specifications for
micro dot printer
Model-150II

October 11, 1984

Rev. 2

EPSON
EPSON CORPORATION

SPECIFICATIONS

M-150 II

REV.

DATE

PAGE

Summary

   Model–150II is the mechanical dot printer, whose Print Head consists of 4 Print Solenoids laying horizontally and moves for 24 dots horizontally. Print Head which moves horizontally prints unidirectionally as each Print Solenoid of it is energized in order. When Print Head return, paper is fed for 1 pitch automatically. By repetition of this dot line printing and paper feed desired Print Format can be obtained.

It is characterized by the following features :

   1. Clear dot printing

   2. Small-size, Light weight (60g) and Super thin thickness

      (12.8mm)

   3. 44.5mm width normal paper

   4. Ni-Cd Battery Drive

   5. Low price

EPSON
EPSON CORPORATION

SPECIFICATIONS

M-150 II

REV

DATE

PAGE

Contents

EPSON
EPSON CORPORATION

SPECIFICATIONS
M·150II

REV. 1

DATE 9-10-1983

PAGE 1

1. General Specifications

1.1 Printing Method: Impact Dot Matrix Printer

1.2 Print Format

  1) Number of Total Dot: Max. 96 dots/1 dot line

  2) Number of Column: Max. 16 Columns (In case of 5×7 dot matrix and 1 dot column space)

1.3 Print Speed

  1) 1 Dot Line: Approx. 100 ms (continous printing, 4.5VDC, 25°C)

  2) 5×7 dot Matrix: (3 dots line space)   Approx. 1 ℓ/s (continuous printing, 4.5VDC, 25°C)

1.4 Character Size

  1) Dot Space: Horizontal   0.35 mm
                            Vertical   0.35 mm

  2) 5×7 Dot Matrix: 1.8 (W) × 2.5 (H)mm

1.5 Paper: 44.5 mm width   woodfree paper

1.6 Paper Feed: Paper is fed automatically per dot line. With paper free mechanism

1.7 Inking: Ribbon Cassette
Ribbon is fed automatically during Motor revolution.

1.8 Motor

  1) Terminal Voltage: $4.5\pm^{0.5}_{0.7}$VDC

  2) Mean Current: Approx. 0.17 A (4.5VDC, 25°C)

1.9 Timing Detector: Tachometer-Generator (directly connected with motor)

1.10 Reset Detector: Reed-Switch

1.11 Print Solenoid   4 columns/sol. × 4 pcs of Solenoids

  1) Terminal Voltage : $4.5\pm^{0.5}_{1.2}$ VDC

Note : Print Solenoid terminal voltage and Motor terminal voltage should satisfy the voltage relationship which is shown in item 2.8.1).

  2) Ohmic Resistance : $1.5\Omega \pm 0.15\ \Omega$ (at 25°C)

EPSON
EPSON CORPORATION

SPECIFICATIONS

M-150II

REV.

DATE

PAGE 2

1. 12 Connection

   1) Printer side: P. C. Board with 2. 54mm pitch cupper leaf patern that is fixed on printer frame.

   2) Circuit side :   Cable wires or Lead wires

1. 13 Ambient Temperature Operating: $0°C$ to $50°C$

1. 14 Reliability: MCBF 5×10^5 lines

1. 15 Dimensions: 73.2 (W) $\times 42.6$ (D) $\times 12.8$ (H)mm

1. 16 Weight: Approx. 60.g

EPSON

EPSON CORPORATION

SPECIFICATIONS

M-150 II

REV.

DATE

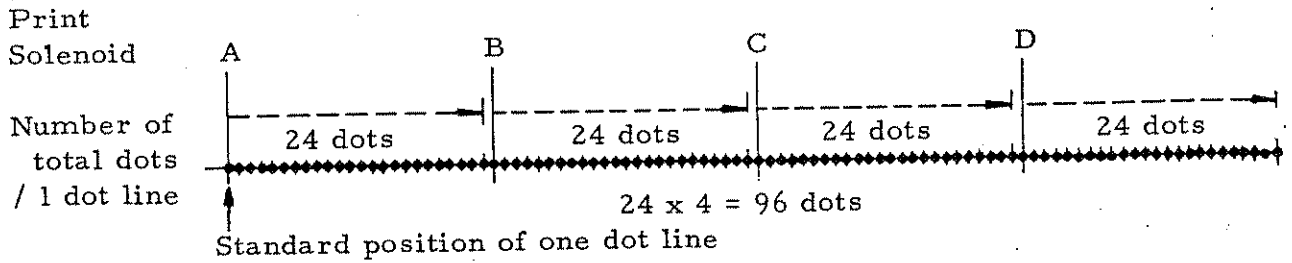PAGE   3

2.   Detail Specifications
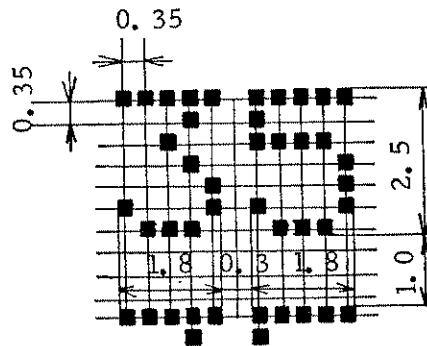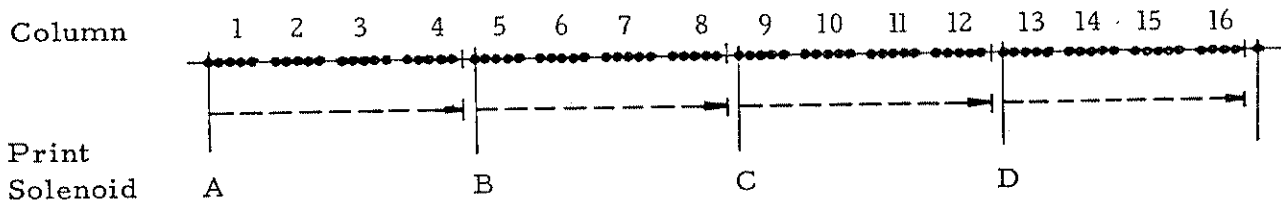
2.1   Print Format

