

SERVICE MANUAL FOR

MODEL PE-300S

GENERAL INFORMATION

This service manual has been compiled for explaining repair procedures of the model PE-300S.
This was produced based on up-to-date product specifications at the time of issue, but there may have been changes of specifications for the purpose of improvements.
Contact manufacturer or local sales company for information concerning such changes.

Brother Industries, Ltd.
Nagoya, Japan

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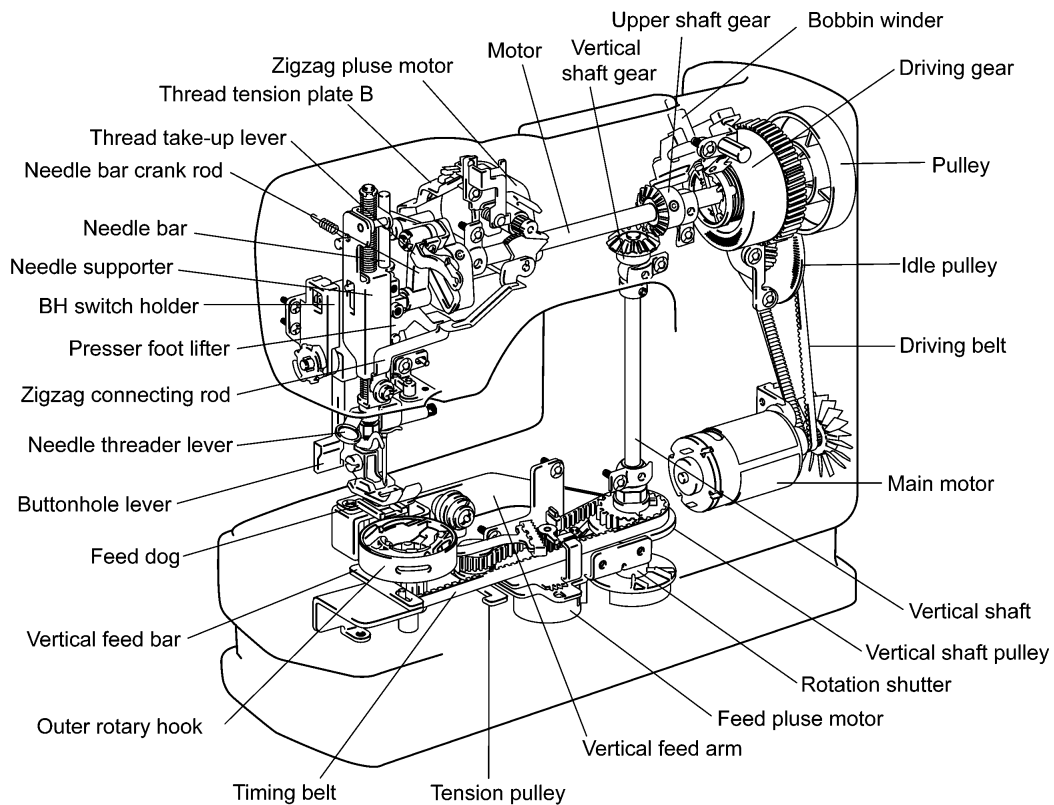
CAUTION

1. Always use rubber gloves when handling printed circuit boards and never touch the metal portion of a printed circuit board with bare hands.
2. Keep your body earthed in order to avoid generating static electricity.
3. Pack printed circuit boards in aluminum foil and avoid subjecting them to any form of impact during storage or transportation.
4. Do not touch or damage the metal portion of a printed circuit board with a screwdriver or any other tool while making repairs or the like.

