EPSON

Thermal Label Printer

TM-L90

Specification

STANDARD	
Rev. No.	D
Notes	

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SEIKO EPSON CORPORATION

REVISION SHEET

The table below indicates which pages in this specification have been revised.
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Revisions		Design Section			Sheet Rev. No.					
Rev.	Document	WRT	CHK	APL	Sheet	Rev.	Sheet	Rev.	Sheet	Rev.
A	Enactment	Hosomi	Ikegami	Takizawa	I	D	17	D	42	D
B	Change	Hosomi	Ikegami	Takizawa	II	D	18	D	43	D
C	Change	Hosomi	Ikegami	Godo	III	D	19	D	44	D
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					VI	D	22	D	47	D
					VII	D	23	D	48	D
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					1	D	26	D	51	D
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					3	D	28	D	53	D
					4	D	29	D	54	D
					5	D	30	D	55	D
					6	D	31	D	56	D
					7	D	32	D	57	D
					8	D	33	D	58	D
					9	D	34	D	59	D
					10	D	35	D	60	D
					11	D	36	D	61	D
					12	D	37	D	62	D
					13	D	38	D	63	D
					14	D	39	D	64	D
					15	D	40	D	65	D
					16	D	41	D	66	D

TITLE		Front Part							
TM-L90 Specification (STANDARD)		Cover	Rev. Sheet	Confidentiality Agreement	General Features	Table of Contents	Contents	Appendix	Total
		1	8	1	1	5	203	17	236

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Revisions		Design Section			Sheet Rev. No.					
Rev.	Document	WRT	CHK	APL	Sheet	Rev.	Sheet	Rev.	Sheet	Rev.
A	Enactment				67	D	92	D	117	D
B	Change				68	D	93	D	118	D
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					84	D	109	D	134	D
					85	D	110	D	135	D
					86	D	111	D	136	D
					87	D	112	D	137	D
					88	D	113	D	138	D
					89	D	114	D	139	D
					90	D	115	D	140	D
					91	D	116	D	141	D

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A	Enactment				142	D	169	D	196	D
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					157	D	184	D	App.6	D
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	8	6) Substitution paper → Usable paper 　　Description (changed) 7) Recommended two-color thermal paper → Notes on using two-color thermal paper 　　Description (changed)
	9	10) High-speed print mode 　　→ Papers to use for high speed The high-speed print mode can ….. → If the one of the following types …..
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	II	General Features 　• Ticket printing → Receipt printing 　• Normal mode → Normal printing, High-speed mode → High-speed printing 　• Using two-color thermal paper, …　(added) 　• UB-S03 (deleted) 　• Environment-friendly design … (added) 　• Using with the EPSON PS-180 … (added)
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	15	1.10 Electrical Characteristics 　　2) Current consumption　for two-color printing (added)
	16	1.12 Reliability 　　Type No. of the specified roll paper (added) 　　Autocutter　(changed)
	31	2.1.3 Other Interfaces 　　UB-S03　(deleted)
	33	2.2.3 Drawer Kick-out Connector 　　MOLEX 52065-6615 → DDK 285D-7660J-100
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	166	GS g 2 [Range] $20 \leq (nL+nH \times 254) \leq 70 \rightarrow 20 \leq (nL+nH \times 254) \leq 198$ $20 \leq n \leq 70 \rightarrow nL$ = 20, 21, 50, 70, 148, 149, 178, 198 [Description] [Units] (added)
	App.13~ App.14	APPENDIX G. NOTES ON TURNING THE PRINTING POWER OFF → NOTES ON UPDATING THE MAINTENANCE COUNTER AND TURNING THE PRINTER'S POWER OFF G.1 → G.2.1 Printer setup control by the host with printer power off G.2 → G.2.2 Power off control by the host
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GENERAL FEATURES

1) This specification applies to the following models of the TM-L90 series printer:

TM-L90   (with serial interface)

TM-L90P   (with parallel interface)

2) Features

The TM-L90 series printer has the following features:

<Printing>

- Label printing is possible.
- Receipt printing is possible (thickness: 145 μm).
- High-speed printing is possible.

  Normal printing: 120 mm/s {4.72"/s} maximum

  High-speed printing: 150 mm/s {5.91"/s} maximum
- Using two-color thermal paper, two-color printing is possible (print speed: 90 mm/s {3.54"/s} maximum).

<Printer handling>

- The printer can be placed vertically (standard) or horizontally on a table, and hung vertically on a wall.
- Easy drop-in paper loading.
- Cable connectors are housed in the bottom of the printer.

<Software>

- Command protocol is based on the ESC/POS® Proprietary Command System.
- OPOS ADK and Windows® printer drivers are available.
- Printing of various bar codes is possible.   Two-dimensional codes (PDF417, MaxiCode, QRCode) are supported.
- Various layouts are possible by using page mode.

<General>

- Various interface boards (EPSON UB series, except UB-P02) can be used.
- Using a paper roll spacer, various width papers can be used (38 mm to 70 mm {1.5 to 2.76"}) by adjustment of the paper roll spacer.
- Can use a paper roll with up to 90 mm {3.5"} diameter.
- Environment-friendly design reduces the power consumption in standby mode (compared to the EPSON's legacy models: approximately 1/2).
- Using with the EPSON PS-180 power supply (power-saving type), the power consumption for the printer and the AC adapter can be reduced by a large amount.

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1. GENERAL SPECIFCATIONS

1.1 Printing Specifications

1) Printing method: Thermal line printing

2) Dot density: 8 dots/mm $\times$ 8 dots/mm (203 dpi $\times$ 203 dpi)
(dpi: dots per 25.4 mm {1"})

3) Printing direction: Unidirectional forward with friction feed
(When feeding to the print starting position, paper may be fed in a reverse direction.)

4) Paper width: 80 mm {3.15"} (default setting) or variable other than 80 mm with the paper roll spacer packed in the box.
(Refer to Section 1.5, Paper Roll Supply Device, for details.)

5) Print width: 72 mm {2.83"}, 576 dot positions
(when the paper width is 80 mm)

6) Number of characters per line:
48 (using font A when the paper width is 80 mm)
(The default setting is font A)

7) Print speed: \<Normal printing> (default setting)
120 mm/s {4.72"} maximum

\<High-speed printing> (selected with the memory switch)
150 mm/s {5.91"} maximum
(The high-speed printing is selected when the specified paper is used. Refer to Section 1.6, Paper Specifications, for details.)

\<Ladder bar code, two-dimensional code printing>
90 mm/s {3.54"} maximum

\<Two-color printing>
90 mm/s {3.54"} maximum

NOTES:
- The print speeds listed above are values when the print density is set to the default setting at 24 V and 25°C {77°F}. The print speed may change automatically depending on the power supply voltage and the condition of the head temperature.
- 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. (Example: at least 19,200 bps for printing with font A) (bps: bits per second)
- When the ladder bar code or 2-dimensional code is printed, the print starts when the specific paper feed speed is reached. Therefore, the paper may be fed for the maximum 10 dot lines, depending on the paper feed speed at the time that the print data is received.

8) Line spacing: 3.75 mm {0.15"}
(Programmable by control command.)

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1.2 Character Specifications

1) Number of characters:

Alphanumeric characters:	95
Extended graphics:	128 × 11 pages
	(including one space page)
International characters:	37
Japanese model:	JIS (JIS X0208-1990): 6879
	Special font:

Code System	Number of Characters	JIS Code	Shift JIS Code
Special	845	2D-21 ~ 2D-7E 79-21 ~ 7C-7E	87-40 ~ 87-9D ED-40 ~ EE-FC FA-40 ~ FC-4E

Multilingual character model supports printing with one of the following character sets:

① Simplified Chinese (GB2312)
  7580
  (Using the GB5199 of the Chinese national standard font)

② Traditional Chinese (Big 5)
  13494

③ Thai (3-pass printing font)
  128 characters × 7 pages
  (133 character types)

④ Korean (KS C5601)
  8366

2) Character structure:

Font A (12 × 24):	12 × 24
Font B (9 × 17):	9 × 17
Font B (10 × 24):	10 × 24
Font C (8 × 16):	8 × 16
Kanji font A (24 × 24):	24 × 24
Kanji font B (20 × 24):	20 × 24
Kanji font C (16 × 16):	16 × 16
Thai (12 × 72):	12 × 72

(When the font is configured with Font A (12 × 24))

Thai (9 × 51):	9 × 51

(When the font is configured with Font B (9 × 17))

Depending on the model types, the supported fonts are different.
Font A is selected as the default.

NOTE: Thai fonts built into this printer are 3-pass printing fonts (*1) that are combined in three different parts, shown in character code pages 20 through 26 for the alphanumeric fonts. There are two kinds of Thai fonts: font A (12 × 72) with 3-pass printing and font B (9 × 51) with 3-pass printing.

(*1): 3-pass printing is the printing method to print one Thai character with three character parts configured vertically with upper, middle, and lower parts sent from the host PC.

3) Character size (Character area):

<ANK / Multilingual model>

Table 1.2.1   Character Size for ANK / Multilingual Model

		Standard W×H (mm)	Double-height W×H (mm)	Double-width W×H (mm)	Double-width / Double-height W×H (mm)
Font A	12 × 24	1.50 × 3.0	1.50 × 6.0	3.0 × 3.0	3.0 × 6.0
Font B	9 × 17	1.13 × 2.13	1.13 × 4.25	2.25 × 2.13	2.25 × 4.25
Kanji font A	24 × 24	3.0 × 3.0	3.0 × 6.0	6.0 × 3.0	6.0 × 6.0
Thai	12 × 72	1.50 × 9.0	1.50 × 18.0	3.0 × 9.0	3.0 × 18.0
Thai	9 × 51	1.13 × 6.38	1.13 × 12.75	2.25 × 6.38	2.25 × 12.75

NOTES: 1. The actual print character may be smaller than the size shown in the table above, because the above size includes spaces in the font.

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

3. Character size not including the horizontal spacing in the standard scale is as follows:

Font A (12 × 24):   1.25 (W) × 3.0 (H) mm
Font B (9 × 17):   0.88 (W) × 2.13 (H) mm

(ANK = alphanumeric)

<Japanese model>

Table 1.2.2   Character Size for Japanese Model

		Standard W×H (mm)	Double-height W×H (mm)	Double-width W×H (mm)	Double-width / Double-height W×H (mm)
Font A	12 × 24	1.50 × 3.0	1.50 × 6.0	3.0 × 3.0	3.0 × 6.0
Font B	10 × 24	1.25 × 3.0	1.25 × 6.0	2.5 × 3.0	2.5 × 6.0
Font C	8 × 16	1.0 × 2.0	1.0 × 4.0	2.0 × 2.0	2.0 × 4.0
Kanji font A	24 × 24	3.0 × 3.0	3.0 × 6.0	6.0 × 3.0	6.0 × 6.0
Kanji font B	20 × 24	2.5 × 3.0	2.5 × 6.0	5.0 × 3.0	5.0 × 6.0
Kanji font C	16 × 16	2.0 × 2.0	2.0 × 4.0	4.0 × 2.0	4.0 × 4.0

NOTES: 1. The actual print character may be smaller than the size shown in the table above, because the above size includes spaces in the font.

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

3. Character size not including the horizontal spacing in the standard scale is as follows:

Font A (12 × 24):   1.25 (W) × 3.0 (H) mm
Font B (10 × 24):   1.0 (W) × 3.0 (H) mm

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4) Product specifications and supported characters

Table 1.2.3   Product Specifications and Supported Characters

Product Specifications	Supported Characters	
ANK model	• Alphanumeric • Extended graphics • International characters	---
Multilingual model (Simplified Chinese)		Simplified Chinese characters
Multilingual model (Traditional Chinese)		Traditional Chinese characters
Multilingual model (Thai)		Thai characters
Multilingual model (Korean)		Korean characters
Japanese model		Japanese characters, Special font

(ANK = alphanumeric)

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1.3 Autocutter

1) Type of cut: Full cut (cuts paper completely) (default setting)

Partial cut (one point left uncut) is also available as a dealer option. (Set by changing the position of the autocutter unit.)

NOTES:
- Install the paper exit guide packed in the box with the printer when the autocutter is used with a full cut, positioning the printer horizontally.   If the printer is installed horizontally without the paper exit guide, and the autocutter full cut is used, a cut sheet may drop in the paper path, and it may cause a double-cut, paper jam, or autocutter error.   However, if the printer is installed vertically or if the autocutter is used with a partial cut, the paper exit guide does not have to be used.
- After cutting, paper must be fed approximately 1 mm {16/406"} or more, then be stopped, because if it is not, paper may be jammed in the autocutter unit.
- To prevent dot displacement after cutting, it is recommended to feed paper for approximately 1 mm {16/406"} or more before printing.
- Changing partial cut or full cut is not controlled by a software command.
- If a die cut label is used, cut the backing paper (liner) between labels (face stock). Do not cut the label paper (face stock), because the label adhesive bonds to the autocutter blade, causing a cutting problem.

2) Possible thickness to be cut with a manual cutter:

100 μm or less.

NOTES:
- The manual cutter installed in the autocutter unit is intended to cut the receipt (paper thickness: approximately 75 μm) manually.
- If a paper thickness of 100 μm or more is cut with the manual cutter, be sure to cut paper so that the paper is not out of alignment.
- The cutting type (partial cut or full cut) must be selected before the printer is first used.   If the cutting type is changed from partial cut to full cut after the printer has been used, the printer may not be reliable because the wear-out level of the cutter blade differs.

1.4 Function of the Paper Detectors

The printer has the paper detection functions described below, depending on the type of paper to be used and the memory switch settings:

1) Paper end detection

This detects the presence of the paper, regardless of the type of paper or the memory switch settings.

2) Label position detection

This detects the label position if the origin of the layout is set to "label" with the memory switch or if the auto-setting mode of the paper layout specifies "label."

3) Black mark detection

This detects the black mark position if the origin of the layout is set to "black mark" with the memory switch or if the auto-setting mode of the paper layout specifies "black mark paper" (Refer to 3.8, Auto-setting Mode for Paper Layout, for details.)

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1.5 Paper Roll Supply Device

1) Supply method: Drop-in paper roll

2) Near-end sensor:

   a) Detection method: Microswitch

   b) Paper roll spool diameter: Inside: 25.4 mm {1.00"}
                                      Outside: 31.4 mm {1.24"}

   c) Near-end adjustment: Adjusting screw

                                          Fixed position #1 (approximately 36 mm {1.42"})
                                          #2 (approximately 41 mm {1.61"})
                                          (The adjusting screw has two positions.)

NOTES:
- A command can be used to select whether printing is stopped or not when the paper near end is detected.

- When the paper roll diameter becomes sufficiently small, the sensor detects a near-end of the paper roll, and the PAPER OUT LED indicator lights. If the sensor is enabled by **ESC c 4**, the printer stops printing.
  After installing a new paper roll, close the printer cover; then the printer restarts printing.

3) Paper width selection: 80 mm {3.15"} (default setting)

                                          By adjusting the paper roll spacer, it is also possible to set optional positions in the range of 38 to 70 mm {1.50 to 2.76"}. The range of 71 to 79 mm {2.80 to 3.11"} cannot be set.

NOTES:
- Be sure to set the paper width with the memory switch to adjust printing to the print width.

- Never change the paper width from narrow to wide once you set the paper width to narrow.
      Example: 60 mm {2.36"} → 80 mm {3.15"}
  The reason not to change the width setting if the printer has ever been used is because once narrow paper is used, some part of the head always contacts the platen. Therefore, if a width setting of 80 mm is set, there is a possibility that the head or the cutter blade may be worn out. By this means, printing is inhibited in the area described above.

- If roll paper other than the specified ones is used, the paper near-end may not be detected correctly. However, the paper near-end for roll paper that has a 12 mm {0.47"} inside diameter and 18 mm {0.71"} outside diameter or 12 mm inside diameter and 22 mm {0.87"} outside diameter can be detected, even though it is not as accurate as the specified roll paper.

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1.6 Paper Specifications

1) Paper type: Specified thermal paper
The following four kinds of paper can be used:
- Receipt paper (without black mark)
- Receipt paper (with black mark)
- Label (face stock) paper (without black mark)
- Label (face stock) paper (with black mark)

Refer to Function 49 of the **GS (E** command for the paper layout details.

NOTES: 1. When a label (with black mark) is printed, the user must consider the print position and the autocutting position. If the printing is executed on the backing paper (liner) or the label on backing paper is cut by the autocutter, the printer may be damaged.

         2. Labels (with black marks) cannot be used in the automatic paper layout setting mode.

2) Form: Paper roll

3) Paper width: 80 mm paper width model: 79.5 ± 0.5 mm {3.13 ± 0.02"}
60 mm paper width model: 59.5 ± 0.5 mm {2.34 ± 0.02"}
38 mm paper width model: 37.5 ± 0.5 mm {1.48 ± 0.02"}

4) Paper roll size: Roll diameter: Maximum 90 mm {3.54"}
Take-up paper roll width: 80, 60, 38, +0.5/-1.0 mm
{3.15", 2.36", 1.50", +0.02"/-0.04"}

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5) Specified roll paper type No.

Receipt	Paper width			Original paper
	80 mm {3.15"}	60 mm {2.36"}	38 mm {1.50"}	
Single-color thermal roll paper	ENTPD080090	---	---	TF60KS-E
Single-color thermal roll paper (thickness type)	ENTPE080090	---	---	TF11KS-ET
Two-color thermal roll paper	ENTPC080090	---	---	PD750R

Label (face stock)	Length of label	Liner width			Original paper
		80 mm {3.15"}	60 mm {2.36"}	38 mm {1.50"}	
Single-color label (face stock) paper	25 mm {1"}	ENTLA080090025	ENTLA060090025	ENTLA038090025	
	51 mm {2"}	ENTLA080090051	ENTLA060090051	---	
	76 mm {3"}	ENTLA080090076	ENTLA060090076	---	
	102mm {4"}	ENTLA080090102	ENTLA060090102	---	
Two-color label (face stock) paper	25 mm {1"}	ENTLB080090025	ENTLB060090025	ENTLB038090025	
	51 mm {2"}	ENTLB080090051	ENTLB060090051	---	
	76 mm {3"}	ENTLB080090076	ENTLB060090076	---	
	102mm {4"}	ENTLB080090102	ENTLB060090102	---	

NOTES:
- To ensure print quality, be sure to use the specified paper.
- Refer to 7) of this section for notes on using two-color thermal paper.
- Print quality may be reduced if labels (face stock) are used for high ratio printing, such as full dot or outline character printing.

6) Specified original paper type No.:

The following original paper can be used for receipt:
(Paper marked with * is a specified roll paper.)

- Single-color thermal roll paper:
  *TF60KS-E (paper thickness: 75 μm) Nippon Paper Industries Co., Ltd.
  *TF11KS-ET (paper thickness: 145 μm) Nippon Paper Industries Co., Ltd.
  TF50KS-E (paper thickness: 65 μm) Nippon Paper Industries Co., Ltd.
  PD160R (paper thickness: 75 μm) Oji Paper Mfg. Co., Ltd.
  P350 (paper thickness: 62 μm) Kanzaki Specialty Paper (USA)
  KF50 (paper thickness: 62 μm) KANZAN Spezialpapiere GmbH
  (Germany)

- Two-color thermal roll paper:
  *PD750R (paper thickness: 75 μm) Oji Paper Mfg. Co., Ltd.

7) Notes on using two-color thermal paper

- Two-color printing is performed using a two-color thermal paper, if the two-color print is selected by the customized value setting with Function 5 of the **GS (E** command.
- There may be some cases where the print color may not be clear depending on the print pattern.
- Printing with Color 2 (red on the specified two-color thermal paper) may fade over time, depending on the environmental circumstances.   To keep the print for long-term storage, it is recommended to print with Color 1 (black on the specified two-color thermal paper).
- The reliability when two-color thermal paper is used differs from the reliability when single-color thermal paper is used.   Refer to Section 1.12, Reliability, for details.

8) Paper roll spool diameter

Inside: 25.4 mm {1.00"}

Outside: 31.4 mm {1.24"}

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

9) Print density adjustment

For best print quality and reliability, select the proper print density for the paper type used. See the table below.   Print density can be set with a software command.

Roll Paper No.	Original Paper No.	Density Level
	P350	× 0.9
	KF50	× 0.95
ENTPC series ENTPD series	TF60KS-E, TF50KS-E, PD750R	× 1.0
ENTPE series	PD160R, TF11KS-ET	× 1.05
ENTLA series ENTLB series		× 1.3

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10) Paper to use for high speed

If any one of the following types of thermal paper is used, the customized value setting can be used to set the maximum print speed to 150 mm/s {5.91"/s} (level 9):

- ENTLA series
- TF60KS-E
- PD160R
- TF50KS-E
- P350
- KF50

11) Requirement for label length
(when labels (without black marks) or labels (with black marks) are used)

30.4–106.6

25.4–101.6

[Units: mm]
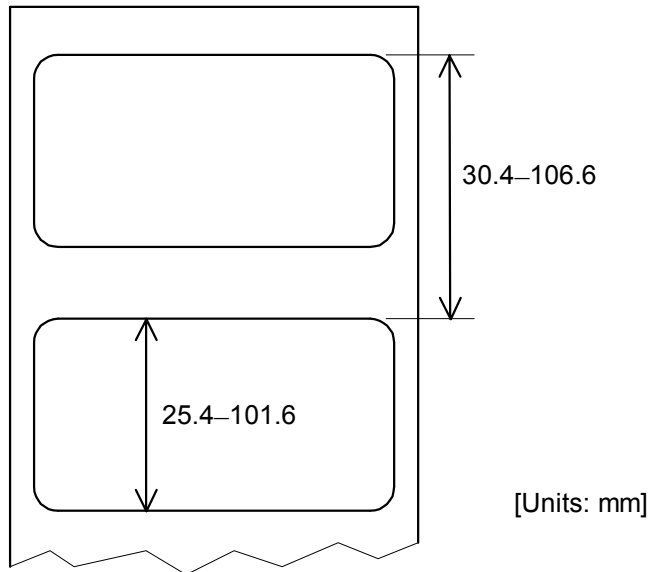
Figure 1.6.1   Requirement for Label Length

12) Requirement for black mark intervals (when receipt paper (with black marks) is used)

Back (non-printing face)

Preprintable area

15
or
more

40 – 160

Paper feeding
direction

[Units: mm]
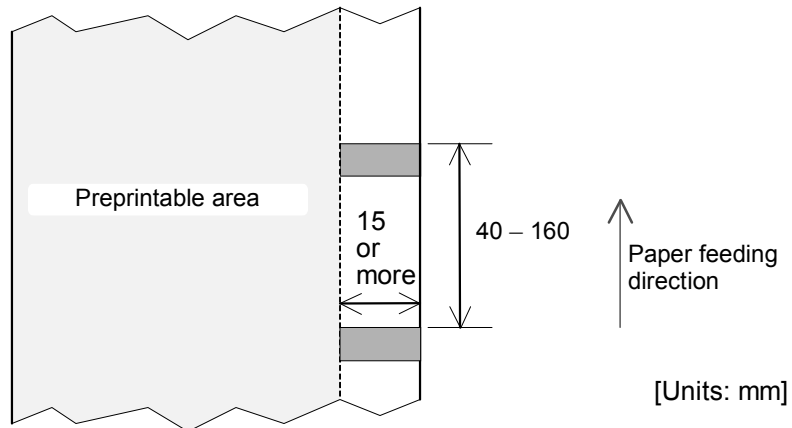
Figure 1.6.2   Requirement for Black Mark Intervals

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13) Requirement for black mark position (when labels (with black marks) are used)

Back (non-printing face)
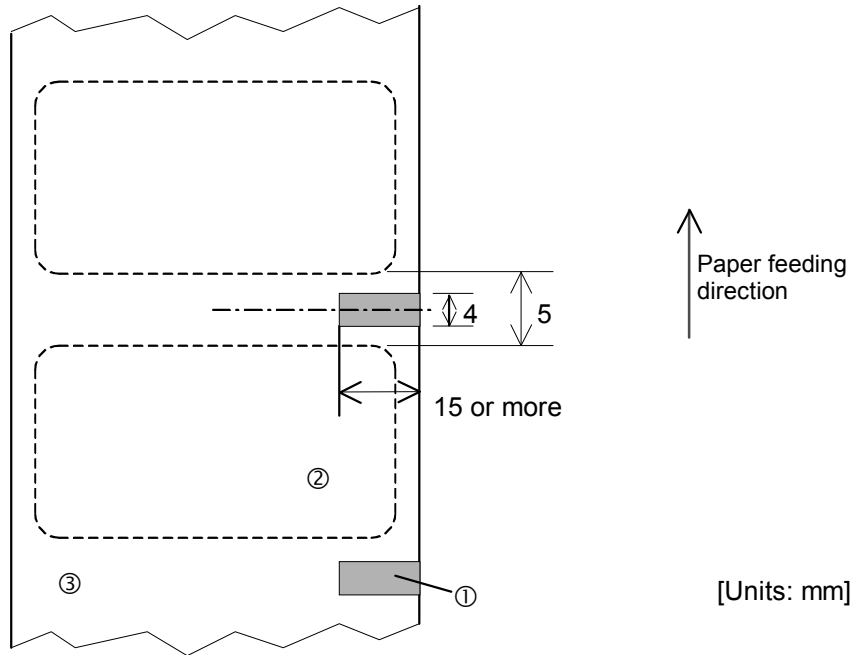
Figure 1.6.3　Requirement for Black Mark Position

NOTES:
- If labels (with black marks) are used, set the paper layout using Function 49 of the **GS (E** command.
- The allowable relation between the reflecting rate in the black mark portion (①) and the non black mark portion (② and ③) must be as shown in the table below (② is the back of label and liner, ③ is a back of liner):

	Allowable combination of the reflecting rate [Units: %]					
Black mark portion ①	17	16	15	14	13	or less
Non black mark portion ②, ③	90	85	80	75	70	or more

- The reflecting rate means the value which is measured with a Macbeth density meter (PCMII) D filter.

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1.7 Printable Area

1) Paper roll

Example: <80 mm paper width model>   <70 mm paper width model>

<60 mm paper width model>   <58 mm paper width model>
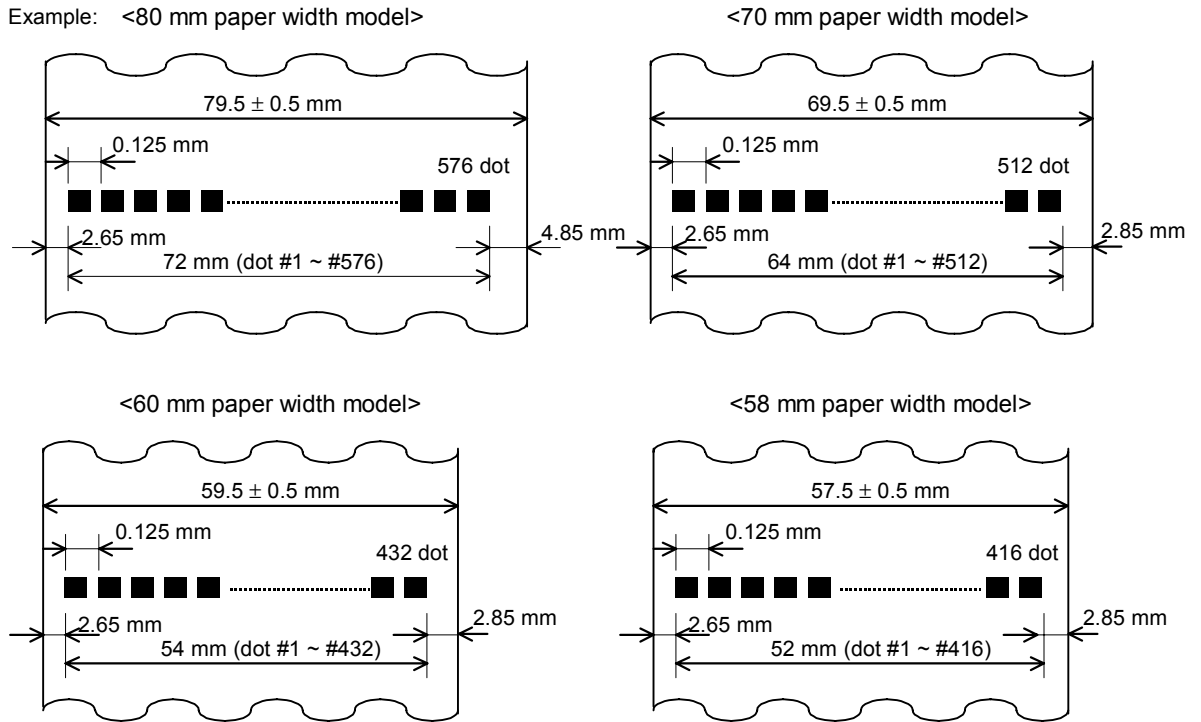
Figure 1.7.1   Printable Area (for Thermal Paper)

NOTES:
- The printable area may be out of alignment by 2 mm {0.08"} maximum (left or right), due to the paper position or tolerance of parts.   Therefore, the print area must be set in the range of more than 2 mm from the edges of the paper.   To make the margin for both sides safely, it is recommended to set a margin of 2.6 mm {0.1"} or more, as shown in Figure 1.7.1.

- A roll paper which has a 71 to 79 mm of the paper width cannot be used because of the thickness of the paper roll spacer.

Table 1.7.1   Paper Width and Printable Area

Paper width (mm)	(80)	(70)	(65)	(60)	(58)	(50)	(45)	(38)
Printable area (mm)	72	64	59	54	52	44	39	32
Left margin (mm)	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65
Right margin (mm)	4.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85
Positioning dot number	1~576	1~512	1~472	1~432	1~416	1~352	1~312	1~256
Total number of dots	576	512	472	432	416	352	312	256

(Numeric values used here are average values for designing.   Only the paper width dimension is exact.   The values in parentheses are the maximum value for the paper tolerance.)

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2) Labels (face stocks)

Make a margin of 2.8 mm {0.11"} or more from the label edges on both left and right sides as the printable area of the label (face stock).
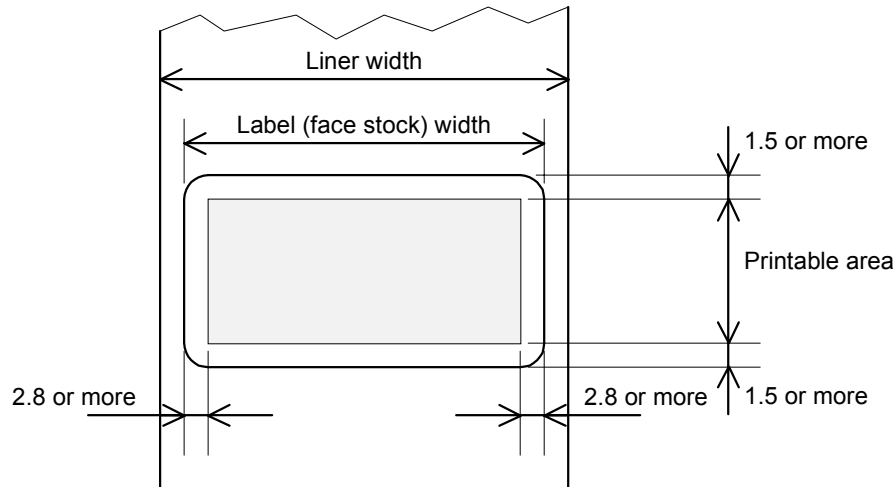
[Units: mm]

Figure 1.7.2   Printable Area (for Labels)

NOTES: • If the margins are not set, the printing may be off the label due to paper misalignment or the parts tolerance.

• A label which has a 71 to 79 mm of the liner width cannot be used because of the thickness of the paper roll spacer.

Table 1.7.2   Example of Liner Width and Printable Area

Liner width (mm)	(80)	(70)	(60)	(50)	(45)	(38)
Label (face stock) width (mm)	76	66	56	46	41	34
Printable area (mm)	70	60	50	40	35	28
Left margin (mm)	2.9	2.9	2.9	2.9	2.9	2.9
Right margin (mm)	3.1	3.1	3.1	3.1	3.1	3.1
Positioning dot number	17 ~ 576	17 ~ 496	17 ~ 416	17 ~ 336	17 ~ 296	17 ~ 240
Total number of dots	560	480	400	320	280	224

(The label must be positioned in the center of the liner.   Numeric values used here are center values in designing.   Only paper width is for nominal dimension.   The values in parenthesis are the maximum value for the paper tolerance.)

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1.8 Printing and Cutting Positions

[Units: mm]
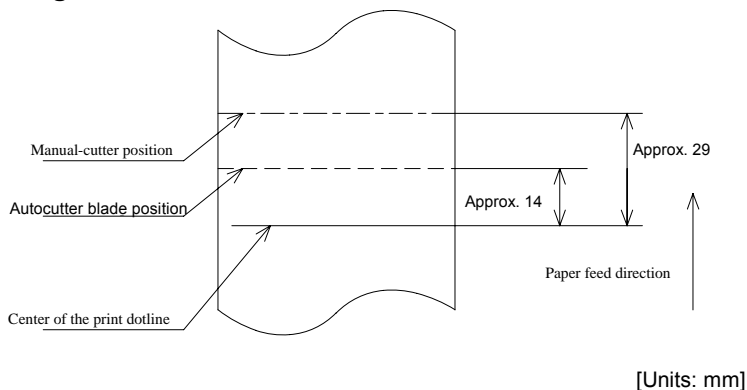
Figure 1.8.1   Printing and Cutting Positions

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 this into account when setting the cutting position of the autocutter.

1.9 Internal Buffer

1) Receive buffer: Selectable as 45 bytes or 4KB using a memory switch

2) User-defined buffer: Downloaded bit image: Approximately 12KB
                                                          (common for all models)
                                 User-defined characters: Approximately 11KB
                                                          (for ANK/Multilingual model)
                                                          Approximately 15KB
                                                          (for Japanese model)

3) Macro buffer: 2KB

4) NV (non-volatile) graphics data area:
                                 0 bytes through 384KB

5) NV user memory: 1KB through 192KB

6) Page mode area: 106KB

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1.10 Electrical Characteristics

1) Supply voltage: +24 VDC ± 7% (optional power supply: EPSON PS-170, PS-180)

2) Current consumption (at 24 V at room temperature):

Mean: Approximately 1.7 A (for single-color printing)
(Character font A, alphanumeric, capital letters, 36-character rolling pattern, full-column printing)

Mean: Approximately 1.7 A (for two-color printing)
(Character font A, alphanumeric, capital letters, 36-character rolling pattern, full-column printing, changing the print color each line)

Peak: Approximately 7.7 A maximum (with full dot printing)

Standby:
Mean: Approximately 0.1 A

NOTE: Maximum 1 A for drawer kick-out driving.

