



IFD001-01SK-E / IFD001-01UK-E
INTERFACE BOARD
TECHNICAL REFERENCE

U00112773301

Seiko Instruments Inc.

IFD001-01SK-E/ IFD001-01UK-E INTERFACE BOARD TECHNICAL REFERENCE

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PREFACE

This technical reference manual describes the specifications, functions, and operating procedures for the IFD001-01SK-E/01UK-E.

The IFD001-01SK-E/01UK-E is an interface board for the LTPDx47 or CAPDx47 series printer.

In this technical reference manual, the IFD001 is used when referring to contents common to all models. The IFD001-01SK-E or IFD001-01UK-E that omitted '-E' is used when referring to contents indigenous to each.

This reference manual also describes the print operation of the LTPDx47 or CAPDx47 series printer. Read this technical reference manual thoroughly before using.

SII has not investigated the intellectual property rights of the sample circuits included in this manual. Fully investigate the intellectual property rights of these circuits before using.

The IFD001 complies with EU RoHS Directive (2002/95/EC).

The IFD001 contains "Pb", the details are described below:

- A particular copper alloy parts, a particular component in glass of electronic parts.

*Lead-containing items listed above are exempt from EU RoHS (2002/95/EC).

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CHAPTER 1

OVERVIEW

1.1 PRODUCT DESCRIPTION

The IFD001-01SK-E and the IFD001-01UK-E (hereinafter called 'IFD001') are the interface board used with LTPDx47 or CAPDx47 series printer for printing data sent from a host device.

The IFD001 processes the data input from a host device and outputs that data to the LTPDx47 or CAPDx47 series printer.

The IFD001-01SK-E is applicable to communication method for the serial. The IFD001-01UK-E is applicable to communication method for the USB. The LTPDx47 or CAPDx47 series printer prints the characters or bit images by the command of the IFD001. IFD001-01SK-E connects the PC directly when using communication method as serial input/output because of RS-232C use.

As for the characters, the IFD001 prints the extended graphics character set, katakana character set, Codepage 1252, JIS 1st or 2nd level kanji.

The IFD001 supports autocutter control function of CAPDx47 series and can cut a paper automatically.

Mounts the voltage regulator $V_{dd}(+3.3V)$ for the logic. Thus a power supply operates in V_p (21.6 to 26.4V) single input.

1.2 PRECAUTIONS

(1) Power Supply Precautions

- Use a power supply voltage within the range specified in 10.1 GENERAL CHARACTERISTICS.
- Use a power supply which provides stable voltage output even when the current fluctuates.
- The resetting circuit mounts on the IFD001 to prevent malfunction due to V_{dd} decreasing.

(2) Connecting Precautions

- Be sure that terminals are not shorted.
- Be sure to turn the power off before connecting or disconnecting any cables to or from the IFD001.
- Make the connecting cable (CN1, CN4 to CN9) to the host device and power supply as short as possible.
- To prevent damaging the thermal head by static electricity, FG conduction part A described at "APPENDIX A DIMENSIONS" connect to the frame ground (FG) of the chassis.
Recommend to connect from FG conduction part A to the frame ground, verify the performance with your actual device.
Add the resistance (R69) and the capacitor (C67) between the signal ground and the frame ground as needed.
- When using the option cables OC-D1430A-E and OC-D0730A-E, use that in consideration of the effects of noise applied to the option cables after evaluating enough. Moreover, noise suppression should be given depending on the situation. Connect a Dsub connector of the option cable OC-D0730A-E to the FG of the chassis.
- Use USB cable: IFC-U01-1-E
- When connecting to a power supply (CN1), use all power supply terminals (V_p , and GND).
- Since the signal terminal of the connecting cable CN5 to the host device is CMOS input/output, configure the connecting circuit so as not to cause latch-up: when a voltage of $V_{dd} + 0.3$ V or more, $GND - 0.3$ V or less is on the signal terminal, the IC is damaged by the flow of overcurrent in the IC. Latch-up will occur in the following cases:
 - The output signal voltage of the power supply on the host device side and V_{dd} are different.
 - The power-on of the interface and the host device are not executed simultaneously.
 - GND impedance is high: the power cable is too long or too thin, or the number of the cables is too few.

(3) Handling Precautions

- Never modify.
- When installing/uninstalling the IFD001, discharge all static electricity and make a body grounding to prevent damaging IC by static electricity.
- Do not install the IFD001 in a location that is subject to intensive static electricity, high vibration, electromagnetic fields, corrosive gas, siloxane, rain, fog, or direct sunlight.
- Use the SII-recommended thermal paper for printing. See the CAPDx47 SERIES AUTO CUTTER ASSEMBLED LINE THERMAL PRINTER UNIT TECHNICAL REFERENCE or LTPDx47 SERIES THERMAL PRINTER MECHANISM TECHNICAL REFERENCE for the SII-recommended thermal paper.
- If printing at a high print ratio for longer length, non-printing area may be colored.

- The CG ROM is configured with the FLASH memory. The maximum rewritable number of the FLASH memory is approximately 100000 times. Execute the User Area Defragment command after getting low memory for restraining the numbers of the memory rewriting.
- Do not turn the printer off while the command on writing or invalidation into the CG ROM executes. If doing like that, the data is broken and does not operate properly.
- When set the function setting command from disable to enable, if the autocutter is not at the home position to drive the autocutter for return to the home position. To avoid injuries, operate the function setting shortly after the power on or reset, do not perform otherwise.

1.3 TERMINOLOGY

- **Dot**

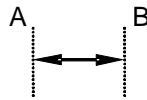
A character or graphic image is composed of picture elements called dots.
A dot corresponds to one of the thermal head heat elements.

- **Dot line**

A line of dots arranged in the direction perpendicular to the paper feed direction.
The dot line corresponds to the line of the thermal head heat elements.

- **Character spacing**

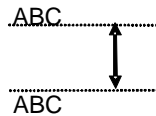
The space between two characters in the direction perpendicular to the paper feed direction.



Character Spacing

- **Space between lines**

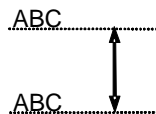
The space between two adjacent characters in the direction parallel to the paper feed direction.



Space between Lines

- **Line spacing**

The pitch between two adjacent characters bottom in the direction parallel to the paper feed direction.



Line Spacing

- **Input buffer**

The memory inside the interface for storing the data (characters and commands) received from the host device.

The command is executed at the time when fetching from the input buffer. The characters are fetched from the input buffer and stored in the line buffer described below.

The capacity of the input buffer is 4096 bytes.

- **Line buffer**

The memory for storing one line of character data fetched from the input buffer during standard mode. When the input buffer is filled with character data (one line full print) or the printing conditions are made valid through a command, the data in the input buffer is printed. The system configuration is shown in Figure 1-1.

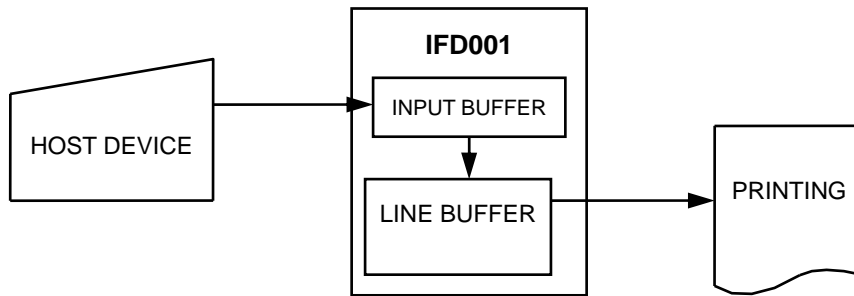


Figure 1-1 System Configuration

- **One line full print**

The printing executed when the data in the line buffer exceeds one line. The one line character data stored in the line buffer. If the character data is overflow in one line, the data in the line buffer is printed. The overflowing data is stored at the beginning of the next line.

- **2-byte character**

Kanji character and user-defined character

- **1-byte character**

Extended graphics character, Katakana character and Downloaded character. The width of character is half size of 2-byte character.

- **Font**

The form of a character. A character is composed of dots in a group. The user can define a font using the downloaded font, etc.

- **Font size**

The size of a character. There are two sizes of font, 24-dot and 16-dot font family. 1-byte character and 2-byte character size are listed below.

	16-dot	24-dot
1-byte character	16 x 8	24 x 12
2-byte character	16 x 16	24 x 24

- **1-byte characters and 2-byte characters**

The classification by the character code for specifying a character.

In 1-byte character, the IFD001 processes the 1-byte code as one character.

In 2-byte character, the IFD001 processes the 2-byte code as one character by the kanji mode.

1-byte characters:

- Katakana character

- Extended graphics character

- Downloaded character

- Optional font

- Codepage 1252

2-byte characters:

- Kanji character

- User-defined character

- 1-byte character

1.4 NOTATION IN THE TECHNICAL REFERENCE

The notation in the technical reference is described below.

- **Character string**

A character string is showing as follows;

Example: 'G' (a character string 'G' is enclosed with a single quotation mark.)

- **Negative logic**

The negative logic signals have '!' before the signal name. The input/output direction is the direction from the IFD001 view.

- **Level of a Digital signal**

"High" indicates 1 of a digital signal, "Low" indicates 0 of the digital signal.

- **Hexadecimal**

Hexadecimal is showing as follows;

Example: 0AH (a hexadecimal unit 'H' is added behind a hexadecimal number.)

CHAPTER 2 SPECIFICATIONS

Table 2-1 lists the general specifications of the IFD001.

Table 2-1 General Specifications

Item	Specifications	
Applicable model	LTPD247 CAPD247	LTPD347 CAPD347
Printing method	Thermal dot line printing	
Character type	Extended graphics character set Katakana character set Codepage 1252 JIS 1st and 2nd level Kanji Downloaded character User-defined character Optional font	
Character configuration	16-dot 24-dot	
1-byte character	16×8	24×12 ^{*1}
2-byte character	16×16	24×24 ^{*1}
Input control method	Serial input/output ^{*2} USB input/output ^{*3}	
Printable dot number	432 dots	576 dots
Number of characters per line (Condition 1)	36	48
Line spacing	34 dots ^{*1}	
Character spacing	0 dot ^{*1}	
Maximum print speed (Condition 2)	200 mm / second	150 mm / second
Operating voltage range: V _p	21.6 V to 26.4 V	
Operating temperature	-10 to 50°C	
Storage temperature	-30 to 80°C	
Dimensions	69 mm (W)× 50 mm (D)× 14 mm (H) ^{*4}	
Mass	approx. 23g	

¹ The default value can be changed through commands.

^{*2} For IFD001-01SK

^{*3} For IFD001-01UK

^{*4} The protrusion part is excluded.

Condition 1: 24-dot 1-byte character, 0-dot character spacing.

Condition 2: 25°C, 144 dots dynamic division, 24-dot line spacing, 0-dot character spacing,
24-dot 1-byte character (Extended graphics character set, Character code B2H), 12 character or less.

Table 2-2 DC Power Cable (CN1 for DC power supply connection) Specifications

Item	Specifications
Part number	DC-04100A-E
Length	approx. 100cm

Table 2-3 Option Cable (CN5 for host device connection) Specifications

Item	Specifications
Part number	OC-D1430A-E
Length	approx. 30cm

Table 2-4 Option Cable (CN7 for RS232C communication) Specifications

Item	Specifications
Part number	OC-D0730A-E
Length	approx. 30cm

Table 2-5 Interface Cable (CN8 for USB communication) Specifications

Item	Specifications
Part number	IFC-U01-1-E
Length	approx. 1.8m

CHAPTER 3

CONNECTOR AND TERMINAL FUNCTIONS

The IFD001, the LTPDx47 or CAPDx47 series printer, the power supply, the mark sensor, the near-end sensor, the drawer, the winder, the serial cable, the serial cable, the USB cable, and the host device are connected using eight connectors.

In the tables for each terminal, the negative logic signals have '!' before the signal name. The input/output direction indicates the direction of a signal as viewed from the IFD001.

3.1 POWER SUPPLY CONNECTOR (CN1)

Connect CN1 that has 4 pins to the power supply. CN1 terminal assignments are listed in Table 3-1.

Table 3-1 CN1 Terminal Assignments

Terminal No.	Signal Name	I/O*	Function
1	V_p	I	+24V
2	V_p	I	+24V
3	GND	-	GND
4	GND	-	GND

Connector on the Interface board side uses: S4P-VH(LF) (SN), J.S.T. Mfg Co., Ltd.
Housing for cable side: VHR-4N(LF) (SN), J.S.T. Mfg Co., Ltd.
Contact for cable side: BVH-41T-P1.1, J.S.T. Mfg Co., Ltd.

* : I-input, O-output, - -not applicable

(NOTE) Do not give excessive force to other elements when connecting/disconnecting the connector.

V_{dd} from outside is unnecessary, because V_p inside IFD001 generates V_{dd} .

3.2 THERMAL HEAD, MOTOR, SENSOR CONNECTOR (CN2)

Connect CN2 that has 50 pins to the thermal head, motor and sensor of the LTPDx47/CAPDx47 series printer.

Connecting to FPC of LTPDx47/CAPDx47 series printer, as the top of the connector mounted side is the contact face of FPC and cable.

CN2 terminal assignments are listed in Table 3-2.

Table 3-2 CN2 Terminal Assignments

Terminal No.	Signal Name	I/O	Function
1	HV _p	O	Head drive power
2	HV _p	O	Head drive power
3	HV _p	O	Head drive power
4	HV _p	O	Head drive power
5	HV _p	O	Head drive power
6	HV _p	O	Head drive power
7	DAT	O	Print data output
8	CLK	O	Synchronizing signal for print data transfer
9	GND	-	Head GND
10	GND	-	Head GND
11	GND	-	Head GND
12	GND	-	Head GND
13	GND	-	Head GND
14	GND	-	Head GND
15	NC	-	Unused
16	!DST4	O	Head strobe signal
17	!DST3	O	Head strobe signal
18	V _{dd}	-	Logic power
19	TH GND	-	Thermistor GND
20	TH GND	-	Thermistor GND
21	TH	I	Thermistor signal
22	NC	-	Unused
23	!DST2	O	Head strobe signal
24	!DST1	O	Head strobe signal
25	GND	-	Head GND

Terminal No.	Signal Name	I/O	Function
26	GND	-	Head GND
27	GND	-	Head GND
28	GND	-	Head GND
29	GND	-	Head GND
30	GND	-	Head GND
31	!LATCH	O	Print data latch
32	HV _p	O	Head drive power
33	HV _p	O	Head drive power
34	HV _p	O	Head drive power
35	HV _p	O	Head drive power
36	HV _p	O	Head drive power
37	HV _p	O	Head drive power
38	NC	-	Unused
39	PS	I	Signal of the out-of-paper sensor
40	V _{ps}	O	Power supply of the out-of-paper sensor
41	GND	-	GND of the platen position/ out-of-paper sensor
42	HS	I	Signal of the platen position sensor
43	NC	-	Unused
44	FG	-	Frame GND
45	FG	-	Frame GND
46	NC	-	Unused
47	!A	O	Motor drive signal
48	B	O	Motor drive signal
49	A	O	Motor drive signal
50	!B	O	Motor drive signal

Connector on the Interface board side uses: 54104-5031, Molex

3.3 AUTOCUTTER CONNECTOR (CN3)

Connect CN3 that has 12 pins to the autocutter of the CAPDx47 series printer unit. CN3 terminal assignments are listed in Table 3-3.

Connecting to FPC of CAPDx47 series printer unit, as the top of the connector mounted side is the contact face of FPC and cable

Table 3-3 CN3 Terminal Assignments

Terminal No.	Signal Name	I/O	Function
1	NC	-	Unused
2	V _{CS}	O	Power supply of the home position sensor
3	GND	-	GND of the home position sensor
4	CUTS	I	Signal of the home position sensor
5	!B	O	Autocutter motor drive signal
6	!B	O	Autocutter motor drive signal
7	!A	O	Autocutter motor drive signal
8	!A	O	Autocutter motor drive signal
9	B	O	Autocutter motor drive signal
10	B	O	Autocutter motor drive signal
11	A	O	Autocutter motor drive signal
12	A	O	Autocutter motor drive signal

Connector on the Interface board side uses: 08-6223-012-101-829+, KYOCERA ELCO

3.4 OPTIONAL MARK SENSOR CONNECTOR (CN4)

Connect CN4 that has 4 pins to the optional mark sensor of the LTPDx47/CAPDx47 series printer. CN4 terminal assignments are listed in Table 3-4.

Table 3-4 CN4 Terminal Assignments

Terminal No.	Signal Name	I/O	Function
1	NC	-	Unused
2	GND	-	GND of the mark sensor
3	MS	I	Signal of the mark sensor
4	V _{ms}	O	Power supply of the mark sensor

Connector on the Interface board side uses: 04FMN-SMT-A-TF (LF) (SN), J.S.T. Mfg Co., Ltd.

3.5 EXTERNAL I/O CONNECTOR (CN5)

Connect CN5 that has 14 pins to following signals:

- Feed and reset input terminals
- Status output terminal
- Drawer drive terminals

CN5 terminal assignments are listed in Table 3-5.

Table 3-5 CN5 Terminal Assignments

Terminal No.	Signal Name	I/O	Function
1	!FEED	I	Feed signal
2	!RESET	I	Reset signal
3	GND	-	GND
4	ST1	O	Status signal
5	ST2	O	Status signal
6	ST3	O	Status signal
7	ST4	O	Status signal
8	GND	-	GND
9	DRS	I	Drawer sensor signal
10	DSW	I	Drawer switch signal
11	Vdu	O	Drive terminal for the drawer (V_p side)
12	GNDdu	O	Drive terminal for the drawer(GND side)
13	GND	-	GND
14	NC	-	Unused

Connector on the Interface board side uses: SM14B-SRSS-TB(LF)(SN), J.S.T. Mfg Co., Ltd.

Housing for cable: SHR-14V-S-B, J.S.T. Mfg Co., Ltd.

Contact for cable: SSH-003T-P0.2-H, J.S.T. Mfg Co., Ltd.

(NOTE) Do not give excessive force to other elements when connecting/disconnecting the connector.

Do not connect GNDdu to GND. If they are connected, a winder/drawer is not operated correctly.

Vwu always outputs V_p voltage. Do not connect Vdu to the circuit other than winder/drawer.

3.6 PAPER-NEAR-END SENSOR CONNECTOR (CN6)

Connect CN6 that has 3 pins to the paper-near-end sensor.
CN6 terminal assignments are listed in Table 3-6.

Table 3-6 CN6 Terminal Assignments

Terminal No.	Signal Name	I/O	Function
1	Vns	O	Power supply of the near end sensor
2	NS	I	Signal of the near end sensor
3	GND	-	GND of the near end sensor

Connector on the Interface board side uses: SM03B-SRSS-TB(LF)(SN), J.S.T. Mfg Co., Ltd.
Housing for cable: SHR-03V-S-B, J.S.T. Mfg Co., Ltd.
Contact for cable: SSH-003T-P0.2-H, J.S.T. Mfg Co., Ltd.

3.7 RS-232 CONNECTOR (CN7) (FOR IFD001-01SK-E)

Connect CN7 that has 7 pins to the RS-232.
CN7 terminal assignments are listed in Table 3-7.

Table 3-7 CN7 Terminal Assignments

Terminal No.	I/O	Signal Name
1	O	TxD
2	I	RxD
3	O	RTS
4	I	CTS
5	O	DTR
6	I	DSR
7	-	GND

Connector on the Interface board side uses: SM07B-SRSS-TB (LF)(SN), J.S.T. Mfg Co., Ltd.
Housing for cable: SHR-07V-S-B, J.S.T. Mfg Co., Ltd.
Contact for cable: SSH-003T-P0.2-H, J.S.T. Mfg Co., Ltd.

3.8 USB INTERFACE CONNECTOR (CN8) (FOR IFD001-01UK-E)

Connect CN8 that has 5 pins to the USB.
CN8 terminal assignments are listed in Table 3-8.

Table 3-8 CN8 Terminal Assignments

Terminal No.	Signal Name
1	Vbus
2	D-
3	D+
4	NC
5	GND

Connector on the Interface board side uses: 54819-0572, Molex

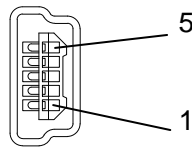


Figure 3-1 USB Interface Connector

3.9 PRESENTER/WINDER CONNECTING TERMINAL (CN9)

Connect CN9 that has 10 pins to the optional presenter or winder of the LTPDx47/CAPDx47 series printer.
CN9 terminal assignments are listed Table 3-9.

Table 3-9 CN9 Terminal Assignments

Terminal No.	Signal Name	I/O	Function
1	PA	O	Presenter/Winder drive signal
2	PA	O	Presenter/Winder drive signal
3	PB	O	Presenter/Winder drive signal
4	PB	O	Presenter/Winder drive signal
5	Vprs1	O	Presenter sensor 1 Power supply
6	PRS1	I	Presenter sensor 1 Signal
7	GND	-	Presenter sensor 1 GND
8	Vprs2	O	Presenter sensor 2 Power supply
9	PRS2	I	Presenter sensor 2 Signal
10	GND	-	Presenter sensor 2 GND

Connector on the Interface board side uses: SM10B-SRSS-TB(LF)(SN), J.S.T. Mfg Co., Ltd.
Housing for cable: SHR-10V-S-B, J.S.T. Mfg Co., Ltd.
Contact for cable: SSH-003T-P0.2-H, J.S.T. Mfg Co., Ltd.

CHAPTER 4

BASIC OPERATION

4.1 BASIC STRUCTURE

The IFD001 consists of a single circuit board. The circuit block diagram for the IFD001 is illustrated in Figure 4-1.

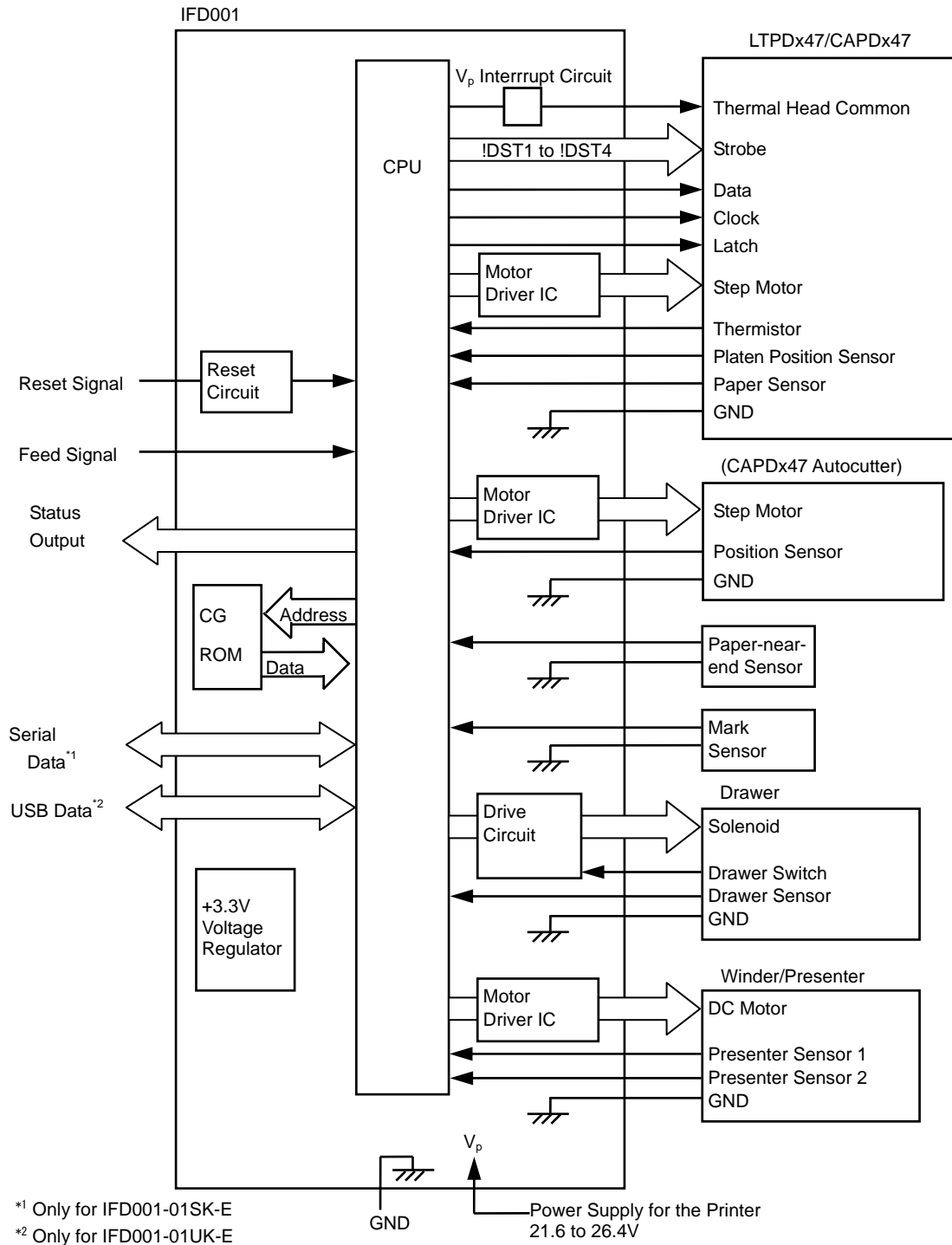


Figure 4-1 IFD001 Circuit Block Diagram

The IFD001 consists of a CPU, a reset circuit, a head resistance sensing circuit, a V_p interrupt circuit, and a motor control circuit.

4.2 BASIC PRINT OPERATION

4.2.1 Initialization

The IFD001 is initialized through power-on (power-on reset) and hardware reset. And input "Low" to !RESET terminal (CN5-2) for 2ms or longer, also IFD001 is initialized. According to the functions selected using the function selecting stored in the CG-ROM, the IFD001 checks the peripheral circuit, clears the memory, measures head resistance, and senses V_p voltage.

When an error occurs the thermal head during initialization, head error is performed (see Chapter 7 ERROR PROCESSING).

The IFD001 does not finish initializing process until V_p voltage becomes allowable range for 5 seconds. During these times, data input cannot be performed and error codes are not output. If V_p voltage does not become allowable range after 5 seconds from initialization, initializing V_p error occur.

When turning off V_p following V_p power-on and initialization, a V_p error may occur (see CHAPTER 7 ERROR PROCESSING).

(NOTE) The V_p voltage allowable range is programmed to be from 21.6 to 26.4 V in consideration of detection errors and instantaneous changes.

4.2.2 Basic Operation for Printing One Line

- (1) The data sent from the host device is stored in the input buffer.
Since the storage to the input buffer is processed using interrupts, it is possible to receive data during printing.
- (2) The data is fetched from the input buffer. If it is character data, step (3) is executed.
If it is not character data but a command, the function specified by the command is executed.
- (3) The IFD001 transforms the character into image data and then stores the data in the line buffer.
When the character data exceeds one line or fetches the print command, printing starts.
- (4) The character code in the line buffer, change to the image data for one dot line.
- (5) The image data is transferred to the head.
- (6) The motor and the head are driven.
- (7) The IFD001 repeats steps (4) to (6) until the printing of one line has been complete.
- (8) Feed the paper for a space between lines, and then returns step (2).

4.3 POST-RESET TIMING

Figure 4-2 shows the operation timing immediately after IFD001 is initialized.

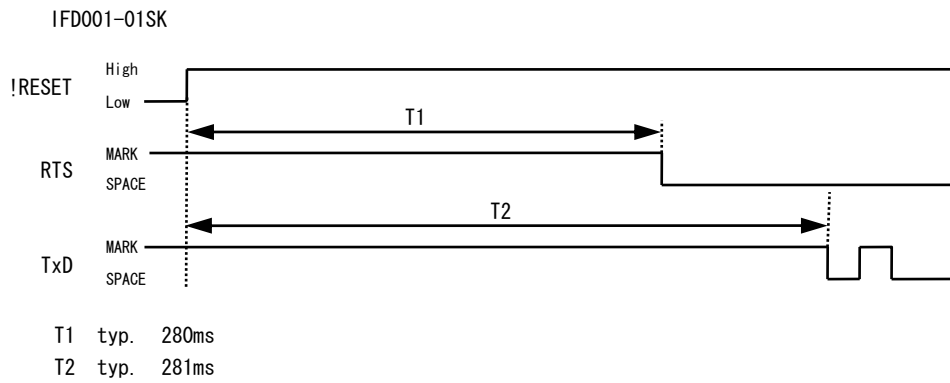


Figure 4-2 Post-Reset Operation Timing

- **IFD001-01SK**

When an error occurs just after initialization completes, IFD001 changes RTS signal to “MARK” and then outputs Xoff. IFD001 changes RTS signal to “SPACE” and then outputs Xon if the error conditions are cleared.

