FTP-6X8DCL/DSL45X SERIES

PRODUCT SPECIFICATION

(PRELIMINARY)

DOCUMENT CONTROL SECTION

DATE

EDIT	DATE	DESIG	CHECK	DESCRIPTION
DESIG	20040916	H.Usa	CHECK	APPR S.Watanabe

TITLE *FTP-6X8DCL/DSL45X SERIES PRODUCT SPECIFICATION*

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Application

This specification concerns the FTP-628DCL/DSL45Xseries(450-499)that controls the thermal printer mechanism FTP-628/638MCL4XXseries.

Prior to use this product, refer to the precautions in the Appendix to insure careful handling.

FTP-6X8DCL/DSL45X series include parts number as below,

Part number		Mounted circuit or devices			
		Cutter Circuit	Flash Memory (Chinese Character Type)	SRAM: (Static Random Access Memory)	Interface
(1)	FTP-628DSL490 FTP-638DSL490	Yes	No	No	Centronics/RS-232C
(2)	FTP-628DSL491 FTP-638DSL491	Yes	No	Yes	Centronics/RS-232C
(3)	FTP-628DSL493 FTP-638DSL493	Yes	Yes (Minchou)	Yes	Centronics/RS-232C
(4)	FTP-628DSL498 FTP-638DSL498	Yes	Yes (Maru Gothic)	Yes	Centronics/RS-232C
(5)	FTP-628DSL499 FTP-638DSL499	Yes	Yes (Minchou)	Yes	Centronics/RS-232C (with SW1,2, LED1,2)

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SECTION A
Features

The features of the printer unit using this control board and printer mechanism FTP-628/638MCL 4XXseries are as follows.

1. Maximum TBD mm/second high-speed printing. (standard paper[PD150R,], high-speed collective image printing mode, only when SRAM is mounted, condition [voltage:8.5V, temperature 25℃])
2. Centronics conforming parallel interface, RS-232C interface.*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. 384dots/line (628MCL), 576dots/line (638MCL) 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.*4
16. Power down 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) Only when Flash Memory or SRAM is mounted.

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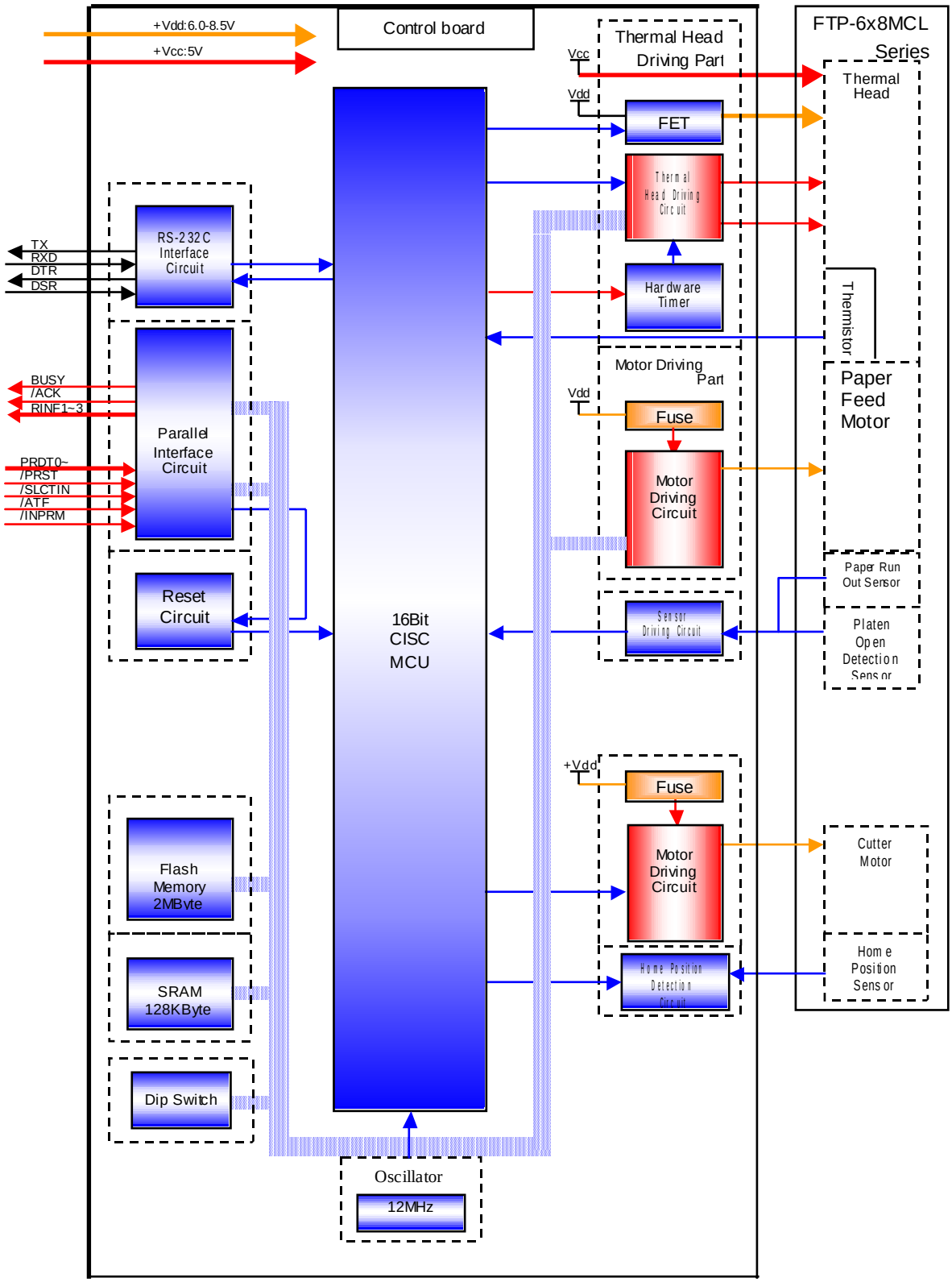
SECTION B
Circuit Configuration

The circuit configuration of the control board is as follows,



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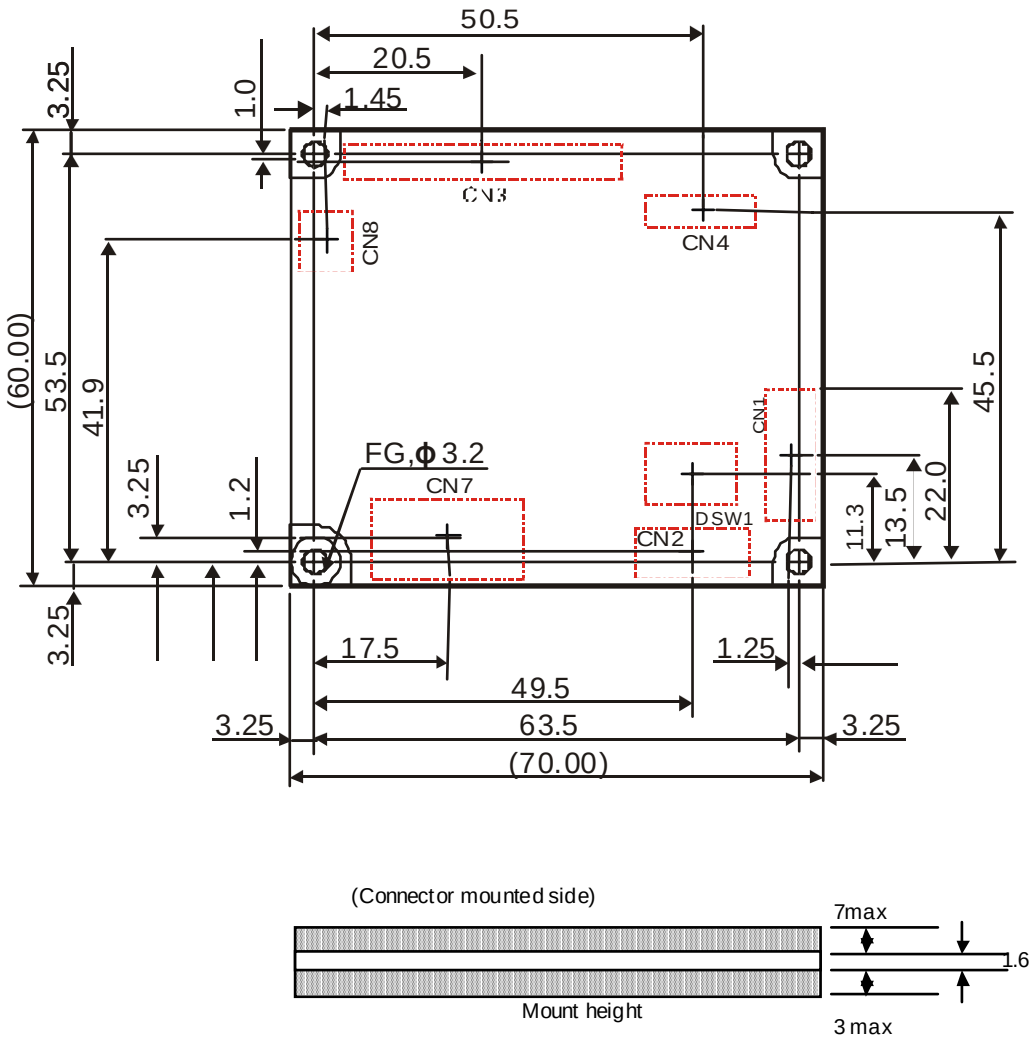
SECTION C
General Specifications

General specifications of a printer unit using this board and a printer mechanism FTP-628/638MCL4XX 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	Head/Motor Connector	Connection for Thermal Head/Printer Motor	628/638MCL
CN4	Cutter Connector	Connection for Paper Cutter	
CN7	Power Connector	Connection for +Vdd,+Vcc Power Supply	
CN8	Near End Sensor Connector	Connection for Near End Sensor	

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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 (Thermal head driving connector [FPC])

(1) Connector Type
52610-3071: made by Molex

(2) Connector Pin Configuration

No.	Signal Name		Data Direction		Explanation	
	628MCL	638MCL	628MCL	638MCL	628MCL	638MCL
1	PHK		---		Cathode side of paper run out sensor	
2	VSEN		Output		Logic power supply	
3	PHE		Input		Paper out detection signal	
4	VH		Output		Power supply for thermal head driving	
5	VH					
6	DO		Output		Printing data output signal	
7	CLK		Output		Data communication synchronizing clock signal	
8	GND		---		Ground of power supply for thermal head driving	
9	GND					
10	STB6	STB5	Output	Output	Head energizing control signal	Head energizing control signal
11	STB5	STB4	Output	Output	Head energizing control signal	Head energizing control signal
12	STB4	STB3	Output	Output	Head energizing control signal	Head energizing control signal
13	Vcc		---		Logic power supply	
14	TM		---		Head thermistor input	
15	TMR	STB2	Output	Output	Head thermistor ground	Head energizing control signal
16	STB3	STB1	Output	Output	Head energizing control signal	Head energizing control signal
17	STB2	AEO2	Output	Output	Head energizing control signal	
18	STB1	AEO1	Output	Output	Head energizing control signal	
19	GND		---		Ground of power supply for thermal head driving	
20	GND					
21	LAT		Output		Printing data latch signal	
22	DI		Input		Printing data input signal	
23	VH		---		Power supply for thermal head driving	
24	VH					
25	SW		Output		Platen open detection signal	
26	SW		Input		Platen open detection signal	
27	MT-A		Sink/ Source		Phase signal for conveyance motor	
28	MT-/A					
29	MT-B					
30	MT-/B					