Print Head consists of 4 Print Solenoids (A. B. C. D) which are laid horizontally. Print Head moves to right direction from left side on stand-by condition. Moving amount of Print Head is 24 dots per Print Solenoid. One dot line is formed by energizing Print Solenoid one by one as Print Head is moving. Number of total dots per dot line is 96 dots (24 dots × 4 Print Solenoids)

Print
Solenoid

Number of
total dots
/ 1 dot line

A	B	C	D
24 dots	24 dots	24 dots	24 dots

24 x 4 = 96 dots

Standard position of one dot line

1) 5x7 Dot Matrix

Divide 24 dots which one Print Solenoid is printable into four equal parts. And 6 dots in one part are used as one column ; That is 5 dots for printing and one dot for column space. Accordingly one dot line is formed of 96 dots which are divided into 16 parts and 5x7 dot matrix character can be got by repeating 7 times in the direction of paper feed. Number of columns is 16.

$$(5+1) \times 16 = 96 \text{ dots} / 1 \text{ dot line}$$

Column   1 2 3 4   5 6 7 8   9 10 11 12   13 14 15 16

Print
Solenoid   A   B   C   D

0. 35

0.35

2.5

1.8   0.3   1.8

1.0

Line space 3 dots

Column space 1 dot

EPSON
EPSON CORPORATION

SPECIFICATIONS
Model-150II

REV.

DATE

PAGE 4

2.2 Paper Feed

1) One dot line Feed : Paper is fed automatically for 0.35mm (one pitch) when Print Head is returned to left from right side.

2) Space Feed : Line space feed is done by feeding one dot line continuously.

3) Paper Free Mechanism : Paper can be pulled out forward when the printer is in the halted state.

4) Manual Paper Feed Knob : Option

2.3 Ribbon Cassette

1) Color : Purple or Black

2) Dimensions : Approx. 74 mm(W)x25mm(D)x7mm(H)

3) Life : Purple Approx. 1×10^4 lines
(4.5VDC 25°C continuous printing)
Black Approx. 7×10^3 lines
(4.5VDC 25°C continuous printing)
(Life test is done with print mode in Attached Table 1.)

4) Parts number : EPSON ERC-05

2.4 Paper

1) Kind : Woodfree paper

2) Width : 44.5 ± 0.5mm

3) Diameter : Max. ϕ 50mm

4) Thickness : Approx. 0.07mm

5) Basis weight : 52.3g/m^2 (14lb/500 sheet/17″x 22″)

EPSON
EPSON CORPORATION

SPECIFICATIONS

M-150 II

REV.

DATE

PAGE   5

2. 5 Timing Detector

Timing Detector is tachometer-generator that is directly connected with motor. Detector generates 168 out-put signals per dot line ; 96 out-put signals correspond to dot position of Print Head and 72 out-put signals correspond to Print Head return. These out-put signals are arranged in a pulse wave form on the customer side, and are used as Timing Pulse.

1) Timing Pulse :

Timing Pulses should be obtained for threshold level to be 0 ± 1 V of Timing Detector out-put signal.

2) Out-put Wave Form

Timing Detector out-put signal
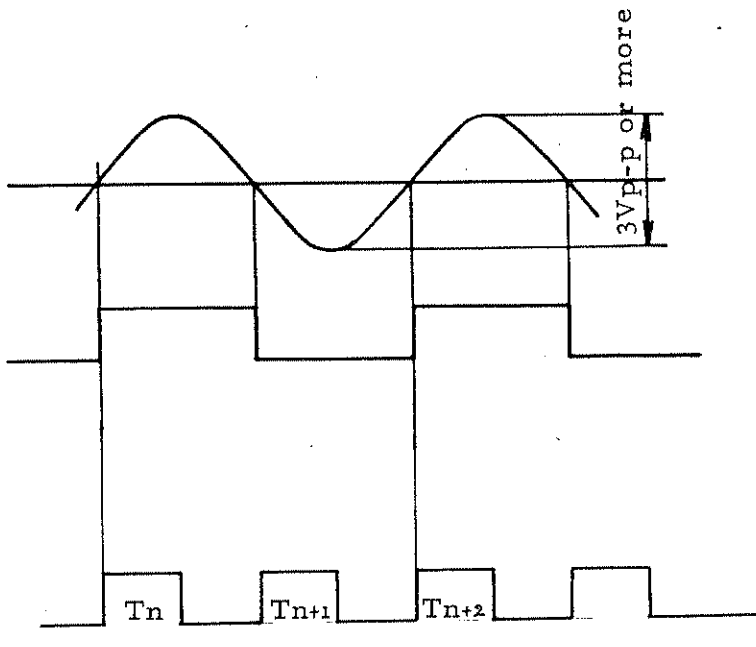
3Vp-p or more

Timing Pulse

Tn   Tn+1   Tn+2

☐ denotes the signal to be generated by the customer side.

〈Wave shaping circuit〉
(Reference)

(+)

Timing Detector

One Shot

↓

Timing Pulse

(-)

EPSON
EPSON CORPORATION

SPECIFICATIONS

M-150 II

REV. 2
DATE- 1984.10.11
PAGE 6

2.6 Reset Detector

Reset Detector has Lead-Switch that makes at each time of dot lines. Reset Detector out-put signal is used as Reset Signal which denotes standard position of dot position at each time of print cycles.

