THERMAL PRINTER
FTP-639MCL354

PRODUCT SPECIFICATION

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Date

Rev.	Date	Design	Inspection	Changes made
02	030312	Y.Yada		P10,14,16,19,24 change
Design	02.08.22	H. Ohtsuka	Inspect.	Approv.

Name: FTP-639MCL354 SPECIFICATION

Drawing No.: A1NA02273-0354/6

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1. Guideline for product recycling

- Fujitsu Component Co., Ltd. is making an effort to promote the environmental management per ISO 14001 with a policy "Better corporate activities while valuing the environment"
- The below lists the components and their materials used in this printer. Refer this list when the printer is to be recycled.

FTP-639MCL354 List of materials

No.	Name of components	Material
1	Printer frame (gear side)	Zinc alloy
2	Printer frame (center)	Zinc alloy
3	Printer frame (switch side)	Zinc alloy
4	Gear cover	POM resin
5	Rubber roller	Silicone rubber + SUM
6	Platen gear, middle gears 1 and 2	POM resin
7	Pulse motor	SPCC + iron + copper wire
8	Paper guide	PPE resin
9	Platen open lever	SUS
10	Thermal head	Aluminum + ceramic substrate
11	Head pressuring spring	SUS
12	Bearing	Sintered alloy
13	FPC	PI, copper leaf, solder plating
14	Auto cutter	*1

【Abbreviations for the materials used】

SUS: Stainless steel
POM: Polyacetal resin
PC: Polycarbonate
SPCC: Rolled steel plate
PI: Polyimide
PPE: Polyphenylene Ether

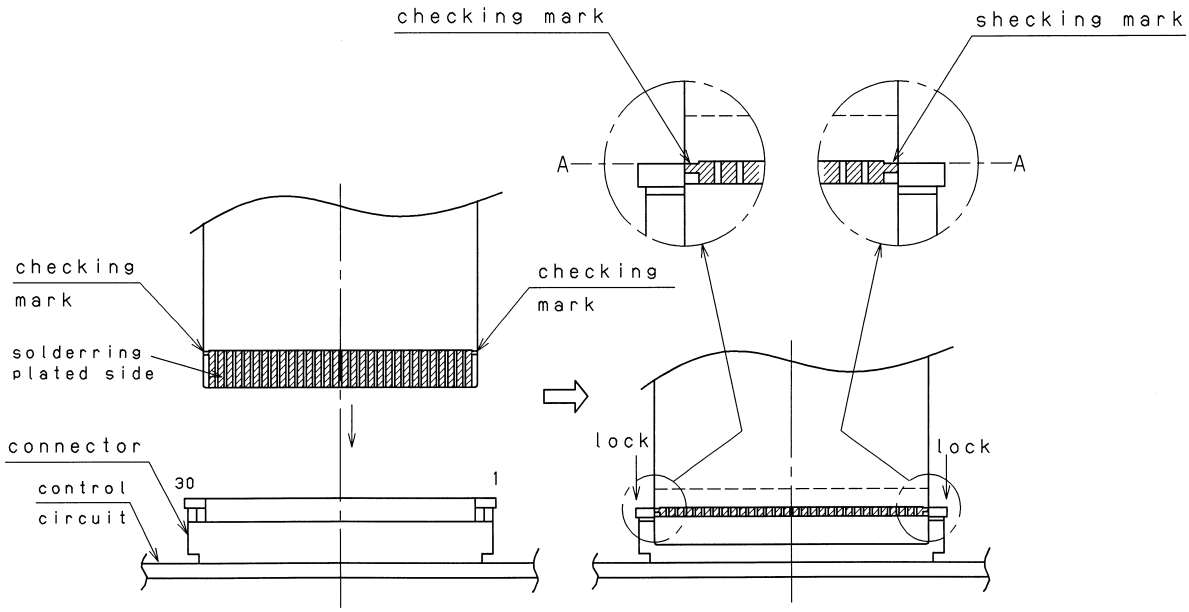
*1:Please refer to specifications of FTP-639CT001.

2.Product design, warnings and cautions for using the product

2-1. Handling the printer

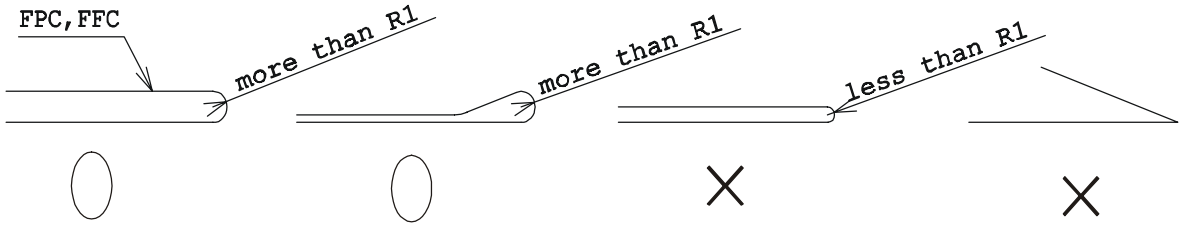
(1) When handling this printer, be sure to take any preventive measure against static electricity such as Disposable Wrist Strap in order to prevent damages of inner parts of the printer caused by the static electricity.

(2) The thermal head and FPC are shipped as they are connected. When installing the printer, do not pull or apply any extra force in order to avoid the connected part of the thermal head and FPC from being disconnected or deviated. Using the printer with the part is deviated may destroy the head. If it is deviated or disconnected, contact us.
In addition, for the connection of FPC and the control circuit side, as shown in the figure below, the checking mark for attachment is seen on FPC; therefore, follow the mark and make sure not to deviate when attaching.



(3) Never attempt to touch FPC and the probe part of the signal line of FFC (parts which are soldering-plated) and not to hit them with something hard.

(4) Do not perform the contact bending of FPC because it may cause the disconnection. If FPC requires to be bent, the bending should be more than R1. Once it is bent, do not rework (straighten or bend backward).



(5) If any paper ejected from this printer is pulled away with an unnecessarily strong force when the platen-open lever is open, it may cause the platen gear to get off the track and damage the gear. Do not attempt to pull any paper ejected from the printer.

(6) If any voltage is applied to the thermal head when the head or paper is wet due to condensation, it may be damaged by electrolytic corrosion; therefore, when using the printer, pay attention to the following items.

- ＊ Do not apply any electric power to the printer when it is not used.
- ＊ Do not perform the printing with any wet paper.
- ＊ Do not apply any electric power to the printer under any environment where any dew condensation is possible to occur.

* Turn off all electric power to the head immediately when condensation occurs. Use the head only after the head is completely dried.
* Depending on the environment where the printer is used (the low temperature or high humidity), condensation may be caused by water vapor generated from the used paper when performing the printing of the high printing rate (solid fills, zigzag printing); therefore, the environment should be considerably evaluated.

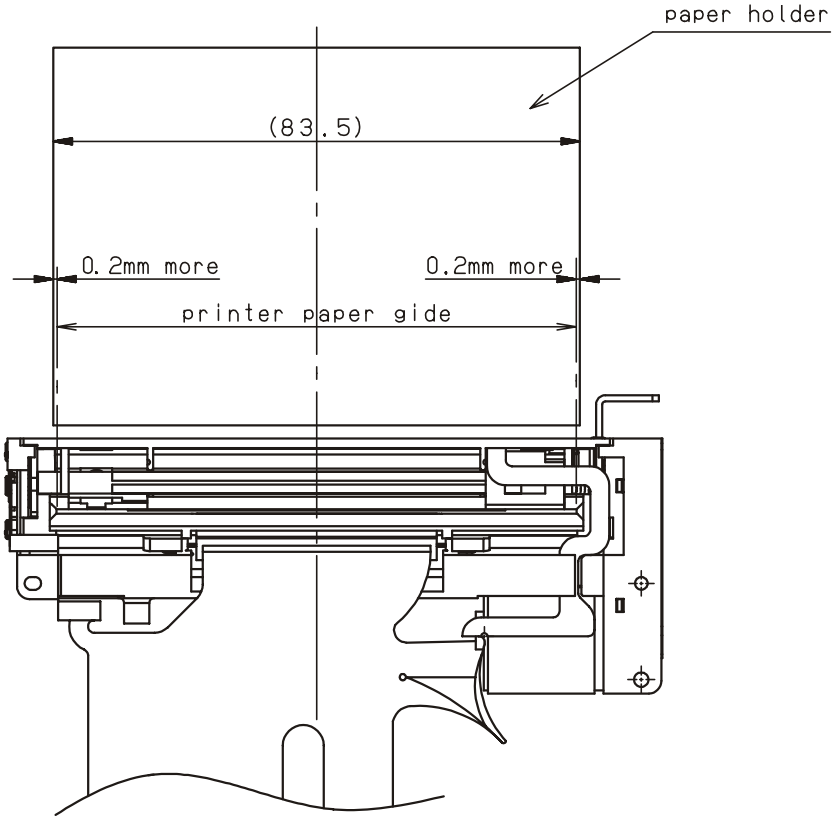
(7) When any paper is not set at the printer, be sure to lift down the platen-release lever. If the paper is run out during the printing, stop all actions of the printer in order to prevent the printing without the paper fed. If the printing is continued without any paper fed, it may cause the trouble of the printer.

