PORTI-S (PORTABLE PRINTER)

Operator's Manual

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Warning - U.S. (FCC Statement)

This equipment has been tested and found to comply with the limit for a Class B digital device digital device pursuant to Part 15 of the FCC Rules

These limits are designed to provide reasonable protection against harmful interference in a residential Installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions. If this equipment does cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. IF this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encourage to try to correct the interference by one or the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected

- Consult the dealer or an experience radio TV technician for help

Change or modification not expressly approved by the party responsible for Compliance could void the user's authority to operate the equipment

Caution

Some semiconductor devices are easily damaged by static electricity. You should turn the printer "OFF", before you connect or remove the cables on the rear side, in order to guard the printer against the static electricity. If the printer is damaged by the static electricity, you should turn the printer "OFF".

INTRODUCTION

The PORTI-S is designed for use with electronic instruments such as mobile POS, retail, transportation. warehousing, other traveling and mobile computing.

The main features of the printer are as follows:

1. High speed printing : 50mm per second.
2. Low noise thermal printing.
3. RS-232 communication and IrDA (protocol method)
4. Characters can be scaled up to 64 times compared to its original size.

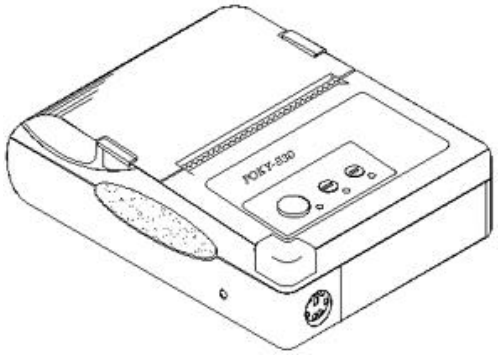
Please be sure to read the instruction in this manual carefully before using your new PORTI-S

Table of Contents

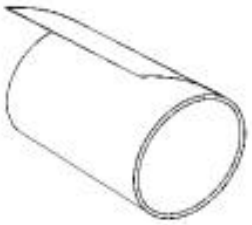
Chapter 1. Setting up the printer

1.1 Unpacking

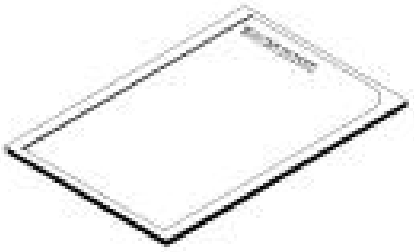
Your printer box should include these items. If any items are damaged or missing, please contact your dealer for assistance.



PORTI-S

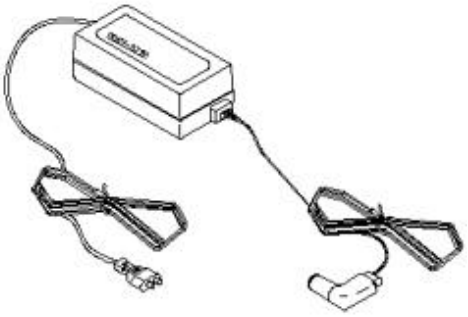


Roll Paper

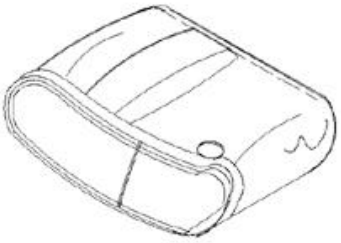


Operator's Manual

Connector



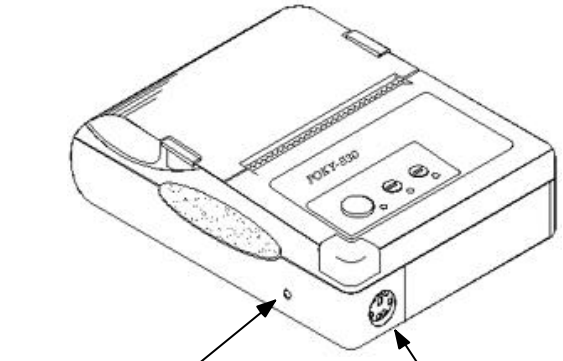
Adaptor for battery recharge



Leatherette case

1.2. Connecting the cable

You can connect up to two cables to the printer. It connects to the connector part on the left and front side of the printer, which is shown below.



Refer to the APPENDIX B for more information about communication connector.

Note : Before connecting the cable, make sure that both the host and the power button to apply to the printer are turned off. If your power supply is broken or out of order, please contact your dealer for assistance.

1.3. Installing or replacing the paper roll

Note : Be sure to use paper rolls that meet the specifications. Do not use paper rolls that have the paper glued to the core because the printer cannot detect the paper end correctly.

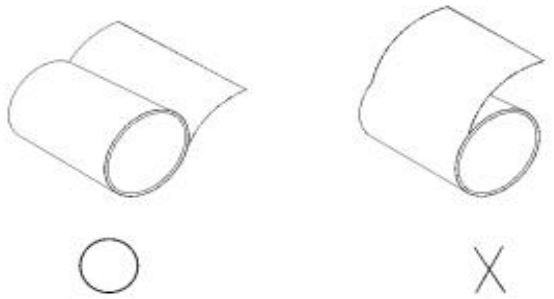
1. Make sure that the printer is not receiving data; otherwise, data may be lost.

2. Open the paper roll cover by applying your finger on both side of printer, push it up when the lock is released as shown in the drawing.

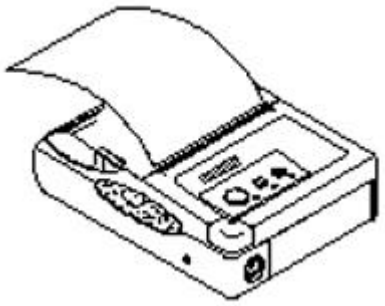
3. Remove the used paper roll core if there is one.

4. Insert the paper roll as shown.

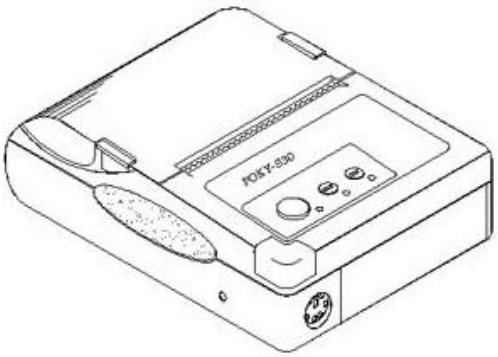
5. Be sure to note the correct direction that the paper comes off the roll.



6, Pull out a small amount of paper and then close the cover, as shown.



7. Tear off the paper as shown.

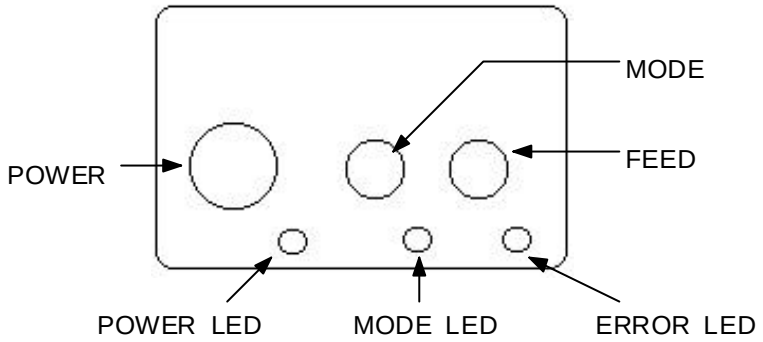


1.4. Adjustments and setting

The PORTI-S is set up at the factory to be appropriate for almost all users. But if you want another specification to fit the printer at your system such as change the baud rate, handshaking, parity check, as well as print density, please contact to our development team or your dealer.

1.5. Using the printer

1. Control Panel



2. Button

1) MODE

Mode button is for use to change communication mode.

The communication mode is set to RAW IrDA mode when the power is on.

Press the mode button once, the mode will be changed to Standard IrDA (Version 1.0) for Windows 98, please confirm the mode LED will twinkle 2 times.

Press the mode button twice, the mode will be changed to RS-232C mode for Windows 98, please confirm the mode LED will twinkle 3 times.

All communication environment must be set with 9600 bps, 1 stop bit, no parity, no flow control.

If you want to use the standard IrDA mode for Windows 98, check the your computer's IrDA speed.

For example,

Your computer -> Start Menu -> Setting -> Control Panel -> IrDA -> Option -> ***Communication Speed Limitation With 57600 bps***

2) FEED

Press the FEED button once to advance paper one line. You can also hold down the FEED button to feed paper continuously.

