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EPSON

Receipt Printer

TM-T88V

Specification

STANDARD	
Rev. No.	B
Notes	

Copied Date	, ,
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A	Enactment	Yokoyama	--	Fujikawa	I	B	17	B	42	B
B	Change	Yokoyama	--	Fujikawa	II	B	18	B	43	B
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							25	B	50	B
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					2	B	27	B	52	B
					3	B	28	B	53	B
					4	B	29	B	54	B
					5	B	30	B	55	B
					6	B	31	B	56	B
					7	B	32	B	57	B
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REV.	SHEET	CHANGED CONTENTS
A	All	Newly enacted.
B	All	Added the content regarding graphics printing in multi-tone and the optional external buzzer. Changed the content regarding the head control.
	II	2) Features <Software> The description of the ESC/POS APG (Application Programming Guide) is moved to the software section. <General> Changed “tool software” to “utility software.” <Environmental> Changed “Conforms to International ENERGY STAR program.” to “The TM-T88V is Energy Star qualified.”
	1	1.1 Printing Specifications NOTES: 1. Added “(except for the Japanese model).” NOTES: 3. Changed “The area of the paper that has been widened in the middle of use cannot be used for printing or cut with the autocutter.” to “The area of the 80-mm paper that is wider than the 58-mm paper cannot be used for printing or cut with the autocutter.” NOTES: 5. Added “The Japanese model with 80-mm paper width is exclusively for the 80-mm paper width use. Do not change the paper width from 80 mm to 58 mm.”
	2	Printing Specifications 9) Maximum printing speed Added the content regarding graphics printing in multi-tone. NOTES: The way of describing the notes is changed. Added “11) Limitations on the graphics printing in multi-tone:”
	6	Table 1.5.2 Original Paper Type and Density Level F5041: Changed “Medium” to “Standard.” P300, P310, P350: Changed “Standard” to “Medium.” Table 1.5.3 Original Paper Type and Density Level AF50KS-E: Changed “7” to “4.” TF50KS-E, P220AGB-1: Changed “7” to “5.” F5041: Changed “9” to “7.” P300, P310, P350: Changed “7” to “8.”
	10	Changed Table 1.9.1 Current Consumption (Operating).
	12	1.10 EMI and Safety Standards Applied Changed “Conforms to International ENERGY STAR program.” to “The TM-T88V is Energy Star qualified.” 1.11 Reliability 1) Life: Added “(printing + paper feeding).” Changed “Assumed in the condition where a 10 line-printing is repeated in a 15 line-feeding with 4.23 mm line spacing.” to “Assumed in the condition where 10 line-printing + 5 line-paper feeding is repeated with 4.23 mm line spacing.”

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REV.	SHEET	CHANGED CONTENTS
B	13	Figure 1.12.1 Operating Temperature and Humidity Range Changed the range of P300, P310, and P350.
	14	1.13 Installation Changed “The TM-T88V printer must be installed horizontally.” to “The TM-T88V printer must be installed on a flat surface without tilting.”
	16	2.1.2.2 USB communication specifications 1) USB functions USB packet size: Removed “(TM)” and “USB device class.”
	18	Table 2.1.3 TM-T88V Printer Status and Signals Corrected “5. When the printer stops printing due to a paper-end. (Only when the roll paper is not present.)” to “5. When the printer stops printing due to a paper-end.”
	25	2.1.4.3 Interface pin assignments for each mode Changed “5. Interface cables shall be as minimum required short in length as possible.” to “5. Interface cables shall be the minimum required length and as short in length as possible.”
	29-30	2.2.3 Drawer kick-out connector (modular connector) Added the content regarding the optional external buzzer.
	31-34	3.1 List of Commands DLE DC4, ESC (A, FS (E, GS (E, GS (L/GS 8 L, GS D The commands and functions are added.
	44, 46, 51	Page 11 [PC851: Greek], Page 13 [PC857: Turkish], Page 18 [PC852: Latin2] The character code tables are corrected.
	68	Page 42 [PC1118: Lithuanian]: Corrected “774” to “PC1118.”
	69	Page 43 [PC1119: Lithuanian]: Corrected “772” to “PC1119.”
	83	3.3.3 DIP switches NOTES: Changed “1. The default value of the transmission speed is 9600 bps.” to “The factory default for the transmission speed is 9600 bps.” Changed “The factory setting is 38400.” to “When both DIP switches 1-7 and 1-8 are ON, the default for the transmission speed is 38400 bps.”
	86	3.3.3.3 Built-in USB interface specification, USB Plus Power interface specification Added “Built-in” and “USB Plus Power interface specification.”
	87	Added 3.3.3.4 Other interfaces (Ethernet, Wireless LAN, UB-U01/U02/U03 series).
	88	3.3.4 Customized values Table 3.3.11 Types of Customized Values Selection of print speed: Corrected “13 levels in the print density levels 1 to 13” to “13 levels in the print speed levels 1 to 13.” Added “(ARP = Automatic Reduction of Paper).” Added the content regarding graphics printing in multi-tone and the optional external buzzer.
	89	Changed Figure 3.4.1 Control Panel Buttons and Indicators.

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REV.	SHEET	CHANGED CONTENTS
B	90	3.5 Self-test Added more information on the self-test function. Changed the print message.
	92	3.7.2 R/E information print mode 1) R/E (receipt enhancement) information printing function Added “(receipt enhancement).”
	93	3.7.3 Customized value (memory switch) setting mode Added “Printing speed” and “Other settings (such as controlling the optional external buzzer).” Changed “Selection of USB class” to “Communication conditions using a USB interface.”
	95	3.12 Optional Internal Buzzer (for Model with an Optional Internal Buzzer) Changed “The buzzer beeps by a pulse signal with the **ESC p** or **DLE DC4** command.” to “The optional internal buzzer beeps with a pulse signal set with the **ESC p** or **DLE DC4** command.” 3.13 Optional External Buzzer Added the section.
	96	3.14 Printing in Multi-Tone Added the section.
	98	4.3 External Dimensions Changed “external” to “exterior.” Added “(UL grade for flame resistance).”
	99	5.1 Standard Accessories Changed “Tool software” to “Utility software.” Added “AC cable (depending on the models)” and “except for the Japanese model.” 5.2 Options Added “Optional internal buzzer” and “Optional external buzzer.”
	109	Added DLE DC4 *fn a n r t1 t2* (fn = 3) Control Buzzer (optional external buzzer).
	113	Added ESC (A *pL pH fn [parameter]* Control Buzzer (optional external buzzer).
	124	ESC p *m t1 t2* Generate pulse Added the note on when the optional external buzzer is enabled.
	125	ESC t *n* Select character code table Corrected “Page 30 [TSVN-3 (Vietnamese)]” to “Page 30 [TCVN-3 (Vietnamese)].” Corrected “Page 31 [TSVN-3 (Vietnamese)]” to “Page 31 [TCVN-3 (Vietnamese)].” Corrected “Page 40 [ISO8859-9 (Latin9)] to “Page 40 [ISO8859-15 (Latin9)]
	127-132	FS (E *pL pH fn [parameter]* Group of commands for receipt enhancement control The description regarding the command is revised.
	127	FS (E *pL pH fn [parameter]* [Description] Corrected “(*n* and *m*)” to “(*fn* and [*parameter*]).”
	128	<Function 61> FS (E *pL pH fn m c* (*fn*=61) [Description] c = 50: Corrected “Transmits extended set values for bottom logo printing.” to “Transmits extended set values for top/bottom logo printing.”

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REV.	SHEET	CHANGED CONTENTS
B	131	<Function 64> FS (E *pL pH fn m a1 n1…[ak nk]* (*fn*=64) [Range] Corrected "(*pL* + *pH* × 256) ≤ 12" to "4 ≤ (*pL* + *pH* × 256) ≤ 12."
	137-147	GS (E *pL pH fn* [*parameter*] Set user setup commands Added the content regarding graphics printing in multi-tone and the optional external buzzer.
	140, 142, 145	Added "(ARP = Automatic Reduction of Paper)."
	151	GS (L *pL pH m fn [parameter]* / GS 8 L *p1 p2 p3 p4 m fn [parameter]* Set graphics data: Added the content regarding graphics printing in multi-tone.
	170	<Function 282> GS (k *pL pH cn fn m* Corrected "(*cn* = 50, *fn* = 81)" to "(*cn* = 50, *fn* = 82)"
	173	<Function 472> GS (k *pL pH cn fn n* Corrected *"*GS (k *pL pH cn fn m" to "*GS (k *pL pH cn fn n"*
	175	<Function 481> GS (k *pL pH cn fn m* (*cn* = 52, *fn* = 81) Corrected "(*cn* = 50, *fn* = 81)" to "(*cn* = 52, *fn* = 81)" <Function 482> GS (k *pL pH cn fn m* (*cn* = 52, *fn* = 82) Corrected "(*cn* = 51, *fn* = 82)" to "(*cn* = 52, *fn* = 82)"
	177-179	GS D *m fn [parameter]* Specify Windows BMP graphics data Added the content regarding graphics printing in multi-tone.
	181	GS I *n* Printer name: Corrected "TM-T88IV" to "TM-T88V."
	App.8	APPENDIX F: NOTES ON USING THE DRAWER KICK-OUT CONNECTOR NOTES: (*3) Corrected "Connection to equipment whose resistance is 24 Ω or less or whose input current is 1 A or more may damage the connected equipment as well as the printer." to "Connection to equipment whose resistance is less than 24Ω or whose input current is more than 1 A may damage the connected equipment as well as the printer."
	App.12	APPENDIX H: NOTES ON PRINTING 2-DIMENSIONAL SYMBOLS Added 4) and 5).
	App.14	APPENDIX K: USING A POWER SUPPLY OTHER THAN THE PS-180 The description is revised.
	App.17	Added "(R/E = Receipt Enhancement)."
	App.18	19. Manual paper feed Corrected "(During paper feeding with the paper Feed button, ASB cannot be transmitted.)" to "(ASB of paper being fed with the paper Feed button is not transmitted.)"
	App.20	APPENDIX N: Changed "AUTOMATIC REDUCTION PAPER" to "AUTOMATIC REDUCTION OF PAPER."
	App.21	Added APPENDIX O: TO PREVENT USB CABLE FROM BEING PULLED OUT. Added APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCHES).

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GENERAL FEATURES

1) This specification applies to the TM-T88V printer.

The following models are available:

1) Alphanumeric (ANK) model
2) Japanese model
3) Simplified Chinese
4) Traditional Chinese

2) Features

The TM-T88V printer has the following features:

<Printing>

- High-speed printing (300 mm/s {11.8"/s} maximum), which enables issuing of batch receipts.
- Graphics are also printed with high-speed printing.
- Graphics can also be printed in multi-tone.

<Printer handling>

- Easy drop-in paper loading.

<Software>

- Command protocol is based on the ESC/POS Proprietary Command System.*
- OPOS ADK, Windows printer drivers, and other drivers (Linux CUPS, Mac driver) are available.
- In addition to printing of several kinds of conventional bar codes, printing of GS1-DataBar, two-dimensional symbols (PDF417, QR code, MaxiCode, Composite Symbology) is supported.
- Various layouts are possible by using page mode.
- Has a maintenance counter function.

* This specification describes only the outline of the general functions and the model-dependent functions of the commands. For detailed specifications and usage of the commands, please refer to the ESC/POS APG (Application Programming Guide) that is separately issued.

<General>

- Various interface boards (EPSON UB series) can be used.
- The serial/parallel interface type can also use a USB interface.
- The 80-mm paper width model can be switched to the 58-mm paper width model.
- Bundles a CD-ROM that features drivers, utility software, and user's manual.

<Environmental>

- Has a paper-saving function.
- The TM-T88V is Energy Star qualified. (Some models may be exempted depending on the specifications of the main unit.)

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1. GENERAL SPECIFICATIONS

1.1 Printing Specifications

1) Printing method: Thermal line printing

2) Dot density: 180 dpi × 180 dpi
[dpi: dots per 25.4 mm {1"}]

3) Printing direction: Unidirectional with friction feed

4) Paper width: 80-mm paper width model is available with the ANK model, Japanese model, and multilingual model.

58-mm paper width model is available only with the Japanese model.

NOTES: 1. Use of the 58-mm width paper guide enables the 80-mm paper width be switched to 58-mm paper width (except for the Japanese model).

2. To change the paper width from 80 mm to 58 mm, be sure to set the paper width with the customized value (memory switch) to adjust the print area. (See APPENDIX P for how to change the setting.)

3. After changing the paper width from 80 mm to 58 mm and using the printer, do not change it back to 80 mm. (When using 58-mm width paper, a part of the print head without paper directly contacts the platen, which can damage the part of the print head. The part of the cutter blade that is not covered by paper may be worn out. The area of the 80-mm paper that is wider than the 58-mm paper cannot be used for printing or cut with the autocutter.)

4. The 58-mm paper width model is exclusively for the 58-mm paper width use. Do not change the paper width from 58 mm to 80 mm.

5. The Japanese model with 80-mm paper width is exclusively for the 80-mm paper width use. Do not change the paper width from 80 mm to 58 mm.

5) Printing width: When paper width is set to 80 mm: 72 mm {2.83"}, 512 dot positions
When paper width is set to 58 mm: 50.8 mm {2"}, 360 dot positions

6) Characters per line (default): For 80-mm paper width model:
Font A: 42
Font B: 56
Kanji: 21

For 58-mm paper width model:
Font A: 30
Font B: 40
Kanji: 15

7) Character spacing (default): Font A: 0.28 mm {0.01"} (2 dots)
Font B: 0.28 mm {0.01"} (2 dots)
Programmable by control command.

8) Line spacing (default): 4.23 mm {1/6"}
Programmable by control command.

9) Maximum printing speed:

Text printing (with embedded fonts): 300 mm/s {11.81 inch/s}
When line spacing is 4.23 mm: approximately 70.9 lps

Page mode printing: 300 mm/s {11.81"/s}

Graphics printing in monochrome: 300 mm/s {11.81"/s}
Ladder bar code, 2-dimensional symbol printing: 100 mm/s {3.94"/s}

Graphics printing in multi-tone: 150 mm/s {5.91"/s} (NV/download graphics)
70 mm/s {2.76"/s} (raster graphics)

NOTES:
1. The printing speed listed above is the value when the printer prints with the standard print density level at 24 V and 25°C {77°F}. However, the printing speed changes automatically depending on the condition of the supply voltage or the head temperature.
2. The maximum printing speed listed above may not be achieved depending on the type of interface, the setting of data transmission speed, and the combination of control commands.
3. If the data transmission speed is slower than the maximum printing speed, the printing speed may fluctuate and there may be some cases where the print result becomes shaded and/or dot displacement in paper feeding occurs.
4. Furthermore, if the data transmission speed is much slower than the maximum printing speed, intermittent printing will occur and white lines will be formed when printing graphics.
5. Especially when using a serial interface, low transmission speed may cause intermittent printing. It is recommended to transmit data to the printer as quickly as possible.

10) Paper feed speed: 200 mm/s {7.87"/s} (when feeding with the Feed button)

11) Limitations on graphics printing in multi-tone:

- Voids (white spaces) may appear depending on the paper type (uneven development in chromogenic coating.)
- An original image may not be recreated because a certain density level cannot be achieved due to the following causes:
  - Environmental temperature, power supply and voltage
  - Paper type (chromogenic characteristics)
  - Paper variations, such as variations among manufacturing lots
  - Printing pattern (effect of heat accumulation of the print head, effect of voltage drop/speed change due to high duty)
- Reading quality of bar codes/2-dimensional symbols in graphics printing in multi-tone is not guaranteed.
- The print density setting for printing in multi-tone is affected by the print density setting for printing in monochrome; therefore, be sure to set the print density for printing in monochrome first then set the print density for printing in multi-tone.
- The data size of graphics printing in multi-tone is approximately 4 or more times larger than that of graphics printing in monochrome; therefore, graphics printing in multi-tone tends to have intermittent printing more than graphics printing in monochrome.
  - For graphics printing in multi-tone, it is recommended to use NV/download graphics.
  - For raster graphics printing, it is recommended to use the built-in USB interface.
  - It is recommended not to specify double-height and double-width for the raster graphics printing commands.

1.2 Character Specifications

1) Number of characters:

Alphanumeric characters: 95
Extended graphics: 128 × 43 pages (including user-defined page)
International characters: 18 sets
Japanese model: JIS (JIS X0208-1990): 6879
Special font: 845 (See the table below.)

JIS code	Shift JIS code
2D21 to 2D7E 7921 to 7C7E	8740 to 879D ED40 to EEFC FA40 to FC4E

See “Character Code Table (for Japanese font)” for details of special characters.

Simplified Chinese model: GB18030-2000: 28,553
Traditional Chinese model: Big 5: 13,535

Table 1.2.1 Supported Characters for Each Model Type

Product specifications	Supported characters	
ANK model	• Alphanumeric • Extended graphics • International characters	--
Japanese model		Japanese characters
Simplified Chinese model		Simplified Chinese characters
Traditional Chinese model		Traditional Chinese characters

(ANK = alphanumeric)

2) Character structure:

Font A: 12 × 24 (including 2-dot spacing horizontally)
Font B: 9 × 17 (including 2-dot spacing horizontally)
Kanji: 24 × 24

NOTE: The supported fonts depend on each model type. Font A is selected as the default.

3) Character size: See Table 1.2.2.

Table 1.2.2 Character Size

	Standard		Double-height		Double-width		Double-width/ Double-height	
	W × H (mm)	cpl	W × H (mm)	cpl	W × H (mm)	cpl	W × H (mm)	cpl
Font A 12 × 24	1.41 × 3.39	42	1.41 × 6.77	42	2.82 × 3.39	21	2.82 × 6.77	21
		30		30		15		15
Font B 9 × 17	0.99 × 2.40	56	0.99 × 4.80	56	1.98 × 2.40	28	1.98 × 4.80	28
		40		40		20		20
Kanji 24 × 24	3.39 × 3.39	21	3.39 × 6.77	21	6.77 × 3.39	10	6.77 × 6.77	10
		15		15		7		7

Space between characters is not included.

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

cpl = characters per line

The values listed above in the upper columns are for 80-mm paper width, in the lower columns are for 58-mm paper width.

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)

NOTES: 1. The cut paper may be pulled at the uncut edge when it is removed, causing reduced printing pitch for the first line of the next receipt. To prevent dot displacement, after cutting, feed paper approximately 1 mm {14/360"} or more before printing.

2. When operating the autocutter after leaving the printer unused for some time, feed paper 40 mm {1.57"} or longer to prevent paper jams in the autocutter unit.

1.4 Roll Paper Supply Unit

1) Supply method: Drop-in paper roll

2) Roll paper end sensor: Detects whether paper is present or not. Detects a roll paper-end during printing, and stops printing if it detects a paper-end. The printer resumes printing when paper is loaded and the roll paper cover is closed.

a) Detection method: Microswitch

NOTE: If any paper other than the specified paper is used, the roll paper end sensor may not work correctly.

3) Roll paper near-end sensor: When the roll paper diameter becomes sufficiently small, this sensor detects a near-end of the roll paper and lights the Paper LED. Enabling/disabling of this sensor to stop printing on detection of a paper near-end can be selected by a command (**ESC c 4**).

a) Detection method: Microswitch

b) Near-end adjustment: Can be adjusted by changing the position of the adjusting screw.
Fixed positions: #1 (approximately 23 mm {0.91"}),
#2 (approximately 27 mm {1.06"})

NOTE: If roll paper with a paper core that is out of the specified range is used, the roll paper near-end detection may not work correctly.

1.5 Paper Specification

1) Paper type: Specified thermal paper

2) Form and size: Roll paper
The chromogenic side must face outside.

a) Roll paper diameter: 83 mm {3.27"} maximum

b) Roll paper core: Inside: 12 mm {0.47"}
Outside: 18 mm {0.71"}
Width: Same as the paper width or less than the paper width by 1 mm.

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

c) Take-up roll paper width: For 80-mm paper width: 80 +0.5/–1.0 mm {3.15+0.02/–0.04"}
For 58-mm paper width: 58 +0.5/–1.0 mm {2.28+0.02/–0.04"}

d) Paper width: For 80-mm paper width: 79.5 ± 0.5 mm {3.13 ± 0.02"}
For 58-mm paper width: 57.5 ± 0.5 mm {2.26 ± 0.02"}

3) Specified paper: Specified thermal roll paper:
For 80-mm paper width: NTP080-80
For 58-mm paper width: NTP058-80
[Original paper: TF50KS-E Nippon Paper Industries Co., Ltd.]

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

4) Specified original paper type no.:
The following original paper can be used:

NOTE: 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.

Table 1.5.1 Specified Original Paper Type No.

Specified original paper type no.	Manufacturer
TF50KS-E, TF60KS-E	NIPPON Paper Industries Co., Ltd.
PD150R, PD160R, PD190R	OJI Paper Mfg. Co., Ltd.
P220AGB-1	Mitsubishi Paper Mills Limited.
P300, P310, P350	Kanzaki Specialty Papers
AF50KS-E	Jujo Thermal Oy
F5041	Mitsubishi HiTec Paper Flensburg GmbH
KT55F20, KT48F20	Koehler Paper Group

5) Print density adjustment

- Depending on the paper type, it is recommended to set the print density as shown in the table below, to keep the print quality. The print density can be set with the DIP switch.

Table 1.5.2 Original Paper Type and Density Level

Original paper type	Density level
TF50KS-E, TF60KS-E, PD150R, PD160R, PD190R, P220AGB-1, AF50KS-E , KT48F20, KT55F20, F5041	Standard
P300, P310, P350	Medium

- The print density can also be set with the customized value (memory switch). (See APPENDIX P for how to change the setting.)

Table 1.5.3 Original Paper Type and Density Level

Original paper type	Density level
AF50KS-E	4 (85%)
TF50KS-E, P220AGB-1	5 (90%)
TF60KS-E, PD150R, PD160R, PD190R, KT48F20, KT55F20, F5041	7 (100%)
P300, P310, P350	8 (105%)

NOTES: 1. When the print density setting is too dark, the printing speed tends to drop.

2. When the print density setting is too dark, paper dust sticks to the print head surface, often resulting in faded print. (See APPENDIX E, PRINT HEAD CLEANING.)
3. The print density levels shown in 5) are measurements in Epson evaluation conditions; you may need to change the level with the DIP switch or the customized value (memory switch) if the print is faint or dark. (See APPENDIX P for how to change the setting.)

6) Notes on preprinting on the recording surface of thermal paper

When using thermal paper with a recording surface which has been preprinted, sticking (a problem of the thermal head sticking to the surface of the thermal paper during printing) may occur, causing faulty printing and other problems. It is, therefore, strongly recommended to avoid using preprinted thermal paper. If such paper must be used, conduct preprinting tests under the conditions (type of ink/print conditions) recommended by the paper manufacturer and confirm that no faulty printing, print density, or any other problems occur before you use it for actual printing.

1.6 Printable Area

<For 80-mm paper width>

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

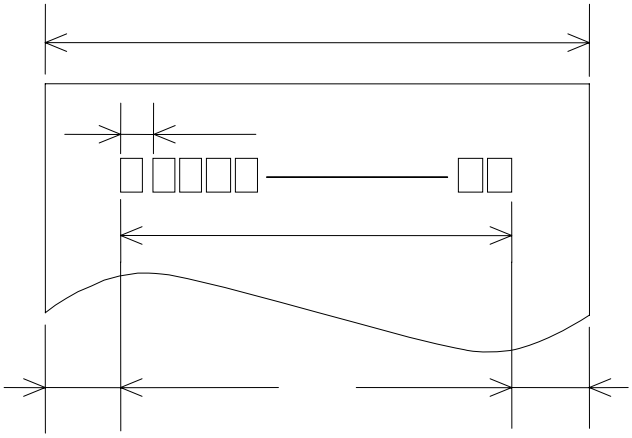


Figure 1.6.1 Roll Paper Printable Area

<For 58-mm paper width>

The printable area of paper with a width of 57.5 ± 0.5 mm {2.26" ± 0.02"} is 50.8 ± 0.2 mm {2.00" ± 0.008"} (360 dots), and the space is approximately 3.7 mm {0.15"} on the left side and approximately 3.0 mm {0.12"} on the right side.

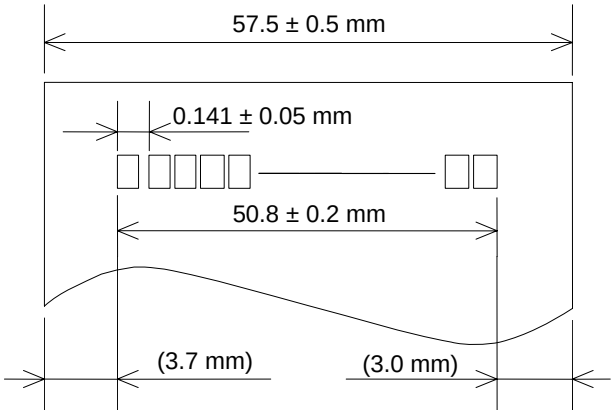


Figure 1.6.2 Roll Paper Printable Area

NOTE: For printing with two-part energization, the print position within the printable area of the thermal elements for dots 257 to 512 is shifted approximately 0.07 mm {0.0028"} in the paper feed direction as shown in Figure 1.6.3 from the position for dots 1 to 256. Although the print area with 58-mm paper width is 1 to 360 dots, the bump occurs at the same position as below.

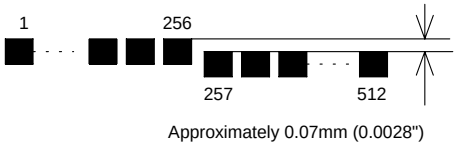


Figure 1.6.3 Shifting of the Print Position

NOTE: For printing with four-part energization, the print position within the printable area of the thermal elements for each block 1 to 128, 129 to 256, 257 to 384, and 385 to 512 is shifted approximately 0.04 mm {0.0016"} in the paper feed direction as shown in Figure 1.6.4. Although the print area with 58-mm paper width is 1 to 360 dots, the bump occurs at the same position as below.

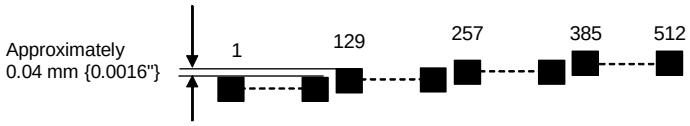
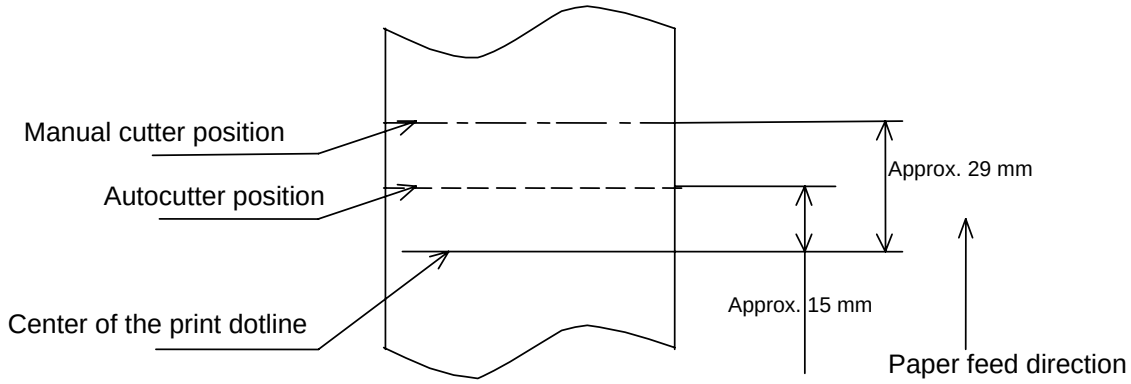


Figure 1.6.4 Shifting of the Print Position

1.7 Printing and Cutting Positions



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

Figure 1.7.1 Printing and Cutting Positions

1.8 Internal Buffer

1) Receive buffer: Selectable as 45 bytes or 4 KB using the DIP switch.
2) User-defined buffer (both for user-defined characters and user-defined bit images): 12 KB
3) Macro buffer: 2 KB
4) NV (Non-volatile) graphics memory: 256 KB
5) Download graphics memory: 208 KB
6) NV user memory: 1 KB
7) User-defined page area: 64 KB

1.9 Electrical Characteristics

1) Supply voltage: DC+24 V ± 7%

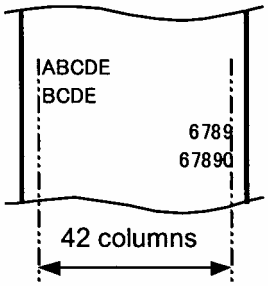
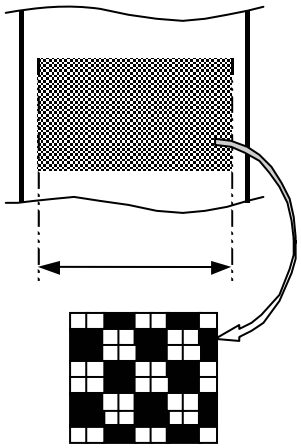
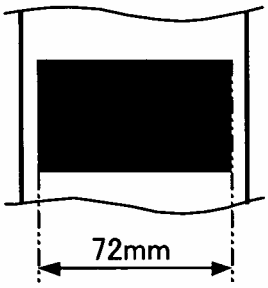
2) DC current consumption (at 24 VDC, 25°C {77°F}, normal print density)

Operating: See Table 1.9.1.

Standby: Mean: Approximately 0.1 A

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

Table 1.9.1 Current Consumption (Operating)

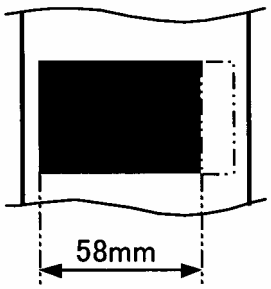
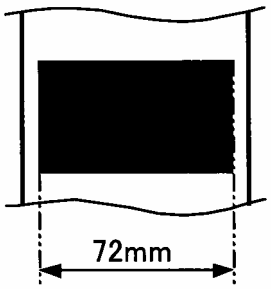
Print ratio	Approximately 18% (with the print pattern below) Font A, 42 columns, ANK rolling pattern for 50 lines + paper feeing of 5 lines + autocutting (Repeats 20H–7FH)	50% (Printing length: 20 mm)	100% (Printing length: 20 mm)
Print example			
High speed mode	Mean: Approx. 1.8 A Peak: Approx. 6.4 A	Mean: Approx. 3.5 A Peak: Approx. 7.6 A	Mean: Approx. 4.3 A Peak: Approx. 11.1 A

NOTES: 1. Notes on using the Epson PS-180 power supply unit

Printing with this product is assumed to be receipts or the equivalent. If printing is continuously performed with a high print ratio, the overcurrent limitation may be operated. Therefore, the printing length must not exceed the following values when printing with high print ratio.

Print ratio: Number of dots being energized per one dotline / Total number of dots per one dotline (512 dots)

Table 1.9.2 Limitation of the Printing Length on Print Ratio

Print ratio	80%	100%
Print example		
Print length	30 mm or less	20 mm or less

If the overcurrent limitation is operated when printing is continuously performed with a high print ratio, uneven print density or a low voltage error may occur.

2. Notes on using a power supply unit other than the Epson specified one (PS-180)
   - The current consumption of this printer is as shown in Figure 1.9.1. The user must consider these values when the user provides a power supply unit other than the Epson specified one.
     Note that the current consumption may increase if the printer is used at a low temperature or the print density is set to “dark.”
   - A power supply unit with a small power capacity may not operate the printer correctly.

1.10 EMI and Safety Standards Applied

(EMC is tested using an EPSON AC adapter.)

1) Europe	CE marking: Directive: 2004/108/EC EN55022 Class A EN55024 IEC61000-4-2 IEC61000-4-3 IEC61000-4-4 IEC61000-4-5 IEC61000-4-6 IEC61000-4-11 Safety Standard: TÜV (EN60950-1)
2) North America	EMI: FCC/ICES-003 Class A Safety standards: UL60950-1/CSA C22.2 No.60950-1
3) Japan	EMI: VCCI Class A
4) Oceania	EMI: AS/NZS CISPR22 Class A
5) Russia	Safety standard & EMC: GOST-R (IEC60950, CISPR 22)
6) Korea	EMI KN22 Class A, KN61000-4-2/-3/-4/-5/-6/-11
7) China	Safety standards & EMC: GB8898, GB9254 Class A, GB17625.1

Conditions of Acceptability

1) This component has been judged on the basis of the required spacing in the Standard for Information Technology equipment, Including Electrical Business Equipment, UL 60950-1 and CSA C22.2 No. 60950-1, Sub-clause 2.9, which would cover the component itself if submitted for Listing.
2) This unit is intended to be supplied by a SELV circuit only.
3) The terminals and connectors have not been evaluated for field wiring.

The TM-T88V is Energy Star qualified. (Some models may be exempted depending on the specifications.)

1.11 Reliability

1) Life:
(End of life is defined as the point at which the printer reaches the beginning of the wear out period.)
Printer mechanism (except thermal head and autocutter):
20 million lines (printing + paper feeding)
NOTE: Assumed in the condition where 10 line-printing + 5 line-paper feeding is repeated with 4.23 mm line spacing.

Thermal head:	150 million pulses, 150 km
Autocutter:	2,000,000 cuts: Specified original paper type PD150R, PD160R.

2) MTBF: 360,000 hours
(Failure is defined as a random failure occurring at the time of the random failure period.)

3) MCBF: 70 million lines
(This is an average failure interval based on failures related to wear out and random failures up to the life of 20 million lines.)

1.12 Environmental Conditions

1) Temperature: Operating: 5 to 45°C {41 to 113°F}
Storage: -10 to 50°C {14 to 122°F} (paper excluded)

2) Humidity: Operating: 10 to 90% RH
Storage: 10 to 90% RH (paper excluded)

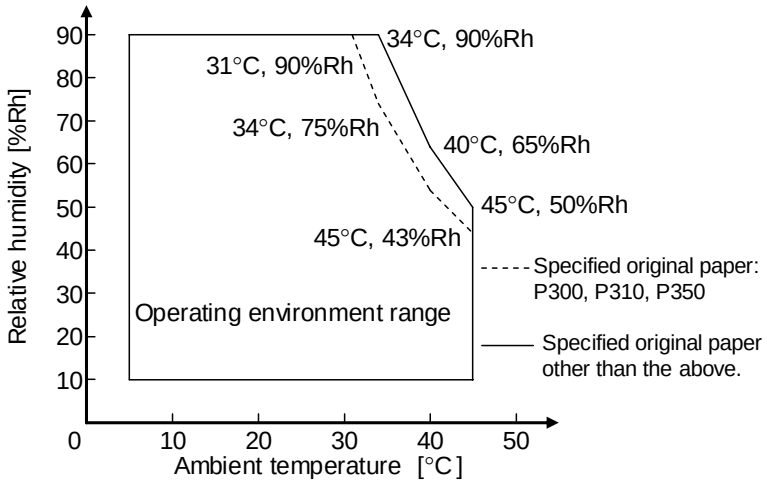


Figure 1.12.1 Operating Temperature and Humidity Range

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

3) Vibration resistance:

When packed:
Frequency: 5 to 55 Hz
Acceleration: Approximately 19.6 m/s^2 {2 G}
Sweep: 10 minutes (half cycle)
Duration: 1 hour
Directions: x, y, and z

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

4) Impact resistance:

When packed:
Package: Epson standard package
Height: 60 cm {23.6"}
Directions: 1 corner, 3 edges, and 6 surfaces

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

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

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

5) Acoustic noise (operating): Approximately 55 dB (bystander position)

NOTE: The values above are measured in the Epson evaluation condition.
The acoustic noise varies, depending on the paper used, printing contents, or the setting values, such as print speed or print density.

1.13 Installation

The TM-T88V printer must be installed on a flat surface without tilting.

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

An optional hanging bracket can attach the printer to a wall. (Following the procedures described in the installation manual, install the wall hanging bracket and change the location of the roll paper near-end sensor (see APPENDIX D), then install the roll paper stopper and other parts.)

NOTES: 1. When the printer is placed on a wall, be sure to attach the connector cover.

2. If the printer is installed not straight horizontally or vertically, problems such as inability to detect a roll paper near-end may occur.

2. CONFIGURATION

2.1 Interfaces

2.1.1 Interface combination

1) Built-in USB + serial/parallel interface

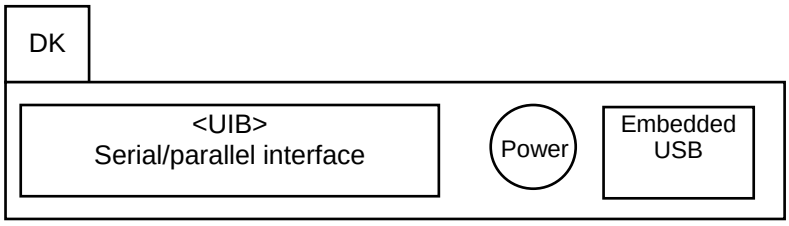
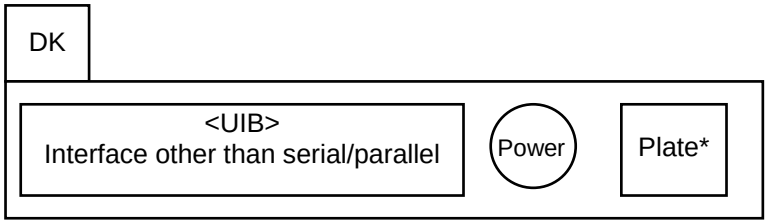


Figure 2.1.1

Interface mode setting at factory shipping: Auto Selection

2) Built-in USB + interface other than serial/parallel



*Some interfaces may not have the plate.

Figure 2.1.2

Interface mode setting at factory shipping: Auto Selection

3) Interface mode settings

Table 2.1.1 Interface Mode Settings and Combination

Interface mode	Auto selection		Fixed to built-in USB		Fixed to UIB	
Interface / Attached UIB	UIB	Built-in USB	UIB	Built-in USB	UIB	Built-in USB
Serial/parallel interface	Both can be used. Auto selection*		Cannot communicate.	Can communicate.	Can communicate.	Cannot communicate.
Interface other than serial/parallel	Can communicate.	Cannot communicate.				

Use the customized value (memory switch) for interface mode setting. (See APPENDIX P for how to change the setting.)
See the TM-UIB Combination Specification for combination with Epson UIB series interfaces.

*The interface of either the built-in USB or UIB to which data is transmitted first is selected. Once an interface is selected, it remains selected until the printer is turned off or initialized. If data is transmitted from an interface not selected, the data is ignored.

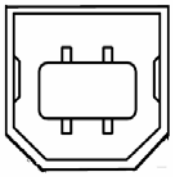
2.1.2 Built-in USB (Universal Serial Bus) interface

2.1.2.1 USB interface connector

Has a USB upstream port connector (USB type-B connector).
Connector pin assignments: See Table 2.1.2.

Table 2.1.2 USB Connector Pin Assignments

Pin no.	Signal name
1	VBUS
2	D-
3	D+
4	GND
Shell	Shield



2.1.2.2 USB communication specifications

1) USB functions

Overall specifications: USB 2.0
Communication speed: Full-speed (12 Mbps)
Communication method: USB bulk
Power supply specifications: USB self power supply function
Current consumed by USB bus: 2 mA (provided entirely from the main unit)
USB packet size

With full-speed connection:
USB bulk OUT 64 bytes
USB bulk IN 64 bytes

USB device class

Both USB vendor-defined class and USB printer class are supported.

Switching of the class can be set by the customized value (memory switch) on startup. (See APPENDIX P for how to change the setting.)

USB descriptor

	USB vendor-defined class	USB printer class
Vendor ID	04b8h	04b8h
Product ID	0202h	0E02h
String Descriptor Manufacturer Product Serial Number	 EPSON TM-T88V Character string based on the product serial number	 EPSON TM-T88V Character string based on the product serial number

2) Status transmission from the printer with a USB interface

With this interface, the status of the printer is transmitted to the host PC via the USB bulk transmission method.

The USB bulk transmission method is a host-controlled transmission method. Unlike RS-232 transmission, it cannot spontaneously interrupt data transmission to the host PC.

The printer has a 128-byte status data buffer. Statuses that exceed the buffer capacity are canceled. In order to avoid lack of status data, it is necessary to periodically retrieve status data at the host PC.

3) USB Device Requests of USB printer class

- GET PORT STATUS

If this USB device request is requested, returns the following states.

Bit	Field	Description
7, 6	Reserved	Reserved
5	Paper Empty	0: Paper Not Empty
		1: Paper Empty
4	Select	0: Not Select
		1: Select
3	Not Error	0: Error
		1: Not Error
2, 1, 0	Reserved	Reserved

- GET DEVICE ID

When Device ID: USB Device Request is requested, returns the following character string:

```
[00H][XXH] *1
MFG:EPSON;
CMD:ESC/POS;
MDL:TM-T88V;*2
CLS:PRINTER;
DES:EPSON[SP]TM-T88V;
CID:EpsonTM00000001; *2
```

*1 Buffer size

*2: The character string varies depending on the supported language.