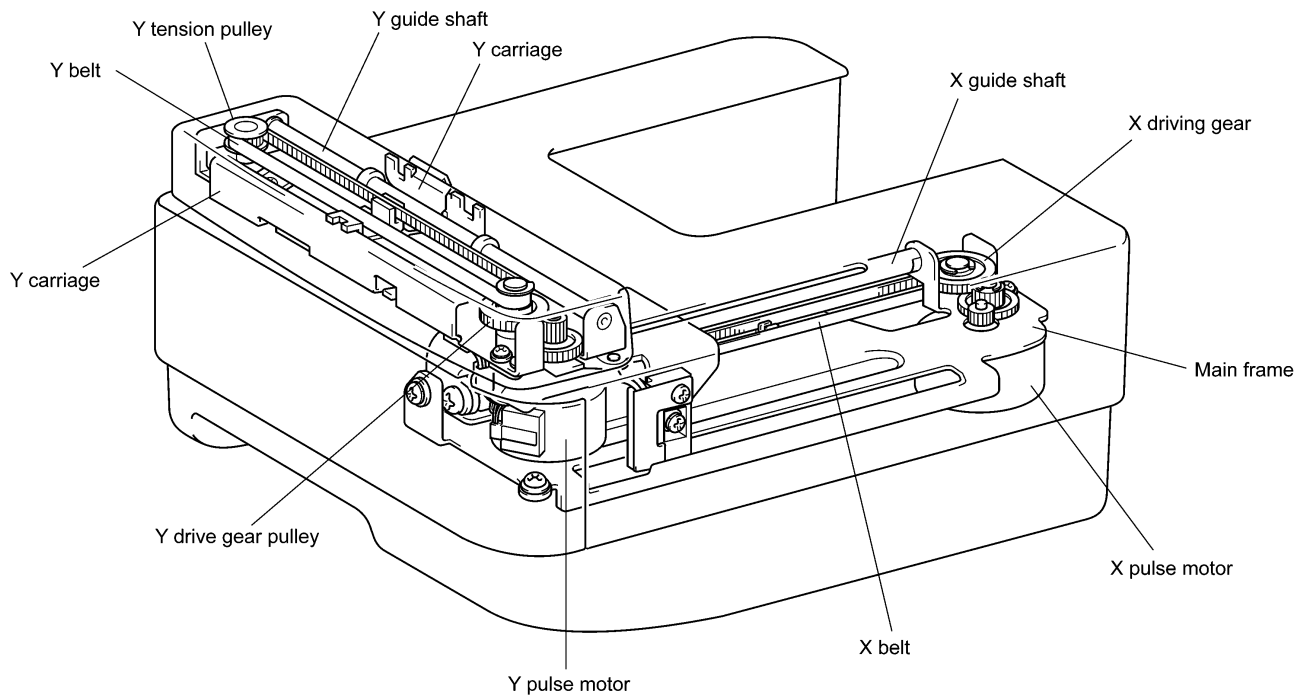
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1. MECHANICAL CHART

