MECANISME D'IMPRIMANTE MATRICIELLE A IMPACT

MP212FP-12-A

MP216FP-12-A

MANUEL TECHNIQUE

star

version Anglaise

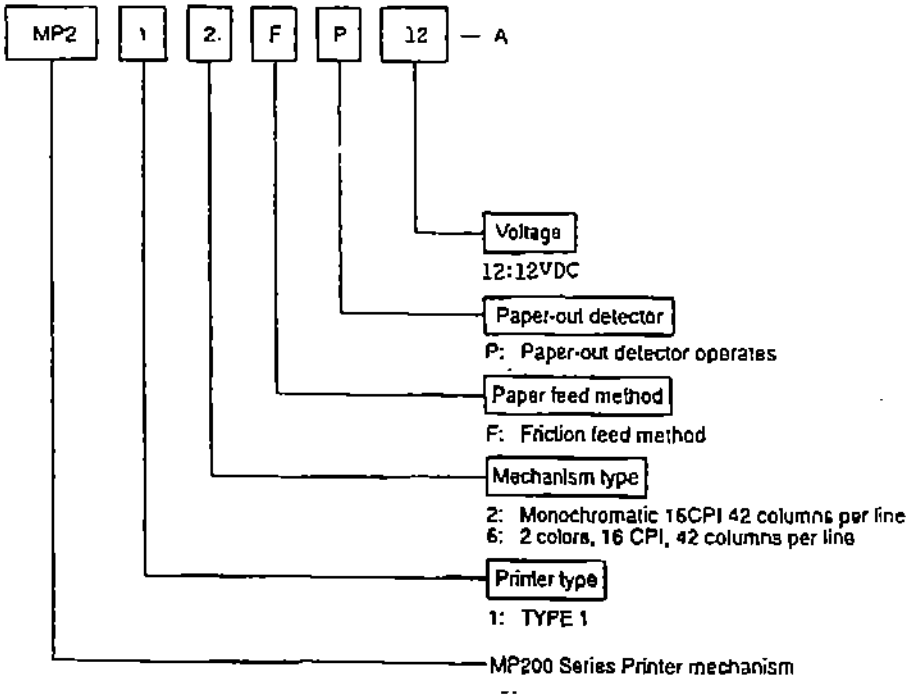
MEGATRON

CONTENTS

1. GENERAL DESCRIPTION

MP210 series is the mechanism of serial impact dot matrix printer having the applications for the electronic equipment, such as in POS, or data recorder, and so on.

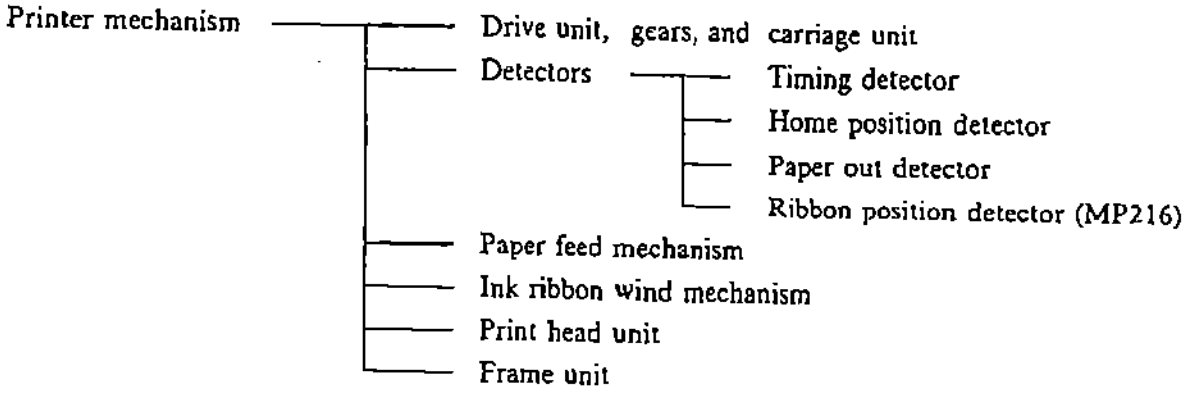
Model Name Notation



2. CONSTRUCTION

2.1 Configuration

This printer mechanism is composed of the following components.



2.2 Principle of Operation

2.2.1 Drive

This printer mechanism moves the print head, paper feed, ribbon shift (MP216) and feeds ribbon with the motor.

2.2.2 Print head movement

The rotation of the motor is transmitted to drive shaft through the reduction gears. The carriage makes lateral reciprocal movements along a groove that is carved on this drive shaft, consequently moving the print head.

2.2.3 Print timing

Printing is done when the timing signal is generated synchronized with the rotation of the motor, based on the home position signal.

2.2.4 Ribbon feed

The ink ribbon is housed inside a ribbon cartridge in endless fashion. A ribbon feed roller is turned by the rotation of the motor whereby the ink ribbon is wound up.

2.2.5 Paper feed

Paper feeding is done by the rotation of the motor turns on the line feed solenoid to activate the spring clutch and to turn the gear.

2.2.6 Ribbon shift

In case of MP216, make the motor rotate to make electricity flow to the ribbon solenoid so that the spring clutch operates and so that the cam gear rotates half a turn, and then change to a ribbon of another color.

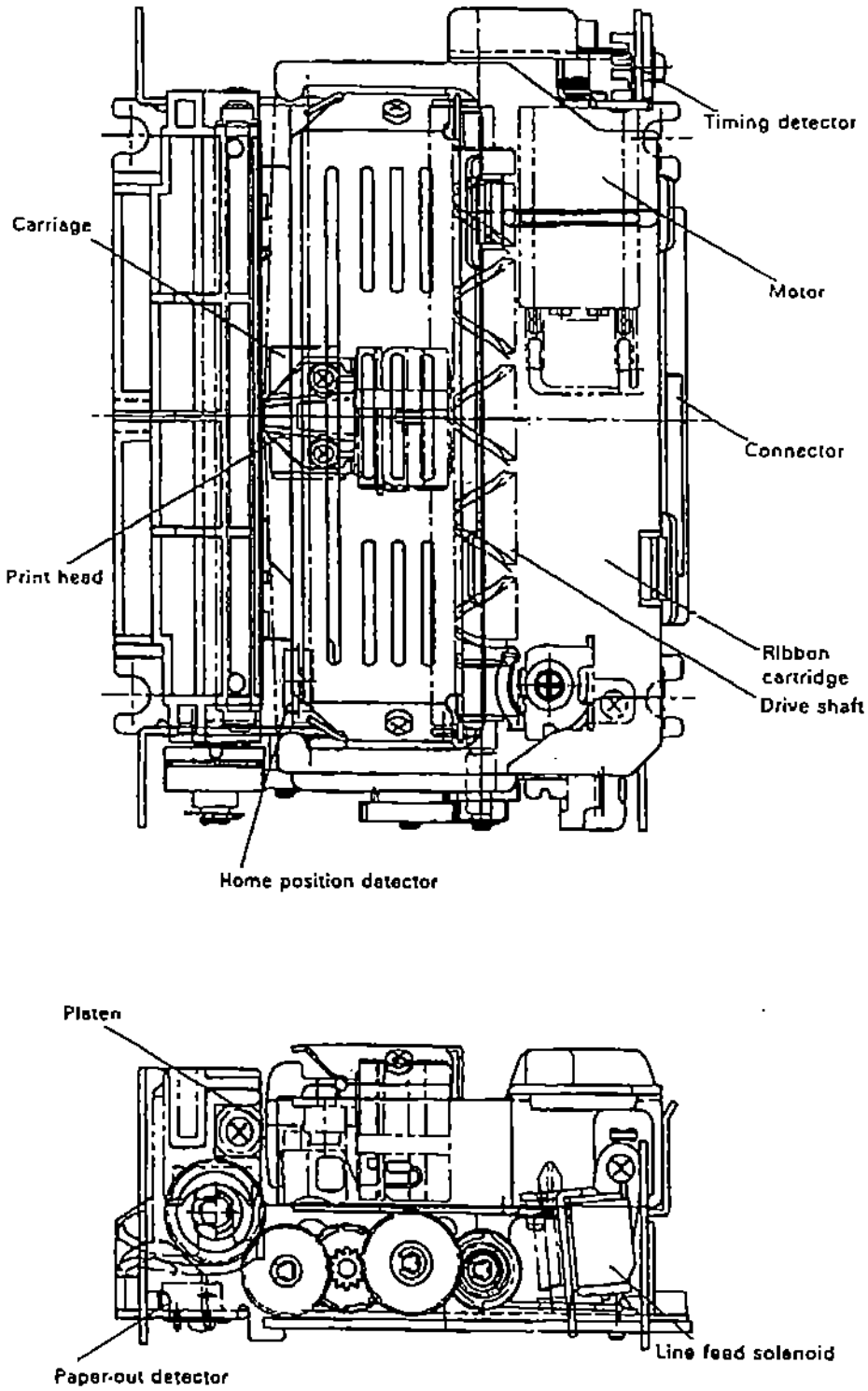


Fig. 2-1-1 External view of MP212

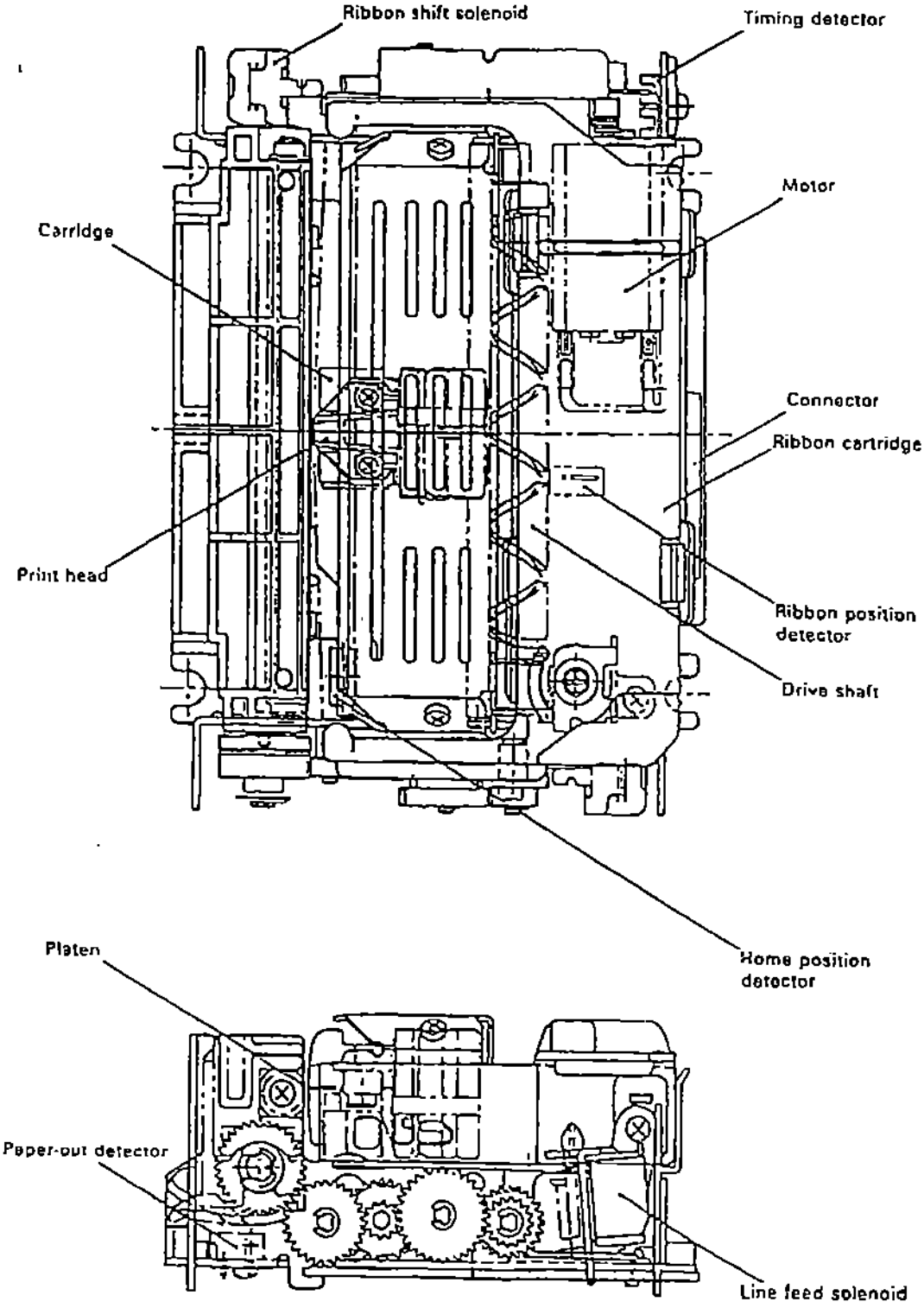


Fig. 2-1-2 External view of MP216

3. GENERAL SPECIFICATIONS

3.1 Printing Specifications

Item	Specifications
Printing method	Impact dot matrix printing
Font configuration	7 × 7 (half dot) or 9 × 7 (half dot)
Print direction	Bidirectional
Print speed	Approx. 2.5 lines/sec. (besides when shifting ribbons)
Paper feed speed	Approx. 9 lines/sec. (continuous feeding)
Head wire	ϕ0.33mm in diameter
Line space	1/6 inch fixed