	MDL	CID
ANK:	“TM-T88V”	EpsonTM00000001
Japanese:	“TM-T88V-JPN”	EpsonTM00000101
Simplified Chinese:	“TM-T88V-S/C”	EpsonTM00000201
Traditional Chinese:	“TM-T88V-T/C”	EpsonTM00000301

- SOFT RESET

The host PC uses this USB Device Request when initializing the printer input buffer.

2.1.3 RS-232 serial interface

2.1.3.1 Specifications (Complies with RS-232)

Data transmission:	Serial
Synchronization:	Asynchronous
Handshaking:	DTR/DSR or XON/XOFF control
Signal levels:	MARK = -3 to -15 V: Logic "1"/ OFF SPACE = +3 to +15 V: Logic "0"/ ON
Baud rates:	2400, 4800, 9600, 19200, 38400, 57600, 115200 bps [bps: bits per second]
Data word lengths:	7 or 8 bits
Parity settings:	None, even, odd
Stop bits:	1 or more
Connector (printer side):	Female DSUB-25 pin connector

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

2.1.3.2 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 (including the printer reset through the interface) and when the printer is ready to receive data.
2) During a self-test.
3) When the roll paper cover is open.
4) During paper feeding using the Feed button.
5) When the printer stops printing due to a paper-end (in cases where a paper-out is detected by the roll paper-end sensor or where a paper-out occurs when a printing halt feature is enabled by **ESC c 4**.)
6) When waiting for the Feed button to be pressed before macro execution.
7) When an error has occurred.

2.1.3.3 Interface connector terminal assignments and signal functions

Table 2.1.3 TM-T88V Printer Status and Signals

<table>
<tr><th>Pin number</th><th>Signal name</th><th>Signal direction</th><th>Function</th></tr>
<tr><td>1</td><td>FG</td><td>—</td><td>Frame ground</td></tr>
<tr><td>2</td><td>TXD</td><td>Output</td><td>Transmit data</td></tr>
<tr><td>3</td><td>RXD</td><td>Input</td><td>Receive data</td></tr>
<tr><td>4</td><td>RTS</td><td>Output</td><td>Same as DTR signal</td></tr>
<tr><td>6</td><td>DSR</td><td>Input</td><td>This signal indicates whether the host computer can receive data.
SPACE indicates that the host computer can receive data, and MARK indicates that the host computer cannot receive data.
When DTR/DSR control is selected, the printer transmits data after confirming this signal (except when transmitting data by DLE EOT or GS a).
When XON/XOFF control is selected, the printer does not check this signal.
Changing the DIP switch setting enables this signal to be used as a reset signal for the printer. (See Section 3.3.3.)
The printer is reset when the signal remains to be MARK for 1 ms or more. (See Section 2.1.3.7.)</td></tr>
<tr><td>7</td><td>SG</td><td>—</td><td>Signal ground</td></tr>
<tr><td>20</td><td>DTR</td><td>Output</td><td>1) When DTR/DSR control is selected:
This signal indicates whether the printer is busy. SPACE indicates that the printer is ready to receive data, and MARK indicates that the printer is busy. The busy condition can be changed by using DIP SW 2-1 as follows (See Section 3.3.3.):
The printer goes BUSY (MARK) in the following conditions:
<table>
<tr><th></th><th>Printer status</th><th>DIP SW 2-1 status ON</th><th>DIP SW 2-1 status OFF</th></tr>
<tr><td rowspan="7">Offline</td><td>1. During the period from when the power is turned on (including resetting through the interface) to when the printer becomes ready to receive data.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>2. During a 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. When waiting for the Feed button to be pressed before macro execution.</td><td>—</td><td>BUSY</td></tr>
<tr><td>7. When an error has occurred.</td><td>—</td><td>BUSY</td></tr>
<tr><td></td><td>8. When the receive buffer becomes full. (*1)</td><td>BUSY</td><td>BUSY</td></tr>
</table></td></tr>
</table>

Table 2.1.4 TM-T88V 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 from the host computer. SPACE indicates that the printer is ready to receive data from the host computer. The signal is always SPACE except in the following cases: • During the period from when the power is turned on to when the printer becomes ready to receive data • During a self-test
25	INIT	Input	Changing the DIP switch setting enables this signal to be used as a reset signal for the printer. The printer is reset when the signal remains SPACE for 1 ms or more.

*1 • Definition of "receive buffer full"
- When the receive buffer capacity is specified as 4 KB (DIP SW1-2 is Off):
  - If DIP SW2-5 is off, 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.
  - If DIP SW2-5 is on, 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 138 bytes.
- When the receive buffer capacity is specified as 45 bytes (DIP SW1-2 is On):
  - Regardless of the DIP SW2-5 setting, when the remaining space in the receive buffer drops to 16 bytes, the printer status becomes "buffer full" and it remains "buffer full" until the space in the receive buffer increases to 26 bytes.
- The printer ignores the data received when the remaining space in the receive buffer is 0 bytes.

2.1.3.4 XON/XOFF transmission timing

When XON/XOFF control is selected, the printer transmits XON or XOFF signal at the timing shown below. Transmission timing differs depending on the DIP SW2-1 setting.

Table 2.1.4 XON/XOFF Transmission Timing

	Printer status	DIP SW 2-1 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 a recoverable error using the **DLE ENQ 1** or **DLE ENQ 2** command	—	Transmit
XOFF transmission	5) When the receive buffer becomes full	Transmit	Transmit
	6) When the printer switches from online to offline	—	Transmit

NOTES: 1. The XON code is <11>H and the XOFF code is <13>H.
2. Even in case 3), XON is not transmitted when the receive buffer is full.
3. Even in case 6), XOFF is not transmitted when the receive buffer is full.

2.1.3.5 Example serial interface connection

Host computer side (DTE ex.8251)	Printer side
TXD	RXD
DSR	DTR
CTS	RTS
RXD	TXD
DTR	DSR
FG	FG
SG	SG

NOTES: 1. Set the handshaking so that the transmit data can be received.
2. Transmit data to the printer after turning on the power and initializing the printer.

2.1.3.6 Notes on setting DIP switch 2-1 to ON

1) The printer mechanism stops but does not become busy when: an error has occurred, the cover is open, the printer stops printing when stop of printing on a paper-end is set, or paper is fed using the Feed button.
2) When setting DIP switch 2-1 to ON to enable handshaking with the printer, be sure to check the printer status using the **GS a** command and the ASB function. In this setting, the default value of *n* for **GS a** is 2. The printer automatically transmits the printer status, depending on 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 computer 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 computer that can transmit data when the printer is busy:
     When the receive buffer becomes full while transmitting bit-image data, **DLE EOT**, **DLE ENQ**, or **DLE DC4** used while transmitting the bit-image data is processed as bit-image data. The data transmitted when the receive buffer is full may be lost.

     Example: Check the printer status using **GS r** after transmitting each line of data and use the 4 KB receive buffer. Data amount of one line must not make the receive buffer full.

2.1.3.7 Notes on resetting the printer using the interface

The printer can be reset using interface pin 6 or pin 25 by changing the DIP switch setting. (See Section 3.3.3, DIP switch 2.)

Table 2.1.5 Reset Switching

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

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

- DC characteristics:

Table 2.1.6 Reset DC Characteristics

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

- AC characteristics:
  Minimum reset pulse width: T_{RS} 1 ms (minimum)
  - When using pin 6 (DSR) (DIP switch 2-7 is ON):

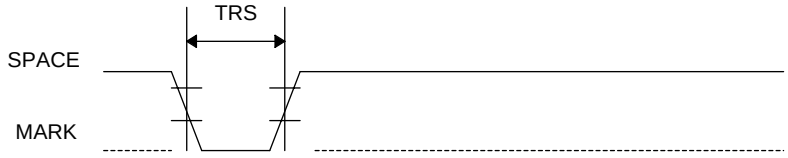


Figure 2.1.3 Minimum Reset Pulse Width (Pin 6)

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

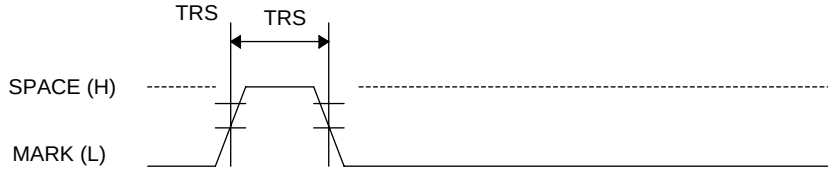


Figure 2.1.4 Minimum Reset Pulse Width (Pin 25)

NOTES: 1. When a signal that does not satisfy the requirements above is input, correct 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.

2. When pin 6 (DSR) and pin 25 (INIT) are open, the printer is operating.

2.1.4 IEEE 1284 bidirectional parallel interface

2.1.4.1 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 the 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 under any of 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 a self-test.
(3) When the roll paper cover is open.
(4) During paper feeding using the Feed button.
(5) When the printer stops printing due to a paper-end. (When the paper sensor that enables a stop of printing set by **ESC c 4** operates.)
(6) When waiting for the Feed button to be pressed before macro execution.
(7) When an error has occurred.

2.1.4.2 Reverse mode (data transmission from printer to host)

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

- Description

  This mode allows data transmission from the asynchronous printer under the control of the host computer.
  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 fail to process concurrently in the Compatibility Mode, causing half duplex transmission.

2.1.4.3 Interface pin assignments for each mode

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

*NC: Not Connected
ND: Not Defined

NOTES: 1. A prefix “n” to signal names indicates “L” active signals. For the host computer 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. Follow the IEEE Std 1284 for the specifications of the interface cable.

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

4. Data transmission shall not ignore the signal nAck or Busy. An attempt to transmit data with either signal, nAck or Busy, ignored can cause data loss.

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

2.1.4.4 Electrical characteristics

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

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

Logic-H Signal Sender Characteristics

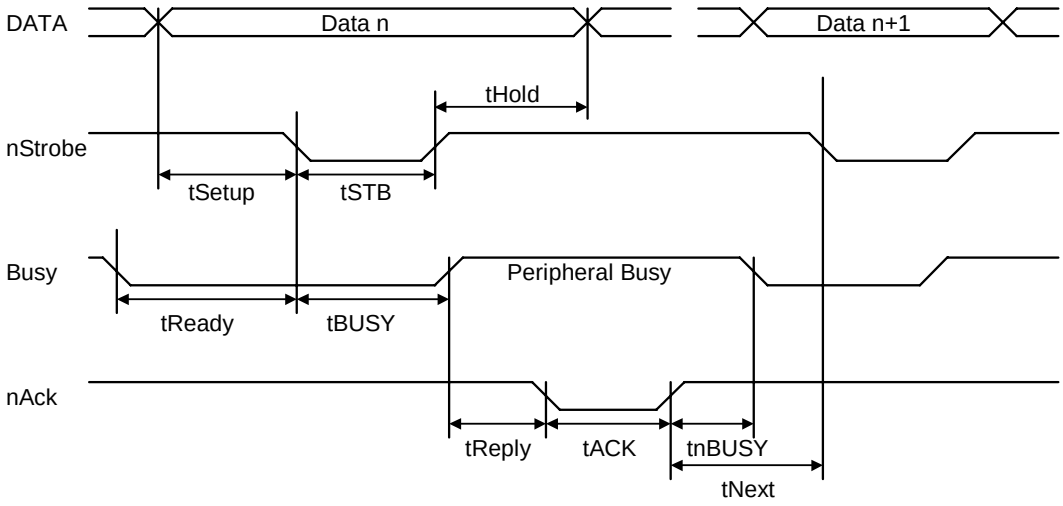
Characteristics	Symbol	Specifications		Conditions
		Min	Max	
Output HIGH voltage	V_{OH}	3.0 V	5.5 V	
Output LOW voltage	V_{OL}	–	2.0 V	While the power is OFF

+5 V Signal Sender Characteristics

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

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

2.1.4.5 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	10µs
BUSY Release Time	tnBUSY	0	∞
ACK Cycle Idle Time	tNext	0	–

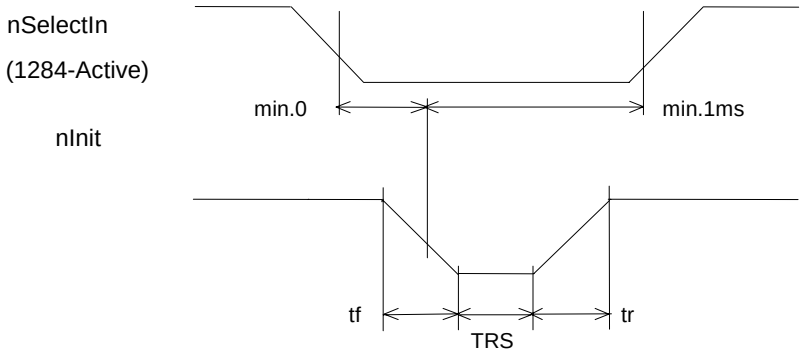
*The printer latches data at a nStrobe ↓ timing

2.1.4.6 Notes on resetting the printer through the interface

To enable printer reset through the interface nInit signal (pin #31) in compatibility mode, satisfy the following characteristics; however, note that the printer reset signal is ignored when the signal nSelectIn (#36 pin, 1284-Active high) is active in reverse mode.

- DC characteristic:
  TTL level
- AC characteristics:

Minimum reset pulse width:	TRS	50 µs (min.)
Trailing edge period:	tf	500 ns (max.)
Leading edge period:	tr	500 ns (max.)



2.1.4.7 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 IEEE 1284.

In this case, as opposed to the RS-232 serial interface specifications, the real-time interruptions from the printer to the host computer are disabled, and thus, precautions must be taken to the following:

1) The allowable capacity of the printer internal buffer is 99 bytes (except ASB status). The status signals exceeding this capacity will be discarded. To prevent possible loss of status, the host computer shall be ready for data reception (Reverse mode).
2) When ASB is used, the host computer is preferably in the wait state for data reception (Reverse idle mode). When this state is not available, the host computer 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 in the Reverse Mode.

2.1.4.8 Notes on setting DIP switch 2-1 to ON

See Section 2.1.3.6.

2.1.5 Other interfaces

Various interface boards (Epson UB series) can be used.

However, the following models with the buzzer function cannot be used.

- UB-E02A
- UB-R02A
- UB-R03A

If the above models are used, the printer or the interface board may be damaged.

For the combination of printer and UB series, see “TM-UIB combination” specifications.

2.2 Connectors

2.2.1 Interface connectors

See 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: See Table 2.2.1.

Table 2.2.1 Power Supply Connector Pin Assignments

Pin number	Signal name
1	+24 V
2	GND
3	N.C
SHELL	F.G.

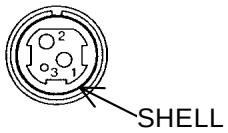


Figure 2.2.1 Power Supply Connector

NOTE: Be sure to ground the metal of the interface using the locking screw for the frame ground.

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

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 computer can confirm the status of the input signal by using the **DLE EOT**, **GS a**, or **GS r** command.

1) Pin assignments: See 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 or the optional external buzzer.

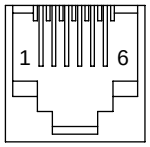


Figure 2.2.2 Drawer Kick-out Connector

2) Connector model: Printer side: MOLEX 52065-6615 or the 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.

The ON/OFF signal of the drawer kick-out solenoid is shown in Figure 2.2.3.
t1 (ON time) and *t2* (OFF time) are specified by **ESC p** or **DLE DC4**.

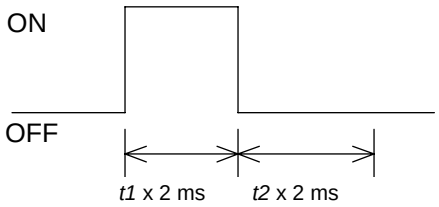


Figure 2.2.3 Drawer Kick-out Drive Signal

4) Drawer open/close signal

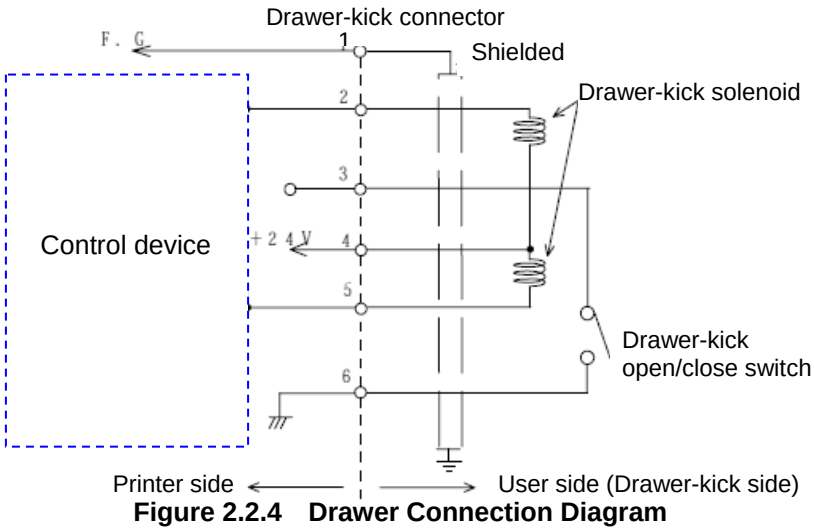
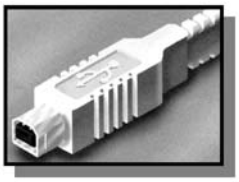


Figure 2.2.4 Drawer Connection Diagram

NOTES:
1. Use a shielded cable for the drawer connector cable.
2. Two driver transistors cannot be energized simultaneously.
3. The drawer drive duty must be as shown below.

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

4. Be sure to use the printer power supply (connector pin 4) for the drawer power source.
5. The resistance of the drawer kick-out solenoid must not be less than specified. Otherwise, an overcurrent could damage the solenoid.
6. Do not connect a telecommunication network to the drawer kick-out connector.
7. Do not connect the USB connector (“B” Plugs of the series B connectors) to the drawer-kick connector. Doing so may damage the printer or the host computer system.



"B" Plugs
(From the Host System)

5) Connection of the optional external buzzer

The optional external buzzer can be connected to the drawer kick-out connector. When the optional external buzzer is connected, be sure to set the optional external buzzer to Enable with the customized value (memory switch). (See APPENDIX P for how to change the setting.)

When the optional external buzzer is used, a drawer cannot be used. It is prohibited that both the optional external buzzer and the drawer are connected at the same time by using a branched connector.

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	Transmit real-time status
DLE ENQ	Send real-time request to printer
DLE DC4	Generate pulse in real-time (*fn* = 1)
	Execute power-off sequence (*fn* = 2)
	Control buzzer (*fn* = 3) (optional external buzzer)
	Clear buffer(s) (*fn* = 8)
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 (A	Control buzzer (optional external buzzer)
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
ESC W	Set print area in page mode

Command	Name
**ESC **	Set relative print position
ESC a	Select justification
ESC c 3	Select paper sensor(s) to output paper-end signals
ESC c 4	Select paper sensor(s) to stop printing
ESC c 5	Enable/disable panel buttons
ESC d	Print and feed *n* lines
ESC p	Generate pulse
ESC t	Select character code table
ESC {	Turn upside-down print mode on/off
FS (E	Group of commands for receipt enhancement control <Function 60> Cancel set values for top/bottom logo printing. <Function 61> Transmit set values for top/bottom logo printing. <Function 62> Set top logo printing. <Function 63> Set bottom logo printing. <Function 64> Make extended settings for top/bottom logo printing. <Function 65> Enable/disable top/bottom logo printing.
FS g 1	Write to NV user memory
FS g 2	Read from NV user memory
GS !	Select character size
GS $	Set absolute vertical print position in page mode
GS (A	Execute test print
GS (D	Enable/disable real-time command
GS (E	Set user setup commands <Function 1> Change into the user setting mode. <Function 2> End the user setting mode session. <Function 5> Set the customized setting values. <Function 6> Transmit the customized setting values. <Function 11> Set the configuration item for the serial interface. <Function 12> Transmit the configuration item for the serial interface. <Function 15> Set conditions for USB interface communication. <Function 16> Transmit conditions for USB interface communication.
GS (H	Request transmission of response or status <Function 48> Set the process ID response.
GS (K	Select print control method(s) <Function 50> Select the print speed. <Function 97> Select the number of parts for the thermal head energizing.

Command	Name
GS (L / GS 8 L	Set graphics data <Function 48> Transmit the NV graphics memory capacity. <Function 50> Print the graphics data in the print buffer. <Function 51> Transmit the remaining capacity of the NV graphics memory. <Function 52> Transmit the remaining capacity of the download graphics memory. <Function 64> Transmit the key code list for defined NV graphics. <Function 65> Delete all NV graphics data. <Function 66> Delete the specified NV graphics data. <Function 67> Define the NV graphics data (raster format). <Function 69> Print the specified NV graphics data. <Function 80> Transmit the key code list for defined download graphics. <Function 81> Delete all download graphics data. <Function 82> Delete the specified download graphics data. <Function 83> Define the download graphics data (raster format). <Function 85> Print the specified download graphics data. <Function 112> Store the graphics data in the print buffer (raster format).

Command	Name
GS (k	Set up and print symbol <Function 065> PDF417: Set the number of columns in the data region. <Function 066> PDF417: Set the number of rows. <Function 067> PDF417: Set the width of the module. <Function 068> PDF417: Set the row height. <Function 069> PDF417: Set the error correction level. <Function 070> PDF417: Select the options. <Function 080> PDF417: Store the data in the symbol storage area. <Function 081> PDF417: Print the symbol data in the symbol storage area. <Function 082> PDF417: Transmit the size information of the symbol data in the symbol storage area. <Function 165> QR Code: Select the model. <Function 167> QR Code: Set the size of module. <Function 169> QR Code: Select the error correction level. <Function 180> QR Code: Store the data in the symbol storage area. <Function 181> QR Code: Print the symbol data in the symbol storage area. <Function 182> QR Code: Transmit the size information of the symbol data in the symbol storage area. <Function 265> MaxiCode: Select the mode. <Function 280> MaxiCode: Store the data in the symbol storage area. <Function 281> MaxiCode: Print the symbol data in the symbol storage area. <Function 282> MaxiCode: Transmit the size information of the symbol data in the symbol storage area. <Function 367> Two-dimensional GS1 DataBar: Set the width of the module. <Function 371> Two-dimensional GS1 DataBar: Set the maximum width of GS1 DataBar Expanded Stacked. <Function 380> Two-dimensional GS1 DataBar: Store the data in the symbol storage area. <Function 381> Two-dimensional GS1 DataBar: Print the symbol data in the symbol storage area. <Function 382> Two-dimensional GS1 DataBar: Transmit the size information of the symbol data in the symbol storage area. <Function 467> Composite Symbology: Set the width of module. <Function 471> Composite Symbology: Set the maximum width of GS1 DataBar Expanded Stacked. <Function 472> Composite Symbology: Select a font for HRI character. <Function 480> Composite Symbology: Store the data in the symbol storage area. <Function 481> Composite Symbology: Print the symbol data in the symbol storage area. <Function 482> Composite Symbology: Transmit the size information of the symbol data in the symbol storage area.
GS ∗	Define downloaded bit image
GS /	Print downloaded bit image
GS :	Start/end macro definition
GS B	Turn white/black reverse print mode on/off
GS D	Specify Windows BMP graphics data <Function 67> Define Windows BMP NV graphics data. <Function 83> Define Windows BMP download graphics data.
GS H	Select print position of HRI characters

Command	Name
GS I	Transmit printer ID
GS L	Set left margin
GS P	Set horizontal and vertical motion units
GS V	Select cut mode and cut paper
GS W	Set print 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 w	Set bar code width

List of Multi-byte Code Characters Commands
(for Japanese model, Simplified Chinese model, and Traditional Chinese model)

Command	Name
FS !	Select print mode(s) for Kanji characters
FS &	Select Kanji character mode
FS –	Turn underline mode on / off for Kanji characters
FS .	Cancel Kanji character mode
FS 2	Define user-defined Kanji characters
FS C	Select Kanji character code system
FS S	Set Kanji character spacing
FS W	Turn quadruple-size mode on / off for Kanji characters

The commands listed below in the first column are defined as “obsolete commands” in the ESC/POS command system. This printer supports both upward-compatible commands and obsolete commands. However, the upward-compatible commands are recommended to use.

Obsolete command		Upward-compatible command
ESC i	Partial cut (one point left uncut)	**GS V**
ESC m	Partial cut (three points left uncut)	**GS V**
ESC u	Transmit peripheral device status	**GS r**
ESC v	Transmit paper sensor status	**GS r**
FS p	Print NV bit image	**GS (L** <Function 69>
FS q	Define NV bit image	**GS (L** <Function 67>
GS v 0	Print raster bit image	**GS (L** <Function 112 + 50>

NOTE: “Obsolete commands” are commands that are supported by legacy models; however it is recommended to replace them with upward-compatible commands, because they will not be supported in future products.

3.2 Character Code Tables

- The character code tables show only character configurations. They do not show the actual print pattern.
- "SP" in the table shows space.

3.2.1 Common to all pages (International Character Set: USA)

HEX	0	1	2	3	4	5	6	7
0	NUL 00	DLE 16	SP 32	0 48	@ 64	P 80	` 96	p 112
1	01	XON 17	! 33	1 49	A 65	Q 81	a 97	q 113
2	02	18	" 34	2 50	B 66	R 82	b 98	r 114
3	03	XOFF 19	# 35	3 51	C 67	S 83	c 99	s 115
4	EOT 04	DC4 20	$ 36	4 52	D 68	T 84	d 100	t 116
5	ENQ 05	NAK 21	% 37	5 53	E 69	U 85	e 101	u 117
6	ACK 06	22	& 38	6 54	F 70	V 86	f 102	v 118
7	07	23	' 39	7 55	G 71	W 87	g 103	w 119
8	08	CAN 24	(40	8 56	H 72	X 88	h 104	x 120
9	HT 09	25	) 41	9 57	I 73	Y 89	i 105	y 121
A	LF 10	26	* 42	: 58	J 74	Z 90	j 106	z 122
B	11	ESC 27	+ 43	; 59	K 75	[91	k 107	{ 123
C	FF 12	FS 28	, 44	< 60	L 76	\ 92	l 108	| 124
D	CR 13	GS 29	– 45	= 61	M 77	] 93	m 109	} 125
E	14	RS 30	. 46	> 62	N 78	^ 94	n 110	~ 126
F	15	31	/ 47	? 63	O 79	_ 95	o 111	SP 127

3.2.2 Page 0 [PC437: USA, Standard Europe]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	░ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2	é 130	Æ 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	■ 220	∞ 236	n 252
D	ì 141	¥ 157	¡ 173	╜ 189	═ 205	▌ 221	Φ 237	² 253
E	Ä 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	ε 238	■ 254
F	Å 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.3 Page 1 [Katakana]

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

3.2.4 Page 2 [PC850: Multilingual]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	░ 176	└ 192	ð 208	Ó 224	– 240
1	ü 129	æ 145	í 161	▒ 177	┴ 193	Đ 209	ß 225	± 241
2	é 130	Æ 146	ó 162	▓ 178	┬ 194	Ê 210	Ô 226	‗ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	¾ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5	à 133	ò 149	Ñ 165	Á 181	┼ 197	ı 213	Õ 229	§ 245
6	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	¸ 247
8	ê 136	ÿ 152	¿ 168	© 184	╚ 200	Ï 216	Þ 232	° 248
9	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250
B	ï 139	ø 155	½ 171	╗ 187	╦ 203	█ 219	Ù 235	¹ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	ý 236	³ 252
D	ì 141	Ø 157	¡ 173	¢ 189	═ 205	¦ 221	Ý 237	² 253
E	Ä 142	× 158	« 174	¥ 190	╬ 206	Ì 222	¯ 238	■ 254
F	Å 143	ƒ 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

3.2.5 Page 3 [PC860: Portuguese]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	À 145	í 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2	é 130	È 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ã 132	õ 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	Á 134	Ú 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	Ì 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	Ê 137	Õ 153	Ò 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	Í 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	Ô 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252
D	ì 141	Ù 157	¡ 173	╜ 189	═ 205	▌ 221	Φ 237	² 253
E	Ã 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	ε 238	■ 254
F	Â 143	Ó 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.6 Page 4 [PC863: Canadian-French]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	¦ 160	░ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	È 145	´ 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2	é 130	Ê 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	Â 132	Ë 148	¨ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	Ï 149	¸ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	¶ 134	û 150	³ 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	ç 135	ù 151	¯ 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	¤ 152	Î 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	ë 137	Ô 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252
D	‗ 141	Ù 157	¾ 173	╜ 189	═ 205	▌ 221	Φ 237	² 253
E	À 142	Û 158	« 174	╛ 190	╬ 206	▐ 222	ε 238	■ 254
F	§ 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.7 Page 5 [PC865: Nordic]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	░ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	β 225	± 241
2	é 130	Æ 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	ï 139	ø 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252
D	ì 141	Ø 157	¡ 173	╜ 189	═ 205	▌ 221	Φ 237	² 253
E	Ä 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	ε 238	■ 254
F	Å 143	*f* 159	¤ 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.8 Page 11 [PC851: Greek]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	Ί 144	ΐ 160	░ 176	└ 192	Τ 208	ζ 224	240
1	ü 129	SP 145	ΰ 161	▒ 177	┴ 193	Υ 209	η 225	± 241
2	é 130	Ό 146	ό 162	▓ 178	┬ 194	Φ 210	θ 226	υ 242
3	â 131	ô 147	ύ 163	│ 179	├ 195	Χ 211	ι 227	φ 243
4	ä 132	ö 148	Α 164	┤ 180	─ 196	Ψ 212	κ 228	χ 244
5	à 133	Ύ 149	Β 165	Κ 181	┼ 197	Ω 213	λ 229	§ 245
6	Ά 134	û 150	Γ 166	Λ 182	Π 198	α 214	μ 230	ψ 246
7	ç 135	ù 151	Δ 167	Μ 183	Ρ 199	β 215	ν 231	¸ 247
8	ê 136	Ώ 152	Ε 168	Ν 184	╚ 200	γ 216	ξ 232	° 248
9	ë 137	Ö 153	Ζ 169	╣ 185	╔ 201	┘ 217	ο 233	¨ 249
A	è 138	Ü 154	Η 170	║ 186	╩ 202	┌ 218	π 234	ω 250
B	ï 139	ά 155	½ 171	╗ 187	╦ 203	█ 219	ρ 235	ϋ 251
C	î 140	£ 156	Θ 172	╝ 188	╠ 204	▄ 220	σ 236	ΰ 252
D	Έ 141	έ 157	Ι 173	≡ 189	═ 205	δ 221	ς 237	ώ 253
E	Ä 142	ή 158	« 174	Ο 190	╬ 206	ε 222	τ 238	■ 254
F	Ή 143	ί 159	» 175	┐ 191	Σ 207	▀ 223	΄ 239	SP 255

3.2.9 Page 12 [PC853: Turkish]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	▒ 176	└ 192	SP 208	Ó 224	– 240
1	ü 129	ċ 145	í 161	▒ 177	┴ 193	SP 209	β 225	SP 241
2	é 130	Ċ 146	ó 162	▓ 178	┬ 194	Ê 210	Ô 226	ℓ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	ŉ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	Ġ 228	˘ 244
5	à 133	ò 149	Ñ 165	Á 181	┼ 197	ı 213	ġ 229	§ 245
6	ĉ 134	û 150	Ğ 166	Â 182	Ŝ 198	Í 214	µ 230	÷ 246
7	ç 135	ù 151	ğ 167	À 183	ŝ 199	Î 215	Ħ 231	¸ 247
8	ê 136	İ 152	Ĥ 168	Ş 184	╚ 200	Ï 216	ħ 232	° 248
9	ë 137	Ö 153	ĥ 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249
A	è 138	Ü 154	SP 170	║ 186	╩ 202	┌ 218	Û 234	· 250
B	ï 139	ĝ 155	½ 171	╗ 187	╦ 203	▉ 219	Ù 235	SP 251
C	î 140	£ 156	Ĵ 172	╝ 188	╠ 204	■ 220	Ŭ 236	³ 252
D	ì 141	Ĝ 157	ş 173	Ż 189	═ 205	SP 221	ŭ 237	² 253
E	Ä 142	× 158	« 174	ż 190	╬ 206	Ì 222	SP 238	■ 254
F	Ĉ 143	ĵ 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

3.2.10 Page 13 [PC857: Turkish]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	░ 176	└ 192	º 208	Ó 224	– 240
1	ü 129	æ 145	í 161	▒ 177	┴ 193	ª 209	β 225	± 241
2	é 130	Æ 146	ó 162	▓ 178	┬ 194	Ê 210	Ô 226	SP 242
3	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	¾ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5	à 133	ò 149	Ñ 165	Á 181	┼ 197	€ 213	Õ 229	§ 245
6	å 134	û 150	Ğ 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7	ç 135	ù 151	ğ 167	À 183	Ã 199	Î 215	SP 231	¸ 247
8	ê 136	İ 152	¿ 168	© 184	╚ 200	Ï 216	× 232	° 248
9	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250
B	ï 139	ø 155	½ 171	╗ 187	╦ 203	■ 219	Ù 235	¹ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	ì 236	³ 252
D	ı 141	Ø 157	¡ 173	¢ 189	═ 205	¦ 221	ÿ 237	² 253
E	Ä 142	Ş 158	« 174	¥ 190	╬ 206	Ì 222	¯ 238	■ 254
F	Å 143	ş 159	» 175	┐ 191	¤ 207	▀ 223	´ 239	SP 255

3.2.11 Page 14 [PC737: Greek]

HEX	8	9	A	B	C	D	E	F
0	A 128	Ρ 144	ι 160	▒ 176	└ 192	╙ 208	ω 224	Ώ 240
1	Β 129	Σ 145	κ 161	▒ 177	┴ 193	╤ 209	ά 225	± 241
2	Γ 130	Τ 146	λ 162	▓ 178	┬ 194	╥ 210	έ 226	≥ 242
3	Δ 131	Υ 147	μ 163	│ 179	├ 195	╙ 211	ή 227	≤ 243
4	Ε 132	Φ 148	ν 164	┤ 180	─ 196	╘ 212	ϊ 228	Ϊ 244
5	Ζ 133	Χ 149	ξ 165	╡ 181	┼ 197	╒ 213	ί 229	Ϋ 245
6	Η 134	Ψ 150	ο 166	╢ 182	╞ 198	╓ 214	ό 230	÷ 246
7	Θ 135	Ω 151	π 167	╖ 183	╟ 199	╫ 215	ύ 231	≈ 247
8	Ι 136	α 152	ρ 168	╕ 184	╚ 200	╪ 216	ϋ 232	° 248
9	Κ 137	β 153	σ 169	╣ 185	╔ 201	┘ 217	ώ 233	• 249
A	Λ 138	γ 154	ς 170	║ 186	╩ 202	┌ 218	Ά 234	· 250
B	Μ 139	δ 155	τ 171	╗ 187	╦ 203	▉ 219	Έ 235	√ 251
C	Ν 140	ε 156	υ 172	╝ 188	╠ 204	■ 220	Ή 236	ⁿ 252
D	≡ 141	ζ 157	φ 173	╜ 189	═ 205	▌ 221	Ί 237	² 253
E	Ο 142	η 158	χ 174	╛ 190	╬ 206	▐ 222	Ό 238	■ 254
F	Π 143	θ 159	ψ 175	┐ 191	╧ 207	▀ 223	Ύ 239	SP 255

3.2.12 Page 15 [ISO8859-7: Greek]

HEX	8	9	A	B	C	D	E	F
0	SP 128	SP 144	SP 160	° 176	ΐ 192	Π 208	ΰ 224	π 240
1	SP 129	SP 145	‘ 161	± 177	Α 193	Ρ 209	α 225	ρ 241
2	SP 130	SP 146	’ 162	² 178	Β 194	SP 210	β 226	ς 242
3	SP 131	SP 147	£ 163	³ 179	Γ 195	Σ 211	γ 227	σ 243
4	SP 132	SP 148	€ 164	΄ 180	Δ 196	Τ 212	δ 228	τ 244
5	SP 133	SP 149	*Dp* 165	΅ 181	Ε 197	Υ 213	ε 229	υ 245
6	SP 134	SP 150	¦ 166	Ά 182	Ζ 198	Φ 214	ζ 230	φ 246
7	SP 135	SP 151	§ 167	• 183	Η 199	Χ 215	η 231	χ 247
8	SP 136	SP 152	¨ 168	Έ 184	Θ 200	Ψ 216	θ 232	ψ 248
9	SP 137	SP 153	© 169	Ή 185	Ι 201	Ω 217	ι 233	ω 249
A	SP 138	SP 154	ͺ 170	Ί 186	Κ 202	Ϊ 218	κ 234	ϊ 250
B	SP 139	SP 155	« 171	» 187	Λ 203	Ϋ 219	λ 235	ϋ 251
C	SP 140	SP 156	¬ 172	Ό 188	Μ 204	ά 220	μ 236	ό 252
D	SP 141	SP 157	- 173	½ 189	Ν 205	έ 221	ν 237	ύ 253
E	SP 142	SP 158	SP 174	Ύ 190	Ξ 206	ή 222	ξ 238	ώ 254
F	SP 143	SP 159	― 175	Ώ 191	Ο 207	ί 223	ο 239	SP 255

3.2.13 Page 16 [WPC1252]

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

3.2.14 Page 17 [PC866: Cyrillic #2]

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

3.2.15 Page 18 [PC852: Latin2]

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

3.2.16 Page 19 [PC858: Euro]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	▒ 176	└ 192	ð 208	Ó 224	– 240
1	ü 129	æ 145	í 161	▒ 177	┴ 193	Đ 209	β 225	± 241
2	é 130	Æ 146	ó 162	▓ 178	┬ 194	Ê 210	Ô 226	═ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	Ë 211	Ò 227	¾ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	È 212	õ 228	¶ 244
5	à 133	ò 149	Ñ 165	Á 181	┼ 197	€ 213	Õ 229	§ 245
6	å 134	û 150	ª 166	Â 182	ã 198	Í 214	µ 230	÷ 246
7	ç 135	ù 151	º 167	À 183	Ã 199	Î 215	þ 231	¸ 247
8	ê 136	ÿ 152	¿ 168	© 184	╚ 200	Ï 216	Þ 232	° 248
9	ë 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	Ú 233	¨ 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Û 234	· 250
B	ï 139	ø 155	½ 171	╗ 187	╦ 203	█ 219	Ù 235	¹ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	■ 220	ý 236	³ 252
D	ì 141	Ø 157	¡ 173	¢ 189	═ 205	¦ 221	Ý 237	² 253
E	Ä 142	× 158	« 174	¥ 190	╬ 206	Ì 222	¯ 238	■ 254
F	Å 143	ƒ 159	» 175	┐ 191	¤ 207	■ 223	´ 239	SP 255

3.2.17 Page 20 [KU42: Thai]

HEX	8	9	A	B	C	D	E	F
0	┌ 128	๐ 144	SP 160	ฒ 176	ย 192	เ 208	◌ั 224	◌็ 240
1	┐ 129	๑ 145	ก 161	ณ 177	ร 193	แ 209	◌ั 225	◌่ 241
2	└ 130	๒ 146	ข 162	ด 178	ฤ 194	โ 210	◌ิ 226	◌้ 242
3	┘ 131	๓ 147	ค 163	ต 179	ล 195	ใ 211	◌ี 227	◌๊ 243
4	│ 132	๔ 148	ฆ 164	ถ 180	ว 196	ไ 212	◌ึ 228	◌๋ 244
5	─ 133	๕ 149	ง 165	ท 181	ศ 197	ๆ 213	◌ื 229	◌์ 245
6	├ 134	๖ 150	จ 166	ธ 182	ษ 198	ฯ 214	◌ุ 230	◌ํ 246
7	┤ 135	๗ 151	ฉ 167	น 183	ส 199	◌ู 215	◌ฺ 231	◌๎ 247
8	┴ 136	๘ 152	ช 168	บ 184	ห 200	◌ฺ 216	◌ฺ 232	◌๏ 248
9	┬ 137	๙ 153	ซ 169	ป 185	ฬ 201	◌ 217	◌ฺ 233	◌๐ 249
A	┼ 138	ฺ 154	ฌ 170	ผ 186	อ 202	◌ 218	◌ฺ 234	◌๑ 250
B	▉ 139	ค 155	ญ 171	ฝ 187	ฮ 203	◌ 219	◌ฺ 235	◌๒ 251
C	← 140	ร 156	ฎ 172	พ 188	ะ 204	◌ 220	◌ฺ 236	◌๓ 252
D	↑ 141	ฯ 157	ฏ 173	ฟ 189	ฦ 205	◌ 221	◌ฺ 237	◌๔ 253
E	→ 142	ๆ 158	ฐ 174	ภ 190	า 206	◌ 222	◌ฺ 238	◌๕ 254
F	↓ 143	ไ 159	ฑ 175	ม 191	◌ำ 207	◌ 223	◌ฺ 239	SP 255

