JX-2R-01K Model

Thermal Printer Mechanism Specification

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1. Brief introduction

1.1 Thermal printer mechanism

It is a small size, wide operating voltage, high efficiency thermal printer mechanism. The unique easy loading makes it become an ultra compact, reliable and cost-effective printer mechanism.

1.2 Characteristics

◆ Easy loading paper
◆ Small size, light weight
◆ Metal frame, metal gear shaft, stable, reliable, high life, excellent thermal properties
◆ Print speed（max）: 85 mm / s （at 9.5 V voltage of motor）
◆ Wide operating voltage (3.5 V-9.5V)
◆ High accuracy (8 dots / mm)
◆ Wear life: more than 50 km
◆ Low noise: brushless magnetic incentive step motor; high wear resistance, composed of resistant to high / low temperature special engineering plastics gears, makes it has very low noise.

Apply to: ■ Portable printer/terminal
■ EFT
■ Cash register
■ POS
■ Weight machines
■ Medical equipment

1.3 Description

The manual describes electrical characteristics and mechanical properties of JX-2R-01K. That is operation principle, basic parameters, the scope of application, peripheral interface definitions and structure size. The contents of this document are subject to change without notice. Please contact us for the latest information. Jingxin Technology will not bear any responsibility for any damage or injuries arising from use of this product that is not in accordance with the specifications and the notes provided below.

2. General Specifications

Item	Specifications
Print method	Thermal dot line printing
Effective printing width（mm）	48
Heater resolution（dot/mm）	8
Printing Dots of per line	384dots
Paper width (mm)	58
Dot pitch（mm）	0.125mm
Dot size	0.125mm x 0.12mm
Printing speed(MAX)	85mm/s（at 9.5 V voltage of motor）
Thermal head temperature detection	Via thermistor
Out of paper detection	Via reflect light sensor
Printer Head working voltage(V)	3.13~9.5
Printer Head Logic voltage(V)	3.13~5.25
Motor working voltage	3.5~9.5
Operating temperature	+0℃~50℃
Operating humidity	20%~85%RH
Store temperature	-20℃~60℃
Store humidity	5%~95%RH
Machine noise	<60dB
Platen open-close times	>5000 times
Thermal paper traction force	≥50g
Thermal paper grasp brake force	≥80g
Wear life	>50km
Electric life	One hundred-million pulses (under our standard printing conditions.)
Mass(g)	40.5
Outline dimension(D x W x H)	70±0.2mm x 33±0.2mm x 15.3±0.2mm

3. Thermal head specification

3.1 Rated parameters

Heating points	384dots/line
Dot pitch	0.125mm
Dot size	0.125mm x 0.12mm
Per step	0.0625mm
printing width	48 ±0.2mm
Paper width	58 mm
average resistance	176Ω±4%
Working voltage	3.15V-9.5V
Pulse life	10^8 pulse
Machine wear life	50km
Life test condition	25℃
The time of heating not less than	12.5%.

3.2 Maximum conditions at 25℃

Item	Symbol	Maximum Conditions	Condition
Printing cycle	S.L.T	1.25ms/line	Tsub=25℃
Printing energy	E0	0.20 mJ/dot	S.L.T=1.25ms
Printing voltage	VH	9.5V	Normally, voltage is 7.2 V.
Logic voltage	Vdd	7V	Including peak voltage of Vdd
Logic input voltage	Vin	-0.5V~Vdd+0.5V	
Substrate temperature	Ta	65℃	Thermistor temperature
printing dots		64 dots	At the same time

3.3 Condition for electrical actions

item		symbol	electric parameter	Conditions
Power consumption		Po	0.24W/dot	Rav=176Ω,Vdd=5V, concurrent applied dot number with 64dots
Supply voltage		VH	7.2V	
Print cycle		S.L.T	1.25ms/line	
Energy consumption	5℃	Eo (Ton)	0.16mJ/dot(0.67ms)	
	25℃		0.13mJ/dot(0.54ms)	
	45℃		0.11mJ/dot(0.46ms)	
Current consumption		Io	2.4A	

3.4 Calculation formula

The relation of the applied voltage and the electric power application time (Ton) is calculated with calculation formula as shown bellow:

$$P_0 = I_0^{\,2} \times Rav = \frac{VH^2 \times Rav}{(Rcom \times N + Rav + Ric + Rlead)^2}$$

$$\because Ton = \frac{E_0}{P_0}$$

$$\therefore P_0 = \frac{E_0}{Ton}$$

$$VH = \sqrt{p_0 \div Rav} \times (Rcom \times N + Rav + Ric + Rlead)$$

Rav:	average resistance value	176Ω
N:	simultaneous printing dot	64dot
Rcom:	common resistance	0.05Ω
Ric:	drive-on resistance	6Ω
Rlead:	lead resistance	10Ω

