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PROGRAMMING MANUAL
V1.0

SHANDONG NEW BEIYANG INFORMATION TECHNOLOGY CO.,LTD

REVISION HISTORY

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Content

1 General Information

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 possesses all data in specified memory and thinks of this as a virtual page. The page is printed 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 data and feeds paper upon print line buffer full (data is enough for one print line) or receiving print command like **LF**;

HRI character – Human Readable Interface;

NV memory– Non-volatile memory in which data stored does not loss when power off.

RAM –Random Access Memory

Motion unit –The motion unit has vertical motion unit and horizontal motion unit, which specify the least space for vertical motion and horizontal motion.

ASB – Auto status back.

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

1.2 Command Format

1) [Name]   The name and function summary.
2) [Format]   The command format is expressed in ASCII, Hex and Decimal separately.
3) [Range]   The range of variation value is selected for a command.
4) [Default]   After initialization of printer with power on, primary value is used in commands.
5) [Description] The detailed functions of command.
6) [Note]   Lists items shall be given about attention and main features in use.
7) [Reference]   Lists all other commands related to current command.

---> DLE EOT n

--->	[Name]	Real-time status transmission			
--->	[Format]	ASCII	DLE	EOT	n
		Hex	10	04	n
		Decimal	16	4	n
--->	[Range]	1 ≤ n ≤ 4			
--->	[Description]	Transmits the printer status specified by 'n' in real-time.			
--->	[Note]	The printer will return relevant status immediately after receiving this command.			

2 Command set

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.

• The default setting of the horizontal tab position for the paper roll is font 0 (12×24) every 8th character.

• When the buffer of the line is full, the printer executes as follows:

In standard mode, the printer print the data of current line and set the printing position at the beginning of next line.

In page mode, the printer shifts newline and sets the printing position at the beginning of next line.

[Reference] **ESC D**

LF

[Name]	Print and feed a line.	
[Format]	ASCII	LF
	Hex	0A
	Decimal	10

[Description] In standard mode, it prints the data in the print buffers and feeds one line based on the current line spacing.

[Note] This command sets the print position at the beginning of the line.

In page mode, the printer shift newline and set the position at the beginning of Next line. But it doesn't execute the print.

[Reference] **ESC 2, ESC 3**

FF

[Name]	Print and feed paper	
[Format]	ASCII	FF
	Hex	0C
	Decimal	12

[Description] (1) If the paper is continuous type;

* In page mode print all data in buffers and return to standard mode;

* In standard mode this command is same as **LF**;

* The print area set by **ESC W** is recovered to the default;

(2) If the paper is marked type:

* In page mode prints all data in the print buffers, then it shall not return to standard mode and not clear the data in the buffers. After the printing, the printer feeds the next label to printing position. The coordinates in current print buffers are not changed.

* In standard mode this command equals to **GS FF** when executing mark orientation.

[Notes]	This command sets the print position at the beginning of the line.
[Reference]	**ESC FF, ESC L, ESC S, GS (F, GS FF**

CR

[Name]	Print and carriage return	
[Format]	ASCII	CR
	Hex	0D
	Decimal	13
[Description]	When automatic line feed is enabled, this command functions the same as LF; when automatic line feed is disabled, this command is ignored.	
[Notes]	Set the print starting position at the beginning of the lines.	
	This command **CR** is set according to the printer configuration.	
[Reference]	**LF**	

CAN

[Name]	Cancel print data in page mode	
[Format]	ASCII	CAN
	Hex	18
	Decimal	24
[Description]	In page mode, deletes all print data in current print buffers.	
[Notes]	This command is enabled only in page mode.	
	· If data that existed in the previously specified printing area also exists in the currently specified printing area, it is deleted.	
[Reference]	**ESC L**, **ESC W**	

DLE EOT n

[Name]	Real-time status transmission		
[Format]	ASCII	DLE	EOT	n
	Hex	10	04	n
	Decimal	16	4	n
[Range]	$1 \le n \le 4$		
[Description]	Transmits the printer status specified by n in real-time, according to the following parameters:		
	n = 1: Transmit off-line/on-line status		
	n = 2: Transmit printer status		
	n = 3: Transmit printer status		
	n = 4: Transmit paper sensor status		
[Notes]	· The status is transmitted whenever the command is received.		

· This command should not be used within the data sequence of another command that consists of 2 or more bytes.

· Even though the printer is not selected with **ESC =** (select peripheral device), this command is effective.

· 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.

· The printer executes this command upon receiving it.

· The command is enabled only for serial interface printer. In any status the printer executes this command upon receiving it.

n = 1: Printer on-line/off-line status

Bit	0/1	Hex	Decimal	Function
0	0	00	0	Fixed to 0
1	1	02	2	Fixed to 0
2	0	00	0	Fixed to 0
3	0	00	0	On-line
	1	08	8	Off-line
4	1	10	16	Fixed to 0
5	0	00	0	Fixed to 0
6	0	00	0	The state of printer is normal
	1	40	64	The state of printer is abnormal
7	0	00	00	Fixed to 0.

n = 2: 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	Top cover is closed
	1	04	4	Top cover is open
3	0	00	0	Without using the FEED button
	1	08	8	Press down the FEED button
4	1	10	16	Fixed to 1
5	0	00	0	Fixed to 0
6	0	00	0	The printer status is normal
	1	40	64	The state of printer is abnormal
7	0	00	0	Fixed to 0

n = 3: Printer status

Bit	0/1	Hex	Decimal	Function
0	0	00	0	Fixed to 0
1	1	02	2	Fixed to 1
2				Fixed to 0
3				Fixed to 0
4	1	10	16	Fixed to 1
5	0	00	0	Top cover is closed
	1	20	00	Top cover is open
6	0	00	0	The Printhead temperature
	1	40	64	The Printhead temperature
7	0	00	0	Fixed to 0

n = 4:   Paper transmission 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	Paper end
	1	0C	12	Paper adequate
4	1	10	16	Fixed to 1.
5,6	0	00	0	Paper present
	1	60	96	Paper end
7	0	00	0	Fixed to 0

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

DLE ENQ n

[Name]	Real-time request to printer			
[Format]	ASCII	DLE	ENQ	n
	Hex	10	05	n
	Decimal	16	5	n

[Range]   1 ≤n ≤ 2

[Description] Respond to a request from the host computer. n specifies the requests 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 the receiving and printing buffers

[Notes]   · This command is effective only when mark checkout has error or paper is end.

· In Serial interface mode, the printer starts processing data upon receiving this command.

· In Parallel interface model, this command can not be executed when the printer is busy.

· This command should not be contained within another command that consists of two or more bytes.

· Even though the printer is disabled with **ESC =** (Select peripheral device), the error recovery functions are effective.

[Reference] **DLE EOT**

ESC FF

[Name]	Print data in page mode		
[Format]	ASCII	ESC	FF
	Hex	1B	0C
	Decimal	27	12

[Description] In page mode, prints all buffered data in the printing area collectively.

[Notes] · This command is enabled only in page mode.

· In using labels, the command shall not execute label orientation after the printing.

· After printing, the printer does not clear the buffered data, don't change

setting values for **ESC T** and **ESC W**, and the position for buffering characters.

[Reference] **FF, ESC L, ESC S**

ESC SP n

[Name]	Set right-side character spacing			
[Format]	ASCII	ESC	SP	n
	Hex	1B	20	n
	Decimal	27	32	n

[Range] 0 ≤ n ≤ 255

[Description] Sets the character spacing for the right side of the character to [n × 0.125mm(n × 0.0049 inches).

[Notes] · When characters are magnified, the character spacing is n times normal value.

· This command sets values independently in each mode (standard and page modes).

[Default] n = 0

ESC ! n

[Name]	Select print mode(s)			
[Format]	ASCII	ESC	!	n
	Hex	1B	21	n
	Decimal	27	33	n

[Range] 0 ≤ n ≤ 255

[Description] Selects print mode(s) using n as follows:

Bit	1/0	Hex	Decimal	Function
0	0	00	0	If the printer use chinese font, it is disabled. If the printer use west font, setting character is font 0.
	1	01	1	If the printer use chinese font, it is disabled. If the printer use western font, setting character is font 1.
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, quadruple size characters are printed.

· The printer can underline all characters, but can not underline the space set by **HT** or 90° clockwise rotated characters.

· The thickness of the underline is that selected by **ESC -,** regardless of the character size.

· All the characters on the line are aligned at the baseline.

· **ESC E** can also turn on or off emphasized mode. However, the setting of the last received command is effective.

· **ESC G** functions same as 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 absolute horizontal print position			
[Format]	ASCII	ESC	$	nL nH
	Hex	1B	24	nL nH
	Decimal	27	36	nL nH

[Range]   0≤nL ≤ 255

0 ≤nH≤255

[Description] Sets the distance from the beginning of the line to the print position is [(nL + nH × 256) × (vertical or horizontal motion unit)] inches.

[Notes]   · Settings outside the specified printable area are ignored.

· In standard mode, the horizontal motion unit (x) is used.

· In page mode, **ESC W** can also set starting position. However, the setting of the last received command is effective.

· In page mode, horizontal or vertical motion unit differs depending on the direction and starting position of the printable area as follows:

(1) When the starting position is set to the upper left or lower right of the printable area using **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 printable area using **ESC T**, the vertical motion unit (y) is used.

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

ESC % n

[Name]	Select/cancel user-defined character set		
[Format]	ASCII	ESC	%	n
	Hex	1B	25	n
	Decimal	27	37	n

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

[Description] Selects or cancels the user-defined character set.

· When the LSB of n is 0, the user-defined character set is canceled.

· When the LSB of n is 1, the user-defined character set is selected.

[Notes]   · When the user-defined character set is canceled, the internal character is automatically selected.

· n is available only for the least significant bit.

[Default]   n = 0

[Reference] **ESC &, ESC ?**

ESC & y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]

[Name]	Define user-defined characters		
[Format]	ASCII	ESC	&	y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]
	Hex	1B	26	y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]
	Decimal	27	38	y c1 c2 [x1 d1...d(y × x1)]...[xk d1...d(y × xk)]

[Range]   y = 3

$32 \le c1 \le c2 \le 127$

$0 < x \le 24$

$0 \le d1 ... d(y \times xk) \le 255$

[Description] Defines user-defined characters.

· y specifies the number of bytes in the vertical direction.

· c1 specifies the beginning character ASCII code , and c2 specifies the final character ASCII code.

· x specifies the number of dots in the horizontal direction.

[Notes]   · 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 dot data for download characters. The dot pattern is in the horizontal direction from the left side.

· The data to define a user-defined character is (y × x) bytes.

· When X value is less than 13, the user-defined character width is defaulted as 13.

· Each bit of data presents one dot, set a corresponding bit to 1 to print a dot or 0 to not print a dot.

