THERMAL PRINTER FTP-627MCL401 PRODUCT SPECIFICATION ⑥ ~~{Provisional}~~

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Rev.	Date	Design	Inspection	Changes made
05	03.06.24	Tsuchiya		Reexamination, such as notes Mori
07	04.06.21	Tsuchiya		⑧mark addition (6,15p) Mori
06	03.11.25	Tsuchiya		Complete reexamination(Page addition) Mori
Design	02.12.15	Mori	Inspect.	Approv. Watanabe

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06	03.11.25			⑥Mark change

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2. 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－627MCL401 List of materials

No.	Name of components	Material
1	Printer frame	Zinc alloy
2	Gear cover	POM resin
3	Rubber roller	Silicone rubber + SUS
4	Gear relation (a platen gear, drive part gear)	POM resin
5	Pulse motor (Paper conveyance, a cutter drive)	SPCC + iron + copper wire
6	Paper guide	PC resin
7	Thermal head	Aluminum + ceramic substrate
8	Head pressuring spring Fixed edge pressurization spring	SUS
9	FPC	PI, copper leaf, solder plating
10	The lock nail of a platen, a shaft	SUS
11	Cutter frame	PC
⑤ 12	Cutter reinforcement board	SUS

【Abbreviations for the materials used】

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

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05	030624			⑤Part addition of a material list
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3 Product design, warnings and cautions for using the product

3-1 Notes on the handling of a 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.

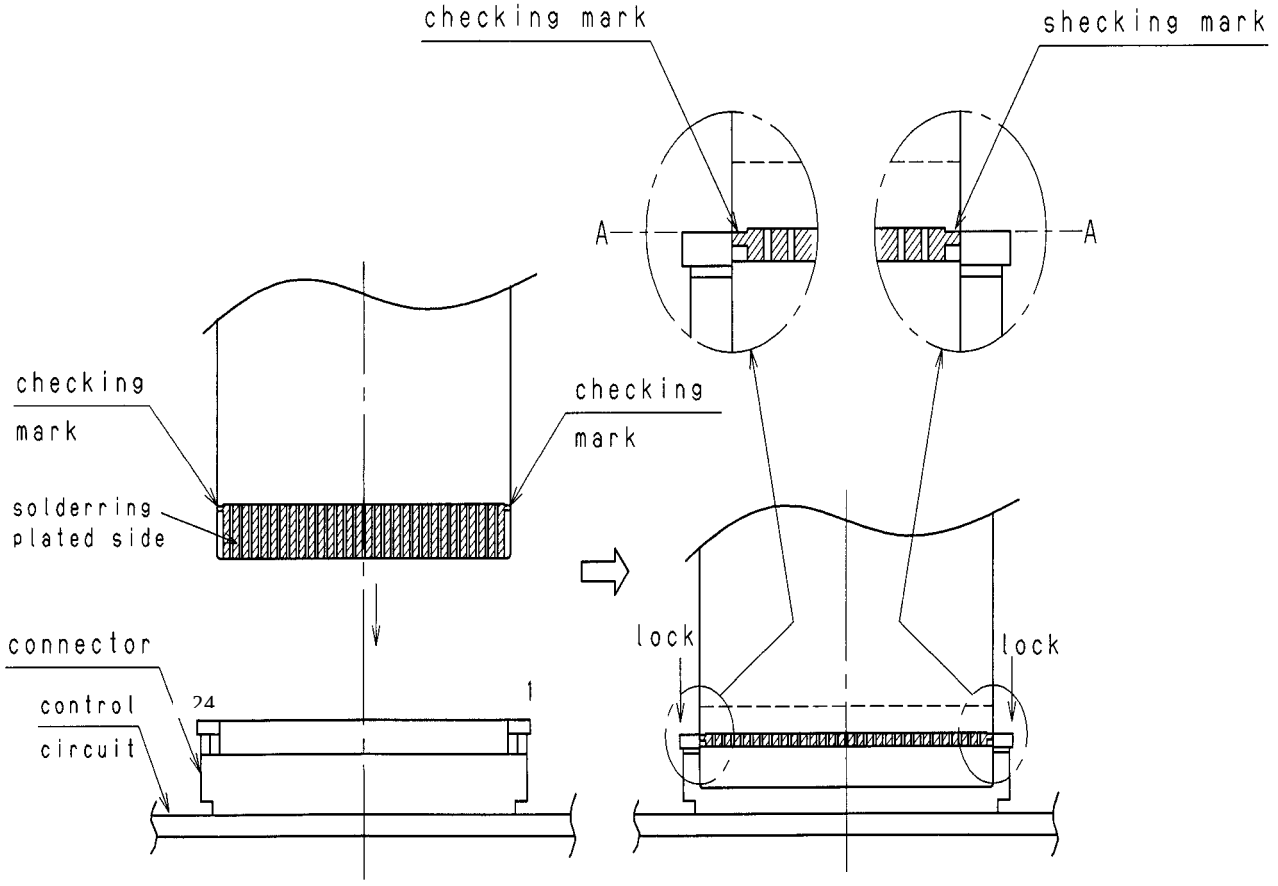
(2) Be careful enough not to attach a crack, dirt, etc. to a rubber part, a platen gear, an axle hole part of a platen, etc. in the case of the attachment to a case of a movable edge unit. (Don't attach oil and fats and a foreign substance especially to a rubber part)

(3) Please do not touch a movable edge and a fixed edge empty-handed. Moreover, be careful not to apply hard things, such as a driver. The paper cut characteristic may be affected.

(4) Never attempt to touch the thermal head surface with bear hands. Attaching any oil or grease such as oils from palms on the heating element part may be shorten the lifetime of the thermal head. In case that any oil and grease or foreign materials are attached on it, perform the cleaning immediately. (Section 2-4 describes the cleaning.) In addition, pay attention not to hit it with something hard such as a driver.

(5) Since this printer ships a main part and a movable edge unit by the set, I wish use by the set as much as possible.

(6) 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.



(7) 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.

(8) 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).

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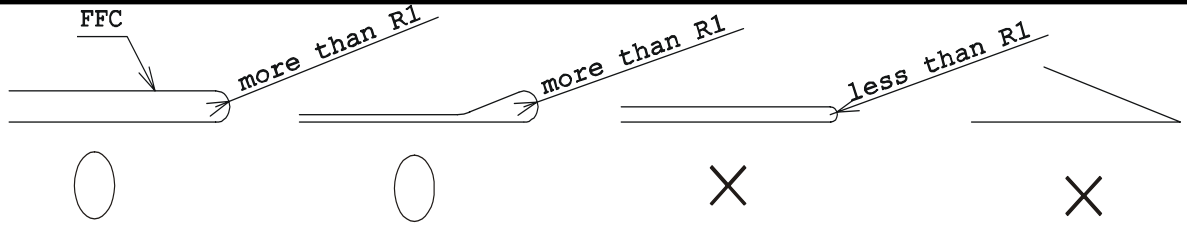

(9) In order to have a bad influence on printing quality, please do not pull by hand etc. the paper under printing operation discharged from the printer.

(10)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.

(11) When any paper is not set at the printer, be sure to separate the head and the platen. 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.

(12) 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.

(13) Never attempt to any back feeding action of the paper.

(14) The printing side side of rolled paper should use an outside volume. When a printing side side is an inner volume, the paper discharged from the printer may contact a case etc. and may cause jam.

(15) The optical sensor (infrared photograph sensor) is used for paper detection and the movable edge of this printer. Therefore, since this sensor may be influenced of visitor light, please check enough that a sensor does not incorrect-operate under actual environment. When you incorrect-operate, please give me care/measure with a cover board etc. so that outdoor daylight may not enter.

(16) If a printer is operated near pocket apparatus, radio, etc. , there is a possibility that a receiving obstacle will occur. When pocket apparatus, radio, etc. are in near, please check that a receiving obstacle does not occur.。
In addition, please give me care/measures, such as FG strengthening and a shield, at the time of receiving obstacle generating.

(17) If a printer is operated near pocket apparatus (cellular phone) etc. , the sensor of paper detection and movable edge initialization may incorrect-operate, and will leave. When it is apparatus pocket (cellular phone) in near, I ask you for an evaluation check enough.

3-2 **Casing design**

□About a movable edge unit attachment part

(1)Refer to Attached Paper, Section 4-5(4) "movable edge attachment part form figure" for attachment of the platen part. Please fix attachment by two flat head machine screw of m2 and two fokks. If it is used with any different size from the recommended ones, it may cause uneven printing, unfavorable removal of the platen, and troubles such as damages due to the lack of the strength; therefore, be sure to conform with the recommendation.

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(2)Please cover the connection gear part of a movable edge unit part with a cover etc. not to become unreserved.

(3) Please install the cover on the case side so that neither garbage nor the foreign body may enter the PLATEN open and close detection switch of the printer in the gear box as much as possible. When garbage and the foreign body, etc. enter, it causes the breakdown.

⑦ (4) In order to attain stabilization of the opening-and-closing switch of a paper cut and a movable edge unit, when you attach a printer unit in equipment, a movable edge unit should become the printer bottom and parallel. In addition, please give the attachment range as 0±1 degree. (Refer to 4-5 figure) When used out of the above-mentioned range, paper cutting and switch operation may become unstable.

□About a movable edge unit part attachment cover and the position relation of a fulcrum

(1) Refer to the figure in Section 3-8(1) for the fulcrum position of the cover. Make sure to set so that the position is surely above more than 10° from the centerline of the platen (the recommended angle value is 11°±1°). In addition, the recommendation value of the X-direction dimension should be within a range of 50～200mm. If the printer is used with different values from the recommended angle and X-direction dimension, contact us in advance.

(2) The fulcrum of the cover should be parallel to the platen of this printer as much as possible (make sure to set the position of the fulcrum so that the standard line of this printer S is the reference when setting the dimension).

(3) When having set the platen in the printer, pay attention if any load is applied to the platen part due to effects of the twisted cover or deviation of the dimensions. If any load is applied to the platen part, it will give unfavorable effects to the printing quality, the paper feeding property, and the lifetime. Confirm that the bearing does not float form the bearing part of the printer cabinet when the platen part is closed.

(4) Materials of the cover should have high strength, high durability, and high torsional strength as the ones for the cover (equivalent to PC or PC+ABS). Power with a movable edge unit part impossible for should not be added by distortion of a cover. Trouble may appear in the home positioning of a movable edge, and it leaves.

(5) To improve the detachability of the platen, attach guides for preventing the strike slip on the both sides of the cover as well as the shape of the cover should be torsional-resistant. When removing the platen, carefully check that any platen gear is lacked or deformed because the platen gear contacts to the printer. Damages to the platen gear will give unfavorable effects to the printing quality and the paper feeding property.

(6) The paper feeding motor (a pulse motor) of the printer and the thermal head may have the hot temperature, depending on the running time. When designing the casing, consider the heat radiation property. Be sure to design the casing so that no one is allowed to directly touch with bear hands such as adopting a cover structure, etc.

(7) The platen of a movable edge unit part has structure which does not have play as much as possible in order to keep constant the backlash (crevice between a gear and a gear) of a gear. In order to absorb attachment of the main part of a printer, and the attachment variation of a platen unit part, please give the fulcrum of the case where a movable edge unit part is attached, as structure which can move to a printer attachment side and a horizontal direction by oblong hole. In addition, please set up the amount of movements in consideration of the attachment variation of a printer part and a platen unit part. (About ±0.5 movement is usually required) However, a printer attachment side and a perpendicular direction should not have play as much as possible. If there is much play, the contact angle of a fixed edge and a movable edge may change, and paper cutting may be affected.

□Lock mechanism of the casing

With the lock nail by the side of the main part of a printer, it is the mechanism in which the plastic ten axis both sides of a movable edge unit part are held. However, when the following item is taken into consideration, we recommend you that a case side also has a lock mechanism held.

(1) When using with a portable terminal, the casing may be opened and the rolled paper inside may jump out when it is dropped or moved (particularly, while it is being carried).

(2) There is a possibility that the lock nail which holds the platen axis by the side of the main part of a printer by fall etc. may change.

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☐Installing the printer

(1) When installing the printer, fix the edge part with a hook at two place and fix the rear part with screws of M2 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 M2 at two places (refer to the figure of the installation dimension). Pay attention not to apply any extra force to the printer main body and 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) When 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 Fig (4) in Section 3-8. 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) The paper detection sensor is provided on the main body side of the printer; therefore, be sure to design the paper holder so that the printing paper surely contact to the sensor (refer to Section 3-8 (3)). Please avoid use in the direction (3-8 (3) C type of a figure), which separates from a paper sensor.

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

(5) 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.