3.5 Thermistor characteristics

Calculation formula: $R_X = R25 \times EXP[B \times (\frac{1}{T_X} - \frac{1}{T25})]$ (T: absolute temperature)

B constant: 3950K±2%
Resistance value R25: 30KΩ±5% at 25℃
Tx operating temperature: -20℃~+80℃
T25 1pulse width operating temperature: 25℃
Thermal time constant: within 30sec (in the air)

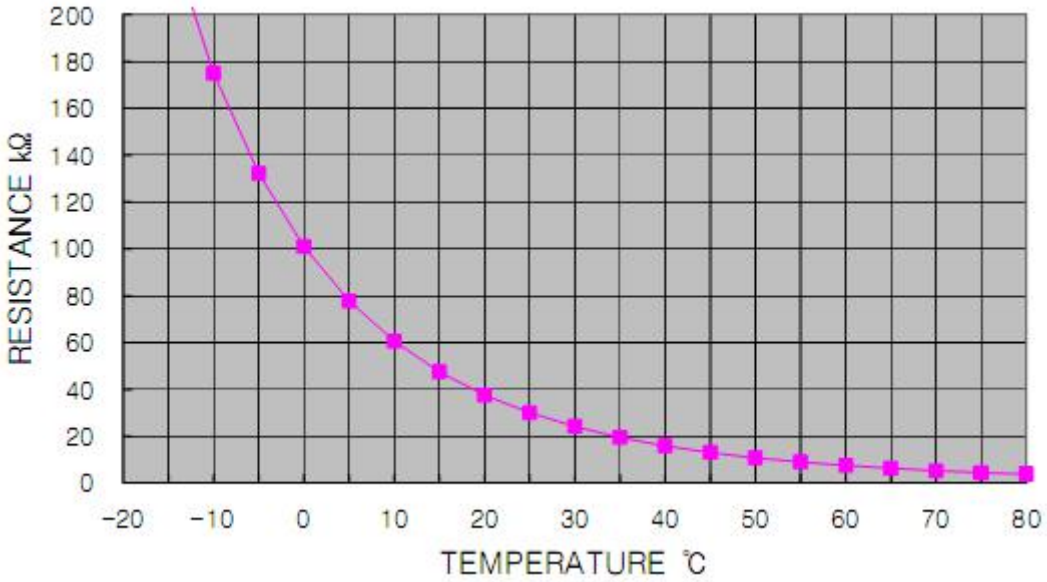


Table of thermistor temperature

Temp. (℃)	Resistance (KΩ)	Temp. (℃)	Resistance (KΩ)	Temp. (℃)	Resistance (KΩ)	Temp. (℃)	Resistance (KΩ)
-20	269	10	60	40	15.9	70	5.21
-15	208	15	47.1	45	13.1	75	4.4
-10	178	20	37.5	50	10.8		
-5	124	25	30.0	55	8.91		
0	100	30	24.2	60	7.41		
5	78	35	19.6	65	6.2		