· The user-defined character is cleared when:

  ①**ESC ?** is executed.

  ②The the power is turned off.

[Default]   Internal character set.

[Reference] **ESC %, ESC ?**

[Example]

d1= <0F>H   d4 = <30>H   d7 = <40>H . . . .
d2 = <03>H   d5 = <80>H   d8 = <40>H . . . .
d3 = <00>H   d6 = <00>H   d9 = <20>H . . . .

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 ≤ nL ≤ 255
	0 ≤ nH ≤ 3
	0 ≤ d ≤255

[Description] Selects a bit-image mode using m for the number of dots specified by nL and nH, as follows:

m	Mode	Vertical Direction		Horizontal Direction	
		Dots	Resolution	Resolution	Number of Data (K)
0	8-dot single-density	8	67 DPI	101 DPI	nL + nH × 256
1	8-dot double-density	8	67 DPI	203 DPI	nL + nH × 256
32	24-dot single-density	24	203 DPI	101 DPI	(nL + nH × 256) × 3
33	24-dot double-density	24	203 DP	203 DPI	(nL + nH × 256) × 3

[Notes]   · If the values of m is out of the specified range, nL and data following are
processed as normal data.

· The nL and nH indicate the number of dots of the bit image in the horizontal
direction. The number of dots is calculated by nL + nH × 256.

· If the bit-image data input exceeds the number of dots to be printed on a line,
the excess data is ignored.

· d indicates the bit-image data, each bit represent a dot.   Set a corresponding bit to 1 to
print a dot or to 0 to not print a dot.

· After sending a bit image, the printer returns to normal data processing mode.

· If the printing area set by **GS L** and **GS W** is less than the printing width needed by **GS/**, the printer shall act as below quickly (but cannot exceed Max. printing width).

1) The printing area shall extend to the right for matching the printing bit image.

2) If step 1) cannot provide enough width for the data, the left margin shall be reduced to match it. For each bit of the data in single density mode (m=0.32), the printer shall print two dots; for each bit of the data in double density mode (m=1.33), the printer shall print one dots. In calculating the printable data for each line, you must consider it.

· After printing a bit image, the printer shall return normal data processing mode.

· This command shall not be effected by other printing modes (such as emphasized, double-strike, underline, character size, or white/black reverse printing) except upside-down printing mode.

· The relation of the data and the dots to be printed is as below:

When 8-dot bit image is selected:
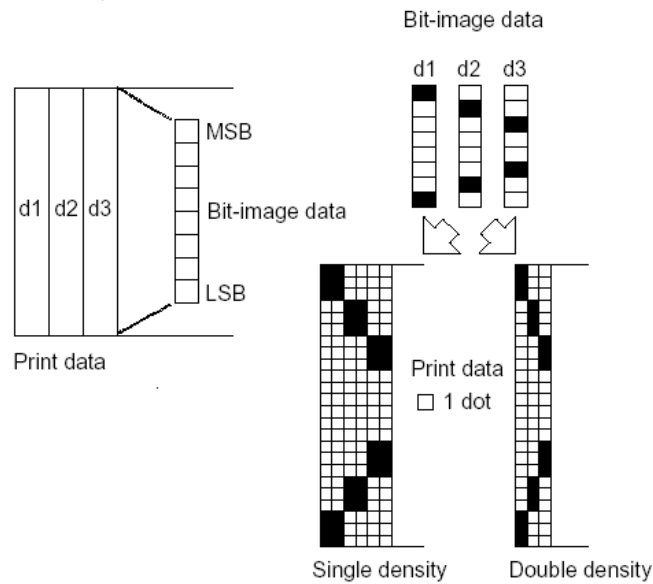
When 24-dot bit image is selected:
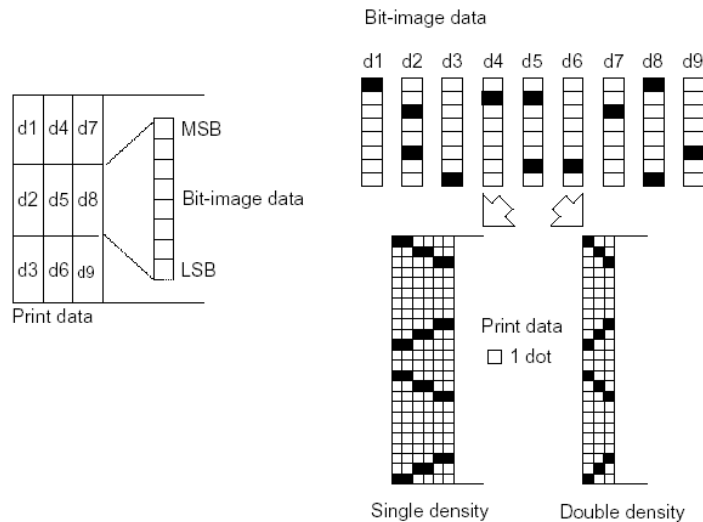
ESC–n

[Name]	Turn underline mode on/off			
[Format]	ASCII	ESC	-	n
	Hex	1B	2D	n
	Decimal	27	45	n

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

[Description] Turns underline mode on or off, based on the following values of n:

n	Function
0, 48	Turns off underline mode
1, 49	Turns on underline mode (1-dot thick)
2, 50	Turns on underline mode (2-dots thick)

[Notes]   · The printer can underline all characters (including right-side character spacing),
      but cannot underline the space set by **HT.**

    · The printer cannot underline 90° clockwise rotated characters and white/black
      inverted characters.

    · When underline mode is turned off the following data is not underlined, and
      the underline thickness set does not change. The default underline thickness is 1 dot.

    · Changing the character size does not affect the current underline thickness.

    · Underline mode can also be turned on or off by using **ESC !**. Note, however,
      that the last received command is effective.

[Default]   n = 0

[Reference] **ESC !**

ESC 2

[Name]	Select default line spacing		
[Format]	ASCII	ESC	2
	Hex	1B	32
	Decimal	27	50

[Description] Set the line spacing to be 3.875 mm (31 x 0.125 mm)

[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	1B	33	n
	Decimal	27	51	n

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

[Description] Sets the line spacing to [n × vertical or horizontal motion unit] inches.

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

    · In standard mode, the vertical motion unit (y) is used.

    · In page mode, this command functions as follows, depending on the starting
      position of the printable area for selecting horizontal or vertical motion unit:

      ① When the starting position is set to the upper left or lower right of the

printable area using **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

able area using **ESC T**, the horizontal motion unit (x) is used.

[Default]   n = 31

[Reference]   **ESC 2**

ESC = n

[Name]	Select printer		
[Format]	ASCII	ESC	=	n
	Hex	1B	3D	n
	Decimal	27	61	n

[Range]   0 ≤ n ≤ 1

[Description] Selects device to which host computer sends data, using n as follows:

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

[Notes]   · When the printer is disabled, it ignores all data except for error-recovery commands **(DLE EOT, DLE ENQ**) **ESC** ＝until it is enabled by this command.

[Default]   n = 1

ESC ? n

[Name]	Cancel user-defined characters		
[Format]	ASCII	ESC	?	n
	Hex	1B	3F	n
	Decimal	27	63	n

[Range]   32 ≤n ≤127

[Description] Cancels user-defined characters.

[Notes]   · If a user-defined character has not been defined for the specified character code, the printer ignores this command.

· Cancel the character presented by n in user-defined characters. After the cancellation, internal character set shall be used.

[Reference]   **ESC &, ESC %**

ESC @

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

[Description] Clear the data in the printing buffer. The print mode is set to be the default mode when powered on.

[Note]   • Not clear the downloaded bit image, and clear the downloaded user-defined character in RAM.

• When the default configuration of the printer is label, the defaulted print mode is page

mode when powered on.

• When the default configuration of the printer is continuous paper, the defaulted print mode is standard mode when powered on.

• Keep macro-definition.

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 ≤ n ≤ 255				
	1 ≤ k ≤ 32				

[Description] Sets horizontal tab positions.

· n specifies the column number for setting a horizontal tab position from the beginning of l the line.

· k indicates the total number of horizontal tab positions to be set.

[Notes]   · The horizontal tab position is calculated as follows:

Character width x n. The character width includes the right-side character spacing.

· This command cancels the previous horizontal tab settings.

· When setting n = 8, the print 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.

· Arrange tab positions in ascending order and place a NUL 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.

· Change character width, and previous tab positions specified is not changed.

· Character width is independent under standard mode and page mode.

[Default]   The default tab positions are at intervals of 8 characters 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 ≤ n ≤ 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. The last command received is enabled.

· **ESC G** can turn on or off emphasized mode and double-strike mode. The last command received is enabled.

[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.

· This command and **ESC !** turn on and off emphasized mode in the same way.
  The last command received is valid.

[Default]   n = 0
[Reference] **ESC E**

ESC J n

[Name]	Print and feed paper n dots line		
[Format]	ASCII	ESC	J	n
	Hex	1B	4A	n
	Decimal	27	74	n

[Range]   0 ≤n ≤ 255

[Description] Prints the data in the print buffer and feeds the paper [n × horizontal motion unit] inches.

[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**.

· In standard mode, the printer uses the vertical motion unit (y).

· In page mode, select vertical motion unit or horizontal motion unit according to the print
  area direction and the beginning position of print in the way as below:

① When the starting position is set to the upper left or lower right of the
  printable area using **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 printable area
  using **ESC T**, the horizontal motion unit (x) is used.

· The maximum feeding distance is 900mm (35.4 inches). When the setting value
  exceeds the maximum, it is converted to the maximum automatically.

ESC L

[Name]	Select page mode	
[Format]	ASCII	ESC	L
	Hex	1B	4C

Decimal	27	76

[Description] Switches from standard mode to page mode.

[Notes]   · This command is enabled only when processed at the beginning of a line in
             standard mode.

           · This command has no effect in page mode.

           · After printing by **FF** is completed or by using **ESC S**, the printer returns to
             standard mode.

           · This command sets the printing position where data is buffered to the position specified
             by **ESC T** within the printing area defined by **ESC W**.

           · This command switches the settings for the following commands to those for page mode:
             ①Set right-side character spacing: **ESC SP, FS S**
             ②Select default line spacing: **ESC 2, ESC 3**

           · Only flag operation is possible for the following commands in page mode; these
             commands are not executed until transfer to standard mode..
             ①Turn 90° clockwise rotation mode on/off: **ESC V**
             ②Select justification: **ESC a**
             ③Turn upside-down printing mode on/off: **ESC {**
             ④Set left margin: **GS L**
             ⑤Set printable area width: **GS W**

           · The printer returns to the default print mode when power is turned off, the printer is reset,
             or **ESC @** is used.