1. In the bidirectional printing, the horizontal drift is liable to occur more than in the unidirectional printing.

Dot, Column space Specifications

1	Paper width		3.0 inch (76mm)	
2	Font configuration (H×V)		~~10~~×7 (half)	~~9×7 (half)~~ 6×7 full
3	CPI		16	13.4
4	Column number		42	35
5	Dot space	H mm (a)	0.316	0.316
		V mm (b)	0.423	0.423
6	Character size	W mm (c)	1.28	1.59
		H mm (d)	2.87	2.87
7	Column space	mm (e)	1.58	1.90
8	Total no. of dots		210	210
9	Print area	mm	66.0	66.0

CPI: Character Per Inch

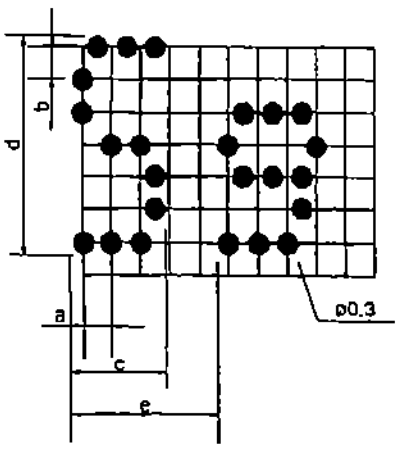


Fig. 3-1 Character size (7 × 7 font)

3.2 Paper Specifications

Item	Specifications
Paper type	Ordinary bond and carbonless copy paper (Roll paper)
Paper width	76±0.5mm (3.0 inch)
Diameter	Max. 85mm (3.35 inch)
Thickness	Single: 0.07 mm to 0.10 mm Copies: Original + 1 copy Total thickness within 0.14mm, with each sheet 0.05 to 0.08mm thick Original + 2 copies Total thickness within 0.2mm, with each sheet 0.05 to 0.08mm thick
Inside diameter	12±1mm
Others	No glue between the paper and the inside diameter
Print area	Shown in Fig. 3-2

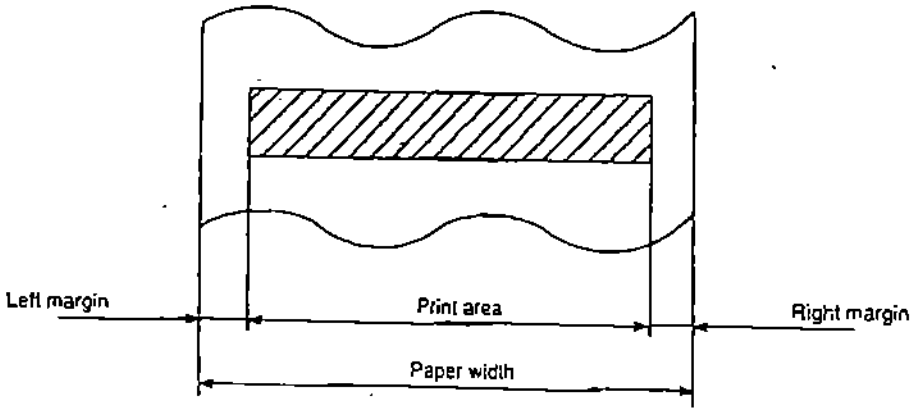


Fig. 3-2 Paper spec. & print area

3.3 Ink Ribbon Specifications

MP212

Item	Specificaitons
Type	Special cartridge
Color	Purple (standard) or black (option)
Ribbon material	Nylon 66 #40 denier
Ribbon size	Width: 13mm
Model No	Purple (standard): Part No.30980010 Part Name: INK RIBBON CARTRIDGE RC200P Black (option): Part No.30980110 Part Name: INK RIBBON CARTRIDGE RC200B
Ribbon life	Purple: Approx. 3,000,000 characters Black: Approx. 1,200,000 characters

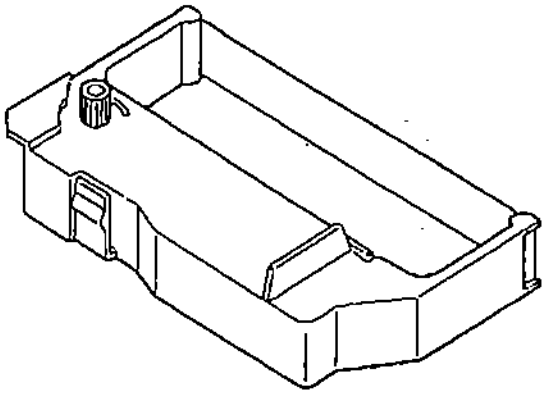


Fig. 3-3-1 Ink ribbon cartridge

Item	Specificaitons
Type	Special cartridge
Color	Black and red
Ribbon material	Nylon 66 #40 denier
Ribbon size	Width: 13mm
Model No.	Black and red: Part No.30980210 Part Name: INK RIBBON CARTRIDGE RC200BR
Ribbon life	Black: Approx. 600,000 characters Red: Approx. 300,000 characters

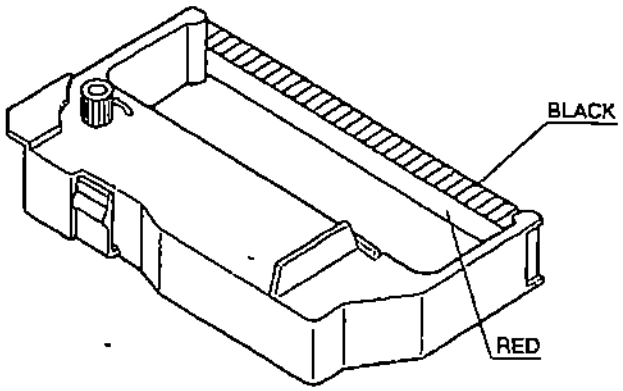


Fig. 3-3-2 Ink ribbon cartridge

3.4 Connector Specifications

	Parts No.	Mating Cable
	BURNDY CORPORATION HLEM23R-1	SUMITOMO ELECTRIC INDUSTRIES, Ltd. SUMI CARD SMCD-23×60-BD×10-P1.25-S6-M, UL2896
Manufacturer (USA)	BURNDY CORPORATION (U.S. ELECTRONICS GROUP) 51 Richards Avenue Mail: P.O. Box 5200 Norwalk. CT 06856, U.S.A. TEL : 203-838-4444 FAX : 203-852-6227, 6228	SUMITOMO ELECTRIC U.S.A. INC., (New York Office) 551 Madison Avenue, New York, NY 10022, U.S.A. TEL : 413-863-4757 FAX : 413-863-2305
(EC)	FRAMATOME CONNECTORS DEUTSCHLAND GMBH Heinrich-Hertz-Strasse 1 D40699 Erkrath 1, Germany TEL : 211-9254-150 FAX : 211-9254-142	SUMITOMO ELECTRIC EUROPE S.A. (London Office) 30 Dorset Square, London NW1 6QJ, England, U.K. TEL : 071-723-4003 FAX : 071-724-2102

