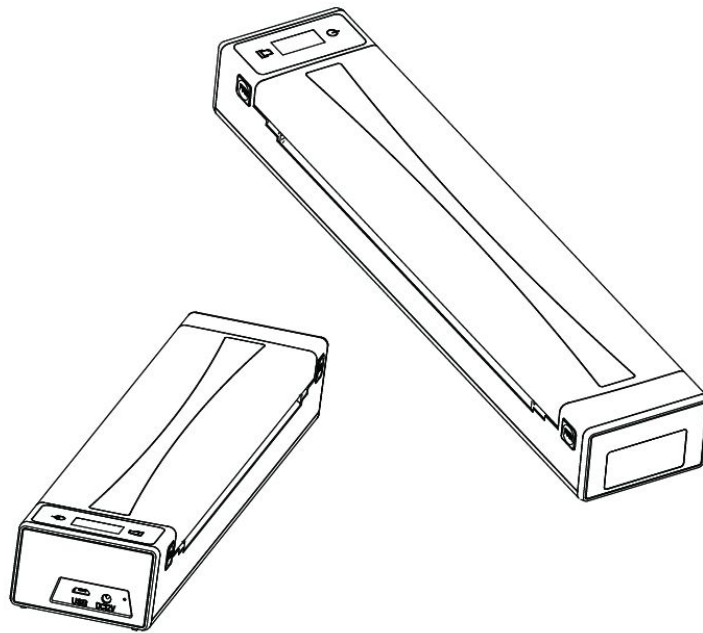


MPT8

Programming Manual



CONTENTS

1. Overview.....	1
1.1 Key Terms.....	1
1.2 Command Notation.....	1
2. Commands.....	2
HT.....	2
LF.....	2
FF.....	2
ESC SP n.....	2
ESC ! n.....	3
ESC \$ nL nH.....	3
ESC * m nL nH d1... Dk.....	4
ESC - n.....	5
ESC 2.....	6
ESC 3 n.....	6
ESC @.....	6
ESC D n1...nk NUL.....	6
ESC E n.....	7
ESC G n.....	7
ESC J n.....	8
ESC M n.....	8
ESC R n.....	8
ESC S.....	9
ESC V n.....	9
ESC \ nL nH.....	9
ESC a n.....	9
ESC d n.....	10
ESC t n.....	10
ESC v.....	11
ESC { n.....	11
FS p n m.....	12
FS q n [xL xH yL yH d1...dk]1...[xL xH yL yH d1...dk]n.....	13
GS ! n.....	14
GS (A pL pH n m.....	15
GS * x y d1...d(x × y × 8).....	16
GS / m.....	16
GS B n.....	17
GS H n.....	17
GS L nL nH.....	18
GS W nL nH.....	18
GS f n.....	18
GS h n.....	19
①GS k m d1...dk NUL②GS k m n d1...dn.....	19
GS r n.....	21
GS v 0 m xL xH yL yH d1...dk.....	22
GS w n.....	23
3. Command User Guide.....	24
3.1 Command User Guide Instructions.....	24
3.2 Command Application Introduction.....	24
3.2.1 Initialize set.....	24
3.2.2 Print set and print contents(Character/Barcode/Bitmap).....	24
3.2.3 Character property set.....	25

3.2.4 Print.....	26
3.2.5 State query.....	26
3.2.6 Bitmap download.....	26
3.2.7 Recommended program application process.....	29
APPENDIX A:CODE128 BAR CODE.....	30
A.1 Description of the CODE128 Bar Code.....	30
A.2 Code Tables.....	30
APPENDIX B:Print mode and its transformation.....	33
B.1 General Description.....	33
B.2 Setting Values in Standard and Page Modes.....	33
B.3Formatting of Print Data in the Printable Area.....	33

1. Overview

1.1 Key Terms

Real-time commands:	These commands are acted on immediately upon being received by the printer.
Page mode:	Under this mode, the printer stores all data in storage and thinks it as a virtual page. The printer doesn't print the page until it receives commands FF or ESC FF.
Standard mode:	Standard mode is the default mode of printer, namely line mode. Under this mode, the printer prints data and feeds paper when printer line buffer is full, namely data is enough for one print line or it receives command like LF.
HRI character:	Bar code comment character. HRI: Human Readable Interface.
NV storage0:	Non-volatile storage which feature is stored data does not loss when the power is turned off..
RAM:	Random Access Memory.
ASB:	Auto Send Back.
DPI:	Print dots per inch (one inch equals to 25.4mm). It is used to identify the resolution of the printer. For example, 203DPI means it can print 203 dots per inch. DPI: Dot Per Inch

1.2 Command Notation

[Name]	The name of the command.
[Format]	The format of the command, such as ASCII, Hexadecimal, Decimalism, etc.
[Range]	It gives the range of parameter which is used in commands.
[Default]	It gives the default values.
[Description]	It describes the function of the command.
[Notes]	It provides important information on setting and using the printer command.
[Reference]	It gives the explanation of other related commands.

2. Commands

HT

[Name] Horizontal tab

[Format] ASCII HT
Hex 09
Decimal 9

[Description] Moves the print position to the next horizontal tab position.

[Notes] This command is ignored unless the next horizontal tab position has been set.
If the next horizontal tab position exceeds the printing area, the printer sets the printing position to [printing area width + 1].
Horizontal tab positions are set with **ESC D**
If this command is received when the printing position is at [printing area width+ 1], the printer executes print buffer-full printing of the current line and horizontal tab processing from the beginning of the next line.
Set Horizontal tab default to 8 character width of character ASCII (12×24).
When the print buffer is full, the printer performs the following actions:
In standard mode, the printer prints the current line and sets the print position to the beginning of the line.
In page mode, the printer sets the print position to the beginning of the line.

[Reference] **ESC D**

LF

[Name] Print and move to next line.

[Format] ASCII LF
Hex 0A
Decimal 10

[Description] Prints the data in the print buffer and feeds one line.

[Notes] This command sets the print position to the beginning of the line.
When this command is processed in page mode, only the print position moves, and the printer does not perform actual printing.

[Reference] ESC 2, ESC 3

FF

[Name] Printer feed paper

[Format] ASCII FF
Hex OC
Decimal 12

[Description] If the type of paper is continuous paper, feed paper in 20mm.

If the type of paper is A4, paper is out of printer.

[Notes] This command is mainly used in the end of printing to separate the papers.

ESC SP n

[Name] Set the right spacing of character.

[Format] ASCII ESC SP n
Hex 1B 20 n
Decimal 1B 20 n

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

[Default] $n = 0$

[Description] Set the right spacing of character as $[n \times 0.125\text{mm}(n \times 0.0049 \text{ inch})]$.

[Notes] When characters are enlarged, the character spacing is n times normal value. This command sets values independently in each mode (standard and page modes).

ESC ! n

[Name] Select print mode(s).
 [Format] ASCII ESC ! n
 Hex 1B 21 n
 Decimal 27 33 n
 [Range] $0 \leq n \leq 255$
 [Description] Select print mode(s) using n as follows:

Bit	1/0	HEX	Decimal	Function
0	0	00	0	Character font 0 selected.
	1	01	1	Character font 1 selected.
1,2				Undefined.
3	0	00	0	Emphasized mode not selected.
	1	08	8	Emphasized mode selected.
4	0	00	0	Double-height mode not selected.
	1	10	16	Double-height mode selected.
5	0	00	0	Double-width mode not selected.
	1	20	32	Double-width mode selected.
6				Undefined.
7	0	00	0	Underline mode not selected.
	1	80	128	Underline mode selected.

[Notes] When both double-height and double-width modes are selected, characters will magnify two times in horizontal and vertical.
 The printer can underline all characters, except the space set by **HT**, 90° clockwise rotated characters and **HRI** characters..
 All characters align at bottom.
ESC E can also turn on or off emphasized mode. However, the setting of the last received command is effective.
ESC _ can also turn on or off underline mode. However, the setting of the last received command is effective.
GS ! can also select character size. However, the setting of the last received command is effective.

[Default] n = 0
 [Reference] ESC -, ESC E, GS !

ESC \$ nL nH

[Name] Set horizontal absolute print position.
 [Format] ASCII ESC \$ nL nH
 Hex 1B 24 nL nH
 Decimal 27 36 nL nH
 [Range] $0 \leq nL \leq 255$
 $0 \leq nH \leq 255$
 [Description] The distance from the beginning of the line to the printing position is [(nL + nH × 256) × 0.125 mm].

[Notes] This command is ignored when the setting position is outside of printing area.
 ESC W can set horizontal starting position in page modes. However, the setting of the last received command is effective.