(8) When using this printer for the continuous actions, the temperature of the head printer board (the detected temperature with the thermistor) should be equal or less than 65 degrees Centigrade for the temperature protection of IC inside of the printer as well as the surface temperature of the motor should be equal or less than 90 degrees Centigrade for he temperature protection of the motor coil.

2-2 Notice on installation and settings

(1) When installing the printer, fix the edge part with a hook at two places and fix the rear part with screws of M3 at two places. Flatness of the installing surface of the printer should be within equal or less than 0.1mm. It is recommended that the printer is connected to the main body FG with screws of M3 at two places (refer to the figure of the installation dimension). Pay attention not to apply any extra force to the printer main body, FPC since any of such force will give unfavorable effects to the printing quality, paper traveling property (meandering, running short of the paper, and the paper jam), and life time.

(2) Then installing the printer, install it so that the printer and the rolled paper should be parallel as much as possible. When designing the casing, it should be designed so that the printer and the holder part of the roller paper are located at the place shown in the bellow figure. The roller paper should be ejected smoothly so that the paper does not hit anything such as the cover. If the above is not conformed, troubles such as meandering of the printing paper, the running short of the paper, and the paper jam may occur.

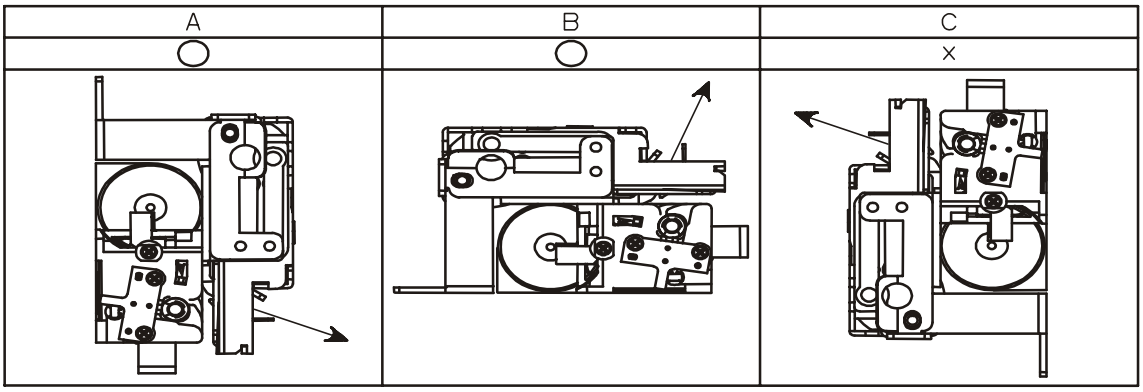


(3) When plugging in and out FPC to the connector of the control side, be sure that all power is turned off before doing that.

(4) Use our recommended connector as the one of the control side of FPC. If any other connector is used, fully confirm the properties (the contact resistance, drawing strength, and the allowable power supply voltage) before using.

(5) The back tension of the rolled paper should be equal or less than 1.96N (200g) including the start up. If it exceeds equal or greater than 1.96N, the platen gear may get off the track and causes to damage the gear.

(6) For the attitude of mounting the cutter, follow the instructions below.



Attitude C: Do not use C because paper chips intrude the cutter.

2-3 Paper to be used

(1) Regarding the printing quality and lifetime; therefore, carefully confirm the property of the paper before using.

(2) When using the perforated paper, the punching direction of the perforations should be set to face the thermosensitive side. The height of burrs of the perforations and dusts of them may cause troubles such as deterioration of the printing quality, the paper end sensor, the platen gear's getting off the track, and the lifetime; therefore, carefully check the perforated paper before using.

(3) To reduce the loads during the paper feeding and to improve the sensitivity of the paper end sensor, when rolling the paper, the thermosensitive side of the paper should be faced outside.

(4) Use the rolled paper of which inner diameter should be equal or greater than ϕ 8 (the diameter when there is not core).

2-4 Cleaning

Paper residues or foreign matter may shorten the life of the head or platen. Clean the printer periodically.

2-5 Storing

(1) When storing the printer for the long-term (equal or longer than six months at the room temperature), lift down the platen-release lever and insert the paper between the head and the platen. If the rubber part of the platen and the head have continued to directly contact for a long term, the rubber part will be deformed and may affect the quality of printing.

(2) Do not store the printer in damp places and places with drastic temperature variations. Condensation on the printer may cause troubles such as thermal head damages and action failures.

(3) Do not store the printer in dusty places. Using the printer with dusts adhered on it may cause troubles to the printing and actions.

2-6 The supply method of rolled paper

(1) When printing in the paper supplied from rolled paper, printing disorder may occur according to the inertia of rolled paper at the time of a printing start. When you use the rolled paper exceeding ϕ 80mm, please establish the mechanism for a shock buffer between rolled paper and a printer.

2-7 Others

(1) If any trouble occur, it shall be solved by mutual discussion based on this specification. Only the printer is subject to quality assurance.

(2) Changes and additions that do not have compatibility of this specification shall be carries out according to the mutual discussion. However, because this printer is the standard model, changes can be carried out without notices within a range where compatibility exists.

(3) This thermal printer comes with an 18-month warranty after the date of production (printer serial No.). Any failure caused by the customer side in the warranty period and after expiry of the warranty shall be serviced with charge. The maintenance service can be available in five year after the date of discontinuation of producing this printer.

(4) This printer does not provide the dust-tight and drip-proof structure. Take measures for the dust-tightness and drip-proof from the main body casing side, as required.

(5) Surfaces and edge surfaces of metallic parts may change colors; therefore, take measures for discoloration as required, such as covering with a casing.

(6) Smoke may be generated from parts of the printer; therefore, take measures for preventing any foreign conductive materials from entering the inside as required, such as covering with a casing.

3. Specifications

3-1 Application

This specification is applies to FTP-639MCL354.
Standards by this specification are satisfied by standard interface .

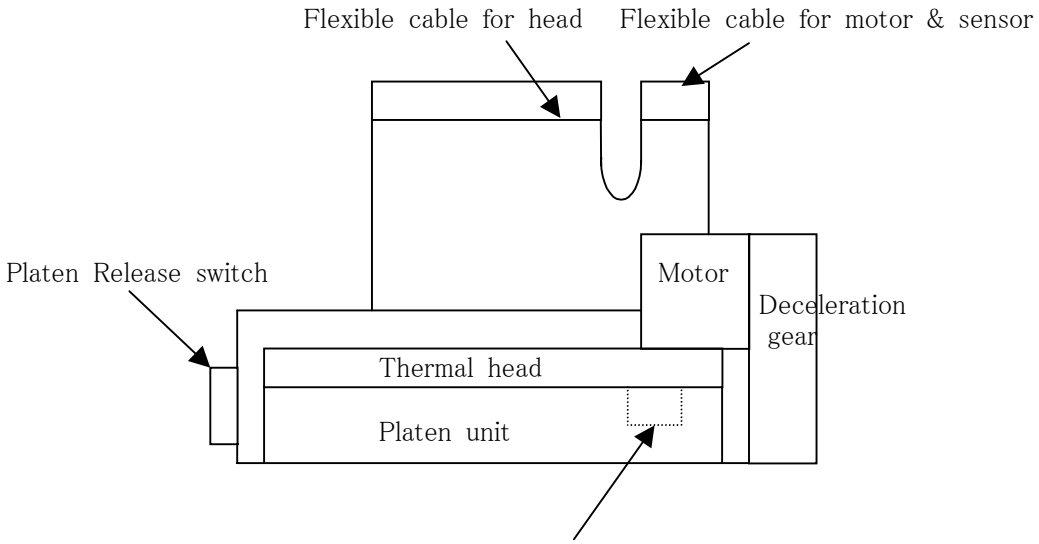
3-2 Overview

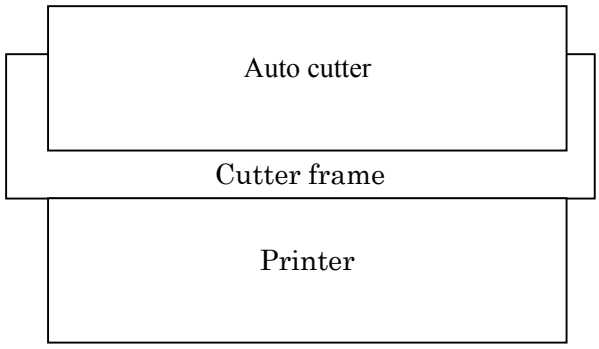
This printer is the small and lightweight printer which build in a line dot thermal head of resolution 8 dots /mm..
The auto cutter is carried in this printer. These specifications should presuppose that it is main with the specification of a printer part, and refer to the following product specifications for the specification of an auto cutter.

