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DPU-30

THERMAL PRINTER

TECHNICAL REFERENCE

U00084936302

Seiko Instruments Inc.

DPU-30 TECHNICAL REFERENCE

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Introduction

DPU-30-0B-E is a compact printer unit which is connected to a computer or a host system via a parallel port (Centronics interface) or serial port (RS-232C) and prints the data input through such interface in the direct thermal printing.

Features of this printer
- Provides the High-speed and noiseless print according to thermal printing system.
- Because of the direct thermal printing, this printer is very quiet while printing.
- Prints both 16×16 and 24×24 dot size characters clearly.
- Prints the Kanji characters (JIS level 1 non-kanji, level 1 and 2).
- Prints barcodes using the barcode print function. (UPC-E, JAN13, JAN8, CODE39, ITF, CODABAR, and CODE128).
- Test patterns can be printed.
- Prints the test pattern and dump mode characters.
- Print the various size characters such as enlargement character.
  - Standard size character
  - Kanji size character
  - Enlargement characters (64 times characters size max)
- Defines the line spacing and character spacing arbitrarily.
- Prints the various size characters such as enlargement character.
- Prints the graphic using the Bitimage.
- Registers and prints any font using the downloaded character function and user-defined character function.
- Feeds paper forward or backward using the paper feed functions.
- Characters to be printed can be inverted from black-on-white to white-on black, or vice versa.
- Characters to be printed can be flipped from top to bottom.
- Provides various functions including the reverse printing, flip or ruler line.
- Changes the print density using print density command.
- ESC/POS compliant command system is adopted.

Structure of this printer
- This printer is compact and thin so that it takes less space than the others.
- Its design is simple so that it can be used with any type of devices.

Functions
- The out-of-paper detection sensor is mounted on this printer.
- The easy-to-use operation function allows to easily replenish paper.

Power supply
- The power is fed via a connector for interface.

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CHAPTER 1

OPERATIONAL PRECAUTION

1.1   SAFETY PRECAUTION

Meanings of symbols

The following symbols are used in this Instruction Manual in order to make use of the printer properly and prevent the printer from being damaged.
Follow the instructions marked with the symbol.

⚠ **WARNING**	Failure to follow the guidelines marked with this symbol could result in severe personal injury or death.
⚠ **CAUTION**	Failure to follow the guidelines marked with this symbol could result in minor personal injury or product and/or peripheral damage.

Symbol Examples

⚠ The symbol △ indicates caution(including danger and warning).
The example on the left indicates warning or caution.

🚫 The symbol ⊘ indicates prohibition.
The example on the left means prohibition of disassembling.

⚠ WARNING

🚫	Do not use a power supply outside of its specified range. Doing so may cause fire leading to serious accidents.
🚫	Do not forcefully bend, or put a heavy matter on, the power cable. Failure to follow this instruction may damage the power cable, which may result in a fire or electric shock. Do not use the power cable if it is damaged.
🚫	Never disassemble the printer. Failure to follow this instruction may cause overheating or burning of the printer which may lead to fires or accidents.

⚠ CAUTION

🚫	Do not drop any metallic objects or liquids such as water or coffee into the printer.
🚫	Never use the printer in a place of extreme humidity or any place where it can possibly be splashed by any liquids. If any liquids get into the printer, it could lead to fire, electric shock, or other serious accidents.
🚫	Never touch the thermal head immediately after printing because it becomes very hot. Make sure that the thermal head is cool before setting papers or cleaning the thermal head.
❗	Be sure to hold the connector part of the power cable when disconnecting the cable. Pulling on the cable portion may cause it to fray and break.
❗	Power OFF the printer in any of the following cases: • The printer does not recover from an error. • Smoke, strange noise or smells erupt from the printer. • A piece of metal or any liquid touches the internal parts or slot of the printer. Using the printer in any manner other than for which it was designed may cause accidents or fire.

1.2   NOTES ON USE

- Do not disassemble or repair the printer by yourself.
- Do not drop the printer down on the floor or hit it against the walls.
- Avoid exposure to the water.
- Use the specified type of thermal paper.
- When a trouble such as a paper jam occurs, turn off the power first to fix it.
- The printer does not receive the data in some cases such as a paper out. Monitor the printer to check if an error occurs and not to stop the system.
- Fix an error if something happens to the printer in order to prevent the whole system from hanging up. Thus, you need to take an action to prevent the error from affecting the whole system.
- Immediately turn off the power if the printer fails (for example, you smell something strange, hear a noise, or smoke rises from the printer). After checking that such failure does not continue, contact your dealer or us.

1.3 NOTES ON TREATMENT OF THERMAL PAPERS

The surface of thermal paper is specially processed using the chemical agent. And the color rises through the thermo chemical reaction process. Be aware of the following points.

1) Store the papers in a dry, cool and dark place.
2) Do not rub the papers with hard substance.
3) Keep the papers away from organic solvent.
4) Do not let the papers touched with vinyl chloride film, eraser or adhesive tapes for hours.
5) Do not put the papers on diazo print or wet copy that is just copied
6) Use the water-based glue (for example, starch glue and synthetic glue) when you glue thermal paper.
7) Adhesive tape may discolor the surface of thermal paper. Put two-sided tape on the back side of thermal paper if you need to tape it.
8) If you touch thermal paper with sweaty hand, your fingerprint may be left on the surface of thermal paper and the characters may printed unclearly.
9) If you use this printer to print receipts given to your customers, print the notice which states that the paper used is thermal paper and the instructions on how to keep it.
10) Use dedicated thermal papers only.

1.4 NOTES ON INSTALLATION

Avoid such places with:

1) Dusty places
2) Unstable places and places that significantly shakes
3) Watery and oily places
4) Places which receive direct sunlight
5) Places where the temperature is 50°C or higher
6) Places where the temperature is 0°C or lower
7) Places where the electromagnetic interference or corrosive gas is generated
8) Places where the relative humidity is over 80%
9) Places where the significant temperature change may result in the formation of any condensation

CHAPTER 2

TERMS USED IN THIS MANUAL

This chapter describes the terms used in this manual.

Dot	A character or graphic image is composed of picture elements called dots. A dot corresponds to one of the thermal head heat elements.
Dot line	A line of dots arranged perpendicular to the paper feed direction. A dot line corresponds to a line of thermal head heat elements. One dot line consists of 384 dots in DPU-30.
Character spacing	The space separating contiguous characters on one character line.
Line spacing	The space separating character lines.
Input buffer	The memory for temporarily storing the data (characters and commands) received from the host device. Data is executed when fetched from the input buffer. The capacity of the input buffer is 4,096 bytes.
Line buffer	The memory for storing one line of character data fetched from the input buffer. When the line buffer is filled with character data (i.e. printing of an entire line) or the printing conditions are made valid through a command, the data in the input buffer is printed. The system configuration is shown in **Figure 2-1**.

Host device → DPU-30 [Input buffer → Line buffer] → Printer
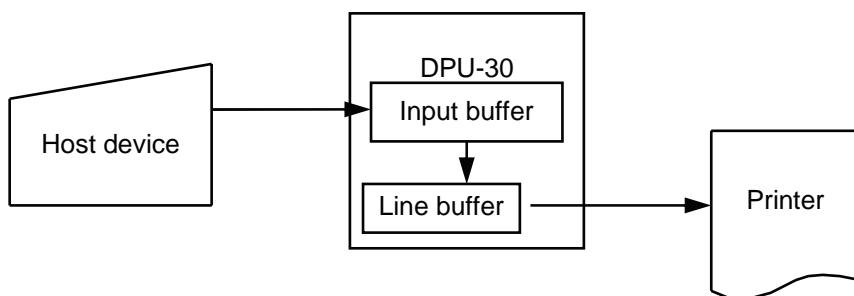
Figure 2-1   System Configuration

One line full print	The printing executed when the data in the line buffer exceeds one line. Character data for one line is stored in the line buffer. When inflowing data exceeds the number of characters that can be stored in the line buffer, the data in the line buffer are printed. The overflowing data is stored at the beginning of the next line.
Kanji size characters	Kanji and user-defined characters.
Standard size characters	Extended graphics characters, katakana, and downloaded characters.
Font	The form of a character. A character is composed of a group of dots. The user can define a font using downloaded fonts, etc.
Font size	The size of a character. There are two font sizes, 16-dot font size and 24-dot font size. The sizes for standard size and Kanji size characters are shown below. Each size is represented as vertical dots by horizontal dots.

	16-dot (height × width)	**24-dot (height × width)**
Standard size characters	16 × 8	24 × 12
Kanji size characters	16 × 16	24 × 24

1-byte characters/ 2-byte characters	Classification by character codes. Characters can be specified by 2 types of character codes: 1-byte character codes and 2-byte character codes. 2-byte character is effective when the situation of kanji mode is specified.

Characters that can be specified by 1-byte character codes include:
- Alphabets, Numbers, and Katakana
- Extended graphics characters
- Downloaded characters

Characters that can be specified by 2-byte character codes include:
- Kanji
- User-defined characters

CHAPTER 3

PREPARATIONS AND OPERATION

This section describes the information necessary to use the printer connecting to a host device such as the part names and dimensions of the printer, and how to set the functions.

3.1 PARTS NAME

Paper cover open button

Paper cutter

Paper cover
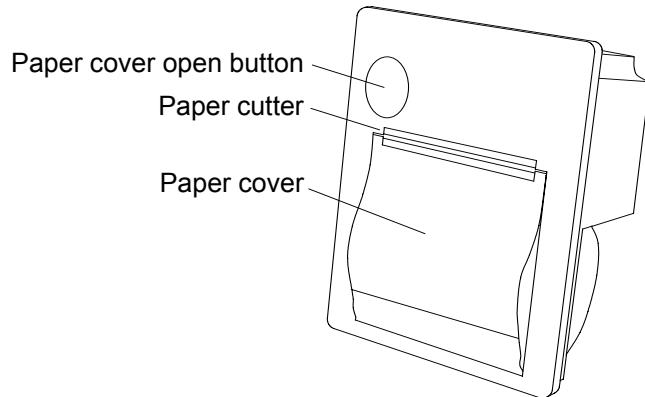
Figure 3-1   Front Name of the Printer

Interface Connector

Dip switches

Insert nut for fitting

DC socket
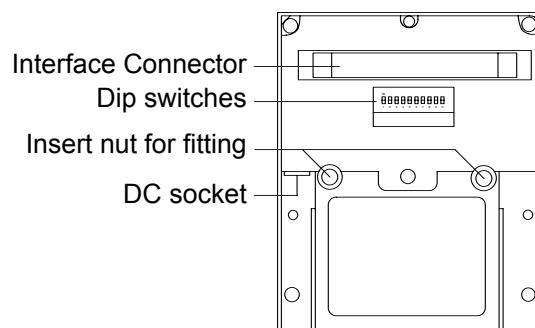
Figure 3-2   Back Name of the Printer

3.2 DIMENSIONS

1. Dimensions of the printer
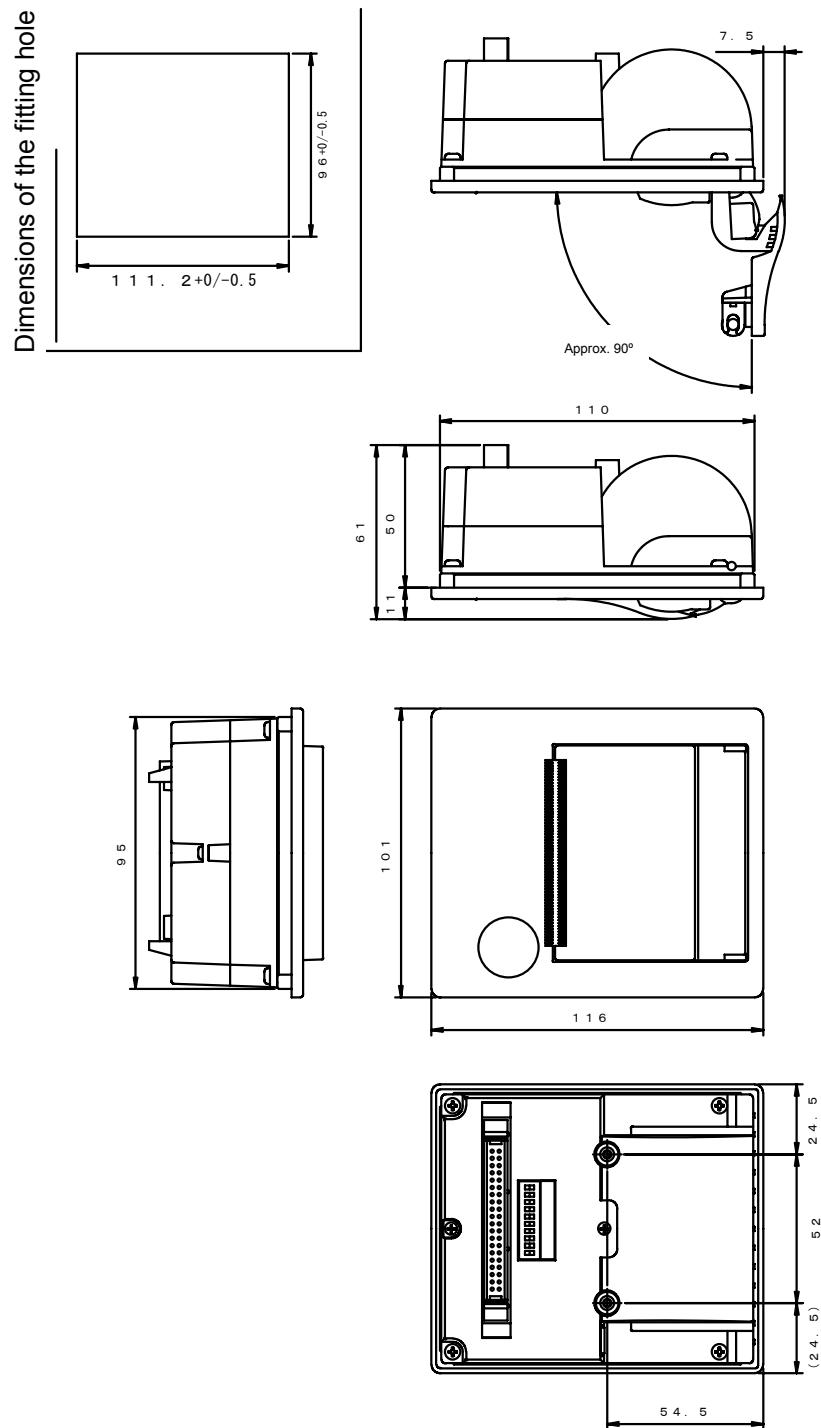
Figure 3-3 Printer Dimensions

Unit: mm

2.   Dimensions of the fixing bracket

24

(25)