1.11 EMI and Safety Standards Applied

EMC is measured using SEIKO EPSON's AC adapter PS-170 or PS-180.   The model packed with the PS-175 power supply unit applies only for North America EMI.

1) Europe   CE marking:
                           Directive: 89/336/EEC
                                 EN55022 Class B
                                 EN55024
                                     IEC61000-4-2
                                     IEC61000-4-3
                                     IEC61000-4-4
                                     IEC61000-4-5
                                     IEC61000-4-6
                                     IEC61000-4-11

                  Safety Standard: EN 60950

2) North America   EMI: FCC/ICES-003 Class A
                  Safety standards: UL1950/CSA C22.2 No.950

3) Japan   EMC: VCCI Class A, JEIDA-52

4) Oceania   EMC: AS/NZS 3548

UL's Conditions of Acceptability

1. This component has been judged on the basis of the required spacings in the Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment, CAN/CSA C22.2 No.950-95 * UL 1950, Third Edition, including revisions through revision date March 1, 1998, which are based on the Fourth Amendment to IEC 950, Second Edition, which would cover the component itself if submitted for Listing.

2. The equipment has been evaluated for use in a Pollution Degree 2 environment.

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1.12 Reliability

1) Life:

Printer mechanism (including the thermal head life)

When printing labels (face stock) with the ENTLA series (in single-color mode):

1,000,000 labels issued

(When the length of the label in the paper feeding direction is 25.4 mm {1"} through 63.5 mm {2.5"}. The value above corresponds to approximately 30 km to 70 km {18.64 to 43.5 miles} of running length. When printing labels whose length exceeds 63.5 mm, the label-issuing life is 70 km {43.5 miles} of running length.)

When issuing receipts (thickness type) with the ENTPE series (in single-color mode):

10,000,000 lines printed (3.75 mm {0.15"} for one line)

(When the value above is calculated, the printer uses 15-line feeding and 10-line printing repeatedly with a 145 μm paper thickness. The value above corresponds to approximately 60 km {37.28 miles} of running length.)

When printing receipts with the ENTPD series (in single-color mode):

20,000,000 lines printed (3.75 mm {0.15"} for one line)

(When the value above is calculated, the printer uses 15-line feeding and 10-line printing repeatedly with 75 μm of paper thickness. The value above corresponds to approximately 120 km {74.57 miles} of running length.)

When printing labels (face stock) with the ENTLB series (in two-color mode):

500,000 labels issued

(When the length of the label in the paper feed direction is 25.4 mm {1"} through 63.5 mm {2.5"}. The value above corresponds to approximately 15 km to 35 km {9.32 to 21.75 miles} of running length.)

When printing receipts with the ENTPC series (in two-color mode):

10,000,000 lines printed (3.75 mm {0.15"} for one line)

(When the value above is calculated, the printer uses 15-line feeding and 10-line printing repeatedly. The value above corresponds to approximately 60 km {37.28 miles} of running length.)

Thermal head: 150 million pulses

Autocutter:

When cutting receipts: 2,000,000 cuts (except for KF50, when the paper thickness is less than 75 μm)

1,200,000 cuts (for KF50 (KANZAN))

1,000,000 cuts (when the paper thickness is more than 75 μm and less than 145 μm)

When cutting labels: 1,000,000 cuts

NOTE: If a die cut label is used, cut the backing paper (liner) between labels (face stock). Otherwise, adhesive attaches the cutter blade, and it may cause cutting trouble.

End of life is defined as the point at which the component reaches the beginning of the wearout period.

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2) MTBF: 360,000 hours (when printing receipts with the ENTPD series in single-color)
(Failure is defined as a random failure occurring during the random failure period.)

3) MCBF: 70,000,000 lines printed (when printing receipts with the ENTPD series in single-color)
(This is an average failure interval based on failures relating to wearout and random failures up to the life of 20,000,000 lines printed.)

1.13 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)
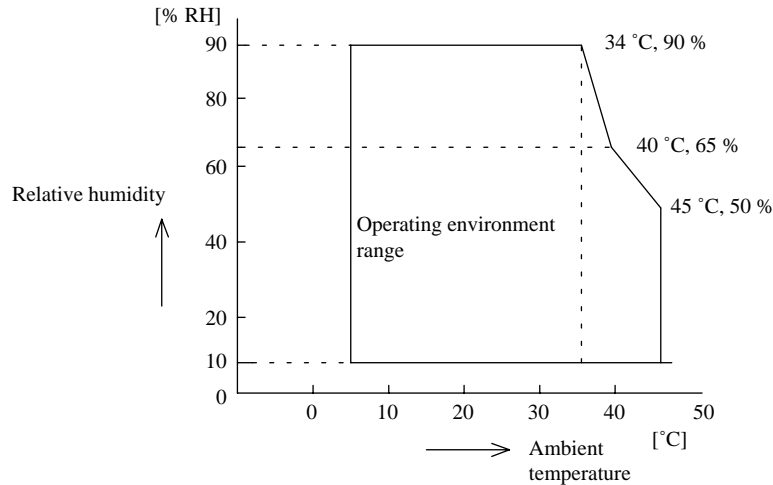
Figure 1.13.1   Operating Temperature and Humidity Range

NOTE: If the printer is not used for a long time with paper installed, some part of the printing may be light, due to the deformation of the paper.   If the printer is not used for a long time with paper installed, be sure to feed paper approximately 30 mm {1.18"} before printing.

3) Vibration resistance: When packed: Frequency: 5 to 55 Hz
                                                Acceleration: Approximately 19.6 m/s^2 {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.

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4) Impact resistance: When packed: Package: EPSON standard package
                                                    Height: 60 cm {23.62"}
                                                    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.

5) Acoustic noise (operating):   Approximately 53 dB (ANSI bystander position)

NOTE: The value as shown above is measured when the EPSON evaluation printing pattern is used.   This value may be different, depending on the paper to be printed, the print duty, or the print conditions, such as the print speed or the print density.

1.14 Installation

The TM-L90 series printer can be installed horizontally or vertically.

When installing the printer horizontally using an autocutter with a full cut, attach the paper exit guide packed in the printer's box to the printer, and change the location of the paper roll near-end sensor (refer to Appendix C).

(Vibration during paper cutting and using a drawer should be considered. Take measures to prevent the printer from moving. Affixing tapes are provided as an option.)

An optional hanging bracket can attach the printer to a wall. (Follow the procedure described in the user's manual to install the wall mount.)

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"/ OFF
	SPACE = +3 to +15 V: Logic "0"/ ON
Baud rates:	2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
	(bps: bits per second)
Data word lengths:	7 or 8 bits
Parity settings:	None, even, odd
Stop bits:	1 bit or more
Connector (printer side):	Female DSUB-25 pin connector

NOTES:
- The handshaking, data word length, baud rate, and parity depend on the DIP switch settings. (Refer to Section 3.3.3.) or the memory switch. (Refer to the **GS (E** command.)
- The stop bit from the printer side is fixed to 1.

2.1.1.2 Switching between online and offline

The printer does not have an online/offline switch.

The printer goes offline:

1) Between when the power is turned on (or the printer is reset using the interface) and when the printer is ready to receive data.
2) During the self-test.
3) When the cover is open.
4) During paper feeding using the paper FEED button.
5) When the printer stops printing due to a paper-end (in cases when an empty paper supply is detected by either paper roll end detector or the paper roll near-end detector with a printing halt feature due to a paper-end enabled by **ESC c 4**).
6) During standby status for macro execution.
7) When a temporary abnormality occurs in the power supply voltage.
8) When an error has occurred.

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2.1.1.3 Interface connector terminal assignments and signal functions

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

Table 2.1.1   TM-L90 Printer Status and Signals

Pin number	Signal name	Signal direction	Function
1	FG	—	Frame ground
2	TXD	Output	Transmit data
3	RXD	Input	Receive data
4	RTS	Output	Same as DTR signal (pin 20)
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. When XON/XOFF control is selected, the printer does not check this signal. Changing memory switch Msw 1-7 enables this signal to be used as a reset signal for the printer (refer to Section 3.3.4). The printer is reset when the signal remains MARK for 1 ms or more (refer to Section 2.1.1.6).
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 memory switch as follows (refer to Section 3.3.4):

	Printer status	Memory switch Msw 1-3 status	
Offline	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 button.	—	BUSY
	5. When the printer stops printing due to a paper-end.	—	BUSY
	6. During standby status for macro execution.	—	BUSY
	7. When a temporary abnormality occurs in the power supply voltage.	—	BUSY
	8. When an error has occurred.	—	BUSY
	9. When the receive buffer becomes full. (*1)	BUSY	BUSY

Table 2.1.1   TM-L90 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: • 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 memory switch Msw 1-8 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.

*1: • When the receive buffer capacity is specified to 45 bytes:
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.

• When the receive buffer capacity is specified as 4KB:
When the remaining space in the receive buffer drops to 128 bytes, the printer status becomes "buffer full" and it remains "buffer full" until the space in the receive buffer increases to 256 bytes.

• The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

2.1.1.4 XON/XOFF transmission timing

When XON/XOFF control is selected, the printer transmits XON or XOFF signals as follows. Transmission timing differs depending on the memory switch setting.

Table 2.1.2   XON/XOFF Transmission Timing

		Memory switch Msw 1-3 status	
	Printer status	ON	OFF
XON transmission	① When the printer goes online after turning on the power (or resetting using interface)	Transmit	Transmit
	② When the receive buffer is released from the buffer full state	Transmit	Transmit
	③ When the printer switches from offline to online	—	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 online to offline	—	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.
- When memory switch Msw 1-3 is set to OFF, XON is not transmitted if the printer is in offline state in case ②.

2.1.1.5 Notes on setting the handshake operation using memory switch Msw 1-3

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 the memory switch 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 online/offline 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, and **DLE EOT**, **DLE ENQ**, or **DLE DC4** is used while sending bit-image data, the code 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 r** after transmitting each line of data and use the 4KB receive buffer.   Transmit data one line at a time 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 memory switch setting.

Table 2.1.3   Reset Switching

Signal Line	Memory Switch	Reset Condition
Pin 6 (DSR)	Msw 1-7: ON	MARK level input
Pin 25 (INIT)	Msw 1-8: ON	SPACE or TTL-HIGH level input

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

- DC characteristics:

Table 2.1.4   Reset DC Characteristics

		Pin 6 (DSR)	Pin 25 (INIT)
Reset active voltage	V_A	-15 to -3 V	+2 to +15 V
Reset negative voltage	V_N	+3 to +15 V	-15 to + 0.8 V
Reset active current	I_A	-5.3 mA (maximum)	1 mA (maximum)
Reset negative current	I_N	-5.0 mA (maximum)	-2 mA (maximum)
Input impedance	R_{IN}	3 kΩ (minimum)	

• AC characteristics:

Minimum reset pulse width: TRS   1 ms (minimum)

  • When using pin 6 (DSR) (Msw 1-7: ON):
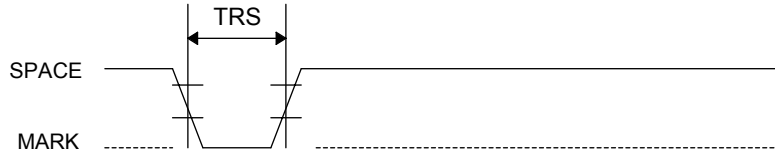
Figure 2.1.1   Minimum Reset Pulse Width (Pin 6)

  • When using pin 25 (INIT) (Msw 1-8: ON):
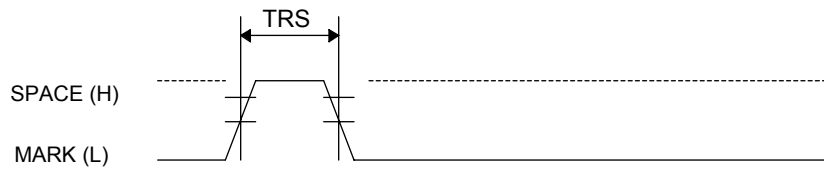
Figure 2.1.2   Minimum Reset Pulse Width (Pin 25)

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.

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) Outline

Compatibility mode supports the compatibility with a Centronics parallel interface.

2) Specifications

Data transmission:	8-bit parallel
Synchronization:	Externally supplied nStrobe signals
Handshaking:	nAck and Busy signals
Signal levels:	TTL compatible
Connector:	ADS-B36BLFDR176 (Honda) or equivalent (IEEE 1284 Type B)

3) Switching between online and offline

The printer is not equipped with any online/offline switch. The printer is placed into offline status in the following conditions:

1) 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.

2) During the self-test.

3) When the cover is open.

4) During paper feeding using the paper FEED button.

5) When the printer stops printing due to a paper-end (in cases when an empty paper supply is detected by either the paper roll end detector or the paper roll near-end detector with a printing halt feature due to a paper end enabled by **ESC c 4**).

6) During standby status for macro execution.

7) When a temporary abnormality occurs in the power supply voltage.

8) 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 proceeds 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 (a nibble). In the Byte Mode, data transmissions are accomplished by making the eight-bit data lines bidirectional.
Both modes cannot work at the same time as the Compatibility Mode, thereby causing half duplex transmission.

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	Host	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: Not Connected

 ND: Not Defined

NOTES: 1. A prefix "n" to signal names refers to "L" active signals. If the host does not support 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 0.5 μs 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

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

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 mA
Output LOW voltage	V_{OL}	-0.5 V	*0.4 V	*I_{OL}=-12 mA
Output HIGH current	I_{OH}	0.32 mA	-	V_{OH}=2.4 V
Output LOW current	I_{OL}	-12 mA	-	V_{OL}=0.4 V
Input HIGH voltage	V_{IH}	2.0 V	-	
Input LOW voltage	V_{IL}	-	0.8 V	
Input HIGH current	I_{IH}	-	-0.32 mA	V_{IH}=2.0 V
Input LOW current	I_{IL}	-	12 mA	V_{IL}=0.8 V

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 mA
Output LOW voltage	V_{OL}	-	- **	While the power is OFF
Output HIGH current	I_{OH}	-	0.32 mA	V_{OH}=2.4 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)
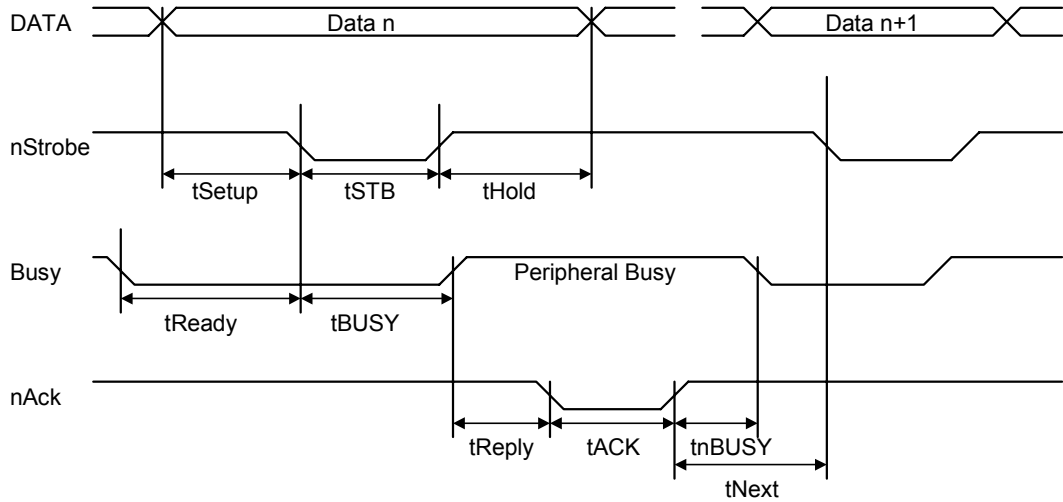
Characteristics	Symbol	Specifications	
		Min [ns]	Max [ns]
Data Hold Time (host)	tHold	750	--
Data Setup Time	tSetup	750	--
STROBE Pulse Width	tSTB	750	--
READY Cycle Idle Time	tReady	0	--
BUSY Output Delay Time	tBUSY	0	500
Data Processing Time	tReply	0	∞
ACKNLG Pulse Width	tACK	500	10 µs
BUSY Release Time	tnBUSY	0	∞
ACK Cycle Idle Time	tNext	0	--

*The printer latches data at a nStrobe ↓ timing

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2.1.2.6 Notes on resetting the printer through the interface

To enable the printer reset through the interface nInit signal (pin #31) in compatibility mode, the following signal timing shall be statisfied. However, the printer reset is ignored when the signal nSelectln (pin #36, 1284-Active HIGH) is active in reverse mode.

- DC characteristics:
     TTL level

- AC characteristics:
     Minimum reset pulse width: TRS   50 µs (min.)
     Trailing edge period: tf   500 ns (max.)
     Leading edge period: tr   500 ns (max.)
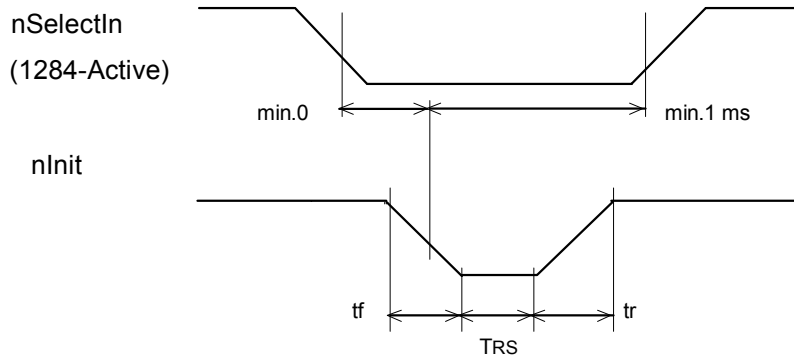
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2.1.2.7 Reception of status from the printer through the bidirectional parallel interface

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, unlike the RS-232 serial interface specifications, the real-time interruptions from the printer to the host are disabled and thus precautions must be taken:

1) The allowable capacity of the printer internal buffer is 99 bytes (except ASB status). Status signals exceeding this capacity will be discarded. To prevent possible loss of status, the host shall be ready for data reception (Reverse Mode).

2) When ASB is used, the host is preferably in the wait state for data reception (Reverse Idle Mode). When this state is not available, the host shall enter the Reverse Mode to continually 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.

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2.1.2.8 Notes on setting memory switch Msw 1-3 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 the memory switch 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 online/offline changes.

3) When using **DLE EOT, DLE ENQ**, and **DLE DC4**, be sure that the receive buffer does not become full.

   - When the printer is busy due to a receive buffer-full state:

   If an error has occurred, **DLE EOT**, **DLE ENQ**, and **DLE DC4** cannot be used.

2.1.3 Other Interfaces

Various interface boards (EPSON UB series, except UB-P02) can be used.

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2.2 Connectors

2.2.1 Interface Connectors

Refer to Section 2.1, Interfaces.

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.

Table 2.2.1   Power Supply Connector Pin Assignments

Pin Number	Signal Name
1	+24 V
2	GND
3	NC
SHELL	Frame GND

SHELL
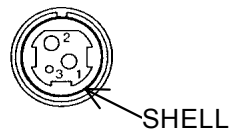
Figure 2.2.1   Power Supply Connector

NOTE: Be sure to ground the metal of the interface using through hole for the frame ground.

2) Connector model: Printer side: Hosiden TCS7960-532010 or equivalent
User side: Hosiden TCP8927-631100 or equivalent
Hosiden TCP8927-531100 or equivalent

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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 a**, or **GS r** commands.

1) Pin assignments: Refer to Table 2.2.2

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.
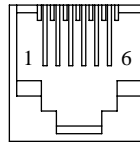
Figure 2.2.2   Drawer Kick-out Connector

2) Connector model: Printer side: DDK 285D-7660J-100 or equivalent
                                 User side: 6-position 6-contact (RJ12 telephone jack)

3) Drawer kick-out drive signal

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

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

   Output waveforms: Outputs the waveforms in Figure 2.2.3 to the points A and B in Figure 2.2.4.

                                 $t1$ (ON time) and t2 (OFF time) are specified by **ESC p** or **DLE DC4**.

$t1 \times 2$ ms $t2 \times 2$ ms
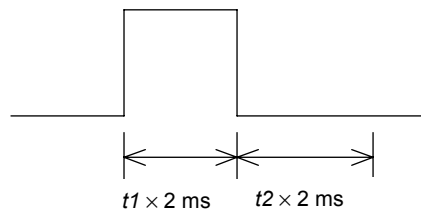
Figure 2.2.3   Drawer Kick-out Drive Signal Output Waveform (by ESC p)

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4) Drawer open/close signal

Input signal level (connector pin 3): "L" = 0 to 0.8 V
"H" = 2 to 5 V
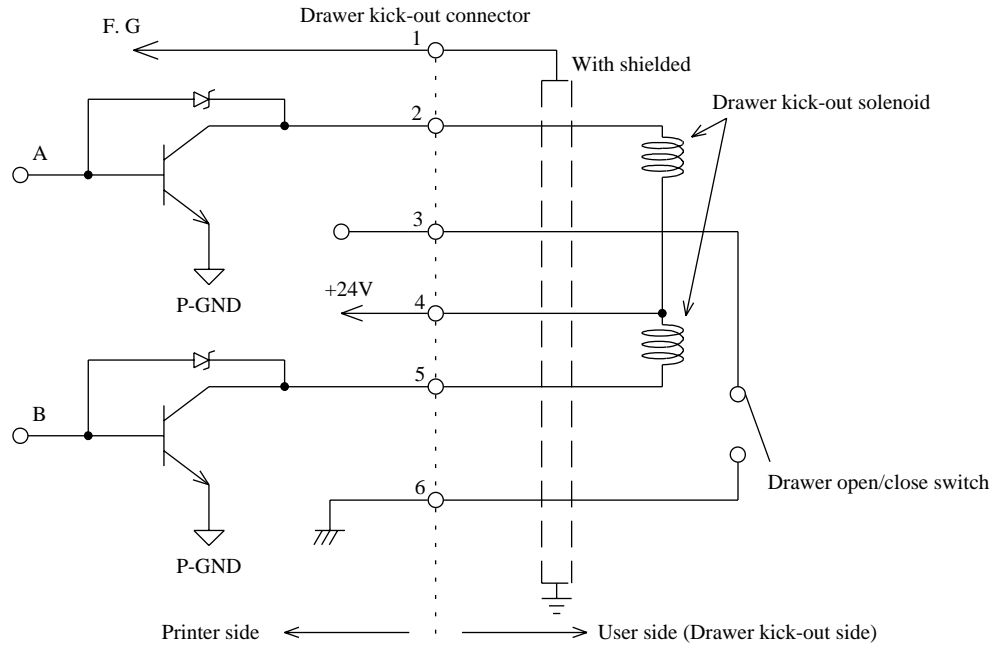
Figure 2.2.4   Drawer Circuitry

NOTES: 1. Use a shielded cable for the drawer connector cable.

2. Two driver transistors cannot be energized simultaneously.

3. The drawer drive duty must be as shown below.

$$\frac{\text{ON time}}{(\text{ON time + OFF time})} \leq 0.2$$

4. Be sure to use the printer power supply (connector pin 4) for the drawer power source.

5. The resistance of the drawer kick-out solenoid must not be less than the specified resistance.   Otherwise, an overcurrent could damage the solenoid.

6. Do not connect telecommunication network to the drawer kick-out connector.

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3. FUNCTIONS

3.1 List of Commands

Command	Name
HT	Horizontal tab
LF	Print and line feed
FF	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 in real-time
	Execute power-off sequence
	Clear buffer(s)
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 =	Select peripheral device
ESC ?	Cancel user-defined characters
ESC @	Initialize printer
ESC D	Set horizontal tab positions
ESC E	Turn emphasized mode on/off
ESC G	Turn double-strike mode on/off
ESC J	Print and feed paper
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 V	Turn 90° clockwise rotation mode on/off

Command	Name
ESC W	Set printing area in page mode
**ESC **	Set relative print position
ESC a	Select justification
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 *n* lines
ESC p	General pulse
ESC t	Select character code table
ESC {	Turn upside-down printing mode on/off
FS (L	Select label and black mark control function(s)
GS 8 L	Set graphics data
GS (L	
GS (C	Edit of user NV memory
GS (D	Enable / disable real-time command
GS (E	User setup commands
GS (K	Select print control method(s)
GS (M	Customize printer control value(s)
GS (N	Select character style(s)
GS (k	Setup and print symbol
GS !	Select character size
GS $	Set absolute vertical print position in page mode
GS ∗	Define downloaded bit image
GS (A	Execute test print
GS /	Print downloaded bit image
GS :	Start/end macro definition
GS B	Turn white/black reverse printing mode on/off
GS C 0	Select counter print mode
GS C 1	Select count mode (A)
GS C 2	Set counter
GS C ;	Select count mode (B)
GS H	Select printing position of HRI characters
GS T	Set print position to the beginning of print line

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Command	Name
GS g 0	Initialize maintenance counter
GS g 2	Transmit maintenance counter
GS I	Transmit printer ID
GS L	Set left margin
GS P	Set horizontal and vertical motion units
GS V	Select cut mode and 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 c	Print counter
GS f	Select font for HRI characters
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

Kanji command list
(when the Japanese, Simplified Chinese, Traditional Chinese, or Korean model is used)

Command	Name
FS !	Set print mode(s) for Kanji characters
FS &	Select Kanji character mode
FS (A (*)	Select Kanji character style(s)
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 Kanji character spacing
FS W	Turn quadruple-size mode on/off for Kanji characters

(*) **FS (A** is effective only in the Japanese model.

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3.2 Character Code Tables

3.2.1 Page 0 (PC437: USA, Standard Europe) (International Character Set: USA)

HEX / BIN	0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111	8 1000	9 1001	A 1010	B 1011	C 1100	D 1101	E 1110	F 1111
0 0000	NUL 00	DLE 16	SP 32	0 48	@ 64	P 80	` 96	p 112	Ç 128	É 144	á 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1 0001	01	XON 17	! 33	1 49	A 65	Q 81	a 97	q 113	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2 0010	02	18	" 34	2 50	B 66	R 82	b 98	r 114	é 130	Æ 146	ó 162	▒ 178	┬ 194	╥ 210	Γ 226	≥ 242
3 0011	03	XOFF 19	# 35	3 51	C 67	S 83	c 99	s 115	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4 0100	EOT 04	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5 0101	ENQ 05	21	% 37	5 53	E 69	U 85	e 101	u 117	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6 0110	06	22	& 38	6 54	F 70	V 86	f 102	v 118	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7 0111	07	23	' 39	7 55	G 71	W 87	g 103	w 119	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8 1000	08	CAN 24	(40	8 56	H 72	X 88	h 104	x 120	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9 1001	09	25	) 41	9 57	I 73	Y 89	i 105	y 121	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	∙ 249
A 1010	HT 10	26	* 42	: 58	J 74	Z 90	j 106	z 122	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B 1011	LF 11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C 1100	FF 12	FS 28	, 44	< 60	L 76	\ 92	l 108	| 124	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252
D 1101	CR 13	GS 29	- 45	= 61	M 77	] 93	m 109	} 125	ì 141	¥ 157	¡ 173	╜ 189	═ 205	▌ 221	φ 237	² 253
E 1110	14	30	. 46	> 62	N 78	^ 94	n 110	~ 126	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	ε 238	■ 254
F 1111	15	31	/ 47	? 63	O 79	_ 95	o 111	SP 127	Å 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

NOTE: The character code tables show only character configurations.   They do not show the actual print pattern.

EPSON	TITLE **TM-L90** Specification (STANDARD)	SHEET REVISION D	NO.
			NEXT 39 — SHEET 38

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

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	Đ 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	¾ 243
4 0100	ä 132	ö 148	ñ 164	┤ 180	— 196	È 212	õ 228	¶ 244
5 0101	à 133	ò 149	Ñ 165	Á 181	+ 197	ı 213	Õ 229	§ 245
6 0110	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7 0111	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	¸ 247
8 1000	ê 136	ÿ 152	¿ 168	© 184	╚ 200	Ï 216	Þ 232	° 248
9 1001	ë 137	Ö 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	½ 171	╗ 187	╦ 203	█ 219	Ù 235	¹ 251
C 1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	ý 236	³ 252
D 1101	ì 141	Ø 157	¡ 173	¢ 189	= 205	¦ 221	Ý 237	² 253
E 1110	Ä 142	× 158	« 174	¥ 190	╬ 206	Ì 222	¯ 238	■ 254
F 1111	Å 143	ƒ 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

EPSON	TITLE	**TM-L90** Specification (STANDARD)	SHEET REVISION	NO.	
			D	NEXT 41	SHEET 40

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 128	É 144	á 160	▓ 176	└ 192	╨ 208	α 224	≡ 240
1 0001	ü 129	À 145	í 161	▓ 177	┴ 193	╤ 209	β 225	± 241
2 0010	é 130	È 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	ã 132	õ 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	Á 134	Ú 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7 0111	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8 1000	ê 136	Ì 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9 1001	Ê 137	Õ 153	Ò 169	╣ 185	╔ 201	┘ 217	θ 233	• 249
A 1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B 1011	Í 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C 1100	Ô 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	ⁿ 252
D 1101	ì 141	Ù 157	¡ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E 1110	Ã 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F 1111	Â 143	ó 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

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	¦ 160	▓ 176	└ 192	┴ 208	α 224	≡ 240
1	0001	ü 129	È 145	´ 161	▒ 177	⊥ 193	┬ 209	β 225	± 241
2	0010	é 130	Ê 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	Â 132	Ë 148	¨ 164	┤ 180	─ 196	└ 212	Σ 228	⌠ 244
5	0101	à 133	Ï 149	¸ 165	╡ 181	┼ 197	┌ 213	σ 229	⌡ 245
6	0110	¶ 134	û 150	³ 166	╢ 182	╞ 198	┌ 214	μ 230	÷ 246
7	0111	ç 135	ù 151	─ 167	┐ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	¤ 152	Î 168	┐ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	ë 137	Ô 153	┌ 169	╣ 185	╔ 201	┘ 217	θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	ï 139	¢ 155	½ 171	┐ 187	╦ 203	■ 219	δ 235	√ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▬ 220	∞ 236	ⁿ 252
D	1101	= 141	Ù 157	¾ 173	╜ 189	= 205	▮ 221	ø 237	² 253
E	1110	À 142	Û 158	« 174	╛ 190	╬ 206	▋ 222	∈ 238	■ 254
F	1111	§ 143	ƒ 159	» 175	┐ 191	⊥ 207	▬ 223	∩ 239	SP 255

	TITLE		SHEET	NO.	
EPSON	**TM-L90** Specification (STANDARD)		REVISION D	NEXT 43	SHEET 42

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	└ 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	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 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	Ü 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	¡ 173	╜ 189	= 205	▌ 221	ø 237	² 253
E	1110	Ä 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	Å 143	ƒ 159	¤ 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.7 Page 16 (WPC1252)

HEX		8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	€ 128	SP 144	SP 160	° 176	À 192	Ð 208	à 224	ð 240
1	0001	SP 129	' 145	¡ 161	± 177	Á 193	Ñ 209	á 225	ñ 241
2	0010	‚ 130	' 146	¢ 162	² 178	Â 194	Ò 210	â 226	ò 242
3	0011	ƒ 131	" 147	£ 163	³ 179	Ã 195	Ó 211	ã 227	ó 243
4	0100	„ 132	" 148	¤ 164	´ 180	Ä 196	Ô 212	ä 228	ô 244
5	0101	… 133	• 149	¥ 165	µ 181	Å 197	Õ 213	å 229	õ 245
6	0110	† 134	– 150	¦ 166	¶ 182	Æ 198	Ö 214	æ 230	ö 246
7	0111	‡ 135	— 151	§ 167	· 183	Ç 199	× 215	ç 231	÷ 247
8	1000	ˆ 136	˜ 152	¨ 168	¸ 184	È 200	Ø 216	è 232	ø 248
9	1001	‰ 137	™ 153	© 169	¹ 185	É 201	Ù 217	é 233	ù 249
A	1010	Š 138	š 154	ª 170	º 186	Ê 202	Ú 218	ê 234	ú 250
B	1011	‹ 139	› 155	« 171	» 187	Ë 203	Û 219	ë 235	û 251
C	1100	Œ 140	œ 156	¬ 172	¼ 188	Ì 204	Ü 220	ì 236	ü 252
D	1101	SP 141	SP 157	- 173	½ 189	Í 205	Ý 221	í 237	ý 253
E	1110	Ž 142	ž 158	® 174	¾ 190	Î 206	Þ 222	î 238	þ 254
F	1111	SP 143	Ÿ 159	‾ 175	¿ 191	Ï 207	ß 223	ï 239	ÿ 255

3.2.8 Page 17 (PC866: Cyrillic #2)

HEX	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	А 128	Р 144	а 160	▦ 176	╚ 192	╨ 208	р 224	Ё 240
1	0001	Б 129	С 145	б 161	▓ 177	╤ 193	╤ 209	с 225	ё 241
2	0010	В 130	Т 146	в 162	█ 178	╥ 194	╥ 210	т 226	Є 242
3	0011	Г 131	У 147	г 163	│ 179	╟ 195	╙ 211	у 227	є 243
4	0100	Д 132	Ф 148	д 164	╡ 180	─ 196	╘ 212	ф 228	Ї 244
5	0101	Е 133	Х 149	е 165	╢ 181	┼ 197	╒ 213	х 229	ї 245
6	0110	Ж 134	Ц 150	ж 166	╣ 182	╞ 198	╓ 214	ц 230	Ў 246
7	0111	З 135	Ч 151	з 167	╕ 183	╟ 199	╫ 215	ч 231	ў 247
8	1000	И 136	Ш 152	и 168	╗ 184	╚ 200	╪ 216	ш 232	° 248
9	1001	Й 137	Щ 153	й 169	╛ 185	╔ 201	┘ 217	щ 233	• 249
A	1010	К 138	Ъ 154	к 170	║ 186	╩ 202	┌ 218	ъ 234	· 250
B	1011	Л 139	Ы 155	л 171	╗ 187	╦ 203	█ 219	ы 235	√ 251
C	1100	М 140	Ь 156	м 172	╝ 188	╠ 204	▄ 220	ь 236	№ 252
D	1101	Н 141	Э 157	н 173	╜ 189	═ 205	█ 221	э 237	¤ 253
E	1110	О 142	Ю 158	о 174	╛ 190	╬ 206	█ 222	ю 238	■ 254
F	1111	П 143	Я 159	п 175	┐ 191	╧ 207	▀ 223	я 239	SP 255