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3.4 CN4 (Cutter Unit Connector)

(1) Connector Type
52610-0871: made by Molex

(2) Connector Pin Configuration

No.	Signal Name	Data Direction	Explanation
1	VSEN	Output	Power supply of Cutter home position sensor
2	PHE	Input	Cutter home position detection signal
3	PHK	---	Cathode side of Cutter home position sensor
4	MTA	Sink/ Source	Cutter motor driving signals
5	MT/A		
6	MTB		
7	MT/B		
8	N.C	---	

3.5 CN7 (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	Vcc	Input	Power supply for Logic
2	GND(Vcc)	---	Grond of power supply for Logic I
3	GND(Vdd)	---	Ground of power supply for thermal head and mortor
4	GND(Vdd)	---	Ground of power supply for thermal head and mortor
5	Vdd	Input	Power supply for thermal head and motor
6	Vdd	Input	Power supply for thermal head and motor

3.6 CN8 (Paper Near End Sensor Connector)

(1) Connector Type
B2B-PH-SM3-TB: made by J.S.T

(2) Connector Pin Configuration

No.	Signal Name	Data Direction	Explanation
1	Vcc	---	Power supply for Logic
2	/NES	Input	Paper near end detection signal

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4 Print Specification

4.1 Printing System

Thermal printing system

4.2 Thermal Head Configuration

Item	Specification	
	FTP-628MCL	FTP-638MCL
Resolution	8dots/mm	
Heating Unit Size	0.125mm (Vertical) x 0.125mm (Horizontal)	
Number of Heating Units	384	576
Effective Printing Area	About 54mm	About 72mm

4.3 Number of Digits of Print Characters

Print Mode	Type		Number of digits	
			FTP-628MCL	FTP-638MCL
Alphanumeric Katakana	Internal half size character	12x24	32	48
	Internal full size character	24x24	16	24
	Registered half size character	12x24	32	48
	Registered full size character	24x24	16	24
	Internal half size character	8x16	48	72
	Internal full size character	16x16	24	36
	Registered half size character	8x16	48	72
	Registered full size character	16x16	27	36
Kanji *2) (Chinese Character)	Kanji, non-kanji	24x24	16	24
	Kanji, non-kanji	16x16	24	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 *1)	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 *2) (Chinese Character)	Kanji, non-kanji	24x24	About 6800
	Kanji, non-kanji	16x16	About 6800

*1)Only when flash memory or SRAM is mounted
*2)Only when flash memory is mounted

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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
	Internal full size character	24x24	24
	Internal half size character	8x16	8
	Internal full size character	16x16	16
Registered Characters	Registered half size character	12x24	12
	Registered full size character	24x24	24
	Registered half size character	8x16	8
	Registered full size character	16x16	16
Kanji (Chinese Character)	Kanji, non-kanji	24x24	24
	Kanji, non-kanji	16x16	16

(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 (Chinese Character)	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 (Chinese Character)	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 *1 Non-Kanji *1	Horizontal double size, reverse order, black and white reversal, vertical double size, x4 size
Image *1 (Chinese Character)	Reverse order, black and white reversal

*1) Only when flash memory is mounted

(5) Image Mode

	FTP-628MCL	FTP-638MCL
Max. Number of dots/line	384	576

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4.6 Printing Speed

Max TBD

(standard paper[PD150R,], high-speed collective image printing mode, only when SRAM is mounted, condition [voltage: 8.5V, temperature 25℃])

4.7 Printing Density

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

	FTP-628MCL	FTP-638MCL
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	TBD mm / sec (By * ATF signals)

6 Paper Specification

	FTP-628MCL		FTP-638MCL	
Specified Paper	Sensitive paper	TF50KS-E4		(Nippon Paper)
	Standard paper	PD150R		(Oji Paper)
		TF60KS-E		(Japan Paper)
	Medium-term storage paper	TP60KJ-R		(Nippon Paper)
		PD170R		(Oji Paper)
		PD170R		(Oji Paper)
	Long-term storage paper	HA220AA		(Mitsubishi Paper)
		AFP-235		(Mitsubishi Paper)
Paper Width	58 +0 (-1) mm		80 +0(-1) mm	
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) Voltage detection function	
(8) Internal RAM abnormality detection function	
(9) Cutter abnormality detection function	
(10) Mark detection function	By GS < command
(11) MCU operation abnormality detection function	By watchdog timer
(12) Motor power saving function	
(13) Power supply disconnection protection function	By power switching FET
(14) Motor protection function	By fuse
(15) 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	High Speed Print Mode	Middle Speed Print Mode	Low Speed Print Mode
12.5% 628MCL	TBD	TBD	TBD	TBD
638MCL	TBD	TBD	TBD	TBD
25.0% 628MCL	TBD	TBD	TBD	TBD
638MCL	TBD	TBD	TBD	TBD
50.0% 628MCL	TBD	TBD	TBD	TBD
638MCL	TBD	TBD	TBD	TBD
100.0% 628MCL		TBD	TBD	TBD
638MCL		TBD	TBD	TBD

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

- Conditions

Voltage:	7.2 V
Head resistance:	169Ω (176Ω - 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

Printer Motor

Voltage: 6.0V-8.5V

Current: 628MCL4XX :0.8A (max)
638MCL4XX :1.0A (max)

Cutter Motor

Voltage: 6.0V-8.5V

Current: 1.1A (max)

8.3 Driving Logic

Voltage: 5V ±5%

Current: 0.5A (max)

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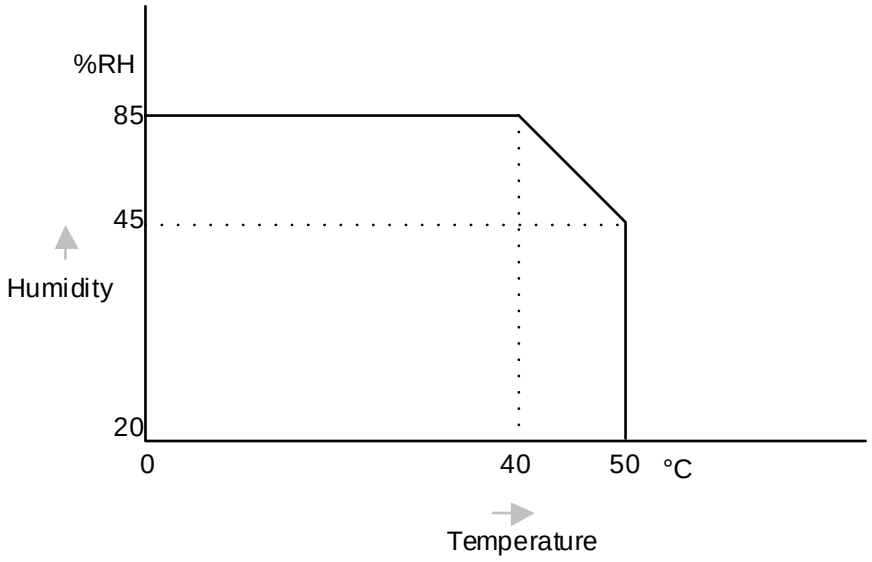
9 Operating Environment

During Operation	Operating Temperature Operating Humidity	0~ 50°C 20 ~ 85% RH (no condensation)
During Stopping	Storage Temperature Storage Humidity	-20 ~ 60°C 5 ~ 90%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

(2) Head life
Electric life : $1x10^8$ pulses
Wear life : 50km

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

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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

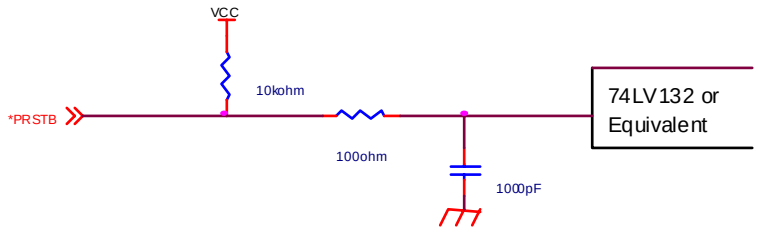
1.2 Electrical Characteristics of Input/Output signals

(1) Signal level (for Output)

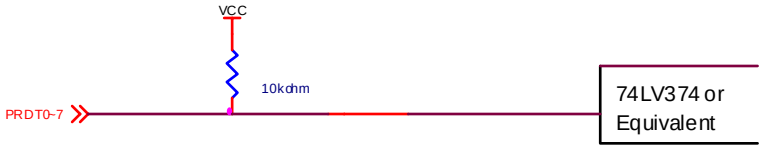
"L": ±0.0 ~ 0.3 x Vcc

"H": 0.7 x Vcc ~ Vcc

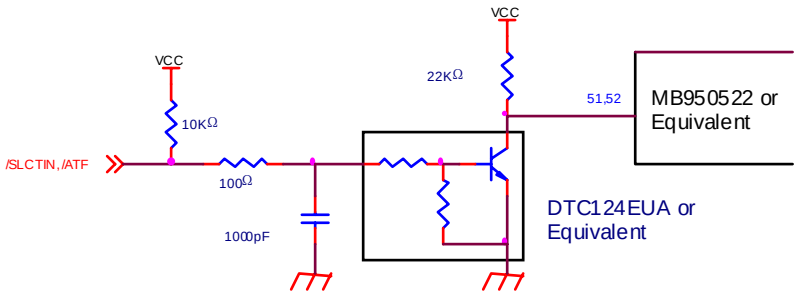
(2) Input conditions (/PRSTB)



(3) Input condition (PRDT0~7)



(4) Input condition (/SLCTIN,/ATF)



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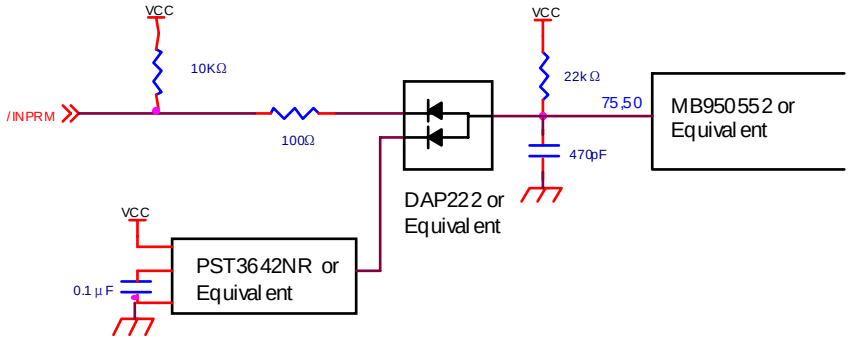
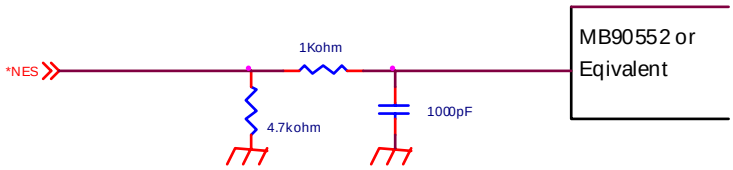
(5) Input condition (/INPRM)



(6) Input condition (/NES)



(7) Output condition (/ACKLNG)

(8) Output condition (BUSY)

(9) 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 AWG28-30 or equivalent
Cable length: 1.0m or less (twisted cable)