2- φ3.6

52

25

102

44.5 - Panel thickness + 0.5 ± 0.3

Panel thickness

44.5 - Panel thickness + 0.5 ± 0.2

44.5

Unit: mm
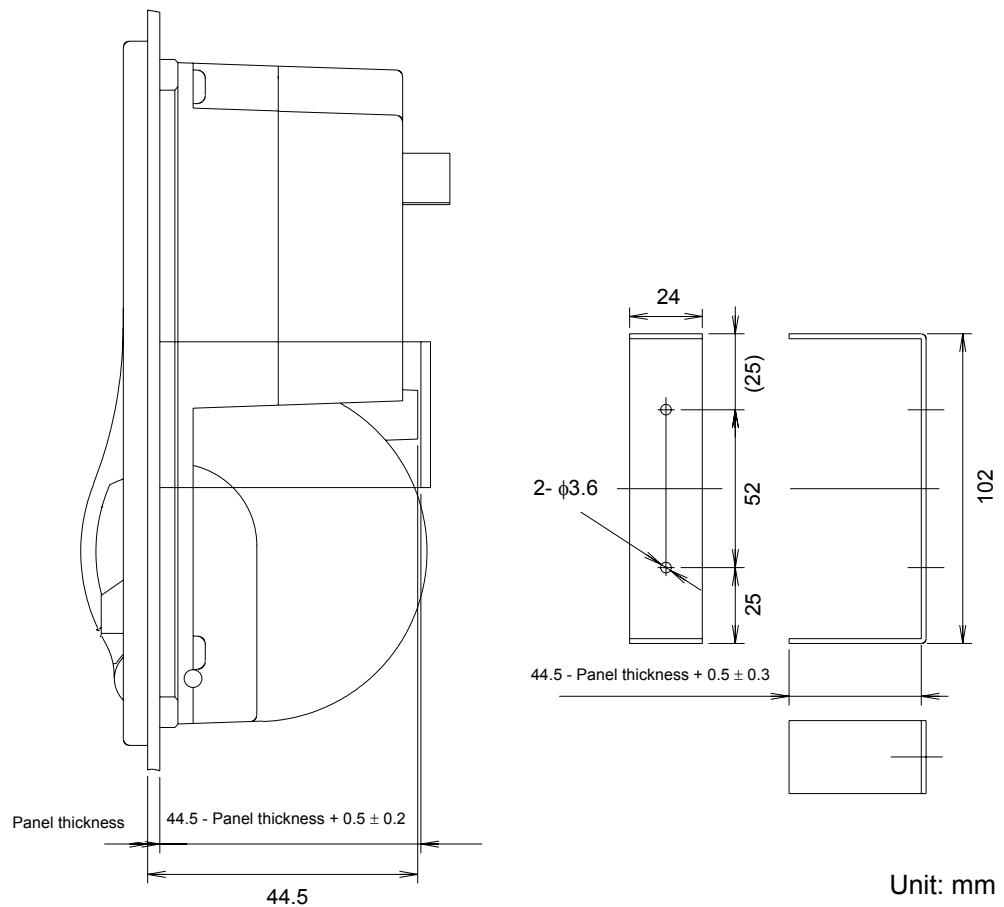
Figure 3-4   Fixing Bracket Dimensions

3.3   INSTALLATION

1.   How to Install the Fixing Bracket

Use the spacers as much as you need
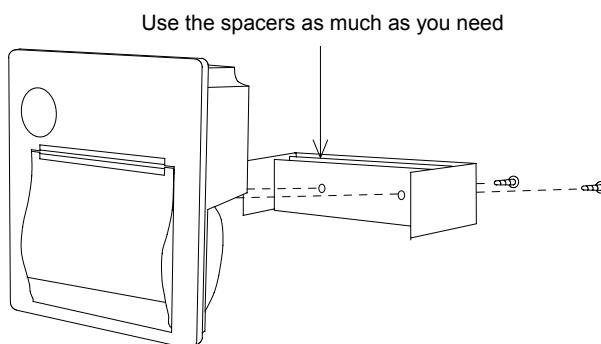
Figure 3-5   Installing the Fixing Bracket

∗ Use the spacers depending on the fitting panel thickness referring to the next table. If not, the body may be deformed, and therefore it may be hard to open the paper cover or printing quality may be deteriorated. (If the fitting panel thickness exceeds 2.2 mm, it may be hard to tighten the screws.)

Panel thickness	Spacer thickness	Panel thickness	Spacer thickness
1.0 mm	None	1.7 to 1.8 mm	0.5 mm and 0.2 mm
1.2 mm	0.2 mm	2.0 mm	1.0 mm
1.5 to 1.6 mm	0.5 mm	2.2 mm	1.0 mm and 0.2 mm

∗ The screw torque is 49 cN m (5 kgf cm).

[Note] Do not touch the end of the DC plug.

2.   Setting Paper

(1)   Press the paper cover open button, and open the paper cover.

⚠   Handle the paper cutter carefully not to cut your hand.

(2)   Set a paper roll as shown in the figure.

(3)   Close the paper cover by pressing both ends of the cover so the tip end of the paper will be emerged from the printer.
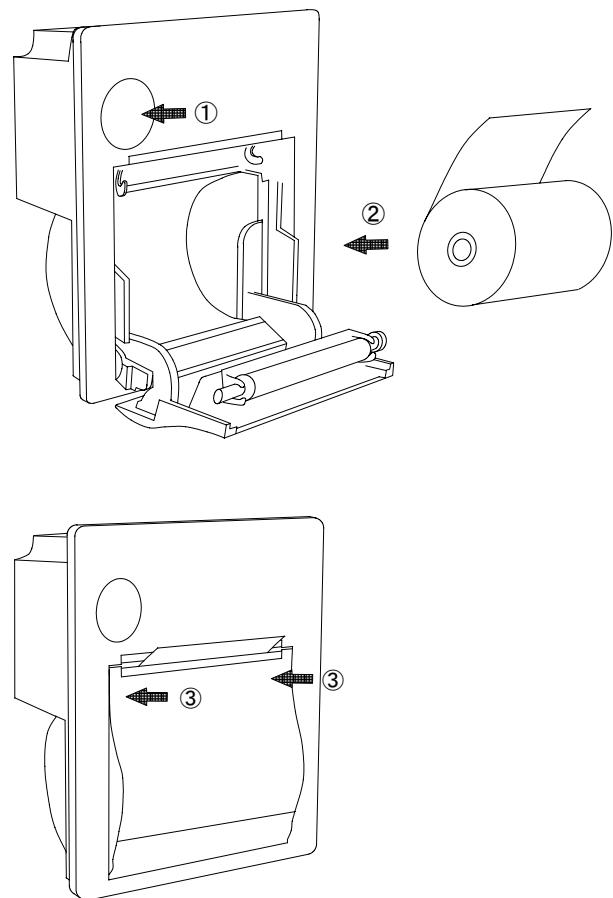
Figure 3-6   Setting Paper

3.4 SETTINGS OF THE FUNCTIONS

Printer functions can be set with the dip switches.
The [ ] indicates the factory default setting.

Table 3-1   DIP Switch Setting

No	Function	OFF	ON
1 to 4	Communication method	See Table 3-2.	
5	Bit length	8BIT	7BIT
6	Flow	RTS/CTS	Xon/Xoff
7 to 8	Command mode	See Table 3-3.	
9	Direction	Upright	Invert
0	Test pin	Normal mode	Prohibited

Table 3-2   Communication Method

Method	Baud	Parity	DP1	DP2	DP3	DP4
Serial	38400	None	OFF	OFF	OFF	OFF
	19200		ON	OFF	OFF	OFF
	9600		OFF	ON	OFF	OFF
	4800		ON	ON	OFF	OFF
	2400		OFF	OFF	ON	OFF
	38400	Odd	ON	OFF	ON	OFF
	19200		OFF	ON	ON	OFF
	9600		ON	ON	ON	OFF
	4800		OFF	OFF	OFF	ON
	2400		ON	OFF	OFF	ON
	38400	Even	OFF	ON	OFF	ON
	19200		ON	ON	OFF	ON
	9600		OFF	OFF	ON	ON
	4800		ON	OFF	ON	ON
	2400		OFF	ON	ON	ON
Parallel	–	–	ON	ON	ON	ON

Table 3-3   Command Mode

Mode	DP7	DP8
Mode 1 (20 digit DPU-20-20CF compatible)	ON	ON
Mode 2 (24 digit DPU-20-24CF compatible)	OFF	ON
Mode 3 (32 digit ESC/POS compliant)	OFF	OFF
HEX dump mode	ON	OFF

3.4.1   Test Print

The detail of the setting by dip switches is confirmed by test printing.

In the test print mode, characters (ANK, Kanji) and barcode are printed.
Turning power ON with the !FEED_IN signal kept low starts the test print.

3.4.2   Hex Dump Print

In the hex dump mode, the printer prints data input from the computer with hexadecimal numbers and characters.

Set the dip switch No.7 ON, No.8 OFF, and turn the power on to enter the HEX dump mode.

- If the input data exceeds a line long, such data will be printed as follows. If the input data does not exceeds a line log, set the !FEED_IN signal to Low. The rest of the data will be printed.

- Turn off the power to finish the HEX dump mode.

```
[ HEX DUMP MODE ]

00 01 02 03 04 05 06 07  ........

08 09 0A 0B 0C 0D 0E 0F  ........

10 11 12 13 14 15 16 17  ........

18 19 1A 1B 1C 1D 1E 1F  ........

20 21 22 23 24 25 26 27   !" #$%&'

28 29 2A 2B 2C 2D 2E 2F  ()*+,-./

0D 0A 20 20 0D 0A         ..  ..
```


3.4.3   Paper Empty (Paper Out) Detection Function

Detects the existence of paper using the photo interrupter.
Use the specified type of paper.

3.4.4   Adjustment of Print Density

The print density is automatically adjusted by the head resistance, the number of dots, the head temperature, and the head voltage.
The commands are also able to correct the print density.
It can be adjusted in the range from 0% to 255% of the rated energy.

3.4.5 Resetting the Printer While Printing

When the data with a lot of dots is printed, the print data may be missing and then, the printing may often continue in the state that each setting by the commands is reset.
This is because too many print dots decrease the voltage, which results in the activation of the reset circuit of the printer.
The commands which tend to increase the number of print dots are:
- Underline
- Reverse
- Ruled line (in case that the number of dots is many)
- Bitimage

Case that a horizontal line is printed when printing a full line of "H" characters without spaces between the characters.
The print density set command (case that the print density is set at over 100%) expands the length of strobe, which very often resets the settings, although this command does not increase the number of print dots. Be aware of these points when using the printer.

3.4.6 Memory

1. Input buffer memory
   An input buffer memory (RAM) with the capacity of 4,096 bytes is built in the printer.

2. User memory
   A user memory (RAM) with the capacity of 16,384 can be used when setting the printer in Mode 3.
   The data registered in this memory are cleared when turning off the power.
   This memory is used when using the downloaded characters, the user-defined characters, and the downloaded Bitimages.
   The memory used by the downloaded characters and user-defined character is restricted as follows. The remaining is used for the downloaded Bitimages. However, it can release the memory of the downloaded character and use-defined character so that ensuring the capacity for Downloaded Bitimage.