MP212

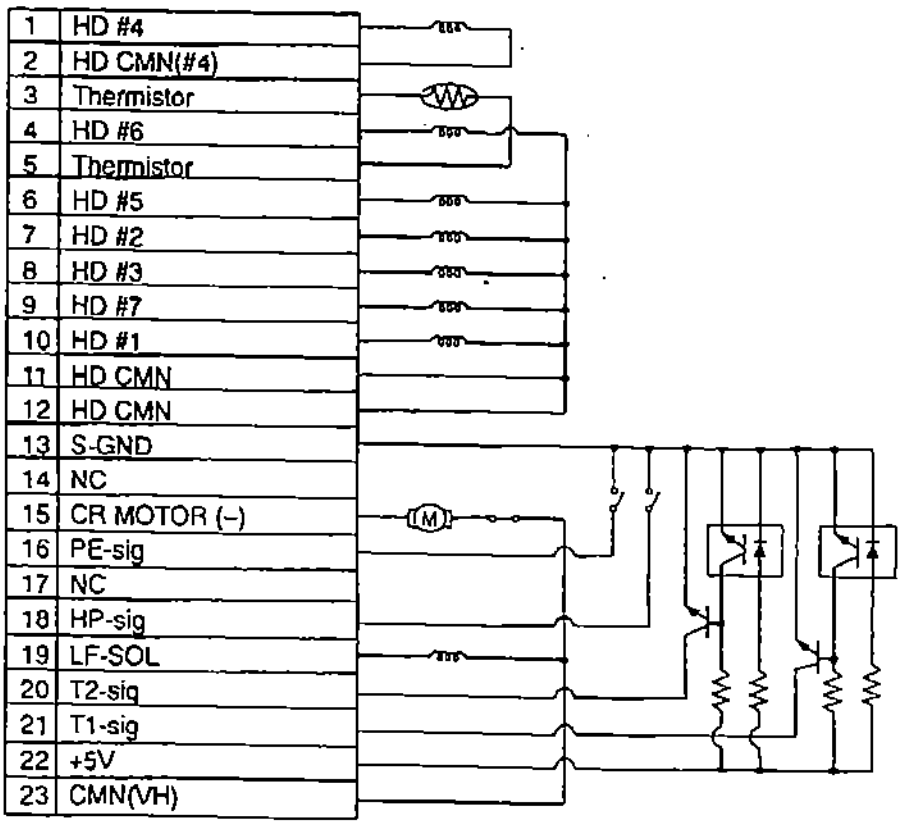


Fig. 3-4-1 Connector connections

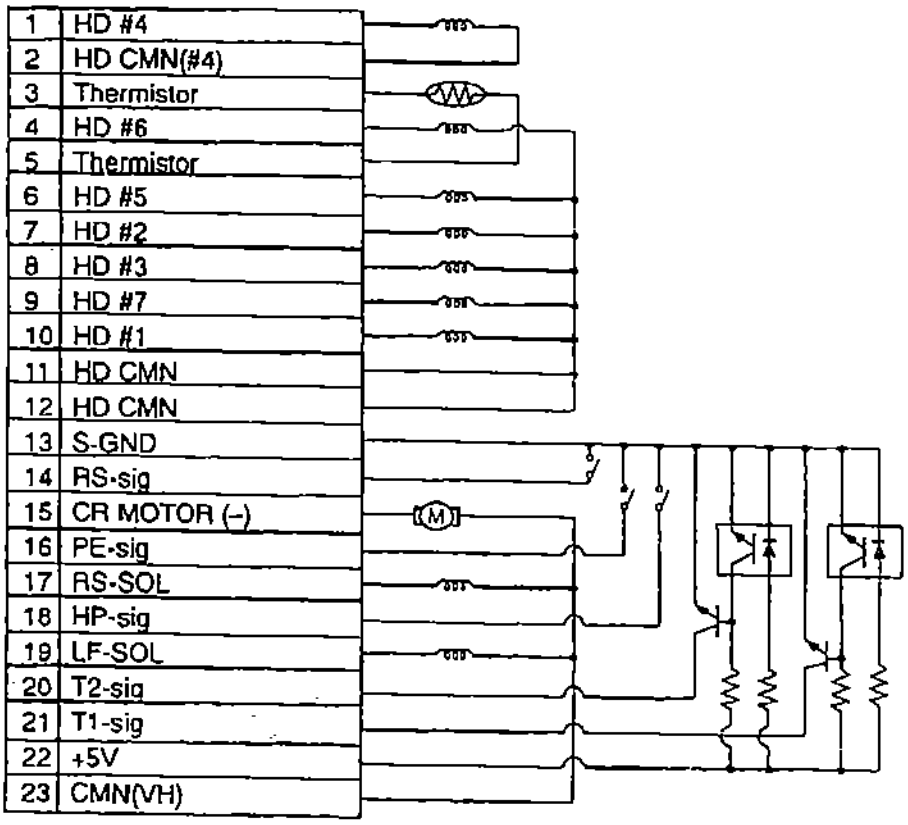
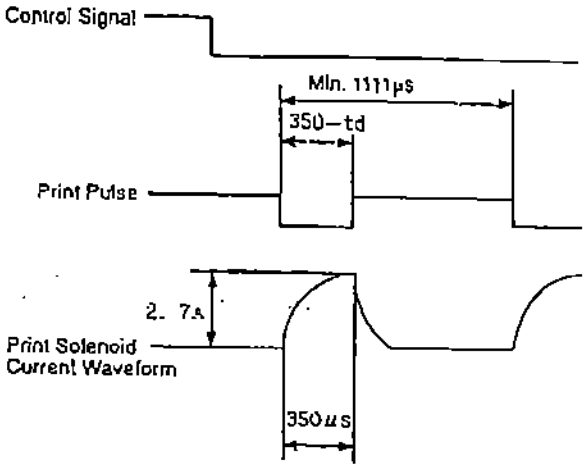


Fig. 3-4-2 Connector connections

3.5 Print Head Specifications

3.5.1. Basic Specifications

Item	Specifications
Supply voltage	12VDC±1. 2V
Response frequency	900Hz
Pulse width	See Fig. 3-6
Coil resistance	2. 9±0. 5Ω (Includes cable resistance)
Peak current	2. 7A(12VDC, 350μs)
Timing	Energizing is begun at the falling of the output signal of timing signal 1 in Fig. 3-18. Energizing cycle shall be 2 pulses or more of timing signal 1.



	Typ.	Max.
Peak current	2. 7A	3. 1A
Power Consumption	7. 0mj/dot	7. 8mj/dot
Condition	12V 350μs	13. 2V 320μs

Transistor's turn off delay time (td): 2μs

Fig. 3-5 Current waveform

The relation of the supply voltage and the pulse width is shown in Figure 3-6.

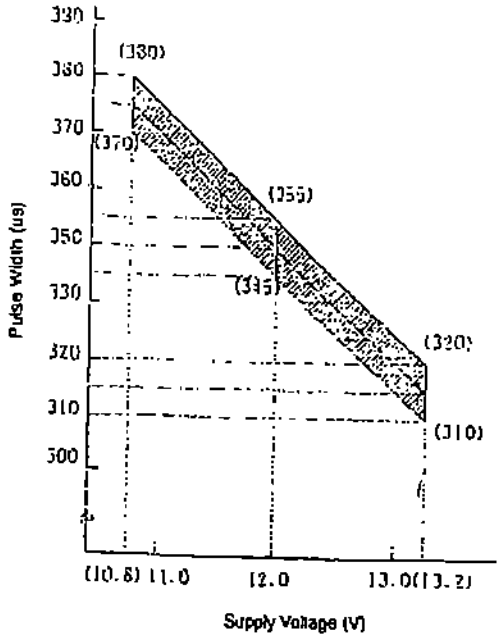
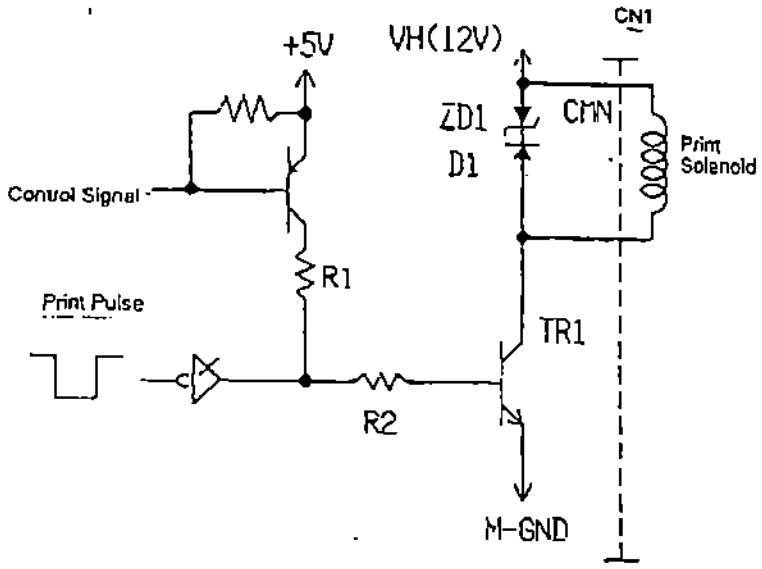


Fig. 3-6 The relation of the supply voltage and the pulse width

Set the pulse width inside of the range of the hachures as shown in Figure 3-6.

A zener diode is employed for suppressing the spike voltage that appears when the transistor is turned OFF. An example of drive circuit is shown in Figure 3-7. In this circuit, a transistor with zener diode (zener voltage 60^{+10}_{-5}V) is used between the base and collector.



TR1	MP44104 (TOSHIBA)(1/4)	Ic=4A, Pc=2.0W Pt=4.0W
R1	1K Ω	
R2	330 Ω	
D1	DAM1D1(Hitachi)	I_F=1.0A
ZD1	RD33FB2(NEC)	P=1W, Vz=33V
VH	V_{CE} of 11V+TR1 (Sat.)=12V	

3.5.2 Pre-fire

This operation is the warming up of printer, in which the operation of a needle wire is improved by applying to it micro vibrations. Pre-fire is executed under the following conditions. Since the pulse width is short, no print operation takes place.

Operation timing	When power is turned ON
Supply voltage	12VDC±1. 2V
Frequency	900Hz
Pulse width	80±5 μs
Count	32

3.5.3 Head temperature sensor circuit

When the printer prints continuously for a prolonged time, the print head faces the risk of getting overheated. There, this head temperature sensor circuit finds out the internal temperature of print head by sensing the resistance value of a thermistor located inside the head.

Make the printer execute the following operations, according to the internal temperature of its print head.

a. $T < 105°C$
   - Execute regular print operation (bidirectional printing).

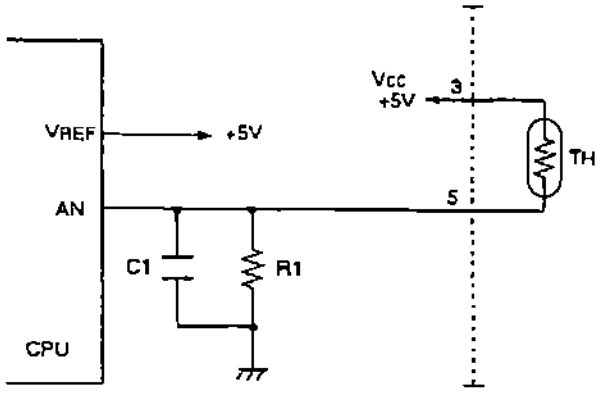
b. $105°C \leqq T$
   - Stop print operation. As soon as the internal temperature of print head lowers down to below 105°C, resume the bidirectional printing of above item 'a'.

Below is given a conversion table of internal temperature of print head and resistance values of thermistor. The resistance value of thermistor is sensed every alternate line.

AN voltage is controlled to set 3.868V at 105°C.

	Temp. (°C)	Resistance value of thermister (KΩ)		
		Min.	Typ.	Max.
T	105	2.622	2.926	3.232

One example of head temperature sensor circuit is given in Fig. 3-8. This circuit senses the temperature by employing an A/D converter built inside CPU.



TH	Thermistor TM5410H (HITACHI)
R1	10KΩ ±1%
C1	0.01μF Ceramic capacitor (noise elimination)

Fig. 3-8 Head temperature sensor circuit (example)

3.5.4 Print Duty

When you dont't use the head temperature sensor circuit, you can print under the maximum print ratio N as shown in Figure 3-9. No matter what pattern you may use, set the maximum print ratio under N. Even if you set the maximum print ratio over N, the printer prints, but it gives to printer the possible damage. However, when the head temperature sensor circuit is activated and the print ratio is over this maximum ratio, the printer stops printing.

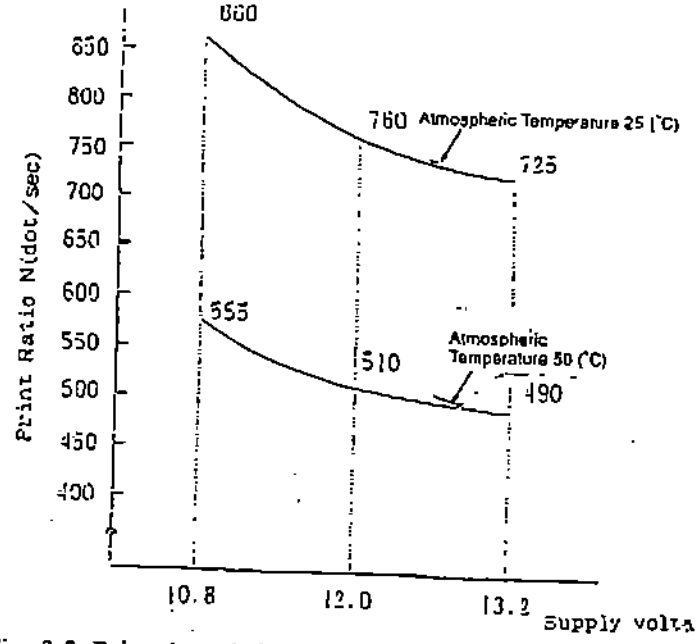


Fig. 3-9 Print duty (without the head temperature sensor circuit)

When you print by using the wires evenly, the print duty of the continuous print is curved as shown in Figure 3-9. The possible dot number D of a character is calculated by the numerical formula.

$$D = \frac{N\ (\text{Print Ratio}) \times T\ (\text{Print time per line includes the time of the paper feed [sec]})}{L\ (\text{number of character per line})}\ [\text{dot/chars}]$$

When you use the specific wires many times, make sure the maximum print ratio is not over the print duty shown in Figure 3-10. However, when the head temperature sensor circuit is activated, and the print using 5 or more specific wires is over this maximum ratio, the printer stops printing.