[Reference] **FF, CAN, ESC FF, ESC S, ESC T, ESC W, GS $, GS **

ESC M n

[Name]   Select character font

[Format]   ASCII   ESC   M   n
             Hex   1B   4D   n
             Decimal   27   77   n

[Range]   0 ≤ n ≤ 9, 48≤ n ≤ 57

[Description] Select character font:

n	Function
0,48	Character font A (12 × 24) selected
1,49	Character font B (9 × 17) selected
2,50	User defined character selected
3,51	Select Kanji font 3 (24 × 24).
4,52	Select Kanji Font 4 (36×36)
5,53	Select ASCII Font 5 (12 × 18)
6,54	Select ASCII Font 6 (8 ×12)
7,58	Select ASCII Font 7 (16 × 17)
8,59	Select ASCII Font 8 (16 × 26)
9,60	Select ASCII Font 9 (18 × 34)

[Note]   · **ESC !** can also set font. Last command received is valid.

           · If there is no required font by the configuration in character set, this command is disabled.

[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 an international character from the following table，see

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

[Note]   Only Font 0 and Font 1 have international character set. The command is disabled for 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 are cleared.

· This command sets the print position to the beginning of the line.

· The printing area in page mode are initialized to be default value.

· This command switches the settings for the following commands

to those for standard mode:

①Set right-side character spacing: **ESC SP, FS S**

②Select default line spacing: **ESC 2, ESC 3**

[Reference] **FF, ESC FF, ESC L**

ESC T n

[Name]	Select print direction in page mode
[Format]	ASCII ESC T n
	Hex 1B 54 n
	Decimal 27 84 n
[Range]	$0 \le n \le 3$
	$48 \le n \le 51$

[Description] Selects the print direction and starting position in page mode.

n specifies the print direction and starting position as follows:

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)
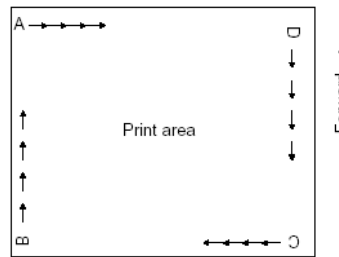
[Notes]
· When the command is input in standard mode, the printer executes only internal flag operation. This command does not affect printing in standard mode.

· This command sets the position where data is buffered within the printing area.

· Parameters for horizontal or vertical motion units (x or y) differ as follows, depending on the starting position of the printing area:

①If the starting position is the upper left or lower right of the printing area, data is buffered in the direction perpendicular to the paper feed direction:

Commands using horizontal motion units: **ESC SP, ESC $, ESC **

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

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

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

Commands using vertical motion units: **ESC SP, ESC $, ESC **

[Default]	n = 0
[Reference]	**ESC $, ESC L, ESC W, ESC \, GS $, GS P, GS **

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]	$0 \le n \le 1, 48 \le n \le 49$

[Description] Turns 90° clockwise rotation mode on/off

n is used as follows:

n	Function
0, 48	Turns off 90° clockwise rotation mode
1, 49	Turns on 90° clockwise rotation mode

[Notes]   · This command affects printing only in standard mode.

              · When underline mode is turned on, the printer does not underline 90° clockwise-rotated.

              · Double-width and double-height commands in 90° rotation mode magnify
                characters in the opposite directions from double-height and double- width
                commands in normal mode.

[Default]   n = 0

[Reference]   **ESC !, ESC** -

ESC W xL xH yL yH dxL dxH dyL dyH

[Name]	Set printing area in page mode		
[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 ≤ 255 (Except dxL= dxH=0 or dyL= dyH=0)

[Description] · The horizontal starting position, vertical starting position, printing area width,
               and printing area height are defined respectively. Each setting for the printing
               area is calculated as follows:

               horizontal starting position $x_0 = [(xL + xH \times 256) \times$ (horizontal motion unit)]
               vertical starting position $y_0 = [(yL + yH \times 256) \times$ (vertical motion unit)]
               printing area width $dx = [dxL + dxH \times 256] \times$ (horizontal motion unit)]
               printing area height $dy = [dyL + dyH \times 256] \times$ (vertical motion unit)]

[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 printable area, the
                printer stops command processing and processes the following data as normal data.

               · If the printing area width or height is set to 0, the printer stops command
                processing and processes the following data as normal data.

               · This command sets the current printing position together with **ESC T.**

               · If (horizontal starting position + printing area width) exceeds the printable area, the
                printing area width shall be adjusted as horizontal printable width automatically, namely
                horizontal starting position.

               ·If (vertical starting position + printing area width) exceeds the printable area, the
                printing area width shall be adjusted as horizontal printable width automatically, namely
                horizontal starting position.

               · The horizontal and vertical motion unit are specified by **GS P**. Changing the
                horizontal or vertical motion unit does not affect the current printing area.

               · Use 0.125 mm unit (x) for setting the horizontal starting position and printing area width,
                and use 0.125mm unit (y) for setting the vertical starting position and printing area height.

               · When the horizontal starting position, vertical starting position, printing area
                width, and printing area height are defined as X, Y, Dx, and Dy respectively, the
                printing area is set as shown in the figure below.
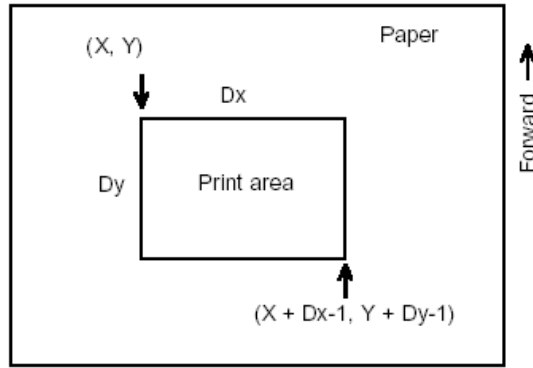
[Default]   xL = xH = yL = yH = 0

                dxL, dxH, dyL和dyH are decided by printer configuration

[Reference]   **CAN, ESC L, ESC T**

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 ≤ nl ≤ 255

            0 ≤ nH ≤ 255

[Description] Set horizontal relatively displacement based on motion unit setting.

           · This command sets the distance from the current position to [(nL + nH × 256) ×
horizontal or vertical motion unit]

[Notes]   · Any setting that exceeds the printable area is ignored.

           · When printing position move to the right: nL+ nH × 256 = N

           When printing position move to the left (the negative direction), use the
complement : nL+ nH × 256 = 65536 - N

           · The print starting position moves from the current position to [N × horizontal or
vertical motion unit]

           · In standard mode, the horizontal motion unit is used.

           · In page mode, the horizontal or vertical motion unit can be selected as follows, depending
on the starting point and direction of the printing area:

           ①When the starting position is set to the upper left or lower right of the
printable area using **ESC T**, the horizontal motion unit (x) is used.

           ②When the starting position is set to the upper right or lower left of the
printable area using **ESC T**, the vertical motion unit (y) is used.

[Reference]   **ESC $**

ESC a n

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

[Range]   0 ≤ n ≤ 2, 48 ≤ n ≤ 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] · 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 **.

· The command is enabled only at the beginning of the line in standard mode.

[Default] n = 0

[Example]

ESC c 0 n

[Name]	Selects the paper type			
[Format]	ASCII	ESC	c	0 n
	Hex	1B	63	30 n
	Decimal	27	99	48 n

[Range] 0 ≤ n ≤ 2

[Description] Selects the paper type. The relation of n value and paper type is shown as below:

n = 0, set paper type as normal paper roll.

n = 1, 2, set paper type as Marked paper.

[Notes] · This command can select paper type.

· When continuous paper is selected, the printer enter to standard mode automatically.

· When marked paper is selected, the printer enter to page mode automatically.

· After the printer is reset, or powered on again or execute **ESC @**, the paper type is recovered as a default

ESC c 3 n

[Name]	Select paper sensor(s) to output paper end signals			
[Format]	ASCII	ESC	c	3 n
	Hex	1B	63	33 n
	Decimal	27	99	51 n

[Range] 0 ≤ n ≤ 255

[Description] Selects the paper sensor(s) to output paper end signals

· Each bit of n is used as follows:

Bit	0/1	Hex	Decimal	Function
0	0	00	0	Paper roll near-end sensor disabled
	1	01	1	Paper roll near-end sensor enabled
1	0	00	0	Paper roll near-end sensor disabled

	1	02	2	Paper roll near-end sensor enabled
2-7				Undefined

[Notes] · It is possible to select paper near end sensors to output signals. Then, if any of the sensors detects a paper end, the paper end signal is output.

· The command is available only with a parallel interface and is ignored with a serial interface.

[Default] n = 0

ESC c 4 n

[Name] Select paper sensor(s) to stop printing

[Format] ASCII   ESC   c   4   n

        Hex   1B   63   34   n

        Decimal   27   99   52   n

[Range] 0 ≤ n ≤ 255

[Description] Selects the paper sensor(s) used to stop printing when a paper-end is detected, using n as follows:

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

[Notes] · When either bit 0 or 1 is on, the printer selects the paper roll near-end sensor for the paper sensor to stop printing after finish the current task..

[Default] n = 0

ESC c 5 n

[Name] Enable/disable panel buttons

[Format] ASCII   ESC   c   5   n

        Hex   1B   63   35   n

        Decimal   27   99   53   n

[Range] 0 ≤ n ≤ 255

[Description] Enables or disables the panel buttons.

· When the LSB of n is 0, the panel buttons are enabled.

· When the LSB of n is 1, the panel buttons are disabled.

[Notes] · Only the lowest bit of n is valid.

· When the panel buttons are disabled, none of them are usable.

· In the macro ready mode, the FEED button are enabled.

[Default] n = 0

ESC d n

[Name] Print and feed n lines

[Format] ASCII   ESC   d   n

	Hex	1B	64	n
	Decimal	27	100	n

[Range]　　0 ≤n ≤ 255

[Description] Prints the data in the print buffer and feeds n lines. (character line)

[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. When the settings is larger than 900 mm, the maximum value is used.

[Reference]　**ESC 2**, **ESC 3**

ESC l n X0l X0h Y0l Y0h X1l X1h Y1l Y1h

[Name]　　Underline command

[Format]　　ASCII　　ESC　　l　　n　　X0l X0h Y0l Y0h X1l X1h Y1l Y1h

　　　　　　Hex　　1B　　6C　　n　　X0l X0h Y0l Y0h X1l X1h Y1l Y1h

　　　　　　Decimal　27　　108　　n　　X0l X0h Y0l Y0h X1l X1h Y1l Y1h

[Range]　　0 ≤n ≤ 255

[Description] Set the starting and terminal coordinates, then generate a underline in the printing buffers:

· N specifies line thickness.

·X0l X0h Y0l Y0h can set (X0，Y0) of underline and X1l X1h Y1l Y1h can set (X1，Y1)

$X0 = X0l + X0h \times 255$, $Y0 = Y0l + Y0h \times 255$, $X1 = X1l + X1h \times 255$,

$Y1 = Y1l + Y1h \times 255$

[Notes]　　· The command is enabled only in page mode.

