

CONFIDENTIAL

EPSON

Hybrid printer

TM-H5000II series

Specification

STANDARD	
Rev. No.	E
Notes	

Copied Date	
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SEIKO EPSON CORPORATION

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REVISION SHEET

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Rev.	Document	WRT	CHK	APL	Sheet	Rev.	Sheet	Rev.	Sheet	Rev.	
A	Enactment	Y.Ito	--	R.Kanai	I	E	17	E	41	E	
B	Change	Y.Ito	--	R.Kanai	II	E	18	E	42	E	
C	Change	Matsumoto	--	R.Kanai	III	E	19	E	43	E	
D	Change	Matsumoto	--	R.Kanai	IV	E	20	E	44	E	
E	Change		--		V	E	21	E	45	E	
					VI	E	22	E	46	E	
					VII	E	23	E	47	E	
							24	E	48	E	
					1		25	E	49	E	
					2	E	26	E	50	E	
					3	E	27	E	51	E	
					4	E	28	E	52	E	
					5	E	29	E	53	E	
					6	E	30	E	54	E	
					7	E	31	E	55	E	
					8	E	32	E	56	E	
					9	E	33	E	57	E	
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					11	E	35	E	59	E	
					12	E	36	E	60	E	
					13	E	37	E	61	E	
					14	E	38	E	62	E	
					15	E	39	E	63	E	
					16	E	40	E	64	E	
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A	Enactment				65	E	89	E	113	E	
B	Change				66	E	90	E	114	E	
C	Change				67	E	91	E	115	E	
D	Change				68	E	92	E	116	E	
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A	Enactment				137	E	161	E	185	E	
B	Change				138	E	162	E	186	E	
C	Change				139	E	163	E	187	E	
D	Change				140	E	164	E	188	E	
E	Change				141	E	165	E	189	E	
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A	Enactment				App.5	E					
B	Change				App.6	E					
C	Change				App.7	E					
D	Change				App.8	E					
E	Change				App.9	E					
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REV.	SHEET	CHANGED CONTENTS
B	9	1.2.1 Printing Specifications 7) Printing speed: NOTES • Low transmission speed as possible. (Addition)
	11	1.2.5 Paper Specification 5) Specified paper:, P310 ... (Addition)
	75	5.3 Consumables, P310 ... (Addition)
C	All	All page numbers are re-numbered. Descriptions for multilingual are added.
D	All	All page numbers are renumbered due to a correction of page numbering mistake.
	II - VI	Table of contents 3.2.17 Page 27 → (intentionally blanked)
	1	1.1.2 Character specifications Thai characters 128 characters × 8 pages (138 character types) → 128 characters × 7 pages (133 character types)
	11	1.2.2 Character specifications Thai characters 128 characters × 8 pages (138 character types) → 128 characters × 7 pages (133 character types)
	54 - 61	3.2.10 - 3.2.16 Thai character code tables (Page 20 through 26) are changed. 3.2.17 Thai character code table (Page 27) is deleted.
	138	ESC t n Range, Description, and Default are changed due to a change of Thai character code table
E	All	"Confidential" is written in the header of all pages.
	16	1.3.4 Reliability Receipt: 2) MTBF: 180,000 hours → 360,000 hours 3) MCBF: 37,000,000 lines → 52,000,000 lines
<div>TITLE</div> <div>TM-H5000II series</div> <div>Specification</div> <div>(STANDARD)</div>		

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	TITLE TM-5000II series Specification (STANDARD)	SHEET REVISION E	NO.	
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GENERAL DESCRIPTION

The TM-H5000II is a high-quality POS printer that can print on slip and receipt paper (paper roll).

This specification applies the following models of the TM-H5000II series printer:

TM-H5000II	(with serial interface)
TM-H5000IIP	(with parallel interface)
TM-H5000IIM	(supporting Multilingual characters with serial interface) (*1)
TM-H5000IIPM	(supporting Japanese Kanji characters with parallel interface)

The printer has the following features:

<Slip Section>

- Wide slip paper capability (maximum characters per line: 88 with 7 x 9 font).
- Copy printing is possible.
- High throughput using bidirectional, minimum distance printing.
- Optional Magnetic Ink Character Recognition (MICR) reader that enables the printer to perform consecutive reading and processing of MICR characters and printing endorsements.

<Receipt section>

- High speed printing with collective printing.
- The standard auto-cutter provides easy user operation.
- Ladder bar code printing is possible by using a bar code command.
- New paper handling enables easy paper roll setting.

<Both Receipt and Slip>

- EPSON customer display series connection (DM-D). (Available only for serial interface model)
- Selectable receive buffer size (45 bytes or 4K bytes).
- Command protocol based on the ESC/POS® standard.
- Automatic Status Back (ASB) function that automatically transmits changes in the printer status.
- Available NV (non-volatile) bit image buffer size (384 Kbytes).
- User NV (non-volatile) memory size (1K byte).

NOTE *1: Multilingual characters means that the printer can print with one of Japanese Kanji, Chinese Kanji, Taiwanese Kanji or Thai characters. In this specification, Kanji (Chinese character) means Japanese, Chinese, and Taiwanese characters.

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1. GENERAL SPECIFICATIONS

1.1 Slip Section

1.1.1 Printing Specifications

- 1) Printing method: Serial impact dot matrix
- 2) Head wire configuration: 9-pin vertical line, wire pitch 1/72 inch
- 3) Head wire diameter: 0.29 mm (.01")
- 4) Printing direction: Bidirectional, minimum distance printing
- 5) Printing speed: Refer to Table 1.1.1
- 6) Characters per line: Refer to Table 1.1.1
- 7) Characters per inch: Refer to Table 1.1.1
- 8) Kanji characters print: Unidirectional two-pass printing

1.1.2 Character Specifications

- 1) Number of characters: Alphanumeric characters: 95
International characters: 32
Extended graphics: 128 × 10 pages
(including one space page)

Multilingual character model supports printing with one of the following characters:
 - ① Japanese Kanji (Two-pass printing font)
JIS (JIS X0208-1990) Level 1, Level 2
 - ② Chinese Kanji (Two-pass printing font)
7580 (GB2312)
 - ③ Taiwanese Kanji
13494 (Big 5)
 - ④ Thai character (3-pass printing font)
128 characters × 7 pages (133 character types)
- 2) Character structure: Font A: 9 × 9 3-dot spacing (in half dot units)
Font B: 7 × 9 2-dot spacing (in half dot units)
Kanji: 16 × 16 Left 0-dot, Right 2-dot spacing (in half dot units)
Thai characters
Font A: 9 × 27 3-dot spacing (in half dot units)
Font B: 7 × 27 2-dot spacing (in half dot units)

Larger spacing can be changed by using **ESC SP** or **FS S**.
- 3) Character size: Refer to Table 1.1.1

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Table 1.1.1 Characters Per Inch, Characters Per Second, Characters Per Line, Character Size

Font type	Character Structure (Horizontal dots × vertical dots)	Character Spacing (half dots)	Characters interval (mm)	Characters Per Second (CPS) (Carriage moving speed)	Characters Per Line (CPL)	Characters Size (units: mm) Width × Height
Font A	9 × 9	3 dots	2.03	233	66	1.6 × 3.1
Font B	7 × 9	2 dots	1.52	311	88	1.3 × 3.1
Kanji	16 × 16 (*1)	2 dots	3.06	45	44	2.7×2.9
Thai Font A	9 × 27	3 dots	2.03	77	66	1.6 × 9.5
Thai Font B	7 × 27	2 dots	1.52	103	88	1.3 × 9.5

(*1) Kanji character spacing at default setting is 2 half dots. (Kanji character spacing can be changed by **FS S**.) Printing speed for Kanji characters shown in table above is in the case of full column printing with two-pass printing.

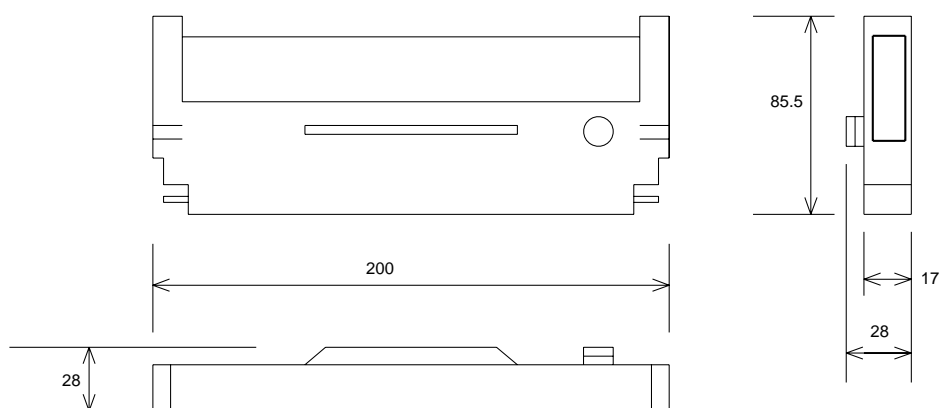
EPSON	TITLE TM-H5000II series Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 3	SHEET 2

1.1.3 Ribbon

- 1) Type: Exclusive cassette ribbon
- 2) Ribbon cassette specifications:

Part number	ERC-31 (P)
Color	Purple
Ribbon life (*)	7,000,000 characters

(*): when one character consists of 18 dots
- 3) Ribbon cassette overall dimensions (refer to Figure 1.1.1)



[Units: mm (All the numeric values are typical.)]

Figure 1.1.1 Ribbon Cassette Overall Dimensions

NOTE: If ribbon cassettes other than those specified is used, damage may occur. Seiko Epson will not be held responsible for problems arising from the above.

1.1.4 Paper Feed and Paper Specification

- 1) Paper feed method: Friction feed
- 2) Paper feed pitch: Default 1/6 inch
- 3) Paper feed speed: Approximately 60.3 msec/line (1/6 inch feeding)
Approximately 3.4 inches/second (continuous feeding)

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			NEXT 4	SHEET 3

4) Paper size:

a) Paper type:

- Normal paper
- Carbon copy paper
- Pressure sensitive paper

b) Total thickness: 0.09 to 0.36 mm (.0035 to .0141") (Refer to e))

c) Size (W × L): 70 mm × 70 mm to 210 mm × 297 mm (A4)
(2.76" × 2.76" to 8.27" × 11.69")

d) Ambient temperature and copy capability

Copy capability is greatly influenced by the ambient temperature, so printing must be performed under the conditions described in Table 1.1.2.

Table 1.1.2 Relationship between Ambient Temperature and Number of Copies

Number of copies	Ambient temperature
Original + 4 copies	Approx. 20° to 45°C (68° to 113°F)
Original + 1 to 3 copies	5 to 45°C (41° to 113°F)

e) Copy capability and paper thickness:

① Normal paper (single-ply): 0.09 to 0.2 mm (.0035 to .0079")

② Carbon copy paper combination:

5 sheets maximum (original + 4 copies, at 20° to 45°C (68° to 113°F))

- Backing paper: 0.06 to 0.15 mm (.0023 to .0059")
- Copy and original: 0.04 to 0.07 mm (.0015 to .0028")
- Carbon paper: Approximately 0.035 mm (.0014")
- Total thickness: 0.30 mm (.0118") or less (for any combination from a single original to an original + 3 copies)
0.36 mm (.0141") or less (for any combination from a single original to an original + 4 copies)

③ Pressure sensitive paper: 5 sheets maximum (original + 4 copies, at 20° to 45°C (68° to 113°F))

- Backing paper: 0.06 to 0.15 mm (.0023 to .0059")
- Copy and original: 0.06 to 0.075 mm (.0023 to .003")
- Total thickness: 0.24 mm (.0094") or less (original to original + 3 copies)
0.30 mm (.0118") or less (original + 4 copies)

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			NEXT 5	SHEET 4

- NOTE:**
- When using multi-ply paper that consists of an original and three copies, be sure to print with a 9 × 9 font. If a 7 × 9 font is used, some characters on some of the copies may not be readable.
 - In the same way, when printing Kanji characters which consist of many lines, be sure to consider that some of characters may not be readable regardless of number of the copies.

5) Notes on slip paper

- The slip paper must be flat, without curls or wrinkles, especially at the top edges. Otherwise, the paper may rub against the ribbon and become dirty.
- There must be no glue on the bottom edge of slip paper. Choose slip paper carefully when the glue is on the right or top edge, since paper feeding and insertion are affected by gluing conditions (e.g., glue quality, method, and length) and glue location (refer to Figure 1.1.2). Be especially careful when slip paper is wide and has the glue on the left edge, since skew may occur.
- Since the slip insertion sensor uses a photo sensor, do not use paper that has holes at the sensor position, or is translucent (refer to Figure 1.1.4).
- Since the slip ejection sensor uses a reflective photo sensor and it detects from the back of slip paper, do not use paper that has holes or dark portions with low reflection (less than 40% reflection) at the sensor position (refer to Figure 1.1.5).
- Use thinner paper (N30 or equivalent) between the top and bottom sheets of multi-ply paper. If thick paper is used, the copy capability is lowered.

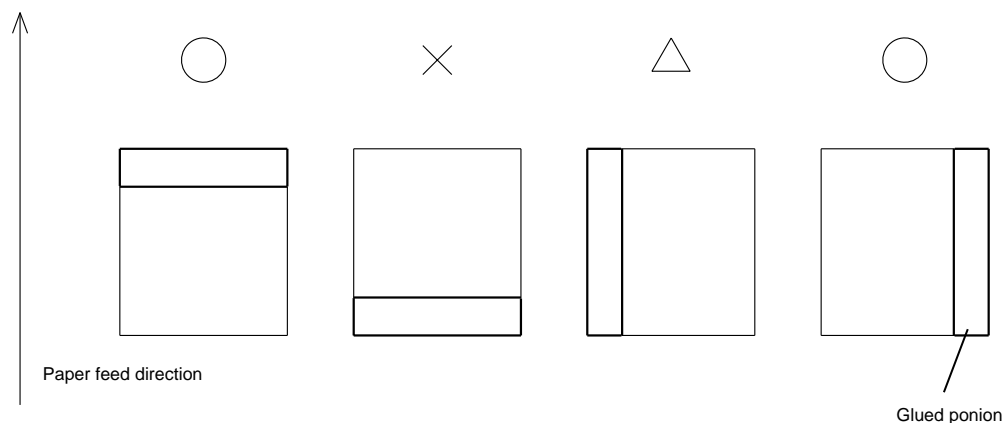


Figure 1.1.2 Slip Paper Glued Area

EPSON	TITLE TM-H5000II series Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 6	SHEET 5

1.1.5 Printable Area

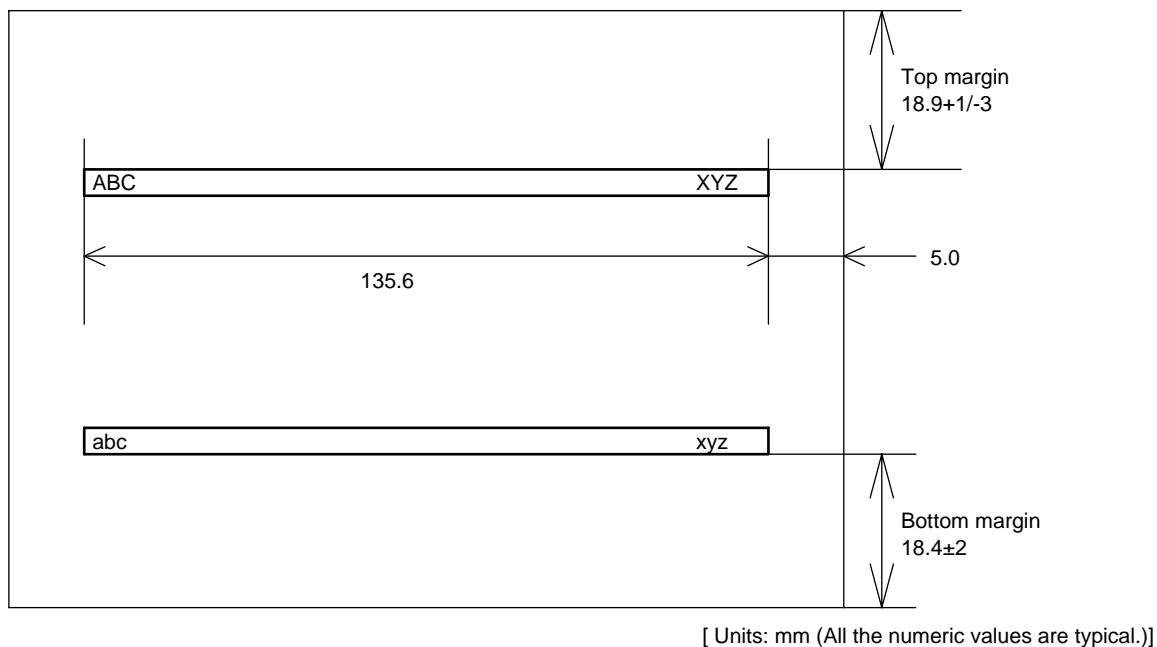


Figure 1.1.3 Slip Paper Printable Area

The top margin can be set to a minimum of 5 mm (0.19") by using a command to feed the paper backward.

NOTES:

1. All the numeric values are typical; therefore, there may be variations depending on paper setting and insertion.
2. When inserting slip paper, be sure to use the slip side guide and form stopper. If you insert the slip paper exceeding the form stopper, the slip paper may be ejected.
3. Do not print on the slip paper in the reverse paper feed direction (in the paper insertion direction).
4. Transmitting the **ESC c 0** command before setting paper is recommended.

EPSON	TITLE TM-H5000II series Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 7	SHEET 6

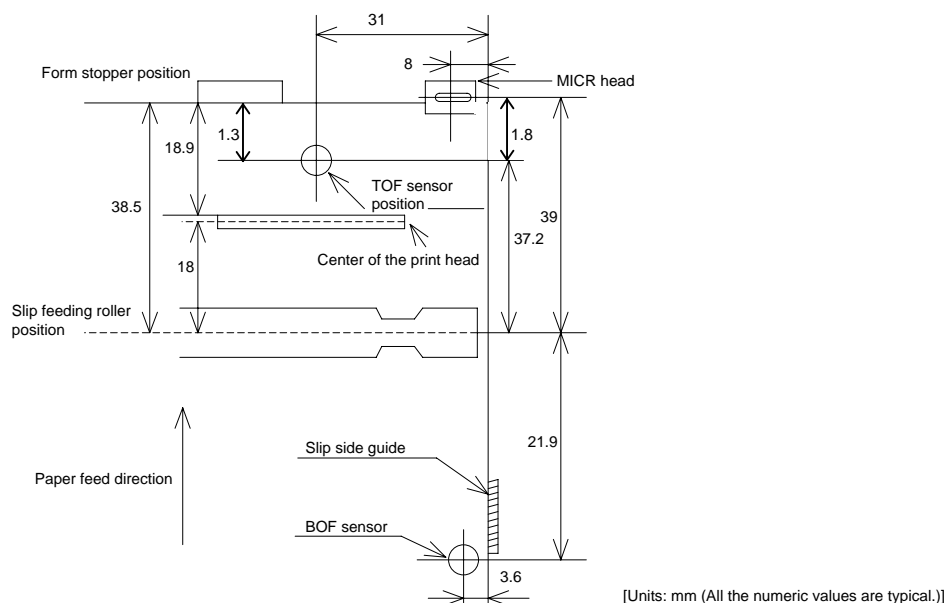


Figure 1.1.4 Slip Sensor Positions

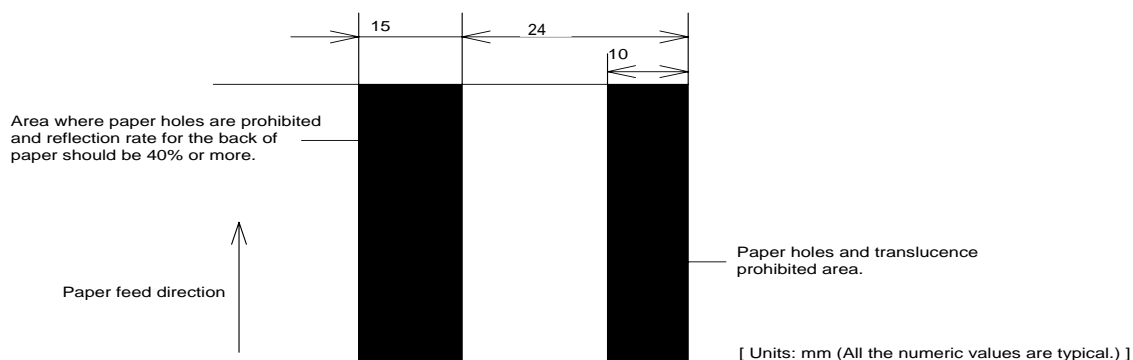


Figure 1.1.5 Paper Holes and Low Reflection Prohibited Area

1.1.6 MICR Reader (when the printer is used with the MICR reader)

- 1) Reading method: Magnetic bias
- 2) Recognition rating: 98 % or more (at 25°C)

Recognition rating is defined as follows:

$$\text{Recognition rating (\%)} = \frac{\text{Total number of checks} - (\text{number of sheets misread or not identified.})}{\text{Total number of checks}} \times 100$$

- Check paper used for test is Epson standard check paper.
- Checks must be flat, without curls, folds, or wrinkles.
- The magnet bias method is used for reading.

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			NEXT 8	SHEET 7

3) Inserting direction and endorsement printing

Insert the check with the surface printed with the magnetic ink downward, following the slip side guide.

Endorsement printing can be performed. In this case, the print starting position is point A in the illustration shown below.

- To print endorsements in the specified area (within 38.1 mm [1.5"] from the top), set the print position for the last line so that it is printed at least 3 mm (0.118") above the bottom of the printable area.

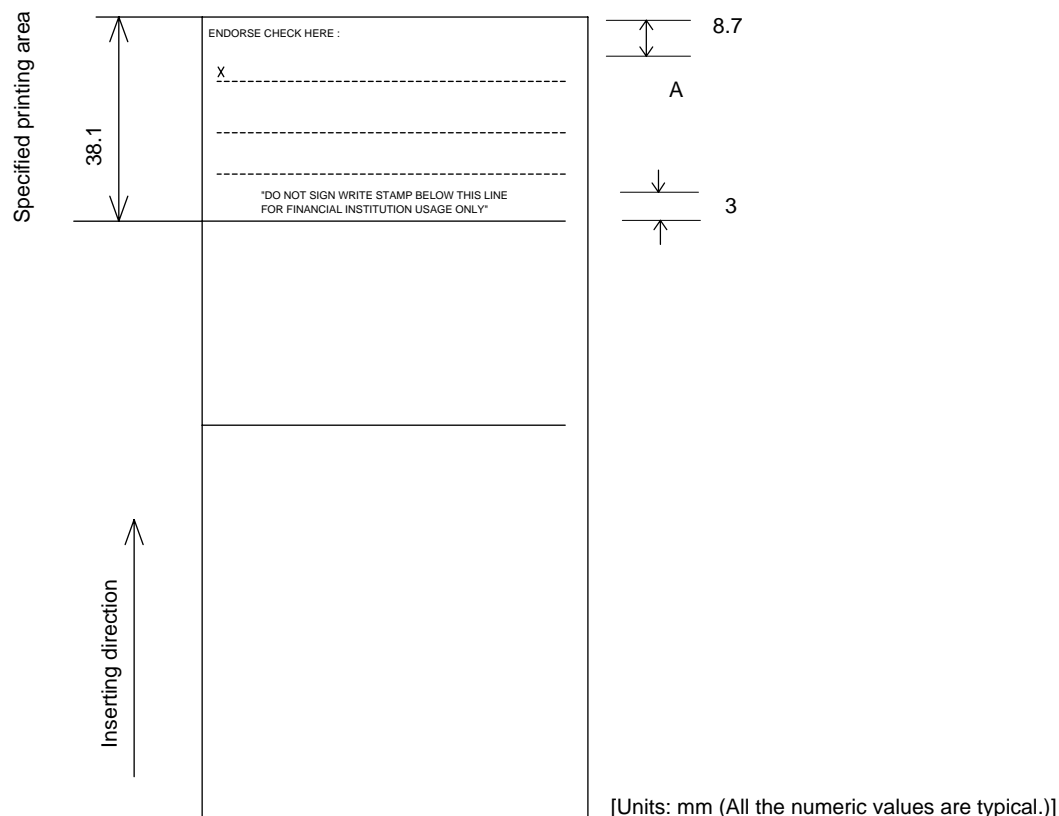


Figure 1.1.6 Endorsement Printing

EPSON	TITLE TM-H5000II series Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 9	SHEET 8

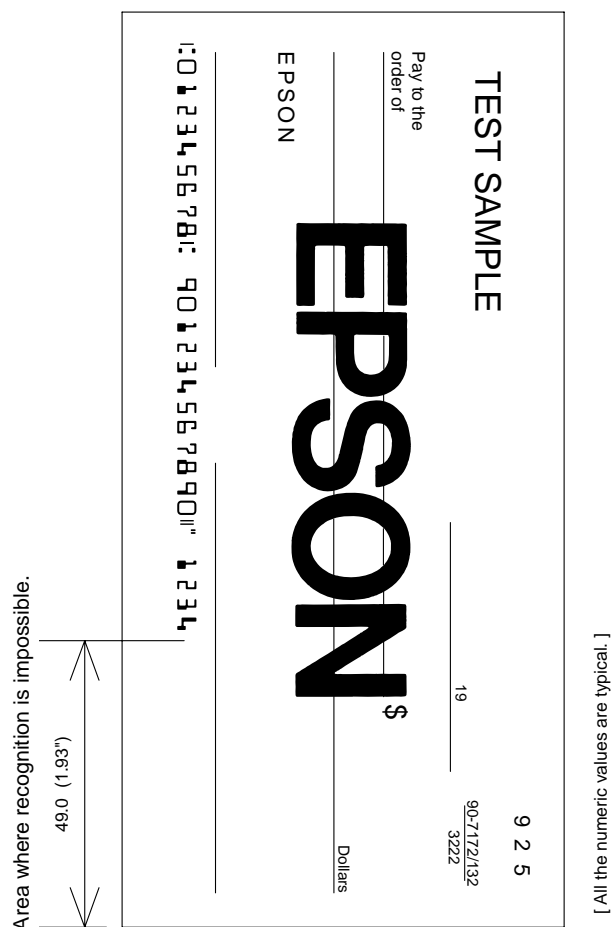


Figure 1.1.7 MICR Character Recognition Impossible Area of Personal Check

NOTES:

1. Do not install the printer near any magnetic fields because this may cause MICR reading errors.
2. The MICR characters may not be recognized when impact or vibration is applied to the printer.
- 4) Notes on using the MICR reader (only when the printer is used with MICR)
 - The personal checks must be flat, without curls, folds, or wrinkles (especially at the edges). Otherwise, the check may rub against the ribbon and become ink-stained.
 - Do not insert checks that have clips or staples. This may cause paper jams, MICR reading errors, and damage to the MICR head.
 - Let go of the check immediately as soon as the printer starts feeding it. Otherwise, the paper is not fed straight, causing paper jams and MICR reading errors.

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			NEXT 10	SHEET 9

1.2 Receipt Section

1.2.1 Printing Specifications

- 1) Printing method: Thermal line printing
- 2) Dot density: 180 dpi × 180 dpi. The number of dots per 25.4 mm (1")
- 3) Printing direction: Unidirectional with friction feed
- 4) Printing width: 72 mm (2.83"), 512 dot positions
- 5) Characters per line (default): Font A: 42
Font B: 56
- 6) Character spacing (default): Font A: 0.28 mm (.01") (2 dots)
Font B: 0.28 mm (.01") (2 dots)
Programmable by control command.
- 7) Printing speed: High speed mode:
28.4 lines/second maximum
(1/6 inch feed) (at 24V, 20°C, Density level 2)
120 mm/second maximum
(4.72 inches/second maximum)
Speeds are switched depending on the applied voltage to the printer and head temperature conditions automatically.
Low power consumption mode:
Approximately 16.5 lines/second
(1/6 inch feed)
Approximately 70 mm/second
(approximately 2.76 inches/second)
When a ladder bar code is printed:
Approximately 42 mm/second
(approximately 1.7 inches/second)
- NOTES:**
- Printing speed may be slower depending on the data transmission speed and the combination of control commands.
 - Low transmission speed may cause intermittent printing. It is recommended to transmit data to the printer as quickly as possible.
 - High speed mode or low power consumption mode is selected by a DIP switch. (Refer to Table 3.3.4 or 3.3.7).
- 8) Paper feed speed: Approximately 120 mm/second
(approximately 4.72 inches/second) (continuous paper feeding)
- 9) Line spacing (default): 1/6 inch (4.23 mm)
Programmable by control command

EPSON	TITLE TM-H5000II series Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 11	SHEET 10

1.2.2 Character Specifications

- 1) Number of characters:
- | | |
|---------------------------|---|
| Alphanumeric characters: | 95 |
| Extended graphics: | 128 × 7 pages
(including one space page) |
| International characters: | 37 |
- Multilingual character model supports printing with one of the following characters:
- ① Japanese Kanji JIS (JIS X0208-1990)
 - Level 1: 3489
 - Level 2: 3388
 - ② Chinese Kanji (GB2312)
 - 7580
 - (Using the GB5199 of the Chinese national standard font)
 - ③ Taiwanese Kanji (Big 5)
 - 13494
 - ④ Thai characters (3-pass printing font)
 - 128 characters × 7 pages
 - (133 character types)
- 2) Character structure:
- | | |
|-----------------|---|
| Font A: | 12 × 24 (including 2-dot spacing in horizontal) |
| Font B: | 9 × 17 (including 2-dot spacing in horizontal) |
| Kanji: | 24 × 24 |
| Thai character: | 12 × 72, 9 × 51 |
- Font A is selected as the default
- 3) Character size:
- Refer to Table 1.2.1.

Table 1.2.1 Character Size

	Standard		Double-height		Double-width		Double-width/ Double-height	
	W×H (mm)	CPL	W×H (mm)	CPL	W×H (mm)	CPL	W×H (mm)	CPL
FontA 12×24	1.41×3.39	42	1.41×6.77	42	2.82×3.39	21	2.82×6.77	21
FontB 9×17	0.99×2.40	56	0.99×4.80	56	1.98×2.40	28	1.98×4.80	28
Kanji 24×24	3.39×3.39	21	3.39×6.77	21	6.77×3.39	10	6.77×6.77	10
Thai FontA	1.41×10.16	42	1.41×20.32	42	2.82×10.16	21	2.82×20.32	21
Thai FontB	0.99×7.20	56	0.99×14.40	56	1.98×7.20	28	1.98×14.40	28

Space between characters is not included.

Characters can be scaled up to 64 times as large as the standard sizes.

CPL = Characters per line

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			NEXT 12	SHEET 11

CONFIDENTIAL

1.2.3 Auto Cutter

Partial cut: Cutting with one point left uncut

NOTE: To prevent dot displacement, after cutting, paper must be fed approximately 1 mm (14/360 inches) or more before printing.

1.2.4 Paper Roll Supply Device Section

- 1) Supply method: Drop-in paper roll
- 2) Near-end sensor
 - a) Detection method: Microswitch
 - b) Paper roll spool diameter: Inside: 12 mm (.47")
Outside: 18 mm (.71")
 - c) Near-end adjustment: Adjusting screw
 - d) Remaining amount: Fixed position #1 (approximately 23 mm (0.9"))
#2 (approximately 27 mm (1.06"))
(The adjusting screw has two positions.)
Refer to Appendix D.
- 3) Paper roll end detection
 - a) Detection method: Reflective light sensor

NOTE: You can use a command to stop printing upon detection of a paper near-end.

1.2.5 Paper Specification

- 1) Paper type: Specified thermal paper
- 2) Form: Paper roll
- 3) Paper width: 79.5 ± 0.5 mm (3.13" ± 0.02")
- 4) Paper roll size: Roll diameter: Maximum 83 mm
Take-up paper roll width: $80 \pm \begin{smallmatrix} 0.0 \\ 1.0 \end{smallmatrix}$ mm (3.15" ± $\begin{smallmatrix} 0.020 \\ 0.04 \end{smallmatrix}$ ")
- 5) Specified paper: Specified thermal roll paper, NTP080-80
In Japan: Nakagawa, Seisakujo
In U.S.A.: Nakagawa Mfg. (USA) Inc.
In Europe: Nakagawa Mfg. (Europe) GmbH
In Southeast Asia: N.A.K. Mfg. (Malaysia) SDN BHD
[Original paper: TF50KS-E Nippon Paper Industries Co.,Ltd.,]
The following paper can be used instead of the specified paper above:
Original paper: PD 160R (Oji Paper Mfg. Co. Ltd.)
Original paper: AF50KS-E (Jujo Thermal Oy (Finland))
Original paper: P350(F380), P310, P300
(Kanzaki Specialty Papers, Inc. (U.S.A.))
- 6) Paper roll spool diameter: Inside: 12 mm (.47")
Outside: 18 mm (.71")

NOTE: Paper must not be pasted to the paper roll spool.

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1.2.6 Printable Area

1) Paper roll

The printable area of a paper with width of 79.5 ± 0.5 mm ($3.13" \pm 0.02"$) is 72.2 ± 0.2 mm ($2.84" \pm 0.008"$) (512 dots) and the space on the right and left sides are approximately 3.7 ± 2 mm ($0.15" \pm 0.079"$).

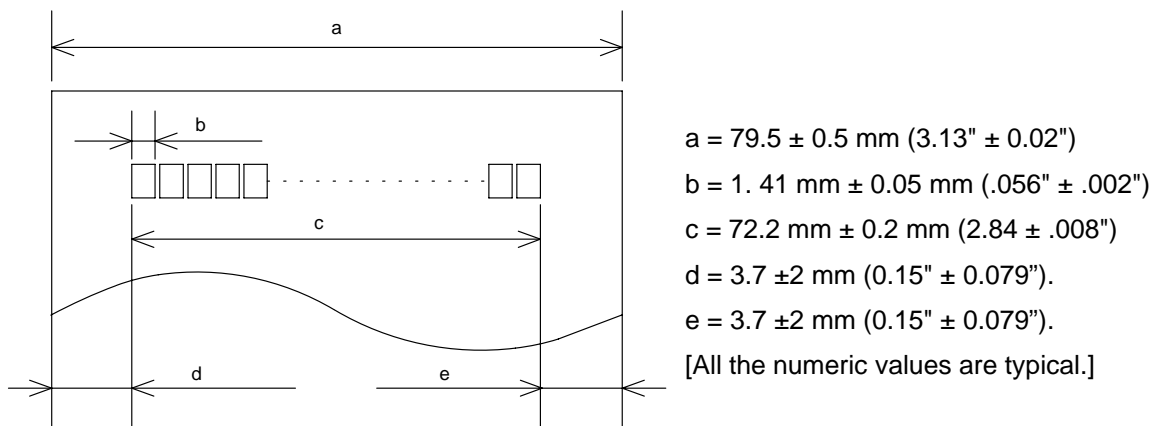


Figure 1.2.1 Paper Roll Printable Area

NOTE: The print position within the printable area of the thermal elements for dots 257 to 512 is shifted approximately 0.07 mm (.003") in the paper feed direction from the position for dots 1 to 256. Be sure not to print a ladder bar code across both printable areas, as this can cause variations in printing which are difficult to read. However, when the ladder bar code is printed with level 2 of print density, the difference is only approximately 0.04 ~ 0.05 mm (.0015~.0019").

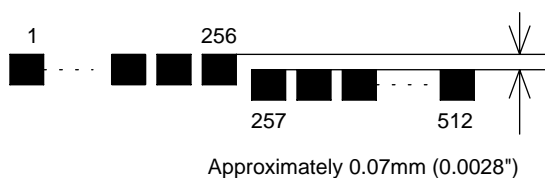
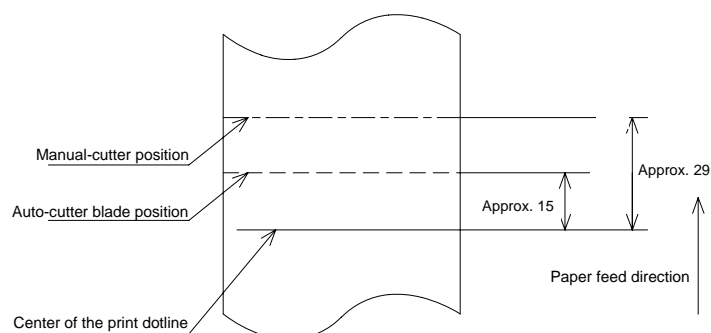


Figure 1.2.2 Shifting of the Print Position

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1.2.7 Printing and Cutting Positions



[Units: mm (All the numeric values are typical.)]

Figure 1.2.3 Printing and Cutting Positions

NOTE: Numeric values used here are typical values; the values may vary slightly as a result of paper slack or variations in the paper. Take the notice into account when setting the cutting position of the auto-cutter.

1.3 General Section (for both receipt and slip)

1.3.1 Internal Buffer

- 1) Receive buffer selectable as 45 or 4K bytes using the DIP switch.
- 2) User-defined buffer (both for user-defined characters and user-defined bit images)
Receipt : 12K bytes Slip: 3K bytes
- 3) Macro buffer 2K bytes
- 4) NV (non-volatile) bit image buffer 384K bytes
- 5) User NV (non-volatile) memory 1K byte

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1.3.2 Electrical Characteristics

- 1) Supply voltage: +24 VDC \pm 10% (optional power supply: EPSON PS-170)
Ripple voltage: 300 mVpp or less
(only when the printer is used with the MICR reader)
- 2) Current consumption (at 24V except for drawer kickout driving)
Slip: Operating: Mean: Approximately 1.9A
(Character font A α -N all columns printing)
Peak: Approximately 8.0A (20 msec)
When the print platen is released: 2.0A (200 msec)
Receipt: Operating: Mean: Approximately 1.7A
(Character font A α -N all columns printing)
Peak: Approximately 7.7A
Low power consumption mode:
Mean: Approximately 1.2A
(Character font A α -N all columns printing)
Peak: Approximately 6.6A
Standby: Mean: Approximately 0.3A

1.3.3 EMI and Safety Standards Applied (EMC is tested using the EPSON PS-170 power supply)

- 1) Europe: CE marking
EN55022
EN50082-1
EN45501
Safety Standard: TÜV (EN 60950)
- 2) North America: EMI: FCC Class A
Safety standards: UL1950-2TH-D3
C-UL
- 3) Japan: EMI: VCCI Class 1
- 4) China (the People's Republic of China):
Safety standards: GB4943-1995
- 5) Oceania: EMI: AS/NZS 3548 class B

Conditions of Acceptability

- 1) This component has been judged on the basis of the required spacing in the Standard for Information Technology equipment, Including Electrical Business Equipment, UL 1950 and CSA22.2 No. 950, Sub-clause 2.9, which would cover the component itself if submitted for Listing.
- 2) This unit is intended to be supplied by a SELV circuit only.
- 3) The terminals and connectors have not been evaluated for field wiring.
- 4) Interface Connectors (DK, DM-D) are not intended for TNV connection.

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1.3.4 Reliability

Slip

1) Life (when printing alphanumeric characters)

Mechanism: 12,000,000 lines

Print head: 200 million characters
(when printing with font B)

MICR reader mechanism (only when the printer is used with the MICR reader):

240,000 passes

The MICR reader is defined to have reached the end of its life when it reaches the beginning of the Wearout Period.

2) MTBF

180,000 hours

Failure is defined as Random Failure occurring at the time of the Random Failure Period.

3) MCBF

29,000,000 lines

This is an average failure interval based on failures relating to wearout and random failures up to the life of 12 million lines.

Receipt:

1) Life

Mechanism: 15,000,000 lines

Thermal head: 100 million pulses, 100 Km

Auto cutter: 1,500,000 cuts

2) MTBF

360,000 hours

3) MCBF

52,000,000 lines

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1.3.5 Environmental Conditions

- | | | |
|-----------------|------------|--|
| 1) Temperature: | Operating: | 5° to 45°C (41° to 113°F) |
| | Storage: | -10° to 50°C (14° to 122°F) (except for paper) |
| 2) Humidity: | Operating: | 10 to 90% RH |
| | Storage: | 10 to 90% RH (except for paper) |

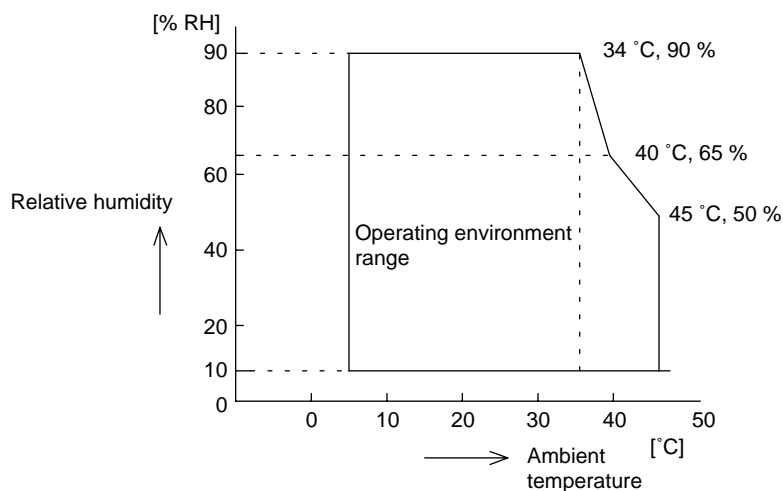


Figure 1.3.1 Operating Temperature and Humidity Range

- 3) Vibration resistance: When Packed: Frequency: 5 to 55 Hz
Acceleration: 2 G
Sweep: 10 minutes (half cycle)
Duration: 1 hour
Directions: x, y, and z


No external or internal damage should be found after the vibration test, and the unit should operate normally.

- | | | | |
|-----------------------|--------------|-------------|-----------------------------------|
| 4) Impact resistance: | When Packed: | Package: | EPSON standard package |
| | | Height: | 50 cm (19.69") |
| | | Directions: | 1 corner, 3 edges, and 6 surfaces |

No external or internal damage should be found after the drop test, and the unit should operate normally.

- When unpacked: Height: 5 cm (1.97")
- Directions: Lift one edge and release it (for all 4 edges).

When the printer is not printing, no external or internal damage should be found after the drop test.

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- 5) Acoustic noise(Operating):
Receipt:

When using auto cutter:
Approximately 52 dB (Bystander position)
When not using auto cutter:
Approximately 45 dB (Bystander position)

Slip: Approximately 65 dB (Bystander position)

1.3.6 Installation

The TM-H5000II series printer must be installed horizontally.

