

Confidential

EPSON

Receipt Printer

TM-T90

Specification

STANDARD	
Rev. No.	E
Notes	

Copied Date	, ,
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SEIKO EPSON CORPORATION

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REVISION SHEET

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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	E	18	E	42	E
B	Change	Hosomi	Ikegami	Takizawa	II	E	19	E	43	E
C	Change	Hosomi	Ikegami	Takizawa	III	E	20	E	44	E
D	Change	Hosomi	Ikegami	Godo	IV	E	21	E	45	E
E	Change	Tsukada	--	Takizawa	V	E	22	E	46	E
					VI	E	23	E	47	E
					VII	E	24	E	48	E
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					2	E	26	E	50	E
					3	E	27	E	51	E
					4	E	28	E	52	E
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					17	E	41	E	65	E
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A	Enactment				66	E	90	E	114	E
B	Change				67	E	91	E	115	E
C	Change				68	E	92	E	116	E
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A	Enactment				138	E	162	E	App.1	E
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					158	E			App.21	E
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REV.	SHEET	CHANGED CONTENTS
B	61	3.7 Memory Switch Setting Mode 2) Starting the memory switch setting mode Press the paper FEED button twice and ... (added)
C	All	All pages are newly renumbered.
	II	GENERAL FEATURES Korean characters → Korean Kanji • Using with the Epson PS-180 ... (added)
	1, 2	1.1 Printing Specifications (changed)
	3	1.2 Character specifications Extended graphics: 128 x 11 pages (corrected) 2) Character structure (changed)
	4	3) Character size (changed)
	5	1.3 Paper Cutter → Autocutter
	7, 8	1.8 Paper Specifications (changed)
	11	1.9 Internal Buffer 3) NV bit-image data buffer → NV graphics data 1.10 Electrical Characters PS-175 (added), current consumption in two-color print (added)
	12	1.12 EMI and Safety Standards Applied (changed)
	30	2.2.3 Drawer Kick-out Connector Connector model (printer side) (changed)
	34	Kanji command list (added)
	--	3.12 Page Mode (deleted)
	70, 71	6.2 Explanation of Terms 3), 4), 9) (deleted) 5) Printable area (3) (changed)
	80	DLE DC4 ($fn=8$) [Description] • Selects the paper .. (deleted)
	82	ESC ! [Description] Bit 0 (changed)
	83	ESC & [Range] and [Description] (changed)
	84	ESC * [Description] (changed)
	86	ESC 3 1015 mm → 1016 mm
	88	ESC J 1015 mm → 1016 mm
	89	ESC M [Range] [Description] (changed)
	92, 93	ESC W [Default] (changed)
	94	ESC c 3 [Range] (changed)
	97	ESC t [Range] [Default] [Description] (changed)
	98	FS p [Description] (changed)
	99	FS q [Range] [Description] (changed)
	102	GS (C [Description] (changed)
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	119 - 121	GS (E <Function 6> [Description] (changed)
	123	GS (E <Function 8> [Range] (10 × 24) and (8 × 16) (added)
	125	GS (E <Function 8> [Range] (10 × 24) and (8 × 16) (added)
	131	GS (K <Function 48> (changed)
	132	GS (K <Function 49> [Description] (changed)
	133	GS (K <Function 50> <Function 97> (added)
	134 - 142	GS (L (all changed)
	143, 144	GS (M [Description] 2-dimensional code (added)
	145	GS (N [Format] (changed)
	146 - 152	GS (k (all changed)
	153	GS * [Notes] (added)
	153	GS / m [Description] (changed)
	157	GS P [Default] [Description] (changed)
	159	GS W [Default] (changed)
	163	GS a [Notes] (changed)
	164	GS f [Range] [Description] (changed)
	168	GS k [Description] (changed)
	170	GS v 0 [Description] (changed)
	171	GS w [Description] (changed)
	172 - 178	6.4 Kanji Control Commands (added)
	App. 1	Appendix A Table A.2 (added)
	App. 14	Appendix H Comparison (changed)
	App. 19	Appendix I (added)
	App. 20	Appendix J (added)
D	All	All pages are revised. Japanese Kanji → Japanese, Chinese Kanji → Simplified Chinese, Taiwanese Kanji → Traditional Chinese, Korean Kanji → Korean
	II	GENERAL FEATURES 2) Features <Printing> (Print speed: ...) (added) <General> (... and UB-S03) (deleted)
	2	7) Print speed Two-color printing mode 55 mm/s {2.17"/s} → 100 mm/s {3.94"/s}
	4	3) Character size Table 1.2.1 and 1.2.2 NOTES: 3. (added)
	5	Table 1.2.3 Languages (changed) 1.3 Autocutter NOTES: • The cutting type ... (added)
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D	11	1.10 Electrical Characteristics PS-175 (deleted)
	12	1.11 EMI and Safety Standards Applied PS-175 (deleted)
	13	1.12 Reliability Note for the thermal head (added)
	58	2) Customized value Selection of the print color → Selection of the paper Selection of the adjustment coefficient of black-color density (added)
	33, 34	3.1 List of Commands FS p and FS q are moved to Table in Sheet 34.
	64	3.7 Memory Switch Setting Mode 2) Starting the memory switch setting mode (changed)
	69	5.1 Standard Accessories • External power supply unit (added)
	90	ESC R [Default] (changed)
	97	ESC t [Range] [Default] Thai character support → Thai model
	98	FS p GS (L < Function 69>, ... (added)
	99	FS q GS (L < Function 67>, ... (added)
	116-118	GS (E <Function 5> a=118 (added)
	119, 121	GS (E <Function 6> a=118 (added)
	142	GS (L <Function 112> [Range] (changed)
	155, 156	GS I [Description] n = 69 (changed) Table [Type ID] bit 0 (changed) [Notes] (added)
	App.13	APPENDIX G In order to maintain the quality of the printer, the print head must be capped ... → In order to keep the latest values in the maintenance counter, the printer must be turned off ...
	App.14	APPENDIX H H.2 (added)
	App.15	APPENDIX H H.3 ESC R (added)
E	All	All pages are revised. Monochrome → Single-color
	3	1.2 Character Specifications Japanese model: Special font table (added)
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E	8	1.6 Paper Specification 7) Notes on using two-color thermal paper • Printing with Color 2 (added) 9) Print density adjustment If the printing is continued in condition ... (deleted)
	56	Table 3.3.7, 0→48, 1→49
	57	Table 3.3.8, 0→48, 1→49, Undefined→Reserved Table 3.3.9, 0→48, 1→49, Undefined→Reserved, Bit 5: Undefined→Enables left or right margin for bar code print
	58	2) Customized value Selection of the adjustment coefficient of black-color density → Selection of black-color density in two-color printing. 70→Light, 85→Medium, 100→Dark
	114	GS (E <Function 3> In table for a = 8, bit 5 (added)
	116	GS (E <Function 5> a = 118, the adjustment coefficient (deleted)
	117	GS (E <Function 5> • The combinations that can be (added)
	118	GS (E <Function 5> a = 118, the adjustment coefficient (deleted), 70→Light, 85→Medium, 100→Dark • The density of printing..... (added) • To improve the quality..... (added)
	121	GS (E <Function 6> a=118, the adjustment coefficient (deleted) 70→Light, 85→Medium, 100→Dark
	131	GS (K [Notes] (added)
	165	GS g 0 [Range] $20 \leq n \leq 70 \rightarrow nL = 20, 21, 50, 70$ [Description] [Units] (added)
	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 products in the TM-T90 series printer:

TM-T90	(with serial interface)
TM-T90 P	(with parallel interface)

The following models are available for each product above.

- 1) Alphanumeric (ANK) model (dot density: 0.141 mm/dot)
- 2) Multilingual model (dot density: 0.141 mm/dot)
- 3) Japanese model (dot density: 0.125 mm/dot)

NOTE: The multilingual character model supports printing with one of the following characters:

- ① Simplified Chinese
- ② Traditional Chinese
- ③ Thai
- ④ Korean

2) Features

The TM-T90 series printer has the following features:

<Printing>

- High-speed printing (170 mm/s {6.69"/s} maximum), which enables issuing of batch receipts.
- Logos and graphics are also printed with a 170 mm/s maximum high-speed printing (when the parallel or USB interface is used.)
- Highlight printing is possible on the two-color paper (Print speed: 100 mm/s {3.94"/s} maximum for ANK/multilingual model or 50 mm/s {1.97"/s} for Japanese model). (ANK = alphanumeric)

<Printer handling>

- Placing the printer is easy, because it can be placed horizontally on a table or vertically by hanging it 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.
- In addition to supporting several kinds of bar code printing, two-dimensional code (PDF417) printing is possible.
- Various layouts are possible by using page mode.

<General>

- Various interface boards (EPSON UB series, except UB-P02) can be used.
- Maximum paper width is 80 mm {3.15"}. Using a paper roll spacer, 58 mm or 60 mm {2.28" or 2.36"} paper width is selectable.
- Can use a paper roll with up to 102 mm {4.02"} diameter to reduce both the running cost and the number of paper roll exchanges.
- Environment-friendly design reduces the power consumption in standby mode (compared to the EPSON's legacy models: approximately 1/2).
- When used with the EPSON PS-180 power supply (power-saving type), the power consumption for the printer and the AC adaptor can be reduced by a large amount.

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<Function 97> GS (K pL pH fn m (fn = 97)	133
GS (L pL pH m fn [<i>parameter</i>] GS 8 L p1 p2 p3 p4 m fn [<i>parameter</i>]	134
<Function 48> GS (L pL pH m fn (fn = 0, 48).....	135
<Function 50> GS (L pL pH m fn (fn = 2, 50).....	135

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<Function 51> GS (L pL pH m fn (fn = 3, 51).....	136
<Function 64> GS (L pL pH m fn d1 d2 (fn = 64).....	137
<Function 65> GS (L pL pH m fn d1 d2 d3 (fn = 65).....	139
<Function 66> GS (L pL pH m fn kc1 kc2 (fn = 66).....	139
<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).....	140
<Function 69> GS (L pL pH m fn kc1 kc2 b x y (fn = 69).....	141
<Function 112> GS (L pL pH m fn a bx by c xL xH yL yH d1...dk (fn = 112).....	142
GS (M pL pH fn m.....	143
<Function 1> GS (M pL pH fn m (fn = 1,49).....	144
<Function 2> GS (M pL pH fn m (fn = 2,50).....	144
<Function 3> GS (M pL pH fn m (fn = 3,51).....	144
GS (N pL pH fn [parameter].....	145
<Function 48> GS (N pL pH fn m (fn = 48).....	145
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<Function 065> GS (k pL pH cn fn n (fn = 65).....	147
<Function 066> GS (k pL pH cn fn n (fn = 66).....	147
<Function 067> GS (k pL pH cn fn n (fn = 67).....	148
<Function 068> GS (k pL pH cn fn n (fn = 68).....	148
<Function 069> GS (k pL pH cn fn n (fn = 69).....	149
<Function 070> GS (k pL pH cn fn m (fn = 70).....	150
<Function 080> GS (k pL pH cn fn m d1...dk (fn = 80).....	150
<Function 081> GS (k pL pH cn fn m (fn = 81).....	151
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GS * x y [d1...d(x × y × 8)].....	153
GS / m.....	153
GS :.....	154
GS B n.....	154
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GS I n.....	155
GS L nL nH.....	157
GS P x y.....	157
GS T n.....	158
① GS V m ② GS V m n.....	158
GS W nL nH.....	159
GS \ nL nH.....	159
GS ^ r t m.....	160
GS a n.....	161
GS b n.....	164
GS f n.....	164
GS g 0 m nL nH.....	165
GS g 2 m nL nH.....	166
GS h n.....	167
① GS k m d1...dk NUL ② GS k m n d1...dn.....	168
GS r n.....	169
GS v 0 m xL xH yL yH d1...dk.....	170
GS w n.....	171

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FS ! <i>n</i>	172
FS &	173
FS (<i>A pL pH fn [parameter]</i>	173
<Function 48> FS (<i>A pL pH fn m (fn = 48)</i>	173
FS - <i>n</i>	174
FS	174
FS 2 <i>c1 c2 d1...dk</i>	175
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1. GENERAL SPECIFICATIONS

1.1 Printing Specifications

	ANK/Multilingual Model			Japanese Model		
1) Printing method	Thermal line printing					
2) Dot density	0.141 × 0.141 mm/dot (180 × 180 dpi)			0.125 × 0.125 mm/dot (203 × 203 dpi)		
	[dpi: dots per 25.4 mm {1"}]					
3) Printing direction	Unidirectional with friction feed					
4) Paper width	Standard (default)	Possible to select (Using an optional paper roll spacer)		Possible to select (See NOTE1)	Possible to select (See NOTE2)	Standard (default)
	80 mm {3.15"}	60 mm {2.36"}	58 mm {2.28"}	80 mm {3.15"}	60 mm {2.36"}	58 mm {2.28"}
5) Maximum printable area	72.2 mm (512 dots)	54.1 mm (384 dots)	50.8 mm (360 dots)	72 mm (576 dots)	54.5 mm (436 dots)	52.5 mm (420 dots)
6) Character per line						
Font A (12×24)	42	32	30	48	36	35
Font B (9×17)	56	42	40	---	---	---
Font B (10×24)	---	---	---	57	43	42
Font C (8×16)	---	---	---	72	54	52
Kanji font A (24 × 24)	21	16	15	24	18	17
Kanji font B (20 × 24)	---	---	---	28	21	21
Kanji font C (16 × 16)	---	---	---	36	27	26
Thai characters (12 × 72)	42	32	30	---	---	---
Thai characters (9 × 51)	56	42	40	---	---	---
	NOTE 1: Without an attached paper roll spacer, 80 mm {3.15"} paper width can be used. 2: With changing the installation position of the attached paper roll spacer, 60 mm {2.36"} paper width can be used. 3: ANK = alphanumeric					

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	ANK/Multilingual Model	Japanese Model
7) Print speed		
Normal	170 mm/s {6.69"/s} maximum	170 mm/s {6.69"/s} maximum
Ladder bar code or two-dimensional code printing	100 mm/s {3.94"/s} maximum	90 mm/s {3.54"/s} maximum
Printing with four-part energizing	70 mm/s {2.76"/s} maximum	70 mm/s {2.76"/s} maximum
Two-color printing	100 mm/s {3.94"/s} maximum	50 mm/s {1.97"/s} maximum
	<p>NOTES:</p> <ul style="list-style-type: none">• The print speed listed above is the value when the printer prints with the default print density level at 24 V and 25°C {77°F}. The print speed may change automatically with the condition of the supply voltage or the head temperature.• Printing speed may be slower, depending on the data transmission speed and the combination of control commands.• The four-part energizing mode can be selected with the memory switch. If the power supply is a power-savings type with lower capacity, the printer can print with the four-part energizing mode set.• Low transmission speed may cause intermittent printing. It is recommended to transmit data to the printer as quickly as possible. (Example: at least 19200 bps for printing with Font A) (bps: bits per second)• When a 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	4.23 mm {1/6"}	3.75 mm
	NOTE: Programmable by command.	

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			NEXT 3	SHEET 2

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

Refer to “Character Code Table (for Japanese font)” for details.

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 characters (3-pass printing font): 128 characters × 7 pages
(133 character types)
- ④ Korean Kanji (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 characters (12 × 72): | 12 × 72
(When the font is configured with Font A (12 × 24)) |
| Thai characters (9 × 51): | 9 × 51
(When the font is configured with Font B (9 × 17)) |

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

NOTE: Thai fonts that are built into this printer are 3-pass printing fonts (*1) that are combined with three different parts, which are shown in character code pages 20 through 26 for the alphanumeric font. 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 which are configured vertically with upper, middle, and lower parts sent from the host PC.

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3) Character size (Character area):
<ANK/Multilingual model>

Table 1.2.1 Character Size for ANK/Multilingual Model

		Standard	Double-height	Double-width	Double-width / Double-height
		W × H (mm)	W × H (mm)	W × H (mm)	W × H (mm)
Font A	12 × 24	1.692 × 3.384	1.692 × 6.768	3.384 × 3.384	3.384 × 6.768
Font B	9 × 17	1.269 × 2.397	1.269 × 4.794	2.538 × 2.397	2.538 × 4.794
Kanji font A	24 × 24	3.384 × 3.384	3.384 × 6.768	6.768 × 3.384	6.768 × 6.768
Thai characters	12 × 72	1.692 × 10.152	1.692 × 20.304	3.384 × 10.152	3.384 × 20.304
Thai characters	9 × 51	1.269 × 7.191	1.269 × 14.382	2.538 × 7.191	2.538 × 14.382

- 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	Double-height	Double-width	Double-width / Double-height
		W × H (mm)	W × H (mm)	W × H (mm)	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	<ul style="list-style-type: none">• 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)

1.3 Autocutter

- 1) Cutting method: Scissors type with separated blades
- 2) Cutting type: Partial cut (cutting with one point in left edge left uncut) (default setting)
- Full cut (completely cut) is also possible as a dealer option. (Set by changing the position of the autocutter unit.)

- NOTES:
- After cutting, paper must be fed approximately 1 mm or more, then stopped. This length corresponds to 7 dots or more for the ANK or Multilingual model, and 8 dots or more for the Japanese model, because, if it is not done, paper may jam in the autocutter unit.
 - To prevent dot displacement after cutting, it is recommended to feed paper for approximately 1 mm or more before printing.
 - Changing partial cut or full cut is not controlled by a software command.
 - Full cut by an autocutter can be used only when the printer is installed vertically or hanging on the wall, since if the printer is installed horizontally 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.
 - 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.