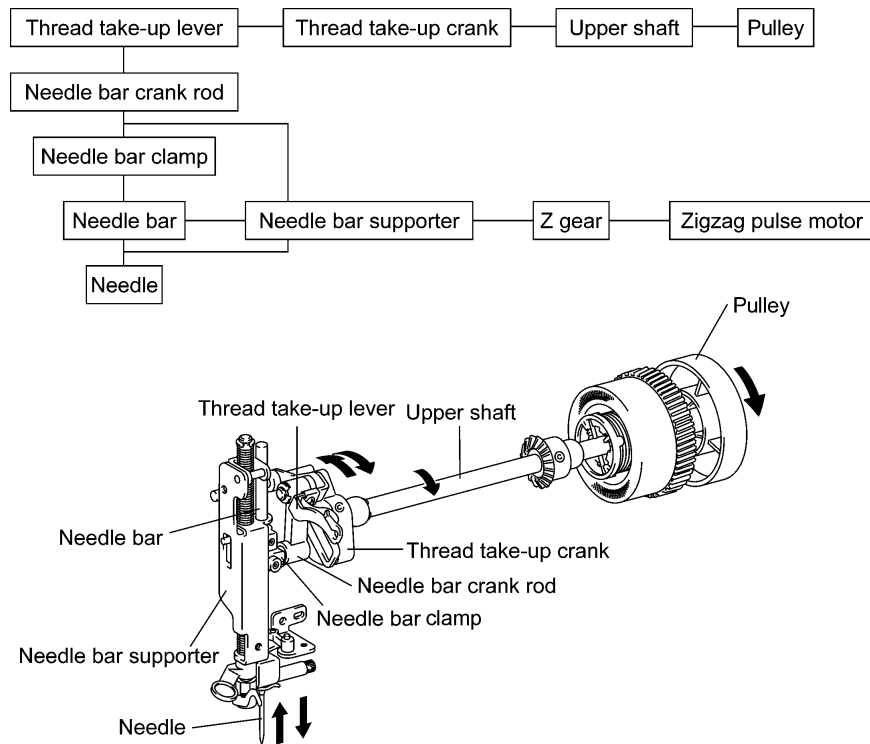


EMBROIDERY UNIT MECHANISM

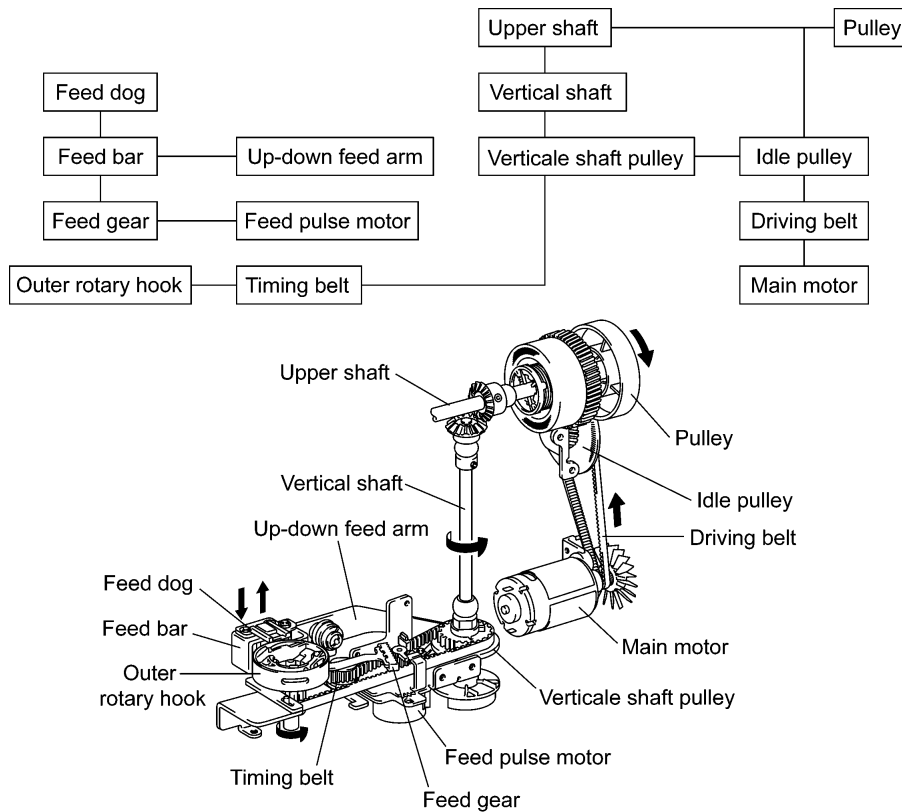


2. POWER TRANSMISSION CHART

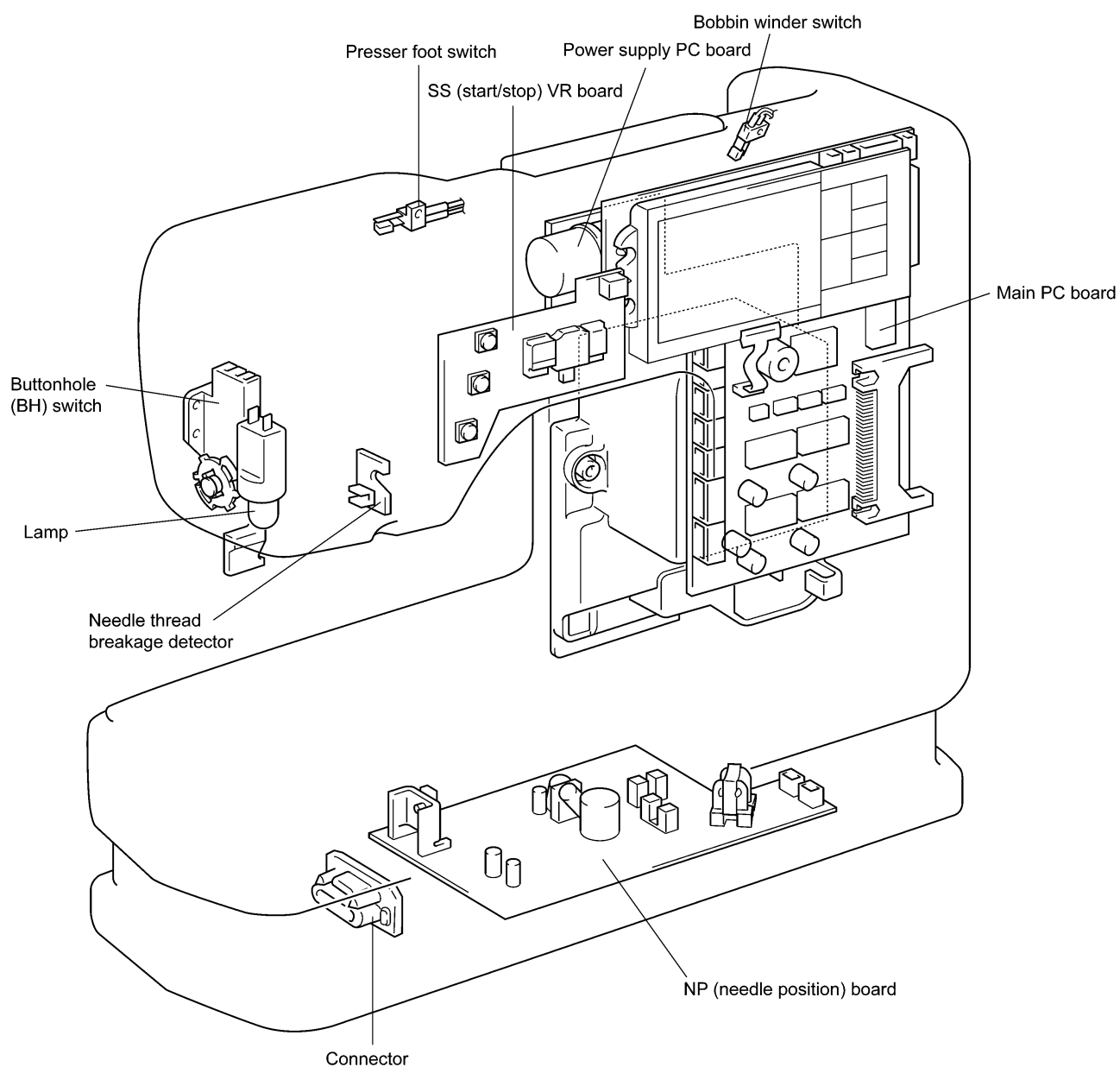
(A) Generating mechanism of needle bar, thread take-up lever and zigzag movements



