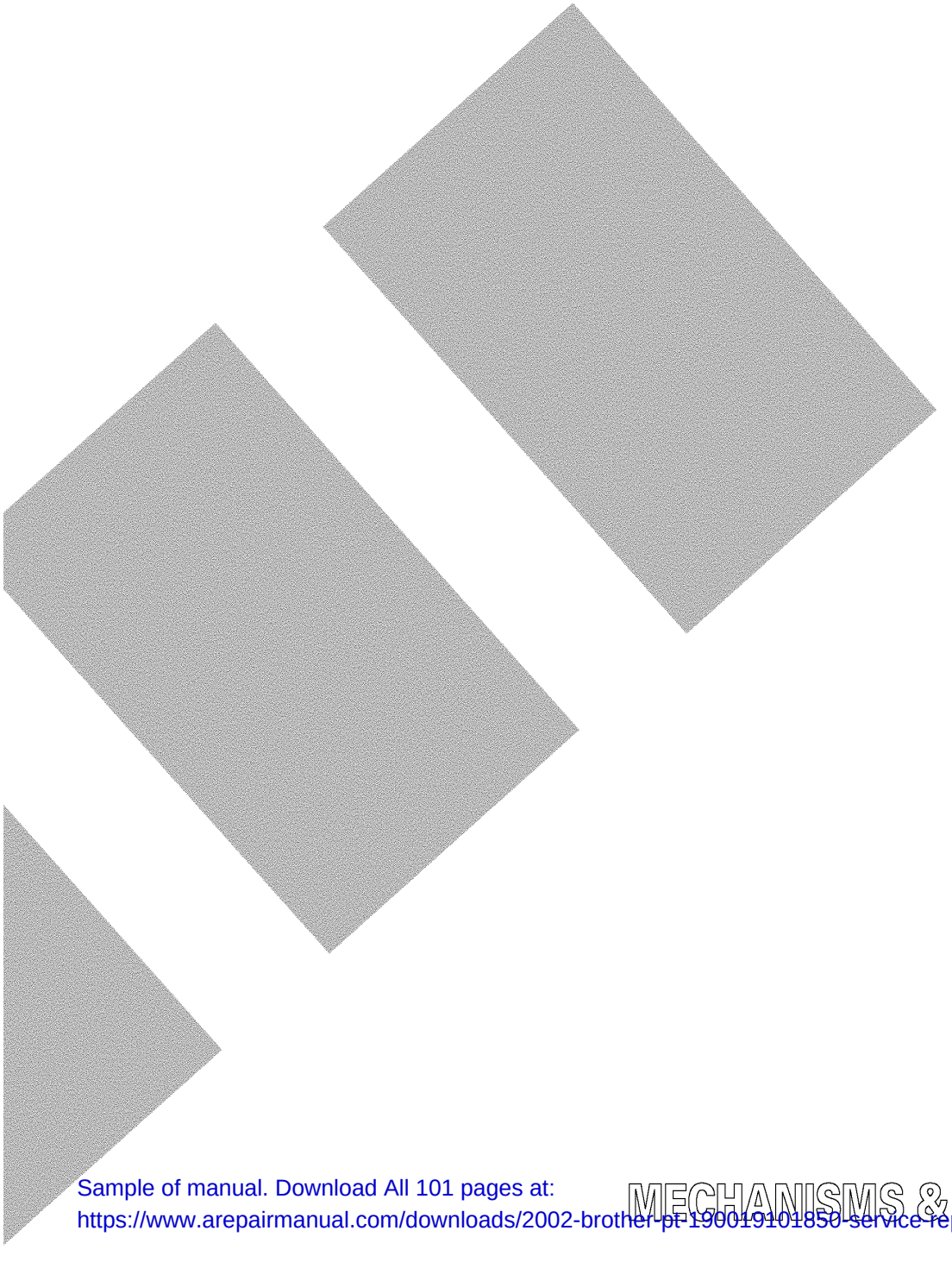
brother®

SERVICE MANUAL

MODEL: PT-1900/1910/1850



MECHANISMS & ELECTRONICS

PREFACE

This publication is a service manual covering the specifications, general mechanisms, disassembly/reassembly procedure, and troubleshooting and error message of the Brother PT-1900/1910/1850. It is intended for service personnel and other concerned persons to accurately and quickly provide after-sale service for our PT-1900/1910/1850.

To perform appropriate maintenance so that the machine is always in best condition for the customer, the service personnel must adequately understand and apply this manual.

This manual is made up of four chapters and appendices.

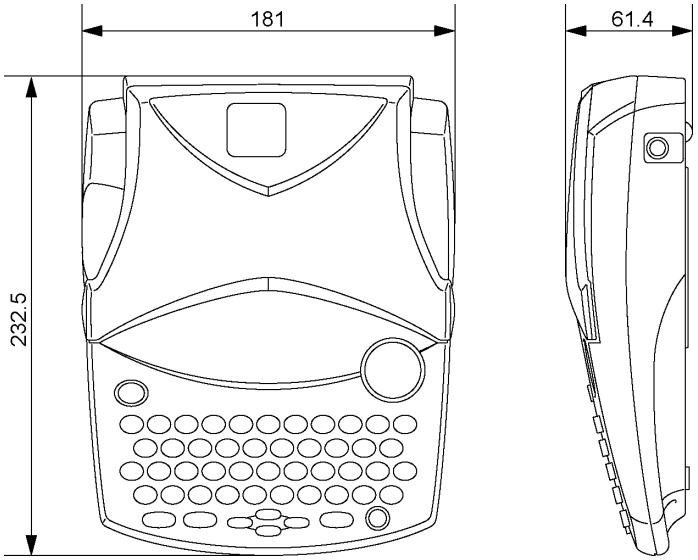
CONTENTS

CHAPTER I SPECIFICATIONS

1.1 MECHANICAL SPECIFICATIONS

1.1.1 External Appearance

(PT-1900/1910)



(PT-1850)

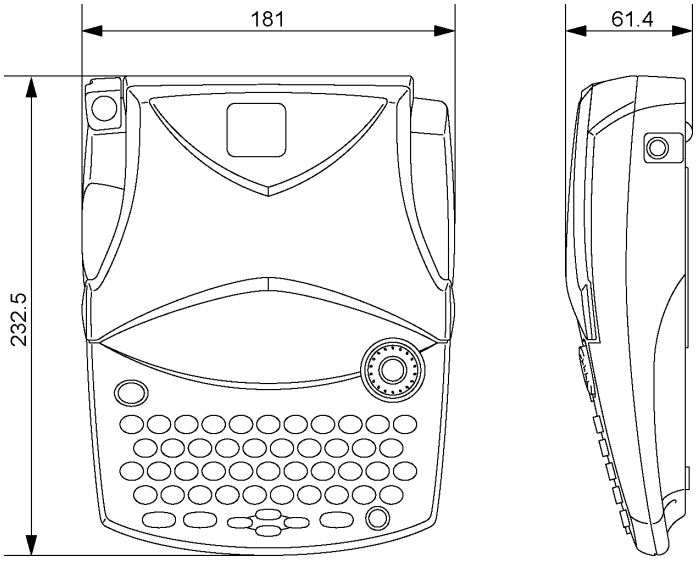


Fig. 1.1-1 PT-1900/1850

(1)	Dimensions (W x D x H)	181 x 232.5 x 61.4 mm (7.13" x 9.15" x 2.42")
(2)	Weight	
	Machine proper	Approx. 800 g
	In package	Approx. 1.31 kg (PT-1900 (U.S.A./AUS))
		Approx. 1.35 kg (PT-1900 (CANADA)/1850)
		Approx. 2.7 kg (PT-1910/1850cc)
		(including batteries, a tape cassette, and user's manual)

1.1.2 Keyboard

(1)	Entry system	Rubber key pad
(2)	Number of alphanumeric and symbol keys	39
(3)	Number of function keys	12 (including “On/Off (⏻) ” key)
(4)	Key arrangement	See Fig. 1.1-2.
(5)	Navigation dial (PT-1850)	Rotary switch : 24 positions / cycle Set key : 1

1.1.3 Display

(1)	Display type	Liquid crystal display (LCD)
(2)	Display composition	16 x 59 dots
(3)	Number of indicators	20 (See Fig. 1.1-2.)
(4)	Dot size	0.65 mm(25.6 mils) wide by 0.65 mm(25.6 mils) high
(5)	Field-of-view angle adjustment	Fixed by a resistor

1.1.4 Printing Mechanism

(1)	Print method	Thermal transfer onto plastic tapes (laminate tape and non-laminated tape) or special tapes (instant lettering tape, non-laminated thermal film tape, iron-on transfer tape, and porous-stamp tape) (Fixed print head and tape feeding mechanism)
(2)	Print speed	10 mm/second (Typical)
(3)	Print head	
	Type	Thermal print head
	Heat generator	Consists of 112 heating elements vertically aligned (PT-1850 : 128 heating elements)
	Size of heating element	0.195 mm (7.7 mils) wide by 0.141 mm (5.6 mils) high

(4) Character size

Character size	Height x Width (dots)
Size 6	1.55 mm x 1.13 mm (11 x 8)
Size 9	1.97 mm x 1.41 mm (14 x 10)
Size 12	2.82 mm x 2.12 mm (20 x 15)
Size 18	4.51 mm x 3.38 mm (32 x 24)
Size 24	5.92 mm x 4.37 mm (42 x 31)
Big <12 mm>	7.61 mm x 5.64 mm (54x 40)
Size 36	9.02 mm x 6.77 mm (64 x 48)
Size 42	10.72 mm x 8.04 mm (76 x 57)
Big <18 mm>	13.54 mm x 10.30 mm (96 x 73)

* The height and width of the printed character are different depending on characters. The values in the above list refer to the values of ‘H’ of HELSINKI.

* The character size indicates the point size.

