FTP-629DCL/DSL100 SERIES

PRODUCT SPECIFICATION

(PRELIMINARY)

DOCUMENT CONTROL SECTION

DATE

EDIT	DATE	DESIG	CHECK	DESCRIPTION
03	20031022	N.Ishida		Overall change S.Watanabe
02	20030327	S.Yamaji		P2 Part No. error correction S.Watanabe
DESIG	20021203	S.Yamaji	CHECK	APPR K.Maeda

TITLE *FTP-629DCL/DSL100 SERIES PRODUCT SPECIFICATION*

DRW NO.

CUST.

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Application

This specification concerns the FTP-629DCL/DSL100series that controls the thermal printer mechanism FTP-629/639MCL series. Prior to using this product, refer to the precautions in the Appendix to insure careful handling.

FTP-629DCL/DSL100 series include parts number as below,

Part number		Mounted circuit or devices				
		Presenter Circuit	Head Connection	Kanji Font	Cutter Circuit	Interface
(1)	FTP-629DSL110	No	Cable	Minchou	No	USB
(2)	FTP-629DSL112	No	Cable	Minchou	Yes	USB
(3)	FTP-629DSL180*1	No	Cable	Minchou	No	Centro RS-232C
(4)	FTP-629DSL181*1	No	Cable	Minchou	Yes	Centro RS-232C

Note *1) Interface is able to select by Dip Switch.

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SECTION A
Features

The features of the printer unit using this control board and printer mechanism FTP-629/639MCL series are as follows.

1. Maximum 200mm/second high-speed printing. (standard paper, high-speed collective image printing mode, only when SRAM is mounted)
2. Centronics conforming parallel interface, RS-232C interface, USB Ver1.1 are included.*1
3. Based on ESC/POS™ command.*2
4. Automatic starting point detection function by mark detection method is included.
5. Paper cut function is included.*3
6. Paper run out, platen open (head-up), head temperature abnormality, motor temperature abnormality, paper near end, head voltage abnormality functions are included.
7. Various papers can be selected by commands.
8. 432dots/line (629MCL), 576dots/line (639MCL) printing with 8 lines/mm high resolution.
9. Stable printing quality by temperature detection function.
10. Stable printing quality by thermal head driving voltage detection function.
11. 24 dots type character (12x24 dots font and 24x24 dots font), 16 dots type character (8x16 dots font and 16x16dots font) can be selected by commands.
12. MCU operation abnormality detection function by watchdog timer is included
13. The circuit of motor over-current protection fuse is included.
14. Various bar code commands are supported.
15. Character registration function is included.
16. Presenter unit control circuit is included.*4
17. Firmware download function is included.

Note *1) The interface circuits carried by the model differ.
*2) ESC/POS™ is the registered trademark of Seiko Epson Corp.
*3) The cutter drive circuit can be specified by the model.
*4) The presenter unit control circuit can be specified by the model.

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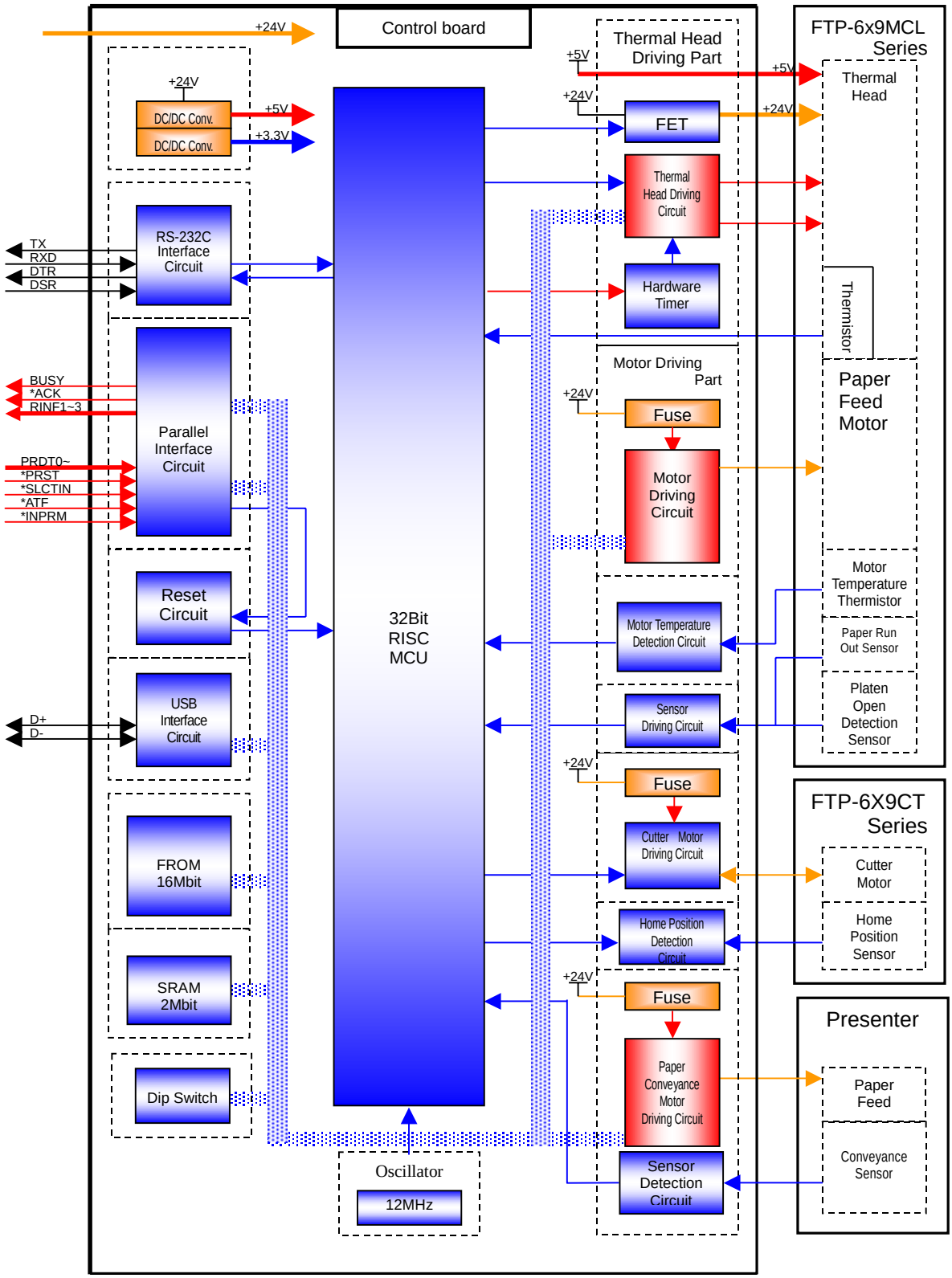
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SECTION B
Circuit Configuration

The circuit configuration of the control board is as follows,



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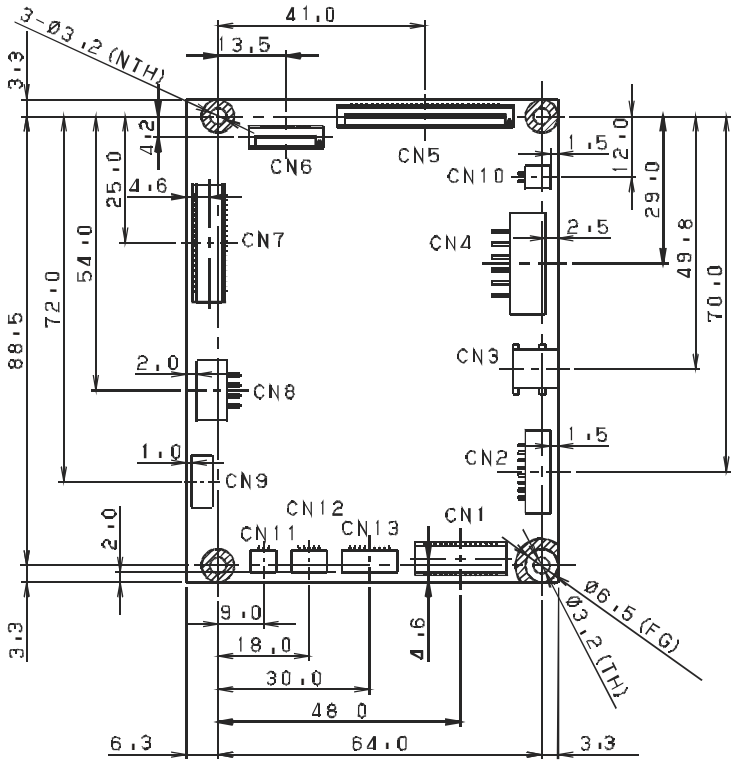
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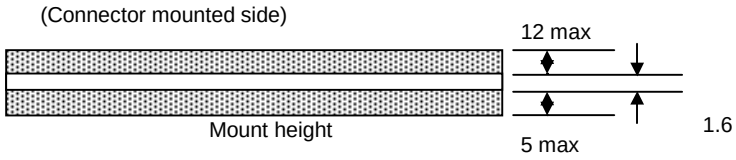
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SECTION C
General Specifications

General specifications of a printer unit using this board and a printer mechanism FTP-629/639MCL series are the following.

1 Control Board Dimensions Specifications





2 Kind of Connector on Control Board

No.	Name	Function	Remark
CN1	Centro I/F Connector	Connection for Centronics Interface	
CN2	RS-232C I/F Connector	Connection for RS-232C Interface	
CN3	USB I/F Connector	Connection for USB Interface	
CN4	Power Connector	Connection for +24V Power Supply	
CN5	Thermal Head Connector	Connection for Thermal Head (FPC)	*1
CN6	Printer Motor Connector	Connection for Printer Motor (FPC)	*1
CN7	Head/Motor Connector	Connection for Thermal Head/Printer Motor	*1
CN8	Cutter Connector	Connection for Paper Cutter	
CN9	Conveyance Motor Connector	Connection for Conveyance Motor	
CN10	Near End Sensor Connector	Connection for Near End Sensor	
CN12	Mecha-Tilte/Mark Sensor Connector	Connection for Mecha-Tilte/Mark Sensor	
CN13	Conveyance Sensor Connector	Connection for Conveyance Sensor Connector	

Note *1) When CN5 and CN6 are mounted, CN7 is not mounted. When CN7 is mounted, CN5 and CN6 are not mounted.

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3 Connector Construction

Types and pin configurations of several connectors are following. Data direction is a look from the interface board.

3.1 CN1 (Centronics interface connector)

Reference to section D “Interface Specifications”.

3.2 CN2 (RS-232C interface connector)

Reference to section D “Interface Specifications”.

3.3 CN3 (USB interface connector)

Reference to section D “Interface Specifications”.

3.4 CN4 (+24V Power supply Connector)

(1) Connector Type
S6B-XH-SM3-TB: made by J.S.T

(2) Connector Pin Configuration

No.	Signal Name	Data Direction	Explanation
1	+24V	Input	+24V Power supply
2	+24V	Input	+24V Power supply
3	+24V	Input	+24V Power supply
4	GND	---	Ground of power supply
3	GND	---	Ground of power supply
4	GND	---	Ground of power supply

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3.5 **CN5** (Thermal head driving connector [FPC])

(1) Connector Type
52610-3090: made by Molex

(2) Connector Pin Configuration

No.	Signal Name		Data Direction	Explanation
	629MCL	639MCL		
1	HUP		Input	Platen open detection signal
2	+5V		---	Logic power supply
3	+24V		---	Power supply for thermal head driving
4	+24V			
5	+24V			
6	+24V			
7	HDO		Output	Printing data output signal
8	*STB2	*STB3	Output	Head energizing control signal
9	*STB3	*STB4		
10	+5VH		---	Power supply for thermal head control
11	GND (+24V)		---	Ground of power supply for thermal head driving
12	GND (+24V)			
13	GND (+24V)			
14	GND (+24V)			
15	GND (+24V)			
16	GND (+24V)			
17	GND (+24V)			
18	GND (+24V)			
19	GND (+24V)			
20	GND (+24V)			
21	TMP		Input	Thermistor input
22	*STB1	*STB1	Output	Head energizing control signal
23	N.C.	*STB2		
24	*LAT		Output	Printing data latch signal
25	HCLK		Output	Data communication synchronizing clock signal
26	HDI		Input	Printing data input signal
27	+24V		---	Power supply for thermal head driving
28	+24V			
29	+24V			
30	+24V			

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3.6 **CN6** (Pulse Motor / Sensor Connector [FPC])

(1) Connector Type
52610-1090: made by MOLEX

(2) Connector Pin Configuration

No.	Signal Name	Data Direction	Explanation
1	N.C.	---	No connection
2	MTMP	Input	Motor temperature detection signal
3	GND(+5V)	---	Ground pin of logic power supply
4	MT/*A	Sink/ Source	Stepping motor driving signal
5	MT/A		
6	MT/*B		
7	MT/B		
8	PESK	---	Cathode side of paper run out sensor
9	+5V	---	Logic power supply pin
10	*PES	Input	Paper out detection signal

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3.7 **CN7** (Thermal head/ Printer motor connector)

(1) Connector Type
SM40B-SRDS-G-TF: made by J.S.T

(2) Connector Pin Configuration

No.	Signal Name		Data Direction	Explanation
	629MCL	639MCL		
1	HUP		Input	Platen open detection signal
2	+5V		---	Logic power supply
3	+24V		---	Power supply for thermal head driving
4	+24V			
5	+24V			
6	+24V			
7	HDO		Output	Printing data output signal
8	*STB2	*STB3	Output	Head energizing control signal
9	*STB3	*STB4		
10	+5VH		---	Power supply for thermal head control
11	GND (+24V)		---	Ground of power supply for thermal head driving
12	GND (+24V)			
13	GND (+24V)			
14	GND (+24V)			
15	GND (+24V)			
16	GND (+24V)			
17	GND (+24V)			
18	GND (+24V)			
19	GND (+24V)			
20	GND (+24V)			
21	TMP		Input	Thermistor input
22	*STB1	*STB1	Output	Head energizing control signal
23	N.C.	*STB2		
24	*LAT		Output	Printing data latch signal
25	HCLK		Output	Data communication synchronizing clock signal
26	HDI		Input	Printing data input signal
27	+24V		---	Power supply for thermal head driving
28	+24V			
29	+24V			
30	+24V			
31	N.C.		---	No connection
32	MTMP		Input	Motor temperature detection signal
33	GND(+5V)		---	Ground pin of logic power supply
34	MT/*A		Sink/ Source	Stepping motor driving signal
35	MT/A			
36	MT/*B			
37	MT/B			
38	PESK		---	Cathode side of paper run out sensor
39	+5V		---	Logic power supply pin
40	*PES		Input	Paper out detection signal

3.8 **CN8** (Cutter Unit Connector)

(3) Connector Type
S4B-PH-SM3-TB: made by J.S.T

(4) Connector Pin Configuration

No.	Signal Name	Data Direction	Explanation
1	CHP	---	Cutter home position detection signal
2	GND	Input	Ground of logic power supply pin
3	MT+	Sink/ Source	Cutter motor driving signals
4	MT-		

3.9 CN9 (Conveyance Motor Connector)

(1) Connector Type
53261-0490: made by MOLEX

(2) Connection Pin Configuration

No.	Signal Name	Data Direction	Explanation
1	EX-MTA	Sink/ Source	Conveyance motor phase A
2	EX-MT/A		Conveyance motor phase /A
3	EX-MTB		Conveyance motor phase B
4	EX-MT/B		Conveyance motor phase /B

3.10 CN10 (Paper Near End Sensor Connector)

(1) Connector Type
S2B-ZR-SM3A-TF: made by J.S.T

(2) Connector Pin Configuration

No.	Signal Name	Data Direction	Explanation
1	+3V	---	Logic power supply pin
2	*NES	Input	Paper near end detection signal

3.11 CN12 (Mecha-Tilte/ Mark Sensor Connector)

(1) Connector Type
SM05B-SRSS-TB: made by J.S.T

(2) Connector Pin Configuration

No.	Signal Name	Data Direction	Explanation
1	+3V	Output	Logic power supply pin
2	/MRKS	Input	Paper near end detection signal
3	/MRKK	Input	Paper near end detection signal
4	/COVERS	Input	Paper near end detection signal
5	GND	---	Paper near end detection signal

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3.12 CN13 (Paper Discharge Connector)

(3) Connector Type
SM09B-SRSS-TB: made by J.S.T

(4) Connector Pin Configuration

No.	Signal Name	Data Direction	Explanation
1	+3V	Output	Logic power supply pin
2	/PDS1S	Input	
3	/MRKK	Input	
4	/COVERS	Input	
5	GND	---	
6	/MRKS	Input	
7	/MRKK	Input	
8	/COVERS	Input	
9	GND	---	

4 Print Specification

4.1 Printing System

Thermal printing system

4.2 Thermal Head Configuration

Item	Specification	
	FTP-629MCL	FTP-639MCL
Resolution	8dots/mm	
Heating Unit Size	0.125mm (Vertical) x 0.125mm (Horizontal)	
Number of Heating Units	432	576
Effective Printing Area	About 54mm	About 72mm

4.3 Number of Digits of Print Characters

Print Mode	Type		Number of digits	
			FTP-629MCL	FTP-639MCL
Alphanumeric Katakana	Internal half size character	12x24	36	48
	Internal full size character	24x24	18	24
	Registered half size character	12x24	36	48
	Registered full size character	24x24	18	24
	Internal half size character	8x16	54	72
	Internal full size character	16x16	27	36
	Registered half size character	8x16	54	72
	Registered full size character	16x16	27	36
Kanji	Kanji, non-kanji	24x24	18	24
	Kanji, non-kanji	16x16	27	36

4.4 Type of Print Characters and Character Configuration

Print Mode	Type		Number of Characters
Alphanumeric Katakana	Internal half size character	12x24	159
	Internal full size character	24x24	159
	Internal half size character	8x16	159
	Internal full size character	16x16	159
Registered Characters	Registered half size character	12x24	224
	Registered full size character	24x24	224
	Registered half size character	8x16	224
	Registered full size character	16x16	224
International, Special	Internal half size character	12x24	195
	Internal full size character	24x24	195
	Internal half size character	8x16	195
	Internal full size character	16x16	195
Kanji	Kanji, non-kanji	24x24	About 6800
	Kanji, non-kanji	16x16	About 6800

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4.5 Print Mode

(1) Character Space

Print Mode	Type		Character Space (Number of dots)
Alphanumeric Katakana	Internal half size character	12x24	12~44
	Internal full size character	24x24	24~56
	Internal half size character	8x16	8~40
	Internal full size character	16x16	16~48
Registered Characters	Registered half size character	12x24	12~44
	Registered full size character	24x24	24~56
	Registered half size character	8x16	8~40
	Registered full size character	16x16	16~48
Kanji	Kanji, non-kanji	24x24	24~56
	Kanji, non-kanji	16x16	16~48

(2) Line Feed

Print Mode	Type		Line Feed (Number of dots)
Alphanumeric Katakana	Internal half size character	12x24	24 ~ 255
	Internal full size character	24x24	24 ~ 255
	Internal half size character	8x16	16 ~ 255
	Internal full size character	16x16	16 ~ 255
Registered Characters	Registered half size character	12x24	24 ~ 255
	Registered full size character	24x24	24 ~ 255
	Registered half size character	8x16	16 ~ 255
	Registered full size character	16x16	16 ~ 255
Kanji	Kanji, non-kanji	24x24	24 ~ 255
	Kanji, non-kanji	16x16	16 ~ 255

(3) Print Character Type

Print Mode	Type of Print Character
Alphanumeric Katakana	Internal half size character (12x24), Registered half size character (24x24) *1 Internal full size character (24x24), Registered half size character (8x16) *1 Internal half size character (8x16), Registered full size character (24x24) *1 Internal full size character (16x16), Registered full size character (16x16) *1
Kanji	Non-kanji, kanji JIS Lever 1, Level 2 (conforms to JIS C6226-1983)

(4) Extended Mode

Print Mode	Type of Print Character
Alphanumeric Katakana Kanji *2 Non-Kanji *2	Horizontal double size, reverse order, black and white reversal, vertical double size, x4 size
Image *1	Reverse order, black and white reversal

(5) Image Mode

	FTP-629MCL	FTP-639MCL
Max. Number of dots/line	432	576

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4.6 Printing Speed

Max 200mm/sec

4.7 Printing Density

OD Value: 0.8 or more (density of solid black print area under standard print condition)

	FTP-629MCL	FTP-639MCL
Max. Number of dots/line	Specified paper	
Measuring Instrument	Sakura Densitometer PDA 65	

Discoloration of printing caused by paper is not included in this specification.

5 Paper Feed Specification

Paper Feed System	Friction feed
Line Feed Space	About 1/8 inch (when power is turned ON), n/203 inch programmable
Line Feed Speed	About 30 mm / sec (By * ATF signals)

6 Paper Specification

	FTP-629MCL	FTP-639MCL
Specified Paper	Sensitive paper: TF50KS-E4 (Nippon Paper) Standard paper: TF60KS-E (Japan Paper), PD150R (Oji Paper) Medium-term storage paper: TF60KS-F1 (Nippon Paper), PD170R (Oji Paper), HA220AA (Mitsubishi Paper) Long-term storage paper: TF60KJ-R (Nippon Paper), PD160R-N (Oji Paper), AFP-235 (Mitsubishi Paper)	
Paper Width	58 +0 (-1) mm: MCL053/103 60 +0 (-1) mm: MCL054	80 +0(-1) mm: MCL053/103 82.5 +0(-1) mm: MCL054
Paper Type	Thermo-sensitive roll paper (thermo-sensitive side is on outside)	

7 Functional Specification

(1) Self test print function	
(2) Paper feed function	By *ATF signal
(3) Paper run out detection function	By internal sensor of printer mechanism
(4) Paper near end detection function	By external mechanical switch
(5) Platen open detection function	By internal mechanical switch of printer mechanism
(6) Thermal head temperature detection function	By internal thermistor of printer mechanism
(7) Motor temperature detection function	By internal thermistor of printer
(8) Voltage detection function	
(9) Internal RAM abnormality detection function	
(10) Cutter abnormality detection function	
(11) Mark detection function	By GS < command
(12) MCU operation abnormality detection function	By watchdog timer
(13) Motor power saving function	
(14) Power supply disconnection protection function	By power switching FET
(15) Motor protection function	By fuse
(16) Thermal head protection function	By hardware timer

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8 Power Consumption

8.1 Driving Head

Voltage: 24.0V ± 5%

Current: See the following table

Printing rate / Speed / Model	Ultra High Speed Print Mode 200mm/sec		High Speed Print Mode 125mm/sec		Middle Speed Print Mode 80mm/sec		Low Speed Print Mode 40mm/sec	
12.5% 629MCL	TBD	(1.54)	TBD	(1.03)	TBD	(1.03)	TBD	(0.51)
12.5% 639MCL	TBD	(2.04)	TBD	(1.03)	TBD	(1.03)	TBD	(0.51)
25.0% 629MCL	TBD	(3.07)	TBD	(2.05)	TBD	(2.05)	TBD	(1.03)
25.0% 639MCL	TBD	(4.06)	TBD	(2.04)	TBD	(2.04)	TBD	(1.03)
50.0% 629MCL	TBD	(6.09)	TBD	(4.08)	TBD	(4.08)	TBD	(2.05)
50.0% 639MCL	TBD	(8.02)	TBD	(4.06)	TBD	(4.06)	TBD	(2.04)
100.0% 629MCL			TBD	(8.09)	TBD	(8.09)	TBD	(4.08)
100.0% 639MCL			TBD	(8.02)	TBD	(8.02)	TBD	(4.06)

Unit:[A]

Values inside () indicate peak values, and values outside () indicate mean values.

• Conditions

Voltage:	24.0 V
Head resistance:	776Ω (800Ω - 3%)
Ambient temperature:	25°C
Paper:	Standard paper (equivalent to PD150R)
Printing density:	Applied dots are assumed to be evenly distributed.

• The average current increases at the low temperature for the print density correction.

8.2 Driving Motor

Voltage: 24 V ± 5 %

Current:		
	Printer Motor	1.0A (max)
	Conveyance Motor	1.0A (max)
	Cutter Motor	1.2A (max)

8.3 Driving Logic(Step down from +24V to +5V and +3.3V)

Voltage: 24V ± 5%

Current: TBDA (max)

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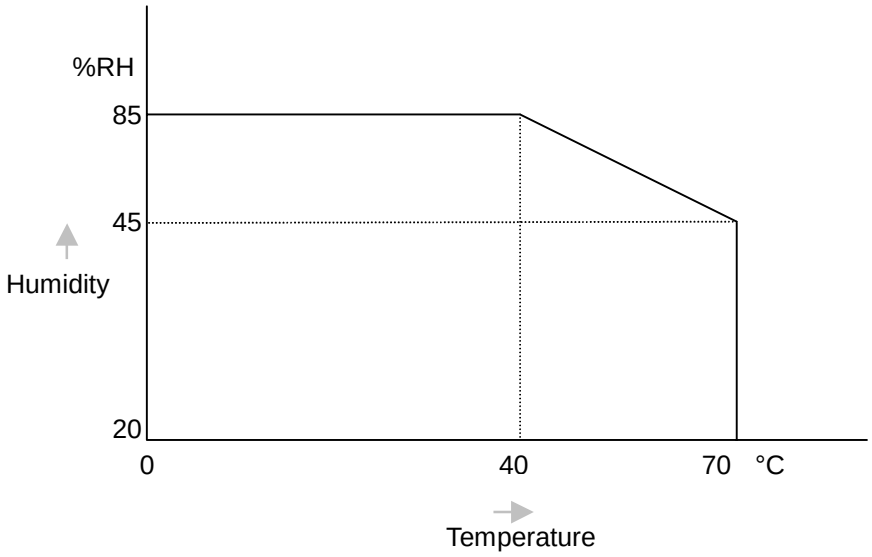
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9 Operating Environment

During Operation	Operating Temperature Operating Humidity	TBD 20 ~ 85% RH (no condensation)
During Stopping	Storage Temperature Storage Humidity	-40 ~ 85°C 5 ~ 95%RH (no condensation) excluding thermo sensitive paper

Note 1)
When printing is continued under high temperature conditions, the printer may enter off-line status automatically because of the temperature rise of the head, and stop printing (head temperature abnormality). When the head temperature drops to normal, the printer automatically returns to on-line status and continues printing.

Note 2)
Relation between temperature and humidity in printing is as follows.



10 Noise
Less than 60 db (at a point 1m above from the printing mechanism position level)

11 Life
(1) Head life
Electric life : $1x10^8$ pulses
Wear life : 100km

[Condition]
Using paper : PD150R
Temperature : 25°C
Printing duty : 12.5%

12 Reliability characteristics

11.1 Vibration (non-operation)
10~55~10Hz.Amplitude is 0.15mm. An 1 octave/min, 1G max. 20 cycle each to X, Y and Z directions.

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SECTION D
Interface Specifications

1 Centronics Interface Specification

1.1 General Specification

(1)	System:	8-bit parallel interface
(2)	Maximum data receiving speed	about 28,000byte/sec
(3)	Synchronous system:	By external strobe pulse (*PRSTB)
(4)	Handshake:	by BUSY / *ACKNLG signal
(5)	Input/Output level:	C-MOS level

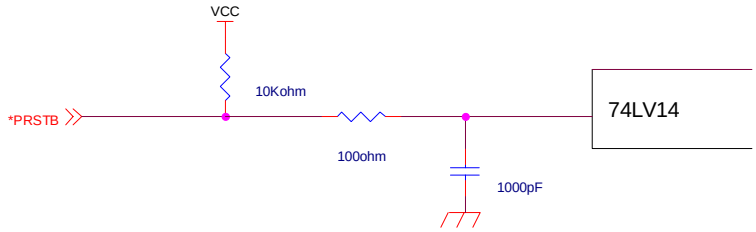
1.2 Electrical Characteristics of Input/Output signals

(1) Signal level (for Output)

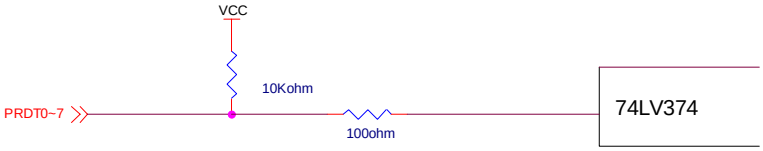
"L": ±0.0 ~ 0.3 x Vcc

"H": 0.7 x Vcc ~ Vcc

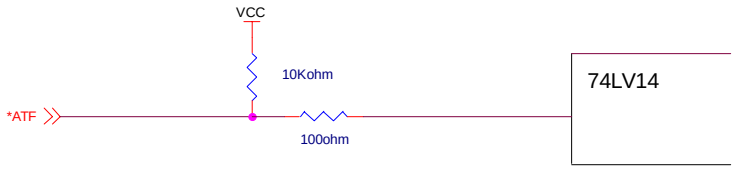
(2) Input conditions (*PRSTB)



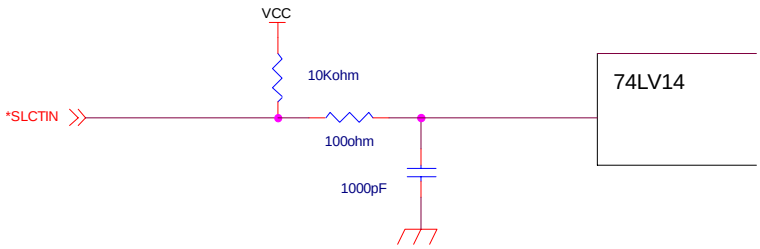
(3) Input condition (PRDT0~7)



(4) Input condition (*ATF)



(5) Input condition (*SLCTIN)



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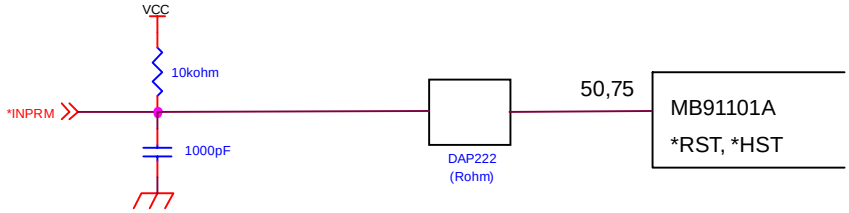
DRW NO.