(6) Please give the back tension of rolled paper as below 0.49N (50g). And please give as below 0.98N (100g) including the inertia power of rolled paper. In addition, since a back tension becomes high, please avoid the installation method like E type of 3-8 clause (3) as much as possible. When carrying out, in order to reduce the load of a paper, please prepare a load reduction guide etc. in a paper insertion part, and use it below by the above-mentioned back tension. When a back tension is high, the life of printing quality and a drive system may be influenced.

☐About the closing method of a case, and form

(1) When shutting a movable edge unit part, in order to prevent a single-sided insertion lock, please push the central part of the case and shut a platen unit part certainly(Until it is locked of both sides). Therefore, it recommends that I have the portion pushed with a finger specified in the case central part by the mark etc.

(2) In case you close a movable edge unit part, please set the gear attached to the both sides of a platen not to hit other parts (especially side wall of a printer etc.). Moreover, the case where a platen unit part is attached should lessen play of a transverse direction as much as possible. When a shock joins the gear of the both sides of a platen, there is a possibility that a gear may be damaged.

☐ Others

(1) 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.

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

(3) 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.

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3-3 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 recommends the outside rolling.

(4) Use the rolled paper of which inner diameter should be equal or greater than φ10 (the diameter when there is not core).

3-4 About ⑥~~head~~ cleaning (Please carry out after power supply cutting.)

About head cleaning

Adhesion of dusts of the paper and foreign materials may deteriorate the lifetime of the head and platen. When they adhere, clean the head according to the following procedures.

(1)Take measures against the static electricity such as Disposable Wrist Strap for the work.

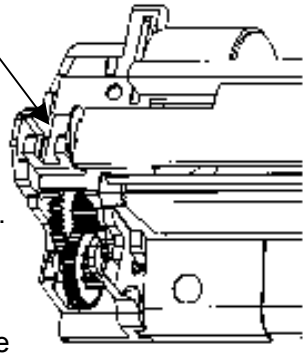
(2)Cleaning should be done with the cover opened and the platen part separated from the head.

Note) Do not hit the head surface with anything hard.

(3)Wipe off the heating element part of the head surface lightly with cotton swabs which Athyl-alcohol is applied. After Athyl-alcohol has completely been dried, set the platen and perform the action check.

Note) Do not use any thing that may destroy the heating element, such as sandpaper. Do not add any unnecessary force to the thermal head.

Movable edge initialization sensor



About cleaning of a movable edge initialization sensor

The powder of paper etc. is generated by the time of a paper cut, it adheres to a movable edge initialization sensor, and the incorrect recognition by voltage descent may be caused. When they adhere, please clean a sensor according to the following procedure.

(1)Take measures against the static electricity such as Disposable Wrist Strap for the work.

(2) Please wipe off the inside of a sensor lightly with the cotton swab which applied ethyl alcohol. Please set, after ethyl alcohol gets dry completely after that, and perform a check of operation.

3-5 Storing

(1) When storing the printer for the long-term (equal or longer than six months at the room temperature) store it with the platen separated from the thermal head. 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. Please use the printer after confirming the printer drives accustoming in that case and there is no problem in the print quality.

(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.

3-6 **About warning**

(1) A motor, a head, and a circumference component may become high temperature by continuation operation. Please warn against carrying out a direct feeler and carrying out a burn etc. Furthermore, it recommends sticking a warning label on the position which can be checked enough.

(Example)

(2) End face of the fixed edge of loading in the printer upper part, the movable edge inside a movable edge unit, and metal parts is very sharp. Please warn against being injured by carrying out a feeler. Furthermore, the appearance cover, which cannot carry out a feeler as much as possible, is prepared, and it recommends sticking a warning label on the position, which can be checked enough.

(Example)

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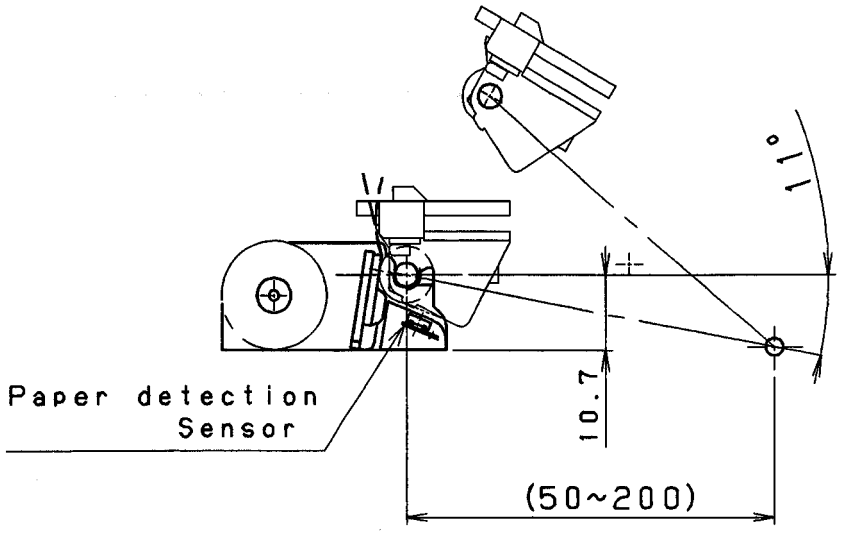
3-7 Others

(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.
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.

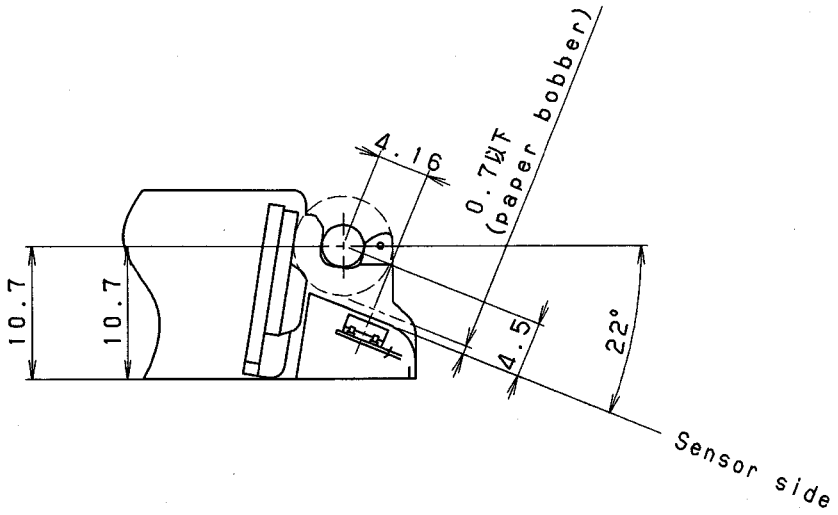
3-8 Appending data

(1) Movable edge unit part attachment case fulcrum position



＊Please set angles also including assembly tolerance of a fulcrum as 10 degrees or more.

(2) Paper detection sensor position detail view



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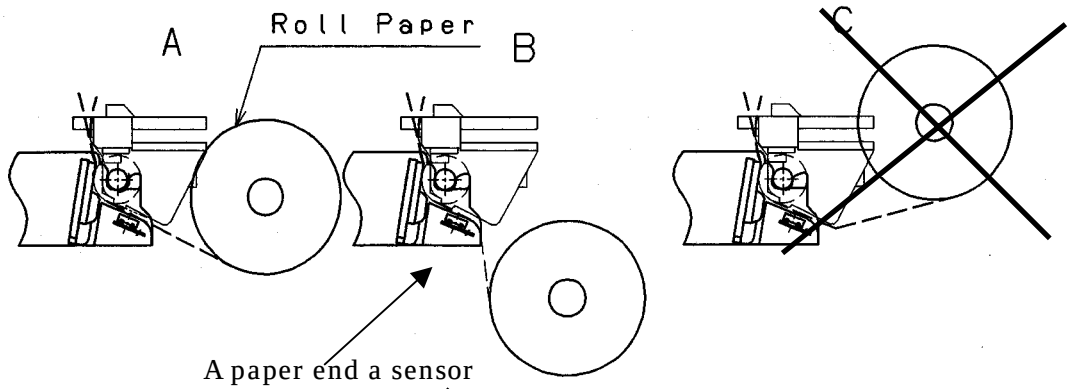
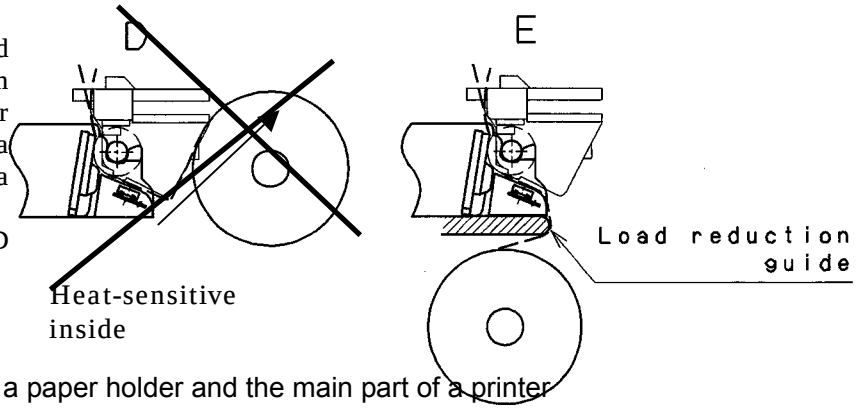
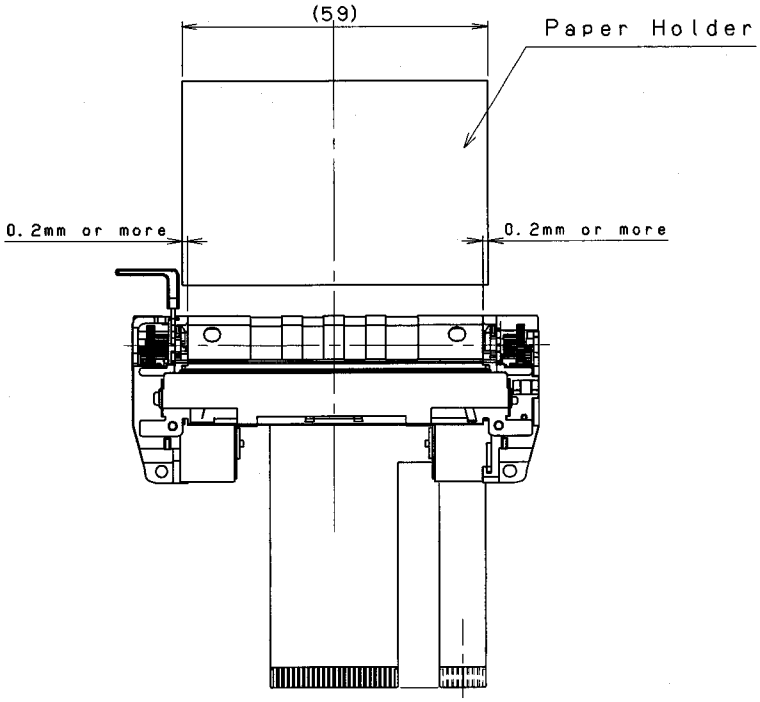
(3) A rolled paper position and a route



*A type is recommended.
*When use is carried out by B and E type, I aim at load reduction of the rolled paper in a printer entrance, and please give me a back tension within a specification value.
*Please avoid use with C and D type.



(4) Position relation between a paper holder and the main part of a printer



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4 Specifications

4－1 Application

This specification is applies to FTP-627MCL401.
Standards by this specification are satisfied by standard interface boards described below or LSI for driving and reference circuits.