1.1.5 Tape Cassette

(1) Cassette — Cartridge type

(2) Types of tape cassettes

- Laminated tape cassette — Laminate tape, ink ribbon, and adhesive base tape
- Non-laminated tape cassette — Non-laminate tape and ink ribbon
- Instant lettering tape cassette — Instant lettering tape and ink ribbon
- Non-laminated thermal film tape cassette — Non-laminated thermal film tape
- Iron-on transfer tape cassette — Iron-on transfer tape and ink ribbon
- Stamp tape cassette — Porous-stamp tape and base paper
- Cloth tape cassette — Cloth tape and ink ribbon

(3) Tape size

	Width	Length
Laminate tape	6, 9, 12, 18 mm	8 m (5 m for the fluorescent coating tape)
Non-laminate tape	6, 9, 12, 18 mm	8 m
Iron-on transfer tape	18 mm	6 m
Porous-stamp tape	18 mm	3 m
Cloth tape	12 mm	4 m
Cleaning tape	18 mm	

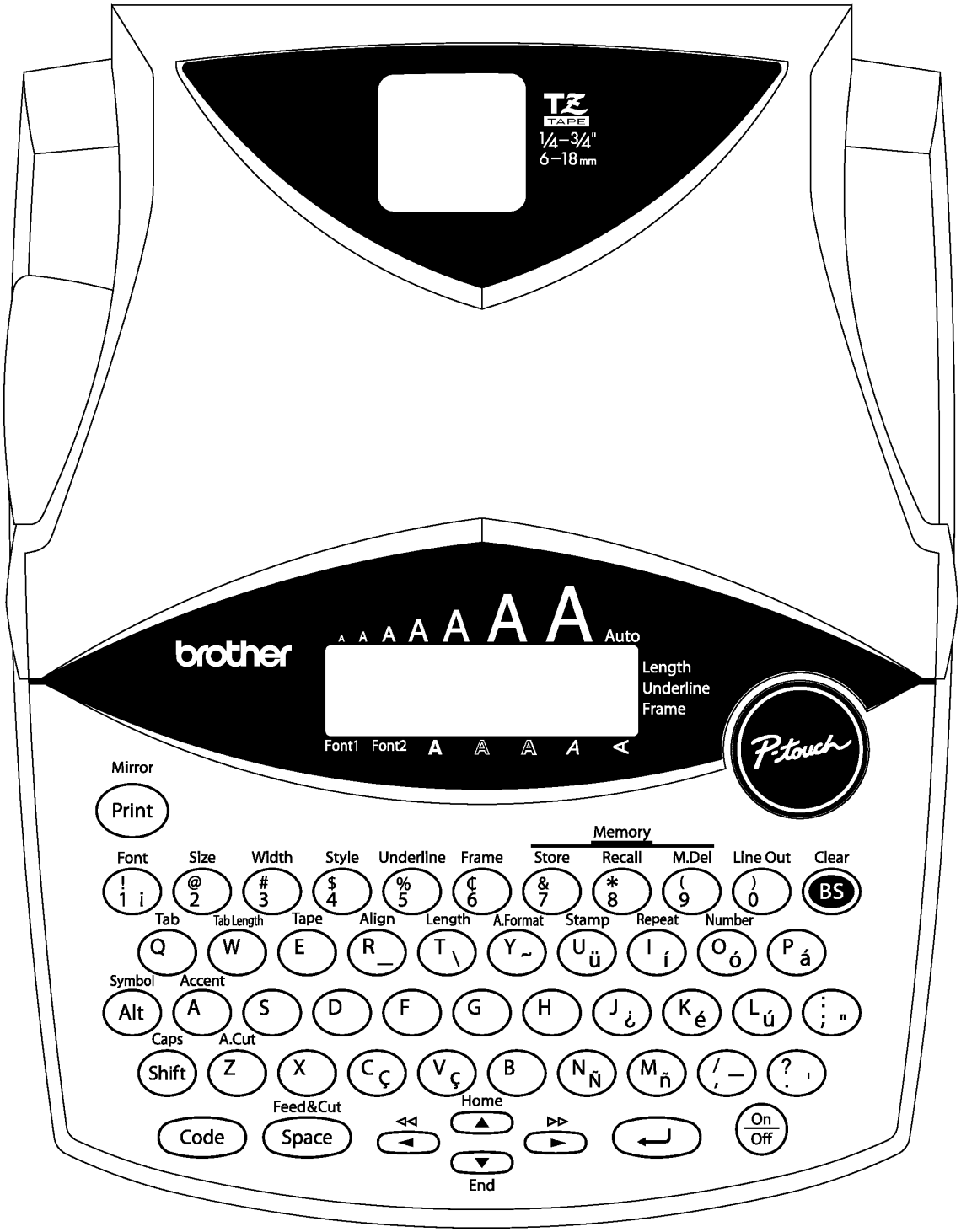
(4) Tape cassette packed with the machine

Laminated tape cassette containing a 12-mm-wide black ink ribbon, laminate tape, and adhesive base tape

1.1.6 Tape Cutter

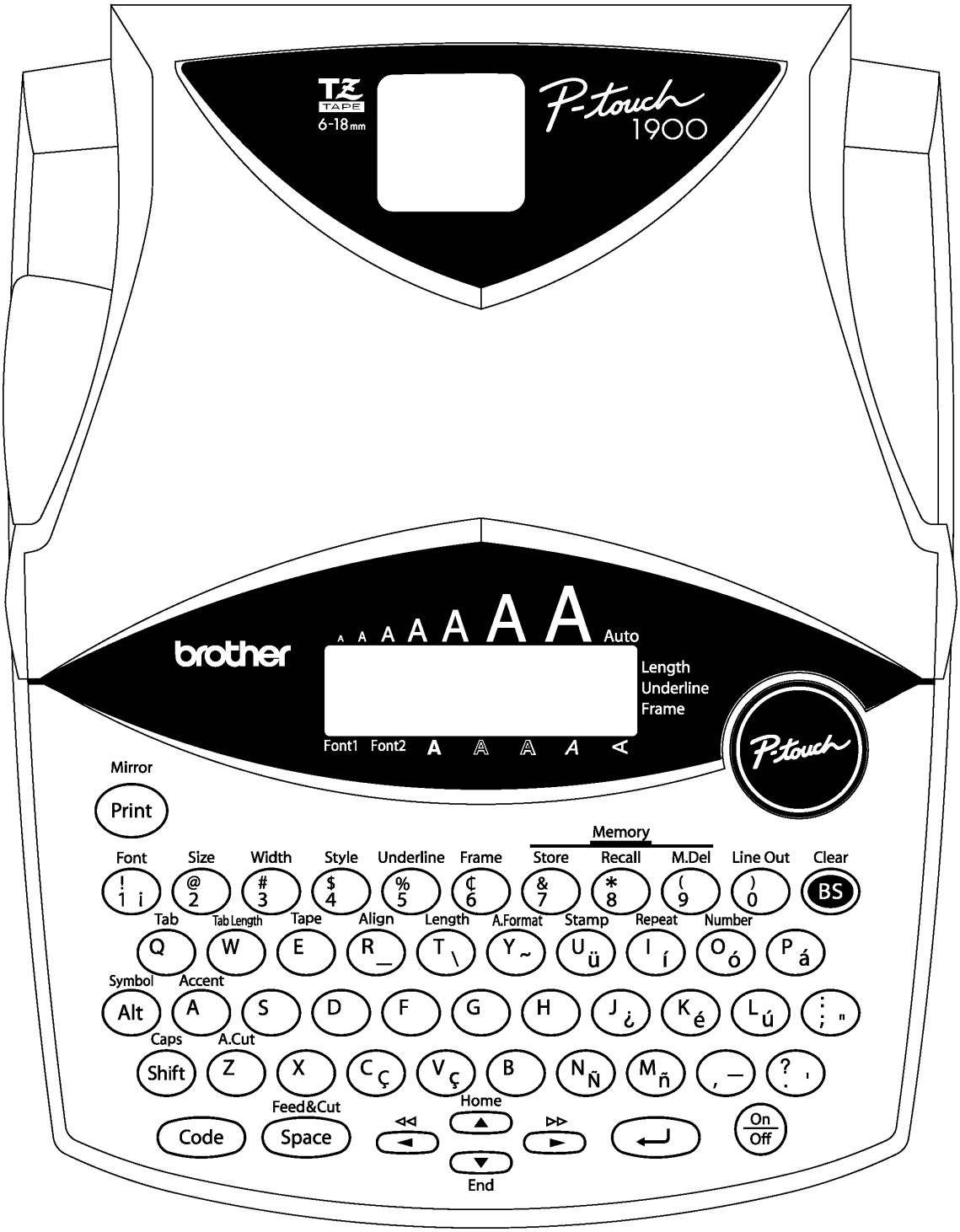
(1) Tape cutting — Automatic cutter (scissors type) (PT-1900/PT1910)
Manual cutter (scissors type) (PT-1850)