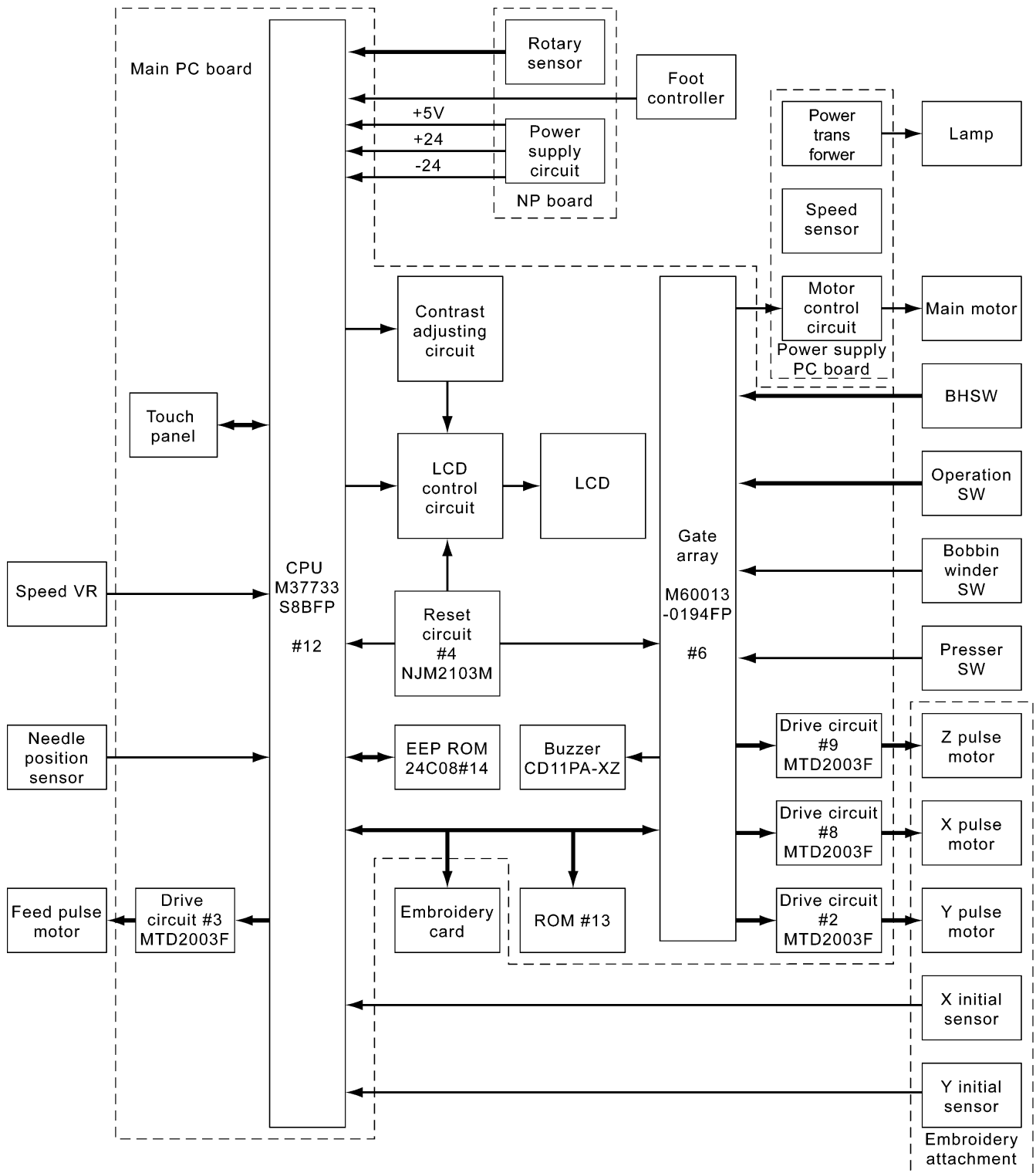
(B) Mechanism of feed dog and rotary hook movement