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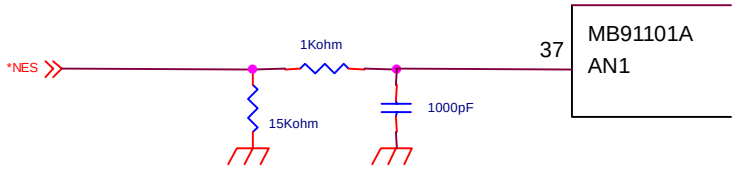
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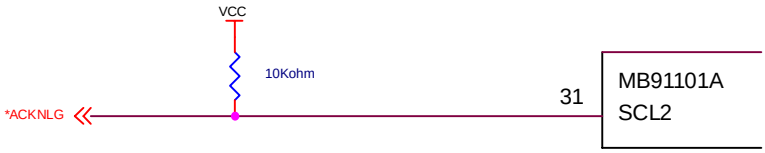
(6) Input condition (*INPRM)



(7) Input condition (*NES)



(8) Output condition (*ACKLNG)



(9) Output condition (BUSY)



(10)Output condition (RINF1, 2, 3)



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1.3 Pin Configuration of Input/Output Signals

(1) Connector number: CN1
(2) Connector type: SM30B-SRDS-G-TF (made by JST)
(3) Connector Pin Configuration

No.	Signal name	Data direction	No.	Signal name	Data direction
1	*PRSTB	Input	2	*PRSTB-RET	---
3	PRDT0	Input	4	PRDT0-RET	---
5	PRDT1	Input	6	PRDT1-RET	---
7	PRDT2	Input	8	PRDT2-RET	---
9	PRDT3	Input	10	PRDT3-RET	---
11	PRDT4	Input	12	PRDT4-RET	---
13	PRDT5	Input	14	PRDT5-RET	---
15	PRDT6	Input	16	PRDT6-RET	---
17	PRDT7	Input	18	PRDT7-RET	---
19	*ACKLNG	Output	20	*ACKLNG-RET	---
21	BUSY	Output	22	BUSY-RET	---
23	RINF2	Output	24	*INPRM-RET	---
25	*SLCTIN	Input	26	*INPRM	Input
27	RINF1	Output	28	RINF3	Output
29	*ATF	Input	30	GND	---

NOTE1)
A signal with an "*" indicates a negative logic signal.
NOTE2)
"-RET" signals are all connected to GND.
NOTE3)
Input/output directions indicate directions from the printer.
NOTE4)
The connector type is an BM30B-SRDS-G-TFC (made by JST) equivalent product. For the connector at other side, use an SHDR-30V-S-B (made by JST) equivalent product.

1.4 Recommended Cable Specifications

Wire: More than AWG30or equivalent
Cable length: 1.0m or less (twisted cable)

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1.5 Description of Input Signals

Signal Name	Function
PRDT0~7	1) Input signals of 8-bit parallel data. 2) "High" indicates that data exists (=1); "Low" indicates no data (=0). 3) PRDT0 is the least significant bit (LSB); PRDT7 is the most significant bit (MSB).
*PRSTB	1) Strobe signal to read PRDT0~7. 2) Normally "High". Data is latched when "High" changes to "Low".
*INPRM	1) Signal to initialize printer 2) Normally "High". A hardware reset is executed when "Low" changes to "High". 3) This signal sets the printer status as follows. (1) Print buffer — Clear (2) Line feed pitch — About 3.25mm (3) ANK character pitch — 12dots / character (4) Print character type — 12x24 dots half size character (5) Page length setting — 44 lines, about 143 mm (6) Double width specification — Clear (7) Double height specification — Clear (8) Black and white reversal printing — Clear (9) Reverse order printing — Clear (10) Underline specification — Clear (11) Character code — Set to Japanese characters (12) International character setting — Japan (13) Printing speed setting — High-speed mode (14) Horizontal tab setting — Every 8 characters (15) Mark detection to start point setting — About 2 mm (16) Paper run out detection setting — Valid *1 (17) Platen open detection setting — Valid *1 (18) Temperature abnormality detection setting — Valid *1 (19) Near end detection setting — Invalid (20) Voltage abnormality detection setting — Valid *1 (21) Paper type — Continuous paper (22) Kanji print mode specification — Clear (23) Print quality setting — Standard paper (24) x4 size print mode specification — Clear (25) Kanji code setting — JIS code (26) 90° character rotation — Clear (27) Paper auto-feed amount setting — 20mm (28) Motor off-time setting — One excitation time = 5 sec Excitation holding time = 10sec (29) Printing mode setting — Line printing mode *1: This can be set to invalid by the *SLCTIN signal. 4) If the *ATF signal in "Low" status is initialized by this signal, the test function mode is set. 5) Only initialization is executed without printing data in the buffer.

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Signal Name	Function
*ATF	1) Paper feed request signal 2) Normally "High". Paper is fed in "Low" status. 3) When paper is fed by this signal, the internal processing time is not constant. Use the line feed command for a more accurate paper feed. 4) When this signal is received, a line feed is executed by setting the BUSY signal to “High”. If an error dose not occur after a line feed, the BUSY signal becomes “Low”, and the printer enters data receive enable status. 5) When paper is fed by receiving this signal, the position on the page does not change. If paper is fed by the new page command after paper is fed by this signal, the page start position deviates. 6) If this signal in "Low" status is initialized by the *INPRM signal or the power supply is turned on, the test function mode is set.
*SLCTIN	1) Signal that makes the detection functions of initial setting invalid 2) If power is turned ON or if initialization by the *INPRM signal is executed when this signal is "Low", paper run out detection, paper near end, platen open detection, head temperature abnormality detection, motor temperature abnormality detection, head driving voltage abnormality detection and paper feed by *ATF signal become invalid.

1.6 Description of Output Signals

Signal Name	Function
*ACKNLG	1) Reply signal to *PRSTB signal. 2) Negative logic pulse signal, which is output when data input completes.
BUSY	1) Indicates that printer busy, which means that data cannot be received. 2) This signal is “High” when receiving data, printing, feeding paper, and when in error status and in initialization operation.
RINF1~3	1) This signal indicates the error status of the printer. 2) The following table shows each error status.

	Error status	RINF1	RINF2	RINF3
a.	Paper run out	Low	High	Low
b.	Paper near end	High	High	Low
c.	Platen open	High	Low	Low
d.	Head Temperature abnormality	High	Low	High
e.	Head voltage abnormality	Low	High	High
f.	Hardware abnormality	High	High	High
g.	Mark detection abnormality	Low	Low	Low
h.	Normal	Low	Low	High

3) Each error status is output in the following status.
   a. Paper run out is detected and printer is in off-line status.
   b. Paper near end is detected.
   c. Platen open is detected and printer is in off-line status.
   d. Head temperature abnormality or motor temperature abnormality is detected and printer is in off-line status.
   e. Head driving-voltage is not in 24V±15% range.
   f. The following hardware abnormalities are detected.
      - Internal RAM abnormality
      - Watch-dog is occurred
      - Thermo run away of head
      - Cutter abnormality
      - MCU is in hardware-reset status.
      - Disconnect of head cable
   g. Printer is in the following status.
      - Mark is not detected within page
      - During printer initialization
   h. Normal status
4) Error detection priority
   Hardware > head voltage > head temperature > paper run out > platen open > mark undetected > near end > normal

2 RS-232C Interface Specification

2.1 General Specification

(1)	System:	Serial interface
(2)	Data receiving speed:	115200,19200,9600,4800bps (selected by dip switch)
(3)	Synchronous system:	Start-Stop synchronous system, full duplex communication
(4)	Handshake:	by DTR/DSR signal or XON/XOFF (selected by dip switch)
(5)	Input/Output level:	RS-232C level

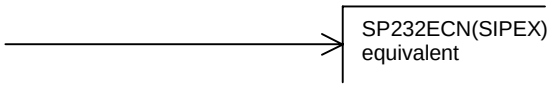
2.2 Electrical Characteristics of Input/Output signals

(a) Signal level (for Output)

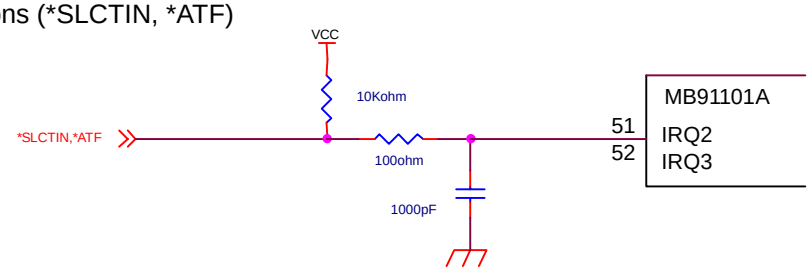
Space (logic=0): +3V ~ +12V

Mark (logic=1): -3V ~ -12V

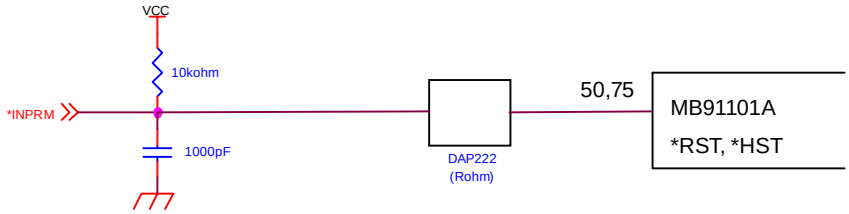
(1) Input conditions (RD,DSR)



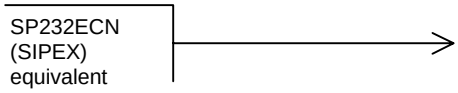
(2) Input conditions (*SLCTIN, *ATF)



(3) Input condition (*INPRM)



(4) Output Conditions (TD, DTR)



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2.3 Communication Format

(1) XON / XOFF control: Communication is controlled by what remains in the receive buffer. (XOFF is sent when what remains is 10 bytes or less, then XON code is sent when what remains becomes 20 bytes or more.) This is invalid when DSR / DTR is selected by dipswitch.

(2) Receive buffer length: 45 bytes / 4096 bytes (selected by dip switch)

(3) Receive error processing: When a receive error occurs (ex. parity, flaming) this data is ignored and printing restarts from the next data.

2.4 Pin Configuration of Input/Output Signals

(1) Connector number: CN2

(2) Connector type: S9B-ZR-SM3A-TF (made by JST)

(3) Connector Pin Configuration

No.	Signal Name	Direction	Function
1	FG	---	Frame ground
2	RXD	Input	Receive data
3	TXD	Output	Transmission data
4	DTR	Output	Data terminal ready
5	GND	---	Signal ground
6	DSR	Input	Data set ready
7	*SLCTIN	Input	Detection setting invalid signal
8	*INPRM	Input	Initialize request signal
9	*ATF	Input	Paper feed request signal

NOTE1)
Input/Output directions indicate directions from printer.
NOTE2)
For the connector of the other side, use an ZHR-9 (made by JST) equivalent product.

2.5 Description of Signals

Signal Name	Function
RXD	(1) Serial data input signal. Data signal to be transferred from host to printer. (2) "Space" indicates no data (= 0), "Mark" indicates that data exists (= 1). (3) The data format is as follows. Start | b0 | b1 | b2 | b3 | b4 | b5 | b6 | b7 | Parity | Stop Note *1) Length of stop bit is 1 bit fixed. Note *2) With/without parity (odd) can be selected by dipswitch. Note *3) Data length setting is 8 bits. (4) Start bit is "Space" and stop bit is "Mark". (5) Communication speed setting (115200, 19200, 9600, 4800 bps) can be selected by dipswitch.
TXD	(1) Serial data output signal. Data signal to be transferred from printer to host. (2) When XON/XOFF control is selected by dipswitch, XOFF code (13H) is sent in data receive disabled status. XON code (11H) is sent to host when printer returns to data receive enable status. (3) Other functions are the same as RXD.
DTR	(1) Output signal to indicate that printer is in data receive enable status. (2) "Space" indicates data receive enable status, "Mark" indicates data receive disable status. (3) If data is sent from host when this signal is "Mark", an error occurs and data is ignored. (4) "Mark" is output during initialization, receive buffer full status and when an abnormality is detected. When XON / XOFF control is set by dipswitch, "Mark" is output only during initialization.
DSR	(1) Input signal to indicate that printer is in data transmission enable status. (2) When this signal is "Space", printer judges the status as data transmission enable, and sends data to host. When this signal is "Mark", printer does not send data. (3) When XON/XOFF control is set by dipswitch, printer ignores this signal and sends data.
*ATF	(1) Paper feed request signal. (2) Normally "High". Paper is fed in "Low" status. (3) When paper is fed by this signal, the internal processing time is not constant. Use the line feed command for a more accurate paper feed. (4) When paper is fed by this signal, when XON/XOFF control is set by dipswitch signal XOFF code is sent, when DTR/DSR control is set DTR becomes “Mark”. (5) When paper is fed by receiving this signal, the position on the page does not change. If paper is fed by the new page command after paper is fed by this signal, the page start position deviates. (6) If this signal in "Low" status is initialized by the *INPRM signal or the power supply is turned on, the test function mode is set.
*SLCTIN	(1) Signal that makes the detection functions of initial setting invalid (2) If power is turned ON or if initialization by the *INPRM signal is executed when this signal is "Low", paper run out detection, paper near end, platen open detection, head temperature abnormality detection, motor temperature abnormality detection, head driving voltage abnormality detection and paper feed by *ATF signal become invalid.

Signal Name	Function
*INPRM	(1) Signal to initialize printer (2) Normally "High". A hardware reset is executed when "Low" changes to "High". (3) This signal sets the printer status as follows. (1) Print buffer — Clear (2) Line feed pitch — About 3.25mm (3) ANK character pitch — 12dots / character (4) Print character type — 12x24 dots half size character (5) Page length setting — 44 lines, about 143 mm (6) Double width specification — Clear (7) Double height specification — Clear (8) Black and white reversal printing — Clear (9) Reverse order printing — Clear (10) Underline specification — Clear (11) Character code — Set to Japanese characters (12) International character setting — Japan (13) Printing speed setting — High-speed mode (14) Horizontal tab setting — Every 8 characters (15) Mark detection to start point setting — About 2 mm (16) Paper run out detection setting — Valid *1 (17) Platen open detection setting — Valid *1 (18) Temperature abnormality detection setting — Valid *1 (19) Near end detection setting — Invalid (20) Voltage abnormality detection setting — Valid *1 (21) Paper type — Continuous paper (22) Kanji print mode specification — Clear (23) Print quality setting — Standard paper (24) x4 size print mode specification — Clear (25) Kanji code setting — JIS code (26) 90° character rotation — Clear (27) Paper auto-feed amount setting — 20mm (28) Motor off-time setting — One excitation time = 5 sec Excitation holding time = 10sec (29) Printing mode setting — Line printing mode (30) Print buffer — Clear *1: This can be set to invalid by the *SLCTIN signal. (4) If the *ATF signal in "Low" status is initialized by this signal, the test function mode is set. (5) Only initialization is executed without printing data in the buffer. (6) During initialization, DTR outputs “Mark”. After initialization end if an error does not occur, when XON/XOFF control is set by dipswitch signal XON code is sent, when DTR/DSR control is set DTR becomes “Space”. After initialization end if an error occurs, when XON/XOFF control is set by dipswitch XOFF code is sent, when DTR/DSR control is set DTR keeps “Mark”.

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3 USB Interface Specification

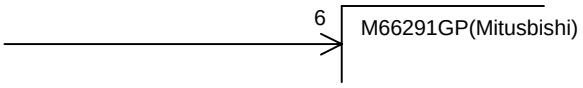
3.1 General Specification

(1) System: USB Serial interface Ver 1.1
(2) Data receiving speed: Full speed mode (12Mbit/sec)

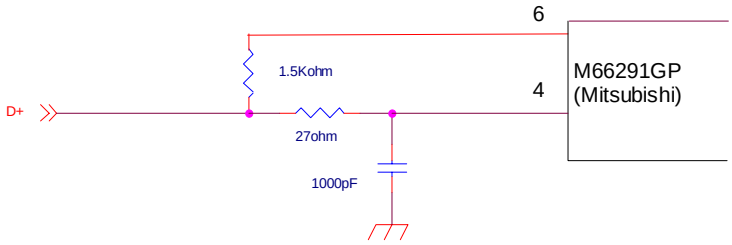
3.2 Electrical Characteristics of Input/Output signals

(a) Signal level (for Output)
Space (logic=0): +3V ~ +12V
Mark (logic=1): -3V ~ -12V

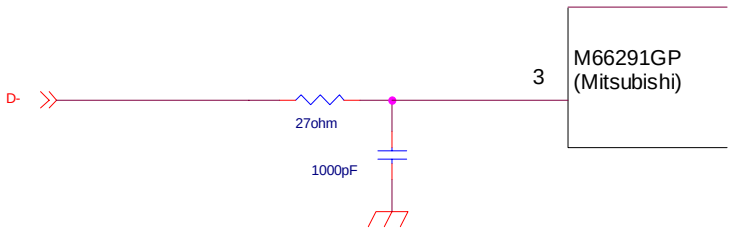
(1) VBUS



(2) D+



(3) D-



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3.3 Communication Format

Please refer USB Ver 1.1 standard

3.4 Pin Configuration of Input/Output Signals

① Connector number: CN3
② Connector type: UX60-MB-5ST (made by Hirose Electric)
③ Connector Pin Configuration

No.	Signal Name	Direction	Function
1	VBUS	Input	Bus power supply
2	D-	Input/Output	Deferential data -
3	D+	Input/Output	Deferential data +
4	N.C.	---	No Connection
5	GND	---	Signal ground

NOTE1)
Input/Output directions indicate directions from printer.

NOTE2)
For the connector of the other side, use an UX40-MB-5P (made by Hirose Electric) equivalent product.

3.5 Description of Signals

Signal Name	Function
VBUS	(1) Signal for USB power supply. (2) Please input +5V power supply.
D+	(1) Signal of USB D+.
D-	(1) Signal of USB D-.

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3.6 Bus emulation of USB

When the connection of the device is detected, host PC processes emulation to the device. Host PC gives the address for a peculiar communication to the device and acquires attribute information on the device. Simultaneously, host PC does various setting to the device, and activates the device.
Information (Description) on the attribute of this device used at the bus emulation is as follows.
Refer to "**USB specification ver.1.1**" for the method of operating emulation and the meaning of attribute information on the undermentioned device.

(1) DEVICE_DESCRIPTOR

Device_bLength:	x12
Device_bDescriptor Type:	x01
Device_bcdUSB:	x0110
Device_bDeviceClass:	x00
Device_bDeviceSubClass:	x00
Device_bDeviceProtocol:	x00
Device_wMaxPacketSize0:	x08
Device_wVendorId:	x0430
Device_wProductId:	x0600
Device_bcdDevice:	x0001
Device_iManufacturer:	x01
Device_iProduct:	x02
Device_iSerialNumber:	x00
Device_bNumConfigurations:	x01

(2) CONFIGURATION_DESCRIPTOR

Config_bLength:	x09
Config_bDescriptorType:	x02
Config_wTotalLength:	x0020
Config_bNumInterfaces:	x01
Config_bConfiguration Value:	x01
Config_iConfiguration:	x00
Config_iSerialNumber:	xC0
Config_bNumConfigurations:	x32

(3) INTERFACE0_DESCRIPTOR

Interface0_bLength:	x09
Interface0_bDescriptorType:	x04
Interface0_bInterfaceNo:	x00
Interface0_bAlternateSetting:	x00
Interface0_bNumEndPoints:	x02
Interface0_bInterfaceClass:	x07
Interface0_bInterfaceSubClass:	x01
Interface0_bProtocol:	x02
Interface0_iInterface:	x00

(4) ENDPOINT_DESCRIPTOR

EP0_bDescriptorLength:	x07
EP0_bType:	x05
EP0_bEndPointAddress:	x01
EP0_bmAtrributes:	x02
EP0_wMaxPacketSize:	x0040
EP0_bInterval:	x00

(5) ENDPOINT_DESCRIPTOR

EP1_bDescriptorLength:	x07
EP1_bType:	x05
EP1_bEndPointAddress:	x82
EP1_bmAtrributes:	x02
EP1_wMaxPacketSize:	x0040
EP1_bInterval:	x00

(6) STRING_DESCRIPTOR

i) Index:0

-bLength:	x04
-bDescriptorType:	x03
-bString:	xFF
-String:	x0409 (English)

ii) Index:1

-bLength:	x24
-bDescriptorType:	x03
-bString:	xFF
-String:	“FUJITSU COMPONENT”

iii) Index:3

-bLength:	x24
-bDescriptorType:	x03
-bString:	xFF
-String:	“FTP-629DSL Series”

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3.7 Class request of USB

BmRequest	bRequest	wValue	wIndex	wLength	data
10100001B	0	0	0	x3F1	–

(1) The data of 84 bytes replies.
(2) The content of the replying data is as follows.

No.	①	②	③	④
Number of data	2 bytes	8 bytes	18 bytes	22 bytes
data	0x0054	MFG:FTA;	CMD:ESCPOS,BDC,D8;	MDL:FTP-629DSL Series;

⑤	⑥
12 bytes	22 bytes
CLS:PRINTER;	DES:FTP-629DSL Series;

(3) Specify the values other than 0 for "WLength". The printer replies stall when 0 is specified.

3.8 Vender request of USB

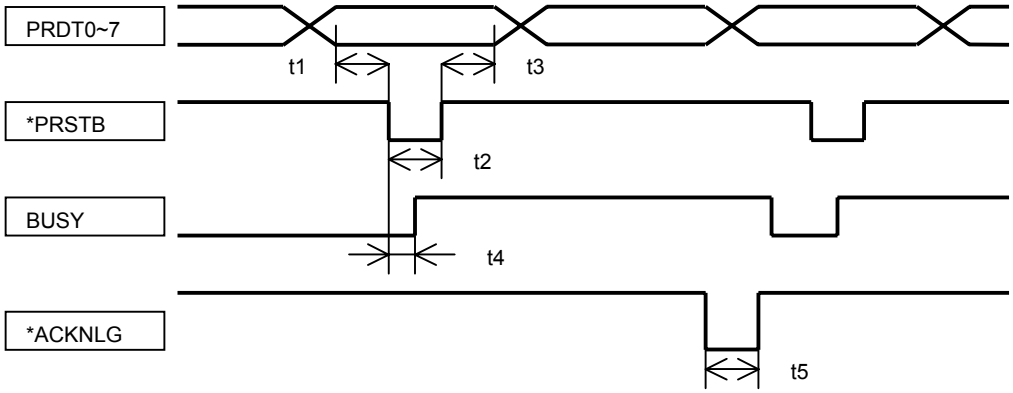
This printer notifies the status of the printer by using the Vender request. Refer to "**H. Vender request**" for the parameter of the Vender request and the notified content of status.

SECTION E
Timing Chart

1 Centronics Interface

1.1 When data is received:

(Figure 1)



(1)	Data set time	t1 ≥ 0.5usec
(2)	*PRSTB pulse time	t2 ≥ 0.5usec
(3)	Data hold time	t3 ≥ 0.5usec
(4)	From *PRSTB input to BUSY = “High”	t4 ≤ 0.5usec
(5)	*ACKNLG pulse time	t5 about 6.5usec

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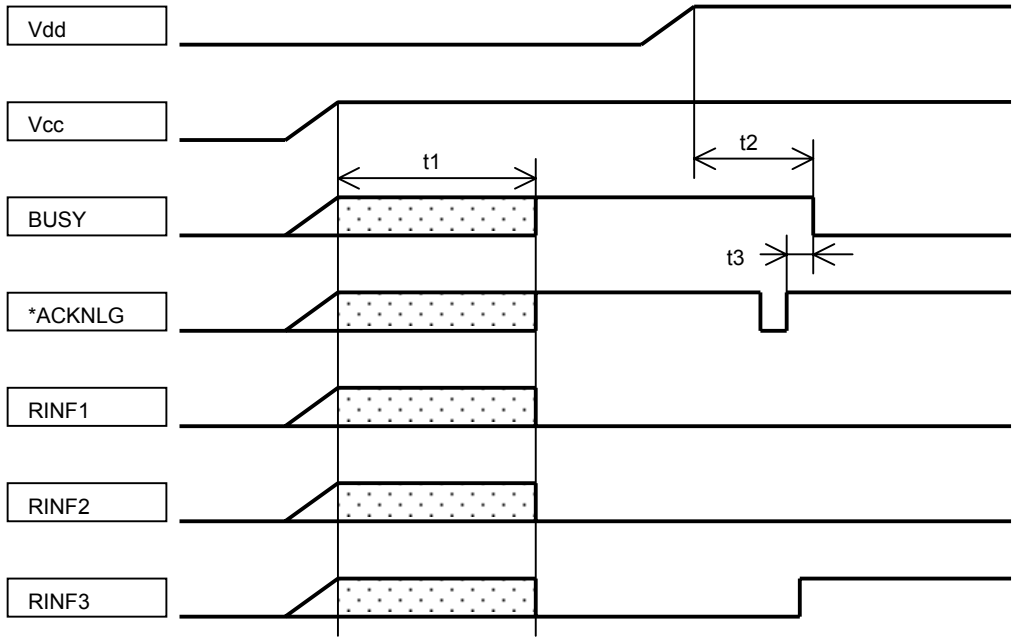
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1.2 When power is turn ON (no error):

(Figure 2)



(1)	MCU reset time	t1 ≤ 300msec
(2)	Initialization time	t2 ≤ TBD
(3)	From *ACKNLG=" ↑" to BUSY="L"	t3 ≤ TBD

NOTE 1)
To set paper run out, platen open, head voltage abnormality and head temperature abnormality detections to invalid at the initial setting, set the *SLCTIN signal to "Low" level before turning power on.

NOTE 2)
The shaded area in the above figure indicates arbitrary status.

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DATE

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DRW NO.

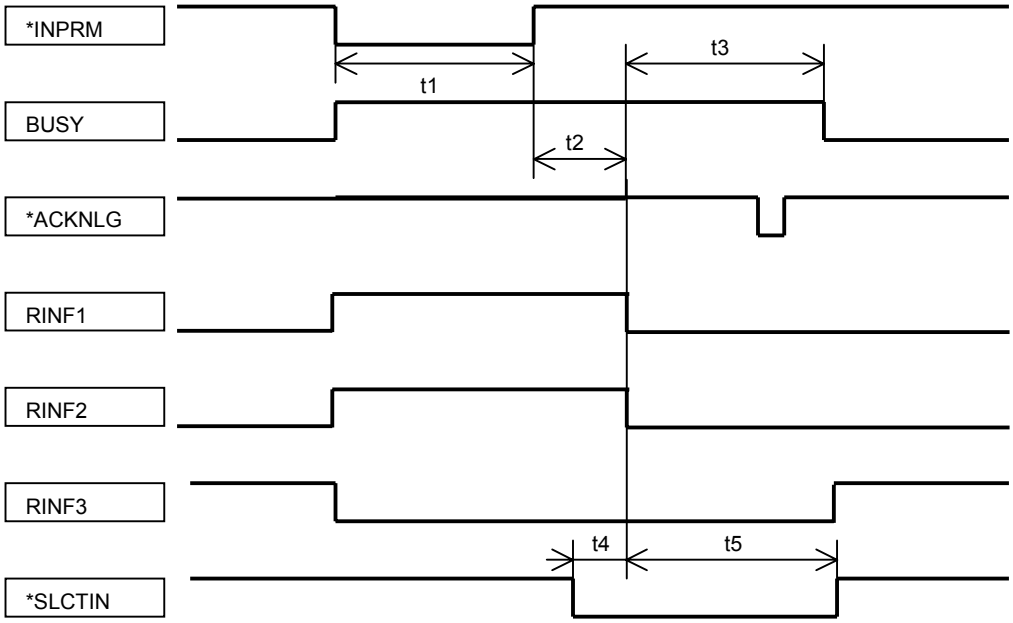
CUST.

FUJITSU COMPONENT LIMITED

SHEET 33

1.3 *INPRM Reset Timing (No error and standby status when data is not in buffer):

(Figure 3)

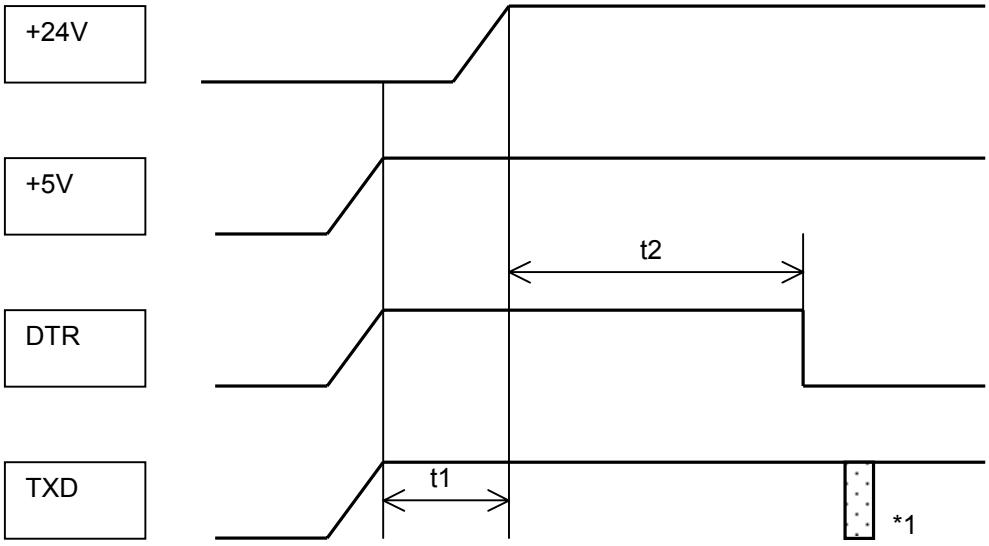


(1)	*INPRM="L" time	t1 ≥ 10usec
(2)	Initialization transition time	t2 ≤ TBD
(3)	Initialization time	t3 ≤ TBD
(4)	*SLCTIN setup time	t4 ≥ 0msec
(5)	*SLCTIN hold time	t5 ≥ t3

NOTE 1)
To set paper run out, platen open, head voltage abnormality and head temperature abnormality detections to invalid at the initial setting, set the *SLCTIN signal to "Low" level before turning power on.

2 RS-232C Serial Interface

2.1 When power is turned on (no error)



(1) Power supply sequence time: 0msec ≤ t1
(2) Initialization time t2 ≤ 2.8 sec

NOTE 1)
To set paper run out, platen open, head voltage abnormality and head temperature abnormality detections to invalid at the initial setting, set the *SLCTIN signal to “Low” level before turning power on.

NOTE 2)
*1: When XON/XOFF control is selected by dipswitch setting, XON code is send.

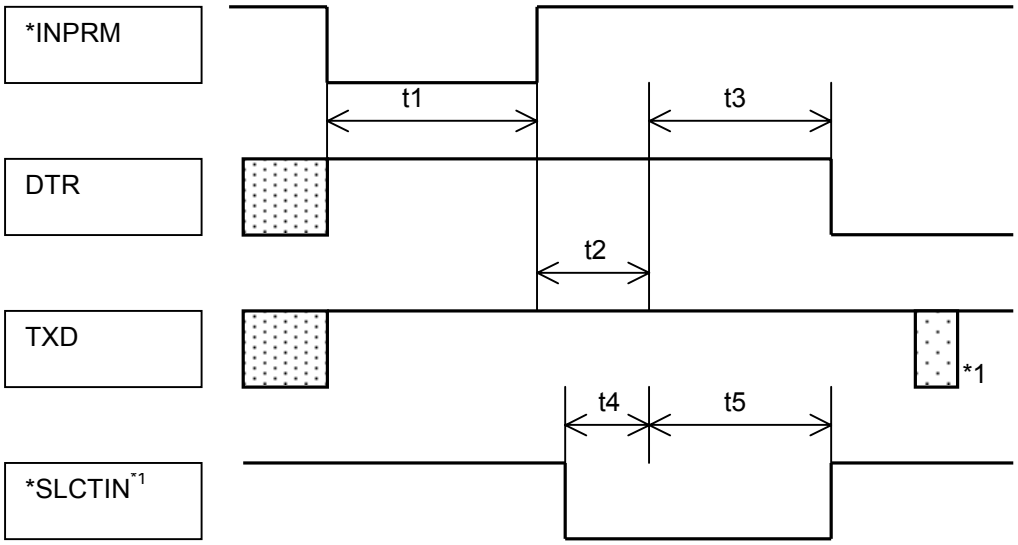
DOCUMENT CONTROL SECTION

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DESIG			CHECK	APPR

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2.2 *INPRM Reset Timing (no error)



(1) *INPRM = “L” time: t1 ≥ 10usec
(2) Initialization transition time: t2 ≤ 90msec
(3) Initialization time: t3 ≤ 2.8sec
(4) *SLCTIN setup time: t4 ≥ 0msec
(5) *SLCTIN hold time: t5 ≥ t3

NOTE 1)
To set paper run out, platen open, head voltage abnormality and head temperature abnormality detections to invalid at the initial setting, set the *SLCTIN signal to “Low” level before turning power on.