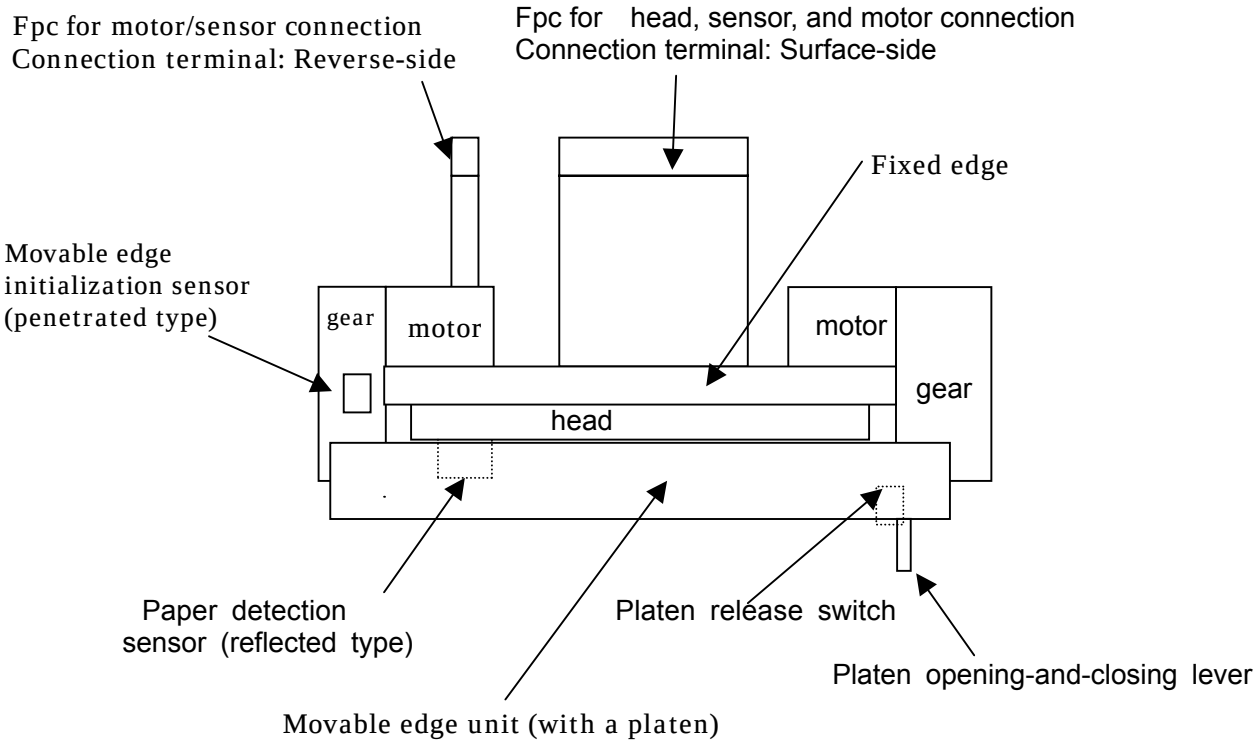
(1) Standard interface board: FTP-627DCL2＊＊
(2) LSI for driving : FTP-627CU＊＊＊

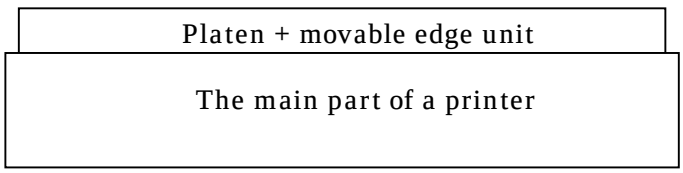
4－2 Overview

This printer is a small and lightweight printer with an auto cutter which carried the line dot head with a resolution of 8 dot/mm.
In consideration of the insertion nature of a paper, a platen unit part is separated from the main part of a printer by one action.

4－3 Structure

The composition figure of this printer (mechanism part) is shown.





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4－4 **Standard specifications**

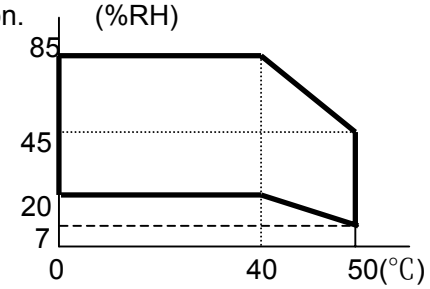
Item		Specifications
Printing specifications	Printing method	Direct thermosensitive method
	Valid printing width	54mm
	Dot structure	432 dots /line
	Dot pitch	0.125mm (8dots /line)
	Printing density	OD value greater than 0.8, in use of the specified paper under our standard printing conditions. ※Measuring device: Sakura densitometer, PDA-65, by Konika Co., Ltd.
	Printing speed	100mm/s (800dotline／S) 【At 24V drive, Standard paper(PD150R equivalent), Room temperature, High speed mode】
Specified paper for recording *1	Highly sensitive paper	TF50KS-E4 (width: 58.0 $^{+0}_{-1}$mm), Nippon Paper
	Standard paper	TF60KS-E (width: 58.0 $^{+0}_{-1}$mm), Nippon Paper
		PD150R (width: 58.0 $^{+0}_{-1}$mm), Oji Paper
	Middle preservation paper	TP60KS-F1 (width: 58.0 $^{+0}_{-1}$mm), Nippon Paper
		P220VBB-1 (width: 58.0 $^{+0}_{-1}$mm), Mitsubishi Paper
		PD170R (width: 58.0 $^{+0}_{-1}$mm), Oji Paper
	Long-term preservation paper	TP50KJ-R (width: 58.0 $^{+0}_{-1}$mm), Nippon Paper
		AFP-235 (width: 58.0 $^{+0}_{-1}$mm), Mitsubishi Paper
		PD160R-N (width: 58.0 $^{+0}_{-1}$mm), Oji Paper
		HA220AA (width: 58.0 $^{+0}_{-1}$mm), Mitsubishi Paper
Paper feeding method		Friction feeding (1 dot line/4 pulses, bi-polar 1-2 phase excitation)
Paper feeding precision		±5% At fixed-speed feed with the back-tension 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
	Movable edge Initialization	Photograph sensor (penetrated type)
⑤External dimensions (W×D×H)		81.2mm±1×42.2±1mm×21.8±0.5mm (excluding FPC) Refer to the outer dimension drawing in section 4-5 for details
Weight		97g
Average resistance of the thermal head		1500Ω ±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.

Item			Specifications
Drive power	Head	For printing	Voltage：DC24V±5% Current: Approx2.2A(25 ℃、Rav=1500Ω、24V、 ⑥ ~~The rate of printing 25%~~) (concurrently electrified with 144 dots)
		For logic	Voltage：DC 3.3～5.25V Current： 0.1A max
	Motor drive		Voltage：DC24V±5% Current: 1.0A max(It calls at the standard constant current drive circuit of our company.)
Environmental characteristics	Operating temperature and humidity *1		＋5℃～40℃、20～85%RH The figure below shows humidity. 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. (At the time of paper cutting TBD)
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 temperature (2H)～65℃、85%RH(2H)～Room temperature(2H)
Life	Head	Electric life	5×10^7 pulses (under our standard printing conditions.)
		Wear life	Paper feed length, 50 km (printing rate 12.5% max.)
	Platen open 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.
	Cutter Life (target value)		They are 500,000 cuts (cutting synchronization: 20cut or less/1minute) with a standard paper.
Printing start position on the left edge			2±1mm (by paper width 57.5 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：It is a printing concentration guarantee range. However, it can operate at 0℃～+50℃. In addition, the relation between temperature and humidity is based on the following figure.

*2：Printing specification shall be fulfilled after an examination.



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06	031125			⑥mark Clerical error correction

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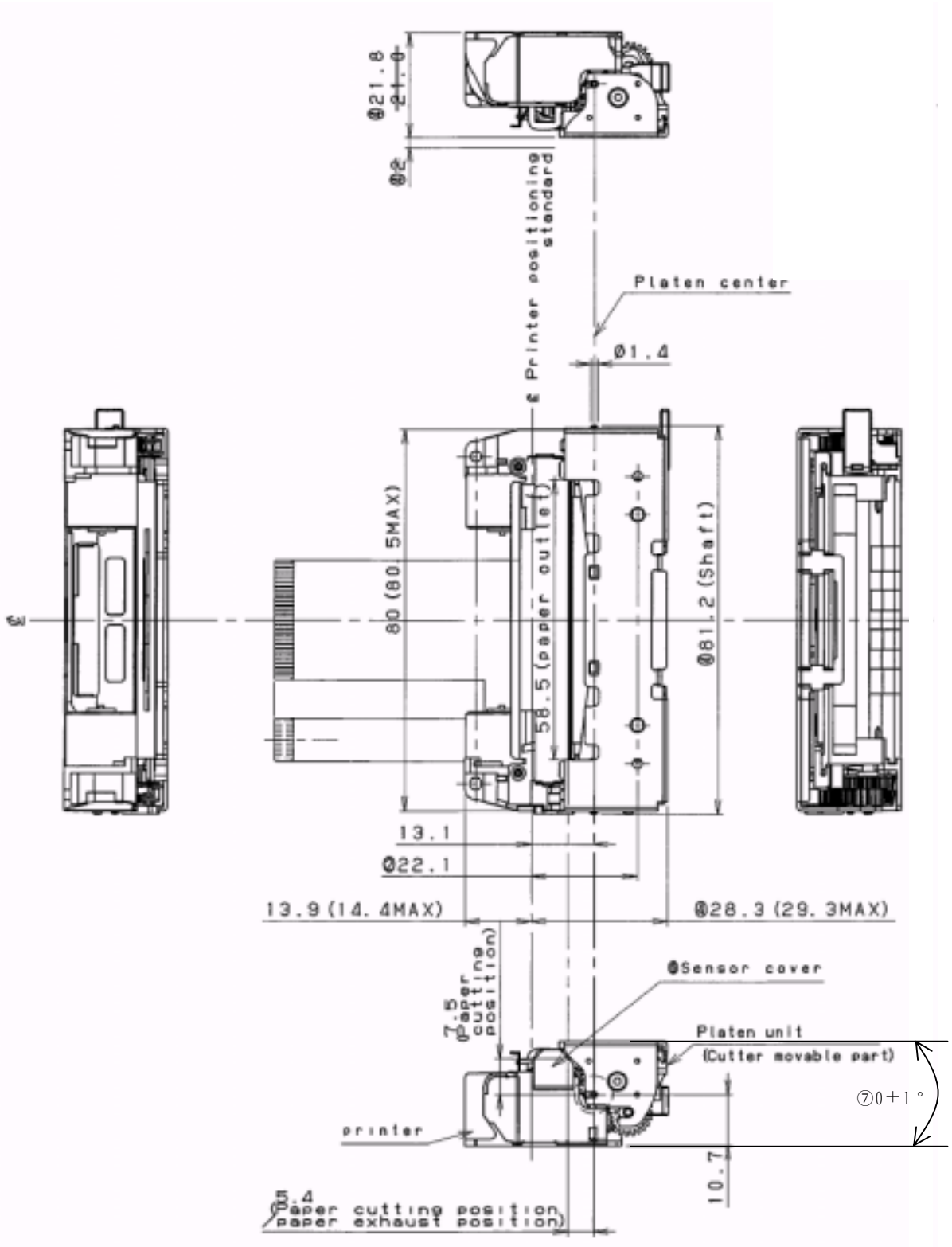
4－5. **An outside size figure and an attachment position**

(1) Outline size (movable edge unit part set state)