1) Rating :

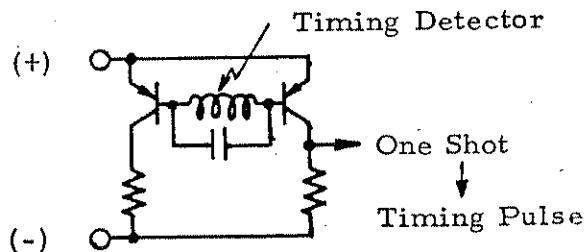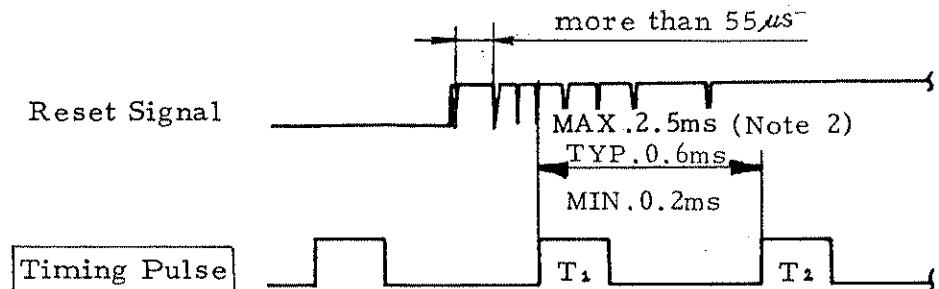|	
Voltage	2.85VDC - 20VDC
Current	20μA - 1mA
Instantaneous power	5mW or less (Resistance load)

2) Pulse Wave Form, Phase

Reset Signal

more than 55μs

MAX.2.5ms (Note 2)
TYP.0.6ms
MIN.0.2ms

Timing Pulse   T₁   T₂

Note 1.   [▭] denotes the signal to be generated by the customer side.

2.   During motor steady driving (except for period from motor starting to generation of Reset signal R₁)

2.7 Motor

1) Driving and Stopping

The motor is in the halted state when the printer is in the stand-by state (i. e., non-printing condition). Application of electric brake to quikly stop the motor must be performed by interrupting Motor Drive Signal within 0.5ms after the leading edge of Reset Signal Rn (Rn is R₁₀ in case of 5x7 dot matrix and 3 dots line space.), and applying the Motor Stop Signal more than 100ms, and short-circuiting across the Motor terminals with a transistor.

∠Circuit Example>

(+)

Motor Drive Signal

Motor Stop Signal

(-)

Circuit side   Printer side
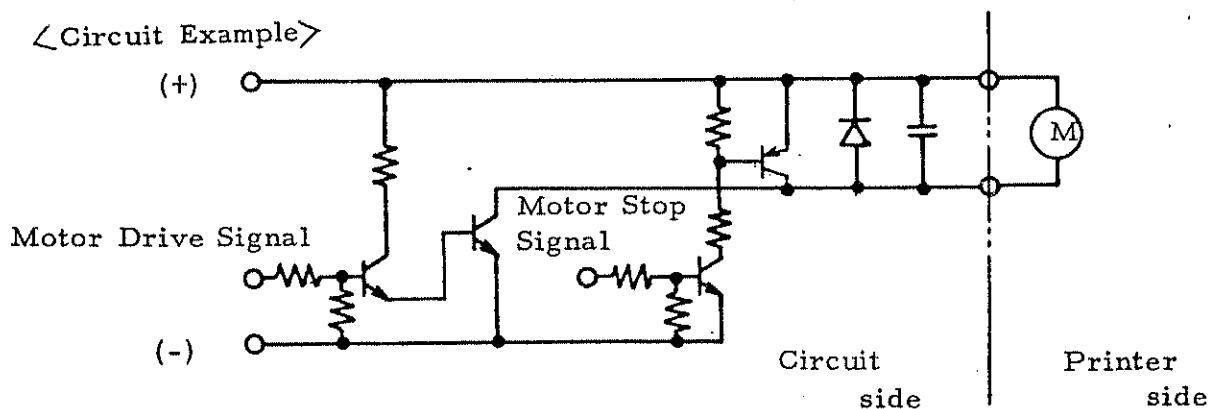
2) Stopping at abnormality
Motor driving signal is cut off before the interval of timing pulse (Tn~Tn+₁) is performed more than 1 second.

EPSON
EPSON CORPORATION

SPECIFICATIONS

M- 150II

REV.

DATE

PAGE   7

3) Terminal Voltage :   4. 5 $\pm^{0.5}_{0.7}$ VDC

4) Current
   a) Peak Current :   Approx. 0. 8A (4. 5VDC, 25°C)
                                (Worst case 1.2 A or less)

   b) Mean Current :   Approx. 0.17 A (4. 5VDC, 25°C)
   c) Current wave form
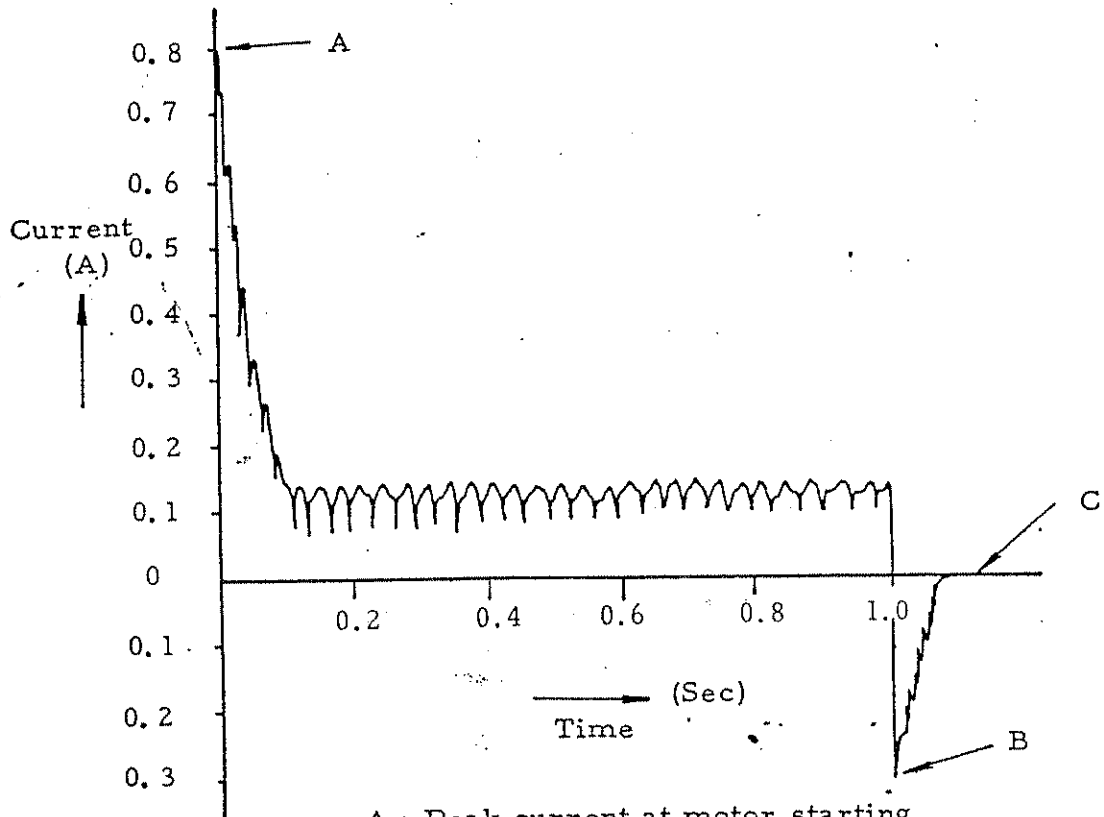
A : Peak current at motor starting
B : Current at motor stopped
C : Halted state