3. ELECTRONIC PARTS ARRANGEMENT CHART



4. CONTROL SYSTEM BLOCK DIAGRAM



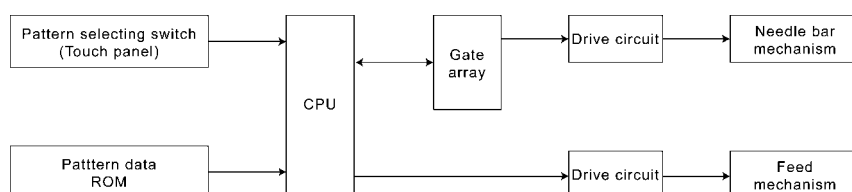
5. MAIN MOTOR CONTROL

The main motor for the sewing machine is required to smoothly change from low speed to high speed without any fluctuations due to load or temperature changes. To fully comply with this requirement, the PE-300S adopts PWM control using FET.

6. PATTERN GENERATOR

For conventional sewing machines of the past, the pattern was generated by rocking the needle bar and the feed regulator by means of a pattern cam onto which the pattern data had been mechanically engraved. In contrast to this, the PE-300S stores the data electronically in memory and uses a zigzag pulse motor to directly rock the needle bar and the feed gear to generate the pattern. In addition, the pulse motors must move the position of the needle while the needle is raised and stop it in the correct position (and similarly, they must move the position of the feed gear while the needle is lowered), thus highly-precise positioning and a fast response speed are required. For this reason, PM feed and zigzag pulse motors were adopted, and a simple open-loop circuit structure was employed.

Block diagram of pattern generator control



7. OTHER ELECTRONIC COMPONENT FUNCTIONS

Start/stop switch	Used to start and stop (SS) the machine. If you want to start sewing at low speed, keep this switch depressed and start sewing.
Backstitch switch	Used for backstitching and lockstitching. Backstitching is performed at low speed in the reverse direction while the switch is pressed. For lockstitching, three stitches are made at the current needle position and then sewing stops.
Needle position (UP/DOWN) switch....	Used to change the needle position either up or down.
Touch panel.....	Used to select pattern and input test mode number required for sewing. by This simply touching the display on the panel. This simplifies the operation for selecting the desired pattern and number.
Buttonhole stitch switch	Used to detect the edges of the buttonhole stitch by means of the buttonhole stitch presser foot and lever.
Buttonhole stitch lever switch	Used to detect whether the buttonhole stitch lever is raised or lowered.
Rotation sensor	Detects the vertical position of the needle and the drive timing of the zigzag and feed pulse motors. Detects the turning angle by means of a photointerrupter and shutter installed on the vertical shaft.
Speed sensor	Used to detect the rotation speed of the main motor. Detects the operating speed of the main motor by means of a photointerrupter and shutter installed on the idle pulley.
Bobbin winder switch	Used to detect whether the bobbin winder has been set when winding the lower thread.
Junction foot controller	When using the foot controller, connect it to this terminal.
Transformer.....	Used for driving the pulse motors and solenoids, to illuminate the lamps and to supply power to the electronic circuitry.
Lamp.....	is 12V 5W.

II. DISASSEMBLY AND REASSEMBLY OF THE SEWING MACHINE

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*** Note**

On this machine, the arm bed cannot be setup when the outer components are disassembled. Likewise, damage can result when items are attached to the rear side of arm bed and the machine is carelessly laid on its side or knocked over.

When assembling or disassembling, do so on top of a flexible mat.

* For the mat, use a polyethylene sheet with a thickness of about 10-20mm.

You may also use 2-3 layers of wadded material (such as quilting).