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			NEXT 19	SHEET 18

2. CONFIGURATION

2.1 Interface

2.1.1 RS-232 serial interface

2.1.1.1 Specifications

Data transmission:	Serial
Synchronization:	Asynchronous
Handshaking:	DTR/DSR or XON/XOFF control
Signal levels:	MARK = -3 to -15 V: Logic "1" SPACE = +3 to +15 V: Logic "0"
Stop bits:	1 or more
Connector (printer side):	Female DSUB-25 pin connector

The data word length, baud rate, and parity depend on the DIP switch settings. (Refer to Section 3.3.3.) The stop bit for the printer side is fixed to 1.

2.1.1.2 Switching between on-line and off-line

The printer does not have an on-line/off-line switch. The printer goes off-line:

- Between when the power is turned on (including reset using the interface) and when the printer is ready to receive data.
- During the self-test.
- When the cover is open (the cover for the paper sheet selected by **ESC c 0**).
- During paper feeding using the paper feed switch.
- When the printer stops printing due to a paper-end (only when the paper roll is not present).
- When an error has occurred.

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2.1.1.3 Interface connector terminal assignments and signal functions

Interface connector terminal assignments and signal functions are described in Table 2.1.1.

Table 2.1.1 TM-H5000II series Printer Status and Signals

Pin No.	Signal name	Signal direction	Function																																	
1	FG	—	Frame ground																																	
2	TXD	Output	Transmit data																																	
3	RXD	Input	Receive data																																	
4	RTS	Output	DIP SW 2-2 OFF: Same as DTR signal (Pin 20) DIP SW 2-2 ON: Logical product of DTR signals of DM-D and TM (If both are SPACE, the printer can receive data (SPACE).)																																	
6	DSR	Input	This signal indicates whether the host computer can receive data. SPACE indicates that the host computer can receive data, and MARK indicates that the host computer cannot receive data. When DTR/DSR control is selected, the printer transmits data after confirming this signal (except when transmitting data by DLE EOT , and GS a). When XON/XOFF control is selected, the printer does not check this signal. Changing the DIP switch setting enables this signal to be used as a reset signal for the printer (refer to Section 3.3.3). The printer is reset when the signal remains MARK for 1 ms or more.																																	
7	SG	—	Signal ground																																	
20	DTR	Output	1) When DTR/DSR control is selected, this signal indicates whether the printer is busy. SPACE indicates that the printer is ready to receive data, and MARK indicates that the printer is busy. The busy condition can be changed by using DIP SW 2-1 as follows (refer to Section 3.3.3): <table border="1"> <thead> <tr> <th colspan="2"></th><th colspan="2">DIP SW 2-1 status</th></tr> <tr> <th colspan="2">Printer status</th><th>ON</th><th>OFF</th></tr> </thead> <tbody> <tr> <td rowspan="8">OFF-line</td><td>1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.</td><td>BUSY</td><td>BUSY</td></tr> <tr> <td>2. During the self-test.</td><td>BUSY</td><td>BUSY</td></tr> <tr> <td>3. When the cover is open.</td><td>—</td><td>BUSY</td></tr> <tr> <td>4. During paper feeding using the paper feed switch.</td><td>—</td><td>BUSY</td></tr> <tr> <td>5. When the printer stops printing due to a paper-end. (only when the paper roll is not present)</td><td>—</td><td>BUSY</td></tr> <tr> <td>6. During macro executing standby states.</td><td>—</td><td>BUSY</td></tr> <tr> <td>7. When an error has occurred.</td><td>—</td><td>BUSY</td></tr> <tr> <td>8. When the receive buffer becomes full.(*1)</td><td>BUSY</td><td>BUSY</td></tr> </tbody> </table>			DIP SW 2-1 status		Printer status		ON	OFF	OFF-line	1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.	BUSY	BUSY	2. During the self-test.	BUSY	BUSY	3. When the cover is open.	—	BUSY	4. During paper feeding using the paper feed switch.	—	BUSY	5. When the printer stops printing due to a paper-end. (only when the paper roll is not present)	—	BUSY	6. During macro executing standby states.	—	BUSY	7. When an error has occurred.	—	BUSY	8. When the receive buffer becomes full.(*1)	BUSY	BUSY
		DIP SW 2-1 status																																		
Printer status		ON	OFF																																	
OFF-line	1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.	BUSY	BUSY																																	
	2. During the self-test.	BUSY	BUSY																																	
	3. When the cover is open.	—	BUSY																																	
	4. During paper feeding using the paper feed switch.	—	BUSY																																	
	5. When the printer stops printing due to a paper-end. (only when the paper roll is not present)	—	BUSY																																	
	6. During macro executing standby states.	—	BUSY																																	
	7. When an error has occurred.	—	BUSY																																	
	8. When the receive buffer becomes full.(*1)	BUSY	BUSY																																	

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Table 2.1.1 TM-H5000II series Printer Status and Signals (Continued)

Pin number	Signal name	Signal direction	Function
			2) When XON/XOFF control is selected: The signal indicates whether the printer is correctly connected and is ready to receive data. SPACE indicates that the printer is ready to receive data. The signal is always SPACE except in the following cases: <ul style="list-style-type: none"> • During the period from when the power is turned on to when the printer is ready to receive data • During the self-test
25	INIT	Input	Changing the DIP switch setting enables this signal to be used as a reset signal for the printer. The printer is reset when the signal remains SPACE for 1 ms or more.

- NOTES:**
1. When the remaining space in the receive buffer drops to 16 bytes, the printer status becomes "buffer full" and it remains "buffer full" until the space in the receive buffer increases to 26 bytes.
 2. The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

2.1.1.4 XON/XOFF transmit timing

When XON/XOFF control is selected, the printer transmits XON or XOFF signals as follows. Transmit timing differs depending on the DIP SW1-3 setting.

Table 2.1.2 XON/XOFF Transmit Timing

	Printer status	DIP SW 1-3 status	
		ON	OFF
XON transmission	① When the printer goes on-line after turning on the power (or reset using interface)	Transmit	Transmit
	② When the receive buffer is released from the buffer full state	Transmit	Transmit
	③ When the printer switches from off-line to on-line	—	Transmit
	④ When the printer recovers from an error using the DLE ENQ 1 or DLE ENQ 2 commands	—	Transmit
XOFF Transmission	⑤ When the receive buffer becomes full	Transmit	Transmit
	⑥ When the printer switches from on-line to off-line	—	Transmit

- NOTES:**
- The XON code is <11>H and the XOFF code is <13>H.
 - In case ③, XON is not transmitted when the receive buffer is full.
 - In case ⑥, XOFF is not transmitted when the receive buffer is full.

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- When the DIP SW 2-1 is set to OFF, XON is not transmitted if the printer is in off-line state in case ②.

2.1.1.5 Notes on setting DIP switch 2-1 to ON

- 1) The printer mechanism stops but does not become busy when: an error has occurred, the cover is open, printing stops due to a paper-end, or paper is fed using the paper feed button.
- 2) When setting DIP switch 2-1 to ON to enable handshaking with the printer, be sure to check the printer status using the **GS a** command and the ASB function. In this setting, the default value of *n* for **GS a** is 2. The printer automatically transmits the printer status, depending on on-line/off-line changes.
- 3) When using **DLE EOT**, **DLE ENQ**, and **DLE DC4** be sure that the receive buffer does not become full.
 - When using a host that cannot transmit data when the printer is busy:
If an error has occurred, **DLE EOT**, **DLE ENQ**, and **DLE DC4** cannot be used when the printer is busy due to a receive buffer-full state.
 - When using a host that can transmit data when the printer is busy:
When the receive buffer becomes full while transmitting bit-image data, **DLE EOT** or **DLE ENQ**, and **DLE DC4** used while sending the bit-image data is processed as bit-image data. The data transmitted when the receive buffer is full may be lost.
Example: Check the printer status using **GS l** or **GS r** after transmitting each line of data and use the 4K byte receive buffer. Transmit one line of data so that the receive buffer does not become full.

2.1.1.6 Notes on Resetting the Printer Using the Interface

The printer can be reset using interface pins 6 and 25 by changing the DIP switch setting (refer to Section 3.3.3, DIP switch 2).

Table 2.1.3 Reset Switching

Signal Line	DIP Switch	Reset Condition
Pin 6 (DSR)	DSW 2-7: ON	MARK level input
Pin 25 (INIT)	DSW 2-8: ON	SPACE or TTL-HIGH level input

To reset the printer, the following requirements must be satisfied.

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- DC characteristics:

Table 2.1.4 Reset DC Characteristics

		Pin 6 (DSR)	Pin 25 (INIT)
Input HIGH voltage	V_{IH}	+3 to +15 V	+2 to +15 V
Input LOW voltage	V_{IL}	-15 to + -3 V	-15 to + 0.8 V
Input HIGH current:	I_{IH}	5 mA (maximum)	1 mA (maximum)
Input LOW current:	I_{IL}	-5.3 mA (maximum)	-2 mA (maximum)
Input impedance:	R_{IN}	3 K Ω (minimum)	

- AC characteristics:

Minimum reset pulse width: TRS 1 msec (minimum)

- When using pin 6 (DSR) (DIP switch 2-7 is ON):



Figure 2.1.1 Minimum Reset Pulse Width (pin 6)

- When using pin 25 (INIT) (DIP switch 2-8 is ON):

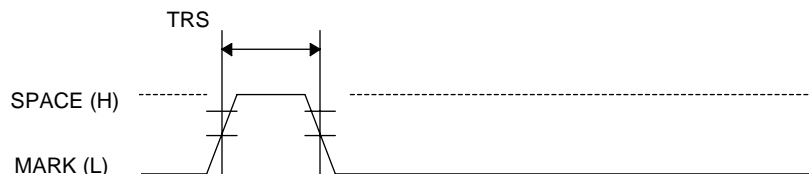


Figure 2.1.2 Minimum Reset Pulse Width (pin 25)

- NOTES:**
- When a signal that does not satisfy the requirements above is input, printer operation is not guaranteed. When a signal is input to pin 25 (INIT) at the TTL level, the requirements above must also be satisfied. Although a signal is input to pin 6 (DSR) at the TTL level, according to the DC characteristics described above, the operation is not guaranteed and pin 6 cannot be controlled.
 - When pin 6 (DSR) and pin 25 (INIT) are open, the printer is operating.

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2.1.2 IEEE 1284 Bidirectional Parallel Interface(Parallel Interface Specifications)

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2.1.2.1 Compatibility Mode

(Data Transmission from Host to Printer: Centronics compatible)

(1) Specifications

Data transmission:	8-bit Parallel
Synchronization:	Externally supplied nStrobe signals
Handshaking:	nAck and Busy signals
Signal levels:	TTL compatible
Connector:	57RE-40360-830B (DDK) or equivalent (IEEE 1284 Type B)

Reverse communication (Printer Host): Nibble or Byte Mode

(2) Switching between on-line and off-line

The printer is not equipped with any on-line/off-line switch. The printer is placed into off-line status in either of the followings:

- When the power is turned on or until the printer becomes ready for data transmission after it is initialized by the reset signal (nInit) from the interface.
- During the self-test.
- When the cover is open.
- During paper feeding using the FORWARD/REVERSE button.
- When the printer stops printing due to a paper-end (only when the paper roll is not present).
- During macro executing standby status.
- When a temporary abnormality occurs in the power supply voltage.
- When an error has occurred.

2.1.2.2 Reverse Mode (Data Transmission from Printer to Host)

The STATUS data transmission from the printer to the host is proceeded in the Nibble or Byte mode.

- Description

This mode allows data transmission from the asynchronous printer under the control of the host.

Data transmissions in the Nibble Mode are made via the existing control lines in units of four bits (Nibble). In the Byte Mode, data transmissions are proceeded by making the eight-bits data lines bidirectional.

The both modes fail to be proceeded concurrently with the Compatibility Mode, thereby causing half duplex transmission.

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			NEXT 25	SHEET 24

2.1.2.3 Interface Pin Assignments for Each Mode

Pin	Source	Compatibility Mode	Nibble Mode	Byte Mode
1	Host	nStrobe	HostClk	HostClk
2	Host/Ptr	Data0(LSB)	Data0(LSB)	Data0(LSB)
3	Host/Ptr	Data1	Data1	Data1
4	Host/Ptr	Data2	Data2	Data2
5	Host/Ptr	Data3	Data3	Data3
6	Host/Ptr	Data4	Data4	Data4
7	Host/Ptr	Data5	Data5	Data5
8	Host/Ptr	Data6	Data6	Data6
9	Host/Ptr	Data7(MSB)	Data7(MSB)	Data7(MSB)
10	Printer	nAck	PtrClk	PtrClk
11	Printer	Busy	PtrBusy/Data3, 7	PtrBusy
12	Printer	PError	AckDataReq/Data2, 6	AckDataReq
13	Printer	Select	Xflag/Data1, 5	Xflag
14	Hostr	nAutoFd	HostBusy	HostBusy
15		NC	ND	ND
16		GND	GND	GND
17		FG	FG	FG
18	Printer	Logic-H	Logic-H	Logic-H
19		GND	GND	GND
20		GND	GND	GND
21		GND	GND	GND
22		GND	GND	GND
23		GND	GND	GND
24		GND	GND	GND
25		GND	GND	GND
26		GND	GND	GND
27		GND	GND	GND
28		GND	GND	GND
29		GND	GND	GND
30		GND	GND	GND
31	Host	nInit	nInit	nInit
32	Printer	nFault	nDataAvail/Data0, 4	nDataAvail
33		GND	ND	ND
34	Printer	DK_STATUS	ND	ND
35	Printer	+5V	ND	ND
36	Host	nSelectIn	1284-Active	1284-Active

* NC: No connect
 ND: Not Defined

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NOTE: 1. A prefix “n” to signal names refers to “L” active signals. To the host provided with none of the signal lines listed above, both-way communication fails.

2. For interfacing, signal lines shall use twisted pair cables with the return sides connected to signal ground level.

3. Interfacing conditions shall be all based on the TTL level to meet the characteristics described below. In addition, both rise time and fall time of each signal shall be 0.5μs or less.

4. Data transmission shall not ignore the signal nAck or Busy. An attempt to transmit data with either signal, nAck or Busy, ignored can cause lost data. (Data transmissions to the printer shall be made after verifying the nAck signal or while the Busy signal is at the “L” level.)

5. Interface cables shall be as minimum required short in length as possible.

*NC: No Connect

ND: Not Defined

6. When the DTR/DSR control is selected, the printer becomes the BUSY state under the following conditions.

	Printer status	DIP SW 2-1 status	
		ON	OFF
Off-line	1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.	BUSY	BUSY
	2. During the self-test.	BUSY	BUSY
	3. When the cover is open.	—	BUSY
	4. During paper feeding using the paper feed switch.	—	BUSY
	5. When the printer stops printing due to a paper-end. (only when the paper roll is not present)	—	BUSY
	6. During macro executing standby status.	—	BUSY
	7. When an error has occurred.	—	BUSY
	8. When the receive buffer becomes full.	BUSY	BUSY

NOTE: When the remaining space in the receive buffer drops to 16 bytes, the printer status becomes “buffer full” and it remains “buffer full” until the space in the receive buffer increases to 26 bytes.

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			NEXT 27	SHEET 26

2.1.2.4 Electrical Characteristics**DC Characteristics (Except Logic-H, +5 V signals)**

Characteristics	Symbol	Specifications		Conditions
		Min	Max	
Output HIGH voltage	V_{OH}	*2.4 V	5.5 V	* $I_{OH}=0.32\text{mA}$
Output LOW voltage	V_{OL}	-0.5 V	*0.4 V	* $I_{OL}=-12\text{mA}$
Output HIGH current	I_{OH}	0.32 V	-	$V_{OH}=0.32\text{V}$
Output LOW current	I_{OL}	-12 V	-	$V_{OL}=0.4\text{V}$
Input HIGH voltage	V_{IH}	2.0 V	-	$V_{IH}=2.0\text{V}$ $V_{IL}=0.8\text{V}$
Input LOW voltage	V_{IL}	-	0.8 V	
Input HIGH current	V_{IH}	-	-0.32 mA	
Input LOW current	V_{IL}	-	12 mA	

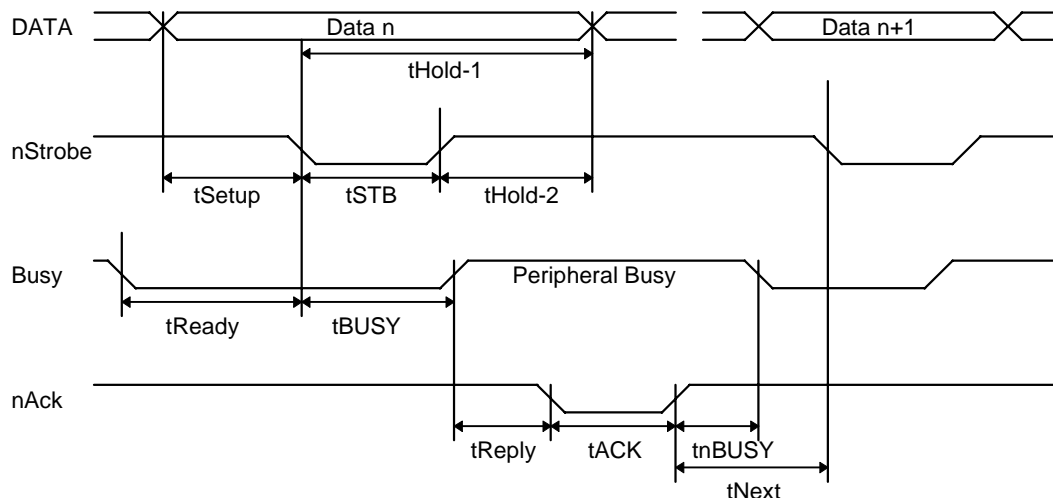
Logic-H Signal Sender Characteristics

Characteristics	Symbol	Specifications		Conditions
		Min	Max	
Output HIGH voltage	V_{OH}	3.0 V	5.5 V	
Output LOW voltage	V_{OL}	-	2.0 V	While the power is OFF

+5 V Signal Sender Characteristics

Characteristics	Symbol	Specifications		Conditions
		Min	Max	
Output HIGH voltage	V_{OH}	*2.4 V	5.5 V	* $I_{OH}=0.32\text{mA}$
Output LOW voltage	V_{OL}	-	- **	While the power is OFF
Output HIGH current	I_{OH}	-	0.32 mA	$V_{OH}=2.4\text{V}$
Output LOW current	I_{OL}	- **	-	While the power is OFF

** No guarantee is offered to V_{OL} and I_{OL} while the power is OFF.



2.1.2.5 Data Receiving Timing (Compatibility Mode)

Characteristics	Symbol	Specifications	
		Min[ns]	Max[ns]
Data Hold Time (host)	tHold-1	--	500
Data Hold Time (printer)	tHold-2	--	--
Data Setup Time	tSetup	--	500
STROBE Pulse Width	tSTB	--	500
READY Cycle Idle Time	tReady	--	--
BUSY Output Delay Time	tBUSY	0	500
Data Processing Time	tReply	0	∞
ACKNLG Pulse Width	tACK	500	10 μ s
BUSY Release Time	tnBUSY	0	∞
ACK Cycle Idle Time	tNEXT	--	0

*The printer latches data at a nStrobe ↓ timing

2.1.2.6 Notes on resetting the printer through the interface

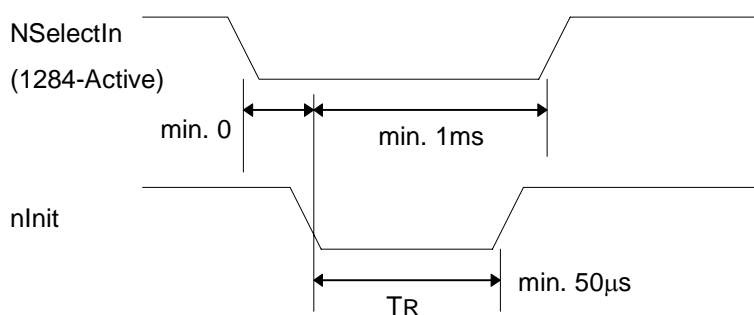
The printer reset is available through the interface nInit signal (#31 pin) by changing the DIP switch setting. (Refer to Table 3.3.5 DIP Switch 2.)

Table 2.1.5 DIP Switch Setting for Printer Reset

Signal Line	DIP Switch	Reset Condition
#31 Pin (nInit)	DSW 2-8: ON	TTL-LOW level input

The printer reset through the nInit signal is only available with the SelectIn(1284-Active) signal at LOW.

To enable the printer reset, the following signal timing shall be satisfied.

Minimum reset pulse width TR: 50 μ s (min)

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2.1.2.7 Reception of status from the printer through the bidirectional parallel interface

In the bidirectional parallel interface specifications, the printer status transmission is available by using the both-way communication facility in the Nibble/Byte Modes in accordance with the IEEE 1284.

In this case, different from in the RS-232 serial interface specifications, the real-time interruptions from the printer to the host are disabled and thus precautions must be taken to the followings.

- 1) Allowable capacity of the printer internal buffer is 99 bytes (except ASB status). The status signals exceeding this capacity will be discarded. To prevent possible loss of status, the host shall be ready for data acceptance (Reverse Mode).
- 2) When ASB is used, the host is preferably in the wait state for data acceptance (Reverse Idle Mode). When this state is not available, the host shall enter the Reverse Mode to always monitor the presence of data.
- 3) When ASB is used, preference shall be given to the ASB status for transmission over the other status signals. Any accumulated ASB status signals left for transmission from the last to the newest ASB status transmission shall be transmitted together at a time as one ASB status showing the presence of change, followed by the latest ASB status.

Example: In the normal (wait) state, the ASB status is configured as follows.

First Status	Second Status	Third Status	Fourth Status
0001 0000	0000 0000	0110 0000	0000 1111

When a sequence of operations are proceeded, the near end is detected and the printer cover is opened, then the printer cover is closed, the following pieces of data are accumulated.

	First Status	Second Status	Third Status	Fourth Status	
①	0001 0000	0000 0000	0110 0011	0000 1111	Near end detection
②	0011 1000	0000 0000	0110 0011	0000 1111	The printer cover is opened.
③	0001 0000	0000 0000	0110 0011	0000 1111	The printer cover is closed.

When the ASB status is received following this, a total of eight (8) bytes of ASB will be transmitted as follows.

Accumulated ASB (①+②+③)

Accumulated ASB(①+②+③) + The latest ASB (③) Fourth Status	First Status	Second Status	Third Status	Fourth Status
	0011 0000	0000 0000	0110 0011	0000 1111
	First Status	Second Status	Third Status	Fourth Status
	0001 0000	0000 0000	0110 0011	0000 1111

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			NEXT 31	SHEET 30

2.1.2.8 Notes on setting DIP switch 2-1 to ON

(1) The printer mechanism stops but does not become BUSY in the following cases:

- When an error occurs.
- When the cover is open.
- When the printer stops printing due to a paper end.
- When paper is fed using the FORWARD/REVERSE button.

(2) When handshaking with the printer while using this switch setting, make sure to monitor the printer with the **GS a** command and the ASB function.

With this switch setting, the default value of the **GS a** command *n* is 2. This automatically transmits the printer status, depending on on-line/off-line changes.

(3) When using the **DLE EOT** or **DLE ENQ** command, make sure that the receive buffer does not become full.

- Notes on using a host that cannot transmit data when the printer is BUSY:

If an error occurs when the receive buffer is full and the printer is BUSY, the **DLE EOT** and **DLE ENQ** commands cannot be used.

- Notes on using a host that can transmit data when the printer is BUSY:

If a **DLE EOT** or **DLE ENQ** command is used while sending bit-image data, and the receive buffer-full state is encountered during transmission of the data, the **DLE EOT** or **DLE ENQ** is processed as bit-image data.

In addition, the data transmitted during the receive buffer-full state may be lost.

Example of use:

Set the receive buffer to 4K bytes, and check the status with **GS r** for each line of printing transmitted. Make sure that the data for printing each line does not cause the printer to enter the receive buffer-full state.

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			NEXT 32	SHEET 31

2.1.3 RS-485 Serial Interface

(RS-485 serial interface specification is a dealer option.)

2.1.3.1 Specifications (RS-485 compatible)

Data transmission:	Serial
Synchronization:	Asynchronous
Handshaking:	Depend on the DIP switch settings (DTR/DSR or XON/XOFF control)
Signal levels:	2.0 V to 5.0 V: Logic 1 0.0 V to 0.8 V: Logic 0
Baud rates:	2400, 4800, 9600, 19200 bps
Data word lengths:	7 or 8 bits
Parity settings:	None, even, odd
Stop bits:	1 or more
Connector (printer side):	Female D-SUB25 pin connector

Notes: The handshaking data word length, baud rate, and parity depend on the DIP switch (Refer to Section 3.3.3)

Data transmitted from the printer has 1 stop bit (fixed).

DR1 > DR2 CS1 > CS2 indicates that:

Channel 1 is high.

Channel 2 is low.

DR1 < DR2 CS1 < CS2 indicates that:

Channel 2 is high.

Channel 1 is low.

Table 2.1.6 Signal Levels and Communication Control Functions

CS1	CS2	Function
H	L	Communication is available
L	H	Communication is not available

If the electric potential of CS1 is higher than that of CS2, the printer is ready for communication (the host is ready to receive data). If the electric potential of CS1 is lower than that of CS2, the printer is not ready for communication (the host is not ready to receive data).

Table 2.1.7 Signal Levels and Communication Control Functions

DR1	DR2	Function
H	L	Communication is available
L	H	Communication is not available

If the electric potential of DR1 is higher than that of DR2, the printer is ready for communication (the host is ready to receive data). If the electric potential of DR1 is lower than that of DR2, the printer is not ready for communication (the host is not ready to receive data).

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			NEXT 33	SHEET 32

2.1.3.2 Switching between on-line and off-line

The printer does not have an on-line/off-line switch.

The printer goes off-line:

- Between when the power is turned on (including reset using the interface) and when the printer is ready to receive data.
- During the self-test.
- When the cover is open.
- During paper feeding using the FORWARD/REVERSE button.
- When the printer stops printing due to paper-end (in cases when an empty paper supply is detected by either paper roll and detector or the paper roll near-end detector with a printing halt feature set enabled due to paper shortage by **ESC c 4**).
- During macro executing standby status.
- When a temporary abnormality occurs in the power supply voltage.
- When an error has occurred.
- When the receive buffer becomes full. (*1)

- *1:
- When the remaining space in the receive buffer drops to 16 bytes, the printer status becomes "buffer full" and it remains "buffer full" until the space in the receive buffer increases to 26 bytes.
 - The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

Refer to 2.1.1 RS-232 Serial interface for notes on setting DIP switch 2-1 to ON.

2.1.3.3 Interface pin assignments

Table 2.1.8 TM-H5000II series Printer Status and Signals

Pin Number	Signal name	Signal direction	Function
1	FG	--	Frame ground
2	SD1	Output	Transmit data
3	SD2	Output	Transmit data
4	RD1	Input	Receive data
5	RD2	Input	Receive data
7	SG	--	Signal ground

EPSON	TITLE TM-H5000II series Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 34	SHEET 33

Table 2.1.8 TM-H5000II series Printer Status and Signals (Continued)

Pin Number	Signal name	Signal direction	Function																															
8	DR1	Output	When DTR/DRS is selected, this signal indicates whether the host computer is BUSY or READY.																															
9	DR2	Output	<p>1)DR1>DR2 indicates that the printer is READY and DR1<DR2 indicates that the printer is BUSY. The BUSY condition can be changed depending on the off-line conditions set by the DIP switches (refer to Section 3.3.3).</p> <p>When the DTR/DSR control is selected, the printer becomes the BUSY state (DR1<DR2) under the following conditions.</p> <table border="1"> <thead> <tr> <th rowspan="2"></th><th rowspan="2">Printer status</th><th colspan="2">DIP SW 2-1 status</th></tr> <tr> <th>ON</th><th>OFF</th></tr> </thead> <tbody> <tr> <td rowspan="8">Off-line</td><td>1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.</td><td>BUSY</td><td>BUSY</td></tr> <tr> <td>2. During the self-test.</td><td>BUSY</td><td>BUSY</td></tr> <tr> <td>3. When the cover is open.</td><td>—</td><td>BUSY</td></tr> <tr> <td>4. During paper feeding using the paper feed switch.</td><td>—</td><td>BUSY</td></tr> <tr> <td>5. When the printer stops printing due to a paper-end. (only when the paper roll is not present)</td><td>—</td><td>BUSY</td></tr> <tr> <td>6. During macro executing standby status.</td><td>—</td><td>BUSY</td></tr> <tr> <td>7. When an error has occurred.</td><td>—</td><td>BUSY</td></tr> <tr> <td>8. When the receive buffer becomes full. (*1)</td><td>BUSY</td><td>BUSY</td></tr> </tbody> </table> <p>2)When XON/XOFF control is selected: The signal indicates whether the printer is correctly connected and is ready to receive data. SPACE indicates that the printer is ready to receive data. The signal is always DR1>DR2 (READY) indicates that the printer is ready to receive data. The signal is always DR1>DR2 except in the following cases:</p> <ul style="list-style-type: none"> • During the period from when the power is turned on to when the printer is ready to receive data • During the self-test <p>This signal indicates whether the host computer is BUSY or READY.</p> <p>CS1>CS2 indicates that the printer is READY and CS1<CS2 indicates that the printer is BUSY.</p>		Printer status	DIP SW 2-1 status		ON	OFF	Off-line	1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.	BUSY	BUSY	2. During the self-test.	BUSY	BUSY	3. When the cover is open.	—	BUSY	4. During paper feeding using the paper feed switch.	—	BUSY	5. When the printer stops printing due to a paper-end. (only when the paper roll is not present)	—	BUSY	6. During macro executing standby status.	—	BUSY	7. When an error has occurred.	—	BUSY	8. When the receive buffer becomes full. (*1)	BUSY	BUSY
	Printer status	DIP SW 2-1 status																																
		ON	OFF																															
Off-line	1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.	BUSY	BUSY																															
	2. During the self-test.	BUSY	BUSY																															
	3. When the cover is open.	—	BUSY																															
	4. During paper feeding using the paper feed switch.	—	BUSY																															
	5. When the printer stops printing due to a paper-end. (only when the paper roll is not present)	—	BUSY																															
	6. During macro executing standby status.	—	BUSY																															
	7. When an error has occurred.	—	BUSY																															
	8. When the receive buffer becomes full. (*1)	BUSY	BUSY																															

Table 2.1.8 TM-H5000II series Printer Status and Signals (Continued)

Pin Number	Signal name	Signal direction	Function
10	CS1	Input	1)When DTR>DSR is selected:
11	CS2		The signal is checked and data is transmitted only when the host is ready to receive data (READY) (except for transmitted by DLE EOT or GS a). 2)When XON/XOFF control is selected: Transmits data regardless of the status of this signal.

- NOTES:**
1. When the remaining space in the receive buffer drops to 16 bytes, the printer status becomes “buffer full” and it remains “buffer full” until the space in the receive buffer increases to 26 bytes.
 2. The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

2.1.3.4 XON/XOFF transmit timing

Refer to Section 2.1.1.4.

For the DIP switch settings of the off-line status, refer to Section 3.3.3

2.1.3.5 Data format when using RS-485

Transmission data (8bits, none parity)

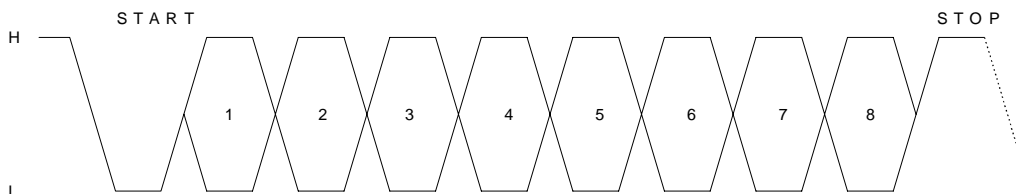


Figure 2.1.5 RS-485 Communication data format

“H” indicates

<Printer transmission data> SD1<SD2

<Printer reception data> RD1<RD2

“L” indicates:

<Printer transmission data> SD1<SD2

<Printer reception data> RD1<RD2

The transmission data is H = 1, L = 0

NOTE: This format is used when the UART for RS-232 is connected to the RS-485 driver.

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Table 2.1.11 Printer Reception Data Level

DR1	DR2	Read data
H	L	Receiving data line is low level
L	H	Receiving data line is high level

Table 2.1.12 Printer Transmission Data Level

SD1	SD2	Send data
H	L	Sending data line is low level
L	H	Sending data line is high level

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2.2 Connectors

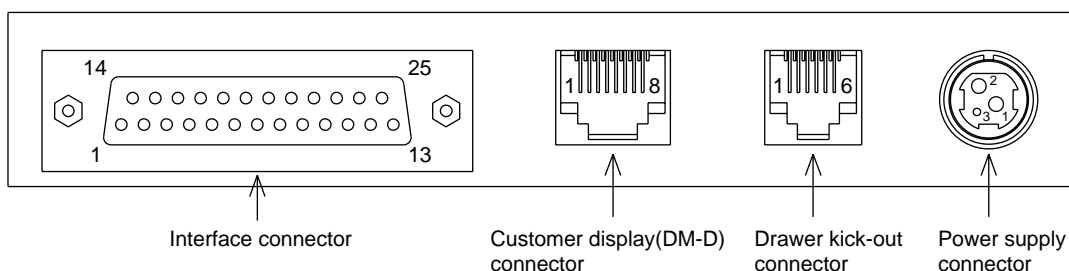


Figure 2.2.1 Serial Interface Connector Panel External Appearance

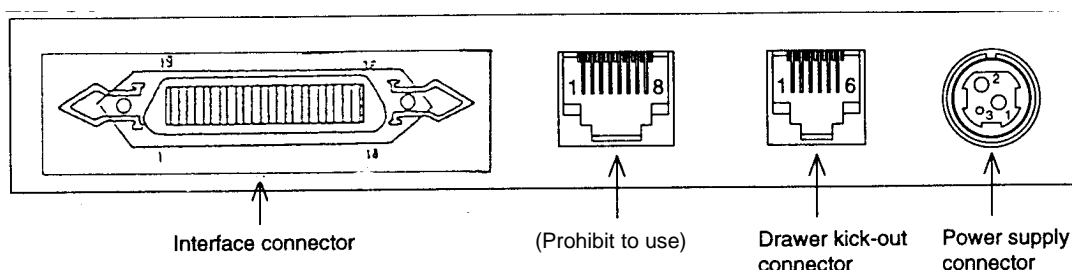


Figure 2.2.2 Parallel Interface Connector Panel External Appearance

2.2.1 Interface Connectors

Refer to Section 2.1, Interface.

2.2.2 Power Supply Connector

This connector is used to connect the printer to an external power source.

- 1) Pin assignments: Refer to Table 2.2.1.
- 2) Connector model: Printer side: Hoshiden TCS7960-532010 or equivalent
User side: Hoshiden TCP8927-631100 or equivalent
Hoshiden TCP8927-531100 or equivalent

Table 2.2.1 Power Supply Connector Pin Assignments

Pin Number	Signal Name
1	+24 VDC
2	GND
3	NC
Shell	Frame GND

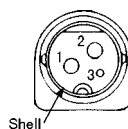


Figure 2.2.3 Power Supply Connector

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2.2.3 Drawer Kick-out Connector (Modular Connector)

The pulse specified by **ESC p** or **DLE DC4** is output to this connector. The host can confirm the status of the input signal by using the **DLE EOT**, **GS r**, or **GS a** (ASB) commands.

- 1) Pin assignments: Refer to Table 2.2.2
- 2) Connector model:

Printer side:	MOLEX 52065-6615 or equivalent
User side:	6-position 6-contact (RJ12 telephone jack)

Table 2.2.2 Drawer Kick-out Connector Pin Assignments

Pin Number	Signal Name	Direction
1	Frame GND	—
2	Drawer Kick-out drive signal 1	Output
3	Drawer open/close signal	Input
4	+24 V	—
5	Drawer Kick-out drive signal 2	Output
6	Signal GND	—

+24 V is output through pin 4 when the power is turned on. However, pin 4 must be used only for the drawer.

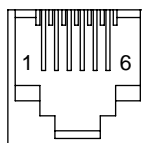


Figure 2.2.4 Drawer Kick-out Connector

- 3) Drawer kick-out drive signal

Output signal:	Output voltage: Approximately 24 V
	Output current: 1A or less

CAUTION: To avoid an overcurrent, the resistance of the drawer kick-out solenoid must be 24 Ω or more.

Output waveform:	Outputs the waveforms in Figure 2.2.5 to the points A and B in Figure 2.2.6.
	$t1$ (ON time) and $t2$ (OFF time) are specified by ESC p or DLE DC4 .

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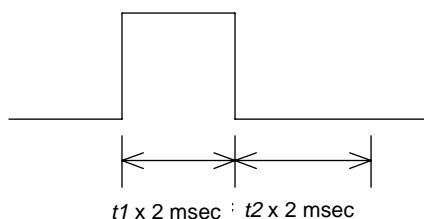


Figure 2.2.5 Drawer Kick-out Drive Signal Output Waveform

4) Drawer open/close signal

Input signal level (connector pin 3): "L" = 0 to 0.8 V

"H" = 2 to 5 V

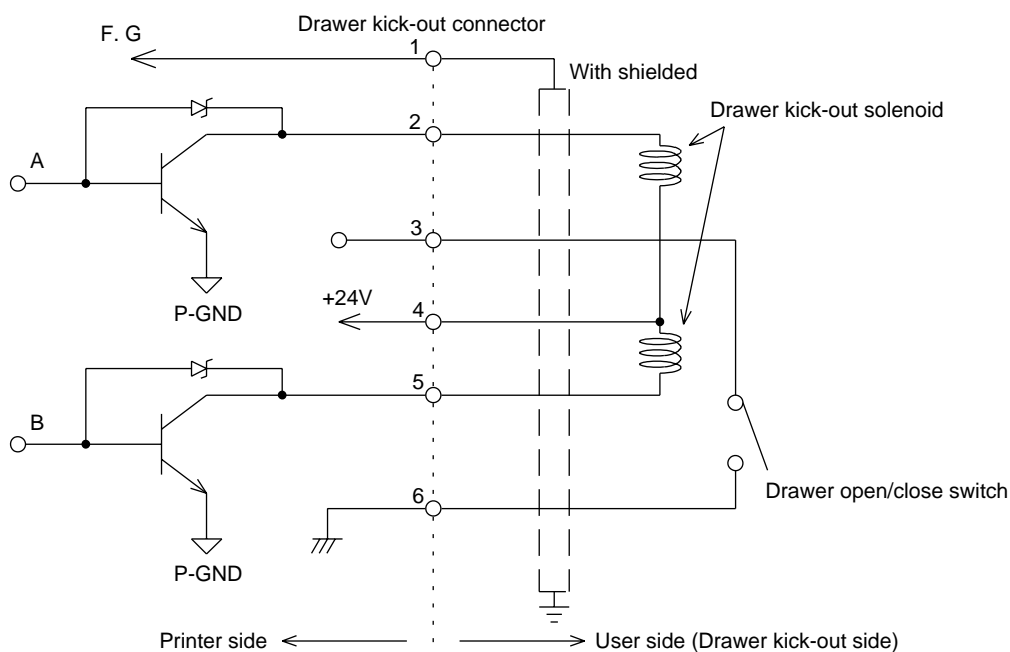


Figure 2.2.6 Drawer Circuitry

- NOTES:**
1. Two driver transistors cannot be energized simultaneously.
 2. The driver must not be energized continuously.
 3. Be sure to use the printer power supply (connector pin 4) for the drawer power source.
 4. The resistance of the drawer kick-out solenoid must not be less than the specified. Otherwise, an overcurrent could damage the solenoid.

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2.2.4 Customer Display Connector (Available only for serial interface model)

1) Model:

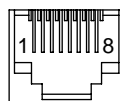
Receptacle: MOLEX 52065-8845 or equivalent

2) Pin assignments:

Table 2.2.3 Customer Display Connector Pin Assignments

Pin Number	Signal Name	Direction
1	FG	—
2	N.C.	—
3	TXD	Output
4	DTR	Output
5	DSR	Input
6	SG	—
7	+24	—
8	PG	—

+24 V is always output through pin 7. The driving capability is 350 mA or less. Be sure not to use customer displays other than Seiko Epson DM-D series.

**Figure 2.2.7 DM-D Connector**

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3. FUNCTIONS

3.1 Command List

- ① The executing command which is executed when a paper roll is selected as the print sheet by **ESC c 0** or the setting command which affects printing or operating a paper roll.
- ② The executing command which is executed when a slip is selected as the print sheet by **ESC c 0** or the setting command which affects printing or operating a slip.
- ③ The command which changes the setting of the print sheet by **ESC c 1**.

○ indicates the corresponding command.

