Confidential

EPSON

Receipt Printer

TM-T88III series

Specification

STANDARD	
Rev. No.	B
Notes	

Copied Date	, ,
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SEIKO EPSON CORPORATION

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REVISION SHEET

The table below indicates which pages in this specification have been revised.
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Revisions		Design Section			Sheet Rev. No.					
Rev.	Document	WRT	CHK	APL	Sheet	Rev.	Sheet	Rev.	Sheet	Rev.
A	Enactment	Nakayama	--	Omura	I	B	17	B	42	B
B	Change				II	B	18	B	43	B
					III	B	19	B	44	B
					IV	B	20	B	45	B
					V	B	21	B	46	B
					VI	B	22	B	47	B
							23	B	48	B
							24	B	49	B
							25	B	50	B
					1	B	26	B	51	B
					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
					8	B	33	B	58	B
					9	B	34	B	59	B
					10	B	35	B	60	B
					11	B	36	B	61	B
					12	B	37	B	62	B
					13	B	38	B	63	B
					14	B	39	B	64	B
					15	B	40	B	65	B
					16	B	41	B	66	B

TITLE	Front Part							
TM-T88III series Specification (STANDARD)	Cover	Rev. Sheet	Confidentiality Agreement	General Features	Table of Contents	Contents	Appendix	Total
	1	4	1	1	4	152	20	183

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Revisions		Design Section			Sheet Rev. No.					
Rev.	Document	WRT	CHK	APL	Sheet	Rev.	Sheet	Rev.	Sheet	Rev.
A	Enactment				67	B	92	B	117	B
B	Change				68	B	93	B	118	B
					69	B	94	B	119	B
					70	B	95	B	120	B
					71	B	96	B	121	B
					72	B	97	B	122	B
					73	B	98	B	123	B
					74	B	99	B	124	B
					75	B	100	B	125	B
					76	B	101	B	126	B
					77	B	102	B	127	B
					78	B	103	B	128	B
					79	B	104	B	129	B
					80	B	105	B	130	B
					81	B	106	B	131	B
					82	B	107	B	132	B
					83	B	108	B	133	B
					84	B	109	B	134	B
					85	B	110	B	135	B
					86	B	111	B	136	B
					87	B	112	B	137	B
					88	B	113	B	138	B
					89	B	114	B	139	B
					90	B	115	B	140	B
					91	B	116	B	141	B

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A	Enactment				142	B	App.1	B		
B	Change				143	B	App.2	B		
					144	B	App.3	B		
					145	B	App.4	B		
					146	B	App.5	B		
					147	B	App.6	B		
					148	B	App.7	B		
					149	B	App.8	B		
					150	B	App.9	B		
					151	B	App.10	B		
					152	B	App.11	B		
							App.12	B		
							App.13	B		
							App.14	B		
							App.15	B		
							App.16	B		
							App.17	B		
							App.18	B		
							App.19	B		
							App.20	B		

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REVISION SHEET

REV.	SHEET	CHANGED CONTENTS
B	All	All pages are revised, due to addition of the multilingual support.
	II	GENERAL FEATURES The following models are available … (added)
	III - VI	Table of Contents (changed)
	1 – 3	1.1 Printing Specifications 1.2 Character Specifications Description for Kanji and Thai characters support (added)
	25	2.1.4 Other interfaces (added)
	31	Kanji command list (added)
	42 - 50	3.2.11 Page 20 through 3.2.17 Page 26 (added) 3.2.11 → 3.2.18, 3.2.12 → 3.2.19
	66	5.1 Standard Accessories User's manual (Languages: .. Simplified Chinese, Traditional Chinese) (added)
	77	ESC ! [Details] • Emphasized mode is … (added)
	86	ESC - [Details] • This command does not … (added)
	106	ESC t [Range] [Description] [Default] Thai model (added)
	123	GS I [Range] [Description] n=69 (added)
	145 - 152	6.4 Kanji Control Commands (added)
	App.1	Table A.1 Kanji font (added)
	App.20	APPENDIX K, Multilingual support (changed)

TITLE

TM-T88III series

Specification

(STANDARD)

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GENERAL FEATURES

This specification applies the following models of the TM-T88III series printer:

TM-T88III	(with serial interface (*1))
TM-T88IIIP	(with parallel interface)

The following models are available for each product above.

1) Alphanumeric (ANK) model
2) Multilingual model (*)
3) Japanese model

(*): The multilingual character model supports printing with one of the following characters:

① Simplified Chinese
② Traditional Chinese
③ Thai
④ Korean

The printer has the following features:

1) Printing

- High speed printing: approximately 35.5 lps (4.23 mm {1/6"} feed) maximum. [lps: lines per second]
- Low-noise thermal printing.
- High reliability due to a stable mechanism.

2) Application Software

- Command protocol is based on the ESC/POS® standard.
- Various Layouts are possible by using page mode.
- Characters can be scaled up to 64 times as large as the standard size. Smoothing is also possible.
- Bar code printing is possible by using a bar code command. Bar codes can be printed both in the vertical direction (fence bar code) and in the horizontal direction (ladder bar code) (*2).
- Repeated operation and copy printing are possible by using macro definitions.
- Character font size (12 × 24 font or 9 × 17 font) can be selected using a command.

3) Printer Handling

- Easy paper roll setting.
- Equipped with an autocutter.
- The printer allows easy maintenance for tasks such as head cleaning.
- Three different print densities can be selected by DIP switches.
- The built-in interface provides control capability for two drawers.

NOTES) *1: An RS-485 serial interface is a factory option.
*2: The ladder bar code is effective only in the page mode.

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Table of Contents

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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) Printing width: 72 mm {2.83"}, 512 dot positions

5) Characters per line (default):
Font A: 42
Font B: 56
Kanji: 21

6) 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.

7) Printing speed:
High speed mode:
Approximately 150 mm/s maximum
{Approximately 5.9"/s maximum}
47.2 lps maximum (computed value for 3.18 mm {1/8"} feed)
35.5 lps maximum (4.23 mm {1/6"} feed)

(at 24V, 28°C {82.4°F}, Density level 1. Speeds are switched automatically depending on the voltage applied to the printer and head temperature conditions.)

Low power consumption mode:
Approximately 16.5 lps (4.23 mm {1/6"} feed)
Approximately 70 mm/s {approximately 2.76"/s}

When a ladder bar code is printed:
Approximately 42 mm/s {approximately 1.7"/s}

[lps: lines per second]

NOTES:
- There may be variations in printing after switching the mode of the printing speed. To prevent this for logo printing with **ESC ∗** command, using a downloaded bit image is recommended. Change in printing speed does not occur during down loaded bit image printing.
- Printing speed may be slower depending on the data transmission speed and the combination of control commands.
- Low transmission speed may cause intermittent printing. It is recommended to transmit data to the printer as quickly as possible.
- High speed mode or low power consumption mode is selected by a DIP switch. (Refer to Table 3.3.4 and 3.3.7).

8) Paper feed speed: Approximately 150 mm/s {approximately 5.9"/s}
(continuous paper feeding)

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

1.2 Character Specifications

1) Number of characters:

Alphanumeric characters:	95
Extended graphics:	128 × 11 pages (including one space page)
International characters:	37
Japanese model:	JIS (JIS X0208-1990): Level 1: 3489 Level 2: 3390

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

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

② Traditional Chinese (Big 5)
13494

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

④ Korean Kanji (KS C5601)
8366

2) Character structure:

Font A:	12 × 24 (including 2-dot spacing in horizontal)
Font B:	9 × 17 (including 2-dot spacing in horizontal)
Kanji:	24 × 24
Thai font:	12 × 72, 9 × 51

Font A is selected as the default

3) Character size: Refer to Table 1.2.1.

Table 1.2.1 Character Size

	Standard		Double-height		Double-width		Double-width/ Double-height	
	W×H (mm)	cpl	W×H (mm)	cpl	W×H (mm)	cpl	W×H (mm)	cpl
Font A 12×24	1.41×3.39	42	1.41×6.77	42	2.82×3.39	21	2.82×6.77	21
Font B 9×17	0.99×2.40	56	0.99×4.80	56	1.98×2.40	28	1.98×4.80	28
Kanji 24 × 24	3.39×3.39	21	3.39×6.67	21	6.77×3.39	10	6.77×6.77	10
Thai FontA	1.14×10.16	42	1.41×20.32	42	2.82×10.16	21	2.82×20.32	21
Thai FontB	0.99×7.20	56	0.99×14.40	56	1.98×7.20	28	1.98×14.40	28

Space between characters is not included.
Characters can be scaled up to 64 times as large as the standard sizes.
cpl = characters per line

4) Supporting character on each model type: Refer to Table 1.2.2

Table 1.2.2 Supporting Character on Each Model Type

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

(ANK = alphanumeric)

1.3 Autocutter

Partial cut: Cutting with one point left uncut

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

1.4 Paper Roll Supply Device

1) Supply method: Drop-in paper roll

2) Near-end sensor:

a) Detection method: Microswitch

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

c) Near-end adjustment: Can be adjusted by changing the position of the adjusting screw.
Fixed position #1 (approximately 23 mm {0.9"})
#2 (approximately 27 mm {1.06"})

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

1.5 Paper Specification

1) Paper type: Specified thermal paper

2) Form: Paper roll

3) Paper width: 79.5 ± 0.5 mm {3.13 ± 0.02"}

4) Paper roll size: Roll diameter: Maximum 83 mm {3.26"}
Take-up paper roll width: 80 +0.5/–1.0 mm {3.15+0.02/–0.04"}

5) Specified paper: Specified thermal roll paper:
NTP080-80
[Original paper: TF50KS-E Nippon Paper Industries Co., Ltd.]
Packaged roll paper:
[Original paper: PD160R (Oji Paper Mfg. 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

The following paper can be used instead of the specified paper above:

Original paper: PD190R (Oji Paper Mfg. Co., Ltd.)
P350(F380), P310, P300
(Kanzaki Specialty Papers, Inc. (U.S.A.))
AF50KS-E (Jujo Thermal Oy (Finland))

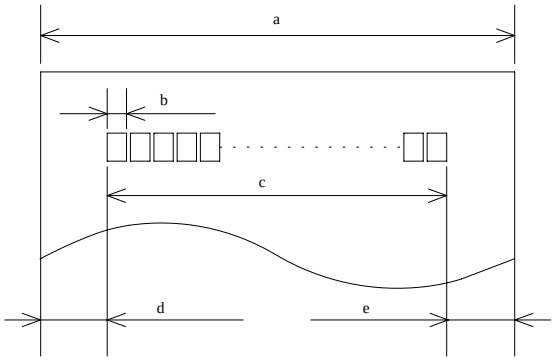
6) Paper roll spool diameter: Inside: 12 mm {0.47"}
Outside: 18 mm {0.71"}

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

1.6 Printable Area

1) Paper roll

The printable area of a paper with 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 are approximately 3.7 ±2 mm {0.15 ± 0.079"}.



a = 79.5 ± 0.5 mm {3.13 ± 0.02"}
b = 0.141 ± 0.05 mm {0.056 ± .002"}
c = 72.2 ± 0.2 mm {2.84 ± .008"}
d = 3.7 ± 0.2 mm {0.15 ± 0.079"}
e = 3.7 ± 0.2 mm {0.15 ± 0.079"}
[All the numeric values are typical.]

Figure 1.6.1 Paper Roll Printable Area

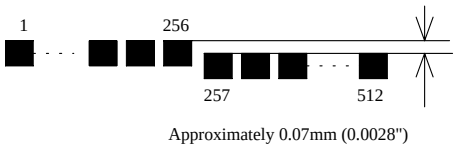
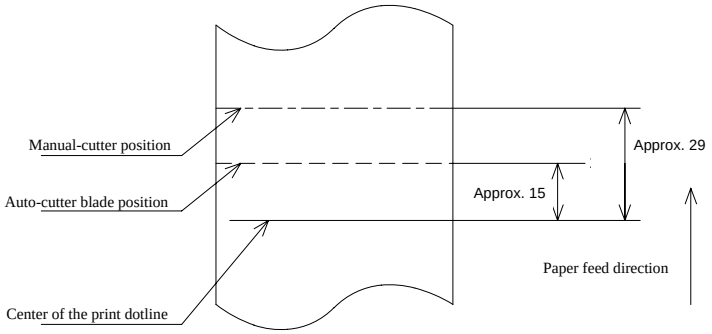


Figure 1.6.2 Shifting of the Print Position

NOTE: The print position within the printable area of the thermal elements for dots 257 to 512 is shifted approximately 0.07 mm {0.003"} in the paper feed direction from the position for dots 1 to 256. Be sure not to print a ladder bar code across both printable areas, as this can cause variations in printing which are difficult to read. However, when the ladder bar code is printed with level 2 of print density, the difference is only approximately 0.04 ~ 0.05 mm {0.0015~0.0019"}.

1.7 Printing and Cutting Positions



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

Figure 1.7.1 Printing and Cutting Positions

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

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) bit image buffer: 256 KB
5) NV user memory: 1 KB

1.9 Electrical Characteristics

1) Supply voltage: +24 VDC ± 7%

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

High speed mode:
Mean: Approximately 1.8 A
(Character font A α-N, capital letters, 36-character rolling pattern, 42 columns printing)
Peak: Approximately 7.7 A

Low power consumption mode:
Mean: Approximately 1.2 A
(Character font A α-N, capital letters, 36-character rolling pattern, 42 columns printing)
Peak: Approximately 6.6 A

Standby:
Mean: Approximately 0.2 A

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

1.10 EMI and Safety Standards Applied

EMC is measured using SEIKO EPSON's AC adapter

1) Europe
CE marking:
Directive: 89/336/EEC
EN55022 Class B
EN55024
IEC61000-4-2
IEC61000-4-3
IEC61000-4-4
IEC61000-4-5
IEC61000-4-6
IEC61000-4-11
Safety Standard: EN60950

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

3) Japan
EMI: VCCI Class A

4) Oceania
EMC: AS/NZS 3548

Conditions of Acceptability

1) This component has been judged on the basis of the required spacing in the Standard for Information Technology equipment, Including Electrical Business Equipment, UL 1950 and CSA C22.2 No. 950, Sub-clause 2.9, which would cover the component itself if submitted for Listing.
2) This unit is intended to be supplied by a SELV circuit only.
3) The terminals and connectors have not been evaluated for field wiring.

1.11 Reliability

1) Life:

Mechanism:	15,000,000 lines
Thermal head:	100 million pulses, 100 km
Auto cutter:	1,500,000 cuts

(End of life is defined to have reached the end of its life when it reaches the beginning of the Wearout Period.)

2) MTBF: 360,000 hours

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

3) MCBF: 52,000,000 lines

(This is an average failure interval based on failures relating to wearout and random failures up to the life of 15 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} (except for paper)
2) Humidity:	Operating:	10 to 90% RH
	Storage:	10 to 90% RH (except for paper)

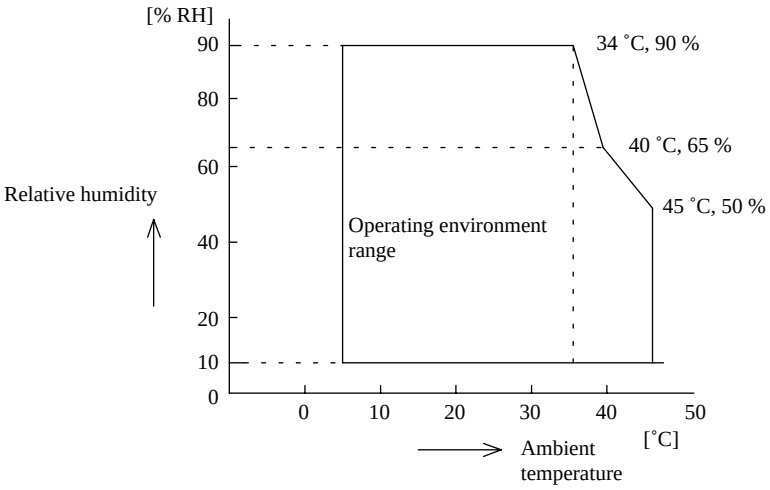


Figure 1.12.1 Operating Temperature and Humidity Range

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):

When using autocutter:
Approximately 55 dB (Bystander position)

When not using autocutter:
Approximately 45 dB (Bystander position)

1.13 Installation

The TM-T88III series printer must be installed horizontally.

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

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

2. CONFIGURATION

2.1 Interface

2.1.1 RS-232 serial interface

2.1.1.1 Specifications

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

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

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

2.1.1.3 Interface connector terminal assignments and signal functions

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

Table 2.1.1 TM-T88III 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, and GS a).
When XON/XOFF control is selected, the printer does not check this signal.
Changing the DIP switch setting enables this signal to be used as a reset signal for the printer (refer to Section 3.3.3).
The printer is reset when the signal remains MARK for 1 ms or more. (refer to Section 2.1.1.7)</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 (refer to Section 3.3.3):
<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="9">Offline</td><td>1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>2. During the self-test.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>3. When the cover is open.</td><td>—</td><td>BUSY</td></tr>
<tr><td>4. During paper feeding using the paper feed button.</td><td>—</td><td>BUSY</td></tr>
<tr><td>5. When the printer stops printing due to a paper-end.</td><td>—</td><td>BUSY</td></tr>
<tr><td>6. During macro executing standby status.</td><td>—</td><td>BUSY</td></tr>
<tr><td>7. When a temporary abnormality occurs in the power supply voltage.</td><td>—</td><td>BUSY</td></tr>
<tr><td>8. When an error has occurred.</td><td>—</td><td>BUSY</td></tr>
<tr><td></td><td>9. When the receive buffer becomes full.(*1)</td><td>BUSY</td><td>BUSY</td></tr>
</table></td></tr>
</table>

Table 2.1.1 TM-T88III Printer Status and Signals (Continued)

Pin number	Signal name	Signal direction	Function
			2) When XON/XOFF control is selected: The signal indicates whether the printer is correctly connected and is ready to receive data. SPACE indicates that the printer is ready to receive data. The signal is always SPACE except in the following cases: • During the period from when the power is turned on to when the printer is ready to receive data • During the self-test
25	INIT	Input	Changing 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 to 4 KB (DIP SW1-2 is Off):
  - If the 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 the 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 to 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.

2.1.1.4 XON/XOFF transmit timing

When XON/XOFF control is selected, the printer transmits XON or XOFF signals as follows. Transmit timing differs depending on the DIP SW2-1 setting.

Table 2.1.2 XON/XOFF Transmit 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 an error using the **DLE ENQ 1** or **DLE ENQ 2** commands	—	Transmit
XOFF Transmission	⑤ When the receive buffer becomes full	Transmit	Transmit
	⑥ When the printer switches from online to offline	—	Transmit

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

2.1.1.5 Serial interface connection example

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

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

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

     Example: Check the printer status using **GS r** after transmitting each line of data and use the 4 KB receive buffer. Transmit one line of data so that the receive buffer does not become full.

2.1.1.7 Notes on Resetting the Printer Using the Interface

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

Table 2.1.3 Reset Switching

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

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

- DC characteristics:

Table 2.1.4 Reset DC Characteristics

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

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

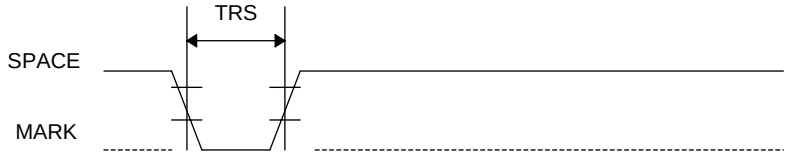


Figure 2.1.1 Minimum Reset Pulse Width (pin 6)

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

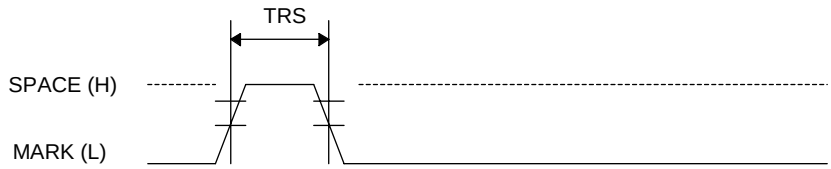


Figure 2.1.2 Minimum Reset Pulse Width (pin 25)

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

2.1.2 IEEE 1284 Bidirectional Parallel Interface

2.1.2.1 Compatibility Mode

(Data Transmission from Host to Printer: Centronics compatible)

1) Outline

Compatibility mode supports the compatibility with Centronics parallel interface.

2) Specifications

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

3) Switching between online and offline

The printer is not equipped with any online/offline switch. The printer is placed into offline status in either of the followings:

1) When the power is turned on or until the printer becomes ready for data transmission after it is initialized by the reset signal (nInit) from the interface.
2) During the self-test.
3) When the cover is open.
4) During paper feeding using the paper feed button.
5) When the printer stops printing due to a paper-end (in cases when empty paper supply is detected by either the paper roll end detector or the paper roll near-end detector with a printing halt due to paper shortage enabled by **ESC c 4**).
6) During macro executing standby status.
7) When a temporary abnormality occurs in the power supply voltage.
8) When an error has occurred.

2.1.2.2 Reverse Mode (Data Transmission from Printer to Host)

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

- Description

  This mode allows data transmission from the asynchronous printer under the control of the host. Data transmissions in the Nibble Mode are made via the existing control lines in units of four bits (Nibble). In the Byte Mode, data transmissions are proceeded by making the eight-bits data lines bidirectional.

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

2.1.2.3 Interface Pin Assignments for Each Mode

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

*NC: Not Connected
ND: Not Defined

NOTES:
1. A prefix “n” to signal names refers to “L” active signals. To the host provided with none of the signal lines listed above, both-way communication fails.
2. For interfacing, signal lines shall use twisted pair cables with the return sides connected to signal ground level.
3. Interfacing conditions shall be all based on the TTL level to meet the characteristics described below. In addition, both rise time and fall time of each signal shall be 0.5 μs or less.
4. Data transmission shall not ignore the signal nAck or Busy. An attempt to transmit data with either signal, nAck or Busy, ignored can cause lost data. (Data transmissions to the printer shall be made after verifying the nAck signal or while the Busy signal is at the “L” level.)
5. Interface cables shall be as minimum required short in length as possible.