3. Panel lights

1) POWER LED

The POWER light is on whenever the printer is on.

But when the battery is almost exhausted, this led flashes with red color occasionally.

In this case, you must recharge the battery by using the power supply.

2) MODE LED

Normally this led is off.

But if you select the protocol IrDA mode using the mode key, it flashes once.

In case of selecting the RS232C mode by pressing the mode key, it flashes twice times.

3) ERROR LED

This led indicates an error such as paper end, or cover open, etc

Chapter 2. The self test

The self-test checks whether the printer has any problems. If the printer does not function properly, contact your dealer. The self-test checks the following;

1. Make sure paper roll has been installed properly.
2. Turn on the power while holding down the FEED button. The self-test begins.
3. The self-test prints the current printer status, which provides the control ROM version and the communication method setting.
4. After printing the current printer status, self-test printing will print a pattern using the built-in character set.
5. The self-test automatically ends
   The printer is ready to receive data as soon as it completes the self-test.

Chapter 3. Code table

The following pages show the character code tables. To find the character corresponding to a hexadecimal number, count across the top of the table for the left digit and count down the left column of the table for the right digit.
For example 4A = J

	HEX	0	1	2	3	4	5	6	7
HEX	BIN	0000	0001	0010	0011	0100	0101	0110	0111
0	0000	NULL	DLE	SP	0	@	P	`	p
1	0001			!	1	A	Q	a	q
2	0010			"	2	B	R	b	r
3	0011			#	3	C	S	c	s
4	0100	EOT		$	4	D	T	d	t
5	0101	ENQ		%	5	E	U	e	u
6	0110			&	6	F	V	f	v
7	0111			'	7	G	W	g	w
8	1000		CAN	(	8	H	X	h	x
9	1001	HT		)	9	I	Y	i	y
A	1010	LF		*	:	J	Z	j	z
B	1011		ESC	+	;	K	[	k	{
C	1100	FF		,	<	L	\	l	|
D	1101	CR	GS	-	=	M	]	m	}
E	1110			.	>	N	^	n	~
F	1111			/	?	O	_	o	SP

Page 0 (PC437 ; USA, Standard Europe) (0x00 - 0x7F)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç	É	á	░	└	╨	α	≡
1	0001	ü	æ	í	▒	┴	╤	ß	±
2	0010	é	Æ	ó	▓	┬	╥	Γ	≥
3	0011	â	ô	ú	│	├	╙	π	≤
4	0100	ä	ö	ñ	┤	─	╘	Σ	⌠
5	0101	à	ò	Ñ	╡	┼	╒	σ	⌡
6	0110	å	û	ª	╢	╞	╓	µ	÷
7	0111	ç	ù	º	╖	╟	╫	τ	≈
8	1000	ê	ÿ	¿	╕	╚	╪	Φ	°
9	1001	ë	Ö	⌐	╣	╔	┘	Θ	∙
A	1010	è	Ü	¬	║	╩	┌	Ω	·
B	1011	ï	¢	½	╗	╦	█	δ	√
C	1100	î	£	¼	╝	╠	▄	∞	ⁿ
D	1101	ì	¥	¡	╜	═	▌	φ	²
E	1110	Ä	₧	«	╛	╬	▐	ε	■
F	1111	Å	ƒ	»	┐	╧	▀	∩	SP

Page 0 (PC437 ; USA, Standard Europe) (0x80 - 0xFF)

Chapter 4. Control commands

Command Notation

[Name] The name of the command

[Format] The code sequence

ASCII indicates the ASCII equivalents

HEX indicates the hexadecimal equivalents.

Decimal indicates the decimal equivalents.

[ ]k indicates the contents of the [ ] should be repeated k times.

[Range] Gives the allowable ranges for the arguments.

[Description] Describes the function of the command.

Explanation of Terms

LSB Least Significant Bit

MSB Most Significant Bit

Control Commands

HT

[Name] Horizontal Tab

[Format] ASCII HT

HEX 09

Decimal 9

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

[Notes]

1) This command is ignored unless the next horizontal tab position has been set.
2) If the next horizontal tab position exceeds the printing area, the printer sets the printing position to [Printing area width + 1]'
3) Horizontal tab positions are set with ESC D.
4) 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.
5) The default setting of the horizontal tab position for the paper roll is every 8th character(9th, 17th, 25th, ... column).

[Reference] **ESC D**

LF

[Name] Print and line feed

[Format] ASCII LF
HEX 0A
Decimal 10

[Description] Prints the data in the print buffer and feeds one line based on the current line spacing.

[Notes] This command sets the print position to the beginning of the line.

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

FF

[Name] Print and return to standard mode in page mode.

[Format] ASCII FF
HEX 0C
Decimal 12

[Description] Prints the data in the print buffer collectively and returns to standard mode.

[Notes]
1) The buffer data is deleted after being printed.
2) The Printing area set by ESC W is reset to the default setting.
3) This command sets the print position to the beginning of the line.
4) This command is enabled only in page mode...

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

CAN

[Name] Cancel print data in page mode

[Format] ASCII CAN
HEX 18
Decimal 24

[Description] In page mode, deletes all the print data in the current printable area.

[Notes]
1) This command is enable only in page mode.
2) 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**

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.

After printing, the printer does not clear the buffered data, setting values for ESC T and ESC W, and the position for buffering character data.

[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 x horizontal or vertical motion units].

[Notes]

1) The right side character spacing for double-width mode is twice the normal value. When characters are enlarged, the right side character spacing is n times normal value.
2) This command sets values independently in each mode.
3) The horizontal and vertical motion unit are specified by GS P. Changing the horizontal or vertical motion unit does not affect the current right-side spacing.
4) The GS P command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.
5) The maximum right side spacing if 255/180 inches, Any setting exceeding the maximum is converted to the maximum automatically.

[Default] n = 0

[Reference] **GS P**

ESC ! n

[Name] Select print mode

[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	Off/On	Hex	Decimal	Function
0	Off	00	0	Character font A (12x24)
	On	01	1	Character font B (9x17)
1	-	-	-	Undefined
2	-	-	-	Undefined
3	Off	00	0	Emphasized mode not selected
	On	08	8	Emphasized mode selected
4	Off	00	0	Double-height mode not selected
	On	10	16	Double-height mode selected
5	Off	00	0	Double-width mode not selected
	On	20	32	Double-width mode selected
6	-	-	-	Undefined
7	Off	00	0	Underline mode not selected
	On	80	128	Underline mode selected

[Notes]

1) When both double-height and double-width modes are selected, quadruple size characters are printed.
2) The printer can underline all characters, but can not underline the space set by **HT**.
3) The thickness of the underline is that selected by ESC -, regardless of the character size.

4) When some characters in a line are double or more height, all the characters on the line are aligned at the baseline.
5) ESC E can also turn on or off emphasized mode. However, the setting of the last received command is effective.
6) ESC - can also turn on or off underline mode. However, the setting of the last received command is effective.
7) GS ! can also select character size. However, the setting of the last received command is effective..

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

ESC $ nL nH

[Name] Set absolute 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] Set the distance from the beginning of the line to the position at which subsequent characters are to be printed.

[Notes]
1) The distance from the beginning of the line to the print position is [(nL + nHx256) x (vertical or horizontal motion unit)] inches.
2) Setting outside the specified printable area are ignored.
3) The horizontal and vertical motion unit are specified by GS P.
4) The GS P command can change the horizontal (and vertical) motion unit.
However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of he minimum horizontal movement amount.
5) In standard mode, the horizontal motion unit (x) is used.
6) In page mode, horizontal or vertical motion unit differs depending on the starting position of the printable area as follows;
1. When the starting position is set to the upper left or lower right of the 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 \, GS P**

ESC % n

[Name] Select/Cancel user defined character set.

[Format]

ASCII	ESC	%	n
HEX	1B	25	n
Decimal	27	37	n

[Range] 0 <= n <= 255

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

[Notes]
1) When the LSB of n is 0, the user defined character set is canceled.
2) When the LSB of n is 1, the user defined character set is selected.
3) When the user defined character set is canceled, the internal character set is automatically selected.
4) n is available only for the least significant bit.

[Default] n = 0

[Reference] **ESC $, ESC ?**

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

[Name] Define user defined characters.