NOTE 2)
*1: When XON/XOFF control is selected by dipswitch setting, XON code is send.

NOTE 3)
The shaded area in the above figure indicates arbitrary status.

3 USB Interface

Please refer USB Ver 1.1 standard

SECTION F
Functional Specification

1 Centronics Interface Specification

1.1 Test Print Function

Test Print Function	(1) The self-test print function is selected when power is turned ON or if initialization by the *INPRM signal is executed while the *ATF signal is "Low". (2) The mode automatically changes as follows. ┌ → (a) → (b) → (c) → (d) → (e) → (f) → (g) → (h) → (i) → (j) → (k) ┐ (a) 50% checkered printing (2 lines) (b) 25% checkered printing (6 lines) (c) Printer setting status printing (d) Japanese character set (12x24) (1 set) (e) Overseas character set (12x24) (1 set) (f) International characters (12x24) (14 lines) (g) Japanese character set (8x16) (1 set) (h) Overseas character set (8x16) (1 set) (i) International characters (8x16) (14 lines) (j) Kanji JIS levels 1, 2 *1 (24x24) (3) Interface setting and expand function setting are printed at printer setting status printing. (4) Test printing is executed with standard paper (PD150R equivalent) mode. (5) If an error occurs during test printing, printing stops (except when paper is at near end). When error is cleared, printing restarts after one line feed. (6) To clear test printing, shut power OFF or execute initialization by the *INPRM signal when *ATF is set to "High".

1.2 Detection Function

Detection Function	Function
Paper Run Out Detection	(1) During printing or feeding paper, a paper run out is detected when the sensor continuously detects a black level for about 6mm. (2) When the printer detects a paper run out during printing, and if currently printing data exists, the printer automatically enters off-line (BUSY) status after printing one line. (3) Set the paper. If an error has not occurred, one line is fed and printing restarts from the next line. (4) When paper run out detection invalid mode is set by the detection function setting command or the *SLCTIN pin, paper run out is not detected. (5) When paper run out status is detected in paper run out detection valid mode, paper cannot be fed by command, but can be fed by the *ATF signal. (6) When paper run out is detected, driving of the motor is turned OFF. (7) When the connector for detection is in open status, it is judged as a paper run out.
Paper Near End Detection	(1) When the near end detection signal (*NES) becomes about 1.5V or less, it is judged as paper near end. In this status, data receiving and printing are executed continuously. (2) When the connector for detection is in open status, it is judged as paper near end. (3) When power is turned ON and at initialization, this function is invalid, and can be valid by the detection function setting command.

Detection Function	Function
Platen Open Detection	(1) When the printer detects platen open during printing, the printer stops driving the head and the motor in one line unit, and the printer automatically enters off-line (BUSY) status. (2) Move the platen close. If an error has not occurred, one line is fed and printing restarts from the next dot line. At this time printing continuity is not guaranteed. (3) When the platen open detection invalid mode is set by the detection function setting command or by the *SLCTIN pin, platen open is not detected. (4) When platen status is detected in platen detection valid mode, paper cannot be fed by command, but can be fed by the *ATF signal. (5) When platen open is detected, driving the motor is turned OFF.
Thermal Head Temperature Abnormality Detection	(1) Temperature is detected by the thermistor inside the thermal head to protect the head from heating. (2) When abnormal temperature (high temperature) is detected, the printer stands by in busy status until the temperature drops to the specified temperature. (3) When the temperature abnormality detection invalid mode is set by the detection function setting command or by the *SLCTIN pin, abnormal temperature is not detected. (4) When temperature abnormality is detected in temperature abnormality detection valid mode, paper cannot be fed by command. (5) When the temperature of the thermal head returns to printing enable status and an error has not occurred, the printer immediately returns to normal status.
Motor Temperature Abnormality Detection	(1) Temperature is detected by the thermistor inside the stepping motor to protect the head from heating. (2) When abnormal temperature (high temperature) is detected, the printer stands by in busy status until the temperature drops to the specified temperature. (3) When the temperature abnormality detection invalid mode is set by the detection function setting command or by the *SLCTIN pin, abnormal temperature is not detected. (4) When temperature abnormality is detected in temperature abnormality detection valid mode, paper cannot be fed. (5) When the temperature of the motor returns to printing enable status and an error has not occurred, the printer immediately returns to normal status.
Voltage Abnormality Detection	(1) Printing head drive voltage is detected, when this voltage is abnormality, the printer automatically enters off-line status. (2) When power-supply voltage returns within the above-mentioned range and an error has not occurred, the printer immediately returns to normal status. (3) When the voltage abnormality detection invalid mode is set by the detection function setting command or by the *SLCTIN pin, abnormal voltage is not detected.
Cutter Abnormality Detection	(1) When cutting does not end within four seconds, a hardware abnormality is detected as a cutter defect, and the printer automatically enters off-line status. (2) The printer returns by turning power on again or by hardware reset processing. (3) When the cutter blade is not in the home position at initialization, the printer automatically positions the cutter. (4) If the paper cut command is received when the cutter is not connected, a hardware abnormality occurs after about four seconds.

Detection Function	Function
Mark Detection Function	(1) Mark is detected by the paper run out detection sensor. (2) The shape of the mark is as follows. (Directly contact Fujitsu for details on dimensions.) Mark  5mm±0.5mm (3) When paper run out or head down status is detected at initialization, the sensor may be on the mark. Feed paper for a maximum of 8 mm and stop the printer avoiding the mark position. If paper run out status is not cleared, it is judged as paper run out status and the printer stops. (4) If a mark is not detected on the page when mark detection is executed, mark undetected status is reported. (5) Mark undetected status is held until the next data (command) is received or until a high priority error occurs.
MCU Operation Abnormality Detection	(1) The watchdog timer to prevent printer damage caused by a malfunction detects MCU operation abnormality. (2) When watchdog is occurred, printer goes internal reset state and MCU operation is stopped. (3) If MCU runaway activates the watchdog timer, it is detected as a hardware abnormality.

1.3 Protective Function

Protective Function	Function
Power Supply Disconnection Sequence Protection	(1) This function prevents burning of the head caused by the reverse order disconnection of the logic power supply and power supply for the head. (2) The head driving power supply is switched by FET, which is controlled by MCU. (3) MCU detects the head power supply voltage at initialization, and stops initialization until these values reach the specified values.
Motor Protection	(1) Motor excitation is shutdown by a hardware timer to prevent motor smoking caused by an operation abnormality. (2) Motor current is shut OFF about ten seconds after the motor stops.
Hardware Timer	(1) Limit the applied pulse width of the head by a hardware timer to prevent head burning by fixing the logic of the thermal head enable pin.
Motor Power Save Function	(1) After the motor operation stops, current flows for one phase to maintain the phase of the pulse motor. This takes about 10seconds. (2) If current is OFF when motor operation starts, current flows in the same phase for maximum of 200msec to fix the pulse motor phase before motor operation starts.

2 RS-232C Interface Specification

2.1 Test Print Function

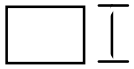
Test Print Function	(1) The self-test print function is selected when power is turned ON or if initialization by the *INPRM signal is executed while the *ATF signal is "Low". (2) The mode automatically changes as follows. ┌ → (a) → (b) → (c) → (d) → (e) → (f) → (g) → (h) → (i) → (j) → (k) ┐ (a) 50% checkered printing (2 lines) (b) 25% checkered printing (6 lines) (c) Printer setting status printing (d) Japanese character set (12x24) (1 set) (e) Overseas character set (12x24) (1 set) (f) International characters (12x24) (14 lines) (g) Japanese character set (8x16) (1 set) (h) Overseas character set (8x16) (1 set) (i) International characters (8x16) (14 lines) (j) Kanji JIS levels 1, 2 *1 (24x24) (3) Interface setting and expand function setting are printed at printer setting status printing. (4) Test printing is executed with standard paper (PD150R equivalent) mode. (5) If an error occurs during test printing, printing stops (except when paper is at near end). When error is cleared, printing restarts after one line feed. (6) To clear test printing, shut power OFF or execute initialization by the *INPRM signal when *ATF is set to "High".

*1: Printed only when Kanji ROM is mounted
*2: Only when cutter is mounted and selected

2.2 Detection Function

Detection Function	Function
Paper Run Out Detection	(1) During printing or feeding paper, a paper run out is detected when the sensor continuously detects a black level for about 6mm. If "XON/XOFF" flow is selected, "XOFF" code is transmitted. If "DTR/DSR" flow is selected, "DTR" signal goes to "mark" state. (2) When the printer detects a paper run out during printing, and if currently printing data exists, the printer automatically enters off-line (BUSY) status after printing one line. (3) Set the paper. If an error has not occurred, one line is fed and printing restarts from the next line. If "XON/XOFF" flow is selected, "XON" code is transmitted. If "DTR/DSR" flow is selected, "DTR" signal goes to "space" state. (4) When paper run out detection invalid mode is set by the detection function setting command or the *SLCTIN pin, paper run out is not detected. (5) When paper run out status is detected in paper run out detection valid mode, paper cannot be fed by command, but can be fed by the *ATF signal. (6) When paper run out is detected, driving of the motor is turned OFF. (7) When the connector for detection is in open status, it is judged as a paper run out.
Paper Near End Detection	(1) When the near end detection signal (*NES) becomes about 1.5V or less, it is judged as paper near end. In this status, data receiving and printing are executed continuously. (2) When the connector for detection is in open status, it is judged as paper near end. (3) When power is turned ON and at initialization, this function is invalid, and can be valid by the detection function setting command.

Detection Function	Function
Platen open Detection	(1) When the printer detects platen open during printing, the printer stops driving the head and the motor in one line unit, and the printer automatically enters off-line (BUSY) status. If "XON/XOFF" flow is selected, "XOFF" code is transmitted. If "DTR/DSR" flow is selected, "DTR" signal goes to "mark" state. (2) Move the platen close. If an error has not occurred, one line is fed and printing restarts from the next dot line. At this time printing continuity is not guaranteed. If "XON/XOFF" flow is selected, "XON" code is transmitted. If "DTR/DSR" flow is selected, "DTR" signal goes to "space" state. (3) When the platen open detection invalid mode is set by the detection function setting command or by the *SLCTIN pin, platen open is not detected. (4) When platen open status is detected in platen open detection valid mode, paper cannot be fed by command, but can be fed by the *ATF signal. (5) When platen open is detected, driving the motor is turned OFF.
Thermal Head Temperature Abnormality Detection	(1) Temperature is detected by the thermistor inside the thermal head to protect the head from heating. (2) When abnormal temperature (high temperature) is detected, the printer stands by in busy status until the temperature drops to the specified temperature. (3) When the temperature abnormality detection invalid mode is set by the detection function setting command or by the *SLCTIN pin, abnormal temperature is not detected. (4) When temperature abnormality is detected in temperature abnormality detection valid mode, paper cannot be fed by command. (5) When the temperature of the thermal head returns to printing enable status and an error has not occurred, the printer immediately returns to normal status.
Motor Temperature Abnormality Detection	(1) Temperature is detected by the thermistor inside the stepping motor to protect the head from heating. (2) When abnormal temperature (high temperature) is detected, the printer stands by in busy status until the temperature drops to the specified temperature. (3) When the temperature abnormality detection invalid mode is set by the detection function setting command or by the *SLCTIN pin, abnormal temperature is not detected. (4) When temperature abnormality is detected in temperature abnormality detection valid mode, paper cannot be fed. (5) When the temperature of the motor returns to printing enable status and an error has not occurred, the printer immediately returns to normal status.
Paper Near End Detection	(1) When the near end detection signal (*NES) becomes about 1.5V or less, it is judged as paper near end. In this status, data receiving and printing are executed continuously. (2) When the connector for detection is in open status, it is judged as paper near end. (3) When power is turned ON and at initialization, this function is invalid, and can be valid by the detection function setting command.
Cutter Abnormality Detection	(1) When cutting does not end within four seconds, a hardware abnormality is detected as a cutter defect, and the printer automatically enters off-line status. If "XON/XOFF" flow is selected, "XOFF" code is transmitted. If "DTR/DSR" flow is selected, "DTR" signal goes to "mark" state. (2) The printer returns by turning power on again or by hardware reset processing. (3) When the cutter blade is not in the home position at initialization, the printer automatically positions the cutter. (4) If the paper cut command is received when the cutter is not connected, a hardware abnormality occurs after about four seconds.

Detection Function	Function
Voltage Abnormality Detection	(1) Printing head drive voltage is detected, when this voltage is abnormality, the printer automatically enters off-line status. (2) When power-supply voltage returns within the above-mentioned range and an error has not occurred, the printer immediately returns to normal status. (3) When the voltage abnormality detection invalid mode is set by the detection function setting command or by the *SLCTIN pin, abnormal voltage is not detected.
Mark Detection Function	(1) Mark is detected by the paper run out detection sensor. (2) The shape of the mark is as follows. (Directly contact Fujitsu for details on dimensions.) Mark  5mm±0.5mm (3) When paper run out or head down status is detected at initialization, the sensor may be on the mark. Feed paper for a maximum of 8 mm and stop the printer avoiding the mark position. If paper run out status is not cleared, it is judged as paper run out status and the printer stops. (4) If a mark is not detected on the page when mark detection is executed, mark undetected status is reported. (5) Mark undetected status is held until the next data (command) is received or until a high priority error occurs.
MCU Operation Abnormality Detection	(1) The watchdog timer to prevent printer damage caused by a malfunction detects MCU operation abnormality. (2) If MCU runaway activates the watchdog timer, it is detected as a hardware abnormality.

2.3 Protective Function

Protective Function	Function
Power Supply Disconnection Sequence Protection	(1) This function prevents burning of the head caused by the reverse order disconnection of the logic power supply and power supply for the head. (2) The head driving power supply is switched by FET, which is controlled by MCU. (3) MCU detects the head power supply voltage at initialization, and stops initialization until these values reach the specified values.
Motor Protection	(1) The Rush resistant is mounted to prevent motor smoking caused by an operation abnormality. (2) After about 10 sec of motor stop, the motor power supply is cut OFF.
Hardware Timer	(1) Limit the applied pulse width of the head by a hardware timer to prevent head burning by fixing the logic of the thermal head enable pin.
Motor Power Save Function	(1) After the motor operation stops, current flows for one phase to maintain the phase of the pulse motor. This takes about 10seconds. (2) If current is OFF when motor operation starts, current flows in the same phase for maximum of 200msec to fix the pulse motor phase before motor operation starts.

3 Paper ejection and collection function

3.1 Paper transportation

(1) Presenter check
Presence of the paper on the presenter is checked by the **GS s** command. **Transportation error** is set when there is no paper on the presenter. The paper is moved to the home position when there is a paper on the presenter. Even when eject/collection pattern has been changed by the **GS X+n** command, the home position is common.

(2) Eject preparation
The paper on the presenter is moved to the eject preparation position by the **GS y** command. When the paper has already been ejected, The processing of this command becomes operation same as **(3) Paper retraction**, and returns the paper in the state of the eject to the eject preparation position. **Transportation error** is set when there is no paper on the presenter. The eject preparation position is different in eject/collection pattern set by the **GS X+n** command.

(3) Paper retraction
The paper in the ejecting state is returned to the eject preparation position by the **GS z** command. When the paper is not in the state of the eject, the processing of this command becomes operation same as **(2) Eject preparation**, and moves the paper on the presenter to the eject preparation position. **Transportation error** is set when there is no paper on the presenter. The eject preparation position is different in eject/collection pattern set by the **GS X+n** command.

3.2 Paper ejection
The paper is ejected from the eject preparation position by the **GS t+n** command. The amount of the eject can be set at intervals of 1mm. When it is shorter than the amount of the eject which the length of the paper specified, the amount of the eject is length of the paper. After the paper on the presenter is moved to the eject preparation position when the paper is not at the eject preparation position, the paper is ejected. The direction of the eject is different according to the eject pattern selected by the **GS X+n** command.

3.3 Paper collection
The paper on the presenter is collected by the **GS x+n** command.
The ejecting direction is different according to the collection pattern selected by the **GS X+n** command.

3.4 Switch of presenter mode
Eject/collection pattern is switched by **GS u+n**.
Refer to **GS u+n** of **G.Commands Specification** for parameter n and the selected pattern.

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3.5 Error related to presenter

For RS-232C and USB, the printer can notify status and the error concerning the form transportation and the collection.

(1) Transportation error

When the paper blocking is detected when the form is transported, this error is set. This error is released by reading status.

(2) Abnormal paper detection

When longer paper than the maximum length is detected, this error is set. This error is maintained until the paper is removed.

(3) Collection error

When "Transportation error", "Abnormal paper detection", and "Paper remaining on Presenter" are detected in the form collection processing, this error is set. This error is released by reading status.

(4) Paper detection of uncollection

When the paper of the uncollection is detected on the presenter when beginning to print, the printer stops the print processing and sets this error. This error is maintained until the form is removed.

(5) Paper remaining on Presenter

When remaining of an abnormal form is detected when the form is transported, this error is set. This error is maintained until the form is removed.

SECTION G

Commands Specification

Each command is explained using the following conventions:

[Name] Command name

[Function] Function of command

[Code] Control code represented in hexadecimal or decimal notation.

$[X]_{16}$ Hexadecimal notation

$[X]_{10}$ Decimal notation

[Explanation] Explanation of command function

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(1) HT

[Name] Horizontal tab

[Function] The HT command moves the printing position to the next horizontal tab position.

[Code] $[09]_{16}$
$[09]_{10}$

[Explanation]

(1) If the next horizontal tab position is not set, the HT command is ignored.

(2) If the next horizontal tab position is outside the printing area, the printing position is shifted to the proper position by adding 1 to the printing area width.

(3) If an HT command is received when the print head is located at the position to which the printing has been newly shifted by adding 1 to the printing area width, buffer-full printing is executed. Then, the horizontal tab operation is executed from the head of the next line.

(4) The horizontal tab position is set with *ESC D*.

(5) If characters are received when the print head is located at the position to which the printing has been shifted by adding 1 to the printing area width, buffer-full printing is executed. Then, the print head moves to the leftmost column on the next line, and the received characters are processed. When a line feed command such as LF is received, data is printed and a line is fed. The print head then moves to the leftmost column on the next line.

(6) In backward printing, the tab indicates a position from the rightmost column.

(2) LF

[Name] Line feed

[Function] The LF command prints the data already contained in the print buffer, then sets the next-data receive position at the leftmost column on the next line.

[Code] $[0A]_{16}$
$[10]_{10}$

[Explanation]

(1) The *LF* command prints the data already contained in the print buffer, then sets the next-data receive position at the leftmost column on the next line.

(2) In the initial state, the line spacing is set to approx. 1/8 inch.

(3) When there is no data in the print buffer, only a line feed operation is executed.

(4) When different-height character typefaces are to be printed on the same line, these character typefaces are arranged so that their bottom ends are aligned at the same level.

(5) If line spacing during printing/line-feeding is shorter than the character height, a length equal to the character height feeds the paper.

(3) FF

[Name] Forms feed (new page)

[Function] The *FF* command prints the data already contained in the print buffer, then sets the next-data receive position at the leftmost column on the next page.

[Code] $[0C]_{16}$
$[12]_{10}$

[Explanation]

(1) The *FF* command feeds paper by the specified page length.

(2) In the initial state, the page length is set to approx. 143 mm. (44 lines).

(3) When cut-sheet printing is selected, the *FF* command executes the following operations:

- When the page length is set to 0 (page length cancellation) by using *ESC C*, the paper is ejected.
- Paper ejection is checked using the paper-out sensor. When the detection is invalid, the paper ejection is checked.
- The maximum paper ejection length is approx. 1m. If the paper-out state is not detected within the span of the 1-meter ejection, the paper ejection terminates.

(4) When paper with mark is selected, the *FF* command executes the following operations:

- The data contained in the print buffer is printed, and a search is made for the head of the next label.
- The beginning of a line is set as the next printing position.
- A paper with mark is selected with *ESC c1*.

(4) ESC FF

[Name] Data printing in page printing mode.

[Function] This command collectively prints data developed in entire printing area in page printing mode.

[Code] [1B] $_{16}$ [0C] $_{16}$
[27] $_{10}$ [12] $_{10}$

[Explanation]

(1) This command is enabled only when page printing mode is selected.

(2) Paper ejection and paper cut are not executed.

(3) After printing, developed data, setting of the *ESC W*, and character development positions are unchanged.

(4) The range specified by the *ESC W* command is printed.

(5) ESC EM + n

[Name] Setting the amount of the feeding at automatic paper feed

[Function] The amount of the feeding at automatic paper feeding is set.

[Code] $[1B]_{16}$ $[19]_{16}$ [n]
$[27]_{10}$ $[25]_{10}$ [n]

[Explanation]

(1) The amount of feeding is set by this command.

(2) The set amount of feeding is 8 x n dot line.

(3) The range of n is $0 \leq n \leq 255$. The automatic paper feed function becomes invalid for n=0.

(4) At the time of power ON or reset, the printer is set the continuous paper mode with automatic paper feeding.

(5) An initial value is n = 120.

(6) ESC RS

[Name] Black-white reversed printing specification

[Function] The *ESC RS* command specifies black-white reversed printing.

[Code] $[1B]_{16}$ $[1E]_{16}$
$[27]_{10}$ $[30]_{10}$

[Explanation]

(1) The *ESC RS* command specifies black-white reversed printing.

(2) The *ESC RS* command can be specified in units expressed in characters. One line can contain both normal printed characters and reverse printed characters.

(3) The *ESC RS* command can be used in all character modes.

(4) The *ESC RS* command can also be used in bit image printing.

(5) The line-spacing area is not appeared in reverse format.

(6) When a printing start command (*LF* or *FF*) is received in reverse mode, some of the print image is not appear in reverse format. This reverse suppression continues from the reverse mode specified character to the rightmost column (in forward printing mode) or to the leftmost column (in backward printing mode).

(7) The print image of the characters skipped with a *HT* command is not appear in reverse format.

(7) ESC US

[Name] Black-white reversed printing cancellation

[Function] The *ESC US* command cancels black-white revered printing.

[Code] $[1B]_{16}$ $[1F]_{16}$
$[27]_{10}$ $[31]_{10}$

[Explanation]

(1) The *ESC US* command cancels the reverse printing mode.

(2) The *ESC US* command does not start character printing.

(8) ESC SP + n

[Name] Character spacing setting

[Function] This command sets character spacing.

[Code] [1B] $_{16}$ [20] $_{16}$ [n]
[27] $_{10}$ [32] $_{10}$ [n]

[Explanation]

(1) This command sets character spacing.

(2) This command is invalid for Kanji.

(3) The range of n is $0 \leq n \leq 32$.

(4) Character spacing is set for the right side of a character.

(5) Number of dots occupied by one character is set to the total value of the number of actual printing dots in horizontal direction and character spacing. If this value cannot be secured between current character position and right margin, data development position is set at left end of next line after printing and alines feed.

(6) When character enlargement is specified, character spacing is also enlarged.

(7) Different character spacing can be set for line printing mode and page printing mode.

(9) ESC ! + n

[Name] Printing mode specification

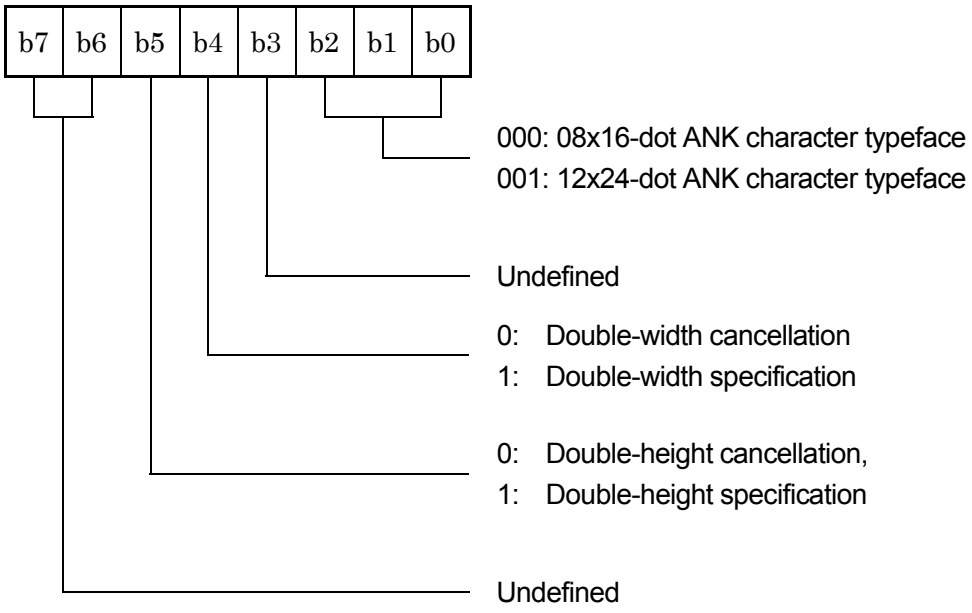
[Function] The ESC ! + n command specifies printing mode.

[Code] $[1B]_{16}$ $[21]_{16}$ [n]
$[27]_{10}$ $[33]_{10}$ [n]

[Explanation]

(1) The *ESC ! + n* command specifies printing mode.

(2) The following figure shows the relationship between the bits of parameter n and printing mode:



(3) When both the double width and double height are specified, characters with the double height and width character typeface are printed.

(4) When one line contains different-height character typefaces, the character typefaces are arranged so that their bottom ends are aligned at the same level.

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(10) ESC $+$n_1$+$n_2$

[Name] Absolute position specification

[Function] This command specifies printing position based on left margin position.

[Code] $[1B]_{16}$ $[24]_{16}$ $[n_1]$ $[n_2]$
$[27]_{10}$ $[36]_{10}$ $[n_1]$ $[n_2]$

[Explanation]

(1) The next printing position is the [n2x256+n1] dot from the left margin position.

(2) When a value outside the printing area is specified, a parameter error occurs and the previous value is maintained.

(11) ESC % + n

[Name] External registration character specification/cancellation

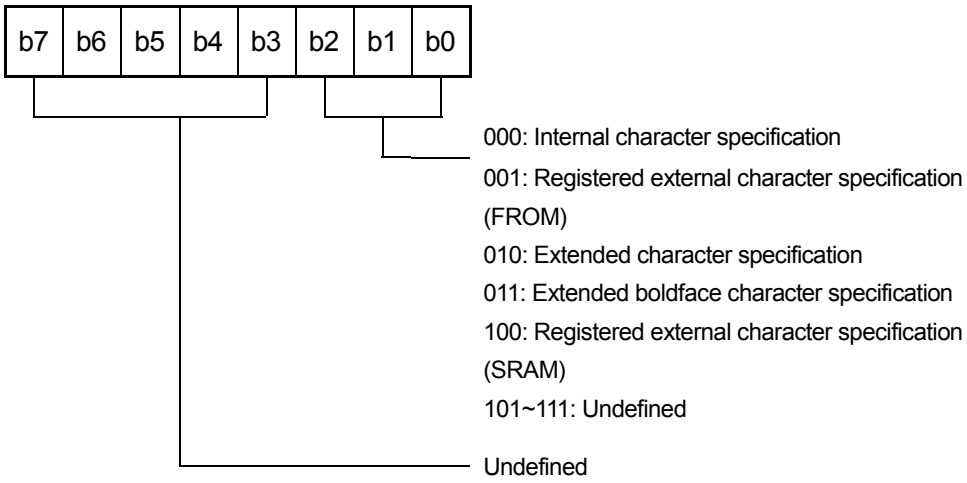
[Function] The ESC % + n command specifies or cancels registered external characters.

[Code] $[1B]_{16}$ $[25]_{16}$ [n]
$[27]_{10}$ $[37]_{10}$ [n]

[Explanation]

(1) The *ESC %+n* command selects an internal character set (system-defined font) or a registered external character set (user-defined font).

(2) The following figure shows the relationship between the bits of parameter n and the character set to be selected:



(3) One of the following character sets is selected with the character type selected with the *ESC !* command:

No.	*ESC !* Specification	Registered External Character Specification	Extended Character Specification	Extended Boldface Character Specification
1	08 x 16 ANK	08 x 16 registered	08 x 16 extended	08 x 16 boldface
2	12 x 24 ANK	12 x 24 registered	12 x 24 extended	12 x 24 boldface

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(4) If an undefined external character code is received when the registered character-printing mode is set, the corresponding internal character is printed.

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(12) ESC & + y + n + m + x + d_1 to d_n

[Name] External registration character definition

[Function] The ESC & + y + c_1 + c_2 + x + d_1 to d_n command defines external characters to be registered.

[Code] $[1B]_{16}$ $[26]_{16}$ [y] $[c_1]$ $[c_2]$ [x] $[d_1]$ to $[d_n]$
$[27]_{10}$ $[38]_{10}$ [y] $[c_1]$ $[c_2]$ [x] $[d_1]$ to $[d_n]$

[Explanation]

(1) This *ESC* command defines external characters to be registered.

(2) Parameter y specifies a dummy code. A NUL code must be specified.

(3) Parameter x specifies a dummy code. A NUL code must be specified.

(4) Parameter d specifies the data to be defined.

(5) Parameter c_1 and c_2 specify the areas to be defined. The values of parameter c_1 and c_2 values must satisfy the following conditions:$[20]_{16} \leq c_1 \leq c_2 \leq [FF]_{16}$

(6) To define one character, parameter c_1 and c_2 must be specified so that the c_1 value is equal to the c_2 value. To define two or more characters, the data block of d_1 to d_n must be specified the same number of times as the number of characters to be defined.

(7) If "$c_2 < c_1$" is detected, a parameter error is assumed and the external characters are not registered.

(8) The length of the data required to define one external character to be registered depends on the character type specified with the *ESC !* command (see the following table):

Character type specified with *ESC !*	Data length
08 x 16 ANK	16 bytes
12 x 24 ANK	48 bytes
16 x 16 ANK	32 bytes
24 x 24 ANK	72 bytes

(9) The *ESC & + y + c_1 + c_2 + x + d_1 to d_n* command cannot be used when Flash ROM is not installed.