2.1.2.4 Electrical Characteristics

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

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

Logic-H Signal Sender Characteristics

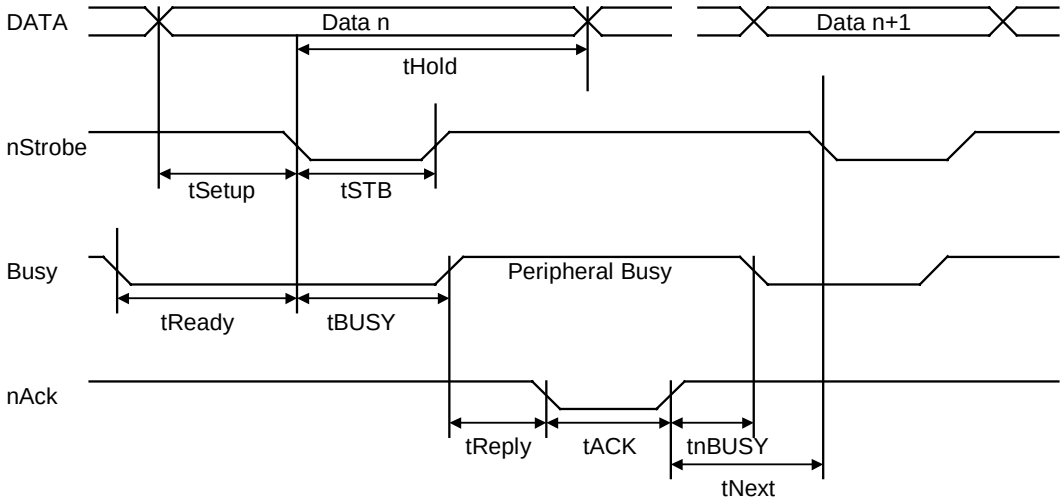
Characteristics	Symbol	Specifications		Conditions
		Min	Max	
Output HIGH voltage	V_{OH}	3.0 V	5.5 V	
Output LOW voltage	V_{OL}	-	2.0 V	While the power is OFF

+5 V Signal Sender Characteristics

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

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

2.1.2.5 Data Receiving Timing (Compatibility Mode)



Characteristics	Symbol	Specifications	
		Min[ns]	Max[ns]
Data Hold Time (host)	tHold	750	--
Data Setup Time	tSetup	750	--
STROBE Pulse Width	tSTB	750	--
READY Cycle Idle Time	tReady	0	--
BUSY Output Delay Time	tBUSY	0	500
Data Processing Time	tReply	0	∞
ACKNLG Pulse Width	tACK	500	10µs
BUSY Release Time	tnBUSY	0	∞
ACK Cycle Idle Time	tNext	0	--

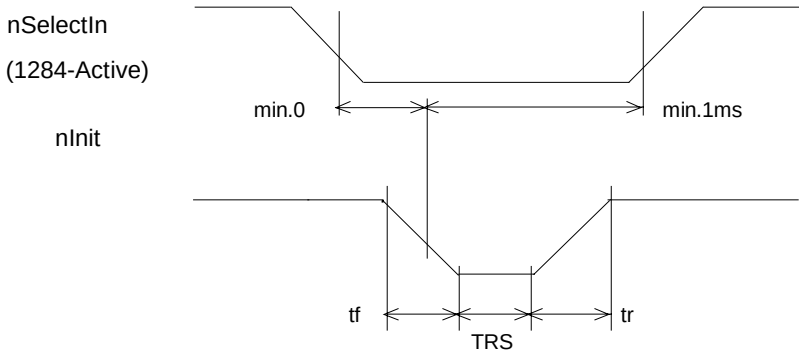
*The printer latches data at a nStrobe ↓ timing

2.1.2.6 Notes on resetting the printer through the interface

To enable the printer reset in compatibility mode, the following signal timing shall be satisfied. However, the printer reset is ignored when the signal nSelectIn (#36 pin, 1284-Actie 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.)



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

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

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

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

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

First Status	Second Status	Third Status	Fourth Status
0001 1000	0000 0000	0000 0000	0000 0000

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

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

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

Accumulated ASB (①+②+③)

	First Status	Second Status	Third Status	Fourth Status
Accumulated ASB (①+②+③)	0011 1000	0000 0000	0000 0011	0000 0000
+				
The latest ASB (③)	0001 1000	0000 0000	0000 0011	0000 0000
	Fourth Status			

2.1.2.8 Notes on setting DIP switch 2-1 to ON

Refer to Section 2.1.1.6.

2.1.3 RS-485 Serial Interface

(An RS-485 serial is a factory option.)

2.1.3.1 Specifications (RS-485 compatible)

Data transmission:	Serial
Synchronization:	Asynchronous
Handshaking:	Depend on the DIP switch settings (DTR/DSR or XON/XOFF control)
Signal levels:	2.0 to 5.0 V: Logic 1 0.0 to 0.8 V: Logic 0
Baud rates:	4800, 9600, 19200, 38400 bps
Data word lengths:	7 or 8 bits
Parity settings:	None, even, odd
Stop bits:	1 or more
Connector (printer side):	Female D-SUB25 pin connector

NOTES:
- The handshaking data word length, baud rate, and parity depend on the DIP switch (Refer to Section 3.3.3)
- Data transmitted from the printer has 1 stop bit (fixed).

DR1 > DR2 CS1 > CS2 indicates that:
Channel 1 is high.
Channel 2 is low.

DR1 < DR2 CS1 < CS2 indicates that:
Channel 2 is high.
Channel 1 is low.

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

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

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

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

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

*1
- Definition of “receive buffer full”
  - When the receive buffer capacity is specified to 4 KB (DIP SW1-2 is Off):
    - If the 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 the 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 to 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.

* For notes on setting DIP switch 2-1 to ON, refer to Section 2.1.1.6.

2.1.3.3 Interface pin assignments

Table 2.1.5 TM-T88III 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
3</td><td>SD1
SD2</td><td>Output</td><td>Transmit data</td></tr>
<tr><td>4
5</td><td>RD1
RD2</td><td>Input</td><td>Receive data</td></tr>
<tr><td>7</td><td>SG</td><td>--</td><td>Signal ground</td></tr>
<tr><td>8
9</td><td>DR1
DR2</td><td>Output</td><td>When DTR/DRS is selected, this signal indicates whether the host computer is BUSY or READY.
1) DR1>DR2 indicates that the printer is READY and DR1<DR2 indicates that the printer is BUSY. The BUSY condition can be changed depending on the offline conditions set by the DIP switches (refer to Section 3.3.3).
When the DTR/DSR control is selected, the printer becomes the BUSY state (DR1<DR2) under the following conditions.
<table>
<tr><th></th><th>Printer status</th><th>DIP SW 2-1 status</th><th></th></tr>
<tr><th></th><th></th><th>ON</th><th>OFF</th></tr>
<tr><td rowspan="8">Offline</td><td>1. During the period from when the power is turned on (including resetting using the interface) to when the printer is ready to receive data.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>2. During the self-test.</td><td>BUSY</td><td>BUSY</td></tr>
<tr><td>3. When the cover is open.</td><td>—</td><td>BUSY</td></tr>
<tr><td>4. During paper feeding using the paper feed button.</td><td>—</td><td>BUSY</td></tr>
<tr><td>5. When the printer stops printing due to a paper-end. (only when the paper roll is not present)</td><td>—</td><td>BUSY</td></tr>
<tr><td>6. During macro executing standby status.</td><td>—</td><td>BUSY</td></tr>
<tr><td>7. When a temporary abnormality occurs in the power supply voltage.</td><td>—</td><td>BUSY</td></tr>
<tr><td>8. When an error has occurred.</td><td>—</td><td>BUSY</td></tr>
<tr><td></td><td>9. When the receive buffer becomes full.(*1)</td><td>BUSY</td><td>BUSY</td></tr>
</table>
2) When XON/XOFF control is selected:
The signal indicates whether the printer is correctly connected and is ready to receive data. SPACE indicates that the printer is ready to receive data. The signal is always DR1>DR2 (READY) indicates that the printer is ready to receive data. The signal is always DR1>DR2 except in the following cases:
• During the period from when the power is turned on to when the printer is ready to receive data
• During the self-test</td></tr>
</table>

Table 2.1.5 TM-T88III Printer Status and Signals (Continued)

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

*1
- Definition of “receive buffer full”
  - When the receive buffer capacity is specified to 4 KB (DIP SW1-2 is Off):
    - If the 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 the 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 to 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.

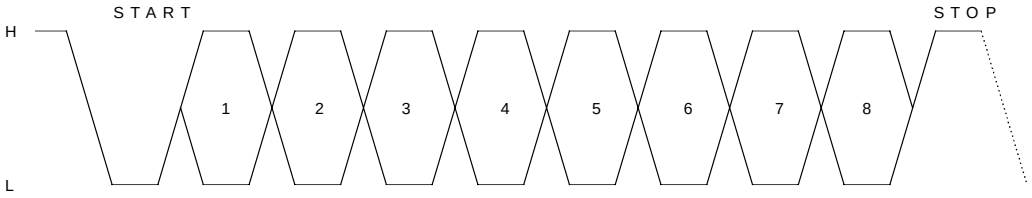
2.1.3.4 XON/XOFF transmit timing

Refer to Section 2.1.1.4.

For the DIP switch settings of the offline status, refer to Section 2.1.1.6.

2.1.3.5 Data format when using RS-485

Transmission data (8 bits, none parity)



RS-485 Communication data format

"H" indicates

<Printer transmission data> SD1<SD2
<Printer reception data> RD1<RD2

"L" indicates:

<Printer transmission data> SD1>SD2
<Printer reception data> RD1>RD2

The transmission data is H = 1, L = 0

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

Printer Reception Data Level

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

Printer Transmission Data Level

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

2.1.4 Other Interfaces

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

2.2 Connectors

2.2.1 Interface Connectors

Refer to Section 2.1, Interface.

2.2.2 Power Supply Connector

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

1) Pin assignments: Refer to Table 2.2.1.

Table 2.2.1 Power Supply Connector Pin Assignments

Pin Number	Signal Name
1	+24 V
2	GND
3	NC
SHELL	F.G.

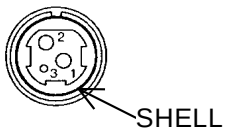


Figure 2.2.1 Power Supply Connector

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

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

2.2.3 Drawer Kick-out Connector (Modular Connector)

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

1) Pin assignments: Refer to Table 2.2.2

Table 2.2.2 Drawer Kick-out Connector Pin Assignments

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

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

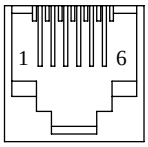


Figure 2.2.2 Drawer Kick-out Connector

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

3) Drawer kick-out drive signal
Output signal: Output voltage: Approximately 24 V
Output current: 1 A or less

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

Output waveform: Outputs the waveforms in Figure 2.2.3 to the points A and B in Figure 2.2.4.
t1 (ON time) and *t2* (OFF time) are specified by **ESC p** or **DLE DC4**.

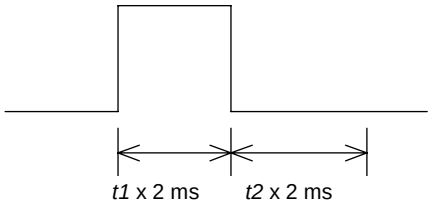


Figure 2.2.3 Drawer Kick-out Drive Signal Output Waveform

4) Drawer open/close signal

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

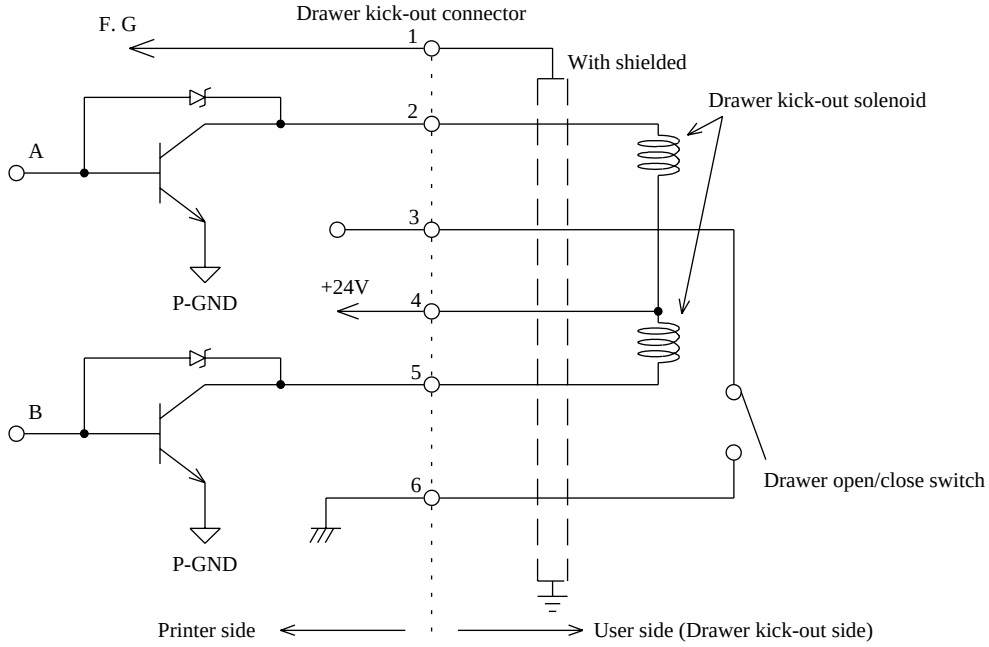


Figure 2.2.4 Drawer Circuitry

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

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

4. Be sure to use the printer power supply (connector pin 4) for the drawer power source.
5. The resistance of the drawer kick-out solenoid must not be less than the specified. Otherwise, an overcurrent could damage the solenoid.
6. Do not connect telecommunication network to the drawer kick-out connector.

3. FUNCTIONS

3.1 List of commands

Command	Name	Command classification		Standard mode	Page mode	GS P function
		Executing	Setting			
HT	Horizontal tab	O		O	O	
LF	Print and line feed	O		O	O	
FF	Print and return to standard mode (in page mode)	O		Ignored	O	
CR	Print and carriage return	O		O	O	
CAN	Cancel print data in page mode	O		Ignored	O	
DLE EOT	Real-time status transmission	O		O	O	
DLE ENQ	Real-time request to printer	O		O	O	
DLE DC4	Generate pulse at real-time	O		O	O	
ESC FF	Print data in page mode	O		Ignored	O	
ESC SP	Set right-side character spacing		O	O	O	O
ESC !	Select print mode(s)		O	O	O	
ESC $	Set absolute print position	O		O	O	O
ESC %	Select/cancel user-defined character set		O	O	O	
ESC &	Define user-defined characters		O	O	O	
ESC ∗	Select bit-image mode	O		O	O	
ESC -	Turn underline mode on/off		O	O	O	
ESC 2	Select default line spacing		O	O	O	
ESC 3	Set line spacing		O	O	O	O
ESC =	Select peripheral device		O	O	O	
ESC ?	Cancel user-defined characters		O	O	O	
ESC @	Initialize printer	O	O	O	O	
ESC D	Set horizontal tab positions		O	O	O	
ESC E	Turn emphasized mode on/off		O	O	O	
ESC G	Turn double-strike mode on/off		O	O	O	
ESC J	Print and feed paper	O		O	O	O
ESC L	Select page mode	O		(O)	Ignored	
ESC M	Select character font			O	O	
ESC R	Select an international character set		O	O	O	
ESC S	Select standard mode	O		Ignored	O	
ESC T	Select print direction in page mode		O	▲	O	
ESC V	Turn 90° clockwise rotation mode on/off		O	O	▲	

Command	Name	Command classification		Standard mode	Page mode	**GS P** function
		Executing	Setting			
ESC W	Set printing area in page mode		○	▲	○	○
**ESC **	Set relative print position	○		○	○	○
ESC a	Select justification		○	(○)	▲	
ESC c 3	Select paper sensor(s) to output paper-end signals		○	○	○	
ESC c 4	Select paper sensor(s) to stop printing		○	○	○	
ESC c 5	Enable/disable panel buttons		○	○	○	
ESC d	Print and feed n lines	○		○	○	
ESC p	General pulse	○		○	○	
ESC t	Select character code table		○	○	○	
ESC {	Turn upside-down printing mode on/off		○	(○)	▲	
FS g 1	Write to NV user memory		○	○	Disabled	
FS g 2	Read from NV user memory	○		○	○	
FS p	Print NV bit image	○		○	Disabled	
FS q	Define NV bit image		○	(○)	Disabled	
GS !	Select character size		○	○	○	
GS $	Set absolute vertical print position in page mode	○		Ignored	○	○
GS ∗	Define downloaded bit image		○	○	○	
GS (A	Execute test print	○		○	Disabled	
GS /	Print downloaded bit image	○		●	○	
GS :	Start/end macro definition	○	○	○	○	
GS B	Turn white/black reverse printing mode on/off		○	○	○	
GS H	Select printing position of HRI characters		○	○	○	
GS I	Transmit printer ID	○		○	○	
GS L	Set left margin		○	(○)	▲	○
GS P	Set horizontal and vertical motion units		○	○	○	
GS V	Select cut mode and cut paper	○		(○)	○	○
GS W	Set printing area width		○	(○)	▲	○
**GS **	Set relative vertical print position in page mode			Ignored	○	○
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		○	○	○	

Command	Name	Command classification		Standard mode	Page mode	**GS P** function
		Executing	Setting			
GS h	Set bar code height		○	○	○	
GS k	Print bar code	○		●	○	
GS r	Transmit status	○		○	○	
GS v 0	Print raster bit image	○		●	Disabled	
GS w	Set bar code width		○	○	○	

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

Command	Name	Command classification		Standard mode	Page mode	**GS P** function
		Executing	Setting			
FS !	Set print mode(s) for Kanji characters		○	○	○	
FS &	Select Kanji character mode		○	○	○	
FS –	Turn underline mode on/off for Kanji characters		○	○	○	
FS .	Cancel Kanji character mode		○	○	○	
FS 2	Define user-defined Kanji characters		○	○	○	
FS C	Select Kanji character code system		○	○	○	
FS S	Set Kanji character spacing		○	○	○	○
FS W	Turn quadruple-size mode on/off for Kanji characters		○	○	○	

Command classification

Executing: Printer executes the command, which does not then affect the following data.
Setting: Printer uses flags to make settings, and those settings affect the following data.

Standard mode

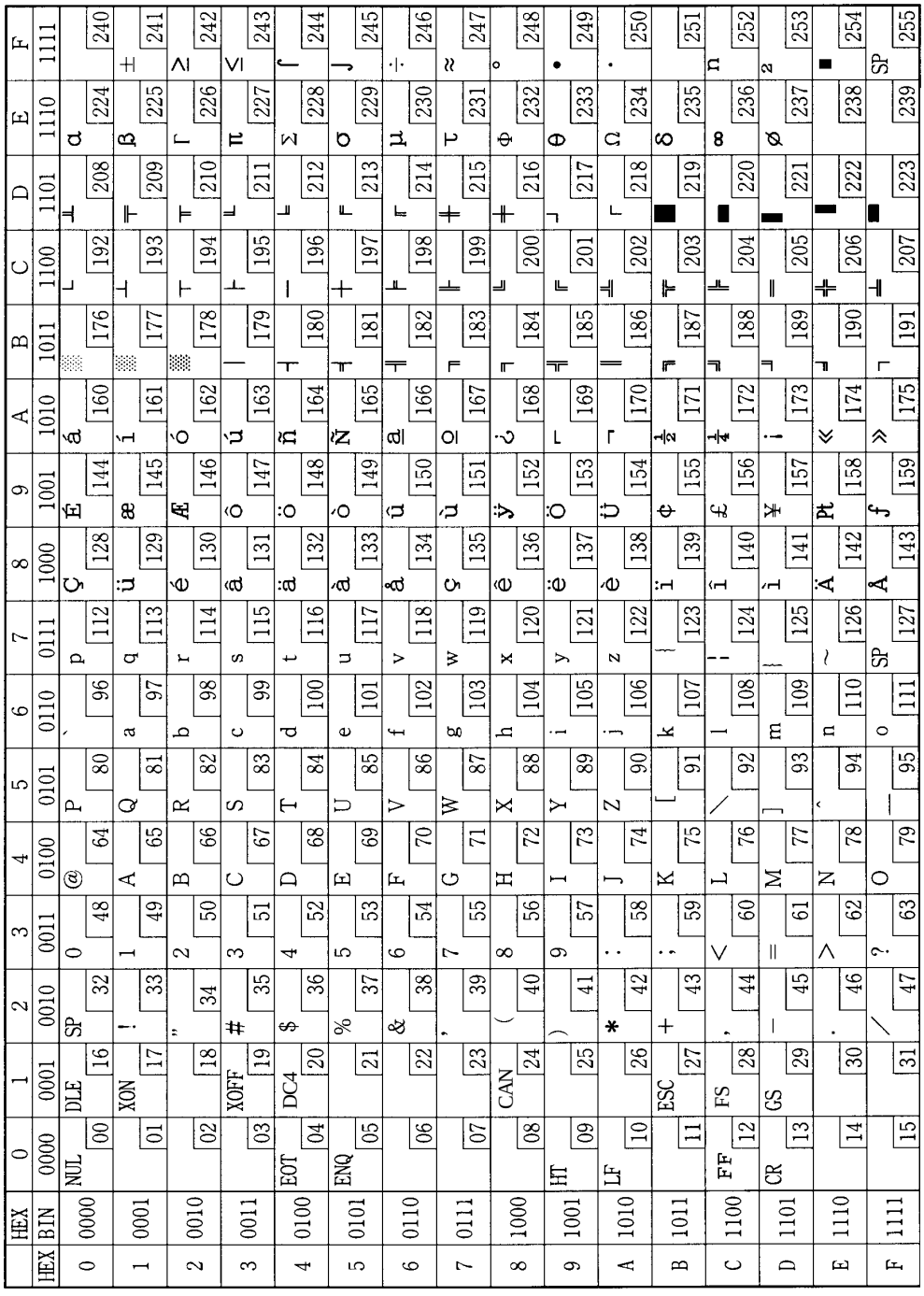
○: Enabled.
(○): Enabled only when the command is set at the beginning of a line.
●: Enabled only when data is not present in the printer buffer.

Page mode

○: Enabled.
▲: Only value setting is possible.
Disabled: Parameters are processed as printable data.
Ignored: All command codes including parameters are ignored and nothing is executed.

3.2 Character Code Tables

3.2.1 Page 0 (PC437: USA, Standard Europe) (International Character Set: U.S.A.)



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

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

3.2.2 Page 1 (Katakana)

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

3.2.3 Page 2 (PC850: Multilingual)

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

3.2.4 Page 3 (PC860: Portuguese)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	0001	ü 129	À 145	í 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	0010	é 130	È 146	ó 162	▓ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	0100	ã 132	õ 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	0101	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	0110	Á 134	Ú 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	Ì 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	Ê 137	Õ 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	Í 139	¢ 155	½ 171	╗ 187	╦ 203	■ 219	δ 235	√ 251
C	1100	Ô 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n 252
D	1101	ì 141	Ù 157	¡ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E	1110	Ã 142	₧ 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	Â 143	Ó 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.5 Page 4 (PC863: Canadian-French)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	¦ 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	0001	ü 129	È 145	´ 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	0010	é 130	Ê 146	ó 162	▒ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	0100	Â 132	Ë 148	¨ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	0101	à 133	Ï 149	¸ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	0110	¶ 134	û 150	³ 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	— 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	¤ 152	Î 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	ë 137	Ô 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	1010	è 138	Ù 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	ï 139	¢ 155	½ 171	╗ 187	╦ 203	■ 219	δ 235	√ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▬ 220	∞ 236	n 252
D	1101	═ 141	Ù 157	¾ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E	1110	À 142	Û 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	§ 143	ƒ 159	» 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.6 Page 5 (PC865: Nordic)

	HEX	8	9	A	B	C	D	E	F
HEX	BIN	1000	1001	1010	1011	1100	1101	1110	1111
0	0000	Ç 128	É 144	á 160	▒ 176	└ 192	╨ 208	α 224	≡ 240
1	0001	ü 129	æ 145	í 161	▒ 177	┴ 193	╤ 209	ß 225	± 241
2	0010	é 130	Æ 146	ó 162	▒ 178	┬ 194	╥ 210	Γ 226	≥ 242
3	0011	â 131	ô 147	ú 163	│ 179	├ 195	╙ 211	π 227	≤ 243
4	0100	ä 132	ö 148	ñ 164	┤ 180	─ 196	╘ 212	Σ 228	⌠ 244
5	0101	à 133	ò 149	Ñ 165	╡ 181	┼ 197	╒ 213	σ 229	⌡ 245
6	0110	å 134	û 150	ª 166	╢ 182	╞ 198	╓ 214	µ 230	÷ 246
7	0111	ç 135	ù 151	º 167	╖ 183	╟ 199	╫ 215	τ 231	≈ 247
8	1000	ê 136	ÿ 152	¿ 168	╕ 184	╚ 200	╪ 216	Φ 232	° 248
9	1001	ë 137	Ö 153	⌐ 169	╣ 185	╔ 201	┘ 217	Θ 233	• 249
A	1010	è 138	Ü 154	¬ 170	║ 186	╩ 202	┌ 218	Ω 234	· 250
B	1011	ï 139	ø 155	½ 171	╗ 187	╦ 203	■ 219	δ 235	√ 251
C	1100	î 140	£ 156	¼ 172	╝ 188	╠ 204	▄ 220	∞ 236	n̄ 252
D	1101	ì 141	Ø 157	¡ 173	╜ 189	═ 205	▌ 221	ø 237	² 253
E	1110	Ä 142	Pt 158	« 174	╛ 190	╬ 206	▐ 222	∈ 238	■ 254
F	1111	Å 143	ƒ 159	¤ 175	┐ 191	╧ 207	▀ 223	∩ 239	SP 255

3.2.7 Page 16 (WPC1252)

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

3.2.8 Page 17 (PC866: Cyrillic#2)

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

3.2.9 Page 18 (PC852: Latin2)

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

3.2.10 Page 19 (PC858)

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

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3.2.11 Page 20 (Thai character code 42)

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

3.2.12 Page 21 (Thai character code 11)

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

3.2.13 Page 22 (Thai character code 13)

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

3.2.14 Page 23 (Thai character code 14)

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

3.2.15 Page 24 (Thai character code 16)

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

3.2.16 Page 25 (Thai character code 17)

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

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3.2.17 Page 26 (Thai character code 18)

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

3.2.18 Page 255 (Space Page)

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

3.2.19 International Character Set

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

3.3 Switches and Buttons

3.3.1 Power Button

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

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

3.3.2 Panel Buttons

1) FEED button: Non-locking push button

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

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

3.3.3 DIP Switches

3.3.3.1 Serial interface specification

1) DIP switch 1: 8 switches

Table 3.3.1 DIP Switch 1

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

Table 3.3.2 Transmission Speed

Transmission Speed (bps)	SW 1-7	SW 1-8
38400	ON	ON
4800	OFF	ON
9600	ON	OFF
19200	OFF	OFF

bps: bits per second

2) DIP switch 2: 8 switches

Table 3.3.3 DIP Switch 2

SW 2	Function	ON	OFF
1	Handshaking (BUSY condition)	• Receive buffer full	• Offline • Receive buffer full
2	Reserved (Do not change settings)	---	Fixed to OFF
3	Selects print density / Low power consumption mode	Refer to Table 3.3.4	
4			
5	Setting the release condition of the receive buffer BUSY state (this function is effective when the capacity of the receive buffer is set to 4 KB.)	Releases the BUSY state when the remaining capacity of the receive buffer reaches 138 bytes.	Releases the BUSY state when the remaining capacity of the receive buffer reaches 256 bytes.
6	Reserved (Do not change settings)	---	Fixed to Off
7	I/F pin 6 reset signal (*1)	Enabled	Disabled
8	IF pin 25 reset signal (*2)	Enabled	Disabled

(*1)(*2) With the RS-485 serial interface specification (a dealer option), DIP Switches 2-7 and 2-8 are disabled.