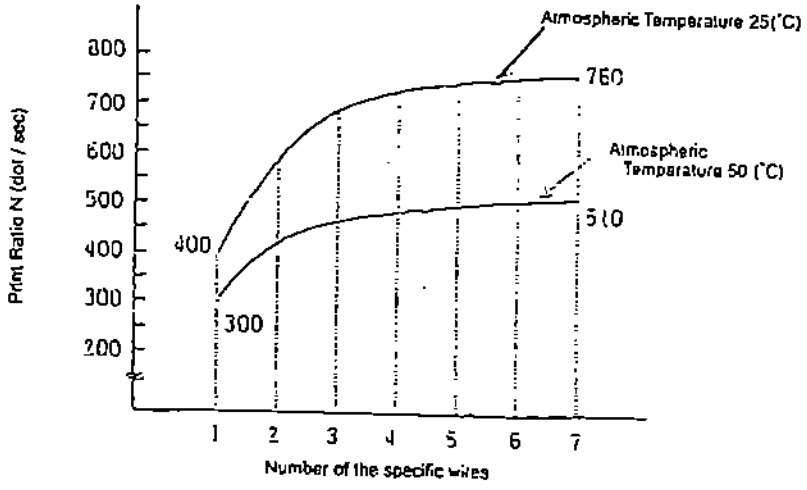


Fig. 3-10 Print duty (using the specific wires many times)

The print duty executed under the supply voltage 12. 0V is shown in Figure 3-10.

3.6 Print Timing Specifications

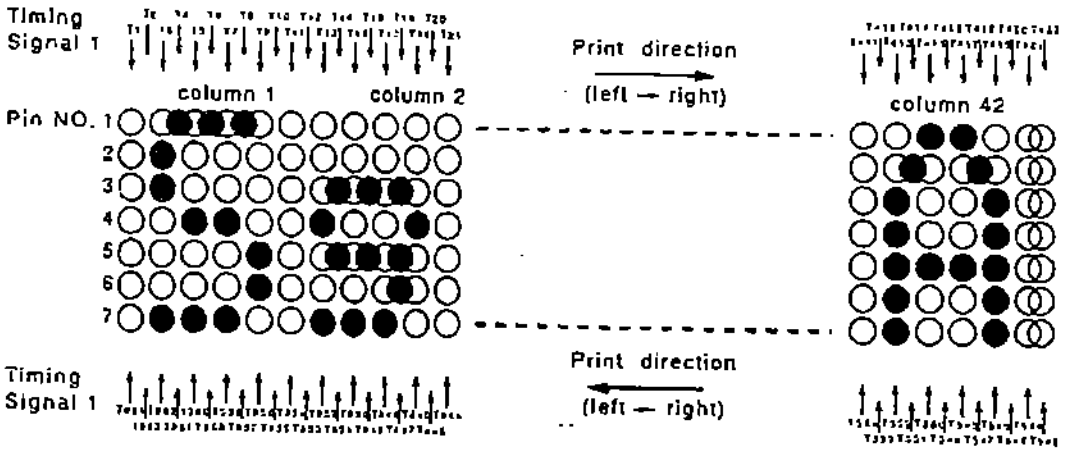
This printer uses timing signal 1 as the counting pulse of the solenoid and motor control. The numbering Tn of the timing signal 1 is obtained as follows.

Detect the first rise of timing signal 2 after the home position signal has risen, and the first drop of timing signal 1 so that it becomes T-1. Then the next timing signals drop so that they become T2, T3, and T4.

Print timing is shown in the figure 3-11.

Please pay attention the following regarding these print timings. The make-time cycle of the same pin should be over 2 pulses at timing signal 1.

① 7 × 7 dot matrix (half dot)



② 9 × 7 dot matrix (half dot)

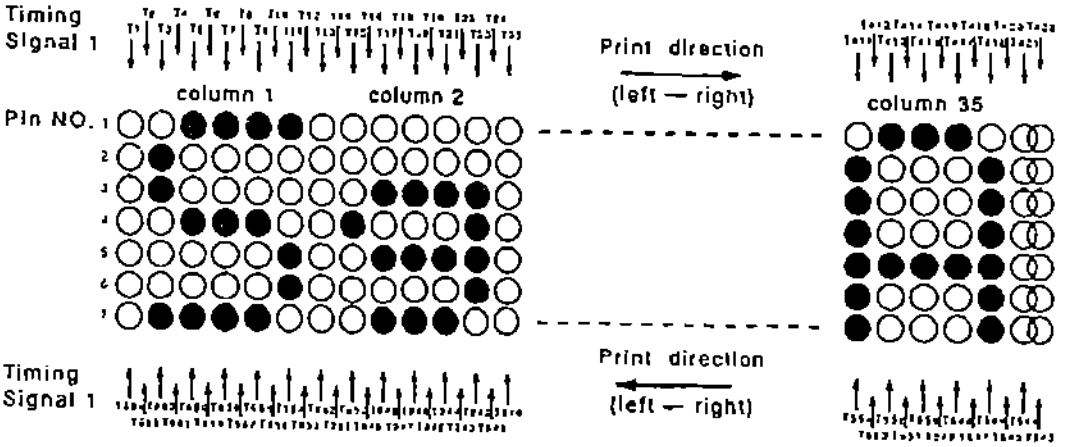
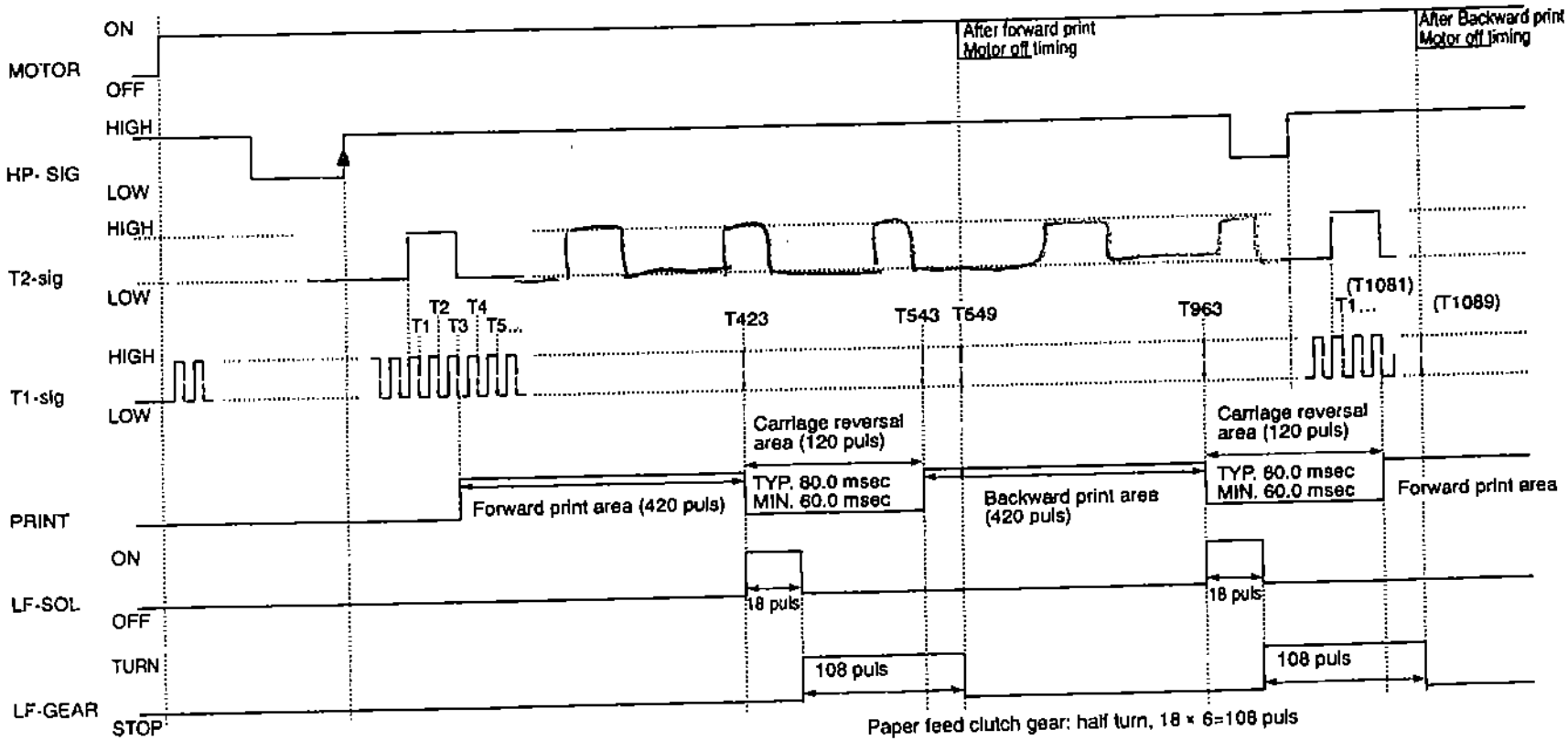


Fig. 3-11 Printing timing

3.7 Timing Chart

(1) Printing Action

990 pulses

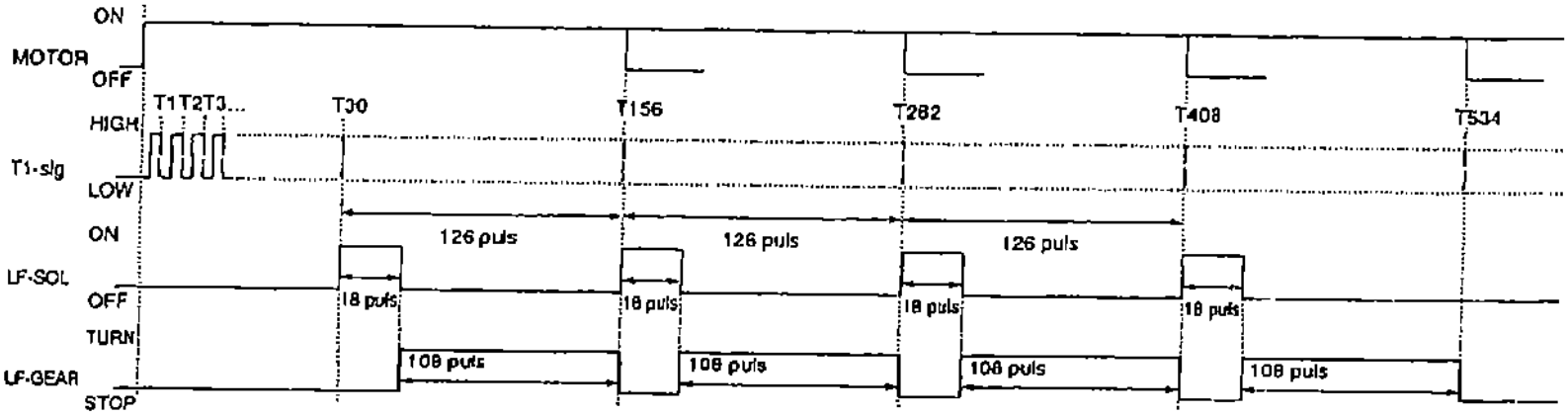


T1-Sig: TYP. 1500Hz, MAX. 1700Hz (Soft and CPU board are available to 2000Hz)

Printing speed: T1-Sig 1500Hz=Approx. 2.78/sec

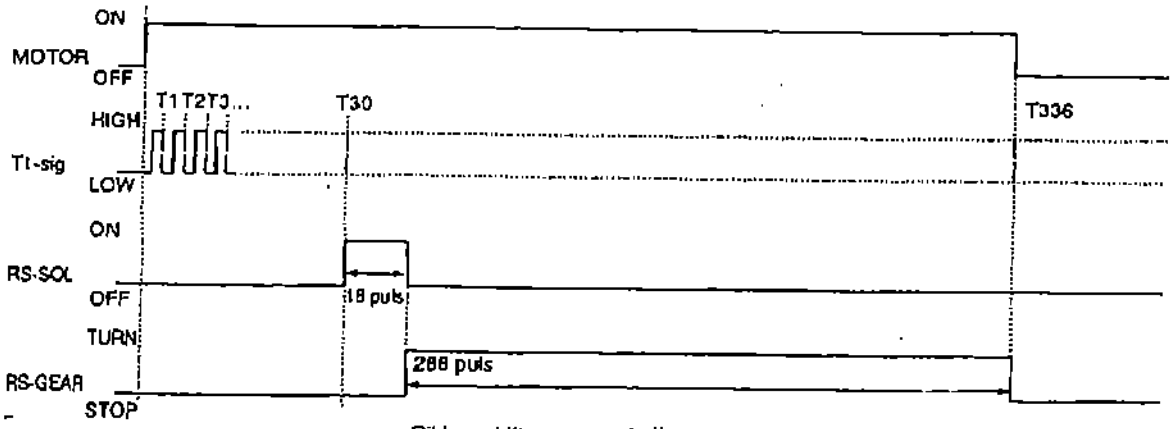
1700Hz=Approx. 3.15/sec

(2) Continuous Feed Action



Paper feed clutch gear: half turn, 18 × 6=108 puls

(3) Ribbon shift operation (for MP216 only)