(2) Cutter unit — Not user-replaceable



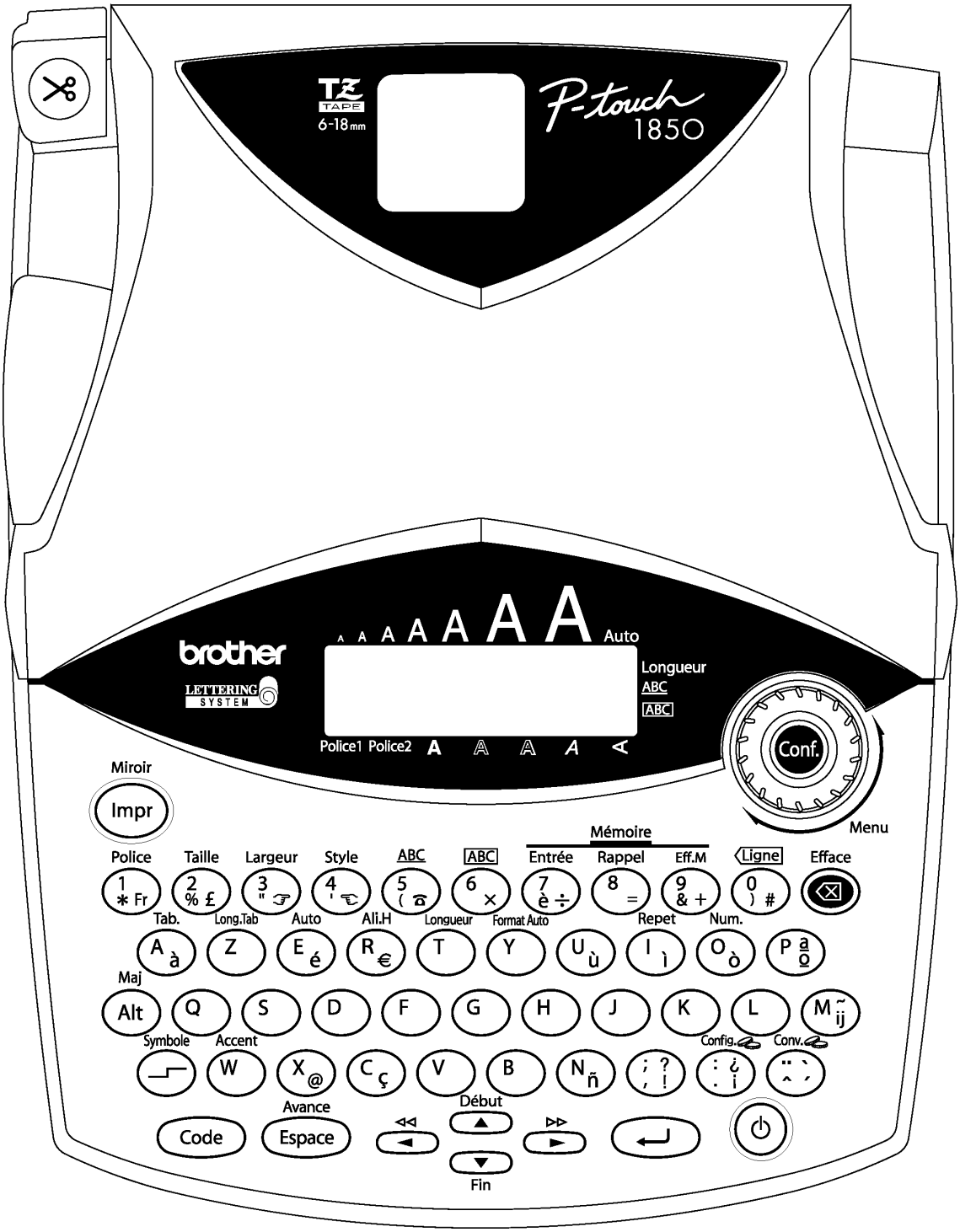
PT-1900 U.S.A. / CANADA
PT-1910 U.S.A.

Fig. 1.1-2 Key Arrangement (1)



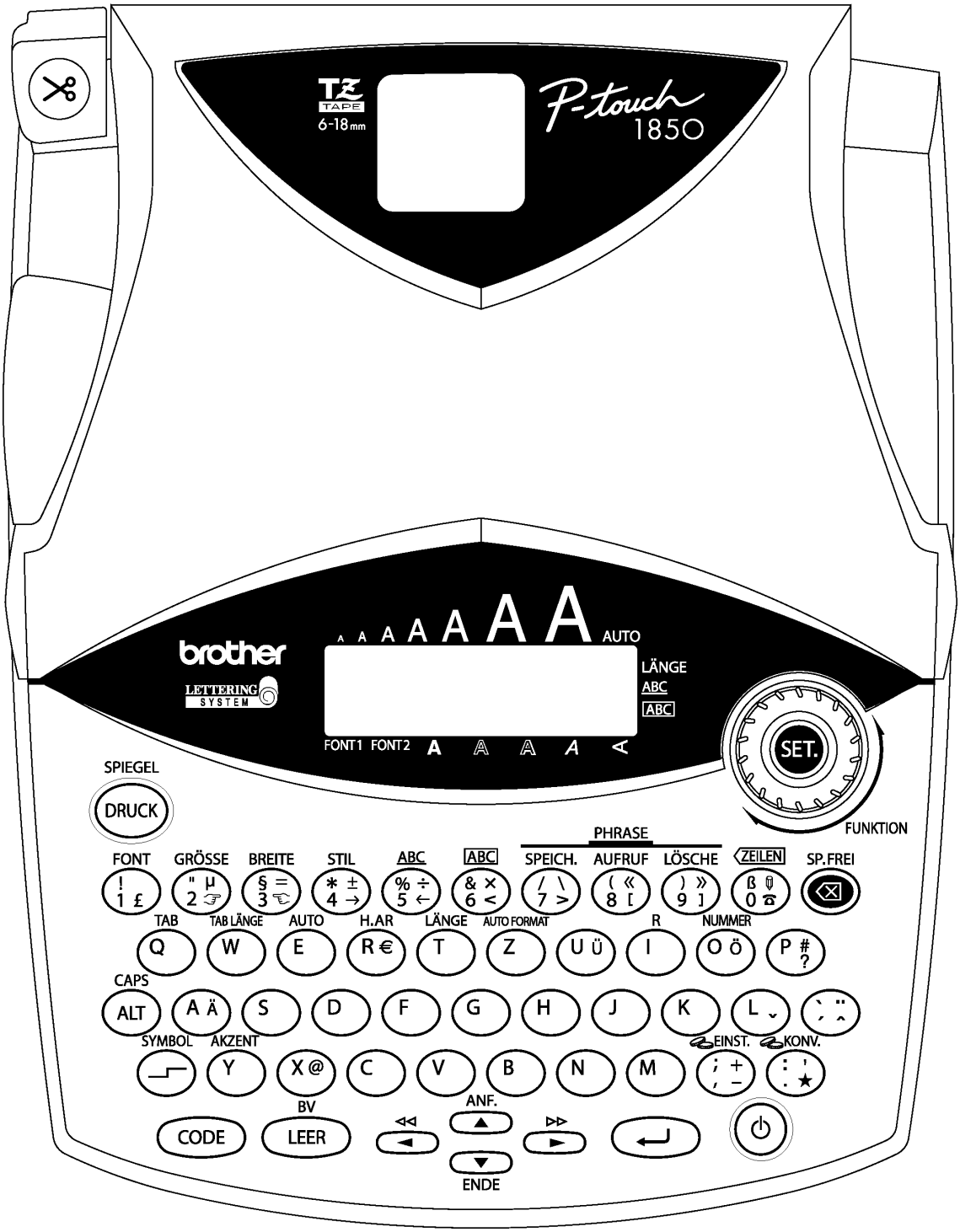
PT-1900 AUSTRALIA

Fig. 1.1-2 Key Arrangement (2)



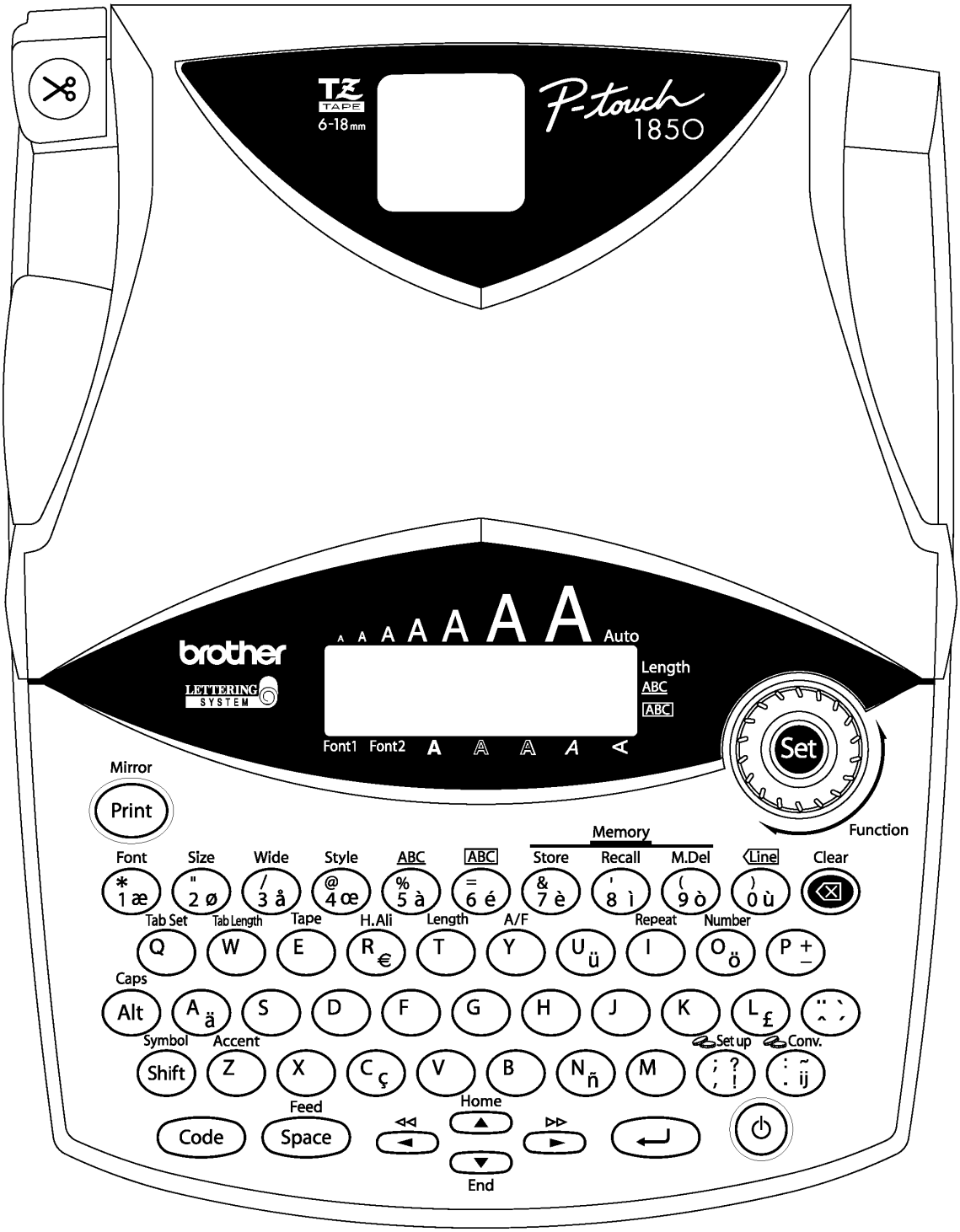
PT-1850 FRENCH

Fig. 1.1-2 Key Arrangement (3)