EPSON
EPSON CORPORATION

SPECIFICATIONS
M- 150II

REV. 2
DATE 1984.10.11
PAGE   8

2.8 Print Solenoid

Dot Print is done by energizing Print Solenoid.

1) Terminal Voltage : $4.5 \pm^{0.5}_{1.2}$ VDC

Print Solenoid terminal voltage and Motor terminal voltage should satisfy the voltage relationship of the extent of an oblique line in the following figure.

Print Solenoid terminal voltage(V)

5.0
4.3
3.8
3.3

3.8   5.0

Motor terminal voltage(V)
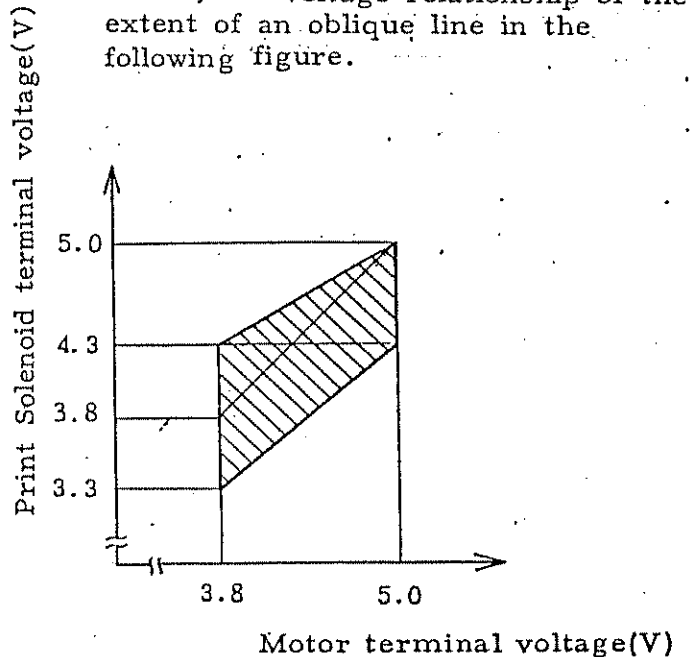
2) Ohmic Resistance : $1.5\Omega \pm 0.15\Omega$ (at 25°C)

3) Current : 3 A/Print Solenoid (Peak current)

4) Pulse Width : From the leading edge of Timing signal T_n to the leading edge of Timing signal T_{n+1} (See following figure)

5.) Watt consumption : 3mj/dot

6) Energizing Duty : 1/4

7) Continous Energizing : One Print Solenoid can be energized continuously by 400 dot lines (24 x 400 = 9600 dots). But it is necessary to take non-printing time longer than continuous energizing time.

8) Spark Killer: Prepared by the customer side refer the circuit and case design recommendations.

9) Protection of solenoid
at abnormality : Energizing pulse to solenoid should be cut off less than 1 sec.

