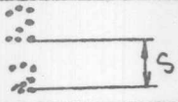
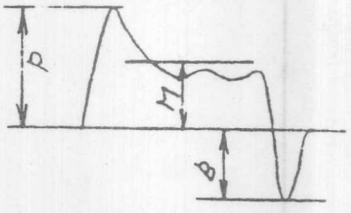
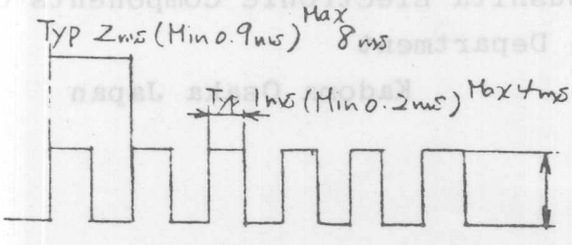
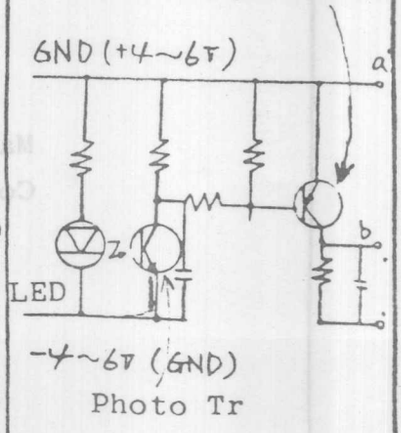
TB EUY 10E2 12LE 187.75.

TGS-80-8

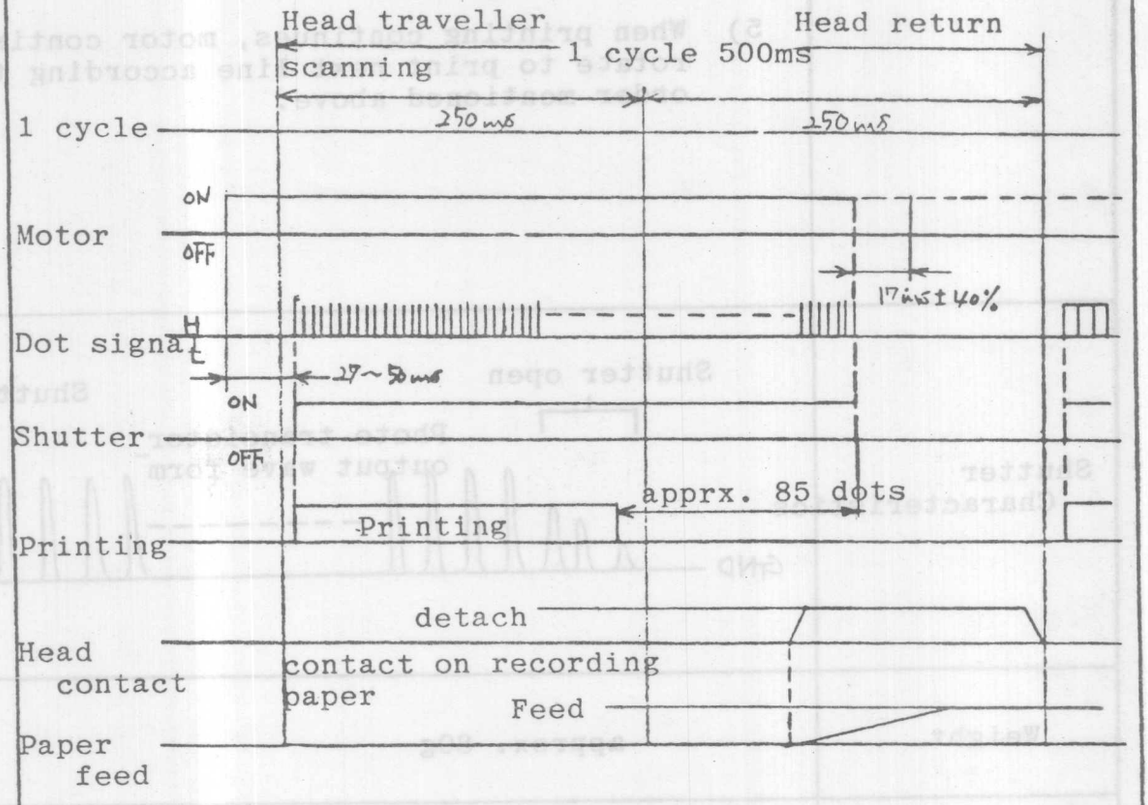
Application Manual
Type EUY-2E

Specifications are subject
to changewhen necessary

Matsushita Electronic Components Co., Ltd.
Coil Department
Kadoma Osaka Japan

Item	Specifications		Remarks
Print characters	7 x 5 dot matrix		
Print Direction	From right to left		
Character size	Height 2.7mm		Pitch between the center of dots 2.4mm
Line pitch(s)	3.5mm ±0.5		
Number of printed characters	15 characters per line		
Printing speed	2 line/s		at 5V
Motor voltage	5± 1V		Voltage between the terminals of a motor
Motor current	Mean (M)	200mA	Motor current wave  at 5V (Voltage between the terminals of a moto
	Peak (P)	900mA	
	Break (B)	550mA	
Timing signal	Photo transistor Output wave form between the terminals of a & b 		Tr for amplification 

Timming chart



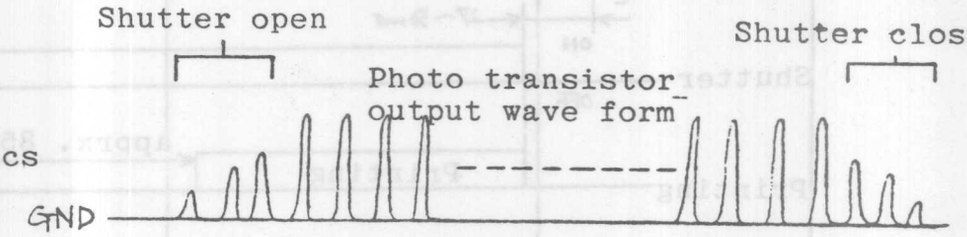
Explanation

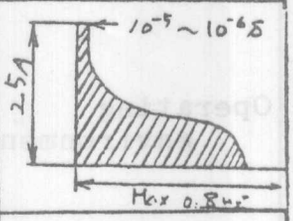
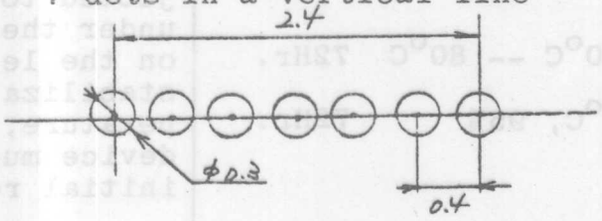
1) By command signal of motor "ON" , motor starts to rotate and after a while, a shutter, which hinders a light of LED, opens at the motor rotation, (This shutter openning can be made by cam action) and print dot timing signal shall be generated from the photo transistor.
This starting of dot timing signal corresponds to a print starting position.

2) Corresponding to the dot timing signal dot per dot, printing dot shall be generated and form character. Finished one line printing and after a while, head starts to move in the opposite direction.

3) At the point of one third of the return way, the head detaches from the recording paper, and one line paper space shall be fed and the motor stops.

4) Motor stop signal shall be generated when the shutter closes and dot timing signal stops and also continues such condition more than 17ms.
Electrically, brake shall be applied.
Brake shall be applied to the motor when dot timing signal continues to stop more than 17ms±40% after the shutter closes.

	5) When printing continues, motor continues to rotate to print next line according to the order mentioned above.	
Shutter Characteristics		
Weight	approx. 80g	
Outside dimensions	Width 72mm Height 36mm Depth 56mm	inc. Paper roll holder ex. Flat cable, lead wire no paper cutter
Battery life	Type of battery SUM-3 4pcs	Applied voltage will be stepped up by DC-DC converter
	Battery life: Number of printed characters 8000 lines	1 line on 1 second off

Item	Specification	Remarks
Voltage	-31V ±10% (28-34V)	
Current	Average 15mA	(15 char/line) 0.1.2.9 PINT
	Peak 2.5A/dot	
Pulse width	0.24 - 0.8ms	
Applied energy	0.6 - 0.41mJ/dot	
Dot dimensions	7 dots in a vertical line 	

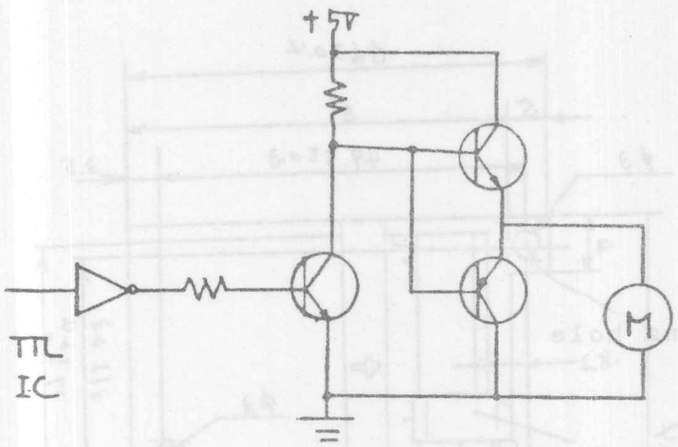
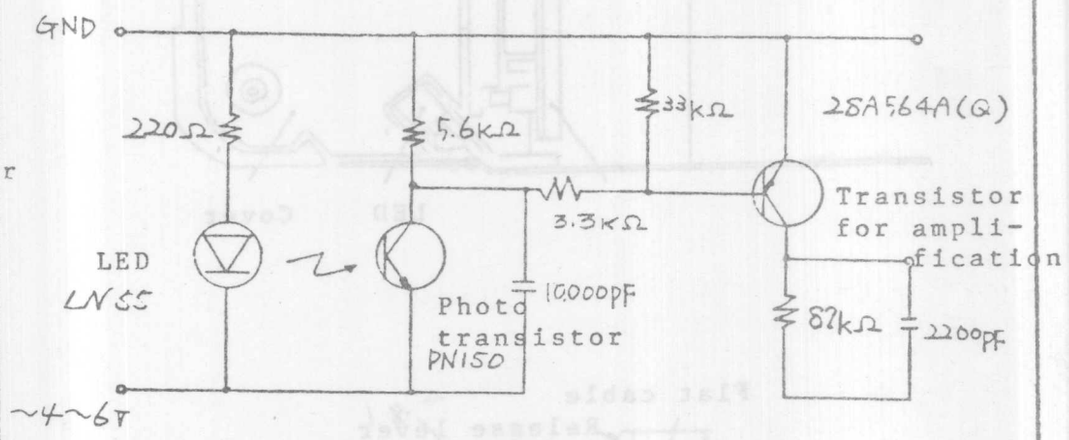
Attention for usage:

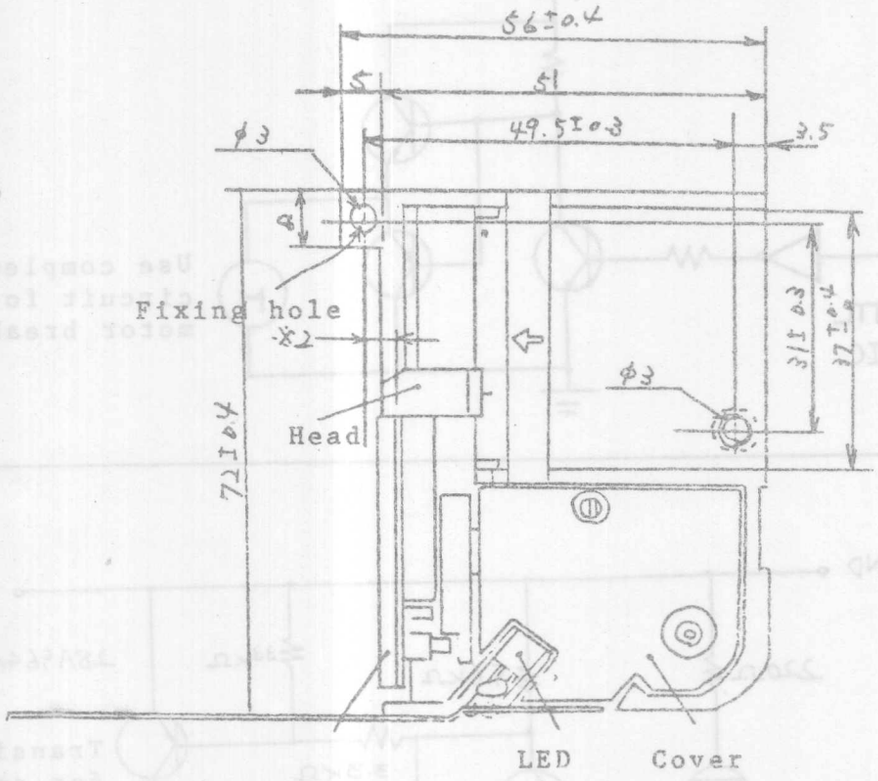
1) Don't operate the printer without feeding the metallized paper. If mistreated, normal printing cannot be expected.
2) It is recommended that you use Matsushita specified metallized paper. If not, clear printing and long life cannot be guaranteed.
3) Printing operation is accompanied with discharge sparks from printing head, and therefore should be free from inflammable gas.

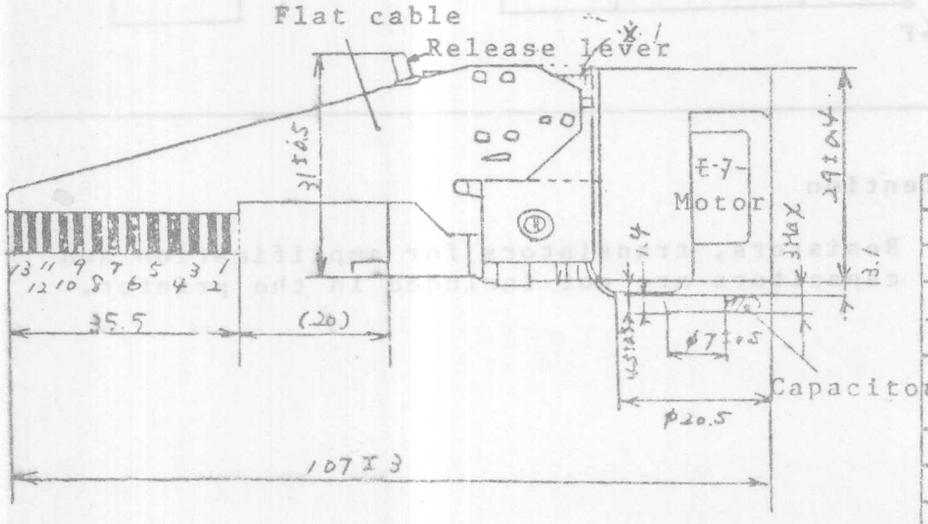
Life and Environmental Characteristics

Item	Specification	Remarks
Life expectancy	MCTF 500,000 lines	
Operating environment	-5°C -- 50°C 40°C, 90%RH	The printer shall be subjected to 3 hours operation under the environment mentioned shown at the left After the operation, the printer shall indicate no change from the initial requirements at a test in the same environment.
Storage environment	-40°C -- 80°C 72Hr. 60°C, 95% 72Hr.	The printer shall be subjected to a 72-hour storage under the conditions shown on the left. After 2 hours stabilization in room temperature, the subjected device must satisfy the initial requirements.
Vibration test	Frequency 10-55 Hz Vibration width 1.5mm Direction X,Y,Z (2 hours/direction)	After subjected to the test, the printer shall indicate no change from initial requirements.
Shock test	Half sine wave; 50G, 11m sec. each in the X, Y and Z direction	
Recording paper	Metallized recording paper Width 36mm, Diameter max. 26.5mm Length approx. 10.5m Bosch RMP 8146 No. 0674, 007, 003 (Robert Bosch Gmbh)	

Drive circuit (reference)

Item	Specification
Motor drive circuit	 Use complementary circuit for good motor breake
Photo transistor circuit	
	Attention Resistors, transistors for amplification and capacitors are not included in the printer.





CONNECTOR

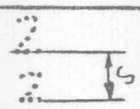
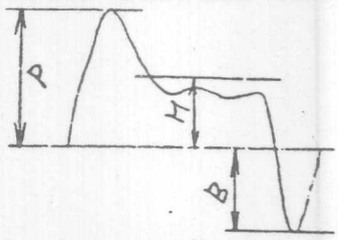
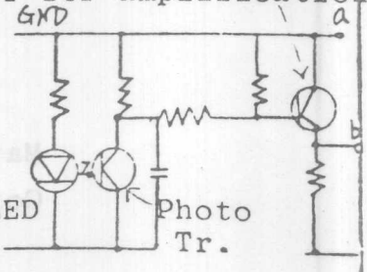
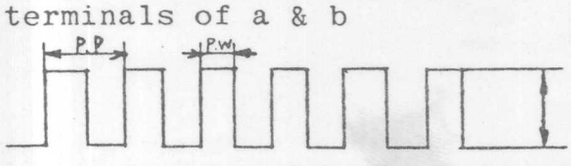
1	Head No. 7(Bottom)
2	Head No. 6
3	Head No. 5
4	Head No. 4
5	Head No. 3
6	Head No. 2
7	Head No. 1(Top)
8	Head common
9	Photo Tr(emitter)
10	Photo Tr(collector)
11	Motor +
12	Motor -
	LED (cathode)
13	LED (anode)

Application Manual

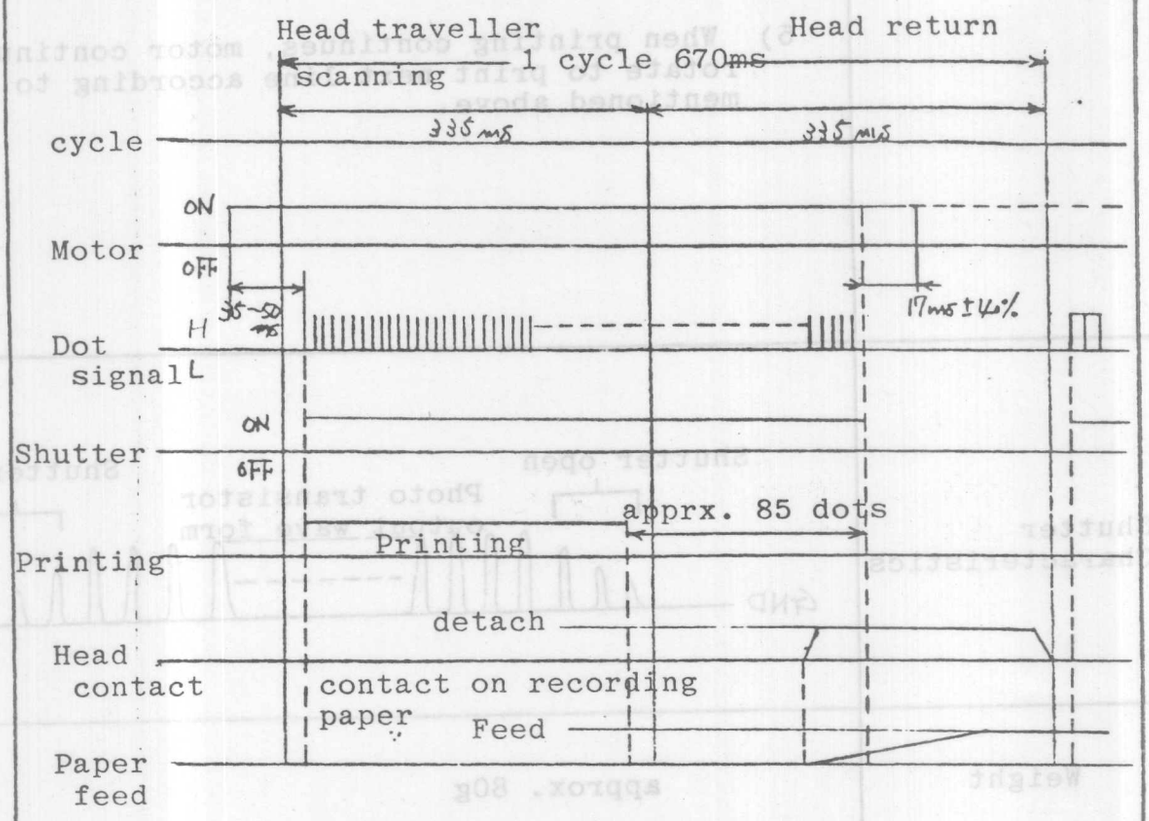
Type EUY-2T

Specifications are subject
to change when necessary

Matsushita Electronic Components Co., Ltd.
Coil Department
Kadoma Osaka Japan

Item	Specifications				Remarks
Print characters	7 x 5 dot matrix				
Print Direction	From right to left				
Character size	Height 2.5mm				Pitch between the center of dots 2.2mm
Line pitch (s)	3.5mm ±0.5				
Number of printed characters	15 characters per line				
Printing speed	Average 1.5 line/s				at 5V (Voltage between the terminals of a motor)
Motor voltage	5 ±1V				Voltage between the terminals of a motor
Motor current	Mean (M)	120mA			Motor current wave  at 5V (Voltage between the terminals of a motor
	Peak (P)	700mA			
	Break (B)	460mA			
Timing signal		Typ.	Min.	Max.	Tr for amplification 
	Pulse(PP) period	2.7ms	1.7ms	8ms	
	Pulse(PW) width	1.4ms	0.4ms	4.5ms	
	Output wave form between the terminals of a & b 				

Timming chart



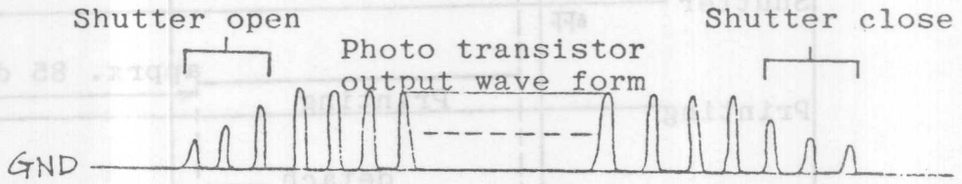
Explanation

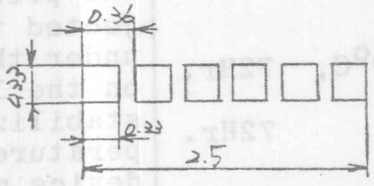
1) By command signal of motor "ON" , motor starts to rotate and after a while, a shutter, which hinders a light of LED, opens at the motor rotation, (This shutter openning can be made by cam action) and print dot timing signal shall be generated from the photo transistor.
This starting of dot timing signal corresponds to a print starting position.

2) Corresponding to the dot timing signal dot per dot, printing dot shall be generated and form character. Finished one line printing and after a while, head starts to move in the opposite direction.

3) At the point of one third of the return way, the head detaches from the recording paper, and one line paper space shall be fed and the motor stops.

4) Motor stop signal shall be generated when the shutter closes and dot timing signal stops and also continues such condition more than 17ms.
Electrically, brake shall be applied.
Brake shall be applied to the motor when dot timing signal continues to stop more than 17ms±40% after the shutter closes.

	5) When printing continues, motor continues to rotate to print next line according to the order mentioned above.	
Shutter Characteristics		
Weight	approx. 80g	
Outside dimensions	Width 72mm Height 36mm Depth 56mm	inc. Paper roll holder ex. Flat cable, lead wire no paper cutter
		Connector Daiichi denshi FF-13C-003
Battery life	Type of battery SUM-3 4pcs	
	Battery life: Number of printed characters 5000 lines	1 line on 1 second off

Item	Specification	Remarks
Voltage	5V ± 1V	Recording paper Jujo TP50CM-Λ TP50KM-Λ
Current	average 280mA 1dot Max. 400mA 1dot	
Pulse width	1.3ms	Refer the "attention for usage" shown below
Applied energy	Standard 1.8mJ	
Dot dimensions	7 dots in a vertical line 	

Attention for usage

1) Circuit should be designed to have narrower pulse width when applied voltage is higher and to have wider pulse width when voltage is lower, because applied energy 1.8mJ is suitable for head.

Applied voltage for head	Preferable pulse width
6V	0.9ms
5V	1.3ms
4V	2.0ms

2) It needs pulse width correction circuit for density of letters depend on ambient temperature.

3) Applied energy for head should not exceed 3mJ.

4) Be careful not to flow abnormal/harmful pulses to the head when printer is equipped in your product.

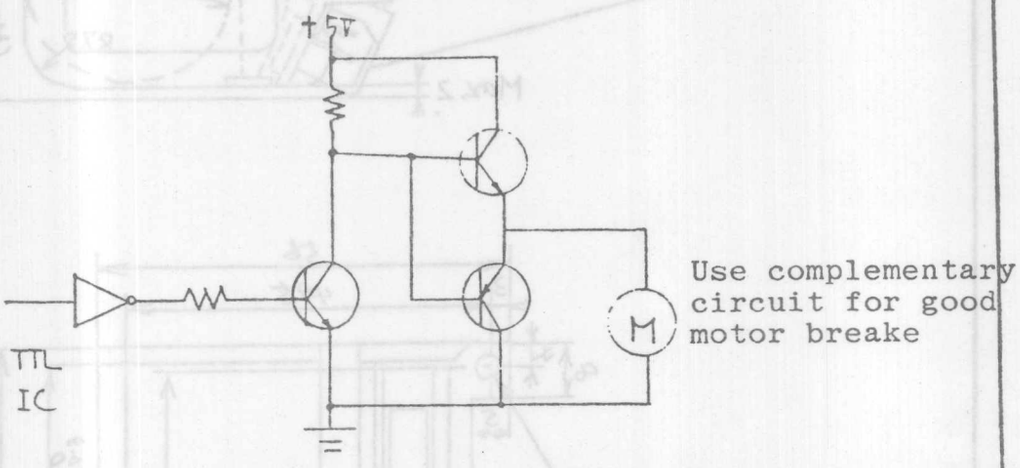
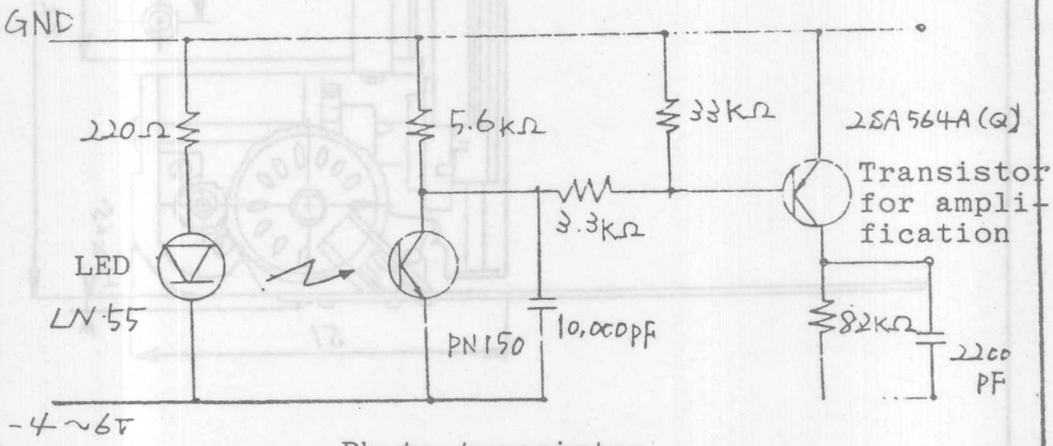
5) Don't operate the printer without feeding the metallized paper. If mistreated, normal printing cannot be expected.

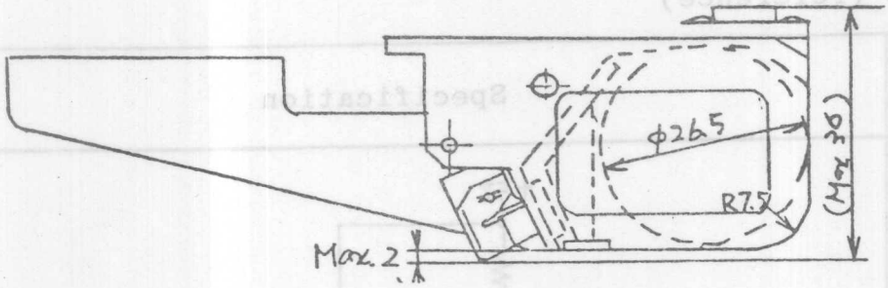
6) It is recommended that you use Matsushita specified metallized paper. If not, clear printing and long life cannot be guaranteed.