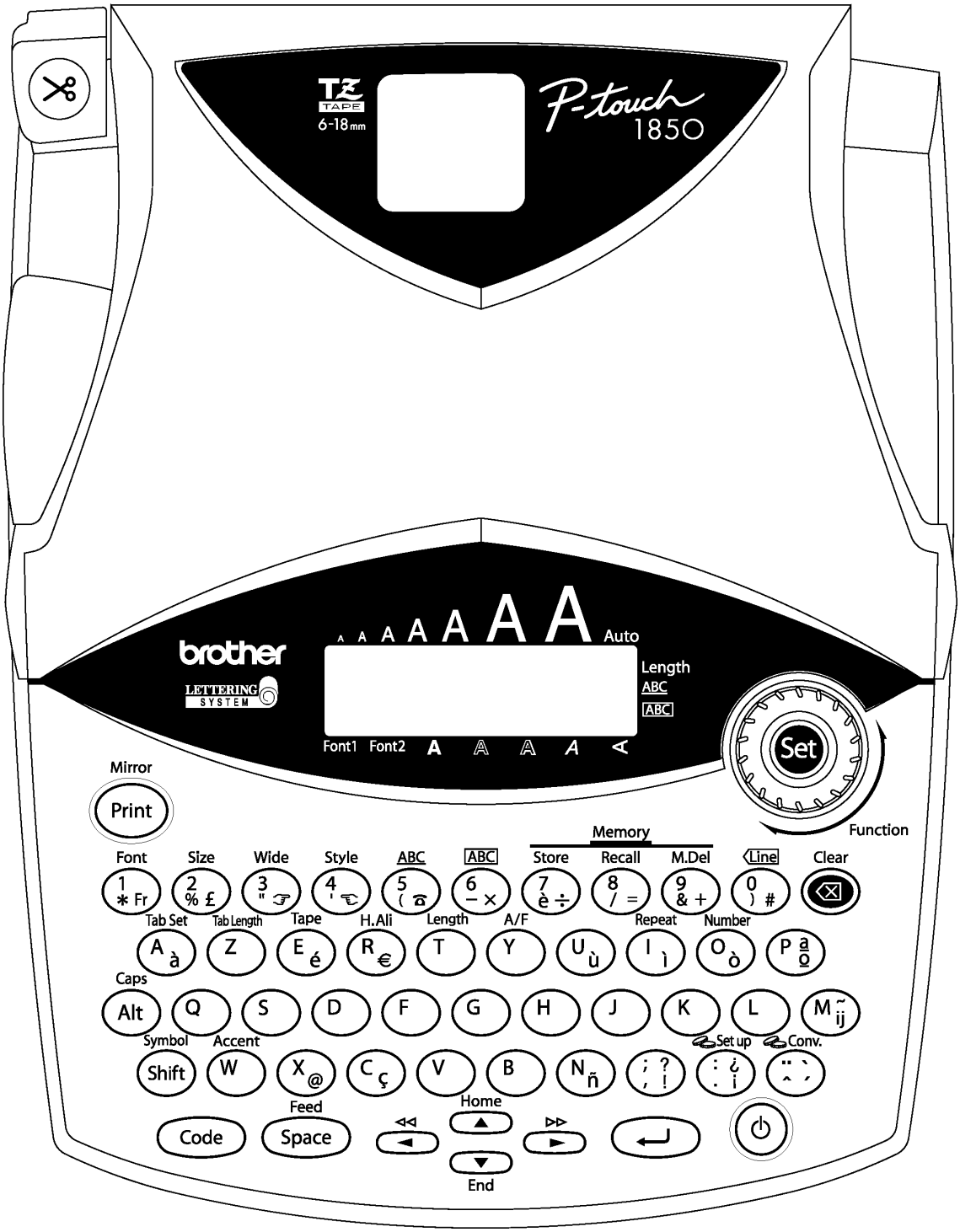
PT-1850 GERMAN

Fig. 1.1-2 Key Arrangement (4)



PT-1850 U.K.

Fig. 1.1-2 Key Arrangement (5)



PT-1850 BELGIUM

Fig. 1.1-2 Key Arrangement (6)

1.2 ELECTRONICS SPECIFICATIONS

1.2.1 Character Generator

(1)	Internal characters	U.S.A./CAN (PT-1900/1910)	179 characters
		U.K./ FRA/ BEL (PT-1850)	198 characters
		GER (PT-1850)	211 characters
(2)	Internal font	HELSINKI, BRUSSELS	
(3)	Internal memory	Text buffer	99 characters (PT-1900/1910/1850)
		File memory	300 characters (PT-1900/1910/1850)

1.2.2 Power Supply

(1)	Automatic power off	Yes
		Normal mode : 5 min. ± 30 sec.

1.3 KEY COMMANDS FOR SPECIAL FUNCTIONS

1.3.1 Initializing

Powering on the machine with both the Code and R keys held down will initialize the machine.

1.3.2 Demonstration Print

Pressing the D key with the Code key held down will start demonstration print. (This key command takes effect only when no data is entered.)

CHAPTER II GENERAL MECHANISMS

2.1 MAIN MECHANISM

2.1.1 Print Mechanism

(1) Structure of Thermal Head

This machine uses thermal transfer printing. The thermal print head has a heat generator consisting of 112 heating elements which are vertically aligned as shown in Fig. 2.1-1. Each heating element is 0.195 mm wide by 0.141 mm high.

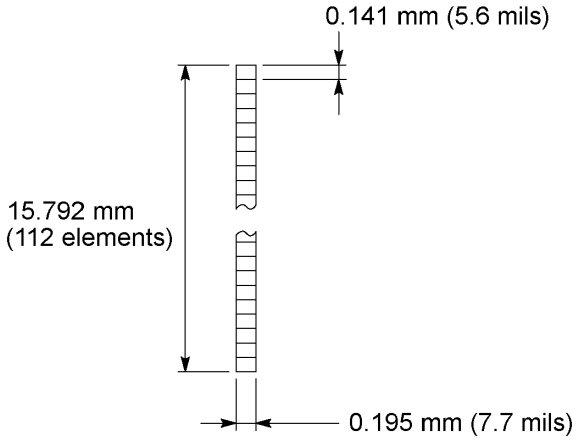


Fig. 2.1-1 Heat Generator of Thermal Head

(2) Printing Process

When the cylindrical rubber platen is pressed against the thermal print head with the tape* and ink ribbon** sandwiched inbetween, the CPU applies electric power to the selected ones of those 112 heating elements.

* Laminate tape when using laminated tape cassettes.
Non-laminated tape when using non-laminated tape cassettes.
Instant lettering tape when using instant lettering tape cassettes.
Non-laminated thermal film tape when using non-laminated thermal film tape cassettes.
Iron-on transfer tape when using iron-on transfer tape cassettes.
Cloth tape when using cloth tape cassettes.

** When using non-laminated thermal film tape cassettes or stamp tape cassettes, no ink ribbon is sandwiched.

[For tape cassettes except non-laminated thermal film tape cassettes and stamp tape cassettes]

If the selected heating element(s) generates heat, the ink on the sandwiched ribbon will be melted and transferred to the tape, producing a dot(s) on the tape. The ink ribbon and the tape are advanced and then the next heating cycle is repeated, thus forming a character on the tape.

[For non-laminated thermal film tape cassettes]

If the selected heating element(s) generates heat, the thermal film tape develops itself to produce a dot on the tape. The tape is advanced and the next heating cycle is repeated, thus forming a character on the tape.

[For stamp tape cassettes]

If the selected heating element(s) generates heat, the porous-stamp tape will be melted so that a pore (pores) will be formed in the tape. The tape is advanced and the next heating cycle is repeated, thus forming a character of pores on the tape. The printed stamp tape can be used as the face of a stamp. When the stamp is pressed against the ink-pad, it will absorb ink through the pores.

For laminated tape cassettes, instant lettering tape cassettes, and iron-on transfer tape cassettes, the CPU processes the print data to generate a mirror image so that the printed character can be seen normally when viewed from the other side of the printed face of the tape.

(3) Character Formation

While the DC motor feeds the tape and ink ribbon (only the tape when using non-laminated thermal film tape cassettes or stamp tape cassettes) by 0.141 mm, the thermal head generates heat once. The feed amount is decided by sending each five pulses of the signal as one dot (0.141 mm) when the photo interrupter detects the encode gear assembled onto the motor shaft. The feed amount of 0.141 mm is smaller than the width (0.195 mm) of the heating elements so that the heat generated at one heating cycle will overlap with the next heating cycle. This forms a character having no gap between adjacent printed dots.

2.1.2 Roller Holder ASSY Setting & Retracting Mechanism

This mechanism consists of the roller release lever, roller holder release rod, and roller holder ASSY.

The roller holder ASSY supports the platen and the tape feed sub roller so that they can move perpendicularly to the head ASSY and the tape feed roller, respectively, as well as rotating freely.

Loading a tape cassette and closing the cassette cover pushes down the roller release lever which moves the roller holder release rod to the left (when viewed from the front of the machine). This pivots the roller holder ASSY around the shaft provided on the chassis so as to press the roller holder ASSY against the head ASSY side.

The platen is pressed perpendicularly against the head ASSY with the tape and ink ribbon (only the tape when using non-laminated thermal film tape cassettes or stamp tape cassettes) sandwiched inbetween under a uniform load by the platen (upper and lower) spring.

At the same time, the platen gear becomes engaged with the platen idle gear.

Also, the tape feed sub roller is pressed perpendicularly against the tape feed roller built in the tape cassette with the tape (and base paper when using laminated tape cassettes or stamp tape cassettes) sandwiched inbetween under a uniform load by the roller holder upper spring and roller holder lower spring. At the same time, the sub roller gear becomes engaged with the tape idle gear.

If you open the cassette cover, the roller release lever pops up, which shifts the roller holder release rod so that the roller holder ASSY is retracted from the head ASSY, providing you with enough space to replace the tape cassette.