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1.4 Paper Sensor

The paper sensor is installed in the paper path and detects the presence of paper from light reflecting from the white of the print paper.

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: 12 mm {0.47"}
Outside: 18 mm {0.71"} - c) Near-end adjustment: Adjusting screw
 - d) Remaining amount: Fixed position #1 (approximately 23 mm {0.91"})
#2 (approximately 27 mm {1.06"})

- 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.

- 3) Paper width selection: 80 mm / 60 mm / 58 mm {3.15"/2.36"/2.28"}
<ANK/Multilingual model>
80 mm {3.15"} (default setting)
<Japanese model>
58 mm {2.28"} (default setting)
58 mm {2.28"} or 60 mm {2.36"} of the paper width can be selected using the roll paper spacer.

- 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 even 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.

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1.6 Paper Specifications

- 1) Paper type: Specified thermal paper
- 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"}
 - <58 mm paper width model>
57.5 ± 0.5 mm {2.26 ± 0.02"}
- 4) Paper roll size:
- Roll diameter: Maximum 102 mm {4.02"}
 - Take-up paper roll width: 80, 60, 58 mm with +0.5/-1.0 mm of tolerance
{3.15", 2.36", 2.28", +0.02"/-0.04"}

5) Specified roll paper type no.:

	Paper width			Original paper
	80 mm {3.15"}	60 mm {2.36"}	58 mm {1.50"}	
Single-color thermal roll paper	ENTPA080100	ENTPA060100	ENTPA058100	TF50KS-E
Two-color thermal roll paper	ENTPB080100	ENTPB060100	ENTPB058100	PD750R

In Japan: Nakagawa Manufacturing Co., Ltd.
In U.S.A.: Nakagawa Mfg. (USA) Inc.
In Europe: Nakagawa Mfg. (Europe) GmbH
In Southeast Asia: N.A.K. Mfg. (Malaysia) SDN BHD

6) Specified original paper type no.:

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

For single-color thermal paper:

*TF50KS-E (paper thickness: 65 µm) (NIPPON Paper Industries Co., Ltd.)
TF60KS-F1 (paper thickness: 75 µm) (NIPPON Paper Industries Co., Ltd.)
PD160R (paper thickness: 75 µm) (Oji Paper Mfg. Co., Ltd.)
PD170R (paper thickness: 75 µm) (Oji Paper Mfg. Co., Ltd.)
P350 (paper thickness: 62 µm) (Kanzaki Specialty Papers (U.S.A.))
P310 (paper thickness: 58 µm) (Kanzaki Specialty Papers (U.S.A.))
P300 (paper thickness: 56 µm) (Kanzaki Specialty Papers (U.S.A.))
KF50 (paper thickness: 62 µm) (Kanzaki Spezialpapiere GmbH (Germany))

For two-color thermal paper:

*PD750R (paper thickness: 75 µm) (Oji Paper Mfg. Co., Ltd.)

- NOTES:
- If paper other than the specified paper is used, the print head may be damaged or the print quality may be poor. Therefore, it is recommended to use the specified paper or its equivalent.
 - The following paper also can be used only for ANK or Multilingual models:
Original paper: AF50KS-E (paper thickness: 65 µm) (Jujo Thermal Oy (Finland))

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7) Notes on using two-color thermal paper

- Two-color printing is performed using two-color thermal paper if the two-color print command is executed and if two-color paper 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 the single-color thermal paper is used. Refer to Section 1.12, Reliability, for details.

8) Paper roll spool diameter Inside: 12 mm {0.47"}
 Outside: 18 mm {0.71"}

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

9) Print density adjustment It is recommended to set the print density depending on the paper type to keep the print quality as shown in the table below. The print density can be set with a software command.

<ANK/Multilingual model>

Original Paper No.	Density Level
P350	× 0.9
P300, P310, KF50	× 0.95
TF50KS-E, PD170R, PD750R, TF60KS-F1	× 1.0
PD160R	× 1.05
AF50KS-E	× 1.1

<Japanese model>

Original Paper No.	Density Level
P350	× 0.9
P300, P310, KF50	× 0.95
TF50KS-E, PD750R, TF60KS-F1	× 1.0
PD160R	× 1.05
PD170R	× 1.1

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1.7 Printable Area

<ANK/Multilingual model>

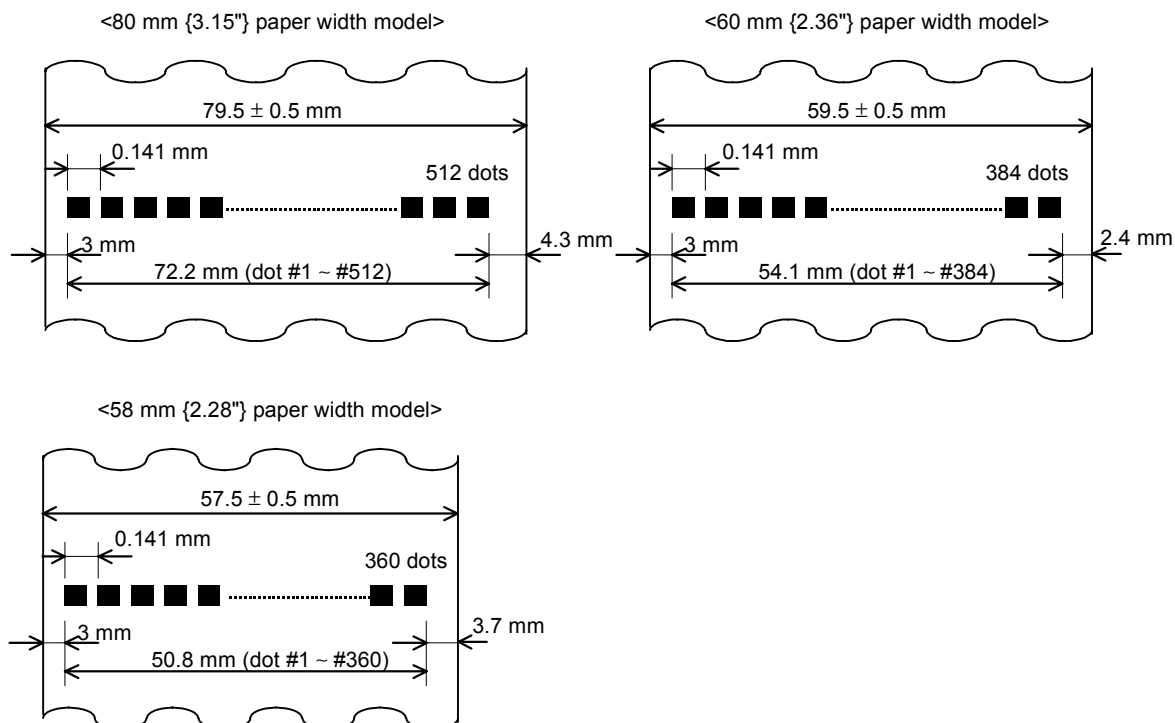


Figure 1.7.1 Printable Area for ANK/Multilingual Model

<Japanese model for default setting>

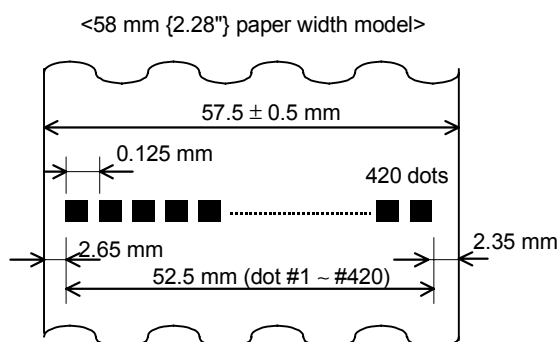


Figure 1.7.2 Printable Area for Japanese Model (for Default Setting)

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<Japanese model when the paper width is changed>

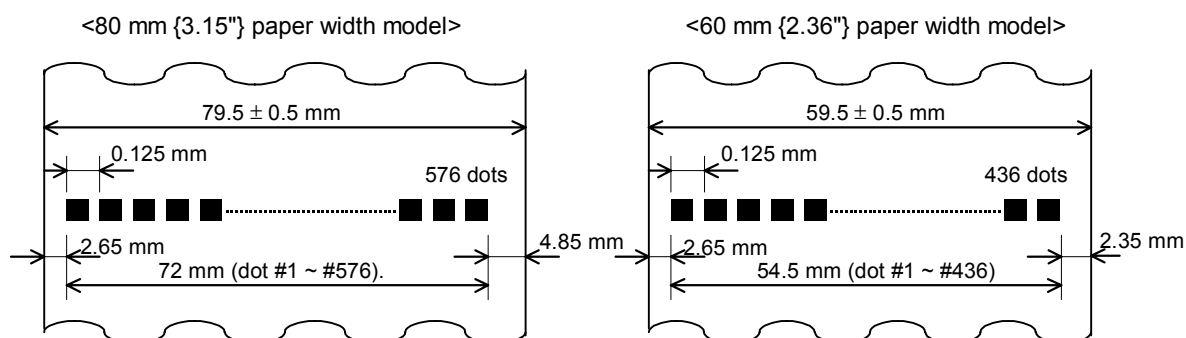
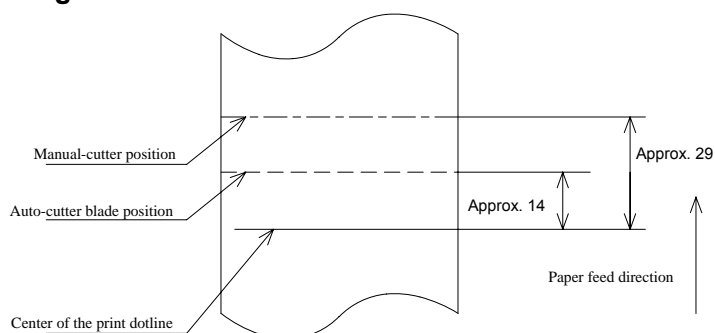


Figure 1.7.3 Printable Area for Japanese Model (When the Paper Width Is Changed)

NOTE: The numeric values used here are center values to be used in designing. The printable area may be out of alignment by 2 mm maximum to the left or right, due to the paper position or tolerance of parts.

1.8 Printing and Cutting Positions



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

Figure 1.8.1 Printing and Cutting Positions

NOTE: Numeric values used here are center values to be used in designing. 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.

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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) User NV memory: | 1KB through 192KB |
| 6) Page mode area: | 106KB |

1.10 Electrical Characteristics

- | | |
|--|---|
| 1) Supply voltage: | +24 VDC \pm 7%
(optional power supply: EPSON PS-170, PS-180) |
| 2) Current consumption (at 24V in room temperature): | <p><Normal printing>
Mean: Approximately 1.7 A (in single-color print)
(Character font A, alphanumeric, capital letters, 36-character rolling pattern, full column printing)
Mean: Approximately 1.7 A (in two-color print)
(Character font A, alphanumeric, capital letters, 36-character rolling pattern, full column printing, changing the print color each line)
Peak: Approximately 7.7 A or less (with full-dot printing)</p> <p><Printing with four-part energizing>
Mean: Approximately 1 A (in single-color print)
(Character font A, alphanumeric, capital letters, 36-character rolling pattern, full column printing)
NOTE: The four-part energizing mode can be selected with the memory switch. If the power supply is the power-savings type with lower capacity, the printer can print with the four-part energizing mode set. Four-part energizing reduces the power supply load by energizing of the print head in four parts.</p> <p><Standby>
Mean: Approximately 0.1 A
NOTE: Maximum 1 A for drawer kick-out driving.</p> |

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1.11 EMI and Safety Standards Applied

EMC is measured using SEIKO EPSON's AC adapters PS-170, PS-180. The printer model packed with the PS-175 is applied only for North America's standards.

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: 20,000,000 lines

NOTE: The line spacing for the ANK or multilingual model is 4.23 mm {0.17"}, and for the Japanese model is 3.75 mm {0.15"}. The reliability values above are measured when a 15-line feed and a 10-line print repeat alternately.

Thermal head:

150 million pulses
150 km {93.21 miles} (when single-color thermal paper is used)
75 km {46.60 miles} (when two-color thermal paper is used)

NOTE: The life of the thermal head when two-color thermal paper is used is reduced to half of the life when the single-color thermal paper is used.

Autocutter:

2,000,000 cuts (except for KF50)
1,200,000 cuts (for KF50 (KANZAN))
(The printer is defined to have reached the end of its life when it reaches the beginning of the wearout period.)

2) MTBF:

360,000 hours
(Failure is defined as a random failure occurring during the random failure period in the life period – 20,000,000 lines for single-color printing.)

3) MCBF:

70,000,000 lines
(This is an average failure interval based on failures relating to wearout and random failures up to the life period – 20,000,000 lines.)

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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)

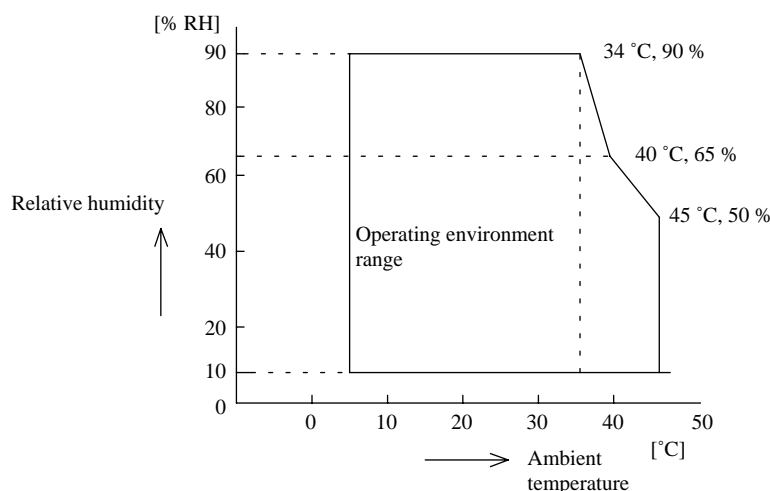


Figure 1.13.1 Operating Temperature and Humidity Range

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/s² {2 G}
Sweep: 10 minutes (half cycle)
Duration: 1 hour
Directions: x, y, and z

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

- 4) Impact resistance: When packed: Package: EPSON standard package
Height: 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.

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5) Acoustic noise (operating): Approximately 52 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-T90 series printer can be installed horizontally or vertically.

In the case of installing the printer vertically, attach the rubber feet packed in the printer's box on the rear of the printer and change the location of the paper roll near-end sensor (refer to Appendix C).

(Consider vibration during paper cutting and drawer usage. Take measures to prevent the printer from moving. Affixing tapes are provided as an option.)

You can attach an optional hanging bracket to attach the printer to a wall. (Following the procedure described in the user's manual, install the wall mount and change the location of the paper roll near-end sensor (refer to Appendix C).

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2. CONFIGURATIONS

2.1 Interfaces

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 rate:	2400, 4800, 9600, 19200, 38400, 57600, 115200 bps (bps: bits per second)
Data word length:	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 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 the paper roll end detector or the paper roll near-end detector with a printing halt feature due to a paper-end set 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

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

Table 2.1.1 TM-T90 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 Msw1-7 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	<p>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 the memory switch as follows (refer to Section 3.3.4):</p> <table> <tr> <th></th><th>Printer status</th><th colspan="2">Memory switch Msw 1-3 status</th></tr> <tr> <td rowspan="9">Offline</td><td>1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.</td><td>BUSY</td><td>BUSY</td></tr> <tr> <td>2. During the self-test.</td><td>BUSY</td><td>BUSY</td></tr> <tr> <td>3. When the cover is open.</td><td>—</td><td>BUSY</td></tr> <tr> <td>4. During paper feeding using the paper FEED button.</td><td>—</td><td>BUSY</td></tr> <tr> <td>5. When the printer stops printing due to a paper-end.</td><td>—</td><td>BUSY</td></tr> <tr> <td>6. During standby status for macro execution.</td><td>—</td><td>BUSY</td></tr> <tr> <td>7. When a temporary abnormality occurs in the power supply voltage.</td><td>—</td><td>BUSY</td></tr> <tr> <td>8. When an error occurs.</td><td>—</td><td>BUSY</td></tr> <tr> <td>9. When the receive buffer becomes full.(*1)</td><td>BUSY</td><td>BUSY</td></tr> </table>		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 occurs.	—	BUSY	9. When the receive buffer becomes full.(*1)	BUSY	BUSY
	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 occurs.	—	BUSY																																
	9. When the receive buffer becomes full.(*1)	BUSY	BUSY																																

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Table 2.1.1 TM-T90 Printer Status and Signals (Continued)

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

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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

	Printer status	Memory switch Msw 1-3 status	
		ON	OFF
XON transmission	① When the printer goes online after turning on the power (or reset using interface)	Transmit	Transmit
	② When the receive buffer is released from the buffer full state	Transmit	Transmit
	③ When the printer switches from 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 with 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.

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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 k Ω (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):

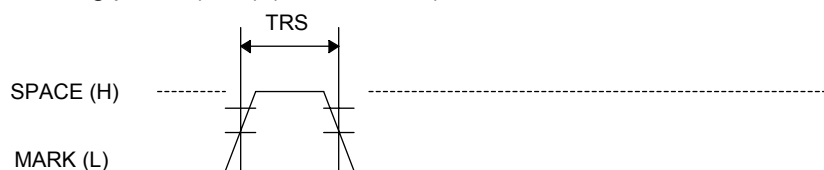


Figure 2.1.2 Minimum Reset Pulse Width (pin 25)

- 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.

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2.1.2 IEEE 1284 Bidirectional Parallel Interface (Parallel Interface Specifications)

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2.1.2.1 Compatibility mode

(data transmission from host to printer: Centronics-compatible)

1) 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 empty paper supply is detected by either the paper roll end detector or the paper roll near-end detector with a printing halt 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 with the Compatibility Mode, thereby causing half duplex transmission.