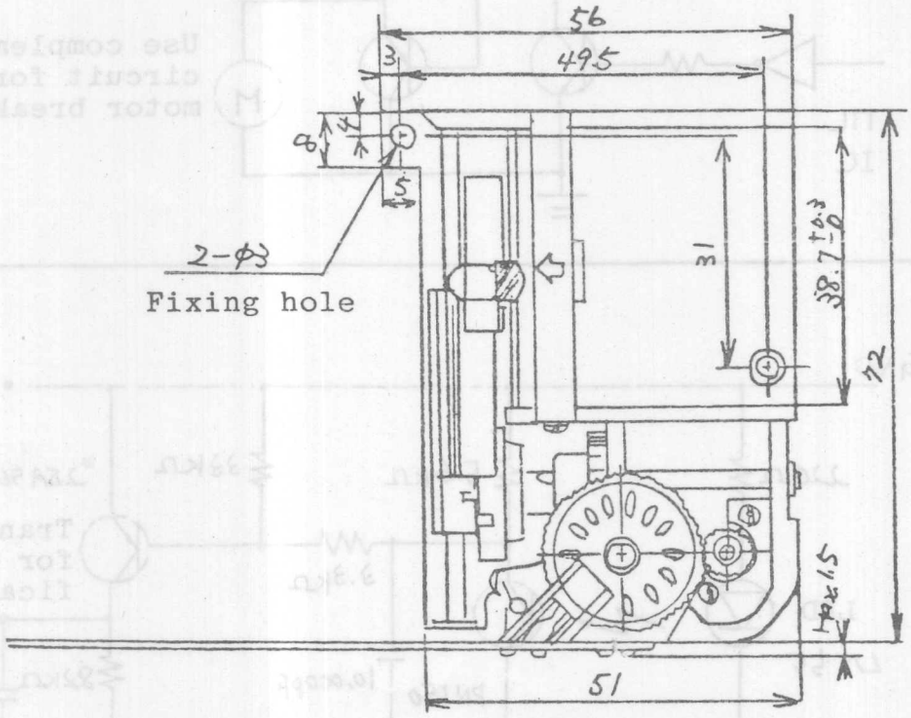
Life and Environmental Characteristics

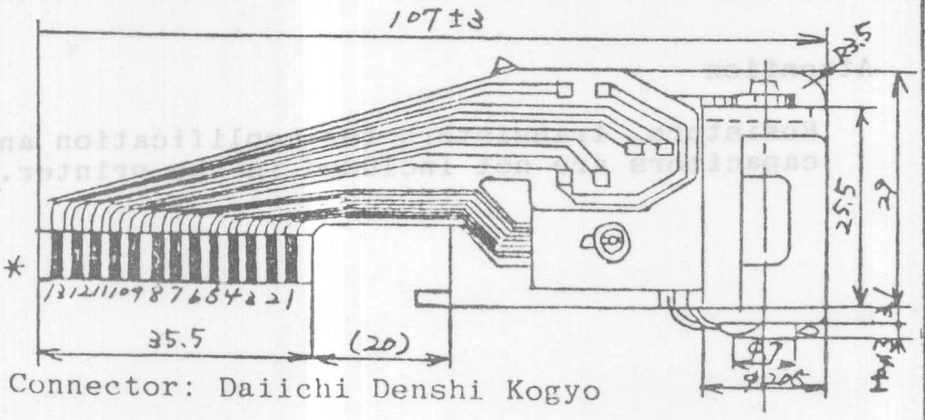
Item	Specification	Remarks
Life expectancy	MCTF 500,000 lines	
Operating environment	-5°C -- 50°C 40°C, 90%RH	The printer shall be subjected to 3 hours operation under the environment mentioned shown at the left. After the operation, the printer shall indicate no change from the initial requirements at a test in the same environment.
Storage environment	-40°C -- 80°C, 72Hr. 60°C, 95% 72Hr.	The printer shall be subjected to a 72-hour storage under the conditions shown on the left. After 2 hours stabilization in room temperature, the subjected device must satisfy the initial requirements.
Vibration test	Frequency 10-55 Hz Vibration width 1.5mm Direction X.Y,Z (2 hours/direction)	After subjected to the test, the printer shall indicate no change from initial requirements.
Shock test	Half sine wave; 50G, 11m sec. each in the X, Y and Z direction	
Recording paper	Jujo seishi Co., Ltd. TP50CM-A (blue) TP50KM-A (black) Paper width 37.8 +0 -0.5 Paper thickness 65±5μ Bobbin non End mark	Paper length approx. 8m (Approx. 2280 line)

Drive curcuit (reference)

Item	Specification
Motor drive circuit	
Photo transistor circuit	 Photo transistor
	Attention Resistors, transistors for amplification and capacitors are not included in the printer.







CONNECTOR

1	Head common
2	Head No. 6
3	Head No. 4
4	Head No. 2
5	Head No. 1(Top)
6	Head NO. 3
7	Head No. 5
8	Head No. 7(Bottom)
9	LED (cathode) Photo Tr(emitter)
10	Photo Tr(collector
11	Motor +
12	Motor -
13	LED (anode)

5.24. 1979

Tentative spec.

5 INCH PRINTER

Model No. EUY - 5 T

(Thermal)

EUY - 5 E

(Electrosensitive)

Note

1. Thermal printer
   We can offer and supply you the thermal printer under the following condition;

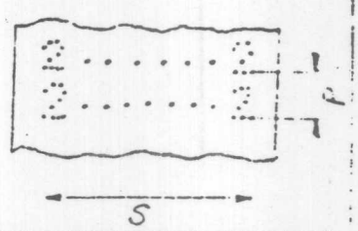
   1) Applications
      The thermal printers offered and supplied to you shall not be applied for the following devices;

      Electronic cash registers, point of service terminals or systems for retailstores and thermal printer equipment which statisfies specific military requirements of any country.

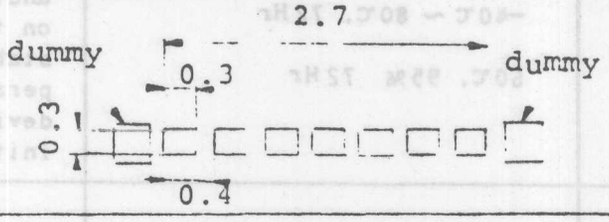
   2) Destinations
      The thermal printers are not authorized to be directly or indirectly sold to Rhodesia and communist countries.

2. Specifications are subject to change without notice for improvements.

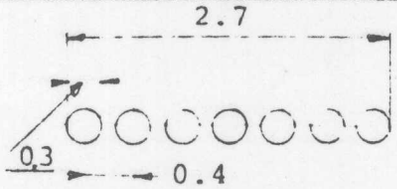
Specifications

Item	Thermal type	Electrosensitive type
Print characters	7 x 5 dot matrix	
Type of print out	Alpha numerics, symbol and graphs	
Character size	Height 2.7mm (0.106")	
Paper width	127mm (5")	
Line pitch	P = 4.5mm (0.177") 	
Line width	S = 103mm (4.055")	
Printing direction	From left to right	
Number of printed characters	cha. 32/L 40 | 64 | 80	32. 40. 64. 80 cha./L
Printing speed	0.8 L/S	2 L/S
Motor voltage	⊕ ⊖ 24V DC +5% −5%	
Timing signal	LED and photo transistor	
Printing head voltage	⊕ ⊖ 24V DC	
Outside dimensions	Width X Depth X Height 195 X 70 X 65 mm	
Weight	Approx. 720g	
Paper	Number : TP-50CA (Jujo seishi co., Ltd.)	Number : RMP8146 (Bosch)
Motor current	Ave. 100mA Peak 600mA	

Thermal head

ITEM	Specification	Remark
Type	Semi-conductive head	
Voltage	⊕ 24V ± 5 %	
Pulse width	0.5 ~ 0.8 ms	
Current	0.8 ~ 1.0 A/dot	
Applied energy	15mJ/ dot Max.	
Life (MCTF)	15 X 10^6 characters	Recording paper Jujo : TP-50CA
Dot dimensions		

Electrosensitive head

Item	Specification	Remark
Voltage	⊖ 24V $^{+\ 10}_{-\ 5}$ %	
Pulse width	0.24 ~ 0.48m sec.	
Current	1.5A/dot (peak)	
Applied energy	0.5mJ/dot	
Life	30 X 10^6 characters	
Dot dimensions		

Remarks

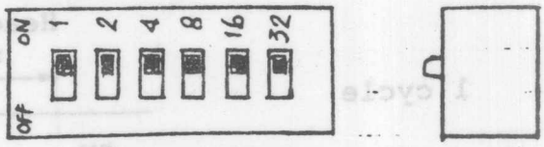
As far as electrosensitive head, -24 v is prefarable to apply compared with +24 v.

. Life and Environmental Characteristics

Item	Specifications	Remarks
Life expectancy	MCBF 1,000,000 lines	Mean cycle between failure ※
Operating environment	-5℃ ~ 50℃ 40℃, 90% RH	The printer shall be subjected to 3 hours operation under the environment mentioned shown at the left. After the operation, the printer shall indicate no change from the initial requirements at a test in the same environment.
Storage environment	-40℃ ~ 80℃, 72 Hr 60℃, 95% 72 Hr	The printer shall be subjected to a 72-hour storage under the conditions shown on the left. After 2 hours stabilization in room temperature, the subjected device must satisfy the initial requirements.
Vibration test	Frequency ····· 10 ~ 55 Hz Vibration width ····· 1.5 mm Direction ····· X, Y, Z (2 hours/direction)	After subjected to the test, the printer shall indicate no change from initial requirements.
Shock test	Half sine wave; 50 G, 11 m sec. each in the X, Y and Z direction	

※ Replacement parts : Thermal head
The sliding shaft requires lubricating oil.

7. DIP SW SETTING



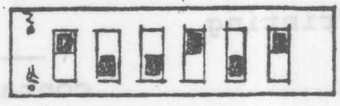
1 ½ 8 16 32 64

FREQ. DIV. CHAR/LINE

EXAMPLE

(1) 32 CHAR/LINE (FREQ DIV = ½)

(2) 40 CHAR/LINE (FREQ. DIV = ½)



(3) 64 CHAR/LINE (FREQ DIV = 1/1)

(4) 80 CHAR/LINE (FREQ DIV = 1/1)

[CATION]

CHARACTER CODE CORRESPONDENCE

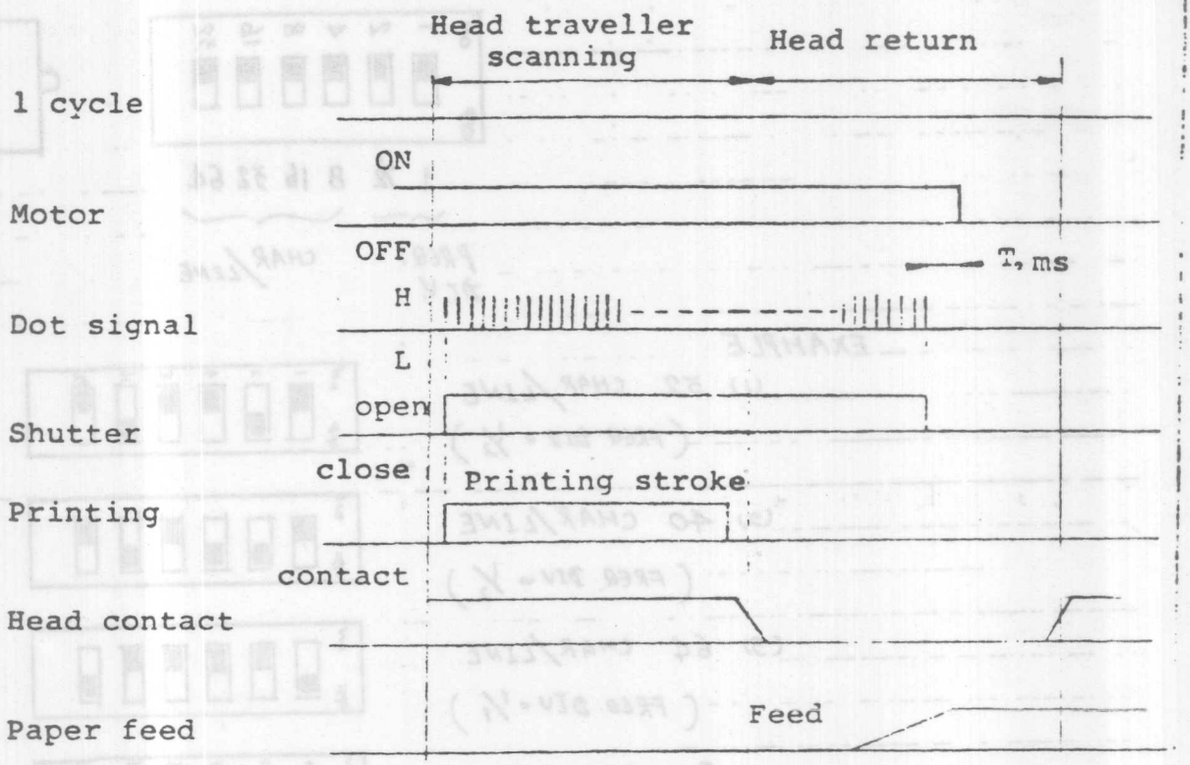
ASCII or JIS C6220	INTERFACE CARD
b 1 (LSB)	DATA BIT 1 (LSB)
b 2	2
b 3	3
b 4	4
b 5	5
b 6	
b 7	6
b 8 (MSB)	7 (MSB)

EXAMPLE

A ASCII b8 b7 b6 b5 b4 b3 b2 b1 = 0 1 0 0 0 0 0 1 Hex Code 41

DATA BIT (ACTIVE LOW)	1	0	1	1	1	1	0	
DB	7	6	5	4	3	2	1	

Timing chart



Explanation

1) By command signal of motor "ON" , motor starts to rotate and after a while, a shutter, which hinders a light of LED, opens at the motor rotation, (This shutter openning can be made by cam action) and print dot timing signal shall be generated from the photo transistor.
This starting of dot timing signal corresponds to a print starting position.

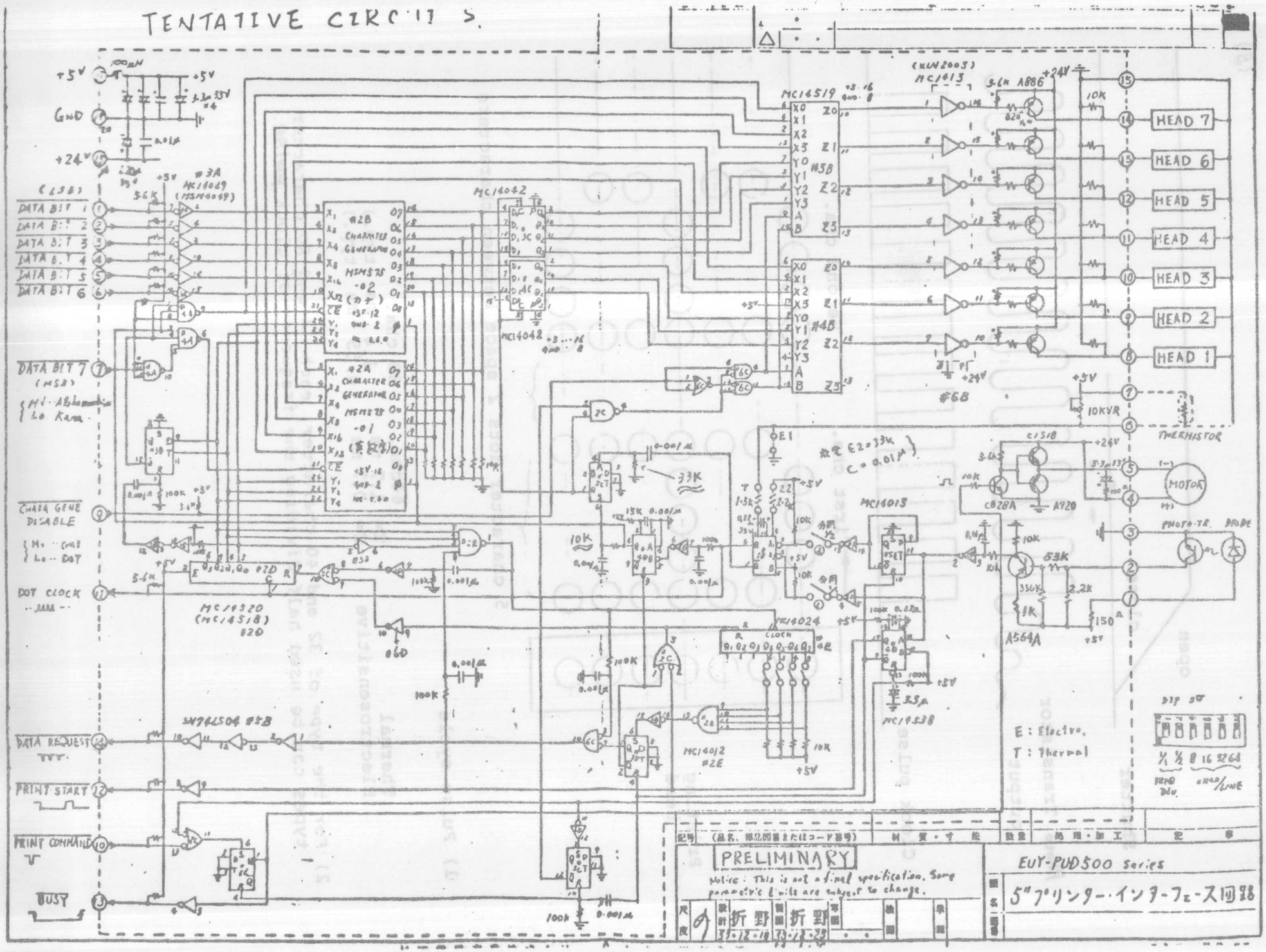
2) Corresponding to the dot timing signal dot per dot, printing dot shall be generated and form charactor.
Finished one line printing and after a while, head starts to move in the opposite direction.

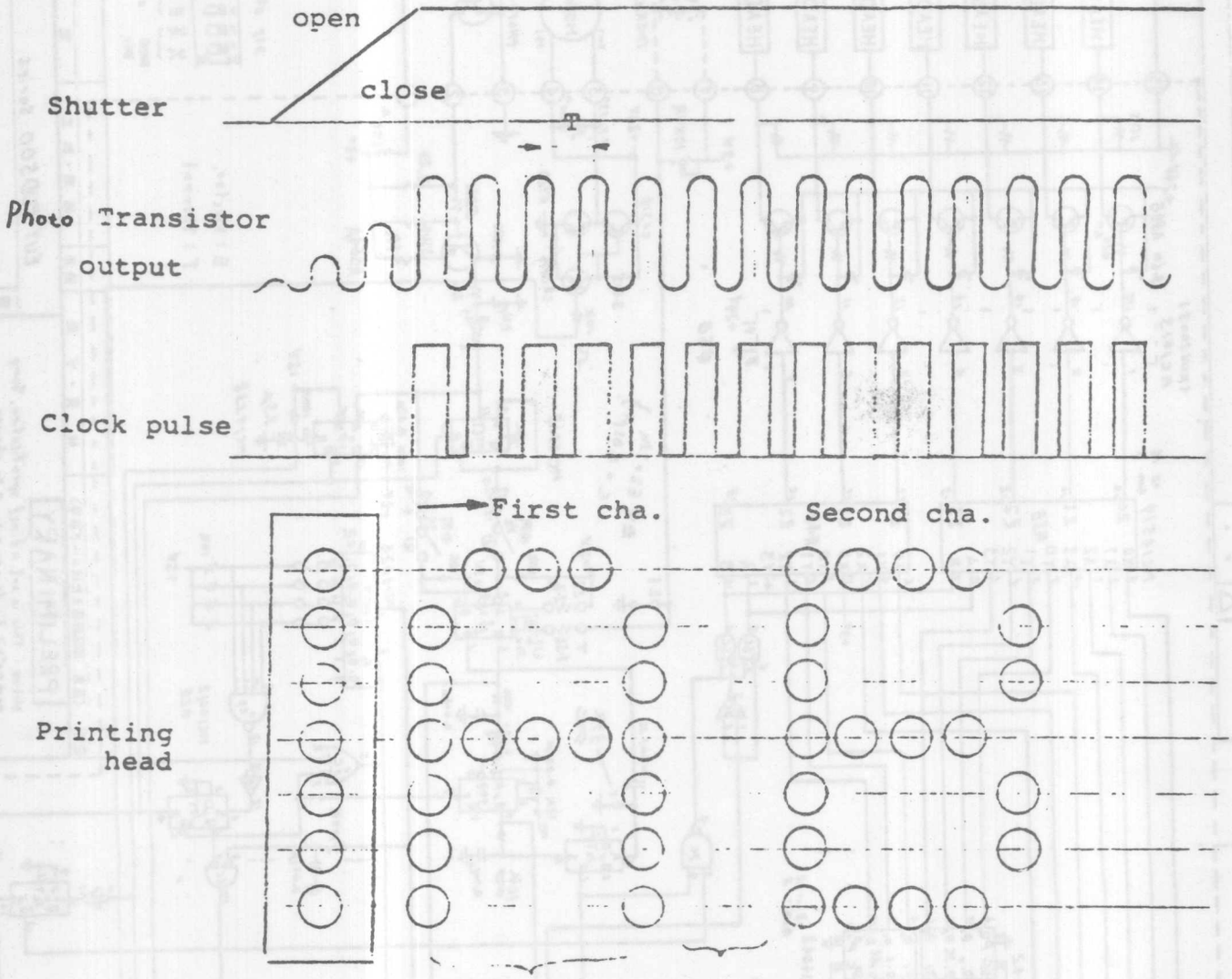
3) At the return way, the head detaches from the recording paper, and one line paper space shall be fed and the motor stops.

4) Motor stop signal shall be generated when the shutter closes and dot timing signal stops and also continues such condition more than T.ms.
Electrically, brake shall be applied.

Thermal To = 40ms
Electrosensitive = 17ms

TENTATIVE CIRCUITS





5 character dots 2 space between characters

1) Pulse cycle

	64cha.	80 cha.
Thermal	T= 1.7 ms	1.4 ms (typ.)
Electrosensitive	T= 0.7 ms	0.55 ms (typ.)

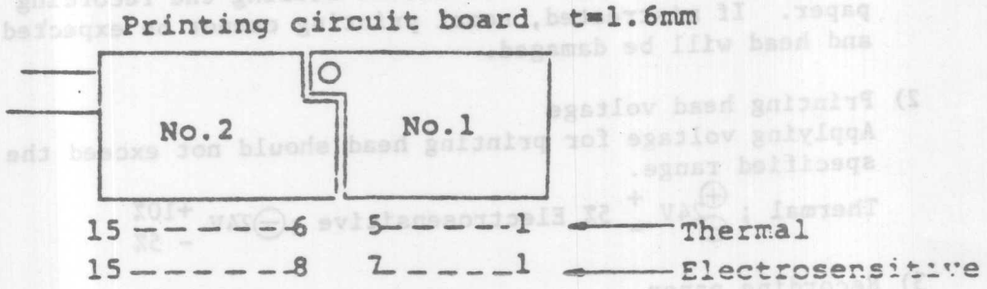
2) For the type of 32 and 40 character, each 64 and 80 character types can be used half dividing the frequency of clock pulse.

Selection of printer model
Standard models are prepared in the following tables.

EUY-5 □ L □ □ 02

T	Thermal	64	64, 32 characters
E	Electrosensitive	80	80, 40 "

Connector terminals



Connector AMPHENCL
225-21521-487

Connector terminals

Thermal Printer			Electrosensitive Printer		
No.	color code	circuits	No.	color code	circuits
1	Blue	LED (+)	1	Blue	LED (+)
2	Yellow	Photo Tr (+)	2	Yellow	Photo Tr (+)
3	White	LED, Photo Tr (-)	3	White	LED, Photo Tr (-)
4	Red	Motor (+)	4	Red	Motor (+)
5	Black	" (-)	5	Black	" (-)
6	———	Thermistor (+)	6	Pink	E. Head COMMON (EARTH)
7	———	" (-)	7	———	
8	———	T. Head (1) (+)	8	———	E. Head (1) (+)
9	———	" (2)	9	———	" (2)
10	———	" (3)	10	———	" (3)
11	———	" (4)	11	———	" (4)
12	———	" (5)	12	———	" (5)
13	———	" (6)	13	———	" (6)
14	———	" (7)	14	———	" (7)
15	———	" COMMON (EARTH)	15	———	

Attention for usage

1) Operation
Don't operate the printer without feeding the recording paper. If mistreated, nomal printing cannot be expected and head will be damaged.

2) Printing head voltage
Applying voltage for printing head should not exceed the specified range.
Thermal ; $\begin{matrix}\oplus \\ \ominus\end{matrix}$24V $\pm$ 5% Electrosensitive ; $\ominus$24V $\begin{matrix}+10\% \\ -5\%\end{matrix}$

3) Recording paper
It is recommended that you use Matsushita specified recording paper. If not, clear printing and long life cannot be guaranteed.

4) Power failure
Printing head stops on the way of scanning simultaneously when the power is failed or turned off. The drive circuit shall be so designed by users as to have a printing head return to home position after power is turned on again.

5) The capacity of power supply
Thermal printer ; $\pm$24V, Min. 1A (with 2200μF)
Electrosensitive printer ; $\pm$24V Min. 300mA (with 220μF)

6) Thermal head
Thermal head composition is made of monolysic semiconductor and therefore circuit design, assembling and adjustment works shall be done so cautiously that a thermal head should not exposed to harmful impulses.

To protect a thermal head from harmful impulses,

i) Turn "ON" ; +5V first and then $\pm$24V
Turn "OFF" ; $\pm$24V first and then +5V

ii) Printing pulse width adjustment
Preferable printing pulse width range is indicated on each flat cable.
There are four kinds of printing head. These heads have each different resistance value and preferable pulse width according to its characteristics.

Type of heads	I	II	III	IV
Preferable pulse width (m. sec)	0.6-0.65	0.65-0.7	0.7-0.75	0.75-0.8

The preferable pulse width shall be adjusted by the following method.
The head terminal pc board (No.2) is disconnected from the connector and instead, a pc board with a 30K ohm resistor inserted into the connector.
Under the above mentioned condition, pulse width adjustment shall be done, followed by an exchange of a pc board with a resistor with the head terminal pc board (No.2) after completion of adjustment.

(Precaution)

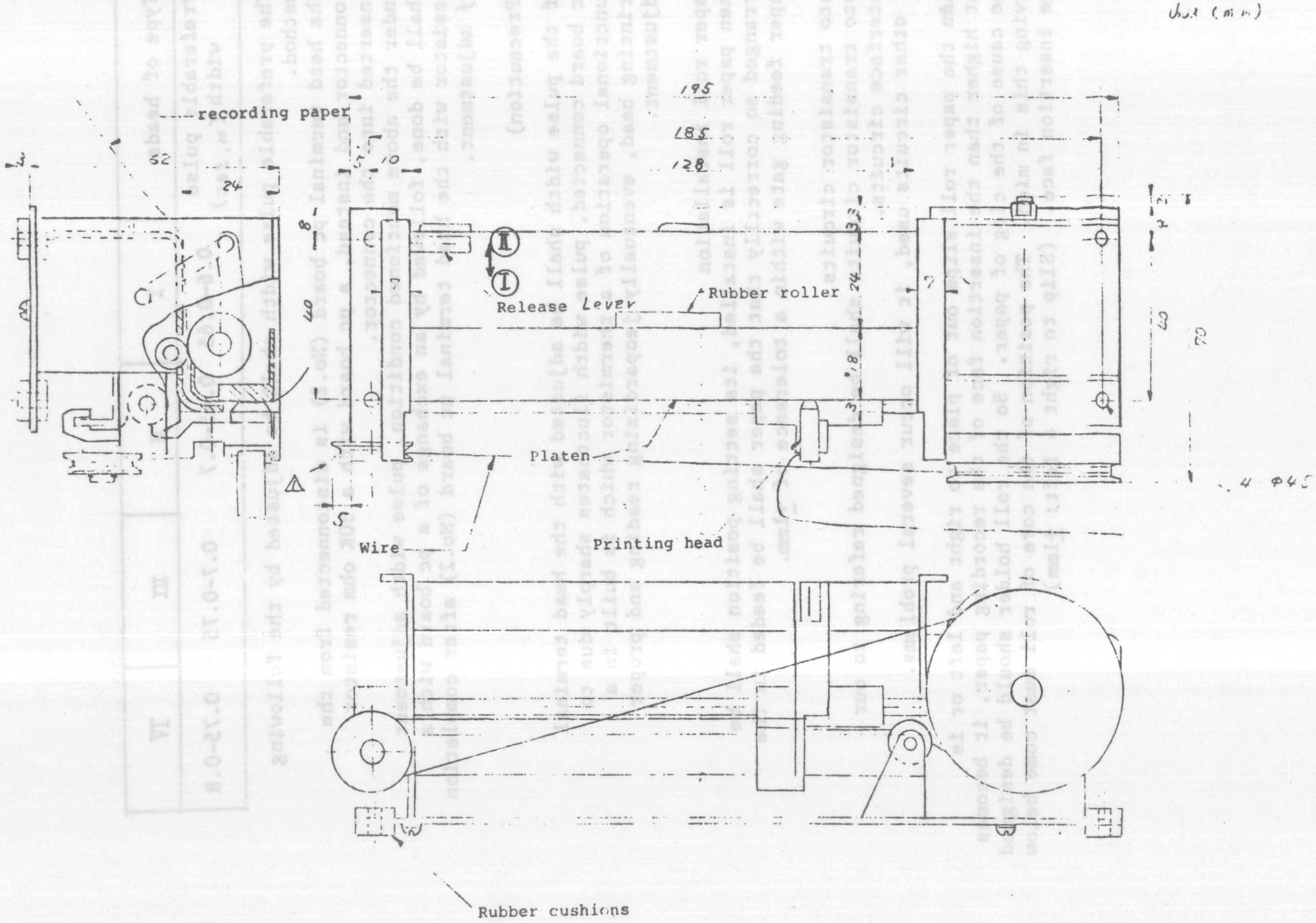
If the pulse width shall be adjusted with the head terminal pc board connected, pulse width fluctuates sharply due to functional operation of a thermistor which is built in a printing head, eventually jeopardizing reading and proper adjustment.

7) Paper roll installation
When paper roll is installed, its setting position shall be arranged so correctlly that the paper shall be feeded in the paper feeding gate within a tolerance of ±1mm.

8) Photo transistor circuits
Photo transistor circuits shall be designed refering to our interface circuits.
If other circuits used, it will occur several problems.