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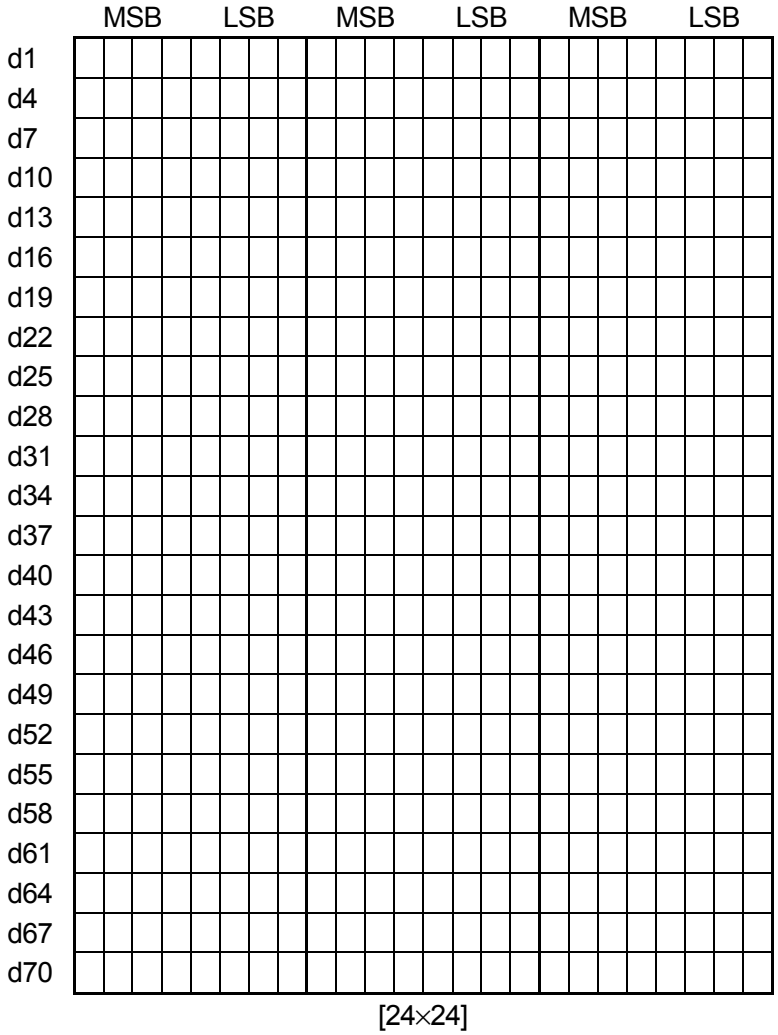
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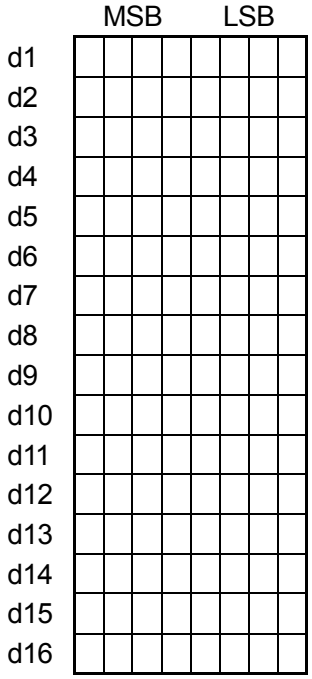
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(10)The character-typeface definition data must use the following formats:



[24×24]

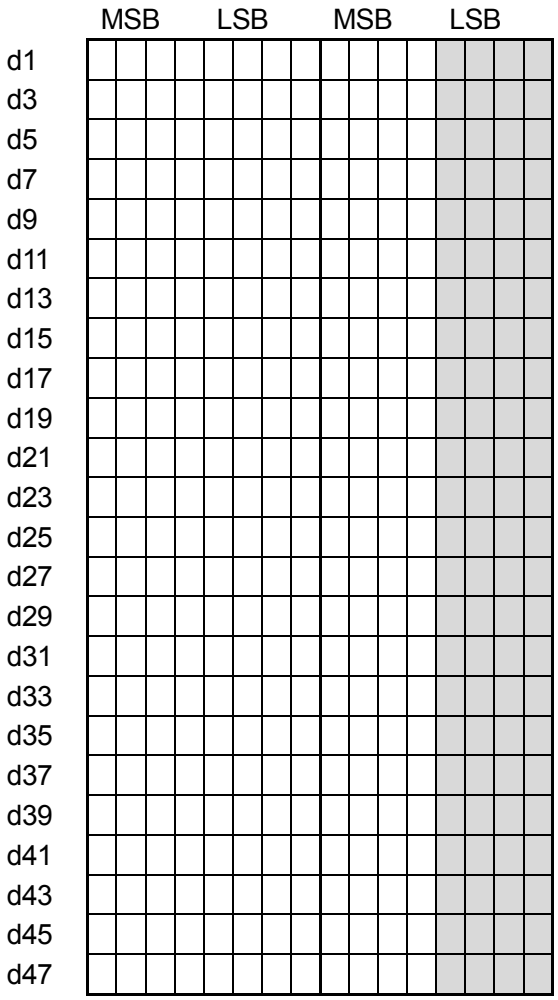


[8×16]

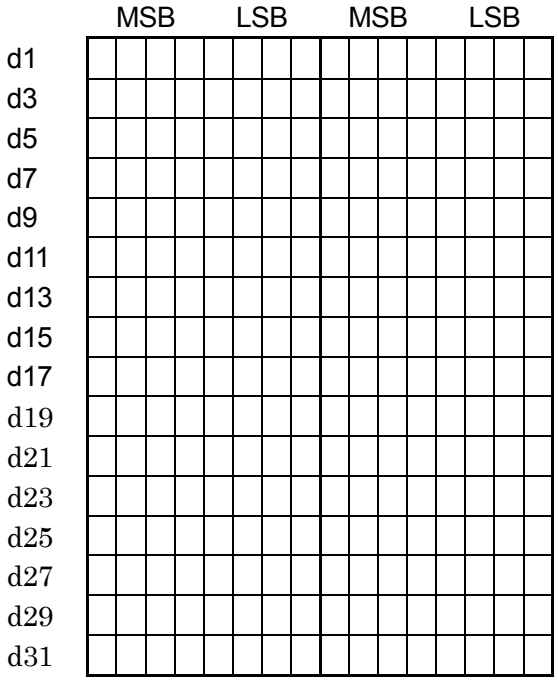
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[12×24]



[16×16]

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SHEET 61

(13) ESC * + m + n_1 + n_2 + d_1 to d_n

[Name] Bit image printing

[Function] The ESC * + m + n_1 + n_2 + d_1 to d_n command specifies and prints a bit image.

[Code] $[1B]_{16}$ $[2A]_{16}$ [m] [n_1] [n_2] [d_1] to [d_n]
$[27]_{10}$ $[42]_{10}$ [m] [n_1] [n_2] [d_1] to [d_n]

[Explanation]

(1) This *ESC* command specifies and prints a bit image.

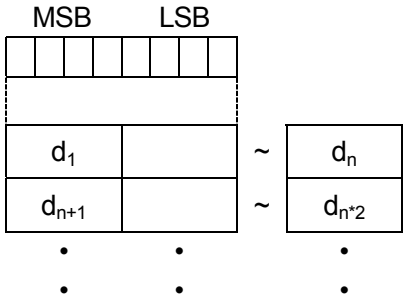
(2) The relationship between parameter m and image print modes is as follows:

m	Mode	Number of print dots		Number of dots
		Vertical direction	Horizontal Direction	
96	Single density	1	16	(n_2*256+n_1)*print-width/2
97	Double density	1	8	(n_2*256+n_1)*print-width

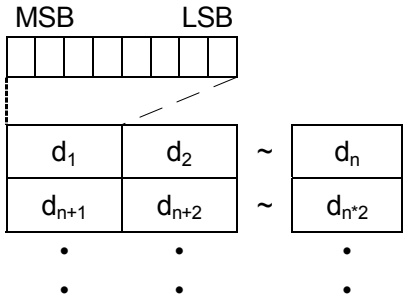
(3) Parameter n_1 and n_2 specify the number of lines to be printed. Without regard to the specified mode, conditions $0 \le n_1 \le 255$ and $0 \le n_2 \le 3$ must be satisfied. If condition $n_1 = n_2 = 0$ is satisfied, a parameter error is assumed and this *ESC* command becomes invalid. Data overflowing from the specified printing area is ignored.

(4) The following figure shows the relationship between bit image data and print data:

- When m = 96



- When m = 97



(5) Parameter n_1 and n_2 specify the number of dots in the vertical direction of the bit image to be printed. That is, the number of dots is "256 x n_2 + n_1." Therefore, the number of dots to be transferred is "(256 x n_2 + n_1) x print-head-width."

(6) The print width is as follows:

Printer	Print width (bytes)
FTP-622MCL	56
FTP-632MCL	72

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SHEET 62

(14) ESC - + n

[Name] Underline setting

[Function] This command sets and cancels underline.

[Code] $[1B]_{16}$ $[2D]_{16}$ [n]
$[27]_{10}$ $[45]_{10}$ [n]

[Explanation]

(1) This command sets and cancels underline.

(2) The relationship between the value of n and mode setting is as follows:

N	Setting
0. 48	Underline cancellation
1, 49	1 dot width setting
2, 50	2 dots width setting

(3) This command is valid for all characters other than Kanji.

(4) Thickness of underline is the thickness specified by the *ESC* - command, even if character size is changed.

(5) When character spacing is specified, underline is added to character spacing area. Underline is not added to the section skipped by the *HT* command and 90˚ rotated characters.

(6) Underline can be specified and canceled by other commands.
The command used last is valid.

(7) Underline is set in line spacing. If line spacing is smaller than width of underline, a minimum 2 dot lines of line spacing is set.

(15) ESC 2

[Name] 1/6-inch line pitch setting

[Function] The ESC 2 command sets the single line pitch to 1/6 inch.

[Code] $[1B]_{16}$ $[32]_{16}$
$[27]_{10}$ $[50]_{10}$

[Explanation]

(1) The *ESC 2* command sets single line pitch to 1/6 inch.

(2) When line pitch is set using the *ESC 2* command, the line spacing set with the *ESC A* command is invalidated.

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(16) ESC 3 + n

[Name] Line pitch setting

[Function] The ESC 3 + n command sets single line pitch.

[Code] $[1B]_{16}$ $[33]_{16}$ [n]
$[27]_{10}$ $[51]_{10}$ [n]

[Explanation]

(1) The *ESC 3 + n* command sets single line pitch to n dot lines.

(2) When line pitch is set using the *ESC 3 + n* command, the line pitch previously set with the *ESC A* command is invalidated.

(3) In line feed with printing, paper is fed by at least the height of the character currently specified. In line feed without printing, paper is fed only by the specified line spacing. For example, when line spacing of 10 dot lines is specified for a character of which height is 24 dot lines, paper is fed by 24 dot lines (in line feed with printing) or 10 dot lines (in line feed without printing).

(17) ESC ? + n

[Name] External registration character deletion

[Function] The ESC ? + n command deletes an external registration character specified with parameter n

[Code] $[1B]_{16}$ $[3F]_{16}$ [n]
$[27]_{10}$ $[63]_{10}$ [n]

[Explanation]

(1) Parameter n specifies the deleted character code.

(2) When the value of parameter n must satisfy the following condition (m is not used) :
$[20]_{16} \leq n \leq [FF]_{16}$

(3) After deletion, the corresponding internal character is printed.

(4) The code definition pattern of the character type specified with the *ESC !* command is deleted.

(5) If an unregistered character code is specified with the *ESC ? + n* command, the *ESC ?+n* command is ignored.

(18) ESC @

[Name] Printer resetting

[Function] The ESC @ command initializes the printer.

[Code] $[\ 1B\ ]_{16}$ $[\ 40\ ]_{16}$
$[\ 27\ ]_{10}$ $[\ 64\ ]_{10}$

[Explanation]

(1) The *ESC @* command initializes the printer.
(2) The *ESC @* command prints the data contained in the print buffer, and initializes various setup items.

(3) When the *ESC @* command is executed, various setup items are set as follows:

1)	Print buffer	Clear
2)	Line feed pitch	26dot line
3)	Character spacing	0 dot
4)	Print character type	12x24 dots half size character
5)	Page length setting	44 lines, about 143 mm
6)	Double width specification	Clear
7)	Double height specification	Clear
8)	Black and white reversal printing	Clear
9)	90° character rotation	Clear
10)	Under line	Clear
11)	Character code	Set to Japanese characters
12)	International character setting	Japan
13)	Oversea registered character, Oversea character code, bit image registered character, macro definition	save
14)	Mark detection to start point setting	About 2 mm
15)	Near end detection setting	Invalid
16)	Paper run out detection setting	Valid *1
17)	Platen open detection setting	Valid *1
18)	Temperature abnormality detection setting	Valid *1
19)	Voltage abnormality detection setting	Valid *1
20)	Kanji print mode specification	Clear
21)	Paper type	Continuous paper with automatic paper feed
22)	Automatic print of buffered data	Clear
23)	Mark detection of label top position	Valid
24)	Kanji code setting	JIS code
25)	Horizontal tab setting	Every 8 characters
26)	Printing mode	Line printing mode

*1: This can be set to invalid by the *SLCTIN signal.

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(19) ESC A + n

[Name] Line spacing setting

[Function] The ESC A + n command sets the line spacing to "n" dot lines.

[Code] $[1B]_{16}$ $[41]_{16}$ [n]
$[27]_{10}$ $[65]_{10}$ [n]

[Explanation]

(1) The *ESC A + n* command sets the line spacing to "n" dot lines.

(2) Condition 0 ≤ n ≤ 255 must be satisfied. However, when "n + character-height" is 256 dot lines or more, the line spacing is n + character-height - 256.

(3) If the *ESC A + n* command is set two or more times for the same line, the last set line spacing is valid.

(4) When line pitch is set with the *ESC 3* or *ESC 2* command, the line spacing set with the *ESC A + n* is invalidated.

(20) ESC C + n

[Name] Page length setting

[Function] The ESC C + n command sets the page length to "n" lines.

[Code] $[1B]_{16}$ $[43]_{16}$ [n]
$[27]_{10}$ $[67]_{10}$ [n]

[Explanation]

(1) The *ESC C + n* command sets the page length to "n" lines.

(2) Condition 0 ≤ n ≤ 63 must be satisfied.

(3) When parameter n specifies 0, the page length is reset. If a *FF* command is received when the cut sheet mode is specified and the page length is reset, the paper is ejected.

(4) If the value of parameter n is incorrect, the page length setting is invalidated and the previous page length is validated.

(5) Even if the line spacing is changed after the page length is set, the page length is not changed.

(6) The line pitch is set as follows:
- When the line spacing is set with *ESC A* command, the line pitch is set with “character-height + line spacing”.
- When the line pitch is set with *ESC 2* or *ESC 3* command, the line pitch is set with the line pitch to be set.

(21) ESC D +d_1 to d_n + NUL

[Name] Horizontal tab position setting

[Function] The ESC D + d_1 to d_n + NUL command sets the horizontal tab position.

[Code] $[1B]_{16}$ $[44]_{16}$ $[d_1]$ to $[d_n]$ $[00]_{16}$
$[27]_{16}$ $[68]_{16}$ $[d_1]$ to $[d_n]$ $[00]_{10}$

[Explanation]

(1) Condition $1 \leq d \leq 255$ must be satisfied.

(2) Condition $1 \leq n \leq 32$ must be satisfied.

(3) The horizontal tab position is set to the position that is "d x ANK-character-width" distant from the head of the line in the printing area. When character-width is satisfied to double-width, the horizontal tab position is applied double- character width.

(4) Even if the character width is changed after the horizontal tab position is set, the set horizontal tab position is not changed.

(5) When the horizontal tab is set with the *ESC D+d_1 to d_n + NUL* command, the horizontal tab position already set is canceled.

(6) When horizontal position d=8 is set, executing a *HT* command moves the next print position to column 9.

(7) Up to 32 horizontal tab positions can be set. If more than 32 horizontal tab positions are set, the data at the excessive tab positions is handled as ordinary data.

(8) The "d" values must be entered in ascending order, and must end with NUL. If the "d_n" value is equal to or smaller than the "d_{n-1}" value, processing this *ESC* command is terminated when the d_n value is received. The subsequent data is handled as ordinary data.

(9) All horizontal tab positions can be canceled with the *ESC D NUL* command.

(10) When the power to the printer is turned on or the printer is reset, the horizontal tab positions are set for intervals of 8characters selected in the initial state.

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(22) ESC E+n

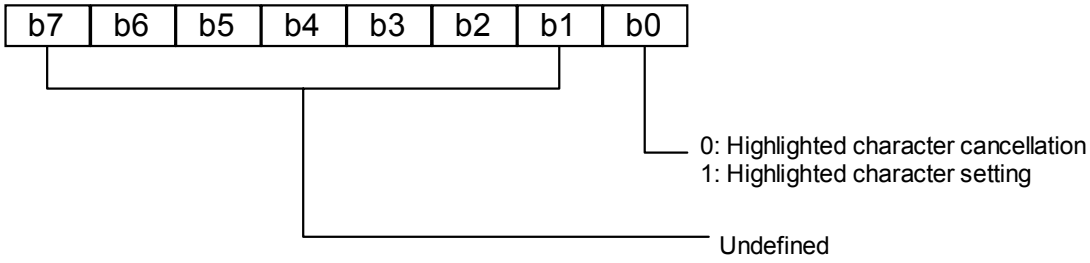
[Name] Highlighted printing specification/cancellation

[Function] This command specifies or cancels highlighted printing.

[Code] $[1B]_{16}$ $[45]_{16}$ [n]
$[27]_{10}$ $[69]_{10}$ [n]

[Explanation]

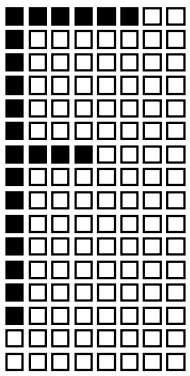
(1) The relationship between the value of n and specification/cancellation is as follows:



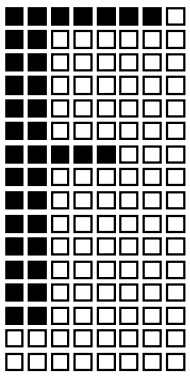
(2) This command is valid for all character fonts.

(3) A highlighted character is a font where one dot is added to the character in the horizontal direction.

Ordinary Character



Highlighted Character



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(23) ESC G + n

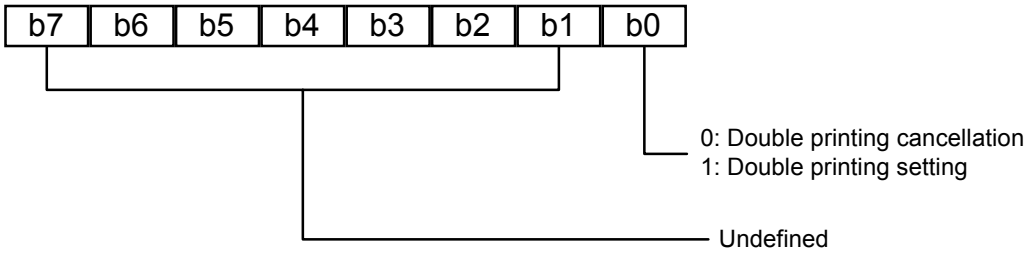
[Name] Double printing specification / cancellation

[Function] This command specifies or cancels double printing.

[Code] $[1B]_{16}$ $[47]_{16}$ [n]
$[27]_{10}$ $[71]_{10}$ [n]

[Explanation]

(1) The relationship between the value of n and specification / cancellation is as follows:



(2) This command is valid for all character fonts.

(3) For this printer, double printing are the same as highlighted character printing.

(24) ESC J + n

[Name] Forward paper feed

[Function] The ESC J + n command feeds paper in the forward direction.

[Code] $[1B]_{16}$ $[4A]_{16}$ [n]
$[27]_{10}$ $[74]_{10}$ [n]

[Explanation]

(1) The *ESC J + n* command feeds paper in the forward direction by "n" dot lines.

(2) Condition 0 ≤ n ≤ 255 must be satisfied.

(3) When there is data in the print buffer, the data in the print buffer is printed after which paper is fed in the forward direction.

(4) When parameter n specifies 0, the data contained in the buffer is printed but paper is not fed.

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(25) ESC K + n

[Name] Backward paper feed

[Function] The ESC K + n command feeds paper in the backward direction.

[Code] $[1B]_{16}$ $[4B]_{16}$ [n]
$[27]_{10}$ $[75]_{10}$ [n]

[Explanation]

(1) The *ESC K + n* command feeds paper in the backward direction by "n" dot lines. Condition $0 \leq n \leq 255$ must be satisfied.

(2) When there is data in the print buffer, the data in the print buffer is printed after which paper is fed in the backward direction.

(3) When parameter n specifies 0, the data contained in the buffer is printed but paper is not fed.

(4) If paper back-feed is executed, paper jam may be occurred. If use this command, it is necessary to confirm application with printer.

(5) If paper back-feed executed, the upper part of character is smashed by gear's back-rush. When the print is execute after back-feeding, feed the paper forward with amount more than back-rush, prevent smash of character.

(6) When this command is executed, the paper must not come off from the rubber roller.

(26) ESC L

[Name] Page printing mode selection

[Function] This command switches line printing mode to page printing mode.

[Code] [1B] $_{16}$ [4C] $_{16}$
[27] $_{10}$ [76] $_{10}$

[Explanation]

(1) After automatic printing is canceled by the *ESC c1* command, this command is valid only when it is input at the beginning of a line. When automatic printing is set and data exists in the print buffer, this command is executed after printing and a line feed. When data does not exist, this command is executed immediately.

(2) If this command is input in page printing mode, command input is ignored.

(3) The mode returns to line printing mode after printing by the *FF* command ends, or by inputting the *ESC S* command.

(4) In page printing mode, received data is developed in the printing area specified by the *ESC W* command, and the entire area is collectively printed by the *FF or ESC FF* command.
When printing / line feed is instructed by the *LF, ESC J, ESC K, ESC d* or *ESC e* command in this mode, then the position of the pointer for next data development is moved, but actual printing is not executed.

(5) The printing development position is the upper left end of the printing area specified by the *ESC W* command.

(6) This command switches setting values of the following commands to the setting for page printing mode. (The following commands have different values for page printing mode and line printing mode.)
- Spacing setting: *ESC SP, FS S*
- Line spacing setting: *ESC 2, ESC 3*

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(27) ESC Q + n + ! + j

[Name] Frame overlay function (page mode)

[Function] The selected frame overlay function is executed.

[Code] [1B] $_{16}$ [51] $_{16}$ [n] [21] $_{16}$ [6A] $_{16}$
[27] $_{10}$ [81] $_{10}$ [n] [33] $_{10}$ [106] $_{10}$

[Explanation]

(1) An effective range of the parameter n is 30h≦n≦3Ah.
The relation between the parameter n and function is as follows.

n	Function	Targeted page
30h	Registration	page 1
31h	Reference	
32h	Deletion	
34h	Registration	page 2
35h	Reference	
36h	Deletion	
38h	Registration	page 3
39h	Reference	
3Ah	Deletion	

(2) The registration function registers page data of the frame buffer in the flash memory. After registration is completed, page data of the frame buffer is cleared. At this time, page data in the frame buffer is not printed.

(3) The reference function copies the overlay data registered in the flash memory onto the frame buffer. After the data of the frame buffer is printed when there is data in the frame buffer, this command is executed. The command is processed at once when there is no data in the frame buffer.

(4) When the reference function is used, it is necessary to set page print area according to the overlay data. When setting the print area is different, the print is abnormal.

(5) When the data of the frame buffer is printed by the FF command, the overlay data of the frame buffer is cleared.

(6) The deletion function deletes the overlay data registered in the flash memory.

(7) This command is effective only in page mode.

(28) ESC R + n

[Name] International character specification

[Function] The *ESC R + n* command specifies printing using a specified set of international characters.

[Code] $[1B]_{16}$ $[52]_{16}$ [n]
$[27]_{10}$ $[82]_{10}$ [n]

[Explanation]

(1) The *ESC R + n* command enables a set of international characters (specified with parameter n) to be printed.

(2) The relationship between international characters and parameter n is as shown below.

(3) In the initial state, the domestic character set and character set "Japan" are set.

(4) If the value of parameter n is invalid, this *ESC* command is invalidated. The previous setting is validated.

n	Code / Country	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	USA	#	$	@	[	¥	]	^	`	{	¦	}	~
1	FRENCH	#	$	à	°	Ç	§	^	`	é	ù	è	¨
2	GERMAN	#	$	§	Ä	Ö	Ü	^	`	ä	ö	ü	ß
3	UK	£	$	@	[	¥	]	^	`	{	¦	}	~
4	DENMARK	#	$	@	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	$	@	¡	Ñ	¿	^	`	¨	ñ	}	~
8	JAPAN	#	$	@	[	¥	]	^	`	{	|	}	¯
9	NORWAY	#	¤	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
10	DENMARK2	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
11	SPAIN2	#	$	á	¡	ñ	¿	é	`	í	ñ	ó	ú
12	RATIN AMERICA	#	$	á	¡	ñ	¿	é	Ü	í	ñ	ó	ú
13	JAPAN2	#	$	@	[	¥	]	^	`	{	¦	}	~

(Each code value is represented in hexadecimal notation.)

n = $[41]_{16}$ Domestic character set ANK
n = $[42]_{16}$ Foreign character set ANK

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(29) ESC S

[Name] Line printing mode selection

[Function] This command switches page printing mode to line printing mode.

[Code] $[1B]_{16}$ $[53]_{16}$
$[27]_{10}$ $[83]_{10}$

[Explanation]

(1) This command is valid only when it is input in page printing mode.

(2) Data developed in page printing mode is deleted.

(3) This command switches the setting values of the following commands to the setting for line printing mode. (The following commands have different values for page printing mode and line printing mode.)

- Spacing setting *ESC SP, FS S*
- Line spacing setting *ESC 2, ESC 3*

(30) ESC T + n

[Name] Print direction setting (Only the page mode)

[Function] The direction of the print is set in page print mode.

[Code] $[1B]_{16}$ $[54]_{16}$ [n]
$[27]_{10}$ $[84]_{10}$ [n]

[Explanation]

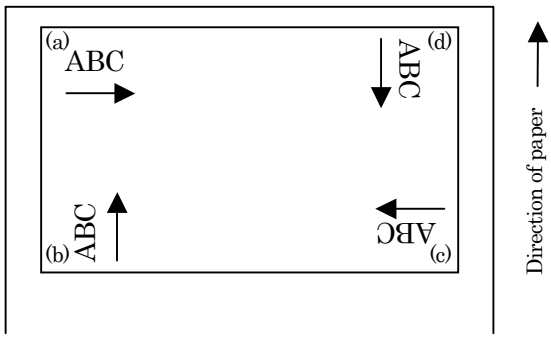
(1) The direction of the character and the starting point are changed.

(2) At page print mode, after the data of page area is printed when there is data in page area, this command is executed. The command is processed at once when there is no data in page area.

(3) An effective range of n is $0 \leqq n \leqq 3$. Setting outside the range is a parameter error . The direction of the print does not change.

(4) The relation between the direction and the starting point is as follows.

n	Direction	Starting point
0	Left to Right	Upper left [Right picture (a)]
1	Bottom to Top	Lower left [Right picture (b)]
2	Right to Left	Lower right [Right picture (c)]
3	Top to Bottom	Upper right [Right picture (d)]



(5) If it is a line print mode when the printer receives this command, setting internal is changed. There is no influence in the print of the line mode.

(6) When page area is changed by ESC W, the starting point of the character development changes according to the area size.

(7) If it is page print mode when the printer receives this command, the data of page area is deleted.

(8) Setting this command does not influence high-speed image print function (FS *).

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(31) ESC V + n

[Name] Right rotation 90°

[Function] The character is rotated right by 90°.

[Code] $[1B]_{16}$ $[56]_{16}$ [n]
$[27]_{10}$ $[86]_{10}$ [n]

[Explanation]

(1) 90° rotation is specified by n and release is set.

N	Set content
0	Rotation release of 90°
1	Rotation specification of 90°

(2) It is effective to all character kind.

(3) It is invalid concerning the barcode, the image, and the registration image.

(4) A standard print and the rotation print of 90° can exist together in the same line because an automatic changing is not done by this command.

(5) Character font becomes equal to 270° rotation (90° in left rotation) when 90° rotation is specified at upside-down printing.

(6) The direction of the expansion must not rotate with the character when you rotate the length double size and the double width character right by 90°.

(32) ESC W+ X1+X2+Y1+Y2+dX1+dX2+dY1+dY2

[Name] Page printing mode printing area specification

[Function] This command sets the position and size of printing area in page printing mode.

[Code] $[1B]_{16}$ $[57]_{16}$ [X1] [X2] [Y1] [Y2] [dX1] [dX2] [dY1] [dY2]
$[27]_{10}$ $[87]_{10}$ [X1] [X2] [Y1] [Y2] [dX1] [dX2] [dY1] [dY2]

[Explanation]

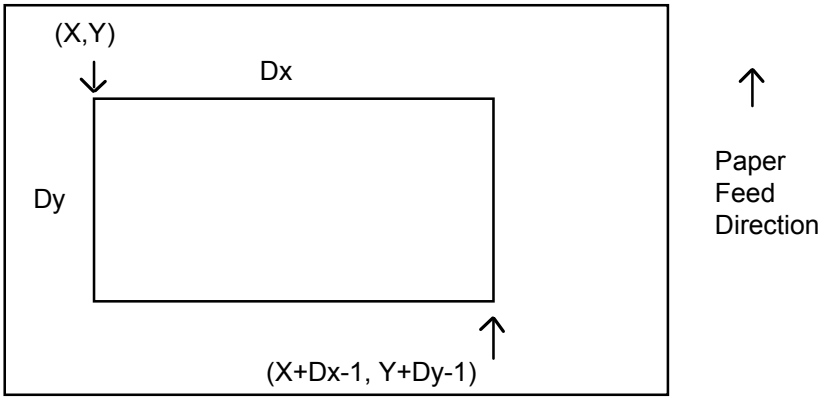
(1) Each parameter has the following functions:
- Horizontal start point = X2 x 256 + X1 dots
- Vertical start point = Y2 x 256 + Y1 dots
- Horizontal length = d xX2 x 256 + dX1 dots
- Vertical length = dY2 x 256 + dY1 dots

(2) The specification range is: 0 ≤ X1, X2, Y1, Y2, dX1, dX2, dY1, dYx ≤ 255.

(3) If the horizontal start point or vertical start point is outside the printable area, a parameter error occurs.

(4) If (horizontal start point + horizontal length) or (vertical start point + vertical length) exceeds the printing area, the maximum values of the printing area are set to the values of the printable area.

(5) When the horizontal start point is X, the vertical start point is Y, the horizontal length is Dx, and the vertical length is Dy, the printing area is as follows:



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(6) When the horizontal buffer is full, a line is fed for the specified line pitch, and the reference position moves to the left end. When the vertical buffer is full, the reference position is lower than the lower boundary (Y + Dy - 1). In this case, characters are not developed.

(7) The font pattern is developed in the range set by this command, and the font pattern is printed by the *FF, or ESC FF* command.

(8) The development reference position is set at the upper left of the page at initialization. Since characters are developed with the lower left of a character as the reference position, characters extend from the development area if development is started in this status. After initialization, line feed for one line so that the character fonts remain within the development area.

(9) The initial values are X = Y = 0. Dx is the maximum value of print head width, Dy = 1144.

(10) The maximum value of Dy is 1209.

(33) ESC X + n + m

[Name] Setting of time to turn off motor

[Function] The turning off time of the motor excitation current is set.

[Code] $[1B]_{16}$ $[58]_{16}$ [n] [m]
$[27]_{10}$ $[88]_{10}$ [n] [m]

[Explanation]

(1) This command sets the time of the motor until the down of power and power off are done.

(2) Parameter n sets time from the motor stop to the down of power in 0.5 seconds.

(3) Parameter m sets time from the down of power to power off in 0.5 seconds.

(4) An effective range of setting is as follows.
0≤m≤n≤ 255 0≤m≤ 20

(5) An initial value is m=1, and n=6.

(6) One aspect of the motor in the current slightly in the time between n and m has been excited.