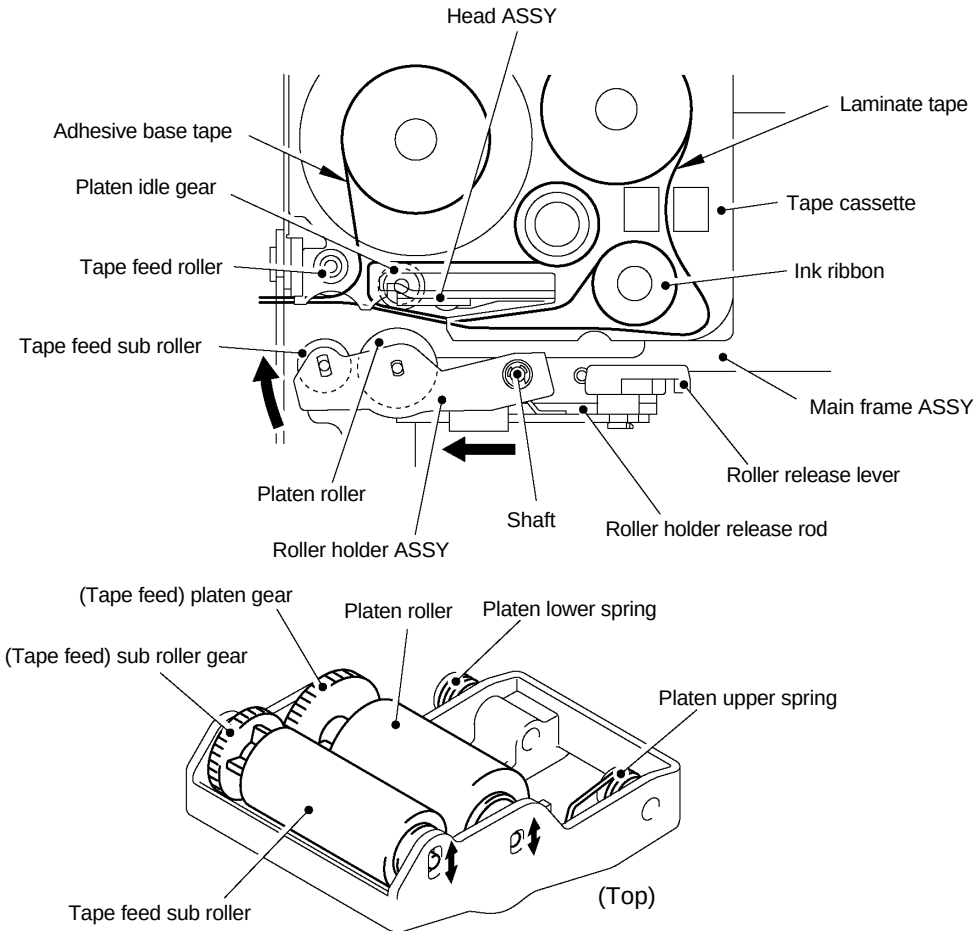


Fig. 2.1-2 Roller Holder ASSY Setting & Retracting Mechanism

2.1.3 Tape & Ribbon Feed Mechanism

This mechanism consists of a DC motor, gear train, and roller holder ASSY.

(1) Tape Feeding

When you load a tape cassette and close the cassette cover, the tape feed roller inside the cassette and the tape feed sub roller in the roller holder ASSY sandwich the tape (the laminate tape and adhesive base tape when using laminated tape cassettes) inbetween, as described in Subsection 2.1.2.

As the DC motor rotates, the rotation is transmitted via the gear train to the tape idle gear (which rotates the tape feed sub roller gear) and the platen idle gear (which rotates the tape feed platen gear). Accordingly, the sandwiched tape and ink ribbon will be advanced. (When a laminated tape cassette is mounted, the sandwiched laminate tape and adhesive base tape and ink ribbon will be advanced together.)

The feeding amount of the platen is slighty less than that of the tape feed sub roller.

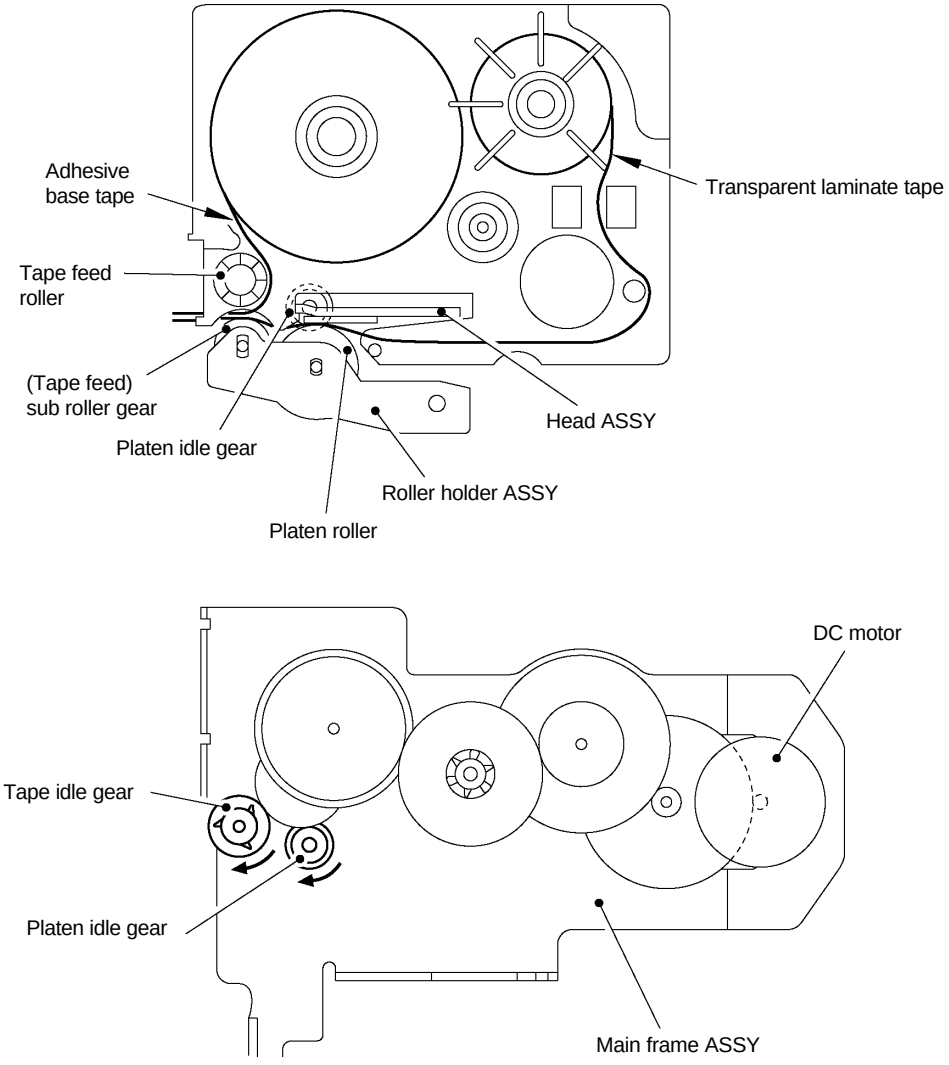


Fig. 2.1-3 Tape Feeding Mechanism

(2) Adhesive Base Tape Feeding (only for laminated tape cassettes)

A laminated tape cassette contains both a transparent laminate tape roll and a separate adhesive base tape roll.

When a transparent laminate tape and an adhesive base tape pass through the contact point (between the tape feed roller and tape feed sub roller), they are then bonded together into a single, printed tape. The ink printed on the laminate tape is, therefore, sealed up with the adhesive base tape.

(3) Ink Ribbon Feeding (except for non-laminated thermal film tape cassettes and stamp tape cassettes)

As the DC motor rotates, the ribbon drive cam located at the middle of the gear train rotates counterclockwise. When fitted on the ribbon drive cam, the ribbon take-up roll in the tape cassette also rotates to take up the ink ribbon.

To apply proper tension to the ink ribbon between the platen and the ribbon drive cam, the feed amount of the ribbon drive cam is slightly greater than that of the tape feed gear. The difference between the tape feed speeds at the platen and at the ribbon drive cam is absorbed by the clutch spring which is integrated in the ribbon drive cam and allows the cam to slip.

This way, the ink ribbon is kept tense, which enables the ribbon to clearly separate from the tape at the stabilized angle after printing.