9) When the paper roll slips out of place to right and left or is put higher than the insertion face of the recording paper, it becomes the cause of the clog of paper. So the roll holder should be designed having this in mind. The position of the core of roll must come below the insertion face. (Slip to right & left: ±1mm)

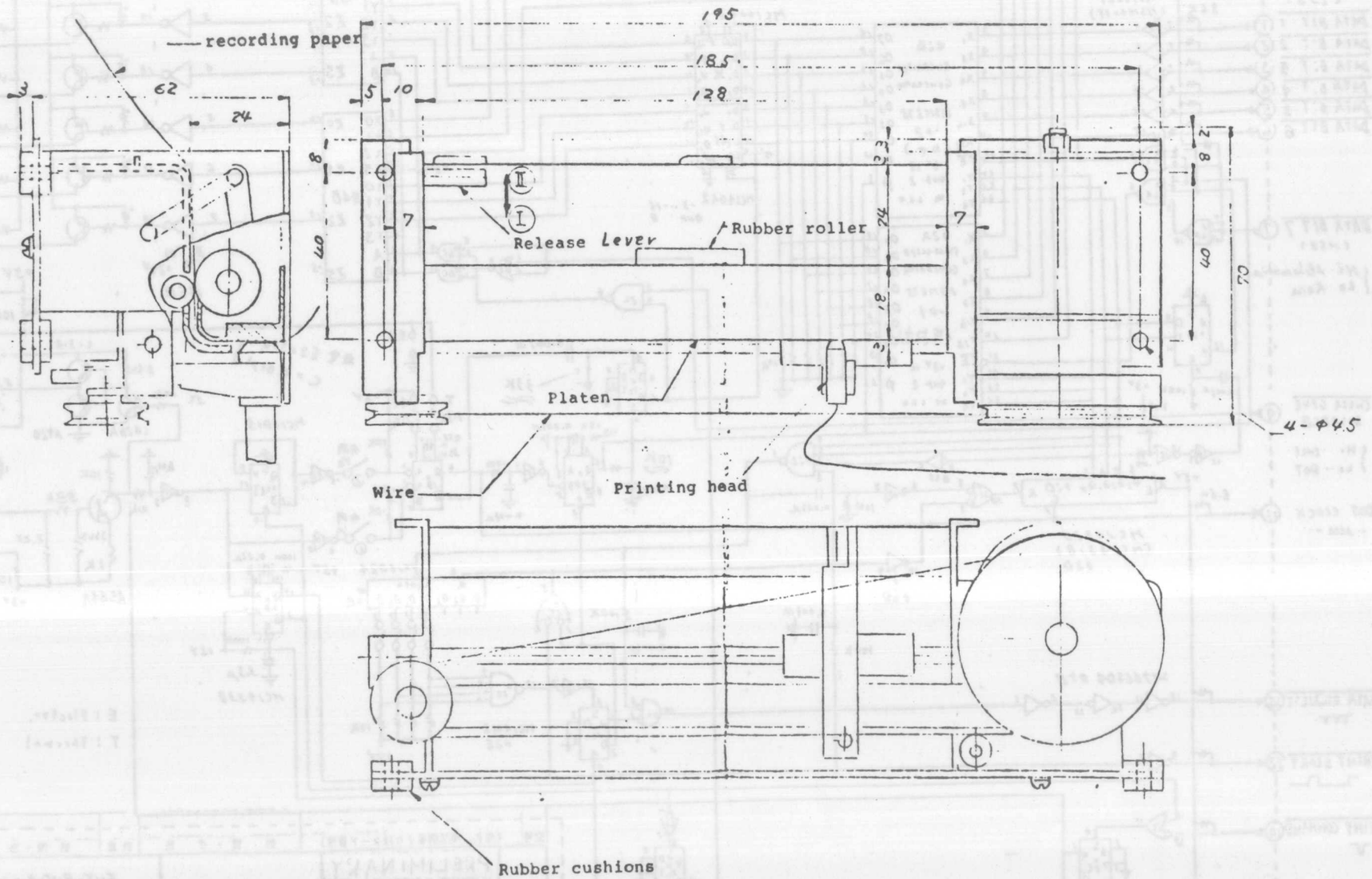
EUY-5E



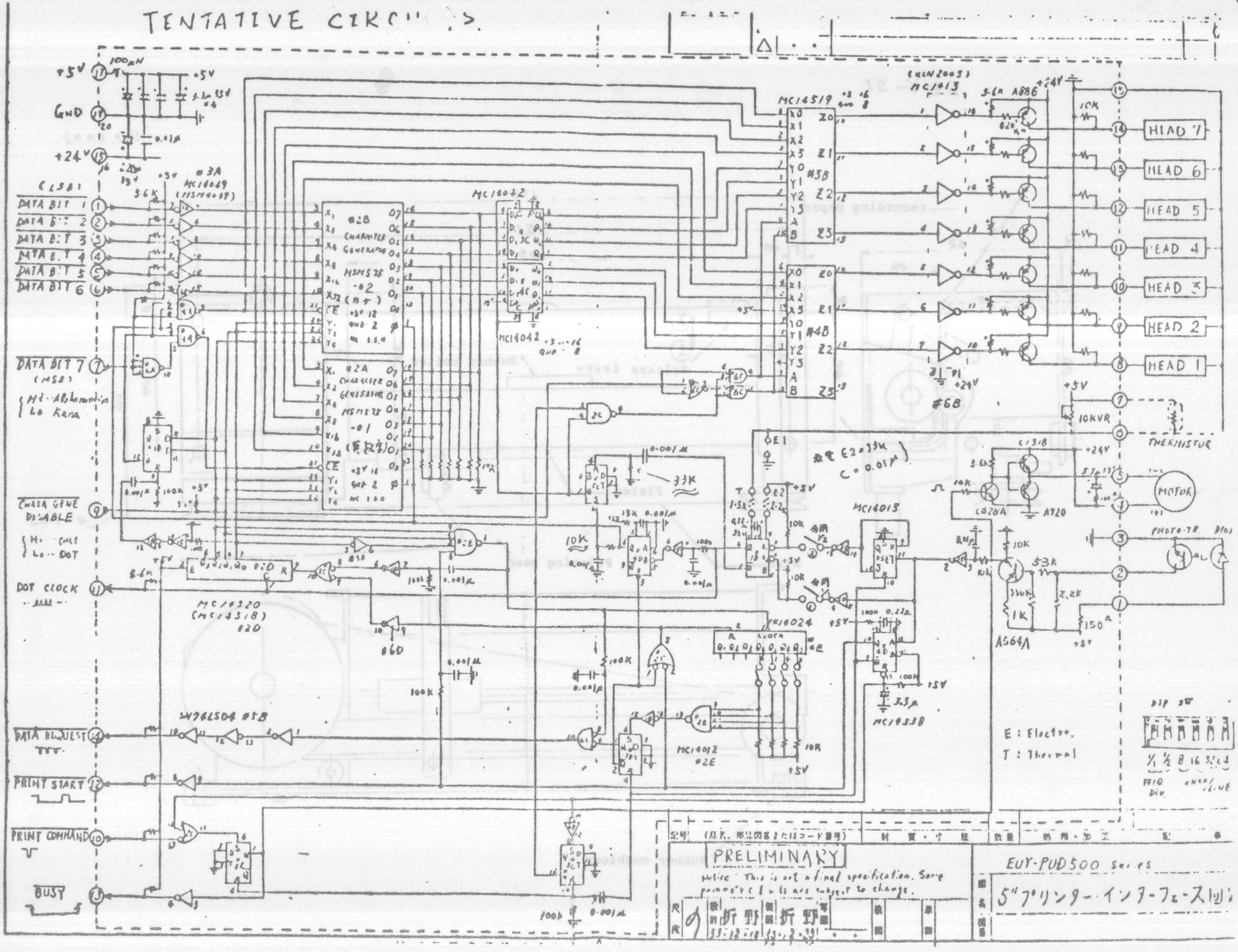
Revision Dec 24

EU'-ST

Unit (mm)


recording paper
62
24
3
195
185
128
5
10
8
40
7
II
I
Release Lever
Rubber roller
24
18
3
2
7
8
40
70
4-φ4.5
Platen
Wire
Printing head
Rubber cushions

TENTATIVE CIRCUIT



ELIMINAK [illegible]

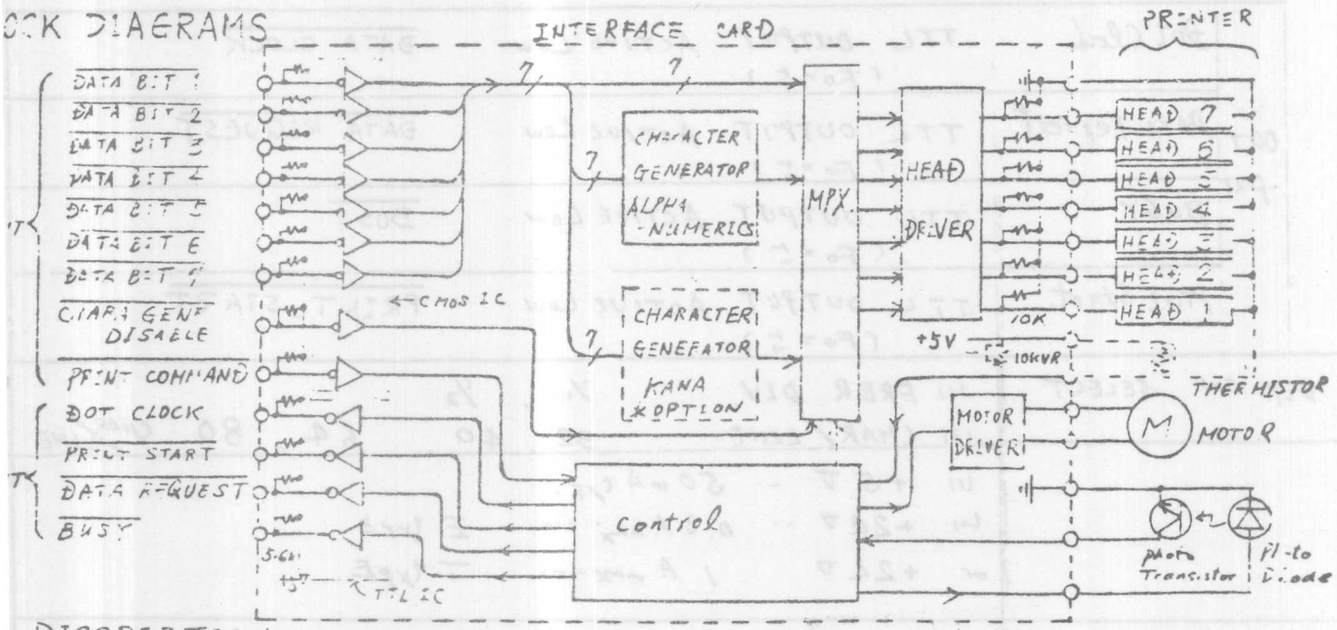
PRINTER INTERFACE UNIT
EJY-PUD 50C series for 5" PRINTER

FEATURERS

- Built in charactergenerator (Alphanumerics, symbols and Kana)
- 7 bit parallel / byte serial data input
- Column / line selected by Dip SW
- TTL compatible
- Low power consumption

TYPE	INTERFACE CARD	PRINTER	
ELECTROSENSITIVE	EJY-PUD501L EJY-PUD502L	EJY-5EL series	Alphanumerics Kana
THERMAL	EJY-PUD551L EJY-PUD552L	EJY-5TL series	Alphanumerics Kana

BLOCK DIAGRAMS



DISCRIPTION

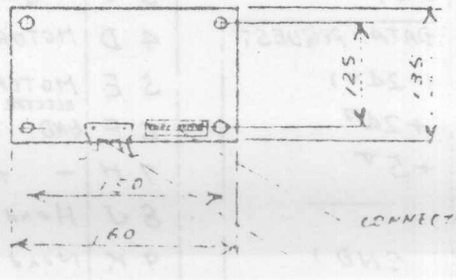
Pin No	Designation	Pin No	Designation
1	DATA BIT 1 (LSB)	11	DOT CLOCK
2	DATA BIT 2	12	———
3	DATA BIT 3	13	BUSY
4	DATA BIT 4	14	DATA REQUEST
5	DATA BIT 5	15	(+24V)
6	DATA BIT 6	16	+24V
7	DATA BIT 7 (MSB)	17	+5V
8	———	18	———
9	Chara Gene Disable	19	GND

Pin No	Designation	Pin No	Designation
1 A	Photo Diode (A)	11 M	Head 4
2 B	Photo Tr (C)	12 N	Head 5
3 C	GND	13 P	Head 6
4 D	MOTOR (+)	14 R	Head 7
5 E	MOTOR (−) ELECTRO. THERMAL	15 S	GND
6 F	GND Thermistor THERMAL		
7 H	— Thermistor		
8 J	Head 1		
9 K	Head 2		

4. SPECIFICATION

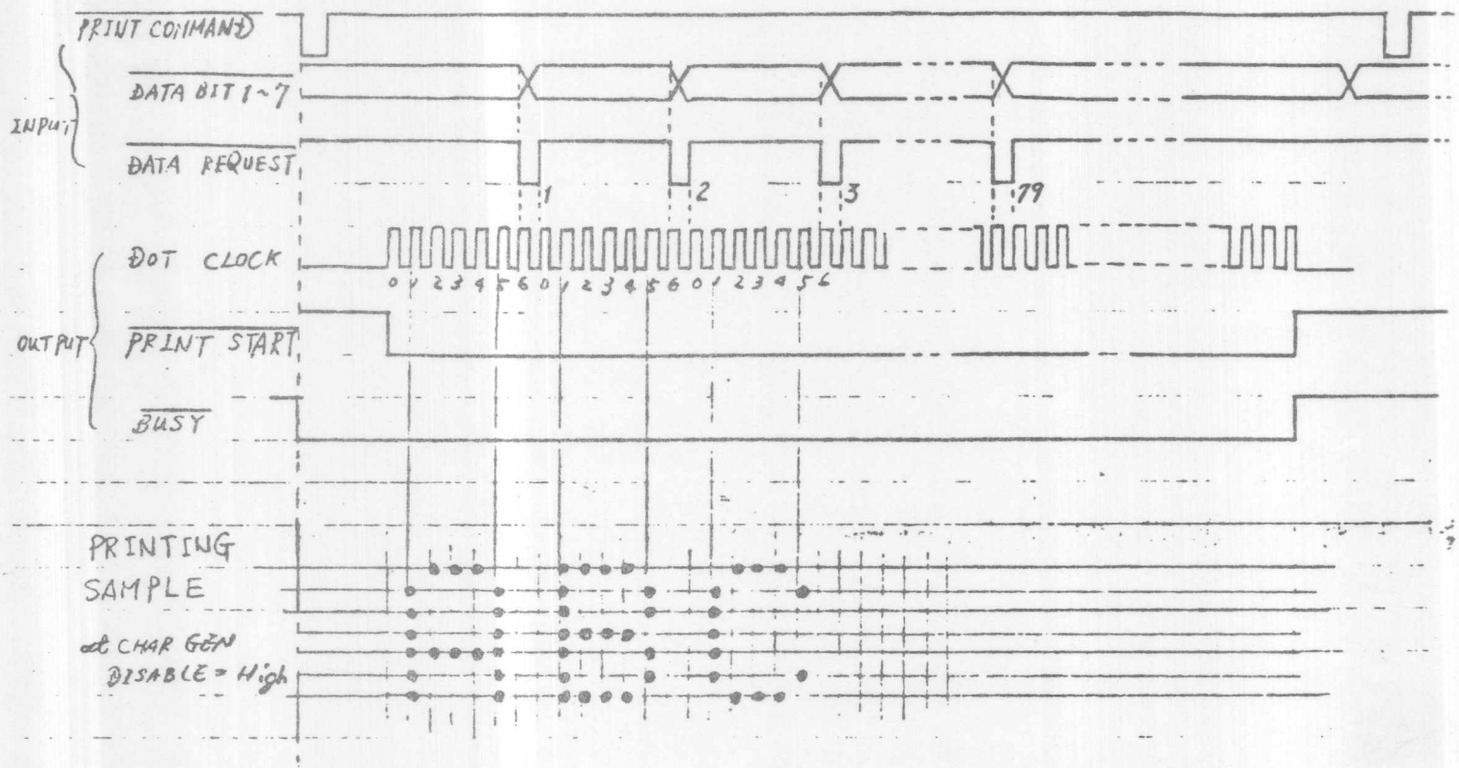
PRINTER	EUY-5EL or EUY-5TL series			
FREQ. DIVISION	1/2		1/1	
CHAR./LINE	32 CHAR/line	40 CHAR/line	64 CHAR/line	80 CHAR/line
PRINTING PULSE	E type -- 0.2 ms typ. , T type -- 0.3 ~ 0.8 ms controlled			
CHARACTER SET	Alphanumerics and symbols -- 64 CHAR.			
	Kana and symbols ---- 64 CHAR. Option			
CHARACTER CODE	ASCII , JIS-C6220			
DATA INPUT	7 Bit parallel / Byte serial			
DATA	(1) Direct dots pattern (7 dots) input for graphic print or special pattern			
	(2) CHARACTER Code input			
INPUT — 7 Bit Data Input	CMOS INPUT	ACTIVE LOW	$\overline{\text{DATA BIT 1}} \sim \overline{\text{DATA BIT 7}}$	
INPUT — CHARA. GEN. Disable	CMOS INPUT	ACTIVE LOW	$\overline{\text{CHAR GEN DISABLE}}$	
INPUT — Print Command	CMOS INPUT	ACTIVE LOW	$\overline{\text{PRINT COMMAND}}$	
OUTPUT — Dot Clock	TTL OUTPUT (Fo=5)	ACTIVE LOW	$\overline{\text{DATA CLOCK}}$	
OUTPUT — DATA Request	TTL OUTPUT (Fo=5)	ACTIVE LOW	$\overline{\text{DATA REQUEST}}$	
OUTPUT — BUSY	TTL OUTPUT (Fo=5)	ACTIVE LOW	$\overline{\text{BUSY}}$	
OUTPUT — Print Start	TTL OUTPUT (Fo=5)	ACTIVE LOW	$\overline{\text{PRINT\_START}}$	
DIP SW SELECT	(1) FREQ DIV. 1/1 , 1/2			
	(2) CHAR/LINE 32 , 40 , 64 , 80 CHAR/LINE			
	(1) +5 V -- 50 mA typ.			
	(2) +24 V -- 0.3 A max -- E type			
	or +24 V / A max -- T type			

PC Board

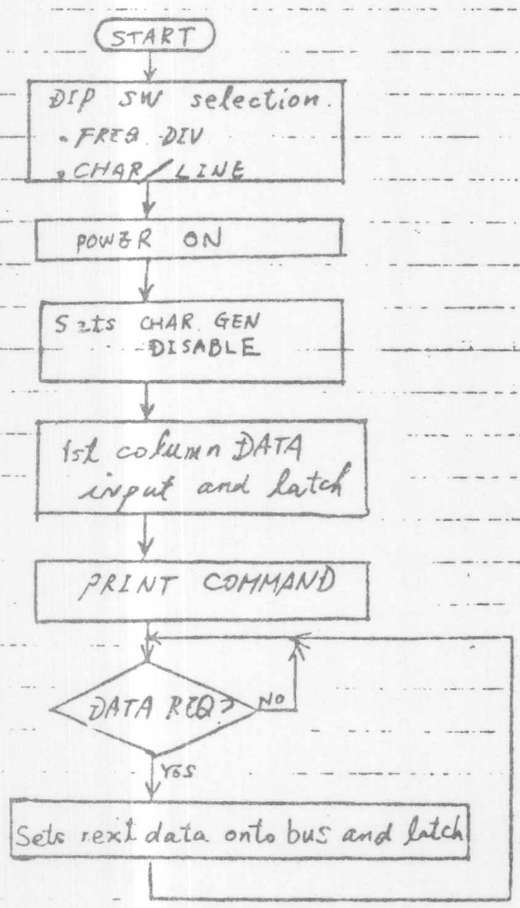


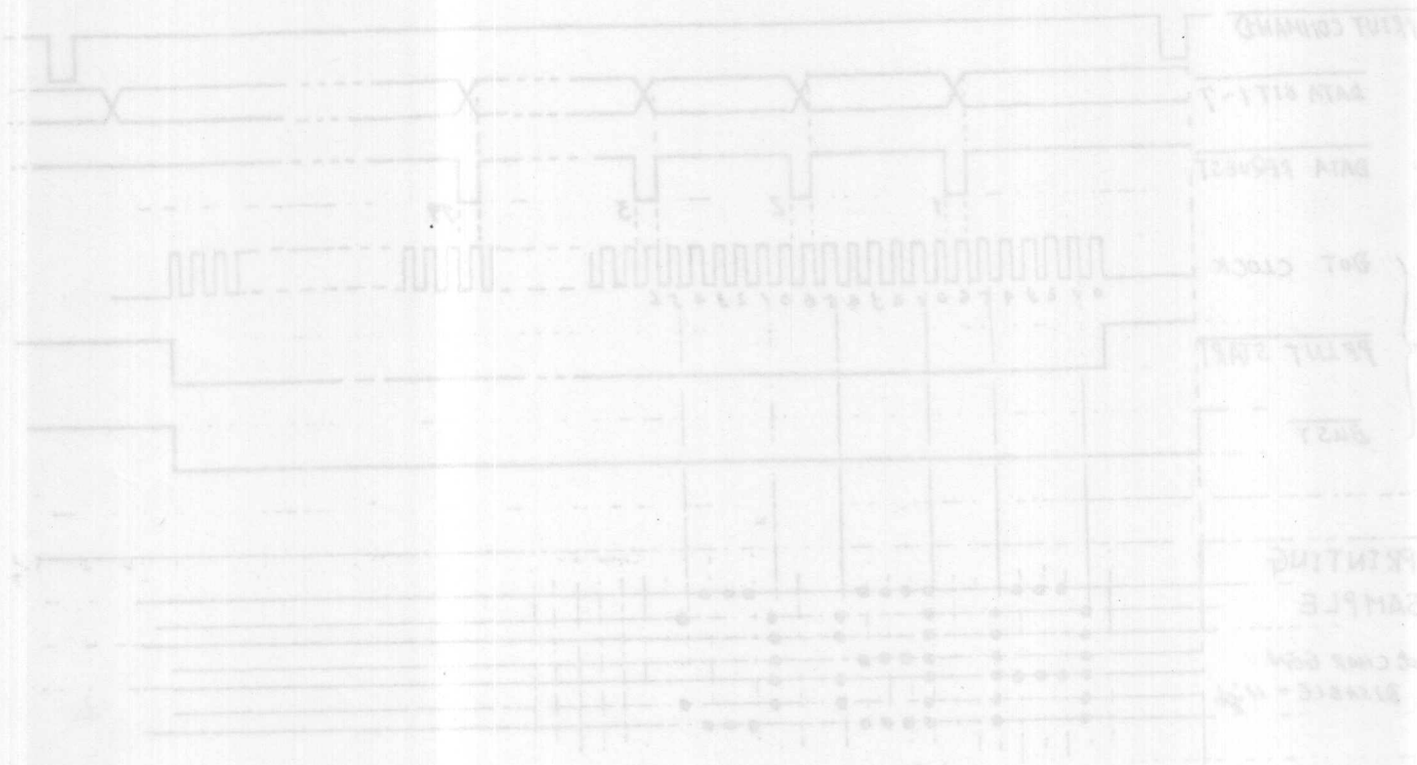
CONNECTOR 2256-21521-467 for PRINTER

5. TIMING (80 CHAR./LINE)



6. PRINTING PROCEDURE





SPECIFICATION AND APPLICATION MANUAL

FOR THERMAL PRINTER

MODEL EUY-101

MATSUSHITA ELECTRIC

Table of contents

1. General description

This printer was developed for electronic calculators, measuring instruments, computer end units, which use alpha-numerics and symbols printed on thermal recording paper.

Note

We can offer and supply you the thermal printer under the following conditions:

1. Applications

The thermal printers offered and supplied to you shall not be applied for the following devices;

Important

Electronic cash registers, point of service terminals or systems for retail stores and financial institutions, and thermal printer equipment which satisfies specific military requirments of any country.

2. Destinations

The thermal printers, or the Know-How, or any direct product thereof are not authorized to be directly or indirectly sold, leased, released, assingned, transferred, conveyed or in any manner disposed of in or to any of the following countries;

U.S.A., Canada, Rhodesia and communist countries.

(Specifications are subject to change without notice for improvements.)

2. Construction of printer

The printer has a DC motor inside and its rotation is transmitted to the mangle gear by use of reduction gears.
The mangle gear rotates reversely as its own characteristic.
The movement of the mangle is transmitted for the head movement (going and returning) by wire.
When the motor operates, a pulse generator gear rotates simultaneously and a sinusoidal wave is generated from the pick up coil.
When the printing head comes to position A, in the case of the R type printer, the shield plate moves from b to a and the printing command signal is shifted.

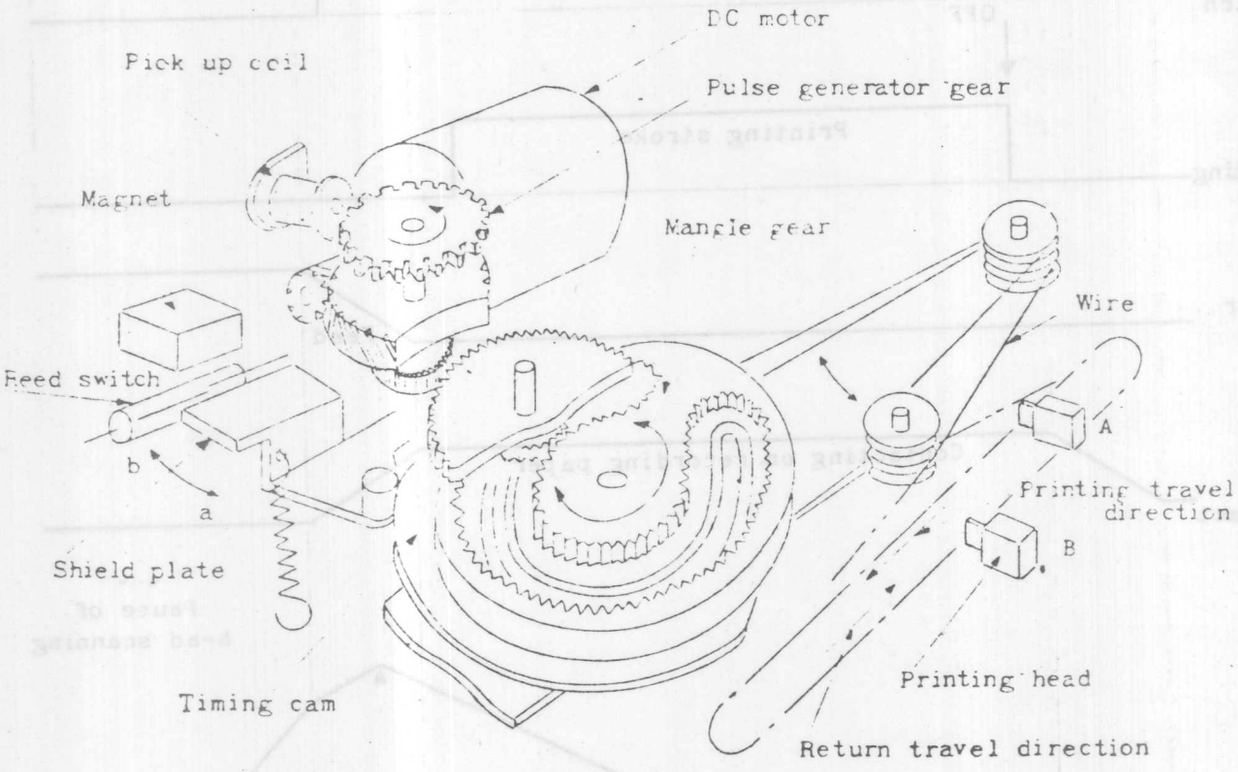


Fig. 1. Construction of printer

While the head moves horizontally, printing is accomplished due to the above-mentioned sinusoidal wave.
When the printing finishes and the head comes to position B, the shield plate moves from a to b and motor stops its operation by the reed switch. By this method, variations of motor rotation do not directly effect the printing position.