[Reference] ESC \, GS \$, GS \

ESC * m nL nH d1... Dk

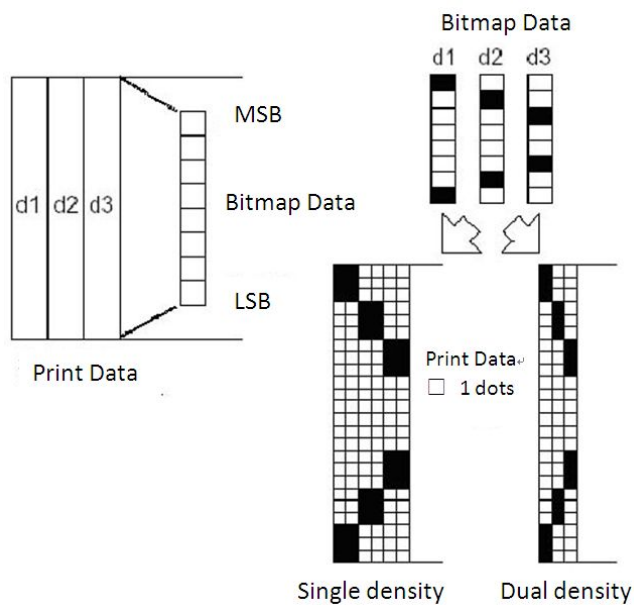
[Name] Select bit-image mode
[Format] ASCII ESC * m nL nH d1...dk
Hex 1B 2A m nL nH d1...dk
Decimal 27 42 m nL nH d1...dk
[Range] m = 0, 1, 32, 33
 $0 \leq nL \leq 255$
 $0 \leq nH \leq 3$
 $0 \leq d \leq 255$

[Description] Select a bit-image mode using **m**, bit-image dot is decided by nL and nH.

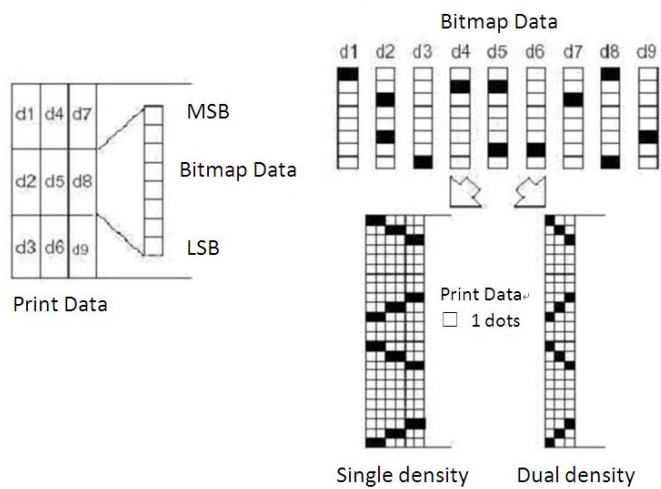
m	Mode	Vertical Direction		Horizontal Direction	
		Number of Bits for vertical data	Dot Density (DPI)	Amount of Data(k)	Number of Bits for vertical data
0	8-dot single-density	8	67	101	$nL + nH \times 256$
1	8-dot double-density	8	67	203	$nL + nH \times 256$
32	24-dot single-density	24	203	101	$(nL + nH \times 256) \times 3$
33	24-dot double-density	24	203	203	$(nL + nH \times 256) \times 3$

[Note] If the value of m out of the specified range, nL and the subsequent data will be processed as normal one.
The number of horizontal direction is up to nL and nH, the total number is $nL + nH \times 256$.
The part which bit-image is beyond the current area will be amputated.
d indicates the bit image data. Set a bit to 1 to print a dot, or set a bit to 0 to not print a dot.
After the bit-image is sent successfully, the printer will be back to the normal data processing mode.
If the width printing area set by GSL and GSW less than the printing width of **GS / required by the data sent with the ESC* command**, the following will be performed on the line in question (but the printing cannot exceed the maximum printable area):
① The width of the printing area is extended to the right to accommodate the amount of data.
② If step ① does not provide sufficient width for the data, the left margin is reduced to accommodate the data. For each bit of data in single-density mode (m = 0, 32), the printer prints two dots: for each bit of data in double-density mode (m = 1, 33), the printer prints one dot. This must be considered in calculating the amount of data that can be printed in one line.
It back to the normal data processing mode after printing a bit-image.
This command won't be influenced by other print modes (emphasized /double-strike /underline /characters amplification /white / black reverse), except upside-down printing mode.
the relationship between data and the point to be print as follows:

Choosing 8-dot density:



Choosing 24-dot density:



ESC - n

[Name] Turn underline mode on /off
[Format] ASCII

Hex
Decimal
[Range] $0 \leq n \leq 2$

$48 \leq n \leq 50$
[Description] turn underline mode on/off, *n* value as follows:

n	Function
0, 48	underline mode is turn off
1, 49	underline mode (one dot width) is turn on
2, 50	underline mode (two dot width) is turn on

[Note] This command is effective for all characters (including the blank space), but not the

blank space set by HT.

When underline mode is on, 90° clock wise rotated characters and characters and white / black reverse characters cannot be underline.

When underline mode is off, there is no underline for following characters.

Underline width stays the same, default width: one dot width.

Character size change has no effects on underline width.

Turn underline mode on / off can be set by ESC !, the command executed at last is effective.

[Default] n = 0

[Reference] ESC !

ESC 2

[Name] Set the default line spacing

[Format]	ASCII	ESC	2
	Hex	1B	32
	Decimal	27	50

[Description] Selects 3.875 mm (31×0.125 mm) line spacing.

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

[Reference] ESC 3

ESC 3 n

[Name] Set line spacing.

[Format]	ASCII	ESC	3	n
	Hex	18	33	n
	Decimal	27	51	n

[Description] Sets the line spacing to $[n \times 0.125 \text{ mm}]$.

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

[Reference] n = 30

[Default] ESC 2

ESC @

[Name] Initialize printer.

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

[Description] Clears the data in the print buffer and resets the printer mode to the mode that was in effect when the power was turned on.

[Notes] The bit image has been downloaded and custom characters in RAM is not cleared. When the printer default is label paper, the print mode is page mode after power-on.

When the printer default is continuous paper, the print mode is standard mode after power-on.

The macro definition is not cleared

ESC D n1...nk NUL

[Name] Set horizontal tab positions.

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

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

$0 \leq k \leq 32$

[Description] Set horizontal tab positions.

	n specifies the column number for setting a horizontal tab position from the beginning of the line.
	k indicates the total number of horizontal tab positions to be set.
[Notes]	The horizontal tab position is stored as a value of [character width × n] measured from the beginning of the line. The character width includes the right-side character spacing, and double-width characters are set with twice the width of normal characters. This command cancels the previous horizontal tab settings. When setting n = 8, the print position is moved to column 9 by sending HT. Up to 32 tab positions (k = 32) can be set. Data exceeding 32 tab positions is processed as normal data. Transmit [n]k in ascending order and place a NUL code 0 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. The previously specified horizontal tab positions do not change, even if the character width changes. The character width is memorized for each standard and page mode.
[Default]	The default tab positions are at intervals of 8 characters (columns 9, 17, 25,...) for Font A (12 × 24).
[Reference]	HT

ESC E n

[Name]	Turn emphasized mode on/off.			
[Format]	ASCII	ESC	E	n
	Hex	1B	45	n
	Decimal	27	69	n
[Range]	$0 \leq n \leq 255$			
[Description]	Turns emphasized mode on or off When the LSB of n is 0, emphasized mode is turned off. When the LSB of n is 1, emphasized mode is turned on.			
[Notes]	Only the least significant bit of n is enabled. This command and ESC ! turn on and off emphasized mode in the same way. Be careful when this command is used with ESC !.			
[Default]	n = 0			
[Reference]	ESC !			

ESC G n

[Name]	Turn on/off double-strike mode.			
[Format]	ASCII	ESC	G	n
	Hex	1B	47	n
	Decimal	27	71	n
[Range]	0 ≤ n ≤ 255			
[Description]	Turns double-strike mode on or off. When the LSB of n is 0, double-strike mode is turned off. When the LSB of n is 1, double-strike mode is turned on.			
[Notes]	Only the lowest bit of n is enabled. Printer output is the same in double-strike mode and in emphasized mode.			
[Default]	n = 0			
[Reference]	ESC E			

ESC J n

[Name]	Print and feed paper.			
[Format]	ASCII	ESC	J	n
	Hex	1B	4A	n
	Decimal	27	74	n
[Range]	$0 \leq n \leq 255$			
[Description]	Prints the data in the print buffer and feeds the paper [$n \times 0.125$ mm (0.0049")].			
[Notes]	After printing is completed, this command sets the print starting position to the beginning of the line. The paper feed amount set by this command does not affect the values set by ESC 2 or ESC 3.			

