SII

RP-F10 SERIES
THERMAL PRINTER
TECHNICAL REFERENCE

Rev.01

Seiko Instruments Inc.

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PREFACE

This technical reference describes about RP-F10 SERIES THERMAL PRINTER (hereinafter referred to as "printer").

See "RP-F10 SERIES THERMAL PRINTER USER'S GUIDE" for operation.

[Product name]

$$\underset{(1)}{\text{RP-\underline{F}10-}}\underset{(2)}{\underline{x}}\underset{(3)}{\underline{27J1}\text{-}}\underset{(4)}{\underline{x}}$$

(1)	: Model	F: RP-F10 series
(2)	: Case color	W : White
		K : Black
(3)	: Model code	27J1: Standard model
(4)	: Interface	2: USB + USB host
		3: Ethernet + USB host
		4: Bluetooth + USB host

The printer complies with EU RoHS Directive (2011/65/EU).

Follow "2.1 PRINTER SPECIFICATIONS" about the input rating of RP-F10 when the power is supplied from customer's device.

When a power supply other than the AC adapter of specified accessories is used, the customer must take action to comply with the safety and EMC regulations of the country of use.

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- This chapter describes the basic terms that are frequently used in this manual.

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- This chapter describes the Function Settings and test print.

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- This chapter describes the printer status by LED indication and functions of switches.

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CHAPTER 1
TERMS USED IN THIS MANUAL

This chapter describes the terms used in this manual.

- **INPUT BUFFER AND LINE BUFFER**

    When the RP-F10 (hereinafter referred to as "printer") receives data (character codes and commands) from the host devices, it stores the data in the printer input buffer. The input buffer has a capacity of 4096 bytes. Then, the printer retrieves data which is stored to the input buffer. When the data is character code, the data is mapped to the line buffer. The normal command is executed immediately when the data is retrieved from the input buffer. Meanwhile, for the realtime command, the command is executed when the data is stored the input buffer from the host.

    The data capacity of the line buffer is 1 line. When the line buffer is filled to the capacity of character codes for 1 line, the characters falling into the character codes are printed.
    The printer repeats this operation to print all the character code.
    The relationship between the input buffer and line buffer is illustrated in Figure 1-1.
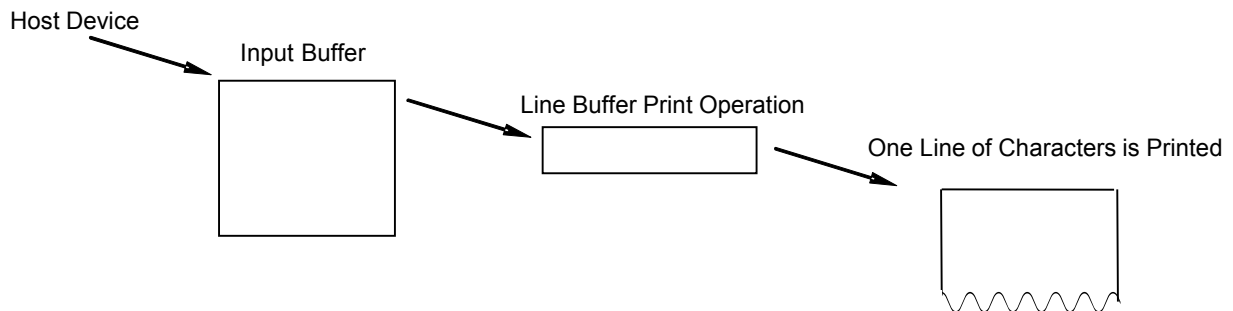
Figure 1-1   Relationship Between Input Buffer and Line Buffer

- **Line Spacing**

  Line spacing is the space between the lines of printed characters (See Figure 1-2).
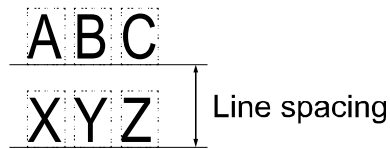
Figure 1-2   Line Spacing

The printer uses a line thermal print mechanism, therefore, a paper feed step is necessary before printing characters or bit images. The line feed with printing feeds the paper for height of characters or bit images. Therefore, a paper feed amount which is smaller than character or bit image height is ignored. When the printing includes underlines, the printer feeds the paper with the line spacing added 3 dot-lines to the character height.
Line feeding without printing feeds the paper for specified line feed amount.

- **Character Spacing**

  Character spacing is the space area adding to between each character in the horizontal direction (See Figure 1-3).
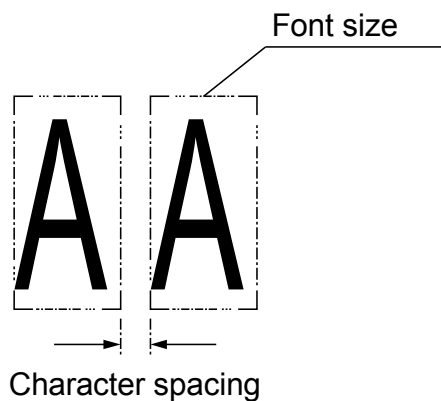
Figure 1-3   Character Spacing

- **Line**

  The word "line" in this manual indicates a line of characters printed on thermal paper.
  For example, the sentence "the printer feeds paper 1 line" indicates that the printer feeds paper a line of characters.

- **Dot-Line**

  The word "dot-line" in this manual indicates an area of 1 dot in the vertical direction of thermal paper.
  For example, the sentence "the printer feeds paper by 1 dot-line" indicates that the printer feeds paper by the space of 1 dot.

- **Fixed Division Drive and Dynamic Division Drive of Thermal Head**

  In the fixed division drive method, the logical blocks (a group of physical blocks simultaneously activated) are predetermined. In this method, high quality printing is available because the physical blocks are always driven in the same order.
  In the dynamic division drive method, counts the number of dots in each physical block so that the

number does not exceed the specified maximum number of simultaneously activated dots when 1 dot-line is printed.

- **Notation in the Technical Reference**

Hexadecimal: the character 'H' which indicates hexadecimal is added behind a number.
Example: 0AH

Character: a character is enclosed with single quotation marks.
Example: 'G'

CHAPTER 2
SPECIFICATIONS

2.1 PRINTER SPECIFICATIONS

Table 2-1   Printer Specifications

(1/3)

Item		Specifications	
		Paper Width 80mm[1]	**Paper Width 58mm[1]**
Printing method		Thermal printing	
Dot density		8 dots/mm	
Number of effective dots		576 dots/line (512 dots/line[2])	432 dots/line (360 dots/line[2])
Printing width max.		72 mm (64 mm[2])	54 mm (45 mm[2])
Operating environment	Temperature	5°C to 45°C (41°F to 113°F)	
	Relative humidity	10 %RH to 90 %RH (non-condensing)	
Storage environment	Temperature	-20°C to 60°C (-4°F to 140°F)	
	Relative humidity	10 %RH to 90 %RH (non-condensing)	
Printing speed max.		250 mm/s[3]	
Paper-feed pitch		0.0625 mm	
Dimensions (excluding projections)		W 127 mm × D 127 mm × H 127 mm	
Mass		Approx. 840 g (excluding thermal paper)	
Input voltage		DC24.0 V ±10%	
Mounting type		Top eject : floor installation Front eject : floor installation or wall-mount[4]	
Communication system	USB	Ver. 2.0 Full speed (12 Mbps)	
	Ethernet	10BASE-T, 100BASE-TX	
	Bluetooth	Ver. 3.0	

Item		Specifications	
		Paper Width 80mm[*1]	Paper Width 58mm[*1]
Character size	1-byte character font A	24 dots × 12 dots	
	1-byte character font B	16 dots × 8 dots	
	2-byte character font A	24 dots × 24 dots	
	2-byte character font B	16 dots × 16 dots	
Character type	1-byte character	USA, Standard Europe (Code Page437) Katakana Multilingual (Code Page850) Portuguese (Code Page860) Canadian-French (Code Page863) Nordic (Code Page865) Turkish (Code Page857) Greek (Code Page737) Latin (Code Page1252) Russian (Code Page866) Eastern Europe (Code Page852) Euro (Code Page858) Cyrillic (Code Page855) Arabic (Code Page864)[*5] Central European (Code Page1250) Cyrillic (Code Page1251) Greek (Code Page1253) Turkish (Code Page1254) User-defined character set Downloaded character, Optional font	
	2-byte character	Kanji (JIS 1st and 2nd levels, NEC special characters, NEC selection of IBM extended characters, IBM extended characters), user-defined character	
Characters per line	1-byte character font A	48 (42[*2])	36 (30[*2])
	1-byte character font B	72 (64[*2])	54 (45[*2])
	2-byte character font A	24 (21[*2])	18 (15[*2])
	2-byte character font B	36 (32[*2])	27 (22[*2])
Barcode	Barcode	UPC-A, UPC-E, JAN13 (EAN13), JAN8 (EAN8), ITF, CODABAR, CODE39, CODE93, CODE128, GS1 Databar Omni-directional, GS1 Databar Truncated, GS1 Databar Limited, GS1 Databar Expanded	
	Two-dimensional barcode	QR Code (Model 2), PDF417, MaxiCode, Data Matrix, GS1 Databar Stacked, GS1 Databar Stacked Omni-directional, GS1 Databar Expanded Stacked	
Print mode		Standard mode Page mode	
Input buffer		4096 bytes	
Autocutter	Paper cutting type	Full cut Partial cut (a tab left at the center)	

Item		Specifications	
		Paper Width 80mm[*1]	**Paper Width 58mm**[*1]
Drawer kick port	Drawer drive output	DC24.0 V, 1.0 A max., 2 circuits[*6]	
	Drawer switch input	1 circuit	
LED		3 color LED	
Operation switch		POWER Switch, FEED Switch	
Reliability[*7]	Abrasion resistance	150 km or more	
	Activation pulse resistance	150 million pulses or more	
	Cutting thermal paper	1.5 million cut or more[*8]	
	MTBF/MCBF	360000 hours / 60 million lines	

*1: Select the paper width by MS4-4 (Paper Width Selection).
*2: When selecting 512/360 dots by MS4-5 (Number of Effective Dots Selection).
*3: Condition: our specified AC adapter (PW-G2421-W1), function settings are default setting,
        printing 1-byte character font A 'K' for all digits, ambient temperature 25°C (77°F) or more.
        However, it may change depending on the connecting time and the printer settings.
*4: Use dedicated wall mounting kit (WLK-B01-1).
*5: Font B cannot be used when this character set is selected.
*6: 2 circuits cannot be driven concurrently.
*7: Except when specific dots are printed continuously. Reliance is a value at average print ratio 12.5%, print density 100%, ambient
    temperature 25°C (77°F), and using specified thermal paper.
*8: Cut operation environment is a value at ambient temperature 25°C (77°F), humidity is 60%, and using specified thermal paper
    indicated in Table 2-4.

2.1.1 Sale Destinations

Sale destinations for the printer and the specified accessories are listed below.

Table 2-2 Sale Destinations

✓: Sale Destinations

Country/Region[*1]	RP-F10		AC Adapter	AC Cable
	(Bluetooth Model)	(Other Models)		
Japan	✓	✓	PW-G2421-W1	CB-JP07-20A CB-JP08-20A
EU(except UK), EFTA	✓	✓		CB-CE04-20A CB-CE05-20A
Turkey	-	✓		
UK	✓	✓		CB-UK03-20A CB-UK04-20A
USA, Canada	✓	✓		CB-US05-20A CB-US05-20A
Brazil	-	✓		*2

*1: Ask your SII sales representative when you want to operate the products in countries/regions other than listed above.
*2: Use the AC cable of 2.0 meters long that complies with Brazil safety standards.

2.1.2 Precautions for Use

- When the two-dimensional barcode or ladder barcode is printed at high speed, it may reduce the barcode's reading accuracy. In that case, print after switching the print speed to Middle (Quality). Use Memory Switch or "Set Print Speed" command (GS 's') to change the print speed.

- When the line such as a ruler line is printed, at least 2 dots are needed for configuration. By configuring with 1 dot only, the printed lines may be hard to see.

- Always use the printer within the shadowed range shown in the graph below for the relationship between temperature and humidity.
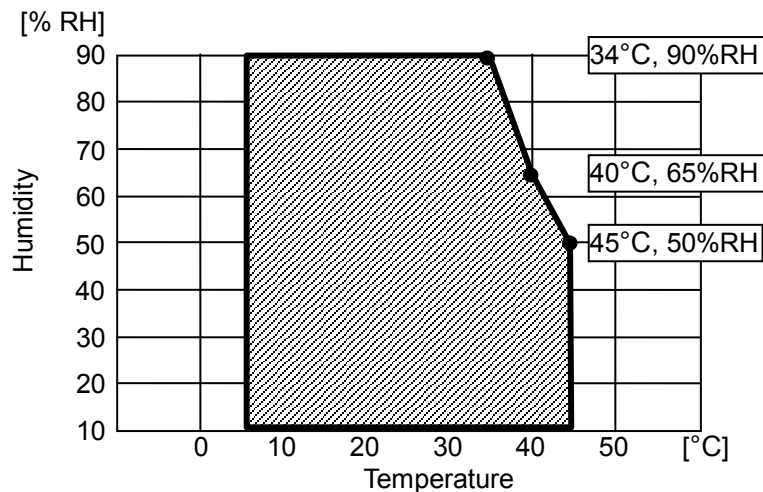
Figure 2-1   Operating Temperature and Humidity Range

- When handling the printer, be aware of static electricity. When the static electricity is discharged, this could cause USB communication failure. When this problem occurs, unplug the USB plug that is connected to the printer and wait a few seconds before connecting it again.

- When the printer is left unused for a long period of time, white powder may appear to the surface of platen. (This is the powder that an ingredient of thermal paper recrystallized.)
  When the powder appears to the platen, wipe the platen with ethanol and use the printer after ethanol has dried completely.
  Also, do not use ethanol on the parts except the platen. When it adheres, wipe it off immediately.

- When printing at high print ratio under a low temperature or high humidity environment, steam may be generated from thermal paper. This may cause the thermal paper to be contaminated, or condensation may occur on the printer.
  Stop printing when water drops are produced on the thermal head. It causes galvanic corrosion of the thermal head. If condensation occurs, do not apply current until dewdrops disappear.

- Install the printer on the smooth surface because the rubber feet that adheres to the printer installation surface are used. When the printer is installed on the uneven surface, it may move during operation, or its surfaces may peel.

- When the printer is moved from the installation site, hold the printer main body tightly with both hands, then lift it upward slowly to leave the rubber feet from the installation surface. Lifting it rapidly or moving it horizontally may peel the entire rubber feet, peel their surfaces, or damage the outer case.

- Paper feeding may be confused a few dot-lines when printing is started or when printing and paper feeding are resumed from a pause state. When printing bit images and so on, always feed the thermal paper for at least 24 steps at the start of printing, and print without interrupting.

- For other precautions, see "2 SAFETY PRECAUTIONS" and "3 OPERATING PRECAUTIONS" in "RP-F10 SERIES THERMAL PRINTER USER'S GUIDE" which is combined with the printer.

2.1.3 Dimensions

127

127

127

USB + USB host model   Ethernet + USB host model   Bluetooth + USB host model

Unit: mm
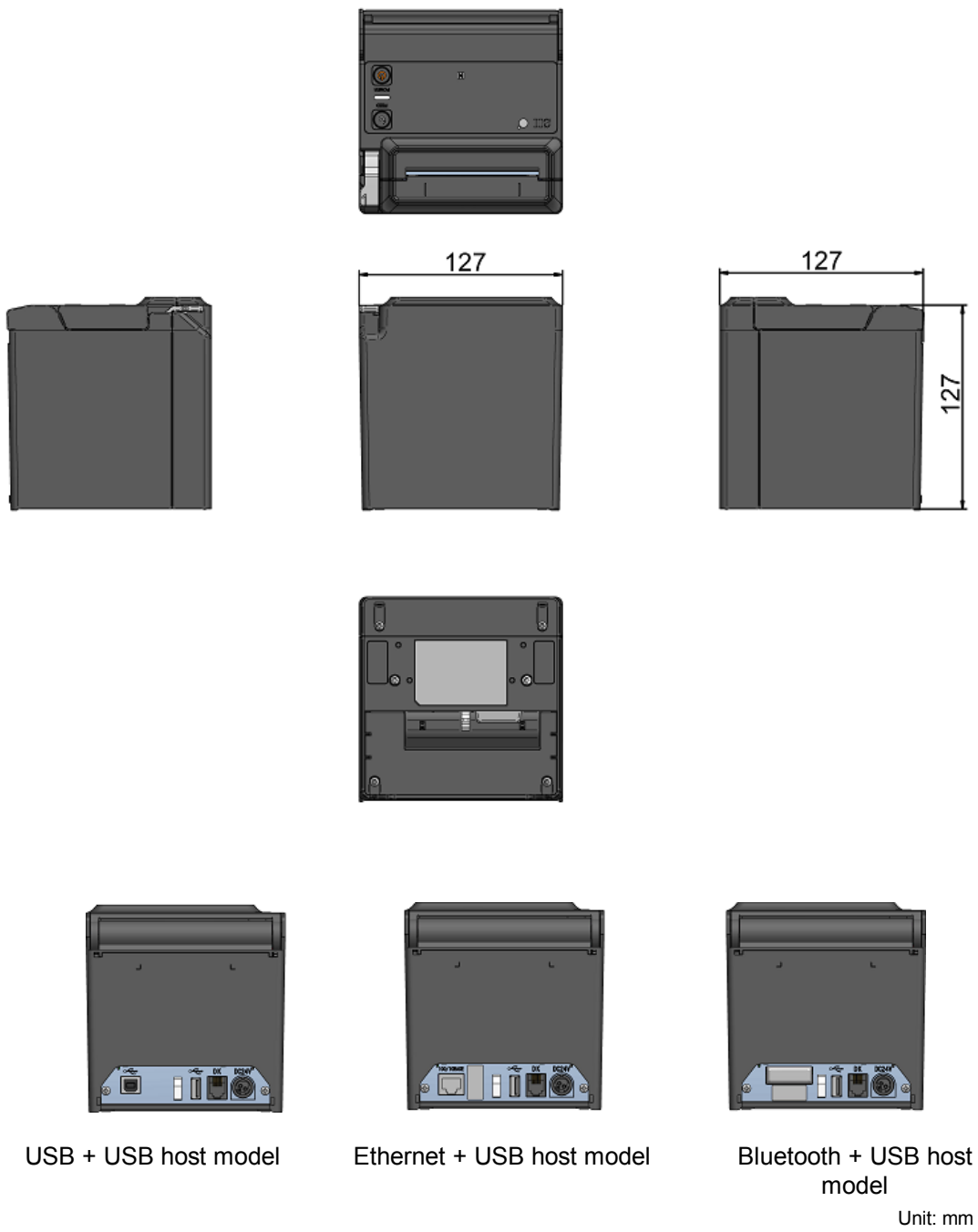
Figure 2-2   RP-F10 Dimensions

- Installation position

  It is possible to use the printer in top eject or front eject according to the installation position.

Top eject   **Front eject**

Figure 2-3   RP-F10 Installation Position

2.1.4 Label

(1) RP-F10 Series Standard Model

Case Color: Black

SII ●	Trade name: Thermal Printer
	Model No.: RP-F10
	Type No.: RP-F10-K27J1
	Rating: 24V DC === 2.1 A

VCI CE ☒
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
CAN ICES-3(A) / NMB-3(A)

Serial No.
FA000000A0

Seiko Instruments Inc.
Made in Malaysia

Case Color: White

SII ●
Trade name: Thermal Printer
Model No.: RP-F10
Type No.: RP-F10-W27J1
Rating: 24V DC === 2.1 A

VCI CE ☒
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
CAN ICES-3(A) / NMB-3(A)

Serial No.
FB000000A0

Seiko Instruments Inc.
Made in Malaysia

(2) RP-F10 Series Bluetooth Model

Case Color: Black

SII ●
Trade name: Thermal Printer
Model No.: RP-F10
Type No.: RP-F10-K27J1-4
Rating: 24V DC === 2.1 A

VCI CE ☒
FC
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
CAN ICES-3(A) / NMB-3(A)
Contains FCC ID: SQK-MBH7BTZXXC2
Contains IC: 337L-MBH7BTZXXC2
Serial No.
FC000000A0

Seiko Instruments Inc.
Made in Malaysia

Case Color: White

SII ●
Trade name: Thermal Printer
Model No.: RP-F10
Type No.: RP-F10-W27J1-4
Rating: 24V DC === 2.1 A

VCI CE ☒
FC
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
CAN ICES-3(A) / NMB-3(A)
Contains FCC ID: SQK-MBH7BTZXXC2
Contains IC: 337L-MBH7BTZXXC2
Serial No.
FD000000A0

Seiko Instruments Inc.
Made in Malaysia

2.1.5 Thermal Paper Specifications

Table 2-3 Thermal Paper Specifications

Item	Specifications
Paper type	Paper roll
Paper width	$80^{\ 0}_{-1}$ mm or $58^{\ 0}_{-1}$ mm
Paper thickness	53 to 75 μm
Paper roll outside diameter max.	83 mm
Paper roll width max.	80.5 mm
Paper roll core	Inside diameter of core: 12.0 mm Outside diameter of core: 18.0 mm
Printing surface	Outside

(NOTE) • **Do not use the paper roll whose end is glued, taped and folded.**
  • **Do not use the paper roll whose core is deformed.**
  • **Do not use the paper roll whose core is protruded from the paper end.**
  • **Do not store the paper roll in high-temperature and humidity environment.**

Table 2-4 Specified Thermal Paper Model

Model		Manufacturer
Specified thermal paper	P220VBB-1	Mitsubishi Paper Mills
	PD160R	Oji Paper
	TP50KR-2Y	Nippon Paper
	TF60KS-E	Nippon Paper
	KT48FA	Papierfabrik August Koehler
	Alpha400-2.1	Appvion

(NOTE) • **Set MS7-1 to 8 (Thermal Paper Selection) according to the thermal paper used.**
  • **Do not use any thermal paper other than the specified thermal paper.**
  • **Do not use labeling paper, 2-ply thermal paper, and perforated thermal paper.**
  • **When different thermal paper from the specified one is used, the printing quality or specified life of the thermal head would not be guaranteed.**

2.1.6 Print Area
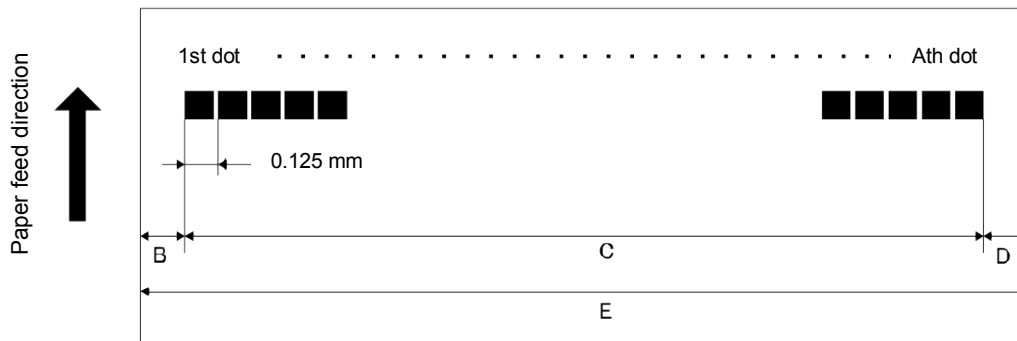
MS4-5 (Number of Effective Dots Selection): 1

Symbol	Name	Specifications	
		Paper Width: 80mm	**Paper Width: 58mm**
A	Printable dots per line	576 dots	432 dots
B	Left margin	4 ±1 mm	2 ±1 mm
C	Print area	72 ±0.3 mm	54 ±0.3 mm
D	Right margin	4 ±1 mm	2 ±1 mm
E	Paper width	80^{0}_{-1} mm	58^{0}_{-1} mm

MS4-5 (Number of Effective Dots Selection): 0

Symbol	Name	Specifications	
		Paper Width: 80mm	**Paper Width: 58mm**
A	Printable dots per line	512 dots	360 dots
B	Left margin	8 ±1 mm	6.5 ±1 mm
C	Print area	64 ±0.2 mm	45 ±0.2 mm
D	Right margin	8 ±1 mm	6.5 ±1 mm
E	Paper width	80^{0}_{-1} mm	58^{0}_{-1} mm

Figure 2-4   Print Area

2.2 CUTTER SPECIFICATIONS

(1) Cutter Specifications

Table 2-5   Cutter Specifications

Item	Specifications
Paper cutting method	Slide cutting
Cutting frequency	1 cut / 2 sec max.

(2) Cut Position
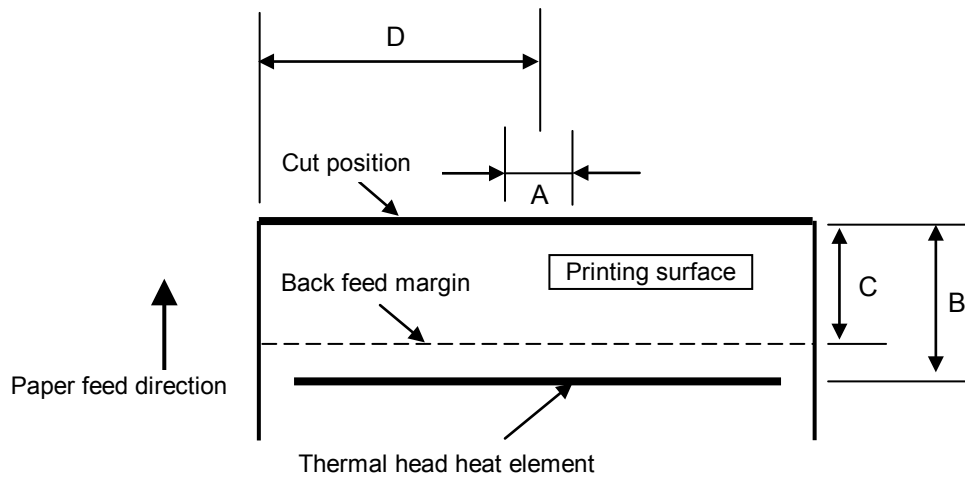
Symbol	Item		Dimension
A	Remaining part of partial cut		Approx. 1.35 mm
B	Distance from cut position to thermal head heat element		Approx. 9.5 mm
C	Distance from cut position to backward feed margin		7.5 mm
D	Distance from paper edge (1st dot side) to partial cut position	Paper width: 80 mm	Approx. 40 mm
		Paper width: 58 mm	Approx. 29 mm

Figure 2-5   Cut Position

(3) Precautions for Using Cutter

Pulling the thermal paper strongly after partial cut may result in uneven pitch because stress is applied to the platen. Feed the thermal paper approx. 1 mm before starting next printing.
Do not cut the thermal paper over maximum cutting frequency because it may damage the cutter.
Leaving the printer for a long time in the situation where the cutting is completed may cause paper jam at the next printing. Execute paper feed or print 2 mm or more after cutting operation.

2.3 POWER SUPPLY SPECIFICATIONS

(1) Power Supply Connector Specifications

Printer side connector: TCS7960-5320177 (HOSIDEN) equivalent
Cable side connector: TCP8927-631167 (HOSIDEN) equivalent

No.	Function
1	+24.0 V
2	GND
3	N.C.
Shell	FG
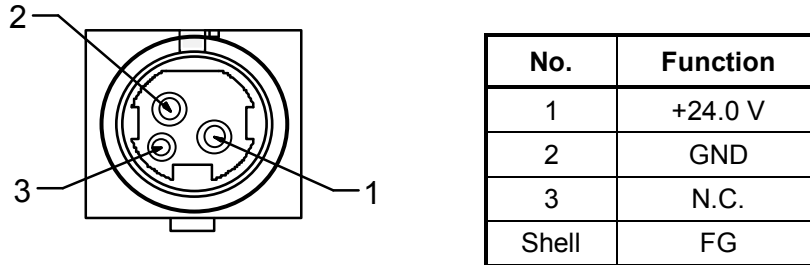
Figure 2-6   Power Supply Connector (View from Joint Surface)

(NOTE) Insert the DC plug into the power connector on the printer correctly. When the DC plug is inserted forcibly in wrong direction, it may cause damage.

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(2) Power Supply Specifications

Table 2-6   Power Supply Specifications

Item	Specifications
Power supply voltage	DC21.6 to 26.4 V
Current consumption*	
Standby	Approx. 20 mA avg.
Printing（print ratio 25%）	Approx. 4.7 A max.
Printing（print ratio 100%）	Approx. 9.0 A max.

*: Under the condition that the driving method is dynamic division 288 dots.

(3) Specified AC Adapter Specifications (PW-G2421-W1)

Table 2-7   Specified AC Adapter Specifications (PW-G2421-W1)

Item	Specifications
Input voltage	AC100 to 240 V
Input frequency	50 to 60 Hz
Output voltage	DC24.0 V
Output current	2.1 A
Dimensions	W 120 mm × D 52.5 mm × H 32.5 mm*
Mass	Approx. 260g

*: The cable part is excluded.

2.4 DRAWER KICK PORT SPECIFICATIONS

(1) Drawer Kick Port Specifications

Table 2-8   Drawer Kick Port Specifications

Item	Specifications
Output voltage	24.0 V
Output current	1.0 A max.
Number of drive circuits	2 circuits
Drawer switch input	1 port
Drawer switch drive voltage	3.3 V
Drawer switch drive current	0.11 mA
Drawer switch input signal level	L: 0.0 to 0.6 V H: 2.2 to 3.3 V

(NOTE) • Use the coil (solenoid) whose resistance is 24 Ω or more for drawer (external device).
  • Two circuits cannot be driven at the same time.

(2) Drawer Kick Connector Specifications

Printer side connector: MJ-66J-RD315 (JST) equivalent (6P modular jack connector)
Cable side connector: TM3P-66 (HRS) equivalent
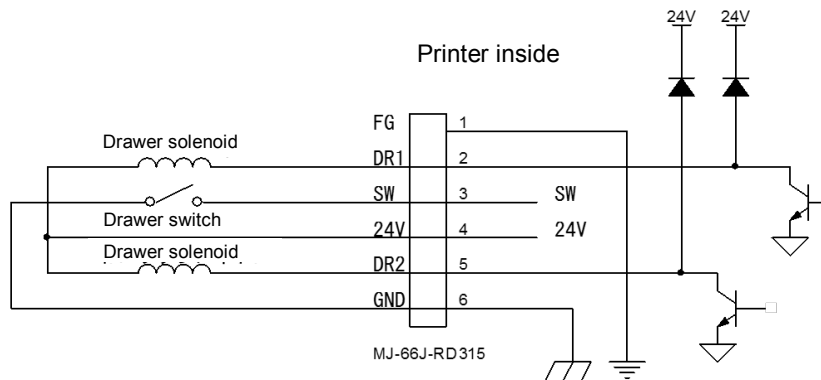
Terminal No.	Terminal Name	Input/Output Direction	Function
1	FG	-	Frame ground
2	DR1	Output	Drive circuit 1
3	SW	Input	Drawer switch input
4	24.0 V	-	-
5	DR2	Output	Drive circuit 2
6	GND	-	Signal ground

·Status of the terminal No.3 (SW) can be detected by "Enable/Disable Automatic Status Back" command (GS 'a').

Figure 2-7   Drawer Kick Connector Circuit Sample

(NOTE) • Do not connect the phone line to this connector.

2.5 COMMUNICATION CABLE SPECIFICATIONS

2.5.1 Specified USB Cable Specifications

Table 2-9   Specified USB Cable Specifications

Item		Specifications
Product name		IFC-U02-2
Use		USB cable
Color		Black
Cable	Length	Approx. 1800 mm
	Outside diameter	Approx. ϕ 4.0 mm
Plug C1	Type	Series "A" plug
Plug C2	Type	Series "B" plug

Table 2-10   Connection Cable for Specified USB Cable

Plug C1	Plug C2
1	1
2	2
3	3
4	4
SHELL	SHELL

2.5.2 Specified Powered USB Cable Specifications

Table 2-11   Specified Powered USB Cable Specifications

Item		Specifications
Product name		IFC-V01-1
Use		Powered USB cable
Color		Black
Cable	Length	Approx. 1800 mm
Plug C1	Type	Powered USB 24.0 V
Plug C2	Type	Series "B" plug
Plug C3	Type	Power Mini DIN 3 pin

Table 2-12   Connection Cable for Specified Powered USB Cable

Plug C1	Plug C2	Plug C3
1	1	-
2	2	-
3	3	-
4	4	-
5	-	2
6	-	1
7	-	1
8	-	2
-	-	3
SHELL	SHELL	SHELL

CHAPTER 3
INTERFACE

This chapter describes specifications of each interface required for connecting host devices and peripheral devices with the printer.

The amount of the input buffer in the printer is 4096 bytes.
The amount of the output buffer is 256 bytes.

3.1 USB + USB HOST MODEL

The USB + USB host model provides both USB and USB host interfaces, and it can be used in the following ways:

- The USB interface is used for data communication with the host device, and the USB host interface is used for data communication with peripheral device such as the display. Peripheral device can communicate data with the host device through the printer.

3.1.1 USB Interface

(1) General Specifications

Table 3-1 General Specifications of USB Interface

Item	Specifications
USB version	Ver. 2.0 Printer device class 1.1
Communication speed	Full speed (12 Mbps)
Communication protocol	Bulk transfer

(2) Pin Assignment

Table 3-2   Pin Assignment of USB Interface

Terminal No.	Terminal Name	Input/Output Direction	Function
1	Vbus	-	USB power supply
2	D-	Input/Output	USB data
3	D+	Input/Output	USB data
4	GND	-	Signal ground
Shell	FG	-	Frame ground

(NOTE)   Use a USB cable that conforms to the Full speed when you prepare a cable separately.

(3) Connector

Printer side connector: UBB-4R-D14T-4D(LF)(SN) (JST) or equivalent (Series B)
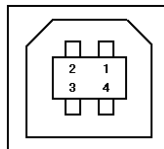
Figure 3-1   Connector

(4) Data Reception

USB data reception uses a bulk-out transfer method.
Data is received during printing. However, since printing is prioritized, the NAK response may be returned even when there is free space in the input buffer.
When the input buffer usage becomes 3840 bytes or more (the remaining capacity becomes 256 bytes or less), the NAK response continues. When the data process is proceeded, and the input buffer usage becomes 3712 bytes or less (the remaining capacity becomes 384 bytes or more), data reception resumes.
The maximum number of bytes that can be received with 1 packet is 64 bytes. Data reception is available during an error.

(5) Data Transmission

USB data transmission uses a bulk-in transfer method.
The response data is stored temporarily in the output buffer, and it is sent in response to the bulk-in packet request from the host device. When the bulk-in packet request is received while no response data exists, zero-length packet is sent.
The maximum number of bytes that can be transmitted with 1 packet is 64 bytes.

(6) iSerialNumber

USB iSerialNumber can be set.

(a) When the USB Device Class is set to "Printer Class"
To set iSerialNumber, there are the following 2 ways:

- Using the utility
Use "SII Communication Setting Utility for Windows", or Communication Settings Utility in "Communication Software Package for RP Series Printer".
See "SII Communication Setting Utility for Windows User's Guide" for RP-F10 series, or "RP Series Communication Software User's Guide" for details.
The screen of SII Communication Setting Utility for Windows is shown in Figure 3-2 as an example.
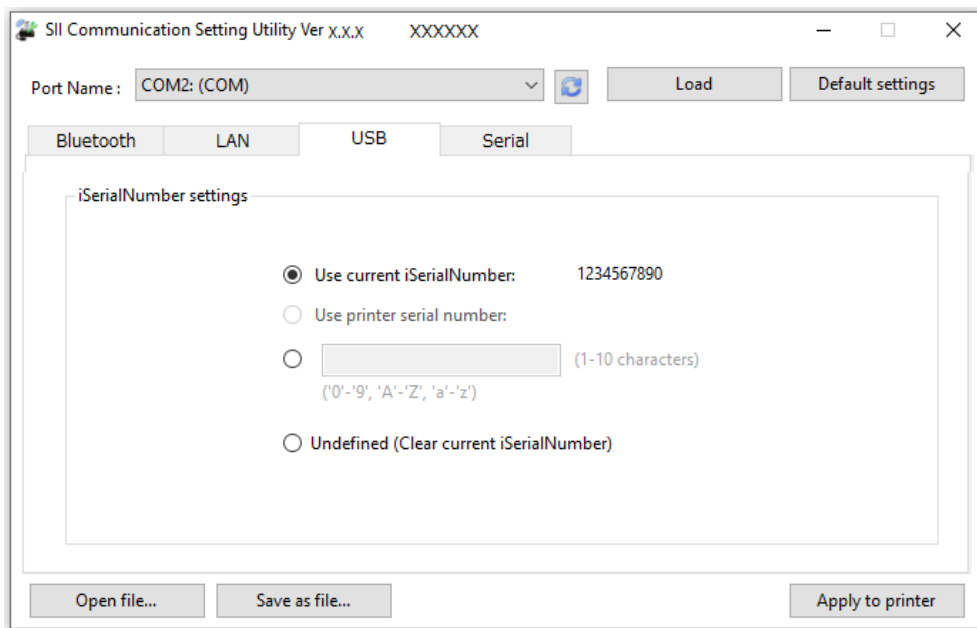
Figure 3-2   Screen of [USB] Tab in SII Communication Settings Utility for Windows

- Using the command
See "Set iSerialNumber" command (DC2 'u' 0, DC2 'u' 1).

(b) When the USB Device Class is set to "Vender Class"
To set iSerialNumber, there are the following 2 ways:

- Using the utility
Use Communication Settings Utility in "Communication Software Package for RP Series Printer".
See "RP Series Communication Software User's Guide" for details.

- Using the command
See "Set iSerialNumber" command (DC2 'u' 0, DC2 'u' 1).

(NOTE)	• iSerialNumber is not initially set.
	• When multiple printers use the same iSerialNumber, do not connect the printers to the host at the same time.
	• iSerialNumber must be set only when the printer is installed.
	• iSerialNumber can input 1-byte alphanumeric characters only.

(7) USB Device Class

It is possible to set the USB Device Class to either "Printer Class" or "Vendor Class".
To set the USB Device Class, there are the following 2 ways:

- Using the utility
  Use Communication Settings Utility in "Communication Software Package for RP Series Printer"
  to set the Driver Type.
  Printer Class: Printer Driver
  Vendor Class: Virtual Serial Port Driver
  See "RP Series Communication Software User's Guide" for supported OS.
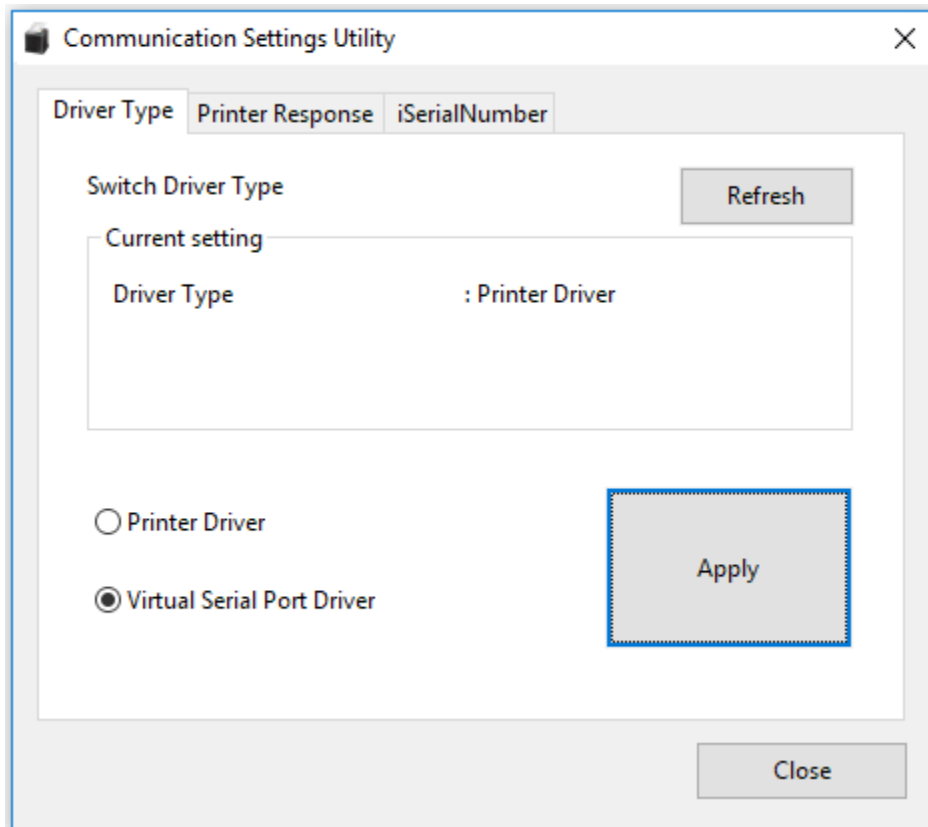
Figure 3-3   Screen of [Driver Type] Tab in Communication Settings Utility

- Using the switches
  It is possible to change the settings by the switch operation.
  See "(2) How to Set the Function Using the Switches" in "4.1.1 Changing Memory Switch".
  Select [11: I/F Setting] for the Setting Mode.

3.1.2 USB Host Interface

(1) General Specifications

Table 3-3 **General Specifications of USB Host Interface**

Item	Specifications
USB version	Ver. 2.0 Printer device class 1.1
Communication speed	Full speed (12 Mbps)
Communication protocol	Bulk transfer
Supported peripheral device	DSP-A01-K1/DSP-A01-W1

(NOTE)   Do not connect USB host other than our specified peripheral device.