Ribbon shift cam gear: half turn, 18×6×32/12=288 puls

3.8 Motor Specifications

Item	Specifications
Type	DC motor
Supply voltage	12VDC±1. 2V
Start current	Max. 0. 6A
Average current	Approx. 135mA

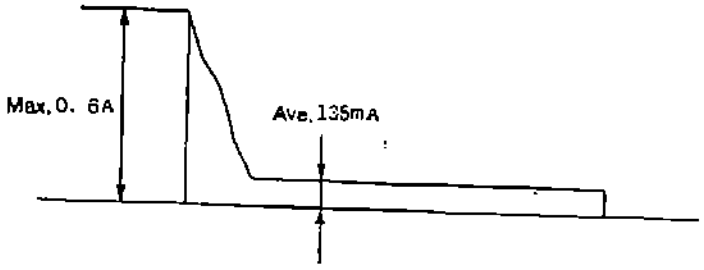


Fig. 3-12 Current waveform of the motor

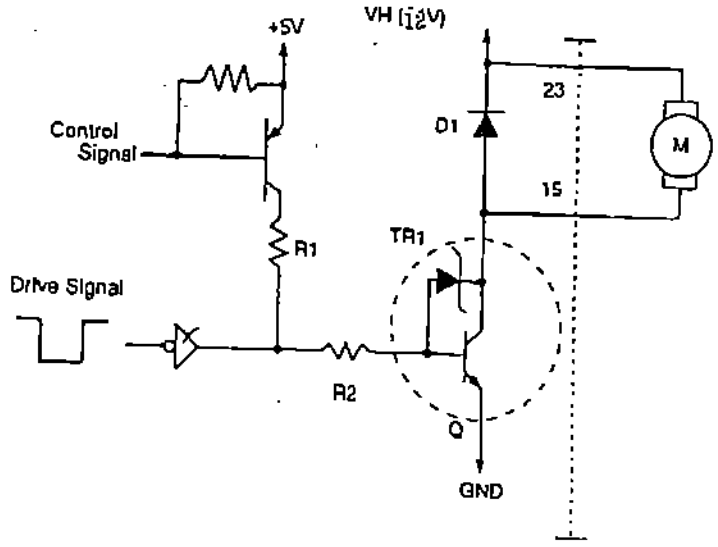


Fig. 3-13 Motor drive circuit (example)

TR1	2SD2010 (ROHM)
D1	DSM1D1
R1	1KΩ
R2	330Ω
VH	11V + TR1 V_{CE} (sat.) = 12V

3.9 Solenoid Specifications

Line feed solenoid (LF-SOL)

Item	Specifications
Supply voltage	12VDC±1. 2V
Pulse width	T1-sig 18 pulse (Approx. 12ms)
Coil resistance	Approx. 18Ω
Average current	Approx. 600mA

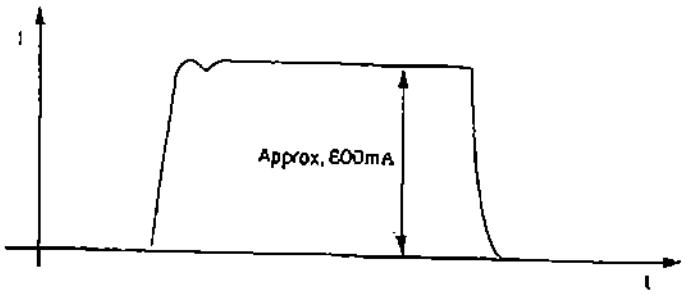


Fig. 3-14 Current waveform of LF-SOL

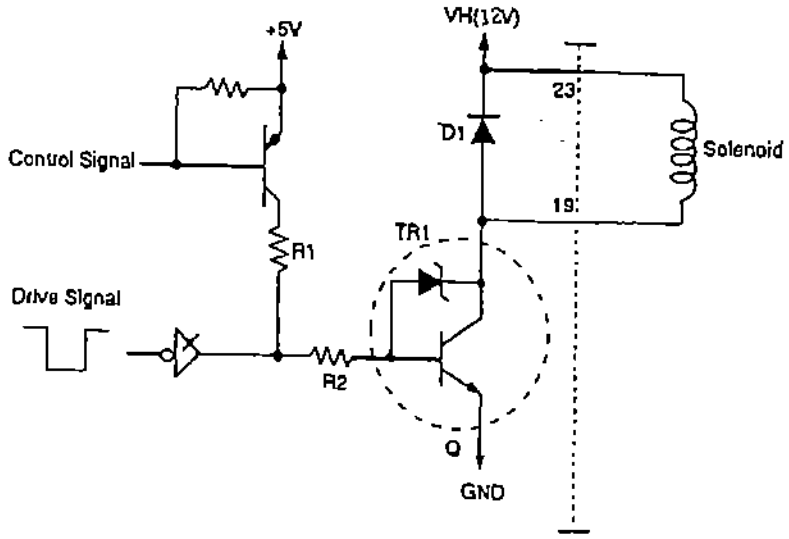


Fig. 3-15 LF-SOL drive circuit (example)

TB1	2SD2010 (ROHM)
D1	DSM1D1
R1	1KΩ
R2	330Ω
VH	11V + TR1 V_{CE} (sat.) = 12V

Ribbon shift solenoid (RS-SOL)

Item	Specifications
Supply voltage	12VDC±1. 2V
Pulse width	T1-sig 18 pulse (Approx. 12ms)
Coil resistance	Approx. 18Ω
Average current	Approx. 600mA

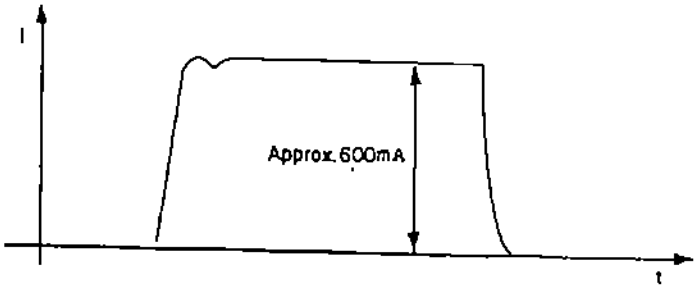


Fig. 3-16 Current waveform of RS-SOL

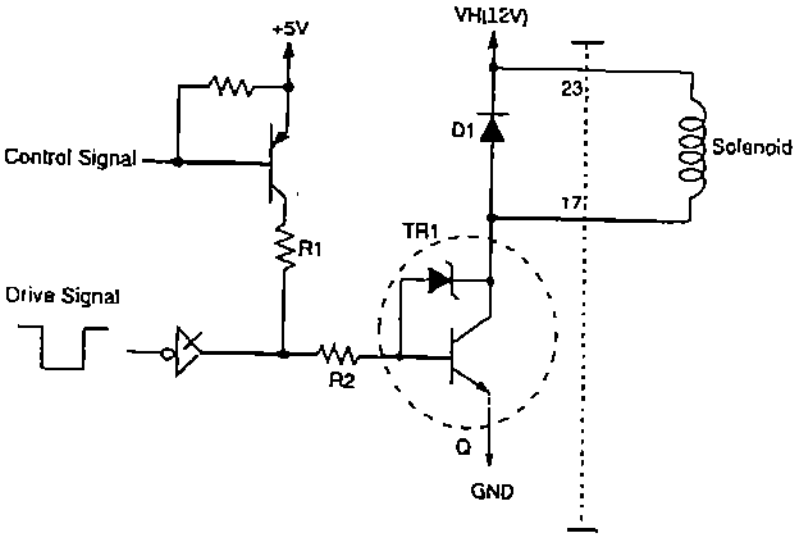


Fig. 3-17 RS-SOL drive circuit (example)

TB1	2SD2010 (ROHM)
D1	DSM1D1
R1	1KΩ
R2	330Ω
VH	11V + TR1 V_{CE} (sat.) =12V

3.10 Timing Signal Detector Specifications

The timing signal detector is composed of a detection slit mounted on the motor shaft, a photo interruptor, and waveform shaping circuit.

Timing signal 1 is generated 18 pulse and timing signal 2 is generated 1 pulse every time the motor rotates by 1 turn.

PS	Photo interruptor ON1004R (MATSUSHITA)
TR1	2SC1740
R1	4.7KΩ
R2	56KΩ
R3	150Ω
C1	2200PF

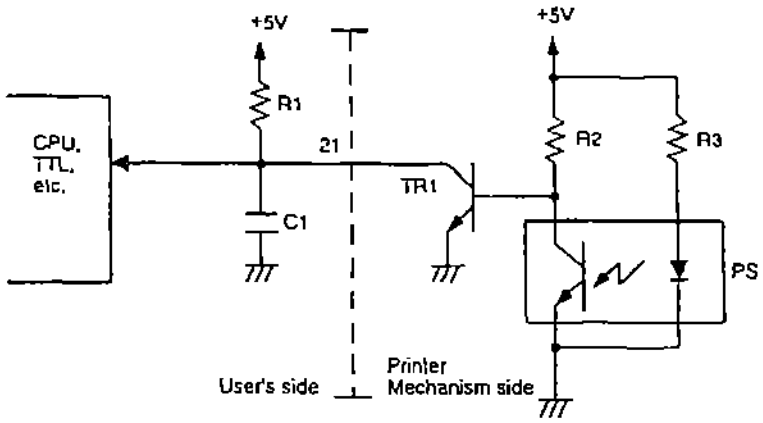


Fig. 3-18 Circuit of timing signal 1 (example)

PS	Photo interruptor ON1004R (MATSUSHITA)
TR1	2SC1740
R1	4.7KΩ
R2	56KΩ
R3	150Ω
C1	2200PF

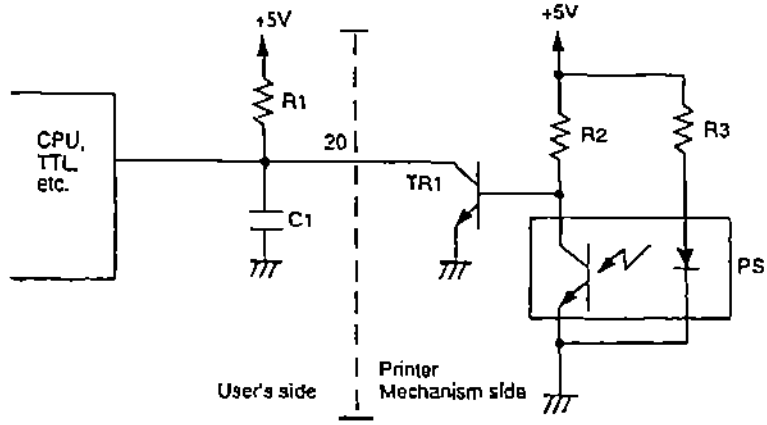


Fig. 3-19 Circuit of timing signal 2 (example)

3.11 Home Position Detector (HP-sig) Specifications

The home position detector is composed of the mechanical switch. While the carriage is located at the left end, the switch remains ON.