ESC M n

[Name] Select character font..

[Format] ASCII ESC M n

Hex 1B 4D n

Decimal 27 77 n

[Range] $0 \leq n \leq 9, 48 \leq n \leq 57$

[Description] Select character font.

n	Function
0	Character Font ASCII 0 (12 × 24) selected
1	Character Font ASCII 1 (8 × 16) selected
16,18	Chinese Character Font (12 × 24) selected
17,19	Chinese Character Font (16 × 16) selected

[Notes] ESC ! can also select character font types. However the setting of the last received command is effective.

This command is invalid if the font is not in the font library.

[Reference] ESC !

ESC R n

[Name]	Select an international character set			
[Format]	ASCII	ESC	R	n
	Hex	1B	52	n
	Decimal	27	82	n
[Range]	0≤n≤13			
[Description]	Selects international character set 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		
[Notes]	Only Font 0 and Font a have international character set.This command is invalid in other font.			
[Default]	n = 0			

ESC S

[Name]	Select standard mode.		
[Format]	ASCII	ESC	S
	Hex	1B	53
	Decimal	27	83
[Description]	Switches from page mode to standard mode.		
[Notes]	This command is effective only in page mode. Data buffered in page mode is cleared. This command sets the print position to the beginning of the line. The area of page mode is initialized as default value. This command switches the settings for the following commands (in which the values can be set independently in standard mode and page mode) to those for standard mode: ①Set right-side character spacing: ESC SP ②Select default line spacing: ESC 2, ESC 3		
[Reference]	FF, ESC FF, ESC L		

ESC V n

[Name]	Turn 90° clockwise rotation mode on/off.			
[Format]	ASCII	ESC	V	n
	Hex	1B	56	n
	Decimal	27	86	n
[Range]	$0 \leq n \leq 3$			
[Description]	n=0 Doesn't rotate n=1 Rotate 90 degrees n=2 Rotate 180 degrees n=3 Rotate 270 degrees			
[Notes]	It only support n=0,1 This command is valid only in standard mode. In underline mode,underline can't rotate 90 degrees clockwise. In clockwise rotation 90 degrees mode,the direction of double-height and double-width is opposite of the normal mode.			
[Default]	n = 0			
[Reference]	ESC !, ESC			

ESC \ nL nH

[Name]	Set relative horizontal print position.				
[Format]	ASCII	ESC	\	nL	nH
	Hex	1B	5C	nL	nH
	Decimal	27	92	nL	nH
[Range]	$0 \leq nL \leq 255$ $0 \leq nH \leq 255$				
[Description]	Sets the relative horizontal print starting position from the current position. This command sets the distance from the current position to [(nL + nH × 256) × 0.125 mm].				
[Notes]	The printer ignores any setting that exceeds the print area. When pitch N is specified for the movement to the right: nL + nH × 256 = N. Use the complement of N for setting N pitch movement to the left: (nL + nH × 256) = 65536 – N. Print starting position from the current position to [N × 0.125mm].				
[Reference]	ESC \$				

ESC a n

[Name]	Select justification			
[Format]	ASCII	ESC	a	n

	Hex	1B	61	n
	Decimal	27	97	n
[Range]	$0 \leq n \leq 2, 48 \leq n \leq 50$			
[Description]	Aligns all the data in one line to the specified position. n selects the justification as follows:			

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

[Notes]	The 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 justifies the space area according to HT, ESC \$ or ESC \.
[Default]	n = 0
[Example]	

Left justification	Centering	Right justification
ABC ABCD ABCDE	ABC ABCD ABCDE	ABC ABCD ABCDE

ESC d n

[Name]	Print and feed n lines
[Format]	ASCII ESC d n Hex 1B 64 n Decimal 27 100 n
[Range]	$0 \leq n \leq 255$
[Description]	Prints the data in the print buffer and feeds n lines.
[Notes]	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 900 mm. If the paper feed amount (n line spacing) of more than 900 mm is specified, the printer feeds the paper only 900 mm.
[Reference]	ESC 2, ESC 3

ESC t n

[Name]	Select character code table
[Format]	ASCII ESC t n Hex B 74 n Decimal 27 116 n
[Range]	$0 \leq n \leq 5; 13 \leq n \leq 21; n=26; 32 \leq n \leq 34; n=36, 37; 39 \leq n \leq 40; 45 \leq n \leq 52; 54 \leq n \leq 66$
[Description]	Selects page n from the character code table.

n	Character Code table	n	Character Code table
0	[PC437 (USA: Standard Europe)]	40	[ISO8859-15 (Latin9)]
1	[Katakana]	45	[WPC1250]
2	[PC850 (Multilingual)]	46	[WPC1251(Cyrillic)]
3	[PC860 (Portuguese)]	47	[WPC1253]

4	[PC863 (Canadian-French)]	48	[WPC1254]
5	[PC865 (Nordic)]	49	[WPC1255]
13	[PC857 (Turkish)]	50	[WPC1256]
14	[PC737 (Greek)]	51	[WPC1257]
15	[ISO8859-7 (Greek)]	52	[WPC1258]
16	[WPC1252]	54	[MIK(Cyrillic /Bulgarian)]
17	[PC866 (Cyrillic #2)]	55	[CP755 (East Europe, Latvian 2)]
18	[PC852 (Latin 2)]	56	[Iran]
19	[PC858 (Euro)]	57	[Iran II]
20	[KU42]	58	[Latvian]
21	[TIS11 (Thai)]	59	[ISO-8859-1 (West Europe)]
26	[TIS18 (Thai)]	60	[ISO-8859-3(Latin 3)]
32	[PC720]	61	[ISO-8859-4(Baltic)]
33	[WPC775]	62	[ISO-8859-5(Cyrillic)]
34	[PC855 (Cyrillic)]	63	[ISO-8859-6(Arabic)]
36	[PC862 (Hebrew)]	64	[ISO-8859-8(Hebrew)]
37	[PC864 (Arabic)]	65	[ISO-8859-9(Turkish)]
39	[ISO8859-2 (Latin2)]	66	[PC856]

ESC v

[Name] Transmit printer status.

[Format] ASCII ESC v
Hex 1B 76
Decimal 27 118

[Description] This command is only effective with a serial interface printer to transmit printer status to host machine.

When the printer receive command, transfer a byte to the hardware.

Defined as follows:

Bit	0/1	HEX	Decimal	Function
0	0	00	0	Normal
	1	01	1	Paper near end
1,6	0	00	0	Print head pressure
	1	42	66	Print head uplift
2	0	00	0	Paper exit
	1	04	4	Paper end
3	0	00	0	Normal
	1	08	8	Cutter error
4	0	00	0	Fixed to off
5	0	00	0	Normal
	1	20	32	Thermal head over
7	---	---	---	Undefined

[Notes] This command is only effective with a serial interface mode.

ESC { n

[Name] Turn upside-down printing mode on/off.

[Format] ASCII ESC { n
Hex 1B 7B n
Decimal 27 123 n

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

[Description] Turns upside-down printing mode on or off.

When the LSB of n is 0, upside-down printing mode is turned off.

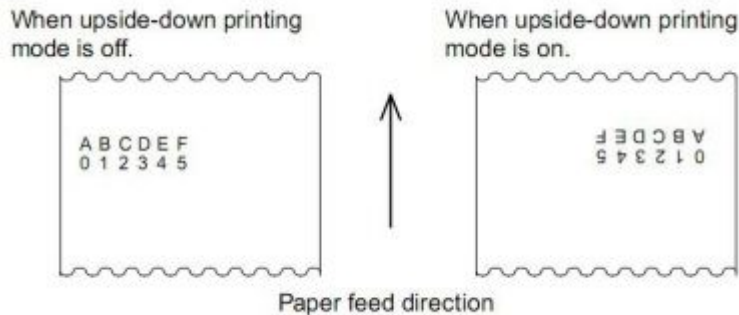
When the LSB of n is 1, upside-down printing mode is turned on.

[Notes] Only the lowest bit 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 printing mode, the printer rotates the line to be printed by 180° and then prints it.
 n = 0

[Default]
 [Example]



FS p n m

[Name] Print NV bit image.