(2) Pin Assignment

Table 3-4   Pin Assignment of USB Host Interface

Terminal No.	Terminal Name	Input/Output Direction	Function
1	Vbus	-	USB power supply
2	D-	Input/Output	USB data
3	D+	Input/Output	USB data
4	GND	-	Signal ground
Shell	FG	-	Frame ground

(3) Connector

Printer side connector: USS-BL04-VA01/2-95 (E-tec) or equivalent
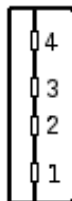
Figure 3-4   Connector

(4) Data Reception

   USB host data reception uses a bulk-in transfer method.
   The printer requests the bulk-in packet periodically to connected peripheral device and receives the
   data from peripheral device. The received data is stored temporarily in the output buffer, and it is sent
   through USB interface in response to the bulk-in packet request from the host device. When the output
   buffer usage becomes 3840 bytes or more (the remaining capacity becomes 256 bytes or less), the
   bulk-in packet request is interrupted.
   The maximum number of bytes that can be received with 1 packet is 64 bytes. Data reception is
   available during an error.

(5) Data Transmission

   USB host data transmission uses a bulk-out transfer method.
   The received data from the host device through the USB interface is stored temporarily in the input
   buffer, and the printer sends the data to connected peripheral device.
   The maximum number of bytes that can be transmitted by 1 packet is 64 bytes. Data reception is
   available during an error.
   When the input buffer usage becomes 3840 bytes or more (the remaining capacity becomes 256 bytes
   or less), the NAK response continues. When the data process is proceeded, and the input buffer usage
   becomes 3712 bytes or less (the remaining capacity becomes 384 bytes or more), data reception
   resumes.
   The maximum number of bytes that can be received with 1 packet is 64 bytes.

3.2 ETHERNET + USB HOST MODEL

3.2.1 Ethernet Interface

(1) General Specifications

Table 3-5 General Specifications of Ethernet Interface

Item	Specifications
Communication standards	10BASE-T, 100BASE-TX
Communication protocol	
Basic protocol	IPv4, ARP, ICMP, UDP, TCP
Print protocol	LPR, TCP Socket Port

(2) Pin Assignment

Table 3-6 Pin Assignment of Ethernet Interface

Terminal No.	Terminal Name	Input/Output Direction	Function
1	TXP	Input/Output	Transmission+
2	TXN	Input/Output	Transmission-
3	RXP	Input/Output	Reception+
4	N.C.	-	-
5	N.C.	-	-
6	RXN	Input/Output	Reception-
7	N.C.	-	-
8	N.C.	-	-

(NOTE)   Use a cable that conforms to the category 5 or higher.

(3) Connector

Printer side connector: RJLTC-202TA (TAIMAG) or equivalent (RJ-45)
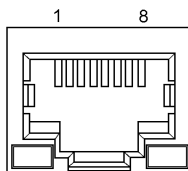
Figure 3-5   Connector

Push the LAN cable into the LAN connector until it clicks.

> **(NOTE)** • Do not insert a customer display connector cable, drawer kick out connector cable, and general public line to the 10BASE-T/100BASE-TX LAN connector.
> • Be sure to connect the aerially wired LAN cable outside to this product via surge-proof devices. Otherwise, induced lightning may damage devices.

(4) LED

Indications of each LED installed on both sides in the bottom of the connector mean the following:

Table 3-7   Network Communication System

Indication	LED (Orange)
100 Mbps	On
10 Mbps	Off

Table 3-8   Network Status Indication

Indication	LED (Green)
Connected	On
Disconnected	Off
Data transferred	Blink

(5) Initialization of Communication Settings

It is possible to restore to the communication settings at the shipping by the switch operation. See "(2) How to Set the Function Using the Switches" in "4.1.1 Changing Memory Switch".

(6) Protocol

Basic communication protocol

   IPv4, ARP, ICMP, UDP, TCP

Print communication protocol

   LPR: Transfers print data.

Table 3-9   Print Communication Protocol (LPR)

Port No.	515
Maximum number of concurrent connections	8 (It changes depending on the connection situation of other protocols such as TCP Socket Port.)
Number of printable connections	1 (Other users wait the completion of printing.)
Timeout	Approx. 5 minutes (This value is changeable.)

TCP Socket Port: Transfers print data and printer status through the bidirectional direct socket communication.

Table 3-10   Print Communication Protocol (TCP Socket Port)

Port type	Direct print TCP communication port
Port No.	9100
Port communication direction	Bidirectional
Maximum number of concurrent connections	14 (It changes depending on the connection situation of other protocols such as LPR.)
Number of printable connections	1 (Other users wait the completion of printing.)
Timeout	Approx. 5 minutes (This value is changeable.)

Protocol for getting and setting the status: Gets and changes the printer status and network parameters on the specified Web page using the HTTP protocol.

Table 3-11   Protocol for Getting and Setting the Status

Port No.	80
HTTP version	HTTP/1.1

Protocol for monitoring settings: Monitors and sets settings using the SNMP protocol.

Table 3-12   Protocol for Monitoring Settings

SNMP version	SNMPV2
Server port No.	161
Trap transmission port No.	162
Trap destination	One IP address can be set (the initial status is not set)
Enabled PDU	Get Request, Get Next Request, Get Response, Set Request
Community name	Public
Enabled MIB	Part of MIB-II (RFC1213)

Protocol for Firmware update: Upgrades the firmware of the LAN module using the TFTP protocol.

Table 3-13   Protocol for F/W Update

Transfer request port No.	69
Maximum number of concurrent connections	1

3.3 BLUETOOTH + USB HOST MODEL

3.3.1 Bluetooth Interface

(1) General Specifications

Table 3-14   General Specifications of Bluetooth Interface

Item	Specifications
Bluetooth version	Ver. 3.0
Transmission power class	Class 2
Authentication	SSP, PIN code
Profile	SPP, iAP2
PIN code*	0000 (at the shipping)
Device name*	RP-F10 (at the shipping)

*: Changeable by "Set Communication Default Value" command (DC2 'i').
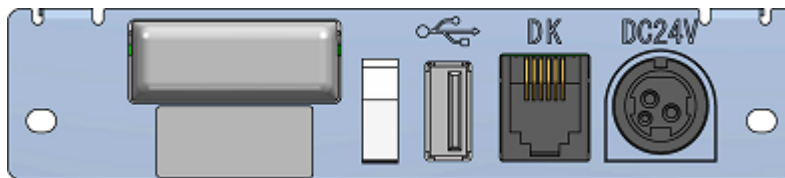
Figure 3-6   Bluetooth Interface

(2) Pairing

When MS39-3 (Inquiry Response Selection) is set to Pairing Mode in the Function Settings, the printer enters pairing mode for about 60 seconds by pushing the power switch for 7 seconds or more with the printer off state.
When the pairing mode starts, the LED blinks twice per second, and the printer can pair with the Bluetooth host device.
When Bluetooth connection is established during the pairing mode, the printer exits the pairing mode.
When Inquiry Response is set to Always in the Function Settings, pairing is always available because the printer responds anytime to the search from the Bluetooth host device.

For Android terminal, pairing is possible using NFC or QR Code.
In that case, our utility software is required.
Download utility software from Google Play, and install on a host device.

Refer to the following for the pairing procedure when using our utility software.

- NFC using:
  Set the Bluetooth function and NFC function of host device to on, and start our utility software.
  Tap the "Printer selection" column of software and slide to "NFC SEARCH".
  Turn on the printer, and bring the NFC antenna of host device closer to the position of N mark on the printer.
  Pairing is started.

- QR Code using:
  Set the Bluetooth function of host device to on, and start our utility software.
  Tap the "Printer selection" column of software and slide to "QRCODE SEARCH".
  Perform the test print. For the method of test print, see "4.3 TEST PRINT".
  Read the QR Code printed on the test print with the camera of host device.
  Pairing is started.

(3) Security

When MS39-2 (Security Mode Selection) is set to SSP (Simple Secure Pairing) in Function Settings, the Bluetooth host device is connected by SSP.
When the host device does not support SSP or the security mode is set to PIN in Function Settings, the Bluetooth host device is connected by PIN code.

3.3.2 Precautions for Use Bluetooth

(1) Precautions for Bluetooth Data Transmission

Check the printer status when the data is transmitted. In addition, do not transmit the data exceeding the input buffer (4096 bytes) if the printer is not in printable status.

(2) Precautions for Disconnecting Bluetooth Connection

Before disconnecting Bluetooth connection, make sure the completion of transmitted data process by executing "Execution Response Request" command (DC2 'q').

CHAPTER 4
FUNCTION SETTINGS

4.1 FUNCTION SETTING METHOD

In this printer, initial states of selectable items such as communication system after power on and thermal paper type can be preset. Preset these functions before using the printer. Details for settings of the software switches are described below.

The function settings are allocated to memory switches (hereinafter referred to as "MS") that are stored in the FLASH memory. These are enabled until they are rewritten.

The function settings can be set using MS1 to 39. Do not rewrite MS8 to 12, 14, and 19 to 38 since they are reserved for the system. The value shown in the shaded cell (in bold) in the table is set at the shipping.

> **(NOTE)** Be sure to configure the setting or the value as instructed when "Fixed" is stated in the table. Otherwise, the printer may not work correctly or may crash.

4.1.1 Changing Memory Switch

(1) Change Procedures

There are following 4 ways to change the MS.

- Using the memory switch setting tool
  As shown in the figure below, utilize the memory switch setting utility from the printer driver property.
  For details, see "SII Printer Setting Utility for Windows User's Guide" for RP-F10/G10 Series.
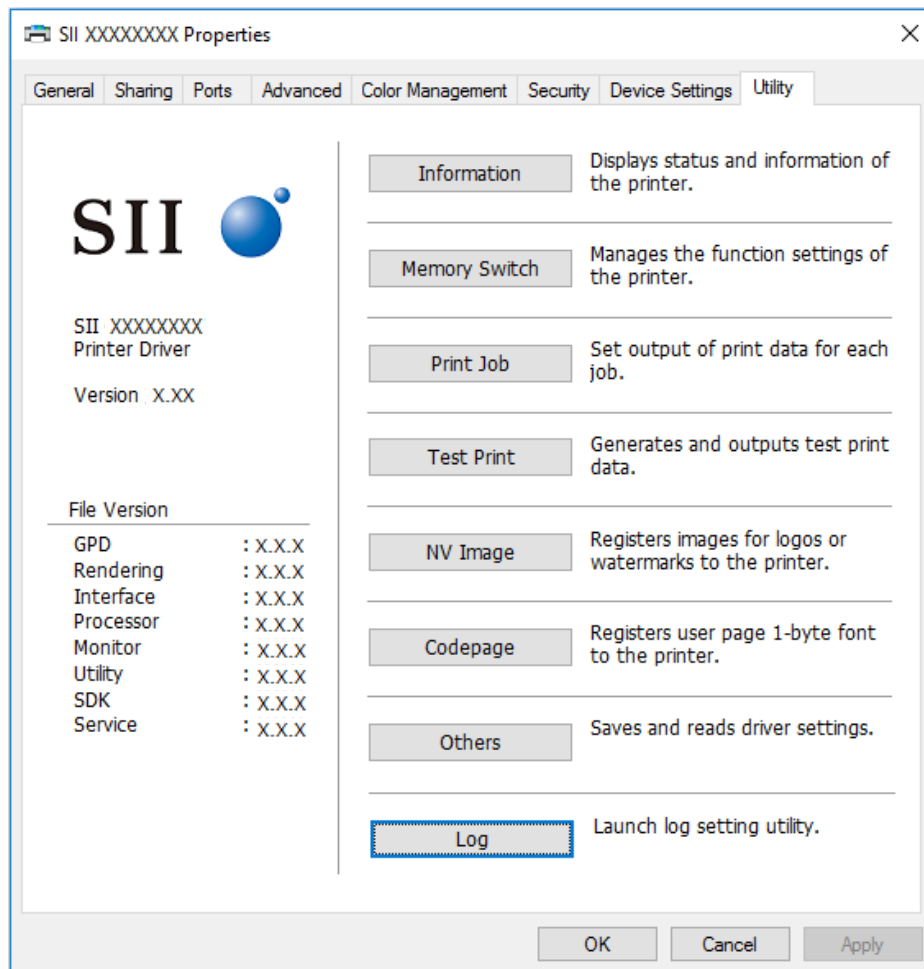
Figure 4-1 Properties of Printer Driver

- Using the "Change Function Settings" command (DC2 'k', DC2 'w')
  See DC2 'k', DC2 'w' in "6.5.10 Auxiliary Functions".

- Using the "Set Communication Default Value" command (DC2 'i')
  See DC2 'i' in "6.5.10 Auxiliary Functions".

- Using the switches
  The MS can be changed manually using the printer's POWER Switch and FEED Switch.
  The procedures are described in the following pages.

(2) How to Set the Function Using Switches

To set functions using the switches, follow the procedures below.

1. Load thermal paper in the printer.
   Ensure that no error occurs, and then turn off the printer.

2. Hold the FEED Switch down and press the POWER Switch, then release the POWER Switch first.
   Keep pressing the FEED Switch until the test print is completed.

3. A message of mode selection is printed as shown in Figure 4-2 when the test print has completed.
   To enter the Setting Mode, press the FEED Switch.

```
[Enter Setting Mode]
Enter Setting Mode: Feed SW
Exit: Power SW
```

Figure 4-2   Mode Selection Message

4. A message for selecting MS to be set is printed as shown in Figure 4-3 when the printer enters the Setting Mode.
   Press the FEED Switch the number of times corresponding to the selected MS number, and then press the POWER Switch.

```
[MS Selection]
0 : Exit
1 : MS1
2 : MS2
3 : MS3
4 : MS4
5 : MS5
6 : MS6
7 : MS7
8 : MS13
9 : MS17
10: MS18
11: I/F Setting
12: International Character
13: Character Code Table
14: Default Setting
Press the FEED switch an equal
number of times to the selected number.
After that, press the POWER SW.
```

・When pressing the FEED Switch once, "1 : MS1" is selected.
・When pressing the POWER Switch without pressing the FEED Switch, "0 : Exit" is selected.

Figure 4-3   MS Selection Message

- For "11: I/F Setting", the items to be set are different for each interface.

  - USB Interface

```
[Function selection of I/F Setting]
0 : Return to MS selection.
1 : LAN Factory Default Setting
Press the FEED switch an equal
number of times to the selected number.
After that, press the POWER SW.
```

The USB Device Class can be changed.

  - Ethernet Interface

```
[Function selection of I/F Setting]
0 : Return to MS selection.
1 : LAN Factory Default Setting
Press the FEED switch an equal
number of times to the selected number.
After that, press the POWER SW.
```

Communication settings can be initialized.

  - Bluetooth Interface

```
[Function selection of I/F Setting]
0 : Return to MS selection.
1 : Auto Connection
2 : Security Mode
3 : Inquiry Response
4 : Association model
Press the FEED switch an equal
number of times to the selected number.
After that, press the POWER SW.
```

The Bluetooth setting can be changed.

5. A message for selecting the function assigned to the selected MS is printed as a sample shown in Figure 4-4.
Press the FEED Switch the number of times corresponding to the selected function number, and then press the POWER Switch.

```
[Function selection of MS1]
0 : Return to MS selection.
1 : Standby LED
2 : Auto Activation by AC
3 : Power SW
Press the FEED switch an equal
number of times to the selected number.
After that, press the POWER SW.
```

・When pressing the FEED Switch once, "1 : Standby LED" is selected.
・When pressing the POWER Switch without pressing the FEED Switch,
 "0 : Return to MS Selection" is selected.

**Figure 4-4　Function Selection Message
(Example: Selected MS1)**

6. A message for selecting the setting value of the selected function is printed as a sample shown in Figure 4-5.
    Press the FEED Switch the number of times corresponding to the selected setting value number, and then press the POWER Switch.

```
[Standby LED]
0 : Return to function selection.
1 : Aqua
2 : Green
3 : Off
4 : Blue
Press the FEED switch an equal
number of times to the selected number.
After that, press the POWER SW.
```

・When pressing the FEED Switch twice, "2 : Green" is selected.

**Figure 4-5   Setting Value Selection Message
(Example: Selected Standby LED)**

7. A message for confirming the selected setting value is printed as a sample shown in Figure 4-6.

```
[Standby LED]
Set Green
Save setting    : Feed SW
Discard setting : Power SW
```

**Figure 4-6   Setting Value Confirmation Message
(Example: Selected Green)**

Press the FEED Switch to save the setting value to the memory. Figure 4-3 is printed.

Press the POWER Switch to discard the selected item. A message of function selection is printed as a sample shown in Figure 4-4. If select "0 : Return to MS Selection" there, function selection is not performed, and Figure 4-3 is printed.

To continue to set functions, return to 4.

8. To exit the Setting Mode, select "0 : Exit" in Figure 4-3.
    The test print and Figure 4-2 printing start again. Verify that the functions are properly set.

4.2 FUNCTION SETTINGS (MS)

Details of each function are described below. The value shown in the shaded cell (in bold) in the table is set at the shipping.

(NOTE) Be sure to configure the setting or the value as instructed when "Fixed" is stated in the table.
For reserved area, be sure to set the specified value. Otherwise, the printer may not work correctly or may crush. Reserved values may be changed.

1. General Setting 1 (MS1)

    Sets the printer and selects the peripheral device.

    - Standby LED Selection (MS1-4)
      The LED color in the standby mode can be selected.

    - Auto Activation by AC Selection (MS1-7)
      When this function is enabled, inserting the AC cable of the specified AC adapter into a socket can turn on the printer.

    - POWER Switch Function Selection (MS1-8)
      Enables or disables the POWER Switch of the printer.

Table 4-1   General Setting 1 (MS1)

MS	Function	Value	
		0	**1**
1-1 to 3	Reserved	-	**Fixed**
1-4 to 5	Standby LED Selection (Standby LED)	See Table 4-2	
1-6	Reserved	-	**Fixed**
1-7	Auto Activation by AC Selection (Auto Activation by AC)	Disable	**Enable**
1-8	POWER Switch Function Selection (Power SW)	Disable	**Enable**

Table 4-2   Standby LED Selection (MS1-4 to 5)

MS2-2	MS2-1	Standby LED
0	**0**	Aqua
0	1	Green
1	0	Off
1	**1**	**Blue**

2. General Setting 2 (MS2)

Sets the external buzzer of when an error occurs.

- Buzzer Count Selection (MS2-1 to 2)
  The beeping times can be selected.

- Buzzer Pattern Selection (MS2-3 to 4)
  The buzzer pattern can be selected.

- Buzzer Volume Selection (MS2-5)
  The buzzer volume can be selected.
  Low: Beeps at buzzer drive frequency 1kHz.
  Loud: Beeps at buzzer drive frequency 4kHz.

Table 4-3   General Setting 2 (MS2)

MS	Function	Value	
		0	**1**
2-1 to 2	Buzzer Count Selection (Buzzer Count)	See Table 4-4	
2-3 to 4	Buzzer Pattern Selection (Buzzer Pattern)	See Table 4-5	
2-5	Buzzer Volume Selection (Buzzer Volume)	Low	**Loud**
2-6 to 8	Reserved	-	**Fixed**

Table 4-4   Buzzer Count Selection When Error Occurs (MS2-1 to 2)

MS2-2	MS2-1	Buzzer Count
0	**0**	**None**
0	1	Once
1	0	Thrice
1	1	Continue

Table 4-5   Buzzer Pattern Selection When Error Occurs (MS2-3 to 4)

MS2-4	MS2-3	Buzzer Pattern
0	**0**	**Pattern1**
0	1	Pattern2
1	0	Pattern3
1	1	Pattern4

3. General Setting 3 (MS3)

    Sets the external buzzer of when cut process completes.

    - Buzzer Count Selection (MS3-1 to 2)
      The beeping times can be selected.

    - Buzzer Pattern Selection (MS3-3 to 4)
      The buzzer pattern can be selected.

    - Buzzer Volume Selection (MS3-5)
      The buzzer volume can be selected.
      Low: Beeps at buzzer drive frequency 1kHz.
      Loud: Beeps at buzzer drive frequency 4kHz.

Table 4-6   General Setting 3 (MS3)

MS	Function	Value	
		0	**1**
3-1 to 2	Buzzer Count Selection (Buzzer Count)	See Table 4-7	
3-3 to 4	Buzzer Pattern Selection (Buzzer Pattern)	See Table 4-8	
3-5	Buzzer Volume Selection (Buzzer Volume)	Low	**Loud**
3-6 to 8	Reserved	-	**Fixed**

Table 4-7   Buzzer Count Selection When Cut Process Completes (MS3-1 to 2)

MS3-2	MS3-1	Buzzer Count
0	**0**	**None**
0	1	Once
1	0	Thrice
1	1	Five Times

Table 4-8   Buzzer Pattern Selection When Cut Process Completes (MS3-3 to 4)

MS3-4	MS3-3	Buzzer Pattern
0	**0**	**Pattern1**
0	1	Pattern2
1	0	Pattern3
1	1	Pattern4

4. General Setting 4 (MS4)

Selects the printer drive method.

- Number of Dots Selection for Fixed Division and Dynamic Division (MS4-1 to 2)
  Fixed 2-division is set automatically when the fixed division is selected.
  The maximum number of simultaneously activated dots can be selected when the dynamic division is selected.
  Set the number of dots for the dynamic division corresponding to the host environment to avoid the voltage drop during printing when Powered USB cable is used.

- Division Drive Method Selection (MS4-3)
  Fixed division or dynamic division can be selected for the thermal head drive method.

- Paper Width Selection (MS4-4)
  The paper width to use can be selected.

- Number of Effective Dots Selection (MS4-5)
  The number of printable dots in 1 dot-line can be selected.

- Maximum Print Speed Selection (MS4-7)
  The maximum printing speed can be selected in 3 levels.

  High: Drives at the maximum print speed of 250 mm/s.
  Middle (Silent):   Decreases the maximum print speed to 150mm/s to print silently.
  Middle (Quality): Decreases the maximum print speed for printing image to 200mm/s to improve the print quality.
                     Printing of image includes the following:
                     Raster bit image, graphics data stored in print buffer, NV graphics, downloaded bit image, bit image mode, barcode, two-dimensional barcode
                     Printing in the page mode, the whole page is regarded as image.

The speed may be lower than the selected maximum speed due to the thermal head driving method, environmental temperature, communication method, and so on.

Table 4-9   General Setting 4 (MS4)

MS	Function	Value	
		0	1
4-1 to 2	Number of Dots Selection for Fixed Division and Dynamic Division (Division Method)	See Table 4-10	
4-3	Division Drive Method Selection (Head Drive)	Fixed	**Dynamic**
4-4	Paper Width Selection (Paper Width)	58 mm	**80 mm**
4-5	Number of Effective Dots Selection (Number of Effective Dots)	512/360 dots	**576/432 dots**
4-6	Reserved	-	**Fixed**
4-7 to 8	Maximum Print Speed Selection (Print Speed)	See Table 4-11	

Table 4-10 Number of Dots Selection for Fixed Division and Dynamic Division (MS4-1 to 2)

MS4-2	MS4-1	Number of Dots Selection for Fixed Division and Dynamic Division
0	0	Fixed 2-division / dynamic 96 dots[*] (2 div. / 96 dots)
0	1	Fixed 2-division / dynamic 144 dots (2 div. / 144 dots)
1	0	Fixed 2-division / dynamic 144 dots (2 div. / 144 dots)
1	**1**	**Fixed 2-division / dynamic 288 dots (2 div. / 288 dots)**

[*]: When dynamic 96 dots is selected, the print ratio should be 50% or less.
  Otherwise, the print result may degrade.

Table 4-11 Maximum Print Speed Selection (MS4-7 to 8)

MS4-8	MS4-7	Maximum Print Speed Selection
0	0	Reserved
0	1	Middle (Quality)
1	0	Middle (Silent)
1	**1**	**High**

5.   General Setting 5 (MS5)

Sets various responses, data processing, and operations.

- Automatic Status Response Selection (MS5-1)
  Enables or disables the automatic status response function.

- Initialized Response Selection (MS5-2)
  Enables or disables the initialized response function.

- Data Discard Selection When Error Occurs (MS5-3)
  Enables or disables data discarding of when an error occurs or in the return-waiting state.
  Once this function is enabled, printing data and the following commands are discarded when an error occurs or in the return-waiting state.

  Commands to be discarded : paper feed commands, paper cut commands, execution response request command

---

(NOTE)   **When an error occurs during command processing while the Data Discard Selection When Error Occurs is enabled, the command processing does not end until all the remaining data is received. When the data remains during command processing at the time of error occurrence, send all the remaining data before entering the next command.**

- Data Discard Selection When Output Buffer Full Occurs (MS5-4)
  Enables or disables discarding of the subsequent response data when the response data of the printer is not received to the host and its data size exceeds the capacity of output buffer in the printer (256 bytes).
  When the host does not receive data from the printer, enable this setting.

(NOTE)   **When the response data from the printer is used by the host, and data discarding is enabled, the data may be missed when the output buffer is full. Therefore, the data must be received regularly.**

- Initialization Performance Selection After Paper Setting (MS5-6 to 7)
  When Initial cut is selected, the initialization operation is performed in the order of feeding paper approximately 20 mm and cutting the thermal paper, after paper setting.
  When Stamp & cut is selected, the initialization operation of "Stamp & cut" command (GS 'Y') is performed after paper setting.
  Even when Initial cut or Stamp & cut is selected, the Stamp & cut operation is not performed when thermal paper is inserted at power on or reset.

(NOTE)   **With Stamp & Cut, since graphics printing is stopped and paper is cut during printing, the print may become corrupt.**

- Cutting Mode Selection After Paper Setting (MS5-8)
  When Initialization Performance Selection After Paper Setting is enabled, whether to perform cutting operation by full cut or partial cut in the paper set initialization operation can be selected.

Table 4-12   General Setting 5 (MS5)

MS	Function	Value	
		0	1
5-1	Automatic Status Response Selection (Auto Status Back)	**Enable**	Disable
5-2	Initialized Response Selection (Init. Response)	**Enable**	Disable
5-3	Data Discard Selection When Error Occurs (Error Through)	**Enable**	Disable
5-4	Data Discard Selection When Output Buffer Full Occurs (Response Data Discarding)	Enable	**Disable**
5-5	Reserved	-	**Fixed**
5-6 to 7	Initialization Performance Selection After Paper Setting (Paper Set Handle)	See Table 4-13	
5-8	Cutting Mode Selection After Paper Setting (Cutting Method)	Partial cut (Partial)	**Full cut (Full)**

Table 4-13   Initialization Performance Selection After Paper Setting (MS5-6 to 7)

MS5-7	MS5-8	Initialization Performance Selection After Paper Setting
0	0	Disable
0	1	Stamp & Cut (Stamp&Cut)
1	**0**	**Initial cut (Standard)**
1	1	Disable

6. General Setting 6 (MS6)

- Print Density Selection (MS6-1 to 8)
  The print density can be selected.

Table 4-14 General Setting 6 (MS6)

MS	Function	Value	
		0	**1**
6-1 to 8	Print Density Selection (Print Density)	See Table 4-15	

Table 4-15 Print Density Selection (MS6-1 to 8)

MS6-8	MS6-7	MS6-6	MS6-5	MS6-4	MS6-3	MS6-2	MS6-1	Print Density Selection
0	0	0	0	0	0	0	0	70%
0	0	0	0	0	0	0	1	75%
0	0	0	0	0	0	1	0	80%
0	0	0	0	0	0	1	1	85%
0	0	0	0	0	1	0	0	90%
0	0	0	0	0	1	0	1	95%
0	**0**	**0**	**0**	**0**	**1**	**1**	**0**	**100%**
0	0	0	0	0	1	1	1	105%
0	0	0	0	1	0	0	0	110%
0	0	0	0	1	0	0	1	115%
0	0	0	0	1	0	1	0	120%
0	0	0	0	1	0	1	1	125%
0	0	0	0	1	1	0	0	130%
Other than those above								Prohibition

(NOTE) **Excessive printing energy may shorten the life of the thermal head or may cause a paper feed problem, so set the thermal paper selection and print density selection accurately. If the thermal paper to use is different from the one selected, or the print density selection is other than 100%, the reliability of the product specification may not be satisfied.**

7. General Setting 7 (MS7)

- Thermal Paper Selection (MS7-1 to 8)
  The thermal paper to use can be selected.

Table 4-16 General Setting 7 (MS7)

MS	Function	Value	
		0	1
7-1 to 8	Thermal Paper Selection (Thermal Paper)	See Table 4-17	

Table 4-17　Thermal Paper Selection (MS7-1 to 8)

MS7-8	MS7-7	MS7-6	MS7-5	MS7-4	MS7-3	MS7-2	MS7-1	Thermal Paper Selection
0	0	0	0	0	0	0	0	Standard
0	0	0	0	0	0	0	1	TP50KR-2Y
0	0	0	0	0	0	1	0	PD160R
0	0	0	0	0	0	1	1	TP60KS-E
0	0	0	0	0	1	0	0	P220VBB-1
0	0	0	0	0	1	0	1	Alpha400-2.1
0	0	0	0	0	1	1	0	KT48FA
Other than those above								Prohibition

(NOTE) **Excessive printing energy may shorten the life of the thermal head or may cause a paper feed problem, so set the thermal paper selection and print density selection accurately. If the thermal paper to use is different from the one selected, or the print density selection is other than 100%, the reliability of the product specification may not be satisfied.**

8. Reserved (MS8 to 12)

MS8 to 12 are all reserved. To write all 40 bytes, send 00H 00H 2CH 01H 18H as values of MS8 to 12.

9. General Setting 13 (MS13)

Selects the Kanji code system and 180° reverse function.

- Kanji Code System Selection (MS13-1)
  The initial Kanji code system can be set to the JIS code or Shift-JIS code system.

- 180° Reverse Function Selection (MS13-2)
  The character print direction and start point in the initial page mode can be set. When this function is enabled, the start point in the page mode is placed in the lower right. See "Select Print Direction in Page Mode" command (ESC 'T') for details of the print direction and start point.

- Realtime Command Selection (MS13-3)
  Enables or disables processing of realtime command.
  Realtime commands are ignored when Disable is selected.

  The following realtime commands are affected by this setting:

  "Generate Pulse in Real Time" command (DLE DC4 fn m t)
  "Clear Buffer at Error" command (DC3 '(' 'c' 'l' 'r' ')')
  "Printer Reset" command (DC3 '(' 'r' 'e' 's' 'e' 't' DC3 'r' 'e' 's' 'e' 't' ')')
  "Stop External Buzzer" command (DEL DC4 fn a n r t1 t2)
  "Send Status Data in Real Time" command(DEL EOT n)

> **(NOTE)** When the image data contains the code line matching the code that constitutes a realtime command, use this setting to disable realtime commands.

Table 4-18 General Setting 13 (MS13)

MS	Function	Value	
		0	**1**
13-1	Kanji Code System Selection (Kanji Code)	Shift-JIS code	**JIS code**
13-2	180° Reverse Function Selection (Reverse Function)	Enable	**Disable**
13-3	Realtime Command Selection (Realtime Command)	Disable	**Enable**
13-4 to 8	Reserved	-	**Fixed**

10. Reserved (MS14)

MS14 is reserved. To write all 40 bytes, send F8H as a value of MS14.

11. International Character Selection (MS15)

A value corresponding to the international character set can be selected.

Table 4-19   International Character Set

n	Country	n	Country
0	USA	9	Norway
1	France	10	Denmark II
2	Germany	11	Spain II
3	United Kingdom	12	Latin America
4	Denmark I	13	Prohibition[*]
5	Sweden	14	Prohibition[*]
6	Italy	15	Prohibition[*]
7	Spain I	16	Prohibition[*]
8	Japan	17	Arabia

*1: The setting is ignored when the prohibition is selected.

When a number not assigned to the international character is selected, USA is set. For the international character selection, see the "Select International Character Set" command (ESC 'R').

Table 4-20   International Character Selection (MS15)

MS	Function	Number of Bytes	Definition Range	Default Setting
15	International Character Selection (International Character)	1 byte	0 to 255	**0**

12. Character Code Table Setting (MS16)

A value corresponding to the character code table number can be selected.
The character code table number is the number shown in Table 4-21.

Table 4-21　Character Code Table

Character Code Table No.	Character Set
0	USA, Standard Europe (Code Page437)
1	Katakana
2	Multilingual (Code Page850)
3	Portuguese (Code Page860)
4	Canadian-French (Code Page863)
5	Nordic (Code Page865)
13	Turkish (Code Page857)
14	Greek (Code Page737)
16	Latin (Code Page1252)
17	Russian (Code Page866)
18	Eastern Europe (Code Page852)
19	Euro (Code Page858)
34	Cyrillic (Code Page855)
37	Arabic (Code Page864)
45	Central European (Code Page1250)
46	Cyrillic (Code Page1251)
47	Greek (Code Page1253)
48	Turkish (Code Page1254)
255	User page

When a number not assigned to the character code table is selected, the character code table number is set to 0 (USA, Standard Europe). For the character code table, see the "Select Character Code Table" command (ESC 't').

Table 4-22　Character Code Table Setting (MS16)

MS	Function	Number of Bytes	Definition Range	Default Setting
16	Character Code Table Setting (Character Code Table)	1 byte	0 to 255	**0**

13. General Setting 17 (MS17)

- Paper Saving Setting (MS17-1 to 2)
  Space between lines and line spacing can be reduced without decreasing the size of character or graphic.

  Mode1:   Space between lines and line spacing are decreased to 0 dots.
  Mode2:   Space between lines and line spacing are decreased to 2 dots.
  Mode3:   Space between lines and line spacing are decreased to 4 dots.
  Disable: No decrease.

(NOTE) **Paper saving is not performed to blank lines contained in the graphics printing data.**

This function is only valid for character printing in standard mode.

When the following 2 conditions are met, the printer feeds paper by decreased dot-lines from the last print position, and then cuts the paper.

・"Cut Paper" command (GS 'V') is transmitted.

・Line feed or space between lines exists after the last printed line.

- Feed Backward Setting After Paper Cutting (MS17-3)
  After paper cutting, before the command accompanying the next printing or paper feeding is executed, the paper is fed backward for 60 dots. The margin from the cut position to the print start position can be reduced up to about 2 mm.
  The paper is not fed backward by partial cutting.

Table 4-23 General Setting 17 (MS17)

MS	Function	Value	
		0	1
17-1 to 2	Paper Saving Setting (Paper Saving)	See Table 4-24	
17-3	Feed Backward Setting After Paper Cutting (Backfeed After Cut)	Enable	**Disable**
17-4 to 8	Reserved	-	**Fixed**

Table 4-24 Paper Saving Setting (MS17-1 to 2)

MS17-2	MS17-1	Paper Saving Setting
0	0	Mode1
0	1	Mode2
1	0	Mode3
1	**1**	**Disable**

14. General Setting 18 (MS18)

Sets the external buzzer to beep with "Generate Pulse" command (ESC 'p') and "Generate Pulse in Real Time" command (DLE DC4 fn).

- Buzzer Count Selection (MS18-1 to 2)
  The beeping times can be selected.

- Buzzer Pattern Selection (MS18-3 to 4)
  The buzzer pattern of can be selected.

- Buzzer Volume Selection (MS18-5)
  The buzzer volume can be selected.
  Low: Beeps at buzzer drive frequency 1kHz.
  Loud: Beeps at buzzer drive frequency 4kHz.

Table 4-25 General Setting 18 (MS18)

MS	Function	Value	
		0	1
18-1 to 2	Buzzer Count Selection (Buzzer Count)	See Table 4-26	
18-3 to 4	Buzzer Pattern Selection (Buzzer Pattern)	See Table 4-27	
18-5	Buzzer Volume Selection (Buzzer Volume)	Low	**Loud**
18-6 to 8	Reserved	-	**Fixed**

Table 4-26　Buzzer Count Selection (MS18-1 to 2)

MS18-2	MS18-1	Buzzer Count
0	**0**	**None**
0	1	Once
1	0	Thrice
1	1	Five Times

Table 4-27　Buzzer Pattern Selection (MS18-3 to 4)

MS18-4	MS18-3	Buzzer Pattern
0	**0**	**Pattern1**
0	1	Pattern2
1	0	Pattern3
1	1	Pattern4

15. Reserved (MS19 to 38)

MS19 to 38 are all reserved. To write all 40 bytes, send FFH as values of MS19 to 38.

16. Bluetooth Setting (MS39)

MS39 is enabled only when executing data input/output by Bluetooth.

- iOS Auto Connection Selection (MS39-1)
  Once this function is enabled and when iOS device connection is disconnected, the printer tries to reconnect to the iOS device last connected.
  Use this function when using the printer exclusively with a specific iOS device.
  Disable this function when using the printer with multiple iOS devices.
  When the iOS device to use is changed, disable this function once and enable it after pairing is completed.

- Security Mode Selection (MS39-2)
  As the security mode, SSP (Mode4, Just Works) or PIN Code (Mode2) can be selected. Even when SSP is selected, the printer is paired by PIN code if the Bluetooth host device does not support SSP.
  PIN code can be set by "Set Communication Default Value" command (DC2 'i').
  Set this function to SSP usually.

- Inquiry Response Selection (MS39-3)
  The Response function to a search from the Bluetooth host device can be selected.
  When Always is selected, the printer always responds to the search from the Bluetooth host device, so pairing is always available.
  When Pairing Mode is selected, the printer enters pairing mode for about 60 seconds by pushing the POWER Switch for 7 seconds or more with the printer off state. During the pairing mode, the LED blinks twice per second. During this time, pair the printer with the host device.

- Association Model Selection (MS39-4)
  As the SSP association model, Just Works or Numeric Comparison can be selected.
  When Numeric Comparison is selected, the printer prints a 6-digit authentication code when pairing with the Bluetooth host. When thermal paper is not loaded in the printer, the pairing is canceled due to out-of-paper error.
  Confirm that the printed authentication code corresponds with the code displayed on the Bluetooth host, and approve the Bluetooth host.
  The pairing is completed when the FEED Switch on the printer is pressed.
  The pairing is canceled when the POWER Switch on the printer is pressed.
  When neither switch is pressed, the printer times out in about 30 seconds and cancels the pairing.

- Reserved (MS39-5 to 8)

Table 4-28   Bluetooth Setting (MS39)

MS	Function	Value	
		0	1
39-1	iOS Auto Connection (Auto Connection)	**Enable**	Disable
39-2	Security Mode Selection (Security Mode)	PIN code (PIN)	**SSP**
39-3	Inquiry Response Selection (Inquiry Response)	Always	**Pairing Mode**
39-4	Association Model Selection (AssocModel)	Numeric Comparison	**Just Works**
39-5 to 8	Reserved	-	**Fixed**

4.3 TEST PRINT

The printer can perform a test print.
In the test print, the firmware version, the MS setting values, etc. are printed.

1. Load thermal paper in the printer.
   Ensure that no error occurs, and then turn off the printer.

2. Hold the FEED Switch down and press the POWER Switch, then release the POWER Switch first.
   Release the FEED Switch when the test print has been started.

3. After the test print, the printer cuts the thermal paper and returns to the print-ready status.

```
RP series Interface
RP-F10 [ Ver X.XX ]
  DD.MMM.YYYY
Copyright(C):SII

* MS1 *
4-5)Standby LED:Blue
7)  Auto Activation by AC:Enable
8)  Power SW:Enable

* MS2 *
1-2)Buzzer Count:None
3-4)Buzzer Pattern:Pattern1
5)  Buzzer Volume:Loud

* MS3 *
1-2)Buzzer Count:None
3-4)Buzzer Pattern:Pattern1
5)  Buzzer Volume:Loud

* MS4 *
1-2)Division Method:288[dots]
3)  Head Drive:Dynamic
4)  Paper Width:80[mm]
5)  Effective Dots:576[dots]
7-8)Print Speed:High

* MS5 *
1)  Auto Status Back:Enable
2)  Init. Response:Enable
3)  Error Through:Enable
4)  Response Data Discarding:Disable
6-7)Paper Set Handle:Standard
8)  Cutting Method:Full

* MS6 *
1-8)Print Density:100[%]

* MS7 *
1-8)Thermal Paper:Standard

* MS13 *
1)  Kanji Code:JIS Code
2)  Reverse Function:Disable
3)  Realtime Command:Enable

* MS17 *
1-2)Paper Saving:Disable
3)  Backfeed After Cut:Disable

* MS18 *
1-2)Buzzer Count:None
3-4)Buzzer Pattern:Pattern1
5)  Buzzer Volume:Loud

* Communication Type *
 USB Communication
 Control Model:RP-F10
 USB Device Class:Printer

* Font Information *
 Character Code Table:Code Page437
 International Character:USA

* Serial Number Information *
 XXXXXXXXXX
```

Figure 4-7 Test Print Sample

CHAPTER 5

LED INDICATION AND SWITCH FUNCTION

5.1 PRINTER STATUS LED INDICATION

This printer shows its status with a LED.

The printer statuses are shown in Table 5-1.

Table 5-1   Printer Status

Printer Status	LED (Color)[*1]	LED (Lighting Pattern)
Power off	-	Off
Power on (print-ready)	Blue[*2]	On[*2]
Printing	Green	On
Waiting for test print	Green	Blink-2
Output buffer full	Green	Blink-1
Out-of-paper error	Lime yellow	Blink-1
Cover open error	Lime yellow	On
Hardware error	Red	On
Head temperature error	Purple	On
Voltage error	Purple	Blink-1
Cutter error	Purple	Blink-2
Pairing mode	Blue	Blink-2
Rewriting firmware	White	On

*1: The color tone may vary depending on the individual difference of the products and the viewing angle.
*2: The value at the shipping

Table 5-2   LED Blink Pattern

Status	Pattern
Blink-1	0.2s 0.8s
Blink-2	0.1s 0.1s 0.7s
Blink-3	0.1s 0.1s

5.2 ERROR AND RECOVERY PROCEDURE

When an error occurs, the printer stops printing operation. However, the data receiving is enabled. The table below shows errors and their recovery procedures.