Command	Name	Command Classification				
		Executing		Setting		
		①	②	①	②	③
HT	Horizontal tab	○	○			
LF	Print and line feed	○	○			
FF	Print and eject slip paper (in standard mode)		○			
	Print and return to standard mode (in page mode)	○				
CR	Print and carriage return	○	○			
CAN	Cancel print data in page mode	○				
DLE EOT	Real-time status transmission	○	○			
DLE ENQ	Real-time request to printer	○	○			
DLE DC4	Generate pulse at real time	○		○	○	
ESC FF	Print data in page mode	○				
ESC SP	Set right-side character spacing			○	○	
ESC !	Select print mode(s)			○	○	
ESC \$	Set absolute print position	○	○			
ESC %	Select/cancel user-defined character set			○	○	
ESC &	Define user-defined characters			○	○	○
ESC *	Select bit-image mode	○	○			
ESC -	Turn underline mode on/off			○	○	
ESC 2	Select default line spacing			○	○	○
ESC 3	Set line spacing			○	○	○
ESC <	Return home		○			
ESC =	Select peripheral device			○	○	
ESC ?	Cancel user-defined characters			○	○	○
ESC @	Initialize printer	○	○	○	○	

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Command	Name	Command Classification				
		Executing		Setting		
		①	②	①	②	③
ESC C	Set slip paper eject length				○	
ESC D	Set horizontal tab positions			○	○	
ESC E	Turn emphasized mode on/off			○	○	
ESC F	Set/cancel slip paper reverse eject				○	
ESC G	Turn double-strike mode on/off			○	○	
ESC J	Print and feed paper	○	○			
ESC K	Print and reverse feed		○			
ESC L	Select page mode	○				
ESC M	Select character font			○	○	
ESC R	Select an international character set			○	○	
ESC S	Select standard mode	○				
ESC T	Select print direction in page mode			○		
ESC U	Turn unidirectional printing mode on/off				○	
ESC V	Turn 90° clockwise rotation mode on/off			○		
ESC W	Set printing area in page mode			○		
ESC \	Set relative print position	○	○			
ESC a	Select justification			○	○	
ESC c 0	Select print paper(s)	○	○	○	○	
ESC c 1	Select paper types for command settings			○	○	
ESC c 3	Select paper sensor(s) to output paper-end signals			○	○	
ESC c 4	Select paper sensor(s) to stop printing			○	○	
ESC c 5	Enable/disable panel buttons			○	○	
ESC d	Print and feed <i>n</i> lines	○	○			
ESC e	Print and reverse feed <i>n</i> lines		○			
ESC f	Set slip paper wait time				○	
ESC p	General pulse	○	○			
ESC q	Release	○	○			
ESC t	Select character code table			○	○	
ESC {	Turn upside-down printing mode on/off			○	○	
FS g 1	Write to user NV memory			○	○	
FS g 2	Read from user NV memory	○	○			
FS p	Print NV bit image	○				

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Command	Name	Command Classification				
		Executing		Setting		
		①	②	①	②	③
FS q	Define NV bit image	○	○	○		
GS !	Select character size			○	○	
GS \$	Set absolute vertical print position in page mode	○				
GS *	Define user-defined bit image			○	○	○
GS (A	Execute test print	○	○			
GS /	Print user-defined bit image	○	○			
GS :	Start/end macro definition	○	○	○	○	
GS B	Turn white/black reverse printing mode on/off			○		
GS H	Select printing position of HRI characters			○		
GS I	Transmit printer ID	○	○			
GS L	Set left margin			○	○	○
GS P	Set horizontal and vertical motion units			○	○	○
GS V	Cut paper	○				
GS W	Set printing area width			○	○	○
GS \	Set relative vertical print position in page mode	○				
GS ^	Execute macro	○	○			
GS a	Enable/disable Automatic Status Back (ASB)	○	○	○	○	
GS b	Turn smoothing mode on/off			○		
GS f	Select font for HRI characters			○		
GS g 0	Initialize maintenance counter			○	○	
GS g 2	Transmit maintenance counter	○	○			
GS h	Set bar code height			○		
GS k	Print bar code	○				
GS r	Transmit status	○	○			
GS v 0	Print raster bit image	○				
GS w	Set bar code width			○		

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Kanji command list (when the TM-H5000IIM/TM-H5000IIPM is used)

Command	Name	Command Classification				
		Executing		Setting		
		①	②	①	②	③
FS !	Set print mode(s) for Kanji characters			○	○	
FS &	Select Kanji character mode			○	○	
FS -	Turn underline mode on/off for Kanji characters			○	○	
FS .	Cancel Kanji character mode			○	○	
FS 2	Define user-defined Kanji characters			○	○	○
FS C	Select Kanji character code system			○	○	
FS S	Set left- and right-side Kanji character spacing			○	○	
FS W	Turn quadruple-size mode on/off for Kanji characters			○	○	

MICR command lists (when the printer is used with the MICR reader)

Command	Name	Command Classification				
		Executing		Setting		
		①	②	①	②	③
DLE EOT BS	Real-time MICR status transmission	○	○			
FS a 0	Read check paper	○	○			
FS a 1	Load check paper to print starting position	○	○			
FS a 2	Eject check paper	○	○			
FS b	Request retransmission of check paper reading result	○	○			
FS c	MICR mechanism cleaning	○	○			

<Fundamental calculation pitch>


The fundamental calculation pitch is used to set the minimum pitch by software instead of by mechanical pitch. Using the fundamental calculation pitch minimizes dependence on the mechanical pitch for setting, e.g., the paper feed amount, and enables the printing position to be set in inches. (Refer to **GS P**.)

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3.2.2 Page 1 (Katakana)


	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	ー	上	SP	ー	タ	ミ	二	×
		128	144	160	176	192	208	224	240
1	0001	ー	下	。	ア	チ	ム	ト	円
		129	145	161	177	193	209	225	241
2	0010	ー	上	「	イ	ツ	メ	キ	年
		130	146	162	178	194	210	226	242
3	0011	ー	下	」	ウ	テ	モ	コ	月
		131	147	163	179	195	211	227	243
4	0100	ー	上	、	エ	ト	ヤ	▲	日
		132	148	164	180	196	212	228	244
5	0101	ー	下	・	オ	ナ	ユ	▼	時
		133	149	165	181	197	213	229	245
6	0110	ー	上	ヲ	カ	ニ	ヨ	▼	分
		134	150	166	182	198	214	230	246
7	0111	ー	下	ア	キ	ヌ	ラ	▼	秒
		135	151	167	183	199	215	231	247
8	1000	ー	上	イ	ク	ネ	リ	♠	〒
		136	152	168	184	200	216	232	248
9	1001	ー	下	ウ	ケ	ノ	ル	♥	市
		137	153	169	185	201	217	233	249
A	1010	ー	上	エ	コ	ハ	レ	♦	区
		138	154	170	186	202	218	234	250
B	1011	ー	下	オ	サ	ヒ	ロ	♣	町
		139	155	171	187	203	219	235	251
C	1100	ー	上	ヤ	シ	フ	ワ	●	村
		140	156	172	188	204	220	236	252
D	1101	ー	下	ユ	ス	ヘ	ン	○	人
		141	157	173	189	205	221	237	253
E	1110	ー	上	ヨ	セ	ホ	・	/	罫
		142	158	174	190	206	222	238	254
F	1111	ー	下	ッ	ソ	マ	・	\	SP
		143	159	175	191	207	223	239	255

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3.2.3 Page 2 (PC850: Multilingual)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	176	192	ð 208	Ó 224	— 240
1	0001	ü 129	æ 145	í 161	177	193	Ð 209	ß 225	± 241
2	0010	é 130	Æ 146	ó 162	178	194	Ê 210	Ô 226	— 242
3	0011	â 131	ô 147	ú 163	179	195	Ë 211	Ò 227	$\frac{3}{4}$ 243
4	0100	ä 132	ö 148	ñ 164	180	196	È 212	Ö 228	¶ 244
5	0101	à 133	ò 149	Ñ 165	À 181	197	É 213	Ø 229	§ 245
6	0110	å 134	û 150	ä 166	Á 182	198	Í 214	µ 230	÷ 246
7	0111	ç 135	ù 151	Ö 167	À 183	199	Î 215	þ 231	247
8	1000	ê 136	ÿ 152	¿ 168	© 184	200	Ï 216	ð 232	° 248
9	1001	ë 137	ÿ 153	® 169	185	201	217	Ú 233	249
A	1010	è 138	Ü 154	170	186	202	218	Û 234	· 250
B	1011	ï 139	ø 155	$\frac{1}{2}$ 171	187	203	219	Ü 235	$\frac{1}{4}$ 251
C	1100	î 140	£ 156	$\frac{1}{4}$ 172	188	204	220	Ý 236	$\frac{3}{8}$ 252
D	1101	ì 141	Ø 157	í 173	189	205	221	Ý 237	$\frac{2}{3}$ 253
E	1110	Ä 142	× 158	« 174	190	206	222	238	254
F	1111	Å 143	ƒ 159	» 175	191	207	223	239	SP 255

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3.2.4 Page 3 (PC860: Portuguese)

	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	≡
		128	144	160	176	192	208	224	240
1	0001	ü	À	Í	⌘	⌘	⌘	β	±
		129	145	161	177	193	209	225	241
2	0010	é	È	Ó	⌘	⌘	⌘	Γ	≥
		130	146	162	178	194	210	226	242
3	0011	â	ô	ú	⌘	⌘	⌘	π	≤
		131	147	163	179	195	211	227	243
4	0100	ã	õ	ñ	⌘	⌘	⌘	Σ	∫
		132	148	164	180	196	212	228	244
5	0101	à	ò	Ñ	⌘	⌘	⌘	σ	∫
		133	149	165	181	197	213	229	245
6	0110	Á	Ú	à	⌘	⌘	⌘	μ	÷
		134	150	166	182	198	214	230	246
7	0111	ç	ù	ó	⌘	⌘	⌘	τ	≈
		135	151	167	183	199	215	231	247
8	1000	ê	î	ô	⌘	⌘	⌘	Φ	°
		136	152	168	184	200	216	232	248
9	1001	Ê	Ï	Ô	⌘	⌘	⌘	Θ	•
		137	153	169	185	201	217	233	249
A	1010	è	Û	⌘	⌘	⌘	⌘	Ω	•
		138	154	170	186	202	218	234	250
B	1011	í	Φ	½	⌘	⌘	⌘	δ	√
		139	155	171	187	203	219	235	251
C	1100	Ô	£	¼	⌘	⌘	⌘	∞	n
		140	156	172	188	204	220	236	252
D	1101	ì	Û	ì	⌘	⌘	⌘	∅	²
		141	157	173	189	205	221	237	253
E	1110	Ä	Þ	«	⌘	⌘	⌘	€	■
		142	158	174	190	206	222	238	254
F	1111	Â	Ó	»	⌘	⌘	⌘	∩	SP
		143	159	175	191	207	223	239	255

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3.2.5 Page 4 (PC863: Canadian-French)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	Ì 160	Ñ 176	Ò 192	Ó 208	Ô 224	Õ 240
1	0001	ü 129	Ê 145	Í 161	Î 177	Ï 193	Ð 209	Ñ 225	Ò 241
2	0010	é 130	Ê 146	Ó 162	Ô 178	Õ 194	Ö 210	× 226	÷ 242
3	0011	â 131	ô 147	ú 163	ÿ 179	ÿ 195	ÿ 211	ÿ 227	ÿ 243
4	0100	Â 132	Ë 148	Ï 164	Ð 180	Ñ 196	Ò 212	Ó 228	Ô 244
5	0101	à 133	Ï 149	ÿ 165	ÿ 181	ÿ 197	ÿ 213	ÿ 229	ÿ 245
6	0110	ñ 134	û 150	ÿ 166	ÿ 182	ÿ 198	ÿ 214	ÿ 230	ÿ 246
7	0111	ç 135	ù 151	ÿ 167	ÿ 183	ÿ 199	ÿ 215	ÿ 231	ÿ 247
8	1000	ê 136	ÿ 152	ÿ 168	ÿ 184	ÿ 200	ÿ 216	ÿ 232	ÿ 248
9	1001	ë 137	ÿ 153	ÿ 169	ÿ 185	ÿ 201	ÿ 217	ÿ 233	ÿ 249
A	1010	è 138	ÿ 154	ÿ 170	ÿ 186	ÿ 202	ÿ 218	ÿ 234	ÿ 250
B	1011	ï 139	Φ 155	½ 171	ÿ 187	ÿ 203	ÿ 219	ÿ 235	ÿ 251
C	1100	î 140	£ 156	¼ 172	ÿ 188	ÿ 204	ÿ 220	ÿ 236	ÿ 252
D	1101	ÿ 141	ÿ 157	¾ 173	ÿ 189	ÿ 205	ÿ 221	ÿ 237	ÿ 253
E	1110	À 142	ÿ 158	« 174	ÿ 190	ÿ 206	ÿ 222	ÿ 238	ÿ 254
F	1111	§ 143	f 159	» 175	ÿ 191	ÿ 207	ÿ 223	ÿ 239	SP 255

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3.2.6 Page 5 (PC865: Nordic)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▒ 176	Ł 192	⌚ 208	α 224	≡ 240
1	0001	ü 129	æ 145	í 161	▒ 177	⌚ 193	⌚ 209	β 225	± 241
2	0010	é 130	Æ 146	ó 162	▒ 178	⌚ 194	⌚ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	▒ 179	⌚ 195	⌚ 211	π 227	≤ 243
4	0100	ä 132	ö 148	ñ 164	▒ 180	⌚ 196	⌚ 212	Σ 228	∫ 244
5	0101	à 133	ò 149	Ñ 165	▒ 181	⌚ 197	⌚ 213	σ 229	∫ 245
6	0110	å 134	û 150	ä 166	▒ 182	⌚ 198	⌚ 214	μ 230	÷ 246
7	0111	ç 135	ù 151	ó 167	▒ 183	⌚ 199	⌚ 215	τ 231	≈ 247
8	1000	ê 136	ÿ 152	¿ 168	▒ 184	⌚ 200	⌚ 216	Φ 232	° 248
9	1001	ë 137	Ö 153	⌚ 169	▒ 185	⌚ 201	⌚ 217	θ 233	• 249
A	1010	è 138	Û 154	⌚ 170	▒ 186	⌚ 202	⌚ 218	Ω 234	· 250
B	1011	ï 139	ø 155	½ 171	▒ 187	⌚ 203	▒ 219	δ 235	√ 251
C	1100	î 140	£ 156	¼ 172	▒ 188	⌚ 204	▒ 220	∞ 236	n 252
D	1101	ì 141	Ø 157	ı 173	▒ 189	⌚ 205	▒ 221	ø 237	² 253
E	1110	Ä 142	Þ 158	« 174	▒ 190	⌚ 206	▒ 222	€ 238	■ 254
F	1111	Å 143	ƒ 159	Ɔ 175	▒ 191	⌚ 207	▒ 223	∩ 239	SP 255

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3.2.7 Page 6 (Hiragana) (Available on TM-H5000IIM/TM-H5000IIPM)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	礎 128	本 144	SP 160	一 176	た 192	み 208	過 224	換 240
1	0001	129	145	。 161	あ 177	ち 193	む 209	225	241
2	0010	除 130	荷 146	「 162	い 178	つ 194	め 210	足 226	攻 242
3	0011	131	147	」 163	う 179	て 195	も 211	227	243
4	0100	定 132	特 148	、 164	え 180	と 196	や 212	利 228	産 244
5	0101	133	149	・ 165	お 181	な 197	ゆ 213	229	245
6	0110	信 134	越 150	を 166	か 182	に 198	よ 214	用 230	打 246
7	0111	135	151	あ 167	き 183	ぬ 199	ら 215	231	247
8	1000	緑 136	他 152	い 168	く 184	ね 200	り 216	移 232	納 248
9	1001	137	153	う 169	け 185	の 201	る 217	233	249
A	1010	科 138	社 154	え 170	こ 186	は 202	れ 218	下 234	変 250
B	1011	139	155	お 171	さ 187	ひ 203	ろ 219	235	251
C	1100	目 140	瓶 156	や 172	し 188	ふ 204	わ 220	加 236	誂 252
D	1101	141	157	ゆ 173	す 189	へ 205	ん 221	237	253
E	1110	々 142	奉 158	よ 174	せ 190	ほ 206	・ 222	解 238	件 254
F	1111	143	159	っ 175	そ 191	ま 207	・ 223	239	255

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3.2.8 Page 7 (One-pass printing Kanji characters)

(Available on TM-H5000IIM/TM-H5000IIPM)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	日 128	会 144	水 160	受 176	点 192	課 208	買 224	非 240
1	0001	129	145	161	177	193	209	225	241
2	0010	扱 130	客 146	木 162	前 178	中 194	証 210	号 226	承 242
3	0011	131	147	163	179	195	211	227	243
4	0100	外 132	券 148	土 164	残 180	内 196	組 212	有 228	送 244
5	0101	133	149	165	181	197	213	229	245
6	0110	額 134	回 150	振 166	止 182	部 198	店 214	期 230	一 246
7	0111	135	151	167	183	199	215	231	247
8	1000	割 136	在 152	数 168	純 184	別 200	認 216	限 232	棄 248
9	1001	137	153	169	185	201	217	233	249
A	1010	検 138	算 154	精 170	替 186	戻 202	廃 218	頭 234	累 250
B	1011	139	155	171	187	203	219	235	251
C	1100	高 140	上 156	銭 172	代 188	門 204	両 220	差 236	違 252
D	1101	141	157	173	189	205	221	237	253
E	1110	価 142	火 158	総 174	値 190	料 206	効 222	括 238	番 254
F	1111	143	159	175	191	207	223	239	255

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3.2.9 Page 8 (One-pass printing Kanji characters)

(Available on TM-H5000IIM/TM-H5000IIPM)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	訂 128	計 144	払 160	売 176	名 192	次 208	万 224	室 240
1	0001	129	145	161	177	193	209	225	241
2	0010	正 130	小 146	掛 162	取 178	個 194	不 210	責 226	商 242
3	0011	131	147	163	179	195	211	227	243
4	0100	品 132	金 148	入 164	係 180	領 196	枚 212	終 228	人 244
5	0101	133	149	165	181	197	213	229	245
6	0110	円 134	現 150	貸 166	未 182	収 198	誤 214	了 230	大 246
7	0111	135	151	167	183	199	215	231	247
8	1000	種 136	釣 152	出 168	消 184	予 200	休 216	免 232	安 248
9	1001	137	153	169	185	201	217	233	249
A	1010	担 138	預 154	支 170	費 186	約 202	契 218	伝 234	仕 250
B	1011	139	155	171	187	203	219	235	251
C	1100	当 140	税 156	単 172	年 188	込 204	開 220	自 236	控 252
D	1101	141	157	173	189	205	221	237	253
E	1110	合 142	引 158	返 174	月 190	明 206	閉 222	設 238	基 254
F	1111	143	159	175	191	207	223	239	255

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3.2.10 Page 20 (Thai character code 42)

	8	9	A	B	C	D	E	F
0	ร	๐		ฌ	ย	เ	.	D3
1	๖	๑	ก	ฌ	ร	แ	๖	D+
2	๗	๒	ข	ด	ถ	โ	๗	D๑
3	๘	๓	ค	ต	ล	ใ	+	D-
4	๙	๔	ฆ	ถ	ว	ไ	๙	D๒
5	-	๕	ง	ท	ศ	๗	.	D3
6	๑	๖	จ	ธ	ษ	๗	๑	D+
7	๒	๗	ฉ	น	ส	๑	๒	D-
8	๓	๘	บ	ป	ห	๓	๓	D๒
9	๔	๙	ช	ป	ฬ	๔	๔	D3
A	๕	๐	ฌ	ผ	อ	๕	๕	D+
B	๖	๑	ฌ	ผ	ฮ	๖	๖	D-
C	๗	๒	ฌ	ผ	๗	๗	๗	D๑
D	๘	๓	ฌ	ผ	๘	๘	๘	D๒
E	๙	๔	ฌ	ผ	๙	๙	๙	D3
F	๐	๕	ฌ	ผ	๐	๐	๐	D+

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3.2.11 Page 21 (Thai character code 11)

	8	9	A	B	C	D	E	F
0	๐	๑	๒	๓	๔	๕	๖	๗
1	๘	๙	๐	๑	๒	๓	๔	๕
2	๖	๗	๘	๙	๐	๑	๒	๓
3	๔	๕	๖	๗	๘	๙	๐	๑
4	๒	๓	๔	๕	๖	๗	๘	๙
5	๓	๔	๕	๖	๗	๘	๙	๐
6	๔	๕	๖	๗	๘	๙	๐	๑
7	๕	๖	๗	๘	๙	๐	๑	๒
8	๖	๗	๘	๙	๐	๑	๒	๓
9	๗	๘	๙	๐	๑	๒	๓	๔
A	๘	๙	๐	๑	๒	๓	๔	๕
B	๙	๐	๑	๒	๓	๔	๕	๖
C	๐	๑	๒	๓	๔	๕	๖	๗
D	๑	๒	๓	๔	๕	๖	๗	๘
E	๒	๓	๔	๕	๖	๗	๘	๙
F	๓	๔	๕	๖	๗	๘	๙	๐

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3.2.12 Page 22 (Thai character code 13)

	8	9	A	B	C	D	E	F
0		๒		๓	๔	๕	๖	๗
1	๘	๙	๐	๑	๒	๓	๔	๕
2	๖	๗	๘	๙	๐	๑	๒	๓
3	๔	๕	๖	๗	๘	๙	๐	๑
4	๒		๓	๔	๕	๖	๗	๘
5		๒	๓	๔	๕	๖	๗	๘
6	๐	๑	๒	๓	๔	๕	๖	๗
7	๒	๓	๔	๕	๖	๗	๘	๙
8	๔	๕	๖	๗	๘	๙	๐	๑
9	๖		๗	๘	๙	๐	๑	๒
A		๒	๓	๔	๕	๖	๗	๘
B	๒	๓	๔	๕	๖	๗	๘	๙
C	๓	๔	๕	๖	๗	๘	๙	๐
D	๔	๕	๖	๗	๘	๙	๐	๑
E	๕		๖	๗	๘	๙	๐	๑
F	๖		๗	๘	๙	๐	๑	๒

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3.2.13 Page 23 (Thai character code 14)

	8	9	A	B	C	D	E	F
0	ร	๙		ฐ	ภ	ะ	เ	๐
1	๖	๓	ก	ท	ม	๕	แ	๑
2	๕	๖	ป	ฒ	ย	า	โ	๒
3	๔	๗	บ	ณ	ร	ำ	ใ	๓
4	๓	๘	ค	ด	ถ	๙	ไ	๔
5	๒	๙	ค	ด	ฉ	๙	ำ	๕
6	๑	๙	ฆ	ถ	ภ	๙	ำ	๖
7	๐	๙	ง	ท	ว	๙	๙	๗
8	๙	๙	จ	ฐ	ศ	๙	๙	๘
9	๙	๙	ฉ	น	๙	๙	๙	๙
A	๙	๙	๙	๙	๙	๙	๙	๙
B	๙	๙	๙	๙	๙	๙	๙	๙
C	๙	๙	๙	๙	๙	๙	๙	๙
D	๙	๙	๙	๙	๙	๙	๙	๙
E	๙	๙	๙	๙	๙	๙	๙	๙
F	๙	๙	๙	๙	๙	๙	๙	๙

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3.2.14 Page 24 (Thai character code 16)

	8	9	A	B	C	D	E	F
0	ร	โ		ฐ	ภ	ะ	เ	อ
1	า	ใ	ก	ท	ม	ะ	แ	ฉ
2	ล	ะ	บ	ผ	ย	า	ะ	๒
3	จ	ะ	ป	ณ	ร	า	ะ	๓
4	ด	ะ	ค	ด	ถ	า	ะ	๔
5	-	ะ	ค	ด	ล	า	ะ	๕
6	ท	ะ	ข	ถ	ภ	า	ะ	๖
7	ท	ะ	ง	ท	ว	า	ะ	๗
8	ด	ะ	จ	ธ	ศ	า	ะ	๘
9	ด	ะ	ฉ	น	ช	า	ะ	๙
A	ด	ะ	บ	บ	ส	า	ะ	๑๐
B	■	ะ	ช	ป	ห	า	ะ	๑๑
C	←	ะ	ณ	ผ	ฬ	า	ะ	๑๒
D	↑	ะ	ณ	ผ	อ	า	ะ	๑๓
E	→	ะ	ณ	ผ	ฮ	า	ะ	๑๔
F	↓	เ	ณ	ผ	ๆ	฿	๐	

3.2.15 Page 25 (Thai character code 17)

	8	9	A	B	C	D	E	F
0	๐	๑		๒	๓	๔	๕	๖
1	๗	๘	๙	๐	๑	๒	๓	๔
2	๕	๖	๗	๘	๙	๐	๑	๒
3	๓	๔	๕	๖	๗	๘	๙	๐
4	๑	๒	๓	๔	๕	๖	๗	๘
5	๒	๓	๔	๕	๖	๗	๘	๙
6	๓	๔	๕	๖	๗	๘	๙	๐
7	๔	๕	๖	๗	๘	๙	๐	๑
8	๕	๖	๗	๘	๙	๐	๑	๒
9	๖	๗	๘	๙	๐	๑	๒	๓
A	๗	๘	๙	๐	๑	๒	๓	๔
B	๘	๙	๐	๑	๒	๓	๔	๕
C	๙	๐	๑	๒	๓	๔	๕	๖
D	๐	๑	๒	๓	๔	๕	๖	๗
E	๑	๒	๓	๔	๕	๖	๗	๘
F	๒	๓	๔	๕	๖	๗	๘	๙

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3.2.16 Page 26 (Thai character code 18)

	8	9	A	B	C	D	E	F
0	ร	๙		ฐ	ภ	๕	เ	๐
1	๖	๓	ก	ท	ม	๖	แ	๑
2	๗	๔	ข	ฒ	ย	๗	โ	๒
3	๘	๕	ช	ณ	ร	๘	ใ	๓
4	๙	๖	ค	ด	ถ	๙	ไ	๔
5	๐	๗	ศ	ต	ล	๐	๖	๕
6	๑	๘	ฆ	ถ	ภ	๑	๗	๖
7	๒	๙	ง	ท	ว	๒	๘	๗
8	๓	๐	จ	ธ	ศ	๓	.	๘
9	๔	๑	ฉ	น	ช	๔	๙	๙
A	๕	๒	ช	บ	ส	๕	๐	๐
B	๖	๓	ช	ป	ห	๖	๑	๑
C	๗	๔	ณ	ผ	ฬ	๗	๒	๒
D	๘	๑	ณ	ผ	อ	๘	๓	๓
E	๙	๒	ณ	ผ	ฮ	๙	๔	๔
F	๐	๓	ณ	ผ	ย	๐	๕	

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3.2.18 Page 255 (Space Page)

In the space page (page 255), the following font is defined as the default.

7 × 7 font (only when font 7 × 9 is selected. When 9 × 9 font is selected, character codes 80H to FFH are all spaces.)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	128	144	160	176	192	208	224	240
1	0001	δ	μ	l	1	A	Q	a	q
2	0010	Đ	þ	"	2	B	R	b	r
3	0011	Ê	Ð	#	3	C	S	c	s
4	0100	È	Ú	\$	4	D	T	d	t
5	0101	Ê	Ô	%	5	E	U	e	u
6	0110	í	Û	&	6	F	V	f	v
7	0111	Î	Ý	'	7	G	W	g	w
8	1000	Ï	Ÿ	(	8	H	X	h	x
9	1001	Ì	±)	9	I	Y	i	y
A	1010	Ó	÷	*	:	J	Z	j	z
B	1011	ß	.	+	;	K	[k	
C	1100	Ô	,	<	L	\	l		
D	1101	Ö	-	=	M]	m		
E	1110		.	>	N	^	n	~	
F	1111	ö	/	?	O	—	o	.	

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3.2.19 International Character Set

Country	ASCII code (Hex)											
	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
U.S.A	#	\$	@	[	\	\]	^	`	{	|	}	~
France	#	\$	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	\$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
U.K.	£	\$	@	[	\	\]	^	`	{	|	}	~
Denmark I	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	\$	@	°	\	é	^	ù	à	ò	è	ì
Spain I	Pt	\$	@	í	Ñ	¿	^	`	¨	ñ	}	~
Japan	#	\$	@	[	¥	]	^	`	{	|	}	~
Norway	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Denmark II	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Spain II	#	\$	á	í	Ñ	¿	é	`	í	ñ	ó	ú
Latin America	#	\$	á	í	Ñ	¿	é	ü	í	ñ	ó	ú
Korea	#	\$	@	[₩]	^	`	{		}	~

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3.3 Switches and Buttons

3.3.1 Power Button

The power button (a rocker switch) located on the lower left front of the printer turns the power on or off.

NOTE: Turn on the power only after connecting the power supply.

3.3.2 Panel Buttons

There are panel buttons on both the slip and receipt sections. All the panel buttons are disabled by **ESC c 5**.

3.3.2.1 Slip

- 1) RELEASE button (non-locking push button)

[Function] Release paper

- 2) REVERSE button (non-locking push button)

[Function] Reverse paper feeding for the line spacing set by **ESC 2** and **ESC 3**

- 3) FORWARD button (non-locking push button)

[Function] Feed paper for the line spacing set by **ESC 2** and **ESC 3**

Paper feed is not executed without paper.

NOTE: When the printer cover is open, the printer will not operate.

3.3.2.2 Receipt

FEED button: Non-locking push button

- [Function]
- If you push this button once and release it, the printer feeds paper for one line based on the line spacing set by **ESC 2** and **ESC 3**. However, Paper feeding using the FEED button cannot be performed under the following conditions:
 - ① The paper roll end sensor detects a paper end
 - ② When the printer cover is open.
 - If you push this button when the printer is in the macro execution standby state, the defined macro is executed.
 - During self-test printing, you can stop the self test temporarily by pressing this button and restart it by pressing the button again.

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3.3.3 DIP Switches

3.3.3.1 Serial interface specification (TM-H5000II/TM-H5000IIM)

1) DIP switch 1: 8 switches

Table 3.3.1 DIP Switch 1

SW 1	Function	ON	OFF
1	Data reception error	Ignored	Prints '?'
2	Receive buffer capacity	45 bytes	4K bytes
3	Handshaking	XON/XOFF	DTR/DSR
4	Word length	7 bits	8 bits
5	Parity check	Yes	No
6	Parity selection	Even	Odd
7	Transmission speed selection	Refer to Table 3.3.2	
8			

Table 3.3.2 Transmission Speed

Transmission Speed (BPS)	SW 1-7	SW 1-8
2400	ON	ON
4800	OFF	ON
9600	ON	OFF
19200	OFF	OFF

BPS: Bits Per Second

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2) DIP switch 2: 8 switches

Table 3.3.3 DIP Switch 2

SW 2	Function	ON	OFF
1	Handshaking (BUSY condition)	Receive buffer full	Off line or receive buffer full
2	Customer display (DM-D) connection	Connected	Not connected
3	Selects print density / Receipt low power consumption mode	Refer to Table 3.3.4	
4			
5	Internal use		Fixed to Off
6	Internal use		Fixed to Off
7	I/F pin 6 reset signal	Enabled	Disabled
8	IF pin 25 reset signal	Enabled	Disabled

Table 3.3.4 DIP Switch 2-3 and 2-4

Level	Function	SW 2-3	SW 2-4
--	Low power consumption mode	ON	ON
1	Print density (Normal)	OFF	OFF
2	↕	ON	OFF
3	Print density (Dark)	OFF	ON

- NOTES:**
- When pin 6 of the interface connector is used for the reset signal, the printer is reset at MARK on the RS-232 level.
 - When pin 25 of the interface connector is used for the reset signal, the printer is reset at SPACE on the RS-232 level or at HIGH on the TTL level.
 - Changes in DIP switch settings (excluding switches 2-7 and 2-8 interface reset signals) are recognized only when the printer power is turned on or when the printer is reset by using the interface. If the DIP switch setting is changed after the printer power is turned on, the change does not take effect until the printer is turned on again or is reset.
 - If you turn on DIP switch 2-7 or 2-8 while the printer power is turned on, the printer may be reset, depending on the signal state. DIP switches should not be changed while the printer power is on.
 - If the print density is set to level 2 or 3, printing speed is inclined to be low speed.
 - In low power consumption for receipt, printing speed is fixed to 70 mm/sec.

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			NEXT 67	SHEET 66

3.3.3.2 Parallel interface specification (TM-H5000IIIP/TM-H5000IIPM)**Table 3.3.5 DIP Switch 1**

SW	Function	ON	OFF
1	Handshaking (BUSY condition)	Always enabled	Always disabled
2	Receive buffer capacity	45 bytes	4K bytes
3-8	Undefined	---	---

Table 3.3.6 DIP Switch 2

SW	Function	ON	OFF
1	Handshaking (BUSY condition)	Receive buffer full	Off-line or Receive buffer full
2	Internal use (Do not change settings)	---	Fixed to Off
3	Selects print density / Receipt low power consumption mode	Refer to Table 3.3.7	
4			
5-7	Internal use (Do not change settings)	---	Fixed to Off
8	I/F pin 31 reset signal (Do not change settings)	Fixed to On	---

Table 3.3.7 DIP Switch 2-3 and 2-4

Level	Function	SW 2-3	SW 2-4
--	Low power consumption mode	ON	ON
1	Print density (Normal)	OFF	OFF
2	↕	ON	OFF
3		OFF	ON

- NOTES:
- Changes in DIP switch settings (excluding switch 2-8, interface reset signal) are recognized only when the printer power is turned on or when the printer is reset by using the interface. If the DIP switch setting is changed after the printer power is turned on, the change does not take effect until the printer is turned on again or is reset.
 - If the DIP switch 2-8 is turned on while the printer power is turned on, the printer may be reset, depending on the signal state. DIP switches should not be changed while the printer power is on.
 - If the print density is set to level 2 or 3, printing speed is inclined to be low speed.
 - In a low power consumption for receipt, printing speed is fixed to 70 mm/sec.

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			NEXT 68	SHEET 67

3.4 Panel LED Indicators

3.4.1 Slip

- 1) Power supply (POWER) LED: Green
 - On: Power is stable.
 - Off: Power is not stable.
- 2) Error (ERROR) LED: Red
 - On: Off-line (except during paper feeding using the FORWARD and the REVERSE buttons and during self test printing)
 - Off: Normal condition
 - Blinking: Error (refer to Section 3.7)
- 3) RELEASE LED: Green
 - On: The print platen and paper feed roller are released.
 - Off: The print platen and paper feed roller are clamped together. (During printing on slip paper.)
 - Blinking: Waiting for continuous self test printing or macro execution standby state
- 4) Slip LED: Green
 - On: During printing on slip paper.
 - Off: When slip paper is not selected. (Receipt is selected.)
 - Blinking: Slip insertion/removal waiting state or personal check insertion/removal waiting state (only when the printer is used with the MICR reader).

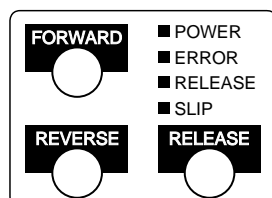


Figure 3.4.1 Panel Switches and Indicators

- Blinking: Slip insertion waiting state

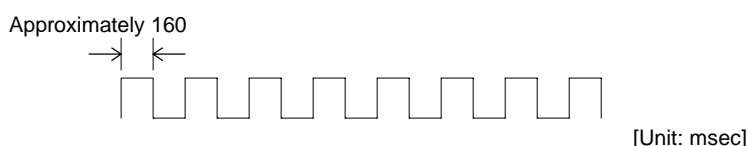


Figure 3.4.2

EPSON	TITLE TM-H5000II series Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 69	SHEET 68

Blinking: Slip removal waiting state / Personal check removal waiting state
(when the printer is used with the MICR reader)

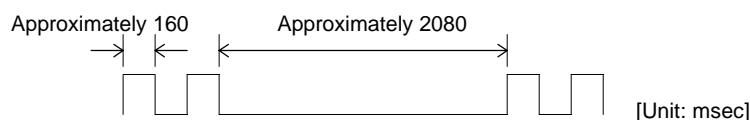


Figure 3.4.3

Blinking: Personal check insertion waiting state (when the printer is used with the MICR reader)

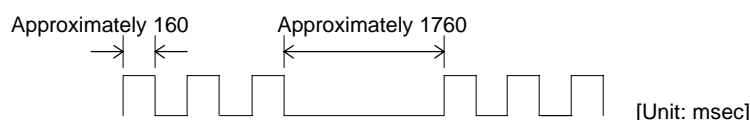


Figure 3.4.4

3.4.2 Receipt

- 1) Power (POWER) LED: Green
 - On: Power is stable.
 - Off: Power is not stable.
- 2) Error (ERROR) LED: Red
 - On: Off line (except during paper feeding using the FEED button and during test printing.)
 - Off: Normal condition
 - Blinking: Error (refer to Section 3.8)
- 3) Paper roll end (PAPER OUT) LED: Red
 - On: The paper roll near end or paper end of the receipt is detected.
 - Off: Paper is loaded (Normal condition)
 - Blinking: Self-test standby state (refer to Section 3.5.3) or macro standby state when the macro execution command is used.

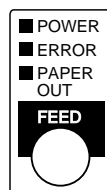


Figure 3.4.5 Panel Switches and Indicators

EPSON	TITLE TM-H5000II series Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 70	SHEET 69

3.5 Self-test

- 1) The printer has a self-test function that checks the following:
 - Control circuit functions
 - Printer mechanisms
 - Print quality
 - Control software version
 - DIP switch settings
- 2) Starting the self-test
 - a) Self-test on paper roll

To start the self-test on a paper roll, hold down the FEED button and turn on the printer with the cover closed.
 - b) Self-test on slip paper

To start the self-test on slip paper, hold down the REVERSE button and turn on the printer with the cover closed. The printer enters the paper waiting state. Insert slip paper to begin printing the printer status.
- 3) Self-test standby state
 - a) Self-test on paper roll

After printing the current printer status, the printer prints the message "Self-test printing. Please press PAPER FEED button." The PAPER OUT LED indicator blinks and the printer enters the test printing standby state. Press the PAPER FEED button to start test printing.
 - b) Self-test on slip paper

After printing the current printer status, the printer ejects the slip and waits for the next slip paper to be inserted.
- 4) Ending the self-test

After a number of lines are printed, the printer indicates the end of the self-test by printing "**** completed ****", initializes, and goes to the normal mode.

The printer then prints the current printer status.

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			NEXT 71	SHEET 70

3.6 Hexadecimal Dumping

1) Hexadecimal dumping function

This function prints the data transmitted from the host computer in hexadecimal numbers and in its corresponding characters.

2) Starting hexadecimal dumping

Open the cover and turn the power on while pressing the FEED button or executing **GS (A** command, then close the cover. The printer first prints "Hexadecimal Dump" on paper roll and prints the received print data in hexadecimal numbers and in its corresponding characters.

NOTES: 1. If no characters correspond to the data received, the printer prints ".".

2. During hexadecimal dumping, any commands other than **DLE EOT**, **DLE ENQ**, and **DLE DC4** do not function.

3. Insufficient print data to fill the last line can be printed by setting the printer off-line.

3) Ending hexadecimal dumping

Hexadecimal dumping ends by turning the power off, pressing the FEED button three times, or resetting the printer after printing has finished.

<Printing example>

Hexadecimal Dump

To terminate hexadecimal dump,
press FEED button three times.

1B 21 00 1B 26 02 40 40 1B 69	. ! . . & . @ . i
1B 25 01 1B 63 34 00 1B 30 31	. % . . c 4 . . 0 1
41 42 43 44 45 46 47 48 49 4A	A B C D E F G H I J

*** completed ***




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			NEXT 72	SHEET 71

3.7 Error Processing

3.7.1 Error Types

- 1) Errors that automatically recover

Table 3.7.1 Errors That Automatically Recover


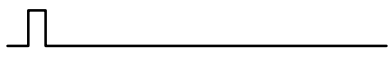
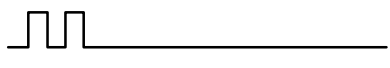
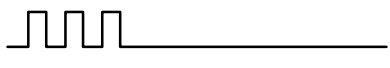
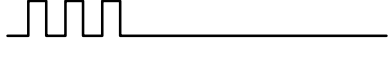
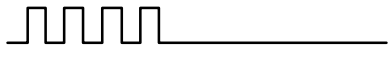
Error	Description	ERROR LED Blinking Pattern 	LED		Recovery
			Receipt	Slip	
Print head temperature error	The temperature of the print head is extremely high.		○	○	Recovers automatically when the print head cools.
Paper roll cover open error	Printing on the paper roll is not performed correctly due to a cover-open		○		Recovers automatically when cover is closed. The printer restarts printing with the line being printed when the cover was opened.

NOTE: Print head temperature error is not an abnormality.

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			NEXT 73	SHEET 72

2) Errors that have the possibility of recovery

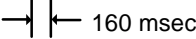

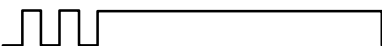
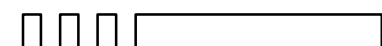

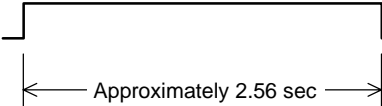
Table 3.7.2 Errors That Can Possibly Recover

Error	Description	ERROR LED Blinking Pattern 	LED		Recovery
			Receipt	Slip	
Auto cutter error	The auto cutter does not work correctly.		○		Recovers by DLE ENQ 1 or DLE ENQ 2 .
Home position detection error	The home position cannot be detected due to a paper jam.			○	Recovers by DLE ENQ 1 or DLE ENQ 2 .
Carriage detection error	The carriage is malfunctioning due to a paper jam, etc.			○	Recovers by DLE ENQ 1 or DLE ENQ 2 .
Front cover open error	Printing on the slip is not performed correctly due to a cover-open			○	Recovers by DLE ENQ 1 or DLE ENQ 2 with the cover closed.
Slip ejection error	The slip is not ejected when the printer feeds a specified amount of paper.			○	Recovers by DLE ENQ 1 or DLE ENQ 2 .

- NOTES:**
- Errors that have the possibility of recovery are recovered by **DLE ENQ 1** or **DLE ENQ 2**.
 - When the printer recovers from an error using **DLE ENQ 1** while slip paper is selected, the printer first ejects the slip, then loads paper. However, when the printer recovers from a slip ejection error, the printer only ejects the slip and does not load paper.
 - When the printer recovers from an error using **DLE ENQ 2** while slip paper is selected, the printer ejects the slip.

3) Errors that are impossible to recover

Table 3.7.3 Unrecoverable Errors

Error	Description	ERROR LED Blinking Pattern 	LED		Recovery
			Receipt	Slip	
R/W error in memory or gate array (*2)	After R/W checking, the printer does not work correctly.		○	○	Impossible to recover.
High voltage error (*2)	The power supply voltage is extremely high. (*1)		○	○	Impossible to recover.
Low voltage error (*2)	The power supply voltage is extremely low. (*1)		○	○	Impossible to recover.
CPU execution error (*2)	The CPU executes an incorrect address or I/F board is not connected.		○	○	Impossible to recover.
Thermistor error	There is an abnormality in the print head temperature, thermistor is detected incorrectly, or thermistor wiring is not connected.		○	○	Impossible to recover.

(*1) Refer to Appendix A.

NOTE: When any error shown above occurs, turn off the power as soon as possible.

3.7.2 Printer Operation When an Error Occurs

The printer executes the following operations when detecting an error on both slip and receipt sections.

- Stops all printer operations for the selected paper section.
- Goes off-line.
- Blinks the ERROR LED for the selected paper section.
- For the errors with (*2) symbol, the ERROR LEDs of slip and receipt blink.

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			NEXT 75	SHEET 74

3.7.3 Data Receive Error

If one of the following errors occurs during serial interface communication, the printer prints "?" or ignores the data, depending on the setting of DIP switch 1-1.

