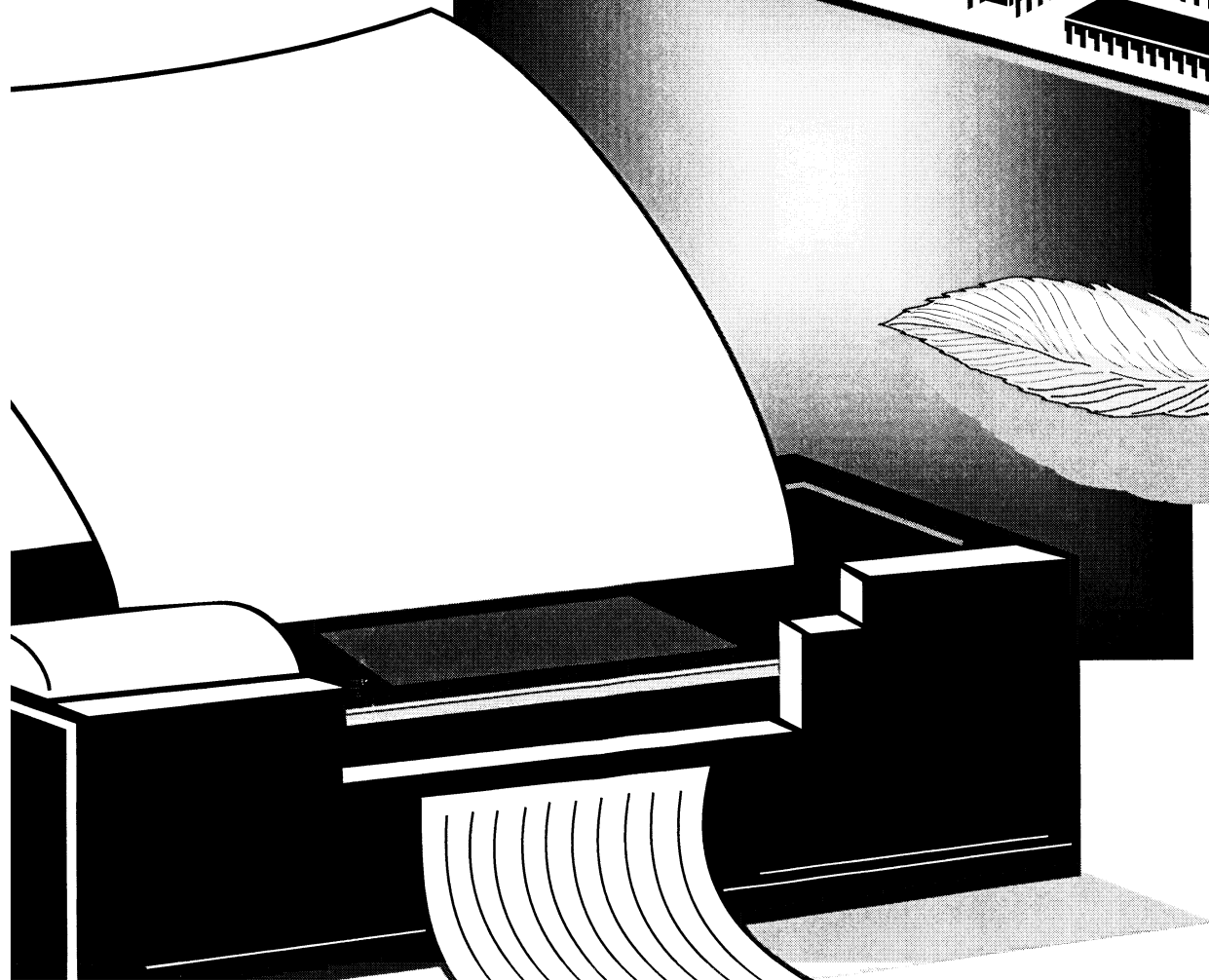
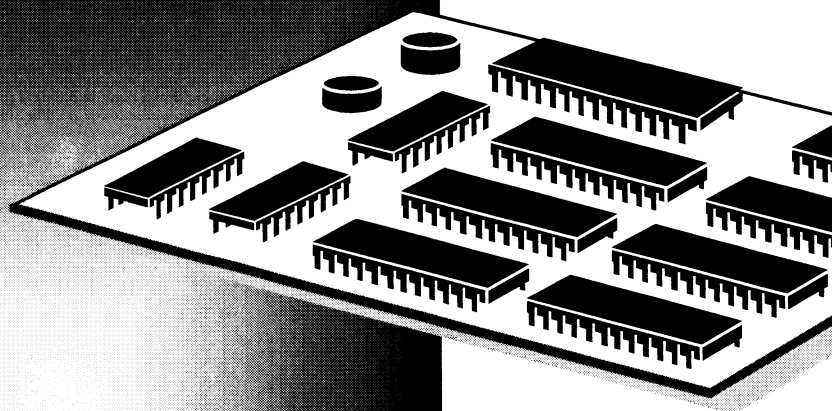
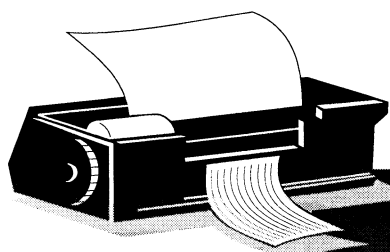


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MTP SERIES

Technical Reference





**MTP SERIES
THERMAL
PRINTER MECHANISM
TECHNICAL REFERENCE**

39019-2352-01

Seiko Instruments Inc.

MTP SERIES THERMAL PRINTER MECHANISM TECHNICAL REFERENCE

Document Number 39019-2352-01

January 1995

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PREFACE

This reference manual describes the specifications and basic operating procedures for the MTP Series Thermal Printer Mechanisms. Read it thoroughly so that you are able to use the MTP Series Thermal Printer Mechanisms properly.

Fully investigate the intellectual proprietary rights of the sample circuits designed in this manual before using.

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CHAPTER 1

FEATURES

The MTP Series Line Thermal Printer Mechanism is a series of compact, thermal printers designed to meet the demand for small, low cost units. It can be used in adding machines, measuring instruments and analyzers, office machines, medical apparatus, and data terminal devices.

The MTP Series Line Thermal Printer Mechanism has the following features:

- Low cost
- Maintenance-free
- High quality printing
- Battery drive
- Silent, nonimpact system
- Designed for versatile applications
- High reliability

CHAPTER 2 SPECIFICATIONS

2.1 PART NUMBER

(1) Character printers

MTP□□□-□□□
□□□ □□□
① ② ③

- ① : Base model code
- ② : Characters per line*
- ③ : Print head type used

* Maximum number of characters per line based on character matrix in General Specifications.

(2) Graphic printers

MTP□□□-□□□□
□□□ □□□□
① ③ ④

- ① : Base model code
- ③ : Print head type used
- ④ : Maximum number of dots per row per line

2.2 GENERAL SPECIFICATIONS

2.2.1 Character Printers

Table 2-1 Character Printer Specifications

Item	Specifications				
Base model code	MTP102		MTP201		MTP401
Model	MTP102-13B	MTP102-16B	MTP201-20B	MTP201-24B	MTP401-40B
Printing method	Thermal serial dot printing				
Printing direction	left to right with respect to the direction the paper is fed.				
Dots per line (H × W / line)	7 dots × 89 dots	7 dots × 110 dots	7 dots × 138 dots	7 dots × 166 dots	7 dots × 278 dots
Paper feed pitch (H × W)	0.35mm × 0.30mm	0.35mm × 0.24mm	0.35mm × 0.33mm	0.35mm × 0.28mm	0.35mm × 0.24mm
Character matrix (H × W)	7 × 5 dot matrix				
Character size (H × W)	2.4mm × 1.5mm	2.4mm × 1.2mm	2.4mm × 1.6mm	2.4mm × 1.4mm	2.4mm × 1.2mm
Characters per line	13 dot (2 dot spaces)	16 dot (2 dot spaces)	20 dot (2 dot spaces)	24 dot (2 dot spaces)	40 dot (2 dot spaces)
Printing width	26.7mm	26.4mm	45.9mm	46.0mm	66.7mm
Printing speed (room temperature, 5.0V)	Approx.1.5 line / s	Approx.1.2 line / s	Approx.1.0 line / s	Approx.0.9 line / s	Approx.0.5 line / s
Paper feed pitch	3.8mm				
Head activation timing detection	Via a tachogenerator				
Home position detection	Via a mechanical switch				
Operating voltage range	DC5.0V±1.0V				

Table 2-1 Character Printer Specifications (continued)

Item		Specifications														
Current consumption (room temperature, 5.0V)	during printing	3.2A max.														
	during paper feed	250mA max.														
Operating temperature range		0 to 50°C														
Storage temperature range		-40 to 60°C														
Life span		5 hundred thousand lines (5.0V rated enrgy, room temperature, "8" full line printing)														
Failure rate		10 ⁻⁶ / line or less (5.0V rated enrgy, room temperature, "8" full line printing)														
Operating noise (room temperature, 5.0V)		70dB or less (back ground noise: 40dB or less, measuring distance: 15cm, weighing: JIS A curve, dynamic characteristics : SLOW range)														
Paper feed force		20g or more	50g or more													
Paper hold force		50g or more	100g													
Dimensions (WDH)		48×31×13.8mm	70×34×14.4mm	91.5×35.5×20mm												
Weight		Approx. 35g	Approx. 40g	Approx. 50g												
Paper width		38 ⁰ ₋₁ mm	58 ⁰ ₋₁ mm	80 ⁰ ₋₁ mm												
Paper thickness		65±5μm														
Recommended thermal paper		<table border="1"> <thead> <tr> <th>Maker /Sensitivity</th> <th>Normal</th> <th>High sensitivity</th> </tr> </thead> <tbody> <tr> <td>Nippon Paper Industries</td> <td>TP50KS-A</td> <td>TF50KS-E2C</td> </tr> <tr> <td>Honshu Paper Co., Ltd.</td> <td>FH65BX-14N</td> <td>FH65BU-2</td> </tr> <tr> <td>Mitsubishi Paper Co., Ltd.</td> <td>F-200U7N5</td> <td>F-200U9W3</td> </tr> </tbody> </table>			Maker /Sensitivity	Normal	High sensitivity	Nippon Paper Industries	TP50KS-A	TF50KS-E2C	Honshu Paper Co., Ltd.	FH65BX-14N	FH65BU-2	Mitsubishi Paper Co., Ltd.	F-200U7N5	F-200U9W3
Maker /Sensitivity	Normal	High sensitivity														
Nippon Paper Industries	TP50KS-A	TF50KS-E2C														
Honshu Paper Co., Ltd.	FH65BX-14N	FH65BU-2														
Mitsubishi Paper Co., Ltd.	F-200U7N5	F-200U9W3														

2.2.2 Graphic Printers

Table 2-2 Graphic Printer Specifications

Item	Specifications			
Base model code	MTP201		MTP401	
Model	MTP201-G128	MTP201-G166	MTP401-G256	MTP201-G280
Printing method	Thermal serial dot printing			
Printing direction	left to right with respect to the direction the paper is fed.			
Dots per line (H×W / line)	8 dots ×128 dots	8 dots ×166 dots	8 dots ×256 dots	8 dots ×280 dots
Paper feed pitch (H×W)	0.35mm ×0.35mm	0.35mm ×0.28mm	0.35mm ×0.26mm	0.35mm ×0.24mm
Character matrix (H×W)	7×5 dot matrix			
Character size (H×W)	2.4mm ×1.7mm	2.4mm ×1.4mm	2.4mm ×1.3mm	2.4mm ×1.2mm
Characters per line	18 dot (2 dot spaces)	24 dot (2 dot spaces)	36 dot (2 dot spaces)	40 dot (2 dot spaces)
Printing width	44.7mm	46.0mm	66.6mm	67.2mm
Printing speed (room temperature, 5.0V)	Approx.0.9 line / s	Approx.0.9 line / s	Approx.0.5 line / s	Approx.0.5 line / s
Paper feed pitch	2.8mm			
Head activation timing detection	Via a tachogenerator			
Home position detection	Via a mechanical switch			
Operating voltage range	DC5.0V±1.0V			

Table 2-2 Graphic Printer Specifications

Item		Specifications													
Current consumption (room temperature, 5.0V)	during printing	3.2A max.													
	during paper feed	250mA max.													
Operating temperature range		0 to 50°C													
Storage temperature range		-40 to 60°C													
Life span		5 hundred thousand lines (5.0V rated energy, room temperature, "8" full line printing)													
Failure rate		10 ⁻⁶ / line or less (5.0V rated energy, room temperature, "8" full line printing)													
Operating noise (room temperature, 5.0V)		70dB or less (back ground noise : 40dB or less, measuring distance: 15cm, weighing network: JIS A curve, dynamic characteristics: SLOW range)													
Paper feed force		20g or more													
Paper hold force		50g or more	100g or more												
Dimensions (W×D×H)		70×34×14.4mm	91.5×35.5×20mm												
Weight		Approx. 40g	Approx. 50g												
Paper width		58.0 ⁰ mm	80.0 ⁰ mm												
Paper thickness		65±5μm													
Recommended thermal paper		<table border="1"> <thead> <tr> <th>Maker /Sensitivity</th> <th>Normal</th> <th>High sensitivity</th> </tr> </thead> <tbody> <tr> <td>Nippon Paper Industries</td> <td>TP50KS-A</td> <td>TF50KS-E2C</td> </tr> <tr> <td>Honshu Paper Co., Ltd.</td> <td>FH65BX-14N</td> <td>FH65BU-2</td> </tr> <tr> <td>Mitsubishi Paper Co., Ltd.</td> <td>F-200U7N5</td> <td>F-200U9W3</td> </tr> </tbody> </table>		Maker /Sensitivity	Normal	High sensitivity	Nippon Paper Industries	TP50KS-A	TF50KS-E2C	Honshu Paper Co., Ltd.	FH65BX-14N	FH65BU-2	Mitsubishi Paper Co., Ltd.	F-200U7N5	F-200U9W3
Maker /Sensitivity	Normal	High sensitivity													
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Honshu Paper Co., Ltd.	FH65BX-14N	FH65BU-2													
Mitsubishi Paper Co., Ltd.	F-200U7N5	F-200U9W3													
		* Only high-sensitivity thermal papers can be used with the MTP201-16E.													