[Format]

ASCII	ESC	&	y	c1	c2	[x1 d1...d[y x x1)]...[xk d1...d(y x xk)]
HEX	1B	26	y	c1	c2	[x1 d1...d[y x x1)]...[xk d1...d(y x xk)]
Decimal	27	38	y	c1	c2	[x1 d1...d[y x x1)]...[xk d1...d(y x xk)]

[Range] 32 <= c1 <= c2 <= 126

0 <= x <= 12 Font A (12 x 24)

0 <= x <= 9 Font B (9 x 24)

0 <= d1...d(y x xk) <= 255

[Description] Defines user defined characters.

[Notes]
1) y specifies the number of bytes in the vertical direction.
2) c1 specifies the beginning character code for the definition, and c2 specifies the final code.
3) x specifies the number of dots in the horizontal direction.
4) The allowable character code range is from ASCII code <20H>to <7EH> (95 characters)

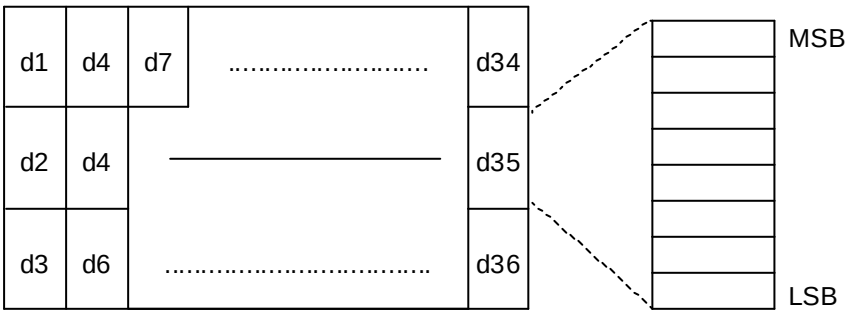
5) It is possible to define multiple characters for consecutive character codes.
   If only one character is desired, use c1 = c2.
6) d is the dot data for the characters. The dot pattern is in the horizontal direction from the left side. Any remaining dots on the right side are blank.
7) The data to define a user defined character is (y x x) bytes.
8) Set a corresponding bit to 1 to print a dot or to 0 not to print a dot.
9) This command can define different user-defined character patterns by each fonts. To select a font, use ESC !
10) A user-defined character and a downloaded bit image cannot be defined simultaneously. When this command is executed, the downloaded bit image is cleared.
11) The user-defined character definition is cleared when:
    ESC @ is executed.
    ESC ? is executed.
    GS * is executed.
    The printer is reset or the power is turned off.
12) When the user-defined characters are defined in font B(9x17), only the most significant bit of the 3rd byte of data in vertical direction is effective.

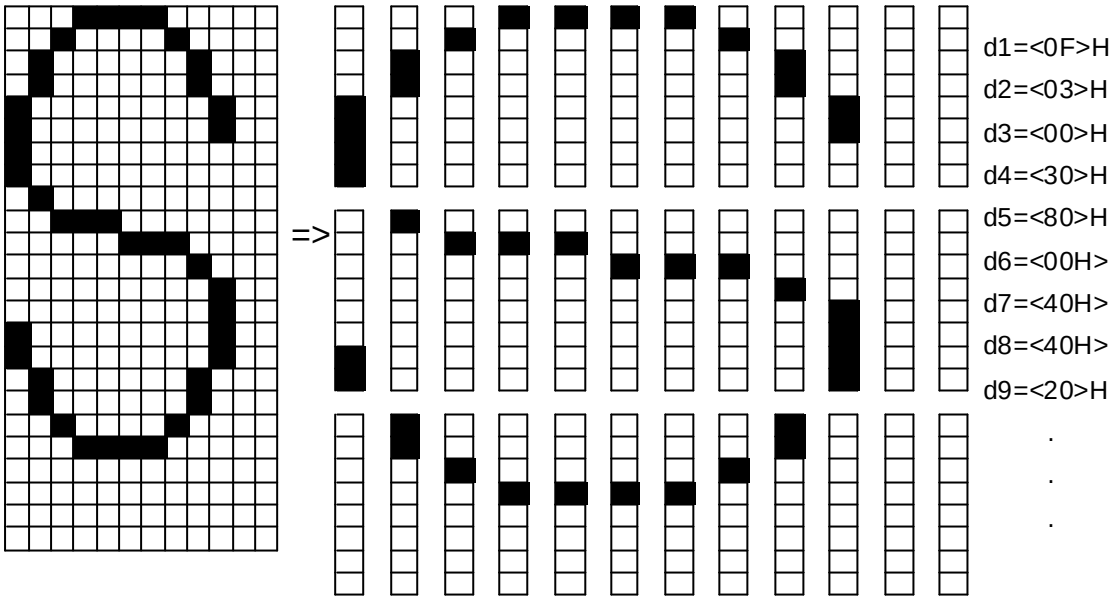
[Default] The internal character set

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

[Example]

- When font A(12x24) is selected.





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:

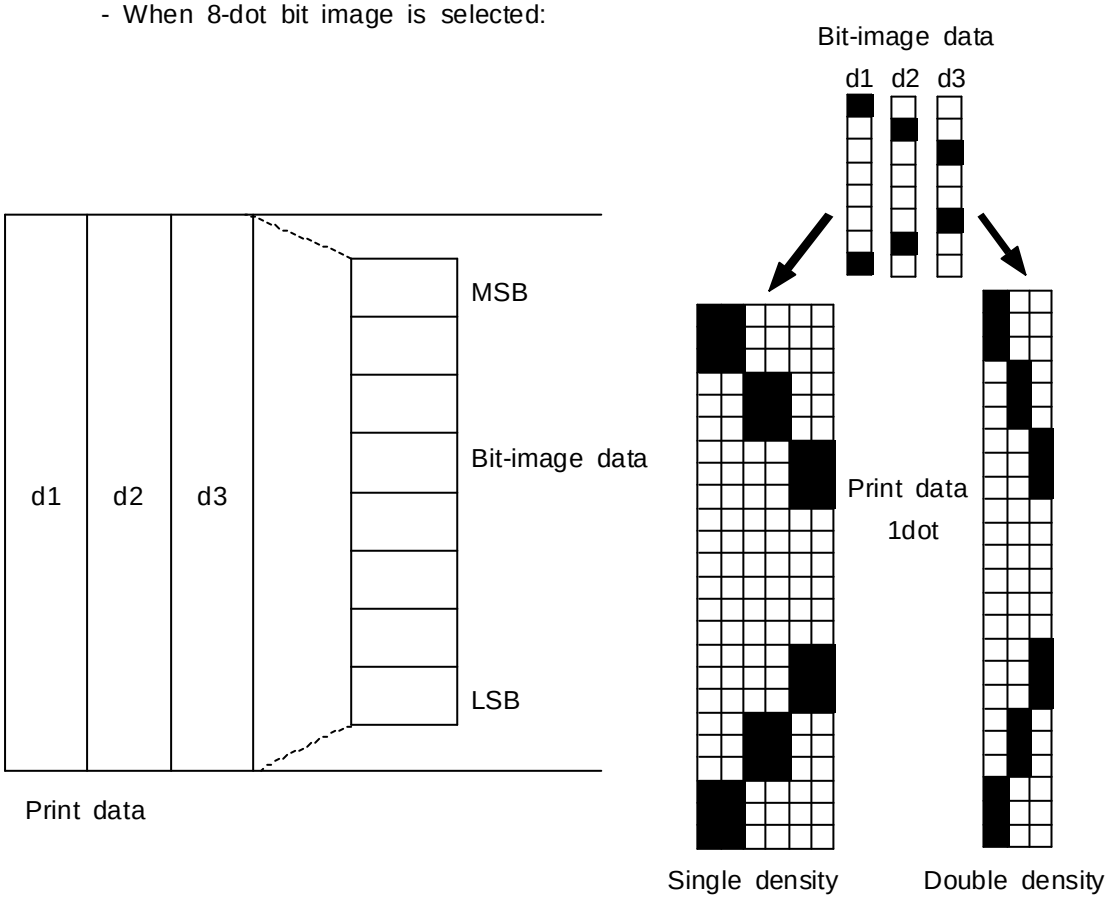
m	Mode	Vertical direction		Horizontal direction	
		Number of Dots	Dot density	Dot density	Number of Data
0	8-dot single density	8	60 DPI	90 DPI	nL+nHx256
1	8-dot double density	8	60 DPI	180 DPI	nL+nHx256
32	24-dot single density	24	180 DPI	90 DPI	(nL+nHx256)x3
33	24-dot double density	24	180 DPI	180 DPI	(nL+nHx256)x3