Table 5-3   Error and Recovery Procedure

Error	Detail	Recovery Procedure	Priority[*]
Return-waiting	The printer becomes this state after releasing out-of-paper error, cover open error, cutter error or voltage error.	The return-waiting state is released 1 second later, and the printer becomes print-ready state.	-
Output buffer full	Output buffer of the printer is full.	Read response data from the host device.	1
Out-of-paper error	There is no thermal paper.	Open the paper cover, load thermal paper, and then close the paper cover.	2
Cover open error	The paper cover is open.	Close the paper cover.	3
Cutter error	Cut failure due to paper jam at cutting.	Open the paper cover to remove the error cause and close the paper cover, the printer automatically recovers. If the paper cover is not open or the printer does not automatically recover, see "Cutter Error Treatment" in the USER'S GUIDE.	4
Voltage error	The power voltage is out of the allowable range.	The printer automatically recovers when the voltage is returned to the allowable range.	5
Head temperature error	Head temperature rises to 85°C (185°F) or higher.	The printer automatically recovers when head temperature becomes 80°C (176°F) or lower.	6
Hardware error	An abnormality occurs in the thermal head or the circuit board.	Recovery is not possible. Request for repair.	7

*: This indicates the priority when multiple errors occur simultaneously. The bigger number indicates higher priority.
  For example, when "Cover open error" and "Out-of-paper error" occur simultaneously, the LED shows "Cover open error" which has the higher priority.

5.3 SWITCH

There are 2 switches, the POWER Switch and the FEED Switch on this printer.

5.3.1 POWER Switch

The printer can be turned on/off by POWER Switch.
To turn on the printer, hold down the POWER Switch until the LED lights up.
To turn off the printer, hold down the POWER Switch until the LED turns off.

> **(NOTE)** **Always use the POWER Switch to turn off the printer. When the printer is turned off by removing AC adapter, the memory may be damaged.**

5.3.2 FEED Switch

The thermal paper can be fed by FEED Switch.
The printer feeds a small amount of thermal paper by pressing the FEED Switch once. The thermal paper is fed continuously by holding down the FEED Switch.

> **(NOTE)** **When an error occurs, the printer does not feed paper by FEED Switch.**

CHAPTER 6
COMMAND FUNCTIONS

6.1 CHARACTER CODES AND COMMANDS

The character code range and user-defined character codes differ between when Kanji mode is selected with the "Specify Kanji Mode" command (FS '&') after selecting JIS code system with the "Select Kanji Code System" command (FS 'C'), and when Shift-JIS code system is selected.

6.1.1 JIS Code System

In order to print 2-byte characters by JIS code system, select JIS code system with the "Select Kanji Code System" command (FS 'C'), and then specify 2 bytes character code after selecting Kanji mode with the "Specify Kanji Mode" command (FS '&').
A command functions as character code of 1-byte code system character, or either of the 1st byte or the 2nd byte of character code of 2-byte code system character.
When a command is input with a character code of 2-byte code system character, the next data is always processed as the 1st byte. However, the next data is character code of 1-byte code system character for the "Cancel Kanji Mode" command (FS '.').
When a command is input with the 2nd byte of character code of 2-byte code system character, the data up to the 1st byte is ignored.

(1)   Character codes of 1-byte code system character

00H to 1FH:	The following codes are processed as commands. The other codes are ignored. 09H(HT), 0AH(LF), 0CH(FF), 0DH(CR), 10H(DLE), 12H(DC2), 13H(DC3), 18H(CAN), 1BH(ESC), 1CH(FS), 1DH(GS)
20H to 7EH:	Character code
7FH:	Ignored
80H to FEH:	Character code
FFH:	Depends on the character set. For the Codepage 1250 to 1254 character sets and the user-defined character, it is processed as a character code. For character sets other than above, it is ignored.

(2) Character code of 2-byte code system character

2-byte character is specified with 2 bytes character code.

(a) The 1st byte

00H: 1-byte code system character area
Specify the character code of 1-byte code system character with the 2nd byte.

21H to 76H: 2-byte character area

77H: User-defined character area

78H to 7EH: 2-byte character area

93H to 97H: 2-byte character area

The codes other than above are ignored when they are not commands. The data to be received next is processed as the 1st byte.

(b) The 2nd byte

(When the 1st byte is 00H)

20H to 7EH: Processed as the 1-byte code system character.

80H to FEH: Processed as the 1-byte code system character.

FFH: Depends on the character set.
For the Codepage 1250 to 1254 and the user-defined character, it is processed as a 1-byte code system character.
For character sets other than above, it is ignored with the 1st byte.

(When the 1st byte is other than 00H)

21H to 7EH: Processed as the 2nd byte of a 2-byte character.

The codes other than above are ignored with the 1st byte when they are not commands. The data to be received next is processed as the 1st byte.

The codes not defined as JIS code system or special characters within the 2-byte character area are processed as 2-byte spaces.

6.1.2 Shift-JIS Code System

When Shift-JIS code system is selected with the "Select Kanji Code System" command (FS 'C'), Kanji characters can be printed with 2 bytes character code without entering the "Specify Kanji Mode" command (FS '&').

A command functions either as a character code of 1-byte code system character or the 2nd byte of character code of 2-byte code system character.
When a command is input with the 2nd byte of character code of 2-byte code system character, the 1st byte is ignored.

(1) Character codes of 1-byte code system character

00H to 1FH:	The following codes are processed as commands. The other codes are ignored. 09H(HT), 0AH(LF), 0CH(FF), 0DH(CR), 10H(DLE), 12H(DC2), 13H(DC3), 18H(CAN), 1BH(ESC), 1CH(FS), 1DH(GS)
20H to 7EH:	Character code
7FH:	Ignored
80H to FEH:	See (2).
FFH:	Depends on the character set. For the Codepage 1250 to 1254 character sets and the user-defined character, it is processed as a character code. For character sets other than above, it is ignored.

(2) Character codes of 2-byte code system character

2-byte character is specified with 2 bytes character code.

(a) The 1st byte

81H to 9FH:	2-byte character area
E0H to EBH:	2-byte character area
ECH:	User-defined character area
EDH to EFH:	2-byte character area
FAH to FCH:	2-byte character area

The codes 80H to FEH other than above are processed as 1-byte code system characters.

(b) The 2nd byte

40H to 7EH:	Processed as the 2nd byte of Shift-JIS code.
80H to FCH:	Processed as the 2nd byte of Shift-JIS code.

The codes other than above are ignored with the 1st byte when they are not commands.

The codes not defined as Shift-JIS code system or special characters within the 2-byte character area are processed as 2-byte spaces.

6.2 FLASH MEMORY

The FLASH memory of the printer allows user-defined characters, downloaded characters, optional fonts, macro function, NV graphics function, downloaded bit image function, User page 1-byte fonts, and User page international characters to be used. The FLASH memory consists of the following areas.

System area: Stores data for controlling system.

Font area: Stores font data such as Kanji.

User area: Stores user-defined characters, downloaded characters, optional fonts, macros, NV graphics, downloaded bit images, User page 1-byte fonts, User page international characters, and so on.

The system area is rewritten using commands, such as "Change Function Settings" command (DC2 'k', DC2 'w') and "Save Maintenance Counter" command (GS 'g' '1').
The font area cannot be rewritten through the download mode selection.
The user area can be rewritten using registration commands for user-defined characters, downloaded characters, optional fonts, macro function, NV graphics function, downloaded bit image function, User page 1-byte fonts, User page international characters, and so on.
The memory capacity of the user area is 1048576 bytes. When using registration commands, it is necessary to know the remaining memory capacity beforehand. Read this section for the remaining memory capacity.

(1)   Memory area

The printer allocates or releases the memory area in order to change the use of the memory in the user area and its capacity.
Allocating the memory area means that the memory is divided into the specified capacity (bytes) so as to be exclusively used for a certain function.
And releasing the memory area is to disable the division of the memory that the certain function has used. The released memory area is not reused until the "Initialize User Area" command (DC2 'R') or "Defragment User Area" command (DC2 '*' '1') is executed.
When using user-defined characters, downloaded characters, optional fonts, macro function, NV graphics function, downloaded bit image function, User page 1-byte fonts, and User page international characters, the remaining memory capacity must not be exceeded.
Moreover, the memory capacities for optional fonts, macro function, NV graphics function, and downloaded bit image function are limited to the values as follows. When using these functions, do not exceed the limits.

Font Size	Capacity (Bytes)
Optional font	65536
Macro	2060
NV graphics (per key code)	917504
Downloaded bit image	65536

See the description of each command on how to calculate the memory usage.

Table 6-1 Memory Area After Initialization

Use	Capacity (Bytes)
User-defined characters	9784
Downloaded characters	6184
Optional fonts	0
Macros	0
NV graphics	0
Downloaded bit images	0
User page 1-byte fonts	0
User page international characters	0

For user-defined characters and downloaded characters, the memory area is allocated at the shipping and initialization of the user area.
For optional fonts, macros, NV graphics, downloaded bit images, User page 1-byte fonts, and User page international characters, the memory area is not allocated at the shipping and initialization of the user area, but the area is automatically allocated when the corresponding commands are input.
When registering these, check beforehand that there is sufficient memory remaining capacity.
The remaining memory capacity can be confirmed by the "Send Remaining User Area" command (DC2 '*' '2').
This memory area can be released/allocated with a command, so the memory remaining capacity can be increased for registering other functions.

When the command is normal and the memory area has been allocated, the data is registered.
In the following cases, the data is not correctly registered.

(a) When the command is not normal, that is, when the parameter is out of the definition range, the subsequent data is processed as normal data.

(b) When the command is normal, but the memory area is not allocated or the memory remaining capacity is insufficient, the operation with each command is as follows:

- "Register User-Defined Character" command (FS '2')
  Up to FS '2' is ignored, and the subsequent data is processed as normal data.

- "Register Downloaded Character" command (ESC '&')
  Up to ESC '&' is ignored, and the subsequent data is processed as normal data.

- "Register Optional Font" command (DC2 'P')
  Up to DC2 'P' s e y x is ignored, and the subsequent data is processed as normal data.

- "Register Downloaded Bit Image" command (GS '*')
  Up to GS '*' x y is ignored, and the subsequent data is processed as normal data.

- "Register NV Graphics Data" command (GS '(' 'L', GS '8' 'L')
  All data including the subsequent data is ignored.

- "Start/End Macro Definition" command (GS ':')
  ·When the data is registered more than the allocated memory area
   The data beyond the area is processed as normal data.
  ·When the memory remaining capacity is less than 4 bytes
   Up to GS ':' is ignored, and the subsequent data is processed as normal data.

(2) Memory control information

When allocating the area or registering to use each function, the memory control information is always added to the beginning of the allocated area. The number of bytes of memory control information depends on each function.
The number of bytes of memory control information for each function is listed in Table 6-2.

Table 6-2   Number of Bytes of Memory Control Information for Each Function

Function	Number of Bytes
User-defined character	8
Downloaded character	104
Optional font	12
Macro	12
NV graphics	14
Downloaded bit image	12
User page 1-byte font	74
User page international character	11

[Example]

The user-defined character has up to 94 characters for the area of 24 × 3 = 72 bytes and 16 × 2 = 32 bytes, and with 8 bytes of memory control information, the memory capacity to be used therefore becomes as shown below:

(72 + 32) × 94 + 8 = 9784 bytes

When calculating the remaining memory capacity, include the number of bytes of memory control information.
For the optional font, since the memory area is limited to 65536 bytes, the maximum number of bytes of the optional font that can be registered is as follows:

Optional font = 65536 - 12 = 65524 bytes

(3) Precautions for the macro function

The macro function cannot include the commands that involve allocating or releasing the memory area listed in Table 6-3 in macros.

Table 6-3 Commands Involving Allocation or Release of Memory Area

Command	Command Name
DC2 'P'	Register Optional Font
DC2 'Q'	Release Optional Font Area
GS '<'	Start/End Macro Definition
ESC '@'	Register Downloaded Character
DC2 'D'	Release/Allocate Downloaded Character Area
FS '2'	Register User-Defined Character
DC2 'G'	Release/Allocate User-Defined Character Area
GS '(' 'L' GS '8' 'L'	Register NV Graphics Data
GS '(' 'L'	Delete NV Graphics Data in Batch
GS '(' 'L'	Delete Specified NV Graphics Data
GS '*'	Register Downloaded Bit Image
GS 'v'	Print Raster Bit Image
DC2 '*' '1'	Defragment User Area
DC2 'R'	Initialize User Area

When there is a command shown in Table 6-3 during macro definition, the definition is canceled and the macro being defined is deleted.

(4) Memory management

1. Usage status of the user area in the FLASH memory

The user area in the FLASH memory has the following 3 usage states:

- In use state
- Used state
- Unused state
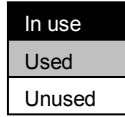
In use
Used
Unused

The memory area other than allocated for user-defined character and downloaded character is in "Unused state" at the shipping.

When a data is registered in the user area, the user area turns to "In use state" as described in the figure below. When the data in use state is released, the area turns to "Used state". This area cannot be reused as it is.

[1] State at the shipping

| Allocated memory area for user-defined character |
| Allocated memory area for downloaded character |
| Unused state |

[2] State that a data is registered

| Allocated memory area for user-defined character |
| Allocated memory area for downloaded character |
| Data (1) In use state |
| Unused state |

[3] State that the registered data is released

| Allocated memory area for user-defined character |
| Allocated memory area for downloaded character |
| Data (1) Used state |
| Unused state |

[4] State that the registration and release are repeated

| Allocated memory area for user-defined character |
| Allocated memory area for downloaded character |
| Data (1) Used state |
| Data (2) In use state |
| Data (3) In use state |
| Data (4) Used state |
| Data (5) In use state |
| Unused state |

[5] State that the "Defragment User Area" command (DC2 '*' '1') is executed

| Allocated memory area for user-defined character |
| Allocated memory area for downloaded character |
| Data (2) In use state |
| Data (3) In use state |
| Data (5) In use state |
| Unused state |

"Data (1)" - "Data (5)" in this figure are the data other than User-defined character and downloaded character.

When data registration and release are repeated, the memory state turns to the [4] state in the figure. In order to use the "Used state" area again, execute the "Defragment User Area" command (DC2 '*' '1'). When the unused state area is less than the amount of data to be registered next time, issuing a registration command automatically executes the user area defragmentation. The [5] shows the memory state after defragmented.

Execute the "Send Remaining User Area" command (DC2 '*''2') to check the current memory empty capacity.
By the "Send Remaining User Area" command (DC2 '*''2'), the printer sends the current memory capacity which is in an unused state.

2. Precautions during rewriting, releasing and allocating in the FLASH memory area

While registering the commands (user-defined character, downloaded character, optional font, macro, NV graphics, downloaded bit image, User page 1-byte font, and User page international character), when the data is already registered in the area, the registered data and the data to be newly registered are compared. And when they are equal, overwriting is not performed.
As for the remaining memory capacity, check it by the "Send Remaining User Area" command (DC2 '*' '2').

The FLASH memory can be rewritten approximately 100000 times. In order to effectively use the number of rewritable times, execute the "Defragment User Area" command (DC2 '*' '1') only after the free area of memory becomes low.

Do not turn off the power while executing the command invloving writing or deleting to the FLASH memory. When doing so, the data in the FLASH memory may be destructed and operational malfunctioning may occur. To confirm the termination, send the "Execution Response Request" command (DC2 'q') following the command and check the response code.

6.3 STANDARD MODE AND PAGE MODE

In the printer, the print mode can be selected from the standard mode to print the received data sequentially or the page mode to print after receiving 1 page data.

6.3.1 Standard Mode

Standard mode is a mode in which the received data is printed sequentially.
Printing is executed when 1 line buffer is filled up with character data (1 line full print), or the printing conditions are satisfied by the "Line Feed" command (LF), "Carriage Return" command (CR), and so on.

6.3.2 Page Mode

Page mode is a mode to print page by page.
The printer enters the page mode by the "Select Page Mode" command (ESC 'L'). In page mode, the printer maps the received data in the print area on the memory. When the printer receives the "Print and Return to Standard Mode" command (FF) or "Print Data in Page Mode" command (ESC FF), it prints the data of the print area collectively.
There are 2 methods to print in page mode: the metod to print only 1 page and the method to print the same data in multiple pages. See the following processes.

(1) Page mode operational procedure

Table 6-4 and Table 6-5 show the printing procedure in page mode.

Table 6-4   Printing Procedure for Printing One Page in Page Mode

Step	Command	Operation	Remarks
1	ESC 'L'	Selects the page mode.	Needs to be in standard mode and at the beginning of the line.
2	ESC 'W'	Sets the print area.	If not set, the maximum print area will be set.
3	ESC 'T'	Specifies the print start point and print direction.	If not specified, the print start point will be upper left, the print direction will be left to right.
4	Various	Maps the data in the set print area.	
5	FF	Prints all data of the page mode collectively and returns to standard mode.	

Table 6-5 Printing Procedure for Printing Multiple Pages in Page Mode

Step	Command	Operation	Remarks
1	ESC 'L'	Selects the page mode.	Needs to be in standard mode and at the beginning of the line.
2	ESC 'W'	Sets the print area.	If not set, the maximum print area will be set.
3	ESC 'T'	Specifies the print start point and print direction.	If not specified, the print start point will be upper left, the print direction will be left to right.
4	Various	Maps the data in the set print area.	
5	ESC FF	Prints all data of the page mode collectively.	The data of the page mode is retained.
6	⋮	Repeats Step 5 [number of reprinting - 1] times.	To change a part of the print data, execute Step 2 to Step 5.
7	ESC 'S'	Returns to standard mode.	

(2) Data processing in page mode

1. Setting of the mapping start position

Characters, bit images, and barcodes are mapped based on the mapping start position. Specify the mapping start position with the "Specify Vertical Absolute Position in Page Mode" command (GS '$') before sending the printing contents. When mapping characters and bit images, the mapping start position will be shifted automatically.

2. Mapping of character and image data

- Character
  The reference point of a character is lower left. The next mapping start position shifts horizontally the width of the character (including the right and left spaces).

- Bit image
  The reference point of a bit image is lower left. The next mapping start position shifts horizontally the width of the image.

- Downloaded bit image, NV graphics
  The reference point of a downloaded bit image and NV graphics is lower left. The next mapping start position shifts horizontally the width of the image.

- Graphics data stored in print buffer
  The reference point of the graphics data stored in the print buffer is lower left. The next mapping start position does not shift.

- Barcode
  The reference point of a barcode is lower left. The next mapping start position shifts horizontally the width of the barcode.

- Raster bit image
  The reference point of a raster bit image is its upper left. The next mapping start position shifts horizontally the width of the image.

The character and image data are mapped as shown in Figure 6-1.
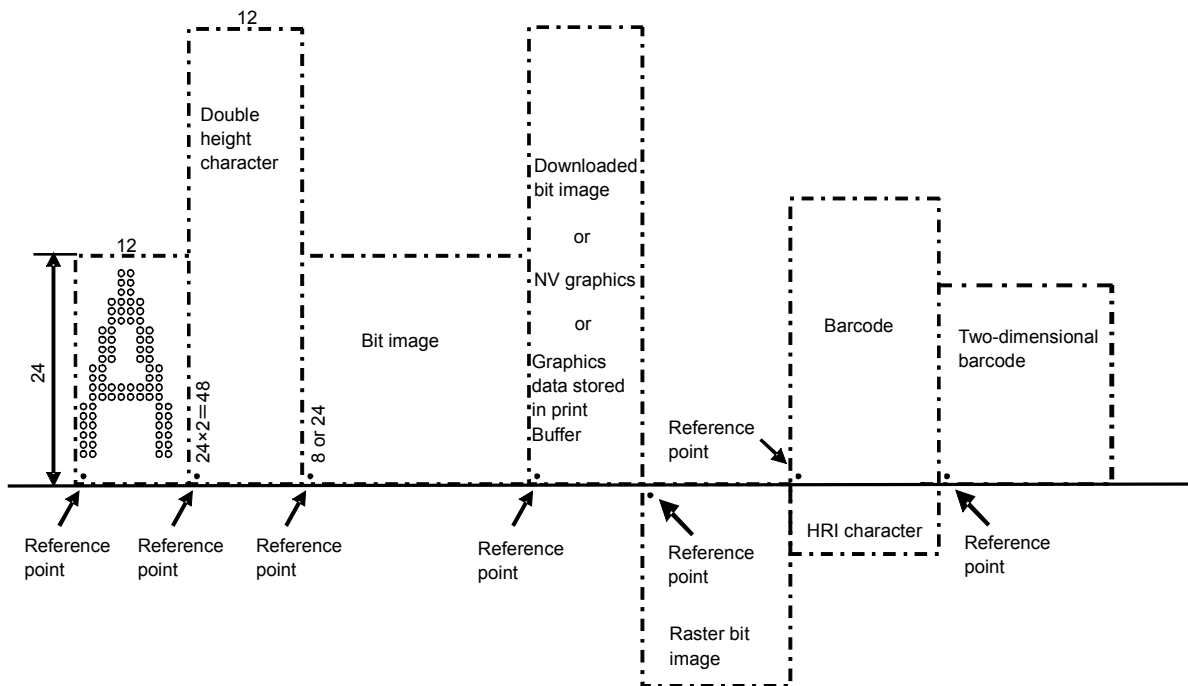
Figure 6-1   Mapping of Character and Image Data

After executing the "Select Page Mode" command (ESC 'L') or "Set Print Area in Page Mode" command (ESC 'W'), be sure to specify mapping start position before sending the print data. When the print data is sent without specifying the mapping start position, the mapping position will be undefined.

3.   Direction of data mapping

The printer can specify the direction of data mapping. See the "Select Print Direction in Page Mode" command (ESC 'T') for details.

4.   Processing of print command

The commands that involve a printing operation in page mode are the "Print and Return to Standard Mode" command (FF) and the "Print Data in Page Mode" command (ESC FF). The print commands in standard mode ("Line Feed" command (LF), "Print and Feed Forward" command (ESC 'J'), etc.) only move the mapping start position without actually printing.

5.   Processing of 1 line full print

When the line buffer for 1 line is filled up with character data, the subsequent data is mapped from the beginning of the next line.
When the next line does not fit in the print area, the excess data is discarded.

6. Setting of print area in page

  Table 6-6 shows the maximum print area of the printer.

Table 6-6 Maximum Print Area in Page Mode

Paper Width	Maximum Width (X Direction)	Maximum Length (Y Direction)
58 mm	432 dots	2400 dots
80 mm	576 dots	

6.4 RESPONSE DATA

All of upper 4 bits in response data sent from the printer to the host device are identifiers. Table 6-7 shows the meanings to the identifiers.

Table 6-7 Response Identifiers

Identifier	Function
0xH	Start or end of multi-byte string
2xH to 7xH	ASCII characters
8xH	Execution response
9xH	Progress situation response
AxH	Status response, realtime status response
BxH	Initialized response
CxH	1st byte of automatic status response
DxH	2nd byte to 8th byte of automatic status response
ExH	Lower 4 bits of HEX code
FxH	Upper 4 bits of HEX code

The responses are sent in the following forms.

(1) Character string

The data is sent in the order of start code (02H), character string, and termination code (00H).

For example, when the character string 'SII' is sent from the printer:
02H, 53H, 49H, 49H, 00H

(2) HEX code

The data is sent in the order of start code (0EH), lower byte of HEX code, higher byte of HEX code, and termination code (00H).

For example, when 12H, 34H, and 56H are sent from the printer:
0EH, E2H, F1H, E4H, F3H, E6H, F5H, 00H

(3) Execution response

One byte data which is the logical sum of lower 4 bits of the parameter n input in the "Execution Response Request" command (DC2 'q') and 80H is sent.

For example, when inputting n = 4:
84H

(4) Status response, realtime status response

The status byte specified by the "Send Status Data" command (GS 'r') or "Send Status Data in Real Time" command (DLE EOT) is sent in 1 byte.
Do not transmit the next data until the corresponding status is received after executing "Send Status Data in Real Time" command (DLE EOT).
In addition, do not send "Send Status Data in Real Time" command (DLE EOT) until all response data is retrieved when the response command other than "Send Status Data in Real Time" command (DLE EOT) is executed.

(5) Progress situation response

Various progress situations are sent with lower 4 bits at 16 steps.

(6) Initialized response

The printer sends 1 byte data to inform that initialization has completed.
And lower 4 bits shows the factor of the initialization.

B0H: Initialization by the power on or "Hardware Reset" command (DC2 '@')
B1H: Initialization by USB class request resetting or "Reset Download Mode" command ('@')
B2H: Initialization by the "Initialize Printer" command (ESC '@')
B3H: Initialization by the "Printer Reset" command (DC3 '(' 'r' 'e' 's' 'e' 't' DC3 'r' 'e' 's' 'e' 't' ')')

(7) Automatic status response

When the automatic status response is enabled by the "Enable/Disable Automatic Status Back"
command (GS 'a'), the printer sends the status in 8 bytes when the specified status bit changes.
When the code CxH is sent from the printer as a response, treat the continuous 8 bytes including the
response (except Xoff) as the status from the automatic status response function.

(8) Display response

The response data from the display is sent in the order of start code (10H), response data, and
termination code (00H).

For example, when the character string 'SII' is sent from the display:
10H, 32H, 53H, 49H, 49H, 00H

6.5 COMMAND DESCRIPTION

This chapter describes the commands in each function.

```
┌──────────────────────────────────────────────────────┐
│  X X                                    X X X X       │
└──────────────────────────────────────────────────────┘
         └──── Command              └──── The name of the command
```

Code	Indicates the hexadecimal code (H).
Definition Range	Shows the parameter and the settable data range.
Default	Describes the default value for the command involving parameter.
Function	Shows the function of the command.
Notes	Describes notes about the command as needed.
Related Commands	Describes commands related to this command operation.

The meanings of the terms are described below.

- Buffer full
  It signifies the line buffer is in a full state. During buffer full in the standard mode, the printer prints data in the line buffer and feeds paper 1 dot-line when new print data is input. The operation is the same as the "Line Feed" command (LF). During buffer full in page mode, the printer shifts the mapping start position to the beginning of the next line and then maps the data when new print data is input.

- Beginning of line
  The beginning of line signifies a state satisfying the following conditions:
    · No print data (including spaces and the portion skipped by the "Horizontal Tab" command (HT)) exists in the current line buffer.
    · The print position is not specified by the "Specify Absolute Position" command (ESC '$') or "Specify Relative Position" command (ESC '\').

- Printable area
  This area is X direction maximum width defined by paper width setting. See "6.3.2 Page Mode" for the paper width setting. In page mode, Y direction maximum width is defined by the "Select Print Direction in Page Mode" command (ESC 'T').

- Print area
  This is a printing range set with the "Set Print Area Width" command (GS 'W') and the "Set Print Area in Page Mode" command (ESC 'W'). The print area cannot be set beyond the printable area.

- Ignore
  This is a state of discarding all codes including parameters and not doing anything.

- Inch
  Unit of length. 1 inch = approx. 25.4 mm

- LSB/MSB
  LSB represents the least significant bit and MSB represents the most significant bit.

- Realtime command
  This is a command that executes processing when receiving data.

6.5.1 Printing Command

LF   Line Feed

Code   0AH

Function [In standard mode]
Prints the data in the line buffer and performs line feed based on the set line spacing.

[In page mode]
Moves the mapping start position to the beginning of the next line based on the set line spacing.

Related Commands   ESC '2', ESC '3'

FF   Print and Return to Standard Mode

Code   0CH

Function In page mode, prints the data mapped in the whole print area in batch and returns to standard mode.

Notes   This command is valid only when page mode is selected. Ignored when standard mode is selected.
All the mapped data is deleted after printing.
Thermal paper cut, etc. are not performed.
The beginning of the line is the next printing position.
The print area set by "Set Print Area in Page Mode" command (ESC 'W') is initialized.

Related Commands   ESC FF, ESC 'L', ESC 'S'

CR   Carriage Return

Code   0DH

Function This command is ignored.

ESC FF   Print Data in Page Mode

Code   1BH 0CH

Function Prints all data mapped in the page buffer in batch in page mode.

Notes   This command is valid only when page mode is selected. Ignored when standard mode is selected.
The mapped data, setting values of the "Set Print Area in Page Mode" command (ESC 'W') and the "Select Print Direction in Page Mode" command (ESC 'T'), and mapping start positions are still retained after printing. Thermal paper cut, marked paper form feed etc. are not performed.

Related Commands   FF, ESC 'L', ESC 'S'

Code   1BH 4AH n

Definition Range   0 ≤ n ≤ 255

Function   [In standard mode]
            Feeds the paper by predefined distance.
            When there is data in the line buffer, the printer prints 1 line and then feeds the paper.
            The paper feed length is [n × basic calculation pitch] inches.
            The vertical basic calculation pitch (y) is used.

            [In page mode]
            Moves the mapping start position by predefined distance.
            The moving distance is [n × basic calculation pitch] inches.
            The basic calculation pitch used differs depending on the starting point.

            When the starting point is specified as "upper left" or "lower right" by the "Select Print
            Direction in Page Mode" command (ESC 'T'), the basic calculation pitch (y) of the paper feed
            direction (characters' vertical direction) is used.

            When the starting point is specified as "upper right" or "lower left" by the "Select Print
            Direction in Page Mode" command (ESC 'T'), the basic calculation pitch (x) of the direction
            perpendicular to paper feed (characters' vertical direction) is used.

Notes   Following the command execution, the beginning of the line is the next print position.
            This command does not affect the line spacing that has been set by the "Set 1/6 Inch Line
            Spacing" command (ESC '2') or "Set Line Spacing" command (ESC '3').
            The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
            When the calculation result is a fractional figure, it is corrected using the minimum pitch of the
            printer, and the remainder is discarded.

Related Commands   GS 'P'

Code   1BH 6AH n

Definition Range   0 ≤ n ≤ 255

Function   Feeds the paper backward by predefined distance.
            When there is data in the line buffer, the printer prints 1 line and then feeds the paper
            backward.
            The paper feed length is [n × basic calculation pitch] inches.
            The vertical basic calculation pitch (y) is used.

Notes   This command is valid only when standard mode is selected. Ignored when page mode is
            selected.
            Following the command execution, the beginning of the line is the next print position.
            This command does not affect the line spacing that has been set by the "Set 1/6 Inch Line
            Spacing" command (ESC '2') or "Set Line Spacing" command (ESC '3').
            The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
            When the calculation result is a fractional figure, it is corrected using the minimum pitch of the
            printer, and the remainder is discarded.
            When the paper feed length exceeds 60 dot-lines by the correction calculation with the basic
            calculation pitch, this command is ignored.

Related Commands   GS 'P'

ESC 'd' n — Print and n Lines Feed Forward

Code   1BH 64H n

Definition Range   0 ≤ n ≤ 255

Function   [In standard mode]
Feeds the paper n lines.
The paper feed length is [n × the set line spacing].
When there is data in the line buffer, the printer prints 1 line and then feeds the paper.

[In page mode]
Moves the mapping start position by n lines.
The moving distance is [n × the set line spacing].

Notes   The beginning of the line is the next printing position.

CAN — Cancel Print Data in Page Mode

Code   18H

Function   Deletes all the data in the print area currently set in the page mode.

Notes   This command is valid only when page mode is selected. Ignored in the standard mode.
Within the printable area, the data outside the print area currently set is not deleted.

Related Commands   ESC 'L', ESC 'W'
See "6.3.2 Page Mode".

6.5.2 Line Spacing

ESC '2'   Set 1/6 Inch Line Spacing

Code   1BH 32H

Function Specifies the line spacing per line as 1/6 inches (34 dots).

Notes   The line spacing can be independently set in the standard mode and the page mode.
          This command is not affected by the basic calculation pitch.

Related Commands   ESC '3'

ESC '3' n   Set Line Spacing

Code   1BH 33H n

Definition Range   0 ≤ n ≤ 255

Default   The line spacing corresponding to 1/6 inches (34 dots)

Function Sets the line spacing per line.
          The line spacing is [n × basic calculation pitch] inches.

Notes   The line spacing can be independently set in the standard mode and the page mode.
          The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
          Moreover, once set, the line spacing is not changed even when the basic calculation pitch is
          changed by the "Set Basic Calculation Pitch" command (GS 'P').
          When the calculation result is a fractional figure, it is corrected using the minimum pitch of the
          printer, and the remainder is discarded.
          In the standard mode, the vertical basic calculation pitch (y) is used.

          When using the command in page mode, its behavior is as follows depending on the starting
          point.
          When the starting point is specified as "upper left" or "lower right" by the "Select Print
          Direction in Page Mode" command (ESC 'T'), the basic calculation pitch (y) of the paper feed
          direction (characters' vertical direction) is used.
          When the starting point is specified as "upper right" or "lower left" by the "Select Print
          Direction in Page Mode" command (ESC 'T'), the basic calculation pitch (x) of the direction
          perpendicular to paper feed (characters' vertical direction) is used.

Related Commands   ESC '2', GS 'P'

6.5.3 Character Set

ESC SP n	Set Character Right Spacing

Code   1BH 20H n

Definition Range   0 ≤ n ≤ 255

Default   n = 0

Function   Sets the amount of space to the right of a character.
The amount of the right space is [n × basic calculation pitch] inches.

Notes   This command does not affect 2-byte characters.
When the double width is specified, the right space becomes twice as much as the setting value.
The right spacing can be independently set in the standard mode and the page mode.
The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
Moreover, once set, the right spacing is not changed even when the basic calculation pitch is changed by the "Set Basic Calculation Pitch" command (GS 'P').
When the calculation result is a fractional figure, it is corrected using the minimum pitch of the printer, and the remainder is discarded.
In the standard mode, the horizontal basic calculation pitch (x) is used.

In the page mode, the basic calculation pitch used is as follows depending on the starting point.
When the starting point is specified as "upper left" or "lower right" by the "Select Print Direction in Page Mode" command (ESC 'T'), the horizontal basic calculation pitch (x) is used.
When the starting point is specified as "upper right" or "lower left" by the "Select Print Direction in Page Mode" command (ESC 'T'), the vertical basic calculation pitch (y) is used.

Related Commands   GS 'P'

Character width

Character height

Character right space
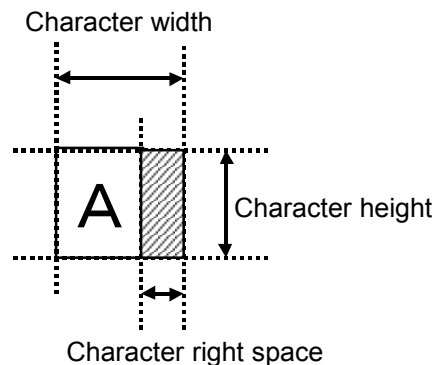
Code   1BH 21H n

Definition Range   0 ≤ n ≤ 255

Default   n = 0

Function   Specifies print modes in batch.

Bit	Function	Value	
		0	**1**
0	Character font	Font A selected (24 × 12)	Font B selected (16 × 8)
1	Undefined	-	-
2	Undefined	-	-
3	Bold printing	Cancel	Specify
4	Double height	Cancel	Specify
5	Double width	Cancel	Specify
6	Undefined	-	-
7	Underline	Cancel	Specify

Notes   When both double height and double width are specified, the character size is quadrupled. When characters with different vertical scale exist on the same line, the characters are enlarged with the bottom edges of the characters as a reference, and so the bottom edges are aligned.
When enlarging the character horizontally, it is enlarged in the right direction with the left edge of the character as a reference.

Underline is applied to the entire character width including the right space of the character. However, no underline is applied to the portion skipped by the "Horizontal Tab" command (HT) and to 90° right rotated characters.
The underline width is the thickness set by the "Specify/Cancel Underline" command (ESC '-') regardless of the character size. When not set by the "Specify/Cancel Underline" command (ESC '-'), the underline width is 1 dot.
This command does not affect 2-byte characters except bit 3 (bold printing).

The print modes can also be specified or canceled by commands other than this command. However, the command processed last is valid. For example, when bold printing is canceled by this command after specified by the "Specify/Cancel Bold Print" command (ESC 'E'), the bold printing specified by the "Specify/Cancel Bold Print" command (ESC 'E') is canceled.

Related Commands   ESC '-', ESC 'E', ESC 'M', GS '!'

ESC 'M' n — Select Character Font

Code   1BH 4DH n

Definition Range   n = 0, 1, 48, 49

Default   n = 0

Function   Selects a character font.

n	Function
0, 48	Select font A (24 × 12)
1, 49	Select font B (16 × 8)

Notes   The character font can also be selected by the "Specify Print Mode" command (ESC '!'), but the setting of the command processed last is valid.

Related Commands   ESC '!'

GS '!' n — Specify Character Size

Code   1DH 21H n

Definition Range   0 ≤ n ≤ 255
1 ≤ vertical scale ≤ 8, 1 ≤ horizontal scale ≤ 8

Default   n = 0

Function   Specifies a character size (vertical scale / horizontal scale).

Bit	Function	Value	
		Hexadecimal	Decimal
0 to 3	Vertical scale	See Table 1 [Vertical Scale].	
4 to 7	Horizontal scale	See Table 2 [Horizontal Scale].	

Table 1   Vertical Scale

Hexadecimal	Decimal	Scale
00H	0	× 1 (default)
01H	1	× 2 (double height)
02H	2	× 3
03H	3	× 4
04H	4	× 5
05H	5	× 6
06H	6	× 7
07H	7	× 8

Table 2   Horizontal Scale

Hexadecimal	Decimal	Scale
00H	0	× 1 (default)
10H	16	× 2 (double width)
20H	32	× 3
30H	48	× 4
40H	64	× 5
50H	80	× 6
60H	96	× 7
70H	112	× 8

The command is valid for all characters (including Kanji) except HRI characters. However, the scale of the optional font is up to double width or double height. Specifying the optional font in triple or larger size will result in printing in double size.
When either the vertical scale or horizontal scale is out of the definition range, this command is ignored.
In the standard mode, the scale is applied with the paper feed direction as the vertical direction and the direction perpendicular to the paper feed as the horizontal direction.
Therefore, when specifying 90° right rotated characters, the relationship between vertical and horizontal directions for characters becomes reverse.
In page mode, the scale is applied with the character height direction as the vertical direction and the character width direction as the horizontal direction.

Related Commands ESC '!', FS '!'

ESC '-' n   Specify/Cancel Underline

Code   1BH 2DH n

Definition Range   0 ≤ n ≤ 2, 48 ≤ n ≤ 50

Default   n = 0

Function   Specifies or cancels underline.

n	Function
0, 48	Cancel underline
1, 49	Specify 1-dot underline
2, 50	Specify 2-dot underline

Notes   Underline is applied to the entire character width including the right space of the character.
However, no underline is applied to the portion skipped by the "Horizontal Tab" command (HT) or others and to 90° right rotated characters.
When underline is canceled with n = 0, no underline is applied to the subsequent data, but the underline width set before canceling is retained. Moreover, underline is canceled (n = 0) in the initial state.
The underline width is constant as specified regardless of the character size.
This command does not affect 2-byte characters.
In addition to this command, underline can also be specified or canceled by the "Specify Print Mode" command (ESC '!'). However, the command processed last is valid. For example, when underline is canceled by this command after specified by the "Specify Print Mode" command (ESC '!'), the specification with the "Specify Print Mode" command (ESC '!') is canceled.

Related Commands   ESC '!'

ESC 'E' n   Specify/Cancel Bold Print

Code   1BH 45H n

Definition Range   0 ≤ n ≤ 255

Default   n = 0

Function   Specifies or cancels bold printing.
When n = <*******0>B, bold printing is canceled.
When n = <*******1>B, bold printing is specified.

Notes   Only the LSB is valid for n.
         This command affects both 1-byte characters and 2-byte characters.
         But it does not affect optional fonts.

Related Commands   ESC '!'

ESC 'G' n   Specify/Cancel Double Strike Print

Code   1BH 47H n

Definition Range   0 ≤ n ≤ 255

Default   n = 0

Function   Specifies or cancels double strike printing.
            When n = <*******0>B, double strike printing is canceled.
            When n = <*******1>B, double strike printing is specified.

Notes   Only the LSB is valid for n.
         The print result of double strike printing is exactly the same as that of bold printing.
         This command affects both 1-byte characters and 2-byte characters.
         But it does not affect optional fonts.

Related Commands   ESC 'E'

ESC 'V' n   Specify/Cancel Character 90° Right Rotate

Code   1BH 56H n

Definition Range   n = 0, 1, 48, 49

Default   n = 0

Function   Specifies or cancels 90° character rotation to the right.

n	Function
0, 48	Cancel 90° character rotation to right
1, 49	Specify 90° character rotation to right

Notes   Even when underlining is specified, underline is not applied to characters rotated 90° to the right.
         When 90° right rotation is specified, the relation between horizontal and vertical enlargements to the character direction is opposite to the case when 90° right rotation is canceled.
         The setting of this command does not affect the page mode.
         When page mode is selected, inputting this command executes only the internal flag operation of the printer.
         This command affects both 1-byte characters and 2-byte characters.

Related Commands   ESC '!', ESC '-', FS '!', FS '-'

ESC '{' n — Specify/Cancel Inversion (Flip) Print

Code 1BH 7BH n

Definition Range 0 ≤ n ≤ 255

Default n = 0

Function Specifies or cancels inversion (flip) printing.
When n = <*******0>B, inversion (flip) printing is canceled.
When n = <*******1>B, inversion (flip) printing is specified.

Notes Only the LSB is valid for n.
This command is valid only when input at the beginning of the line.
When page mode is selected, inputting this command executes only the internal flag operation of the printer.
The setting of this command does not affect the page mode.
The inversion (flip) printing is to rotate the data of the line 180° and print.
This command affects both 1-byte characters and 2-byte characters.

GS 'B' n — Specify/Cancel Reverse Print

Code 1DH 42H n

Definition Range 0 ≤ n ≤ 255

Default n = 0

Function Specifies or cancels reverse printing of characters.
When n = <*******0>B, reverse printing is canceled.
When n = <*******1>B, reverse printing is specified.