FTP-639CT001 Auto cutter specification

3-3 Structure

Below is the figure of this printer's structure (the mechanical part).





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3-4 Standard specifications

Item		Specifications
Printing specifications	Printing method	Direct thermosensitive method
	Valid printing width	72 mm
	Dot structure	576 dots /line
	Dot pitch(rsolution)	0.125 mm (8 dots/mm)
	Dot size	0.125mm×0.16mm
	Printing density	OD value greater than 0.8, in use of the specified paper under our standard printing conditions. ※Measuring device: Sakura densitometer, PDA-65, by Konika Co., Ltd.
	Printing speed	200mm/s [24V drive, Standard paper(PD150R equivalent), Room temperature, High speed mode]
Specified paper for recording *1	Highly sensitive paper	TF50KS-E4 (width: 82.5 $^{+0}_{-1}$mm), Nippon Paper
	Standard paper	TF60KS-E (width: 82.5 $^{+0}_{-1}$mm), Nippon Paper
		PD150R (width: 82.5 $^{+0}_{-1}$mm), Oji Paper
	Middle-term preservable	TP60KS-F1 (width: 82.5 $^{+0}_{-1}$mm), Nippon Paper
		P220VBB-1 (width: 82.5 $^{+0}_{-1}$mm), Mitsubishi Paper
		PD170R (width: 82.5 $^{+0}_{-1}$mm), Oji Paper
	Long-term preservable	TP50KJ-R (width: 82.5 $^{+0}_{-1}$mm), Nippon Paper
		AFP-235 (width: 82.5 $^{+0}_{-1}$mm), Mitsubishi Paper
		PD160R-N (width: 82.5 $^{+0}_{-1}$mm), Oji Paper
		HA220AA (width: 82.5 $^{+0}_{-1}$mm), Mitsubishi Paper
Paper feeding method		Friction feeding (1 dot line/2 pulses, bi-polar 1-2 phase excitation)
Paper feeding precision		±5% At fixed-speed feed with the back tention of 0.49N or less (±2% at 25℃ and RH 60%)
Line gap in one print line by enable drive		Less than 0.125 mm, the step difference between the right and left printing lines.
Detective functions	Thermal head temperature detection	Thermistor
	Paper detection Mark detection	Photo interrupter
	Platen release	Sliding switch
External dimensions (W x D x H)		109.7±1mm×62.5±0.5mm×37.7±0.5mm (excluding FPC) Refer to the outer dimension drawing in section 3-5 for details.
Weight		Approx 320g
Average resistance of the thermal head		800 Ω ±3%

*1: If any other paper except for the specified above is used, through the mutual discussion, the paper shall be evaluated, checked and adoption shall be determined.

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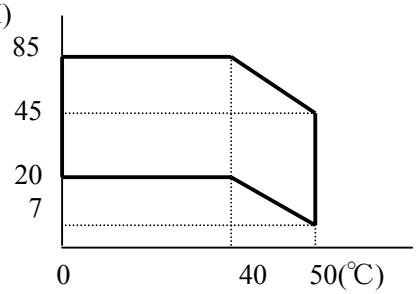
Item			Specifications
Drive power	Head	For printing	Voltage: DC 24V±5%,Printing speed:200mm/s Peak current: 4.0A (at 25℃, Rav=800Ω, 24V, printing black ratio 25%)
		For logic	Voltage: DC 5V±5% Current: 0.2 A Max.
	Motor drive		Voltage: DC 24V±5% Current: 1.0 A Max. (by the F&T standard constant-current drive circuit)
Environmental characteristics	Operating temperature and humidity *1		2) -10℃～+55℃, 10～90%RH. No dew should be allowed.
	Temperature and humidity in storage		-20℃～60℃, 5～95%RH. No dew should be allowed. Yet, the paper is not included.
	Noise		Should not exceed 60dB at a point 1 m above from the printing mechanism position level.
Reliability characteristics*2	Vibration (non-operation)		10～55～10Hz. Amplitude is 0.15mm. An 1 octave/min, 1G Max. 20 cycle each to X, Y, and Z directions.
	Inpact (non-operation)		50G, 11m/s, half-sine wave, 5 times each to X, Y and Z direction
	Package drop		75 cm of 6 faces, 75 cm of corners and ridges as it is packed.
	Temperature & humidity cycling (non-operation)		2 continuous cycles as a unit cycles: -25℃ (2H)～room temp. (2H)～65℃, 10%RH (2H)～room temp.
Life	Head	Electric life	1 hundred-million pulses (under our standard printing conditions.)
		Wear life	Paper feed length, 100 km (printing rate 12.5% max.)
	Platen release life		More than 5000 times (regarding opening and closing as one time.)
	Photo interpreter life		1.2×10^4 hours (electrified time) with the recommended circuit.
Printing start position on the left edge			5.25±1.5mm (by paper width 82 mm) from the paper edge to the left printing edge. However, ①1PLY, when the specified paper for long-term record storage is used.② When no paper jam or no paper empty is present.

*1: The Print density guarantee is +5~+40˚C. Refer to the figure below for the relation of the temperature and humidity.(The range is in fat line)

*2: After the test, it shall satisfy the printing specification.



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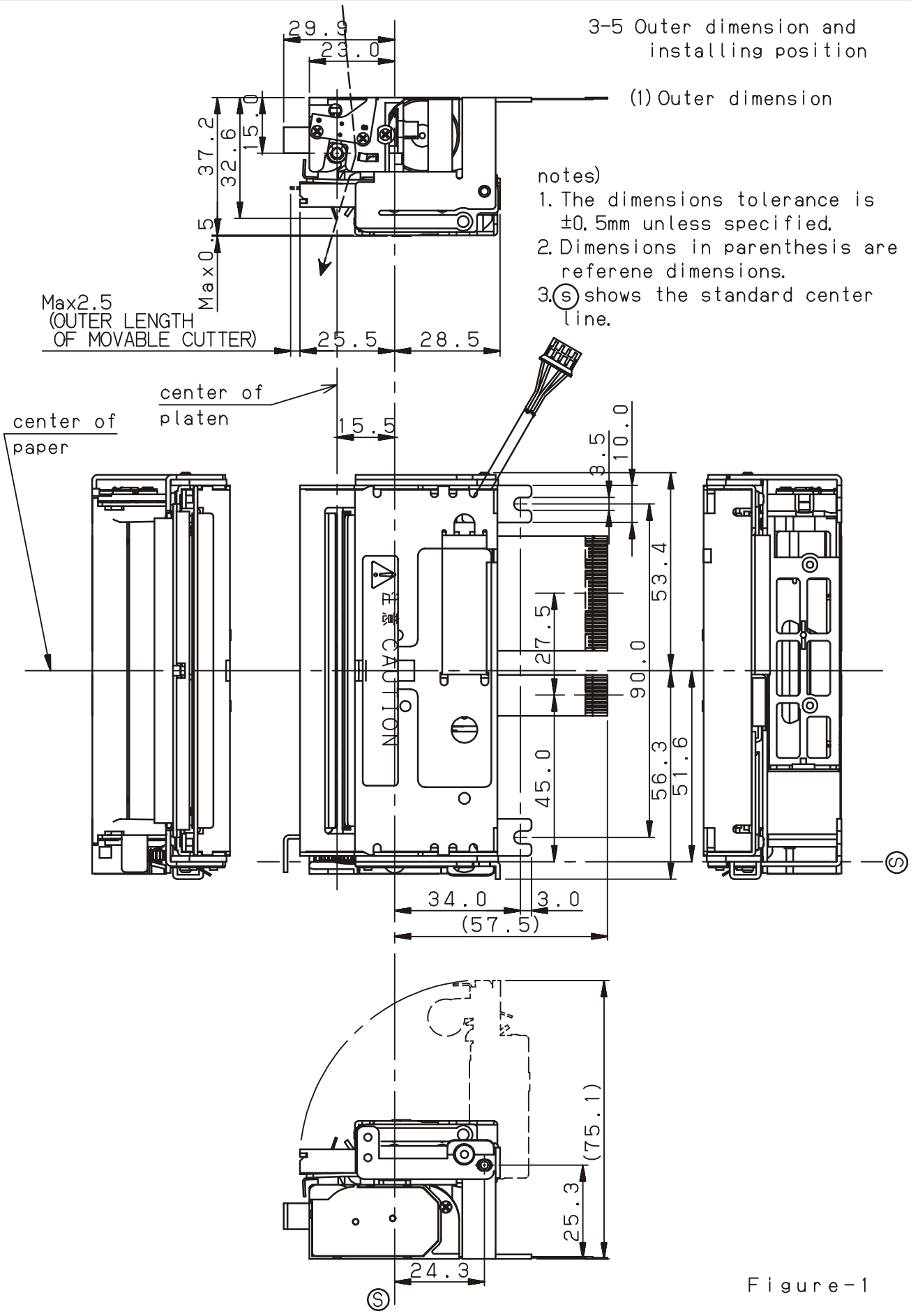
3-5 Outer dimension and installing position

(1) Outer dimension



notes)
1. The dimensions tolerance is ±0.5mm unless specified.
2. Dimensions in parenthesis are referene dimensions.
3. (S) shows the standard center line.