The memory capacity immediately after the initialization

Application	Capacity (in byte)
Downloaded character	4,560
User-defined character	1,080
Downloaded Bitimage	10,744
Total	16,384

The capacity for the downloaded characters and the user-defined characters is readily ensured at the initialization.
This area can be released by a command to use the area for the downloaded Bitimages.
When registering the downloaded Bitimages, calculate the remaining capacity of the memory before registering them.
Be sure that the data with the larger capacity than the remaining capacity is ignored even if you trying to register such data.

CHAPTER 4

INTERFACE

This chapter describes information that is required when using the printer connected to a host, such as the serial and parallel interface specifications.

4.1 CONNECTOR TERMINAL LAYOUT

1. Interface and power connector terminal layout

   Connector (plug) : XG4A-4032(Omron)
   Connector signal layout
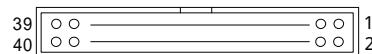
(!signal name indicates Active Low.)

Table 4-1   Connector Terminal Assignment

No.	Signal name	Direction	Description
1	!STROBE	In	Parallel data input
2 to 9	DATA0 to 7	In	High:1, Low:0
10	!ACK	Out	Acknowledge
11	BUSY	Out	Busy to read
12	PE	Out	Paper empty
13	SEL OUT	Out	Online High
14	!ERROR	Out	Error
15	!RESET	In	Reset (Valid in Low 20ms)
16	TxD	Out	Serial data ouput
17	RxD	In	Serial data input
18	RTS	Out	RS-232C Request to send
19	CTS	In	RS-232C Clear to send
20	NEAR_A	Out	Paper near end · A $(+)$
21	NEAR_C	In	Paper near end · C $(+)$
22	NEAR_K	−	Paper near end · K $(-)$
23	NEAR_E	−	Paper near end · E $(-)$
24	NEAR_OUT	Out	Paper near end signal
25	!FEED_IN	In	Feed signal
26	GND	−	Ground
27	SEL_LED+	Out	SEL LED on $(+)$
28	SEL_LED-	Out	SEL LED on $(-)$
29 to 34	V+	−	Power $(+)$
35 to 40	V−	−	Power $(-)$

∗ Connect to all the No.29 to 34 and No.35 to 40 terminal when supplying the power

into V+ and V-pins. (To avoid voltage drops.)

> ⚠ When supplying the power through the DC socket, be sure to leave V+ and V- unconnected. Never supply the power into V+ and V- terminals, and never short V+ and V- terminals.

∗ Use terminal numbers 22, 23 or 26 as the signal ground for RS-232C.
∗ Short terminal numbers 25 and 26 to feed the paper.
∗ SEL LED lights up at the time on-line by connecting it to terminal numbers 27 and 28.
∗ Paper near end sensor:
  This printer does not have the paper near end function. However, this function can be built in by mounting a device such as a photo sensor.

  NEAR_A: Pull up it with +4.75 to +5.1 V through the current limit resistance.
  NEAR_OUT: The logic of NEAR_C is inversed and output.

  Example:
  The following diagram describes how a device such as a photo sensor is mounted to use.
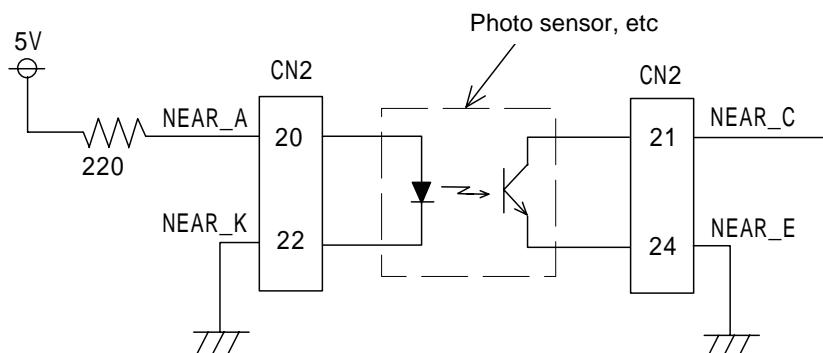
2. DC socket terminal layout

   Connector (Socket) : HEC0470-01-630 (Hosiden)
   Polarity: ⊖———●———⊕ (Center plus)

Table 4-2   DC Socket Terminal Assignment

No.	Signal name	Direction	Function
1	DC+8.7V	–	Power input
2	GND	–	Ground

∗ Supply of the power through the interface connector terminals is available, instead of the DC socket terminal.

> ⚠ When supplying the power through the interface and power connector terminals, do not connect the DC socket.

4.2 PARALLEL INTERFACE

1. Data input timing
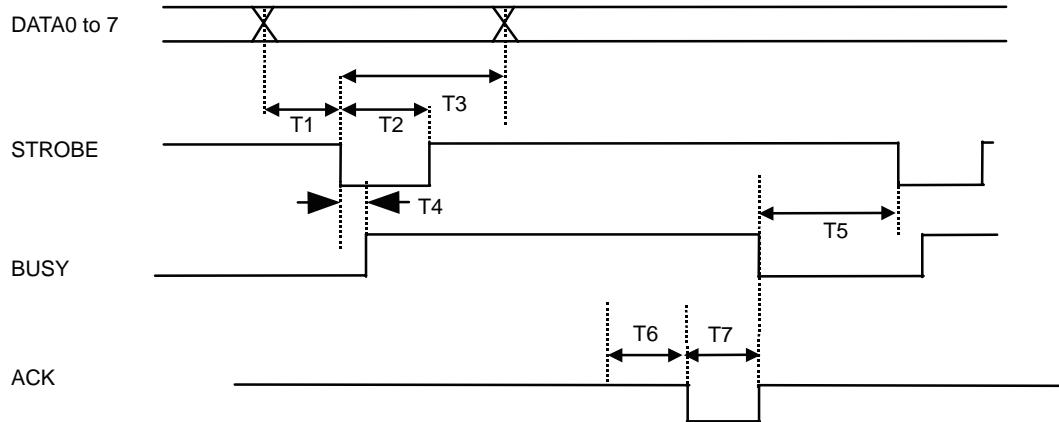
	Min.	Max.	Unit
T1	0.1	–	μs
T2	0.5	–	μs
T3	0.5	–	μs
T4	–	0.5	μs
T5	0	–	μs
T6	0.5	–	μs
T7	–	1.0	μs

4.3 SERIAL INTERFACE

1. Hardware control
   The RTS signal (Low or High) controls the transmission of the data from a host computer.

   When the data stored in the input buffer of the printer exceeds 4,046 bytes, the RTS signal turns Low.
   Once the RTS signal turns Low, the host computer stops to transmit the data.
   If the data stored in the input buffer of the printer falls below 3,995 bytes, the RTS signal turns High.
   Once the RTS signal turns High, the host computer resumes transmitting the rest of the data.

   ∗ When the printer fails (for example, paper-out), the RTS signal also turns Low.
     And then, after the printer gets back to normal, the RTS signal turns High.

Data timing for hardware control
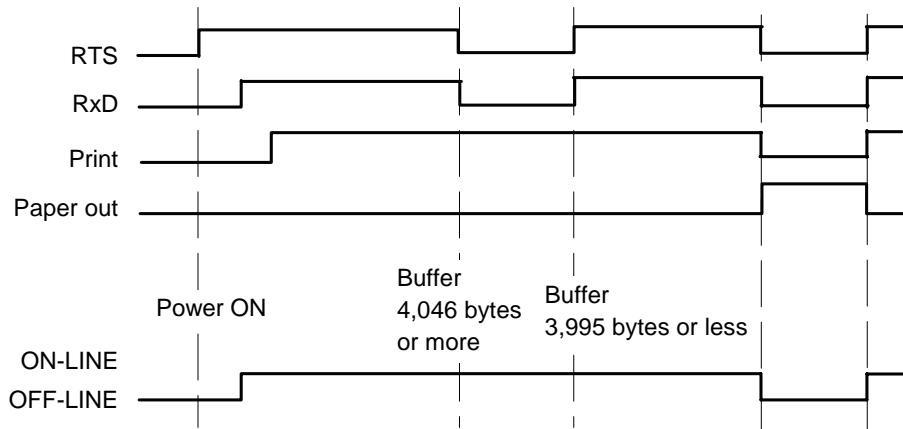
2. Xon/Xoff control

The data transmission from a host computer is controlled through the exchange of $Xon(11_{16})$ command and $Xoff(13_{16})$ command between the printer and the host computer.

When the data stored in the input buffer of the printer exceeds 4,046 bytes, the printer sends the Xoff command to the host computer.
Upon the reception of the Xoff command, the host computer stops to send the data.
If the data stored in the input buffer of the printer falls below 3,995 bytes, the printer sends the Xon command to the host computer.
Upon the reception of the Xon command, the host computer resumes sending the rest of the data.

   ∗ When the printer fails (for example, paper-out), the printer sends the Xoff command to the host computer.
    And then, after the printer gets back to normal, the printer sends the Xon command to the host computer.

Data timing for Xon/Xoff control
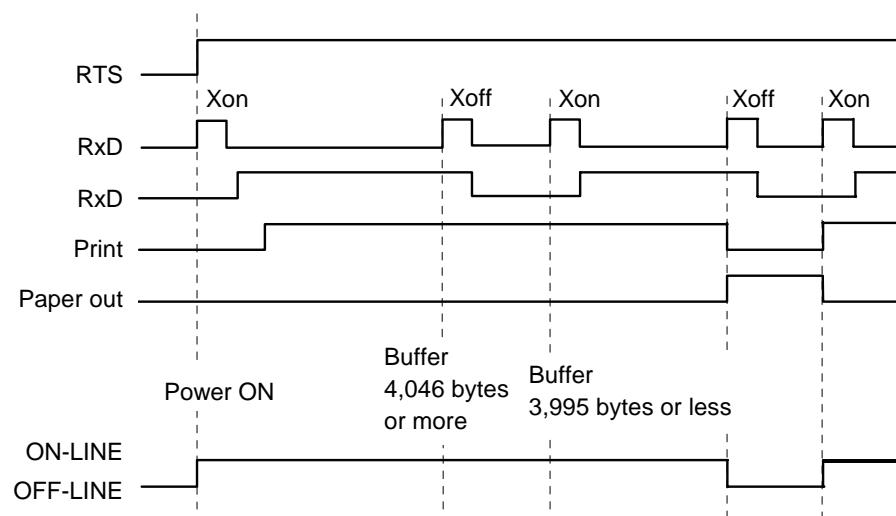
3. Input / Output signal specifications

Table 4-3   I/O Signal Specifications

Item	Condition	Rate Value			Unit
		Min	**Typ.**	**Max**	
High input voltage	!RESET	1.76	–	5.5	V
Low input voltage	!RESET	0	–	1.44	V
High input voltage	DATA0 to 7, !STROBE, !FEED_IN, NEAR_C	3.15	–	5.5	V
Low input voltage	DATA0 to 7, !STROBE, !FEED_IN, NEAR_C	0	–	1.35	V
High input voltage	RXD, CTS	+2.8	–	+15	V
Low input voltage	RXD, CTS	−15	–	−2.8	V
High output voltage	BUSY, !ACK, !ERROR, SEL OUT, PE, NEAR_OUT	4.75	–	5.1	V
Low output voltage	BUSY, !ACK, !ERROR, SEL OUT, PE, NEAR_OUT	0	–	0.5	V
High output voltage	TXD, RTS (RL = 3 KΩ)	+5	+9	+15	V
Low output voltage	TXD, RTS (RL = 3 KΩ)	−15	−9	−5	V

CHAPTER 5

COMMAND FUNCTION

This chapter describes the functions of the commands processed by the printer.