Table 3.3.4 DIP Switch 2-3 and 2-4

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

NOTES:
- Changes in DIP switch settings (excluding switches 2-7 and 2-8 interface reset signals) are recognized only when the printer power is turned on or when the printer is reset by using the interface. If the DIP switch setting is changed after the printer power is turned on, the change does not take effect until the printer is turned on again or is reset.
- If you turn on DIP switch 2-7 or 2-8 while the printer power is turned on, the printer may be reset, depending on the signal state. DIP switches should not be changed while the printer power is on.
- If the print density is set to level 2 or 3, printing speed is inclined to be low speed.
- In low power consumption, printing speed is fixed to 70 mm/s.

3.3.3.2 Parallel interface specification

Table 3.3.5 DIP Switch 1

SW	Function	ON	OFF
1	Auto line feed	Always enabled	Always disabled
2	Receive buffer capacity	45 bytes	4 KB
3-8	Undefined	---	---

Table 3.3.6 DIP Switch 2

SW	Function	ON	OFF
1	Handshaking (BUSY condition)	• Receive buffer full	• Offline • Receive buffer full
2	Reserved (Do not change settings)	---	Fixed to Off.
3	Selects print density /	Refer to Table 3.3.7	
4	Low power consumption mode		
5	Setting the release condition of the receive buffer BUSY state (this function is effective when the capacity of the receive buffer is set to 4 KB.)	Releases the BUSY state when the remaining capacity of the receive buffer reaches 138 bytes.	Releases the BUSY state when the remaining capacity of the receive buffer reaches 256 bytes.
6	Reserved (Do not change settings)	---	Fixed to Off.
7	Reserved (Do not change settings)	---	Fixed to Off.
8	I/F pin 31 reset signal (Do not change settings)	Fixed to On	---

Table 3.3.7 DIP Switch 2-3 and 2-4

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

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

3.4 Panel LED Indicators

1) Power (POWER) LED: Green

On: Power is stable.

Off: Power is not stable.

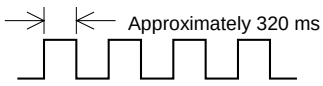
2) Paper roll end (PAPER OUT) LED: Red

On: The paper roll near end is detected.

Off: Paper is loaded (Normal condition)

Blinking:
- Self-test standby state (refer to Section 3.5.3) or macro standby state
- Macro execution standby state when the macro execution command is used.

Table 3.4.1 Standby State Indication

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

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

3) Error (ERROR) LED: Red

On: Offline (except during paper feeding using the FEED button and during test printing, and the error state). (refer to Section 2.1.1.2, Switching between online and offline)

Off: Normal condition

Blinking: Error (refer to Section 3.7)

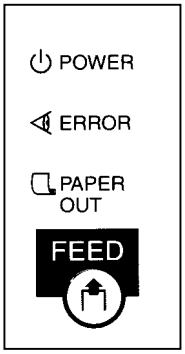


Figure 3.4.1 Panel Switches and Indicators

3.5 Self-test

1) The printer has a self-test function that checks the following:

- Control circuit functions
- Printer mechanisms
- Print quality
- Control software version
- DIP switch settings

2) Starting the self-test

To start the self-test on a paper roll, hold down the FEED button and turn on the printer with the cover closed, then the current printer status (*1) is printed.

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

3) Self-test standby state

After printing the current printer status, the printer prints the message "Self-test printing. Please press FEED button." The PAPER OUT LED indicator blinks and the printer enters the test printing (*2) standby state. Press the FEED button to start test printing.

(*2)
- A rolling pattern using only the built-in character set
- A partial cut after completing the test printing

4) Ending the self-test

After a number of lines are printed, the printer indicates the end of the self-test by printing "*** completed ***", initializes, and goes to the standard mode (refer to Section 3.12, Page Mode).

3.6 Hexadecimal Dumping

1) Hexadecimal dumping function

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

2) Starting hexadecimal dumping

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

NOTES:
1. If no characters correspond to the data received, the printer prints ".".
2. During hexadecimal dumping, any commands other than **DLE EOT, DLE ENQ**, and **DLE DC4** do not function.
3. Insufficient print data to fill the last line can be printed by setting the printer offline.

3) Ending hexadecimal dumping

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

<Printing example>

```
Hexadecimal Dump
To terminate hexadecimal dump,
press FEED button three times.




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

                        *** completed ***
```

3.7 Error Processing

3.7.1 Error Types

1) Errors that automatically recover

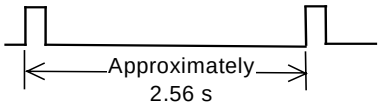
Table 3.7.1 Errors That Automatically Recover

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

NOTE: Print head temperature error is not an abnormality.

2) Errors that have the possibility of recovery

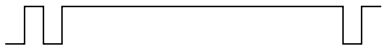
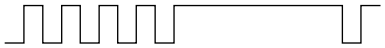
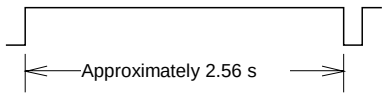
Table 3.7.2 Errors That Can Possibly Recover

Error	Description	ERROR LED Blinking Pattern 	Recovery
Autocutter error	The autocutter does not work correctly.		Recovers by **DLE ENQ 1** or **DLE ENQ 2**.

NOTE: If the paper jams, turn the printer off and remove jammed paper; then turn the printer on again.

3) Errors that are impossible to recover

Table 3.7.3 Unrecoverable Errors

Error	Description	ERROR LED Blinking Pattern ← → 160 ms	Recovery
R/W error in memory or gate array	After R/W checking, the printer does not work correctly.		Impossible to recover.
High voltage error	The power supply voltage is extremely high.		Impossible to recover.
Low voltage error	The power supply voltage is extremely low.		Impossible to recover.
CPU execution error	The CPU executes an incorrect address or I/F board is not connected.		Impossible to recover.
Internal circuit connection error	Internal circuits are not connected correctly.		Impossible to recover.

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

3.7.2 Printer Operation When an Error Occurs

The printer executes the following operations when detecting an error.

- Stops all printer operations for the selected paper section.
- Goes BUSY (Refer to Section 3.3.3 DIP switches when DIP switch 2-1 is off).
- Blinks the ERROR LED.

3.7.3 Data Receive Error (only in the serial interface specification)

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

- Parity error
- Framing error
- Overrun error

3.8 Paper Sensors

The printer has 2 paper sensors as follows:

1) Paper roll end sensor

The sensor which detects whether paper is present or not.
When the sensor detects a paper-end, the printer stops printing.

2) Paper roll near-end sensor

The sensor which detects a near-end of a paper roll.
When the paper roll diameter becomes sufficiently small, the detects a near-end of the paper roll and the PAPER OUT LED lights. If the sensor is enabled by **ESC c 4**, the printer stops printing.

NOTE: After installing new paper roll, close the printer cover; then the printer restarts printing.

3.9 Cover Open Button

When the cover open button (located to the right of the cover) is pressed, the printer cover is opened. When the cover is closed, the cover open button is latched.

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

3.10 Cover Open Sensor

The cover open sensor monitors the printer cover. When the sensor detects a cover open during printing, the error LED blinks 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: Whether the cover is open or not does not affect the status reported by the paper roll end sensor.

3.11 Print Buffer-full Printing

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

3.12 Page Mode

3.12.1 General Description

The printer operates in two print modes only when the paper roll is selected as the print sheet: standard mode and page mode. In standard mode, the printer prints and feeds paper each time it receives print data or paper feed commands. In page mode, all the received print data and paper feed commands are processed in the specified memory, and the printer executes no operations. All the data in the memory is then printed when an **ESC FF** or **FF** command is received.

For example, when the printer receives the data "ABCDEF" <**LF**> in standard mode, it prints "ABCDEF" and feeds the paper by one line. In page mode, "ABCDEF" is written to the specified printing area in memory, and the position in memory for the next print data is shifted by one line.

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

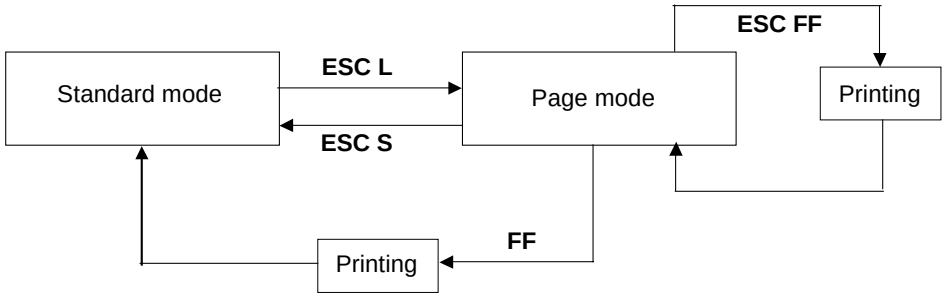


Figure 3.12.1 Shifting Between Standard Mode and Page Mode

3.12.2 Setting Values in Standard and Page Modes

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

3.12.3 Formatting of Print Data in the Printable Area

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

1) The printable area is set using **ESC W**. If all printing and feeding are complete before the printer receives the **ESC W** command, the left side (as you face the printer) is taken as the origin (x0, y0) of the printable area. The printable rectangular area is defined by the length (dx dots) extending from and including the origin (x0, y0) in the x direction (perpendicular to the paper feed direction), and by the length (dy dots) in the y direction (paper feed direction). (If the **ESC W** command is not used, the printable area remains the default value.)

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

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

   At the points labeled Point B, if characters (such as double-height characters) higher than normal size characters or downloaded bit image characters are received, any part of the character higher than the normal-size character is not printed.

3) If the print data (including the space to the right of a character) exceeds the printable area before the printer receives a command (e.g., **LF** or **ESC J**) that includes line feeding, a line feed is executed automatically within the printable area. The print position, therefore, moves to the beginning of the next line. The line feed amount depends on the values set by commands (such as **ESC 2** and **ESC 3**).

4) The default value of the line spacing is set to 4.23 mm {1/6″} and corresponds to 30 dots in the vertical direction. If print data for the next line contains extended characters that are higher than double-height characters, bit images taking up two or more lines, or bar codes higher than normal characters, the amount of line feeding may be insufficient, resulting in overlapping of the characters' higher-order dots with the previous line. To avoid this, increase the amount of line spacing. The line spacing in Figure 3.12.4 requires 27 dots or more.

Example

When printing a downloaded bit image of six bytes in the vertical direction, use the following formula:

{number of vertical dots (8 × 6) - number of dots for feeding at the beginning of the printable area (21)} × vertical motion unit conversions (360/180) = 54

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

Use the following commands:

ESC W ***xL***, ***xH***, ***yL***, ***yH***, ***dxL***, ***dxH***, ***dyL***, ***dyH***
ESC T ***n***
ESC 3 54 ← Set line spacing to be added.
LF
GS / 1
ESC 2 ← Reset the line spacing to 4.23 mm {1/6"}.

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

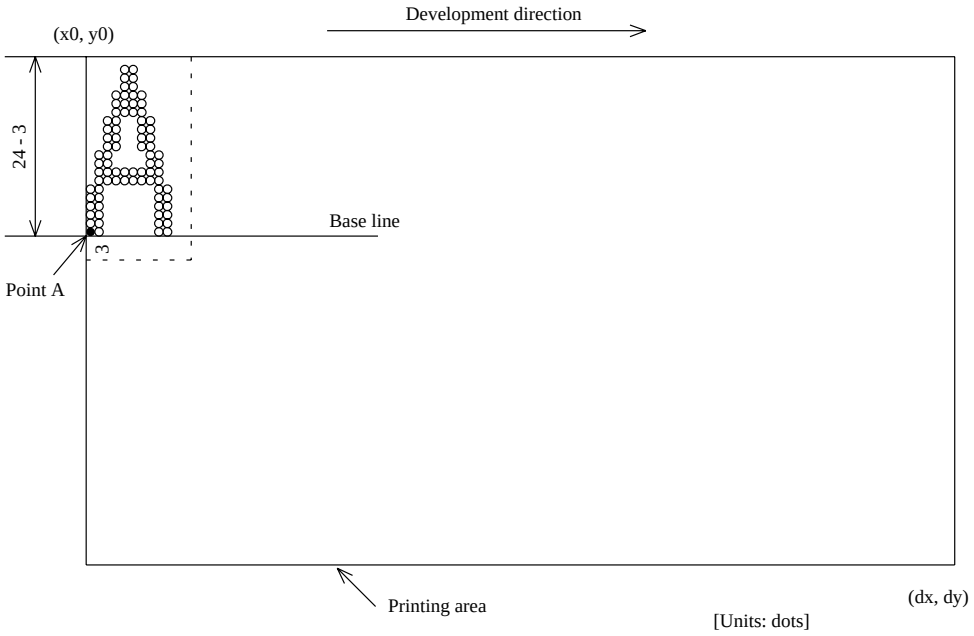


Figure 3.12.2 Character Data Developing Position

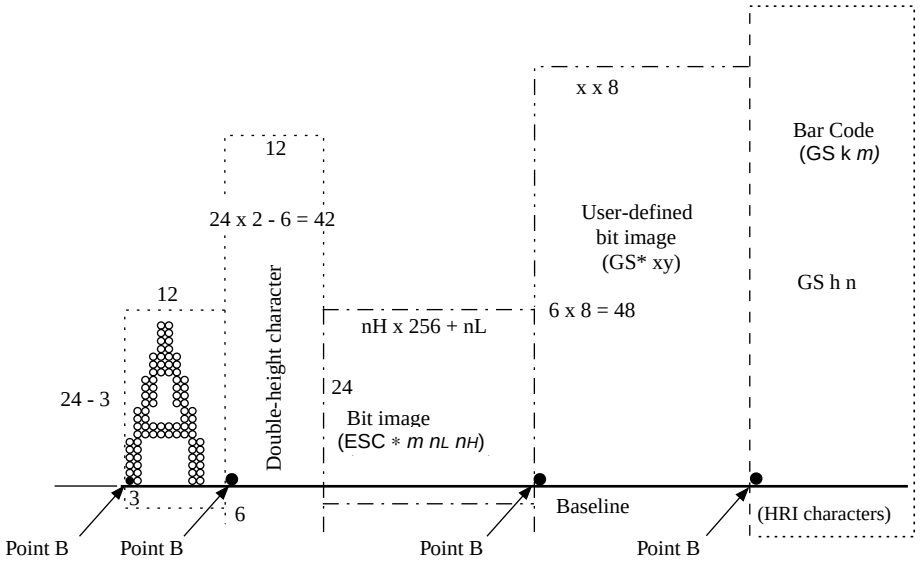


Figure 3.12.3 Print Data Developing Position

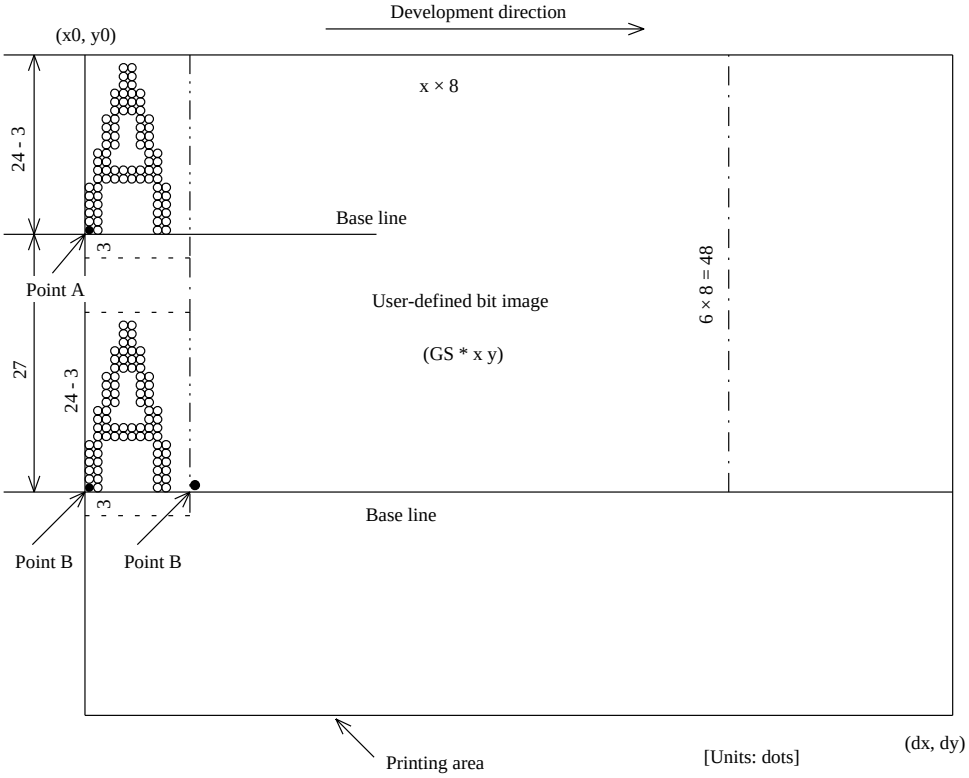


Figure 3.12.4 Downloaded Bit Image Developing Position

4. CASE SPECIFICATIONS

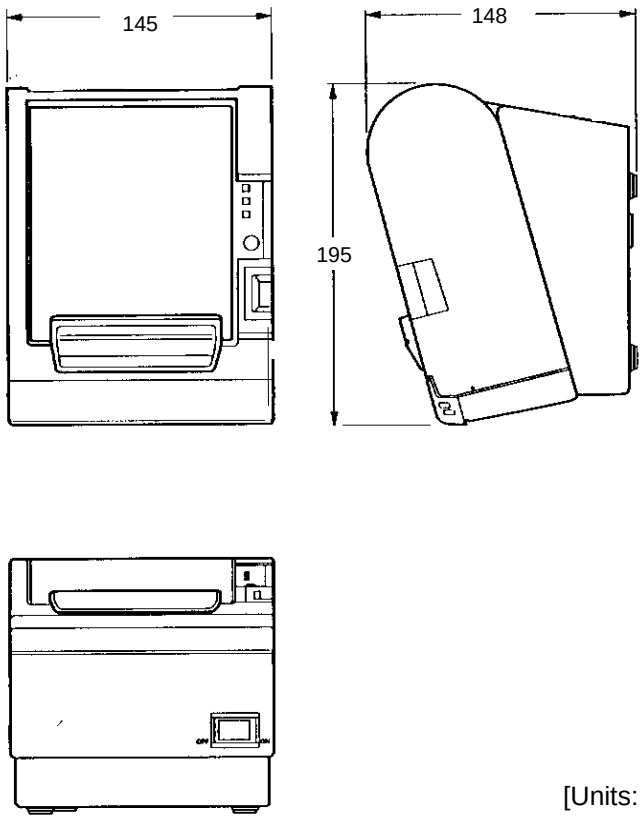
4.1 External Dimensions and Mass

Height: Approximately 148 mm {5.83"}
Width: Approximately 145 mm {5.71"}
Depth: Approximately 195 mm {7.68"}
Mass: Approximately 1.8 kg {3.96 lb} (except for a paper roll)

4.2 Color

EPSON standard color (ECW, EDG)

4.3 External Appearance



[Units: mm]

Materials for the external: 94V-0

Figure 4.3.1 External Appearance

5. OPTIONS AND CONSUMABLES

5.1 Standard Accessories

- Paper roll (diameter 50 mm [1.96"]) × 1 roll
- User's Manual (Languages: English, German, French, Spanish, Portuguese, Italian, Dutch, Simplified Chinese, Traditional Chinese, Japanese)
- External power supply (for the model with the power supply unit)

  Model: PS-180
  PS-175 (only for North America)

5.2 Options

- Affixing tapes

  Model: DF-10
- Wall hanging bracket

  Model: WH-10
- RS-485 interface board (installed at the factory)
- External power supply

  Model: PS-180
  PS-170

5.3 Consumables

- Specified paper

  Thermal roll paper: NTP080-80
  [Original paper: TF50KS-E Nippon Paper Industries Co., Ltd.]

  Packaged roll paper: [Original paper: PD160 Oji Paper Mfg. 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

  The following paper can be used instead of the specified paper above:

  Original paper: PD190 (Oji Paper Mfg. Co., Ltd.)
  P350(F380), P310, P300 Kanzaki Specialty Papers, Inc. (U.S.A.)
  AF50KS-E Jujo Thermal Oy (Finland)

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

6. COMMANDS

6.1 Command Notation

[Name] The name of the command.

[Format] The code sequence.

[Range] Gives the allowable ranges for the arguments.

[Description] Describes the command's function.

[Details] Describes the usage of the command in detail.

[Notes] Provides important information on setting and using the printer command, if necessary.

[Default] Gives the default values, if any, for the command parameters.

[Reference] Lists related commands.

[Example] Gives examples of how to use the command.

Hex indicates the hexadecimal equivalents.

Decimal indicates the decimal equivalents.

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

6.2 Explanation of Terms

(1) Receive buffer
The receive buffer is a buffer that stores, as is, the data received from the host (the reception data). The reception data is stored in the receive buffer temporarily, and is then processed sequentially.