3.2.18 Page 21 [TIS11: Thai]

HEX	8	9	A	B	C	D	E	F
0	่ 128	๐ 144	เ 160	ฐ 176	ภ 192	ะ 208	เ 224	๐ 240
1	้ 129	๑ 145	ก 161	ฑ 177	ม 193	ั 209	แ 225	๑ 241
2	๊ 130	๒ 146	ข 162	ฒ 178	ย 194	า 210	โ 226	๒ 242
3	๋ 131	๓ 147	ฃ 163	ณ 179	ร 195	ำ 211	ใ 227	๓ 243
4	์ 132	๔ 148	ค 164	ด 180	ฤ 196	ิ 212	ไ 228	๔ 244
5	ํ 133	๕ 149	ฅ 165	ต 181	ล 197	ี 213	ๅ 229	๕ 245
6	๎ 134	๖ 150	ฆ 166	ถ 182	ฦ 198	ึ 214	ๆ 230	๖ 246
7	๏ 135	๗ 151	ง 167	ท 183	ว 199	ื 215	็ 231	๗ 247
8	๐ 136	๘ 152	จ 168	ธ 184	ศ 200	ุ 216	่ 232	๘ 248
9	๑ 137	๙ 153	ฉ 169	น 185	ษ 201	ู 217	้ 233	๙ 249
A	๒ 138	๚ 154	ช 170	บ 186	ส 202	ฺ 218	๊ 234	๚ 250
B	๓ 139	๛ 155	ซ 171	ป 187	ห 203	฿ 219	๋ 235	๛ 251
C	๔ 140	ญ 156	ฌ 172	ผ 188	ฬ 204	เ 220	์ 236	ๆ 252
D	๕ 141	ฯ 157	ญ 173	ฝ 189	อ 205	แ 221	ํ 237	ๆ 253
E	๖ 142	ๆ 158	ฎ 174	พ 190	ฮ 206	โ 222	๎ 238	ๆ 254
F	๗ 143	ฯ 159	ฏ 175	ฟ 191	ฯ 207	ใ 223	๏ 239	SP 255

Confidential

3.2.19 Page 26 [TIS18: Thai]

HEX	8	9	A	B	C	D	E	F
0	┌ 128	ฐ 144	SP 160	ฐ 176	ภ 192	ะ 208	เ 224	๐ 240
1	┐ 129	ญ 145	ก 161	ฑ 177	ม 193	ั 209	แ 225	๑ 241
2	└ 130	ั่ 146	ข 162	ฒ 178	ย 194	า 210	โ 226	๒ 242
3	┘ 131	ั้ 147	ฃ 163	ณ 179	ร 195	ำ 211	ใ 227	๓ 243
4	│ 132	ั๊ 148	ค 164	ด 180	ฤ 196	ิ 212	ไ 228	๔ 244
5	─ 133	ั๋ 149	ฅ 165	ต 181	ล 197	ี 213	ๅ 229	๕ 245
6	├ 134	่ 150	ฆ 166	ถ 182	ฦ 198	ึ 214	ๆ 230	๖ 246
7	┤ 135	้ 151	ง 167	ท 183	ว 199	ื 215	็ 231	๗ 247
8	┴ 136	๊ 152	จ 168	ธ 184	ศ 200	ุ 216	่ 232	๘ 248
9	┬ 137	๋ 153	ฉ 169	น 185	ษ 201	ู 217	้ 233	๙ 249
A	┼ 138	์ 154	ช 170	บ 186	ส 202	ฺ 218	๊ 234	๛ 250
B	█ 139	่ 155	ซ 171	ป 187	ห 203	ั่ 219	๋ 235	่ 251
C	← 140	้ 156	ฌ 172	ผ 188	ฬ 204	ั้ 220	์ 236	้ 252
D	↑ 141	๊ 157	ญ 173	ฝ 189	อ 205	ั๊ 221	ํ 237	๊ 253
E	→ 142	๋ 158	ฎ 174	พ 190	ฮ 206	ั๋ 222	๎ 238	๋ 254
F	↓ 143	เ 159	ฏ 175	ฟ 191	ฯ 207	฿ 223	๏ 239	SP 255

3.2.20 Page 30 [TCVN-3: Vietnamese]

HEX	8	9	A	B	C	D	E	F
0	SP 128	SP 144	SP 160	SP 176	SP 192	é 208	SP 224	SP 240
1	SP 129	SP 145	SP 161	SP 177	SP 193	ẹ 209	ỏ 225	ủ 241
2	SP 130	SP 146	SP 162	SP 178	SP 194	ề 210	õ 226	ũ 242
3	SP 131	SP 147	SP 163	SP 179	SP 195	ể 211	ó 227	ú 243
4	SP 132	SP 148	SP 164	SP 180	SP 196	ễ 212	ọ 228	ụ 244
5	SP 133	SP 149	SP 165	à 181	SP 197	ế 213	ồ 229	ừ 245
6	SP 134	SP 150	SP 166	ả 182	ặ 198	ệ 214	ổ 230	ử 246
7	SP 135	SP 151	SP 167	ã 183	ầ 199	ì 215	ỗ 231	ữ 247
8	SP 136	SP 152	ă 168	á 184	ẩ 200	ỉ 216	ố 232	ứ 248
9	SP 137	SP 153	â 169	ạ 185	ẫ 201	SP 217	ộ 233	ự 249
A	SP 138	SP 154	ê 170	SP 186	ấ 202	SP 218	ờ 234	ỳ 250
B	SP 139	SP 155	ô 171	ầ 187	ậ 203	SP 219	ở 235	ỷ 251
C	SP 140	SP 156	ơ 172	ẳ 188	è 204	ĩ 220	ỡ 236	ỹ 252
D	SP 141	SP 157	ư 173	ẵ 189	SP 205	í 221	ớ 237	ý 253
E	SP 142	SP 158	đ 174	ắ 190	ẻ 206	ị 222	ợ 238	ỵ 254
F	SP 143	SP 159	SP 175	SP 191	ẽ 207	ò 223	ù 239	SP 255

3.2.21 Page 31 [TCVN-3: Vietnamese]

HEX	8	9	A	B	C	D	E	F
0	SP 128	SP 144	SP 160	SP 176	SP 192	É 208	SP 224	SP 240
1	SP 129	SP 145	Ă 161	SP 177	SP 193	Ẹ 209	Ỏ 225	Ủ 241
2	SP 130	SP 146	Â 162	SP 178	SP 194	Ề 210	Õ 226	Ũ 242
3	SP 131	SP 147	SP 163	SP 179	SP 195	Ể 211	Ó 227	Ú 243
4	SP 132	SP 148	SP 164	SP 180	SP 196	Ễ 212	Ọ 228	Ụ 244
5	SP 133	SP 149	SP 165	À 181	SP 197	Ế 213	Ồ 229	Ừ 245
6	SP 134	SP 150	SP 166	Ả 182	Ặ 198	Ệ 214	Ổ 230	Ử 246
7	SP 135	SP 151	Đ 167	Ã 183	Ầ 199	Ì 215	Ỗ 231	Ữ 247
8	SP 136	SP 152	SP 168	Á 184	Ẩ 200	Ỉ 216	Ố 232	Ứ 248
9	SP 137	SP 153	SP 169	Ạ 185	Ẫ 201	SP 217	Ộ 233	Ự 249
A	SP 138	SP 154	Ê 170	SP 186	Ấ 202	SP 218	Ờ 234	Ỳ 250
B	SP 139	SP 155	Ô 171	Ằ 187	Ậ 203	SP 219	Ở 235	Ỷ 251
C	SP 140	SP 156	Ơ 172	Ẳ 188	È 204	Ĩ 220	Ỡ 236	Ỹ 252
D	SP 141	SP 157	Ư 173	Ẵ 189	SP 205	Í 221	Ớ 237	Ý 253
E	SP 142	SP 158	SP 174	Ắ 190	Ẻ 206	Ị 222	Ợ 238	Ỵ 254
F	SP 143	SP 159	SP 175	SP 191	Ẽ 207	Ò 223	Ù 239	SP 255

3.2.22 Page 32 [PC720: Arabic]

HEX	8	9	A	B	C	D	E	F
0	SP 128	SP 144	ب 160	▒ 176	┗ 192	╨ 208	ض 224	≡ 240
1	SP 129	ّ 145	ة 161	▓ 177	┻ 193	╤ 209	ط 225	ً 241
2	é 130	ْ 146	ت 162	▓ 178	┳ 194	╥ 210	ظ 226	ٌ 242
3	â 131	ô 147	ث 163	┃ 179	┣ 195	╙ 211	ع 227	ٍ 243
4	SP 132	¤ 148	ج 164	┫ 180	━ 196	╘ 212	غ 228	َ 244
5	à 133	- 149	ح 165	╡ 181	╋ 197	╒ 213	ف 229	ُ 245
6	SP 134	û 150	خ 166	╢ 182	╞ 198	╓ 214	μ 230	ِ 246
7	ç 135	ù 151	د 167	╖ 183	╟ 199	╫ 215	ق 231	≈ 247
8	ê 136	ء 152	ذ 168	╕ 184	╚ 200	╪ 216	ك 232	° 248
9	ë 137	آ 153	ر 169	╣ 185	╔ 201	┘ 217	ل 233	∙ 249
A	è 138	أ 154	ز 170	║ 186	╩ 202	┌ 218	م 234	· 250
B	ï 139	ؤ 155	س 171	╗ 187	╦ 203	▉ 219	ن 235	√ 251
C	î 140	£ 156	ش 172	╝ 188	╠ 204	■ 220	ه 236	ⁿ 252
D	SP 141	إ 157	ص 173	╜ 189	═ 205	▌ 221	و 237	² 253
E	SP 142	ئ 158	« 174	╛ 190	╬ 206	▐ 222	ى 238	■ 254
F	SP 143	ا 159	» 175	┐ 191	╧ 207	▀ 223	ي 239	SP 255

3.2.23 Page 33 [WPC775: Baltic Rim]

HEX	8	9	A	B	C	D	E	F
0	Ć 128	É 144	Ā 160	░ 176	└ 192	ą 208	Ó 224	– 240
1	ü 129	æ 145	Ī 161	▒ 177	┴ 193	č 209	ß 225	± 241
2	é 130	Æ 146	ó 162	▓ 178	┬ 194	ę 210	Ō 226	“ 242
3	ā 131	ō 147	Ż 163	│ 179	├ 195	ė 211	Ń 227	¾ 243
4	ä 132	ö 148	ż 164	┤ 180	─ 196	į 212	õ 228	¶ 244
5	ģ 133	Ģ 149	ź 165	Ą 181	┼ 197	š 213	Õ 229	§ 245
6	å 134	¢ 150	” 166	Č 182	Ų 198	ų 214	µ 230	÷ 246
7	ć 135	Ś 151	¦ 167	Ę 183	Ū 199	ū 215	ń 231	„ 247
8	ł 136	ś 152	© 168	Ė 184	╚ 200	ž 216	Ķ 232	° 248
9	ē 137	Ö 153	® 169	╣ 185	╔ 201	┘ 217	ķ 233	· 249
A	Ŗ 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ļ 234	· 250
B	ŗ 139	ø 155	½ 171	╗ 187	╦ 203	█ 219	ļ 235	¹ 251
C	ī 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	ņ 236	³ 252
D	Ź 141	Ø 157	Ł 173	¢ 189	═ 205	▌ 221	Ē 237	² 253
E	Ä 142	× 158	« 174	Š 190	╬ 206	▐ 222	Ņ 238	■ 254
F	Å 143	¤ 159	» 175	┐ 191	Ž 207	▀ 223	’ 239	SP 255

3.2.24 Page 34 [PC855: Cyrillic]

HEX	8	9	A	B	C	D	E	F
0	ђ 128	љ 144	а 160	░ 176	└ 192	л 208	Я 224	– 240
1	Ђ 129	Љ 145	А 161	▒ 177	┴ 193	Л 209	р 225	ы 241
2	ѓ 130	њ 146	б 162	▓ 178	┬ 194	м 210	Р 226	Ы 242
3	Ѓ 131	Њ 147	Б 163	│ 179	├ 195	М 211	с 227	з 243
4	ё 132	ћ 148	ц 164	┤ 180	─ 196	н 212	С 228	З 244
5	Ё 133	Ћ 149	Ц 165	х 181	┼ 197	Н 213	т 229	ш 245
6	є 134	ќ 150	д 166	Х 182	к 198	о 214	Т 230	Ш 246
7	Є 135	Ќ 151	Д 167	и 183	К 199	О 215	у 231	э 247
8	ѕ 136	ў 152	е 168	И 184	╚ 200	п 216	У 232	Э 248
9	Ѕ 137	Ў 153	Е 169	╣ 185	╔ 201	┘ 217	ж 233	щ 249
A	і 138	џ 154	ф 170	║ 186	╩ 202	г 218	Ж 234	Щ 250
B	І 139	Џ 155	Ф 171	╗ 187	╦ 203	▉ 219	в 235	ч 251
C	ї 140	ю 156	г 172	╝ 188	╠ 204	■ 220	В 236	Ч 252
D	Ї 141	Ю 157	Г 173	й 189	═ 205	П 221	ь 237	§ 253
E	ј 142	ъ 158	« 174	Й 190	╬ 206	я 222	Ь 238	■ 254
F	Ј 143	Ъ 159	» 175	┐ 191	¤ 207	▀ 223	№ 239	SP 255

3.2.25 Page 35 [PC861: Icelandic]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	░ 176	└ 192	╨ 208	α 224	≡ 240
1	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	é 130	Æ 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ä 132	ö 148	Á 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	à 133	þ 149	Í 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	å 134	û 150	Ó 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	ç 135	Ý 151	Ú 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ê 136	ý 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	· 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	Ð 139	ø 155	½ 171	╗ 187	╦ 203	▉ 219	δ 235	√ 251
C	ð 140	£ 156	¼ 172	╝ 188	╠ 204	■ 220	∞ 236	ⁿ 252
D	Þ 141	Ø 157	¡ 173	╜ 189	═ 205	▌ 221	φ 237	² 253
E	Ä 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	ε 238	■ 254
F	Å 143	*f* 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.26 Page 36 [PC862: Hebrew]

HEX	8	9	A	B	C	D	E	F
0	א 128	נ 144	á 160	░ 176	└ 192	╙ 208	α 224	≡ 240
1	ב 129	ס 145	í 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	ג 130	ע 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	ד 131	ף 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	ה 132	פ 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	ו 133	ץ 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	ז 134	צ 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	ח 135	ק 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	ט 136	ר 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	י 137	ש 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	· 249
A	ך 138	ת 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	כ 139	¢ 155	½ 171	╗ 187	╦ 203	▉ 219	δ 235	√ 251
C	ל 140	£ 156	¼ 172	╝ 188	╠ 204	■ 220	∞ 236	ⁿ 252
D	ם 141	¥ 157	¡ 173	╜ 189	═ 205	▌ 221	φ 237	² 253
E	מ 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	ε 238	■ 254
F	ן 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.27 Page 37 [PC864: Arabic]

HEX	8	9	A	B	C	D	E	F
0	° 128	β 144	SP 160	٠ 176	¢ 192	ذ 208	- 224	240
1	· 129	∞ 145	- 161	١ 177	ء 193	ر 209	ف 225	241
2	· 130	φ 146	آ 162	٢ 178	آ 194	ز 210	ق 226	ن 242
3	√ 131	± 147	£ 163	٣ 179	أ 195	س 211	ك 227	ه 243
4	▒ 132	½ 148	¤ 164	٤ 180	ؤ 196	ش 212	ل 228	ﻫ 244
5	─ 133	¼ 149	أ 165	٥ 181	ع 197	ص 213	م 229	ى 245
6	│ 134	≈ 150	SP 166	٦ 182	ئ 198	ض 214	ن 230	ي 246
7	┼ 135	« 151	€ 167	٧ 183	ا 199	ط 215	ه 231	غ 247
8	┤ 136	» 152	ا 168	٨ 184	ب 200	ظ 216	و 232	ق 248
9	┬ 137	لأ 153	ب 169	٩ 185	ة 201	ع 217	ى 233	لآ 249
A	├ 138	لأ 154	ت 170	ف 186	ت 202	غ 218	ﻱ 234	لآ 250
B	┴ 139	SP 155	ث 171	؛ 187	ث 203	ـ 219	ض 235	ل 251
C	┐ 140	SP 156	، 172	س 188	ج 204	ـ 220	ﻉ 236	ك 252
D	┌ 141	لا 157	ج 173	ش 189	ح 205	÷ 221	غ 237	ي 253
E	└ 142	لا 158	ح 174	ص 190	خ 206	× 222	غ 238	■ 254
F	┘ 143	ء 159	خ 175	؟ 191	د 207	ع 223	م 239	SP 255

3.2.28 Page 38 [PC869: Greek]

HEX	8	9	A	B	C	D	E	F
0	SP 128	Ί 144	ΐ 160	░ 176	└ 192	Τ 208	ζ 224	– 240
1	SP 129	Ϊ 145	ΰ 161	▒ 177	┴ 193	Υ 209	η 225	± 241
2	SP 130	Ό 146	ό 162	▓ 178	┬ 194	Φ 210	θ 226	υ 242
3	SP 131	SP 147	ύ 163	│ 179	├ 195	Χ 211	ι 227	φ 243
4	SP 132	SP 148	Α 164	┤ 180	─ 196	Ψ 212	κ 228	χ 244
5	SP 133	Ύ 149	Β 165	Κ 181	┼ 197	Ω 213	λ 229	§ 245
6	Ά 134	Ϋ 150	Γ 166	Λ 182	Π 198	α 214	μ 230	ψ 246
7	€ 135	© 151	Δ 167	Μ 183	Ρ 199	β 215	ν 231	΅ 247
8	· 136	Ώ 152	Ε 168	Ν 184	╚ 200	γ 216	ξ 232	° 248
9	¬ 137	² 153	Ζ 169	╣ 185	╔ 201	┘ 217	ο 233	¨ 249
A	¦ 138	³ 154	Η 170	║ 186	╩ 202	┌ 218	π 234	ω 250
B	‘ 139	ά 155	½ 171	╗ 187	╦ 203	█ 219	ρ 235	ϋ 251
C	’ 140	£ 156	Θ 172	╝ 188	╠ 204	■ 220	σ 236	ΰ 252
D	Έ 141	έ 157	Ι 173	Ξ 189	═ 205	δ 221	ς 237	ώ 253
E	— 142	ή 158	« 174	Ο 190	╬ 206	ε 222	τ 238	■ 254
F	Ή 143	ί 159	» 175	┐ 191	Σ 207	■ 223	΄ 239	SP 255

3.2.29 Page 39 [ISO8859-2: Latin2]

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

3.2.30 Page 40 [ISO8859-15: Latin9]

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

3.2.31 Page 41 [PC1098: Farsi]

HEX	8	9	A	B	C	D	E	F
0	SP 128	ﺅ 144	ﺣ 160	▒ 176	ﺎ 192	ﻉ 208	ﻙ 224	ـ 240
1	SP 129	ﺋ 145	ﺧ 161	▒ 177	ﺏ 193	ﻊ 209	ﻚ 225	ﻯ 241
2	، 130	ﺑ 146	ﺧ 162	▓ 178	ﺕ 194	ﻋ 210	ﮒ 226	ﻱ 242
3	؛ 131	ﺒ 147	ﺩ 163	│ 179	ﺗ 195	ﻍ 211	ﮓ 227	ﻲ 243
4	؟ 132	ﭘ 148	ﺫ 164	┤ 180	ﺘ 196	ﻎ 212	ﻝ 228	ﻳ 244
5	ً 133	ﭙ 149	ﺭ 165	ﺽ 181	┼ 197	ﻏ 213	ﻞ 229	١ 245
6	آ 134	ﺗ 150	ﺯ 166	ﺿ 182	ﻅ 198	ﻐ 214	ﻡ 230	٢ 246
7	آ 135	ﺘ 151	ﮊ 167	ﻁ 183	ﻉ 199	ﻑ 215	ﻢ 231	٣ 247
8	ﷲ 136	ﺙ 152	ﺱ 168	ﻂ 184	╚ 200	ﻒ 216	ﻥ 232	٤ 248
9	ا 137	ﺜ 153	ﺲ 169	╣ 185	╔ 201	ﻟ 217	ﻦ 233	٥ 249
A	ﺎ 138	ﺝ 154	ﺵ 170	║ 186	╩ 202	ﻠ 218	ﻭ 234	٦ 250
B	ﻟ 139	ﺟ 155	ﺸ 171	╗ 187	╦ 203	■ 219	ﻩ 235	٧ 251
C	ء 140	ﭽ 156	ﺹ 172	╝ 188	╠ 204	■ 220	ﻫ 236	٨ 252
D	أ 141	ﭼ 157	ﺼ 173	ﷺ 189	═ 205	ﻕ 221	ﻬ 237	٩ 253
E	أ 142	× 158	« 174	ﻇ 190	╬ 206	ﻗ 222	ﺀ 238	■ 254
F	ﺃ 143	ﺡ 159	» 175	┐ 191	SP 207	■ 223	ﻯ 239	SP 255

3.2.32 Page 42 [PC1118: Lithuanian]

HEX	8	9	A	B	C	D	E	F
0	Ç 128	É 144	á 160	░ 176	└ 192	ą 208	α 224	≡ 240
1	ü 129	æ 145	í 161	▒ 177	┴ 193	č 209	β 225	± 241
2	é 130	Æ 146	ó 162	▓ 178	┬ 194	ę 210	Γ 226	≥ 242
3	â 131	ô 147	ú 163	│ 179	├ 195	ė 211	π 227	≤ 243
4	ä 132	ö 148	ñ 164	┤ 180	─ 196	į 212	Σ 228	„ 244
5	à 133	ò 149	Ñ 165	Ą 181	┼ 197	š 213	σ 229	“ 245
6	å 134	û 150	ª 166	Č 182	Ų 198	ų 214	µ 230	÷ 246
7	ç 135	ù 151	º 167	Ę 183	Ū 199	ū 215	τ 231	≈ 247
8	ê 136	ÿ 152	¿ 168	Ė 184	╚ 200	ž 216	Φ 232	° 248
9	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	∙ 249
A	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	ï 139	¢ 155	½ 171	╗ 187	╦ 203	█ 219	δ 235	√ 251
C	î 140	£ 156	¼ 172	╝ 188	╠ 204	■ 220	∞ 236	ⁿ 252
D	ì 141	¥ 157	¡ 173	╜ 189	═ 205	▌ 221	φ 237	² 253
E	Ä 142	Pt 158	« 174	Š 190	╬ 206	▐ 222	ε 238	■ 254
F	Å 143	ƒ 159	» 175	┐ 191	Ž 207	▀ 223	∩ 239	SP 255

3.2.33 Page 43 [PC1119: Lithuanian]

HEX	8	9	A	B	C	D	E	F
0	А 128	Р 144	а 160	▒ 176	└ 192	ą 208	р 224	Ё 240
1	Б 129	С 145	б 161	▒ 177	┴ 193	č 209	с 225	ё 241
2	В 130	Т 146	в 162	▓ 178	┬ 194	ę 210	т 226	≥ 242
3	Г 131	У 147	г 163	│ 179	├ 195	ė 211	у 227	≤ 243
4	Д 132	Ф 148	д 164	┤ 180	─ 196	į 212	ф 228	„ 244
5	Е 133	Х 149	е 165	Ą 181	┼ 197	š 213	х 229	“ 245
6	Ж 134	Ц 150	ж 166	Č 182	Ų 198	ų 214	ц 230	÷ 246
7	З 135	Ч 151	з 167	Ę 183	Ū 199	ū 215	ч 231	≈ 247
8	И 136	Ш 152	и 168	Ė 184	╚ 200	ž 216	ш 232	° 248
9	Й 137	Щ 153	й 169	╣ 185	╔ 201	┘ 217	щ 233	· 249
A	К 138	Ъ 154	к 170	║ 186	╩ 202	┌ 218	ъ 234	· 250
B	Л 139	Ы 155	л 171	╗ 187	╦ 203	█ 219	ы 235	√ 251
C	М 140	Ь 156	м 172	╝ 188	╠ 204	▄ 220	ь 236	ⁿ 252
D	Н 141	Э 157	н 173	¦ 189	═ 205	▌ 221	э 237	² 253
E	О 142	Ю 158	о 174	Š 190	╬ 206	▐ 222	ю 238	■ 254
F	П 143	Я 159	п 175	┐ 191	Ž 207	▀ 223	Я 239	SP 255

3.2.34 Page 44 [PC1125: Ukrainian]

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

3.2.35 Page 45 [WPC1250: Latin 2]

HEX	8	9	A	B	C	D	E	F
0	€ 128	SP 144	SP 160	° 176	Ŕ 192	Đ 208	ŕ 224	đ 240
1	SP 129	‘ 145	ˇ 161	± 177	Á 193	Ń 209	á 225	ń 241
2	‚ 130	’ 146	˘ 162	˛ 178	Â 194	Ň 210	â 226	ň 242
3	SP 131	“ 147	Ł 163	ł 179	Ă 195	Ó 211	ă 227	ó 243
4	„ 132	” 148	¤ 164	´ 180	Ä 196	Ô 212	ä 228	ô 244
5	… 133	• 149	Ą 165	µ 181	Ĺ 197	Ő 213	Í 229	ő 245
6	† 134	– 150	¦ 166	¶ 182	Ć 198	Ö 214	ć 230	ö 246
7	‡ 135	— 151	§ 167	· 183	Ç 199	× 215	ç 231	÷ 247
8	SP 136	SP 152	¨ 168	¸ 184	Č 200	Ř 216	č 232	ř 248
9	‰ 137	™ 153	© 169	ą 185	É 201	Ů 217	é 233	ů 249
A	Š 138	š 154	Ş 170	ş 186	Ę 202	Ú 218	ę 234	ú 250
B	‹ 139	› 155	« 171	» 187	Ë 203	Ű 219	ë 235	ű 251
C	Ś 140	ś 156	¬ 172	Ľ 188	Ě 204	Ü 220	ě 236	ü 252
D	Ť 141	ť 157	- 173	˝ 189	Í 205	Ý 221	í 237	ý 253
E	Ž 142	ž 158	® 174	ľ 190	Î 206	Ţ 222	î 238	ţ 254
F	Ź 143	ź 159	Ż 175	ż 191	Ď 207	ß 223	ď 239	˙ 255

3.2.36 Page 46 [WPC1251: Cyrillic]

HEX	8	9	A	B	C	D	E	F
0	Ђ 128	ђ 144	SP 160	° 176	А 192	Р 208	а 224	р 240
1	Ѓ 129	‘ 145	Ў 161	± 177	Б 193	С 209	б 225	с 241
2	, 130	’ 146	ў 162	І 178	В 194	Т 210	в 226	т 242
3	ѓ 131	“ 147	Ј 163	і 179	Г 195	У 211	г 227	у 243
4	„ 132	” 148	¤ 164	ґ 180	Д 196	Ф 212	д 228	ф 244
5	… 133	• 149	Ґ 165	µ 181	Е 197	Х 213	е 229	х 245
6	† 134	– 150	¦ 166	¶ 182	Ж 198	Ц 214	ж 230	ц 246
7	‡ 135	— 151	§ 167	· 183	З 199	Ч 215	з 231	ч 247
8	€ 136	SP 152	Ё 168	ё 184	И 200	Ш 216	и 232	ш 248
9	‰ 137	™ 153	© 169	№ 185	Й 201	Щ 217	й 233	щ 249
A	Љ 138	љ 154	Є 170	є 186	К 202	Ъ 218	к 234	ъ 250
B	‹ 139	› 155	« 171	» 187	Л 203	Ы 219	л 235	ы 251
C	Њ 140	њ 156	¬ 172	j 188	М 204	Ь 220	м 236	ь 252
D	Ќ 141	ќ 157	- 173	S 189	Н 205	Э 221	н 237	э 253
E	Ћ 142	ћ 158	® 174	s 190	О 206	Ю 222	о 238	ю 254
F	Џ 143	џ 159	Ї 175	ї 191	П 207	Я 223	п 239	я 255

3.2.37 Page 47 [WPC1253: Greek]

HEX	8	9	A	B	C	D	E	F
0	€ 128	SP 144	SP 160	° 176	ΐ 192	Π 208	ϋ 224	π 240
1	SP 129	‘ 145	΅ 161	± 177	A 193	P 209	α 225	ρ 241
2	, 130	’ 146	Ά 162	² 178	B 194	SP 210	β 226	ς 242
3	ƒ 131	“ 147	£ 163	³ 179	Γ 195	Σ 211	γ 227	σ 243
4	„ 132	” 148	¤ 164	΄ 180	Δ 196	T 212	δ 228	τ 244
5	… 133	• 149	¥ 165	µ 181	E 197	Y 213	ε 229	υ 245
6	† 134	– 150	¦ 166	¶ 182	Z 198	Φ 214	ζ 230	φ 246
7	‡ 135	— 151	§ 167	· 183	H 199	X 215	η 231	χ 247
8	SP 136	SP 152	¨ 168	Έ 184	Θ 200	Ψ 216	θ 232	ψ 248
9	‰ 137	™ 153	© 169	Ή 185	I 201	Ω 217	ι 233	ω 249
A	SP 138	SP 154	ª 170	Ί 186	K 202	Ϊ 218	κ 234	ϊ 250
B	‹ 139	› 155	« 171	» 187	Λ 203	Ϋ 219	λ 235	ϋ 251
C	SP 140	SP 156	¬ 172	Ό 188	M 204	ά 220	μ 236	ό 252
D	SP 141	SP 157	- 173	½ 189	N 205	έ 221	ν 237	ύ 253
E	SP 142	SP 158	® 174	΄Y 190	Ξ 206	ή 222	ξ 238	ώ 254
F	SP 143	SP 159	― 175	Ώ 191	O 207	ί 223	ο 239	SP 255

3.2.38 Page 48 [WPC1254: Turkish]

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

3.2.39 Page 49 [WPC1255: Hebrew]

HEX	8	9	A	B	C	D	E	F
0	€ 128	SP 144	SP 160	° 176	ְ 192	׀ 208	א 224	נ 240
1	SP 129	‘ 145	¡ 161	± 177	ֱ 193	ׁ 209	ב 225	ס 241
2	‚ 130	’ 146	¢ 162	² 178	ֲ 194	ׂ 210	ג 226	ע 242
3	ƒ 131	“ 147	£ 163	³ 179	ֳ 195	׃ 211	ד 227	ף 243
4	„ 132	” 148	₪ 164	´ 180	ִ 196	ׄ 212	ה 228	פ 244
5	… 133	• 149	¥ 165	µ 181	ֵ 197	ׅ 213	ו 229	ץ 245
6	† 134	– 150	¦ 166	¶ 182	ֶ 198	׆ 214	ז 230	צ 246
7	‡ 135	— 151	§ 167	· 183	ַ 199	ׇ 215	ח 231	ק 247
8	ˆ 136	˜ 152	¨ 168	¸ 184	ָ 200	״ 216	ט 232	ר 248
9	‰ 137	™ 153	© 169	¹ 185	ֹ 201	SP 217	י 233	ש 249
A	SP 138	SP 154	× 170	÷ 186	SP 202	SP 218	ך 234	ת 250
B	‹ 139	› 155	« 171	» 187	ֻ 203	SP 219	כ 235	SP 251
C	SP 140	SP 156	¬ 172	¼ 188	ּ 204	SP 220	ל 236	SP 252
D	SP 141	SP 157	- 173	½ 189	ֽ 205	SP 221	ם 237	SP 253
E	SP 142	SP 158	® 174	¾ 190	־ 206	SP 222	מ 238	SP 254
F	SP 143	SP 159	¯ 175	¿ 191	ֿ 207	SP 223	ן 239	SP 255

3.2.40 Page 50 [WPC1256: Arabic]

HEX	8	9	A	B	C	D	E	F
0	€ 128	گ 144	SP 160	° 176	ـ 192	ذ 208	à 224	ً 240
1	پ 129	‘ 145	، 161	± 177	ء 193	ر 209	ل 225	ٌ 241
2	, 130	’ 146	¢ 162	² 178	آ 194	ز 210	â 226	ٍ 242
3	ƒ 131	“ 147	£ 163	³ 179	أ 195	س 211	م 227	َ 243
4	„ 132	” 148	¤ 164	´ 180	ؤ 196	ش 212	ن 228	ô 244
5	… 133	• 149	¥ 165	µ 181	إ 197	ص 213	ه 229	ُ 245
6	† 134	– 150	¦ 166	¶ 182	ئ 198	ض 214	و 230	ِ 246
7	‡ 135	— 151	§ 167	· 183	ا 199	× 215	ç 231	÷ 247
8	ˆ 136	ک 152	¨ 168	¸ 184	ب 200	ط 216	è 232	ّ 248
9	‰ 137	™ 153	© 169	¹ 185	ة 201	ظ 217	é 233	ù 249
A	ٹ 138	ڑ 154	ھ 170	؛ 186	ت 202	ع 218	ê 234	ْ 250
B	‹ 139	› 155	« 171	» 187	ث 203	غ 219	ë 235	û 251
C	Œ 140	œ 156	¬ 172	¼ 188	ج 204	- 220	ى 236	ü 252
D	چ 141	SP 157	- 173	½ 189	ح 205	ف 221	ي 237	SP 253
E	ژ 142	SP 158	® 174	¾ 190	خ 206	ق 222	î 238	SP 254
F	ڈ 143	ں 159	¯ 175	؟ 191	د 207	ك 223	ï 239	ے 255

3.2.41 Page 51 [WPC1257: Baltic Rim]

HEX	8	9	A	B	C	D	E	F
0	€ 128	SP 144	SP 160	° 176	Ą 192	Š 208	ą 224	š 240
1	SP 129	‘ 145	SP 161	± 177	Į 193	Ń 209	į 225	ń 241
2	, 130	’ 146	¢ 162	² 178	Ā 194	Ņ 210	ā 226	ņ 242
3	SP 131	“ 147	£ 163	³ 179	Ć 195	Ó 211	ć 227	ó 243
4	„ 132	” 148	¤ 164	´ 180	Ä 196	Ō 212	ä 228	ō 244
5	… 133	• 149	SP 165	µ 181	Å 197	Õ 213	å 229	õ 245
6	† 134	– 150	¦ 166	¶ 182	Ę 198	Ö 214	ę 230	ö 246
7	‡ 135	— 151	§ 167	· 183	Ē 199	× 215	ē 231	÷ 247
8	SP 136	SP 152	Ø 168	ø 184	Č 200	Ų 216	č 232	ų 248
9	‰ 137	™ 153	© 169	¹ 185	É 201	Ł 217	é 233	ł 249
A	SP 138	SP 154	Ŗ 170	ŗ 186	Ź 202	Ś 218	ź 234	ś 250
B	‹ 139	› 155	« 171	» 187	Ė 203	Ū 219	ė 235	ū 251
C	SP 140	SP 156	¬ 172	¼ 188	Ģ 204	Ü 220	ģ 236	ü 252
D	¨ 141	¯ 157	- 173	½ 189	Ķ 205	Ż 221	ķ 237	ż 253
E	ˇ 142	˛ 158	® 174	¾ 190	Ī 206	Ž 222	ī 238	ž 254
F	¸ 143	SP 159	Æ 175	æ 191	Ļ 207	ß 223	ļ 239	˙ 255

3.2.42 Page 52 [WPC1258: Vietnamese]

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

3.2.43 Page 53 [KZ1048: Kazakhstan]

HEX	8	9	A	B	C	D	E	F
0	Ђ 128	ђ 144	SP 160	° 176	А 192	Р 208	а 224	р 240
1	Ѓ 129	‘ 145	Ұ 161	± 177	Б 193	С 209	б 225	с 241
2	‚ 130	’ 146	ұ 162	І 178	В 194	Т 210	в 226	т 242
3	ѓ 131	“ 147	Ә 163	і 179	Г 195	У 211	г 227	у 243
4	„ 132	” 148	¤ 164	ө 180	Д 196	Ф 212	д 228	ф 244
5	… 133	• 149	Ө 165	µ 181	Е 197	Х 213	е 229	х 245
6	† 134	– 150	¦ 166	¶ 182	Ж 198	Ц 214	ж 230	ц 246
7	‡ 135	— 151	§ 167	· 183	З 199	Ч 215	з 231	ч 247
8	€ 136	SP 152	Ё 168	ё 184	И 200	Ш 216	и 232	ш 248
9	‰ 137	™ 153	© 169	№ 185	Й 201	Щ 217	й 233	щ 249
A	Љ 138	љ 154	Ғ 170	ғ 186	К 202	Ъ 218	к 234	ъ 250
B	‹ 139	› 155	« 171	» 187	Л 203	Ы 219	л 235	ы 251
C	Њ 140	њ 156	¬ 172	қ 188	М 204	Ь 220	м 236	ь 252
D	Қ 141	қ 157	173	Ң 189	Н 205	Э 221	н 237	э 253
E	Һ 142	һ 158	® 174	ң 190	О 206	Ю 222	о 238	ю 254
F	Ұ 143	ұ 159	Ү 175	ү 191	П 207	Я 223	п 239	я 255

3.2.44 Page 255 [User-defined page]

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

3.2.45 International character sets

Country	ASCII code (Hex)													
	23	24	25	26	40	5B	5C	5D	5E	60	7B	7C	7D	7E
USA	#	$	%	*	@	[	\	]	^	`	{	|	}	~
France	#	$	%	*	à	°	ç	§	^	`	é	ù	è	¨
Germany	#	$	%	*	§	Ä	Ö	Ü	^	`	ä	ö	ü	β
U.K.	£	$	%	*	@	[	\	]	^	`	{	|	}	~
Denmark I	#	$	%	*	@	Æ	Ø	Å	^	`	æ	ø	å	~
Sweden	#	¤	%	*	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
Italy	#	$	%	*	@	°	\	é	^	ù	à	ò	è	ì
Spain I	Pt	$	%	*	@	¡	Ñ	¿	^	`	¨	ñ	}	~
Japan	#	$	%	*	@	[	¥	]	^	`	{	|	}	~
Norway	#	¤	%	*	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Denmark II	#	$	%	*	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
Spain II	#	$	%	*	á	¡	Ñ	¿	é	`	í	ñ	ó	ú
Latin America	#	$	%	*	á	¡	Ñ	¿	é	ü	í	ñ	ó	ú
Korea	#	$	%	*	@	[	₩	]	^		{	|	}	~
Slovenia/ Croatia	#	$	%	*	Ž	Š	Đ	Ć	Č	ž	š	đ	ć	č
China	#	¥	%	*	@	[	\	]	^		{	|	}	~
Vietnam	đ	$	%	*	@	[	\	]	^	`	{	|	}	~
Arabia	#	$	%	*	@	[	\	]	^	`	{	|	}	~

3.3 Switches and Buttons

3.3.1 Power button

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

NOTES: 1. Turn on the power only after connecting the power supply.
2. To turn the power on immediately after turning off the power, press the Power button after the LED lights go off.
3. If the power is turned off without the execution of the **DLE DC4** (*fn* = 2) command, the values of the maintenance counter are not updated correctly. To use the maintenance counter correctly, see APPENDIX G.

3.3.2 Panel buttons

1) Feed button: Non-locking push button

[Function]
- Feeds paper 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) When the roll paper end sensor has detected a paper end
  2) When the roll paper 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: Enabling/disabling of this button can be selected by **ESC c 5**. If the command is set to disable the button, this button is unable to function.

3.3.3 DIP switches

3.3.3.1 Serial interface specification

Table 3.3.1 DIP Switch 1

SW 1	Function	ON	OFF	Factory setting
1	Data reception error	Ignored	Prints '?'	OFF
2	Receive buffer capacity	45 bytes	4K bytes	OFF
3	Handshaking	XON/XOFF	DTR/DSR	OFF
4	Word length	7 bits	8 bits	OFF
5	Parity check	Yes	No	OFF
6	Selection of parity	Even	Odd	OFF
7	Selection of transmission speed	See Table 3.3.2.		ON
8				OFF

Table 3.3.2 Transmission Speed

Transmission speed (bps)	SW 1-7	SW 1-8
(*1)	ON	ON
4800	OFF	ON
9600	ON	OFF
19200	OFF	OFF

bps: bits per second

NOTES:
1. The factory default for the transmission speed is 9600 bps.
2. *1: The transmission speed depends on the setting of the transmission condition of the serial interface set with the customized value (memory switch). 2400, 4800, 9600, 19200, 38400, 57600, and 115200 are available as setting values. When both DIP switches 1-7 and 1-8 are ON, the default for the transmission speed is 38400 bps.
3. See APPENDIX P for how to change the setting of the communication condition of the serial interface set with the customized value (memory switch).
4. The communication condition of the serial interface set with the customized value (memory switch) is enabled only when DIP switches 1-7 and 1-8 are on. For other settings, the setting values by DIP switch 1 are enabled.

Table 3.3.3 DIP Switch 2

SW 2	Function	ON	OFF	Factory setting
1	Handshaking (Condition for BUSY)	• Receive buffer full	• Offline • Receive buffer full	OFF
2	Reserved (Do not change settings)	Fixed to OFF		OFF
3	Selects print density	See Table 3.3.4.		OFF
4				OFF
5	Setting the conditions that cancel the receive buffer BUSY state (This function is effective when the receive buffer capacity is set to 4 KB.)	Cancels the BUSY state when the remaining capacity of the receive buffer reaches 138 bytes.	Cancels the BUSY state when the remaining capacity of the receive buffer reaches 256 bytes.	OFF
6	Reserved (Do not change settings.)	Fixed to Off.		OFF
7	I/F pin 6 reset signal	Enabled	Disabled	OFF
8	I/F pin 25 reset signal	Enabled	Disabled	OFF

Table 3.3.4 DIP Switch 2-3 and 2-4

Switch No.		Function
3	4	
OFF	OFF	Print density (Standard)
ON	OFF	Print density (Medium)
OFF	ON	Print density (Dark)
ON	ON	Prohibited

NOTES: 1. Change the DIP switch when the printer power is turned off.