(7) When the parameter is set in n=255, the printer does neither the down of power nor the power off of the motor.

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(34) ESC Y + 01h + ESC + x + a + m + d ~

[Name] Program download

[Function] This command rewrites the program in a flash memory.

[Code] $[\ 1B\ ]_{16}$ $[\ 58\ ]_{16}$ $[\ 01\ ]_{16}$ $[\ 1B\ ]_{16}$ $[\ 78\ ]_{16}$ $[\ 61\ ]_{16}$ $[\ m\ ]_{16}$ $[\ d\ ]$~
$[\ 27\ ]_{10}$ $[\ 88\ ]_{10}$ $[\ 01\ ]_{10}$ $[\ 27\ ]_{10}$ $[\ 120\ ]_{10}$ $[\ 97\ ]_{10}$ $[\ m\ ]_{10}$ $[\ d\ ]$~

[Explanation]

(1) This command rewrites the program code in the flash memory.
(2) Parameter m specifies the mode of rewriting. Setting the rewriting mode is as follows.

m	Rewriting mode	Note
0Bh	The main program and boot program	
0Ch	Only the main program	

(3) Data d transmits the improvement data for this printer.
(4) The program of this printer is composed of the boot program area where start processing is done and the main program area where printer function is done. The main program operates automatically after the boot program starts usually. Only the boot program operates when the main program is abnormal. In this case, the undermentioned limitation is generated.
  - Only the program download command operates.
    (The character data and other commands are annulled)
  - This mode does not correspond to the USB interface.

(5) The command is canceled when the parameter is outside the range.
(6) There is a possibility to destroy the program data in the flash memory when the power supply is cut or the printer is reset before this command is completed. In this case, printer MCU cannot be reactivated. Therefore, please note the use of this command enough.
(7) When doing after the program download ends normally, the printer automatically initializes an internal setting.
(8) The end of this command can be judged according to the undermentioned timing.

Imterface		Timing that command ends
Centro		When the Busy signal becomes Low after receiving the last data, the command is an end.
Serial	DTR/DSR mode	When the DTR signal becomes "space" after receiving the last data, the command is an end.
	XON/XOFF mode	When XON is notified after the last data is received, the command is an end.
USB		The data received at once after the last data is received can be processed. However, NAK replies when data is received at time to rewrite the program of the flash memory.

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(35) ESC Y + 01h + ESC + x + a + m + d ~

[Name] Printer test

[Function] The printer test is executed.

[Code] $[1B]_{16}$ $[58]_{16}$ $[01]_{16}$ $[1B]_{16}$ $[78]_{16}$ $[61]_{16}$ $[m]_{16}$ $[d]$~
$[27]_{10}$ $[88]_{10}$ $[01]_{10}$ $[27]_{10}$ $[120]_{10}$ $[97]_{10}$ $[m]_{10}$ $[d]$~

[Explanation]

(1) A test and various setting of the printer test are done.

(2) The test mode and data are as follows.

m	Test mode	Data d	Note
0	Test print	—	
1	Version print	—	
8	Deletion of FROM	Sector	
10	Notification of FROM empty capacity	—	Only the serial interface
11,12	Program downloard	Up data	Refer to (35)

(3) In case of m=0 and 1, after the print is ended, setting is initialized.

(4) In the serial interface and the USB interface, there is a possibility that the test and the data processing timing change places when other data is received at once when m=0 and 1 is specified.

(5) At the FROM deletion (m=8), data d and the deletion sector are as follows.

d	Number of sector	Content of registration	Note
0	6	Character	
1	7	Macro, ID, Others	
2	8	Image 1	1)
3	9	Image 2	1)
4	10	Image 3	1)

1) When the image area is deleted, all the areas of d=2, 3, and 4 are deleted. There is a possibility to become a registration error at the image registration when only part is deleted.

(6) The amount of the FROM remainder notified with m=10 becomes only the remainder capacity of the image area. (This specification can use only the serial interface.)
The relation between data and the amount of the FROM remainder is as follows.

- Notification data (4 bytes) = $[d_1\ d_2\ d_3\ d_4]$
- Empty capacity = $d_1 + d_2 \times 256 + d_3 \times 256^2 + d_4 \times 256^3$
- Total capacity = 192Kbyte

(7) Please refer to the item of the (35) program down-loading for the program down-loading of m=11 and 12.

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(36) ESC ¥ + n1 + n2

[Name] Relative position setting

[Function] This command specifies the printing position from the current position.

[Code] $[1B]_{16}$ $[5C]_{16}$ [n1] [n2]
$[27]_{10}$ $[92]_{10}$ [n1] [n2]

[Explanation]

(1) The next printing position is n2 x 256 + n1 dots from the current position.

(2) The parameter specification range is $0 \le n1 \le 255$, $0 \le n2 \le 255$.

(3) If the specification exceeds the printable area, a parameter error occurs.

(4) When the right side from the current position is specified, specify a positive number ($0 \le n_2 \le 127$). When the left side is specified, specify a negative number ($128 \le n_2 \le 255$). To specify N dots at the left side of the current position, divide (65536 - N) with 256. The quotient is n2, and the remainder is n1.

(37) ESC a + n

[Name] Positional alignment

[Function] This command aligns all printing data of one line to the specified position.

[Code] [1B] $_{16}$ [61] $_{16}$ [n]
[27] $_{10}$ [97] $_{10}$ [n]

[Explanation]

(1) The relationship between the value of n and the line alignment position is as follows:

n	Position
0, 48	To left end
1, 49	Center
2, 50	To right end

(2) After automatic printing is canceled by the *ESC c1* command, this command is valid only when it is input at the beginning of a line. When automatic printing is set and data exists in the print buffer, this command is executed after printing and aline feed. When data does not exist, this command is executed immediately.

(3) If this command is received in page printing mode, only the internal flag of this printer is set and page printing mode is unchanged.

(4) When the left margin or printing area width is set, positional alignment is executed within the printing area width.

(5) The section skipped by the *HT, ESC $ or ESC ¥* command is also the target of positional alignment.

(38) ESC c + 1 + n

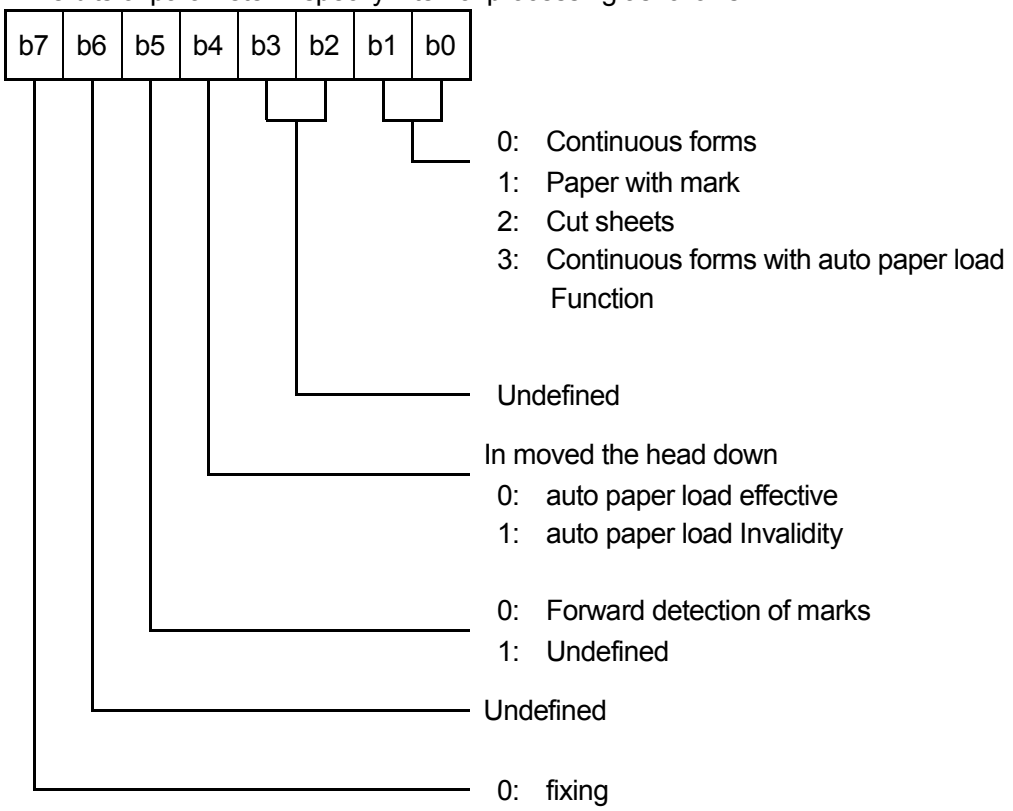
[Name] Internal processing setting

[Function] The ESC c + 1 + n command sets internal processing.

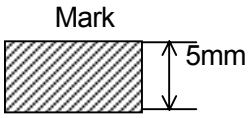
[Code] [1B] $_{16}$ [63] $_{16}$ [31] $_{16}$ [n]
[27] $_{10}$ [99] $_{10}$ [49] $_{10}$ [n]

[Explanation]

(1) The bits of parameter n specify internal processing as follows:



(2) A mark is a black bar with a height of 5 mm.



(3) When the printer is initialized, parameter n is cleared to 0.

(4) If this *ESC* command is issued when there is data in the print buffer, the data in the buffer is printed after which the internal processing is set.

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(5) When the specified paper type is a paper with mark, marks are automatically detected when forms are inserted. When the specified paper type is cut sheets, cut sheets are automatically fed when they are set.

(6) If the paper type is changed from "cut sheets" to "other than cut sheets," the existing forms are automatically ejected.

(7) When the specified paper type is continuous form with auto paper load, continuous forms with auto paper load are automatically fed when they are set.

(39) ESC c + 4 + n

[Name] Paper-out detector selection

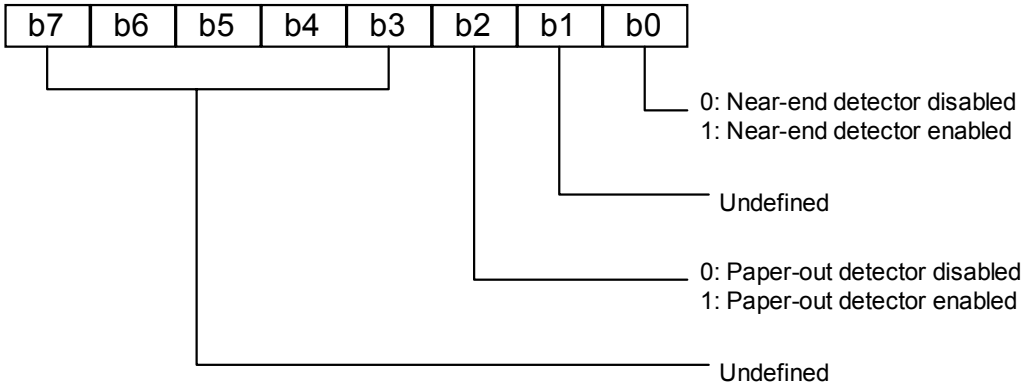
[Function] This command selects the paper-out detector, which is effective to stop printing.

[Code] [1B] $_{16}$ [63] $_{16}$ [34] $_{16}$ [n]
[27] $_{10}$ [99] $_{10}$ [52] $_{10}$ [n]

[Explanation]

(1) This command selects the paper-out detector. When this detector detects paper-out, printing stops.

(2) The relationship between the value of n and the content of setting is as follows:



(3) Printing stops after printing of the currently printing line and paper feed end.

(4) When printing stop is enabled, the printer becomes off line when paper-out is detected.

(5) The initial value of n is 4.

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(40) ESC c + 5 + n

[Name] Panel switch enable / disable setting

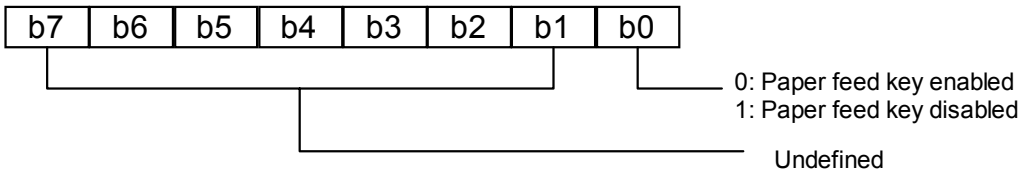
[Function] This command switches enable / disable of the paper feed key.

[Code] [1B] $_{16}$ [63] $_{16}$ [35] $_{16}$ [n]
[27] $_{10}$ [99] $_{10}$ [53] $_{10}$ [n]

[Explanation]

(1) This command switches enable / disable of the paper feed key.

(2) The relationship between the value of n and the content of setting is as follows:



(3) When paper feed key disable is set, paper feed by the paper feed key cannot be executed.

(4) The initial value of n is 0.

(41) ESC d + n

[Name] n-line feed

[Function] The ESC d + n command prints the data and feeds a line, then feeds the paper by "n" lines.

[Code] $[1B]_{16}$ $[64]_{16}$ [n]
$[27]_{10}$ $[100]_{10}$ [n]

[Explanation]

(1) The *ESC d + n* command feeds paper by a line count specified with parameter n.

(2) Condition $0 \leq n \leq 255$ must be satisfied.

(3) After "n" lines are fed, the data receive position is set at the left edge on the line.

(4) When there is data in the print buffer, the data contained in the buffer is printed after which paper is fed by "n" lines.

(42) ESC e + n

[Name] Backward n-line feed

[Function] The ESC e + n command prints the data and feeds a line, then feeds the paper in the backward direction by "n" lines.

[Code] $[1B]_{16}$ $[65]_{16}$ [n]
$[27]_{10}$ $[101]_{10}$ [n]

[Explanation]

(1) The *ESC e + n* command feeds paper in the backward direction by the line count specified with parameter n.

(2) Condition 0 ≤ n ≤ 255 must be satisfied.

(3 After "n" lines are fed, the data receive position is set at the left edge on the line.

(4) When the value of parameter n is 0, the data contained in the buffer is printed but the paper is not fed.

(5) If paper back-feed is executed, paper jam may be occurred. If use this command, it is necessary to confirm application with printer.

(6) If paper back-feed executed, the upper part of character is smashed by gear's back-rush. When the print is execute after back-feeding, feed the paper forward with amount more than back-rush, prevent smash of character.

(7) When this command is executed, the paper must not come off from the rubber roller.

(43) ESC i

[Name] Full cut

[Function] This command executes a full cut of paper.

[Code] [1B] $_{16}$ [69] $_{16}$
[27] $_{10}$ [105] $_{10}$

[Explanation]

(1) This command executes a full cut of paper.

(2) After automatic printing is canceled by the ESC c1 command in line printing mode, this command is valid only when it is input at the beginning of a line. When automatic printing is set and data exists in the print buffer, this command is executed after printing and a line feed. When data does not exist, this command is executed immediately.

(3) If an abnormality occurs during a cut operation, the abnormality is unrecoverable.

(44) ESC m

[Name] Partial cut

[Function] This command executes a partial cut of paper.

[Code] [1B] $_{16}$ [6D] $_{16}$
[27] $_{10}$ [109] $_{10}$

[Explanation]

(1) This command executes a partial cut of paper.

(2) After automatic printing is canceled by the ESC c1 command in line printing mode, this command is valid only when it is input at the beginning of a line. When automatic printing is set and data exists in the print buffer, this command is executed after printing and a line feed. When data does not exist, this command is executed immediately.

(3) If an abnormality occurs during a cut operation, the abnormality is unrecoverable.

(45) ESC s + n

[Name] Printing speed setting

[Function] The ESC s + n command sets printing speed.

[Code] $[1B]_{16}$ $[73]_{16}$ [n]
$[27]_{10}$ $[115]_{10}$ [n]

[Explanation]

(1) The *ESC s + n* command sets printing speed.

(2) When there is data in the print buffer, the data contained in the print buffer is printed after which the printing speed is set.

(3) When the same printing speed as the current printing speed is specified with this *ESC* command, no change occurs.

(4) The relationship between parameter n and the specified printing speed is as follows:

N	Function mode
$[60]_{16}$	Ultra High-speed printing
$[61]_{16}$	High-speed printing
$[62]_{16}$	Medium-speed printing
$[63]_{16}$	Low-speed printing

(5) If a parameter value not listed in the above table is set, the newly set printing speed is invalidated. The previous printing speed is validated.

(6) If n=60H is set at line mode, printing speed is High-speed mode.

(46) ESC t + n

[Name] Character code table selection

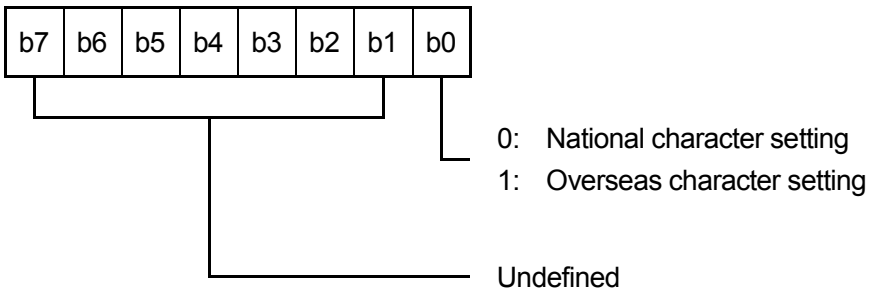
[Function] The ESC t + n command selects page n from the character code table.

[Code] $[1B]_{16}$ $[74]_{16}$ [n]
$[27]_{10}$ $[116]_{10}$ [n]

[Explanation]

(1) The *ESC t + n* command selects page n from the character code table.

(2) The bits of parameter n specify the following information:



(3) The *ESC t + n* command has the same effect as that acquired by specifying $[41]_{16}$ or $[42]_{16}$ in the parameter of the *ESC R* command. Therefore, when both the *ESC t + n* command and the *ESC R* command are specified, the last of these *ESC* commands specified is validated.

(4) The initial value of parameter n is 0.

(5) See Section H, "List of Character Codes."

(47) ESC u + n

[Name] The status of peripherals is notified.

[Function] The status of the peripheral equipment is notified.

[Code] $[1B]_{16}$ $[76]_{16}$ [n]
$[27]_{10}$ $[118]_{10}$ [n]

[Explanation]

(1) The state of peripherals specified according to n is notified.

n	peripheral	Data
0	Undefined	———
1	Presenter	2byte
2~	Undefined	———

(2) The content of the status notified for n=1 is as follows.

- 1st byte (Status of sensor)

bit	Content	Status
0	Senser A	0: no paper 1:
1	Senser B	0: no paper 1:
2	Senser C	0: no paper 1:
3	Undefined	———
4 - 7	Operation status of Presenter	0000b : Standing 0001b : Cutting 0010b : Paper feeding 0011b : Printing 0100b : Executing on [GS t+n] 0101b : Executing on [GS x+n] 0110b : Automatic paper feeding 0111b : Registering in FROM 1000b : Waiting until retract 1001b : Executing on [GS s] 1010b : Executing on [GS y] 1011b : Executing on [GS z] 1100b : Undefined 1101b : Undefined 1110b : Undefined 1111b : Undefined

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- 2nd byte (Error information)

bit	Content	Status	
0	Transportation error	0: Normal	1: Occurrence
1	Abnormal paper detection	0: Normal	1: Occurrence
2	Collection error	0: Normal	1: Occurrence
3	Paper detection of uncollection	0: Normal	1: Occurrence
4	Paper remaining on Presenter	0: Normal	1: Occurrence
5	Undefined	Fixed 0	
6	Undefined	Fixed 0	
7	Undefined	Fixed 0	

(3) If the host can receive data (The DSR signal is SPACE), the printer transmits status.
(4) When XON/XOFF control has been selected, status is transmitted without depending in host's state.
(5) This command is effective only in the serial interface.

(48) ESC v

[Name] The status of the paper sensor is notified.

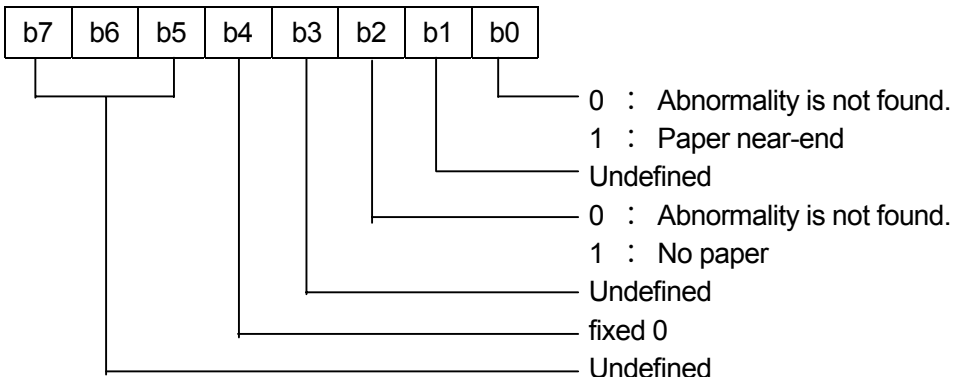
[Function] The status of the paper detection sensor is notified.

[Code] $[1B]_{16}$ $[76]_{16}$
$[27]_{10}$ $[118]_{10}$

[Explanation]

(1) The status of the paper detection sensor is notified.

(2) Status (1 byte) is notified. The content of status is as follows.



(3) If the host can receive data (The DSR signal is SPACE), the printer transmits status.

(4) When XON/XOFF control has been selected, status is transmitted without depending in host's state.

(5) This command is effective only in the serial interface.

(49) ESC { + n

[Name] Upside-down printing setting/cancellation

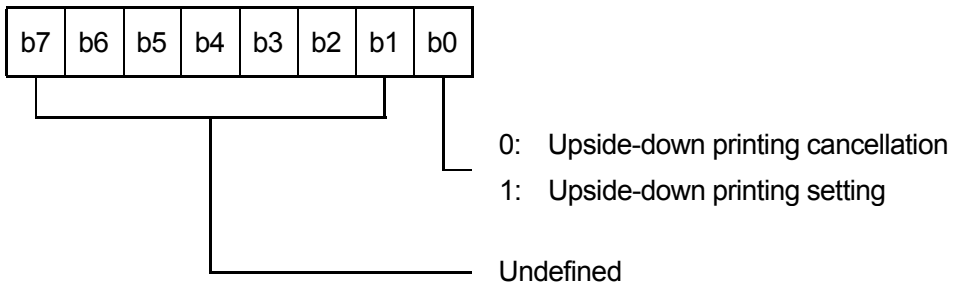
[Function] The ESC { + n command sets or cancels upside-down printing.

[Code] $[1B]_{16}$ $[7B]_{16}$ [n]
$[27]_{10}$ $[123]_{10}$ [n]

[Explanation]

(1) Parameter n sets or cancels upside-down printing.

(2) The bits of parameter n specify the following information:



(3) The *ESC { + n* command can be used in all character modes.

(4) The *ESC { +n* command can also be used in bit image printing.

(5) The character base line is at the bottom of the character typeface. Print character typefaces are arranged so that their bottom ends are aligned at the same level.

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(50) FS ! + n

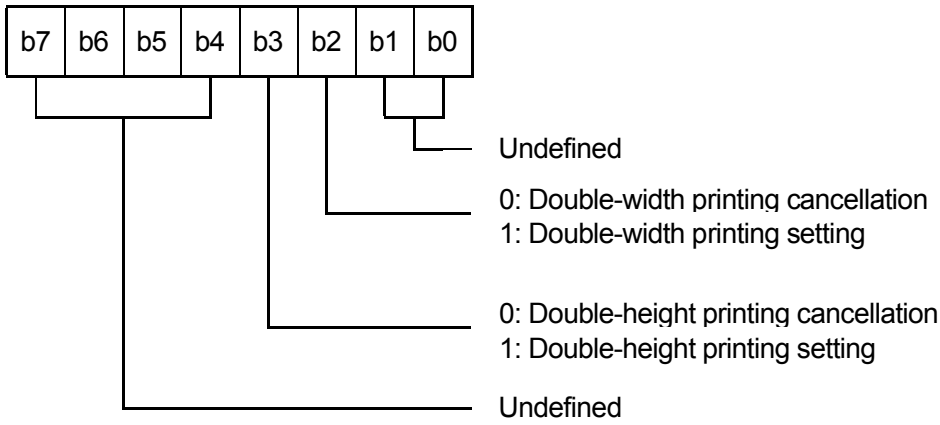
[Name] Kanji printing mode collective specification

[Function] The FS ! + n command specifies kanji printing modes collectively.

[Code] $[1C]_{16}$ $[21]_{16}$ [n]
$[28]_{10}$ $[33]_{10}$ [n]

[Explanation]

(1) The bits of parameter n specify the following information:



(2) When both the double-width printing and double-height printing are specified, double height and width printing is executed.

(3) When one line contains character typefaces with different heights, the character typefaces are arranged so that their base line or bottom ends are aligned at the same level.

(4) When a character typeface is to be extended horizontally, the left edge of the character typeface is fixed and the right edge is extended to the right.

(5) When printing mode is specified with this command and other commands, only the command processed last is validated. For example, the printing mode set with the *FS W* command is invalidated by the *FS ! + n* command.

(6) This command is valid when the kanji ROM is mounted.

(51) FS &

[Name] Kanji printing mode specification

[Function] The FS & command specifies kanji printing mode.

[Code] $[1C]_{16}$ $[26]_{16}$
$[28]_{10}$ $[38]_{10}$

[Explanation]

(1) The *FS &* command specifies kanji printing mode.

(2) A kanji character must be represented with a 2-byte code conforming to JIS C6226-$_{1983}$. The first byte then the second byte must be sent.

(3) The size of each kanji typeface must be 16x16 dots or 24x24 dots.

(4) As for the size on the kanji typeface, the font size specified by the ESC ! command is applied. When 8x16 dots is set the size of kanji typeface is 16x16 dots, when 12x24 dots is set, the size of kanji typeface is 24x24 dots.

(5) The size of a character typeface must be selected with a printing mode setting command (*FS !* and *ESC !*). (For details, see "Printing Mode Setting Commands.")

(6) Even if an undefined character code is specified for printing, a character may be printed.

(7) This command is valid when kanji ROM is mounted.

(52) FS * + m + n_1 + n_2 + d_1 to d_N

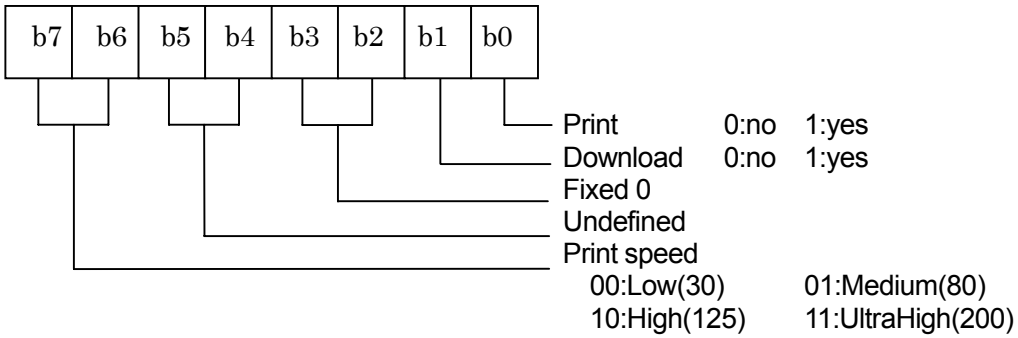
[Name] Bit image printing

[Function] This command specifies the high-speed collective image printing.

[Code] [1C] $_{16}$ [2A] $_{16}$ [m] [n_1] [n_2] [d_1] to [d_N]
[28] $_{10}$ [42] $_{10}$ [m] [n_1] [n_2] [d_1] to [d_N]

[Explanation]

(1) m specifies the operation mode.



(2) When you set bit0 of m in 1, the image data of SRAM is printed in the n1+n2x256 dot-line.

(3) When you set bit1 of m in 1, the image data of the n1+n2 dot-line is registered toSRAM.

(4) The number of maximum lines is ad follows for SRAM(120KB) equipped with this boad.

Printer	Print width	Number of maximum lines
FTP-629MCL	54 byte	2275 line
FTP-639MCL	72 byte	1706 line

(5) The quantity of image data is (n1+n2x256)x print width.

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(53) FS - + n

[Name] Kanji underline specification / cancellation

[Function] This command specifies or cancels Kanji underline.

[Code] [1C] $_{16}$ [2D] $_{16}$ [n]
[28] $_{10}$ [45] $_{10}$ [n]

[Explanation]

(1) The relationship between the value of n and the content of specification is as follows:

n	Function
0, 48	Kanji underline cancellation
1, 49	1 dot wide Kanji underline setting and Kanji underline specification
2, 50	2 dot wide Kanji underline setting and Kanji underline specification

(2) Underline is added to entire character width, including left and right spacing of character. Underline is not added to section skipped by the HT command and to 90° rotated characters.

(3) When Kanji underline cancellation is executed by specifying n = 0, underline is not added to Kanji thereafter. Underline width setting, however, is maintained.

(4) In initialized status, n = 0 and 1 dot wide underline are set.

(5) Kanji underline width is always set to the specified thickness, regardless character size.

(6) Underline can be specified and canceled by the FS ! command. The command used last is valid. Therefore if underline is canceled by this command after underline is specified by the FS ! command, specification by the FS ! command is canceled.

(54) FS .

[Name] Kanji printing mode cancellation

[Function] The FS . command cancels kanji printing mode.

[Code] $[1C]_{16}$ $[2E]_{16}$
$[28]_{10}$ $[46]_{10}$

[Explanation]

(1) The *FS* command cancels kanji printing mode.

(2) This command is valid when kanji ROM is mounted.

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(55) FS 2 + c_1 +c_2 +d_1 to d_n

[Name] External character definition

[Function] This command defines an external Kanji character pattern for the character code specified by c_1 and c_2.

[Code] $[1C]_{16}$ $[32]_{16}$ $[c_1]$ $[c_2]$ $[d_1]$ to $[d_n]$
$[28]_{10}$ $[50]_{10}$ $[c_1]$ $[c_2]$ $[d_1]$ to $[d_n]$

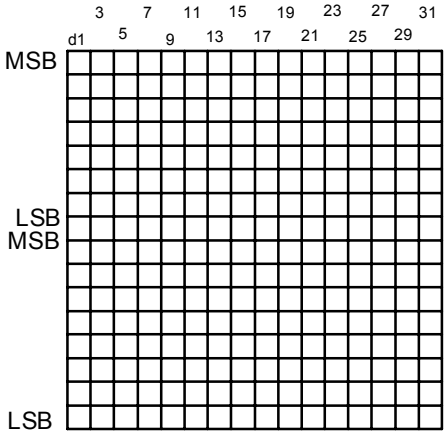
[Explanation]

(1) The value of n differs depending on the Kanji code system.
- When the JIS code system is specified:
  c_1 = 77h, 21h ≤ c_2 ≤ 7Eh
- When the shift JIS code system is specified:
  c_1 = ECH
  40h ≤ c_2 ≤ 7Eh
  80h ≤ c_2 ≤ 9Eh

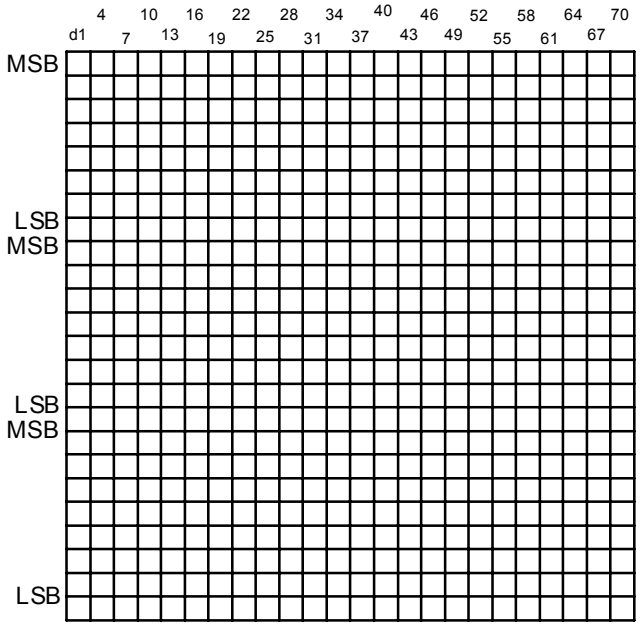
(2) c_1 and c_2 indicate the Kanji code for which an external character is defined. c_1 is the first byte, and c_2 is the second byte.