When an error does not occur just after initialization completes, IFD001 changes RTS signal to “SPACE” and then outputs Xon.

CHAPTER 5 OPERATION PRINCIPLES

5.1 DATA INPUT/OUTPUT

5.1.1 Serial Input/Output (IFD001-01SK)

(1) Input/Output port

The serial data is input/output by asynchronous control. The IFD001-01SK input/output the data at the RS-232C level.

Table 5-1 Serial Input/Output General Specification

Item	Specification
Synchronization	Asynchronous
Handshake	BUSY signal, Xon/Xoff (simultaneous output)
Signal level	MARK = -3.0 to -15.0 V: Logic '1' SPACE = +3.0 to +15.0 V: Logic '0'
Baud rate	115200 bps
Data bit length	8 bits
Stop bit length	1 bit
Parity	None

Serial data input (RxD) : Input pin, CN7-2

- Data input port.
- Data input according to the transmission conditions in Table 5-1.
- The IFD001 performs break processing (hardware reset) if RxD changed into SPACE state 20ms or longer.

Serial data output (TxD) : Output pin, CN7-1

- Data output according to the transmission conditions in Table 5-1.
- Outputs various response data.

Serial busy (RTS) : Output pin, CN7-3

- Indicates whether or not the IFD001-01SK is ready to receive data.
- When the RTS signal is SPACE, data can be input.

Serial busy (CTS) : Input pin, CN7-4

- Indicates the request the data out put from the host side.
- When the CTS signal is SPACE, data can be output.

Serial data ready (DTR) : Output pin, CN7-5

- Connected state with the printer.
- When the DTR signal is SPACE, data can be input to the printer.

Serial data ready (DSR) : Input pin, CN7-6

- Connected state with the host.
- When the DSR signal is SPACE, data can be output from the printer.

(2) Data input

When 4032 bytes or more of data are stored in the input buffer, the IFD001-01SK operates like below and requires the host device temporarily stop sending data.

- RTS signal (CN7-3) change to MARK.
- Outputs Xoff(13H) from TxD(CN7-1).

Then the amount of data stored in the input buffer becomes 3968 bytes or less, the IFD001-01SK operates like below and requires the host device to transmit data.

- RTS signal change to SPACE.
- Outputs Xon(11H) from TxD.

Up to 64 bytes of input data are guaranteed after the RTS signal has become MARK.

(3) Data output

The IFD001-01SK transmits the data which correspond to all sorts of response command from TxD pin. Data is transmitted according to the transmission conditions in Table 5-1.

5.1.2 USB Input/Output (IFD001-01UK)

The IFD001-01UK supports bidirectional communication by USB bulk transmission mode.

(1) Data input

The IFD001-01UK performs data input by bulk-out transmission.

The IFD001-01UK can receive the data during printing. However, if the amount of data in an input buffer becomes 4032 bytes + 2 packets, the IFD001-01UK outputs NAK until the input buffer becomes 3968 bytes or less. The number of the maximum bytes that can be received by one packet is 64 bytes.

(2) Data output

The IFD001-01UK performs data output by bulk-in transmission.

The IFD001-01UK temporarily stores response data in output buffer, and responds to bulk-in packet request of the host device. If the IFD001-01UK is required bulk-in packet request in absence of transmission data, zero-length data is transmitted.

The number of the maximum bytes that can be received by one packet is 64 bytes. The capacity of the output buffer is 128 bytes + 2 packets. If the output buffer becomes full, the IFD001-01UK does not print until the buffer is available.

5.2 THERMAL HEAD CONTROL

5.2.1 Data Transfer to the Thermal Head

The IFD001 transfers one dot line of data at 6 Mbps, synchronized with the CLOCK signal. In a view from paper feed direction, the data is transferred to the shift register inside the thermal head from the left. The transferred data is then transferred by the latch signal to the latch register inside the thermal head. The IFD001 prints the data by turning the head strobe signal to ON.

5.2.2 Thermal Head Drive Operation

When the line thermal head is operating, the line is divided into several blocks which are activated one after another in succession.

For the line thermal head of the LTPDx47 and CAPDx47 series printer, the line is divided into 3 (LTPD247/CAPD247 series printer), 4 (LTPD347/CAPD347 series printer) blocks called physical blocks. The head strobe signals (!DST1 to 4) are allocated to each physical block to activate it. To drive the head, physical blocks are activated in groups. The group of physical blocks is called a logical block.

For the IFD001, the method can be selected either dynamic division or fixed division as described below. Default value is set as 144 dots at dynamic division but that value or division method can be changed by a command.

For the selection by the commands, see 8.4.10 Auxiliary Functions.

(1) Dynamic division

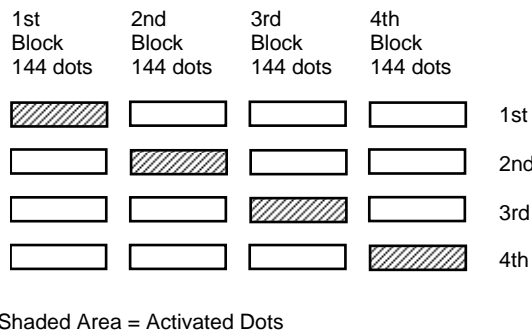
The IFD001 counts the number of dots activated in each physical block and groups the physical blocks into logical blocks to print a single dot line so that the number does not exceed the specified maximum number of activated dots. The IFD001 determines logical blocks each time it prints a single dot line.

In dynamic division, since the order of the printing blocks and printing speed are changed in each dot line according to the content of the print data, print quality may be lower than that in fixed division. If print quality is regarded as important, printing in fixed division is recommended.

The maximum number of activated dots in the initialization status is specified using the function settings. 72 through 288 dots can, however, be set using the DC2 '%' n command.

When the maximum number of activated dots is 144 dots, and all of the dots are driven, as shown in Figure 5-1, set the logical block within 144 dots and drive these blocks in order.

(NOTE) When the maximum number of activated dots is set to 72 dots or more, or less than 144 dots through dynamic division command, that may cause abnormal sound and print disorder, depending on environment or printing condition. If using in this condition, verify the performance beforehand.



**Figure 5-1 Dynamic Division When All Dots are Activated
(Maximum Number of Activated Dots=144 LTPD347/CAPD347 series printer)**

The advantage of dynamic division is that the maximum number of activated dots can be specified according to the capacity of the power supply used. The printer can be operated with a small capacity power supply when a small number is specified for the maximum number of activated dots. However, this process may increase the number of divisions and may lower print speed for printing at a high print ratio. On the other hand, printing speed becomes faster when the maximum number of activated dots is larger, requiring, however, a larger power supply.

(2) Fixed division

In fixed division, the logical blocks (a group of physical blocks simultaneously activated) are determined beforehand. Fixed division always activates physical blocks in the same order, thereby allowing higher print quality.

The initialized state of the fixed division method can be selected with function setting, and that is selectable with the fixed division selection command (DC2 '>' n).

Table 5-2 Head Logical Blocks when Fixed Division is Selected

		Number of logical block				Maximum number of activated dots
		1	2	3	4	
LTPD247	1st	○	×	○	-	288dots
CAPD247	2nd	×	○	×	-	144 dots
LTPD347	1st	○	×	×	○	288 dots
CAPD347	2nd	×	○	○	×	288 dots

5.2.3 Head Control Circuit

(1) Resistance measurement circuit

The IFD001 has a function for measuring the resistance of the thermal head.

Based on the measurement, the IFD001 determines how much energy is to be applied. No adjustment is needed for replacing the CAPDx47 and LTPDx47 series printer to get the best printing.

(2) V_p interrupt circuit

This circuit interrupts V_p to prevent electrolytic corrosion of the thermal head and to enable the detection of the resistance mentioned above.

Thermal paper ordinarily contains electrolytic material to prevent sheets from sticking to each other due to static electricity. If there is too much of this electrolytic material, high temperatures and humidity cause the material to ionize, resulting in electrolytic corrosion of the thermal head.

The IFD001 turns the switch off and breaks the V_p applied to the thermal head during waiting status to prevent electrolysis corrosion of the thermal head.

If the print conditions are met after inputting the data is completed, the IFD001 turns the switch on and starts printing. After printing is completed, the IFD001 turns the switch off.

(3) Head temperature measurement circuit

The thermistor is mounted on the LTPDx47 and CAPDx47 series printer to measure the temperature of the thermal head.

The IFD001 measures the temperature of the thermal head by receiving the signal of the thermistor, and determines the energy to be applied to the head and also checks for head temperature errors.

If the temperature of the thermal head is -25°C (-13°F) or lower, or 85°C (185°F) or higher, the IFD001 stops drive and puts the printer in head temperature error status. If the temperature of the thermal head is returned to from -20°C (-4°F) to 80°C (176°F), the printer goes to print ready status.

Although the temperature of the head is monitored by the CPU, the hardware also can stop thermal head output by sending a strobe signal from the comparator, such as in the case when the CPU loses operational control.

5.2.4 Adjustment of Applied Energy

The IFD001 automatically controls the energy applied to the thermal head according to the resistance, temperature of the thermal head, the V_p voltage and the thermal paper.

The specified thermal paper of the IFD001 is set as TF50KS-E2D (Nippon paper industries).

If use the paper that is different from the specified thermal paper, be sure to change the setting by the function setting. (6.7 FUNCTION SETTINGS)

Print density 60 to 140% against rated applied energy can be adjusted by the Print Density command (See 8.4.10 Auxiliary Functions, DC2 '~'). See 8.4 COMMANDS DESCRIPTION for details.

5.3 PRINTER MECHANISM CONTROL

The paper feed motor of the CAPDx47 and LTPDx47 series printer are a two-phase, bipolar type stepping motor. The CAPDx47 and LTPDx47 series printer drive the motor 2-2 phase excitation. Paper is fed for a single dot line by 2-2 phase excitation two steps.

Maximum drive speed of the motor is 3200pps for the LTPD247/CAPD247 series printer, 2400pps for the LTPD347/CAPD347 series printer. Acceleration control is executed to prevent the printing pitch from being too small and assure the needed paper feed at the start. Acceleration is automatically executed to the drive speed, and then normal-speed operation starts

When the drive time of the head is longer than a single dot line of the motor, the IFD001 controls the motor drive speed less than the head drive speed in advance. Therefore, the motor drive speed decreases during printing according to the division method of the head and the head temperature.

(NOTE) If excessive load is applied to the paper during paper feed and printing, the printer may step out and cannot return to the normal status. The paper supply load to the printer must be 0.98N (100 gf) or less.

5.4 AUTOCUTTER FUNCTION

5.4.1 Autocutter Operation

The IFD001 controls autocutter performance.

The CAPDx47 connecting the IFD001, and cuts paper by the paper cutting commands (8.4.10 Auxiliary Function, GS 'V').

See the CAPDx47 SERIES AUTOCUTTER ASSEMBLED LINE THERMAL PRINTER UNIT TECHNICAL REFERENCE for the details.

When connecting the CAPDx47, set SWDIP1-1 as 1 for preventing an error at initialization. However, the IFD001 ignores the paper cutting commands even if the CAPDx47 is connected when SWDIP1-1 is set as 1.

5.4.2 Autocutter Initialization

When autocutter function is enabled and SWDIP1-1 is set as 1, the autocutter is initialized either through power on or through reset by hardware or software. Moreover, the autocutter is initialized by executing the autocutter enable through function setting command.

When the movable blade of the cutter is outside the paper-through window, the cutter-drive motor automatically rotates, returning the movable blade to the home position.

5.4.3 Unlocking of Movable Blade

If the movable blade is locked due to a paper jam or other error and the cutter does not operate, unlock the movable blade by following the procedure below:

- (1) When the movable blade is at the home position

Remove the external factor (ex. the paper jam).The IFD001 goes to the print-ready status.

- (2) When the movable blade is not at the home position

The IFD001 detects autocutter error. Remove the cause of the lock (ex. the paper jam), then open and close the platen block. Release the platen block and the movable blade back to the home position automatically.

5.5 STATUS OUTPUT

5.5.1 Status Detection

(1) Out-of-paper sensor

The IFD001 uses the input signal from the photo-interrupter mounted in the printer mechanism printer to check for paper.

The IFD001 determines the out of paper by the PS terminal (CN2-39) as "High", the paper existence by the PS terminal as "Low".

When the PS terminal becomes "High" (out of paper), IFD001 enters the out-of-paper error status after printing of current dot line. If set the paper, IFD001 goes to the print-ready status 1 second later. The printer resumes printing from the beginning of the line when stopped in process of the printing at the standard mode. The printer resumes printing from the beginning of the page at the page mode.

(2) Platen position sensor

The IFD001 uses the signal from the mechanism switch mounted in the printer mechanism to detect the platen position. The platen position sensor is close when the platen block is set status, become open when the platen block is release status.

The platen open is detected through the HS terminal (CN2-42). When the printer is in the platen open status, the printer detects "High" and stops mechanism driving and turns to the platen open error status. When the platen is in close status, the IFD001 resumes printing from the beginning of the line that interrupt the printing, 1 second later. When the platen is the page mode, resumes printing from the beginning of the page.

Do not handle a platen release lever during printing. The handle under printing causes the platen release defect.

(3) V_p voltage sensor

The IFD001 measures V_p voltage.

The IFD001 goes to the V_p voltage error if detected V_p voltage is out of the allowable range. The IFD001 goes to the print-ready status 1 second later when V_p voltage is returned to the allowable range. The V_p voltage is detected by initializing or resetting. The IFD001 is not initialized until V_p voltage becomes more than 4.0V for 5 seconds after initializing. When V_p voltage does not become more than 4.0V in 5 seconds, the IFD001 detects a hardware error.

(4) Autocutter error sensor

The IFD001 detects an autocutter error during operation of the cutter.

The movable blade is in the home position after an error occurs during operation of the cutter, the IFD001 detects autocutter error once and goes to the print-ready status 1 second later.

The movable blade is locked in the out of home position when an error occurs during operation of the cutter, the IFD001 goes to the autocutter error. The IFD001 return to print-ready status 1 second later when the cause of the locking of the movable blade is removed and the platen block is set.

(5) Head temperature sensor

The IFD001 detects head temperature of the printer mechanism. The IFD001 goes to the head temperature error when the temperature of the thermal head is -25°C or lower, or 85°C or higher. The IFD001 return to print-ready status when the head temperature ranges from -20°C to 80° .

(6) Paper-near-end sensor

The IFD001 detects paper-near-end using the mechanical switch or the photo interrupter other than the out-of-paper sensor of the printer mechanism.

When the !NS signal (CN6-2) becomes "High", the IFD001 changes bit of paper-near-end of status response as 1.

It is possible to select by the function settings (6.7 Function Settings) whether paper-near-end sensor is used or not. Moreover, it is possible to make paper-near-end sensor as the out-of-paper sensor by selecting the function settings or the Print Stop Capable Paper Sensor command (8.4.10 Auxiliary Functions, ESC 'c4').

When using paper-near-end detecting function, the external sensor that becomes "High" if detecting paper-near-end, connecting to CN6.

(7) Mark sensor

The IFD001 detects paper mark using the out-of-paper sensor of the printer mechanism or the optional mark sensor.

If using the out-of-paper sensor, PS (CN2-39) becomes "High" and determines the mark.

If using the optional mark sensor, MS (CN4-3) becomes "High" and determines the mark.

It is possible to select by the function settings (6.7 Function Settings) using the out-of-paper sensor or optional mark sensor as the mark sensor.

IFD001 performs status output or status response, only if Paper jam error while detecting mark occurred.

(8) Drawer sensor

The IFD001 detects the status of drawer sensor using the mechanical switch. When the DRS signal (CN5-9) becomes "High", the IFD001 changes bit of drawer sensor of status response as 1.

When using drawer sensor detection, install the external mechanical switch between CN5-9 and CN5-13(GND).

Even if the IFD001 detects the status of drawer sensor changes, no process other than status output. Therefore, data input or printing is possible.

5.5.2 Status Output

ST1 (CN5-4), ST2 (CN5-5), ST3 (CN5-6) and ST4 (CN5-7) show the status of the mechanism, the interface and the peripheral.

ST1, ST2 and ST3 are pulled up at a resistance of 47kΩ respectively inside the IFD001.
ST4 is pulled down at a resistance of 47kΩ respectively inside the IFD001.

See “Chapter 7 ERROR PROCESSING” for the each status and release method of the error.
The other status are described below.

- Initializing : The status is during initialization.
- Rewriting the flash memory : The status is downloading the standard size characters and KANJI size characters to the flash memory.
- Paper-near-end : If CN6-2 is “High”, the status is near end. It not effect to the all operation for the communication and printing except status output.
- Printing : The status is the printer mechanism is operating.
Operation here means actual printing status and the command feed status.
If feed by !FEED (CN5-1), not become this status.
- Print-ready status : Normal data input and printing are ready in this status.

Table 5-3 shows the status signals of the each status.

Table 5-3 Status Output Signals

Status	ST1	ST2	ST3	ST4
Initializing	High	High	High	Low
Rewriting flash memory	High	Low	High	High
Thermal head error	Low	Low	Low	Low
Thermal head temperature error	Low	High	Low	Low
V _p voltage error/ V _p voltage initialization error	Low	Low	High	Low
Paper jam error while detecting mark/ Presenter paper jam error	Low	High	High	Low
Paper feed error in presenter	Low	Low	Low	High
Autocutter error	Low	High	Low	High
Platen block position error	Low	Low	High	High
Out-of-paper error	Low	High	High	High
Paper-near-end	High	Low	High	Low
Printing	High	Low	Low	High
Print-ready	High	Low	Low	Low

When more than one status occurs, only the above mentioned status is output.

CHAPTER 6

SETUP

This chapter described how to set the function settings, connection, power supply and the terminals for connecting the IFD001 to the CAPDx47, LTPDx47 series printer host device. Turn the power supply OFF before setting the printer.

6.1 CONNECTING TO THE PRINTER MECHANISM

To connect the IFD001 to LTPDx47 or CAPDx47 series printer, the following two FPC are connected.

- (1) The FPC for the thermal head, motor and sensor (LTPDx47/CAPDx47 series printer)

Connecting the FPC for the thermal head, motor and sensor into the CN2 connector on the IFD001.

- (2) The FPC for the Autocutter (CAPDx47 printer unit)

Plug the FPC for the Autocutter into the CN3 connector on the IFD001.

6.2 CONNECTING TO THE POWER SUPPLY

6.2.1 Power Supply Voltage

The IFD001 requires V_p for driving the printer.
The power supplies must satisfy the following conditions.

The maximum current consumption of V_p varies according to the used voltage and print method.
Select the power supply according to the used voltage and print method.

Drive power supply (V_p): $V_p = 21.6$ to 26.4 V
Current capacity $I_p(\text{max})$: $I_p(\text{max.}) = V_p * N/1500 + 0.6$ (A) + 0.1 (A)
N: the number of maximum activated dots

- Fixed division mode

When selecting the fixed division mode, substitute the value in Table 6-1 to N.

Table 6-1 Maximum Number of Activated Dots (Fixed Division Mode)

Mechanism	Maximum Number of Activated Dots (N)
LTPD247/CAP247	288
LTPD347/CAP347	288

- Dynamic division

When selecting the dynamic division mode, set N as the value specified by the function setting or command DC2 '% ' n. the default value is N=144.

Be careful that voltage drops due to the wiring resistance because a large current flows to V_p .
Narrow and/or long wiring for the power supply line may cause pale or uneven printing due to the voltage drop when the thermal head is activated.

6.2.2 Connecting to the Power Supply

For connecting to the power supply, CN1 is used.

Table 6-2 Power Supply Connecting Terminals (CN1)

Terminal No.	Signal Name	I/O	Function
1	V_p	I	+24 V
2	V_p	I	+24 V
3	GND	-	GND
4	GND	-	GND

6.3 CONNECTING TO THE HOST DEVICE

6.3.1 Connecting to the Serial Input/Output (IFD001-01SK)

For the serial input/output, CN7 is used.

Table 6-3 Serial Input/Output Terminals (CN7)

Terminal No.	I/O	Signal Name
1	O	TxD
2	I	RxD
3	O	RTS
4	I	CTS
5	O	DTR
6	I	DSR
7	-	GND

These signals connect the serial port for PC due to the signal of RS-232C level without using the level converter.

6.3.2 Connecting to the USB Input/output (IFD001-01UK)

Connect the USB cable to the connector CN8.
IFD001-01UK mounts the socket connector in mini-B type.

Option cable for USB: IFC-U01-1-E (Length: 1.8m)

6.4 CONNECTING TO SWITCHES AND LEDS

To connect to the reset and feed switches, CN5 terminals 1 and 2 are used.
To connect to the LEDs that display the status, CN5 terminals 4 to 7 are used.

Table 6-4 Reset and Feed Terminals (CN5)

Terminal No.	Signal name	I/O	Function
1	!FEED	I	Feed signal
2	!RESET	I	Reset signal
4	ST1	O	Status signal
5	ST2	O	Status signal
6	ST3	O	Status signal
7	ST4	O	Status signal

The !RESET and !FEED signals are pulled up by V_{dd} at a resistance of $47k\Omega$ respectively. When connecting the switch externally, it is possible to operate the printer unit only if the switch is connected between the each signals and GND, as shown in Figure 6-1. ST1, ST2 and ST3 are pulled up at a resistance of $47k\Omega$ respectively. ST4 is pulled down at a resistance of $47k\Omega$ respectively.

Figure 6-1 shows the switch and LED display circuit sample.

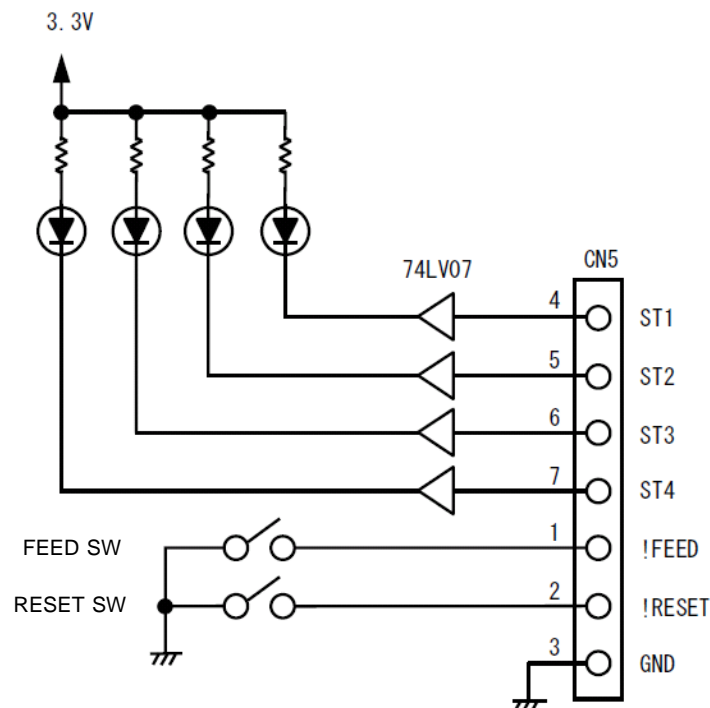


Figure 6-1 Switch and Display Circuit Sample

6.5 CONNECTING TO OPTION MARK SENSOR AND NEAR END SENSOR

The IFD001 has terminals to detect paper-near-end and mark sensor.

CN4 is used for the option mark sensor.

CN6 is used for the near end sensor.

Refer to 5.5.1 Status Detection for each sensor.

Use the specified option sensor for Mark sensor.

Table 6-5 Mark Sensor Terminals (CN4)

Terminal No.	Signal Name	I/O	Function
2	GND	-	Mark sensor GND
3	MS	I	Mark sensor signal
4	Vms	O	Mark sensor power supply

It is possible to detect the near end, if using the equivalent of the reflective photo interrupter that model number is below for near end sensor.

- (1) Model number : NJL5902RB
Manufacturer : New Japan Radio Co., Ltd.

Table 6-6 Near End Sensor Terminals (CN6)

Terminal No.	Signal Name	I/O	Function
1	Vns	O	Near end sensor power supply
2	NS	I	Near end sensor signal
3	GND	-	Near end sensor GND

6.6 CONNECTING TO WINDER, DRAWER AND PRESENTER

The IFD001 has the terminals to activate the cash drawer and connect to the winder or cash drawer to rewind the printed paper and driving.

The terminal that number is 11 (Vdu) or 12 (GNDdu) of CN5 is used for driving the drawer. Connecting these terminals to the drawer.

The terminal that number is 9 (DRS) of CN5 is used for the drawer sensor. Refer to 5.5.1 Status Detection for drawer sensor detection.

The terminal that number is 10 (DSW) of CN5 is used for the drawer switch. Input the “High” to this terminal, be able to drive the drawer otherwise the command.

Table 6-7 Drawer Terminals (CN5)

Terminal Number	Signal Name	Direction	Function
8	GND	—	GND
9	DRS	I	Drawer sensor signal
10	DSW	I	Drawer switch signal
11	Vdu	O	Drawer drive signal (V _p side)
12	GNDdu	O	Drawer drive signal (GND side)

The terminal that number is CN9 is used for driving presenter or winder. Connecting these terminals to specified presenter or drawer.

Table 6-8 Presenter/Winder Terminals (CN9)

Terminal Number	Signal Name	Direction	Function
1	PA	O	Presenter/Winder drive signal
2	PA	O	Presenter/Winder drive signal
3	PB	O	Presenter/Winder drive signal
4	PB	O	Presenter/Winder drive signal
5	Vprs1	O	Presenter sensor 1 power supply
6	PRS1	I	Presenter sensor 1 signal
7	GND	—	Presenter sensor 1 GND
8	Vprs2	O	Presenter sensor 2 power supply
9	PRS2	I	Presenter sensor 2 signal
10	GND	—	Presenter sensor 2 GND

6.7 FUNCTION SETTING

The printing method, a paper types, and so on can be preset after turn on the IFD001.

Preset these functions before using the printer.

There are the function settings from SWDIP1 to 11, the function settings are stored in the FLASH memory that is mounted on the IFD001. Once these are set, these are stored until changing again.

When set the function settings send the function setting command (8.4.10 Auxiliary Functions, DC2 'k' or DC2 'w') after connecting the IFD001 to host device.

Table 6-9 Function Setting

SWDIP	Function	Number of byte
1 to 5	General settings 1 to 5	5 bytes
6 to 7	Auto-loading length	2 bytes
8 to 9	Mark position correction	2 bytes
10 to 11	Mark detection maximum feeding length setting	2 bytes

There are two ways for function settings: the function settings are executed by the command after turn on the printer or initialization (not stored in CG ROM), or the function settings are stored into the CG ROM by the command. When the function settings are stored into the CG ROM, the IFD001 rereads the function settings during initialization. Thus, do not need to execute the command for function settings after turn on the printer or initialization.

Details for settings of SWDIP1 to DIP 11 are described below. The value that is indicated by shaded region at the table shows a default setting value.

(NOTE) Be sure to set the directed value according to 0 or 1 is “Fixed” in list. Otherwise IFD001 does not work correctly.

(1) General Setting 1 (SWDIP1)

Setting the printer mechanism or selecting the peripheral.

- Autocutter selection (SWDIP1-1)
Enable/disable of Autocutter is selected.
- Drawer winder or presenter selection (SWDIP1-2 or 3)
Enable/disable of drawer, winder or presenter is selected.
If drive just winder, select drawer/winder enable and nothing connect to drawer terminal.
- Auto-loading selection (SWDIP1-4)
Enable/disable of the auto-loading in the printer mechanism is selected.
- Mark sensor selection (SWDIP1-5)
The photo sensor used as a mark sensor is selected.
- Paper-near-end sensor selection (SWDIP1-6)
Enable/disable of the paper-near-end sensor is selected.