5.1 FUNCTION OUTLINE

DPU-30 has two sets of commands: Mode 1/Mode 2 and Mode 3. The commands are as listed below:

5.1.1 Mode 1/Mode 2

1. Basic commands (DPU-20-20CF/24CF compatible commands)

Command	Function	See page
CR	Line Feed	5-7
LF	Carriage Return	5-7
SO	Double–Width Printing Mode Specify	5-7
SI	Double–Width Printing Mode Clear	5-8
CAN	Cancel	5-8
ESC S	Bitimage Graphic	5-8
ESC c	Special Character Specify	5-9
ESC R	International Character Specify	5-9

2. Extension commands

Command	Function	See page
ESC @	Initialization	5-10
DC2 >	Print Drive Mode Select	5-10
DC2 %	Print Drive User Define	5-11
DC2 ~	Print Density Set	5-11

5.1.2 Mode 3

1. Paper feed commands

Command	Function	See page
CR	Carriage Return	5-12
LF	Line Feed	5-12
FF	Page Length Print	5-12
ESC J	Print and Feed Forward	5-13
ESC j	Print and Feed Backward	5-13
ESC d	Print and Continuous Line Feed	5-13
ESC C	Page Length Set	5-14

2. Tab commands

Command	Function	See page
HT	Horizontal Tab	5-15
ESC D	Horizontal Tab Set	5-15

3. Form commands

Command	Function	See page
ESC 2	Default Amount of Line Spacing Specify	5-16
ESC 3	Amount of Line Spacing Set	5-16
ESC SP	Standard Size Character Right Spacing Set	5-16
GS L	Left Margin Set	5-17
GS W	Width of Printing Area Set	5-17
ESC $	Absolute Position of Printing Area Specify	5-18
ESC a	Position Align	5-18

4. Character decoration commands

Command	Function	See page
ESC !	Decorated Characters Collectively Specify	5-19
ESC G ESC E	Bold Characters Specify and Clear	5-20
ESC {	Inversion (Flip) Specify and Clear	5-20
ESC -	Underline Specify and Clear	5-21
GS !	Character Size Set	5-21
GS B	Reverse Character Specify and Clear	5-22

5. Character selection commands

Command	Function	See page
ESC M	Font Select	5-23
ESC R	International Character Select	5-24
ESC &	Downloaded Character Register	5-25
ESC ?	Downloaded Character Delete	5-25
ESC %	Downloaded Character Specify and Clear	5-26

6. Barcode commands

Command	Function	See page
GS H	HRI Character Printing Set	5-27
GS w	Width of Barcode Set	5-27
GS h	Height of Barcode Set	5-28
GS k	Barcode Print	5-29

7. Ruled line control commands

Command	Function	See page
DC3 A	Ruled Line Buffer A Select	5-30
DC3 B	Ruled Line Buffer B Select	5-30
DC3 C	Ruled Line Buffer Clear	5-30
DC3 D	Write in Position Specified by Dot in Ruled Line Buffer	5-31
DC3 L	Write in Position Specified by Line in Ruled Line Buffer	5-31
DC3 +	Print Mode of Ruled Line Approve	5-32
DC3 −	Print Mode of Ruled Line Prohibit	5-32
DC3 P	1 Dot Line of Ruled Line Print	5-32

8. Response commands (only for serial mode)

Command	Function	See page
GS a	Validity / Invalidity of Automatic Status Transmission and Real Time Command Select	5-33
GS r	Status Transmit	5-34
DLE EOT	Status Transmit in Real Time	5-35
DLE ENQ	Major Buffers Clear in Real Time	5-36

9. Bitimage commands

Command	Function	See page
ESC *	Bitimage Select	5-37
GS *	Downloaded Bitimage Register	5-38
GS /	Downloaded Bitimage Print	5-39

10. Kanji commands

Command	Function	See page
FS &	Kanji Mode Specify	5-40
FS .	Kanji Mode Clear	5-40
FS C	Kanji Code System Select	5-40
FS S	Character Spacing for Kanji Set	5-41
FS !	Print Mode for Kanji Collectively Specify	5-42
FS −	Underline of Kanji Specify and Clear	5-43
FS W	Double-Width and Double-Height Kanji Set and Clear	5-43
FS 2	User-Defined Character Register	5-44

11. Function and setting commands

Command	Function	See page
ESC @	Initialization	5-46
CAN	Print Buffer Clear	5-46
DC2 D	Registration Area of Downloaded Character Ensure and Release	5-47
DC2 G	Registration Area of User-Defined Character Ensure and Release	5-47
DC2 >	Print Drive Mode Select	5-48
DC2 %	Print Drive User-Define	5-49
DC2 ~	Print Density Set	5-49

5.2 FUNCTION CODES

All commands start with one of the following control codes (called function codes hereinafter):

LF ($0A_{16}$), CR ($0D_{16}$), SO ($0E_{16}$), SI ($0F_{16}$), DC2 (12_{16}), DC3 (13_{16}), CAN (18_{16}), ESC ($1B_{16}$), FS ($1C_{16}$), DEL ($7F_{16}$)

Some function codes form a command by itself and others are followed by parameters and/or image data.

The number of bytes configuring a command differs from command to command. The shortest commands consist of 1-byte and the longest, some hundred bytes.

5.3 CHARACTER CODES

This section describes the character codes in detail.

The character codes are classified into two groups: 1-byte character codes and 2-byte character codes. The 1-byte character codes are used to print standard-size characters, whereas the 2-byte character codes print Kanji, user-defined characters.
In Mode 1 and Mode 2, the printer uses only the 1-byte character codes.
The following subsections describe the 1-byte and 2-byte character codes individually.

5.3.1 1-Byte Character Codes

Used for standard size character printing.
The hexadecimal codes valid as the 1-byte character codes are as shown below:
- 20_{16} to FF_{16} (Some character tables make codes $7F_{16}$ and FF_{16} invalid.)

5.3.2 2-Byte Character Codes

The 2-byte character codes are invalid in mode 1 and 2. The 2-byte character codes are used to print Kanji, and user-defined characters when in the Kanji mode.

- The first byte
  00_{16} through 20_{16}: Function codes are processed as function codes (See **5.2 FUNCTION CONDES**). All the other codes are ignored.
  If the second-byte code is received along with a Kanji mode clear command, the next received data is processed as a 1-byte character code.
  21_{16} through $7E_{16}$: First byte of a JIS Kanji code.
  $7F_{16}$ through FF_{16}: Ignored.

- The second byte
  - 00_{16} through $1F_{16}$: The first byte already entered is ignored. Function codes are processed as function codes. All the other codes are ignored along with the first byte. If the following code accompanies a Kanji mode clear command, the next received data is processed as a 1-byte character code.
  - 20_{16}:   Ignored along with the first byte.
  - 21_{16} through $7E_{16}$: Print Kanji or user-defined characters if the first byte is one of 21_{16} through $7E_{16}$.
  - $7F_{16}$:   Ignored along with the first byte.
  - 80_{16} through FE_{16}: Ignored along with the first byte unless the first byte is 00_{16}.
  - FF_{16}:   Ignored along with the first byte.

For the correspondence between the 2-byte codes and the printed characters, refer to "Kanji Code Table" (as per JIS C 6226-1983).

5.4 FUNCTION CODE DESCRIPTION

This chapter describes the commands in each function by the mode.

5.4.1 Function Code Description Format

Each function code is described in the format below.
The same format is used for both Mode 1/Mode 2 and Mode 3.

X X   X X X X
└ **Indicates the command**.   └ **Indicates the command name**.
Code   Indicates command part and parameter past.
X_{16} indicates hexadecimal code.
Function   Indicates the functions of the commands.
Details   Explains detailed printer operation when inputting commands.
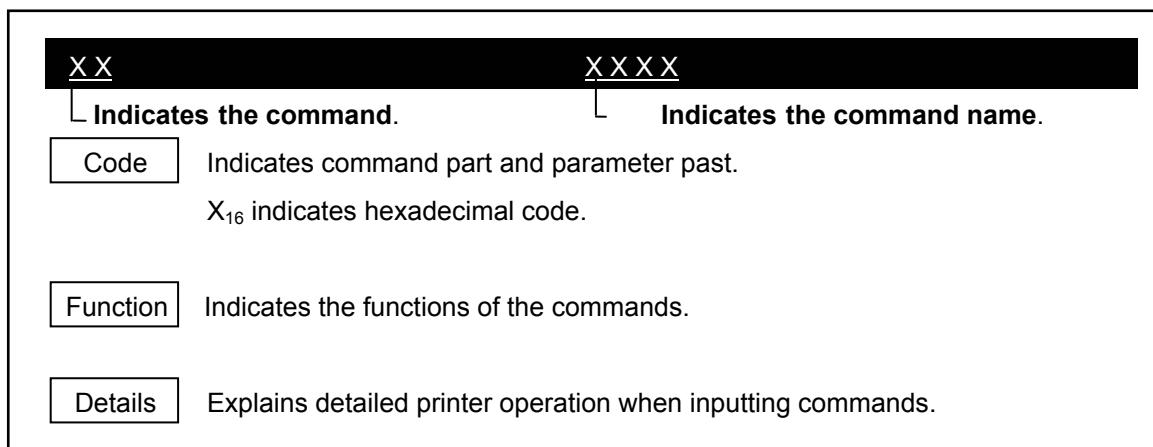
5.4.2 Mode 1/Mode 2

1. Basic command

CR	Carriage Return

Code $0D_{16}$

Function   Prints the data stored in the print buffer, and then starts a new line according to the defined amount of paper feed for one line.

Details
- After executing this command, a head of a line is set as a starting position of printing.
- LF command received immediately following CR is ignored.
- The amount of paper feed for one line is fixed at 24-dot pitch.

LF	Line Feed

Code $0A_{16}$

Function   Prints the data stored in the print buffer, and then starts a new line according to the defined amount of paper feed for one line.

Details
- After executing this command, a head of a line is set as a starting position of printing.
- LF command received immediately following CR is ignored.
- The amount of paper feed for one line is fixed at 24-dot pitch.

SO	Double−Width Printing Mode Specify

Code $0E_{16}$

Function   Specifies the double−width printing. Hereafter, the width of characters to be printed is doubled.

Details
- This command is not cancelled until either ESC @ or SI command is entered.

Double–Width Printing Mode Clear

Code	$0F_{16}$

Function	Clears the double–width printing.

Cancel

Code	18_{16}

Function	Clears the print buffer.

Details	• After executing this command, a head of a line is set as a starting position of printing.

Bitimage Graphic

Code	$1B_{16} + 53_{16} + n1 + n2 + n3 + n4 + [DATA]$

Domain of function	$30_{16} \leq n1, n2, n3, n4 \leq 39_{16}$ "0001" ≤ "n1 n2 n3 n4" ≤ "1023" $0 \leq d \leq 255$ (graphic data)

Function	The number of data specified in ASCII code n1, n2, n3 and n4 are specified as a Bitimage. Example: Case that 192 Bitimages are specified $1B_{16} + 53_{16} +$ "0192" + ... [192 DATA]

Details	• The code outside the domain of function processes the data as the 1-byte data thereafter.
	• If the dots are specified outside the printing area, the data is ignored.
	• The data deployment position is set in accordance with the predefined starting position of the data deployment.
	• This command is affected by the inverse printing.
	• If the next Bitimage Specify command is received at the occurrence of the line overflow, the data of the previous line stored in the print buffer is printed. The line overflow is determined according to the number of dots described below.
	   − Mode 1: Determined as the line overflow if the number of dots exceeds 276.
	   − Mode 2: Determined as the line overflow if the number of dots exceeds 332.
	• Refer to the figure shown below for how the data is deployed.

(Input image)   (Deployment image)

d1 d2 d3

MSB

d1 | d2 | d3

LSB
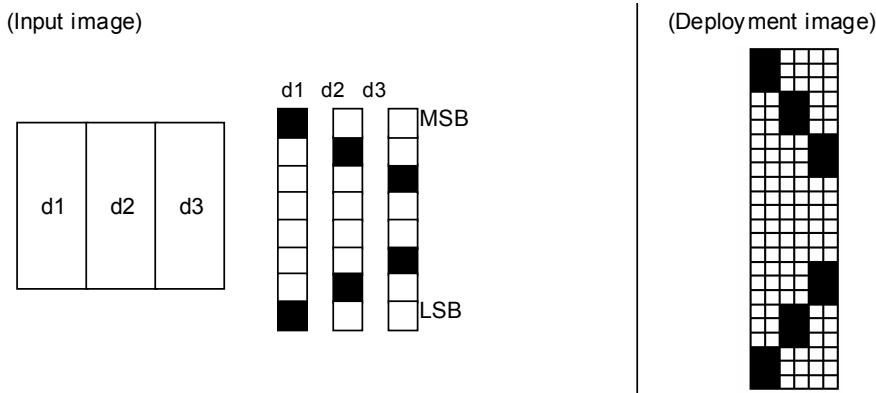
ESC c   Special Character Specify

Code $1B_{16} + 63_{16}$

Function Replaces the character code table from $F9_{16}$ to FD_{16} as follows.

Category	$F9_{16}$	FA_{16}	FB_{16}	FC_{16}	FD_{16}
1 (default value)	市	区	町	村	人
2	Σ	μ	Ω	π	δ

Details • The operation is executed as a toggle operation.
• The table is changed when this command is executed.

ESC R n   International Character Specify

Code $1B_{16} + 52_{16} + n$

Domain of function $0 \le n \le 6$

Function Selects a set of characters of each country described below.
The characters are replaced with only the characters of a country of specified corresponding code according to the katakana – compliant character code table (refer to "APPENDIX B. DATA CODE TABLE.").