Figure-1

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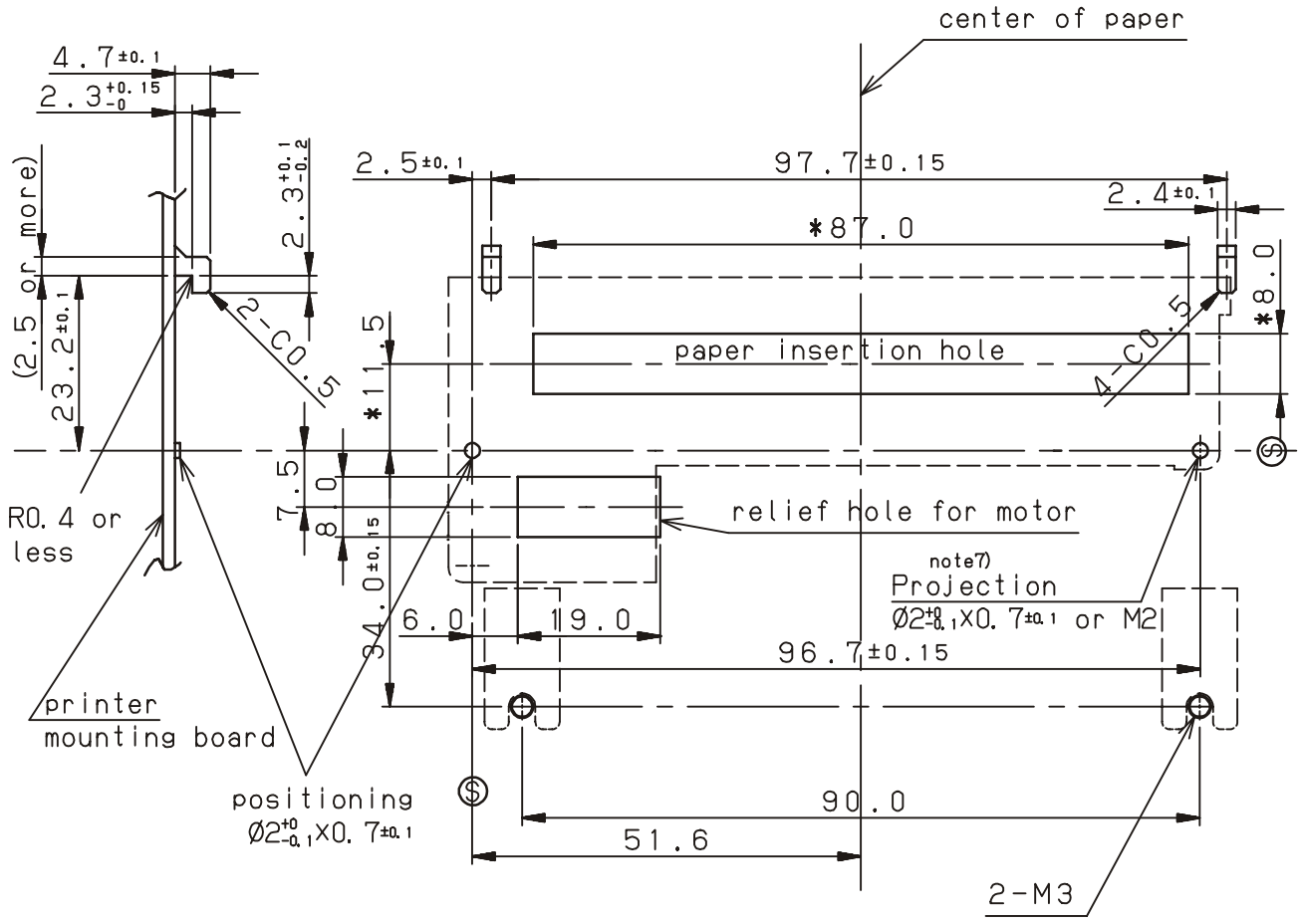
(2) Installing position



Notes)
1. This figure seen from the printer attachment side.
2. The flatness of the printer mounting plate shall be with in 0.1mm.
3. The dimensions tolerance is ±0.15mm unless specified.
4. Ⓢ shows the standard center line.
5. Since when the hook for front fixation is resin aims at an on-the-strength rise, the thickness of a parenthesis size part should make it as thick as possible.
   (the parenthesis size of a hook part be a recommendation value.)
6. Mounting screw (2-M3) is contact the frame ground.
7. Please perform a projection or M2 screw stop for positioning of a printer.
8. *sign size is a center at the entrance of the form of the printer. The size is assumed to be a reference value.
   (Please set the size that the form don't come in contact.)

Figure-2

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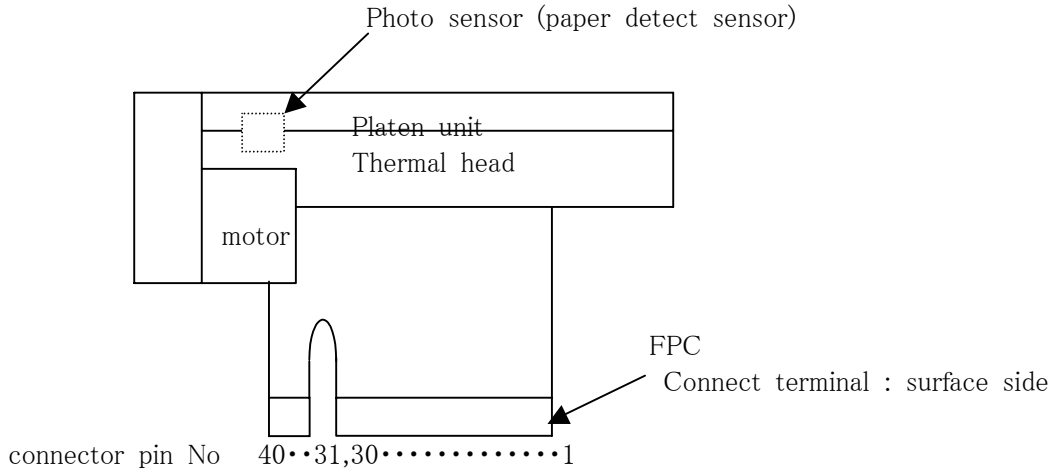
3-6 Connector (flexible) specifications

(1) Connector of the control circuit side
CN1: 52610-3090 (molex)
CN2: 52610-1090(molex)

(2) Pin assignment (flexible) of the printer mechanical side
CN1:The platen release switch side is defined as No1
CN2:The motor excitation signal side is defined as No1(31)

No	Symbol	Signal name
1	SW	Platen open switch
2	SW	Platen open switch
3	VH	Head drive power
4	VH	Head drive power
5	VH	Head drive power
6	VH	Head drive power
7	DI	Data in
8	STB 3	Strobe 3
9	STB 4	Strobe 4
10	VDD	Logic power
11	TM	Head Thermistor
12	GND	Head ground
13	GND	Head ground
14	GND	Head ground
15	GND	Head ground
16	GND	Head ground
17	GND	Head ground
18	GND	Head ground
19	GND	Head ground
20	GND	Head ground
21	TM	Head Thermistor
22	STB 1	Strobe 1
23	STB 2	Strobe 2
24	LAT	Data latch
25	CLK	Clock
26	DO	Data out
27	VH	Head drive power
28	VH	Head drive power
29	VH	Head drive power
30	VH	Head drive power
31	N.C	—
32	TM	Motor Thermistor
33	TM	Motor Thermistor
34	MT／A	Excitation signal／A
35	MT A	Excitation signal A
36	MT／B	Excitation signal／B
37	MT B	Excitation signal B
38	PHK	Cathode for photo interrupter
39	VSEN	Paper sensor power
40	PHE	Emitter for photo interrupter



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(3) Cautions

① Do not plug in and out any flexible connector when the power is being supplied.
② Do not add any unnecessary force to the flexible connector.
③ Plugging in and out FPC of the control circuit side shall be equal or less than 10 times. Do not plug in and out FPC of the head side.