Table 6-10 General Setting 1 (SWDIP1)

SWDIP	Function	Value	
		0	1
1-1	Autocutter selection	Enable	Disable
1-2 to 3	Drawer or winder selection	Refer to Table 6-11	
1-4	Auto-loading selection	Enable	Disable
1-5	Mark sensor selection	Paper sensor	Option mark sensor
1-6	Paper-near-end sensor selection	Enable	Disable
1-7	Reserved	-	Fixed
1-8	Reserved	-	Fixed

Table 6-11 Drawer, Winder and Presenter Selection (SWDIP1-2 to 3)

SWDIP1-3	SWDIP1-2	Drawer, Winder and Presenter Selection
0	0	Presenter
0	1	Drawer/Winder
1	0	Drawer
1	1	Disable

(2) General Setting 2 (SWDIP2)

Selecting the drive method of the printer mechanism.

- Division drive method selection (SWDIP2-1)
Select the thermal head drive method from dynamic division or fixed division.
- Number of dots selection for dynamic division drive (SWDIP2-2 or 3)
When selecting the dynamic division, the maximum number of the drive dot can be set.

Table 6-12 General Setting 2 (SWDIP2)

SWDIP	Function	Value	
		0	1
2-1	Division drive method selection (Head drive)	Fixed div.	Dynamic div.
2-2 to 3	Number of dots selection for dynamic drive (Division method)	Refer to Table 6-13	
2-4	Reserved	-	Fixed
2-5	Reserved	-	Fixed
2-6	Reserved	-	Fixed
2-7	Reserved	-	Fixed
2-8	Reserved	-	Fixed

Table 6-13 Number of Dots Selection for Dynamic Drive (SWDIP2-2 to 3)

SWDIP2-3	SWDIP2-2	Number of dots selection for dynamic drive
0	0	72
0	1	144
1	0	288
1	1	144

(3) General Setting 3 (SWDIP3)

Selecting the mark mode and the thermal paper.

- Mark mode selection (SWDIP3-1)
Enable/disable of the mark detection is selected.
- Thermal paper selection (SWDIP3-2 to 6)
Selecting the thermal paper to use.

Table 6-14 General Setting 3 (SWDIP3)

SWDIP	Function	Value	
		0	1
3-1	Mark mode selection	Enable	Disable
3-2 to 6	Thermal paper selection	Refer to Table 6-15	
3-7	Reserved	-	Fixed
3-8	Reserved	-	Fixed

Table 6-15 Thermal Paper Selection (SWDIP3-2 to 6)

SWDIP3-6	SWDIP3-5	SWDIP3-4	SWDIP3-3	SWDIP3-2	Thermal paper selection
0	0	0	0	0	TF50KS-E2D
0	0	0	0	1	TP50KJ-R
0	0	0	1	0	Prohibit the setting
0	0	0	1	1	PD160R-63
0	0	1	0	0	TL69KS-LH
0	0	1	0	1	P220VBB-1
0	0	1	1	0	P300
0	0	1	1	1	P350
0	1	0	0	0	KIP370
0	1	0	0	1	KIP470
0	1	0	1	0	PD160R-N
0	1	0	1	1	AF50KS-E
0	1	1	0	0	Alpha900-3.4
0	1	1	0	1	KT55F20
0	1	1	1	0	F5041
0	1	1	1	1	KF50
1	0	0	0	0	AP50KS-D
1	0	0	0	1	KPR440
1	0	0	1	0	AP50KS-FZ
1	0	0	1	1	P5045
Other than those above					Prohibit the setting

(NOTE) If too much energy is applied to the thermal head, it would shorten its life span and cause the paper feed problem. Set an accurate thermal paper selection and print density. If selecting the thermal paper that is different from the one specified in the thermal paper selection or in case of not setting the print density in 100%, the specified life span would not be guaranteed of the product specification in this technical reference. Verify the performance with your actual device before printing.

(4) General Setting 4 (SWDIP4)

Setting the print density by 1%.

Table 6-16 Setting the Print Density (SWDIP4)

SWDIP	Function	Number of byte	Definition range	Default
4	Print density selection	1 byte	60 to 140 (%)	100 (%)

(NOTE) If too much energy is applied to the thermal head, it would shorten its life span and cause the paper feed problem. Set an accurate thermal paper selection and print density. If selecting the thermal paper that is different from the one specified in the thermal paper selection or in case of not setting the print density in 100%, the specified life span would not be guaranteed of the product specification in this technical reference. Verify the performance with your actual device before printing.

(5) General Setting 5 (SWDIP5)

Setting the function of status response and print data handling when an error occurs.

- Automatic status response selection (SWDIP5-1)
Selecting the automatic status response function whether to be enable or not.
- Print data handling when an error occurs (SWDIP5-2)
Select print data handling when an error occurs whether to enable or not.
If select print data handling when an error occurs to enable, discard the command below.
->Printing data, feeding, cut the paper, execution response request

(NOTE) If print data handling when an error occurs enable, get errors during processing the command, the command processing does not exit till receive the all remaining data. When the errors occur if there is the data during processing, send the all remaining data and enter the next command.

- Paper-near-end sensor error selection (SWDIP5-4)
Select the function to stop the print as the error whether enable or disable, when the paper-near-end sensor detects out-of-paper.
- Initialization performance selection after paper setting (SWDIP5-5)
If initialization performance selection after paper setting is enabled, IFD001 operates the feeding of initialization performance after set the thermal paper, like feeding 20mm approx. -> cut the thermal paper -> feeding 3mm approx.
If the autocutter function is disabled, during turning on the power or the thermal paper is inserted during resetting, IFD001 does not operate the initialization performance after set the thermal paper even this function is Enable.

Table 6-17 General Setting 5 (SWDIP5)

SWDIP	Function	Value	
		0	1
5-1	Automatic status response selection	Enable	Disable
5-2	Print data handling when an error occurs selection	Enable	Disable
5-3	Reserved	-	Fixed
5-4	Paper-near-end sensor error selection	Enable	Disable
5-5	Initialization performance selection after paper setting	Enable	Disable
5-6	Reserved	-	Fixed
5-7	Reserved	-	Fixed
5-8	Reserved	-	Fixed

(6) Auto-loading paper feeding length setting (SWDIP6 to 7)

When the setting of auto-loading is enabled, setting the paper feeding length by 1mm.

Table 6-18 Auto-Loading Paper Feeding Length Setting (SWDIP6 to 7)

SWDIP	Function	Numbers of bytes	Definition range	Default value
6 to 7	Auto-loading paper feeding length setting	2 bytes	20 to 300 (mm)	80 (mm)

(7) Mark position correction (SWDIP8 to 9)

Preset the correct direction and length of mark position correction in the SWDIP8 to 9 by 1 dot line.

If 1 (1H) to 8000 (1F40H), the correct direction is forward.

If -1 (FFFFH) to -72 (FFB8H), the correct direction is reverse. The negative set by the two's complement.

Table 6-19 Mark Position Correction (SWDIP8 to 9)

SWDIP	Function	Numbers of bytes	Definition range	Default value
8 to 9	Mark position correction	2 bytes	-72 to 8000 (dot line)	0

(8) Mark detection maximum feeding length setting (SWDIP10 to 11)

The IFD001 feeds paper until detecting the mark by 1mm.

Table 6-20 Mark Detection Maximum Feeding Length Setting (SWDIP10 to 11)

SWDIP	Function	Numbers of bytes	Definition range	Default value
10 to 11	Mark detection maximum feeding length setting	2 bytes	0 to 4000 (mm)	500 (mm)

6.8 OPERATING

6.8.1 Loading Paper

(1) Easy operation type mechanism (LTPDx47 printer mechanism)

Set the paper after releasing the platen of the LTPDx47 or CAPDx47 series printer.
How to set the paper shows below.

- (a) Release the platen after pushing the platen release lever.
- (b) Set the paper into the paper inlet until 5cm or more of the paper edge is projected from the upper surface of the CAPDx47 or LTPDx47 series printer.
- (c) Make sure that the paper is straight in the printer, and then put the platen in the close position.
The print-ready status returns about one second later.
If there is data to print, the IFD001 resumes printing from the beginning of the line when stopped in process of the printing.

(2) Automatic loading type mechanism (CAPDx47A printer unit)

There are two ways to set the paper for CAPDx47 printer unit. : the way of automatic paper loading, and the way of manual paper loading when the platen is release position.
The way of manual paper loading, see (1) Easy operation type mechanism.

Auto-loading function loads paper automatically when paper is inserted at the paper empty status and the platen is closed.

When the platen is opened, the auto-loading function is not performed.

The default amount of paper feed is 640 dots (8cm approx.) line. This amount is able to change by the function settings. The paper feed driving speed is 320 pps at this time.

The operation of auto-loading is as follows:

Cut the edge of the paper so that the corners of the paper are square (90°) in advance.

- (a) The printer must have no paper condition.
If there is paper in the printer, remove the paper by feeding the paper either in the forward direction or the reverse direction.
- (b) Insert the paper into the paper inlet of the CAPDx47 printer unit with the platen in the close position until the paper stops, and then the paper is loaded automatically.
- (c) After auto-loading is complete, the IFD001 goes to print-ready status automatically. However, when selecting the mark mode by the function setting, the IFD001 goes to print-ready status after detecting the mark on paper.
If there is data to print, the IFD001 resumes printing from the beginning of the line when stopped in process of the printing.

6.8.2 Paper Feed

The IFD001 has a function to feed the paper to the forward direction by inputting the signal from outside. The IFD001 feeds paper to the forward direction by receiving !FEED signal (CN5-1) which changes to "Low". !FEED signal is "Low", the operation is as follows.

(1) Enable the Mark mode selection

- (a) The IFD001 feeds paper to the mark position.
- (b) After feeding to the mark position, operating the position correction.
- (c) After feeding the paper, cut the paper if the autocutter is enable.

(2) Disable the Mark mode selection

- (a) The IFD001 feeds paper one line space in the forward direction.
- (b) After feeding the first line, operation is suspended for 0.5 second.
- (c) The printer continues to feed paper one line until the !FEED signal input returns to "High".

The amount of paper feed is the line feed space of settings at that time. The default amount of paper feed is 34 dots (4mm approx.) line.

6.8.3 Test Printing / HEX Dump Printing

The IFD001 has a test print function which prints the current settings of the function switches, and has a hex dump print function which allows data to be printed in hexadecimal code.

This function simply confirms the current settings of the function switches, whether or not the circuit and the printer mechanism are connected correctly and the transmitting or receiving the data from the host device is correctly.

To perform test/HEX dump printing, turn on the power while set the !FEED signal (CN5-1) to "Low", or cancel the reset. The test/HEX dump printing procedure is as follows.

(1) Test printing by turning the power on

Set the !FEED signal to "Low", and turn on the power. The test print will then start.

(2) Test printing by resetting

Turn on the power.

Set the !RESET signal (CN5-2) to "Low".

Set the !FEED signal to "Low", and the !RESET signal to "High". The test print will then start.

After completing a test printing, the printer unit enters Hex Dump mode. The data is printed eight bytes each. The data less than eight bytes can print when the !FEED signal is switched to "Low".

<p>(NOTE) Test printing can only check SWDIP1 to 4 of the function settings. If want to check after SWDIP5, it is possible to check by Function Set Response command. (8.4.10 Auxiliary Functions DC2 'I')</p>

LTPD-24V series Interface
PTD00P01 [Ver X.XX]
DD. MMM. YYYY
Copyright(C):SII

Mechanism:LTPD247
58mm, 24V, 8dot/mm

* SWDIP1 *
1) Autocutter:Disable
2-3)Peripheral device:Disable
4) Autoloading:Disable
5) Mark sensor:Option sensor
6) Near end sensor:Disable
7-8)(Reserved)

* SWDIP2 *
1) Head drive:
Dynamic division
2-3)Division method:144[dot]
5-8)(Reserved)

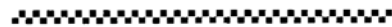
* SWDIP3 *
1) Mark mode:Disable
2-6)Thermal paper:TF50KS-E2D
7-8)(Reserved)

* SWDIP4 *
Print density:100[%]

* Communication type *
USB communication
Control model:PTD00

* Font information *
漢文字の使用可
外字の使用可
Down-load Font enable

* Memory information *
User area:880K[byte]
Check sum 1:XXXX
Check sum 2:XXXX
Check sum 3:XXXX
Check sum 4:XXXX



[HEX DUMP MODE]

Figure 6-2 Test Print Sample

CHAPTER 7

ERROR PROCESSING

Errors are classified into ten types. Thermal head error, thermal head temperature error, V_p voltage error, Autocutter error, platen open error, out-of-paper error, V_p voltage initialization error, presenter paper jam error, paper feed error in presenter, and paper jam error while detecting mark.

The type of operation errors can be judged by the status signal from the status output terminal. Moreover, that can be received the error code by the Error Status Back Enable/Disable command (see 8.4.10 Auxiliary Functions).

Since the data is buffered except thermal head error or V_p voltage initialization error, printing can be resumed once the causes of the errors are removed and the errors are canceled.

The causes of the errors and the solution for each error are listed below.

- **Thermal head error**

When the power is switched on, or during the initialization just after reset, detects the abnormality of the head.

The average resistance of the thermal head is lower than rated value, or the dot resistance is especially low.

The average resistance of the thermal head is higher than rated value, or some of the physical blocks are damaged.

This means that the printer mechanism is damaged, or not correctly connected to the IFD001 and the printer.

-> Nonrecoverable error.

- **V_p voltage initialization error**

When the power is switched on, or during the initialization just after reset, V_p voltage is not over 20.0V within 5 seconds. That cause of abnormal power supply or circuit.

-> Nonrecoverable error

- **Out-of-paper error**

No paper.

-> Load paper.

The IFD001 goes to print ready status in about a second.

- **Platen block position error**

The platen is not correct position.

-> Set the platen to return the normal position.

The IFD001 goes to print ready status in about a second.

- **V_p voltage error**

V_p voltage is out of the allowable range.

-> Return V_p voltage to allowable range.

The IFD001 goes to print ready status in about a second.

- **Thermal head temperature error**

The temperature of the thermal head is -25 °C or lower, or 85 °C or higher.
-> If it ranges from -20 °C to 80 °C, the IFD001 goes to print ready status.

- **Autocutter error**

There are two kinds of autocutter errors:

- An error occurs during operation of the cutter; the movable blade is in the home position.
-> IFD001 detects the autocutter error, and goes to print ready status in about a second.
- An error occurs during operation of the cutter; the movable blade is not in the home position (the movable blade is locked).
-> The IFD001 detects the autocutter error. When the cause of the locking of the movable blade (such as paper jam) is removed and the platen block is set, the IFD001 goes to print ready status in about a second. See 5.4.3 Unlocking of Movable Blade.

- **Paper jam error while detecting mark**

After the mark detects, cannot detect the mark end.

-> Make out-of-paper status or platen open status, then set again and become the print ready status about one second later.

- **Presenter paper jam error**

The presenter sensor PRS1 cannot detect the paper, despite the printer mechanism start print and feed the paper certain distance.

-> Make out-of-paper status or platen open status, then set again and become the print ready status about one second later.

- **Paper feed error in presenter**

The presenter sensor PRS1 and PRS2 detect the some error.

-> Make out-of-paper status or platen open status, then set again and become the print ready status about one second later.

<p>(NOTE) The V_p voltage allowable range is programmed to be from 21.6 to 26.4 V in consideration of detection errors and instantaneous changes.</p>

CHAPTER 8

SOFTWARE SPECIFICATIONS

8.1 CHARACTER CODES AND COMMANDS

The character code range and user-defined character codes when the Kanji Specification/Cancel mode is selected are different from those when the Shift Kanji mode is selected with the Kanji Code System Select command.

8.1.1 Kanji Specification/Cancel Mode

When the Kanji Specification/Cancel mode is selected with the Kanji Code System Select command, Kanji characters can be printed using 2-byte character codes after Kanji mode is selected with the Kanji Mode Specify command.

The command functions as 1-byte character code or the first or second byte of 2-byte character code. If a command is input in 2-byte character codes, the next data is always processed as the first byte. However, the next data is 1-byte character code for FS '.'. If a command is input as the second byte of 2-byte character code, the first byte is ignored.

(1) 1-byte character codes

00H - 1FH: The codes listed below are processed as commands. The other codes are ignored.

09H (HT), 0AH (LF), 0CH (FF), 12H (DC2), 13H (DC3), 18H (CAN),
1BH (ESC), 1CH (FS), 1DH (GS)

20H - 7EH: The codes are processed as 1-byte character.

7FH: Ignored

80H - FEH: The codes are processed as 1-byte character.

FFH: It is different each character set.

If the extended graphics character set or the katakana character set are selected, they are ignored.

If the Codepage 1252 is selected, it is processed as character code.

(2) 2-byte character codes

2-byte character codes specify Kanji characters or User-defined characters.

(a) First byte

00H: The 1-byte character area. Specify the 1-byte character code with the second byte.

21H - 76H: Kanji size character area

77H: User-defined character area

78H - 7EH: Kanji size character area

If the codes other than the above are not commands, these codes are ignored.
The next data to be received is processed as the first byte.

(b) Second byte

(If the first byte is 00H)

20H - 7EH: The codes are processed as the 1-byte character.

80H - FEH: The codes are processed as the 1-byte character.

FFH : It is different each character set.

If the extended graphics character set or the katakana character set are selected, they are ignored with the first byte.

If the Codepage 1252 is selected, it is processed as the 1-byte character.

(If the first byte is not 00H)

21H - 7EH: The codes are processed as the second byte of a Kanji character or a user-defined character.

If the codes other than the above are not commands, these codes are ignored with the first byte. The next data to be received is processed as the first byte.

- (3) The codes not defined as JIS or special characters in the Kanji size character area are processed as Kanji size character spaces.

2-byte character codes when selecting Korean.

It specify Korean and user-defined character by 2-byte character codes

(a) First byte

00H : 1 byte character area. Specify the 1 byte character code at second byte.

77H : Area for user-defined characters.

A1H - FDH : Area for Korean characters when selecting Korean.

If the other codes except above are not command, they are ignored. The next received data processed as first byte.

(b) Second byte

(If the first byte is 00H)

20H - 7EH : Processed as the first byte characters.

80H - FEH : Processed as the first byte characters.

FFH : It is different depend on the character set.

If the extended graphics or Katakana character set, they are ignored with first byte.

If the Codepage 1252 character set, it processed as the first byte character set.

(If the first byte is 77H)

21H - 7EH : Processed as the second byte of user-defined characters.

(If the first byte is A1H to FDH)

A1H - FEH : Processed as the second byte of Korean characters.

If the other codes except above are not command, they are ignored with first byte. The next received data processed as first byte.

In the double byte character area, the code are not defined by Korean processed as the double byte character space.

8.1.2 Shift Kanji Mode

If the shift Kanji mode is selected with the Kanji Code System Select command, Kanji characters can be printed with 2-byte character codes without entering the Kanji Mode Specify command.

The command functions as 1-byte character code or the second byte of 2-byte character code.
If a command is input for the second byte of 2-byte character code, the first byte is ignored.

(1) 1-byte character codes

00H - 1FH: The codes listed below are processed as commands. The other codes are ignored because they are 1 byte.

09H (HT), 0AH (LF), 0CH (FF), 12H (DC2), 13H (DC3), 18H (CAN),
1BH (ESC), 1CH (FS), 1DH (GS)

20H - 7EH: The codes are processed as the 1-byte character

7FH: Ignored

80H - FEH: See (2).

FFH: It is different each character set.

If the extended graphics character set or the katakana character set are selected, they are ignored.

If the Codepage 1252 is selected, it is processed as the 1-byte character.

(2) 2-byte character codes

2-byte character codes specify Kanji and user-defined characters.

(a) First byte

81H - 9FH: Kanji size character area

E0H - EBH: Kanji size character area

ECH: User-defined character area

EDH - EFH: Kanji size character area

The other codes 80H - FEH are processed as 1 byte characters.

(b) Second byte

40H - 7EH: The codes are processed as the second byte of a shift JIS code.

80H - FCH: The codes are processed as the second byte of a shift JIS code.

If the codes other than the above are not commands, these codes are ignored with the first byte.

The codes not defined as Shift JIS or special characters in the Kanji size character area are processed as Kanji size character spaces.

(3) 2-byte character codes when selecting Korean.

(a) First byte

A0H : Area for user-defined characters.

A1H - FDH : Area for Korean characters when selecting Korean.

If the other codes except above are not command, they are ignored. The next received data processed as first byte.

(b) Second byte

(If the first byte is A0H)

A1H - FEH : Processed as the second byte of user-defined characters.

(If the first byte is A1H to FDH)

A1H - FEH : Processed as the second byte of Korean characters.

If the other codes except above are not command, they are ignored with first byte. The next received data processed as first byte.

In the double byte character area, the code are not defined by Korean processed as the double byte character space.

8.2 CG ROM

A CG ROM is mounted on IFD001. It is possible to use user-defined characters, downloaded characters, optional fonts, macro function, NV bit image function, downloaded bit image function. A CG ROM is nonvolatility (NV memory) and that consists of the following area.

- System area
stores data for controlling system, the value of function settings and maintenance counter.
- Font area
stores font data such as Kanji and so on.
- User area
stores downloaded characters, user-defined characters, optional fonts, macro, NV bit image, and downloaded bit image.

System area is rewritten using the commands such as Function Setting (DC2 'k') or Maintenance Counter Preservation (GS 'S'). Font area can not be rewritten. User area can be rewritten using registration commands of user-defined characters, downloaded characters, optional fonts, macro, NV bit image, and downloaded bit image.

Amount of memory other than system area and font area is 917504 bytes. When using optional fonts, macro, NV bit image, and downloaded bit image, it is necessary to know the remaining amount of memory beforehand. Read this section before using these functions.

(1) Memory area

IFD001 allocates or frees memory area in order to change uses of the user area and its capacity. Allocating the memory area means that the memory is divided into the specified capacity (the number of bytes) so as to be exclusively used for a certain function.

Freeing the memory area means that the division of the memory for the exclusive use of a certain function is abolished so that the other functions become usable. The freed memory area is not reused until IFD001 executes the commands User Area Initializaton (DC2 'R') or User Area Defragment (DC2 '** '1').

System area is rewritten using the commands such as Function Setting (DC2 'k') or Maintenance Counter Preservation (GS 'S'). Font area can not be rewritten. User area can be rewritten using registration commands of user-defined characters, downloaded characters, optional fonts, macro, NV bit image, and downloaded bit image.

Amount of memory other than system area and font area is 917504 bytes. When using optional fonts, macro, NV bit image, and downloaded bit image, it is necessary to know the remaining amount of memory beforehand. Read this section before using these functions.

How to calculate the amount of using memory, see the description of each command.

Table 8-1 Memory Area after Initialization

Use	Bytes	Release memory area
User-defined characters	9784	Enable
Downloaded characters	6184	Enable
Optional font	0	Enable
Macro definition	0	Enable
NV bit image	0	Disable
Downloaded bit image	0	Disable

For user-defined characters and downloaded characters, the memory in the User area is allocated beforehand at initialization and shipment. This area can be freed using commands, and its empty area increased for optional font, macro, NV bit image, and downloaded bit image.

When defining and registering optional font, macro, NV bit image, and downloaded bit image, it is necessary to calculate the remaining memory area constantly. Be aware that all of the data which exceeds the remaining memory area is ignored.

For definition optional font, macro, NV bit image, and downloaded bit image, the area is automatically allocated when the corresponding command is input. These commands operate as follows:

- When the parameter of the command is outside the range:
IFD001 ignores the part outside and processes the remaining data as character codes.
- When the command is normal but memory area has not been allocated (memory shortage):
All of the data, including the successive data, is ignored.
- When the command is normal and memory area has been allocated:
The data is registered.
The remaining memory is confirmed by using the Remaining Memory Response command (DC2 '*' '2').

(2) Memory control information

After allocating the area, the memory control information is added at the beginning of the allocated area. The number of bytes for memory control information differs depending on each function. The number of bytes for memory control information of each function is listed in Table 8-2.

Table 8-2 Number of Bytes of Memory Control Information (User Area)

Function	Number of Bytes
User-defined characters	8
Downloaded characters	104
Optional font	12
Macro	12
NV bit image	2048
Downloaded bit image	12

[Example]

For a user-defined character, the 24 × 24 dot character takes 72 bytes and the 16 × 16 character takes 32 bytes. Therefore, there can be up to 94 characters, with 8 bytes of memory control information, as shown below:

$$(72+32) \times 94 + 8 = 9784 \text{ bytes}$$

When calculating the remaining memory, include the number of bytes for memory control information. Since one memory area is limited to 65536 bytes, the maximum number of bytes which can be registered, is as follows:

$$\text{Optional font} = 65536 - 12 = 65524 \text{ bytes}$$

(3) Precautions for the macro function

Macro function can not include the commands for allocating or freeing (up) the memory area listed in Table 8-3.

Table 8-3 Commands for Allocating or Freeing Memory Area

Command	Command Name
DC2 'P'	Optional Font Define
DC2 'Q'	Optional Font Invalidation
GS ':'	Macro Define Start/Stop
ESC '&	Downloaded Character Define
DC2 'D'	Downloaded Character Area Operation
FS '2'	User-Defined Character Define
DC2 'G'	User-Defined Character Area Operation
FS 'q'	NV Bit Image Define
GS '*'	Downloaded Bit Image Define
GS 'v'	Raster Bit Image Printing
DC2 '*1'	User Area Defragment
DC2 'R'	Extension Memory Initialize

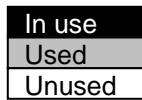
If the commands listed in Table 8-3 are input during macro definition, that is canceled and deleted.

(4) Memory management

(a) About Memory in the User area of CG ROM

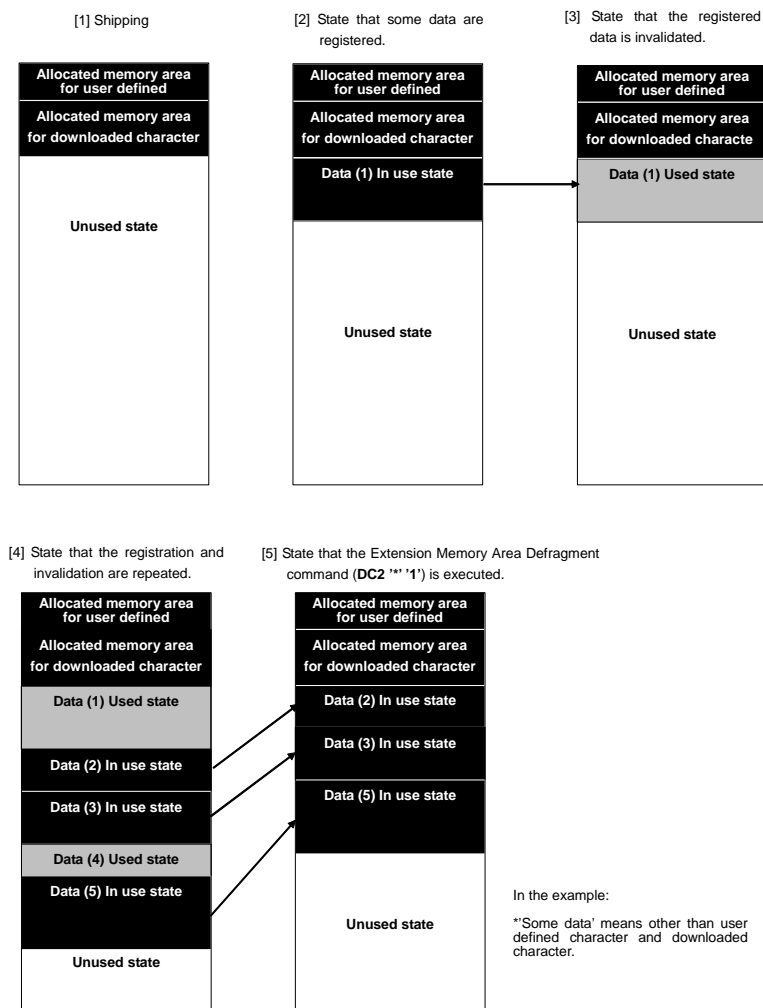
Memory in the User area of CG ROM has the following three kinds of conditions:

- In use state
- Used state
- Unused state



The user area other than exclusive use for user-defined character and downloaded character is in Unused state at shipping.

When some data is saved in the user area, the user area turns to In use state as explained in the figure below. When the data in use state is invalidated, the invalidated area turns to Used state. The invalidated area cannot be returned to its original state again.



When data registration and invalidation are repeated, the memory state turns to the [4] state. To use the Used state area again, execute the User Area Reduction command (DC2 '**'1'). The [5] shows the memory state after the command is executed.

Execute Remaining capacity response command in the user area to be sure the current memory empty capacity.

By Remaining capacity response command in the user area, the current memory empty capacity is respond.