EPSON

EPSON CORPORATION

SPECIFICATIONS

M- 150II

REV. 2

DATE 1984.10.11

PAGE 9

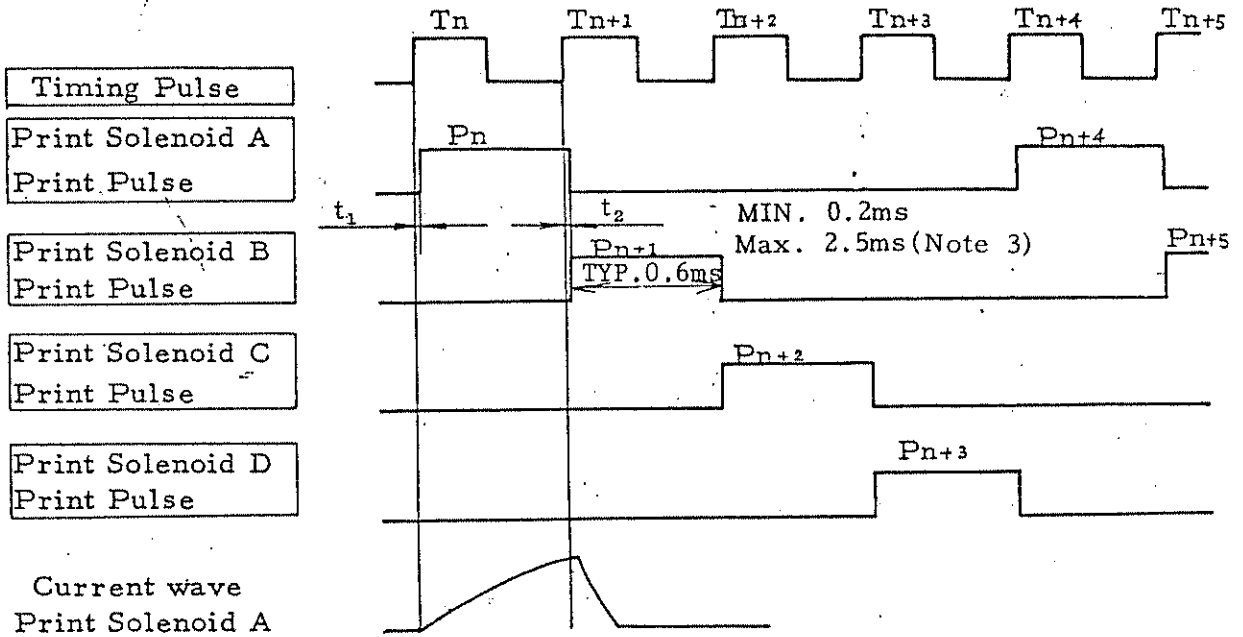Timing Pulse

Print Solenoid A
Print Pulse

Print Solenoid B
Print Pulse

Print Solenoid C
Print Pulse

Print Solenoid D
Print Pulse

Current wave
Print Solenoid A

T_n T_{n+1} T_{n+2} T_{n+3} T_{n+4} T_{n+5}

P_n P_{n+4}

t_1 t_2 MIN. 0.2ms
Max. 2.5ms (Note 3)

P_{n+1} P_{n+5}

TYP. 0.6ms

P_{n+2}

P_{n+3}

☐ denotes the signal to be generated by the customer side.

Note; 1. $t_1 = t_2 \leqq 50 \mu$ s

2. In case of printing 5x7 matrix character, Print Solenoid A is energized with Print Pulse Pn which has Pulse width of Timing signal Tn to Tn+1, and nest Print Solenoid B is energized with Print Pulse Pn+1 which has Pulse width of Timing signal Tn+1 to Tn+2. In the same way Print Solenoid C is energized with