3-7 Thermal head specifications

(1) General characteristics

① System: Thermosensitive line dot system
② The total number of dots: 576 dots/line
③ Heating resistor dot pitch: 0.125mm
④ Heating element structure: 2 heating elements/dot
⑤ Average resistance value of a heating element : 800Ω ± 3%

(2) Maximum rating (at 25 degrees centigrade of the surrounding temperature)

Item	Max. rated value			Unit	Conditions
2) Printing cycle (S. L. T.)	1.00	0.82	0.625	ms/line	Tsub=25℃
2) Printing energy	0.23	0.20	0.17	mj/dot	When it impresses continuously. (printing rate 100%)
Printing power voltage: (VH)	26.4			V	Vp<28V Vp is peak voltage of VH
Board temperature	65			℃	Thermistor temperature.
Concurrent printing dot number	2) 288			Dot	
Logic power voltage: (Vdd)	7			V	Including the peak voltage.
Logic input voltage: (Vin)	-0.5～Vdd+0.5			V	

(3) Electrical characteristics

① Electrical characteristics: Table 1
② Timing chart: Fig. 3-1
③ Equivalent circuit: Fig. -2
④ Driver structure: 144 bits×4 drivers

(4) Conditions for electrical actions

Item	Symbol	Electric conditions		Unit	Conditions
Power consumption	Po	2) 0.59		W/dot	Rav=800Ω Concurrent applied dot number. With 144 dots. (Average printing rate 25%)
Supply voltage	VH	24.0		V	
2) Recording cycle	S.L.T	0.82	1.00	ms/line	
2) Energy consumption (Record pulse width) (Note 2)	Eo (Ton)	0.22		mj/dot	5℃
		(0.37)		ms	
		0.20		mj/dot	25℃
		(0.34)		ms	
		0.18		mj/dot	45℃
		(0.31)		ms	
2) Current consumption	Io	4.0		A	
Division number		1		1	

Note 2) The printing interval (SLT) is defined as the time in which strobes are sequentially driven and the printing of one line has all been completed. The relation of the applied voltage and the electric power application time (Ton) is calculated with calculation formula as shown below.

$$Po = Io^2 \times Rav = \frac{VH^2 \times Rav}{(Rcom \times N + Rav + Ric + Rlead)^2}$$

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Ton＝Eo÷Po

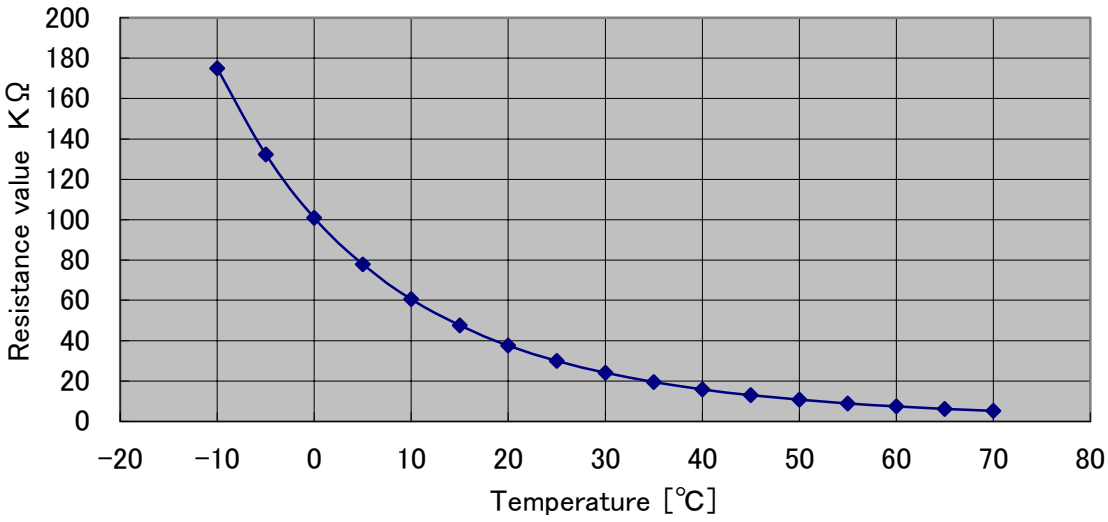
or

Po ＝Eo÷Ton
VH ＝√(Po÷Rav)×(Rcom×N＋Rav＋Ric＋Rlead)

Rav:	Average resistance value	(example)	800	［Ω］
N:	The number of simultaneous printing dot	(example)	144	［dot］
Rcom:	Common resistance		0.075	［Ω］
Ric:	Driver-On resistance		50	［Ω］
Rlead:	Lead resistance		14	［Ω］

(5) Thermistor characteristics

B constant:	3950K±2%
Resistance value R25:	30KΩ ±5% at25℃
Thermistor calculation formula:	RX=R25×EXP{B×(1/TX-1/T25)}　T: Absolute temperature
Operating temp. range:	-20～+80℃
Thermal time constant:	Within 30sec (in the air)



(6) Cautions on operation

① When performing the continuous printing with high printing rate, regulate the head base (thermistor) temperature so that it does not exceed the standard value.

② For the waiting time, control (circuit design) the printer so that VH (power supply of the heating element) is turned off (the GND level) in order to prevent thermal head damages caused by ions and noises.

③ When the thermistor is disconnected, control (circuit design) the printer so that the thermal head is not overheated.

④ Do not input any pulse noise of equal or more than 2V, 20ns in each signal terminal.

⑤ Control signals of CLK, LAT, DIN, and STB with C-MOS (equivalent to 74HC240). In addition, when the power supply is on/off and for the non-printing time, maintain the STB signal in the "DISABLE" state.

⑥ Surge noise to prevent , the cable length of VH and GND shall be equal or shorter than 100mm. Mount an aluminum electrolytic capacitor of 47 μF between VH and GND of the head side, which should be as close to the head side as possible. In addition, mount a

laminating ceramic condenser of 0.1 μ F between VDD and GND.

⑦ When the power supply is on, the order shall be VDD → VH. When the power supply is off, it shall be VH → VDD.

⑧ Make sure not to condense dews on the head. If condensation occurs on the head, maintain the VH power supply in the off state until condensation has been solved.

Ta＝25±10℃

Item		Symbol	Min.	Standard	Max.	Unit	Conditions etc.
Printing power voltage		VH	—	24.0	26.4	V	
Circuit power voltage		Vdd	4.75	5.00	5.25	V	
Circuit power current		Idd	—	—	2) 24	mA	fDI=fCLK/2
Input voltage	H	VIH	0.8Vdd	—	Vdd	V	STB,DI,LAT,CLK
	L	VIL	0	—	0.2Vdd	V	〃
Data input current (DI)	H	IIH DI	—	—	0.5	μA	VIH＝5V
	L	IIL DI	—	—	-0.5	μA	VIL＝0V
STB input current (LOW-ACTIVE)	H	IIH STB	—	—	0.5	μA	
	L	IIL STB	—	—	-30	μA	
Clock input current (CLK)	H	IIH CLK	—	—	2.0	μA	
	L	IIL CLK	—	—	-2.0	μA	
Latch input current (LAT)	H	IIH LAT	—	—	2.0	μA	
	L	IIL LAT	—	—	-2.0	μA	
Data out (DO)	H	VDOH	4.45	—	—	V	OPEN status, Vdd=4.5V
	L	VDOL	—	—	0.05	V	
Output voltage		VOL	—	(1.0)	—	V	Reference value, Driver output part
Clock frequency		fCLK	—	—	4	MHz	Refer to the timing chart.
Clock pulse width		tw CLK	120	—	—	ns	
Data setup time		testup DI	50	—	—	ns	
Data hold time		thold DI	50	—	—	ns	
Data out delay time		td DO	—	—	500	ns	
Latch pulse width		tw LAT	100	—	—	ns	
Latch setup time		Testup LAT	200	—	—	ns	
Latch hold time		thold LAT	50	—	—	ns	
STB setup time		Testup STB	300	—	—	ns	
Output delay time		Tdo	—	—	5	μs	