(b) Precaution of the CG ROM area rewriting, release and ensure

When define and register the command (user-defined character, downloaded character, optional font, macro, NV bit image and downloaded bit image), the data are registered in the area already, compare the registered data and newly registered data. If all data are equal, does not process the overwritten.

The remaining memory amount is checked by Remaining capacity response command in the user area. (DC'***2').

The CG ROM is configured with the FLASH memory.

The maximum rewritable number of the FLASH memory is approximately 100000 times.

Execute the User Area Reduction command after getting low memory for restraining the numbers of the memory rewriting.

Do not turn off the printer while the command on writing or invalidation into the CG ROM executes. If doing so, operational malfunctioning may occur. To prevent destruction of the CG ROM, transfer the Execute Response Request command (DC2 'q' n) after command on writing or invalidation, and check a response code.

8.3 PAGE MODE AND STANDARD MODE

There are two ways for print mode: the standard mode that the IFD001 prints the received data each time or the page mode that the IFD001 prints the page data after received one page data can be selected.

8.3.1 Standard Mode

In the standard mode, the IFD001 prints the received data each time.

When one line buffer is filled up with the character data (one line full print) or the print condition is established by the Line Feed command or the Printer return command, the IFD001 prints.

8.3.2 Page Mode

In the page mode, the IFD001 prints at each one page.

The printer enters to the page mode by the Page Mode Select command.

When the IFD001 enters to the page mode, the printer develops the received data in the print area of the memory.

When the IFD001 receives the Page Mode Print and Recovery or Page Mode Data Print commands, the IFD001 prints the print data developed on the memory collectively.

In the page mode, there are two methods, the method that the IFD001 prints only one page and the method that the IFD001 prints the save data for multiple numbers.

(1) Page mode operational procedures

Table 8-4 When Only One Page Print is Desired

Procedure	Command	Description	Remark
1	ESC 'L'	Selects the page mode.	The standard mode and there is no data in the line buffer are required.
2	ESC 'W'	Specifies print area.	When the print area is not specified, all print area is specified.
3	ESC 'T'	Specifies the print start point and print direction.	When the print start point and print direction are not specified; Print start point: upper left; Print direction: left to right
4	Various	Develops the data in the specified print area.	
5	FF	Prints all data of the page mode correctively and returns to the standard mode.	

Table 8-5 When Multiple Prints are Desired

Procedure	Command	Description	Remark
1	ESC 'L'	Selects the page mode.	The standard mode and the top of the line are required.
2	ESC 'W'	Specifies print area.	When the print areas are not specified, all print areas are specified.
3	ESC 'T'	Specifies the print start point and print direction.	When the print start point and print direction are not specified; Print start point: upper left; Print direction: left to right
4	Various	Develops the data in the specified print area.	
5	ESC FF	Prints all data of the page mode correctively.	The data of the page mode is held.
6	:	Repeats procedure 5 for [A number to Reprinted-1] times.	When changing a part of the print data, execute procedure 2 to 5.
7	ESC 'S'	Returns to the standard mode.	

(2) Data processing of the page mode

(a) Preset of the print start position

A character, a bit image, and a bar code are developed with the reference of the print start position.

Preset the print start position by the Vertical Absolute Position Specify in Page Mode command before transmitting the print contents.

When the printer starts developing characters and bit images, the print start position will be shifted automatically.

When the print area is less than one character, the character cannot be developed.

In this case, the printer reads out the data and prints nothing.

(b) Developing position of characters and image data

- Characters

The reference point of characters is lower left.

The developing position is the position that is matched the lower left of characters with the print start position.

After developing, the print start position shifts horizontally for character width plus right space.

- Bit image

The reference point of the bit image is lower left.

The developing position is the position that is matched to the lower left of the bit image with the print start position. After developing, the print start position shifts horizontally for image width.

- Download bit image

The reference point of the download bit image is lower left.

The developing position is the position that is matched the lower left of the download bit image with the print start position. After developing, the print start position shifts horizontally for the image width.

- Barcode

The reference point of the barcode is lower left.

The developing position is the position that is matched the lower left of the image with the print start position.

Therefore, HRI characters are developed at the under position of the print start position.

After developing, the print start position shifts horizontally for the barcode width.

- Raster bit image

The reference point of the raster bit image is upper left.

The developing position is the position that is matched the upper left of the image with the print start position.

After developing, the print start position shifts horizontally for the image width.

The developing positions of the character and the image data are shown in Figure 8-1.

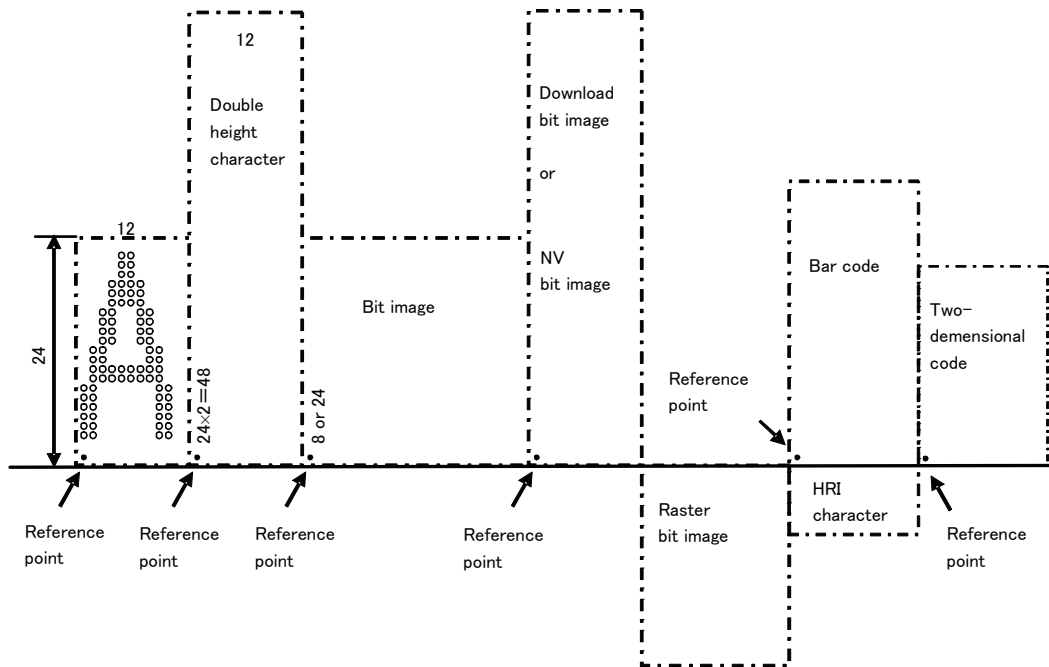


Figure 8-1 Deployment Positions of Characters and Image Data

- HINT

Transmit print data after executing Page Mode Select command or Print Area Set in Page Mode command then specifying developing position. If developing position is not specified, IFD001 does not print data correctly.

(c) Direction of Developing position

The IFD001 prints data according to specified direction. Refer to Character Print Direction Specify in Page Mode command.

(d) Print command processing

The commands that involve a print operation in the page mode are FF and ESC FF. Print commands in the standard mode (LF, ESC 'J', etc) do not result in actual printing, but only moving of the print deployment position.

(e) Buffer full processing

Buffer full processing in the horizontal character direction is performed when all the character data cannot be deployed in the print area like in the standard mode, and the subsequent data is deployed from the beginning of the next line.

Buffer full processing in the vertical character direction is performed when there is no deployment reference position within the area, and the subsequent data is discarded.

(f) Setting of printing area in page mode

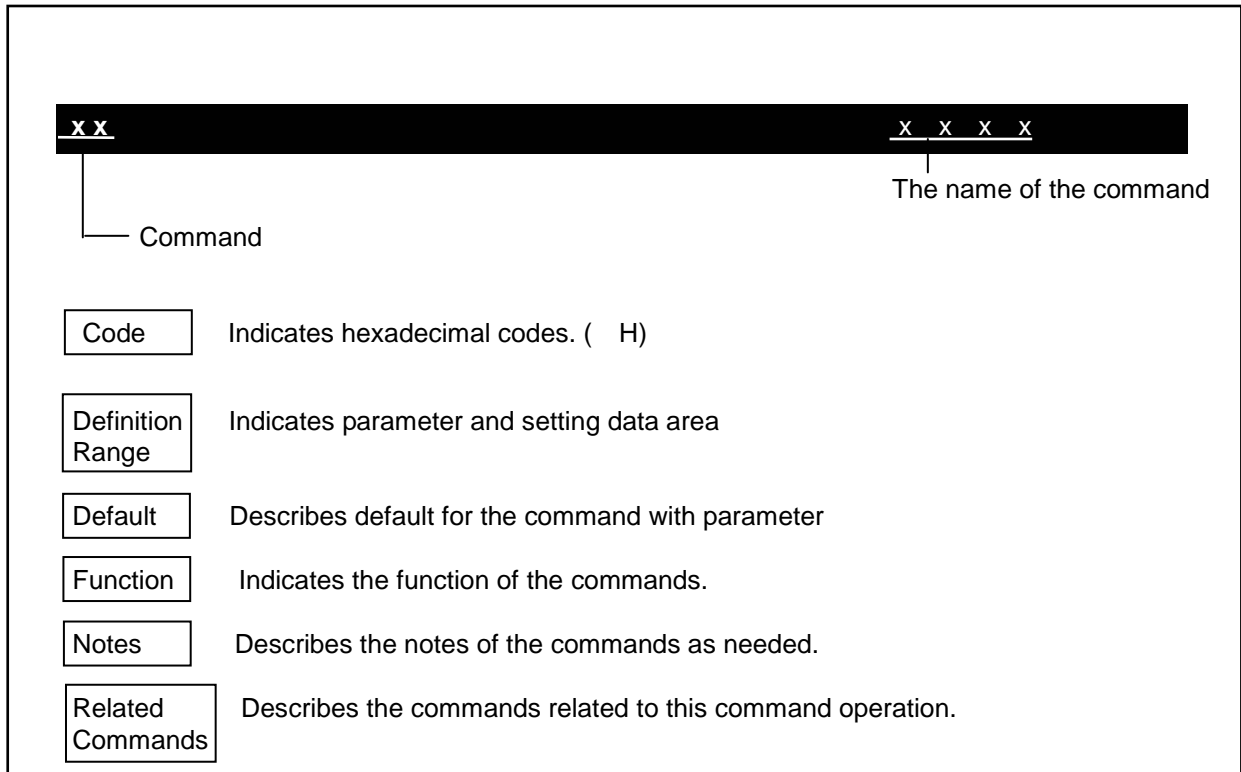
The IFD001 prints all printable area in page mode except work using area from extended RAM area. The all printable area is different depend on the connecting mechanism.

Table 8-6 Page Mode Maximum Print Range

Printer mechanism	Maximum width (X direction)	Maximum length (Y direction)
LTPD247/CAPD247	432 dots	4110 dots
LTPD347/CAPD347	576 dots	3100 dots

8.4 FUNCTION CODE DESCRIPTION

This chapter describes the commands in each function.



- Buffer full

The line buffer is full status. In the standard mode, IFD001 prints data in line buffer and feeds paper one dot line after receiving new data. That performance is same as LF. In the page mode, the IFD001 shifts the print position to beginning of the line and develops the data after receiving new data.

- Beginning of line

The beginning of a line signifies satisfaction of the following conditions.
 No print data (including space and skip portion caused by HT) exists in the current line buffer.
 No specification of the print position by ESC '\$', ESC 'Y'.

- Printable area

X direction maximum width that can be printed, as specified by the print width specification. See 8.3.2 Page Mode for the print width setting. The print width shows the printable area. In the page mode, the print length of Y direction maximum width is defined by Character Print Direction Specify in Page Mode command (ESC 'T').

- Print area

Print area set with the Print Area Width Set command (GS 'W') and Print Area Set in Page Mode (ESC 'W'). Must always (Print area ≤ Printable area).

- Ignore

This is the state of discarding all the code including the parameter and not doing anything.

- Inch

Unit of length. 1 inch = 25.4 mm approx.

- LSB / MSB

LSB is the least significant bit and MSB is the most significant bit.

8.4.1 Printing Command

LF

Line Feed

Code 0AH

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

[When the page mode is selected]
Moves the print start position to the top of the next line based on the set line spacing.

Related Commands ESC '2', ESC '3'

FF

(1) Page Mode Print and Recovery (when the page mode is selected)
(2) Marked Paper Print and Form Feed (when the standard mode is selected)

Code 0CH

Function Differs depending on the mode selected.

[When the page mode is selected]
Prints data, which is entirely developed over all the printable area, in block and returns it to the standard mode.

[When the standard mode is selected]
When Mark is selected in the function setting, the printer prints data in the line buffer and executes the paper form feed.

Notes [When the page mode is selected]
All the developed print data is erased after having been printed.
The paper form feed and cut is not executed.
The next print position is the beginning of the line.
The print area set by ESC 'W' is initialized.

[When the standard mode is selected]
The next print position is the beginning of the line.

Related Commands [When the page mode is selected]
ESC FF, ESC 'L', ESC 'S'

[When the standard mode is selected]
GS FF, GS '<'

Code 1BH 0CH

Function In the page mode, batch prints the data deployed in the entire page buffer.

Notes Only valid when the page mode is selected. When the standard mode is selected, this command is ignored.
Following printout, the deployed data, ESC 'W', ESC 'T' setting values, and print start positions are held. The paper form feed and cut is not executed.

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

Code 1BH 4AH n

Definition Range $0 \leq n \leq 255$

Function [When the standard mode is selected]
Feeding the paper for a predefined distance.
When the data exist in the line buffer, the paper is feed after printing one line.
The paper feed distance is [$n \times$ basic calculation pitch] inches.
The vertical basic calculation pitch (y) is used.

[When the page mode is selected]
Shifts the print start position for predefined distance.
Distance is [$n \times$ basic calculation pitch] inches.
The basic calculation pitch differs depending on the start position.

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

When the starting point is specified as "upper right" or "lower left" with ESC 'T', the basic calculation pitch (x) in the direction perpendicular to paper feed (characters' vertical direction) is used.

Notes The beginning of the line following print completion is the next print position.
This command does not affect the line spacing set by ESC '2' or ESC '3'.
The basic calculation pitch is set by GS 'P'.
If the calculation result is a fractional figure, it is compensated using the mechanism minimum pitch, and the remainder is discarded.

Related Commands GS 'P'

Code 1BH 64H n

Definition Range $0 \leq n \leq 255$

Function [When the standard mode is selected]

Feeding the paper for n lines.

The paper feed distance is $[n \times \text{the specified line spacing} \times \text{basic calculation pitch}]$ inches.

The vertical basic calculation pitch (y) is used.

If the data in the line buffer, printing a line and then feeding paper.

[When the page mode is selected]

Moves the print start position for n lines.

Moving distance is $[n \times \text{specified line spacing} \times \text{basic calculation pitch}]$ inches.

The basic calculation pitch differs depending on the start position.

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

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

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

Code 18H

Function Deletes all the data in the latest print area in the page mode.

Notes Only valid when the page mode is selected. When the standard mode is selected, this command is ignored. Data out of print area that is set currently cannot be deleted.

Related Commands ESC 'L', ESC 'W' 8.3.2 Page Mode.

8.4.2 Line Spacing

ESC '2'

1/6 Inch Line Spacing Set

Code 1BH 32H

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

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

Related Commands ESC '3'

ESC '3' n

Line Spacing Set

Code 1BH 33H n

Definition Range $0 \leq n \leq 255$

Default The line spacing per line as 1/6 inch (34 dots).

Function Sets the line spacing per line.
The line spacing is $[n \times \text{basic calculation pitch}]$ inches.

Notes The line spacing can be independently set in the standard mode and the page mode.
The basic calculation pitch is set by GS 'P'. Moreover, once set, the line spacing is not changed even when the basic calculation pitch is changed by GS 'P'.
If the calculation result is a fractional number, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.
In the standard mode, the vertical basic calculation pitch (y) is used.

When the printer unit is used in the page mode, the operations are as follows depending on the starting point.

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

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

Related Commands ESC '2', GS 'P'

8.4.3 Character Set

ESC SP n Character Right Space Amount Set

Code 1BH 20H n

Definition Range $0 \leq n \leq 255$

Default n=0

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

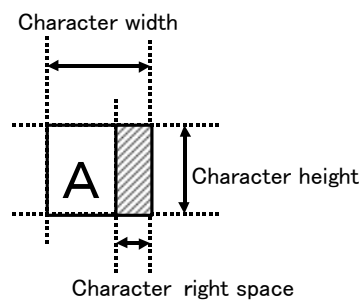
Notes This command does not affect Kanji.
The amount of right space of double width becomes double against the amount of the setting value.
The Character Right Space Amount Set command can be independently set for the standard mode and the page mode.
The basic calculation pitch is set by GS 'P'. Furthermore, the set right space amount is not changed even if the basic calculation pitch is changed with GS 'P' after the right space amount has been set.
If the calculation result is a fractional figure, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.
In the standard mode, the horizontal direction basic calculation pitch (x) is used.

In the page mode, the basic calculation pitch used here is as follows depending on the starting point.

When the starting point is specified as "upper left" or "lower right" by ESC 'T', the horizontal direction basic calculation pitch (x) is used.

When the starting point is specified as "upper right" or "lower left" by ESC 'T', the vertical direction basic calculation pitch (y) is used.

Related Commands GS 'P'



Code 1BH 21H n

Definition Range $0 \leq n \leq 255$

Default n=0

Function Selects the print mode.

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

Notes

When both the double height and double width are specified, the character size is double height and width.

Underlines are used along the entire character width including the space to the right of the character. However, no underline is used for the portion skipped through the use of HT and for 90° right rotated characters.

The underline width is the thickness set by Underline Settings (ESC '-'), and is independent of the character size. If not restricted by ESC '- ', the underline width is 1 dot.

This command does not affect Kanji, except bit 3 (bold characters).

If characters with different vertical direction extension factors exist in mix on the same line, extension is executed based on the character's bottom edge (the characters' bottom edges are aligned).

If extending characters in the horizontal direction, they are extended in the right direction using the left edge of the character as reference.

In case of print modes for which bold print, underline, etc., can be set and cancelled as with other commands, the command processed last is valid. Therefore, if bold print is cancelled with ESC '! n the following specification of bold print with Bold Print Specify/Cancel command (ESC 'E'), specification with ESC 'E' is cancelled.

The last specified command by this command (ESC '! n) or Character Size Specify command affects double width and double height.

Related Commands ESC '- ', ESC 'E'

Code 1BH 4DH n

Definition Range n=0, 1, 2, 3, 48, 49, 50, 51,

Default n=0

Function Selects a character font.

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

Notes Character fonts can also be selected with Print Mode Select command (ESC '!'), but the last executed command becomes effective.

Related Commands ESC '!'

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]	

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

2 Horizontal Scale

Hexadecimal	Decimal	Scale
00H	0	×1 (default)
10H	16	×2 (double height)
20H	21	×3
30H	48	×4
40H	64	×5
50H	80	×6
60H	96	×7
70H	112	×8

Notes

The setting applies to all characters (including Kanji) except HRI characters. However, as for the character size of optional font, the scale is specified up to double width or double height. If the command specifies the scale to three or larger, the optional font is modified with double width or double height.

When either vertical scale or horizontal scale is out of definition, this command is ignored.

In the standard mode, vertical direction shows the paper feed direction and horizontal direction shows the vertical direction for the paper feed direction. Therefore, when specifying character 90° right rotate, the relationship between the length and breadth becomes reverse.

In the page mode, vertical direction shows the vertical direction for the character and horizontal direction shows the horizontal direction for the character.

ESC ' - ' n**Underline Settings****Code**

1BH 2DH n

Definition Range

0≤n≤2, 48≤n≤50

Default

n=0

Function

Defines or cancels underline.

n	Function
0, 48	Cancel underline
1, 49	Set 1-dot height underline and specify underline
2, 50	Set 2-dot height underline and specify underline

Notes

Underlines are used along the entire character width including the space to the right of the character. However, no underline is used for the portion skipped through the use of HT and for 90° right rotated characters.

When underline is canceled with n=0, no underline is added to the subsequent data, but the underline height setting immediately before underline cancel is retained. Moreover, in the initial state, underline cancel (n=0) is selected.

Regardless of the size of characters, underline height is constant

Even if the underline height changes in the middle of a line, the last specified height becomes effective.

This command does not affect Kanji.

Underline specification/cancellation is also possible with ESC '!', but the command that was last processed becomes valid. Therefore, if the following specification of underline with ESC '!', underline is canceled with ESC '-', the ESC '!' specification is canceled

Related Commands

ESC '!'

ESC 'E' n**Bold Print Specify/Cancel****Code** 1BH 45H n**Definition Range** $0 \leq n \leq 255$ **Default** n=0**Function** Specifies or cancels bold printing.
If n=<*****0>B, cancels bold printing.
If n=<*****1>B, specifies bold printing.**Notes** Only the LSB is valid for n.
This command affects both 1 byte character and Kanji.**Related Commands** ESC '!'**ESC 'G' n****Double Strike Printing Specify/Cancel****Code** 1BH 47H n**Definition Range** $0 \leq n \leq 255$ **Default** n=0**Function** Specifies or cancels double strike printing.
If n=<*****0>B, cancels double strike printing.
If n=<*****1>B, specifies double strike printing.**Notes** Only the LSB is valid for n.
Print result is exactly the same as bold printing.
This command affects both 1 byte character and Kanji.**Related Commands** ESC 'E'**ESC 'V' n****Character 90° Right Rotate Specify/Cancel****Code** 1BH 56H n**Definition Range** n=0, 1, 48, 49**Defaults** 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 (1 dot interval in horizontal direction)

Notes

Even when underline is specified, underline is not done for characters that are rotated 90° to the right.
 If 90° right rotation is specified, the relation between horizontal scaling and vertical scaling in relation to the character direction is opposite when 90° right rotation is canceled.
 This command does not affect the page mode.
 When the page mode is selected, only the printer unit's internal flag operation is performed when this command is input.

Related Commands

ESC '!', ESC '- ', FS '!', FS '- '

ESC '{' n**Inversion (Flip) Printing Specify/Cancel****Code**

1BH 7BH n

Definition Range

0≤n≤255

Default

n=0

Function

Specifies or cancels inversion (flip) printing.
 If n=<*****0>B, cancels inversion (flip) printing.
 If n=<*****1>B, specifies inversion (flip) printing.

Notes

Only the LSB is significant for n.
 This command is valid only when it is input at the beginning of a line.
 When the page mode is selected, only the printer unit's internal flag operation is performed when this command is input.
 This command does not affect the page mode.
 Inversion (flip) printing rotates the data of the line 180°.
 This command affects both 1 byte character and Kanji.

GS 'B' n**Reverse Print Specify/Cancel****Code**

1DH 42H n

Definition Range

0≤n≤255

Default

n=0

Function

Specifies or cancels reverse printing of characters.
 If n=<*****0>B, cancels reverse printing.
 If n=<*****1>B, specifies reverse printing.

Notes

Only the LSB is significant for n.
 The characters that can be reverse printed are internal characters and downloaded characters.
 The right space defined with ESC SP is also subject to reverse printing.

In the following cases, reverse printing is not performed.

- Bit image (ESC '*')
- Downloaded bit image (GS '/')
- Barcode (GS 'k')
- HRI character (GS 'H')
- Portion skipped by horizontal tab (HT)
- Portion skipped by Absolute Position Specify (ESC '\$')
- Portion skipped by Relative Position Specify (ESC '\')
- NV bit image (FS 'p')
- Two-dimensional code (GS 'p')

This command does not affect the space between lines.
 Bold printing specified and double strike printing are ignored.

Reverse print 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.

ESC 'R' n **International Character Select**

Code 1BH 52H n

Definition Range 0≤n≤10

Default n=0

Function Selects the international character sets listed in the following table.

n	Country	n	Country
0	USA	6	Italy
1	France	7	Spain
2	Germany	8	Japan
3	United Kingdom	9	Norway
4	Denmark I	10	Denmark II
5	Sweden		

Related Commands See CHAPTER 9 CHARACTER CODES.

ESC 't' n **Character Code Table Select**

Code 1BH 74H n

Definition Range n=0, 1, 16, 254, 255

Default n=0

Function Selects page n in the character code table as follows.

n	Character set
0	Extended graphics
1	Katakana1
16	Codepage 1252
254	Katakana 2
255	Blank page

Related Commands See CHAPTER 9 CHARACTER CODES.

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

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

Default Unregistered

Function Registers the downloaded character pattern to the specified character code.
 y defines the number of bytes in the vertical direction.
 s defines the registration start character code, and e defines the registration end character code.
 x specifies the horizontal dot count to be registered.

Notes The character codes that can be registered are ASCII code in the range of 20H to 7EH.
 Multiple continuous character codes can be registered per registration. To specify only one character, specify s=e.

d is registration data and indicates the pattern the number of dots in direction x from the left end. If at this time x is less than the character configuration dot count, the remaining dots on the right side become spaces.

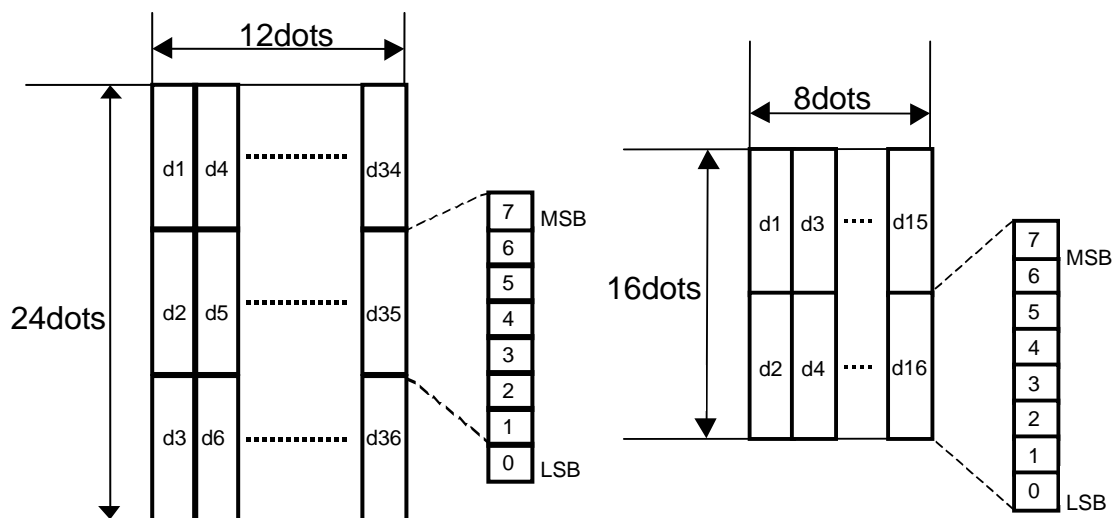
The number of data bytes required for the downloaded character registration of one character k is $k=y \times x$ bytes.

The number of data bytes required for the downloaded character registration of total data n is $n=k \times (e-s+1)$.

Registration data bit is 1 in case of corresponding to a dot to be printed, or is 0 in case of corresponding to a dot not to be printed.

The memory usage is $m=6184$ bytes. (includes information amount)

Related Commands ESC '%', ESC '?'



Code 1BH 25H n

Definition Range $0 \leq n \leq 255$

Default n=0

Function Specifies or cancels a downloaded character set.
If n=<*****0>B, cancels the downloaded character set.
If n=<*****1>B, specifies the downloaded character set.

Notes Only the LSB is significant for n.
If the downloaded character set was canceled, the internal character set is automatically specified.

Related Commands ESC '&', ESC '?'

Code 1BH 3FH n

Definition Range $20H \leq n \leq FEH$

Function Releases the downloaded character corresponding to the specified code.

Notes n indicates the character code for releasing the registration pattern. After releasing, the IFD001 prints the internal character.
Releases the defined pattern of the selected character font code by ESC '!'.
If the specified character code is undefined, this command is ignored.

Related Commands ESC '&', ESC '%'

Code 12H 44H n

Definition Range $0 \leq n \leq 255$

Function Releases the downloaded character area.
If n=<*****0>B, releases the downloaded character area.
If n=<*****1>B, allocates downloaded character area.