NOTE: A signal name preceded by the letter "n" indicates active LOW.


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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	PErr	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

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- NOTES:
1. A prefix “n” to signal names refers to “L” active signals. To the host not provided with all of the signal lines listed above, both-way communication fails.
 2. For interfacing, signal lines shall use twisted pair cables with the return sides connected to signal ground level.
 3. Interfacing conditions shall all be 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 μ s 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	-	V _{IH} =2.0 V V _{IL} =0.8 V
Input LOW voltage	V _{IL}	-	0.8 V	
Input HIGH current	I _{IH}	-	-0.32 mA	
Input LOW current	I _{IL}	-	12 mA	

Logic-H Signal Sender Characteristics

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

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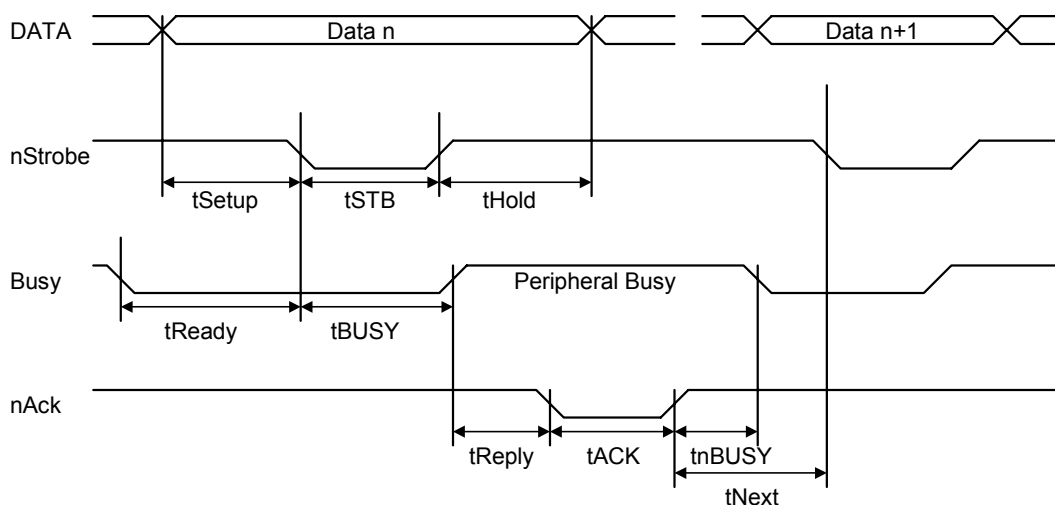
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+5 V Signal Sender Characteristics

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 μ s
BUSY Release Time	tnBUSY	0	∞
ACK Cycle Idle Time	tNext	0	--

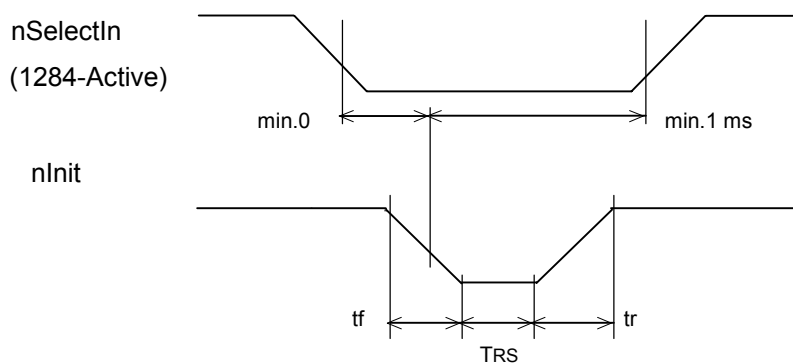
*The printer latches data at a nStrobe \downarrow timing

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2.1.2.6 Notes on resetting the printer through the interface

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

- DC characteristics:
TTL level
- AC characteristics:
Minimum reset pulse width: TRS 50 μ s (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.

This case is different from in the RS-232 serial interface specifications where the real-time interruptions from the printer to the host are disabled, and thus precautions must be taken:

- 1) 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 constantly 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 when memory switch Msw 1-3 is set 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

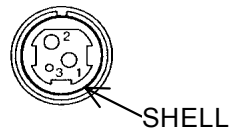


Figure 2.2.1 Power Supply Connector

NOTE: Be sure to ground the metal of the interface using the 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.

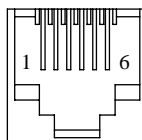


Figure 2.2.2 Drawer Kick-out Connector

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

t_1 (ON time) and t_2 (OFF time) are specified by **ESC p** or **DLE DC4**.

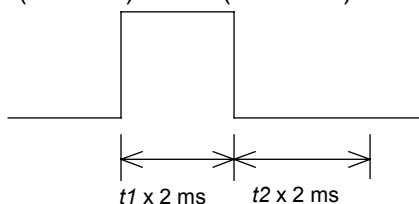


Figure 2.2.3 Drawer Kick-out Drive Signal Output Waveform (by ESC p)

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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

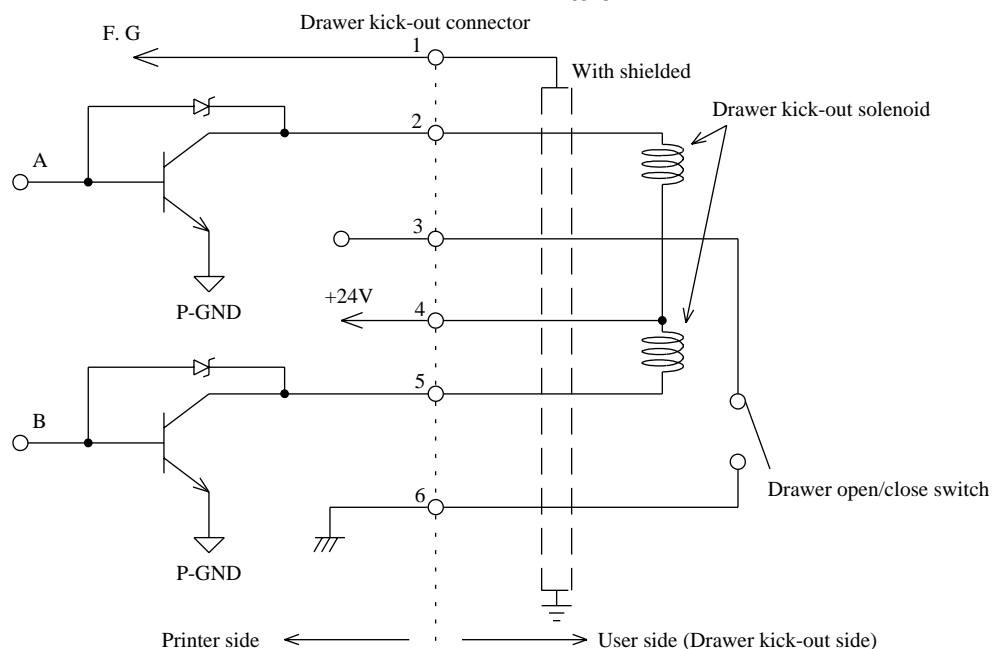


Figure 2.2.4 Drawer Circuitry

- 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.

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

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

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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 <i>n</i> lines
ESC p	General pulse
ESC t	Select character code table
ESC {	Turn upside-down printing mode on/off
FS p	Print NV bit image
FS q	Define NV bit image
GS !	Select character size
GS \$	Set absolute vertical print position in page mode
GS (A	Execute test print
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 8 L GS (L	Set graphics data
GS (M	Customize printer control value(s)
GS (N	Select character style(s)
GS (k	Setup and print symbol
GS *	Define downloaded bit image
GS /	Print downloaded bit image
GS :	Start/end macro definition
GS B	Turn white/black reverse printing mode on/off
GS H	Select printing position of HRI characters
GS I	Transmit printer ID
GS L	Set left margin
GS P	Set horizontal and vertical motion units
GS T	Set print position to the beginning of print line

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Command	Name
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 f	Select font for HRI characters
GS g 0	Initialize maintenance counter
GS g 2	Transmit maintenance counter
GS h	Set bar code height
GS k	Print bar code
GS r	Transmit status
GS v 0	Print raster bit image
GS w	Set bar code width

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 left- and right-side Kanji character spacing
FS W	Turn quadruple-size mode on/off for Kanji characters

(*): **FS (A** is effective only in 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	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
HEX BIN	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	NUL	DLE	0	@	P	,	p	Ç	É	á	176	192	1	α	
1	0001		XON	1	A	Q	a	q	ü	æ	í	177	193	2	β	±
2	0010			2	B	R	b	r	é	Æ	ó	178	194	3	γ	≥
3	0011		XOFF	3	C	S	c	s	â	ô	ú	179	195	4	π	≤
4	0100		EOT	4	D	T	d	t	ä	ö	ñ	180	196	5	Σ	Γ
5	0101		ENQ	5	E	U	e	u	à	ò	Ñ	181	197	6	σ	∫
6	0110			6	F	V	f	v	å	û	ä	182	198	7	μ	÷
7	0111			7	G	W	g	w	Ç	ù	o	183	199	8	τ	≈
8	1000			8	H	X	h	x	ê	ÿ	ç	184	200	9	φ	°
9	1001			9	I	Y	i	y	è	ö	ı	185	201	10	θ	•
A	1010			:	J	Z	j	z	è	ü	ı	186	202	11	Ω	•
B	1011			:	K	[	k	{	ï	φ	½	187	203	12	δ	
C	1100			<	L	\	l	ı	î	£	¼	188	204	13	∞	n
D	1101			=	M	]	m	{	ì	¥	ı	189	205	14	∅	²
E	1110			>	N	^	n	~	Ä	Pl	«	190	206	15		■
F	1111			?	O	_	o	SP	Å	f	»	191	207	16		SP

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

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			<div>NEXT</div> <div>36</div>	<div>SHEET</div> <div>35</div>

3.2.2 Page 1 (Katakana)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	ー	上	SP	ー	タ	ミ	二	×
		128	144	160	176	192	208	224	240
1	0001	ー	下	。	ア	チ	ム	ト	円
		129	145	161	177	193	209	225	241
2	0010	ー	ナ	「	イ	ツ	メ	キ	年
		130	146	162	178	194	210	226	242
3	0011	ー	ハ	」	ウ	テ	モ	コ	月
		131	147	163	179	195	211	227	243
4	0100	■	ー	、	エ	ト	ヤ	▲	日
		132	148	164	180	196	212	228	244
5	0101	■	ー	・	オ	ナ	ユ	▲	時
		133	149	165	181	197	213	229	245
6	0110	■	丨	ヲ	カ	ニ	ヨ	▲	分
		134	150	166	182	198	214	230	246
7	0111	■	丨	ア	キ	ヌ	ラ	▲	秒
		135	151	167	183	199	215	231	247
8	1000	丨	「	イ	ク	ネ	リ	♠	千
		136	152	168	184	200	216	232	248
9	1001	丨	「	ウ	ケ	ノ	ル	♥	市
		137	153	169	185	201	217	233	249
A	1010	丨	「	エ	コ	ハ	レ	♦	区
		138	154	170	186	202	218	234	250
B	1011	丨	「	オ	サ	ヒ	ロ	♣	町
		139	155	171	187	203	219	235	251
C	1100	■	「	ヤ	シ	フ	ワ	●	村
		140	156	172	188	204	220	236	252
D	1101	■	「	ユ	ス	ヘ	ン	○	人
		141	157	173	189	205	221	237	253
E	1110	■	「	ヨ	セ	ホ	・	／	罫
		142	158	174	190	206	222	238	254
F	1111	+	ノ	ッ	ソ	マ	・	＼	SP
		143	159	175	191	207	223	239	255

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3.2.3 Page 2 (PC850: Multilingual)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	Á 160	176	Ł 192	Š 208	Ó 224	— 240
1	0001	Ü 129	Æ 145	Í 161	177	Ƨ 193	Đ 209	ß 225	± 241
2	0010	É 130	Æ 146	Ó 162	178	Ƨ 194	Ê 210	Ô 226	= 242
3	0011	Â 131	Ô 147	Ú 163	179	Ƨ 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	Ö 229	§ 245
6	0110	Å 134	Û 150	Ä 166	Á 182	ä 198	İ 214	µ 230	÷ 246
7	0111	Ç 135	Ü 151	Ö 167	Á 183	Ä 199	İ 215	þ 231	ˆ 247
8	1000	Ê 136	Ÿ 152	¿ 168	© 184	Ł 200	İ 216	þ 232	° 248
9	1001	Ë 137	Ö 153	® 169	¶ 185	Ƨ 201	Ƨ 217	Ů 233	ˆ 249
A	1010	È 138	Ů 154	Ƨ 170	¶ 186	Ƨ 202	Ƨ 218	Ů 234	ˆ 250
B	1011	İ 139	ø 155	½ 171	¶ 187	Ƨ 203	■ 219	Ů 235	¹ 251
C	1100	Î 140	£ 156	¼ 172	¶ 188	Ƨ 204	■ 220	Ÿ 236	³ 252
D	1101	Ì 141	Ø 157	ı 173	φ 189	= 205	ı 221	Ÿ 237	² 253
E	1110	Ä 142	× 158	« 174	¥ 190	† 206	İ 222	— 238	■ 254
F	1111	Å 143	ƒ 159	» 175	Ƨ 191	Ƨ 207	■ 223	' 239	SP 255

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3.2.4 Page 3 (PC860: Portuguese)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 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	ƒ 244
5	0101	ä 133	ö 149	Ñ 165	181	197	213	σ 229	Ƶ 245
6	0110	Á 134	Ú 150	ä 166	182	198	214	μ 230	÷ 246
7	0111	ç 135	ù 151	ó 167	183	199	215	τ 231	≈ 247
8	1000	ê 136	î 152	¿ 168	184	200	216	Φ 232	° 248
9	1001	Ê 137	Ï 153	Ò 169	185	201	217	Θ 233	• 249
A	1010	è 138	Û 154	¬ 170	186	202	218	Ω 234	• 250
B	1011	í 139	Φ 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	Û 157	í 173	189	205	221	ø 237	² 253
E	1110	Ä 142	Þ 158	« 174	190	206	222	€ 238	■ 254
F	1111	Å 143	Ó 159	» 175	191	207	223	∩ 239	SP 255

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3.2.5 Page 4 (PC863: Canadian-French)

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

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3.2.6 Page 5 (PC865: Nordic)

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

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	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	Đ 208	à 224	ò 240
1	0001	SP 129	‘ 145	ı 161	± 177	Á 193	Ñ 209	á 225	ñ 241
2	0010	, 130	, 146	¢ 162	’ 178	Â 194	Ò 210	â 226	ò 242
3	0011	f 131	“ 147	£ 163	” 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	ı 166	¶ 182	Æ 198	Ö 214	æ 230	ö 246
7	0111	‡ 135	— 151	§ 167	• 183	Ç 199	× 215	ç 231	+ 247
8	1000	^ 136	~ 152	•• 168	’ 184	È 200	Ø 216	è 232	ø 248
9	1001	‰ 137	™ 153	© 169	ı 185	É 201	Ù 217	é 233	ù 249
A	1010	Š 138	š 154	ª 170	° 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

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












































NEXT

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SHEET

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3.2.8 Page 17 (PC866: Cyrillic #2)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
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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	ё 242
3	0011	Г 131	У 147	г 163	 179	 195	 211	у 227	ё 243
4	0100	Д 132	Ф 148	д 164	 180	 196	 212	ф 228	й 244
5	0101	Е 133	Х 149	е 165	 181	 197	 213	х 229	й 245
6	0110	Ж 134	Ц 150	ж 166	 182	 198	 214	ц 230	й 246
7	0111	З 135	Ч 151	з 167	 183	 199	 215	ч 231	й 247
8	1000	И 136	Ш 152	и 168	 184	 200	 216	ш 232	ё 248
9	1001	Й 137	Щ 153	й 169	 185	 201	 217	щ 233	ё 249
A	1010	К 138	Ъ 154	к 170	 186	 202	 218	ъ 234	ё 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

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3.2.9 Page 18 (PC852: Latin2)

	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	đ 208	Ó 224	- 240
1	0001	ü 129	Ł 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	Ě 211	Ň 227	ˇ 243
4	0100	ä 132	ö 148	À 164	180	196	ď 212	ń 228	˘ 244
5	0101	ù 133	Ł 149	ą 165	Á 181	197	Ň 213	ň 229	š 245
6	0110	ć 134	Ĳ 150	Ž 166	Â 182	198	Í 214	Š 230	÷ 246
7	0111	ç 135	Ś 151	ž 167	Ě 183	199	Î 215	š 231	˙ 247
8	1000	ı 136	ś 152	Ę 168	Ş 184	200	č 216	Ř 232	° 248
9	1001	ē 137	Ö 153	ę 169	185	201	217	Ú 233	˚ 249
A	1010	Ö 138	Ü 154	SP 170	186	202	218	ı 234	˘ 250
B	1011	õ 139	Ť 155	ž 171	187	203	219	Ů 235	ũ 251
C	1100	î 140	ť 156	Č 172	188	204	220	ý 236	Ř 252
D	1101	Ž 141	Ł 157	š 173	Ž 189	205	221	Ý 237	ř 253
E	1110	Ä 142	× 158	« 174	ž 190	206	222	ı 238	254
F	1111	Ć 143	č 159	» 175	191	207	223	´ 239	SP 255