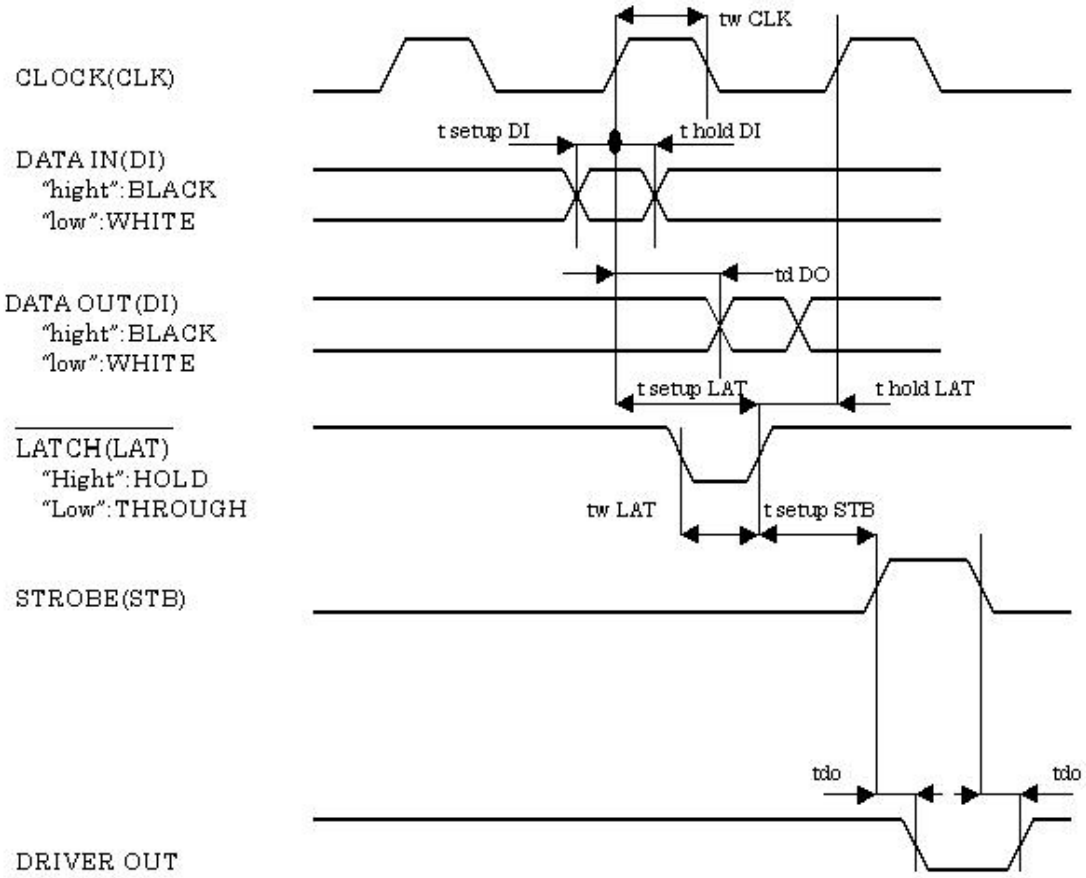
3.6 Electric parameter (25±10℃)

Item	Symbol	Min.	Typical	Max.	Unit	Conditions
Printing voltage	VH	3．13	7．2	9.5	V	
Logic voltage	Vdd	2.7	5.0	5.25	V	
Logic current	Idd	--	--	54	mA	fDI=fclk/2
Input voltage(high)	VIH	0.8Vdd	--	Vdd	V	STB,DI,LAT,CLK
Input voltage(low)	VIL	0	--	0.3Vdd	V	
Latch input current(high)	IIH	--	--	3.0	μA	
Heating input current(high)		--	--	30		
Clock input current(high)		--	--	3.0		
Data input current(high)		--	--	0.5		VIH=5V
Latch input current(low)	IIL	--	--	-3.0	μA	
Heating input current (low)		--	--	-0.5		
Clock input current (low)		--	--	-3.0		
Data input current (low)		--	--	-0.5		VIL=0V
Data output voltage(high)	VDOH	4.45	--	--	V	Open ,Vdd=4.5V
Data output voltage (low)	VDOL	--	--	0.05	V	
Output voltage	VOL	--	(1.0)	--	V	Driver output part，reference

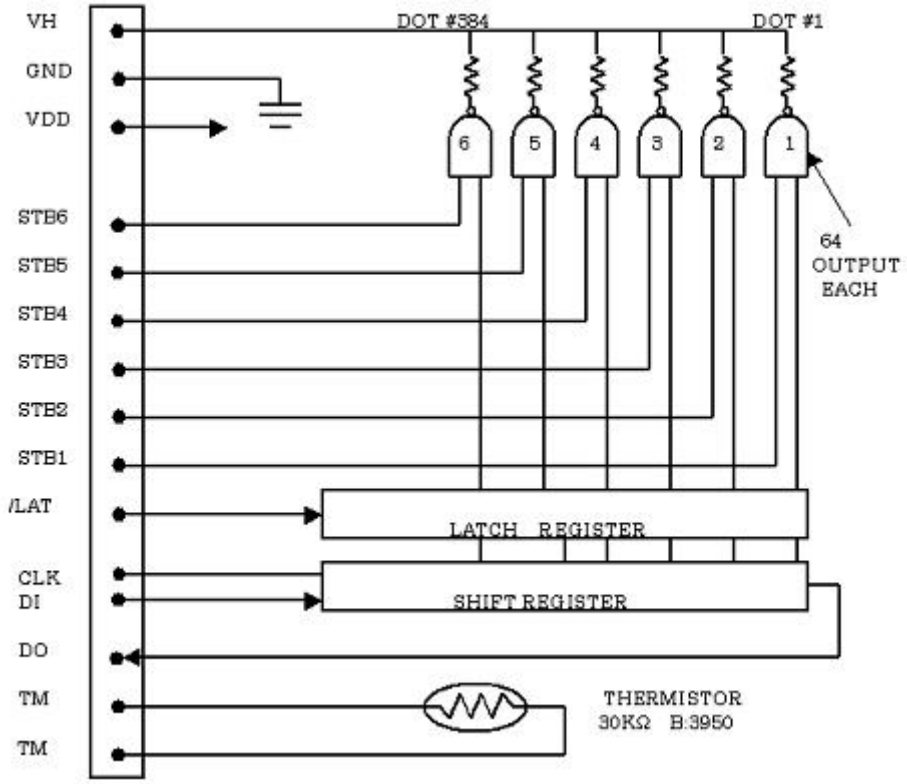
3.7 Time Characteristic (25±10℃)