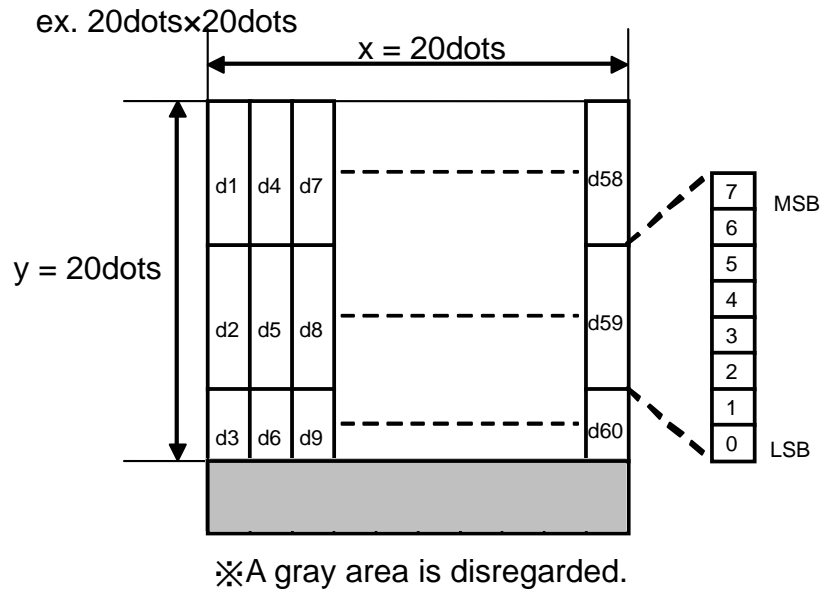
Notes Only the LSB is significant for n.
When the downloaded character area is released, the downloaded characters are deleted, and the downloaded character specification is canceled. Moreover, Downloaded Character Registration (ESC '&') command and Downloaded Character Set Specify/Cancel (ESC '%') command are ignored.

To allocate again a downloaded character area that has been freed, a remaining memory capacity of 6184 bytes or more is required. If the remaining memory capacity is insufficient, the downloaded character area is not allocated and DC2 'D' 1 is ignored.

The remaining memory capacity is not increase. It is possible to use again as the user area by the reduction command of the extended memory area (DC2''''1').

Code	12H 4FH n
Definition Range	$0 \leq n \leq 255$
Default	n=0 (Optional font printing cancel)
Function	Performs optional font selection and cancellation. If n=<*****0>B, cancels optional font printing. If n=<*****1>B, selects optional font printing.
Notes	Only the LSB is significant for n. When an optional font is selected, the subsequent character codes are printed using this optional font when the optional font has been registered previously. Optional font has priority over download font in printing

Code	12H 50H s e y x [d]k
Definition Range	$20H \leq s \leq e \leq 7EH$ $1 \leq y \leq 127, 1 \leq x \leq 127$
Default	Undefined
Function	Allocates memory area of optional font and registers it.
Notes	When optional font is already registered, if it is not as same as the registered content, allocate the area again and register it. The registration start character code is specified with s, and the registration end character code with e. Optional font vertical dot count is specified with y. If y falls outside the domain, the subsequent data is processed as character code. Optional font horizontal dot count is specified with x. If x falls outside the domain, the subsequent data is processed as character code. The data count per character is $INT((y+7)/8) \times x$ bytes. Therefore, the total data count $k = INT((y+7)/8) \times x \times (e-s+1)$. Regarding the font data of one character, 8 vertical dots are input as 1 byte data in the order shown in the following figure. The following figure is based on x=y=20. The calculating method of the total data is different from the calculating method of the total data count k. Because register the memory, the font image is explicate by the low scan style. The memory usage amount $m = INT((x+7)/8) \times y \times (e-s+1) +$ (information amount of the memory)



DC2 'Q'

Optional Font Release

Code 12H 51H

Definition Range Undefined

Function Releases all the registered optional fonts and frees the memory that was used for these optional fonts. Thus, the registered optional fonts are not printed after release.

Notes Line buffer is also cleared.
 The remaining memory capacity is not increased.
 It is possible to use again as the user area by the reduction command of the extended memory area (DC2'***1').

8.4.4 Character Position

ESC 'L'

Page Mode Select

Code 1BH 4CH

Function Switches the mode from the standard mode to the page mode.

Notes This command is effective only when input is executed at the beginning of a line.
This command is not effective when input is executed in the page mode.
The printer unit returns to the standard mode after processing the print with FF or executing the command of ESC 'S'.
In the page mode, the received data is deployed in the print area specified with ESC 'W', and it is batch printed with the FF or ESC FF commands. Print/line feed commands such as LF, ESC 'J', and ESC 'd' just move the pointer to the next data and do not actually cause printing.
The character deployment position is the starting point specified with ESC 'T' in the print area specified with ESC 'W'.

The setting values of the following commands, which have independent values in the page mode and standard mode. The Page Mode Select command is switched to the setting values of the page mode.

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

Although the following commands are set in page mode, the actual printing is not performed.

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

Related Commands FF, CAN, ESC FF, ESC 'S', ESC 'T', ESC 'W', GS '\$', GS '^'
See 8.3.2 Page Mode.

ESC 'S'

Standard Mode Select

Code 1BH 53H

Function Switches the printer unit from the page mode to the standard mode.

Notes This command is effective only when it is input in the page mode.
The data used in the page mode is deleted.
The print area set through the Print Area Set in Page Mode (ESC 'W') is initialized.

The setting values of the following commands, which have independent values in the page mode and standard mode, are switched to the setting values of the standard mode.

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

Related Commands ESC 'L'

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 mechanism)

Function Sets the horizontal basic calculation pitch to 1/x inches, and the vertical basic calculation pitch to 1/y inches.
 Returns to the initial value when x=0, y=0.

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 '\$', FS 'S', GS 'L', GS 'W'
 Commands that use y: ESC '3', ESC 'J', GS '\$', GS 'A', GS 'Y'

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

When starting point is "top left" or "bottom right" through ESC 'T' (characters deployed in 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 'A', GS 'Y'

When starting point is "top right" or "bottom left" through ESC 'T' (characters deployed in paper feed direction)

Commands that use x: ESC '3', ESC 'J', ESC 'W', GS '\$', GS 'A', GS 'Y'
 Commands that use y: ESC SP, ESC '\$', ESC 'W', ESC 'Y', FS 'S'

This command does not affect existing settings.

If the calculation result combined with other commands is a fractional figure, it is compensated using the mechanism's minimum pitch, and the remainder is discarded

Related Commands ESC SP, ESC '\$', ESC '3', ESC 'J', ESC 'W', ESC '\', FS 'S', GS '\$', GS 'A', GS 'L', GS 'W', GS 'Y'

Code 09H

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

Notes This command is ignored if the next horizontal tab position has not been set.
 The print position is shifted to [print area + 1] if the next horizontal tab position is beyond the print area.
 The horizontal tab position is set with ESC 'D'.
 The initial horizontal tab position value is every 8 characters for the characters selected in the initial state.
 Upon reception of this command when the print position is at [print area + 1] and the standard mode is selected, the current line buffer full print 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 + 1] and the page mode is selected, the current line buffer full processing 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 eight characters selected in the initial state

Function Sets the horizontal tab positions.
 n indicates the number of columns from the left margin or the beginning of the line up to the setting position.
 k indicates the number of horizontal tab position data to be set.

Notes The horizontal tab position is set as [n × character width] from the left margin or the beginning of the line.
 Character width here means the entire character width including the space to the right of the character, and when double width is specified, this width is doubled.
 This command cancels already set horizontal tab positions.
 If n=8 is set as the horizontal tab position, the next print position shifts to the 9th column as the result of HT execution.
 A maximum of 32 horizontal tabs can be set (k=32). If the number of tabs exceeds this number, the data after the last tab is processed as regular data.
 The n that specifies the setting position is input in ascending order and then input 00H finally.
 When n is not input in ascending order, the printer exits the process of Horizontal Tab Position Set command and the subsequent data is processed as normal data.
 The values of n must be in ascending order and end with 00H. If n is a value equal to or smaller than the immediately preceding n, tab setting ends the moment this n is input, and the subsequent data is processed as normal data.
 Send the ESC 'D' NUL command to cancel all tab settings.
 If n exceeds the printable area for one line, a horizontal tab is set in the [maximum print column number + 1] position.
 Even if the character width is changed after setting the horizontal tab positions, the set horizontal tab positions remain unchanged.

Related Commands HT

Code 1BH 61H n

Definition Range $0 \leq n \leq 2$, $48 \leq n \leq 50$

Default n=0

Function Selects the type of justification for the print data on each line.

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

Notes This command is effective only when it is input at the beginning of a line.
When the page mode is selected, only the printer unit's internal flag operation is performed when this command is input.
This command does not affect the page mode.
Alignment is performed within the print area's width.
Even portions skipped through the use of HT, ESC '\$', ESC '¥', etc., are subject to alignment.

Code 1DH 4CH nl nh

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

Default nl=0, nh=0

Function Sets the left margin set with nl and nh.
The left margin is $[(nh \times 256 + nl) \times \text{basic calculation pitch}]$ inches.

Notes This command is effective only when input at the beginning of a line.
When the page mode is selected, only the internal flag operation of the printer unit is performed when this command is input.
This command does not affect the page mode.

If a value that exceeds the printable area for 1 line is input, the maximum value of the printable area is set as the left margin.

The basic calculation pitch is set with GS 'P'. The set left margin does not change even if the basic calculation pitch is changed with GS 'P' after the left margin has been set.

The GS 'P' horizontal basic calculation pitch (x) is used for calculating the left margin. Moreover, if the calculation result is a fractional number, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.

If, during character data deployment, the set print area width is less than one character of the currently specified type, the following processing is performed only for that line.

(1) In the range that does not exceed the printable area, the print area corresponding to one character of the specified type is extended toward the right side.

(2) If an area corresponding to one character cannot be secured even when processing (1) is performed, the print area is extended to the left side (the left margin is reduced).

If, during deployment of non-character data (bit image, etc.), the set print area width is less than the minimum width of one internal character, the following processing is performed only for that line.

(1) In the range that does not exceed the printable area, the print area up to one character of the minimum width among the internal characters is extended toward the right side.

(2) If an area corresponding to one character cannot be secured even when processing (1) is performed, the print area is extended to the left side (the left margin is reduced).

Ruled line data specified with ruled line command (DC3) is not shifted or masked by Left Margin Set. (Ruled line data is always valid in printable area.)

Related Commands GS 'P', GS 'W'

GS 'W' nl nh

Print Area Width Set

Code 1DH 57H nl nh

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

Default Printable area

Function Sets the print area width specified with nl and nh.
The print area width is $[(nh \times 256 + nl) \times \text{basic calculation pitch}]$ inches.

Notes This command is effective only when input is executed at the beginning of a line.
When the page mode is selected, only the internal flag operation of the printer unit is performed when this command is input.
This command does not affect the page mode.

If a value that exceeds the printable area for 1 line is input, the entire area except the left margin is set as the print area width.

The basic calculation pitch is set with GS 'P'. Moreover, the set print area width does not change even if the basic calculation pitch is changed with GS 'P' after the print area width has been set.

The GS 'P' horizontal basic calculation pitch (x) is used for calculating the print area width. Moreover, if the calculation result is a fractional number, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.

If, during character data deployment, the set print area width is less than one character of the currently specified type, the following processing is performed only for that line.

(1) In the range that does not exceed the printable area, the print area corresponding to one character of the specified type is extended toward the right side.

(2) If an area corresponding to one character cannot be secured even when processing (1) is performed, the print area is extended to the left side (the left margin is reduced).

If, during deployment of non-character data (bit image, etc.), the set print area width is less than the minimum width of one internal character, the following processing is performed only for that line.

(1) In the range that does not exceed the printable area, the print area up to one character of the minimum width among the internal characters is extended toward the right side.

(2) If an area corresponding to one character cannot be secured even when processing (1) is performed, the print area is extended to the left side (the left margin is reduced).

Ruled line data specified with ruled line command (DC3) is not shifted or masked by Left Margin Set. (Ruled line data is always valid in maximum printable area.)

Related Commands GS 'L', GS 'P'

ESC 'T' n Character Print Direction Specify in Page Mode

Code 1BH 54H n

Definition Range $0 \leq n \leq 3$, $48 \leq n \leq 51$

Default n=0

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

n	Print direction	Starting point
0, 48	Left -> Right	Top left (A in Figure below)
1, 49	Bottom -> Top	Lower left (B in Figure at below)
2, 50	Right -> Left	Bottom right (C in Figure at below)
3, 51	Top -> Bottom	Top right (D in Figure at below)

Notes When the standard mode is selected, only the printer unit's internal flag operation is performed when this command is input.
 This command does not affect the standard mode.
 The character deployment position is the starting point specified with ESC 'W'.
 The basic calculation pitch parameters (x or y) used for the following commands differ depending on the starting point.

When the starting point is "Top Left" or "Bottom Right" (character arranged in direction perpendicular to paper feed)

Commands that use x: ESC 'S', ESC '\$', ESC 't', FS 'S', ESC 'S'

Commands that use y: ESC '3', ESC 'J', GS '\$', GS 'A', GS 'P'

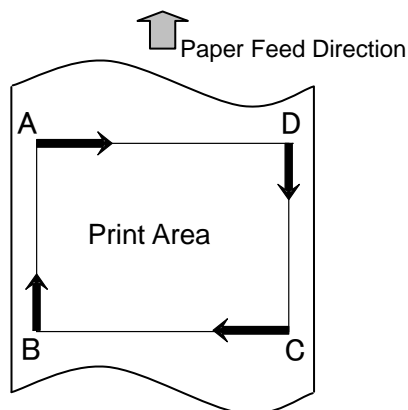
When the starting point is "Top Right" or "Bottom Left" (character arranged in paper feed direction)

Command that use x: ESC '3', ESC 'J', GS '\$', GS 'A', GS 'P'

Commands that use y: ESC 'S', ESC '\$', ESC 'P', FS 'S'

Related Commands ESC '\$', ESC 'L', ESC 'W', ESC 'P', GS '\$', GS 'P', GS 'P'

See 8.3.2 Page Mode.



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 print paper
Function	Sets the print area position and size. 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, only the printer unit's internal flag operation is performed when this command is input.
 This command does not affect the standard mode.
 This command is ignored when the horizontal or vertical starting point falls outside the printable area. Refer to 8.3.2 Page Mode for page mode printable area.

The character deployment position is the starting point specified with ESC 'T' in the print area.

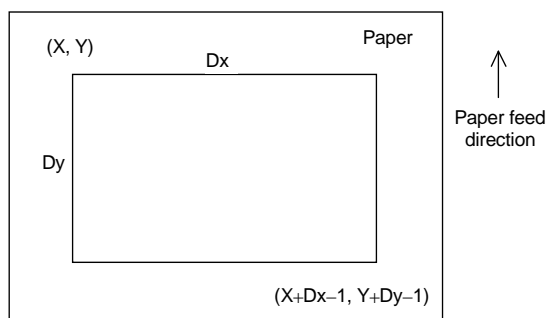
If either the (horizontal starting point + horizontal length) or (vertical starting point + vertical length) falls outside the printable area, the maximum value of the print area becomes the printable area.

The basic calculation pitch is set with GS 'P'. Moreover, the set print area does not change even if the basic calculation pitch is changed with GS 'P' after the print area has been set.

If the calculation result is a fractional figure, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.

Basic calculation pitch (x) is used to calculate the horizontal starting point and horizontal length, and basic calculation pitch (y) is used to calculate the vertical starting point and vertical length.

Using X 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 appears as follows.



When the page mode is selected, the ruled line data specified by the ruled line command (DC3) is effected by the print area specified by this command. The ruled line is not printed outside the print area.

Related Commands CAN, ESC 'L', ESC 'T', GS 'P'
 8.3.2 Page Mode.

Code 1BH 24H nl nh

Definition Range 0≤nl≤255
0≤nh≤255

Function Specifies the print position using the left margin position as reference.
The next print position is [(nH×256+nL) × basic calculation pitch] inches from the left margin position.

Notes Specified values that fall outside the print area are ignored.
The absolute position of the print position is specified using the beginning of the line as reference.

The basic calculation pitch is set with GS 'P'.

If the calculation result is a fractional figure, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.

In case of a printer unit that supports this command, the horizontal basic calculation pitch (x) is used in the standard mode.

In the page mode, the following operations are executed, depending on the starting point.

(1) When the starting point is specified as “upper left” or “lower right” with ESC 'T', the absolute position in the perpendicular direction (horizontal direction of character) is specified for paper feed. At this time, the horizontal direction basic calculation value (x) is used for calculation.

(2) When the starting point is specified as “upper right” or “lower left” with ESC 'T', the absolute position in the paper feed direction (horizontal direction of character) is specified. At this time, the vertical direction basic calculation value (y) is used for calculation.

Related Commands ESC '¥', GS 'P'

Code 1BH 5CH nl nh

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

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

Notes Specified values that exceed the print area are ignored.
In relation to the character direction, to specify a position right of the current position, specify a positive number, and to specify a position left of the current position, specify a negative number. The negative number is in 2's complement.

The basic calculation pitch is set with GS 'P'.

If the calculation result is a fractional figure, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.

In the standard mode, the horizontal basic calculation pitch is used (x).

When the printer unit is used in the page mode, the operations are as follows depending on the starting point.

(1) When the starting point is specified as "upper left" or "lower right" with ESC 'T', the relative position of the direction perpendicular to the paper feed direction (character's horizontal direction) specified. At this time, the horizontal basic calculation pitch (x) is used.

(2) When the starting point is specified as "upper right" or "lower left" with ESC 'T', the relative position of the paper feed direction (character's horizontal direction) is used. At this time, the vertical basic calculation pitch (y) is used

Related Commands ESC '\$', GS 'P'

Code 1DH 24H nl nh

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

Function The absolute vertical data deployment start position of the character is specified on the basis of the starting point, when the page mode is specified.
The absolute position is $[(nh \times 256 + nl) \times \text{basic calculation pitch}]$ inches.

Notes This command is effective only when input at the beginning of a line.
This command is ignored other than when the page mode is selected.
The reference starting point refers to the position specified with ESC 'T'.
Absolute position specification that exceeds the specified print area is ignored.

The operations are as follows depending on the starting point for ESC 'T'.

(1) When the starting point is specified as "upper left" or "lower right", the absolute position in the paper feed direction (vertical direction of the character) is specified. At this time, the vertical basic calculation pitch (y) is used.

(2) When the starting point is specified as "upper right" or "lower left", the absolute position in the direction perpendicular to paper feed (vertical direction of the character) is used. At this time, the horizontal basic calculation pitch (x) is used.

The basic calculation pitch is set with GS 'P'.

If the calculation result is a fractional figure, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.

If characters with different vertical direction extension factors exist in mix on the same line, extension is performed based on the base line or the bottom edge of the character.

The base line is set at 0 dot.

The references for data to the specified print position are as follows.

Character data: Bottom edge of character

Bit image: Bottom edge of bit image

Downloaded bit image: Bottom edge of downloaded bit image

Raster bit image: Upper edge of raster bit image.

NV bit image: Bottom edge of NV bit image

Barcode: Bottom edge of barcode (except HRI character)

Related Commands ESC '\$', ESC 'T', ESC 'W', ESC 'Y', GS 'P', GS 'Y'
8.3.2 Page Mode.

Code 1DH 5CH nl nh

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

Function Specifies the relative vertical data deployment start position using the current position as reference, when the page mode is specified.
The relative position is $[(nh \times 256 + nl) \times \text{basic calculation pitch}]$ inches.

Notes This command is effective only when the page mode is selected.
The current position used as reference means the deployment reference position for the next data.

In relation to the character, to specify a position lower than the current position, specify a positive number, and to specify a position higher than the current position, specify a negative number. The negative number is in 2's complement.

Relative position specifications that exceed the specified print area are ignored.

The basic calculation pitch is set with GS 'P'.

If the calculation result of a model that supports GS 'P' is a fractional figure, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.

The following operations are performed depending on the starting point of ESC 'T'.

(1) When the starting point is specified as "top left" or "bottom right", the relative position of paper feed (Vertical character direction) is specified. At this time, the vertical basic calculation pitch (y) is used for calculation by printer models that support GS 'P'.

(2) When the starting point is specified as "bottom left" or "top right", the relative position perpendicular to paper feed (vertical character direction) is specified. At this time, the horizontal basic calculation pitch (x) is used for calculation by printer models that support GS 'P'.

The references for the deployment of data to the specified print position are as follows.

Character data: Bottom edge of character
 Bit image: Bottom edge of bit image
 Downloaded bit image: Bottom edge of downloaded bit image
 Raster bit image: Upper edge of raster bit image
 NV bit image: Bottom edge of NV bit image
 Barcode: Bottom edge of barcode (except HRI characters)

Related Commands ESC 'T', GS '\$', GS 'P'

8.4.5 Image

ESC '*' m nl nh [d]k

Bit Image Mode Print

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

Definition Range m=0, 1, 32, 33
 0≤nl≤255, 0≤nh≤3, 0≤d≤255

Function Specifies the bit image in mode m for the dot count specified with nl and nh.

m	Mode	Vertical dot density	Horizontal dot density	Data count (k)
0	8-dot single density	8	Single density	nh×256+nl
1	8-dot double density	8	Double density	nh×256+nl
32	24-dot single density	24	Single density	(nh×256+nl) × 3
33	24-dot double density	24	Double density	(nh×256+nl) × 3

Notes If m falls outside the parameter range, the data past nl is processed as normal data. nl and nh indicate the horizontal dots of the bit image to be printed, and are [nh×256+nl]. If bit image data exceeds the printable dot count for one line, the exceeding portion is discarded. d indicates the bit image data. Bits that correspond to dots to be printed are 1, and bits that correspond to dots that are not printed are 0.

If print width of deployed character data by setting GS 'L' or GS 'W' is less than internal one-character, the IFD001 processes only for that line as follows.

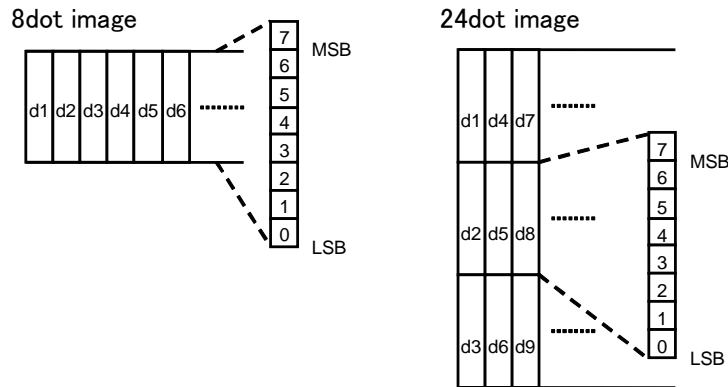
(1) In the range that does not exceed the printable area, the print area corresponding to one character of the specified type is extended toward the right side.

(2) If an area corresponding to one character cannot be secured even when processing (1) is performed, the print area is extended to the left side (the left margin is reduced).

The IFD001 returns to usual data processing after executing image data.

The commands for Bold Print Specify, Double Strike Printing Specify, Underline Specify and Character Font Select other than Inversion printing do not affect this command.

<Data input order>



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

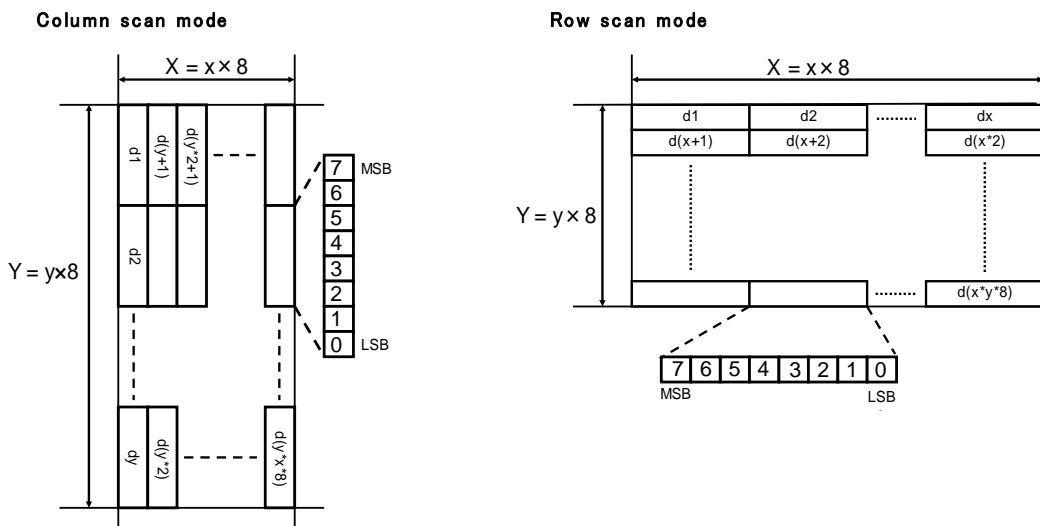
Code 1DH 2AH x y [d]k

Definition Range $1 \leq x \leq 255, 1 \leq y \leq 255, 0 \leq d \leq 255, 8 \leq k \leq 65524$
 (However, delete in case of $x=0$ or $y=0$)

Function Registers the downloaded bit image with bit count defined with x and y.
 $x \times 8$ specifies the horizontal bit count.
 $y \times 8$ specifies the vertical bit count.

Notes Downloaded bit image is register in user area with this command. And it is possible to print by the downloaded bit image print (GS '/'). A horizontal dot count of $(x \times 8)$ dots, and a vertical dot count of $(y \times 8)$ dots is used.
 d indicates the bit image data of the downloaded bit image. 1 is used for bits corresponding to dots to be printed, and 0 for bits corresponding to dots that are not printed.
 Cannot register more than the image data of 65524 bytes.
 Whether to use the column scan mode or the row scan mode for transfer data can be selected with the DC2 'I' command.
 The relation between the downloaded bit image and image data is as follows.
 The memory usage amount $m=k + (\text{amount of the information of the memory})$ bytes.
 If there is the data in the line buffer at the standard mode, this command is ignored.

Related Commands GS '/'



(1) GS 'P' m
(2) GS 'P' m n

Downloaded Bit Image Print
Downloaded Bit Image Selection

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 specified downloaded bit image data in mode m.
When m is in the range $4 \leq m \leq 7$ or $52 \leq m \leq 55$, print position in horizontal direction of downloaded bit image can be specified with n.
(The print position is specified with nx8-dot from the left edge of the paper.)

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

Notes This command is not effective if the downloaded bit image data is not defined.
When the standard mode is selected, this command is effective only when there is no data in the line buffer.
Except for inversion (flip) printing, this command does not affect the print mode (bold print, double strike printing, underline, character size, etc.).
If the registered downloaded bit image data count exceeds the print area, the data that exceeds the print area is not printed.

When downloaded bit image, character data, bit image and barcodes mix in the same line in page mode, the bottom of downloaded bit image and the others are aligned as follows;

Character data: Bottom edge of the character are aligned.

Bit image: The bottom edges of bit images are aligned.

Barcode: The bottom edges of barcodes are aligned. At this time, HRI characters is not included.

If the print area width set with GS 'L' and GS 'W' is less than one character of the minimum width among the internal characters, the following processing is performed only for that line.

(1) In the range that does not exceed the printable area, the print area up to one character of the minimum width among the internal characters is extended toward the right side.

(2) If an area corresponding to one character cannot be secured even when processing (1) is performed, the print area is extended to the left side (the left margin is reduced).

When this command is received with m in the range $0 \leq m \leq 3$ or $48 \leq m \leq 51$, printing starts immediately.

When m is in the range $4 \leq m \leq 7$ or $52 \leq m \leq 55$, the selected downloaded bit image is printed in the character print area and the space between lines. Printing is also done in the paper feed area with ESC 'J' and ESC 'd'.

When the downloaded bit image is selected, specifying outside the range $4 \leq m \leq 7$ or $52 \leq m \leq 55$ cancels the downloaded bit image selection.
 In the page mode, downloaded bit image selection is invalid.

Related Commands GS '*'

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

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

Definition Range $0 \leq m \leq 3, 48 \leq m \leq 51$
 $0 \leq xL \leq 255, 0 \leq xH \leq 255$
 $0 \leq yL \leq 255, 0 \leq yH \leq 15, 0 \leq d \leq 255$
 $k = (xH \times 256 + xL) \times (yH \times 256 + yL)$, however $k \neq 0$

Function Prints raster format dot images in mode m.

m	Mode	Vertical dot density	Horizontal dot density
0, 48	Normal mode	203dpi	203dpi
1, 49	Double width mode	203dpi	101dpi
2, 50	Double height mode	101dpi	203dpi
3, 51	Double height and width mode	101dpi	101dpi

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

Notes When the standard mode is selected, this command is effective only when there is no print data in the line buffer.