2.3 MOTOR DRIVE CHARACTERISTICS

The motor is the power source for head movement and paper feed. Through the application of DC voltage to the motor, the head automatically moves back and forth, and paper fed on its return; therefore, there is no need to reverse the motor.

(1)	Motor terminal voltage	5.0±1.0 VDC
(2)	Motor power consumption	
	During printing	170 mA max. (room temperature, room humidity, 5.0 VDC)
	During paper feeding	250 mA max. (room temperature, room humidity, 5.0 VDC)
	Commencing movement	700 mA max. (room temperature, room humidity, 5.0 VDC)
	Ceasing movement	500 mA max. (room temperature, room humidity, 5.0 VDC)

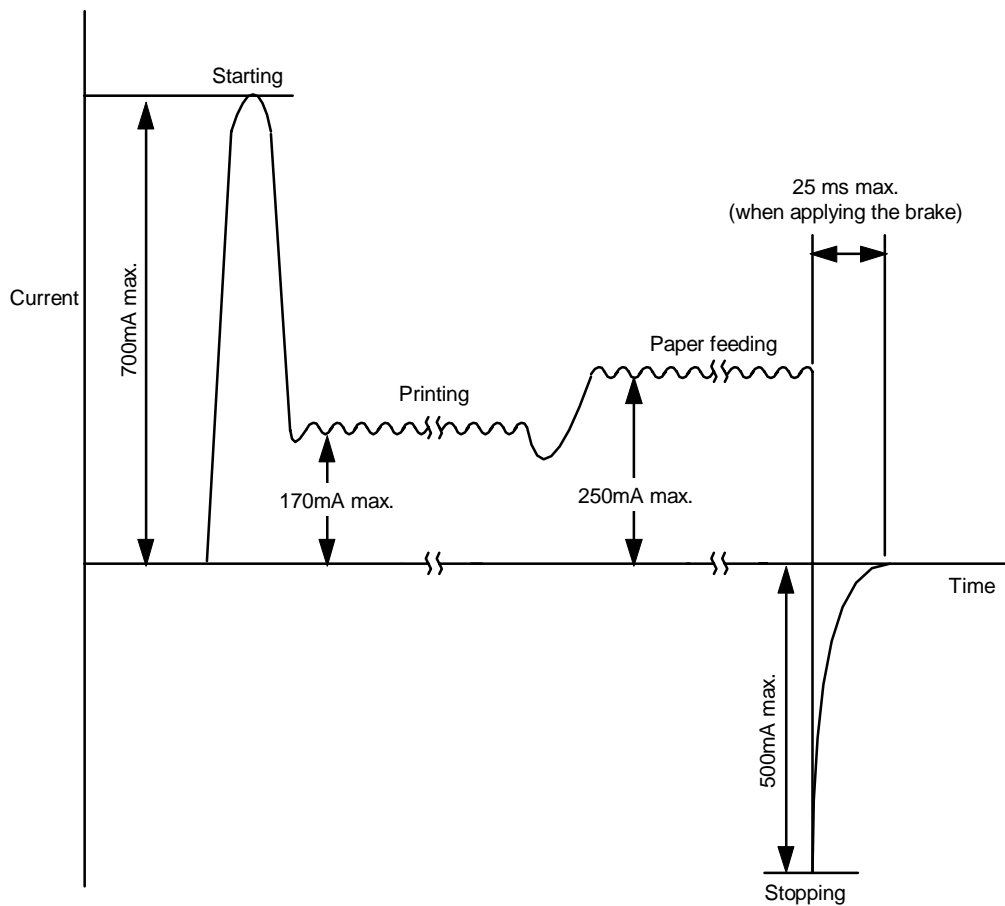
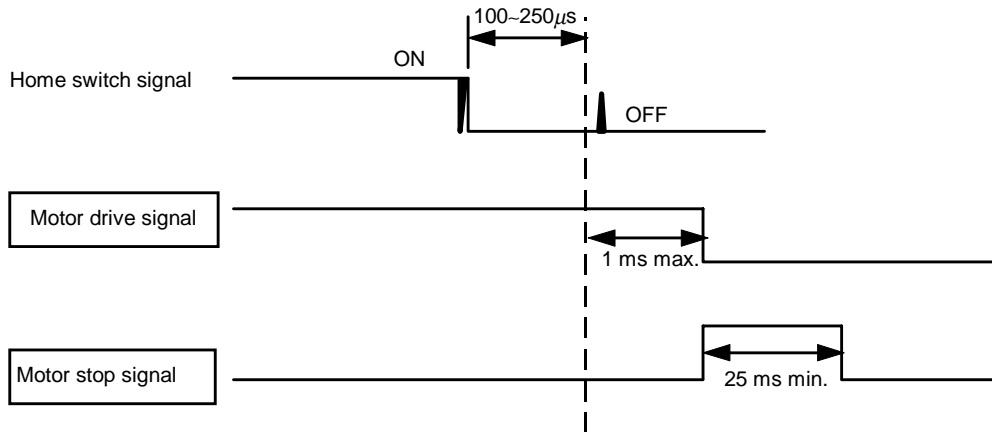


Figure 2-1 Motor Drive Characteristics

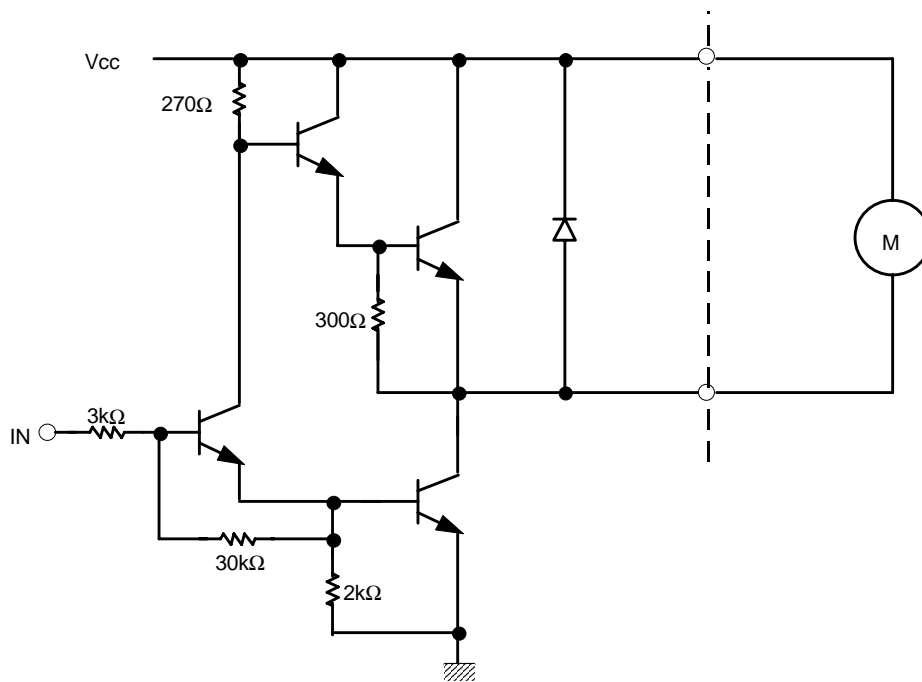
(3) Motor stop signal

Stop the motor drive signal within 1 ms after detecting a home switch "OFF" (100 to 250 μ s) signal, and input a motor stop signal of at least 25 ms.



* See Section 2.5, Home Switch, for home switch signal.

Figure 2-2 Motor Drive Signal Timing



* When using Sanyo Electric's LB1256 as the thermal head and motor drive IC, because of a built-in motorstop circuit, a motor stop signal is not required.

Figure 2-3 Sample Motor Drive Circuit

2.4 TG (TACHO-GENERATOR) OUTPUT CHARACTERISTICS

The TG is a signal generator directly connected to the motor, that generates false sine waves of two cycles per 1 turn of the motor. These waves are converted by a waveform shaping circuit into rectangular wave signals, which are used as a pulse impression timing signal for the thermal head.

(1) TG output

Table 2-3 TG Output

	4 to 6V	5V
Output voltage (Vp-p)	2.0 to 7.0	3.5 to 6.0
Period (ms)	2.5 to 6.5	3.0 to 5.0

(2) Sample TG waveform shaping circuit

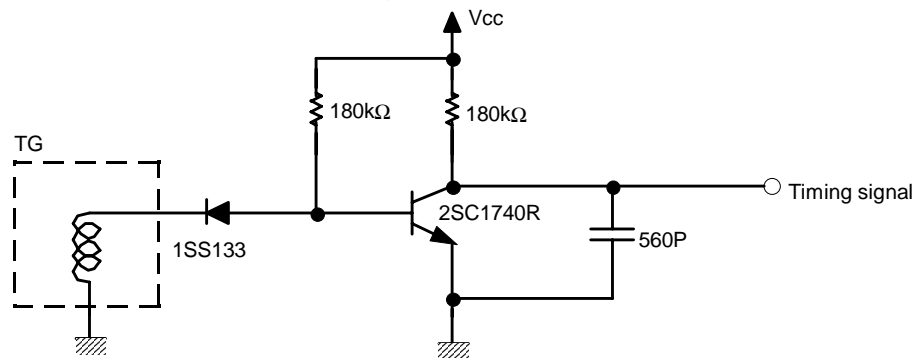
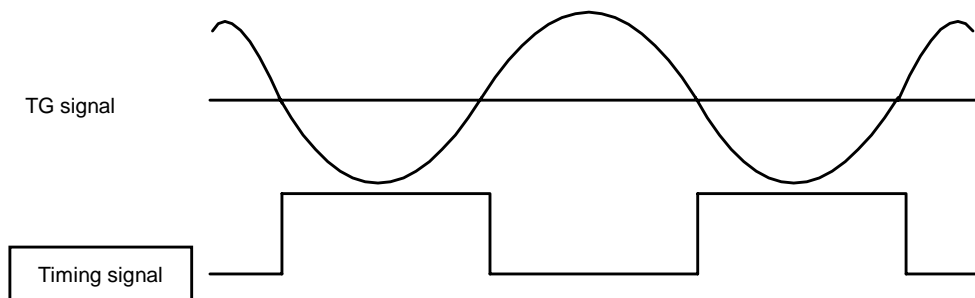


Figure 2-4 Sample TG waveform shaping circuit



* Generation of the timing signals depends on the user.

Figure 2-5 TG Timing Signal

2.5 HOME SWITCH

The home switch is a push-open type mechanical switch, which switches “OFF” when the head is at the home position (left end). The switch has two functions. The first is to detect the home position when the head stops there. Upon returning to the home position, the home switch switches from “ON” to “OFF”, and brakes are applied to stop the motion of the print head.

The second function is it is used as reference point for starting the counting of the print timing signals. As the head begins to move to the right from the home position, the home switch switches from “OFF” to “ON”, at which point counting of the print timing signal begins (TG signals after waveform shaping).

- (1) Contact resistance
5 Ω max. (measuring current: 50 μ A)
- (2) Current
1.0 mA max. (5.0 VDC)
- (3) OFF-to-ON detection

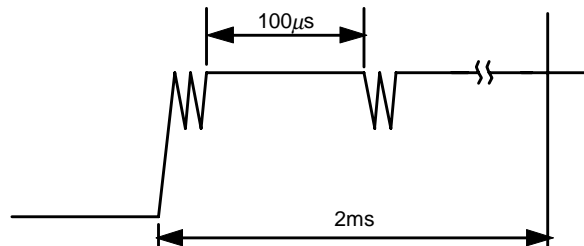


Figure 2-6 OFF-to-ON Detection

This switch has the characteristics that the ON state exists for more than 100 μ s within 2 ms of when the home switch switches from OFF-to-ON. Do not detect the switch until after 1-line has printed after detection of the first ON detection.

- (4) ON-to-OFF detection

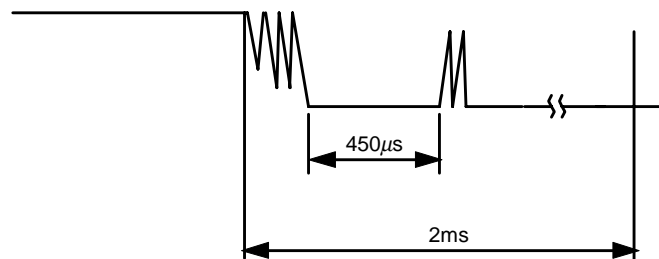


Figure 2-7 ON-to-OFF Detection

This switch has the characteristics that the OFF state exists for more than 450 μ s within 2 ms of when the home switch switches from ON-to-OFF. Do not detect the switch for 10 ms after detection of OFF.

2.6 THERMAL PRINT HEAD

Because the thermal print head in the MTP Series is a thin film type with high thermal efficiency, it has an excellent print quality. The CPU determines which vertically placed heating units to energize, and drives them with the thermal head driver (transistor array).