	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
$n = 0$ JAPAN	#	$	@	[	¥	]	^	`	{	|	}	~
$n = 1$ FRANCE	#	$	à	°	ç	§	^	`	é	ù	è	¨
$n = 2$ GERMANY	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	β
$n = 3$ ENGLAND	£	$	@	[	\	]	^	`	{	|	}	~
$n = 4$ SWEDEN	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
$n = 5$ ITALY	#	$	@	°	\	é	^	ù	à	Ò	è	ì
$n = 6$ U. S. A	#	$	@	[	\	]	^	`	{	|	}	~

Details • The data beyond the defined domain of function is ignored.
• In default, $n = 0$.

2. Extension commands

ESC @   Initialization

| Code | $1B_{16} + 40_{16}$ |

| Function | Initializes the printer. |

| Details | • The allocation of the user memory is initialized. |

- The receive buffer is retained.
- The print buffer is cleared.
- The settings of each command are initialized.
- ROM SW is reread.

DC2 > n   Print Drive Mode Select

| Code | $12_{16} + 3E_{16} + n$ |

| Domain of function | $0 \leq n \leq 2$ |

| Function | Sets the print drive mode. |

n	Print drive mode	Feature
0	High speed mode	The printer is driven at high speed and high electric power.
1	Medium speed mode 1	The printer is driven at medium speed and low electric power.
2	Medium speed mode 2	The printer is driven at our recommended electric power. The speed of printing in this mode is slower than that in the medium speed mode 1.

| Details | • Even if our recommended electric power is adopted in the high speed mode, the print speed may slow depending on the print ratio. |

- In default, $n = 2$.

DC2 % n   Print Drive User Define

Code $12_{16} + 25_{16} + n$

Domain of function $1 \leq n \leq 16$

Function   Executes the printing according to the print drive defined by a user.

n = 1:   The amount of 1×8 dots

⋮

n = 16: The amount of 16×8 dots

Details
- When one line is printed, the number of division is calculated every $n \times 8$ dots.
  Example: Suppose that the number of dots printed = 128 dots, and n = 1
  $128 \div (1 \times 8)$ = 16 (one line printed is divided into 16 parts)
- The smaller the value of n, the lower the required electric power. And the bigger the value of n, the faster the speed of printing.

DC2 ~ n   Print Density Set

Code $12_{16} + 7E_{16} + n$

Domain of function $0 \leq n \leq 255$

Function   Sets the print density.

Details
- n means n%.
- When adjusting the print density double for low heat sensitive paper, set n=200.
- The print density cannot be set for each character. The print density can be set for each line.
- In default, n = 100.

5.4.3   Mode 3

1.   Paper feed commands

CR	Carriage Return

Code	$0D_{16}$

Function	Prints the data stored in the print buffer, and then starts a new line according to the defined amount of paper feed for one line.

Details	• After executing this command, a head of a line is set as a starting position of printing. • LF command received immediately following CR is ignored.

LF	Line Feed

Code	$0A_{16}$

Function	Provides the same function as CR.

Details	• After executing this command, a head of a line is set as a next starting position of printing. • LF command received immediately following CR is ignored.

FF	Page Length Print

Code	$0C_{16}$

Function	Feeds paper based on the setting of page length.

Details	• After executing this command, a head of a line is set as a next starting position of printing.

ESC J n   Print and Feed Forward

Code $1B_{16} + 4A_{16} + n$

Domain of function $0 \leq n \leq 255$

Function   Prints the data stored in the print buffer, and then feeds paper n × dot pitch forward.

Details
- After executing this command, a head of a line is set as a next starting position of printing.
- This function is not affected by the setting of the amount of line spacing.

ESC j n   Print and Feed Backward

Code $1B_{16} + 6A_{16} + n$

Domain of function $0 \leq n \leq 255$

Function   Prints the data stored in the print buffer, and then feeds paper n × dot pitch backward.

Details
- After executing this command, a head of a line is set as a next starting position of printing.
- This function is not affected by the setting of the amount of line spacing.

ESC d n   Print and Continuous Line Feed

Code $1B_{16} + 64_{16} + n$

Domain of function $0 \leq n \leq 255$

Function   Prints the data stored in the print buffer, and then feeds paper n lines forward.

Details
- After executing this command, a head of a line is set as a next starting position of printing.

ESC C n   Page Length Set

Code	$1B_{16} + 43_{16} + n$

Domain of function	$1 \leq n \leq 255$

Function	Sets the amount of page feed.

Details	• The page feed is executed using the FF command.

2. Tab commands

HT — Horizontal Tab

Code	09_{16}

Function Moves the printing position to the position of the next horizontal tab.

Details
- If the position of the horizontal tab is not set, this command is ignored.
- If the position of the horizontal tab is out of the printing area, it is set at the head of the next line.
- The position of the horizontal tab is set using the ESC D command.
- The default value of the horizontal tab is 8 character pitches.

ESC D n1...nk NUL — Horizontal Tab Set

Code	$1B_{16} + 44_{16} + n1...nk + 00_{16}$

Domain of function
$1 \le n \le 255$
$0 \le k \le 32$

Function Sets the position of the horizontal tab.
n describes the number of characters from the head of a line to the position at which the horizontal tab is set.
k describes the number of data to be set.

Details
- The position of the horizontal tab to be set is [character width × n].
  $\rightarrow$ The character width includes the right space and the horizontal scaling factor.
- All the values previously set are cleared.
- The maximum number of horizontal tab positions settable is 32. If the number exceeds the limit, the rest of the data is processed as normal data.
- The positions are set in ascending order. And the final value is NUL code.
- If the smaller value is set than previously set value, such value is recognized as NUL code.
- Even if changing the width of character after setting, the position of tab set is not changed.

3. Form commands

ESC 2   Default Amount of Line Spacing Specify

Code	$1B_{16} + 32_{16}$

Function	Restores the amount of paper feed for one line to its default value.

ESC 3 n   Amount of Line Spacing Set

Code	$1B_{16} + 33_{16} + n$

Domain of function	$0 \leq n \leq 255$

Function	Sets the amount of paper feed for one line at [n × dot pitch].

Details	• The default amount of paper feed for one line, n = 28.

ESC SP n   Standard Size Character Right Spacing Set

Code	$1B_{16} + 20_{16} + n$

Domain of function	$0 \leq n \leq 127$

Function	Sets the character spacing for standard size character at [n × dot pitch].

Details	• The right character spacing increases depending on the horizontal scaling factor. • This command does not affect kanji. • In default, n = 0.

GS L nl nh   Left Margin Set

Code $1D_{16} + 4C_{16} + nl + nh$

Domain of function
$0 \leq nl \leq 255$
$0 \leq nh \leq 255$

Function Sets the left margin at $[(nh \times 256 + nl) \times dot\ pitch]$.

Details
- This setting is only valid at a head of a line.
- The maximum settable left margin corresponds to the horizontally printable area.
- When a setting value exceeds maximum value, the setting value is replaced within printable maximum area.
- In default, nh and $nl = 0$.

GS W nl nh   Width of Printing Area Set

Code $1D_{16} + 57_{16} + nl + nh$

Domain of function
$0 \leq nl \leq 255$
$0 \leq nh \leq 255$

Function Sets the width of the printing area at $[(nh \times 256 + nl) \times dot\ pitch]$

Details
- This setting is only valid at a head of a line.
- The settable printing area corresponds to the horizontally printable area except for the left margin. If printable range is exceeded, it replaces to the horizontally printable maximum area except the left margin.
- In default, $nh \times 256 + nl = 384$.

ESC $ nl nh   Absolute Position of Printing Area Specify

Code $1B_{16} + 24_{16} + nl + nh$

Domain of function

$0 \leq nl \leq 255$

$0 \leq nh \leq 255$

$0 \leq nh \times 256 + nl \leq 127$

Function   Sets the printing area at the absolute position based on the left margin. The setting range is $[(nh \times 256 + nl) \times dot\ pitch]$.

Details
- This setting is only valid at a head of a line.
- The value of setting exceeding the maximum value of nh or nl invalidates this command.

ESC a n   Position Align

Code $1B_{16} + 61_{16} + n$

Domain of function $0 \leq n \leq 2$

Function   Aligns one line of data to be printed in the specified position.
n = 0: left – aligned
n = 1: center – aligned
n = 2: right – aligned

Details
- This function makes an alignment within the predefined printing area.
- In default, n = 0.

4. Character decoration commands

ESC ! n	Decorated Characters Collectively Specify

Code $1B_{16} + 21_{16} + n$

Domain of function $0 \le n \le 255$

Function Collectively specifies the printing modes.

Bit	Description	Function	
		0	1
0	Font	24 dot type	16 dot type
1	Undefined	–	–
2	Undefined	–	–
3	Bold character	clear	specify
4	Double–height character	clear	specify
5	Double–width character	clear	specify
6	Undefined	–	–
7	Underline	clear	specify

Details
- When specifing both Bit 4 and Bit 5 described in the table above, the double-height and double-width size characters are printed.
- The dot pitch of underline is 2 dot pitch. However, if the several underlines with the different thicknesses exist in one line, the thickness of those underlines will be brought into line with the thickest underline.
- Each setting is not related to the previous settings.
- The settings of the characters except for the bold characters and the font are valid only for the standard size characters.
- In default, $n = 0$.

ESC G n

ESC E n   Bold Characters Specify and Clear

Code	$1B_{16} + 47_{16} + n$
	$1B_{16} + 45_{16} + n$

Domain of function	$0 \leq n \leq 255$

Function	Specifies and clears the bold characters.
	n = <xxxxxxx0>B: The bold characters are cleared.
	n = <xxxxxxx1>B: The bold characters are specified.

Details	• n is valid only for the least significant bit.
	• In default, n = 0.

ESC { n   Inversion (Flip) Specify and Clear

Code	$1B_{16} + 7B_{16} + n$

Domain of function	$0 \leq n \leq 255$

Function	Specifies and clears the inversion.
	n = <xxxxxxx0>B: The inversion is cleared.
	n = <xxxxxxx1>B: The inversion is specified.

Details	• n is valid only for the least significant bit.
	• This setting is valid only at a head of a line.
	• In default, n = 0.

ESC – n   Underline Specify and Clear

Code $1B_{16} + 2D_{16} + n$

Domain of function $0 \leq n \leq 255$

Function   Specifies and clears the underline.
$n = <xxxxx000>B$: underline 0 dot pitch
        ⋮
$n = <xxxxx111>B$: underline 7 dot pitch

Details
- n is valid only for the low 3 bits.
- This setting is valid only for the standard size characters.
- The underline is added to the width of character and the character spacing.
- This function is not affected by the setting of the amount of line specing.
- If the several underlines with the different thicknesses exist in one line, the thickness of those underlines will be brought into line with the thickest underline.
- In default, $n = 0$.

GS ! n   Character Size Set

Code $1D_{16} + 21_{16} + n$

Domain of function $0 \leq n \leq 255$

Function   Specifies the character size.
$n = <xxxx0000>B$: scaling factor in the vertical direction : $\times 1$ <minimum>
        ⋮
$n = <xxxx0111>B$: scaling factor in the vertical direction : $\times 8$ <maximum>

$n = <0000xxxx>B$: scaling factor in the horizontal direction : $\times 1$ <minimum>
        ⋮
$n = <0111xxxx>B$: scaling factor in the horizontal direction : $\times 8$ <maximum>

Details
- This setting is valid for any type of characters other than HRI characters.
- n is valid only for 0 to 2 bits and 4 to 6 bits.
- In default, $n = 0$.

| Code | $1D_{16} + 42_{16} + n$ |

| Domain of function | $0 \leq n \leq 255$ |

| Function | Specifies and clears the reverse characters. |

n = <xxxxxxx0>B: The reverse characters are cleared.
n = <xxxxxxx1>B: The reverse characters are specified.

| Details | • n is valid only for the least significant bit. |

• In default, n = 0.

5. Character selection commands

ESC M n Font Select

| Code | $1B_{16} + 4D_{16} + n$ |

| Domain of function | $0 \leq n \leq 255$ |

Function — Selects the character font.
n = <xxxxxxx0>B: character font (12 × 24 and 24 × 24)
n = <xxxxxxx1>B: character font (8 × 16 and 16 × 16)

Details — • n is valid only for the least significant bit.
• This setting is also valid for Kanji.
• The character font can be set by ESC ! command but the setting by the command which has been processed at last becomes valid.
• In default, n = 0.

Code	$1B_{16} + 52_{16} + n$

Domain of function	$0 \leq n \leq 7$

Function Selects a set of characters of each country described below.

When selecting JAPAN, the set of characters corresponds to the katakana – compliant character code table (refer to APPENDIX B. DATA CODE TABLE.).

When selecting a set of characters other than JAPAN, the characters are replaced with only the characters of a country of specified corresponding code according to PC 437 code table (refer to APPENDIX B. DATA CODE TABLE.).