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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
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1	0001	Ü 129	Æ 145	Í 161	177	± 193	Ð 209	ß 225	± 241
2	0010	É 130	Æ 146	Ó 162	178	Ƨ 194	Ê 210	Ô 226	242
3	0011	â 131	ô 147	ú 163	179	Ƨ 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	À 181	† 197	€ 213	Ö 229	§ 245
6	0110	å 134	û 150	ä 166	Á 182	ã 198	í 214	µ 230	÷ 246
7	0111	ç 135	ù 151	ó 167	À 183	Ä 199	î 215	þ 231	247
8	1000	ê 136	ÿ 152	¿ 168	© 184	Ł 200	Ï 216	ƒ 232	° 248
9	1001	ë 137	Ö 153	® 169	ƒ 185	ŕ 201	ƒ 217	Û 233	249
A	1010	è 138	Û 154	¬ 170	186	± 202	ŕ 218	Ü 234	250
B	1011	ï 139	ø 155	½ 171	187	Ƨ 203	219	Ù 235	¹ 251
C	1100	î 140	£ 156	¼ 172	188	Ƨ 204	220	Ý 236	³ 252
D	1101	ì 141	Ø 157	í 173	¢ 189	205	221	Ý 237	² 253
E	1110	Ä 142	× 158	« 174	¥ 190	† 206	Ï 222	238	254
F	1111	Å 143	ƒ 159	» 175	191	207	223	239	SP 255

EPSON	TITLE TM-T90 Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 45	SHEET 44

3.2.11 Page 20 (Thai character code 42)

	8	9	A	B	C	D	E	F
0	ร	อ		ผ	ย	เ	.	D3
1	๖	๑	ก	ณ	ร	แ	๖	D+
2	๗	๒	บ	ด	ถ	โ	๖	D๔
3	๘	๓	ค	ต	ล	ใ	+	D-
4	๙	๔	ฆ	ถ	ว	ไ	๔	D๕
5	-	๕	ง	ท	ศ	๗	.	D3
6	๑	๖	จ	ธ	ษ	๗	.	D+
7	๒	๗	ฉ	น	ส	๑	๖	D-
8	๓	๘	ช	บ	ห	๖	๖	D๕
9	๔	๙	ซ	ป	ฬ	๗	๑	D3
A	๕	๐	ผ	ผ	อ	๗	๖	D+
B	๖	๑	ค	ณ	ร	๗	๖	D-
C	๗	๒	บ	ด	ถ	๗	๖	D๕
D	๘	๓	ค	ต	ล	๖	๑	D3
E	๙	๔	ฆ	ถ	ว	๑	๗	D+
F	๐	๕	ง	ท	ศ	๗	๖	

EPSON	TITLE TM-T90 Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 46	SHEET 45

3.2.12 Page 21 (Thai character code 11)

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

EPSON	TITLE TM-T90 Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 47	SHEET 46

3.2.13 Page 22 (Thai character code 13)

	8	9	A	B	C	D	E	F
0		๒-		๒๒	๒๓	๒๔	๒๕	๒๖
1	๒๗	๒๘	๒๙	๓๐	๓๑	๓๒	๓๓	๓๔
2	๓๕	๓๖	๓๗	๓๘	๓๙	๔๐	๔๑	๔๒
3	๔๓	๔๔	๔๕	๔๖	๔๗	๔๘	๔๙	๕๐
4	๕๑		๕๒	๕๓	๕๔	๕๕	๕๖	๕๗
5		๕๘	๕๙	๖๐	๖๑	๖๒	๖๓	๖๔
6	๖๕	๖๖	๖๗	๖๘	๖๙	๗๐	๗๑	๗๒
7	๗๓	๗๔	๗๕	๗๖	๗๗	๗๘	๗๙	๘๐
8	๘๑	๘๒	๘๓	๘๔	๘๕	๘๖	๘๗	๘๘
9	๘๙		๙๐	๙๑	๙๒	๙๓	๙๔	๙๕
A		๙๖	๙๗	๙๘	๙๙	๐๐	๐๑	๐๒
B	๐๓	๐๔	๐๕	๐๖	๐๗	๐๘	๐๙	๐๐
C	๐๑	๐๒	๐๓	๐๔	๐๕	๐๖	๐๗	๐๘
D	๐๙	๐๐	๐๑	๐๒	๐๓	๐๔	๐๕	๐๖
E	๐๗		๐๘	๐๙	๐๐	๐๑	๐๒	๐๓
F	๐๔		๐๕	๐๖	๐๗	๐๘	๐๙	๐๐

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			NEXT 48	SHEET 47

3.2.14 Page 23 (Thai character code 14)

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

EPSON	TITLE TM-T90 Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 49	SHEET 48

3.2.15 Page 24 (Thai character code 16)

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

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3.2.16 Page 25 (Thai character code 17)

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

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			NEXT 51	SHEET 50

3.2.17 Page 26 (Thai character code 18)

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

EPSON	TITLE TM-T90 Specification (STANDARD)	SHEET REVISION E	NO.	
			NEXT 52	SHEET 51

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
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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

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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	\$	@	í	Ñ	¿	^	`	..	ñ	}	~
Japan	#	\$	@	[	¥	]	^	`	{	|	}	~
Norway	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Denmark II	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Spain II	#	\$	á	í	Ñ	¿	é	`	í	ñ	ó	ú
Latin America	#	\$	á	í	Ñ	¿	é	ü	í	ñ	ó	ú
Korea	#	\$	@	[₩]	^	`	{		}	~

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3.3 Switches and Buttons

3.3.1 Power Button (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 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) Using a 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 right 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	DTR/DSR
4	Data 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 power button	Disabled	Enabled
2	Reserved	Fixed to On	--
3-8	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

NOTE: If the TM-T88II compatible mode is selected, Msw 1-1 must be set to On (when the OPOS driver is 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	Reserved	--	--
5	Enable left or right margin of bar code print	Does not enable margin	Enables margin
6	Reserved	--	--
7	TM-T88II-compatible mode	Not compatible	Compatible
8	Printer cover open during operation	Errors that automatically recover	Errors that can possibly recover

NOTE: Msw 8-7 is reserved in the Japanese model.

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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	58 mm	60 mm
	80 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%	--
Selection of the paper	Single-color	Two-color
Selection of black-color density in two-color printing	Light	Medium
	Dark	--

- NOTES:
- The maximum print speed is available in the one-part energizing mode. However, in the ANK/Multilingual model, even if the one-part energizing mode is selected, two-part energizing is selected automatically if the print duty is high-ratio. But, in the Japanese model, the head energizing is not divided regardless of any print control setting.
 - Four-part energizing mode can reduce power consumption.

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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 Panel LEDs

1) Power (POWER) LED: Green

On: Power is stable.

Off: Power is not stable.

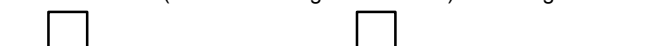
Flashing: During execution of each operation.

<Flashing pattern>

Power on (during each execution): Flashing



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).

Flashing: • 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.	<p>PAPER OUT</p>	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.
- Blinking: Error (refer to Section 3.8)
- Off: Normal condition



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 FEED button and turn on the printer with the cover closed; then the current printer status (*1) is printed.

- (*1)
- Control software version
 - DIP switch settings
 - Memory switch settings

[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 FEED button to start test printing.

- (*2)
- Prints a rolling pattern using only the built-in character set
 - Cuts automatically 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 in 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) or executing the **GS (A** command; then close the cover. The printer first prints "Hexadecimal Dump To terminate ..." on the paper roll and prints the received print data in hexadecimal numbers and in 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 functions

The following memory switches can be set by operating the button and opening and closing the cover.

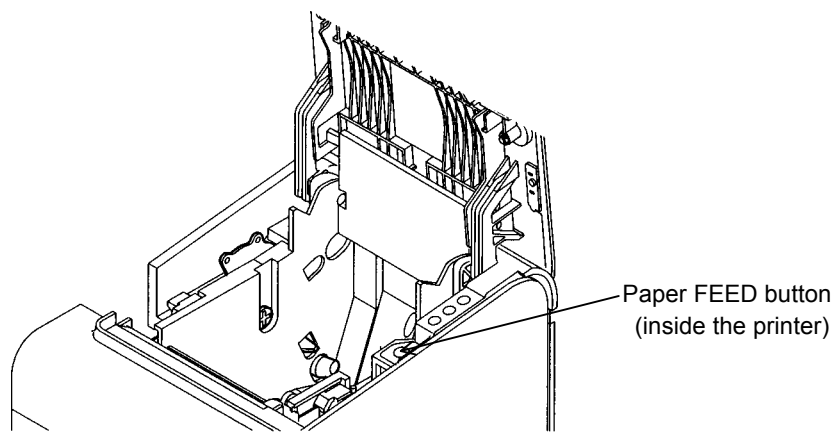
- ① Enabling or disabling the autocutter
- ② Print density
- ③ Setting communication conditions of the serial interface
- ④ Making settings related to serial communication
 - Capacity of the receive buffer
 - Data processing for receiving errors
 - Conditions for BUSY
- ⑤ Selection of interface reset signal
- ⑥ Setting paper width
- ⑦ Type of paper (single-color/two-color)
- ⑧ TM-T88II-compatible mode and the power on information status (except for Japanese model)

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 light is on; release the paper FEED button when the ERROR LED light is on. Next, press the paper FEED button 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 the setting is performed, the contents of the settings are stored; then the printer executes the initialization. After initializing, the printer enters the normal state.



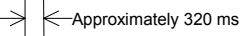


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3.8 Error Processing

3.8.1 Error Types

1) Errors that automatically recover

Table 3.8.1 Automatically Recoverable Errors

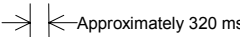

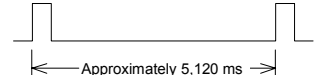
Error	Description	ERROR LED flashing pattern 	Recovery
Paper roll cover open error (when recoverable error is selected) (*1)	Printing on the paper roll is not performed correctly due to a cover-open		Recovers automatically when the cover is closed.
Print head temperature error (*2)	The temperature of 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 the memory switch.

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

2) Errors can be recovered with a command

Table 3.8.2 Errors Where Recovery is Possible

Error	Description	ERROR LED flashing pattern 	Recovery
Paper roll cover open error (when an error that may 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 .

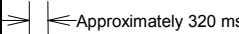
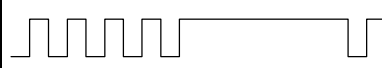
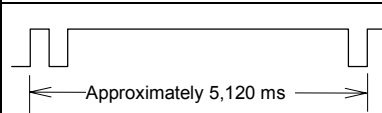

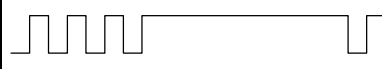
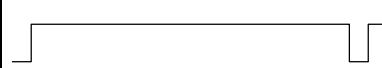

NOTES: *1: The printer cover open error operation can be selected with a memory switch.

*2: When an autocutter error occurs caused by jamming paper, turn the power off and remove the jammed paper, then turn the power on again.

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3) Unrecoverable errors

Table 3.8.3 Unrecoverable Errors

Error	Description	ERROR LED flashing pattern 	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.		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.

3.8.2 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 3.3.3, DIP switches, and 3.3.4, Memory switches.)
- Blinks the ERROR LED.

3.8.3 Data Receive Error (Only for the Serial Interface Specification)

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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3.9 Cover Open Lever

When the cover open lever is pulled, the printer cover is opened. When the cover is closed, the cover open lever is latched.

- NOTES:
- Be sure to use the cover open button to open the printer cover.
 - Do not open the cover during printing.
 - Do not open the cover during the autocutting operation; otherwise the mechanism may be damaged.

3.10 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 automatic error recovery 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 possible error recovery is selected:

When the cover is closed, the printer recovers upon receipt of **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.

3.11 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).

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4. CASE SPECIFICATIONS

4.1 External Dimensions and Mass

Height:	148 mm {5.83"}
Width:	140 mm {5.51"}
Depth:	201 mm {7.91"}
Mass:	Approximately 1.8 kg {3.96 lb} (not including the paper roll)

4.2 Color

EPSON standard color (ECW, EDG)

4.3 External Appearance

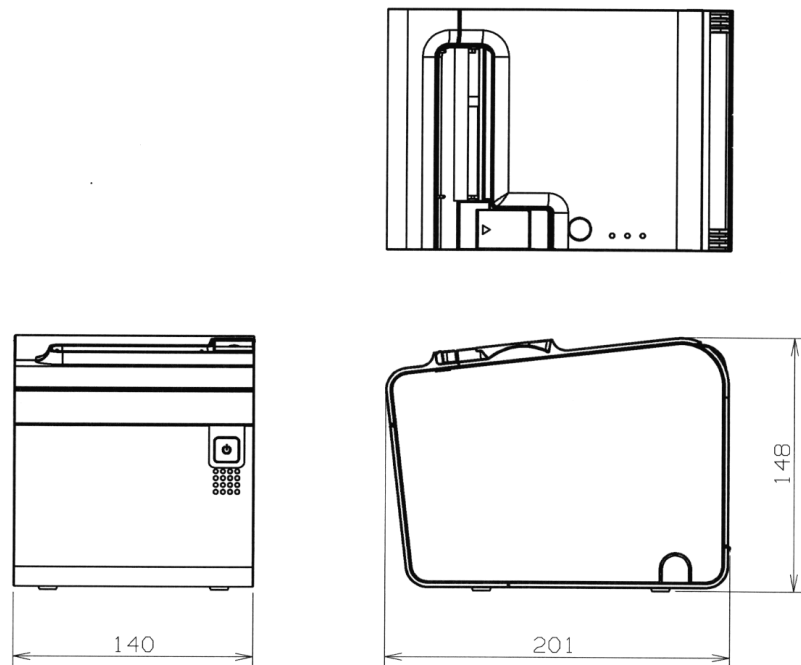


Figure 4.3.1 External Appearance [Units: mm]

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5. OPTIONS AND CONSUMABLES

5.1 Standard Accessories

- Roll paper (diameter 40 mm {1.57"})
- User's manual (Languages: English, German, French, Spanish, Portuguese, Italian, Dutch, Simplified Chinese, Traditional Chinese, Japanese)
- Rubber feet for vertical installation
- Panel label for vertical installation
- Power button cover
- External power supply unit (model: PS-175, PS-180)
(For the model packed with the power supply unit. The packed power supply differs depending on the model.)

5.2 Options

- Affixing Velcro® tape (model: DF-10)
- Wall hanging 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)
- Paper roll spacer (model: PG-90) (Only the Japanese model is equipped with it as standard equipment.)

5.3 Consumables

- Specified paper Refer to Section 1.6, Paper Specification.

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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 [] 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:

① The length in the horizontal direction in standard mode:

Model	Maximum printable area
ANK / Multilingual model	72.192 mm {512/180"}
Japanese model	72 mm {576/203"}

② The length in the horizontal direction in page mode:

Model	Maximum printable area
ANK / Multilingual model	72.192 mm {512/180"}
Japanese model	72 mm {576/203"}

③ The length in the vertical direction in page mode:

Model	Maximum printable area (single-color)
ANK / Multilingual model	234.342 mm {3324/360"}
Japanese model	184.5 mm {2952/406"}

NOTE: The length in the vertical direction in page mode with two-color print is half of the maximum size for a single-color print.

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3) Printing area

Printing range is set by command. It must be \leq the printable area.

4) Ignore

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.

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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.
- In page mode
- Moves the print position in memory to feed 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.

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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.

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- $n = 4$: 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.

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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 during 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.

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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] $fn = 1$
 $0 \leq m \leq 8$
 $1 \leq t \leq 8$

[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 $[t \times 100 \text{ ms}]$.

- [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.

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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 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	<i>n</i>
	Hex	1B	20	<i>n</i>
	Decimal	27	32	<i>n</i>

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

[Default] $n = 0$

[Description] • Sets the character spacing for the right side of the character to [$n \times$ horizontal motion unit].

- The maximum right-side character spacing is:
For ANK/Multilingual model, 35.955 mm {255/180" or 1.416"}.
For Japanese model, 31.875 mm {255/203" or 1.255"}

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ESC ! *n*

[Name] Select print mode (s)

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

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

[Default] $n = 0$

[Description] Selects the font and the character 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] $0 \leq (nL + nH \times 256) \leq 65535$ ($0 \leq nH \leq 255$, $0 \leq nL \leq 255$)

[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 $[(nL + nH \times 256) \times (\text{vertical or horizontal motion units})]$.