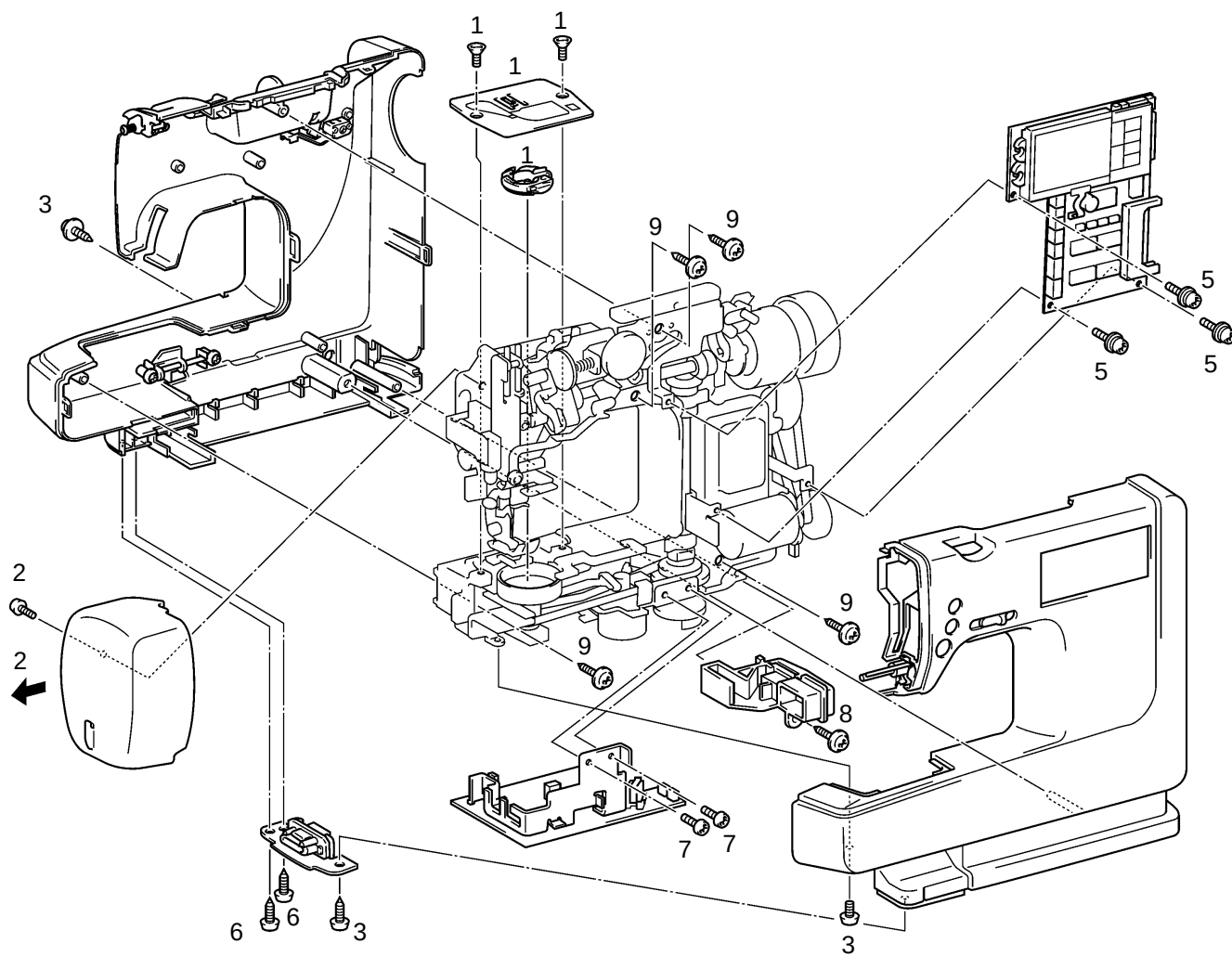
1. DISASSEMBLY AND REASSEMBLY OF THE OUTER PARTS AND MAIN PARTS (SEWING MACHINE)

Disassembly

1. Remove both screws from needle plate, remove needle plate, remove inner rotary hook.
2. Remove screw from face plate, remove face plate to the left side.
3. Remove all 3 screws from front cover, remove front cover.
4. Remove SS (start/stop) VR board connectors from main PC board.
5. Remove all 10 connectors, remove 3 screws, remove main PC board.
6. Remove both screws from connector set plate. Sever binder. Remove connectors and connector set plate together.
7. Remove both connectors from NP (needle position) board, remove both screws, remove both NP (needle position) board and set plate C together.
8. Remove screw from plug case.
9. Remove 4 screws from rear cover, remove rear cover from machine.