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Rev.	Date	Design	Inspection	Changes made
07	040621			⑦mark Addition
06	031125			⑥mark Addition
04	030326			④mark form change
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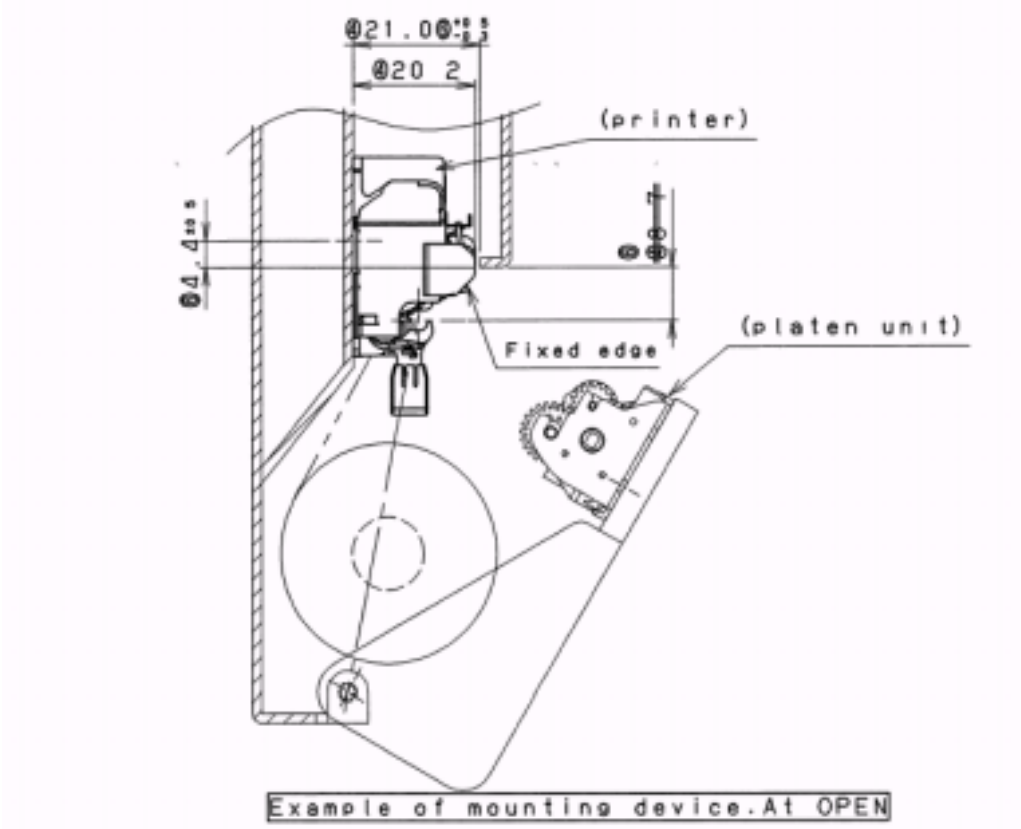
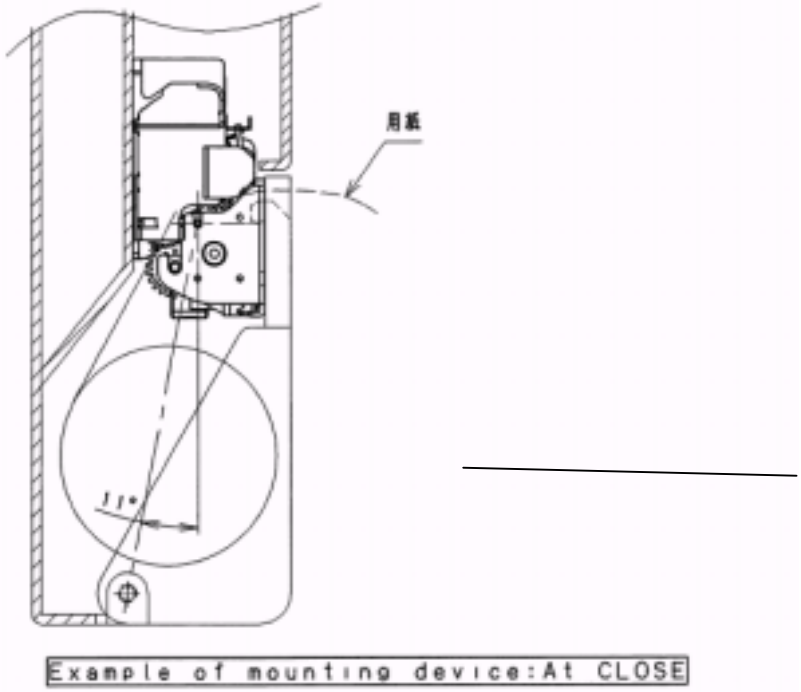
(2) The attachment reference figure by the side of equipment



Example of mounting device.At OPEN



Example of mounting device:At CLOSE

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06	031125			⑥external form Change
04	030326			④mark size addition

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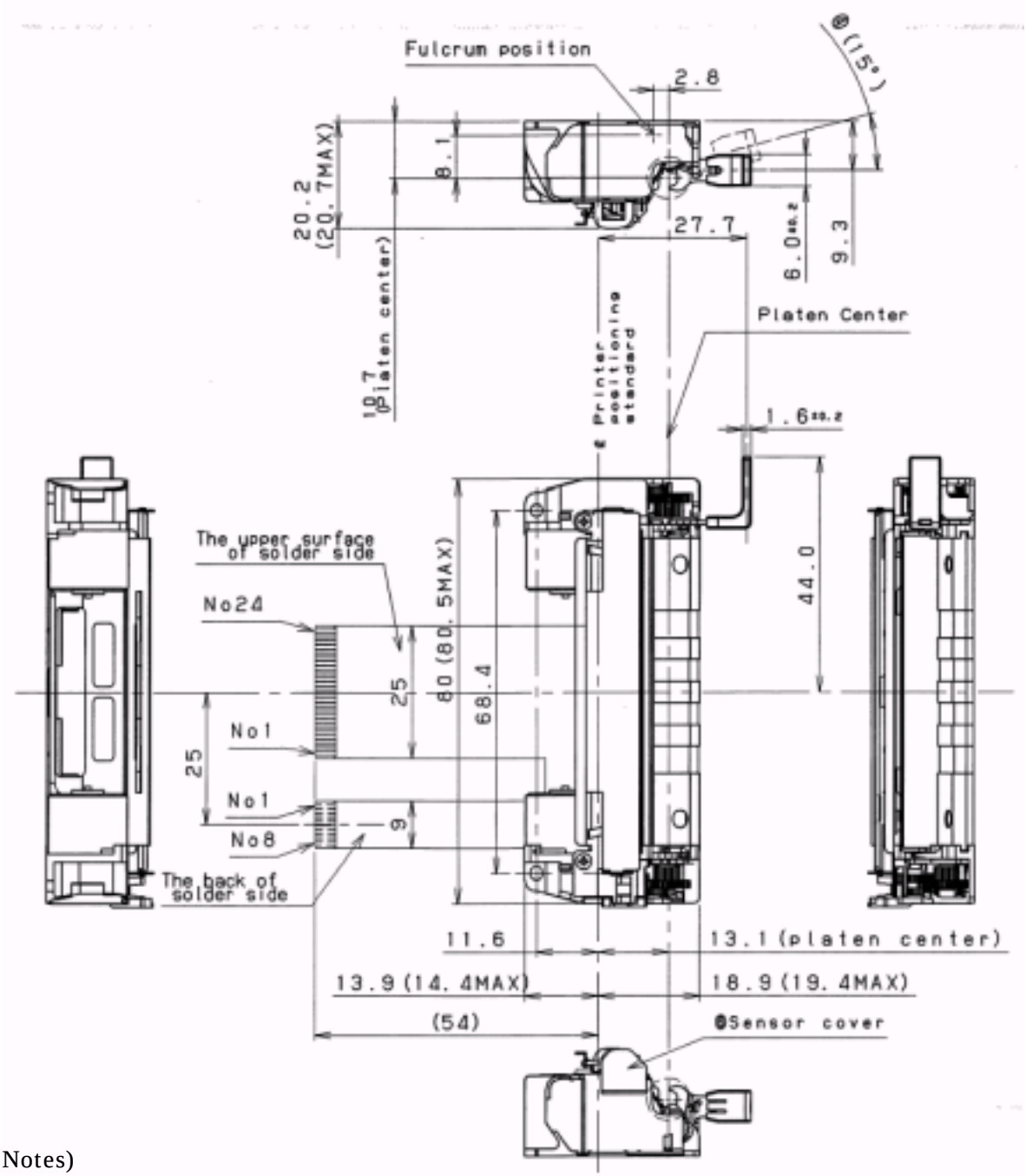
(3) Printer outside type size



Notes)

1. An outside size wishes a case design in consideration of the case where it becomes a MAX size.
2. 2. Please fix attachment to two M2 screws and the front by two hooks.
   (An attachment size is based on the following page)

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Rev.	Date	Design	Inspection	Changes made
06	031125			⑥external form Change
04	030326			④mark size change

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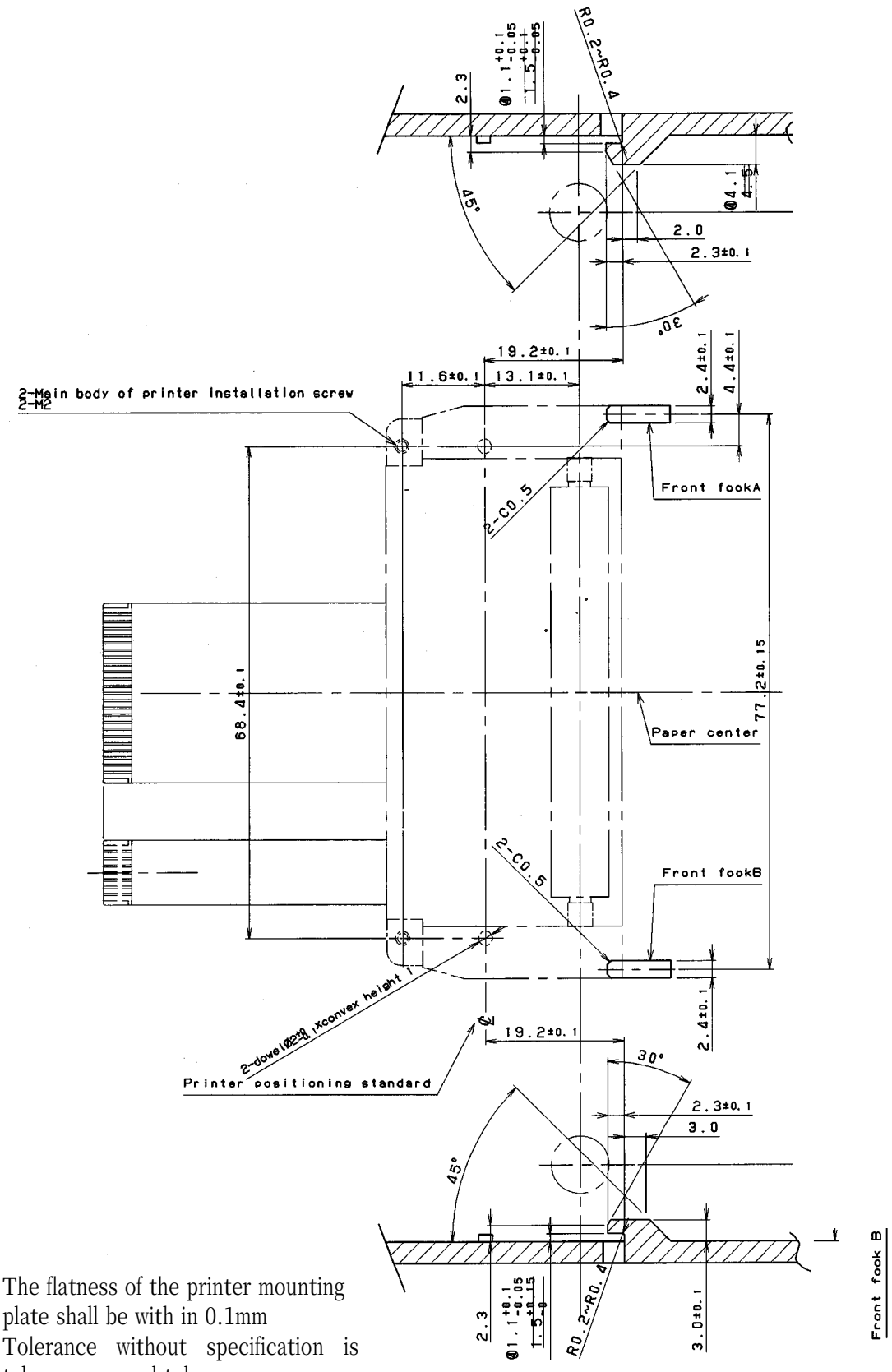
(4) Printer part attachment size figure



Notes)

1. The flatness of the printer mounting plate shall be with in 0.1mm
2. Tolerance without specification is taken as general tolerance.
3. mounting screw(2-M2) is contact the frame ground.