		23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
n = 0	JAPAN	#	$	@	[	¥	]	^	`	{	|	}	~
n = 1	U.S.A	#	$	@	[	＼	]	^	`	{	|	}	~
n = 2	GERMANY	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
n = 3	ENGLAND	₤	$	@	[	＼	]	^	`	{	|	}	~
n = 4	FRANCE	#	$	à	°	ç	§	^	`	é	ù	è	¨
n = 5	SPAIN	₨	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
n = 6	ITALY	#	$	@	°	＼	é	^	ù	à	ò	è	ì
n = 7	SWEDEN	#	☼	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü

Details • The data beyond the defined domain of function is ignored.

• In default, n = 0.

ESC & y c1 c2 [x1 d1...d(y×x1)]...[xk d1...d(y×xk)]   Downloaded Character Register

| Code | $1B_{16} + 26_{16} + y + c1 + c2 [x1\ d1...d\ (y \times x1)]...[xk\ d1...d\ (y \times xk)]$ |

| Domain of function | $y = 3$ |

$20_{16} \leq c1 \leq c2 \leq 7E_{16}$

$0 \leq x \leq 12$ (When font (12 × 24) is selected)

$0 \leq x \leq 9$ (When font (8 × 16) is selected)

$0 \leq d1...d\ (y \times xk) \leq 255$

| Function | Defines the downloaded pattern for the specified character code. |

     y : The number of bytes in the vertical direction

     x : The number of bits in the horizontal direction

     c1 : Start code of character definition

     c2 : End code of character definition

| Details | • When defining only one character, c1 is equal to c2. |

     • d means the graphic data of the downloaded characters,

     • The residual right space generated by specifying x is processed as blank.

     • The code previously registered is overwritten.

     • When making the registered font valid, set ESC %.

     • The maximum output for 16 bit type fonts is 8 dots (width) × 16 dots (height).

ESC ? n   Downloaded Character Delete

| Code | $1B_{16} + 3F_{16} + n$ |

| Domain of function | $20_{16} \leq n \leq 7E_{16}$ |

| Function | Deletes the downloaded characters of the specified code. |

| Details | • n means the defined character code. After deleting the downloaded characters, the internal characters are printed. |

     • If the specified character code is undefined, this command is ignored.

| Code | $1B_{16} + 25_{16} + n$ |

| Domain of function | $0 \leq n \leq 255$ |

| Function | Specifies and clears the downloaded character set.
n = <xxxxxxx0>B: The downloaded character set is cleared.
n = <xxxxxxx1>B: The downloaded character set is specified. |

| Details | • n is valid only for the least significant bit.
• When clearing the downloaded character set, specify the internal character set.
• When specifying the downloaded character set, specify the downloaded characters for the defined code and the internal characters for the undefined code.
• In default, n = 0. |

Image of registration

Font 12 × 24

d1	d4	· · ·	d34
d2	d5	· · ·	d35
d3	d6	· · ·	d36

Font 8 × 16

d1	d4	· · ·	d25	MSB
d2	d5	· · ·	d26	
d3	d6	· · ·	d27	LSB
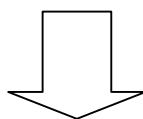
Character output range

Font 12 × 24

d1	d4	· · ·	d34
d2	d5	· · ·	d35
d3	d6	· · ·	d36

Font 8 × 16

d1	d4	· · ·	d22
d2	d5	· · ·	d23
		· · ·	

6. Barcode commands

| Code | $1D_{16} + 48_{16} + n$ |

| Domain of function | $0 \leq n \leq 255$ |

| Function | Specifies the printing position of the HRI characters when printing a Barcode. |

n = <xxxxxx00>B: HRI characters are not printed.
n = <xxxxxx01>B: HRI characters are printed on top of the Barcode.
n = <xxxxxx10>B: HRI characters are printed below the Barcode.
n = <xxxxxx11>B: HRI characters are printed on top of and below the Barcode.

| Details | • n is valid only for the low 2 bits. |
| | • In default, n = 0. |

| Code | $1D_{16} + 77_{16} + n$ |

| Domain of function | $1 \leq n \leq 4$ |

| Function | Sets the width of Barcode. |

n	Module width of JAN/UPCE	Module width of ITF, CODE39, and CODABAR	
		Narrow bar	Wide bar
1	2 dot pitch	1 dot pitch	3 dot pitch
2	3 dot pitch	2 dot pitch	5 dot pitch
3	4 dot pitch	3 dot pitch	8 dot pitch
4	5 dot pitch	4 dot pitch	10 dot pitch

| Details | • For CODE128, the width of a Barcode cannot be set (the module width is fixed at 2 dot pitch). |
| | • In default, n = 2. |

Code	$1D_{16} + 68_{16} + n$

Domain of function	$1 \leq n \leq 255$

Function	Sets the height of Barcode.

Details	• In default, $n = 162$.

| Code | $1D_{16} + 6B_{16} + m + d1...dk + NUL$ |

| Domain of function | $1 \leq m \leq 7$
 The values of d1 to dk depend on a type of Barcode. |

| Function | Selects a type of Barcode and prints the Barcode. |

m	Type of Barcode
1	UPC-E
2	JAN13
3	JAN8
4	CODE39
5	ITF
6	CODABAR
7	CODE128

| Details | |

- This command is finished by a NUL code.
- UPC−E is the 7-byte Barcode data and internally adds a check digit.
- JAN13 is the 12-byte Barcode data and internally adds a check digit.
- JAN8 is the 7-byte Barcode data and internally adds a check digit.
- CODE39 automatically adds the start and stop modules.
- ITF is the even number-byte Barcode data and automatically adds the start and stop modules.
- CODE128 transmits the start module and the Barcode data. And the check digit and the stop module are automatically added.

  If the special characters are included in the data, specify them at 2 bytes as follows.

$$
\begin{array}{lll}
\text{SHIFT} & \rightarrow & 7B_{16},\ 53_{16}\ (\{S) \\
\text{CODE A} & \rightarrow & 7B_{16},\ 41_{16}\ (\{A) \\
\text{CODE B} & \rightarrow & 7B_{16},\ 42_{16}\ (\{B) \\
\text{CODE C} & \rightarrow & 7B_{16},\ 43_{16}\ (\{C) \\
\text{FNC 1} & \rightarrow & 7B_{16},\ 31_{16}\ (\{1) \\
\text{FNC 2} & \rightarrow & 7B_{16},\ 32_{16}\ (\{2) \\
\text{FNC 3} & \rightarrow & 7B_{16},\ 33_{16}\ (\{3) \\
\text{FNC 4} & \rightarrow & 7B_{16},\ 34_{16}\ (\{4) \\
\text{'\{'} & \rightarrow & 7B_{16},\ 7B_{16}\ (\{\{) \\
\end{array}
$$

Example) When printing Start Code C, Fnc 1, and 0012, (where $n = 7$), send $1D_{16}$, $6B_{16}$, 07_{16}, 69_{16}, $7B_{16}$, 31_{16}, 30_{16}, 30_{16}, 31_{16}, 32_{16}, 00_{16} in this order.

7. Ruled line control commands

DC3 A	Ruled Line Buffer A Select

Code $13_{16} + 41_{16}$

Function Selects the ruled line buffer A.

Details
- This function selects the ruled line buffer A.
- There are 2 independent buffers (A and B) as the ruled line buffer.
- The ruled line buffer A is selected as the default.

DC3 B	Ruled Line Buffer B Select

Code $13_{16} + 42_{16}$

Function Selects the ruled line buffer B.

Details
- This function selects the ruled line buffer B.
- The ruled line buffer A is selected as the default.

DC3 C	Ruled Line Buffer Clear

Code $13_{16} + 43_{16}$

Function Clears the contents of the selected ruled line buffer.

Details
- The whole data is cleared to 0.

DC3 D nl nh   Write in Position Specified by Dot in Ruled Line Buffer

Code $13_{16} + 44_{16} + nl + nh$

Domain of $0 \leq nl \leq 255$
function $0 \leq nh \leq 3$

Function   Writes 1 in the specified position in the ruled line buffer.
            The position is set at $[(nh \times 256 + nl) \times$ dot pitch$]$.

Details   • Regardless of the printable area, this function writes 1 in the selected ruled line
             buffer.
           • nh is valid only for the low 2 bits.

DC3 L nl nh ml mh   Write in Position Specified by Line in Ruled Line Buffer

Code $13_{16} + 4C_{16} + nl + nh + ml + mh$

Domain of $0 \leq nl \leq 255$
function $0 \leq nh \leq 3$
            $0 \leq ml \leq 255$
            $0 \leq mh \leq 3$

Function   Writes 1 in the range from nhnl to mhml in the ruled line buffer.
            $0 \leq nhnl \leq mhml \leq 1023$
            $nhnl = (nh \times 256 + nl) \times$ dot pitch
            $mhml = (mh \times 256 + ml) \times$ dot pitch

Details   • Regardless of the printable area, this function writes 1 in the selected ruled line
             buffer.
           • nh and mh are valid only for the low 2 bits.

DC3 +   Print Mode of Ruled Line Approve

Code $13_{16} + 2B_{16}$

Function   Approves the print mode of the data stored in the ruled line buffer.

Details
- When a printing command (CR, LF, etc.) is executed after the approval, the data stored in the selected ruled line buffer is always included in the data to be printed.
- This command is not affected by the printing area commands such as GS L, and GS W.
- In default, the print mode of the data stored in the ruled line buffer is prohibited.

DC3 –   Print Mode of Ruled Line Prohibit

Code $13_{16} + 2D_{16}$

Function   Prohibits the print mode of the data stored in the ruled line buffer.

Details
- After the print mode of the ruled line is cancelled, the data stored in the ruled line buffer is not printed.

DC3 P   1 Dot Line of Ruled Line Print

Code $13_{16} + 50_{16}$

Function   Prints the data stored in the print buffer and 1 dot line of the data in the selected ruled line buffer.

Details
- Even if no data exists in the print buffer, 1 dot line of the data in the selected ruled line buffer is printed.
- If the print mode of the data stored in the ruled line buffer is prohibited, none of the data is printed.

8. Response commands (only for serial mode)

GS a n   Validity / Invalidity of Automatic Status Transmission and Real Time Command Select

---

Code $1D_{16} + 61_{16} + n$

Domain of function $0 \leq n \leq 3$

Function   Specifies the validity or invalidity of the automatic status response which is one of the printer statuses.
Specifies the validity or invalidity of the real time command.
$n = 0$: The automatic status response becomes invalid.
$n = 1$: The automatic status response becomes valid. And the current status is returned.
$n = 2$: The real time command becomes invalid.
$n = 3$: The real time command becomes valid

Details   • The automatic status response automatically returns a response depending on the change in status.
• The real time command is executed at the reception.
• For the status values, refer to **Table 5-1 Status Response Value Table**.
• This command is executed at the deployment of the receive buffer so that the execution of the command may be delayed depending on the conditions of the receive buffer.
• When a value is returned, the conditions of the host computer are not checked.
• In default, both the automatic status response and the real time command are invalid.

| Code | $1D_{16} + 72_{16} + n$ |

| Domain of function | $0 \leq n \leq 255$ |

| Function | Returns the current printer status. |
| | n = <xxxxxxx1>B : The status is returned |

Details	• n is valid only for the least significant bit.
	• Regardless of the validity of the automatic status response, this function returns the current status.
	• For the status values, refer to **Table 5-1 Status Response Value Table**.
	• This command is executed at the deployment of the receive buffer so that the execution of the command may be delayed depending on the conditions of the receive buffer.
	• When a value is returned, the conditions of the host machine are not checked.

Code	$10_{16} + 04_{16} + n$

Domain of function	$n = 1$

Function	Returns the current printer status in real time.

Details	• Regardless of the validity of the automatic status response, this function returns the current status.
	• For the status values, refer to **Table 5-1 Status Response Value Table**.
	• This command is executed at the reception.
	• When the real time command is invalid, this command is ignored.
	• Users should be aware that even if this command is valid and consistent with DLE ENQ 1 in the image data, this command will be executed.

Table 5-1   Status Response Value Table

Response value (1 byte)	Printer status	Description	
		0	1
Bit 0	Out-of-paper error	no error	error
Bit 1	Cover open error	no error	error
Bit 2	Voltage error	no error	error
Bit 3	Temperature error	no error	error
Bit 4	Printer operation	standby	operating
Bit 5	Fixed to 1	–	fixed
Bit 6	Fixed to 1	–	fixed
Bit 7	Fixed to 0	fixed	–

* :This bit is valid only for DLE EOT. The value is fixed at 0 for the other commands.

Code	$10_{16} + 05_{16} + n$

Domain of function	$n = 1$

Function	Clears the major buffers in real time while off line.

n = 1: The major buffers are cleared.

Details	• This command is valid while off line.