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ESC % *n*

[Name]	Select/cancel user-defined character set			
[Format]	ASCII	ESC	%	<i>n</i>
	Hex	1B	25	<i>n</i>
	Decimal	27	37	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Default]	<i>n</i> = 0			
[Description]	<ul style="list-style-type: none"> • Selects or cancels the user-defined character set. <ul style="list-style-type: none"> • When the LSB of <i>n</i> is 0, the user-defined character set is canceled. • When the LSB of <i>n</i> 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	&	<i>y</i>	<i>c1</i>	<i>c2</i> [<i>x1</i> <i>d1</i> ... <i>d</i> (<i>y</i> × 1)]...[<i>xk</i> <i>d1</i> ... <i>d</i> (<i>y</i> × <i>xk</i>)]
	Hex	1B	26	<i>y</i>	<i>c1</i>	<i>c2</i> [<i>x1</i> <i>d1</i> ... <i>d</i> (<i>y</i> × 1)]...[<i>xk</i> <i>d1</i> ... <i>d</i> (<i>y</i> × <i>xk</i>)]
	Decimal	27	38	<i>y</i>	<i>c1</i>	<i>c2</i> [<i>x1</i> <i>d1</i> ... <i>d</i> (<i>y</i> × 1)]...[<i>xk</i> <i>d1</i> ... <i>d</i> (<i>y</i> × <i>xk</i>)]
[Range]	<p>For ANK/Multilingual model:</p> <p><i>y</i> = 3</p> <p>$32 \leq c1 \leq c2 \leq 126$</p> <p>$0 \leq x \leq 12$ (when font A (12 × 24) is selected)</p> <p>$0 \leq x \leq 9$ (when font B (9 × 17) is selected)</p> <p>$0 \leq d \leq 255$</p> <p>$k = c2 - c1 + 1$</p> <p>For Japanese model:</p> <p><i>y</i> = 3 (when font A (12 × 24) / font B (10 × 24) selected)</p> <p><i>y</i> = 2 (when font C (8 × 16) selected)</p> <p>$32 \leq c1 \leq c2 \leq 126$</p> <p>$0 \leq x \leq 12$ (when font A (12 × 24) is selected)</p> <p>$0 \leq x \leq 10$ (when font B (10 × 24) is selected)</p> <p>$0 \leq x \leq 8$ (when font C (8 × 16) is selected)</p> <p>$0 \leq d \leq 255$</p> <p>$k = c2 - c1 + 1$</p>					
[Description]	<ul style="list-style-type: none"> • Assigns the user-defined character pattern for the specified character codes. <ul style="list-style-type: none"> • <i>y</i> specifies the number of bytes in the vertical direction. • <i>c1</i> specifies the beginning character code for the definition, and <i>c2</i> specifies the final code. • <i>x</i> specifies the number of dots in the horizontal direction. • <i>d</i> specifies the definition data. 					
[Notes]	When memory switch 8-7 is On, the user-defined character and the downloaded bit image cannot be defined simultaneously. The downloaded bit image data is cleared with this command.					

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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*.

<For ANK/Multilingual model>

<i>m</i>	Mode	Number of dots in vertical direction	Vertical dot density	Horizontal dot density	Number of bytes (<i>k</i>)
0	8-dot single-density	8	60 dpi	90 dpi	$(nL + nH \times 256)$
1	8-dot double-density	8	60 dpi	180 dpi	$(nL + nH \times 256)$
32	24-dot single-density	24	180 dpi	90 dpi	$(nL + nH \times 256) \times 3$
33	24-dot double-density	24	180 dpi	180 dpi	$(nL + nH \times 256) \times 3$

dpi: dots per 25.4 mm {1"}

<For Japanese model>

<i>m</i>	Mode	Number of dots in vertical direction	Vertical dot density	Horizontal dot density	Number of bytes (<i>k</i>)
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] • For ANK/Multilingual model:
 Sets the current line spacing to approximately 4.23 mm {1/6"}.

• For Japanese model:
 Sets the current line spacing to approximately 3.75 mm {30/203" or 0.15"}.

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ESC 3 *n*

- [Name] Set line spacing
- [Format]
- | | | | |
|---------|-----|----|----------|
| ASCII | ESC | 3 | <i>n</i> |
| Hex | 1B | 33 | <i>n</i> |
| Decimal | 27 | 51 | <i>n</i> |
- [Range] $0 \leq n \leq 255$
- [Default]
- For ANK/Multilingual model:
Equivalent to approximately 4.23 mm {1/6"}.
 - For Japanese model:
Equivalent to approximately 3.75 mm {30/203" or 0.15"}.
- [Description] • Sets the current line spacing to [*n* × vertical motion units] inches.
- [Notes]
- For ANK/Multilingual model:
The maximum settable line spacing is 1016 mm {40"}.
 - For Japanese model:
The maximum settable line spacing is 900 mm {35.5"}.

ESC = *n*

- [Name] Select peripheral device
- [Format]
- | | | | |
|---------|-----|----|----------|
| ASCII | ESC | = | <i>n</i> |
| Hex | 1B | 3D | <i>n</i> |
| Decimal | 27 | 61 | <i>n</i> |
- [Range] $1 \leq n \leq 3$
- [Default] Serial interface specification:
- When turning on the printer: *n* = 1
 - When executing **ESC @**:

Setting before executing ESC @	<i>n</i>		
	1	2	3
After ESC @ processing	1	2	1

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

<i>n</i>	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] $32 \leq n \leq 126$

[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 mode 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] $1 \leq n \leq 255$
 $0 \leq k \leq 32$

[Default] $n = 8, 16, 24, 32, 40, \dots, 232, 240, 248$ (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	<i>n</i>
	Hex	1B	45	<i>n</i>
	Decimal	27	69	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Default]	$n = 0$			
[Description]	<ul style="list-style-type: none">• Turns emphasized mode on or off.<ul style="list-style-type: none">• When the LSB of <i>n</i> is 0, emphasized mode is turned off.• When the LSB of <i>n</i> is 1, emphasized mode is turned on.			

ESC G *n*

[Name]	Turn double-strike mode on/off			
[Format]	ASCII	ESC	G	<i>n</i>
	Hex	1B	47	<i>n</i>
	Decimal	27	71	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Default]	$n = 0$			
[Description]	<ul style="list-style-type: none">• Turns double-strike mode on or off.<ul style="list-style-type: none">• When the LSB of <i>n</i> is 0, double-strike mode is turned off.• When the LSB of <i>n</i> is 1, double-strike mode is turned on.			

ESC J *n*

[Name]	Print and feed paper			
[Format]	ASCII	ESC	J	<i>n</i>
	Hex	1B	4A	<i>n</i>
	Decimal	27	74	<i>n</i>
[Range]	$0 \leq n \leq 255$			
[Description]	<ul style="list-style-type: none">• Prints the data in the print buffer and feeds the paper [$n \times$ vertical motion unit].• For ANK/Multilingual model: The maximum paper feed amount is approximately 1016 mm {40"} if [$n \times$ vertical motion unit] exceeds 1016 mm {40"}.• For Japanese model: The maximum paper feed amount is approximately 900 mm {35.5"} if [$n \times$ vertical motion unit] exceeds 900 mm {35.5"}.			

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ESC L

[Name] Select page mode

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

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

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:

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

For Japanese model:

<i>n</i>	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] $0 \leq n \leq 13$

[Default] Except for Korean model: $n = 0$
 For Korean model: $n = 13$
 In the TM-T88II-compatible mode: $n = 0$

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

<i>n</i>	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] $0 \leq n \leq 3$, $48 \leq n \leq 51$

[Default] $n = 0$

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

<i>n</i>	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] $0 \leq n \leq 2$, $48 \leq n \leq 50$

[Default] $n = 0$

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

- When the roll paper is selected:

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

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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]	<For ANK/Multilingual model>										
	•When a paper width of 80 mm {3.15"} is selected:										
	$(xL + xH \times 256) = 0$ ($xL = 0$, $xH = 0$)										
	$(yL + yH \times 256) = 0$ ($yL = 0$, $yH = 0$)										
	$(dxL + dxH \times 256) = 512$ ($dxL = 0$, $dxH = 2$)										
	$(dyL + dyH \times 256) = 1662$ ($dyL = 126$, $dyH = 6$)										
	•When a paper width of 60 mm {2.36"} is selected:										
	$(xL + xH \times 256) = 0$ ($xL = 0$, $xH = 0$)										
	$(yL + yH \times 256) = 0$ ($yL = 0$, $yH = 0$)										
	$(dxL + dxH \times 256) = 384$ ($dxL = 128$, $dxH = 1$)										
	$(dyL + dyH \times 256) = 1662$ ($dyL = 126$, $dyH = 6$)										
	•When a paper width of 58 mm {2.28"} is selected:										
	$(xL + xH \times 256) = 0$ ($xL = 0$, $xH = 0$)										
	$(yL + yH \times 256) = 0$ ($yL = 0$, $yH = 0$)										
	$(dxL + dxH \times 256) = 360$ ($dxL = 104$, $dxH = 1$)										
	$(dyL + dyH \times 256) = 1662$ ($dyL = 126$, $dyH = 6$)										
	<For Japanese model>										
	•When a paper width of 80 mm {3.15"} is selected:										
	$(xL + xH \times 256) = 0$ ($xL = 0$, $xH = 0$)										
	$(yL + yH \times 256) = 0$ ($yL = 0$, $yH = 0$)										
	$(dxL + dxH \times 256) = 576$ ($dxL = 64$, $dxH = 2$)										
	$(dyL + dyH \times 256) = 1476$ ($dyL = 196$, $dyH = 5$)										
	•When a paper width of 60 mm {2.36"} is selected:										
	$(xL + xH \times 256) = 0$ ($xL = 0$, $xH = 0$)										
	$(yL + yH \times 256) = 0$ ($yL = 0$, $yH = 0$)										
	$(dxL + dxH \times 256) = 436$ ($dxL = 180$, $dxH = 1$)										
	$(dyL + dyH \times 256) = 1476$ ($dyL = 196$, $dyH = 5$)										
	•When a paper width of 58 mm {2.28"} is selected:										
	$(xL + xH \times 256) = 0$ ($xL = 0$, $xH = 0$)										
	$(yL + yH \times 256) = 0$ ($yL = 0$, $yH = 0$)										
	$(dxL + dxH \times 256) = 420$ ($dxL = 164$, $dxH = 1$)										
	$(dyL + dyH \times 256) = 1476$ ($dyL = 196$, $dyH = 5$)										

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- [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 = $[(dyL + dyH \times 256) \times (\text{vertical motion units})]$.
- [Notes]
- The maximum printable area is 117.263 mm {1662/360"} maximum.

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 $((nL + nH \times 256) \times \text{horizontal or vertical motion units})$.
 - When $(nL + nH \times 256)$ is positive number, the print starting position is specified to the right based on the current position.
 - When $(nL + nH \times 256)$ is negative number, the print starting position is specified to the left based on the current position.

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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:

<i>n</i>	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] $n = 0$ (when the memory switch 8-7 is Off.)
 $n = 15$ (when the memory switch 8-7 is On.)

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

[Default] $n = 0$

[Description] • Selects the paper sensor(s) 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] $0 \leq n \leq 255$

[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 panel buttons are always ignored regardless of the setting with this command.

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ESC d n

[Name] Print and feed n lines

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

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

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

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] $m = 0, 1, 48, 49$
 $0 \leq t1 \leq 255$
 $0 \leq t2 \leq 255$

[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 [$t1 \times 2$ ms], and $t2$ specifies the pulse OFF time as [$t2 \times 2$ ms].
- If $t2$ is smaller than $t1$, OFF time is set as [$t1 \times 2$ 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]	Except for Thai model: $0 \leq n \leq 5, 16 \leq n \leq 19, n = 255$			
	For Thai model: $0 \leq n \leq 5, 16 \leq n \leq 26, n = 255$			
[Default]	Except for Thai model: $n = 0$			
	For Thai model: $n = 20$			
[Description]	• Selects page n from the character code table.			

n	Selected character code
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

($20 \leq n \leq 26$) is supported only by a Thai model.

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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] $0 \leq n \leq 255$

[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.

FS p *n m*

[Name] Print NV bit image

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

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

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

[Description] • Prints an NV bit image *n* in *m* mode.

<For ANK/Multilingual model>

<i>m</i>	Mode	Vertical dot density	Horizontal dot density
0, 48	Normal	180 dpi	180 dpi
1, 49	Double-width	180 dpi	90 dpi
2, 50	Double-height	90 dpi	180 dpi
3, 51	Quadruple	90 dpi	90 dpi

<For Japanese model>

<i>m</i>	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"}

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

[Name]	Define NV bit image													
[Format]	ASCII	FS	q	n	[xL	xH	yL	yH	d1...dk]1...	[xL	xH	yL	yH	d1...dk]n
	Hex	1C	71	n	[xL	xH	yL	yH	d1...dk]1...	[xL	xH	yL	yH	d1...dk]n
	Decimal	28	113	n	[xL	xH	yL	yH	d1...dk]1...	[xL	xH	yL	yH	d1...dk]n
[Range]	$1 \leq n \leq 255$													
	$1 \leq (xL + xH \times 256) \leq 1023$ ($0 \leq xL \leq 255$, $0 \leq xH \leq 3$)													
	$1 \leq (yL + yH \times 256) \leq 288$ ($0 \leq yL \leq 255$, $yH = 0, 1$)													
	$0 \leq d \leq 255$													
	$k = (xL + xH \times 256) \times (yL + yH \times 256) \times 8$													
	Either one of the total capacity data [0, 64K, 128K, 192K, 256K, 320K, 384K] bytes can be selected by GS (E . The default value is 384 KB.													
[Description]	• Defines the specified NV bit image.													
	• n specifies the number of the NV bit image you are defining.													
	• xL, xH specify the number of dots in the horizontal direction for the NV bit image with $[(xL + xH \times 256) \times 8]$.													
	• yL, yH specify the number of dots in the vertical direction for the NV bit image with $[(yL + yH \times 256) \times 8]$.													
	• If this command is processed when NV graphics are defined with GS (L or GS 8 L , deletes all NV graphics data, then defines the bit image data with this command.													
[Notes]	• Frequent write command executions by this command may damage to the NV memory. Therefore, it is recommended to write to the NV memory 10 times or less a day.													
	• During processing of this command, the printer is BUSY while writing the data to the NV bit image memory and stops receiving data. Therefore, it is prohibited to transmit data, including real-time commands, during the execution of this command.													

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GS ! n

[Name] Select character size

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

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

[Default] $n = 0$

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

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

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GS \$ *nL nH*

[Name] Set absolute vertical print position in page mode

[Format]	ASCII	GS	\$	<i>nL</i>	<i>nH</i>
	Hex	1D	24	<i>nL</i>	<i>nH</i>
	Decimal	29	36	<i>nL</i>	<i>nH</i>

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

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

GS (*A pL pH n m*

[Name] Execute test print

[Format]	ASCII	GS	(	A	<i>pL</i>	<i>pH</i>	<i>n</i>	<i>m</i>
	Hex	1D	28	41	<i>pL</i>	<i>pH</i>	<i>n</i>	<i>m</i>
	Decimal	29	40	65	<i>pL</i>	<i>pH</i>	<i>n</i>	<i>m</i>

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

[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:

<i>n</i>	Paper type
0, 48	Roll paper
1, 49	
2, 50	

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

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

[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 styles) 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 user NV memory

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

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

- *pL, pH* specifies ($pL + pH \times 256$) for the number of bytes after *pH* (*m, fn, b, [c1 c2], [d1...dk]*).
- *c1, c2* specifies the key code (which identifies the record).
- The total capacity of the UV user memory is selectable as any one of these: [0, 64K, 128K, or 192K] bytes 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.

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<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 specified 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.

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<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] $(pL + pH \times 256) = 5$ ($pL = 5, pH = 0$)
 $m = 0$
 $fn = 2, 50$
 $b = 0$
 $32 \leq c1 \leq 126$
 $32 \leq c2 \leq 126$

[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 [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] $(pL + pH \times 256) = 3$ ($pL = 3$, $pH = 0$)
 $m = 0$
 $fn = 5, 53$
 $b = 0$

[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 byte
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 byte
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)

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

[Default]

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

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

<i>a</i>	<i>b</i>	Function
1	0, 48	DLE DC4 <i>fn m t</i> ($fn = 1$): Not processed (disabled)
	1, 49	DLE DC4 <i>fn m t</i> ($fn = 1$): Processed (enabled)
2	0, 48	DLE DC4 <i>fn a b</i> ($fn = 2$): Not processed (disabled)
	1, 49	DLE DC4 <i>fn a b</i> ($fn = 2$): Processed (enabled)

- pL, pH specifies ($pL + pH \times 256$) 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.

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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. Executes commands related to the user setting mode by specifying the function code *fn*.

<i>fn</i>	Format	No.	Function
1	GS (E <i>pL pH fn d1 d2</i>)	1	Changes into the user setting mode
2	GS (E <i>pL pH fn d1 d2 d3</i>)	2	Ends the user setting mode session. (Performs a soft reset.)
3	GS (E <i>pL pH fn [a1 b18...b11]... [ak bk8...bk1]</i>)	3	Sets value(s) for the memory switch.
4	GS (E <i>pL pH fn a</i>)	4	Transmits the settings of the memory switch to the host.
5	GS (E <i>pL pH fn [a1 n1L n1H]... [ak nkL nkH]</i>)	5	Sets the customized value(s).
6	GS (E <i>pL pH fn a</i>)	6	Transmits the customized value settings.
7	GS (E <i>pL pH fn a d1 d2</i>)	7	Copies the user-defined page.
8	GS (E <i>pL pH fn y c1 c2 [x d1... d(y × x)]k</i>)	8	Defines data in column format for the character code page in the active area.
9	GS (E <i>pL pH fn x c1 c2 [y d1... d(y × x)]k</i>)	9	Defines data in raster format for the character code page in the active area.
10	GS (E <i>pL pH fn c1 c2</i>)	10	Deletes the data in the character code page in the active area.
11	GS (E <i>pL pH fn a d1...dk</i>)	11	Sets the communication conditions for the serial interface.
12	GS (E <i>pL pH fn a</i>)	12	Transmits the communication conditions for the serial interface.

- *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 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 ascertained with Function 4, 6, or 12, even though the printer does not enter the user setting mode.

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- [Notes]
- Frequent write commands using 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	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>d1</i>	<i>d2</i>
	Hex	1D	28	45	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>d1</i>	<i>d2</i>
	Decimal	29	40	69	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>d1</i>	<i>d2</i>

[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> 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.

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

[Default] Msw 2-1, Msw 2-2, and Msw 8-8 are set to On ($b = 49$), and all other switches are set to Off ($b = 48$).