1.5 Descriptions 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) Character code — Set to Japanese characters (11) International character setting — Japan (12) Printing speed setting — High-speed mode (13) Horizontal tab setting — Every 8 characters (14) Mark detection to start point setting — About 2 mm (15) Paper run out detection setting — Valid *1 (16) Platen open detection setting — Valid *1 (17) Temperature abnormality detection setting — Valid *1 (18) Near end detection setting — Invalid *1 (19) Voltage abnormality detection setting — Valid *1 (20) Paper type — Continuous paper (21) Kanji print mode specification — Clear (22) Print quality setting — Standard paper (23) x4 size print mode specification — Clear (24) Kanji code setting — JIS code (25) 90° character rotation — Clear (26) Paper auto-feed amount setting — 20mm (27) Motor off-time setting — One excitation time = 0.5 sec Excitation holding time = 1sec (28) 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 is detected and printer is in off-line status.
   e. Head driving-voltage is not in TBD range.
   f. The following hardware abnormalities are detected.
      - Internal RAM abnormality
      - Watch-dog is occurred
      - Thermo run away of head
      - MCU is in hardware-reset status.
      - Disconnect of head cable
      - Cutter abnormality (Only it can return from hardware abnormality state by motion of platen open-close.)
   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:	19200,9600,4800,2400 bps (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

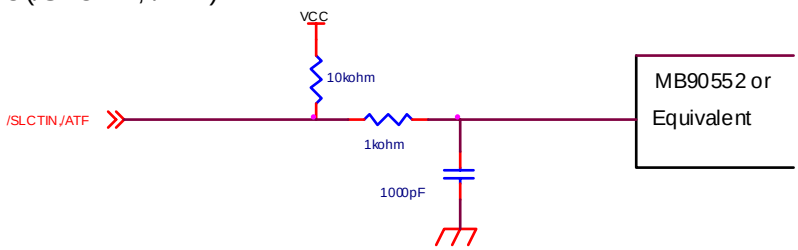
(a) Signal level (for Output)

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

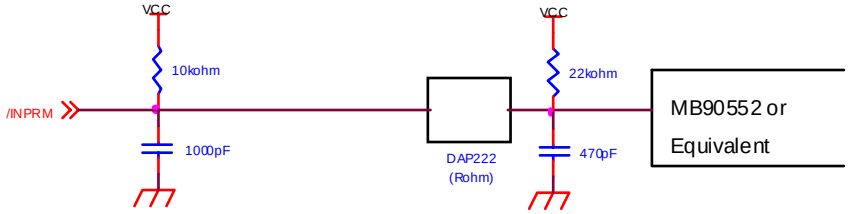
Mark (logic=1): -3V ~ -12V

(1) Input conditions (RD,DSR)

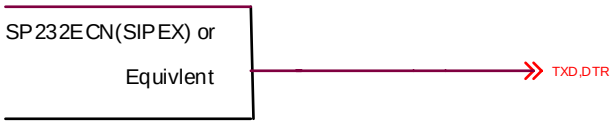
(2) Input conditions (/SLCTIN, /ATF)



(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: S8B-ZR-SM3A-TF (made by JST)

(3) Connector Pin Configuration

№	Signal Name	Direction	Function
1	RXD	Input	Receive data
2	TXD	Output	Transmission data
3	DTR	Output	Data terminal ready
4	GND	---	Signal ground
5	DSR	Input	Data set ready
6	/SLCTIN	Input	Detection setting invalid signal
7	/INPRM	Input	Initialize request signal
8	/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-8 (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 (19200,9600,4800,2400bps) 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) Black and white reversal printing	Clear
(8) Reverse order printing	Clear
(9) Character code	Set to Japanese characters
(10) International character setting	Japan
(11) Printing speed setting	High-speed mode
(12) Horizontal tab setting	Every 8 characters
(13) Mark detection to start point setting	About 2 mm
(14) Paper run out detection setting	Valid *1
(15) Platen open detection setting	Valid *1
(16) Temperature abnormality detection setting	Valid *1
(17) Near end detection setting	Invalid
(18) Voltage abnormality detection setting	Valid *1
(19) Paper type	Continuous paper
(20) Kanji print mode specification	Clear
(21) Kanji code setting	JIS code
(22) Double height specification	Clear
(23) x4 size print mode specification	Clear
(24) Print quality setting	Standard paper
(25) 90° character rotation	Clear
(26) Paper auto-feed amount setting	20mm
(27) Motor off-time setting	One excitation time = 0.5 sec Excitation holding time = 1sec

*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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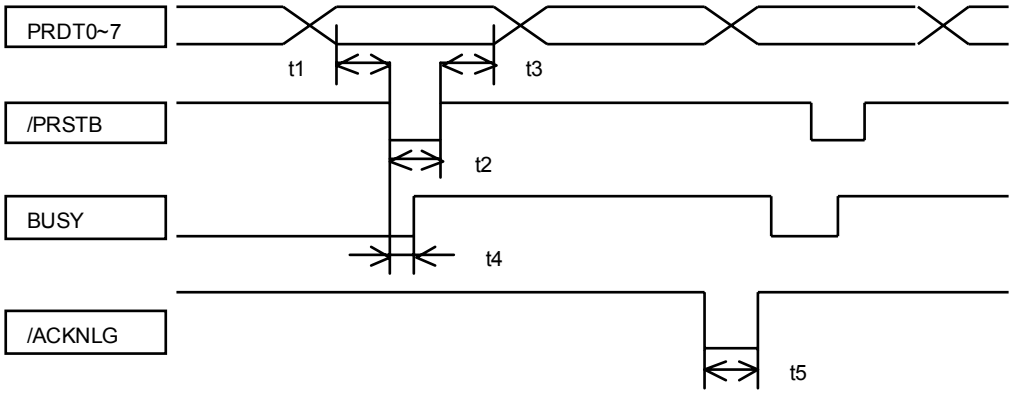
SECTION E
Timing Chart

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 3.2usec

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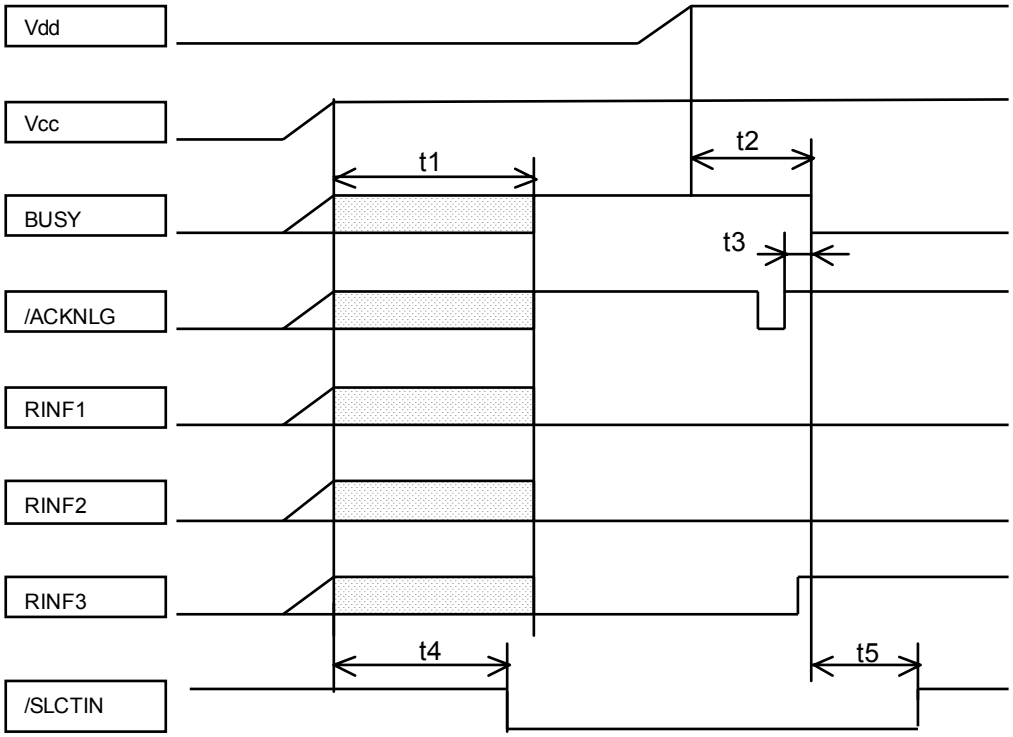
1.2 When power is turn ON (no error):

(Figure 2)



(1) MCU reset time	t1 ≤ 90msec
(2) Initialization time	t2 ≤ TBD
(3) From /ACKNLG=" ↑" to BUSY="L"	t3 ≤ TBD
(4) /SLCTIN setup time	t4 ≤ t1
(5) /SLCTIN hold time	t5 ≥ 0msec

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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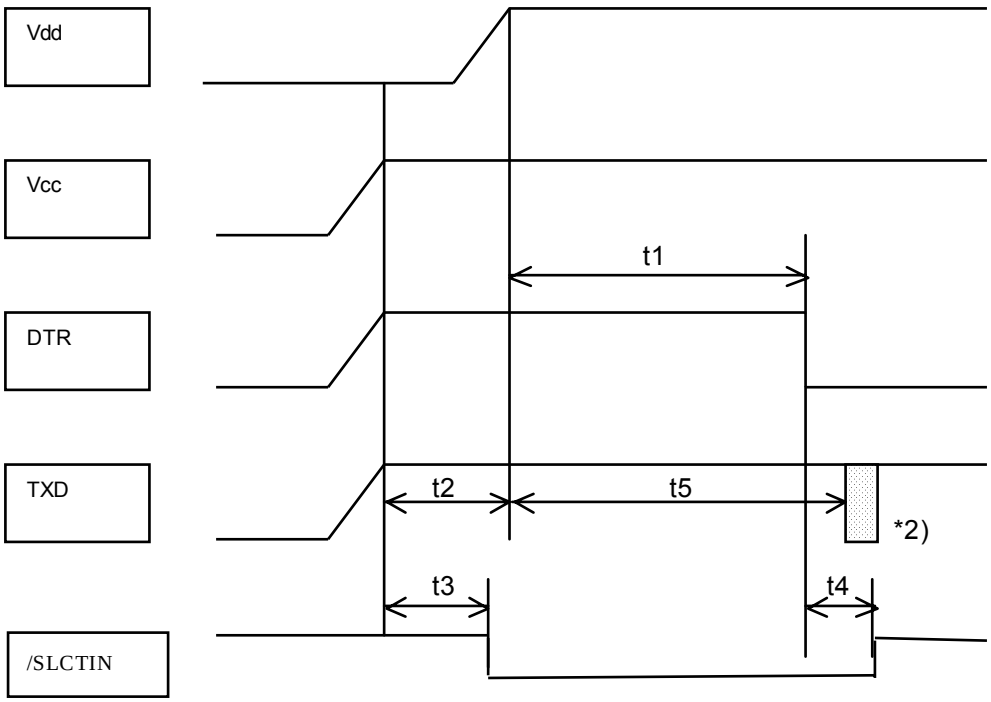
1.3 /INPRM Reset Timing (No error):

(Figure 3)



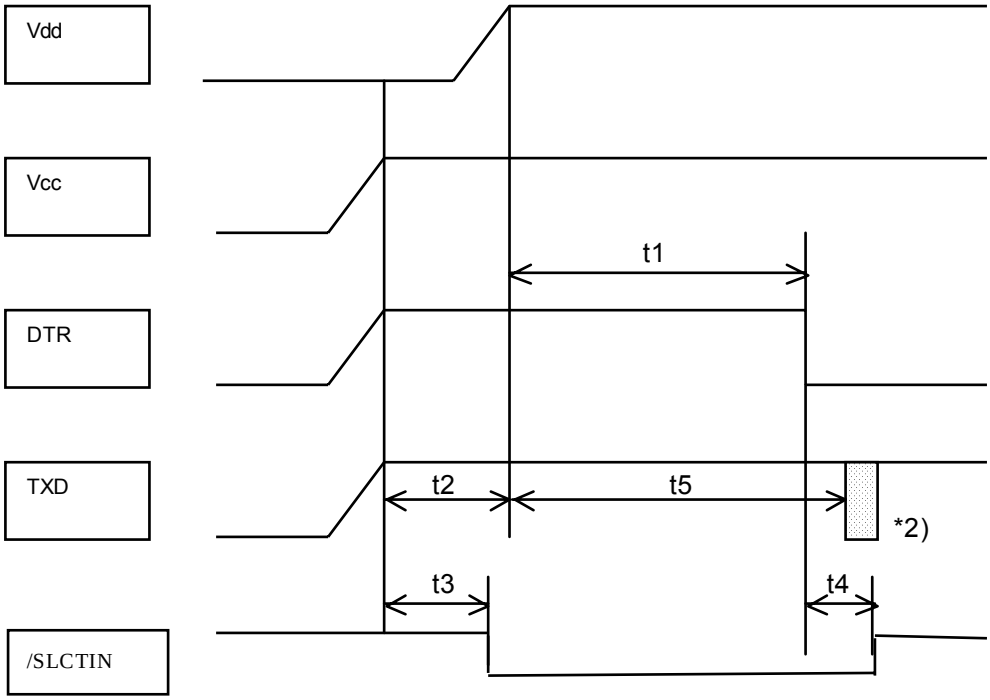
(1)	Initialization transition time	t1 ≥ 10usec
(2)	Initialization time	t2 ≤ TBD
(3)	/SLCTIN setup time	t3 ≤ t1
(4)	/SLCTIN hold time	t4 ≥ 0msec
(5)	Time to XON transmission	t5 ≥ TBD

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 XON code is transmitted when XON/XOFF setting is chosen by DSW.