3. Timing chart of printer mechanism

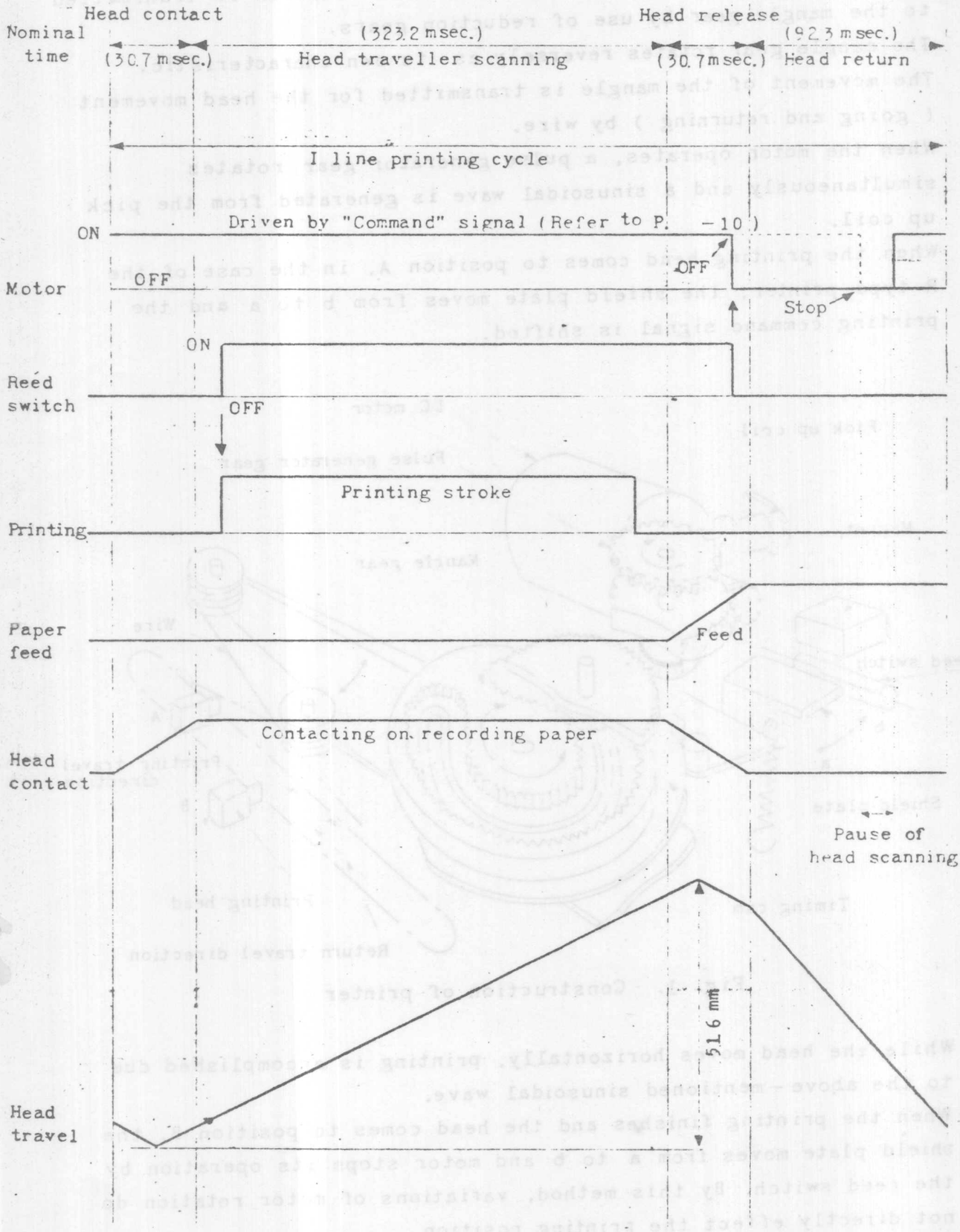
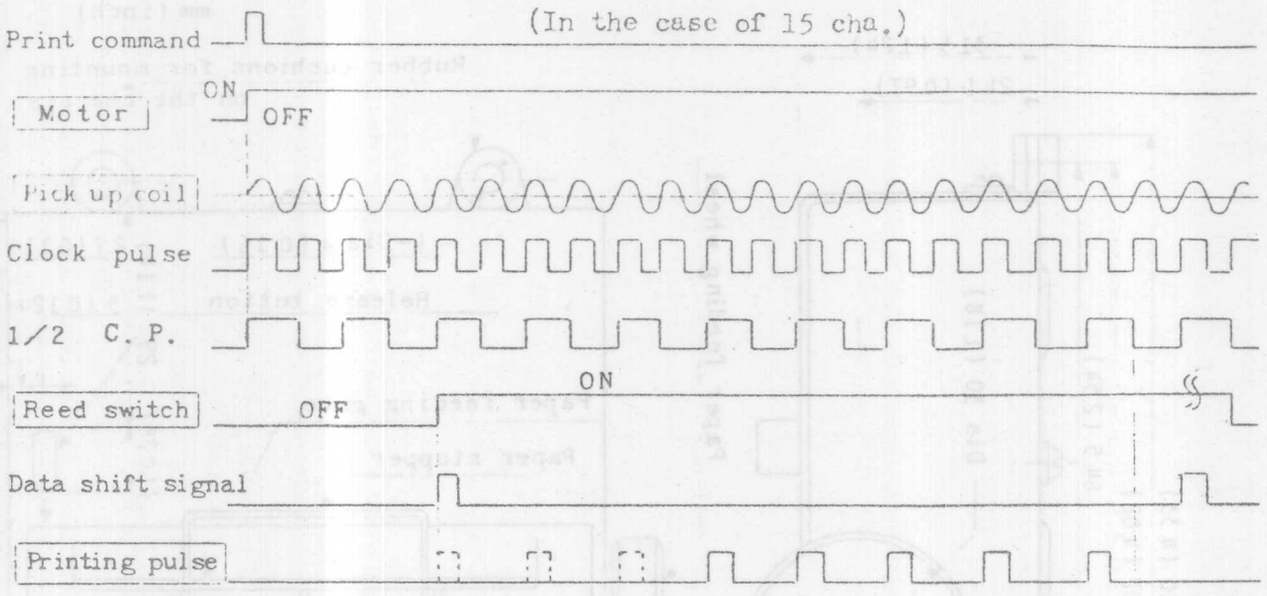


Fig. 2. Timing chart of printer mechanism

4. Printing method and timing



	characters/line	
	15	21 (20)
Number of teeth of the pulse generator gear	24	30 (24)
Pick up coil frequency	720	900 (870)
Number of dots per line	117	145 (139)
Construction of characters	5 + 3	5 + 2

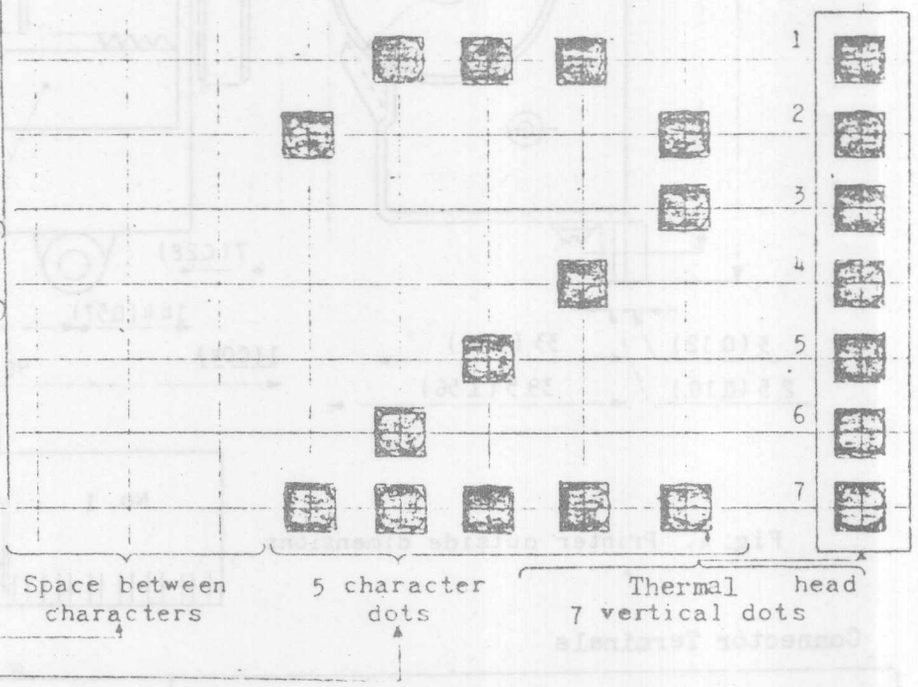


Fig. 3. Printing method and timing

Printing is done by horizontal scanning of the thermal head which has 7 ~~dot~~ electrodes in a vertical line. The character is determined by means of applying an electric pulse which follows the character pattern, synchronizing the head position of the recording paper to each dot of the thermal head.

(Caution)

Two kinds of printers are available depending upon scanning direction and printing order. Since the commands for columns 1 to 5 of character the pattern are opposite, attention should be given to the output specifications of the buffer memory and the character generator.

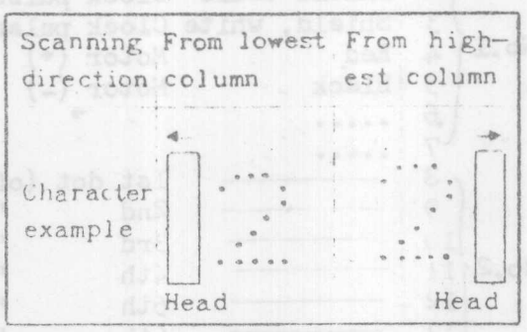


Fig. 4. Scanning direction

5. Printer outside dimensions and connector

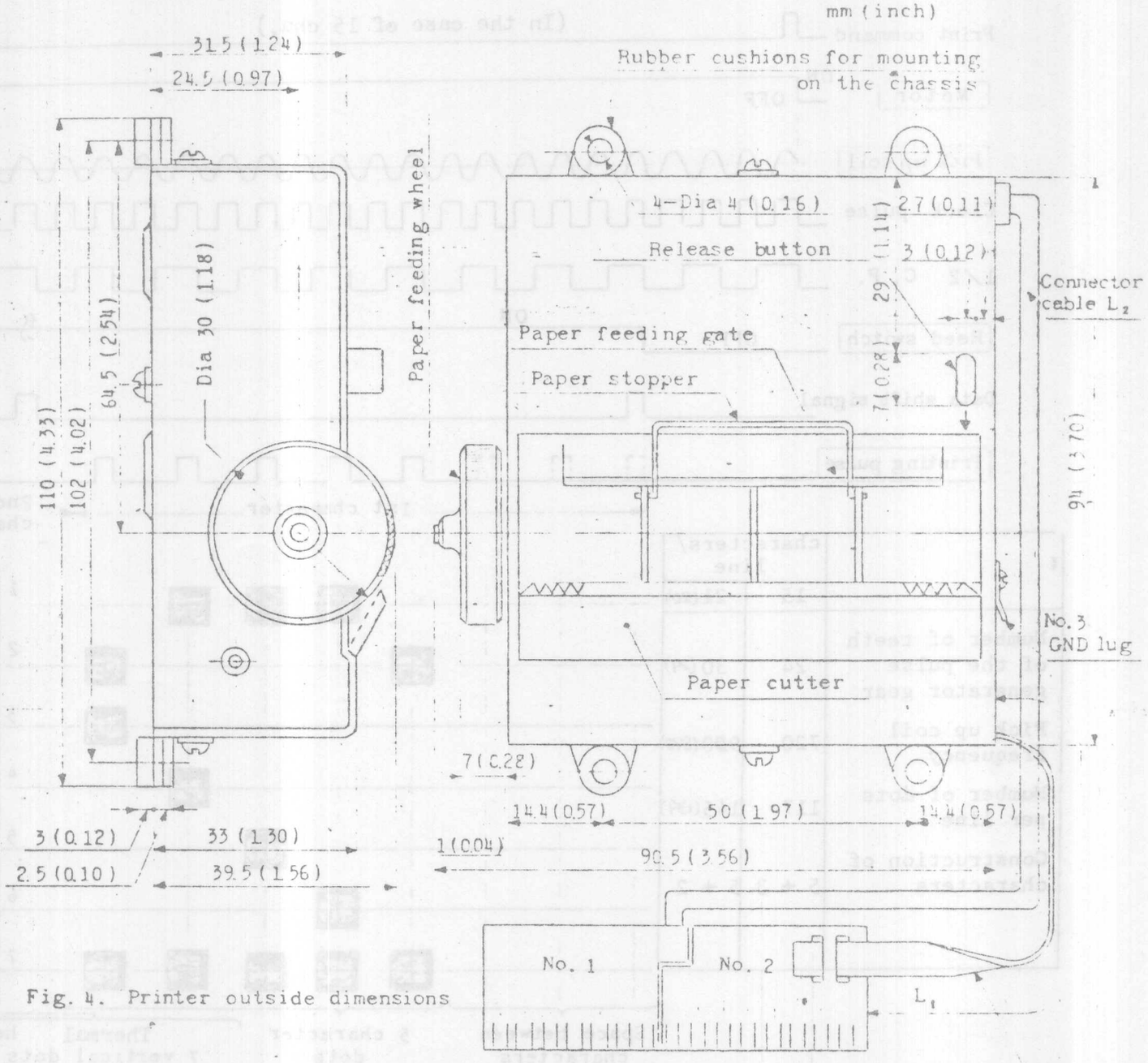


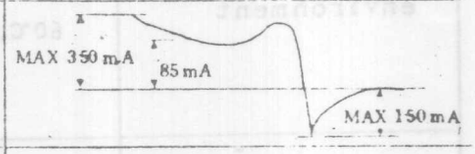
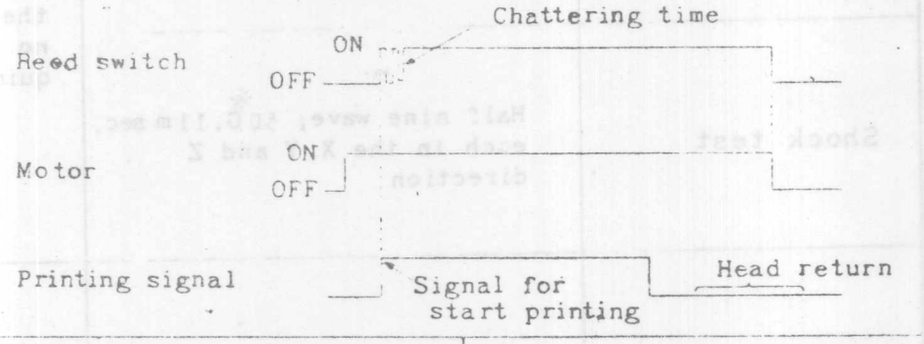
Fig. 4. Printer outside dimensions

Connector Terminals

Flat cable

Head without a thermistor				Head with a thermistor			
Ter. No.		Color code	Circuits	Ter. No.		Color code	Circuits
No.1	1	White	Reed switch	No.1	1	White	Reed switch
	2	Shield cable	Clock pulse		2	Shield cable	Clock pulse
	3	Shield, white	Clock pulse, Reed Sw.		3	Shield, white	Clock pulse, Reed Sw.
	4	Red	Motor (+)		4	Red	Motor (+)
	5	Black	Motor (-)		5	Black	Motor (-)
	6	.....			6	———	Thermistor
	7	.....			7	———	Thermistor (-)
No.2	8	———	1st dot (of the head)	No.2	8	———	1st dot (of the head)
	9	———	2nd "		9	———	2nd "
	10	———	3rd "		10	———	3rd "
	11	———	4th "		11	———	4th "
	12	———	5th "		12	———	5th "
	13	———	6th "		13	———	6th "
	14	———	7th "		14	———	7th "
	15	———	Head common (GND)(+)		15	———	Head common (GND)(+)

6. Printer specifications

	Specifications	Notes
Print characters	7 × 5 dot matrix	Dot size, φ0.3mm
Number of printed characters	15 and 21 cha. (20)	
Type of print out	Alpha-numerics, and symbols	
Printing speed	530 ± 170 msec/line	At motor voltage −24V ± 5 %
Distance between lines	L = 2.0 ± 0.6 mm	
Character size	Height, 2.7 mm	
Moter voltage	−24 V ±5%	
Motor current	Max. 350mA. Average 85mA Brake current. 150mA	
Pick up coil (Timing pulse)	Sine wave output, 0.6 p-p min. (at load of 1k ohm) Internal resistance of pick up coil. Max. 1k ohm	
Reed switch	Chattering time: Max. 2m sec. Current: Max. 80mA at DC 50V	
Printing start & motor stop		
Printer life	MCBF 1×10^6 lines	
	Useful life 3×10^6 lines	Main replacement parts are rubber roller, ~~punch roller~~, and printing head.
Weight	Approx. 370g	
Outside dimensions	Width: 90.5mm Height: 42.5mm Depth : 110 mm	
Printer connector	Printing circuit board No. 1 : for motor, reed switch, etc. No. 2 : for printing head	
Controller connector	AMPHENOL 143-015-[illegible] or 225J-21521-487	Three kinds of contacts: solder, mother board or wrapping type.

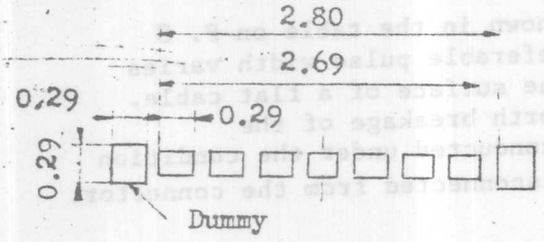
	Specifications	Notes
Operating environment	-5℃ ~ 50℃ 40℃, 90% RH	The printer shall be subjected to 3 hours operation under the environment mentioned shown at the left. After the operation, the printer shall indicate no change from the initial requirements at a test in the same environment.
Storage environment	-20℃ ~ 80℃, 72Hr 60℃, 95% 72Hr	The printer shall be subjected to a 72-hour storage under the conditions shown on the left. After 2 hours stabilization in room temperature, the subjected device must satisfy the initial requirements.
Vibration test	Frequency ····· 10 ~ 55Hz Vibration width ····· 1.5mm Direction ····· X, Y, Z (2 hours/direction)	After subjected to the test, the printer shall indicate no change from initial requirements.
Shock test	Half sine wave; 50※G, 11m sec. each in the X, Y and Z direction	
Insulation resistance	Min. 10M ohm at 500 VDC	Insulation resistance between connector and body.
Recording paper	TP-50CA Width 60mm (JUJO SEISHI CO.; LTD.) Paper Length 30m Paper Roll Outside Dia. 54mm (Maximum) Paper Roll Inside Dia. 12mm	

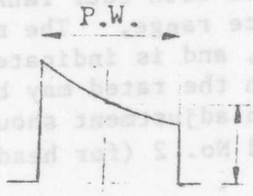
※ Printers should be free from impact exceeding 50G.

7. Printing head

Head model EUX-TP703A (Head without a thermistor)
EUX-TP703AT (Head with a thermistor)

Head resistance (Ω)	14 ~ 15.5	15.5 ~ 17	17 ~ 18.5	18.5 ~ 20	Notes
Pulse width (Head without a thermistor, ms)	0.5 ~ 0.55	0.55 ~ 0.6	0.6 ~ 0.65	0.65 ~ 0.7	Reference is made to Engineering data on thermal head.
Pulse width (Head with a thermistor, ms)	0.55 ~ 0.6	0.6 ~ 0.65	0.65 ~ 0.7	0.7 ~ 0.75	
Voltage (V)	-24V ±5%				
Current (A)	0.8 ~ 1.0 A/dot				
Pulse freq. (Hz)	15 Cha. 360 Hz 21 Cha. 450 Hz				
Energy (mJ)	Max. 15 mJ/dot				
Life (MCTF)	1×10^6 line				210 dot/line

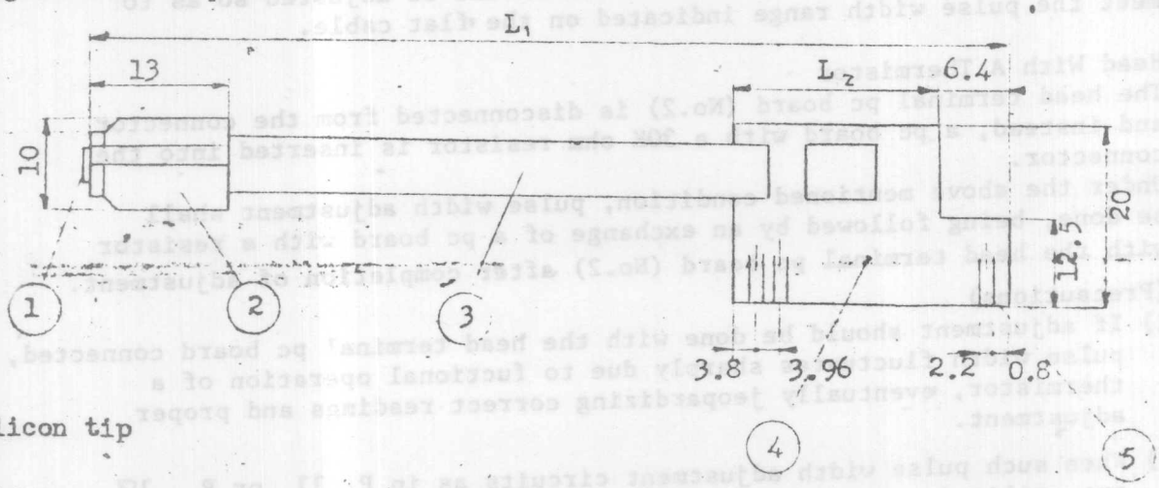




P.W. : Pulse width
I : Central current
V : Supply voltage

Energy (mJ) = P.W.(ms) x I(A) x V(V)

Fig.5. Head composition



(1) Silicon tip
(2) Holder
(3) Flat cable
(4) Connector board
(5) Connector contacts

	L_1	L_2
Head without a ther.	212	27
Head with a thermistor	219	34.9

Fig.6. Printing head mechanical data.

8. Thermistor and Pulse Width Adjustment

Two kinds of printing heads are available, the one with a thermistor built in and the other without it.
The thermistor head is recommended either when the number of characters per line is 21(20), or when continuous printing of over 50 lines is expected even if the number of characters per line is 15 or less.

In other cases than the above mentioned, a thermistor type is not necessarily required to obtain normal operation.
Choice of the two types should be done in accordance with individual design and application.

A thermistor built in a printing head works to obtain the most preferable pulse width, changing the pulse width in correspondance with heat up of printing head as shown in the figure below.

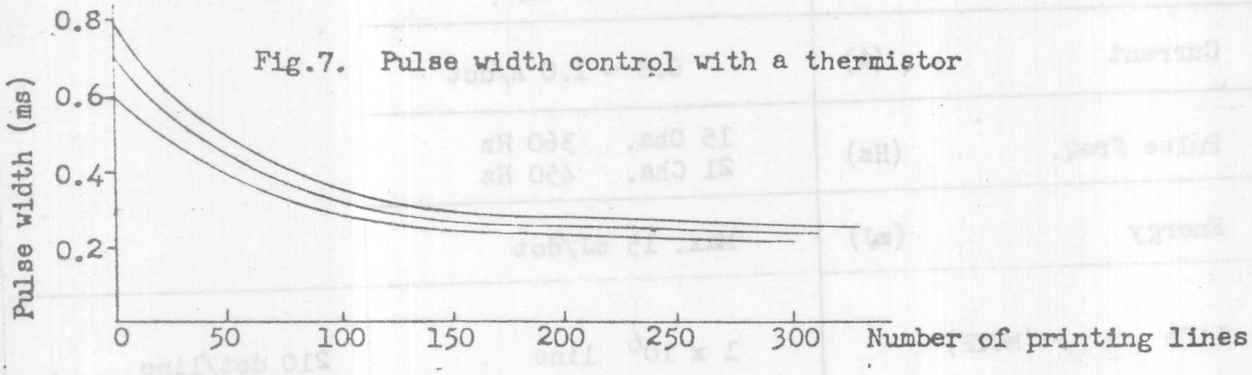


Fig.7. Pulse width control with a thermistor

(Adjustment of Printing Pulse Width)

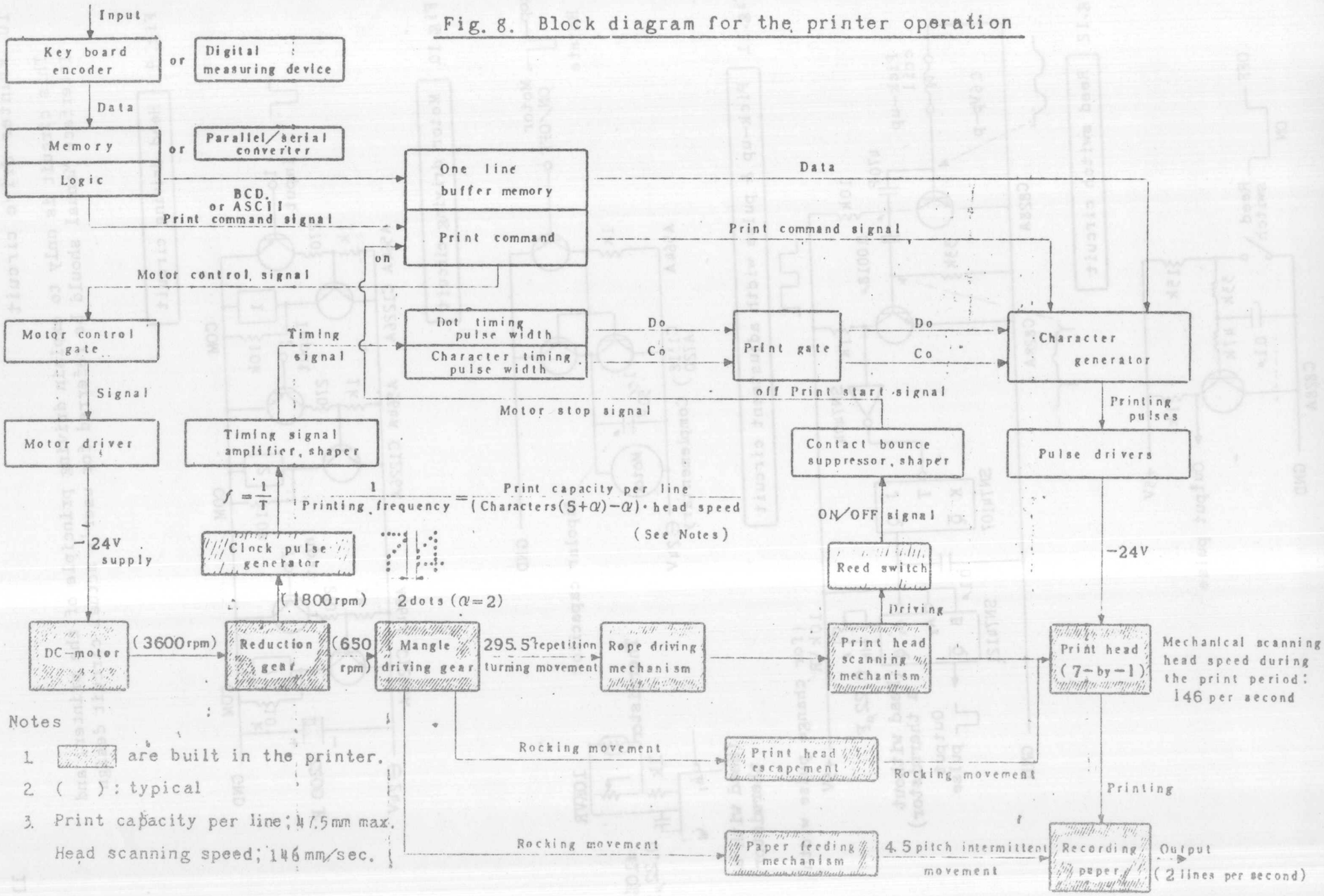
Printing head is classified with four ranks as shown in the table on P. 8 depending on its resistance range, The most preferable pulse width varies with the resistance ranks, and is indicated on the surface of a flat cable. As larger pulse width than the rated may bring forth breakage of the printing head, pulse width adjustment should be conducted under the condition that the terminal pc board No. 2 (for head) is disconnected from the connector.

1. Head Without A Thermistor
   As described in the above, pulse width should be adjusted so as to meet the pulse width range indicated on the flat cable.

2. Head With A Thermistor
   The head terminal pc board (No.2) is disconnected from the connector and instead, a pc board with a 30K ohm resistor is inserted into the connector.
   Under the above mentioned condition, pulse width adjustment shall be done, being followed by an exchange of a pc board with a resistor with the head terminal pc board (No.2) after completion of adjustment.

   (Precautions)
   1) If adjustment should be done with the head terminal pc board connected, pulse width fluctuates sharply due to fuctional operation of a thermistor, eventually jeopardizing correct readings and proper adjustment.
   2) When such pulse width adjustment circuits as in P. 11 or P. 17 are utilized, capacitor rating should be 0.22 μF $\pm$10% and resistor rating 1k $\pm$10%

Fig. 8. Block diagram for the printer operation



10. Printer drive circuit

This circuit is only to explain driving principle of the printer, and Interface Manual should be referred for user's actual circuit design

Fig. 9. Head driving circuit

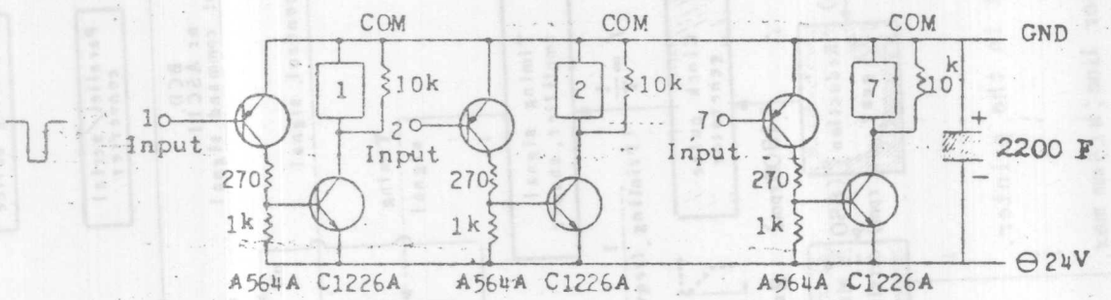


Fig.10. Motor driving circuit

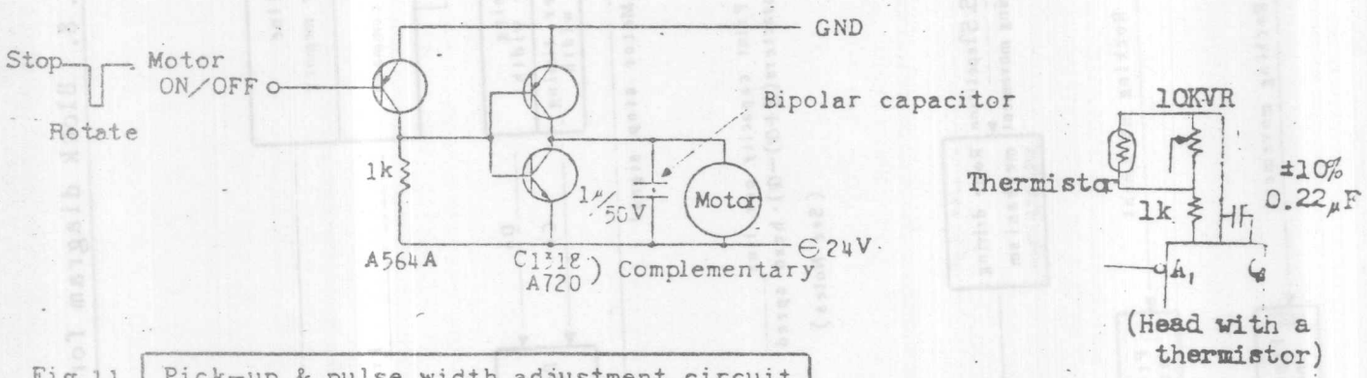


Fig.11. Pick-up & pulse width adjustment circuit

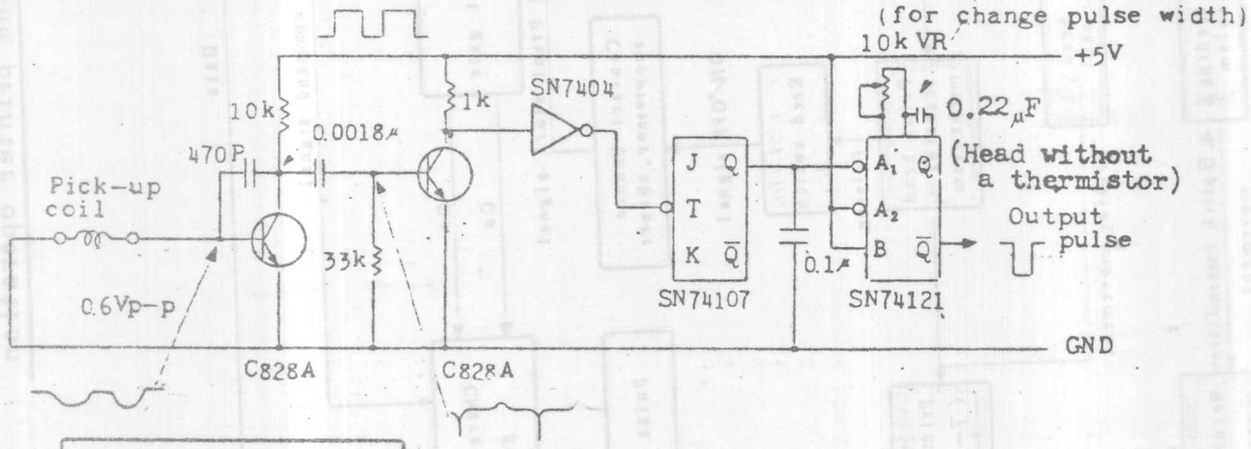
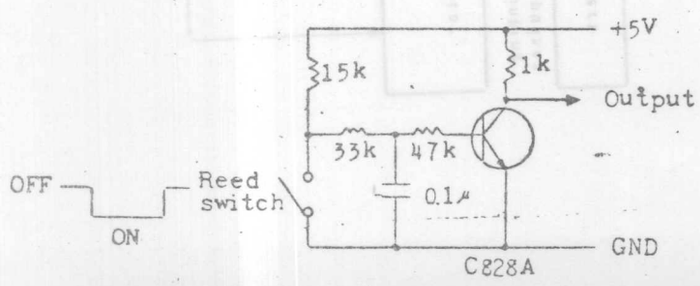


Fig.12. Reed switch circuit



11. Selection of printer model

Standard models are prepared in the following tables.
Please select the Model Number by filling the following blanks when you release order to us.