R1	10KΩ
R2	15KΩ
C1	0.022μF

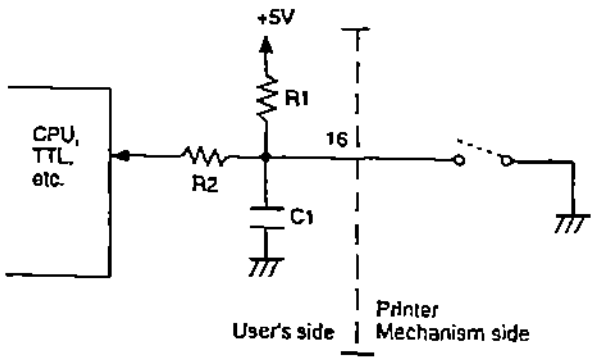


Fig. 3-20 Home position detector circuit (example)

In order to improve the reliability, we recommend that the HP-sig is detected as described below.

(1) When the T1-sig is unstable when turning on the power, etc.
Detect the L level after having detected the H level of the HP-sig, and then, after having carried out 92 pulse counts for the T1-sig, detect the H level.

(2) When the T1-sig is decided during continuous operation of the motor
Detect the L level of the HP-sig, and then, after having counted 1066 pulses of the T1-sig, detect the H level.

3.12 Paper-out Detector (PE-sig) Specifications

The Paper-out Detector is composed of the mechanical switch. While the paper is set in the paper tray, the switch remains ON.

R1	10KΩ
R2	15KΩ
C1	0.022μF

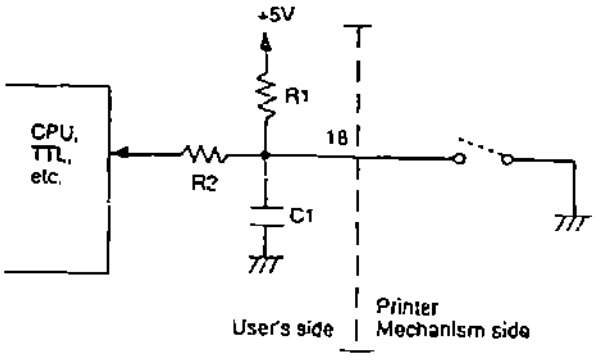


Fig. 3-21 Paper-out detector circuit (example)

3.13 Ribbon position detector (RS-sig) Specifications (MP216 only)

The ribbon position detector is made up by a mechanical switch.
When the ribbon is at the position for printing of black characters, the switch is ON.

R1	10KΩ
R2	15KΩ
C1	0.022μF

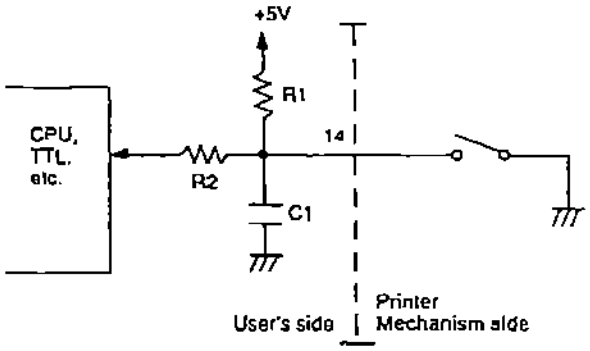


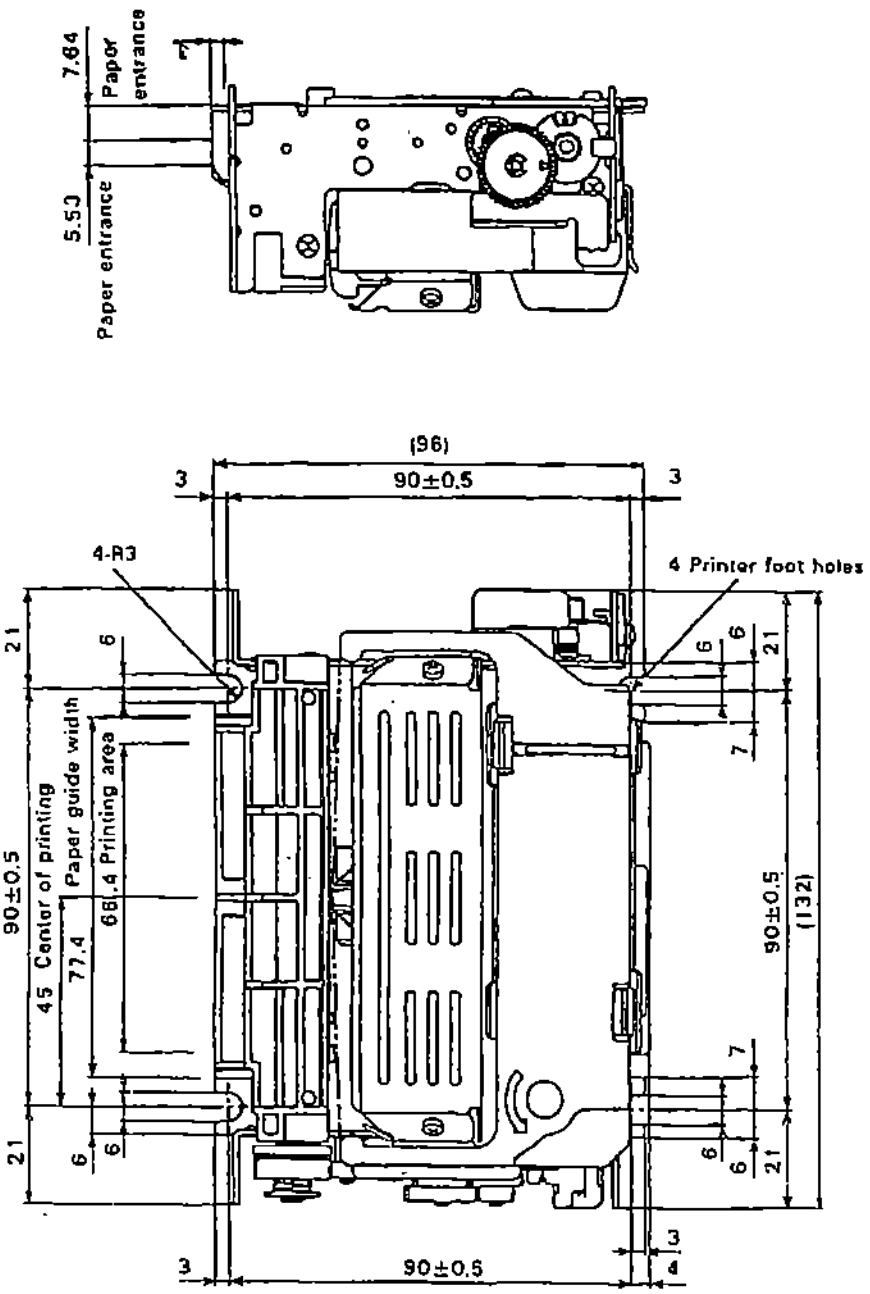
Fig. 3-22 Example of ribbon position detection circuit

In order to improve the reliability, we recommend that the RS-sig is detected while the motor is off.

3.14 Dimension and Weight

See Fig on the next page for external dimension of the printer mechanism.

Weight of printer mechanism: MP212 approx. 460g (excludes the ribbon cartridge)
MP216 approx. 480g (excludes the ribbon cartridge)
Weight of ink ribbon cartridge: approx. 30g



Unit: mm

Fig. 3-23-1 MP212 External Dimension

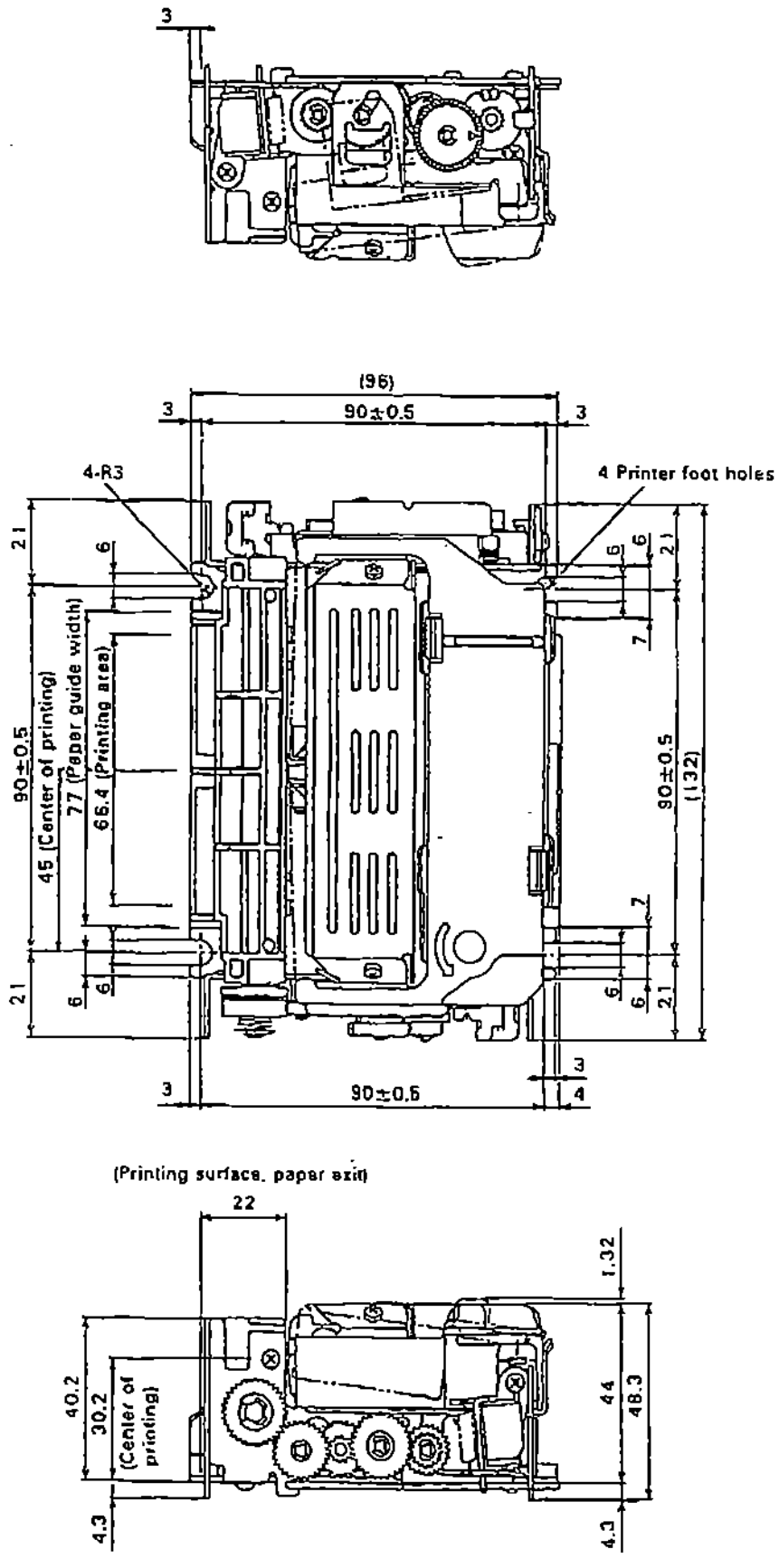


Fig. 3-23-2 MP216 External Dimension

4. RELIABILITY SPECIFICATIONS

Item		Specification	Remarks
Life	Printer reliability	2.5 million lines MCBF	Except print head life
	Print head life	75 million characters	14 dots per character Recommended ribbon: MP212: purple color ink ribbon cartridge (part No. 30980010) MP216: black & red color ink ribbon cartridge (part No. 30980210)
Operating environment	Temperature Relative humidity	0°C to 50°C 10 to 80% RH (at 40°C)	After being left under this environment for two hours, the printer mechanism must satisfy general specification.
Storage environment	Temperature Relative humidity	−20°C to +70°C 5 to 95% RH (at 40°C)	After being left under this environment for 96 hours, and under normal temparature and humidity for two hours, the printer mechanism must satisfy general specification.
Vibration test		Vibration : 10 – 55 – 10Hz Amplitude : 1.54 mm (at regular range) Sweep : one minutes Gravity : 0.3 – 9.3G Direction : X, Y and Z directions Test time : Two hours in each direction (Six hours in three directions) Packing : With the least packing unit	The printer must satisfy general specification after testing.
Shock test		Height : 85 cm Order : 1 corner, 3 edges, and 6 surfaces Packing : With the least packing unit	The printer must satisfy general specification after testing.
Insulation resistance		1MΩ (100VDC)	When you put the printer mechanism to the quality control test, use the printer under the environment as shown at the left.