(3) d is the definition data.

(4) The format of character definition data is shown on the next page.



[16 X 16]



[24 X 24]

(5) An external character definition is not deleted, even if power is shut off.

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(56) FS 9 + n

[Name] Detection function enable/disable setting

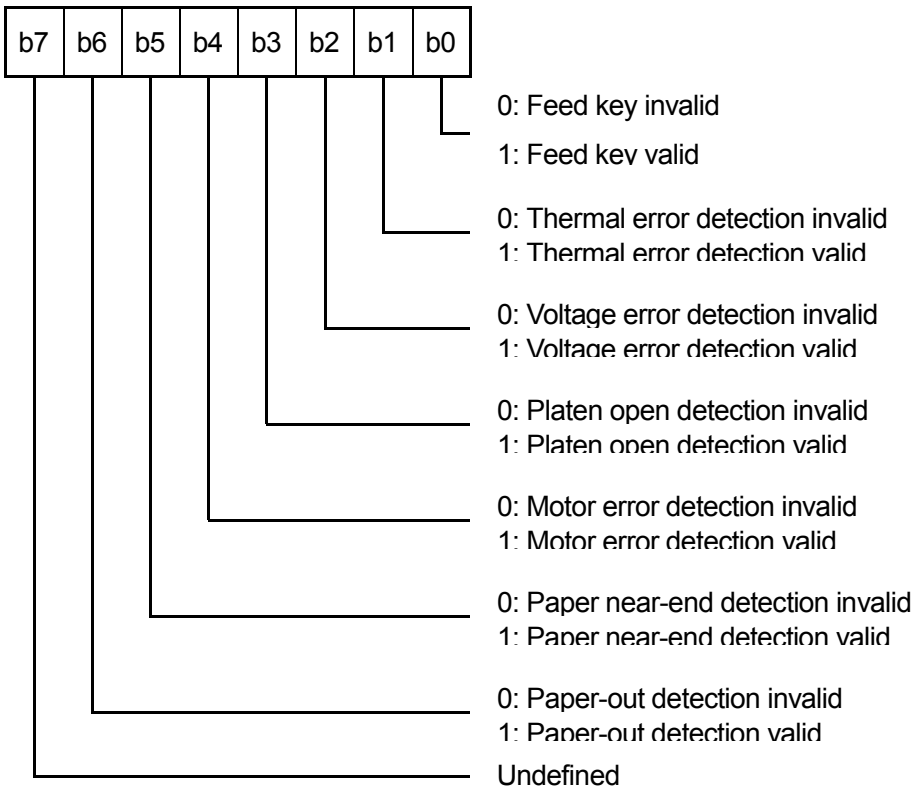
[Function] The FS 9 + n command enables or disables various detection functions.

[Code] $[1C]_{16}$ $[39]_{16}$ [n]
$[28]_{10}$ $[57]_{10}$ [n]

[Explanation]

(1) Condition $0 \leq n \leq 255$ must be satisfied.

(2) The bits of parameter n specify the following information:



(3) In the initial state, all of the detection functions other than the paper near-end detection function are valid.

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(57) FS C + n

[Name] Kanji code system selection

[Function] The FS C + n command selects kanji code system.

[Code] $[1C]_{16}$ $[43]_{16}$ [n]
$[28]_{10}$ $[67]_{10}$ [n]

[Explanation]

(1) Parameter n specifies the kanji code system as follows:

n	Selected system
0, 48	JIS code system
1, 49	Shift JIS code system

(2) In each kanji code system, the following code values are valid:
- JIS code system
  Byte 1: $[21]_{16}$ to $[7E]_{16}$
  Byte 2: $[21]_{16}$ to $[7E]_{16}$
- Shift JIS code system
  Byte 1: $[81]_{16}$ to $[9F]_{16}$ and $[E0]_{16}$ to $[EF]_{16}$
  Byte 2: $[40]_{16}$ to $[7E]_{16}$ and $[80]_{16}$ to $[FC]_{16}$

(3) The initial value of parameter n is 0.

(4) Even if a code value outside the permitted range is specified, the character of a font may print.

(5) When the code outside the range is specified when the shift JIS code system is specified, ANK character which corresponds to code is printed.

(6) This command is valid when kanji ROM is mounted.

(58) FS E + n

[Name] Applied energy adjustment

[Function] Impressed energy is corrected

[Code] $[1C]_{16}$ $[45]_{16}$ [n]
$[28]_{10}$ $[69]_{10}$ [n]

[Explanation]

(1) The correction value is set by n. The range of n is shown below.
$0 \leq n \leq 255$

(2) Applierd energy grows by the value of n large.

(3) Please note that the life of the head shortens when the applied energy is too large. There is danger to which the head is disconnected for $n \geq 128$.

(4) An initial value is n = 52.

(59) FS S + n1 + n2

[Name] Kanji spacing setting

[Function] This command sets the left and right spacing of a Kanji.

[Code] $[1C]_{16}$ $[53]_{16}$ $[n_1]$ $[n_2]$
$[28]_{10}$ $[83]_{10}$ $[n_1]$ $[n_2]$

[Explanation]

(1) This command sets the left (n_1) and right (n_2) spacing of a Kanji.

(2) The setting range of n_1 and n_2 is as follows:

$0 \leq n \leq 32$

(3) The number of dots occupied by one character is set to the total value of actual printing dots in the horizontal direction and left and right spacing. If this value cannot be secured between the current character position and right margin, the data receive position is set at the left end of the next line after a line feed.

(4) When character enlargement is specified, left and right spacing is also expanded.

(5) Different left and right spacing is set for line printing mode and page printing mode.

(60) FS W + n

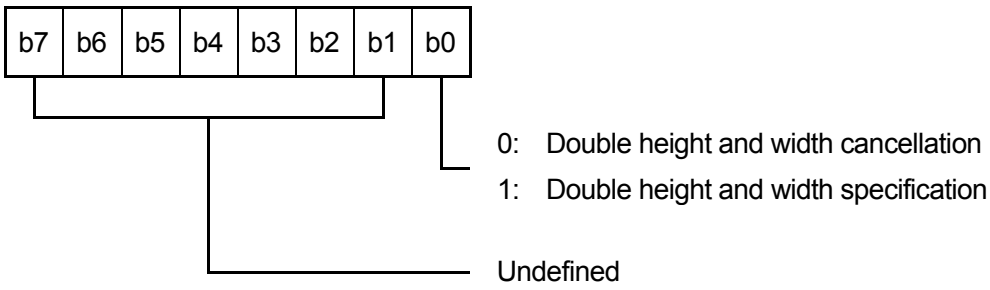
[Name] Kanji double height and width printing specification/cancellation

[Function] The FS W + n command specifies or cancels kanji double height and width printing.

[Code] $[1C]_{16}$ $[57]_{16}$ [n]
$[28]_{10}$ $[87]_{10}$ [n]

[Explanation]

(1) The bits of parameter n specify the following information:



(2) The double height and width size is the same as that acquired when both the double width and double height are specified simultaneously.

(3) When the double height and width mode is canceled with the *FS W + n* command, subsequent characters are printed at ordinary size.

(4) When different-height character typefaces are to be printed on the same line, their base line or bottom ends are aligned at the same level.

(5) When a character typeface is to be extended horizontally, the left edge of the character typeface is fixed and the right edge is extended to the right.

(6) The double height and width mode can also be specified with the *FS !* command by specifying both the double width and double height simultaneously. However, only command executed last is validated. Therefore, when the double height and width mode is specified with an *FS !* command after which the double height and width mode is canceled with an *FS W + n* command, the setting with the *FS !* command is canceled.

(7) This command is valid when kanji ROM is mounted.

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(61) FS r + n

[Name] Notification parameter setting

[Function] 4th data of the automatic status notification is set.

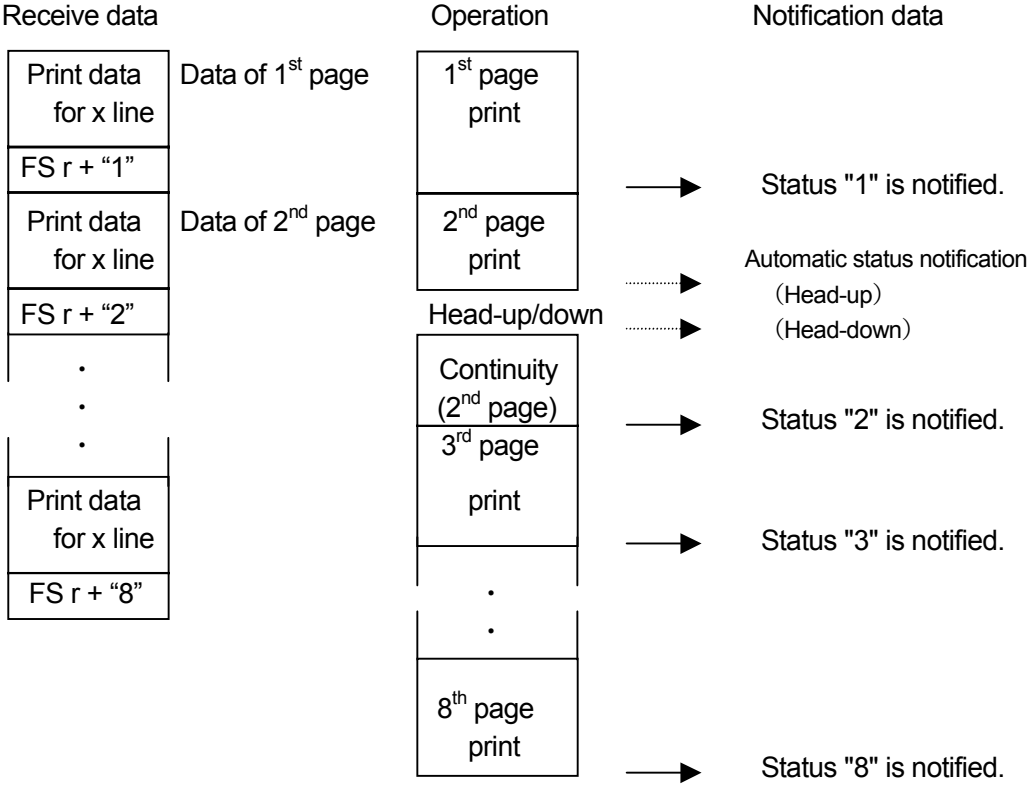
[Code] $[1C]_{16}$ $[72]_{16}$ [n]
$[28]_{10}$ $[114]_{10}$ [n]

[Explanation]

(1) The value of n is set in the notification parameter.
(2) An initial value is n=0.
(3) An effective range of n is 0-255.
(4) The parameter specified when this command in the reception buffer is interpreted is set.
(5) Data is notified after a specified parameter is set when the serial interface is selected. The value of parameter n is notified to the fourth byte of the automatic status notification.

1st byte	2nd byte	3rd byte	4th byte
Printer information	error status	Paper status	Parameter

(6) The fourth byte of the automatic status notification is a value of set n until this command is executed next when the parameter notified by this command is changed.
(7) The example of using this command is shown.
<Confirm method on page that print ends>
This command is executed after page print starts and the parameter is set. The set parameter is notified when the print of the page ends.



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(62) GS ! + n

[Name] Character size specification

[Function] This command specifies character size.

[Code] [1D] $_{16}$ [21] $_{16}$ [n]
[29] $_{10}$ [33] $_{10}$ [n]

[Explanation]

(1) The relationship between the value of n and the content of specification is as follows:

Horizontal Magnification

Bit				
7	6	5	4	Magnification
0	0	0	0	x1
0	0	0	1	x2
0	0	1	0	x3
0	0	1	1	x4
0	1	0	0	x5
0	1	0	1	x6
0	1	1	0	x7
0	1	1	1	x8
1	0	0	0	x9
1	0	0	1	x10
1	0	1	0	x11
1	0	1	1	x12
1	1	0	0	x13
1	1	0	1	x14
1	1	1	0	x15
1	1	1	1	x16

Vertical Magnification

bit				
3	2	1	0	Magnification
0	0	0	0	x1
0	0	0	1	x2
0	0	1	0	x3
0	0	1	1	x4
0	1	0	0	x5
0	1	0	1	x6
0	1	1	0	x7
0	1	1	1	x8
1	0	0	0	x9
1	0	0	1	x10
1	0	1	0	x11
1	0	1	1	x12
1	1	0	0	x13
1	1	0	1	x14
1	1	1	0	x15
1	1	1	1	x16

(2) This command is valid for all character modes.

(3) When rotation 90° is specified, the relationship between horizontal and vertical of a character is reversed.

(4) When characters with different vertical magnifications coexist on the same line, characters are enlarged upwards with the bottom ends of the characters fixed. (Bottom ends of characters are aligned.)

(5) When a character is enlarged horizontally, the character is enlarged toward the right with the left end of the character fixed.

(6) When other commands can specify character size, the command used last is valid. Therefore if character size x1 is specified by the GS ! command after the ESC ! command specifies horizontal width, the setting by the ESC ! command is canceled.

(7) The initial value of n is 0.

(8) When the size of an enlarged character exceeds the maximum number of printable lines, the top of the character will be cut off.

(63) GS $+n_1+n_2$

[Name] Vertical absolute position specification in page printing mode.

[Function] This command specifies the absolute position to start data development in the vertical direction of a character from the start point in page printing mode.

[Code] $[1D]_{16}$ $[24]_{16}$ $[n_1]$ $[n_2]$
$[29]_{10}$ $[36]_{10}$ $[n_1]$ $[n_2]$

[Explanation]

(1) Absolute position is n2 x 256 + n1 dot.

(2) This command is ignored when mode is not page printing mode.

(3) The start point to be the reference is the upper left end of the area specified by the ESC W command.

(4) When absolute position is specified outside the specified printing area, a parameter error occurs and the previous value is maintained.

(5) When characters with different vertical magnifications coexist on the same line,
characters are enlarged upward with the bottom ends of the characters fixed (bottom ends of characters are aligned).

(6) The reference of developing data to specified printing position is as follows:
- Character data: Bottom ends of characters are aligned.
- Bit image: Bottom ends of bit images are aligned.
- Registered bit image: Bottom ends of registered bit images are aligned.
- Bar-code: Bottom ends of bar-codes are aligned (HRI characters are not included).

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(64) GS & + m + x + y_1 + y_2 + d_1 to d_N

[Name] Registered bit image definition

[Function] This command defines a registered bit image which has the number of dots specified by x and y.

[Code] $[1D]_{16}$ $[26]_{16}$ [m] [x] [y_1] [y_2] [d_1] to [d_N] N=X x (Y_1+Y_2x256) x 8
$[29]_{10}$ $[42]_{10}$ [m] [x] [y_1] [y_2] [d_1] to [d_N]

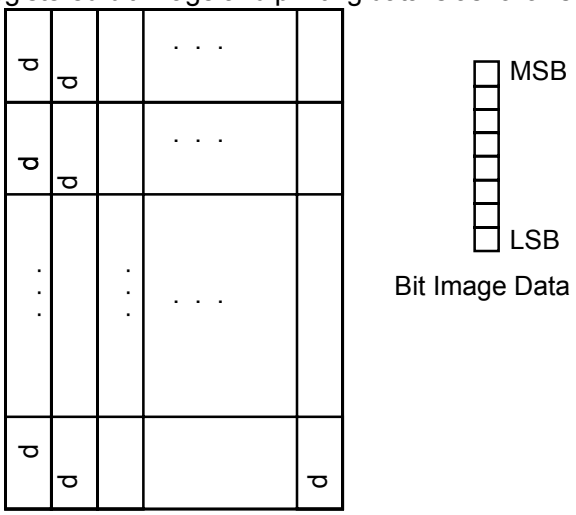
[Explanation]

(1) Parameter m specifies the identification number of the registered image. An effective range of m is $1 \leqq m \leqq 255$. When two or more images are registered, the image is distinguished with this ID.

(2) X indicates the number of bytes in the horizontal direction, and Y(Y1+Y2x256) indicates the same in the vertical direction.

(3) d indicates the bit image data.

(4) The relationship between registered bit image and printing data is as follows:



(5) The setting range of x and y is as follows:

$1 \leq x < 255$

$1 \leq Y_1, Y_2 \leq 255$

$X \times (Y_1 + Y_2 \times 256) \times 8 \leq 65535$

(6) Registered bit images are not deleted, even if power is shut off.

(7) When the image is registered by GS * command, ID=1 is automatically selected. Therefore, when other data is written in ID=1 by this command, the content registered by GS * command is destroyed.

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(65) GS ‘ + m +n

[Name] Registered bit image printing

[Function] This command prints defined registered bit image data in mode m.

[Code] $[1D]_{16}$ $[27]_{16}$ [m] [n]
$[29]_{10}$ $[39]_{10}$ [m] [n]

[Explanation]

(1) n specifies the ID number of the registration image. When the ID number of unregistration is specified, the command is disregarded.

(2) The relationship between the value of m and the content of specification is as follows:

M	Mode
0, 48	Normal mode
1, 49	Double width mode
2, 50	Double height mode
3, 51	Double height and width mode

(3) When registered bit image data is not defined, this command is ignored.

(4) After automatic printing is canceled by the ESC c1 command in line printing mode, this command is valid only when it is input at the beginning of a line. When automatic printing is set and data exists in the print buffer, this command is executed after printing and a line feed. When data does not exist, this command is executed immediately.

(5) This command is not influenced by other modes (highlighted printing, double printing, underline, character size, etc.) except for upside-down printing mode.

(6) When registered bit image data exceeds printing area, data outside printing area is not printed.

(7) When a registered bit image, character data, bit images, and bar- codes coexist on the same line in page printing mode, the bottom end of a registered bit image is aligned as follows:
- Character data: Bottom ends of characters are aligned.
- Bit image: Bottom ends of bit images are aligned.
- Bar-code: Bottom ends of bar-codes are aligned (HRI characters are not included).

(8) After a registered image is developed, the position of the character development pointer comes to the lower right of the registered image.

(66) GS * + X + Y_1 + Y_2 + d_1 to d_N

[Name] Registered bit image definition

[Function] This command defines a registered bit image which has the number of dots specified by x and y.

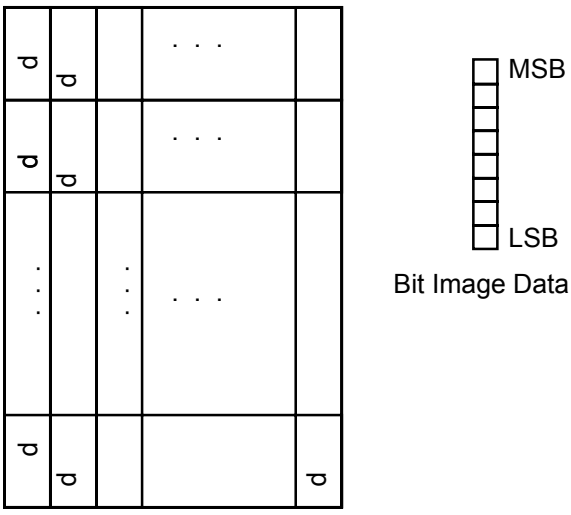
[Code] $[1D]_{16}$ $[2A]_{16}$ [X] $[Y_1]$ $[Y_2]$ $[d_1]$ to $[d_N]$ $N=X \times (Y_1+Y_2 \times 256) \times 8$
$[29]_{10}$ $[42]_{10}$ [X] $[Y_1]$ $[Y_2]$ $[d_1]$ to $[d_N]$

[Explanation]

(1) X indicates the number of bytes in the horizontal direction, and Y(Y1+Y2x256) indicates the same in the vertical direction.

(2) d indicates the bit image data.

(3) The relationship between registered bit image and printing data is as follows:



(4) The setting range of x and y is as follows:
$1 \le X < 255$
$1 \le Y_1, Y_2 \le 255$
$X \times (Y_1+Y_2 \times 256) \times 8 \le 65535$

(5) Registered bit images are not deleted, even if power is shut off.

(6) When the bitimage is registered by this command, ID=1 is automatically selected. Data is overwrited when having registered in ID=1 by the GS & command. Moreover, the registered content is overwrited when registering in ID=1 by the GS & command after the image is registered by this command.

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(67) GS /+m

[Name] Registered bit image printing

[Function] This command prints defined registered bit image data in mode m.

[Code] [1D] $_{16}$ [2F] $_{16}$ [m]
[29] $_{10}$ [47] $_{10}$ [m]

[Explanation]

(1) The relationship between the value of m and the content of specification is as follows:

M	Mode
0, 48	Normal mode
1, 49	Double width mode
2, 50	Double height mode
3, 51	Double height and width mode

(2) When registered bit image data is not defined, this command is ignored.

(3) After automatic printing is canceled by the ESC c1 command in line printing mode, this command is valid only when it is input at the beginning of a line. When automatic printing is set and data exists in the print buffer, this command is executed after printing and a line feed. When data does not exist, this command is executed immediately.

(4) This command is not influenced by other modes (highlighted printing, double printing, underline, character size, etc.) except for upside-down printing mode.

(5) When registered bit image data exceeds printing area, data outside printing area is not printed.

(6) When a registered bit image, character data, bit images, and bar-codes coexist on the same line in page printing mode, the bottom end of a registered bit image is aligned as follows:
- Character data: Bottom ends of characters are aligned.
- Bit image: Bottom ends of bit images are aligned.
- Bar-code: Bottom ends of bar-codes are aligned (HRI characters are not included).

(7) After a registered image is developed, the position of the character development pointer comes to the lower right of the registered image.

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(68) GS :

[Name] Macro definition start / end

[Function] This command specifies the start or end of a macro definition.

[Code] $[1D]_{16}$ $[3A]_{16}$
$[29]_{10}$ $[58]_{10}$

[Explanation]

(1) When this command is received during ordinary operation, macro definition starts.

(2) When this command is received during macro definition, macro definition ends.

(3) When the GS ^ command is received during macro definition, macro definition stops and the defined content is cleared.

(4) Initial status of macro is undefined.

(5) Defined content is not cleared by the ESC @ command. Content is not deleted even if power is shut off.

(6) When the GS : command is received immediately after receiving the GS : command, macro becomes undefined status.

(7) The maximum registration data size is 2048 bytes. If the setting exceeds this value, the setting is not registered.

(69) GS <

[Name] Mark detection execution

[Function] The GS < command feeds paper up to the next mark position.

[Code] $[1D]_{16}$ $[3C]_{16}$
$[29]_{10}$ $[60]_{10}$

[Explanation]

(1) The *GS* < command feeds paper up to the next mark position.

(2) After a mark is detected, paper is fed (the head is detected) in accordance with the head detection base; the paper feed then stops.

(3) If no mark is found within the specified page length from the mark-detection-execution starting point, an error is assumed and the page feed stops.

(4) For an explanation of the relationship between mark position and print line position, see the printer mechanism specifications.

(70) GS A + m + n

[Name] After-mark-detection head distance setting

[Function] The GS A + m + n command sets the head detection distance to be used after mark detection.

[Code] $[1D]_{16}$ $[41]_{16}$ [m] [n]
$[29]_{10}$ $[65]_{10}$ [m] [n]

[Explanation]

(1) The *GS A + m + n* command sets the head detection distance to be used after mark detection.

(2) The value of parameter m is always 0.

(3) Parameter n specifies the head detection distance in dot lines.

(4) Condition 0 ≤ n ≤ 63 must be satisfied. If an "n" value outside this range is specified, a parameter error occurs. The previous head detection distance is not changed.

(5) When the power is turned on or the printer is reset, parameter m is cleared to 0 and parameter n is set to 16.

(71) GS B + n

[Name] Angle setting of barcode

[Function] The angle of the bar code is set.

[Code] $[1D]_{16}$ $[42]_{16}$ [n]
$[29]_{10}$ $[66]_{10}$ [n]

[Explanation]

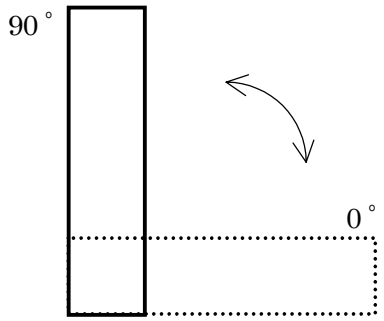
(1) The angle of the bar code is set.

(2) n specifies a set angle. Setting (n>1) outside the range is a parameter error.

n	angle
0	0 °
1	90 °

(3) An initial value of the angle is 0 ° (n=0).

(4) The angle rotates based on under the left of the bar code.



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(72) GS E + n

[Name] Print quality setting

[Function] The GS E + n command sets print quality in paper units.

[Code] $[1D]_{16}$ $[45]_{16}$ [n]
$[29]_{10}$ $[69]_{10}$ [n]

[Explanation]

(1) The *GS E + n* command sets print quality for each paper and automatic division print mode is set or canceled.

(2) The five low-order bits of parameter n are used to select paper quality. The three high-order bits of parameter n are disregarded.

(3) The relationship between four low-order bits of parameter n and paper quality is as follows:

N	Mode	Paper quality	Applicable paper type	Manufacturer
0	TYPE [1]			
1	TYPE [2]			
2	TYPE [3]		TF50KS-E4	Nippon Paper Mfg. Co., Ltd.
3	TYPE [4]	Standard paper	PD150R, PD160R, PD170R	Oji Paper Mfg. Co., Ltd.
4	TYPE [5]		TF60KS-F1, TF60KJ-R	Nippon Paper Mfg. Co., Ltd.
5	TYPE [6]		TF60KS-E	Nippon Paper Mfg. Co. Ltd.
6	TYPE [7]		HA220AA	Mitsubishi Paper Mills, Ltd.
7	TYPE [8]			
8	TYPE [9]	Long preservation	AFP-235	Mitsubishi Paper Mills, Ltd.
9	TYPE [10]			
10	TYPE [11]			
11	TYPE [12]			
12	TYPE [13]	Disable to use		
13	TYPE [14]			
14	TYPE [15]			
15	TYPE [16]			

(4) The initial value of parameter n is 3.

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(73) GS H + n

[Name] HRI character printing position selection

[Function] This command selects the printing position for HRI characters in bar-code printing mode.

[Code] [1D] $_{16}$ [48] $_{16}$ [n]
[29] $_{10}$ [72] $_{10}$ [n]

[Explanation]

(1) The relationship between the value of n and the content of specification is as follows:

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

(2) HRI characters refer to (Human Readable Interpretation) characters.

(3) HRI characters are printed with the font selected by the GS f command.

(74) GS I + n + m

[Name] Printer ID registration

[Function] ID is registered in the specified number.

[Code] [1D] $_{16}$ [49] $_{16}$ [n] [m]
[29] $_{10}$ [73] $_{10}$ [n] [m]

[Explanation]

(1) An effective range of parameter n and m is as follows.
$0 \leqq n \leqq 63$ 、 $0 \leqq m \leqq 255$

(2) Registration number n can be specified in the arbitrary order.

(3) The command is disregarded if the parameter is outside the range.

(4) When registration is repeatedly done to the same number, the last registration ID is effective.

(5) Even when the power supply is cut or the printer is initialized, the registered data is maintained.

(6) When abnormality occurs at the time of writing in the flash memory, "Abnormality of registration" is set, and operation is stopped.
"Abnormality of registration" is released by reading status.

(75) GS L + n_1 + n_2

[Name] Left margin position setting

[Function] This command sets the position of the left margin.

[Code] [1D] $_{16}$ [4C] $_{16}$ [n_1] [n_2]
[29] $_{10}$ [76] $_{10}$ [n_1] [n_2]

[Explanation]

(1) This command sets the position of the left margin in line printing mode.

(2) After automatic printing is canceled by the ESC c1 command, this command is valid only when it is input at the beginning of a line. When automatic printing is set and data exists in the print buffer, this command is executed after prinitng and a line feed. When data does not exist, this command is executed immediately.

(3) The left margin is set at [n_2 x 256+n_1] dot from the left end.

(4) When character data is developed, and if the printing area width set by this command is smaller than the width of one character of the specified character type, only this line is processed as follows:
• Printing area is enlarged to the right within the range which does not exceed the printable area.
• When the printing area cannot be secured by the above processing, the printing area is enlarged to the left within the range which does not exceed the printable area (left margin decreases).
• When the printing area still cannot be secured by the above processing, characters are not developed.

(5) When the specified bit image is larger than the specified printing area, the bit image outside the printing area is ignored.

(6) When the specified bar-code is larger than the specified printing area, the bar-code is not developed.

(7) When this command is received in page printing mode, only the internal setting is performed.

(76) GS R + n

[Name] Printer ID demand

[Function] ID registered in the specified number is notified.

[Code] $[1D]_{16}$ $[52]_{16}$ [n]
$[29]_{10}$ $[82]_{10}$ [n]

[Explanation]

(1) ID registered in the number specified by n is notified.

(2) An effective range of parameter n is $0 \leqq n \leqq 63$.

(3) The command is disregarded if the parameter is outside the range.

(4) The printer replies NUL when data is not registered in the specified number.

(77) GS W + n_1 + n_2

[Name] Printing area width setting

[Function] This command sets the printing area width.

[Code] [1D] $_{16}$ [57] $_{16}$ [n_1] [n_2]
[29] $_{10}$ [87] $_{10}$ [n_1] [n_2]

[Explanation]

(1) This command sets the printing area width.

(2) After automatic printing is canceled by the ESC c1 command, this command is valid only when it is input at the beginning of a line. When automatic printing is set and data exists in the print buffer, this command is executed after printing and aline feed. When data does not exist, this command is executed immediately.

(3) The left margin is set at [n_2 x 256+n_1] dot from the left end.

(4) When character data is developed, and if the printing area width set by this command is smaller than the width of one character of the specified character type, only this line is processed as follows:
- Printing area is enlarged to the right within the range which does not exceed the printable area.
- When the printing area cannot be secured by the above processing, the printing area is enlarged to the left within the range which does not exceed the printable area (left margin decreases).
- When the printing area still cannot be secured by the above processing, characters are not developed.

(5) When the specified bit image is larger than the specified printing area, the bit image outside the printing area is ignored.

(6) When the specified bar-code is larger than the specified printing area, the bar-code is not developed.

(7) When a range wider than the printable area is specified, the width of the printable area is set.

(8) In page printing mode, this command executes only the flag operation inside the printer.

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(78) GS ¥ + n_1 + n_2

[Name] Vertical relative position specification in page printing mode (vertical direction of characters)

[Function] This command specifies the relative position to start data development in the vertical direction of characters from the current position in page printing mode.