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

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

$0 \leq m \leq 3, 48 \leq m \leq 51$

[Description] Prints NV bit image n using the mode specified by m.

m	Mode	Vertical Dot Density	HorizontalDot Density
0,48	Normal	203.2 dpi	203.2 dpi
1,49	Double-width	203.2 dpi	101.6 dpi
2,50	Double-height	101.6 dpi	203.2 dpi
3,51	Quadruple	101.6 dpi	101.6 dpi

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

m specifies the bit image mode.

[Detail] NV bit image is a bit image defined in non-volatile memory by FS q and printed by FS p.

This command is not effective when the specified NV bit image has not been defined.

In standard mode, this command is effective only when there is no data in the print buffer.

This command is not affected by print modes (emphasized, double-strike, underline, character size, white/black reverse printing, or 90° rotated characters, etc.), except upside-down printing mode.

If the downloaded bit-image to be printed exceeds one line, the excess data is not printed.

If the printing area width set by GS L and GS W for the NV bit image is less than one vertical line, the following processing is performed only on the line in question. However, in NV bit image mode, one vertical line means 1 dot in normal mode (m=0, 48) and in double-height mode (m=2, 50), and it means 2 dots in double-width mode (m=1, 49) and in quadruple mode (m=3, 51).

① The printing area width is extended to the right in NV bit image mode up to one line vertically. In this case, printing does not exceed the printable area.

② If the printing area width cannot be extended by one line vertically, the left margin is reduced to accommodate one line vertically.

This command feeds dots (for the height n of the NV bit image) in normal and double-width modes, and (for the height $n \times 2$ of the NV bit image) in double-height and quadruple modes, regardless of the line spacing specified by ESC 2 or ESC 3.

After printing the bit image, this command sets the print position to the beginning of the line and processes the data that follows as normal data.

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

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

[Name] Define NV bit image.

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

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

$1 \leq (yL + yH \times 256) \leq 800$

$0 \leq d \leq 255$

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

Total defined data area = 64K bytes.

[Description] Define the NV bit image specified by n

[Notes] Frequent write command executions may damage the NV memory. Therefore, it is recommended to write the NV memory 10 times or less a day.

This command cancels all NV bit images that have already been defined by this command. The printer cannot redefine only one of several data definitions previously defined. In this case, all data needs to be sent again.

During processing of this command, the printer is BUSY when writing data to the user NV memory and stops receiving data. Therefore it is prohibited to transmit the data, including real-time commands, during the execution of this command.

NV bit image is a bit image defined in non-volatile memory by FS q and printed by FS p.

In standard mode, this command is effective only when processed at the beginning of the line.

This command is effective when 7 bytes <FS yH> of the command are processed normally.

When the amount of data exceeds the capacity left in the range defined by xL, xH, yL, yH, the printer processes xL, xH, yL, yH out of the defined range.

In the first group of NV bit images, when any of the parameters xL, xH, yL, yH is out of the definition range, this command is disabled.

In groups of NV bit images other than the first one, when the printer encounters xL, xH, yL, yH out of the defined range, it stops processing this command and starts writing into the NV images. At this time, NV bit images that haven't been defined are disabled (undefined), but any NV bit images before that are enabled. The d indicates the definition data. In data (d) a 1 bit specifies a dot to be printed and a 0 bit specifies a dot not to be printed.

This command defines n as the number of a NV bit image. Numbers rise in order from NV bit image 01H. Therefore, the first data group [xL xH yL yH d1...dk] is NV bit image 01H, and the last data group [xL xH yL yH d1...dk] is NV bit image n. The total agrees with the number of NV bit images specified by the command FS p.

The definition data for an NV bit image consists of [xL xH yL yH d1...dk].

Therefore, when only one NV bit image is defined n=1, the printer processes a data group [xL xH yL yH d1...dk] once. The printer uses ([data: (xL xH 256) (yL yH 256) 8] [header :4]) bytes of NV memory.

The definition area in this printer is a maximum of 64K bytes. This command can define several NV bit images, but cannot define bit image data whose total

The printer is busy immediately before writing into NV memory.

The printer does not transmit ASB status or perform status detection during processing of this command even when ASB is specified.

When this command is received during macro definition, the printer ends macro definition, and begins performing this command.

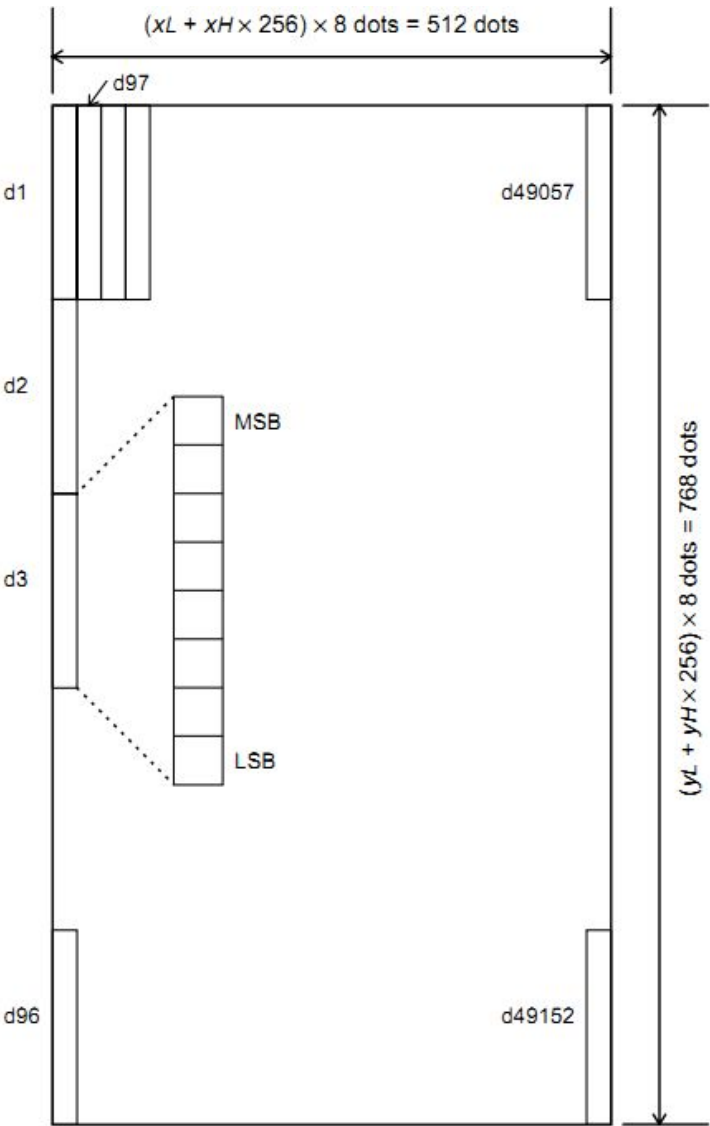
Once an NV bit image is defined, it is not erased by performing ESC @, reset, and power off.

This command performs only definition of an NV bit image and does not perform

printing. Printing of the NV bit image is performed by the FS p command.
NV bit image of each piece of space in NV memory is equal to the size of the NV bit image data plus 4 bytes.

[Reference]
[Example]

FS p
When xL = 64, xH = 0, yL = 96, yH = 0



GS ! n

[Name] Select character size.
[Format] ASCII GS ! n
Hex 1D 21 n
Decimal 29 33 n
[Range] $0 \leq n \leq 255$

($1 \leq \text{vertical number of times} \leq 2$, $1 \leq \text{horizontal number of times} \leq 2$)
[Description] Selects the character height using bits 0 to 2 and selects the character width using bits 4 to 7, as follows:

Bit	Off/On	Hex	Decimal	Function
0~3				Character height selection. See Table 2.
4~7				Character width selection. See Table 1.

[Width magnification]

Hex	Decimal	Enlargement
00	0	1(standard)

[Height magnification]

Hex	Decimal	Enlargement
00	0	1(standard)

10	16	2
----	----	---

01	1	2
----	---	---

[Notes] This command is effective for all characters (alphanumeric and Chinses),except for HRI characters .
 If n is 0 to 3 beyond the specified range, the horizontal magnification is set to 6 times.
 If n is 4 to 7 beyond the specified range, the horizontal magnification is set to 6 times.
 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 mode, the relationship between vertical and horizontal directions is reversed.
 In page mode, vertical and horizontal directions are based on the character orientation.
 When characters are enlarged with different sizes on one line, all the characters on the line are aligned at the baseline.
 The **ESC !** command can also turn double-width and double-height modes on or off. However, the setting of the last received command is effective.