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[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	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 data as follows:

	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	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	Function
1 – 4	50	Reserved.
5	48	Does not enable left or right margin of bar code print.
	49	Enables left or right margin of bar code print.
6	50	Reserved.
7	48	TM-T88II-compatible mode: Not compatible.
	49	TM-T88II-compatible mode: Compatible.
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	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>a</i>
	Hex	1D	28	45	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>a</i>
	Decimal	29	40	69	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>a</i>

[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

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<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]	$4 \leq (pL + pH \times 256) \leq 65535$ $fn = 5$ $1 \leq a \leq 3, a = 5, 97, 116, 118$ $1 \leq (nL + nH \times 256) \leq 65535$													
[Default]	When $a = 1$: $(nL + nH \times 256) = 1$ When $a = 2$: $(nL + nH \times 256) = 7$ When $a = 3$: $(nL + nH \times 256) = 6$ When $a = 5$: $(nL + nH \times 256) = 0$ When $a = 97$: $(nL + nH \times 256) = 1$ When $a = 116$: $(nL + nH \times 256) = 1$ When $a = 118$: $(nL + nH \times 256) = 85$													

[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.
3	Selects the paper width.
5	Selects the print density.
97	Selects the number of parts used for head energizing
116	Selects the type of paper (single-color or two-color).
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

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- 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

- When $a = 3$, the paper width is selected as the size specified with $(nL + nH \times 256)$.

Value of $(nL + nH \times 256)$	Paper width
2	58 mm
3	60 mm
6	80 mm

- 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 %

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

Value of $(nL + nH \times 256)$	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 $(nL + nH \times 256)$.

Value of $(nL + nH \times 256)$	Paper
1	Specified single-color paper
257	Recommended two-color paper

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

$(nL + nH \times 256)$	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.
- The adjustment function of black-color density is enabled only in the ANK/Multilingual model.
It is disabled in the Japanese model.
- This function code $fn = 5$ is enabled only in the user setting mode.
- The values 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.

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<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] $(pL + pH \times 256) = 2$ ($pL = 2, pH = 0$)
 $fn = 6$
 $1 \leq a \leq 3, a = 5, 97, 116, 118$ (except for Japanese model)

[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	--	--
3	51	--	--
5	53	--	--
97	57	55	--
116	49	49	54
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 paper width ($a = 3$) is specified:

Setting status		Transmission data				
Data to be stored	Paper width	1st byte	2nd byte	3rd byte	4th byte	5th byte
2	58 mm	50	--	--	--	--
3	60 mm	51	--	--	--	--
6	80 mm	54	--	--	--	--

- 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	--	--	--	--

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- 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 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

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<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.

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

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

[Range] $5 \leq (pL + pH \times 256) \leq 65535$
 $fn = 8$
 $y = 2$ (when font C (8 × 16) is selected)
 $y = 3$ (when any font except font C (8 × 16) is selected)
 $128 \leq c1 \leq c2 \leq 255$
 $0 \leq x \leq 12$ (when font A (12 × 24) is selected)
 $0 \leq x \leq 9$ (when font B (9 × 17) is selected)
 $0 \leq x \leq 10$ (when Japanese font B (10 × 24) is selected)
 $0 \leq x \leq 8$ (when Japanese font C (8 × 16) is selected)
 $0 \leq d \leq 255$
 $k = c2 - c1 + 1$

[Description] • Defines the data for each character on 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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			NEXT 124	SHEET 123

- 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	○	○	○	○	○	○	○	○	○
Bit6	○	○	○	○	○	○	○	○	○
Bit5	○	○	○	○	○	○	○	○	○
Bit4	○	○	○	○	○	○	○	○	○
Bit3	○	○	○	○	●	●	○	○	○
Bit2	○	○	●	●	○	●	○	○	○
Bit1	○	●	○	●	○	○	○	○	○
Bit0	●	●	●	●	●	●	○	○	○
Bit7	○	○	○	○	○	○	○	○	○
Bit6	○	○	○	○	○	○	○	○	○
Bit5	○	○	○	○	○	○	○	○	○
Bit4	○	○	○	○	○	○	○	○	○
Bit3	○	○	○	●	●	●	○	○	○
Bit2	○	●	●	○	○	●	○	○	○
Bit1	●	○	●	○	●	○	○	○	○
Bit0	○	○	○	○	○	○	○	○	○
Bit7	○	○	○	○	○	○	○	○	○
Bit6	○	○	○	○	○	○	○	○	○
Bit5	○	○	○	○	○	○	○	○	○
Bit4	○	○	○	○	○	○	○	○	○
Bit3	○	○	○	●	●	●	○	○	○
Bit2	○	●	●	○	○	●	○	○	○
Bit1	●	○	●	○	●	○	○	○	○
Bit0	○	○	○	○	○	○	○	○	○

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

Confidential

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

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

[Range] $5 \leq (pL + pH \times 256) \leq 65535$
 $fn = 9$
 $x = 1$ (when font C (8 × 16) is selected)
 $x = 2$ (when any font except 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 on 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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			NEXT 126	SHEET 125

- 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 odd bytes are printed.
Bits 7 through 4 in even dots are printed.
Even if “1” is specified for any bit from 3 to 0, it is not printed.

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

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

[Range] $(pL + pH \times 256) = 3$ ($pL = 3$, $pH = 0$)
 $fn = 10$
 $128 \leq c1 \leq c2 \leq 255$

- [Description]
- Deletes the data for each character in the character code page in the active area (RAM).
 - After deleting the data, space patterns (no printing) are given.
 - 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	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>a</i>	<i>d1 ... dk</i>
	Hex	1D	28	45	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>a</i>	<i>d1 ... dk</i>
	Decimal	29	40	69	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>a</i>	<i>d1 ... dk</i>

[Range] $3 \leq (pL + pH \times 256) \leq 65535$ ($0 \leq pL \leq 255$, $0 \leq pH \leq 255$)
 $fn = 11$
 $1 \leq a \leq 4$
 $48 \leq d \leq 57$
 $1 \leq k \leq 6$

- [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 of the serial interface specified by a according to value d .

<i>a</i>	Communication condition	<i>d</i>
1	Baud rate	k bytes of ($d1...dk$)
2	Parity	1 byte of ($d1$)
3	Handshake control	1 byte of ($d1$)
4	Data length	1 byte of ($d1$)

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<Baud rate setting ($d1\dots dk$) >

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

<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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			NEXT 129	SHEET 128

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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 of 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	39	1 byte
Type of 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

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- When the parity setting ($a = 2$) 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 ignores the value specified with a .

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GS (K *pL* *pH* *fn* *m*

[Name] Print control method(s)

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

<i>fn</i>	Function
48	Specifies the print control mode.
49	Sets the print density.
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
 $1 \leq m \leq 4, 49 \leq m \leq 52$

[Default] *m* = 1

[Description] • Selects the print control mode.

<i>m</i>	Print control mode
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] $(pL + pH \times 256) = 2$ ($pL = 2$, $pH = 0$)
 $fn = 49$
 $0 \leq m \leq 6$, $250 \leq m \leq 255$

[Default] $m = 0$ (setting value of the customized value)

[Description] • Specifies the print density.

<i>m</i>	Print density
250	Selects print density level – 6.
251	Selects print density level – 5.
252	Selects print density level – 4.
253	Selects print density level – 3.
254	Selects print density level – 2.
255	Selects print density level – 1.
0	Selects the standard print density.
1	Selects print density level +1.
2	Selects print density level +2.
3	Selects print density level +3.
4	Selects print density level +4.
5	Selects print density level +5.
6	Selects print density level +6.

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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
 $0 \leq m \leq 6, 48 \leq m \leq 52$

[Default] *m* = 0 (setting value of the customized value)

[Description] • Specifies the number of parts for energizing the head.

<i>m</i>	Number of divided parts for energizing the 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 exceeds 65533 bytes use **GS 8 L**.

[Description] • Processes graphics data according to the function code *fn*.

<i>fn</i>	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 kc1 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 [parameter]).

[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.

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<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] $(pL + pH \times 256) = 2$ ($pL = 2, pH = 0$)
 $m = 48$
 $fn = 3, 51$

[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	<i>pL</i>	<i>pH</i>	<i>m</i>	<i>fn</i>	<i>d1</i>	<i>d2</i>
	Hex	1D	28	4C	<i>pL</i>	<i>pH</i>	<i>m</i>	<i>fn</i>	<i>d1</i>	<i>d2</i>
	Decimal	29	40	76	<i>pL</i>	<i>pH</i>	<i>m</i>	<i>fn</i>	<i>d1</i>	<i>d2</i>

[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 the single-color paper is selected)
 $c = 50$ (when the two-color paper is selected)
 $0 \leq d \leq 255$
 $k = (\text{int}((xL + xH \times 256) + 7) / 8) \times (yL + yH \times 256)$
 - 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 the color of the defined data.
 - 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.

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- [Notes]
- If the color specified with *b* is the same color as the previously specified one, and it 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, then disregards the remaining data after it.
 - When this command is processed while NV bit image data is defined with **FS q**, the printer deletes all NV bit image data, and then defines data with this command.

<Function 69> **GS (L *pL pH m fn kc1 kc2 x y* (fn = 69)**

[Format]	ASCII	GS	(	L	<i>pL</i>	<i>pH</i>	<i>m</i>	<i>fn</i>	<i>kc1</i>	<i>kc2</i>	<i>x</i>	<i>y</i>
	Hex	1D	28	4C	<i>pL</i>	<i>pH</i>	<i>m</i>	<i>fn</i>	<i>kc1</i>	<i>kc2</i>	<i>x</i>	<i>y</i>
	Decimal	29	40	76	<i>pL</i>	<i>pH</i>	<i>m</i>	<i>fn</i>	<i>kc1</i>	<i>kc2</i>	<i>x</i>	<i>y</i>

[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.

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<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 the single-color paper is selected)
 $c = 49, 50$ (when the two-color paper is selected)
 $1 \leq (xL + xH \times 256) \leq 1024$

For ANK/Multilingual model:

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 $by = 2$)

For Japanese model:

When single-color paper is specified:

$1 \leq (yL + yH \times 256) \leq 1476$ (when $by = 1$)

$1 \leq (yL + yH \times 256) \leq 738$ (when $by = 2$)

When two-color paper is specified:

$1 \leq (yL + yH \times 256) \leq 738$ (when $by = 1$)

$1 \leq (yL + yH \times 256) \leq 369$ (when $by = 2$)

$0 \leq d \leq 255$

$k = (\text{int}((xL + xH \times 256) + 7) / 8) \times (yL + yH \times 256)$

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[Description] • Stores the raster graphics data, enlarged by bx and by in the horizontal and vertical directions in 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] • In standard mode, each color can be defined only once.

GS (M pL pH fn m

[Name] Customize printer

[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> of GS (k
Print position	ESC D, ESC T, ESC a, GS L, GS W
Etc.	ESC c 4, ESC c 5, GS (D, GS P

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<Function 1> **GS (M *pL pH fn m* (fn = 1,49)**

[Format]	ASCII	GS	(M	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>m</i>
	Hex	1D	28	4D	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>m</i>
	Decimal	29	40	77	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>m</i>

[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 the real-time commands, during the execution of this command.

<Function 2> **GS (M *pL pH fn m* (fn = 2,50)**

[Format]	ASCII	GS	(	M	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>m</i>
	Hex	1D	28	4D	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>m</i>
	Decimal	29	40	77	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>m</i>

[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.

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

[Format]	ASCII	GS	(	M	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>m</i>
	Hex	1D	28	4D	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>m</i>
	Decimal	29	40	77	<i>pL</i>	<i>pH</i>	<i>fn</i>	<i>m</i>

[Range] $(pL + pH \times 256) = 2$ ($pL = 2, pH = 0$)
 $fn = 3, 51$
 $m = 0, 1, 48, 49$

[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.

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GS (N *pL pH fn* [*parameters*]

[Name] Select character style

[Description] • Executes commands for the character style as specified by the function code *fn*.

<i>fn</i>	Format	Function No.	Description
48	GS (N <i>pL pH fn m</i>	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] ($pL + pH \times 256$) = 2 ($pL = 2, pH = 0$)
fn = 48
m = 49 (when the 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*.

<i>m</i>	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.

<i>cn</i>	Type of Symbol
48	PDF417 (2-dimensional code)

<i>cn</i>	<i>fn</i>	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 of PDF417.
	68	GS (k pL pH cn fn n	Function 068	Sets the module height of PDF417.
	69	GS (k pL pH cn fn m n	Function 069	Sets the error correction level of PDF417 .
	70	GS (k pL pH cn fn m	Function 070	Specifies the options of 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.

- "Symbol data" refers to the data (*d1...dk*) received with Function 080.
- "Symbol storage area" refers to the range for storing data received with Function 080 before encoding.

[Reference] Appendix I

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<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.								
	<ul style="list-style-type: none"> n = 0 specifies automatic processing. 								
	<ul style="list-style-type: none"> 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. 								
	<ul style="list-style-type: none"> n ≠ 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.								
	<ul style="list-style-type: none"> Start and stop patterns 								
	<ul style="list-style-type: none"> Left and right indicator code words 								

<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]	$(pL + pH \times 256) = 3$ ($pL = 3, pH = 0$)								
	cn = 48								
	fn = 66								
	$n = 0, 3 \leq n \leq 90$								
[Default]	n = 0								
[Description]	Sets the number of rows of data area for PDF417.								
	<ul style="list-style-type: none"> n = 0 specifies automatic processing. 								
	<ul style="list-style-type: none"> 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. 								
	<ul style="list-style-type: none"> n ≠ 0 sets the number of rows to n. 								

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<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] $(pL + pH \times 256) = 3$ ($pL = 3, pH = 0$)
 $cn = 48$
 $fn = 67$
 $2 \leq n \leq 8$

[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] $(pL + pH \times 256) = 3$ ($pL = 3, pH = 0$)
 $cn = 48$
 $fn = 68$
 $2 \leq n \leq 8$

[Default] $n = 3$

[Description] Sets the module height to $[(\text{module width}) \times n]$.

- 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

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<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] $(pL + pH \times 256) = 3$ ($pL = 3, pH = 0$)
 $cn = 48$
 $fn = 81$
 $m = 48$

[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] $(pL + pH \times 256) = 3$ ($pL = 3, pH = 0$)
 $cn = 48$
 $fn = 82$
 $m = 48$

[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 amount
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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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] $1 \leq x \leq 255$
 $1 \leq y \leq 48$ (where $x \times y \leq 1536$)
 $0 \leq d \leq 255$

[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.

[Notes] When memory switch 8-7 is On, the user-defined character and the downloaded bit image cannot be defined simultaneously. The downloaded bit image data is cleared with this command.

GS / m

[Name] Print downloaded bit image

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

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

[Description] Prints the defined downloaded bit image in m mode.

<For ANK/Multilingual model>

m	Mode	Vertical dot density	Horizontal dot density
0, 48	Normal	180 dpi	180 dpi
1, 49	Double-width	180 dpi	90 dpi
2, 50	Double-height	90 dpi	180 dpi
3, 51	Quadruple	90 dpi	90 dpi

<For Japanese model>

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"}

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GS :

[Name] Start/end macro definition

[Format] ASCII GS :
 Hex 1D 3A
 Decimal 29 58

[Description] • Starts or ends macro definition.
 • 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] $0 \leq n \leq 255$

[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 H *n*

[Name] Select printing position for HRI characters

[Format] ASCII GS H *n*
 Hex 1D 48 *n*
 Decimal 29 72 *n*

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

[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:

<i>n</i>	Printing position
0, 48	Not printed
1, 49	Above the bar code
2, 50	Below the bar code
3, 51	Both above and below the bar code

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GS I n

[Name] Transmit printer ID

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

[Range] $1 \leq n \leq 3$, $49 \leq n \leq 51$, $65 \leq n \leq 69$, $n = 112$
 $1 \leq n \leq 3$, $49 \leq n \leq 51$, $65 \leq n \leq 69$ (When TM-T88II compatible mode is selected.)

[Description] Transmits the printer ID specified.

- n specifies the types of the printer ID.

n	Printer ID type	ID
1, 49	Printer model ID	Hexadecimal: 2EH Decimal: 46
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-T90
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 model: THAI 3 PASS 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.

[Note] • When memory switch Msw 8-7 is On, the printer model ID is 32, and the firmware version ID is 70.

[Reference] APPENDIX H

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GS L nL nH

[Name] Set left margin

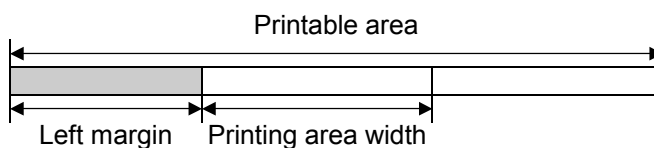
[Format]	ASCII	GS	L	nL	nH
	Hex	1D	4C	nL	nH
	Decimal	29	76	nL	nH

[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 $[(nL + nH \times 256) \times (\text{horizontal motion units})]$.



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] For ANK/Multilingual model: $x = 180, y = 360$
For Japanese model: $x = 203, y = 406$

[Description] • Sets the horizontal and vertical motion units as follows:

<For ANK/Multilingual model>

- When $x = 0$, the default setting of 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 $\{(1/y)''\}$.

<For Japanese model>

- When $x = 0$, the default setting of 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.

<i>n</i>	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 to be set.
- When deleting is specified (*n* = 0, 48), the printer executes the cancel process for 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 ≤ *n* ≤ 255

[Description] • Cuts paper in the specified mode.

<i>m</i>	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).

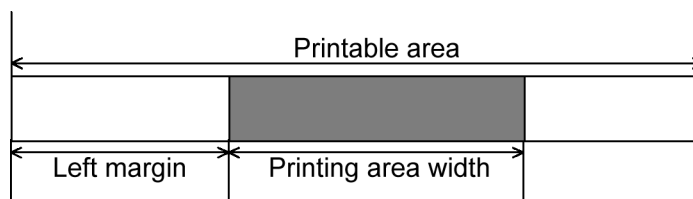
- *n* specifies how data in the print buffer is processed when this command is executed.
- Full cut or one point left uncut cannot be changed by software.