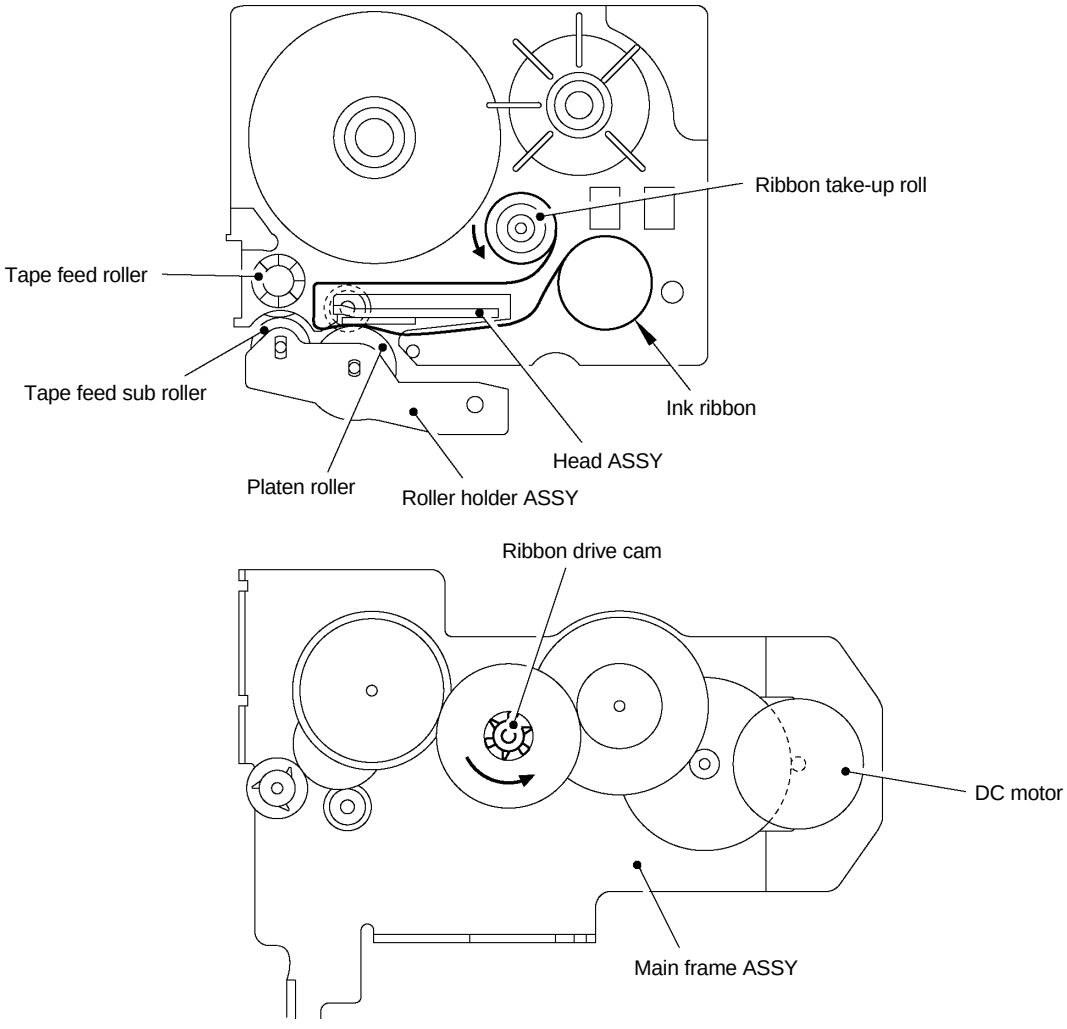


Fig. 2.1-4 Ribbon Feeding Mechanism

2.1.4 Automatic Tape Cutter Mechanism (PT-1900/1910)

The cutter ASSY consists of a stationary blade and a movable blade driven by the cutter motor.

Upon completion of printing and tape feeding, the CPU activates the cutter motor whose clockwise rotation is transmitted via the idle gears to the cutter moving gear.

As the cutter moving gear rotates counterclockwise, its boss "X" (which is fitted in the opening of the movable blade) actuates the movable blade to pivot it around shaft "Y." Consequently, the cutter cuts the printed tape routing through the movable and stationary blades, just like a scissors.

After that, the CPU keeps the cutter motor on. When the movable blade comes back to the home position, its end "Z" activates the cutter sensor actuator which presses the cutter sensor. The moment the CPU receives the sensor signal, it stops the cutter motor.

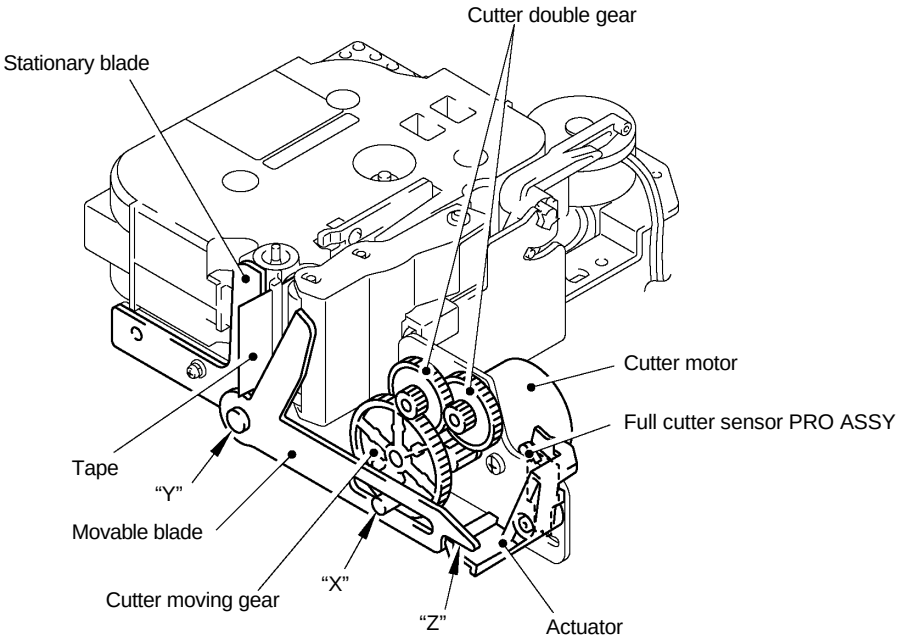


Fig. 2.1-5 Automatic Tape Cutter Mechanism (PT-1900/1910)

2.1.5 Tape Cutter Mechanism (PT-1850)

The cutter unit consists of a stationary cutter and a movable cutter.

Pressing the cutter lever actuates the movable cutter so that the cutter cuts the printed tape routing through the movable and stationary cutters, just like a scissors. Attached to the cutter lever, the cutter sensor arm turns up so that its tip comes into contact with the switch of the cutter sensor circuit on the cutter sensor holder ASSY, stopping printing and tape feeding.

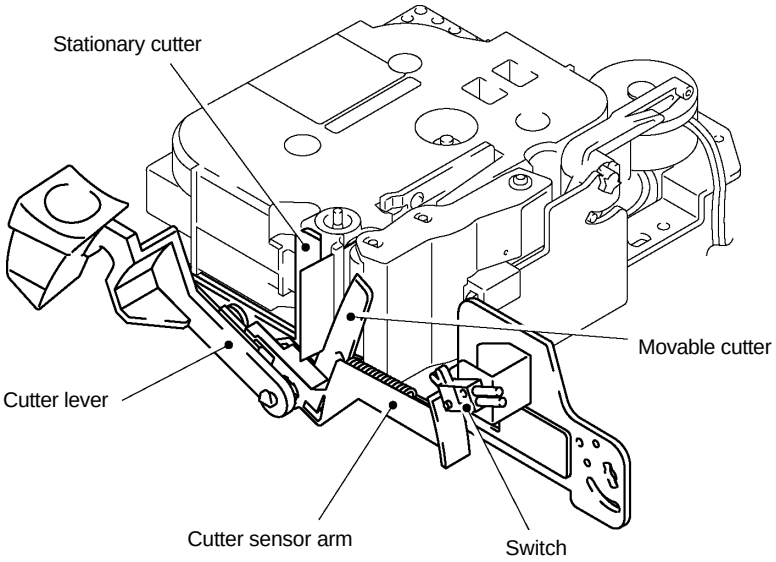


Fig. 2.1-6 Tape Cutter Mechanism (PT-1850)

2.1.6 Roller Holder ASSY & Cassette Cover Interlocking Mechanism

Closing the cassette cover pushes down the roller release lever and brings the top of the lever into the hooked section provided on the inside of the cassette cover.

As described in Subsection 2.1.2 “Roller Holder ASSY Setting & Retracting Mechanism”, the roller release lever shifts the roller holder release rod so that the roller holder ASSY is pressed towards the head ASSY side.

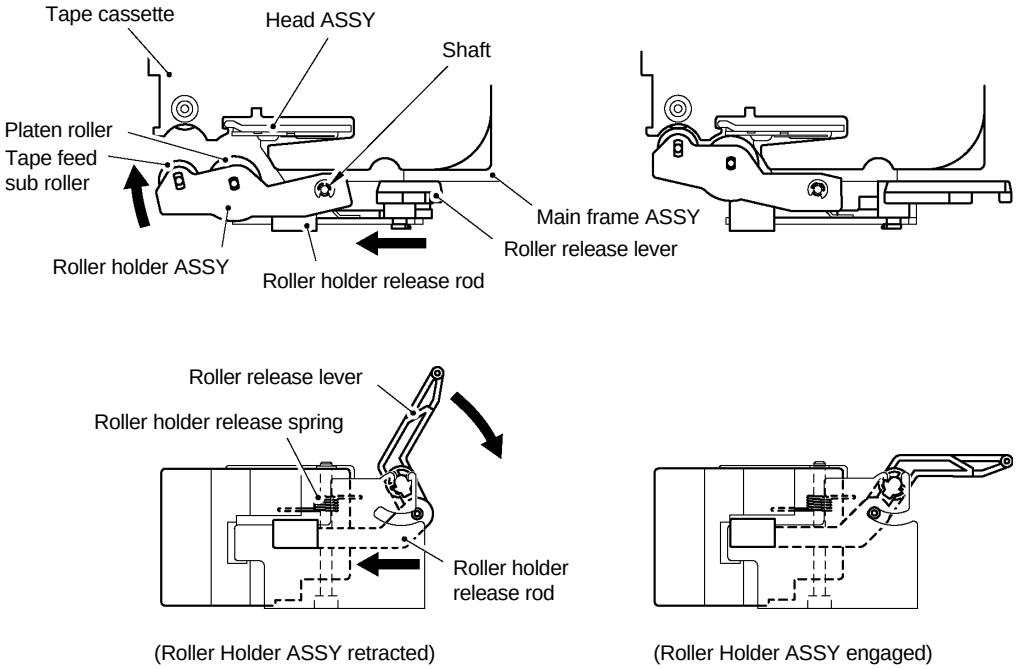
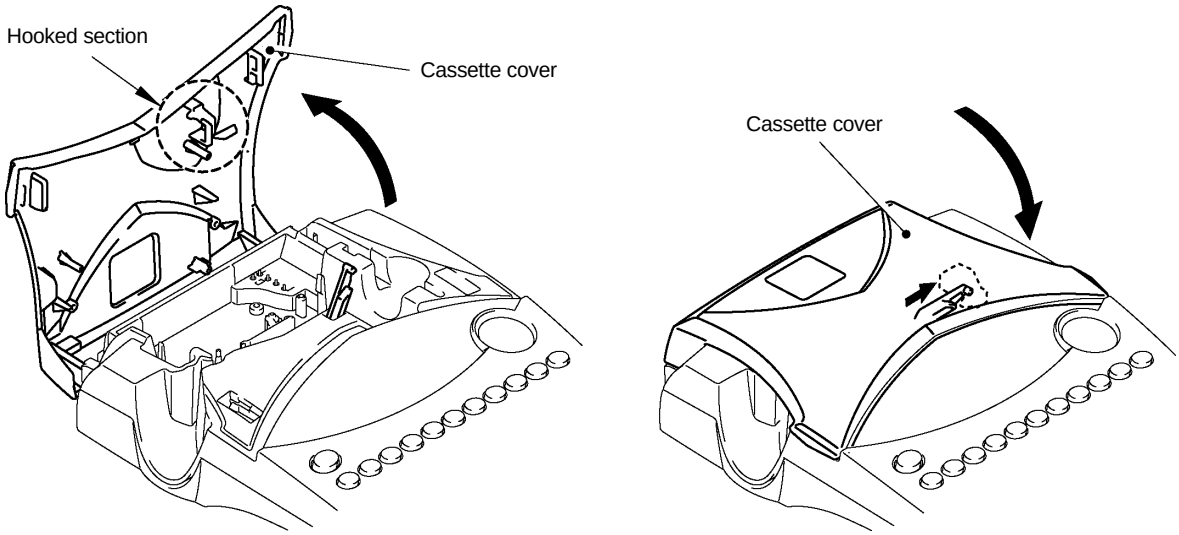