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04	030326			④mark size clerical error correction

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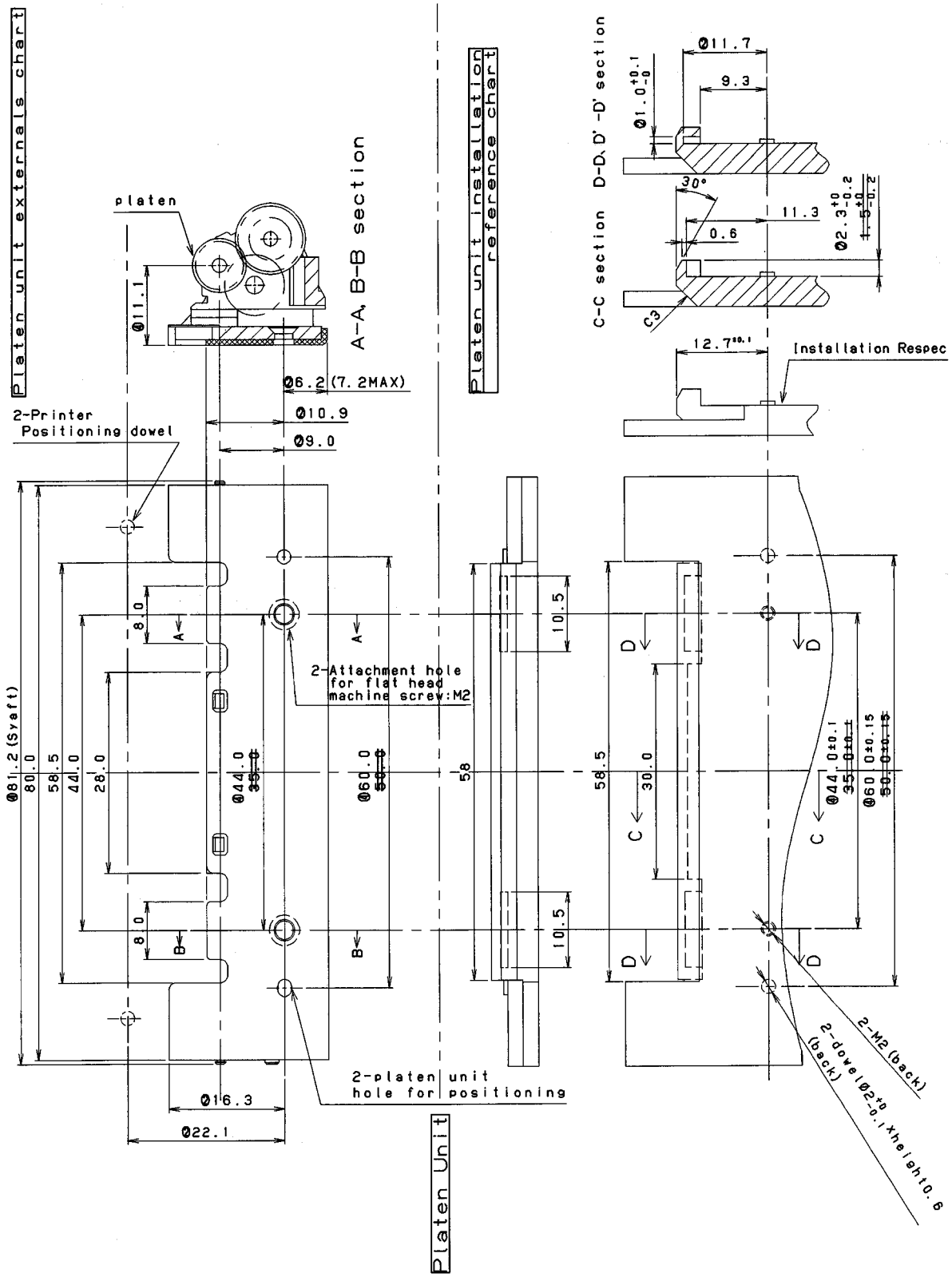
(5) Movable edge unit outside type and an attachment size figure



						Name	FTP-627MCL401 SPECIFICATION ⑥ ~~(Provisional)~~	
						Drawing (No.)	Tech Bes F&T-0414	Submit to
04	030326			④mark form change				
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4－6 **Connector (flexible) specifications**

4-6-1. FPC for heads

(1) Connector of the control circuit side
52610－2490 (molex) Equivalent

(2) Pin assignment (flexible) of the printer mechanical side

No.	Symbol	Signal name	
1	PHK	Cathode for photo interrupter	Paper detection sensor
2	VSEN	Paper sensor power	
3	PHE	Emitter for photo interrupter	
4	VH	Head drive power	
5	DI	Data in	
6	STB 2	Strobe 2	
7	STB 3	Strobe 3	
8	Vdd	Logic power	
9	GND	Head ground	
10	GND	Head ground	
11	GND	Head ground	
12	TM	Thermistor	
13	STB 1	Strobe 1	
14	LAT	Data latch	
15	CLK	Clock	
16	VH	Head drive power	
17	VH	Head drive power	
18	SW	Platen switch	Platen release switch
19	SW	Platen switch	
20	MT /A	Excitation signal A	Paper conveyance motor
21	MT /A	Excitation signal A	
22	MT /B	Excitation signal B	
23	MT /B	Excitation signal B	
24	NC	NC	

4-6-2. FPC for cutter drive motors

(1) Circuit side connector
52610－0890 (molex) Equivalent

(2) Printer mechanism side (flexible) terminal arrangement

No.	Symbol	Signal name	
1	VSEN	Home position sensor power	cutter initialization sensor
2	PHE	Emitter for photo interrupter	
3	PHK	Cathode for photo interrupter	
4	MT /A	Excitation signal A	movable edge drive motor
5	MT /A	Excitation signal A	
6	MT /B	Excitation signal B	
7	MT /B	Excitation signal B	
8	NC	NC	

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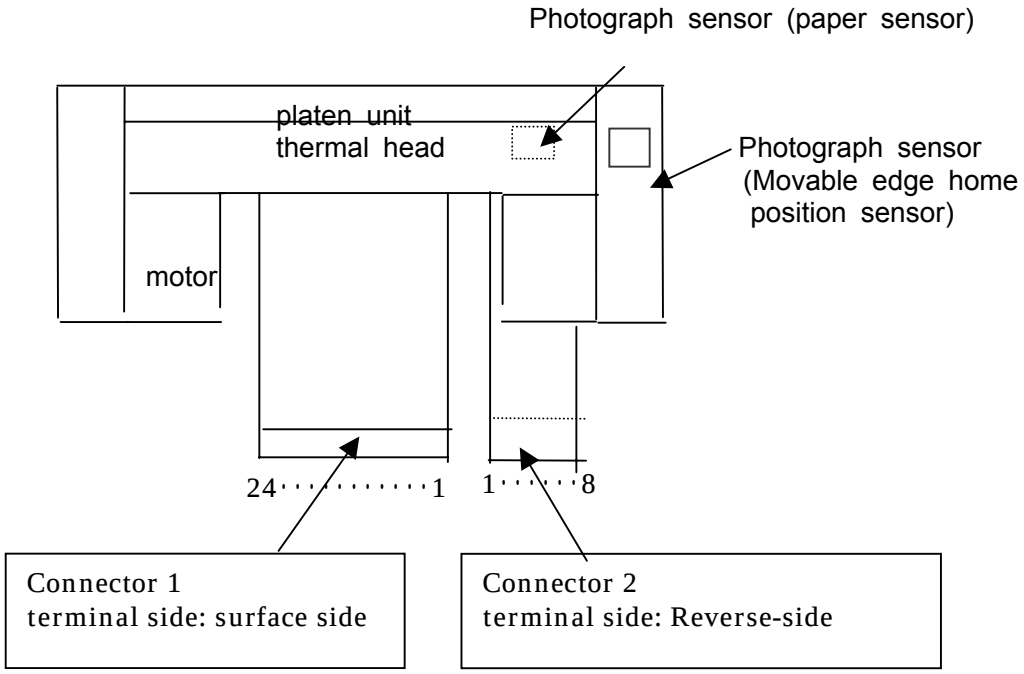

(3) Notes

①Do not plug in and out any flexible connector when the power is being supplied.
②Do not add any unnecessary force to the flexible connector.
③Plugging 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。

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4－7 **Thermal head specifications**

(1) General characteristics

① System: Thermosensitive line dot system
② The total number of dots: 432 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 ：1500Ω± 3%

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

Item	Max. rated value		Unit	Conditions
Printing cycle (S. L. T.)	1.25	2.5	ms/line	Tsub=25℃
Printing energy	0.27	0.45	mj/dot	Maximum at the time of continuation current
Printing power voltage: (VH)	26.4		V	Vp<28V Vp is the peak voltage of VH.
Board temperature	65		℃	Thermistor temperature
Concurrent printing dot number	144		ドット	Notes 1
Logic power voltage: (Vdd)	7		V	Including the peak voltage.
Logic input voltage: (Vin)	-0.5～Vdd+0.5		V	

(3) Electrical property

Electrical characteristics

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

(4) Conditions for electrical actions

Item	Symbol	Electric conditions	Unit	Conditions
Power consumption	Po	0.35	W/dot	Rav＝1500Ω Concurrent applied dot number. With 144 dots
Supply voltage	VH	24.0	V	
Recording cycle	S.L.T	2.5	ms/line	
Energy consumption (Record pulse width) (Note 2)	Eo (Ton)	0.27	mj/dot	5℃
		(0.82)	ms	
		0.22	mj/dot	25℃
		(0.67)	ms	
		0.20	mj/dot	45℃
		(0.61)	ms	
Current consumption	Io	2.2	A	
Division number				

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

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

$Ton = Eo \div Po$

or

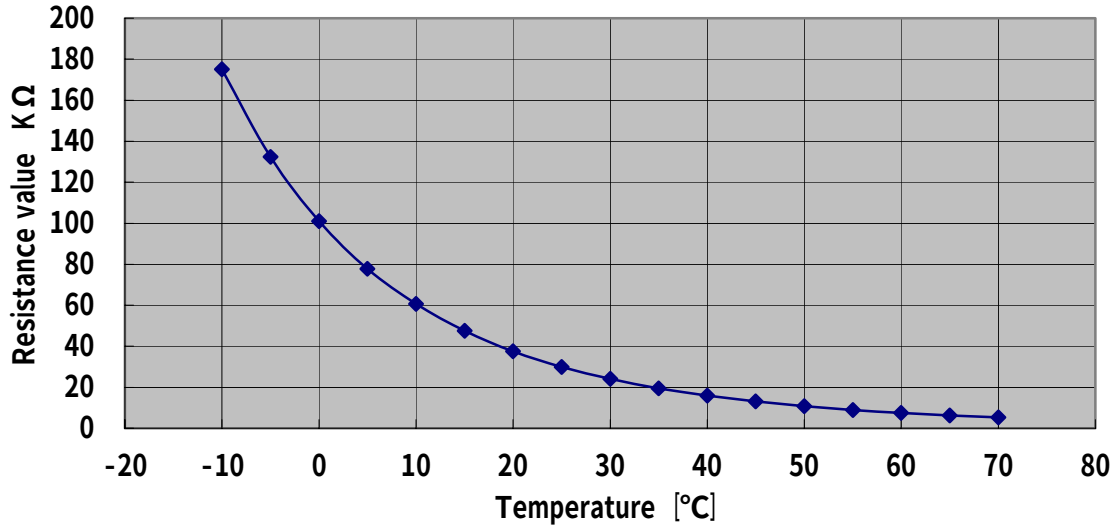
$Po = Eo \div Ton$

$VH = \sqrt{(Po \div Rav)} \times (Rcom \times N + Rav + Ric + Rlead)$

Rav:	Average resistance value	(example)	1500	[Ω]
N:	The number of simultaneous printing dot	(example)	144	[dot]
Rcom:	Common resistance		0.1	[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 GNDof the head side, which should be as close to the head side as possible. In addition, mount a laminating ceramic condenser of 0.1 μF between VDD and GND.

⑦ Please carry out by the following sequence (at the time of power supply ON/OFF) not to do damage to a heating element.
At the time of a power-supply injection: Order of VDD->VH
At the time of power-supply interception: Order of 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.

⑨ Thermal heads are exothermic parts, and if fault occurs mechanically, unusual generation of heat is carried out and they have electricity or a possibility of fuming and igniting. Therefore, in order to secure the safety of a system, please carry out temperature management with a thermistor and intercept a head power supply (VH, VDD) at the time of abnormalities.