5. SETTING THE RIBBON CARTRIDGE

1. Turn the ribbon feed knob of ribbon cartridge in the direction of the arrow to remove slack in the ribbon.
2. Place the ribbon cartridge as shown in Fig. 5-1, and press it to set in the Unit. When the ribbon cartridge is hard to set to the proper position, turn the ribbon feed knob in the direction of the arrow.
   Insert the ink ribbon between the print head and the platen.
3. Turn the ribbon feed knob of ribbon cartridge in the direction of the arrow to remove slack in the ribbon.

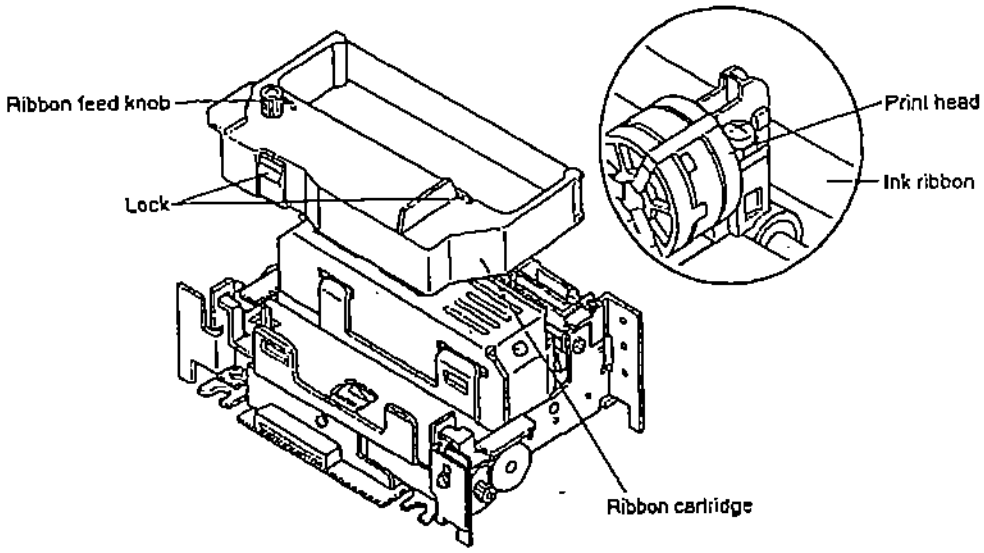


Fig. 5-1 Setting the ribbon cartridge

6. SETTING THE PAPER

6.1 Setting the Paper

1. Tear off straight the leading edge of the paper (roll paper).
2. Make sure you set the paper in the direction of the following figure, and insert the paper to the paper guide.

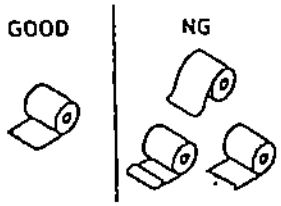


Fig. 6-1 Positions of adjust lever

3. Turn the feed motor, and turn on the solenoid to feed the paper.
4. When the paper comes out of the paper outlet, turn the feed motor off, and stop the paper feed.

Caution: The roll paper has a mark that gives you a Paper-out notice. When you notice this mark, set the new roll paper.

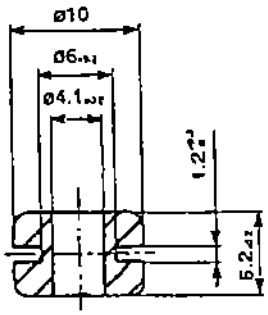
6.2 Removing the Paper

1. Tear the paper behind the paper guide.
2. Turn the feed motor to remove the paper.

Caution: If snatched out manually, the paper may become askew, causing it to be jammed inside the printer.

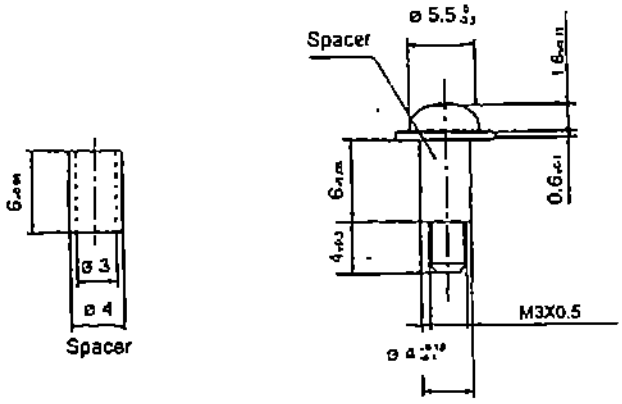
7. INSTALLATION

1. At the time of mounting the printer mechanism into its housing cabinet, put cushion material, such as, rubber foot, on the printer mechanism legs. If installed directly, reverberations occur producing noise. We recommend that you use the following rubber foot.



Parts name : DAMPER RUBBER SP2
Parts No. : 30290010

Fig. 7-1 Recommended Rubber foot



Parts name : SCREW 3.0
Parts No. : 30250010

Unit: mm

Fig. 7-2 Recommended Set screw

2. Set the play between the roll paper holder and paper thrust direction to within 2mm, and ensure that the roll paper holder doesn't hold back the edge of paper.
3. Set the paper inserting angle to within 40°.
4. Attach R of size R2 or larger at places which contact the corners of the paper insertion case.
5. Set the paper feed load, at the printer's paper inlet, to 30g or less.
6. Take into account prevention of paper rewinding, when designing the case.
7. Allow needed space surrounding the printer. Fig. 7-3 shows an example of installation space. In the case of MP216, please be especially careful as the ribbon moves up and down.
8. Fig. 7-4 shows an example of installation.
9. Since this printer mechanism employs galvanized steel panels, the end surface doesn't come plated.

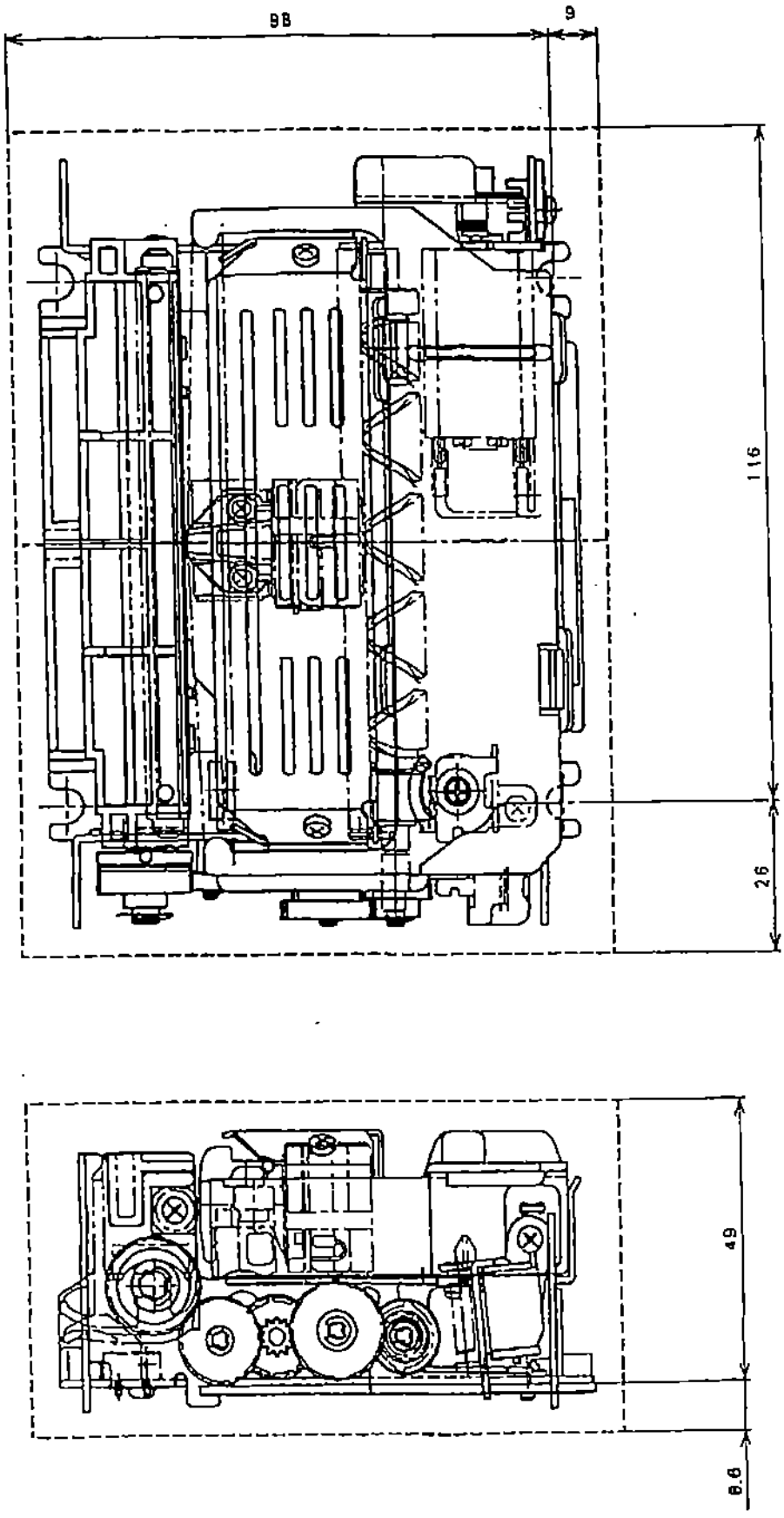


Fig. 7-3-1 MP212 Installation space (example)