· The command can only generate acrossing line or vertical line except bias. Therefore when X0 doesn't equal to X1, Y0 must equal to Y1; Also when Y0 doesn't equal to Y1, X0 must equal to X1.

· When (X0, Y0) and (X1, Y1) of the line exceed the printing area, the command is disabled.

ESC t n

[Name]　　Select character code table

[Format]　　ASCII　　ESC　　t　　n

　　　　　　Hex　　1B　　74　　n

　　　　　　Decimal　27　　116　　n

[Range]　　0≤n≤5, 16≤n≤19

[Description] Selects a page n from the character code table.

n	Page
0	PC437
1	Katakana
2	PC850
3	PC860
4	PC863
5	PC865
16	WPC1252
17	PC866

18	PC852
19	PC858

[Note]   • Only Font 0 and Font 1 has code page. This command is disabled in other fonts.

[Default]   437

ESC v

[Name]	Transmit printer status to host machine

[Format]   ASCII   ESC   v

              Hex   1B   76

              Decimal   27   118

[Descripe]   • Transmit printer status to host machine, only serial interface printer is valid.

           • When the printer receive the command, transmit a byte to a host.

           • This byte is 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	Printhead closed
	1	42	66	Printhead lifted
2	0	00	0	Adequate paper
	1	04	4	Paper end
3	0	00	0	Normal
	1	08	8	Cutter error
4	0	00	0	Fixed to 0
5	0	00	0	Normal
	1	20	32	Printhead overheated
7	---	---	---	Undefined

[Note]   This command is enabled only for serial interface printer.

ESC { n

[Name]	Turns on/off upside-down printing mode

[Format]   ASCII   ESC   {   n

              Hex   1B   7B   n

              Decimal   27   123   n

[Range]   0 ≤ n ≤ 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.

[Default]   n = 0

[Example]

Paper feed direction
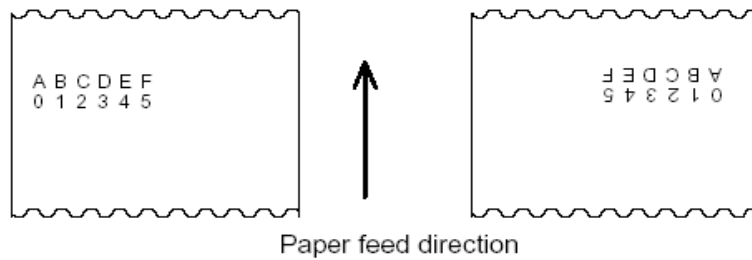
FS p n m

[Name]	Print NV bit image			
[Format]	ASCII	FS	p	n m
	Hex	1C	70	n m
	Decimal	28	112	n m

[Range]   1 ≤ n ≤ 255

0 ≤ m ≤ 3, 48 ≤ m ≤51

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

m	Mode	Vertical Dot Density (DPI)	Horizontal Dot Density (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 the NV bit image (defined using the **FS q** command).

m specifies the bit image mode.

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

* In standard mode, this command is enabled only when no data in the print buffers.

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

* 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 set by **GS L** and **GS W** is less than the printing width needed by **GS /**, the printer shall operate as below immediately. (But cannot exceed Max. printing width).

1) The printing area extends to the right for matching the data of the printing bit image;

2) If step 1) cannot provide enough extending width, the left margin shall be reduced to meet with bit image width.

* In normal an double-width mode, this command feed n paper which is NV bit image spacing; In double-height and fout times mode, this command feed n paper which is NV bit image spacing. It doesn't relate to the line spacing set by **ESC 2** or **ESC 3**.

* After printing a bit image, the printer shal shift to next line

[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]	$1 \le n \le 255$
	$0 \le xL \le 255$
	$1 \le (xL + xH \times 256) \le 1023$
	$1 \le (yL + yH \times 256) \le 800$
	$0 \le d \le 255$
	$k = (xL + xH \times 256) \times (yL + yH \times 256) \times 8$
	Total defined data area (MAX) = 64K bytes.
[Description]	Define the NV bit image specified by n .
	* n specifies the number of the defined NV bit image.
	* xL, xH specifies (xL + xH × 256) × 8 dots in the horizontal direction for the NV bit image you are defining.
	* yL, yH specifies (yL + yH × 256) × 8 dots in the vertical direction for the NV bit image you are defining.
[Note]	* Frequent write command execution may cause damage to 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 the processing of this command, the printer is busy to write data to NV memory and stops receiving any more commands. Therefore, before the ending of the processing of this command, do not send any other commands even real-time commands to the printer.
	*NV bit image means a bit image which is defined in a 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 commences effective when 7 bytes <FS~yH> is processed as a normal value which is not a part of image data.
	*When the amount of data exceeds the capacity left in the range defined by xL, xH, yL, yH, the printer processes the defined range by xL, xH, yL, yH.
	*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 processes 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 command **FS p**.

*A definition data of a 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 a bit image data exceeding 64K bytes.
(Different printer downloads different space, please refer to printer configuration)

*Before inputing NV memory, the printer is in busy status immediately.

*During the processing of this command, the printer does not transmit status and does not respond to status inquiry as well.

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

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

*This command performs only definition of a NV bit image and does not perform printing. Printing of the NV bit image is performed by the **FS p** command.

*The NV memory space used by each NV bit image equals to NV bit image data plus 4 bytes.

[Reference] **FS p**
[Example] When xL = 64, xH = 0, yL = 96, yH = 0
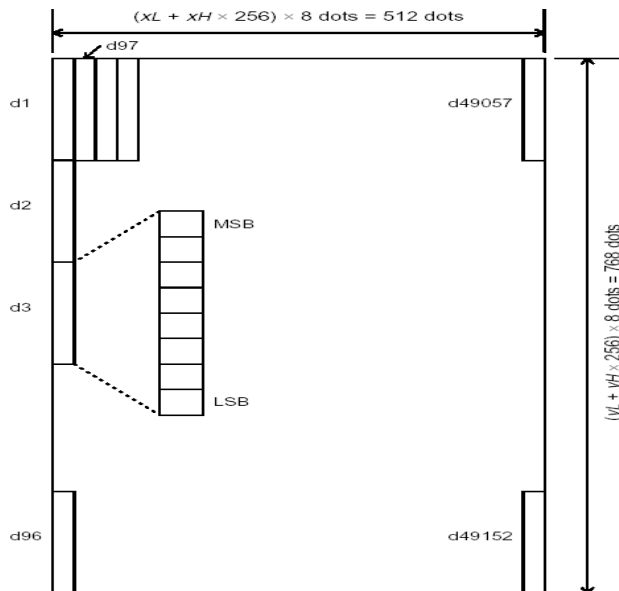
GS FF

[Name]	Feed marked paper to print position		
[Format]	ASCII	GS	FF
	Hex	1D	0C
	Decimal	29	12

[Description] Feed marked paper to print position，Feed paper until the next mark get to special position.

[Notes]   · This Command is valid only when the paper type is set to marked paper.

               · In using continuous paper, this command is ignored.

[Reference] **GS (F, FF**

GS ! n

[Name]	Select character size

[Format]   ASCII   GS   !   n

               Hex   1D   21   n

               Decimal   29   33   n

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

               (1 ≤ vertical number of times ≤ 6, 1 ≤ horizontal number of times ≤ 6)

[Description] Selects the character height using bits 0 to 2 and selects the character width using bits 4 to 7, as follows:

Bit	Function
0-3	Character height selection. See Table 2.
4-7	Character width selection. See Table 1.

Table 1   **Table 2**

Character Width Selection			Character Height Selection		
Hex	**Decimal**	**Horizontal width**	**Hex**	**Decimal**	**Vertical width**
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

[Notes]   · This command is all characters (ASCII and Kanji) effective except for HRI characters.

               · If n(0-3bit or 4-7bit) is outside of the defined range,   then magnifying times (height or width) is set to be 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 thecharacters 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 # n

[Name]	Define current download image No.		
[Format]	ASCII	GS	#	n
	Hex	1D	23	n
	Decimal	29	35	n

[Range]:   0≤n<7

[Description] Select current download image No., download bit image and printing bit image based on it.

[Note]:   • The command is valid only for bit image downloaded to RAM.

            • Bit image downloaded in NV memory shall not use the bit image specified by this command.

            • When n is outside of the range, the bit image shall not be changed

            •.The bit image is defaulted as 0 when the printer is powered on.

[Default]   n=0

[Reference]   **GS #，GS /**

GS $ nL nH

[Name]	Set absolute vertical print position in page mode		
[Format]	ASCII	GS	$	nL nH
	Hex	1D	24	nL nH
	Decimal	29	36	nL nH

[Range] $0 \le nL \le 255$, $0 \le nH \le 255$

[Description] · Sets the absolute vertical print starting position in page mode.

              · This command sets the absolute print position to [(nL + nH × 256) × (vertical or horizontal motion unit)] inches.

[Notes]   · This command is effective only in page mode.

            · If the [(nL + nH × 256) × (vertical or horizontal motion unit)] exceeds the specified printing area, this command is ignored.

            · After the command is executed, the horizontal starting buffer position does not move.

            · The reference starting position is specified by **ESC T**.

            · This command operates as follows, depending on the starting position of the printing area specified by **ESC T**:

            ① When the starting position is set to the upper left or lower right, this command sets the absolute position in the vertical direction.

            ② When the starting position is set to the upper right or lower left, this command sets the absolute position in the horizontal direction.

 [Reference]   **ESC $, ESC T, ESC W, ESC \, GS **

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 × 56))=2 (pL=2, pH=0)

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

1 ≤ m≤ 6,   49 ≤ m ≤ 54

[Description] · Executes a test print, n and m shall specifies the printing mode

n specifies the paper to be tested.

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

m specifies a test pattern.

m	Test pattern
1, 49	Hexadecimal dump
2, 50	Printer status print
3, 51	Reserved
4, 52	Start paper checkout process
5, 53	Reserved
6, 54	Quey sensor status

[Note]　　　· This command is enabled only when processed at the beginning of a line in
standard mode.

· When this command is received during macro definition, the printer ends macro
definition and begins performing 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 downloaded 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 ≤ x ≤ 255, 1 ≤ y ≤ 48

x × y ≤ 1023

0 ≤ d ≤ 255

[Description] Defines a downloaded bit image using the number of bytes specified by x and y

· x specifies the number of dots in the horizontal direction.

· y specifies the number of dots in the vertical direction.

[Notes]　　· The number of dots in the horizontal direction is x × 8, in the vertical direction it is y × 8.

· If x × y is out of the specified range, this command is disabled.

· The d indicates bit-image data. Data (d) specifies a bit printed to 1 and not printed to 0.

· The downloaded bit image definition is cleared when printer power is turned off.