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

(3) Print buffer full
This is the state where the print buffer is full. If new print data is input while the print buffer is full, the data in the print buffer is printed out and a line feed is executed. This is the same operation as the **LF** operation.

(4) Start of line
The start of line state satisfies the following condition:

- There is no print data (including spaces and portions of data skipped due to bit image data) currently in the print buffer.
- There is no print data (including portions of data skipped due to **HT**)
- The print position is not specified by the **ESC $** or **ESC ** command.

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

① The length of the horizontal direction in standard mode:
approximately 72.2 mm {512/180"}

② The length of the horizontal direction in page mode:
approximately 72.2 mm {512/180"}

③ The length of the vertical direction in page mode: approximately 117.3 mm {1662/360"}

(6) Printing area
Printing range is set by the command. It must be printing area ≤ printable area.

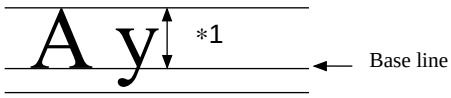
(7) Ignore
The state in which all codes, including parameters, are read in and discarded, and nothing happens.

(8) Inch
A unit of length. One inch is 25.4 mm.

(9) MSB
Most Significant Bit

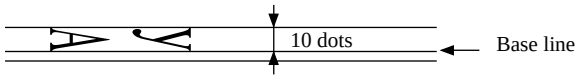
(10) LSB
Least Significant Bit

(11) Base line
Standard position when character data is stored in the print buffer.
Normal character in standard mode and page mode:



*1. When font A (12×24 dots) is selected, this height is for 21 dots.
When font B (9×17 dots) is selected, this height is for 16 dots.

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



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.

[Details]
- This command is ignored unless the next horizontal tab position has been set.
- If the next horizontal tab position exceeds the printing area, the printer sets the printing position to [Printing area width + 1].
- Horizontal tab positions are set with **ESC D**.
- If this command is received when the printing position is at [printing area width + 1], the printer executes print buffer-full printing of the current line and horizontal tab processing from the beginning of the next line.
- The default setting of the horizontal tab position for the paper roll is font A (12 × 24) every 8th character (9th, 17th, 25th, ... column).

[Reference] **ESC D**

LF

[Name] Print and line feed

[Format]

ASCII	LF
Hex	0A
Decimal	10

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

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

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

FF

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

[Format]
ASCII	FF
Hex	0C
Decimal	12

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

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

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

CR

[Name] Print and carriage return

[Format]
ASCII	CR
Hex	0D
Decimal	13

[Description] When automatic line feed is enabled, this command functions the same as **LF**; when automatic line feed is disabled, this command is ignored.

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

[Reference] **LF**

CAN

[Name] Cancel print data in page mode

[Format]
ASCII	CAN
Hex	18
Decimal	24

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

[Details]
- This command is enabled only in page mode.
- If data that existed in the previously specified printing area also exists in the currently specified printing area, it is deleted.

[Reference] **ESC L**, **ESC W**

DLE EOT *n*

[Name] Real-time status transmission

[Format]

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

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

[Description] Transmits the selected printer status specified by *n* in real-time, according to the following parameters:

n = 1: Transmit printer status
n = 2: Transmit offline status
n = 3: Transmit error status
n = 4: Transmit paper roll sensor status

[Details]
- The printer transmits the current status. Each status is represented by one-byte data.
- The printer transmits the status without confirming whether the host computer can receive data.
- The printer executes this command upon receiving it.
- This command is executed even when the printer is offline, the receive buffer is full, or there is an error status with a serial interface model.
- With a parallel interface model, this command can not be executed when the printer is busy. This command is executed even when the printer is offline or there is an error status when DIP switch 2-1 is on with a parallel interface model.
- When Auto Status Back (ASB) is enabled using the **GS a** command, the status transmitted by the **DLE EOT** command and the ASB status must be differentiated. (Refer to Appendix G, *TRANSMISSION STATUS IDENTIFICATION)*
- Even though the printer is not selected using **ESC =** (select peripheral device), this command is effective.

[Notes]
- The status is transmitted whenever the data sequence of <10>H<04>H<*n*> ($1 \le n \le 4$) is received.

  Example:
  In **ESC** ∗ ***m nL nH d1...dk***, *d1*=<10>H, *d2*=<04>H, *d3*=<01>H
- This command should not be used within the data sequence of another command that consists of 2 or more bytes.

  Example:
  If you attempt to transmit **ESC 3 *n*** to the printer, but DTR (DSR for the host computer) goes to MARK before *n* is transmitted and then **DLE EOT 3** interrupts before *n* is received, the code <10>H for **DLE EOT 3** is processed as the code for **ESC 3 <**10>H.

n = 1: Printer status

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

n = 2: Offline status

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

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

n = 3: Error status

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

Bit 3: If these errors occur due to paper jams or the like, it is possible to recover by correcting the cause of the error and executing **DLE ENQ *n*** ($1 \leq n \leq 2$). If an error due to a circuit failure (e.g. wire break) occurs, it is impossible to recover.

Bit 6: When printing is stopped due to high print head temperature until the print head temperature drops sufficiently or when the paper roll cover is open during printing, bit 6 is On.

n = 4: Continuous paper sensor status

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not used. Fixed to Off.
1	On	02	2	Not used. Fixed to On.
2, 3	Off	00	0	Paper roll near-end sensor: paper adequate.
	On	0C	12	Paper near-end is detected by the paper roll near-end sensor.
4	On	10	16	Not used. Fixed to On.
5, 6	Off	00	0	Paper roll sensor: Paper present.
	On	60	96	Paper roll end detected by paper roll sensor.
7	Off	00	0	Not used. Fixed to Off.

[Reference] **DLE ENQ**, **GS a**, **GS r**, Appendix G

DLE ENQ *n*

[Name] Real-time request to printer

[Format]

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

[Range] $1 \le n \le 2$

[Description] Responds to a request from the host computer. *n* specifies the requests as follows:

n	Request
1	Recover from an error and restart printing from the line where the error occurred
2	Recover from an error aft clearing the receive and print buffers

[Details]

- When the printer is disabled with **ESC =** (Select peripheral device), this command is effective.
- This command is effective only when an autocutter error occurs.
- The printer starts processing data upon receiving this command.
- This command is executed even when the printer is offline, the receive buffer is full, or there is an error status with a serial interface model.
- With a parallel interface model, this command can not be executed when the printer is busy. This command is executed even when the printer is offline or there is an error status when DIP switch 2-1 is on with a parallel interface model.
- **DLE ENQ 2** enables the printer to recover from an error after clearing the data in the receive buffer and the print buffer. The printer retains the settings (by **ESC !**, **ESC 3**, etc.) that were in effect when the error occurred. The printer can be initialized completely by using this command and **ESC** @. This command is enabled only for errors that have the possibility of recovery, except for print head temperature error.

[Notes]

- The status is also transmitted whenever the data sequence of <10>H<05>H<*n*> ($1 \le n \le 2$) is received.

  Example:
  In **ESC ∗ *m nL nH dk***, *d1* = <10>H, *d2* = <05>H, d3 = <01>H

- This command should not be contained within another command that consists of two or more bytes.

  Example:
  If you attempt to transmit **ESC 3 *n*** to the printer, but DTR (DSR for the host computer) goes to MARK before *n* is transmitted, and **DLE ENQ 2** interrupts before *n* is received, the code <10>H for **DLE ENQ 2** is processed as the code for **ESC 3** <10>H.

[Reference] **DLE EOT**

DLE DC4 *n m t*

[Name] Generate pulse at real-time

[Format]

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

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

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

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

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

[Details]
- When the printer is in an error status when this command is processed, this command is ignored.
- When the pulse is output to the connector pin specified while **ESC p** or **DEL DC4** is executed while this command is processed, this command is ignored.
- The printer executes this command upon receiving it.
- With a serial interface model, this command is executed even when the printer is offline, the receive buffer is full, or there is an error status.
- With a parallel interface model, this command cannot be executed when the printer is busy. This command is executed even when the printer is offline or there is an error status when DIP switch 2-1 is on.
- This command is effective even when the printer is disabled with **ESC =** (Select peripheral device).

[Notes]
- If print data includes the same character strings as this command, the printer performs the same operation specified by this command. The user must consider this.
- This command should not be used within the data sequence of another command that consists of 2 or more bytes.

[Reference] **ESC p**

ESC FF

[Name] Print data in page mode

[Format]

ASCII	ESC	FF
Hex	1B	0C
Decimal	27	12

[Description] In page mode, prints all buffered data in the printing area collectively.

[Details]
- This command is enabled only in page mode.
- After printing, the printer does not clear the buffered data, setting values for **ESC T** and **ESC W**, and the position for buffering character data.

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

ESC SP *n*

[Name] Set right-side character spacing

[Format]

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

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

[Description] Sets the character spacing for the right side of the character to [$n \times$ horizontal or vertical motion units].

[Details]
- The right-side character spacing for double-width mode is twice the normal value. When characters are enlarged, the right-side character spacing is *n* times normal value.
- This command does not affect the setting of Kanji characters.
- This command sets values independently in each mode (standard and page modes).
- The horizontal and vertical motion unit are specified by **GS P**. Changing the horizontal or vertical motion unit does not affect the current right-side spacing.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.
- In standard mode, the horizontal motion unit is used.
- In page mode, the horizontal or vertical motion unit differs in page mode, depending on starting position of the printable area as follows:
  ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the horizontal motion unit (*x*) is used.
  ② When the starting position is set to the upper right or lower left of the printable area using **ESC T**, the vertical motion unit (*y*) is used.
- The maximum right-side spacing is 35.983 mm {255/180"}. Any setting exceeding the maximum is converted to the maximum automatically.

[Default] *n* = 0

[Reference] **GS P**

ESC ! *n*

[Name] Select print mode(s)

[Format]

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

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

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

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Character font A (12 × 24).
	On	01	1	Character font B (9 × 17).
1	-	-	-	Undefined.
2	-	-	-	Undefined.
3	Off	00	0	Emphasized mode not selected.
	On	08	8	Emphasized mode selected.
4	Off	00	0	Double-height mode not selected.
	On	10	16	Double-height mode selected.
5	Off	00	0	Double-width mode not selected.
	On	20	32	Double-width mode selected.
6	-	-	-	Undefined.
7	Off	00	0	Underline mode not selected.
	On	80	128	Underline mode selected.

[Details]

- When both double-height and double-width modes are selected, quadruple size characters are printed.
- The printer can underline all characters, but can not underline the space set by **HT** or 90° clockwise rotated characters.
- The thickness of the underline is that selected by **ESC** –, regardless of the character size.
- When some characters in a line are double or more height, all the characters on the line are aligned at the baseline.
- **ESC E** can also turn on or off emphasized mode. However, the setting of the last received command is effective.
- **ESC –** can also turn on or off underline mode. However, the setting of the last received command is effective.
- **GS !** can also select character size. However, the setting of the last received command is effective.
- Emphasized mode is effective for alphanumeric and Kanji. All print modes except emphasized mode is effective only for alphanumeric.

[Default] *n* = 0

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

ESC $ n*L* n*H*

[Name] Set absolute print position

[Format]

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

[Range] $0 \le n_L \le 255$
$0 \le n_H \le 255$

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

- The distance from the beginning of the line to the print position is $[(n_L + n_H \times 256) \times$ (vertical or horizontal motion unit)].

[Details]

- Settings outside the specified printable area are ignored.
- The horizontal and vertical motion unit are specified by **GS P**.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.
- In standard mode, the horizontal motion unit (*x*) is used.
- In page mode, horizontal or vertical motion unit differs depending on the starting position of the printable area as follows:
  1 When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the horizontal motion unit (*x*) is used.
  2 When the starting position is set to the upper right or lower left of the printable area using **ESC T**, the vertical motion unit (*y*) is used.

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

ESC % *n*

[Name] Select/cancel user-defined character set

[Format]

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

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

[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.

[Details]

- When the user-defined character set is canceled, the internal character set is automatically selected.
- *n* is available only for the least significant bit.

[Default] *n* = 0

[Reference] **ESC &**, **ESC ?**

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)
$0 \le d1 \ldots d(y \times xk) \le 255$

[Description] Defines user-defined characters.

- *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.

[Details]

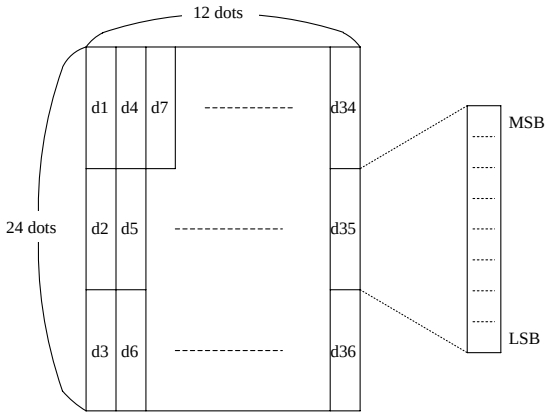
- The allowable character code range is from ASCII code <20>H to <7E>H (95 characters).
- It is possible to define multiple characters for consecutive character codes.
  If only one character is desired, use *c1 = c2*.
- *d* is the dot data for the characters. The dot pattern is in the horizontal direction from the left side. Any remaining dots on the right side are blank.
- The data to define a user-defined character is ($y \times x$) bytes.
- Set a corresponding bit to 1 to print a dot or 0 to not print a dot.
- This command can define different user-defined character patterns by each fonts. To select a font, use **ESC !**
- A user-defined character and a downloaded bit image cannot be defined simultaneously. When this command is executed, the downloaded bit image is cleared.
- The user-defined character definition is cleared when:
  ① **ESC @** is executed.
  ② **FS q** is executed.
  ③ **GS ∗** is executed.
  ④ **ESC ?** is executed.
  ⑤ The printer is reset or the power is turned off.
- When the user-defined characters are defined in font B (9×17), only the most significant bit of the 3rd byte of data in vertical direction is effective.

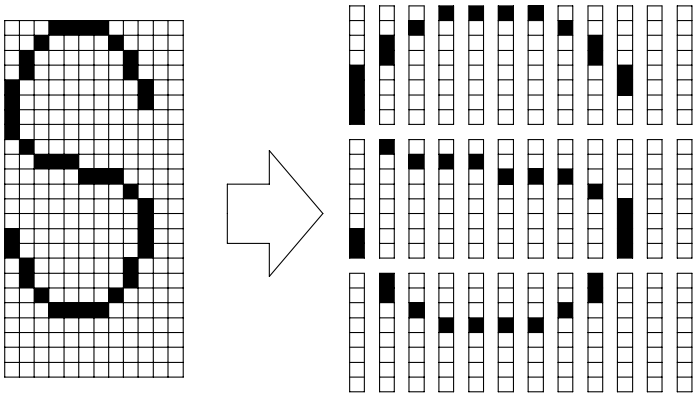
[Default] The internal character set

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

[Example]

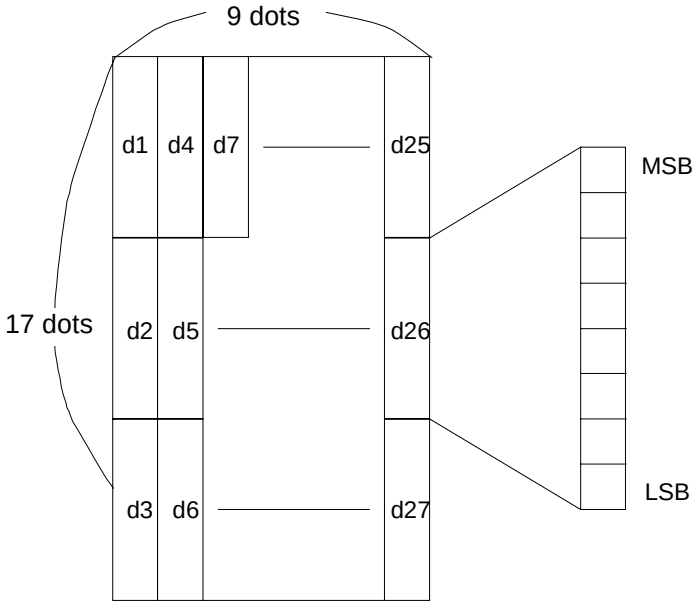
- When font A (12 × 24) is selected.

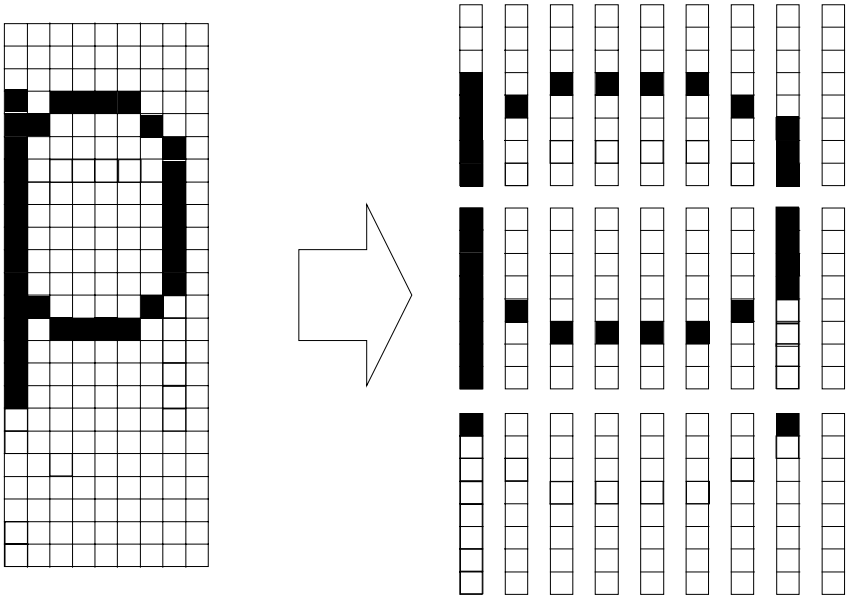




d1= <0F>H d4 = <30>H d7 = <40>H . . . .
d2 = <03>H d5 = <80>H d8 = <40>H . . . .
d3 = <00>H d6 = <00>H d9 = <20>H . . . .

• When font B (9 × 17) is selected.





d1 = <1F>H d4 = <08>H d7 = <10>H...
d2 = <FF>H d5 = <08>H d8 = <04>H...
d3 = <80>H d6 = <00>H d9 = <00>H...

ESC ∗ *m nL nH d1...dk*

[Name] Select bit-image mode

[Format]

ASCII	ESC	∗	*m*	*nL*	*nH*	*d1...dk*
Hex	1B	2A	*m*	*nL*	*nH*	*d1...dk*
Decimal	27	42	*m*	*nL*	*nH*	*d1...dk*

[Range] $m = 0, 1, 32, 33$
$0 \le n_L \le 255$
$0 \le n_H \le 3$
$0 \le d \le 255$

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

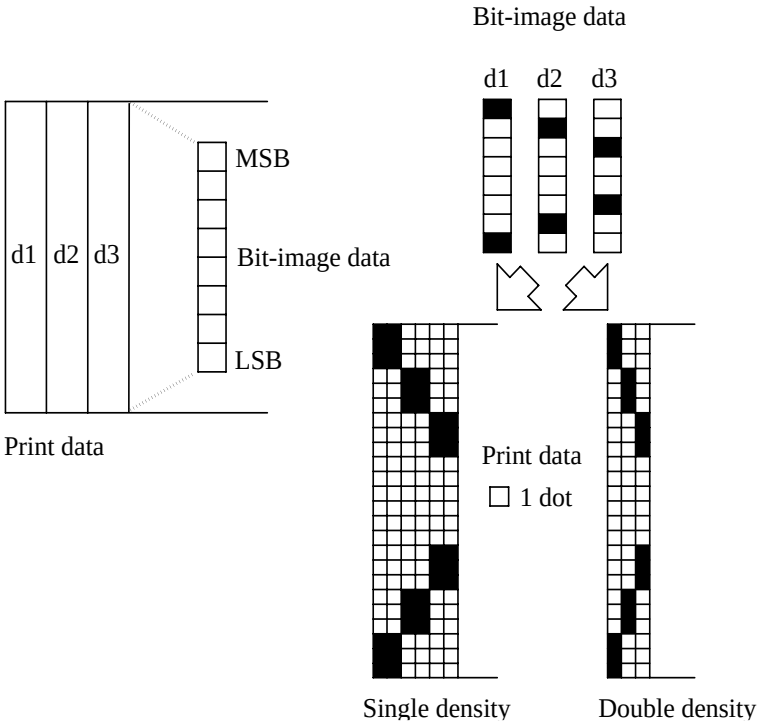
m	Mode	Vertical Direction		Horizontal Direction	
		Number of Dots	Dot Density	Dot Density	Number of Data (K)
0	8-dot single-density	8	60 dpi	90 dpi	$n_L + n_H \times 256$
1	8-dot double-density	8	60 dpi	180 dpi	$n_L + n_H \times 256$
32	24-dot single-density	24	180 dpi	90 dpi	$(n_L + n_H \times 256) \times 3$
33	24-dot double-density	24	180 dpi	180 dpi	$(n_L + n_H \times 256) \times 3$

[dpi: dots per 25.4 mm {1"}]

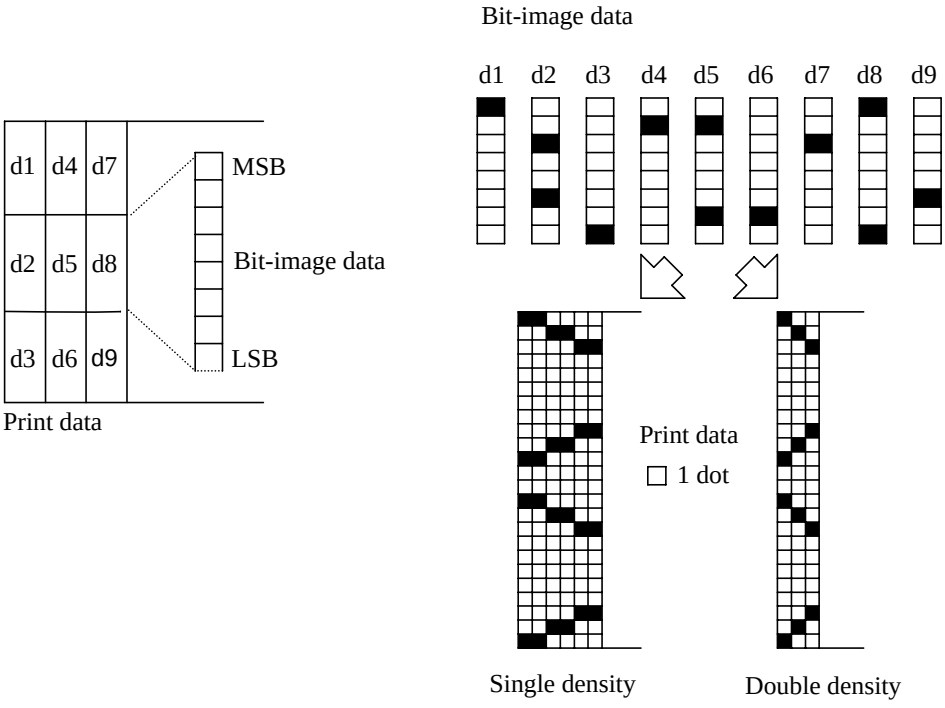
[Details]

- If the values of *m* is out of the specified range, *nL* and data following are processed as normal data.
- The *nL* and *nH* indicate the number of dots of the bit image in the horizontal direction. The number of dots is calculated by $n_L + n_H \times 256$.
- If the bit-image data input exceeds the number of dots to be printed on a line, the excess data is ignored.
- *d* indicates the bit-image data. Set a corresponding bit to 1 to print a dot or to 0 to not print a dot.
- If the width of the printing area set by **GS L** and **GS W** less than the width required by the data sent with the **ESC ∗** command, the following will be performed on the line in question (but the printing cannot exceed the maximum printable area):
  ① The width of the printing area is extended to the right to accommodate the amount of data.
  ② If step ① does not provide sufficient width for the data, the left margin is reduced to accommodate the data.