[Default] n = 0

[Reference] **ESC !**

GS (A pL pH n m

[Name] Execute test print

[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 × 256))=2 (pL=2, pH=0)

$0 \leq n \leq 2$, $48 \leq n \leq 50$

$1 \leq m \leq 5$, $49 \leq m \leq 53$

[Description] Execute test printing , the way of printing depends on n,m.
 n specifies the paper used for the test print.

n	Paper source
0,48	Basic sheet(roll paper)
1,49	Roll paper
2,50	

m specifies a test pattern.

m	Test pattern
1,49	Hexadecimal dump print
2,50	Printer status print
3,51	Rolling pattern print

[Notes] This command is effective at the beginning of the line in standard mode.
 Receiving this command when defining macro, stop defining macro and execute this command.
 After the test print is finished, the printer resets itself automatically. Therefore, the already-defined data before this command is executed, such as an user-defined characters, downloaded bit image, and macro, becomes undefined,and the receive buffer and print buffer are cleared, and each setting returns to the default value.

GS * x y d1...d(x × y × 8)

[Name] Define download bit image.

[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] $1 \leq x \leq 255$, $1 \leq y \leq 48$, $0 \leq d \leq 255$, $x \times y \leq 1023$

[Description] It defines a downloaded bit image using **x** and **y**.

x dots in the horizontal direction of bytes

y dots in the vertical direction of bytes

[Notes] **x** × 8 dots in the horizontal direction and **y** × 8 dots in the vertical direction.

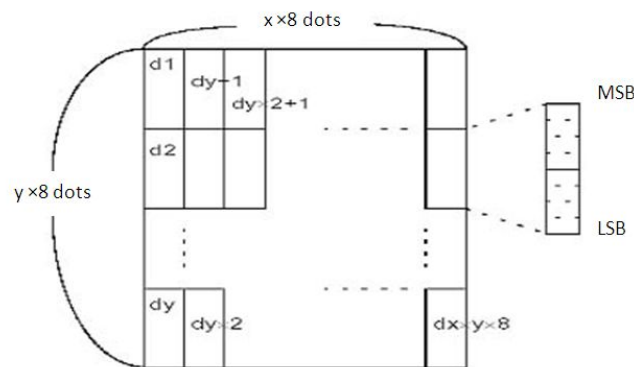
Once the value of **x** × **y** beside the defined range, the command is ineffective.

d indicates the bit image data. Set a bit to 1 to print a dot, or set a bit to 0 to not print a dot.

The downloaded bit image will be cleared if the power is turned off.

If the area of storing downloaded bit image in RAM has no room to store the current downloaded bit image, the printer will clear the previously one to store the latest downloaded bit image.

The relationship between printing data and downloading bit image as follows:



[Reference] GS /

GS / m

[Name] Print downloaded bit image.

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

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

[Description] Print downloaded bit image and using the mode specified by m.

M	Mode	Vertical direction	Horizontal direction
0,48	Normal	203dpi	203dpi
1,49	Double-width	203dpi	101dpi
2,50	Double-height	101dpi	203dpi
3,51	Quadruple	101dpi	101dpi

[Notes] This command is ignored if a downloaded bit image has not been defined.

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 (emphasized, double-strike,

underline, character size, or white/black reverse printing), except for upside-down printing mode.

If the downloaded bit-image to be printed exceeds the printable area, the excess data is not printed.

Refer to Figure 3.11.3 for the downloaded bit image development position in page mode.

If the width of the printing area set by GS L and GS W is less than the width required by the data sent with the GS / command; the following will be performed on the line in question (but the printing cannot exceed the maximum printable area)

① The width of the printing area is extended to the right to accommodate the amount of data.

② If step ① does not provide sufficient width for the data, the left margin is reduced to accommodate the data.

For each bit of data in normal mode ($m = 0,48$) and double-height mode ($m = 2, 50$), the printer prints one dot: for each bit of data in double-width mode ($m = 1, 49$) and quadruple mode ($m = 3, 15$), the printer prints two dots.

[Reference]

GS *

GS B n

[Name]

Turn white/black reverse printing mode

[Format]

ASCII	GS	B	n
Hex	1D	42	n
Decimal	29	66	n

[Range]

$0 \leq n \leq 255$

[Description]

Turns on or off white/black reverse printing mode.

When the LSB of n is 0, white/black reverse mode is turned off.

When the LSB of n is 1, white/black reverse mode is turned on.

[Notes]

Only the lowest bit of n is valid.

This command is available for built-in characters and user-defined characters.

When white/black reverse printing mode is on, it also applies to character spacing set by ESC SP.

This command does not affect bit images, user-defined bit images, bar codes, HRI characters, and spacing skipped 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. Even if underline mode is on, it is disabled (but not canceled) when white/black reverse mode is selected.

[Default]

n = 0

GS H n

[Name]

Select printing position for HRI characters.

[Format]

ASCII	GS	H	n
Hex	1D	48	n
Decimal	29	72	n

[Range]

$0 \leq n \leq 3, 48 \leq n \leq 51$

[Description]

Selects the printing position of HRI characters when printing a bar code.

n selects the printing position as follows

n	Printing position
0,48	Not printed
1,49	Above the bar code
2,50	Below the bar code

3,51	Both above and below the bar code
------	-----------------------------------

HRI indicates Human Readable Interpretation.

[Notes] HRI characters are printed using the font specified by GS f.

[Default] n = 0

[Reference] **GS f, GS k**

GS L nL nH

[Name] Set left margin

[Format] ASCII GS L nL nH

Hex 1D 4C nL nH

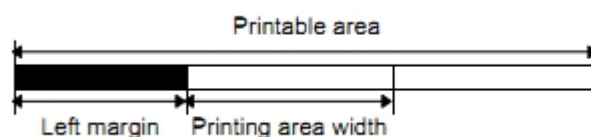
Decimal 29 76 nL nH

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

$0 \leq nH \leq 255$

[Description] Sets the left margin using nL and nH.

The left margin is set to $[(nL + nH \times 256) \times 0.125 \text{ mm}]$.



[Notes] This command is effective 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 does not affect printing in page mode.

If the setting exceeds the printable area, the maximum value of the printable area is used.

[Default] nL = 0, nH = 0

[Reference] **GS W**

GS W nL nH

[Name] Set printing area width

[Format] ASCII GS W nL nH

Hex 1D 57 nL nH

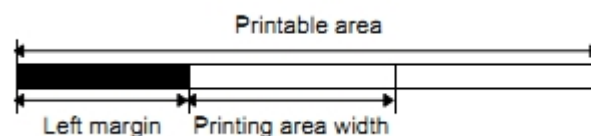
Decimal 29 87 nL nH

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

$0 \leq nH \leq 255$

[Description] Sets the printing area width to the area specified by nL and nH.

The printing area width is set to $[(nL + nH \times 256) \times 0.125 \text{ mm (0.0049")}]$.



[Notes] This command is effective only when processed at the beginning of the line.

If this command is input in page mode, the printer performs only internal flag operations.

This command does not affect printing in page mode.

If the setting exceeds the printable area, the maximum value of the printable area is used.

[Default] It's related to the actual print width. It can be set different in different printers.

[Reference] **GS L**

GS f n

[Name] Select font for Human Readable Interpretation (HRI) characters

[Format]	ASCII	GS	f	n
	Hex	1D	66	n
	Decimal	29	102	n
[Range]	n = 0, 1, 48, 49			
[Description]	Selects a font for the HRI characters used when printing a bar code. n selects a font from the following table:			
	n	Font		
	0,48	Font ASCII 0(12 × 24)		
	1,49	Font ASCII 1(8 × 16)		
[Notes]	HRI indicates Human Readable Interpretation. HRI characters are printed at the position specified by GS H.			
[Default]	n = 0			
[Reference]	GS H, GS k			

GS h n

[Name]	Select bar code height.			
[Format]	ASCII	GS	h	n
	Hex	1D	68	n
	Decimal	29	104	n
[Range]	$1 \leq n \leq 255$			
[Description]	Selects the height of the bar code.			
	n specifies the number of dots in the vertical direction.			
[Default]	n = 50			
[Reference]	GS k			