EUY-10T □ 1 □ □ E

1) 2) 3)

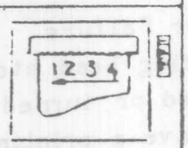
1). Selection of head

No.	
0	Head without a thermistor
3	Head with a thermistor

2) Number of characters per line

No.	Characters/line
1	15 characters
2	21 characters

3) Printing direction (Please indicate R or L)

Character generator \ Application mode		
L.S.D. (Least significant digit)	R type 	L type 
M.S.D. (Most significant digit)	L type 	R type 

(Ex.)

Head without a thermistor → 0
Characters/line 15 → 1
R type → R
} → EUY-10T011RE

12. Attention for usage

1) Printing scanning direction
Take care of the mutual relationship between scanning direction and character generator. (Refer to page 12)

2) Operation
Don't operate the printer without feeding the recording paper. If mistreated, normal printing cannot be expected.

3) Motor and printing head voltage
Applying voltages for driving motor and head should not exceed the specified range of −24V ±5%

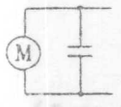
4) Thermal recording paper
It is recommended that you use Matsushita specified recording paper. If not, clear printing and long life cannot be guaranteed.

5) Thermal printing head.
Thermal head composition is a monolythic semiconductor and therefore circuit design, assembling and adjustment works should be done so that a thermal head should not be exposed to harmful impulses.

6) Printer driving circuit
Drive circuit design is recommended to be as per in this manual.
(Refer to pages 11 and 19)

7) Printing pulse width
Preferable printing pulse width range is indicated on each flat cable.
Instruction details for adjustment on p.9 should be refered.

8) Motor noise
When motor noise is preferred to be minimized, a bipolar capacitor of 50V and 1 μF rating is recommended across the motor.



9) Motor failure on the way of paper feeding
If a motor should cease to operate on the way of paper feeding, a paper feeding wheel should be rotated manually to drive it again.

10) Power failure
Printing head stops on the way of scanning simultaneously when the power is failed or turned off, The drive circuit should be so designed by users as to have a printing head return to the normal specified position immediately after power is turned on again.

11) Head drive circuits
So as to protect a thermal head from harmful impulses, turning on and off of power supply should be done in the following order.

Turn "ON" : +5V first and then −24V
Turn "OFF" : −24V first and then +5V

12) Operation of release button and paper cutter

1. Release button

When paper has stopped or is torn in the printer, please pull the release button in the direction of the arrow and pull the paper out of the printer by hand.

Please do not touch the release button during printing.

2. Paper cutter

The paper cutter can be removed from the cover by moving in the direction of the arrow (1) and pulling up in the direction of the arrow (2). The paper cutter can be reset by pushing part B to part C and by inserting part A and B into the holes of the cover.

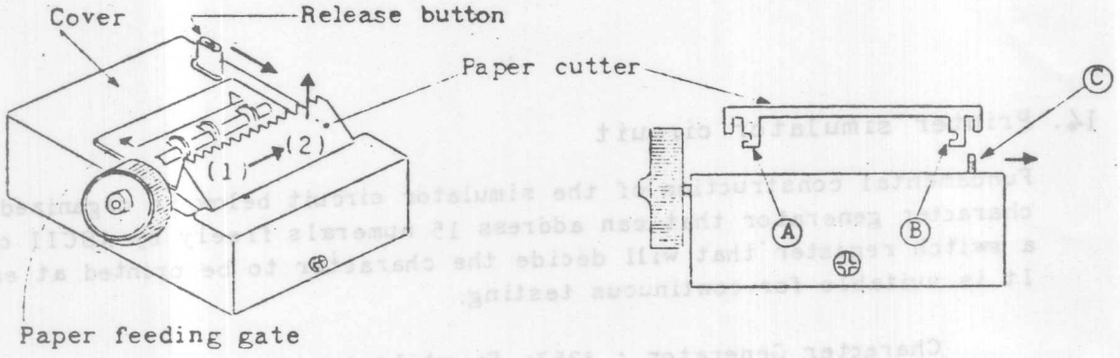


Fig. 13. Release button and paper cutter

13) Paper roll installation

Paper roll installing position should be so designed to be centered with the center of paper feeding gate within a tolerance of ±2mm.

14) Line to line distance precision

The tolerance of line to line distance can be minimized by means of installing a damper between a paper roll and printer so as to provide tention to the printing paper as shown in Fig. 14.

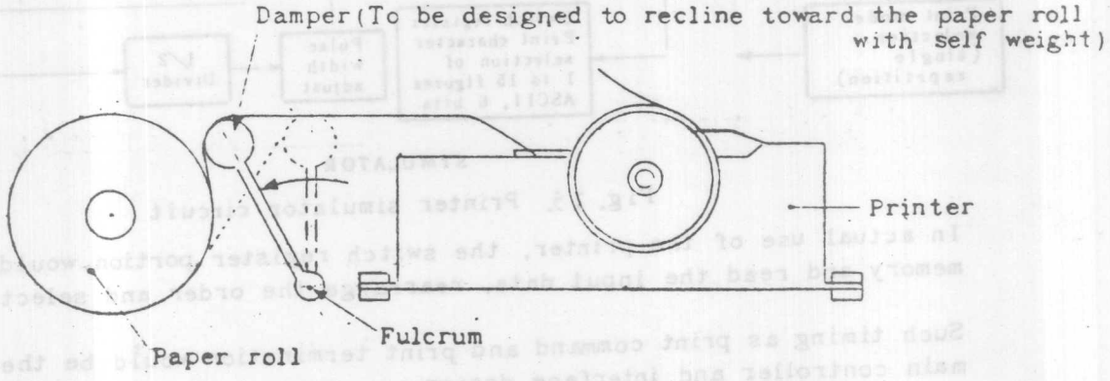


Fig. 14. Damper

15) Lubrication

When slow down of scanning speed is observed the scanning shaft should be lubricated with sawing machine oil or spindle oil.

13. Service parts lists

Service Parts	Parts Number	Structure	Package
Printing head assembly (without a thermistor)	EUX-TP703AS	Printing head Installing parts Rubber spacer Mini screw	one
Printing head assembly (with a thermistor)	EUX-TP703ATS	Printing head Installing parts Rubber spacer Mini screw	one
Paper feed roller assembly	EUY-SUB201	Rubber roller & spindle Rachet wheel Two bearings Two E-Rings	five
Paper cutter	EUY-SUB202	Paper cutter	five

14. Printer simulator circuit

Fundamental construction of the simulator circuit below is organized with a character generator that can address 15 numerals freely by ASCII code and a switch register that will decide the character to be printed at each figure. It is suitable for continuous testing.

Character Generator : 3257 Fairchild (counter built-in)
(note) Head scanning direction : Left to right

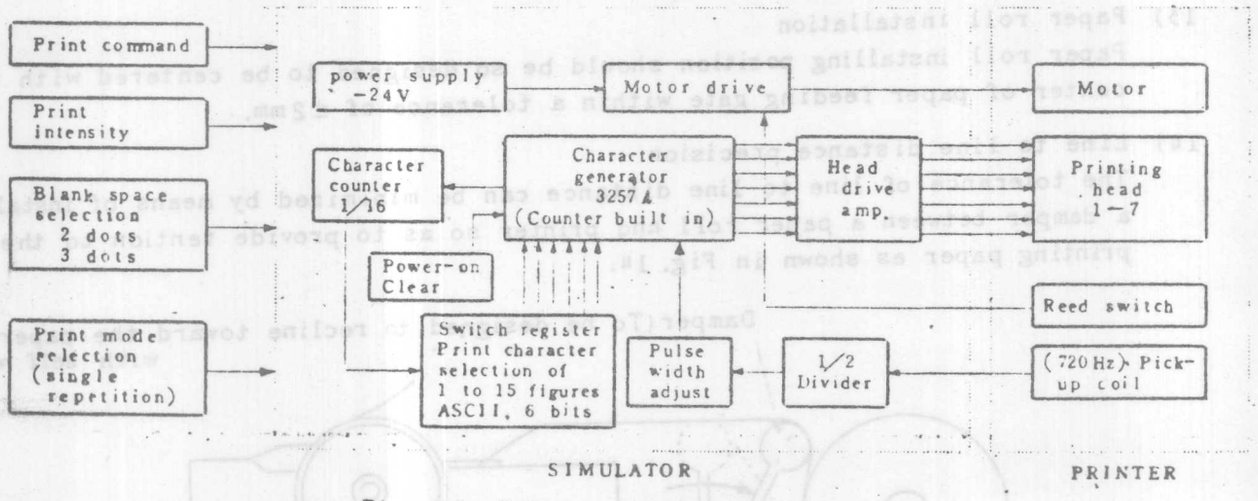
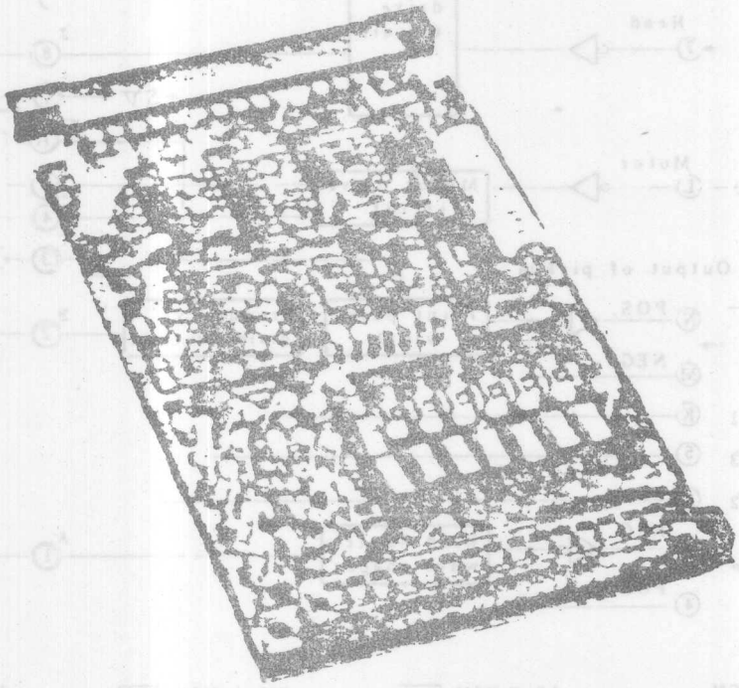


Fig. 15. Printer simulator circuit

In actual use of the printer, the switch register portion would be the buffer memory and read the input data, rearrange the order and select the character.

Such timing as print command and print termination would be the center of the main controller and interface design.
Since the main controller differs according to use, an appropriate design is required for each case.

APPLICATION MANUAL
OF
INTERFACE UNIT EUY-PUD



EXCLUSIVELY DESIGNED FOR

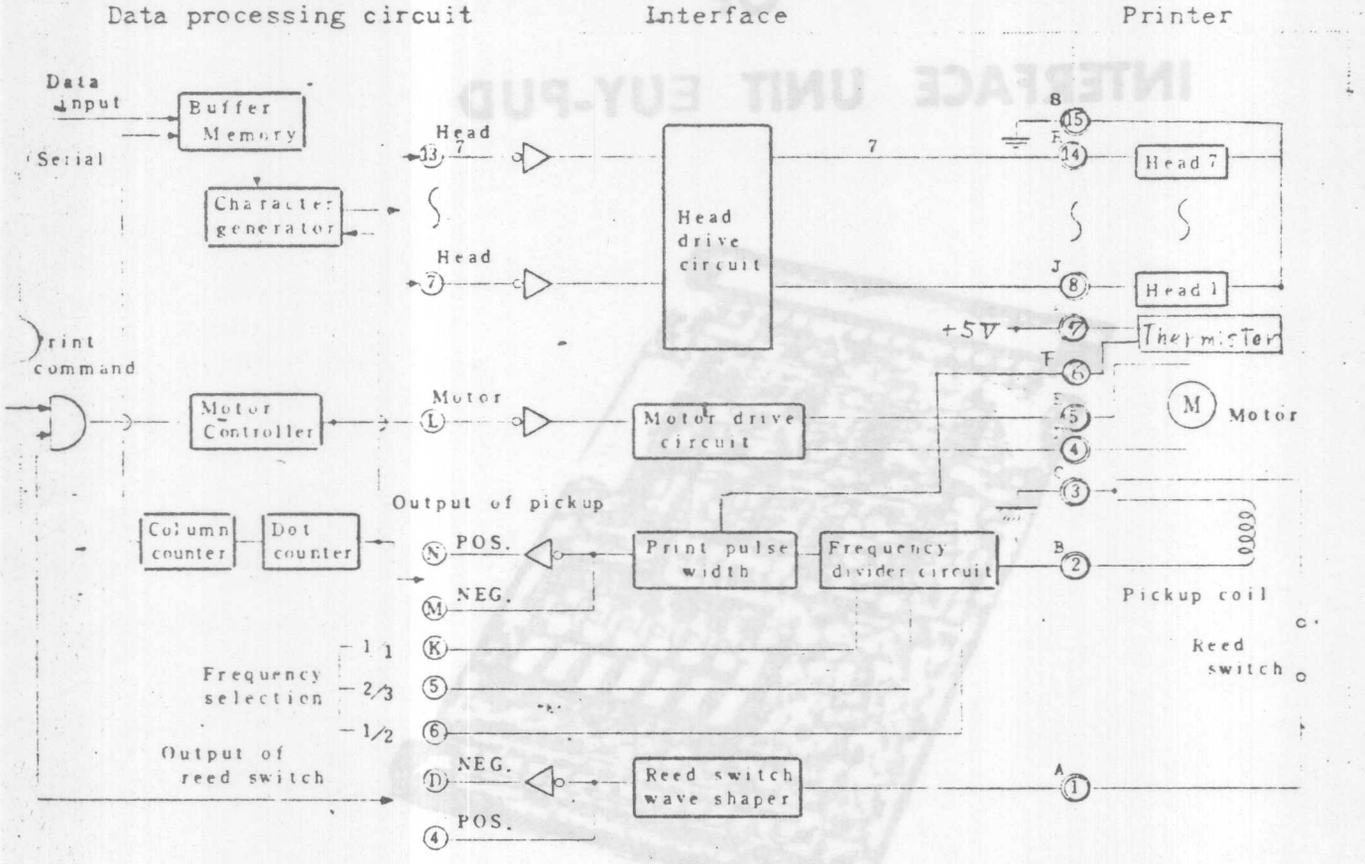
EUY-1●TSERIES

Matsushita Electric

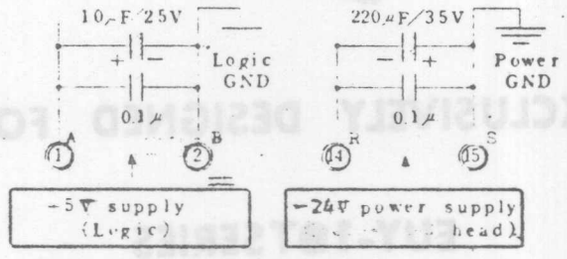
Outlines

In application of the thermal printer EUY-10T series, an interface circuit is required between a printer and data processing circuit as shown in the Fig. below.

The interface unit EUY-PUD[illegible], consisting of head drive and motor drive circuits, pickup coil output, reed switch output and selection of frequency divider, is ready to drive a printer simply with feeding power sources and TTL logic level signals.



Selection of frequency division shall be done by means of grounding of either Ⓚ or ⑤ or ⑥.



"Logic GND" and power GND should be grounded at the side of power supply.

The interface circuit works to

(1) drive the thermal printer head with TTL level signal. (-24V)
(2) drive a motor with TTL level signal. (-24V)
(3) rectify waveform with a reed switch input circuit (with chattering elimination circuit built in).
(4) amplify pickup signal (sine wave) and rectify its waveform being followed by selection of frequency division. (1/1, 2/3 and 1/2)
(5) be built in with noise suppressing functions for motor, reed switch and pickup circuits.

(Specifications are subject to change without notice for improvements.)

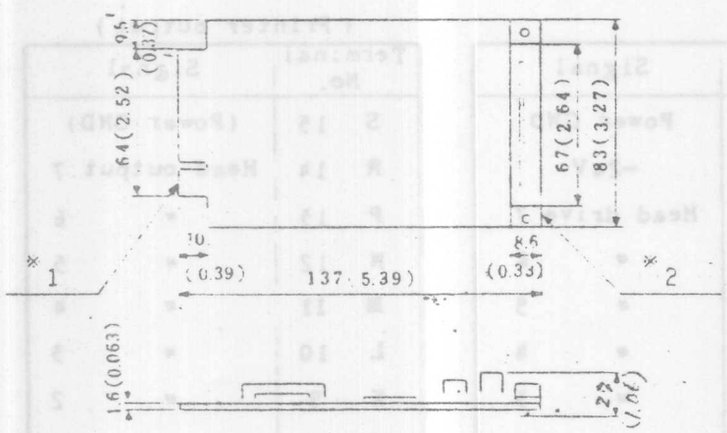
Features

1. Stable characteristics against environmental stresses due to highly reliable components and glass epoxy substrate.
2. Small in size employing as miniaturized and capable transistors and ICs as possible.
3. A female connector for printer connection and male connector for connection with data processing circuit are built in.
4. Applicable for all kinds of EUY-10T series.

Specifications

Item	Specifications
Power Supply	+5V±5%(200mA), −24V±5%
Logic Level	All input and output signals are compatible with TTL. $F_I = 1$, $F_O = 10$
	Input signal: active low
	Output signal: both active low and high
Frequency Divider	Selection: 1/1, 2/3 or 1/2
Printing Pulse Width	0.55 ~ 0.75
Maximum Outside Dimensions	83(W) × 137(L) × 22(H) mm
Operating Environment	0℃ ~ 50℃ 90%RH (40℃)
Weight	approx. 100 g

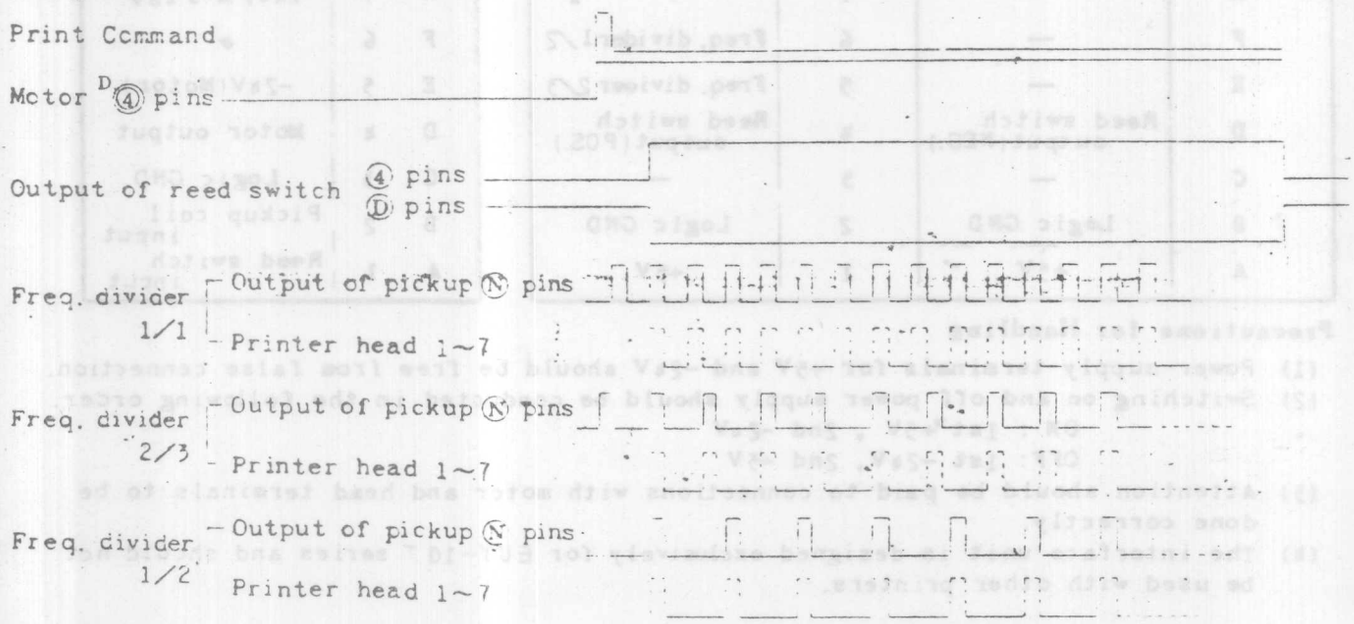
Shapes and Dimensions



unit: mm (inch)

*1.2 CONNECTOR
225-21521-487 (AMPHENOL)
PITCH: 3.96 mm
PIN NO.: 15 BCT H SIDE

Timing and Waveform



Information for Decision on Number of Digits

According to various combinations of frequency divider and number of space dots, the variety of number of digits as shown in the table below is obtained.
Recommended printer models are EUY-10T0□1□E and EUY-10T3□2□E
(10T3□1■E)

Printer models	Max. Printing dots per line	Spacing dots	Characters per line: Freq. divider 1/1	Freq. divider 2/3	Freq. divider 1/2
	(dots)	(dots)			
EUY-10T0□1□E (10T3■1■E)	234	2	—	—	16
		3	—	19	15
EUY-10T3□2□E	290	2	—	—	21
		3	—	—	18

Table for Terminal Connection

(Data input)

Terminal No.	Signal	Terminal No.	Signal
S	Power GND	15	Power GND
R	−24V	14	−24V
P	—	13	Head drive 7
N	Pickup coil output (POS.)	12	" 6
M	Pickup coil output (NEG.)	11	" 5
L	Motor drive input	10	" 4
K	Freq. divider 1/1	9	" 3
J	—	8	" 2
H	—	7	" 1
F	—	6	Freq. divider 1/2
E	—	5	Freq. divider 2/3
D	Reed switch output (NEG.)	4	Reed switch output (POS.)
C	—	3	—
B	Logic GND	2	Logic GND
A	+5V	1	+5V

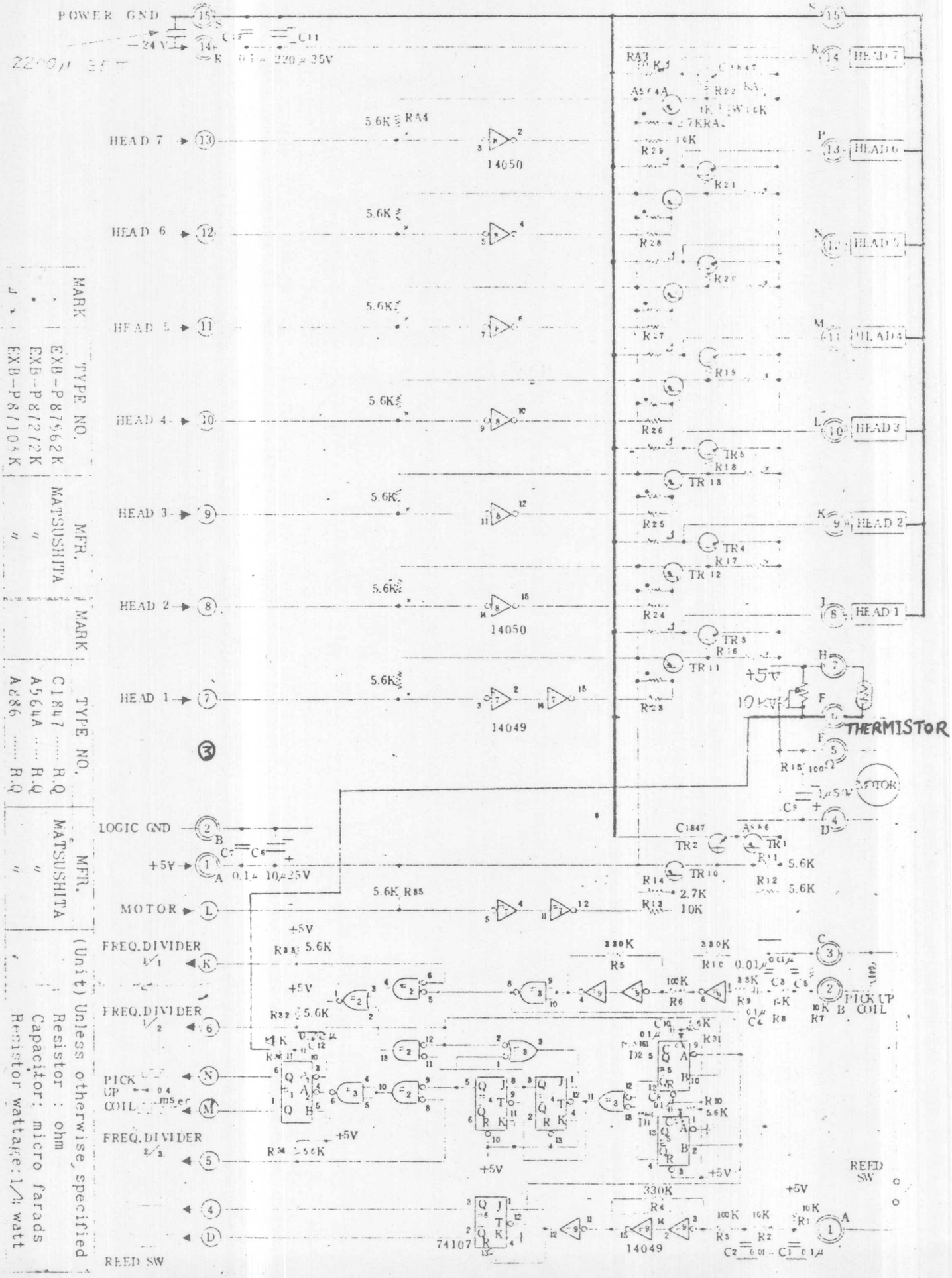
(Printer output)

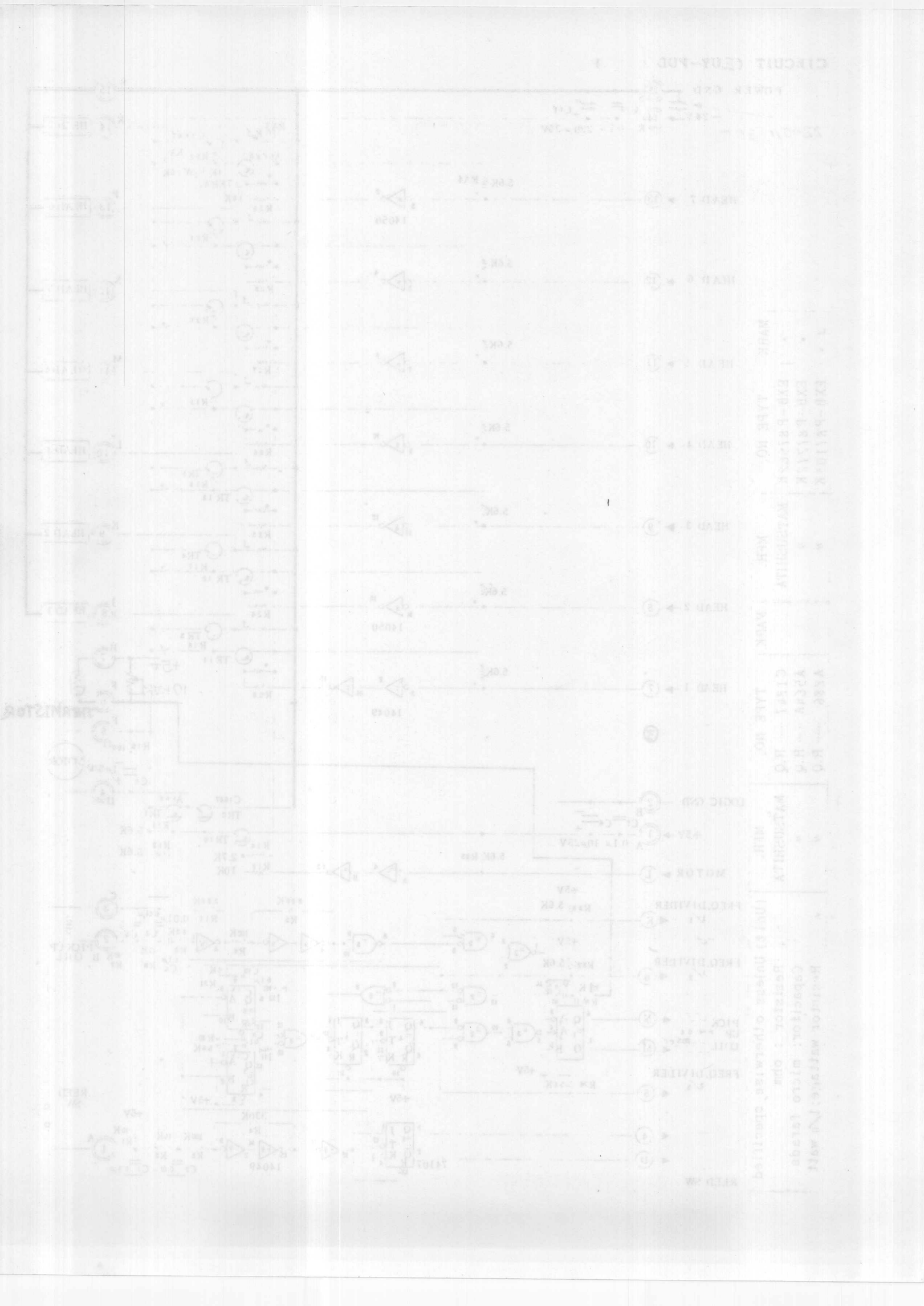
Terminal No.		Signal
S	15	(Power GND)
R	14	Head output 7
P	13	" 6
N	12	" 5
M	11	" 4
L	10	" 3
K	9	" 2
J	8	" 1
H	7	Thermistor
F	6	"
E	5	−24V (Motor)
D	4	Motor output
C	3	Logic GND
B	2	Pickup coil input
A	1	Reed switch input

Precautions for Handling

(1) Power supply terminals for +5V and −24V should be free from false connection.
(2) Switching on and off power supply should be conducted in the following order.
ON : 1st +5V , 2nd −24V
OFF: 1st −24V, 2nd +5V
(3) Attention should be paid to connections with motor and head terminals to be done correctly.
(4) The interface unit is designed exclusively for EUY-10T series and should not be used with other printers.