Notes Only the LSB is valid for n.
Internal characters and downloaded characters are affected by the reverse printing.
The right space of the character set by the "Set Character Right Spacing" command (ESC SP) is also affected by the reverse printing.
The reverse printing does not affect the followings:

Bit image (ESC '*')
Downloaded bit image (GS '/')
Barcode (GS 'k')
HRI character (GS 'H')
Portion skipped by Horizontal Tab (HT)
Portion skipped by Specify Absolute Position (ESC '$')
Portion skipped by Specify Relative Position (ESC '\')
NV graphics (GS '(' 'L')
Graphics Data Storage into Print Buffer (GS '(' 'L')
Each two-dimensional barcode print (GS 'p')

This command does not affect spaces between lines.
The specifications of bold printing and double strike printing are ignored. (The line width of a reverse print character is as same as that of a normal character.)
The reverse printing takes precedence over underline. Therefore, even when underline is specified, no underline is applied to reverse print characters. However, the underline setting status does not change.
This command affects both 1-byte characters and 2-byte characters.

Code   1BH 52H n

Definition Range   0 ≤ nl ≤ 17

Default   n = 0

Function   Selects an international character set from the following table.

n	Country	n	Country
0	USA	9	Norway
1	France	10	Denmark II
2	Germany	11	Spain II
3	United Kingdom	12	Latin America
4	Denmark I	13	Prohibition[1]
5	Sweden	14	Prohibition[1]
6	Italy	15	Prohibition[1]
7	Spain I	16	Prohibition[1]
8	Japan	17	Arabia

*1: When the prohibition is selected, the setting is ignored.

Related Commands   See "A.2 International Character Set".

Code   1BH 74H n

Definition Range   n = 0 to 5, 16, 18, 19, 37, 45 to 48, 255

Default   Depends on the Function Settings.

Function   Selects the page n in the character code table.

When selecting the User page, it is required to register the User page beforehand. Set the User page in the "Select Download Mode" command (DC2 DC2) and the "Rewrite 1-Byte Font" command ('S' 'W').

n	Character Set
0	USA, Standard Europe (Code Page437)
1	Katakana
2	Multilingual (Code Page850)
3	Portuguese (Code Page860)
4	Canadian-French (Code Page863)
5	Nordic (Code Page865)
13	Turkish (Code Page857)
14	Greek (Code Page737)
16	Latin (Code Page1252)
17	Russian (Code Page866)
18	Eastern Europe (Code Page852)
19	Euro (Code Page858)
34	Cyrillic (Code Page855)
37	Arabic (Code Page864)
45	Central European (Code Page1250)
46	Cyrillic (Code Page1251)
47	Greek (Code Page1253)
48	Turkish (Code Page1254)
255	User page

Notes   Arabic is printed in font A (24 × 12) regardless of character font selection.

Related Commands   DC2 'w', DC2 'l'
See "A.2 International Character Set".

ESC 'y' a b c   Send 1-Byte Font ID

Code   1BH 79H a b c

Definition Range   a = 0, 1
b = 255, 0 ≤ c ≤ 7

Function   In response to the request of this command, the printer sends the information specified by c, the 1-byte font specified by a and b.
a: Font size
b: Page number
c: Information

The page number is the number registered in the "Rewrite 1-Byte Font" command ('S' 'W' a [d1]k1 b [d2]k2).

a	Font Size
0	24-dot font
1	16-dot font

c	Function	Response Format
0	Reserved	-
1	Reserved	-
2	Reserved	-
3	Checksum (2 bytes)	HEX code
4	Reserved	-
5	Reserved	-
6	ID (64 bytes)	Character string
7	Registered international character	Character string

When 7 is specified for c, the printer sends the abbreviation of the registered international character in a character string.
When 2 or more international characters are registered, the country names are separated by a ',' (comma).
The character strings sent according to the registeration content are as shown below.

International Character	Response Character String
USA	US
France	FR
Germany	DE
United Kingdom	UK
Denmark I	DK1
Sweden	SE
Italy	IT
Spain I	ES
Japan	JP
Norway	NO
Denmark II	DK2
Spain II	ES2
Latin America	LA*
Arabia	AR*

Notes   When the font specified by a and b is not registered, only the header and footer of the response format of the selected function are sent.

Related Commands   See "6.4 RESPONSE DATA", "6.5.12 Download Mode".

Code   1BH 26H y s e [x [d]k]n

Definition Range   y = 3 (Font A (24 × 12) selected)
                        y = 2 (Font B (16 × 8) selected)
                        20H ≤ s ≤ e ≤ 7EH
                        0 ≤ x ≤ 12 (Font A (24 × 12) selected)
                        0 ≤ x ≤ 8 (Font B (16 × 8) selected)
                        0 ≤ d ≤ 255

Function   Registers a downloaded character pattern to the specified character code.
            y: Number of bytes in vertical direction
            s: Registration start character code
            e: Registration end character code
            x: Number of dots in horizontal direction to be registered
            d: Font data
            k: Number of data bytes for 1 character
            n: Number of characters to register
            The downloaded character is not registered at the shipping.

Notes   The registrable character codes are ASCII codes in the range of 20H to 7EH.
            Multiple continuous character codes can be registered in 1 registration. To register only 1
            character, specify s = e.
            d is registration data and indicates a pattern of x dots in the horizontal direction from the left
            end. When x is less than the character configuration number of dots at this time, the
            remaining dots on the right side become spaces.
            The number of data bytes k necessary for registering 1 downloaded character is k = y × x
            bytes.
            The number of characters n to register is n = e - s + 1.
            In the registration data, the bits corresponding to dots to print are 1, and the bits corresponding
            to dots not to print are 0.
            The memory usage m is 6184 bytes (including the number of bytes of memory control
            information).

Related Commands   ESC '%', ESC '?'
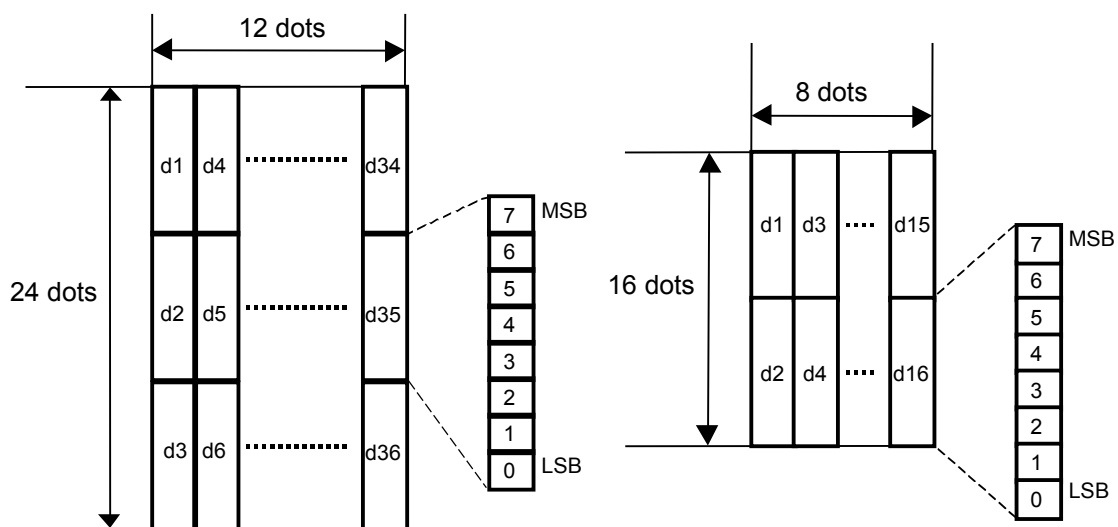
ESC '%' n   Specify/Cancel Downloaded Character Set

Code   1BH 25H n

Definition Range   0 ≤ n ≤ 255

Default   n = 0

Function   Specifies or cancels the downloaded character.
When n = <*******0>B, the downloaded character is canceled.
When n = <*******1>B, the downloaded character is specified.

Notes   Only the LSB is valid for n.
When the downloaded character is canceled, the internal character set is automatically
specified.

Related Commands   ESC '&', ESC '?'

ESC '?' n   Release Downloaded Character

Code   1BH 3FH n

Definition Range   20H ≤ n ≤ 7EH

Function   Releases the downloaded character of the specified code to make it undefined. After releasing,
the printer prints the internal character.
n: Character code to release registration pattern

Notes   The downloaded character specified by the character code n is released. The character font
selected by the "Specify Print Mode" command (ESC '!') is affected.
When the specified character code is undefined, this command is ignored.

Related Commands   ESC '&', ESC '%'

DC2 'D' n   Release/Allocate Downloaded Character Area

Code   12H 44H n

Definition Range   0 ≤ n ≤ 255

Function   Releases or allocates the downloaded character area.
When n = <*******0>B, the downloaded character area is released.
When n = <*******1>B, the downloaded character area is allocated.

Notes   Only the LSB is valid for n.
When releasing the downloaded character area, the registered downloaded characters are
deleted, and the downloaded character specification is canceled. Moreover, the "Register
Downloaded Character" command (ESC '&') and the "Specify/Cancel Downloaded Character
Set" command (ESC '%') are ignored.
The downloaded character area is 6184 bytes.
In order to allocate again the downloaded character area that has been released, 6184 bytes
or more are necessary for the remaining memory capacity. When the remaining memory
capacity is insufficient, the downloaded character area is not allocated, and this command is
ignored.

Releasing the area cannot increase the remaining memory capacity. The area can be used
again as the user area by the "Defragment User Area" command (DC2 '*' '1').

Code   12H 4FH n

Definition Range   0 ≤ n ≤ 255

Default   n = 0 (Optional font printing canceled)

Function Specifies and cancels the optional font.
          When n = <*******0>B, optional font printing is canceled.
          When n = <*******1>B, optional font printing is specified.

Notes   Only the LSB is valid for n.
          When the optional font printing is specified, and the character codes to print are registered as
          optional font, they are printed with the optional font.
          In printing, the optional font has priority over the downloaded character.

Code   12H 50H s e y x [d]k

Definition Range   20H ≤ s ≤ e ≤ 7EH
                      1 ≤ y ≤ 127, 1 ≤ x ≤ 127

Function Allocates a memory area of optional font and registers the optional font.
          s: Registration start character code
          e: Registration end character code
          y: Number of vertical dots of optional font
          x: Number of horizontal dots of optional font
          d: Font data
          k: Total number of data bytes
          The optional font is not registered at the shipping.

Notes   When the optional font of the specified set is already registered, but the registeration content
          is not the same, the area is allocated again to register the optional font.
          When y or x is out of the definition range, the subsequent data is processed as normal data.

          The number of data bytes for 1 character is calculated by the formula below.
          INT $((y + 7) / 8) \times x$ bytes

          The total number of data bytes k is calculated by the formula below.
          $k = INT ((y + 7) / 8) \times x \times (e - s + 1)$

For the font data of 1 character, vertical 8 dots are input as 1 byte data in the order shown in the following figure. The following figure is the case of x = y = 20.

e.g. 20 dots × 20 dots
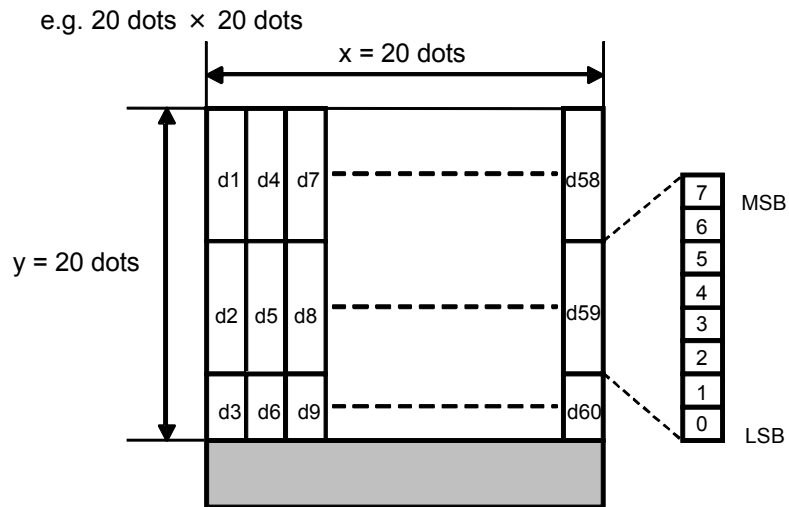
*The gray area is disregarded.

The calculating method of the memory usage m is different from the calculating method of the total number of data bytes k, because the font image is stored by the low scan method when registering in the memory.
The memory usage m is calculated by the formula below.
$m = INT((x + 7) / 8) \times y \times (e - s + 1) + $ Number of bytes of memory control information

DC2 'Q'   Release Optional Font Area

Code   12H 51H

Function   Releases the memory area of the registered optional fonts.
            After releasing, the registered optional fonts are not printed.

Notes   Releasing the area cannot increase the remaining memory capacity. The area can be used
            again as the user area by the "Defragment User Area" command (DC2 '*' '1').

6.5.4 Print Position

ESC 'L'   Select Page Mode

Code   1BH 4CH

Function   Switches from standard mode to page mode.

Notes   This command is valid only when input at the beginning of the line.
This command is not valid when input in page mode.
The printer returns to the standard mode after printing by the "Print and Return to Standard Mode" command (FF) or executing the "Select Standard Mode" command (ESC 'S').
The page mode is a mode to map the received data in the print area specified by the "Set Print Area in Page Mode" command (ESC 'W') and print the data of the whole area in batch by the "Print and Return to Standard Mode" command (FF) or "Print Page Mode Data" command (ESC FF). Printing or line feed commands such as "Line Feed" command (LF), "Print and Feed Forward" command (ESC 'J'), and "Print and n Lines Feed Forward" command (ESC 'd') just move the mapping start position of the next data and do not actually print.
The mapping start position is the starting point specified by the "Specify Character Print Direction in Page Mode" command (ESC 'T') in the print area specified by the "Set Print Area in Page Mode" command (ESC 'W').

The following commands can provide independent setting values in the page mode and the standard mode. The "Select Page Mode" command (ESC 'L') changes the setting values of the following commands to those for the page mode.

ESC SP   Set Character Right Spacing
FS 'S'   Set Kanji Spacing
ESC '3'   Set Line Spacing
ESC '2'   Set 1/6 Inch Line Spacing

As for the following commands, only setting is enabled in the page mode.

ESC 'V'   Specify/Cancel Character 90° Right Rotate
ESC 'a'   Alignment
ESC '{'   Specify/Cancel Inversion (Flip) Print
GS 'L'   Set Left Margin
GS 'W'   Set Print Area Width

Related Commands   FF, CAN, ESC FF, ESC 'S', ESC 'T', ESC 'W', GS '$', GS '\'
                               See "6.3.2 Page Mode".

ESC 'S'   Select Standard Mode

Code   1BH 53H

Function   Switches from page mode to standard mode.

Notes   This command is valid only when input in page mode.
The data mapped in page mode is deleted.
The print area set by the "Set Print Area in Page Mode" command (ESC 'W') is initialized.

The setting values of the following commands have independent values in the page mode and the standard mode, and this command changes the setting values to those for the standard mode.

ESC SP	Set Character Right Spacing
FS 'S'	Set Kanji Spacing
ESC '3'	Set Line Spacing
ESC '2'	Set 1/6 Inch Line Spacing

Related Commands ESC 'L'

GS 'P' x y   Set Basic Calculation Pitch

Code   1DH 50H x y

Definition Range $0 \leq x \leq 255$
                       $0 \leq y \leq 255$

Default $x = 203$, $y = 203$ (Minimum pitches of the printer)

Function   Sets the basic calculation pitch in the horizontal direction to $1/x$ inches, and the basic calculation pitch in the vertical direction to $1/y$ inches.
When $x = 0$ and/or $y = 0$, x and/or y returns to the default value.

Notes   The horizontal direction means the direction perpendicular to paper feed, and the vertical direction means the paper feed direction.

In the standard mode, the following parameters are used regardless of the character orientation (inversion (flip), 90° right rotated, etc.).

Commands that use x: ESC SP, ESC '$', ESC '\', FS 'S', GS 'L', GS 'W'
Commands that use y: ESC '3', ESC 'J', ESC 'j', GS 'V'

In the page mode, the following parameters are used depending on the character orientation.

When the starting point is "upper left" or "lower right" through "Select Print Direction in Page Mode" command (ESC 'T') (Characters are mapped in the direction perpendicular to paper feed.)
Commands that use x: ESC SP, ESC '$', ESC 'W', ESC '\', FS 'S'
Commands that use y: ESC '3', ESC 'J', ESC 'W', GS '$', GS '\'

When the starting point is "upper right" or "lower left" through "Select Print Direction in Page Mode" command (ESC 'T') (Characters are mapped in the paper feed direction.)
Commands that use x: ESC '3', ESC 'J', ESC 'W', GS '$', GS '\'
Commands that use y: ESC SP, ESC '$', ESC 'W', ESC '\', FS 'S'

Executing this command does not affect various settings that have been already set (line spacing, character spacing, etc.).
When the calculation result combined with other commands is a fractional figure, it is corrected using the minimum pitch of the printer, and the remainder is discarded.

Related Commands   ESC SP, ESC '$', ESC '\', ESC '3', ESC 'J', ESC 'j', ESC 'W', FS 'S', GS '$', GS '\', GS 'L', GS 'W', GS 'V'

Code	09H

Function   Shifts the print position to the next horizontal tab position.

Notes   This command is ignored when the next horizontal tab position is not set.
The print position is shifted to [print area width + 1] when the next horizontal tab position is beyond the print area.
The horizontal tab position is set by the "Set Horizontal Tab Position" command (ESC 'D').
The default of the horizontal tab position is every 8 characters of the character font in the initial state.
Upon reception of this command when the print position is at [print area width + 1] in the standard mode, full print of the current line and horizontal tab processing from the beginning of the next line are executed.
Upon reception of this command when the print position is at [print area width + 1] in the page mode, full print processing of the current line and horizontal tab processing from the beginning of the next line are executed.

Related Commands   ESC 'D'

Code	1BH 44H [n]k 00H

Definition Range $1 \leq n \leq 255$, $0 \leq k \leq 32$

Default   Every 8 characters of the character font in the initial state

Function   Sets the horizontal tab position.
n: Number of characters from the left margin or beginning of the line to the setting position
k: Number of horizontal tab positions to be set

Notes   The horizontal tab position is set as [n × character width] from the left margin or beginning of the line. The character width here means the entire character width including the right space of the character, and when the double width is specified, this width is doubled.
This command cancels the horizontal tab positions already set.
When n = 8 is set as the horizontal tab position, the next print position shifts to the 9th character by executing the "Horizontal Tab" command (HT).
Up to 32 horizontal tabs can be set (k = 32).
When the number of tabs exceeds this number, the subsequent data is processed as normal data. Input n that specifies the setting position in ascending order and end with 00H. When n is equal to or smaller than the preceding n, the setting process of horizontal tab position ends at the moment that n is input, and the subsequent data is processed as normal data.
Canceling all horizontal tab positions is performed by the "Set Horizontal Tab Position" command (ESC 'D' [n]k NUL).
When n exceeds the printable area of 1 line, the horizontal tab position is set at the number of printable characters per line + 1.
Even when the character width is changed after setting the horizontal tab position, the set horizontal tab position remains unchanged.

Related Commands   HT

ESC 'a' n   Alignment

Code   1BH 61H n

Definition Range   0 ≤ n ≤ 2, 48 ≤ n ≤ 50

Default   n = 0

Function   Aligns all print data on 1 line to the specified position.

n	Alignment
0, 48	Aligned left
1, 49	Centered
2, 50	Aligned right

Notes   This command is valid only when input at the beginning of the line.
When page mode is selected, inputting this command executes only the internal flag
operation of the printer.
The setting of this command does not affect the page mode.
Alignment is performed within the print area width being set. The portion skipped by the
"Horizontal Tab" command (HT), "Specify Absolute Position" command (ESC '$'), or "Specify
Relative Position" command (ESC '\') is also aligned.

GS 'L' nl nh   Set Left Margin

Code   1DH 4CH nl nh

Definition Range   0 ≤ nl ≤ 255, 0 ≤ nh ≤ 255

Default   nl = 0, nh = 0

Function   Sets the left margin specified by nl and nh.
The left margin is [(nh × 256 + nl) × basic calculation pitch] inches.

Notes   This command is valid only when input at the beginning of the line.
When page mode is selected, inputting this command executes only the internal flag
operation of the printer.
The setting of this command does not affect the page mode.

When a value that exceeds the printable area of 1 line is input, the maximum value of the
printable area is set as the left margin.
The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
Moreover, once set, the left margin does not change even when the basic calculation pitch is
changed by the "Set Basic Calculation Pitch" command (GS 'P').
The basic calculation pitch in the horizontal direction (x) of "Set Basic Calculation Pitch"
command (GS 'P') is used for calculating the left margin. Moreover, when the calculation
result is a fractional figure, it is corrected using the minimum pitch of the printer, and the
remainder is discarded.

When the set print area width is less than 1 character of the currently specified character type
at character data mapping, the following processing is performed only for that line.
(1)   Within the printable area, the print area is extended to the right side up to the equivalent
of 1 character of the specified character type.
(2)   When an area up to the equivalent of 1 character cannot be secured even when (1) is
performed, the print area is extended to the left side. (The left margin is reduced.)

When the set print area width is less than the minimum width of 1 internal character (the width of the font size selected by character font selection) at mapping of the data other than characters (bit image, etc.), the following processing is performed only for that line.
(1) Within the printable area, the print area is extended to the right side up to the equivalent of the minimum width of 1 internal character.
(2) When an area up to the equivalent of 1 character cannot be secured even when (1) is performed, the print area is extended to the left side. (The left margin is reduced.)

Ruled line data set in the "Ruled Line" command (DC3) is not shifted or masked due to the left margin setting. (The ruled line data is always valid for the printable area.)

Related Commands   GS 'P', GS 'W'

GS 'W' nl nh   Set Print Area Width

Code   1DH 57H nl nh

Definition Range   0 ≤ nl ≤ 255, 0 ≤ nh ≤ 255

Default   Printable area

Function   Sets the print area width specified by nl and nh.
The print area width is [(nh × 256 + nl) × basic calculation pitch] inches.

Notes   This command is valid only when input at the beginning of the line.
When page mode is selected, inputting this command executes only the internal flag operation of the printer.
The setting of this command does not affect the page mode.

When a value that exceeds the printable area of 1 line is input, the entire area excluding the left margin is set as the print area width.
The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P'). Moreover, once set, the print area width does not change even when the basic calculation pitch is changed by the "Set Basic Calculation Pitch" command (GS 'P').
The basic calculation pitch in the horizontal direction (x) of "Set Basic Calculation Pitch" command (GS 'P') is used for calculating the print area width. Moreover, when the calculation result is a fractional figure, it is corrected using the minimum pitch of the printer, and the remainder is discarded.

When the set print area width is less than 1 character of the currently specified character type at character data mapping, the following processing is performed only for that line.
(1) Within the printable area, the print area is extended to the right side up to the equivalent of 1 character of the specified character type.
(2) When an area up to the equivalent of 1 character cannot be secured even when (1) is performed, the print area is extended to the left side. (The left margin is reduced.)

When the set print area width is less than the minimum width of 1 internal character (the width of the font size selected by character font selection) at mapping of the data other than characters (bit image, etc.), the following processing is performed only for that line.
(1) Within the printable area, the print area is extended to the right side up to the equivalent of the minimum width of 1 internal character.
(2) When an area up to the equivalent of 1 character cannot be secured even when (1) is performed, the print area is extended to the left side. (The left margin is reduced.)

Ruled line data set in the "Ruled Line" commands (DC3) is not shifted or masked due to the print area width setting. (The ruled line data is always valid for the maximum value of the printable area.)

Related Commands   GS 'L', GS 'P'

Code   1BH 54H n

Definition Range   0 ≤ n ≤ 3, 48 ≤ n ≤ 51

Default   MS13-2 (180° Reverse Function Selection) is set to Disable: n = 0
            MS13-2 (180° Reverse Function Selection) is set to Enable: n = 2

Function   Specifies the print direction and starting point of characters in page mode.

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

Notes   When the standard mode is selected, inputting this command executes only the internal flag
            operation of the printer.
            The setting of this command does not affect the standard mode.
            The mapping start position of characters is the starting point in the print area specified by the
            "Set Print Area in Page Mode" command (ESC 'W').
            The parameter (x or y) of the basic calculation pitch used for the following commands differs
            depending on the starting point.

            When the starting point is "upper left" or "lower right" (Characters are mapped in the direction
            perpendicular to paper feed.)
            Commands that use x: ESC SP, ESC '$', ESC '\', FS 'S'
            Commands that use y: ESC '3', ESC 'J', GS '$', GS '\'

            When the starting point is "upper right" or "lower left" (Characters are mapped in the paper
            feed direction.)
            Commands that use x: ESC '3', ESC 'J', GS '$', GS '\'
            Commands that use y: ESC SP, ESC '$', ESC '\', FS 'S'

Related Commands   ESC '$', ESC 'L', ESC 'W', ESC '\', GS '$', GS 'P', GS '\'
                    See "6.3.2 Page Mode".

Paper feed direction
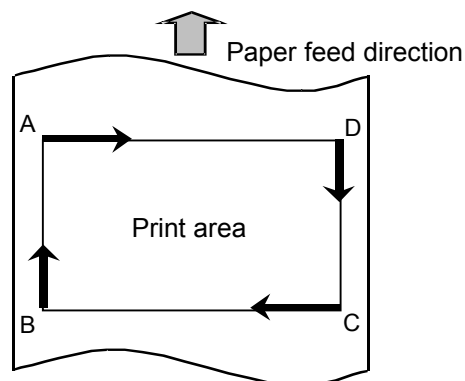
Print area

Code   1BH 57H xL xH yL yH dxL dxH dyL dyH

Definition Range   0 ≤ xL, xH, yL, yH, dxL, dxH, dyL, dyH ≤ 255

Default   Printable area of the thermal paper

Function   Sets the position and size of the print area.
              The settings are as follows:
              Horizontal starting point = [(xH × 256 + xL) × basic calculation pitch] inches
              Vertical starting point = [(yH × 256 + yL) × basic calculation pitch] inches
              Horizontal length = [(dxH × 256 + dxL) × basic calculation pitch] inches
              Vertical length = [(dyH × 256 + dyL) × basic calculation pitch] inches

Notes   When the standard mode is selected, inputting this command executes only the internal flag
              operation of the printer.
              The setting of this command does not affect the standard mode.
              This command is ignored when the horizontal or vertical starting point is outside the printable
              area. See "6.3.2 Page Mode" for the printable area.
              The mapping start position of characters is the starting point specified by the "Select Print
              Direction in Page Mode" command (ESC 'T') in the print area.
              When (horizontal starting point + horizontal length) or (vertical starting point + vertical length)
              exceeds the printable area, the maximum value of the print area is the printable area.
              The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
              Moreover, once set, the print area does not change even when the basic calculation pitch is
              changed by the "Set Basic Calculation Pitch" command (GS 'P').
              When the calculation result is a fractional figure, it is corrected using the minimum pitch of the
              printer, and the remainder is discarded.
              The basic calculation pitch (x) is used for calculating the horizontal starting point and the
              horizontal length, and the basic calculation pitch (y) is used for calculating the vertical starting
              point and the vertical length.

              When X is as the horizontal starting point, Y as the vertical starting point, Dx as the horizontal
              length, and Dy as the vertical length, the print area is as follows:
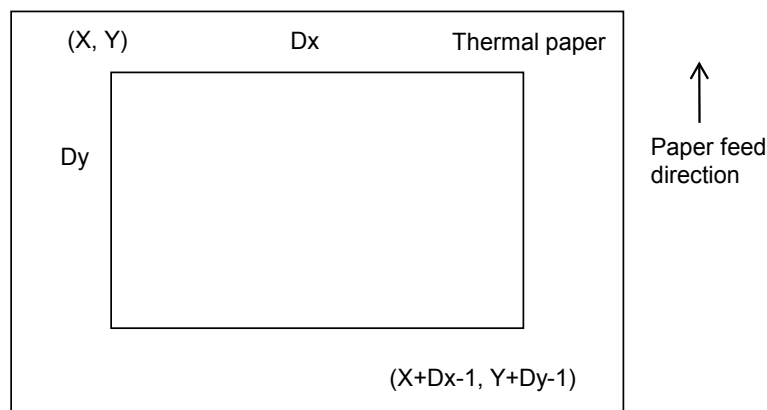
              In page mode, the ruled line data set in the "Ruled Line" command (DC3) is affected by the
              print area set by this command. The ruled line is not printed outside the print area.

Related Commands   CAN, ESC 'L', ESC 'T', GS 'P'
                    See "6.3.2 Page Mode".

Code   1BH 24H nl nh

Definition Range $0 \le nl \le 255$, $0 \le nh \le 255$

Function   Specifies the print position based on the left margin position.
The next print position is $[(nh \times 256 + nl) \times \text{basic calculation pitch}]$ inches from the left margin position.

Notes   Specifications beyond the print area are ignored.
The absolute print position is specified based on the beginning of the line.
The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
When the calculation result is a fractional figure, it is corrected using the minimum pitch of the printer, and the remainder is discarded.
In the standard mode, the horizontal basic calculation pitch (x) is used.

When using the command in page mode, its behavior is as follows depending on the starting point.
(1) When the starting point is specified at "upper left" or "lower right" by the "Select Print Direction in Page Mode" command (ESC 'T'), the absolute position in the direction perpendicular to paper feed (horizontal direction of character) is specified.At this time, the basic calculation pitch in the horizontal direction (x) is used for calculation.
(2) When the starting point is specified at "upper right" or "lower left" by the "Select Print Direction in Page Mode" command (ESC 'T'), the absolute position in the paper feed direction (horizontal direction of character) is specified. At this time, the basic calculation pitch in the vertical direction (y) is used for calculation.

Related Commands   ESC '\', GS 'P'

Code   1BH 5CH nl nh

Definition Range $0 \le nl \le 255$, $0 \le nh \le 255$

Function   Specifies the print position based on the current position.
The next print position is $[(nh \times 256 + nl) \times \text{basic calculation pitch}]$ inches from the current position.

Notes   Specifications beyond the print area are ignored.
In relation to the character direction, specify a positive number to specify rightward from the current position and specify a negative number to specify leftward from the current position.
Negative numbers are represented by 2's complement.
The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
When the calculation result is a fractional figure, it is corrected using the minimum pitch of the printer, and the remainder is discarded.
In the standard mode, the horizontal basic calculation pitch (x) is used.

When using the command in page mode, its behavior is as follows depending on the starting point.
(1) When the starting point is specified at "upper left" or "lower right" by the "Select Print Direction in Page Mode" command (ESC 'T'), the relative position in the direction perpendicular to paper feed (horizontal direction of character) is specified.
At this time, the basic calculation pitch in the horizontal direction (x) is used.
(2) When the starting point is specified at "upper right" or "lower left" by the "Select Print Direction in Page Mode" command (ESC 'T'), the relative position in the paper feed direction (horizontal direction of character) is specified.At this time, the basic calculation pitch in the vertical direction (y) is used.

Related Commands   ESC '$', GS 'P'

GS '$' nl nh   Specify Absolute Vertical Position in Page Mode

Code   1DH 24H nl nh

Definition Range $0 \le nl \le 255$, $0 \le nh \le 255$

Function   Specifies the absolute position of starting data mapping of characters in the vertical direction based on the starting point when the page mode is specified.
The absolute position is [(nh × 256 + nl) × basic calculation pitch] inches.

Notes   This command is ignored except when page mode is selected.
The reference starting point indicates the position specified by the "Select Print Direction in Page Mode" command (ESC 'T').
Absolute position specification exceeding the specified print area is ignored.

The behavior is as follows depending on the starting point of "Select Print Direction in Page Mode" command (ESC 'T').
(1)   When the starting point is specified at "upper left" or "lower right", the absolute position in the paper feed direction (vertical direction of character) is specified. At this time, the basic calculation pitch in the vertical direction (y) is used.
(2)   When the starting point is specified at "lower left" or "upper right", the absolute position in the direction perpendicular to paper feed (vertical direction of character) is specified. At this time, the basic calculation pitch in the horizontal direction (x) is used.

The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
When the calculation result is a fractional figure, it is corrected using the minimum pitch of the printer, and the remainder is discarded.
When characters with different vertical scale exist on the same line, the characters are extended based on the base line or bottom edges of the characters.

The base line is set to 0 dots.

The references for mapping data to the specified print position are as shown in the table below.

Data	Mapping Reference
Character	Bottom edge of character
Bit image	Bottom edge of bit image
Downloaded bit image	Bottom edge of downloaded bit image
Raster bit image	Top edge of raster bit image
NV graphics	Bottom edge of NV graphics
Graphics data stored in print buffer	Bottom edge of graphics
Barcode	Bottom edge of barcode (excluding HRI characters)

Related Commands   ESC 'T', GS '\', GS 'P'
See "6.3.2 Page Mode".

Code   1DH 5CH nl nh

Definition Range   0 ≤ nl ≤ 255, 0 ≤ nh ≤ 255

Function   Specifies the relative position of starting data mapping of characters in the vertical direction
            based on the current position when the page mode is specified.
            The relative position is [(nh × 256 + nl) × basic calculation pitch] inches.

Notes   This command is ignored except when page mode is selected.
            The reference current position indicates the mapping reference position of the next data.
            In relation to the character, specify a positive number to specify downward from the current
            position and specify a negative number to specify upward from the current position. Negative
            numbers are represented by 2's complement.
            Relative position specification exceeding the specified print area is ignored.
            The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
            When the calculation result is a fractional figure, it is corrected using the minimum pitch of the
            printer, and the remainder is discarded.

            The behavior is as follows depending on the starting point of "Select Print Direction in Page
            Mode" command (ESC 'T').
            (1) When the starting point is specified at "upper left" or "lower right", the relative position in
                 the paper feed direction (vertical direction of character) is specified. At this time, the basic
                 calculation pitch in the vertical direction (y) is used for calculation.
            (2) When the starting point is specified at "lower left" or "upper right", the relative position in
                 the direction perpendicular to paper feed (vertical direction of character) is specified. At
                 this time, the basic calculation pitch in the horizontal direction (x) is used for calculation.

            The references for mapping data to the specified print position are as shown in the table
            below.

Data	Mapping Reference
Character	Bottom edge of character
Bit image	Bottom edge of bit image
Downloaded bit image	Bottom edge of downloaded bit image
Raster bit image	Top edge of raster bit image
NV graphics	Bottom edge of NV graphics
Graphics data stored in print buffer	Bottom edge of graphics
Barcode	Bottom edge of barcode (excluding HRI characters)

Related Commands   ESC 'T', GS '$', GS 'P'
                    See "6.3.2 Page Mode".

6.5.5 Image

ESC '*' m nl nh [d]k   Print Bit Image Mode

Code   1BH 2AH m nl nh [d]k

Definition Range   m = 0, 1, 32, 33
                   $0 \le nl \le 255$, $0 \le nh \le 3$, $0 \le d \le 255$

Function   Stores a bit image of the number of dots specified by nl and nh in the line buffer in the mode specified by m.

m	Mode	Number of Vertical Dots	Vertical Dot Density	Horizontal Dot Density	Number of Data Dots (k)
0	8 dots single density	8	67 dpi	101 dpi	nh × 256 + nl
1	8 dots double density	8	67 dpi	203 dpi	nh × 256 + nl
32	24 dots single density	24	203 dpi	101 dpi	(nh × 256 + nl) × 3
33	24 dots double density	24	203 dpi	203 dpi	(nh × 256 + nl) × 3

This command only stores the bit image in the line buffer in the standard mode. It is printed through a print command or 1 line full.
Maps the bit image in the set print area in the page mode.

Notes   When m is out of the definition range, the subsequent data is processed as normal data.
nl and nh indicate the horizontal dots of the bit image to be printed, and the number of data dots is [nh × 256 + nl].
When bit image data exceeding the printable dots on 1 line is input, the excess data is discarded.
d indicates the bit image data. The bits that correspond to dots to print are 1, and the bits that correspond to dots not to print are 0. The data is input in the order in the figure below.

When the print area width set by the "Set Left Margin" command (GS 'L') or "Set Print Area Width" command (GS 'W') is less than the minimum width of 1 internal character (the width of the font size selected by character font selection), the following processing is performed only for that line.
(1) Within the printable area, the print area is extended to the right side up to the equivalent of the minimum width of 1 internal character.
(2) When an area up to the equivalent of 1 character cannot be secured even when (1) is performed, the print area is extended to the left side. (The left margin is reduced.)

The printer returns to usual data processing after completion of processing the image data.
The print modes (bold printing, double strike printing, underline, character size, etc.) excluding inversion (flip) printing have no effect.

<Data input order>

8 dots image

d1 d2 d3 d4 d5 d6 ········

7 MSB
6
5
4
3
2
1
0 LSB

24 dots image

d1 d4 d7 ········

d2 d5 d8 ········

7 MSB
6
5
4
3
2
1
0 LSB

d3 d6 d9 ········

GS '*' x y [d]k   Register Downloaded Bit Image

Code   1DH 2AH x y [d]k

Definition Range $1 \leq x \leq 255$, $1 \leq y \leq 255$, $0 \leq d \leq 255$, $8 \leq k \leq 65524$
(Deleted when x = 0 or y = 0)

Function   Registers the downloaded bit image of dots specified by x and y.
($x \times 8$) specifies the number of dots in the horizontal direction.
($y \times 8$) specifies the number of dots in the vertical direction.
The downloaded bit image is not registered at the shipping.

Notes   Downloaded bit image is a bit image which can be registered in the user area by this
command and printed by the "Print Downloaded Bit Image" command (GS '/').
The number of dots in horizontal direction is $x \times 8$ dots, and the number of dots in vertical
direction is $y \times 8$ dots.
d indicates the bit image data. The bits that correspond to dots to print are 1, and the bits that
correspond to dots not to print are 0.
Image data exceeding 65524 bytes cannot be registered.
Whether to use column scan mode or row scan mode for transfer data can be selected by the
"Select Bit Image Scan Method" command (DC2 'I').
k indicates the number of data bytes. $k = y \times x \times 8$ bytes.
The relation between the downloaded bit image and the print data is shown as follows.
The memory usage m is calculated by the formula below.
   m = Number of data bytes + Number of bytes of memory control information
In the standard mode, when there is data in the line buffer, this command is ignored.

Related Commands   GS '/'

<Column scan mode>

$X = x \times 8$

d1 d(y+1) d(y × 2+1)

7 MSB
6
5
4
3
2
1
0 LSB

$Y = y \times 8$

d2

dy d(y × 2) d(y × x × 8)

<Row scan mode>

$X = x \times 8$

| d1 | d2 | ...... | dx |
| d(x+1) | d(x+2) | | d(x × 2) |

$Y = y \times 8$

d(x × y × 8)

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
MSB   LSB

---
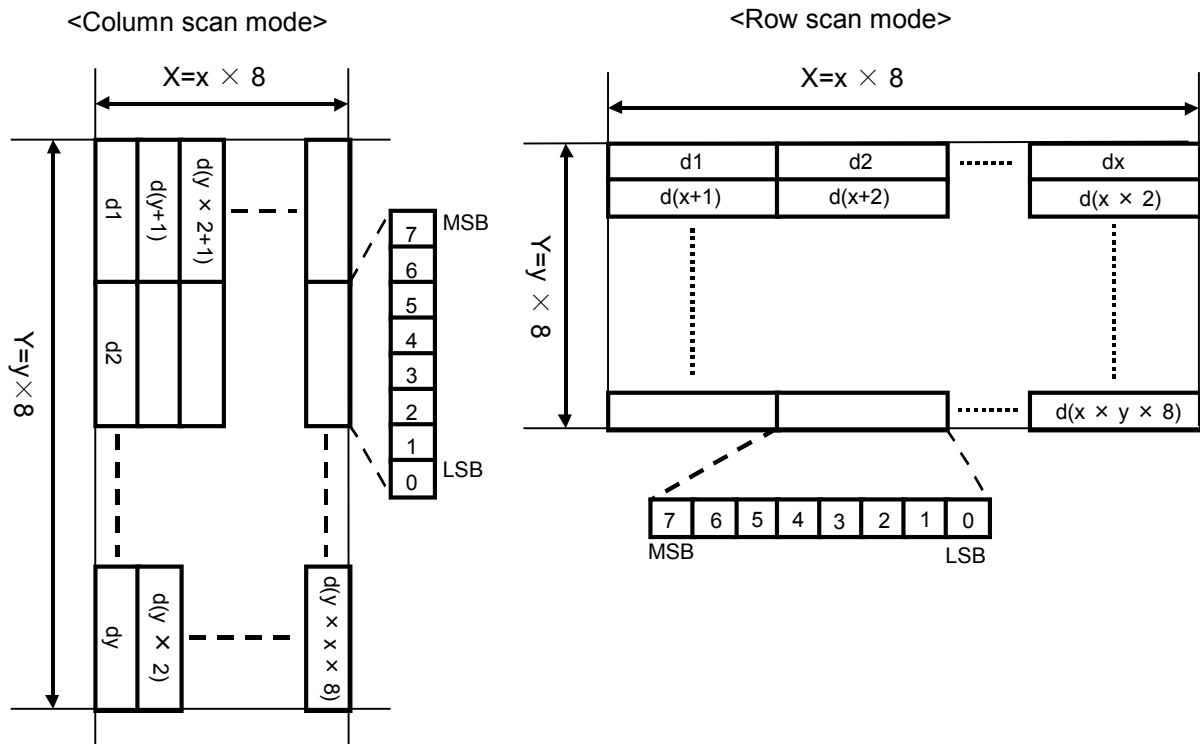
(1)GS '/' m   **Print Downloaded Bit Image**
(2)GS '/' m n   **Select Downloaded Bit Image**

Code   (1)1DH 2FH m
             (2)1DH 2FH m n

Definition Range   (1)$0 \leq m \leq 3$, $48 \leq m \leq 51$
                        (2)$4 \leq m \leq 7$, $52 \leq m \leq 55$, $0 \leq n \leq 255$

Function   Prints the registered downloaded bit image data in mode m.
When $4 \leq m \leq 7$ or $52 \leq m \leq 55$, the print start position in the horizontal direction of the downloaded bit image can be specified by n. (The print start position is specified at the position of n × 8 dots from the left end of the paper.)

m	Function
0, 48	Normal mode printing
1, 49	Double width mode printing
2, 50	Double height mode printing
3, 51	Quadruple mode printing
4, 52	Normal mode selection
5, 53	Double width mode selection
6, 54	Double height mode selection
7, 55	Quadruple mode selection

Notes   This command is ignored when the downloaded bit image data is not registered.
In the standard mode, this command is valid only when there is no data in the line buffer.
The print modes (bold printing, double strike printing, underline, character size, etc.) excluding inversion (flip) printing have no effect. The inversion (flip) printing is invalid in the "Select Downloaded Bit Image" command (GS '/').
When the size of the registered downloaded bit image data exceeds the print area, the excess data is not printed.