- This command is executed at the reception.
- When the real time command is invalid, this command is ignored.
- Users should be aware that even if this command is valid and consistent with DLE ENQ 1 in the image data, this command will be executed. (however, this note is not necesary while on line)
- The buffers cleared are:
  - Receive buffer
  - Print buffer
  - Command edit mode

9. Bitimage commands

ESC ∗ m nl nh [d1...dk]   Bitimage Select

Code $1B_{16} + 2A_{16} + m + nl + nh + [d1...dk]$

Domain of function

$m = 0, 1, 32, 33$
$0 \leq nl \leq 255$
$0 \leq nh \leq 3$
$0 \leq d \leq 255$

Function   Specifies the Bitimages with the number of dots specified as nl and nh in Mode m.

m	Mode	The number of dots in the vertical direction	The number of dots in the horizontal direction (1 line)	The number of data (k)
0	8 dot single density	8	192	$nh \times 256 + nl$
1	8 dot double density	8	384	$nh \times 256 + nl$
32	24 dot single density	24	192	$(nh \times 256 + nl) \times 3$
33	24 dot double density	24	384	$(nh \times 256 + nl) \times 3$

Details

- If m is out of the domain of function, the data after nl is processed as the normal data.
- nl and nh mean the number of dots in the horizontal direction of the Bitimage to be printed.
- If the dot is specified beyond the printable area, the data is deleted.
- The data deployment position corresponds to the deployment start position.
- This command is affected by the inverse print but the others such as dual print, bold print and reverse print.
- Refer to the diagram for how to deploy the data.

8-dot bitimage

d1	d2	d3

d1 d2 d3

MSB

LSB

24-dot bitimage

d1	d4	d7
d2	d5	d8
d3	d6	d9

d1 - - - - - - - - - d9

MSB

LSB

Double density

Single density
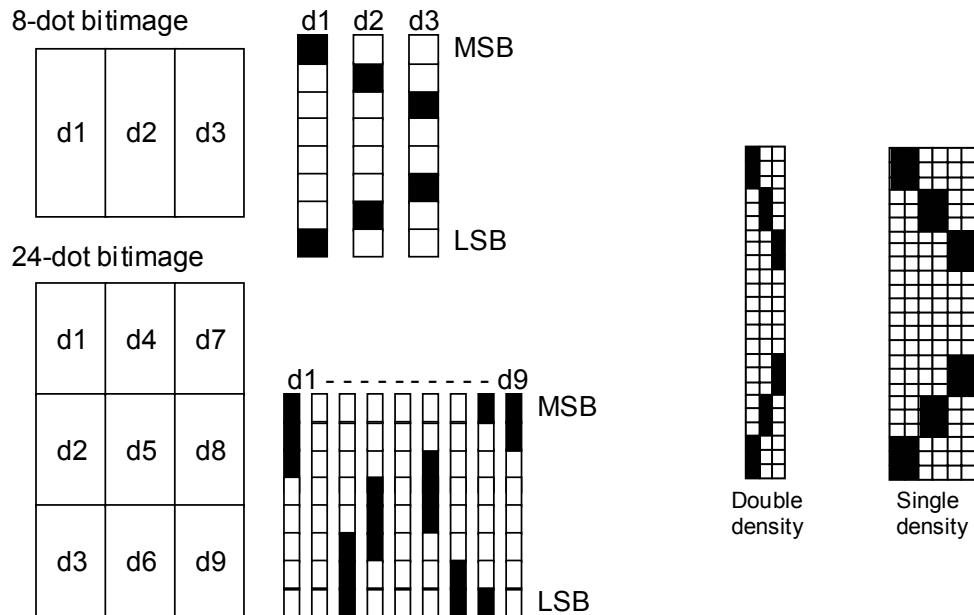
GS ∗ x y [d1...d(x × y × 8)]   Downloaded Bitimage Register

Code	$1D_{16} + 2A_{16} + x + y + [d1...d\ (x × y × 8)]$

Domain of function	$1 \le x \le 255$
	$1 \le y \le 48$
	$0 \le d \le 255$
	$(x × y × 8) \le$ Empty space of user memory

Function	Defines the downloaded Bitimage with the number of dots specified as x and y.

x: The number of dots in the horizontal direction (x × 8) is specified.

y: The number of dots in the vertical direction (y × 8) is specified.

Details	• If the number of dots is specified beyond the defined domain of function, this command is ignored.

• Check the user memory for the empty space.

• Refer to the diagram for how to deploy the data.

| Code | $1D_{16} + 2F_{16} + m$ |

| Domain of function | $0 \leq m \leq 3$ |

| Function | Prints the downloaded Bitimage in the specified Mode m. |

m	Print mode	Description
0	Normal mode	Prints the normal size characters
1	Double width mode	Prints the double-width characters
2	Double height mode	Prints the double-height characters
3	Double height and width mode	Prints the double-height and double−width characters

| Details | • If the downloaded Bitimage is not defined, this command is ignored.
• If the data is stored in the print buffer, both such data and the downloaded Bitimage are printed.
• No print mode but inversion affects this command.
• As for unprintable area, the fractional images are printed per rightward bytes to the unprintable area. |

Structure of downloaded Bitimage

$X \times 8$ dots

$Y \times 8$ dots

d1	dy + 1	. . . . . .	MSB
d2	dy + 2	. . . . . .	
. . .	. . .		LSB
dy	dy × 2	. . . . . .	dy × x × 8
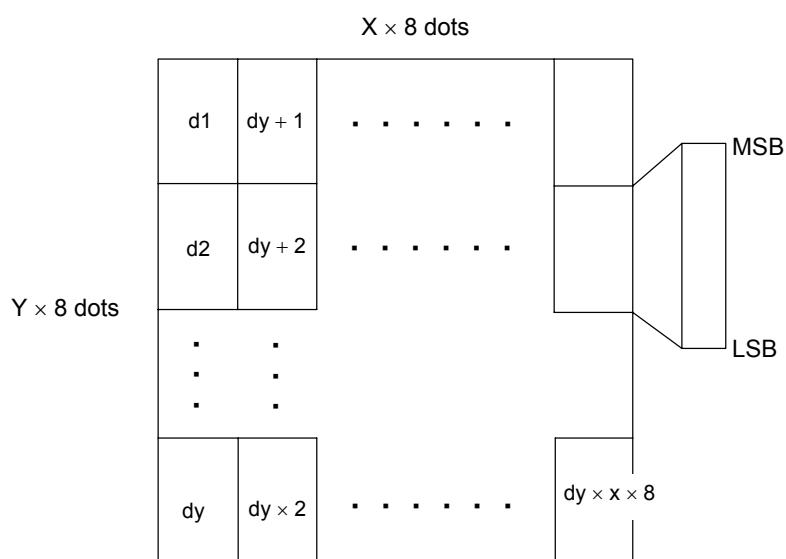
10. Kanji commands

FS &   Kanji Mode Specify

Code	$1C_{16} + 26_{16}$

Function	Specifies the kanji mode.

Details	• The Kanji Mode Specify is valid only when the JIS code is selected.

- If the kanji mode is selected, each and every character code is processed as 2 byte kanji code.
- In default, the kanji mode is cleared.

FS .   Kanji Mode Clear

Code	$1C_{16} + 2E_{16}$

Function	Clears the kanji mode.

Details	• The Kanji Mode Clear is valid only when the JIS code is selected.

- If the kanji mode is cleared, each and every character code is processed as ASCII code.
- In default, the kanji mode is cleared.

FS C   Kanji Code System Select

Code	$1C_{16} + 43_{16} + n$

Domain of function	$0 \leq n \leq 255$

Function	Selects the kanji code system.

n = <xxxxxxx0>B: JIS code
n = <xxxxxxx1>B: Shift JIS code

Details	In default, n = 0.

| Code | $1C_{16} + 53_{16} + nl + nr$ |

| Domain of function | $0 \leq nl \leq 127$
 $0 \leq nr \leq 127$ |

| Function | Sets the amount of the left (nl) and right (nr) spacing for kanji. |

| Details | • The amount of character spacing for normal size kanji is set. And the amount of character spacing proportionally increases according to [character scaling factor × the amount of character spacing].

 • When the value exceeds the maximum, such value is set at the maximum value.

 • This command is valid only for kanji.

 • In default, nl and nr = 0. |

Code | $1C_{16} + 21_{16} + n$

Domain of function | $0 \leq n \leq 255$

Function | Collectively specifies the print mode for kanji.

Bit	Description	Function	
		0	**1**
0	Undefined	−	−
1	Undefined	−	−
2	Double width character	clear	specify
3	Double height character	clear	specify
4	Undefined	−	−
5	Undefined	−	−
6	Undefined	−	−
7	Underline	clear	specify

Details
- When specifiying both Bit 2 and Bit 3 desicribed in the table above, the double-height and double-width size characters are printed.
- The underline is specified as 2 dot pitch line.
  If multiple thinckness underlines are set on the same line, the underline is unified to the thickest line.
- The kanji mode can be set with other command, however, the last command is effective.
- In default, n = 0.

FS – n   Underline of Kanji Specify and Clear

| Code | $1C_{16} + 2D_{16} + n$ |

| Domain of function | $0 \leq n \leq 255$ |

| Function | Sets the underline of kanji. |

n = <xxxxx000>B: Underline dot pitch: 0
$\vdots$
n = <xxxxx111>B: Underline dot pitch: 7

| Details | • n is valid only for the low 3 bits. |

• This command is valid only for kanji.
• The underline is added to the width of characters and the character spacing.
• If the several underlines with the different thicknesses exist in one line, the thickness of those underlines will be brought into line with the thickest underline.
• In default, n = 0.

FS W n   Double–Width and Double–Height Kanji Set and Clear

| Code | $1C_{16} + 58_{16} + n$ |

| Domain of function | $0 \leq n \leq 255$ |

| Function | Specifies and clears the double-width and double-height kanji. |

n = <xxxxxxx0>B: The double-width and double-height kanji is cleared.
n = <xxxxxxx1>B: The double-width and double-height kanji is specified.

| Details | • n is valid only for the least significant bit. |

• This command is valid only for kanji.
• In default, n = 0.

Code	$1C_{16} + 32_{16} + c1 + c2 + d1...dk$

Domain of function	$0 \leq d \leq 255$
	$k = 72$

c1 and c2 depend on the kanji code system.

Kanji code system	c1	c2
JIS code	77_{16}	$21_{16} \leq c2 \leq 2F_{16}$
Shift JIS code	EC_{16}	$40_{16} \leq c2 \leq 4E_{16}$

Function	Registers the codes specified (c1 and c2) as the user-defined characters.

Details	• c1 = first byte and c2 = second byte.
	• d means the image data, the bit = 1 printed, and the bit = 0 not printed, respectively.
	• The maximum output for 16 dot type font is 16 dots (width) × 16 dots (height).

Image of registration

Font 24 × 24

d1	d4	· · ·	d70
d2	d5	· · ·	d71
d3	d6	· · ·	d72

Font 16 × 16

d1	d4	· · ·	d70	MSB
d2	d5	· · ·	d71	
d3	d6	· · ·	d72	LSB

⬇

Character output range

Font 24 × 24

d1	d4	· · ·	d70
d2	d5	· · ·	d71
d3	d6	· · ·	d72

Font 16 × 16

d1	d4	· · ·	D46
d2	d5	· · ·	D47
		· · ·	
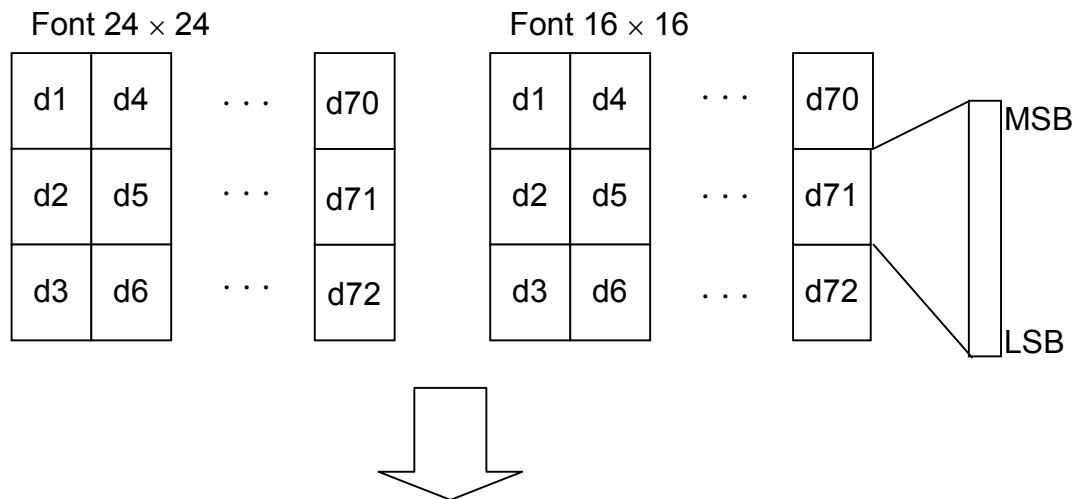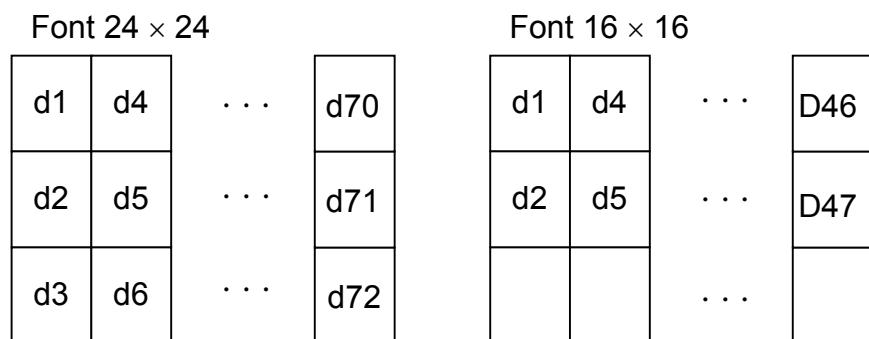
11. Function and setting commands

ESC @   Initialization

| Code | $1B_{16} + 40_{16}$ |

| Function | Initializes the printer. |

Details	• The allocation of the user memory is initialized.
	• The receive buffer is retained.
	• The print buffer is cleared.
	• The settings of each command are initialized.
	• ROM SW is reread.