①GS k m d1...dk NUL②GS k m n d1...dn

[Name]	Print bar code					
[Format]	①ASCII	GS	k	m	d1...dk	NUL
	Hex	1D	6B	m	d1...dk	00
	Decimal	29	107	m	d1...dk	0
	②ASCII	GS	k	m	n	d1...d n
	Hex	1D	6B	m	n	d1...d n
	Decimal	29	107	m	n	d1...d n
[Range]	① $0 \leq m \leq 6$ (k and d depend on the bar code system used)					
	② $65 \leq m \leq 73$ (n and d depend on the bar code system used)					
[Description]	Selects a bar code system and prints the bar code.					
	m selects a bar code system as follows:					
	①					
	m	Bar Code System	Number of Characters		Remarks	
	0	UPC-A	$11 \leq k \leq 12$		$48 \leq d \leq 57$	
	1	UPC-E	$11 \leq k \leq 12$		$48 \leq d \leq 57$	
	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	$1 \leq k \leq 255$		$48 \leq d \leq 57, 65 \leq d \leq 90, 32, 36, 37, 4$	
	5	ITF	$1 \leq k \leq 255$		$48 \leq d \leq 57$	
	6	CODABAR	$1 \leq k \leq 255$		$48 \leq d \leq 57, 65 \leq d \leq 68, 36, 43, 45, 46, 47, 58$	
	②					
	m	Bar Code System	Number of Characters		Remarks	
	65	UPC-A	$11 \leq k \leq 12$		$48 \leq d \leq 57$	
	66	UPC-E	$11 \leq k \leq 12$		$48 \leq d \leq 57$	
	67	JAN13 (EAN13)	$12 \leq k \leq 13$		$48 \leq d \leq 57$	

68	JAN 8 (EAN8)	$7 \leq k \leq 8$	$48 \leq d \leq 57$
69	CODE39	$1 \leq k \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 90, 32, 36, 37, 43$ $d1 = dk = 42$
70	ITF	$1 \leq k \leq 255$	$48 \leq d \leq 57$
71	CODABAR	$1 \leq k \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 68, 36, 43, 45, 46, 47, 58$
72	CODE93	$1 \leq k \leq 255$	$0 \leq d \leq 127$
73	CODE128	$2 \leq k \leq 255$	$0 \leq d \leq 127$

[Notes for ①]

This command ends with a NUL code.

When the bar code system used is UPC-A or UPC-E, the printer prints the bar code data after receiving 12 bytes of bar code data and processes the following data as normal data.

When the bar code system used is JAN13 (EAN13), the printer prints the bar code after receiving 13 bytes of bar code data and processes the following data as normal data.

When the bar code system used is JAN8 (EAN8), the printer prints the bar code after receiving 8 bytes of bar code data and processes the following data as normal data.

The number of data for the ITF bar code must be even numbers. When an odd number of bytes of data is input, the printer ignores the last received data.

[Notes for ②]

n indicates the number of bar code data bytes, and the printer processes n bytes from the next character data as bar code data.

If n is outside the specified range, the printer stops command processing and processes the following data as normal data.

[Notes in standard mode]

If d is outside the specified range, the printer only feeds paper and processes the following data as normal data.

If the horizontal size exceeds printing area, the printer only feeds the paper.

This command feeds as much paper as is required to print the bar code, 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 printer processes the data following m as normal data.

After printing the bar code, 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° rotated character, etc.), except for upside-down printing mode.

[Notes in page mode]

This command develops bar code data in the print buffer, but does not print it. After processing bar code data, this command moves the print position to the right side dot of the bar code.

If d is out of the specified range, the printer stops command processing and processes the following data as normal data. In this case the data buffer position does not change.

If bar code width exceeds the printing area, the printer does not print the bar code, but moves the data buffer position to the left side out of the printing area.

Refer to Figure 3.11.3 for the bar code data buffer position.

When CODE128 ($m = 73$) is used:

Refer to Appendix F for the information for the CODE128 bar code and its code table.

When using CODE128 in this printer, take the following points into account for data transmission:

- ① The top of the bar code data string must be the code set selection character (CODE A, CODE B, or CODE C), which selects the first code set.
- ② Special characters are defined by combining two characters "{" and one character. The ASCII character "{" is defined by transmitting "{" twice consecutively.

Specific character	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

[Example]

Example data for printing "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 bar code data is not the code set selection character, the printer stops command processing and processes the following data as normal data.

If the combination of "{" and the following character does not apply any special character, the printer stops command processing and processes the following data as normal data.

If the printer receives characters that cannot be used in the special code set, the printer stops command processing and processes the following data as normal data.

The printer does not print HRI characters that correspond to the shift character or code set selection characters.

HRI character for the function character is space.

HRI characters for the control character (<00>H to <1F>H and <7F>H) are Space.

Be sure to keep spaces on both right and left sides of a bar code. (Spaces are different depending on the types of the bar code.)

[Reference]

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

GS r n

[Name]	Transmit status			
[Format]	ASCII	GS	r	n
	Hex	1D	72	n
	Decimal	29	114	n
[Range]	n=1,49			
[Description]	Transmits the status. n Function 1,49 Transmits paper sensor status.			

[Note] This command is only valid for serial printer.
 Since this command is executed after the data is processed in the receive buffer, there may be a time lag between data reception and status transmission.
 transmit 1 byte of status data specified by **n** as follows:

Paper sensor status (n = 1 , 49) :

Bit	0/1	Hex	Decimal	Status
0,1	0	00	0	Paper roll sensor: paper end
	1	03	3	Paper roll sensor: paper adequate
2,3	0	00	0	Paper roll end sensor: paper present
	1	0c	12	Paper roll end sensor: paper bot present
4	0	00	0	Not used. Fixed to Off
5,6				Undefined
7	0	00	0	Not used. Fixed to Off

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

GS v 0 m xL xH yL yH d1....dk

[Name]	Print raster bit image				
[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] $0 \leq m \leq 3, 48 \leq m \leq 51$

$0 \leq xL \leq 255$

$0 \leq xH \leq 255$

$0 \leq yL \leq 255$

$0 \leq d \leq 255$

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

[Description] Selects raster bit-image mode.

The value of m selects the mode, as follows:

M	Mdoe	Vertical Dot Density	Horizontal Dot Density
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, xH, select the number of data bytes (xL+xH×256) in the horizontal direction for the bit image.

yL, yH, select the number of data bits (yL+yH×256) in the vertical direction for the bit image.

[Notes] In standard mode, this command is effective only when there is no data in the print buffer.

Printing modes, such as characters amplification/ emphasized/ double-strike/ underline/ white/ black reverse/ upside-down printing, etc., are effective to this command.

The part exceeds printing area is not to be printed.

ESC a (select justification) is effective to raster bit image.

If this command is received while a macro is being defined, the printer ends macro definition mode and execute it. This command is not part of macro definition.

d indicates the bit image data. Set a bit to 1 to print a dot, or set a bit to 0 to not print a dot.

[Example] When $xL + xH \times 256 = 64$,

GS w n

[Name]	Set bar code width.			
[Format]	ASCII	GS	w	n
	Hex	1D	77	n
	Decimal	29	119	n
[Range]	$2 \leq n \leq 6$			
[Description]	Sets the horizontal size of the bar code. n specifies the bar code width as follows:			
	n	Module Width (mm) for Multi-level Bar Code	Binary-level Bar Code Thin Element Width (mm) Thick Element Width (mm)	
	2	0.250	0.250	0.625
	3	0.375	0.375	1.000
	4	0.560	0.500	1.250
	5	0.625	0.625	1.625
	6	0.750	0.750	2.000
	Multi-level bar codes are as follows: UPC-A, UPC-E, JAN13 (EAN13), JAN8 (EAN8), CODE93, CODE128 Binary-level bar codes are as follows: CODE39, ITF, CODABAR			
[Default]	n = 2			
[Reference]	GS k			

33 33 33 33 33 33

09 (Move print position to the next tab)

33 33 33 33

33 33 33 33

33 33 33 33

[illegible]

33 33

4E 65 77 20 61 62 73 6F 6C 75 74 65 20 73 74 61 72 74 20 70 6F 73 69 74 69 6F

6E 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33

1B 4C(Enter into page mode)

1B 54 00(Select printing area direction in page mode)

30 30 30 30 30 30 30 30 30 30 30

31 31

32 32

33 33

0A (Print) 50 72 69 6E 74 20 45 6E 64

0C (Print)

- a) Turn underline mode on/off (**1B 2D n**)
- b) Select character print mode (**1B 21 n**)
- c) Turns on/off upside-down printing mode (**1B 7B n**)
- d) Select character size (**1D 21**)
- e) Turn on/off reverse printing mode (**1D 42 n**)

0A(Set the print starting position to the beginning of the line)

1B 40 (Initialize printer)

1B 53(Enter into standard mode)

33 33 53 6C 65 63 74 20 75 6E 64 65 72 6C 69 6E 65 20 70 72 69 6E 74 20 6D 6F
64 65 20

1B 2D 02 (Turn underline mode on/off)

4E 6F 77 20 69 74 20 77 6F 72 6B 73 20 21 20 53 65 6C 65 63 74 20 20 20 20 20

50 72 69 6E 74 20 6D 6F 64 65 20

1B 21 01 (Select character print mode)