Table-1 Electrical characteristics

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02	030312			2) change

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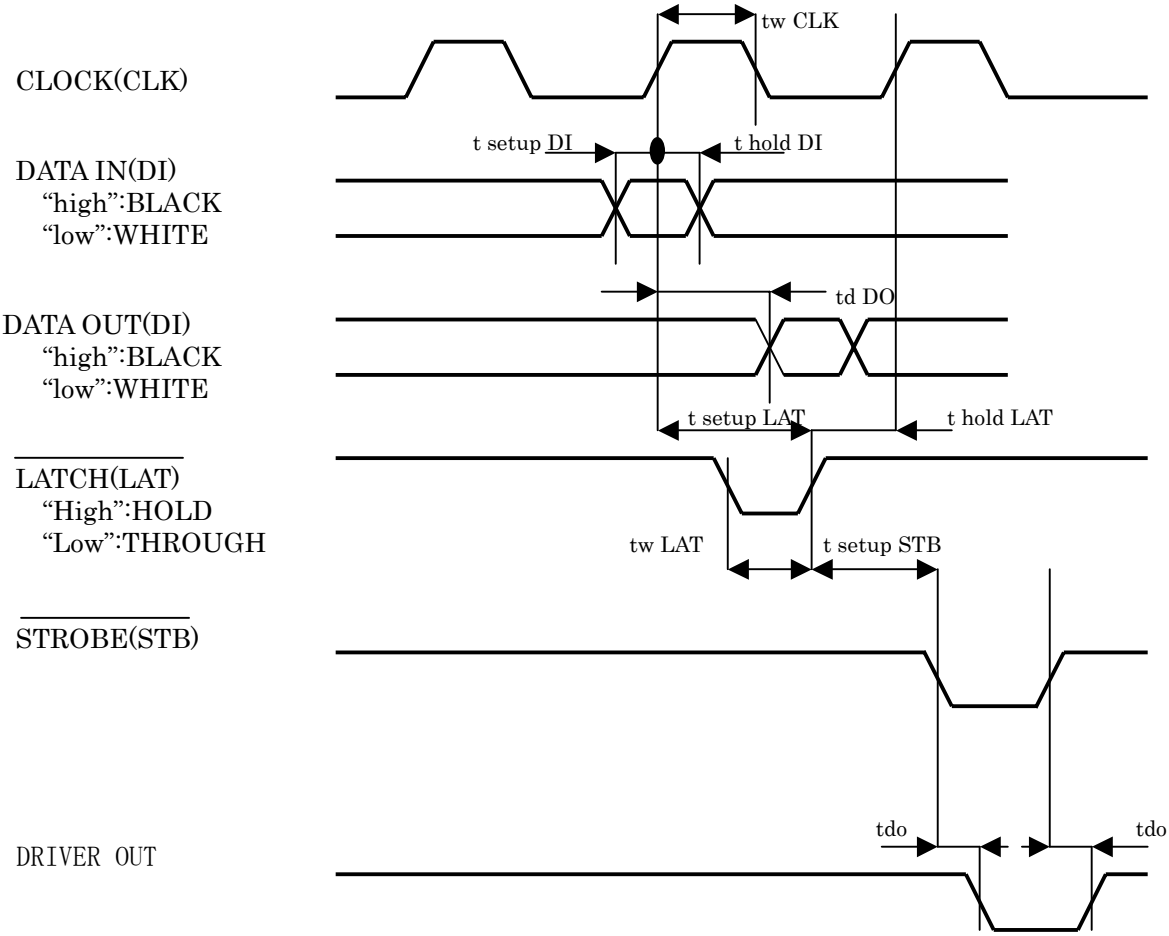

Figure 3 － 1　Timing　chart

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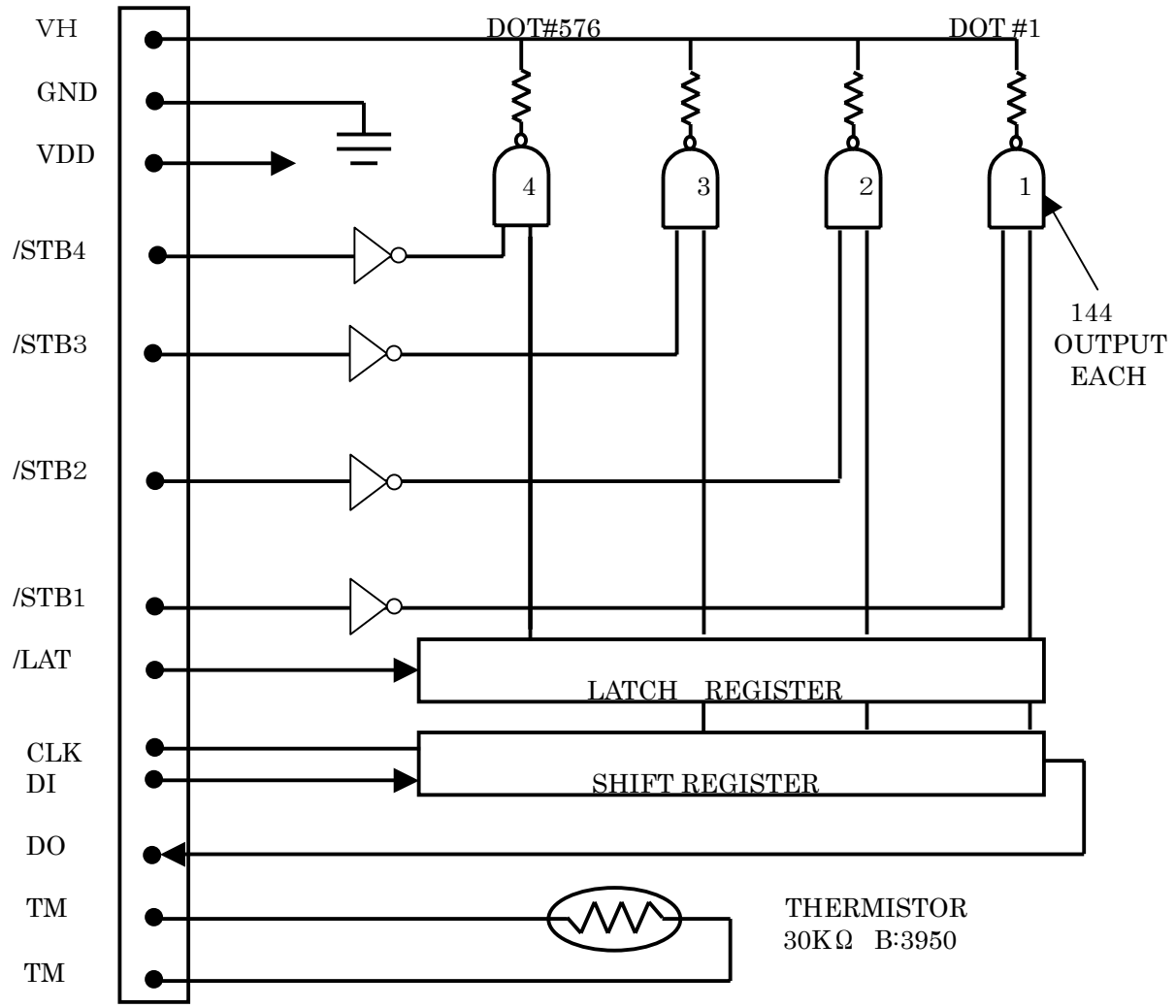


STB No.	Dot No.	dots/STB
1	1 ~ 144	144
2	145 ~ 288	144
3	289 ~ 432	144
4	433 ~ 576	144

Figure 3 － 2 Equivalent circuit

3-8 Stepping motor specifications

(1) General specification (motor only)

Item	Specifications
Model	Permanent magnet type
Phase	Two phase (bi-polar specification)
Step angle	9 degrees by 1-2 phase excitation
Winding resistance / phase	6Ω±10%(at 25℃)
Rated voltage	DC24 V

(2) Driving procedures of the stepping motor

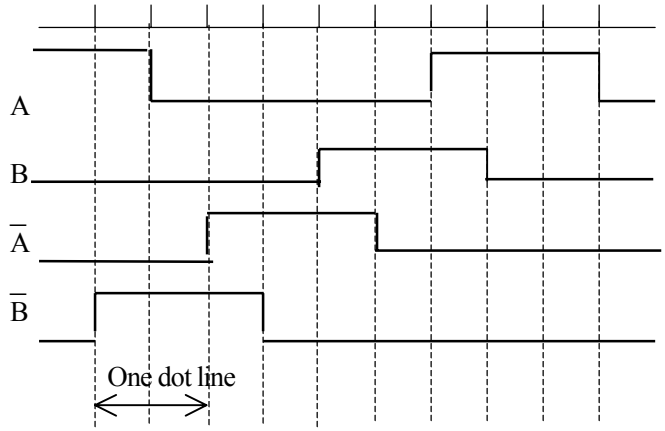
① Drive the motor with the 1-2 phase excitation of the bipolar.

② The number of steps per dot line of printing

Excitation method	Step No.	Rotation angle
1-2 phase excitation	2	9 degrees /step

③ The reference excitation method is described below.

2)

Method	Excitation sequence (H: ON, L: OFF)
The 1-2phase excitation	

(3) Driving the bipolar transistor

① Drive the motor by the fixed current control for the output torque stabilization to the applied voltage change. This reference excitation current is 500mA. Applying any excessive electric current will cause the abnormal generation and the excessive torque, which will end in mechanical damages; therefore, do not apply any electric current that exceeds the requirement.

② Determine the motor driving requirements after confirming effects of load variations caused by temperature, the humidity, and types of paper. If the motor is driven by any excessive torque, the gears may be damaged when the paper is locked; therefore, attention should be paid.