Print Pulse Pn+2, Print Solenoid D is energized with Print Pulse Pn+3, and the Print Solenoid A is energized with Print Pulse Pn+4 again. As upper mentioned four Print Solenoids should be energized according to the order of Print Solenoid A, B, C, D.

3. Max 2.5ms : During motor steady driving (except for period from motor starting to generation of Reset signal R₁)

EPSON
EPSON CORPORATION

SPECIFICATIONS

M-150 II

REV.

DATE

PAGE 10

2.9 Terminal Assignment

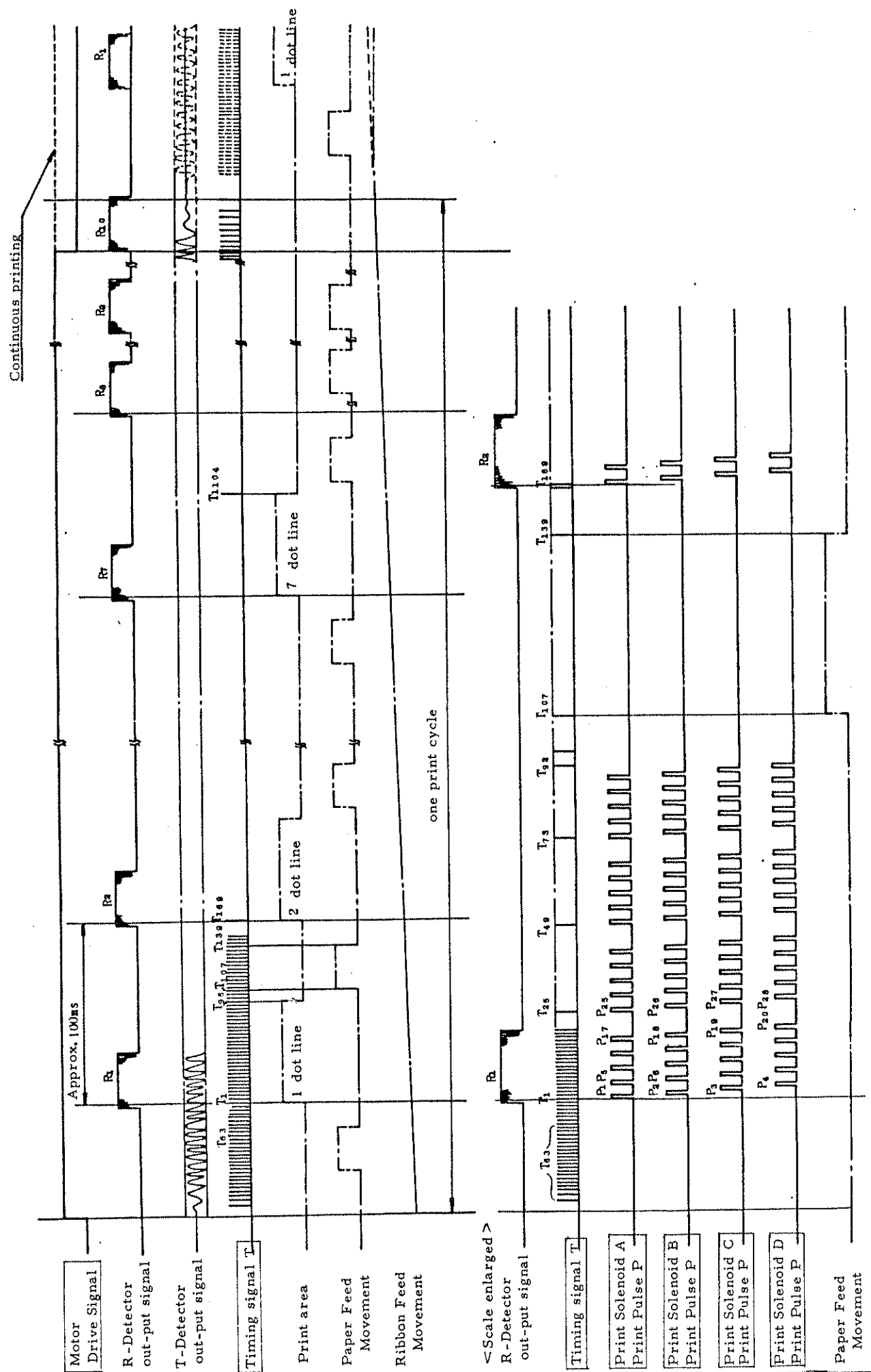| Connection	Terminal No.
Reset Detector	1
//	2
Motor (-)	3
// (+)	4
Print Solenoid common	5
Print Solenoid (D)	6
// (C)	7
// (B)	8
// (A)	9
Timing Detector	10
//	11
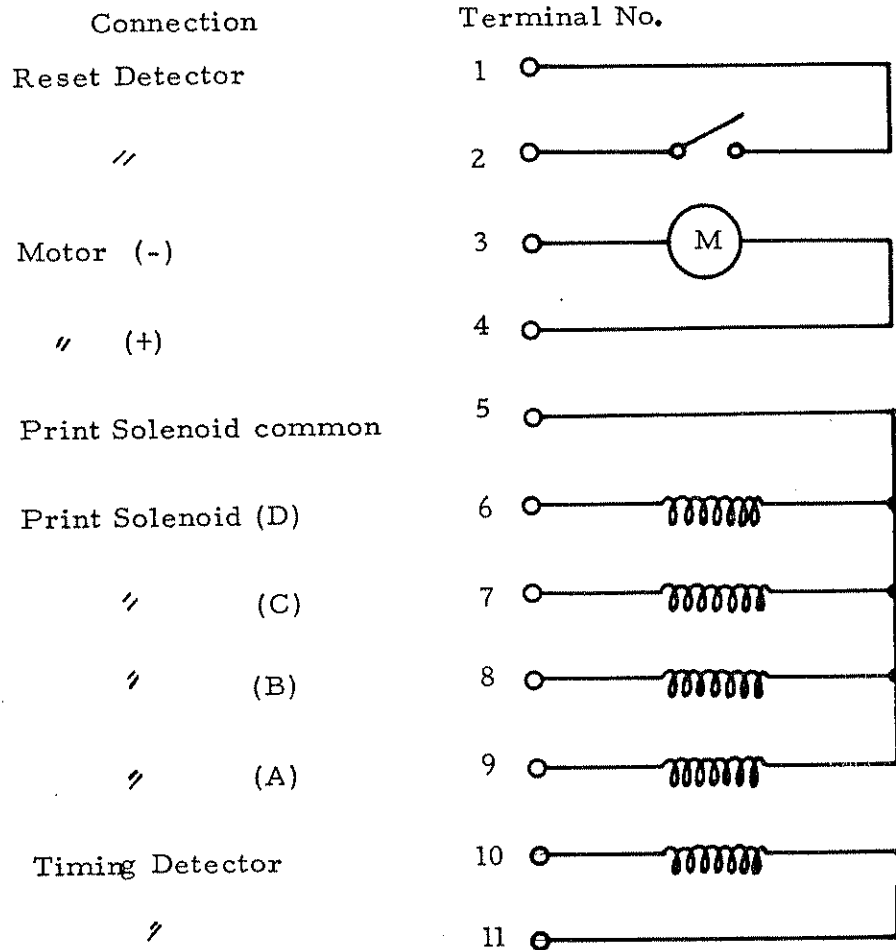
Note ; Terminal numbers are 1, 2,..... 11 from left side of cupper leaf patern on P. C. Board.   (See 2. 11 Overall Dimensions)