[Notes]

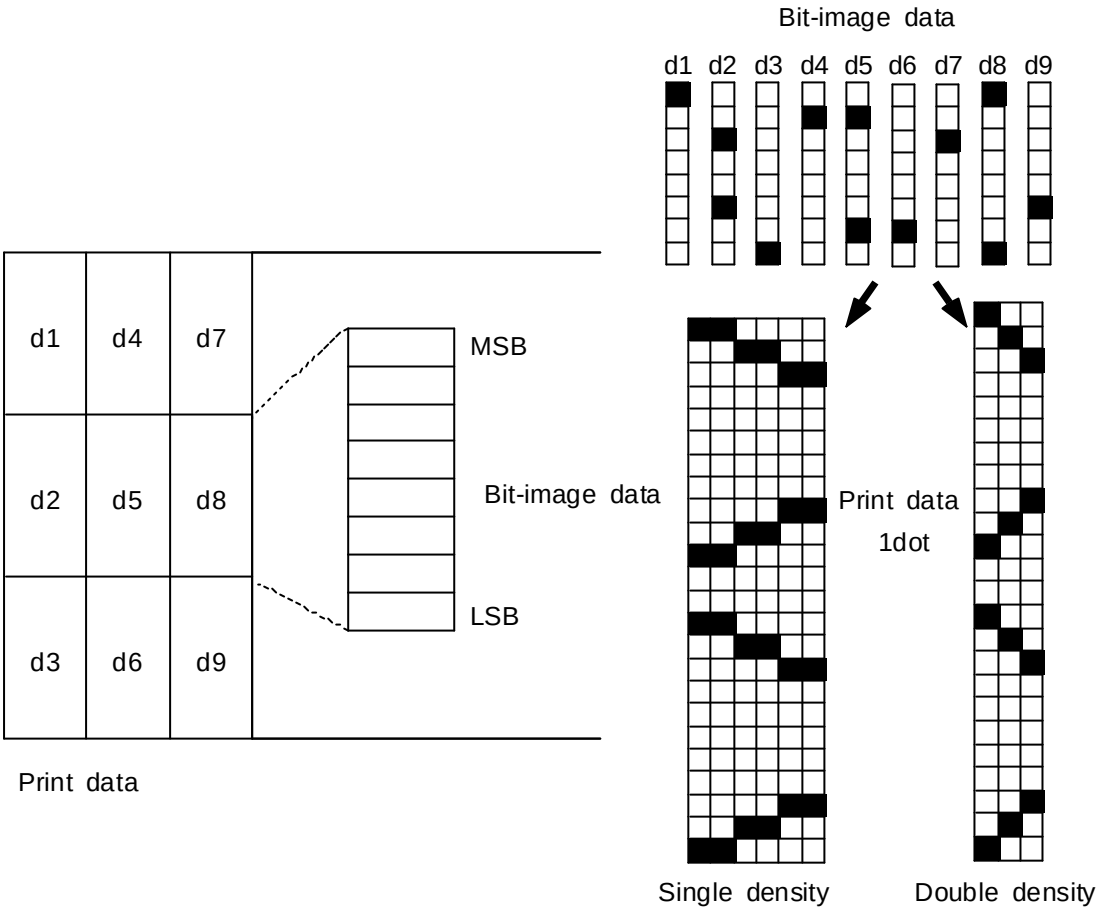
1) If the values of m is out of the specified range, nL and data following are processed an normal data.
2) The nL and nH indicate the number of dots of the bit image in the horizontal direction.

3) The number of dots is calculated by nL + nH x 256.
4) If the bit-image data input exceeds the number of dots to be printed on a line, the excess data is ignored.
5) d indicates the bit-image data. Set a corresponding bit to 1 to print a dot or to 0 to not print a dot.
6) If the width of the printing area set by GS L and GS W less than the width required by the data sent with the ESC * command, the following will be performed on the line in question (but the printing cannot exceed the maximum printable area):
   The width of the printing area is extended to the right to accommodate the amount of data.
   If step does not provide sufficient width for the data, the left margin is reduced to accommodate the data.
7) After printing a bit image, the printer returns to normal data processing mode.
8) This command is not affected by print modes (emphasized, double-strike, underline, character size or white/black reverse printing), except upside-down printing mode.
9) The relationship between the image data and the dots to be printed is as follows;

- 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 <= n <= 2, 48 <= n <= 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-dot thick).

[Notes] 1) The printer can underline all characters (including right-side character spacing), but cannot underline the space set by HT.
2) The printer cannot underline white/black inverted characters.
3) When underline mode id turned off by setting the value of n to 0 or 48, the following data is not underlined, and the underline thickness set before the mode is turned off does not change. The default underline thickness is 1 dot.
4) Changing the character size does not affect the current underline thickness.
5) 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] Selects 1/6 inch line (approximately 4.23mm) spacing.

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

[Reference] **ESC 3**

ESC 3 n

[Name] Set line spacing

[Format] ASCII ESC 3 n
HEX 1B 33 n
Decimal 27 51 n

[Range] 0 <= n <= 255

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

[Notes] 1) The line spacing can be set independently in standard mode and in page mode.

2) The horizontal and vertical motion unit are specified by GS P. Changing the horizontal or vertical motion unit does not affect the current line spacing.
3) The GS P command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum vertical movement amount, and it must be in even units of the minimum vertical movement amount.
4) In standard mode, the vertical motion unit (y) is used.
5) In page mode, this command functions as follows, depending on the starting position of the printable area:
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
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.
6) The maximum paper feed amount is 1016 mm (40 inches). Even if a paper feed amount of more than 1016 mm (40 inches) is set, the printer feeds the paper only 1016 mm (40 inches).

[Default] Line spacing equivalent to approximately 4.23mm (1/6 inches).

[Reference] **ESC 2, GS P**

ESC ? n

[Name] Cancel user defined characters.

[Format]

ASCII	ESC	?	n
HEX	1B	3F	n
Decimal	27	63	n

[Range] 32 <= n <= 126

[Description] Cancels user defined characters.

[Notes] 1) This command cancels the pattern defined for the character code specified by n. After the user defined characters is canceled, the corresponding pattern for the internal character is printed.
2) This command deletes the pattern defined for the specified code

in the font selected by ESC !.

3) If a user defined character has not been defined for the specified character code, the printer ignores this command.

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

ESC @

[Name] Initialize printer.

[Format]

ASCII	ESC	@
HEX	1B	40
Decimal	27	64

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

[Notes] 1) The data in the receive buffer is not cleared.

2) The macro definition is not cleared.

ESC D n1...nk NUL

[Name] Set horizontal tab positions.

[Format]

ASCII	ESC	D	n1...nk	NUL
HEX	1B	44	n1....nk	00
Decimal	27	68	n1....nk	0

[Range] 1 <= n <= 255

0 <= k <= 32

[Description] Sets horizontal tab position.

[Notes] 1) n specifies the column number for setting a horizontal tab position from the beginning of the line.

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

3) The horizontal tab position is stored as a value of [character width x n] measured from the beginning of the line. The character width includes the right-side character spacing, and double-width characters are set with twice the width of normal characters.

4) This command cancels the previous horizontal tab settings.

5) When setting n=8, the print position is moved to column 9 by

sending HT.

6) Up to 32 tab positions (k=32) can be set. Data exceeding 32 tab positions is processed as normal data.

7) Transmit [n]k in ascending order and place a NUL code 0 at the end.

8) 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.

9) ESC D NUL cancels all horizontal tab positions.

10) The previously specified horizontal tab positions do not change, even if the character width changes.

11) The character width is memorized for each standard and page mode.

[Default] The default tab positions are at intervals of 8 characters (columns 9, 17, 25, ...) for font A (12x24)

[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 is 0, emphasized mode is turned off.

When the LSB is 1, emphasized mode is turned on.

[Notes] 1) Only the least significant bit of n is enabled.

2) This command and ESC ! turn on and off emphasized mode in the same way.

Be careful when this command is used with ESC !

[Default] n = 0

[Reference] **ESC !**

ESC J n

[Name] Print and feed paper.

[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 x vertical or horizontal motion unit] inches.

[Notes]

1) After printing is completed, this command sets the print starting position to the beginning of the line.
2) The paper feed amount set by this command does not affect the values set by ESC 2 or ESC 3.
3) The horizontal and vertical motion unit are specified by GS P.
4) The GS P command can change the vertical (and horizontal) motion unit.
   However, the value cannot be less than the minimum vertical movement amount, and it must be in even units of the minimum vertical movement amount.
5) In standard mode, the printer uses the vertical motion unit (y).
6) In page mode, this command functions as follows, depending on the starting position of the printable area;
   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
   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.
7) The maximum line spacing is 1016mm (40inches). When the setting value exceeds the maximum, it is converted to the maximum automatically.

