@	40	64	H	68	104			
A	41	65	i	69	105			
B	42	66	j	6A	106			
C	43	67	k	6B	107			
D	44	68	l	6C	108			

E	45	69	m	6D	109			
F	46	70	n	6E	110			
G	47	71	o	6F	111			

Characters in CODE C:

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
00	00	0	40	28	40	80	50	80
01	01	1	41	29	41	81	51	81
02	02	2	42	2A	42	82	52	82
03	03	3	43	2B	43	83	53	83
04	04	4	44	2C	44	84	54	84
05	05	5	45	2D	45	85	55	85
06	06	6	46	2E	46	86	56	86
07	07	7	47	2F	47	87	57	87
08	08	8	48	30	48	88	58	88
09	09	9	49	31	49	89	59	89
10	0A	10	50	32	50	90	5A	90
11	0B	11	51	33	51	91	5B	91
12	0C	12	52	34	52	92	5C	92
13	0D	13	53	35	53	93	5D	93
14	0E	14	54	36	54	94	5E	94
15	0F	15	55	37	55	95	5F	95
16	10	16	56	38	56	96	60	96
17	11	17	57	39	57	97	61	97
18	12	18	58	3A	58	98	62	98
19	13	19	59	3B	59	99	63	99
20	14	20	60	3C	60	FNC1	7B,31	123,49
21	15	21	61	3D	61	CODEA	7B,41	123,65
22	16	22	62	3E	62	CODEB	7B,42	123,66
23	17	23	63	3F	63			
24	18	24	64	40	64			
25	19	25	65	41	65			
26	1A	26	66	42	66			
27	1B	27	67	43	67			
28	1C	28	68	44	68			
29	1D	29	69	45	69			
30	1E	30	70	46	70			
31	1F	31	71	47	71			
32	20	32	72	48	72			

33	21	33	73	49	73			
34	22	34	74	4A	74			
35	23	35	75	4B	75			
36	24	36	76	4C	76			
37	25	37	77	4D	77			
38	26	38	78	4E	78			
39	27	39	79	4F	79			

Appendix B: Print mode and its change

B.1 General Description

The printer operates in two modes: standard mode and page mode. In standard mode, when line buffer is full or when the printer receives print or paper feed commands, the printer will print and feed paper. In page mode, all the received print data and paper feed commands are stored in the specified memory, and the printer executes no operation. All the data in the memory is then printed when an **ESC FF** or **FF** command is received.

For example, when the printer receives the data "ABCDEF" <LF> in standard mode, it prints "ABCDEF" and feeds one line. In page mode, "ABCDEF" is written to the specified print area in memory, and the position in memory for the following print data is shifted by one line. The **ESC L** command switches the printer to page mode, and all data received thereafter are processed in page mode. Executing **ESC FF** command can print all the received data collectively, and executing a **FF** command can not only print all the received data but also switch the printer to standard mode. Executing **ESC S** command also can switch the printer to standard mode without printing the received data in page mode, and the received data is cleared from memory instead.

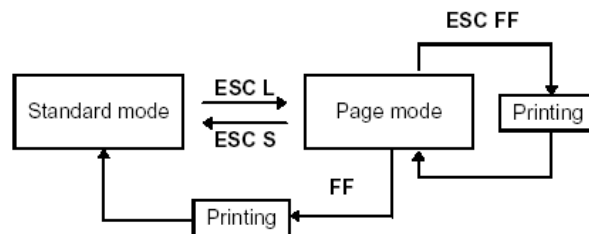


Figure B.1 switch between standard mode and page mode

B.2 Set values in standard and page modes

Some commands (such as **ESC SP**, **ESC 2**, **ESC 3**, and **FS S**) can be used in both standard and page modes, besides the parameters of them are the same. However, these values can be set independently in each mode. For these commands, different settings can be stored independently for each mode.

B.3 Set print area

- 1) The print area is set by **ESC W**. If all printing and feeding operations are completed before the printer receives the **ESC W** command, the left side (as you face the printer) will be taken as the origin (x0, y0) of the print area. The rectangular print area (dx dots) is defined by width extending rightward from the origin (x0, y0) in the x direction (perpendicular to the paper feed direction), and height (dy dots) in the y direction (paper feed direction). If the **ESC W** command is not used, the

print area remains the default value.