· If the free space in downloading area of RAM is not enough for a bit image, clear previous
downloaded bit image for downloading current bit image.

· The following figure shows the relationship between the downloaded bit image
and the printed data.
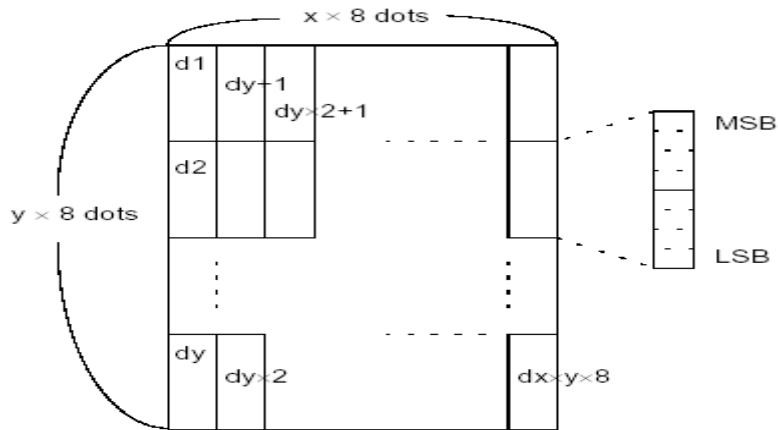
[Reference] **GS /**

GS / m

[Name]	Print downloaded bit image

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

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

[Description] Prints a downloaded bit image using the mode specified by m.

m selects a mode from the table below:

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

[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.

· If the printing area set by **GS L** and **GS W** is less than that needed by **GS /**, the process as below shall be executed immediately(but cannot exceed Max. printing width).

1) The printing area extends to the right for meeting the data volumn of bit image.

2) If step 1) cannot provide enough width, the left margin shall be reduced to meet the bit image width.

· For a dot of bit image in standard mode (m=0.48) and double height mode (m=2.50), the printer shall print one dot; For a dot of bit image in double width mode (m=1.49) and double height/width mode (m=3.51), the printer shall print two dots.

[Reference] **GS ***

GS :

[Name]	Start/end macro definition		
[Format]	ASCII	GS	:
	Hex	1D	3A
	Decimal	29	58

[Description] Starts or ends macro definition.

[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 and clear macro definition.

· Macro is not defined when the power is turned on.

· The defined contents of the macro are not 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 1023 bytes. If the macro definition exceed 1023 bytes, excess data is treated as normal data..

[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 ≤ n ≤ 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 all characters except for HRI characters.

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

· This command does not affect bit image, user-defined bit image, bar code, 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. After cancelling White/black reverse mode, it is enabled when underline mode is on.

[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 ≤ n ≤ 3, 48 ≤ n ≤ 51

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

n selects the printing position for HRI 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 ≤ nL ≤ 255

             0 ≤ nH ≤ 255

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

· The left margin is set to [(nL + nH × 256) × 0.125mm]].
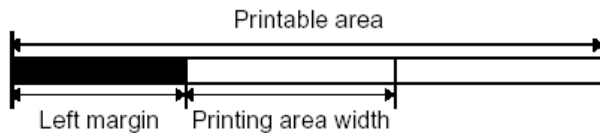
Left margin   Printing area width

[Notes]   · This command is effective only 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 ≤ nL ≤ 255

             0 ≤ nH ≤ 255

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

· The printing area width is set to [(nL + nH × 256) × 0.125 mm]].
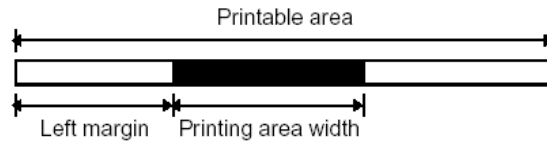
[Notes]   · This command is effective only processed at the beginning of the line in standard mode.

· In page mode, this command is disabled and the data is processed as ordinary characters.

· This command does not affect printing in page mode.

· If the [left margin + printing area width] exceeds the printable area, (printable area width - left margin) the printing area width is used.

[Default]   It is related to real printable width. Different printers have different parameter.

[Reference]   **GS L**

GS \ nL nH

[Name]	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 ≤ nL ≤ 255

0 ≤ nH ≤ 255

[Description] Sets the relative vertical print starting position from the current position in page mode.

· This command sets the distance from the current position to [(nL + nH × 256) × 0.125 mm].

[Notes]   · This command is ignored unless page mode is selected.

· When pitch N is specified to the movement downward:

nL + nH × 256 = N

When pitch N is specified to the movement upward (the negative direction), use the complement to calculate: nL+nH×256=65536-N..

· Any setting that exceeds the specified printing area is ignored.

[Reference]   **ESC $, ESC T, ESC W, ESC \, GS $**

GS ^ r t m

[Name]	Execute macro				
[Format]	ASCII	GS	^	r	t	m
	Hex	1D	5E	r	t	m
	Decimal	29	94	r	t	m

[Range]   0 ≤ r ≤ 255

0 ≤ t ≤ 255

m = 0, 1

[Description] Executes a macro.

· r specifies the number of times to execute the macro.

· t specifies the waiting time for executing the macro.

· m specifies macro executing mode.

When the LSB of m = 0:

The macro executes r times continuously at the interval specified by tx100ms.

When the LSB of m = 1:

After waiting for the period specified by t x 100 ms, the PAPER OUT LED

blink and the printer waits for the FEED button to be pressed. After the

button is pressed, the printer executes the macro once. The printer

repeats the operation r times.

[Notes] · The waiting time is t × 100 ms for each macro execution.

· If this command is received while a macro is being defined, the macro definition

is aborted and the macro definition being defined is cleared.

· If the macro is not defined or if r is 0, nothing is executed.

· When the macro is executed (m = 1), paper always cannot be fed by using the

FEED button.

[Reference] **GS :**

GS a n

[Name]	Enable/Disable Automatic Status Back (ASB)
[Format]	ASCII GS a n
	Hex 1D 61 n
	Decimal 29 97 n
[Range]	0 ≤ n ≤ 255

[Description] Specifies the status items to include, using n as follows:

Bit	Off /On	Hex	Decimal	Status for ASB
0	off	00	0	Undefined, fixed to 0.
1	off	00	0	On-line/off-line status enabled.
	on	02	2	On-line/off-line status disabled.
2	off	00	0	Error status enabled.
	on	04	4	Error status disabled.
3	off	00	0	Paper roll status enabled.
	on	08	8	Paper roll status disabled.
4-7	-	-	-	Undefined.

[Notes] · If any of the status items in the table above are enabled, the printer transmits

four-byte status of the printer in case that this status is changed.

· If all status items are disabled, the ASB function is also disabled.

· The following status bytes are transmitted without confirming whether the

host is ready to receive data.

· 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.

· Even though the printer is disabled by **ESC =,** the four-byte status are transmitted

whenever the status changes.

· The status to be transmitted are 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	On	04	4	Not used. Fixed to 1.
3	Off	00	0	On-line.
3	On	08	8	Off-line.
4	On	10	16	Not used. Fixed to 1.
5	Off	00	0	Cover is closed.
5	On	20	32	Cover is open.
6	Off	00	0	Paper is not being fed by using the PAPER FEED button.
6	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	Off	00	0	No unfound mark error
0	On	01	1	Unfound mark error
1	-	-	-	Undefined.
2	-	-	-	Undefined.
3	Off	00	0	Fixed to 0.
4	Off	00	0	Fixed to 0.
5	Off	00	0	No unrecoverable error.
5	On	20	32	Unrecoverable error occurred.
6	Off	00	0	No automatically recoverable error.
6	On	40	64	Automatically recoverable error occurred.
7	Off	00	0	Not used. Fixed to Off.

Bit 5: It is similar with paper end or paper checkout error. The printer could be recovered by **DLE ENQ n** ($1 \le n \le 2$).

Bit 6: Printhead overheated error is an Auto recoverable error. When the printer occurs error, it can recover to normal operation status automatically after waiting a certain time.

Third byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Printer status
0,1	Off	00	0	Paper roll near-end sensor: paper not present.
0,1	On	03	3	Paper roll near-end sensor: paper present.
2,3	Off .	00	0	Paper roll end sensor: paper adequate
2,3	On .	0C	12	Paper roll end sensor: paper end
4	Off	00	0	Not used. Fixed to 0.
5	Off	00	0	No unrecoverable error in the print.
5	On	20	32	Unrecoverable error occurred in the print.
6	Off	00	0	The printer is not in printing status
6	On	40	64	The printer is in printing status
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	-	-	-	Undefined.
6	Off	00	0	The printing is not prohibited
	On	40	64	Prohibit the printing after error occurs
7	Off	00	0	Not used. Fixed to Off.

BIT6: set to 0 in all cases and shall set to 1 only when paper roll is adequate and paper roll present affects the printing.

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 A (12×24)
1,49	Font B (9 × 17)

[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 ≤ n ≤ 255			

[Description] Selects the height of the bar code.

n specifies the height of the bar code.

[Default] n = 162

[Reference] **GS k**

①GS k m d1...dk NUL②GS k m n d1...dn

[Name]	Print bar code					
[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]　　①0 ≤ m ≤ 6 (k and d depends on the bar code system used)

　　　　　②65 ≤ m ≤ 73 (k and d depends 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:

	m	Bar Code System	Number of Characters	d
①	0	UPC-A	11 ≤ k ≤ 12	48 ≤ d ≤ 57
	1	UPC-E	11 ≤ k ≤ 12	48 ≤ d ≤ 57
	2	JAN13 (EAN13)	12 ≤ k ≤ 13	48 ≤ d ≤ 57
	3	JAN 8 (EAN8)	7 ≤ k ≤ 8	48 ≤ d ≤ 57
	4	CODE39	1 ≤ k ≤ 255	45 ≤ d ≤ 57, 65 ≤ d ≤ 90, 32, 36, 37,43
	5	ITF	1 ≤ k ≤ 255	48 ≤ d ≤ 57
	6	CODABAR	1 ≤ k ≤ 255	48 ≤ d ≤ 57, 65 ≤ d ≤ 68 , 36, 43, 45,46,47,58
②	65	UPC-A	11 ≤ n ≤ 12	48 ≤ d ≤ 57
	66	UPC-E	1 ≤ n ≤ 12	48 ≤ d ≤ 57
	67	JAN13 (EAN13)	12 ≤n ≤ 13	48 ≤ d ≤ 57
	68	JAN 8 (EAN8)	7 ≤n ≤ 8	48 ≤ d ≤ 57
	69	CODE39	1 ≤ n ≤ 255	45 ≤ d ≤ 57, 65 ≤ d ≤ 90, 32, 36, 37,43 d1 = dk = 42
	70	ITF	1 ≤ n ≤ 255	48 ≤ d ≤ 57
	71	CODABAR	1 ≤ n≤ 255	48 ≤ d ≤ 57 65 ≤ d ≤ 68, 36, 43,45,46,47 58
	72	CODE93	1 ≤ n≤ 255	0 ≤ d ≤ 127
	73	CODE128	2 ≤ n≤ 255	0 ≤ d ≤ 127

[Notes for ①]

　　　　· This command ends with a NUL code.