- Parity error
- Framing error
- Overrun error

3.8 Paper Sensors

The printer has 4 paper sensors as follows:

Slip:

- TOF (Top of Form) sensor
- BOF (Bottom of Form) sensor

Receipt:

- Paper roll near-end sensor
- Paper roll end sensor

3.8.1 Sensors and LED Indicators

1) Paper roll near-end sensor

The near-end sensor is located on the roll paper supply device on the receipt side. It detects the near-end of the paper roll by detecting the paper roll diameter.

2) Paper roll end sensor

The paper sensor is located in the paper path on the receipt side. It detects the presence of paper from the paper roll in the paper path of the printer mechanism.

When there is no paper in the paper path (paper end status), the PAPER OUT LED indicator lights.

3) TOF sensor

The slip insertion sensor is located in the slip paper path and detects the presence of slip paper in the paper path. The SLIP LED indicator lights accordingly.

4) BOF sensor

The slip ejection sensor is located in the slip entrance and detects whether the paper is set correctly and whether it is removed or not. The printer does not proceed to the next operation until the paper has been removed. (The SLIP LED indicator continues blinking.)

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3.8.2 Sensors and Printing

When the printer detects a paper near-end, it either stops or continues printing depending on the **ESC c 4** setting. The corresponding sensors are as follows:

- Paper roll near-end sensor
- Slip BOF sensor
- Slip TOF sensor

The paper roll near-end sensor is enabled only when paper roll is selected as the print sheet and the slip BOF and TOF sensors are enabled only when slip is selected as the print sheet. However, since the paper roll end sensor is used for paper-end detection, the printer stops printing. Use the paper roll near-end sensor for detecting a roll paper end, and also use the paper roll end sensor, if necessary.

The printer behaves as follows in the paper-end state:

1) When the slip is selected

When the slip BOF sensor is selected for printing stop, the slip BOF sensor detects a paper-end and the printer prints data up to the end of the printable area, ejects the slip when all the next print data are transmitted, and then waits for the slip to be removed. After the slip is removed, the printer enters the paper insertion waiting state.

When the slip TOF sensor is selected for printing stop, the slip TOF sensor detects a paper-end. Then the slip TOF sensor ejects the slip when all the next data are transmitted with the status of reverse paper feed until the paper is removed from the print head.

After the slip is removed, the printer enters the paper insertion waiting state.

2) When the receipt is selected

When printing stop is enabled, the paper roll near-end sensor detects a paper near end and the printer automatically goes off line after printing the line being printed when the paper near end is detected. To restart printing, load the paper and set the printer back on line by closing the printer cover. The printer starts initializing and continues printing data stored in the print buffer.

3.9 Printer Cover Sensors

3.9.1 Cover Open Sensor in the Slip Section

- The sensor detects opening/closing of the front cover. When the cover open is detected, the printer releases the print platen immediately and stops the carriage movements. The printer goes off line automatically. The printer is in the recovery error state and the error LED blinks.

The printer goes on-line by closing the front cover. Even if the front cover is closed, the error LED blinks. The printer can recover by sending an error recovery command. If the printer continues printing, it starts printing the beginning of the line it was printing when the front cover was opened. In this case, printing position may shift; therefore, it is recommended to initialize the printer and resend the print data.

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3.9.2 Opening/Closing the Front Cover of the Slip Section

- The cover can be opened by pulling a hook on the left of the cover toward you. When you close the cover, push the cover backward.
- When the cover open is detected by the cover open sensor, the printer releases the print platen and stops carriage movements. If the front cover is opened during printing, data lines are cut. Be sure not to open the front cover.

3.9.3 Cover Open Sensor in the Receipt Section

The cover-open sensor monitors the printer cover. When the sensor detects a cover open, the printer automatically goes off line and stops printing. The error LED (automatic recovery error) blinks when the cover is open. When the printer cover is closed, the error LED goes off and the printer goes on line and starts initializing automatically and begins printing at the beginning of the line it was printing when the cover was opened.

Note: Whether the cover is open or not does not affect the status reported by the paper roll end sensor.

3.9.4 Opening/Closing the Cover in the Receipt Section

When the cover open button is pressed, the printer cover is opened. When the cover is closed, the cover open button is latched.

Notes: Be sure to use the cover open button to open the printer cover.

Because the printer mechanism is reinitialized after the printer cover is opened and closed, the cover must not be opened during printing or an incorrect pitch may be caused. Opening the cover during the auto-cutter operation may damage the printer.

3.10 Print Buffer-full Printing

When subsequent data is received after the printer processes one line of data in the print buffer, the printer automatically prints the processed line and feeds the paper by one line.

3.11 Paper Jam Removal

3.11.1 Slip

Around the print head

To remove jammed paper from the print head area, open the front cover.

- Notes:**
- Since the print head becomes very hot just after printing, remove jammed paper only after the print head cools sufficiently.
 - The carriage moves to the specified position after the printer is reset. Do not touch the carriage.

3.11.2 Receipt

To remove jammed paper from the print head area and auto cutter, open the printer cover on the receipt side by pushing the cover open button.

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3.12 Page Mode

3.12.1 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 each time it receives print data or paper feed commands. In page mode, all the received print data and paper feed commands are processed in the specified memory, and the printer executes no 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" and feeds the paper by one line. In page mode, "ABCDEF" is written to the specified printing area in memory, and the position in memory for the next print data is shifted by one line.

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

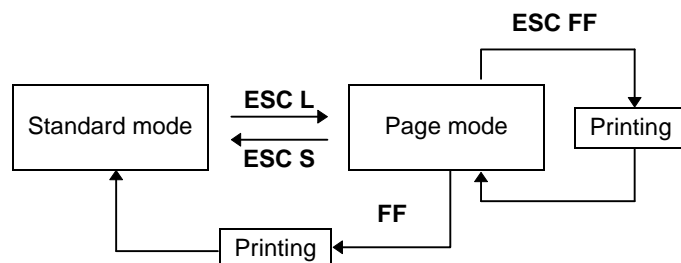


Figure 3.12.1 Shifting Between Standard Mode and Page Mode

3.12.2 Setting Values in Standard and Page Modes

- 1) The available commands and parameters are the same for both standard and page modes. However, these values can be set independently in each mode for the **ESC SP**, **ESC 2**, **ESC 3**, and **FS S** commands. For these commands, different settings can be stored for each mode.
- 2) Although the maximum number of printable dots for a bit image when the paper roll is selected as the print sheet is 512 in standard mode, 831 bit-image dots can be printed in the y direction (paper feed direction) in page mode. (This is possible only when the **ESC W** command has specified 831 printable-area dots in the y direction and the printing direction value of *n* in the **ESC T** command is 1 or 3.)

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3.12.3 Formatting of Print Data in the Printable Area

Formatting of print data in the printable area is performed as follows:

- 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 W** sets the printable area and **ESC T** sets the printing direction, the print data is formatted within the printable area so that point A in Figure 3.12.2 is at the beginning of the printable area as a default value. (When a character is printed, point A is the baseline.)

Print data containing downloaded bit images or bar codes is formatted so that the bottom point of the left side of the image data (point B in Figure 3.12.3) is aligned with the baseline. However, any Human Readable Interpretation (HRI) characters are printed under the baseline.

At the points labeled Point B, if characters (such as double-height characters) higher than normal size characters or downloaded bit image characters are received, any part of the character higher than the normal-size character is not printed.
- 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 1/6 inch and corresponds to 30 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. The line spacing in Figure 3.12.4 requires 27 dots (54 pitch) or more.

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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 (21)} \times vertical motion unit conversions ($360/180$) = 54

Therefore, 27 dots (54 pitch) are required for feeding.

Use the following commands:

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

ESC T *n*

ESC 3 54 \leftarrow Set line spacing to be added.

LF

GS/ 1

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

NOTE: Vertical and horizontal motion units are 1/360 in the vertical direction and 1/180 in the horizontal direction; therefore, the position you specify varies depending on the printing direction. Setting the vertical motion unit to 1/180 using the **GS P** command does not change the current print position.

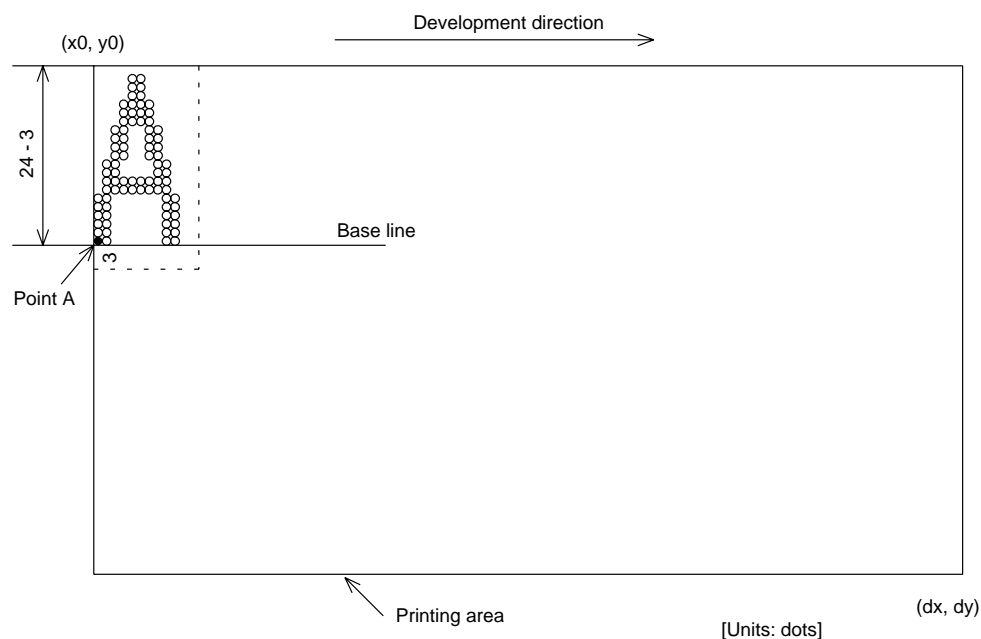


Figure 3.12.2 Character Data Developing Position

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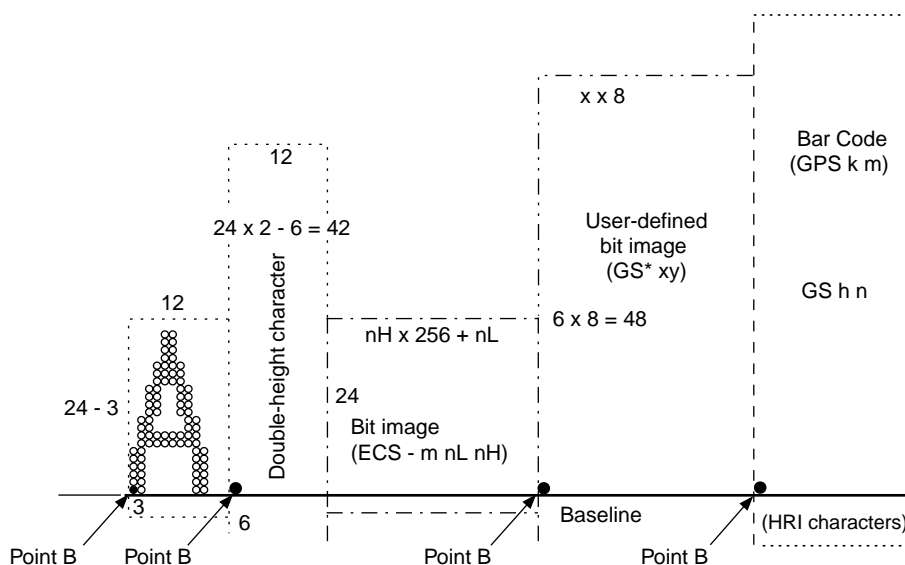


Figure 3.12.3 Print Data Developing Position

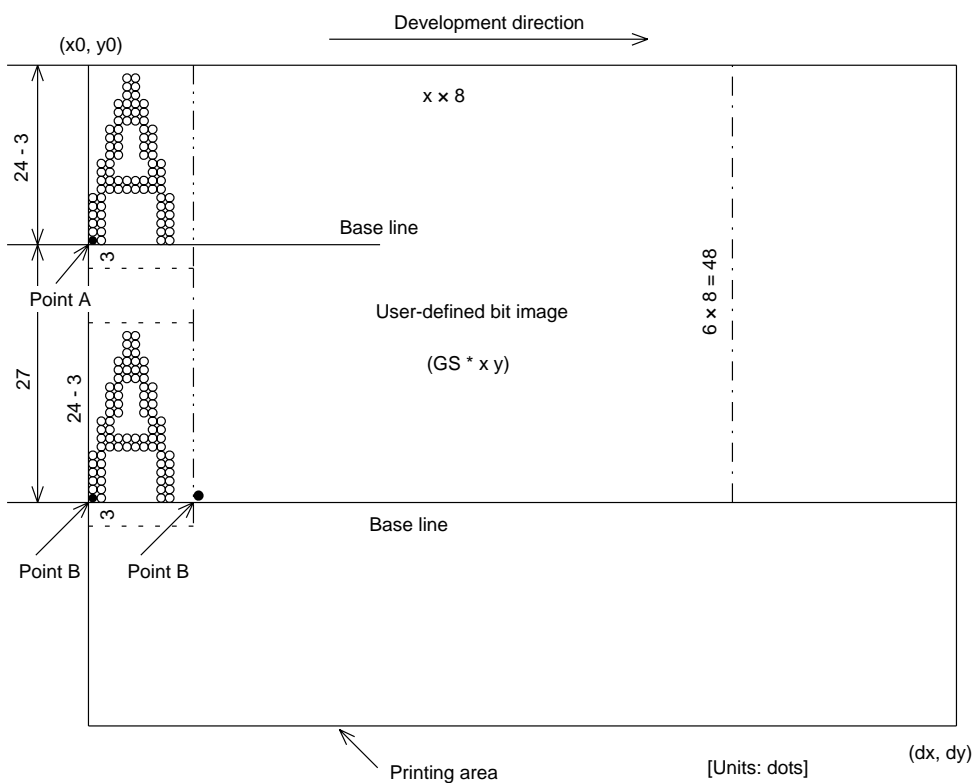


Figure 3.12.4 Downloaded Bit Image Developing Position

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3.13 Reading MICR Characters and Printing Endorsements

(when the printer is used with the MICR reader)

Use the following procedure to read MICR characters.

	User Operation	Printer Operation
1	Transmit FS a 0 <00> H. (Transmit DLE ENQ 3.)	Mechanically switches to MICR mode and waits for a personal check to be loaded. The slip LED blinks. (when the check insertion waiting state is canceled)
2	Insert a check.	Detects the check, lights the slip LED, and reads MICR characters. After reading, transmits the reading results.
3	(Transmit FS b.)	(Re-transmits the reading result.)
4	Transmit FS a 1.	Loads the check paper to the print starting position.
5	Transmit endorsement printing data.	Prints data and feeds paper.
6	Transmit FF.	After printing, ejects paper. The slip LED blinks until the check is removed.
7	Eject the check paper.	The slip LED is off.

- NOTES:**
1. Personal check is ejected in the forward direction only. (The default is the forward direction.)
 2. The check insertion waiting state is canceled using **DLE ENQ 3.**
 3. After the personal check is ejected, the slip LED indicator lights and the printer does not proceed to the next operation until the check is removed.
 4. Personal checks should be inserted correctly by matching the top edge with the form stopper and the right side with the right side of the paper insert portion.
 5. The check waiting time and the interval from when a check is inserted to when the operation starts can be set using **ESC 1.**
 6. To check the MICR function status exactly, **DLE EOT BS 1** should be used.

3.14 Cleaning the MICR Mechanism

(when the printer is used with MICR reader)

Foreign matter on the MICR mechanism can cause MICR reading errors. To clean the MICR mechanism, execute the cleaning command (**FS c**). Then insert cleaning paper the same way you insert check paper to clean the MICR head, roller, and the paper path.

Cleaning period: Once per month or every 6000 passes

Example cleaning paper: KIC Products PRESAT brand check reader cleaning card or equivalent

Cleaning paper size: 63 mm (2.48") (W) × 152 mm (5.98") (H)

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4. CASE SPECIFICATIONS

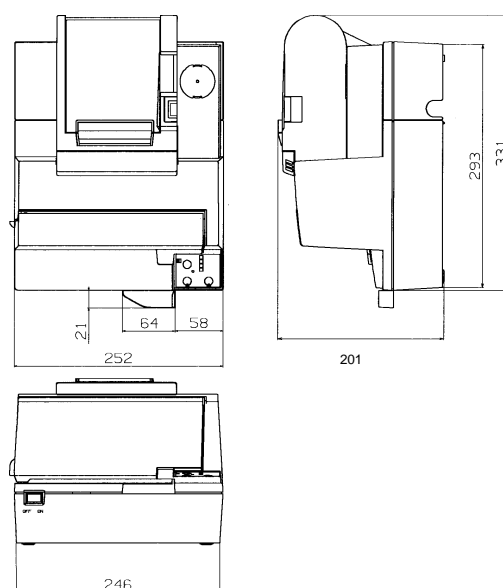
4.1 External Dimensions and Weight

Height: 201 mm (7.91")
Width: 252 mm (9.92")
Depth: 331 mm (13.03") (except for the protrusion)
Weight: Approximately 6.5 kg (14.3 lbs)
(All the numeric values are typical.)

4.2 Color

EPSON standard color (ECW)

4.3 External Appearance



[Unit: mm]

Materials for the external: 94V-0

Figure 4.3.1 External Appearance

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5. OPTIONS AND CONSUMABLES

5.1 Standard Accessories

- Paper roll (diameter 50 mm [1.96"]) × 1 roll
- Exclusive ribbon cassette ERC-31(P)
- Operator's Manual
- I/F fixing screw (hexagonal millimeter screw)
- Power switch cover

5.2 Options

- External power supply PS-170
- MICR reader (factory-installed option) (Available only for serial interface model)
- Direct connection customer display DM-D102-012/DM-D203-012
- Front extended table

5.3 Consumables

- Specified paper:
Thermal roll paper: NTP080-80
In Japan: Nakagawa Seisakujo
In U.S.A.: Nakagawa Mfg. (USA) Inc.
In Europe: Nakagawa Mfg. (Europe) GmbH
In Southeast Asia: N.A.K. Mfg. (Malaysia) SDN BHD
[Original paper: TF50KS-E Nippon Paper Industries Co., Ltd.]
The following paper can be used instead of the specified paper above:
Original paper: PD160R Oji Paper Mfg. Co., Ltd.
AF50KS-E Jujo Thermal Oy (Finland)
P350(F380), P310, P300 Kanzaki Specialty Papers, Inc. (U.S.A.)

NOTE: Do not use any paper other than these specified above. Otherwise, print head reliability and print quality are affected adversely.

- Ribbon Cassette
ERC-31(P)
ERC-31(B) (Line: 4,500,000 characters)
In Japan: EPSON HANBAI Co., LTD.
In U.S.A.: EPSON America Inc.
In Europe: EPSON Europe B.V.

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6. Commands

6.1 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. [] <i>k</i> indicates the contents of the [] should be repeated <i>k</i> times.
[Range]	Gives the allowable ranges for the arguments.
[Description]	Describes the function of the command.
[Notes]	Provides important information on setting and using the printer command, if necessary.
[Default]	Gives the default values, if any, for the command parameters.
[Reference]	Lists related commands.
[Example]	Provides examples using the command.

The numbers denoted by < >H are hexadecimal.

The numbers denoted by < >B are binary.

The numbers denoted by < > are decimal.

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6.2 Explanation of Terms

- (1) Reception buffer
The reception buffer is a buffer that stores, as is, the data received from the host (the reception data). The reception data is stored in the reception buffer temporarily, and is then processed sequentially.
- (2) Print buffer
The print buffer is a buffer that stores the image data to be printed.
- (3) Print buffer full
This is the state where the print buffer is full. If new print data is input while the print buffer is full, the data in the print buffer is printed out and a line feed is executed. This is the same operation as the **LF** operation.
- (4) Start of line
The phrase "beginning of a line" in command descriptions assumes that the following conditions have been met:
 - There is no print data currently in the print buffer.
 - There is no portions of data skipped due to **HT** currently in the print buffer.
 - The print position is not specified by the **ESC \$** or **ESC ** command.
- (5) Printable area
The maximum range within which printing is possible under the printer specifications. The printable area for this printer is as follows:
 - ① The length of the horizontal direction in standard mode:
Receipt: approximately 72.249 mm (512/180 inch)
Slip: approximately 135.467 mm (800/150 inch)
 - ② The length of the horizontal direction in page mode: approximately 72.249 mm (512/180 inch)
 - ③ The length of the vertical direction in page mode: approximately 117.263 mm (1662/360 inch)
- (6) Printing area
Printing range is set by the command. It must be printing area ≤ printable area.
- (7) Ignore
The state in which all codes, including parameters, are read in and discarded, and nothing happens.
- (8) Inch
A unit of length. One inch is 25.4 mm.
- (9) MSB
Most Significant Bit
- (10) LSB
Least Significant Bit

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(11) Line Spacing Setting

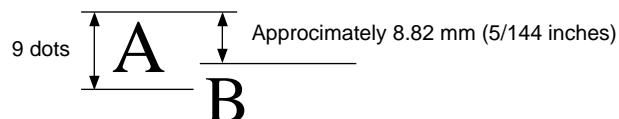
Line spacing of the receipt and slip is different.

A: First line printing

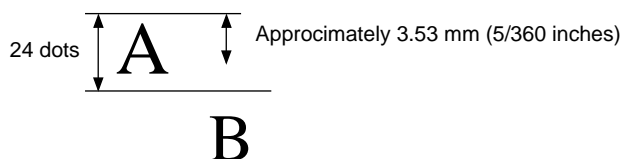
B: Second line printing

[Example 1] When $n = 5$ for **ESC 3 n**

Slip:



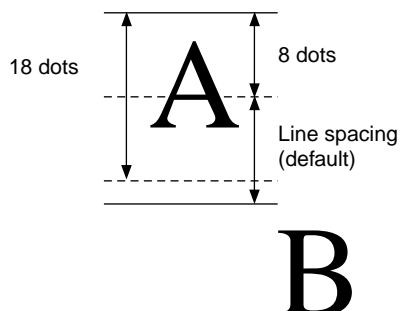
Receipt (When front A (12×24 dots) is selected):



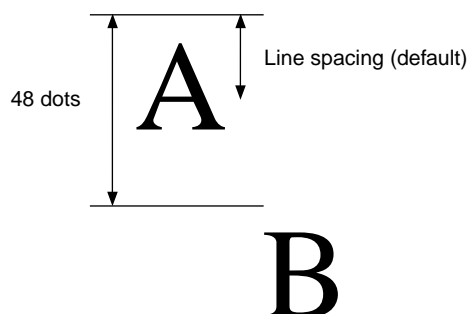
For the receipt, if the line spacing is shorter than the height of a character, line feed is executed for the height of the character.

[Example 2] When the height of a character is doubled.

Slip:



Receipt:



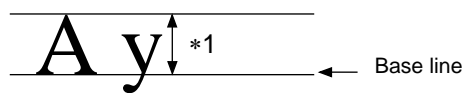
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(12) Base line

Standard position when character data is stored in the print buffer.

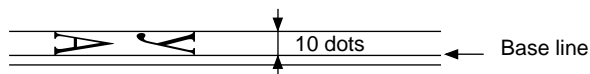
Receipt:

Normal character in standard mode and page mode:

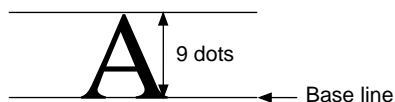


*1. When font A (12×24 dots) is selected, this height is for 24 dots.
When font B (9×17 dots) is selected, this height is for 16 dots.

Rotated character in standard mode (only when font A is selected):



Slip:



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6.3 Exception Processing

6.3.1 Undefined codes

This term refers to the codes ranging from <00>H to <1F>H in the character code table. If a code in this range that is not defined as a command is input, that code (one byte) is read in and discarded, and subsequent data is processed as normal data.

Example: <30>H, <31>H, <03>H, <32>H, <0A>H, <33>H

If the above data string is input, the printer reads in and discards "<03>H" as an undefined code. Note that <0A>H is defined as a command (**LF**). As a result, the data string that is actually processed is: <30>H, <31>H, <32>H, <0A>H, <33>H

6.3.2 Undefined commands

If the data following **ESC** (<1B>H), **FS** (<1C>H), or **GS** (<1D>H) is not defined as a command, then the two bytes (**ESC**, **FS**, **GS** and the code that follows) are read in and discarded.

Example: <30>H, <1B>H, <22>H, <31>H, <32>H

If the above data string is input, the printer discards the data <1B>H and <22>H as undefined commands. As a result, the data string that is actually processed is: <30>H, <31>H, <32>H.

6.3.3 Settings outside the defined range

If a value outside of the defined range is input for a command that takes parameters, that command execution is stopped and the previous value for that setting remains unchanged. In the case of a command that takes multiple parameters, command processing is halted the moment that a value outside of the defined range is input and subsequent values are processed as normal data.

Example: <1B>H, <52>H, <15>H

If the above data string is input, <1B>H and <52>H are defined as a command (**ESC R**), but the parameter <15>H is outside of the defined range. As a result, the printer reads in and discards the data string <1B>H, <52>H, <15>H. Accordingly, the previously set international character set is not changed.

6.3.4 Real-time commands

Real-time commands are stored after executing in the print buffer.

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6.4 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]
- 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 A (12 × 24) every 8th character (9th, 17th, 25th, ... column), and for the slip paper is font A (9 × 9) 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.

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

[Reference] **ESC 2, ESC 3, Appendix A.1**

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FF

[Name]	① Print and eject slip paper (enable only when slip is selected)	
	② Print and return to standard mode in page mode (enable only when paper roll is selected)	
[Format]	ASCII	FF
	Hex	0C
	Decimal	12

For ①

[Description] Prints the data in print buffer and ejects the slip paper.

- [Notes]
- The command is enabled only when slip paper is selected for printing by **ESC c 0**.
 - When the slip ejection length has been set by **ESC C**, the specified length is ejected, regardless of the TOF and BOF sensors.
 - The slip is ejected in the direction specified by **ESC F**.
 - This command sets the print position to the beginning of the line.
 - After the slip is ejected, the printer selects the paper roll.

[Reference] **ESC C, ESC F**

For ②

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

- [Notes]
- This command is enabled only in page mode.
 - The buffer data is deleted after being printed.
 - The printing area set by **ESC W** is reset to the default setting.
 - The printer does not execute paper cutting.
 - This command sets the print position to the beginning of the line.

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

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CR

[Name] Print and carriage return

[Format] ASCII CR

Hex 0D

Decimal 13

[Description]

Paper	Automatic line feed enabled	Automatic line feed disabled
Paper roll	Functions as same as LF	Ignored
Slip paper	Functions as same as LF	Prints the data in the print buffer and does not feed the paper.

- [Notes]
- Sets the print starting position to the beginning of the line.
 - The automatic line feed is ignored with a serial interface model.
 - This command is set according to the DIP switch 1-1 setting with a parallel interface model.

[Reference] **LF**

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]
- 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**

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DLE EOT n

[Name]	Real-time status transmission			
[Format]	ASCII	DLE	EOT	n
	Hex	10	04	n
	Decimal	16	4	n
[Range]	$1 \leq n \leq 5$			
[Description]	<p>Transmits the selected printer status specified by n in real time, according to the following parameters:</p> <p style="margin-left: 40px;">$n = 1$: Transmit printer status</p> <p style="margin-left: 40px;">$n = 2$: Transmit off-line status</p> <p style="margin-left: 40px;">$n = 3$: Transmit error status</p> <p style="margin-left: 40px;">$n = 4$: Transmit paper roll sensor status</p> <p style="margin-left: 40px;">$n = 5$: Transmit slip paper status</p>			
[Notes]	<ul style="list-style-type: none"> The status is transmitted whenever the data sequence of $\langle 10 \rangle H \langle 04 \rangle H \langle n \rangle$ ($1 \leq n \leq 5$) is received. Example: In ESC * m nL nH $d1$... dk, $d1 = \langle 10 \rangle H$, $d2 = \langle 04 \rangle H$, $d3 = \langle 01 \rangle H$ This command should not be used within the data sequence of another command that consists of 2 or more bytes. Example: If you attempt to transmit ESC 3 n to the printer, but DTR (DSR for the host computer) goes to MARK before n is transmitted and then DLE EOT 3 interrupts before n is received, the code $\langle 10 \rangle H$ for DLE EOT 3 is processed as the code for ESC 3 $\langle 10 \rangle H$. 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. This command is executed even when the printer is off-line, the receive buffer is full, or there is an error status with a serial interface model. With a parallel interface model, this command can not be executed when the printer is busy. This command is executed even when the printer is off-line or there is an error status when DIP switch 2-1 is on with a parallel interface model. The printer executes this command upon receiving it. When Auto Status Back (ASB) is enabled using the GS a command, the status transmitted by the DLE EOT command and the ASB status must be differentiated. This command is effective even if the printer is not selected by set peripheral device command, ESC =. 			

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n = 1: Printer status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2	Off	00	0	Drawer open/close signal is LOW (connector pin 3).
	On	04	4	Drawer open/close signal is HIGH (connector pin 3).
3	Off	00	0	On-line.
	On	08	8	Off-line.
4	On	10	16	Not used. Fixed to On.
5,6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

- The printer enters off-line when the printer cover is open while printing is stopped.
- The printer enters recoverable error status when the slip paper mode is selected and enters automatic recoverable error status when paper roll mode is selected, when cover is open during printing.

n = 2: Off-line status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2	Off	00	0	Cover is closed.
	On	04	4	Cover is open.
3	Off	00	0	Paper is not being fed by using the PAPER FEED button.
	On	08	8	Paper is being fed by the PAPER FEED button.
4	On	10	16	Not used. Fixed to On.
5	Off	00	0	No paper-end stop.
	On	20	32	Printing is being stopped.
6	Off	00	0	No error.
	On	40	64	Error occurs.
7	Off	00	0	Not used. Fixed to Off.

Bit 5: Becomes on when the paper roll end sensor detects paper end and printing stops.

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$n = 3$: Error status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2	Off	00	0	No mechanical error.
	On	04	4	Mechanical error occurs.
3	Off	00	0	No auto-cutter error.
	On	08	8	Auto-cutter error occurs.
4	On	10	16	Not used. Fixed to On.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error occurs.
6	Off	00	0	No auto-recoverable error.
	On	40	64	Auto recoverable error occurs.
7	Off	00	0	Not used. Fixed to Off.

- Bit 2: Mechanical error indicates the home position detection error, carriage detection error, slip paper ejection error, or slip cover open error during printing.
- Bit 2 and 3: If these errors occur due to paper jams or the like, it is possible to recover by correcting the cause of the error and executing **DLE ENQ n** ($1 \leq n \leq 2$). If an error due to a circuit failure (e.g. wire break) occurs, it is impossible to recover.
- Bit 6: When printing is stopped due to high print head temperature until the print head temperature drops sufficiently or when the paper roll cover is open during printing, bit 6 is On.

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$n = 4$: Continuous paper sensor status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2	Off	00	0	Paper roll near-end sensor: paper adequate.
	On	04	4	Paper near-end is detected by the paper roll near-end sensor.
3	Off	00	0	Paper roll near-end sensor: paper adequate.
	On	08	8	Paper near-end is detected by the paper roll near-end sensor.
4	On	10	16	Not used. Fixed to On.
5	Off	00	0	Paper roll sensor: Paper present.
	On	20	32	Paper roll end detected by paper roll sensor.
6	Off	00	0	Paper roll sensor: Paper present.
	On	40	64	Paper roll end is detected by the paper roll sensor.
7	Off	00	0	Not used. Fixed to Off.

For bits 5 and 6, when the paper roll cover is open, paper detection may be incorrect.

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$n = 5$: Slip paper status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2	Off	00	0	Slip paper selected.
	On	04	4	Slip paper not selected.
3	Off	00	0	Does not wait for slip paper insertion.
	On	08	8	Waits for slip paper insertion.
4	On	10	16	Not used. Fixed to On.
5	Off	00	0	TOF sensor: paper present.
	On	20	32	TOF sensor: paper not present.
6	Off	00	0	BOF sensor: paper present.
	On	40	64	BOF sensor: paper not present.
7	Off	00	0	Not used. Fixed to Off.

- Bit 2: Bit 2 = 1 (slip is not selected) before selecting a MICR function, such as the time when a delay occurs to process **ESC c 0** command.
 Bit 2 = 0 (slip is selected) before taking the slip paper off after ejecting the paper.
- Bit 3: Becomes 0 (slip insertion is not waiting) just before the platen being closed after detecting it.
- Bit 5 and 6: Transmit the current status of the slip sensors.
- [Reference] **DLE ENQ**, **GS a**, **GS r**, **FS a**, Appendix E

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DLE ENQ n

[Name] Real-time request to printer

[Format]	ASCII	DLE	ENQ	n
	Hex	10	05	n
	Decimal	16	5	n

[Range] $1 \leq n \leq 3$

[Description] Responds 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 aft clearing the receive and print buffers
3	Cancel the slip waiting status

- [Notes]
- The status is also transmitted whenever the data sequence of $\langle 10 \rangle H \langle 05 \rangle H \langle n \rangle$ ($1 \leq n \leq 3$) is received.
Example:
In **ESC * m nL nH dk**, $d1 = \langle 10 \rangle H$, $d2 = \langle 05 \rangle H$, $d3 = \langle 01 \rangle H$
 - This command should not be contained within another command that consists of two or more bytes.
Example:
If you attempt to transmit **ESC 3 n** to the printer, but DTR (DSR for the host computer) goes to MARK before n is transmitted, and **DLE ENQ 2** interrupts before n is received, the code $\langle 10 \rangle H$ for **DLE ENQ 2** is processed as the code for **ESC 3** $\langle 10 \rangle H$.
 - The printer starts processing data upon receiving this command.
 - This command is also executed when the printer is off-line, the receive buffer is full, or an error occurs.
 - This command is executed even when the printer is off-line, the receive buffer is full, or there is an error status with a serial interface model.
 - With a parallel interface model, this command can not be executed when the printer is busy. This command is executed even when the printer is off-line or there is an error status when DIP switch 2-1 is on with a parallel interface model.
 - DLE ENQ 1** starts printing from the line where an error occurred. This command is available only for errors that have the possibility of recovery, except print head temperature error.
 - When the printer recovers from an error using **DLE ENQ 1**, and slip paper is selected, the printer ejects the slip completely and loads paper. However, the printer only ejects the slip and does not load paper when the printer recovers from a slip ejection error.

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- **DLE ENQ 2** enables the printer to recover from an error after clearing the data in the receive buffer and the print buffer. The printer retains the settings (by **ESC !**, **ESC 3**, etc.) that were in effect when the error occurred. The printer can be initialized completely by using this command and **ESC @**. This command is enabled only for errors that have the possibility of recovery, except for print head temperature error.
- When the printer recovers from an error using **DLE ENQ 2** with slip selected, the printer ejects the slip completely and selects the paper roll. Therefore, when printing on slip is to be continued, select slip mode again using **ESC c 0 4** after the slip is ejected.
- **DLE ENQ 3** is ignored except when the printer is in the slip waiting state. Therefore, be sure to use **DLE EOT 5** to check whether slip paper is selected and the printer is in the slip waiting state before executing **DLE ENQ 3**. After the printer is released from the slip waiting state, the printer selects the paper roll.
- When the slip waiting status is cancelled **DLE ENQ 3**, the receive and print buffers are cleared.
- When the printer is disabled with **ESC =** (Select peripheral device), the error recovery functions (**DLE ENQ 1** and **DLE ENQ 2**) are enabled, and the other functions are disabled.

[Reference] **DLE EOT**

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DLE DC4 *n m t*

[Name] Generate pulse at real time

[Format]	ASCII	DLE	DC4	<i>n</i>	<i>m</i>	<i>t</i>
	Hex	10	14	<i>n</i>	<i>m</i>	<i>t</i>
	Decimal	16	20	<i>n</i>	<i>m</i>	<i>t</i>

[Range] $n = 1$
 $m = 0, 1$
 $1 \leq t \leq 8$

[Description] Outputs the pulse specified by *t* to connector pin *m* as follows:

<i>m</i>	Connector pin
0	Drawer kick-out connector pin 2.
1	Drawer kick-out connector pin 5.

The pulse ON time is [$t \times 100$ ms] and the OFF time is [$t \times 100$ ms].

- [Notes]
- When the printer is in an error status when this command is processed, this command is ignored.
 - When the pulse is output to the connector pin specified while **ESC p** or **DEL DC4** is executed while this command is processed, this command is ignored.
 - The printer executes this command upon receiving it.
 - With a serial interface model, this command is executed even when the printer is off-line, the receive buffer is full, or there is an error status.
 - With a parallel interface model, this command cannot be executed when the printer is busy. This command is executed even when the printer is off-line or there is an error status when DIP switch 2-1 is on.
 - If print data includes the same character strings as this command, the printer performs the same operation specified by this command. The user must consider this.
 - This command should not be used within the data sequence of another command that consists of 2 or more bytes.
 - This command is effective even when the printer is disabled with **ESC =** (Select peripheral device).

[Reference] **ESC p**

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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]	<ul style="list-style-type: none"> 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	<i>n</i>
	Hex	1B	20	<i>n</i>
	Decimal	27	32	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Sets the character spacing for the right side of the character to [<i>n</i> × horizontal or vertical motion units].			
[Notes]	<ul style="list-style-type: none"> The right-side character spacing for double-width mode is twice the normal value. When characters are enlarged, the right-side character spacing is <i>n</i> times normal value. This command sets values independently in each mode (standard and page modes). 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. 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. The maximum right-side spacing is 35.983 mm {255/180 inches} for the paper roll and is 43.18 mm {255/150 inches} for the slip paper. Any setting exceeding the maximum is converted to the maximum automatically. In standard mode, the horizontal motion unit is used. In page mode, the horizontal or vertical motion unit differs in page mode, depending on starting position of the printable area as follows: <ol style="list-style-type: none"> When the starting position is set to the upper left or lower right of the printable area using ESC T, the horizontal motion unit (<i>x</i>) 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 (<i>y</i>) is used. 			
[Default]	<i>n</i> = 0			
[Reference]	GS P			

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ESC ! n

[Name] Select print mode(s)

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

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

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

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Character font A (12 × 24) for the paper roll and 9 × 9 for the slip paper selected.
	On	01	1	Character font B (9 × 17) for the paper roll and 7 × 9 for the slip paper selected.
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.

- Determine the values of n by adding the values of all the characteristics you want to select.

[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.

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- When some characters in a line are double or more height, 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 –** 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.
- **ESC M** can also select character font types. However the setting of the last received command is effective.

[Default] $n = 0$

[Reference] **ESC -, ESC E, ESC M, 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] $0 \leq nL \leq 255$

$0 \leq nH \leq 255$

[Description] Sets the distance from the beginning of the line to the position at which subsequent characters are to be printed.

- [Notes]
- The distance from the beginning of the line to the print position is $[(nL + nH \times 256) \times (\text{vertical or horizontal motion unit})]$ inches.
 - Settings outside the specified printable area are ignored.
 - The horizontal and vertical motion unit are specified by **GS P**.
 - 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.
 - In standard mode, the horizontal motion unit (x) is used.
 - 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**

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ESC % n

[Name]	Select/cancel user-defined character set			
[Format]	ASCII	ESC	%	n
	Hex	1B	25	n
	Decimal	27	37	n
[Range]	$0 \leq n \leq 255$			
[Description]	Selects or cancels the user-defined character set.			
	<ul style="list-style-type: none">• When the LSB of n is 0, the user-defined character set is cancelled.• When the LSB of n is 1, the user-defined character set is selected.			
[Notes]	<ul style="list-style-type: none">• n is available only for the least significant bit.			
	<ul style="list-style-type: none">• When the user-defined character set is cancelled, the internal character set is automatically selected.			
[Default]	$n = 0$			
[Reference]	ESC &, ESC ?			

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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]	(For the paper roll)				
	y = 3				
	$32 \leq c1 \leq c2 \leq 126$				
	$0 \leq x \leq 12$ Font A (12 × 24)				
	$0 \leq x \leq 9$ Font B (9 × 17)				
	$0 \leq d1 \dots d(y \times xk) \leq 255$				
	(For slip paper)				
	y = 2				
	$32 \leq c1 \leq c2 \leq 126$				
	$0 \leq x \leq 12$ Font A (9 × 9)				
[Description]	Defines user-defined characters.				
	<ul style="list-style-type: none"> y specifies the number of bytes in the vertical direction. c1 specifies the beginning character code for the definition, and c2 specifies the final code. x specifies the number of dots in the horizontal direction. 				
[Notes]	<ul style="list-style-type: none"> The allowable character code range is from ASCII code <20>H to <7E>H (95 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 the characters. The dot pattern is in the horizontal direction from the left side. Any remaining dots on the right side are blank. The data to define a user-defined character is (y × x) bytes. Set a corresponding bit to 1 to print a dot or 0 to not print a dot. This command can define different user-defined character patterns by each fonts. To select a font, use ESC ! or ESC M. A user-defined character and a downloaded bit image cannot be defined simultaneously. When this command is executed, the downloaded bit image is cleared. The user-defined character definition is cleared when: <ul style="list-style-type: none"> ① ESC @ is executed. ② ESC ? is executed. ③ FS q is executed. ④ GS * is executed. ⑤ The printer is reset or the power is turned off. User-defined characters are defined for the paper types selected by ESC c 1. When the receipt paper is selected and when the user-defined characters are defined in font B (9 × 17), only the most significant bit of the 3rd byte of data in vertical direction is effective. 				

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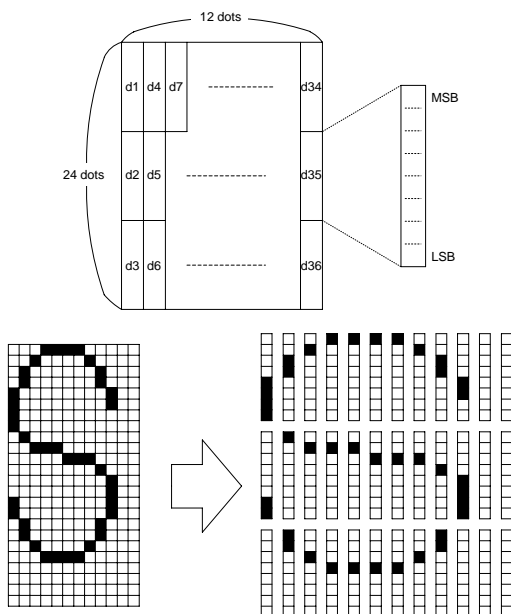
- If the slip paper is selected:
The dots adjoining each other horizontally cannot be printed.
Only the most upper bit can be printed in the second byte for the vertical direction.