2. 10 Time Chart

1) Time Chart Diagram (5x7 Dot Matrix, 3 dots line space)

Continuous printing

Approx. 100ms

Motor Drive Signal

R-Detector out-put signal

T-Detector out-put signal

Timing signal T

Print area

Paper Feed Movement

Ribbon Feed Movement

1 dot line　　2 dot line　　7 dot line　　11 dot line

one print cycle

<Scale enlarged>

R-Detector out-put signal

Timing signal T

Print Solenoid A / Print Pulse P

Print Solenoid B / Print Pulse P

Print Solenoid C / Print Pulse P

Print Solenoid D / Print Pulse P

Paper Feed Movement

Note : ☐ denotes the signal to be generated by the customer side.

EPSON
EPSON CORPORATION

SPECIFICATIONS
M- 150 II

REV.

DATE

PAGE 12

2) Detail Timing Pulse distribution (5x7 Dot Matrix, 3 dots line space)

$Pn = Tn \sim Tn+1$ (Pn ; Print Pulse, Tn ; Timing Pulse)

EPSON
EPSON CORPORATION

SPECIFICATIONS

M-150 II

REV.

DATE

PAGE 13
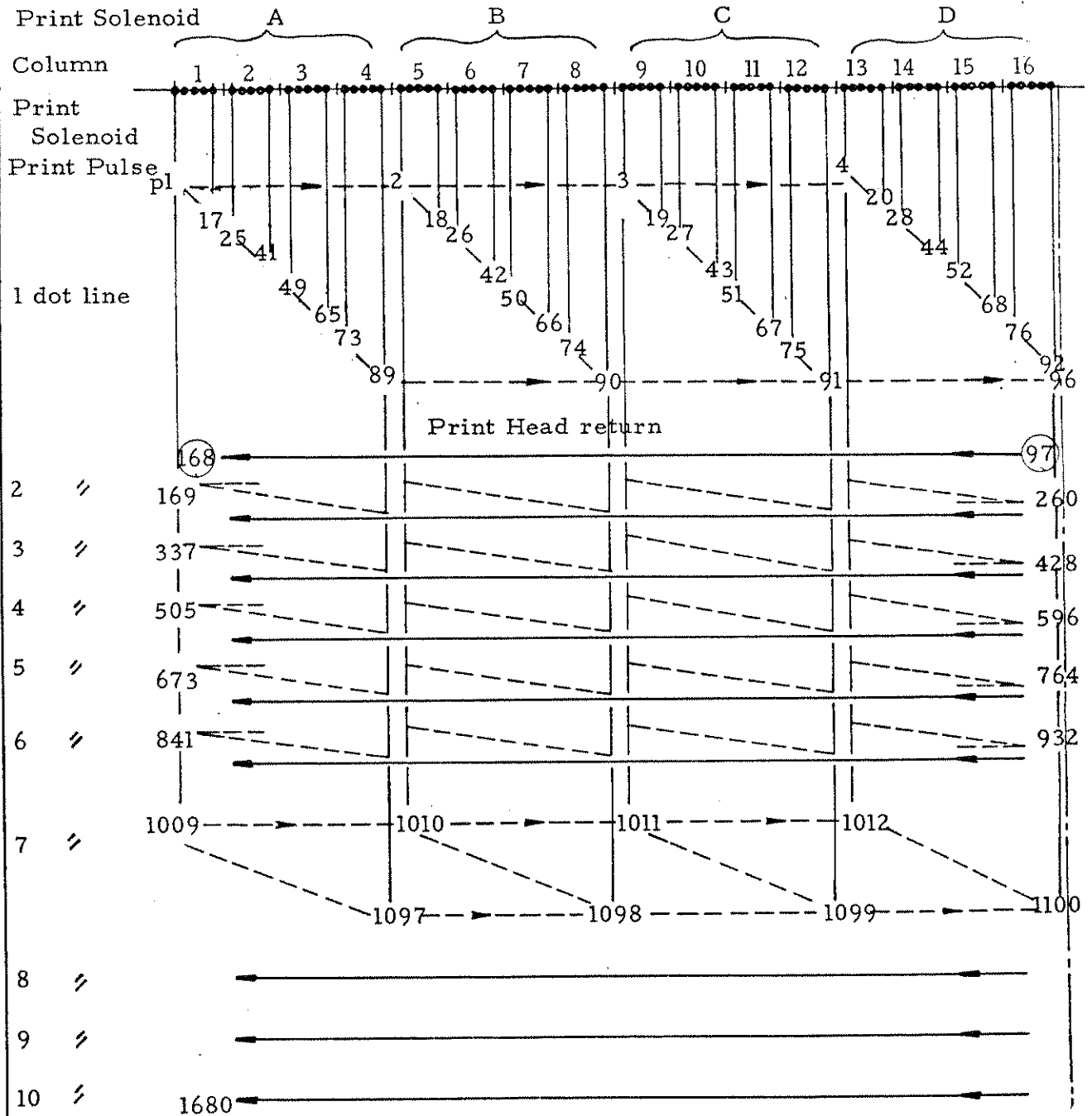
Print Solenoid A is energized with Print Pulse P_1 of Timing Pulse T_1 to T_2 , and the left-upper-most dot of first column character is printed. Next Print Solenoid B is energized with Print Pulse P_2 of Timing Pulse T_2 to T_3 , and the left-upper-most dot line of 5 th column characters is printed. Upper-mentioned control is done in order, and Print Solenoid D is energized with Print Pulse P_{92} of Timing Pulse T_{92} to T_{93} , and the right-upper-most dot of 16th column characters is printed.

Column space of 4 th, 8th, 12th and 16th column are kept one dot, and Print Head is returned to home position between Timing signal T_{96} and T_{168} . And paper is fed automatically one dot. Upper-mentioned movement is done continuously through 7 dot lines, and Print Solenoid D is energized with Print Pulse P_{1100} of Timing Pulse T_{1100} to T_{1101} , and the right-down-most dot of 16th column characters is printed. And printing of 5x7 dot matrix character has completed. Next, to keep 3 dots line space, paper is fed in 3 dots line ; that is 8, 9 and 10 dot line, and one print cycle has completed at Timing signal T_{1680}.

3) Discrimination of R_1 and R signal

After the motor is started by applying Motor Drive Signal, Timing Signal should be counted. The Reset Signal after 63 times of Timing Signal counting should be set as R_1 signal. After R_1 signal is set, the Reset Signal from R_2 to R_n is set as same as R_1 signal is set. Initial Setting to confirm that Print Head is set at the stand-by state is completed by detecting R_1 signal. Timing signal T_1 that shows standard dot position of each one print cycle is determined by detecting R_1 signal.

4) Continuous printing or continuous Paper feed

It is performed by applying Motor Drive Signal continuously without interrupting Motor Drive Signal.
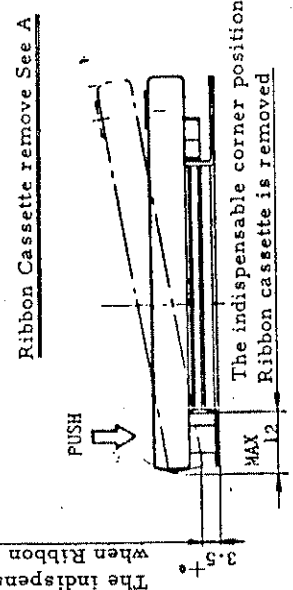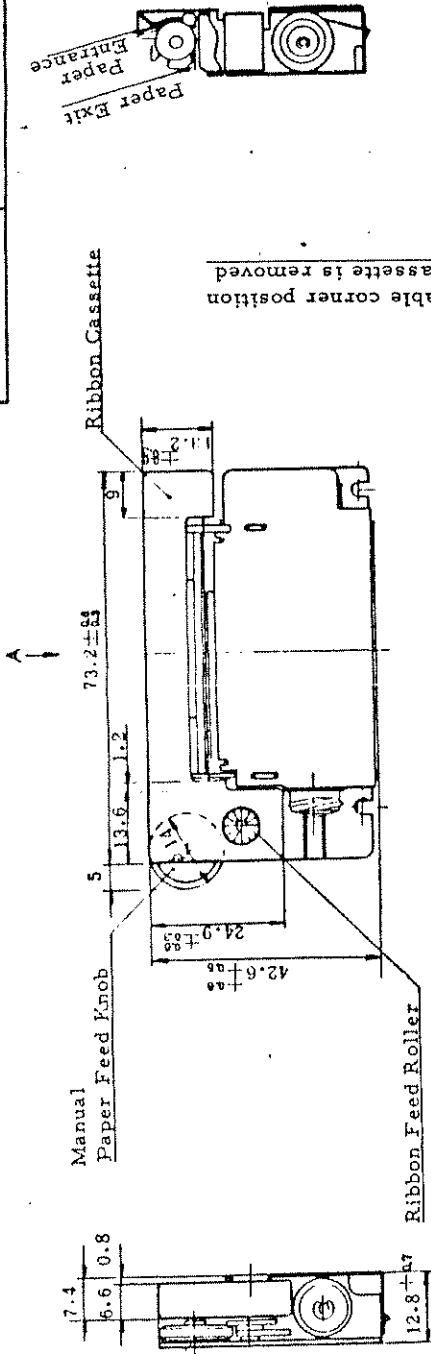
5) Reset Signal