Ta＝25±10℃

Item		Symbol	Min.	Standard	Max.	Unit	Conditions etc.
Printing power voltage		VH	—	24.0	26.4	V	
Circuit power voltage		Vdd	3.3	5.00	5.25	V	
Circuit power current		Idd	—	—	18	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 (HIGH-ACTIVE)	H	IIH STB	—	—	0.5	μA	
	L	IIL STB	—	—	-30	μA	
Clock input current (CLK)	H	IIH CLK	—	—	1.5	μA	
	L	IIL CLK	—	—	-1.5	μA	
Latch input current (LAT)	H	IIH LAT	—	—	1.5	μA	
	L	IIL LAT	—	—	-1.5	μA	
Data out (D0)	H	VDOH	—	—	—	V	
	L	VDOL	—	—	—	V	
Output voltage		VOL	—	(1.0)	—	V	A reference value, a driver output part
Clock frequency		fCLK	—	—	4	MHz	Refer to 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	—	—	—	ns	
			—	—	—	ns	
Latch pulse width		tw LAT	100	—	—	ns	
Latch setup time		tsetup LAT	200	—	—	ns	
Latch hold time		thold LAT	50	—	—	ns	
STB setup time		testup STB	300	—	—	ns	
Output delay time		tdo	—	—	10	μs	

Table -1 Electrical property

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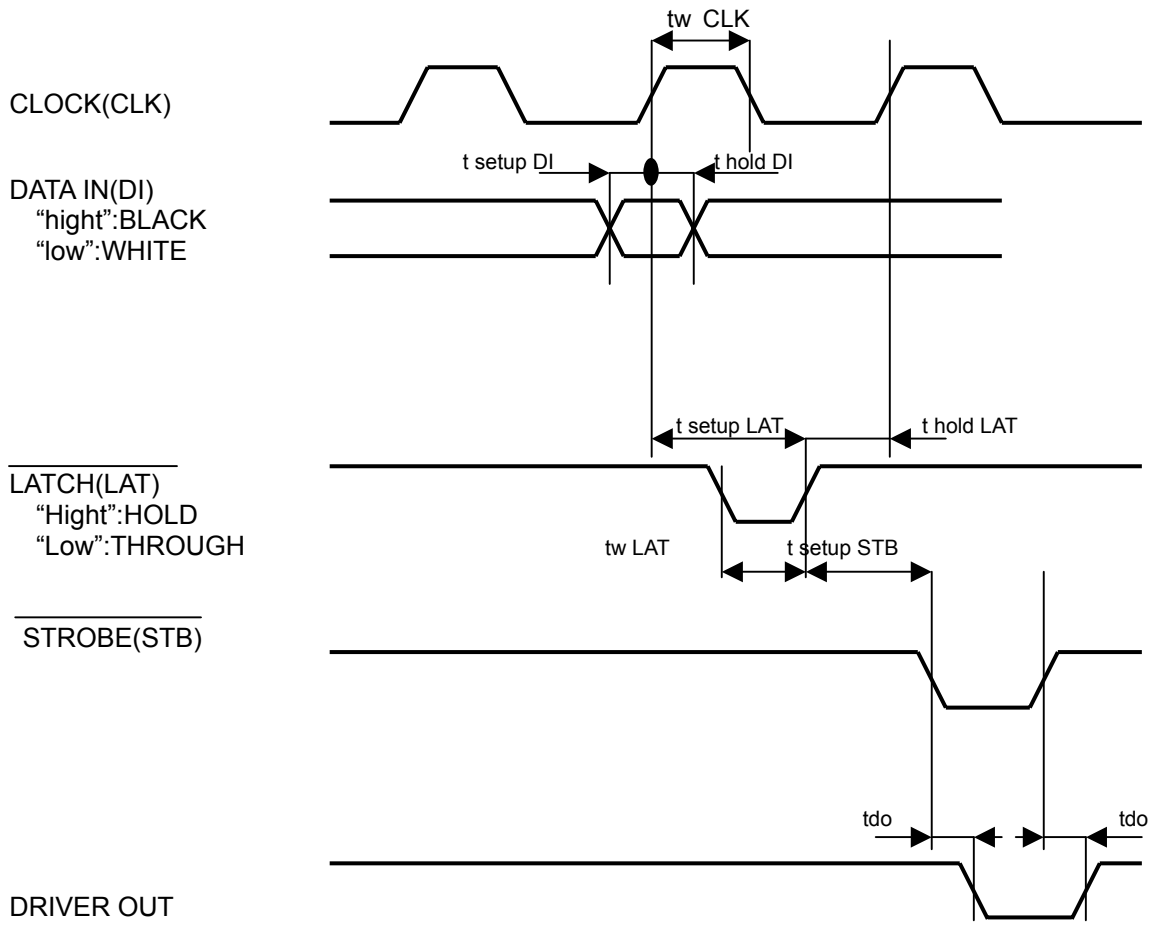
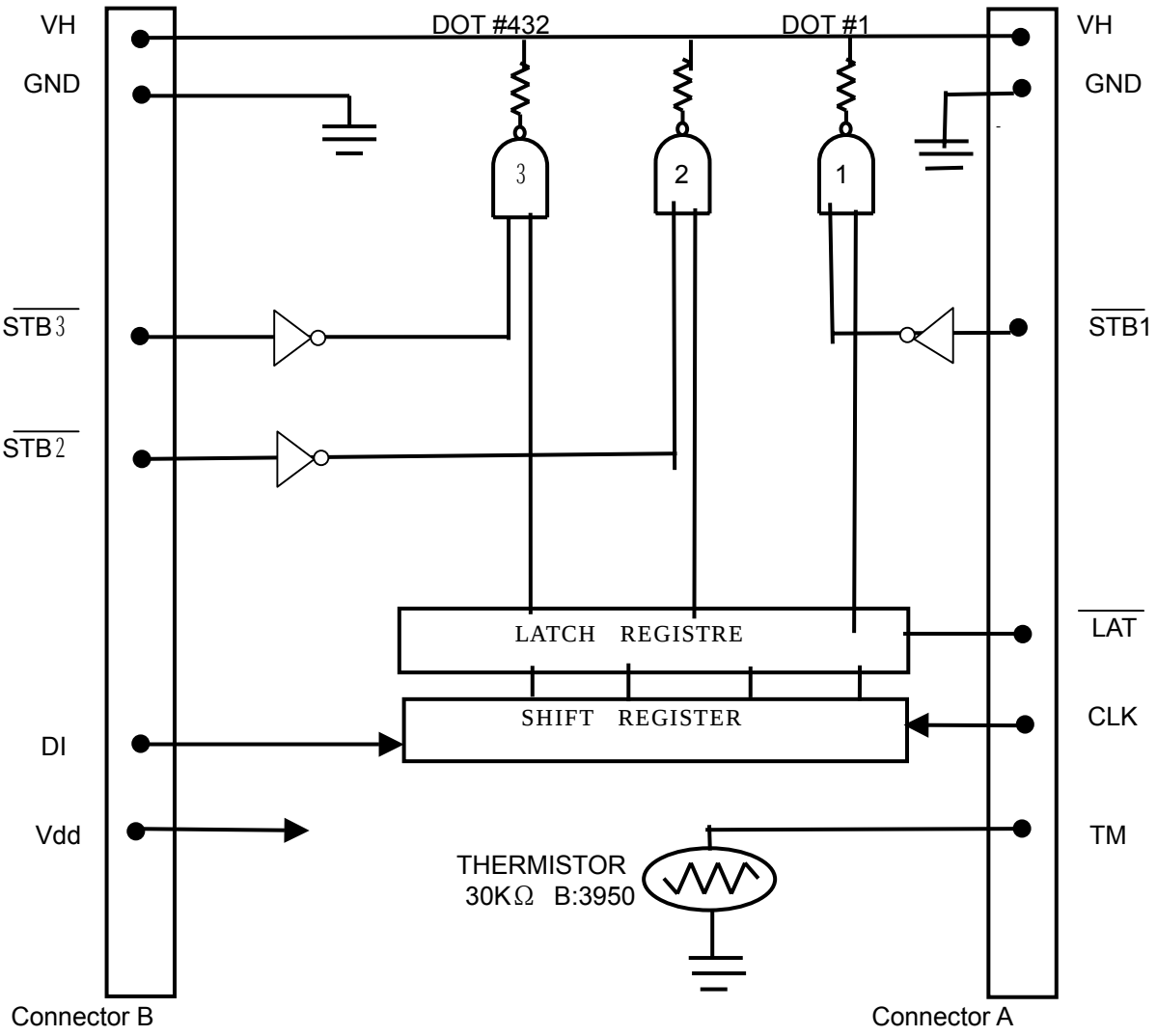
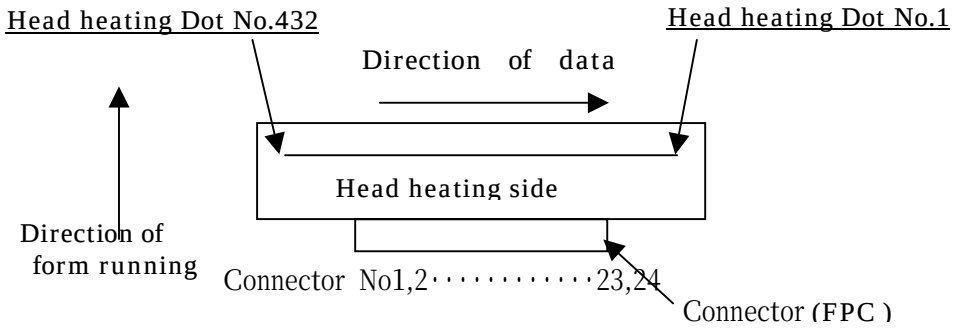


Figure 4 − 1 **Timing chart**



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

Figure 4 － 2 Equivalent circuit



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4－8 **Stepping motor specifications**

1). Paper conveyance motor

(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	10 Ω
Rated voltage	DC 24.0 V±5%

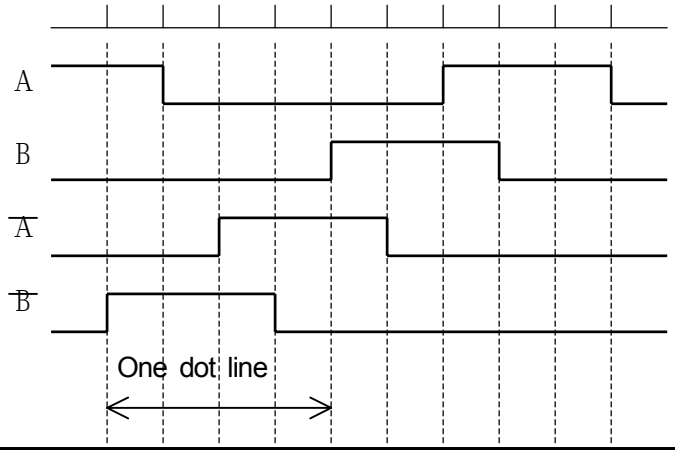
(2) Driving procedures of the stepping motor

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	4	9 degrees /step

③ The reference excitation method is described below.

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

(3) About a bipolar drive

① Drive the motor by the fixed current control for the output torque stabilization to the applied voltage change. This reference excitation current is ⑥376~~500~~mA. 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 Please perform acceleration control at the beginning of a high-speed printing, and motor excitation OFF.

(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 anddamage the head. Do not perform the printing in this state.

⑦ Constant "Backlash" is caused in the deceleration gear. Therefore, if the print is executed from the first dot line because it is delayed <backlash of the gear> to transmit immediately after the motor drive, "Print collapsing" might be generated. Please print after doing the form sending of 12 dot line(1.5mm) (blank) when printing to evade the print collapsing after the following operations are done.

- ＊ Excitation of the motor in case of "OFF"
- ＊ In case of the power OFF
- ＊ When you detach PLATEN
- ＊ When you pull the exhausted form

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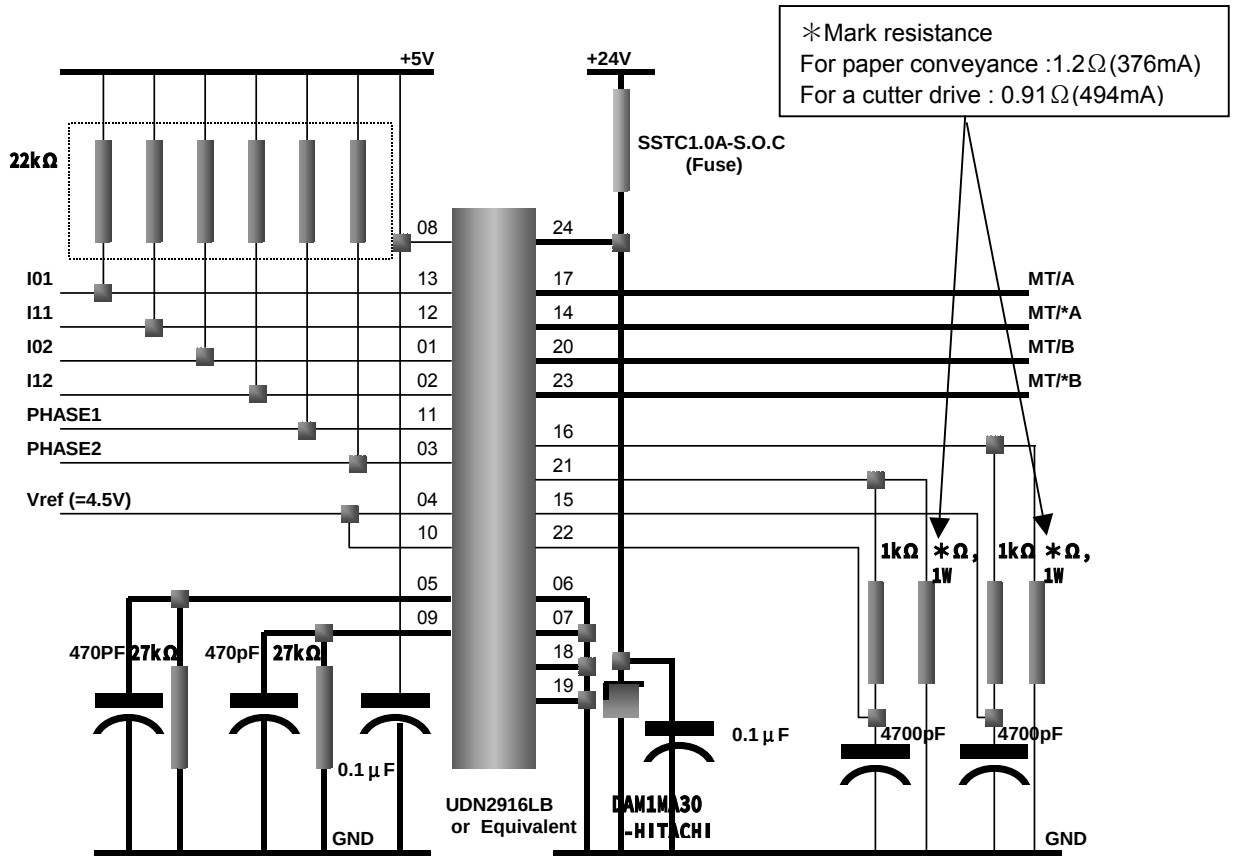
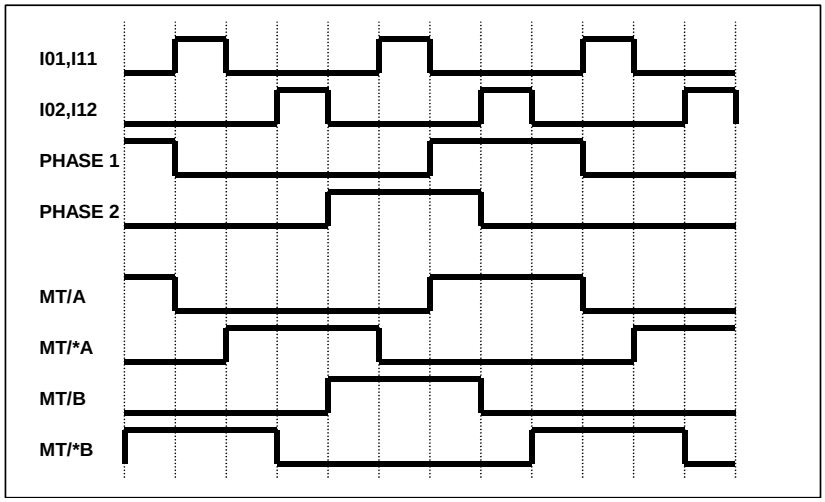
⑥ (6) The example of a drive circuit of a conveyance stepping motor
(Example of bipolar fixed current drive)