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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]	For ANK/Multilingual model:				
	$(nL + nH \times 256) = 512$ ($nL = 0, nH = 2$) (for 80 mm of the paper width)				
	$(nL + nH \times 256) = 384$ ($nL = 128, nH = 1$) (for 60 mm of the paper width)				
	$(nL + nH \times 256) = 360$ ($nL = 104, nH = 1$) (for 58 mm of the paper width)				
	For Japanese model:				
	$(nL + nH \times 256) = 576$ ($nL = 64, nH = 2$) (for 80 mm of the paper width)				
	$(nL + nH \times 256) = 436$ ($nL = 180, nH = 1$) (for 60 mm of the paper width)				
	$(nL + nH \times 256) = 420$ ($nL = 164, nH = 1$) (for 58 mm of the paper width)				
[Description]	Sets the printing area width specified with nL and nH.				
	<ul style="list-style-type: none"> The printing area width is $[(nL + nH \times 256) \times (\text{horizontal motion units})]$. 				



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.

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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 1-3 is Off.
 $n = 2$ when memory switch 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	Roll paper sensor status disabled.
	On	08	8	Roll paper sensor status enabled.
4	Off	00	0	Reserved.
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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- 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 by using the paper FEED button.
	On	40	64	Paper is being fed by using the paper FEED button.
7	Off	00	0	Fixed.

- 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.

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Third byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Roll paper near-end sensor: paper adequate.
	On	01	1	Roll paper near-end sensor: paper near end.
1	Off	00	0	Roll paper near-end sensor: paper present.
	On	02	2	Roll paper near-end sensor: paper not present.
2	Off	00	0	Roll paper end sensor: paper present.
	On	04	4	Roll paper end sensor: paper not present.
3	Off	00	0	Roll paper end sensor: paper present.
	On	08	8	Roll paper 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.

[Notes]

- When memory switch Msw 8-7 is On, the printer transmits the ASB data to the host whether the host can receive or not.
- When memory switch Msw 8-7 is On, the printer transmits the ASB data with the panel button status always being ignored.

[Reference] APPENDIX J

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

[Default] $n = 0$

[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>

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

<For Japanese model>

<i>n</i>	Font
0, 48	Font A (12 × 24)
1, 49	Font B (10 × 24)
2, 50	Font C (8 × 16)

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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 times energizing head [times]
32	50	Number of autocutter operations [times]
46	70	Printer 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 maintenance counter memory and stops receiving data. Therefore it is prohibited to transmit data including the real-time commands during the execution of this command.

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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]
- The printer transmits [Header + Data + NUL] collectively without confirming whether the host is ready to receive data. To receive all data correctly, adequate capacity is required in the receive buffer of the host.
 - During the transmission of block 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.

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GS h n

[Name] Select bar code height

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

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

[Default] $n = 162$

[Description] Selects the height of the bar code as *n* dots.

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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	$1 \leq n \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 68,$ $d = 36, 43, 45, 46, 47, 58$
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).

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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	Roll paper near-end sensor: paper adequate.
	On	03	3	Roll paper near-end sensor: paper near end.
2, 3	Off	00	0	Roll paper end sensor: paper present.
	On	0C	12	Roll paper 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

Bits 2 and 3: This command cannot be executed, since the printer goes offline when the roll paper end sensor detects that the paper is 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	Off	00	0	Reserved
2	Off	00	0	Reserved
3	Off	00	0	Reserved
4	Off	00	0	Fixed
5	Off	00	0	Reserved
5	Off	00	0	Reserved
7	Off	00	0	Fixed

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

[Name] Print raster bit image

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

[Range] $0 \leq m \leq 3, 48 \leq m \leq 51$
 $1 \leq (xL + xH \times 256) \leq 128$ ($0 \leq xL \leq 128, xH = 0$)
 $1 \leq (yL + yH \times 256) \leq 4095$ ($0 \leq yL \leq 255, 0 \leq yH \leq 15$)
 $0 \leq d \leq 255$
 $k = (xL + xH \times 256) \times (yL + yH \times 256)$

[Description] Prints a raster bit image in *m* mode.

- m* specifies the bit image mode.

<For ANK/Multilingual model>

<i>m</i>	Mode	Vertical dot density	Horizontal dot density
0, 48	Normal	180 dpi	180 dpi
1, 49	Double-width	180 dpi	90 dpi
2, 50	Double-height	90 dpi	180 dpi
3, 51	Quadruple	90 dpi	90 dpi

<For Japanese model>

<i>m</i>	Mode	Vertical dot density	Horizontal dot density
0, 48	Normal	203 dpi	203 dpi
1, 49	Double-width	203 dpi	230/2 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.

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GS w n

[Name] Set bar code width

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

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

[Default] $n = 3$

[Description] Sets the horizontal size of the bar code, using n as follows:

<For ANK/Multilingual model>

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

<For Japanese model>

n	Multi-level bar code Module width (mm)	Binary-level bar code	
		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

[Notes]

- 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

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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	-	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.

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FS &

[Name] Select Kanji character mode

[Format] ASCII FS &
 Hex 1C 26
 Decimal 28 38

[Description] Selects Kanji character mode.

- [Notes]
- 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*.

<i>fn</i>	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] $(pL + pH \times 256) = 2$ ($pL = 2, pH = 0$)
 $fn = 48$
 $0 \leq m \leq 2, 48 \leq m \leq 50$

[Default] $m = 0$

[Description] • Selects the type of the Kanji font.

<i>m</i>	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)

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FS - n

[Name] Turn underline mode on/off for Kanji characters

[Format] ASCII FS - n
 Hex 1C 2D n
 Decimal 28 45 n

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

[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	<i>c1</i>	<i>c2</i>	<i>d1...dk</i>
Hex	1C	32	<i>c1</i>	<i>c2</i>	<i>d1...dk</i>
Decimal	28	50	<i>c1</i>	<i>c2</i>	<i>d1...dk</i>

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

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

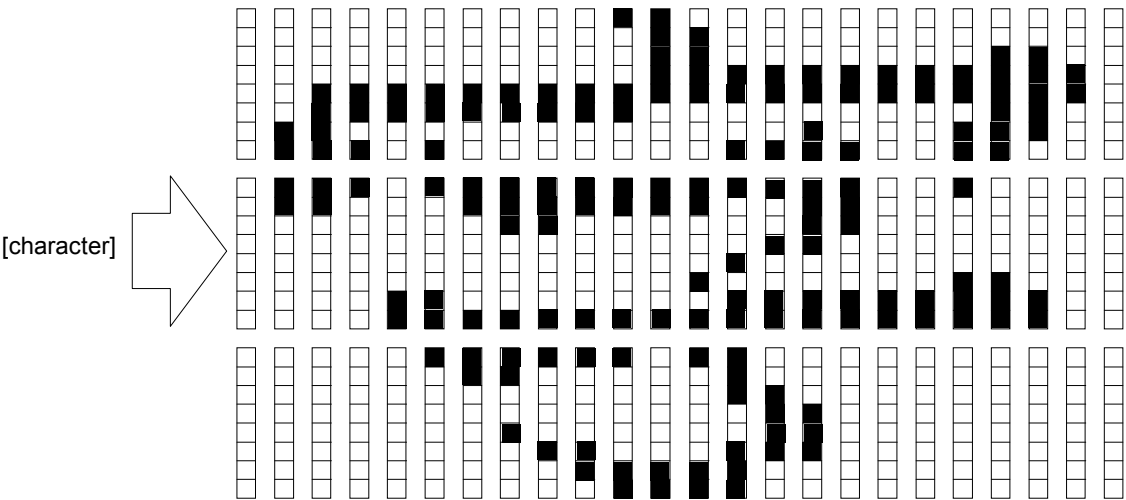
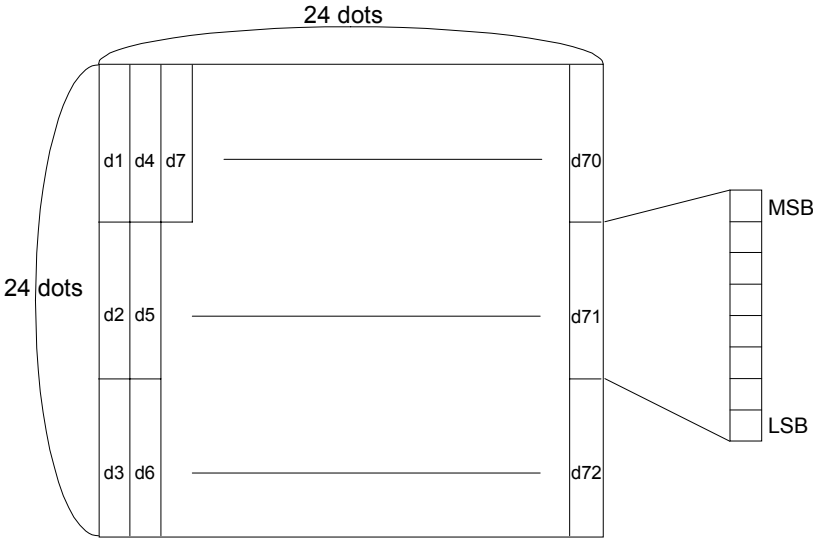
- $0 \leq d \leq 255$
- *k* depends on the Kanji support model

	<i>k</i>
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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[Example]



d1 = <00>H

p4 = <03>H

d7 = <0F>H

.. d10 = <0D>H

d13 = <0C>H

d16 = <0D>H

....

d2 = <00>H

p5 = <00>H

d8 = <00>H

.. d11 = <80>H

d14 = <03>H

d17 = <83>H

....

d3 = <00>H

p6 = <00>H

d9 = <00>H

.. d12 = <00>H

d15 = <00>H

d18 = <80>H

....

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FS C *n*

[Name] Select Kanji character code system

[Format] ASCII FS C *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 the Japanese model, based on the following values of *n*:

<i>n</i>	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] $0 \leq n1 \leq 255$
 $0 \leq n2 \leq 255$

[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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FS W *n*

[Name] Turn quadruple-size mode on/off for Kanji characters

[Format]	ASCII	FS	W	<i>n</i>
	Hex	1C	57	<i>n</i>
	Decimal	28	87	<i>n</i>

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

[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.

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APPENDIX A: MISCELLANEOUS NOTES**A.1 Notes on Printing and Paper Feeding**

- 1) Because the TM-T90 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 (10/180 inches) and only paper feeding is executed, paper is fed for 10 dots; however, if bit-image characters are printed, paper is fed for 24 dots.

When only rotated characters are printed on one line, paper feeding is executed as shown in Tables 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 × number of times enlarged vertically

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 × number of times enlarged vertically

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- 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 power supply connector of the printer. Then plug in the external power supply and turn it on if necessary. Be sure not to connect the external power supply with the wrong polarity. If it is connected incorrectly, the internal circuit fuse of the printer may be blown or the external power supply may be damaged.
- The power supply voltage is within the range of $24\text{ V} \pm 7\%$. If the power supply voltage drops to a value 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 3.8.3. 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.
 - 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, since the printer mechanism may be damaged.
 - 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 Loading the Paper Roll

- 1) Open the cover by pressing the cover open lever.
- 2) Load the new roll paper roll and pull out some of the paper from the roll paper.
- 3) Close the printer cover.

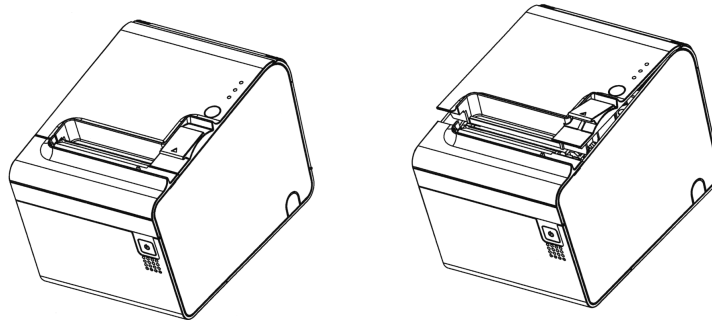


Figure B.1 Operating the Cover Open Lever

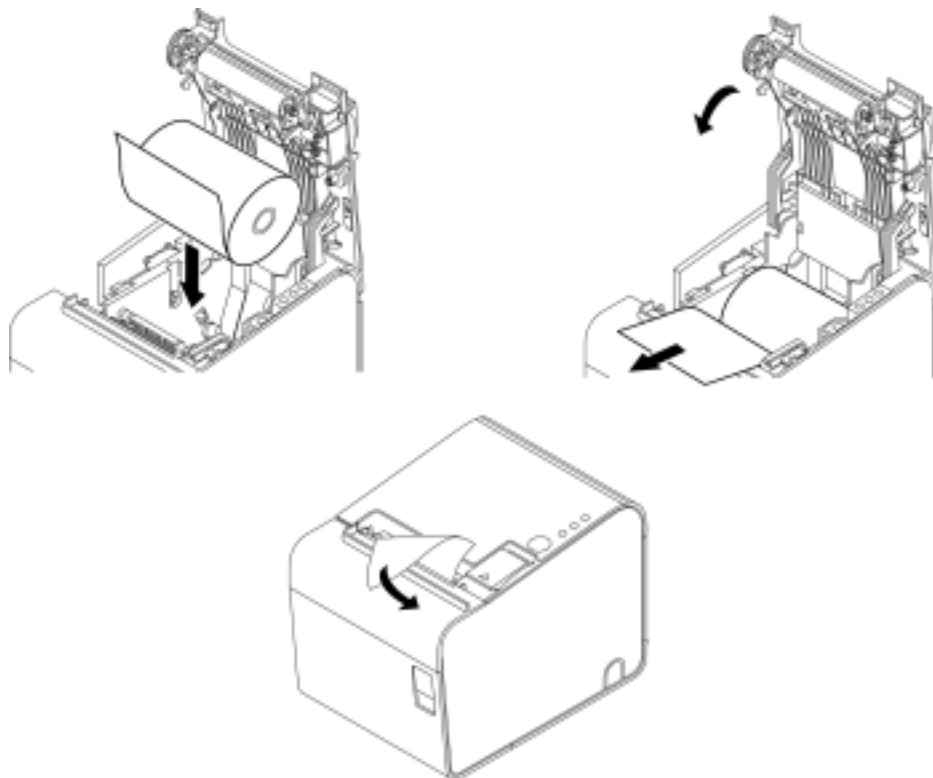


Figure B.2 Loading the Roll Paper

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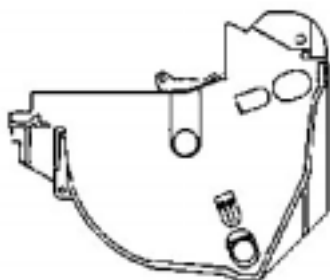
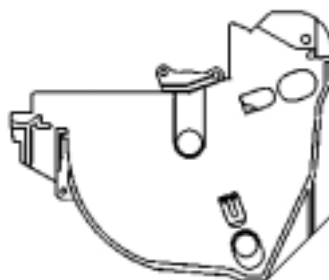
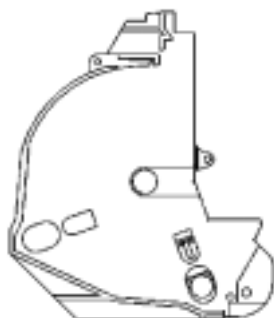
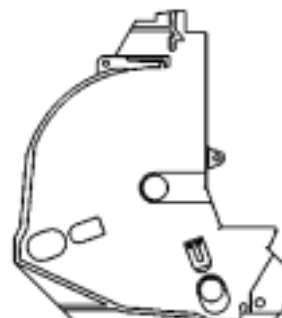
**APPENDIX C: ADJUSTING THE ROLL PAPER NEAR-END SENSOR
LOCATION**

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

Table C.1 Adjustment Positions

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

**Positioning Plate #1 Horizontal****Positioning Plate #2 Horizontal****Positioning Plate #1 Vertical****Positioning Plate #2 Vertical**

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- NOTES:
1. Since the specified thermal paper dimension of the outside diameter of roll paper in Table C.1 is a calculated value, there may be some variations depending on the printer.
 2. Be sure that the detection lever 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 attached to a wall. (Refer to Figure C.2)
 - Loosen the screw for the detector.
 - Push and hold the lever on the detector as far into hole 1 as possible.
 - Press the knob inward to move the detector lever past hole 1, and then move the knob toward the front of the printer until the lever clicks into place in hole 2.
 - After setting the lever into hole 2, secure it with the screw.