2.6.1 Head Specifications

Type of Head		B Head	G Head
Heating unit size			
Resistance value*	A rank	15.3±1Ω	17.6±1Ω
	B rank	14.0±1Ω	16.0±1Ω
	C rank	12.7±1Ω	14.4±1Ω
Head applied voltage		DC5.0±1V (at FPC terminal)	
Peak current (in simultaneous drive of all dots at 5.0 VDC)		3.0Amax.	3.0Amax.
Head applied energy (24°C, 5.0V)	Rated	High sensitive thermal paper 2.30mJ Standard thermal paper 2.50mJ	High sensitive thermal paper 2.30mJ Standard thermal paper 2.50mJ
	Max.	3.00mJ	3.00mJ

* The resistance value of each dot in the same head may have a 5% dispersion rate, and the average values are indicated on the rank table above. Rank symbols are printed on the FPC.

2.6.2 Head Applied Energy Correction

Use the Applied Energy Correction Formula below to correct for when the power voltage and ambient temperature fluctuation during operation (see sample pulse width control circuit).

Applied energy correction formula

$$E = \frac{V_0 + V}{2V} E_0 \left(1 + \frac{T_0 - T}{100} \right)$$

E: Applied energy (mJ)
 V: FPC terminal voltage (V)
 T: Temperature (°C)
 E₀: Rated energy (mJ)

	B head	G head
High sensitive thermal paper	2.3mJ	2.3mJ
Standard thermal paper	2.5mJ	2.5mJ

V₀: Rated voltage (5.0V)
 T₀: Room temperature (24°C)

2.6.3 Head Activation Pulse Width

To ensure high quality printing with the MTP Series, the thermal head activation pulse width must be set according to the head drive voltage and the head resistance.

Pulse width calculation formula

$$t = \frac{R \cdot E}{V^2}$$

t: Pulse width for applying rated energy (ms)
 R: Head resistance (Ω)

	B head	G head
A rank	15.3Ω	17.6Ω
B rank	14.0Ω	16.0Ω
C rank	12.7Ω	14.4Ω

E: Applied energy (mJ)
 V: FPC terminal voltage (V)

Note: Procedure for pulse width adjustment

- ① Minimize pulse width.
- ② Activate the thermal head with a checked pattern.
- ③ Measure the head terminal voltage by using a synchroscope.
- ④ Gradually adjust applied pulse width, which is calculated by using the pulse width calculation formula.

2.6.4 Control of Printing Pulse Width

Superior print quality can be maintained by controlling the print pulse width by the print pulse width control circuit. This is an oscillating circuit in which the frequency varies depending upon the voltage and ambient temperature, and provides a specified pulse width by counting a certain number of pulses with the CPU. The leading edge of the pulse is synchronized with the timing signal. Control the leading edge of the pulse by the pulse width control circuit to obtain the rated applied energy.

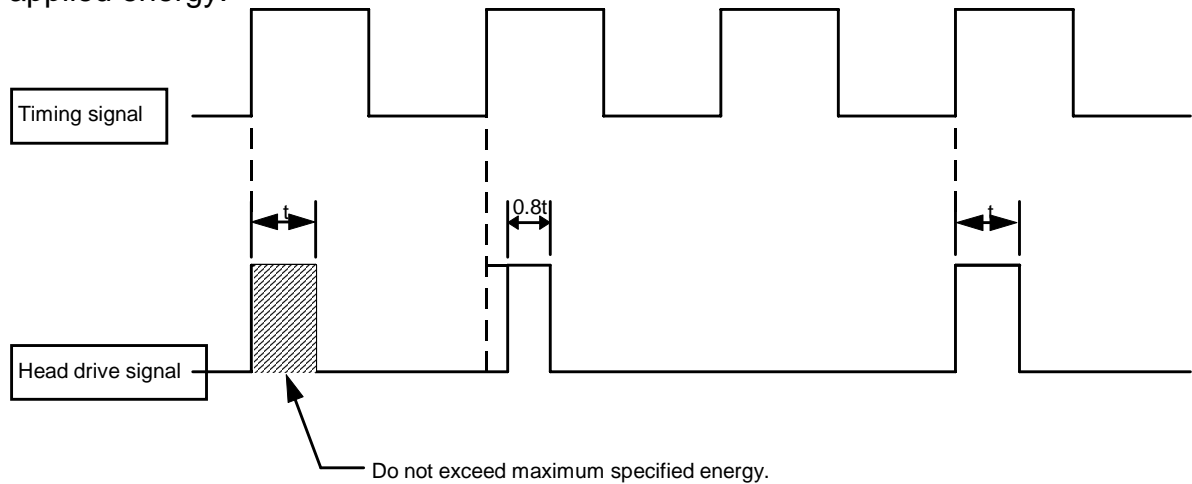
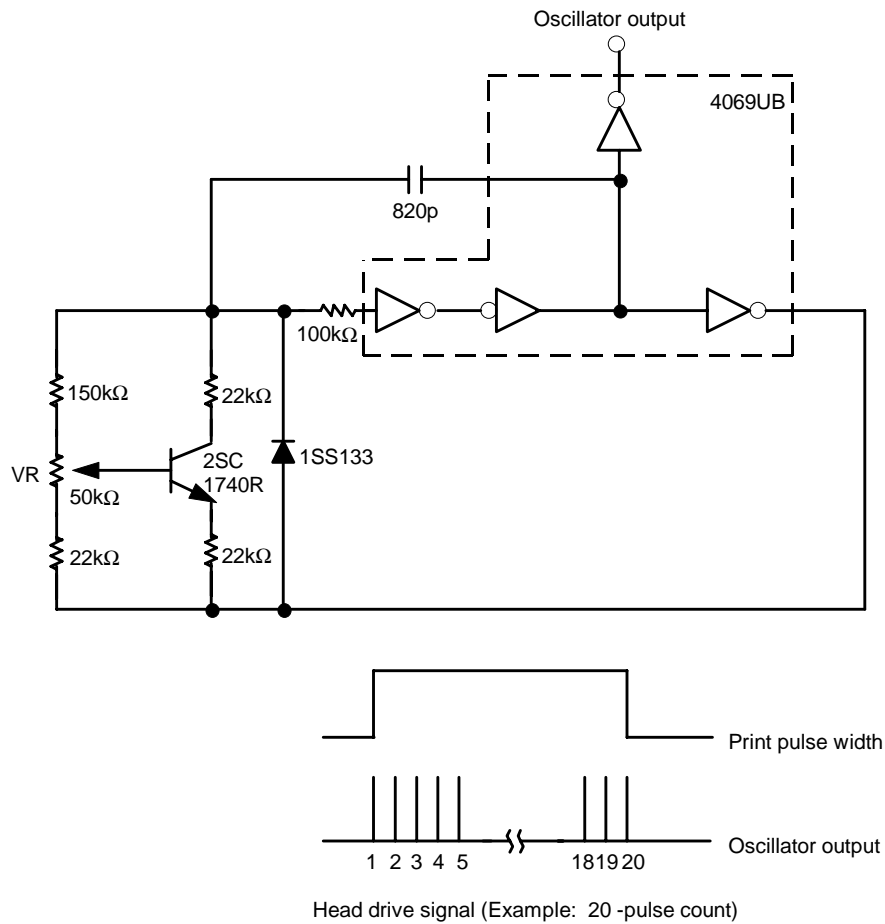


Figure 2-8 Pulse Width Control

- Avoid continuous energizing.
- When driving the same dot successively, reduce the applied energy to 80% of the rated applied energy and slow down the rise of the head driving signal.



- * The compensation circuits for temperature and voltage are included.
- * Adjust an oscillating frequency with VR to obtain the proper pulse width in 20 counts at the normal temperature.
- * A print pulse width is made by counting the above oscillator output with the CPU.

Figure 2-9 Sample Pulse Width Control Circuit

2.6.5 Initialization

Feed out the paper by one line and stop the print head at the home position after turning on the power.

2.6.6 Paper Feeding

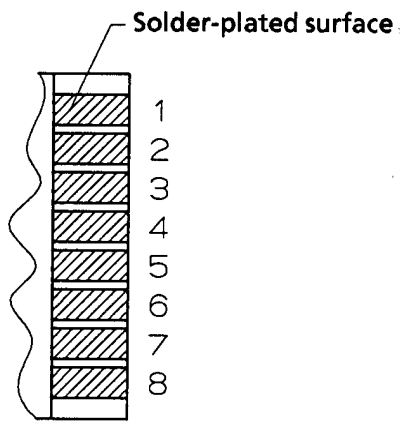
Paper is fed automatically upon input of a motor drive signal. After paper is fed, the head must stop always at the home position.

CHAPTER 3 PIN ASSIGNMENT

3.1 B HEAD-MOUNTED PRINTER

3.1.1 Thermal Head Control Pin

Recommended connector: HBLB8S-1J (Japan Burndy)



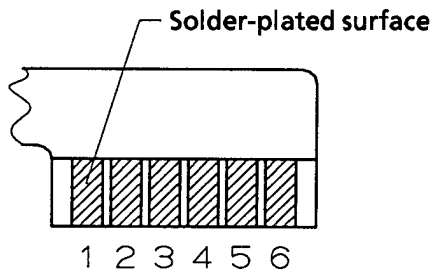
Pin Number	Signal Name	Function
1	Dot 1	Thermal head 1st dot
2	Dot 2	Thermal head 2nd dot
3	Dot 3	Thermal head 3rd dot
4	Dot 4	Thermal head 4th dot
5	Dot 5	Thermal head 5th dot
6	Dot 6	Thermal head 6th dot
7	Dot 7	Thermal head 7th dot
8	H-COM	Thermal head common (+5V)

Figure 3-1 Thermal Head Control Pin Assignment (B Head-mounted Printer)

3.1.2 Motor and Switch Control Pin

(1) MTP102

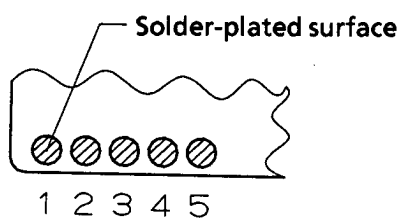
Recommended connector: HBLB6S-1J (Japan Burndy)



Pin Number	Signal Name	Function
1	HS	Home switch, GND for VCC
2	HS	
3	TG	Tachogenerator, GND for VCC
4	TG	
5	M -	Motor minus
6	M+	Motor plus (+5V)

Figure 3-2 Motor and Switch Control Pin Assignment (B Head-mounted Printer, MTP102)

(2) MTP201 and MTP401



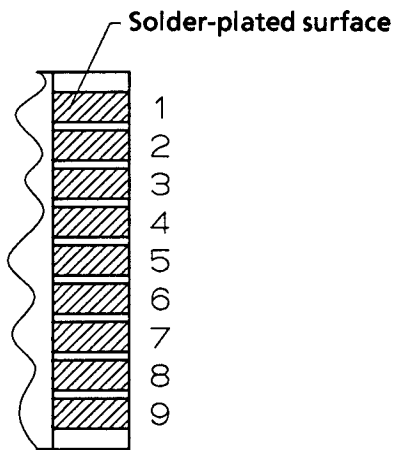
Pin Number	Signal Name	Function
1	M+	Motor plus (+5V)
2	M -	Motor minus
3	TG	Tachogenerator
4	HS · TG-COM	Home switch · Tachogenerator common (GND)
5	HS	Home switch

Figure 3-3 Motor and Switch Control Pin Assignment (B Head-mounted Printer, MTP201 and MTP401)

3.2 G HEAD-MOUNTED PRINTER

3.2.1 Thermal Head Control Pin

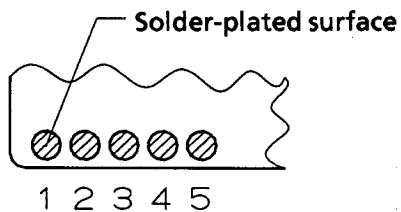
Recommended connector: HBLB9S-1J (Japan Burndy)



Pin Number	Signal Name	Function
1	Dot 1	Thermal head 1st dot
2	Dot 2	Thermal head 2nd dot
3	Dot 3	Thermal head 3rd dot
4	Dot 4	Thermal head 4th dot
5	Dot 5	Thermal head 5th dot
6	Dot 6	Thermal head 6th dot
7	Dot 7	Thermal head 7th dot
8	Dot 8	Thermal head 8th dot
9	H-COM	Thermal head common (+5V)

Figure 3-4 Thermal Head Control Pin Assignment (G Head-mounted Printer)

3.2.2 Motor and Switch Control Pin



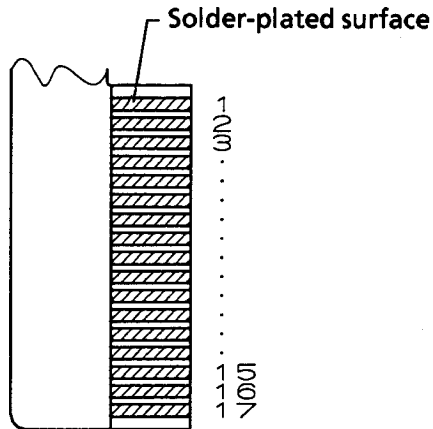
Pin Number	Signal Name	Function
1	M+	Motor plus (+5V)
2	M-	Motor minus
3	TG	Tachogenerator
4	HS · TG-COM	Home switch · Tachogenerator common (GND)
5	HS	Home switch

Figure 3-5 Motor and Switch Control Pin Assignment (G Head-mounted Printer)

3.3 E HEAD-MOUNTED PRINTER

3.3.1 Thermal Head Control Pin

Recommended connector: 52045-1710 (Molex Japan)

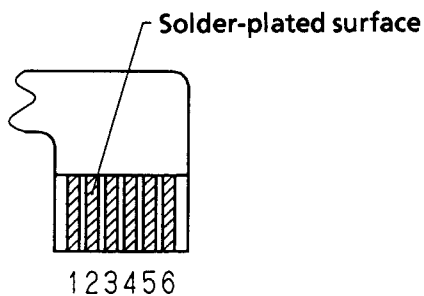


Pin Number	Signal Name	Function
1	Dot 1	Thermal head 1st dot
2	Dot 2	Thermal head 2nd dot
3	Dot 3	Thermal head 3rd dot
4	Dot 4	Thermal head 4th dot
5	Dot 5	Thermal head 5th dot
6	Dot 6	Thermal head 6th dot
7	Dot 7	Thermal head 7th dot
8	Dot 8	Thermal head 8th dot
9	Dot 9	Thermal head 9th dot
10	Dot 10	Thermal head 10th dot
11	Dot 11	Thermal head 11th dot
12	Dot 12	Thermal head 12th dot
13	Dot 13	Thermal head 13th dot
14	Dot 14	Thermal head 14th dot
15	Dot 15	Thermal head 15th dot
16	Dot 16	Thermal head 16th dot
17	H-COM	Thermal head common (+5 V)

Figure 3-6 Thermal Head Control Pin Assignment (E Head-mounted Printer)

3.3.2 Motor and Switch Control Pin

Recommended connector: 5597-06CPB (Molex Japan)



Pin Number	Signal Name	Function
1	HS	Home switch, GND for Vcc
2	HS	
3	M -	Motor minus
4	TG	Tachogenerator, GND for Vcc
5	TG	
6	M+	Motor plus (+5V)

Figure 3-7 Motor and Switch Control Pin Assignment (E Head-mounted Printer)

CHAPTER 4

TIMING CHART

4.1 TIMING CHART

Figure 4-11 shows the timing chart when using a B-head mounted printer. The number of the head drive signal depends on the type of thermal head mounted on the printer.