- After printing a bit image, the printer returns to normal data processing mode.
- This command is not affected by print modes (emphasized, double-strike, underline, character size or white/black reverse printing), except upside-down printing mode.
- Refer to Figure 3.12.3 for the bit image development position in page mode.
- The relationship between the image data and the dots to be printed is as follows:
- When 8-dot bit image is selected:



- When 24-dot bit image is selected:



ESC - *n*

[Name] Turn underline mode on/off

[Format]

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

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

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

n	Function
0, 48	Turns off underline mode
1, 49	Turns on underline mode (1-dot thick)
2, 50	Turns on underline mode (2-dots thick)

[Details]

- The printer can underline all characters (including right-side character spacing), but cannot underline the space set by **HT.**
- The printer cannot underline 90° clockwise rotated characters and white/black inverted characters.
- When underline mode id turned off by setting the value of *n* to 0 or 48, the following data is not underlined, and the underline thickness set before the mode is turned off does not change. The default underline thickness is 1 dot.
- Changing the character size does not affect the current underline thickness.
- Underline mode can also be turned on or off by using **ESC !**. Note, however, that the last received command is effective.
- This command does not affect Kanji printing.

[Default] *n* = 0

[Reference] **ESC !**

ESC 2

[Name] Select default line spacing

[Format]

ASCII	ESC	2
Hex	1B	32
Decimal	27	50

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

[Details]

- The line spacing can be set independently in standard mode and in page mode.

[Reference] **ESC 3**

ESC 3 *n*

[Name] Set line spacing

[Format]

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

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

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

[Details]

- The line spacing can be set independently in standard mode and in page mode.
- The horizontal and vertical motion unit are specified by **GS P**. Changing the horizontal or vertical motion unit does not affect the current line spacing.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum vertical movement amount, and it must be in even units of the minimum vertical movement amount.
- In standard mode, the vertical motion unit (*y*) is used.
- In page mode, this command functions as follows, depending on the starting position of the printable area:
  ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the vertical motion unit (*y*) is used.
  ② When the starting position is set to the upper right or lower left of the print able area using **ESC T**, the horizontal motion unit (*x*) is used.
- The maximum paper feed amount is 1016 mm {40"}. Even if a paper feed amount of more than 1016 mm {40"} is set, the printer feeds the paper only 1016 mm {40"}.

[Default] Line spacing equivalent to approximately 4.23mm {1/6"}.

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

ESC = *n*

[Name] Set peripheral device

[Format]

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

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

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

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

[Details]
- When the printer is disabled, it ignores all data except for error-recovery commands (**DLE EOT, DLE ENQ, DLE DC4**) until it is enabled by this command.

[Default] *n* = 1

ESC ? *n*

[Name] Cancel user-defined characters

[Format]

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

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

[Description] Cancels user-defined characters.

[Details]
- This command cancels the pattern defined for the character code specified by *n*. After the user-defined characters is canceled, the corresponding pattern for the internal character is printed.
- This command deletes the pattern defined for the specified code in the font selected by **ESC !**.
- If a user-defined character has not been defined for the specified character code, the printer ignores this command.

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

ESC @

[Name] Initialize printer

[Format]

ASCII	ESC	@
Hex	1B	40
Decimal	27	64

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

[Details]

- The DIP switch settings are not checked again.
- The data in the receive buffer is not cleared.
- The macro definition is not cleared.
- The NV bit image data is not cleared.
- The data of the NV user memory is not cleared.

ESC D *n1...nk NUL*

[Name] Set horizontal tab positions

[Format]

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

[Range] $1 \le n \le 255$
$0 \le k \le 32$

[Description] Sets horizontal tab positions.

- *n* specifies the column number for setting a horizontal tab position from the beginning of the line.
- *k* indicates the total number of horizontal tab positions to be set.

[Details]

- The horizontal tab position is stored as a value of [character width × *n*] measured from the beginning of the line. The character width includes the right-side character spacing, and double-width characters are set with twice the width of normal characters.
- This command cancels the previous horizontal tab settings.
- When setting *n* = 8, the print position is moved to column 9 by sending **HT**.
- Up to 32 tab positions (*k* = 32) can be set. Data exceeding 32 tab positions is processed as normal data.
- Transmit [*n*]*k* in ascending order and place a NUL code 0 at the end.
- When [*n*]*k* is less than or equal to the preceding value [*n*]*k*-1, tab setting is finished and the following data is processed as normal data.
- **ESC D NUL** cancels all horizontal tab positions.
- The previously specified horizontal tab positions do not change, even if the character width changes.
- The character width is memorized for each standard and page mode.

[Default] The default tab positions are at intervals of 8 characters (columns 9, 17, 25,...) for font A (12 × 24).

[Reference] **HT**

ESC E *n*

[Name] Turn emphasized mode on/off

[Format]

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

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

[Description] Turns emphasized mode on or off

When the LSB of *n* is 0, emphasized mode is turned off.
When the LSB of *n* is 1, emphasized mode is turned on.

[Details]
- Only the least significant bit of *n* is enabled.
- This command and **ESC !** turn on and off emphasized mode in the same way. Be careful when this command is used with **ESC !**.

[Default] *n* = 0

[Reference] **ESC !**

ESC G *n*

[Name] Turn on/off double-strike mode

[Format]

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

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

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

[Details]
- Only the lowest bit of *n* is enabled.
- Printer output is the same in double-strike mode and in emphasized mode.

[Default] *n* = 0

[Reference] **ESC E**

ESC J *n*

[Name] Print and feed paper

[Format]

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

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

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

[Details]

- After printing is completed, this command sets the print starting position to the beginning of the line.
- The paper feed amount set by this command does not affect the values set by **ESC 2** or **ESC 3**.
- The horizontal and vertical motion unit are specified by **GS P**.
- The **GS P** command can change the vertical (and horizontal) motion unit. However, the value cannot be less than the minimum vertical movement amount, and it must be in even units of the minimum vertical movement amount.
- In standard mode, the printer uses the vertical motion unit (*y*).
- In page mode, this command functions as follows, depending on the starting position of the printable area:
  ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the vertical motion unit (*y*) is used.
  ② When the starting position is set to the upper right or lower left of the print able area using **ESC T**, the horizontal motion unit (*x*) is used.
- The maximum line spacing is 1016mm {40"}. When the setting value exceeds the maximum, it is converted to the maximum automatically.

[Reference] **GS P**

ESC L

[Name] Select page mode

[Format]

ASCII	ESC	L
Hex	1B	4C
Decimal	27	76

[Description] Switches from standard mode to page mode.

[Details]

- This command is enabled only when processed at the beginning of a line in standard mode.
- This command has no effect in page mode.
- After printing by **FF** is completed or by using **ESC S**, the printer returns to standard mode.
- This command sets the position where data is buffered to the position specified by **ESC T** within the printing area defined by **ESC W**.
- This command switches the settings for the following commands (in which the values can be set independently in standard mode and page mode) to those for page mode:
  ① Set right-side character spacing: **ESC SP, FS S**
  ② Select default line spacing: **ESC 2, ESC 3**
- Only valve settings is possible for the following commands in page mode; these commands are not executed.
  ① Turn 90° clockwise rotation mode on/off: **ESC V**
  ② Select justification: **ESC a**
  ③ Turn upside-down printing mode on/off: **ESC {**
  ④ Set left margin: **GS L**
  ⑤ Set printable area width: **GS W**
- The following command is ignored in page mode:
  ① Execute test print: **GS (A**
- The following command is not available in page mode:
  ① Print NV bit image: **FS p**
  ② Define NV bit image: **FS q**
  ③ Write to NV user memory: **FS g 1**
  ④ Print raster bit image: **GS v 0**
- The printer returns to standard mode when power is turned on, the printer is reset, or **ESC** @ is used.

[Reference] **FF**, **CAN**, **ESC FF**, **ESC S**, **ESC T**, **ESC W**, **GS $**, **GS **, 3.12 *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

[Description] Selects character fonts.

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

[Details]
- The **ESC !** command can also select the character fonts. However, the setting of the last received command is effective.

[Reference] **ESC !**

ESC R *n*

[Name] Select an international character set

[Format]

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

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

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

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

[Default] *n* = 0

[Reference] 3.2.12 *International Character Set*

ESC S

[Name] Select standard mode

[Format]

ASCII	ESC	S
Hex	1B	53
Decimal	27	83

[Description] Switches from page mode to standard mode.

[Details]

- This command is effective only in page mode.
- Data buffered in page mode are cleared.
- This command sets the print position to the beginning of the line.
- The printing area set by **ESC W** are initialized.
- This command switches the settings for the following commands (in which the values can be set independently in standard mode and page mode) to those for standard mode:
  ① Set right-side character spacing: **ESC SP, FS S**
  ② Select default line spacing: **ESC 2, ESC 3**
- The following commands are enabled only to set in standard mode.
  ① Set printing area in page mode: **ESC W**
  ② Select print direction in page mode: **ESC T**
- The following commands are ignored in standard mode.
  ① Set absolute vertical print position in page mode: **GS $**
  ② Set relative vertical print position in page mode: **GS **
- Standard mode is selected automatically when power is turned on, the printer is reset, or command **ESC** @ is used.

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

ESC T *n*

[Name] Select print direction in page mode

[Format]

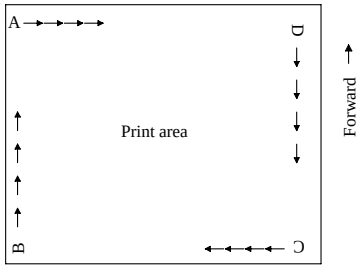
ASCII	ESC	T	*n*
Hex	1B	54	*n*
Decimal	27	84	*n*

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

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

n specifies the print direction and starting position as follows:

n	Print Direction	Starting Position
0, 48	Left to right	Upper left (A in the figure)
1, 49	Bottom to top	Lower left (B in the figure)
2, 50	Right to left	Lower right (C in the figure)
3, 51	Top to bottom	Upper right (D in the figure)



[Details]

- When the command is input in standard mode, the printer executes only internal flag operation. This command does not affect printing in standard mode.
- This command sets the position where data is buffered within the printing area set by **ESC W**.
- Parameters for horizontal or vertical motion units (*x* or *y*) differ as follows, depending on the starting position of the printing area:
  - ① If the starting position is the upper left or lower right of the printing area, data is buffered in the direction perpendicular to the paper feed direction:
    Commands using horizontal motion units: **ESC SP**, **ESC $**, **ESC **
    Commands using vertical motion units: **ESC 3**, **ESC J**, **GS $**, **GS **
  - ② If the starting position is the upper right or lower left of the printing area, data is buffered in the paper feed direction:
    Commands using horizontal motion units: **ESC 3**, **ESC J**, **GS $**, **GS **
    Commands using vertical motion units: **ESC SP**, **ESC $**, **ESC **

[Default] *n* = 0

[Reference] **ESC $**, **ESC L**, **ESC W**, **ESC **, **GS $**, **GS P**, **GS **

ESC V *n*

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

[Format]

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

[Range] $0 \le n \le 1, 48 \le n \le 49$

[Description] Turns 90° clockwise rotation mode on/off

n is used as follows:

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

[Details]
- This command affects printing in standard mode. However, the setting is always effective.
- When underline mode is turned on, the printer does not underline 90° clockwise-rotated.
- Double-width and double-height commands in 90° rotation mode enlarge characters in the opposite directions from double-height and double- width commands in normal mode.

[Default] *n* = 0

[Reference] **ESC !, ESC –**

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

[Name] Set printing area in page mode

[Format]

ASC II	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] $0 \le xL, xH, yL, yH, dxL, dxH, dyL, dyH \le 255$ (except $dxL=dxH=0$ or $dyL=dyH=0$)

[Description]

- The horizontal starting position, vertical starting position, printing area width, and printing area height are defined as *x*0, *y*0, *dx*, *dy*, respectively.

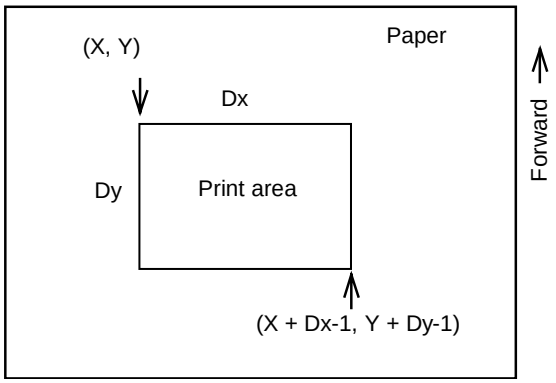
  Each setting for the printing area is calculated as follows:

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

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

[Details]

- If this command is input in standard mode, the printer executes only internal flag operation. This command does not affect printing in standard mode.
- If the horizontal or vertical starting position is set outside the printable area, the printer stops command processing and processes the following data as normal data.
- If the printing area width or height is set to 0, the printer stops command processing and processes the following data as normal data.
- This command sets the position where data is buffered to the position specified by **ESC T** within the printing area.
- If (horizontal starting position + printing area width) exceeds the printable area, the printing area width is automatically set to (horizontal printable area - horizontal starting position).
- If (vertical starting position + printing area height) exceeds the printable area, the printing area height is automatically set to (vertical printable area - vertical starting position).
- The horizontal and vertical motion unit are specified by **GS P**. Changing the horizontal or vertical motion unit does not affect the current printing area.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of minimum horizontal movement amount.
- Use the horizontal motion unit (*x*) for setting the horizontal starting position and printing area width, and use the vertical motion unit (*y*) for setting the vertical starting position and printing area height.
- When the horizontal starting position , vertical starting position, printing area width, and printing area height are defined as *X*, *Y*, *Dx*, and *Dy* respectively, the printing area is set as shown in the figure below.



- This printable area for this printer is approximately 72.2 mm {512/180"} in the horizontal direction and approximately 117.3 mm {1662/360"} in the vertical direction.

[Default] $x_L = x_H = y_L = y_H = 0$
$dx_L = 0$, $dx_H = 2$, $dy_L = 126$, $dy_H = 6$

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

ESC \ *nL nH*

[Name] Set relative print position

[Format]

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

[Range] $0 \le n_L \le 255$
$0 \le n_H \le 255$

[Description] Sets the print starting position based on the current position by using the horizontal or vertical motion unit.

- This command sets the distance from the current position to [($n_L + n_H \times 256$) $\times$ horizontal or vertical motion unit]

[Details]

- Any setting that exceeds the printable area is ignored.
- When pitch *N* is specified to the right:
  $n_L + n_H \times 256 = N$
  When pitch *N* is specified to the left (the negative direction), use the complement of 65536.
  When pitch *N* is specified to the left:
  $n_L + n_H \times 256 = 65536 - N$
- The print starting position moves from the current position to [*N* $\times$ horizontal or vertical motion unit]
- The horizontal and vertical motion unit are specified by **GS P**.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.
- In standard mode, the horizontal motion unit is used.
- In page mode, the horizontal or vertical motion unit differs as follows, depending on the starting point of the printing area:
  ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the horizontal motion unit (*x*) is used.
  ② When the starting position is set to the upper right or lower left of the printable area using **ESC T**, the vertical motion unit (*y*) is used.

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

ESC a *n*

[Name] Select justification

[Format]

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

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

[Description] Aligns all the data in one line to the specified position

n selects the justification as follows:

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

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

[Default] *n* = 0

[Example]

Left justification

```
ABC
ABCD
ABCDE
```

Centering

```
 ABC
ABCD
ABCDE
```

Right justification

```
  ABC
 ABCD
ABCDE
```

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] $0 \le n \le 255$

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

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

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Paper roll near-end sensor disabled
	On	01	1	Paper roll near-end sensor enabled
1	Off	00	0	Paper roll near-end sensor disabled
	On	02	2	Paper roll near-end sensor enabled
2	Off	00	0	Paper roll end sensor disabled
	On	04	4	Paper roll end sensor enabled
3	Off	00	0	Paper roll end sensor disabled
	On	08	8	Paper roll end sensor enabled
4-7	-	-	-	Undefined

[Details]

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

[Default] *n* = 15

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] $0 \le n \le 255$

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

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Paper roll near end sensor disabled.
	On	01	1	Paper roll near end sensor enabled.
1	Off	00	0	Paper roll near end sensor disabled.
	On	02	2	Paper roll near end sensor enabled.
2-7	-	-	-	Undefined.

[Details]

- When a paper sensor is enabled with this command, printing is stopped only when the corresponding paper is selected for printing.
- When a paper-end is detected by the paper roll sensor, the printer goes offline after printing stops.
- When either bit 0 or 1 is on, the printer selects the paper roll near-end sensor for the paper sensor to stop printing.

[Default] *n* = 0

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] $0 \le n \le 255$

[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.

[Details]

- Only the lowest bit of *n* is valid.
- When the panel buttons are disabled, none of them are usable when the printer cover is closed.
- In this printer, the panel buttons are the FEED button.
- In the macro ready mode, the FEED button are enabled regardless of the settings of this command; however, the paper cannot be fed by using these buttons.

[Default] *n* = 0

ESC d *n*

[Name] Print and feed *n* lines

[Format]

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

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

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

[Details]

- This command sets the print starting position to the beginning of the line.
- This command does not affect the line spacing set by **ESC 2** or **ESC 3**.
- The maximum paper feed amount is 1016 mm {40"}. If the paper feed amount (*n* × line spacing) of more than 1016 mm {40"} is specified, the printer feeds the paper only 1016 mm {40"}.

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

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 connector pin *m* as follows:

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

[Details]
- The pulse ON time is [$t1 \times 2$ ms] and the OFF time is [$t2 \times 2$ ms].
- If $t2 < t1$, the OFF time is [$t1 \times 2$ ms]

[Reference] **DLE DC4**, Section 2.2.3, *Drawer kick-out connector*, Appendix F

ESC t *n*

[Name] Select character code table

[Format]

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

[Range] $0 \le n \le 5$, $16 \le n \le 26$, $n = 255$

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

n	Page
0	PC437 [U.S.A., Standard Europe]
1	Katakana
2	PC850 [Multilingual]
3	PC860 [Portuguese]
4	PC863 [Canadian-French]
5	PC865 [Nordic]
16	WPC1252
17	PC866 [Cyrillic #2]
18	PC852 [Latin2]
19	PC858
20 (*1)	Thai character code 42
21 (*1)	Thai character code 11
22 (*1)	Thai character code 13
23 (*1)	Thai character code 14
24 (*1)	Thai character code 16
25 (*1)	Thai character code 17
26 (*1)	Thai character code 18
255	Space page

(*1): ($20 \le n \le 26$) is supported only by a Thai model.

[Default] *n* = 0
For Thai model: *n* = 20

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

ESC { *n*

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

[Format]

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

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

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

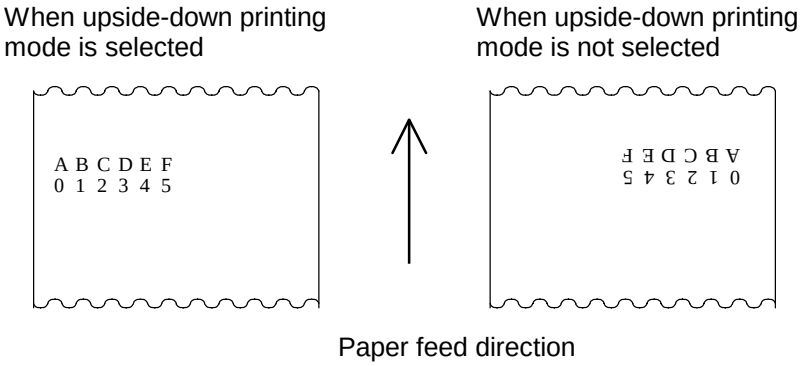
- When the LSB of *n* is 0, upside-down printing mode is turned off.
- When the LSB of *n* is 1, upside-down printing mode is turned on.

[Details]

- Only the lowest bit of *n* is valid.
- This command is enabled only when processed at the beginning of a line in standard mode.
- When this command is input in page mode, the printer performs only internal flag operations.
- This command does not affect printing in page mode.
- In upside-down printing mode, the printer rotates the line to be printed by 180° and then prints it.

[Default] *n* = 0

[Example]



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

[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] $m = 0$
$0 \le (a1+(a2\times256)+(a3\times65536)+(a4\times16777216)) \le 1023$
$1 \le (n_L+(n_H\times256)) \le 1024$
$32 \le d \le 255$
$k = (n_L+(n_H\times256))$

[Description] Writes data to NV user memory.

- *m* is always set to 0.
- a1, a2, a3, and a4 specify the data stored starting address to $(a1+(a2\times256)\times(a3\times65536)+(a4\times16777216))$.
- n_L, n_H select the number of stored data bytes $(n_L+(n_H\times256))$.
- *d* specifies the stored data.

[Details]

- NV user memory means the memory area which is used for storing character font data in non-volatile memory.
- This command is available only when processed at the beginning of a line in standard mode.
- This command is ignored in page mode.
- When this command is received during macro definition, the printer ends macro definition and begins executing this command.
- If the values of the argument (*m*), the stored starting address (*a1, a2, a3, a4*), and the number of the stored data (n_L, n_H) are out of the specified range, or if the stored starting address (*a1, a2, a3, a4*) + the number of the stored data (n_L, n_H) $\ge$ 1024, this command is ignored and data following are processed as normal data.
- If the value of the stored data *d* is out of range, the execution of this command is ended, and data following are processed as normal data.
  In this case, the data which are stored in the NV memory still remain.
- Writing data to the NV memory overwrites previous data. Therefore, previous data is deleted.
- If an error occurs during writing data to the NV memory, “Memory or Gate array R/W error” appears.
- Data which are stored in the NV user memory can be read by **FS g 2**.
- Once data is stored in the NV user memory, it is not erased by executing **ESC @, FS q**, reset, or power off.

[Notes]

- Frequent write command execution by **FS g 1** may damage the NV memory. Therefore, it is recommended to write the NV memory 10 times or less a day.
- While processing this command, the printer is BUSY when writing the data to the NV user memory and stops receiving data. Therefore it is prohibitted to transmit data including the real-time commands during the execution of this command.

[Reference] **FS g 2**

FS g 2 *m a1 a2 a3 a4 nL nH*

[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] $m = 0$

$0 \le (a1+(a2\times256)+(a3\times65536)+(a4\times16777216)) \le 1023$

$1 \le (n_L+(n_H\times256)) \le 80$

[Description] Transmits data from NV user memory.

- *m* is always set to 0.
- *a1, a2, a3*, and *a4* specify the data stored starting address to (*a1*+(*a2*×256)×(*a3*×65536)+(*a4*×16777216)).
- n_L, n_H select the number of stored data bytes (n_L+(n_H×256)).

[Details]

- NV user memory means the memory area which is used for storing character font data in non-volatile memory.
- If the values of the argument (*m*), the stored starting address (*a1, a2, a3, a4*) and the number of the stored data (n_L, n_H) are out of the specified range, or if the stored staring address (*a1, a2, a3, a4*) + the number of the stored data (n_L, n_H) ≥ 1024, this command is ignored and data following are processed as normal data.
- After the data is ready to be transmitted, the printer executes the following process.
  ① Executes READY to BUSY. If it is already BUSY, the printer executes nothing.
  ② Transmits [Header + Data + NUL].
  ③ Executes BUSY to READY. If it is already BUSY from any other cause, the printer executes nothing.
- The contents of [Header + Data + NUL] are as follows:
  Header: Hexadecimal = 5FH / Decimal = 95 (1 byte)
  Data: Data stored in NV user memory ((n_L+(n_H×256)) bytes)
  NUL: Hexadecimal = 00H / Decimal = 0 (1 byte)
- When DTR/DSR control is selected, the printer transmits data consecutively after confirming whether the host computer is ready to receive data. When the host is not ready to receive data, the printer waits until the host is ready.
- When XON/XOFF control is selected, the printer transmits all data consecutively without confirming whether the host computer is ready to receive data. The data transmission must be consecutive, except for the XOFF code.
- With the parallel interface mode, the data buffer capacity (which is the memory area to store all transmitted data except ASB status) is 99 bytes. Data which exceeds 99 bytes are ignored.
- Data which is stored in the NV user memory can be written by **FS g 1**.