[Default] The internal character set

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

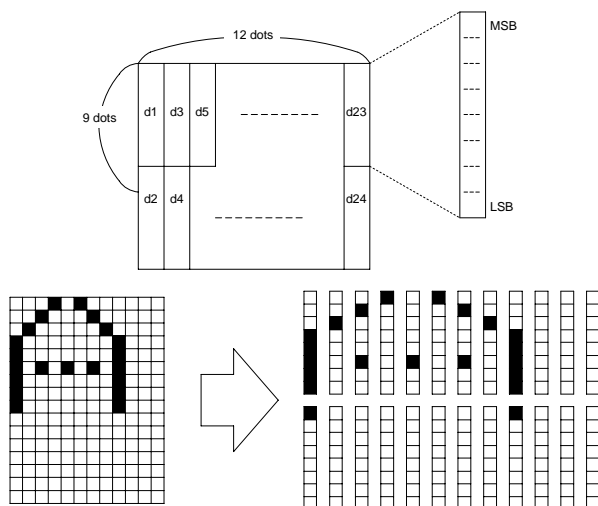
[Example]

- When receipt paper is selected (font A: 12 × 24).



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

- When slip paper is selected (font A: 9 × 9).



d1 = <03>H d4 = <01>H d7 = <02>H . .
d2 = <FF>H d5 = <00>H d8 = <00>H . . .
d3 = <FF>H d6 = <20>H d9 = <10>H

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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 (for the paper roll)

m = 0, 1 (for the slip paper)

$0 \leq nL \leq 255$

$0 \leq nH \leq 3$

$0 \leq d \leq 255$

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

(For the paper roll)

<i>m</i>	Mode	Vertical Direction		Horizontal Direction	
		Number of Dots	Dot Density	Dot Density	Number of Data (K)
0	8-dot single-density	8	60 DPI	90 DPI	$nL + nH \times 256$
1	8-dot double-density	8	60 DPI	180 DPI	$nL + nH \times 256$
32	24-dot single-density	24	180 DPI	90 DPI	$(nL + nH \times 256) \times 3$
33	24-dot double-density	24	180 DPI	180 DPI	$(nL + nH \times 256) \times 3$

(For slip paper)

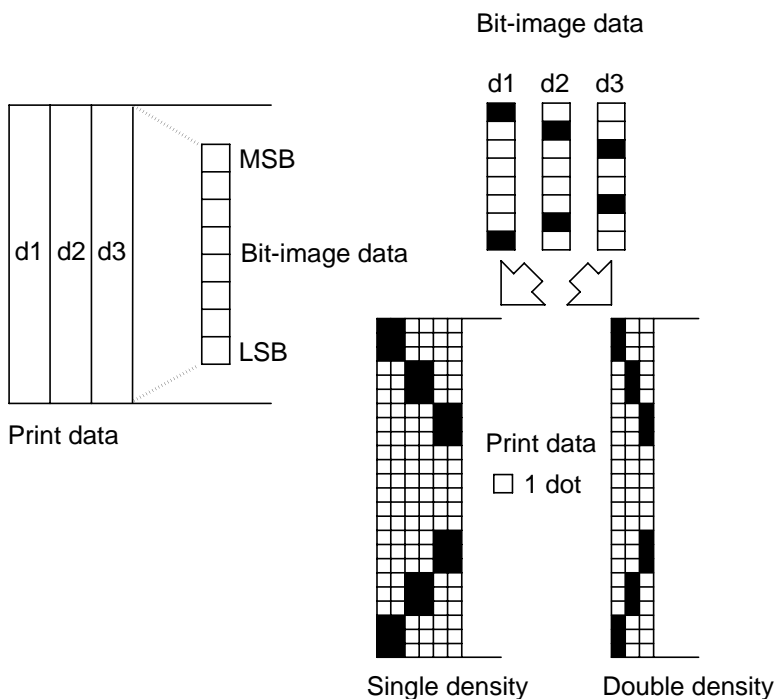
<i>m</i>	Mode	Vertical Direction	Horizontal Direction		
		Number of Dots	Dot adjacency	Maximum number of dots in horizontal	Number of Data (K)
0	8-dot single-density	8	Available	400 DPI	$nL + nH \times 256$
1	8-dot double-density	8	Not available	800 DPI	$nL + nH \times 256$

- [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 $nL + nH \times 256$.
 - 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. Set a corresponding bit to 1 to print a dot or to 0 to not print a dot.

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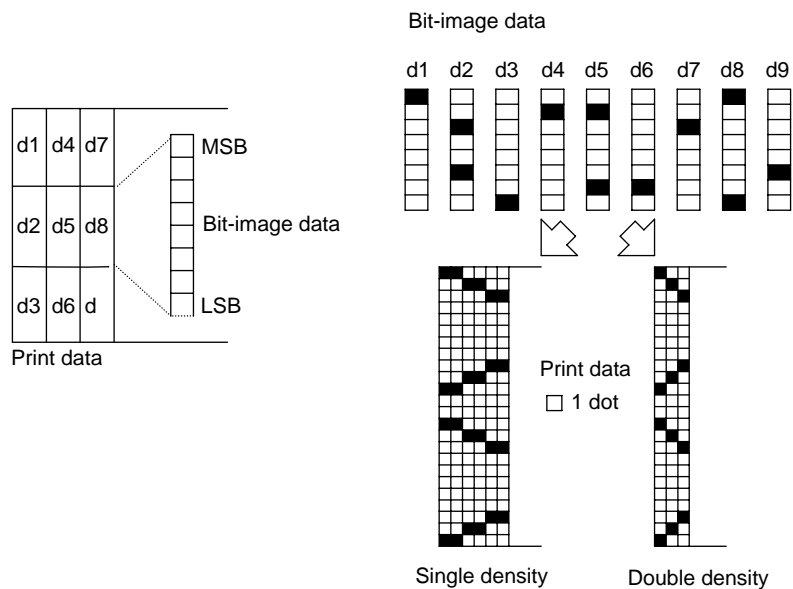
- If the width of the printing area set by **GS L** and **GS W** less than the width required by the data sent with the **ESC *** command, the following will be executed on the line in question (but the printing cannot exceed the maximum printable area):
 - ① The width of the printing area is extended to the right to accommodate the amount of data.
 - ② If step ① does not provide sufficient width for the data, the left margin is reduced to accommodate the data.

For each bit of data in single-density mode ($m=0, 32$), the printer prints two dots (two half dot for the slip): for each bit of data in double-density mode ($m=1, 33$), the printer prints one dot (one half dot for the slip). This must be considered in calculating the amount of data that can be printed in one line.
- After printing a bit image, the printer returns to normal data processing mode.
- This command is not affected by print modes (emphasized, double-strike, underline, character size, white/black reverse printing, or 90° rotated character etc.), except upside-down printing mode.
- The relationship between the image data and the dots to be printed is as follows:
- 8-dot bit image for the receipt paper

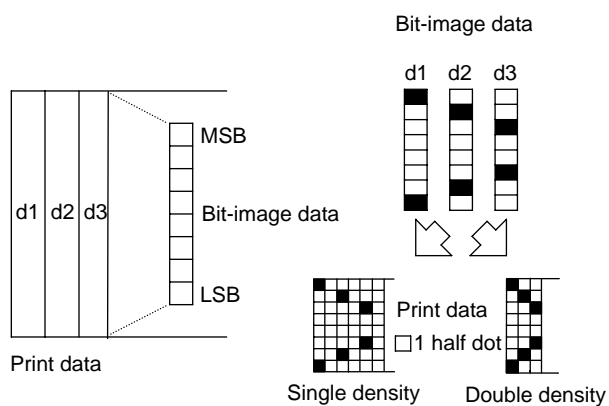


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- 24-dot bit image for the receipt paper



- 8-dot bit image for slip paper



ESC – *n*

[Name] Turn underline mode on/off

[Format]	ASCII	ESC	–	<i>n</i>
	Hex	1B	2D	<i>n</i>
	Decimal	27	45	<i>n</i>

[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*:

<i>n</i>	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 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.
 - 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.
 - If slip paper is selected, the underline is printed with 1-dot thickness even if *n* is specified as 2 or 50.

[Default] *n* = 0

[Reference] **ESC !**

ESC 2

[Name] Select default line spacing

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

[Description] Selects approximately 4.23 mm {1/6 inches} line spacing.

- [Notes]
- The line spacing can be set independently in standard mode and in page mode.
 - The line spacing is set to paper selected by **ESC c 1**.

[Reference] **ESC 3, ESC c 1**

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ESC 3 *n*

[Name]	Set line spacing			
[Format]	ASCII	ESC	3	<i>n</i>
	Hex	1B	33	<i>n</i>
	Decimal	27	51	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Sets the line spacing to [<i>n</i> × vertical or horizontal motion unit] inches.			
[Notes]	<ul style="list-style-type: none"> The line spacing is set to the paper selected by ESC c 1. The line spacing can be set independently in standard mode and in page mode. 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. 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. 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: <ul style="list-style-type: none"> 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 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 4.23 mm (1/6 inches).			
[Reference]	ESC 2, ESC c 1, GS P			

ESC <

[Name]	Return home		
[Format]	ASCII	ESC	<
	Hex	1B	3C
	Decimal	27	60
[Description]	Moves the print head to the standby position.		
[Notes]	<ul style="list-style-type: none"> This command is available only when slip paper is selected. Since the home position is detected when this command is executed, the printing position may shift after this command is executed. The standby position is in the left. 		

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ESC = n

[Name] Set peripheral device

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

[Range] $1 \leq n \leq 3$

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

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Printer disabled.
	On	01	1	Printer enabled
1	Off	00	0	Customer display disabled.
	On	02	2	Customer display enabled.
2-7	-	-	-	Undefined.

[Notes] • When the printer is disabled, it ignores all data except for error-recovery commands (**DLE ENQ 1**, **DLE ENQ 2**, **DLE EOT**, **DLE EOT BS**, **DLE ENG**, and **DLE DC4**) until it is enabled by this command.

[Default]

Serial interface specification

- When turning on the printer:

Direct Connection Customer Display Status	n
Customer display is recognized (*1)	2
Customer display is not recognized (*1)	1

- When executing **ESC @**:

Default values set by **ESC @** are as follows, depending on the value set by **ESC =** just before processing **ESC @** and on the setting of DIP switch 2-2:


Direct Connection Customer Display Status Default Value to be Set		n		
		1	2	3
After ESC @ Processing	When customer display is connected (*1)	1	2(*2)	2
	When customer display is not connected (*1)	1	2(*2)	1

(*1) Depending on the setting of DIP switch 2-2.

(*2) The printer is disabled and it does not process **ESC @**; therefore, the **ESC =** setting is changed.

Parallel interface specification: $n = 1$

[Reference] **DLE ENQ**

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ESC ? *n*

[Name]	Cancel user-defined characters			
[Format]	ASCII	ESC	?	<i>n</i>
	Hex	1B	3F	<i>n</i>
	Decimal	27	63	<i>n</i>
[Range]	$32 \leq n \leq 126$			
[Description]	Cancels user-defined characters.			
[Notes]	<ul style="list-style-type: none"> This command cancels the pattern defined for the character code specified by <i>n</i>. After the user-defined characters is canceled, the corresponding pattern for the internal character is printed. This command deletes the pattern defined for the specified code in the font selected by ESC ! or ESC M. If a user-defined character has not been defined for the specified character code, the printer ignores this command. This command deletes the pattern defined for the paper selected by ESC c 1. 			
[Reference]	ESC & , ESC % , ESC c 1			

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]	<ul style="list-style-type: none"> The DIP switch settings are not checked again. The data in the receive buffer is not cleared. The macro definition is not cleared. When this command is executed in slip mode, the printer ejects the slip and selects the paper roll. The non-volatile bit image data is not cleared. The data of the user NV memory is not cleared. 		

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ESC C *n*

[Name]	Set slip paper eject length			
[Format]	ASCII	ESC	C	<i>n</i>
	Hex	1B	43	<i>n</i>
	Decimal	27	67	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Sets the eject length setting for slip paper to <i>n</i> lines.			
[Notes]	<ul style="list-style-type: none"> When $n = 0$, the eject length setting for slip paper is cancelled. The printer continues feeding the paper until the printer gets to the position where the slip can be ejected. The positions are defined as below: <p>When reverse ejection is executed:</p> <p>If both TOF and BOF sensors detect a paper present status, paper is fed approximately 80 mm (3.15 inches) in the reverse paper feed direction.</p> <p>If only TOF sensor detects a paper present status, the printer feeds paper until the BOF sensor detects a paper present status and then the paper is fed approximately 80 mm (3.15 inches) in the reverse paper feed direction. In this case, if the BOF sensor can not detect a paper present status even if the printer feeds paper 450 mm (17.72 inches) or more, it is a slip ejection error.</p> <p>If only BOF sensor detects a paper present status, paper is fed approximately 20 mm (0.79 inches) in the reverse paper feed direction.</p> <p>When forward ejection is executed:</p> <p>Paper is fed until the BOF sensor detects a paper-end and then the paper is fed approximately 20 mm (0.79 inches) in the paper feed direction. In this case, if the BOF sensor can not detect a paper not present status even if the printer feeds paper 450 mm (17.72 inches) or more, it is a slip ejection error.</p> <ul style="list-style-type: none"> Specified eject length doesn't change even if line spacing changes. The maximum eject length that can be set is 450 mm (17.72 inches). If the specified amount exceeds 450 mm (17.72 inches), the eject length is automatically set to 450 mm (17.72 inches). 			
[Default]	$n = 0$			
[Reference]	FF, ESC 2, ESC 3			

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ESC D $n1 \dots nk$ NUL

[Name]	Set horizontal tab positions				
[Format]	ASCII	ESC	D	$n1 \dots nk$	NUL
	Hex	1B	44	$n1 \dots nk$	00
	Decimal	27	68	$n1 \dots nk$	0
[Range]	$1 \leq n \leq 255$				
	$0 \leq k \leq 32$				
[Description]	Sets horizontal tab positions. <ul style="list-style-type: none"> n specifies the column number for setting a horizontal tab position from the beginning of the line. k indicates the total number of horizontal tab positions to be set. 				
[Notes]	<ul style="list-style-type: none"> The horizontal tab position is stored as a value of $[\text{character width} \times n]$ measured from the beginning of the line. The character width includes the right-side character spacing, and double-width characters are set with twice the width of normal characters. This command cancels the previous horizontal tab settings. When setting $n = 8$, the print position is moved to column 9 by sending HT. Up to 32 tab positions ($k = 32$) can be set. Data exceeding 32 tab positions is processed as normal data. Transmit $[n]k$ in ascending order and place a NUL code 0 at the end. When $[n]k$ is less than or equal to the preceding value $[n]k-1$, tab setting is finished and the following data is processed as normal data. ESC D NUL cancels all horizontal tab positions. The previously specified horizontal tab positions do not change, even if the character width changes. The character width is memorized for each paper type when this command is executed. The character width is memorized for each standard and page mode. 				
[Default]	The default tab positions are at intervals of 8 characters (columns 9, 17, 25,...) for font A (12 × 24) in the paper roll mode and for the font A (9 × 9) in the slip mode.				
[Reference]	HT				

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ESC E *n*

[Name]	Turn emphasized mode on/off			
[Format]	ASCII	ESC	E	<i>n</i>
	Hex	1B	45	<i>n</i>
	Decimal	27	69	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Turns emphasized mode on or off			
	When the LSB of <i>n</i> is 0, emphasized mode is turned off.			
	When the LSB of <i>n</i> is 1, emphasized mode is turned on.			
[Notes]	<ul style="list-style-type: none"> Two-pass printing is executed on the slip; therefore, printing speed goes slow. Only the least significant bit of <i>n</i> is enabled. This command and ESC ! turn on and off emphasized mode in the same way. Be careful when this command is used with ESC !. Emphasized and double-strike printing appear the same. 			
[Default]	<i>n</i> = 0			
[Reference]	ESC !			

ESC F

[Name]	Set/cancel slip paper reverse eject			
[Format]	ASCII	ESC	F	<i>n</i>
	Hex	1B	46	<i>n</i>
	Decimal	27	70	<i>n</i>
[Range]	$0 \leq n \leq 255$			
Description]	Sets or cancels the slip paper reverse eject			
	When the LSB of <i>n</i> is 0, cancels the slip paper reverse eject.			
	When the LSB of <i>n</i> is 1, sets the slip paper reverse eject.			
[Notes]	<ul style="list-style-type: none"> Only the least significant bit of <i>n</i> is enabled. 			
[Default]	<i>n</i> = 1			
[Reference]	FF			

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ESC G *n*

[Name]	Turn on/off double-strike mode			
[Format]	ASCII	ESC	G	<i>n</i>
	Hex	1B	47	<i>n</i>
	Decimal	27	71	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Turns double-strike mode on or off.			
	<ul style="list-style-type: none">When the LSB of <i>n</i> is 0, double-strike mode is turned off.When the LSB of <i>n</i> is 1, double-strike mode is turned on.			
[Notes]	<ul style="list-style-type: none">Two-pass printing is executed on the slip; therefore, printing speed goes slow.			
	<ul style="list-style-type: none">Only the lowest bit of <i>n</i> is enabled.			
	<ul style="list-style-type: none">Printer output is the same in double-strike mode and in emphasized mode.			
[Default]	<i>n</i> = 0			
[Reference]	ESC E			

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ESC J *n*

[Name]	Print and feed paper			
[Format]	ASCII	ESC	J	<i>n</i>
	Hex	1B	4A	<i>n</i>
	Decimal	27	74	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Prints the data in the print buffer and feeds the paper [<i>n</i> × vertical or horizontal motion unit] inches.			
[Notes]	<ul style="list-style-type: none"> 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. The horizontal and vertical motion unit are specified by GS P. 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. In standard mode, the printer uses the vertical motion unit (<i>y</i>). In page mode, this command functions as follows, depending on the starting position of the printable area: <ul style="list-style-type: none"> 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 (<i>y</i>) 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 (<i>x</i>) is used. 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). 			
[Reference]	GS P			

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ESC K *n*

[Name]	Print and reverse feed			
[Format]	ASCII	ESC	K	<i>n</i>
	Hex	1B	4B	<i>n</i>
	Decimal	27	75	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Prints the data in the print buffer and feeds the paper $n \times$ vertical motion unit inches in the reverse direction			
[Notes]	<ul style="list-style-type: none">• This command is ignored when receipt paper is selected as the print sheet by ESC c 0.• 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.• The horizontal and vertical motion units are specified by GS P.• The GS P command can change the vertical (and horizontal) motion units. 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.• 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).• This command uses the vertical motion unit (<i>y</i>).• This command is ignored in the page mode.			
[Reference]	GS P			

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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.
 - This command has no effect in page mode.
 - This command is available only when the paper roll is selected by **ESC c 0**.
 - After printing by **FF** is completed or by using **ESC S**, the printer returns to standard mode.
 - This command sets the 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 (in which the values can be set independently in standard mode and page mode) to those for page mode:
 - ① Set right-side character spacing: **ESC SP**, **FS S**
 - ② Select default line spacing: **ESC 2**
 - ③ Set line spacing: **ESC 3**
 - Only valve settings is possible for the following commands in page mode; these commands are not executed.
 - ① Turn 90° clockwise rotation mode on/off: **ESC V**
 - ② Select justification: **ESC a**
 - ③ Turn upside-down printing mode on/off: **ESC {**
 - ④ Set left margin: **GS L**
 - ⑤ Set printable area width: **GS W**
 - The following command is ignored in page mode:
 - ① Execute test print: **GS (A**
 - The following command is not available in page mode:
 - ① Select paper: **ESC c 0**
 - ② Print non-volatile bit image: **FS P**
 - ③ Define non-volatile bit image: **FS q**
 - ④ Write to user NV memory: **FS g 1**
 - ⑤ Initialize maintenance counter: **GS g 0**
 - 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 @**, **ESC S**, **ESC T**, **ESC W**, **GS \$**, **GS **, 3.12 *Page Mode*

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ESC M *n*

[Name] Select character font

[Format]	ASCII	ESC	M	<i>n</i>
	Hex	1B	4D	<i>n</i>
	Decimal	27	77	<i>n</i>

[Range] *n* = 0, 1, 48, 49

[Description] Selects character fonts.

n	Function
0, 48	Character font A selected. 12 × 24 for the paper roll. 9 × 9 for the slip paper
1, 49	Character font B selected. 9 × 17 for the paper roll. 7 × 9 for the slip paper

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

[Reference] **ESC !**

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ESC R n

[Name] Select an international character set

[Format]	ASCII	ESC	R	n
	Hex	1B	52	n
	Decimal	27	82	n

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

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

n	Character set
0	U.S.A.
1	France
2	Germany
3	U.K.
4	Denmark I
5	Sweden
6	Italy
7	Spain I
8	Japan
9	Norway
10	Denmark II
11	Spain II
12	Latin America
13	Korea

[Default] $n = 0$

[Reference] 3.2.11 *International Character Set*

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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 set by **ESC W** are initialized.
 - 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:
 - ① Set right-side character spacing: **ESC SP, FS S**
 - ② Select default line spacing: **ESC 2**
 - ③ Set line spacing: **ESC 3**
 - The following commands are enabled only to set in standard mode.
 - ① Set printing area in page mode: **ESC W**
 - ② Select print direction in page mode: **ESC T**
 - The following commands are ignored in standard mode.
 - ① Set absolute vertical print position in page mode: **GS \$**
 - ② Set relative vertical print position in page mode: **GS **
 - Standard mode is selected automatically when power is turned on, the printer is reset, or command **ESC @** is used.

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

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ESC T *n*

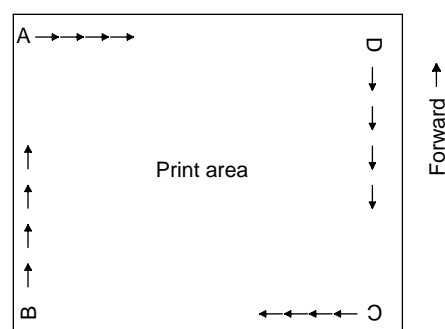
[Name] Select print direction in page mode

[Format]	ASCII	ESC	T	<i>n</i>
	Hex	1B	54	<i>n</i>
	Decimal	27	84	<i>n</i>

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

[Description] Selects the print direction and starting position in page mode.
n specifies the print direction and starting position as follows:

<i>n</i>	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 set by **ESC W**.
 - 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 units: **ESC SP, ESC \$, ESC **
 Commands using vertical motion units: **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 SP, ESC 3, ESC \$, ESC J, ESC L, ESC W, ESC \, GS \$, GS P, GS **

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ESC U *n*

[Name]	Turn on/off unidirectional printing mode			
[Format]	ASCII	ESC	U	<i>n</i>
	Hex	1B	55	<i>n</i>
	Decimal	27	85	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Turns unidirectional printing mode on or off			
	When the LSB of <i>n</i> is 0, turns on unidirectional printing mode. When the LSB of <i>n</i> is 1, turns off unidirectional printing mode and turns on bidirectional printing mode.			
[Notes]	• Only the least significant bit of <i>n</i> is enabled.			
	• When unidirectional printing mode is turned on, the printer prints from left to right.			
	• When printing on a slip sheet, to avoid horizontal printing misalignment, unidirectional printing mode should be used.			
	• This command affects printing on a slip.			
[Default]	<i>n</i> = 0			

ESC V *n*

[Name]	Turn 90° clockwise rotation mode on/off			
[Format]	ASCII	ESC	V	<i>n</i>
	Hex	1B	56	<i>n</i>
	Decimal	27	86	<i>n</i>
[Range]	$0 \leq n \leq 1, 48 \leq n \leq 49$			
[Description]	Turns 90° clockwise rotation mode on/off			
	<i>n</i> is used as follows:			

<i>n</i>	Function
0, 48	Turns off 90° clockwise rotation mode
1, 49	Turns on 90° clockwise rotation mode

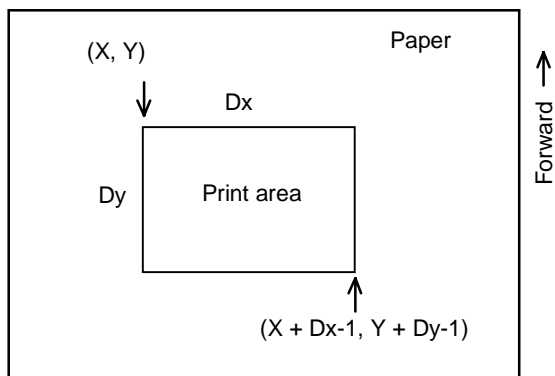
[Notes]	• This command affects printing on a receipt paper in standard mode. However, the setting is always effective.
	• When underline mode is turned on, the printer does not underline 90° clockwise-rotated.
	• Double-width and double-height commands in 90° rotation mode enlarge characters in the opposite directions from double-height and double-width commands in normal mode.
[Default]	<i>n</i> = 0
[Reference]	ESC ! , ESC –

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

[Name]	Set printing area in page mode						
[Format]	ASC II	ESC	W	<i>xL xH yL yH dxL dxH dyL dyH</i>			
	Hex	1B	57	<i>xL xH yL yH dxL dxH dyL dyH</i>			
	Decimal	27	87	<i>xL xH yL yH dxL dxH dyL dyH</i>			
[Range]	$0 \leq xL, xH, yL, yH, dxL, dxH, dyL, dyH \leq 255$ (except $dxL=dxH=0$ or $dyL=dyH=0$)						
[Description]	<ul style="list-style-type: none">The horizontal starting position, vertical starting position, printing area width, and printing area height are defined as $x0$, $y0$, dx (inch), dy (inch), respectively. <p>Each setting for the printing area is calculated as follows:</p> $x0 = [(xL + xH \times 256) \times (\text{horizontal motion unit})]$ $y0 = [(yL + yH \times 256) \times (\text{vertical motion unit})]$ $dx = [dxL + dxH \times 256] \times (\text{horizontal motion unit})$ $dy = [dyL + dyH \times 256] \times (\text{vertical motion unit})$ <p>The printing area is set as shown in the figure below.</p>						
[Notes]	<ul style="list-style-type: none">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 position where data is buffered to the position specified by ESC T within the printing area.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).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).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.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.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.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.						

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- This printable area for this printer is approximately 72.249 mm {512/180 inches} in the horizontal direction and approximately 117.263 mm {1662/360 inches} in the vertical direction.
- This command is available only when slip paper is selected in page mode.

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

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

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ESC \ *nL nH*

[Name]	Set relative print position				
[Format]	ASCII	ESC	\	<i>nL</i>	<i>nH</i>
	Hex	1B	5C	<i>nL</i>	<i>nH</i>
	Decimal	27	92	<i>nL</i>	<i>nH</i>
[Range]	$0 \leq nL \leq 255$				
	$0 \leq nH \leq 255$				
[Description]	<p>Sets the print starting position based on the current position by using the horizontal or vertical motion unit.</p> <ul style="list-style-type: none"> This command sets the distance from the current position to $[(nL + nH \times 256) \times \text{horizontal or vertical motion unit}]$ 				
[Notes]	<ul style="list-style-type: none"> Any setting that exceeds the printable area is ignored. When pitch <i>N</i> is specified to the right: $nL + nH \times 256 = N$ When pitch <i>N</i> is specified to the left (the negative direction), use the complement of 65536. When pitch <i>N</i> is specified to the left: $nL + nH \times 256 = 65536 - N$ The print starting position moves from the current position to $[N \times \text{horizontal or vertical motion unit}]$ The horizontal and vertical motion unit are specified by GS P. 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. In standard mode, the horizontal motion unit is used. In page mode, the horizontal or vertical motion unit differs as follows, depending on the starting point of the printing area: <ul style="list-style-type: none"> 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 (<i>x</i>) 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 (<i>y</i>) is used. 				
[Reference]	ESC \$, GS P				

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ESC a *n*

[Name] Select justification

[Format]	ASCII	ESC	a	<i>n</i>
	Hex	1B	61	<i>n</i>
	Decimal	27	97	<i>n</i>

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

[Description] Aligns all the data in one line to the specified position
n selects the justification as follows:

<i>n</i>	Justification
0, 48	Left justification
1, 49	Centering
2, 50	Right justification

[Notes]

- The command is enabled only when processed at the beginning of the line.
- If this command is input in page mode, the printer executes only internal flag operations.
- This command has no effect in page mode.
- This command executes justification in the printing area.
- This command justifies the space area according to **HT**, **ESC \$** or **ESC **.

[Default] $n = 0$

[Example]

Left justification

ABC
ABCD
ABCDE

Centering

ABC
ABCD
ABCDE

Right justification

ABC
ABCD
ABCDE

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ESC c 0 n

[Name] Select paper type(s) for printing

[Format]

ASCII	ESC	c	0	<i>n</i>
Hex	1B	63	30	<i>n</i>
Decimal	27	99	48	<i>n</i>

[Range] $1 \leq n \leq 4$

[Description] Selects the type of paper for printing, using *n* as follows:

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Paper roll disabled.
	On	01	1	Paper roll enabled.
1	Off	00	0	Paper roll disabled.
	On	02	2	Paper roll enabled.
2	Off	00	0	Slip paper disabled.
	On	04	4	Slip paper enabled.
3-7	-	-	-	Undefined.

- [Notes]
- This command is available only when processed at the beginning of a line.
 - This command is ignored in page mode.
 - When this command is input, the printer executes the following:
If paper roll is selected, a previously selected slip paper is cancelled out and ejected.
If a slip was previously selected and is selected again, no operation is executed.
If paper roll was previously selected, and then slip paper is selected, the printer waits for the slip paper to be loaded.
 - When either bit 0 or 1 is on, the paper roll is selected.
 - When a slip is not inserted correctly, the printer ejects the slip and waits for the slip to be inserted. Refer to Section 1.1.5 for inserting a slip.

[Default] $n = 3$

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ESC c 1 *n*

[Name] Select paper type(s) for command settings

[Format]	ASCII	ESC	c	1	<i>n</i>
	Hex	1B	63	31	<i>n</i>
	Decimal	27	99	49	<i>n</i>

[Range] $1 \leq n \leq 4$

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Paper roll disabled.
	On	01	1	Paper roll enabled.
1	Off	00	0	Paper roll disabled.
	On	02	2	Paper roll enabled.
2	Off	00	0	Slip paper disabled.
	On	04	4	Slip paper enabled.
3-7	-	-	-	Undefined.

[Notes] • The paper selected by this command has effect on the following:

- ① Select 1/6-inch line spacing: **ESC 2**
 - ② Set line spacing: **ESC 3**
 - ③ Set left margin: **GS L**
 - ④ Set printable area width: **GS W**
 - ⑤ Define user-defined characters: **ESC &**
 - ⑥ Cancel user-defined characters: **ESC ?**
 - ⑦ Define user-defined bit image: **GS ***
 - ⑧ Set horizontal and vertical motion units: **GS P**
- When either 0 or 1 is on, the paper roll is selected.

[Default] $n = 3$

[Reference] **ESC 2, ESC 3, ESC &, ESC ?, GS *, GS L, GS P, GS W**

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ESC c 3 *n*

[Name] Select paper sensor(s) to output paper end signals

[Format]	ASCII	ESC	c	3	<i>n</i>
	Hex	1B	63	33	<i>n</i>
	Decimal	27	99	51	<i>n</i>

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

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

- Each bit of *n* is used as follows:

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Paper roll near-end sensor disabled
	On	01	1	Paper roll near-end sensor enabled
1	Off	00	0	Paper roll near-end sensor disabled
	On	02	2	Paper roll near-end sensor enabled
2	Off	00	0	Paper roll end sensor disabled
	On	04	4	Paper roll end sensor enabled
3	Off	00	0	Paper roll end sensor disabled
	On	08	8	Paper roll end sensor enabled
4	Off	00	0	TOF sensor disabled
	On	10	16	TOF sensor enabled
5	Off	00	0	BOF sensor disabled
	On	20	32	BOF sensor enabled
6, 7	-	-	-	Undefined

- [Notes]
- It is possible to select multiple sensors to output signals. Then, if any of the sensors detects a paper end, the paper end signal is output.
 - Sensor is switched when executing this command. The paper end signal switching be delayed depending on the receive buffer state.
 - If either bit 0 or bit 1 is on, the paper roll near-end sensor is selected as the paper sensor outputting paper-end signals
 - If either bit 2 or bit 3 is on, the paper roll end sensor is selected as the paper sensor outputting paper-end signals.
 - When all the sensors are disabled, the paper end signal always outputs a paper present status.
 - The command is available only with a parallel interface and is ignored with a serial interface.

[Default] $n = 15$

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			NEXT 133	SHEET 132

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] $0 \leq n \leq 255$

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

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Paper roll near end sensor disabled.
	On	01	1	Paper roll near end sensor enabled.
1	Off	00	0	Paper roll near end sensor disabled.
	On	02	2	Paper roll near end sensor enabled.
2-3	-	-	-	Undefined.
4	Off	00	0	TOF sensor disabled.
	On	10	16	TOF sensor enabled.
5	Off	00	0	BOF sensor disabled.
	On	20	32	BOF sensor enabled.
6-7	-	-	-	Undefined.

- [Notes]
- When a paper sensor is enabled with this command, printing is stopped only when the corresponding paper is selected for printing.
 - It is possible to select multiple sensors for print control to stop printing. Then if any sensor detects a paper end, the printer stops printing.
 - When a paper end is detected, printing is stopped after printing the current line and feeding the paper.
 - When a paper-end is detected by the paper roll sensor, the printer goes off-line after printing stops.
 - When the BOF sensor detects a paper-end, the printer ejects the paper after printing as much data as possible and enters the paper waiting state.
 - When either bit 0 or 1 is on, the printer selects the paper roll near-end sensor for the paper sensor to stop printing.

[Default] $n = 0$

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			NEXT 134	SHEET 133

ESC c 5 *n*

[Name]	Enable/disable panel buttons				
[Format]	ASCII	ESC	c	5	<i>n</i>
	Hex	1B	63	35	<i>n</i>
	Decimal	27	99	53	<i>n</i>
[Range]	$0 \leq n \leq 255$				
[Description]	Enables or disables the panel buttons.				
	<ul style="list-style-type: none"> When the LSB of <i>n</i> is 0, the panel buttons are enabled. When the LSB of <i>n</i> is 1, the panel buttons are disabled. 				
[Notes]	<ul style="list-style-type: none"> Only the lowest bit of <i>n</i> is valid. When the panel buttons are disabled, none of them are usable when the printer cover is closed. In this printer, the panel buttons are the FEED, FORWARD, REVERSE, and RELEASE buttons. In the macro ready mode, the FEED and REVERSE buttons are enabled regardless of the settings of this command; however, the paper cannot be fed by using these buttons. When the cover is open, the following panel buttons are disabled regardless of the settings of this command. <ul style="list-style-type: none"> When the paper roll cover is open: FEED button is disabled When the front cover is open: FORWARD, REVERSE, and RELEASE buttons are disabled 				
[Default]	<i>n</i> = 0				

ESC d *n*

[Name]	Print and feed <i>n</i> lines			
[Format]	ASCII	ESC	d	<i>n</i>
	Hex	1B	64	<i>n</i>
	Decimal	27	100	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Prints the data in the print buffer and feeds <i>n</i> lines.			
[Notes]	<ul style="list-style-type: none"> This command sets the print starting position to the beginning of the line. This command does not affect the line spacing set by ESC 2 or ESC 3. The maximum paper feed amount is 1016 mm (40 inches). If the paper feed amount (<i>n</i> x line spacing) of more than 1016 mm (40 inches) is specified, the printer feeds the paper only 1016 mm (40 inches). 			
[Reference]	ESC 2 , ESC 3			

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ESC e *n*

[Name]	Print and reverse feed <i>n</i> lines			
[Format]	ASCII	ESC	e	<i>n</i>
	Hex	1B	65	<i>n</i>
	Decimal	27	101	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Prints the data in the print buffer and feeds <i>n</i> lines in the reverse direction.			
[Notes]	<ul style="list-style-type: none">• This command is ignored when paper roll is selected as the print sheet by ESC c 0.• This command is ignored in page mode.• 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.• Even if the number of (<i>n</i> × line feed amount) exceeds 1016 mm (40 inches), the printer feeds the paper only 1016 mm (40 inches).			
[Reference]	ESC 2, ESC 3			

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			NEXT 136	SHEET 135

ESC f *t1 t2*

[Name]	Set slip paper waiting time				
[Format]	ASCII	ESC	f	<i>t1</i>	<i>t2</i>
	Hex	1B	66	<i>t1</i>	<i>t2</i>
	Decimal	27	102	<i>t1</i>	<i>t2</i>
[Range]	$0 \leq t1 \leq 15$				
	$0 \leq t2 \leq 64$				
[Description]	<p>Sets the time that the printer waits for slip paper to be inserted and the time from insertion of the slip to the start of printing.</p> <ul style="list-style-type: none"> <i>t1</i> specifies the wait time for slip paper to be inserted. <i>t2</i> specifies time from insertion of the slip to the start of printing. 				
[Notes]	<ul style="list-style-type: none"> When the slip insertion wait time is set to be longer than the default value, the problem such as paper jam may occur. The default value for the slip insertion wait time is recommended. This command sets the slip paper wait time to [<i>t1</i> × 1] minutes. If slip paper is not inserted within this time, the printer cancels slip paper mode and selects the paper roll. When <i>t1</i> is set to 0, the printer waits until slip paper is inserted. The printer starts operation [<i>t2</i> × 0.1] seconds after detecting a slip. When either <i>t1</i> or <i>t2</i> is out of the specified range, this command is ignored and the previously set value is not changed. In the following cases, the printer continues waiting for a slip to be inserted (until the TOF sensor detects a paper present status). <ul style="list-style-type: none"> ① Waits for a slip to be inserted when a printing stop due to a paper-end is enabled. ② Waits for a slip to be inserted when the printer recovers from an error. Using DLE ENQ 3 cancels the slip waiting state. The data in the receive buffer and the print buffer are cleared in this time. 				
[Default]	<i>t1</i> = 0, <i>t2</i> = 5				

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ESC p m t1 t2

[Name] Generate pulse

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

[Range] m = 0, 1, 48, 49
 0 ≤ t1 ≤ 255, 0 ≤ t2 ≤ 255

[Description] Outputs the pulse specified by t1 and t2 to connector pin m as follows:

m	Connector pin
0, 48	Drawer kick-out connector pin 2.
1, 49	Drawer kick-out connector pin 5.

[Notes] • The pulse ON time is [t1 × 2 ms] and the OFF time is [t2 × 2 ms].
 • If t2 < t1, the OFF time is [t1 × 2 ms]

[Reference] Section 2.2.3, *Drawer kick-out connector*, Appendix J

ESC q

[Name] Release

[Format] ASCII ESC q
 Hex 1B 71
 Decimal 27 113

[Description] Releases the paper

[Notes] • This command is enabled only when processed at the beginning of a line.
 • When the slip paper is selected as the print sheet, the printer waits for the paper to be removed after executing a release; then the printer selects the paper roll.
 • When the paper roll is selected as the print sheet, the printer moves to the next operation immediately after executing a release.

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ESC t *n*

[Name] Select character code table

[Format] ASCII ESC t *n*
 Hex 1B 74 *n*
 Decimal 27 116 *n*

[Range] $0 \leq n \leq 8$, $20 \leq n \leq 26$, $n = 255$

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

<i>n</i>	Page
0	PC437 [U.S.A., Standard Europe]
1	Katakana
2	PC850 [Multilingual]
3	PC860 [Portuguese]
4	PC863 [Canadian-French]
5	PC865 [Nordic]
6	Hiragana
7	One-pass printing Kanji characters
8	One-pass printing Kanji characters
20 (*)	Thai character code 42
21 (*)	Thai character code 11
22 (*)	Thai character code 13
23 (*)	Thai character code 14
24 (*)	Thai character code 16
25 (*)	Thai character code 17
26 (*)	Thai character code 18
255	Space page (except for font B (7 × 9) for slip)

(*) The character code table ($n = 20$ through 26) is available only on TM-H5000IIM (Thai character supporting model).

Character code table ($n = 6$, 7 , and 8) is available only on the Kanji supporting model on the slip printing.