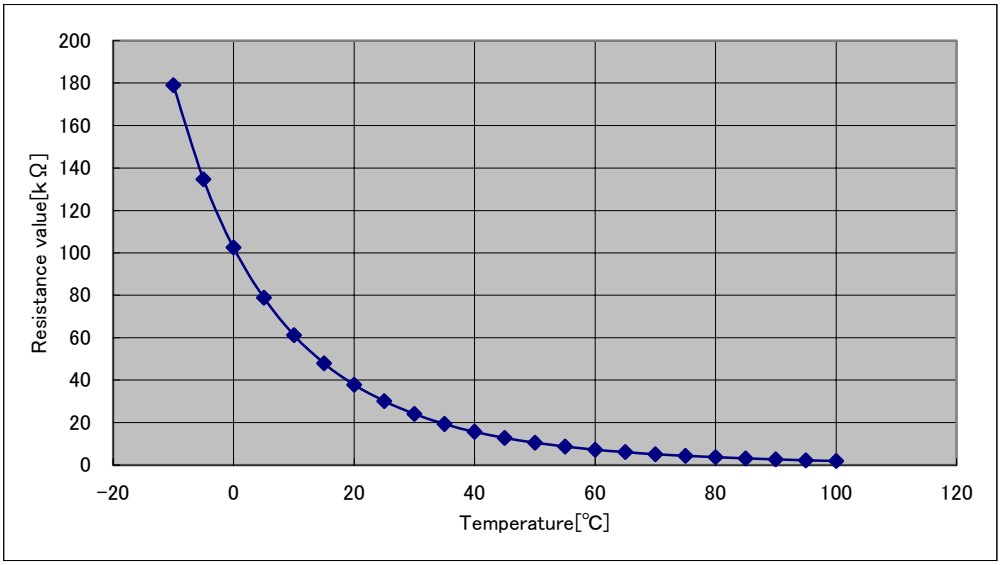
③ In the low-speed drive (the low driving frequency), abnormal noises and the torque reduction may occur due to resonance of the motor. In the low-speed drive, be sure to perform sufficient evaluation and confirmation.

④ The reference exciting current when the pressurization power supply is applied is 440mA. Applying any excessive electric current will generate the excessive torque and cause mechanical damages; therefore, do not apply any electric current that exceeds the requirement.

⑤ At the start of the high-speed printing and the start of the printing after turning off the motor excitation, perform the speedup control.

(4) Thermistor (Motor) characteristics

B constant:	4000 K±2%
Resistance value R25:	30 KΩ ±5% at25℃
Thermistor calculation formula:	RX=R25×EXP{B×(1/TX-1/T25)} T: Absolute temperature
Operating temp. range:	-40～+125℃



(5) Cautions

① If the motor is stopped and its excitation is turned off while the printing is being performed, because of the elasticity of the rubber roller, troubles may occur at the restart of the motor: the order of the printing may be disconnected, the printing may be smudged, white lines may be inserted. When the printing contents are necessary to be continued, complete the printing without interrupting once it is started. In addition, applying the slight electric current in the waiting state can reduce effects such as deformation of the rubber roller, as shown above. In this case, the reference electric current should be 150mA.

② When leaving the printer for the long term, turn off the excitation. Failure to do so, it may cause heat generation of the motor and the driving elements.

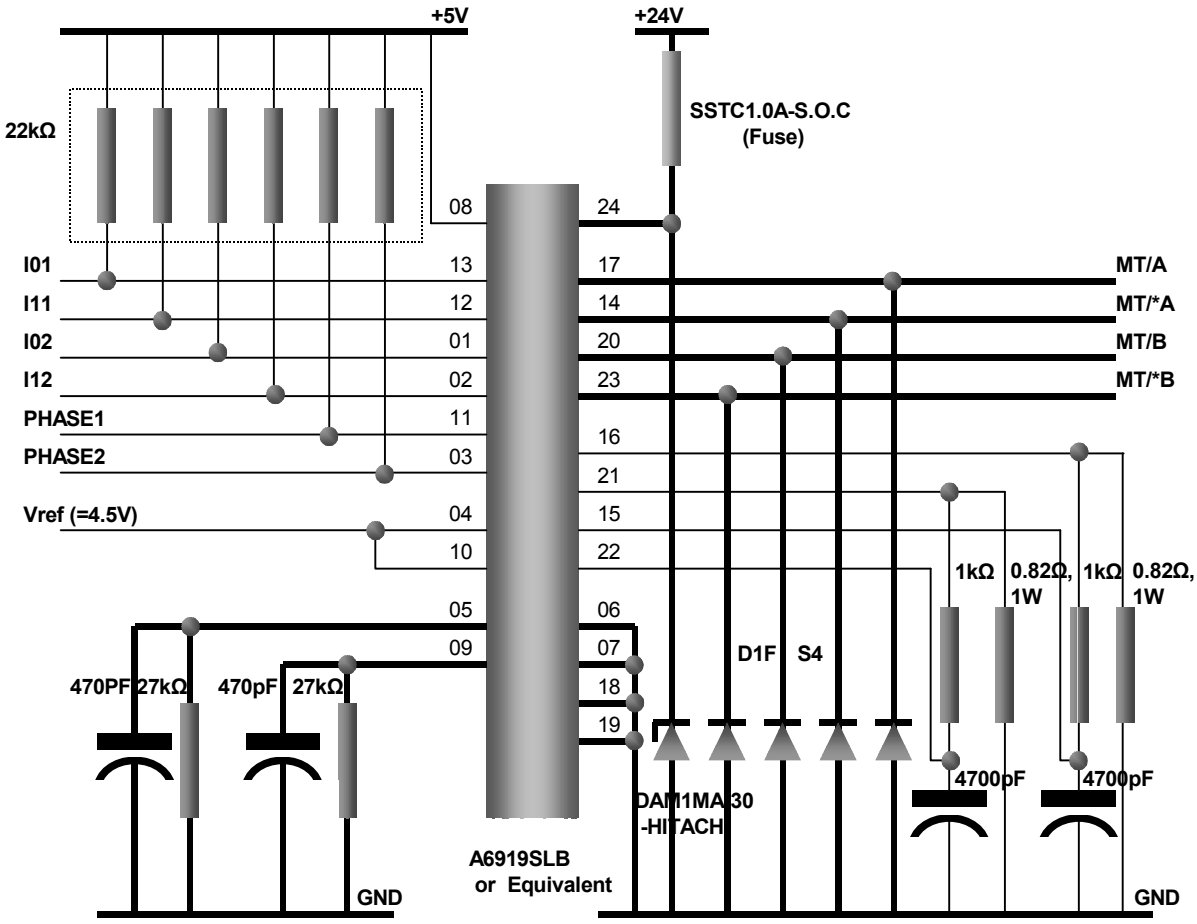
③ The motor side wall temperature shall be equal or less than 90 degrees centigrade. If the temperature exceeds 90 degrees centigrade, the coil inside of the motor may be damaged.

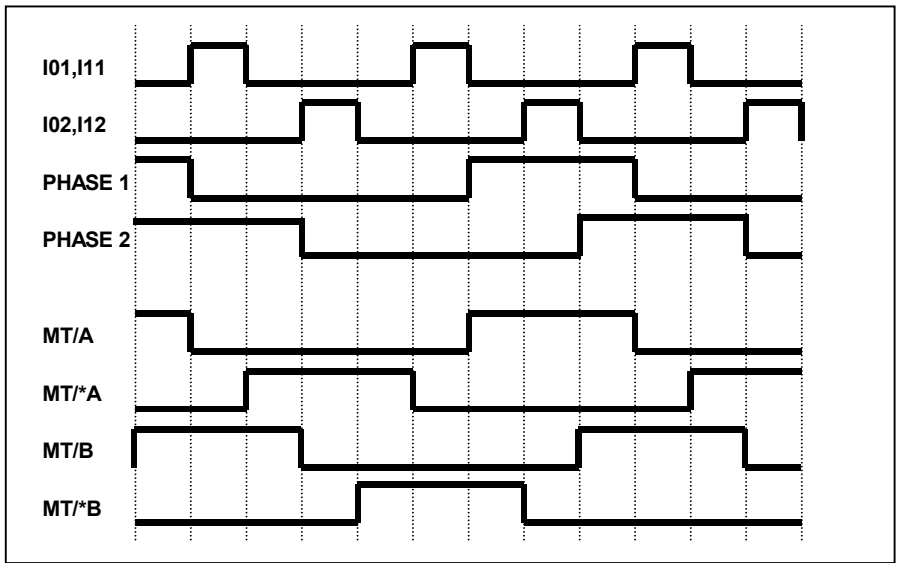
④ When any abnormal state occurs, stop driving the printer as soon as possible.

⑤ This printer performs one paper feeding operation of one dot line with four steps. Therefore, for power saving and stable actions, when driving the motor with the 1-2 phase excitation, control the motor so that it is stopped in the 1-phase excitation state and started in the 2-phase excitation.

⑥ Any printing action with the platen closed and no paper fed may wear the rubber roller and damage the head. Do not perform the printing in this state.

(6) The example of a motor drive circuit.
The example of a constant current circuit is show blow.





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3-9 Sensor specifications

4-9-1 Photo-interrupter specification

This photo-interrupter is mainly used for detecting whether the paper is set. In addition, it can be used as the paper-positioning tool by seeking the mark.