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2). The drive motor for cutters

(1) General specification (motor simple substance)

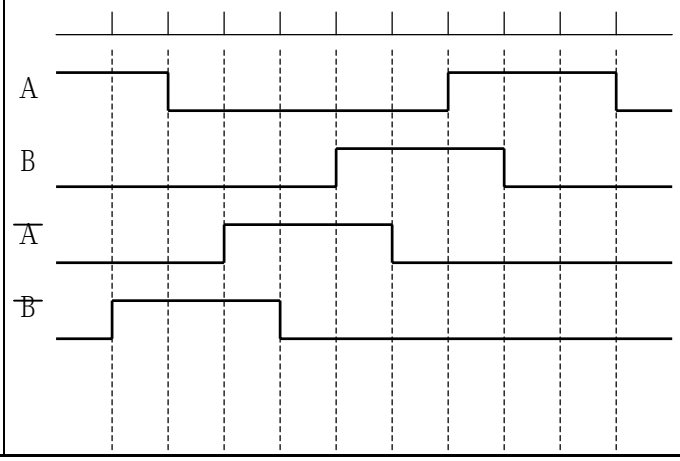
Item	Specifications
Model	Permanent magnet type
Phase	Two phase (bi-polar specification)
Step angle	9 degrees by 1-2 phase excitation
Winding resistance / phase	10 Ω
Rated voltage	DC 24.0 V±5%

(2) The drive method of a stepping motor

Please perform the same drive as a conveyance motor.

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

②The reference excitation method is described below.

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

(3) About a bipolar drive

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 Please perform acceleration control at the beginning of cutter step up high-speed printing, and motor excitation OFF.

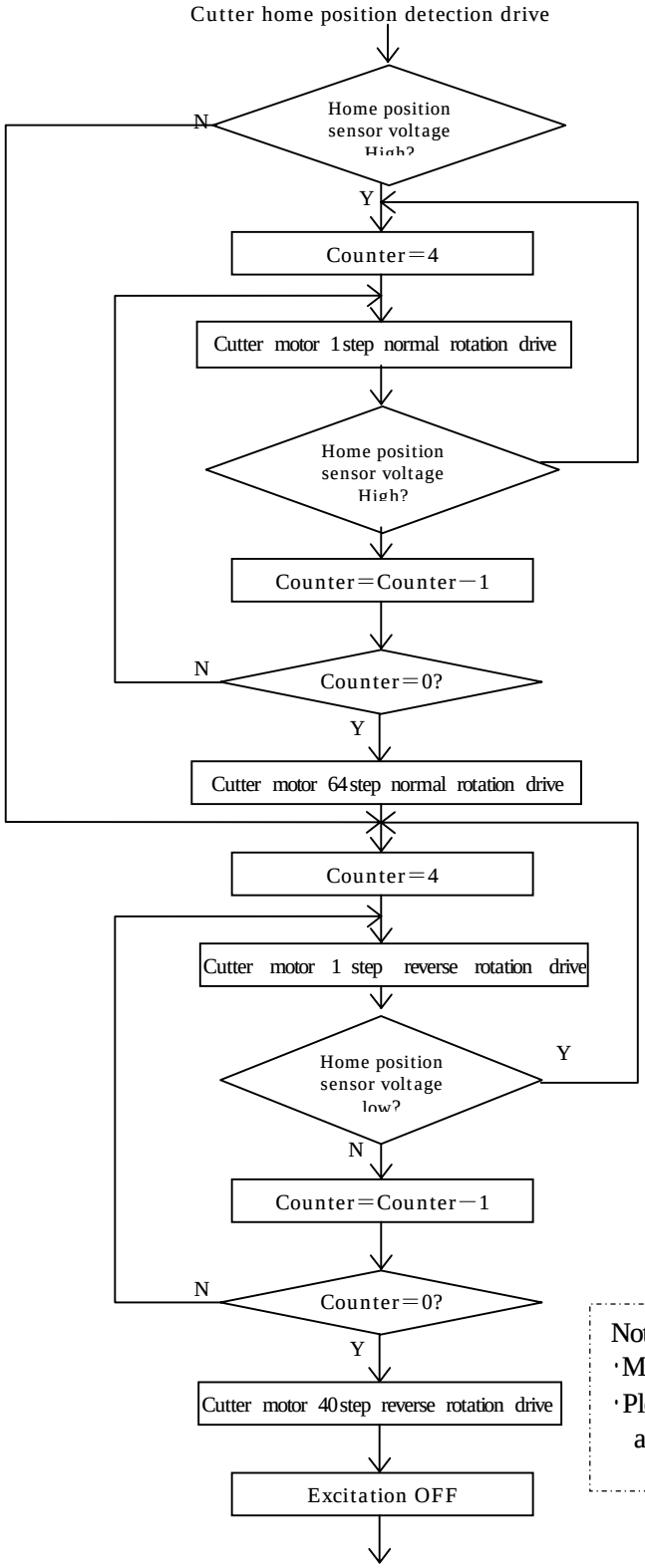
(4) The example of a drive circuit: It is the same as a paper conveyance motor.

⑥ (5) The motor drive method for cutters, ⑥~~and a timing chart~~

~~The detailed specification at the time of a cut (a position relation with a sensor and the drive method at the time of full/partial) is connected separately~~.

・The example of drive recommendation of a cutter (the drive method of cutter home position detection, and full / partialness cut)

A. The example of cutter home position detection drive recommendation



Be sure to carry out cutter home position detection in the following case.

・At the time of a power supply ON
・At the time of platen OPEN/DOWN
・Before printing starting

Notes
・Move distance per 1step: 0.0147mm
・Please turn off excitation except the time of a cutter motor drive.

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06	031125			⑥mark addition

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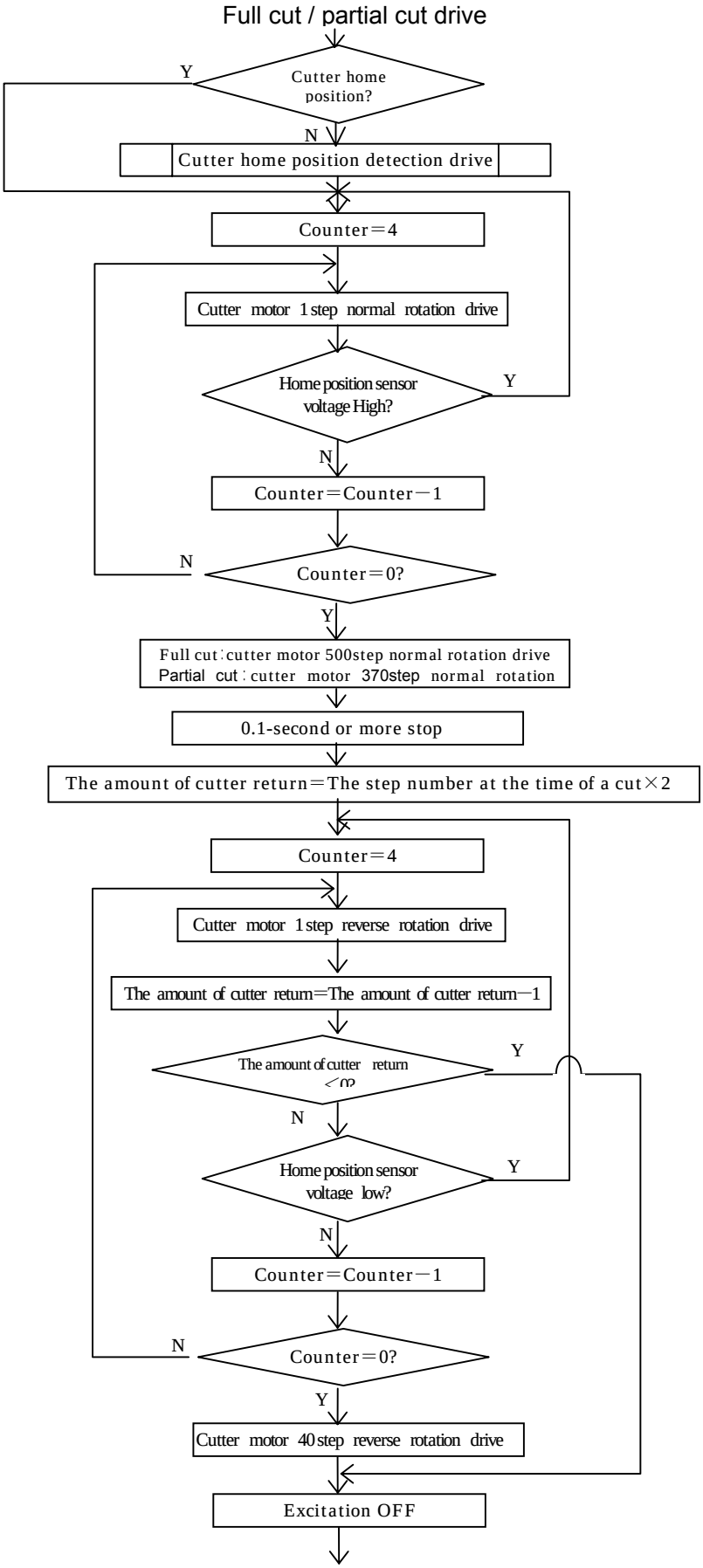
B. The example of drive recommendation of a full cut and a partialness cut

⑥



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Date

Rev.	Date	Design	Inspection	Changes made
06	031125			⑥mark addition

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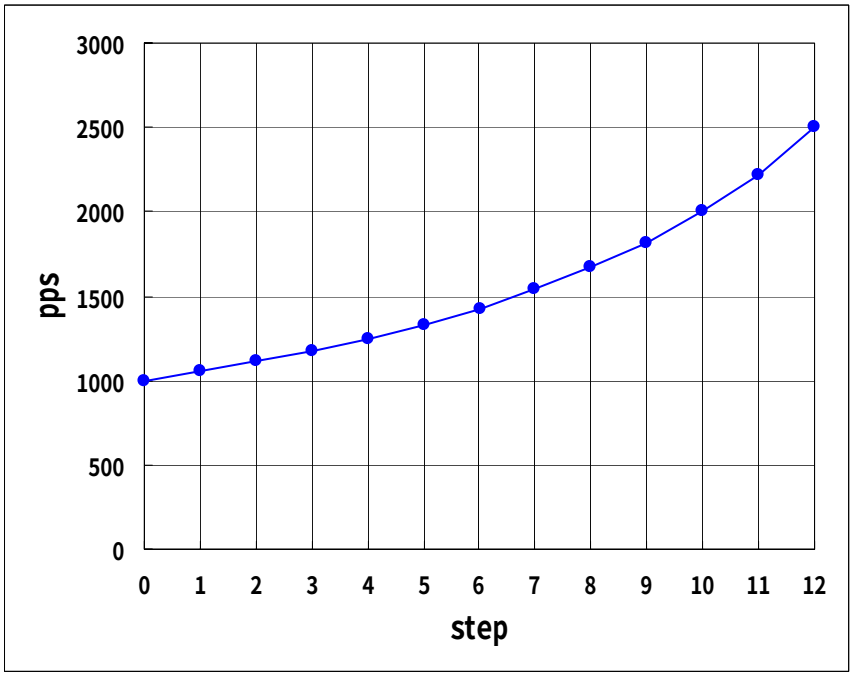
C. About the motor acceleration control for cutters

⑥ Please control by the following acceleration table at the time of starting of the motor for cutters.
Moreover, after a stop should carry out acceleration control in a reverse sequence.