[Default] $n = 0$

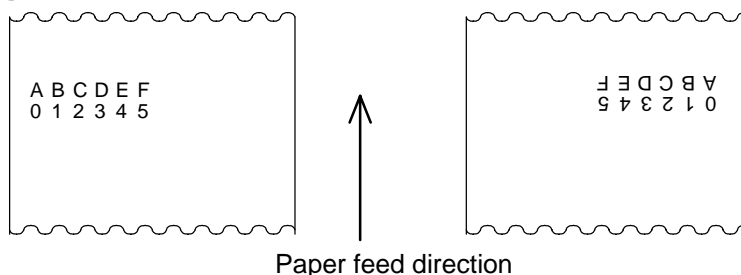
For Thai character supporting model: $n = 20$

[Reference] Appendix F, 3.2 *Character Code Tables*

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ESC { *n*

[Name]	Turns on/off upside-down printing mode			
[Format]	ASCII	ESC	{	<i>n</i>
	Hex	1B	7B	<i>n</i>
	Decimal	27	123	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Turns upside-down printing mode on or off. <ul style="list-style-type: none">• When the LSB of <i>n</i> is 0, upside-down printing mode is turned off.• When the LSB of <i>n</i> is 1, upside-down printing mode is turned on.			
[Notes]	<ul style="list-style-type: none">• Only the lowest bit of <i>n</i> is valid.• This command is enabled only when processed at the beginning of a line.• When this command is input in page mode, the printer executes 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]	<i>n</i> = 0			
[Example]				



FS g 1 m a1 a2 a3 a4 nL nH d1...dk

[Name]	Write to user NV memory										
[Format]	ASCII	FS	g	1	m	a1	a2	a3	a4	nL	nH d1...dk
	Hex	1C	67	31	m	a1	a2	a3	a4	nL	nH d1...dk
	Decimal	28	103	49	m	a1	a2	a3	a4	nL	nH d1...dk
[Range]	$m = 0$										
	$0 \leq (a1+(a2 \times 256)+(a3 \times 65536)+(a4 \times 16777216)) \leq 1023$										
	$1 \leq (nL+(nH \times 256)) \leq 1024$										
	$32 \leq d \leq 255$										
	$k = (nL+(nH \times 256))$										
[Description]	<p>Writes data to user NV memory.</p> <ul style="list-style-type: none"> m is always set to 0. $a1$, $a2$, $a3$, and $a4$ specify the data stored starting address to $(a1+(a2 \times 256) \times (a3 \times 65536)+(a4 \times 16777216))$. nL, nH select the number of stored data bytes $(nL+(nH \times 256))$. d specifies the stored data. 										
[Notes]	<ul style="list-style-type: none"> Frequent write command execution by FS g 1, GS g 0 may damage the NV memory. Therefore, it is recommended to write the NV memory 10 times or less a day. While processing this command, the printer is BUSY when writing the data to the user NV memory and stops receiving data. Therefore it is prohibited to transmit data including the real-time commands during the execution of this command. User NV memory means the memory area which is used for storing character font data in non-volatile memory. This command is available only when processed at the beginning of a line in standard mode. This command is ignored in page mode. When this command is received during macro definition, the printer ends macro definition and begins executing this command. If the values of the argument (m), the stored starting address ($a1$, $a2$, $a3$, $a4$), and the number of the stored data (nL, nH) are out of the specified range, or if the stored starting address ($a1$, $a2$, $a3$, $a4$) + the number of the stored data (nL, nH) ≥ 1024, this command is ignored and data following are processed as normal data. If the value of the stored data d is out of range, the execution of this command is ended, and data following are processed as normal data. In this case, the data which are stored in the NV memory still remain. Writing data to the NV memory overwrites previous data. Therefore, previous data is deleted. If an error occurs during writing data to the NV memory, "Memory or Gate array R/W error" appears. Data which are stored in the user NV memory can be read by FS g 2. Once data is stored in the user NV memory, it is not erased by executing ESC @, FS q, reset, or power off. 										
[Reference]	FS g 2										

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FS g 2 m a1 a2 a3 a4 nL nH

[Name]	Read from user NV memory											
[Format]	ASCII	FS	g	2	m	a1	a2	a3	a4	nL	nH	
	Hex	1C	67	32	m	a1	a2	a3	a4	nL	nH	
	Decimal	28	103	50	m	a1	a2	a3	a4	nL	nH	
[Range]	$m = 0$											
	$0 \leq (a1 + (a2 \times 256) + (a3 \times 65536) + (a4 \times 16777216)) \leq 1023$											
	$1 \leq (nL + (nH \times 256)) \leq 80$											
[Description]	Transmits data from user NV memory. <ul style="list-style-type: none"> • m is always set to 0. • $a1$, $a2$, $a3$, and $a4$ specify the data stored starting address to $(a1 + (a2 \times 256) \times (a3 \times 65536) + (a4 \times 16777216))$. • nL, nH select the number of stored data bytes $(nL + (nH \times 256))$. 											
[Notes]	<ul style="list-style-type: none"> • The printer transmits all data collectively without confirming whether the host is ready to receive data. To receive all data result correctly, (the capacity of the transmitted data + 2) bytes or more space is required in the receive buffer. • During data transmission, the printer ignores the real-time commands. Also, the printer does not transmit ASB even when the ABS is enabled. Therefore, the user cannot confirm changes in the printer status during these periods. • User NV memory means the memory area which is used for storing character font data in non-volatile memory. • If the values of the argument (m), the stored starting address ($a1$, $a2$, $a3$, $a4$) and the number of the stored data (nL, nH) are out of the specified range, or if the stored starting address ($a1$, $a2$, $a3$, $a4$) + the number of the stored data (nL, nH) ≥ 1024, this command is ignored and data following are processed as normal data. • After the data is ready to be transmitted, the printer executes the following process. <ol style="list-style-type: none"> ① Executes READY to BUSY. If it is already BUSY, the printer executes nothing. ② Transmits [Header + Data + NUL]. ③ Executes BUSY to READY. If it is already BUSY from any other cause, the printer executes nothing. • The contents of [Header + Data + NUL] are as follows: Header: Hexadecimal = 5FH / Decimal = 95 (1 byte) Data: Data stored in user NV memory $((nL + (nH \times 256))$ bytes) NUL: Hexadecimal = 00H / Decimal = 0 (1 byte) • When DTR/DSR control is selected, the printer transmits data consecutively after confirming whether the host computer is ready to receive data. When the host is not ready to receive data, the printer waits until the host is ready. • When XON/XOFF control is selected, the printer transmits all data consecutively without confirming whether the host computer is ready to receive data. The data transmission must be consecutive, except for the XOFF code. 											

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- With the parallel interface mode, the data buffer capacity (which is the memory area to store all transmitted data except ASB status) is 99 bytes. Data which exceeds 99 bytes are ignored.
- Data which is stored in the user NV memory can be written by **FS g 1**.
- Depending on the status of the receive buffer, there can be a time difference between the receiving of this command and the storing of data.

[Reference] **FS g 1**

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FS p *n m*

[Name] Print NV bit image

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

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

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

<i>m</i>	Mode	Vertical Dot Density (DPI)	Horizontal Dot Density (DPI)
0, 48	Normal	180	180
1, 49	Double-width	180	90
2, 50	Double-height	90	180
3, 51	Quadruple	90	90

- *n* is the number of the NV bit image (defined using the **FS q** command).
- *m* specifies the bit image mode.

- [Notes]
- NV bit image means a bit image which is defined in a non-volatile memory by **FS g** and printed by **FS p**.
 - This command is not effective when the specified NV bit image has not been defined.
 - This command is available only when paper roll is selected using **ESC c 0**.
 - In standard mode, this command is effective only when there is no data in the print buffer.
 - In page mode, this command is not effective.
 - 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 printing area width set by **GS L** and **GS W** for the NV bit image is less than one vertical line, the following processing is executed only on the line in question. However, in NV bit image mode, one vertical line means 1 dot (one half dot for slip paper) in normal mode (*m*=0, 48) and in double-height mode (*m*=2, 50), and it means 2 dots (two half dots for slip paper) in double-width mode (*m*=1, 49) and in quadruple mode (*m*=3, 51).
 - ① The printing area width is extended to the right in NV bit image mode up to one line vertically. In this case, printing does not exceed the printable area.
 - ② If the printing area width cannot be extended by one line vertically, the left margin is reduced to accommodate one line vertically.
 - If the downloaded bit image to be printed exceeds one line, the excess data is not printed.

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- This command feeds dots (for the height n of the NV bit image) in normal and double-width modes, and (for the height $n \times 2$ of the VN bit image) in double-height and quadruple modes, regardless of the line spacing specified by **ESC 2** or **ESC 3**.
- After printing the bit image, this command sets the print position to the beginning of the line and processes the data that follows as normal data.

[References] **FS q**

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

[Name]	Define NV bit image				
[Format]	ASCII	FS	q	n	$[xL\ xH\ yL\ yH\ d1...dk]1...[xL\ xH\ yL\ yH\ d1...dk]n$
	Hex	1C	71	n	$[xL\ xH\ yL\ yH\ d1...dk]1...[xL\ xH\ yL\ yH\ d1...dk]n$
	Decimal	28	113	n	$[xL\ xH\ yL\ yH\ d1...dk]1...[xL\ xH\ yL\ yH\ d1...dk]n$
[Range]	$1 \leq n \leq 255$				
	$0 \leq xL \leq 255$				
	$0 \leq xH \leq 3$ (when $1 \leq (xL + xH \times 256) \leq 1023$)				
	$0 \leq yL \leq 1$ (when $1 \leq (yL + yH \times 256) \leq 288$)				
	$0 \leq d \leq 255$				
	$k = (xL + xH \times 256) \times (yL + yH \times 256) \times 8$ Total defined data area = 3M bits (384K bytes)				
[Description]	Define the NV bit image specified by n .				
	<ul style="list-style-type: none"> • n specifies the number of the defined NV bit image. • xL, xH specifies $(xL + xH \times 256) \times 8$ dots in the horizontal direction for the NV bit image you are defining. • yL, yH specifies $(yL + yH \times 256) \times 8$ dots in the vertical direction for the NV bit image you are defining. 				
[Notes]	<ul style="list-style-type: none"> • Frequent write command execution may cause damage the NV memory. Therefore, it is recommended to write the NV memory 10 times or less a day. 				
	<ul style="list-style-type: none"> • The printer executes a hardware reset after the procedure to place the image into the non-volatile memory. Therefore, user-defined characters, downloaded bit images, and macros should be defined only after completing this command. The printer clears the receive and print buffers and resets the mode to the mode that was in effect at power on. At this time, DIP switch settings are checked again. 				
	<ul style="list-style-type: none"> • During processing this command, the printer is in BUSY when writing the data to the user NV memory and stops receiving data. Therefore it is prohibited to transmit the data including the real-time commands during the execution of this command. 				
	<ul style="list-style-type: none"> • This command cancels all NV bit images that have already been defined by this command. The printer can not redefine only one of several data definitions previously defined. In this case, all data needs to be sent again. 				
	<ul style="list-style-type: none"> • From the beginning of the processing of this command till the finish of hardware reset, mechanical operations (including initializing the position of the printer head when the cover is open, paper feeding by using the PAPER FEED button, etc.) cannot be executed. 				

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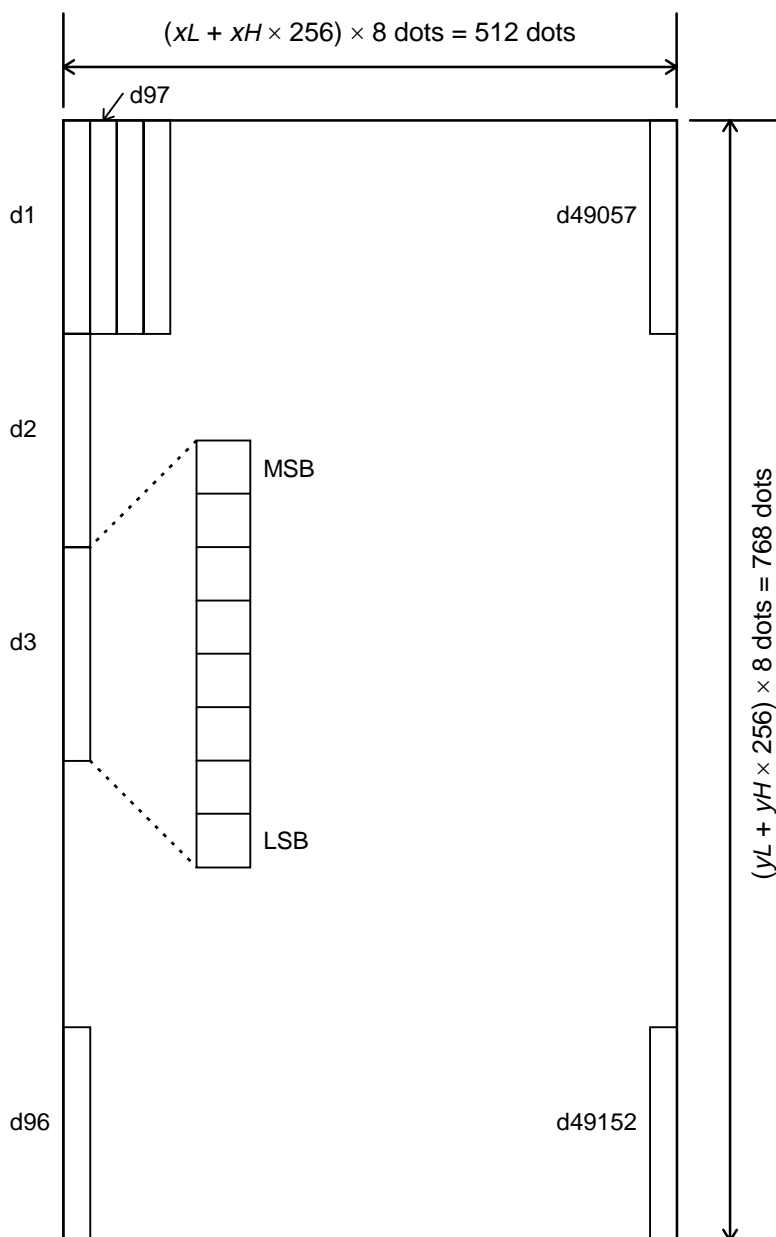
- NV bit image means a bit image which is defined in a non-volatile memory by **FS q** and printed by **FS p**.
- In standard mode, this command is effective only when processed at the beginning of the line.
- In page mode, this command is not effective.
- This command is effective when 7 bytes <FS~yH> is processed as a normal value.
- When the amount of data exceeds the capacity left in the range defined by xL , xH , yL , yH , the printer processes xL , xH , yL , yH out of the defined range.
- In the first group of NV bit images, when any of the parameters xL , xH , yL , yH is out of the definition range, this command is disabled.
- In groups of NV bit images other than the first one, when the printer processes xL , xH , yL , yH out of the defined range, it stops processing this command and starts writing into the non-volatile 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: $(xL + xH \times 256) \times (yL + yH \times 256) \times 8$] + [header :4]) bytes of non-volatile memory.
- The definition area in this printer is a maximum of 3M bits (384K bytes). This command can define several NV bit images, but cannot define a bit image data whose total capacity [bit image data + header] exceeds 3M bytes (384K bytes).
- The printer is busy immediately before writing into non-volatile memory, regardless of the setting of DIP switch 2-1.
- The printer does not transmit ASB status and executes status detection during processing of this command even when ASB is specified.
- This command defines NV bit image printing on a paper roll without being affected by the sheet setting selected in **ESC c 1**.
- When this command is received during macro definition, the printer ends macro definition, and begins executing this command.
- Once a NV bit image is defined, it is not erased by executing **ESC @**, reset, and power off.
- This command executes only definition of a NV bit image and does not execute printing. Printing of the NV bit image is executed by the **FS p** command.

[Reference] **FS p**

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[Example] When $xL = 64$, $xH = 0$, $yL = 96$, $yH = 0$



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GS ! *n*

[Name] Select character size

[Format]	ASCII	GS	!	<i>n</i>
	Hex	1D	21	<i>n</i>
	Decimal	29	33	<i>n</i>

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

($1 \leq$ vertical number of times ≤ 8 , $1 \leq$ horizontal number of times ≤ 8)

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

Bit	Off/On	Hex	Decimal	Function
0				Character height selection. See Table 2.
1				
2				
3				
4				Character width selection. See Table 1.
5				
6				
7				

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

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- [Notes]
- When character width or height is set to 3 or more in slip mode, the printer executes the internal flag operation but the actual width or height to be printed is 2 (double-width or double-height).
 - If n is outside of the defined range, this command is ignored.
 - In standard mode, the vertical direction is the paper feed direction, and the horizontal direction is perpendicular to the paper feed direction. However, when character orientation changes in 90° clockwise-rotation mode, the relationship between vertical and horizontal directions is reversed.
 - In page mode, vertical and horizontal directions are based on the character orientation.
 - When characters are enlarged with different sizes on one line, all the characters on the line are aligned at the baseline.
 - The **ESC !**, **FS !**, **FS W** command can also turn double-width and double-height modes on or off. However, the setting of the last received command is effective.
 - This command is not effective all characters (alphanumeric and kanji) except for HRI characters.
- [Default] $n = 0$
- [Reference] **ESC !**, **FS !**, **FS W**

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GS \$ *nL nH*

[Name]	Set absolute vertical print position in page mode			
[Format]	ASCII	GS	\$	<i>nL nH</i>
	Hex	1D	24	<i>nL nH</i>
	Decimal	29	36	<i>nL nH</i>
[Range]	$0 \leq nL \leq 255, 0 \leq nH \leq 255$			
[Description]	<ul style="list-style-type: none"> Sets the absolute vertical print starting position for buffer character data in page mode. This command sets the absolute print position to $[(nL + nH \times 256) \times (\text{vertical or horizontal motion unit})]$ inches. 			
[Notes]	<ul style="list-style-type: none"> This command is effective only in page mode. If the $[(nL + nH \times 256) \times (\text{vertical or horizontal motion unit})]$ exceeds the specified printing area, this command is ignored. The vertical or horizontal motion unit for the paper roll is used. The horizontal starting buffer position does not move. The reference starting position is that specified by ESC T. This command operates as follows, depending on the starting position of the printing area specified by ESC T: <ul style="list-style-type: none"> 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. The horizontal and vertical motion unit are specified by GS P. 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 \ , 3.12 <i>Page Mode</i>			

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GS * x y d1 ... d(x × y × 8)

[Name]	Define user-defined 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 (when paper roll is selected)					
	where x × y ≤ 1536 (when the paper roll is selected)					
	1 ≤ y ≤ 255 (when slip is selected)					
	where x × y ≤ 404 (when the slip is selected)					
	0 ≤ d ≤ 255					
[Description]	Defines a user-defined bit image using the number of dots specified by x and y					
[Notes]	<ul style="list-style-type: none"> x specifies the number of dots in the horizontal direction. y specifies the number of dots in the vertical direction. 					
	<ul style="list-style-type: none"> 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. A user-defined character and a user-defined bit image cannot be defined simultaneously. When this command is executed, the user-defined character is cleared. The downloaded bit image definition is cleared when: <ol style="list-style-type: none"> ① ESC @ is executed. ② ESC & is executed. ③ FS q is executed. ④ Printer is reset or the power is turned off. The user-defined bit image can be defined on the selected paper by the ESC c 1. 					
[Reference]	ESC &, ESC c 1, GS /					

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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] $(pL + (pH \times 256)) = 2$ (where $pL=2$, $pH=0$)
 $0 \leq n \leq 4$, $48 \leq n \leq 52$
 $1 \leq m \leq 3$, $49 \leq m \leq 51$

[Description] • Executes a test print with a specified test pattern on a specified paper.
• pL and pH specifies the number of the parameter such as n , m to $(pL + (pH \times 256))$ bytes.
 n specifies the paper to be tested.

n	Paper
0, 48	Basic sheet (paper roll)
1, 49 2, 50	Paper roll
3, 51 4, 52	Slip

m specifies a test pattern.

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

[Description] • This command is enabled only when processed at the beginning of a line in standard mode.
• This command is no effect in page 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. The printer also re-reads the DIP switch settings .
• At the end of the test print, the printer cuts the paper, or ejects the cut sheet when the cut sheet is selected.
• When the cut sheet is selected, this command is executed after the ejection of the paper if the paper is ejected currently.
• The printer goes BUSY while this command is executed.

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GS / *m*

[Name] Print downloaded bit image
 [Format] ASCII GS / *m*
 Hex 1D 2F *m*
 Decimal 29 47 *m*
 [Range] $0 \leq m \leq 3, 48 \leq m \leq 51$
 [Description] Prints a downloaded bit image using the mode specified by *m*.
m selects a mode from the table below:

< paper roll >

<i>m</i>	Mode	Vertical Dot Density (DPI)	Horizontal Dot Density (DPI)
0, 48	Normal	180	180
1, 49	Double-width	180	90
2, 50	Double-height	90	180
3, 51	Quadruple	90	90

<slip>

<i>m</i>	Mode	Vertical Dot Density (DPI)	Maximum Number of Dots in Horizontal
0, 48	Normal	Not available	800 dots
1, 49	Double-width	Available	400 dots

- [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, white/black reverse printing, or 90° rotated character etc.), except for upside-down printing mode.
 - If the downloaded bit image to be printed exceeds the printable area, the excess data is not printed.
 - Refer to Figure 3.12.3 for the downloaded bit image development position in page mode.
 - If the printing area width set by **GS L** and **GS W** is less than one line in vertical, the following processing is executed only on the line in question:
 - ① The printing area width is extended to the right up to one line in vertical. In this case, printing does not exceed the printable area.
 - ② If the printing area width cannot be extended by one line in vertical, the left margin is reduced to accommodate one line in vertical.
 One line in vertical means 1 dot (one half dot for the slip) in normal ($m = 0, 48$) and double-height (2,50), 2 dots (two half dot for the slip) in double-width ($m = 1, 49$) and quadruple ($m = 3, 51$) modes.
 - The user-defined bit image is printed on the selected paper set by the **ESC c 0** command.

[Reference] **GS ***

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GS :

[Name]	Start/end macro definition		
[Format]	ASCII	GS	:
	Hex	1D	3A
	Decimal	29	58
[Description]	Starts or ends macro definition.		
[Notes]	<ul style="list-style-type: none">• Macro definition starts when this command is received during normal operation. Macro definition ends when this command is received during macro definition.• When GS ^ is received during macro definition, the printer ends macro definition and clears the definition.• Macro is not defined when the power is turned on.• The defined contents of the macro are not cleared by ESC @. Therefore, ESC @ can be included in the contents of the macro definition.• If the printer receives GS : again immediately after previously receiving GS : the printer remains in the macro undefined state.• While the macro is defined, normal printing is executed.• 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 ^		

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GS B n

[Name]	Turn white/black reverse printing mode			
[Format]	ASCII	GS	B	n
	Hex	1D	42	n
	Decimal	29	66	n
[Range]	$0 \leq n \leq 255$			
[Description]	Turns on or off white/black reverse printing mode. <ul style="list-style-type: none"> 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]	<ul style="list-style-type: none"> Only the lowest bit of n is valid. In white/black reverse printing mode, print dots and non-print dots are reversed. (Characters are printed in white on a black background.) This command is available for built-in characters and user-defined 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 cancelled) when white/black reverse mode is selected. This command affects printing on a paper roll. However, the setting is always effective. 			
[Default]	$n = 0$			

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GS H *n*

[Name] Select printing position for HRI characters

[Format]	ASCII	GS	H	<i>n</i>
	Hex	1D	48	<i>n</i>
	Decimal	29	72	<i>n</i>

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

[Description] Selects the printing position of HRI characters when printing a bar code.
n selects the printing position as follows:

<i>n</i>	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**.
- The bar code is printed only in the paper roll mode.

[Default] *n* = 0

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

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GS | n

[Name] Transmit printer ID

[Format] ASCII GS | n
Hex 1D 49 n
Decimal 29 73 n

[Range] $1 \leq n \leq 3$, $49 \leq n \leq 51$, $65 \leq n \leq 59$

[Description] Transmits the printer ID specified by n as follows:

n	Printer ID	Specification	ID (hexadecimal)
1, 49	Printer model ID	TM-H5000II series	0F
2, 50	Type ID	See table below.	
3, 51	ROM version ID	Depends on ROM version.	
65	Firmware version	Depends on Firmware version.	
66	Manufacturer	EPSON	
67	Printer name	TM- H5000II	
68	Serial number	Depends on serial number.	
69	Supporting Kanji type	Japan model: KANJI JAPANESE China model: CHINA GB2312 Taiwan model: TAIWAN BIG-5 Thai model: THAI 3 PASS	

$n = 2$, Type ID

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Two-byte character code not supported.
	On	01	1	Two-byte character code supported.
1	On	02	2	Auto-cutter equipped.
2	Off	00	0	DIP switch 2-2 is set to Off.
	On	04	4	DIP switch 2-2 is set to On.
3	Off	00	0	No MICR reader.
	On	08	8	A MICR reader is installed.
4	Off	00	0	Not used. Fixed to Off.
5	-	-	-	Undefined.
6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

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[Notes]

- When DTR/DSR control is selected in the serial interface model, the printer transmits only 1 byte after confirming that the host is ready to receive data (DSR signal is SPACE). If the host computer is not ready to receive data (DSR signal is MARK), the printer waits until the host is ready.
- When XON/XOFF control is selected in the serial interface model, the printer transmits only 1 byte without confirming the condition of the DSR signal.
- The printer ID is transmitted when the data in the receive buffer is developed. Therefore, there may be a time lag between receiving this command and transmitting the status, depending on the receive buffer status.
- When the printer ID transmission is specified with $(1 \leq n \leq 3)$ or $(49 \leq n \leq 51)$, one byte code is transmitted.
- When Auto Status Back (ASB) is enabled using **GS a**, the status transmitted by **GS I** and the ASB status must be differentiated.
- When the printer ID transmission is specified with $(65 \leq n \leq 69)$, the following contents are transmitted:

Header: Hexadecimal = 5FH / Decimal = 95 (1 byte)

Data: Printer information

NUL: Hexadecimal = 00H / Decimal = 0 (1 byte)

After the data is ready to be transmitted, the printer executes the following process.

- ① Executes READY to BUSY. If it is already BUSY, the printer executes nothing.
- ② Transmits [Header + Data + NUL].
- ③ Executes BUSY to READY. If it is already BUSY from any other cause, the printer executes nothing.

[Reference] Appendix E

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GS L *nL nH*

[Name] Set left margin

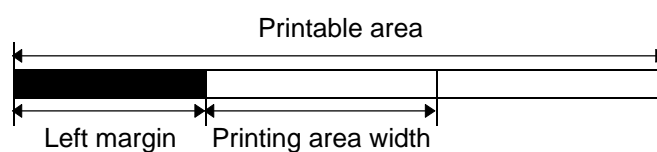
[Format]	ASCII	GS	L	<i>nL</i>	<i>nH</i>
	Hex	1D	4C	<i>nL</i>	<i>nH</i>
	Decimal	29	76	<i>nL</i>	<i>nH</i>

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

$0 \leq nH \leq 255$

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

- The left margin is set to $[(nL + nH \times 256) \times \text{horizontal motion unit}]$ inches.



[Notes]

- This command is effective only processed at the beginning of the line.
- If this command is input in page mode, the printer executes 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.
- 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.
- 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.
- The command sets left margin on the selected sheet by the **ESC c 1** command.

[Default] $nL = 0, nH = 0$

[Reference] **ESC c 1, GS P, GS W**

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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 inches} and approximately 25.4/y mm {1/y inches}, respectively. When x and y are set to 0, the default setting of each value is used.					
[Notes]	<ul style="list-style-type: none">• The command sets a line spacing for the sheet selected by the ESC c 1 command.• The horizontal direction is perpendicular to the paper feed direction and the vertical direction is the paper feed direction.• In standard mode, the following commands use x or y, regardless of character rotation (upside-down or 90° clockwise rotation):<ul style="list-style-type: none">① Commands using x: ESC SP, ESC \$, ESC \, FS S, GS L, GS W② Commands using y: ESC 3, ESC J, ESC K, GS V• In page mode, the following command use x or y, depending on character orientation:<ul style="list-style-type: none">① 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): Commands using x: ESC SP, ESC \$, ESC W, ESC \, FS S Commands using y: ESC 3, ESC J, ESC W, GS \$, GS V, GS \② When the print starting position is set to the upper right or lower left of the printing area using ESC T (data is buffered in the paper feed direction): Commands using x: ESC 3, ESC J, ESC W, GS \$, GS \, GS V Commands using y: ESC SP, ESC \$, ESC W, ESC \, GS V, FS S• The command does not affect the previously specified values.• The calculated result from combining this command with others is truncated to the minimum value of the mechanical pitch.• The horizontal and vertical motion unit for paper roll can be set by 1/360 unit, but the printer actually operates based on the minimum value of the mechanical pitch (1/180).					
[Default]	Receipt	x = 180, y = 360				
	Slip	x = 150, y = 144				
[Reference]	ESC SP, ESC \$, ESC 3, ESC J, ESC K, ESC W, ESC \, GS \$, GS L, GS V, GS W, GS \, ESC c 1, FS S					

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① GS V *m* ② GS V *m n*

[Name] Select cut mode and cut paper

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

[Range] ① $m = 1, 49$

② $m = 66, 0 \leq n \leq 255$

[Description] Selects a mode for cutting paper and executes paper cutting. The value of *m* selects the mode as follows:

<i>m</i>	Print mode
0, 1, 49	Partial cut (one point left uncut)
66	Feeds paper (cutting position + [$n \times$ (vertical motion unit)]), and cuts the paper partially (one point left uncut).

[Notes for ① and ②]

- This command is ignored when slip paper is selected as the print sheet by **ESC c 0**.
- This command is effective only processed at the beginning of a line.

[Note for ①] • Only the partial cut is available; there is no full cut.

[Notes for ②] • When $n = 0$, the printer feeds the paper to the cutting position and cuts it.
 • When $n \neq 0$, the printer feeds the paper to (cutting position + [$n \times$ vertical motion unit]) and cuts it.
 • The horizontal and vertical motion unit are specified by **GS P**.
 • The paper feed amount is calculated using the vertical motion unit (*y*). 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.

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GS W *nL nH*

[Name] Set printing area width

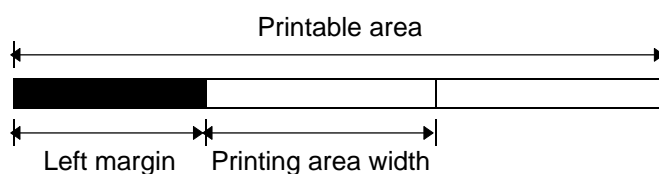
[Format]	ASCII	GS	W	<i>nL</i>	<i>nH</i>
	Hex	1D	57	<i>nL</i>	<i>nH</i>
	Decimal	29	87	<i>nL</i>	<i>nH</i>

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

$0 \leq nH \leq 255$

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

- The printing area width is set to $[(nL + nH \times 256) \times \text{horizontal motion unit}]$ inches.



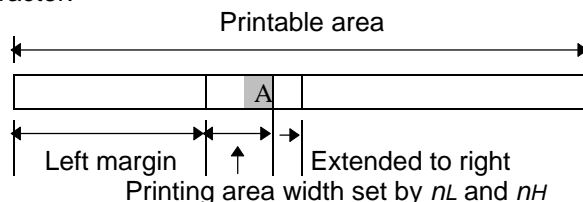
[Notes]

- This command is effective only processed at the beginning of the line.
- In page mode, the printer executes only internal flag operations.
- 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] is used.
- 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.
- 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.

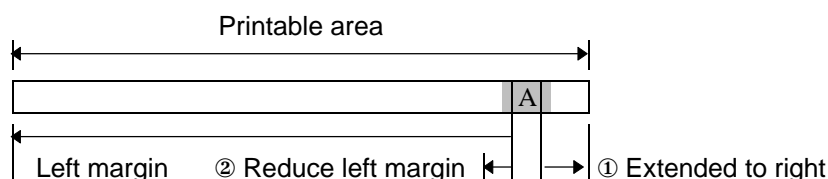
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- If the width set for the printing area is less than the width of one character, when the character data is developed, the following processing is executed:

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



- 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.

- If the width set for the printing area is less than one line in vertical, the following processing is executed 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.

- The commands which set the printing area width for bit image printing and its minimum widths are as follows:

- Bit image (**ESC ***):
 - Single density mode = 2 dots
 - Double density mode = 1 dot
- Downloaded bit image (**GS /**):
 - Double width mode or Quadruple mode = 2dots
 - Normal mode or Double-height mode = 1 dot
- NV bit image (**FS p**):
 - Double width mode or Quadruple mode = 2dots
 - Normal mode or Double-height mode = 1 dot
- Rester bit image (**GS r 0**):
 - Double width mode or Quadruple mode = 2 dots
 - Normal mode or Double-height mode = 1 dot

[Default] Paper roll: $nL = 0$, $nH = 2$
 Slip: $nL = 32$, $nH = 3$

[Reference] **ESC c 1**, **GS L**, **GS P**

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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]	$0 \leq nL \leq 255$				
	$0 \leq nH \leq 255$				
[Description]	Sets the relative vertical print starting position from the current position in page mode.				
[Notes]	<ul style="list-style-type: none"> This command sets the distance from the current position to $[(nL + nH \times 256) \times \text{vertical or horizontal motion unit}]$ inches. 				
	<ul style="list-style-type: none"> This command is ignored unless page mode is selected. 				
	<ul style="list-style-type: none"> When pitch N is specified to the movement downward: $nL + nH \times 256 = N$ 				
	<ul style="list-style-type: none"> When pitch N is specified to the movement upward (the negative direction), use the complement of 65536. 				
	<ul style="list-style-type: none"> When pitch N is specified to the movement upward: $nL + nH \times 256 = 65536 - N$ 				
	<ul style="list-style-type: none"> Any setting that exceeds the specified printing area is ignored. 				
	<ul style="list-style-type: none"> The movement amount is calculated using the vertical motion unit of the receipt. 				
	<ul style="list-style-type: none"> The horizontal and vertical motion unit are specified by GS P. 				
	<ul style="list-style-type: none"> 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. 				
	<ul style="list-style-type: none"> This command function as follows, depending on the print starting position set by ESC T: 				
	<ul style="list-style-type: none"> ① When the starting position is set to the upper left or lower right of the printing, the vertical motion unit (y) is used. 				
	<ul style="list-style-type: none"> ② When the starting position is set to the upper right or lower left of the printing area, the horizontal motion unit (x) is used. 				
[Reference]	ESC \$, ESC T , ESC W , ESC \ , GS \$, GS P , 3.12 <i>Page Mode</i>				

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GS ^ r t m

[Name]	Execute macro				
[Format]	ASCII	GS	^	<i>r</i>	<i>t</i> <i>m</i>
	Hex	1D	5E	<i>r</i>	<i>t</i> <i>m</i>
	Decimal	29	94	<i>r</i>	<i>t</i> <i>m</i>
[Range]	$0 \leq r \leq 255$				
	$0 \leq t \leq 255$				
	$m = 0, 1$				
[Description]	Executes a macro. <ul style="list-style-type: none"> <i>r</i> specifies the number of times to execute the macro. <i>t</i> specifies the waiting time for executing the macro. <i>m</i> specifies macro executing mode. <ul style="list-style-type: none"> When the LSB $m = 0$: The macro executes <i>r</i> times continuously at the interval specified by <i>t</i>. When the LSB of $m = 1$: After waiting for the period specified by <i>t</i>, the PAPER OUT 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 <i>r</i> times. 				
[Notes]	<ul style="list-style-type: none"> The waiting time is $t \times 100$ msec for every macro execution. If this command is received while a macro is being defined, the macro definition is aborted and the definition is cleared. If the macro is not defined or if <i>r</i> is 0, nothing is executed. When the macro is executed ($m = 1$), paper always cannot be fed by using the FEED, FORWARD, or REVERSE buttons. 				
[Reference]	GS :				

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GS a *n*

[Name] Enable/Disable Automatic Status Back (ASB)

[Format]	ASCII	GS	a	<i>n</i>
	Hex	1D	61	<i>n</i>
	Decimal	29	97	<i>n</i>

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

[Description] Enables or disables ASB and specifies the status items to include, using *n* as follows:

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Drawer kick-out connector pin 3 status disabled.
	On	01	1	Drawer kick-out connector pin 3 status enabled.
1	Off	00	0	On-line/off-line status disabled.
	On	02	2	On-line/off-line status enabled.
2	Off	00	0	Error status disabled.
	On	04	4	Error status enabled.
3	Off	00	0	Paper roll sensor status disabled.
	On	08	8	Paper roll sensor status enabled.
4	-	-	-	Undefined.
5	Off	00	0	Slip paper sensor status disabled.
	On	20	32	Slip paper sensor status enabled.
6, 7	-	-	-	Undefined.

- [Notes]
- If any of the status items in the table above are enabled, the printer transmits the status when this command is executed. The printer automatically transmits the status whenever the enabled status item changes. The disabled status items may change, in this case, because each status transmission represents the current status.
 - If all status items are disabled, the ASB function is also disabled.
 - If the ASB is enabled as a default, the printer transmits the status when the printer data reception and transmission is possible at the first time from when the printer is turned on.
 - The following four status bytes are transmitted without confirming whether the host is ready to receive data. The four status bytes must be consecutive, except for the XOFF code.
 - 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.

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- When the printer is disabled by **ESC =** (Select peripheral device), the four status bytes are transmitted whenever the status changes.
- When using **DLE EOT**, **GS I**, or **GS r**, the status transmitted by these commands and ASB status must be differentiated, according to the procedure in Appendix E, *Transmission Status Identification*.
- The status to be transmitted are as follows:

First byte (printer information)

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

The printer is off-line when the printer cover is open during non-printing.

When the printer cover is open during printing, the printer is in the recoverable error in the slip mode.

When the receipt is selected, the printer is in the automatic recovery error status.

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Second byte (printer information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	-	-	-	Undefined.
1	-	-	-	Undefined.
2	Off	00	0	No mechanical error.
	On	04	4	Mechanical error occurred.
3	Off	00	0	No auto cutter error.
	On	08	8	Auto cutter error occurred.
4	Off	00	0	Not used. Fixed to Off.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error occurred.
6	Off	00	0	No automatically recoverable error.
	On	40	64	Automatically recoverable error occurred.
7	Off	00	0	Not used. Fixed to Off.

- Bit 2: Mechanical error indicates the home position detection error, carriage detection error, slip paper ejection error, or slip cover open error during printing.
- Bit 2 and 3: If these errors occur due to paper jams or the like, it is possible to recover by correcting the cause of the error and executing **DLE ENQ n** ($1 \leq n \leq 2$). If an error due to a circuit failure (e.g. wire break) occurs, it is impossible to recover.
- Bit 6: When printing is stopped due to high print head temperature until the print head temperature drops sufficiently or when the paper roll cover is open during printing, bit 6 is On.

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Third byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Paper roll near-end sensor: paper adequate.
	On	01	1	Paper roll near-end sensor: paper near end.
1	Off	00	0	Paper roll near-end sensor: paper adequate.
	On	02	2	Paper roll near-end sensor: paper near end.
2	Off	00	0	Paper roll end sensor: paper present.
	On	04	4	Paper roll end sensor: paper not present.
3	Off	00	0	Paper roll end sensor: paper present.
	On	08	8	Paper roll end sensor: paper not present.
4	Off	00	0	Not used. Fixed to Off.
5	Off	00	0	TOF sensor: paper present.
	On	20	32	TOF sensor: paper not present.
6	Off	00	0	BOF sensor: paper present.
	On	40	64	BOF sensor: paper not present.
7	Off	00	0	Not used. Fixed to Off.

For bits 2 and 3, when the paper roll cover is open, paper detection may be incorrect.

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Fourth byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Slip is selected.
	On	01	1	Slip is not selected.
1	Off	00	0	Can print on slip.
	On	02	2	Cannot print on slip.
2, 3	-	-	-	Undefined.
4	Off	00	0	Not used. Fixed to Off.
5, 6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

Bit 0: Bit 0 is 1 (slip is not selected) when selecting a MICR function.

Bit 1: Bit 1 is 0 when the slip is set (can print) and Bit 1 is 1 when the slip ejection starts (cannot print).

- When the slip is selected and the printer waits for the slip to be inserted, bits 5 and 6 of third byte are 1 (paper not present), Bit 0 of forth byte is 0 (slip is selected) and Bit 1 of fourth byte is 1 (cannot print on slip).
- When printing stop due to paper end of a slip is disabled by **ESC c 4**, if there is no printable area on the slip, Bit 1 of fourth byte is not On (cannot print on slip). Check if there is printing area on the slip by using **GS r 3**.

[Default] $n = 0$ when DIP SW 2-1 is off, $n = 2$ when DIP SW 2-1 is on.

[Reference] **DLE EOT**, **ESC c 4**, **GS r**, Appendix E, *Transmission Status Identification*

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GS b *n*

[Name]	Turns smoothing mode on/off			
[Format]	ASCII	GS	b	<i>n</i>
	Hex	1D	62	<i>n</i>
	Decimal	29	98	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Turns smoothing mode on or off.			
	When the LSB of <i>n</i> is 0, smoothing mode is turned off.			
	When the LSB of <i>n</i> is 1, smoothing mode is turned on.			
[Notes]	<ul style="list-style-type: none"> • This command affects printing on a paper roll. However, the setting is always effective. 			
	<ul style="list-style-type: none"> • Smoothing mode is available for built-in, user-defined characters. 			
	<ul style="list-style-type: none"> • Even if smoothing mode is turned on, smoothing is not executed when either of character width or character height is the normal size. 			
	<ul style="list-style-type: none"> • Only the lowest bit of <i>n</i> is valid. 			
[Default]	<i>n</i> = 0			
[Reference]	ESC !, GS !			

GS f *n*

[Name]	Select font for Human Readable Interpretation (HRI) characters			
[Format]	ASCII	GS	f	<i>n</i>
	Hex	1D	66	<i>n</i>
	Decimal	29	102	<i>n</i>
[Range]	<i>n</i> = 0, 1, 48, 49			
[Description]	Selects a font for the HRI characters used when printing a bar code.			
	<i>n</i> selects a font from the following table:			

<i>n</i>	Font
0, 48	Font A (12 × 24)
1, 49	Font B (9 × 17)

[Notes]	<ul style="list-style-type: none"> • HRI indicates Human Readable Interpretation.
	<ul style="list-style-type: none"> • HRI characters are printed at the position specified by GS H.
	<ul style="list-style-type: none"> • The bar code can be printed in the paper roll mode only.
[Default]	<i>n</i> = 0
[Reference]	GS H, GS k

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GS g 0 m nL nH

[Name] Initialize maintenance counter

[Format]

ASCII	GS	g	0	<i>m</i>	<i>nL</i>	<i>nH</i>
Hex	1D	67	30	<i>m</i>	<i>nL</i>	<i>nH</i>
Decimal	29	103	48	<i>m</i>	<i>nL</i>	<i>nH</i>

[Range] $m = 0$
 $0 \leq (nL + (nH \times 256)) \leq 65535$

[Description] Set the specified resettable maintenance counter to 0.

- *m* is always set to 0.
- *nL*, *nH* specify the maintenance counter number to $(nL + (nH \times 256))$.

Counter number		Counter
Hex	Decimal	
0A	10	Number of feeding lines (for slip)
0B	11	Number of printed characters (for slip)
14	20	Number of feeding lines (for paper roll)
15	21	Number of energizing head (for paper roll)
32	50	Number of auto-cutter operations
3C	60	Number of reading amount of MICR
46	70	Period of printer operation

- [Notes]
- Frequent write command execution to the NV memory by **FS g 1**, **GS g 0** may damage the NV memory. Therefore, it is recommended to write the NV memory 10 times or less a day.
 - This command is available only when processed at the beginning of a line in standard mode.
 - This command is ignored in page mode.
 - When this command is received during macro definition, the printer ends macro definition and begins executing this command.
 - If the value of the argument (*m*) is out of the specified range, this command is ignored and data following are processed as normal data.
 - If the counter number (*nL*, *nH*) is not set, this command is ignored.
 - If an error occurs at an initializing process, "Memory or Gate array R/W error" appears.
 - Data stored in the user NV memory can be read by **GS g 2**.
 - Once data is stored in the user NV memory, it is not erased by executing **ESC @**, **FS q**, reset, or power off.
 - The non-resettable maintenance counter is not erased.

[Reference] **FS g 2**

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GS g 2 m nL nH

[Name] Transmit maintenance counter

[Format] ASCII GS g 2 m nL nH
Hex 1D 67 32 m nL nH
Decimal 29 103 50 m nL nH

[Range] $m = 0$
 $0 \leq (nL + (nH \times 256)) \leq 65535$

[Description] Transmits the specified maintenance counter.