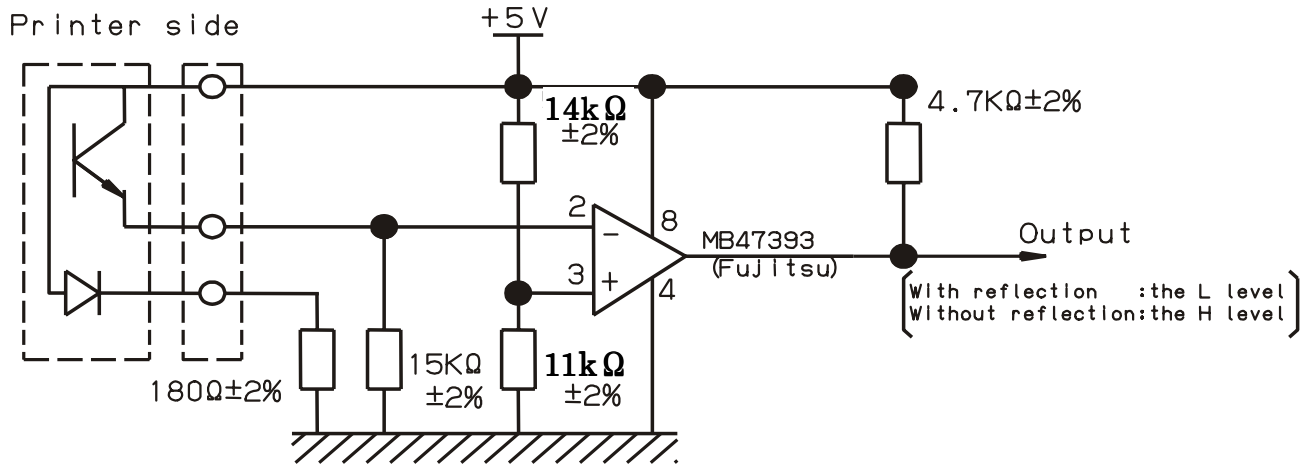
(1) Absolute maximum rating

Item		Symbol	Rated value	Unit
Input	Forward current	I_F	50	mA
	Reversed voltage	V_R	5	V
	Loss of capacity	P	70	mW
Output	Voltage between the collector and emitter	V_{CEO}	20	V
	Voltage between the emitter and collector	V_{ECO}	5	V
	Collector current	I_C	20	mA
	Loss of collector	P_C	70	mW

(2) Electric optics characteristics (25℃)

Item		Mark	Min. value	Ref. value	Max. value	Unit	Requirement
Input	Forward voltage	V_F	1.0	1.2	1.6	V	I_F=10mA
	Reverse current	I_R	——	——	10	μA	V_R=5V
Output	Dark current	I_{CEO}	——	——	200	nA	V_{CE}=10V,I_F=0mA
Transfer characteristics	Photocurrent	I_C	150	——	600	μA	V_{CE}=5V,I_F=10mA
	Leakage current	I_{LEAK}	——	——	1	μA	V_{CE}=5V,I_F=10mA
	Response time (rising)	tr	——	5	——	μs	V_{CE}=5V,I_F=1mA R_L=100Ω
	Response time (dropping)	tf	——	5	——	μs	

(3) Connecting circuit



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4-9-2 Sliding-switch specifications

This printer is built in a sliding switch for detecting whether the platen is opened.

Item	Specifications
Rated voltage	DC5V
Rated current	1mA
contact resistance	Equal or less than 1 Ω

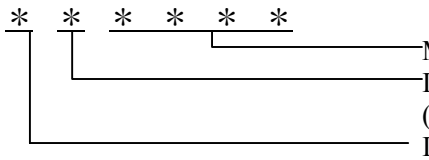
4. Product model plate

(1) Contents to be indicated: The model, manufacturing additional No., and version No.

(2) Indicating locations: Labels are plated on the gearbox side.

(3) Indicating methods: The model, additional and version numbers are stamped.

(4) Indication of the additional No.: The indicating method is described as follows. It is consisted of a six-digit character string.



(5) Indication of the version No.: It indicates the version No. of the printer.

5. Packing

(1) Packing state: It is individually packed in an anti-static bag and contained in an exclusive packing box.

(2) Dimensions: They are conformed to our standard.

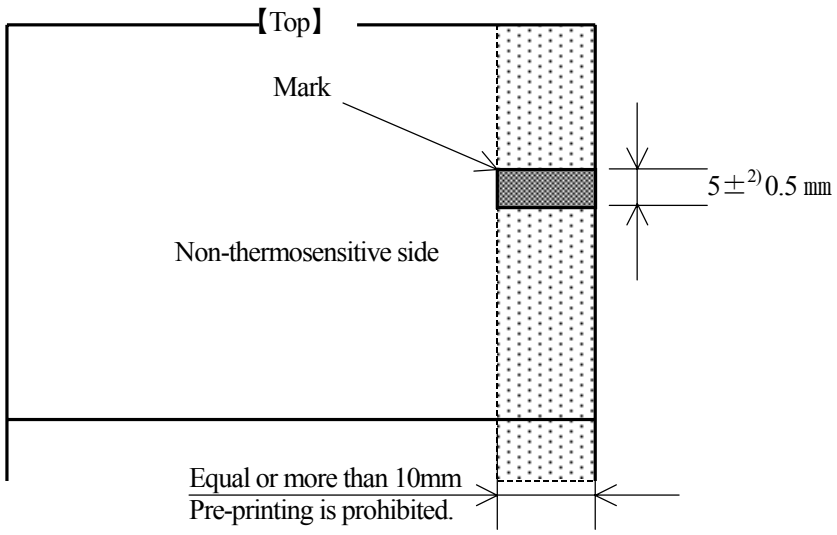
(3) Number of boxes to be piled up: If it is placed horizontally, up to three boxes can be piled up in maximum.

(4) Indication: The model and quantity is plated on the outside of the packing box.

6. Pre-printing specifications

6-1 Position of the detecting mark

When printing, the mark should be the width equal to or more than 5 ± 2)0.5mm x10mm and printed on the thermosensitive side, as shown below.



6-2 Pre-printing the positioning mark

The positioning mark should be printed as follows: the color is black, the reflection rate is equal or less than 7 % and PCS is equal or more than 0.9 for the deepness.
To eliminate the light and shade, use the oil-base ink for printing the mark. To improve the PCS value, overprinting is recommended.
The measuring apparatus and value for deepness are described below.

- PCS measuring apparatus: GretagMacbeth reflection type densitometer PCM-II (Filter used: D-range of 900nm)

6-3 Prohibiting the pre-printing

Pre-printing in the range where the mark is detected (10 mm from the right edge) is prohibited; however, if pre-printing is required for absolute necessity, select the used ink so that the reflection rate is equal or more than 80% within the range where the wavelength band of the photo-interrupter is used (700-1000 nm).

6-4 Cautions on pre-printing

The thermosensitive paper has different characteristics from those of general printed paper and non-carbon paper. In the print process, pay attention to the followings.

A Printing method

Print the thermosensitive paper by the UV print method because the drying characteristics of the ink is bad.

B Ink to be used

(1) Select the ink that does not give unfavorable effects to the thermal printer, such as adhesion of work-up, wear of the head, and sticking.

(2) The quantity of the ions, Na and K in the ink should be respectively equal to or less than 50ppm. In addition, the quantity of ion of Cl should be equal to or less than 100ppm.

Recommended ink: RNC type by T&K TOKA

(3) The surface strength of the thermosensitive layer is weaker than that of the general printed paper; therefore, pay attention to tacks of the ink. Set the tack of the ink to about 6.0 for the general thermosensitive paper, to the same level as the non-carbon paper for the high saving type thermosensitive paper. However, when reducing the tuck with a reducer, the quantity of addition should be equal to or less than 5%. (Failure to do so, the drying characteristics will be worse.)

(4) Do not introduce too much quantity of the ink. Excessive amount of the ink may cause defectiveness of the printing color development and sticking of the thermal printer.

(5) Materials used for the ink should be heat-resistant and have cooling effects. The same ink should be used for the non-thermosensitive paper side.

(6) After the printing has been completed, confirm if the ink is contacted to the paper. Furthermore, the UV ink is generally weak to the water; therefore, care should be taken for controlling the dampening solution.

(7) Make sure that transcription and blocking of the ink do not occur.

(8) Do not remove the pre-printing with water or alcohol.

C Dampening solution

(1) The thermosensitive paper is water-repellent; therefore, care should be taken for controlling the dampening solution.

(2) Excessive amount of IPA of the dampening solution may cause color development fog; therefore, the amount should be equal to or less than 5% for the general thermosensitive paper, equal to or less than 10% for the high saving type thermosensitive paper, respectively.

D Others

(1) When a large number of UV lamps are used, care should be taken for paper shrinkage due to heat (the flow direction, the width direction) and the color development fog.

(2) The paper surface is quite smooth; therefore, set the rolling pressure to be strong.

(3) When increasing in the PCS value of the positioning mark, perform the overprinting.

(4) Sticking may occur in some pre-printing results; therefore, be sure to perform evaluation and confirmation with the actually operated unit.

7. Revision history table

MODEL:FTP-639MCL354

SPECIFICATION REVISION	PRODUCT REVISION	ITEM／CHANGE-CONTENTS	APPLIED-TIME	A REMARKS COLUMN
ＲＥＶ．０	０１Ａ			
REV.02	01A	10, 14, 16, 19, 24 page change		

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