None of the printing modes (character size, bold print, double strike printing, inversion (flip) printing, underline, reverse print, etc.) affect raster bit images.

If the print area set with GS 'L' or GS 'W' is less than the minimum width, the print area width is extended to the minimum width for that line only. The minimum width is 1 dot irrespective of the mode.

The data that cannot fit in the print area is discarded by dots.

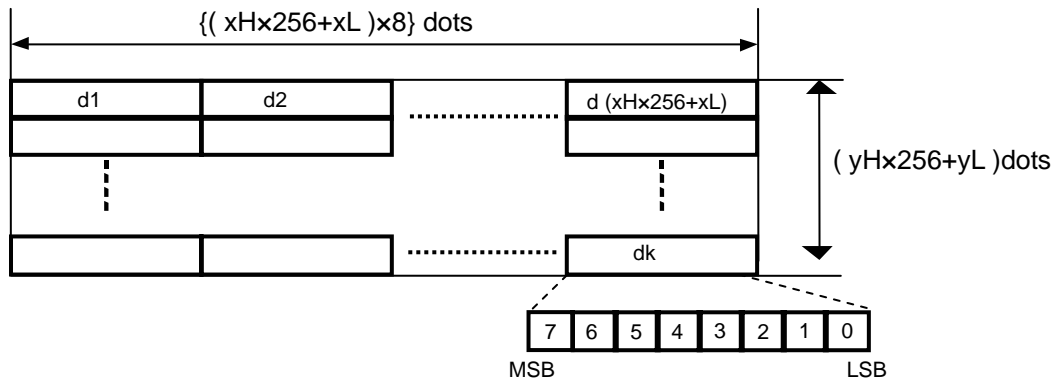
The raster bit image print start position can be freely set with HT (Horizontal Tab), ESC '\$' (Absolute Position Specify), ESC 'Y' (Relative Position Specify), or GS 'L' (Left Margin Set).

The ESC 'a' (Alignment) setting is also effective for raster bit images.

If this command is executed during macro definition, macro definition is stopped and processing of this command starts. At this time, the macro becomes undefined.

d indicates the definition data. Bits that correspond to dots to be printed are 1, and bits that correspond to dots that are not printed are 0.

When executing this command, reduced printing speed due to communication speed may cause poor print quality or abnormal noise. Therefore, this command should be used under the environment which can maintain with a constant speed, for example the Page mode and so on.



(1) FS 'p' n m (2) FS 'p' n m o	NV Bit Image Print NV Bit Image Selection
------------------------------------	--

Code (1) 1CH 70H n m
 (2) 1CH 70H n m o

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

Default Canceled

Function Prints the NV bit image specified with n in mode m.
 In the ranges $4 \leq m \leq 7$ and $52 \leq m \leq 55$, the print position in the horizontal direction of the NV bit image can be specified with o.
 (The print position is specified with 8-dot boundary.)

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

Notes An NV bit image refers to a bit image that can be printed using this command according to the definition of the NV bit image in the nonvolatile memory.
 If specified NV bit image n is undefined, this command is invalid.

When the standard mode is selected, this command is valid only when there is no data in the line buffer.

Except for inversion (flip) printing, this command does not affect the print mode (bold print, double strike printing, underline, character size, reverse print, character 90° right rotate).

If the print area set by GS 'L' and GS 'W' is less than width of one internal character (width of the font size selected by the font size), the following processing actions are executed only for this line.

(1) In a range that does not exceed the printable area, the print area is expanded to the right side to a size where one vertical column of the NV bit image can be printed.

(2) If a sufficient area cannot be secured even when processing (1) is performed, the print area is expanded to the left side (the left margin is reduced).

If a bit image of a size exceeding the print area is specified, the data in the print area becomes the target for printing, but data beyond the print area is not printed.

Regardless of the line spacing set with the initial lines spacing setting (ESC '2') or the line spacing setting (ESC '3'), paper feed is performed (height of NV bit image n dots when the normal mode and double width mode are specified, and (height of NV bit image $n \times 2$) dots when the double height mode and the double height and double width mode are specified.

Upon the completion of printing of the bit image, the beginning of the line becomes the next print position and normal data processing is executed.

When this command is received with m in the range $0 \leq m \leq 3$ or $48 \leq m \leq 51$, printing starts automatically.

When m is in the range $4 \leq m \leq 7$ or $52 \leq m \leq 55$, the selected NV bit image is printed in the character print area and the area between lines. Printing is also done in the paper feed area with ESC 'J' and ESC 'd'.

When the NV bit image is selected, specifying m outside the range $4 \leq m \leq 7$ or $52 \leq m \leq 55$ cancels the NV bit image selection.

Multiple NV bit images cannot be selected. Only the last selection is valid.

In the page mode, NV bit image selection is invalid.

In the page mode, when printing of an NV bit image is specified, the NV bit image is allocated in the image memory inside the printer unit. Actual printing is not performed until page mode printing with the FF or ESC FF command.

Related Commands ESC '*', FS 'q', GS '/', GS 'v' '0'

FS 'q' n [xL xH yL yH [d]k]1 to
[xL xH yL yH [d]k]n

NV Bit Image Define

Code 1CH 71H n [xL xH yL yH [d]k]1 to [xL xH yL yH [d]k]n

Definition Range

- $1 \leq n \leq 255$
- $0 \leq xL \leq 255$
- $0 \leq xH \leq 3$, however, $1 \leq (xH \times 256 + xL) \leq 1023$
- $0 \leq yL \leq 255$
- $0 \leq yH \leq 1$, however $1 \leq (yH \times 256 + yL) \leq 288$
- $0 \leq d \leq 255$
- $k = (xH \times 256 + xL) \times (yH \times 256 + yL) \times 8$
- Entire definition area=(260096 bytes)

Defaults Undefined

Function Defines the NV bit image.

Notes NV bit images refers to items defined with this command in nonvolatile memory, which can be printed with the NV Bit Image Print (FS 'p') command.
 n specifies the number of NV bit images to be defined.

xL and xH specify the horizontal direction of the NV bit image as $(xH \times 256 + xL) \times 8$ bits.
 yL and yH specify the vertical direction of the NV bit image as $(yH \times 256 + yL) \times 8$ bits.

One NV bit image definition data consists of [xL xH yL yH d1 ... dk].

Defines n number of NV bit images in ascending order from NV bit image number 01H. Therefore, the first data group [xL xH yL yH d1 ... dk] becomes NV bit image number 01H, and the last data group [xL xH yL yH d1 ... dk] becomes NV bit image number n. This corresponds to the NV bit image number specified with the NV Bit Image Print (FS 'p') command.

d indicates the definition data. Bits that correspond to dots to be printed are 1, and bits that correspond to dots that are not printed are 0.

This command becomes valid when the 7 bytes from FS to yH are processed as normal values.

All the already defined NV bit images are deleted when this command is executed. Therefore, it is not possible to redefine only one NV bit image among multiple already defined NV bit images. In this case, all the data must be resend.

The definition area in this printer unit is a maximum of 260096 bytes. Multiple NV bit images can be defined, but bit image data whose total capacity exceeds 260096 bytes cannot be defined.

If parameters that exceed the total capacity are specified in the first NV bit image data group ($xH \times 256 + xL > 1023$), ($yH \times 256 + yL > 288$) or ($k > 260096$), this command is invalid. The data following the parameter is processed as character code or a command. In this case, deletion of nonvolatile memory and writing to the nonvolatile memory are not performed.

If a parameter that exceeds the remaining capacity of the definition area in the second and subsequent NV bit image data group is specified with xL, xH, yL and yH, execution of this command is interrupted and writing to nonvolatile memory starts. At this time, the NV bit image in the process of being defined becomes invalid (undefined), but NV bit images before that are valid.

When this command is processed during macro definition, macro definition is interrupted, processing of this command is started, and the contents of macro definition are cleared.

This command defines only NV bit images without printing them. NV bit image printing is executed with the NV Bit Image Print (FS 'p') command.

Do not turn the printer off during executing the command.

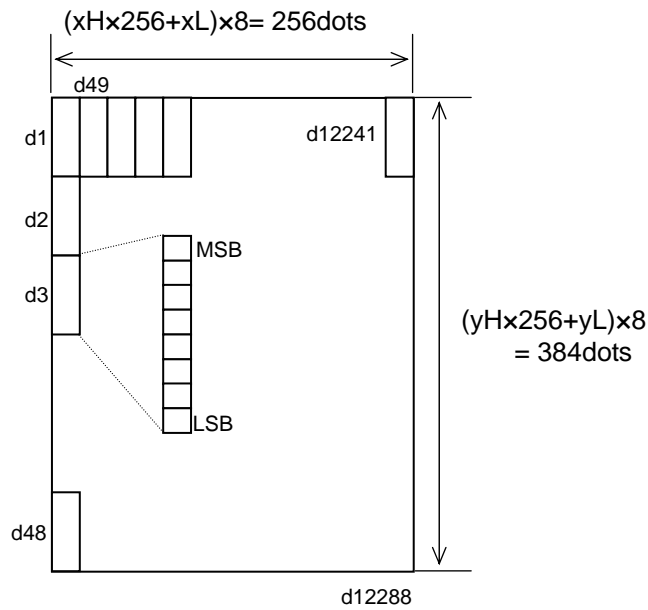
Whether to use the column scan mode or the row scan mode for transfer data can be selected with the DC2 'I' command.

The relation between NV bit images and print data in the column scan mode is as follows.

The memory usage m is

$m = (xH \times 256 + xL) \times (yH \times 256 + yL) \times 8 + (\text{amount of the information of the memory})$ bytes.

If there is the data in the line buffer at the standard mode, this command is ignored.



Example: Using the column scan mode, with $xL=32$, $xH=0$, $yL=48$, $yH=0$

Related Commands FS 'p'

DC2 'l' n

Bit Image Scan Method Selection

Code 12H 49H n

Definition Range $0 \leq n \leq 255$

Default $n=0$ (Column scan)

Function Specifies whether to perform bit image registration transfer data with column scan or row scan.
If $n = \langle \text{*****}0 \rangle_B$, column scan is performed.
If $n = \langle \text{*****}1 \rangle_B$, row scan is performed.

Notes Only the LSB is significant for n.

The commands that are affected by this command are as follows.
NV Bit Image Define (FS 'q')
Downloaded Bit Image Registration (GS '*')

DC2 '=' n

Image LSB/MSB Selection

Code 12H 3DH n

Definition Range $0 \leq n \leq 255$

Default $n=1$

Function When the row scan method is selected as the bit image scan method, selects whether the left edge of the print image is the LSB or MSB.
If $n = \langle \text{*****}0 \rangle_B$, the LSB is the left edge or top.
If $n = \langle \text{*****}1 \rangle_B$, the MSB is the left edge or top.

Notes

Only the LSB is significant for n.

The commands that are affected by this setting are as follows.

NV bit image Mode Define (FS 'q')
Downloaded Bit Image Registration (GS '*')
Raster Bit Image Print (GS 'v' '0')
Ruled Line Image Write (DC3 'v')
Ruled Line Pattern Fill (DC3 'F')

When the column scan method is selected, only the internal flag operation is performed when this command is input.

Related Commands

DC2 'l',

8.4.6 Macro

GS ':'

Macro Definition Start/Stop

Code IDH 3AH

Function Starts and stops macro definition.

Notes Macro definition is define the macro to the nonvolatile memory by this command. It is possible to perform the registered macro by the macro execution (GS '^'). When this command is input during normal operation, macro definition start is specified. Moreover, when this command is input during macro definition, macro definition stop is specified.

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

Macro Execution (GS '^')
Downloaded Character All Release (DC2 'D')
User Defined Character All Release (DC2 'G')
Optional Font Registration (DC2 'P')
Optional Font Release (DC2 'Q')
Extension Memory Initialize (DC2 'R')
NV Bit Image Define (FS 'q')
Downloaded Bit Image Print (GS '*')
Raster Bit Image Print (GS 'v')
User area reduction (DC2 '* '1')

The macro initialization status is undefined.
The definition contents are not cleared by ESC '@'.
When GS ':' is input immediately following input of GS '^', the macro status changes to the undefined status.
A maximum of 2048 bytes of data can be macro defined.

The formula is below shows the memory usage m byte.
 $m = (\text{number of the data}) + (\text{amount of the information of the memory})$

Related Commands GS '^'

GS '^' r t m

Macro Execution

Code 1DH 5EH r t m

Definition Range $0 \leq r \leq 255, 0 \leq t \leq 255, m = 0$

Function Executes macro definition contents.
r specifies the macro execution count.
t specifies the wait time during macro execution.
m specifies the macro execution mode.
Performs continuous execution r number of times, at time intervals specified by $m = 0: t$.

Notes Waits approx. $(t \times 100\text{ms})$ following one macro execution as a result of t specification. When this command is input during macro definition, macro definition is stopped and the definition contents are cleared. When no macro is defined, $r = 0$, and $m \neq 0$, this command is ignored.

Related Commands GS ':'

8.4.7 Bar Code

GS 'H' n

HRI Character Print Position Selection

Code 1DH 48H n

Definition Range $0 \leq n \leq 3, 48 \leq n \leq 51$

Default n=0

Function Selects the HRI character print position during barcode printing.

n	Character position
0, 48	Do not print
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.
HRI characters are printed in the typeface selected with GS 'f'.

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

GS 'f' n

HRI Character Typeface Selection

Code 1DH 66H n

Definition Range n=0, 1, 48, 49

Default n=0

Function Selects the HRI character typeface to be used to print barcodes.

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

Notes HRI is an acronym that stands for Human Readable Interpretation.
HRI characters are printed to the position specified by GS 'H'.
HRI characters are printed as the base position that is downed for the specified characters height from the base line of the barcode print.
Change to initial value in case of hardware reset or initialization.

Related Commands GS 'H'

Code 1DH 68H n

Definition Range $1 \leq n \leq 255$

Default n=162

Function Sets the barcode height to n dots.

Related Commands GS 'k'

Code 1DH 77H n

Definition Range $2 \leq n \leq 6$

Default n=3

Function Sets the barcode's horizontal size.

n	Multilevel barcode module width (mm)	Binary level barcode	
		Fine element (mm)	Thick element (mm)
2	0.250	0.250 (2 dots)	0.625 (5 dots)
3	0.375	0.375 (3 dots)	1.000 (8 dots)
4	0.500	0.500 (4 dots)	1.250 (10 dots)
5	0.625	0.625 (5 dots)	1.625 (13 dots)
6	0.750	0.750 (6 dots)	1.875 (15 dots)

Notes Multilevel barcode refer to the following barcode systems.
UPC-A, UPC-E, JAN13 (EAN13), JAN8 (EAN8), CODE93, CODE128, JAN13 add-on

Binary barcode refer to the following barcode systems.
CODE39, ITF, CODABAR

Set a value of 3 or greater to n to print a ladder barcode (barcode printed horizontally when viewed in the paper feed direction).

When 2 is set to n, read out accuracy may be downed.

If the direction of ladder barcode is perpendicular to the paper feed direction, and printing JAN13 add-on with LTPD247/CAPD247, can not print by the default n=3. Set to n=2.

Related Commands GS 'k'

Code 12H 3AH n

Definition Range $0 \leq n \leq 2$

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

Notes Some barcode readers may not read the barcode depending on the setting of the narrow width and the setting value of this command.
Use this command after confirming that there is no problem.

Related Commands ESC '@'

(1) GS 'k' m [d]k NUL**(2) GS 'k' m n [d]n****Barcode Print**

Code 1DH 6BH m [d]k 00H
 1DH 6BH m n [d]n
 1DH 6BH m [d]k 00H [d2]s 00H (JAN13 add-on)
 1DH 6BH m n [d]n s [d2]s (JAN13 add-on)

Definition Range $0 \leq m \leq 6$, $m=10$, $32 \leq d \leq 126$, $1 \leq k \leq 255$
 $65 \leq m \leq 73$, $m=75$, $1 \leq n \leq 255$, $0 \leq d \leq 127$
 $s=2,5$ $48 \leq d2 \leq 57$ (JAN13 add-on)

Function Selects the barcode typeface and prints the barcode.

m	Barcode system	Barcode data count	Remark
0	UPC-A	Fixed ($11 \leq k \leq 12$)	Same barcode system as m = 65
1	UPC-E	Fixed ($11 \leq k \leq 12$)	Same barcode system as m = 66
2	JAN13 (EAN)	Fixed ($12 \leq k \leq 13$)	Same barcode system as m = 67
3	JAN8 (EAN)	Fixed ($7 \leq k \leq 8$)	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
10	JAN13 add-on	Variable	Same barcode system as m = 75
65	UPC-A	Fixed ($11 \leq k \leq 12$)	Same barcode system as m = 0
66	UPC-E	Fixed ($11 \leq n \leq 12$)	Same barcode system as m = 1
67	JAN13 (EAN)	Fixed ($12 \leq n \leq 13$)	Same barcode system as m = 2
68	JAN8 (EAN)	Fixed ($7 \leq n \leq 8$)	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	JAN13 add-on	Variable	Same barcode system as m = 10

Notes The command configuration, code, domain, and some notes differ depending on the value of m. When $m=0$ to 6 and $m=65$ to 71, or $m=10$ and $m=75$, the same barcode system is selected and the print result is also the same.

d and d2 indicate the characters to be printed. In all the barcode systems, if d and d2 are the characters that cannot be printed, the barcode is printed until then and normal data processing is resumed from the next data.

s indicates the number of added symbol data.

If specifying a UPC-A barcode data and a UPC-E barcode data by 12 bytes including the check digit, the printer ignores the 12th byte and automatically calculates the check digit.

If specifying a JAN13 (EAN) barcode data by 13 bytes including the check digit, the printer ignores the 13th byte and automatically calculates the check digit.

If specifying a JAN8 (EAN) barcode data by 8 bytes including the check digit, the printer ignores the 8th byte and automatically calculates the check digit.

The printer unit performs paper feed a distance equivalent to the barcode height (including HRI characters when HRI character printing is specified), regardless of the line spacing set with ESC '2' or ESC '3'.

When the standard mode is selected and the horizontal direction exceeds the print area for one line, the printer unit does not print the barcode and performs only paper feed.

When the standard mode is selected, this command is effective only when there is no data in the line buffer. If data exists in the line buffer, data past m is processed as normal data. Moreover, the beginning of the line following barcode operation completion becomes the next print position.

Selecting the standard mode does not affect the print modes other than the inversion (flip) printing (bold printing, double strike printing, underline, character size, etc.)

For the concept of the barcode printing in the standard mode, refer to the figure [Barcode print in the standard mode].

When the page mode is selected, the printer unit performs only barcode data deployment and does not print. After completion of barcode deployment, the next dot following the last barcode data becomes the next print position.

In page mode, if barcodes, character data, bit images, and downloaded bit images exist together on the same line, the bottom edge of the barcode and the following positions of the character data, bit image and downloaded bit image are aligned. At this time, HRI characters are not included. (See the figure [Barcode print in the page mode].)

Character data: Bottom edge of character

Bit image: Bottom edge of bit image

Downloaded bit image: Bottom edge of downloaded bit image

In page mode, after completion of barcode deployment, the next dot following the last barcode data becomes the next print position.

When the barcode width exceeds the print area in page mode, barcode printing is not performed, and the position for data deployment shifts to the left side outside the print area.

In page mode, barcode layout includes horizontal tab.

In page mode, inversion (flip) printing, bold line, under line and character size do not affect barcode printing.

In page mode, when the print start position is specified to lower left or upper right by Character Print Direction Specify in Page Mode (ESC 'T'), the direction of bars is perpendicular to the paper feed direction (ladder barcodes).

When printing using ladder barcodes, height of the barcode should be 10 mm or higher and ambient temperature should be 0 to 40 °C (32 to 104 °F).

If not, print may be unstable and read out accuracy may be worsened.

In page mode, when the print start position is specified to lower left or upper right by Character Print Direction Specify in Page Mode (ESC 'T'), width of the barcode should be 30 cm or shorter. The IFD001 can not print correctly if long width bar code is printed.

[1 Notes regarding: <GS 'k' m[d]k NUL>]

This command ends with NUL code.

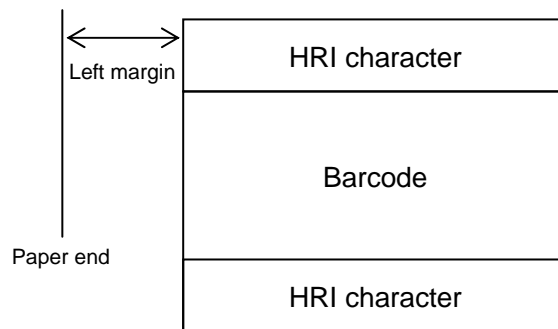
k indicates the barcode data count. If a barcode system with fixed data count is selected, be sure to make k match this character count. If the data count is insufficient, data processing is performed up to the NUL code. Moreover, if the data count is excessive, a fixed length of data is processed and any excess data is processed as normal data.

Always make the data count for ITF barcodes with m=5 an even number. If the data count is an odd number, the last data is ignored.

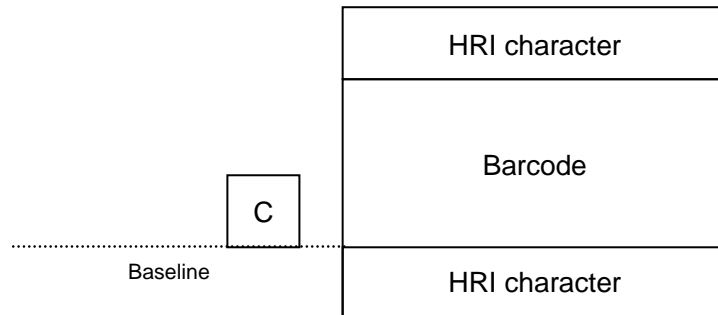
[2 Notes regarding: <GS 'k' m n [d]n>]

n indicates the data count, and n bytes are processed as barcode data from the next data. If n falls outside the domain or the data count when the ITF barcode with m=70 is selected is an odd number, command processing is stopped and data from the next data is processed as normal data.

[Barcode print in the standard mode]



[Barcode print in the page mode]



Related Commands GS 'H', GS 'f', GS 'h', GS 'W', DC2 'z'

8.4.8 Two-dimensional Bar Code

GS 'n' n

Nominal Fine Element Width

Code	1DH 6EH n
Definition Range	$2 \leq n \leq 4$ (dot count)
Function	Sets the nominal fine element width.
Default	n=3
Related Commands	GS 'p'

GS 'o' n

PDF Module Height Set

Code	1DH 6FH n
Definition Range	$2 \leq n \leq 127$
Default	n=10
Function	Sets the PDF module height by dot.
Notes	If the module height is set too low, the barcode reader may not be able to read barcodes. Min. height should be specified more than 3 dots in case of the normal use.

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

PDF417 Print

Code	IDH 70H 00H m2 e r c nl nh [d]k
Definition Range	$0 \leq m2 \leq 255$ $0 \leq e \leq 8$ $0, 3 \leq r \leq 90$ $0, 1 \leq c \leq 30$ $0 \leq d \leq 255$ $0 \leq nl, nh \leq 255$ $1 \leq k (=nh \times 256 + nl) \leq 499$
Function	PDF417 is printed from the specified contents. m2=<*****0>B : Normal mode m2=<*****1>B : Simple mode (Micro PDF is not supported) e: Error correction level r: Module (0 is automatically set) c: Number of columns in data area (0 is automatically set) d: Data k: Data count
Related Commands	GS 'n', GS 'o'

Code 12h 3BH n

Definition Range $2 \leq n \leq 16$

Default n=6

Function Specifies a module size of QR Code and Data Matrix.
n: The number of dots for one side of the module size.

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

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

Definition Range model=01H, 02H
e=4CH, 4DH, 51H, 48H
 $0, 1 \leq v \leq 40$
mode=4EH, 41H, 42H, 4BH, 4DH
 $1 \leq nh \times 256 + nl \leq 7089$

Function Prints QRCode data based on the specified contents.

model: Specifies a model

e: Selects an error correction level.

'L' (4CH), 'M' (4DH), 'Q' (51H), 'H' (48H)

v:=0: Automatic selection (A version is automatically selected depending on the number of input data.)

$1 \leq v \leq 40$ Fixed version (up to 14 for model-1)

mode: Specifies a mode of data.

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

nl, nh: Specifies the number of data.

Data: Kanji data of the QRCode data should be set by Shift JIS code.

Notes

When specifying any value out of the defined range, this command is ignored, and the subsequent data is processed as the normal data.
 When specifying any value of 7090 or more bytes, the subsequent data is processed as the normal data.
 The maximum value should be 7089 or less bytes depending on the model, the mode, and the error revision level.
 When specifying any value exceeding the maximum value, the value is read out.

When the horizontal width (includes a quiet zone) of the QRCode exceeds the print area, this command is ignored.
 In the standard mode, when data exists in the line buffer, this command is ignored.
 In the standard mode, Alignment and Inversion (Flip) Printing are enable.
 The width of the quiet zone is fixed 4 modules.

Related Commands

ESC 'a', ESC '{'

GS 'p' 2 ecc row col nl nh data**Data Matrix Print****Code**

1DH 70H 02H ecc row col nl nh [data]

Definition Range

ecc=00H
 $8 \leq \text{row} \leq 144$
 $10 \leq \text{col} \leq 144$
 $1 \leq \text{nh} \times 256 + \text{nl} \leq 3116$

Function

Prints the Data Matrix code base on the specified contents.

ecc: 00H (ECC 200) (for future extensional function)

row: Specifies the number of the modules for the vertical direction.
 When '0' is specified, this is defined automatically.

col: Specifies the number of the modules for the horizontal direction.
 When '0' is specified, this is defined automatically.

nl, nh: Specifies the number of the data.
 The maximum number of the data is 3116 bytes.
 When specifying any value of more than 3117 bytes, the subsequent data is processed as the normal data.

Notes

When specifying any value other than the number of the modules for horizontal and vertical directions in ECC 200, this command is ignored.
 When specifying any value exceeding 3116 bytes, the subsequent data is processed as the normal print data.
 The maximum value varies depending on the number of the modules for horizontal and vertical directions and storage data. When specifying any data exceeding the maximum value, it is discarded.
 When the barcode size (includes a quiet zone) exceeds the print area, this command is ignored.
 In the standard mode, when the data exists in the line buffer, this command is ignored.
 In the standard mode, Alignment and Inversion (Flip) Printing are enable.
 The width of the quiet zone is fixed to 1 value.
 The Structured Append is not supported.

Only the following combinations between horizontal line (row) and vertical line (column) are enable.

Squares (Row × Column)

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 × Column)

8×18, 8×32, 12×26, 12×36, 16×36, 16×48

Related Commands ESC 'a', ESC '{

GS 'p' 3 mode ...n data

Maxi Code Print

Code 1DH 70H 03H 02H sc cc pc n [data] (mode2)
1DH 70H 03H 03H sc cc pc n [data] (mode3)
1DH 70H 03H 04H n [data] (mode4)
1DH 70H 03H 05H n [data] (mode5)

Definition Range $1 \leq n \leq 138$

Function Prints the Maxi Code data based on the specified contents.

- sc: Specifies a service class.
In mode 2, and mode 3, sc should be 3-digit numerals.
- cc: Specifies a country code.
In mode 2, and mode 3, cc should be 3-digit numerals.
- pc: Specifies a postal code.
In mode 2, the postal code should be specified in 9-digit numerals.
If less than 9-digit numerals is desired, specify data except numerals for the remainder.
In mode 3, the postal code should be specified in 6 alpha numerals.
- n: Specifies the number of the data.

Notes When specifying any value of 139 or more bytes, the subsequent data is processed as the normal print data.
The maximum data value will be 138 or less bytes depending on the mode. When specifying any data exceeding the maximum value, it is discarded.

When the barcode size (includes a quiet zone) exceeds the print area, this command is ignored.
In the standard mode, when data exists in the line buffer memory, this command is ignored.
In the standard mode, Alignment and Inversion (Flip) Printing are enable.
The print size of the barcode is fixed to vertical 213 dots × horizontal 225 dots.
The right and left width of the quiet zone is 8 dots.
The bottom and top width of the quiet zone is 7 dots.
The Structured Append is not supported.

Related Commands ESC 'a', ESC '{

8.4.9 Kanji

FS '&'

Kanji Mode Specify

Code 1CH 26H

Function Specifies the Kanji mode.