Fig. 2.1-7 Roller Release Lever and Roller Holder Release Rod

(PT-1900/1910)



(PT-1850)

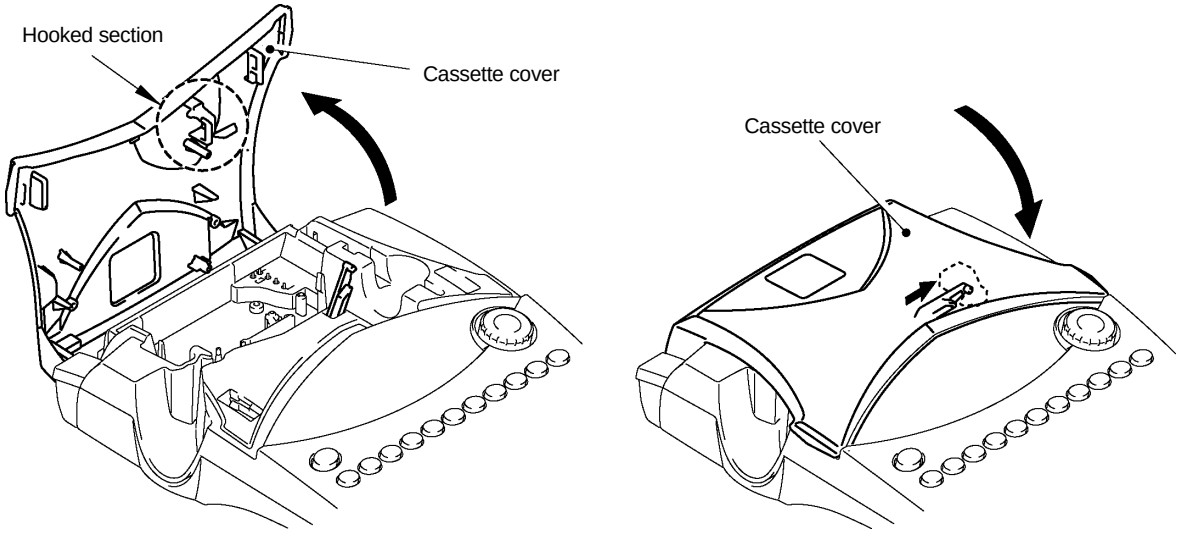


Fig. 2.1-8 Roller Holder ASSY & Cassette Cover Interlocking Mechanism

Opening the cassette cover pulls up the roller release lever placed in the hooked section of the cassette cover, which shifts the roller holder release rod so that the roller holder ASSY is retracted from the head ASSY side by the roller holder release spring.

2.2 OUTLINE OF CONTROL ELECTRONICS

2.2.1 Configuration of the Electronic Part

Fig. 2.2-1 shows a block diagram of the control electronics of the PT-1900/1910/1850. The control electronics consists of three printed circuit boards (main PCB, motor PCB, and power supply PCB), a tape feed motor, a cutter motor (PT-1900/1910), and a thermal print head assembly.

2.2.2 Main PCB

This manages all the PT-1900/1910/1850 components including an LCD, key pad, two DC motors (PT-1850: One DC motor), and thermal print head.

Note: When mounting the chips onto the PCB, use the lead-free solder.

2.2.3 Power Supply PCB

This has electrolytic capacitors (as filters for output lines), an AC adapter jack, battery terminal plates, and other related electronic devices to feed power to the control electronics and the DC motors from the AC adapter or batteries.

Note: When mounting the chips onto the PCB, use the lead-free solder.

2.2.4 Cassette Sensor

This supports the sensors that detect the tape width and ink ribbon type in the tape cassette.

2.2.5 DC Motors

This machine has two DC motors (PT-1850: One DC motor). One feeds tape and ink ribbon and the other drives the cutter to cut (PT-1900/1910) the tape.

2.2.6 Thermal Print Head

This is a thick-film thermal print head which integrates a heat generator (consisting of 128 heating elements vertically aligned) and driver circuitry.

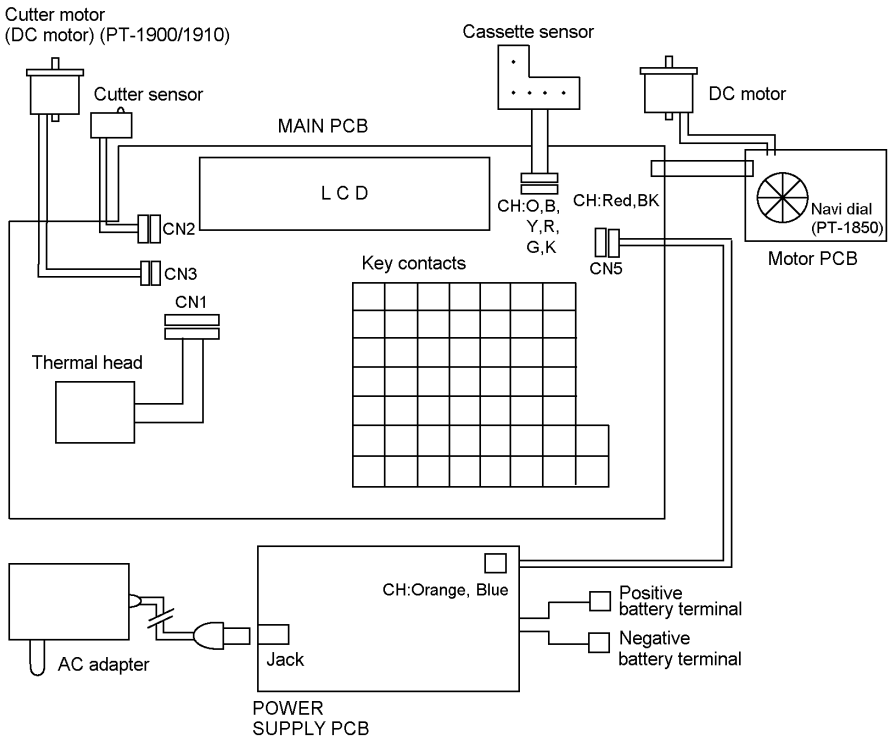


Fig. 2.2-1 Control Electronics of PT-1900/1910/1850

2.3 MAIN PCB

2.3.1 Block Diagram

Fig. 2.3-1 shows a block diagram of the main PCB. The main PCB consists of the following:

(1) CPU
(2) ROM (Masked)
(3) Key contacts matrix and solder points
(4) Power ON/OFF circuit and power saving circuit
(5) DC motor driver circuit
(6) Cutter motor driver circuit (PT-1900/1910)
(7) Thermal head drive circuit
(8) Voltage detector circuit and temperature sensor circuit
(9) Cassette sensor circuit
(10) Cutter sensor circuit
(11) Oscillator circuit
(12) Reset circuit
(13) LCD driver circuit
(14) Navi dial (PT-1850)

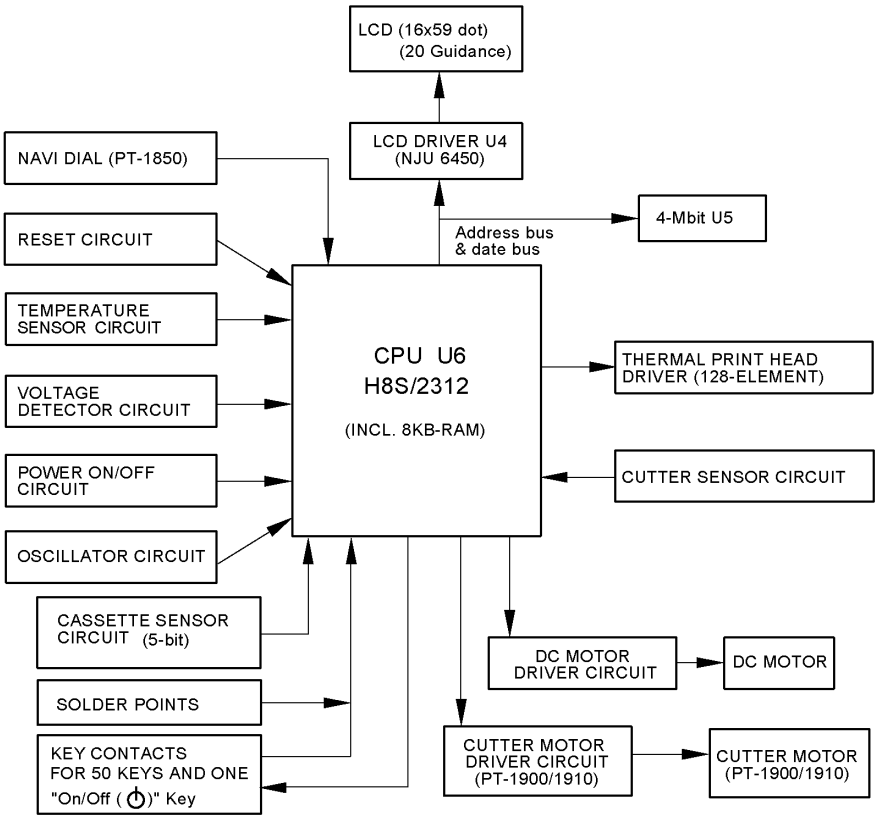


Fig. 2.3-1 Block Diagram of Main PCB

2.3.2 Solder Points

Solder points 1 through 5 customize the machine for the destination. Solder points A through C are used for the individual thermal head properties.