　　　　· When UPC-A or UPC-E code is selected, the remaining characters are processed as normal characters after the printer receiving 12-byte barcode data.

　　　　· When JAN13 (EAN13) is selected, the remaining characters are processed as normal characters after the printer receiving 13-byte character barcode data.

　　　　· When JAN8 (EAN8) is used, the remaining characters are processed as normal characters after the printer receiving 8-byte barcode data.

　　　　· The number of data for ITF bar code must be even numbers. When an odd number of data is input, the last data shall be ignored.

[Notes for ②]

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

　　　　· If n is outside of the specified range, the printer throw away the following data..

[Notes in standard mode]

　　　　· If d is outside of the specified range, the commande is disabled.

　　　　· If the horizontal size exceeds printing area, the command is ignored.

　　　　· 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 command is ignored..

· After printing 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 command is ignored.

· If bar code width exceeds the printing area, the exceeding part is ignored.

When CODE128 (m = 73) is used:

· Refer to Appendix A for the information of the CODE 128 bar code and its code table.

· When using the CODE 128 in this printer, take the following points into account
for data transmission:

① The top of the bar code data string must be code set selection character
(any of CODE A, CODE B or CODE C) which selects

② Special characters are defined by combining "{" and another 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

No.123456

· If the top of the bar code data is not the code set selection, the printer
stops command processing and process the following data as normal data..

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

· The printer does not print HRI characters that correspond to the shift characters

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 not printed.

· 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 specified by n as follows:

n	Function
1, 49	Transmits paper sensor status
2, 50	

[Notes] · This command is valid for serial model only,

· This command is executed when the data in the receive buffer is developed.

Therefore, there may be a time lag between receiving this command and

transmitting the status .

· The status types to be transmitted are shown below:

Paper sensor status (n = 1, 49):

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

[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 ≤ m ≤ 3, 48 ≤ m ≤ 51

0 ≤ xL ≤ 255

0 ≤ xH ≤ 255

0 ≤ yL ≤ 255

0 ≤ d ≤ 255

k = (xL + xH × 256) × (yL + yH × 256) (k ≠ 0)

[Description] Print Raster bit-image. The value of m selects it's mode, as follows:

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

· xL, xH, show the number of data bytes (xL+ xH × 256) in the horizontal direction for the bit image.

· yL, yH, show the number of data bytes (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.

· This command has no effect in all print modes (character size, emphasized, double-strike, upside-down, underline, white/black reverse printing, etc.) for raster bit image.

· Bit images outside the printing area is ignored.

· The **ESC a** (Select justification) setting is also effective on raster bit images.

· When this command is received during macro definition, the printer ends macro definition, and begins performing this command. The definition of this command should be cleared in macro definition.

· d indicates the bit-image data. Set a bit to 1 prints a dot and setting it to 0 does not print a dot.

[Example] When xL+ xH × 256 = 64
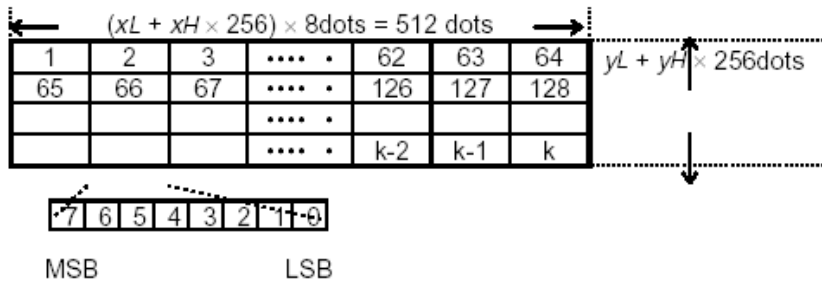
GS w n

[Name]	Set bar code width		
[Format]	ASCII	GS	w	n
	Hex	1D	77	n
	Decimal	29	119	n

[Range] 2 ≤ n ≤ 6

[Description] Set the horizontal size of the bar code.

n specifies the bar code width as follows:

		Even-level Module Width	
n	Odd-level Module Width (mm)	Thin element width (mm)	Thick element width (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

· Odd-level bar codes are as follows:

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

· Even-level bar codes are as follows:

CODE39, ITF, CODABAR

[Default]   n = 2

[Reference] **GS k**

FS ! n

[Name]	Set print mode(s) for Kanji characters		
[Format]	ASCII	FS	!	n
	Hex	1C	21	n
	Decimal	28	33	n

[Range]   0 ≤n ≤ 255

[Description] Sets the print mode for Kanji characters, using n as follows:

Bit	0/1	Hex	Decimal	Function
0, 1				Undefined
2	0	00	0	Double-width mode is OFF
	1	04	4	Double-width mode is ON
3	0	00	0	Double-height mode is OFF.
	1	08	8	Double-height mode is ON
4-6				Undefined
7	0	00	0	Underline mode is OFF
	1	80	128	Underline mode is ON

[Notes]   · When both double-width and double-height modes are set (including right- and
left-side character spacing), quadruple-size characters are printed.

· The printer can underline all characters (including right- and left-side character
spacing), but cannot underline the space set by **HT** and 90° clockwise-rotated characters.

· The thickness of the underline is that specified by **FS -**, regardless of the character size.

· When some of the characters in a line are double or more height, all the
characters on the line are aligned at the baseline.

· It is possible to emphasize the Kanji character using **FS W** or **GS** !, the setting
of the last received command is effective.

· It is possible to turn under line mode on or off using **FS -**, and the setting of the last
received command is effective.

[Default]   n = 0

[Reference] **FS -** ，**FS W**，**GS !**

FS &

[Name]	Select Kanji character mode	
[Format]	ASCII	FS	&
	Hex	1C	26
	Decimal	28	38

[Description] Selects Kanji character mode.

[Notes] · When Kanji character mode is selected, the printer identifies if the characters are Kanji internal code. If they are Kanji internal code, Kanji codes are processed in the order of the first byte and second byte.

· Kanji character mode is selected automatically when the power is turned on.

[Reference] **FS**

FS - n

[Name]	Turn underline mode on/off for Kanji characters		
[Format]	ASCII	FS	-	n
	Hex	1C	2D	n
	Decimal	28	45	n

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

[Description] Turns underline mode for Kanji characters on or off, based on the following values of n.

n	Function
0, 48	Turns off underline mode for Kanji characters
1, 49	Turns on underline mode for Kanji characters (1-dot thick)
2, 50	Turns on underline mode for Kanji characters (2-dot thick)

[Notes] · The printer can underline all characters (including right- and left-side character spacing), but cannot underline the space and 90° clockwise-rotated characters.

· After the underline mode for Kanji characters is turned off, underline printing is no longer performed, but the previously specified underlinethickness is not changed. The default underline thickness is 1 dot.

· The specified line thickness does not change even when the character size changes.

· It is possible to turn underline mode on or off using **FS !,** and the last received command is effective.

[Default] n = 0

[Reference] **FS !**

FS .

[Name]	Cancel Kanji character mode	
[Format]	ASCII	FS	.
	Hex	1C	2E
	Decimal	28	46

[Description] Cancels Kanji character mode.

[Notes] · When the Kanji character mode is not selected, all character codes are processed one byte at a time as ASCII code.

· Kanji character mode is selected when the power is turned on.

[Reference] **FS &**

FS S n1 n2

[Name]	Set left/right-side Kanji 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				

[Description] Sets right-side Kanji character spacing as [(n1 + n2)× 0.125mm].

[Notes] · When double-width mode is set, the right-side character spacing is twice the normal value.

· The maximum right-side spacing is approximately 36 mm. Any setting exceeding the maximum is converted to the maximum automatically.

[Default] n1 = 0, n2 = 0

FS W n

[Name]	Turn quadruple-size mode on/off for Kanji characters		
[Format]	ASCII	FS	W	n
	Hex	1C	57	n
	Decimal	28	87	n
[Range]	0 ≤ n ≤ 255		

[Description] Turns quadruple-size mode on or off for Kanji characters.

· When the LSB of n is 0, quadruple-size mode for Kanji characters is turned off.

· When the LSB of n is 1, quadruple-size mode for Kanji characters is turned on.

[Notes] · Only the lowest bit of n is valid.

· In quadruple-size mode, the printer prints the same size Kanji characters as when double-width and double-height modes are both turned on.

· When quadruple-size mode is turned off using this command, the following Kanji characters are printed in normal size.

· All the characters on the line are aligned at the baseline.

· **FS !** or **GS !** can also select and cancel quadruple-size mode by selecting double-height and double-width modes, and the setting of the last received command is effective.

[Default] n = 0

[Reference] **FS !, GS !**

3 Programming Instructions

3.1 General information

1. The instructions are compiled to help users who use commands to control the printer and master the command set quickly.
2. All programming examples are given in Hex.
3. Commands cited in the instructions are bolded and underlined. For instance, **1B 40**. Data following the commands are not underlined. For instance, 42 43..
4. Contents in parentheses are interpretations of the commands. Parentheses and contents in them are not parts of the commands transmitted to printer.

3.2 Commands application

The paragraghs below describe most common five sorts of commands detailed in commands set. In general the process shall be taken in the development as: Initialization ─> Setting printout ─> Print and feed paper ─> Status query. The programmer can refer the commands brief as below to reach his purpose quickly.