When downloaded bit image, character data, bit image mode printing, and barcode are mixed on the same line in page mode, the bottom edge of the downloaded bit image is aligned with the followings:

Character data: Bottom edge of the character
Bit image: Bottom edge of the bit image
Barcode: Bottom edge of the barcode
                 At this time, HRI characters are not included.

When the print area width set by the "Set Left Margin" command (GS 'L') or "Set Print Area Width" command (GS 'W') is less than the minimum width of 1 internal character (the width of the font size selected by character font selection), the following processing is performed only for that line.
(1) Within the printable area, the print area is extended to the right side up to the equivalent of the minimum width of 1 internal character.
(2) When an area up to the equivalent of 1 character cannot be secured even when (1) is performed, the print area is extended to the left side. (The left margin is reduced.)

When $0 \leq m \leq 3$ or $48 \leq m \leq 51$, printing starts as soon as the command is accepted.
When $4 \leq m \leq 7$ or $52 \leq m \leq 55$, the selected downloaded bit image is printed on the character printing portion and the space between lines. The image is also printed on the portion of paper feed by the "Print and n Lines Feed Forward" command (ESC 'J') or "Print and n Lines Feed Forward" command (ESC 'd').
When the downloaded bit image is selected, specifying m outside $4 \leq m \leq 7$ and $52 \leq m \leq 55$ cancels the downloaded bit image selection.
In page mode, the downloaded bit image selection is invalid.

Related Commands   GS '*'

GS 'v' '0' m xL xH yL yH [d]k   Print Raster Bit Image

Code   1DH 76H 30H m xL xH yL yH [d]k

Definition Range $0 \leq m \leq 3$, $48 \leq m \leq 51$, $64 \leq m \leq 67$, $128 \leq m \leq 131$, $192 \leq m \leq 195$,
                       $0 \leq xL \leq 255$, $0 \leq xH \leq 255$
                       $0 \leq yL \leq 255$, $0 \leq yH \leq 15$, $0 \leq d \leq 255$
                       $k = (xH \times 256 + xL) \times (yH \times 256 + yL)$ However, $k \neq 0$

Function   Prints a raster format bit image in mode m.

m	Mode	Vertical Dot Density	Horizontal Dot Density
0, 48, 64, 128, 192	Normal mode	203 dpi	203 dpi
1, 49, 65, 129, 193	Double width mode	203 dpi	101 dpi
2, 50, 66, 130, 194	Double height mode	101 dpi	203 dpi
3, 51, 67, 131, 195	Quadruple mode	101 dpi	101 dpi

xL and xH specify the number of horizontal data bytes of the bit image as $(xH \times 256 + xL)$ bytes.
yL and yH specify the number of vertical data bits of the bit image as $(yH \times 256 + yL)$ bits.

When $128 \leq m \leq 131$ or $192 \leq m \leq 195$ is set, the received bit image data is mapped on the memory, and then the image is printed collectively.

When $64 \leq m \leq 67$ or $192 \leq m \leq 195$ is set, the received bit image data is treated as compressed data and printed after uncompressing.

In the standard mode, this command is valid only when there is no print data in the line buffer. All print modes (character size, bold printing, double strike printing, inversion (flip) printing, underline, reverse printing, etc.) have no effect on raster bit images.
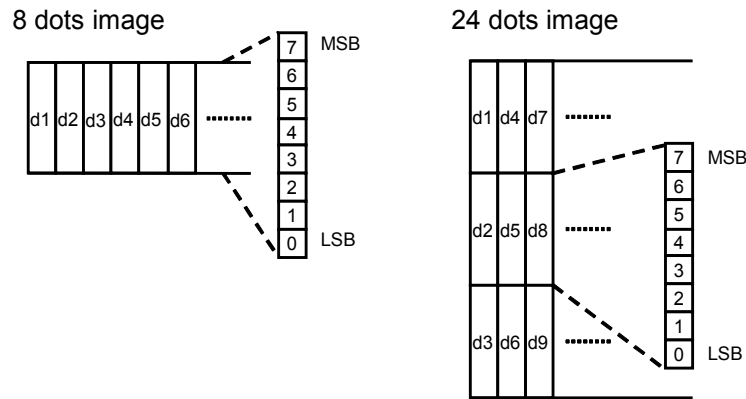
When the print area width set by the "Set Left Margin" command (GS 'L') or "Set Print Area Width" command (GS 'W') is less than the minimum width, the print area width is extended to the minimum width only for that line. The minimum width is 1 dot regardless of the mode. The data outside of the printable area is discarded in dots.

The print start position of the raster bit image can be freely specified by the "Horizontal Tab" command (HT), "Specify Absolute Position" command (ESC '$'), "Specify Relative Position" command (ESC '\'), or "Set Left Margin" command (GS 'L').
The setting of the "Alignment" command (ESC 'a') is valid for raster bit images as well.

When this command is executed during macro definition, the processing of macro definition is canceled, and processing of this command is started. At this time, the macro is undefined.

When $0 \leq m \leq 3$, $48 \leq m \leq 51$, or $128 \leq m \leq 131$ is set, the bits that correspond to dots to print are 1, and the bits that correspond to dots not to print are 0 in the bit image data d.
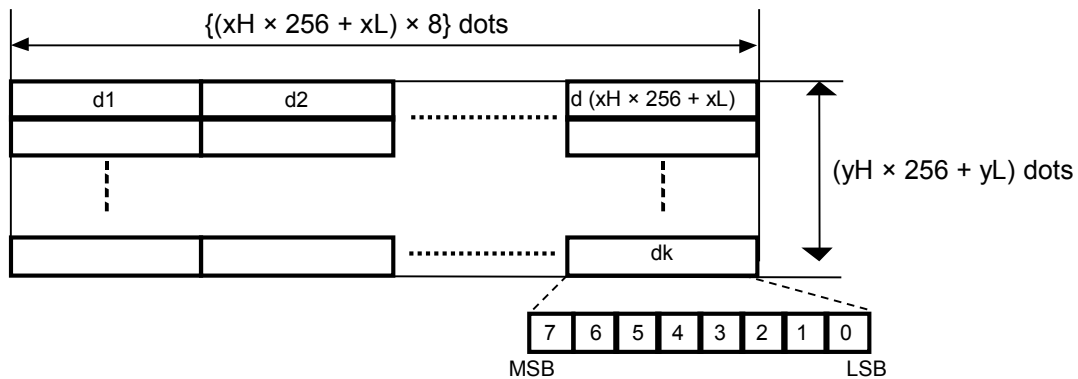
When $64 \leq m \leq 67$ or $192 \leq m \leq 195$ is set, the bit image data is input in an RLE (Run Length Encoding) compression data format positioning MSB on the left.
The data of 1 dot-line is defined by the following format.
  [n [d]n]: Compressed data of 1 dot-line
      n = Number of compressed data bytes of 1 dot-line
      d = Compressed data 1 byte
When the bit 7 of d is 0, the bits 6 to 0 indicate as follows:
  Bit 6:   Color (0 = white / 1 = black)
  Bit 5 to 0: Number of continuous dots
When the bit 7 of d is 1, the bits 6 to 0 directly indicate the image data of 7 dots.
  e.g.) When 1 dot-line is an image as below,
      the bit image data is 03H 4FH ABH 0AH.

01001111B (Black: 15 dots)　　　10101011B (7 dots)　　　00001010B (White: 10 dots)
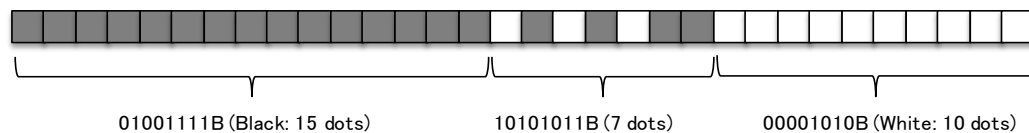
Depending on the data before compression, the size of the compressed data may be larger than before compression. In that case, the compressed data takes longer to transfer.

When using this command, reduced printing speed, for example due to the communication speed may cause poor print quality or abnormal noise. Therefore, use this command in combination with page mode, etc. and in the environment where printing can be performed maintaining the print speed above a certain speed regardless of the communication speed.

Code   12H 49H n

Definition Range   0 ≤ n ≤ 255

Default   n = 0 (Column scan)

Function   Specifies whether to transfer bit image registration with column scan or row scan data.
When n = <*******0>B, column scan is specified.
When n = <*******1>B, row scan is specified.

Notes   Only the LSB is valid for n.

The command affected by this setting is as follows:
Register Downloaded Bit Image (GS '*')

Code   12H 3DH n

Definition Range   0 ≤ n ≤ 255

Default   n = 1

Function   When the row scan method is selected as the bit image scan method, the command selects
whether the left edge of the print image is the LSB or MSB of the bit image data.
When n = <*******0>B, the LSB is the left edge or top.
When n = <*******1>B, the MSB is the left edge or top.

Notes   Only the LSB is valid for n.

The commands affected by this setting are as follows:

Register NV Graphics Data
  ((1)GS '(' 'L' pL pH '0' fn '0' kc1 kc2 b xL xH yL yH '1' [d]k
    (2)GS '8' 'L' p1 p2 p3 p4 '0' fn '0' kc1 kc2 b xL xH yL yH '1' [d]k)
Store Graphics Data in Print Buffer
  ((1) GS '(' 'L' pL pH '0' fn '0' bx by '1' xL xH yL yH [d]k
    (2) GS '8' 'L' p1 p2 p3 p4 '0' fn '0' bx by '1' xL xH yL yH [d]k)
Register Downloaded Bit Image (GS '*')
Print Raster Bit Image (GS 'v' '0')
Write Ruled Line Image (DC3 'v')
Fill Ruled Line Pattern (DC3 'F')

When 64 ≤ m ≤ 67 or 192 ≤ m ≤ 195 is set in the "Print Raster Bit Image" command (GS 'v'),
only the internal flag operation of the printer is executed.

When this command is input while the column scan is selected, only the internal flag
operation of the printer is executed.

Related Commands   DC2 'I'

GS '(' 'L' pL pH '0' fn — Send NV Graphics Memory Capacity

<u>Code</u>   1DH 28H 4CH pL pH 30H fn

<u>Definition Range</u>   pL = 2, pH = 0
                                  fn = 0, 48

<u>Function</u>   In response to the request of this command, the printer sends the number of bytes of total
                 capacity in NV graphics area by 4 bytes in a HEX code format.
                 The number of data bytes to be sent is 2 bytes of header and footer + 4 × 2 = 10 bytes.
                 pL, pH: Number of bytes of the following parameter
                 fn: Function selection number

<u>Notes</u>   The NV graphics memory capacity means the maximum value available for NV graphics in
                 the user area. This value varies depending on the usage of the user area by other commands.

<u>Related Commands</u>   GS '(' 'L', GS '8' 'L'
                                  See "6.4 RESPONSE DATA".

GS '(' 'L' pL pH '0' fn — Print Graphics Data Stored in Print Buffer

<u>Code</u>   1DH 28H 4CH pL pH 30H fn

<u>Definition Range</u>   pL = 2, pH = 0
                                  fn = 2, 50

<u>Function</u>   Prints the graphics data stored in the print buffer by the "Store Graphics Data in Print Buffer"
                 command (GS '(' 'L', GS '8' 'L').
                 pL, pH: Number of bytes of the following parameter
                 fn: Function selection number

<u>Notes</u>   In the standard mode, this command is valid only when there is no print data in the line buffer.
                 All print modes (character size, bold printing, double strike printing, inversion (flip) printing,
                 underline, reverse printing, etc.) have no effect.

<u>Related Commands</u>   GS '(' 'L', GS '8' 'L'

GS '(' 'L' pL pH '0' fn — Send NV Graphics Memory Remaining Capacity

<u>Code</u>   1DH 28H 4CH pL pH 30H fn

<u>Definition Range</u>   pL = 2, pH = 0
                                  fn = 3, 51

<u>Function</u>   In response to the request of this command, the printer sends the number of bytes of
                 remaining capacity in NV graphics area by 4 bytes in a HEX code format.
                 The number of data bytes to be sent is 2 bytes of header and footer + 4 × 2 = 10 bytes.
                 pL, pH: Number of bytes of the following parameter
                 fn: Function selection number

<u>Notes</u>   The memory capacity of the unused area excluding the released area is sent by HEX code.
                 The value to be sent is the same as that of the "Send Remaining User Area" command.

<u>Related Commands</u>   GS '(' 'L', GS '8' 'L', DC2 '*' '1', DC2 '*' '2'
                                  See "6.4 RESPONSE DATA".

Code   1DH 28H 4CH pL pH 30H fn 4BH 43H

Definition Range   pL = 4, pH = 0
                        fn = 64

Function   In response to the request of this command, the printer sends the key code list of the
              registered NV graphics by character string.
              pL, pH: Number of bytes of the following parameter
              fn: Function selection number

Notes   When 40 or more key codes are registered, the data is divided to the upper limit of 40 key
              codes and sent. The 1st character of the response shows the status of the data that follows.

Response Data	Status
40H	No following data exists
41H	Following data exists

              The printer performs the following operations according to the transmission data from the host
              device after sending the character string once.

Transmission Data	Operation
06H	Preceding status 40H: Terminates processing Preceding status 41H: Sends next data group
15H	Resends preceding data group
18H	Even when following data exists, processing is aborted and terminated.

              The printer does not return to normal processing until the processing is terminated or
              suspended by the operations above.

Related Commands   GS '(' 'L', GS '8' 'L'
                    See "6.4 RESPONSE DATA".

Code   1DH 28H 4CH pL pH 30H fn 43H 4CH 52H

Definition Range   pL = 5, pH = 0
                        fn = 65

Function   Deletes all NV graphics data in batch.
              pL, pH: Number of bytes of the following parameter
              fn: Function selection number

Notes   In the standard mode, this command is valid only when there is no print data in the line buffer.
              Deleting the graphics data cannot increase the remaining memory capacity. The area can be
              used again as the user area by the "Defragment User Area" command (DC2 '*' '1').

Related Commands   GS '(' 'L', GS '8' 'L'

GS '(' 'L' pL pH '0' fn kc1 kc2   Delete Specified NV Graphics Data

Code   1DH 28H 4CH pL pH 30H fn kc1 kc2

Definition Range   pL = 4, pH = 0
                            fn = 66
                            $32 \leq kc1 \leq 126$, $32 \leq kc2 \leq 126$

Function   Deletes the NV graphics data specified by key code.
           pL, pH: Number of bytes of the following parameter
           fn: Function selection number
           kc1, kc2:   Key code

Notes   When the NV graphics data is not registered in the specified key code, this command is
ignored.
In the standard mode, this command is valid only when there is no print data in the line buffer.
Deleting the graphics data cannot increase the remaining memory capacity. The area can be
used again as the user area by the "Defragment User Area" command (DC2 '*' '1').

Related Commands   GS '(' 'L', GS '8' 'L'

GS '(' 'L' pL pH '0' fn kc1 kc2 x y   Print Specified NV Graphics Data

Code   1DH 28H 4CH pL pH 30H fn kc1 kc2 x y

Definition Range   pL = 6, pH = 0
                            fn = 69
                            $32 \leq kc1 \leq 126$, $32 \leq kc2 \leq 126$
                            x = 1, 2
                            y = 1, 2

Function   Prints the NV graphics data specified by key code in x times the width and y times the height.
           pL, pH: Number of bytes of the following parameter
           fn: Function selection number
           kc1, kc2:   Key code
           x: Horizontal scale
           y: Vertical scale

Notes   When the NV graphics data is not registered in the specified key code, this command is
ignored.
In the standard mode, this command is valid only when there is no print data in the line buffer.
The print modes (bold printing, double strike printing, underline, character size, etc.) excluding
the inversion (flip) printing have no effect.

When the print area width set by the "Set Left Margin" command (GS 'L') or "Set Print Area
Width" command (GS 'W') is less than the minimum width of 1 internal character (the width of
the font size selected by character font selection), the following processing is performed only
for that line.
(1)   Within the printable area, the print area is extended to the right side up to the equivalent
       of the minimum width of 1 internal character.
(2)   When an area up to the equivalent of 1 character cannot be secured even when (1) is
       performed, the print area is extended to the left side. (The left margin is reduced.)

In page mode, the printer maps the image memory inside the printer. Actual printing is not
performed by page mode printing by FF or ESC FF.

Related Commands   GS '(' 'L', GS '8' 'L'

GS '(' 'L' pL pH '0' fn kc1 kc2 x y z — Select Specified NV Graphics Data

Code   1DH 28H 4CH pL pH 30H fn kc1 kc2 x y z

Definition Range
  pL = 7, pH = 0
  fn = 70
  $32 \le kc1 \le 126$, $32 \le kc2 \le 126$
  x = 1, 2
  y = 1, 2
  $0 \le z \le 255$

Function   Selects the NV graphics data specified by key code with x times the width and y times the height. The print start position in the horizontal direction of the graphics data can be specified by z. (The print start position is specified at the position of z × 8 dots from the left edge of the paper.)
  pL, pH: Number of bytes of the following parameter
  fn: Function selection number
  kc1, kc2:   Key code
  x: Horizontal scale
  y: Vertical scale
  z: Horizontal print start position

Notes   When the NV graphics data is not registered in the specified key code, this command is ignored.
  Multiple NV graphics cannot be selected. The last selected graphics data is valid.
  In the standard mode, this command is valid only when there is no print data in the line buffer.
  In the page mode, NV graphics selection is invalid.

Related Commands   GS '(' 'L', GS '8' 'L'

(1)GS '(' 'L' pL pH '0' fn '0' kc1 kc2 b xL xH yL yH '1' [d]k
(2)GS '8' 'L' p1 p2 p3 p4 '0' fn '0' kc1 kc2 b xL xH yL yH '1' [d]k
Register NV Graphics Data

Code   (1)1DH 28H 4CH pL pH 30H fn 30H kc1 kc2 b xL xH yL yH 31H [d]k
  (2)1DH 38H 4CH p1 p2 p3 p4 30H fn 30H kc1 kc2 b xL xH yL yH 31H [d]k

Definition Range
  For (1) : $12 \le (pH \times 256 + pL) \le 65535$
  For (2) : $12 \le (p4 \times 16777216 + p3 \times 65536 + p2 \times 256 + p1) \le 917501$
  fn = 67
  $32 \le kc1 \le 126$, $32 \le kc2 \le 126$, b = 1
  $1 \le (xH \times 256 + xL) \le 8192$
  $1 \le (yH \times 256 + yL) \le 2304$
  $0 \le d \le 255$, k = (int((xH × 256 + xL) + 7) / 8) × (yH × 256 + yL)

Function   Registers the NV graphics data corresponding to key code kc1 and kc2.
  When the key code is different, more than one data can be registered within the memory capacity.
  pL, pH or p1, p2, p3, p4:
    Number of bytes of the following parameter
  fn: Function selection number
  b: Fixed value
  xL, xH: Horizontal size of registered data, (xH × 256 + xL) dots
  yL, yH: Vertical size of registered data, (yH × 256 + yL) dots
  d: Registered data
  k: Number of image data bytes
  The NV graphics is not registered at the shipping.

By this command, the number of data bytes + memory control information bytes is used in the user area of the FLASH memory.
When the remaining capacity of the user area is less than the memory usage m, this command is ignored.
In the standard mode, this command is valid only when there is no print data in the line buffer.
The memory usage m is calculated by the formula below.

  m = Number of data bytes + Number of bytes of memory control information

Related Commands   GS '(' 'L'

---
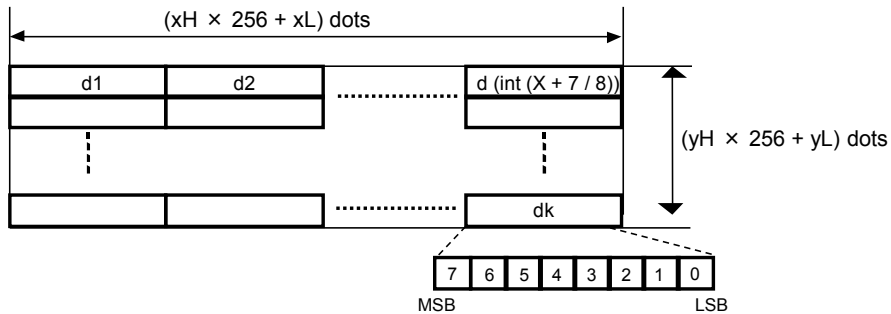
(1) GS '(' 'L' pL pH '0' fn '0' bx by '1' xL xH yL yH [d]k
(2) GS '8' 'L' p1 p2 p3 p4 '0' fn '0' bx by '1' xL xH yL yH [d]k

Store Graphics Data in Print Buffer

Code   (1) 1DH 28H 4CH pL pH 30H fn 30H bx by 31H xL xH yL yH [d]k
            (2) 1DH 38H 4CH p1 p2 p3 p4 30H fn 30H bx by 31H xL xH yL yH [d]k

Definition Range   For (1) : $11 \leq (pH \times 256 + pL) \leq 65535$
            For (2) : $11 \leq (p4 \times 16777216 + p3 \times 65536 + p2 \times 256 + p1) \leq 425482$
            fn = 112
            bx = 1, 2
            by = 1, 2
            $1 \leq (xH \times 256 + xL) \leq 2047$
            $1 \leq (yH \times 256 + yL) \leq 1662$ (when by = 1)
            $1 \leq (yH \times 256 + yL) \leq 831$ (when by = 2)
            $0 \leq d \leq 255$
            $k = (int((xH \times 256 + xL) + 7) / 8) \times (yH \times 256 + yL)$

Function   Stores graphics data in raster format in the print buffer with "bx" times the width and "by" times the height.
            pL, pH or p1, p2, p3, p4:
                        Number of bytes of the following parameter
            xL, xH: Horizontal size of registered data, (xH × 256 + xL) dots
            yL, yH: Vertical size of registered data, (yH × 256 + yL) dots
            fn: Function selection number
            d: Registered data
            k: Number of image data bytes

In the standard mode, this command is valid only when there is no print data in the line buffer. This command only stores graphics data in the print buffer in the standard mode. Actual printing is performed by the "Print Graphics Data Stored in Print Buffer" command (GS '(' 'L'), line feeds, or sending characters.

When the print area width set by the "Set Left Margin" command (GS 'L') or "Set Print Area Width" command (GS 'W') is less than the minimum width, the print area width is extended to the minimum width only for that line. The minimum width is 1 dot when bx = 1 and 2 dots when bx = 2.

The data outside of the printable area is discarded in dots. The print start position of the graphics data can be freely specified by the "Horizontal Tab" command (HT), "Specify Absolute Position" command (ESC '$'), "Specify Relative Position" command (ESC '\'), or "Set Left Margin" command (GS 'L'). The setting of the "Alignment" command (ESC 'a') is valid for graphics data as well.
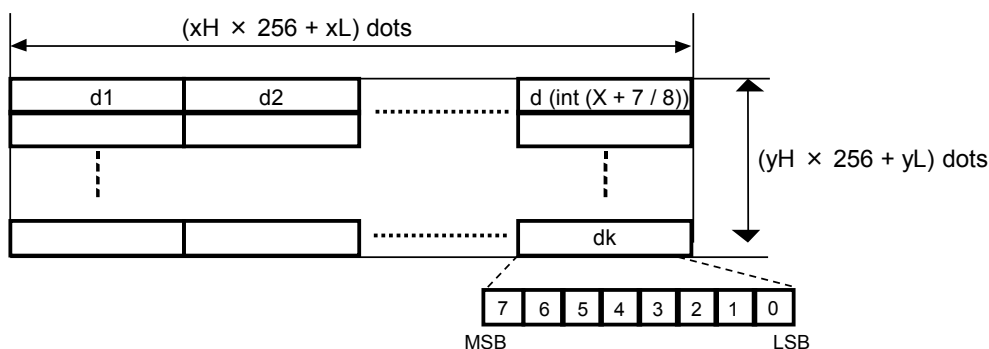
Related Commands   GS '(' 'L'

GS '(' 'L' pL pH '0' fn kc1 kc2 n w yL yH   Specify Watermark Print Position

Code   1DH 28H 4CH pL pH 30H fn kc1 kc2 n w yL yH

Definition Range   pL = 8, pH = 0
fn = 71
$32 \leq kc1 \leq 126$, $32 \leq kc2 \leq 126$
$1 \leq n \leq 9$
$1 \leq w \leq 72$ (MS4-4 (Paper Width Selection) is set to 80 mm, and MS4-5 (Number of Effective Dots Selection) is set to 576 dots)
$1 \leq w \leq 64$ (MS4-4 is set to 80 mm and MS4-5 is set to 512 dots)
$1 \leq w \leq 54$ (MS4-4 is set to 58 mm and MS4-5 is set to 432 dots)
$1 \leq w \leq 45$ (MS4-4 is set to 58 mm and MS4-5 is set to 360 dots)
$1 \leq (yH \times 256 + yL) \leq 32768$

Function   Overlaps and prints NV graphics data corresponding to the key code at the specified print position. The horizontal print area is specified with w × 8 dots and the vertical print area with (yH × 256 + yL) dots, where the NV graphics data is mapped. The print position of the NV graphics data is as shown in the figure.
pL, pH: Number of bytes of the following parameter
fn: Function selection number
kc1, kc2:   Key code
w: Horizontal print area
yL, yH: Vertical print area

w: horizontal print area

y: vertical print area

(1) (2) (3)

(4) (5) (6)

(7) (8) (9)

n: watermark print position

paper
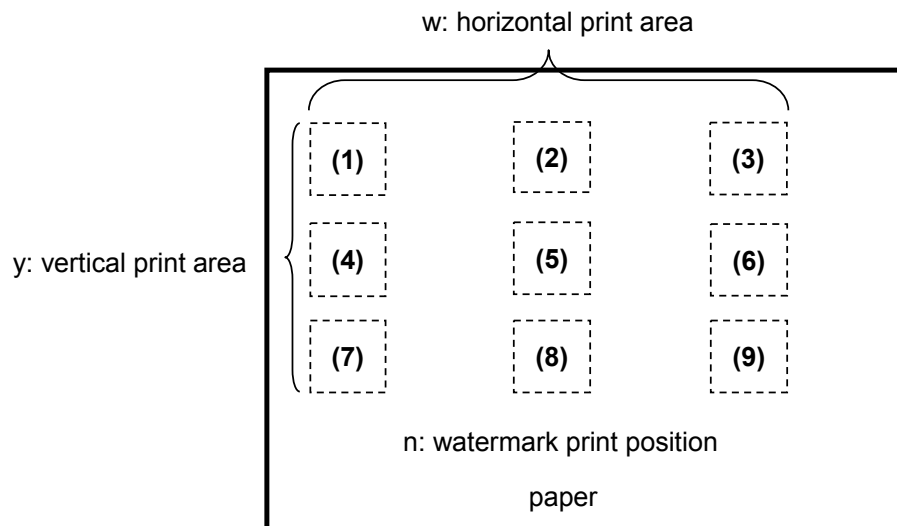
Notes   This command is valid only in the standard mode.
This command is valid only when input at the beginning of the line. Otherwise it is ignored.
When the horizontal or vertical size is smaller than the size of NV graphics data
corresponding to the key code, the data is not printed. When the horizontal size is specified
outside the definition range, it is automatically adjusted to the maximum value.
The meaning of n is as stated below.

n	Print Position
1	Upper left
2	Upper center
3	Upper right
4	Center left
5	Center
6	Center right
7	Lower left
8	Lower center
9	Lower right

The setting outside the range is ignored.

Related Commands   GS '(' 'L'

6.5.6 Macro

Code   1DH 3AH

Function   Specifies start or end of macro definition.
            The macro is not registered at the shipping.

Notes   Macro definition is to register a macro in the user area by this command, and the "Execute
            Macro" command (GS '^') can execute the registered macro.
            When this command is input during normal operation, the start of macro definition is specified.
            Moreover, when this command is input during macro definition, the end of macro definition is
            specified.

            When 00H is sent first after starting macro definition, the printer registers the macro without
            execution of processing command.

            When the following items are input during macro definition, the macro definition is canceled
            and the definition contents are cleared.

            Execute Macro (GS '^')
            Register Downloaded Character (ESC '&')
            Release/Allocate Downloaded Character Area (DC2 'D')
            Register User-Defined Character (FS '2')
            Release/Allocate User Defined Character Area (DC2 'G')
            Register Optional Font (DC2 'P')
            Release Optional Font Area (DC2 'Q')
            Initialize User Area (DC2 'R')
            Register NV Graphics Data (GS '(' 'L'、 GS '8' 'L')
            Delete NV Graphics Data in Batch (GS '(' 'L')
            Delete Specified NV Graphics Data (GS '(' 'L')
            Store Graphics Data in Print Buffer (GS '(' 'L'、 GS '8' 'L')
            Register Downloaded Bit Image (GS '*')
            Print Raster Bit Image (GS 'v')
            Defragment User Area (DC2 '*' '1')

            The registered contents are not cleared by "Initialize Printer" command (ESC '@').
            When "Start/End Macro Definition" command (GS ':') is input immediately after inputting
            "Start/End Macro Definition" command (GS ':'), the macro is put in an undefined state.
            A maximum of 2048 data bytes can be defined for macro.

            The memory usage m is calculated by the formula below.
              m = Number of data bytes + Number of bytes of memory control information

Related Commands   GS '^'

Code   1DH 5EH r t m

Definition Range   0 ≤ r ≤ 255, 0 ≤ t ≤ 255
                        m = 0, 1

Function   Executes macro definition contents.
           r: Macro execution count
           t: Wait time during macro execution
           m: Macro execution mode
               m = 0:   The printer executes r times consecutively at the time interval specified by t.
               m = 1:   After the time specified by t, the printer waits for the FEED Switch to be pressed.
                          When the FEED Switch is pressed, the macro is executed once.
                          The operation is repeated r times.

Notes   The wait time is approximately (t × 100 ms) for each execution mode.
           When this command is input during macro definition, the macro definition is canceled and the
           definition contents are cleared.
           When no macro is defined or r = 0, this command is ignored.
           Even when the panel switch is disabled by the "Enable/Disable FEED Switch" command (ESC
           'c' '5'), the FEED Switch operation by the "Execute Macro" command (GS '^') is valid.

Related Commands   GS ':', ESC 'c' '5'

6.5.7 Barcode

GS 'H' n   Select HRI Character Print Position

Code   1DH 48H n

Definition Range   0 ≤ n ≤ 3, 48 ≤ n ≤ 51

Default   n = 0

Function   Selects the HRI character print position at barcode printing.

n	Print Position
0, 48	Not printed
1, 49	Over barcode
2, 50	Under barcode
3, 51	Over and under barcode (both)

Notes   HRI is an acronym that stands for Human Readable Interpretation.
The HRI character is printed in the font selected by the "Select HRI Character Font" command (GS 'f').

Related Commands   GS 'f', GS 'k', ESC 'M'

GS 'f' n   Select HRI Character Font

Code   1DH 66H n

Definition Range   n = 0, 1, 48, 49

Default   n = 0

Function   Selects the HRI character font at barcode printing.

n	Font
0, 48	Font A (24 × 12)
1, 49	Font B (16 × 8)

Notes   HRI is an acronym that stands for Human Readable Interpretation.
The HRI character is printed at the position specified by the "Select HRI Character Print Position" command (GS 'H').
The HRI character is printed on the basis of the position that is lowered by the specified character's height under the base line of the barcode printing.

Related Commands   GS 'H'

GS 'h' n   Set Barcode Height

Code   1DH 68H n

Definition Range   1 ≤ n ≤ 255

Default   n = 162

Function   Sets the barcode height to n dots.

Notes   When the value less than the GS1 Databar standard is specified, it is automatically adjusted
            to the minimum height of each GS1 Databar.

Related Commands   GS 'k'

GS 'w' n   Set Barcode Width

Code   1DH 77H n

Definition Range   2 ≤ n ≤ 6

Default   n = 3

Function   Sets the barcode width in dots.

n	Multilevel Barcode Module Width (mm)	Binary Level Barcode Narrow Element (mm)
2	0.250	0.250 (2 dots)
3	0.375	0.375 (3 dots)
4	0.500	0.500 (4 dots)
5	0.625	0.625 (5 dots)
6	0.750	0.750 (6 dots)

Notes   Multilevel barcode refers to the following barcode systems:

            UPC-A, UPC-E, JAN13 (EAN13), JAN8 (EAN8), CODE93, CODE128, JAN13 add-on
            GS1 Databar Omni-directional, GS1 Databar Truncated, GS1 Databar Limited,
            GS1 Databar Expanded

            Binary level barcode refers to the following barcode systems:

            CODE39, ITF, CODABAR

            The wide element of the binary level barcode varies depending on the setting of the barcode
            N:W ratio.

            Set 3 or greater to n when the bars are parallel to the thermal paper feed direction. When 2 is
            set to n, the reading accuracy may degrade.

Related Commands   GS 'k', DC2 ':'

Code   1DH 6AH n

Definition Range   0 ≤ n ≤ 3

Default   n = 0

Function   Selects the barcode print direction.

n	Rotation Direction
0	No rotation
1	Rotation of 90° to right
2	Rotation of 180° to right
3	Rotation of 270° to right

Notes   When n is out of the definition range, this command is ignored.
            This command is valid for the barcode and two-dimensional barcode in the standard mode.
            The setting of this command does not affect the page mode.
            The setting of this command is valid only for the barcode and two-dimensional barcode that
            are input immediately after this command.
            When page mode is selected, inputting this command executes only the internal flag
            operation of the printer. When the rotation is specified to 90° or 270° to right, the maximum
            width of printable barcode is 300 mm. And the barcode is not printed when its width exceeds
            300 mm.

Related Commands   GS 'k', GS 'p'

Code   12H 3AH n

Definition Range   0 ≤ n ≤ 2

Default   n = 1

Function   Changes the barcode N:W ratio (Narrow width : Wide width).

n	N:W
0	1:2
1	1:2.5
2	1:3

The width of the element is determined as follows depending on the barcode width setting.

Narrow Element (mm)	Wide Element (mm)		
	N:W = 1:2	N:W = 1:2.5	N:W = 1:3
0.250 (2 dots)	0.500 (4 dots)	0.625 (5 dots)	0.750 (6 dots)
0.375 (3 dots)	0.750 (6 dots)	1.000 (8 dots)	1.125 (9 dots)
0.500 (4 dots)	1.000 (8 dots)	1.250 (10 dots)	1.500 (12 dots)
0.625 (5 dots)	1.250 (10 dots)	1.625 (13 dots)	1.875 (15 dots)
0.750 (6 dots)	1.500 (12 dots)	1.875 (15 dots)	2.250 (18 dots)

Notes   Some barcode readers may not read the barcode depending on the setting of the narrow width and the setting value of this command. Fully evaluate with your barcode reader before use.

Related Commands   GS 'w'

GS 'k' m   Print Barcode

Code   (1)   1DH 6BH m [d]k 00H $(0 \leq m \leq 6)$
        (2)   1DH 6BH m n [d]n $(65 \leq m \leq 73, 75 \leq m \leq 78)$
        (3)   1DH 6BH m [d]k 00H [d2]s 00H $(m = 22)$
        (4)   1DH 6BH m n [d]n s [d2]s $(m = 87)$

Definition Range   (1) $0 \leq m \leq 6, 32 \leq d \leq 126, 1 \leq k \leq 150$
                    (2)-1 $65 \leq m \leq 73, 1 \leq n \leq 150, 0 \leq d \leq 127$
                    (2)-2 $75 \leq m \leq 77, n = 13, 48 \leq d \leq 57$
                    (2)-3 $m = 78, 2 \leq n \leq 255, 32 \leq d \leq 34, 37 \leq d \leq 63, 65 \leq d \leq 90, d = 95,$
                           $97 \leq d \leq 123$
                    (3) $m = 22, 32 \leq d \leq 126, 1 \leq k \leq 150, s = 2, 5, 48 \leq d2 \leq 57$
                    (4) $m = 87, 1 \leq n \leq 150, 0 \leq d \leq 127, s = 2, 5, 48 \leq d2 \leq 57$

Function	Selects the barcode system and prints the barcode.

m	Barcode System	Number of Barcode Data Bytes	Remarks
0	UPC-A	11 ≤ k ≤ 12	Same barcode system as m = 65
1	UPC-E	11 ≤ k ≤ 12	Same barcode system as m = 66
2	JAN13 (EAN13)	12 ≤ k ≤ 13	Same barcode system as m = 67
3	JAN8 (EAN8)	7 ≤ k ≤ 8	Same barcode system as m = 68
4	CODE39	Variable	Same barcode system as m = 69
5	ITF	Variable (always even number)	Same barcode system as m = 70
6	CODABAR	Variable	Same barcode system as m = 71
22	JAN13 add-on	Add-on 2: 12 ≤ k ≤ 13, s = 2	Same barcode system as m = 87
		Add-on 5: 12 ≤ k ≤ 13, s = 5	
65	UPC-A	11 ≤ n ≤ 12	Same barcode system as m = 0
66	UPC-E	11 ≤ n ≤ 12	Same barcode system as m = 1
67	JAN13 (EAN13)	12 ≤ n ≤ 13	Same barcode system as m = 2
68	JAN8 (EAN8)	7 ≤ n ≤ 8	Same barcode system as m = 3
69	CODE39	Variable	Same barcode system as m = 4
70	ITF	Variable (always even number)	Same barcode system as m = 5
71	CODABAR	Variable	Same barcode system as m = 6
72	CODE93	Variable	
73	CODE128	Variable	
75	GS1 Databar Omni-directional	n = 13	
76	GS1 Databar Truncated	n = 13	
77	GS1 Databar Limited	n = 13	
78	GS1 Databar Expanded	2 ≤ n ≤ 255	
87	JAN13 add-on	Add-on 2: 12 ≤ n ≤ 13, s = 2	Same barcode system as m = 22
		Add-on 5: 12 ≤ n ≤ 13, s = 5	

Notes	The command configuration, code, definition range, and a part of notes differ depending on the value of m.

The barcode system selected for 0 ≤ m ≤ 6 is the same as 65 ≤ m ≤ 71, and the barcode system selected for m = 22 is the same as m = 87, and the print result is also the same. d and d2 indicate the character to be printed. In each barcode system, when d or d2 is a character code that cannot be printed, the barcode is printed until then, and the subsequent data is processed as normal data. s indicates the number of added symbol data bytes.

When UPC-A barcode data and UPC-E barcode data with 12 bytes including the check digit are specified, the 12th byte is ignored and the check digit is automatically calculated by the printer.

When JAN13 (EAN13) barcode data with 13 bytes including the check digit are specified, the 13th byte is ignored and the check digit is automatically calculated by the printer.

When JAN8 (EAN8) barcode data with 8 bytes including the check digit are specified, the 8th byte is ignored and the check digit is automatically calculated by the printer.

When GS1 Databar Omni-directional, GS1 Databar Truncated, or GS1 Databar Limited is specified, '01' at the beginning is automatically added by the printer. And the check digit is automatically calculated by the printer.

Paper feeding length is equivalent to the barcode height (including HRI character when HRI character printing is specified) regardless of the line spacing set by the "Set 1/6 Inch Line Spacing" command (ESC '2'), "Set Line Spacing" command (ESC '3') and so on.
Quiet zones are not secured. Set the quiet zone in accordance with the standard of each barcode system.

In the standard mode, when the horizontal direction exceeds the print area of 1 line, only paper feed is performed without printing barcode.
When the standard mode is selected, this command is valid only when there is no data in the line buffer. When data exists in the line buffer, the data after m is processed as normal data. Moreover, after the operation of the barcode is completed, the beginning of the line is the next print position.
When the standard mode is selected, the print modes (bold printing, double strike printing, underline, character size, etc.) excluding inversion (flip) printing have no effect.
For the concept of barcode printing in the standard mode, see [Barcode print in standard mode].

When the page mode is selected, the printer performs only barcode data mapping and does not print. After completion of barcode mapping, the next dot of the last data of barcode is the next mapping start position.
In the page mode, when barcode and character data, bit image, and downloaded bit image exist on the same line, the bottom edge of the barcode is aligned with the following. At this time, HRI characters are not included. (See [Barcode print in page mode])

Data	Mapping Reference
Character	Bottom edge of character
Bit image	Bottom edge of bit image
Downloaded bit image	Bottom edge of downloaded bit image

In the page mode, when the width of the barcode exceeds the print area, the printer does not print the barcode and moves the data mapping start position to the left edge of the print area.
In the page mode, the placement of the barcode includes horizontal tab.
In the page mode, the print modes (inversion (flip) printing, bold print, under line, character size, etc.) have no effect on the barcode printing.

[(1) In the case of GS 'k' m [d]k NUL]
This command ends with NUL code.
k indicates the number of barcode data bytes. When a barcode system with fixed number of bytes is selected, make sure that k matches that number of characters. When the number of bytes is insufficient, the data is processed up to the NUL code. Moreover, when the number of bytes is excessive, the data is processed for fixed length and excess data is processed as normal data.
Make sure that the number of bytes for ITF barcode of m = 5 is an even number. If the number of bytes is an odd number, the last data is ignored.