2 RS-232C Serial Interface

2.1 When power is turned on (no error)



(1)	Initialization transition time	t1 ≤ TBD
(2)	Initialization time	t2 ≤ TBD
(3)	/SLCTIN setup time	t3 ≤ t2
(4)	/SLCTIN hold time	t4 ≥ 0msec
(5)	Time to XON transmission	t5 ≥ 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)
*1: When XON/XOFF control is selected by dipswitch setting, XON code is send.

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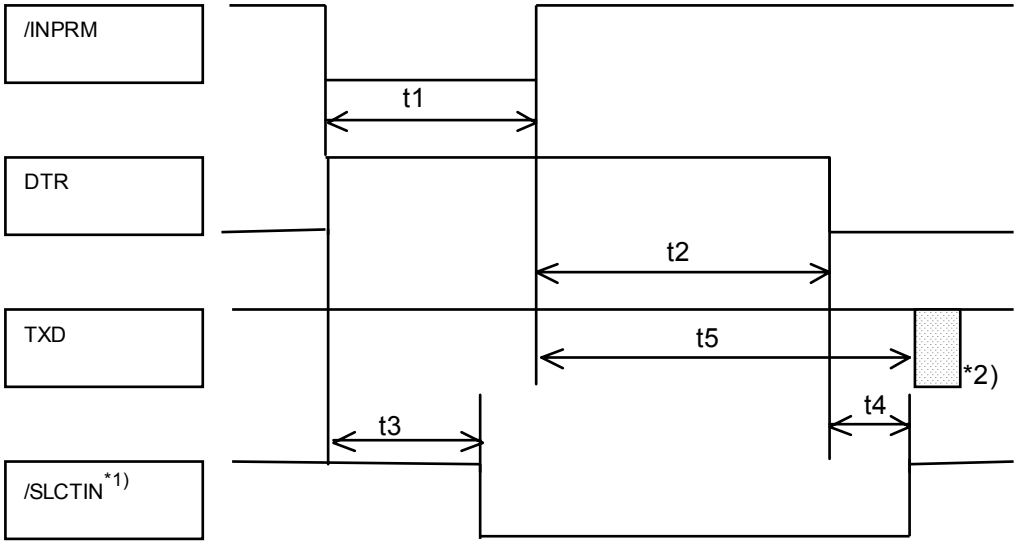
2.2 /INPRM Reset Timing (no error)



(1) /INPRM = "L" time: t1 ≥ 10usec
(2) Initialization transition time: t2 ≤ TBD
(3) Initialization time: t3 ≤ t1
(4) /SLCTIN setup time: t4 ≥ 0msec
(5) /SLCTIN hold time: t5 ≥ 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)
*1: When XON/XOFF control is selected by dipswitch setting, XON code is send.

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) →(l) ┐ (a) 50% checkered printing (2 lines) (b) 25% checkered printing (6 lines) (c) Printer setting status printing (d) Partial cutting*2 (e) Japanese character set (12x24) (1 set) (f) Overseas character set (12x24) (1 set) (g) International characters (12x24) (14 lines) (h) Japanese character set (8x16) (1 set) (i) Overseas character set (8x16) (1 set) (j) International characters (8x16) (14 lines) (k) Kanji JIS levels 1, 2 *1 (24x24) (l) Cutting*2 (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 Flash Memory is mounted
*2: Cut only when cutter driving circuit is mounted

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 7mm. (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 signal, 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.

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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 after that (the home positioning initialization of a cutter when the cutter is mounted , new one-line feeding When the ATR signal are set as "High")etc. 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 signal, 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 (about 70℃) is detected, the printer stands by in busy status until the temperature drops to the specified temperature (about 60℃). (3) When the temperature abnormality detection invalid mode is set by the detection function setting command or by the /SLCTIN signal, 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.
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 signal, abnormal voltage is not detected.
Cutter Abnormality Detection	(1) When cutting does not end, a Cutter 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) When a paper cut command is received in the state of cutter un-connecting, it will be in a Hardware abnormality state.
Thermal Head Critical Temperature Abnormality Limit Detection	(1) When abnormal limit critical temperature (about 90℃) of thermal head is detected, the printer will be in a Hardware abnormality state. (2) Thermal head critical temperature limit detection cannot be invalid by the /SLCTIN signal.

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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 about 7 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 signal.
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 1seconds. (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) →(l) → (a) 50% checkered printing (2 lines) (b) 25% checkered printing (6 lines) (c) Printer setting status printing (d) Partial cutting*2 (e) Japanese character set (12x24) (1 set) (f) Overseas character set (12x24) (1 set) (g) International characters (12x24) (14 lines) (h) Japanese character set (8x16) (1 set) (i) Overseas character set (8x16) (1 set) (j) International characters (8x16) (14 lines) (k) Kanji JIS levels 1, 2 *1 (24x24) (l) Cutting*2 (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 Flash Memory is mounted
*2: Cut only when cutter driving circuit is mounted

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 7mm. 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 signal, 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 after that (the home positioning initialization of a cutter when the cutter is mounted , new one-line feeding When the ATR signal are set as "High")etc. 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 signal, 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 (about 70℃) is detected, the printer stands by in busy status until the temperature (about 60℃) 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 signal, 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.
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, a Cutter 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) When a paper cut command is received in the state of cutter un-connecting, it will be in a Hardware abnormality state.
Thermal Head Critical Temperature Abnormality Limit Detection	(1) When abnormal limit critical temperature (about 90℃) of thermal head is detected, the printer will be in a Hardware abnormality state. (2) Thermal head critical temperature limit detection cannot be invalid by the /SLCTIN signal.

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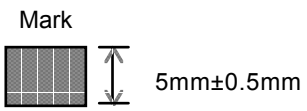
Detection Function	Function
Voltage Abnormality Detection	(1) Printing head drive voltage is detected, when this voltage is abnormality, the printer automatically enters off-line status. (2) When power-supply voltage returns within the above-mentioned range and an error has not occurred, the printer 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 signal, 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.)  (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 signal.
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 1seconds. (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.

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) DC 2

[Name] Power down

[Function] When it receives this command, the printer switches to power down mode.

[Code] $[12]_{16}$
$[18]_{10}$

[Explanation]

(1) When receiving this code, the printer switches to power down mode.

(2) If the printer buffer contains data, the prints the data before switching to power down mode. If the print buffer contains no data, the printer immediately switches to power down mode.

(3) When level of /SLCTIN or /ATF signal become “low”, power down mode is canceled.

(4) If this code is received during printing, the printer switches to power down mode up on completion of the operation.

(5) This code is invalid in bit image print mode.

(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 2x n dot line.

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

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

(7) An initial value is n = 80. (About 20mm)

(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 ! + n

[Name] Printing mode specification

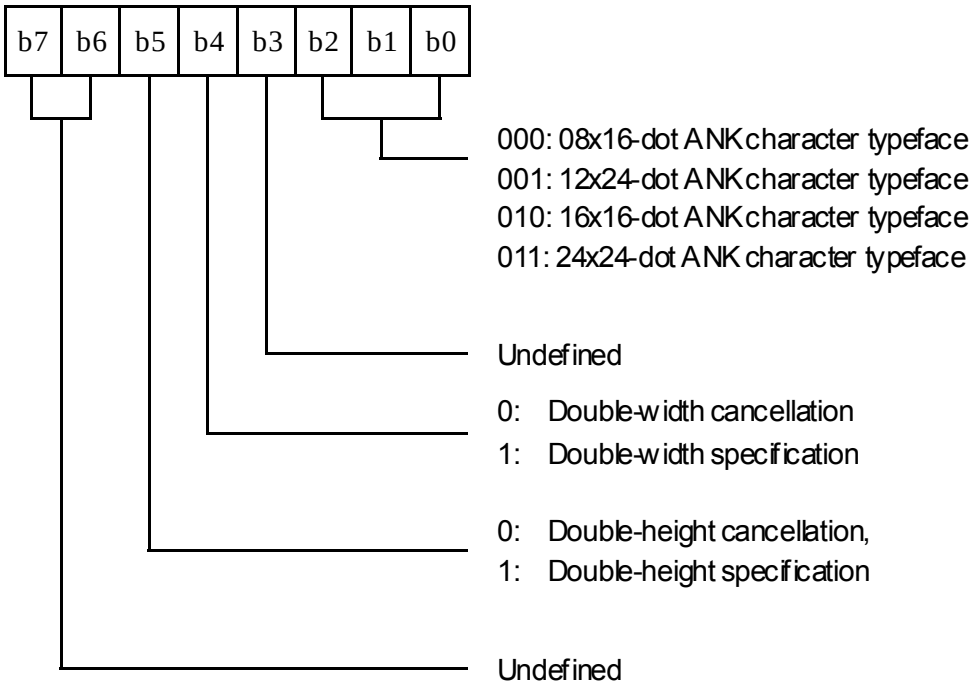
[Function] The ESC ! + n command specifies printing mode.

[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.

(9) ESC % + n

(effect only when Flash Memory or SRAM mounted)

[Name] External registration character specification/cancellation

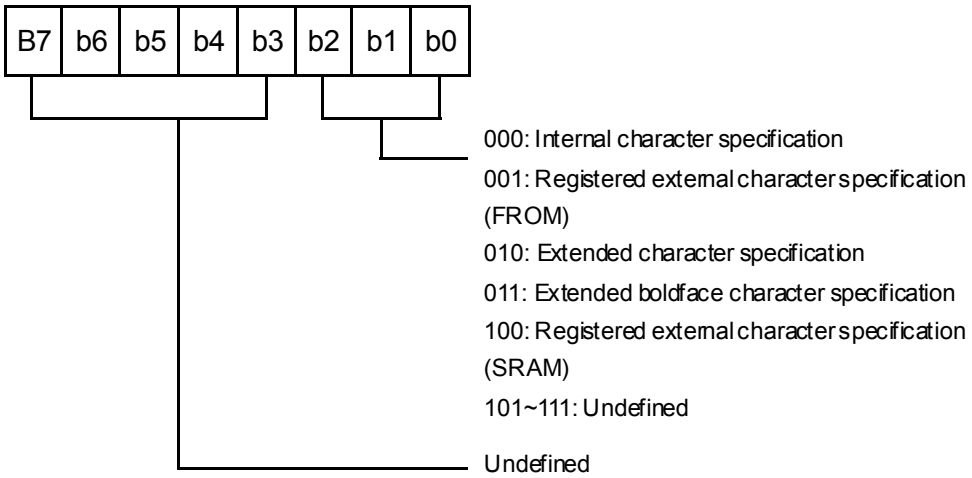
[Function] The ESC % + n command specifies or cancels registered external characters.