EPSON	TITLE	**TM-L90** Specification (STANDARD)	SHEET REVISION	NO.	
			D	NEXT 46	SHEET 45

3.2.9 Page 18 (PC852: Latin2)

HEX	BIN	8 / 1000	9 / 1001	A / 1010	B / 1011	C / 1100	D / 1101	E / 1110	F / 1111
0	0000	Ç 128	É 144	á 160	▦ 176	└ 192	đ 208	Ó 224	240
1	0001	ü 129	Ĺ 145	í 161	▩ 177	┴ 193	Đ 209	ß 225	″ 241
2	0010	é 130	Í 146	ó 162	■ 178	┬ 194	Ď 210	Ô 226	˛ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ń 227	ˇ 243
4	0100	ä 132	ö 148	Ą 164	┤ 180	─ 196	ď 212	ń 228	˘ 244
5	0101	ů 133	Ľ 149	ą 165	Á 181	┼ 197	Ň 213	ň 229	§ 245
6	0110	ć 134	ľ 150	Ž 166	Â 182	Ă 198	Í 214	Š 230	÷ 246
7	0111	ç 135	Ś 151	ž 167	Ě 183	ă 199	Î 215	š 231	¸ 247
8	1000	ł 136	ś 152	Ę 168	Ş 184	└ 200	ě 216	Ŕ 232	° 248
9	1001	ë 137	Ö 153	ę 169	╣ 185	┌ 201	┘ 217	Ú 233	¨ 249
A	1010	Ő 138	Ü 154	SP 170	║ 186	╩ 202	┌ 218	ŕ 234	˙ 250
B	1011	ő 139	Ť 155	ź 171	┐ 187	╦ 203	■ 219	Ű 235	ű 251
C	1100	î 140	ť 156	Č 172	┘ 188	╠ 204	▄ 220	ý 236	Ř 252
D	1101	Ź 141	Ł 157	ş 173	Ż 189	═ 205	Ţ 221	Ý 237	ř 253
E	1110	Ä 142	× 158	« 174	ż 190	╬ 206	Ů 222	ţ 238	■ 254
F	1111	Ć 143	č 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

EPSON	TITLE	**TM-L90** Specification (STANDARD)	SHEET REVISION D	NO.	
				NEXT 47	SHEET 46

3.2.10 Page 19 (PC858)

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	¾ 243
4 0100	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5 0101	à 133	ò 149	Ñ 165	Á 181	┼ 197	€ 213	Õ 229	§ 245
6 0110	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7 0111	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	¸ 247
8 1000	ê 136	ÿ 152	¿ 168	© 184	╚ 200	Ï 216	Þ 232	° 248
9 1001	ë 137	Ö 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	½ 171	╗ 187	╦ 203	█ 219	Ù 235	¹ 251
C 1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	ý 236	³ 252
D 1101	ì 141	Ø 157	¡ 173	¢ 189	═ 205	¦ 221	Ý 237	² 253
E 1110	Ä 142	× 158	« 174	¥ 190	╬ 206	Ì 222	¯ 238	■ 254
F 1111	Å 143	ƒ 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

EPSON	TITLE	TM-L90 Specification (STANDARD)	SHEET REVISION D	NO.
				NEXT 48 — SHEET 47

3.2.11 Page 20 (Thai character code 42)

	8	9	A	B	C	D	E	F
0	┌	o		ผ	ย	เ	่	๚
1	┐	๑	ก	ฌ	ร	แ	๋	๛
2	└	๒	ข	ฎ	ฤ	โ	๎	๚
3	┘	๓	ค	ฏ	ล	ใ	๋	๚
4	│	๔	ฆ	ฐ	ว	ไ	็	๚
5	─	๕	ง	ฑ	ศ	ๆ	่	๚
6	├	๖	จ	ฒ	ษ	ๅ	้	๚
7	┤	๗	ฉ	ณ	ส	๋	๊	๚
8	┴	๘	ช	ด	ห	ั	๋	๚
9	┬	๙	ซ	ต	ฬ	า	๋	๚
A	┼	ฃ	ฌ	ถ	อ	ำ	๋	๚
B	■	ฅ	ญ	ท	ฮ	ิ	๋	๚
C	←	ฦ	ฎ	ธ	ะ	ี	๋	๚
D	↑	ๆ	ฏ	น	ภ	ึ	๋	๚
E	→	ฯ	ฐ	ภ	ๅ	ื	๋	๚
F	↓	ๅ	ฑ	ม	ๅ	ุ	๚	

3.2.12 Page 21 (Thai character code 11)

	8	9	A	B	C	D	E	F
0	ฺ	๋	เ	ฐ	ภ	็	เ	๐
1	้	่	ก	ฑ	ม	๎	แ	๑
2	๊	้	ข	ฒ	ย	ๅ	โ	๒
3	๋	๊	ฃ	ณ	ร	ๆ	ใ	๓
4	ฺ	๋	ค	ด	ฤ	๎	ไ	๔
5	้	ฺ	ฅ	ต	ล	๎	ๅ	๕
6	๊	็	ฆ	ถ	ฦ	๎	ๆ	๖
7	้	๊	ง	ท	ว	๎	๎	๗
8	๋	็	จ	ธ	ศ	ๆ	ๅ	๘
9	ฺ	┌	ฉ	น	ษ	ๅ	๎	๙
A	้	┐	ช	บ	ส	๎	๎	ฦ
B	๊	└	ซ	ป	ห	─	╷	๒
C	๋	┘	ฌ	ผ	ฬ	┴	๎	๎
D	ฺ	│	ญ	ฝ	อ	┬	๐	๑
E	้	├	ฎ	พ	ฮ	┼	๎	๎
F	๊	┤	ฏ	ฟ	ๆ	฿	๐	

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TM-L90
Specification
(STANDARD)</td><td>SHEET
REVISION

D</td><td>NO.

NEXT
50</td><td>

SHEET
49</td></tr>
</table>

3.2.13 Page 22 (Thai character code 13)

	8	9	A	B	C	D	E	F
0		ิ		ฐ	ภ	ึ	เ	๐
1	่	ั	ก	ฑ	ม	็	แ	๑
2	้	ั	บ	ฒ	ย	า	โ	๒
3	๊	ั	ป	ณ	ร	ำ	ใ	๓
4	๋		ค	ด	ฤ	ั	ไ	๔
5		ิ	ฅ	ต	ล	ั	า	๕
6	ฺ	ั	ฆ	ถ	ฦ	ั	า	๖
7	ุ	ั	ง	ท	ว	ั	ั	๗
8	ู	ั	จ	ธ	ศ	ิ	ฺ	๘
9	ฺ		ฉ	น	ษ	ึ	ั	๙
A		ิ	ช	บ	ส	่	ั	ฑ
B	ิ	ั	ซ	ป	ห	้	+	๏
C	ั	ั	ฌ	ผ	ฬ	๊	๋	←
D	ั	ั	ญ	ฝ	อ	๋	๐	↑
E	ั		ฎ	พ	ฮ	เ	๎	→
F	ั		ฏ	ฟ	ๆ	฿	๐	↓

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Specification
(STANDARD)</td><td>SHEET
REVISION</td><td colspan="2">NO.</td></tr>
<tr><td></td><td colspan="2"></td><td>D</td><td>NEXT
51</td><td>SHEET
50</td></tr>
</table>

3.2.14 Page 23 (Thai character code 14)

	8	9	A	B	C	D	E	F
0	⌐	╕		ฐ	ภ	็	เ	o
1	ᒧ	๑	ก	ฑ	ม	๋	แ	๑
2	∟	๎	ข	ฒ	ย	ๅ	โ	๒
3	⌐	๎	ฃ	ณ	ร	ำ	ใ	๓
4	│	๎	ค	ด	ฤ	๎	ไ	๔
5	─	๎	ฅ	ต	ล	๎	ๅ	๕
6	├	๎	ฆ	ถ	ฦ	๎	ๆ	๖
7	┤	๎	ง	ท	ว	๎	๎	๗
8	┴	๎	จ	ธ	ศ	๎	๎	๘
9	┬	๎	ฉ	น	ษ	๎	๎	๙
A	┼	๎	ช	บ	ส	๎	๎	๚
B	█	๎	ซ	ป	ห	๎	๎	๎
C	๎	๎	ฌ	ผ	ฬ	๎	๎	๎
D	๎	๎	ญ	ฝ	อ	๎	๎	๎
E	๎	๎	ฎ	พ	ฮ	๎	๎	๎
F	๎	ไ	ฏ	ฟ	ๆ	฿	๏	๛

3.2.15 Page 24 (Thai character code 16)

	8	9	A	B	C	D	E	F
0	⌐	โ		ฐ	ภ	◌ั	เ	๐
1	┐	ใ	ก	ฑ	ม	◌ุ	แ	๑
2	└	◌๋	ข	ฒ	ย	ำ	◌ู	๒
3	┘	◌ั	ฃ	ณ	ร	ๅ	◌ฺ	๓
4	├	◌ั	ค	ด	ฤ	◌	◌	๔
5	─	◌ั	ฅ	ต	ล	◌	า	๕
6	┼	◌ั	ฆ	ถ	ฦ	◌	◌	๖
7	┤	◌ั	ง	ท	ว	◌	◌	๗
8	⊥	◌ั	จ	ธ	ศ	◌ฺ	،	๘
9	┬	◌ั	ฉ	น	ษ	◌ุ	◌	๙
A	┴	◌ั	ช	บ	ส	◌	◌	๚
B	■	◌ั	ซ	ป	ห	◌ั	+	◌ั
C	←	◌ั	ฌ	ผ	ฬ	◌ั	،	◌ั
D	↑	◌ั	ญ	ฝ	อ	◌ั	๐	◌ั
E	→	◌ั	ฎ	พ	ฮ	◌ั	ไ	◌ั
F	↓	ไ	ฏ	ฟ	ๆ	฿	๏	

Confidential

3.2.16 Page 25 (Thai character code 17)

	8	9	A	B	C	D	E	F
0	ั	ั		ฐ	ภ	ั	เ	๐
1	ั	ั	ก	ฑ	ม	ั	แ	๑
2	ั	ั	ข	ฒ	ย	ๅ	โ	๒
3	ั	ั	ฃ	ณ	ร	ๆ	ใ	๓
4	ั	ั	ค	ด	ฤ	ั	ไ	๔
5	ั	ั	ฅ	ต	ล	ั	ๅ	๕
6	ั	–	ฆ	ถ	ฦ	ั	ๆ	๖
7	ั	+	ง	ท	ว	ั	ั	๗
8	ั	⌐	จ	ธ	ศ	ั	,	๘
9	ั	⌐	ฉ	น	ษ	ั	ั	๙
A	ั	∟	ช	บ	ส	ั	ั	๚
B	ั	⌐	ซ	ป	ห	ั	+	๛
C	ั	⊢	ฌ	ผ	ฬ	๑	ั	←
D	ั	⊤	ญ	ฝ	อ	ั	๐	↑
E	ั	⊣	ฎ	พ	ฮ	เ	ั	→
F	ั	⊥	ฏ	ฟ	ๅ	฿	๐	↓

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3.2.17 Page 26 (Thai character code 18)

	8	9	A	B	C	D	E	F
0	Γ	ฯ		ฐ	ภ	ั้	เ	0
1	ๅ	๑	ก	ฑ	ม	ุ	แ	๑
2	L	๎	ข	ฒ	ย	า	โ	๒
3	⌐	ั๊	ฃ	ณ	ร	ๅ	ใ	๓
4			ั๋	ค	ด	ฤ	ฺ	ไ	๔
5	–	็	ฅ	ต	ล	ฺ	ำ	๕
6	├	ฺ	ฆ	ถ	ฦ	ฺ	ๅ	๖
7	┤	่	ง	ท	ว	ฺ	ฺ	๗
8	⊥	้	จ	ธ	ศ	ๆ	.	๘
9	⊤	๊	ฉ	น	ษ	ฺ	ฺ	๙
A	┼	๋	ช	บ	ส	.	ฺ	๒
B	█	ฺ	ซ	ป	ห	ฺ	+	ฺ
C	←	ฺ	ฌ	ผ	ฬ	ฺ	๏	ฺ
D	↑	ฺ	ญ	ฝ	อ	ฺ	๐	ฺ
E	→	ฺ	ฎ	พ	ฮ	ฺ	ฺ	ฺ
F	↓	เ	ฏ	ฟ	ๆ	฿	๏	

3.2.18 Page 255 (Space Page)

HEX		8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	SP 128	SP 144	SP 160	SP 176	SP 192	SP 208	SP 224	SP 240
1	0001	SP 129	SP 145	SP 161	SP 177	SP 193	SP 209	SP 225	SP 241
2	0010	SP 130	SP 146	SP 162	SP 178	SP 194	SP 210	SP 226	SP 242
3	0011	SP 131	SP 147	SP 163	SP 179	SP 195	SP 211	SP 227	SP 243
4	0100	SP 132	SP 148	SP 164	SP 180	SP 196	SP 212	SP 228	SP 244
5	0101	SP 133	SP 149	SP 165	SP 181	SP 197	SP 213	SP 229	SP 245
6	0110	SP 134	SP 150	SP 166	SP 182	SP 198	SP 214	SP 230	SP 246
7	0111	SP 135	SP 151	SP 167	SP 183	SP 199	SP 215	SP 231	SP 247
8	1000	SP 136	SP 152	SP 168	SP 184	SP 200	SP 216	SP 232	SP 248
9	1001	SP 137	SP 153	SP 169	SP 185	SP 201	SP 217	SP 233	SP 249
A	1010	SP 138	SP 154	SP 170	SP 186	SP 202	SP 218	SP 234	SP 250
B	1011	SP 139	SP 155	SP 171	SP 187	SP 203	SP 219	SP 235	SP 251
C	1100	SP 140	SP 156	SP 172	SP 188	SP 204	SP 220	SP 236	SP 252
D	1101	SP 141	SP 157	SP 173	SP 189	SP 205	SP 221	SP 237	SP 253
E	1110	SP 142	SP 158	SP 174	SP 190	SP 206	SP 222	SP 238	SP 254
F	1111	SP 143	SP 159	SP 175	SP 191	SP 207	SP 223	SP 239	SP 255

3.2.19 International Character Sets

Country	ASCII code (Hex)											
	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
USA	#	$	@	[	\	]	^	`	{	|	}	~
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	$	@	¡	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	¡	Ñ	¿	é	`	í	ñ	ó	ú
Latin America	#	$	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú
Korea	#	$	@	[	₩	]	^	`	{	|	}	~

3.3 Switches and Buttons

3.3.1 Power Button (Non-locking push button)

1) The power button located on the upper right front of the printer turns the power on or off.   The power button is enabled or disabled with a DIP switch.

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

2) To turn the power off, press the power button for at least 3 seconds.

3) The printer operates depending on the DIP switch setting (enable/disable power button function) as shown in Table 3.3.1.

Table 3.3.1   Printer Operation by DIP SW1-1

	Setting of the DIP SW 1-1	
	On (power button is disabled)	Off (power button is enabled)
When the power button is pressed for at least 3 seconds	The printer is reset (only when an error has occurred). (*1)	The printer power is turned off.
When the power off is controlled by the host PC (Transmission of **DLE DC4 2**)	The printer flashes the POWER LED after power off processing. (*2)	The printer power is turned off.

  NOTES: *1: Refer to Section 3.8.1 for types of error.

        *2: Refer to Section 3.4.1 for the POWER LED flashing pattern.

  <How to disable the power button>

1) Power button cover
   A power button cover option is available.   Use this cover to avoid turning power off accidentally.

2) **DLE DC4** (Execute power-off sequence)
   To control the printer's power off in situations when the power button is covered, disable the power button using the DIP switch and the power off command **DLE DC4**.   (Refer to Appendix G for details.)

NOTE: Pulling the paper out forcibly causes turning the power button on when the power button is turned off, if +24 V power voltage is supplied and the DIP switch 1-1 is off (the power button is effective).

3.3.2 Panel Buttons

1) FEED button: Non-locking push button

[Function] • If you push this button once and release it, the printer feeds paper 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.

NOTE: This button is disabled by **ESC c 5**.

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3.3.3 DIP Switches

DIP switch 1 is located on the left side inside the printer cover and is accessible when the DIP switch cover is removed.   DIP switch 2 is located on the main PCB.

3.3.3.1 Serial interface

Table 3.3.2   DIP Switch 1

SW 1	Function	ON	OFF
1	Power button function	Disabled	Enabled
2	Interface condition selection	By DIP switch	By memory switch
3	Handshaking	XON/XOFF control	DTR/DSR control
4	Word length	7 bits	8 bits
5	Parity check	Yes	No
6	Parity selection	Even	Odd
7	Transmission speed selection	Refer to Table 3.3.3	
8			

Table 3.3.3   Transmission Speed

Transmission Speed (bps)	SW1-7	SW1-8
2400	ON	ON
4800	OFF	ON
9600	ON	OFF
19200	OFF	OFF

bps: bits per second

NOTE: Changes in DIP switch settings are recognized only when the printer power is turned on or when the printer is reset by using the interface.

Table 3.3.4   DIP Switch 2

SW 2	Function	ON	OFF
1	Reserved	--	Fixed to Off.

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3.3.3.2 Parallel interface

Table 3.3.5   DIP Switch 1

SW 1	Function	ON	OFF
1	Operation of the power button	Disabled	Enabled
2–8	Reserved	--	Fixed to Off

NOTE: Changes in DIP switch settings are recognized only when the printer power is turned on or when the printer is reset by using the interface.

Table 3.3.6   DIP Switch 2

SW 2	Function	ON	OFF
1	Reserved	--	Fixed to Off

3.3.4 Memory Switches

The memory switches are: Msw 1, Msw 2, Msw 8.   These switches

- Set customized values
- Set the communication conditions of the serial interface

1) Tables for memory switches Msw 1, Msw 2, Msw 8 are shown below.

Table 3.3.7   Memory Switch Msw 1

Bit	Function	48 (Off)	49 (On)
1	Transmit the power ON information	Does not transmit	Transmits
2	Capacity of receive buffer	4KB	45 bytes
3	Conditions for BUSY	Receive buffer full or offline	Receive buffer full
4	Data processing for receiving error	Prints "?"	Ignored
5	Automatic line feed	Disabled	Enabled
6	Reserved	Fixed to Off	--
7	Pin #6: Selection of reset signal	Not used	Used
8	Pin #25: Selection of reset signal	Not used	Used

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Table 3.3.8   Memory Switch Msw 2

Bit	Function	48 (Off)	49 (On)
1	Reserved	--	Fixed to On
2	Autocutter operation	Disabled	Enabled
3	Reserved	--	--
4	Reserved	--	--
5	Reserved	--	--
6	Reserved	--	--
7	Reserved	--	--
8	Reserved	--	--

Table 3.3.9   Memory Switch Msw 8

Bit	Function	48 (Off)	49 (On)
1	Reserved	--	--
2	Reserved	--	--
3	Reserved	--	--
4	Selection of the maximum length of automatic paper measurement	160 mm	300 mm
5	Enable left or right margin of bar code print	Does not enable margin	Enables margin
6	Feeding paper to the print starting position at power on	Enabled	Disabled
7	Reserved	--	--
8	Printer cover open during operation	Errors that automatically recover	Errors that can possibly recover

2) Customized value

The customized value is set with the **GS (E** command.

Function	Value		
Selection of the NV user memory capacity	1KB	64KB	
	128KB	192KB	
Selection of the NV graphics memory capacity	None	64KB	
	128KB	192KB	
	256KB	320KB	
	384KB	--	
Selection of the paper width	38 mm, 39 mm, ….. 79 mm, 80 mm (43 settings in increments of 1 mm)		
Selection of the print control	One-part energizing	Two-part energizing	
	Three-part energizing	Four-part energizing	
Selection of the print density	70 %	75 %	
	80 %	85 %	
	90 %	95 %	
	100 %	105 %	
	110 %	115 %	
	120 %	125 %	
	130 %	135 %	140 %
Selection of the paper	Single-color	Two colors	
Selection of the print speed	Print speed level 1 (max. 26 mm/s), print speed level 2, print speed level 3, print speed level 4, print speed level 5, print speed level 6 (max. 120 mm/s), print speed level 7, print speed level 8, print speed level 9 (max. 150 mm/s).		
Selection of black-color density in two-color printing	Light	Medium	
	Dark	--	

NOTES:
- The maximum print speed is available only in a one-part energizing mode.
- Four-part energizing mode can reduce power consumption.
- The print width can be set for 43 paper types with a 1 mm pitch in the range from 38 to 80 mm {1.50 to 3.15"}.   However, print width cannot be set in the range from 71 to 79 mm {2.80 to 3.11"}, because the thickness of the paper roll spacer.

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3) Communication conditions of the serial interface

The communication conditions of the serial interface are set with the **GS (E** command.

Function	Value	
Baud rate	2400 bps	4800 bps
	9600 bps	19200 bps
	38400 bps	57600 bps
	115200 bps	--
Parity	None	Odd
	Even	--
Handshaking	DSR/DTR control	XON/XOFF control
Data length	7 bits	8 bits

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3.4 Indicators

3.4.1 Panel LEDs

1) Power (POWER) LED: Green

On: Power is stable.

Off: Power is not stable.

Flashing: During execution of each operation

<Flashing pattern>

During executing each operation: Flashing

Approximately 160 ms
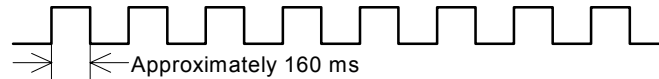
Power off termination (after executing **DLE DC4 2**): Flashing
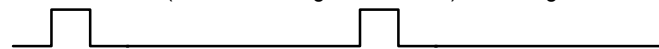
2) Paper roll end (PAPER OUT) LED: Red

On: The roll paper near end or real end is detected.

Off: Paper is loaded (normal condition)

Blinking: • Self-test waiting state for test print

          • Macro execution standby state when the macro execution command is used.

Table 3.4.1 Standby State Indication

State	PAPER LED Flashing Pattern	Recovery Conditions
Waiting for self-test printing to be continued or macro execution ready state.	PAPER OUT Approximately 320 ms	Pressing the FEED button causes self-test printing to be continued or executes the macro.

NOTE: A macro can be executed *r* times (*r* specifies the number of times to execute the macro) within the specified definition range.   The macro can be executed continuously or can be executed by pressing the button.   If the macro is executed by pressing the FEED button, the PAPER OUT LED flashes to indicate the macro execution ready state.   (See Section 6, Commands.)

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3) Error (ERROR) LED: Red

On: Offline (except during paper feeding using the FEED button and during test printing, and in the error state).   Refer to "Switching between online and offline" in Section 2.1, Interfaces.

Flashing: Error (refer to Section 3.8)

Off: Normal condition

FEED

○ 🗍 PAPER OUT

○ ◁ ERROR

○ ⏻ POWER
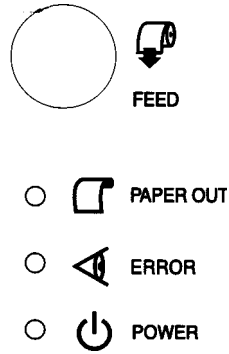
Figure 3.4.1   Panel Switches and Indicators

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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
- Memory switch settings
- Paper width to be set

2) Executing the self-test

[Starting the self-test]

To start the self-test on roll paper, hold down the paper FEED button and turn on the printer with the cover closed, and continue holding down the paper FEED button until the ERROR LED comes on; then the current printer status (*1) is printed.

(*1)
- Control software version
- DIP switch settings
- Memory switch settings
  (The contents of the memory switch settings may not be the same as the actual print in the self-test.   If the paper layout is not saved in memory, the printer prints "6553.5.")

[Self-test standby state]

After printing the current printer status, the printer prints the message "If you want to continue SELF-TEST printing, please press FEED button."   The PAPER OUT LED indicator flashes and the printer enters the test printing (*2) standby state.   Press the paper FEED button to start test printing.

(*2)
- Prints with a rolling pattern using only the built-in character set
- Autocuts after completing the rolling pattern printing
- Feeds to the print starting position

3) Ending the self-test

After a number of lines are printed, the printer indicates the end of the self-test by printing "∗∗∗ completed ∗∗∗," and initializes.

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3.6 Hexadecimal Dumping

1) Hexadecimal dumping function

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

2) Starting hexadecimal dumping

Open the cover and turn the power on while pressing the paper FEED button (located inside the printer). Then close the cover or execute the **GS (A** command. The printer first prints "Hexadecimal Dump   To terminate..." on the paper roll and prints the received print data in hexadecimal numbers and their corresponding characters.

NOTES: 1. If a character does not 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 offline.

3) Ending hexadecimal dumping

Hexadecimal dumping ends by turning the power off, pressing the paper 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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3.7 Memory Switch Setting Mode

1) Memory switch setting function

The following memory switch can be set by operating the button and opening and closing the cover:

① Enabling or disabling the autocutter

② Setting communication conditions of the serial interface

③ Making settings related to the serial communication

- Capacity of the receive buffer
- Data processing for receiving error
- Conditions for BUSY

④ Selection of interface reset signal

⑤ Setting paper width

⑥ Setting print density

⑦ Setting type of paper (single-color/two-color)

⑧ Setting label

2) Starting the memory switch setting mode

Open the cover and turn the power on while holding down the paper FEED button (located inside the printer), and continue holding down the paper FEED button until the ERROR LED comes on; release the paper FEED button once the ERROR LED comes on. Next, press the paper FEED button (located inside the printer) twice, and close the cover. Then, the printer prints the possible setting contents of the memory switch and instructions. Follow the instructions to set the memory switches.

3) Ending the memory switch setting mode

Once setting is performed, the setting contents are stored; then the printer executes initialization. After initializing, the printer enters the normal state.

Paper FEED button
(inside the printer)
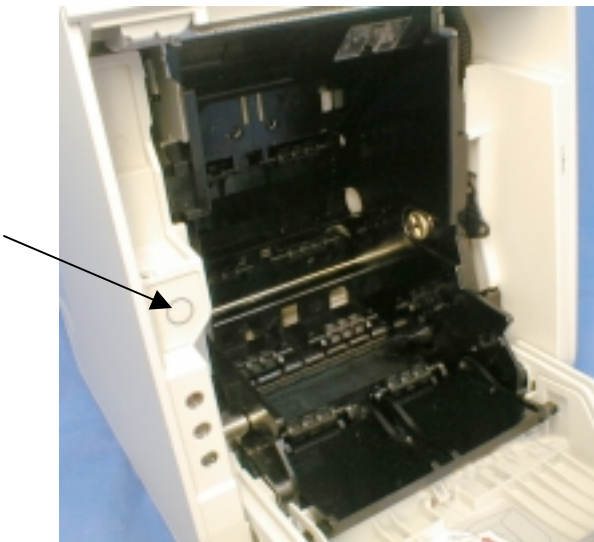
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3.8 Automatic Paper Recognition Function

1) Automatic paper recognition function

This function is to detect the paper type – any of the following papers – and store that information in the volatile memory (RAM).

① Label (face stock) paper (without black mark)
② Receipt paper (without black mark)
③ Receipt paper (with black mark)

In this function, the length of the label interval in ① (distance between the bottom of the label and the bottom of the next label) and the length of the black mark (BM) interval in ③ (distance between the top of the BM and the top of the next BM) are also measured.

2) Starting the automatic paper recognition function

This function will start in the following case, and the paper is fed until it is finished:

* When the power is turned on and the paper is loaded, and then the printer cover is closed.
* When the power is turned on if the paper is already loaded.

NOTES:
* If labels (with black marks) are used, the automatic paper recognition function must not be used.   Use Function 49 or the **GS (E** command.
* If the automatic paper layout setting mode for labels (with black marks) is used, the automatic paper recognition function may not work.   In this case, the paper layout is set as a receipt (without black marks).
* If the paper layout information is already written in the NV memory, this function will not work.   For the paper layout setting in the NV memory, refer to function 49 of **GS (E**, **GS (A**, or Section 3.9, Automatic paper layout setting mode.

3.9 Automatic Paper Layout Setting Mode

1) Automatic paper layout setting mode

This function is to measure the paper layout settings of the paper inserted automatically and store them in the NV memory.

2) Starting the automatic paper layout setting mode

Open the cover and turn the power on while holding down the paper FEED button (located inside the printer), and continue holding down the paper FEED button until the ERROR LED comes on; release the paper FEED button once the ERROR LED comes on.   Press the paper FEED button (located inside the printer) six times, and then close the cover.

NOTES:
* If labels (with black marks) are used, the automatic paper recognition function must not be used.   Use Function 49 or the **GS (E** command.
* If the automatic paper layout setting mode for labels (with black marks) is used, the automatic paper recognition function may not work.   In this case, the paper layout is set as a receipt (without black marks).

3) Ending the automatic paper layout setting mode

Once the setting is performed, the automatic paper layout setting mode is ended.
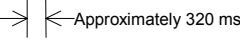
3.10 Error Processing

3.10.1 Error Types

1) Errors that recover automatically

Table 3.10.1   Automatically Recoverable Errors
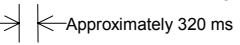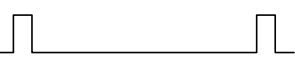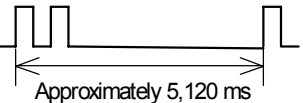
Error	Description	ERROR LED Flashing Pattern → ⊢← Approximately 320 ms	Recovery
Paper roll cover open error (when recoverable error is selected) (*1)	Printing on the paper roll is not performed correctly due to a cover-open.	⎍⎍⎍⎍⎍⎍⎍⎍	Recovers automatically when the cover is closed.
Print head temperature error (*2)	The temperature of the print head is extremely high.	⎍⎍⎍⎍⎍⎍⎍⎍	Recovers automatically when the print head cools.

NOTES: *1: The printer cover open error operation can be selected with a memory switch.

*2: If an abnormal temperature is detected, the printer generates a CPU execution error as an unrecoverable error.

2) Errors that can be recovered with a command

Table 3.10.2   Errors That Can Possibly Recover

Error	Description	ERROR LED Flashing Pattern → ⊢← Approximately 320 ms	Recovery
Paper roll cover open error (when an error that can possibly recover is selected)	Printing on the paper roll is not performed correctly due to a cover-open.	⎍⎍⎍⎍⎍⎍ ⎍	Recovers by **DLE ENQ 1** or **DLE ENQ 2** when the cover is closed.
Autocutter error (*2)	The autocutter does not work correctly.	⎍___⎍	Recovers by **DLE ENQ 1** or **DLE ENQ 2**.
Paper layout error (*3)	Cannot detect the label or the black mark.	⎍⎍__⎍ ←— Approximately 5,120 ms —→	Recovers by **DLE ENQ 1** or **DLE ENQ 2**.

NOTES: *1: The printer cover open error operation can be selected with a memory switch.
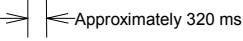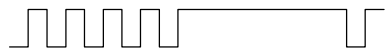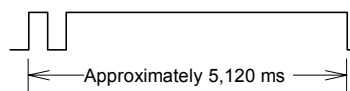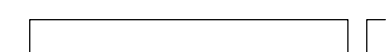
*2: When an autocutter error occurs because of jammed paper, turn the power off and remove the jammed paper; then turn the power on again.

*3: When a paper layout error occurs because of jammed paper while printing, turn the power off and remove the jammed paper; then turn the power on again.

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3) Unrecoverable errors

Table 3.10.3   Unrecoverable Errors

Error	Description	ERROR LED Flashing Pattern (Approximately 320 ms)	Recovery
CPU execution error	CPU executes an incorrect address.		Impossible to recover.
R/W error in memory or gate array	After R/W checking, the printer does not work correctly.	Approximately 5,120 ms	Impossible to recover.
High-voltage error	The power supply voltage is extremely high.		Impossible to recover.
Low-voltage error	The power supply voltage is extremely low.		Impossible to recover.
Internal circuit connection error	Internal circuits are not connected correctly.		Impossible to recover.
UIB error	An abnormal operation occurs in UIB.		Impossible to recover.

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

3.10.2 Printer Operation When an Error Occurs

The printer executes the following operations when detecting an error.

- Stops all printer operations.
- Goes BUSY (Refer to Section 3.3.4, Memory Switches.)
- Flashes the ERROR LED.

3.10.3 Data Receive Error (Only for the Serial Interface Model)

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

- Parity error
- Framing error
- Overrun error

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3.11 Cover Open Button

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

NOTES: • Be sure to use the cover open button to open the printer cover.

• Do not open the printer cover during printing.

• Do not operate the cover open button during the autocutting operation; otherwise the mechanism may be damaged.

3.12 Cover Open Sensor

The cover open sensor monitors the printer cover. When the sensor detects a cover open during printing, the printer enters an error state and goes offline automatically. The printer recovers to online when the cover is closed.

When an error that automatically recovers is selected:
If the printer detects the cover open during printing, the error LED flashes. When the cover is closed, the error LED turns off and the printer initializes by itself and starts printing from the beginning of the line that stopped printing.

When an error that can possibly recover is selected:
When the cover is closed, the printer recovers by **DLE ENQ 1** or **DLE ENQ 2**. If the cover is open during standby, the printer goes offline. When the cover is closed, the printer recovers to online.

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

3.13 Print Buffer-full Printing

• When subsequent data is received after the printer processes one line of data in the print buffer, the printer prints the processed line and automatically feeds the paper one line (in standard mode).

• When subsequent data is received after the printer processes one line of data in the print buffer, the printer prints the processed line and automatically sets the print starting position to the next line (in page mode).