* Signals in are issued from the circuit side.

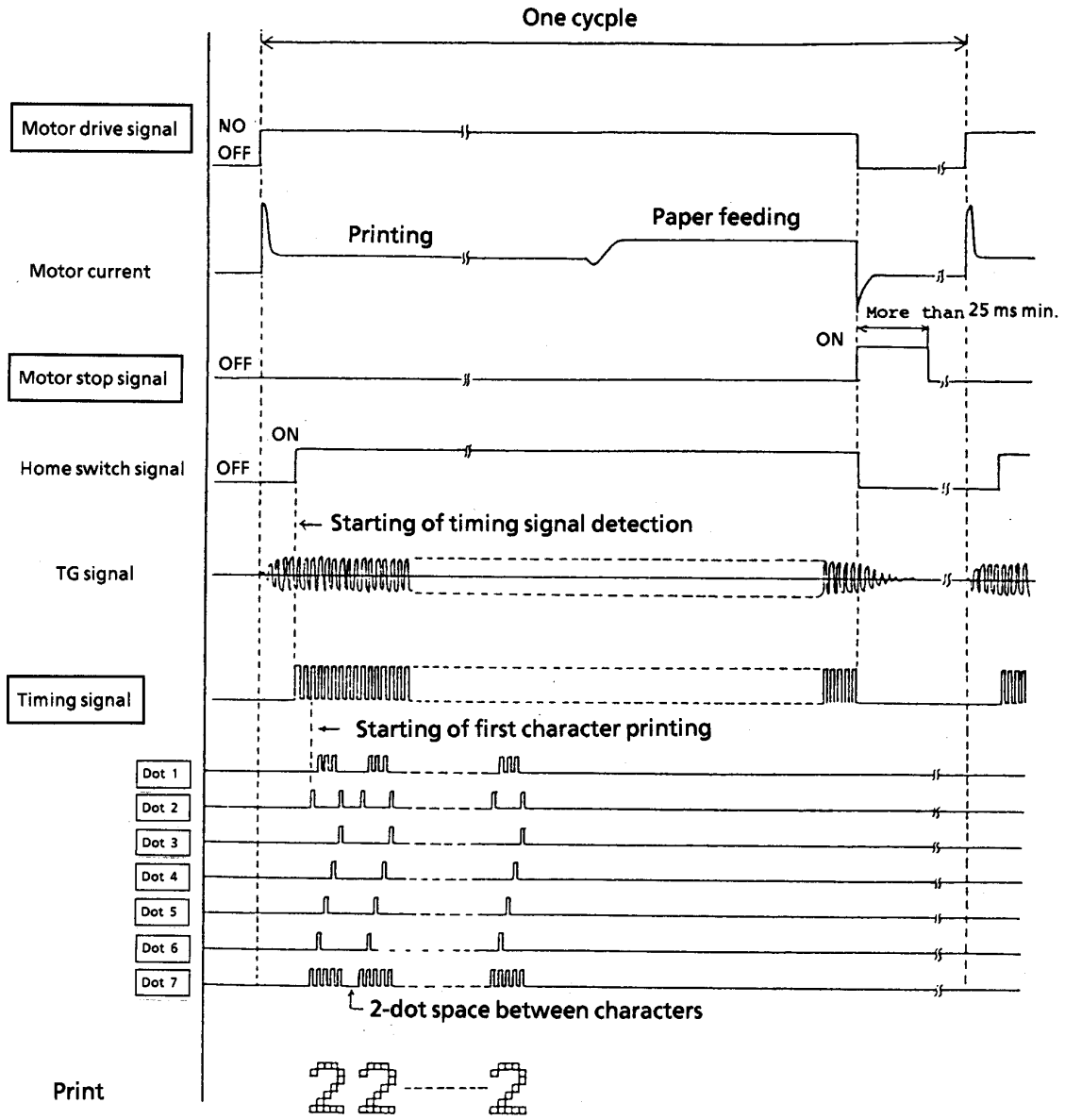
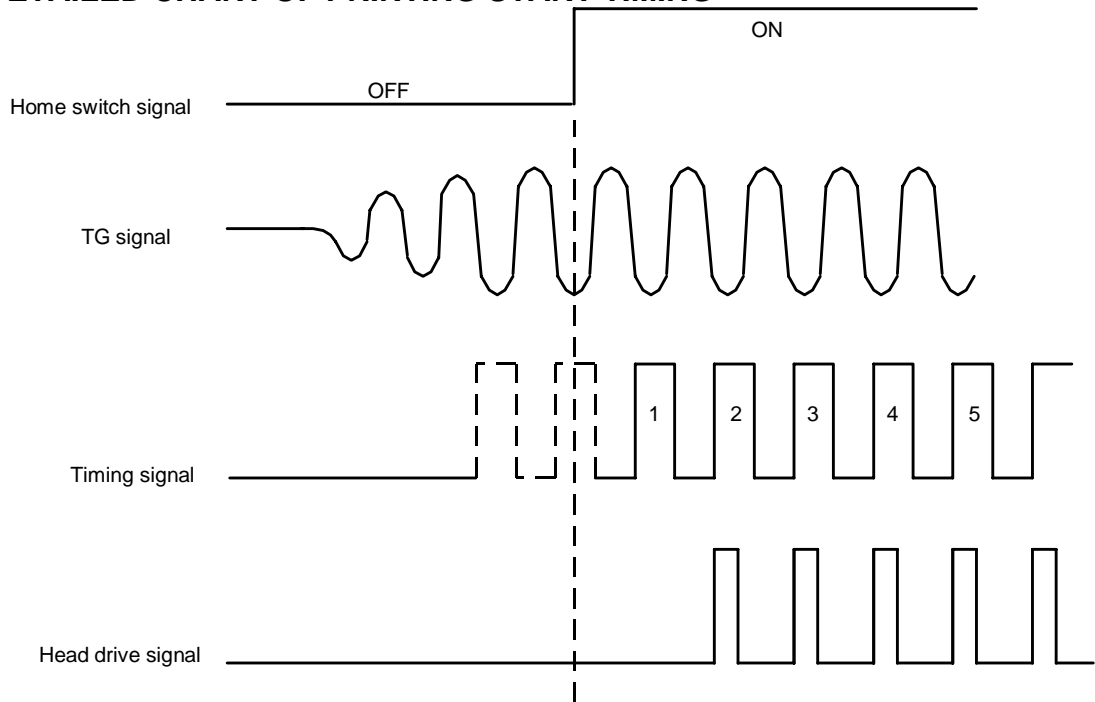


Figure 4-1 Timing Chart

4.2 DETAILED CHART OF PRINTING START TIMING



* Start printing from the second pulse of timing signals.

Figure 4-2 Printing Start Timing Chart

4.3 CONTINUOUS PRINTING OPERATION

4.3.1 Home Switch Signal Method

The print start position is determined for each line on the basis of the ON-rise of the home switch signal.

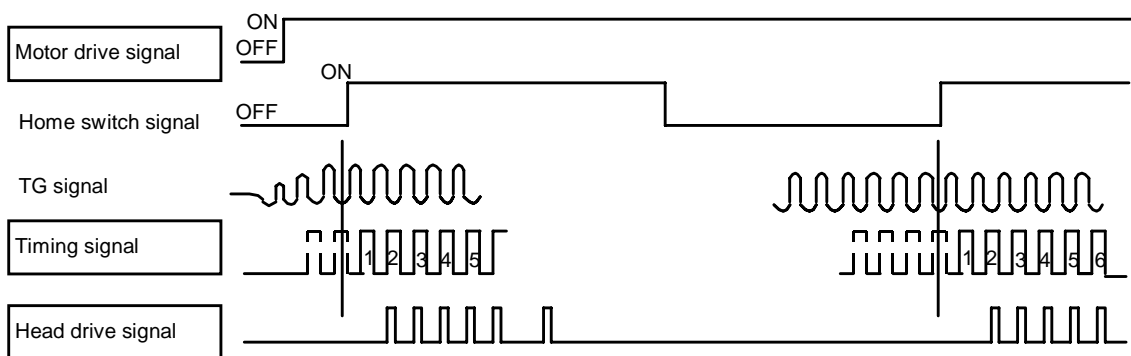


Figure 4-3 Continuous Printing Timing Chart (Home Switch Detection Method)

- Due to a detection error of the home switch signal, the print start position may deviate by a maximum of 1 dot.

4.3.2 Home Switch Signal Method

When printing a graphic image, print a picture unit by the following method. The print start position deviation may not occur.

1. Determine the print start position of the first line by the ON-rise of the home switch signal (same as the home switch signal method).
2. For the second and the subsequent lines, determine the print start position by counting timing signals (do not stop the head at its home position).

Example: When printing one picture unit by three lines

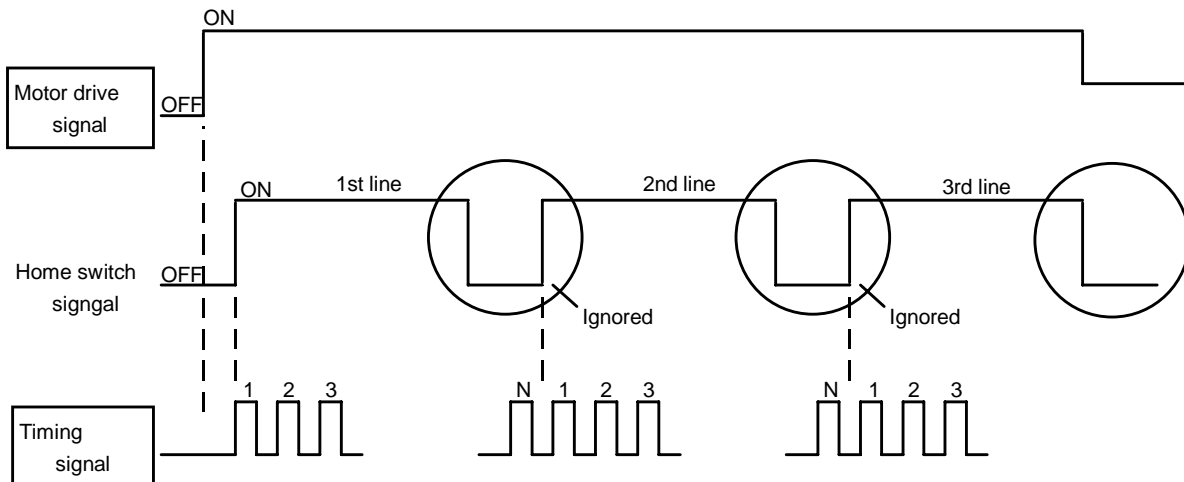


Figure 4-4 Continuous Printing Timing Chart (Timing Signal Count Method)

- ① Timing signal count is started after the home switch turned ON for the first line.
- ② When the timing signal count becomes $N+1$, the head completes one stroke, and returns to the position of timing signal count 1 on the first line. At this point, ignore the home switch signal.
- ③ For the second line, replace $N+1$ with 1, and proceed to the timing signal count.
- ④ When the timing signal count becomes $N+1$, replace $N+1$ with 1, and conduct timing signal count for the third line.
- ⑤ Upon completion of printing the third line, detect the ON-to-OFF of the home switch, and stop the motor to complete an operation cycle.