2. 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. If the DIP switch setting is changed after the printer power is turned on, the change does not take effect until the printer is turned on again or is reset.
3. If the print density is set to “medium”/”dark” level, printing speed tends to slow down.
4. If the print density is set to “medium”/”dark” level, paper dust sticks to the print head surface, often resulting in faded print.

3.3.3.2 Parallel interface specification

Table 3.3.5 DIP Switch 1

SW	Function	ON	OFF	Factory setting
1	Auto line feed	Always enabled	Always disabled	OFF
2	Receive buffer capacity	45 bytes	4 KB	OFF
3	Selects paper sensors to output paper-end signals (default value of **ESC c 3**)	Disabled	Roll paper end sensor enabled; roll paper near-end sensor enabled	OFF
4	Sets error signal	Disabled	Enabled	OFF
5-8	Undefined	–	–	OFF

Table 3.3.6 DIP Switch 2

SW	Function	ON	OFF	Factory setting
1	Handshaking (Condition for BUSY)	• Receive buffer full	• Offline • Receive buffer full	OFF
2	Reserved (Do not change settings)	Fixed to Off		OFF
3	Selects print density	See Table 3.3.7.		OFF
4				OFF
5	Setting the conditions that cancel the receive buffer BUSY state (This function is effective when the capacity of the receive buffer is set to 4 KB.)	Cancels the BUSY state when the remaining capacity of the receive buffer reaches 138 bytes.	Cancels the BUSY state when the remaining capacity of the receive buffer reaches 256 bytes.	OFF
6	Reserved (Do not change settings)	Fixed to Off		OFF
7	Reserved (Do not change settings)	Fixed to Off		OFF
8	I/F pin 31 reset signal (Do not change settings)	Fixed to On		ON

Table 3.3.7 DIP Switch 2-3 and 2-4

3	4	Function
OFF	OFF	Print density (Standard)
ON	OFF	Print density (Medium)
OFF	ON	Print density (Dark)
ON	ON	Prohibited

NOTES: 1. Change the DIP switch settings when the printer power is turned off.

2. 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. If the DIP switch settings are changed after the printer power is turned on, the changes do not take effect until the printer is turned on again or is reset.
3. If the print density is set to “medium”/”dark” level, printing speed is inclined to slow down.
4. If the print density is set to “medium”/”dark” level, paper dust sticks to the print head surface, often resulting in faded print.

3.3.3.3 Built-in USB interface specification, USB Plus Power interface specification

Table 3.3.8 DIP Switch 1

SW	Function	ON	OFF	Factory setting
1	Auto line feed	Always enabled	Always disabled	OFF
2	Receive buffer capacity	45 bytes	4 KB	OFF
3	Undefined	–	–	OFF
4	Undefined	–	–	OFF
5	Undefined	–	–	OFF
6	Undefined	–	–	OFF
7	Undefined	–	–	OFF
8	Sets USB power-saving function.	Disabled	Enabled	OFF

Table 3.3.9 DIP Switch 2

SW	Function	ON	OFF	Factory setting
1	Handshaking (BUSY condition)	• Receive buffer full	• Offline • Receive buffer full	OFF
2	Reserved (Do not change settings)	Fixed to Off		OFF
3	Selects print density	See Table 3.3.10.		OFF
4				OFF
5	Settings of the conditions that cancel the receive buffer BUSY state (This function is effective when the capacity of the receive buffer is set to 4 KB.)	Cancels the BUSY state when the remaining capacity of the receive buffer reaches 138 bytes.	Cancels the BUSY state when the remaining capacity of the receive buffer reaches 256 bytes.	OFF
6	Reserved (Do not change settings)	Fixed to Off		OFF
7	Reserved (Do not change settings)	Fixed to Off		OFF
8	Reserved (Do not change settings)	Fixed to On		ON

Table 3.3.10 DIP Switch 2-3 and 2-4

3	4	Function
OFF	OFF	Print density (Standard)
ON	OFF	Print density (Medium)
OFF	ON	Print density (Dark)
ON	ON	Prohibited

NOTES:
1. Change the DIP switch when the printer power is turned off.
2. 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. If the DIP switch settings are changed after the printer power is turned on, the changes do not take effect until the printer is turned on again or is reset.
3. If the print density is set to “medium”/”dark” level, printing speed is inclined to slow down.
4. If the print density is set to “medium”/”dark” level, paper dust sticks to the print head surface, often resulting in faded print.

3.3.3.4 Other interfaces (Ethernet, Wireless LAN, UB-U01/U02/U03 series)

Table 3.3.11 DIP Switch 1

SW	Function	ON	OFF	Factory setting
1	Auto line feed	Always enabled	Always disabled	OFF
2	Receive buffer capacity	45 bytes	4 KB	OFF
3	Undefined	–	–	OFF
4	Undefined	–	–	OFF
5	Undefined	–	–	OFF
6	Undefined	–	–	OFF
7	Undefined	–	–	OFF
8	Undefined	–	–	OFF

Table 3.3.12 DIP Switch 2

SW	Function	ON	OFF	Factory setting
1	Handshaking (BUSY condition)	• Receive buffer full	• Offline • Receive buffer full	OFF
2	Reserved (Do not change settings)	Fixed to Off		OFF
3	Selects print density	See Table 3.3.13.		OFF
4				OFF
5	Settings of the conditions that cancel the receive buffer BUSY state (This function is effective when the capacity of the receive buffer is set to 4 KB.)	Cancels the BUSY state when the remaining capacity of the receive buffer reaches 138 bytes.	Cancels the BUSY state when the remaining capacity of the receive buffer reaches 256 bytes.	OFF
6	Reserved (Do not change settings)	Fixed to Off		OFF
7	Reserved (Do not change settings)	Fixed to Off		OFF
8	Reserved (Do not change settings)	Fixed to On		ON

Table 3.3.13 DIP Switch 2-3 and 2-4

3	4	Function
OFF	OFF	Print density (Standard)
ON	OFF	Print density (Medium)
OFF	ON	Print density (Dark)
ON	ON	Prohibited

NOTES:
1. Change the DIP switch when the printer power is turned off.
2. 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. If the DIP switch settings are changed after the printer power is turned on, the changes do not take effect until the printer is turned on again or is reset.
3. If the print density is set to “medium”/”dark” level, printing speed is inclined to slow down.
4. If the print density is set to “medium”/”dark” level, paper dust sticks to the print head surface, often resulting in faded print.

3.3.4 Customized values

See APPENDIX P for setting the customized values. See **GS (E** for details.

Table 3.3.11 Types of Customized Values

Function	Value
Selection of roll paper width	58 mm/80 mm
Selection of print density	13 levels in the print density levels 1 to 13
Selection of print speed	13 levels in the print speed levels 1 to 13
Character code table defaults	43 pages selectable with **ESC t**
International character defaults	18 types selectable with **ESC R**
Selection of interface	Fixed to UIB/Fixed to built-in USB/Auto selection of UIB or built-in USB
Number of head energization parts (See Note 1.)	One-part energization, two-part energization, or four-part energization
Capacity of power supply	Level 1, level 2, and level 3 (3 levels)
Autocutting after closing the cover	Does not cut/cuts
(ARP) Reduction of top margin	Does not reduce/reduces
(ARP) Reduction of bottom margin	Does not reduce/reduces
(ARP) Reduction of line spacing	Does not reduce/reduces 25%/reduces 50%/reduces 75%
(ARP) Reduction of line spacing where extra line feeds are included	Does not reduce/reduces 25%/reduces 50%/reduces 75%
(ARP) Reduction of bar code heights	Does not reduce/reduces 25%/reduces 50%/reduces 75%
Font A auto replacement	Does not replace/ Font B
Font B auto replacement	Does not replace/ Font A
Print density when printing in multi-tone	13 levels in the print density levels 1 to 13
Buzzer function: Enabling/disabling optional external buzzer	Enables/disables
Buzzer function: Buzzer frequency (Error) (See Note 2.)	Does not sound/sounds 1 time/sounds continuously
Buzzer function: Sound pattern (Autocut) (See Note 2.)	5 patterns selectable with **ESC (A**
Buzzer function: Buzzer frequency (Autocut) (See Note 2.)	Does not sound/sounds 1 time
Buzzer function: Sound pattern (Pulse 1) (See Note 2.)	5 patterns selectable with **ESC (A**
Buzzer function: Buzzer frequency (Pulse 1) (See Note 2.)	Does not sound/sounds 1 time
Buzzer function: Sound pattern (Pulse 2) (See Note 2.)	5 patterns selectable with **ESC (A**
Buzzer function: Buzzer frequency (Pulse 2) (See Note 2.)	Does not sound/sounds 1 time

(ARP = Automatic Reduction of Paper)

NOTES: 1) Printing speed is controlled depending on the number of head energizations. The maximum printing speed (300 mm/s {11.81"/s}) can be performed only when one-part energization is selected.

2) The functions are enabled for the optional external buzzer.

3.4 Indicators

3.4.1 Control panel LEDs

1) Power LED: Green

On: Power is stable.

Off: Power is not stable.

2) Error (Error) LED: Orange

On: Offline (except while paper is being fed using the Feed button, during test printing, and in the error state.) (See Section 2.1.3.2, Switching between online and offline.)

Off: Normal condition

Flashing: Error (See Section 3.8.)

3) Roll paper (Paper) LED: Orange

On: The roll paper near end is detected.

Off: Paper is loaded (Normal condition)

Flashing: • Self-test printing standby state (See Section 3.5.)

• 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.	→ ← Approx.320 ms	Pressing the Feed button causes self-test printing to be continued or executes the macro.

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

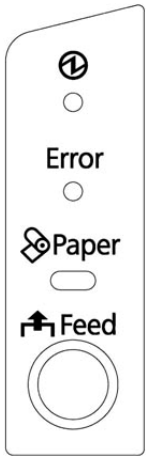


Figure 3.4.1 Control Panel Buttons and Indicators

3.5 Self-test

1) The printer has a self-test function that checks the following:
   - Control software version
   - Interface type
   - Receive buffer size
   - Busy conditions (depending on interfaces)
   - Mounted multilingual fonts
     Japanese model: KANJI JAPANESE
     Simplified Chinese model: CHINA GB18030
     Traditional Chinese model: TAIWAN BIG-5
   - Auto line feed enabled/disabled (with a parallel interface)
   - Print density
   - Maintenance information
     Head running length, number of times of autocutting
   - DIP switch settings

2) A self-test on the roll paper

[Starting a self-test]

Hold down the Feed button while turning on the printer with the roll paper cover closed, then the current printer status (*1) is printed.

(*1) Information in the current printer status is as follows:
- Control software version
- DIP switch settings

[Self-test printing standby state]

After printing the current printer status, the printer prints the following messages:

"Select Modes by pressing Feed Button.
Continue SELF-TEST: Less than 1 second
Mode Selection: 1 second or more"

Then the Paper LED flashes and the printer enters the test printing (*2) standby state. Press the Feed button in this state to start test printing.

(*2) Information printed in test printing is as follows:
- A rolling pattern using only the built-in character set
- A partial cut after completing the test printing

3) Ending the self-test and operation after the test

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

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) Running hexadecimal dumping

1. Start hexadecimal dumping by executing either of the following:
   a. Open the roll paper cover and turn the power on while pressing the Feed button, and then close the roll paper cover.
   b. Execute the **GS (A** command.
2. The printer first prints "Hexadecimal Dump To terminate ….." on roll paper, and then prints the received print data in hexadecimal numbers and in their corresponding characters.
3. After printing has finished, Hexadecimal dumping ends by executing any of the following:
   a. Turn the power off.
   b. Press the Feed button three times.
   c. Reset the printer through the interface.

NOTES: 1. If no characters correspond to the data received, the printer prints "."
2. During hexadecimal dumping, any commands other than **DLE EOT** do not function.
3. Insufficient print data to fill the last line can be printed by pressing down the Feed button.