[(2) In the case of GS 'k' m n [d]n]

n indicates the number of data bytes, and n bytes are processed as barcode data from the next data. If n is out of the definition range, or if the number of bytes is an odd number when ITF barcode of m = 70 is selected, command processing is terminated, and the subsequent data is processed as normal data.

[Barcode print in standard mode]
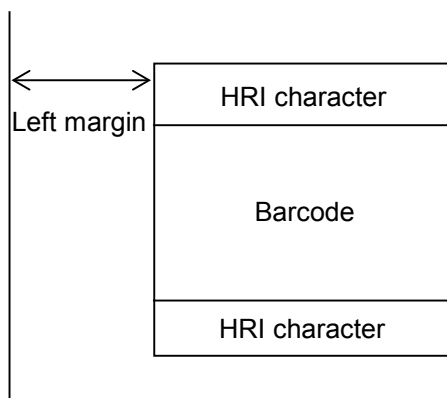
[Barcode print in page mode]
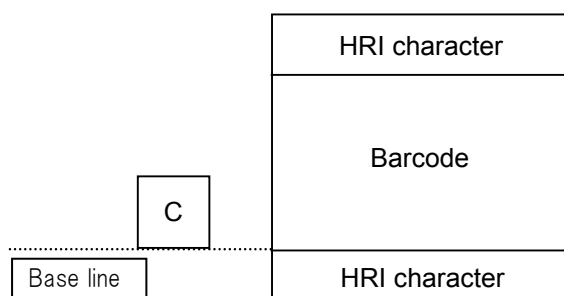
When the rotation direction is set to 90° or 270° by the "Select Barcode Print Direction" command (GS 'j' n) in the standard mode, and when the mapping start position is specified to "lower left" or "upper right" by the "Select Print Direction in Page Mode" command (ESC 'T') in the page mode, the direction of bars is vertical to the paper feed direction (ladder barcodes). When printing a ladder barcode, the height of the barcode should be 10 mm or higher and the ambient temperature should be 0°C to 40°C (32°F to 104°F).   If not, the printing may be unstable and the reading accuracy may degrade.

In the page mode, when the mapping start position is set to "lower left" or "upper right" by the "Select Print Direction in Page Mode" command (ESC 'T'), the horizontal length of the barcode should be 300 mm or shorter. If exceeding 300 mm, the data cannot be printed properly.

UPC-A: Enter 11 characters using numbers from '0' to '9'. Alternatively, enter additional 1 check digit.
The check digit is automatically calculated inside the printer as well.

UPC-E: Enter 11 characters using numbers from '0' to '9'. Alternatively, enter additional 1 check digit.
The check digit is automatically calculated inside the printer as well.
The following data can be input:
When the original code is 0 - ABCDE - VWXYZ
1 . 0 - ABCDE - 0000Z (Z is 5 to 9)
2 . 0 - ABCD0 - 0000Z
3 . 0 - ABC00 - 000YZ (C is 3 to 9)
4 . 0 - ABC00 - 00XYZ (C is 0 to 2)

JAN13:   Enter 12 characters using numbers from '0' to '9'. Alternatively, enter additional 1 check digit.
The check digit is automatically calculated inside the printer as well.

JAN8: Enter 7 characters using numbers from '0' to '9'. Alternatively, enter additional 1 check digit.
The check digit is automatically calculated inside the printer as well.

CODE39: Enter any number of characters using ' ', '$', '%', '+', '-', '.', '/', '0' to '9', and 'A' to 'Z'.

ITF: Enter any even number of characters using numbers from '0' to '9'.

CODABAR:Enter 1 start character of 'A' to 'D', any number of characters using '0' to '9', '+', '.', '/', ':', '$', '-', and 1 stop character of 'A' to 'D'.

CODE93: Input any data from 00H to 2EH. Multiple data can be input. Input 2FH or more lastly.

CODE93 Code Set

Input	Data	Input	Data	Input	Data
00H	0	10H	G	20H	W
01H	1	11H	H	21H	X
02H	2	12H	I	22H	Y
03H	3	13H	J	23H	Z
04H	4	14H	K	24H	-
05H	5	15H	L	25H	.
06H	6	16H	M	26H	SP
07H	7	17H	N	27H	$
08H	8	18H	O	28H	/
09H	9	19H	P	29H	+
0AH	A	1AH	Q	2AH	%
0BH	B	1BH	R	2BH	[S1]
0CH	C	1CH	S	2CH	[S2]
0DH	D	1DH	T	2DH	[S3]
0EH	E	1EH	U	2EH	[S4]
0FH	F	1FH	V		

CODE128: There are the following 2 types of data input format.
The start code determines which type of data input format has been selected.

(1) Input the start code of 67H, 68H, or 69H shown in the table of CODE128 Code Set.
Then input any data from 00H to 66H. Multiple data can be input.

(2) Input the start code (START A, START B, or START C) of the code set to be selected shown in the table of CODE128 Special Code. Then input the data in the respective formats.

Code Set A	Data from 00H to 5FH can be input.
Code Set B	Data from 20H to 7FH can be input.
Code Set C	Data from 00H(00) to 63H(99) can be input.

As for the data corresponding to the special code, input it in 2 characters according to the table of CODE128 Special Code.

CODE128 Code Set

Input	CodeSet A	CodeSet B	CodeSet C	Input	CodeSet A	CodeSet B	CodeSet C	Input	CodeSet A	CodeSet B	CodeSet C
00H	SP	SP	00	24H	D	D	36	48H	BS	h	72
01H	!	!	01	25H	E	E	37	49H	HT	i	73
02H	"	"	02	26H	F	F	38	4AH	LF	j	74
03H	#	#	03	27H	G	G	39	4BH	VT	k	75
04H	$	$	04	28H	H	H	40	4CH	FF	l	76
05H	%	%	05	29H	I	I	41	4DH	CR	m	77
06H	&	&	06	2AH	J	J	42	4EH	SO	n	78
07H	'	'	07	2BH	K	K	43	4FH	SI	o	79
08H	(	(	08	2CH	L	L	44	50H	DLE	p	80
09H	)	)	09	2DH	M	M	45	51H	DC1	q	81
0AH	*	*	10	2EH	N	N	46	52H	DC2	r	82
0BH	+	+	11	2FH	O	O	47	53H	DC3	s	83
0CH	,	,	12	30H	P	P	48	54H	DC4	t	84
0DH	-	-	13	31H	Q	Q	49	55H	NAK	u	85
0EH	.	.	14	32H	R	R	50	56H	SYN	v	86
0FH	/	/	15	33H	S	S	51	57H	ETB	w	87
10H	0	0	16	34H	T	T	52	58H	CAN	x	88
11H	1	1	17	35H	U	U	53	59H	EM	y	89
12H	2	2	18	36H	V	V	54	5AH	SUB	z	90
13H	3	3	19	37H	W	W	55	5BH	ESC	{	91
14H	4	4	20	38H	X	X	56	5CH	FS	|	92
15H	5	5	21	39H	Y	Y	57	5DH	GS	}	93
16H	6	6	22	3AH	Z	Z	58	5EH	RS	~	94
17H	7	7	23	3BH	[	[	59	5FH	US	DEL	95
18H	8	8	24	3CH	\	\	60	60H	FNC3	FNC3	96
19H	9	9	25	3DH	]	]	61	61H	FNC2	FNC2	97
1AH	:	:	26	3EH	^	^	62	62H	SHIFT	SHIFT	98
1BH	;	;	27	3FH	_	_	63	63H	CODE C	CODE C	99
1CH	<	<	28	40H	NUL	`	64	64H	CODE B	FNC4	CODE B
1DH	=	=	29	41H	SOH	a	65	65H	FNC4	CODE A	CODE A
1EH	>	>	30	42H	STX	b	66	66H	FNC1	FNC1	FNC 1
1FH	?	?	31	43H	ETX	c	67				
20H	@	@	32	44H	EOT	d	68	67H	START A		
21H	A	A	33	45H	ENQ	e	69	68H	START B		
22H	B	B	34	46H	ACK	f	70	69H	START C		
23H	C	C	35	47H	BEL	g	71				

CODE128 Special Code

Input Code	Input ASCII	CodeSet A	CodeSet B	CodeSet C
7B41H	{A	START A	CODE A	CODE A
7B42H	{B	CODE B	START B	CODE B
7B43H	{C	CODE C	CODE C	START C
7B31H	{1	FNC1	FNC1	FNC1
7B32H	{2	FNC2	FNC2	-
7B33H	{3	FNC3	FNC3	-
7B34H	{4	FNC4	FNC4	-
7B53H	{S	SHIFT	SHIFT	-
7B7BH	{{	-	'{'	-

GS1 Databar Omni-directional, GS1 Databar Truncated, GS1 Databar Limited:
Enter 13 characters using numbers from '0' to '9'.
'01' at the beginning is automatically added, and the check digit is automatically calculated by the printer.

GS1 Databar Expanded:

Enter any number of characters using ' ', '!', '"', '%', '&', ''', '(', ')', '*', '+', ',', '-', '.', '/', ':', ';', '<', '=', '>', '?', '_', '0' to '9', 'A' to 'Z', and 'a' to 'z'. Enter '{1' for FNC1.

Be sure to input the check digit because it is not automatically calculated by the printer.

Related Commands   GS 'H', GS 'f', GS 'h', GS 'W'

6.5.8 Two-dimensional Barcode

GS 'n' n   Set Nominal Narrow Element Width

Code   1DH 6EH n

Definition Range   2 ≤ n ≤ 8 (number of dots)

Default   n = 3

Function   Sets the nominal narrow element width.

Related Commands   GS 'p'

GS 'o' n   Set PDF Module Height

Code   1DH 6FH n

Definition Range   2 ≤ n ≤ 127

Default   n = 10

Function   Sets the PDF module height in dots.

Notes   When the module height is set too low, some barcode readers may not be able to read the barcode.
            The minimum height should be 3 dots or more in normal use.

GS 'p' 0 m2 e r c nl nh [d]k   Print PDF417

Code   1DH 70H 00H m2 e r c nl nh [d]k

Definition Range $0 ≤ m2 ≤ 255$
                        $0 ≤ e ≤ 8$
                        $r = 0, 3 ≤ r ≤ 90$
                        $c = 0, 1 ≤ c ≤ 30$
                        $0 ≤ d ≤ 255$
                        $0 ≤ nl ≤ 255, 0 ≤ nh ≤ 255$
                        $1 ≤ k(= nh × 256 + nl) ≤ 499$

Function   Prints PDF417 on the basis of the specified contents.
            When m2 = <*******0>B, PDF417 is in normal mode.
            When m2 = <*******1>B, PDF417 is in simple mode (Micro PDF is not supported).
            e: Error correction level
            r: Number of rows (0 is automatically set)
            c: Number of columns in the data area (0 is automatically set)
            nl, nh: Number of data bytes
            d: Data
            k: Number of data bytes specified by nl and nh

Notes   Only the LSB is valid for m2.
            Quiet zones are not secured. Set the quiet zone in accordance with the standard of each barcode system.

Related Commands   GS 'n', GS 'o'

Code   12H 3BH n

Definition Range   2 ≤ n ≤ 16

Default   n = 6

Function   Specifies the module size of QR Code, Data Matrix, GS1 Databar Stacked, GS1 Databar
           Stacked Omni-directional, and GS1 Databar Expanded Stacked.
           n: Number of dots for 1 side of the module size

Related Commands   GS 'p' 1, GS 'p' 2, GS 'p' 4

Code   1DH 70H 01H model e v mode nl nh [d]k

Definition Range   model = 01H, 02H
                        e = 4CH, 4DH, 51H, 48H
                        v = 0, 1 ≤ v ≤ 40
                        mode = 4EH, 41H, 42H, 4BH, 4DH
                        1 ≤ k(= nh × 256 + nl) ≤ 7089

Function   Prints QR Code data on the basis of the specified contents.
           model: Model
           e: Error correction level
                      'L'(4CH), 'M'(4DH), 'Q'(51H), 'H'(48H)
           v: Version
                      When v = 0, the version is automatically selected (depending on the number of
                      input data bytes).
                      When 1 ≤ v ≤ 40, the version is fixed (up to 14 when model-1 is selected).
           mode: Mode of data

mode	Hexadecimal	Mode of data
N	4E	Numerical mode
A	41	Alphanumeric mode
B	42	8-bit byte mode
K	4B	Kanji mode
M	4D	Mixed mode

           nl, nh: Number of data bytes
           d: QR Code input data
                      When using 2-byte code (such as Kanji and Hiragana), it should be input by
                      Shift-JIS.
           k: Number of data bytes specified by nl and nh

Notes   When any value out of the definition range is specified, this command is ignored, and the
           subsequent data is processed as normal data.
           The maximum value should be 7089 bytes or less depending on the model, the mode, and
           the error correction level. When any data exceeding the maximum value is specified, the data
           is discarded.
           When the horizontal width of QR Code exceeds the print area, this command is ignored.

In the standard mode, when there is data in the line buffer, this command is ignored.
In the standard mode, alignment and inversion (flip) printing are valid.
Quiet zones are not secured. Set the quiet zone in accordance with the standard of each barcode system.

Related Commands   ESC 'a', ESC '{'

GS 'p' 2 ecc row col nl nh [d]k   Print Data Matrix

Code   1DH 70H 02H ecc row col nl nh [d]k

Definition Range   ecc = 00H
                        row = 0, 8 ≤ row ≤ 144
                        col = 0, 10 ≤ col ≤ 144
                        1 ≤ k(= nh × 256 + nl) ≤ 3116

Function   Prints a Data Matrix code on the basis of the specified contents.
            ecc: 00H (ECC200) (for future extensional function)
            row: Number of modules in the vertical direction
                    When '0' is specified, this is defined automatically.
            col: Number of modules in the horizontal direction
                    When '0' is specified, this is defined automatically.
            nl, nh: Number of data bytes
            d: Barcode data
            k: Number of data bytes specified by nl and nh

Notes   When any value other than the number of vertical and horizontal modules available in
            ECC200 is specified, this command is ignored.
            When k is out of the definition range, the subsequent data is processed as normal data.
            The maximum value varies depending on the number of modules in the vertical and
            horizontal directions and the data to be stored. When any data exceeding the maximum value
            is specified, the data is discarded.
            When the barcode size exceeds the print area, this command is ignored.
            In the standard mode, when there is data in the line buffer, this command is ignored.
            In the standard mode, alignment and inversion (flip) printing are valid.
            Quiet zones are not secured. Set the quiet zone in accordance with the standard of each
            barcode system.
            The Structured Append is not supported.

            Only the following combinations of the number of modules in the vertical direction ('row') and
            the horizontal direction ('col') are valid.
            Squares ('row' × 'col')
              10 × 10, 12 × 12, 14 × 14, 16 × 16, 18 × 18, 20 × 20, 22 × 22, 24 × 24, 26 × 26,
              32 × 32, 36 × 36, 40 × 40, 44 × 44, 48 × 48, 52 × 52, 64 × 64, 72 × 72, 80 × 80,
              88 × 88, 96 × 96, 104 × 104, 120 × 120, 132 × 132, 144 × 144
            Rectangles ('row' × 'col')
              8 × 18, 8 × 32, 12 × 26, 12 × 36, 16 × 36, 16 × 48

Related Commands   ESC 'a', ESC '{'

GS 'p' 3 mode · · · n [d]k   Print MaxiCode

Code   1DH 70H 03H 02H sc cc pc n [d]k   (mode 2)
            1DH 70H 03H 03H sc cc pc n [d]k   (mode 3)
            1DH 70H 03H 04H m [d]k   (mode 4)
            1DH 70H 03H 05H m [d]k   (mode 5)

Definition Range   1 ≤ n ≤ 126, 1 ≤ m ≤ 138

Prints MaxiCode data on the basis of the specified contents.

        sc: Service class
               In mode 2 and mode 3, specify sc in 3-digit numerals.
        cc: Country code
               In mode 2 and mode 3, specify cc in 3-digit numerals.
        pc: Postal code
               In mode 2, specify the postal code in 9-digit numerals. In order to specify less than 9 digits, specify data other than numerals for the remaining digits.
               In mode 3, specify the postal code in 6 alphanumeric characters. When the postal code is less than 6 characters, specify space for the remainder.
        n, m: Number of data bytes
        d: Barcode data
        k: Number of data bytes specified by n or m

Notes   When n or m is out of the definition range, the subsequent data is processed as normal data. Moreover, the maximum data value will be less than the maximum value of n or m depending on the mode, and when any data exceeding the maximum value is specified, the whole command is discarded.
When the barcode size exceeds the print area, this command is ignored.
In the standard mode, when there is data in the line buffer, this command is ignored.
In the standard mode, alignment and inversion (flip) printing are valid.
The print size of the barcode is fixed in vertical 213 dots × horizontal 225 dots.
Quiet zones are not secured. Set the quiet zone in accordance with the standard of each barcode system.
The Structured Append is not supported.

Related Commands   ESC 'a', ESC '{'

GS 'p' 4 0 n [d]n   Print GS1 Databar Stacked

Code   1DH 70H 04H 00H n [d]n

Definition Range   n = 13, 48 ≤ d ≤ 57

Function   Prints GS1 Databar Stacked data on the basis of the specified contents.
        n: Number of data bytes
        d: Input data of GS1 Databar
          Enter 13 characters using numbers from '0' to '9'.
          '01' at the beginning is automatically added, and the check digit is automatically calculated by the printer.

Notes   When any value out of the definition range is specified, this command is ignored, and the subsequent data is processed as normal data.
When the horizontal width of GS1 Databar exceeds the print area, this command is ignored.

In the standard mode, when there is data in the line buffer, this command is ignored.
In the standard mode, alignment and inversion (flip) printing are valid.

Related Commands   ESC 'a', ESC '{'

GS 'p' 4 1 h n [d]n — Print GS1 Databar Stacked Omni-directional

Code: 1DH 70H 04H 01H h n [d]n

Definition Range: 33 ≤ h ≤ 255, n = 13, 48 ≤ d ≤ 57

Function: Prints GS1 Databar Stacked Omni-directional data on the basis of the specified contents.
- n: Number of data bytes
- h: Height of GS1 Databar Stacked Omni-directional in modules
- d: Input data of GS1 Databar
  Enter 13 characters using numbers from '0' to '9'.
  '01' at the beginning is automatically added, and the check digit is automatically calculated by the printer.

Notes: When any value out of the definition range is specified, this command is ignored, and the subsequent data is processed as normal data.
When the horizontal width of GS1 Databar exceeds the print area, this command is ignored.

In the standard mode, when there is data in the line buffer, this command is ignored.
In the standard mode, alignment and inversion (flip) printing are valid.

Related Commands: ESC 'a', ESC '{'

GS 'p' 4 2 s n [d]n — Print GS1 Databar Expanded Stacked

Code: 1DH 70H 04H 02H s n [d]n

Definition Range: 2 ≤ s ≤ 20 (even number only), 1 ≤ n ≤ 255

Function: Prints GS1 Databar Expanded Stacked on the basis of the specified contents.
- n: Number of data bytes
- s: Number of segments (Even number from 2 to 20)
- d: Input data of GS1 Databar
  Enter any number of characters using ' ', '!', '"', '%', '&', ''', '(', ')', '*', '+', ',', '-', '.', '/', ':', ';', '<', '=', '>', '?', '_', '0' to '9', 'A' to 'Z', and 'a' to 'z'. Enter '{1' for FNC1.
  Be sure to input the check digit because it is not automatically calculated by the printer.

Notes: When any value out of the definition range is specified, this command is ignored, and the subsequent data is processed as normal data.
When the horizontal width of GS1 Databar exceeds the print area, this command is ignored.

In the standard mode, when there is data in the line buffer, this command is ignored.
In the standard mode, alignment and inversion (flip) printing are valid.

Related Commands: ESC 'a', ESC '{'

GS '(' 'k' pL pH '0' fn n1 n2 — Select QR Code Model

Code: 1DH 28H 6BH pL pH cn fn n1 n2

Definition Range:
pL = 4, pH = 0
cn = 49
fn = 65
n1 = 49, 50
n2 = 0

Default: n1 = 50, n2 = 0

Function Selects the QR Code model.

n1	Model
49	Model 1
50	Model 2

Notes This command is ignored when any value out of the definition range is specified.
This setting does not affect GS 'p' 1.

Related Commands GS '(' 'k', GS 'p' 1

GS '(' 'k' pL pH cn fn n1 n2   Set QR Code Module Size

Code 1DH 28H 6BH pL pH cn fn n

Definition Range pL = 3, pH = 0
cn = 49
fn = 67
$2 \le n \le 16$

Default n = 3

Function Specifies the QR Code module size.
n: Number of dots for 1 side of the module size

Notes This command is ignored when any value out of the definition range is specified.
This setting affects DC2 ';'.

Related Commands GS '(' 'k', DC2 ':'

GS '(' 'k' pL pH cn fn m   Select QR Code Error Correction Level

Code 1DH 28H 6BH pL pH cn fn m

Definition Range pL = 3, pH = 0
cn = 49
fn = 69
$48 \le m \le 51$

Default m = 48

Function Selects the QR Code error correction level.

M	Error correction level
48	Error correction level L
49	Error correction level M
50	Error correction level Q
51	Error correction level H

Notes This command is ignored when any value out of the definition range is specified.
This setting does not affect GS 'p' 1.

Related Commands GS '(' 'k', GS 'p' 1

Code   1DH 28H 6BH pL pH cn fn m [d] k

Definition Range $4 \le (pL + pH \times 256) \le 7092$
cn = 49
fn = 80
m = 48
$0 \le d \le 255$
$1 \le k (= pH \times 256 + pL - 3) \le 7089$

Function   Stores the QR Code data (d1 to dk) in the memory.

Notes   This command is ignored when any value out of the definition range is specified.
            This setting does not affect GS 'p' 1.

Related Commands   GS '(' 'k', GS 'p' 1

Code   1DH 28H 6BH pL pH cn fn m

Definition Range   pL = 3, pH = 0
cn = 49
fn = 81
m = 48

Function   Performs encoding and printing the QR Code data that stores in the memory depending on
            the setting of following commands.

            Select QR Code Model (GS '(' 'k' pL pH '0' fn n1 n2)
            Set QR Code Module Size (GS '(' 'k' pL pH cn fn n1 n2)
            Select QR Code Error Correction Level (GS '(' 'k' pL pH cn fn m)

            The version is automatically selected.
            Mode of data is fixed to the mixed mode.

Notes   This command is ignored when any value out of the definition range is specified.
            When the horizontal width of QR Code exceeds the print area, this command is ignored.
            In the standard mode, when there is data in the line buffer, this command is ignored.
            In the standard mode, alignment and inversion (flip) printing are valid.
            Quiet zones are not secured. Set the quiet zone in accordance with the standard of each
            barcode system.

Related Commands   GS '(' 'k'

6.5.9 Kanji

FS '&'   Specify Kanji Mode

Code   1CH 26H

Function   Specifies the Kanji mode.

Notes   When the Kanji code system is the Shift-JIS code system, inputting this command executes
          only the internal flag operation of the printer. In this case, printing is not affected.
          The Kanji code is processed in order of the 1st byte and the 2nd byte.

Related Commands   FS '.', FS 'C'

FS '.'   Cancel Kanji Mode

Code   1CH 2EH

Function   Cancels the Kanji mode.

Notes   When the Kanji code system is the Shift-JIS code system, inputting this command executes
          only the internal flag operation of the printer. In this case, printing is not affected.

Related Commands   FS '&', FS 'C'

FS '!' n   Specify Kanji Print Mode

Code   1CH 21H n

Definition Range   0 ≤ n ≤ 255

Default   n = 0

Function   Specifies Kanji print modes in batch.

Bit	Function	Value	
		0	1
0	Kanji font	Font A (24 × 24)	Font B (16 × 16)
1	Undefined	-	-
2	Double width	Cancel	Specify
3	Double height	Cancel	Specify
4	Undefined	-	-
5	Undefined	-	-
6	Undefined	-	-
7	Underline	Cancel	Specify

Notes   When both double height and double width are specified, the character size is quadrupled.
          When characters with different vertical scale exist on the same line, the characters are
          enlarged with the bottom edges of the characters as a reference, and so the bottom edges are
          aligned.
          When the character is enlarged horizontally, it is enlarged in the right direction with the left
          edge of the character as a reference.

Underline is applied to the entire character width including the right and left spaces of the character. However, no underline is applied to the portion skipped by the "Horizontal Tab" command (HT) or others and to 90° right rotated characters.
The underline width is the thickness set by the "Specify/Cancel Kanji Underline" command (FS '-') regardless of the character size.
When the underline width is not set by the "Specify/Cancel Kanji Underline" command (FS '-'), it is 1 dot.

The print modes can also be specified or canceled by commands other than this command. However, the command processed last is valid. For example, when double height and double width are canceled by this command after quadrupled character is specified by the "Specify/Cancel Kanji Quadruple-Size" command (FS 'W'), the quadrupled character specified by the "Specify/Cancel Kanji Quadruple-Size" command (FS 'W') is canceled.

Related Commands   FS '-', FS 'W', DC2 '.', GS '!'

FS '-' n   Specify/Cancel Kanji Underline

Code   1CH 2DH n

Definition Range   0 ≤ n ≤ 2, 48 ≤ n ≤ 50

Default   n = 0

Function   Specifies and cancels Kanji underline.

n	Function
0, 48	Cancel Kanji underline
1, 49	Specify 1-dot Kanji underline
2, 50	Specify 2-dot Kanji underline

Notes   Underline is applied to the entire character width including the left and right spaces of the character. However, no underline is applied to the portion skipped by the "Horizontal Tab" command (HT) or others and to 90° right rotated characters.
When Kanji underline is canceled with n = 0, underline is not applied to the subsequent Kanji data, but the underline width set before canceling is retained.
The Kanji underline width is constant as specified regardless of the character size.
In addition to this command, Kanji underline can also be specified or canceled by the "Specify Kanji Print Mode" command (FS '!'). However, the command processed last is valid. For example, when Kanji underline is canceled by this command after specified by the "Specify Kanji Print Mode" command (FS '!'), the Kanji underline specified by the "Specify Kanji Print Mode" command (FS '!') is canceled.

Related Commands   FS '!'

Code   1CH 43H n

Definition Range   n = 0, 1, 48, 49

Default   MS13-1 (Kanji Code System Selection) is JIS code: n = 0
             MS13-1 (Kanji Code System Selection) is Shift-JIS code: n = 1

Function   Selects the Kanji code system.

n	Function
0, 48	JIS code system
1, 49	Shift-JIS code system

Notes   The Kanji codes valid in the JIS code system are as follows:
             The 1st byte: 21H to 7EH and 93H to 97H
             The 2nd byte: 21H to 7EH

             The Kanji codes valid in the Shift-JIS code system are as follows:
             The 1st byte: 81H to 9FH, E0H to EFH, and FAH to FCH
             The 2nd byte: 40H to 7EH and 80H to FCH

Code   1CH 53H n1 n2

Definition Range   0 ≤ n1 ≤ 255, 0 ≤ n2 ≤ 255

Default   n1 = 0, n2 = 0

Function   Sets the left spacing (n1) and the right spacing (n2) of Kanji.
             The left space is [n1 × basic calculation pitch] inches, and the right space is [n2 × basic
             calculation pitch] inches.

Notes   When specifying double width, the right and left spaces double from the setting amount.
             The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
             Moreover, once set, the Kanji spacing is not changed even when the basic calculation pitch is
             changed by the "Set Basic Calculation Pitch" command (GS 'P').
             When the result calculated by the "Set Basic Calculation Pitch" command (GS 'P') is a
             fractional figure, it is corrected using the minimum pitch of the printer, and the remainder is
             discarded.
             It is possible to set the independent spacing for the standard mode and the page mode.
             In the standard mode, the horizontal basic calculation pitch (x) is used.

             In the page mode, the basic calculation pitch used is as follows depending on the starting
             point.
      (1)   When the starting point is specified as "upper left" or "lower right" by "Select Print
            Direction in Page Mode" command (ESC 'T'), the horizontal basic calculation pitch (x) is
            used.
      (2)   When the starting point is specified as "upper right" or "lower left" by "Select Print
            Direction in Page Mode" command (ESC 'T'), the vertical basic calculation pitch (y) is
            used.
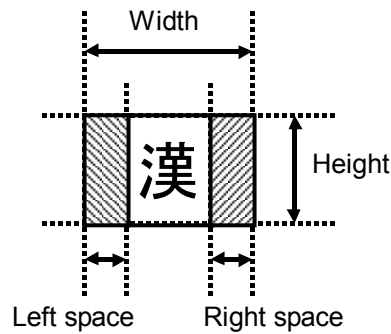
FS 'W' n   Specify/Cancel Kanji Quadruple-Size

Code   1CH 57H n

Definition Range   0 ≤ n ≤ 255

Default   n = 0

Function   Specifies or cancels the quadrupled character of Kanji.
            When n = <*******0>B, the quadrupled character is canceled.
            When n = <*******1>B, the quadrupled character is specified.

Notes   Only the LSB is valid for n.
            Quadrupled characters are the characters for which double height and double width are
            specified simultaneously.
            When the quadrupled character is canceled using this command, the printer prints characters
            of normal size after the next character.
            When characters with different vertical scale exist on the same line, the characters are
            enlarged with the bottom edges of the characters as a reference, and so the bottom edges are
            aligned.
            When the character is enlarged horizontally, it is enlarged in the right direction with the left
            edge of the character as a reference.
            In addition to this command, the quadrupled character can also be specified or canceled by
            simultaneously specifying double width and double height in the "Specify Kanji Print Mode"
            command (FS '!'). However, the command processed last is valid. For example, when the
            quadrupled character is canceled by this command after double height and double width are
            specified by the "Specify Kanji Print Mode" command (FS '!'), the specification in the "Specify
            Kanji Print Mode" command (FS '!') is canceled.

Related Commands   FS '!'

DC2 '.' n   Select Kanji Font

Code   12H 2EH n

Definition Range   n = 0, 1, 48, 49

Default   n = 0

Function   Selects Kanji font.

n	Function
0, 48	Select font A (24 × 24)
1, 49	Select font B (16 × 16)

Notes   The Kanji font can also be selected by the "Specify Kanji Print Mode" command (FS '!'), but the command processed command last is valid.

Related Commands   FS '!'

FS 'I' a b c   Send 2-Byte Font ID

Code   1CH 49H a b c

Definition Range   a = 0
                     b = 0
                     0 ≤ c ≤ 5

Function   In response to the request of this command, the printer sends the information specified by c, the 2-byte font specified by a and b.
             a: Font size
             b: Font type number
             c: Information

c	Function	Response Format
0	Language	Character string
1	Standard	Character string
2	Company name	Character string
3	Checksum (4 bytes)	HEX code
4	Data size	HEX code
5	ROM ID	HEX code

Notes   When a or b is out of the definition range, only the header and footer of the response format of the selected function are sent.

Related Commands   See "6.4 RESPONSE DATA".

FS '2' c1 c2 [d]k   Register User-Defined Character

Code   1CH 32H c1 c2 [d]k

Definition Range   The definition range differs depending on the Kanji code system.

                     When JIS code system is specified:
   c1 = 77H
                     21H ≤ c2 ≤ 7EH
                     0 ≤ d ≤ 255

                     When Shift-JIS code system is specified:
                     c1 = ECH
                     40H ≤ c2 ≤ 7EH , 80H ≤ c2 ≤ 9EH
                     0 ≤ d ≤ 255

k = 72 (when font A 24 × 24 is selected)
k = 32 (when font B 16 × 16 is selected)

Function Registers the user-defined character pattern of Kanji to the character code specified by c1 and c2.
When the character code is specified in which the user-defined character has already been registered, the character is overwritten.
The user-defined character is not registered at the shipping.

<Font A 24 × 24 selected>   <Font B 16 × 16 selected>
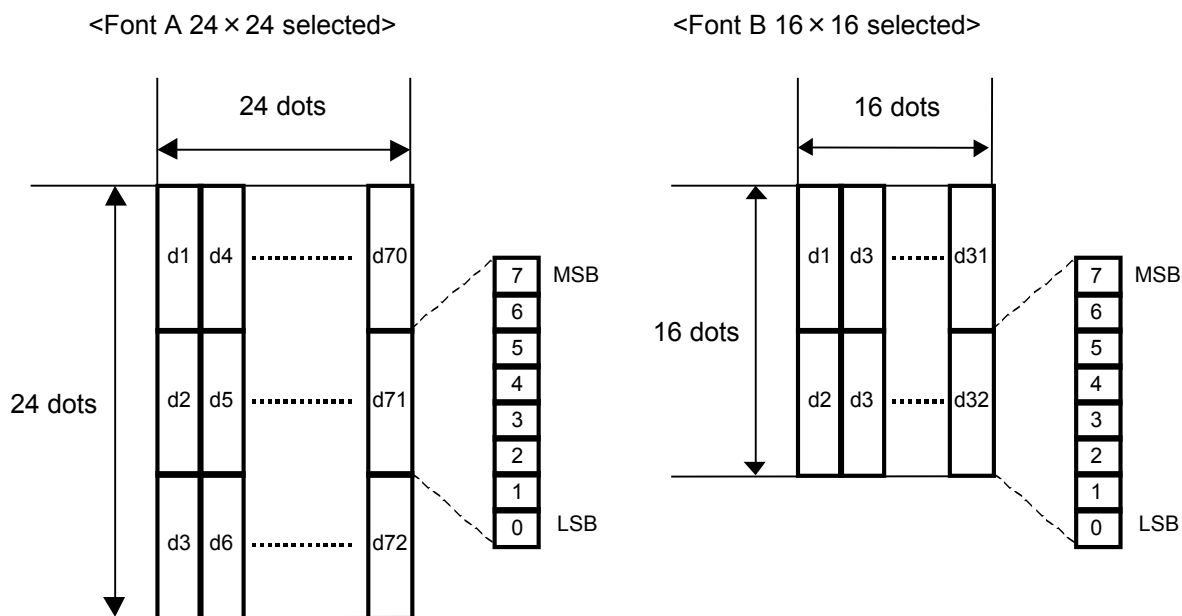
Notes c1 and c2 indicate the Kanji code for registering user-defined characters; c1 is the 1st byte and c2 is the 2nd byte.
d indicates the registration data. The bits that correspond to dots to print are 1, and the bits that correspond to dots not to print are 0.
k indicates the number of registration data bytes. It differs depending on the selected font size.
The memory usage m (including the amount of memory control information) is 9784 bytes.

Related Commands FS 'C'

DC2 'G' n   Release/Allocate User-Defined Character Area

Code 12H 47H n

Definition Range $0 \leq n \leq 255$

Function Releases or allocates the user-defined character area.
When n = <*******0>B, the user-defined character area is released.
When n = <*******1>B, the user-defined character area is allocated.

Notes Only the LSB is valid for n.
User-defined characters are not printed when the user-defined character area is released. The user-defined character area is 9784 bytes. Releasing the user-defined character area cannot increase the remaining memory capacity.
The area can be used again as the user area by the "Defragment User Area" command (DC2 '*' '1').
To allocate again the user-defined character area once released, 9784 bytes or more is required for the remaining memory capacity. When the remaining memory capacity is insufficient, the user-defined character area is not allocated, and this command is ignored.

6.5.10 Auxiliary Functions

ESC '=' n   Select Peripheral Device

Code   1BH 3DH n

Definition Range   0 ≤ n ≤ 255

Default   n = 1

Function   Selects the peripheral device for which data from the host computer is valid.

Bit	Function	Value	
		0	1
0	Printer	Disable	Enable
1	Undefined	-	-
2	Undefined	-	-
3	Undefined	-	-
4	Undefined	-	-
5	Undefined	-	-
6	Undefined	-	-
7	Undefined	-	-

Notes   When the printer is disabled, the printer discards all data except realtime commands from next data until the printer is enabled again by this command.

ESC '@'   Initialize Printer

Code   1BH 40H

Function   Clears the data in the line buffer and initializes the settings.

Notes   The information of the Function Settings is not re-read. The data in the input buffer is retained.

Related Commands   See "CHAPTER 7 INITIALIZATION".

DC2 '@'   Hardware Reset

Code   12H 40H

Function   Performs hardware reset.

Notes   Performs the same operation as when turning on the power.
When this command is executed during printing, printing is stopped, and reset is performed.

Code   1DH 43H 30H n m

Definition Range   0 ≤ n ≤ 5
                        0 ≤ m ≤ 2, 48 ≤ m ≤ 50

Default   n = 0, m = 0

Function   Sets the print mode of consecutive counter.

n: Number of digits to print
      When n = 0, only the actual number of digits of the counter value is printed.
      At this time, the value of m does not affect the operation.
      When n ≠ 0, the number of digits to print is set.

m: Print position of the consecutive counter within the set number of digits

m	Print Position	Processing for Counter Value Lower Than Set Digits
0, 48	Aligned right	Add space(s) to left side
1, 49	Aligned right	Add '0' to left side
2, 50	Aligned left	Add space(s) to right side

Notes   When the number of digits of the counter value is larger than the number of digits set in n, the
             lower n digits of the counter value are printed.
             When n or m is out of the definition range, this command is ignored, and the setting value
             does not change.

Related Commands   GS 'C' '1', GS 'C' '2', GS 'c'

Code   1DH 43H 31H aL aH bL bH n r

Definition Range   0 ≤ aL ≤ 255, 0 ≤ aH ≤ 255
                        0 ≤ bL ≤ 255, 0 ≤ bH ≤ 255
                        0 ≤ n ≤ 255
                        0 ≤ r ≤ 255

Default   aL = 1, aH = 0, bL = 255, bH = 255, n = 1, r = 1

Function   Sets the count mode of the consecutive counter.
                n: Step magnitude during count-up or count-down
                r: Number of repetitions with the counter value fixed

Notes   When [aH × 256 + aL < bH × 256 + bL and n ≠ 0 and r ≠ 0], the count-up mode is set.
             When [aH × 256 + aL > bH × 256 + bL and n ≠ 0 and r ≠ 0], the count-down mode is set.
             When [aH × 256 + aL = bH × 256 + bL or n = 0 or r = 0], count stop is set.
             ・ When the count-up mode is set:
                [aH × 256 + aL] is the minimum counter value, and [bH × 256 + bL] is the maximum
                counter value. When the counter exceeds the maximum value, count-up from the
                minimum value starts again.
             ・ When the count-down mode is set:
                [aH × 256 + aL] is the maximum counter value, and [bH × 256 + bL] is the minimum
                counter value. When the counter is smaller than the minimum value, count-down from
                the maximum value starts again.

Related Commands   GS 'C' 'O', GS 'C' '2', GS 'c'

GS 'C' '2' nl nh   Set Counter Value

Code   1DH 43H 32H nl nh

Definition Range   0 ≤ nl ≤ 255, 0 ≤ nh ≤ 255

Default   nl = 1, nh = 0

Function   Sets the consecutive counter value.

Notes   nl and nh indicate the consecutive counter value, and the counter value is [nh × 256 + nl].
           ・ When the count-up mode is set:
               When the counter value set with this command falls outside the counter range set with
               "Set Count Mode" command (GS 'C' '1'), the counter value is forcibly changed to the
               minimum value by execution of the "Print Counter " command (GS 'c').
           ・ When the count-down mode is set:
               When the counter value set with this command falls outside the counter range set with
               "Set Count Mode" command (GS 'C' '1'), the counter value is forcibly changed to the
               maximum value by execution of the "Print Counter " command (GS 'c').

Related Commands   GS 'C' '0', GS 'C' '1', GS 'c'

GS 'c'   Print Counter

Code   1DH 63H

Function   Sets the consecutive counter value in the line buffer and updates the counter.

Notes   After setting the current consecutive counter value as print data (character string) in the line
           buffer, the counter is updated according to the set count mode. The counter value set in the
           line buffer is printed through a print command or buffer full.
           When setting the counter value in the line buffer, if it exceeds the range of the maximum
           value and the minimum value, the counter is reset to the minimum when the count-up mode
           is set, or to the maximum when the count-down mode is set, before setting in the line buffer.
           When the updated counter value exceeds the range of the maximum value and the minimum
           value, the counter is reset to the minimum when the count-up mode is set, or to the maximum
           when the count-down mode is set.

Related Commands   GS 'C' '0', GS 'C' '1', GS 'C' '2'

Code   1DH 49H n

Definition Range   1 ≤ n ≤ 3, 49 ≤ n ≤ 51, 65 ≤ n ≤ 67, 97 ≤ n ≤ 100

Function In response to the request of this command, the printer sends the specified printer ID.

n	Printer ID Type	Specifications	Response Format
1, 49	Printer model ID	25H	HEX code
2, 50	Type ID	See Table [Type ID].	HEX code
3, 51	ROM version ID	Depends on ROM version.	HEX code
65	Firmware version (main)	x.xx.xx	Character string
66	Manufacturer	Seiko Instruments Inc.	Character string
67	Model name	See Table [Model name].	Character string
97	Firmware version (boot)	x.xx.xx	Character string
98	Firmware checksum (boot)	2 bytes checksum	HEX code
99	Firmware checksum (main)	2 bytes checksum	HEX code
100	Firmware checksum (main + boot)	2 bytes checksum	HEX code

Table [Type ID]

Bit	Information	Value	
		0	1
0	Paper width selection	58 mm	80 mm
1	Reserved	Fixed to 1	
2	Undefined	Fixed to 0	
3	Undefined	Fixed to 0	
4	Reserved	No	Yes
5	Reserved	No	Yes
6	Undefined	Fixed to 0	
7	Undefined	Fixed to 0	

Table [Model name]

Model name	Value
RP-F10	SII RP-F10 Series.

Notes   The printer ID is sent according to the response format.
             Because this command is executed when retrieved from the input buffer, a delay may occur
             between command reception and printer ID transmission depending on the input buffer status.
             ROM version ID is needed when the firmware of the printer is uploaded.