The CPU reads the solder point status once in the powering-on sequence to recognize the customization.

< Country Display >

The country display displays the country specifications as designated by the solder points (1 to 5.)

Country Specification	LCD Display	Solder Points				
		1	2	3	4	5
U.S.A./CAN/AUS	US	×	×	×	×	×
U.K.	UK	○	×	×	×	×
GERMAN	GE	×	○	×	×	×
FRENCH	FR	×	×	○	×	×
BELGIUM	BE	×	×	×	○	×

< Head Rank Display >

The head rank display displays the rank as designated by the solder points (A to C.)

The rank “B” is difined ad the setting for no soldering.

CAUTION: When soldering, use the lead-free solder.

2.4 POWER SUPPLY PCB

C1 for the logic circuitry and the thermal print head and motor drive sources.

Connecting the AC adapter plug with the AC jack J1 cuts off the power fed from the batteries and feeds power from the AC adapter.

Fig. 2.4-1 hows the polarity of the AC adapter plug.

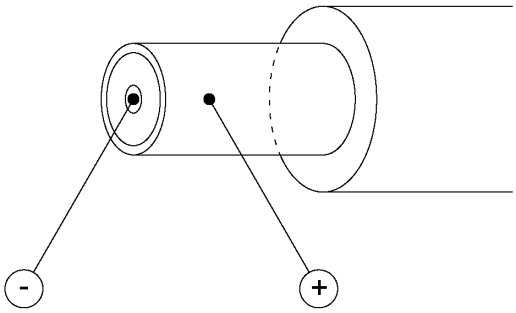


Fig. 2.4-1 AC Adapter Plug

CHAPTER III DISASSEMBLY & REASSEMBLY

3.1 DISASSEMBLY PROCEDURE

[1] Removing the Battery Lid and Batteries

(1) Turn the machine upside down.

(2) Press section “A” of the battery lid to remove, then take out batteries.

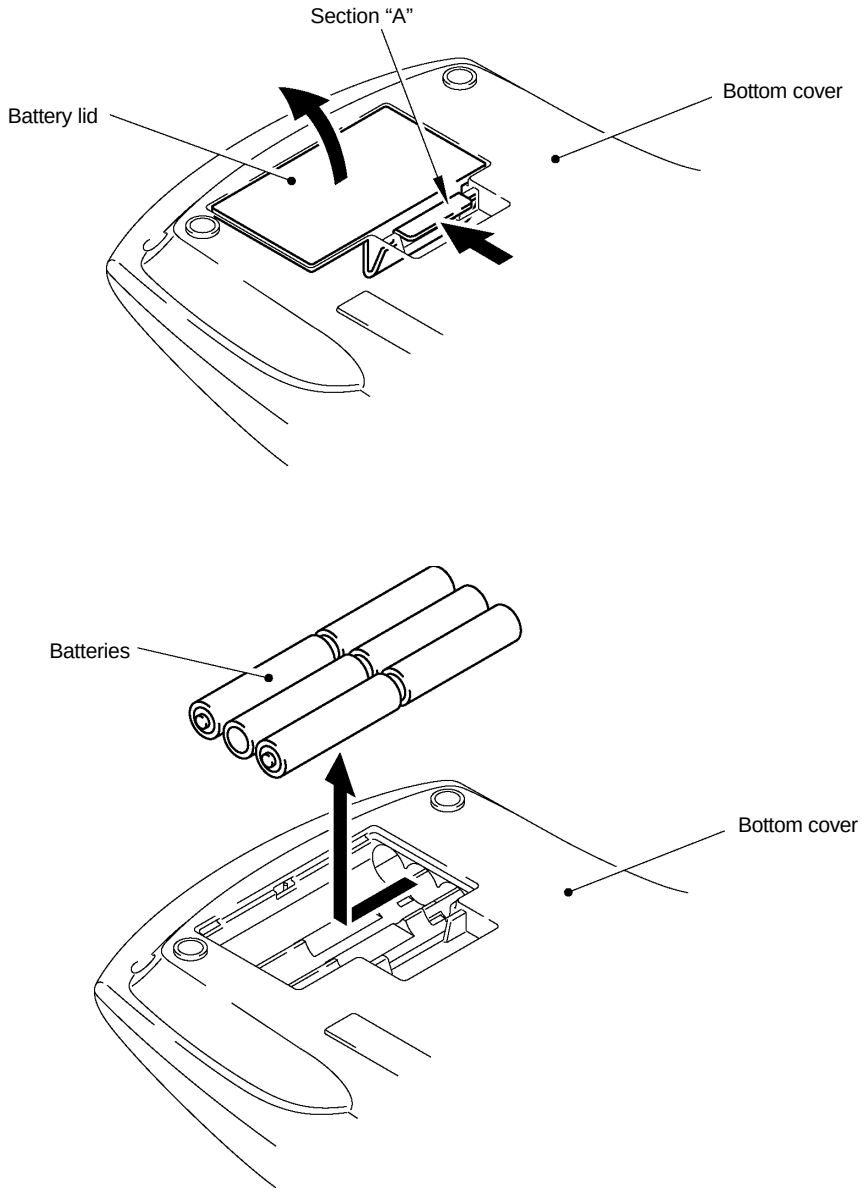


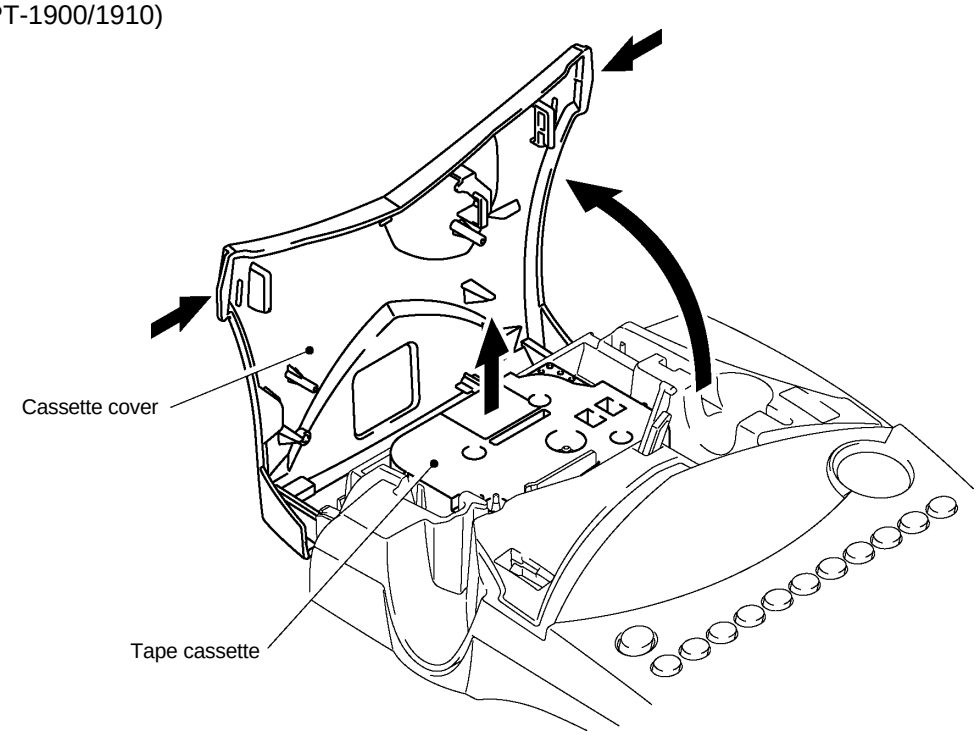
Fig. 3.1-1 Removing the Battery Lid and Batteries

[2] Removing the Tape Cassette and Tape Separator Stick

(1) Place the machine rightside up and open the cassette cover fully.

(2) Pull the tape cassette up and out of the machine.

(PT-1900/1910)



(PT-1850)

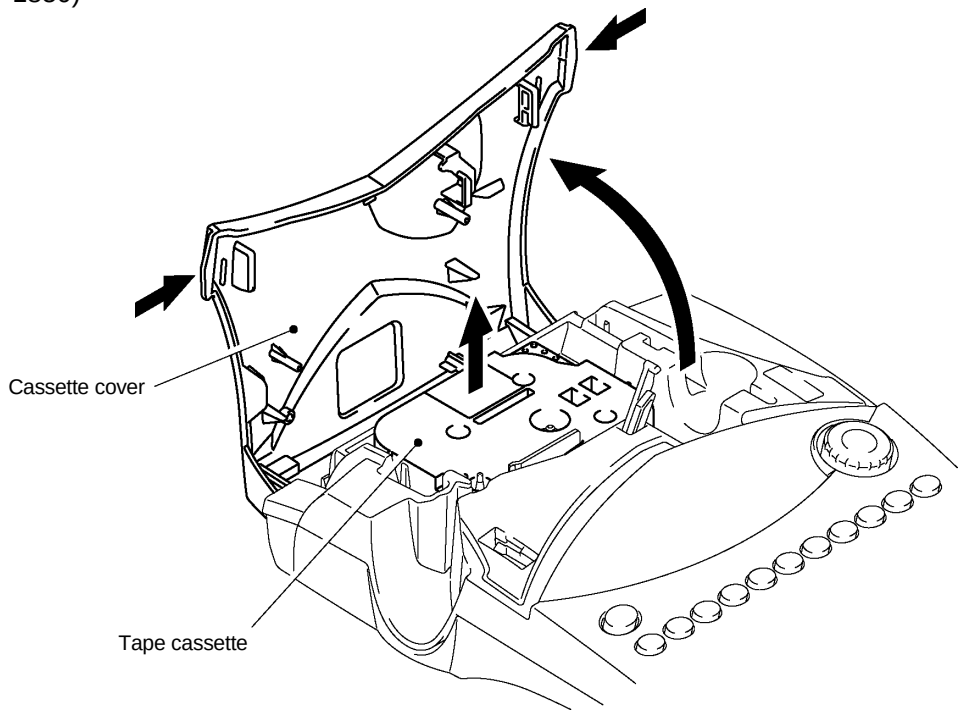


Fig. 3.1-2 Removing the Tape Cassette