Parameter	Symbol	Speed			Unit	conditions
		Min.	Typical	Max.		
Clock frequency	fCLK	--	--	8	MHz	3≤Vdd≤5.25
		--	--	5	MHz	2.7≤Vdd<3
Clock pulse width	twCLK	30	--	--	ns	Refer to the timing chart
Data setup time	testup DI	30	--	--	ns	
Data hold time	thold DI	30	--	--	ns	
Data out delay time	td DO	--	--	120	ns	3≤Vdd≤5.25
		--	--	150	ns	2.7≤Vdd<3
Latch pulse width	tw LAT	100	--	--	ns	
Latch setup time	testup LAT	200	--	--	ns	

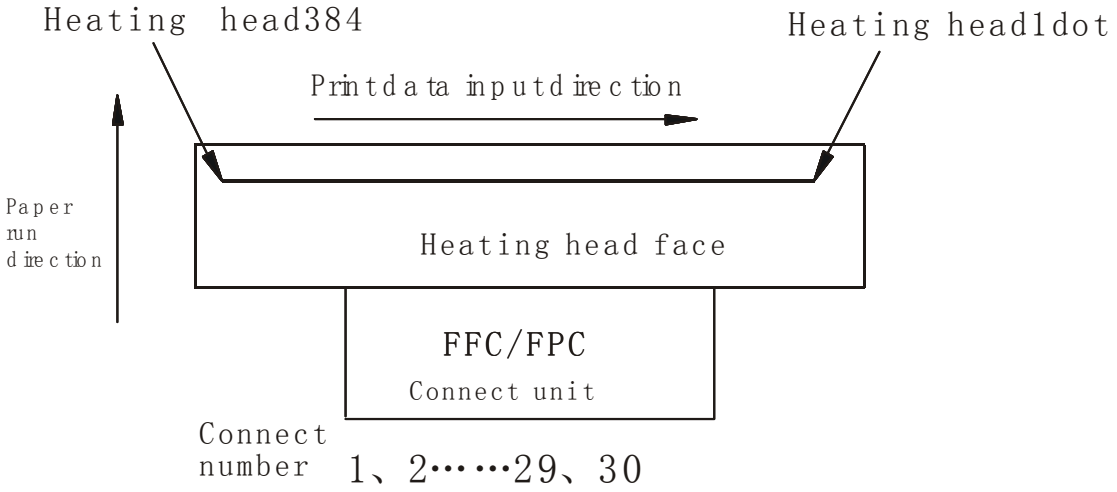
Latch hold time	thold LAT	50	--	--	ns	
STB setup time	testup STB	300	--	--	ns	
Output delay time	tdo	--	--	10	μs	5V(Vdd)
		--	--	60	μs	2.7V(Vdd)



Timing Chart



STB No.	Dot No.	Dots/STB
1	1 to 64	64
2	65 to 128	64
3	129 to 192	64
4	193 to 256	64
5	257 to 320	64
6	321 to 384	64



3.8 Cautions on operation

Please turn off the power when no printing.

When turning the power on or off, always DISABLE (put in “low” state) the DST terminals.