Related Commands   See "6.4 RESPONSE DATA".

(1)GS 'V' m
(2)GS 'V' m n — Cut Paper

Code
(1)1DH 56H m
(2)1DH 56H m n

Definition Range
(1)m = 0, 1 , 48, 49
(2)m = 65, 66, 0 ≤ n ≤ 255

Function Feeds the thermal paper to the specified paper cut position and cuts the paper at the position.

m	Function
0, 48	Full cut
1, 49	Partial cut
65	Paper feed to cut position + [n × basic calculation pitch] and full cut
66	Paper feed to cut position + [n × basic calculation pitch] and partial cut

Notes The command configuration, code, definition range, and some notes differ depending on the value of m.
In the standard mode, this command is valid only when input at the beginning of the line.

[(1) GS 'V' m]
Cuts the thermal paper with the specified cutting method.

[(2) GS 'V' m n]
When n=0, the thermal paper is fed to the cut position and cut at the position.
When n≠0, the thermal paper is fed [n × basic calculation pitch] beyond the cut position and cut.
The basic calculation pitch is set by the "Set Basic Calculation Pitch" command (GS 'P').
The vertical basic calculation pitch (y) is used for the paper feed length. Moreover, when the calculation result is a fractional figure, it is corrected using the minimum pitch of the printer, and the remainder is discarded.
When the Function Setting MS17-3 (Feed Backward Setting After Paper Cutting) is enabled and the Function Setting MS1-3 (Mark Mode Selection) is disabled, after this command and before the next print or paper feed command is executed, the thermal paper is fed backward automatically to minimize the margin.

Related Commands DC2 'w', DC2 'l'

ESC i — Full cut

Code 1BH 69H

Function Cuts the thermal paper by full cutting.

Notes In the standard mode, this command is valid only when input at the beginning of the line.

ESC m — Partial cut

Code 1BH 6DH

Function Cuts the thermal paper by partial cutting.

Notes In the standard mode, this command is valid only when input at the beginning of the line.

Code   1DH 59H n

Definition Range   0 ≤ n ≤ 255

Function   Prints the NV graphics registered with the key code '0' '0' at the center within the set printable area width, and then cuts the thermal paper.
When n = <*******0>B, the thermal paper is cut by full cutting.
When n = <*******1>B, the thermal paper is cut by partial cutting.

Notes   Only the LSB is valid for n.
In the page mode, this command is ignored.
The command is valid even when input in the middle of the line.
The following operations are performed according to the height of the NV graphics registered with the key code '0' '0'.

NV Graphics Height	Operation
7.5 mm or less	2 mm paper feeding NV graphics printing Paper cutting 2 mm paper feeding
7.625 mm to 9.375 mm	2 mm paper feeding NV graphics printing by 7.5 mm Paper cutting Remaining NV graphics printing (9.5 mm - NV graphics height) paper feeding
9.5 mm or more	2 mm paper feeding NV graphic printing by 7.5 mm Paper cutting Remaining NV graphics printing

When the NV graphics whose key code is '0' '0' is not registered, the initial cut is performed.
With Stamp & Cut, since NV graphics printing is stopped and paper is cut during printing, the print may become corrupt.

Code   1BH 70H m n1 n2

Definition Range   0 ≤ m ≤ 255
                       0 ≤ n1 ≤ 255, 0 ≤ n2 ≤ 255

Function   Differs depending on the device connected.
[When the drawer is connected]
Drives the drawer.
When m = <*******0>B, the drawer 1 is driven.
When m = <*******1>B, the drawer 2 is driven.

Specify the ON/OFF time of the pulse by n1 and n2.
ON time: n1 × 2 ms
OFF time: n2 × 2 ms

[When the external buzzer is connected]
Beeps according to the setting of MS18.

Notes Only the LSB is valid for m

     When n1 = 0, the drawer is not driven.

Related Commands DC2 'w', DC2 'l'

DLE DC4 fn m t   Generate Pulse in Real Time

Code 10H 14H fn m t

Definition Range fn = l 0 ≤ m ≤ 255, 1 ≤ t ≤ 8

Function Differs depending on the device connected.
    [When the drawer is connected]
    Drives the drawer.
    When m = <*******0>B, the drawer 1 is driven.
    When m = <*******1>B, the drawer 2 is driven.

    Specify the ON/OFF time of the pulse by t.
    ON/OFF time: t × 100 ms

    [When the external buzzer is connected]
    Beeps according to the setting of MS18.

Notes This is a realtime command.
    The operation of this command differs depending on the Function Setting MS13-3 (Realtime Command Selection).
    ・ When the Function Setting MS13-3 (Realtime Command Selection) is enabled:
     This command is valid.
     Notes when using a realtime command:
      The user should note that the same behavior as this command occurs when the code line matching the code that comprises this command is received. For example, graphics data contains such code line.
    ・ When the Function Setting MS13-3 (Realtime Command Selection) is disabled:
     This command is ignored.

GS 'g' '0' m nl nh   Initialize Maintenance Counter

Code 1DH 67H 30H m nl nh

Definition Range m = 0
         nh × 256 + nl = 20, 21, 50, 70

Function Sets the value of the specified resettable maintenance counter to 0. The maintenance counter saved in the FLASH memory is also set to 0. nl and nh specify the maintenance number as [nh × 256 + nl].

nh × 256 + nl		Counter Type
Hexadecimal	Decimal	
14H	20	Number of paper feed lines (unit: 100 dot-lines)
15H	21	Number of thermal head activation times (unit: 100 dot-lines)
32H	50	Number of autocutter drive times
46H	70	Drive time of printer (unit: minute)

Note that frequent use of this command will shorten the life of the FLASH memory. The FLASH memory can be rewritten approximately 100000 times.
The printer may turn to BUSY status while writing data to the FLASH memory with this command processing. Do not transmit data from the host since the printer stops data receiving while in BUSY status.
Do not turn off the power while executing this command.

Related Commands   GS 'g' '1', GS 'g' '2'

GS 'g' '1' m   Save Maintenance Counter

Code   1DH 67H 31H m

Definition Range   m = 0

Function   Saves all maintenance counter values in the FLASH memory.

Notes   The number of paper feed lines and the number of thermal head activation times are saved at a value of 1/100.
The maintenance counter is automatically saved at 2-minute intervals without using this command.
Note that frequent use of this command will shorten the life of the FLASH memory. The FLASH memory can be rewritten approximately 100000 times.
Do not turn off the power while executing this command.

Related Commands   GS 'g' '0', GS 'g' '2'

GS 'g' '2' m nl nh   Send Maintenance Counter

Code   1DH 67H 32H m nl nh

Definition Range   m = 0
            nh × 256 + nl = 20, 21, 50, 70, 148, 149, 178, 198

Function   In response to the request of this command, the printer sends the maintenance counter value. nl and nh specify the maintenance number as [nh × 256 + nl].

nh × 256 + nl		Counter Type
Hexadecimal	Decimal	
14H	20	Number of paper feed lines (unit: 100 dot-lines)
15H	21	Number of thermal head activation times (unit: 100 dot-lines)
32H	50	Number of autocutter drive times
46H	70	Drive time of printer (unit: minute)
94H	148	Number of paper feed lines (integrated value) (unit: 100 dot-lines)
95H	149	Number of thermal head activation times (integrated value) (unit: 100 dot-lines)
B2H	178	Number of autocutter drive times (integrated value)
C6H	198	Drive time of printer (integrated value) (unit: minute)

Notes	The maintenance counter value is sent by 4 bytes in a HEX code format.

The maintenance counter value is sent by 4 bytes in a HEX code format.
The number of data bytes to be sent is 2 bytes of header and footer + 4 × 2 = 10 bytes.
The number of thermal head activation times is not counted for the paper feed with the FEED Switch. The number is counted for the paper feed with printing action, or the paper feed by the "Line Feed" command (LF), the page print command, and so on.

Related Commands   GS 'g' '0', GS 'g' '1', GS 'a'

DC2 '*' '1' n   Defragment User Area

Code   12H 2AH 31H n

Definition Range   0 ≤ n ≤ 255

Function   Defragments the user area (FLASH memory), and allocates the remaining memory capacity.
When n = <*******0>B, the printer defragments the user area without progress response.
When n = <*******1>B, the printer defragments the user area with progress response.

Notes   In the user area, releasing the area or deleting data cannot increase the remaining memory capacity. The area can be used again as the user area by this command.
When n = 1, the printer sends the progress situation during execution of this command. The proportion of the remaining amount of data movement in the user area is sent as progress situation response. Note that the value of progress situation is a reference. The processing time of 1 data movement varies depending on the amount of data registered in the user area.
The FLASH memory can be rewritten approximately 100000 times. Execute this command after the free area of memory becomes low in order to effectively use the number of rewritable times.

Related Commands   See "6.4 RESPONSE DATA".

DC2 '*' '2'   Send Remaining User Area

Code   12H 2AH 32H

Function   In response to the request of this command, the printer sends the remaining memory capacity of the user area (FLASH memory) by 4 bytes in a HEX code format.
The number of data bytes to be sent is 2 bytes of header and footer + 4 × 2 = 10 bytes.

Notes   The memory capacity of the unused area excluding the released area is sent by HEX code.

Related Commands   See "6.4 RESPONSE DATA".

DC2 '*' '6'   Send Remaining User Area after Defragment

Code   12H 2AH 36H

Function   In response to the request of this command, the printer sends the remaining memory capacity after defragmenting the user area by 4 bytes in a HEX code format.
The number of data bytes to be sent is 2 bytes of header and footer + 4 × 2 = 10 bytes.

Notes   This command does not defrag the user area.
The memory capacity of the unused area including the released area is sent by HEX code.

Related Commands   See "6.4 RESPONSE DATA".

DC2 'R' n — Initialize User Area

Code   12H 52H n

Definition Range   n = 1

Function   Initializes the user area (FLASH memory).

Notes   All user-defined characters, downloaded characters, optional fonts, downloaded bit images, macros, NV graphics, User page 1-byte fonts, and User page international characters are cleared and returned to the initial state. (The area for user-defined characters and downloaded characters are allocated.)
The Function Settings and the maintenance counter are not initialized.
When n is out of the definition range, this command is ignored.

DC2 'k' f [d]k NUL — Change Function Settings

Code   12H 6BH f [d]k 00H

Definition Range   f = 0, 128
0 ≤ d ≤ 255
k = 40

Function   Sets all MS in a batch.

Sets the following function. The setting value is valid from when the command is executed.
f = 00H: Does not write to the system area of the FLASH memory at the same time as setting.
MS39 (Bluetooth Setting) is not changed.
f = 80H: Writes to the system area of the FLASH memory at the same time as setting.

Specify the total 40 bytes of MS1 to 40 continuously.

Notes   Do not set f = FFH. The printer may not work properly.
The printer is initialized after execution of this command.
However, initialization operation of the cutter is not performed.
Do not turn off the power while executing this command.
See "Chapter 4 Function Settings" for each content of MS.
Execute software reset or hardware reset to enable the setting when MS39 is changed.

Related Commands   DC2 'w'

Code   12H 77H f [d]k 00H

Definition Range   0 ≤ d ≤ 255
                        0 ≤ f ≤ 255 (See the following functions.)
                        k = 40 (f = 00H, f = 80H), k = 1 (other than left value)

Function   Sets the MS.
            The MSB of f has the meaning below.
            f = 00H: Does not write to the system area of the FLASH memory at the same time as
                      setting.
                      MS39 (Bluetooth Setting) is not changed.
            f = 80H: Writes to the system area of the FLASH memory at the same time as setting.

MS	f		Function
All MS	00H	80H	40 Bytes All Writing
1	01H	81H	General Setting 1
2	02H	82H	General Setting 2
3	03H	83H	General Setting 3
4	04H	84H	General Setting 4
5	05H	85H	General Setting 5
6	06H	86H	General Setting 6
7	07H	87H	General Setting 7
8 to 12	08H to 0CH	88H to 8CH	(Reserved)
13	0DH	8DH	General Setting 13
14	0EH	8EH	(Reserved)
15	0FH	8FH	International Character Selection
16	10H	90H	Character Code Table Setting
17	11H	91H	General Setting 17
18	12H	92H	General Setting 18
19 to 38	13H to 26H	93H to A6H	(Reserved)
39	-	A7H	Bluetooth Setting
40	-	A8H	(Reserved)
-	7FH	FFH	(Prohibited)

Notes   The printer is initialized after execution of this command.
            However, initialization operation of the cutter is not performed.
            Do not turn off the power while executing this command.
            When 40 bytes are all written, the settings of MS39 (Bluetooth Setting) is written to the system
            area of the FLASH memory, but the settings are not changed. Execute software reset or
            hardware reset to enable the setting.
            Execute software reset or hardware reset to enable the setting when MS39 is changed.
            See "Chapter 4 Function Settings" for details of each function.

DC2 'l' n — Send Function Settings

Code   12H 6CH n

Definition Range   n = 0

Function   In response to the request of this command, the printer sends the MS setting.

Notes   Sends the values of all MS currently set.
See "Chapter 4 Function Settings" for the meaning of MS.

The response is sent by 40 bytes in a HEX code format.
The number of data bytes to be sent is 2 bytes of header and footer + 40 × 2 = 82 bytes.

Related Commands   DC2 'w'
See "6.4 RESPONSE DATA".

DC2 'q' n — Execution Response Request

Code   12H 71H n

Definition Range   0 ≤ n ≤ 255

Function   At the moment that this command has been processed, the printer sends the specified response code.

Notes   Specify the response code by n. The low order 4 bits are valid for n. The code to be sent is the code from 80H to 8FH, which is the logical sum of the low order 4 bits of the specified n and 80H.

The printer has an input buffer of 4096 bytes, and input and execution of command/data are not synchronized. Therefore, the command execution completion cannot be confirmed from outside. This command enables the completion of command execution to be confirmed from outside. To confirm the end of the command, input this command following those commands. The response to this command is sent after the command input immediately before is ended.

Related Commands   See "6.4 RESPONSE DATA".

DC2 't' — Test Print

Code   12H 74H

Function   Performs a test print.

Notes   All setting values by commands are initialized.
The line buffer is cleared when executing the test print.

ESC 'c' '5' n — Enable/Disable Panel Switch

Code   1BH 63H 35H n

Definition Range   0 ≤ n ≤ 255

Default   n = 0

Function Enables or disables the panel switch (FEED Switch).
When n = <*******0>B, the panel switch is enabled.
When n = <*******1>B, the panel switch is disabled.

Notes Only the LSB is valid for n.
This command affects the FEED Switch operation. Even when the panel switch is disabled by this command, the FEED Switch operation by "Execute Macro" command (GS '^') is enabled.

Related Commands GS '^'

GS 'r' n   Send Status Data

Code 1DH 72H n

Definition Range 0 ≤ n ≤ 11

Function In response to the request of this command, the printer sends the specified status data.

(NOTE)   Reserved values in the following tables may be changed.

Printer Status 1 (n = 0)

Bit	Function	Value	
		0	1
0	Voltage error	No	Yes
1	Hardware error	No	Yes
2	Head temperature error	No	Yes
3	Cutter error	No	Yes
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Printer Status 2 (n = 1)

Bit	Function	Value	
		0	1
0	Out-of-paper error	No	Yes
1	Reserved	Fixed to 0	
2	Reserved	Fixed to 0	
3	Cover open error	No	Yes
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Printer Status 3 (n = 2)

Bit	Function	Value	
		0	**1**
0	FEED Switch status	OFF	ON
1	Reserved	Fixed to 0	
2	Paper feed status	Stop	Operating
3	Return-waiting status	No	Yes
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Option Sensor Status (n = 3)

Bit	Function	Value	
		0	**1**
0	Reserved	Fixed to 0	
1	Reserved	Fixed to 1	
2	Reserved	Fixed to 1	
3	Drawer switch input status	Low	High
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Printer Status 4 (n = 4)

Bit	Function	Value	
		0	**1**
0	Rewriting FLASH memory[1]	No	Yes
1	Reserved	Fixed to 0	
2	Reserved	Fixed to 0	
3	Reserved	Fixed to 1	
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

*1:   The value is 1 (Yes) during writing to and deleting from the FLASH memory.

Reserved (n = 5 to 7)

Bit	Function	Value	
		0	1
0	Reserved	Fixed to 1	
1	Reserved	Fixed to 1	
2	Reserved	Fixed to 1	
3	Reserved	Fixed to 1	
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Paper Sensor Status (n = 8)

Bit	Function	Value	
		0	1
0	Cover open sensor	Closed	Open
1	Out-of-paper sensor	Yes	No
2	Reserved	Fixed to 1	
3	Reserved	Fixed to 0	
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Cutter Status (n = 9)

Bit	Function	Value	
		0	1
0	Cutter blade does not return to home position	Returned	Not returned
1	Cutter blade is locked in home position	Unlocked	Locked
2	Cutter error history	No	Yes
3	Autocutter driving	Stop	Driving
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Reserved (n = 10 to 11)

Bit	Function	Value	
		0	1
0	Reserved	Fixed to 0	
1	Reserved	Fixed to 0	
2	Reserved	Fixed to 0	
3	Reserved	Fixed to 0	
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Notes   A delay may occur between command reception and status transmission depending on the input buffer status because this command is executed at the time of retrieving from the input buffer.

Related Commands   GS 'a'
See "6.4 RESPONSE DATA".

GS 'a' n   Enable/Disable Automatic Status Back

Code   1DH 61H n

Definition Range   0 ≤ n ≤ 255

Default   MS5-1 (Automatic Status Response Selection) is disabled: n = 00H
MS5-1 (Automatic Status Response Selection) is enabled: n = FFH

Function   Selects the status items to be sent by ASB (Automatic Status Back).

Bit	Function	Value	
		0	1
0	Printer status 1	Disable	Enable
1	Printer status 2	Disable	Enable
2	Printer status 3	Disable	Enable
3	Option sensor status	Disable	Enable
4	Printer status 4	Disable	Enable
5	Reserved	-	-
6	Reserved	-	-
7	Reserved	-	-

When any one of the status items is enabled, the status data at the time of executing this command is sent. After that, the status data is sent each time the state of the enabled status item changes. At this time, since each status item shows the current state, the state may change even with the status item for which ASB is not enabled.
When all status items are disabled, the ASB function becomes disabled.
When the ASB function is enabled in the initial state, the status at the first time that the printer communication becomes available after turning on the power is sent.
The 8-byte status is always continuous except for Xoff code.
Because this command is executed when retrieved from the input buffer, a delay may occur between command reception and status transmission depending on the input buffer status.
The status data is sent only to the interface currently selected.
When the cable is connected, the status data is sent right after connecting.
The high order 4 bits of all bytes are identifiers to distinguish from other responses. For the identifier, the 1st byte is CxH (1100xxxx), and the 2nd byte to the 8th byte are DxH (1101xxxx). When the code CxH is sent from the printer as a response, treat the continuous 8 bytes including the response (except Xoff) as the status from the ASB function.

(NOTE)   Reserved values in the following tables may be changed.

---

(1) The 1st Byte (Printer Status 1)

Bit	Function	Value	
		0	**1**
0	Voltage error	No	Yes
1	Hardware error	No	Yes
2	Head temperature error	No	Yes
3	Cutter error	No	Yes
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 0	
6	Identifier	Fixed to 1	
7	Identifier	Fixed to 1	

(2) The 2nd Byte (Printer Status 2)

Bit	Function	Value	
		0	**1**
0	Out-of-paper error	No	Yes
1	Reserved	Fixed to 0	
2	Reserved	Fixed to 0	
3	Cover open error	No	Yes
4	Identifier	Fixed to 1	
5	Identifier	Fixed to 0	
6	Identifier	Fixed to 1	
7	Identifier	Fixed to 1	

(3) The 3rd Byte (Printer Status 3)

Bit	Function	Value 0	Value 1
0	FEED Switch status	OFF	ON
1	Reserved	Fixed to 0	
2	Paper feed status	Stop	Operating
3	Return-waiting status	No	Yes
4	Identifier	Fixed to 1	
5	Identifier	Fixed to 0	
6	Identifier	Fixed to 1	
7	Identifier	Fixed to 1	

(4) The 4th Byte (Option Sensor Status)

Bit	Function	Value 0	Value 1
0	Reserved	Fixed to 0	
1	Reserved	Fixed to 1	
2	Reserved	Fixed to 1	
3	Drawer switch input status	Low	High
4	Identifier	Fixed to 1	
5	Identifier	Fixed to 0	
6	Identifier	Fixed to 1	
7	Identifier	Fixed to 1	

(5) The 5th Byte (Printer Status 4)

Bit	Function	Value 0	Value 1
0	Rewriting FLASH memory[1]	No	Yes
1	Select Peripheral Device	Printer	Others
2	Reserved	Fixed to 0	
3	Reserved	Fixed to 1	
4	Identifier	Fixed to 1	
5	Identifier	Fixed to 0	
6	Identifier	Fixed to 1	
7	Identifier	Fixed to 1	

[1]: The value is 1 (Yes) during writing to and deleting from the FLASH memory.

(6) The 6th Byte to the 8th Byte (Reserved)

Bit	Function	Value	
		0	1
0	Reserved	Fixed to 1	
1	Reserved	Fixed to 1	
2	Reserved	Fixed to 1	
3	Reserved	Fixed to 1	
4	Identifier	Fixed to 1	
5	Identifier	Fixed to 0	
6	Identifier	Fixed to 1	
7	Identifier	Fixed to 1	

Related Commands   GS 'r', DC2 'w', DC2 'l'
See "6.4 RESPONSE DATA".

DC2 '0' 'c' n   Send Error History

Code   12H 30H 63H n

Definition Range   0 ≤ n ≤ 255

Function   The printer records an error as a history when it occurs.
In response to the request of this command, the printer sends the error history by HEX code.

Specify the target history number by n.
When the specified history number does not contain data, 00H data is sent.

Executing this command stops collecting the error history.
To resume collecting error history, specify again the data of history number that has been once specified, or read data of n = 255.

The data sent in the error history is as follows:
The 1st to 4th byte: Elapse time (seconds) after turning on the power
The 5th to 12th byte: Response value of automatic status response

Notes   The number of data bytes to be sent is 2 bytes of header and footer + 12 × 2 = 26 bytes.

Related Commands   See "6.4 RESPONSE DATA".

DC3 '(' 'c' 'l' 'r' ')'   Clear Buffer at Error

Code   13H 28H 63H 6CH 72H 29H

Function   The printer clears the input buffer and the line buffer upon receiving this command and returns from parameter waiting.

This is a realtime command.
This command is executed only at an error.
This command is executed only when Data Discard Selection When Error Occurs is enabled.
The operation of this command differs depending on the Function Setting MS13-3 (Realtime Command Selection).
・ When the Function Setting MS13-3 (Realtime Command Selection) is enabled:
   This command is valid.
   Notes when using a realtime command:
      The user should note that the same behavior as this command occurs when the code line matching the code that comprises this command is received. For example, graphics data contains such code line.
・ When the Function Setting MS13-3 (Realtime Command Selection) is disabled:
   This command is ignored.

DC3 '(' 'r' 'e' 's' 'e' 't' DC3 'r' 'e' 's' 'e' 't' ')'   Printer Reset

Code   13H 28H 72H 65H 73H 65H 74H 13H 72H 65H 73H 65H 74H 29H

Function Resets the printer.
Performs the same operation as when turning on the power. (For USB connection, communication is not disconnected, but the buffer is cleared.)

Notes   This is a realtime command.
The operation of this command differs depending on the Function Setting MS13-3 (Realtime Command Selection).
・ When the Function Setting MS13-3 (Realtime Command Selection) is enabled:
   This command is valid.
   After sending this command, do not send any data until the initialization is completed by the reset.
   Notes when using a realtime command:
      The user should note that the same behavior as this command occurs when the code line matching the code that comprises this command is received. For example, graphics data contains such code line.
・ When the Function Setting MS13-3 (Realtime Command Selection) is disabled:
   This command is ignored.

DC2 '>' n   Specify Fixed Division

Code   12H 3DH n

Definition Range   0 ≤ n ≤ 1

Function Specifies the thermal head driving method to fixed division.
          n specifies the number of divisions.

n	Number of Divisions
0	Fixed 2-division
1	Fixed 3-division

Notes   When this command is input, the thermal head driving is specified to the fixed division method.
The initial state can be determined by MS4-1 to 2 (Number of Dots Selection for Fixed Division and Dynamic Division).

Code   12H 25H n

Definition Range   12 ≤ n ≤ 36

Function   Specifies the thermal head driving method to dynamic division and specifies the maximum number of simultaneously activated dots.
n: Maximum number of simultaneously activated dots (Specified by n × 8)

Notes   When this command is input, the thermal head driving is specified to the dynamic division method.
The range of n is from 12 to 36. Specify the maximum number of simultaneously activated dots to n × 8 dots.
n < 12 is processed as n = 12, and n > 36 is processed as n = 36.
Specifying a large number of dots when using a power supply with a small capacity may result in faint print or voltage error. Make sure not to exceed the capacity of the power supply when specifying the number of division dots by this command.
The initial state can be determined by MS4-1 to 2 (Number of Dots Selection for Fixed Division and Dynamic Division) and MS4-3 (Division Driving Method Selection).

Code   12H 7EH n

Definition Range   70 ≤ n ≤ 130

Function   Sets the print density.

Notes   The print density can be adjusted by setting the energy applied to the thermal head in the range of 70% to 130% of the rated energy. However, if the print density that exceeds the rating (100%) is set, the thermal head life may not be satisfied.
When n is out of the definition range, this command is ignored, and the setting value does not change.
The initial state can be selected from 70% to 130% using the Function Setting MS6-1 to 8 (Print Density Selection).

Excessive printing energy may shorten the life of the thermal head or may cause a paper feed problem, so set the thermal paper selection and print density selection accurately. If the thermal paper to use is different from the one selected, or the print density selection is other than 100%, the reliability of the product specification may not be satisfied.

GS 's' n   Set Print Speed

Code   1DH 73H n

Definition Range   0 ≤ n ≤ 3

Function   Sets the print speed.

n	Speed Setting
0	High
1	Middle (Quality)
2	Reserved
3	Middle (Silent)

High: Drives at the maximum print speed of 250 mm/s.
Middle (Quality):   Decreases the maximum print speed for printing image to 200 mm/s to
                     improve the print quality. Printing of image includes the following:
                     Raster bit image, graphics data stored in print buffer, NV graphics,
                     downloaded bit image, bit image mode, barcode, two-dimensional barcode
                     Printing in the page mode, the whole page is regarded as image.
Middle (Silent):   Decreases the maximum print speed to 150mm/s to print silently.

Notes   The speed may be lower than the selected maximum speed due to the thermal head driving
            method, environmental temperature, communication method, and so on.
            The initial state can be selected using the Function Setting MS4-7 (Maximum Print Speed
            Selection).

GS 'O'   Execute Power Off

Code   1DH 4FH

Function   Performs power off processing after the value of the maintenance counter is saved and the
            interface goes offline. No data is processed after this command is executed.

Notes   To return to the printable state, the POWER Switch should be turned on again.

DC2 'u' 0   Set iSerialNumber

Code   12H 75H 00H

Function   Sets the printer's serial number to iSerialNumber.

Notes   It may break the FLASH memory when this command is frequently used.
            Use this command only when the printer is installed, and do not use it during normal
            operation.

DC2 'u' 1 [d]k NUL   Set iSerialNumber

Code   12H 75H 01H [d]k 00H

Definition Range   d: 1-byte alphanumeric character
                       1 ≤ k ≤ 8

Function   Sets any character string to iSerialNumber.
           The character string can be set with 1 to 10 characters.
           '0' to '9' (30H to 39H), 'A' to 'Z' (41H to 5AH) and 'a' to 'z' (61H to 7AH) can be specified for d.

Notes   When multiple printers use the same iSerialNumber, do not connect the printers to the host at
           the same time.
           Do not set characters other than 1-byte characters.
           It may break the FLASH memory when this command is frequently used.
           Use this command only when the printer is installed, and do not use it during normal
           operation.

DC2 'i' m [d]k   Set Communication Default Value

Code   12H 69H m [d]k

Definition Range   m: 33H to 35H, 37H to 38H
                       d: 20H, 23H, 2AH, 2BH, 2DH, 30H to 39H, 41H to 5AH, 5Fh, 61H to 7AH

Function   Sets, clears, and reads Bluetooth.
           This command is valid only for Bluetooth model.

m	Function	Data	Default
33H	Initializing Bluetooth device name	None	RP-F10
34H	Reading out Bluetooth device name	None	-
35H	Setting Bluetooth device name	2 ≤ k ≤ 32 bytes + NULL character	-
37H	Initializing Bluetooth PIN code	None	0000
38H	Setting Bluetooth PIN code	4 ≤ k ≤ 16 bytes + NULL character	-

Bluetooth device name can be set in 2 bytes to 32 bytes character string.

The Bluetooth device name setting is completed when the number of setting data bytes
exceeds 32 bytes or NULL is detected in the setting data.
When the number of setting data bytes exceeds 32 bytes, the 33rd character is considered as
NULL character, and the following data is processed as character code.
When the number of setting data bytes is less than 2 bytes, it is ignored.

By reading out Bluetooth device name, the printer transmits the specified Bluetooth device
name to the host device from the beginning in order. The completion of data transmission is
signaled by transmitting NULL character.

By initializing Bluetooth device name, the specified Bluetooth device name can be restored to
the state at the shipping.

Bluetooth PIN code can be set in 4 bytes to 16 bytes character string.

The Bluetooth PIN code setting is completed when the number of setting data bytes exceeds 16 bytes or NULL is detected in the setting data.
When the number of setting data bytes exceeds 16 bytes, the 17th character is considered as NULL character, and the following data is processed as character code.
When the number of setting data bytes is less than 4 bytes, it is ignored.

The characters available for setting Bluetooth device name or PIN code are as follows:
'0' to '9', 'a' to 'z', 'A' to 'Z', '+', '-', '_', '#', '*', ' '(space:20H)
Characters other than above are ignored.

After setting the Bluetooth device name or PIN code, turn on the printer again or execute hardware reset.

DEL DC4 fn a n r t1 t2   Stop External Buzzer

Code   10H 14H fn a n r t1 t2

Definition Range   fn = 3
                        a = 0
                        n = 0
                        r = 0
                        t1 = 1, t2 = 0

Function   Stops the following beeping of the external buzzer.
            ・ Auto beeping when an error occurs or when cut process completes
            ・ Beeping by "Generate Pulse" command (ESC 'p')
            ・ Beeping by "Generate Pulse in Real Time" command (DLE DC4 fn)
            ・ Beeping by "Stop External Buzzer" command (ESC '(' 'A' 1 pL pH fn n c)

Notes   This is a realtime command.
            The operation of this command differs depending on the Function Setting MS13-3 (Realtime Command Selection).
            ・ When the Function Setting MS13-3 (Realtime Command Selection) is enabled:
                This command is valid.
                Notes when using a realtime command:
                    The user should note that the same behavior as this command occurs when the code line matching the code that comprises this command is received. For example, graphics data contains such code line.
            ・ When the Function Setting MS13-3 (Realtime Command Selection) is disabled:
                This command is ignored.

ESC '(' 'A' 1 pL pH fn n c   Set External Buzzer

Code   1BH 28H 41H pL pH fn n c

Definition Range   pL = 3, pH = 0
                        fn = 97
                        $0 \le n \le 3$
                        $0 \le c \le 255$

Function   Beeps the buzzer pattern specified by n the number of times specified by c.
            Repeats the specified buzzer pattern indefinitely when c = 0.
            Stops beeping when the following operations are performed while the buzzer beeps.
            ・ Open the paper cover.
            ・ Press the POWER Switch.
            ・ Press the FEED Switch.
            ・ Execute "Stop External Buzzer" command (DLE DC4 (fn=3)).

Notes This command is ignored if it is executed during an automatic beeping when an arror occurs or when cut process completes.

DEL EOT n   Send Status Data in Real Time

Code   10H 04H n

Definition Range   0 ≤ n ≤ 11

Function   In response to the request of this command, the printer sends the specified status data.

(NOTE)   Reserved values in the following tables may be changed.

Printer Status 1 (n = 0)

Bit	Function	Value	
		0	1
0	Voltage error	No	Yes
1	Hardware error	No	Yes
2	Head temperature error	No	Yes
3	Cutter error	No	Yes
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Printer Status 2 (n = 1)

Bit	Function	Value	
		0	1
0	Out-of-paper error	No	Yes
1	Reserved	Fixed to 0	
2	Reserved	Fixed to 0	
3	Cover open error	No	Yes
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Printer Status 3 (n = 2)

Bit	Function	Value	
		0	**1**
0	FEED Switch status	OFF	ON
1	Reserved	Fixed to 0	
2	Paper feed status	Stop	Operating
3	Return-waiting status	No	Yes
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Option Sensor Status (n = 3)

Bit	Function	Value	
		0	**1**
0	Reserved	Fixed to 0	
1	Reserved	Fixed to 1	
2	Reserved	Fixed to 1	
3	Drawer switch input status	Low	High
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Printer Status 4 (n = 4)

Bit	Function	Value	
		0	**1**
0	Rewriting FLASH memory[1]	No	Yes
1	Reserved	Fixed to 0	
2	Reserved	Fixed to 0	
3	Reserved	Fixed to 1	
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

[1]: The value is 1 (Yes) during writing to and deleting from the FLASH memory.

Reserved (n = 5 to 7)

Bit	Function	Value	
		0	**1**
0	Reserved	Fixed to 1	
1	Reserved	Fixed to 1	
2	Reserved	Fixed to 1	
3	Reserved	Fixed to 1	
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Paper Sensor Status (n = 8)

Bit	Function	Value	
		0	**1**
0	Cover open sensor	Closed	Open
1	Out-of-paper sensor	Yes	No
2	Reserved	Fixed to 1	
3	Reserved	Fixed to 0	
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Cutter Status (n = 9)

Bit	Function	Value	
		0	**1**
0	Cutter blade does not return to home position	Returned	Not returned
1	Cutter blade is locked in home position	Unlocked	Locked
2	Cutter error history	No	Yes
3	Autocutter driving	Stop	Driving
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Reserved (n = 10 to 11)

Bit	Function	Value	
		0	1
0	Reserved	Fixed to 0	
1	Reserved	Fixed to 0	
2	Reserved	Fixed to 0	
3	Reserved	Fixed to 0	
4	Identifier	Fixed to 0	
5	Identifier	Fixed to 1	
6	Identifier	Fixed to 0	
7	Identifier	Fixed to 1	

Notes   This is a realtime command.
The operation of this command differs depending on the Function Setting MS13-3 (Realtime Command Selection).
・ When the Function Setting MS13-3 (Realtime Command Selection) is enabled:
   This command is valid.
   Notes when using a realtime command:
    The user should note that the same behavior as this command occurs when the code line matching the code that comprises this command is received. For example, graphics data contains such code line.
・ When the Function Setting MS13-3 (Realtime Command Selection) is disabled:
   This command is ignored.
Do not transmit the next data until the corresponding status is received after executing this command.
Do not send this command until all response data is retrieved when the response command other than this command is executed.

6.5.11 Ruled Line

DC3 '#' n — Select Ruled Line Overlapping Mode

Code | 13H 23H n

Definition Range | 0 ≤ n ≤ 255

Default | Ruled line OR overlapping mode

Function | Specifies OR or XOR for the overlapping mode of ruled line with character and image data.
When n = <*******0>B, the OR overlapping mode is specified.
When n = <*******1>B, the XOR overlapping mode is specified.

Notes | Only the LSB is valid for n.
When the page mode is selected, inputting this command executes only the internal flag of the printer. The setting of this command does not affect the page mode.
When the OR overlapping mode is specified, the part where dots exist either in the ruled line or in the image and character is printed out in black.
XOR shows exclusive OR. When the XOR overlapping mode is specified, the part where the ruled line is overlapped with the image and character is printed out in white, and the non-overlapped part is printed out in black.

DC3 '(' — Specify Ruled Line Command

Code | 13H 28H

Function | Following input of this command, the printer accepts ruled line commands without DC3 code until it receives 29H.

Notes | All commands other than ruled line commands are ignored.

DC3 '+' — Set Ruled Line ON

Code | 13H 2BH

Default | Ruled line OFF

Function | Sets the ruled line to ON.

Notes | After this command, ruled line is printed in the following cases:
(1) Printing characters and spaces between lines
(2) Execution of the "Line Feed" command (LF), "Print and Feed Forward" command (ESC 'J'), "Print and n Lines Feed Forward" command (ESC 'd'), "Print Ruled Line 1 Dot-Line" command (DC3 'P'), or "Print Ruled Line n Dot-Lines" command (DC3 'p')

This command is valid until the "Set Ruled Line OFF" command (DC3 '-') is executed.
The dots whose bit of the selected ruled line buffer is 1 are printed out.
· In the page mode:
The ruled line data beyond the print area set in "Set Print Area in Page Mode" command (ESC 'W') is not printed.
· In the standard mode:
The ruled line data of the printable area width is always printed.

Related Commands | DC3 '-', ESC '#'

DC3 '-'   Set Ruled Line OFF

Code   13H 2DH

Default   Ruled line OFF

Function   Sets the ruled line to OFF.

Notes   After this command, ruled line is not printed.

Related Commands   DC3 '+'

DC3 'A'   Select Ruled Line A

Code   13H 41H

Default   Ruled line buffer A selected

Function   Selects ruled line buffer A.

Notes   Following this, ruled line data is set for the ruled line buffer A, and the image of the ruled line buffer A is printed out.
After using this command, the setting or printing for the ruled line buffer only applies to the ruled line buffer A.

Related Commands   DC3 'B'

DC3 'B'   Select Ruled Line B

Code   13H 42H

Default   Ruled line buffer A selected

Function   Selects ruled line buffer B.

Notes   Following this, ruled line data is set for the ruled line buffer B, and the image of the ruled line buffer B is printed out.
After using this command, the setting or printing for the ruled line buffer only applies to the ruled line buffer B.

Related Commands   DC3 'A'

DC3 'C'   Clear Ruled Line Buffer

Code   13H 43H

Default   All data of both ruled line buffer A and B cleared

Function   Clears all bits of the selected ruled line buffer to 0.

DC3 'D' nl nh — Set Ruled Line (Unit: Dot)

Code   13H 44H nl nh

Definition Range $0 \leq nl \leq 255$, $0 \leq nh \leq 255$

Default   All ruled lines cleared

Function   Sets the bit of the [nh × 256 + nl]th dot of the selected ruled line buffer to 1.

Notes   The position of the dot is counted by regarding the dot on the left edge of the screen as position 0.
The specification exceeding the printable area is ignored. At this time, the maximum value of the printable area is not the maximum width (X direction), but the maximum length (Y direction) in consideration of rotate 90° in the page mode.
The specified data by this command is added on the selected ruled line buffer.

DC3 'F' n1 n2 — Fill Ruled Line Pattern

Code   13H 46H n1 n2

Definition Range $0 \leq n1 \leq 255$, $0 \leq n2 \leq 255$

Default   All ruled lines cleared

Function   Fills the selected ruled line buffer with 2 bytes of data specified by n1 and n2.

Notes   The ruled line buffer is filled with a repetitive pattern of 16-dot image in which n1 is 8 dots on the left side and n2 is 8 dots on the right side.
The correspondence of each bit and dots of n1 and n2 can be changed by the "Select Image LSB/MSB" command (DC2 '='). (In the initial state, MSB is on the left side.)
The specification exceeding the printable area is ignored. At this time, the maximum value of the printable area is not the maximum width (X direction), but the maximum length (Y direction) in consideration of rotate 90° in the page mode.
The specified data by this command is overwritten on the entire area of the selected ruled line buffer.

Related Commands   DC2 '='

DC3 'L' ml mh nl nh — Set Ruled Line (Unit: Dot-Line)

Code   13H 4CH ml mh nl nh

Definition Range $0 \leq ml \leq 255$, $0 \leq mh \leq 255$
$0 \leq nl \leq 255$, $0 \leq nh \leq 255$

Default   All ruled lines cleared

Function   Sets the bits in the range from the [mh × 256 + ml]th dot to the [nh × 256 + nl]th dot of the selected ruled line buffer to 1.

Notes   The position of the dot is counted by regarding the dot on the left edge of the screen as position 0.
The specification exceeding the printable area is ignored. At this time, the maximum value of the printable area is not the maximum width (X direction), but the maximum length (Y direction) in consideration of rotate 90° in the page mode.
The specified data by this command is overwritten on the specified area of the selected ruled line buffer.

DC3 'P' — Print Ruled Line 1 Dot-Line

Code   13H 50H

Function   Prints the image of the selected ruled line buffer in 1 dot-line when ruled line is ON.

Notes   When there is data in the line buffer, the data is printed and the thermal paper is fed for distance of space between lines, then the ruled line is printed in 1 dot-line. (The ruled line is also printed on printed characters and spaces between lines.)
When ruled line is OFF, no ruled line is printed, and the paper is fed by 1 dot-line.
Configure the ruled line by 2 dots or more. 1 dot ruled line may be hard to see.

DC3 'p' nl nh — Print Ruled Line n Dot-Lines

Code   13H 70H nl nh

Definition Range $0 \le nl \le 255$, $0 \le nh \le 255$
$0 \le nh \times 256 + nl \le 65535$

Function   Prints the image of the selected ruled line buffer in the defined [$nh \times 256 + nl$] dot-lines when ruled line is ON.

Notes   When there is data in the line buffer, the data is printed and the thermal paper is fed for distance of space between lines, then the ruled line is printed in [$nh \times 256 + nl$] dot-lines. (The ruled line is also printed on printed characters and spaces between lines.)
When ruled line is OFF, no ruled line is printed, and the paper is fed by [$nh \times 256 + nl$] dot-lines.