Notes When the Kanji code system is Shift JIS, only the internal flag operation of the printer unit is performed when this command is input. In this case, printing is not affected.
The initial state is the Kanji mode cancel status.
The Kanji code is processed 1st byte first, then 2nd byte.

Related Commands FS '.', FS 'C'

FS '.'

Kanji Mode Cancel

Code 1CH 2EH

Function Cancels the Kanji mode.

Notes If the Kanji code system is Shift JIS, only the internal flag operation of the printer unit is performed when this command is input. In this case, printing is not affected.
The initial state is the Kanji mode cancel status.

Related Commands FS '&', FS 'C'

FS '! n

Kanji Print Mode Specify

Code 1CH 21H n

Define Range $0 \leq n \leq 255$

Default n=0

Function Specifies the Kanji print mode.

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	Underlined	Cancel	Specify

Notes

When both double width and double height are specified, the character size becomes double height and double width.

Underline is applied to the entire character width including the spaces to the left and right of the character. However, underline is not applied to the portion skipped by HT, etc., and to 90° rotated characters.

The underline width is the thickness set with FS '- ', regardless of the character size. If the underline width is not set with FS '- ', it is set to 1 dot.

If characters with different vertical extension rates exist on the same line, the characters are extended using the bottom edge of the characters as reference (bottom edges of characters are aligned).

When characters are extended horizontally, extension is done in the right direction using the bottom edge of the characters as reference.

In case of print modes that enable specification/cancellation of the same parameters, such as character size and underline, as other commands, the command that is processed last is the one that is effective. Therefore, if, after double height and double width are specified with FS 'W', double height and double width are canceled with FS '!', the FS 'W' specification is canceled.

Related Commands

FS '- ', FS 'W'

FS '- ' n**Kanji Underline Specify****Code**

1CH 2DH n

Define 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	Set 1-dot height Kanji underline and specify Kanji underline
2, 50	Set 2-dot height Kanji underline and specify Kanji underline

Notes

Underline is applied to the entire character width including the spaces to the left and right of the character. However, underline is not applied to the portion skipped by HT, etc., and to 90° rotated characters.

If Kanji underline is canceled with n=0, underline is not applied to the subsequent Kanji data, but the underline width setting in effect until immediately before is retained. Moreover, in the initial state, the default width of Kanji is 2 dots.

The Kanji underline width is the specified thickness (and thus is constant), regardless of the character size.

Underline specification/cancellation is also possible with FS '!', but the command that was processed last is valid. Therefore, if following specification of underline with FS '!', underline is canceled with FS '- ', the FS '!' specification is canceled.

Related Commands

FS '!'

Code 1CH 43H n

Definition Range n=0, 1, 48, 49

Default n=0

Function Selects the Kanji code system.

n	Function
0, 48	JIS code system
1, 49	Shift JIS code system

Notes The Kanji code valid in the JIS code system is as follows.
 1st byte: 21H to 7EH
 2nd byte: 21H to 7EH

The Kanji code valid in the Shift JIS code system is as follows.
 1st byte: 81H to 9FH and E0H to EFH
 2nd byte: 40H to 7EH and 80H to FCH

Code 1CH 53H n1 n2

Definition Range $0 \leq n1 \leq 255, 0 \leq n2 \leq 255$

Default n1=0, n2=0

Function Sets the Kanji's left space (n1) and the Kanji's right space (n2).
 The left space is [n1 × basic calculation pitch] inches, and the right space is [n2 × basic calculation pitch] inches.

Notes When specify the expand width as double, the space of the left and the right is double as the setting amount. The basic calculation pitch is set with GS 'P'. Moreover, the set space does not change even if the basic calculation pitch is changed with GS 'P' after the Kanji space settings have been performed.

If the result calculated with GS 'P' is a fractional figure, it is compensated using the mechanism's minimum pitch with the remainder discarded.

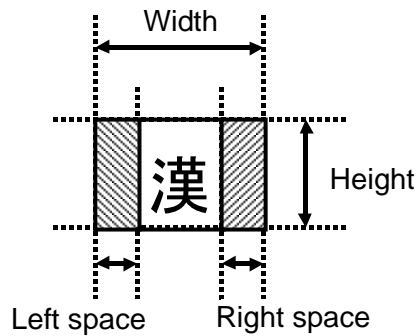
It is possible to set the independent right space amount for standard mode and page mode.
 In standard mode, the horizontal basic calculation pitch (x) is used.

In the page mode, the basic calculation pitch is as follows, depending on the starting point.

(1) When the starting point is specified as "top left" or "bottom right" with ESC 'T', the horizontal basic calculation pitch (x) is used.

(2) When the starting point is specified as "top right" or "bottom left" with ESC 'T', the vertical basic calculation pitch (y) is used.

Related Commands GS 'P'



FS 'W' n

Kanji Double Height and Double Width Specify/Cancel

Code 1CH 57H n

Define Range $0 \leq n \leq 255$

Default n=0

Function Specifies or cancels double height and double width for Kanji.
 When $n = \langle \text{*****}0 \rangle B$, double height and double width is canceled.
 When $n = \langle \text{*****}1 \rangle B$, double height and double width is specified.

Notes Only the LSB is significant for n.
 Double height and double width characters are the characters for which double height and double width are specified simultaneously.

When double height and double width is canceled using this command, the printer unit prints the subsequent data starting from the next character in the normal size.

If characters with different vertical extension rates exist on the same line, they are extended using the characters' bottom edge as reference (the characters' bottom edges are aligned).

If extending characters in the horizontal direction, they are extended in the right direction using the left edge of the character as reference.

It is possible to specify/cancel double height and double width characters by simultaneously specifying double width extension and double height extension with FS '!', but the command that is processed last is valid. Therefore, if double height and double width are canceled with FS 'W' following specification of double height and double width, the specification with FS '!' is cancelled.

Related Commands FS '!'

DC ' ' n

Kanji Font Selection

Code 12H 2EH n

Definition Range n=0, 1, 48, 49

Default n=0

Function Selects the Kanji font.

n	Function
0, 48	Select Kanji font A (24X24)
1, 49	Select Kanji font B (16X16)

Notes It is possible to select the Kanji font with FS !, but the command that is processed last is valid.

Related Commands FS !

FS '2' c1 c2 [d]k

User-Defined Character Registration

Code 32H c1 c2 [d]k

Definition Range The domain 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 and 80H≤c2≤9EH
0≤d≤255

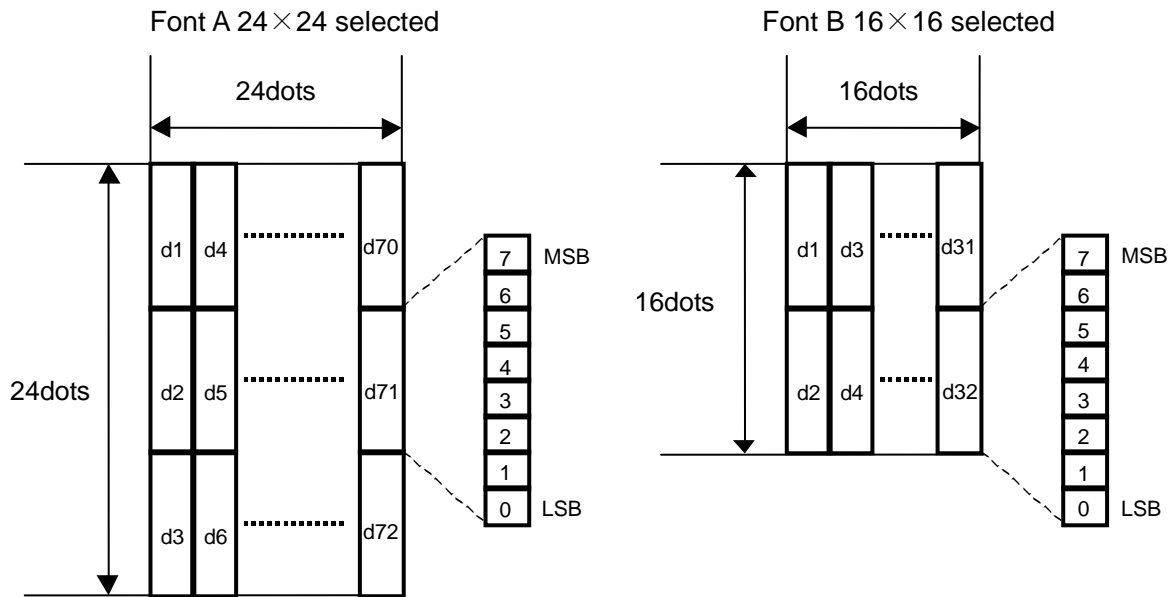
k=72 (when 24 × 24 font is selected)
k=32 (when 16 × 16 font is selected)

Default Undefined

Function Registers the Kanji user-defined character pattern as the character code specified with c1, c2. Rewriting to already registered external character is over written.

Notes c1, c2 indicate the Kanji code for defining user-defined characters, c1 indicating the 1st byte, and c2 the 2nd byte.
d indicates the definition data. Bits that correspond to dots to be printed are 1, and bits that correspond to dots that are not printed are 0.
k indicates the definition data count. This count differs depending on the selected font size.
The memory usage m=9784 bytes.(included the information amount of memory)

Related Commands FS'C'



DC2 'G' n

User-Defined Character Area Operation

Code 12H 47H n

Definition Range $0 \leq n \leq 255$

Function Releases user-defined character area.
 If $n = \langle \text{*****}0 \rangle B$, releases user-defined character area.
 If $n = \langle \text{*****}1 \rangle B$, allocates user-defined character area.

Notes Only the LSB is significant for n.
 User-defined characters are not printed when the user-defined character area is released.
 The user-defined character area is 9784 bytes. If this area is released, the remaining memory capacity is not increase.
 The user area is allocated again by the reduction command of extended memory area (DC2''*1').
 To allocate again a user-defined character area that has been freed, a remaining memory capacity of 9784 bytes or more is required. If the remaining memory capacity is insufficient, the user-defined character area is not allocated and DC2 'G' 1 is ignored.

8.4.10 Auxiliary Functions

ESC '=' n

Peripheral Equipment Selection

Code 1BH 3DH n

Definition Range $0 \leq n \leq 255$

Default n=1

Function Selects peripheral equipment for which data from the host computer is valid.

Bit	Function	Value	
		0	1
0	Printer unit	Disable	Enable
1	Undefined	–	–
2	Undefined	–	–
3	Undefined	–	–
4	Undefined	–	–
5	Undefined	–	–
6	Undefined	–	–
7	Undefined	–	–

Notes If the printer disable setting is selected, the printer unit discards all the data except the error recover command, until the printer enable setting is again selected.

ESC '@'

Printer Initialize

Code 1BH 40H

Function Clears the data in the line buffer and initializes the settings.

Notes The function settings and DIP switch reread is not performed.
The data in the input buffer is held.

Related Commands 8.5 List of Initial values.

DC2 '@'

Hardware Reset

Code 12H 40H

Function Performs hardware reset.

Notes Performs the same operation as during power on.

GS FF**Marked Paper Form Feed****Code** 1DH 0CH**Function** Executes the marked paper form feed (form feed to the cut position).**Notes** This command is enabled only when entered at the top of the line. Otherwise it is ignored. Executing this command at the print start position does not have the paper form feed to the next print start position.**GS '<'****Marked Paper Form Feed****Code** 1DH 3CH**Function** Performs the marked paper form feed.**Notes** This command is effective only when marked paper is selected. Executes the paper form feed to the cutting position after initialization.**GS 'A' m n****Marked Paper Form Feed Position Correct****Code** 1DH 41H m n**Definition Range** $0 \leq m \leq 1, 48 \leq m \leq 49$
 $0 \leq n \leq 255$ **Function** Sets the amount of correction for the marked paper form feed position in relation to the initial position.
m specifies the correction direction.

m	Print Position
0, 48	Forward
1, 49	Reverse
2, 50	Forward, NV memory
3, 51	Reverse, NV memory

n specifies the amount of correction.
The absolute position is [n × basic calculation pitch] inches.**Notes** This command is effective only when the marked paper have been selected. This command is ignored unless it is input immediately the following marked paper form feed (FF, GS FF, GS '<', paper feed switch operation, etc.).

The edge of next mark cannot go beyond the mark sensor. If a correction amount that exceeds the marked paper edge is set, the paper form feed position is set at the end of mark.

The basic calculation pitch is set with GS 'P'.

The vertical basic calculation pitch (y) is used for calculating the correction amount. If the calculation result is a fractional figure, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.

Paper feed is performed to compensate during command execution. The paper feed distance depends on the set correction amount.

If choose the writing to NV memory, initialize the printer after writing to NV memory.

When adjusting the paper form feed position, set the distance from the paper edge to the print start position with an enough margin.

The print start position for the paper may change depending on the temperature and humidity. If setting with no margin, unprinted area or paper jam may occur. Set a margin of 3 mm or more from the paper edge.

When the paper form feed position is corrected forward, note that the next mark does not overlap with the sensor.

A printing defect may occur when the paper form feed performs paper reverse.

Related Commands FF, GS 'FF', GS '<', GS 'P'

GS 'C' '0' n m

Counter Print Mode Set

Code 1DH 43H 30H n m

Definition Range $0 \leq n \leq 5$
 $0 \leq m \leq 2, 48 \leq m \leq 50$

Default n=0, m=0

Function Sets the continuous counter print mode.

n specifies the number of print columns.

When n=0, only the number of columns corresponding to the counter value is printed.

When n≠0, the number of print columns is set.

m specifies the print position of the continuous counter print position within the set number of columns.

m	Print Position	Processing when counter value is lower than the set number of columns
0, 48	Align right	Add space(s) to left side
1, 49	Align right	Add '0' to left side
2, 50	Align left	Add space(s) to right side

Notes When the counter value is higher than the n set number of columns, the printer unit prints n columns below the counter value.

When n=0, the value of m is meaningless.

When n or m falls outside the domain, 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 continuous counter.
 n specifies the step magnitude during count-up or count-down.
 r specifies the 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] becomes the minimum counter value, and [bH×256+bL] becomes the maximum counter value. Moreover, 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] becomes the maximum counter value, and [bH×256+bL] becomes the minimum counter value. Moreover, when the counter is smaller than the minimum value, count-down from the maximum value starts again.

Related Commands GS 'C' '0', GS 'C' '2', GS 'c'

Code 1DH 43H 32H nL nH

Definition Code

0≤nL≤255
 0≤nH≤255

Default nL=1, nH=0

Function Sets the continuous counter value.

Notes nL and nH indicate the continuous counter value, and the counter value is [nH×256+nL].

When the count-up mode is specified, if the counter value set with this counter falls outside the counter range set with GS 'C' '1', the counter value is forcibly changed to the minimum value upon execution of the next GS 'c' command.

When the count-down mode is specified, if the counter value set with this command falls outside the counter range set with GS 'C' '1', the counter value is forcibly changed to the maximum value upon execution of the GS 'c' command.

Related Commands GS 'C' '0', GS 'C' '1', GS 'c'

Code 1DH 63H

Function Sets the continuous counter value to the line buffer and updates the counter.

Notes After setting the current continuous counter value as print data (character string) to the line buffer, performs counter count-up or count-down according to the set count mode. The counter value set to the line buffer is printed through a print command or buffer full.

When the count-up mode is specified, if the counter value exceeds the counter range set with GS 'C' '1', the counter value is forcibly changed to the minimum value through execution of this command.

When the count-down mode is specified, if the counter value exceeds the counter range specified with GS 'C' '1', the counter value is forcibly changed to the maximum value through execution of this command

Related Commands GS 'C' '0', GS 'C' '1', GS 'C' '2'

Code 1DH 49H n

Definition Range $1 \leq n \leq 3, 49 \leq n \leq 51$

Function Sends the specified printer ID.

n	Printer ID type	Specification
1, 49	Printer model ID	0BH
2, 50	Type ID	See Table [Type ID]
3, 51	ROM version ID	Depends on ROM version

Table [Type ID]

Bit	Sensor	Value	
		0	1
0	Extended CG	No	Yes
1	Autocutter	No	Yes
2	Mechanism	LTPD247/ CAPD247	LTPD347/ CAPD347
3	Undefined(Reserved)	Fixed to 0	
4	Identifier	Fixed to 0	
5	Presenter	No	Yes
6	Undefined(Reserved)	Fixed to 0	
7	Identifier	Fixed to 0	

Notes

Each printer ID is responded by 1-byte.
 Since this command is executed during input buffer deployment, a delay may occur between command reception and printer ID transmission, depending on the input buffer status.
 ROM version ID is needed when the IFD001 F/W is uploaded.

- (1) GS 'V' m
- (2) GS 'V' m n

Paper Cut Position Feed**Code**

- (1) 1DH 56H m
- (2) 1DH 56H m n

Definition Range

- (1) m=0, 1, 48, 49
- (2) m=65, 66, $0 \leq n \leq 255$

Function

Feeds the paper to the specified paper cut position.

m	Function
0, 48	Full cut
1, 49	Partial cut
65	Cut position + [n × basic calculation pitch] feed forward and full cut
66	Cut position + [n × basic calculation pitch] feed forward and partial cut

Notes

The command configuration, code, domain, and some notes differ depending on the value of m. In the standard mode, this command is effective only when input is executed at the beginning of a line.

[1 Note regarding: GS 'V' m]

If no autocoder is selected in the function settings, only paper feed is performed.

[2 Notes regarding: GS 'V' m n]

If no autocoder is selected in the function settings, only paper feed is performed.

When n=0, the printer unit feeds the paper to the cut position.

When n≠0, the printer feeds [n × basic calculation pitch] inches beyond the cut position.

The basic calculation pitch is set with GS 'P'.

The vertical basic calculation pitch (y) is used as the paper feed distance. Moreover, if the calculation result is a fractional figure, it is compensated using the mechanism's minimum pitch, and the remainder is discarded.

Related Commands

6.7 FUNCTION SETTINGS.

Code 1BH 70H m n1 n2

Definition Range $0 \leq m \leq 255$
 $0 \leq n1 \leq 255, 0 \leq n2 \leq 255$

Operating Drive the drawer.
 If $n = \langle \text{*****}0 \rangle B$, drive the drawer.
 If $n = \langle \text{*****}1 \rangle B$, ignored.

Specified the time of the pulse ON/OFF, by n1 and n2.
 time ON : $n1 \times 2$ ms
 time OFF : $n2 \times 2$ ms

Notes Only the LSB is significant for n.
 If $n1=0$, drawer is not driven. When the function settings enable, this command is ignored.

Related Commands 6.7 FUNCTION SETTINGS

Code 1DH 67H 30H m n1 nh

Definition Range $m=0$
 $(nh \times 256 + n1) = 20, 21, 50, 61, 62, 70$

Function Sets the values of the specified maintenance counter and the maintenance counter saved in the non-volatile memory to '0'.
 Specifies the maintenance number as $nh \times 256 + n1$.

nh×256+n1		Counter type
Hexadecimal	Decimal	
14H	20	Paper feed line count (unit: 100-dot line)
15H	21	Number of head activation times (unit: 100 dot line)
32H	50	Number of autocutter drive times
3DH	61	(Reserved)
46H	70	Drive time of printer unit (unit: minute)

Notes It may cause a breakage in the non-volatile memory because this command is frequently used. It is recommended that this command be used less than 10 times/day.

The printer turns BUSY status during writing data to the non-volatile memory for this command. Do not transmit data from the host computer while the printer is in BUSY status. The printer stops data receiving.

Do not turn the printer off during executing the command.

Related Commands GS 'g' '1', GS 'g' '2'

Code 1DH 67H 31H m

Definition Range m=0

Function Saves all maintenance counter values in the non-volatile memory.

Notes The paper feed line number and head activation count are returned in 1/100 unit.

It may cause a break down of the non-volatile memory if this command is frequently used. It is recommended that this command be used less than 10 times/day.

Do not turn the printer off during executing the command.

Related Commands GS 'g' '0', GS 'g' '2'

Code 1DH 67H 32H m nl nh

Definition Range m = 0
(nh×256+nl)=20, 21, 50, 61, 62, 70, 148, 149, 178, 189, 190, 198

Function Transmits the maintenance counter value. The initial value of the maintenance counter becomes the value saved in the non-volatile memory. Specifies the maintenance number as nh×256+nl.

nh×256+nl		Counter type
Hexadecimal	Decimal	
14H	20	Line number of paper feed (unit: 100-dot line)
15H	21	Head activation time (unit: 100-dot line)
32H	50	Number of autocutter drive times
3DH	61	(Reserved)
3EH	62	(Reserved)
46H	70	Product drive time (unit: minute)
94H	148	Line number of paper feed (unit: 100-dot line) (integrated value)
95H	149	Head activation time (unit: 100-dot line) (integrated value)
B2H	178	Number of autocutter drive times(integrated value)
BDH	189	(Reserved)
BEH	190	(Reserved)
C6H	198	Product drive time (unit: minute) (integrated value)

Configuration of the maintenance counter data listed below.

	Hexadecimal	Decimal	Number of data
Header	5FH	95	1 byte
Data	30H to 39H	48 to 57	1 to 10 bytes
NUL	00H	0	1 byte

Notes Note that the automatic status may be transmitted during transmitting the maintenance counter value.

The head activation time is not counted up for paper feed with the feed button and paper feed by the command. The head activation time is counted up for the paper feed or line feed with print action and paper feed for the page print with the command.

Related Commands GS g '0', GS 'g' '1', GS 'a'

Code 12H 2AH 31H

Function Set the user area (NV memory) again, remaining memory capacity is allocated.

Notes If release the user area, not increase the available memory.
When execute this command, released memory become reusable.
Pay attention to use this command often, the life of NV memory will be shorter.
The life of NV memory is 100000 times approx. using.

Code 12H 2AH 32H

Function Sends the remaining memory capacity at the user area (NV memory).

Notes The remaining memory capacity except the released area is notified.
The remaining memory capacity is notified as 12 bytes in the following format.
The following example assumes a remaining memory capacity of 4864 bytes.

Remaining memory capacity rewritten as 6-digit hexadecimal. (4864 -> 00H 13H 00H)
Expressed as ASCII code starting from the highest of the 6 digits. (See the table below)
Each item expressed as ASCII code is divided into the low order 4 bits and high order 4 bits,
which are operated OR with 00H. (See the table below.)
This is transmitted in the following sequence: Low order value and high order value of 1st digit of
code, 2nd digit of code, . . . 6th digit of code.

Hexadecimal	ASCII	High order	Low order
0	30H	03H	00H
0	30H	03H	00H
1	31H	03H	01H
3	33H	03H	03H
0	30H	03H	00H
0	30H	03H	00H

Response data transmission sequence (12 bytes):
00H, 03H, 00H, 03H, 01H, 03H, 03H, 03H, 00H, 03H, 00H, 03H

Code 12H 52H n

Definition Range n=1

Function Initializes user area (NV memory).

Notes All user-defined characters, downloaded characters, optional fonts, downloaded bit images and macro are cleared and returned to the initial state. (User-defined characters and downloaded characters area are allocated.)
Function settings and maintenance counter are not initialized.
When the status is except n=1, ignores this command.

Code 12H 6BH f [d] k

Definition Range 0≤f≤254
f=255: Prohibition
0≤d≤255
k=40

Function Sets all of SWDIP switch.

Sets the functions below. The setting value is valid when the command is executed.
f=00H : Does not write at the system area in the CG ROM at the same time as the setting.
f=80H : Writing at the system area in the CG ROM at the same time as the setting.

Specify continuously SWDIP1 to 40 the total is 40 bytes.

Does not set f=FFH. It cause not operate properly.

Notes For the SWDIP switch meanings, see 6.7 FUNCTION SETTINGS.
Do not turn the printer off during executing the command.

Code 12H 77H f [d] k 00H

Definition Range 0≤d≤255
0≤f≤255 (See the following each function)
k=40 (f=00H, f=80H), k=1 (except left value)

Function Sets the SWDIP switch.

The highest bit of f has mean below.
f=00H : Does not write at the system area in the CG ROM at the same time as the setting.
f=80H : Writing at the system area in the CG ROM at the same time as the setting.

SW DIP No.	f		Function
All SW DIP	00H	80H	40 byte 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
6,7	06H, 07H	86H, 87H	Auto-loading paper feeding length setting
8,9	08H, 09H	88H, 89H	Mark position correction
10,11	0AH, 0BH	8AH, 8BH	Mark detection maximum feeding length setting
After 12	0CH to 28H	8CH to A8H	(Reserved)
-	7FH	FFH	(Prohibit)

Notes

The printer performs hardware reset after completion of writing.
See 6.7 FUNCTION SETTINGS for SWDIP switch meanings.
Do not turn the printer off during executing the command.

DC2 'I' n Function Set Response

Code

12H 6CH n

Definition Range

n=0

Function

Reads the SWDIP switch setting.

Notes

The value of all the SWDIP switches written in the NV memory is responded.
For the SWDIP switch meanings, see 6.7 FUNCTION SETTINGS.

Responses are sent as 80 bytes in the following format.

- 1st response byte: Indicates number that is logical sum of low 4 bits of SWDIP1 and 00H
- 2nd response byte: Indicates number that is logical sum of high 4 bits of SWDIP1 and 00H
4 bits right shift
- :
- 77th response byte: Indicates number that is logical sum of low 4 bits of SWDIP39 and 00H
- 78th response byte: Indicates number that is logical sum of high 4 bits of SWDIP39 and 00H
4 bits right shift
- 79th response byte: Indicates number that is logical sum of low 4 bits of SWDIP40 and 00H
- 80th response byte: Indicates number that is logical sum of high 4 bits of SWDIP40 and 00H
4 bits right shift

When Automatic Status Back Enable/Disable command is set to valid, 4 bytes of automatic status may be inserted into the function setting response according to timings.

To disable automatic status response, set all of bits to '0' with Automatic Status Back Enable/Disable command before executing Function Set Response command

Distinguish the status using identifiers whether that is the response of executed Function Set Response command or automatic status response.

DC2 'q' n

Execution Response Request

Code 12H 71H n

Definition Range $0 \leq n \leq 255$

Function Sends n.

Notes This printer unit has 4-k byte input buffer, and command and data input, execution, and printing are not synchronized. Therefore, it is not possible to confirm command execution completion and character printing completion from external. By inputting this command following a command or character print command, upon return of the response to that command, it is possible to confirm whether the command or printing prior to when the command was issued has been completed.

Specify the response code with n. The low order 4 bits are valid for n. The transmitted code, which is the logical sum of the specified 4 low-order bit of n and 80H, consists of the code from 80H to 8FH.

DC2 't'

Test Print

Code 12H 74H

Function Performs test print.

Notes All setting values using commands are initialized.
The printer cannot communicate during test print.
The input buffer is cleared when executing the test print.
Do not input commands and print data subsequently to the test print command.
Input commands in the communication ready state after completion of the test print.

ESC 'c' '3' n

Paper-out Signal Output Capable Paper Sensor Selection

Code 1BH 63H 33H n

Definition Range $0 \leq n \leq 255$

Default n=15

Function This command is ignored.

Code 1BH 63H 34H n

Definition Range $0 \leq n \leq 255$

Default Depends on function setting

Function Selects a paper sensor that stops printing when paper out occurs.

Bit No.	Function	Value	
		0	1
0	Paper-near-end sensor	Disable	Enable
1			
2	Undefined	–	–
3	Undefined	–	–
4	Undefined	–	–
5	Undefined	–	–
6	Undefined	–	–
7	Undefined	–	–

Notes Printing actually stops when the line that is currently being printed completes printing and paper feed has been executed.

When SWDIP1-6 is set as 'invalid', this command is ignored.

When SWDIP5-4 is set as 'invalid' the initial value becomes '0', and SWDIP5-4 is set as 'valid' the initial value becomes '3'.

Related Commands 6.7 FUNTION SETTINGS

Code 1DH 72H n

Definition Range $1 \leq n \leq 3, 49 \leq n \leq 51$

Function Sends the specified status data.
 n=1, 49: Sends status data of paper sensor.
 n=3, 50: Sends status data of presenter.