CAN   Print Buffer Clear

| Code | 18_{16} |

| Function | Clears the print buffer. |

| Details | • After executing this command, a head of a line is set as a starting position of printing. |

DC2 D n — Registration Area of Downloaded Character Ensure and Release

Code $12_{16} + 44_{16} + n$

Domain of function $0 \le n \le 255$

Function Ensures and releases the registration area of the downloaded characters.
n = <xxxxxxx0>B: The registration area of the downloaded characters is released.
n = <xxxxxxx1>B: The registration area of the downloaded characters is ensured.

Details
- If the registration area is released, the area is added to the empty space of the user memory.
- After the registration area is released, the downloaded characters cannot be registered.
- If the registration area is ensured, the 4,560 bytes of capacity are extracted from the empty space of the user memory.
- After the registration area is ensured, the downloaded characters can be registered.
- In default, $n = 1$ (ensure).

DC2 G n — Registration Area of User–Defined Character Ensure and Release

Code $12_{16} + 47_{16} + n$

Domain of function $0 \le n \le 255$

Function Ensures and releases the registration area of the user-defined characters.
n = <xxxxxxx0>B: The registration area of the user-defined characters is released.
n = <xxxxxxx1>B: The registration area of the user-defined characters is ensured.

Details
- If the registration area is released, the area is added to the empty space of the user memory.
- After the registration area is released, the user-defined characters cannot be registered.
- If the registration area is ensured, the 1,080 bytes of capacity are extracted from the empty space of the user memory.
- After the registration area is ensured, the user-defined characters can be registered.
- In default, $n = 1$ (ensure).

DC2 > n   Print Drive Mode Select

Code | $12_{16} + 3E_{16} + n$

Domain of function | $0 \le n \le 2$

Function | Sets the print drive mode.

n	Print drive mode	Feature
0	High speed mode	The printer is driven at high speed and high electric power.
1	Medium speed mode 1	The printer is driven at medium speed and low electric power.
2	Medium speed mode 2	The printer is driven at our recommended electric power.

Details

- Even if our recommended electric power is adopted in the high speed mode, the print speed may be slow depending on the print ratio.
- The general comparisons among the modes in terms of power consumption and printing speed is described below.
- (1) Power consumption:
     high speed mode > medium speed mode 1 > medium speed mode 2
- (2) Printing speed:
     high speed mode > medium speed mode 1 > medium speed mode 2
- In default, $n = 2$.

DC2 % n   Print Drive User-Define

Code $12_{16} + 25_{16} + n$

Domain of function $1 \leq n \leq 16$

Function   Executes the printing according to the print drive defined by a user.
n = 1   : The amount of 1×8 dots
⋮
n = 16   : The amount of 16×8 dots

Details
- When one line is printed, how many times the line is divided is determined depending on the amount of $n \times 8$ dots.
  - Example)   Suppose that the number of dots printed = 128 dots, and n = 1
    - $128 \div (1 \times 8) = 16$ (one line printed is divided into 16 parts)
- The smaller the value of n, the lower the required electric power. And the bigger the value of n, the faster the speed of printing.

DC2 ~ n   Print Density Set

Code $12_{16} + 7E_{16} + n$

Domain of function $0 \leq n \leq 255$

Function   Sets the print density

Details
- n means n %.
- When adjusting the print density double for low heat sensitive paper, set n = 200.
- The print density cannot be set for each character.
- In default, n = 100.

APPENDIX A.   SPECIFICAIONS

General specifications

☐   Printing method   Thermal line dot

☐   Data input
    Parallel type   8-bit parallel (Handshake by $\overline{STROBE}$ and BUSY)
    Serial type   RS-232C (2400 to 38400 bps, BUSY control, Xon/Xoff control)

☐   Dot density
    8 dots/mm

☐   Maximum printing speed
    20 mm/s max. (Power supply 5 V)
    50 mm/s max. (Power supply 8.7 V)

☐   Command mode
    Mode 1:   DPU-20-20CF compatible
    Mode 2:   DPU-20-24CF compatible
    Mode 3:   ESC/POS compliant

☐   Total number of dots, Print width
    Mode 1:   278 dot, 34.75 mm
    Mode 2:   334 dot, 41.75 mm
    Mode 3:   384 dot, 48.00 mm

    ∗ The print width is aligned at the center.

☐   Character mode
Mode 1
    (1)   Character type   ANK: 250 types
    (2)   Character configuration   Standard size character: 24 × 12 dots (H × W)
    (3)   Font size   3.0 × 1.5 mm (H × W)
    (4)   Printable character   20 characters with standard characters
                         (with character spacing of 2 dots)

Mode 2
    (1)   Character type   ANK: 250 types
    (2)   Character configuration   Standard size character: 24 × 12 dots (H × W)
    (3)   Font size   3.0 × 1.5mm (H × W)
    (4)   Printable character   24 characters with standard characters
                         (with character spacing of 2 dots)

Mode 3
    (1)   Character type   ANK: 379 types, and JIS Kanji level I and II
    (2)   Character configuration   Standard size character: 24 × 12 dots, 16 × 8 dots (H × W)
                         Kanji size character: 24 × 24 dots, 16 × 16 dots (H × W)
    (3)   Font size   Standard size character: 3.0 × 1.5 mm, 2.0 × 1.0 mm (H × W)
                         Kanji size character: 3.0 × 3.0 mm, 2.0 × 2.0 mm (H × W)

(4) Printable character	32 characters with standard characters
	(24 dot standard characters with character spacing of 0 dot)

☐ Horizontal dot pitch
   0.125 mm

☐ Paper feed pitch
   0.125 mm

☐ Useful service life (at 25 °C and the rated energy)

Pulse resistance	100 million pulses or more (percentage of print: 12.5%)
Abrasion resistance	50 km or more

☐ Power supply

(1) Connector for interface	
DC 5 V to 8.7 V	3 A (4 A during a peak period)
(2) DC socket	
input: DC 8.7 V	3 A

☐ Current consumption

Standby	100 mA or less
Printing	Average: 1.7 A (4 A during a peak period)

   ∗ The number of dots simultaneously energized is 64 in both cases.

☐ External dimensions	101 × 116 × 61 (W × H × D, excluding projection)
☐ Weight	Approx. 230g (excluding paper roll)

☐ Operating environment

Temperature:	0°C to +50°C
Humidity:	30% to 80% RH (no condensation)

☐ Storage environment

Temperature:	−20°C to +60°C
Humidity:	20% to 85% RH (no condensation)

☐ EMI standard	VCCI CLASS B, FCC CLASS B, CE
☐ Connector	XG4A-4032 (Omron)
☐ Receive buffer	4,096 bytes

☐ Summary of mechanism
   • Panel built-in type
   • Manually usable cutter built-in on top and bottom
   • Diameter of thermal paper roll: 50 mm
   • Easy-to-use operation mechanism

□ Thermal papers used
- Product No.: TP-211C-1(10 rolls per box)
- Paper width: 58 mm
- Outer diameter of roll paper: φ50 mm or less
- Core: included

∗ Use the specified thermal paper. If you use another type of thermal paper, the quality of print and the useful service life of the thermal head may not be guaranteed.

APPENDIX B.   DATA CODE TABLE

Katakana compliant characters (gothic)

Low order bit \ High order bit	0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111	8* 1000	9* 1001
0 0000		DLE	SP	0	@	P	`	p	─	┴
1 0001			!	1	A	Q	a	q	▬	┬
2 0010		DC2	″	2	B	R	b	r	▬	┤
3 0011		DC3	#	3	C	S	c	s	■	├
4 0100	EOT		$	4	D	T	d	t	■	─
5 0101	ENQ		%	5	E	U	e	u	■	─
6 0110			&	6	F	V	f	v	■	│
7 0111			'	7	G	W	g	w	■	│
8 1000		CAN	(	8	H	X	h	×	│	┌
9 1001	HT		)	9	I	Y	i	y	│	┐
A 1010	LF		*	:	J	Z	j	z	▮	└
B 1011		ESC	+	;	K	[	k	{	▮	┘
C 1100	FF	FS	,	<	L	¥	l	|	■	ﾉ
D 1101	CR	GS	-	=	M	]	m	}	■	ﾞ
E 1110			.	>	N	^	n	~	■	ﾟ
F 1111			/	?	O	_	o		＋	ﾉ

Low order bit \ High order bit	A 1010	B 1011	C 1100	D 1101	E* 1110	F* 1111
0 0000	SP	─	タ	ミ	＝	×
1 0001	｡	ア	チ	ム	﬩	円
2 0010	｢	イ	ツ	メ	∓	年
3 0011	｣	ウ	テ	モ	∓	月
4 0100	､	エ	ト	ヤ	◣	日
5 0101	･	オ	ナ	ユ	◤	時
6 0110	ヲ	カ	ニ	ヨ	◥	分
7 0111	ァ	キ	ヌ	ラ	◢	秒
8 1000	ィ	ク	ネ	リ	▲	〒
9 1001	ゥ	ケ	ノ	ル	♥	市
A 1010	ェ	コ	ハ	レ	♦	区
B 1011	ォ	サ	ヒ	ロ	♣	町
C 1100	ャ	シ	フ	ワ	●	村
D 1101	ュ	ス	ヘ	ン	○	人
E 1110	ョ	セ	ホ	゛	／	■
F 1111	ッ	ソ	マ	゜	＼	

- SP means space.
- The codes for blank cells are ignored.
- The codes in the heavy line frames are function codes.

* The characters of a line are not printed in Shift-JIS code.

PC 437 type

Low order bit \ High order bit	0 (0000)	1 (0001)	2 (0010)	3 (0011)	4 (0100)	5 (0101)	6 (0110)	7 (0111)	8 (1000)	9 (1001)
0 0000		DLE	SP	0	@	P	`	p	Ç	É
1 0001			!	1	A	Q	a	q	ü	æ
2 0010		DC2	"	2	B	R	b	r	é	Æ
3 0011		DC3	#	3	C	S	c	s	â	ô
4 0100	EOT		$	4	D	T	d	t	ä	ö
5 0101	ENQ		%	5	E	U	e	u	à	ò
6 0110			&	6	F	V	f	v	å	û
7 0111			'	7	G	W	g	w	ç	ù
8 1000		CAN	(	8	H	X	h	x	ê	ÿ
9 1001	HT		)	9	I	Y	i	y	ë	Ö
A 1010	LF		*	:	J	Z	j	z	è	Ü
B 1011		ESC	+	;	K	[	k	{	ï	¢
C 1100	FF	FS	,	<	L	\	l	|	î	£
D 1101	CR	GS	-	=	M	]	m	}	ì	¥
E 1110			.	>	N	^	n	~	Ä	₧
F 1111			/	?	O	_	o	SP	Å	·

Low order bit \ High order bit	A (1010)	B (1011)	C (1100)	D (1101)	E (1110)	F (1111)
0 0000	á	░	└	┴	α	≡
1 0001	í	▒	┴	┬	ß	±
2 0010	ó	▓	┬	┬	Γ	·
3 0011	ú	│	├	·	π	·
4 0100	ñ	┤	─	·	Σ	·
5 0101	Ñ	╡	+	·	σ	·
6 0110	ª	╢	├	·	µ	÷
7 0111	º	·	├	+	τ	·
8 1000	¿	·	└	╪	Φ	°
9 1001	·	╣	┌	┘	θ	·
A 1010	·	║	┴	┌	Ω	·
B 1011	½	┐	┬	█	δ	√
C 1100	¼	┘	├	·	∞	·
D 1101	¡	·	─	█	∅	·
E 1110	«	·	┼	·	∈	·
F 1111	»	┐	┴	·	∩	SP

- SP means space.
- The codes for blank cells are ignored.
- The codes in the heavy line frames are function codes.

NOTE) Above DATA CODE TABLE shows the form of a character to the last, and does not show the actual printing pattern itself.

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