[Reference] **GS P**

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] 1) This command is enabled only when processed at the beginning of a line in standard mode.
2) This command has no effect in page mode.
3) After printing by FF is completed or by using ESC S, the printer returns to standard mode.
4) This command sets the position where data is buffered to the position specified by ESC T within the printing area defined by ESC W.
5) This command switches the settings for the following commands (in which the values can be set independently in standard mode and page mode) to those for page mode;
Set right-side character spacing : ESC SP
Select default line spacing : ESC 2, ESC 3
6) Only valve settings is possible for the following commands in page mode; these commands are not executed.
Select justification : ESC a
Turn upside-down printing mode on/off : ESC {
Set left margin : GS L
Set printable area width : GS W
7) The printer returns to standard mode when power is turned on, the printer is reset, or ESC @ is used.

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

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 <= 10

[Description] Selects an international character set n from the following table.

n	Character set	n	Character set
0	U.S.A.	6	Sweden
1	France	7	Italy
2	Germany	8	Spain
3	U.K.	9	Norway
4	Denmark I	10	Denmark II

[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] 1) This command is effective only in page mode.

2) Data buffered in page mode are cleared.

3) This command sets the print position to the beginning of the line.

4) The printing area set by ESC W are initialized.

5) This command switches the settings for the following commands (in which the values can be set independently in standard mode and page mode) to those for standard mode;
Set right-side character spacing : ESC SP
Select default line spacing : ESC 2, ESC 3

6) The following commands are enabled only to set in standard mode.
Set printing area in page mode : ESC W
Select print direction in page mode : ESC T

7) The following commands are ignored in standard mode.
Set absolute vertical print position in page mode : GS $
Set relative vertical print position in page mode : GS \

8) Standard mode is selected automatically when power is turned on, the printer is reset, or command ESC @ is used.

[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

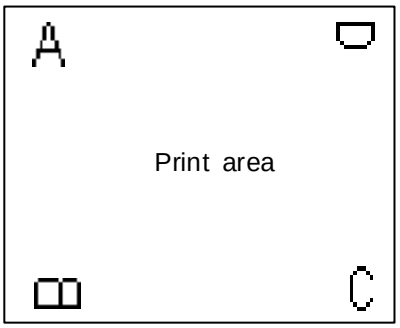
Decimal 27 84 n

[Range] 0 <= n <= 3 or 48 <= n <= 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]

1) When the command is input in standard mode, the printer executes only internal flag operation. This command does not affect printing in standard mode.
2) This command sets the position where data is buffered within the printing area set by ESC W.
3) Parameters for horizontal or vertical motion units (X or Y) differ as follows, depending on the starting position of the printing area;
   If 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 unit: ESC SP, ESC $, ESC \
   Commands using vertical motion unit: ESC 3, ESC J, GS $, GS \
   If 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 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 <= 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 as x0, y0, dx(inch), respectively.

x0 = [(xL + xH x 256)] x (horizontal motion unit)
y0 = [(yL + yH x 256)] x (vertical motion unit)
dx = [(dxL + dxH x 256)] x (horizontal motion unit)
dy = [(dyL + dyH x 256)] x (vertical motion unit)

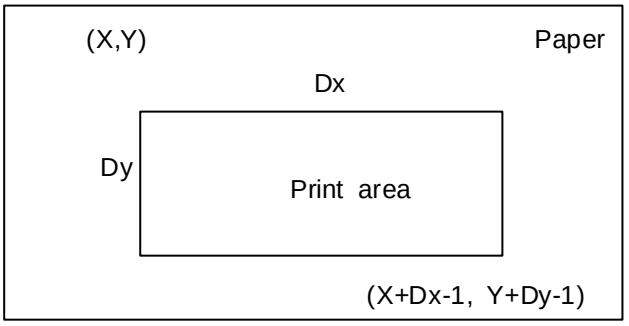
The printing area is set as shown in the figure below.

[Notes]

1) If this commands is input in standard mode, the printer executes only internal flag operation. This command does not affect printing in standard mode.
2) 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.
3) If the printing area width or height is set to 0, the printer stops command processing and processes the following data as normal data.
4) This command sets the position where data is buffered to the position specified by ESC T within the printing area.
5) If (horizontal starting position + printing area width) exceeds the printable area, the printing area width is automatically set to (horizontal printable area-horizontal starting position).
6) If (vertical starting position + printing area height) exceeds the printable area, the printing area height is automatically set to

(vertical printable area-vertical starting position).

7) 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.
8) The GS P command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of minimum horizontal movement amount.
9) Use the horizontal motion unit (x) for setting the horizontal starting position and printing area width, and use the vertical motion unit (y) for setting the vertical starting position and printing area height.
10) When the horizontal starting position, vertical starting position, printing area width, and printing area height are defined as X, Y, Dx, Dy respectively, the printing area is set as shown in the figure below.



[Default] xL = xH = yL = yH = 0
dxL = 0, dxH = 2, dyL = 126, dyH = 6

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

ESC \ nL nH

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

[Notes] 1) This command sets the distance from the current position to

[(nL+nHx256) x horizontal or vertical motion unit]

2) Any setting that exceeds the printable are is ignored
3) When pitch N is specified to the right;
   nL + nH x 256 = N
   When pitch N is specified to the left (the negative direction), use the complement of 65536.
4) The print starting position moves from the current position to [N x horizontal or vertical motion unit)]
5) The horizontal and vertical motion unit are specified by GS P.
6) The GS P command can change the horizontal (and vertical) motion unit.
   However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.
7) In standard mode, the horizontal motion unit is used.
8) In page mode, the horizontal or vertical unit differs as follows, depending on the starting point of the printing area;
   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. 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 $, ESC P**

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 type of justification as follows;

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

[Notes] 1) The command is enabled only when processed at the beginning of the line in standard mode.
2) If this command is input in page mode, the printer performs only internal flag operations.
3) This command has no effect in page mode.
4) This command executes justification in the printing area.
5) This command justifies the space area according to HT, ESC $ or ESC \

[Default] n = 0

[Example]

Left justification

```
ABC
ABCD
ABCDE
```

Center justification

```
  ABC
 ABCD
ABCDE
```

Right justification

```
  ABC
 ABCD
ABCDE
```

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 is 0, the panel buttons are enabled.
When the LSB is 1, the panel buttons are disabled.

[Notes] 1) Only the least significant bit of n is valid.
2) When the panel buttons are disabled, none of them are usable when the printer cover is closed.
3) In this printer, the panel buttons is the FEED button.
4) In the macro ready mode, the FEED button are enabled regardless of the settings of this command; however, the paper cannot be fed by using these buttons.

[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.

[Notes] 1) This command sets the print starting position to the beginning of the line.

2) This command does not affect the line spacing set by ESC 2 or ESC 3.

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

ESC y

[Name] Print and feed paper to next label index hole

[Format] ASCII ESC y

HEX 1B 79

Decimal 27 121

[Description] Prints the data in the print buffer collectively and feed paper until find next index hole of label paper

ESC { n

[Name] Turn 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 is 0, upside-down mode is turned off.

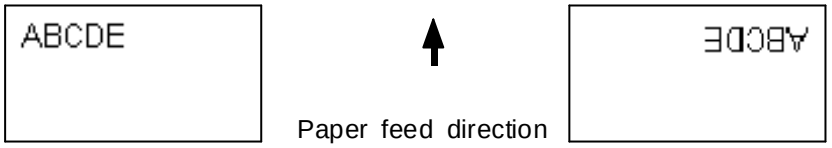
When the LSB is 1, upside-down mode is turned on.

[Notes] 1) Only the lowest significant bit of n is valid.

2) This command is enabled only when processed at the beginning of a line in standard mode.
3) When this command is input in page mode, the printer performs only internal flag operations.
4) This command does not affect printing in page mode.
5) In upside-down printing mode, the printer rotates the line to be printed by 180 degree and then prints it.