3.2.1 Initialization

1. Initialize the printer **1B 40**
2. Mode selection **1B 53** enter standard mode (Default)，**1B 4C** enter page mode

3.2.2 Printing settings and printout (Characters/barcode/bit image)

1) The printing area and position setting

    a) Horizontal tab (**09**)
    b) Set horizontal absolute beginning position of the printing (**1B 24**)
    c) Set horizontal tab position (**1B 44**)
    d) Select the printing direction in page mode (**1B 54 n**)
    e) Set the printing area in page mode (**1B 57**)
    f) Set horizontal relative printing position (**1B 5C nL nH**)
    g) Select alignment mode (**1B 61 n**)
    h) Set vertical absolute position in page mode (**1D 24**)
    i) Set left margin (**1D 4C**)
    j) Set horizontal/vertical motion unit (**1D 50**)
    k) Set the printing area width (**1D 57**)
    l) Set vertical relative position in page mode (**1D 5C**)

Several typical examples are given as below:

    a) Set printing area in page mode (width: 40, height: 50)
        0A (set the print starting position to the beginning of the line)
        1B 4C (switch to page mode)
        1B 57 20 00 00 00 40 01 90 01 (set printing area)
        50 72 69 6E 74 20 49 6E 20 50 61 67 65 20 4D 6F 64 65 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 3333 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33
        0C (print)
    b) Set horizontal tab position and absolute print starting position:

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

1B 40 (initialize printer)

1B 53(switch to standard mode)

 33 33 33 33 33 33

1B 44 08 10 20 00 (set horizontal tab position)

09 (move the print position to the next horizontal tab position)

33 33 33 33

09 (as above)

33 33 33 33

09 (as above)

33 33 33 33

0A (print)

33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33

0A (print)

33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 **1B 24**

50 00   (set absolute print position)

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

0A (print)

c) Select print direction in page mode:

1B 4C(switch to page mode)

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

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

30 30 30 30 30 30 30 30 30 30 30

 0A (print) **1B 54 01**(select print direction in page mode)

 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 31 **0A** (print)**1B 54**

02(select print direction in page mode)

 32 32 32 32 32 32 32 32 32 32 32 rday2 32 32 32 32 32 32 32 32 32 32 32 32 32

0A (print)

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

33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33 33

0A (print)

50 72 69 6E 74 20 45 6E 64

0C (print)

2) Set character property

  a) Turn underline mode on/off (**1B 2D n**)

  b) Select print mode (**1B 21 n**)

  c) Turn up-side-down printing mode on/off (**1B 7B n**)

  d) Select character size (**1D 21**)

  e) Turn white/black reverse printing mode on/off (**1D 42 n**)

Typical example:

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

1B 40 (initialize printer)

1B 53(switch to 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)

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 print mode)

33 33 33 33 33 33 33

1B 21 00   (select 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** (turn upside-down printing mode on)

33 33 33 33 33 4F 4B 21

0A (print)**1B 7B 00**   (turn 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 (select white/black reverse printing mode on)

33 33 33 33 33 33 33

1D 42 00   (turn white/black reverse printing mode off)

33 33 33 33 33

0A (print)

3.2.3 Print

1. Print in line mode and page mode
   The command in line mode is **0A**, and in page mode is **0C** and **1B 0C** (not clear page buffers).
   Typical example:
   1B 4C (switch to page mode)
   1B 57 20 00 00 00 60 02 20 03   (set the 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 not clear page buffers)
   0C (print and clear page buffers)

3.2.4 Status inquiry

User may check the printer status (normal or error) through real-time status inquiry when error (paper end, printhead open, cutter error, paper jam etc.) occurs.

1. Real-time status transmission (**10 04 n**)command: This command is automatically enabled when the printer is turned on or when error occurs after printer is powered on. Note: during printing with printer driver, the real-time command cannot be transmitted for status inquiry.
2. Automatic status back (**1D 61 n**)
   If the ASB command is enabled, the printer will automatically transmit its status under specific condition. The details refer to **1D 61 n** command.

3.2.5 Download bit images

One or more bit images can be downloaded into RAM and nonvolatile memory (NV). Bit images in NV are retained when the printer is powered off, but those in RAM are cleared when the printer is turned off or initialized by using command **1B 40**. Therefore, Therefore, the users need to download the bit images into RAM again whenever the printer is restarted.

Refer to command **1D 2A** (download bit images into RAM)and **1C 71** (download bit images into NV)for detailed information on how to perform the download. In both RAM bit image download and NV bit image download, a number must be specified for the image to be downloaded. Please read carefully the commands **1D 2A** and **1C 71** for the difference between RAM bit image download and NV bit image download.

Bit image data processing by taking an example of BMP format bit images:

1. The data is arranged in column data type in the bit image download command. Refer to command **1D 2A** and **1C 71** for details.

2. BMP format bit image data is arranged in line data type. Normally, a monochromic BMP image is made of sixty-two (62) bytes of BMP image attributes description (including bit image width and height etc.) and normal image data. The BMP image data is arranged in integral multiple of 4 bytes. For example, if the width is 34 dots, 8 bytes instead of 5 bytes are needed to store the data. Therefore, the total amount of bytes that a bit image occupies in the memory is "(Line width in bits+31)/32*4 * line height in bits"

Below is an example written under VC++ environment (for reference only):

Note: A non-monochromic BMP image must be transformed into a monochromic image, otherwise the data processed shall not be correct. Because the printer needs vertical data in downloading bit image, both the height (in pixels) and width (in pixels) of BMP image shall be multiple of eight (8), otherwise the printer may not be able to handle the data correctly.

```
//**************************************************//
//Function: AntiRotateBmp90D                        //
// Utility: Transform bmp format bit image into printer processable data //
// Parameter: pBmpData--- Pointer to source data                    //
//       nPixelsOfWidth----bit image width (dots)          //
//       nPixelsOfHeight---bit image height (dots)          //
//       pBmpDataRotated---Pointer to target data              //
//Back value: 1:data transformation success 0: data error              //
//**************************************************//
int AntiRotateBmp90D(
    char *pBmpData，
    const int nPixelsOfWidth，
    const int nPixelsOfHeight，
    char *pBmpDataRotated
    )
{
    // Define process variables
    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};

    // Comparing parameters
    if (pBmpData == NULL || pBmpDataRotated == NULL)   return 0;
    if (nPixelsOfWidth <= 0 || nPixelsOfHeight <= 0)   return 0;
```

```
if ((nPixelsOfWidth % 8) != 0 || (nPixelsOfHeight % 8) != 0)    return 0;


    // get real image dimension
    nBytesOfWidth = (nPixelsOfWidth+31)/32*4;
    nBytesOfHeight = nPixelsOfHeight / 8;


    // White/black reverse，the value 1 in BMP data is for white which is contrary to the printer definition.
    midData = (char*)malloc(nBytesOfWidth*nPixelsOfHeight+1);
    for(i=0;i<nBytesOfWidth*nPixelsOfHeight;i++){midData[i] = 0xff-pBmpData[i];}


    // Rotation. BMP data is arranged in line data type while data downloaded to printer are arranged in
column data type.
    for (row = 0; row <nPixelsOfWidth; row++){
        for (colbyte = 0; colbyte < nBytesOfHeight; colbyte++){
            index = row * nBytesOfHeight + colbyte;
            pBmpDataRotated[index] = 0x00;
            for (col = 0; col < 8; col++){
                colnum = col % 8;
                rownum = row % 8;
                if(colnum >= rownum)
                    tempdata   =   temp[col]   &   (midData[(nPixelsOfHeight-1-colbyte*8-col)   *
nBytesOfWidth + row / 8] >> (colnum-rownum));
                else
                    tempdata   =   temp[col]   &   (midData[(nPixelsOfHeight-1-colbyte*8-col)   *
nBytesOfWidth + row / 8] << (rownum-colnum));
                pBmpDataRotated[index] |= tempdata;
            }
        }
    }
    // release interim buffers
    free(midData);
    return 1;
}
```

Typical example:

Download a bit image shown as below:

1D 23 00 (Define a number of bit image to be downloaded)

1D 2A 1C 08 (Download bit image)

000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000003FC0000000000001
FFF0000000000007FFF800000000001FC0FC00000000003E003E000000000078003E0200000000F0
001E0200000001C0000E0200000003800000060000000700000006000000070000000E0000000E000
0003E0000000C000000FE0000001C00000FFE000000180000FFFE00000038000FFFFE0000003080

```
7FFFF60000003087FFFFE600000030FFFFFF8600000060FFFFF80600000061FFFFC00600000061F
FF8000600000061FFB0000600000061F830000600000618030000E000000600038000C0000006000
78001C000000700078003C0000007000F800780000007803FC00F80000003E0FFF03F00000003FFF
9FFFF00000003FFF9FFFE00000001FFF1FFFC00000000FFE0FFF8000000007FC07FE0000000003
F001F800000000000000000000000000000000000000000000000000000000000000FF00000000000
007FFC000000000003FFFE000000000007FFFE00000000001FFFFE00000000003FFFFE000000000
0FFF03E0000000001FC601E0000000003E0601E000000000380E01C000000000701C03C00000000
0601C038000000000C03078000000000C0780F0000000000E1F01E0000000000FFF03C000000000
0FFE0780000000000FFC0700000000000FF80300000000007F000000000000003E00000000000000
00000000000000000000000000000002000000000000000600000000000000E0007C0000000001
C00FFE0000000003807FFE000000000387FFFE00000000073FFFFE0000000007FFFFFC000000000
FFFFFFC000000000FFFF818007000000FFFC03800F801C00FFC007000FC03E00FC000E000FC03
E0060000C000FC03E00000008000FC03E00040000000FC01C000C00000007C000001C0000000780
00001C0000000780000380000000F800000700000000F000000700000001F000000F80000003E000
000FE0000007C000000FF800000F8000000FFF80003F80000003FFFE00FF00000001FFFFFFFC000
000007FFFFFF8000000000FFFFFF00000000001FFFFC000000000001FFF80000000000000FE00000
000000003FC0000000000001FF0000000000780FFC0000000000FFFFF00000000000FFFFC0000000
0000FFFE000000000000FFF00000000000007F0000000000000000000000000000000000000000000
00000003F000000000001FFC0000000000007FFE000000000001FFFE000000000007FFFE000000
00000FFFFE00000000001FE03E00000000003F001C000000000078001C0000000000F00038000000
0001C000380000000001C00070000000000038000E000000000030001CE00000000070007FE000000
0007003FFE000000000703FFFE00000000073FFFFE0000000007FFFFFC0000000007FFFFFC00000
00007FFFE18000000000FFFC038000000000FF8007000000000FC000E0000000000C0000C000000
0000000080000000000000000000000000000000000000000020000000000000007000000000000
000F0000C0000000001E000FC0000000001C00FFC000000000380FFFC00000000070FFFFC000000
0007FFFFFC0000000007FFFFF0000000000FFFFF00000000000FFFF000000000000FFF0000000000
000FFC0000000000000F380000000000000700000000000000E0000000000000000C000FC0000000
001800FFE0000000003807FFE000000000303FFFE00000000071FFFFE0000000007FFFFFE000000
000FFFFF9C000000000FFFF818000000000FFFC03807C000000FFE00700FE000000FF000E01FF00
000070000C03FF80000000000C07FF8000000000000078780000000003F0F01C000000003FF8E01C0
0000000FFFDC00C00000003FFFD800C00000007FFFF800C0000001FFFFF000C0000003FE07E000
C0000007F001E001C000000F8001C001C000001E000380038000001C000380078000003800070000F
80000070000E003F00000070001E01FF00000060007FFFFE000000E003FFFFFC000000E03FFFFFF
8000000E3FFFFFFF0000000FFFFFFFFC0000000FFFFFFFE00000000FFFFE00000000001FFFC000
000000001FFC0000000000003FC00000000000003C00000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000000
```

1D 23 00   (Select the number of the bit image to be printed)

1D 2F 00   (Print the RAM bit image)

3.2.6 Recommendations on applicable flow for programm

Since ASB command is able to automatically transmit all kinds of printer status and errors, it is recommended to use this command. ASB command is enabled after the printer is turned on and can be

transmited directly for inquiry.