[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
3	16 x 16 ANK	16 x 16 registered	16 x 16 extended	Undefined
4	24 x 24 ANK	24 x 24 registered	24 x 24 extended	Undefined

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

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

(effect only when Flash Memory mounted)

[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) The memory for External registration character specification by value of parameter y is chosen. if y value outside of the range is chosen, it becomes a parameter error.

y	Registration external Memory
O	Flash Memory
1	SRAM

(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: $[20]_{16} \leq c_1 \leq c_2 \leq [FF]_{16}$

(8) 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.

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

(10) 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

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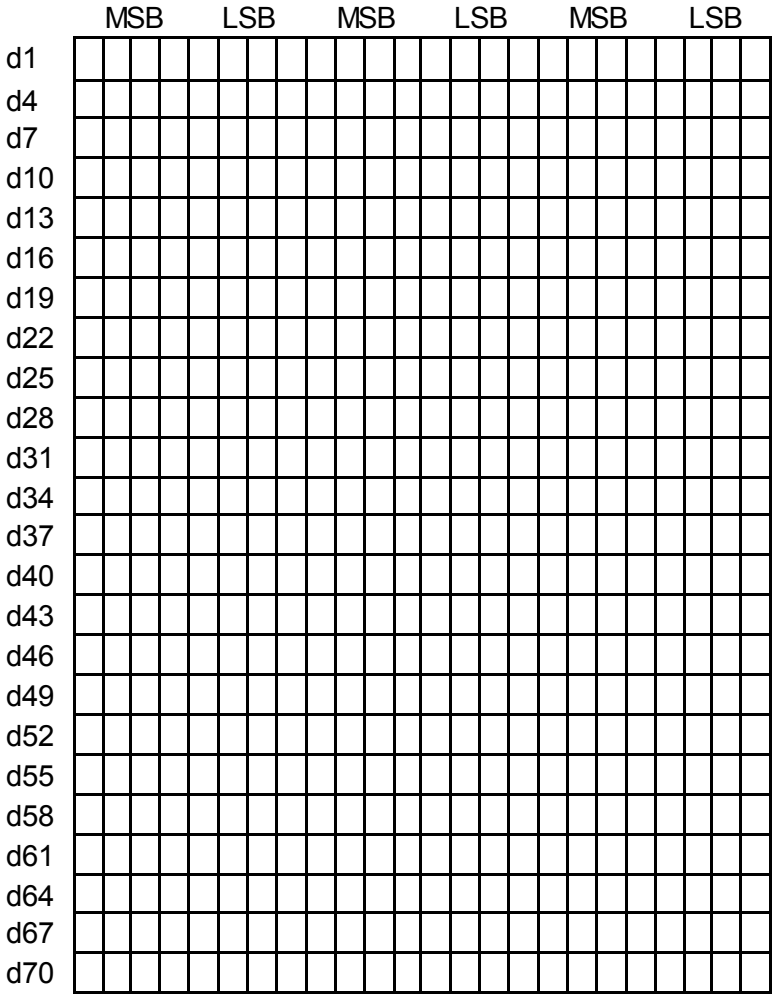
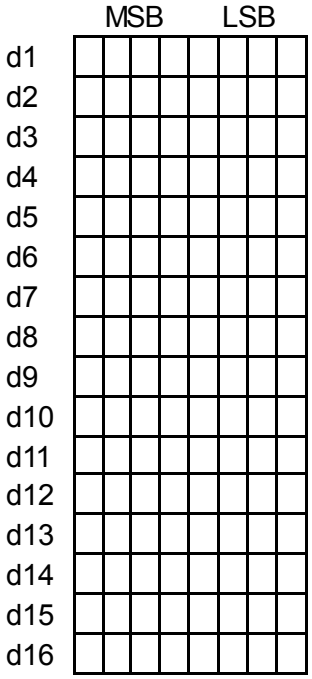
(11) The character-typeface definition data must use the following formats:



[24×24]



[8×16]

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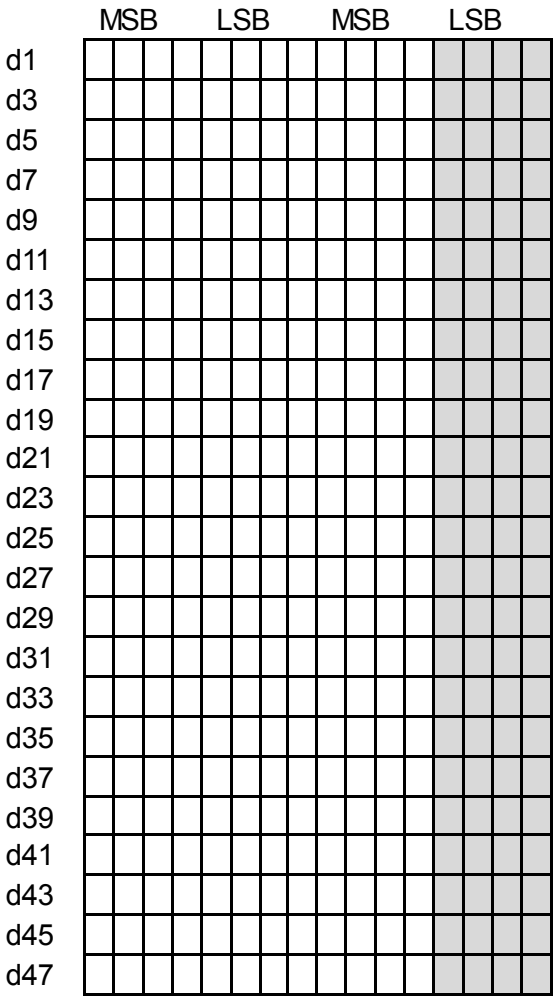
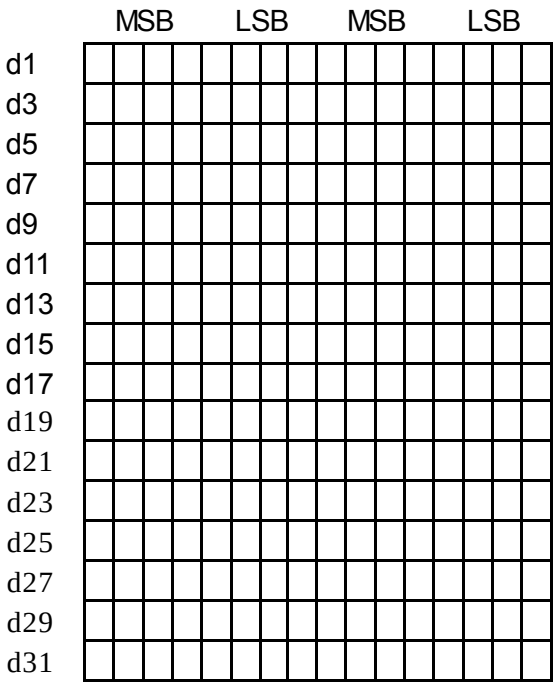


[12×24]



[16×16]

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(11) 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.

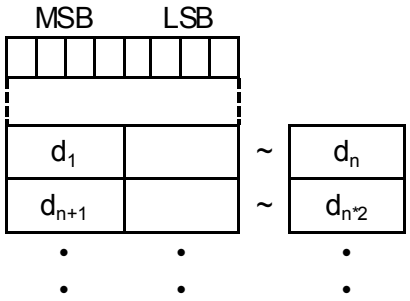
(2) The relationship between parameter m and image print modes is as follows:

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

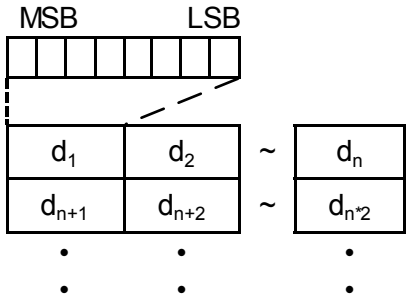
(3) Parameter n_1 and n_2 specify the number of lines to be printed. Without regard to the specified mode, conditions $0 \le n_1 \le 255$ and $0 \le n_2 \le 3$ must be satisfied. If condition $n_1 = n_2 = 0$ is satisfied, a parameter error is assumed and this *ESC* command becomes invalid. Data overflowing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

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

- When m = 97



- When m = 98



(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-628MCL	48
FTP-638MCL	72

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(12) 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.

(13) 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).

(14) ESC ? + n

(effect only when Flash Memory or SRAM mounted)

[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]		:Flash memory area character deletion
$[27]_{10}$	$[63]_{10}$	[n]		
$[1B]_{16}$	$[3F]_{16}$	[0]	[m]	:SRAM area character deletion
$[27]_{10}$	$[63]_{10}$	[0]	[m]	

[Explanation]

(1) Parameter n specifies the deleted character code.

(2) the value of parameter n must satisfy the following condition:
$[20]_{16} \leq n \leq [FF]_{16}$

(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.

(6) When the value of parameter n is 0. the value of parameter m must satisfy the following condition:
$[20]_{16} \leq m \leq [FF]_{16}$

(15) 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)	Print character type	12x24 dots half size character
4)	Double width specification	Clear
5)	Character code setting	Japanese characters
6)	International character setting	Japan
7)	Mark detection to start point setting	About 2 mm
8)	Paper run out detection setting	Valid *1
9)	Platen open detection setting	Valid *1
10)	Temperature abnormality detection setting	Valid *1
11)	Voltage abnormality detection setting	Valid *1
12)	Kanji print mode specification	Clear
13)	Print quality setting	Standard paper
14)	Kanji code setting	JIS code
15)	Printing speed setting	High speed mode
16)	Receive code buffer	Retained
17)	Horizontal tab setting	Every 8 characters
18)	Black and white reversal printing	Clear
19)	Backward printing specification	Clear
20)	Near end detection setting	Invalid
21)	Feed function	Valid
22)	Paper type	Continuous forms
23)	Registered characters	Clear
24)	Page length setting	44 lines, about 143 mm
25)	90° character rotation	Clear
26)	Paper auto-feed amount setting	20mm
27)	Motor off-time setting	One excitation time : 0.5 sec Excitation holding time : 1sec

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

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(16) 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 $0 \leq n \leq 255$ 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.

(17) 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 $0 \leq n \leq 63$ 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.

(18) ESC D+d1 to dN+NUL

[Name] Horizontal tab position setting

[Function] The ESC D+d1 to dN+NUL command sets the horizontal tab position.

[Code] $[1B]_{16}$ $[44]_{16}$ [d1] to [dN] $[00]_{16}$
$[27]_{16}$ $[68]_{16}$ [d1] to [dN] $[00]_{10}$

[Explanation]

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

(2) Condition $1 \leqq N \leqq 32$ 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 are 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+d1 to dN+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 "dN" value is equal to or smaller than the "dN-1 value, processing this *ESC* command is terminated when the dN 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 8 characters selected in the initial state.

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(19) 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 $0 \leq n \leq 255$ 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.