N is as shown below:

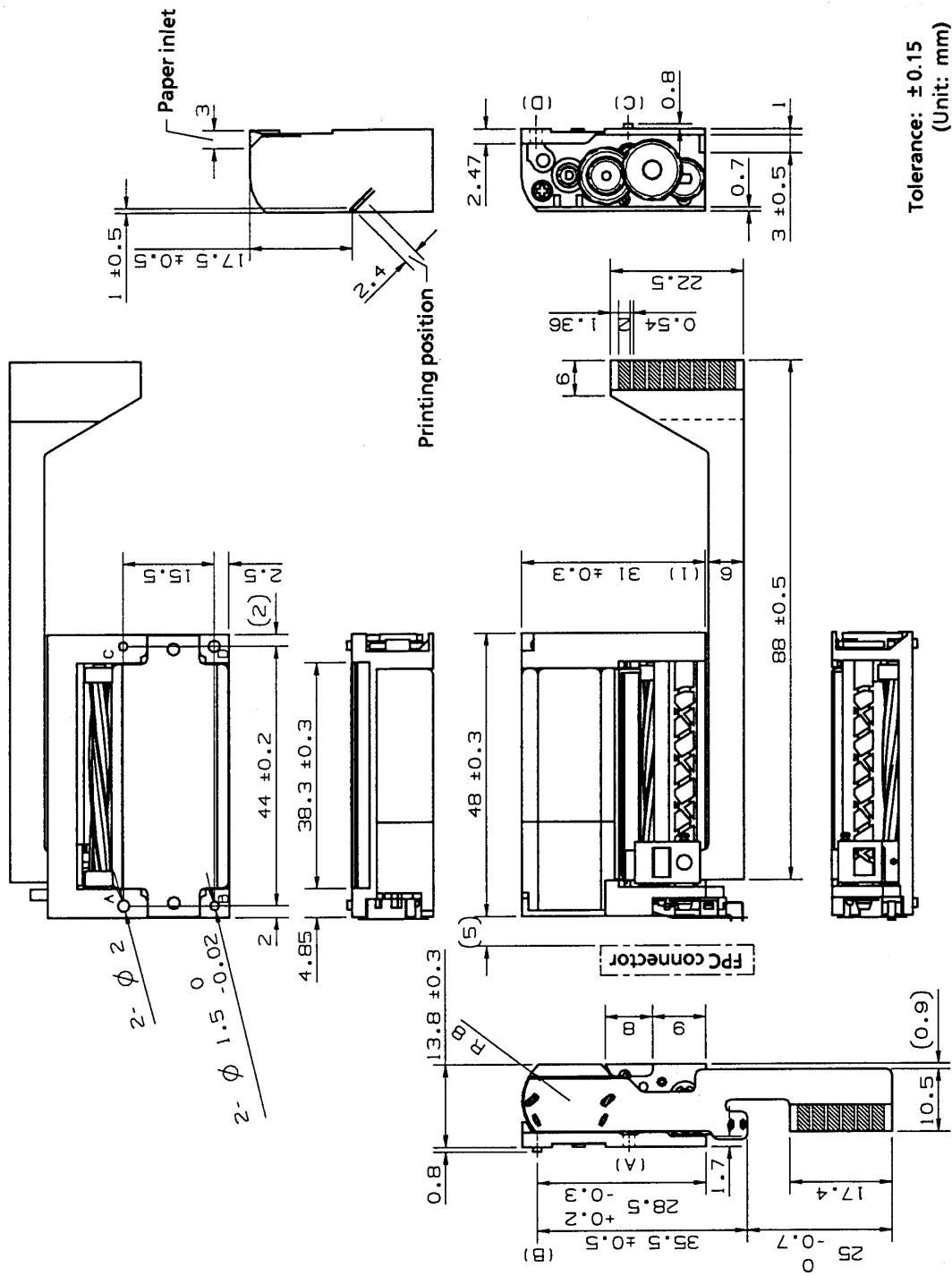
Part Number	N
MTP102-13B	160
-16B	200
MTP201-20B	230
-24B	276
MTP401-40B	450

Part Number	N
MTP201-G128	276
-G166	276
MTP401-G256	450
-G280	450

CHAPTER 5

APPEARANCE AND DIMENSIONS

Figures 5-1 to 5-6 shows the appearance and external dimensions of the MTP Series printer mechanisms.



Tolerance: ± 0.15
(Unit: mm)