[Default] n = 0

[Example]



GS ! n

[Name] Select character size

[Format]

ASCII	GS	!	n
HEX	1D	21	n
Decimal	29	33	n

[Range] 0 <= n <= 255

[Description] (1<=vertical number of times<=8, 1<=horizontal number of times<=8)
Selects the character height using bits 0 to 2 and selects the character width using bits 4 to 7, as follows;

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

Table 1
Character width selection

Hex	Decimal	Width
00	0	1(normal)
10	16	2(double width)
20	32	3
30	48	4
40	64	5
50	80	6
60	96	7
70	112	8

Table 2
Character height selection

Hex	Decimal	Height
00	0	1(normal)
01	1	2(double height)
02	2	3
03	3	4
04	4	5
05	5	6
06	6	7
07	7	8

[Notes] 1) This command is all characters effective
2) If n is outside of the defined range, this command is ignored.
3) In standard mode, the vertical direction is the paper feed direction, and the horizontal direction is perpendicular to the paper feed direction.
4) In page mode, vertical and horizontal directions are based on the character orientation.
5) When characters are enlarged with different sizes on one line, all the characters on the line are aligned at the baseline.
6) The ESC ! command can also turn double width and double height modes on or off.

[Default] n = 0

[Reference] **ESC !**

GS $ nL nH

[Name] Turn emphasized mode on/off.

[Format]

ASCII	GS	$	nL	nH
HEX	1D	45	nL	nH
Decimal	29	36	nL	nH

[Range] 0 <= nL <= 255, 0 <= nH <= 255

[Description] Sets the absolute vertical print starting position for buffer character data in page mode.

[Notes] 1) This command sets the absolute print position to [(nL+nHx256)]x (vertical or horizontal motion unit) inches.
2) This command is effective only in page mode.
3) If the [(nL+nHx256)] x (vertical or horizontal motion unit) exceeds the specified printing area, this command is ignored.
4) The horizontal starting buffer position does not move.
5) The reference starting position is that specified by ESC T.
6) This command operates as follows, depending on the starting position of the printing area specified by ESC T;
When the starting position is set to the upper left or lower right, this command sets the absolute position in the vertical direction.
When the starting position is set to the upper right or lower left, this command sets the absolute position in the horizontal direction.
7) The horizontal and vertical motion unit are specified by GS P.

8) The GS P command can change the horizontal and vertical motion unit.
However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.

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

GS :

[Name] Start/End macro definition

[Format]

ASCII	GS	:
HEX	1D	3A
Decimal	29	58

[Description] Starts ends macro definition.

[Notes]
1) Macro definition starts when this command is received during normal operation. Macro definition ends when this command is received during macro definition.
2) When GS ^ is received during macro definition, the printer ends macro definition and clears the definition.
3) Macro is not defined when the power is turned on.
4) The defined contents of the macro are not cleared by ESC @. Therefore, ESC @ can be included in the contents of the macro definition.
5) If the printer receives GS : again immediately after previously receiving GS : the printer remains in the macro undefined state.
6) The contents of the macro can be defined up to 2048 bytes. If the macro definition exceed 2048 bytes, excess data is not stored.

[Reference] **GS ^**

GS B n

[Name] Turn white/black reverse printing mode on/off.

[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.

[Notes] 1) When the LSB is 0, white/black reverse printing mode is turned on.
2) When the LSB is 1, white/black reverse printing mode is turned off.
3) Only the lowest bit of n is valid.
4) This command is available for built in characters and user defined characters.
5) When white/black reverse printing mode is on, it also applied to character spacing set by ESC SP.
6) This command does not affect the space between lines.
7) White/black reverse mode has a higher priority than underline mode. Even if underline mode is on, it is disabled (but not canceled) when white/black reverse mode is selected.

[Default] n = 0

GS L nL nH

[Name] Set left margin.

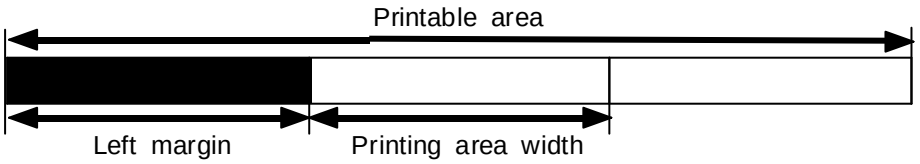
[Format]

ASCII	GS	L	nL	nH
HEX	1D	4C	nL	nH
Decimal	29	76	nL	nH

[Range] 0 <= nL <= 255, 0 <= nL <= 255

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

[Notes] 1) The left margin is set to [(nL+nHx256)] x (horizontal motion unit) inches.



2) This command is effective only processed at the beginning of the line in standard mode.
3) If this command is input in page mode, the printer performs only internal flag operations.
4) This command does not affect printing in page mode.
5) If the setting exceeds the printable area, the maximum value of the printable area is used.
6) The horizontal and vertical motion units are specified by GS P. Changing the horizontal and vertical motion unit does not affect

the current left margin.

7) The horizontal motion unit (x) is used for calculating the left margin. The calculated result is truncated to the minimum value of the mechanical pitch.

[Default] nL = 0, nH = 0

[Reference] **GS P, GS W**

GS P x y

[Name] Set horizontal and vertical motion units.

[Format]

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

[Range] 0 <= x <= 255, 0 <= y <= 255

[Description] Sets the horizontal and vertical motion units to approximately 25.4/x mm(1/x inch) and approximately 25.4/y mm(1/y inch), respectively. When x and y are set to 0, the default setting of each value is used.

[Notes]

1) The horizontal direction is perpendicular to the paper feed direction and the vertical direction is the paper feed direction.
2) In standard mode, the following commands use x or y, regardless of character rotation (upside-down).
   Command using x : ESC SP, ESC $, ESC \, GS L, GS W
   Command using y : ESC 3, ESC J
3) In page mode, the following command use x or y, depending on character orientation;
   When the print starting position is set to the upper left or lower right of the printing area using ESC T(data is buffered in the direction perpendicular to the paper feed direction);
   Command using x : ESC SP, ESC $, ESC W, ESC \
   Command using y : ESC 3, ESC J, ESC W, GS $, GS \
   When the print starting position is set to the upper right or lower left of the printing area ESC T (data is buffered in the paper feed direction);
   Command using x : ESC 3, ESC J, ESC W, GS $, GS \
   Command using y : ESC SP, ESC $, ESC W, ESC \
4) The command does not affect the previously specified values.
5) The calculated result from combining this command with others is

truncated to the minimum value of the mechanical pitch.

[Default] x = 180, y = 360

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

GS W nL nH

[Name] Set printing area width.

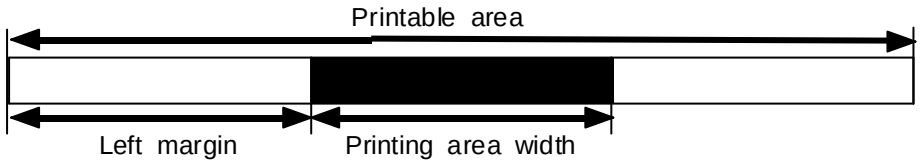
[Format]

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 to the area specified by nL and nH.

[Notes] 1) The printing area width is set to [(nL+nHx256)] x horizontal motion unit inches.



2) This command is effective only processed at the beginning of the line.

3) In page mode, the printer performs only internal flag operations.

4) This command does not affect printing in page mode.

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

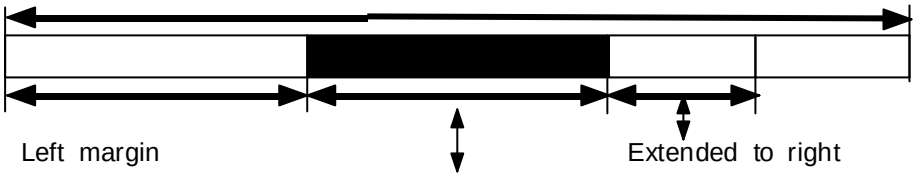
6) The horizontal and vertical motion units are specified by GS P. Changing the horizontal and vertical motion units does not affect the current left margin.

7) The horizontal motion unit (x) is used for calculating the printing area width. The calculated result is truncated to the minimum value of the mechanical pitch.

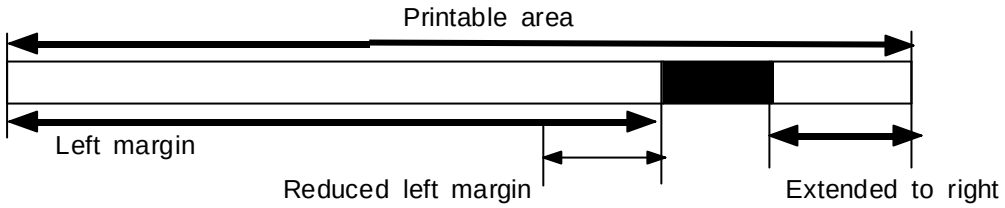
8) If the width set for the printing area is less than the width of one character, when the character data is developed, the following processing is performed;

The printing area width is extended to the right to accommodate one character.