(20) 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.

(21) 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

(22) 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°.

(23) 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.
$0 \leq m \leq n \leq 255$ $0 \leq m \leq 20$

(5) An initial value is m=2, and n=1.

(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.

(24) ESC Y+1+xa+0+n

(effect only when Flash memory mounted)

[Name] Kanji DATA check

[Function] Sum-check for Kanji DATA is executed.

[Code] $[1B]_{16}$ $[59]_{16}$ $[01]_{16}$ $[78]_{16}$ $[61]_{16}$ $[00]_{16}$ [n]
$[27]_{10}$ $[89]_{10}$ $[1]_{10}$ $[120]_{10}$ $[97]_{10}$ $[0]_{10}$ [n]

[Explanation]

(1) Sum-check for the Flash ROM mounted a circuit board is executed by this command.

(1) The parameter n is sum-check data.
{ Chinese Character Type is Minchou: n = $[E0]_{16}$ MaruGothic:n=$[AD]_{16}$}

(3) If a sum-kanji data of the Flash ROM calculated in printer and the value of the parameter n are different, it is Flash ROM abnormality. And the printer become hardware error. (If auto status transmittance is effective, a status of hardware error is transmitted)

(4) A process time of this command is about 2 seconds.

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(25) ESC c + 1 + n

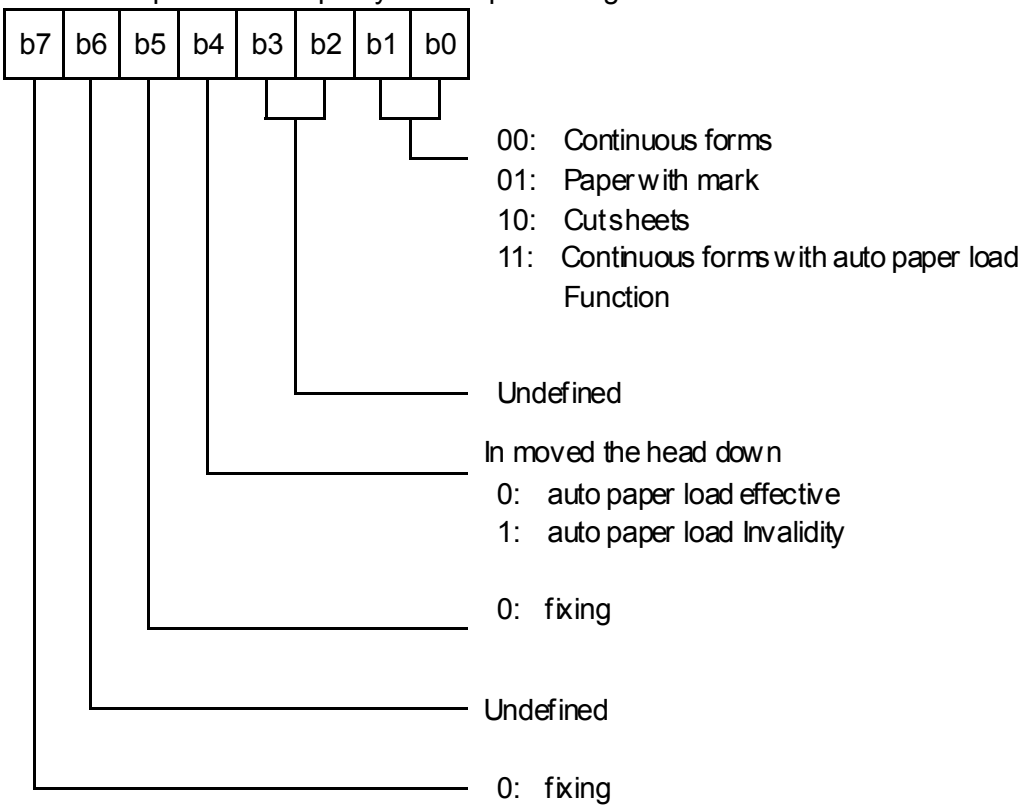
[Name] Internal processing setting

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

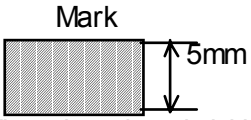
[Code] $[1B]_{16}$ $[63]_{16}$ $[31]_{16}$ [n]
$[27]_{10}$ $[99]_{10}$ $[49]_{10}$ [n]

[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.

(26) 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.

(27) 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 $0 \leq n \leq 255$ must be satisfied.

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

(4) When 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.

(28) 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
$[60]_{16}$	High-speed printing mode
$[61]_{16}$	Medium-speed printing mode
$[62]_{16}$	Medium-speed printing mode
$[63]_{16}$	Low-speed printing mode
$[64]_{16}$	Fixed 6 division printing mode (FTP-628MCL series) Fixed 9 division printing mode (FTP-638MCL series)

(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) An initial value is n=$[60]_{16}$

(29) ESC t + n

[Name] Character code table selection

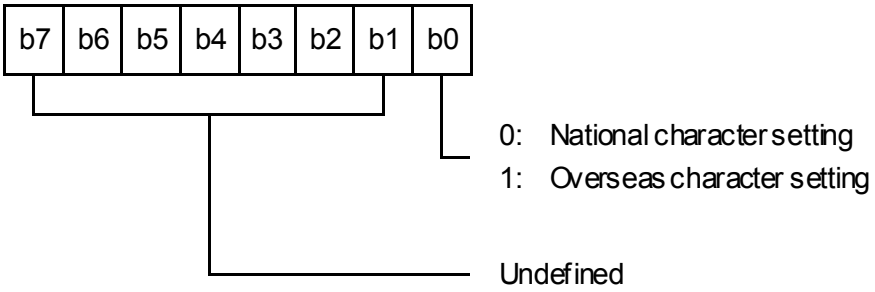
[Function] The ESC t + n command selects page n from the character code table.

[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."

(30) ESC { + n

[Name] Upside-down printing setting/cancellation

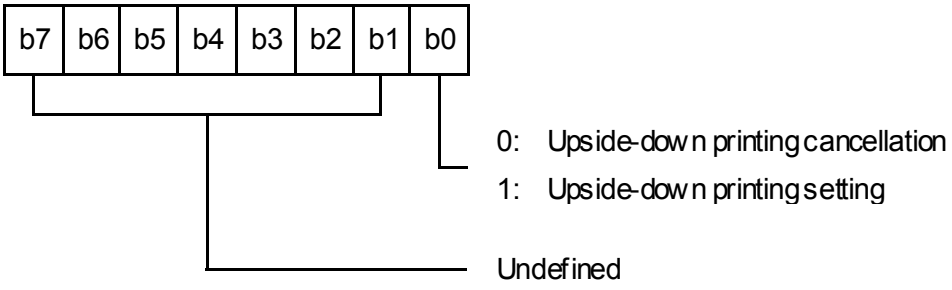
[Function] The ESC { + n command sets or cancels upside-down printing.

[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.

(31) FS ! + n

(effect only when Flash Memory mounted)

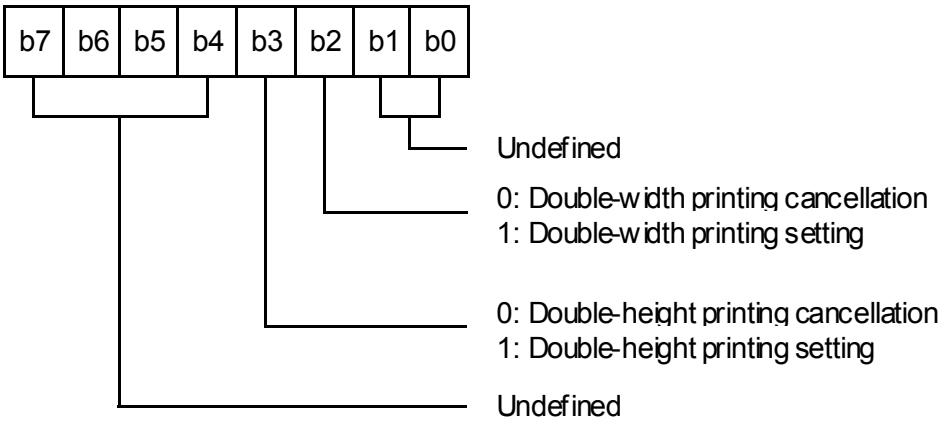
[Name] Kanji printing mode collective specification

[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 Flash ROM is mounted.

(32) FS &

(effect only when Flash Memory mounted)

[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 Flash Memory is mounted.

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

(effect only when SRAM mounted)

[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.

m	Operation	Caption
97	Print	The image data of SRAM is printed in the n1 + n2 * 256 dot-line.
98	Download	The image data of the n1 + n2 * 256 dot-line is registered to SRAM.
99	Print/download	The image data of the n1 + n2 * 256 dot-line is registered to and is printed.

(2) The number of print lines is specified with n1+n2x256.

(3) The number of maximum lines is as follows for SRAM (64KB) equipped with this board.

Printer	Print width	Number of maximum lines
FTP-628MCL	48 byte	2643 line
FTP-638MCL	72 byte	1761 line

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

(5) With this command, the character data registered into SRAM is overwritten and breaks.

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(34) FS .

(effect only when Flash Memory mounted)

[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 Flash Memory is mounted.

(35) FS 9 + n

[Name] Detection function enable/disable setting

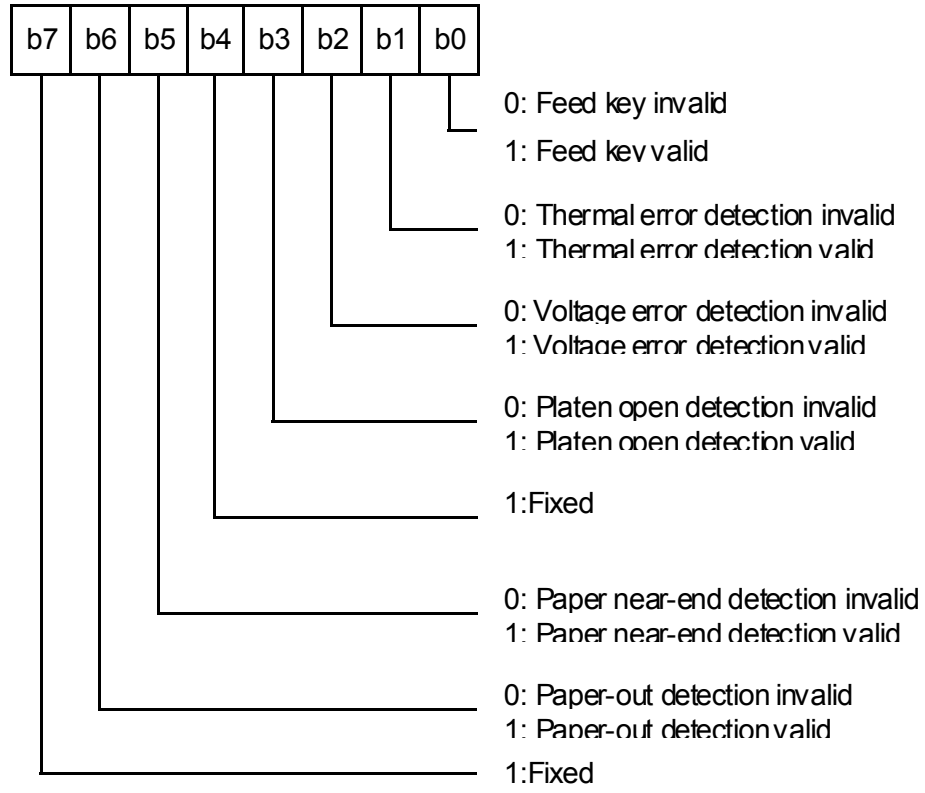
[Function] The FS 9 + n command enables or disables various detection functions.