4. CASE SPECIFICATIONS

4.1 External Dimensions and Mass

Height: 203 mm {7.99"}

Width: 140 mm {5.51"}

Depth: 148 mm {5.83"}

Mass: Approximately 1.9 kg {4.18 lb} (except for the paper roll)

4.2 Color

EPSON standard color (ECW, EDG)

4.3 External Appearance
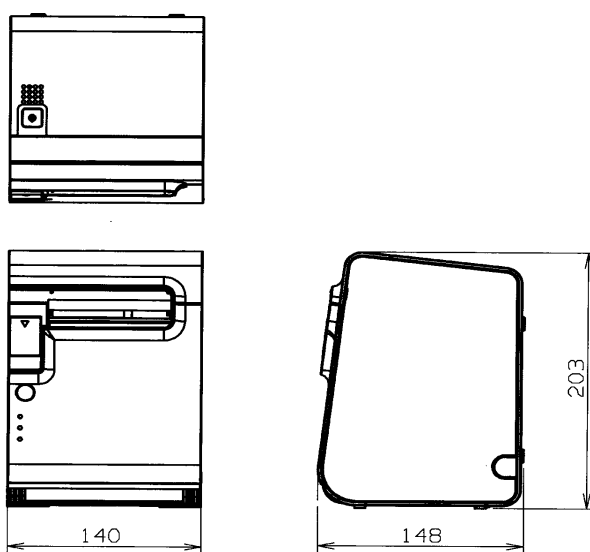
[Units: mm]

Figure 4.3.1   External Appearance

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5. OPTIONS AND CONSUMABLES

5.1 Standard Accessories

- Label roll paper (diameter 40 mm {1.57"})
- User's manual (Languages: English, German, French, Spanish, Portuguese, Italian, Dutch, Simplified Chinese, Traditional Chinese, Japanese)
- Paper roll spacer
- Paper exit guide
- Panel label for horizontal installation
- Power switch cover
- External power supply unit (model: PS-180)
  (For models packed with a power supply unit, the packed power supply differs depending on the model.)

5.2 Options

- Affixing Velcro® tape (model: DF-10)
- Wall handing bracket (model: WH-10)
- External power supply (model: PS-180, PS-170)   (PS-180 is a power-saving type)
- Interface boards (EPSON UB series, except UB-P02)

5.3 Consumables

- Specified paper
  Thermal roll paper: Refer to Section 1.6, Paper Specifications.

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6. COMMANDS

6.1 Command Notation

XXXX

[Name]	The name of the command.
[Format]	The code sequence. The numbers denoted by < >H are hexadecimal. [ ]*k* indicates the contents of the [ ] should be repeated *k* times.
[Range]	Gives the allowable ranges, if any, for the arguments.
[Default]	Gives the default values, if any, for the command parameters.
[Description]	Describes the function of the command.
[Notes]	Provides important information on setting and using the printer command, if necessary.

6.2 Explanation of Terms

1) Print buffer
   The print buffer is a buffer that stores the image data to be printed.

2) Printable area
   The printable area is the maximum range within which printing is possible under the printer specifications.   The printable area for this printer is as follows:

The length in the horizontal direction in standard mode:

Type of paper	Printable area
Receipt	72 mm {576/203"}
Label	70 mm {560/203"}

The length in the horizontal direction in page mode:

Type of paper	Printable area
Receipt	72 mm {576/203"}
Label	70 mm {560/203"}

The length in the vertical direction in page mode:

Type of paper	Printable area
Receipt (single-color)	184.5 mm {2952/406"}
Label (single-color)	101.6 mm {1624/406"}
Receipt (two-color) Label (two-color)	92.25 mm {1476/406"}

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3) Printing area

The printing range is set by command.   The area to be printed must be ≤ the printable area.

4) Ignores the command

The state in which all codes, including parameters, are read in and discarded, and nothing happens.

5) Inch

A unit of length.   One inch is 25.4 mm.

6) Paper layout

This is the information to control printing of labels or black mark paper.   The paper layout includes the origin of the layout, print starting position, size of label, or other information.   The paper layout is set with **GS (A** and **GS (E** commands for detailed control.

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6.3 Control Commands

HT

[Name]　　　　Horizontal tab

[Format]　　　ASCII　　HT
　　　　　　　Hex　　　09
　　　　　　　Decimal　9

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

LF

[Name]　　　　Print and line feed

[Format]　　　ASCII　　LF
　　　　　　　Hex　　　0A
　　　　　　　Decimal　10

[Description]　• In standard mode
　　　　　　　　• Prints the data in the print buffer and feeds one line based on the current line spacing.
　　　　　　　　• If the paper layout (the origin of the layout) specifies "bottom of the label" or "top of the black mark" in standard mode, the printer executes either one of the following operations when the paper feed amount exceeds the printing area in the vertical layout:
　　　　　　　　　• If the maximum height of the characters in one line exceeds the printing area specified in the vertical layout, the printer feeds the paper to the print starting position on the next label and executes the process of this command from the print starting position on the next label.
　　　　　　　　　• If the maximum height of the characters in one line does not exceed the printing area specified in the vertical layout, but the paper feed amount exceeds the printing area, the printer executes printing on the current label and feeds the paper to the bottom of the printing area.
　　　　　　　• In page mode
　　　　　　　　• Feeds one line based on the current line spacing.

FF

[Name]　　　　Print and return to standard mode (in page mode)

[Format]　　　ASCII　　FF
　　　　　　　Hex　　　0C
　　　　　　　Decimal　12

[Description]　In page mode, prints the data in the print buffer collectively and returns to standard mode.

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CR

[Name]	Print and carriage return

[Format]   ASCII   CR
           Hex   0D
           Decimal   13

[Description]   • When automatic line feed is enabled, the printer functions the same as **LF**.

               • When automatic line feed is disabled, the printer ignores **CR**.

[Notes]   • The automatic line feed is ignored with a serial interface model.

          • With a parallel interface model, the automatic line feed is set with memory switch 1-5 when the printer power is turned on or reset.

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.

DLE EOT *n*

[Name]   Transmit real-time status

[Format]

	ASCII	DLE	EOT	*n*
	Hex	10	04	*n*
	Decimal	16	4	*n*

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

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

n	Function
1	Transmits printer status.
2	Transmits offline status.
3	Transmits error status.
4	Transmits paper roll sensor status.

• This printer transmits the following status in real time.

• *n* = 1: Printer status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Fixed.
1	On	02	2	Fixed.
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	Online.
	On	08	8	Offline.
4	On	10	16	Fixed.
5	Off	00	0	Not in online waiting status.
	On	20	32	During online waiting status.
6	Off	00	0	Paper FEED button is turned Off.
	On	40	64	Paper FEED button is turned On.
7	Off	00	0	Fixed.

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- *n* = 2: Offline status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Fixed.
1	On	02	2	Fixed.
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	Fixed.
5	Off	00	0	No paper-end stop.
	On	20	32	Printing is being stopped due to a paper end.
6	Off	00	0	No error.
	On	40	64	Error has occurred.
7	Off	00	0	Fixed.

- *n* = 3: Error status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Fixed.
1	On	02	2	Fixed.
2	Off	00	0	No mechanical error.
	On	04	4	Mechanical error has occurred.
3	Off	00	0	No autocutter error.
	On	08	8	Autocutter error occurred.
4	On	10	16	Fixed.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error has occurred.
6	Off	00	0	No automatically recoverable error.
	On	40	64	Automatically recoverable error has occurred.
7	Off	00	0	Fixed.

Confidential

- *n* = 4: Continuous paper sensor status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Fixed.
1	On	02	2	Fixed.
2	Off	00	0	Roll paper near-end sensor: paper adequate.
	On	04	4	Roll paper near-end sensor: paper near end.
3	Off	00	0	Roll paper near-end sensor: paper adequate.
	On	08	8	Roll paper near-end sensor: paper near end.
4	On	10	16	Fixed.
5	Off	00	0	Roll paper end sensor: paper present.
	On	20	32	Roll paper end sensor: paper not present.
6	Off	00	0	Roll paper end sensor: paper present.
	On	40	64	Roll paper end sensor: paper not present.
7	Off	00	0	Fixed.

[Notes]

- If print data includes a character string containing this command, the printer performs the command.   Users must consider this.

  For example: Bit image data accidentally might include a data string with this command.

- Do not embed this command within another command.

  For example: Bit image data might include this command.

- This command is ignored when block data is transmitted.

DLE ENQ *n*

[Name]	Real-time request to the printer

[Format]

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

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

[Description] • Responds to a request from the host computer.

  • *n* specifies the requests as follows:

n	Request
0	Works the same as when the paper FEED button is pressed once in waiting status during the operation of the **GS ^** command.
1	Recovers from an error and restarts printing from the line where the error occurred.
2	Recovers from an error after clearing the receive and print buffers.

[Notes] • Specify *n* = 1 or 2 after removing the cause of the error.

  • If print data includes a character string containing this command, the printer performs the command.   Users must consider this.

  For example: Bit image data accidentally might include a data string with this command.

  • Do not embed this command within another command.

  For example: Bit image data might include this command.

  • This command is ignored when block data is transmitted.

DLE DC4 *fn m t* (*fn* = 1)

[Name]   Generate pulse in real-time

[Format]

ASCII	DLE	DC4	*fn*	*m*	*t*
Hex	10	14	*1*	*m*	*t*
Decimal	16	20	*1*	*m*	*t*

[Range]   *fn* = 1
$0 \le m \le 8$
$1 \le t \le 8$

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

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

The pulse ON time or OFF time is set to [$t \times 100$ ms].

[Notes]
- If print data includes a character string containing this command, the printer performs the command.   Users must consider this.

  For example: A bit image accidentally might include the same data string as this command.

- Do not embed this command within another command.

  For example: Bit image data might include this command.

- This command is ignored in the following states:
  - During transmission of block data.
  - During driving of drawer kick-out.
  - When an error has occurred.

DLE DC4 *fn a b* (*fn* = 2)

[Name]	Execute power-off sequence

[Format]

	ASCII	DLE	DC4	*fn*	*a*	*b*
	Hex	10	14	*fn*	*a*	*b*
	Decimal	16	20	*fn*	*a*	*b*

[Range] *fn* = 2
a = 1
b = 8

[Description] Executes the printer power-off sequence.

- Stores the values of the maintenance counter.
- Transmits the following power-off status (Header + Status + NUL).

Power off status	Hex	Decimal	Amount of data
Header	3B H	59	1 byte
Status	30 H	48	1 byte
NUL	00 H	0	1 byte

- Executes the printer power off.

[Notes]

- If this command is encountered, the printer will not continue to process anything.   To recover the printer to print again, it is necessary to turn the power on again or execute a hardware reset.

- If print data includes a character string containing this command, the printer performs the command.   Users must consider this.

  For example: Bit image data accidentally might include a data string with this command.

- Do not embed this command within another command.

  For example: Bit image data might include this command.

- This command is ignored when block data is transmitted.

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DLE DC4 *fn d1…d7* (*fn* = 8)

[Name]   Clear buffer(s)

[Format]   ASCII   DLE   DC4   *fn*   *d1…d7*
           Hex   10   14   *8*   *d1…d7*
           Decimal   16   20   *8*   *d1…d7*

[Range]   *fn* = 8
           d1 = 1, *d2* = 3, *d3* = 20, *d4* = 1, *d5* = 6, *d6* = 2, *d7* = 8

[Description] • Clears all data stored in the receive buffer and the print buffer.

              • Transmits the following three bytes of data.

	Hex	Decimal	Amount of data
Header	37H	55	1 byte
Flag	25H	37	1 byte
NUL	00H	0	1 byte

              • Enters in standard mode.

[Notes]   • This command must be inhibited for use in a system using this printer and the EPSON OPOS / JavaPOS driver.

           • If print data includes a character string containing this command, the printer performs the command.   Users must consider this.

                   For example: Bit image data accidentally might include a data string with this command.

           • Do not embed this command within another command.

                   For example: Bit image data might include this command.

           • This command is ignored when block data is transmitted.

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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.

ESC SP *n*

[Name]   Set right-side character spacing

[Format]   ASCII   ESC   SP   *n*
                Hex   1B   20   *n*
                Decimal   27   32   *n*

[Range]   0 ≤ *n* ≤ 255

[Default]   *n* = 0

[Description]   • Sets the character spacing for the right side of the character to [*n* × horizontal motion unit].

                • The maximum right-side character spacing is 31.875 mm {255/203" or 1.255"}.

ESC ! *n*

[Name] Select print mode (s)

[Format]

ASCII	ESC	!	*n*
Hex	1B	21	*n*
Decimal	27	33	*n*

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

[Default] *n* = 0

[Description] Selects the character font and styles (emphasized, double-height, double-width, and underlined) together.

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Character font A (12 × 24) selected.
	On	01	1	For ANK/Multilingual model: font B (9 × 17) selected. For Japanese model: font C (8 × 16) selected.
1, 2	--	-	-	Reserved.
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	--	-	-	Reserved.
7	Off	00	0	Underlined mode not selected.
	On	80	128	Underlined mode selected.

NOTE: ANK = alphanumeric

ESC $ *nL nH*

[Name] Set absolute print position

[Format]

ASCII	ESC	$	*nL*	*nH*
Hex	1B	24	*nL*	*nH*
Decimal	27	36	*nL*	*nH*

[Range] $0 \le (nL + nH \times 256) \le 65535$ ($0 \le nH \le 255$, $0 \le nL \le 255$)

[Description] • Sets the next print starting position, and the absolute print position, in reference to the left margin.　The distance from the beginning of the line to the left margin is $[(nL + nH \times 256) \times$ (vertical or horizontal motion units)].

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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] $0 \leq n \leq 255$

[Default]   *n* = 0

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

- When the LSB of *n* is 0, the user-defined character set is canceled.
- When the LSB of *n* is 1, the user-defined character set is selected.

ESC & *y c1 c2 [x1 d1...d(y×1)]...[xk d1...d(y×xk)]*

[Name]	Define user-defined characters

[Format]

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

[Range]   For ANK/Multilingual model:

y = 3
$32 \leq c1 \leq c2 \leq 126$
$0 \leq x \leq 12$ (when font A (12 × 24) is selected)
$0 \leq x \leq 9$ (when font B (9 × 17) is selected)
$0 \leq d \leq 255$
$k = c2 - c1 + 1$

For Japanese model:

y = 3 (when font A (12 × 24) / font B (10 × 24) is selected)
y = 2 (when font C (8 × 16) is selected)
$32 \leq c1 \leq c2 \leq 126$
$0 \leq x \leq 12$ (when font A (12 × 24) is selected)
$0 \leq x \leq 10$ (when font B (10 × 24) is selected)
$0 \leq x \leq 8$ (when font C (8 × 16) is selected)
$0 \leq d \leq 255$
$k = c2 - c1 + 1$

[Description] • Assigns the user-defined character pattern for the specified character codes.

- *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.
- *d* specifies the definition data.

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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] $m = 0, 1, 32, 33$
            $1 \leq (nL + nH \times 256) \leq 1023$ $(0 \leq nL \leq 255, 0 \leq nH \leq 3)$
            $0 \leq d \leq 255$

[Description] • Specifies the bit image in *m* mode for the number of dots specified by *nL* and *nH*.

m	Mode	Number of dots in vertical direction	Vertical dot density	Horizontal dot density	Number of bytes (*k*)
0	8-dot single-density	8	203/3 dpi	203/2 dpi	$(nL + nH \times 256)$
1	8-dot double-density	8	203/3 dpi	203 dpi	$(nL + nH \times 256)$
32	24-dot single-density	24	203 dpi	203/2 dpi	$(nL + nH \times 256) \times 3$
33	24-dot double-density	24	203 dpi	203 dpi	$(nL + nH \times 256) \times 3$

dpi: dots per 25.4 mm {1"}

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ESC – *n*

[Name]   Turn underline mode on/off

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

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

[Default] $n = 0$

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

n	Function
0, 48	Turns off underline mode.
1, 49	Turns on underline mode, set at 1-dot width.
2, 50	Turns on underline mode, set at 2-dot width.

ESC 2

[Name]   Select default line spacing

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

[Description] Set the current line spacing to approximately 3.75 mm {30/203" or 0.15"}.

ESC 3 *n*

[Name]   Set line spacing

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

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

[Default]   Equivalent to approximately 3.75 mm {30/203" or 0.15"}

[Description] • Sets the current line spacing to [*n* × vertical motion units] inches.

[Notes]   • The maximum settable line spacing is 900 mm {35.5"}.

ESC = *n*

[Name]   Select peripheral device

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

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

[Default]   Serial interface specification:

               • When turning on the printer: *n* = 1

               • When executing **ESC @**:

Setting before executing **ESC @**	*n*		
	1	2	3
After **ESC @** processing	1	2	1

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

n	Function
1	Specifies printer only.
2	Specifies customer display only.
3	Specifies printer and customer display.

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ESC ? *n*

[Name]	Cancel user-defined characters			
[Format]	ASCII	ESC	?	*n*
	Hex	1B	3F	*n*
	Decimal	27	63	*n*
[Range]	32 ≤ *n* ≤ 126			

[Description] • Cancels user-defined characters, specified with character codes.

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 modes to the modes that were in effect when the power was turned on.

ESC D *n1...nk NUL*

[Name]	Set horizontal tab positions				
[Format]	ASCII	ESC	D	*n1...nk*	*NUL*
	Hex	1B	44	*n1...nk*	*00*
	Decimal	27	68	*n1...nk*	*0*
[Range]	1 ≤ *n* ≤ 255				
	0 ≤ *k* ≤ 32				

[Default] *n* = 8, 16, 24, 32, 40, ... , 232, 240, 248 (for font A in a standard character size width)

[Description] • Sets horizontal tab positions.

   • *n* specifies the number of columns from the setting position to the left margin or the beginning of the line.
   • *k* specifies the number of bytes set for the horizontal tab position.

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ESC E *n*

[Name]   Turn emphasized mode on/off

[Format]   ASCII   ESC   E   *n*
                Hex   1B   45   *n*
                Decimal   27   69   *n*

[Range]   0 ≤ *n* ≤ 255

[Default]   *n* = 0

[Description]   • Turns emphasized mode on or off.

                • When the LSB of *n* is 0, emphasized mode is turned off.

                • When the LSB of *n* is 1, emphasized mode is turned on.

ESC G *n*

[Name]   Turn double-strike mode on/off

[Format]   ASCII   ESC   G   *n*
                Hex   1B   47   *n*
                Decimal   27   71   *n*

[Range]   0 ≤ *n* ≤ 255

[Default]   *n* = 0

[Description]   • Turns double-strike mode on or off.

                • When the LSB of *n* is 0, double-strike mode is turned off.

                • When the LSB of *n* is 1, double-strike mode is turned on.

ESC J *n*

[Name]   Print and feed paper

[Format]   ASCII   ESC   J   *n*
              Hex   1B   4A   *n*
              Decimal   27   74   *n*

[Range]   0 ≤ *n* ≤ 255

[Description] • Prints the data in the print buffer and feeds the paper [*n* × vertical motion unit].

- If the paper layout (the origin of the layout) specifies "bottom of the label" or "top of the black mark" in standard mode, the printer executes either one of the following operations when the paper feed amount exceeds the printing area in the vertical layout:
  - If the maximum height of the characters in one line exceeds the printing area specified in the vertical layout, the printer feeds the paper to the print starting position on the next label and executes the process of this command from the print starting position on the next label.
  - If the maximum height of the characters in one line does not exceed the printing area specified in the vertical layout, but the paper feed amount exceeds the printing area, the printer executes printing on the current label and feeds the paper to the bottom of the printing area.

[Notes]   • If the paper feed amount calculated with [*n* × vertical motion unit] exceeds 900 mm {35.5"}, the printer feeds paper 900 mm {35.5"}.

ESC L

[Name]   Select page mode

[Format]   ASCII   ESC   L
              Hex   1B   4C
              Decimal   27   76

[Description] • Switches from standard mode to page mode.

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ESC M *n*

[Name] Select character font

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

[Range] For ANK/Multilingual model: *n* = 0, 1, 48, 49
For Japanese model: $0 \leq n \leq 2$, $48 \leq n \leq 50$

[Default] *n* = 0

[Description] • Selects one-byte character fonts.

For ANK/Multilingual model:

n	Function
0, 48	Character font A (12 × 24) selected.
1, 49	Character font B (9 × 17) selected.

For Japanese model:

n	Function
0, 48	Character font A (12 × 24) selected.
1, 49	Character font B (10 × 24) selected.
2, 50	Character font C (8 × 16) selected.

NOTE: ANK = alphanumeric

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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 ≤ *n* ≤ 13

[Default]   Except for Korean model: *n* = 0
               For Korean model: *n* = 13

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

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

ESC S

[Name]   Select standard mode

[Format]   ASCII   ESC   S
               Hex   1B   53
               Decimal   27   83

[Description] • Switches from page mode to standard mode.

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ESC T *n*

[Name]   Select print direction in page mode

[Format]   ASCII   ESC   T   *n*
              Hex   1B   54   *n*
              Decimal   27   84   *n*

[Range]   0 ≤ *n* ≤ 3 , 48 ≤ *n* ≤ 51

[Default]   *n* = 0

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

n	Print direction	Starting position
0, 48	Left to right	Upper left
1, 49	Bottom to top	Lower left
2, 50	Right to left	Lower right
3, 51	Top to bottom	Upper right

ESC V *n*

[Name]   Turn 90° clockwise rotation mode on/off

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

[Range]   0 ≤ *n* ≤ 2 , 48 ≤ *n* ≤ 50

[Default]   *n* = 0

[Description] • Turns 90° clockwise rotation mode on/off in standard mode.

  • When roll paper is selected:

n	Function
0, 48	Turns off 90° clockwise rotation mode
1, 49 2, 50	Turns on 90° clockwise rotation mode

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

[Name]   Set printing area in page mode

[Format]
	ASCII	ESC	W	*xL*	*xH*	*yL*	*yH*	*dxL*	*dxH*	*dyL*	*dyH*
	Hex	1B	57	*xL*	*xH*	*yL*	*yH*	*dxL*	*dxH*	*dyL*	*dyH*
	Decimal	27	87	*xL*	*xH*	*yL*	*yH*	*dxL*	*dxH*	*dyL*	*dyH*

[Range] $0 \leq (xL + xH \times 256) \leq 65535$ ($0 \leq xL \leq 255$, $0 \leq xH \leq 255$)
$0 \leq (yL + yH \times 256) \leq 65535$ ($0 \leq yL \leq 255$, $0 \leq yH \leq 255$)
$1 \leq (dxL + dxH \times 256) \leq 65535$ ($0 \leq dxL \leq 255$, $0 \leq dxH \leq 255$)
$1 \leq (dyL + dyH \times 256) \leq 65535$ ($0 \leq dyL \leq 255$, $0 \leq dyH \leq 255$)

[Default]
- When the paper layout (the origin of the layout) is set not to use a layout or to "top of the black mark":
  $(xL + xH \times 256) = 0$ ($xL = 0$, $xH = 0$)
  $(yL + yH \times 256) = 0$ ($yL = 0$, $yH = 0$)
  $(dxL + dxH \times 256) = 576$ ($dxL = 64$, $dxH = 2$)
      (when 80 mm through 78 mm of the paper width is selected)
  $(dxL + dxH \times 256) = (256 + ((\text{paper width}) - 38) \times 8)$
      (when 77 mm through 38 mm of the paper width is selected)
  $(dyL + dyH \times 256) = 1476$ ($dyL = 196$, $dyH = 5$)

- When the paper layout (the origin of the layout) is set to "bottom of the label":
  $(xL + xH \times 256) = 0$ ($xL = 0$, $xH = 0$)
  $(yL + yH \times 256) = 0$ ($yL = 0$, $yH = 0$)
  $(dxL + dxH \times 256) = 560$ ($dxL = 48$, $dxH = 2$)
      (when 80 mm of the paper width is selected)
  $(dxL + dxH \times 256) = (256 + ((\text{paper width}) - 38) \times 8)$
      (when 79 mm through 38 mm of the paper width is selected)
  $(dyL + dyH \times 256) = 1476$ ($dyL = 196$, $dyH = 5$)

[Description]
- Sets the position and the size of the printing area.
  - Horizontal starting position = $[(xL + xH \times 256) \times (\text{horizontal motion units})]$.
  - Vertical starting position = $[(yL + yH \times 256) \times (\text{vertical motion units})]$.
  - Horizontal printing area width = $[(dxL + dxH \times 256) \times (\text{horizontal motion units})]$.
  - Vertical printing area width = $[(dyL + dyH \times 256) \times (\text{vertical motion units})]$.

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ESC \ *nL nH*

[Name]   Set relative print position

[Format]   ASCII   ESC   \   *nL*   *nH*
              Hex   1B   5C   *nL*   *nH*
              Decimal   27   92   *nL*   *nH*

[Range] $0 \leq (nL + nH \times 256) \leq 65535$ $(0 \leq nL \leq 255, 0 \leq nH \leq 255)$

[Description] • Sets the print starting position based on the current position to $((nL + nH \times 256) \times$ horizontal or vertical motion units).

   • When $(nL + nH \times 256)$ is a positive number, the print starting position is specified to the right, based on the current position.

   • When $(nL + nH \times 256)$ is a negative number, the print starting position is specified to the left, based on the current position.

ESC a *n*

[Name]   Select justification

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

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

[Default]   *n* = 0

[Description] • In standard mode, aligns all the data in one line to the position specified by *n* as follows:

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

ESC c 3 *n*

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

[Format]   ASCII   ESC   c   3   *n*
                Hex   1B   63   33   *n*
                Decimal   27   99   51   *n*

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

[Default]   *n* = 0

[Description]   • Selects the paper sensor(s) to output paper end signals when a paper end is detected.

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Roll paper near-end sensor disabled.
	On	01	1	Roll paper near-end sensor enabled.
1	Off	00	0	Roll paper near-end sensor disabled.
	On	02	2	Roll paper near-end sensor enabled.
2	Off	00	0	Roll paper end sensor disabled.
	On	04	4	Roll paper end sensor enabled.
3	Off	00	0	Roll paper end sensor disabled.
	On	08	8	Roll paper end sensor enabled.
4 ~ 7	--	--	--	Reserved.

[Notes]   • This command is available only with a parallel interface and is ignored with a serial interface.

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ESC c 4 *n*

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

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

[Range]　　　0 ≤ *n* ≤ 255

[Default]　　　*n* = 0

[Description]　• Selects the paper sensor(s) to use to stop printing when a paper end is detected.

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Roll paper near-end sensor disabled.
	On	01	1	Roll paper near-end sensor enabled.
1	Off	00	0	Roll paper near-end sensor disabled.
	On	02	2	Roll paper near-end sensor enabled.
2 ~ 7	--	--	--	Reserved.

ESC c 5 *n*

[Name]　　　　Enable/disable panel buttons

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

[Range]　　　0 ≤ *n* ≤ 255

[Default]　　　*n* = 0

[Description]　• Enables or disables the panel buttons.
　　　　　　　　• When the LSB of *n* is 0, the panel buttons are enabled.
　　　　　　　　• When the LSB of *n* is 1, the panel buttons are disabled.

[Notes]　　　　• When the printer cover is open, the paper feed function is always ignored, regardless of the setting with this command.

ESC d *n*

[Name]   Print and feed *n* lines

[Format]   ASCII   ESC   d   *n*
                Hex   1B   64   *n*
                Decimal   27   100   *n*

[Range]   0 ≤ *n* ≤ 255

[Description]   • Prints the data in the print buffer and feeds *n* lines.

                • If the paper layout (the origin of the layout) specifies "bottom of the label" or "top of the black mark" in standard mode, the printer executes either one of the following operations when the paper feed amount exceeds the printing area in the vertical layout:

                   • If the maximum height of the characters in one line exceeds the printing area specified in the vertical layout, the printer feeds the paper to the print starting position on the next label and executes the process of this command from the print starting position on the next label.

                   • If the maximum height of the characters in one line does not exceed the printing area specified in the vertical layout, but the paper feed amount exceeds the printing area, the printer executes printing on the current label and feeds the paper to the bottom of the printing area.

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

                • *t1* specifies the pulse ON time as [*t1* × 2 ms], and *t2* specifies the pulse OFF time as [*t2* × 2 ms].

                • If *t2* is smaller than *t1*, OFF time is set as [*t1* × 2 ms].

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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]　　　For a model without Thai character support:　0 ≤ *n* ≤ 5, 16 ≤ *n* ≤ 19 , *n* = 255
　　　　　　　For a model with Thai character support:　　　0 ≤ *n* ≤ 5, 16 ≤ *n* ≤ 26 , *n* = 255

[Default]　　For a model without Thai character support:　*n* = 0
　　　　　　　For a model with Thai character support:　　　*n* = 20

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

n	Selected character code table
0	PC437 (USA: Standard Europe)
1	Katakana
2	PC850 (Multilingual)
3	PC860 (Portuguese)
4	PC863 (Canadian-French)
5	PC865 (Nordic)
16	WPC1252
17	PC866 (Cyrillic #2)
18	PC852 (Latin 2)
19	PC858 (Euro)
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	User defined page

(20 ≤ *n* ≤ 26) is supported only by a model with Thai character support.

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ESC { *n*

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

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

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

[Default]   *n* = 0

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

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

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

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FS (L *pL pH fn [parameter]*

[Name]   Select label and black mark control function(s)
[Description]   Performs the miscellaneous controls for the label or black mark paper printing

- Executes the function specified by *fn*.

fn	Format	Function number	Function
48	**FS (L *pL pH fn m***	Function 48	Transmits the positioning information.
65	**FS (L *pL pH fn m***	Function 65	Feeds paper to the label peeling position.
66	**FS (L *pL pH fn m***	Function 66	Feeds paper to the cutting position.
67	**FS (L *pL pH fn m***	Function 67	Feeds paper to the print starting position.

<Function 48> FS (L *pL pH fn m*   (*fn* = 48)

[Format]   ASCII   FS   (L   *pL*   *pH*   *fn*   *m*
                Hex   1C   28   4C   *pL*   *pH*   *fn*   *m*
                Decimal   28   40   76   *pL*   *pH*   *fn*   *m*

[Range]   ($pL + pH \times 256$) = 2   (pL = 2, pH = 0)
                fn = 48
                m = 48

[Description]   Transmits the positioning information of the label or black mark paper.

Transmission data	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	38H	56	1 byte
Positioning information A	40H – 47H	64 – 71	1 byte
Positioning information B	40H – 43H	64 – 67	1 byte
NUL	00H	0	1 byte

- Positioning information A

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Relationship to the label peeling position: Not at the appropriate peeling position.
	On	01	1	Relationship to the label peeling position: Standby at the peeling position.
1	Off	00	0	Relationship to the cutting position: Not at the appropriate cutting position.
	On	02	2	Relationship to the cutting position: Standby at the cutting position.
2	Off	00	0	Relationship to the print starting position: Not at the print starting position.
	On	04	4	Relationship to the print starting position: Standby at the print starting position.
3 – 5	Off	00	0	Reserved.
6	On	40	64	Fixed to On.
7	Off	00	0	Fixed to Off.

- Positioning information B

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Possible to feed to the current print starting position.
	On	01	1	Impossible to feed to the current print starting position.
1	Off	00	0	Possible to feed to the next print starting position.
	On	02	2	Impossible to feed to the next print starting position.
2 – 5	Off	00	0	Reserved.
6	On	40	64	Fixed to On.
7	Off	00	0	Fixed to Off.

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<Function 65> FS (L *pL pH fn m*   (*fn* = 65)

[Format]
	ASCII	FS	(	L	*pL*	*pH*	*fn*	*m*
	Hex	1C	28	4C	*pL*	*pH*	*fn*	*m*
	Decimal	28	40	76	*pL*	*pH*	*fn*	*m*

[Range] $(pL + pH \times 256) = 2$ $(pL = 2, pH = 0)$
fn = 65
m = 48, 49

[Function]   Feeds paper to the label peeling position.

m	Function
48	Feeds paper to the label peeling position. However, if the paper has been in the standby position to peel the label, the printer does not feed.
49	Feeds paper to the label peeling position. However, if the paper has been in the standby position to peel the label, the printer feeds paper to the next label peeling position.

<Function 66> FS (L *pL pH fn m*   (*fn* = 66)

[Format]
	ASCII	FS	(	L	*pL*	*pH*	*fn*	*m*
	Hex	1C	28	4C	*pL*	*pH*	*fn*	*m*
	Decimal	28	40	76	*pL*	*pH*	*fn*	*m*

[Range] $(pL + pH \times 256) = 2$ $(pL = 2, pH = 0)$
fn = 66
m = 48, 49

[Function]   Feeds paper to the cutting position.

m	Function
48	Feeds paper to the cutting position. However, if the paper has been in the standby position to cut the paper, the printer does not feed.
49	Feeds paper to the cutting position. However, if the paper has been in the standby position to cut the paper, the printer feeds paper to the next cutting position.

<Function 67> **FS (L *pL pH fn m*** (*fn* = 67)

[Format]   ASCII   FS   (L   *pL*   *pH*   *fn*   *m*
           Hex   1C   28   4C   *pL*   *pH*   *fn*   *m*
           Decimal 28   40   76   *pL*   *pH*   *fn*   *m*

[Range]   (pL + $pH \times 256$) = 2   (pL = 2, pH = 0)
           fn = 67
           $48 \leq m \leq 50$

[Function]   Feeds paper to the print starting position.

m	Function
48	Feeds paper to the print starting position on the next label. However, if the paper has been in the standby position to start printing, the printer does not feed.
49	Feeds paper to the print starting position on the next label. However, if the paper has been in the standby position to start printing, the printer feeds paper to the next label peeling position.
50	Feeds paper to the print starting position on the current label. However, if the paper has been in the standby position to start printing, the printer does not feed.

- The current label is defined as the print area of either the label or black mark as follows:
  - The print area whose print starting position is located directly below the peeling position after executing Function 65.
  - The print area whose print starting position is located directly below the cutting position after executing Function 66.
  - The print area at which the print starting position currently is set.
  - The print area at which the print head is located, except the one above.
- The next label is defined as the print area on the next label after the current label or black mark sheet.