Figure 5-1 MTP102(B head-mounted) Appearance and External Dimensions

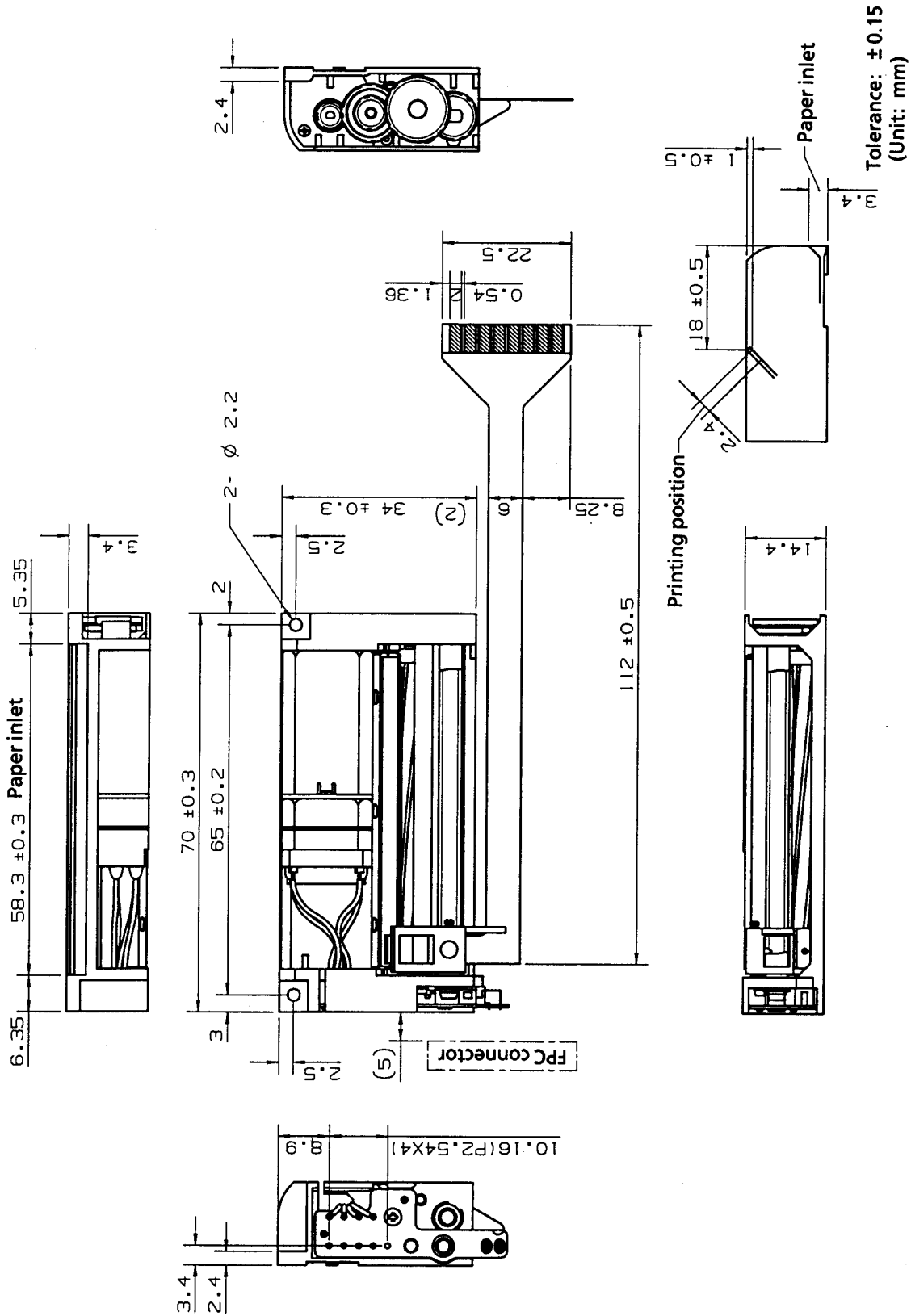


Figure 5-2 MTP201(B head-mounted) Appearance and External Dimensions

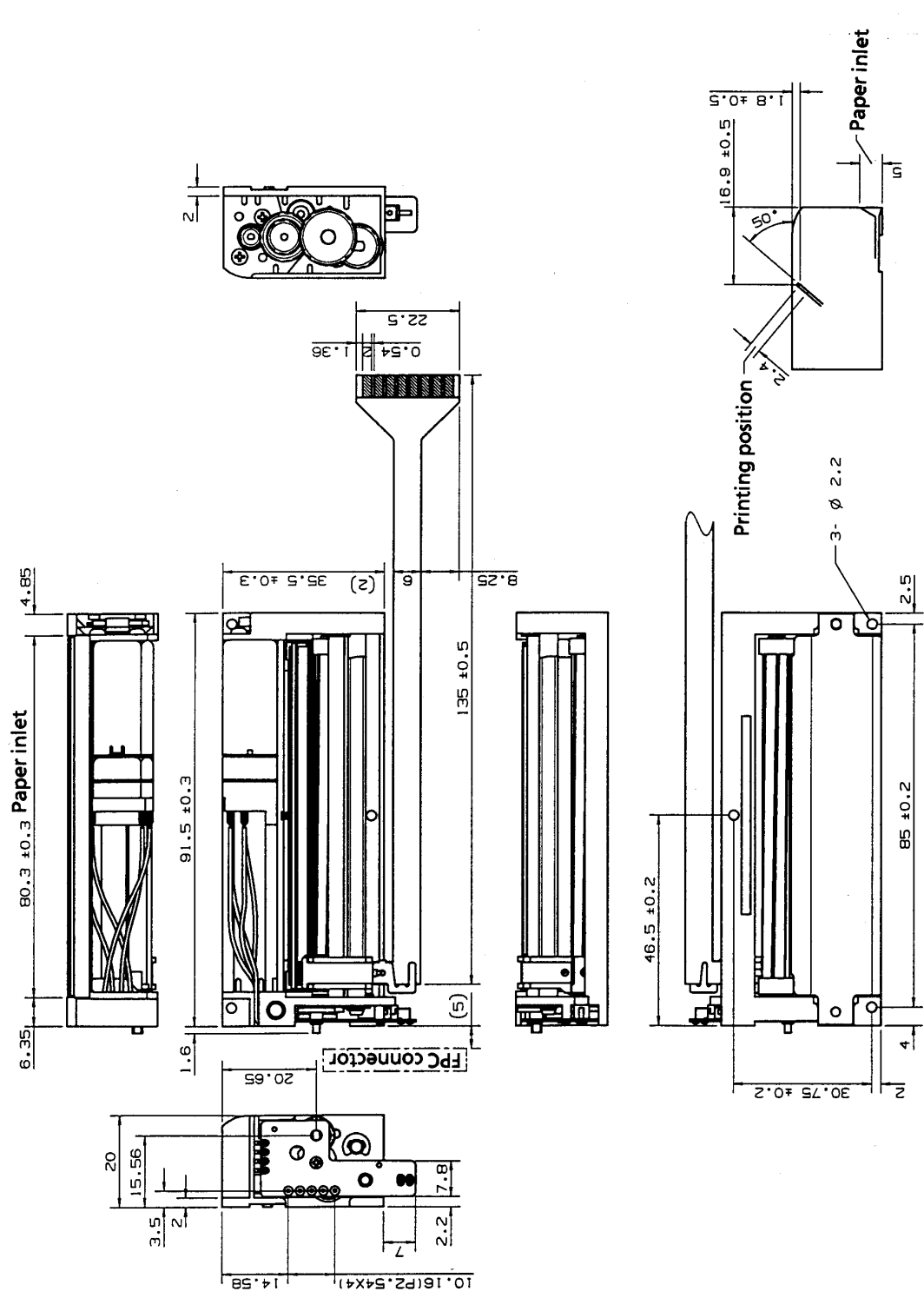


Figure 5-4 MTP401(B head-mounted) Appearance and External Dimensions

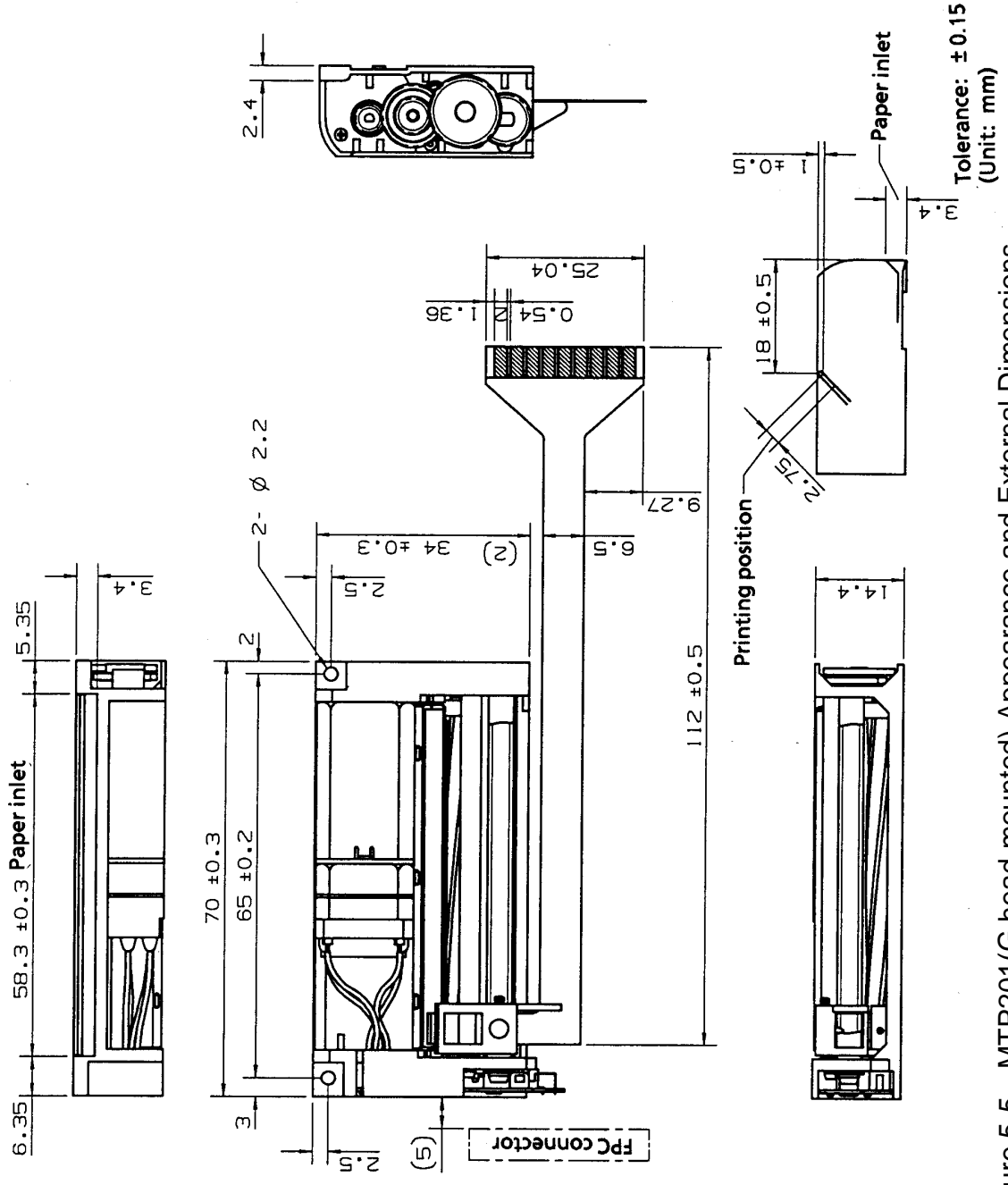


Figure 5-5 MTP201(G head-mounted) Appearance and External Dimensions

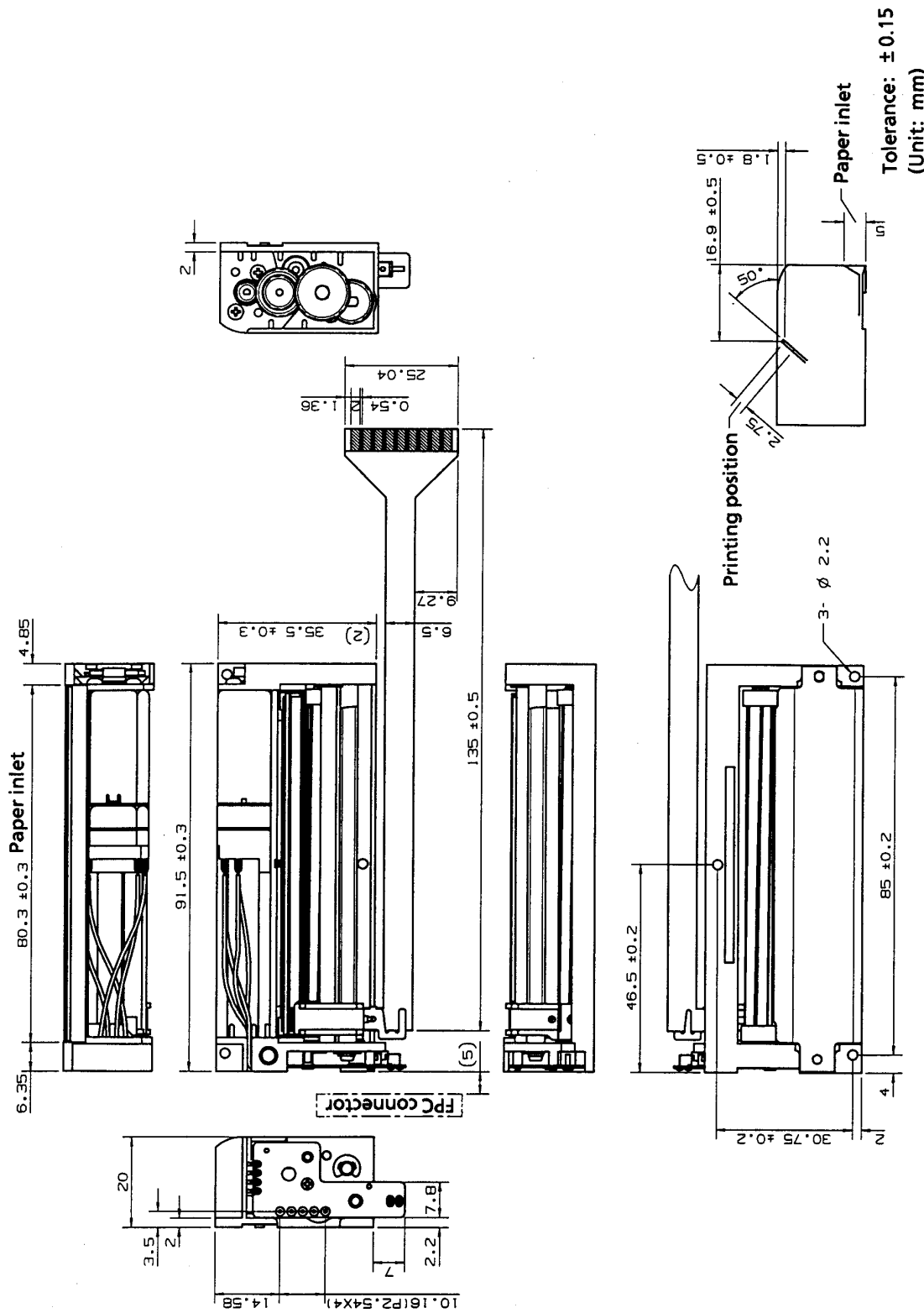


Figure 5-6 MTP401(G head-mounted) Appearance and External Dimensions

CHAPTER 6
SAMPLE CIRCUIT BLOCK DIAGRAM

Figures 6-1 and 6-2 shows the samples of the circuit block diagrams.

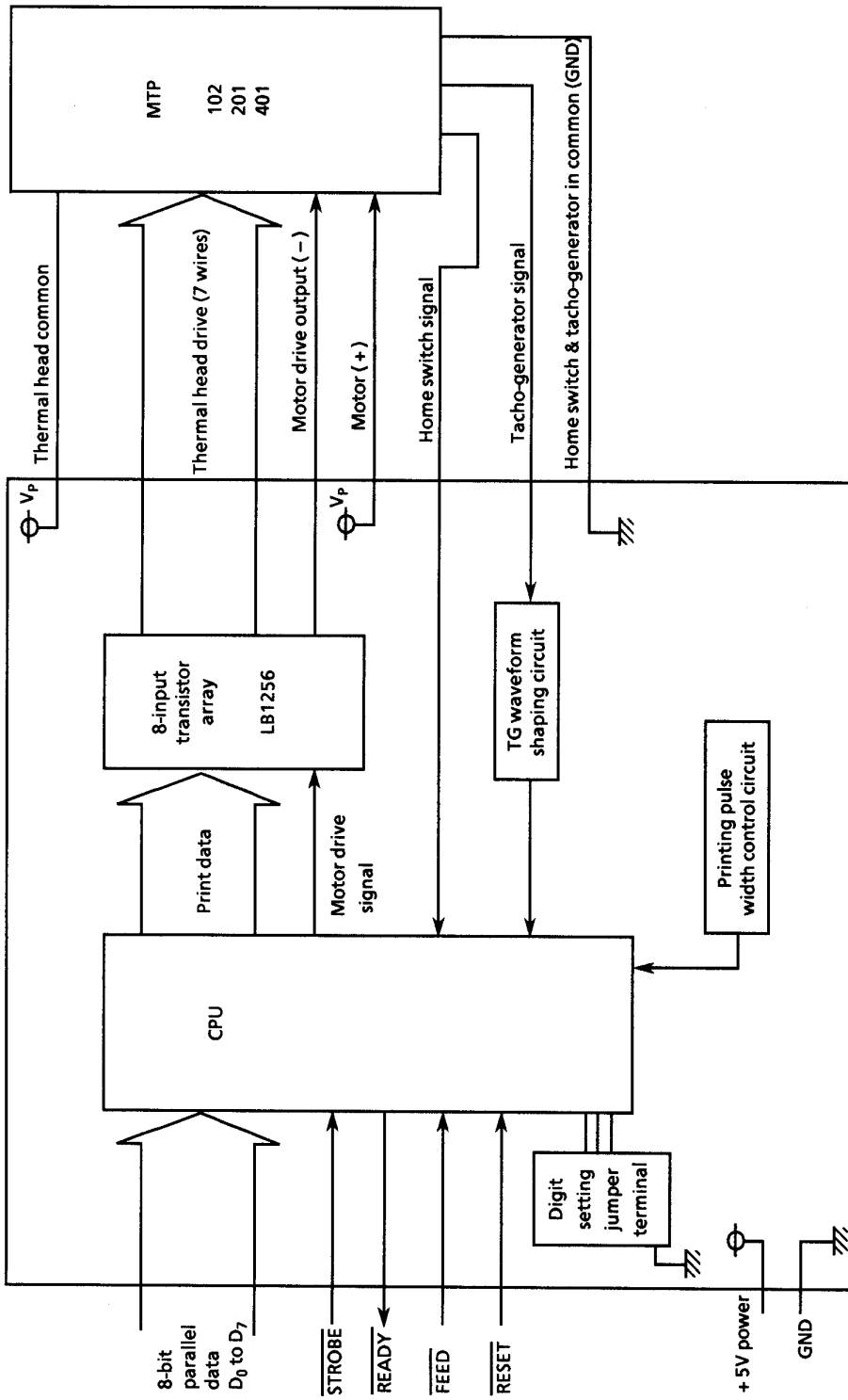


Figure 6-1 Sample Block Diagram(B Head-mounted Printer)

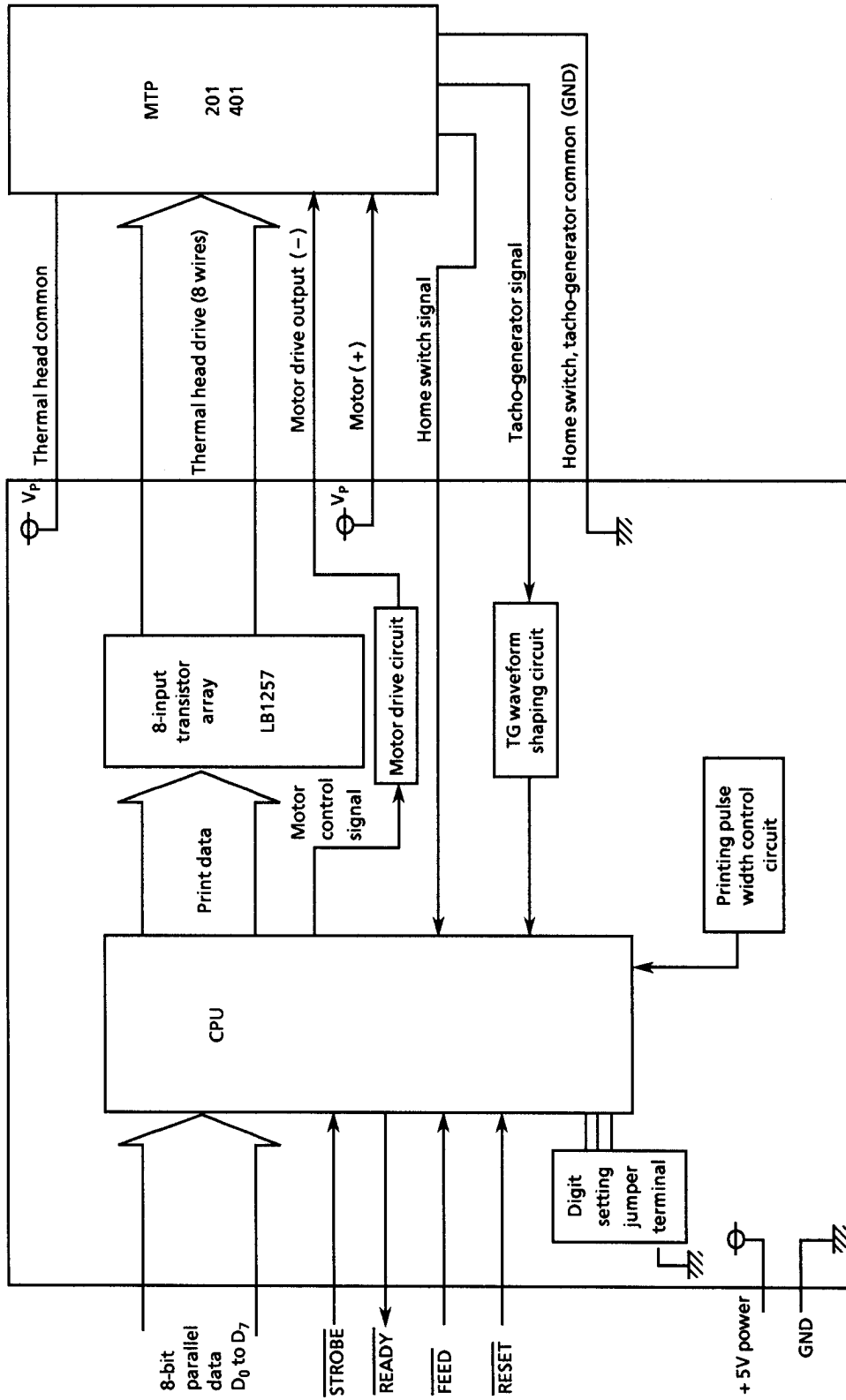


Figure 6-2 Sample Block Diagram(G Head-mounted Printer)

CHAPTER 7

DESIGNING AND HANDLING PRECAUTIONS

To maintain the performance of the MTP Series and to prevent future problems from occurring, observe the following precautions.

7.1 DESIGN PRECAUTIONS

- ① Do not apply an energy source that is too high.

If too much energy is applied to the thermal head, it may overheat and become damaged. Always use the printer with the specified pulse width.

- ② Stop activating to the motor if the thermal head does not return to the home position because of a paper jam (the home switch signal detection is not executed).

- ③ If the MTP Series is used at extremely high temperature or at high humidity, the thermal head may be electrolytically corroded. To prevent the thermal head from being electrolytically corroded:

- Keep the thermal paper away from the ground.
- Turn OFF the V_P power supply when not printing.