<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 ***
```

3.7 NV Graphics Information Print Mode, R/E Information Print Mode, Customized Value (Memory Switch) Setting Mode

3.7.1 NV graphics information print mode

1) NV graphics information printing function

Prints the NV graphics information registered in the printer. The printer prints:

- Capacity of the NV graphics
- Occupied capacity of the NV graphics
- Unused capacity of the NV graphics
- Number of NV graphics that are registered
- Key code, number of dots in X direction, number of dots in Y direction, number of colors to be defined
- NV graphics data

2) Starting the mode

(1) With the roll paper cover closed, turn the printer power on while pressing the Feed button until printing of the printer status starts.
(2) After the printer status has been printed, keep pressing the Feed button until printing of the guidance for operation method starts.
(3) After the guidance for operation method has been printed, briefly press the Feed button once.
(4) Then keep pressing the Feed button again until printing of the NV graphics information starts.

3) Ending the mode

Turn the power off.

3.7.2 R/E information print mode

1) R/E (receipt enhancement) information printing function

Prints the following R/E information presently registered in the printer.

- Auto top logo setting
- Auto bottom logo setting
- Extended auto setting of top logo/bottom logo

2) Starting the mode

(1) With the roll paper cover closed, turn the printer power on while pressing the Feed button until printing of the printer status starts.
(2) After the printer status has been printed, keep pressing the Feed button until printing of the guidance for operation method starts.
(3) After the guidance for operation method has been printed, briefly press the Feed button twice.
(4) Then keep pressing the Feed button again until printing of the R/E information starts.

3) Ending the mode

Turn the power off.

3.7.3 Customized value (memory switch) setting mode

1) Customized value (memory switch) setting function

Sets the customized values (memory switches) by operating the switches on the printer.

The settable customized values (memory switches) are as follows:

- Print density
- Communication conditions using a serial interface
- Auto reduction of amount of paper to use
- Autocutting of paper while the cover is closed
- Paper width
- Default value of Character code page/international character set
- Auto replacement of font
- Selection of an interface
- Communication conditions using a USB interface
- Power supply capacity
- Printing speed
- Other settings (such as controlling the optional external buzzer)

2) Starting the mode

(1) With the roll paper cover closed, turn the printer power on while pressing the Feed button until printing of the printer status starts.

(2) After the printer status has been printed, press the Feed button until printing of the guidance for operation method starts.

(3) After the guidance for operation method has been printed, briefly press the Feed button three times.

(4) Then keep pressing the Feed button again until printing of the customized value (memory switch) setting mode starts.

3) Ending the mode

After completing the memory switch setting, the set content is stored, and the printer is initialized. When printer initialization ends, the printer is ready for normal printing.

3.8 Error Processing

3.8.1 Error types

1) Errors that automatically recover

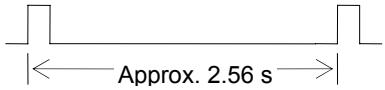
Table 3.8.1 Errors That Automatically Recover

Error	Description	Error LED flashing pattern →| |← Approx.160 ms	Recovery
Print head temperature error	The temperature of the print head is extremely high.		Recovers automatically when the print head cools.
Roll paper cover open error	Printing on the roll paper is not performed correctly due to a cover-open.		Recovers automatically when the cover is closed.

NOTE: Print head temperature error is not an abnormality.

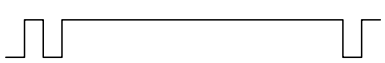
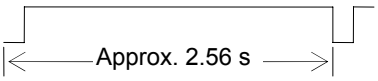
2) Recoverable errors

Table 3.8.2 Recoverable Errors

Error	Description	Error LED flashing pattern →| |← Approx.160 ms	Recovery
Autocutter error	The autocutter does not work correctly.		Recovers with **DLE ENQ 1** or **DLE ENQ 2**.

3) Unrecoverable errors

Table 3.8.3 Unrecoverable Errors

Error	Description	Error LED flashing pattern →| |← Approx.160 ms	Recovery
R/W error in memory	After R/W checking, the printer does not work correctly.		Unable to recover.
High voltage error	The power supply voltage is extremely high.		Unable to recover.
Low voltage error	The power supply voltage is extremely low.		Unable to recover.
CPU execution error	The CPU executes an incorrect address.		Unable to recover.
Internal circuit connection error	Internal circuits are not connected correctly.		Unable 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 has occurred

The printer executes the following operations when an error is detected.

- Stops all printer operations for the selected paper section.
- Goes offline.
- Goes BUSY. (See Section 3.3.3, DIP switches when DIP switch 2-1 is off.)
- Flashes the Error LED.

3.8.3 Data receive error (only with the serial interface model)

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

- Parity error
- Framing error
- Overrun error

3.9 Cover Open Button

When the cover open button (located to the right of the cover) is pressed, the roll paper cover opens.

NOTES: 1. Be sure to use the cover open button to open the roll paper cover.
2. Do not open the roll paper cover during printing.
3. Do not open the roll paper cover during autocutting operation; doing so may damage the mechanism.

3.10 Cover Open Sensor

The cover open sensor monitors the roll paper cover. When the sensor detects a cover open during printing, the error LED flashes and the printer stops printing. The printer recovers when the cover is closed. When the sensor detects a cover open while the printer is in the standby status, the printer goes offline. The printer recovers when the cover is closed.

NOTE: The status reported by the paper sensors remains the same as that reported immediately before the cover was opened.

3.11 Print Buffer-full Printing

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

<When in page mode>
When subsequent data is received after the printer processes one line of data in the print buffer, the printer automatically moves the printing position to one line below the processed line.

3.12 Optional Internal Buzzer (for Model with an Optional Internal Buzzer)

The optional internal buzzer beeps with a pulse signal set with the **ESC p** or **DLE DC4** command.

NOTE: Since the buzzer drive signal and the cash drawer drive signal are common in the printer, do not use the same connector pin number to output the signal for the buzzer and the cash drawer.

Specify the connector pin number to output the buzzer drive signal with the DIP switches on the optional internal buzzer board.

Table 3.12.1 DIP Switches

SW No.	Connector pin to be specified	ON	OFF	Default
1	Drawer kick-out connector pin 5	Beeps	Does not beep	ON
2	Drawer kick-out connector pin 2	Beeps	Does not beep	OFF

3.13 Optional External Buzzer

The optional external buzzer (OT-BZ20) can be used by connecting to the drawer kick-out connector and setting “Enabling/disabling optional external buzzer” to Enabled with the customized value (memory switch). (See APPENDIX P for how to change the setting.)

- Sounding/stopping by the buzzer commands
  It is possible to sound the buzzer by setting a sound pattern and a buzzer frequency with **ESC (A**.
  It is possible to stop sounding the buzzer with **DLE DC4** <Function 3>.
- Cooperative sounding by using commands other than the buzzer commands

Buzzer sounding is possible by autocutting commands/operations (**ESC V** 0, **ESC V** 65, **ESC i**, **ESC m**, autocutting for automatic top logo printing, automatic cutting at cover close).
Buzzer sounding is possible by the commands that generate the specified pulse (drawer kick-out) (**ESC p**, **DLE DC4** <fn = 1>).
The sound pattern and buzzer frequency can be set with the customized value (memory switch). (See APPENDIX P for how to change the setting.)

- Autonomic sound

  Buzzer sounding is possible when a paper-end is detected.
  Buzzer sounding is possible when an error occurs.
  The sound pattern and buzzer frequency can be set with the customized value (memory switch). (See APPENDIX P for how to change the setting.)

Notes on connecting, installing, and using the optional external buzzer:

- When the optional external buzzer is set to Enabled with the customized value (memory switch), a pulse is not output to the drawer kick-out connector pin; therefore, a drawer cannot be driven.
- It is prohibited that both the optional external buzzer and the drawer are connected at the same time by using a branched connector.
- The optional external buzzer does not sound when the optional external buzzer is connected after the printer power is on or if the optional external buzzer is disconnected and reconnected while the printer power is on; therefore, be sure to turn on the printer with the optional external buzzer connected and do not disconnect the optional external buzzer when the printer power is on.
- Be sure to fix the buzzer to the printer unit with the affixing tape (bundled with the optional external buzzer).
- For the position (surface) where the optional external buzzer is attached to the printer, it is prohibited to install the optional external buzzer at the roll paper exit; otherwise, it interrupts paper ejection. The following surfaces are recommended:

  When installing horizontally: both sides
  When installing vertically, wall-hanging installation: both sides, top side, bottom side for wall-hanging installation
- Be sure to clean and dry the surface of the printer and the optional external buzzer where the affixing tape is attached before attaching the affixing tape to the printer and the optional external buzzer.
- To prevent liquid from entering, it is recommended to install the optional external buzzer so that the volume adjustment knob is positioned sideways or downward.
- Be sure not to apply any liquid components such as water, oil, or chemicals on the optional external buzzer intentionally. Otherwise, the optional external buzzer may be damaged.

3.14 Printing in Multi-Tone

Printing in multi-tone enables printing in mid-level (density) between white (not in chromogenic state) and black (in completely-chromogenic state) by controlling the supply voltage to the thermal head. Only graphics printing is supported for printing in multi-tone.

1) Print density setting for printing in multi-tone

To achieve good printing results, the energy setting of black for printing in multi-tone is lower than black for printing in monochrome. Therefore, the print density can be set for printing in multi-tone in addition to the print density setting for printing in monochrome.

- The print density for printing in multi-tone can be set with the customized value (memory switch). (See APPENDIX P for how to change the setting.)

- The print density setting for printing in multi-tone is affected by the print density setting for printing in monochrome; therefore, be sure to set the print density for printing in monochrome first then set the print density for printing in multi-tone.
- Be sure to set the print density for printing in multi-tone, considering density balance in a whole image to be printed because if the print density is set to too dark, density difference at dark density side becomes reduced and printing at light density side becomes dark.

2) Image processing when graphics printing in multi-tone

For graphics printing in multi-tone, a good printing result that is as much as possible similar to an original image can be achieved by correcting the image based on the chromogenic characteristics of thermal paper and processing the dithering. Enabling/disabling the image processing by the printer depends on the type of commands as follows:

- **GS (L / GS 8 L** command (raster format): image processing by the printer unit disabled
- **GS D** command (Windows BMP format): image processing by the printer unit enabled
  Enabled only when multi-tone is specified and BMP file format is 4 bits or more (when mid-level is included).

When using driver/logo utility software, appropriate image processing is performed by driver/logo utility software.

4. CASE SPECIFICATIONS

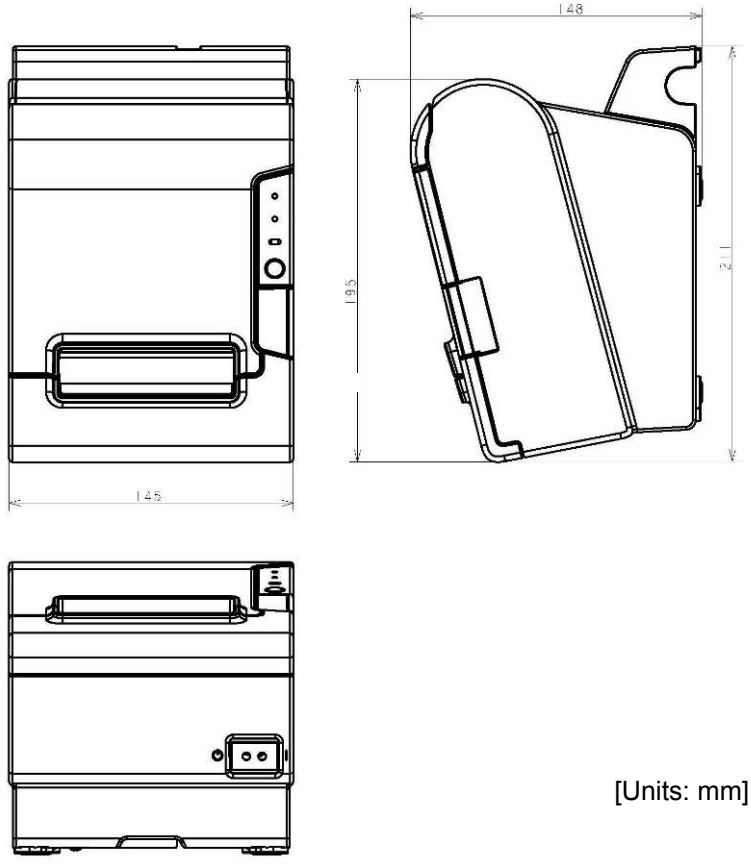
4.1 External Dimensions and Mass

Height: Approximately 148 mm {5.83"}
Width: Approximately 145 mm {5.71"}
Depth: Approximately 195 mm {7.68"} (Connector cover excluded)
Mass: Approximately 1.6 kg {3.53 lb} (Roll paper excluded)

4.2 Color

EPSON standard color (ECW (Epson Cool White), EDG (Epson Dark Gray))

4.3 External Dimensions



[Units: mm]

Materials for the exterior: 94V-0 (UL grade for flame resistance)

Figure 4.3.1 External Dimensions

5. OPTIONS AND CONSUMABLES

5.1 Standard Accessories

- Roll paper (For checking initial movement of the printer)
- CD-ROM (Only available for models that bundle the CD-ROM)
  - Drivers
  - Utility software
  - User's manual
- Setup guide (Paper manual. Only available for models that bundle the CD-ROM)
- User's manual (Paper manual. Only available for models that do not bundle the CD-ROM)
- Power switch cover
- External power supply (Only available for models that bundle a power supply unit)
  Model: PS-180
- AC cable (depending on the models)
- Connector cover
- 58-mm width paper guide plate (Only available for the 80-mm paper width model except for the Japanese model)

5.2 Options

- Affixing tape
  Model: DF-10
- Wall hanging bracket
  Model: WH-10
- External power supply
  Model: PS-180
  *1 Do not use PS-180 units manufactured in Japan (100 VAC) in Year 2002 or earlier. The serial numbers of the PS-180 manufactured in Year 2002 or earlier are as follows:
  Consist of 13 digits that start with CYYZ or D73Z, and the digit immediately after CYYZ or D73Z is a number.
- Power supply box
  Model: OT-BX88V
  NOTE: The power supply that can be stored in this box is only the PS-180.
- Various interface boards (UB series)
  NOTE: The UB-E02A, UB-R02A, and UB-R03A cannot be used.
- Optional internal buzzer
  Set at factory shipment
- Optional external buzzer
  Model: OT-BZ20

5.3 Consumables

- Specified paper

  Thermal roll paper: NTP080-80 (When paper width is set to 80 mm)
  NTP058-80 (When paper width is set to 58 mm)
  [Original paper: TF50KS-E Nippon Paper Industries Co., Ltd.]

  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. COMMANDS

6.1 Command Notation

XXXX

[Name]	The name of the command.
[Format]	The code sequence. *[ ]k* indicates the contents in brackets [ ] should be repeated *k* times.
[Range]	Gives the allowable ranges, if any, for the command parameters.
[Default]	Gives the default values, if any, for the arguments.
[Description]	Describes the function of the command. "–" in the table indicates 0 or 1.
[Notes]	Provides important information on setting and using the printer command, if necessary.
[Reference]	Gives references, if any.

6.2 Explanation of Terms

1) Real-time command

Real-time commands are identified with a **DLE** extension, such as **DLE EOT**, **DLE ENQ,** or **DLE DC4**. The printer executes these commands as soon as they are received.

2) Obsolete command

Obsolete commands are commands that will not be supported by future printer models. Therefore, we recommend replacing them with more recent, upward-compatible commands that have the same functions.

3) NV memory write command

NV memory write commands delete or store data in the NV memory (flash ROM).

GS (E <some functions>, **GS (L** / **GS 8 L** <some functions>, **GS g 0**, **GS D**, **FS g 1**, **FS q**

4) ESC/POS Handshaking Protocol

ESC/POS Handshaking Protocol is a handshaking protocol between the host PC and the printer when the printer transmits data. The ESC/POS Handshaking Protocol is required if the following commands are executed:

GS (L / **GS 8 L** <some functions>

5) Print buffer

The print buffer is used to store image data for printing.

6) Receive buffer

The receive buffer is used to store data from the host PC. All received data is stored in this buffer and processed in the order received.

7) Maximum printable area

The maximum printable area of this printer is as follows:

- Standard Mode (Horizontal direction) : 72.25 mm {512/180"} [When paper width is set to 80 mm]
  : 50.80 mm {360/180"} [When paper width is set to 58 mm]
- Page Mode (Horizontal direction) : 72.25 mm {512/180"} [When paper width is set to 80 mm]
  : 50.80 mm {360/180"} [When paper width is set to 58 mm
- Page Mode (Vertical direction) : 234.53 mm {3324/360"}

8) Horizontal or vertical motion units

The horizontal or vertical motion units are used for calculating the setting values for various commands and can be changed with **GS P**.

9) Left edge of the print area

The left edge of the print area indicates the first column for character(s) to be developed, and also the print position to be moved when ($n_L + n_H \times 256$) = 0 is specified with **ESC $**.

- In standard mode, the left edge of the print area is the position of the left margin.
- In page mode, the left edge of the print area is the position of the left edge when the starting position specified with **ESC T** is viewed as the top left of the print area.

10) Column format / Raster format

Column format is a format where data is set in descending order (bit 7, 6, …, 0) from the top vertically.

d1	*d4*	*d7*	MSB LSB
d2	*d5*	*d8*	MSB LSB
d3	*d6*	*d9*	MSB LSB

Raster format is a format where data is set in descending order (bit 7, 6, …, 0) from the left horizontally.

d1	*d2*	*d3*
d4	*d5*	*d6*
d7	*d8*	*d9*
MSB LSB	MSB LSB	MSB LSB

11) Inch

A unit of length. One inch is 25.4 mm.

12) dpi

dpi (dots per inch) is the number of dots per 25.4 mm.

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

FF (In page mode)

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

[Format]
ASCII	FF
Hex	0C
Decimal	12

[Description]
- Prints all the data in the print buffer collectively and switches from page mode to standard mode.

CR

[Name] Print and carriage return

[Format]
ASCII	CR
Hex	0D
Decimal	13

[Description]
- Executes one of the following operations.

Condition	Function
When automatic line feed is enabled.	Functions the same as **LF**.
When automatic line feed is disabled and when using the serial interface model.	This command is ignored.

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 print area.

DLE EOT *n*

[Name] Transmit real-time status

[Format]

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

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

[Description]
- Transmits the real-time status.

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

- This printer transmits the following status in real time.
  - Printer status (*n* = 1)

Bit	Off/On	Hex	Decimal	Status
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, 6	--	--	--	Reserved.
7	Off	00	0	Fixed.

• Offline cause status (*n* = 2)

Bit	Off/On	Hex	Decimal	Status
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 with the paper Feed button.
	On	08	8	Paper is being fed with the paper Feed button.
4	On	10	16	Fixed.
5	Off	00	0	No paper end stop.
	On	20	32	Printing stopped due to paper end.
6	Off	00	0	No error.
	On	40	64	Error occurred.
7	Off	00	0	Fixed.

• Error cause status (*n* = 3)

Bit	Off/On	Hex	Decimal	Status
0	Off	00	0	Fixed.
1	On	02	2	Fixed.
2	--	--	--	Reserved.
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 occurred.
6	Off	00	0	No automatically recoverable error.
	On	40	64	Automatically recoverable error occurred.
7	Off	00	0	Fixed.

• Roll paper sensor status (*n* = 4)

Bit	Off/On	Hex	Decimal	Status
0	Off	00	0	Fixed.
1	On	02	2	Fixed.
2, 3	Off	00	0	Roll paper near-end sensor: paper adequate.
	On	0C	12	Roll paper near-end sensor: paper near end.
4	On	10	16	Fixed.
5, 6	Off	00	0	Roll paper end sensor (paper sensor): paper present.
	On	60	96	Roll paper end sensor (paper sensor): paper not present.
7	Off	00	0	Fixed.

Bits 5 and 6: While the cover is open, this shows the state when the cover was still closed.

[Notes]
- Take the following into consideration:
  - If the received data includes a data string matching this command, the printer performs this command. Users must consider this.
    Example: Graphic data might accidentally include a data string matching this command.
  - Do not embed this command within another command.
    Example: Graphic data might include this command.
- Transmit this command using the following method:
  - When this command is transmitted, subsequent data must not be transmitted until the status is received.
  - However, if this command must be transmitted continuously, it is possible to transmit up to 4 commands at once.
    In this case, subsequent data must not be transmitted until the all status is received.
    If this command is transmitted without using the above method, the status may not be received.

DLE ENQ *n*

[Name] Send real-time request to printer

[Format]

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

[Range] *n* = 1, 2

[Description]
- Responds to a request in real-time from the host PC.

n	Function
1	Recovers from a recoverable error and restarts printing from the line where the error occurred. • This command is ignored unless a recoverable error has occurred.
2	Recovers from a recoverable error after clearing the receive and print buffers. • This command is ignored unless a recoverable error has occurred.

[Notes]
- Use this command after removing the cause of the error.
- Take the following into consideration:
  - If the received data includes a data string matching this command, the printer performs the command. Users must consider this.
    Example: Graphic data might accidentally include a data string matching this command.
  - Do not embed this command within another command.
    Example: Graphic data might include this command.

[Reference] APPENDIX C: RECOVERY FROM AN AUTOCUTTER ERROR

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

[Name] Generate pulse in real-time

[Format]

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

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

[Description]
- Outputs the signal specified by *t* in real-time to the output pulse specified by *m*.
- With the model with an optional internal buzzer, the same pulse is output to the connector pin and the drive signal line of the optional internal buzzer.

m	Output pulse
0	Drawer kick-out connector pin 2. [With optional internal buzzer] Drawer-kick connector pin 2 and optional internal buzzer drive signal line 1
1	Drawer kick-out connector pin 5. [With optional internal buzzer] Drawer-kick connector pin 5 and optional internal buzzer drive signal line 2

- *t* specifies the pulse on time or off time as [$t \times 100$ ms].

[Notes]
- Take the following into consideration:
  - If the received data includes a data string with this command, the printer performs the command. Users must consider this.
    Example: Graphic data might accidentally include a data string matching this command.
  - Do not embed this command within another command.
    Example: Graphic data might include this command.
- When the setting of “Enabling/disabling optional external buzzer” is enabled with the customized value, <Function 05> **GS (E** <a = 119>, a pulse is not output to both the drawer kick-out connector pin and the drive signal line of the optional internal buzzer; however, the optional external buzzer sounds.

  Note: For the sound pattern and the buzzer frequency for the optional external buzzer, follow the customized value setting, <Function 05> **GS (E** <a = 123 to 126>.

[Reference] APPENDIX F: NOTES ON USING THE DRAWER KICK-OUT CONNECTOR, "3.12 Optional Internal Buzzer (for Model with an Optional Internal Buzzer)", “3.13 Optional External Buzzer”, APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCHES)

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 and transmits the power-off notice.
  - Stores the values of the maintenance counter.
  - Sets the interface to BUSY.
  - Sets the printer to standby mode.

[Notes]
- Take the following into consideration:
  - If the received data includes a data string matching this command, the printer performs the command. Users must consider this.
    Example: Graphic data might accidentally include a data string matching this command.
  - Do not embed this command within another command.
    Example: Graphic data might include this command.
- This command does not shut the power off. The operator must turn the power off after receiving the power-off notice.
- If this command is executed, 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.

[Reference] APPENDIX G: NOTES ON UPDATING THE MAINTENANCE COUNTER AND TURNING THE PRINTER'S POWER OFF

DLE DC4 *fn a n r t1 t2* (*fn* = 3)

[Name] Control buzzer (optional external buzzer)

[Format]

ASCII	DLE	DC4	*fn*	*a*	*n*	*r*	*t1*	*t2*
Hex	10	14	03	*a*	*n*	*r*	*t1*	*t2*
Decimal	16	20	3	*a*	*n*	*r*	*t1*	*t2*

[Range]
fn = 3
a = 0
n = 0
r = 0
t1 = 1
t2 = 0

[Description]
- Stops sounding the optional external buzzer.
- When the buzzer has stopped sounding by this function, the printer transmits the buzzer sound end response as shown below to the host PC.

Data group of buzzer sound end response	Hex	Decimal	Data
(1) Header	37H	55	1 byte
(2) Identifier	54H	84	1 byte
(3) Data	40H	64	1 byte
(4) NUL	00H	0	1 byte

[Notes]
- Take the following into consideration:
  - If the received data includes a data string matching this command, the printer performs the command. Users must consider this.
    Example: Graphic data might accidentally include a data string matching this command.
  - Do not embed this command within another command.
    Example: Graphic data might include this command.

DLE DC4 *fn d1…d7* (*fn* = 8)

[Name] Clear buffer(s)

[Format]

ASCII	DLE	DC4	*fn*	*d1…d7*
Hex	10	14	*fn*	*d1…d7*
Decimal	16	20	*fn*	*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 and transmits Clear response.
- If a recoverable error occurs, recovers from the error.

[Notes]
- Do not use this command in a system that uses the printer with the OPOS driver or the JavaPOS driver provided by Seiko Epson Corporation.
- Take the following into consideration:
  - If the received data includes a data string matching this command, the printer performs the command. Users must consider this.
    Example: Graphic data might accidentally include a data string matching this command.
  - Do not embed this command within another command.
    Example: Graphic data might include this command.
- Do not transmit subsequent data until the status is received after transmitting this command.

ESC FF

[Name] Print data in page mode

[Format]

ASCII	ESC	FF
Hex	1B	0C
Decimal	27	12

[Description]
- In page mode, prints all the data in the print buffer collectively.

ESC SP *n*

[Name] Set right-side character spacing

[Format]

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

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

[Default] *n* = 0

[Description]
- Sets the right-side character spacing to [*n* × (horizontal or vertical motion unit)].

[Note]
- The maximum right-side spacing is 35.98 mm {255/180"}.

ESC ! *n*

[Name] Select print mode(s)

[Format]

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

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

[Default] $n = 0$

[Description]

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

(*n*) Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Character font A (12 × 24) selected.
	On	01	1	Character font B (9 × 17) selected.
1, 2	Off	00	0	Reserved.
3	Off	00	0	Emphasized mode is turned off.
	On	08	8	Emphasized mode is turned on.
4	Off	00	0	Double-height canceled.
	On	10	16	Double-height selected.
5	Off	00	0	Double-width canceled.
	On	20	32	Double-width selected.
6	Off	00	0	Reserved.
7	Off	00	0	Underline mode is turned off.
	On	80	128	Underline mode is turned on.

[Note]

- When auto replacement of the font with the customized value, <Function 05> **GS (E** (a = 111, 112), is set for the font selected by bit 0, the font to be replaced is set to enabled.

[Reference] APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCHES)

ESC $ *nL nH*

[Name] Set absolute print position

[Format]

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

[Range] $0 \le (n_L + n_H \times 256) \le 65535$ $(0 \le n_L \le 255, 0 \le n_H \le 255)$

[Description]

- Moves the print position to [($n_L + n_H \times 256$) × (horizontal or vertical motion unit)] from the left edge of the print area.

ESC % *n*

[Name] Select/cancel user-defined character set

[Format]

ASCII	ESC	%	*n*
Hex	1B	25	*n*
Decimal	27	37	*n*

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

[Default] $n = 0$

[Description]
- Selects or cancels the user-defined character set.
- When the LSB of *n* is 0, the user-defined character set is canceled.
- When the LSB of *n* is 1, the user-defined character set is selected.

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

[Name] Define user-defined characters

[Format]

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

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

[Description]
- Defines the user-defined character pattern for the specified character codes.
- *y* specifies the number of bytes in the vertical direction.
- *c1* specifies the beginning character code for the definition, and *c2* specifies the final code.
- *x* specifies the number of dots in the horizontal direction from the left edge.
- *d* specifies the defined data (column format).

[Note]
- User-defined characters and a downloaded bit image (**GS** ∗) cannot be defined simultaneously. When this command is executed, the downloaded bit image is deleted.

ESC (A *pL pH fn [parameter]*

[Name] Control buzzer (optional external buzzer)

[Description] Controls the optional external buzzer

- *pL*, *pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* (*fn* and *[parameter]*).
- *fn* specifies the function.
- *[parameters]* specify the process of the function.

fn	Format	Function number	Function
97	**ESC (A *pL pH fn n c***	Function 97	Sounds buzzer (sound pattern specified).

<Function 97> **ESC (A *pL pH fn n c*** (*fn*=97)

[Name] Sound buzzer (sound pattern specified) (optional external buzzer)

[Format]

ASCII	ESC	(	A	*pL*	*pH*	*fn*	*n*	*c*
Hex	1B	28	41	*pL*	*pH*	*fn*	*n*	*c*
Decimal	27	40	65	*pL*	*pH*	*fn*	*n*	*c*

[Range] (*pL* + *pH* × 256) = 3 (*pL*=3, *pH*=0)
fn = 97
1 ≤ *n* ≤ 7
0 ≤ *c* ≤ 255

[Description]

- Sounds a pattern specified by ***n*** the number of times specified by ***c***.

  When *c* = 0, repeats the specified sound pattern infinitely.

  If the cover is opened during sounding and a sound stop is requested by <Function 03> **DLE DC4**, the sound stops.

  Sound patterns are as follows:

Pattern name	***n***	X th sound	Sound pattern	
			Counter for making frequency	Sound time*
Pattern A	1	1st	777h (2093.005Hz)	3
		2nd	5EDh (2637.020Hz)	3
		3rd	4FCh (3135.963Hz)	3
		4th	3BCh (4186.009Hz)	3
Pattern B	2	1st	3BCh (4186.009Hz)	6
		2nd	4FCh (3135.963Hz)	6
		3rd	0h (0.000Hz)	0 (No setting)
		4th	0h (0.000Hz)	0 (No setting)
Pattern C	3	1st	4FCh (3135.963Hz)	3
		2nd	5EDh (2637.020Hz)	3
		3rd	4FCh (3135.963Hz)	6
		4th	777h (2093.005Hz)	3
Pattern D	4	1st	777h (2093.005Hz)	3
		2nd	6A7h (2349.318Hz)	2
		3rd	5EDh (2637.020Hz)	1
		4th	598h (2793.826Hz)	2

Pattern E	5	1st	3BCh (4186.009Hz)	3
		2nd	4FCh (3135.963Hz)	3
		3rd	5EDh (2637.020Hz)	3
		4th	777h (2093.005Hz)	3
Pattern for error	6	1st	3BCh (4186.009Hz)	1
		2nd	3F4h (3951.066Hz)	2
		3rd	470h (3520.000Hz)	1
		4th	4FCh (3135.963Hz)	2
Pattern for paper-end	7	1st	4FCh (3135.963Hz)	2
		2nd	0h (0.000Hz) (No sound)	1
		3rd	3F4h (3951.066Hz)	2
		4th	0h (0.000Hz) (No sound)	1

* Sound time units: 100ms

- When the buzzer has stopped sounding the pattern specified by ***n***, the printer transmits the buzzer sound end response as shown below to the host PC.

Data group of buzzer sound end response	Hex	Decimal	Data
(1) Header	37H	55	1 byte
(2) Identifier	54H	84	1 byte
(3) Data	30H	48	1 byte
(4) NUL	00H	0	1 byte

ESC * *m* n_L n_H *d1...dk*

[Name] Select bit-image mode

[Format]

ASCII	ESC	*	*m*	n_L	n_H	*d1...dk*
Hex	1B	2A	*m*	n_L	n_H	*d1...dk*
Decimal	27	42	*m*	n_L	n_H	*d1...dk*

[Range] $m = 0, 1, 32, 33$
$1 \le (n_L + n_H \times 256) \le 2047 \quad (0 \le n_L \le 255, 0 \le n_H \le 7)$
$0 \le d \le 255$
$k = n_L + n_H \times 256$ [when $m = 0, 1$]
$k = (n_L + n_H \times 256) \times 3$ [when $m = 32, 33$]

[Description]
- Stores the bit image data in the print buffer using the bit image mode specified by *m*.

m	Bit image mode	Vertical direction	Horizontal direction
0	8-dot single-density	180/3 dpi	180/2 dpi
1	8-dot double-density	180/3 dpi	180 dpi
32	24-dot single-density	180 dpi	180/2 dpi
33	24-dot double-density	180 dpi	180 dpi

- n_L, n_H specify the number of dots of the image data in the horizontal direction as ($n_L + n_H \times 256$).
- *d* specifies the bit image data (column format).

ESC – *n*

[Name] Turn underline mode on/off

[Format]

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

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

[Default] $n = 0$

[Description]
- Turns underline mode on or off.

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]
- Sets the line spacing to approximately 4.23 mm {30/180"}.

ESC 3 *n*

[Name] Set line spacing

[Format]

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

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

[Default] Equivalent to approximately 4.23 mm {30/180"}.

[Description]
- Sets the line spacing to [*n* × (vertical or horizontal motion unit)].

[Note]
- The maximum is 1016 mm {40"}.

ESC = *n*

[Name] Select peripheral device

[Format]

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

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

[Default] $n = 1$

[Description]
- Selects the device to which the host PC transmits data.

n	Function
1, 3	Enables printer.
2	Disables printer.

- When the printer is disabled (*n* = 2), all data except this command and the real-time commands are ignored.

ESC ? *n*

[Name] Cancel user-defined characters

[Format]

ASCII	ESC	?	*n*
Hex	1B	3F	*n*
Decimal	27	63	*n*

[Range] $32 \le n \le 126$

[Description]
- Deletes the user-defined character pattern specified by character code *n*.

ESC @

[Name] Initialize printer

[Format]

ASCII	ESC	@
Hex	1B	40
Decimal	27	64

[Description]
- Clears the data in the print buffer and resets the printer modes to the modes that were in effect when the power was turned on.
  Keeps the following data:
  - Macro definition data.
  - Contents stored in the NV user memory.
  - Contents defined for the NV graphics (NV bit image).
  - Maintenance counter value.
  - Setting values specified with the customized values (memory switches), **GS (E**.

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] $1 \le n1 \le n2 \le ... \le nk \le 255$
$0 \le k \le 32$

[Default] $n = 8, 16, 24, 32, 40, ..., 232, 240, 248$
[for Font A (12×24) in a standard character size width]

[Description]
- Sets horizontal tab positions.
  - *n* specifies the number of digits from the setting position to the left edge of the print area.
  - *k* is used to indicate the number of bytes set for the horizontal tab position.

ESC E *n*

[Name] Turn emphasized mode on/off

[Format]

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

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

[Default] $n = 0$

[Description]
- Turns emphasized mode on or off.
  - When the LSB of *n* is 0, turns off emphasized mode.
  - When the LSB of *n* is 1, turns on emphasized mode.

ESC G *n*

[Name] Turn double-strike mode on/off

[Format]

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

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

[Default] $n = 0$

[Description]
- Turns double-strike mode on or off.
- When the LSB of *n* is 0, turns off double-strike mode.
- When the LSB of *n* is 1, turns on double-strike mode.

ESC J *n*

[Name] Print and feed paper

[Format]

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

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

[Description]
- Prints the data in the print buffer and feeds the paper [$n \times$ (vertical or horizontal motion unit)].

[Note]
- The maximum paper feed amount is 1016 mm {40"}.

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] $n = 0, 1, 48, 49$

[Default] $n = 0$

[Description]
- Selects a character font.

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

[Note]
- When auto replacement of the font with the customized value, <Function 05> **GS (E** <a = 111, 112>, is set for the selected font, the font to be replaced is enabled.

[Reference] APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCHES)

ESC R *n*

[Name] Select an international character set

[Format]

ASCII	ESC	R	*n*
Hex	1B	52	*n*
Decimal	27	82	*n*

[Range] $0 \le n \le 17$

[Default] *n* = 0 [Except the following model]
n = 15 [Simplified Chinese model]
However, when the default of the international character set is changed with the customized value, <Function 05> **GS (E** <a=9>, the default value becomes the one specified by the customized value.

[Description]
- Selects an international character set.

n	International 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
14	Slovenia / Croatia
15	China
16	Vietnam
17	Arabia

[Reference] "3.2.45 International character sets", APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCHES)

ESC S

[Name] Select standard mode

[Format]

ASCII	ESC	S
Hex	1B	53
Decimal	27	83

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

ESC T *n*

[Name] Select print direction in page mode

[Format]

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

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

[Default] $n = 0$

[Description] • In page mode, selects the print direction and starting position.

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

ESC V *n*

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

[Format]

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

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

[Default] $n = 0$

[Description] • In standard mode, turns 90° clockwise rotation mode on or off for characters.

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

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

[Name] Set print 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]
$0 \le (x_L + x_H \times 256) \le 65535 \quad (0 \le x_L \le 255, 0 \le x_H \le 255)$
$0 \le (y_L + y_H \times 256) \le 65535 \quad (0 \le y_L \le 255, 0 \le y_H \le 255)$
$1 \le (dx_L + dx_H \times 256) \le 65535 \quad (0 \le dx_L \le 255, 0 \le dx_H \le 255)$
$1 \le (dy_L + dy_H \times 256) \le 65535 \quad (0 \le dy_L \le 255, 0 \le dy_H \le 255)$

[Default]
$(x_L + x_H \times 256) = 0 \quad (x_L = 0, x_H = 0)$
$(y_L + y_H \times 256) = 0 \quad (y_L = 0, y_H = 0)$
$(dx_L + dx_H \times 256) = 512 \quad (dx_L = 0, dx_H = 2)$ [When paper width is set to 80 mm]
$(dx_L + dx_H \times 256) = 360 \quad (dx_L = 104, dx_H = 1)$ [When paper width is set to 58 mm]
$(dy_L + dy_H \times 256) = 1662 \quad (dy_L = 126, dy_H = 6)$

[Description]
- In page mode, sets the size and the logical origin of the print area.
  - x_L, x_H specify the horizontal logical origin as $[(x_L + x_H \times 256) \times$ (horizontal motion unit)] from absolute origin.
  - y_L, y_H specify the vertical logical origin as $[(y_L + y_H \times 256) \times$ (vertical motion unit)] from absolute origin.
  - dx_L, dx_H specify the horizontal dimension of print area as $[(dx_L + dx_H \times 256) \times$ (horizontal motion unit)].
  - dy_L, dy_H specify the vertical dimension of print area as $[(dy_L + dy_H \times 256) \times$ (vertical motion unit)].

[Note]
- The vertical dimension of the print area can be set to 234.53 mm {3324/360"} 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]
$-32768 \le (n_L + n_H \times 256) \le 32767$

[Description]
- Moves the print position to $[(n_L + n_H \times 256) \times$ (horizontal or vertical motion unit)] from the current position.
  - A positive number specifies movement to the right, and a negative number specifies movement to the left.

ESC a *n*

[Name] Select justification

[Format]

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

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

[Default] $n = 0$

[Description] • In standard mode, aligns all the data in one line to the selected layout.

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

ESC c 3 *n*

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

[Format]

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

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

[Default] $n = 0$ [when DIP switch [SW 1-3] is on.]
$n = 15$ [when DIP switch [SW 1-3] is off.]

[Description] • Selects whether the paper sensor(s) to output paper end signals or not when a paper end is detected.

(*n*) Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Disables roll paper near-end sensor.
	On	01	1	Enables roll paper near-end sensor.
1	Off	00	0	Disables roll paper near-end sensor.
	On	02	2	Enables roll paper near-end sensor.
2	Off	00	0	Disables roll paper end sensor (paper sensor).
	On	04	4	Enables roll paper end sensor (paper sensor).
3	Off	00	0	Disables roll paper end sensor (paper sensor).
	On	08	8	Enables roll paper end sensor (paper sensor).
4 - 7	Off	00	0	Reserved.

[Note] • This command is enabled only with a parallel interface model.

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] $0 \le n \le 255$

[Default] $n = 0$

[Description]

- Selects the paper sensor(s) whether to use to stop printing or not when a paper end is detected.

(*n*) 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	Off	00	0	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] $0 \le n \le 255$

[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]

- This command affects the Feed button.
- The Feed button is disabled regardless of the settings with this command, when the cover is open.

ESC d *n*

[Name] Print and feed *n* lines

[Format]

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

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

[Description]

- Prints the data in the print buffer and feeds the paper [$n \times$ (current line spacing)].

[Note]

- The maximum paper feed amount is 1016 mm {40"}.

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

[Description]
- Outputs the pulse specified by *t1* and *t2* to the output pulse specified by *m*.
- With the model with an optional internal buzzer, the same pulse is output to the connector pin and the drive signal line of the optional internal buzzer.

m	Output pulse
0, 48	Drawer kick-out connector pin 2. [With optional internal buzzer] Drawer-kick connector pin 2 and optional internal buzzer drive signal line 1
1, 49	Drawer kick-out connector pin 5. [With optional internal buzzer] Drawer-kick connector pin 5 and optional internal buzzer drive signal line 2

- *t1* specifies the pulse on time as [*t1* × 2 ms].
- *t2* specifies the pulse off time as [*t2* × 2 ms].

[Note]
- Specify a value (*t1* < *t2*) so that the off time is longer than the on time.
- When the setting of “Enabling/disabling optional external buzzer” is enabled with the customized value, <Function 05> **GS (E** <a = 119>, a pulse is not output to both the drawer kick-out connector pin and the drive signal line of the optional internal buzzer; however, the optional external buzzer sounds.

  Note: For the sound pattern and the buzzer frequency for the optional external buzzer, follow the customized value setting, <Function 05> **GS (E** <a = 123 to 126>.

[Reference] APPENDIX F: NOTES ON USING THE DRAWER KICK-OUT CONNECTOR, "3.12 Optional Internal Buzzer (for Model with an Optional Internal Buzzer)", "3.13 Optional External Buzzer”, APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCHES)

ESC t *n*

[Name] Select character code table

[Format]

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

[Range] $0 \le n \le 5$, $11 \le n \le 21$, $n = 26$, $30 \le n \le 53$, $n = 255$

[Default] $n = 0$

However, when the default of the international character set is changed with the customized value, <Function 05> **GS (E** <a=8>, the default value becomes the one specified by the customized value.

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

n	Character code table
0	Page 0 [PC437 (USA: Standard Europe)]
1	Page 1 [Katakana]
2	Page 2 [PC850 (Multilingual)]
3	Page 3 [PC860 (Portuguese)]
4	Page 4 [PC863 (Canadian-French)
5	Page 5 [PC865 (Nordic)]
11	Page 11 [PC851 (Greek)]
12	Page 12 [PC853 (Turkish)]
13	Page 13 [PC857 (Turkish)]
14	Page 14 [PC737 (Greek)]
15	Page 15 [ISO8859-7 (Greek)]
16	Page 16 [WPC1252]
17	Page 17 [PC866 (Cyrillic #2)]
18	Page 18 [PC852 (Latin 2)]
19	Page 19 [PC858 (Euro)]
20	Page 20 [KU42]
21	Page 21 [TIS11 (Thai)]
26	Page 26 [TIS18 (Thai)]
30	Page 30 [TCVN-3 (Vietnamese)]
31	Page 31 [TCVN-3 (Vietnamese)]
32	Page 32 [PC720]]
33	Page 33 [WPC775]
34	Page 34 [PC855 (Cyrillic)]
35	Page 35 [PC861 (Icelandic)]
36	Page 36 [PC862 (Hebrew)]
37	Page 37 [PC864 (Arabic)]
38	Page 38 [PC869 (Greek)]
39	Page 39 [ISO8859-2 (Latin2)]
40	Page 40 [ISO8859-15 (Latin9)]
41	Page 41 [PC1098 (Farsi)]
42	Page 42 [PC1118 (Lithuanian)]
43	Page 43 [PC1119 (Lithuanian)]
44	Page 44 [PC1125 (Ukrainian)]

n	Character code table
45	Page 45 [WPC1250]
46	Page 46 [WPC1251]
47	Page 47 [WPC1253]
48	Page 48 [WPC1254]
49	Page 49 [WPC1255]
50	Page 50 [WPC1256]
51	Page 51 [WPC1257]
52	Page 52 [WPC1258]
53	Page 53 [KZ1048 (Kazakhstan)]
255	Page 255 [User-defined page]

[Reference] "3.2 Character Code Tables", APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCHES)

ESC { *n*

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

[Format]

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

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

[Default] $n = 0$

[Description]
- In standard mode, turns upside-down print mode on or off.
- When the LSB of *n* is 0, turns off upside-down print mode.
- When the LSB of *n* is 1, turns on upside-down print mode.

FS (E *pL pH fn [parameter]*

[Name] Group of commands for receipt enhancement control

[Description]
- Controls the user setting modes
  - *pL*, *pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* (*fn* and *[parameter]*).
  - *fn* specifies the function.
  - *[parameters]* specify the process of each function.

fn	Code	Function No.	Function name
60	**FS (E *pL pH fn m c d1 d2 d3***	Function 60	Cancel set values for top/bottom logo printing
61	**FS (E *pL pH fn m c***	Function 61	Transmit set values for top/bottom logo printing
62	**FS (E *pL pH fn m kc1 kc2 a n***	Function 62	Set top logo printing
63	**FS (E *pL pH fn m kc1 kc2 a***	Function 63	Set bottom logo printing
64	**FS (E *pL pH fn m*** **a1 n1 ... [ak nk]**	Function 64	Make extended settings for top/bottom logo printing
65	**FS (E *pL pH fn m a n***	Function 65	Enable/disable top/bottom logo printing

[Notes]
- Frequent write command executions by an NV memory write command may damage the NV memory. Therefore, it is recommended to limit using the commands to no more than 10 times a day.
- If the power is turned off or the printer is reset via an interface while this command is being executed, the printer may go into an abnormal condition. Be careful not to turn the power off or let the printer be reset via an interface while this command is being executed.
- While processing this command, the printer may become BUSY while writing the data to the NV memory and stops receiving data. Therefore, be sure not to transmit data from the host PC while the printer is BUSY.

<Function 60> **FS (E *pL pH fn m c d1 d2 d3*** (*fn*=60)

[Name] Cancel set values for top/bottom logo printing

[Format]

ASCII	FS	(	E	*pL*	*pH*	*fn*	*m c*	*d1*	*d2*	*d3*
Hex	1C	28	45	*pL*	*pH*	*fn*	*m c*	*d1*	*d2*	*d3*
Decimal	28	40	69	*pL*	*pH*	*fn*	*m c*	*d1*	*d2*	*d3*

[Range] (*pL* + *pH* × 256) = 6 (*pL*=6, *pH*=0)
fn = 60
m = 2
c = 48, 49
d1 = 67 (Character “C”)
d2 = 76 (Character “L”)
d3 = 82 (Character “R”)

[Description] • Cancels set values for top/bottom logo printing by specifying ***c***.

c	Function
48	Cancels setting set values for top logo printing.
49	Cancels setting set values for bottom logo printing.

After canceling set values for top/bottom logo printing, no settings remain for logo printing.

<Function 61> **FS (E *pL pH fn m c*** (*fn*=61)

[Name] Transmit set values for top/bottom logo printing

[Format]

ASCII	FS	(	E	*pL*	*pH*	*fn*	*m*	*c*
Hex	1C	28	45	*pL*	*pH*	*fn*	*m*	*c*
Decimal	28	40	69	*pL*	*pH*	*fn*	*m*	*c*

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)
fn = 61
m = 2
c = 48, 49, 50

[Description] • Transmits set values for top/bottom logo printing by specifying ***c***.

c	Function
48	Transmits set values for top logo printing.
49	Transmits set values for bottom logo printing.
50	Transmits extended set values for top/bottom logo printing.

• Data to be transmitted is as follows:

Data to be transmitted	Hex	Decimal	Data amount
(1) Header	37H	55	1 byte
(2) Extension	48H	72	1 byte
(3) Set values for top/bottom logo	See the next page.	See the next page.	0 to 11 bytes
(4) NUL	00H	0	1 byte

When c = 48 is specified.

(3) Set values for top logo	Hex	Decimal	Data amount
a) Fixed value (***m***)	32H	50	1 byte
b) Recognition of top logo/bottom logo	30H	48	1 byte
c) Fixed value	32H	50	0 or 1 byte
d) NV graphics key codes	20H to 7EH	32 to 126	0 or 2 bytes
e) Justification setting	30H to 32H	48 to 50	0 or 1 byte
f) Number of lines to be deleted	30H to 39H	48 to 57	0 to 3 bytes

When ***c*** = 49 is specified

(3) Set values for bottom logo	Hex	Decimal	Data amount
a) Fixed value (***m***)	32H	50	1 byte
b) Recognition of top logo/bottom logo	31H	49	1 byte
c) Fixed value	32H	50	0 or 1 byte
d) NV graphics key codes	20H to 7EH	32 to 126	0 or 2 bytes
e) Justification setting	30H to 32H	48 to 50	0 or 1 byte

When ***c*** = 50 is specified

(3) Set values for bottom logo	Hex	Decimal	Data amount
a) Fixed value (***m***)	32H	50	1 byte
b) Recognition of top logo/bottom logo	32H	50	1 byte
c) Fixed value	32H	50	1 byte
d) Prints the top logo while paper feeding to the cutting position.	30H, 31H	48, 49	1 byte
e) Prints the top logo at power-on.	30H, 31H	48, 49	1 byte
f) Prints the top logo when the roll paper cover is closed.	30H, 31H	48, 49	1 byte
g) Prints the top logo while clearing the buffer to recover from a recoverable error.	30H, 31H	48, 49	1 byte
h) Prints the top logo after paper feeding with the paper Feed button has finished.	30H, 31H	48, 49	1 byte

<Function 62> **FS (E *pL pH fn m kc1 kc2 a n*** (*fn*=62)

[Name] Set top logo printing

[Format]

ASCII	FS	(	E	*pL*	*pH*	*fn*	*m*	*kc1*	*kc2*	*a*	*n*
Hex	1C	28	45	*pL*	*pH*	*fn*	*m*	*kc1*	*kc2*	*a*	*n*
Decimal	28	40	69	*pL*	*pH*	*fn*	*m*	*kc1*	*kc2*	*a*	*n*

[Range] (*pL* + *pH* × 256) = 6 (*pL* = 6, *pH* = 0)
fn = 62
m = 2
32 ≤ *kc1* ≤ 126
32 ≤ *kc2* ≤ 126
48 ≤ *a* ≤ 50
0 ≤ *n* ≤ 255

[Description]
- Sets top logo key code, justification, and number of lines to be removed after top logo printing.
  - Associates key codes (*kc1, kc2*) of NV graphics to be printed as a top logo.
  - *a* specifies justification for top logo printing.

a	Function
48	Specifies left justification.
49	Specifies centering.
50	Specifies right justification.

- *n* specifies the number of lines to be removed after top logo printing.

[Notes]
- NV memory is used as the storage area for set values of top logo printing.

<Function 63> **FS (E *pL pH fn m kc1 kc2 a*** (*fn*=63)

[Name] Set bottom logo printing

[Format]

ASCII	FS	(	E	*pL*	*pH*	*fn*	*m*	*kc1*	*kc2*	*a*
Hex	1C	28	45	*pL*	*pH*	*fn*	*m*	*kc1*	*kc2*	*a*
Decimal	28	40	69	*pL*	*pH*	*fn*	*m*	*kc1*	*kc2*	*a*

[Range] (*pL* + *pH* × 256) = 5 (*pL* = 5, *pH* = 0)
fn = 63
m = 2
32 ≤ *kc1* ≤ 126
32 ≤ *kc2* ≤ 126
48 ≤ *a* ≤ 50

[Description]
- Sets bottom logo key code, and justification.
  - Associates key codes (*kc1, kc2*) of NV graphics to be printed as a bottom logo.
  - *a* specifies justification for bottom logo printing.

a	Function
48	Specifies left justification.
49	Specifies center justification
50	Specifies right justification.

[Notes]
- NV memory is used as the storage area for set values of bottom logo printing.

<Function 64> **FS (E *pL pH fn m a1 n1…[ak nk]*** (*fn*=64)

[Name] Make extended settings for top/bottom logo printing

[Format]

ASCII	FS	(	E	*pL*	*pH*	*fn*	*m*	*a1*	*n1 ... [ak*	*nk]*
Hex	1C	28	45	*pL*	*pH*	*fn*	*m*	*a1*	*n1 ... [ak*	*nk]*
Decimal	28	40	69	*pL*	*pH*	*fn*	*m*	*a1*	*n1 ... [ak*	*nk]*

[Range] $4 \le (pL + pH \times 256) \le 12$ (However, $(pL + pH \times 256) = 2 \times k + 2$: $4 \le pL \le 12$, $pH = 0$)