GS ! *n*

[Name]   Select character size

[Format]   ASCII   GS   !   *n*
            Hex   1D   21   *n*
            Decimal   29   33   *n*

[Range]   0 ≤ *n* ≤ 255
            (where 1 ≤ Enlargement in vertical direction ≤ 8,
            1 ≤ Enlargement in horizontal direction ≤ 8)

[Default]   *n* = 0

[Description]   • Selects character size (enlargement in vertical and horizontal directions).

Bit	Function	Setting
0		
1	Specifies the number of times to be enlarged in the vertical direction.	Refer to Table 2 [Enlargement in vertical direction]
2		
3		
4		
5	Specifies the number of times to be enlarged in the horizontal direction.	Refer to Table 1 [Enlargement in horizontal direction]
6		
7		

Table 1
[Enlargement in horizontal direction]

Hex	Decimal	Enlargement
00	0	1 time (standard)
10	16	2 times
20	32	3 times
30	48	4 times
40	64	5 times
50	80	6 times
60	96	7 times
70	112	8 times

Table 2
[Enlargement in vertical direction]

Hex	Decimal	Enlargement
00	0	1 time (standard)
01	1	2 times
02	2	3 times
03	3	4 times
04	4	5 times
05	5	6 times
06	6	7 times
07	7	8 times

GS $ *nL nH*

[Name]   Set absolute vertical print position in page mode

[Format]

ASCII	GS	$	*nL*	*nH*
Hex	1D	24	*nL*	*nH*
Decimal	29	36	*nL*	*nH*

[Range] $0 \le (nL + nH \times 256) \le 65535$ $(0 \le nL \le 255, 0 \le nH \le 255)$

[Description] • Sets the absolute vertical print starting position to $[(nL + nH \times 256) \times$ (vertical or horizontal motion units)] in page mode.

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] $(pL + pH \times 256) = 2$ $(pL = 2, pH = 0)$
$0 \le n \le 2, 48 \le n \le 50$
$1 \le m \le 3, 49 \le m \le 51, m = 64$

[Description] • Executes a test print with a specified test pattern on a specified paper type (roll paper).

        • *n* specifies the paper type as listed below to be tested:

n	Target paper source
0, 48 1, 49 2, 50	Roll paper

        • *m* specifies a test pattern as listed below:

m	Test pattern
1, 49	Hexadecimal dump
2, 50	Printer status print
3, 51	Rolling pattern print
64	Automatic paper layout setting mode function

    • When automatic paper layout setting mode function (*m* = 64) is performed, the paper layout specified with Function 49 of **GS (E** is canceled.

[Notes]   • The printer executes a hardware reset after the procedure to place the image into the non-volatile memory. The printer clears the receive and print buffers, and resets all settings (user-defined characters, macros, and the character style) to the mode that was in effect at power on.

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GS (C *pL pH m fn b [c1 c2] [d1...dk]*

[Name] Edit NV user memory

[Description] • Deletes, stores, and moves data in the NV user memory specified by the function code *fn*.

fn	Format	Function number	Function
0, 48	**GS (C *pL pH m fn b c1 c2***	Function 0	Deletes the specified record.
1, 49	**GS (C *pL pH m fn b c1 c2 d1...dk***	Function 1	Stores data in the specified record.
2, 50	**GS (C *pL pH m fn b c1 c2***	Function 2	Sends the data in the specified record.
3, 51	**GS (C *pL pH m fn b***	Function 3	Sends the number of bytes of memory used.
4, 52	**GS (C *pL pH m fn b***	Function 4	Sends the number of bytes of remaining memory (unused area).
5, 53	**GS (C *pL pH m fn b***	Function 5	Transmits the key code list identifying the stored record.
6, 54	**GS (C *pL pH m fn b d1 d2 d3***	Function 6	Deletes all data in the NV user memory.

• *pL*, *pH* specify ($pL + pH \times 256$) for the number of bytes after *pH* (*m, fn, b, [c1 c2], [d1...dk]*).

• *c1*, *c2* specify the key code (which identifies the record).

• The total capacity of the NV user memory is selectable as any one of these: [1KB, 64KB, 128KB, or 192KB] with **GS (E**.   The default capacity is 1KB.

[Notes] • Frequent write command executions by this command may damage the NV memory. Therefore, it is recommended to write to the NV memory no more than 10 times a day.

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

<Function 0> **GS (C *pL pH m fn b c1 c2*** (*fn* = 0, 48)

[Format]

	ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*
	Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*
	Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*

[Range] $(pL + pH \times 256) = 5$ $(pL = 5, pH = 0)$
$m = 0$
$fn = 0, 48$
$b = 0$
$32 \leq c1 \leq 126$
$32 \leq c2 \leq 126$

[Description] • Deletes the record specified by *c1* and *c2* in the NV user memory.

<Function 1> **GS (C *pL pH m fn b c1 c2 d1...dk*** (*fn* = 1, 49)

[Format]

	ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*	*d1...dk*
	Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*	*d1...dk*
	Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*	*d1...dk*

[Range] $6 \leq (pL + pH \times 256) \leq 65535$ $(0 \leq pL \leq 255, 0 \leq pH \leq 255)$
$m = 0$
$fn = 1, 49$
$b = 0$
$32 \leq c1 \leq 126$
$32 \leq c2 \leq 126$
$32 \leq d \leq 254$
$k = (pL + pH \times 256) - 5$

[Description] • Stores the data in the record specified by *c1* and *c2* in the NV user memory.

• The new data overwrites the data already stored, if there is data already stored.

<Function 2> **GS (C *pL pH m fn b c1 c2*** (*fn* = 2, 50)

[Format]

	ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*
	Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*
	Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*	*c1*	*c2*

[Range] $(pL + pH \times 256) = 5$ (*pL* = 5, *pH* = 0)
$m = 0$
fn = 2, 50
$b = 0$
$32 \le c1 \le 126$
$32 \le c2 \le 126$

[Description] • Transmits data for the record specified by *c1*, *c2* in the NV user memory.

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	70H	112	1 byte
Status	40H or 41H	64 or 65	0 through 80 bytes
Data	20H – FEH	32– 254	1 byte
NUL	00H	0	1 byte

• If the specified record cannot be detected, the following data is transmitted:

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	70H	112	1 byte
Status	40H	64	1 byte
NUL	00H	0	1 byte

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- After the [Header – NUL] is transmitted, the printer receives a response from the host; then it performs the process defined in the response. (See the tables below.)

When the status (existence of the next data block) is
Hexadecimal = 41H / Decimal = 65

Response		Process performed
ASCII	Decimal	
ACK	6	Transmits the next data.
NAK	21	Transmits the previous data again.
CAN	24	Ends the process.

When the status (existence of the last data block) is
Hexadecimal = 40H / Decimal = 64

Response		Process performed
ASCII	Decimal	
ACK	6	Ends the process.
NAK	21	Transmits the previous data again.
CAN	24	Cancels the process.

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<Function 3> GS (C *pL pH m fn b*   (*fn* = 3, 51)

[Format]   ASCII   GS   (C   *pL*   *pH*   *m*   *fn*   *b*
Hex   1D   28   43   *pL*   *pH*   *m*   *fn*   *b*
Decimal   29   40   67   *pL*   *pH*   *m*   *fn*   *b*

[Range] $(pL + pH \times 256) = 3$ $(pL = 3, pH = 0)$
$m = 0$
fn = 3, 51
$b = 0$

[Description] • Transmits the number of bytes of memory used in the NV user memory.

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	28H	40	1 byte
Number of bytes of memory used	30H – 39H	48 – 57	1 – 6 bytes
NUL	00H	0	1 byte

<Function 4> GS (C *pL pH m fn b*   (*fn* = 4, 52)

[Format]   ASCII   GS   (C   *pL*   *pH*   *m*   *fn*   *b*
Hex   1D   28   43   *pL*   *pH*   *m*   *fn*   *b*
Decimal   29   40   67   *pL*   *pH*   *m*   *fn*   *b*

[Range] $(pL + pH \times 256) = 3$ $(pL = 3, pH = 0)$
$m = 0$
fn = 4, 52
$b = 0$

[Description] • Transmits the number of bytes of remaining memory (unused area) in the NV user memory.

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	29H	41	1 byte
Number of bytes of remaining memory	30H – 39H	48 – 57	1 – 6 bytes
NUL	00H	0	1 byte

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<Function 5> **GS (C *pL pH m fn b*** (*fn* = 5, 53)

[Format]	ASCII	GS	(	C	*pL*	*pH*	*m*	*fn*	*b*
	Hex	1D	28	43	*pL*	*pH*	*m*	*fn*	*b*
	Decimal	29	40	67	*pL*	*pH*	*m*	*fn*	*b*

[Range] (*pL* + *pH* × 256) = 3   (*pL* = 3 , *pH* = 0)
m = 0
fn = 5, 53
b = 0

[Description] • Transmits the key code list identifying the stored record.

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	71H	113	1 byte
Status	40H or 41H	64 or 65	1 bytes
Data	20H – FEH	32 – 254	2 – 80 bytes
NUL	00H	0	1 byte

　• Data consists of the data groups identified with key codes.

• If the specified record cannot be detected, the contents of the transmitted data are as follows:

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	71H	113	1 byte
Status	40H	64	1 bytes
NUL	00H	0	1 byte

• After the [Header – NUL] is transmitted, the printer receives a response from the host; then it performs the process defined by the response. (See the tables below.)

When the status (existence of the next data block) is
Hexadecimal = 41H / Decimal = 65

Response		Process performed
ASCII	Decimal	
ACK	6	Transmits the next data.
NAK	21	Transmits the previous data again.
CAN	24	Ends the process.

When the status (for the last data block) is
Hexadecimal = 40H / Decimal = 64

Response		Process performed
ASCII	Decimal	
ACK	6	Ends the process.
NAK	21	Transmits the previous data again.
CAN	24	Cancels the process.

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<Function 6> **GS (C pL pH m fn b d1 d2 d3**   (*fn* = 6, 54)

[Format]	ASCII	GS	(	C	pL	pH	m	fn	b	d1	d2	d3
	Hex	1D	28	43	pL	pH	m	fn	b	d1	d2	d3
	Decimal	29	40	67	pL	pH	m	fn	b	d1	d2	d3

[Range] $(pL + pH \times 256) = 6$ $(pL = 6, pH = 0)$
            $m = 0$
            $fn = 6, 54$
            $b = 0$
            $d1 = 67$
            $d2 = 76$
            $d3 = 82$

[Description] • Deletes all data in the NV user memory.

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GS (D *pL pH m [a1 b1]...[ak bk]*

[Name]	Enable/disable real-time command

[Format]

	ASCII	GS	(	D	*pL*	*pH*	*m*	*[a1 b1]...[ak bk]*
	Hex	1D	28	44	*pL*	*pH*	*m*	*[a1 b1]...[ak bk]*
	Decimal	29	40	68	*pL*	*pH*	*m*	*[a1 b1]...[ak bk]*

[Range] $3 \le (pL + pH \times 256) \le 65535$
         m = 20
         a = 1, 2
         b = 0, 1, 48, 49

[Default]

a	Type(s) of real-time commands	Default
1	**DLE DC4 *fn m t*** (*fn* = 1): Generate pulse in real time	Enabled (*b* = 1)
2	**DLE DC4 *fn a b*** (*fn* = 2): Execute power-off sequence	Disabled (*b* = 0)

[Description]   Enables or disables the following real-time commands.

a	*b*	Function
1	0, 48	**DLE DC4 *fn m t*** (*fn* = 1): Not processed (disabled)
	1, 49	**DLE DC4 *fn m t*** (*fn* = 1): Processed (enabled)
2	0, 48	**DLE DC4 *fn a b*** (*fn* = 2): Not processed (disabled)
	1, 49	**DLE DC4 *fn a b*** (*fn* = 2): Processed (enabled)

- *pL*, *pH* specify (*pL*+ *pH* × 256) as the number of bytes after *pH* (*m* and *[a1 b1]…[ak bk]*).
- *a* specifies the type of real-time command.
- *b* specifies enabled or disabled.

[Note]   • If bit image data accidentally includes a character string containing a real-time command, it is recommended to use this command in advance to disable the real-time commands.

EPSON	TITLE	**TM-L90** Specification (STANDARD)	SHEET REVISION	NO.	
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GS (E *pL pH fn [parameter]*

[Name] User setup commands

[Description] • Customizes the NV user memory area. The table below explains the functions available in this command. The printer executes commands related to the user setting mode that are made by specifying the function code *fn*.

fn	Format	No.	Function
1	**GS (E *pL pH fn d1 d2***	1	Changes into the user setting mode.
2	**GS (E *pL pH fn d1 d2 d3***	2	Ends the user setting mode session (performs a soft reset).
3	**GS (E *pL pH fn [a1 b18...b11]… [ak bk8...bk1]***	3	Sets value(s) for the memory switch.
4	**GS (E *pL pH fn a***	4	Transmits the settings of the memory switch to the host.
5	**GS (E *pL pH fn [a1 n1L n1H]… [ak nkL nkH]***	5	Sets the customized value(s).
6	**GS (E *pL pH fn a***	6	Transmits the customized value settings.
7	**GS (E *pL pH fn a d1 d2***	7	Copies the user-defined page.
8	**GS (E *pL pH fn y c1 c2 [x d1… d(y × x)]k***	8	Defines data in column format for the character code page in the active area.
9	**GS (E *pL pH fn x c1 c2 [y d1… d(y × x)]k***	9	Defines data in raster format for the character code page in the active area.
10	**GS (E *pL pH fn c1 c2***	10	Deletes the data in the character code page in the active area.
11	**GS (E *pL pH fn a d1...dk***	11	Sets the communication conditions for the serial interface.
12	**GS (E *pL pH fn a***	12	Transmits the communication conditions for the serial interface.
48	**GS (E *pL pH fn m***	48	Deletes the paper layout.
49	**GS (E *pL pH fn sa ; sb ; sc ; sd ; se ; sf ; sg ; sh ;***	49	Sets the paper layout.
50	**GS (E *pL pH fn m***	50	Transmits the paper layout information.

 • *pL*, *pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* (*fn* and *[parameter]*).

- The user setting mode is a special mode to change the values in the NV user memory with this command.

- In Function 2, the printer performs a software reset. Therefore, the printer clears the receive and print buffers, and resets all settings (user-defined characters, macros, and the character style) to the mode in effect at power on.

- The customized values can be reviewed with Function 4, 6, 12, or 50, even though the printer does not enter the user setting mode.

[Notes]
- Frequent write commands by this command, may damage the NV memory. Therefore, it is recommended to write to NV memory no more than 10 times a day.

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

<Function 1> GS (E *pL pH fn d1 d2*   (*fn* = 1)

[Format]
	ASCII	GS	(	E	*pL*	*pH*	*fn*	*d1*	*d2*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*d1*	*d2*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*d1*	*d2*

[Range] $(pL + pH \times 256) = 3$ $(pL = 3, pH = 0)$
fn = 1
d1 = 73
d2 = 78

[Description]
- Enters the user setting mode and notifies the host that the mode has changed.

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	20H	32	1 byte
NUL	00H	0	1 byte

- The following commands are enabled in the user setting mode.
  Function 2 through Function 12 and Function 48 through Function 50 of **GS (E**, **GS I**

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<Function 2> **GS (E *pL pH fn d1 d2 d3*** (*fn* = 2)

[Format]	ASCII	GS	(	E	*pL*	*pH*	*fn*	*d1*	*d2*	*d3*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*d1*	*d2*	*d3*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*d1*	*d2*	*d3*

[Range] $(pL + pH \times 256) = 4$ (*pL* = 4 , *pH* = 0)
 fn = 2
 d1 = 79
 d2 = 85
 d3 = 84

[Description] • Ends the user setting mode and performs a software reset.   Therefore, the printer clears the receive and print buffers, and resets all settings (user-defined characters, downloaded bit images, macros, and the character style) to the mode that was in effect at power on.

  • This function code (*fn* = 2) is enabled only in the user setting mode.

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<Function 3> GS (E *pL pH fn [a1 b18...b11]...[ak bk8...bk1]*   (*fn* = 3)

[Format]	ASCII	GS	(	E	*pL*	*pH*	*fn*	*[a1*	*b18 ... b11]*	*... [ak*	*bk8 ... bk1]*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*[a1*	*b18 ... b11]*	*... [ak*	*bk8 ... bk1]*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*[a1*	*b18 ... b11]*	*... [ak*	*bk8 ... bk1]*

[Range] $10 \le (pL + pH \times 256) \le 65535$
fn = 3
a = 1, 2, 8
b = 48, 49, 50

[Default]   Msw 2-2, and Msw 8-8 are set to On (*b* = 49) and all other switches are set to Off (*b* = 48).

[Description]   • Changes the memory switch specified by *a* to the values specified by *b*.
   • When *b* = 48, the applicable bit is turned to Off.
   • When *b* = 49, the applicable bit is turned to On.
   • When *b* = 50, the applicable bit is not changed.

   • When *a* =1, memory switch 1 is set as follows:

Bit	Setting value (*b*)	Function
1	48	Does not transmit the power ON information.
	49	Transmits the power ON information.
2	48	Sets the receive buffer as 4KB.
	49	Sets the receive buffer as 45 bytes.
3	48	Condition for BUSY: Receive buffer full or offline
	49	Condition for BUSY: Receive buffer full
4	48	Data processing for receiving error: Prints "?"
	49	Data processing for receiving error: Ignored.
5	48	Automatic line feed: Disabled.
	49	Automatic line feed: Enabled.
6	50	Reserved.
7	48	Pin #6: selection of reset signal: Not used.
	49	Pin #6: selection of reset signal: Used.
8	48	Pin #25: selection of reset signal: Not used.
	49	Pin #25: selection of reset signal: Used.

   • The power ON information consists of the following data:

	Hexadecimal	Decimal	Amount of data
Header	3BH	59	1 byte
Flag	31H	49	1 byte
NUL	00H	0	1 byte

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- When *a* =2, memory switch 2 is set as follows:

Bit	Setting value (*b*)	Function
1	50	Reserved.
2	48	Autocutter is installed.
	49	Autocutter is not installed.
3 – 8	50	Reserved.

- When *a* =8, memory switch 8 is set as follows:

Bit	Setting value (*b*)	Function
1 – 3	50	Reserved.
4	48	Sets the maximum length of automatic paper measurement to 160 mm.
	49	Sets the maximum length of automatic paper measurement to 300 mm.
5	48	Does not enable left or right margin of bar code print.
	49	Enables left or right margin of bar code print.
6	48	Performs the print starting positioning operation at power on.
	49	Does not perform the print starting positioning operation at power on.
7	50	Reserved.
8	48	Printer cover open during operation: Error that automatically recovers.
	49	Printer cover open during operation: Error that can possibly recover.

- This function code (*fn* = 3) is enabled only in the user setting mode.

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\<Function 4\> **GS (E *pL pH fn a***   (*fn* = 4)

[Format]
ASCII	GS	(	*E*	*pL*	*pH*	*fn*	*a*
Hex	1D	28	*45*	*pL*	*pH*	*fn*	*a*
Decimal	29	40	*69*	*pL*	*pH*	*fn*	*a*

[Range] $(pL + pH \times 256) = 2$ $(pL = 2 , pH = 0)$
           fn = 4
           a = 1, 2, 8

[Description] • Transmits the setting value(s) of the memory switch specified by *a*.

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	21H	33	1 byte
Data	30H or 31H	48 or 49	8 bytes
NUL	00H	0	1 byte

      • Data for the setting is transmitted as 8 bytes or a data string in the order from bit 8 to bit 1, as follows:
          Off: Hexadecimal = 30H / Decimal = 48
          On: Hexadecimal = 31H / Decimal = 49

\<Function 5\> **GS (E *pL pH fn [a1 n1L n1H]...[ak nkL nkH]***   (*fn* = 5)

[Format]
ASCII	GS	(	E	*pL*	*pH*	*fn*	*[a1*	*n1L*	*n1H]* ...	*[ak*	*nkL*	*nkH]*
Hex	1D	28	45	*pL*	*pH*	*fn*	*[a1*	*n1L*	*n1H]* ...	*[ak*	*nkL*	*nkH]*
Decimal	29	40	69	*pL*	*pH*	*fn*	*[a1*	*n1L*	*n1H]* ...	*[ak*	*nkL*	*nkH]*

[Range] $4 \leq (pL + pH \times 256) \leq 65533$
           fn = 5
           a = 1, 2, 5, 6, 97, 116, 117
           $1 \leq (nL + nH \times 256) \leq 65535$

[Default]
When *a* = 1: $(nL + nH \times 256) = 1$
When *a* = 2: $(nL + nH \times 256) = 7$
When *a* = 5: $(nL + nH \times 256) = 0$
When *a* = 6: $(nL + nH \times 256) = 6$
When *a* = 97: $(nL + nH \times 256) = 1$
When *a* = 116: $(nL + nH \times 256) = 1$
When *a* = 117: $(nL + nH \times 256) = 80$
When *a* = 118: $(nL + nH \times 256) = 85$

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[Description] • Changes the setting of the customized value that is specified with *a* as ($nL + nH \times 256$).

a	Function
1	Specifies the capacity of the NV user memory.
2	Specifies the capacity of the NV graphics memory.
5	Selects the print density.
6	Selects the print speed.
97	Selects the number of parts used for head energizing
116	Selects the type of paper (single-color or two-color).
117	Selects the paper width.
118	Selects the black-color density in two-color printing.

• When *a* = 1, the capacity of the NV user memory is selected as the size specified with ($nL + nH \times 256$).

Value of ($nL + nH \times 256$)	Memory size
1	1KB
2	64KB
3	128KB
4	192KB

• When *a* = 2, the capacity of the NV graphics memory is selected as the size specified with ($nL + nH \times 256$).

Value of ($nL + nH \times 256$)	Memory size
1	None
2	64KB
3	128KB
4	192KB
5	256KB
6	320KB
7	384KB

• The combinations that can be specified for the NV user memory capacity and the NV bit image capacity are as shown in the table below. Even if the printer receives an impossible combination, the printer automatically sets a possible combination for each memory size.

Memory size of NV user memory	Memory size of NV bit image memory
1KB	384KB or less
64KB	256KB or less
128KB	128KB or less
192KB	0

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- When a = 5, the print density is selected as the level specified with (nL + $nH \times 256$).

Value of (nL + $nH \times 256$)	Print density
65530	70 %
65531	75 %
65532	80 %
65533	85 %
65534	90 %
65535	95 %
0	100 %
1	105 %
2	110 %
3	115 %
4	120 %
5	125 %
6	130 %
7	135 %
8	140 %

- When a = 6, the print speed is selected as the level specified with (nL + $nH \times 256$).

Value of (nL + $nH \times 256$)	Print speed level
1	Print speed level 1 (the lowest speed: slow)
2	Print speed level 2
3	Print speed level 3
4	Print speed level 4
5	Print speed level 5
6	Print speed level 6
7	Print speed level 7
8	Print speed level 8
9	Print speed level 9 (the highest speed: fast)

- When *a* = 97, the number of parts for head energizing is set to the number specified with (*nL* + *nH* × 256).

Value of (*nL* + *nH* × 256)	Number of parts for head energizing
1	One-part energizing
2	Two-part energizing
3	Three-part energizing
4	Four-part energizing

- When *a* = 116, the paper is selected as the paper specified with (*nL* + *nH* × 256).

Value of (*nL* + *nH* × 256)	Paper
1	Single-color paper
257	Two-color paper

- When *a* = 117, the paper width is selected as the size specified with (*nL* + *nH* × 256).

Value of (*nL* + *nH* × 256)	Paper width
38	38 mm {1.50"}
39	39 mm {1.54"}
:	:
79	79 mm {3.11"}
80	80 mm {5.15"}

  Total 43 kinds of paper width that is from 38 mm {1.50"} to 80 mm {3.15"} can be set for the selection of the paper width, however the range of 71 to 79 m {2.80 to 3.11"} of the paper width cannot be used because of the thickness of the paper roll spacer.

- When *a* = 118, the black-color density is selected as the number specified with (*nL* + *nH* × 256).

(*nL* + *nH* × 256)	Black-color density
70	Light
85	Medium
100	Dark

  - Adjustment of black-color density:
    The black-color density is affected only in two-color printing.
    This is not affected for single-color printing.

- This function code *fn* = 5 is enabled only in the user setting mode.

- The values that were changed with this command become effective with the following:
  - Execution of Function 2 of this command (recommended)
  - Turning the power on again
  - Hardware reset by the RESET signal input through the interface

- The density of printing with four-part energizing on the two-color paper may not be changed.

- To improve the quality of two-color printing, it is recommended to print with two-part energizing.

<Function 6> **GS (E *pL pH fn a*** (*fn* = 6)

[Format]   ASCII   GS   (E   *pL*   *pH*   *fn*   *a*
           Hex   1D   28   45   *pL*   *pH*   *fn*   *a*
           Decimal   29   40   69   *pL*   *pH*   *fn*   *a*

[Range]   (*pL* + *pH* × 256) = 2   (*pL* = 2, *pH* = 0)
           fn = 6
           a = 1, 2, 5, 6, 97, 116, 117, 118

[Description] • Transmits the customized value corresponding to the number specified by *a*.

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	27H	39	1 byte
Customized value number	30H – 39H	48 – 57	1 – 3 bytes
Separator	1FH	31	1 byte
Customized value	30H – 39H	48 – 57	1 – 5 bytes
NUL	00H	0	1 byte

• The customized value number is as follows:

	Transmission data		
	1st byte	2nd byte	3rd byte
1	49	--	--
2	50	--	--
5	53	--	--
6	54	--	--
97	57	55	--
116	49	49	54
117	49	49	55
118	49	49	56

• Configuration of the customized value
  • When the NV user memory capacity (*a* = 1) is specified:

Setting status		Transmission data				
Data to be stored	Memory capacity	1st byte	2nd byte	3rd byte	4th byte	5th byte
1	1KB	49	--	--	--	--
2	64KB	50	--	--	--	--
3	128KB	51	--	--	--	--
4	192KB	52	--	--	--	--

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- When the NV graphics memory capacity (*a* = 2) is specified:

Setting status		Transmission data				
Data to be stored	Memory capacity	1st byte	2nd byte	3rd byte	4th byte	5th byte
1	None	49	--	--	--	--
2	64KB	50	--	--	--	--
3	128KB	51	--	--	--	--
4	192KB	52	--	--	--	--
5	256KB	53	--	--	--	--
6	320KB	54	--	--	--	--
7	384KB	55	--	--	--	--

- When the print density (*a* = 5) is specified:

Setting status		Transmission data				
Data to be stored	Print density	1st byte	2nd byte	3rd byte	4th byte	5th byte
65530	70%	54	53	53	51	48
65531	75 %	54	53	53	51	49
65532	80 %	54	53	53	51	50
65533	85 %	54	53	53	51	51
65534	90 %	54	53	53	51	52
65535	95%	54	53	53	51	53
0	Standard density	48	--	--	--	--
1	105 %	49	--	--	--	--
2	110 %	50	--	--	--	--
3	115 %	51	--	--	--	--
4	120 %	52	--	--	--	--
5	125 %	53	--	--	--	--
6	130 %	54	--	--	--	--
7	135 %	55	--	--	--	--
8	140 %	56	--	--	--	--

- When the print speed (*a* = 6) is specified:

Setting status		Transmission data				
Data to be stored	Memory capacity	1st byte	2nd byte	3rd byte	4th byte	5th byte
1	Speed level 1	49	--	--	--	--
2	Speed level 2	50	--	--	--	--
3	Speed level 3	51	--	--	--	--
4	Speed level 4	52	--	--	--	--
5	Speed level 5	53	--	--	--	--
6	Speed level 6	54	--	--	--	--
7	Speed level 7	55	--	--	--	--
8	Speed level 8	56	--	--	--	--
9	Speed level 9	57	--	--	--	--

- When the number of parts for head energizing (*a* = 97) is specified:

Setting status		Transmission data				
Data to be stored	Number of parts	1st byte	2nd byte	3rd byte	4th byte	5th byte
1	One-part energizing	49	--	--	--	--
2	Two-part energizing	50	--	--	--	--
3	Three-part energizing	51	--	--	--	--
4	Four-part energizing	52	--	--	--	--

- When the type of paper (*a* = 116) is specified:

Setting status		Transmission data				
Data to be stored	Print control method	1st byte	2nd byte	3rd byte	4th byte	5th byte
1	Single-color paper	49	--	--	--	--
257	Two-color paper	50	53	55	--	--

- When the paper width (*a* = 117) is specified:

Setting status		Transmission data				
Data to be stored	Paper width	1st byte	2nd byte	3rd byte	4th byte	5th byte
38	38 mm {1.50"}	51	56	--	--	--
39	39 mm {1.54"}	51	57	--	--	--
:	:	:	:	--	--	--
79	79 mm {3.11"}	55	57	--	--	--
80	80 mm {3.15"}	56	48	--	--	--

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- When black-color density (*a* = 118) is specified for two-color:

Setting status		Transmission data		
Data to be stored	Black-color density	1st byte	2nd byte	3rd byte
70	Light	55	48	--
85	Medium	56	53	--
100	Dark	49	48	48

<Function 7> **GS (E *pL pH fn a d1 d2***   (*fn* = 7)

[Format]

ASCII	GS	(	E	*pL*	*pH*	*fn*	*a*	*d1*	*d2*
Hex	1D	28	45	*pL*	*pH*	*fn*	*a*	*d1*	*d2*
Decimal	29	40	69	*pL*	*pH*	*fn*	*a*	*d1*	*d2*

[Range]   ($pL + pH \times 256$) = 4   (*pL* = 4, *pH* = 0)
        fn = 7
        a = 10,12, 17, 18
        ((*a* = 17, 18) is enabled or (*a* = 10) is disabled only for Japanese model)

[Description] • Copies the data on the user-defined code page specified with *a*.

Font no. (*a*)	Font type	Data configuration	
		Number of dots in horizontal direction	Number of dots in vertical direction
10	9×17	9	17
12	12×24	12	24
17	8×16	8	16
18	10×24	10	24

d1	*d2*	Function
31	30	Loads the character code page data of the font specified with *a* in the storage area to the active area.
30	31	Saves the character code page data in the active area to the storage area specified by the font specified with *a*.

- Active area: Volatile memory (RAM)
- Storage area: Non-volatile memory (Flash ROM)
- User-defined code page: Page 255 (space page)

- This function code *fn* = 7 is enabled only in the user setting mode.

<Function 8> **GS (E *pL pH fn y c1 c2 [x d1...d(y × x)]k*** (*fn* = 8)

[Format]

	ASCII	GS	(	E	*pL*	*pH*	*fn*	*y*	*c1*	*c2*	[*x*	*d1...d(y × x)]k*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*y*	*c1*	*c2*	[*x*	*d1...d(y × x)]k*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*y*	*c1*	*c2*	[*x*	*d1...d(y × x)]k*

[Range] $5 \le (pL + pH \times 256) \le 65535$

fn = 8

y = 3 (when font A (12 × 24), font B (9 × 17), or Japanese font B (10 × 24) is selected)

y = 2 (when Japanese font C (8 × 16) is selected)

$128 \le c1 \le c2 \le 255$

$0 \le x \le 12$ (when font A (12 × 24) is selected)

$0 \le x \le 9$ (when font B (9 × 17) is selected)

$0 \le x \le 10$ (when Japanese font B (10 × 24) is selected)

$0 \le x \le 8$ (when Japanese font C (8 × 16) is selected)

$0 \le d \le 255$

k = *c2* - *c1* + 1

[Description]   • Defines the data for each character in the character code page in the active area (RAM).

   • The character pattern is defined as the column type.

   • This function code *fn* = 8 is enabled in the user setting mode.

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- The data configuration is as follows
  Example: 9 dots horizontally × 17 dots vertically:

	d1 *d3*	*d4* *d6*	*d7* *d9*	*d10* *d12*	*d13* *d15*	*d16* *d18*	*d19* *d21*	*d22* *d24*	*d25* *d27*
Bit7	O	O	O	O	O	O	O	O	O
Bit6	O	O	O	O	O	O	O	O	O
Bit5	O	O	O	O	O	O	O	O	O
Bit4	O	O	O	O	O	O	O	O	O
Bit3	O	O	O	O	●	●	O	O	O
Bit2	O	O	●	●	O	●	O	O	O
Bit1	O	●	O	●	O	O	O	O	O
Bit0	●	●	●	●	●	●	O	O	O
Bit7	O	O	O	O	O	O	O	O	O
Bit6	O	O	O	O	O	O	O	O	O
Bit5	O	O	O	O	O	O	O	O	O
Bit4	O	O	O	O	O	O	O	O	O
Bit3	O	O	O	●	●	●	O	O	O
Bit2	O	●	●	O	O	●	O	O	O
Bit1	●	O	●	O	●	O	O	O	O
Bit0	O	O	O	O	O	O	O	O	O
Bit7	O	O	O	O	O	O	O	O	O
Bit6	O	O	O	O	O	O	O	O	O
Bit5	O	O	O	O	O	O	O	O	O
Bit4	O	O	O	O	O	O	O	O	O
Bit3	O	O	O	●	●	●	O	O	O
Bit2	O	●	●	O	O	●	O	O	O
Bit1	●	O	●	O	●	O	O	O	O
Bit0	O	O	O	O	O	O	O	O	O

← Only bit 7 is printed.
Even if "1" is specified for any bit from 6 to 0, it is not printed.

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<Function 9> **GS (E** *pL pH fn x c1 c2 [y d1...d(x × y)]k* (*fn* = 9)

[Format]	ASCII	GS	(	E	*pL*	*pH*	*fn*	*x*	*c1*	*c2*	*[y d1...d(x × y)]k*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*x*	*c1*	*c2*	*[y d1...d(x × y]k*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*x*	*c1*	*c2*	*[y d1...d(x × y)k*

[Range] $5 \leq (pL + pH \times 256) \leq 65535$

fn = 9

x = 2 (when font A (12 × 24), font B (9 × 17), or Japanese font B (10 × 24) is selected)

x = 1 (when Japanese font C (8 × 16) is selected)

$128 \leq c1 \leq c2 \leq 255$

$0 \leq y \leq 24$ (when font A (12 × 24) is selected)

$0 \leq y \leq 17$ (when font B (9 × 17) is selected)

$0 \leq y \leq 24$ (when Japanese font B (10 × 24) is selected)

$0 \leq y \leq 16$ (when Japanese font C (8 × 16) is selected)

$0 \leq d \leq 255$

k = *c2* – *c1* + 1

[Description] • Defines the data for each character in the character code page in the active area (RAM).