- m is always set to 0.
- nL , nH specify the maintenance counter number to $(nL + (nH \times 256))$.

Counter number		Counter	Type of maintenance counter
Hex	Decimal		
0A	10	Number of feeding lines (for slip)	Resettable
0B	11	Number of printed characters (for slip)	Resettable
14	20	Number of feeding lines (for paper roll)	Resettable
15	21	Number of energizing head (for paper roll)	Resettable
32	50	Number of auto-cutter operations	Resettable
3C	60	Number of reading amount of MICR	Resettable
46	70	Period of printer operation	Resettable
8A	138	Number of feeding lines (for slip)	Non-resettable
8B	139	Number of printed characters (for slip)	Non-resettable
94	148	Number of feeding lines (for paper roll)	Non-resettable
95	149	Number of energizing head (for paper roll)	Non-resettable
B2	178	Number of auto-cutter operations	Non-resettable
BC	188	Number of reading amount of MICR	Non-resettable
C6	198	Period of printer operation	Non-resettable

- If the value of the argument (m) is out of the specified range, this command is ignored and data following are processed as normal data.
- If the counter number (nL , nH) is not set, this command is ignored.
- After the data is ready to transmit, the printer executes the following process.
 - ① Executes READY to BUSY. If it is already BUSY, the printer executes nothing.
 - ② Transmits [Header + Data + NUL].
 - ③ Executes BUSY to READY. If it is already BUSY for any other cause, the printer executes nothing.
- The contents of [Header + DATA + NUL] are as follows:
Header: Hexadecimal = 5FH / Decimal = 95 (1 byte)
Data: Value of counters (1 to 10 bytes)
NUL: Hexadecimal = 00H / Decimal = 0 (1 byte)

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- When the counter values are transmitted, the printer converts them to the character codes corresponding those decimal value, and transmits from the most significant column. The range of transmitted data is [Hex: 30H to 39H / Decimal: 48 to 57].
 - (Example 1) When the counter value is 78H, the transmitted data are (31H, 32H, 30H) corresponding to "120".
 - (Example 2) When the counter value is 7CDH, the transmitted data are (31H, 39H, 39H, 37H) corresponding to "1997".
- When DTR/DSR control is selected, the printer transmits data consecutively after confirming whether the host computer is ready to receive data. The printer waits until the host is ready.
- When XON/XOFF control is selected, the printer transmits all data consecutively without confirming whether the host computer is ready to receive data. The data transmission must be consecutive, except for the XOFF code.
- With the parallel interface mode, the data buffer capacity (which is the memory area to store all transmitted data except ASB status) is 99 bytes. Data which exceeds 99 bytes are ignored.
- The printer transmits all data collectively without confirming whether the host is ready to receive data. To receive all data correctly, 12 bytes or more space is required in the receive buffer of the host.
- During data transmission, the printer ignores **DLE EOT *n*** and **DLE EOT BS *n***. Also, the printer does not transmit ASB even when the ABS is enabled. Therefore, the user cannot confirm changes in the printer status during these periods.
- Each maintenance counter has the following details. When the value of the counter reaches the maximum, it becomes 0 at the next counting.

Counter	Unit	counting method	Maximum value
Number of feeding lines (for slip)	lines	Counts when 4.23mm {24/144 inches} line feed is executed.	178, 956, 970
Number of printed characters (for slip)	characters	Counts each 6 times of energizing head for one character.	715, 827, 882
Number of feeding lines (for paper roll)	lines	Counts when 4.23mm {24/144 inches} line feed is executed.	143, 165, 576
Number of energizing head (for paper roll)	times	Counts each time when the thermal head is energized when printing on the paper roll.	4, 294, 967, 295
Number of auto-cutter operations	times	Counts each time when the auto-cutter executes a cutting operation	4, 294, 967, 295
Number of reading amount of MICR	times	Counts each time when the check paper is read.	4, 297, 967, 295
Period of printer operation	hours	Counts the operation hours after turning on.	71, 582, 788

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- The resettable maintenance counter is initialized by **GS g 0**.
- Depending on the status of the receive buffer, there can be a time difference between the receiving of this command and the storing of data.

[Reference] **GS g 0**

GS h n

[Name] Select bar code height

[Format]	ASCII	GS	h	<i>n</i>
	Hex	1D	68	<i>n</i>
	Decimal	29	104	<i>n</i>

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

[Description] Selects the height of the bar code.

n specifies the number of dots in the vertical direction.

[Note] • A bar code can be printed only in the paper roll mode.

[Default] *n* = 162

[Reference] **GS k**

① GS k m d1...dk NUL ② GS k m n d1...dn

[Name] Print bar code

[Format]	①ASCII	GS	k	<i>m</i>	<i>d1...dk</i>	<i>NUL</i>
	Hex	1D	6B	<i>m</i>	<i>d1...dk</i>	<i>00</i>
	Decimal	29	107	<i>m</i>	<i>d1...dk</i>	<i>0</i>
	②ASCII	GS	k	<i>m</i>	<i>n</i>	<i>d1...dn</i>
	Hex	1D	6B	<i>m</i>	<i>n</i>	<i>d1...dn</i>
	Decimal	29	107	<i>m</i>	<i>n</i>	<i>d1...dn</i>

[Range] ① $0 \leq m \leq 6$ (*k* and *d* depends on the bar code system used)

② $65 \leq m \leq 73$ (*n* and *d* depends on the bar code system used)

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[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
①	0	UPC-A	$11 \leq k \leq 12$	$48 \leq d \leq 57$
	1	UPC-E	$11 \leq k \leq 12$	$48 \leq d \leq 57$
	2	JAN13 (EAN13)	$12 \leq k \leq 13$	$48 \leq d \leq 57$
	3	JAN 8 (EAN8)	$7 \leq k \leq 8$	$48 \leq d \leq 57$
	4	CODE39	$1 \leq k$	$48 \leq d \leq 57, 65 \leq d \leq 90, 32, 36, 37, 43, 45, 46, 47$
	5	ITF	$1 \leq k$ (even number)	$48 \leq d \leq 57$
	6	CODABAR(NW7)	$1 \leq k$	$48 \leq d \leq 57, 65 \leq d \leq 68, 36, 43, 45, 46, 47, 58$
②	65	UPC-A	$11 \leq n \leq 12$	$48 \leq d \leq 57$
	66	UPC-E	$11 \leq n \leq 12$	$48 \leq d \leq 57$
	67	JAN13 (EAN13)	$12 \leq n \leq 13$	$48 \leq d \leq 57$
	68	JAN 8 (EAN8)	$7 \leq n \leq 8$	$48 \leq d \leq 57$
	69	CODE39	$1 \leq n \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 90, 32, 36, 37, 43, 45, 46, 47$ $d1 = dk = 42$ (1)
	70	ITF	$1 \leq n \leq 255$ (even number)	$48 \leq d \leq 57$
	71	CODABAR(NW7)	$1 \leq n \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 68, 36, 43, 45, 46, 47, 58$
	72	CODE93	$1 \leq n \leq 255$	$0 \leq d \leq 127$
	73	CODE128	$2 \leq n \leq 255$	$0 \leq d \leq 127$

[Description for ①]

- *d* indicates the character code to be printed and *k* indicates the number of characters to be printed.

[Description 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.
- *d* indicates the character code to be printed.

[Note for ① and ②]

- This command is valid only in the paper roll mode.

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[Notes for ①]

- This command ends with a NUL code.
- When the bar code system used is UPC-A or UPC-E, the printer prints the bar code data after receiving 12 bytes bar code data and processes the following data as normal data.
- When the bar code system used is JAN13 (EAN13), the printer prints the bar code after receiving 13 bytes bar code data and processes the following data as normal data.
- When the bar code system used is JAN8 (EAN8), the printer prints the bar code after receiving 8 bytes bar code data and processes the following data as normal data.
- 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.

[Notes for ②]

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

[Notes in standard mode]

- If d is outside of the specified range, the printer only feeds paper and processes the following data as normal data.
- If the horizontal size exceeds printing area, the printer only feeds the paper.
- This command feeds as much paper as is required to print the bar code, regardless of the line spacing specified by **ESC 2** or **ESC 3**.
- This command is enabled only when no data exists in the print buffer. When data exists in the print buffer, the printer processes the data following m as normal data.
- After printing bar code, this command sets the print position to the beginning of the line.
- This command is not affected by print modes (emphasized, double-strike, underline, character size, white/black reverse printing, or 90° rotated character, etc.), except for upside-down printing mode.

[Notes in page mode]

- This command develops bar code data in the print buffer, but does not print it. After processing bar code data, this command moves the print position to the right side dot of the bar code.
- If d is out of the specified range, the printer stops command processing and processes the following data as normal data. In this case the data buffer position does not change.
- If bar code width exceeds the printing area, the printer does not print the bar code but moves the data buffer position to the left side out of the printing area.
- Refer to Figure 3.12.3 for bar code data buffer position.

When CODE93 ($m = 72$) is used:

- The printer prints an HRI character (□) as start character at the beginning of the HRI character string.
- The printer prints an HRI character (□) as a stop character at the end of the HRI character string.

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- The printer prints HRI characters (■ + an alphabetic character) as a control character (<00>H to <1F>H and <7F>H):

Control character			HRI character	Control character			HRI character
ASCII	Hex	Decimal		ASCII	Hex	Decimal	
NUL	00	0	■ U	DLE	10	16	■ P
SOH	01	1	■ A	DC1	11	17	■ Q
STX	02	2	■ B	DC2	12	18	■ R
ETX	03	3	■ C	DC3	13	19	■ S
EOT	04	4	■ D	DC4	14	20	■ T
ENQ	05	5	■ E	NAK	15	21	■ U
ACK	06	6	■ F	SYN	16	22	■ V
BEL	07	7	■ G	ETB	17	23	■ W
BS	08	8	■ H	CAN	18	24	■ X
HT	09	9	■ I	EM	19	25	■ Y
LF	0A	10	■ J	SUB	1A	26	■ Z
VT	0B	11	■ K	ESC	1B	27	■ A
FF	0C	12	■ L	FS	1C	28	■ B
CR	0D	13	■ M	GS	1D	29	■ C
SO	0E	14	■ N	RS	1E	30	■ D
SI	0F	15	■ O	US	1F	31	■ E
				DEL	7F	127	■ T

[Example] Printing **GS k 72 7 67 111 100 101 13 57 51**



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

- Refer to Appendix H 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:
 - 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 the first code set.

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- ② Special characters are defined by combining two characters "{" and one character. The ASCII character "{" is defined by transmitting "{" twice consecutively.

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

[Example] Example data for printing "No. 123456"

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

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



- If the top of the bar code data is not the code set selection character, the printer stops command processing and processes the following data as normal data.
- If combination of "{" and the following character does not apply any special character, the printer stops command processing and processes the following data as normal data.
- If the printer receives characters that cannot be used in the special code set, the printer stops command processing and processes the following data as normal data.
- The printer does not print HRI characters that correspond to the shift 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 space.

<Others> 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 H

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GS r n

[Name] Transmit status

[Format]	ASCII	GS	r	n
	Hex	1D	72	n
	Decimal	29	114	n

[Range] $1 \leq n \leq 3, 49 \leq n \leq 51$

[Description] Transmits the status specified by *n* as follows:

<i>n</i>	Function
1, 49	Transmits paper sensor status
2, 50	Transmits drawer kick-out connector status
3, 51	Transmits slip status

- [Notes]
- When using a serial interface
When DTR/DSR control is selected, the printer transmits only 1 byte after confirming the host is ready to receive data (DSR signal is SPACE). If the host computer is not ready to receive data (DSR signal is MARK), the printer waits until the host is ready.
When XON/XOFF control is selected, the printer transmits only 1 byte without confirming the condition of the DSR signal.
 - 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, depending on the receive buffer status.
 - When Auto Status Back (ASB) is enabled using **GS a**, the status transmitted by **GS r** and the ASB status must be differentiated using the table in Appendix E.
 - The status types to be transmitted are shown below:

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Paper sensor status ($n = 1, 49$):

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Paper roll near-end sensor: paper adequate.
	On	01	1	Paper roll near-end sensor: paper near end.
1	Off	00	0	Paper roll near-end sensor: paper present.
	On	02	2	Paper roll near-end sensor: paper not present.
2	Off	00	0	Paper roll end sensor: paper adequate.
	On	04	4	Paper roll end sensor: paper near end.
3	Off	00	0	Paper roll end sensor: paper present.
	On	08	8	Paper roll end sensor: paper not present.
4	Off	00	0	Not used. Fixed to Off.
5	Off	00	0	TOF sensor: paper present.
	On	20	32	TOF sensor: paper not present.
6	Off	00	0	BOF sensor: paper present.
	On	40	64	BOF sensor: paper not present.
7	Off	00	0	Not used. Fixed to Off.

Bits 2 and 3: When the paper roll end sensor detects a paper end, the printer goes off-line and does not execute this command. Therefore, bits 2 and 3 do not transmit the status of paper end.

When the cover is open in the receipt section, the detection of the paper roll end sensor may be incorrect.

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Drawer kick-out connector status ($n = 2, 50$):

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Drawer kick-out connector pin 3 is LOW.
	On	01	1	Drawer kick-out connector pin 3 is HIGH.
1-3	-	-	-	Undefined.
4	Off	00	0	Not used. Fixed to Off.
5, 6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

Slip Status ($n = 3, 51$)

The remaining print area (times of the number of dots in vertical for one character) is transmitted as values from <00>H to <06>H.

The number of remaining dots	Slip status
0 - 8	<00>H
9 - 17	<01>H
18 - 26	<02>H
27-35	<03>H
36 - 44	<04>H
45 - 53	<05>H
54 or more	<06>H

When the slip is not selected, the status is <00>H.

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

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

[Name] Print raster bit image

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

[Range] $0 \leq m \leq 3, 48 \leq m \leq 51$
 $0 \leq xL \leq 255$
 $0 \leq xH \leq 255$
 $0 \leq yL \leq 255$
 $0 \leq d \leq 255$
 $k = (xL + xH \times 256) \times (yL + yH \times 256) \quad (k \neq 0)$

[Description] Selects Raster bit image mode. The value of *m* selects the mode, as follows:

<i>m</i>	Mode	Vertical Dot Density (DPI)	Horizontal Dot Density (DPI)
0, 48	Normal	180 DPI	180 DPI
1, 49	Double-width	180 DPI	90 DPI
2, 50	Double-height	90 DPI	180 DPI
3, 51	Quadruple	90 DPI	90 DPI

- *xL*, *xH*, select the number of data bytes ($xL+xH \times 256$) in the horizontal direction for the bit image.
- *yL*, *yH*, select the number of data bits ($yL+yH \times 256$) in the vertical direction for the bit image.

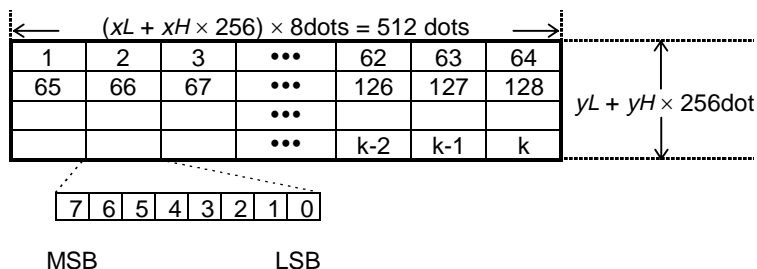
- [Notes]
- In standard mode for receipt paper, this command is effective only when there is no data in the print buffer.
 - This command has no effect in all print modes (character size, emphasized, double-strike, upside-down, underline, white/black reverse printing, etc.) for raster bit image.
 - If the printing area width set by **GS L** and **GS W** is less than the minimum width, the printing area is extended to the minimum width only on the line in question. The minimum width means 1 dot in normal ($m=0, 48$) and double-height ($m=2, 50$), 2 dots in double-width ($m=1, 49$) and quadruple ($m=3, 51$) modes.
 - Data outside the printing area is read in and discarded on a dot-by-dot basis.
 - The position at which subsequent characters are to be printed for raster bit image is specified by **HT** (Horizontal Tab), **ESC \$** (Set absolute print position), **ESC □** (Set relative print position), and **GS L** (Set left margin). If the position at which subsequent characters are to be printed is not a multiple of 8, print speed may decline.
 - 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 executing this command. The definition of this command should be cleared.

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

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



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GS $w\ n$

[Name] Set bar code width

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

[Range] $2 \leq n \leq 6$

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

n specifies the bar code width as follows:

n	Module Width (mm) for Multi-level Bar Code	Binary-level Bar Code	
		Thin element width (mm)	Thick element width (mm)
2	0.282	0.282	0.706
3	0.423	0.423	1.129
4	0.564	0.564	1.411
5	0.706	0.706	1.834
6	0.847	0.847	2.258

- Multi-level bar codes are as follows:
UPC-A, UPC-E, JAN13 (EAN13), JAN8 (EAN8), CODE93, CODE128
- Binary-level bar codes are as follows:
CODE39, ITF, CODABAR

[Note] • A bar code can be printed in the paper roll mode only.

[Default] $n = 3$

[Reference] **GS k**

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6.5 Kanji Control Commands (only for TM-H5000IIM/TM-H5000IIPM)

FS ! *n*

[Name] Set print mode(s) for Kanji characters

[Format]	ASCII	FS	!	<i>n</i>
	Hex	1C	21	<i>n</i>
	Decimal	28	33	<i>n</i>

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

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

Bit	Off/On	Hex	Decimal	Function
0	-	-	-	Undefined.
1	-	-	-	Undefined.
2	Off	00	0	Double-width mode is OFF.
	On	04	4	Double-width mode is ON.
3	Off	00	.	Double-height mode is OFF.
	On	08	8	Double-height mode is ON.
4	-	-	-	Undefined.
5	-	-	-	Undefined.
6	-	-	-	Undefined.
7	Off	00	0	Underline mode is OFF.
	On	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 !**

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FS &

[Name]	Select Kanji character mode		
[Format]	ASCII	FS	&
	Hex	1C	26
	Decimal	28	38
[Description]	Selects Kanji character mode.		
[Notes]	For Japanese Kanji model:		
	<ul style="list-style-type: none">• This command is effective only when the JIS code system is selected.• When the Kanji character mode is selected, the printer processes all Kanji code for each two bytes.• Kanji codes are processed in the order of the first byte and second byte.• Kanji character mode is not selected when the power is turned on.• Using FS C, the Kanji character code system is selected.		
	For Chinese/Taiwanese Kanji model:		
	<ul style="list-style-type: none">• When the kanji character mode is selected, the printer checks whether the code is for Kanji or not, then processed the first byte and the second byte if the code is for Kanji.• Kanji codes are processed in the order of the first byte and second byte.• Kanji character mode is not selected when the power is turned on.		
[Reference]	FS . , FS C		

FS - *n*

[Name]	Turn underline mode on/off for Kanji characters			
[Format]	ASCII	FS	-	<i>n</i>
	Hex	1C	2D	<i>n</i>
	Decimal	28	45	<i>n</i>
[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 <i>n</i> for both receipt and slip.			

<i>n</i>	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]	<ul style="list-style-type: none">• 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.• After the underline mode for Kanji characters is turned off by setting <i>n</i> to 0, underline printing is no longer executed, but the previously specified underline thickness is not changed. The default underline thickness is 1 dot.

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- 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.
- When the slip paper is selected, the underline thickness is 1 dot even if n is 2 or 50.

[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] For Japanese Kanji model:

- This command is effective only when the JIS code system is selected.
- 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 not selected when the power is turned on.

For Chinese/Taiwanese Kanji model:

- 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 C**

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FS 2 *c1 c2 d1...dk*

[Name] Define user-defined Kanji characters

[Format] ASCII FS 2 *c1 c2 d1...dk*
 Hex 1C 32 *c1 c2 d1...dk*
 Decimal 28 50 *c1 c2 d1...dk*

[Range] *c1* and *c2* indicate character codes for the defined characters. The range of values for *c1* and *c2* differ depending on the character code system used.

Model type	<i>c1</i>	<i>c2</i>
Japanese Kanji supporting model (JIS code system)	<i>c1</i> = 77H	21H ≤ <i>c2</i> ≤ 7EH
Japanese Kanji supporting model (SHIFT-JIS code system)	<i>c1</i> = ECH	40H ≤ <i>c2</i> ≤ 7EH 80H ≤ <i>c2</i> ≤ 9EH
Chinese Kanji supporting model	<i>c1</i> = FEH	A1H ≤ <i>c2</i> ≤ FEH
Taiwanese Kanji supporting model	<i>c1</i> = FEH	A1H ≤ <i>c2</i> ≤ FEH

$0 \leq d \leq 255$

$k = 32$ (slip), $k = 72$ (paper roll)

[Description] Defines user-defined Kanji characters for the character codes specified by *c1* and *c2*.

[Notes]

- *c1* and *c2* indicate character codes for the defined characters. *c1* specifies for the first byte, and *c2* for the second byte.
- *d* indicates the dot data. Set a corresponding bit to 1 to print a dot or to 0 to not print a dot.
- The user-defined Kanji characters is printed on the selected paper set by the **ESC c 1** command.

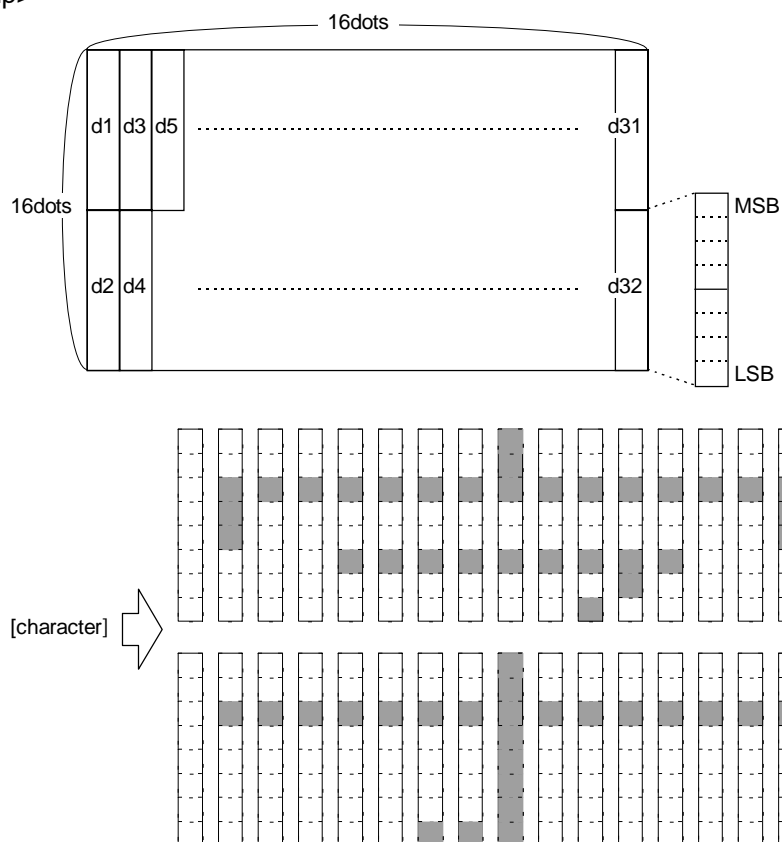
[Default] All spaces.

[Reference] **ESC c 1**, **FS C**

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[Example]

<slip>



When the dot pattern for JIS code <7721>H is defined as shown above.

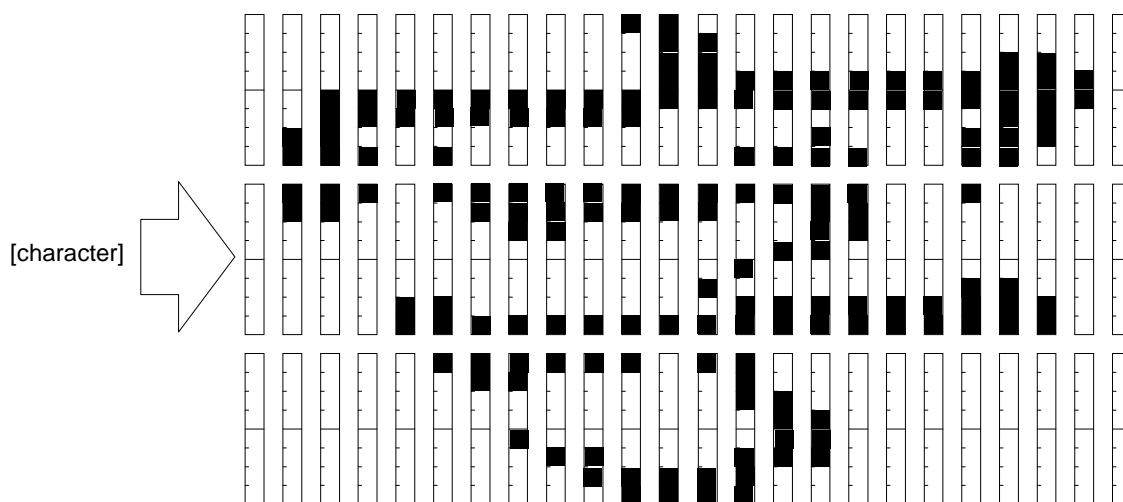
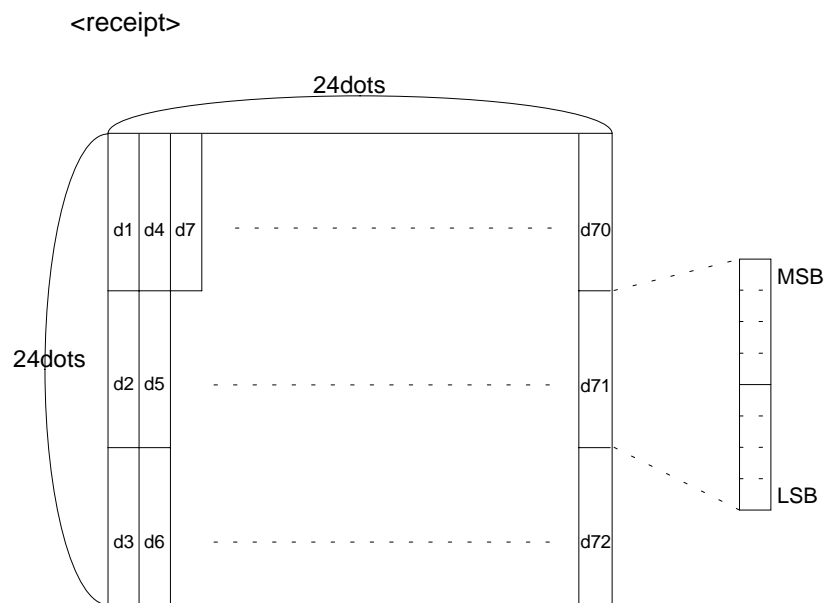
FS	2	c1	c2	d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12
Code (Hex)	1C	32	77	21	00	00	38	20	20	20	20	24	20	24	20

d13	d14	d15	d16	d17	d18	d19	d20	d21	d22	d23	d24	d25	d26	d27	d28	d29
24	21	24	21	E4	FF	24	20	25	20	26	20	24	20	20	20	20

d30	d31	d32
20	38	20

The corresponding bit is 1 when printing and 0 when not printing.

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d1 = <00>H	p4 = <03>H	d7 = <0F>H	.. d10 = <0D>H	d13 = <0C>H	d16 = <0D>H
d2 = <00>H	p5 = <00>H	d8 = <00>H	.. d11 = <80>H	d14 = <03>H	d17 = <83>H
d3 = <00>H	p6 = <00>H	d9 = <00>H	.. d12 = <00>H	d15 = <00>H	d18 = <80>H

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FS C *n*

[Name] Select Kanji character code system

[Format]	ASCII	FS	C	<i>n</i>
	Hex	1C	43	<i>n</i>
	Decimal	28	67	<i>n</i>

[Range] *n* = 0, 1, 48, 49

[Description] Selects a Kanji character code system, based on the following values of *n*:

<i>n</i>	Kanji System
0, 48	JIS code
1, 49	SHIFT JIS code

- [Notes]
- This command is effective only for Japanese Kanji model.
 - In the JIS code system, the following codes are available:
Primary byte: <21>H to <7E>H
Secondary byte: <21>H to <7E>H
 - In the SHIFT JIS code system, the following codes are available:
Primary byte: <81>H to <9F>H and <E0>H to <EF>H
Secondary byte: <40>H to <7E>H and <80>H to <FC>H

[Default] *n* = 0

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FS S *n1 n2*

[Name]	Set left- and right-side Kanji character spacing				
[Format]	ASCII	FS	S	<i>n1</i>	<i>n2</i>
	Hex	1C	53	<i>n1</i>	<i>n2</i>
	Decimal	28	83	<i>n1</i>	<i>n2</i>
[Range]	$0 \leq n1 \leq 255$				
	$0 \leq n2 \leq 255$				
[Description]	Sets left- and right-side Kanji character spacing <i>n1</i> and <i>n2</i> , respectively. <ul style="list-style-type: none"> When the printer model used supports GS P, the left-side character spacing is [<i>n1</i> × horizontal or vertical motion units], and the right-side character spacing is [<i>n2</i> × horizontal or vertical motion units]. 				
[Notes]	<ul style="list-style-type: none"> When double-width mode is set, the left- and right-side character spacing is twice the normal value. The horizontal and vertical motion units are set by GS P. The previously specified character spacing does not change, even if the horizontal or vertical motion unit is changed using GS P. The value cannot be less than the minimum horizontal movement amount, and must be in even units of the minimum horizontal movement amount. In standard mode, the horizontal motion unit is used. In page mode, the horizontal or vertical motion unit differs in page mode, depending on starting position of the printable area as follows: <ol style="list-style-type: none"> When the starting position is set to the upper left or lower right of the printable area using ESC T, the horizontal motion unit (<i>x</i>) 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 (<i>y</i>) is used. The maximum right-side spacing is 255/180 inches for the paper roll and is approximately 35.983 mm {255/150 inches} for the slip paper. Any setting exceeding the maximum is converted to the maximum automatically. 				
[Default]	For paper roll: $n1 = 0, n2 = 0$				
	For slip: $n1 = 0, n2 = 0$				
[Reference]	GS P				

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FS W *n*

[Name]	Turn quadruple-size mode on/off for Kanji characters			
[Format]	ASCII	FS	W	<i>n</i>
	Hex	1C	57	<i>n</i>
	Decimal	28	87	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	Turns quadruple-size mode on or off for Kanji characters. <ul style="list-style-type: none"> When the LSB of <i>n</i> is 0, quadruple-size mode for Kanji characters is turned off. When the LSB of <i>n</i> is 1, quadruple-size mode for Kanji characters is turned on. 			
[Notes]	<ul style="list-style-type: none"> Only the lowest bit of <i>n</i> is valid. In quadruple-size mode, the printer prints the same size 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 characters are printed in normal size. When some of the characters on a line are different in height, all the characters on the line are aligned at the baseline. When characters are enlarged in the horizontal direction, they are enlarged to the right, based on the left side of the character. 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]	<i>n</i> = 0			
[Reference]	FS ! , GS !			

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6.6 MICR Control Commands (only for printers with MICR)

DLE EOT BS *n*

[Name] Transmit real-time MICR status

[Format]	ASCII	DLE	EOT	BS	<i>n</i>
	Hex	10	04	08	<i>n</i>
	Decimal	16	4	8	<i>n</i>

[Range] *n* = 1

[Description] Transmits the selected MICR status specified by *n* in real time as follows:

<i>n</i>	Function
1	Transmit MICR status

- [Notes]
- The status information to be transmitted is shown in the tables on the following pages.
 - The printer starts MICR status transmission when this command is buffered in the receive buffer.
 - When transmitting status, the printer transmits only 1 byte without confirming the condition of the DSR signal.
 - This command is executed even when the printer is in off-line, the receive buffer full, or in an error status with a serial interface model.
 - With a parallel interface model, this command can not be executed when the printer is busy. This command is executed even when the printer is off-line or there is an error status when DIP switch 2-1 is on with a parallel interface model.
 - The status is transmitted whenever the data sequence for **DLE EOT BS *n*** (*n* = 1) is received.
Example:
In **ESC * *m* nL nH d1 ... dk**, *d1*=<10>H, *d2*=<04>H, *d3*=<01>H
 - This command should not be contained within another command that consists of 2 or more bytes.
Example:
If you attempt to transmit **ESC 3 *n*** to the printer, and then **DLE EOT BS 1** interrupts before *n* is received, the code <10>H for **DLE EOT BS 1** is processed as the code for **ESC 3 <10>H**.
 - This command is effective even if the printer is not selected by set peripheral device command, **ESC =**.
 - This command is ignored while the printer transmits reading results of MICR (**FS a 0**, **FS b**).
 - When Automatic Status Back (ASB) is enabled using the **GS a** command, the status transmitted by the **DLE EOT BS** command and the ASB status must be differentiated using the table in Appendix E.

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$n = 1$: MICR status

Bit	Off/On	Hex	Decimal	Status
0	Off	-	-	Not used. Fixed to Off.
1	On	-	-	Not used. Fixed to On.
2	Off	00	0	MICR function selected.
	On	04	4	MICR function not selected.
3	Off	00	0	Does not wait for check paper or cleaning sheet to be inserted.
	On	08	8	Waits for check paper or cleaning sheet to be inserted.
4	On	10	16	Not used. Fixed to On.
5	Off	00	0	TOF sensor: paper present.
	On	20	32	TOF sensor: paper not present.
6	Off	00	0	BOF sensor: paper present.
	On	40	64	BOF sensor: paper not present.
7	Off	00	0	Not used. Fixed to Off.

- Bit 2:
- There may be a time lag between receiving **FS a 0**, **FS c** and selecting the MICR function.
 - Remains 0 (selected) until MICR function is completed.
- Bit 3:
- Becomes 0 (not waiting) just before starting MICR reading, or starting MICR head cleaning, after detecting the personal check or cleaning sheet, respectively.
- Bit 5 and 6:
- Transmit the current status of the paper sensors.
- [Reference] **DLE ENQ**, **FS a 0**, **FS b**, **FS c**, Appendix E

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FS a 0 *n*

[Name] Read check paper

[Format] ASCII FS a 0 *n*
 Hex 1C 61 30 *n*
 Decimal 28 97 48 *n*

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

[Description] Selects MICR function and reads MICR characters specified by *n* as follows:

Bit	Off/On	Hex	Decimal	Function
0	Readable fonts.			
1	See the table below.			
2	-	-	-	Undefined
3	-	-	-	Undefined
4	-	-	-	Undefined
5	-	-	-	Undefined
6	-	-	-	Undefined
7	Off	00	0	Not used. Fixed to Off.

Readable Fonts

Hex	Decimal	Font
00	0	E13B
01	1	CMC7
02	2	Undefined
03	3	Undefined

- [Notes]
- This command is available only when input at the beginning of the line.
 - This command is executed after being buffered in the receive buffer. Therefore, there may be a time lag between receiving this command and starting MICR reading.
 - When an undefined font is selected, this command is ignored.
 - If MICR function is not selected when this command is executed, the MICR function is selected and the printer enters the personal check waiting status. When slip paper is selected for printing, the printer ejects the current slip, then waits for check paper to be loaded.
 - The personal check wait time is infinite, based on the **ESC f t1 t2** setting, and the printer starts reading [$t2 \times 0.1$] second after detecting insertion of a personal check.
 - The printer processes only the real-time commands during the paper wait time.
 - This command is ignored in page mode.

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- The check waiting status continues until: a check is inserted, the waiting state is cancelled, the waiting time $t1$ set by **ESC f** elapses, or the power is turned off. When check waiting state is cancelled, or when the wait time elapses, the printer ends reading abnormally. The printer starts reading when a personal check is inserted.
- When character waveforms or normal waveform reading are not detected or when an error occurs, the printer ends reading abnormally. Otherwise, the printer ends reading normally.
- When the printer ends reading abnormally, the printer ejects paper, selects the default paper type for **ESC c 0**, and ends MICR function. When a recoverable error occurs, the printer selects the paper roll and ends MICR function when recovering from the error.
- If the characters read are not identified as the specified character font, the printer converts the data to “?”.
- When the printer ends reading normally, it transmits “header + reading status (normal end) + data + NULL” to the host computer. In other cases, it transmits “header + reading status + NULL” to the host computer.

Header: <5F>H

NUL: <00>H

Each bit of n is used as follows:

Bit	Off/On	Hex	Decimal	Function
0,1	Readable fonts. See the table below.			
2,3	-	-	-	Undefined
4	On	10	16	Rereading not possible. Fixed to On.
5	Off	00	0	Reading normal.
	On	20	32	Reading not normal.
6	On	40	64	Not used. Fixed to On.
7	Off	00	0	Not used. Fixed to Off.

Readable Fonts

Hex	Decimal	Font
00	0	E13B
01	1	CMC7
02	2	Undefined
03	3	Undefined

Bits 0 and 1: Identified character fonts. When bit 5 is 1 (abnormal end), either bit 0 or 1 has no meaning.

Bit 4: Under the following conditions, the printer sets bit 4=1 (rereading not possible)

- ① When bit 5=1 (abnormal end),
- ② If the MICR status is “Not Selected”.
- ③ When **ESC @** is executed, the printer is reset, and printer power is on, but the printer doesn't execute.

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Bit 5: Under the following conditions, the printer sets bit 5=1 (abnormal end).

- ① If the personal check waiting is canceled.
- ② If the waiting time ($t1$) set by **ESC f** elapses during the personal check waiting.
- ③ When character waveforms are not detected.
- ④ If character waveforms detected during reading are not identified as the specified character font.
- ⑤ If between the start of processing this command and the start of transmitting the header, an error occurs.
- ⑥ When **ESC @** is executed, the printer is reset, and printer power is on, but the printer doesn't execute.

• The identified characters consist of the following:

① E13B

MICR	Character	Hex	Decimal	MICR	Character	Hex	Decimal
	NULL	0 0	0	0	0	3 0	4 8
	SP	2 0	3 2	1	1	3 1	4 9
	?	3 F	6 3	2	2	3 2	5 0
				3	3	3 3	5 1
T	T	5 4	8 4	4	4	3 4	5 2
A	A	4 1	6 5	5	5	3 5	5 3
O	O	4 F	7 9	6	6	3 6	5 4
D	D	4 4	6 8	7	7	3 7	5 5
				8	8	3 8	5 6
				9	9	3 9	5 7

② CMC7

MICR	Character	Hex	Decimal	MICR	Character	Hex	Decimal
	NULL	0 0	0	0	0	3 0	4 8
	SP	2 0	3 2	1	1	3 1	4 9
	?	3 F	6 3	2	2	3 2	5 0
				3	3	3 3	5 1
/	/	2 F	4 7	4	4	3 4	5 2
#	#	2 3	3 5	5	5	3 5	5 3
=	=	3 D	6 1	6	6	3 6	5 4
>	>	3 E	6 2	7	7	3 7	5 5
^	^	5 E	9 4	8	8	3 8	5 6
				9	9	3 9	5 7

MICR	Character	Hex	Decimal	MICR	Character	Hex	Decimal
A	A	4 1	6 5	N	N	4 E	7 8
B	B	4 2	6 6	O	O	4 F	7 9
C	C	4 3	6 7	P	P	5 0	8 0
D	D	4 4	6 8	Q	Q	5 1	8 1
E	E	4 5	6 9	R	R	5 2	8 2
F	F	4 6	7 0	S	S	5 3	8 3
G	G	4 7	7 1	T	T	5 4	8 4
H	H	4 8	7 2	U	U	5 5	8 5
I	I	4 9	7 3	V	V	5 6	8 6
J	J	4 A	7 4	W	W	5 7	8 7
K	K	4 B	7 5	X	X	5 8	8 8
L	L	4 C	7 6	Y	Y	5 9	8 9
M	M	4 D	7 7	Z	Z	5 A	9 0

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- If an error occurs before transmitting the identification result, the printer does not transmit the identified result.
- When DTR/DSR control is selected, the printer transmits data consecutively after confirming whether the host computer is ready to receive data. When the host is not ready to receive data, the printer waits until the host is ready.
- When XON/XOFF control is selected, the printer transmits all data consecutively without confirming whether the host computer is ready to receive data. The data transmission must be consecutive, except for the XOFF code.
- The printer transmits all data collectively without confirming whether the host is ready to receive data. To receive all data correctly, 67 bytes or more space is required in the receive buffer.
- During identification result transmission, the printer ignores **DLE EOT *n*** and **DLE EOT BS *n***. Also, the printer does not transmit ASB even when the ABS is enabled. Therefore, the user cannot confirm changes in the printer status during these periods.
- It is possible to differentiate the reading results of MICR, ASB, and real-time status. Refer to Appendix E for data identifying method.
- The identification result is not cleared until: the next **FS a 0** is executed, **ESC @** is executed, **FS q** is executed, the printer is reset, or the printer power is turned off.
- Data transmission (real-time commands and the like) should not be executed during MICR reading, because it affects the reading precision and may lower the recognition rating.
- If the printer receives **FS a 1**, **FS a 2**, or **FS b** when bit 5 is 0 (normal end), the printer executes each command. If the printer receives any other code (except for real-time commands), the printer ejects the check, ends MICR function, and selects the paper roll.
- Paper feeding with the FORWARD/REVERSE button and auto loading cannot be executed during the period from starting MICR character reading to ending check paper ejection. Also, do not change the ink ribbon during this period.