CIRCUIT (EUY-PUD)

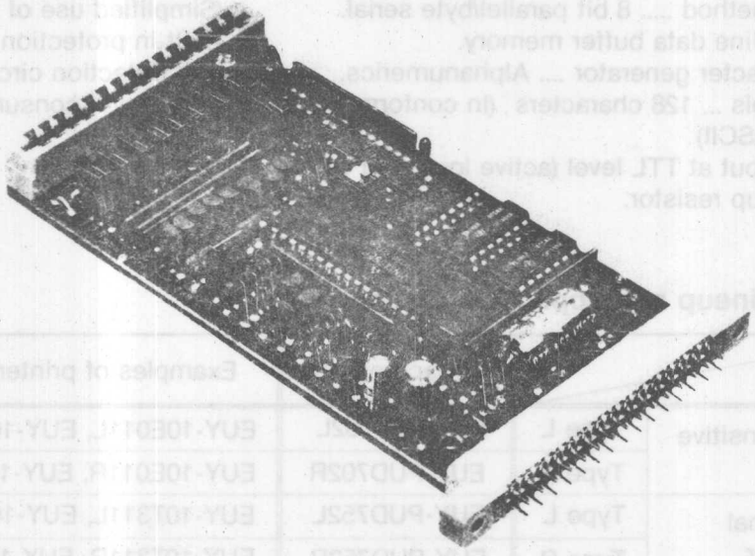




1st Issue
Nov. 1980

National

Application Manual Interface Units for Electrosensitive and Thermal Printers (Parallel Input)



Type:

EUY-PUD 702L	EUY-PUD 752L
EUY-PUD 702R	EUY-PUD 752R

Matsushita Electric

☐ General description

EUY-PUD702 & 752 Series Printer Interface is a compact board unit which integrates three functions, electrosensitive/thermal printer control, one line buffer memory of data and character generation of alphanumerics, Kana and symbols by employing a special 4 bit single chip microcomputer.
The parallel data input method can be easily maintained by the use of electrosensitive/thermal printer as the data terminals. Also, host system works to shorten the time of data transmission due to one line buffer memory.
This interface unit can be easily and widely used in the peripherals of various microcomputer systems which require the recording of data, and also for measuring instruments and medical equipment.

☐ Features

1. Small in size and versatile in function, employing a 4 bit single chip microcomputer.
2. Data input method ..... 8 bit parallel/byte serial.
3. Built-in one line data buffer memory.
4. Built-in character generator .... Alphanumerics, Kana, symbols ... 128 characters. (In conformity to JIS-C6220, ASCII)
5. All input/output at TTL level (active low), and with a built-in pull up resistor.
6. Built-in circuit which has a function to control power on, power off sequence (+5V, −24V). (Simplified use of a thermal printer)
7. Built-in protection circuit for power failure. (Built-in +5V detection circuit)
8. Low power consumption.

☐ Interface lineup and applicable printers

		Interface part No.	Examples of printer part No.	Examples of attachment
Electrosensitive printer	Type L	EUY-PUD702L	EUY-10E011L, EUY-10E012L,...	Fig, 1—a
	Type R	EUY-PUD702R	EUY-10E011R, EUY-10E012R,...	Fig, 1—b
Thermal printer	Type L	EUY-PUD752L	EUY-10T311L, EUY-10T312L,...	Fig, 1—a
	Type R	EUY-PUD752R	EUY-10T311R, EUY-10T312R,...	Fig, 1—b

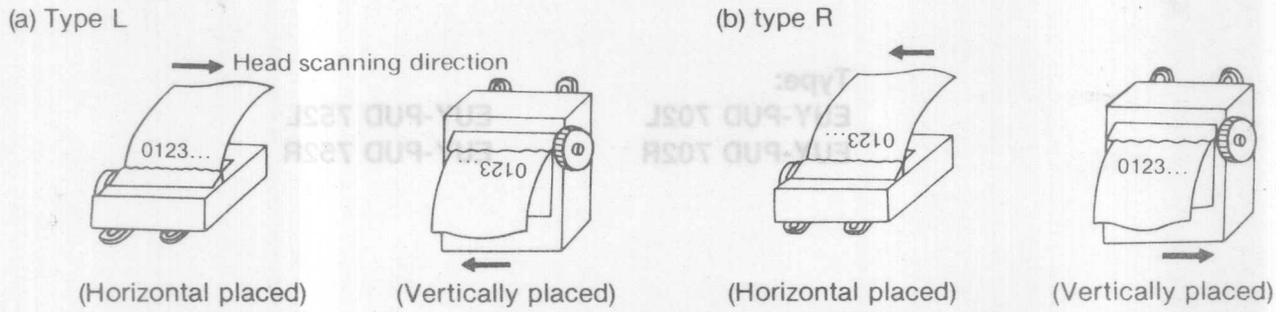


Fig. 1 Mounting direction of printer and printing output

Fig. 1 is for your reference in choosing character direction and output of your choice according to the mounting direction (horizontal or vertical) of printer in the combination with interface (Type R or Type L).
It should be noted that character direction becomes reverse when a different type of interface (L or R) is used even with the same mounting direction.

☐ General Specifications

Items		Electrosensitive		Thermal	
Interface unit		EUY-PUD702L, R		EUY-PUD752L, R	
Printer		EUY-10E011L, R	EUY-10E012L, R	EUY-10T311L, R	EUY-10T312L, R
No. of character per line		16, 32	20, 40	16	20
Printing pulse width		0.55ms ± 10%		Controlled with in the range from 0.8 to 0.3ms	
Kinds of characters		128 alphanumerics, symbols and 'Kana'			
Character code		ASCII, JIS-C6220 All control codes (OX) shall be CRLF			
Date transmission signal	Data input	$\overline{\text{DATA BIT 1}}\sim\overline{8}$	TTL active low		$F_{IN}=1$ With pull up 10kΩ
	Strobe input	$\overline{\text{STROBE}}$	TTL active low		
	Acknowledge output	$\overline{\text{ACK}}$	TTL active low		$F_{OUT}=10$ With pull up 10kΩ
	Ready output	$\overline{\text{RDY}}$	TTL active low		
	Char. scale input	$\overline{\text{CHAR. SCALE}}$	TTL		$F_{IN}=1$ 、 With pull up 10KΩ
	Reset input	$\overline{\text{RESET}}$	Transistor input mode		Refer to circuit diagram
Power source		+5V ± 5% 150mA typical −24V +10/−5 % 300mA max.		+5V ± 5% 150mA typical −24V ±5% 1A max.	
Dimensions		67mm (W) × 130mm (D) × 19.6mm (H/max.)			
Weight		Approx. 100g			
Operating environment	Temperature	0 ∼ 50°C			
	Humidity	35 ∼ 90%RH			

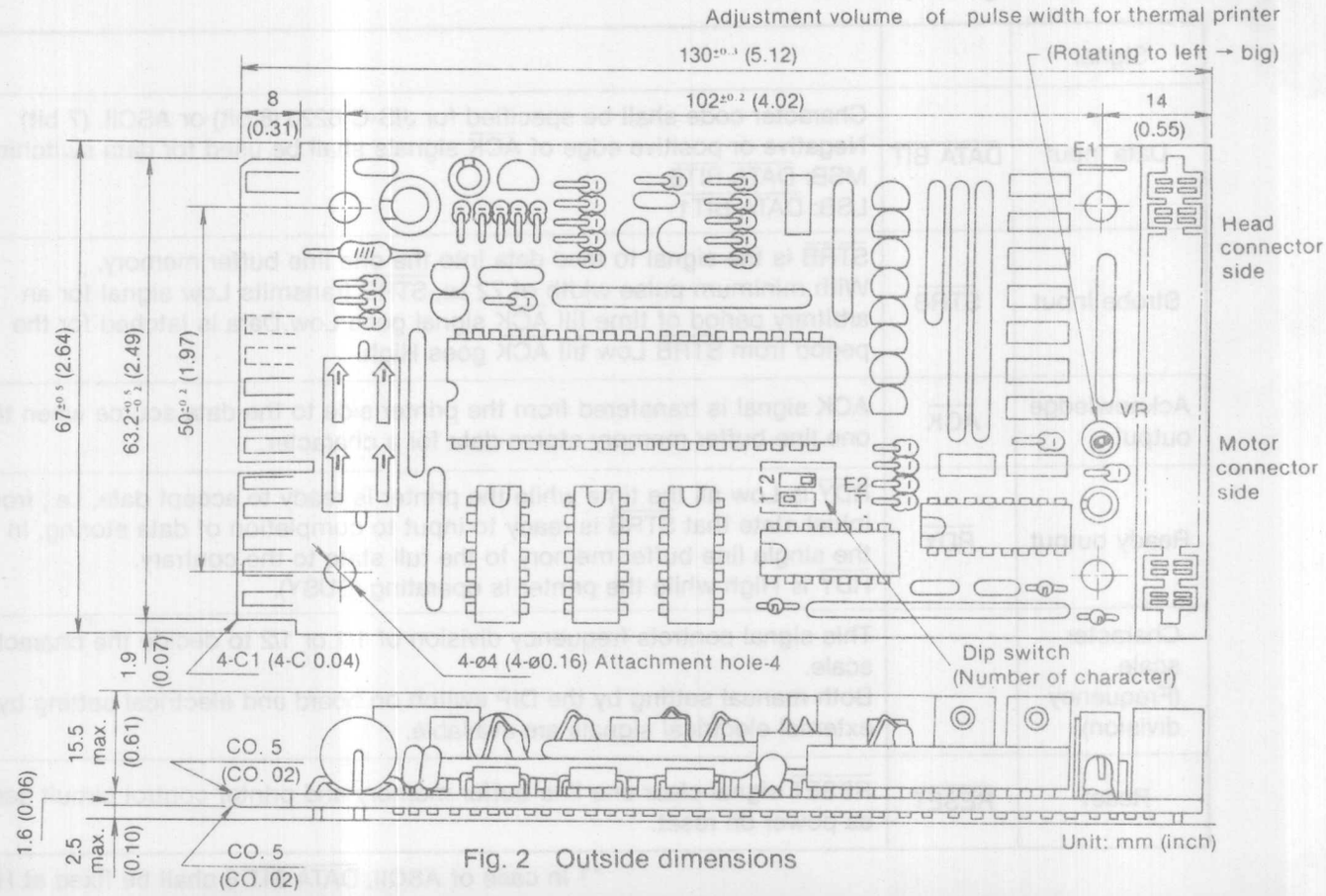


Fig. 2 Outside dimensions

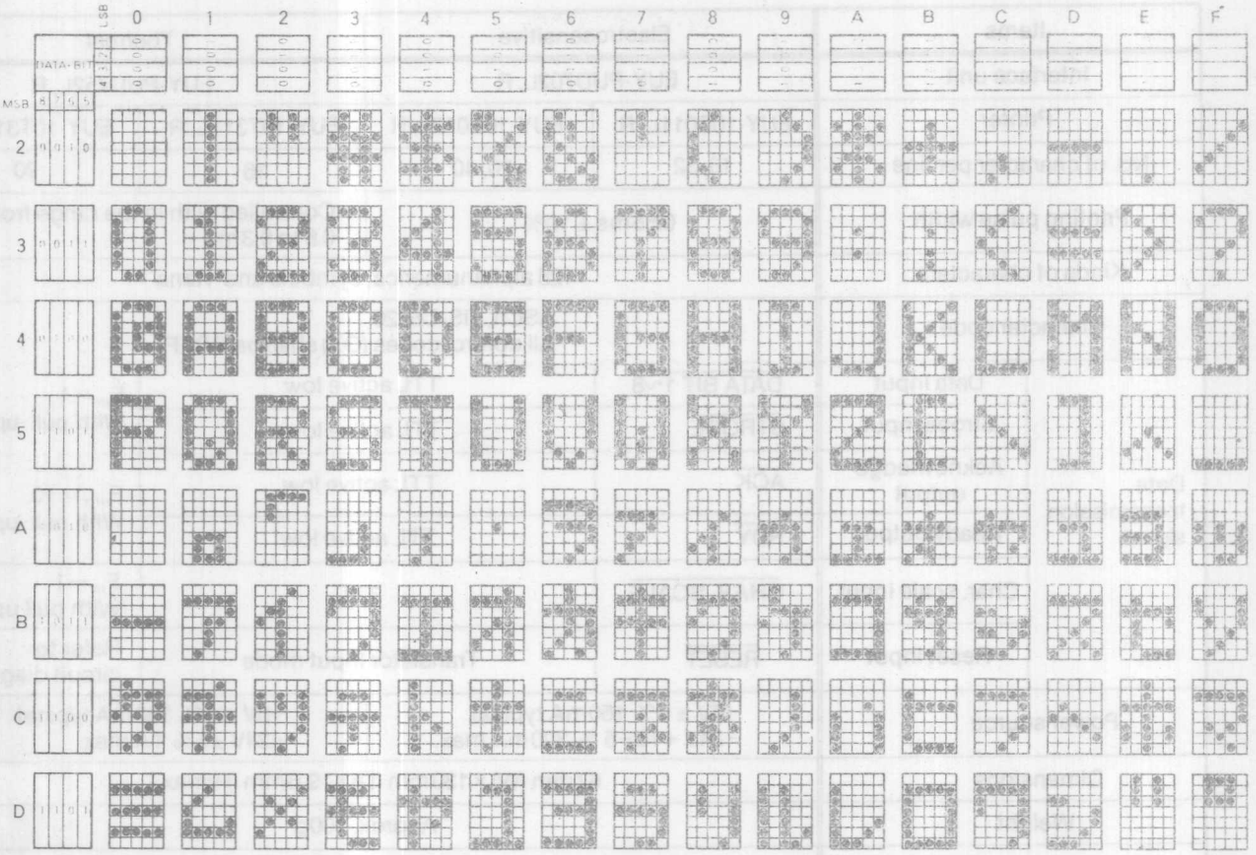
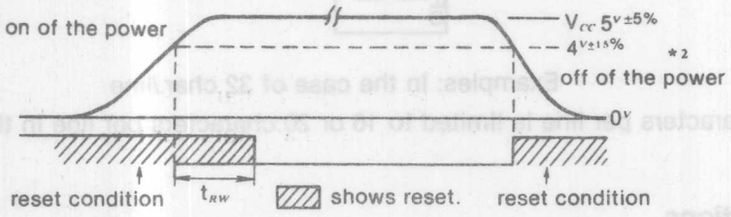


Fig. 3 Character code and font

☐ Input/Output signal specification

Signal		
Data input	$\overline{\text{DATA BIT}}$	Character code shall be specified for JIS-C 6220 (8 bit) or ASCII. (7 bit) *1 Negative or positive edge of $\overline{\text{ACK}}$ signals shall be used for data switching. MSB: $\overline{\text{DATA BIT8}}$ LSB: $\overline{\text{DATA BIT1}}$
Strobe input	$\overline{\text{STRB}}$	$\overline{\text{STRB}}$ is the signal to feed data into the one line buffer memory. With minimum pulse width of 72 μs, $\overline{\text{STRB}}$ transmits Low signal for an arbitrary period of time till $\overline{\text{ACK}}$ signal goes Low. Data is latched for the period from $\overline{\text{STRB}}$ Low till $\overline{\text{ACK}}$ goes High.
Acknowledge output	$\overline{\text{ACK}}$	ACK signal is transfered from the printer side to the data source when the one line buffer memory stores data for a character.
Ready output	$\overline{\text{RDY}}$	$\overline{\text{RDY}}$ is Low all the time while the printer is ready to accept data, i.e., from initial state that $\overline{\text{STRB}}$ is ready to input to completion of data storing. In the single line buffer memory to the full state to the contrary. $\overline{\text{RDY}}$ is High while the printer is operating (BUSY).
Character scale (Frequency division)		This signal controls frequency division of 1/1 or 1/2 to decide the character scale. Both manual setting by the DIP switch on board and electrical setting by external electrical signals are available.
Reset	$\overline{\text{RESET}}$	$\overline{\text{RESET}}$ signal clear one line buffer memory and printer control circuit same as power on reset.

*1 In case of ASCII, $\overline{\text{DATA BIT 8}}$ shall be fixed at High.

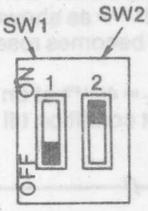
<table>
<tr><th>Items</th><th>Description</th><th>Remarks</th></tr>
<tr><td>Data input method</td><td>1. Shakehand asynchronous input system with STROBE, ACK and READY signals.
2. Fixed interval strobe system with STROBE and READY signals.</td><td>Refer to the Timing Diagram on the annexed for input timing</td></tr>
<tr><td>Printing start</td><td>1. Start of printing by the input of CR·LF (carriage return line feed) codes.
2. Automatic start of printing through the full of data on one line (16, 20, 32, 40 char./line)</td><td>CR·LF = OX (Hexadecimal)
X: Don't care</td></tr>
<tr><td>Reset operation</td><td>1. Under condition of on and off of the power, from 0^{V} to +5^{V} (to on of the power) or from +5$^{V\pm5\%}$ to 0^{V} (off of the power), reset operation works correctly more than V_{CC} = 4$^{V\pm15\%}$ as shown below. In case of less than that, it becomes reset condition.
Also, when it rises over V_{CC} = 4$^{V\pm15\%}$ at on of the power, it keeps reset condition till passage of t_{RW}^{*1} after that.
 

2. By RESET input
Low level... Reset condition (Motor, printing heads are off on the spot)
High level... When to change from L to H, operation begins to work after t_{RW}. *3</td><td>*1 t_{RW} (Time for setting up printer)
*2 When it directs switch on of the power again after turning the power off, it becomes necessary to wait till V_{CC} discharge becomes below 0.5^{V}. If it's done without waiting, there are cases when Power On Reset does not work.
*3 In the case of an electrosensitive printer, if RESET input becomes High from Low with the printing heads pressed onto the recording paper, light printing of a vertical line remains and it becomes to condition of waiting of data input after feeding one line.</td></tr>
<tr><td>Number of character</td><td>16, 20, *4 32 and *4 40 per line
<Method of changing the number of printed characters>
1. By a dip switch
(However, with CHAR·SCALE terminals at H level or open condition)
<table><tr><th>SW2 \ SW1</th><th>ON</th><th>OFF</th></tr><tr><td>ON</td><td>16 char./line</td><td>*4 32 char./line</td></tr><tr><td>OFF</td><td>20 char./line</td><td>*4 40 char./line</td></tr></table>2. By a CHAR·SCALE terminal
(However, with the dip switch 1 ON*5)
<table><tr><th>Char. Scale terminal \ SW2</th><th>ON</th><th>OFF</th></tr><tr><td>L level</td><td>32 char./line</td><td>40 char./line</td></tr><tr><td>H level</td><td>16 char./line</td><td>20 char./line</td></tr></table>3. The dip switch is preset at 20 characters/line for shipment.</td><td>*4 Possible only with an electrosensitive printer. (There is no model with 32 and 40 char. per line on thermal type.)
*5 With the dip switch OFF, control from CHAR·SCALE terminal becomes impossible.</td></tr>
</table>

Setting up of the number of characters per line
(To change frequency divider on printer models)

DIP SW	1	2
ON Side	16/20 char. (Frequency divider 1/2)	EUY-10E011L, R EUY-10T311L, R (16/32)
OFF Side	32/40 char. (Frequency divider 1/1)	EUY-10E012L, R EUY-10T312L, R (20/40)

1 Selection from 16, 20, 32 and 40 character per line... Setting up SW1
2 Deciding of printer model according to the above selection... Setting up SW2



Examples: In the case of 32 char./line

(Note) The number of characters per line is limited to 16 or 20 characters per line in the case of a thermal printer.

☐ Electrical Specifications

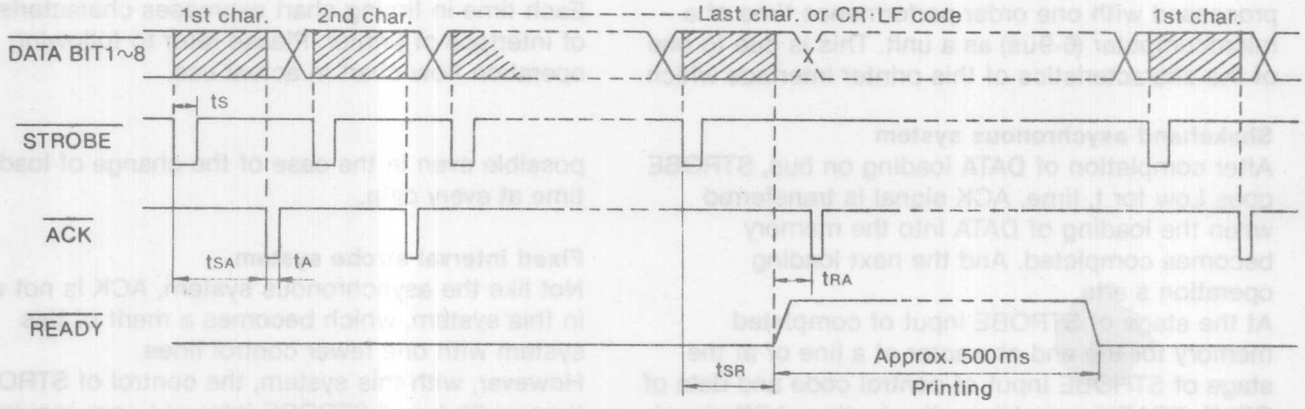
Items	Symbols	Description	min.	typical	max.	Remarks
Consumption current	V_{cc}	+5V	—	150mA	170mA	
		−24V	—	—	0.1mA	
Input high voltage	V_{IH}	$\overline{\text{DATA B1T 1}}\sim8$ $\overline{\text{STROBE}}$ CHAR. SCALE	2.0V	—	V_{cc}	
Input low voltage	V_{IL}		0V	—	0.8V	
Output high voltage	V_{OH}	$\overline{\text{ACK}}$ $\overline{\text{READY}}$	2.4V	—	V_{cc}	$I_{OH} = -400\mu A$
Output low voltage	V_{OL}		0V	—	0.4V	$I_{OL} = 16mA$
Reset input high voltage	V_{IHR}	$\overline{\text{RESET}}$	$V_{cc} - 0.3V$	—	V_{cc}	
Reset input low voltage	V_{ILR}		0V	—	0.8V	
Reset input source current	I_{ILR}		—	—	1.1mA	

Mode of operation	Items	Symbols			min.	typ.	max.
Common items	Printing pulse width		For electrosensitive printers		0.45ms	0.55ms	0.65ms
			For thermal printers		0.6ms	0.7ms	0.8ms
	$\overline{\text{RESET}}$ pulse width	t_R			50μs	—	—
	$\overline{\text{RESET}}$ response time	t_{RR}			—	50μs	150μs
	Printer set-up time	t_{RW}			—	0.6 sec	1.2 sec
	$\overline{\text{READY}}$ response time	t_{SR}	Input of char. code of last char.		204μs	300μs	414μs
			CR·LF code input	1st char.	138μs	195μs	252μs
				From 2nd char. on	66μs	82.5μs	99μs
Shakehand asynchronous input system	$\overline{\text{STROBE}}$ pulse width	t_s			72μs	—	t_{SA}
	$\overline{\text{ACK}}$ response time	t_{SA}	1st char.		264μs	352.5μs	441μs
			From 2nd char. on (Except for last char.)		192μs	285μs	396μs
	$\overline{\text{ACK}}$ pulse width	t_A			6μs	7.5μs	9μs
Strobe input system with fixed intervals	$\overline{\text{STROBE}}$ pulse width	t_S			72μs		192μs
	Data storing time	t_D			441μs		
	$\overline{\text{STROBE}}$ interval	t_{SS}			495μs		

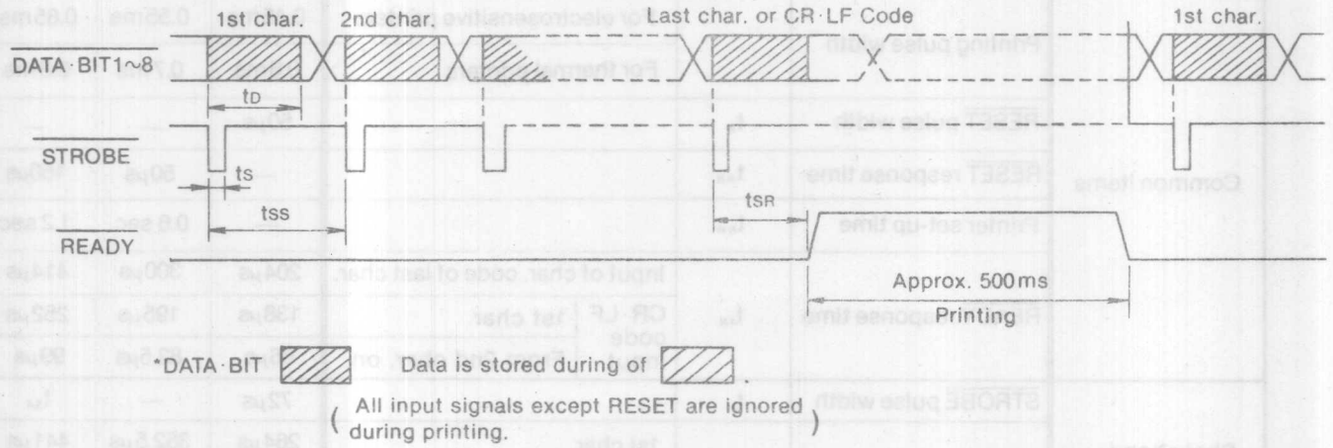
Note: 1. Printing pulse width for a thermal printer shows the value when the head connecter removed and the resister of 30kΩ is connected to the thermister part.
2. Typ. shows representative value when the number of characters per line is set as 20 char./line.

□ Operation timing

Shakehand asynchronous system



Strobe input system with fixed intervals



Reset timing

A Waiting of STROBE and reset while input of character code.

B Reset while printing (operation)

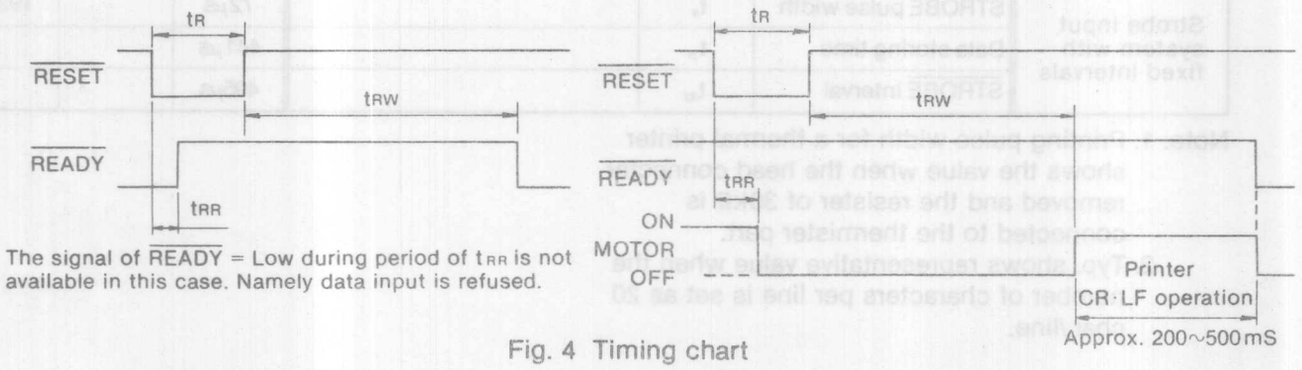


Fig. 4 Timing chart

Explanation about timing

A series of expressions of timing, such as of data memory for one line and print out is serially processed with one order performance time of a microcomputer (6-9us) as a unit. This is due to one of the characteristics of this printer interface which employs a single chip microcomputer for all printer controls.

Each time in timing chart expresses characteristics of interface of printer. Please refer to following operation flow chart in actual use.

Shakehand asychronous system

After completion of DATA loading on bus, STROBE goes Low for t, time. ACK signal is transferred when the loading of DATA into the memory becomes completed. And the next loading operation s arts.

At the stage of STROBE input of completed memory for the end character of a line or at the stage of STROBE input of control code and data of CRLF, READY goes High after t_{SR} then ACK signal is transferred to the source after t_{RA}.

Thus, the possibility of loading data into the one line buffer memory can be checked from host system side by checking READY before loading data on bus.

In the shakehand asychronous system ACK is utilized for going back to High from Low in STROBE.

That is; $t_s = t_{SA}$.

By this, an uniterrupted data processing becomes possible even in the case of the change of loading time at every data.

Fixed interval strobe system

Not like the asynchronous system, ACK is not used in this system, which becomes a merit of this system with one fewer control lines.

However, with this system, the control of STROBE time width t_s and STROBE interval t_{ss} are required.

In this system, data loading process starts at t_s time and any data processing finishes within t_{ss} time.

Therefore, t_{ss} time can be long without a limit as long as it is over 495μs of the table.

As to the t_s time limit, it is becomes longer than $t_s = t_{SA}$, data loading process starts again and the content of the same data bus will be put into the memory, STROBE time must be set within t_s min. $< t_s < t_{SA}$ max.