[Notes]

- The printer transmits all data collectively without confirming whether the host is ready to receive data. To receive all data result correctly, (the capacity of the transmitted data + 2) bytes or more space is required in the receive buffer.
- During data transmission, the printer ignores real-time commands. Also, the printer does not transmit ASB even when the ABS is enabled. Therefore, the user cannot confirm changes in the printer status during these periods.

[Reference] **FS g 1**

FS p *n m*

[Name] Print NV bit image

[Format]

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

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

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

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

[dpi: dots per 25.4 mm {1"}]

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

[Details]

- NV bit image means a bit image which is defined in a non-volatile memory by **FS q** and printed by **FS p**.
- This command is not effective when the specified NV bit image has not been defined.
- In standard mode, this command is effective only when there is no data in the print buffer.
- In page mode, this command is not effective.
- This command is not affected by print modes (emphasized, double-strike, underline, character size, white/black reverse printing, or 90° rotated characters, etc.), except upside-down printing mode.
- If the printing area width set by **GS L** and **GS W** for the NV bit image is less than one vertical line, the following processing is performed only on the line in question. However, in NV bit image mode, one vertical line means 1 dot in normal mode (*m*=0, 48) and in double-height mode (*m*=2, 50), and it means 2 dots in double-width mode (*m*=1, 49) and in quadruple mode (*m*=3, 51).
  ① The printing area width is extended to the right in NV bit image mode up to one line vertically. In this case, printing does not exceed the printable area.
  ② If the printing area width cannot be extended by one line vertically, the left margin is reduced to accommodate one line vertically.
- If the downloaded bit-image to be printed exceeds one line, the excess data is not printed.
- This command feeds dots (for the height *n* of the NV bit-image) in normal and double-width modes, and (for the height $n \times 2$ of the NV bit-image) in double-height and quadruple modes, regardless of the line spacing specified by **ESC 2** or **ESC 3**.
- After printing the bit image, this command sets the print position to the beginning of the line and processes the data that follows as normal data.

[References] **ESC ∗**, **FS q**, **GS *l***, **GS v 0**

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

[Name] Define NV bit image

[Format]

ASCII	FS	q	*n*	*[xL xH yL yH d1...dk]1...[xL xH yL yH d1...dk]n*
Hex	1C	71	*n*	*[xL xH yL yH d1...dk]1...[xL xH yL yH d1...dk]n*
Decimal	28	113	*n*	*[xL xH yL yH d1...dk]1...[xL xH yL yH d1...dk]n*

[Range]
$1 \le n \le 255$
$0 \le xL \le 255$
$0 \le xH \le 3$ (when $1 \le (xL + xH \times 256) \le 1023$)
$0 \le yL \le 255$
$0 \le yL \le 1$ (when $1 \le (yL + yH \times 256) \le 288$)
$0 \le d \le 255$
$k = (xL + xH \times 256) \times (yL + yH \times 256) \times 8$
Total defined data area = 2M bits (256K bytes)

[Description] Define the NV bit image specified by *n* .

- *n* specifies the number of the defined NV bit image.
- *xL*, *xH* specifies $(xL + xH \times 256) \times 8$ dots in the horizontal direction for the NV bit image you are defining.
- *yL*, *yH* specifies $(yL + yH \times 256) \times 8$ dots in the vertical direction for the NV bit image you are defining.

[Details]

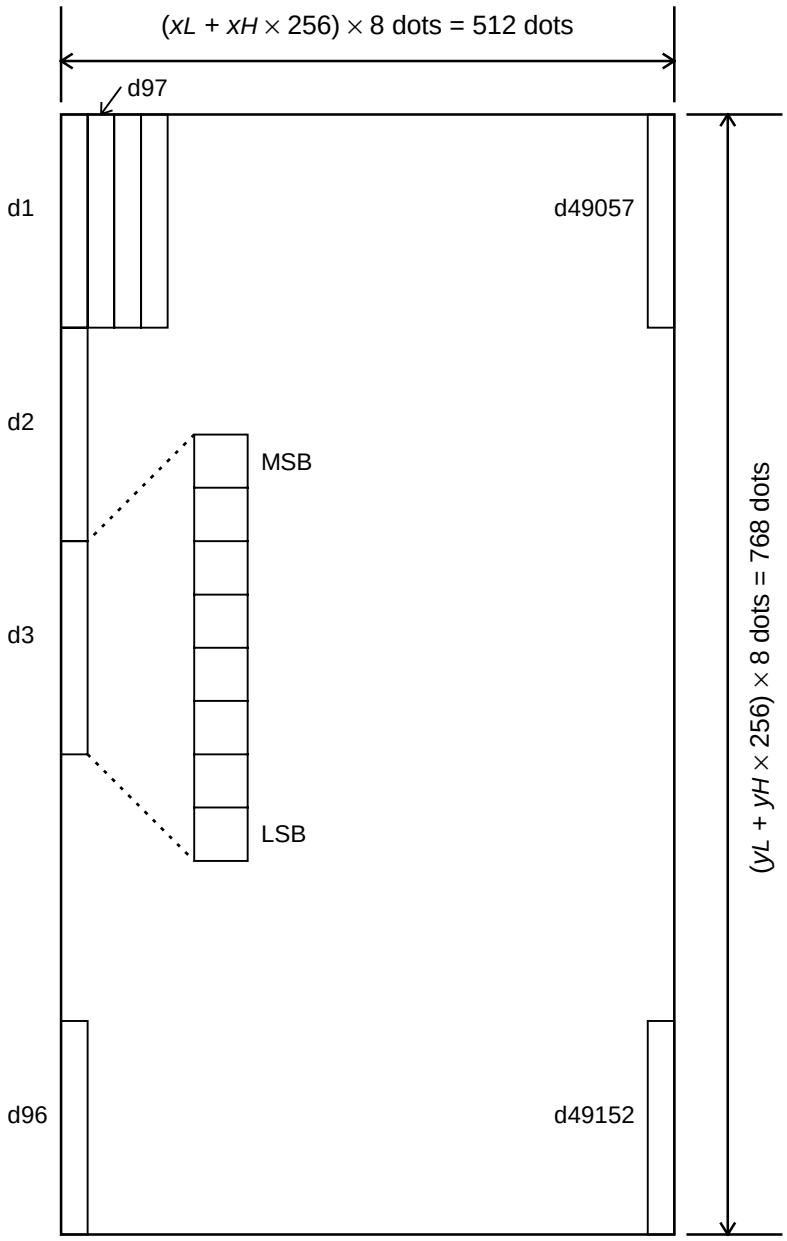
- This command cancels all NV bit images that have already been defined by this command. The printer can not redefine only one of several data definitions previously defined. In this case, all data needs to be sent again.
- From the beginning of the processing of this command till the finish of hardware reset, mechanical operations (including initializing the position of the printer head when the cover is open, paper feeding by using the FEED button, etc.) cannot be performed.
- During processing this command, the printer is in BUSY when writing the data to the NV user memory and stops receiving data. Therefore it is prohibitted to transmit the data including the real-time commands during the execution of this command.
- NV bit image means a bit image which is defined in a non-volatile memory by **FS q** and printed by **FS p**.
- In standard mode, this command is effective only when processed at the beginning of the line.
- In page mode, this command is not effective.
- This command is effective when 7 bytes <FS~yH> is processed as a normal value.
- When the amount of data exceeds the capacity left in the range defined by *xL, xH, yL, yH*, the printer processes *xL, xH, yL, yH* out of the defined range.
- In the first group of NV bit images, when any of the parameters *xL, xH, yL, yH* is out of the definition range, this command is disabled.
- In groups of NV bit images other than the first one, when the printer processes *xL, xH, yL, yH* out of the defined range, it stops processing this command and starts writing into the NV images. At this time, NV bit images that haven't been defined are disabled (undefined), but any NV bit images before that are enabled.

- The *d* indicates the definition data. In data (*d*) a 1 bit specifies a dot to be printed and a 0 bit specifies a dot not to be printed.
- This command defines *n* as the number of a NV bit image. Numbers rise in order from NV bit image 01H. Therefore, the first data group *[xL xH yL yH d1...dk]* is NV bit image 01H, and the last data group *[xL xH yL yH d1...dk]* is NV bit image *n.* The total agrees with the number of NV bit images specified by command **FS p**.
- A definition data of a NV bit image consists of *[xL xH yL yH d1...dk].* Therefore, when only one NV bit image is defined *n*=1, the printer processes a data group *[xL xH yL yH d1...dk]* once. The printer uses ([data: (*xL* + *xH* × 256) × (*yL* + *yH* × 256) × 8] + [header :4]) bytes of NV memory.
- The definition area in this printer is a maximum of 2M bits (256K bytes). This command can define several NV bit images, but cannot define a bit image data whose total capacity [bit image data + header] exceeds 2M bytes (256K bytes).
- The printer is busy immediately before writing into NV memory, regardless of the setting of DIP switch 2-1.
- The printer does not transmit ASB status and perform status detection during processing of this command even when ASB is specified.
- When this command is received during macro definition, the printer ends macro definition, and begins performing this command.
- Once a NV bit image is defined, it is not erased by performing **ESC** @, reset, and power off.
- This command performs only definition of a NV bit image and does not perform printing. Printing of the NV bit image is performed by the **FS p** command.

[Notes]
- Frequent write command execution may cause damage the NV memory. Therefore, it is recommended to write the NV memory 10 times or less a day.
- The printer performs a hardware reset after the procedure to place the image into the NV memory. Therefore, user-defined characters, downloaded bit images, and macros should be defined only after completing this command. The printer clears the receive and print buffers and resets the mode to the mode that was in effect at power on. At this time, DIP switch settings are checked again.

[Reference] **FS p**

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



GS ! *n*

[Name] Select character size

[Format]

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

[Range] $0 \le n \le 255$
($1 \le$ vertical number of times ≤ 8, $1 \le$ horizontal number of times ≤ 8)

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

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

Table 1 Character Width Selection

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

Table 2Character Height Selection

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

[Details]
- This command is all characters (alphanumeric and Kanji) effective except for HRI characters.
- If *n* is outside of the defined range, this command is ignored.
- In standard mode, the vertical direction is the paper feed direction, and the horizontal direction is perpendicular to the paper feed direction. However, when character orientation changes in 90° clockwise-rotation mode, the relationship between vertical and horizontal directions is reversed.
- In page mode, vertical and horizontal directions are based on the character orientation.
- When characters are enlarged with different sizes on one line, all the characters on the line are aligned at the baseline.
- The **ESC !** command can also turn double-width and double-height modes on or off. However, the setting of the last received command is effective.

[Default] *n* = 0

[Reference] **ESC !**

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] $0 \le n_L \le 255$, $0 \le n_H \le 255$

[Description]
- Sets the absolute vertical print starting position for buffer character data in page mode.
- This command sets the absolute print position to [($n_L + n_H \times 256$) × (vertical or horizontal motion unit)].

[Details]
- This command is effective only in page mode.
- If the [($n_L + n_H \times 256$) × (vertical or horizontal motion unit)] exceeds the specified printing area, this command is ignored.
- The horizontal starting buffer position does not move.
- The reference starting position is that specified by **ESC T**.
- This command operates as follows, depending on the starting position of the printing area specified by **ESC T**:
  ① When the starting position is set to the upper left or lower right, this command sets the absolute position in the vertical direction.
  ② When the starting position is set to the upper right or lower left, this command sets the absolute position in the horizontal direction.
- The horizontal and vertical motion unit are specified by **GS P**.
- The **GS P** command can change the horizontal and vertical motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.

[Reference] **ESC $**, **ESC T**, **ESC W, ESC **, **GS P, GS **, 3.12 *Page Mode*

GS ∗ *x y d1...d(x × y × 8)*

[Name] Define downloaded bit image

[Format]

ASCII	GS	∗	*x*	*y*	*d1...d(x × y × 8)*
Hex	1D	2A	*x*	*y*	*d1...d(x × y × 8)*
Decimal	29	42	*x*	*y*	*d1...d(x × y × 8)*

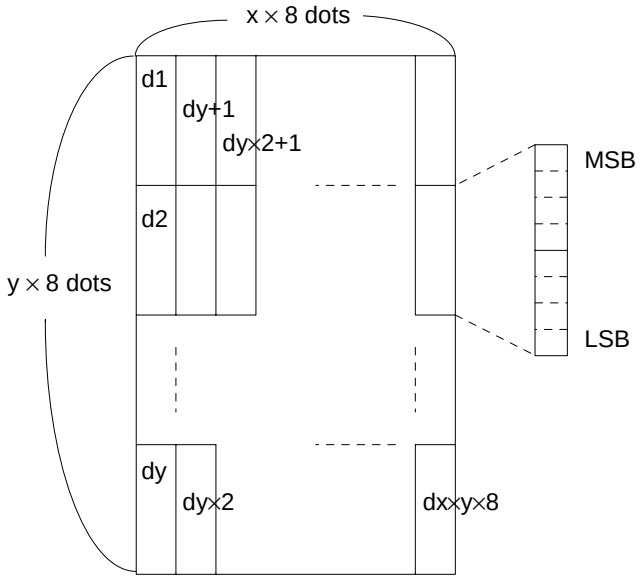
[Range] $1 \le x \le 255$
$1 \le y \le 48$
$x \times y \le 1536$
$0 \le d \le 255$

[Description] Defines a downloaded bit image using the number of dots specified by *x* and *y*

- *x* specifies the number of dots in the horizontal direction.
- *y* specifies the number of dots in the vertical direction.

[Details]

- The number of dots in the horizontal direction is $x \times 8$, in the vertical direction it is $y \times 8$.
- If $x \times y$ is out of the specified range, this command is disabled.
- The *d* indicates bit-image data. Data (*d*) specifies a bit printed to 1 and not printed to 0.
- The downloaded bit image definition is cleared when:
  ① **ESC @** is executed.
  ② **ESC &** is executed.
  ③ **FS q** is executed.
  ④ Printer is reset or the power is turned off.
- The following figure shows the relationship between the downloaded bit image and the printed data.



[Reference] **GS /**

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] $(p_L+(p_H\times256))=2$ ($p_L=2$, $p_H=0$)
$0 \le n \le 2$, $48 \le n \le 50$
$1 \le m \le 3$, $49 \le m \le 51$

[Description]
- Executes a test print with a specified test pattern on a specified paper.
- p_L and p_H specifies the number of the parameter such as *n*, *m* to (p_L + ($p_H \times 256$)) bytes.

  n specifies the paper to be tested.

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

  m specifies a test pattern.

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

[Details]
- This command is enabled only when processed at the beginning of a line in standard mode.
- This command is no effect in page mode.
- When this command is received during macro definition, the printer ends macro definition and begins performing this command.
- After the test print is finished, the printer resets itself automatically. Therefore, the already-defined data before this command is executed, such as an user-defined characters, downloaded bit image, and macro, becomes undefined, and the receive buffer and print buffer are cleared, and each setting returns to the default value. The printer also re-reads the DIP switch settings .
- The printer cuts the paper at the end of the test print.
- The printer goes BUSY while this command is executed.

GS / *m*

[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 a downloaded bit image using the mode specified by *m*.
m selects a mode from the table below:

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

[dpi: dots per 25.4 mm {1"}]

[Details]

- This command is ignored if a downloaded bit image has not been defined.
- In standard mode, this command is effective only when there is no data in the print buffer.
- This command has no effect in the print modes (emphasized, double-strike, underline, character size, or white/black reverse printing), except for upside-down printing mode.
- If the downloaded bit-image to be printed exceeds the printable area, the excess data is not printed.
- Refer to Figure 3.12.3 for the downloaded bit image development position in page mode.
- If the printing area width set by **GS L** and **GS W** is less than one line in vertical, the following processing is performed only on the line in question:
  ① The printing area width is extended to the right up to one line in vertical. In this case, printing does not exceed the printable area.
  ② If the printing area width cannot be extended by one line in vertical, the left margin is reduced to accommodate one line in vertical.

[Reference] **GS ∗**

GS :

[Name] Start/end macro definition

[Format]

ASCII	GS	:
Hex	1D	3A
Decimal	29	58

[Description] Starts or ends macro definition.

[Details]

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

[Reference] **GS ^**

GS B *n*

[Name] Turn white/black reverse printing mode

[Format]

ASCII	GS	B	*n*
Hex	1D	42	*n*
Decimal	29	66	*n*

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

[Description] Turns on or off white/black reverse printing mode.

- When the LSB of *n* is 0, white/black reverse mode is turned off.
- When the LSB of *n* is 1, white/black reverse mode is turned on.

[Details]

- Only the lowest bit of *n* is valid.
- This command is available for built-in characters and user-defined characters.
- When white/black reverse printing mode is on, it also applied to character spacing set by **ESC SP**.
- This command does not affect bit image, user-defined bit image, bar code, HRI characters, and spacing skipped by **HT**, **ESC $**, and **ESC **.
- This command does not affect the space between lines.
- White/black reverse mode has a higher priority than underline mode. Even if underline mode is on, it is disabled (but not canceled) when white/black reverse mode is selected.

[Default] *n* = 0

GS H *n*

[Name] Select printing position for HRI characters

[Format]

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

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

[Description] Selects the printing position of HRI characters when printing a bar code.

n selects the printing position as follows:

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

[Details]

- HRI indicates Human Readable Interpretation.
- HRI characters are printed using the font specified by **GS f**.

[Default] *n* = 0

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

GS I *n*

[Name] Transmit printer ID

[Format]

ASCII	GS	I	*n*
Hex	1D	49	*n*
Decimal	29	73	*n*

[Range] $1 \le n \le 3$, $49 \le n \le 51$, $65 \le n \le 69$

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

n	Printer ID	Specification	ID (hexadecimal)
1, 49	Printer model ID	TM-T88II series	20
2, 50	Type ID	See table below.	
3, 51	ROM version ID	Depends on ROM version.	
65	Firmware version	Depends on Firmware version.	
66	Manufacturer	EPSON	
67	Printer name	TM-T88III	
68	Serial number	Depends on serial number.	
69	Type of model	Japanese model: KANJI JAPANESE Simplified Chinese model: CHINA GB2312 Traditional Chinese model: TAIWAN BIG-5 Thai model: THAI 3 PASS Korean model: KOREA C-5601C	

n = 2, Type ID

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Two-byte character code not supported.
	On	01	1	Two-byte character code supported.
1	On	02	2	Autocutter equipped.
2	Off	00	0	Not used. Fixed to Off.
3	Off	00	0	Not used. Fixed to Off.
4	Off	00	0	Not used. Fixed to Off.
5	-	-	-	Undefined.
6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

[Details]

- When DTR/DSR control is selected in the serial interface model, the printer transmits the printer ID after confirming that the host is ready to receive data (DSR signal is SPACE). If the host computer is not ready to receive data (DSR signal is MARK), the printer waits until the host is ready.
- When XON/XOFF control is selected in the serial interface model, the printer transmits the printer ID without confirming the condition of the DSR signal.
- The printer ID is transmitted when the data in the receive buffer is developed. Therefore, there may be a time lag between receiving this command and transmitting the status, depending on the receive buffer status.
- When the printer ID transmission is specified with ($1 \leq n \leq 3$) or ($49 \leq n \leq 51$), one byte code is transmitted.
- When Auto Status Back (ASB) is enabled using **GS a**, the printer ID transmitted by **GS I** and the ASB status must be differentiated using the table in Appendix G.
- After the data is ready to be transmitted, the printer executes the following process.
- When the printer ID transmission is specified with ($65 \leq n \leq 68$), the following contents are transmitted:

  Header: Hexadecimal = 5FH / Decimal = 95 (1 byte)
  Data: Printer information
  NUL: Hexadecimal = 00H / Decimal = 0 (1 byte)

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

[Reference] Appendix G

GS L *nL nH*

[Name] Set left margin

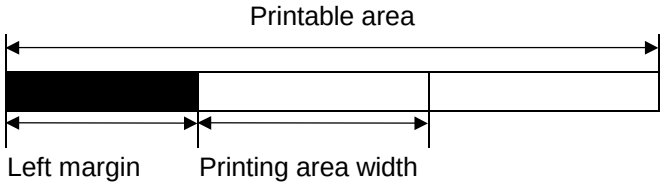
[Format]

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

[Range] $0 \le nL \le 255$
$0 \le nH \le 255$

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

- The left margin is set to [(*nL* + *nH* × 256) × horizontal motion unit)] inches.



[Details]

- This command is effective only processed at the beginning of the line in standard mode.
- If this command is input in page mode, the printer performs only internal flag operations.
- This command does not affect printing in page mode.
- If the setting exceeds the printable area, the maximum value of the printable area is used.
- The horizontal and vertical motion units are specified by **GS P**. Changing the horizontal and vertical motion unit does not affect the current left margin.
- The horizontal motion unit (*x*) is used for calculating the left margin. The calculated result is truncated to the minimum value of the mechanical pitch.

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

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

GS P *x y*

[Name] Set horizontal and vertical motion units

[Format]

ASCII	GS	P	*x*	*y*
Hex	1D	50	*x*	*y*
Decimal	29	80	*x*	*y*

[Range] $0 \le x \le 255$
$0 \le y \le 255$

[Description] Sets the horizontal and vertical motion units to approximately 25.4/*x* mm { 1/*x* inches} and approximately 25.4/*y* mm {1/*y* inches}, respectively.

When *x* and *y* are set to 0, the default setting of each value is used.

[Details]

- The horizontal direction is perpendicular to the paper feed direction and the vertical direction is the paper feed direction.
- In standard mode, the following commands use *x* or *y*, regardless of character rotation (upside-down or 90° clockwise rotation):
  ① Commands using *x*: **ESC SP, ESC $, ESC \, FS S, GS L, GS W**
  ② Commands using *y*: **ESC 3, ESC J, GS V**
- In page mode, the following command use *x* or *y*, depending on character orientation:
  ① When the print starting position is set to the upper left or lower right of the printing area using **ESC T** (data is buffered in the direction perpendicular to the paper feed direction):
  Commands using *x*: **ESC SP, ESC $, ESC W, ESC \, FS S**
  Commands using *y*: **ESC 3, ESC J, ESC W, GS $, GS \, GS V**
  ② When the print starting position is set to the upper right or lower left of the printing area using **ESC T** (data is buffered in the paper feed direction):
  Commands using *x*: **ESC 3, ESC J, ESC W, GS $, GS **
  Commands using *y*: **ESC SP, ESC $, ESC W, ESC \, FS S, GS V**
- The command does not affect the previously specified values.
- The calculated result from combining this command with others is truncated to the minimum value of the mechanical pitch.

[Default] *x* = 180, *y* = 360

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

① GS V *m* ② GS V *m n*

[Name] Select cut mode and cut paper

[Format]

①	ASCII	GS	V	*m*	
	Hex	1D	56	*m*	
	Decimal	29	86	*m*	
②	ASCII	GS	V	*m*	*n*
	Hex	1D	56	*m*	*n*
	Decimal	29	86	*m*	*n*

[Range] ① $m = 1, 49$

② $m = 66, 0 \leq n \leq 255$

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

m	Print mode
1, 49	Partial cut (one point left uncut)
66	Feeds paper (cutting position + [*n* × (vertical motion unit)]), and cuts the paper partially (one point left uncut).