[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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(36) FS C + n

(effect only when Flash ROM mounted)

[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 Flash Memory is mounted.

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(37) 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 = TBD.

(38) FS r + n

(effect only when serial interface selected)

[Name] Parameter transmission

[Function] A specified parameter replies when the serial communications mode is selected.

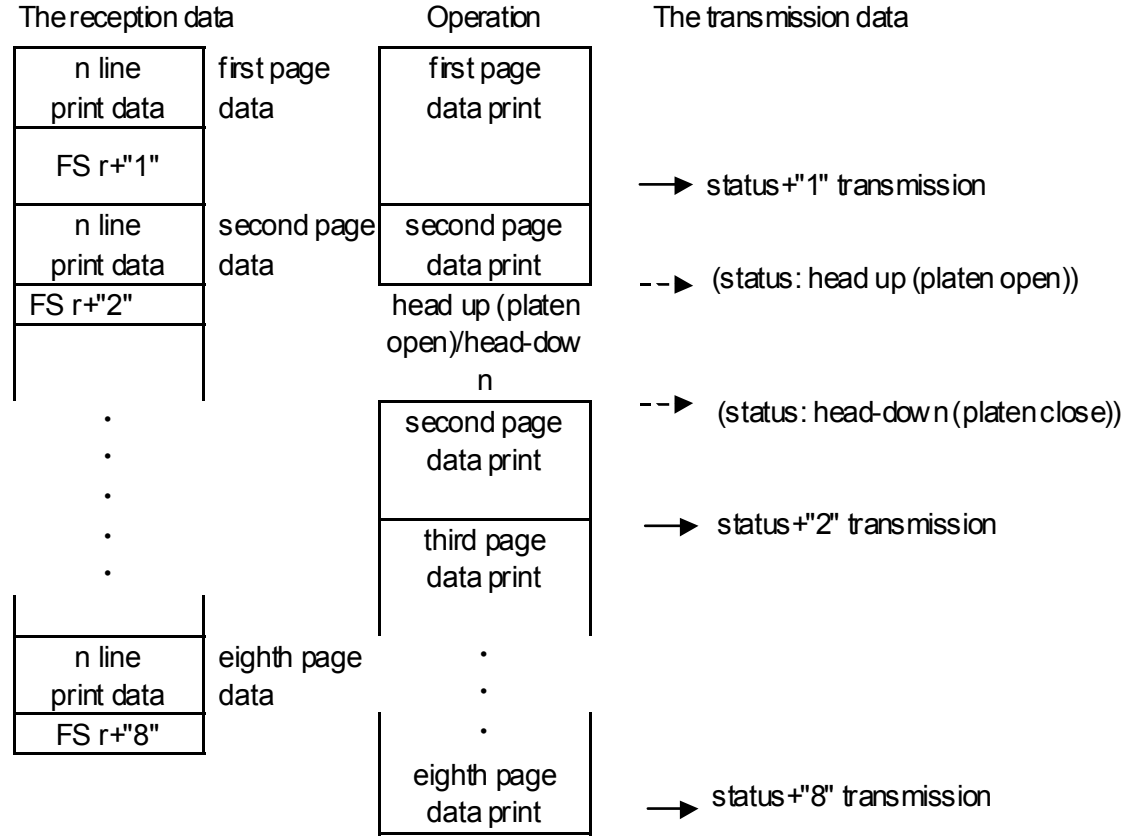
[Code] $[1C]_{16}$ $[72]_{16}$ [n]
$[28]_{10}$ $[114]_{10}$ [n]

[Explanation]

(1) This command is effective only serial communications.
(2) The reply parameter is specified by n.
(3) An initial value is n=0.
(4) The range of n is $0 \leqq n \leqq 255$.
(5) The parameter is transmitted when this command is received. The reply data follows the format of the automatic status transmission and replies parameter n as status in the fourth byte.

The first byte	The second byte	The third byte	The fourth byte
Printer information	Error information	Paper information	Parameter

(6) When the parameter reply is done by this command, the automatic status transmission always reaches the value of a specified parameter.
(7) It can be confirmed that the ending of print by this command.



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(39) FS W + n

(effect only when Flash Memory mounted)

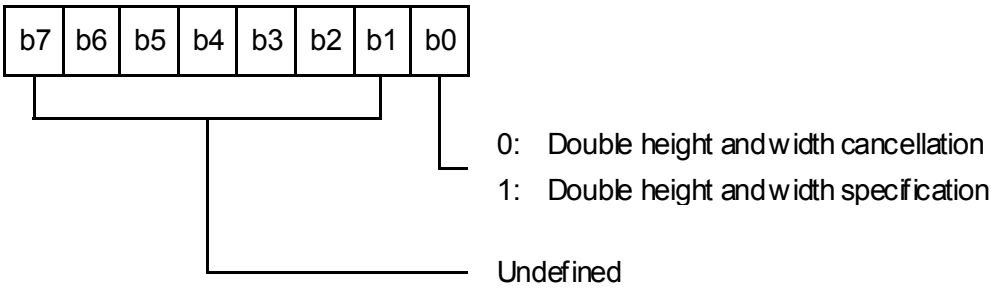
[Name] Kanji double height and width printing specification/cancellation

[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 Flash Memory is mounted.

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

(effect only when Flash Memory mounted)

[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) When the number of data is 0, if specified ID has already been registered, that data is deleted. if not, nothing is done.

(5) Header is automatically added to the image data and it is registered. Header is composed of 6 bytes and controls the identification number and the size etc. of the image data.

(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.

(8) The capacity of the image data is 128KB. Please note that the data that exceeds this capacity cannot be registered.

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(41) GS ‘ + m +n

(effect only when Flash ROM mounted)

[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) 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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(42) 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.

(43) 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 $0 \leqq n \leqq 63$ 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.

(44) 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, PD170R	Oji Paper Mfg. Co., Ltd.
4	TYPE [5]		TP60KJ-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 paper	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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(45) GS V + n + m

(effect only a board included a cutter driving circuit)

[Name] Paper cutting

[Function] The paper cut is executed.

[Code] $[1D]_{16}$ $[56]_{16}$ [n] [m]
$[29]_{10}$ $[86]_{10}$ [n] [m]

[Explanation]

(1) The relationship between parameter n and the operation is as follows:

n	Operation	Note
0, 48	Full cutting	Without m
1,49	Partial cutting	Without m
65	Paper feed and full cutting	With m
66	Paper feed and Partial cutting	With m

(2) Full cutting completely cut off paper.

(3) Partial cutting leaves part of the paper uncut.

(4) When n is 65 or 66, paper cut is executes after feeding related m. The parameter m indicates the amount of feeding.

(5) The parameter m indicates dot line and can be set range is $0 \leqq m \leqq 255$.

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(46) 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:

$1 \leqq n \leqq 255$
$1 \leqq m \leqq 255$

(47) 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 $1 \leqq n \leqq 255$ must be satisfied.

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

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

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(48) GS k+m+n+d_1 to d_n

[Name] Bar code printing

[Function] The GS k+m+n+d_1 to d_n command selects a bar code type and prints a bar code.

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

[Explanation]

(1) Parameter m specifies the type of bar codes to be printed (see the following table):

m	Type of bar code	Number of records
65	UPC-A	Fixed ($11 \leqq n \leqq 12$)
66	Undefined	———
67	JAN(EAN)13	Fixed ($12 \leqq n \leqq 13$)
68	JAN(EAN)8	Fixed ($7 \leqq n \leqq 8$)
69	CODE39	Variable
70	ITF	Variable (an even number)
71	CODABAR	Variable

(2) The command configuration, code, definition area, and part of the conditions depend on parameter m.

(3) Parameter d specifies the character to be printed. If parameter d specifies a character code that cannot be printed when the data length is fixed, the corresponding bar code is not printed. If parameter d specifies a character code that cannot be printed when the data length is variable, the bar code prior to this command is printed but the subsequent data is handled as ordinary data.

(4) After a bar code is extended, the printing start position is set to the next dot of the bar code end data.

(5) If the print data exceeds the printing area of which width is one line, the overflowing part of the data is ignored.

(6) If the bar code is higher than the line spacing set with the *ESC 2* or *ESC 3* command, paper is fed by the bar code height without regard to the specified line spacing.

(7) When NUL is specified at the check digit position or when an odd number of data records is specified in ITF with m=70, the check digit is calculated automatically. The calculation results are added to the bar code. When data other than NUL is specified at the check digit position, the received data is expanded in the bar code without modifications.

(8) When one line contains both a bar code and characters to be printed, the bottom of these characters and the bottom of the bar code are aligned at the same level.

(9) Two or more bar codes cannot be contained on the same line. If this GS command is received when there is a bar code in the print buffer, the data contained in the print buffer is automatically printed, after which the command is accepted.

(10) A code area which is available to be set by each bar codes is shown as below :

A kind of bar codes	Code area
UPC-A, ITF, EAN-13/8	'0' ～ '9'
CODE 39	'0' ～ '9', 'A'～ 'Z', ' ', '$', '/', '+', '%'
CODABAR	'0' ～ '9', '-', '$', ':', '/', '.', '+', 'A'～'D'

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(49) GS w+n

[Name] Bar code width setting

[Function] Bar code width magnification setting

[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 $1 \leqq n \leqq 255$ 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.

(50) GS a + n

(effect only when serial interface selected)

[Name] Setting and cancellation of auto status transmission.

[Function] When the serial communications mode is selected, the target status for the automatic status transmission is selected.

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

[Explanation]

(1) The relation of the target status for n and the transmission is as follows.

Bit	Status	setting
0	Undefined	————
1	State of online/off-line	0:Invalidity 1:Effective
2	State of error	0:Invalidity 1:Effective
3	Undefined	————
4	State of automatic paper feed	0:Invalidity 1:Effective
5-7	Undefined	————

(2) An initial value becomes n=0.

(3) Status is transmitted when this command is received or status is changed. At this time, because each status shows a present state, the status transmission of invalidity is not done.

(4) When all status is invalid, the automatic status transmission is not done.

(5) This command is effective only serial interface board.

(6) There is a possibility to cause the delay between reception of command and sending of status.

(7) The following status in four bytes is transmitted without confirming host's state.

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The first byte (printer information).

Bit	Status	Caption
0	Unused	0: Fixation
1	Unused	0: Fixation
2	Unused	0: Fixation
3	online/off-line	0: online 1: Off-line
4	auto-loading	0: not auto-loading 1: auto-loading
5	Unused	0: Fixation
6	Form sending with /ATF signal	0: not feed 1:feed
7	Unused	0: Fixation

The second byte. (error information)

Bit	Status	caption
0	Unused	0:Fixation
1	Receive data abnormal	0:normality 1:abnormality
2	Head up (platen open)	0:undetection 1:detection
3	The cutter is abnormal	0:undetection 1:detection
4	Mark check failed	0:undetection 1:detection
5	Hard ware error	0:undetection 1:detection
6	Head temperature is abnormal	0:undetection 1:detection
7	Power supply voltage is abnormal	0:undetection 1:detection

Note 1) Hard ware error is abnormal of internal RAM, head heat reckless driving, fuse blow out.

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The third byte (paper detection status)

Bit	Status	caption
0	near end	0:undetection 1:detection
1	Unused	0: Fixation
2	out of paper	0:undetection 1:detection
3-7	Unused	0: Fixation

The fourth byte (parameter) ···· specification parameter (Refer to the FS r command)

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	NUL		SP	0	@	P	`	p	_	┴	SP	ー	タ	ミ	━	×
1			!	1	A	Q	a	q	▬	┬	。	ア	チ	ム	┣	円
2		DC2	"	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		RS	.	>	N	^	n	~	■	└	ョ	セ	ホ	゛	／	▒
F		US	／	?	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	NUL		SP	0	@	P	`	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2		DC2	"	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.)