fn = 64
m = 2
a = 48, 64 to 67
n = 48, 49
$1 \le k \le 5$

[Default] *n* = 49 [when *a* = 48]
n = 48 [when *a* = 64]
n = 49 [when *a* = 65]
n = 49 [when *a* = 66]
n = 48 [when *a* = 67]

[Description]

- Makes extended settings for top/bottom logo printing.

a	Function
48	Prints the top logo while paper feeding to the cutting position.
64	Prints the top logo at power-on.
65	Prints the top logo when the roll paper cover is closed.
66	Prints the top logo while clearing the buffer to recover from a recoverable error.
67	Prints the top logo after paper feeding with the paper Feed button has finished.

- Extended settings when a = 1 to 3

n	Function
48	Disabled
49	Enabled

[Notes]

- NV memory is used as the storage area for set values (***n***).

<Function 65> **FS (E *pL pH fn m a n*** (*fn*=65)

[Name] Enable/disable top/bottom logo printing

[Format]

ASCII	FS	(	E	*pL*	*pH*	*fn*	*m*	*a*	*n*
Hex	1C	28	45	*pL*	*pH*	*fn*	*m*	*a*	*n*
Decimal	28	40	69	*pL*	*pH*	*fn*	*m*	*a*	*n*

[Range] (*pL* + *pH* × 256) = 4 (*pL*= 4, *pH* = 0)
fn = 65
m = 2
a = 48, 49
n = 48, 49

[Default] *n* = 48 [when *a* = 48]
n = 48 [when *a* = 49]

[Description]
- Specifies top/bottom logo printing by *a* and enables or disables top/bottom logo printing by *n.*
- Top/bottom logo printing specified by *a* is as follows:

a	Function
48	Specifies top logo printing.
49	Specifies bottom logo printing.

- Enabling/disabling setting specified by *n* is as follows:

n	Function
48	Enables.
49	Disables.

[Notes]
- Volatile memory is used as the storage area for set values (***n***).
- This command is used when changing the setting of “Logo printing enabled” set with <Function 64> **FS (E** to Disabled temporarily.

FS g 1 *m a1 a2 a3 a4 nL nH d1...dk* [obsolete command]

[Name] Write to NV user memory

[Format]

ASCII	FS	g	1	*m*	*a1*	*a2*	*a3*	*a4*	n_L	n_H	*d1...dk*
Hex	1C	67	31	*m*	*a1*	*a2*	*a3*	*a4*	n_L	n_H	*d1...dk*
Decimal	28	103	49	*m*	*a1*	*a2*	*a3*	*a4*	n_L	n_H	*d1...dk*

[Range] $m = 0$
$0 \le (a1 + a2 \times 256 + a3 \times 65536 + a4 \times 16777216) \le 1023$
$(0 \le a1 \le 255, 0 \le a2 \le 3, a3 = 0, a4 = 0)$
$1 \le (n_L + n_H \times 256) \le 1024 \quad (0 \le n_L \le 255, 0 \le n_H \le 4)$
$32 \le d \le 255$
$k = (n_L + n_H \times 256)$
The entire capacity size = 1KB.

[Description]
- Stores the data (*d1...dk*) in the area from ($a1 + a2 \times 256 + a3 \times 65536 + a4 \times 16777216$) to ($n_L + n_H \times 256$) bytes in the NV user memory.

[Notes]
- Frequent write command executions by an NV memory write command may damage the NV memory. Therefore, it is recommended to limit using the commands to no more than 10 times a day.
- If the power is turned off or the printer is reset via an interface while this command is being executed, the printer may go into an abnormal condition. Be careful not to turn the power off or let the printer be reset via an interface while this command is being executed.
- While processing this command, the printer may become BUSY while writing the data to the NV memory and stops receiving data. Therefore, be sure not to transmit data from the host PC while the printer is BUSY.

FS g 2 *m a1 a2 a3 a4 nL nH* [obsolete command]

[Name] Read from NV user memory

[Format]

ASCII	FS	g	2	*m*	*a1*	*a2*	*a3*	*a4*	n_L	n_H
Hex	1C	67	32	*m*	*a1*	*a2*	*a3*	*a4*	n_L	n_H
Decimal	28	103	50	*m*	*a1*	*a2*	*a3*	*a4*	n_L	n_H

[Range] $m = 0$
$0 \le (a1 + a2 \times 256 + a3 \times 65536 + a4 \times 16777216) \le 1023$
$(0 \le a1 \le 255, 0 \le a2 \le 3, a3 = 0, a4 = 0)$
$1 \le (n_L + n_H \times 256) \le 80 \quad (1 \le n_L \le 80, n_H = 0)$

[Description]
- Transmits the data in the area from ($a1 + a2 \times 256 + a3 \times 65536 + a4 \times 16777216$) to ($n_L + n_H \times 256$) bytes in the NV user memory.

[Note]
- When this command is transmitted, do not transmit subsequent data until the status is received.

GS ! *n*

[Name] Select character size

[Format]

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

[Range] $0 \le n \le 7$, $16 \le n \le 23$, $32 \le n \le 39$, $48 \le n \le 55$, $64 \le n \le 71$, $80 \le n \le 87$, $96 \le n \le 103$, $112 \le n \le 119$
($1 \le$ Enlargement in vertical direction ≤ 8, $1 \le$ Enlargement in horizontal direction ≤ 8)

[Default] $n = 0$

[Description]
- Selects character size (height magnification and width magnification).

(*n*) Bit	Off/On	Hex	Decimal	Function
0 - 2	See table [Height magnification].			Selects the height magnification.
3	Off	00	0	Reserved.
4 - 6	See table [Width magnification].			Selects the width magnification.
7	Off	00	0	Reserved.

[Height magnification]

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

[Width magnification]

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

GS $ *nL nH*

[Name] Set absolute vertical print position in page mode

[Format]

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

[Range] $0 \le (n_L + n_H \times 256) \le 65535$ $(0 \le n_L \le 255, 0 \le n_H \le 255)$

[Description]
- In page mode, moves the vertical print position to $[(n_L + n_H \times 256) \times$ (vertical or horizontal motion unit)] from the starting position set with **ESC T**.

GS (A *pL pH n m*

[Name] Execute test print

[Format]

ASCII	GS	(	A	*pL*	*pH*	*n*	*m*
Hex	1D	28	41	*pL*	*pH*	*n*	*m*
Decimal	29	40	65	*pL*	*pH*	*n*	*m*

[Range] $(p_L + p_H \times 256) = 2$ $(p_L = 2, p_H = 0)$
$0 \le n \le 2, 48 \le n \le 50$
$1 \le m \le 3, 49 \le m \le 51$

[Description]
- Executes a specified test print.
- p_L, p_H specify $(p_L + p_H \times 256)$ as the number of bytes after p_H (*n* and *m*).
- *n* specifies the paper used for the test print.

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

- *m* specifies a test pattern.

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

[Notes]
- The printer executes a software reset after processing this command.
- Clears the receive and print buffers.
- Resets all setting values in RAM (the print area, the character styles, and others) that were in effect at power on. (The data in the NV memory is not reset.)

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

[Name] Enable/disable real-time command

[Format]

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

[Range] $3 \le (p_L + p_H \times 256) \le 65535$ $(0 \le p_L \le 255, 0 \le p_H \le 255)$
m = 20
a = 1, 2
b = 0, 1, 48, 49

[Default] *b* = 1 [when *a* = 1]
b = 0 [when *a* = 2]

[Description]
- Enables or disables the real-time command specified by *a*.
- *pL*, *pH* specify ($p_L + p_H \times 256$) as the number of bytes after *pH* (*m* and *[a1 b1]...[ak bk]*).

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

[Note]
- If graphics data includes a data string matching **DLE DC4** (*fn* = 1 or 2), it is recommended to use this command in advance to disable the real-time commands.

GS (E *pL pH fn [parameters]*

[Name] Set user setup commands

[Description]
- Controls the user setting modes.
  - *pL*, *pH* specify (*pL* + *pH* ×256) as the number of bytes after *pH* (*fn* and *[parameters]*).
  - *fn* specifies the function.
  - *[parameters]* specify the process of each function.

fn	Format	Function No.	Function name
1	**GS (E *pL pH fn d1 d2***	1	Change into the user setting mode
2	**GS (E *pL pH fn d1 d2 d3***	2	End the user setting mode session
5	**GS (E *pL pH fn*** **[*a1 n1L n1H*] ... [*ak nkL nkH*]**	5	Set the customized setting values
6	**GS (E *pL pH fn a***	6	Transmit the customized setting values
11	**GS (E *pL pH fn a d1...dk***	11	Set the configuration item for the serial interface
12	**GS (E *pL pH fn a***	12	Transmit the configuration item for the serial interface
15	**GS (E *pL pH fn a d1...dk***	15	Set conditions for USB interface communication
16	**GS (E *pL pH fn a***	16	Transmit conditions for USB interface communication

[Notes]
- Frequent write command executions by an NV memory write command may damage the NV memory. Therefore, it is recommended to limit using the commands to no more than 10 times a day.
- If the power is turned off or the printer is reset via an interface while this command is being executed, the printer may go into an abnormal condition. Be careful not to turn the power off or let the printer be reset via an interface while this command is being executed.
- While processing this command, the printer may become BUSY while writing the data to the NV memory and stops receiving data. Therefore, be sure not to transmit data from the host PC while the printer is BUSY.
- When <Function 1, 6, 12, or 16> is transmitted, the data following must not be transmitted until the status is received.

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

[Name] Change into the user setting mode

[Format]

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

[Range] (*pL* + *pH* × 256) = 3 (*pL* = 3, *pH* = 0)
fn = 1
d1 = 73
d2 = 78

[Description]
- Enters the user setting mode and transmits a mode change notice.

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

[Name] End the user setting mode session

[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* × 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.
- Clears the receive and print buffers.
- Resets all setting values in RAM (the print area, the character styles, and others) that were in effect at power on. (The data in the NV memory are not reset.)

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

[Name] Set the customized setting values

[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 ≤ (pL + pH × 256) ≤ 65533 (0 ≤ *pL* ≤ 255, 0 ≤ *pH* ≤ 255)
fn = 5
a = 3, 5, 6, 8 ≤ a ≤ 10, 97 ≤ *a* ≤ 98, 100 ≤ *a* ≤ 105, 111 ≤ *a* ≤ 112, 117, 119 ≤ *a* ≤ 126
(*nL* + *nH* × 256) = 2, 6 (*nL* = 2,6 , *nH* = 0) [80-mm paper width model (when a = 3)]
(*nL* + *nH* × 256) = 2 (*nL* = 2, *nH* = 0) [58-mm paper width model (when a = 3)]
0 ≤ (*nL* + *nH* × 256) ≤ 6, (*nL* + *nH* × 256) = 100, 65530 ≤ (*nL* + *nH* × 256) ≤ 65535
(0 ≤ *nL* ≤ 6, *nH* = 0, *nL* = 100, *nH* = 0, 250 ≤ *nL* ≤ 255, *nH* = 255) [when *a* = 5]
1 ≤ (*nL* + *nH* × 256) ≤ 13 (1 ≤ *nL* ≤ 13, *nH* = 0) [when *a* = 6]
0 ≤ (*nL* + *nH* × 256) ≤ 5, 11 ≤ (*nL* + *nH* × 256) ≤ 21, (*nL* + *nH* × 256) = 26, 30 ≤ (*nL* + *nH* × 256) ≤ 53, (*nL* + *nH* × 256) = 255 (0 ≤ *nL* ≤ 5, 11 ≤ *nL* ≤ 21, *nL* = 26, 30 ≤ *nL* ≤ 53, *nL* = 255 , *nH* = 0) [when *a* = 8]
0 ≤ (*nL* + *nH* × 256) ≤ 17 (0 ≤ *nL* ≤ 17, *nH* =0) [when *a* = 9]
(*nL* + *nH* × 256) = 0, 1, 32 (*nL* = 0,1, 32, *nH* = 0) [when *a* = 10]
(*nL* + *nH* × 256) = 1, 2, 4 (*nL* = 1,2,4, *nH* = 0) [when *a* = 97]
(*nL* + *nH* × 256) = 0, 1, 2 (*nL* = 0, 1,2, *nH* = 0) [when *a* = 98]
(*nL* + *nH* × 256) = 0, 1 (*nL* = 0,1, *nH* = 0) [when *a* = 100]
(*nL* + *nH* × 256) = 0, 1 (*nL* = 0 1, *nH* = 0) [when *a* = 101]
(*nL* + *nH* × 256) = 0, 1 (*nL* = 0 1, *nH* = 0) [when *a* = 102]
(*nL* + *nH* × 256) = 0, 1, 2, 3 (*nL* = 0,1,2,3, *nH* = 0) [when *a* = 103]
(*nL* + *nH* × 256) = 0, 1, 2, 3 (*nL* = 0,1,2,3, *nH* = 0) [when *a* = 104]
(*nL* + *nH* × 256) = 0, 1, 2, 3 (*nL* = 0,1,2,3, *nH* = 0) [when *a* = 105]
(*nL* + *nH* × 256) = 0, 1, 48, 49 (*nL* = 0,1,48,49, *nH* =0) [when *a* = 111]
(*nL* + *nH* × 256) = 0, 1, 48, 49 (*nL* = 0,1,48,49 *nH* =0) [when *a* = 112]
0 ≤ (*nL* + *nH* × 256) ≤ 6, 65530 ≤ (*nL* + *nH* × 256) ≤ 65535 (0 ≤ *nL* ≤ 6, *nH* = 0, 250 ≤ *nL* ≤ 255, *nH* = 255) [when *a* = 117]
(*nL* + *nH* × 256) = 0, 1 (*nL* = 0, 1, *nH* = 0) [when *a* = 119]
(*nL* + *nH* × 256) = 0, 1, 65535 (0 ≤ *nL* ≤ 1, *nH* =0, *nL* = 255, *nH* = 255) [when *a* = 120]

$1 \le (nL + nH \times 256) \le 5$ ($1 \le nL \le 5$, $nH = 0$) [when *a* = 121, 123, 125]
$(nL + nH \times 256) = 0, 1$ ($nL = 0, 1$, $nH = 0$) [when *a* = 122, 124, 126]

[Default (upon shipment)]

$(nL + nH \times 256) = 6$ ($nL = 6$, $nH = 0$) [80-mm paper width model (when *a* = 3)]
$(nL + nH \times 256) = 2$ ($nL = 2$, $nH = 0$) [58-mm paper width model (when *a* = 3)]
$(nL + nH \times 256) = 100$ ($nL = 100$, $nH = 0$) [when *a* = 5]
$(nL + nH \times 256) = 13$ ($nL = 13$, $nH = 0$) [when *a* = 6]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 8]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 9 (other than the Simplified Chinese model)]
$(nL + nH \times 256) = 15$ ($nL = 15$, $nH = 0$) [when *a* = 9 (Simplified Chinese model)]
$(nL + nH \times 256) = 32$ ($nL = 32$, $nH = 0$) [when *a* = 10]
$(nL + nH \times 256) = 1$ ($nL = 1$, $nH = 0$) [when *a* = 97]
$(nL + nH \times 256) = 2$ ($nL = 2$, $nH = 0$) [when *a* = 98]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 100]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 101]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 102]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 103]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 104]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 105]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 111]
$(nL + nH \times 256) = 1$ ($nL = 1$, $nH = 0$) [when *a* = 112]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 117]
$(nL + nH \times 256) = 0$ ($nL = 0$, $nH = 0$) [when *a* = 119]
$(nL + nH \times 256) = 65535$ ($nL = 255$, $nH = 255$) [when *a* = 120]
$(nL + nH \times 256) = 1$ ($nL = 1$, $nH = 0$) [when *a* = 121, 123]
$(nL + nH \times 256) = 2$ ($nL = 2$, $nH = 0$) [when *a* = 125]
$(nL + nH \times 256) = 1$ ($nL = 1$, $nH = 0$) [when *a* = 122, 124, 126]

[Description] •Sets the customized value specified by *a* to the values specified by ($nL + nH \times 256$).

a	Type of customized value
3	Roll paper width
5	Print density
6	Print speed
8	Default character code table
9	Default international character
10	Selection of the interface
97	Number of divisions of thermal head energization
98	Power supply output
100	Paper autocutting after closing the roll paper cover
101	(ARP) Enabling/disabling reduction of excessive top margin
102	(ARP) Enabling/disabling reduction of excessive bottom margin
103	(ARP) Reduction ratio of line spacing
104	(ARP) Reduction ratio of line spacing where extra line feeds are included

105	(ARP) Reduction ratio of bar code height
111	Automatic replacement of Font A
112	Automatic replacement of Font B
117	Print density when printing in multi-tone
119	Buzzer function: Enabling/disabling optional external buzzer
120	Buzzer function: Buzzer frequency (Error) *1
121	Buzzer function: Sound pattern (Autocut) *1
122	Buzzer function: Buzzer frequency (Autocut) *1
123	Buzzer function: Sound pattern (Pulse 1) *1
124	Buzzer function: Buzzer frequency (Pulse 1) *1
125	Buzzer function: Sound pattern (Pulse 2) *1
126	Buzzer function: Buzzer frequency (Pulse 2) *1

(ARP = Automatic Reduction of Paper)

*1 The functions are enabled for the optional external buzzer.

• Print density setting (*a* = 5)

($n_L + n_H \times 256$)	Print density	
100	Density level depending on the DIP switch settings	
65530	Print density level 1	light
65531	Print density level 2	|
65532	Print density level 3	|
65533	Print density level 4	|
65534	Print density level 5	|
65535	Print density level 6	|
0	Print density level 7	standard
1	Print density level 8	|
2	Print density level 9	|
3	Print density level 10	|
4	Print density level 11	|
5	Print density level 12	|
6	Print density level 13	dark

• Print speed setting (*a* = 6)

($n_L + n_H \times 256$)	Print speed	
1	Print speed level 1	slow
2	Print speed level 2	|
3	Print speed level 3	|
4	Print speed level 4	|
5	Print speed level 5	|
6	Print speed level 6	|
7	Print speed level 7	|
8	Print speed level 8	|
9	Print speed level 9	|
10	Print speed level 10	|
11	Print speed level 11	|
12	Print speed level 12	|
13	Print speed level 13	fast

• Default character code table (When *a* = 8)
See (*n*) of the **ESC t** command to select character code table.

• Default international character (When *a* = 9)
See (*n*) of the **ESC R** command to select international character.

• Selection of the interface (When *a* = 10)

($n_L + n_H \times 256$)	Selection of the interface
0	Fixed to the UIB
1	Fixed to the built-in USB
32	Automatic switching between the UIB/Built-in USB

- Number of divisions of thermal head energization setting (a = 97)

($n_L + n_H \times 256$)	Number of divisions of thermal head energization
1	One-part energization
2	Two-part energization
4	Four-part energization

- Power supply output (a = 98)

($n_L + n_H \times 256$)	Power supply output		
0	Level 1	small	
1	Level 2	|	
2	Level 3	large	PS-180

- Paper autocutting after closing the roll paper cover (when a = 100)

($n_L + n_H \times 256$)	Paper autocutting after closing the roll paper cover
0	Disabled
1	Enabled

- (ARP) Enabling/disabling reduction of excessive top margin (when a = 101)

($n_L + n_H \times 256$)	Reduction of excessive top margin
0	Disabled
1	Enabled

- (ARP) Enabling/disabling reduction of excessive bottom margin (when a = 102)

($n_L + n_H \times 256$)	Reduction of excessive bottom margin
0	Disabled
1	Enabled

- (ARP) Reduction ratio of line spacing (when a = 103)

($n_L + n_H \times 256$)	Reduction ratio of line spacing
0	None
1	25% reduction
2	50% reduction
3	75% reduction

- (ARP) Reduction ratio of line spacing where extra line feeds are included (when a = 104)

($n_L + n_H \times 256$)	Reduction ratio of line spacing where extra line feeds are included
0	None
1	25% reduction
2	50% reduction
3	75% reduction

(ARP = Automatic Reduction of Paper)

- (ARP) Reduction ratio of bar code height (when *a* = 105)

($n_L + n_H \times 256$)	Reduction ratio of bar code height
0	None
1	25% reduction
2	50% reduction
3	75% reduction

- Automatic replacement of Font A (when *a* = 111)

($n_L + n_H \times 256$)	Automatic replacement of Font A
0, 48	Font A (Same as no replacement)
1, 49	Font B

- Automatic replacement of Font B (when *a* = 112)

($n_L + n_H \times 256$)	Automatic replacement of Font B
0, 48	Font A
1, 49	Font B (Same as no replacement)

- Pint density when printing in multi-tone (when *a* = 117)

($n_L + n_H \times 256$)	Print density	
65530	Print density level 1	light
65531	Print density level 2	|
65532	Print density level 3	|
65533	Print density level 4	|
65534	Print density level 5	|
65535	Print density level 6	|
0	Print density level 7	standard
1	Print density level 8	|
2	Print density level 9	|
3	Print density level 10	|
4	Print density level 11	|
5	Print density level 12	|
6	Print density level 13	dark

- Buzzer function: Enabling/disabling optional external buzzer (when *a* = 119)

($n_L + n_H \times 256$)	Enabling/disabling optional external buzzer
0	Disabled
1	Enabled

- Buzzer function: Buzzer frequency (Error) (when *a* = 120) (optional external buzzer)

($n_L + n_H \times 256$)	Buzzer frequency
0	No sound
1	1 time
65535	Continuous

- Buzzer function: Sound pattern (when *a* = 121, 123, 125) (optional external buzzer)

($n_L + n_H \times 256$)	Sound pattern
1	Pattern A
2	Pattern B
3	Pattern C
4	Pattern D
5	Pattern E

- Buzzer function: Buzzer frequency (when *a* = 122, 124, 126)
  (optional external buzzer)

($n_L + n_H \times 256$)	Buzzer frequency
0	No sound
1	1 time

[Reference] 3.3.4 Customized values

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

[Name] Transmit the customized setting values

[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] ($p_L + p_H \times 256) = 2$ ($p_L = 2$, $p_H = 0$)
fn = 6
a = 3, 5, 6, 8 ≤ *a* ≤ 10, 97 ≤ a ≤ 98, 100 ≤ a ≤ 105, 111 ≤ *a* ≤ 112, 117, 116 ≤ *a* ≤ 126

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

a	Type of customized value
3	Roll paper width
5	Print density
6	Print speed
8	Default character code table
9	Default international character
10	Selection of the interface
97	Number of divisions of thermal head energization
98	Power supply output
100	Paper autocutting when the roll paper cover is closed
101	(ARP) Enabling/disabling reduction of excessive top margin
102	(ARP) Enabling/disabling reduction of excessive bottom margin
103	(ARP) Reduction ratio of line spacing
104	(ARP) Reduction ratio of excessive line spacing
105	(ARP) Reduction ratio of bar code height
111	Automatic replacement of Font A
112	Automatic replacement of Font B
117	Print density when printing in multi-tone
119	Buzzer function: Enabling/disabling optional external buzzer
120	Buzzer function: Buzzer frequency (Error) *1
121	Buzzer function: Sound pattern (Autocut) *1
122	Buzzer function: Buzzer frequency (Autocut) *1
123	Buzzer function: Sound pattern (Pulse 1) *1
124	Buzzer function: Buzzer frequency (Pulse 1) *1
125	Buzzer function: Sound pattern (Pulse 2) *1
126	Buzzer function: Buzzer frequency (Pulse 2) *1

(ARP = Automatic Reduction of Paper)

*1 The functions are enabled for the optional external buzzer.

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

[Name] Set the configuration item for the serial interface

[Format]

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

[Range] $3 \le (p_L + p_H \times 256) \le 65535$ $(0 \le p_L \le 255, 0 \le p_H \le 255)$
fn = 11
a = 1
$48 \le d \le 57$

[Default (upon shipment)]
d1...dk = “38400”

[Description]
- Sets the configuration item for the serial interface specified by *a* to the values specified by *d*.

a	Configuration item
1	Transmission speed

- Transmission speed settings (*a* = 1)

d1...dk	Transmission speed
“2400”	2400 bps
“4800”	4800 bps
“9600”	9600 bps
“19200”	19200 bps
“38400”	38400 bps
“57600”	57600 bps
“115200”	115200 bps

[Note]
- The configuration item set by this function is enabled by executing **GS (E** <Function 2> or restarting the printer. Note that the host PC must be set to enable the printer to communicate with the host PC.

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

[Name] Transmit the configuration item for the serial interface

[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] $(p_L + p_H \times 256) = 2$ $(p_L = 2, p_H = 0)$
fn = 12
a = 1

[Description]
- Transmits the configuration item for the serial interface specified by *a*.

a	Configuration item
1	Transmission speed

<Function 15> **GS (E *pL pH fn a d1...dk*** (*fn*=15)

[Name] Set conditions for USB communication

[Format]

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

[Range] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
$fn = 15$
$a = 1$
$48 \le d \le 49$

[Description] • Transmits the set value of USB communication specified by *a*.

a	Configuration item
1	Class

• Class settings (*a* = 1)

d1	Class
48	Vendor class
49	Printer class

[Note] • The configuration item set by this function is enabled by executing <Function 2> **GS (E** or restarting the printer. Note that the host PC must be set to enable the printer to communicate with the host PC.

<Function 16> **GS (E *pL pH fn a*** (*fn*=16)

[Name] Transmit conditions for USB communication

[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] $(p_L + p_H \times 256) = 2$ $(p_L = 2, p_H = 0)$
$fn = 16$
$a = 1$

[Description] • Transmits the set value for USB communication specified by *a*.

a	Configuration item
1	Class

• Transmission data is as follows:

Transmission data	Hex	Decimal	Data
(1) Header	37H	55	1 byte
(2) Identifier	52H	82	1 byte
(3) Type of configuration item	30H ~ 39H	48 ~ 57	1 ~ 2 bytes
Separator	1FH	31	1 byte
(4) Set value	30H ~ 39H	48 ~ 57	1 byte
(5) NUL	00H	0	1 byte

GS (H *pL pH fn [parameters]*

[Name] Request transmission of response or status

[Description]
- Various processes are performed in response.
  - *pL*, *pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* (*fn* and *[parameters]*).
  - *fn* specifies the function.
  - *[parameters]* specify the process of each function.

fn	Format	Function No.	Function name
48	**GS (H *pL pH fn m d1 d2 d3 d4***	48	Set the process ID response.

[Note]
- Do not use this command in a system that uses the printer with the OPOS driver or the JavaPOS driver provided by Seiko Epson Corporation.

<Function 48> GS (H *pL pH fn m d1 d2 d3 d4* (*fn* = 48)

[Name] Set the process ID response

[Format]

ASCII	GS	(	H	*pL*	*pH*	*fn*	*m*	*d1*	*d2*	*d3*	*d4*
Hex	1D	28	48	*pL*	*pH*	*fn*	*m*	*d1*	*d2*	*d3*	*d4*
Decimal	29	40	72	*pL*	*pH*	*fn*	*m*	*d1*	*d2*	*d3*	*d4*

[Range] (*pL* + *pH* × 256) = 6 (*pL* =6, *pH* = 0)
fn = 48
m = 48
32 ≤ *d* ≤ 126

[Description]
- Saves the process ID specified by (*d1*, *d2*, *d3*, *d4*) for the data processed immediately before this function.

GS (K *pL pH fn [parameters]*

[Name] Select print control method(s)

[Description]
- Selects the print control methods.
  - *pL*, *pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* (*fn* and *[parameters]*).
  - *fn* specifies the function.
  - *[parameters]* specify the process of each function.

fn	Format	Function No.	Function name
50	**GS (K *pL pH fn m***	50	Select the print speed.
97	**GS (K *pL pH fn m***	97	Select the number of parts for the thermal head energization.

<Function 50> **GS (K *pL pH fn m*** (*fn* = 50)

[Name] Select the print speed

[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] ($p_L + p_H \times 256) = 2$ ($p_L = 2$, $p_H = 0$)
$fn = 50$
$0 \le m \le 13$, $48 \le m \le 57$

[Default] $m = 0$ (customized setting values of **GS (E** <Function 05: *a* = 6>)

[Description]
- Selects the print speed.

m	Print speed	
0, 48	Setting <Function 5> **GS (E** Customized values (*a* = 6)	
1, 49	Print speed level 1	slow
2, 50	Print speed level 2	|
3, 51	Print speed level 3	|
4, 52	Print speed level 4	|
5, 53	Print speed level 5	|
6, 54	Print speed level 6	|
7, 55	Print speed level 7	|
8, 56	Print speed level 8	|
9, 57	Print speed level 9	|
10	Print speed level 10	|
11	Print speed level 11	|
12	Print speed level 12	|
13	Print speed level 13	fast

[Reference] APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCHES)

<Function 97> **GS (K *pL pH fn m*** (*fn* = 97)

[Name] Select the number of parts for the thermal head energization

[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] ($p_L + p_H \times 256) = 2$ ($p_L = 2$, $p_H = 0$)
$fn = 97$
$0 \le m \le 2$, $48 \le m \le 50$, $m = 4, 52$

[Default] $m = 0$ (customized setting values of **GS (E** <Function 5: *a* = 97>)

[Description]
- Selects the number of parts for the thermal head energization.

m	Number of parts of energization
0, 48	Setting <Function 5> **GS (E** Customized values (*a* = 97)
1, 49	One-part energization
2, 50	Two-part energization
4, 52	Four-part energization

[Reference] APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCH)

GS (L *pL pH m fn [parameters]*
GS 8 L *p1 p2 p3 p4 m fn [parameters]*

[Name] Set 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, only **GS (L** is used for explanation.
  - Note that **GS (L** and **GS 8 L** have the same function.
  - If the *[parameters]* in the Format column in the table below exceed 65533 bytes, use **GS 8 L**.
- The only differences between **GS (L** and **GS 8 L** are as listed below. The format for **GS 8 L** is not provided in the following descriptions; however, [Range], [Default], [Description], and [Notes] for parameters other than those listed in the table below are the same as for **GS (L**.

<Parameters specifying the number of parameters after *pH* or *p4*>

Command	Parameters	Structure	Maximum value
GS (L	*pL*, *pH*	2 bytes	65,535
GS 8 L	*p1*, *p2*, *p3*, *p4*	4 bytes	4,294,967,295

[Description]
- Processes graphics data.
  - *pL*, *pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* (*m*, *fn*, and *[parameters]*).
  - *fn* specifies the function.
  - *[parameters]* specify the process of each function.

fn	Format	Function No.	Function name
0, 48	**GS (L *pL pH m fn***	48	Transmit the NV graphics memory capacity
2, 50	**GS (L *pL pH m fn***	50	Print the graphics data in the print buffer
3, 51	**GS (L *pL pH m fn***	51	Transmit the remaining capacity of the NV graphics memory
4, 52	**GS (L *pL pH m fn***	52	Transmit the remaining capacity of the download graphics memory
64	**GS (L *pL pH m fn d1 d2***	64	Transmit the key code list for defined NV graphics
65	**GS (L *pL pH m fn d1 d2 d3***	65	Delete all NV graphics data
66	**GS (L *pL pH m fn kc1 kc2***	66	Delete 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***	67	Define the NV graphics data (raster format)
69	**GS (L *pL pH m fn a kc1 kc2 b x y***	69	Print the specified NV graphics data
80	**GS (L *pL pH m fn d1 d2***	80	Transmit the key code list for defined download graphics
81	**GS (L *pL pH m fn d1 d2 d3***	81	Delete all download graphics data

fn	Format	Function No.	Function name
82	**GS (L *pL pH m fn kc1 kc2***	82	Delete the specified download graphics data
83	**GS (L *pL pH m fn a kc1 kc2 b xL xH yL yH [c d1...dk]1... [c d1...dk]b***	83	Define the download graphics data (raster format)
85	**GS (L *pL pH m fn a kc1 kc2 b x y***	85	Print the specified download graphics data
112	**GS (L *pL pH m fn a bx by c xL xH yL yH d1…dk***	112	Store the graphics data in the print buffer (raster format)

[Notes]

- Frequent write command executions by an NV memory write command may damage the NV memory. Therefore, it is recommended to limit using the commands to no more than 10 times a day.
- If the power is turned off or the printer is reset via an interface while this command is being executed, the printer may go into an abnormal condition. Be careful not to turn the power off or let the printer be reset via an interface while this command is being executed.
- While processing this command, the printer may become BUSY while writing the data to the NV memory and stops receiving data. Therefore, be sure not to transmit data from the host PC while the printer is BUSY.
- When <Function 48, 51, 64, or 80> is transmitted, do not transmit subsequent data until the status is received. ESC/POS Handshaking Protocol procedures are required when using <Function 64>.

<Function 48> **GS (L *pL pH m fn*** (*fn* = 0, 48)

[Name] Transmit the NV graphics memory capacity

[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] ($p_L + p_H \times 256$) = 2 (p_L = 2, p_H = 0)
m = 48
fn = 0, 48

[Description]
- Transmits the entire capacity of the NV graphics area (number of bytes in the NV graphics area).

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

[Name] Print the graphics data in the print buffer

[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] ($p_L + p_H \times 256$) = 2 (p_L = 2, p_H = 0)
m = 48
fn = 2, 50

[Description]
- Prints the buffered graphics data stored by processing of **GS (L** <Function 112>.

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

[Name] Transmit the remaining capacity of the NV graphics memory

[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] ($p_L + p_H \times 256$) = 2 (p_L = 2, p_H = 0)
m = 48
fn = 3, 51

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

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

[Name] Transmit the remaining capacity of the download graphics memory

[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] ($p_L + p_H \times 256$) = 2 (p_L = 2, p_H = 0)
m = 48
fn = 4, 52

[Description]
- Transmits the number of bytes of remaining memory (unused area) in the download graphics area.

<Function 64> **GS (L *pL pH m fn d1 d2*** (*fn* = 64)

[Name] Transmit the key code list for defined NV graphics

[Format]

ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*d1*	*d2*
Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*d1*	*d2*
Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*d1*	*d2*

[Range] ($p_L + p_H \times 256$) = 4 (p_L = 4, p_H = 0)
m = 48
fn = 64
d1 = 75
d2 = 67

[Description]
- Transmits the key code list for defined NV graphics.

<Function 65> **GS (L *pL pH m fn d1 d2 d3*** (*fn* = 65)

[Name] Delete all NV graphics data

[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] ($p_L + p_H \times 256$) = 5 (p_L = 5, p_H = 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)

[Name] Delete the specified NV graphics data

[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] ($p_L + p_H \times 256$) = 4 (p_L = 4, p_H = 0)
m = 48
fn = 66
$32 \le kc1 \le 126$
$32 \le kc2 \le 126$

[Description]
- Deletes the NV graphics data defined by the key codes (*kc1* and *kc2*).

<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)

[Name] Define the NV graphics data (raster format)

[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] (*pL*, *pH*) for **GS (L**:

$12 \le (p_L + p_H \times 256) \le 65535 \quad (0 \le p_L \le 255, 0 \le p_H \le 255)$

(*p1*, *p2*, *p3*, *p4*) for **GS 8 L**:

$12 \le (p1 + p2 \times 256 + p3 \times 65536 + p4 \times 16777216) \le 4294967295$

$(0 \le p1 \le 255, 0 \le p2 \le 255, 0 \le p3 \le 255, 0 \le p4 \le 255)$

Common parameters for **GS (L** and **GS 8 L**:

$m = 48$

$fn = 67$

$a = 48, 52$

$32 \le kc1 \le 126$

$32 \le kc2 \le 126$

$b = 1$ (when $a = 48$)

$1 \le b \le 4$ (when $a = 52$)

$1 \le (x_L + x_H \times 256) \le 8192 \quad (0 \le x_L \le 255, 0 \le x_H \le 32)$

$1 \le (y_L + y_H \times 256) \le 2304 \quad (0 \le y_L \le 255, 0 \le y_H \le 9)$

$c = 49$ (when $a = 48$)

$49 \le c \le 52$ (when $a = 52$)

$0 \le d \le 255$

$k = (\text{int}((x_L + x_H \times 256) + 7) / 8) \times (y_L + y_H \times 256)$

The entire capacity size = 256 KB maximum.

[Description]

- Defines the NV graphics data (raster format) as a record specified by the key codes (*kc1*, *kc2*) in the NV graphics area.
- *a* specifies the data format of the defined data.

a	Data format
48	Monochrome (digital)
52	Multi-tone

- *b* specifies the number of the color of the defined data.
  - The number of the selectable color (*b*) is 1 when *a* = 48 (monochrome).
  - The number of the selectable color (*b*) is 1 ~ 4 when *a* = 52 (multi-tone).
- *xL*, *xH* specify the number of dots in the horizontal direction as ($x_L + x_H \times 256$).
- *yL*, *yH* specify the number of dots in the vertical direction as ($y_L + y_H \times 256$).
- *c* specifies the color of the defined data.

c	Defined data color
49	Color 1
50	Color 2
51	Color 3
52	Color 4

- The color of the selectable defined data (*c*) is Color 1 when *a* = 48 (monochrome).
- The colors of the selectable defined data (*c*) are Color 1 ~ Color 4 when *a* = 52 (multi-tone).
- *d* specifies the defined data (raster format).

[Notes]
- In cases where sufficient capacity is not available for storing NV graphics data specified by ($x_L + x_H \times 256$) and ($y_L + y_H \times 256$), this function is ignored.
- The number of items of NV graphics registered should be within 50 to shorten the execution time of this function. The execution time is 60 seconds or less when the number of items registered is within 50. The execution time for 100 items is 120 seconds or less.
- The [data value (*k*) + control information data value (24 bytes)] area of the NV graphics data domain is used when this function is executed.
- NV graphics and NV bit image (**FS q**) cannot be defined simultaneously. When this function is executed, all NV bit images are deleted.

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

[Name] Print the specified NV graphics data

[Format]

ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*
Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*
Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*

[Range] ($p_L + p_H \times 256$) = 6 (p_L = 6, p_H = 0)
m = 48
fn = 69
32 ≤ *kc1* ≤ 126
32 ≤ *kc2* ≤ 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.

x, *y*	Vertical direction	Horizontal direction
1	180 dpi	180 dpi
2	180/2 dpi	180/2 dpi

<Function 80> **GS (L *pL pH m fn d1 d2*** (*fn* = 80)

[Name] Transmit the key code list for defined download graphics

[Format]

ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*d1*	*d2*
Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*d1*	*d2*
Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*d1*	*d2*

[Range] ($p_L + p_H \times 256$) = 4 (p_L = 4, p_H = 0)
m = 48
fn = 80
d1 = 75
d2 = 67

[Description]
- Transmits the key code list for defined download graphics.

<Function 81> **GS (L *pL pH m fn d1 d2 d3*** (*fn* = 81)

[Name] Delete all download graphics data

[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] ($p_L + p_H \times 256) = 5$ ($p_L = 5, p_H = 0$)
$m = 48$
$fn = 81$
$d1 = 67$
$d2 = 76$
$d3 = 82$

[Description]
- Deletes all defined download graphics data.

<Function 82> **GS (L *pL pH m fn kc1 kc2*** (*fn* = 82)

[Name] Delete the specified download graphics data

[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] ($p_L + p_H \times 256) = 4$ ($p_L = 4, p_H = 0$)
$m = 48$
$fn = 82$
$32 \le kc1 \le 126$
$32 \le kc2 \le 126$

[Description]
- Deletes the download graphics data defined by the key codes (*kc1* and *kc2*).

<Function 83>

GS (L *pL pH m fn a kc1 kc2 b xL xH yL yH [c d1…dk]1…[c d1....dk]b* (*fn* = 83)

[Name] Define the download graphics data (raster format)

[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]

(*pL*, *pH*) for **GS (L**:

$12 \le (p_L + p_H \times 256) \le 65535 \quad (0 \le p_L \le 255, 0 \le p_H \le 255)$

(*p1*, *p2*, *p3*, *p4*) for **GS 8 L**:

$12 \le (p1 + p2 \times 256 + p3 \times 65536 + p4 \times 16777216) \le 4294967295$

$(0 \le p1 \le 255, 0 \le p2 \le 255, 0 \le p3 \le 255, 0 \le p4 \le 255)$

Common parameters for **GS (L** and **GS 8 L**:

$m = 48$

$fn = 83$

$a = 48, 52$

$32 \le kc1 \le 126$

$32 \le kc2 \le 126$

$b = 1$ (when $a = 48$)

$1 \le b \le 4$ (when $a = 52$)

$1 \le (x_L + x_H \times 256) \le 8192 \quad (0 \le x_L \le 255, 0 \le x_H \le 32)$

$1 \le (y_L + y_H \times 256) \le 2304 \quad (0 \le y_L \le 255, 0 \le y_H \le 9)$

$c = 49$ (when $a = 48$)

$49 \le c \le 52$ (when $a = 52$)

$0 \le d \le 255$

$k = (\text{int}((x_L + x_H \times 256) + 7) / 8) \times (y_L + y_H \times 256)$

The entire capacity size = 256 KB maximum.

[Description]

- Defines the download graphics data (raster format) as a record specified by the key codes (*kc1*, *kc2*) in the download graphics area.
- *a* specifies the data format of the defined data.

a	Data format
48	Monochrome (digital)
52	Multi-tone

- *b* specifies the number of the color of the defined data.
  - The number of the selectable color (*b*) is 1 when *a* = 48 (monochrome).
  - The number of the selectable color (*b*) is 1 ~ 4 when *a* = 52 (multi-tone).
- *xL*, *xH* specify the number of dots in the horizontal direction as ($x_L + x_H \times 256$).
- *yL*, *yH* specify the number of dots in the vertical direction as ($y_L + y_H \times 256$).
- *c* specifies the color of the defined data.

c	Defined data color
49	Color 1
50	Color 2
51	Color 3
52	Color 4

  - The color of the selectable defined data (*c*) is Color 1 when *a* = 48 (monochrome).
  - The colors of the selectable defined data (*c*) are Color 1 ~ Color 4 when *a* = 52 (multi-tone).
- *d* specifies the defined data (raster format).

[Notes]
- In cases where sufficient capacity is not available for storing download graphics data specified by ($x_L + x_H \times 256$) and ($y_L + y_H \times 256$), this function is ignored.
- The [data value (k) + control information data value (16 bytes)] area of the download graphics data domain is used when this function is executed.

<Function 85> **GS (L *pL pH m fn kc1 kc2 x y*** (fn = 85)

[Name] Print the specified download graphics data

[Format]

ASCII	GS	(	L	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*
Hex	1D	28	4C	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*
Decimal	29	40	76	*pL*	*pH*	*m*	*fn*	*kc1*	*kc2*	*x*	*y*

[Range]
($p_L + p_H \times 256$) = 6 (p_L = 6, p_H = 0)
m = 48
fn = 85
$32 \le kc1 \le 126$
$32 \le kc2 \le 126$
x = 1, 2
y = 1, 2

[Description]
- Prints the download 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.

x, y	Vertical direction	Horizontal direction
1	180 dpi	180 dpi
2	180/2 dpi	180/2 dpi

<Function 112> **GS (L *pL pH m fn a bx by c xL xH yL yH d1...dk*** (*fn* = 112)

[Name] Store the graphics data in the print buffer (raster format)

[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]

(*pL*, *pH*) for **GS (L**:

$11 \le (pL + pH \times 256) \le 65535 \quad (0 \le pL \le 255, 0 \le pH \le 255)$

(*p1*, *p2*, *p3*, *p4*) for **GS 8 L**:

$11 \le (p1 + p2 \times 256 + p3 \times 65536 + p4 \times 16777216) \le 4294967295$

$(0 \le p1 \le 255, 0 \le p2 \le 255, 0 \le p3 \le 255, 0 \le p4 \le 255)$

Common parameters for **GS (L** and **GS 8 L**:

m = 48

fn = 112

a = 48, 52

bx = 1, 2

by = 1, 2

c = 49 (when *a* = 48)

$49 \le c \le 52$ (when *a* = 52)

$1 \le (xL + xH \times 256) \le 2047 \quad (0 \le xL \le 255, 0 \le xH \le 7)$

$1 \le (yL + yH \times 256) \le 1662 \quad (0 \le yL \le 255, 0 \le yH \le 6)$ [when *a* = 48, *by*=1]

$1 \le (yL + yH \times 256) \le 831 \quad (0 \le yL \le 255, 0 \le yH \le 3)$ [when *a* = 48, *by*=2]

$1 \le (yL + yH \times 256) \le 415 \quad (0 \le yL \le 255, 0 \le yH \le 1)$ [when *a* = 52, *by*=1]

$1 \le (yL + yH \times 256) \le 207 \quad (0 \le yL \le 207, yH = 0)$ [when *a* = 52, *by*=2]

$0 \le d \le 255$

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

[Description]

- Stores the graphics data (raster format) in the print buffer.
- The graphics data is enlarged by *bx* and *by* in the horizontal and vertical directions.

bx, *by*	Vertical direction	Horizontal direction
1	180 dpi	180 dpi
2	180/2 dpi	180/2 dpi

- *a* specifies the data format of the stored data.

a	Data format
48	Monochrome (digital)
52	Multi-tone

- *c* specifies the color of the stored data.

c	Stored data color
49	Color 1
50	Color 2
51	Color 3
52	Color 4

  - The color of the selectable stored data (*c*) is Color 1 when *a* = 48 (monochrome).
  - The colors of the selectable stored data (*c*) are Color 1 ~ Color 4 when *a* = 52 (multi-tone).
- *xL*, *xH* specify the number of dots in the horizontal direction as $(xL + xH \times 256)$.
- *yL*, *yH* specify the number of dots in the vertical direction as $(yL + yH \times 256)$.
- *d* specifies the stored data (raster format).

GS (k *pL pH cn fn [parameters]*

[Name] Set up and print symbol

[Description]
- Processes the data for symbols.
- *pL*, *pH* specify (*pL* + *pH* × 256) as the number of bytes after *pH* (*cn*, *fn*, and *[parameters]*).
- *cn* specifies the type of symbol.
- *fn* specifies the function.
- *[parameters]* specify the process of each function.

cn	Type of symbol
48	PDF417 (two-dimensional symbols)
49	QR Code (two-dimensional symbols)
50	MaxiCode (two-dimensional symbols)
51	Two-dimensional GS1 DataBar (GS1 DataBar Stacked, GS1 DataBar Stacked Omnidirectional,GS1 DataBar Expanded Stacked)
52	Composite Symbology (two-dimensional symbols)

cn	*fn*	Format	Function No.	Function name
48	65	**GS (k *pL pH cn fn n***	065	PDF417: Set the number of columns in the data region.
	66	**GS (k *pL pH cn fn n***	066	PDF417: Set the number of rows.
	67	**GS (k *pL pH cn fn n***	067	PDF417: Set the width of the module.
	68	**GS (k *pL pH cn fn n***	068	PDF417: Set the row height.
	69	**GS (k *pL pH cn fn m n***	069	PDF417: Set the error correction level.
	70	**GS (k *pL pH cn fn m***	070	PDF417: Select the options.
	80	**GS (k *pL pH cn fn m d1...dk***	080	PDF417: Store the data in the symbol storage area.
	81	**GS (k *pL pH cn fn m***	081	PDF417: Print the symbol data in the symbol storage area.
	82	**GS (k *pL pH cn fn m***	082	PDF417: Transmit the size information of the symbol data in the symbol storage area.
49	65	**GS (k *pL pH cn fn n1 n2***	165	QR Code: Select the model.
	67	**GS (k *pL pH cn fn n***	167	QR Code: Set the size of module.
	69	**GS (k *pL pH cn fn n***	169	QR Code: Select the error correction level.
	80	**GS (k *pL pH cn fn m d1...dk***	180	QR Code: Store the data into the symbol storage area.
	81	**GS (k *pL pH cn fn m***	181	QR Code: Print the symbol data in the symbol storage area.
	82	**GS (k *pL pH cn fn m***	182	QR Code: Transmit the size information of the symbol data in the symbol storage area.

cn	*fn*	Format	Function No.	Function name
50	65	**GS (k** *pL pH cn fn n*	265	MaxiCode: Select mode
	80	**GS (k** *pL pH cn fn m d1...dk*	280	MaxiCode: Store data in the symbol storage area
	81	**GS (k** *pL pH cn fn m*	281	MaxiCode: Print data in the symbol storage area
	82	**GS (k** *pL pH cn fn m*	282	MaxiCode: Transmit size information of data in the symbol storage area
51	67	**GS (k** *pL pH cn fn n*	367	2-dimensional GS1 DataBar: Set module width
	71	**GS (k** *pL pH cn fn nL nH*	371	2-dimensional GS1 DataBar: Set the maximum width of GS1 DataBar Expanded Stacked
	80	**GS (k** *pL pH cn fn m n d1...dk*	380	2-dimensional GS1 DataBar: Store data in the symbol storage area
	81	**GS (k** *pL pH cn fn m*	381	2-dimensional GS1 DataBar: Print data in the symbol storage area
	82	**GS (k** *pL pH cn fn m*	382	2-dimensional GS1 DataBar: Transmit size information of data in the symbol storage area
52	67	**GS (k** *pL pH cn fn n*	467	Composite Symbology: Set module width
	71	**GS (k** *pL pH cn fn nL nH*	471	Composite Symbology: Set the maximum width of GS1 DataBar Expanded Stacked
	72	**GS (k** *pL pH cn fn n*	472	Composite Symbology: Select HRI character font
	80	**GS (k** *pL pH cn fn m a b d1...dk*	480	Composite Symbology: Store data in the symbol storage area
	81	**GS (k** *pL pH cn fn m*	481	Composite Symbology: Print data in the symbol storage area
	82	**GS (k** *pL pH cn fn m*	482	Composite Symbology: Transmit size information of symbol data in the symbol storage area

- "Symbol data" means the data received with <Function 080, 180, 280, 380, or 480> before encoding.
- "Symbol storage area" means the area where the data received with <Function 080, 180, 280, 380, or 480> before encoding is stored.

[Notes]
- When <Function 082, 182, 282, 382, or 482> is transmitted, do not transmit subsequent data until the status is received.

[Reference] APPENDIX H: NOTES ON PRINTING 2-DIMENSIONAL SYMBOLS,
APPENDIX I: NOTES ON SCANNING THE PRINT RESULT ON THE RECEIPT

<Function 065> **GS (k *pL pH cn fn n*** (*cn* = 48, *fn* = 65)

[Name] PDF417: Set the number of columns in the data region

[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] ($p_L + p_H \times 256$) = 3 (p_L = 3, p_H = 0)
cn = 48
fn = 65
$0 \le n \le 30$

[Default] *n* = 0

[Description]
- Sets the number of columns in the data region for PDF417.
  - When *n* = 0, specifies automatic processing. In this case, the number of columns in the data region is calculated from the number of codewords or the range of the print area.
  - When $n \neq 0$, sets the number of columns in the data region to *n* codewords:

[Notes]
- The following data is not included in the number of columns.
  - Start pattern and stop pattern
  - Left-row indicator codewords and right-row indicator codewords

<Function 066> **GS (k *pL pH cn fn n*** (*cn* = 48, *fn* = 66)

[Name] PDF417: Set the number of rows

[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] ($p_L + p_H \times 256$) = 3 (p_L = 3, p_H = 0)
cn = 48
fn = 66
n = 0, $3 \le n \le 90$

[Default] *n* = 0

[Description]
- Sets the number of rows for PDF417.
  - When *n* = 0, specifies automatic processing. In this case, the number of rows in the data region is calculated from the number of codewords or the range of the print area.
  - When $n \neq 0$, sets the number of rows to *n* rows.

<Function 067> **GS (k *pL pH cn fn n*** (*cn* = 48, *fn* = 67)

[Name] PDF417: Set the width of the module

[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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
$cn = 48$
$fn = 67$
$2 \le n \le 8$

[Default] $n = 3$

[Description]
- Sets the width of the module for PDF417 to *n* dots.

<Function 068> **GS (k *pL pH cn fn n*** (*cn* = 48, *fn* = 68)

[Name] PDF417: Set the row height

[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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
$cn = 48$
$fn = 68$
$2 \le n \le 8$

[Default] $n = 3$

[Description]
- Sets the row height for PDF417 to [*n* × (the width of the module)].

<Function 069> **GS (k *pL pH cn fn m n*** (*cn* = 48, *fn* = 69)

[Name] PDF417: Set the error correction level

[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] ($p_L + p_H \times 256) = 4$ ($p_L = 4$, $p_H = 0$)
cn = 48
fn = 69
m = 48, 49
$48 \le n \le 56$ [when *m* = 48]
$1 \le n \le 40$ [when *m* = 49]

[Default] *m* = 49, *n* = 1

[Description]
- Sets the error correction level for PDF417.
- When *m* = 48, the error correction level is set by the "Level Setting" and the error correction level set by "Ratio Setting" is canceled. The number of error correction codewords are as follows:

n	Function	Number of error correction codewords
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 by the "Ratio Setting" to the level indicated by the number for encoded data, and the error correction level set by the "Level Setting" is canceled. The rate is set to [$n \times 10\%$].

  The error correction levels in the following table are determined by the calculation [Data codeword $\times n \times 0.1$ = (A)] (Fractions of 0.5 and over are rounded up, and others are truncated.)

Result (A)	Use the error correction level	Number of error correction codeword
0 to 3	Error correction level 1	4
4 to 10	Error correction level 2	8
11 to 20	Error correction level 3	16
21 to 45	Error correction level 4	32
46 to 100	Error correction level 5	64
101 to 200	Error correction level 6	128
201 to 400	Error correction level 7	256
401 or more	Error correction level 8	512

<Function 070> **GS (k *pL pH cn fn m*** (*cn* = 48, *fn* = 70)

[Name] PDF417: Select the options

[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] ($p_L + p_H \times 256) = 3$ ($p_L = 3, p_H = 0$)
cn = 48
fn = 70
m = 0, 1

[Default] *m* = 0

[Description]
- Selects the options for PDF417.

m	Function
0	Selects the standard PDF417.
1	Selects the truncated PDF417.

<Function 080> **GS (k *pL pH cn fn m d1…dk*** (*cn* = 48, *fn* = 80)

[Name] PDF417: Store the data in the symbol storage area

[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] $4 \le (p_L + p_H \times 256) \le 65535$ ($0 \le p_L \le 255, 0 \le p_H \le 255$)
cn = 48
fn = 80
m = 48
$0 \le d \le 255$
$k = (p_L + p_H \times 256) - 3$

[Description]
- Stores the PDF417 symbol data (*d1...dk*) in the symbol storage area.

<Function 081> **GS (k *pL pH cn fn m*** (*cn* = 48, *fn* = 81)

[Name] PDF417: Print the symbol data in the symbol storage area

[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] ($p_L + p_H \times 256) = 3$ ($p_L = 3, p_H = 0$)
cn = 48
fn = 81
m = 48

[Description]
- Encodes and prints the PDF417 symbol data in the symbol storage area with **GS (k** <Function 080>.

[Notes]
- User must secure the quiet zone (left, right, upward, and downward space areas defined by the PDF417 symbol specifications) for PDF417 printing.
- In standard mode, symbols higher than 831 dots cannot be printed with this printer.

<Function 082> **GS (k *pL pH cn fn m*** (*cn* = 48, *fn* = 82)

[Name] PDF417: Transmit the size information of the symbol data in the symbol storage area

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

[Description]
- Transmits the size information for the encoded PDF417 symbol data in the symbol storage area with **GS (k** <Function 080>.

[Notes]
- This function does not print.
- The size information does not include the quiet zone (left, right, upward, and downward space areas defined by the PDF417 symbol specifications).

<Function 165> **GS (k *pL pH cn fn n1 n2*** (*cn* = 49, *fn* = 65)

[Name] QR Code: Select the model

[Format]

ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*n1*	*n2*
Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*n1*	*n2*
Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*n1*	*n2*

[Range] ($p_L + p_H \times 256$) = 4 (p_L = 4, p_H = 0)
cn = 49
fn = 65
n1 = 49, 50
n2 = 0

[Default] *n1* = 50, *n2* = 0

[Description]
- Selects the model for QR Code.

n1	Function
49	Selects model 1 conversion processing.
50	Selects model 2 conversion processing.

<Function 167> **GS (k *pL pH cn fn n*** (*cn* = 49, *fn* = 67)

[Name] QR Code: Set the size of module

[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] ($p_L + p_H \times 256$) = 3 (p_L = 3, p_H = 0)
cn = 49
fn = 67
$1 \le n \le 16$

[Default] *n* = 3

[Description]
- Sets the size of the module for QR Code to *n* dots.

<Function 169> **GS (k *pL pH cn fn n*** (*cn* = 49, *fn* = 69)

[Name] QR Code: Select the error correction level

[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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
$cn = 49$
$fn = 69$
$48 \le n \le 51$

[Default] $n = 48$

[Description]
- Selects the error correction level for QR Code.

n	Function	Reference: Approx. figure of recovery
48	Select error correction level L	7 %
49	Select error correction level M	15 %
50	Select error correction level Q	25 %
51	Select error correction level H	30 %

<Function 180> **GS (k *pL pH cn fn m d1…dk*** (*cn* = 49, *fn* = 80)

[Name] QR Code: Store the data in the symbol storage area

[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] $4 \le (p_L + p_H \times 256) \le 7092$ $(0 \le p_L \le 255, 0 \le p_H \le 27)$
$cn = 49$
$fn = 80$
$m = 48$
$0 \le d \le 255$
$k = (p_L + p_H \times 256) - 3$

[Description]
- Stores the QR Code symbol data (*d1...dk*) into the symbol storage area.

<Function 181> **GS (k *pL pH cn fn m*** (*cn* = 49, *fn* = 81)