   • The character pattern is defined as the raster type.

 • This function code *fn* = 9 is enabled only in the user setting mode.

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			D	NEXT 134	SHEET 133	

- The data configuration is as follows:

  Example: 12 dots horizontally × 24 dots vertically

	Bit	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0
d1	d2	○ ○ ○ ○ ○ ○ ○ ●	○ ○ ○ ○ ○ ○ ● ○
d3	d4	○ ○ ○ ○ ○ ○ ● ●	○ ○ ○ ○ ○ ● ○ ○
d5	d6	○ ○ ○ ○ ○ ● ○ ●	○ ○ ○ ○ ○ ● ● ○
d7	d8	○ ○ ○ ○ ● ● ● ●	○ ○ ○ ● ○ ○ ○ ○
d9	d10	○ ○ ○ ○ ● ○ ○ ●	○ ○ ○ ● ○ ● ○
d11	d12	○ ○ ○ ○ ● ○ ● ●	○ ○ ○ ● ● ○ ○
d13	d14	○ ○ ○ ○ ○ ○ ○ ●	○ ○ ○ ○ ○ ○ ● ○
d15	d16	○ ○ ○ ○ ○ ○ ● ●	○ ○ ○ ○ ○ ● ○ ○
d17	d18	○ ○ ○ ○ ○ ● ○ ●	○ ○ ○ ○ ○ ● ● ○
d19	d10	○ ○ ○ ○ ○ ● ● ●	○ ○ ○ ○ ● ○ ○ ○
d21	d22	○ ○ ○ ○ ● ○ ○ ●	○ ○ ○ ○ ● ○ ● ○
d23	d24	○ ○ ○ ○ ● ○ ● ●	○ ○ ○ ○ ● ● ○ ○
d25	d26	○ ○ ○ ○ ○ ○ ○ ●	○ ○ ○ ○ ○ ○ ● ○
d27	d28	○ ○ ○ ○ ○ ○ ● ●	○ ○ ○ ○ ○ ● ○ ○
d29	d20	○ ○ ○ ○ ○ ● ○ ●	○ ○ ○ ○ ○ ● ● ○
d31	d32	○ ○ ○ ○ ○ ● ● ●	○ ○ ○ ○ ● ○ ○ ○
d33	d34	○ ○ ○ ○ ● ○ ○ ●	○ ○ ○ ○ ● ○ ● ○
d35	d36	○ ○ ○ ○ ● ○ ● ●	○ ○ ○ ○ ● ● ○ ○
d37	d38	○ ○ ○ ○ ○ ○ ○ ●	○ ○ ○ ○ ○ ○ ● ○
d39	d30	○ ○ ○ ○ ○ ○ ● ●	○ ○ ○ ○ ○ ● ○ ○
d41	d42	○ ○ ○ ○ ○ ● ○ ●	○ ○ ○ ○ ○ ● ● ○
d43	d44	○ ○ ○ ○ ○ ● ● ●	○ ○ ○ ○ ● ○ ○ ○
d45	d46	○ ○ ○ ○ ● ○ ○ ●	○ ○ ○ ○ ● ○ ● ○
d47	d48	○ ○ ○ ○ ● ○ ● ●	○ ○ ○ ○ ● ● ○ ○

← All dots in the odd bytes are printed.
Bit7 through 4 in even bytes are printed.
Even if "1" is specified for any bit from 3 to 0, it is not printed.

<Function 10> **GS (E *pL pH fn c1 c2*** (*fn* = 10)

[Format] ASCII GS (E *pL* *pH* *fn* *c1* *c2*
   Hex 1D 28 45 *pL* *pH* *fn* *c1* *c2*
   Decimal 29 40 69 *pL* *pH* *fn* *c1* *c2*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)
   fn = 10
   128 ≤ *c1* ≤ *c2* ≤ 255

[Description] • Deletes the data for each character in the character code page in the active area (RAM).
   • After deleting the data, space patterns (that do not print) are substituted.
   • This function code *fn* = 10 is enabled only in the user setting mode.

<Function 11> **GS (E *pL pH fn a d1...dk*** (*fn* = 11)

[Format] ASCII GS (E *pL* *pH* *fn* *a* *d1 ... dk*
   Hex 1D 28 45 *pL* *pH* *fn* *a* *d1 ... dk*
   Decimal 29 40 69 *pL* *pH* *fn* *a* *d1 ... dk*

[Range] 3 ≤ (*pL* + *pH* × 256) ≤ 65535 (0 ≤ *pL* ≤ 255, 0 ≤ *pH* ≤ 255)
   fn = 11
   1 ≤ *a* ≤ 4
   48 ≤ *d* ≤ 57
   1 ≤ *k* ≤ 6

[Default] • When *a* = 1: (*d1…dk*) = "19200"
   • When *a* = 2: *d1* = 48
   • When *a* = 3: *d1* = 48
   • When *a* = 4: *d1* = 56

[Description] • Sets the communication conditions specified by *a* for the serial interface according to value *d*.

a	Communication Condition	*d*
1	Baud rate	*k* bytes (*d1...dk*)
2	Parity	1 byte (*d1*)
3	Handshake control	1 byte (*d1*)
4	Data length	1 byte (*d1*)

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<Baud rate setting (*d1...dk*) >

Baud rate (bps)	*d1*	*d2*	*d3*	*d4*	*d5*	*d6*
2400	50	52	48	48	--	--
4800	52	56	48	48	--	--
9600	57	54	48	48	--	--
19200	49	57	50	48	48	--
38400	51	56	52	48	48	--
57600	53	55	54	48	48	--
115200	49	49	53	50	48	48

[bps: bits per second]

<Parity setting (*d1*) >

d1	Parity
48	No parity
49	Odd parity
50	Even parity

<Handshake control setting (*d1*) >

d1	Handshake control
48	DTR/DSR
49	XON/XOFF

<Data length setting (*d1*) >

d1	Data length
55	7 bits
56	8 bits

- If the value specified with *a*, *d1* is out of range, this command is ignored. (The setting is not changed.)

- This function code *fn* = 11 is enabled only in the user setting mode.

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<Function 12> GS (E *pL pH fn*   *a*   (*fn* = 12)

[Format]   ASCII   GS   (E   *pL*   *pH*   *fn*   *a*
          Hex   1D   28   45   *pL*   *pH*   *fn*   *a*
          Decimal 29   40   69   *pL*   *pH*   *fn*   *a*

[Range] $(pL + pH \times 256) = 2$ ($pL = 2$, $pH = 0$)
        fn = 12
        $1 \leq a \leq 4$

[Description] • Transmits the communication conditions for the serial interface specified by *a*.

a	Communication conditions
1	Baud rate
2	Parity
3	Handshake control
4	Data length

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	33H	51	1 byte
Type of the communication condition	31H – 34H	49 – 52	1 byte
Separator	1FH	31	1 byte
Setting value	30H – 39H	48 – 57	1 – 6 bytes
NUL	00H	0	1 byte

• Configuration of the setting value

  • When the baud rate (*a* = 1) is specified:

Baud rate (bps)	*d1*	*d2*	*d3*	*d4*	*d5*	*d6*
2400	50	52	48	48	--	--
4800	52	56	48	48	--	--
9600	57	54	48	48	--	--
19200	49	57	50	48	48	--
38400	51	56	52	48	48	--
57600	53	55	54	48	48	--
115200	49	49	53	50	48	48

[bps: bits per second]

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- When the parity (*a* = 2) is specified:

Parity	*d1*
No parity	48
Odd parity	49
Even parity	50

- When the handshake control (*a* = 3) is specified:

Handshake control	*d1*
DSR / DTR	48
XON / XOFF	49

- When the data length (*a* = 4) is specified:

Data length	*d1*
7 bits	55
8 bits	56

- If *a* is out of range, this command is ignored.

<Function 48> GS (E *pL pH fn d1 d2 d3*   (*fn* = 48)

[Format]

	ASCII	GS	(	E	*pL*	*pH*	*fn*	*d1*	*d2*	*d3*
	Hex	1D	28	45	*pL*	*pH*	*fn*	*d1*	*d2*	*d3*
	Decimal	29	40	69	*pL*	*pH*	*fn*	*d1*	*d2*	*d3*

[Range] $(pL + pH \times 256) = 4$ (pL = 4, pH = 0)
fn = 48
$d1$ = 67
$d2$ = 76
$d3$ = 82

[Description]   • Clear all set values for the paper layout.

- This function (*fn* = 48) is enabled only in the user setting mode.

<Function 49>
GS (E *pL pH fn sa; sb; sc; sd; se; sf; sg; sh;* (*fn* = 49)

[Format]	ASCII	GS	(	E	*pL pH fn sa; sb; sc; sd; se; sf; sg; sh;*
	Hex	1D	28	45	*pL pH fn sa; sb; sc; sd; se; sf; sg; sh;*
	Decimal	29	40	69	*pL pH fn sa; sb; sc; sd; se; sf; sg; sh;*

[Range] $9 \leq (pL+pH \times 256) \leq 36$ $(9 \leq pL \leq 36, pH = 0)$
fn = 49
sa ="48", "49", "64"
"135" $\leq$ *sb* $\leq$ "3000"
"25" $\leq$ *sc* $\leq$ "100"
"0" $\leq$ *sd* < "3000"
"0" $\leq$ *se* < "3000"
"38" $\leq$ *sf* $\leq$ "3000"
"27" $\leq$ *sg* $\leq$ "507 (when *sa* = "48" or *sa* = "49" is specified)
"47" $\leq$ *sg* $\leq$ "507" (when *sa* = "64" is specified)
"240" $\leq$ *sh* $\leq$ "720" (when *sa* = "48" or *sa* = "49" is specified)
"240" $\leq$ *sh* $\leq$ "700" (when *sa* = "64" is specified)

If any one of the following cases occurs, this command is ignored because the parameter is improper:

When *sa* = "49" is specified
sb $\leq$ *sd*
sb $\leq$ *se*
sb < *sf*
paper width < *sg* + *sh* + 33 (when paper width is set to 78 mm or less)
paper width < *sg* + *sh* + 43 (when paper width is set to 79 mm)
paper width < *sg* + *sh* + 53 (when paper width is set to 80 mm)

When *sa* = "64" is specified
sd < *sc*
se $\geq$ *sc*
sb < *sd* + *sf*
paper width < *sg* + *sh* + 53

[Default]   The status where no value settings are newly defined.

[Description]   • Sets the paper layout.
• Origin of the layout is selected by *sa*.

sa	Origin of the layout	Remarks (usable paper)
48	None (does not use the layout).	Receipt (without black mark)
49	Top of the black mark	Receipt (with black mark) Label (with black mark)
64	Bottom of the label	Label (without black mark)

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- The vertical layout is set by *sb* ~ *sf*.
  (BM is the abbreviation for black mark).

	When *sa* = "49" is specified	When *sa* = "64" is specified
sb	The distance between the top of the BM and the top of the next BM.	The distance between the bottom of the label and the bottom of the next label.
sc	The distance between the top and bottom of the BM.	The distance between the bottom of the label and the top of the next label.
sd	The distance between the top of the BM and the print starting position. (The print starting position = the top of the print area.)	The distance between the bottom of the label and the print starting position. (The print starting position = the top of the print area.)
se	The distance between the top of the BM and the cutting position.	The distance between the bottom of the label and the cutting position.
sf	The distance between the print starting position and the bottom of the print area.	The distance between the print starting position and the bottom of the print area.
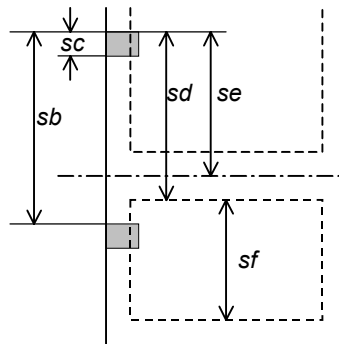
(when *sa* = "49" is specified) (when *sa* = "64" is specified)
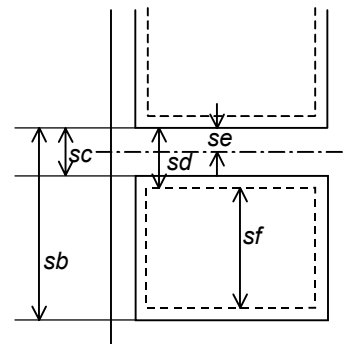
- The horizontal layout is set by *sg* and *sh*.

	When *sa* = "49" is specified	When *sa* = "64" is specified
sg	The distance between the left edge of the paper and the left edge of the print area.	The distance between the left edge of the paper and the left edge of the print area.
sh	The distance between the left edge and the right edge of the print area.	The distance between the left edge and the right edge of the print area.

(when *sa* = "49" is specified) (when *sa* = "64" is specified)

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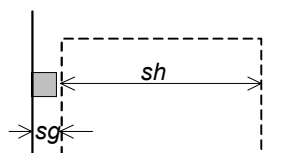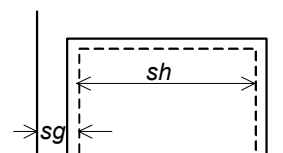
- The vertical layout (*sb* ~ *sf*) and horizontal layout (*sg*, *sh*) can be set in increments of 0.1 mm.

   Example: The distance between the bottom of the label and the bottom of the next label
   = *sb* × 0.1 mm

- This function (*fn* = 49) is enabled only in the user setting mode.

[Notes]

- Make enough margin to set the cutting position.

- If the distance between the cutting position and the next print starting position is set to 3.6 mm {0.14"} or less, the printer will skip one label and feed to the top of the next label, because the printer cannot perform feeding in reverse to set the paper to the print starting position.

- When *sa* = "49" is specified, label printing (with black marks) is possible. However, there is no way that the printer can differentiate the type of paper – label (with black marks) or receipt (with black marks). Therefore, the user must consider carefully the print position and the cutting position for the autocutter.

- The autocutting position *se* must be set between the labels.

- The print position – *sd* and *sf* (top and bottom margin) must be set over 2 mm {0.08"} from the top and the bottom of the label, respectively.

- The print position – *sg* and *sh* (left and right margin) must be set over 2.8 mm {0.11"} from the left and the right of the label, respectively.
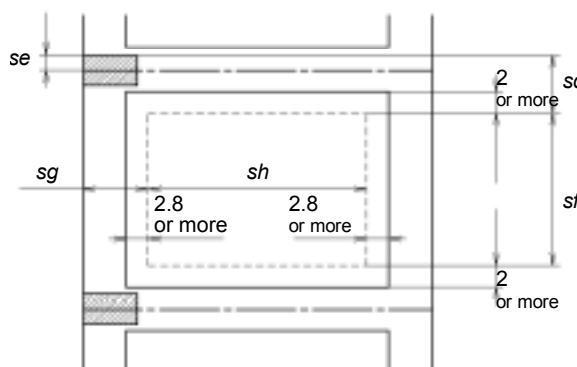
- If the paper layout information is already written in the NV memory and the user wants to change to a new type of paper, the user must have the current type of paper (not the new type) loaded in the printer when this command is used to change to the settings for the new paper.

- When two or more types of paper are used alternately, it is recommended to use the automatic paper recognition function as described in Section 3.8, not setting the paper layout.

- The paper which has a 71 to 79 mm {2.80 to 3.11"} of the paper width cannot be used because of the thickness of the paper roll spacer.

<Function 50> **GS (E *pL pH fn n*** (*fn* = 50)

[Format]

ASCII	GS	(	E	*pL*	*pH*	*fn*	*n*
Hex	1D	28	45	*pL*	*pH*	*fn*	*n*
Decimal	29	40	69	*pL*	*pH*	*fn*	*n*

[Range]   (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)
fn = 50
n = 64, 80

[Description]   • Transmits the paper layout information specified with *n*.

n	Kinds of the paper layout information
64	Setting value of the paper layout [units: 0.1 mm]
80	Actual value of the paper layout [units: dots]

• The transmission data is configured as follows:

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	39H	57	1 byte
Kinds of paper layout information	30H – 39H	48 – 57	2 bytes
Separator	1FH	31	1 byte
Paper layout information			
Origin of layout (*sa*)	30H – 39H	48 – 57	0 – 2 bytes
Separator	1FH	31	1 byte
Vertical layout (*sb*)	30H – 39H	48 – 57	0 – 4 bytes
Separator	1FH	31	1 byte
Vertical layout (*sc*)	30H – 39H	48 – 57	0 – 4 bytes
Separator	1FH	31	1 byte
Vertical layout (*sd*)	30H – 39H	48 – 57	0 – 4 bytes
Separator	1FH	31	1 byte
Vertical layout (*se*)	30H – 39H	48 – 57	0 – 4 bytes
Separator	1FH	31	1 byte
Vertical layout (*sf*)	30H – 39H	48 – 57	0 – 4 bytes
Separator	1FH	31	1 byte
Horizontal layout (*sg*)	30H – 39H	48 – 57	0 – 4 bytes
Separator	1FH	31	1 byte
Horizontal layout (*sh*)	30H – 39H	48 – 57	0 – 4 bytes
NUL	00H	0	1 byte

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- Configuration of kinds of paper layout information

n	Transmission data	
	1st byte	2nd byte
64	54	52
80	56	48

- Configuration of the paper layout
  - The design information is converted to character codes corresponding to decimal data, then transmitted from the MSB.
  - The symbol of the transmission data *sa* or (*sa ~ sh*) corresponds to (*sa* or *sb ~ sh*) in Function 49 of this command.
  - If the setting value is specified (*n* = 64), the values set in Function 49 of this command or **GS (A** (automatic setting of paper layout) are transmitted.
  - If the actual value is specified (*n* = 80), the actual values in Function 49 of this command or **GS (A** (automatic setting of paper layout) are transmitted.
  - Design information that is not set is not transmitted.

GS (K *pL pH fn m*

[Name]   Print control method(s)

[Description] • Set the print control specified by *fn*.

fn	Function
48	Specifies the print control mode.
49	Sets the print density.
50	Sets the print speed.
97	Sets the number of parts for energizing the head.

[Notes]   • The density of printing with the four-part energizing on the two-color paper may not be changed.

           • To improve the quality of two-color printing, it is recommended to print with two-part energizing.

<Function 48> GS (K *pL pH fn m*   (*fn* = 48)

[Format]
ASCII	GS	(	K	pL	pH	fn	m
Hex	1D	28	4B	pL	pH	fn	m
Decimal	29	40	75	pL	pH	fn	m

[Range] $(pL + pH \times 256) = 2$ ($pL = 2$, $pH = 0$)
$fn = 48$
$0 \leq m \leq 4$, $48 \leq m \leq 52$

[Default] $m = 1$

[Description] • Selects the print control mode.

m	Print control mode
0, 48	Selects the print control mode at power on.
1, 49	Selects print control mode 1 (standard).
2, 50	Selects print control mode 2 (fence bar code).
3, 51	Selects print control mode 3 (ladder bar code).
4, 52	Selects print control mode 4 (2-dimensional code).

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<Function 49> **GS (K *pL pH fn m*** (*fn* = 49)

[Format]	ASCII	GS	(	K	*pL*	*pH*	*fn*	*m*
	Hex	1D	28	4B	*pL*	*pH*	*fn*	*m*
	Decimal	29	40	75	*pL*	*pH*	*fn*	*m*

[Range]   (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)
          fn = 49
          0 ≤ *m* ≤ 8, 250 ≤ *m* ≤ 255

[Default]   *m* = 0 (setting value of the customized value)

[Description] • Specifies the print density.

m	Print density
250	Selects the print density level – 6.
251	Selects the print density level – 5.
252	Selects the print density level – 4.
253	Selects the print density level – 3.
254	Selects the print density level – 2.
255	Selects the print density level – 1.
0	Selects the standard print density.
1	Selects the print density level +1.
2	Selects the print density level +2.
3	Selects the print density level +3.
4	Selects the print density level +4.
5	Selects the print density level +5.
6	Selects the print density level +6.
7	Selects the print density level +7.
8	Selects the print density level +8.

\<Function 50\> **GS (K *pL pH fn m*** (*fn* = 50)

[Format]
ASCII	GS	(	K	*pL*	*pH*	*fn*	*m*
Hex	1D	28	4B	*pL*	*pH*	*fn*	*m*
Decimal	29	40	75	*pL*	*pH*	*fn*	*m*

[Range] (*pL* + *pH* $\times$ 256) = 2 (*pL* = 2, *pH* = 0)
fn = 50
$0 \leq m \leq 9$, $48 \leq m \leq 57$

[Default] *m* = 0 (setting value of the customized value)

[Description] • Specifies the print speed.

m	Print speed
0, 48	Selects the print control mode at power on.
1, 49	Selects the print speed level 1 (the lowest speed: slow).
2, 50	Selects the print speed level 2.
3, 51	Selects the print speed level 3.
4, 52	Selects the print speed level 4.
5, 53	Selects the print speed level 5.
6, 54	Selects the print speed level 6.
7, 55	Selects the print speed level 7.
8, 56	Selects the print speed level 8.
9, 57	Selects the print speed level 9 (the highest speed: fast).

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<Function 97> **GS (K *pL pH fn m*** (*fn* = 97)

[Format]   ASCII   GS   (K   *pL*   *pH*   *fn*   *m*
             Hex   1D   28   4B   *pL*   *pH*   *fn*   *m*
             Decimal   29   40   75   *pL*   *pH*   *fn*   *m*

[Range]   (*pL* + *pH* × 256) = 2 (*pL* = 2, *pH* = 0)
             fn = 97
             0 ≤ *m* ≤ 4, 48 ≤ *m* ≤ 52

[Default]   *m* = 0 (setting value of the customized value)

[Description] • Specifies the number of parts for energizing the head.

m	Number of parts for energizing for energizing head
0, 48	Selects the number of parts for energizing the head at power on.
1, 49	Selects one-part energizing.
2, 50	Selects two-part energizing.
3, 51	Selects three-part energizing.
4, 52	Selects four-part energizing.

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GS (L *pL pH m fn* *[parameters]*
GS 8 L *p1 p2 p3 p4 m fn* *[parameters]*

[Name]   Select graphics data

[Format]

	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*[parameters]*	
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*[parameters]*	
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*[parameters]*	
	ASCII	GS	8	L	*p1*	*p2*	*p3*	*p4*	*m*	*fn*	*[parameters]*
	Hex	1D	38	4C	*p1*	*p2*	*p3*	*p4*	*m*	*fn*	*[parameters]*
	Decimal	29	56	76	*p1*	*p2*	*p3*	*p4*	*m*	*fn*	*[parameters]*

* In the description below **GS (L** is used for explanation.

- Note that **GS (L** and **GS 8 L** have the same function.
- If the *[parameters]* of each format exceed 65533 bytes use **GS 8 L**.

[Description]   • Processes graphics data according to the function code *fn*.

fn	Format	Function No.	Function
0, 48	**GS (L** *pL pH m fn*	Function 48	Transmits the NV graphics memory capacity.
2, 50	**GS (L** *pL pH m fn*	Function 50	Prints the graphics data in the print buffer.
3, 51	**GS (L** *pL pH m fn*	Function 51	Transmits the remaining capacity of the NV graphics memory.
64	**GS (L** *pL pH m fn d1 d2*	Function 64	Transmits the defined NV graphics key code list.
65	**GS (L** *pL pH m fn d1 d2 d3*	Function 65	Deletes all NV graphics data.
66	**GS (L** *pL pH m fn kc1 kc2*	Function 66	Deletes the specified NV graphics data.
67	**GS (L** *pL pH m fn a kc2 kc2 b xL xH yL yH [c d1...dk]1...[c d1...dk]b*	Function 67	Defines the raster graphics data in the non-volatile memory.
69	**GS (L** *pL pH m fn kc1 kc2 x y*	Function 69	Prints the specified NV graphics data.
112	**GS (L** *pL pH m fn a bx by c xL xH yL yH d1...dk*	Function 112	Stores the raster graphics data in the print buffer memory.

- *pL*, *pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* or *p4* (*m*, *fn*, and *[parameters]*).

[Notes]   • Frequent write command executions by this command may damage the NV memory. Therefore, it is recommended to write to the NV memory no more than 10 times a day.

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

<Function 48> **GS (L *pL pH m fn***   (*fn* = 0, 48)

[Format]   ASCII   GS   (L   *pL*   *pH*   *m*   *fn*
                 Hex   1D   28   4C   *pL*   *pH*   *m*   *fn*
                 Decimal   29   40   76   *pL*   *pH*   *m*   *fn*

[Range]   ($pL + pH \times 256$) = 2   (pL = 2 , pH = 0)
           m = 48
           fn = 0, 48

[Description] • Transmits the total capacity of the NV bit-image memory (number of bytes in the memory area).

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	30H	48	1 byte
Data	30H – 39H	48 – 57	1 – 8 bytes
NUL	00H	0	1 byte

         • The data describing total capacity is converted to character codes corresponding to decimal data, then transmitted from the MSB.

         • The data length is variable.

         • The total capacity of the NV user memory is selectable as any one of these: [0, 64K, 128K, 192K, 256K, 320K, 384K] bytes with **GS (E**.   The default value is 384KB.

<Function 50> **GS (L *pL pH m fn***   (*fn* = 2, 50)

[Format]   ASCII   GS   (L   *pL*   *pH*   *m*   *fn*
                 Hex   1D   28   4C   *pL*   *pH*   *m*   *fn*
                 Decimal   29   40   76   *pL*   *pH*   *m*   *fn*

[Range]   ($pL + pH \times 256$) = 2 (pL = 2, pH = 0)
           m = 48
           fn = 2, 50

[Description] • Prints the buffered graphics stored by the process of Function 112.

         • Feeds paper by the amount corresponding to the number of dots in the *y* direction of the buffered graphics.

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<Function 51> GS (L *pL pH m fn*   (*fn* = 3, 51)

[Format]   ASCII   GS   (L   *pL*   *pH*   *m*   *fn*
           Hex   1D   28   4C   *pL*   *pH*   *m*   *fn*
           Decimal 29   40   76   *pL*   *pH*   *m*   *fn*

[Range]   (*pL* + *pH* × 256) = 2   (*pL* = 2, *pH* = 0)
           m = 48
           fn = 3, 51

[Description]   • Transmits the number of bytes of remaining memory (unused area) in the NV user memory.

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	31H	49	1 byte
Data	30H – 39H	48 – 57	1 – 8 bytes
NUL	00H	0	1 byte

• The number of bytes of remaining memory is converted to character codes corresponding to decimal data, then transmitted from the MSB.

• The data length is variable.

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<Function 64> **GS (L *pL pH m fn d1 d2*** (*fn* = 64)

[Format]
ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*d1*	*d2*
Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*d1*	*d2*
Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*d1*	*d2*

[Range]   ($pL + pH \times 256$) = 4   (*pL* = 4, *pH* = 0)
m = 48
fn = 64
$d1$ = 75
$d2$ = 67

[Description] • Transmits the defined NV graphics key code list.

• When the key code is present:

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	72H	114	1 byte
Status	40H or 41H	64 or 65	1 byte
Data	30H – 39H	48 – 57	2 – 80 bytes
NUL	00H	0	1 byte

• When the key code is not present:

	Hexadecimal	Decimal	Amount of data
Header	37H	55	1 byte
Flag	72H	114	1 byte
Status	40H	64	1 byte
NUL	00H	0	1 byte

• If the number of the key code exceeds 40, divide the key code by 40 for transmission.

• The status if the continuous transmission data block is present is 41H.

• The status if the continuous transmission data block is not present is 40H.

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- After the [Header – NUL] is transmitted, the printer receives a response from the host; then it performs the process defined by the response. (See the tables below.)

When the status (existence of the next data block) is
Hexadecimal = 41H / Decimal = 65

Response		Process performed
ASCII	Decimal	
ACK	6	Transmits the next data.
NAK	21	Transmits the previous data again.
CAN	24	Ends the process.

When the status (for the last data block) is
Hexadecimal = 40H / Decimal = 64

Response		Process performed
ASCII	Decimal	
ACK	6	Ends the process.
NAK	21	Transmits the previous data again.
CAN	24	Cancels the process.

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<Function 65> **GS (L** *pL pH m fn d1 d2 d3*   (*fn* = 65)

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*d1*	*d2*	*d3*
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*d1*	*d2*	*d3*
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*d1*	*d2*	*d3*

[Range] $(pL + pH \times 256) = 5$ (pL = 5, pH = 0)
m = 48
fn = 65
$d1$ = 67
$d2$ = 76
$d3$ = 82

[Description]   • Deletes all defined NV graphics data.

<Function 66> **GS (L** *pL pH m fn kc1 kc2*   (*fn* = 66)

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*

[Range] $(pL + pH \times 256) = 4$ (pL = 4, pH = 0)
m = 48
fn = 66
$32 \leq kc1 \leq 126$
$32 \leq kc2 \leq 126$

[Description]   • Deletes the NV graphics data defined by the key codes *kc1* and *kc2*.

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<Function 67> GS (L *pL pH m fn a kc1 kc2 b xL xH yL yH [c d1....dk]1… [c d1....dk]b*
(*fn* = 67)

[Format]

	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*a*	*kc1*	*kc2*	*b*
		xL	*xH*	*yL*	*yH [c*	*d1...dk]1... [c*	*d1...dk]b*					
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*a*	*kc1*	*kc2*	*b*
		xL	*xH*	*yL*	*yH [c*	*d1...dk]1... [c*	*d1...dk]b*					
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*a*	*kc1*	*kc2*	*b*
		xL	*xH*	*yL*	*yH [c*	*d1...dk]1... [c*	*d1...dk]b*					

[Range]
- **GS (L** parameters
  $12 \leq (pL + pH \times 256) \leq 65535$ $(0 \leq pL \leq 255, 0 \leq pH \leq 255)$

- **GS 8 L** parameters
  $12 \leq (p1 + p2 \times 256 + p3 \times 65536 + p4 \times 16777216) \leq 4294967295$
  $(0 \leq p1 \leq 255, 0 \leq p2 \leq 255, 0 \leq p3 \leq 255, 0 \leq p4 \leq 255)$

- Common parameters for **GS (L** / **GS 8 L**
  m = 48
  fn = 67
  a = 48
  $32 \leq kc1 \leq 126$
  $32 \leq kc2 \leq 126$
  b = 1, 2
  $1 \leq (xL + xH \times 256) \leq 8192$
  $1 \leq (yL + yH \times 256) \leq 2304$
  c = 49 (when single-color paper is selected)
  c = 49, 50 (when two-color paper is selected)
  $0 \leq d \leq 255$
  $k = (int ((xL + xH \times 256) + 7) /8) \times (yL + yH \times 256)$

- The total capacity of the NV user memory is selectable as any one of these: [0, 64K, 128K, 192K, 256K, 320K, 384K] bytes with **GS (E**.   The default value is 384KB.

[Description]
- Defines the raster graphics data in the NV graphics area.
  - *b* specifies the number of colors for the NV graphics.
  - *xL*, *xH* specify the defined data in the horizontal direction as $(xL + xH \times 256)$ dots.
  - *yL*, *yH* specify the defined data in the vertical direction as $(yL + yH \times 256)$ dots.
  - *c* specifies the color of the defined data.

C	Defined data color
49	Color 1
50	Color 2

  - Color 1 means black (a high level of energy) on the specified two-color thermal paper.
  - Color 2 means red (a low level of energy) on the specified two-color thermal paper.

[Notes]
- If the color is specified with *b* and the same color as the previous also is specified with *c* again, the printer stops processing the command, and regards the defined data as effective up to the time when the printer stops processing, and then disregards the remaining data after it.

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<Function 69> GS (L *pL pH m fn kc1 kc2 x y*   (*fn* = 69)

[Format]
ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*
Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*
Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*

[Range] $(pL + pH \times 256) = 6$ $(pL = 6, pH = 0)$
$m = 48$
$fn = 69$
$32 \leq kc1 \leq 126$
$32 \leq kc2 \leq 126$
$x = 1, 2$
$y = 1, 2$

[Description]   • Prints the NV graphics data defined by the key codes *kc1* and *kc2*. The graphics data is enlarged by *x* and *y* in the horizontal and vertical directions.

<Function 112> **GS (L** *pL pH m fn a bx by c xL xH yL yH d1…dk*   (*fn* = 112)

[Format]	ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*a*	*bx*	*by*	*c*	*xL*	*xH*	*yL*	*yH*
		d1…dk														
	Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*a*	*bx*	*by*	*c*	*xL*	*xH*	*yL*	*yH*
		d1…dk														
	Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*a*	*bx*	*by*	*c*	*xL*	*xH*	*yL*	*yH*
		d1…dk														

[Range]
- **GS (L** parameters
  $11 \leq (pL + pH \times 256) \leq 65535$ $(0 \leq pL \leq 255, 0 \leq pH \leq 255)$

- **GS 8 L** parameters
  $11 \leq (p1 + p2 \times 256 + p3 \times 65536 + p4 \times 16777216) \leq 4294967295$
  $(0 \leq p1 \leq 255, 0 \leq p2 \leq 255, 0 \leq p3 \leq 255, 0 \leq p4 \leq 255)$

- Common parameters for **GS (L** / **GS 8 L**
  m = 48
  fn = 112
  a = 48
  bx = 1, 2
  by = 1, 2
  c = 49 (when single-color paper is selected)
  c = 49, 50 (when two-color paper is selected)
  $1 \leq (xL + xH \times 256) \leq 1024$

When single-color paper is specified:
  $1 \leq (yL + yH \times 256) \leq 1662$ (when *by* = 1)
  $1 \leq (yL + yH \times 256) \leq 831$ (when *by* = 2)

When two-color paper is specified:
  $1 \leq (yL + yH \times 256) \leq 831$ (when *by* = 1)
  $1 \leq (yL + yH \times 256) \leq 415$ (when *by* = 2)

$0 \leq d \leq 255$
$k = (\text{int} ((xL + xH \times 256) + 7) / 8) \times (yL + yH \times 256)$

[Description]
- Stores the raster graphics data, enlarged by *bx* and *by* in the horizontal and vertical directions to the print buffer.
  - *xL*, *xH* specify the raster graphics data in the horizontal direction as $(xL + xH \times 256)$ dots.
  - *yL*, *yH* specify the raster graphics data in the vertical direction as $(yL + yH \times 256)$ dots.
  - *c* specifies the color of the defined data.