Printable area



If the printing area width cannot be extended sufficiently, the left margin is reduced to accommodate one character.



If the printing area width cannot be extended sufficiently, the right space is reduced.

9) If the width set for the printing area is less than one line in vertical, the following processing is performed only on the line in question when data other than character data(e.g., bit image, user defined bit image) is developed:
The printing area width is extended to the right to accommodate one line in vertical for the bit image within the printable area.
If the printing area width cannot be extended sufficiently, the left margin is reduced to accommodate one line in vertical.

[Default] nL = 0, nH = 2

[Reference] **GS L, GS P**

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.

[Notes] 1) This command sets the distance from the current position to [(nL + nHx256)] x vertical or horizontal motion unit inches.

2) This command is ignored unless page mode is selected.

3) When pitch N is specified to the movement downward;

nL + nHx256 = N

When pitch N is specified to the movement upward (the negative direction), use the complement of 65536.

When pitch N is specified to the movement upward;

nL + nHx256 = 65536 - N

4) Any setting that exceeds the specified printing area is ignored.

5) This command function as follows, depending on the print starting position set by ESC T;

When the starting position is set to the upper left or lower right of the printing, the vertical motion unit (y) is used.

When the starting position is set to the upper right or lower left of the printing, the horizontal motion unit (x) is used.

6) The horizontal and vertical motion unit are specified by GS P.

7) The GS P command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.

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

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.

[Notes] 1) r specifies the number of times to execute the macro.

2) t specifies the waiting time for executing the macro.

3) m specifies macro executing mode.

When LSB of m = 0

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

When LSB of m = 1

After waiting for the period specified by t, the ERROR LED indicators 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.

4) The waiting time is t x 100 ms for every macro execution.
5) If this command is received while a macro is being defined, the macro definition is aborted and the definition is cleared.
6) If the macro is not defined or if is 0, nothing is executed.
7) When the macro is executed (m=1), paper always cannot be fed by using the FEED button.

[Reference] **GS :**

GS h n

[Name] Set bar code height

[Format]

ASCII	GS	h	n
HEX	1D	68	n
Decimal	29	104	n

[Range] 1 <= n <= 255

[Description] Set the height of the bar code

n specifies the number of dots in the vertical direction.

[Default] n = 162

[Reference] GS k

GS k m d1...dk NUL GS k m n d1...dn

[Name] Print bar code

[Format]

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

ASCII	GS	k	m	n	d1...dn

HEX	1D	6B	m	n	d1...dn
Decimal	29	107	m	n	d1...dn

[Range] 0 <= m <= 6 (k and d depends on the bar code system used.)
65 <= m <= 73 (n 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	Remarks
	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	JAN8(EAN8)	7<=k<=8	48<=d<=57
	4	CODE 39	1<=k	48<=d<=57,65<=d<=90,32, 36,37,43,45,46,47
	5	ITF	1<=k(even number)	48<=d<=57
	6	CODABAR	1<=k	48<=d<=57,65<=d<=68, 36,43,45,46,47,58
	65	UPC-A	11<=n<=12	48<=d<=57
	66	UPC-E	11<=n<=12	48<=d<=57
	67	JAN13(EAN13)	12<=n<=13	48<=d<=57
	68	JAN8(EAN8)	7<=n<=8	48<=d<=57
	69	CODE 39	1<=n<=255	48<=d<=57,65<=d<=90,32, 36,37,43,45,47,47 d1=dk=42(1)
	70	ITF	1<=n<=255(even number)	48<=d<=57
	71	CODABAR	1<=n<=255	48<=d<=57,65<=d<=68,36,4 3,45,46,47,58
	72	CODE93	1<=n<=255	0<=d<=127
	73	CODE128	2<=n<=255	0<=d<=127

[Notes] 1) This command ends with a NUL code.
2) When the bar code system used is UPC-A or UPC-E, the printer prints the bar code data after receiving 12 bytes bar code data and processes the following data as normal data.
3) When the bar code system used in JAN13(EAN13), the printer

prints the bar code after receiving 13 bytes bar code data and processes the following data as normal data.

4) When the bar code system used in JAN8(EAN8), the pritner prints the bar code after receiving 8 bytes bar code data and processes following data as normal data.

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

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

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

8) 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 W, GS w

GS w n

[Name] Set bar code width

[Format] ASCII GS w n

HEX 1D 77 n

Decimal 29 119 n

[Range] 2 <= n <= 3

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

n specifies the bar code width as follows.

n	Module width for multi level bar code	Binary level bar code	
		Thin element width(mm)	Thick element width(mm)
2	0.282	0.282	0.706
3	0.423	0.423	1.129

1) Multi level bar codes are as follows
UPC-A, UPC-E, JAN13(EAN13), JAN8(EAN8), CODE93, CODE128

2) Binary level bar codes are as follows
CODE39, ITF, CODABAR

[Default] n = 3

[Reference] GS k

ESC Z m n k d d1...dn

[Name] Print 2D bar code

[Format]

ASCII	ESC	Z	m	n	k	d	d1...dn
HEX	1B	5A	m	n	k	d	d1...dn
Decimal	27	90	m	n	k	d	d1...dn

[Range]
1 <= m <= 7
0 <= n <= 8
2 <= k <= 5
1 <= d <= 65535

[Description] Print 2D bar code (PDF417 format).
m specifies column number of 2D bar code.
n specifies security level to restore when bar code image is damaged
k is used for define horizontal and vertical ratio.
d is consist of 2 byte. 1st byte is lower number. And 2nd byte is upper number.

Chapter 5. Introduction of protocol IrDA

5.1 Frame structure

SOF	TOF	DATA	CHECKSUM	EOF

SOF : Start of frame (SOF code must be 0xC0)

TOF : Type of frame (See the table shown below)

EOF : End of frame (EOF code must be 0xC1)

CHECKSUM : Checksum is necessary in case of the TOF code is 0x44.

DATA : Data is in need of the TOF code is 0x44, 0x05, 0x53.

TOF :

Type of frame	Code	Data
ACK	0x06	X
NACK	0x15	X
ENQ	0x05	O
Print data	0x44	O
Require printer status	0x53	O
Response printer status	0x51	X
EOT	0x04	X

1. If the code (0xC0, 0xC1, 0x7D) is included on sending data, first insert 0x7D code, then operate XOR with that code and 0x20.

   Example : In case the send data is 0x20 *0x7D 0xC1*, the sending data will be 0x20 **0x7D** 0x5D **0x7D** 0xE1.

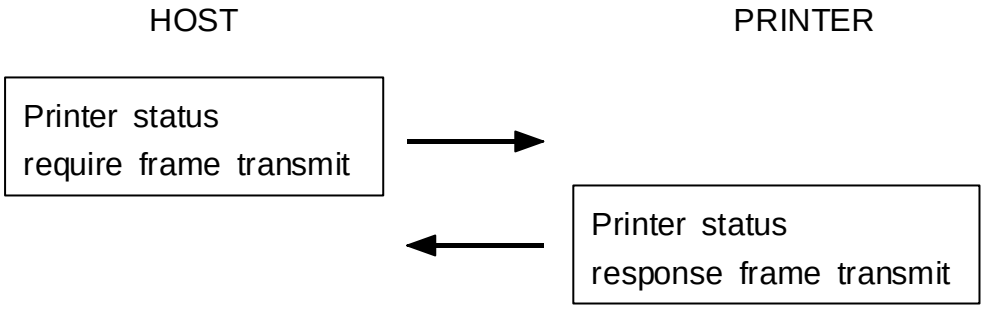
   Note : The bolded character is inserted data.
   And the underlined chacter is the data operated XOR with 0x20.

2. If the code 0x7D is included on receiving, first remove 0x7D code, then operate XOR with next code and 0x20.

   Example : In case the received data is 0x20 *0x7D* 0x5D *0x7D* 0xE1, the real data will be 0x20 0x7D 0xC1.

   Note : The underlined chacter is the data operated XOR with 0x20.

5.2 Process of printer status inquiry



1. If there is no response from printer, after fifth times recheck with every 400ms, then display the error message such as "The printer cannot fined" on your display panel same like CRT, PDA, etc.