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SECTION I
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.

Appendix 1-A
Setting The Dipswitches

The DIP switches (DSW1) mounted on this board must be set in accordance with the use conditions as explained below.

A-1 DSW1

Switch No.	Setting Function	Setting		
		Bit1	Bit2	
1,2	Baud rate	OFF	OFF	19200BPS
		ON	OFF	9600BPS
		OFF	ON	4800BPS
		ON	ON	2400BPS

Switch No.	Setting Function	Setting	
		ON	OFF
3	Flow control	XON/XOFF	DTR/DSR
4	Receiving buffer size	45 byte	4k byte
5	Even/Odd	Even	Odd
6	Parity	Valid	Invalid
7	Auto line feed setting	Invalid	Valid
8	Interface select	RS-232C	Centro

Note .Serial Interface setting:

- Length of stop bit is 1bit fixed.
- Data length setting.is 8bits fixed.
- Only when SRAM mounted,4kbyte of receiving buffer size is able to use.

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Appendix 1-B
Specifications (SW1,2 LED1,2 CN5)

1 Signals of SW ,LED and connector No.5 are following.
(Note: Only board of FTP-628/638DSL499)

B-1 SW1,2 (switch)

Name	Explanation
SW1	Signal to initialize printer:(/INPRM)
SW2	Paper feed request signal:(/ATF)

B-2 LED1,2 (light emitting diode)

Name	Color	Function
LED1	Red	Error detection light (Without mark undetected error)
LED2	Green	5V Power Supply

B-3 CN5 (connector)

(1) Connector Type

B5B-ZR-SM3-TFT made by JST

No.	Signal Name	Data Direction	Explanation
1	GND	---	Ground of power supply
2	/INPRM	Input	/INPRM signal
3	/ATF	Input	/ATF signal
4	LED1(Red)	Output	Error detection signal (without mark undetected error)
5	Vcc	Output	5V Power Supply

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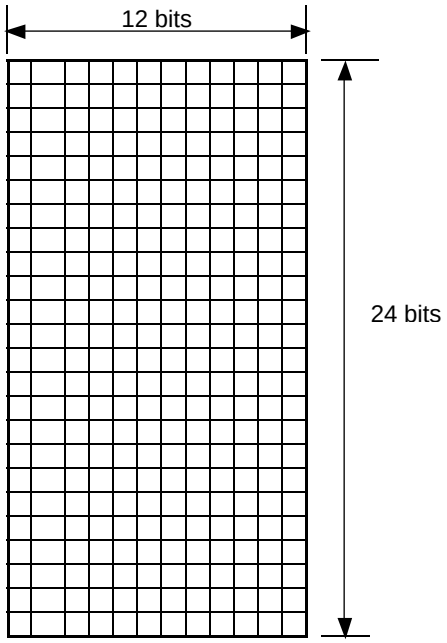
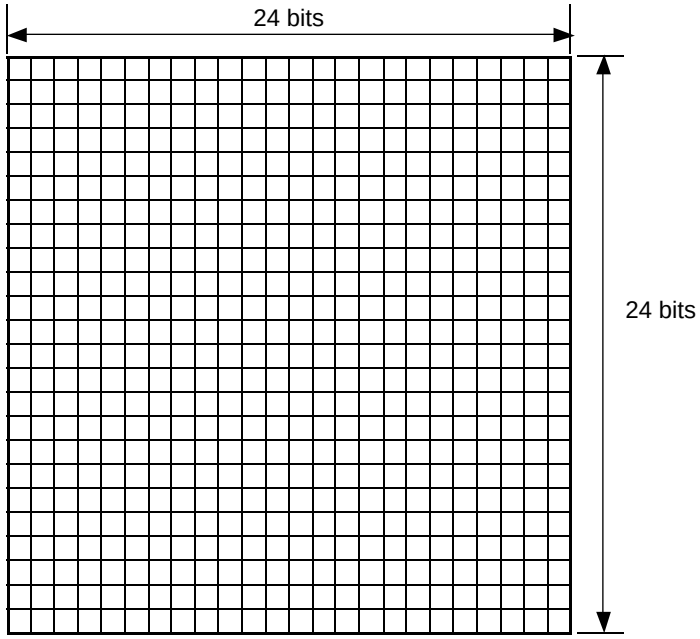
Appendix 2
Configuration of Character Typeface

(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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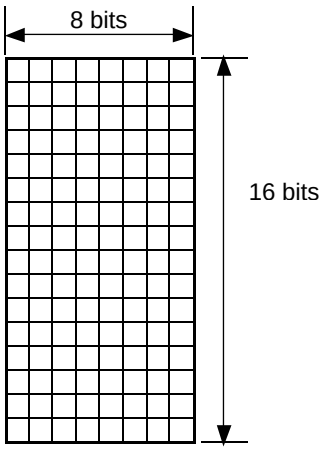
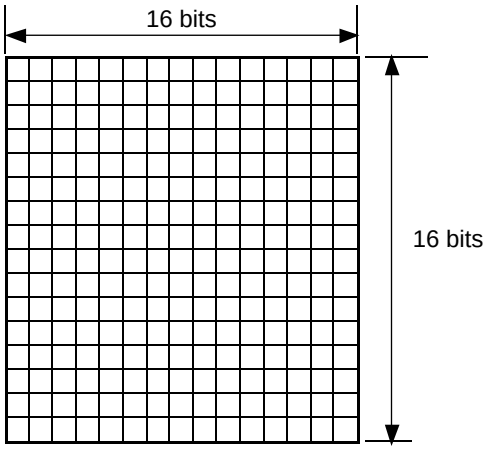
(3) Internal half-size [8 x 16 dots] character typeface (internal data = print pattern)



(4) Internal full-size [16 x 16 dots] character typeface (double-width typeface of internal half-size characters)



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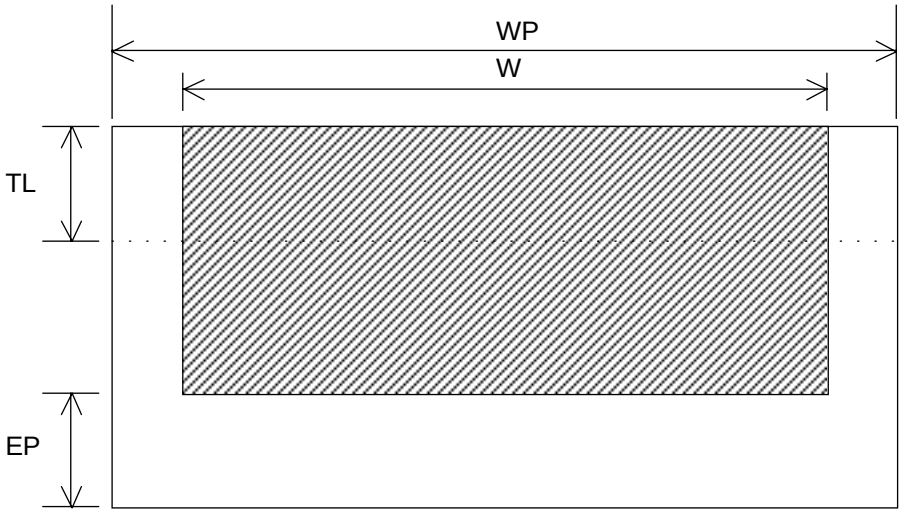
Appendix 3
Paper Printing Area and Mark Detection Position

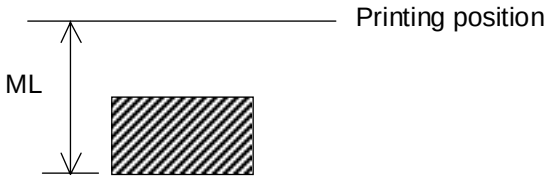
(1) Paper printing area



Symbol	Explanation		Length (mm)
WP	Maximum paper width	FTP-628MCLequivalent	About 58
		FTP-638MCLequivalent	About 80
W	Maximum printable area	FTP-628MCLequivalent	About 48
		FTP-638MCLequivalent	About 72
EP	Paper out state detection position	FTP-628MCLequivalent	About 9.6*1
		FTP-638MCLequivalent	
TL	Distance from paper cutting position to print position		About 7.2

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-6X7MCL or the equivalent	About 7.6

DOCUMENT CONTROL SECTION

DATE

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TITLE *FTP-6X8DCL/DSL4X SERES PRODUCT* SPECIFICATION

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Appendix 4
List of Commands

(1)	HT	Horizontal tab
(2)	LF	Line feed
(3)	FF	Forms feed
(4)	DC2	Power down
(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 ! + n	Printing mode specification
(9)	ESC % + n	External registration character specification/cancellation
(10)	ESC & + y + c_1 + c_2 + x + d_1 to d_n	External registration character definition
(11)	ESC * + m + n_1 + n_2 + d_1 to d_n	Bit image printing
(12)	ESC 2	1/6-inch line pitch setting
(13)	ESC 3 + n	Line pitch setting
(14)	ESC ? + n	External registration character deletion
(15)	ESC @	Printer resetting
(16)	ESC A + n	Line spacing setting
(17)	ESC C + n	Page length (number of lines) setting
(18)	ESC D +d_1 to d_n + NUL	Horizontal tab position setting
(19)	ESC J + n	Forward paper feed
(20)	ESC K + n	Backward paper feed
(21)	ESC R + n	International character specifications
(22)	ESC V + n	Right rotation 90° specification/cancellation
(23)	ESC X + n + m	Setting of time to turn off motor
(24)	ESC Y+1+xa+0+n	Kanji data check
(25)	ESC c + 1 + n	Internal processing setting
(26)	ESC d + n	n-line feed
(27)	ESC e + n	Backward n-line feed
(28)	ESC s + n	Printing speed setting
(29)	ESC t + n	Character code table selection
(30)	ESC { + n	Upside-down printing setting/cancellation
(31)	FS ! + n	Kanji printing mode collective specification
(32)	FS &	Kanji printing mode specification
(33)	FS * + m + n_1 + n_2 + d_1 to d_N	Bit image printing
(34)	FS .	Kanji printing mode cancellation
(35)	FS 9 + n	Detection function enable/disable setting
(36)	FS C + n	Kanji code system selection
(37)	FS E + n	Applied energy adjustment
(38)	FS r + n	Notification parameter setting
(39)	FS W + n	Kanji double height and width printing specification/cancellation
(40)	GS & + m + x + y1 + y2 + d_1 to d_N	Registered bit image definition
(41)	GS ‘ + m + n	Registered bit image printing
(42)	GS <	Mark detection execution
(43)	GS A + m + n	After-mark-detection head distance setting
(44)	GS E + n	Print quality setting
(45)	GS V+n+m	Paper cutting
(46)	GS e + n + m	Bar code width setting
(47)	GS h + n	Bar code height setting
(48)	GS k + m + d_1 to d_k + NUL	Bar code printing
(49)	GS w + n	Bar code width magnification setting
(50)	GS a + n	Automatic notification setting of status

Note) (38) and (50) are Valid only when RS-232C interface is selected.

DOCUMENT CONTROL SECTION

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TITLE *FTP-6X8DCL/DSL4X SERIES PRODUCT SPECIFICATION*

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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. When the power is turned on, the MCU must stop until voltage of VH system becomes approx TBD or higher and enters in the state of the standby.

   c. 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).)