[Details for ① and ②]

- This command is effective only processed at the beginning of a line.

[Details for ①]

- Only the partial cut is available; there is no full cut.

[Details for ②]

- When $n = 0$, the printer feeds the paper to the cutting position and cuts it.
- When $n \neq 0$, the printer feeds the paper to (cutting position + [*n* × vertical motion unit]) and cuts it.
- The horizontal and vertical motion unit are specified by **GS P**.
- The paper feed amount is calculated using the vertical motion unit (y). However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.

GS W *nL nH*

[Name] Set printing area width

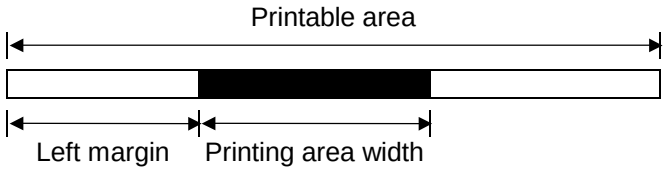
[Format]

ASCII	GS	W	*nL*	*nH*
Hex	1D	57	*nL*	*nH*
Decimal	29	87	*nL*	*nH*

[Range] $0 \le n_L \le 255$
$0 \le n_H \le 255$

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

- The printing area width is set to [(*nL* + *nH* × 256) × horizontal motion unit]].

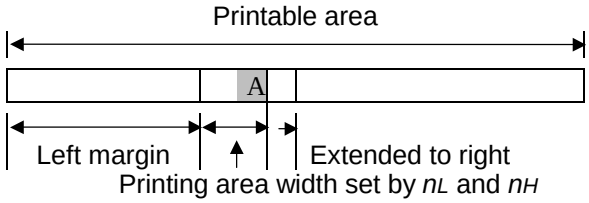


[Details]

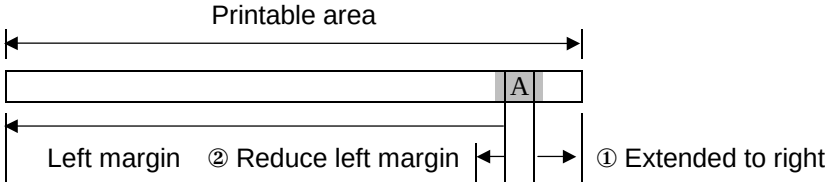
- This command is effective only processed at the beginning of the line.
- In page mode, the printer performs only internal flag operations.
- This command does not affect printing in page mode.
- If the [left margin + printing area width] exceeds the printable area, [printable area width - left margin) is used.
- The horizontal and vertical motion units are specified by **GS P**. Changing the horizontal and vertical motion units does not affect the current left margin.
- The horizontal motion unit (*x*) is used for calculating the printing area width. The calculated result is truncated to the minimum value of the mechanical pitch.

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

  ① The printing area width is extended to the right to accommodate one character.



  ② If the printing area width cannot be extended sufficiently, the left margin is reduced to accommodate one character.



  ③ If the printing area width cannot be extended sufficiently, the right space is reduced.

- If the width set for the printing area is less than one line in vertical, the following processing is performed only on the line in question when data other than character data (e.g., bit image, user-defined bit image) is developed:

  ① The printing area width is extended to the right to accommodate one line in vertical for the bit image within the printable area.

  ② If the printing area width cannot be extended sufficiently, the left margin is reduced to accommodate one line in vertical.

- The commands which set the printing area width for bit image printing and its minimum widths are as follows:
  - Bit image (**ESC ∗**):
    Single density mode = 2 dots
    Double density mode = 1 dot
  - Downloaded bit image (**GS *l***):
    Double width mode or Quadruple mode = 2 dots
    Normal mode or Double-height mode = 1 dot
  - NV bit image (**FS p**):
    Double width mode or Quadruple mode = 2 dots
    Normal mode or Double-height mode = 1 dot
  - Raster bit image (**GS v 0**):
    Double width mode or Quadruple mode = 2 dots
    Normal mode or Double-height mode = 1 dot

[Default] n_L = 0, n_H = 2

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

GS \ *nL nH*

[Name] Set relative vertical print position in page mode

[Format]

ASCII	GS	\	*nL*	*nH*
Hex	1D	5C	*nL*	*nH*
Decimal	29	92	*nL*	*nH*

[Range] $0 \le n_L \le 255$
$0 \le n_H \le 255$

[Description] Sets the relative vertical print starting position from the current position in page mode.

- This command sets the distance from the current position to [($n_L + n_H \times 256$) $\times$ vertical or horizontal motion unit].

[Details]

- This command is ignored unless page mode is selected.
- When pitch *N* is specified to the movement downward:

  $n_L + n_H \times 256 = N$

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

  When pitch *N* is specified to the movement upward:

  $n_L + n_H \times 256 = 65536 - N$
- Any setting that exceeds the specified printing area is ignored.
- This command function as follows, depending on the print starting position set by **ESC T**:

  ①When the starting position is set to the upper left or lower right of the printing, the vertical motion unit (*y*) is used.

  ②When the starting position is set to the upper right or lower left of the printing area, the horizontal motion unit (*x*) is used.
- The horizontal and vertical motion unit are specified by **GS P**.
- The **GS P** command can change the horizontal (and vertical) motion unit. However, the value cannot be less than the minimum horizontal movement amount, and it must be in even units of the minimum horizontal movement amount.

[Reference] **ESC $**, **ESC T**, **ESC W**, **ESC **, **GS $**, **GS P**, 3.12 *Page Mode*

GS ^ *r t m*

[Name] Execute macro

[Format]

ASCII	GS	^	*r*	*t*	*m*
Hex	1D	5E	*r*	*t*	*m*
Decimal	29	94	*r*	*t*	*m*

[Range] $0 \le r \le 255$
$0 \le t \le 255$
$m = 0, 1$

[Description] Executes a macro.

- *r* specifies the number of times to execute the macro.
- *t* specifies the waiting time for executing the macro.
- *m* specifies macro executing mode.

  When the LSB of *m* = 0:
  The macro executes *r* times continuously at the interval specified by *t*.

  When the LSB of *m* = 1:
  After waiting for the period specified by *t*, the PAPER OUT LED indicators blink and the printer waits for the FEED button to be pressed. After the button is pressed, the printer executes the macro once. The printer repeats the operation *r* times.

[Details]

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

[Reference] **GS :**

GS a *n*

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

[Format]

ASCII	GS	a	*n*
Hex	1D	61	*n*
Decimal	29	97	*n*

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

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

Bit	Off/On	Hex	Decimal	Status for ASB
0	Off	00	0	Drawer kick-out connector pin 3 status disabled.
	On	01	1	Drawer kick-out connector pin 3 status enabled.
1	Off	00	0	Online/offline status disabled.
	On	02	2	Online/offline status enabled.
2	Off	00	0	Error status disabled.
	On	04	4	Error status enabled.
3	Off	00	0	Paper roll sensor status disabled.
	On	08	8	Paper roll sensor status enabled.
4-7	-	-	-	Undefined.

[Details]

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

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

First byte (printer information)

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

Second byte (printer information)

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

Bit 3: If these errors occur due to paper jams or the like, it is possible to recover by correcting the cause of the error and executing **DLE ENQ *n*** ($1 \le n \le 2$). If an error due to a circuit failure (e.g. wire break) occurs, it is impossible to recover.

Bit 6: When printing is stopped due to high print head temperature until the print head temperature drops sufficiently or when the paper roll cover is open during printing, bit 6 is On.

Third byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Status for ASB
0, 1	Off	00	0	Paper roll near-end sensor: paper adequate.
	On	03	3	Paper roll near-end sensor: paper near end.
2, 3	Off	00	0	Paper roll end sensor: paper present.
	On	0C	12	Paper roll end sensor: paper not present.
4	Off	00	0	Not used. Fixed to Off.
5, 6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

Fourth byte (paper sensor information)

Bit	Off/On	Hex	Decimal	Status for ASB
0-3	-	-	-	Undefined.
4	Off	00	0	Not used. Fixed to Off.
5, 6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

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

[Reference] **DLE EOT**, **GS r**, Appendix G, *Transmission Status Identification*

GS b *n*

[Name] Turns smoothing mode on/off

[Format]

ASCII	GS	b	*n*
Hex	1D	62	*n*
Decimal	29	98	*n*

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

[Description] Turns smoothing mode on or off.

When the LSB of *n* is 0, smoothing mode is turned off.
When the LSB of *n* is 1, smoothing mode is turned on.

[Details]
- Only the lowest bit of *n* is valid.
- Smoothing mode is available for built-in, user-defined characters.
- Even if smoothing mode is turned on, smoothing is not performed when either of character width or character height is the normal size.

[Default] *n* = 0

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

GS f *n*

[Name] Select font for Human Readable Interpretation (HRI) characters

[Format]

ASCII	GS	f	*n*
Hex	1D	66	*n*
Decimal	29	102	*n*

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

[Description] Selects a font for the HRI characters used when printing a bar code.

n selects a font from the following table:

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

[Details]
- HRI indicates Human Readable Interpretation.
- HRI characters are printed at the position specified by **GS H**.

[Default] *n* = 0

[Reference] **GS H**, **GS k**

GS h *n*

[Name] Select bar code height

[Format]

ASCII	GS	h	*n*
Hex	1D	68	*n*
Decimal	29	104	*n*

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

[Description] Selects the height of the bar code.

n specifies the number of dots in the vertical direction.

[Default] *n* = 162

[Reference] **GS k**

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

[Name] Print bar code

[Format]

① ASCII	GS	k	*m*	*d1...dk*		*NUL*
Hex	1D	6B	*m*	*d1...dk*		*00*
Decimal	29	107	*m*	*d1...dk*		*0*
② ASCII	GS	k	*m*	*n*	*d1...dn*	
Hex	1D	6B	*m*	*n*	*d1...dn*	
Decimal	29	107	*m*	*n*	*d1...dn*	

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

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

[Description] Selects a bar code system and prints the bar code.

m selects a bar code system as follows:

m		Bar Code System	Number of Characters	Remarks
①	0	UPC-A	$11 \le k \le 12$	$48 \le d \le 57$
	1	UPC-E	$11 \le k \le 12$	$48 \le d \le 57$
	2	JAN13 (EAN13)	$12 \le k \le 13$	$48 \le d \le 57$
	3	JAN 8 (EAN8)	$7 \le k \le 8$	$48 \le d \le 57$
	4	CODE39	$1 \le k$	$48 \le d \le 57$, $65 \le d \le 90$, 32, 36, 37, 43, 45, 46, 47
	5	ITF	$1 \le k$ (even number)	$48 \le d \le 57$
	6	CODABAR	$1 \le k$	$48 \le d \le 57$, $65 \le d \le 68$, 36, 43, 45, 46, 47, 58
②	65	UPC-A	$11 \le n \le 12$	$48 \le d \le 57$
	66	UPC-E	$11 \le n \le 12$	$48 \le d \le 57$
	67	JAN13 (EAN13)	$12 \le n \le 13$	$48 \le d \le 57$
	68	JAN 8 (EAN8)	$7 \le n \le 8$	$48 \le d \le 57$
	69	CODE39	$1 \le n \le 255$	$48 \le d \le 57$, $65 \le d \le 90$, 32, 36, 37, 43, 45, 46, 47
	70	ITF	$1 \le n \le 255$ (even number)	$48 \le d \le 57$
	71	CODABAR	$1 \le n \le 255$	$48 \le d \le 57$, $65 \le d \le 68$, 36, 43, 45, 46, 47, 58
	72	CODE93	$1 \le n \le 255$	$0 \le d \le 127$
	73	CODE128	$2 \le n \le 255$	$0 \le d \le 127$

[Details for ①]

- This command ends with a NUL code.
- When the bar code system used is UPC-A or UPC-E, the printer prints the bar code data after receiving 12 bytes bar code data and processes the following data as normal data.
- When the bar code system used is JAN13 (EAN13), the printer prints the bar code after receiving 13 bytes bar code data and processes the following data as normal data.
- When the bar code system used is JAN8 (EAN8), the printer prints the bar code after receiving 8 bytes bar code data and processes the following data as normal data.
- The number of data for ITF bar code must be even numbers. When an odd number of data is input, the printer ignores the last received data.

[Details for ②]

- *n* indicates the number of bar code data, and the printer processes *n* bytes from the next character data as bar code data.
- If *n* is outside of the specified range, the printer stops command processing and processes the following data as normal data.

[Details in standard mode]

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

[Details in page mode]

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

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

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

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

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

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

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

- Refer to Appendix J for the information of the CODE 128 bar code and its code table.
- When using the CODE 128 in this printer, take the following points into account for data transmission:

  ① The top of the bar code data string must be code set selection character (any of CODE A, CODE B or CODE C) which selects the first code set.

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

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

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

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

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

- If the top of the bar code data is not the code set selection character, the printer stops command processing and processes the following data as normal data.
- If combination of "{" and the following character does not apply any special character, the printer stops command processing and processes the following data as normal data.
- If the printer receives characters that cannot be used in the special code set, the printer stops command processing and processes the following data as normal data.
- The printer does not print HRI characters that correspond to the shift characters or code set selection characters.
- HRI character for the function character is space.
- HRI characters for the control character (<00>H to <1F>H and <7F>H) are space.

<Others> Be sure to keep spaces on both right and left sides of a bar code. (Spaces are different depending on the types of the bar code.)

[Reference] **GS H**, **GS f**, **GS h**, **GS w**, Appendix J

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 specified by *n* as follows:

n	Function
1, 49	Transmits paper sensor status
2, 50	Transmits drawer kick-out connector status

[Details]

- When using a serial interface

  When DTR/DSR control is selected, the printer transmits only 1 byte after confirming the host is ready to receive data (DSR signal is SPACE). If the host computer is not ready to receive data (DSR signal is MARK), the printer waits until the host is ready.

  When XON/XOFF control is selected, the printer transmits only 1 byte without confirming the condition of the DSR signal.

- This command is executed when the data in the receive buffer is developed. Therefore, there may be a time lag between receiving this command and transmitting the status, depending on the receive buffer status.
- When Auto Status Back (ASB) is enabled using **GS a**, the status transmitted by **GS r** and the ASB status must be differentiated using the table in Appendix G.
- The status types to be transmitted are shown below:

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

Bit	Off/On	Hex	Decimal	Status for ASB
0, 1	Off	00	0	Paper roll near-end sensor: paper adequate.
	On	03	3	Paper roll near-end sensor: paper near end.
2, 3	Off	00	0	Paper roll end sensor: paper adequate.
	On	(0C)	(12)	Paper roll end sensor: paper near end.
4	Off	00	0	Not used. Fixed to Off.
5, 6	-	-	-	Undefined.
7	Off	00	0	Not used. Fixed to Off.

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

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

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

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

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

[Name] Print raster bit image

[Format]

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

[Range] $0 \le m \le 3, 48 \le m \le 51$
$0 \le xL \le 255$
$0 \le xH \le 255$
$0 \le yL \le 255$
$0 \le yH \le 8$
$0 \le d \le 255$
$k = (xL + xH \times 256) \times (yL + yH \times 256) \quad (k \ne 0)$

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

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

[dpi: dots per 25.4 mm {1"}]

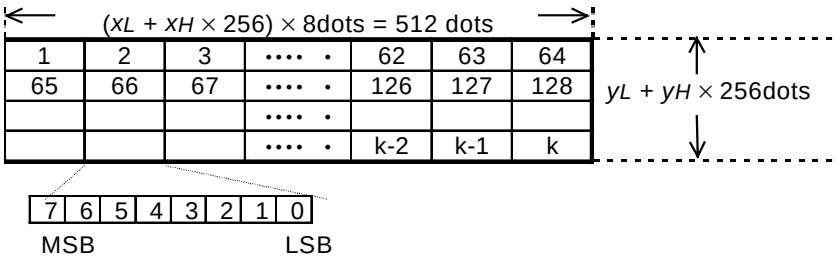
- *xL*, *xH*, select the number of data bytes (*xL*+*xH*×256) in the horizontal direction for the bit image.
- *yL*, *yH*, select the number of data bytes (*yL*+*yH*×256) in the vertical direction for the bit image.

[Details]

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

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

[Example] When *xL*+*xH*×256=64



GS w *n*

[Name] Set bar code width

[Format]

ASCII	GS	w	*n*
Hex	1D	77	*n*
Decimal	29	119	*n*

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

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

n specifies the bar code width as follows:

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

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

[Default] *n* = 3

[Reference] **GS k**

6.4 Kanji Control Commands

(for Japanese model, Simplified Chinese model, Traditional Chinese model, and Korean model)

FS ! *n*

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

[Format]

ASCII	FS	!	*n*
Hex	1C	21	*n*
Decimal	28	33	*n*

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

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

Bit	Off/On	Hex	Decimal	Function
0	-	-	-	Undefined.
1	-	-	-	Undefined.
2	Off	00	0	Double-width mode is OFF.
	On	04	4	Double-width mode is ON.
3	Off	00	.	Double-height mode is OFF.
	On	08	8	Double-height mode is ON.
4	-	-	-	Undefined.
5	-	-	-	Undefined.
6	-	-	-	Undefined.
7	Off	00	0	Underline mode is OFF.
	On	80	128	Underline mode is ON.

[Notes]

- When both double-width and double-height modes are set (including right- and left-side character spacing), quadruple-size characters are printed.
- The printer can underline all characters (including right- and left-side character spacing), but cannot underline the space set by **HT** and 90° clockwise-rotated characters.
- The thickness of the underline is that specified by **FS –**, regardless of the character size.
- When some of the characters in a line are double or more height, all the characters on the line are aligned at the baseline.
- It is possible to emphasize the Kanji character using **FS W** or **GS !**, the setting of the last received command is effective.
- It is possible to turn under line mode on or off using **FS –**, and the setting of the last received command is effective.

[Default] *n* = 0

[Reference] **FS** –, **FS W**, **GS !**

FS &

[Name] Select Kanji character mode

[Format]

ASCII	FS	&
Hex	1C	26
Decimal	28	38

[Description] Selects Kanji character mode.

[Notes]
- When the Kanji character code system is SHIFT JIS, the printer performs only internal flag operations. Printing is not affected.

[Notes] For Japanese model:
- This command is effective only when the JIS code system is selected.
- When the Kanji character mode is selected, the printer processes all Kanji code for each two bytes.
- Kanji codes are processed in the order of the first byte and second byte.
- Kanji character mode is not selected when the power is turned on.
- Using **FS C**, the Kanji character code system is selected.

For Simplified Chinese/Traditional Chinese/Korean model:
- When the kanji character mode is selected, the printer checks whether the code is for Kanji or not, then processed the first byte and the second byte if the code is for Kanji.
- Kanji codes are processed in the order of the first byte and second byte.
- Kanji character mode is not selected when the power is turned on.
- Kanji codes are processed in the order of the first byte and second byte.

[Reference] **FS .**, **FS C**

FS – *n*

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

[Format]

ASCII	FS	–	*n*
Hex	1C	2D	*n*
Decimal	28	45	*n*

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

[Description] Turns underline mode for Kanji characters on or off, based on the following values of *n*.

n	**Function**
0, 48	Turns off underline mode for Kanji characters
1, 49	Turns on underline mode for Kanji characters (1-dot thick)
2, 50	Turns on underline mode for Kanji characters (2-dot thick)

[Notes]

- The printer can underline all characters (including right- and left-side character spacing), but cannot underline the space set by **HT** and 90° clockwise-rotated characters.
- After the underline mode for Kanji characters is turned off by setting *n* to 0, underline printing is no longer performed, but the previously specified underline thickness is not changed. The default underline thickness is 1 dot.
- The specified line thickness does not change even when the character size changes.
- It is possible to turn underline mode on or off using **FS !**, and the last received command is effective.

[Default] *n* = 0

[Reference] **FS !**

FS .

[Name] Cancel Kanji character mode

[Format]

ASCII	FS	.
Hex	1C	2E
Decimal	28	46

[Description] Cancels nKanji character mode.

[Notes] For Japanese model:

- This command is effective only when the JIS code system is selected.
- When the Kanji character mode is not selected, all character codes are processed one byte at a time as ASCII code.
- Kanji character mode is not selected when the power is turned on.

For Simplified Chinese/Traditional Chinese/Korean model:

- When the Kanji character mode is not selected, all character codes are processed one byte at a time as ASCII code.
- Kanji character mode is selected when the power is turned on.

[Reference] **FS &**, **FS C**

FS 2 *c1 c2 d1...dk*

[Name] Define user-defined Kanji characters

[Format]

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

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

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

$0 \le d \le 255$
$k = 72$

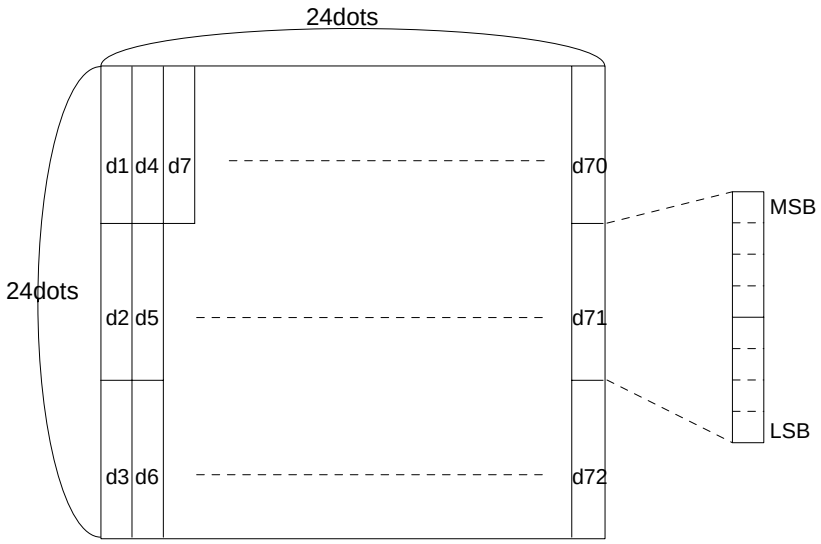
[Description] Defines user-defined Kanji characters for the character codes specified by *c1* and *c2*.

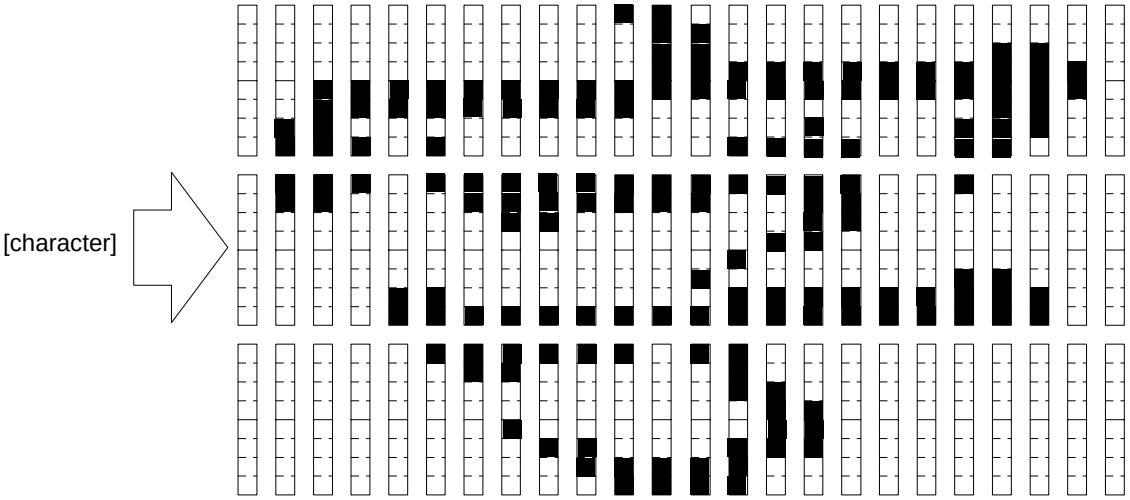
[Notes]

- *c1* and *c2* indicate character codes for the defined characters. *c1* specifies for the first byte, and *c2* for the second byte.
- *d* indicates the dot data. Set a corresponding bit to 1 to print a dot or to 0 to not print a dot.