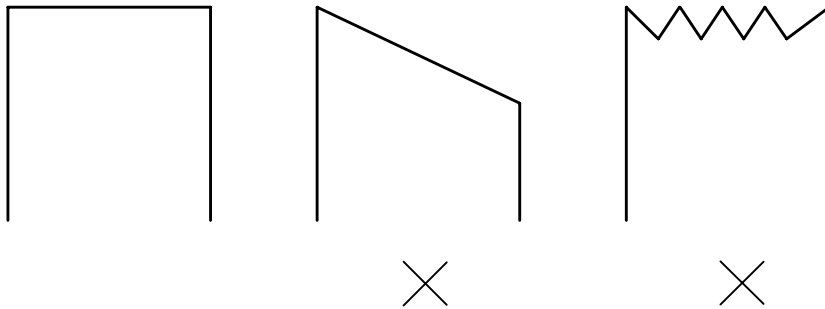
7.2 HANDLING PRECAUTIONS

- ① If any paper other than that specified is used, the high print quality and long life of the thermal head can not be guaranteed.

Possible problems that may occur:

- Poor print quality due to low-sensitivity paper
- Abrasion of the thermal head due to paper surface which is too rough
- Print fading due to low print preservation
- Poor print quality due to paper trash attachment

- ② Stop the thermal head at the home position; otherwise, the platen may become deformed resulting in poor print quality.
- ③ Do not print without paper; otherwise, the platen or thermal head may become damaged.
- ④ Do not damage the platen by removing paper when a paper jam occurs.
- ⑤ Cut the edge of the paper so that the corners of the paper are square (90°); otherwise, a paper jam may occur.



- ⑥ Unload paper in the direction in which the paper is normally fed. If paper is unloaded in the reverse direction, the paper feed mechanism may become damaged.
- ⑦ Do not use a thermal paper roll whose core and the paper are attached; otherwise, the paper will lock causing the paper feed to suddenly increase the amount fed resulting in damage to the paper feed mechanism.
- ⑧ Remove the debris on the surface of the paper; otherwise, a paper jam may occur.

CHAPTER 8
DESIGN OF PERIPHERAL DEVICES

8.1 MOUNTING THE PRINTER

The mounting procedure for MTP Series printers differs somewhat between the MTP102 and the other printers in the series.

Mount the printer so that it is not warped or distorted in any way.

8.1.1 MTP102 Printer

The MTP102 is provided on its back two dowels and two holes diagonally for mounting the printer (see Figure 8-1).

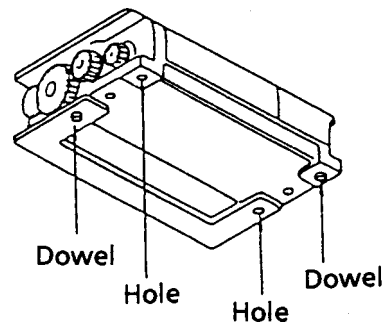


Figure 8-1 MTP102 Printer (Back)

- ① When mounting with screws
Mount the printer by tightening the tapping screws from under the mounting base.
In this case, the dowels are used as a reference for positioning (see Figure 8-2).

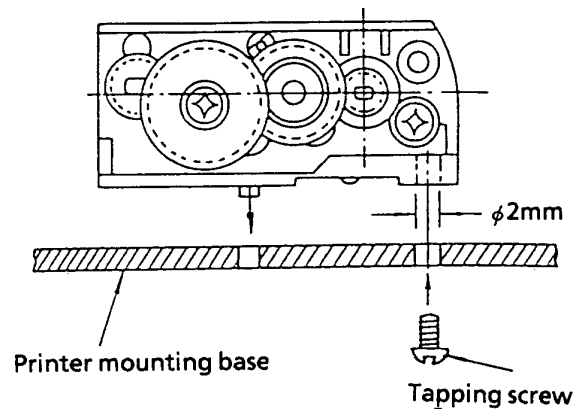


Figure 8-2 Mounting with Screws (MTP102 Printer)

- ② When mounting without screws
Using the dowels and the $\phi 2$ mm holes on the back of the printer as reference for positioning, fix the printer by pressing the eaves on both sides of the upper portion of the printer (see Figure 8-3).
Do not push on the eaves at the motor end.

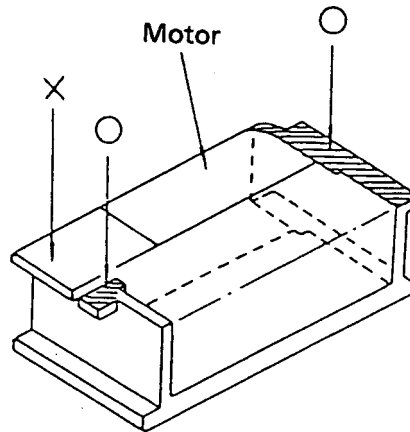


Figure 8-3 Mounting without Screws
(MTP102 printer)

8.1.2 MTP201 and 401 Printers

The MTP201 and 401 printers are provided with $\phi 2.2$ mm mounting holes at the two corners of the printer (see Figure 8-4).

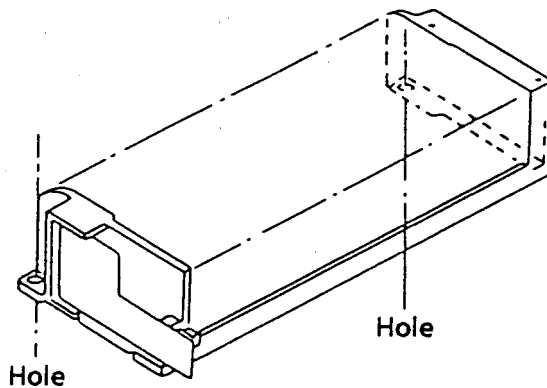


Figure 8-4 MTP201 and 401 Printers
(Back)

- ① When mounting with screws With the $\phi 2.2$ mm holes at the corners of the printer as a reference for positioning, fix the printer on the printer base by tightening the tapping screws from the top of the printer (see Figure 8-5).

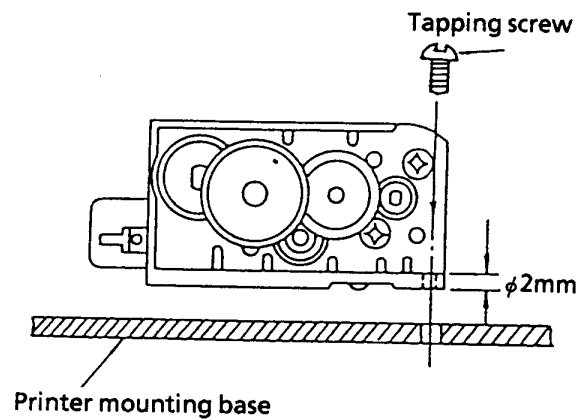


Figure 8-5 Mounting with Screws (MTP201 and 401 Printer)

- ② When mounting without screws With the $\phi 2.2$ mm holes as a reference for positioning, fix the printer by pressing the eaves on both sides of the upper portion of the printer.

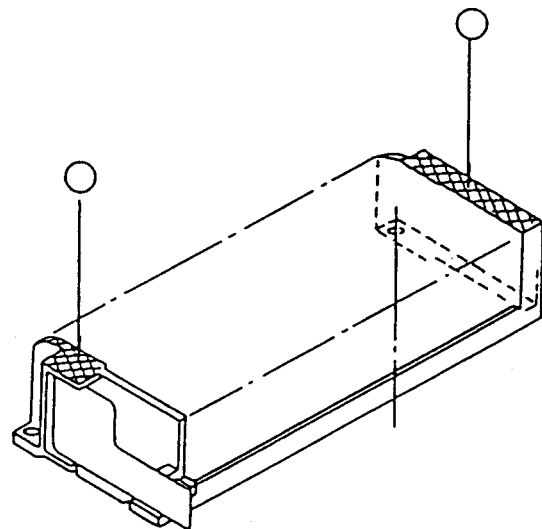


Figure 8-6 Mounting without Screws (MTP201 and 401 Printer)

8.2 MOUNTING THE PAPER CUTTER

Design the paper cutter so that the cutter tip is located over the paper outlet so that it does not interrupt the paper flow (see Figure 8-7).

Design any peripheral devices so that the paper does not re-enter the printer.

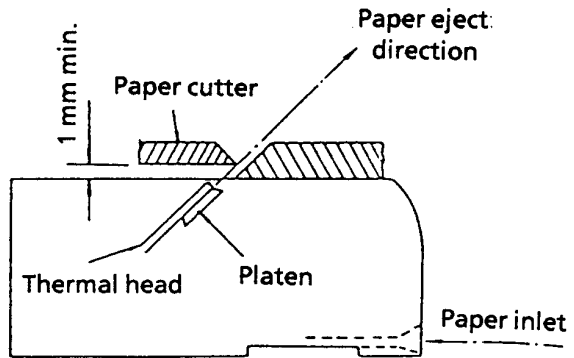
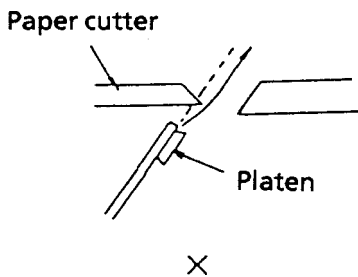


Figure 8-7 Mounting the Paper Cutter

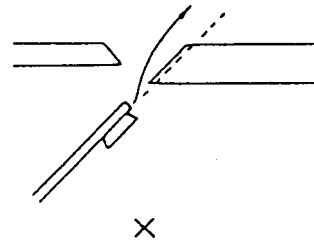
Examples of improper designs:



This type of design may cause improper contact between the platen and the thermal head leading to deterioration in the quality of the print.

Design conditions:

The paper-hold tension indicates the opposing force produced when the paper is pulled out through the outlet. It is expressed as "X g or more" in the specifications. As this is a specification for the printer, design the paper cutter so that paper must be cut with an opposing force of "X g or less".



This type of design may cause damage to the paper surface. Furthermore, it may apply excessive force on the thermal head when cutting the paper.

8.3 MOUNTING A ROLL HOLDER FOR HEAD SENSITIVE PAPER

Design the roll holder to the following specifications:

- 1) No sideways deviation between holder and inlet.
- 2) Less than 2mm between holder and the sides of the roll.
- 3) The holder does not touch the sides of the roll.
- 4) The horizontal axis of the roll in the holder is parallel with the inlet (see Figure 8-8).

Example of improper design:

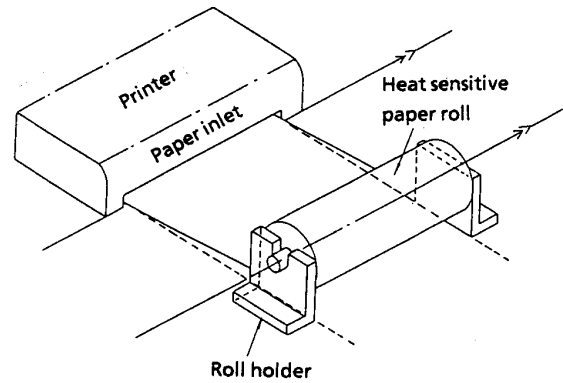
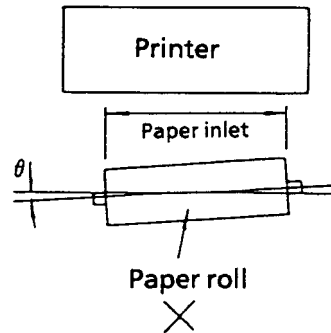
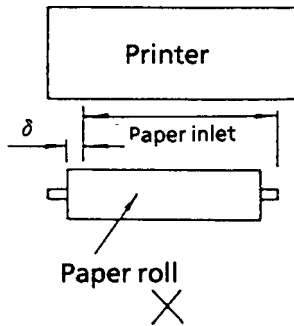


Figure 8-8 Mounting a Roll Holder for Heat Sensitive paper



- Roll without core
 - 1) The roll rolls easily.
 - 2) The roll remains securely in the holder.

Design conditions:

The paper feed tension is expressed as "X g or more" in the specifications. Since this is a specification for the printer feed, design the roll holder so that the paper tension is "X g or less".

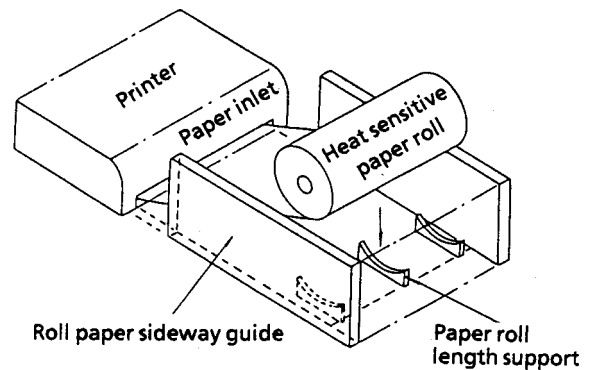


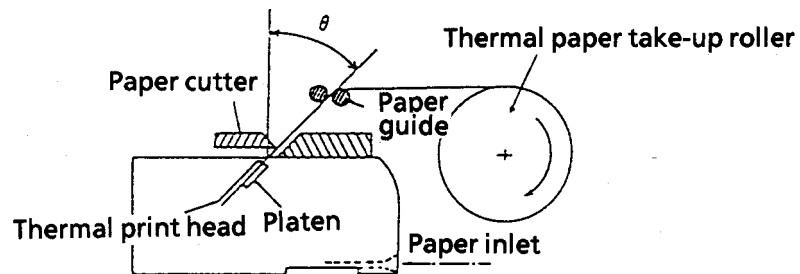
Figure 8-9 Roll without Core

8.4 THERMAL PAPER TAKE-UP DEVICE

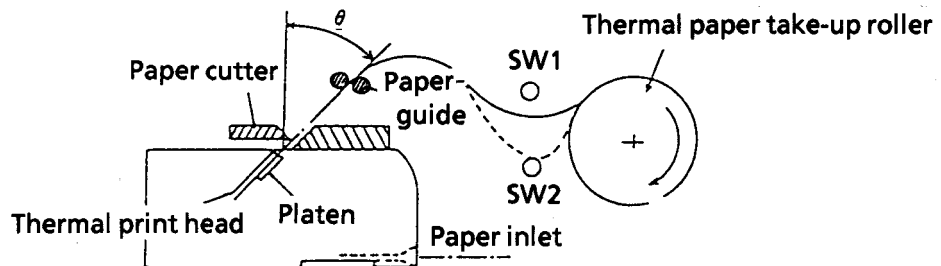
Take into consideration the following items when designing the thermal paper take-up device.