【The acceleration table of 1-2 phase excitation】

Step	Time (ms)	Frequency (pps)
0	1.00	1000
1	0.95	1053
2	0.90	1111
3	0.85	1176
4	0.80	1250
5	0.75	1333
6	0.70	1429
7	0.65	1538
8	0.60	1667
9	0.55	1818
10	0.50	2000
11	0.45	2222
12	0.40	2500



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Rev.	Date	Design	Inspection	Changes made
06	031125			⑥mark addition

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(6) Notes

①~~When leaving the printer for the long term, turn off the excitation.~~ ⑥In other than the time of a cutter motor drive, please carry out excitation OFF. Failure to do so, it may cause heat generation of the motor and the driving elements.

②The 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.

③When any abnormal state occurs, stop driving the printer as soon as possible.

⑥④Please perform a cutter drive in the state where the both sides of a movable edge unit part are certainly locked. When not locked, it cannot cut normally.

⑥⑤Please do not impose power strong against the movable edge unit upper part during a cutter drive.

⑥⑥When performing the motor drive for cutters by 1-2 phase excitation, in order to perform stable operation with power saving, please stop in the state of 1 phase excitation, and control a motor to make it start in the state of 2 phase excitation.

⑥⑦Please carry out, after 100 mseconds or more surely pass after a stop of operation, in carrying out continuation starting or inversion starting of a cutter.

4－9 Sensor specification

4－9－1 Paper detection photosensor 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°C)

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	

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Rev.	Date	Design	Inspection	Changes made
06	031125			⑥Mark change and an addition

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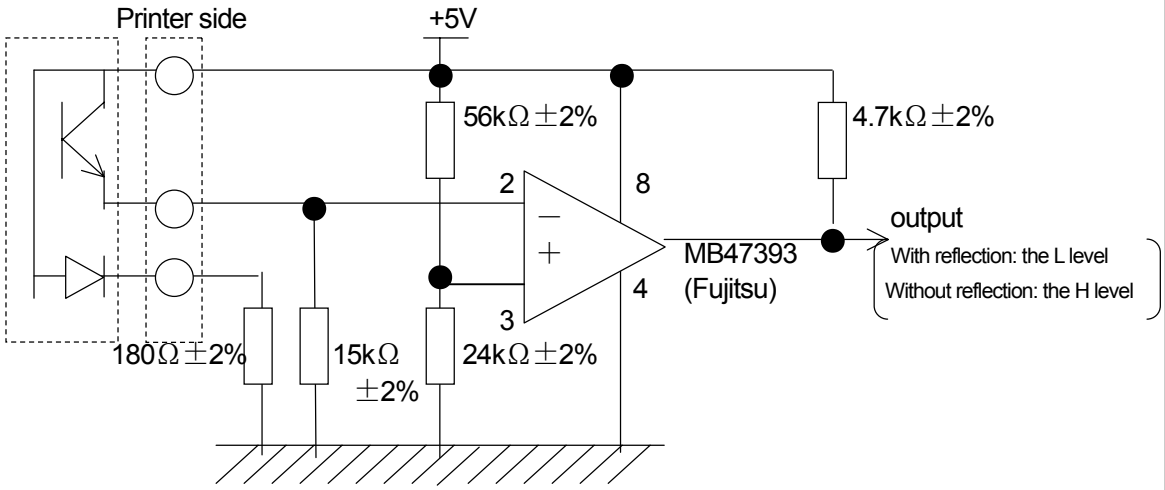
(3) Connecting circuit



4－9－2 cutter home position sensor

This photograph sensor sets positioning of a movable edge and detection of in itialization as the main purpose.

(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	80	mW
Output	Voltage between the collector and emitter	V_{CEO}	30	V
	Voltage between the emitter and collector	V_{ECO}	4.5	V
	Collector current	I_C	30	mA
	Loss of collector	P_C	80	mW

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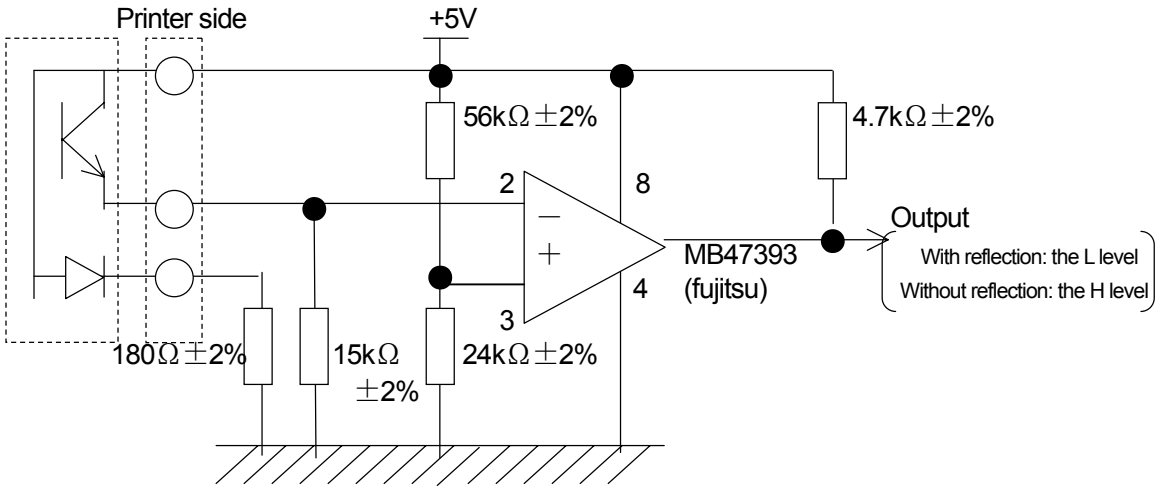
(2) Electric optics characteristics (25°C)

Item		Mark	Min. value	Ref. value	Max. value	Unit	Requirement
Input	Forward voltage	V_F		1.3	1.6	V	I_F=50mA
	Reverse current	I_R	——	——	10	μA	V_R=5V
Output	Dark current	I_{CEO}	——	——	0.5	μA	V_{CE}=10V、I_F=0mA
	Peak sensitivity wavelength	λ	—	800	—	nm	
Transfer characteristics	Collector current	I_C	0.18	0.3	0.95	MA	V_{CE}=5V,I_F=10mA
	Collector- emitter saturation voltage	Vce	——	——	0.4	V	Ip=20mA,Ic=0.1mA
	Response time	tr	——	10	——	μs	V_{CE}=5V,I_F=20mA R_L=100Ω

(4) The example of a connection circuit



4—9—3 Sliding-switch specifications

The slide switch is built in for platen open detection.

Item	Specifications
Rated voltage	DC5V
Rated current	1mA

The state of an internal point of contact of this switch is shown in the following.

: At the print state (platen close)→The switch closes.

: At platen opens →The switch opens.

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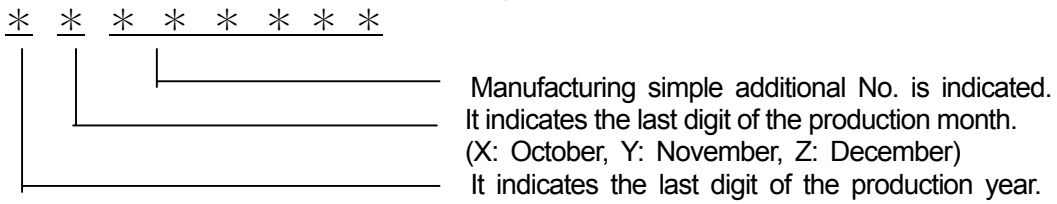
5 Product model plate

(1) Contents to be indicated : The model, manufacturing additional No., and version No.
(2) Display place : label is stuck on FPC.
(3) The display method : The model, additional and version numbers are stamped.
(4) Indication of the additional No : The indicating method is described as follows.



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

6 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.

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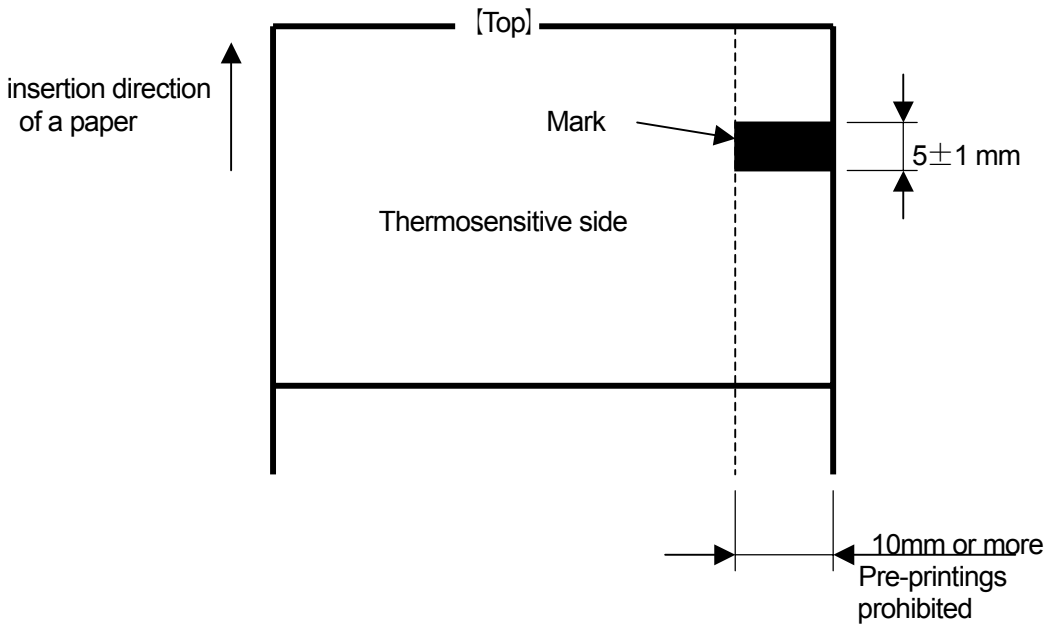
7. Pre-printing specifications

7-1 Position of the detecting mark

When printing, the mark should be the width equal to or more than 5 ± 1mm x10mm and printed on the thermosensitive side, as shown below.



7-2 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)

7-3 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).

7-4 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 F&K TOKA

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(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.

8.Revision history table

MODEL : FTP—627MCL401

Specifications Revision	PRODUCT REVISION	ITEM/CHANGE-CONTENTS	APPLIED-TIME/Number	
② 02	ES	FPC of a cutter, outside figure change, others		
③ 03	ES	Notes reexamination on use		
④ 04	ES	Form change by platen unit part strengthening 15p: ④mark form change 16p: ④mark size addition 17p: ④mark size change 18p: ④Mark size clerial error correction 19p: ④mark form change 37p: History table revision		
⑤ 05	ES	3p: Part addition of a material list 9p: The contents addition of warning 37p: History table revision		
⑥ 06	ES	Complete reexamination (Page addition) 2p:⑥mark Clerical error correction 8p:⑥mark Clause addition 14p:⑥mark deletion 15p:⑥Mark addition 16p:⑥mark Outside figure change 17p:⑥mark Outside figure change 27p:⑥mark Current value change 29p:⑥mark Complete rewriting 31p:⑥mark addition 32p:⑥mark addition 33p:⑥mark addition 34p:⑥mark Change and an addition 40p:History table revision		
⑦ 07	01C	Movable edge unit attachment regulation addition 6p:⑦mark addition 15p:⑦mark addition switch change		

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Rev.	Date	Design	Inspection	Changes made
07040622				⑨mark addition
06 031125				⑥mark addition

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