Reset timing

Reset function is that a single chip microcomputer on the interface is to reset and printing head and motor are turned off at the input of reset or power on and off. (Reference: Reset operation on the table on page 4. In figure 4- A , the position of printing head is home position and READY is Low while STROBE is waiting.

When RESET is directed to input in this status, READY is High after 150μs max. on t_{RR} delay. It is state of reset during period of t_{RW}. In figure 4- B , in the case of input of RESET while the printer is operating, printing head and motor are off of the power temporarily and become state to stop. After passage of t_{RW} time, it starts to operate as well as start of power on.

□Operating flow chart

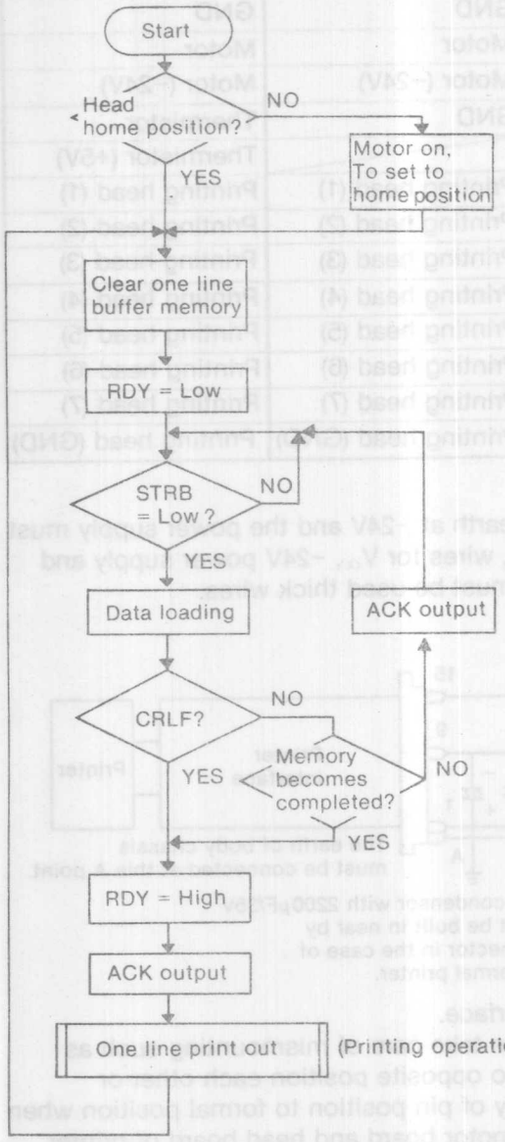
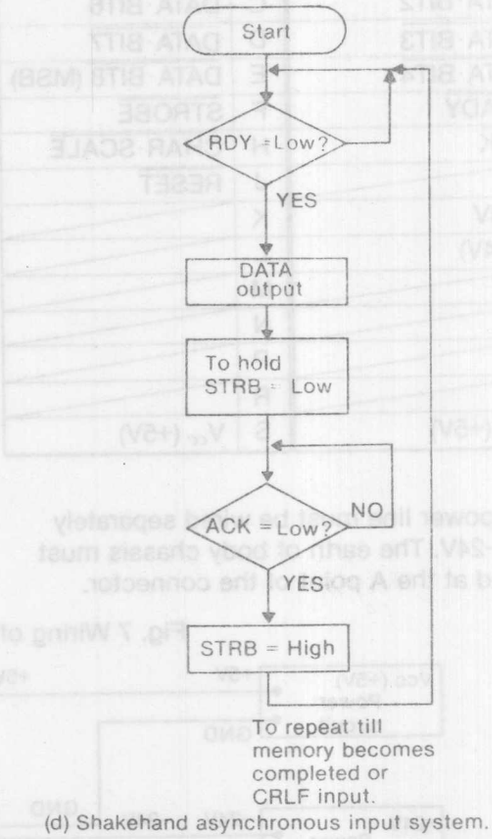
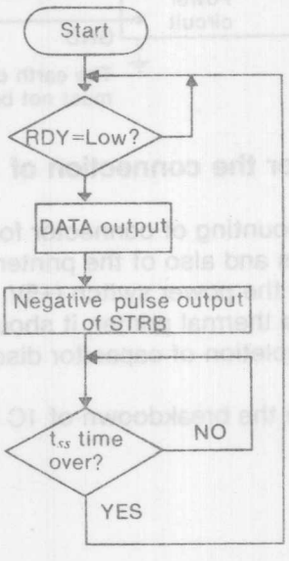


Fig. 5 Processing flow within interface.



(d) Shakehand asynchronous input system.



(b) Fixed interval strobe input system.

Fig. 6 Operating flow of printer from host system.

(Note) Input timing for deciding the number of characters per line.
The number of characters by CHAR.SCALE or dip SW1, 2 (one line buffer memory size) is determined when reading the first character of data.
By using CHAR.SCALE, it is possible to print out 16 characters and 32 characters alternately every one line.

☐ Connection of connector pin

Interface input/output side

Pin No.	Description	Pin No.	Description
1	*GND (Logic ground)	A	*GND (−24V ground)
2	$\overline{\text{DATA}}\cdot\overline{\text{BIT1}}$ (LSB)	B	$\overline{\text{DATA}}\cdot\overline{\text{BIT5}}$
3	$\overline{\text{DATA}}\cdot\overline{\text{BIT2}}$	C	$\overline{\text{DATA}}\cdot\overline{\text{BIT6}}$
4	$\overline{\text{DATA}}\cdot\overline{\text{BIT3}}$	D	$\overline{\text{DATA}}\cdot\overline{\text{BIT7}}$
5	$\overline{\text{DATA}}\cdot\overline{\text{BIT4}}$	E	$\overline{\text{DATA}}\cdot\overline{\text{BIT8}}$ (MSB)
6	$\overline{\text{READY}}$	F	$\overline{\text{STROBE}}$
7	$\overline{\text{ACK}}$	H	$\overline{\text{CHAR}}\cdot\overline{\text{SCALE}}$
8		J	$\overline{\text{RESET}}$
9	−24V	K	
10	(−24V)	L	
11		M	
12		N	
13		P	
14		R	
15	V_{cc} (+5V)	S	V_{cc} (+5V)

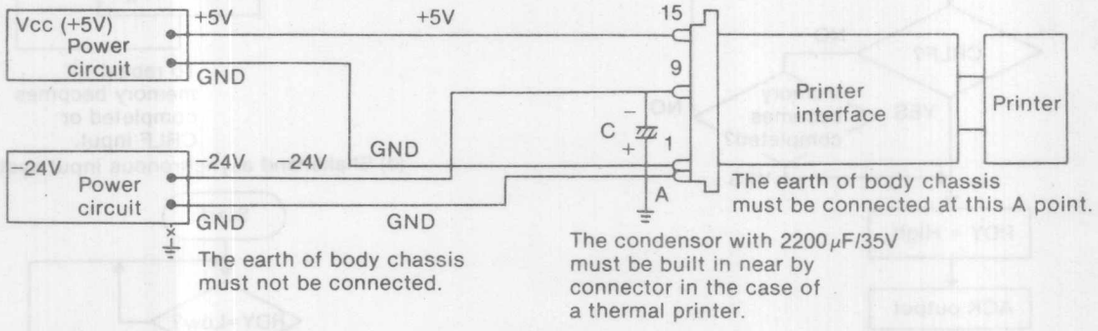
Printer side

Pin No.		For electrosensitive Printer	For thermal Printer
1	A	Reed switch	Reed switch
2	B	Pick up coil	Pick up coil
3	C	GND	GND
4	D	Motor	Motor
5	E	Motor (−24V)	Motor (−24V)
6	F	GND	Thermistor
7	H		Thermistor (+5V)
8	J	Printing head (1)	Printing head (1)
9	K	Printing head (2)	Printing head (2)
10	L	Printing head (3)	Printing head (3)
11	M	Printing head (4)	Printing head (4)
12	N	Printing head (5)	Printing head (5)
13	P	Printing head (6)	Printing head (6)
14	R	Printing head (7)	Printing head (7)
15	S	Printing head (GND)	Printing head (GND)

*Note
GRD of the power line must be wired separately for V_{cc} and −24V. The earth of body chassis must be connected at the A point of the connector.

Also, the earth at −24V and the power supply must be floated, wires for V_{cc}, −24V power supply and the earth must be used thick wires.

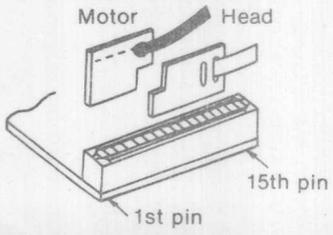
Fig. 7 Wiring of power line



☐ Precautions for the connection of connector.

Mounting and demounting of connector for input/output signals and also of the printer side must be done with the power switch (+5V, −24V) off (in the case of a thermal printer, it should be done after the completion of capacitor discharge of 2200μF).
If not, it may cause the breakdoown of IC in the printer interface.
Also, please take care of mismounting such as mounting to opposite position each other or discrepancy of pin position to formal position when mounting motor board and head board of printer side.

Connection of connector and board dimensions



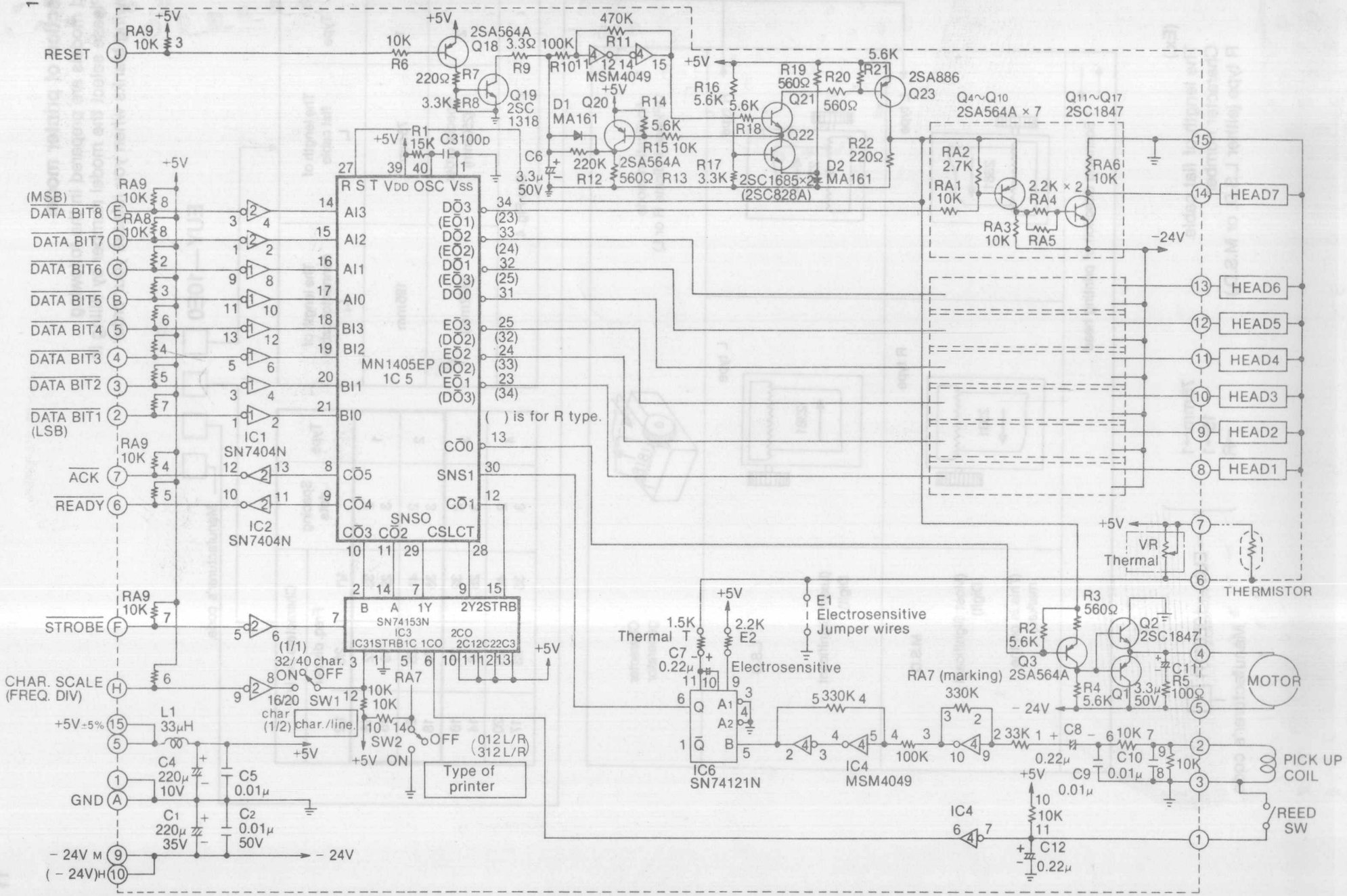


Fig. 8 Circuit diagrams of EUY-PUD702L/R, EUY-PUD752L/R ( ) is for R type.

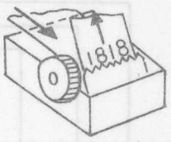
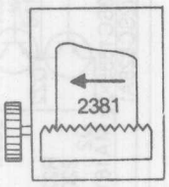
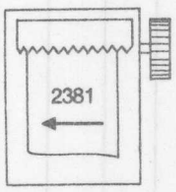
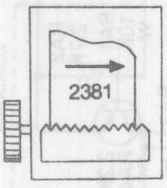
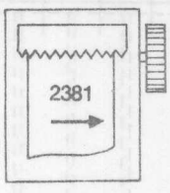
10. Selection of printer model

Standard models are prepared in the following tables. Please select the model number by filling in the following blanks when you release your order to us.

EUY—10E0 □ □ □ □ — Manufacturer's code.

Type	The length of flat cable L_1	The length of connector cable L_2
1	75mm	195mm
2	Special order (250mm)	(372mm)
See Fig. 4.		

Type	Spacing dots	Characters per line		
		Freq. divider		
		1/1	2/3	1/2
1	2	33	22	16
	3	29	19	15
2	2	41	28	21
	3	36	24	18
3	2	32	21	16
	3	28	18	14
4	2	40	26	20
	3	35	23	17

Application mode (Please indicate R or L)		Character generator
R type 	L type 	L.S.D (Least Significant Digit)
L type 	R type 	M.S.D. (Most Significant Digit) (This is on the market.)
: Scanning direction of printing head		

(Ex.)

The length of flat cable 75mm→1
Character number 15→1
R type (either L.S.D. or M.S.D.) →R

→EUY—10E011R □
Manufacturer's code

11. Attention for usage

1) Printing scanning direction

Take care of the mutual relationship between scanning direction and character generator. (Refer to page 11.)

2) Operation

Don't operate the printer without feeding the metallized paper. If mistreated, normal printing cannot be expected.

3) Motor and printing head voltage

Applying voltages for driving motor and head should not exceed the specified range of −24V+10%, −5% (−22.8V∼−26.4V). High voltages exceeding −26.4V for higher density print effect may cause degradation of a printing head shortening its life.

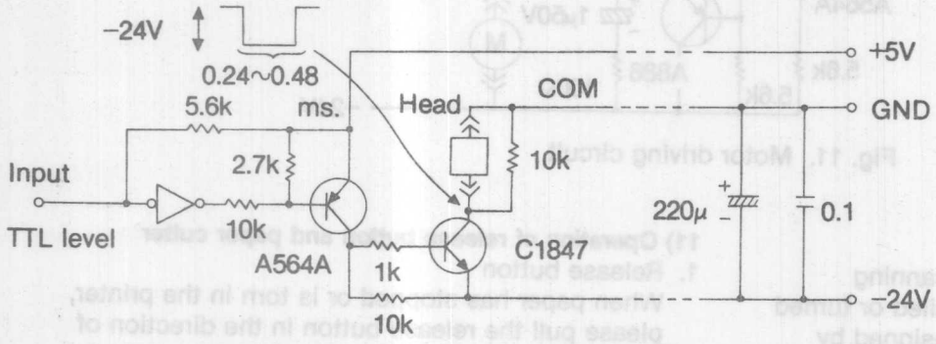


Fig. 9. Head driving circuit

4) Metallized recording paper

It is recommended that you use Matsushita specified metallized paper. If not, clear printing and long life cannot be guaranteed.

5) Exhasut of discharged dust

The exhaust hole at the bottom of the printer is for discharging dust. The user is requested to prepare the receiver plate or study other measures for a safe operation.

6) Filter circuit

To reduce noise and chattering, use filters with pickup coil and reed switch circuit.

7) Discharge spark

Printing operation is accompanied with discharge sparks from printing head, and therefore should be free from inflammable gas.

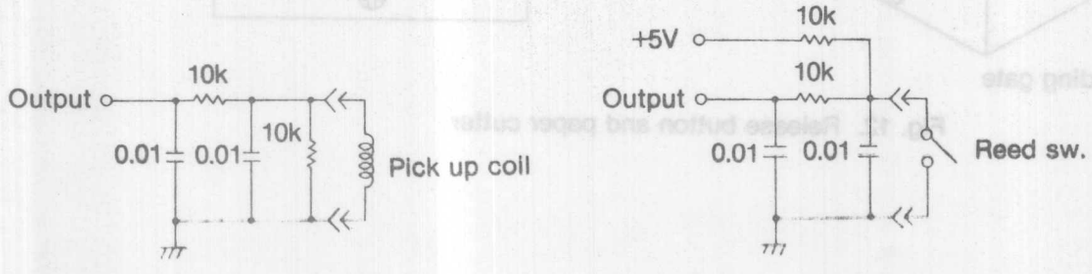


Fig. 10. Filter circuit

8) Motor noise and motor brake

When motor noise is preferred to be minimized, a bipolar capacitor of 50V and 1μF rating is recommended across the motor. And use complementary for good motor brake.

9) Motor failure on the way of paper feeding

If a motor should cease to operate on the way of paper feeding, a paper feeding wheel should be rotated manually to drive it again.

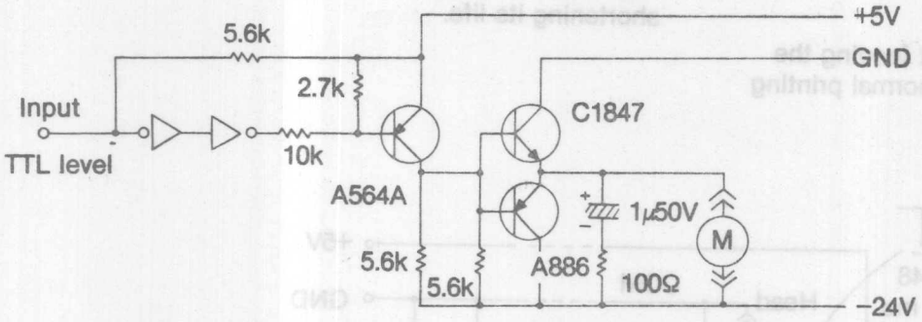


Fig. 11. Motor driving circuit

10) Power failure

Printing head stops on the way of scanning simultaneously when the power is failed or turned off. The drive circuit should be so designed by users as to have a printing head return to the normal specified position immediately after power is turned on again.

11) Operation of release button and paper cutter

1. Release button
   When paper has stopped or is torn in the printer, please pull the release button in the direction of the arrow and pull the paper out of the printer by hand.
   Please do not touch the release button during printing.

2. Paper cutter
   The paper cutter can be removed from the cover by moving in the direction of the arrow (1) and pulling up in the direction of the arrow (2). The paper cutter can be reset by pushing part B to part C and by inserting part A and B into the holes of the cover.

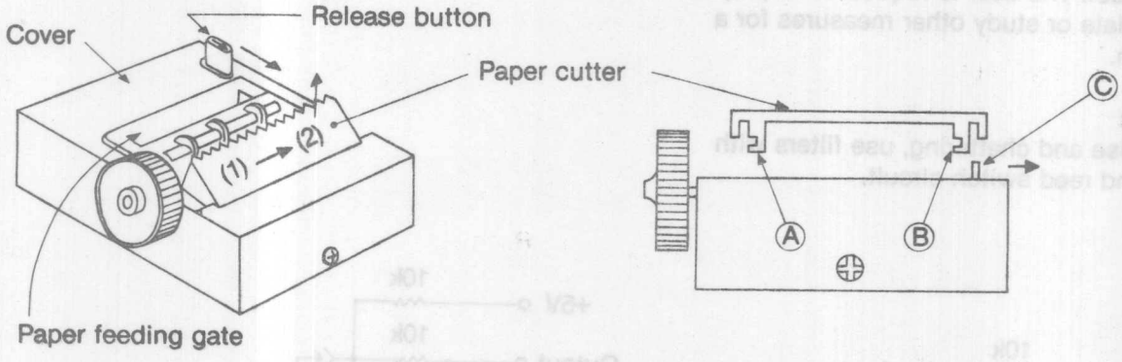


Fig. 12. Release button and paper cutter

12) Paper roll installation
Paper roll installing position should be so designed to be centered with the center of paper feeding gate within a tolerance of ±2mm.

13) Line to line distance precision
The tolerance of line to line distance can be minimized by means of installing a damper between a paper roll and printer so as to provide tention to the printing paper as shown in Fig. 13.

14) Lubrication
When slow down of canning speed is observed the scanning shaft should be lubricated with sawing machine oil or spindle oil.

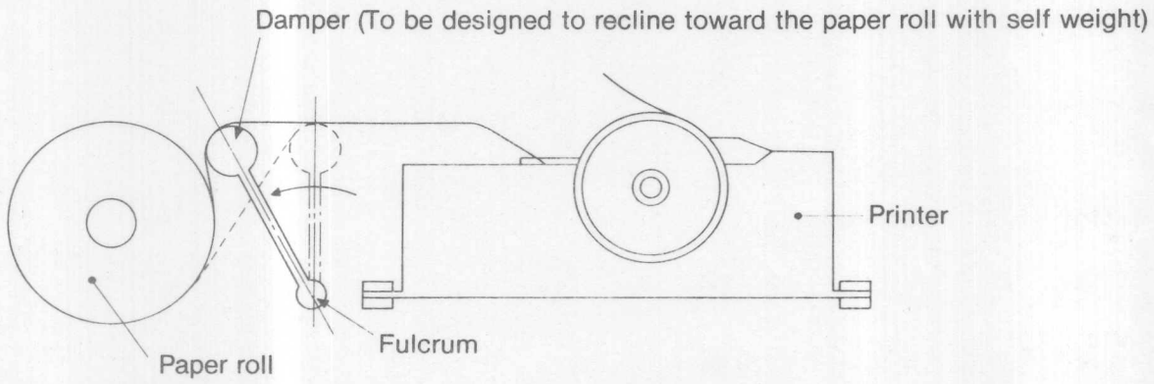


Fig. 13. Damper

12. Service parts lists

Service parts	Parts number	Structure	pcs in one package
Printing head assembly-A The flat cable is short length.	EUX-EP702AS	Printing head Installing parts Rubber spacer Mini screw Cleaning paper	one
Printing head assembly-C The flat cable is long length.	EUX-EP702CS	Printing head installing parts Rubber spacer Mini screw Cleaning paper	one
Paper feed roller assembly	EUY-SUB201	Rubber roller & spindle Racket wheel Two bearings Two E-Rings	five
Paper cutter	EUY-SUB202	Paper cutter	five
Pinch roller	EUY-SUB203	conductive rubber roller & spindle One E-Ring	five

12) Paper roll installation

Paper roll installing position should be so designed to be centered with the center of paper feeding gate within a tolerance of ±2mm.

13) Line to line distance precision

The tolerance of line to line distance can be minimized by means of installing a damper between a paper roll and printer so as to provide tention to the printing paper as shown in Fig. 13.

Fig. 13 Damper

14) Lubrication

When slow down of scanning speed is observed the scanning shaft should be lubricated with sewing machine oil or spindle oil.

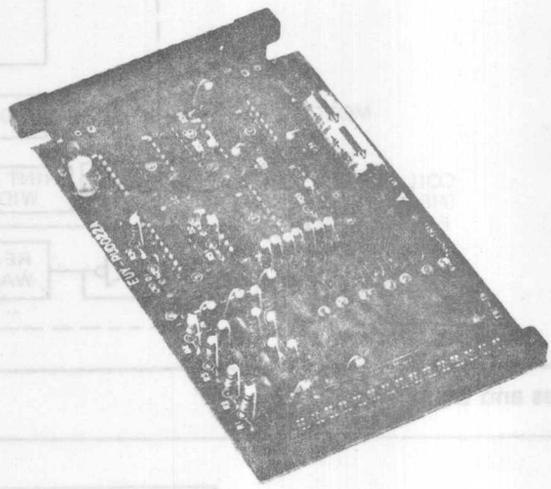
12. Service parts lists

Service parts	Parts number	Structure	pcs in one package
Printing head assembly-A The flat cable is short length.	EUX-EP702AS	Printing head Installing parts Rubber spacer Mini screw Cleaning paper	one
Printing head assembly-C The flat cable is long length.	EUX-EP702CS	Printing head Installing parts Rubber spacer Mini screw Cleaning paper	one
Paper feed roller assembly	EUX-SUB201	Rubber roller & spindle Racket wheel Two bearings Two E-Rings	five
Paper cutter	EUX-SUB202	Paper cutter	five
Pinch roller	EUX-SUB203	conductive rubber roller & spindle One E-Ring	five

Matsushita Electric

Interface Unit for Electrosensitive Printer EUY-PUD022A

The interface unit EUY-PUD022A is designed for use in connection with the electrosensitive printer EUY-10E series, and built in circuits of head driving, motor driving, output of pick up coil, frequency divider and reed switch output. What to be additionally required for printer driving are simply a power source and logic signal device.



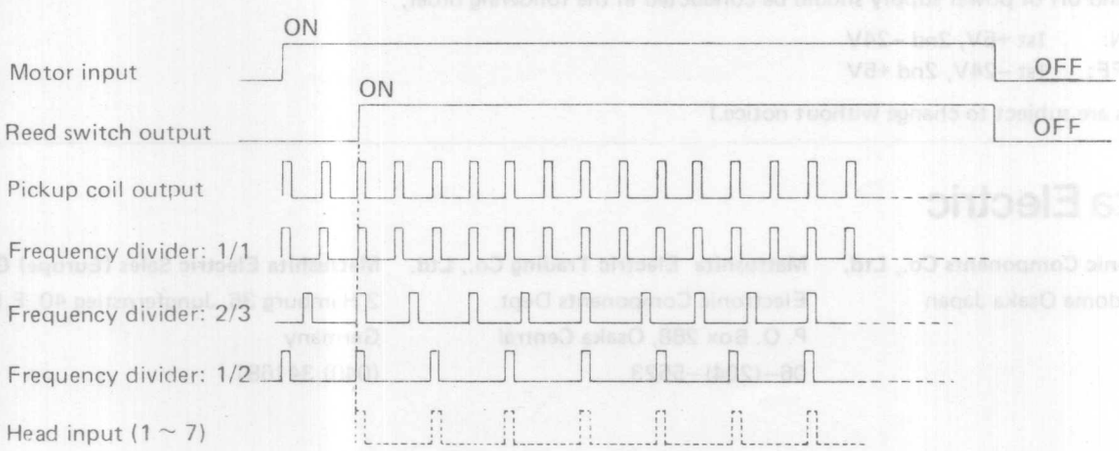
Features

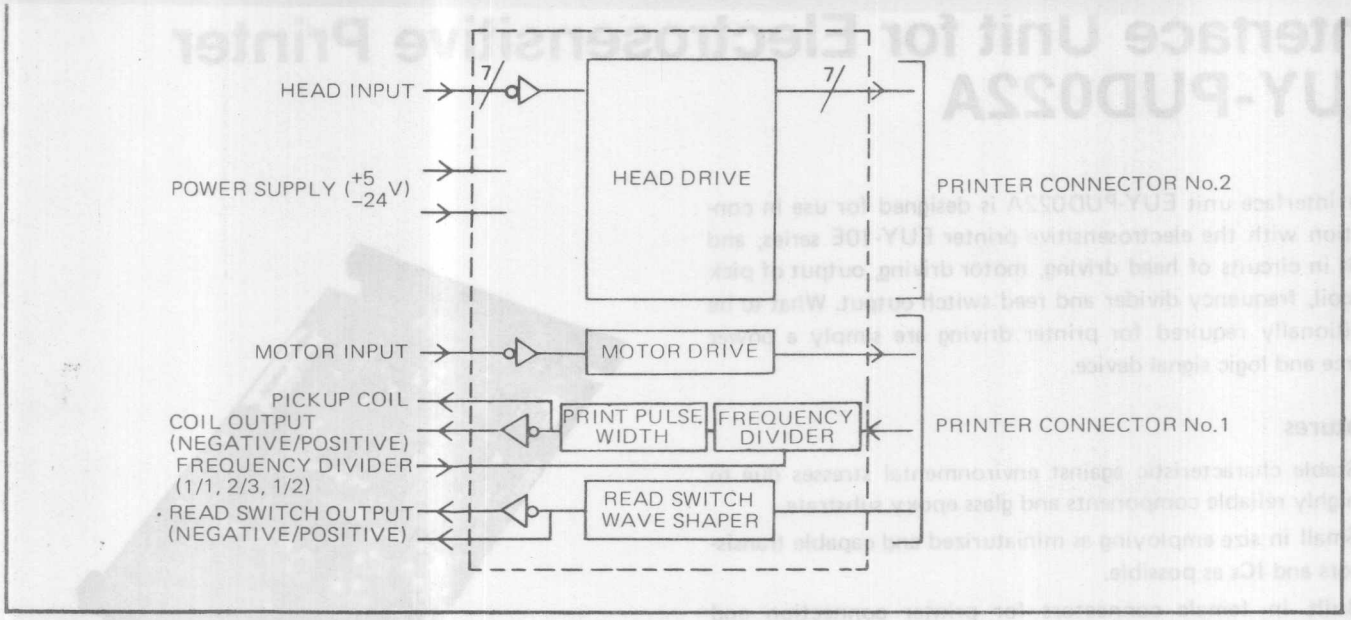
- Stable characteristic against environmental stresses due to highly reliable components and glass epoxy substrate.
- Small in size employing as miniaturized and capable transistors and ICs as possible.
- Built in female connectors for printer connection and outside circuits.
- Applicable for all kinds of EUY-10E series.