1. Printer status inquiry

    Make sure to send printing data only when the printer is in normal status.

2. Transmits the data to be printed (include the command settings before printing)

    If printed data is bit image, don't transmit status inquiry command when processing printing data.

3. Check printer status after printing.

    If the ASB is enabled, the status is transmitted automatically.

APPENDIX A: Code 128 bar code

A.1 Description of the CODE128 Bar Code

In code 128 bar code system, it is possible to represent 128 ASCII characters, 2-digit numerals and some special characters in using one bar code character that is defined by combining one of code set A, code set B and code set C. 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 a character for code set A. The character recovers the previous code set before SHIFT when starting from the second character.   SHIFT characters are used only for Switch between code set A and code set B, but cannot make the current code set enter or exit code set c status.

· 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

Character 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

Character	Hex	Decimal	Character	Hex	Decimal	Character	Hex	Decimal
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			

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	123,65
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 set C

| Character | Transmit data | | Character | Transmit data | | Character | Transmit data | |
	Hex	Decimal		Hex	Decimal		Hex	Decimal
0	00	0	40	28	40	80	50	80
1	01	1	41	29	41	81	51	81
2	02	2	42	2A	42	82	52	82
3	03	3	43	2B	43	83	53	83
4	04	4	44	2C	44	84	54	84
5	05	5	45	2D	45	85	55	85
6	06	6	46	2E	46	86	56	86
7	07	7	47	2F	47	87	57	87
8	08	8	48	30	48	88	58	88
9	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: Printing mode and it's transition

B.1 General Description

The printer operates in two print modes only when the paper roll is selected as the print sheet: standard mode and page mode. In standard mode, the printer prints and feeds paper as long as it receives print data, or paper feed commands, or printer buffer area is full. In page mode, all the received print data and paper feed commands are processed in the specified memory, and the printer executes no operations. 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" immediately 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 cannot prints all received data and 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.
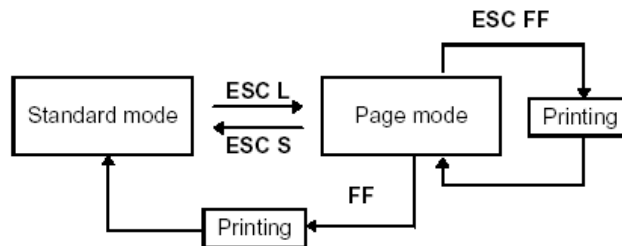

Figure B.1 Shifting Between Standard Mode and Page Mode

B.2 Setting Values in Standard and Page Modes

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 using **ESC W**. If all printing and feeding 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 T** sets the printable area and 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 downside of the image data (point B in Figure B.3) is aligned with the baseline.

3) If the print data (including the space to the right of a character) 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 3.75mm 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 180/180) = 24. i.e. if print complete bit image, it is needed to move the printing position 24 dots based on the printing starting area.

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

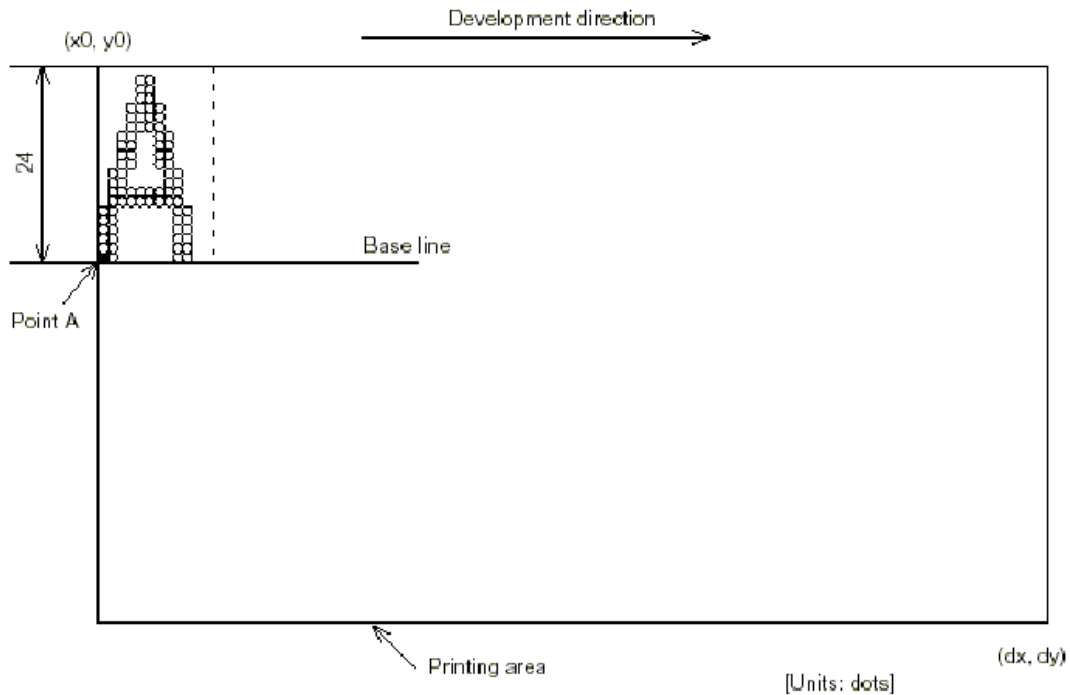**ESC 2** ¬ Reset the line spacing to the default.

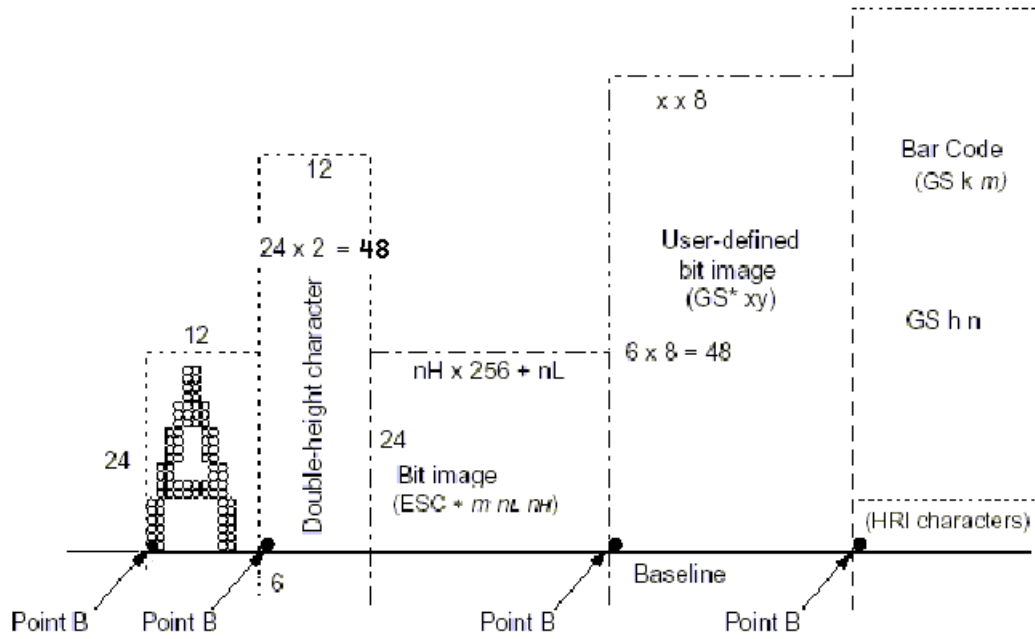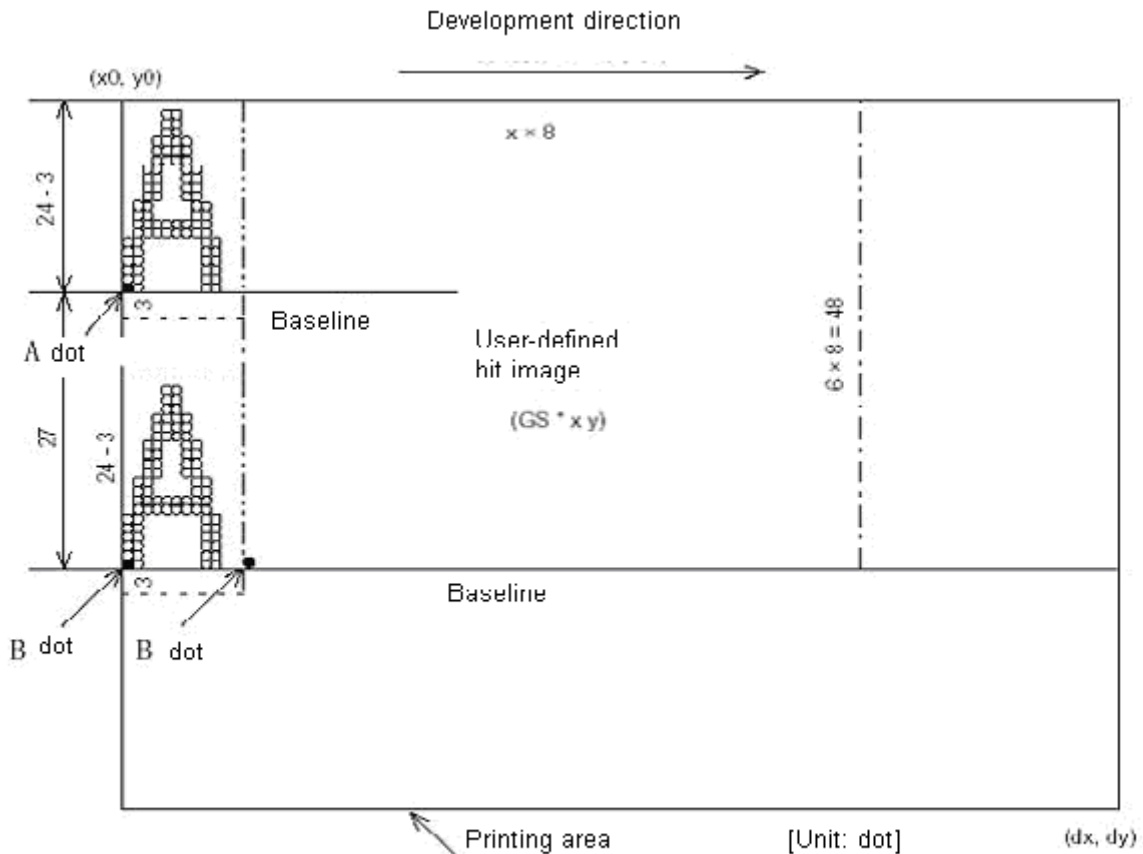**Figure B.2 Character Data Memory Position**

Figure B.3 Print Data Memory Position

Figure B.4 Downloaded Bit Image Memory Position