C	Printing color
49	Color 1
50	Color 2

  - Color 1 means black (a high level of energy) on the specified two-color thermal paper.
  - Color 2 means red (a low level of energy) on the specified two-color thermal paper.

[Notes]
- Each color can be defined once respectively in standard mode.

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GS (M *pL pH fn m*

[Name]   Customize printer

[Format]

ASCII	GS	(	M	*pL*	*pH*	*fn*	*m*
Hex	1D	28	4D	*pL*	*pH*	*fn*	*m*
Decimal	29	40	77	*pL*	*pH*	*fn*	*m*

[Range] $(pL + pH \times 256) = 2$ $(pL = 2, pH = 0)$
               $1 \leq fn \leq 3, 49 \leq fn \leq 51$
               $m = 0, 1, 48, 49$

[Description] • Protects or recovers values or data set or defined in the active area by commands.

Fn	Function No.	Description
1, 49	Function 1	Copies the settings stored in the active area to the storage area (save settings).
2, 50	Function 2	Copies the settings stored in the storage area to the active area (load settings).
3, 51	Function 3	Enables or disables automatic loading of the settings upon initialization.

     • Active area: Volatile memory (RAM)
     • Storage area: Non-volatile memory (Flash ROM)

    • List of commands that are affected by this command

Setting value		Command
Status		**ESC c 3**, **GS a**
Defined data		**GS :**
Characters	Kind of character	**ESC M**, **ESC R**, **ESC t**
	Style	**ESC !**, **ESC –**, **ESC E**, **ESC G**, **ESC V**, **ESC {**, **GS !**, **GS B**, **GS b**, **GS (N**
	etc.	**ESC SP**, **ESC 2**, **ESC 3**
Bar codes		**GS H**, **GS f**, **GS h**, **GS w**
2-dimensional codes		<Function 065> through <Function 070>, <Function 165>, <Function 167>, <Function 169>, and <Function 256> of **GS (k**
Print position		**ESC D**, **ESC T**, **ESC a**, **GS L**, **GS W**
Kanji print		**FS !**, **FS &**, **FS (A**, **FS –**, **FS .**, **FS C**, **FS S**, **FS W**
etc.		**ESC c 4**, **ESC c 5**, **GS (D**, **GS P**

<Function 1> GS (M *pL pH fn m*   (*fn* = 1,49)

[Format]	ASCII	GS	(	M	*pL*	*pH*	*fn*	*m*
	Hex	1D	28	4D	*pL*	*pH*	*fn*	*m*
	Decimal	29	40	77	*pL*	*pH*	*fn*	*m*

[Range] $(pL + pH \times 256) = 2$ $(pL = 2, pH = 0)$
$fn = 1, 49$
$m = 1, 49$

[Description] • Copies the setting stored in the active area to the *m*th storage area.

[Notes] • Frequent write command executions by this command may damage the NV memory. Therefore, it is recommended to write to the NV memory no more than 10 times a day.

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

<Function 2> GS (M *pL pH fn m*   (*fn* = 2,50)

[Format]	ASCII	GS	(	M	*pL*	*pH*	*fn*	*m*
	Hex	1D	28	4D	*pL*	*pH*	*fn*	*m*
	Decimal	29	40	77	*pL*	*pH*	*fn*	*m*

[Range] $(pL + pH \times 256) = 2$ $(pL = 2, pH = 0)$
$fn = 2, 50$
$m = 0, 1, 48, 49$

[Description] • When (*m* = 0, 48), initializes all settings in the active area, as described in these specifications.

• When (*m* = 1, 49), copies the setting stored in the *m*th storage area to the active area.   If no data in the storage area is protected, all settings in the active area are initialized, as described in these specifications.

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<Function 3> **GS (M *pL pH fn m***   (*fn* = 3, 51)

[Format]   ASCII   GS   (M   *pL*   *pH*   *fn*   *m*
             Hex   1D   28   4D   *pL*   *pH*   *fn*   *m*
             Decimal   29   40   77   *pL*   *pH*   *fn*   *m*

[Range]   (*pL* + *pH* × 256) = 2   (*pL* = 2, *pH* = 0)
            fn = 3, 51
            m = 0, 1, 48, 49

[Description]   • When (*m* = 0, 48), does not load data in the storage area to the active area upon initialization.

               • When (*m* = 1, 49), loads data in the storage area to the active area upon initialization.

GS (N *pL pH fn [parameter]*

[Name]   Select character style

[Description]   • Executes commands for the character style, as specified by the function code *fn*.

fn	Format	Function No.	Description
48	**GS (N *pL pH fn m***	Function 48	Selects character color.

<Function 48> **GS (N *pL pH fn m***   (*fn* = 48)

[Format]   ASCII   GS   (N   *pL*   *pH*   *fn*   *m*
             Hex   1D   28   4E   *pL*   *pH*   *fn*   *m*
             Decimal   29   40   78   *pL*   *pH*   *fn*   *m*

[Range]   (*pL* + *pH* × 256) = 2   (*pL* = 2, *pH* = 0)
            fn = 48
            m = 49 (when single-color paper is selected)
            m = 49, 50 (when two-color paper is selected)

[Default]   *m* = 49

[Description]   • Prints characters in the color specified by *m*.

m	Color
49	Color 1
50	Color 2

   • Color 1 means black (a high level of energy) on the specified two-color thermal paper.

   • Color 2 means red (a low level of energy) on the specified two-color thermal paper.

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GS (k *pL pH cn fn [parameters]*

[Name]   Setup and print symbol

[Description]   • Various processes are performed to the symbol specified with *cn* based on the function code
(*fn*) setting.

cn	Type of Symbol
48	PDF417
49	QRCode
50	MaxiCode

cn	*fn*	Code	Function	Description
48	65	**GS (k *pL pH cn fn n***	Function 065	Sets the number of columns for PDF417.
	66	**GS (k *pL pH cn fn n***	Function 066	Sets the number of rows for PDF417.
	67	**GS (k *pL pH cn fn n***	Function 067	Sets the module width for PDF417.
	68	**GS (k *pL pH cn fn n***	Function 068	Sets the module height for PDF417.
	69	**GS (k *pL pH cn fn m n***	Function 069	Sets the error correction level for PDF417.
	70	**GS (k *pL pH cn fn m***	Function 070	Specifies the options for PDF417.
	80	**GS (k *pL pH cn fn m d1...dk***	Function 080	Stores received data in the symbol storage area for PDF417.
	81	**GS (k *pL pH cn fn m***	Function 081	Prints symbol data in the symbol storage area for PDF417.
	82	**GS (k *pL pH cn fn m***	Function 082	Transmits the size of information for the symbol data in the symbol storage area for PDF417.
49	65	**GS (k *pL pH cn fn n1 n2***	Function 165	Specifies the model for QRCode.
	67	**GS (k *pL pH cn fn n***	Function 167	Sets the module size for QRCode
	69	**GS (k *pL pH cn fn m n***	Function 169	Sets the QRCode error correction level for QRCode.
	80	**GS (k *pL pH cn fn m d1...dk***	Function 180	Receives and stores data in the symbol storage area for QRCode.
	81	**GS (k *pL pH cn fn m***	Function 181	Prints symbol data in the symbol storage area for QRCode.
	82	**GS (k *pL pH cn fn m***	Function 182	Transmits the size information for the symbol data in the symbol storage area for QRCode.

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cn	fn	Code	Function	Description
50	65	**GS (k** *pL pH cn fn n*	Function 265	Specifies the mode for MaxiCode.
	80	**GS (k** *pL pH cn fn m d1...dk*	Function 280	Receives and stores data in the symbol storage area for MaxiCode.
	81	**GS (k** *pL pH cn fn m*	Function 281	Prints symbol data in the symbol storage area for MaxiCode.
	82	**GS (k** *pL pH cn fn m*	Function 282	Transmits the size information for the symbol data in the symbol storage area for MaxiCode.

- "Symbol data" refers to the data (*d1…dk*) received with <Function 080>, <Function 180>, and <Function 280>.
- "Symbol storage area" refers to the range for storing data received with <Function 080>, <Function 180>, and <Function 280> before encoding.

<Function 065> **GS (k** *pL pH cn fn n*   (*fn* = 65)

[Format] ASCII GS (k *pL* *pH* *cn* *fn* *n*
          Hex   1D 28 6B *pL* *pH* *cn* *fn* *n*
          Decimal 29 40 107 *pL* *pH* *cn* *fn* *n*

[Range] $(pL + pH \times 256) = 3$ ($pL = 3$, $pH = 0$)
          $cn = 48$
          $fn = 65$
          $0 \leq n \leq 30$

[Default] $n = 0$

[Description] Sets the number of columns of the data area for PDF417.

- $n = 0$ specifies automatic processing.
- When automatic processing ($n = 0$) is specified, the number of columns is calculated with the number of code words based on the range of the printable area.
- $n \neq 0$ sets the number of columns of the data area to n code words.

[Notes] The following data is not included in the number of columns.

- Start and stop patterns
- Left and right indicator code words

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<Function 066> **GS (k *pL pH cn fn n*** (*fn* = 66)

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)
cn = 48
fn = 66
n = 0, 3 ≤ *n* ≤ 90

[Default] *n* = 0

[Description] Sets the number of rows of data area for PDF417.

- *n* = 0 specifies automatic processing.
- When automatic processing (*n* = 0) is specified, the number of rows is calculated with the number of code words or the range of the printable area.
- *n* ≠ 0 sets the number of rows to *n*.

<Function 067> **GS (k *pL pH cn fn n*** (*fn* = 67)

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)
cn = 48
fn = 67
2 ≤ *n* ≤ 8

[Default] *n* = 3

[Description] Sets the module width of one PDF417 symbol to *n* dots.

<Function 068> **GS (k *pL pH cn fn n*** (*fn* = 68)

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)
cn = 48
fn = 68
2 ≤ *n* ≤ 8

[Default] *n* = 3

[Description] Sets the module height to [(module width) × *n*].

- The module width is set with Function 067 of this command.

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\<Function 069\> **GS (k *pL pH cn fn m n*** (*fn* = 69)

[Format]
ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*	*n*
Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*	*n*
Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*	*n*

[Range] $(pL + pH \times 256) = 4$ (*pL* = 4, *pH* = 0)
$cn = 48$
$fn = 69$
$m = 48, 49$
$48 \leq n \leq 56$ (when *m* = 48 is specified)
$1 \leq n \leq 40$ (when *m* = 49 is specified)

[Default] $m = 49, n = 1$

[Description] Sets the error correction level for PDF417 symbols.

- When *m* = 48, the error correction level is set by the "Level Setting" error correction code word.

n	Function	Error correction code word
48	Select error correction level 0	2
49	Select error correction level 1	4
50	Select error correction level 2	8
51	Select error correction level 3	16
52	Select error correction level 4	32
53	Select error correction level 5	64
54	Select error correction level 6	128
55	Select error correction level 7	256
56	Select error correction level 8	512

- When *m* = 49, the error correction level is set to the level indicated by the data code word value.

  The rate is set to [$n \times 10\%$].

  The error correction levels in the following table are determined by the calculation [Data code word $\times$ n $\times$ 0.1 = (A)] (round up fractions of 0.5 and over and truncate others).

Result (A)	Error correction level	Error correction code word
0 - 3	Error correction level 1	4
4 - 10	Error correction level 2	8
11 - 20	Error correction level 3	16
21 - 45	Error correction level 4	32
46 - 100	Error correction level 5	64
101 - 200	Error correction level 6	128
201 - 400	Error correction level 7	256
401 or more	Error correction level 8	512

<Function 070> GS (k *pL pH cn fn m* (*fn* = 70)

[Format]
	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*

[Range] ($pL + pH \times 256$) = 3 (pL = 3, pH = 0)
cn = 48
fn = 70
m = 0, 1

[Default] m = 0

[Description] Specifies or cancels various PDF417 symbol options

- When m = 0, the simple PDF417 symbol processing is canceled, and the standard PDF417 symbol processing is specified.
- When m = 1, the simple PDF417 symbol processing is specified.

<Function 080> GS (k *pL pH cn fn m d1…dk* (*fn* = 80)

[Format]
	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*

[Range] $4 \leq (pL + pH \times 256) \leq 65535$ ($0 \leq pL \leq 255$, $0 \leq pH \leq 255$)
cn = 48
fn = 80
m = 48
$0 \leq d \leq 255$
$k = (pL + pH \times 256) - 3$

[Description] Stores symbol data (*d1...dk*) in the PDF417 symbol storage area.

- Bytes of (($pL + pH \times 256$) – 3) after m (*d1…dk*) are processed as symbol data.

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<Function 081> **GS (k *pL pH cn fn m*** (*fn* = 81)

[Format] ASCII GS (k *pL* *pH* *cn* *fn* *m*
          Hex 1D 28 6B *pL* *pH* *cn* *fn* 30
          Decimal 29 40 107 *pL* *pH* *cn* *fn* 48

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)
         cn = 48
         fn = 81
         m = 48

[Description] Prints the PDF417 symbol data in the symbol storage area.

[Note] • Users must consider the quiet zone for the PDF417 symbols (upward and downward spaces and left and right spaces for the PDF417 symbols specified in the specifications for the PDF417 symbols).

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<Function 082> **GS (k *pL pH cn fn m*** (*fn* = 82)

[Format]   ASCII   GS   (k   *pL*   *pH*   *cn*   *fn*   *m*
Hex   1D   28   6B   *pL*   *pH*   *cn*   *fn*   *m*
Decimal   29   40   107   *pL*   *pH*   *cn*   *fn*   *m*

[Range]   (*pL* + *pH* × 256) = 3   (*pL* = 3, *pH* = 0)
cn = 48
fn = 82
m = 48

[Description]   Transmits the size of the symbol data in the symbol storage area.

The basic types of symbol size information are as follows:

Sent data	Hex	Decimal	Data size
Header	37H	55	1 byte
Flag	2FH	47	1 byte
Width	30H - 39H	48 - 57	1 - 5 bytes
Separator	1FH	31	1 byte
Height	30H - 39H	48 - 57	1 - 5 bytes
Separator	1FH	31	1 byte
Fixed Value	31H	49	1 byte
Separator	1FH	31	1 byte
Other Information	30H or 31H	48 or 49	1 byte
NUL	00H	0	1 byte

Description of the Width and Height data sent:

- The height and width values of the symbol data are in dot units.

Description of the Other Information data sent:

"Hexadecimal = 30H / Decimal = 48" indicates that the data is printable.

"Hexadecimal = 31H / Decimal = 49" indicates that the data is not printable.

[Notes]   • This command does not print the PDF417 symbols.

- Users must consider the quiet zone for the PDF417 symbols (upward and downward spaces and left and right spaces for the PDF417 symbols specified in the specifications for the PDF417 symbols).

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<Function 165> GS (k *pL pH cn fn n1 n2*   (*fn* = 65)

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n1*	*n2*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n1*	*n2*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n1*	*n2*

[Range] *pL* = 4, *pH* = 0
cn = 49
fn = 65
n1 = 49, 50
n2 = 0

[Default] *n1* = 50
n2 = 0

[Description] Specifies the mode for QRCode symbol by *n1*.

n	Function
49	Specifies the mode 1 conversion processing.
50	Specifies the mode 2 conversion processing.

<Function 167> GS (k *pL pH cn fn n*   (*fn* = 67)

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n*

[Range] *pL* = 3, *pH* = 0
cn = 49
fn = 67
$1 \le n \le 16$

[Default] *n* = 3

[Description] Sets the size of the QRCode symbol module to [*n* dots $\times$ *n* dots].

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<Function 169> **GS (k *pL pH cn fn n***   (*fn* = 69)

[Format]   ASCII   GS   (k   *pL*   *pH*   *cn*   *fn*   *n*
            Hex   1D   28   6B   *pL*   *pH*   *cn*   *fn*   *n*
            Decimal 29   40   107   *pL*   *pH*   *cn*   *fn*   *n*

[Range]   *pL* = 3, *pH* = 0
            cn = 49
            fn = 69
            $48 \leq n \leq 51$

[Default]   *n* = 48

[Description] Sets the error correction level for QRCode symbol.

n	Function	Reference: Approximate figure for recovery (%)
48	Select error correction level L	7
49	Select error correction level M	15
50	Select error correction level Q	25
51	Select error correction level H	30

EPSON

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			NEXT 169	SHEET 168

<Function 180> **GS (k *pL pH cn fn m d1…dk*** (*fn* = 80)

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*

[Range] $4 \leq (pL + pH \times 256) \leq 7092$ $(0 \leq pL \leq 255, 0 \leq pH \leq 28)$
cn = 49
fn = 80
m = 48
$0 \leq d \leq 255$
$k = (pL + pH \times 256) - 3$

[Description] • Stores symbol data (*d1…dk*) in the QRCode symbol storage area.

• Bytes of ($(pL + pH \times 256) - 3$) after *m* (*d1…dk)* are processed as symbol data.

<Function 181> **GS (k *pL pH cn fn m*** (*fn* = 81)

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*

[Range] *pL* = 3, *pH* = 0
cn = 49
fn = 81
m = 48

[Description] Prints the QRCode symbol data in the symbol storage area.

• Users must consider the quiet zone for the QRCode symbols (upward and downward spaces and left and right spaces for the QRCode symbols specified in the specifications for the QRCode symbols).

<Function 182> **GS (k *pL pH cn fn m*** (*fn* = 82)

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*

[Range] *pL* = 3, *pH* = 0
cn = 49
fn = 82
m = 48

[Description] Transmits the size of the symbol data in the symbol storage area.

The basic types of symbol size information are as follows:

Sent data	Hex	Decimal	Data size
Header	37H	55	1 byte
Flag	36H	54	1 byte
Width	30H - 39H	48 - 57	1 - 5 bytes
Separator	1FH	31	1 byte
Height	30H - 39H	48 - 57	1 - 5 bytes
Separator	1FH	31	1 byte
Fixed Value	31H	49	1 byte
Separator	1FH	31	1 byte
Other Information	30H or 31H	48 or 49	1 byte
NUL	00H	0	1 byte

Description of the Width and Height data sent:

- The height and width values of the symbol data are in dot units.

Description of the Other Information data sent:

"Hexadecimal = 30H / Decimal = 48" indicates that the data is printable.

"Hexadecimal = 31H / Decimal = 49" indicates that the data is not printable.

[Notes]
- This command does not print the QRCode symbols.

- Users must consider the quiet zone for the QRCode symbols (upward and downward spaces and left and right spaces for the QRCode symbols specified in the specifications for the QRCode symbols).

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<Function 265> **GS (k *pL pH cn fn n*** (*fn* = 82)

[Format]	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n*

[Range] *pL* = 3, *pH* = 0
 cn = 50
 fn = 65
 m = 48
 50 ≤ *n* ≤ 54

[Default] *n* = 50

[Description] Specifies the mode for MaxiCode symbol.

n	Function
50	Specifies the mode 2 conversion processing.
51	Specifies the mode 3 conversion processing.
52	Specifies the mode 4 conversion processing.
53	Specifies the mode 5 conversion processing.
54	Specifies the mode 6 conversion processing.

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<Function 280> **GS (k *pL pH cn fn m d1…dk*** (*fn* = 80)

[Format]

	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*	*d1…dk*

[Range] $4 \leq (pL + pH \times 256) \leq 141$ $(0 \leq pL \leq 141, pH = 0)$
cn = 50
fn = 80
m = 48
$1 \leq d \leq 255$
$k = (pL + pH \times 256) - 3$

[Description] • Stores symbol data (*d1…dk*) in the MaxiCode symbol storage area.

• Bytes of ($(pL + pH \times 256) - 3$) after *m (d1…dk)* are processed as symbol data.

<Function 281> **GS (k *pL pH cn fn m*** (*fn* = 81)

[Format]

	ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*
	Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*
	Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*

[Range]   *pL* = 3, *pH* = 0
cn = 50
fn = 81
m = 48

[Description] Prints the MaxiCode symbol data in the symbol storage area.

[Note]   • Users must consider the quiet zone for the MaxiCode symbols (upward and downward spaces and left and right spaces for the MaxiCode symbols specified in the specifications for the MaxiCode symbols).

<Function 282> **GS (k *pL pH cn fn m*** (*fn* = 82)

[Format] ASCII GS (k *pL* *pH* *cn* *fn* *m*
         Hex   1D 28 6B *pL* *pH* *cn* *fn* *m*
         Decimal 29 40 107 *pL* *pH* *cn* *fn* *m*

[Range] *pL* = 3, *pH* = 0
         cn = 50
         fn = 82
         m = 48

[Description] Transmits the size of the encoded symbol data in the symbol storage area.

The basic types of symbol size information are as follows:

Sent data	Hex	Decimal	Data size
Header	37H	55	1 byte
Flag	37H	55	1 byte
Width	30H - 39H	48 - 57	1 - 5 bytes
Separator	1FH	31	1 byte
Height	30H - 39H	48 - 57	1 - 5 bytes
Separator	1FH	31	1 byte
Fixed Value	31H	49	1 byte
Separator	1FH	31	1 byte
Other Information	30H or 31H	48 or 49	1 byte
NUL	00H	0	1 byte

Description of width and height data sent:

- The height and width values of the symbol data are in dot units.

Description of Other Information data sent:

"Hexadecimal = 30H / Decimal = 48" indicates that the data is printable.

"Hexadecimal = 31H / Decimal = 49" indicates that the data is not printable.

[Notes] • This command does not print MaxiCode symbols.

• Users must consider the quiet zone for the MaxiCode symbols (upward and downward spaces and left and right spaces for the MaxiCode symbols specified in the specifications for the MaxiCode symbols.)

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GS ∗ x y [d1...d(x × y × 8)]

[Name]	Define downloaded bit image

[Format]

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

[Range]   1 ≤ x ≤ 255
1 ≤ y ≤ 46 (where x × y ≤ 1536)
0 ≤ d ≤ 255

[Description] • Defines the downloaded bit image using the number of dots specified by x and y.
• x specifies the horizontal size of the downloaded bit image as a number of bytes.
• y specifies the vertical size of the downloaded bit image as a number of bytes.

GS / m

[Name]	Print downloaded bit image

[Format]

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

[Range]   0 ≤ m ≤ 3, 48 ≤ m ≤ 51

[Description] Prints the defined downloaded bit image in m mode.

m	Mode	Vertical dot density	Horizontal dot density
0, 48	Normal	203 dpi	203 dpi
1, 49	Double-width	203 dpi	203/2 dpi
2, 50	Double-height	203/2 dpi	203 dpi
3, 51	Quadruple	203/2 dpi	203/2 dpi

dpi: dots per 25.4 mm {1"}

GS :

[Name]	Start/end macro definition

[Format]

ASCII	GS	:
Hex	1D	3A
Decimal	29	58

[Description] • Starts or ends macro definition.
• The contents of the macro can be defined up to 2048 bytes.

GS B *n*

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

[Format]   ASCII   GS   B   *n*
                Hex   1D   42   *n*
                Decimal   29   66   *n*

[Range]   0 ≤ *n* ≤ 255

[Default]   *n* = 0

[Description]   Turns white/black reverse printing mode on or off.

- 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.

GS C 0 *n m*

[Name]   Select counter print mode

[Format]   ASCII   GS   C   0   *n*   *m*
                Hex   1D   43   30   *n*   *m*
                Decimal   29   67   48   *n*   *m*

[Range]   0 ≤ *n* ≤ 5
                0 ≤ *m* ≤ 2, 48 ≤ *m* ≤ 50

[Default]   *n* = 0, *m* = 0

[Description]   Selects a print mode for the serial number counter.

- *n* specifies the number of digits to be printed as follows:
  - When *n* = 0, the printer prints the actual digits indicated by the number value.
  - When *n* ≠ 0, this command sets the number of digits to be printed to *n*.
- *m* specifies the printing position within the entire range of printed digits, as follows:

m	Printing position	Processing of digits less than those specified
0, 48	Align right	Adds spaces to the left.
1, 49	Align right	Adds 0 to the left.
2, 50	Align left	Adds spaces to the right.

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GS C 1 *aL aH bL bH n r*

[Name]	Select count mode (A) (in label mode)

[Format]

ASCII	GS	C	1	*aL*	*aH*	*bL*	*bH*	*n*	*r*
Hex	1D	43	31	*aL*	*aH*	*bL*	*bH*	*n*	*r*
Decimal	29	67	49	*aL*	*aH*	*bL*	*bH*	*n*	*r*

[Range] $0 \le (aL + aH \times 256) \le 65535$ $(0 \le aL \le 255, 0 \le aH \le 255)$
$0 \le (bL + bH \times 256) \le 65535$ $(0 \le bL \le 255, 0 \le bH \le 255)$
$0 \le n \le 255$
$0 \le r \le 255$

[Default] $(aL + aH \times 256) = 1$ $(aL = 1, aH = 0)$
$(bL + bH \times 256) = 65535$ $(bL = 255, bH = 255)$
$n = 1, r = 1$

[Description] Selects a count mode for the serial number counter.

- *aL*, *aH* or *bL*, *bH* specify the counter range.
- *n* indicates the stepping amount for counting up or down.
- *r* indicates the repetition number with the counter value fixed.

Count mode	Condition	Minimum value	Maximum value
Count up	$(aL + aH \times 256) < (bL + bH \times 256)$ and $n \ne 0$ and $r \ne 0$	$(aL + aH \times 256)$	$(bL + bH \times 256)$
Count down	$(aL + aH \times 256) > (bL + bH \times 256)$ and $n \ne 0$ and $r \ne 0$	$(bL + bH \times 256)$	$(aL + aH \times 256)$
Count stop	$(aL + aH \times 256) = (bL + bH \times 256)$ or $n = 0$ or $r = 0$	--	--

GS C 2 *nL nH*

[Name]	Set counter (in label mode)

[Format]

ASCII	GS	C	2	*nL*	*nH*
Hex	1D	43	32	*nL*	*nH*
Decimal	29	67	50	*nL*	*nH*

[Range] $0 \le (nL + nH \times 256) \le 65535$ $(0 \le nL \le 255, 0 \le nH \le 255)$

[Default] $(nL + nH \times 256) = 1$ $(nL = 1, nH = 0)$

[Description] Sets the serial number counter value to $(nL + nH \times 256)$.

GS C ; *sa* ; *sb* ; *sn* ; *sr* ; *sc* ;

[Name]	Select count mode (B) (in label mode)

[Format]

ASCII	GS	C	;	*sa*	;	*sb*	;	*sn*	;	*sr*	;	*sc*	;
Hex	1D	43	*3B*	*sa*	*3B*	*sb*	*3B*	*sn*	*3B*	*sr*	*3B*	*sc*	*3B*
Decimal	29	67	*59*	*sa*	*59*	*sb*	*59*	*sn*	*59*	*sr*	*59*	*sc*	*59*

[Range]
"0" $\leq$ *sa* $\leq$ "65535"
"0" $\leq$ *sb* $\leq$ "65535"
"0" $\leq$ *sn* $\leq$ "255"
"0" $\leq$ *sr* $\leq$ "255"
"0" $\leq$ *sc* $\leq$ "65535"

[Default]   *sa* = "1", *sb* = "65535", *sn* = "1", *sr* = "1", *sc* = "1"

[Description]   Selects a count mode for the serial number counter and specifies the value of the counter with the corresponding character strings.

- *sa*, *sb*, *sn*, and *sr* are all displayed in ASCII characters, using "0" to "9."

- *sa* and *sb* specify the counter range.

- *sr* indicates the repetition number with the counter value fixed.

- *sn* indicates the stepping amount for counting up or down.

- *sc* indicates the counter value.

Count mode	Condition	Minimum value	Maximum value
Count up	*sa* < *sb* and *sn* $\neq$ 0 and *sr* $\neq$ 0	*sa*	*sb*
Count down	*sa* > *sb* and *sn* $\neq$ 0 and *sr* $\neq$ 0	*sb*	*sa*
Count stop	*sa* = *sb* or *sn* = 0 or *sr* = 0	--	--

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GS H *n*

[Name]　Select printing position for HRI characters

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

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

[Default]　*n* = 0

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

- *n* selects the execution of printing and the printing position as follows:

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

GS I *n*

[Name]	Transmit printer ID

[Format]

ASCII	GS	I	*n*
Hex	1D	49	*n*
Decimal	29	73	*n*

[Range] $1 \leq n \leq 3$, $49 \leq n \leq 51$, $65 \leq n \leq 69$, $n = 112$

[Description]   Transmits the printer ID specified.

- *n* specifies the types of printer ID.

n	Printer ID type	ID
1, 49	Printer model ID	Hexadecimal: 40H Decimal: 64
2, 50	Type ID	See table below.
3, 51	Firmware version ID	Depends on firmware version.

- *n* specifies the printer information.

n	Printer ID type	ID
65	Firmware version	Depends on firmware version
66	Manufacturer	EPSON
67	Printer name	TM-L90
68	Product ID	Serial number
69	Type of model	Japanese model: KANJI JAPANESE Simplified Chinese model: CHINA GB2312 Traditional Chinese model: TAIWAN BIG-5 Thai character model: THAI Korean model: KOREA C-5601C
112	Status of DIP switches	See 'DIP switch status information' on the next sheets.

[Type ID]

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Two-byte code characters not supported.
	On	01	1	Two-byte code characters supported.
1	Off	00	0	Autocutter not installed.
	On	02	2	Autocutter installed.
2	Off	00	0	Reserved.
3	Off	00	0	Reserved.
4	Off	00	0	Fixed.
5	Off	00	0	Reserved.
6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

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1st byte of DIP switch status information

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	DIP SW 1-1: Off
	On	01	1	DIP SW 1-1: On
1	Off	00	0	DIP SW 1-2: Off
	On	02	2	DIP SW 1-2: On
2	Off	00	0	DIP SW 1-3: Off
	On	04	4	DIP SW 1-3: On
3	Off	00	0	DIP SW 1-4: Off
	On	08	8	DIP SW 1-4: On
4	Off	00	0	Reserved.
5	Off	00	0	Reserved.
6	On	40	64	Fixed.
7	Off	00	0	Fixed.

2nd byte of DIP switch status information

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	DIP SW 1-5: Off
	On	01	1	DIP SW 1-5: On
1	Off	00	0	DIP SW 1-6: Off
	On	02	2	DIP SW 1-6: On
2	Off	00	0	DIP SW 1-7: Off
	On	04	4	DIP SW 1-7: On
3	Off	00	0	DIP SW 1-8: Off
	On	08	8	DIP SW 1-8: On
4	Off	00	0	Reserved.
5	Off	00	0	Reserved.
6	On	40	64	Fixed.
7	Off	00	0	Fixed.

GS L *nL nH*

[Name]	Set left margin

[Format]

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

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

[Default] $(nL + nH \times 256) = 0$ $(nL = 0, nH = 0)$

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

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

Printable area

Left margin   Printing area width
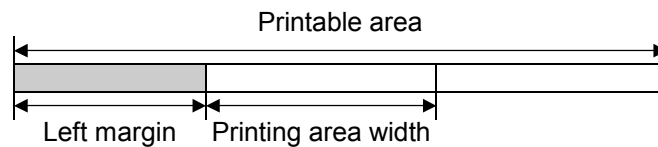
GS P *x y*

[Name]	Set horizontal and vertical motion units

[Format]

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

[Range] $0 \leq x \leq 255$
$0 \leq y \leq 255$

[Default] $x = 203, y = 406$

[Description] • Sets the horizontal and vertical motion units as follows:

- When $x = 0$, the default setting for the horizontal motion unit is used.
- When $1 \leq x \leq 255$, the horizontal motion unit is set to 25.4/*x* mm {1/*x*"}.
- When $y = 0$, the default setting of the vertical motion unit is used.
- When $1 \leq y \leq 255$, the vertical motion unit is set to 25.4/*y* mm {1/*y*"}.

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GS T *n*

[Name] Set print position to the beginning of print line

[Format] ASCII   GS   T   *n*
           Hex   1D   54   *n*
           Decimal 29   84   *n*

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

[Description] • Sets the print position to the beginning of the print line.

      • *n* specifies how data in the print buffer is processed when this command is executed.

n	Function
0, 48	Sets the print position after the data in the print buffer is deleted.
1, 49	Sets the print position after the data in the print buffer is printed.

    • When printing is specified (*n* = 1, 49), the printer prints the data in the print buffer and executes a line feed based on the line feed amount set.

    • When deleting is specified (*n* = 0, 48), the printer cancels the print data in the print buffer, and keeps other data or setting values except for the print data.

① GS V *m*
② GS V *m n*

[Name] Select cut mode and cut paper

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

      ② ASCII   GS   V   *m*   *n*
          Hex   1D   56   *m*   *n*
          Decimal 29   86   *m*   *n*

[Range] ① *m* = 0, 1, 48, 49
      ② *m* = 65, 66, $0 \le n \le 255$
      ③ *m* = 103, 104, $0 \le n \le 255$
      (effective only when the paper layout (the origin of the layout) is set to "does not use the layout")

[Description] • Specifies the mode to use to cut paper.

| *M*	Function
0, 48 1, 49	Cuts paper (one point left uncut, full cut).
65, 66	Feeds and cuts paper (one point left uncut, full cut).
103, 104	Feeds and cuts paper, reverse feed to the print starting position (full cut)

    • *n* specifies the paper feed amount.

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[Notes] • Although you can set this command, full cut or one point left uncut cannot be changed by software.
• If the printer cuts the paper and feeds to the print starting position immediately when the printer feeds to the peeling position, the paper may be pulled inward and the printer may not be able to feed.   Therefore, it is prohibited to use this command immediately when the printer feeds to the peeling position.

GS W *nL nH*

[Name]   Set printing area width

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

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

[Default] When the paper layout (the origin of the layout) is set to "does not use the layout" or "top of the black mark":
           $(nL + nH \times 256) = 576$ ($nL = 64$, $nH = 2$)   (for 80 – 78 mm of the paper width)
           $(nL + nH \times 256) = (256 + (\text{paper width} – 38) \times 8)$ (for 77 – 38 mm of the paper width)

           When the paper layout (the origin of the layout) is set to "bottom of the label":
           $(nL + nH \times 256) = 560$ ($nL = 48$, $nH = 2$)   (for 80 mm of the paper width)
           $(nL + nH \times 256) = (224 + (\text{paper width} – 38) \times 8)$ (for 79 – 38 mm of the paper width)

[Description] Sets the printing area width specified with *nL* and *nH*.
           • The printing area width is $[(nL + nH \times 256) \times (\text{horizontal motion units})]$.