Paper sensor status (n=1, 49)

Bit No.	Function	Value	
		0	1
0	Paper-near-end sensor	Paper	No paper
1	Undefined	Fixed to '0'	
2	Out-of-paper sensor	Paper	No paper
3	Undefined	Fixed to '0'	
4	Identifier	Fixed to '0'	
5	Undefined	Fixed to '0'	
6	Undefined	Fixed to '0'	
7	Identifier	Fixed to '0'	

Undefined status (n=2, 50)

Bit No.	Function	Value	
		0	1
0	Undefined	Fixed to '1'	
1	Undefined	Fixed to '0'	
2	Undefined	Fixed to '0'	
3	Undefined	Fixed to '0'	
4	Identifier	Fixed to '0'	
5	Undefined	Fixed to '0'	
6	Undefined	Fixed to '0'	
7	Identifier	Fixed to '0'	

Presenter status (n=3, 51)

Bit No.	Function	Value	
		0	1
0	Presenter paper sensor	No Paper	Paper
1	Undefined	Fixed to '0'	
2	Presenter feed error	No	Yes
3	Undefined	Fixed to '0'	
4	Identifier	Fixed to '0'	
5	Presenter paper jam error	No	Yes
6	Undefined	Fixed to '0'	
7	Identifier	Fixed to '0'	

Notes

Since this command is executed during input buffer deployment, a delay may occur between command reception and status data transmission, depending on the input buffer status.

Related Commands

GS 'a'

GS 'a' n

Automatic Status Back Enable/Disable

Code

1DH 61H n

Definition Range

$0 \leq n \leq 255$

Default

When the Automatic status response function (SWDIP5-1) is invalid: n=00H

When the Automatic status response function (SWDIP5-1) is valid: n=1FH

Function

Selects a status for ASB (Automatic Status Back).

Bit No.	Function	Value	
		0	1
0	Change drawer sensor status	Disabled	Enabled
1	Printer information	Disabled	Enabled
2	Error status	Disabled	Enabled
3	Continuous paper sensor	Disabled	Enabled
4	Other status	Disabled	Enabled
5	Undefined	–	–
6	Undefined	–	–
7	Undefined	–	–

Notes

When either status becomes enable, the status at the time of executing this command is sent. Hereafter, whenever the enable status condition changes, the status data is sent. At this time, in even the status where the ASB is not enabled, any change may occur because each status data indicates the current state.

When all status become disable, the ASB function becomes disable.

When the ASB function is enable in the default, the status at the 1st communicable time after powering on the printer is sent.

4-bytes status except Xoff code always continues.

Because this command is executed at input buffer development, a delay between command receiving and status data sending may occur depending on the input buffer state.

The printer responds only to the interface being selected.

When the cable is connected, the status data is sent right after connecting.

Bits 0, 4 and 7 of the 1st byte are identifiers to distinguish from other responses. When bits 0, 4, and 7 are responded as 0, 1, 0 respectively from the printer, proceed the subsequent 4 bytes included that response (except Xoff) as statuses by ASB function.

The paper-near-end sensor and mark sensor are responded when enable by the function settings.

(1) The 1st byte (printer unit information)

Bit No.	Function	Value	
		0	1
0	Identifier	Fixed to '0'	
1	Motor drive	Stop	Work
2	Drawer sensor status	Low	High
3	Undefined	Fixed to '0'	
4	Identifier	Fixed to '1'	
5	Platen sensor status	Closed	Opened
6	Paper feed by the switch	OFF	ON
7	Identifier	Fixed to '0'	

(2) The 2nd byte (error information)

Bit No.	Function	Value	
		0	1
0	Undefined	Fixed to '0'	
1	Undefined	Fixed to '0'	
2	Paper jam error while detecting mark	No	Yes
3	Autocutter error	No	Yes
4	Identifier	Fixed to '0'	
5	Unrecoverable error	No	Yes
6	Automatic recovery error	No	Yes
7	Identifier	Fixed to '0'	

Bit 0 to 3: When the errors occur other than the bit 5=0 and 6=0 other bit is 1, the IFD001 performs automatically reset after errors are cleared.

Bit 5: When any one of the thermal head error or V_p voltage initialization error occurs, bit 5 is as '1'.

Bit 6: When the thermal head temperature error occurs, bit 6 is as '1'.

(3) The 3rd byte (paper sensor information)

Bit No.	Function	Value	
		0	1
0	Paper-near-end sensor	Paper	No paper
1	Undefined	Fixed to '0'	
2	Out-of-paper sensor	Paper	No paper
3	Undefined	Fixed to '0'	
4	Identifier	Fixed to '0'	
5	Undefined	Fixed to '0'	
6	Mark sensor	No	Yes
7	Identifier	Fixed to '0'	

(4) The 4th byte (presenter information)

Bit No.	Function	Value	
		0	1
0	Presenter paper sensor	No Paper	Paper
1	Undefined	Fixed to '0'	
2	Presenter feed error	No	Yes
3	Undefined	Fixed to '0'	
4	Identifier	Fixed to '0'	
5	Presenter paper jam error	No	Yes
6	Undefined	Fixed to '0'	
7	Identifier	Fixed to '0'	

Related Commands GS 'r', 6.7 FUNCTION SETTINGS

DC2 '>' n

Fixed Division Selection

Code 12H 3EH n

Function Sets the head driving method to fixed division mode.
n specify the number of the division.

n	Number of the Division	
	LTPD247/CAPD247	LTPD347/CAPD347
0	Fixed 2-division	Fixed 2-division

Notes The IFD001 performs the fixed division drive mode with this command.
For more information on fixed division method, see 5.2.2 (2) Fixed division.
The default status can be determined using SWDIP2-1.

Code 12H 25H n

Function Sets the head driving method to dynamic division mode and specifies the maximum number of activated dots.

n: Specifies maximum number of activated dots to $n \times 8$. the range of n is 9 through 36, the others are specified as follows:

n<09H (9): n=09H ($9 \times 8 = 72$ dots)

n>24H (36): n=24H ($36 \times 8 = 288$ dots)

Notes Set this command, the head is dynamic division driving method.
The range of n is between 9 and 36. Specify the maximum number of activated dots as nx8 dots.

For more information on dynamic division method see 5.2.2 (1), Dynamic division.
When the IFD001 prints the data that is high density by the dynamic division mode using low-capacity power supply, the printing defect or voltage error may occur. Make sure that when the number of dots is specified by this command, do not exceed its voltage capacity.

The default status can be determined using SWDIP 2-1 to 3.

Code 12H 7EH n

Function Sets print density.
n: $60 \leq n \leq 140$

Notes A Print density can be adjusted by setting the energy applied to the head to a value from 60% to 140% of the rated energy. However, when the print density is set as more than 100%, a life span of the head may be shorter than that specification.

If n is specified less than 60 or more than 140, this command is ignored.

The default status can be determined using SWDIP 4 (60% to 140%).

(NOTE) If too much energy is applied to the thermal head, it would shorten its life span and cause the paper feed problem. Set an accurate thermal paper selection and print density. If selecting the thermal paper that is different from the one specified in the thermal paper selection or in case of not setting the print density in 100%, the specified life span would not be guaranteed of the product specification in this technical reference. Verify the performance with your actual device before printing.

8.4.11 Ruled Line

DC3 '# ' n

Overlapping Mode Selection

Code 13H 23H n

Definition Range $0 \leq n \leq 255$

Default Ruled line OR overlapping mode

Function Specifies OR or XOR for the overlapping mode of ruled line, character and image data.
n=<*****0>B: OR overlapping mode
n=<*****1>B: XOR overlapping mode

Notes When the page mode is selected, only the printer unit's internal flag operation is performed when this command is input.
This command setting does not affect the page mode.

If the OR overlapping mode is specified, either the part where dots exist in the ruled line, image or character is print out in black.

XOR shows exclusive OR. If the XOR overlapping mode is specified, the part where image is overlapped with character is printed out in white and the non-overlapped part is print out in black.

DC3 '('

Ruled Line Continuous Command

Code 13H 28H

Function Following input of this command, the printer unit receives ruled line commands without DC3 code until it receives 29H.

Notes All commands other than ruled line commands are ignored.

DC3 '+'

Ruled Line ON

Code 13H 2BH

Definition Range Ruled line OFF

Function Sets the ruled line ON.

Notes Following input of this command, the selected ruled line is printed at paper feed caused by character printing and space between lines, LF, ESC 'J', and ESC 'd', and ruled line dot line printing, DC3 'P' and DC3 'p'.

This command is effective until the Ruled Line OFF command (DC3 '-') is executed.

The dots whose bits on the selected ruled line buffer is '1', printed out. However, ruled line beyond the specified printing area with ESC 'W' is not printed (In the standard mode, the ruled line data is always printed in the printable area width.)

Related Commands DC3 '-', ESC '#'

Code 13H 2DH

Default Ruled line OFF

Function Sets the ruled line to OFF.

Notes After this command is executed, ruled line is not applied.

Related Commands DC3 '+'

Code 13H 41H

Default Ruled line buffer A is selected

Function Selects ruled line buffer A.

Notes Following this, ruled line data set is performed for ruled line buffer A, and the image of ruled line buffer A is printed out.

Related Commands DC3 'B'

Code 13H 42H

Default Ruled line buffer B is selected

Function Selects ruled buffer B.

Notes Following this, ruled line data set is performed for ruled line buffer B, and the image of ruled line buffer B is printed out.

Related Commands DC3 'A'

Code 13H 43H

Default All the data of ruled line buffers A and B cleared

Function Clears all the bits of the selected ruled line buffer to '0'.

Code 13H 44H n1 nh

Definition Range $0 \leq n1 \leq 255, 0 \leq nh \leq 255$

Function Sets to '1' the bit of the $[nh \times 256 + n1]$ dot of the selected ruled line buffer.

Notes The position of the dot is counted by regarding the dot on the left edge of the screen as position '0'.
When dots have been specified outside the printable area, they are ignored. A printable area means that the data is printed with maximum range of Y direction in the page mode, and consideration with rotate 90°.

Code 13H 46H n1 n2

Definition Range $0 \leq n1 \leq 255, 0 \leq n2 \leq 255$

Default Ruled lines all cleared

Function Fills the selected ruled line buffer with 2-bytes data specified with n1, n2.

Notes Fills the ruled line buffer with a 16-dots repetitive image pattern consisting of n1 (8 dots on left side) and n2 (8 dots on right side).

The correspondence of n1 and n2 bits and dots can be changed through Image LSB/MSB Select (DC2 '='). (The initial state is MSB on the left side.)

When dots have been specified outside the printable area, they are ignored. A printable area means that the data is printed with maximum range of Y direction in the page mode, and consideration with rotate 90°.

Related Commands DC2 '='

Code 13H 4CH m1 mh nL nh

Definition Range $0 \leq m1 \leq 255, 0 \leq mh \leq 255$
 $0 \leq n1 \leq 255, 0 \leq nh \leq 255$

Default Ruled lines all cleared

Function Sets to '1' the bits in the range from the $[mh \times 256 + m1]$ dot to the $[nh \times 256 + n1]$ dot of the selected ruled line buffer.

Notes The position of the dot is counted by regarding the dots on the left edge of the screen as position '0'.
When dots have been specified outside the printable area, the dots are ignored. A printable area means that the data is printed with maximum range of Y direction in the page mode, and consideration with rotate 90°.

Code 13H 50H

Function Prints as a 1-dot line the selected ruled line buffer image when ruler line is ON.

Notes When there is data in the line buffer, after this data is printed and paper feed equivalent to the space between lines is performed, the ruled line is printed as a 1-dot line. (A ruled line is also printed on the printed characters and space between lines.)

When the ruled line is OFF, no ruled line is printed and 1-dot line paper feed is performed.

Configure the ruled line by 2 dots or more. The 1-dot ruled line may be invisible.

Code 13H 70H nl nh

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

Function Prints as n-dot line the selected ruler line buffer image when ruled line is ON.

Notes When there is data in the line buffer, after this data is printed and paper feed equivalent to the space between lines is performed, the ruled line is printed as $[nh \times 256 + nl]$ -dot line. (A ruled line is also printed on the printed characters and space between lines.)

When the ruled line is OFF, no ruled line is printed and $[nh \times 256 + nl]$ -dot line paper feed is performed.

Code 13H 76H nl nh [d]k

Definition Range $0 \leq d \leq 255,$
 $1 \leq nh \times 255 + nl \leq (\text{Maximum page length})$

Default Ruled lines all cleared (d=all 0)

Function Writes image data to the selected ruler line buffer.

Notes As for image data, input data corresponding to '1' dot line amount.
 The correspondence between image data bits and dots can be changed with Image LSB/MSB Select (DC2 '='). (The initial state is MSB on the left side.)

When dots have been specified outside the printable area, they are ignored. A printable area means that the data is printed with maximum range of Y direction in the page mode, and consideration with rotate 90°.

Related Commands DC2 '='

8.5 LIST OF INITIAL VALUES

Settings	Initial Value	Command
Character right space amount set	0	ESC SP
Bold printing	Cancel	ESC '! , ESC 'E'
Double strike printing	Cancel	ESC 'G'
Underline	Cancel/ 1 dot width	ESC '! , ESC '-'
90° right rotated character printing	Cancel	ESC 'V'
Inversion (flip) printing	Cancel	ESC '{'
Character font	Font A (12x24)	ESC '!'
Double height	Cancel	ESC '! , FS '! , FS 'W'
Double width	Cancel	ESC '! , FS '! , FS 'W'
Reverse printing	Cancel	GS 'B'
International character set	USA	ESC 'R'
Character code table	Extended graphics	ESC 't'
Downloaded characters	Undefined	ESC '&'
Kanji mode	Cancel	FS '& , FS '.'
Kanji font	24x24	FS '!'
Kanji underline	Cancel/ 1 dot width	FS '! , FS '-'
Kanji code system	JIS code system	FS 'C'
Kanji space amount set	Right=0, Left=0	FS 'S'
User-defined characters	Undefined	FS '2'
Line spacing	1/6 inch	ESC '2 , ESC '3'
Peripheral equipment selection	Printer enabled	ESC '='
Horizontal tab position	Every 8 characters	ESC 'D'
Page mode	Not selected	ESC 'L , ESC 'S'
Print direction in page mode	Left -> Right	ESC 'T'
Starting point in page mode	Top left	ESC 'T'
Print area in page mode	Entire printable area	ESC 'W'
Alignment	Left	ESC 'a'
Print stop capable paper sensor	Depends on function setting	ESC 'c' '4'
Downloaded bit image	Undefined	GS '*'
Macro	Undefined	GS ': '
Counter print mode	Digit number = 0/Align right	GS 'C' '0'
Counter 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'

Settings	Initial Value	Command
HRI character print position	Do not print	GS 'H'
HRI character typeface	Font A	GS 'f'
Barcode height	162 dots	GS 'h'
Barcode width	0.375mm, 0.375/1.000mm	GS 'w'
Barcode N:W ratio	1:2.5	DC2 ':'
Nominal Fine Element Width	3 dots	GS 'n'
PDF Module Height	10 dots	GS 'o'
QRCode, DataMatrix module size set	6 dots	DC2 ';'
Left margin	0 (beginning of line)	GS 'L'
Print area	Entire printable area	GS 'W'
Basic calculation pitch	x direction: 1/203inch y direction: 1/203inch	GS 'P'
Sending of automatic status	Depends on function setting	GS 'a'
Image LSB/MSB	MSB	DC2 '='
Downloaded character area	Secured	DC2 'D'
User-defined character area	Secured	DC2 'G'
Bit image scan method	Column scan method	DC2 'I'
Optional font	Undefined	DC2 'P'
Ruled line	OFF	DC3 '+', DC3 '-'
Ruled line buffer	Clear	DC3 'C'
Ruled line overlapping	OR	DC3 '#'
Downloaded Character Set Specify	Cancel	ESC '%'
Optional Font Select	Cancel	DC2 'O'

CHAPTER 9 CHARACTER CODES

9.1 STANDARD SIZE CHARACTERS

The IFD001 can print an extended graphics character set, a katakana character set, Codepage 1252 character set.

When 1-byte character is printed using Kanji Mode Select command, assign the first byte to 00H and 1-byte character code to second byte.

	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	ï	Ä	Å
90	É	æ	Æ	ô	ö	ò	û	ù	ÿ	Û	Ü	ƒ	€	¥	€	f
A0	á	í	ó	ú	ñ	Ñ	á	â	ã	ä	å	æ	ç	è	é	ê
B0	ë	ì	í	î	ï	ê	ë	ì	í	î	ï	ê	ë	ì	í	î
C0	ì	í	î	ï	ê	ë	ì	í	î	ï	ê	ë	ì	í	î	ï
D0	ê	ë	ì	í	î	ï	ê	ë	ì	í	î	ï	ê	ë	ì	í
E0	α	β	Γ	π	Σ	σ	μ	τ	ϕ	θ	Ω	δ	∞	φ	ε	Π
F0	≡	±	≥	≤	↑	↓	÷	≈	°	•	•	∫	n	z	■	

**Figure 9-1 Extended Graphics Character Set
(International code is set as USA)**

	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	±	〒	†	‡	ˉ	ˉ			ℓ	ℓ	ℓ	ℓ	ℓ	ℓ	€	ノ
A0		。	「	」	、	・	ヲ	ア	イ	ウ	エ	オ	ヤ	ユ	ヨ	ツ
B0	-	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	ヅ	°	
E0	=	†	‡	▲	▼	▽	▽	♠	♥	♦	♣	●	○	/	\	
F0	X	卍	卐	卍	卐	卍	卐	卍	卐	卍	卐	卍	卐	卍	卐	卍

Figure 9-2 Katakana Character Set
(International code is set as USA)

	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	€	,	f	„	…	†	‡	ˆ	%	Š	<	œ		ž		
90	·	’	“	”	•	-	-	˜	™	š	}	œ		ž	ÿ	
A0		ı	¢	£	¤	¥		§	”	@	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

Figure 9-3 Codepage 1252 Character Set
(International code is set as USA)

Table 9-1 International Character Sets

n	Country	HEX											
		23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	USA	#	\$	@	[\]	^	`	{		}	~
1	France	#	\$	À	°	Ç	§	^	`	é	ù	è	¨
2	Germany	#	\$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	United Kingdom	£	\$	@	[\]	^	`	{		}	~
4	Denmark I	#	\$	@	Æ	Ø	Å	^	`	æ	ø	å	~
5	Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
6	Italy	#	\$	@	°	\	é	^	ù	à	ò	è	ì
7	Spain	Pt	\$	@	ı	Ñ	ı	^	`	¨	ñ	}	~
8	Japan	#	\$	@	[¥]	^	`	{		}	~
9	Norway	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
10	Denmark II	#	\$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü

9.2 KANJI SIZE CHARACTERS

The IFD001 can print the 1990 JIS first- and second- level Kanji.
 In addition, special characters are assigned to the Kanji code in non-Kanji character area.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2820	—		┌	┐	└	┘	┌	┐	└	┘	┌	┐	└	┘	┌	┐
2830	┌	└	┐	┘	┌	┐	└	┘	┌	┐	└	┘	┌	┐	└	┘
2840	┌	┐	└	┘	┌	┐	└	┘	┌	┐	└	┘	┌	┐	└	┘
2850	”	”	:	⊕	⊖	〒	≈	≲	≳	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	∪	∩	∪	∩	∪	∩	∪	∩	∪	∩	∪	∩	∪	∩	∪	∩
2960																
2970																

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2020	I	II	III	IV	V	VI	VII	VIII	IX	X	i	ii	iii	iv	v	
2030	vi	vii	viii	ix	x	0	1	2	3	4	5	6	7	8	9	g
2040	m	mm	cm	km	cm	m ²	km ²	cm ³	m ³	mg	kg	cc	dl	l	kl	ms
2050	μs	ns	HP	€	Hz	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	
2060	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ	Ⓗ	Ⓘ	Ⓢ	Ⓣ	Ⓤ	Ⓥ	Ⓦ	Ⓧ	Ⓨ
2070	Ⓩ	ⓐ	ⓑ	ⓒ	ⓓ	ⓔ	ⓕ	ⓖ	ⓗ	ⓘ	ⓙ	ⓚ	ⓛ	ⓜ	ⓝ	ⓞ

Figure 9-4 Special Character Sets

CHAPTER 10

ELECTRICAL CHARACTERISTICS

10.1 GENERAL CHARACTERISTICS

Table 10-1 General Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Circuit power voltage*	V_{dd}	-	3.0	3.3	3.6	V
Reset voltage	VR	V_{dd} : "High" -> "Low"	2.6	2.7	2.8	
Printer mechanism voltage	V_p	-	21.6	-	26.4	
Printer mechanism current consumption	Ip1	Standby	-	-	35	mA
	Ip2	Paper feed	-	-	450	
	Ip3	Printing			5.8	A

* V_{dd} is generated in the IFD001.

For maximum current consumption of printer mechanism during printing, see 6.2 CONNECTING TO THE POWER SUPPLY.

10.2 INPUT / OUTPUT SIGNAL CONDITIONS

Table 10-2 Input Signal Conditions

(Unless otherwise specified, Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Input "Low" level voltage	Vil	!RESET	-0.3	-	0.3	V
		RxD, CTS, DSR	-15.0	-	0.6	
		!FEED, !NS, DRS DSW, MS	-0.3	-	0.6	
Input "High" level voltage	Vih	!RESET	3.0	-	3.6	V
		RxD, CTS, DSR	2.4	-	15.0	
		!FEED, !NS, DRS DSW, MS	2.2		3.6	

Table 10-3 Output Signal Conditions

(Unless otherwise specified, Ta = 25°C)

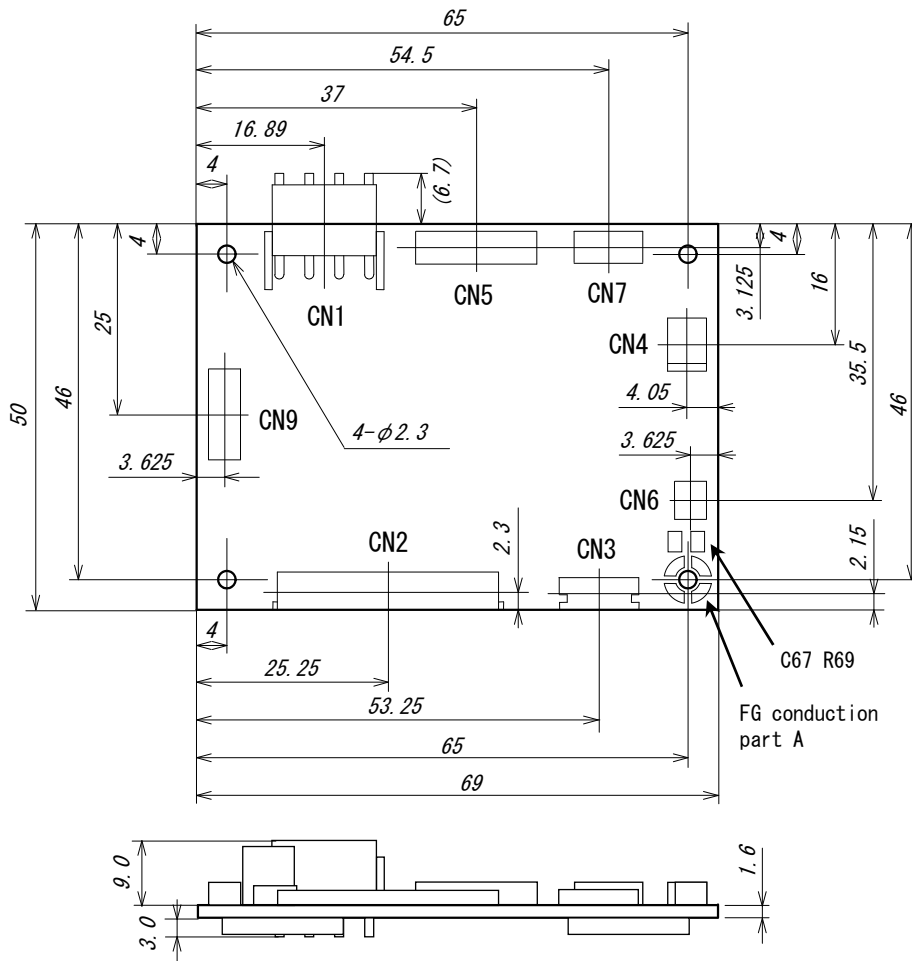
Item	Symbol	Condition	Min	Typ	Max	Unit
Output "Low" level voltage	Vol	TxD, RTS Resistive load 3 to 7 kΩ	-	-	5.0	V
		ST1 to ST4 Io1 = 1mA			0.4	
Output "High" level voltage	Voh	TxD, RTS Resistive load 3 to 7 kΩ	5.0	-	-	V
		ST1 to ST4 Io1 = -200uA	2.5	-	-	
Output current	Io	Vdu - GNDdu	-	-	500	mA

10.3 CONNECTOR LIST

Table 10-4 Connector List

No.	Manufacturer	Model Number
CN1	J.S.T.Mfg Co., Ltd.	S4P-VH(LF)(SN)
CN2	Molex. Inc.	54104-5031
CN3	KYOCERA ELCO	08-6233-012-101-829+
CN4	J.S.T.Mfg Co., Ltd.	04FMN-SMT-A-TF(LF)(SN)
CN5	J.S.T.Mfg Co., Ltd.	SM14B-SRSS-TB(LF)(SN)
CN6	J.S.T.Mfg Co., Ltd.	SM03B-SRSS-TB(LF)(SN)
CN7(IFD001-01SK)	J.S.T.Mfg Co., Ltd.	SM07B-SRSS-TB(LF)(SN)
CN8(IFD001-01UK)	Molex. Inc.	54819-0572
CN9	J.S.T.Mfg Co., Ltd.	SM10B-SRSS-TB(LF)(SN)

APPENDIX A DIMENSIONS



Unit : mm
Dimensional tolerance without mention : ± 0.5

Figure A-1 Circuit Board Dimensions (IFD001-01SK-E)

APPENDIX B

COMMAND INDEX

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ESC 'M' n	Character Font Select	8-22
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ESC 'E' n	Bold Print Specify/Cancel.....	8-24
ESC 'G' n	Double Strike Printing Specify/Cancel	8-24
ESC 'V' n	Character 90° Right Rotate Specify/Cancel.....	8-24
ESC '{' n	Inversion (Flip) Printing Specify/Cancel	8-25
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ESC '?' n	Downloaded Character Release.....	8-28
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ESC 'D' [n]k NUL	Horizontal Tab Position Set.....	8-33
ESC 'a' n	Alignment	8-34
GS 'L' nl nh	Left Margin Set.....	8-34
GS 'W' nl nh	Print Area Width Set.....	8-35
ESC 'T' n	Character Print Direction Specify in Page Mode	8-36
ESC 'W' xL xH yL yH dxL dxH dyL dyH	Print Area Set in Page Mode.....	8-37
ESC '\$' nl nh	Absolute Position Specify.....	8-38
ESC '¥' nl nh	Relative Position Specify.....	8-39
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GS '¥' nl nh	Vertical Relative Position Specify in Page Mode	8-41

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(1)GS '/' m	Downloaded Bit Image Print	8-44
(2)GS '/' m n	Downloaded Bit Image Selection	8-44
GS 'v' '0' m xL xH yL yH	Raster Bit Image Print	8-45
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(2)FS 'p' n m o	NV Bit Image Selection	8-46
FS 'q' n [xL xH yL yH [d]k]1 to [xL xH yL yH [d]k]n	NV Bit Image Define	8-47
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(1)GS 'k' m [d]k NUL		
(2) GS 'k' m [d]n	Barcode Print	8-55

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GS 'o' n	PDF Module Height Set 8-58
GS 'p' 0 m2 e r c nl nh [d]k	PDF417 Print..... 8-58
DC2 ';' n	QR Code, Data Matrix Module Size Set 8-59
GS 'p' 1 model e v mode nl nh data	QR Code Print..... 8-59
GS 'p' 2 ecc row col nl nh data	Data Matrix Print 8-60
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GS 'r' n	Status Data Send 8-82
GS 'a' n	Automatic Status Back Enable/Disable..... 8-83

APPENDIX C OPTION

Options for the IFD001 are listed below:

Item	Part Number	Use
DC Power Cable	DC-04100A-E	CN1 for DC power supply connection
Option Cable	OC-D1430A-E	CN5 for host device connection
Option Cable	OC-D0730A-E	CN7 for RS232C communication (IFD001-01SK only)
Interface Cable	IFC-U01-1-E	CN8 for USB communication (IFD001-01UK only)

(NOTE) When using the option cables OC-D1430A-E and OC-D0730A-E, use that in consideration of the effects of noise applied to the option cables after evaluating enough. Moreover, noise suppression should be given depending on the situation. Connect a Dsub connector of the option cable OC-D0730A-E to the FG of the chassis.