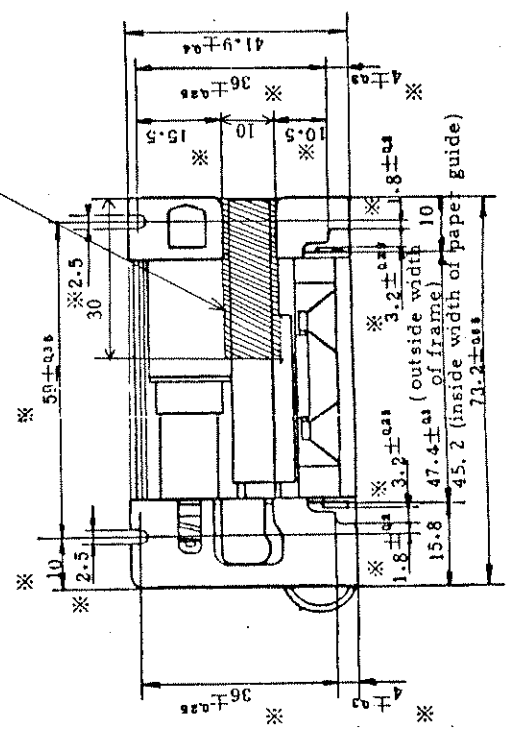Reset Signal does not sometimes make at stand-by state.

Note ;
1. More than 63 Timing Pulses are generated between Motor starting and generation of R_1 signal.
2. Term of energizing Print Solenoid prohibitted
    1) From Motor starting to the leading edge of R_1 signal (from Motor starting to regular revolution)
    2) From Timing Signal $T_{97+168n}$ to $T_{168+168n}$ (Term of Print Head Return ; n is from 0 to 10)
    3) Print Solenoid Print Pulse should not be energized and interrupted with electric noise.
    4) After the Reset Signal R_1 is confirmed per each one print cycle, count of Timing Signal should be cleared per each one print cycle.

2. 11 Overall Dimensions

Ribbon Cassette

Ribbon Cassette remove See A

The indispensable corner position when Ribbon cassette is removed

PUSH

MAX 12

The indispensable corner position when Ribbon cassette is removed

Manual
Paper Feed Knob

Paper Feed Roller

Ribbon Feed Roller

Paper Entrance
Paper Exit

B zone

1.6 (Pattern width)
2.54 (Pitch)
25.4
23.1

Center of rear setting hole

41.9
36
15.5
10
10.5

50
30
2.5

47.4 (outside width of frame)
45.2 (inside width of paper guide)
71.2
36
15.8

Paper guide

line space 3 dots
10. 6 (Character position)

Paper Exit

Paper Entrance

10.6

Note :

1. Mark ※ denotes the dimensions of setting hole.

2. Set the center of paper holder to that of printer frame.

3. In order to prevent paper feeding trouble, the inside dimension of paper holder should not be over the "paper width plus 2. 0mm" and the paper holder should not press the both dege of paper.

4. Roll-in protection device and paper cutter are designed on calculator case side.

5. The calculator case should be set lest any projection of said case come into B zone (30 x 10 x2).

EPSON
EPSON CORPORATION

SPECIFICATIONS

M-150II

REV.

DATE

PAGE 15

Attached Table 1   Print Mode

```
0123456789:;<=>?
123456789:;<=>?@
23456789:;<=>?@A
3456789:;<=>?@AB
456789:;<=>?@ABC
56789:;<=>?@ABCD
6789:;<=>?@ABCDE
789:;<=>?@ABCDEF
89:;<=>?@ABCDEFG
9:;<=>?@ABCDEFGH
:;<=>?@ABCDEFGHI
;<=>?@ABCDEFGHIJ
<=>?@ABCDEFGHIJK
=>?@ABCDEFGHIJKL
>?@ABCDEFGHIJKLM
?@ABCDEFGHIJKLMN
@ABCDEFGHIJKLMNO
ABCDEFGHIJKLMNOP
BCDEFGHIJKLMNOPQ
CDEFGHIJKLMNOPQR
DEFGHIJKLMNOPQRS
EFGHIJKLMNOPQRST
FGHIJKLMNOPQRSTU
```

EPSON
EPSON CORPORATION

SPECIFICATIONS

REV.

DATE

PAGE

M-150II   SPEC. REVISION

REV. NO.	PAGE	DESCRIPTION	DATE
1	1	1.3 Print Speed "Print condition" is added. 1.5 Paper Paper width is "44,5mm", was "45mm". 1.11 Print Solenoid "Terminal voltage " is changed.	September 10, 1983
	4	2.3 Ribbon cassette "Life " is added. "Print condition" is added.	
	6	2.6 2) Wave form, Phase "TYP.0.6ms" is added. "MIN.0.2ms" is added.	
	8	2.8 Print Solenoid "Terminal voltage " is changed. 3) Current "Current value" is "3A", was "2.5A". 8) Spark Killer "Prepared by the customer side refer the circuit and case design recommendations".	
	9	Note : Note 1 is "$t_1 = t_2 \leqq 50 \mu s$", was "$t_1 = t_2 \leqq 28 \mu s$".	
	3, 12,13	Column number is "1 column, 2 column,3 column --- from left side", was "1 column, 2 column, --- from right side".	
	14	2.11 "Overall Dimensions" is changed.	
	15	"Attached Table 1" is added.	
2	6	2.6 2) Pulse Wave Form, Phase "MAX 2.5ms " is added. 2.7 2)"stopping at abnormality" is added.	October 11, 1984
	8	2.8 9)"protection of Solenoid at abnormality" is added.	
	9	Max 2.5ms is added.	