2. Structure of printer status response frame

SOF	0x53	STATUS	Previous DATA ID	EOF

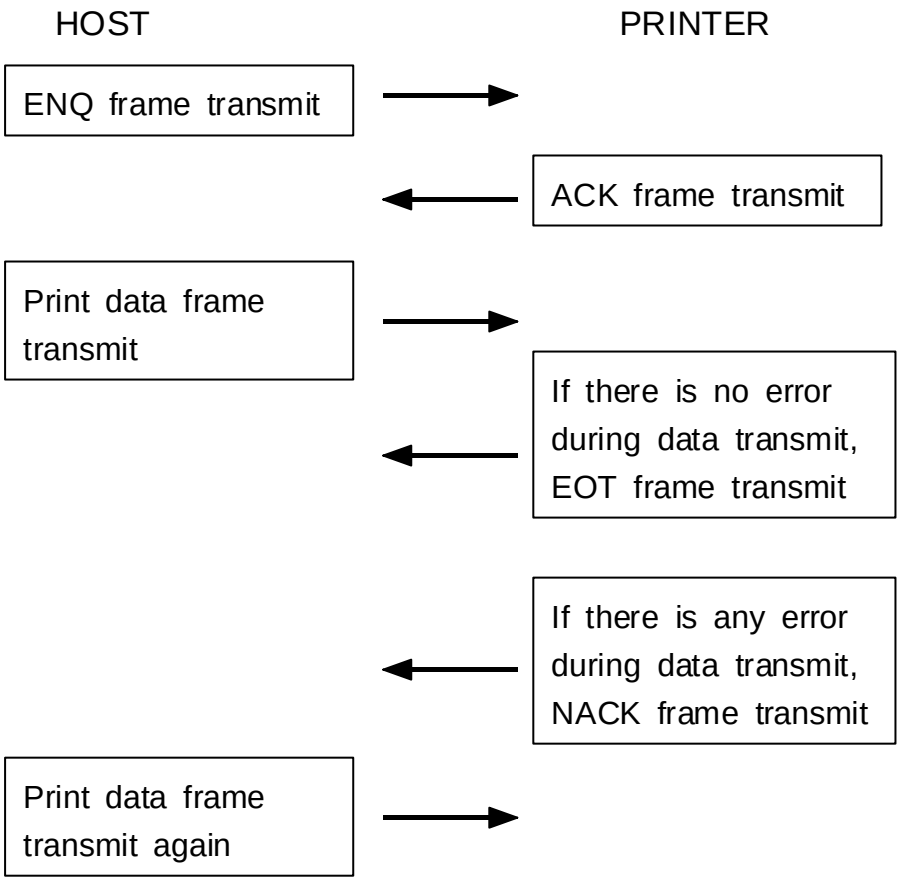
- STATUS

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Bit	ON	OFF
0	Paper empty	Normal
1	Low battery	Normal
2	Head open	Normal
3	Not defined	Not defined
4	Not defined	Not defined
5	Not defined	Not defined
6	Not defined	Not defined
7	Not defined	Not defined

- Previous DATA ID : Finally used DATA ID

5.3 Process of transmitting and receiving print data



1. It is error condition shown below.
   - Wrong checksum received
   - No data received within 200ms after data receive.
   - There is no 0xC1 code after checksum
   - It is not number code (0x30 - 0x39) in data length field.

5.4 Structure of print data frame

SOF	0x44	DATA ID	DATA Length	Print DATA	CHECKSUM	EOF

1. DATA ID : It is made up 1 digit number.
   The range is 0 - 9.
   The number must be character code.

2. DATA Length : It consists of 4 digit numbers.
   The range is 0001 - 9999.
   The number must be character code.
   Example - If you want to send 4 numbers data to printer,
   you must send 0x30 0x30 0x30 0x34 codes as data length.

3. CHECKSUM : It is composed of 2 bytes.
   1st byte is operated XOR value with odd numbers of data.
   And 2nd byte is operated XOR value with even numbers of data
   Example - In case of print data is SAMPLE TEST, data length is 0011 (0x30 0x30 0x31 0x31), the 1st byte of checksum is operated XOR value with S, M, L, space, E, T, and 2nd byte checksum is operated XOR value with A, P, E, T, S.

Note :

1. Do not have time interval over 200ms on transmitting print data.
2. If not receive EOT or NACK frame within 1 second after transmitting print data completely, jump to the transmitting ENQ frame.
3. If receive EOT frame after print data transmitted, quit the print operation
4. In case of receiving NACK frame, if receive NACK frame more than three times after transmit print data three times, display CHECK PRINTER STATUS on your display panel and wait operator's measures.

5.5 Structure of ENQ frame

SOF	0x05	DATA ID	EOF

1. If there is no response ACK frame after transmitting ENQ frame from host, transmit again ENQ frame after waiting 400ms.

2. In case of no response over 10 times from printer about ENQ frame, display PRINTER CANNOT FINDED message on the your display panel, and wait operator's measures.

APPENDIX

A.MISCELLANEOUS NOTES

1. Printer mechanism handing

1) Do not pull the paper out when the cover is closed.
2) Because the thermal elements of the print head and driver ICs are easy to break, so do not touch them with any metal objects.
3) Since the areas around the print head become very hot during and just after printing, do not touch them.
4) Do not use the cover open button except when necessary.
5) Do not touch the surface of the print head because bust and dirt can stick to the surface and damage the elements.
6) Thermal paper containing Na, K, Cl ions can harm the print head thermal elements.
   Therefore, be sure to use only the specified paper.
7) If you want to use label paper, please contact your dealer for assistance.

2. Thermal paper handling

Notes on using thermal paper

Chemicals and oil on thermal paper may cause discoloration and faded printing. Therefore, pay attention to the following;

1) Use water paste, starch paste, polyvinyl paste, or CMC paste when gluing thermal paper.
2) Volatile organic solvents such as alcohol, ester, and ketone can cause discoloration.
3) Some adhesive tapes may cause discoloration or faded printing.
4) If thermal paper touches anything which includes phthalic acid ester plasticizer for a long time, it can reduce the image formation ability of the paper and can cause the printed image to fade. Therefore, when storing thermal paper in a card case or sample notebook, be sure to use only products made from polyethylene, polypropylene, or polyester.
5) If thermal paper touches diazo copy paper immediately after copying, the printed surface may be discolored.
6) Thermal paper must not be stored with the printed surfaces against each other because the printing may be transferred between the surfaces.
7) If the surface of thermal paper is scratched with a hard metal object such as

a nail, the paper may become discolored.

Notes on thermal paper storage

Since color development begins at 70C (158F), thermal paper should be protected from high temperature, humidity, and light, both before and after printing.

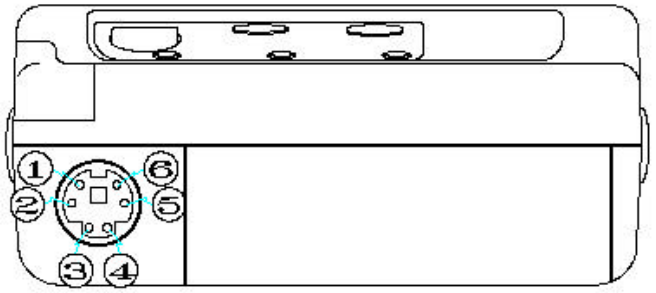
1) Store paper away from high temperature and humidity.
   Do not store thermal paper near a heater or in enclosed places exposed to direct sunlight.
2) Avoid direct light
   Extended exposure to direct light may cause discoloration or faded printing.

3. Others

Because this printer uses plated steel, the manual cutting edge may be subject to rust.

However, this does not affect the printer performance.

B. CONNECTORS



Pin no	Signal name	Direction	Function
1	TxD	Output	Transmit Data
2	NC	-	-
3	RxD	Input	Receive Data
4	CTS	Output	Clear to send
5	RTS	Input	Request to send
6	GND	Input	Ground

C. Specification

Printing method	Direct thermal line printing	
Dot density	203 DPI	
Printing width	48 mm	
Paper width	57 - 58 mm	
Characters per line	40	
Printing speed	50mm / sec	
Receive buffer size	10K bytes	
Note	Printing speed may be slower, depending on the data transmission speed and the combination of control commands.	
Supply voltage	7.2 DCV / 1.8 A	
Environment conditions	Temperature	0C - 40C (operating) -10C - 50 (storage)
	Humidity	30% - 80% (operating) 10% - 90% (storage)
MCBF	Mechanical	37,000,000 lines
	Head	Approximately 100 Km