[Name] QR Code: Print the symbol data in the symbol storage area

[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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
$cn = 49$
$fn = 81$
$m = 48$

[Description]
- Encodes and prints the QR Code symbol data in the symbol storage area with **GS (k** <Function 180>.

[Note]
- User must secure the quiet zone (left, right, upward, and downward space areas defined by the QR Code symbol specifications) for QR Code printing.

<Function 182> **GS (k *pL pH cn fn m*** (*cn* = 49, *fn* = 82)

[Name] QR Code: Transmit the size information of the symbol data in the symbol storage area

[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] ($p_L + p_H \times 256$) = 3 (p_L = 3, p_H = 0)
cn = 49
fn = 82
m = 48

[Description]
- Transmits the size information for the encoded QR Code symbol data in the symbol storage area with **GS (k** <Function 180>.

[Notes]
- This function does not print data.
- The size information does not include the quiet zone (left, right, upward, and downward space areas defined by the QR Code symbol specifications).

<Function 265> **GS (k *pL pH cn fn n*** (*cn* = 50, *fn* = 65)

[Name] MaxiCode: Select mode

[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] ($p_L + p_H \times 256$) = 3 (p_L = 3, p_H = 0)
cn = 50
fn = 65
$50 \le n \le 54$

[Default] *n* = 50

[Description]
- Specifies a mode for MaxiCode.

n	Function
50	Executes conversion mode 2.
51	Executes conversion mode 3.
52	Executes conversion mode 4.
53	Executes conversion mode 5.
54	Executes conversion mode 6.

<Function 280> **GS (k *pL pH cn fn m d1...dk*** (*cn* = 50, *fn* = 80)

[Name] MaxiCode: Store data in the symbol storage area

[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] $4 \le (p_L + p_H \times 256) \le 141$ $(4 \le p_L \le 141, p_H = 0)$
$cn = 50$
$fn = 80$
$m = 48$
$0 \le d \le 255$
$k = (p_L + p_H \times 256) - 3$

[Description]
- Stores symbol data (*d1*…*dk*) in MaxiCode in the symbol storage area

<Function 281> **GS (k *pL pH cn fn m*** (*cn* = 50, *fn* = 81)

[Name] MaxiCode: Print symbol data in the symbol storage area

[Code]

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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
$cn = 50$
$fn = 81$
$m = 48$

[Description]
- Encodes and prints the symbol data stored by **GS (k** <Function 280> in the symbol storage area.

[Notes]
- The user must secure the quiet zones (the space at the top, bottom, right, and left of the symbols, which is specified by the MaxiCode standard.)

<Function 282> **GS (k *pL pH cn fn m*** (*cn* = 50, *fn* = 82)

[Name] MaxiCode: Transmit size information of symbol data in the symbol storage area

[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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
$cn = 50$
$fn = 82$
$m = 48$

[Description]
- Transmits size information for printing the symbol data stored by **GS (k** <Function 280> in the symbol storage area.

[Notes]
- Executing this command does not print data.
- The size information excludes the quiet zones (the space at the top, bottom, right, and left of the symbols, which is specified by the MaxiCode standard.)

<Function 367> **GS (k *pL pH cn fn n*** (***cn*** =51, ***fn***=67)

[Name] 2-dimensional GS1 DataBar: Set the module width

[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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
$cn = 51$
$fn = 67$
$2 \le n \le 8$

[Description]
- Sets the width of one module of 2-dimensional GS1 DataBar to *n* dots.

<Function 371> **GS (k *pL pH cn fn nL nH*** (***cn*** =51, ***fn***=71)

[Name] Set the maximum width of GS1 DataBar: 2-dimensional GS1 DataBar Expanded Stacked

[Format]

ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*nL*	*nH*
Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*nL*	*nH*
Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*nL*	*nH*

[Range] $(p_L + p_H \times 256) = 4$ $(p_L = 4,\ p_H = 0)$
$cn = 51$
$fn = 71$
$106 \le (nL + nH \times 256) \le 3952$

[Default] $(nL + nH \times 256) = 141$ $(nL = 141, nH = 0)$

[Description]
- Sets the maximum width of GS1 DataBar Expanded Stacked (2-dimensional GS1 DataBar) to $(nL + nH \times 256)$ dots.

<Function 380> **GS (k *pL pH cn fn m n d1...dk*** (***cn*** =51, ***fn***=80)

[Name] 2-dimensional GS1 DataBar: Store data in the symbol storage area

[Format]

ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*	*n*	*d1...dk*
Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*	*n*	*d1...dk*
Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*	*n*	*d1...dk*

[Range] $6 \le (p_L + p_H \times 256) \le 259$ $(0 \le p_L \le 255, p_H = 0, 1)$
$cn = 51$
$fn = 80$
$m = 48$
$n = 72, 73, 76$
$0 \le d \le 255$
$k = (p_L + p_H \times 256) - 4$

[Description]
- Stores symbol data (***d1…dk***) in 2-dimensional GS1 DataBar in the symbol storage area.

n	Types of 2-dimensional GS1 DataBar
72	GS1 DataBar Stacked
73	GS1 DataBar Stacked Omnidirectional
76	GS1 DataBar Expanded Stacked

<Function 381> **GS (k *pL pH cn fn m*** (*cn* = 51, *fn* = 81)

[Name] 2-dimensional GS1 DataBar: Print data in the symbol storage area

[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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
cn = 51
fn = 81
m = 48

[Description]
- Encodes and prints the symbol data stored by **GS (k** <Function 380) in the symbol storage area.

[Notes]
- The user must secure the quiet zones (the space at the top, bottom, right, and left of the symbols, which is specified by the 2-dimensional GS1 DataBar standard.)
- In standard mode, if the symbol size exceeds the print area, feeds the paper as much as the symbol's height, without printing the symbol.

<Function 382> **GS (k *pL pH cn fn m*** (***cn*** =51, ***fn***=82)

[Name] 2-dimensional GS1 DataBar: Transmit size information of the symbol data in the symbol storage area

[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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
cn = 51
fn = 82
m = 48

[Description]
- Transmits the size information when printing the symbol data stored by **GS (k** <Function 380) in the symbol storage area.

[Notes]
- Printing is excluded from the processing executed by this function.
- The size information excludes the quiet zones (the space at the top, bottom, right, and left of the symbols, which is specified by the 2-dimensional GS1 DataBar standard.)

<Function 467> **GS (k *pL pH cn fn n*** (***cn*** =52, ***fn***=67)

[Name] Composite Symbology: Set module width

[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] $(p_L + p_H \times 256) = 3$ $(p_L = 3, p_H = 0)$
cn = 52
fn = 67
$2 \le n \le 8$

[Default] *n* = 2

[Description]
- Sets one module width of Composite Symbology to *n* dots.

<Function 471> **GS (k *pL pH cn fn nL nH*** (***cn*** =52, ***fn***=71)

[Name] Composite Symbology: Set the maximum width of GS1 DataBar Expanded Stacked

[Format]

ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*nL*	*nH*
Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*nL*	*nH*
Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*nL*	*nH*

[Range] $(pL + pH \times 256) = 4$ $(pL = 4, pH = 0)$
$cn = 52$
$fn = 71$
$106 \le (pL + pH \times 256) \le 3952$ $(0 \le nL \le 255, 0 \le nH \le 15)$

[Default] $(nL + nH \times 256) = 141$ $(nL = 141, nH = 0)$

[Description]
- Sets the maximum width of GS1 DataBar Expanded Stacked (the straight line element of Composite Symbology) to $(pL + pH \times 256)$.

<Function 472> **GS (k *pL pH cn fn n*** (cn = 52, fn = 72)

[Name] Composite Symbology: Select a font for HRI character

[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] $(pL + pH \times 256) = 3$ $(pL = 3, pH = 0)$
$cn = 52$
$fn = 72$
$0 \le n \le 2, 48 \le n \le 50$

[Default] n = 0

[Description]
- Selects whether or not to turn on/off, and selects a font for HRI character when printing Composite Symbology.

n	Function
0, 48	Does not turn HRI character on.
1, 49	Turns HRI character on. (Selects Font A.)
2,50	Turns HRI character on. (Selects Font B.)

[Notes]
- HRI character is not turned on for the straight line element of the following, even if “Turn HRI character on” is selected.
  - GS1 DataBar Stacked
  - GS1 DataBar Stacked Omnidirectional
  - GS1 DataBar Expanded Stacked

<Function 480> **GS (k *pL pH cn fn m a b d1...dk*** (***cn*** =52, ***fn***=80)

[Name] Composite Symbology: Store data in the symbol storage area

[Format]

ASCII	GS	(	k	*pL*	*pH*	*cn*	*fn*	*m*	*a*	*b*	*d1...dk*
Hex	1D	28	6B	*pL*	*pH*	*cn*	*fn*	*m*	*a*	*b*	*d1...dk*
Decimal	29	40	107	*pL*	*pH*	*cn*	*fn*	*m*	*a*	*b*	*d1...dk*

[Range] $7 \le (p_L + p_H \times 256) \le 2366$ $(0 \le p_L \le 255, 0 \le p_H \le 9)$ [When *a* = 48]

$8 \le (p_L + p_H \times 256) \le 2366$ $(0 \le p_L \le 255, 0 \le p_H \le 9)$ [When *a* = 49]

cn = 52
fn = 80
m = 48
a = 48, 49
$65 \le b \le 67$ [When a = 48]
b=65, 66 [When a = 49]
$0 \le d \le 255$
$k = (p_L + p_H \times 256) - 5$

[Description]
- Stores symbol data (*d1*…*dk*) in Composite Symbology in the symbol storage area.
- (When a = 48) *b* specifies the type of straight line element.

b	Type of straight line element
65	EAN8
66	EAN13
67	UPC-A
68	UPC-E (6-digit version (0 excluded))
69	UPC-E (11-digit version (0 included))
70	GS1 DataBar Omnidirectional
71	GS1 DataBar Truncated
72	GS1 DataBar Stacked
73	GS1 DataBar Stacked Omnidirectional
74	GS1 DataBar Limited
75	GS1 DataBar Expanded
76	GS1 DataBar Expanded Stacked
77	GS1-128

- (When a = 49) *b* selects the type of 2-dimensional synthetic element.

b	2-dimensional synthetic element
65	CC-A, CC-B, or CC-C is automatically selected depending on the number of digits.
66	Fixed to CC-C.

<Function 481> **GS (k *pL pH cn fn m*** (*cn* = 52, *fn* = 81)

[Name] Composite Symbology: Print symbol data in the symbol storage area

[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] ($p_L + p_H \times 256) = 3$ ($p_L = 3$, $p_H = 0$)
cn = 52
fn = 81
m = 48

[Description]
- Encodes and prints the symbol data stored by **GS (k** <Function 480) in the symbol storage area.

[Notes]
- The user must secure the quiet zones (the space at the top, bottom, right, and left of the symbols, which is specified by the Composite Symbology standard.)
- In standard mode, if the symbol size exceeds the print area, feeds the paper as much as the symbol's height, without printing the symbol.

<Function 482> **GS (k *pL pH cn fn m*** (*cn* = 52, *fn* = 82)

[Name] Composite Symbology: Transmit size information of the symbol data in the symbol storage area

[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] ($p_L + p_H \times 256) = 3$ ($p_L = 3$, $p_H = 0$)
cn = 52
fn = 82
m = 48

[Description]
- Transmits size information of the symbol data stored by **GS (k** <Function 480> in the symbol storage area.
  - Detailed error information added to size information

Detailed information	Value
Ready for printing (No error)	"0000"
Symbol data of straight line element is incorrect.	"1001"
Symbol data for 2-dimensional synthetic element is incorrect.	"1002"
Number of digits of symbol data for 2-dimensional synthetic element is too large.	"1003"
(Reserved: Incorrect settings of 2-dimensional synthetic element string)	"1004"
Combination of the straight line element type and 2-dimensional synthetic element type is incorrect.	"1005"
There is no symbol data that has a straight line element or 2-dimensional synthetic element in the symbol storage area.	"1006"
Data exists in the print buffer.	"2001"
Size of encoded symbols exceeds the print area.	"2002"

[Notes]
- Printing is excluded from the processing executed by this function.
- The size information excludes the quiet zones (the space at the top, bottom, right, and left of the symbols, which is specified by the Composite Symbology standard.)

GS ∗ *x y d1...dk* [obsolete command]

[Name] Define downloaded bit image

[Format]

ASCII	GS	∗	*x*	*y*	*d1...dk*
Hex	1D	2A	*x*	*y*	*d1...dk*
Decimal	29	42	*x*	*y*	*d1...dk*

[Range]
$1 \le x \le 255$
$1 \le y \le 48$ [where $1 \le x \times y \le 1536$]
$0 \le d \le 255$
$k = x \times y \times 8$

[Description]
- Defines the downloaded bit image in the downloaded graphic area.
  - *x* specifies the number of bytes in the horizontal direction as *x* bytes.
  - *y* specifies the number of bytes in the vertical direction as *y* bytes.
  - *d* specifies the defined data (column format).

[Note]
- A downloaded bit image and user-defined characters (**ESC &**) cannot be defined simultaneously. When this command is executed, all user-defined characters are deleted.

GS / *m* [obsolete command]

[Name] Print downloaded bit image

[Format]

ASCII	GS	/	*m*
Hex	1D	2F	*m*
Decimal	29	47	*m*

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

[Description]
- Prints downloaded bit image defined by **GS ∗** and using the mode specified by *m*.

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

GS :

[Name] Start/end macro definition

[Format]

ASCII	GS	:
Hex	1D	3A
Decimal	29	58

[Description]
- Starts or ends macro definition.

[Note]
- The contents of the macro can be defined up to 2048 bytes

GS B *n*

[Name] Turn white/black reverse print mode on/off

[Format]

ASCII	GS	B	*n*
Hex	1D	42	*n*
Decimal	29	66	*n*

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

[Default] $n = 0$

[Description]
- Turns white/black reverse print mode on or off.
- When the LSB of *n* is 0, turns off white/black reverse mode.
- When the LSB of, *n* is 1, turns on white/black reverse mode.

GS D *m fn [parameter]*

[Name] Specify Windows BMP graphics data

[Description]
- Processes Windows BMP data specified by the function code (*fn*).
  - *m* specifies the fixed value for function formation.
  - *fn* specifies functions.
  - See *[parameter]* for functional specifications.

b	Code	Function No.	Function name
67	**GS D *m fn a kc1 kc2 b c d1...dk***	67	Define Windows BMP NV graphics data
83	**GS D *m fn a kc1 kc2 b c d1...dk***	83	Define Windows BMP download graphics data

[Notes]
- Frequent write command executions by an NV memory write command may damage the NV memory. Therefore, it is recommended to limit using the commands to no more than 10 times a day.
- If the power is turned off or the printer is reset via an interface while this command is being executed, the printer may go into an abnormal condition. Be careful not to turn the power off or let the printer be reset via an interface while this command is being executed.
- While processing this command, the printer may become BUSY while writing the data to the NV memory and stops receiving data. Therefore, be sure not to transmit data from the host PC while the printer is BUSY.

<Function 67> **GS D *m fn a kc1 kc2 b c d1…dk*** (fn = 67)

[Name] Define Windows BMP NV graphics data

[Format]

ASCII	GS	D	*m*	*fn*	*a*	*kc1*	*kc2*	*b*	*c*	*d1…dk*
Hex	1D	44	*m*	*fn*	*a*	*kc1*	*kc2*	*b*	*c*	*d1…dk*
Decimal	29	68	*m*	*fn*	*a*	*kc1*	*kc2*	*b*	*c*	*d1…dk*

[Range]

m = 48
fn = 67
a = 48
32 ≤ *kc1* ≤ 126 (20h ≤ *kc1* ≤ 7Eh)
32 ≤ *kc2* ≤ 126 (20h ≤ *kc2* ≤ 7Eh)
b = 48, 52
c = 49
0 ≤ *d* ≤ 255
The value of *k* depends on the BMP file size.

[Default] None

[Description]

- Converts Windows BMP data to the specified tone and defines NV graphics data (raster format) that corresponds to the key codes (*kc1, kc2*).
  - *b* specifies the tone of data to define.

b	Tone of data to define
48	Monochrome (digital)
52	Multi-tone

  - *c* specifies the color of data to define.

c	Color of data to define
49	Color 1

  - *d* specifies the defined data (Windows BMP format).

[Notes]

- If the number of the defined data exceeds the remaining capacity of the NV graphics memory, this function is ignored.
- The number of items of NV graphics registered should be within 50 to shorten the execution time of this function. The execution time is 60 seconds or less when the number of items registered is within 50. The execution time for 100 items is 120 seconds or less.
- The [data value (*k*) + control information data value (24 bytes)] area of the NV graphics data domain is used when this function is executed.
- NV graphics and NV bit image (**FS q**) cannot be defined simultaneously. When this function is executed, all NV bit images are deleted.

<Function 83> **GS D *m fn a kc1 kc2 b c d1…dk*** (*fn* = 83)

[Name] Define Windows BMP download graphics data

[Format]

ASCII	GS	D	*m*	*fn*	*a*	*kc1*	*kc2*	*b*	*c*	*d1…dk*
Hex	1D	44	*m*	*fn*	*a*	*kc1*	*kc2*	*b*	*c*	*d1…dk*
Decimal	29	68	*m*	*fn*	*a*	*kc1*	*kc2*	*b*	*c*	*d1…dk*

[Range]

m = 48
fn = 83
a = 48
32 ≤ *kc1* ≤ 126 (20h ≤ *kc1* ≤ 7Eh)
32 ≤ *kc2* ≤ 126 (20h ≤ *kc2* ≤ 7Eh)
b = 48, 52
c = 49
0 ≤ *d* ≤ 255
The value of *k* depends on the BMP file size.

[Default] None

[Description]

- Converts Windows BMP data to the specified tone and defines download graphics data (raster format) that corresponds to the key codes (*kc1, kc2*).
  - *b* specifies the tone of data to define.

b	Tone of data to define
49	Monochrome (digital)
52	Multi-tone

  - *c* specifies the color of data to define.

c	Color of data to define
49	Color 1

  - *d* specifies the data to define (Windows BMP format).

[Notes]

- If the number of the defined data exceeds the remaining capacity of the download graphics memory, this function is ignored.
- The [data value (*k*) + control information data value (16 bytes)] area of the download graphics data domain is used when this function is executed.

GS H *n*

[Name] Select print position of HRI characters

[Format]

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

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

[Default] $n = 0$

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

n	Print position
0, 48	Not printed.
1, 49	Above the bar code.
2, 50	Below the bar code.
3, 51	Both above and below the bar code.

GS I *n*

[Name] Transmit printer ID

[Format]

ASCII	GS	I	*n*
Hex	1D	49	*n*
Decimal	29	73	*n*

[Range] *n* = 1, 2, 49, 50 [the printer ID]
65 ≤ *n* ≤ 69 [printer information B]

[Description]
- Transmits the printer ID or the information of the printer specified.
- The printer IDs that can be specified are as follows:

n	Type of printer ID	ID
1, 49	Printer model ID	Hexadecimal: 20 / Decimal: 32
2, 50	Type ID	See table [Type ID].

[Type ID]

Bit	Off/On	Hex	Decimal	Contents
0	Off	00	0	Multi-byte code characters not supported.
	On	01	1	Multi-byte code characters supported.
1	On	02	2	Autocutter Installed. (Fixed)
2,3	--	--	--	Not used.
4	Off	00	0	Fixed.
5	--	--	--	Reserved.
6	--	--	--	Not used.
7	Off	00	0	Fixed.

- The information B that can be specified is as follows:

n	Type of printer information	Contents
65	Firmware version	Depends on firmware version.
66	Manufacturer	“EPSON”
67	Printer name	“TM-T88V”
68	Serial number	Depends on serial number.
69	Type of mounted additional fonts	Japanese model: “KANJI JAPANESE”
		Simplified Chinese model: ”CHINA GB18030”
		Traditional Chinese model: “TAIWAN BIG-5”
111	DIP switch settings	See Table [DIP Switches] in the following section.

Table [DIP Switches]

- First byte

Bit	Off/On	Hex	Decimal	Contents
0	Off	00	0	DIP switch [SW1-1] is OFF.
	On	01	1	DIP switch [SW1-1] is ON.
1	Off	00	0	DIP switch [SW1-2] is OFF.
	On	02	2	DIP switch [SW1-2] is ON.
2	Off	00	0	DIP switch [SW1-3] is OFF.
	On	04	4	DIP switch [SW1-3] is ON.
3	Off	00	0	DIP switch [SW1-4] is OFF
	On	08	8	DIP switch [SW1-4] is ON.
4, 5	--	--	--	Reserved.
6	Off	40	64	Fixed.
7	Off	00	0	Fixed.

- Second byte

Bit	Off/On	Hex	Decimal	Contents
0	Off	00	0	DIP switch [SW1-5] is OFF.
	On	01	1	DIP switch [SW1-5] is ON.
1	Off	00	0	DIP switch [SW1-6] is OFF.
	On	02	2	DIP switch [SW1-6] is ON.
2	Off	00	0	DIP switch [SW1-7] is OFF.
	On	04	4	DIP switch [SW1-7] is ON.
3	Off	00	0	DIP switch [SW1-8] is OFF
	On	08	8	DIP switch [SW1-8] is ON.
4, 5	--	--	--	Reserved.
6	Off	40	64	Fixed.
7	Off	00	0	Fixed.

- Third byte

Bit	Off/On	Hex	Decimal	Contents
0	Off	00	0	DIP switch [SW2-1] is OFF.
	On	01	1	DIP switch [SW2-1] is ON.
1	Off	00	0	DIP switch [SW2-2] is OFF.
	On	02	2	DIP switch [SW2-2] is ON.
2	Off	00	0	DIP switch [SW2-3] is OFF.
	On	04	4	DIP switch [SW2-3] is ON.
3	Off	00	0	DIP switch [SW2-4] is OFF
	On	08	8	DIP switch [SW2-4] is ON.
4, 5	--	--	--	Reserved.
6	Off	40	64	Fixed.
7	Off	00	0	Fixed.

- Forth byte

Bit	Off/On	Hex	Decimal	Contents
0	Off	00	0	DIP switch [SW2-5] is OFF.
	On	01	1	DIP switch [SW2-5] is ON.
1	Off	00	0	DIP switch [SW2-6] is OFF.
	On	02	2	DIP switch [SW2-6] is ON.
2	Off	00	0	Fixed.
3	Off	00	0	Fixed.
4, 5	On	--	--	Reserved
6	Off	40	64	Fixed.
7	Off	00	0	Fixed.

[Note] • When this command is transmitted, do not transmit subsequent data until the status is received.

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] $0 \le (n_L + n_H \times 256) \le 65535$ $(0 \le n_L \le 255, 0 \le n_H \le 255)$

[Default] $(n_L + n_H \times 256) = 0$ $(n_L = 0, n_H = 0)$

[Description] • In standard mode, sets the left margin to $[(n_L + n_H \times 256) \times$ (horizontal motion unit)].

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] $0 \le x \le 255$
$0 \le y \le 255$

[Default] $x = 180$, $y = 360$

[Description] • Sets the horizontal and vertical motion units to approximately 25.4/*x* mm {1/*x*"} and approximately 25.4/*y* mm {1/*y*"}, respectively.
• When $x = 0$, the default value of the horizontal motion unit is used.
• When $y = 0$, the default value of the vertical motion unit is used.

<A> GS V *m*
<B> GS V *m n*

[Name] Select cut mode and cut paper

[Format]

<A>	ASCII	GS	V	*m*	
	Hex	1D	56	*m*	
	Decimal	29	86	*m*	
<B>	ASCII	GS	V	*m*	*n*
	Hex	1D	56	*m*	*n*
	Decimal	29	86	*m*	*n*

[Range] <A> $m = 0, 1, 48, 49$
<B> $m = 65, 66, \quad 0 \le n \le 255$

[Description]
- Executes paper cutting specified by *m*.

	m	Function
<A>	0, 48 1, 49	Cuts paper.
<B>	65, 66	Feeds paper to (cutting position + [*n* × (vertical motion unit)]) and cuts the paper.

[Note]
- This printer executes a partial cut (one point left uncut).

GS W *nL nH*

[Name] Set print area width

[Format]

ASCII	GS	W	*nL*	*nH*
Hex	1D	57	*nL*	*nH*
Decimal	29	87	*nL*	*nH*

[Range] $0 \le (n_L + n_H \times 256) \le 65535 \quad (0 \le n_L \le 255, 0 \le n_H \le 255)$

[Default] $(n_L + n_H \times 256) = 512 \quad (n_L = 0, n_H = 2)$ [When paper width is set to 80 mm]
$(n_L + n_H \times 256) = 360 \quad (n_L = 104, n_H = 1)$ [When paper width is set to 58 mm]

[Description]
- In standard mode, sets the print area width to [$(n_L + n_H \times 256)$ × (horizontal motion unit)].

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] $-32768 \le (n_L + n_H \times 256) \le 32767$

[Description]
- In page mode, moves the vertical print position to [$(n_L + n_H \times 256)$ × (vertical or horizontal motion unit)] from the current position.
- A positive number specifies downward movement, and a negative number specifies upward movement.

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] $1 \le r \le 255$
$0 \le t \le 255$
$m = 0, 1$

[Description] • Executes the macro that was defined with **GS :**.

m	Operation
0	Executes the macro *r* times continuously at an interval of [$t \times 100$ ms].
1	After waiting for [$t \times 100$ ms], flashes the LED indicator and waits for the Feed button to be pressed. After the button is pressed, executes the macro once. Then repeats the operation *r* times.

GS a *n*

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

[Format]

ASCII	GS	a	*n*
Hex	1D	61	*n*
Decimal	29	97	*n*

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

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

[Description]

- Enables or disables basic ASB (Automatic Status Back).

(*n*) Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Drawer kick-out connector status disabled.
	On	01	1	Drawer kick-out connector status 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 - 7	Off	00	0	Reserved.

- While basic ASB is active, the selected enabled basic ASB status is transmitted whenever the status changes.
- The basic ASB status to be transmitted is the four bytes that follow:
  - First byte (printer information)

Bit	Off/On	Hex	Decimal	Status
0, 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 with the paper Feed button.
	On	40	64	Paper is being fed with the paper Feed button.
7	Off	00	0	Fixed.

• Second byte (printer information)

Bit	Off/On	Hex	Decimal	Status
0 - 2	--	--	--	Reserved.
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 occurred.
6	Off	00	0	No automatically recoverable error.
	On	40	64	Automatically recoverable error occurred.
7	Off	00	0	Fixed.

• Third byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Status
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 sensor): paper present.
	On	0C	12	Roll paper end sensor (Paper sensor): paper not present.
4	Off	00	0	Fixed.
5, 6	--	--	--	Reserved.
7	Off	00	0	Fixed.

Bits 2 and 3: While the cover is open, this shows the state when the cover was still closed.

• Fourth byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Status
0 - 3	--	--	--	Reserved.
4	Off	00	0	Fixed.
5, 6	--	--	--	Reserved.
7	Off	00	0	Fixed.

[Reference] APPENDIX J: NOTES ON USING THE ASB STATUS

GS b *n*

[Name] Turn smoothing mode on/off

[Format]

ASCII	GS	b	*n*
Hex	1D	62	*n*
Decimal	29	98	*n*

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

[Default] $n = 0$

[Description]
- Turns smoothing mode on or off.
- When the LSB of *n* is 0, turns off smoothing mode.
- When the LSB of *n* is 1, turns on smoothing mode.

GS f *n*

[Name] Select font for HRI characters

[Format]

ASCII	GS	f	*n*
Hex	1D	66	*n*
Decimal	29	102	*n*

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

[Default] *n* = 0

[Description] • Selects a font for the HRI characters when printing a bar code.

n	Font for the HRI characters
0, 48	Character font A (12 × 24)
1, 49	Character font B (9 × 17)

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

(*nL* + *nH* × 256) = 20, 21, 22, 50, 70 (*nL* = 20, 21, 22, 50, 70, *nH* = 0)

[Description] • Sets the resettable maintenance counter specified by (*nL* + *nH* × 256) to 0.

(*nL* + *nH* × 256)		Maintenance counter [Units]
Hex	Decimal	
14	20	Number of lines fed. [Lines]
15	21	Number of head energizations. [Times]
16	22	Number of lines fed (when the print head was replaced) [Lines]
32	50	Number of autocutter operations. [Times].
46	70	Duration of printer operation. [Hours].

[Notes]
- Frequent write command executions by an NV memory write command may damage the NV memory. Therefore, it is recommended to limit using the commands to no more than 10 times a day.
- If the power is turned off or the printer is reset via an interface while this command is being executed, the printer may go into an abnormal condition. Do not turn the power off or do not reset the printer via an interface while this command is being executed.
- While processing this command, the printer may become BUSY while writing the data to the NV memory and stops receiving data. Therefore, do not transmit data from the host PC while the printer is BUSY.

[Reference] APPENDIX G: NOTES ON UPDATING THE MAINTENANCE COUNTER AND TURNING THE PRINTER'S POWER OFF

GS g 2 *m nL nH*

[Name] Transmit maintenance counter

[Format]

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

[Range] $m = 0$

$(n_L + n_H \times 256) = 20, 21, 22, 50, 70, 148, 149, 150, 178, 198$

($n_L = 20, 21, 22, 50, 70, 148, 149, 150, 178, 198$, $n_H = 0$)

[Description] • Transmits the value of the maintenance counter specified by $(n_L + n_H \times 256)$.

$(n_L + n_H \times 256)$		Maintenance counter [Units]	Type of counter
Hex	Decimal		
14	20	Number of lines fed. [Lines]	Resettable (can be reset)
15	21	Number of head energizations. [Times]	
16	22	Number of lines fed (when the print head was replaced) [Lines]	
32	50	Number of autocutter operations. [Times].	
46	70	Duration of printer operation. [Hours].	
94	148	Number of lines fed. [Lines]	Cumulative
95	149	Number of head energizations. [Times]	
96	150	Number of lines fed (when the print head was replaced) [Lines]	
B2	178	Number of autocutter operations. [Times].	
C6	198	Duration of printer operation. [Hours].	

[Notes] • The maintenance counter values are measurements; therefore, their values will be affected by the timing of errors and how and when the power is turned off.

• When this command is transmitted, do not transmit subsequent data until the status is received.

[Reference] APPENDIX G: NOTES ON UPDATING THE MAINTENANCE COUNTER AND TURNING THE PRINTER'S POWER OFF

GS h *n*

[Name] Set bar code height

[Format]

ASCII	GS	h	*n*
Hex	1D	68	*n*
Decimal	29	104	*n*

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

[Default] $n = 162$

[Description] • Sets the height of the bar code to *n* dots.

<A> GS k *m d1...dk NUL*
<B> GS k *m n d1...dn*

[Name] Print bar code

[Format]

<A>	ASCII	GS	k	*m*	*d1...dk*	*NUL*
	Hex	1D	6B	*m*	*d1...dk*	*00*
	Decimal	29	107	*m*	*d1...dk*	*0*
<B>	ASCII	GS	k	*m*	*n*	*d1...dn*
	Hex	1D	6B	*m*	*n*	*d1...dn*
	Decimal	29	107	*m*	*n*	*d1...dn*

[Range] <A> $0 \le m \le 6$ (For the range of *k* and *d,* see [Description].)
<B> $65 \le m \le 78$ (For the range of *n* and *d,* see [Description].)

[Description]
- Prints the bar code using the bar code system specified by *m*.

For <Function A>

m	Bar code system	Range of *k*	Range of *d*
0	UPC-A	$k = 11, 12$	$48 \le d \le 57$
1	UPC-E	$6 \le k \le 8$ $k = 11, 12$	$48 \le d \le 57$ [where *d1* = 48 when *k* = 7,8,11,12]
2	JAN13 / EAN13	$k = 12, 13$	$48 \le d \le 57$
3	JAN8 / EAN8	$k = 7, 8$	$48 \le d \le 57$
4	CODE39	$1 \le k$	$48 \le d \le 57, 65 \le d \le 90,$ $d = 32, 36, 37, 42, 43, 45, 46, 47$
5	ITF	$2 \le k$ (even number)	$48 \le d \le 57$
6	CODABAR (NW-7)	$2 \le k$	$48 \le d \le 57, 65 \le d \le 68,$ $97 \le d \le 100,$ $d = 36, 43, 45, 46, 47, 58$ [where $65 \le d1 \le 68, 65 \le dk \le 68,$ $97 \le d1 \le 100, 97 \le dk \le 100$]

- *k* of <Function A> indicates the number of bytes of bar code data.
- *d* specifies the bar code data.

For <Function B>

m	Bar code system	Range of *n*	Range of *d*
65	UPC-A	$n = 11, 12$	$48 \le d \le 57$
66	UPC-E	$6 \le n \le 8$	$48 \le d \le 57$ [where $d1 = 48$ when $n = 7,8,11,12$]
67	JAN13 / EAN13	$n = 12, 13$	$48 \le d \le 57$
68	JAN8 / EAN8	$n = 7, 8$	$48 \le d \le 57$
69	CODE39	$1 \le n \le 255$	$48 \le d \le 57$, $65 \le d \le 90$, $d = 32, 36, 37, 42, 43, 45, 46, 47$
70	ITF	$2 \le n \le 254$ (even number)	$48 \le d \le 57$
71	CODABAR (NW-7)	$2 \le n \le 255$	$48 \le d \le 57$, $65 \le d \le 68$, $97 \le d \le 100$, $d = 36, 43, 45, 46, 47, 58$ [where $65 \le d1 \le 68$, $65 \le dn \le 68$, $97 \le d1 \le 100$, $97 \le dn \le 100$]
72	CODE93	$1 \le n \le 255$	$0 \le d \le 127$
73	CODE128	$2 \le n \le 255$	$0 \le d \le 127$ [where $d1 = 123$, $65 \le d2 \le 67$]
74	GS1-128	$2 \le n \le 255$	$0 \le d \le 127$
75	GS1 DataBar Omnidirectional	$\boldsymbol{n} = 13$	$48 \le d \le 57$
76	GS1 DataBar Truncated	$\boldsymbol{n} = 13$	$48 \le d \le 57$
77	GS1 DataBar Limited	$\boldsymbol{n} = 13$	$48 \le d \le 57$ [However, $48 \le d1 \le 49$]
78	GS1 DataBar Expanded	$2 \le n \le 255$	$32 \le d \le 34$, $37 \le d \le 63$, $65 \le d \le 90$, $d = 95$, $97 \le d \le 122$, $\boldsymbol{d} = 123$ [However, $\boldsymbol{d1} = 40$, $48 \le \boldsymbol{d2} \le 57$, $48 \le \boldsymbol{d3} \le 57$, or $48 \le d1 \le 57$, $48 \le d2 \le 57$]

- *n* of <Function B> specifies the number of bytes of bar code data.
- *d* specifies the bar code data.

[Note]
- Users must secure the quiet zone (left or right side space area defined by the bar code standard) for bar code printing.

[Reference] APPENDIX H: NOTES ON PRINTING 2-DIMENSIONAL SYMBOLS,
APPENDIX I: NOTES ON SCANNING THE PRINT RESULT ON THE RECEIPT

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 status.

n	Function
1, 49	Transmits paper sensor status.
2, 50	Transmits drawer kick-out connector status.

• This printer transmits the following status.

• Paper sensor status (*n* = 1, 49)

Bit	Off/On	Hex	Decimal	Status
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 sensor): paper present.
	On	0C	12	Roll paper end sensor (Paper sensor): paper not present.
4	Off	00	0	Fixed.
5, 6	--	--	--	Reserved.
7	Off	00	0	Fixed.

Bits 2 and 3: While the cover is open, this shows the state when the cover was still closed (this command is not executed).

• Drawer kick-out connector status (*n* = 2, 50)

Bit	Off/On	Hex	Decimal	Status
0	Off	00	0	Drawer kick-out connector pin 3 is LOW.
	On	01	1	Drawer kick-out connector pin 3 is HIGH.
1 - 3	--	--	--	Reserved.
4	Off	00	0	Fixed.
5, 6	--	--	--	Reserved.
7	Off	00	0	Fixed.

[Note] • When this command is transmitted, do not transmit subsequent data until this status is received.

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.

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

- Multi-level bar codes are as follows:
  UPC-A, UPC-E, JAN13 / EAN13, JAN8 / EAN8, CODE93, and CODE128, GS1-128, GS1 DataBar Omnidirectional, GS1 DataBar Truncated, GS1 DataBar Limited, GS1 DataBar Expanded
- Binary-level bar codes are as follows:
  CODE39, ITF, and CODABAR

6.4 Commands of Multi-byte Code Characters (for Japanese Model, Simplified Chinese Model, and Traditional Chinese Model)

FS ! *n*

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

[Format]

ASCII	FS	!	*n*
Hex	1C	21	*n*
Decimal	28	33	*n*

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

[Default] $n = 0$

[Description]

- Selects the character styles (double-height, double-width, and Kanji-underlined) together for multi-byte code character.

(*n*) Bit	Off/On	Hex	Decimal	Function
0, 1	Off	00	0	Reserved.
2	Off	00	0	Double-width canceled.
	On	04	4	Double-width selected.
3	Off	00	0	Double-height canceled.
	On	08	8	Double-height selected.
4 - 6	Off	00	0	Reserved.
7	Off	00	0	Kanji-underline mode is turned off.
	On	80	128	Kanji-underline mode is turned on.

FS &

[Name] Select Kanji character mode

[Format]

ASCII	FS	&
Hex	1C	26
Decimal	28	38

[Description]

- Selects Kanji character mode.

FS – *n*

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

[Format]

ASCII	FS	–	*n*
Hex	1C	2D	*n*
Decimal	28	45	*n*

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

[Default] $n = 0$

[Description]
- Turns on or off underline mode for multi-byte code character (Kanji-underline).

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

FS .

[Name] Cancel Kanji character mode

[Format]

ASCII	FS	.
Hex	1C	2E
Decimal	28	46

[Description]
- Cancels Kanji character mode.

FS 2 *c1 c2 d1...dk*

[Name] Define user-defined Kanji characters

[Format]

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

[Range] The ranges of *c1* and *c2* differ, depending on the models and the character code system used.

Model	Hexadecimal	
	c1	*c2*
Japanese (JIS code)	*c1* = 77	$21 \le c2 \le 7E$
Japanese (SHIFT JIS code)	*c1* = EC	$40 \le c2 \le 7E$ $80 \le c2 \le 9E$
Simplified Chinese (GB18030) Traditional Chinese	*c1* = FE	$A1 \le c2 \le FE$

$0 \le d \le 255$

$k = 72$

[Description]
- Defines the user-defined Kanji character pattern (*d1...dk*) specified by the character codes (*c1* and *c2*).

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 for the Japanese model.

n	Kanji character code system
0, 48	JIS code
1, 49	SHIFT JIS code

FS S *n1 n2*

[Name] Set Kanji character spacing

[Format]

ASCII	FS	S	*n1*	*n2*
Hex	1C	53	*n1*	*n2*
Decimal	28	83	*n1*	*n2*

[Range] $0 \le n1 \le 255$
$0 \le n2 \le 255$

[Default] $n1 = 0$, $n2 = 0$

[Description]
- Sets the left-side character spacing of the multi-byte code character to [*n1* × (horizontal or vertical motion unit)]; sets the right-side character spacing of the multi-byte code character to [*n2* × (horizontal or vertical motion unit)].

[Note]
- The maximum of the left- and the right-side character spacing is 35.98 mm {255/180"} respectively.

FS W *n*

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

[Format]

ASCII	FS	W	*n*
Hex	1C	57	*n*
Decimal	28	87	*n*

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

[Default] $n = 0$

[Description]
- Turns quadruple-size mode on or off for multi-byte code character.
  - When the LSB of *n* is 0, quadruple-size mode is turned off.
  - When the LSB of *n* is 1, quadruple-size mode is turned on.

6.5 Obsolete Commands

ESC i [obsolete command]

GS V, which is the upward-compatible command replacing **ESC i**, is recommended to use, since **ESC i** is an obsolete command in the ESC/POS command system.

[Name] Partial cut (one point left uncut)

[Format]

ASCII	ESC	i
Hex	1B	69
Decimal	27	105

[Description]
- Executes a partial cut of the roll paper.

[Note]
- This printer executes a partial cut (one point left uncut).

ESC m [obsolete command]

GS V, which is the upward-compatible command replacing **ESC m**, is recommended to use, since **ESC m** is an obsolete command in the ESC/POS command system.

[Name] Partial cut (three points left uncut)

[Format]

ASCII	ESC	m
Hex	1B	6D
Decimal	27	109

[Description]
- Executes a partial cut of the roll paper.

[Note]
- This printer executes a partial cut (one point left uncut).

ESC u *n* [obsolete command]

GS r, which is the upward-compatible command replacing **ESC u**, is recommended to use, since **ESC u** is an obsolete command in the ESC/POS command system.

[Name] Transmit peripheral device status

[Format]

ASCII	ESC	u	*n*
Hex	1B	75	*n*
Decimal	27	117	*n*

[Range] *n* = 0, 48

[Description]
- Transmits the peripheral device status as 1 byte of data, as follows.

Bit	Off/On	Hex	Decimal	Status
0	Off	00	0	Drawer kick-out connector pin 3 is LOW.
	On	01	1	Drawer kick-out connector pin 3 is HIGH.
1 - 3	--	--	--	Reserved.
4	Off	00	0	Fixed.
5, 6	--	--	--	Reserved.
7	Off	00	0	Fixed.

[Note]
- When this command is transmitted, do not transmit subsequent data until the status is received.

ESC v

[obsolete command]

GS r, which is the upward-compatible command replacing **ESC v**, is recommended to use, since **ESC v** is an obsolete command in the ESC/POS command system.

[Name] Transmit paper sensor status

[Format]

ASCII	ESC	v
Hex	1B	76
Decimal	27	118

[Description]

- Transmits the status of paper sensor(s) as 1 byte of data, as follows:

Bit	Off/On	Hex	Decimal	Status
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, 6	--	--	--	Reserved.
7	Off	00	0	Fixed.

Bits 2 and 3: While the cover is open, this shows the state when the cover was still closed. (This command is not executed.)

[Note]

- When this command is transmitted, do not transmit subsequent data until the status is received.

FS p *n m*

[obsolete command]

GS (L <Function 69>, which is the upward-compatible command replacing **FS p**, is recommended to use, since **FS p** is an obsolete command in the ESC/POS command system.

[Name] Print NV bit image

[Format]

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

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

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

[Description]

- Prints NV bit image *n* using the process of **FS q** and using the mode specified by *m*.

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

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

GS (L <Function 67>, which is the upward-compatible command replacing **FS q**, is recommended to use, since **FS q** is an obsolete command in the ESC/POS command system.

[Name] Define NV bit image

[Format]

ASCII	FS	q	*n*	*[xL xH yL yH d1...dk]1...[xL xH yL yH d1...dk]n*
Hex	1C	71	*n*	*[xL xH yL yH d1...dk]1...[xL xH yL yH d1...dk]n*
Decimal	28	113	*n*	*[xL xH yL yH d1...dk]1...[xL xH yL yH d1...dk]n*

[Range]
$1 \le n \le 255$
$1 \le (x_L + x_H \times 256) \le 1023 \quad (0 \le x_L \le 255, 0 \le x_H \le 3)$
$1 \le (y_L + y_H \times 256) \le 288 \quad (0 \le y_L \le 255, y_H = 0,1)$
$0 \le d \le 255$
$k = (x_L + x_H \times 256) \times (y_L + y_H \times 256) \times 8$
The entire capacity size = 256 KB.

[Description]
- Defines the NV bit image in the NV graphics area.
  - *n* specifies the number of defined NV bit images.
  - x_L, x_H specify the number of bytes in the horizontal direction as $(x_L + x_H \times 256)$.
  - y_L, y_H specify the number of bytes in the vertical direction as $(y_L + y_H \times 256)$.
  - *d* specifies the defined data (column format).

[Notes]
- Frequent write command executions by an NV memory write command may damage the NV memory. Therefore, it is recommended to limit using the commands to no more than 10 times a day.
- If the power is turned off or the printer is reset via an interface while this command is being executed, the printer may go into an abnormal condition. Do not turn the power off or do not reset the printer via an interface while this command is being executed.
- While processing this command, the printer may become BUSY while writing data to the NV memory and stops receiving data. Therefore, do not to transmit data from the host PC while the printer is BUSY.
- The printer executes a software reset after processing this command.
  - Clears the receive and print buffers.
  - Resets all setting values in RAM (the print area, the character styles, user-defined characters, and others) that were in effect at power on. (The data in the NV memory are not reset.)
- NV bit image and NV graphics (**GS (L**/ **GS 8 L**) cannot be defined simultaneously. When this command is executed, all NV graphics are deleted.

GS v 0 m *xL xH yL yH d1...dk* [obsolete command]

GS (L <Function 112 and 50>, which is the upward-compatible command replacing **GS v 0**, is recommended to use, since **GS v 0** is an obsolete command in the ESC/POS command system.

[Name] Print raster bit image

[Format]

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

[Range]
$0 \le m \le 3, 48 \le m \le 51$
$1 \le (x_L + x_H \times 256) \le 65535 \quad (0 \le x_L \le 255, 0 \le x_H \le 255)$
$1 \le (y_L + y_H \times 256) \le 2303 \quad (0 \le y_L \le 255, 0 \le y_H \le 8)$
$0 \le d \le 255$
$k = (x_L + x_H \times 256) \times (y_L + y_H \times 256)$

[Description]
- Prints a raster bit image using the mode specified by *m*.

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

- *xL*, *xH* specify the number of bytes in the horizontal direction as ($x_L + x_H \times 256$).
- *yL*, *yH* specify the number of dots in the vertical direction as ($y_L + y_H \times 256$).
- *d* specifies the defined data (raster format).

APPENDIX A: MISCELLANEOUS NOTES

A.1 Notes on Printing and Paper Feeding

1) Because the TM-T88V printer is a line printer, it automatically feeds paper after printing 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. (See Table A.1.)
   When only rotated characters are printed on one line, paper feeding is executed as shown in Table A.1.

Table A.1 Paper Feeding Amount

		Required paper feeding amount (dots)
Normal Characters	Font A	24 × vertical scaling factor
	Font B	17 × vertical scaling factor
	Kanji font	24 × vertical scaling factor
Rotated Characters	Font A	12 × vertical scaling factor
	Font B	9 × vertical scaling factor
	Kanji font	24 × vertical scaling factor
Bit image (**ESC ***)		24

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

3) It is recommended to run the autocutter operation after a minimum of 10 lines of printing or paper feeding to prevent small pieces of cut paper from dropping into the autocutter to cause paper jams.

A.2 Notes on 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 V ± 7%. If the power supply voltage falls outside the above range during printing, the printer stops printing and waits until the voltage returns to normal and then automatically resumes printing. If the voltage does not return to normal, the printer generates an error. Therefore, due to the abrupt stop, the print pitch may not be correct, and some dots in some characters may not be printed.
- In both high and low voltage errors, the Error LED indicator flashes.
- When either a high or low voltage error occurs, turn the power off as soon as possible.
- The interface connectors are supplied from Non-LPS.

A.3 Notes on Use Environment

Using in the presence of silicon gas (silicon adhesive, silicon oil, silicon powder, etc.) including siloxane and of malignant gas (nitric acid, hydrosulfuric, ammonia, chlorine, etc.) may cause contact failure at contact points in a mechanical switch and a DC motor, etc., in a short time because of adhesion or oxidization of the insulation film.

A.4 Other Notes

1) Handling of printer mechanism

- Do not pull the paper out when the roll paper 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 immediately after printing, do not touch them.
- Do not open the roll paper cover during printing operation or the printer mechanism may become 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. Be sure to use only the specified paper.
- Label paper cannot be used.

2) Notes on handling thermal paper

(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 that 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. When storing thermal paper in a card case or sample notebook, therefore, be sure to use only products made of polyethylene, polypropylene, or polyester.
e) If thermal paper touches diazo copy paper immediately after copying, the printed surface may become 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 nail or a hard metal, the paper may become discolored.

(2) Notes on thermal paper storage

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

a) Store paper away from high temperature and humidity.
Do not store thermal paper near a heater or in enclosed places exposed to direct sunlight.
b) Avoid direct sunlight.
Extended exposure to direct sunlight by windows may cause discoloration or faded printing to the printed surface.

3) Others

- Because this printer uses plated steel, the cutting edges may be subject to rust. However, this does not affect the printer performance.

APPENDIX B: ROLL PAPER SETUP

1) Open the roll paper cover by pressing down the roll paper cover open button.
2) Load a roll of paper, and pull some of the paper from the roll paper out toward the front of the printer.
3) Close the roll paper cover.

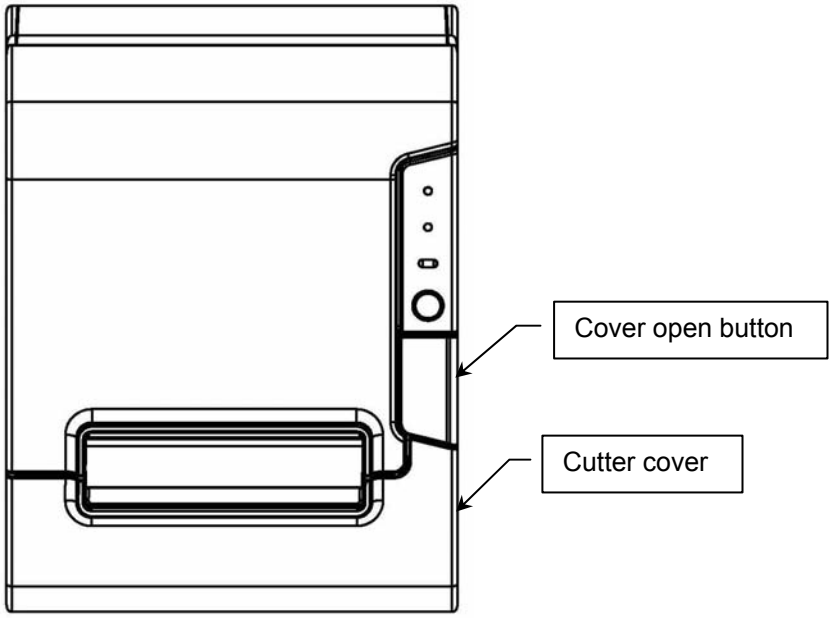


Figure B.1 Printer Upper Side Overview

APPENDIX C: RECOVERY FROM AN AUTOCUTTER ERROR

- If a foreign object such as a push pin or paper clip drops in the autocutter and causes the autocutter to lock up, the printer enters an error state and begins the recovery operation automatically. (Although the Error LED indicator flashes continuously, the error is recoverable.)

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

  If the autocutter does not return to its normal position by itself, follow the steps below to resolve the problem:

  1) Pull the cutter cover (see Figure B.1) toward you so that you can rotate the cutter motor knob.
  2) Rotate the cutter motor knob in the direction shown by an arrow.
  3) Following the instructions on the caution label, rotate the knob until the triangular mark appears in the hole.

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

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

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

1) Use roll paper with the inside diameter of the paper spool of 12 mm {0.47"} and the outside diameter of the paper spool of 18 mm {0.71"}. Use the specified thermal paper.
2) Loosen the adjusting screw that holds the paper near-end sensor and set the top of the positioning plate to the appropriate adjustment value and tighten the adjusting screw.

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

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

Table D.1 Adjustment Positions

Adjustment position number	Specified thermal paper dimension of A
#1	Approximately 23 mm {0.91"}
#2	Approximately 27 mm {1.06"}

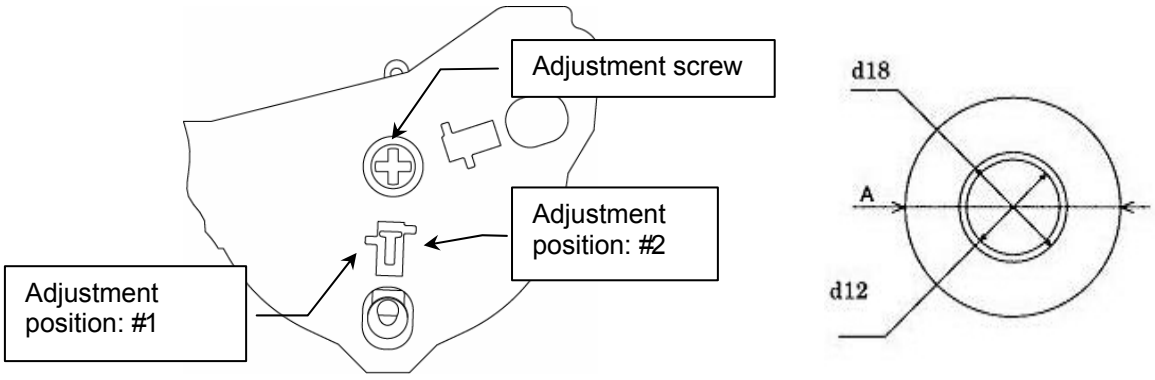


Figure D.1 Near-end Adjusting Position

NOTES: 1. Since dimension A in the table is a calculated value, there may be some variations depending on the printer.
2. Check that the adjustable slider operates smoothly after you finish the adjustment.
3. Change the roll paper near-end sensor position, in order to detect the paper near-end correctly when the printer is attached to a wall. (See Figure D.2, Changing the Near-end Sensor Position.)
   (1) Loosen the adjustment screw that is fixing the roll paper near-end sensor.
   (2) Push in the detection lever.
   (3) Turn the knob towards you until the detection lever clicks into place in the other hole.
   (4) While setting the knob by pressing the knob toward you, tighten the screw.

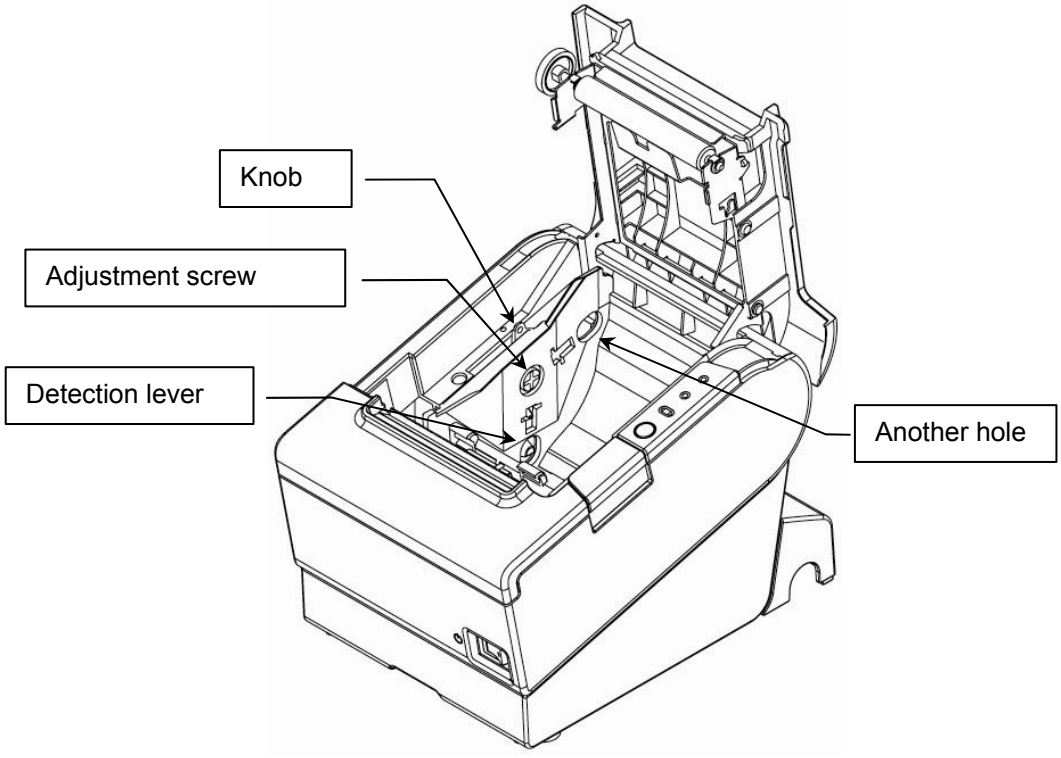


Figure D.2 Changing the Near-end Sensor Position

APPENDIX E: PRINT HEAD AND PLATEN ROLLER CLEANING

E.1 Thermal Head

Paper dust, paper scraps, platen rubber, or other foreign objects on the thermal elements may lower the print quality. In this case, clean the print head as follows:

1) Open the roll paper cover.

2) Clean the thermal elements of the print head using a cotton swab moistened with alcohol solvent (ethanol or IPA).

NOTES: 1. Do not touch the print head thermal elements.
2. Do not scratch the print head.

3) Insert roll paper, pull out some paper, and close the roll paper cover.

NOTE: The print head becomes very hot immediately after printing. 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. Turn on the printer power only after alcohol has completely dried.

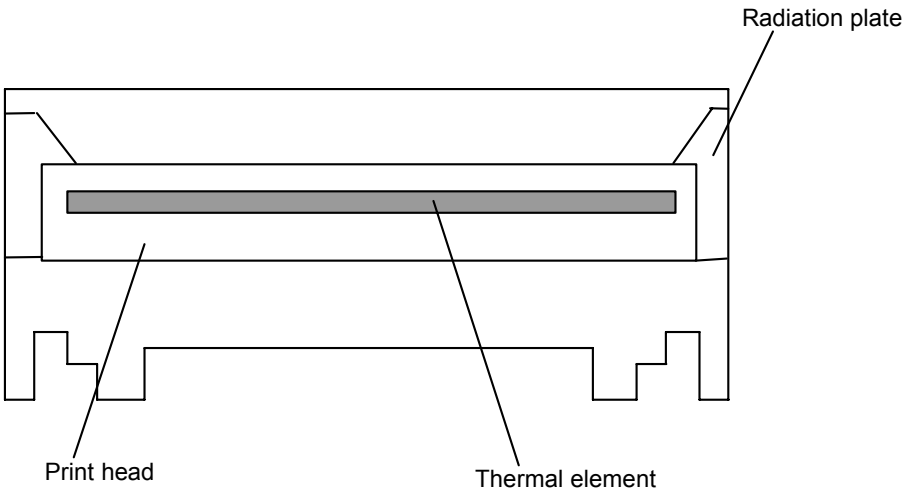


Figure E.1 Print Head Thermal Element

E.1 Platen Roller

Depending on the roll paper used, paper dust may stick to the platen roller and the paper may not be fed correctly. To remove the paper dust, clean the platen roller with a cotton swab moistened with water as described in the thermal head section above. Turn on the printer power only after the water has completely dried.

APPENDIX F: NOTES ON USING THE DRAWER KICK-OUT CONNECTOR

1) Drawer specifications (See Section 2.2.3, Drawer kick-out connector)

Drawer specifications differ significantly depending on the manufacturer and the model. Make sure that the specifications of the drawer used meet the following conditions when connected to the drawer kick-out connector. These conditions also apply to any other devices to be connected to the drawer kick-out connector.

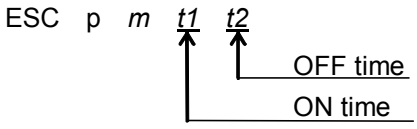
Never use a drawer (or other devices) that does not meet all of the following conditions:

- The load, such as a drawer kick-out solenoid, must be connected between pins 4 and 2 or pins 4 and 5 of the drawer kick-out connector. (*1)
- When the drawer open/close signal that indicates the state of the drawer is used, a switch must be provided between drawer kick-out connector pins 3 and 6. (*2)
- The resistance of the load, such as a drawer kick-out solenoid, must be 24 Ω or more or the input current must be 1 A or less. (*3)
- Make sure to use the drawer kick-out connector 4 pin (24V power supply) for driving the drawer. Never connect any other power supply to the drawer kick-out connector. (*4) The peak current is 1 A. See item 2) below for drive signal duty.

NOTES: (*1): Proper operation is not guaranteed with different connections.
(*2): Proper operation is not guaranteed with different connections or connection to a component other than a switch.
(*3): Connection to equipment whose resistance is less than 24Ω or whose input current is more than 1 A may damage the connected equipment as well as the printer.
(*4): Operation is not guaranteed with other power supplies.

2) Notes on the pulse generating command (**ESC p**)

When using **ESC p** to drive the drawer connected to the drawer kick-out connector, set the command parameters to meet the following conditions:



$$\frac{\text{ON time}}{\text{ON time + OFF time}} \leq 0.2 \quad \text{.....Formula F-1}$$

$$\text{or, OFF time} \geq \text{ON time} \times 4 \quad \text{.....Formula F-2}$$

Figure F-1 shows the drive signal waveform generated when the drawer is driven according to the above conditions.

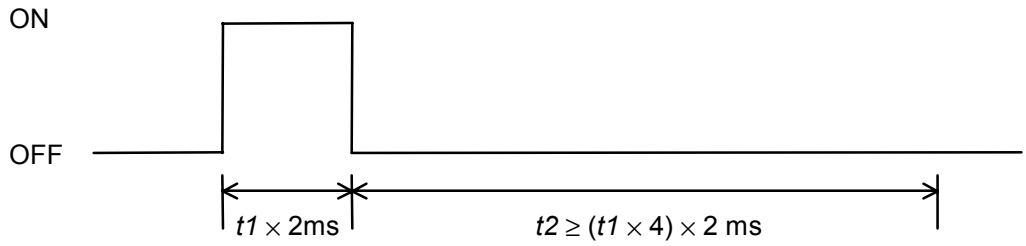


Figure F-1 Drawer Drive Signal Waveform (Formulas F-1 and F-2)

The ON time depends on the specifications of the drawer used. Be sure to check the drawer specifications and set a suitable time. To use a drawer that does not meet the conditions of Formulas F-1 and F-2, see the following section.

3) Using a drawer that does not meet the conditions in 2) (**ESC p**, **DLE DC4**)

(1) For **ESC p**

Setting the values of t1 and t2 according to the conditions in 2) results in a maximum ON time of 126 ms ($0 \leq t1 \leq 63$), since the setting ranges of *t1* and *t2* are 0 to 255. To use a drawer that requires an ON time exceeding 126 ms, the following conditions must be met:

$$\frac{\text{ON time}}{\text{ON time + (OFF time + } \alpha)} \leq 0.2 \quad \text{.....Formula F-3}$$

α: processing time of other sequence

NOTE: α is the period from the OFF time until the next ON time when the drawer-driving is prohibited.

(2) For **DLE DC4**

Since **DLE DC4** sets ON time equal to OFF time, use α so that Formula F-3 is met.

An example program in which the drawer connected to drive signal 1 is driven with an ON time of 200 ms is shown below.