[Reference] **DLE EOT BS, DLE ENQ, ESC f, FS a 1, FS a 2**, Appendix E

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FS a 1

[Name]	Load check paper to print starting position				
[Format]	ASCII	FS	a	1	<i>n</i>
	Hex	1C	61	31	<i>n</i>
	Decimal	28	97	49	<i>n</i>
[Description]	Loads check paper to the print starting position				
[Notes]	<ul style="list-style-type: none">• Since this command is executed after being buffered in the receive buffer, there may be a time lag between receiving this command starting MICR reading.• The command is ignored unless MICR function is selected.• After loading check paper to the print starting position, the printer cancels MICR function and selects slip paper automatically.				
[Reference]	FS a 0				

FS a 2

[Name]	Eject check paper				
[Format]	ASCII	FS	a	1	
	Hex	1C	61	32	
	Decimal	28	97	50	
[Description]	Ejects check paper				
[Notes]	<ul style="list-style-type: none">• Since this command is executed after being buffered in the receive buffer, there may be a time lag between reception and starting paper ejection.• The command is ignored unless MICR function is selected.• After ejecting check paper, the printer cancels MICR function and selects the paper roll.				
[Reference]	ESC c 0, FS a 0				

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FS b

[Name]	Request retransmission of check paper reading result		
[Format]	ASCII	FS	b
	Hex	1C	62
	Decimal	28	98
[Description]	Retransmits the previous check paper (MICR character) reading results.		
[Notes]	<ul style="list-style-type: none"> The printer transmits all data collectively without confirming whether the host computer is ready to receive data after transmitting header. To receive all data correctly, 67 bytes or more space is required in the receive buffer. This command is executed after being buffered in the receive buffer. Therefore, there may be a time lag between sending this command and starting MICR reading. When the previous MICR reading results are correct, the printer transmits header + reading status + identified character strings + NULL to the host computer. If it is abnormal, or when FS a 0 is not executed, the printer transmits header + reading status + NULL to the host. When DTR/DSR control is selected, the printer transmits data consecutively after confirming whether the host computer is ready to receive data. When the host is not ready to receive data, the printer waits until the host is ready. When XON/XOFF control is selected, the printer transmits all data consecutively without confirming whether the host computer is ready to receive data. The data transmission must be consecutive, except for the XOFF code. Refer to the FS a 0 command description for header, reading status, and identified character strings. During identification result transmission, the printer ignores DLE EOT n and DLE EOT BS n. Also, the printer does not transmit ASB even when the ABS is enabled. Therefore, the user cannot confirm changes in the printer status during these periods. It is possible to differentiate the reading results of MICR, ASB, and real-time status. Refer to Appendix E for data identifying method. 		
[Reference]	DLE EOT BS , DLE EOT , FS a 0 , Appendix E		

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FS c

[Name] MICR mechanism cleaning

[Format] ASCII FS c
Hex 1C 63
Decimal 28 99

[Description] Cleans the MICR mechanism.

- [Notes]
- This command is available only when input at the beginning of the line.
 - This command is executed after being buffered in the receive buffer. Therefore, there may be a time lag between sending this command and starting head cleaning.
 - When this command is executed, the printer enters the cleaning sheet wait status.
 - When this command is executed with slip paper selected, the printer ejects the ip paper and waits for the cleaning sheet to be loaded.
 - The cleaning sheet waiting time is infinite minutes, based on the **ESC f t1 t2** setting. The printer starts operation [$t2 \times 0.1$] seconds after detecting a cleaning sheet.
 - The printer waits for the cleaning sheet until a cleaning sheet is inserted, the cleaning sheet waiting status is canceled, the waiting time is over, the printer is reset, or the power is turned off.
 - During the cleaning sheet waiting period, the printer processes only real-time commands.
 - The printer starts MICR mechanism cleaning when the cleaning sheet is loaded.
 - If the cleaning is ended, the printer ejects the cleaning sheet, and selects the paper roll.

[Reference] **ESC c 0**, **ESC f**

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APPENDIX A: MISCELLANEOUS NOTES

A.1 Notes on Printing and Paper Feeding

1) Print duty

- When printing exceeds the allowable print duty cycle, the printer automatically senses the status and controls printing (both for receipt and slip). In this case, the printing speed may slow temporarily. When print duty is lowered to normal, the printing speed also returns to normal.
- If printing stops due to excessive print duty, the ERROR LED indicator blinks as shown in Table 3.8.1.

2) Inserting slip paper

Slip paper should be inserted correctly by matching the top edge with the form stopper and the right side with the right side of the paper insert portion.

If the paper is not straight, the sensors (TOF and BOF sensors) cannot detect it. The paper cannot be clamped.

As soon as the paper is engaged by the paper feed roller and the print head, immediately let go of it.

3) Printing on slip paper

- Slip paper can be ejected in both forward (default) and backward directions. However, for small paper, ejecting in the forward direction is recommended.
- Slip paper should be inserted correctly by matching the top edge with the form stopper and the right side with the right side of the paper insert portion.
- The slip waiting time and the interval from when slip is inserted to when the operation starts can be set using **ESC f**.
- The slip waiting state is canceled using **DLE ENQ 3**.
- After the slip is ejected, the SLIP LED indicator lights and the printer does not proceed to the next operation until the slip paper is removed.
- The remaining printing space for printing the following data on slip can be checked using **GS r 3**.
- Printing with the ejection of the slip paper toward you is prohibited. Doing so may cause paper jams and ink-stained paper.
- Do not execute a mechanical reset with the slip paper inserted. Doing so may cause the paper edge to be caught by the print head carriage.
- Be sure to turn on the power with no slip paper inserted. Otherwise, the paper may be caught by the print head carriage.

ASB function is recommended to check the slip status.

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- 4) Because the TM-H5000II is a line printer, it automatically feeds paper after printing the data.

Therefore, when the line spacing for one line is set to a smaller value than the print data, paper may be fed more than the set amount just to print the data.

For example, when the line spacing for one line is set to 10 dots (10/180 inches) and only paper feeding is executed, paper is fed for 10 dots; however, if bit-image characters are printed, paper is fed for 24 dots. (Refer to Table A.1.)

When only rotated characters are printed on one line, paper feeding is executed as shown in Table A.1.

Table A.1 Paper Feeding Amount

		Required Paper Feeding Amount (dots)
Normal Characters	Font A	24 × number of times enlarged in vertical
	Font B	17 × number of times enlarged in vertical
	Kanji font	24 × number of times enlarged in vertical
Rotated Characters	Font A	12 × number of times enlarged in vertical
	Font B	9 × number of times enlarged in vertical
	Kanji font	24 × number of times enlarged in vertical
Bit image		24

- 5) When the printer goes to the standby (data-waiting) state during printing, it temporarily stops printing and feeding paper. When data is transmitted and printing is executed, paper may shift 1 to 3 dots from the print starting position, which especially affects bit-image printing.

- 6) Interval of auto-cutting operation in the receipt section

For driving the auto cutter of the receipt section, take the interval as a minimum of 10 lines of printing or paper feeding (to prevent small pieces of cut paper from dropping into the auto cutter).

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A.2 Notes on Printer Installation

- When transporting the TM-H5000, the dampers are in the left side of the slip section and in the bottom of the paper roll section. Therefore, remove the dampers before using the printer.
- Connect the external power supply to the power supply connector of the printer. Then plug in the external power supply and turn it on if necessary. Be sure not to connect the external power supply with the wrong polarity. If it is connected incorrectly, the internal circuit fuse of the printer may be blown or the external power supply may be damaged.
- The power supply voltage is within the range of $24\text{ V} \pm 10\%$ (21.6 ~ 26.4V)
If the power supply voltage drops to the outside of the range above during printing, the printer stops printing and waits until the voltage returns to normal and then automatically begins printing again. Therefore, printing speed may slow, the print pitch may not be correct, and some dots in some characters may not be printed.
- Both high and low voltage errors are shown in table 3.7.3. The blinking patterns are shown in the table.
- When either a high or low voltage error occurs, turn off the power as soon as possible.

A.3 Other Notes

1) Printer mechanism handling on the receipt side

- Because the thermal elements of the print head and driver IC are easy to break, do not touch them with any metal objects.
- Since the areas around the print head become very hot during and just after printing, do not touch them.
- Do not use the cover open button except when necessary.
- Do not touch the surface of the print head because dust and dirt can stick to the surface and damage the elements.
- Thermal paper containing Na⁺, K⁺, and C1⁻ ions can harm the print head thermal elements. Therefore, be sure to use only the specified paper.
- Label paper cannot be used.

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2) Thermal paper handling

① Notes on using thermal paper

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

- a) Use water paste, starch paste, polyvinyl paste, or CMC paste when gluing thermal paper.
- b) Volatile organic solvents such as alcohol, ester, and ketone can cause discoloration.
- c) Some adhesive tapes may cause discoloration or faded printing.
- d) 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.
- e) If thermal paper touches diazo copy paper immediately after copying, the printed surface may be discolored.
- f) Thermal paper must not be stored with the printed surfaces against each other because the printing may be transferred between the surfaces.
- g) If the surface of thermal paper is scratched with a hard metal object such as a nail, the paper may become discolored.

② Notes on thermal paper storage

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

- a) Store paper away from high temperature and humidity.

Do not store thermal paper near a heater or in enclosed places exposed to direct sunlight.

- b) Avoid direct light.

Extended exposure to direct light may cause discoloration or faded printing.

3) Others

- Because this printer uses plated steel, the cutting edges may be subject to rust. However, this does not affect the printer performance.
- When you move the printer, put your hand under the printer so that you do not apply excessive pressure to the printer case.
- Do not set any liquids or drinks such as coffee on the printer case.

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APPENDIX B: PAPER ROLL SETUP

B.1 Replacing the Ribbon Cassette in the Slip Section

- 1) Turn off the power.
- 2) Pull the front cover toward you and lift it up.
- 3) Remove the ribbon cassette.
- 4) Make sure that the print head is on the right side and turn the feed knob to take up any slack in the ribbon. Then insert the new ribbon cassette.

(Note that if the ribbon is not correctly placed in the ribbon guide, when you insert slip paper it may catch on the ribbon or become stained with ink from the ribbon.)
- 5) Push the front cover down and back.

B.2 Replacing the Paper Roll in the Receipt Section

- 1) Turn on the printer power.
- 2) Open the printer cover by pressing the cover open button.
- 3) Remove the spool of the used paper roll from the paper holder and load the new paper roll.
(Note the paper roll winding direction.)
- 4) Pull out some of the paper from the paper roll and close the printer cover.

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APPENDIX C: RECOVERY FROM THE AUTO CUTTER ERROR

If a foreign object such as a push pin or paper clip drops in the auto cutter and causes the auto cutter to lock up, the printer enters an error state and begins the recovery operation automatically. (The error LED blinks continuously, but it is possible for the error to be corrected automatically.)

If the problem is not serious, the auto cutter returns to its normal position without any intervention by the user.

If the auto cutter does not return to its normal position by itself, follow the steps below to correct the problem:

- 1) Pull the cutter cover toward you so that you can rotate the cutter motor knob.
- 2) Rotate the cutter motor knob counterclockwise.
- 3) Following the instructions on the caution label, rotate the knob until the ▼ indicator appears in the hole.

If the motor knob cannot be rotated, rotate it in the reverse direction to loosen it; then send the **DLE ENQ n** command. Next, check the ERROR LED. If the ERROR LED is not off, repeat the same procedure and confirm that the ERROR LED is off. When the ERROR LED is off, the auto cutter blade has returned to its normal position and the paper roll cover can be opened. Open the paper roll cover, remove the jammed paper, and reinstall the paper roll. Then close the paper roll cover.

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APPENDIX D: ADJUSTING THE PAPER ROLL NEAR-END SENSOR LOCATION

The remaining detectable amount of paper on the paper roll varies with the inside and outside diameters of the paper core. The minimum detectable amount of paper on the paper roll can be set using the following method:

- 1) The inside diameter of the paper spool should be 12mm (.47") and the outside diameter of the paper spool should be 18mm (.71"). Specified thermal paper should be used.
- 2) Loosen the adjusting screw that holds the paper near-end sensor and set the top of the positioning plate to the appropriate adjustment value and tighten the adjusting screw.

Adjust the positioning plate to #1 if the outside diameter of a paper roll to be used is 18mm.

Adjust the positioning plate to #2 if the outside diameter of a paper roll to be used is more than 18 mm.

Table D.1 Adjustment Positions

	Specified Thermal Paper
Adjustment Position Number	Dimension of A
#1	Approximately 23 mm (0.97")
#2	Approximately 27 mm (1.06")

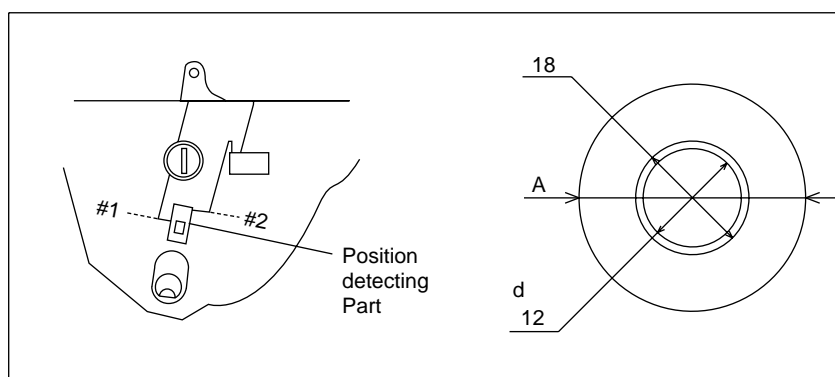


Figure D.1 Near-end Adjusting Position

NOTES:

- 1) Since dimension A in the table is a calculated value, there may be some variations depending on the printer.
- 2) Be sure that the adjustable slider operates smoothly after you finish the adjustment.

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APPENDIX E: TRANSMISSION STATUS IDENTIFICATION

Because the specified status bits transmitted from the TM-H5000 are fixed, the user can confirm the command to which the status belongs, as shown in the following table.

Command & Function	Status Reply
GS l	<0**0****>B
GS r	<0**0****>B
XON	<00010001>B
XOFF	<0**1**11>B
DLE EOT 1~5	<0**1**10>B
ASB (1st byte)	<0**1**00>B
ASB (2nd to 4th bytes)	<0**0****>B

(When the printer is used with the MICR reader.)

Command & Function	Status Reply
FS a 0, FS b (header)	<01011111>B
DLE EOT BS 1	<0**1**10>B

When the printer receives header (<5F>H) transmitted when **FS a 0** or **FS b** is executed, status identification must not be performed until NUL (<00>H) is received.

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APPENDIX F: CONFIGURING THE SPACE PAGE

F.1 Slip Section

The space page is the character code table where character codes 80H to FFH are all undefined. This character code table is selected when *n* is set to 255 using the character code table selection command **ESC t n**.

1) Space page top address

Page	Character Table	Space page top address	
		7 × 9	9 × 9
255	Space page	FD78F6H	FD6CF6H

2) Calculating the character data top address

The character data top address is calculated as follows:

- 7 × 9 font (graphics)

Character data top address = Space page top address + (character code - 80H) × 18

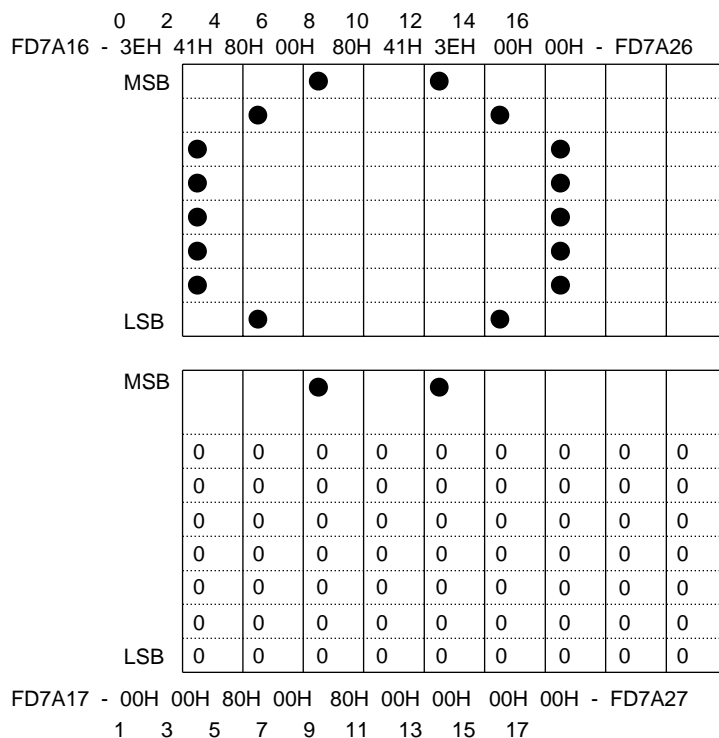
- 9 × 9 font (graphics)

Character data top address = Space page top address + (character code - 80H) × 24

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3) Example configuring the font data

- 7 × 9 font (in case of character code 90H on page 255)



Character code 90H
Character data top address
5600H+(90H-80H)×18=5720H

Address data	Address data
0: FD7A16 3EH	1: FD7A17 00H
2: FD7A18 41H	3: FD7A19 00H
4: FD7A1A 80H	5: FD7A1B 80H
6: FD7A1C 00H	7: FD7A1D 00H
8: FD7A1E 80H	9: FD7A1F 80H
10: FD7A20 41H	11: FD7A21 00H
12: FD7A22 3EH	13: FD7A23 00H
14: FD7A24 00H	15: FD7A25 00H
16: FD7A26 00H	17: FD7A27 00H

Figure F.1 7 × 9 Font

- 9 × 9 font (in case of character code F0H on page 255)

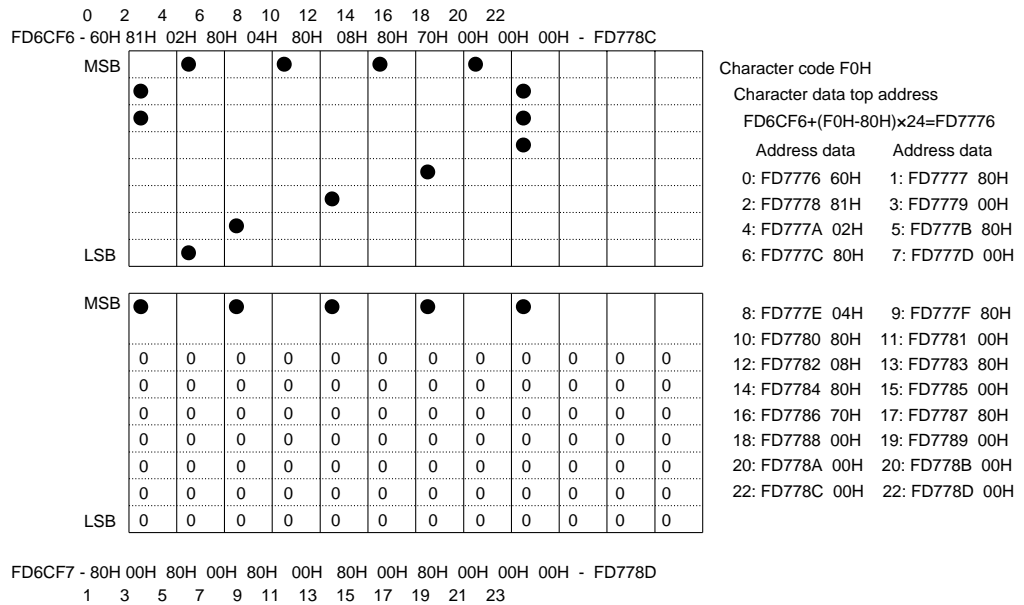
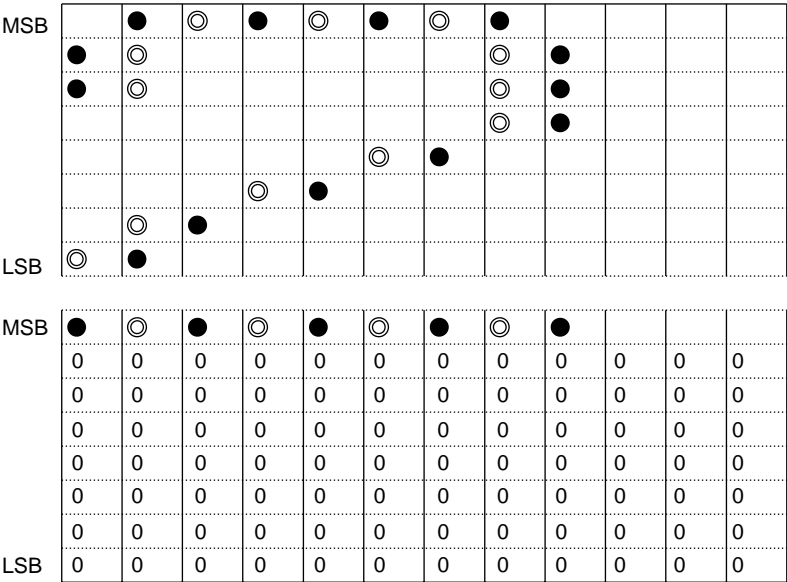


Figure F.2 9 × 9 Font

4) Notes

Do not use character patterns in which dots are horizontally adjacent.



The pattern shown above, in which ○ and ● adjoin horizontally, is prohibited.

Figure F.3 Prohibited Dot Patterns

F.2 Receipt Section

The space page is the character code table where character codes 80H to FFH are all spaces. This character code table is selected when n is set to 255 using the character code table selection command **ESC t n**.

1) Space page top address

Page	Character Table	Space page top address	
		12 × 24	9 × 17
255	Space page	FCA480H	FCBC80H

2) Calculating the character data top address

The character data top address is calculated as follows:

- 12 × 24 font (graphics)

$$\text{Character data top address} = \text{FCA480H} + (\text{character code} - 80\text{H}) \times 48$$

- 9 × 17 font (graphics)

$$\text{Character data top address} = \text{FCBC80H} + (\text{character code} - 80\text{H}) \times 34$$

3) Example configuring the font data

- 12 × 24 font (in case of character code 90H on page 255)

$$\text{Character data top address} = \text{FCA480H} + (90\text{H} - 80\text{H}) \times 48 = \text{FCA780H}$$

MSB								LSB				Address data				
d1												0	0	0	0	d1:FCA780H 00H
d3												0	0	0	0	d2:FCA781H 00H
d5												0	0	0	0	d3:FCA782H 1EH
d7												0	0	0	0	d4:FCA783H 00H
d9												0	0	0	0	d5:FCA784H 7FH
d11												0	0	0	0	:
d13												0	0	0	0	:
d15												0	0	0	0	:
d17												0	0	0	0	:
d19												0	0	0	0	d19:FCA792H 01H
d21												0	0	0	0	d20:FCA793H 80H
d23												0	0	0	0	d21:FCA794H 03H
d25												0	0	0	0	:
d27												0	0	0	0	:
d29												0	0	0	0	:
d31												0	0	0	0	:
d33												0	0	0	0	:
d35												0	0	0	0	:
d37												0	0	0	0	:
d39												0	0	0	0	:
d41												0	0	0	0	:
d43												0	0	0	0	:
d45												0	0	0	0	d47:FCA7AEH 00H
d47												0	0	0	0	d48:FCA7AFH 00H

Figure F.4 12 × 24 Font

- 9 × 17 font (in case of character code F0H on page 255)

Character data top address FCBC80H + (F0H-80H) × 34 = FCCB60H

MSB							LSB	MSB								LSB	Address data
d1								d2	0	0	0	0	0	0	0	0	d1:FCCB60H 00H
d3			●	●	●			d4	0	0	0	0	0	0	0	0	d2:FCCB61H 00H
d5		●	●	●	●	●		d6	0	0	0	0	0	0	0	0	d3:FCCB62H 38H
d7		●	●		●	●	●	d8	0	0	0	0	0	0	0	0	d4:FCCB63H 00H
d9	●	●				●	●	d10	0	0	0	0	0	0	0	0	d5:FCCB64H 7CH
d11	●	●				●	●	d12	0	0	0	0	0	0	0	0	:
d13	●	●				●	●	d14	0	0	0	0	0	0	0	0	:
d15						●	●	d16	0	0	0	0	0	0	0	0	:
d17						●	●	d18	0	0	0	0	0	0	0	0	:
d19					●	●		d20	0	0	0	0	0	0	0	0	d19:FCCB72H 0CH
d21				●	●	●		d22	0	0	0	0	0	0	0	0	d20:FCCB73H 00H
d23			●	●	●			d24	0	0	0	0	0	0	0	0	d21:FCCB74H 1CH
d25		●	●	●				d26	0	0	0	0	0	0	0	0	:
d27	●	●	●					d28	0	0	0	0	0	0	0	0	:
d29	●	●	●	●	●	●	●	d30	0	0	0	0	0	0	0	0	:
d31	●	●	●	●	●	●	●	d32	0	0	0	0	0	0	0	0	d33:FCCB80H 00H
d33								d34	0	0	0	0	0	0	0	0	d34: FCCB1FH00H

Figure F.5 9 × 17 Font

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			NEXT App. 15	SHEET App. 14

APPENDIX G: EXAMPLE PRINTING IN PAGE MODE

Example use of page mode is described in this appendix.

A typical procedure for transmitting commands in page mode is as follows:

- ① Transmit **ESC L** to enter page mode.
- ② Specify the printable area using **ESC W**.
- ③ Specify the printing direction using **ESC T**.
- ④ Transmit the print data.
- ⑤ Collectively print the data by sending an **FF**.
- ⑥ After printing, the printer automatically returns to standard mode.

Example 1: Sample program in BASIC (assumes transmission to the printer is already possible with file #1 open)

```
100 PRINT #1,CHR$(&H1B);"L";  
110 PRINT #1,CHR$(&H1B);"W";CHR$(0);CHR$(0);CHR$(0);CHR$(0);  
120 PRINT #1,CHR$(200);CHR$(0);CHR$(144);CHR$(1);  
130 PRINT #1,CHR$(&H1B);"T";CHR$(0);  
140 PRINT #1,"Page mode lesson TEST 1"  
150 PRINT #1,CHR$(&HC);
```

In the program for Example 1, a printable area of 200×400 dots starting at (0,0) is set, and characters are printed on the first line of the area as shown in Figure G.1.

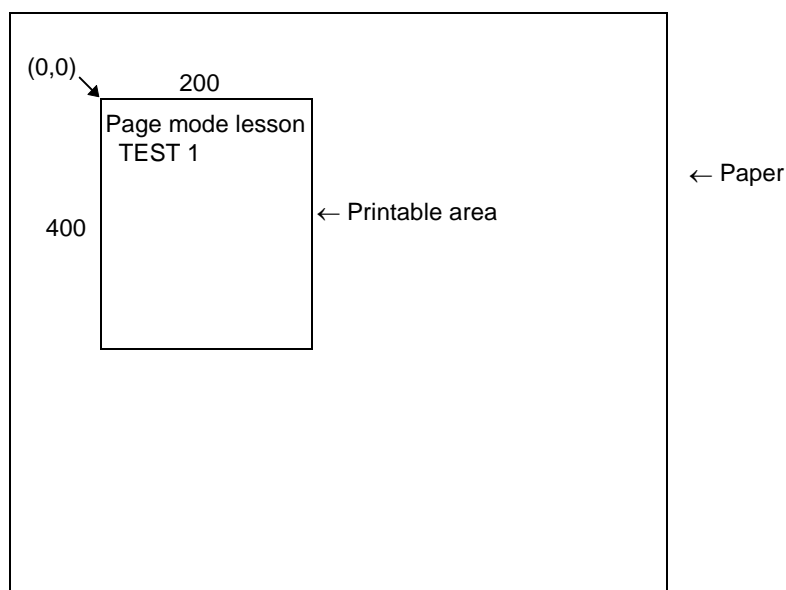


Figure G.1 Page Mode Example 1

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			NEXT App. 16	SHEET App. 15

Note that a line feed was inserted between "lesson" and "TEST 1" in Figure G.1. This line feed was inserted automatically because there was no room for the blank " " following the word "lesson" within the horizontal range of the 200 × 400 printable area. The feed amount here is that specified by **ESC 3**. Any number of printable areas can be specified before the **FF** is executed. If any printable areas overlap, however, the logical sum of the data written to the overlapping portions is used for the final printing.

It is possible to erase a portion of the data that is already developed. Using **ESC W**, specify a printable area consisting of only the section to be erased; then use **CAN** to erase the data. All the data existing in the specified printable area can be erased, even if it is just a portion of a character.

Example 2: Sample program in BASIC

```
100 PRINT #1,CHR$(&H1B);"L";
110 PRINT #1,CHR$(&H1B);"W";CHR$(0);CHR$(0);CHR$(0);CHR$(0);
120 PRINT #1,CHR$(200);CHR$(0);CHR$(144);CHR$(1);
130 PRINT #1,CHR$(&H1B);"T";CHR$(0);
140 PRINT #1,"Page mode lesson 2 CAN command"
150 PRINT #1,CHR$(&HA);
160 PRINT #1,"ABCDEFGHJKLMNOPQRST1234567890"
170 PRINT #1,CHR$(&HC);
```

This example works as follows:

First, transmit **ESC L** to switch to page mode (line no. 100). Then use **ESC W** to send 8 parameters from *n1* to *n8* to specify the printable area. To specify a printable area of 200 dots in the x direction and 400 dots in the y direction, starting from the origin (0,0), the parameters are transmitted in the order of 0,0,0,0,200,0,144,1 (line nos. 110 and 120). In addition, the printing direction is specified as 0 by using **ESC T** (line no. 130).

After these items are specified, the print data "Page mode lesson 2 CAN command" and "ABCDEFGHJKLMNOPQRST1234567890" are transmitted (line nos. 140 to 160). By sending **FF** (line no. 170), the printout shown in Figure G.2 is produced.

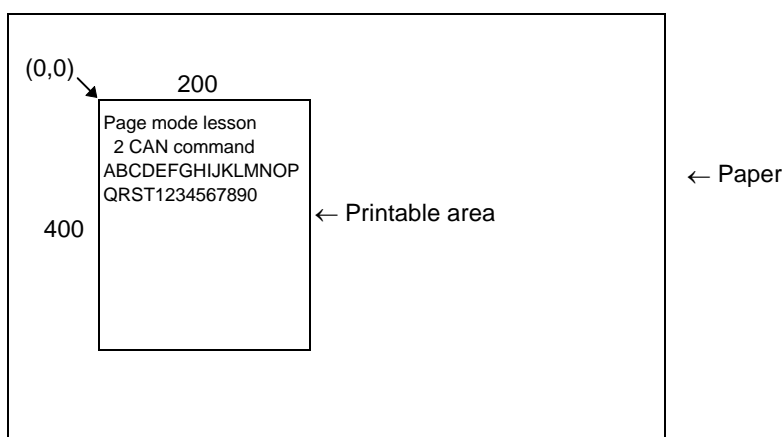


Figure G.2 Page Mode Example 2

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If the program lines listed below are included before the **FF** is transmitted, a portion of the data will be deleted:

```
170 PRINT #1,CHR$(&H1B);"W";CHR$(72);CHR$(0);CHR$(96);CHR$(0);
180 PRINT #1,CHR$(51);CHR$(0);CHR$(81);CHR$(0);
190 PRINT #1,CHR$(&H18);
200 PRINT #1,CHR$(&HC);
```

If the above program is included, character string "GHI" is deleted, resulting in the printout shown in Figure G.3. When an area is deleted with **CAN**, the deleted part is left blank.

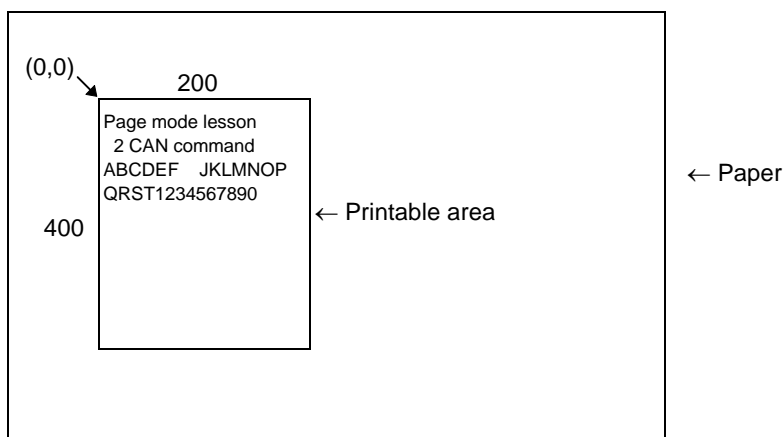


Figure G.3 Page Mode Example 3

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			NEXT App. 18	SHEET App. 17

APPENDIX H: CODE128 BAR CODE

H.1 Description of the CODE128 Bar Code

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

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

The following special characters are also available in CODE128:

- SHIFT characters

In code set A, the character just after SHIFT is processed as a character for code set B. In code set B, the character just after SHIFT is processed as the character for code set A. SHIFT characters cannot be used in code set C.

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

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

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

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

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H.2 Code Tables

Printable characters in code set A

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
NUL	00	0	(	28	40	P	50	80
SOH	01	1	)	29	41	Q	51	81
STX	02	2	*	2A	42	R	52	82
ETX	03	3	+	2B	43	S	53	83
EOT	04	4	,	2C	44	T	54	84
ENQ	05	5	-	2D	45	U	55	85
ACK	06	6	.	2E	46	V	56	86
BEL	07	7	/	2F	47	W	57	87
BS	08	8	0	30	48	X	58	88
HT	09	9	1	31	49	Y	59	89
LF	0A	10	2	32	50	Z	5A	90
VT	0B	11	3	33	51	[	5B	91
FF	0C	12	4	34	52	\	5C	92
CR	0D	13	5	35	53	]	5D	93
SO	0E	14	6	36	54	^	5E	94
SI	0F	15	7	37	55	_	5F	95
DLE	10	16	8	38	56	FNC1	7B,31	123,49
DC1	11	17	9	39	57	FNC2	7B,32	123,50
DC2	12	18	:	3A	58	FNC3	7B,33	123,51
DC3	13	19	;	3B	59	FNC4	7B,34	123,52
DC4	14	20	<	3C	60	SHIFT	7B,53	123,83
NAK	15	21	=	3D	61	CODEB	7B,42	123,66
SYN	16	22	>	3E	62	CODEC	7B,43	123,67
ETB	17	23	?	3F	63			
CAN	18	24	@	40	64			
EM	19	25	A	41	65			
SUB	1A	26	B	42	66			
ESC	1B	27	C	43	67			
FS	1C	28	D	44	68			
GS	1D	29	E	45	69			
RS	1E	30	F	46	70			
US	1F	31	G	47	71			
SP	20	32	H	48	72			
!	21	33	I	49	73			
"	22	34	J	4A	74			
#	23	35	K	4B	75			
\$	24	36	L	4C	76			
%	25	37	M	4D	77			
&	26	38	N	4E	78			
'	27	39	O	4F	79			

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Printable characters in code set B

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
SP	20	32	H	48	72	p	70	112
!	21	33	I	49	73	q	71	113
"	22	34	J	4A	74	r	72	114
#	23	35	K	4B	75	s	73	115
\$	24	36	L	4C	76	t	74	116
%	25	37	M	4D	77	u	75	117
&	26	38	N	4E	78	v	76	118
'	27	39	O	4F	79	w	77	119
(	28	40	P	50	80	x	78	120
)	29	41	Q	51	81	y	79	121
*	2A	42	R	52	82	z	7A	122
+	2B	43	S	53	83	{	7B,7B	123,123
,	2C	44	T	54	84	|	7C	124
—	2D	45	U	55	85	}	7D	125
.	2E	46	V	56	86	—	7E	126
/	2F	47	W	57	87	DEL	7F	127
0	30	48	X	58	88	FNC1	7B,31	123,49
1	31	49	Y	59	89	FNC2	7B,32	123,50
2	32	50	Z	5A	90	FNC3	7B,33	123,51
3	33	51	[	5B	91	FNC4	7B,34	123,52
4	34	52	\	5C	92	SHIFT	7B,53	123,83
5	35	53	]	5D	93	CODEA	7B,41	123,66
6	36	54	^	5E	94	CODEC	7B,43	123,67
7	37	55	—	5F	95			
8	38	56	`	60	96			
9	39	57	a	61	97			
:	3A	58	b	62	98			
;	3B	59	c	63	99			
<	3C	60	d	64	100			
=	3D	61	e	65	101			
>	3E	62	f	66	102			
?	3F	63	g	67	103			
@	40	64	h	68	104			
A	41	65	i	69	105			
B	42	66	j	6A	106			
C	43	67	k	6B	107			
D	44	68	l	6C	108			
E	45	69	m	6D	109			
F	46	70	n	6E	110			
G	47	71	o	6F	111			

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Printable characters in code set C

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
00	00	0	40	28	40	80	50	80
01	01	1	41	29	41	81	51	81
02	02	2	42	2A	42	82	52	82
03	03	3	43	2B	43	83	53	83
04	04	4	44	2C	44	84	54	84
05	05	5	45	2D	45	85	55	85
06	06	6	46	2E	46	86	56	86
07	07	7	47	2F	47	87	57	87
08	08	8	48	30	48	88	58	88
09	09	9	49	31	49	89	59	89
10	0A	10	50	32	50	90	5A	90
11	0B	11	51	33	51	91	5B	91
12	0C	12	52	34	52	92	5C	92
13	0D	13	53	35	53	93	5D	93
14	0E	14	54	36	54	94	5E	94
15	0F	15	55	37	55	95	5F	95
16	10	16	56	38	56	96	60	96
17	11	17	57	39	57	97	61	97
18	12	18	58	3A	58	98	62	98
19	13	19	59	3B	59	99	63	99
20	14	20	60	3C	60	FNC1 CODEA CODEB	7B,31	123,49
21	15	21	61	3D	61		7B,41	123,65
22	16	22	62	3E	62		7B,42	123,66
23	17	23	63	3F	63			
24	18	24	64	40	64			
25	19	25	65	41	65			
26	1A	26	66	42	66			
27	1B	27	67	43	67			
28	1C	28	68	44	68			
29	1D	29	69	45	69			
30	1E	30	70	46	70			
31	1F	31	71	47	71			
32	20	32	72	48	72			
33	21	33	73	49	73			
34	22	34	74	4A	74			
35	23	35	75	4B	75			
36	24	36	76	4C	76			
37	25	37	77	4D	77			
38	26	38	78	4E	78			
39	27	39	79	4F	79			

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APPENDIX I: PRINT HEAD CLEANING

Paper dust on the heating elements may lower the print quality. In this case, clean the print head as follows:

- 1) Open the printer cover.
- 2) Clean the thermal elements of the print head using a cotton swab moistened with alcohol solvent (ethanol, methanol, IPA).

NOTES:

- Do not touch the print head thermal elements.
- Do not scratch the print head.

- 3) Insert a paper roll and close the print head.

NOTE: The print head becomes very hot just after printing and is very dangerous. Be sure to allow the print head to cool down (after printing) before cleaning it. Also, be sure to turn off the printer power before cleaning the print head.

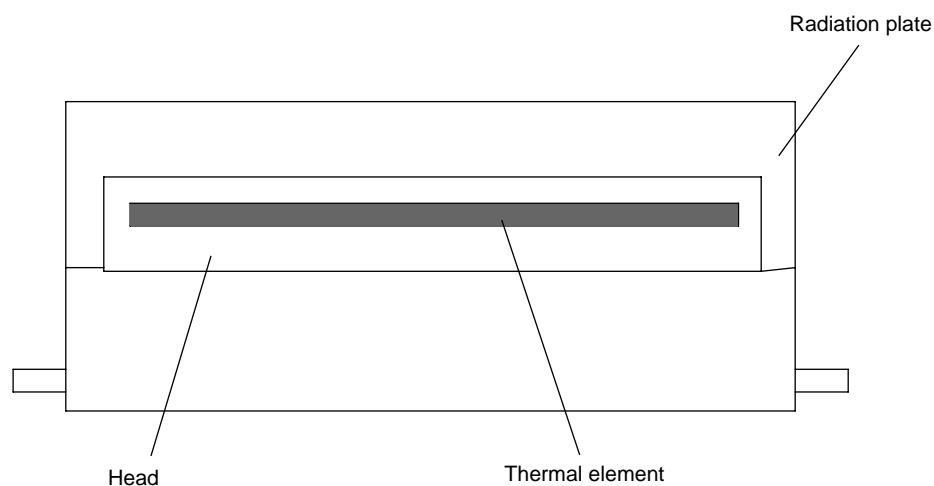


Figure I.1 Print Head Thermal Elements

- (*) Depending on the paper roll used, paper dust may stick to the platen roller and paper roll end sensor. To remove the paper dust, clean the platen roller and paper roll end sensor with a cotton swab moistened with water.

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APPENDIX J: NOTES ON USING THE DRAWER KICK-OUT CONNECTOR

- 1) Drawer kick-out connector use conditions (refer to Section 2.2.3, Drawer kick-out connector)

Because drawer specifications differ depending the manufacturer and the part number, make sure that the specifications of the drawer to be used meet the following conditions before connecting it to the drawer kick-out connector. These conditions also apply to any other devices that use the drawer kick-out connector.

Any devices that do not satisfy all the following conditions must not be used.

[Conditions]

- A load must be provided between drawer kick-out connector pins 4 and 2 or between pins 4 and 5. (Operating the printer with incorrectly installed devices voids the warranty.)
- When the drawer open/close signal is used, a switch must be provided between drawer kick-out connector pins 3 and 6. (Connecting devices other than the drawer open/close switch voids the warranty.)
- The resistance of the load must be 24 Ω or more, or the input current must be 1 A or less. (If a device with a resistance of less than 24 Ω or an input current of over 1 A is used, the resulting overcurrent may damage the printer and the device.)
- Be sure to use drawer kick-out connector pin 4 (24 V power output) to drive the device. Never connect any other power supply to the drawer kick-out connector. (Connecting a power supply other than that specified voids the warranty.)

The peak current is 1 A. When energizing the drawer kick-out drive signal, follow the conditions described in 3) of Section 2.2.3, *Drawer kick-out drive signal*.

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**APPENDIX K COMPARISON TABLE BETWEEN TM-H5000II
AND TM-H5000**

	TM-H5000II	TM-H5000
1. Printing speed for receipt High speed mode Low speed mode ladder bar code	120 mm/sec maximum -- Approximately 42 mm/sec	Approximately 70 mm/sec Approximately 50 mm/sec Approximately 35 mm/sec
2. Font B for receipt	9 × 17 dots	9 × 24 dots
3. Life of print head (for slip)	200 million characters (when printing font B)	150 million characters (2dots/wire per character average)
4. NV bit image buffer area	384K bytes	None
5. User NV memory	1K bytes	Not supported.
6. Low power consumption mode (for receipt)	When DIP switches 2-3 and 2-4 are set to ON, printing speed is fixed to 70 mm/sec. In this mode, the power consumption is almost same as the TM-H5000.	None (When DIP switches 2-3 and 2-4 are set to ON respectively, the most light of print density is set.)
7. Adaptability to high speed parallel interface board	Possible with a combination of Epson original parallel interface board	Impossible
8. Commands	DLE DC4: Generate pulse at real time ESC M: Select character font FS g 1: Write to user NV memory FS g 2: Read from user NV memory FS p: Print NV bit image FS q: Define NV bit image GS (A: Execute test print GS g 0: Initialize maintenance counter GS g 2: Transmit maintenance counter	
9. Multilingual support	Japanese Kanji Chinese Kanji Taiwanese Kanji Thai character Depending on the model type, one of these character is supported.	Japanese Kanji only

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			NEXT END	SHEET App. 24