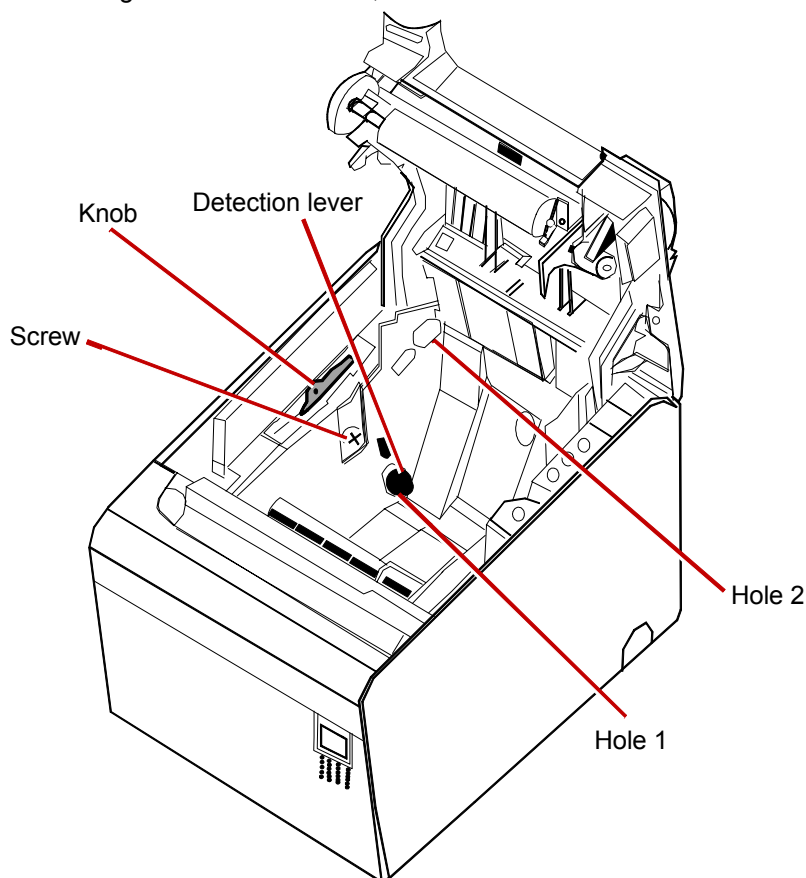


Figure C.2 Changing the Near-end Adjusting Position

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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.

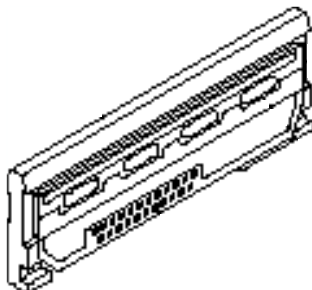


Figure D.1 Print Head Thermal Elements

- (*) 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 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 on the manufacturer and the part number, make sure that the specifications of the drawer to be used meet the following conditions before connecting it to the drawer kick-out connector. These conditions also apply to any other devices that use the drawer kick-out connector.

Any devices that do not satisfy all the following conditions must not be used.

[Conditions]

- A load must be provided between drawer kick-out connector pins 4 and 2 or between pins 4 and 5. (Operating the printer with incorrectly installed devices voids the warranty.)
- When the drawer open/close signal is used, a switch must be provided between drawer kick-out connector pins 3 and 6. (Connecting devices other than the drawer open/close switch voids the warranty.)
- The resistance of the load must be 24 Ω or more, or the input current must be 1 A or less. (If a device with a resistance of less than 24 Ω or an input current of over 1 A is used, the resulting overcurrent may damage the printer and the device.)
- Be sure to use drawer kick-out connector pin 4 (24 V power output) to drive the device. Never connect any other power supply to the drawer kick-out connector. (Connecting a power supply other than that specified voids the warranty.)

The peak current is 1 A. When energizing the drawer kick-out drive signal, follow the conditions described in 3) of Section 2.2.3, *Drawer kick-out drive signal*.

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APPENDIX F: CODE128 BAR CODE

F.1 Description of the CODE128 Bar Code

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

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

The following special characters are also available in CODE128:

- SHIFT characters
In code set A, the character just after SHIFT is processed as a character for code set B. In code set B, the character just after SHIFT is processed as the character for code set A. SHIFT characters cannot be used in code set C.
- Code set selection character (CODE A, CODE B, CODE C)
This character switches the following code set to code set A, B, or C.
- Function character (FNC1, FNC2, FNC3, FNC4)
The usage of function characters depends on the application software. In code set C, only FNC1 is available.

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F.2 Code Tables

Printable characters in code set A

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
NUL	00	0	(	28	40	P	50	80
SOH	01	1	)	29	41	Q	51	81
STX	02	2	*	2A	42	R	52	82
ETX	03	3	+	2B	43	S	53	83
EOT	04	4	,	2C	44	T	54	84
ENQ	05	5	-	2D	45	U	55	85
ACK	06	6	.	2E	46	V	56	86
BEL	07	7	/	2F	47	W	57	87
BS	08	8	0	30	48	X	58	88
HT	09	9	1	31	49	Y	59	89
LF	0A	10	2	32	50	Z	5A	90
VT	0B	11	3	33	51	[	5B	91
FF	0C	12	4	34	52	\	5C	92
CR	0D	13	5	35	53	]	5D	93
SO	0E	14	6	36	54	^	5E	94
SI	0F	15	7	37	55	_	5F	95
DLE	10	16	8	38	56	FNC1	7B,31	123,49
DC1	11	17	9	39	57	FNC2	7B,32	123,50
DC2	12	18	:	3A	58	FNC3	7B,33	123,51
DC3	13	19	;	3B	59	FNC4	7B,34	123,52
DC4	14	20	<	3C	60	SHIFT	7B,53	123,83
NAK	15	21	=	3D	61	CODEB	7B,42	123,66
SYN	16	22	>	3E	62	CODEC	7B,43	123,67
ETB	17	23	?	3F	63			
CAN	18	24	@	40	64			
EM	19	25	A	41	65			
SUB	1A	26	B	42	66			
ESC	1B	27	C	43	67			
FS	1C	28	D	44	68			
GS	1D	29	E	45	69			
RS	1E	30	F	46	70			
US	1F	31	G	47	71			
SP	20	32	H	48	72			
!	21	33	I	49	73			
"	22	34	J	4A	74			
#	23	35	K	4B	75			
\$	24	36	L	4C	76			
%	25	37	M	4D	77			
&	26	38	N	4E	78			
'	27	39	O	4F	79			

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Printable characters in code set B

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
SP	20	32	H	48	72	p	70	112
!	21	33	I	49	73	q	71	113
"	22	34	J	4A	74	r	72	114
#	23	35	K	4B	75	s	73	115
\$	24	36	L	4C	76	t	74	116
%	25	37	M	4D	77	u	75	117
&	26	38	N	4E	78	v	76	118
'	27	39	O	4F	79	w	77	119
(	28	40	P	50	80	x	78	120
)	29	41	Q	51	81	y	79	121
*	2A	42	R	52	82	z	7A	122
+	2B	43	S	53	83	{	7B,7B	123,123
,	2C	44	T	54	84	|	7C	124
-	2D	45	U	55	85	}	7D	125
.	2E	46	V	56	86	—	7E	126
/	2F	47	W	57	87	DEL	7F	127
0	30	48	X	58	88	FNC1	7B,31	123,49
1	31	49	Y	59	89	FNC2	7B,32	123,50
2	32	50	Z	5A	90	FNC3	7B,33	123,51
3	33	51	[	5B	91	FNC4	7B,34	123,52
4	34	52	\	5C	92	SHIFT	7B,53	123,83
5	35	53	]	5D	93	CODEA	7B,41	123,66
6	36	54	^	5E	94	CODEC	7B,43	123,67
7	37	55	¯	5F	95			
8	38	56	`	60	96			
9	39	57	a	61	97			
:	3A	58	b	62	98			
;	3B	59	c	63	99			
<	3C	60	d	64	100			
=	3D	61	e	65	101			
>	3E	62	f	66	102			
?	3F	63	g	67	103			
@	40	64	h	68	104			
A	41	65	i	69	105			
B	42	66	j	6A	106			
C	43	67	k	6B	107			
D	44	68	l	6C	108			
E	45	69	m	6D	109			
F	46	70	n	6E	110			
G	47	71	o	6F	111			

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Printable characters in code set C

Character	Transmit Data		Character	Transmit Data		Character	Transmit Data	
	Hex	Decimal		Hex	Decimal		Hex	Decimal
00	00	0	40	28	40	80	50	80
01	01	1	41	29	41	81	51	81
02	02	2	42	2A	42	82	52	82
03	03	3	43	2B	43	83	53	83
04	04	4	44	2C	44	84	54	84
05	05	5	45	2D	45	85	55	85
06	06	6	46	2E	46	86	56	86
07	07	7	47	2F	47	87	57	87
08	08	8	48	30	48	88	58	88
09	09	9	49	31	49	89	59	89
10	0A	10	50	32	50	90	5A	90
11	0B	11	51	33	51	91	5B	91
12	0C	12	52	34	52	92	5C	92
13	0D	13	53	35	53	93	5D	93
14	0E	14	54	36	54	94	5E	94
15	0F	15	55	37	55	95	5F	95
16	10	16	56	38	56	96	60	96
17	11	17	57	39	57	97	61	97
18	12	18	58	3A	58	98	62	98
19	13	19	59	3B	59	99	63	99
20	14	20	60	3C	60	FNC1 CODEA CODEB	7B,31	123,49
21	15	21	61	3D	61		7B,41	123,65
22	16	22	62	3E	62		7B,42	123,66
23	17	23	63	3F	63			
24	18	24	64	40	64			
25	19	25	65	41	65			
26	1A	26	66	42	66			
27	1B	27	67	43	67			
28	1C	28	68	44	68			
29	1D	29	69	45	69			
30	1E	30	70	46	70			
31	1F	31	71	47	71			
32	20	32	72	48	72			
33	21	33	73	49	73			
34	22	34	74	4A	74			
35	23	35	75	4B	75			
36	24	36	76	4C	76			
37	25	37	77	4D	77			
38	26	38	78	4E	78			
39	27	39	79	4F	79			

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APPENDIX 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/receiving data or is not operating for two seconds 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**.

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- 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: COMPARISON TABLE OF TM-T90 AND TM-T88II

H.1 Comparison of Specifications (1)

	TM-T90 (except Japanese model)	TM-T88II
1. Dot density	0.141 mm/dot	0.141 mm/dot
2. Paper width	80 mm {3.15"} 60 mm {2.36"} (using an optional paper roll spacer) 58 mm {2.28"} (using an optional paper roll spacer)	80 mm {3.15"}
3. Print speed	Normal printing: 170 mm/s {6.69"/s} maximum Ladder bar code or Two-dimensional code printing: 100 mm/s {3.94"/s} maximum Four-part energizing mode: 70 mm/s {2.76"/s} maximum Two-color printing: 90 mm/s {3.54"/s} maximum	120 mm/s {4.72"/s} maximum Ladder bar code: Approximately 42 mm {1.65"/s} Low power consumption: 70 mm/s {2.76"/s} maximum
4. Font C	None (See Note)	Not available
5. NV bit image buffer	0 through 384KB	256KB
6. NV user memory	1KB through 192KB	1KB

NOTE: Font C (8 × 16) is supported in Japanese model.

H.2 Comparison of Specifications (2)


	TM-T90 (Japanese model)	TM-T88II (Japanese model)
1. Dot density	0.141 mm/dot	0.141 mm/dot
2. Paper width	58 mm {2.28"} 60 mm {2.36"} (with an attached paper roll spacer) 80 mm {3.15"} (without an attached paper roll spacer)	58 mm {2.28"} 80 mm {3.15"}
3. Print speed	Normal printing: 170 mm/s {6.69"/s} maximum Two-color printing: 50 mm/s {1.97"/s}	120 mm/s {4.72"/s} maximum
4. Font C	8 × 16 dots	None

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H.3 Comparison of Commands

Command	TM-T90 original	TM-T88II-compatible mode (Msw 8-7 On)	TM-T88II
DLE EOT	1. Add the following bits to the printer status (when $n = 1$) Bit 5: Not waiting for online recovery/ waiting for online recovery Bit 6: PAPER FEED button not being pressed/ PAPER FEED button being pressed 2. Add the following bits to the error cause status (when $n = 3$) Bit 2: Mechanical error has not occurred/ occurred	In the TM-T88II compatible mode, the second bit is always 0, because a cover open error during printing is an automatic recovery error.	1. Printer status (when $n = 1$) Bit 5: Undefined Bit 6: Undefined 2. Error cause status (when $n = 3$) Bit 2: Undefined
DLE ENQ	$n = 0$: Cancellation of waiting for online recovery status is added	←	
DLE DC4 (2)	Newly added	←	--
ESC &	User-defined characters and user-defined bit-images can be defined simultaneously (the size is the same as before). When the command is executed, the definition of a user-defined bit-image is not cleared.	→	User-defined characters and user-defined bit-images cannot be defined simultaneously. When the command is executed, the definition of any user-defined bit-image is cleared.
ESC =	Range: $1 \leq n \leq 3$	→	Range: $0 \leq n \leq 255$
ESC @	Executes reading a default value by customizing the printer.	←	
ESC R	[Default] Except for Korean model: $n=0$ For Korean model: $n=13$	→	[Default] $n=0$
ESC V	Add the range, $n = 2, 50$. (operation is the same as when $n = 1, 49$) Range: $0 \leq n \leq 2, 48 \leq n \leq 50$	←	Range: $0 \leq n \leq 1, 48 \leq n \leq 49$

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Command	TM-T90 original	TM-T88II-compatible mode (Msw 8-7 On)	TM-T88II
ESC W	[Default] vertical length: ANK/Multilingual model: approx. 117.3 mm {4.62"} Japanese model: approx. 92.3 mm {3.63"} [Maximum value] vertical length: ANK/Multilingual model: approx. 234.5 mm {9.23"} Japanese model: approx. 184.5 mm {7.26"} Vertical length will be 117.3 mm {4.62"} when 2-color paper is selected by customized value ($a = 116$) <When paper width is 58 mm {2.28"}> [Default] horizontal length: approx. 50.8 mm {2"} <When paper width is 60 mm {2.36"}> [Default] horizontal length: approx. 54.2 mm {2.13"}>	←	[Default] vertical length: approx. 117.3 mm {4.62"} [Maximum value] vertical length: approx. 117.3 mm {4.62"} <When paper width is 58 mm {2.28"}> [Default] horizontal length: approx. 50.8 mm {2"}>
ESC c 0	Ignored (executing not reading "n")	→	Disabled (not executing "no read" of n)
ESC c 1	Ignored (not reading "n")	→	Disabled (not executing "no read" of n)
ESC c 3	[Default] $n = 0$	→	[Default] $n = 15$
ESC c 6	Ignored (executing not reading "n")	←	Ignored (executing not reading "n")
ESC t	16 to 18 are added to available range for "n" Range: $0 \leq n \leq 5$, $16 \leq n \leq 19$, $n = 255$	←	Range: $0 \leq n \leq 5$, $n = 19$ (*1), $20 \leq n \leq 26$ (*2), $n = 255$ (*1) Applies only to ROMs ver. 3.14 or later (*2) Supported only for Thai characters
FS q	Defined range: 0 to 384KB selectable NV bit-image memory is specified by GS (E command (default: 384KB) Maximum defined area: 3M bits (384KB)	←	All defined area: 2M bits (256KB) fixed
GS (D	Newly added.	←	
GS (E	Newly added.	←	
GS (K	Newly added.	Default of times of a head division is 2.	
GS (L	Newly added.	←	

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Command	TM-T90 original	TM-T88II-compatible mode (Msw 8-7 On)	TM-T88II
GS (M	Newly added. Default value can be customized.	←	Executes a group of customizing commands in the initialization and sets a default value.
GS (N	Newly added.	←	--
GS (k	Newly added.	←	--
GS *	User-defined characters and user-defined bit-images can be defined simultaneously (the size is the same as before).	→	User-defined characters and user-defined bit-images cannot be defined simultaneously. When the command is executed, the definition of any user-defined bit- image is cleared.
GS I	After changing printer ID, the printer name was changed. The status of DIP switches transmitted by $n = 112$ or $n = 113$.	Product ID: 32 Version ID: 70	
GS T	Newly added.	←	
GS V	Add the range, $n = 0, 48, 65$. This change relates to the printer specification and the function has not been changed. Range: ① $0 \leq n \leq 5, 48 \leq m \leq 49$ ② $65 \leq m \leq 66, 0 \leq n \leq 255$	←	Range: ① $m = 1, 49$ ② $m = 66, 0 \leq n \leq 255$
GS W	[Default] $nL = 0, nH = 2$ <When paper width is 60 mm> $nL = 128, nH = 1$	←	[Default] $nL = 0, nH = 2$ <When paper width is 58 mm> $nL = 104, nH = 1$
GS a	Panel switch status is added to the ASB status ② The following bits are added to the second byte (printer information): Bit 0: Not waiting for online recovery/waiting for online recovery	The ASB for the panel switch status is always disabled (cannot be set). In the TM-T88II-compatible mode, since a cover open error during printing is an automatic recovery error, the second bit of the second byte is always 0.	② The second byte (printer information) Bit 0: Undefined Bit 1: Undefined. Bit 2: Undefined.
GS g 0	Newly added.	←	
GS g 2	Newly added.	←	
GS v 0	Printable hight of an image: 4095 dots Range: $0 \leq vL \leq 255, 0 \leq vH \leq 15$	←	Printable hight of an image: 2303 dots Range: $0 \leq vL \leq 255, 0 \leq vH \leq 8$

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Command	TM-T90 original	TM-T88II-compatible mode (Msw 8-7 On)	TM-T88II
Other	Even if the data string is being transmitted, the transmission will be stopped when the host outputs busy. Cover open error during printing follows the setting of Msw 8-8. (Default: recoverable error).	→ →	Once transmission of a data string has been started, the transmission is continued even if the host outputs busy. Cover open error during printing is an automatic recovery error.

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APPENDIX I: NOTES ON PRINTING 2-DIMENSIONAL CODES

The TM-T90 supports 2-dimensional code printing.

Be sure to follow the notes below when printing 2-dimensional codes.

- 1) When printing PDF417 (2-dimensional codes), 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 {0.2"} 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 J: 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 one 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 is 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)					
Accumulated ASB (①+②+③) +	First Status				Second Status
	0011 1000				0000 0000
The latest ASB (③) Fourth Status	First Status				Third Status
	0001 0000				0000 0011