Disassembly Points

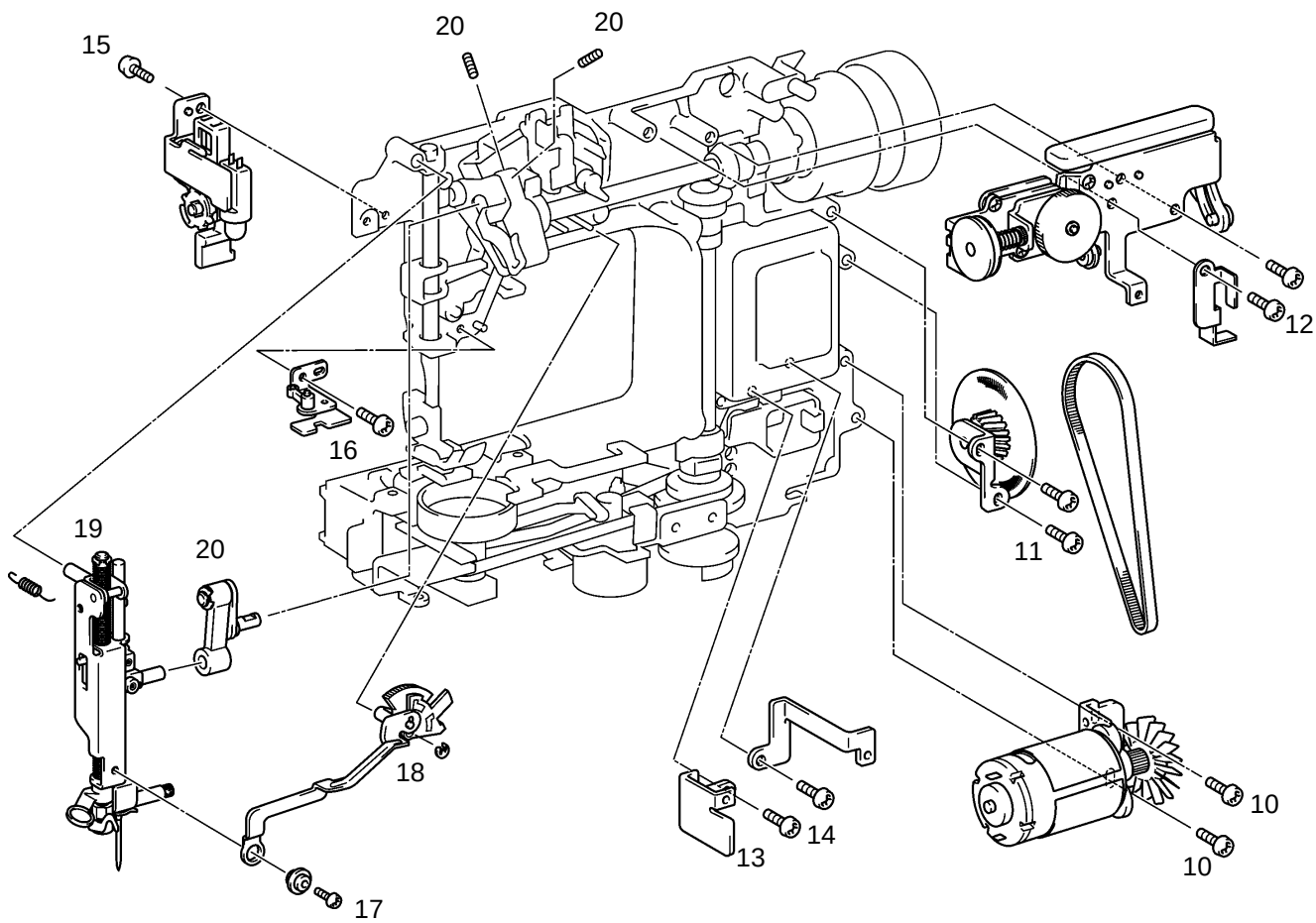
3. Front and rear covers are fastened together via screws and guide in 5 places. After unfastening screws, first remove both guide from bed, and remove front cover.
Next, remove guide in bed section of front cover from thread guide plate. While holding bottom, turn and remove front cover. (When doing this, raise thread take-up lever to its highest position to prevent possible damage.)
5. After removing connectors, pull connector set plate straight out.
 - * Do not touch surface of boards that have been removed to avoid damage to them that could be caused via static electricity. When carrying boards, hold along the edges of board as you would a CD or record album.
9. Make sure that bed section of rear cover does not catch onto presser foot lift. Hold bottom of arm bed and remove rear cover.



10. Remove both screws, remove main motor.
11. Remove both screws, remove idle pulley assembly and motor belt.
12. Remove both screws, and remove thread tension unit holder and handle together.
13. Remove screw and remove set plate A.
14. Remove screw and remove set plate B.
15. Remove sewing light connector, remove screw, remove BH switch base board along with BH switch assembly and sewing light altogether.
16. Remove screw. Remove H shaft holder sub assembly and thread guide plate together as one.
17. Remove screw. Remove zigzag connecting rod eccentric nut.
18. Remove retaining ring. Remove both zigzag connecting rod and Z gear together.
19. Remove needle bar supporter spring , remove needle bar supporter assembly.
20. Remove both screws from needle bar crank. Remove needle bar crank and needle bar crank rod together.