33 33 33 33 33 33 33

1B 21 00 (Select character print mode)

20 4F 70 65 6E 20 69 6E 76 65 72 73 65 20 20 70 72 69 6E 74 20 6D 6F 64 65

0A (Print) **1B 7B 01** (Turns on upside-down printing mode)

33 33 33 33 33 4F 4B 21

0A (Print) **1B 7B 00** (Turns off upside-down printing mode)

33 33 33 33 33 4F 4B 21 33 33 33 33 33 4E 6F 77 20 49 27 6C 6C 20 73 68 6F 77

20 79 6F 75 20 7A 6F 6F 6D 20 69 6E 20 6D 6F 64 65 20

0A (Print) **1D 21 33** (Select character size)

33 33 33 4F 4B 21 20 77 6F 72 6B 73 21 20

0A (Print)

1D 21 00 (Select character size)

1D 42 01 (Turn on reverse printing mode)

33 33 33 33 33 33 33

1D 42 00 (Turn off reverse printing mode)

33 33 33 33 33

0A (Print)

3.2.4 Print

1、Print in line mode and page mode

In line mode, print command is 0A. (Don't clear page buffer)

In page mode, print command is 0C and 1B 0C. (Don't clear page buffer)

Typical examples:

1B 4C(Enter into page mode)

1B 57 20 00 00 00 60 02 20 03 (Set printing area in page mode)

50 72 69 6E 74 20 49 6E 20 50 61 67 65 20 4D 6F 64 65 33 33 33

1B 0C (Print but don't clear page buffer)

0C (Print and clear page buffer)

3.2.5 State query

Query the state of printer through commands (normal status and wrong status)

Wrong status includes: out of paper, printer heads uplift, etc.

1. Real-time state transfer (see details in **10 04 n**)

When the printer power on, it allows real-time state command by default. When printer goes wrong, it automatically allow real-time state command. Please don't send command to inquire state when using the drive program to print.

2. Automatically state return (see details in **1D 61 n**)

Printer can automatically print state return of printer in certain cases.

3.2.6 Bitmap download

Bitmap can download to RAM (hereinafter known as RAM bitmap) and nonvolatile memory (hereinafter known as NV bitmap). NV bitmap can be saved in printer when the printer power off. But RAM bitmap will be lost when the printer power off or initialization (1B 40). So RAM bitmap need redownload when print after power on.

See more details in command set 1D 2A(download RAM bitmap) and 1C 71(download NV bitmap);

NOTE:When download bitmap,choose the number of bitmap.

Simple description of downloading bitmap data dispose

(take BMP bitmap as example):

1 . The data format of bitmap download command is vertical.See more details in command set(1D 2A and 1C 71).

2 . General bitmap save as horizontal format.The following is the simple description of monochrome BMP bitmap:

62 bytes BMP bitmap property description (including the height and width of bitmap) + data
BMP data arrange as integer multiples of 4.For example,basic width is 34 dots,it needs 8 bytes to save instead of 5 bytes.Therefore,the bytes are (bit width +31)/32*4*line height.

The following is simple example program disposed by VC++(This is for your reference only)

NOTES : If it is not monochrome BMP bitmap,data is wrong,Please transform it into monochrome bitmap.

According to the demand of downloading bitmap,the height dots and width dots of BMP bitmap should be integer multiples of 8.Otherwise,program or printer can't dispose it correctly.

```
/**
//Function : AntiRotateBmp90D
//Function : Transform monochrome bmp bitmap into the required data//
//Parameter : pBmpData---source data pointer
//            nPixelsOfWidth----image width(dots)
//            nPixelsOfHeight---image height(dots)
//            pBmpDataRotated---target data pointer
//Return value : 1:Transform successfully 0:Parameter error
//
int AntiRotateBmp90D(
    char *pBmpData ,
    const int nPixelsOfWidth ,
    const int nPixelsOfHeight ,
    char *pBmpDataRotated
)
{
    //Define the variate of process
    int nBytesOfWidth = 0 , nBytesOfHeight = 0;
    int i=0 , col=0 , row=0 , index = 0 , colbyte = 0;
    char* midData;
    unsigned char tempdata = 0 , colnum = 0 , rownum = 0;
    unsigned char temp[8] = {0x80 , 0x40 , 0x20 , 0x10 , 0x08 , 0x04 , 0x02 , 0x01};
    //Parameter judgment
    if (pBmpData == NULL || pBmpDataRotated == NULL) return 0;
    if (nPixelsOfWidth <= 0 || nPixelsOfHeight <= 0) return 0;
    if ((nPixelsOfWidth % 8) != 0 || (nPixelsOfHeight % 8) != 0) return 0;

    //Acquire the actual image size
```



```

08000FC03E00040000000FC01C000C00000007C000001C000000078000001C0000000780000038000
0000F800000700000000F000000700000001F000000F80000003E000000FE0000007C000000FF80000
0F8000000FFF80003F80000003FFFE00FF00000001FFFFFFFC000000007FFFFFFF8000000000FFFFF
F00000000001FFFFC000000000001FFF8000000000000FE0000000000003FC000000000001FF00
00000000780FFC0000000000FFFFF00000000000FFFFC00000000000FFFE000000000000FFF000000
00000007F00000000000000000000000000000000000000000000000000000000000000000000003F0000000000001FFC00000
00000007FFE000000000001FFFE000000000007FFFE000000000000FFFE00000000001FE03E000000
00003F001C000000000078001C0000000000F000380000000001C000380000000001C0007000000000
038000E000000000030001CE00000000070007FE0000000007003FFE000000000703FFFE0000000000
73FFFFFFE0000000007FFFFFFC0000000007FFFFFFC0000000007FFFE180000000000FFFC038000000000
FF80070000000000FC000E0000000000C0000C000000000000000800000000000000000000000000000
000000000000000200000000000000007000000000000000F0000C0000000001E000FC0000000001C00
FFC000000000380FFFC00000000070FFFC0000000007FFFFFFC000000007FFFFFFF0000000000FFFF
F00000000000FFFFF0000000000000FF00000000000000FFC0000000000000F38000000000000070000
000000000000E000000000000000C000FC0000000001800FFE0000000003807FFE000000000303FFFE
00000000071FFFFFFE0000000007FFFFFFE0000000000FFFFF9C000000000FFFFF818000000000FFFC038
07C000000FFE00700FE000000FF000E01FF00000070000C03FF80000000000C07FF80000000000007
8780000000003F0F01C000000003FF8E01C00000000FFFD00C00000003FFFD800C00000007FFFF
800C0000001FFFFFF00C0000003FE07E000C0000007F001E001C000000F8001C001C000001E00038
0038000001C00038007800000380007000F80000070000E003F00000070001E01FF00000060007FFFF
E000000E003FFFFFFC000000E03FFFFFFF8000000E3FFFFFFF0000000FFFFFFF0000000FFFFFFF
E0000000FFFFE00000000001FFFC000000000001FFC0000000000003FC00000000000003C0000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000
00000

```

1D 23 00 (Choose the number of bitmap)

1D 2F 00 (Print RAM bitmap)

3.2.7 Recommended program application process

Because automatically state return command can return all kinds of state an error of printer,we recommend that use automatically state return command and it's valid when printer power on.

1、Inquire the printer state

Firstly it should ensure the printer is in normal state.Then it can send data to print.

2、Send data to print (including the set command before printing)

If the data is bitmap data,don't send state query command when send print data.

3、Inquire the state of printer after printing

If the automatically state return command is valid,printer will return the printer state automatically.

APPENDIX A:CODE128 BAR CODE

A.1 Description of the CODE128 Bar Code

In CODE128 bar code system, it is possible to represent 128 ASCII characters and 2-digit numerals using one bar code character that is defined by combining one of the 103 bar code characters and 3 code sets. Each code set is used for representing the following characters:

- Code set A: ASCII characters 00H to 5FH
- Code set B: ASCII characters 20H to 7FH
- Code set C: 2-digit numeral characters using one character (100 numerals from 00 to 99)

The following special characters are also available in CODE128:

- SHIFT characters

In code set A, the character just after SHIFT is processed as a character for code set B. In code set B, the character just after SHIFT is processed as the character for code set A.

SHIFT characters cannot be used in code set C.

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

This character switches the following code set to code set A, B, or C.