You must assure the following voltage:

VH	0V~9.5V
Vdd	0V~7V
Other signal	GND-0.5V~ Vdd+0.5V

4. Stepper motor

4.1 Stepper motor Parameter

Item	Specification	Term
Rated voltage	3.5~9.5V	
Phase	2phase	
Step angle	9degrees by 1-2phase excitation	
Amount of paper feed	0.0625mm per step	
Phase resistance	10Ω±7%	20℃
Phase current	0.357A	
Drive method	1-2 phase excitation of the bipolar	

4.2 stepper motor Phase

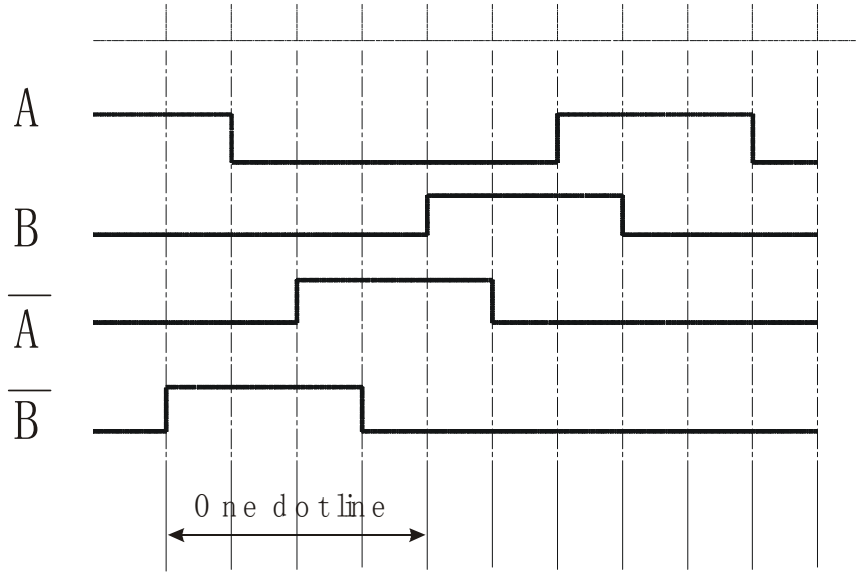
JX-2R-01K stepper motor with the 1-2 phases excitation of the bipolar.

As shown bellow：

Position	STEP1	STEP2	STEP3	STEP4
A	+	-	-	-
B	-	-	-	-
$\overline{A}$	-	-	+	+
$\overline{B}$	+	+	+	-

Driving procedures of the stepper motor（1-2phase）

Motor shift in the CCW（seen from motor gear side）



4.3 Drive the stepper motor

We recommend use the PWM mode in the stepper motor drives, such as the L3967 or driver chips. For different motor speed using different drive current. This will effectively reduce the stepper motor fever, and effectively reduce the noise.
The following table gives the maximum paper feed speed vs. the step motor voltage(at 25℃).

Operating voltage	Drive Frequency of the motor	Duty cycle (%)
3.5DCV	500PPS	92
3.6DCV	550PPS	90
3.7DCV	580PPS	89
3.8DCV	600PPS	88
4.0DCV	650PPS	87
4.2DCV	700PPS	86
4.3DCV	750PPS	85
4.4DCV	800PPS	84
4.5DCV	850PPS	83
4.6DCV	900PPS	82
4.7DCV	950PPS	81
4.8DCV	960PPS	80
4.9DCV	970PPS	79
5.0DCV	980PPS	78
5.1DCV	990PPS	77
5.2DCV	1000PPS	76
5.5DCV	1050PPS	75
6.2DCV	1100PPS	60
6.5DCV	1150PPS	55
7.8DCV	1200PPS	45
8.5DCV	1280PPS	30

In order to avoid stepper motor overheat, it is strongly advised to respect the maximum ON/OFF duty cycle as indicated above. Note that the maximum period for the ON time is 30 seconds (when the duty cycle is not 100%).

5. Out of paper detection

The printer has a built-in paper detector (reflection type photo interrupter) to detect whether paper is present or not.

An external circuit should be designed so that it detects output from the paper detector and does not activate the thermal head and motor when there is no paper. Doing not so may cause damage to the thermal head or platen roller or shorten the life of the head significantly. If the motor is drove when it is out-of paper, a load input on the reduction gear and the life of the gear may be shortened.

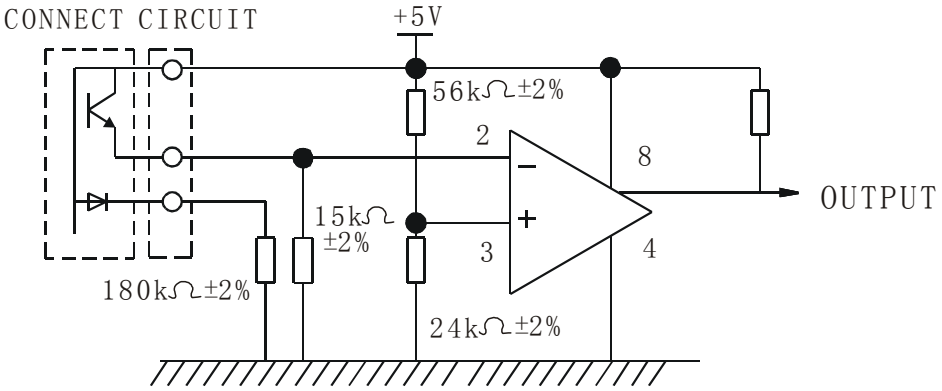
5.1 Absolute Maximum Rating (T= 25℃)