- 1) After printing, the paper must be taken up without being pulled taut.
- 2) Even when paper guides have attached as shown below, if the thermal paper is pulled taut, correct contact between the thermal head and the thermal paper can not be obtained and printing will be adversely affected.

<Improper thermal paper take-up device>



<Proper thermal paper take-up device>



Take-up roller operates when SW2 is ON.
Take-up roller stops when SW1 is ON.

8.5 FLEXIBLE CABLE

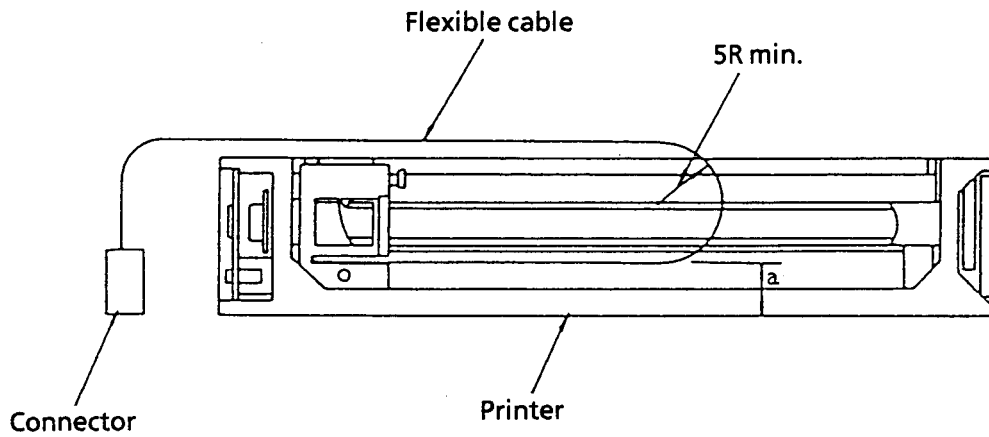
8.5.1 Connecting and Fixing the Flexible Cable Terminal

Use and FPC (Flexible Printed Circuit) connector to connect and fix the flexible cable terminal.

Refer to the external view of each printer for the mounting position of the FPC connector.

8.5.2 Bend Radius of Flexible Cable

Design the case of peripheral device to provide for a minimum radius of at least 5R (mm) at the point where the flexible cable bends.



Base Model	a (mm)
MTP 102	5.3
MTP 201	5.3
MTP 401	8.0

Figure 8-10 Bend Radius of Flexible Cable

8.6 REPLACEMENT OF HEAD UNIT

The head unit can be replaced on two of the models in the MTP Series: MTP401 and MTP402.

8.6.1 Removing Head Unit

- ① Move the head carrier to position A by turning the motor gear by hand to allow easy replacement of the head unit (see Figure 8-11).

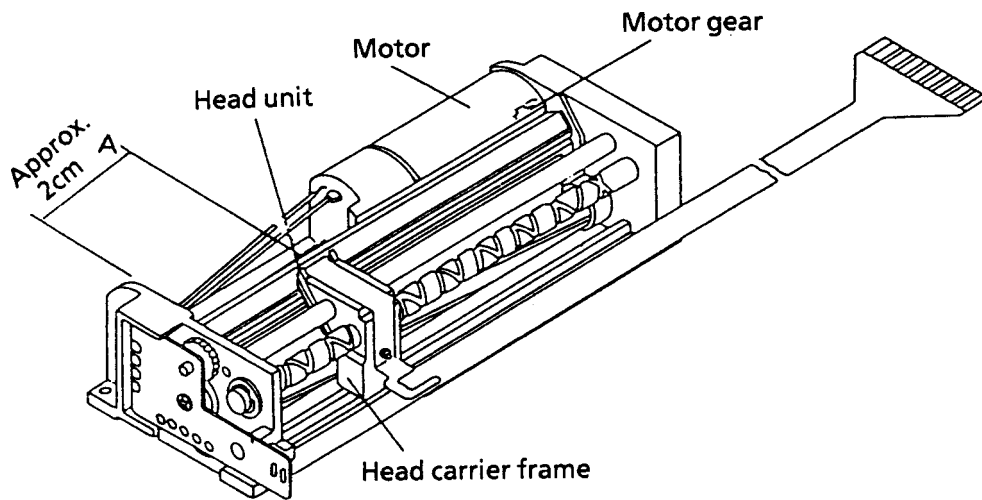


Figure 8-11 Moving the Head Carrier

- ② Remove the flexible lead wire from the cable support of the flexible cable plate. Take the adhesive off of the cable support with tweezers.

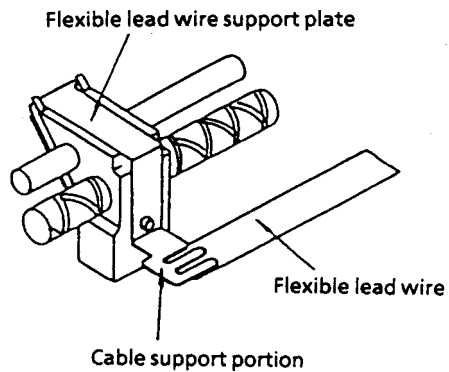


Figure 8-12 Removing the Flexible Lead Wire

- ③ Pull out the flexible cable plate in the direction shown by arrow A holding the edge of the plate with a finger, then disengage the plate from the dowel of the head carrier (see Figure 8-13).

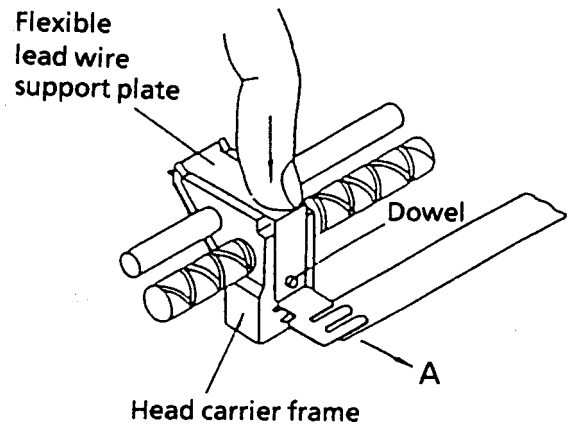


Figure 8-13 Pulling out the Flexible Cable Plate

- ④ Holding both sides of the head unit with your fingers, pull out the head unit in the direction shown by arrow B (see Figure 8-14).

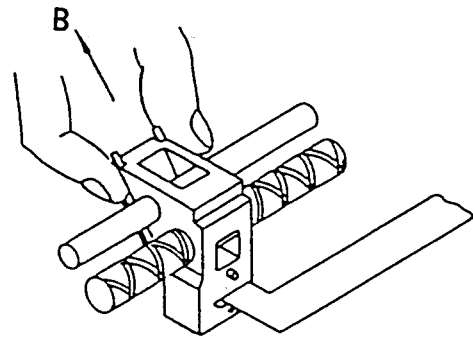


Figure 8-14 Pulling Out the Head Unit

8.6.2 MOUNTING THE HEAD UNIT

- ① Move the head carrier to a position that permits easy replacement (see Figure 8-15).
- ② Insert the head unit terminal between the platen and the guide pin and head feeding screw with the soldered surface of the head unit terminal upwards (see Figure 8-15). Holding the solder-plated face upward, insert the head unit terminal so that it passes in front of the platen and under the guide pin and the head feed screw.

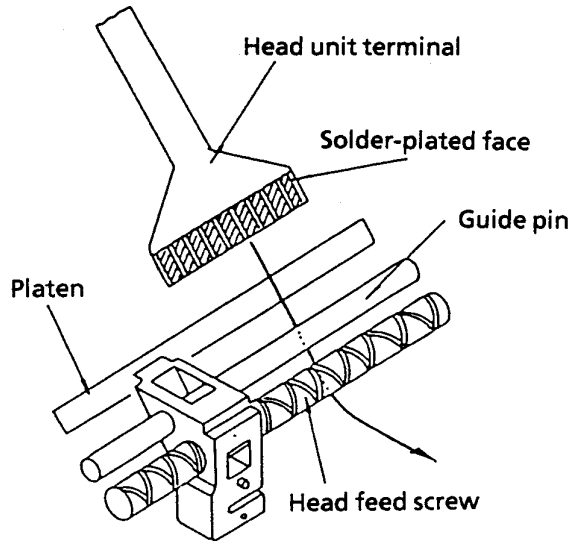


Figure 8-15 Inserting the Head Unit Terminal

- ③ After inserting the head unit terminal, arrange the components as shown in Figure 8-16. Then, rotate the head portion of the unit by 90° into the position shown in Figure 8-13.

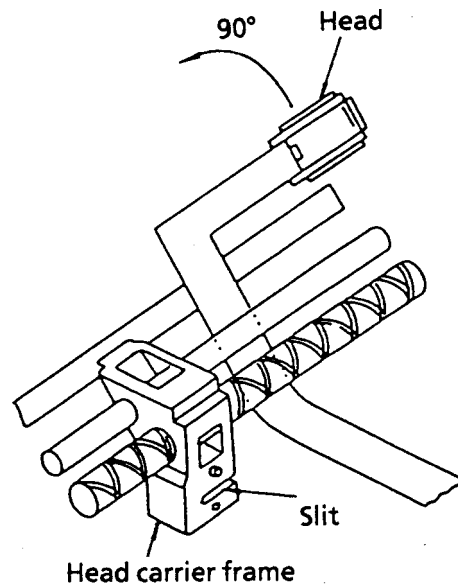


Figure 8-16 Rotating the Head Portion of the Unit

- ④ Slide the head unit terminal cable into the slit provided on the head carrier.
Next, slide the head along the guide of the head carrier until it touches the guide (see Figure 8-17).

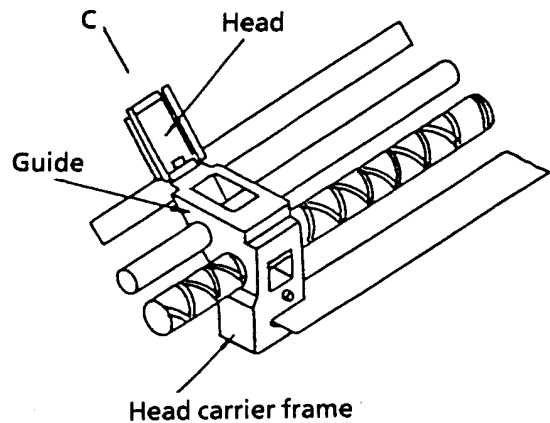


Figure 8-17 Sliding the Head along the Guide of the Head Carrier

- ⑤ Latch the flexible cable plate to the claws of the head and push it down until engages with the dowel on the head carrier.

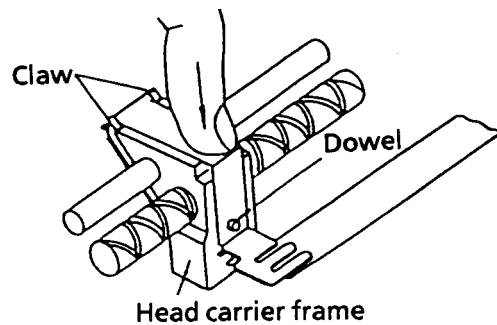


Figure 8-18 Pushing the Flexible Cable Plate

- ⑥ Insert the flexible cable into the cable support of the flexible cable plate with care not to bend the heat compressor of the head unit (see Figure 8-19).

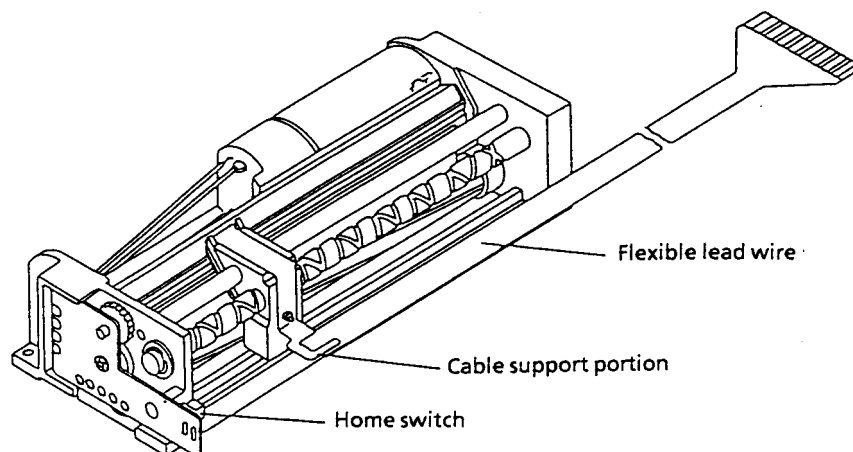


Figure 8-19 Inserting the Flexible Cable

- ⑦ Return the head carrier to the home position (home switch side).