```
PRINT #1,CHR$(&H1B);"p";CHR$(0);CHR$(100);CHR$(250);
GOSUB ∗WAIT300MS
```

ON time 200 ms OFF time 500 ms

```
∗WAIT300MS
  300 [ms] wait routine
RETURN
```

(∗1)

(∗1) Corresponds to α of Formula F-3. Set the value so that it satisfies Formula F-3 (or include an internal processing time that is equal to or longer than this wait routine).

The drive signal waveform generated when the drawer is driven according to the above conditions is shown in Figure F-2.

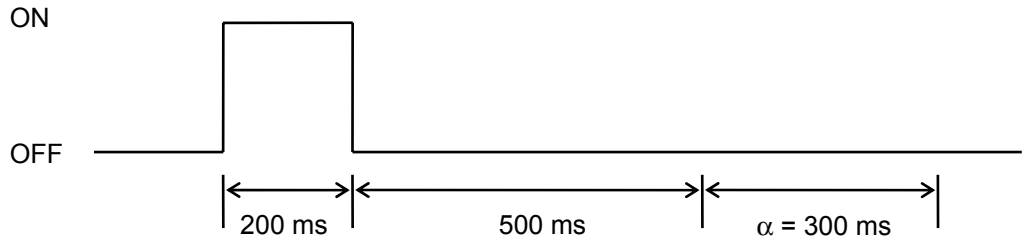


Figure F-2 Drawer Drive Signal Waveform

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 with functions 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 while the power is turned on, the printer enters the power-saving mode.

G.2 Printer Power-off Procedures

It is recommended to turn off the printer after executing the powering-off command **DLE DC4** (*fn* = 2).

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 PC transmits the following continuous procedure before the system is turned off:
   (1) Executes **GS (D *pL pH m a b*** (*pL*=3, *pH* =0, *m* =20, *a* =2, *b* =1)
   (2) Executes **GS r *n*** (*n* =1)
2) The host PC waits for the paper sensor status sent from the printer in response to the **GS r *n*** command.
3) The host PC transmits **DLE DC4 *fn a b*** (*fn* =2, *a* =1, *b* =8).
4) The host PC waits for the power off status.
   - The values of the maintenance counter are stored and the power-off sequence is performed within 20 seconds after the host PC transmits **DLE DC4 *fn a b***; then the power off status is transmitted.
   - With the USB interface model, the printer is required to be ready to receive data from the host PC.
   - With the serial interface model, the printer status is transmitted regardless of the condition of the host PC.
   - With the parallel interface model, the host PC is required to be ready to operate negotiation immediately after transmitting **DLE DC4 *fn a b*** so that the host PC can receive the printer status.
   - If the power off status is not confirmed, wait for at least 20 seconds after transmitting **DLE DE4 *fn a b***.

   NOTE: The printer executes the software sequence, but the power is not cut.

5) Power off the host PC and the printer.

   NOTE: Do not reset the printer until the printer power is turned off after transmitting **DLE DC4** (*fn* = 2).

APPENDIX H: NOTES ON PRINTING 2-DIMENSIONAL SYMBOLS

1) User must set the quiet zone, depending on the bar code standards.

2) When printing PDF417 (2-dimensional symbols), it is recommended to set the height of one step of the symbol to three to five times the width of one module, and the total height should be approximately 5 mm {0.20"} or more.

3) The recognition rate of ladder bar codes and 2-dimensional symbols may vary depending on widths of the modules, print density, environmental temperature, type of thermal paper, and characteristics of the reader. Therefore, user must check the recognition rate before setting the use conditions so that the restrictions of the reader are satisfied.

4) Reading quality of bar codes/2-dimensional symbols in graphics printing in multi-tone is not guaranteed.

5) When printing ladder bar codes/2-dimensional symbols with graphics printing, instead of using the bar codes/2-dimensional symbols print commands, set the printing speed to 100 mm/s (printing speed level 4). The printing speed level can be set with **GS (K**.

APPENDIX I: NOTES ON SCANNING THE PRINT RESULT ON THE RECEIPT

To determine whether the ability of the reader (scanner) can be satisfied by using bar codes, 2-dimensional symbols, or characters printed on receipt (roll paper), take the following points into consideration.

1) Print density

The print density may vary depending on the type of roll paper or the environmental conditions.

2) Slant of the print result

The printed bar code or characters may not be horizontal to the paper as shown in Figure I-1. They may slant in the range of ± 1.6° and the slanting direction or the angle varies during printing or each time a receipt is issued.

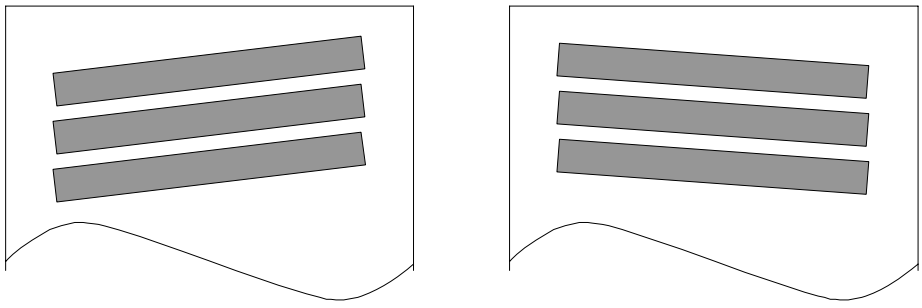


Figure I-1 Slant of the Print

NOTE: If paper other than the ones described in Section 1.5, Paper Specification, is used or if the paper is used out of the range described in Section 1.12, Environmental Conditions, the print density may vary or the slant of print result may become wider.

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 a time as one ASB status showing the presence of change, followed by the latest ASB status.

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

First Status	Second Status	Third Status	Fourth Status
0001 0100	0000 0000	0000 0000	0000 1111

When a sequence of operations as follows is performed and the printer status changes, the following pieces of data are accumulated.

	First Status	Second Status	Third Status	Fourth Status	
1	0011 1100	0000 0000	0000 0000	0000 1111	The printer cover is opened.
2	0001 1100	0000 0000	0000 1111	0000 1111	The printer cover is closed after removing paper.
3	0011 1100	0000 0000	0000 1111	0000 1111	The printer cover is opened.
4	0001 1100	0000 0000	0000 1111	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.

	First Status	Second Status	Third Status	Fourth Status
Accumulated ASB (1+2+3+4)	0011 1100	0000 0000	0000 0000	0000 1111
+				
	First Status	Second Status	Third Status	Fourth Status
The latest ASB (4)	0001 1100	0000 0000	0000 1111	0000 1111

APPENDIX K: USING A POWER SUPPLY OTHER THAN THE PS-180

- When using a power supply with low power capacity or when printing in a high print duty, the power supply may shut down. However, power shut down can be prevented by combining the power supply output setting described below, the printing speed setting, and the number of print head energizations setting.

  NOTE: Operation of power supplies other than the PS-180 is not guaranteed.

- Setting the power supply output low can reduce the power load by lowering the print speed automatically and reducing the consumption current value per unit time when printing in a high print duty.

- The customized value (memory switch) can switch the setting from " Power supply output level 3 (default, high)" to "Power supply output level 2" or "Power supply output level 1 (low)."

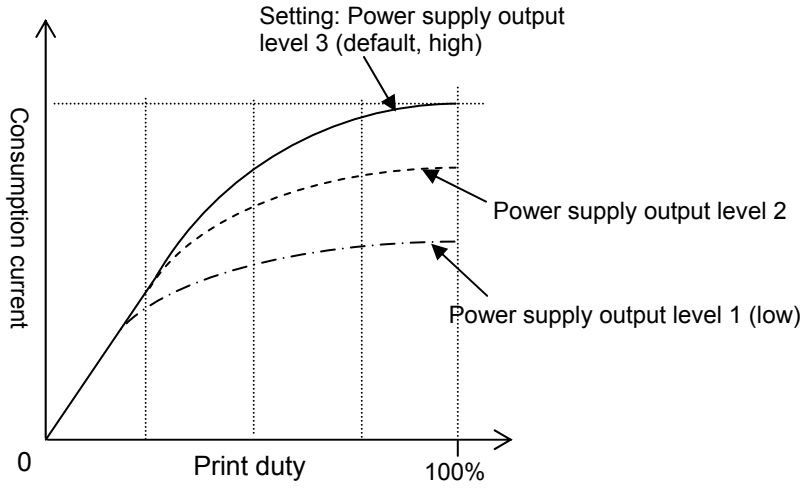


Figure K.1 Image of Power Supply Output and Consumption Current Values

- By setting the printing speed low, the consumption current per unit time can be reduced even when printing in a low print duty.
- The customized value (memory switch) can set the printing speed.
- When the number of print head energizations is set to "two-part energization" or "four-part energization" from "one-part energization (default)," it is possible to lower the peak current value during printing. When the number of print head energization is set to a setting other than "one-part energization (default)", the printing speed is automatically limited.
- The customized value (memory switch) can set the number of print head energizations.
  Note: See APPENDIX P for changing the customized value (memory switch) settings.

APPENDIX L: COMPARISON BETWEEN TM-T88V AND TM-T88IV (EXCEPT COMMANDS)

	TM-T88V	TM-T88IV
1. Print width	80-mm paper width model can be switched to 58-mm paper width model by attaching a 58-mm width paper guide plate.	---
2. Print speed	<High speed mode> 300 mm/s maximum <Low power consumption mode> Not supported <Graphics printing in multi-tone> 150 mm/s (NV/download) 70 mm/s (raster)	<High speed mode> 200 mm/s maximum <Low power consumption mode> 150 mm/s maximum
3. Character types	Expanded graphics 128 characters × 43 pages (User-defined page included) International character sets 18 sets	Expanded graphics 128 characters × 11 pages (User-defined page included) International character sets 48 characters (16 sets)
4. Specified original paper	<Specified paper> (Newly supported) KT55F20, KT48F20 <Two-color paper> Not supported <Table 1.5.2 Original Paper type and density level> TF50KS-E,TF60KS-E,PD150R ,PD160R,PD190R,P220AGB-1 ,AF50KS-E ,KT48F20,KT55F20 ,F5041 Standard P300,P310,P350 Medium <Table 1.5.3 Original Paper type and density level> AF50KS-E 4 TF50KS-E, P220AGB-1 5 TF60KS-E,PD150R ,PD160R,PD190R, KT48F20 ,KT55F20, F5041 7 P300,P310,P350 8	<Two-color paper> P320RB, P320BB <Table 1.5.3 Original Paper type and density level> TF50KS-E,PD150R,PD160R ,F5041 Standard TF60KS-E,P220AGB-1,P300 ,P310,AF50KS-E,PD190R Medium <Table 1.5.4 Original Paper type and density level> TF50KS-E, PD150R, PD160R ,F5041 7 TF60KS-E,P220AGB-1,P300 ,P310,P350 8 AF50KS-E 9 PD190R 10

	TM-T88V	TM-T88IV
5. Power consumption	<High speed mode> Print ratio:Approximately 18% Mean: Approximately 1.8 A Peak: Approximately 6.4 A Print ratio:Approximately 50% Mean: Approximately 3.5 A Peak: Approximately 7.6 A Print ratio:Approximately 100% Mean: Approximately 4.3 A Peak: Approximately 11.1 A <Low power consumption mode / Two-color print mode > Not supported	<High speed mode> Print ratio:Approximately 18% Mean: Approximutely 1.8 A Peak: Approximately 6.1 A Print ratio:Approximately 50% Mean: Approximately 3.3 A Peak: Approximately 7.1 A Print ratio:Approximately 100% Mean: Approximately 2.8 A Peak: Approximately 10.5 A <Low power consumption mode / Two-color print mode >> Supported
6. Reliability	Life Printer mechanism: 20 million lines Print head: 150 million pulse 150 km Autocutter 2 million cuts (When using the specified original paper: PD150R, PD160R) MCBF: 70 million lines	Life Printer mechanism: 15 million lines Print head: 100 million pulse 100 km (In single-color printing) Autocutter 1.5 million cuts MCBF: 52 million lines
7. Interface	USB interface is added to the main unit as standard equipment.	---
8. USB device class	USB vendor-defined class Vendor ID: 04b8h Product ID: 0202h String Descriptor: Manufacturer: EPSON Product: TM-T88V Serial Number: Character string based on the product serial number USB printer class (Newly supported) Vendor ID: 04b8h Product ID: 0E02h String Descriptor: Manufacturer: EPSON Product: TM-T88V Serial Number: Character string based on the product serial number	USB vendor-defined class Vendor ID: 04b8h Product ID: 0202h String Descriptor: Manufacturer: EPSON Product: TM-T88IV Serial Number: Character string based on the product serial number
9. Drawer-kick connector Power supply connector	Position is changed.	---

	TM-T88V	TM-T88IV
10. DIP switch	DIP switch 2-3, 2-4: ON, ON, prohibited	DIP switch 2-3, 2-4: ON, ON, low power consumption mode
11. Self test	Printing pattern is changed.	---
12. R/E information printing mode/customized value (memory switch) setting mode (R/E = Receipt Enhancement)	Newly added.	---
13. Customized value	The following can be set with GS (E: • Print density • Printing speed • Default character code table • Default international character • Selection of an interface • Number of print head energization • Power supply output • Automatic cutting after closing the roll paper cover • (APR) Automatic Reduction of Paper • Automatic replacement of font • Print density when printing in multi-tone • Optional external buzzer function	The following can be set with GS (E: • Print density • Print speed • Number of head energization • Print control (signal or two-color) • Print density level of the black color in two-color printing
14. External appearance	Design has been changed. Connector cover size is changed.	---
15. Bundled items	• CD-ROM Drivers, Utility software, User's manual • 58-paper width paper guide plate	• User's manual
16. Options	• Power supply box: OT-BX88V • Optional external buzzer: OT-BZ20	• Power supply box: OT-BX88
17. Low power consumption mode	Not supported.	Depending on the condition of the command or the print duty, the printer controls the print speed or the number of the head energization to save power.
18. Power supply output setting	Can lower the power supply load by automatically changing the print speed based on print duty.	---

	TM-T88V	TM-T88IV
19. Manual paper feed	Manual paper feed during printing does not function. (ASB of paper being fed with the paper Feed button is not transmitted.)	Manual paper feed during printing is possible after printing pauses. (ASB of paper being fed with the paper Feed button is transmitted.)

APPENDIX M: COMPARISON TABLE BETWEEN TM-T88V AND TM-T88IV (COMMANDS)

COMMAND	TM-T88V	TM-T88 IV
GS (k	Set and print symbols. MaxiCode, GS1 DataBar, and Composite Symbology are added.	---
GS D	Specify Windows BMP graphics data (Newly supported)	---
ESC M	Select character font [Range] *n* = 0, 1, 48, 49, 64, 65	[Range] *n* = 0, 1, 48, 49
ESC R	Select international character [Range] 0 ≤ n ≤ 17	[Range] 0 ≤ n ≤ 15
ESC t	Select character code table [Range] 0 ≤ *n* ≤ 5, 11 ≤ *n* ≤ 21, *n* = 26, 30 ≤ *n* ≤ 53, *n* = 255	[Range] 0 ≤*n* ≤ 5, 16 ≤ *n* ≤ 19, *n* = 255
GS (E	User-defined commands Customized values have been added/eliminated. See APPENDIX L.	---
GS f	Select HRI character font [Range] *n*=0, 1, 48, 49, 64, 65	[Range] *n*=0, 1, 48, 49
GS k	Print bar code [Range] <B> 65 ≤ *m* ≤ 78	[Range] <B> 65 ≤ *m* ≤ 73
FS (E	Receipt enhancement control commands	---
GS (K	Selection of print speed [Range] 0 ≤ m ≤ 13 Selection of number of divisions of thermal head energization [Range] 0 ≤ ***m*** ≤ 2, 48 ≤ ***m*** ≤ 50, ***m*** = 4, 52	[Range] 0≤ m ≤ 9 [Range] 0 ≤ ***m*** ≤ 2, 48 ≤ ***m*** ≤ 50, ***m*** = 4, 52,128
GS (L	Graphics printing in multi-tone is added.	---
GS g0	Resetting the maintenance counter Number of lines fed (when the print head is replaced) [Range] (***nL***+***nH***×256) = 20, 21,22, 50, 70	[Range] (***nL***+***nH***×256) = 20, 21, 50, 70
GS g2	Maintenance counter Number of lines fed (when the print head is replaced) [Range] (***nL***+***nH***×256) = 20, 21,22, 50, 70, 148, 149, 150, 178, 198	[Range] (***nL***+***nH***×256) = 20, 21, 50, 70, 148, 149, 178, 198

APPENDIX N: NOTES ON ARP (AUTOMATIC REDUCTION OF PAPER) AND AUTOMATIC LOGO PRINTING FUNCTION

N.1 ARP: Reduction of Top Margin, Reduction of Bottom Margin, Reduction of Line Spacing, and Reduction of Line Spacing Where Extra Line Feeds Are Included

- Paper reduction is not performed for space dot lines of graphics printing data.

N.2 ARP: Reduction of Bar Code Height

- When reducing a bar code height, reading of the bar code is not guaranteed. Be sure to check reading a bar code with a user's bar code reader in advance.

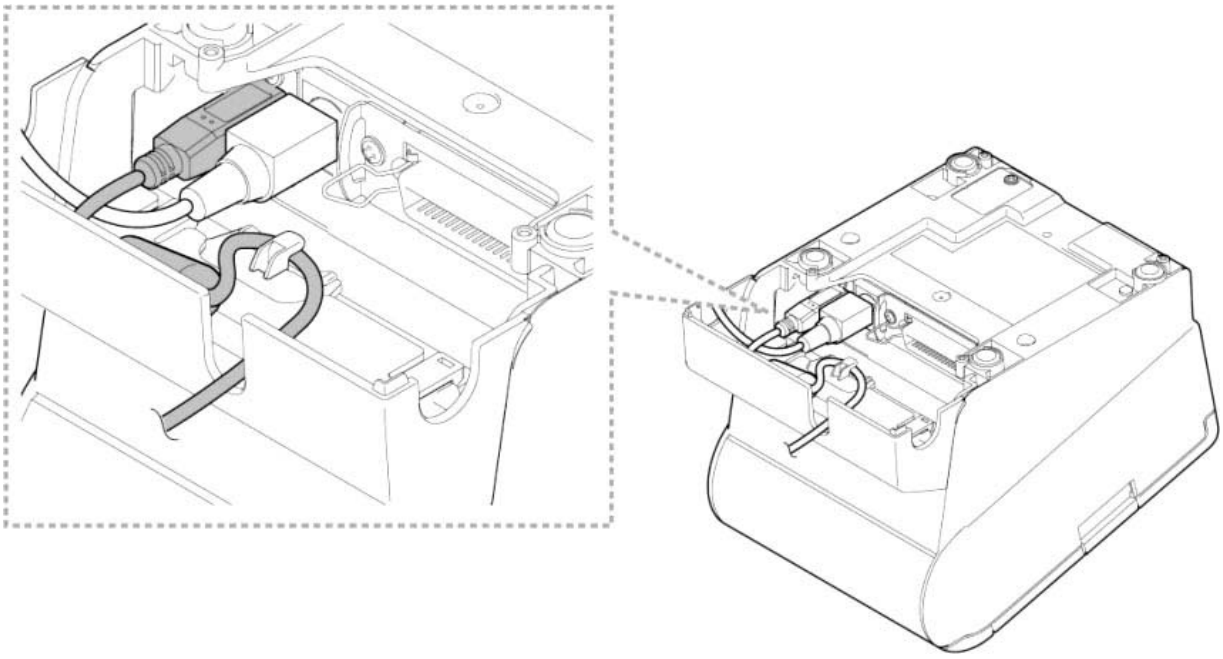
N.3 Automatic Logo Printing Function

- The automatic bottom logo printing is a function of logo printing that works with an autocutting command and produces good printing quality when using the **GS V** *m n* (paper feeding + paper cutting) command. When using cutting only commands (**GS V** *m*, **ESC i**, or **ESC m**), extra line spacing above a bottom logo occurs, depending on the paper feeding command before the cutting command.
- When printing a top logo during paper feeding to the cutting position, the **GS V** *m n* (paper feeding + paper cutting) command will produce good printing quality. When using cutting only commands, printing a logo before cutting is not performed.

APPENDIX O: TO PREVENT USB CABLE FROM BEING PULLED OUT

When you put the USB cable through the cable exit on the back of the connector cover, it is possible to secure the cable in place with the cable-fixing hook on the printer in order to prevent the cable from being accidentally pulled out.

Recommended USB cable diameter: Φ 4.06 to 5.21 mm (Φ 0.160 to 0.205")



APPENDIX P: HOW TO CHANGE CUSTOMIZED VALUES (MEMORY SWITCHES)

The customized values (memory switches) can be changed by any of the following three methods:

- User setup commands: **GS (E**
  1) Change into the user setting mode with **GS (E** <Function 1>.
  2) Set with **GS (E** <Function 5>, <Function 11>, or <Function 15>.
     <Function 5>: Customized setting values
     <Function 11>: Configuration item for the serial interface
     <Function 15>: Conditions for USB interface communication
  3) End the user setting mode with **GS (E** <Function 2>.

  Note: For details, see **GS (E**, Set user setup commands in Section 6, COMMANDS.
- Customized value (memory switch) setting mode
  See Section 3.7.3, Customized value (memory switch) setting mode.
- Utility software
  The settings can be changed by using the utility software for the TM-T88V.