[Default] All spaces.

[Reference] **FS C**





d1=<00>H	p4=<03>H	d7=<0F>H ...	d10=<0D>H	d13=<0C>H	d16=<0D>H ...
d2=<00>H	p5=<C0>H	d8=<C0>H ...	d11=<80>H	d14=<03>H	d16=<83>H ...
d3=<00>H	p6=<00>H	d9=<00>H ...	d12=<00>H	d15=<00>H	d16=<80>H ...

FS C *n*

[Name] Select Kanji character code system

[Format]

ASCII	FS	C	*n*
Hex	1C	43	*n*
Decimal	28	67	*n*

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

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

n	**Kanji System**
0, 48	JIS code
1, 49	SHIFT JIS code

[Notes]

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

[Default] *n* = 0

FS S *n1 n2*

[Name] Set left- and right-side Kanji character spacing

[Format]

ASCII	FS	S	*n1*	*n2*
Hex	1C	53	*n1*	*n2*
Decimal	28	83	*n1*	*n2*

[Range] $0 \le n1 \le 255$
$0 \le n2 \le 255$

[Description] Sets left- and right-side Kanji character spacing *n1* and *n2*, respectively.

- When the printer model used supports **GS P**, the left-side character spacing is [*n1* × horizontal or vertical motion units], and the right-side character spacing is [*n2* × horizontal or vertical motion units].

[Notes]

- When double-width mode is set, the left- and right-side character spacing is twice the normal value.
- The horizontal and vertical motion units are set by **GS P**. The previously specified character spacing does not change, even if the horizontal or vertical motion unit is changed using **GS P**.
- The value cannot be less than the minimum horizontal movement amount, and must be in even units of the minimum horizontal movement amount.
- In standard mode, the horizontal motion unit is used.
- In page mode, the horizontal or vertical motion unit differs in page mode, depending on starting position of the printable area as follows:
  - ① When the starting position is set to the upper left or lower right of the printable area using **ESC T**, the horizontal motion unit (*x*) is used.
  - ② When the starting position is set to the upper right or lower left of the printable area using **ESC T**, the vertical motion unit (*y*) is used.
  - ③ The maximum right-side spacing is 255/180 inches for the paper roll and is approximately 35.983 mm {255/150 inches}. Any setting exceeding the maximum is converted to the maximum automatically.

[Default] *n1* = 0, *n2* = 0

[Reference] **GS P**

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] $0 \leq n \leq 255$

[Description] Turns quadruple-size mode on or off for Kanji characters.

- When the LSB of *n* is 0, quadruple-size mode for Kanji characters is turned off.
- When the LSB of *n* is 1, quadruple-size mode for Kanji characters is turned on.

[Notes]

- Only the lowest bit of *n* is valid.
- In quadruple-size mode, the printer prints the same size characters as when double-width and double-height modes are both turned on.
- When quadruple-size mode is turned off using this command, the following characters are printed in normal size.
- When some of the characters on a line are different in height, all the characters on the line are aligned at the baseline.
- **FS !** or **GS !** can also select and cancel quadruple-size mode by selecting double-height and double-width modes, and the setting of the last received command is effective.

[Default] *n* = 0

[Reference] **FS !**, **GS !**

APPENDIX A: MISCELLANEOUS NOTES

A.1 Notes on Printing and Paper Feeding

1) Because the TM-T88III series printer is a line printer, it automatically feeds paper after printing the data.

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

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

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

Table A.1 Paper Feeding Amount

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

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

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

A.2 Notes on Printer Installation

- Connect the external power supply to the power supply connector of the printer. Then plug in the external power supply and turn it on if necessary. Be sure not to connect the external power supply with the wrong polarity. If it is connected incorrectly, the internal circuit fuse of the printer may be blown or the external power supply may be damaged.
- The power supply voltage is within the range of 24 V ± 7%. If the power supply voltage drops to the outside of the range above during printing, the printer stops printing and waits until the voltage returns to normal and then automatically begins printing again. Therefore, printing speed may slow, the print pitch may not be correct, and some dots in some characters may not be printed.
- Both high and low voltage errors are shown in table 3.7.3. The blinking patterns are shown in the table.
- When either a high or low voltage error occurs, turn off the power as soon as possible.

A.3 Other Notes

1) Printer mechanism handling

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

2) Thermal paper handling

① Notes on using thermal paper

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

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

② Notes on thermal paper storage

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

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

3) Others

- Because this printer uses plated steel, the cutting edges may be subject to rust. However, this does not affect the printer performance.

APPENDIX B: PAPER ROLL SETUP

B.1 Replacing the Paper Roll

1) Open the printer cover by pressing the cover open button.
2) Remove the spool of the used paper roll from the paper holder and load the new paper roll.
3) Pull out some of the paper from the paper roll and close the printer cover.

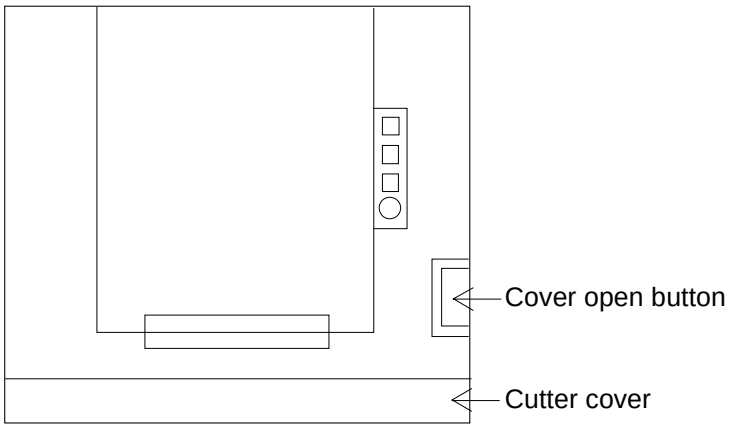


Figure B.1 Printer Upper Side Overview

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

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

1) The inside diameter of the paper spool should be 12mm {0.47"} and the outside diameter of the paper spool should be 18mm {0.71"}. Specified thermal paper should be used.
2) Loosen the adjusting screw that holds the paper near-end sensor and set the top of the positioning plate to the appropriate adjustment value and tighten the adjusting screw.
   Adjust the positioning plate to #1 if the outside diameter of a paper roll to be used is 18mm.
   Adjust the positioning plate to #2 if the outside diameter of a paper roll to be used is more than 18 mm.

Table C.1 Adjustment Positions

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

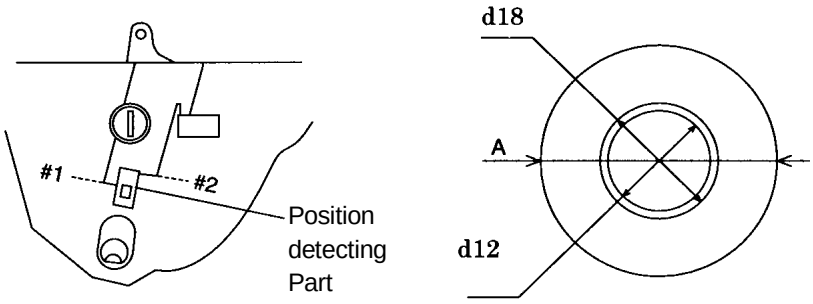


Figure C.1 Near-end Adjusting Position

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

3) Change the paper roll near-end sensor position, in order to detect the paper near-end correctly when the printer is attached to a wall.
   (1) Loosen the screw for the detector.
   (2) Push the lever on the detector until it touches the back off the hole.
   (3) Turn the knob towards you until the lever clicks into place in the other hole.
   (4) While setting the knob by pressing the knob toward you, secure the screw.

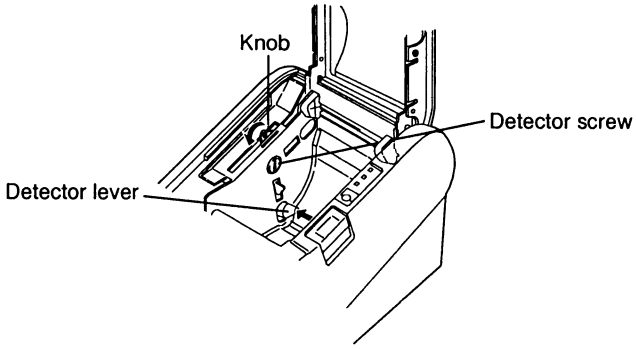


Figure C.2 Changing the Near-end Adjusting Position

APPENDIX D: RECOVERY FROM THE AUTO CUTTER ERROR

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

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

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

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

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

APPENDIX E: PRINT HEAD CLEANING

Paper dust on the heating elements may lower the print quality. In this case, clean the print head as follows:

1) Open the printer cover.

2) Clean the thermal elements of the print head using a cotton swab moistened with alcohol solvent (ethanol, methanol, IPA).

NOTES:
- Do not touch the print head thermal elements.
- Do not scratch the print head.

3) Insert a paper roll and close the print head.

NOTE: The print head becomes very hot just after printing and is very dangerous. Be sure to allow the print head to cool down (after printing) before cleaning it. Also, be sure to turn off the printer power before cleaning the print head.

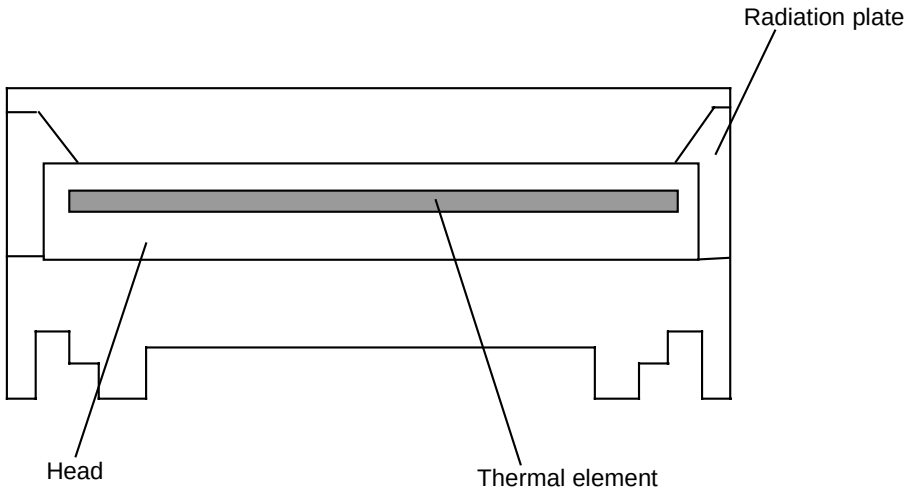


Figure E.1 Print Head Thermal Elements

(*) Depending on the paper roll used, paper dust may stick to the platen roller and paper roll end sensor. To remove the paper dust, clean the platen roller and paper roll end sensor with a cotton swab moistened with water.

APPENDIX F: NOTES ON USING THE DRAWER KICK-OUT CONNECTOR

1) Drawer kick-out connector use conditions (refer to Section 2.2.3, Drawer kick-out connector)

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

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

[Conditions]

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

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

APPENDIX G: TRANSMISSION STATUS IDENTIFICATION

Because the specified status bits transmitted from the TM-T88III series printer are fixed, the user can confirm the command to which the status belongs, as shown in the following table.

When using Auto Status Back (ASB), however, process the consecutive three-byte code (except for XOFF) as ASB data after confirming the first byte of the ASB. Otherwise, the status transmitted by using the **GS r** and the status of the second and following bytes of the ASB cannot be differentiated.

Table G.1 Transmission Status Identification

Command & Function	Status Reply
GS I	<0**0****>B
GS r	<0**0****>B
XON	<00010001>B
XOFF	<00010011>B
DLE EOT	<0**1**10>B
ASB (1st byte)	<0**1**00>B
ASB (2nd to 4th bytes)	<0**0****>B

APPENDIX H: CONFIGURING THE SPACE PAGE

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

1) Space page top address (*1)

Table H.1 Space Page Top Address

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

2) Calculating the character data top address

The character data top address is calculated as follows:

- 12 × 24 font (graphics)
  Character data top address = FCA480H + (character code - 80H) × 48
- 9 × 17 font (graphics)
  Character data top address = FCBC80H + (character code - 80H) × 34

3) Example configuring the font data

- 12 × 24 font (in case of character code 90H on page 255)
  Character data top address FCA480H+(90H-80H)×48 = FCA780H

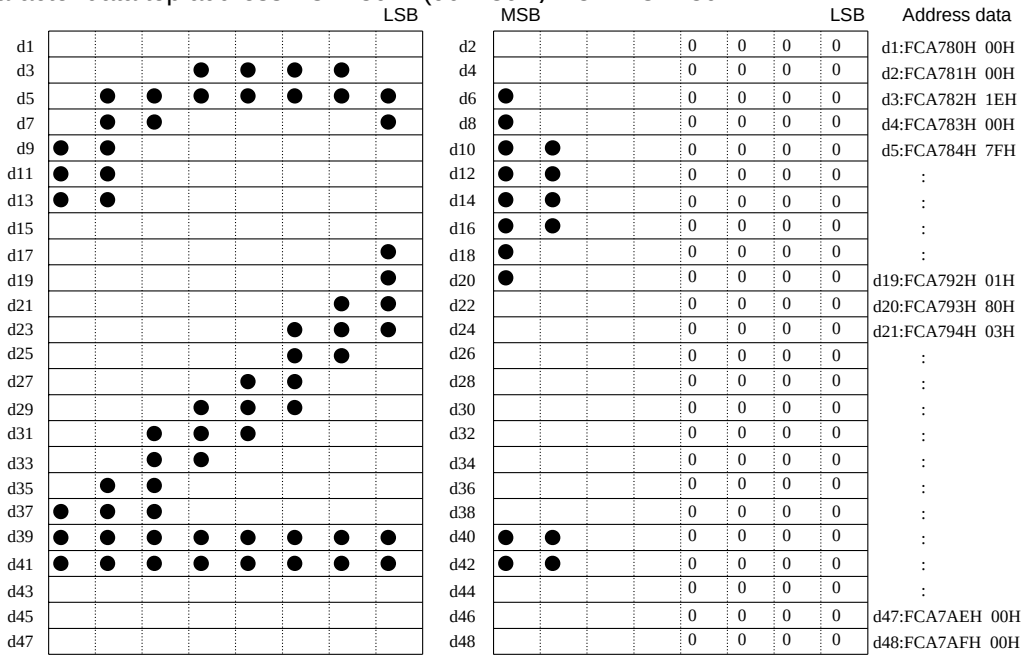


Figure H.1 12 ×24 Font

NOTE: (*1) The space page top address is used for writing character data on to a flash ROM. The address only for a ROM itself is the result of the above address minus F80000H.

- 9 × 17 font (in case of character code F0H on page 255)
  Character data top address FCBC80H+(F0H-80H)×34 = FCCB60H

	MSB							LSB
d1								
d3			●	●	●			
d5		●	●	●	●	●		
d7		●	●		●	●	●	
d9	●	●				●	●	
d11	●	●				●	●	
d13	●	●				●	●	
d15						●	●	
d17						●	●	
d19					●	●		
d21				●	●	●		
d23			●	●	●			
d25		●	●	●				
d27	●	●	●					
d29	●	●	●	●	●	●	●	
d31	●	●	●	●	●	●	●	
d33								

	MSB							LSB	Address data
d2		0	0	0	0	0	0	0	d1:FCCB60H 00H
d4		0	0	0	0	0	0	0	d2:FCCB61H 00H
d6		0	0	0	0	0	0	0	d3:FCCB62H 38H
d8		0	0	0	0	0	0	0	d4:FCCB63H 00H
d10		0	0	0	0	0	0	0	d5:FCCB64H 7CH
d12		0	0	0	0	0	0	0	:
d14		0	0	0	0	0	0	0	:
d16		0	0	0	0	0	0	0	:
d18		0	0	0	0	0	0	0	:
d20		0	0	0	0	0	0	0	d19:FCCB72H 0CH
d22		0	0	0	0	0	0	0	d20:FCCB73H 00H
d24		0	0	0	0	0	0	0	d21:FCCB74H 1CH
d26		0	0	0	0	0	0	0	:
d28		0	0	0	0	0	0	0	:
d30		0	0	0	0	0	0	0	:
d32		0	0	0	0	0	0	0	d33:FCCB80H 00H
d34		0	0	0	0	0	0	0	d34:FCCB1FH 00H

Figure H.2 9 × 17 Font

APPENDIX I: EXAMPLE PRINTING IN PAGE MODE

Example use of page mode is described in this appendix.

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

① Transmit **ESC L** to enter page mode.

② Specify the printable area using **ESC W**.

③ Specify the printing direction using **ESC T**.

④ Transmit the print data.

⑤ Collectively print the data by sending an **FF**.

⑥ After printing, the printer automatically returns to standard mode.

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

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

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

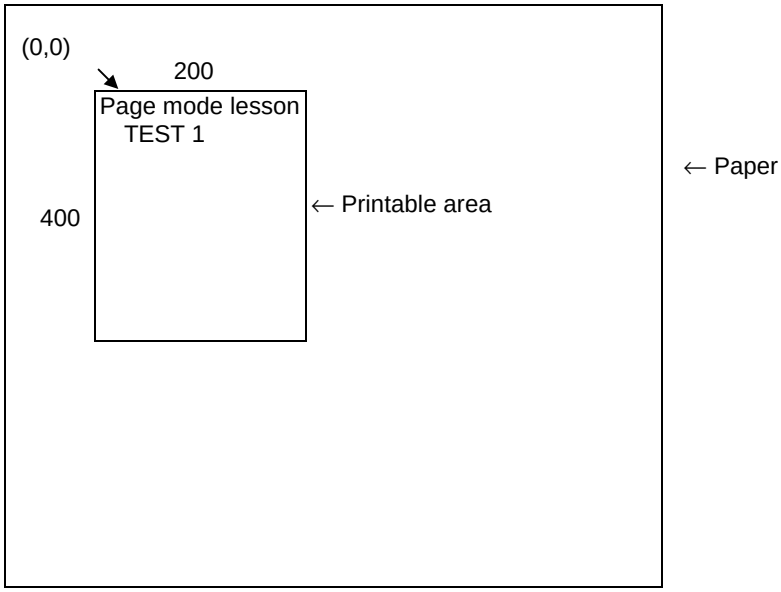


Figure I.1 Page Mode Example 1

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

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

Example 2: Sample program in BASIC

```
100 PRINT #1,CHR$(&H1B);"L";
110 PRINT #1,CHR$(&H1B);"W";CHR$(0);CHR$(0);CHR$(0);CHR$(0);
120 PRINT #1,CHR$(200);CHR$(0);CHR$(144);CHR$(1);
130 PRINT #1,CHR$(&H1B);"T";CHR$(0);
140 PRINT #1,"Page mode lesson 2 CAN command"
150 PRINT #1,CHR$(&HA);
160 PRINT #1,"ABCDEFGHIJKLMNOPQRST1234567890"
170 PRINT #1,CHR$(&HC);
```

This example works as follows:

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

After these items are specified, the print data "Page mode lesson 2 CAN command" and "ABCDEFGHIJKLMNOPQRST1234567890" are transmitted (line nos. 140 to 160). By sending **FF** (line no. 170), the printout shown in Figure I.2 is produced.

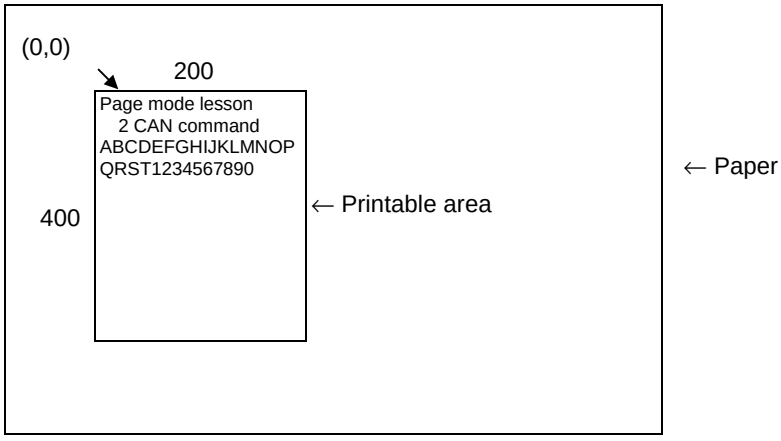


Figure I.2 Page Mode Example 2

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

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

If the above program is included, character string "GHI" is deleted, resulting in the printout shown in Figure I.3. When an area is deleted with **CAN**, the deleted part is left blank.

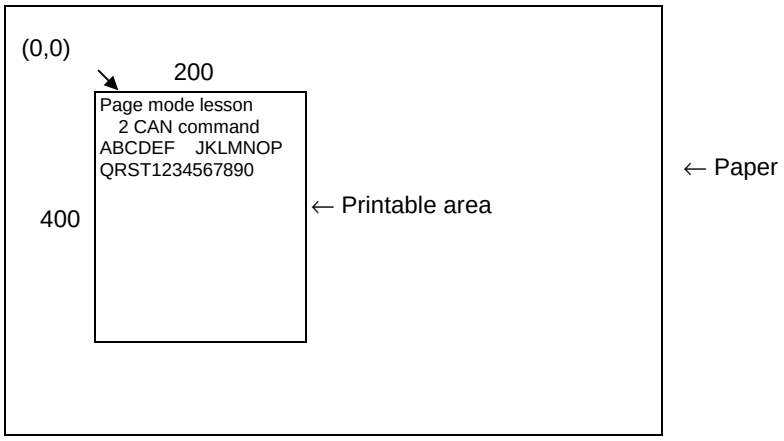


Figure I.3 Page Mode Example 3

APPENDIX J: CODE128 BAR CODE

J.1 Description of the CODE128 Bar Code

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

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

The following special characters are also available in CODE128:

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

J.2 Code Tables

Printable characters in code set A

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

Printable characters in code set B

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

Printable characters in code set C

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

APPENDIX K: COMPARISON TABLE BETWEEN TM-T88III AND TM-T88II

	TM-T88III	TM-T88II
1. Print speed High speed mode	Approximately 150 mm/s maximum	Approximately 120 mm/s maximum
2. Availability of a 58-mm paper width model	None	Yes
3. Current consumption High speed mode	Mean: Approximately 1.8 A	Mean: Approximately 1.7 A
4. Interface Baud rate of serial communication	4800, 9600, 19200, 38400 (2400 is canceled, and 38400 is added.) 38400 bps is available when both DIP SW1-7 and 1-8 is On.	2400, 4800, 9600, 19200
5. Condition to release the receive buffer BUSY state	Sets with the DIP SW2-5 (Refer to ∗1)	Fixed to the condition as below: Except the receive buffer full (BUSY). The receive buffer full indicates that the remaining space in the receive buffer drops 16 bytes and it remains until the space in the receive buffer increases 26 bytes.
6. External power supply device	Models with the power supply included as standard or without the power supply are available. Packaged power supply: PS-180 , PS-175 (only for North America)	PS-170 (option)
7. Multilingual support	Japanese model Simplified Chinese model Traditional Chinese model Thai model Korean model Depending on the model type one of these character is supported.	Japanese model Simplified Chinese model Traditional Chinese model Thai model Korean model Depending on the model type one of these character is supported.

*1 • Definition of “receive buffer full”

- When the receive buffer capacity is specified to 4 KB (DIP SW1-2 is Off):
  - If the 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 the 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 to 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.