Printable area

Left margin | Printing area width
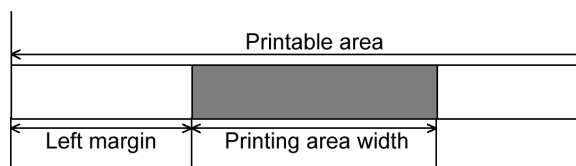
GS \ *nL nH*

[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.   The distance from the current position to the starting position is $[(nL + nH \times 256) \times (\text{vertical or horizontal motion units})]$.

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GS ^ *r t m*

[Name]   Execute macro

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

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

[Description] Executes a macro.

- *r* specifies the number of times to execute the macro.
- *t* specifies the waiting time for executing the macro.
- *m* specifies macro executing mode from the table below.

m	Function
0	Executes the macro *r* times at the intervals specified by $t \times 100$ ms.
1	After waiting for the time specified by $t \times 100$ ms, the PAPER OUT LED flashes to indicate that the FEED button must be pressed. After the button is pressed, the macro is executed once. This operation is then repeated *r* times.

GS a *n*

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

[Format]
ASCII	GS	a	*n*
Hex	1D	61	*n*
Decimal	29	97	*n*

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

[Default]   *n* = 0 when memory switch Msw 1-3 is Off.
                 n = 2 when memory switch Msw 1-3 is On.

[Description] Specifies the status items for ASB (Automatic Status Back).

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Drawer kick-out connector pin 3 disabled.
	On	01	1	Drawer kick-out connector pin 3 enabled.
1	Off	00	0	Online/offline status disabled.
	On	02	2	Online/offline 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, 5	Off	00	0	Reserved.
6	Off	00	0	Panel button status disabled.
	On	40	64	Panel button status enabled.
7	Off	00	0	Reserved.

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			D	NEXT 186	SHEET 185

- The status to be transmitted is the four bytes that follow:

First byte (printer information)

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Fixed.
1	Off	00	0	Fixed.
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	Online.
	On	08	8	Offline.
4	On	10	16	Fixed.
5	Off	00	0	Cover is closed.
	On	20	32	Cover is open.
6	Off	00	0	Paper is not being fed using the paper FEED button.
	On	40	64	Paper is being fed using the paper FEED button.
7	Off	00	0	Fixed to Off.

- If the cover is open, the printer goes offline.

Second byte (printer information)

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not in online waiting status.
	On	01	1	During online waiting status.
1	Off	00	0	Panel button OFF.
	On	02	2	Panel button ON.
2	Off	00	0	No mechanical error.
	On	04	4	Mechanical error has occurred.
3	Off	00	0	No autocutter error.
	On	08	8	Autocutter error occurred.
4	Off	00	0	Fixed.
5	Off	00	0	No unrecoverable error.
	On	20	32	Unrecoverable error has occurred.
6	Off	00	0	No automatically recoverable error.
	On	40	64	Automatically recoverable error has occurred.
7	Off	00	0	Fixed.

Third byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Function
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	Fixed.
5	Off	00	0	Reserved.
6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

• The paper roll end sensor is unstable when the cover is open.

Fourth byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Function
0	On	01	1	Reserved.
1	On	02	2	Reserved.
2	On	04	4	Reserved.
3	On	08	8	Reserved.
4	Off	00	0	Fixed.
5	Off	00	0	Reserved.
6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

[Reference]   Appendix I

EPSON	TITLE	**TM-L90** Specification (STANDARD)	SHEET REVISION	NO.
			D	NEXT 188 / SHEET 187

GS b *n*

[Name]   Turns smoothing mode on/off

[Format]   ASCII   GS   b   *n*
              Hex   1D   62   *n*
              Decimal   29   98   *n*

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

[Default]   *n* = 0

[Description] Turns smoothing mode on or off.

- When the LSB of *n* is 0, smoothing mode is turned off.
- When the LSB of *n* is 1, smoothing mode is turned on.

GS c

[Name]   Print counter

[Format]   ASCII   GS   c
              Hex   1D   63
              Decimal   29   99

[Description] Sets the serial counter value in the print buffer and increments or decrements the counter value.

- After setting the current counter value in the print buffer as print data (a character string), the printer counts up or down based on the count mode set.

	TITLE		SHEET REVISION	NO.	
EPSON		**TM-L90** Specification (STANDARD)	D	NEXT 189	SHEET 188

GS f *n*

[Name]   Select font for HRI characters

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

[Range]   For ANK/Multilingual model: *n* = 0, 1, 48, 49
             For Japanese model: $0 \leq n \leq 2$, $48 \leq n \leq 50$

[Description] Selects a font for the HRI characters used when printing a bar code.

- *n* specifies the font of the HRI characters as follows:

     For ANK/Multilingual model:

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

     For Japanese model:

n	Font
0, 48	Font A (12×24)
1, 49	Font B (10×17)
2, 50	Font C (8×16)

	TITLE		SHEET REVISION	NO.	
EPSON	**TM-L90** Specification (STANDARD)		D	NEXT 190	SHEET 189

GS g 0 *m nL nH*

[Name]   Initialize maintenance counter

[Format]

ASCII	GS	g	0	*m*	*nL*	*nH*
Hex	1D	67	30	*m*	*nL*	*nH*
Decimal	29	103	48	*m*	*nL*	*nH*

[Range] $m = 0$

$20 \leq (nL + nH \times 256) \leq 70$ (nL = 20, 21, 50, 70, nH = 0)

[Description] Initializes the resettable maintenance counter to 0.

- nL, nH specify the maintenance counter number as ($nL + nH \times 256$)

Counter number		Counter [Units]
Hex	Decimal	
14	20	Number of line feeds [lines]
15	21	Number of energizing head [times]
32	50	Number of autocutter operation [times]
46	70	Print operation time [hours]

[Notes]

- Frequent write command executions by this command may damage the NV memory. Therefore, it is recommended to write to the NV memory no more than 10 times a day.

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

EPSON	TITLE	**TM-L90** Specification (STANDARD)	SHEET REVISION	NO.	
			D	NEXT 191	SHEET 190

GS g 2 *m nL nH*

[Name]	Transmit maintenance counter value

[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

$20 \leq (nL + nH \times 256) \leq 198$ (*nL* =20, 21, 50, 70, 148, 149, 178, 198, *nH* = 0)

[Description] Transmits the value of the specified maintenance counter.

- *nL*, *nH* specify the maintenance counter number as ($nL + nH \times 256$).

Counter number		Counter [Units]	Kind of counter
Hex	Decimal		
14	20	Number of line feeds [lines]	Can be reset
15	21	Number of times energizing head [times]	
32	50	Number of autocutter operations [times]	
46	70	Printer operation time [hours]	
94	148	Number of line feeds [lines]	Cumulative
95	149	Number of times energizing head [times]	
B2	178	Number of autocutter operations [times]	
C6	198	Printer operation time [hours]	

- The contents of the maintenance counter are as follows:

	Hexadecimal	Decimal	Amount of data
Header	5FH	95	1 byte
Data	30H – 39H	48 – 57	1 – 10 bytes
NUL	00H	0	1 byte

[Notes]

- During the transmission of the blank data values in the maintenance counter, the printer ignores the real-time commands.   Also, the printer does not transmit ASB even when the ASB is enabled.   Therefore, the user cannot confirm changes in the printer status during these periods.

- The counter values may be different from the actual counts depending on time differences at power off or the occurrence of an error.

GS h *n*

[Name]　　　Select bar code height

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

[Range]　　 $1 \leq n \leq 255$

[Default]　 *n* = 162

[Description]　Selects the height of the bar code as *n* dots.

	TITLE	**TM-L90** Specification (STANDARD)	SHEET REVISION	NO.		
EPSON			D	NEXT 193	SHEET 192	

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

[Name]	Print bar code

[Format]

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

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

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

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

[Description]   Selects a bar code system and prints the bar code.

For ①

m	Bar Code System	Range of *k*	Range of *d*
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	JAN8 (EAN8)	$7 \leq k \leq 8$	$48 \leq d \leq 57$
4	CODE39	$1 \leq k$	$48 \leq d \leq 57, 65 \leq d \leq 90,$ $d = 32,36,37,43,45,46,47$
5	ITF	$1 \leq k$ (even number)	$48 \leq d \leq 57$
6	CODABAR	$1 \leq k$	$48 \leq d \leq 57, 65 \leq d \leq 68,$ $d = 36,43,45,46,47,58$

For ②

m	Bar Code System	Range of *n*	Range of *d*
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	JAN8 (EAN8)	$7 \leq n \leq 8$	$48 \leq d \leq 57$
69	CODE39	$1 \leq n \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 90,$ $d = 32,36,37,43,45,46,47$
70	ITF	$1 \leq n \leq 255$ (even number)	$48 \leq d \leq 57$
71	CODABAR (NW7)	$1 \leq n \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 68,$ $d = 36,43,45,46,47,58$
72	CODE93	$1 \leq n \leq 255$	$0 \leq d \leq 127$
73	CODE128	$2 \leq n \leq 255$	$0 \leq d \leq 127$

[Notes]   • The user must consider the quiet zone of the bar code (left and right spaces beside the bar code).

GS r *n*

[Name]	Transmit status

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

[Range]   *n* = 1, 2, 49, 50

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

n	Function
1, 49	Transmits paper sensor status.
2, 50	Transmits drawer kick-out connector status.

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

Bit	Off/On	Hex	Decimal	Function
0, 1	Off	00	0	Paper roll near-end sensor:　paper adequate.
	On	03	3	Paper roll near-end sensor:　paper near end.
2, 3	Off	00	0	Paper roll end sensor:　paper present.
	On	0C	12	Paper roll end sensor:　paper not present.
4	Off	00	0	Fixed.
5, 6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

Bits 2 and 3:　This command cannot be executed since the printer goes offline when the roll paper end detects the paper not present.　Therefore, the status of bit 2 (1) and bit 3 (1) is not transmitted.

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	Off	00	0	Reserved.
4	Off	00	0	Fixed.
5, 6	Off	00	0	Reserved.
7	Off	00	0	Fixed.

EPSON	TITLE	**TM-L90** Specification (STANDARD)	SHEET REVISION	NO.	
			D	NEXT 195	SHEET 194

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] $0 \le m \le 3, 48 \le m \le 51$
$1 \le (xL + xH \times 256) \le 128$ $(0 \le xL \le 128, xH = 0)$
$1 \le (yL + yH \times 256) \le 4095$ $(0 \le yL \le 255, 0 \le yH \le 15)$
$0 \le d \le 255$
$k = (xL + xH \times 256) \times (yL + yH \times 256)$

[Description]   Prints a raster bit image in *m* mode.

m	Mode	Vertical dot density	Horizontal dot density
0, 48	Normal	203 dpi	203 dpi
1, 49	Double-width	203 dpi	203/2 dpi
2, 50	Double-height	203/2 dpi	203 dpi
3, 51	Quadruple	203/2 dpi	203/2 dpi

dpi: dots per 25.4 mm {1"}

- *xL*, *xH* specify $(xL + xH \times 256)$ byte(s) in the horizontal direction for the bit image.
- *yL*, *yH* specify $(yL + yH \times 256)$ dot(s) in the vertical direction for the bit image.
- *d* specifies the definition data of the bit image data.

EPSON	TITLE **TM-L90** Specification (STANDARD)	SHEET REVISION D	NO.	
			NEXT 196	SHEET 195

GS w *n*

[Name]   Set bar code width

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

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

[Default]   *n* = 3

[Description] Sets the horizontal size of the bar code, using *n* as follows:

n	Multi-level bar code	Binary-level bar code	
	Module width (mm)	Thin element width (mm)	Thick element width (mm)
2	0.250	0.250	0.626
3	0.375	0.375	1.001
4	0.500	0.500	1.251
5	0.626	0.626	1.627
6	0.751	0.751	2.002

- Multi-level bar codes are as follows:
  UPC-A, UPC-E, JAN13, JAN8, CODE93, CODE128

- Binary-level bar codes are as follows:
  CODE39, ITF, CODABAR

6.4 Kanji Control Commands

(for Japanese model, Simplified Chinese model, Traditional Chinese model, and Korean model)

FS ! *n*

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

[Format]

ASCII	FS	!	*n*
Hex	1C	21	*n*
Decimal	28	33	*n*

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

[Default]   *n* = 0

[Description] Sets the style (double-width, double-height, underline) for Kanji characters, together.

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

EPSON	TITLE	**TM-L90** Specification (STANDARD)	SHEET REVISION	NO.	
			D	NEXT 198	SHEET 197

FS &

[Name]	Select Kanji character mode
[Format]	ASCII FS & Hex 1C 26 Decimal 28 38
[Description]	Selects Kanji character mode.
[Notes]	• The default setting in the Japanese model is canceled in the Kanji mode.
	• The default setting in the Simplified Chinese, Traditional Chinese, and Korean model is set in the Kanji mode.

FS (A *pL pH fn [parameter]*

[Name]	Select Kanji character style(s)
[Description]	• Selects the process of the character style specified with *fn*.

fn	Code	Function No.	Description
48	**FS (A *pL pH fn m***	Function 48	Selects the Kanji font process.

[Notes]	• The command is enabled only in the Japanese model.

<Function 48> FS (A *pL pH fn m*   (*fn* = 48)

[Format]	ASCII FS (A *pL* *pH* *fn* *m* Hex 1C 28 41 *pL* *pH* *fn* *m* Decimal 29 40 65 *pL* *pH* *fn* *m*
[Range]	$(pL + pH \times 256) = 2$ $(pL = 2, pH = 0)$ $fn = 48$ $0 \le m \le 2, 48 \le m \le 50$
[Default]	$m = 0$
[Description]	• Selects the type of the Kanji font.

m	Type of Kanji font
0, 48	Kanji font A (24×24)
1, 49	Kanji font B (20×24)
2, 50	Kanji font C (16×16)

FS - *n*

[Name]   Turn underline mode on/off for Kanji characters

[Format]   ASCII   FS   -   *n*
              Hex   1C   2D   *n*
              Decimal   28   45   *n*

[Range]   0 ≤ *n* ≤ 2, 48 ≤ *n* ≤ 50

[Default]   *n* = 0

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

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

FS .

[Name]   Cancel Kanji character mode

[Format]   ASCII   FS   .
              Hex   1C   2E
              Decimal   28   46

[Description] Cancels Kanji character mode.

 • The default setting in the Japanese model is set when the Kanji mode is canceled.

 • The default setting in the Simplified Chinese, Traditional Chinese, and Korean model is canceled when Kanji mode is canceled.

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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	*c1*	*c2*
Japanese model (JIS code system)	*c1* = 77H	21H ≤ *c2* ≤ 7EH
Japanese model (SHIFT-JIS code system)	*c1* = ECH	40H ≤ *c2* ≤ 7EH 80H ≤ *c2* ≤ 9EH
Simplified Chinese model Traditional Chinese model Korean model.	*c1* = FEH	A1H ≤ *c2* ≤ FEH

- $0 \le d \le 255$

- *k* depends on the Kanji support model

	k
Japanese model (font A (24 × 24) selected)	72
Japanese model (font B (20 × 24) selected)	60
Japanese model (font C (16 × 16) selected)	32
Simplified Chinese model Traditional Chinese model Korean model	72

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

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Confidential

[Example]

24 dots

d1 | d4 | d7 — d70

MSB

24 dots

d2 | d5 — d71

d3 | d6 — d72

LSB

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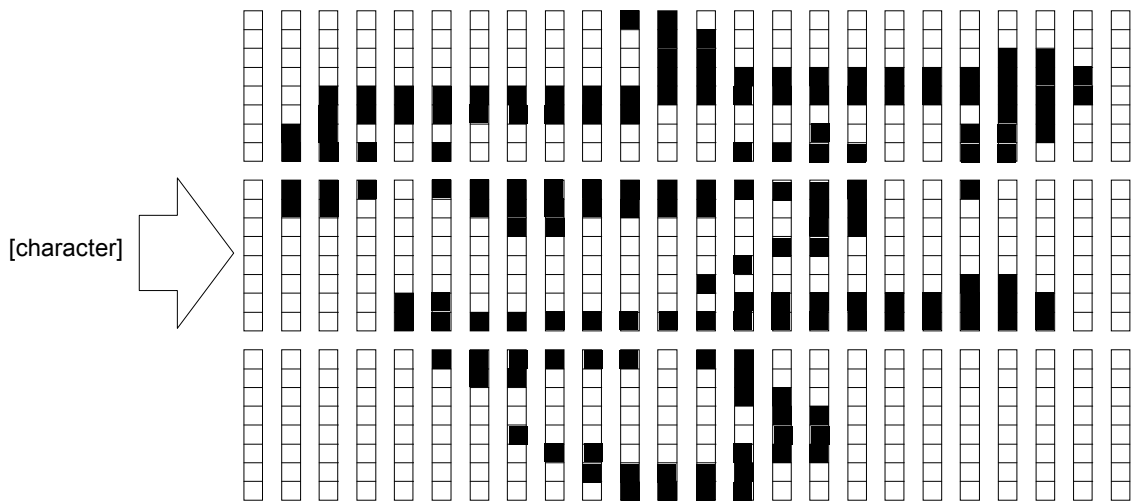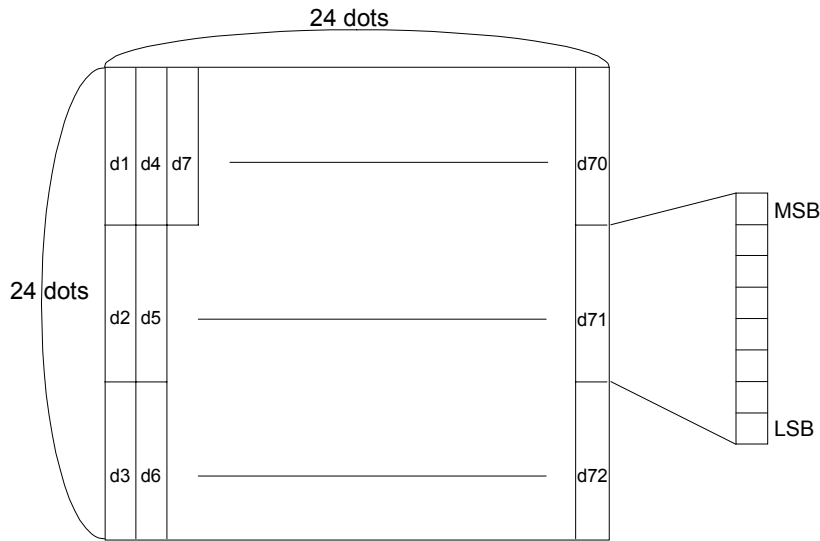
d1 = <00>H	p4 = <03>H	d7 = <0F>H	•• d10 = <0D>H	d13 = <0C>H	d16 = <0D>H	••••
d2 = <00>H	p5 = <00>H	d8 = <00>H	•• d11 = <80>H	d14 = <03>H	d17 = <83>H	••••
d3 = <00>H	p6 = <00>H	d9 = <00>H	•• d12 = <00>H	d15 = <00>H	d18 = <80>H	••••

FS C *n*

[Name] Select Kanji character code system

[Format]
	ASCII	FS	C	*n*
	Hex	1C	43	*n*
	Decimal	28	67	*n*

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

[Default] *n* = 0

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

n	Kanji system
0, 48	JIS code
1, 49	SHIFT JIS code

FS S *n1 n2*

[Name] Set Kanji character spacing

[Format]
	ASCII	FS	S	*n1*	*n2*
	Hex	1C	53	*n1*	*n2*
	Decimal	28	83	*n1*	*n2*

[Range] $0 \le n1 \le 255$
$0 \le n2 \le 255$

[Default] *n1* = 0, *n2* = 0

[Description] Sets left- and right-side Kanji character spacing using *n1* and *n2*, respectively.

- The left-side character spacing is [*n1* × horizontal or vertical motion units], and the right-side character spacing is [*n2* × horizontal or vertical motion units].

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			D	NEXT 203	SHEET 202

FS W *n*

[Name]   Turn quadruple-size mode on/off for Kanji characters

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

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

[Default]   *n* = 0

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

- When the LSB of *n* is 0, quadruple-size mode for Kanji characters is turned off.
- When the LSB of *n* is 1, quadruple-size mode for Kanji characters is turned on.

APPENDIX A: MISCELLANEOUS NOTES

A.1 Notes on Printing and Paper Feeding

1) Because the TM-L90 series printer 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 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 and A.2.

Table A.1 Paper Feeding Amount (ANK/Multilingual Model)

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

Table A.2 Paper Feeding Amount (Japanese Model)

		Required Paper Feeding Amount (dots)
Normal Characters	Font A	24 × number of times enlarged vertically
	Font B	24 × number of times enlarged vertically
	Font C	16 × number of times enlarged vertically
	Kanji font A	24 × number of times enlarged vertically
	Kanji font B	24 × number of times enlarged vertically
	Kanji font C	16 × number of times enlarged vertically
Normal Characters	Font A	12 × number of times enlarged vertically
	Font B	10 × number of times enlarged vertically
	Font C	8 × number of times enlarged vertically
	Kanji font A	24 × number of times enlarged vertically
	Kanji font B	20 × number of times enlarged vertically
	Kanji font C	16 × number of times enlarged vertically
Bit image (**ESC ∗**)		24

2) 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.

3) Interval of autocutting operation in the receipt section

For driving the autocutter of the receipt section, the interval should be a minimum of 10 lines of printing or paper feeding (to prevent small pieces of cut paper from dropping into the autocutter).

A.2 Notes on Printer Installation

- Connect the external power supply to the printer power supply connector. 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 V $\pm$ 7%. If the power supply voltage drops to the outside 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 3.9.3. The flashing 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

- Do not pull the paper out when the cover is closed. Especially when it is required that the paper is pulled out after turning the power off, the power may be turned back on.

- 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 Cl^- ions can harm the print head thermal elements. Therefore, be sure to use only the specified paper.

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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 temperatures, humidity, and light, both before and after printing.

a) Store paper away from high temperatures 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.

- When the printer is not used for one week or more, it is recommended not to leave the thermal paper between the platen and the print head.

3) Others

- Because this printer uses plated steel, the cutting edges may be subject to rust. However, this does not affect the printer performance.

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APPENDIX B: PAPER ROLL SETUP

B.1 Replacing the Paper Roll

1) Open the printer cover by pressing the cover open button.

2) Remove the spool of the used roll paper from the paper holder and load the new paper roll.

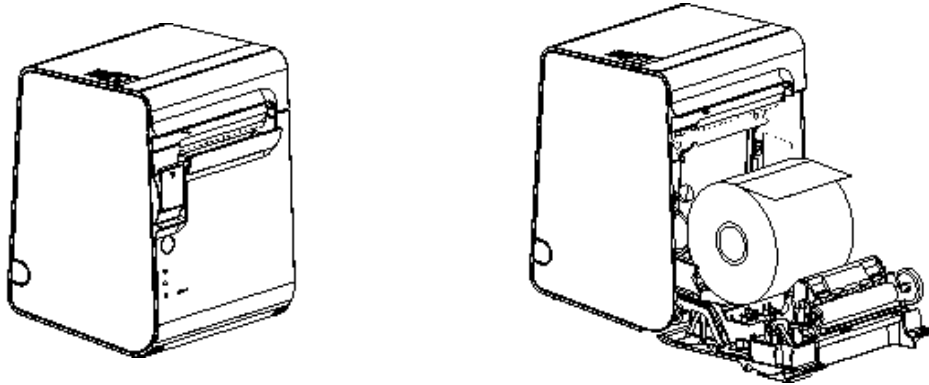3) Pull out some of the paper roll from the paper and close the printer cover.

Figure B.1 Printer Upper Side Overview

NOTE: • If the roll paper is set at a slant, the paper may not feed correctly and the paper detection may not work correctly. To recover from this, set the paper correctly again.

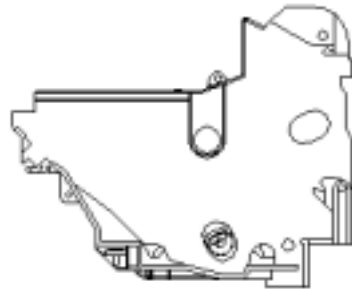| EPSON	TITLE	TM-L90 Specification (STANDARD)	SHEET REVISION	NO.	
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APPENDIX C: ADJUSTING THE ROLL PAPER NEAR-END SENSOR LOCATION

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:
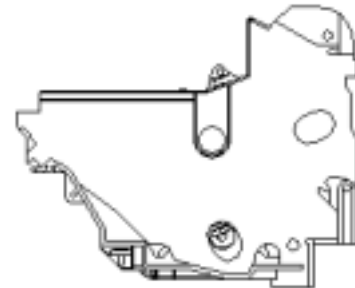
1) The inside diameter of the paper spool should be 25.4 mm {1.00"} and the outside diameter of the paper spool should be 31.4 mm {1.24"}. Specified thermal paper should be used.

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.

Table C.1 Adjustment Positions

Adjustment position number	Specified thermal paper Dimension of outside diameter of paper roll
#1	Approximately 36 mm {1.42"}
#2	Approximately 41 mm {1.61"}

Positioning Plate #1 Horizontal   Positioning Plate #2 Horizontal

Positioning Plate #1 Vertical   Positioning Plate #2 Vertical

Figure C.1 Near-end Adjusting Position

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NOTES:

1) Since the specified thermal paper dimension of outside diameter of paper roll in Table C.1 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.

3) Change the paper roll near-end sensor position to detect the paper near-end correctly when the printer is placed horizontally. (Refer to Figure C.2.)

    (1) Loosen the screw for the detector.

    (2) Push the lever on the detector until it touches the back of the hole.

    (3) Turn the knob toward you until the lever clicks into place in the other hole.

    (4) While setting the knob by pressing the knob toward you, secure the screw.
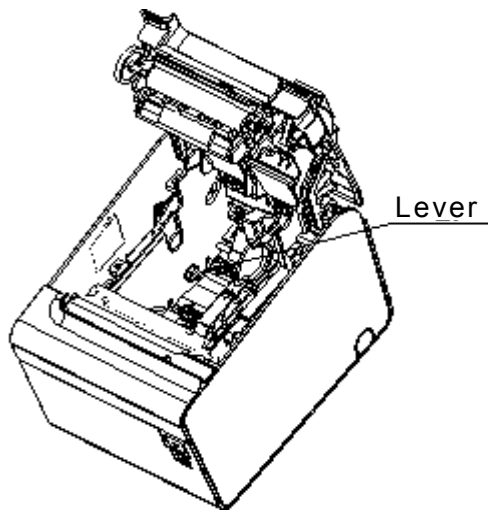
Lever

Figure C.2 Changing the Near-end Adjusting Position

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APPENDIX D: 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 an alcohol solvent (ethanol, methanol, IPA).

    NOTES: • Do not touch the print head thermal elements.

                • Do not scratch the print head.

3) Insert roll paper 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 and turn on after the alcohol solvent is dried out completely.
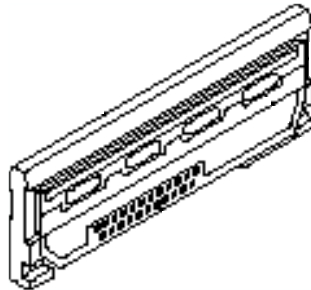
Figure D.1 Print Head Thermal Elements

(*) Depending on the roll paper used, paper dust may stick to the platen roller and roll paper end sensor. To remove the paper dust, clean the platen roller and roll paper end sensor with a cotton swab moistened with water.
Also, be sure to turn on the printer power after the water is dried out completely.

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APPENDIX E: 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 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 F: CODE128 BAR CODE

F.1 Description of the CODE128 Bar Code

In the 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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F.2 Code Tables

Printable characters in code set A

Character	Transmit data Hex	Transmit data Decimal	Character	Transmit data Hex	Transmit data Decimal	Character	Transmit data Hex	Transmit data 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			

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	7B,31	123,49
21	15	21	61	3D	61	CODEA	7B,41	123,65
22	16	22	62	3E	62	CODEB	7B,42	123,66
23	17	23	63	3F	63			
24	18	24	64	40	64			
25	19	25	65	41	65			
26	1A	26	66	42	66			
27	1B	27	67	43	67			
28	1C	28	68	44	68			
29	1D	29	69	45	69			
30	1E	30	70	46	70			
31	1F	31	71	47	71			
32	20	32	72	48	72			
33	21	33	73	49	73			
34	22	34	74	4A	74			
35	23	35	75	4B	75			
36	24	36	76	4C	76			
37	25	37	77	4D	77			
38	26	38	78	4E	78			
39	27	39	79	4F	79			

APPENDIX G: NOTES ON UPDATING THE MAINTENANCE COUNTER AND TURNING THE PRINTER'S POWER OFF

G.1 About updating the maintenance counter

- This printer has a maintenance counter function, as described in the command description for **GS g 0** and **GS g 2**.

- The values of the maintenance counter are automatically stored in the NV memory every 2 minutes (or 4 minutes maximum) when the printer is operating, except in the power save mode.

- However, if the power off is performed as described in Section G.2, the printer stores the latest values of the maintenance counter and executes the power off control, regardless of the updating interval described above.

- If the printer is not sending or receiving data for two seconds or is not operating while the power is turned on, the printer enters the power-saving mode and all of the values of the maintenance counter including the printer operation time stop counting.

G.2 About the printer's power off

In order to keep the latest values in the maintenance counter, the printer must be turned off by the following procedure. If the printer is turned off by any other than this procedure, the latest values of the maintenance counter cannot be saved.

1) Turn the printer's power off using the power button in the front.
2) Execute the **DLE DC4** (*fn* = 2) command from the host to turn the printer's power off.

G.2.1 Printer setup control by the host with printer power off

Follow the procedure below for setting up the printer first.

1) Turn the printer's power off using the power button in the front.
2) Wait until the POWER LED turns off.
3) Turn DIP switch 1-1 on.
4) Turn the printer's power on using the power button.
5) Attach the power button cover on the power button.

G.2.2 Power off control by the host

The following is an example of the printer power off process when the printer is turned off using the **DLE DC4** (*fn* = 2) command.

1) The host transmits the following continuous procedure before the system is turned off:

   ① Executes the last print command such as **LF, ESC d**, etc.

   ② Executes **GS (D *pL pH m a b*** (*pL*=3, *pH* =0, *m* =20, *a* =2, *b* =1)

   ③ Executes **GS r *n*** (*n* =1)

2) The host waits for the paper sensor status sent from the printer in response to the **GS r *n*** command.

3) The host transmits **DLE DC4 *fn a b*** (*fn* =2, *a* =1, *b* =8).

4) The host waits for the power off status.

   - The values of the maintenance counter are stored and the power-off sequence is performed within 10 seconds after the host transmits **DLE DC4 *fn a b***; then the power off status is transmitted.

   - If the power off status is not checked, the host waits for 10 seconds or more after transmitting **DLE DC4 *fn a b***.

   - For the serial interface model, the printer status is transmitted regardless of the condition of the host.

   - For the parallel interface model, after the host transmits **DLE DC4 *fn a b***, the printer is required to be ready for receiving data from the host.

   NOTE: The printer executes the software sequence, but the power is not cut.

5) Please turn the host power off.

   NOTE: Do not execute a reset to the printer until the printer power is turned off after transmitting **DLE DC4** (*fn* = 2).

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APPENDIX H: NOTES ON PRINTING 2-DIMENSIONAL CODES

The TM-L90 supports 2-dimensional code printing.
Be sure to follow the notes below when printing 2-dimensional codes.

1) When printing PDF417 (2-dimensional code), it is recommended to set the height of one module of the symbol to three to five times the width of one module, also making sure that the total height is almost 5 mm {0.20"} or more.

2) The recognition rate of the 2-dimensional code may be affected by such items as different widths of the modules, print density, environmental temperature, type of the thermal paper, and characteristics of the reader. Therefore, the user should check the recognition rate in advance so that the limitations of the reader can be considered.

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APPENDIX I: NOTES ON USING THE ASB STATUS

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	0000 0000	0000 1111

When a sequence of operations are performed, the near end is detected, the printer cover is opened, and 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	0000 0011	0000 1111	Near end detection
②	0011 1000	0000 0000	0000 0011	0000 1111	The printer cover is opened.
③	0001 0000	0000 0000	0000 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)

	First Status	Second Status	Third Status	Fourth Status
Accumulated ASB (①+②+③)	0011 1000	0000 0000	0000 0011	0000 1111
+	First Status	Second Status	Third Status	Fourth Status
The latest ASB (③)	0001 0000	0000 0000	0000 0011	0000 1111

Fourth Status

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APPENDIX J: NOTES ON SETTING MEMORY SWITCH 8-6 "FEEDING PAPER TO THE PRINT STARTING POSITION AT POWER ON IS DISABLED"

This printer can set a paper feeding to the print starting position at power on or software resetting disabled with memory switch 8-6.
Note the following points if this setting is used.

- This setting is enabled only when the paper layout is set. The paper layout can be set with <Function 49> of **GS (E**, **GS (A**, or a panel operation (refer to section 3.8).

- This setting performs on the assumption that the paper is already fed to the print starting position at power on or software reset. If the paper has not been set to the print starting position, the print position of the first print may be misaligned or the paper layout error (recoverable error) may occur. Therefore, take in consideration the following points:

  a) Turing the power off or resetting the printer must be performed in the condition that the paper is fed to the print starting position. Please note that the software reset is activated in the following conditions:

    - When Function 2 of **GS (E** is executed by changing the memory switch.
    - With the parallel interface model, when the host PC reboots.
    - When a reset signal is sent from the host PC.

  b) Do not open the cover or exchange the paper while the power is off.

    ① If the cover is opened or the paper is exchanged while the power is off, open and close the cover once while the power is on.

    ② If printing is performed without the operation described above, the paper layout error (recoverable error) may occur. Execute the **DLE ENQ** (n = 2) command to recover from the error and feed the paper to the print starting position if this error occurs.

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