[Code] $[1D]_{16}$ $[5C]_{16}$ $[n_1]$ $[n_2]$
$[29]_{10}$ $[92]_{10}$ $[n_1]$ $[n_2]$

[Explanation]

(1) This command is ignored when mode is not page printing mode.

(2) The current position to be the reference is the reference position to develop the next data.

(3) When the lower side of a character from the current position is specified, specify positive number ($0<n_2<127$). When the upper side is specified, specify negative number ($128 \leq n_2 \leq 255$).
To specify N dots at the upper side of the current position, divide (65536-N) by 256. The quotient is n_2, and the remainder is n_1.

(4) When the relative position outside the printing area is specified, the specification is ignored.

(5) The reference of developing data to the specified printing position is as follows:
- Character data: Bottom ends of characters are aligned.
- Bit image: Bottom ends of bit images are aligned.
- Registered bit image: Bottom ends of registered bit images are aligned.
- Bar-code: Bottom ends of bar-codes are aligned (HRI characters are not included).

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(79) GS ^ + r + t + m

[Name] Macro execution

[Function] This command executes the contents of a macro execution.

[Code] $[1D]_{16}$ $[5E]_{16}$ [r] [t] [m]
$[29]_{10}$ $[94]_{10}$ [r] [t] [m]

[Explanation]

(1) r specifies the number of times of the macro execution.

(2) t specifies the wait time during a macro execution.

(3) m specifies the macro execution mode.
- m = 0: Macro execution continues r times with the interval specified by t.
- m = 1: Macro execution waits until the FEED key is pressed when the time specified by t has passed. When this key is pressed, the macro is executed once. This operation repeats r times.

(4) Depending on the specification of t, about (t X 100 msec) of wait time occurs after one macro execution.

(5) When this command is received during macro definition, macro definition is stopped and the defined content is cleared.

(6) When a macro is undefined, this command is ignored.

(80) GS a + n

[Name] Automatic notification setting of status

[Function] The status notified automatically is selected . (Only the serial interface)

[Code] $[1D]_{16}$ $[61]_{16}$ [n]
$[29]_{10}$ $[97]_{10}$ [n]

[Explanation]

(1) The relation between the parameter n and the notified status is as follows.

bit	Status	Setting
0	Undefined	—
1	State of online/offline	0:Invalidity 1:Effective
2	State of error	0:Invalidity 1:Effective
3~7	Undefined	—

(2) An initial value is n=0.

(3) Present status is notified if status is effective even by one. Status is notified every time effective status changes. At this time, the state changes into invalid status because each status shows a present state.

(4) Status is not notified automatically when all status is invalid.

(5) The printer does not depend in host's state (state of DSR/XOFF), and notify status in 4 bytes.

The first byte (Printer information)

bit	Content	Status
0	State of data reception buffer	0:Buffer empty 1:Buffer full
1	Unused	Fixed 0
2	Unused	Fixed 0
3	State of online/offline	0: Online 1：Offline
4	Unused	Fixed 1
5	Unused	Fixed 0
6	PF switch	0：Off 1：On
7	Unused	Fixed 0

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The second byte (Error information)

bit	Content	Status	
0	Head power supply voltage anomaly	0: Normal	1: Occurrence
1	Abnormality of data reception	0: Normal	1: Occurrence
2	Head-up anomaly	0: Normal	1: Occurrence
3	Cutter home position	0: Normal	1: Occurrence
4	Unused	Fixed 0	
5	Hardware anomaly (memory, MCU, thermal head, fuse)	0: Normal	1: Occurrence
6	Head temperature anomaly	0: Normal	1: Occurrence
7	Abnormality of registration	0: Normal	1: Occurrence

*The heat reckless driving and the fuse determination of internal abnormal RAM and the head cannot return from abnormality.

The third byte (Paper information)

bit	Content	Status	
0	Paper near-end	0: Normal	1: Occurrence
1	Mark detection anomaly	0: Normal	1: Occurrence
2	No-paper anomaly	0: Normal	1: Occurrence
3 - 7	Unused	Fixed 0	

The fourth byte (Parameter information)
The parameter set by reply parameter command (FS r) is notified.

(6) This command is effective only in the serial interface.

(81) GS e + n + m

[Name] Bar code width setting

[Function] The GS e + n + m command sets the width of a bar code.

[Code] $[1D]_{16}$ $[65]_{16}$ [n] [m]
$[29]_{10}$ $[101]_{10}$ [n] [m]

[Explanation]

(1) Parameter n specifies the width of a narrow bar in dots.

(2) Parameter m specifies the width of a wide bar in dots.

(3) When the code does not consist of wide bars and/or narrow bars, the value of parameter n is set as the minimum width.

(4) The initial value of parameter n is 2. The initial value of parameter m is 6.

(5) The following conditions must be satisfied:
$1 \leq n \leq 255$
$1 \leq m \leq 255$

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(82) GS f + n

[Name] HRI character font selection

[Function] This command selects the HRI character font used when a bar-code is printed.

[Code] [1D] $_{16}$ [66] $_{16}$ [n]
[29] $_{10}$ [102] $_{10}$ [n]

[Explanation]

(1) The relationship between the value of n and the content of selection is as follows.

N	Font
0, 48	Stored 08 x 16 ANK
1, 49	Stored 12 x 24 ANK
2, 50	Undefined
3, 51	Undefined
4, 52	OCR 24 x 40
5, 53	OCR 24 x 48
6, 54	OCR 36 x 60
7, 55	Enlarged numeric

(2) HRI refers to Human Readable Interpretation.

(3) HRI characters are printed at the position specified by the *GS H* command.

(4) The initial value of n is 0.

(5) When the specified value of n is outside the range, a parameter error occurs and the previous value is still valid.

(6) When an undefined area is specified, stored characters are specified.

(83) GS h + n

[Name] Bar code height setting

[Function] The GS h + n command sets the height of a bar code.

[Code] $[1D]_{16}$ $[68]_{16}$ [n]
$[29]_{10}$ $[104]_{10}$ [n]

[Explanation]

(1) Condition $1 \leq n \leq 255$ must be satisfied.

(2) Parameter n specifies the height of a bar code in dots.

(3) The initial value of parameter n is 60.

(84) y) GS k + m + d_1 to d_k + NUL
x) GS k + m + n + d_1 to d_n

[Name] Bar-code printing

[Function] These commands select the bar-code types and print the bar-code.

[Code] y [1D] $_{16}$ [6B] $_{16}$ [m] [d_1] to [d_k] [00] $_{16}$
y [29] $_{10}$ [107] $_{10}$ [m] [d_1] to [d_k] [00] $_{10}$
x [1D] $_{16}$ [6B] $_{16}$ [m] [n] [d_1] to [d_n]
x [29] $_{10}$ [107] $_{10}$ [m] [n] [d_1] to [d_n]

[Explanation]

(1) The relationship between the value of m and the bar-code type to be specified is as follows.
(NUL end) of [Code] y corresponds to m = 0~6, (number of characters specification) of [Code] x corresponds to m = 65~73.

m	Bar-code Type	Data Count	m	Bar-code Type	Data Count
0	UPC-A	Fixed (11≤k≤12)	66	UPC-E	Fixed (11≤n≤12)
1	UPC-E	Fixed (11≤k≤12)	67	JAN (EAN) 13	Fixed (12≤n≤13)
2	JAN (EAN) 13	Fixed (12≤k≤13)	68	JAN (EAN) 8	Fixed (7≤n≤8)
3	JAN (EAN) 8	Fixed (7≤k≤8)	69	CODE39	Variable
4	CODE39	Variable	70	ITF	Variable (must be even number)
5	ITF	Variable (must be even number)	71	CODABAR	Variable
6	CODABAR	Variable	72	Undefined	-
65	UPC-A	Fixed (11≤n≤12)	73	CODE128	Variable

(2) Command configuration, code, definition range and a part of precautions differ depending on the value of m.

(3) When m = 0~6, select the same bar-code type that is selected for m = 65~71. The printing result is also the same.

(4) d indicates the character to be printed. When d indicates an unprintable code in each bar-code type, and the data is of fixed length, the bar-code is not printed. When data is of variable length, the previous bar-codes are printed and subsequent bar-codes are processed as ordinary data.

(5) When bar-code development ends, the dot next to the bar-code end data becomes the printing start position.

(6) When the width exceeds the printing area of a line, bar-code is not printed and only a paper feed is performed.

(7) The operation in line printing mode is as follows.

y When automatic printing is canceled by the *ESC c1* command and data does not exist in the print buffer, this command is valid. When data exists in the print buffer, data after m is processed as ordinary data.

x When automatic printing is set and data exists in the print buffer, this command is executed after printing and aliens feed. When data does not exist, this command is executed immediately.

c Regardless the line pitch set by the *ESC 3* command, paper is fed for the height of the bar-code (when HRI character printing is specified, HRI characters are included).

(8) When page printing mode is selected, only bar-code data development is executed and printing is not executed.

(9) Underline and character size are not influenced.

(10) When bar-codes, character data, bit images and registered bit images coexist on the same line, the bottom ends of bar-codes are aligned as follows. HRI characters are not included.

- Character Data: Bottom ends of characters are aligned.
- Bit image: Bottom ends of bit images are aligned.
- Registered bit image: Bottom ends of registered bit images are aligned.

(11) When a data length, which does not include a check digit, is specified for fixed length data, a check digit is automatically calculated and added to the bar-code. When a data length which includes a check digit is specified, received data is developed into a bar-code as is.

(12) [*GS k m d1~dk NUL*] command

- This command ends with NUL code.
- k indicates the data count of the bar-code. In the case of fixed length data, match value k with the length. When data is small, bar-code is not printed. When data is large, data up to the fixed length is regarded as bar-code data, and excess data is processed as ordinary data.
- Data count of an ITF bar-code with m = 5 must be an even number. If an odd number is specified, the last data is ignored.

(13) [*GS k m n d1~dn*] command

- n indicates the data count, and n bytes of data from the next data to the n byte is processed as bar-code data. If the value of n is outside the definition range, or if the data count is an odd number when an ITF bar-code is selected with m = 70, command processing ends, and data from the next data is processed as ordinary data.

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(14) The development method for UPC-E bar-codes is described below.

• Data format

1	2 ~ 6	7 ~ 11	12
System digit (ASCII)	Manufacture number (ASCII)	Item number (ASCII)	Check digit (ASCII)

• Printing pattern

Left guard pattern	DATA (6 digits)	Check digit	Right guard pattern

• Bar-code development is executed based on the following rule.

y When the system digit is not 0, data for the specified number of characters is received, but printing is ignored.

x When the end of a manufacture number is 000, 100, or 200, item numbers are in the 00000 ~ 00999 range.

c When the end of a manufacture number is 300, 400, 500, 600, 700, 800 or 900, the item number can be set in the 00000 ~ 00099 range, and is developed in the sequence of: the first three characters, last two characters, and 3. When the item number is outside the range, the data is received but printing is ignored.

v When the end of a manufacture number is 10, 20, 30, 40, 50, 60, 70, 80, or 90, the item number can be set in the 00000 ~ 00009 range, and is developed in the sequence of : the first four characters, last single character and 4. When the item number is outside the range, the data is received but printing is ignored.

b When the end of a manufacture number is not 0, the item number can be set in a 00005 ~ 00009 range, and is developed in the sequence of: entire manufacture number (five characters) and the last single character. When the item number is outside the range, the data is received but printing is ignored.

(15) CODE 128

• The transmission data used for CODE 128 is as follows:

Code set A	00H~5FH, 7BH+31H~34H, 7BH+42H~43H, 7BH+53H
Code set B	20H~7FH, 7BH+31H~34H, 7BH+41H, 7BH+43H, 7BH+53H, 7BH+7BH
Code set C	00H~63H, 7BH+31H, 7BH+41H~42H

7BH (' { ' } is special character specification data, and two bytes make one meaning. The next table shows the transmission data to specify a special character.

Transmission Data			
Hexadecimal	**ASCII**	**Special Character**	**Meaning**
7BH+31H	{1	FNC1	Function characters
7BH+32H	{2	FNC2	
7BH+33H	{3	FNC3	
7BH+34H	{4	FNC4	
7BH+41H	{A	CODE A	Code set selection character
7BH+42H	{B	CODE B	
7BH+43H	{C	CODE C	
7BH+53H	{S	SHIFT	Shift character
7BH+7BH	{ {	' { '	Character ' { ' is specified

• In the beginning of bar-code data, one of ' { A ', ' { B ' and ' { C ' must be specified. The code set is selected at the start by this data. If bar-code data does not begin with a code set selection character, a parameter error occurs, and data from the next data is processed as ordinary data.

• Data that can be used differs depending on the code set. When the selected code set cannot use a received character, a parameter error occurs, and data from the next data is processed as ordinary data.

• Data after 7BH (' { ') is none of the special characters in the above table, a parameter error occurs, and data from the next data is processed as ordinary data.

• HRI characters:

• For special characters FNC1~FNC4, a blank is printed, ' { ' is printed as (' { '), and CODEs A~C are not printed.

• For control characters (00H~1FH, 7FH), a blank is printed.

• For 00H~63H of code set C, a two digit numeric is printed (00~99).

• When an HRI character is larger than the printing area, the following processing is performed.

y When the left side extends outside the printing area, the character is shifted to the right.

x When the right side extends outside the printing area, the HRI character is not printed.

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(85) GS k + m + k_1 + k_2 + k_3 + k_4 +
{ [p_1] [$d_{(1,1)}$]~[$d_{(1,j)}$] } ~ { [p_i] [$d_{(i,1)}$]~[$d_{(i,j)}$] } [00]$_{16}$

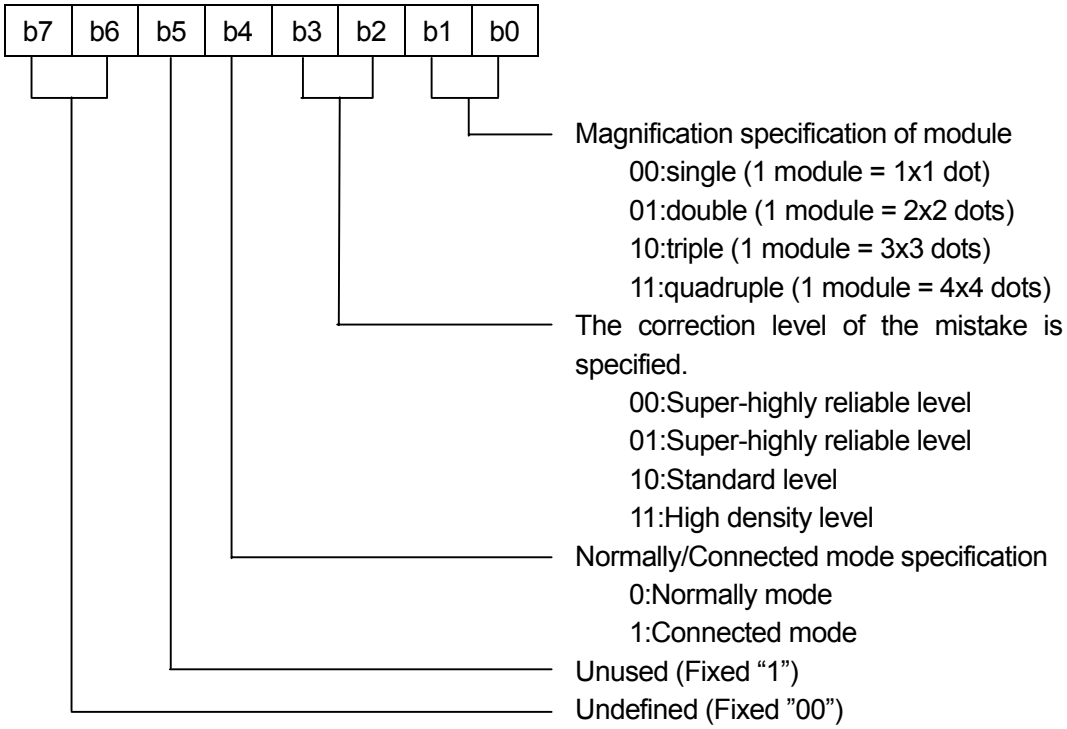
[Name] Print of 2Dcode(QR)

[Function] 2D Barcode(QR) is printed.

[Code] [1D]$_{16}$ [6B]$_{16}$ [m] [k_1] [k_2] [k_3] [k_4]
{ [p_1] [$d_{(1,1)}$]~[$d_{(1,j)}$] }~{ [p_i] [$d_{(i,1)}$] ~ [$d_{(i,j)}$] } [00]$_{16}$
[29]$_{10}$ [107]$_{10}$ [m] [k_1] [k_2] [k_3] [k_4]
{ [p_1] [$d_{(1,1)}$]~[$d_{(1,j)}$] }~{ [p_i] [$d_{(i,1)}$] ~ [$d_{(i,j)}$] } [00]$_{16}$

[Explanation]

(1) The specification of m is as follows.
m = [80]$_{16}$
(2) Parameter (k1)-(k4) is as follows.
(a) 1st parameter (k_1) ・・・ Function set parameter

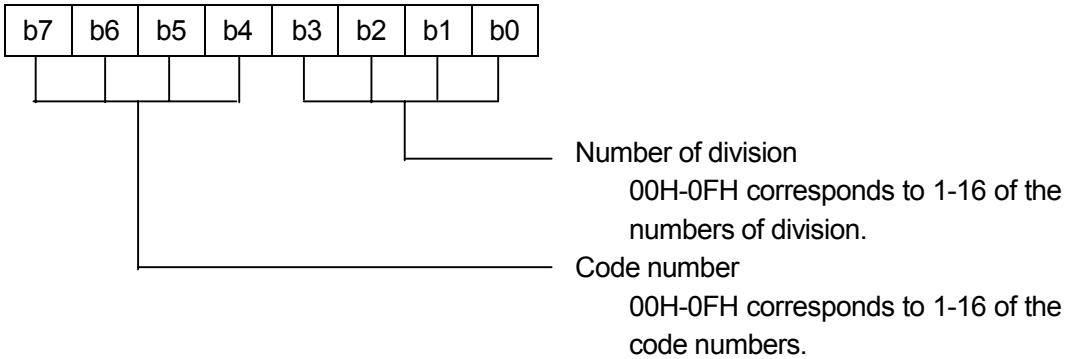


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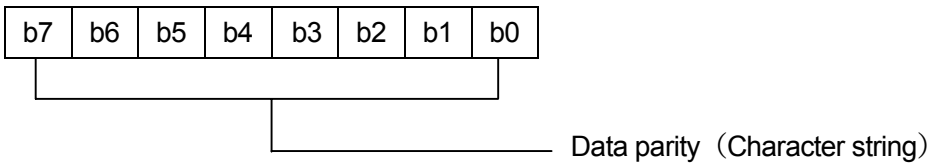
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(b) 2nd parameter (k_2) ・・・ Connected mode function parameter*1



(c) 3rd parameter (k_3) ・・・ Connected mode parity parameter*1



Note*1）K2 and k3 are used only at connected mode, and it is a dummy parameter in the normally mode. (00h is specified)

(d) 4th parameter (k_4) ・・・ Masking specification

00H～07H	:	Number of mask
08H	:	No mask
0FH	:	Auto Select as for the mask

(e) The character mode and the character string are specified in the part CS.

・p is a character mode in the part CS. The relation between p and mode is as follows.

p	Character mode
10H	Figure mode (“0”-”9”)
11H	Alphanumeric character mode (“0”-”9”,”A”-”Z”,SP,”$”,”%”,”＊”,”+”,”-“,”.”,”/”,”:”)
12H	Byte binary mode (8 bit Latin/Japanese syllabary character based on JIS X020)
13H	Shift-JIS Japanese character mode

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・d is a character string in the part CS, and character-string data corresponding to the above-mentioned character mode is specified.
・When the character mode is byte binary mode (p=12H), the number of string bytes is specified for the head of the character string. String byte number specification data becomes a binary coded decimal code in two bytes. When string byte number specification data is 0, the printer ends the command as a parameter error.
・The end delimiter is specified in NUL code (00h). When the NUL code is detected on the data row of the part CS, the printer shifts to the encode processing of the bar code. In the binary mode, the data of the length specified for a number of string bytes is received, and the NUL code is not checked.
・In the figure mode, the alphanumeric character mode, and shift JIS Japanese character mode, the printer disregards the command as a data error when an undefined code is specified.

(e) The bar code is not printed if the number of development dots of QR codes in the vertical direction is more than 256 dots in the line mode.

(f) Details of the specification not described in this book conform to the undermentioned specification.
- International Symbology Specification –QR Code (AIM International, inc.)

(3) The command is disregarded when there is no area in the specified development position.

(86) GS k + m + k_1 + k_2 + k_3 + k_4 + k_5 + d_1 ～ d_n

[Name] Print of 2Dcode(Maxi)

[Function] 2D Barcode(Maxi) is printed.

[Code] [1D]$_{16}$ [6B]$_{16}$ [m] [k_1] [k_2] [k_3] [k_4] [k_5] [d_1] ~ [d_n]
[29]$_{10}$ [107]$_{10}$ [m] [k_1] [k_2] [k_3] [k_4] [k_5] [d_1] ~ [d_n]

[Explanation]

(1) The specification of m is as follows.

$m = [81]_{16}$

(2) Parameter (k1)-(k5) is as follows.

(a) 1st parameter (k_1) ・・・ Parameter which selects symbol mode
The symbol mode is specified with k1.

k_1	Symbol mode
0	mode 2
1	mode 3
2	mode 4
3	mode 5
4	mode 6

(b) 2nd parameter (k_2) ・・・ Parameter which selects symbol number
The symbol number (Number n is shown) of Structurizing append is specified with k2.
An effective range of k2 is as follows.

$1 \leq k_2 \leq 8$

(c) 3rd parameter(k_3) ・・・ Parameter which selects number of symbols
The number of Structurizing append of all symbols is specified with k3.
An effective range of k3 is as follows.

$1 \leq k_3 \leq k_2 \leq 88$

(d)4th 5th parameter (k_4, k_5) ・・・ Parameter which selects length of character string
The length of the character string is specified with k4 and k5.

$k_5 \times 256 + k_4$

(e) The character string (barcode development data) is specified with d1-dn.

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(f) When mode 2 and mode 3 are selected, the printer disregards the command because of the parameter error when differing from mode information on the first message.

(g) The specification of the ZIP code in mode 2 becomes the following formats.
Header (It is possible to omit)] + [ZIP code] + [1DH] + [Country code (3 digits)] + [1DH] + [Service cluster (3 digits)]+ [1DH] + [2nd message]
The ZIP code is a figure of 1-9 digits. When characters other than the figure are specified for data, the printer disregards the command because of the parameter error.

(h) The specification of the ZIP code in mode 3 becomes the following formats.
Header (It is possible to omit)] + [ZIP code] + [1Dh] + [Country code (3 digits)] + [1DH] + [Service cluster (3 digits)]+ [1DH] + [2nd message]
The ZIP code is an alphanumeric character of 1-9 digits. When characters other than the alphanumeric character are specified for data, the printer disregards the command because of the parameter error.

(h) Details of the specification not described in this book conform to the undermentioned specification.
- International Symbology Specification – Maxi Code (AIM International, inc.)

(3) The command is disregarded when there is no area in the specified development position.

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(87) GS k + m + k_1 + k_2 + k_3 + k_4 + k_5 + k_6 + d_1 ～ d_n

[Name] Print of 2Dcode(PDF417)

[Function] 2D Barcode(PDF417) is printed.

[Code] [1D]$_{16}$ [6B]$_{16}$ [m] [k_1] [k_2] [k_3] [k_4] [k_5] [d_1] ~ [d_n]
[29]$_{10}$ [107]$_{10}$ [m] [k_1] [k_2] [k_3] [k_4] [k_5] [d_1] ~ [d_n]

[Explanation]

(1) The specification of m is as follows.

$m = [82]_{16}$

The command is disregarded when m is outside an effective range.

(2) Parameter (k1)-(k6) is as follows.

(a) 1st parameter(k_1) ・・・ Parameter which sets column or number of steps
The column or the number of steps is specified with k1.
Range to specify column : $1 \leq k_1 \leq 30$
Range to specify number of steps : $3 + n \leq k_1 \leq 90 + n$ (n=128)

(b) 2nd parameter(k_2) ・・・ Parameter which specifies width of module
The width of the module (dots) is specified with k2.
Range to specify width of module : $1 \leq k_2 \leq 30$

(c) 3rd parameter(k_3) ・・・ Parameter which specifies height of module
The height of the module (dots) is specified with k3.
Range to specify height of module : $1 \leq k_3 \leq 30$

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(d) 4th parameter(k_4) ・・・ The error correction level is set.
The error correction level is specified with k4.

k_4	Correction level
0	level 0
1	level 1
2	level 2
3	level 3
4	level 4
5	level 5
6	level 6
7	level 7
8	level 8

(e) 5th 6th parameter(k_5, k_6) ・・・ The length of the character string is specified.
The length of the character string is specified with k5 and k6.
$k_6 \times 256 + k_5$

(f) The character string (barcode development data) is specified with d1-dn.

(g) Details of the specification not described in this book conform to the undermentione d specification.
- International Symbology Specification – PDF 417 Code (AIM International, inc.)

(3) The command is disregarded when there is no area in the specified development position.

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(88) GS s

[Name] Check on Presenter

[Function] The existence of the paper is confirmed on Presenter, and the state is notified.

[Code] $[1D]_{16}$ $[73]_{16}$
$[29]_{10}$ $[115]_{10}$

[Explanation]

(1) The on Presenter operation status is switched to "Executing on GS s", and the state of the paper on Presenter is confirmed.
(2) The paper is transported to the home position when there is a paper on Presenter.
(3) "Transportation error" is set when there is no paper on Presenter.
(4) After the above-mentioned operation ends, the Presenter operation status is switched to "Standing".
(5) "paper remaining on Presenter" is set when the paper is detected remaining on Presenter, and operation is stopped.
(6) " Abnormal paper detection " is set when an abnormal paper is detected while transporting the paper, and operation is stopped.
(7) " Transportation error " is set when the paper jam is detected while transporting the paper and operation is stopped.
(8) Refer to the following items for the method of reading status.
- RS232C : SECTION G (*ESC u+n)*
- USB : SECTION H (Vender Request)

(89) GS t + n

[Name] Eject paper

[Function] The paper on the presenter is ejected.

[Code] $[1D]_{16}$ $[74]_{16}$ [n]
$[29]_{10}$ $[116]_{10}$ [n]

[Explanation]

(1) The presenter operation status is switched to "Executing on GS t+n", and the paper is ejected.
(2) The direction where the paper is ejected can be switched by using command (87) *GS u+n*.
(3) The amount of the paper exhaust to the exhaust part is specified according to the value of n. An effective range of n is 0≤n≤255 (The unit:mm).
(4) After the paper is transported, the presenter operation status is switched to "Waiting until retract". When the exhaust specification amount is longer than the paper, The paper is stopped from the exhaust sensor in the place which comes off and returned on the exhaust sensor.
(5) When the paper is taken while operating the above-mentioned, the presenter operation status becomes "Standing".
(6) When the paper is not in the eject preparation position when this command is executed, the paper is moved to the eject preparation position and the command processing is done.
(7) When you receive this command in the state of "Waiting until retract", the ejected paper is taken into the eject preparation position and the command processing is done.
(8) If the paper is detected being extracted in the state of "Waiting until retract", the presenter operation status becomes "Standing".
(9) "Transportation error" is set when there is no paper on Presenter.
(10) "Paper remaining on Presenter" is set when the paper is detected remaining on Presenter, and operation is stopped.
(11) " Abnormal paper detection " is set when an abnormal paper is detected while transporting the paper, and operation is stopped.
(12) " Transportation error " is set when the paper jam is detected while transporting the paper and operation is stopped.
(13) Refer to the following items for the method of reading status.
- RS232C : SECTION G (*ESC u+n)*
- USB : SECTION H (Vender Request)

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(90) GS u + n

[Name] Model selection for presenter

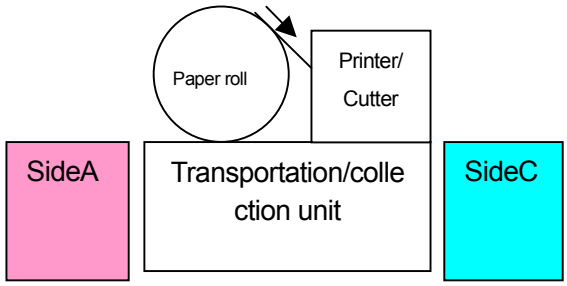
[Function] Exhaust/collection mode of the presenter is selected.

[Code] $[1D]_{16}$ $[75]_{16}$ [n]
$[29]_{10}$ $[117]_{10}$ [n]

[Explanation]

(1) The presenter model is selected, and the mode of exhaust/collection is set.
(2) The command is disregarded when n is outside an effective range.
(3) The relation of n and exhaust/collection mode is as follows.

n	Side A	Side C
0	—	Eject
1	Collection	Eject
2	Eject	—
3	Eject	Collection



(4) The state of the first stage is n=1.

(91) GS v

[Name] Notification of firmware version

[Function] The version of the firmware is notified. (Only the serial interface)

[Code] $[1D]_{16}$ $[76]_{16}$
$[29]_{10}$ $[118]_{10}$

[Explanation]

(1) The program version is notified.
(2) The command is processed only for the serial interface.
(3) Version information is composed of 12 bytes.
First of all, the boot program version (six bytes) is notified . Next, the main program version (six bytes) is notified.
Details of individual version information (six bytes) are as follows.

Data (12byte)	
Boot program version (6byte)	Main program version (6byte)
42H XXH 2EH XXH XXH YYH Version Identifier Supplementary sign	56H XXH 2EH XXH XXH YYH Version Identifier Supplementary sign

① The identifier of the boot program is "B(42H)" it . and the identifier of the main program is "V(56H)"
② When it is not specified, a supplementary sign becomes space (20H).
③ <Example Condition> Boot program version : “B1.01”
Main program version : "V1.05b"
<Data> "42H 31H 2EH 30H 31H 20H 56H 31H 2EH 30H 35H 62H"

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(92) GS w + n

[Name] Bar code width magnification setting

[Function] The GS w + n command sets the width magnification of a bar code.

[Code] $[1D]_{16}$ $[77]_{16}$ [n]
$[29]_{10}$ $[119]_{10}$ [n]

[Explanation]

(1) Parameter n specifies the horizontal magnification of a bar code.
(2) Condition 1 ≤ n ≤ 255 must be satisfied.
(3) The initial value of parameter n is 1.
(4) Both the widths of a narrow bar and a wide bar is multiplied by n times.

(93) GS x + n

[Name] Collect paper

[Function] The paper on the presenter is collected.

[Code] $[1D]_{16}$ $[78]_{16}$ [n]
$[29]_{10}$ $[120]_{10}$ [n]

[Explanation]

(1) The presenter operation status is switched to "Executing on GS x+n", and the paper on the presenter is collected.
(2) The direction where the paper is collected can be switched by using command (87) GS u+n. When the mode without the collection by the GS u+n command is selected, this command is disregarded.
(3) After the paper collection is completed, the presenter operation status is switched to "Standing".
(4) After detecting the state of no paper with the collection sensor after there is a paper, the paper of the specified length is transported.
(5) When the error of something is detected while collecting the paper, "Collection error" is set.
(6) "Transportation error" is set when there is no paper on Presenter.
(7) "Paper remaining on Presenter" is set when the paper is detected remaining on Presenter, and operation is stopped.
(8) " Abnormal paper detection " is set when an abnormal paper is detected while transporting the paper, and operation is stopped.
(9) " Transportation error " is set when the paper jam is detected while transporting the paper and operation is stopped.
(10) Refer to the following items for the method of reading status.
- RS232C : SECTION G (*ESC u+n)*
- USB : SECTION H (Vender Request)

(11) The relation between n and the amount of transportation is as follows.

n	Amount of transportation (mm)	n	Amount of transportation (mm)
0	20	5	70
1	30	6	80
2	40	7	90
3	50	8	100
4	60		

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(94) GS y

[Name] Eject preparation

[Function] The paper on Presenter is transported to the eject preparation position.