Item		Code	Number	Unit
Input	Forward current	IF	50	mA
	Reversed current	VR	5	V
	Loss of capacity	P	70	mW
Output	Collector-emitter voltage	VCEO	20	V
	Emitter-collector voltage	ECO	5	V
	Collector current	IC	20	mA
	Loss of collector	PC	70	mW

5.2 Photoelectrical Characteristics (Ta = 25℃)

Item		Item	Condition	Min. value	Ref. value	Max. value	Unit
Input	Forward current	VF	IF=10mA	1.0	1.2	1.6	V
	Reversed current	IR	VR=5V			10	μA
Output	Collector-emitter voltage	BVCE0	IC=0.5mA	20			V
	Emitter-collector voltage	BVECO	IE=0.1mA	5			
	Collector dark current	ICEO	VCE=10V IF=0mA			200	nA
Coupling characteristic	Collector-emitter saturated voltage	VCE(SAT)	IC=2mA Ee=1mW/cm^2			0.4	V
	Sensor current	Ic	VCE=5V IF=10mA	150		600	μA
	Leakage current	ILEAK	IF=10mA VCE=5V			1	μA

	ascend/decline time	Tr/Tf	VCE=5V IF=1mA RL=100Ω		5/5		μs



5.3 Printer rollers in place detection switch

Mainly detecting whether the printer rollers is reach the designated location or not, there are two states:

(1) When the mechanism is printing (the printer roller is closed), the detection switch is in a connected state.

(2) When the printer roller is separated, the detection switch in the off state.

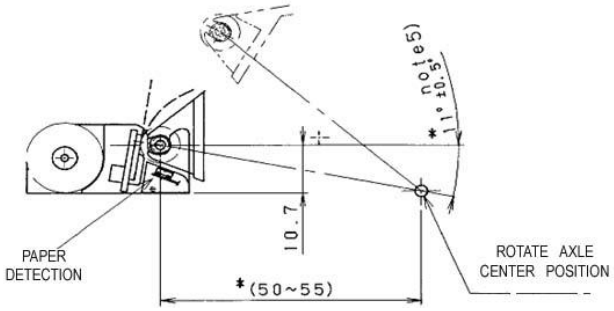
Item	instruction
Rated voltage	DC 5V
Rated current	100mA
Contact resistance	≦1Ω

6. PIN layout for connector

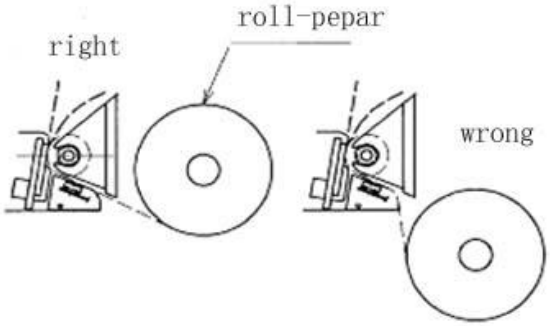
No.	Symbol	Signal name	No.	Symbol	Signal name
1	PHK	Cathode for photo interrupter	16	TM	thermistor
2	VSEN	Paper sensor power	17	TM	thermistor
3	PHE	Emitter for photo interrupter	18	STB3	Strobe 3
4	N.C	Non contact	19	STB2	Strobe 2
5	N.C	Non contact	20	STB1	Strobe 1
6	VH	Head drive power	21	GND	Head ground
7	VH	Head drive power	22	GND	Head ground
8	DI	Data in	23	LAT	Data latch
9	CLK	clock	24	DO	Data out
10	GND	Head ground	25	VH	Head drive power
11	GND	Head ground	26	VH	Head drive power
12	STB6	Strobe 6	27	$\overline{MT/A}$	Excitation signal $\overline{A}$
13	STB5	Strobe 5	28	MT/A	Excitation signal A
14	STB4	Strobe 4	29	$\overline{MT/B}$	Excitation signal $\overline{B}$
15	Vdd	Logic power	30	MT/B	Excitation signal B