DC3 'v' nl nh [d]k — Write Ruled Line Image

Code   13H 76H nl nh [d]k

Definition Range $0 \le d \le 255$
$1 \le nh \times 256 + nl \le$ (Maximum page length)

Default   All ruled lines cleared (d is all 0)

Function   Writes image data of [$nh \times 256 + nl$] bytes from the 0th byte of the selected ruled line buffer.
d indicates image data.
The number of data bytes is $k = nh \times 256 + nl$.

Notes   For the image data, input data equivalent to 1 dot-line.
The correspondence of each bit and dots of the image data can be changed by the "Select Image LSB/MSB" command (DC2 '='). (In the initial state, MSB is on the left side.)
When the specification exceeds the printable area, the data within the print area is retrieved, and the subsequent data is processed as normal data. At this time, the maximum value of the printable area is not the maximum width (X direction), but the maximum length (Y direction) in consideration of rotate 90° in the page mode.
The specified data by this command is overwritten on the specified area of the selected ruled line buffer.

Related Commands   DC2 '='

6.5.12 Download Mode

DC2 DC2 Select Download Mode

Code | 12H 12H

Function | Switches to download mode.
To return from download mode to print mode, turn the power off and on again or execute the "Reset Download Mode" command ('@').
In the download mode, only the commands listed below are valid.

Reset Download Mode ('@')
Rewrite 1-Byte Font ('S' 'W')
Register 1-Byte Font International Character ('S' 'R')
Delete 1-Byte Font ('S' 'C')

Notes | The FEED signal is disabled during the download mode.

'@' Reset Download Mode

Code | 40H

Function | Performs a software reset.

Notes | This command is valid only during the download mode.
If this command is executed after the printer switches to download mode even during printing, the printing is interrupted and reset.

'S' 'W' a [d1]k1 b [d2]k2 Rewrite 1-Byte Font

Code | 53H 57H a [d1]k1 b [d2]k2

Definition Range | a = 255
$32 \leq d1 \leq 126$
k1 = 64
b = 0, 1
$0 \leq d2 \leq 255$
k2 = 10752 (when b = 0)
k2 = 3584 (when b = 1)

Function | Registers 1-byte font data to the User page of the character code table specified by information a and b.
d1 is ID data for identifying a font to be registered.
Register with any character string of 64-bytes.
This command requires the number of data bytes + memory control information bytes in the user area of the FLASH memory.
The font data registered with this command can be used by specifying n to 255 with the "Select Character Code Table" command (ESC 't' n). The data is assigned in the order from 20H to FFH and requires 224 characters. The character assigned for 7FH cannot be used.
At the shipping, the 1-byte font by this command is not registered.

d1: ID data
k1: Number of ID data bytes
b: Font size
d2: Font data
k2: Number of font data bytes

b	Font Size	Number of Font Data Bytes (k2)
0	24-dot font	10752 byte
1	16-dot font	3584 byte

Font data format

<1-byte character>

<24-dot font 24 × 12>

<16-dot font 16 × 8>
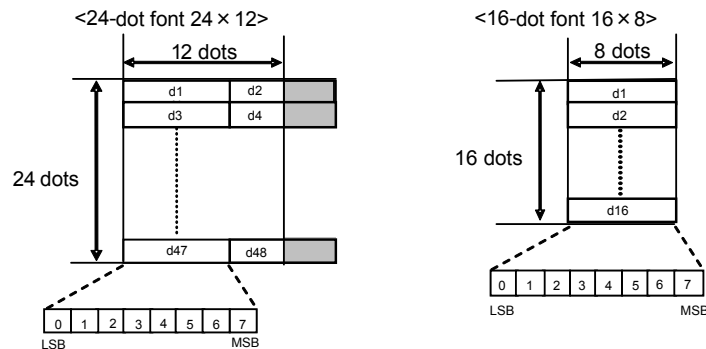
Notes This command is valid only during download mode.

The memory usage m is calculated by the formula below.
m = Number of data bytes + Number of bytes of memory control information

Related Commands ESC 't'

'S' 'R' a b c [d]k   Register 1-Byte Font International Character

Code 53H 52H a b c [d]k

Definition Range
a = 255
b = 0, 1
0 ≤ c ≤ 17
0 ≤ d ≤ 255
k = 576 (when b = 0)
k = 192 (when b = 1)

Function Registers the international character of 1-byte font registered by the "Rewrite 1-Byte Font" command.

B : Font size
c : Country number
d : Font data
k : Number of font data bytes

This command requires the number of data bytes + memory control information bytes in the user area of the FLASH memory.
The font data registered by this command can be used by selecting the country registered by the "Select International Character" command (ESC 'R' n) while specifying n to 255 with the "Select Character Code Table" command (ESC 't'). The data is assigned in the order of 23H, 24H, 40H, 5BH, 5CH, 5DH, 5EH, 60H, 7BH, 7CH, 7DH and 7EH, and requires 12 characters. At the shipping, the 1-byte font international character by this command is not registered.

b	Font Size	Number of Font Data Bytes (k)
0	24-dot font	576 byte
1	16-dot font	192 byte

c	Country	c	Country
0	USA	9	Norway
1	France	10	Denmark II
2	Germany	11	Spain II
3	United Kingdom	12	Latin America
4	Denmark I	13	Prohibition
5	Sweden	14	Prohibition
6	Italy	15	Prohibition
7	Spain I	16	Prohibition
8	Japan	17	Arabia

Font data format

<1-byte character>
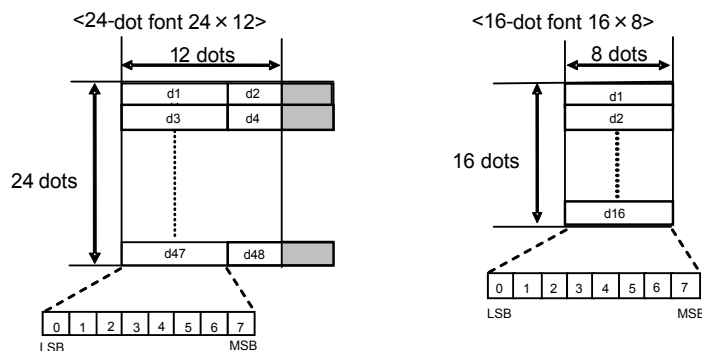
Notes   This command is valid only during the download mode.
When the 1-byte font of the specified page has not been registered, this command is ignored.

The memory usage m is calculated by the formula below.
   m = Number of data bytes + Number of bytes of memory control information

Related Commands   ESC 't', ESC 'R'

'S' 'C' n   Delete 1-Byte Font

Code   53H 43H n

Definition Range   n = 255

Function   Deletes 1-byte font data in the page specified by n.

Notes   This command is valid only during the download mode.
The 24-dot font, the 16-dot font, the 24-dot font international character, and the 16-dot font international character in the page specified by n are all deleted.

6.6 COMMAND LIST

CHAPTER 7
INITIALIZATION

7.1 INITIALIZATION

There are the following processes for initialization:

(1) Initialization of settings

- "Initialize Printer" command (ESC '@')

(2) Initialization by software resetting

- Resetting of USB class request

- "Reset Download Modet" command ('@')

- "Printer Reset" command (DC3 '(' 'r' 'e' 's' 'e' 't' DC3 'r' 'e' 's' 'e' 't' ')')

(3) Initialization by hardware resetting

- "Hardware Reset" command (DC2 '@')

- Power on by the POWER Switch

- INITIALIZATION OF SETTINGS

The items shown in Table 7-1 are initialized by the command below.

- "Initialize Printer" command (ESC '@')

Table 7-1 Setting Value After Initialization

Item	Setting Value	Command
Character right space amount	0	ESC SP
Bold printing	Cancel	ESC '!', ESC 'E'
Double strike printing	Cancel	ESC 'G'
Underline	Cancel	ESC '!', ESC '-'
90° right rotation	Cancel	ESC 'V'
Inversion (flip) printing	Cancel	ESC '{'
Character font	Font A (24×12)	ESC '!', ESC 'M'
Double height	Cancel	ESC '!', FS '!', FS 'W'
Double width	Cancel	ESC '!', FS '!', FS 'W'
Reverse printing	Cancel	GS 'B'
International character	Depends on Function Settings	ESC 'R'
Character code table	Depends on Function Settings	ESC 't'
Kanji mode	Cancel	FS '&', FS '.'
Kanji font	Font A (24 × 24)	FS '!', DC2 '.'
Kanji underline	Cancel	FS '!', FS '-'
Kanji code system	Depends on Function Settings	FS 'C'
Kanji space amount	Right = 0, Left = 0	FS 'S'
Line spacing	1/6 inches	ESC '2', ESC '3'
Horizontal tab position	Every 8 characters	ESC 'D'
Page mode	Not selected	ESC 'L', ESC 'S'
Print direction in page mode	Left to Right	ESC 'T'
Starting point in page mode	Depends on Function Settings	ESC 'T'
Print area in page mode	Entire printable area	ESC 'W'
Alignment	Aligned left	ESC 'a'
Counter print mode	Number of digit = 0, Aligned right	GS 'C' '0'
Count mode	Count-up	GS 'C' '1'
Counter range	1 to 65535	GS 'C' '1'
Counter value	1	GS 'C' '2'
Counter step	1	GS 'C' '1'
Number of repetitions	1	GS 'C' '1'
HRI character print position	Not printed	GS 'H'
HRI character font	Font A (24×12)	GS 'f'
Barcode print direction	No rotation	GS 'j'
Barcode height	162 dots	GS 'h'
Barcode width	0.375 mm 0.375 mm / 1.000 mm	GS 'w'

Item	Setting Value	Command
Barcode N:W ratio	1:2.5	DC2 ':'
Nominal narrow element width	3 dots	GS 'n'
PDF module height	10 dots	GS 'o'
QR Code, Data Matrix module size	6 dots	DC2 ';'
Left margin	0 (beginning of line)	GS 'L'
Printing area	Printable area	GS 'W'
Basic calculation pitch	x direction: 1/203 inches y direction: 1/203 inches	GS 'P'
Downloaded bit image selection	Cancel	GS '/'
NV graphics selection	Cancel	GS '(' 'L'
Watermark	Cancel	GS '(' 'L'
Image LSB/MSB	MSB	DC2 '='
Bit image scan method	Column scan method	DC2 'l'
Ruled line	OFF	DC3 '+', DC3 '-'
Ruled line buffer	Clear	DC3 'C'
Ruled line overlapping	OR	DC3 '#'
Downloaded character specification	Cancel	ESC '%'
Optional font selection	Cancel	DC2 'O'

7.2 INITIALIZATION BY SOFTWARE RESETTING

Initialization is performed by the following commands or operation.

- Resetting of USB class request (Valid only by printer driver)

- "Reset Download Mode" command ('@') (Valid only in download mode)

- "Printer Reset" command (DC3 '(' 'r' 'e' 's' 'e' 't' DC3 'r' 'e' 's' 'e' 't' ')')

By this initialization, in addition to the items in "7.2 INITIALIZATION OF SETTINGS", the items in Table 7-2 are initialized.
Also, the Bluetooth interface is initialized. When the interfaces are initialized, the communications are disconnected.

Table 7-2   Setting Value After Initialized by Software Resetting

Item	Setting Value	Command
Input buffer	Clear	-
Output buffer	Clear	-
Function Settings	Depends on Function Settings	DC2 'k', DC2 'w'
Macro	Cancel	GS ':'
Peripheral device selection	Printer enabled	ESC "="
Panel switch enable/disable	Enabled	ESC 'c' '5'
Automatic status back enable/disable	Depends on Function Settings	GS 'a'
Thermal head driving method	Depends on Function Settings	DC2 '>', DC2 '%'
Print density	Depends on Function Settings	DC2 '~'
Print speed	Depends on Function Settings	GS 's'

7.3 INITIALIZATION BY HARDWARE RESETTING

Initialization is performed by the following commands or operation.

- "Hardware Reset" command (DC2 '@')

- Power on by the POWER Switch

By this initialization, the items in "7.2 INITIALIZATION OF SETTINGS" and "7.3 INITIALIZATION BY SOFTWARE RESETTING " are initialized.
Also, all interfaces are initialized. When the interfaces are initialized, the communications are disconnected.

APPENDIX A
CHARACTER SETS (CHARACTER CODE TABLE)

A.1 CHARACTER CODE TABLE (CODEPAGE)

The codepage when the international character selection is set to USA is shown below.
The printing result of a specific character code differs depending on the international character set to be set.
For specific character codes, See "A.2 INTERNATIONAL CHARACTER SET".

```
      0 1 2 3 4 5 6 7 8 9 A B C D E F
20      ! " # $ % & ' ( ) * + , - . /
30    0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40    @ A B C D E F G H I J K L M N O
50    P Q R S T U V W X Y Z [ \ ] ^ _
60    ` a b c d e f g h i j k l m n o
70    p q r s t u v w x y z { | } ~
80    Ç ü é â ä à å ç ê ë è ï î ì Ä Å
90    É æ Æ ô ö ò û ù ÿ Ö Ü ¢ £ ¥ Pt ƒ
A0    á í ó ú ñ Ñ ª º ¿ ⌐ ¬ ½ ¼ ¡ « »
B0    ░ ▒ ▓ │ ┤ ╡ ╢ ╖ ╕ ╣ ║ ╗ ╝ ╜ ╛ ┐
C0    └ ┴ ┬ ├ ─ ┼ ╞ ╟ ╚ ╔ ╩ ╦ ╠ ═ ╬ ╧
D0    ╨ ╤ ╥ ╙ ╘ ╒ ╓ ╫ ╪ ┘ ┌ █ ▄ ▌ ▐ ▀
E0    α ß Γ π Σ σ µ τ Φ θ Ω δ ∞ φ ε ∩
F0    ≡ ± ≥ ≤ ⌠ ⌡ ÷ ≈ ° ∙ · √ ⁿ ² ■
```

Figure A-1   USA, Standard Europe (Code Page437)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
80	▬	▬	▬	■	■	■	■	▐	▌	▌	▌	▌	▐	▐	▐	┼
90	┴	┬	┤	├	─	│	│	┌	┐	└	┘	┌	┐	└	┘	
A0		。	「	」	、	・	ヲ	ァ	ィ	ゥ	ェ	ォ	ャ	ュ	ョ	ッ
B0	ー	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	サ	シ	ス	セ	ソ
C0	タ	チ	ツ	テ	ト	ナ	ニ	ヌ	ネ	ノ	ハ	ヒ	フ	ヘ	ホ	マ
D0	ミ	ム	メ	モ	ヤ	ユ	ヨ	ラ	リ	ル	レ	ロ	ワ	ン	゛	゜
E0	=	┠	┿	┨	▲	◣	◥	▼	♠	♥	♦	♣	●	○	／	＼
F0	╳	円	年	月	日	時	分	秒	〒	市	区	町	村	人	▨	

Figure A-2   Katakana

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
80	Ç	ü	é	â	ä	à	å	ç	ê	ë	è	ï	î	ì	Ä	Å
90	É	æ	Æ	ô	ö	ò	û	ù	ÿ	Ö	Ü	ø	£	Ø	×	ƒ
A0	á	í	ó	ú	ñ	Ñ	ª	º	¿	®	¬	½	¼	¡	«	»
B0	░	▒	▓	│	┤	Á	Â	À	©	╣	║	╗	╝	¢	¥	┐
C0	└	┴	┬	├	─	┼	ã	Ã	╚	╔	╩	╦	╠	═	╬	¤
D0	ð	Ð	Ê	Ë	È	ı	Í	Î	Ï	┘	┌	█	▄	¦	Ì	▀
E0	Ó	ß	Ô	Ò	õ	Õ	µ	þ	Þ	Ú	Û	Ù	ý	Ý	¯	´
F0	-	±	=	¾	¶	§	÷	¸	°	¨	·	¹	³	²	■	

Figure A-3   Multilingual (Code Page850)

```
     0 1 2 3 4 5 6 7 8 9 A B C D E F
20     ! " # $ % & ' ( ) * + , - . /
30   0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40   @ A B C D E F G H I J K L M N O
50   P Q R S T U V W X Y Z [ \ ] ^ _
60   ` a b c d e f g h i j k l m n o
70   p q r s t u v w x y z { | } ~
80   Ç ü é â ã à Á ç ê Ê è Í Ô ì Ã Â
90   É À È ô ö ò Ú ù Ì Õ Ü ¢ £ Ù ₧ Ó
A0   á í ó ú ñ Ñ ª º ¿ Ò ¬ ½ ¼ ¡ « »
B0   ░ ▒ ▓ │ ┤ ╡ ╢ ╖ ╕ ╣ ║ ╗ ╝ ╜ ╛ ┐
C0   └ ┴ ┬ ├ ─ ┼ ╞ ╟ ╚ ╔ ╩ ╦ ╠ ═ ╬ ╧
D0   ╨ ╤ ╥ ╙ ╘ ╒ ╓ ╫ ╪ ┘ ┌ █ ▄ ▌ ▐ ▀
E0   α ß Γ π Σ σ µ τ Φ θ Ω δ ∞ φ ε ∩
F0   ≡ ± ≥ ≤ ⌠ ⌡ ÷ ≈ ° ∙ · √ ⁿ ² ■
```

Figure A-4   Portuguese (Code Page860)

```
     0 1 2 3 4 5 6 7 8 9 A B C D E F
20     ! " # $ % & ' ( ) * + , - . /
30   0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40   @ A B C D E F G H I J K L M N O
50   P Q R S T U V W X Y Z [ \ ] ^ _
60   ` a b c d e f g h i j k l m n o
70   p q r s t u v w x y z { | } ~
80   Ç ü é â Â à ¶ ç ê ë è ï î ‗ À §
90   É È Ê ô Ë Ï û ù ¤ Ô Ü ¢ £ Ũ Û ƒ
A0   ¦ ´ ó ú ¨ ¸ ³ ¯ Î ⌐ ¬ ½ ¼ ¾ « »
B0   ░ ▒ ▓ │ ┤ ╡ ╢ ╖ ╕ ╣ ║ ╗ ╝ ╜ ╛ ┐
C0   └ ┴ ┬ ├ ─ ┼ ╞ ╟ ╚ ╔ ╩ ╦ ╠ ═ ╬ ╧
D0   ╨ ╤ ╥ ╙ ╘ ╒ ╓ ╫ ╪ ┘ ┌ █ ▄ ▌ ▐ ▀
E0   α ß Γ π Σ σ µ τ Φ θ Ω δ ∞ φ ε ∩
F0   ≡ ± ≥ ≤ ⌠ ⌡ ÷ ≈ ° ∙ · √ ⁿ ² ■
```

Figure A-5   Canadian-French (Code Page863)

```
      0 1 2 3 4 5 6 7 8 9 A B C D E F
20      ! " # $ % & ' ( ) * + , - . /
30    0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40    @ A B C D E F G H I J K L M N O
50    P Q R S T U V W X Y Z [ \ ] ^ _
60    ` a b c d e f g h i j k l m n o
70    p q r s t u v w x y z { | } ~
80    Ç ü é â ä à å ç ê ë è ï î ì Ä Å
90    É æ Æ ô ö ò û ù ÿ Ö Ü ø £ Ø Pt ƒ
A0    á í ó ú ñ Ñ ª º ¿ ⌐ ¬ ½ ¼ ¡ « ¤
B0    ░ ▒ ▓ │ ┤ ╡ ╢ ╖ ╕ ╣ ║ ╗ ╝ ╜ ╛ ┐
C0    └ ┴ ┬ ├ ─ ┼ ╞ ╟ ╚ ╔ ╩ ╦ ╠ ═ ╬ ╧
D0    ╨ ╤ ╥ ╙ ╘ ╒ ╓ ╫ ╪ ┘ ┌ █ ▄ ▌ ▐ ▀
E0    α ß Γ π Σ σ µ τ Φ θ Ω δ ∞ φ ε ∩
F0    ≡ ± ≥ ≤ ⌠ ⌡ ÷ ≈ ° ∙ · √ ⁿ ² ■
```

Figure A-6　Nordic (Code Page865)

```
      0 1 2 3 4 5 6 7 8 9 A B C D E F
20      ! " # $ % & ' ( ) * + , - . /
30    0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40    @ A B C D E F G H I J K L M N O
50    P Q R S T U V W X Y Z [ \ ] ^ _
60    ` a b c d e f g h i j k l m n o
70    p q r s t u v w x y z { | } ~
80    Ç ü é â ä à å ç ê ë è ï î ı Ä Å
90    É æ Æ ô ö ò û ù İ Ö Ü ø £ Ø Ş ş
A0    á í ó ú ñ Ñ Ğ ğ ¿ ® ¬ ½ ¼ ¡ « »
B0    ░ ▒ ▓ │ ┤ Á Â À © ╣ ║ ╗ ╝ ¢ ¥ ┐
C0    └ ┴ ┬ ├ ─ ┼ ã Ã ╚ ╔ ╩ ╦ ╠ ═ ╬ ¤
D0    º ª Ê Ë È   Í Î Ï ┘ ┌ █ ▄ ¦ Ì ■
E0    Ó ß Ô Ò õ Õ µ   × Ú Û Ù ì ÿ ¯ ´
F0    ±    ¾ ¶ § ÷ ¸ ° ¨ · ¹ ³ ² ■
```

Figure A-7　Turkish (Code Page857)

A–4

Figure A-8 Greek (Code Page737)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
80	Α	Β	Γ	Δ	Ε	Ζ	Η	Θ	Ι	Κ	Λ	Μ	Ν	Ξ	Ο	Π
90	Ρ	Σ	Τ	Υ	Φ	Χ	Ψ	Ω	α	β	γ	δ	ε	ζ	η	θ
A0	ι	κ	λ	μ	ν	ξ	ο	π	ρ	σ	ς	τ	υ	φ	χ	ψ
B0	░	▒	▓	│	┤	╡	╢	╖	╕	╣	║	╗	╝	╜	╛	┐
C0	└	┴	┬	├	─	┼	╞	╟	╚	╔	╩	╦	╠	═	╬	╧
D0	╨	╤	╥	╙	╘	╒	╓	╫	╪	┘	┌	█	▄	▌	▐	▀
E0	ω	ά	έ	ή	ϊ	ί	ό	ύ	ϋ	ώ	Ά	Έ	Ή	Ϊ	Ό	Ύ
F0	Ώ	±	≥	≤	Ϊ	Ϋ	÷	≈	°	•	·	√	ⁿ	²	■	

Figure A-9 Latin (Code Page1252)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
80	€		,	ƒ	„	…	†	‡	^	‰	Š	‹	Œ		Ž	
90		'	'	"	"	•	–	—	~	™	š	›	œ		ž	Ÿ
A0		¡	¢	£	¤	¥	¦	§	¨	©	ª	«	¬		®	¯
B0	°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¿
C0	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
D0	Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
E0	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï
F0	ð	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

```
     0 1 2 3 4 5 6 7 8 9 A B C D E F
20     ! " # $ % & ' ( ) * + , - . /
30   0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40   @ A B C D E F G H I J K L M N O
50   P Q R S T U V W X Y Z [ \ ] ^ _
60   ` a b c d e f g h i j k l m n o
70   p q r s t u v w x y z { | } ~
80   А Б В Г Д Е Ж З И Й К Л М Н О П
90   Р С Т У Ф Х Ц Ч Ш Щ Ъ Ы Ь Э Ю Я
A0   а б в г д е ж з и й к л м н о п
B0
C0
D0
E0   р с т у ф х ц ч ш щ ъ ы ь э ю я
F0   Ё ё Є є Ï ï Ў ў ° • · √ № ¤ ■
```

Figure A-10   Turkish (Code Page866)

```
     0 1 2 3 4 5 6 7 8 9 A B C D E F
20     ! " # $ % & ' ( ) * + , - . /
30   0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40   @ A B C D E F G H I J K L M N O
50   P Q R S T U V W X Y Z [ \ ] ^ _
60   ` a b c d e f g h i j k l m n o
70   p q r s t u v w x y z { | } ~
80   Ç ü é â ä ů ć ç ł ë Ő ő î Ź Ä Ć
90   É Ĺ í ô ö Ľ ľ Ś ś Ö Ü Ť ť Ł × č
A0   á í ó ú Ą ą Ž ž Ę ę ¬ ź Č ş « »
B0                 Á Â Ě Ş         Ž ż
C0             Ä ä                     ¤
D0   đ Đ Ď Ë ď Ň Í Î ě         Ţ Ů
E0   Ó ß Ô Ń ń ň Š š Ŕ Ú ŕ Ű ý Ý ţ ´
F0   - ˝ ˛ ˇ ˘ § ÷ ¸ ° ¨ ˙ ű Ř ř ■
```

Figure A-11   Eastern Europe (Code Page852)

```
    0 1 2 3 4 5 6 7 8 9 A B C D E F
20    ! " # $ % & ' ( ) * + , - . /
30  0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40  @ A B C D E F G H I J K L M N O
50  P Q R S T U V W X Y Z [ \ ] ^ _
60  ` a b c d e f g h i j k l m n o
70  p q r s t u v w x y z { | } ~
80  Ç ü é â ä à å ç ê ë è ï î ì Ä Å
90  É æ Æ ô ö ò û ù ÿ Ö Ü ø £ Ø × ƒ
A0  á í ó ú ñ Ñ ª º ¿ ® ¬ ½ ¼ ¡ « »
B0  ░ ▒ ▓ │ ┤ Á Â À © ╣ ║ ╗ ╝ ¢ ¥ ┐
C0  └ ┴ ┬ ├ ─ ┼ ã Ã ╚ ╔ ╩ ╦ ╠ ═ ╬ ¤
D0  ð Ð Ê Ë È € Í Î Ï ┘ ┌ █ ▄ ¦ Ì ▀
E0  Ó ß Ô Ò õ Õ µ þ Þ Ú Û Ù ý Ý ¯ ´
F0  - ± ‗ ¾ ¶ § ÷ ¸ ° ¨ · ¹ ³ ² ■
```

Figure A-12   Euro (Code Page858)

```
    0 1 2 3 4 5 6 7 8 9 A B C D E F
20    ! " # $ % & ' ( ) * + , - . /
30  0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40  @ A B C D E F G H I J K L M N O
50  P Q R S T U V W X Y Z [ \ ] ^ _
60  ` a b c d e f g h i j k l m n o
70  p q r s t u v w x y z { | } ~
80  ђ Ђ ѓ Ѓ ё Ё є Є ѕ Ѕ і І ї Ї ј Ј
90  љ Љ њ Њ ћ Ћ ќ Ќ ў Ў џ Џ ю Ю ъ Ъ
A0  а А б Б ц Ц д Д е Е ф Ф г Г « »
B0  ░ ▒ ▓ │ ┤ х Х и И ╣ ║ ╗ ╝ й Й ┐
C0  └ ┴ ┬ ├ ─ ┼ к К ╚ ╔ ╩ ╦ ╠ ═ ╬ ¤
D0  л Л м М н Н о О п ┘ ┌ █ ▄ П я ▀
E0  Я р Р с С т Т у У ж Ж в В ь Ь №
F0  - ы Ы з З ш Ш э Э щ Щ ч Ч § ■
```

Figure A-13   Cyrillic (Code Page855)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
80	°	·	•	√	▒	─	│	┼	┤	┬	├	┴	┐	┌	└	┘
90	β	∞	φ	±	½	¼	≈	«	»	ﻷ	ﻸ			ﻻ	ﻼ	
A0		─	ﹰ	£	¤	ﺋ		€	ﺍ	ﺏ	،	ﺕ	ﺙ	،	ﺝ	ﺡ	ﺥ
B0	٠	١	٢	٣	٤	٥	٦	٧	٨	٩	ﻑ	؛	ﺱ	ﺵ	ﺹ	؟
C0	¢	ﺀ	آ	أ	ؤ	ﻉ	ﺉ	ﺍ	ﺏ	ﺓ	ﺕ	ﺙ	ﺝ	ﺡ	ﺥ	ﺩ
D0	ﺫ	ﺭ	ﺯ	ﺱ	ﺵ	ﺹ	ﺽ	ﻁ	ﻅ	ﻉ	ﻍ	¦	¬	÷	×	ﻉ
E0	ﻡ	ﻍ	ﻍ	ﻉ	ﻉ	ﻱ	ﻯ	ﺽ	ﻉ	ﻭ	ﻩ	ﻥ	ﻡ	ﻝ	ﻙ	ﻕ	ﻑ	ـ
F0	ﹽ	ﹽ	ﻱ	ﻙ	ﻝ	ﻵ	ﻷ	ﻕ	ﻑ	ﻍ	ﻱ	ﻯ	ﻩ	ﻩ	ﻥ	■

Figure A-14   Arabic (Code Page864)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
80	€		‚		„	…	†	‡		‰	Š	‹	Ś	Ť	Ž	Ź
90		'	'	"	"	•	–	—		™	š	›	ś	ť	ž	ź
A0		ˇ	˘	Ł	¤	Ą	¦	§	¨	©	Ş	«	¬	-	®	Ż
B0	°	±	˛	ł	´	µ	¶	·	¸	ą	ş	»	Ľ	˝	ľ	ż
C0	Ŕ	Á	Â	Ă	Ä	Ĺ	Ć	Ç	Č	É	Ę	Ë	Ě	Í	Î	Ď
D0	Đ	Ń	Ň	Ó	Ô	Ő	Ö	×	Ř	Ů	Ú	Ű	Ü	Ý	Ţ	ß
E0	ŕ	á	â	ă	ä	ĺ	ć	ç	č	é	ę	ë	ě	í	î	ď
F0	đ	ń	ň	ó	ô	ő	ö	÷	ř	ů	ú	ű	ü	ý	ţ	˙

Figure A-15   Central European (Code Page1250)

```
      0 1 2 3 4 5 6 7 8 9 A B C D E F
20      !  ”  #  $  %  &  ’  (  )  *  +  ,  -  .  /
30   0  1  2  3  4  5  6  7  8  9  :  ;  <  =  >  ?
40   @  A  B  C  D  E  F  G  H  I  J  K  L  M  N  O
50   P  Q  R  S  T  U  V  W  X  Y  Z  [  \  ]  ^  _
60   `  a  b  c  d  e  f  g  h  i  j  k  l  m  n  o
70   p  q  r  s  t  u  v  w  x  y  z  {  |  }  ~
80   ђ  Ѓ  ‚  ѓ  „  …  †  ‡  €  ‰  Љ  ‹  Њ  Ќ  Ћ  Џ
90   ђ  ‘  ’  “  ”  •  –  —     ™  љ  ›  њ  ќ  ћ  џ
A0      Ў  ў  Ј  ¤  Ґ  ¦  §  Ё  ©  Є  «  ¬  -  ®  Ї
B0   °  ±  І  і  ґ  µ  ¶  ·  ё  №  є  »  ј  Ѕ  ѕ  ї
C0   А  Б  В  Г  Д  Е  Ж  З  И  Й  К  Л  М  Н  О  П
D0   Р  С  Т  У  Ф  Х  Ц  Ч  Ш  Щ  Ъ  Ы  Ь  Э  Ю  Я
E0   а  б  в  г  д  е  ж  з  и  й  к  л  м  н  о  п
F0   р  с  т  у  ф  х  ц  ч  ш  щ  ъ  ы  ь  э  ю  я
```

Figure A-16   Cyrillic (Code Page1251)

```
      0 1 2 3 4 5 6 7 8 9 A B C D E F
20      !  ”  #  $  %  &  ’  (  )  *  +  ,  -  .  /
30   0  1  2  3  4  5  6  7  8  9  :  ;  <  =  >  ?
40   @  A  B  C  D  E  F  G  H  I  J  K  L  M  N  O
50   P  Q  R  S  T  U  V  W  X  Y  Z  [  \  ]  ^  _
60   `  a  b  c  d  e  f  g  h  i  j  k  l  m  n  o
70   p  q  r  s  t  u  v  w  x  y  z  {  |  }  ~
80   €     ‚  ƒ  „  …  †  ‡        ‰        ‹
90         ‘  ’  “  ”  •  –  —        ™        ›
A0      ΄  Ά  £  ¤  ¥  ¦  §  ¨  ©  ª  «  ¬  -  ®  —
B0   °  ±  ²  ³  ΄  µ  ¶  ·  Έ  Ή  Ί  »  Ό  ½  Ύ  Ώ
C0   ΐ  Α  Β  Γ  Δ  Ε  Ζ  Η  Θ  Ι  Κ  Λ  Μ  Ν  Ξ  Ο
D0   Π  Ρ     Σ  Τ  Υ  Φ  Χ  Ψ  Ω  Ϊ  Ϋ  ά  έ  ή  ί
E0   ΰ  α  β  γ  δ  ε  ζ  η  θ  ι  κ  λ  µ  ν  ξ  ο
F0   π  ρ  ς  σ  τ  υ  φ  χ  ψ  ω  ϊ  ϋ  ό  ύ  ώ
```

Figure A-17   Greek (Code Page1253)

```
   0 1 2 3 4 5 6 7 8 9 A B C D E F
20   ! " # $ % & ' ( ) * + , - . /
30 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
40 @ A B C D E F G H I J K L M N O
50 P Q R S T U V W X Y Z [ \ ] ^ _
60 ` a b c d e f g h i j k l m n o
70 p q r s t u v w x y z { | } ~
80 €   ‚ ƒ „ … † ‡ ˆ ‰ Š ‹ Œ
90     ' ' " " • – — ˜ ™ š › œ       Ÿ
A0   ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯
B0 ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾ ¿
C0 À Á Â Ã Ä Å Æ Ç È É Ê Ë Ì Í Î Ï
D0 Ğ Ñ Ò Ó Ô Õ Ö × Ø Ù Ú Û Ü İ Ş ß
E0 à á â ã ä å æ ç è é ê ë ì í î ï
F0 ğ ñ ò ó ô õ ö ÷ ø ù ú û ü ı ş ÿ
```

Figure A-18   Turkish (Code Page1254)

A–10

A.2 INTERNATIONAL CHARACTER SET

The printing result of a specific character code differs depending on the international character set to be set. Specific character codes and their printing results are shown below.

	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
Arabia	#	$	@	[	\	]	^	`	{	|	}	~

Figure A-19   International Character Set

A.3 2-BYTE CHARACTER

Kanji defined in the JIS 1st and 2nd levels in 1997, NEC selection of IBM extended characters, and IBM extended characters can be printed.

In addition, special characters and NEC special characters are assigned to the Kanji code of the non-Kanji area.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2820	─	│	┌	┐	┘	└	├	┬	┤	┴	┼	━	┃	┏	┓	┛
2830	┗	┣	┳	┫	┻	╋	┠	┯	┨	┷	┿	┝	┰	┥	┸	╂
2840	╂	─	│	┌	┐	┘	└	├	┬	┤	┴	┼	│	│	│	′
2850	〃	〵	∶	⊕	⊖	∓	≃	≲	≳	ħ	℧	⊗				
2860																
2870																

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2920		、	°	'	˙	∣	あ	い	う	え	お	や	ゆ	よ	つ	わ
2930	ア	イ	ウ	エ	オ	ヤ	ユ	ヨ	ツ	ワ	カ	ケ				
2940	‖	∫	＝	─	⋮	∶		‖			⌒	⌣	⌐	⌣		⌐
2950	⌒		∧	∨	⋀	⋁	⌐	└		⌐	└		⌢		│	ˌ
2960																
2970																

Figure A-20   Special Character Set

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2D20		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮
2D30	⑯	⑰	⑱	⑲	⑳	Ⅰ	Ⅱ	Ⅲ	Ⅳ	Ⅴ	Ⅵ	Ⅶ	Ⅷ	Ⅸ	Ⅹ	
2D40	㍉	㌔	㌢	㍍	㌘	㌧	㌃	㌶	㍑	㍗	㌍	㌦	㌣	㌫	㍊	㌻
2D50	㎜	㎝	㎞	㎎	㎏	㏄	㎡								閤	
2D60	〝	〟	№	㏍	℡	㊤	㊥	㊦	㊧	㊨	㈱	㈲	㈹	曜	丼	閏
2D70	≒	≡	∫	∮	Σ	√	⊥	∠	∟	⊿	∵	∩	∪			

Figure A-21   NEC Special Character Set

```
        0 1 2 3 4 5 6 7 8 9 A B C D E F
7920    纊襃鍈銈蓜俉炻昱棈鋹曻彅｜仡仼
7930    伀伃伹佖侒侊侚侔俍偀倢俿倞偆偰偂
7940    傔僴僘兊兤冝冾凬刕劜劦勀勛匀匇匤
7950    卲厓厲叝﨎咊咩哿喆坙坥垬埈埇﨏
7960    塚增墲夋奓奛奝奣妤妺孖寀甯寘寬尞
7970    岦岺峵崧嵓﨑嵂嵭嶸嶹巐弡弴彧德

        0 1 2 3 4 5 6 7 8 9 A B C D E F
7A20    忞恝悅悊惞惕愠惲愑愷愰憘戓抦揵
7A30    摠撝擎敎昀昕昻昉昮昞昤晗晗晴晳
7A40    晴暙暠暲暿曺朎朗杦枻桒柀栁桄棏槇
7A50    樮榩榴橖横橆榻橰橫毖氿汜沆汯泚
7A60    洄涇浯涖涬淏清淲淼淊渹湜渧渼溿澈漸
7A70    澍澐濸瀨炅炫焏焄煜煆煇熙燁燾犱

        0 1 2 3 4 5 6 7 8 9 A B C D E F
7B20    犾猤猪獷珺珉珖珣珤琇珹琦琪琩琮
7B30    瑢璉璟瓲畯皂皜皞皛皦益皽盋盌盩盭
7B40    磠磤礼神祥禔福禛竑竧靖竫箞精絈絜
7B50    綷綠緖繒罇羡羽茁芋茢茥菇萇萟蒄蕙
7B60    蕫蕍薰蘒虻蟶裵訒訷詹誧誾諟諸諶諸
7B70    譓譖賴贊赶趄軏返逸達郎都鄕鄧釚

        0 1 2 3 4 5 6 7 8 9 A B C D E F
7C20    釗釞釭釮鈙鈔鉱鈴鈧鈺鉀鉕鉎鉯鉑
7C30    鈹鉧銧銵鉸鋧銷鋙鋐鋍鋕錒鋿錡鏗
7C40    鋻錞錭錝錂鍰鍗鋧鐯鏞鐔鐱鑣鑼閈隆
7C50    隝隯隭霠靈霹靏靑靕顗顥飯飼餧館
7C60    髣驎髙靗粉魲鮏鮱鮻鰀鵬鶄鶴鷾黑
7C70    ⅰ ⅱ ⅲ ⅳ ⅴ ⅵ ⅶ ⅷ ⅸ ⅹ ⌐ ¦ ´ ¨
```

Figure A-22　NEC Selection of IBM Extended Character Set

```
           0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
9320          i  ii iii iv v  vi vii viii ix x  Ⅰ  Ⅱ  Ⅲ  Ⅳ  Ⅴ
9330   Ⅵ  Ⅶ  Ⅷ  Ⅸ  Ⅹ  ¬  ¦  ′  ″ ㈱ No. Tel ∴ 纊 褜 鍈
9340   銈 蓜 俉 炻 昱 棈 鋹 曻 彅  ｜ 仡 仼 伀 伃 伹 佖
9350   侒 侊 侚 侔 俍 偀 倢 俿 倞 偆 偰 偂 傔 僴 僘 兊
9360   兤 冝 冾 凬 刕 劜 劦 勓 勠 匀 匇 匤 卲 厓 厲 叝
9370   﨎 咜 咊 咩 哿 喆 坙 坆 垬 埈 埇 﨏 塚 增 墲
```

```
           0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
9420       夋 奓 奛 奝 奣 妤 妺 孖 寀 甯 寘 寬 尞 岦 岺
9430   峵 崧 嵓 﨑 嵂 嵭 嶸 嶹 巐 弡 弴 彧 德 忞 恝 悅
9440   悊 惞 惕 愠 惲 愑 愷 愰 憘 戓 抦 揵 摠 撝 擎 敎
9450   昀 昕 昻 昉 昮 昞 昤 晥 晗 晙 晴 晳 暙 暠 暲 暿
9460   曺 朎 朗 杦 枻 桒 柀 栁 桄 棏 栟 椔 楶 榉 榘 槢
9470   樰 橫 橆 橳 橾 櫢 櫤 毖 氿 汜 沆 汯 泚 洄 涇 浯
```

```
           0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
9520       涖 浵 淏 清 淲 淼 渹 湜 渧 渼 溿 澈 渐 濵 瀅
9530   瀇 瀨 炅 炫 焏 焄 煜 煆 煇 凞 燁 燾 犱 犾 猤 猪
9540   獷 玽 珉 珏 珩 珒 琇 珺 琦 琪 琩 琮 瑢 璉 璟 瓷
9550   畯 皂 皜 皞 皛 皦 益 睆 劯 砡 硎 硤 硺 礰 礼 神
9560   祥 禔 福 禛 竑 竧 靖 竫 箞 精 絈 絜 綷 綠 緖 繒
9570   罇 羡 羽 茁 荢 荿 菇 菶 葈 蒴 蕓 蕙 蕫 﨟 薰
```

```
           0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
9620       蘒 甡 蠣 襃 訒 訷 詹 誧 誾 諟 諸 諶 譓 譿 賰
9630   賴 贒 赶 赳 軏 返 逸 遧 郞 都 鄕 鄧 釚 釗 釞 釭
9640   釮 釤 釥 鈆 鈐 鈊 鈺 鉀 鈼 鉎 鉙 鉑 鈹 鉧 銧 鉷
9650   鉸 鋧 鋗 鋙 鋐 鋍 鋕 鋠 鋓 錥 錡 鋻 錝 錞 錝 錝
9660   鍄 鍖 鍜 鍼 鍵 鏆 鏞 鏸 鐧 閒 隆 隝 隝 隝 霳
9670   霻 霦 � 靑 靖 顗 顥 飯 飼 餧 館 馞 驎 髙
```

```
           0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
9720       髜 魵 魲 鮏 鮱 鮻 鰀 鵰 鵫 鶴 鸙 黑
9730
9740
9750
9760
9770
```

Figure A-23   IBM Extended Character Set