[Code] $[1D]_{16}$ $[79]_{16}$
$[29]_{10}$ $[121]_{10}$

[Explanation]

(1) The on Presenter operation status is switched to "Executing on GS y", and the paper on Presenter is transported to the eject preparation position .
(2) When you receive this command in the state of "Waiting until retract", and the ejected paper is taken into the eject preparation position.
(3) "Transportation error" is set when there is no paper on Presenter.
(4) After the above-mentioned operation ends, the Presenter operation status is switched to "Standing".
(5) "Paper remaining on Presenter" is set when the paper is detected remaining on Presenter, and operation is stopped.
(6) " Abnormal paper detection " is set when an abnormal paper is detected while transporting the paper, and operation is stopped.
(7) " Transportation error " is set when the paper jam is detected while transporting the paper and operation is stopped.
(8) Refer to the following items for the method of reading status.
- RS232C : SECTION G (*ESC u+n)*
- USB : SECTION H (Vender Request)

(95) GS z

[Name] Retract paper

[Function] The ejected paper is retracted into the eject preparation position.

[Code] $[1D]_{16}$ $[7A]_{16}$
$[29]_{10}$ $[122]_{10}$

[Explanation]

(1) The transportation road operation status is switched to "Executing on GS z", and the ejected paper is retracted into the eject preparation position.
(2) When you receive this command besides "Waiting until retract", the paper on Presenter is transported to the eject preparation position.
(3) "Transportation error" is set when there is no paper on Presenter.
(4) After the above-mentioned operation ends, the Presenter operation status is switched to "Standing".
(5) "Paper remaining on Presenter" is set when the paper is detected remaining on Presenter, and operation is stopped.
(6) " Abnormal paper detection " is set when an abnormal paper is detected while transporting the paper, and operation is stopped.
(7) " Transportation error " is set when the paper jam is detected while transporting the paper and operation is stopped.
(8) Refer to the following items for the method of reading status.
- RS232C : SECTION G (*ESC u+n)*
- USB : SECTION H (Vender Request)

SECTION H

Vender Request

1. Printer Status

BmRequest	bRequest	wValue	wIndex	wLength	data
11000001B	00000001B	0	0	6	–

(1) The data of six bytes replies.
(2) A detailed content of data is shown below.

-1st data (Printer information)

bit	Content	Status
0	State of data reception buffer	0:Buffer empty 1: Buffer full
1	Unused	Fixed 0
2	Unused	Fixed 0
3	State of online/offline	0: Online 1: Offline
4	Unused	Fixed 1
5	Unused	Fixed 0
6	PF switch	0:Off 1: On
7	Unused	Fixed 0

-2nd data (Error information)

bit	Content	Status
0	Head power supply voltage anomaly	0: Normal 1: Occurrence
1	Abnormality of data reception	0: Normal 1: Occurrence
2	Head-up anomaly	0: Normal 1: Occurrence
3	Cutter home position	0: Normal 1: Occurrence
4	Unused	Fixed 0
5	Hardware anomaly (memory, MCU, thermal head, fuse)	0: Normal 1: Occurrence
6	Head temperature anomaly	0: Normal 1: Occurrence
7	Abnormality of registration	0: Normal 1: Occurrence

*The heat reckless driving and the fuse determination of internal abnormal RAM and the head cannot return from abnormality.

-3rd data (Paper information)

bit	Content	Status
0	Paper near-end	0: Normal 1: Occurrence
1	Mark detection anomaly	0: Normal 1: Occurrence
2	No-paper anomaly	0: Normal 1: Occurrence
3 - 7	Unused	Fixed 0

-4th data (Sensor information on transportation road)

bit	Content	Status
0	Senser A	0: no paper 1:
1	Senser B	0: no paper 1:
2	Senser C	0: no paper 1:
3	Undefined	———
4 - 7	Operation status of Presenter	0000b : Standing 0001b : Cutting 0010b : Paper feeding 0011b : Printing 0100b : Executing on [GS t+n] 0101b : Executing on [GS x+n] 0110b : Automatic paper feeding 0111b : Registering in FROM 1000b : Waiting until retract 1001b : Executing on [GS s] 1010b : Executing on [GS y] 1011b : Executing on [GS z] 1100b : Undefined 1101b : Undefined 1110b : Undefined 1111b : Undefined

-5th data (Parameter information)

The parameter set by reply parameter command (FS r) is notified.

-6th data (Error information)

bit	Content	Status
0	Transportation error	0: Normal 1: Occurrence
1	Abnormal paper detection	0: Normal 1: Occurrence
2	Collection error	0: Normal 1: Occurrence
3	Paper detection of uncollection	0: Normal 1: Occurrence
4	Paper remaining on Presenter	0: Normal 1: Occurrence
5	Undefined	Fixed 0
6	Undefined	Fixed 0
7	Undefined	Fixed 0

2. Notification of registration ID data

BmRequest	bRequest	wValue	wIndex	wLength	data
11000001B	00000010B	n	0	4	–

(1) Registration ID data specified by parameter n is notified.
Data is four bytes.
- The first byte is registration ID data.
- The second byte is registration information.
- The 3-4th byte is Null.

Data (4byte)
XXH YYH 00H 00H Null Registration information Registration ID data

(2) An effective range of parameter n is $0 \leqq n \leqq 63$.
(3) When registration ID data is not registered in a specified number, the seventh bit in the second byte is set in "1".
Details of registration information are as follows.

Registration information (the second byte)

bit	Content	Status
0 - 6	Undefined	Fixed 0
7	Registration information	0: No registration 1: Registered

3. Notification of firmware version

BmRequest	bRequest	wValue	wIndex	wLength	Data
11000001B	00000011B	0	0	12	–

(1) The firmware version is notified by this request.
(2) The version data is composed of 12 bytes. First of all, the boot program version (six bytes) is notified . Next, the main program version (six bytes) is notified.
A detailed format in six bytes is as follows.

Data (12byte)	
Boot program version (6byte)	Main program version (6byte)
42H XXH 2EH XXH XXH YYH Version Identifier Supplementary sign	56H XXH 2EH XXH XXH YYH Version Identifier Supplementary sign

① The identifier of the boot program is "B(42H)" it . and the identifier of the main program is "V(56H)"
② When it is not specified, a supplementary sign becomes space (20H).
③ <Example Condition> Boot program version : “B1.01”
Main program version : "V1.05b"
<Data> "42H 31H 2EH 30H 31H 20H 56H 31H 2EH 30H 35H 62H"

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4. Notification of print distance and cutting frequency

BmRequest	BRequest	wValue	wIndex	wLength	data
11000001B	00000100B	0	0	10	–

(1) Information on the print distance and the cutting frequency is notified by this request.
(2) The notified content is ten bytes (1 byte of administrative information, 1 byte of undefined data (Null), 4 bytes of the print distance, and 4 bytes of the cutting frequency) in total.

Administrative information (1byte)	Undefined (1byte)	Print distance (4byte)	Cut frequency (4byte)
0 0 0 0 0 0 a b Fixed 0 Warning of print distance Warning of cut frequency	Null	Print distance (line).	Cut frequency

Warning of the print distance of administrative information (warn of the cut frequency) is notified when a present print distance (cut frequency) exceeds a standard value.

In printer management command (ESC z+m+d), a standard value for the warning notification can be set .

(m=4:the registration of the comparison value for the warning notification)

A present print distance (cutting frequency) is cleared by printer management command (ESC z+m+d).

(m=2:Clearness of print distance, m=3:Clearness of cut frequency)

5. The remainder amount notification of flash memory.

BmRequest	BRequest	wValue	wIndex	wLength	data
11000001B	00000101B	0	0	4	–

(1) The amount of the remainder of the flash memory is notified by this request. (Only the registration image area.)
(2) The relation to the amount of the remainder of received data and flash memory is as follows.
- Received data (4byte) = $[d_1\ d_2\ d_3\ d_4]$
- Amount of the remainder of flash memory = $d_1 + d_2 \times 255 + d_3 \times 255^2 + d_4 \times 255^3$

(3) Total capacity of the flash memory is 192 Kbyte.

6. Printer reset

BmRequest	BRequest	wValue	wIndex	wLength	data
11000001B	00000111B	0	0	6	–

(1) After present status is notified, the printer is initialized.
(2) The notified status is the same as "1.Printer Status".
(3) The initialized item is as follows.
- Content of ESC@
- Content of FIFO buffer of data reception buffer and USB
  (The data received immediately after this request has the possibility to be deleted.)
- Command operation

(4) When printer reset ends, FF is set in 5th data of status.
After the end of printer reset is confirmed, it is necessary to do the following processing.

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SECTION I
List of Character Codes

1 National Character Code

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P	`	p	_	┴	SP	ー	タ	ミ	═	×
1			!	1	A	Q	a	q	▬	┬	。	ア	チ	ム	╞	円
2			"	2	B	R	b	r	▬	┤	「	イ	ツ	メ	╪	年
3			#	3	C	S	c	s	▬	├	」	ウ	テ	モ	╡	月
4			$	4	D	T	d	t	▬	┼	、	エ	ト	ヤ	◢	日
5			%	5	E	U	e	u	■	—	・	オ	ナ	ユ	◣	時
6			&	6	F	V	f	v	■	|	ヲ	カ	ニ	ヨ	◥	分
7			'	7	G	W	g	w	■	|	ァ	キ	ヌ	ラ	◤	秒
8			(	8	H	X	h	x	▌	┌	ィ	ク	ネ	リ	♠	〒
9	HT	EM	)	9	I	Y	i	y	▌	┐	ゥ	ケ	ノ	ル	♥	市
A	LF		*	:	J	Z	j	z	▌	└	ェ	コ	ハ	レ	♦	区
B		ESC	+	;	K	[	k	{	▌	┘	ォ	サ	ヒ	ロ	♣	町
C	FF	FS	,	<	L	¥	l	¦	▌	╭	ャ	シ	フ	ワ	●	村
D		GS	−	=	M	]	m	}	▌	╮	ュ	ス	ヘ	ン	○	人
E			.	>	N	^	n	~	■	╰	ョ	セ	ホ	゛	／	▩
F		`	／	?	O	_	o	SP	+	╯	ッ	ソ	マ	゜	＼	SP

(In this table, “SP” indicates a space.)

Note 1)
Each code is represented in hexadecimal notation.

Note 2)
If an undefined code ($[00]_{16}$ to $[1F]_{16}$) or an undefined ESC, FS, or GS sequence listed in this table is received, an abnormal operation may occur. (However, when image print data, character registration data, or command parameters are received, they are handled as ordinary data.)

2 Overseas Character Codes

Upper / Lower	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			SP	0	@	P	`	p	Ç	É	á	░	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▓	┬	╥	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	HT	EM	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	●
A	LF		*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	•
B		ESC	+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C	FF	FS	,	<	L	\	l	|	î	£	¼	╝	╠	▄	∞	ⁿ
D		GS	-	=	M	]	m	}	ì	¥	¡	╜	═	▌	ø	²
E		RS	.	>	N	^	n	~	Ä	Pt	«	╛	╬	▐	ε	▪
F		US	/	?	O	_	o	SP	Å	ƒ	»	┐	╧	▀	∩	SP

(In this table, “SP” indicates a space.)

Note 1)
Each code is represented in hexadecimal notation.

Note 2)
If an undefined code ($[00]_{16}$ to $[1F]_{16}$) or an undefined ESC, FS, or GS sequence listed in this table is received, an abnormal operation may occur. (However, when image print data, character registration data, or command parameters are received, they are handled as ordinary data.)

SECTION J
Packaging, Stamping and Other Conditions

1 Packaging

This control board is packed in accordance with Fujitsu component standard packaging specification.

2 Stamping

The type, serial number, and revision information is stamped on the Fujitsu Component standard label affixed to this control board.

3 Other condition

(1) Detected errors must be resolved by mutual agreement in accordance with this specification.

(2) To change the contents of this specification, the changes must be reported on and mutually agreed upon in advance.

(3) The model described in this specification is the standard model. Therefore, when functional compatibility is maintained, the items not described in this specification may be changed without prior notice.

(4) If more detailed information is required or ambiguous information is detected, these problems must be resolved by mutual agreement.

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Appendix 1
Setting The Dipswitches

The DIP switches (DSW1, 2) mounted on this board must be set in accordance with the use conditions as explained below.

(1) DSW1

Switch No.	Setting Function	Setting		Setting on Shipment
		ON	OFF	
1	Baud rate	Refer to following table.		OFF
2				OFF
3	Flow control	XON/XOFF	DTR/DSR	OFF
4	Receiving buffer size	45 byte	4k byte	OFF
5	Even/Odd	Even	Odd	ON
6	Parity	Valid	Invalid	ON

Switch No.1	Switch No.2	Baud rate
ON	ON	115200 BPS
ON	OFF	9600 BPS
OFF	ON	4800 BPS
OFF	OFF	19200 BPS

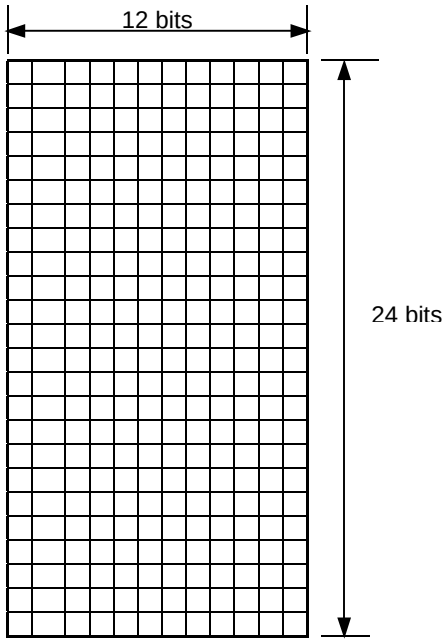
(2) DSW2

Switch No.	Setting Function	Setting		Setting on Shipment
		ON	OFF	
1	Undefined			Fixed OFF
2	Undefined			Fixed OFF
3	Interface select	Refer to following table.		Dependent on a model
4				

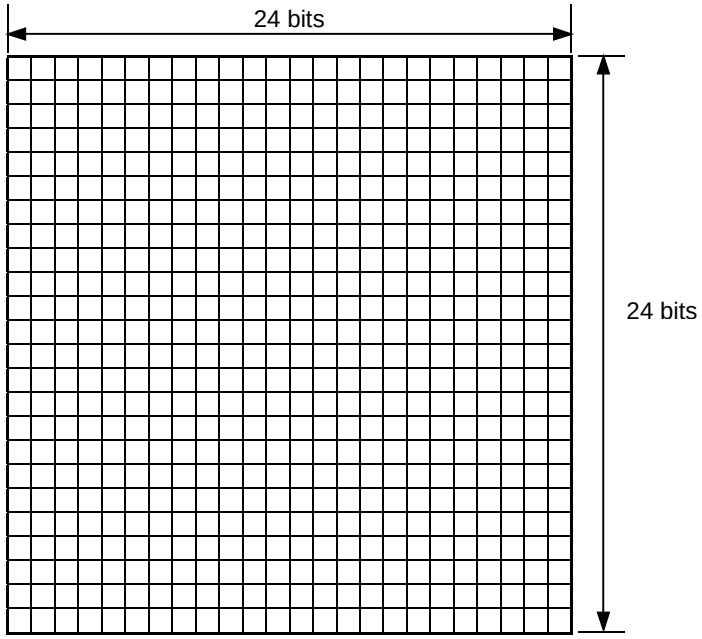
Switch No.3	Switch No.4	Baud rate
ON	ON	Centro
ON	OFF	RS-232C
OFF	ON	USB
OFF	OFF	Centro

Appendix 2
Configuration of Character Typeface

(1) Internal half-size [12 x 24 dots] character typeface (internal data = print pattern)



(2) Internal full-size [24 x 24 dots] character typeface (double-width typeface of internal half-size characters)



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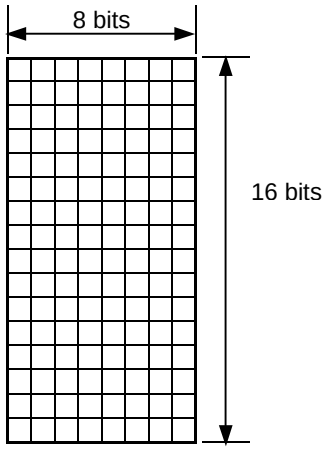
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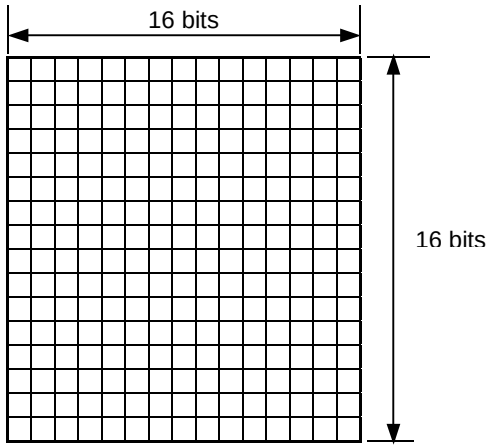
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(3) Internal half-size [8 x 16 dots] character typeface (internal data = print pattern)



(4) Internal full-size [16 x 16 dots] character typeface (double-width typeface of internal half-size characters)



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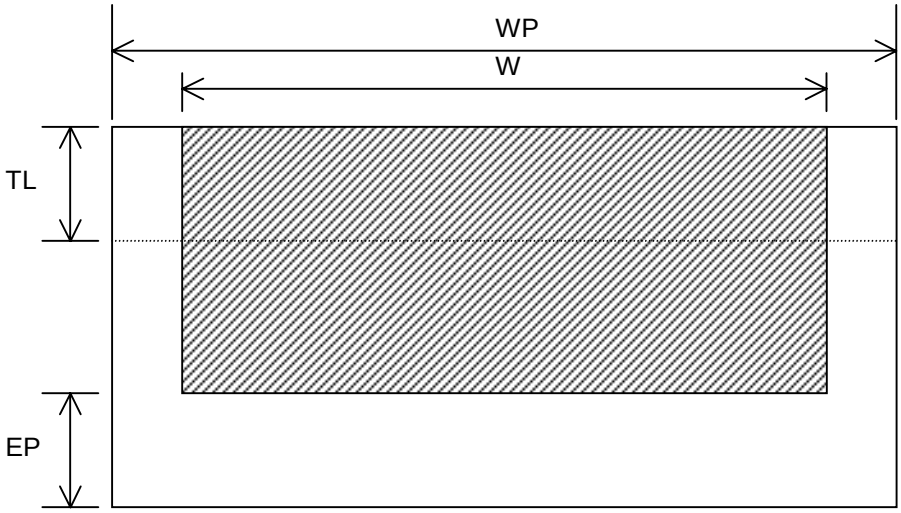
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Appendix 3
Paper Printing Area and Mark Detection Position

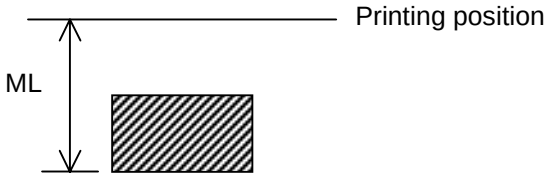
(1) Paper printing area



Symbol	Explanation		Length (mm)
WP	Maximum paper width	FTP-629MCL053/103 equivalent	About 58
		FTP-629MCL054 equivalent	About 60
		FTP-639MCL053/103 equivalent	About 80
		FTP-639MCL054 equivalent	About 82.5
W	Maximum printable area	FTP-629MCL053/103 equivalent	About 54
		FTP-639MCL054 equivalent	About 72
EP	Paper out state detection position	FTP-6X9MCL053/103 equivalent	About 10.3*1
		FTP-6X9MCL054 equivalent	About 10.9*1
TL	Distance from paper cutting position to print position (when automatic cutter FTP-6X9CT001 used)		About 10.1

NOTE *1)
This value varies with the printing mode used.

(2) Mark detection position (when head detection is 2mm)



Symbol	Explanation		Length (mm)
ML	Distance from mark position to printing position	FTP-6X9MCL053/103 or the equivalent	About 8.3
		FTP-6X9MCL054 or the equivalent	About 8.9

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Appendix 4
List of Commands

(1)	HT	Horizontal tab
(2)	LF	Line feed
(3)	FF	Forms feed
(4)	ESC FF	Data printing in page printing mode
(5)	ESC EM + n	Setting the amount of the feeding at automatic paper feed
(6)	ESC RS	Black-white reversed printing specification
(7)	ESC US	Black-white reversed printing cancellation
(8)	ESC SP + n	Character spacing Setting
(9)	ESC ! + n	Printing mode specification
(10)	ESC $ + n_1 + n_2	bsolute position specification
(11)	ESC % + n	External registration character specification/cancellation
(12)	ESC & + y + c_1 + c_2 + x + d_1 to d_n	External registration character definition
(13)	ESC * + m + n_1 + n_2 + d_1 to d_n	Bit image printing
(14)	ESC - + n	Underline setting
(15)	ESC 2	1/6-inch line pitch setting
(16)	ESC 3 + n	Line pitch setting
(17)	ESC ? + n	External registration character deletion
(18)	ESC @	Printer resetting
(19)	ESC A + n	Line spacing setting
(20)	ESC C + n	Page length (number of lines) setting
(21)	ESC D +d_1 to d_n + NUL	Horizontal tab position setting
(22)	ESC E + n	Highlighted printing specification/cancellation
(23)	ESC G + n	Double printing specification/cancellation
(24)	ESC J + n	Forward paper feed
(25)	ESC K + n	Backward paper feed
(26)	ESC L + n	Page printing mode selection
(27)	ESC Q + n + ! + j	Frame overlay function (page mode)
(28)	ESC R + n	International character specifications
(29)	ESC S + n	Line printing mode
(30)	ESC T + n	Print direction setting (Only the page mode)
(31)	ESC V + n	Right rotation 90° specification/cancellation
(32)	ESC W+X1+X2+1+Y2+dX1+dX2+dY1+dY2	Page printing mode printing area setting
(33)	ESC X + n + m	Setting of time to turn off motor
(34)	ESC Y+01h+ESC+x+a+m+d~	Program download
(35)	ESC Y+01h+ESC+x+a+m+d~	Printer test
(36)	ESC \ + n_1 + n_2	Relative position setting
(37)	ESC a + n	Positional alignment
(38)	ESC c + 1 + n	Internal processing setting
(39)	ESC c + 4 + n	Paper-out detector selection
(40)	ESC c + 5 + n	Panel switch enable/disable setting
(41)	ESC d + n	n-line feed
(42)	ESC e + n	Backward n-line feed
(43)	ESC i	Full cut
(44)	ESC m	Partial cut
(45)	ESC s + n	Printing speed setting
(46)	ESC t + n	Character code table selection
(47)	ESC u + n	Status of peripherals
(48)	ESC v	The status of the paper sensor is notified.
(49)	ESC { + n	Upside-down printing setting/cancellation
(50)	FS ! + n	Kanji printing mode collective specification

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(51) FS &	Kanji printing mode specification
(52) FS * + m + n_1 + n_2 + d_1 to d_N	Bit image printing
(53) FS - + n	Kanji underline specification/cancellation
(54) FS .	Kanji printing mode cancellation
(55) FS 2 + c_1 + c_2 + d_1 to d_n	External character definition
(56) FS 9 + n	Detection function enable/disable setting
(57) FS C + n	Kanji code system selection
(58) FS E + n	Applied energy adjustment
(59) FS S + n_1 + n_2	Kanji spacing setting
(60) FS W + n	Kanji double height and width printing specification/cancellation
(61) FS r + n	Notification parameter setting
(62) GS ! + n	Character size specification
(63) GS $ + n_1 + n_2	Vertical absolute position specification in page printing mode
(64) GS & + m + x + y1 + y2 + d_1 to d_N	Registered bit image definition
(65) GS ‘ + m + n	Registered bit image printing
(66) GS * + x + y + d_1 to d_{X*Y*8}	Registered bit image definition
(67) GS / + m	Registered bit image printing
(68) GS :	Macro definition start/end
(69) GS <	Mark detection execution
(70) GS A + m + n	After-mark-detection head distance setting
(71) GS B + n	Angle setting of barcode
(72) GS E + n	Print quality setting
(73) GS H + n	HRI character printing position selection
(74) GS I + n + m	Printer ID registration
(75) GS L + n_1 + n_2	Left margin position setting
(76) GS R + n	Printer ID demand
(77) GS W + n_1 + n_2	Printing area width setting
(78) GS \ + n_1 + n_2	Vertical relative position specification in page printing mode (vertical direction of characters)
(79) GS ^+ r + t + m	Mark detection execution
(80) GS a + n	Automatic notification setting of status
(81) GS e + n + m	Bar code width setting
(82) GS f + n	HRI character font selection
(83) GS h + n	Bar code height setting
(84) y) GS k + m + d_1 to d_k + NUL x) GS k + m + n + d_1 to d_n	Bar code printing
(85) GS k + m + k_1 + k_2 + k_3 + k_4 + { [p_1] [$d_{(1,1)}$]~[$d_{(1,j)}$] } ~ { [p_i] [$d_{(i,1)}$]~[$d_{(i,j)}$] } [00]$_{16}$	Print of 2Dcode(QR)
(86) GS k + m + k_1 + k_2 + k_3 + k_4 + k_5 + d_1 ～ d_n	Print of 2Dcode(Maxi)
(87) GS k + m + k_1 + k_2 + k_3 + k_4 + k_5 + k_6 + d_1～ d_n	Print of 2Dcode(PDF417)
(88) GS s	Check on Presenter
(89) GS t + n	Eject paper
(90) GS u + n	Model selection for presenter
(91) GS v	Notification of firmware version
(92) GS w + n	Bar code width magnification setting
(93) GS x + n	Collect paper
(94) GS y	Eject preparation
(95) GS z	Retract paper

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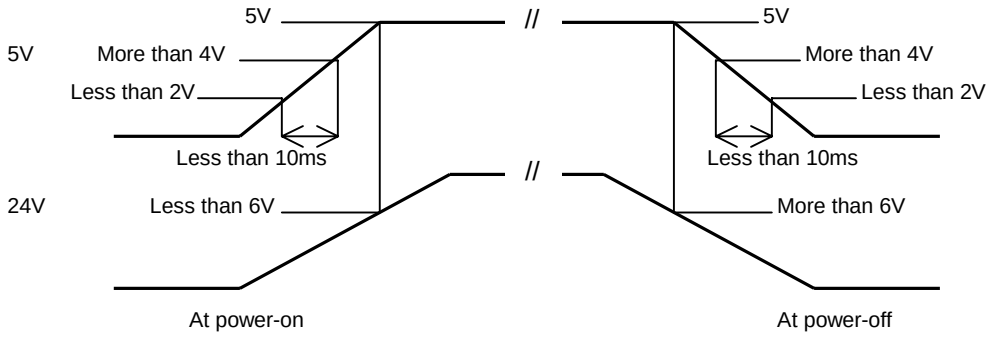
Appendix 5
Conditions for Use

To use the printer with this control board built in, the following conditions must be satisfied.

(1) Power supply

a. The power supply unit that satisfies the specified specification must be used. If power supply unit doses not satisfy the specified specifications are used, normal operation is not assured and errors may occur.

b. To turn on or off the power, a protective circuit is mounted on the control board. For safety, the following voltage change conditions must be satisfied:



c. When the power is turned on, the MCU must stop and must be in standby mode until the voltage of the 24V power line increases up to approx. 21.6V or higher.

d. The MCU automatically controls the print density in accordance with the detect power voltage. The power voltage is detected every four dot-lines. If the print head power voltage changes during this period, the density cannot be controlled. If the power voltage changes extremely, an overload may apply to the print head. To prevent this, the print head voltage variation must be kept within ±5%.

(2) The printing head heat

a. The print head becomes a high temperature very much along with the print. Please do not touch the print head and the support board directly by the hand.

b. When the print head is pulled down with paper run out state, platen might be transformed by heat.

(3) The motor heat

a. The motor and motor drive element become a high temperature. Please do not touch by the hand.

(4) Cutter

a. Please don't insert fingers or foreign matters to the cutter part. Injuries may be received or troubles may occur.

(5) Paper

a. The recommended paper is wound on a roll. The external side of the rolled paper is the heat-sensitive side. Set the paper so that the heat-sensitive side can touch the print head.

b. If paper is set so that its edge is oblique to the paper guide, a skew feed or jam may occur. Set paper so that its edge is parallel to the paper guide.

c. If the paper that does not satisfy the specified specifications is used, the print quality is not assured and errors may occur.

d. Heat-sensitive paper is liable to deteriorate in a high-temperature, high-humidity environment. Especially when the temperature increases up to 60℃ or higher, coloring may occur. Carefully store heat-sensitive paper.

(6) Paper jam

a. When the paper jam is generated, the power supply of the printer is cut and please raise the head and removes the paper. When working without turning off the power supply of the printer, if the connector comes off, the head is occasionally damaged. Moreover, causes the printer to break down when the printing in the state of the form jam.

(7) Water and foreign matter

a. Adhering liquid such as water or metal chips such as needles and pins to the control board may cause a printer failure.

b. If printing is performed in a condensation state, the print head may be damaged. If condensation is occurred, let the printer dry sufficiently before starting printing.

(8) Impact

a. Because this product is made of precision electronic and mechanical components, do not drop it or hit it with a solid object. Applying the force of an impact to the product may cause errors to occur.

(9) When not using for a long time

a. When the printer is not used for a long time, please put into the state to raise the head. When the head is left lowered, platen might be transformed.

(10) Installation

a. This product must be kept horizontally as much as possible. Use this product in a place free of vibration.

b. Please ground the printer mechanism to FG (frame playground) surely.

c. The printer with this board mounted must not be used in an environment subject to direct sunlight or dust (oil or iron dust).

d. The power supply line must be separated from other devices (e.g., large-sized motors) that cause noise.

e. The printer with this board built in must be installed so that it is positioned as far away as possible from large-noise-emitting devices such as high-voltage devices and large-sized motors.

f. To connect or remove the connector, always turn off the power in advance. If the connector is connected or removed while the power to the printer is on, errors may occur.

g. Please lock surely, and connect the connector of connected each cable correctly. There is no lock mechanism in the connector on the head side and confirm insertion up to the deepest part, please.

h. Impossible power must not join each cable when you mount the printer on the device. Especially, it is necessary to note because the head connection cable influences the pressurizing power of the head. Moreover, please note that causes abnormal heating and the head damage, etc. of the head when the connection of the head connector is imperfect enough about the connector connection.

i. If continuous printing is performed at a high print rate (high print density), the head heat may build up and the head temperature may exceed the maximum usable temperature. In this case, printing may be stopped by the thermal error detection function. Printing resumes automatically after the head cools down to the print enabling temperature.

j. If power is supplied to the print head for a long period of time, the heater may undergo electrolytic corrosion. If the no-printing state continues for a long period of time, turn off the power to the print head and set the printer to the standby state. (See the "*FS 9*" (detection function setting command).)