Specifications (EUY-PUD 022A)

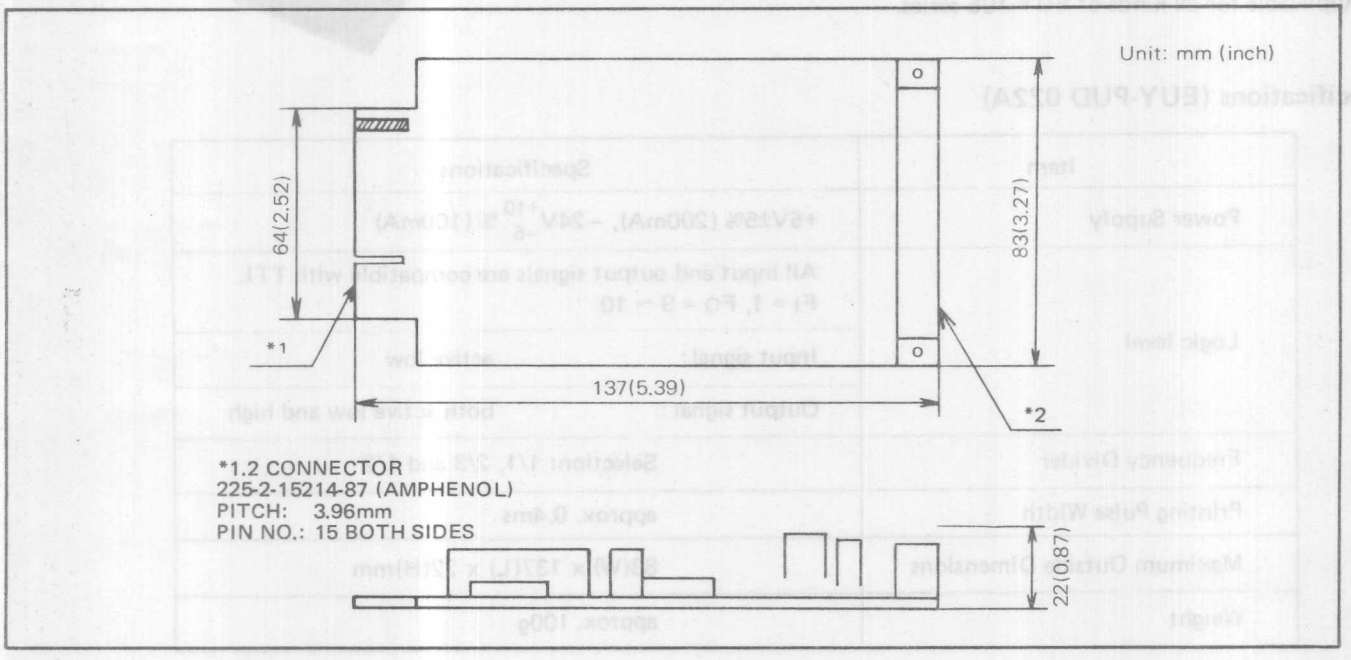
Item	Specifications
Power Supply	+5V±5% (200mA), $-24V^{+10}_{-5}$ % (100mA)
Logic level	All input and output signals are compatible with TTL. FI = 1, FO = 9 ~ 10
	Input signal : active low
	Output signal : both active low and high
Frequency Divider	Selection: 1/1, 2/3 and 1/2
Printing Pulse Width	approx. 0.4ms
Maximum Outside Dimensions	83(W) x 137(L) x 22(H)mm
Weight	approx. 100g

Pulse Synchronism





Shapes and Dimensions



Precaution for Handling

Switching on and off of power supply should be conducted in the following order,

ON: 1st +5V, 2nd −24V
OFF: 1st −24V, 2nd +5V

(Specifications are subject to change without notice.)

Matsushita Electric

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Contents

Electrosensitive Printer EUY-10E Series

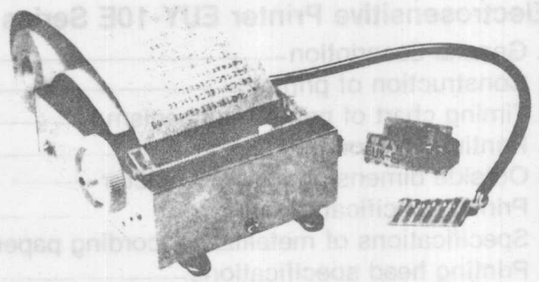
Interface unit EUY-PUD700 Series

Interface unit EUY-PUD022A

Electrosensitive Printers EUY-10E Series

1. General description

This printer was developed for electronic calculators, measuring instruments, cash registers and computer end units, which use alphanumerics and symbols printed on electrosensitive recording paper. All characters are based on the 7-row, 5-column dot matrix structure which is printed by a mechanical horizontally scanning operation of a 7-row by one-column print head, and it is permanent dry printing without the use of inks, ribbons or chemicals.
(Specifications are subject to change without notice for improvements.)



2. Construction of printer

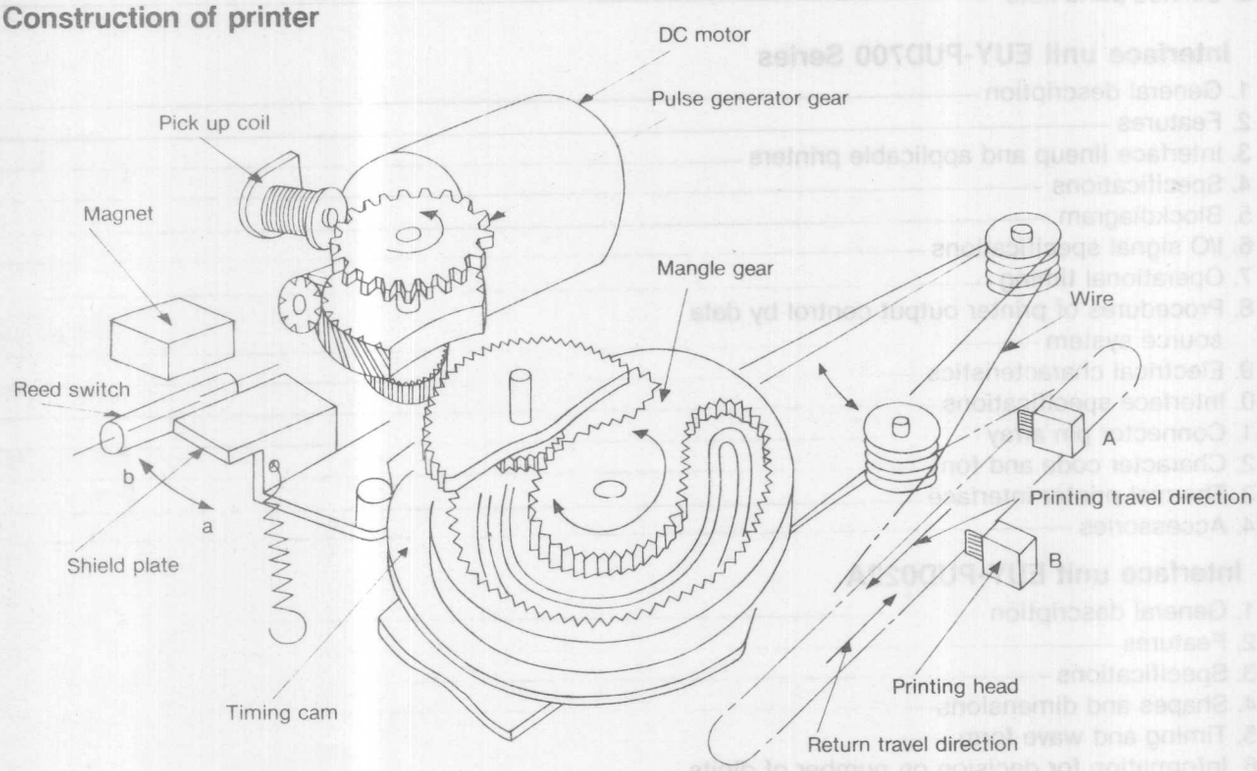


Fig. 1. Construction of printer

The printer has a DC motor inside and its rotation is transmitted to the mangle gear by use of reduction gears. The mangle gear rotates reversely as its own characteristic. The movement of the mangle is transmitted for the head movement (going and returning) by wire. When the motor operates, a pulse generator gear rotates simultaneously and a sinusoidal wave is generated from the pick up coil. When the printing head comes to position A, in the case of the R type printer, the shield plate moves from b to a and the printing command signal is shifted.

While the head moves horizontally, printing is accomplished due to the above-mentioned sinusoidal wave. When the printing finishes and the head comes to position B, the shield plate moves from a to b and motor stops its operation by the reed switch. By this method, variations of motor rotation do not directly effect the printing position.

3. Timing chart of printer mechanism

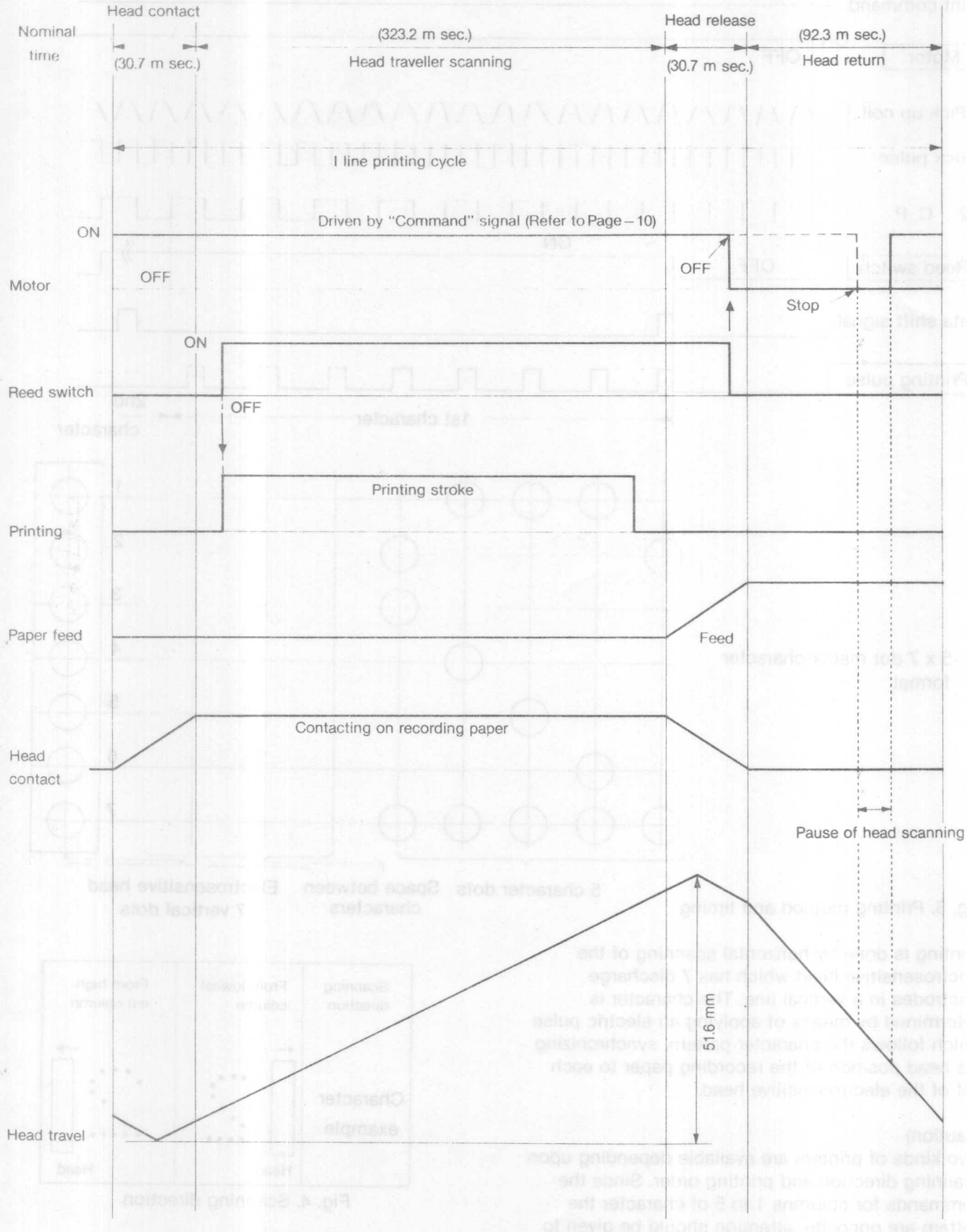


Fig. 2. Timing chart of printer mechanism

4. Printing method and timing

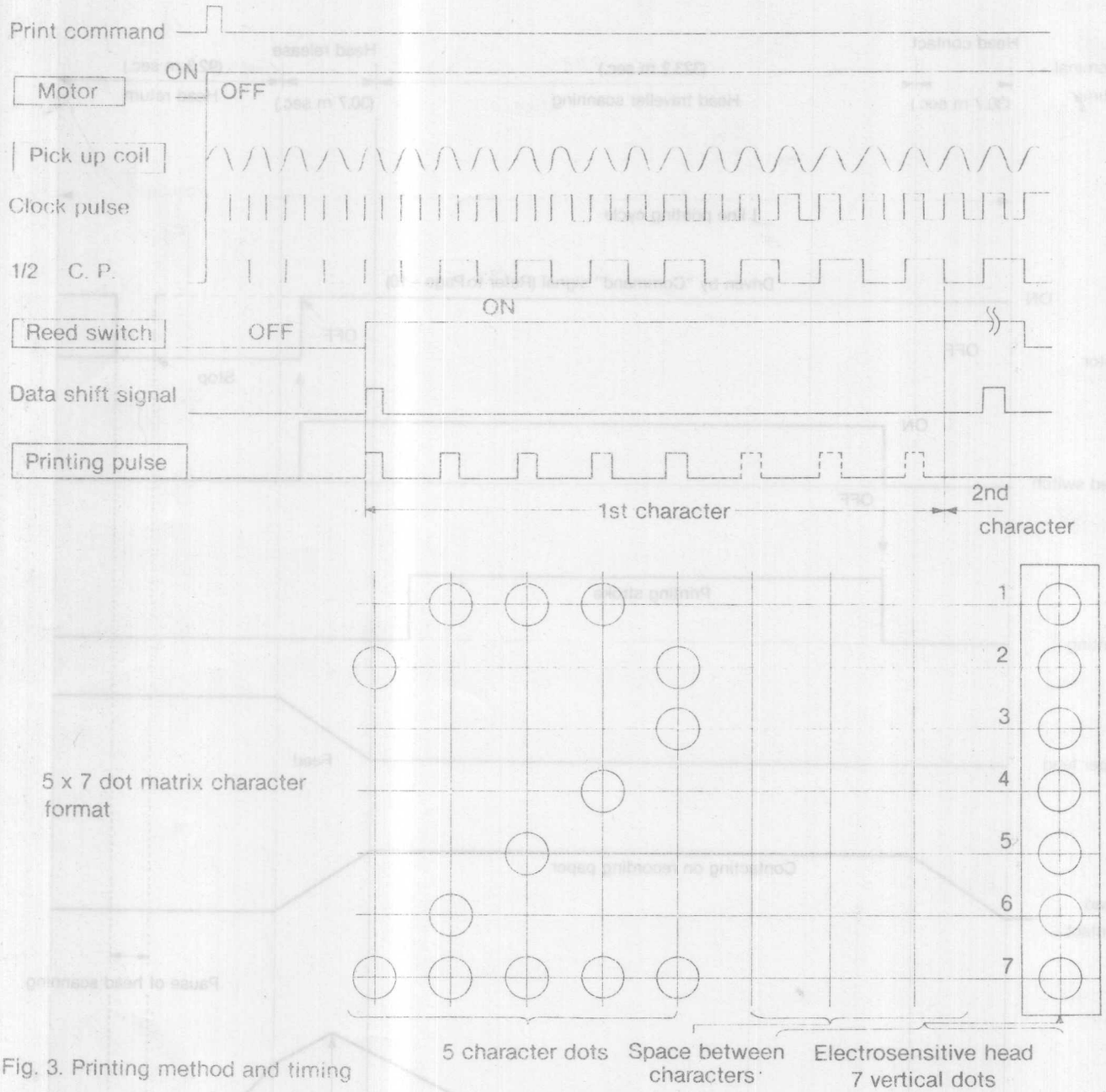


Fig. 3. Printing method and timing

Printing is done by horizontal scanning of the electrosensitive head which has 7 discharge electrodes in a vertical line. The character is determined by means of applying an electric pulse which follows the character pattern, synchronizing the head position of the recording paper to each dot of the electrosensitive head.

(Caution)
Two kinds of printers are available depending upon scanning direction and printing order. Since the commands for columns 1 to 5 of character the pattern are opposite, attention should be given to the output specifications of the buffer memory and the character generator.

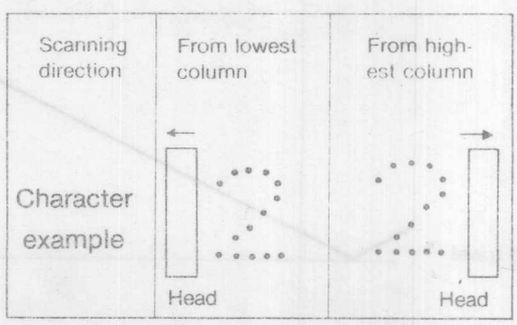


Fig. 4. Scanning direction

5. Printer outside dimensions and connector

Unit: mm (inch)

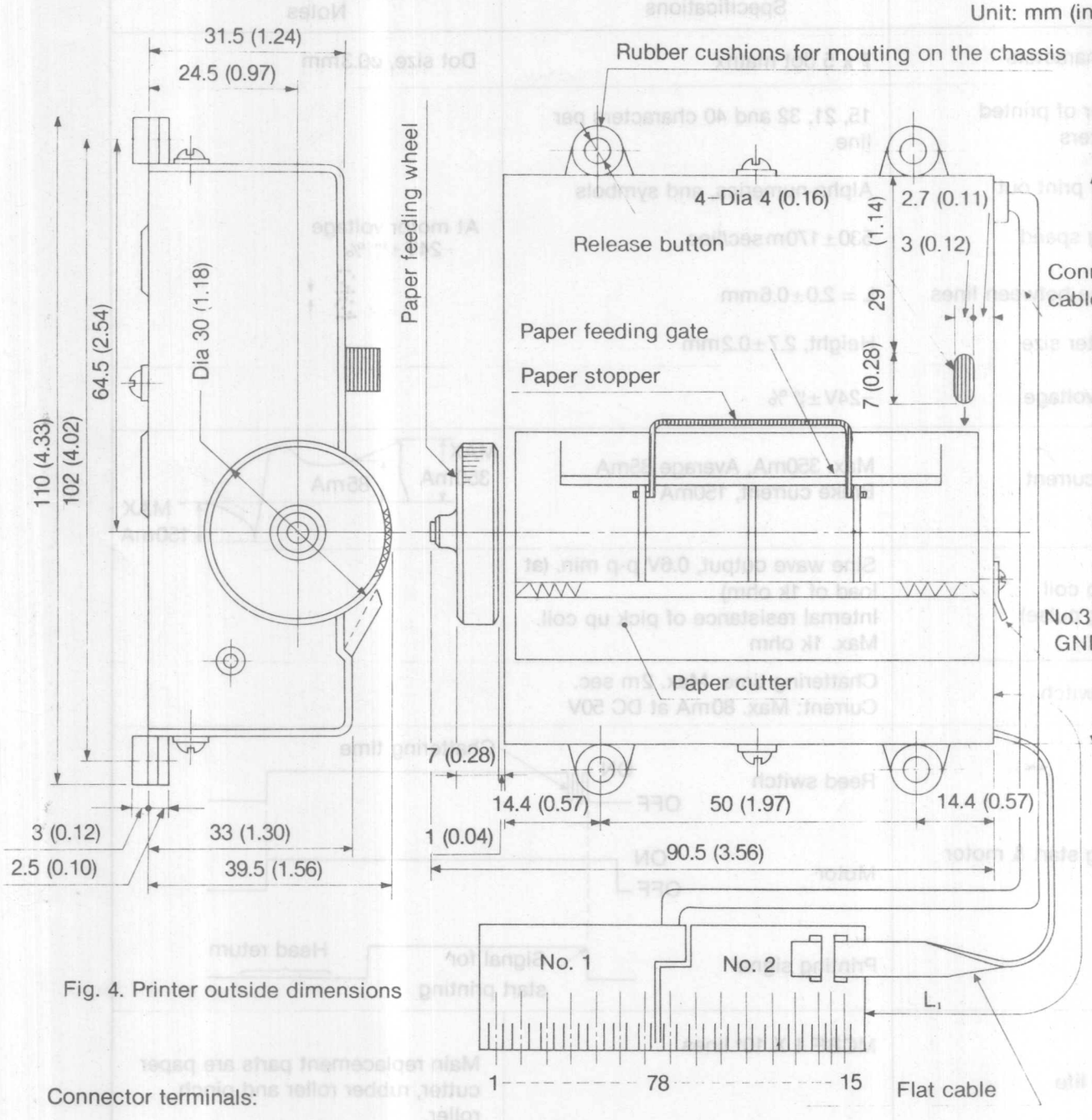
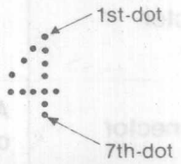


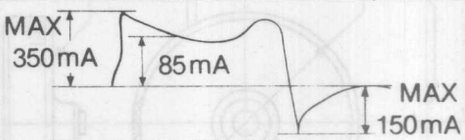
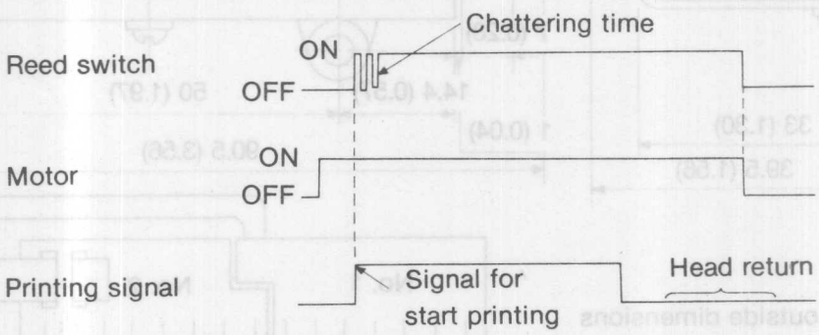
Fig. 4. Printer outside dimensions

Connector terminals:

Terminal No.		Color code	Circuits
No.1	1	White	Reed-switch
	2	Shield cable	Pick up coil
	3	Shield cable, White	Pick up coil, Reed switch
	4	Red	Motor (+)
	5	Black	Motor (–)
	6	Pink	Head common; Roller electrode GND
	7		Blank
No. 2	8		1st-dot (of the head) (–)
	9		2nd "
	10		3rd "
	11		4th "
	12		5th "
	13		6th "
	14		7th "
	15		Blank
No. 3		GND lug	GND



6. Printer specifications

	Specifications	Notes
Print characters	7 x 5 dot matrix	Dot size, ø0.3mm
Number of printed characters	15, 21, 32 and 40 characters per line	At motor voltage −24V ± $^{10}_{5}$ % 
Type of print out	Alpha-numerics, and symbols	
Printing speed	530 ± 170m sec/line	
Distance between lines	L = 2.0 ± 0.6mm	
Character size	Height, 2.7 ± 0.2mm	
Motor voltage	−24V ± $^{10}_{5}$ %	
Motor current	Max. 350mA, Average 85mA Brake current, 150mA	
Pick up coil (Timing pulse)	Sine wave output, 0.6V p-p min. (at load of 1k ohm) Internal resistance of pick up coil. Max. 1k ohm	
Reed switch	Chattering time: Max. 2m sec. Current: Max. 80mA at DC 50V	
Printing start & motor stop		
Printer life	MCBF 1 X 10^6 lines	Main replacement parts are paper cutter, rubber roller and pinch roller.
Weight	Approx. 370g	
Outside dimensions	Width: 90.5mm Height: 42.5mm Depth: 110mm	
Printer connector	Printing circuit board No. 1 (7 contacts): for motor, reed switch, etc. No. 2 (8 contacts): for printing head	
Controller connector	AMPHENOL 143—015—☐ or 225-21521-487	Three kinds of contacts: solder, mother board or wrapping type.

	Specifications	Notes
Operating environment	−5°C∼50°C 40°C, 90%RH	The printer shall be subjected to 3 hours operation under the environment mentioned shown at the left. After the operation, the printer shall indicate no change from the initial requirements at a test in the same environment.
Storage environment	−40°C∼80°C, 72Hr 60°C, 95% 72Hr	The printer shall be subjected to a 72-hour storage under the conditions shown on the left. After 2 hours stabilization in room temperature, the subjected device must satisfy the initial requirements.
Vibration test	Frequency. . . . . 10∼55Hz Vibration width . . . . . 1.5mm Direction. . . . . X, Y, Z (2 hours/direction)	After subjected to the test, the printer shall indicate no change from initial requirements.
Shock test	Half sine wave; *50G, 11m sec. each in the X, Y and Z direction	
Insulation resistance	Min. 10M ohm at 500 VDC	Insulation resistance between connector and body.
Recording paper	Metallized recording paper; 60mm width Silverno 890-2B (HONSHU PAPER CO., LTD.) Bosch RMP 8146 24V (ROBERT BOSCH GMBH) or equivalent.	

* Printers should be free from impact exceeding 50 G.

7. Specifications of metallized recording paper (Bosch. RMP8146 Code-No. 0674,007,001)

	Item	Specifications	Unit	Notes
Quality Specifications	1. Ambient temperature and humidity	−10~+50°C 10~90%RH		
	2. Storage temperature and humidity	−10~+60°C 10~90%RH 3 years		To be put in heat sealed poly envelope.
	3. Preservative character before printing	No extreme change in color and printing quality under preservation at less than 30°C and 60%RH.		To be put in heat sealed poly envelope; Stains on the outer winding are to be accepted.
	4. Preservative character after printed	No extreme change in color and printed quality in storage at less than 30°C, 60%RH.		No aggressive atomospheres.
	5. Safety degree	1. No harmful gas for human health at printing or disposition by burning. 2. No discomfortable smell.		At printing
Dimensions	1. Paper width	59.6±0.4	mm	
	2. Paper length/roll	30±1	m	
	3. Outside diameter of rolled paper	40±3ø	mm	
	4. Diameter of core	Outside: 15ø Inner: 12ø	mm mm	
	5. Material of core	Plastics		
	6. Paper roll width	60±0.8	mm	
	7. Thickness	$40\pm^{5}_{3}$	μm	
Paper Rolling Spec.	1. Rolled paper surface	Printing surface to be outside of roll.		
	2. Paper joint	Nothing		
	3. End mark	Nothing		

8. Printing head specifications

Electrosensitive head Model EUX-EP702AS/EP702CS

	Specifications	Notes
Printing electrodes	7 dots x 1 column Size: 2.69mm	See Fig. 5.
	Dot size: ø0.3mm	
Input power rating	Energy: 0.5mJ/dot	See Fig. 6.
	Voltage: −24V $\pm^{10}_{5}$%	
	Current: 1.5A/dot (Peak)	Transistor capacity
	Pulse width 0.24—0.48m sec.	
Life expectancy	30 x 10^6 characters	Recording paper: HONSHU SILVERNO 890−2B Voltage: −24V (Printing electrodes are required to be polishing and brushing.)
Environment	Temperature: −5°C to 50°C	
	Humidity: 90% RH	

Fig. 5 Printing electrodes

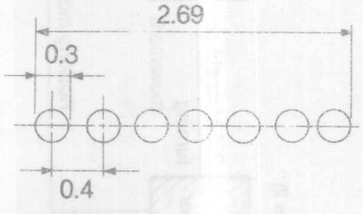
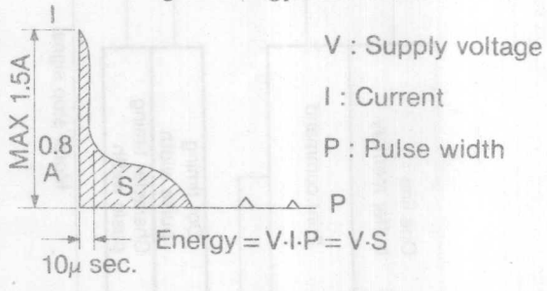


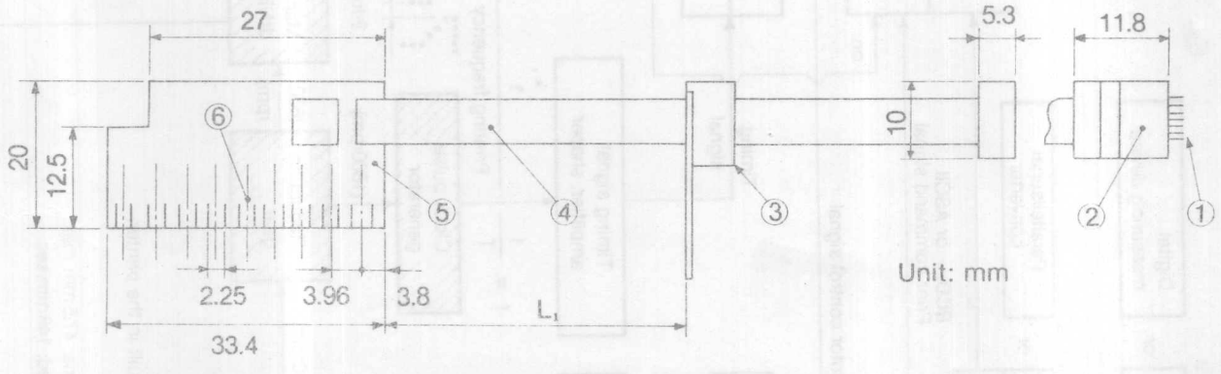
Fig. 6 Energy caluculation



V : Supply voltage

I : Current

P : Pulse width



Unit: mm

1 Printing electrodes
2 Electrode holder
3 Cable holder
4 Flat cable
5 Connector board
6 Connector contacts

Fig. 7. Printing head

9. Blockdiagram for the printer operation