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

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

A.2 Code Tables

Printable characters in code set 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
DC1	11	17	9	39	57	FNC2	7B,32	123,50
DC2	12	18	:	3A	58	FNC3	7B,33	123,51
DC3	13	19	;	3B	59	FNC4	7B,34	123,52
DC4	14	20	<	3C	60	SHIFT	7B,53	123,83
NAK	15	21	=	3D	61	CODEB	7B,42	123,66
SYN	16	22	>	3E	62	CODEC	7B,43	123,67
ETB	17	23	?	3F	63			

CAN	18	24	@	40	64			
EM	19	25	A	41	65			
SUB	1A	26	B	42	66			
ESC	1B	27	C	43	67			
FS	1C	28	D	44	68			
GS	1D	29	E	45	69			
RS	1E	30	F	46	70			
US	1F	31	G	47	71			
SP	20	32	H	48	72			
!	21	33	I	49	73			
"	22	34	J	4A	74			
#	23	35	K	4B	75			
\$	24	36	L	4C	76			
%	25	37	M	4D	77			
&	26	38	N	4E	78			
'	27	39	O	4F	79			

Printable characters in code set 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	123,66
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			

Printable characters in code set 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 CODEA CODEB	7B,31	123,49
21	15	21	61	3D	61		7B,41	123,65
22	16	22	62	3E	62		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			

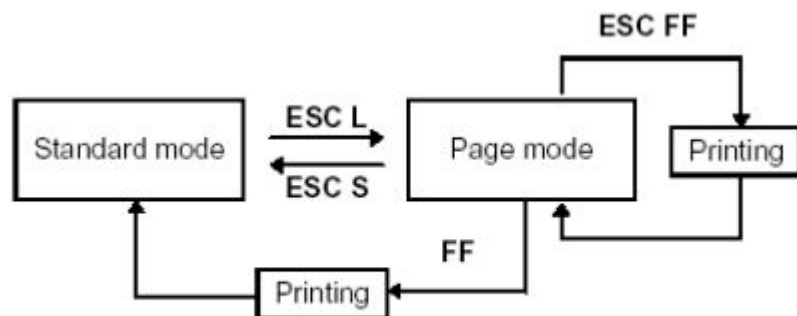
APPENDIX B: Print mode and its transformation

B.1 General Description

The printer operates in two print modes: standard mode and page mode. In standard mode, the printer prints and feeds paper each time it receives print data or paper feed commands. In page mode, all the received print data and paper feed commands are processed 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 the paper by one line. In page mode, "ABCDEF" is written to the specified printing area in memory, and the position in memory for the next print data is shifted by one line.

The ESC L command puts the printer into page mode, and all commands received thereafter are processed in page mode. Executing an ESC FF command prints the received data collectively, and executing an FF command restores the printer to standard mode after the received data is printed collectively. Executing an ESC S command restores the printer to standard mode without printing the received data in page mode; the received data is cleared from memory instead.



Shifting Between Standard Mode and Page Mode

Figure B.1 Shifting Between Standard Mode and Page Mode

B.2 Setting Values in Standard and Page Modes

1) The available commands and parameters are the same for both standard and page modes. However, these values can be set independently in each mode for the ESC SP, ESC 2, ESC 3, and FS S commands. For these commands, different settings can be stored for each mode.

B.3 Formatting of Print Data in the Printable Area

1) The printable area is set by ESC W. If all printing and feeding operations are complete before the printer receives the ESC W command, the left side (as you face the printer) is taken as the origin (x0,y0) of the printable area. The printable rectangular area is defined by the length (dx dots) extending from and including the origin (x0, y0) in the x direction (perpendicular to the paper feed direction), and by the length (dy dots) in the y direction (paper feed direction). (If the ESC W command is not used, the printable area remains the default value.)

2) When the printer receives print data after ESC W sets the printable area and ESC T sets the printing direction, the print data is formatted within the printable area so that point A in Figure B.2 is at the beginning of the printable area as a default value. (When a character is printed, point A is the baseline.) Print data containing downloaded bit images or bar codes 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 printable 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 printable area. The print position, therefore, moves to the beginning of the next line. The line feed amount depends on the values set by commands (such as ESC 2 and ESC 3).

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 extended characters that are higher than double-height characters, bit images taking up two or more lines, or bar codes higher than normal characters, the amount of line feeding may be insufficient, resulting in overlapping of the characters' higher-order dots with the previous line. To avoid this, increase the amount of line spacing.

Example:

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

{number of vertical dots (8 × 6) - number of dots for feeding at the beginning of the printable area (24)} × vertical motion unit (203/203) = 24

Therefore, 24 dots are required for feeding.

Use the following commands:

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

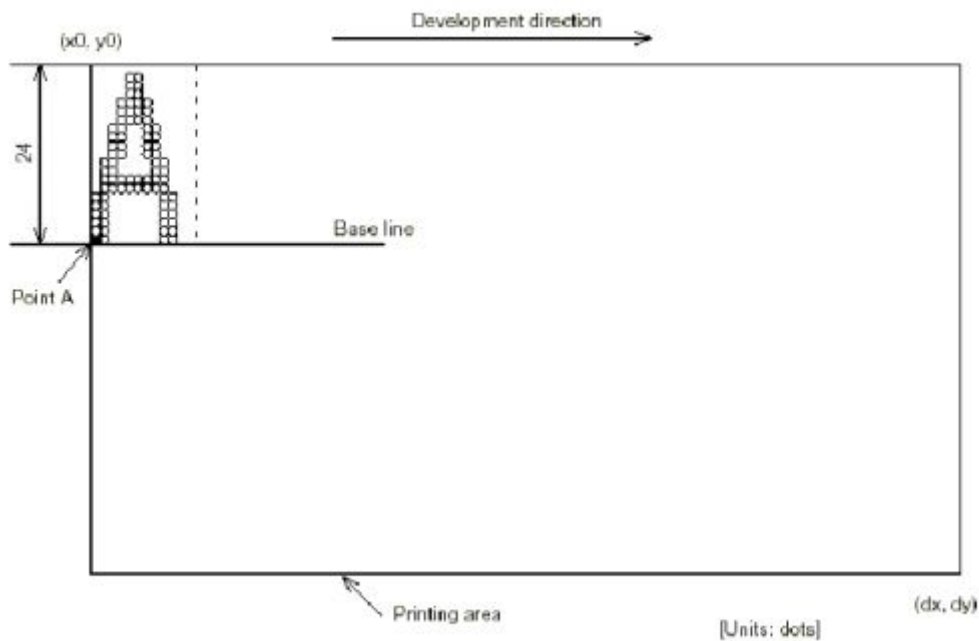
ESC T n

ESC 3 24 ⇨ Set line spacing to be added.

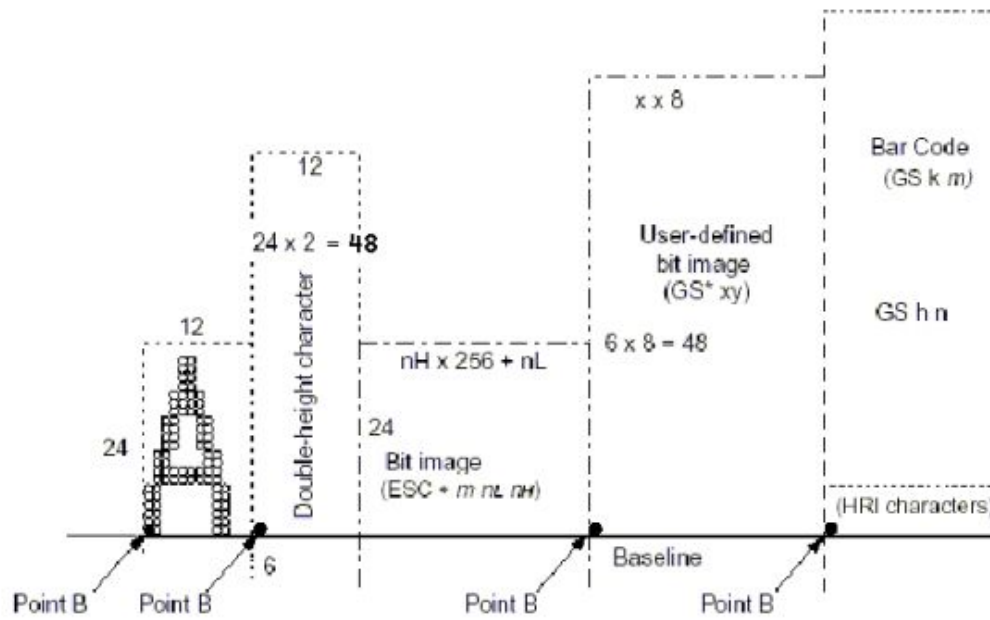
LF

GS / 1

ESC 2 ⇨ Reset the line spacing to 1/6 inch.



Character Data Developing Position



Print Data Developing Position