7. Printer mechanism design reference

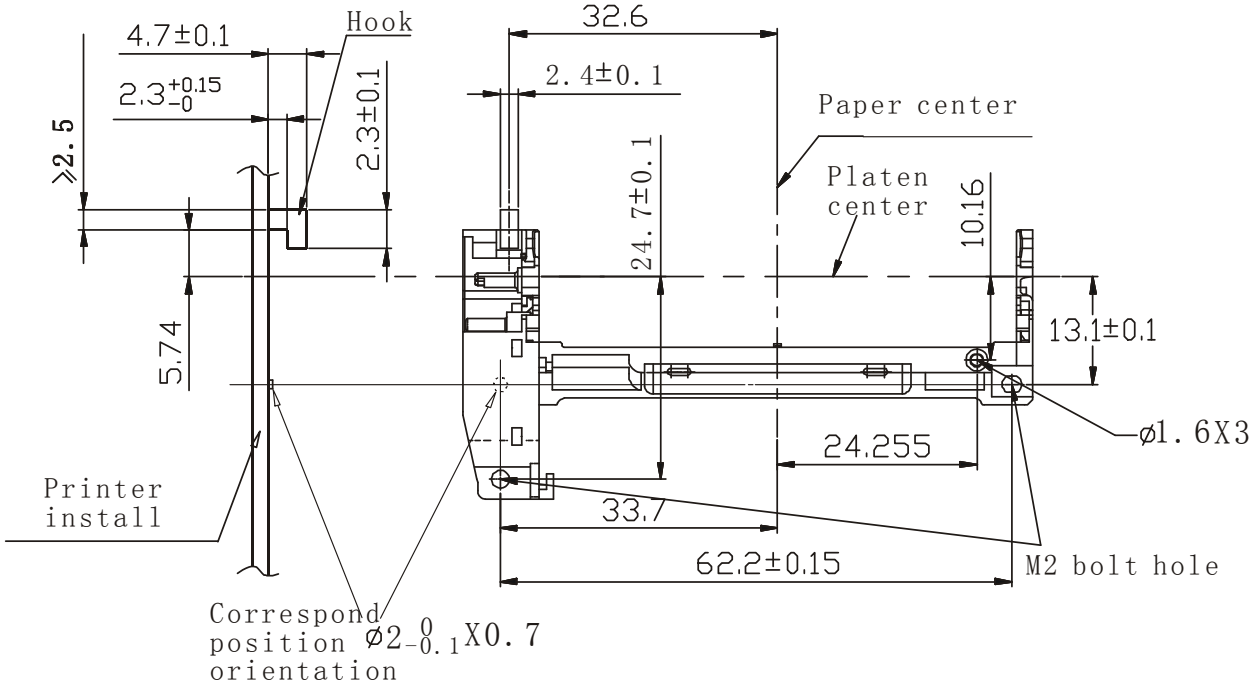
7.1 Easy loading paper structure design



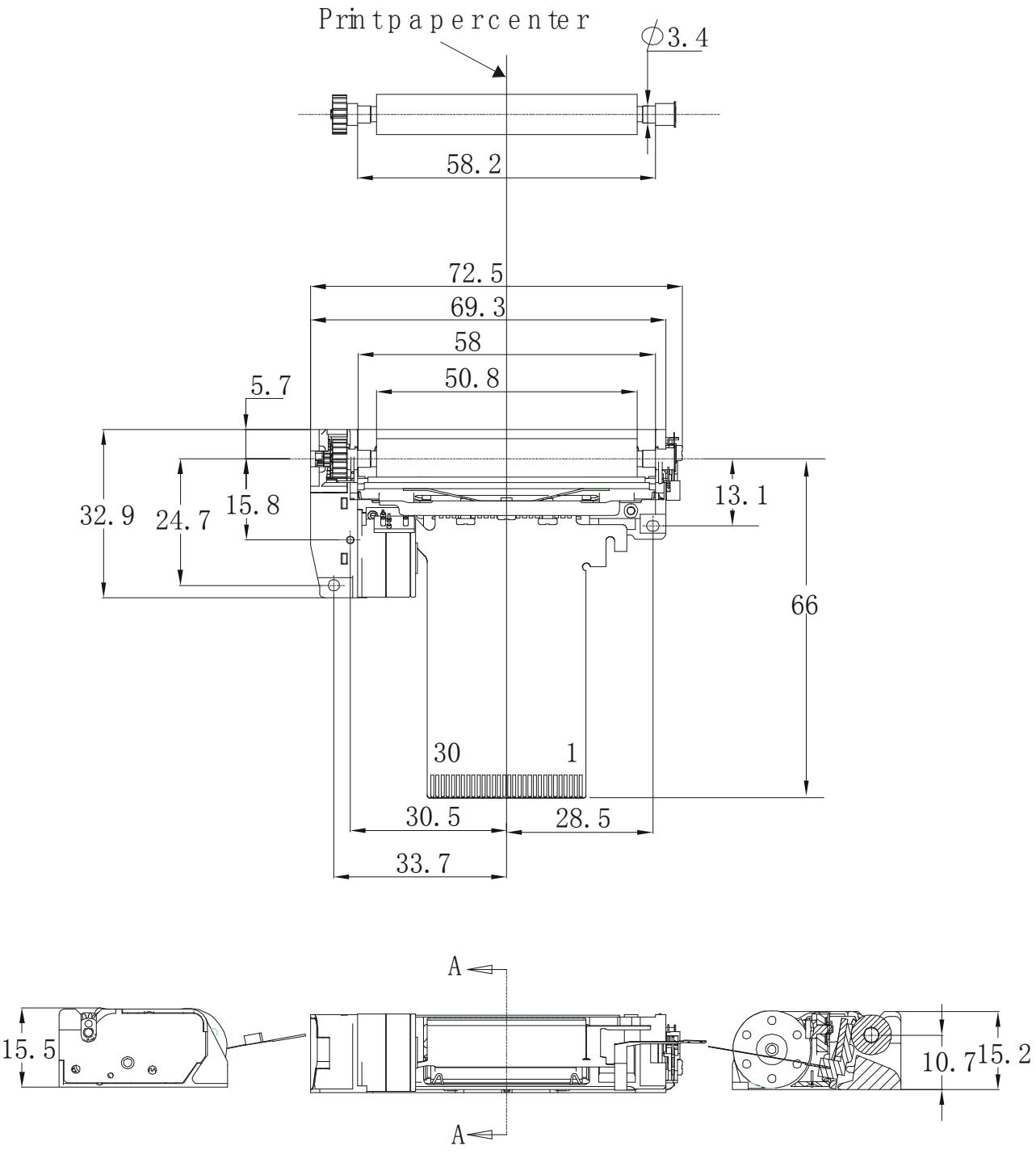
7.2 Paper container structure design



7.3 Mounting position



7.4 Mechanical dimension



8 Printer Mechanism Application Attentions

8.1 The specific structure of the printer mechanism references to the formal samples from Xiamen Jingxin science and technology co; Ltd.

8.2 Before test, it is necessary that makes sure that the printer mechanism type and specification is correlation with that required and identified former.

8.3 Many attention shall be paid during inspection, repairing and assembling of the printer mechanism. Anti-electrostatic measures shall also be taken in such as working platform, assembly line, turnover box and manufacturer respects and the like.

8.4 The printer mechanism connecting Pin of FPC can't be touched by naked hands. When connected with control circuit, it will be kept relax status preventing extra tension force. Before pullout and inserting into FPC, makes sure that cut down completely the control circuit power. The numbers of pullout and inserting must be less than ten times.

8.5 As for the storage of printer mechanism, more attention shall be paid to water-proof, moisture-proof, and sun-proof and corrosive chemical gases proof. In case of condensation, please first cut off the power of printer mechanism, and restart the printer mechanism after blow-dry.

8.6 Do not print without paper. Forcing to printing without paper will cause platen rubber rubbing with the thermal head heating elements, which will affect and reduce the longevity of thermal head.

8.7 Other operation precaution is reference to the operation precaution of thermal line printer wrote by Xiamen Jingxin science and technology Co., LTD

8.8 It is recommended that customers use higher quality thermal paper for printing. Low quality thermal paper will cause low print quality and increase the wear of thermal head, even the shortage life of thermal head extremely.

9 Quality Assurances and Service

Our company makes sure that the printer mechanism will give the superior performance In the case of normal use and maintenance and that the printer mechanism is guaranteed for one year.

9.1 Service

9.1.1 Maintenance must be made by professional maintainer.

9.1.2 During maintenance, do not change the printer mechanism internal parts unauthorized. The problems caused by customers' improper repairs and changing the parts are not covered by this warranties policy.

9.2 Guarantee

Warranty：The printer mechanism is guaranteed one year from the shipping date; even if within the warranty date，the cases below are not covered and the repairing fee is paid by customers self:

A. Damage caused by customers' misuse.

B. Damage caused by repairing and transforming self.

C. Damage caused by the improper use conditions not according to the specification requirements.

D. Damage caused by force majored.