- 2) The print data received after print area and print direction are set (set by **ESC T** command) will be formatted within the print area as shown in figure **B.2**. Point A is the starting position of print area as a default value. (When a character is printed, point A is the baseline.). Print data containing downloaded bitmaps or barcodes is formatted so that the bottom point of the left side of the image data (point B in Figure **B.3**) is aligned with the baseline.
- 3) If the print data (including character spacing) exceeds the print area before the printer receives a command (e.g., **LF** or **ESC J**) that includes line feeding, a line feed is executed automatically within the print area (The paper feed amount depends on the line spacing set by **ESC 2** and **ESC 3**). The print position, therefore, moves to the beginning of the next line.
- 4) The default value of the line spacing is set to 1/6 inch and corresponds to 31 dots in the vertical direction. If print data for the next line contains enlarged characters that are higher than double-height characters, bitmaps taking up two or more lines, or barcodes higher than normal characters, the amount of line feeding may be insufficient, resulting in overlapping of the characters printed in the current line and characters printed in previous line. To avoid this, increase the amount of line spacing.

Example

When printing a downloaded bitmap of six bytes in the vertical direction, use the following formula:

{number of vertical dots (8×6) - number of dots for feeding paper at the beginning of the print area (24) }
× vertical motion unit (203/203) = 24. Therefore, to print a complete bitmap, the print position needs to move down 24 dots on the basis of the starting position of print area.

Use the following commands:

ESC W xL, xH, yL, yH, dxL, dxH, dyL, dyH

ESC T n

ESC 3 24 ← Set new line spacing

LF

GS / 1

ESC 2 ← Reset the line spacing to 1/6 inch

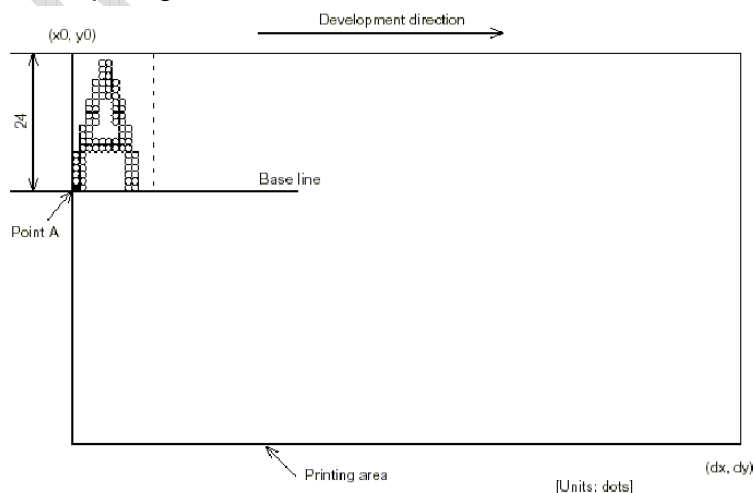


Figure B.2 storage location of character data

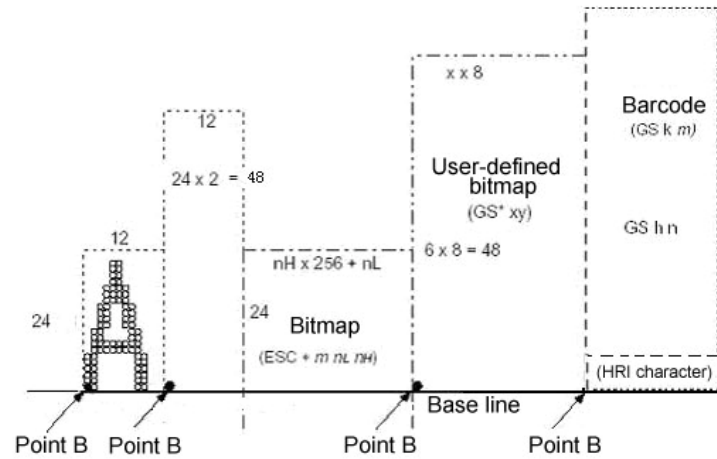


Figure B.3 storage location of print data

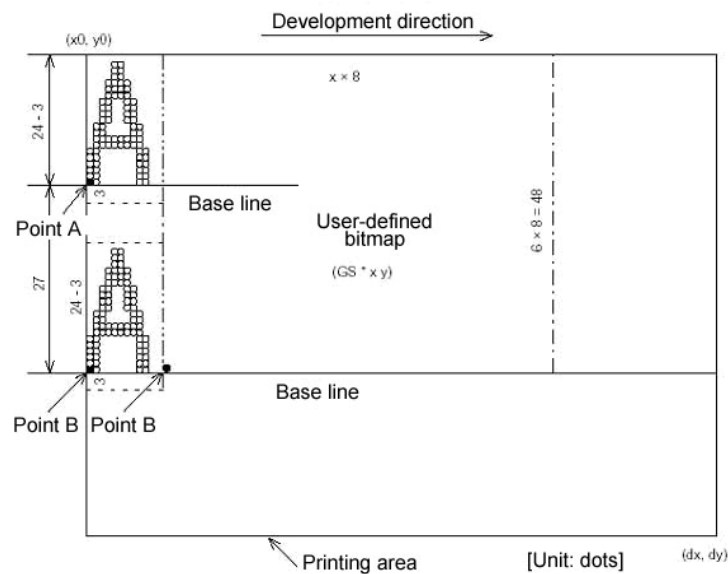


Figure B.4 storage location of downloaded bitmap

Appendix C: Command index

Command	Function
<u>HT</u>	Horizontal tab
<u>LF</u>	Print and feed one line
<u>FF</u>	Print and feed paper
<u>CR</u>	Print and carriage return
<u>CAN</u>	Delete data in print buffer in page mode
<u>DLE EOT</u>	Real-time status transmission
<u>DLE ENQ</u>	Real-time request
<u>ESC FF</u>	Print in page mode
<u>ESC SP</u>	Set right-side character spacing
<u>ESC !</u>	Select print mode
<u>ESC \$</u>	Set absolute horizontal print position
<u>ESC %</u>	Select/Cancel user-defined characters

<u>ESC &</u>	Define user-defined characters
<u>ESC *</u>	Select bitmap mode
<u>ESC - n</u>	Select/Cancel underline mode
<u>ESC 2</u>	Set default line spacing
<u>ESC 3 n</u>	Set line spacing
<u>ESC ?</u>	Cancel user-defined characters
<u>ESC @</u>	Initialize the printer
<u>ESC D</u>	Set horizontal tab positions
<u>ESC E</u>	Select/Cancel emphasized mode
<u>ESC G</u>	Select/Cancel double-strike mode
<u>ESC J</u>	Print and feed paper
<u>ESC L</u>	Select page mode
<u>ESC M</u>	Select character font
<u>ESC R</u>	Select an international character set
<u>ESC S</u>	Select standard mode
<u>ESC T</u>	Select print area direction in page mode
<u>ESC V n</u>	Select/Cancel 90° clockwise rotation
<u>ESC W</u>	Set print area in page mode
<u>ESC \ nL nH</u>	Set relative horizontal printing position
<u>ESC a</u>	Select character align mode
<u>ESC c 5</u>	Enable/disable button
<u>ESC c : n</u>	Select paper saving mode
<u>ESC d</u>	Print and feed n lines
<u>ESC t</u>	Set code page
<u>ESC {</u>	Select/Cancel upside-down print mode
<u>GS !</u>	Select character size
<u>GS \$</u>	Set the absolute vertical position in page mode
<u>GS *</u>	Define downloaded bitmap
<u>GS /</u>	Print downloaded bitmap
<u>GS :</u>	Start/End macro definition
<u>GS B</u>	Select/Cancel white/black reverse print mode
<u>GS H</u>	Select print position for HRI characters
<u>GS L</u>	Set left margin
<u>GS V</u>	Select paper cutting mode and cut paper
<u>GS W</u>	Set print area width
<u>GS \ nL nH</u>	Set relative vertical position in page mode
<u>GS ^</u>	Execute macro command
<u>GS a</u>	Automatic Status Back (ASB)
<u>GS f n</u>	Select font for HRI characters
<u>GS h</u>	Select barcode height

<u>GS k</u>	Print barcode
<u>GS r</u>	Return status
<u>GS v 0</u>	Print raster bitmap
<u>GS w</u>	Set barcode width
<u>FS !</u>	Set Chinese character mode
<u>FS &</u>	Select Chinese mode
<u>FS -</u>	Select/Cancel underline mode for Chinese characters
<u>FS .</u>	Cancel Chinese mode
<u>FS 2</u>	Define user-defined Chinese characters
<u>FS S</u>	Set left-side and right-side Chinese character spacing
<u>FS W</u>	Select/Cancel quadruple-size mode for Chinese characters
<u>FS p</u>	Print bitmap downloaded in FLASH
<u>FS q n</u>	Define NV bitmap
<u>GS s</u>	Set parameters of GS1 barcode
<u>ESC r</u>	Enter/Exit two-color print mode
<u>ESC C</u>	Select print color
<u>GS (</u>	Enter upside-down mode
<u>GS {</u>	Set parameters of watermark bitmap
<u>FS r</u>	Download Flash gray scale bitmap
<u>ESC c</u>	Download RAM gray scale bitmap