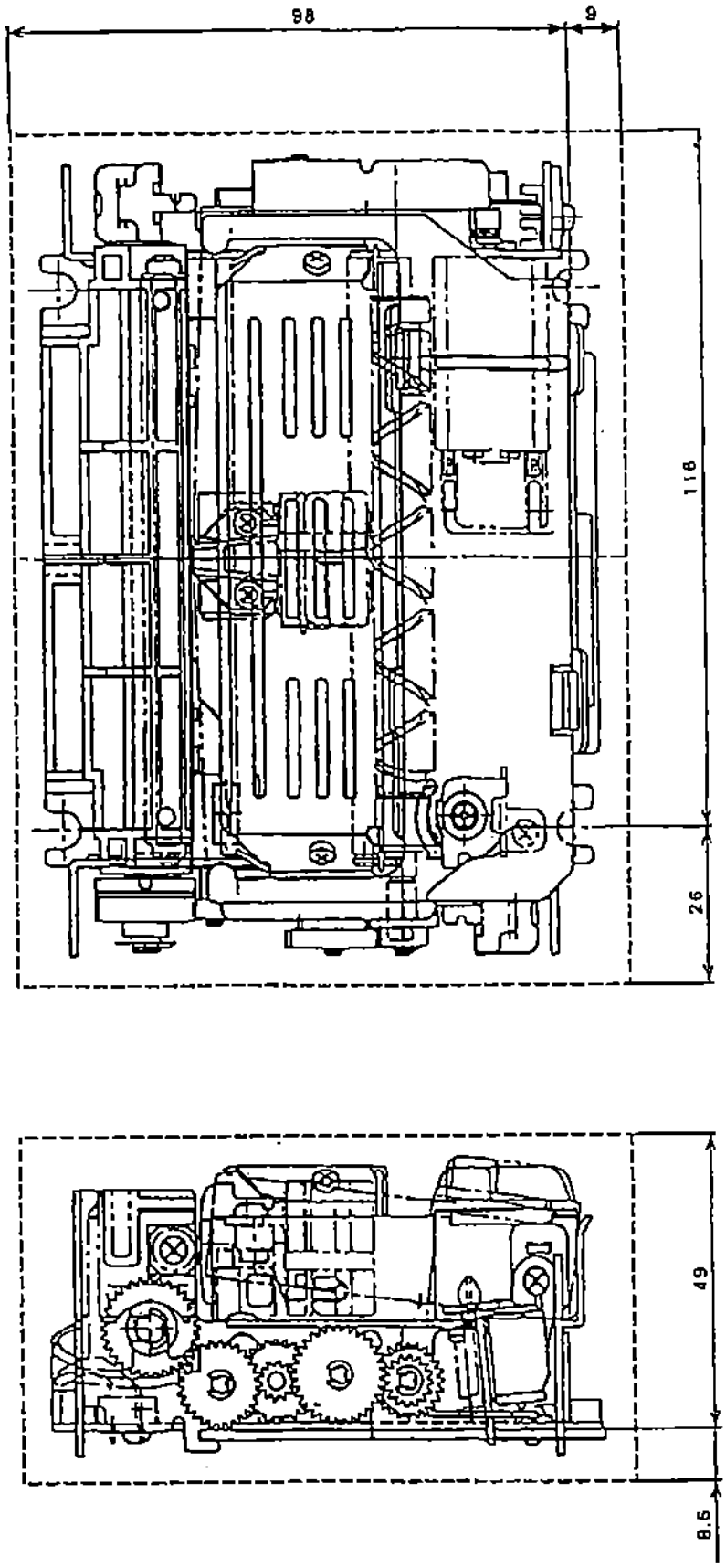
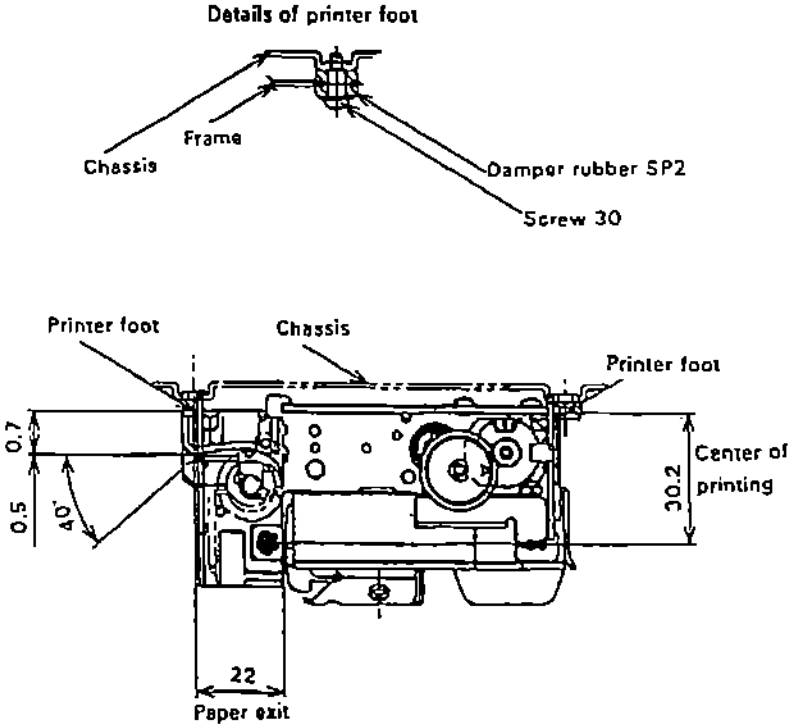
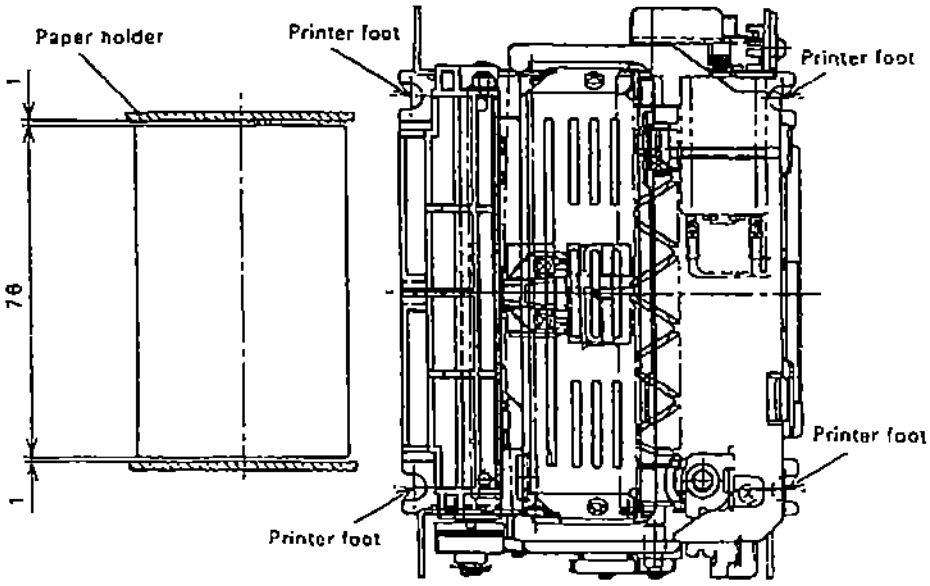


Fig. 7-3-2 MP216 Installation space (example)





Unit: mm

Fig. 7-4 Printer installation (example)

8. OPERATIONAL NOTES

8.1 Power ON/OFF Note

If the 5V power supply line for logic has not fully risen or fallen immediately after the power supply is turned ON or OFF, the CPU or TTL in the logic circuit may misoperate. At such times, power is supplied to the motor or solenoid, causing, in the worst case, burnt out solenoid or running of motor (misoperation), unless the12V power supply line for motor drive is completely OFF. To avoid such misoperation, take into account the following points.

8.1.1 Power supply ON/OFF timing rule

Supply 12V line after the 5V line has fully risen. Similarly, cut off the 5V line after the12V line has fully fallen.

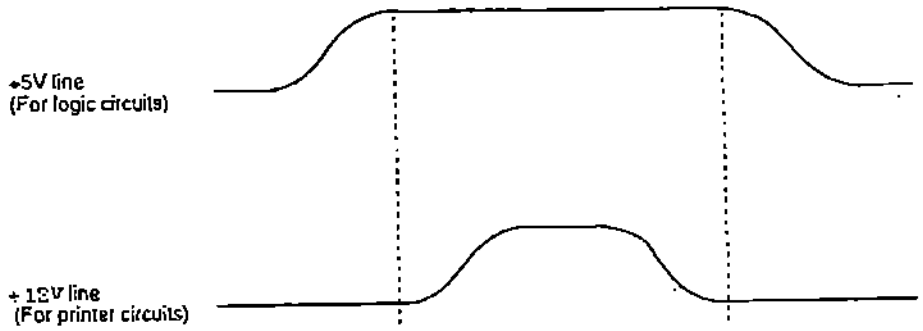


Fig. 8-1 Power supply ON/OFF timing rule

8.1.2 Method of controlling the drive circuit

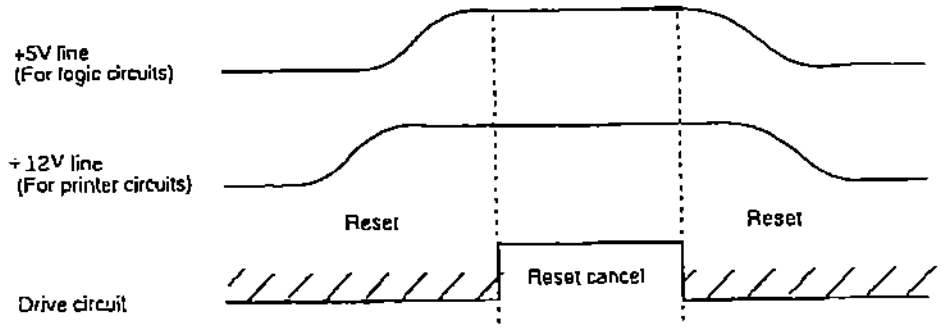


Fig. 8-2 Drive circuit controlling method

If the power supply ON/OFF timing rule cannot be followed, reset the print solenoid or motor drive circuit with control signal. An example of this type of circuit is shown in Fig. 8-3. Turn OFF transistor TR1, while the 5V line has not completely risen, in order to inhibit power to the print solenoid. Then as soon as the 5V line has completely risen, turn ON TR1, permitting power to the print solenoid.

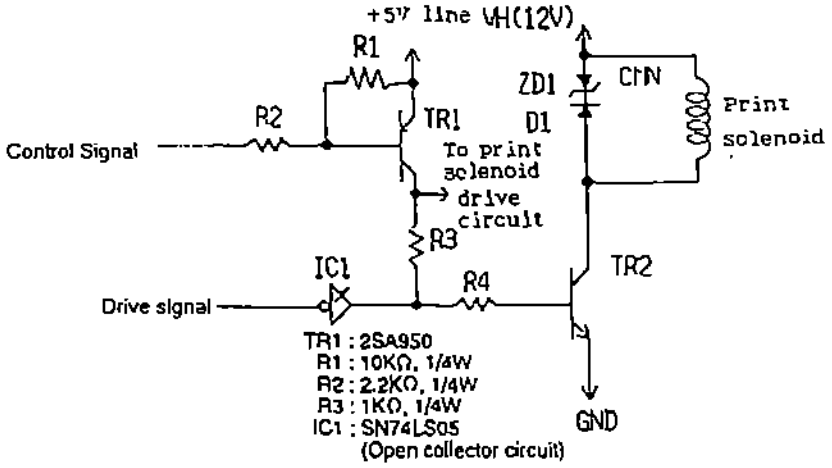


Fig. 8-3 Circuit to control drive circuit (example)

8.2 Carriage Motor Protection Method (Against Mechanical Errors)

If the carriage motor gets locked as a result of trapping foreign matter, etc. in the printer mechanism, a risk of damaging the motor due to flow of excess current to it is generated. Therefore, it becomes necessary to monitor the excess load status of printer mechanism, by detecting the cycle of timing signal 1 with timer, etc. Once the cycle of timing signal 1 becomes as given below, stop power being supplied to the motor.

a. Print interval: 2ms or more/450μms or less
b. Outside print interval: 200ms or more

8.3 Other Notes

1. Do not attempt to print when the paper or ribbon cartridge are not loaded in the printer mechanism as this could damage the print head.
2. Do not store or use the printer mechanism at places of substantial dust, iron content, etc., or in oily atmosphere.
3. Wipe off dust, dirt, etc. from the printer mechanism, using a soft brush. Or, wipe with a piece of cloth dampened in alcohol.
4. Never inflict strong force on the printer mechanism. Otherwise, the frame or other parts may be distorted, rendering normal functioning impossible.
5. Avoid sudden changes in the ambient conditions like, temperature, humidity, etc. even while they are held in prescribed limits. If sudden change occurs, allow about 30 minutes for acclimatizing, before using the printer mechanism.
6. Never use the printer mechanism with condensation deposited onto it.

9. POWER SUPPLY CAPACITY

9.1 12V Line

Arrange for the following power supply, taking into account the voltage drop (about 1V) of V_{CE} (sat) of the power transistor for driving print solenoid.

Power supply voltage	11V+1V=12V±10%

Similarly, arrange for 3A or larger power supply capacity; and connect an electrolytic condenser of 4700μF to 6800μF/35V to the power source.

9.2 5V Line

Arrange for 5V power supply for the detector (photo interruptor).

Voltage	5V±5%
Current consumption	Approx. 60mA