Disassembly Points

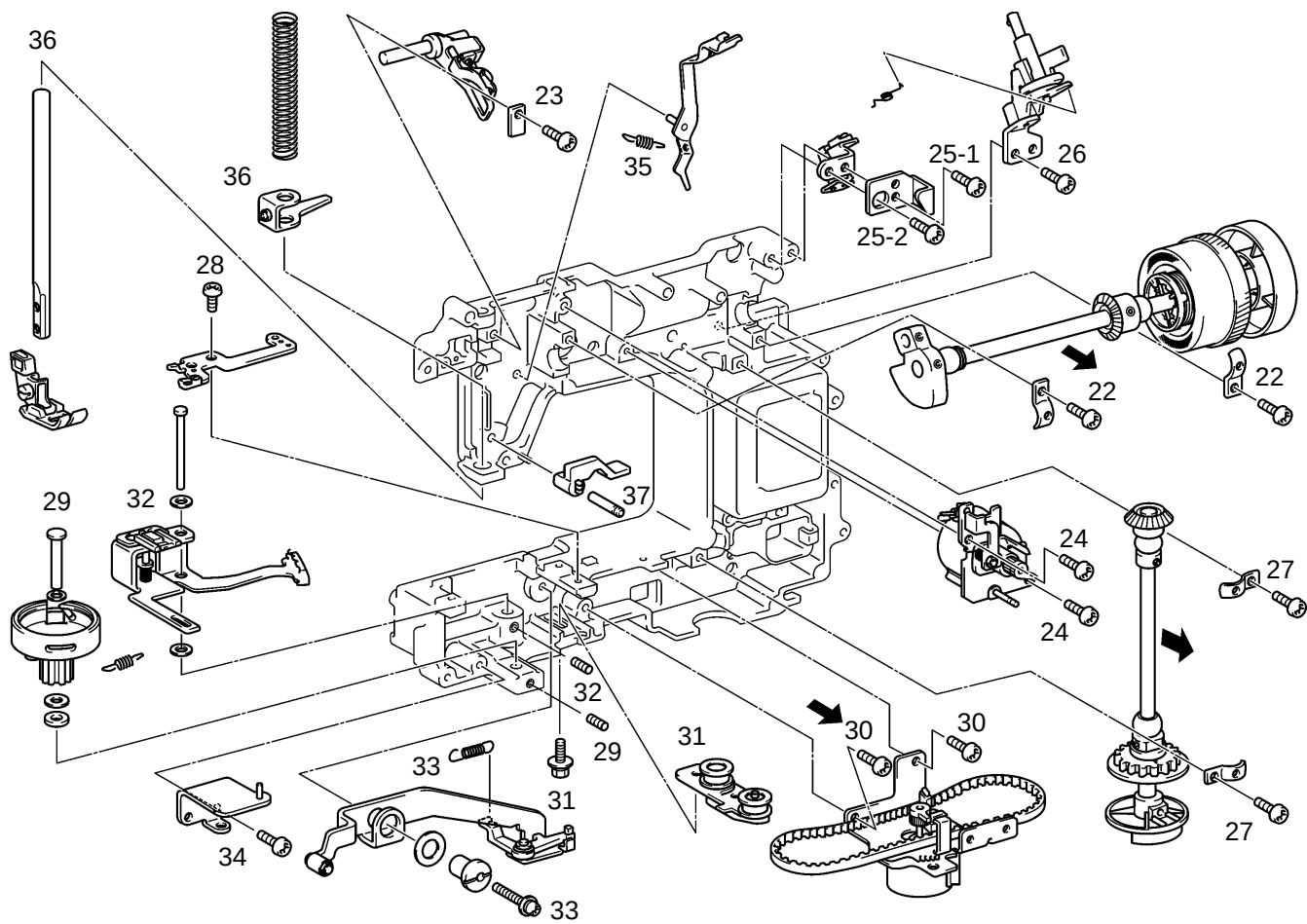
10. Before removing screws, remove motor lead wire from clip and remove connectors from power supply board.
19. First remove upper needle bar supporter shaft from arm of machine. Then slide needle bar supporter assembly to the side and pull needle bar clamp shaft out of needle bar crank rod.



22. Remove both screws from bushing presser and remove bushing presser.
23. Remove screws from presser plate, remove thread take-up lever and thread take-up lever shaft.
24. Remove both screws and remove ZPM assembly.
25.
 - 1. Remove screw, remove set plate.
 - 2. Remove screw, remove bobbin winder spring plate and bobbin winder spring.
26. Remove screw, remove bobbin winder assembly.
27. Remove both screws from vertical shaft bushing presser. Remove vertical shaft assembly.
28. Remove screw. Remove inner rotary hook bracket assembly.
29. Loosen screw, lift out outer rotary hook shaft and remove outer rotary hook assembly.
30. Remove both screws, remove both FPM assembly and timing belt together.
31. Remove Allen screws, remove tension pulley assembly.
32. Remove spring, loosen screw, lift out horizontal feed shaft and remove feed link assembly.
33. Remove springs from the rear and front, remove vertical feed arm assembly and eccentric collar.
34. Remove screw, remove guide pin holder.
35. Remove spring, remove thread tension plate B.
36. Loosen presser bar bracket screw, lift out presser bar, remove presser bar bracket and spring.
37. Remove presser foot lift shaft, in the direction towards you. Remove presser foot lift.

Disassembly Points

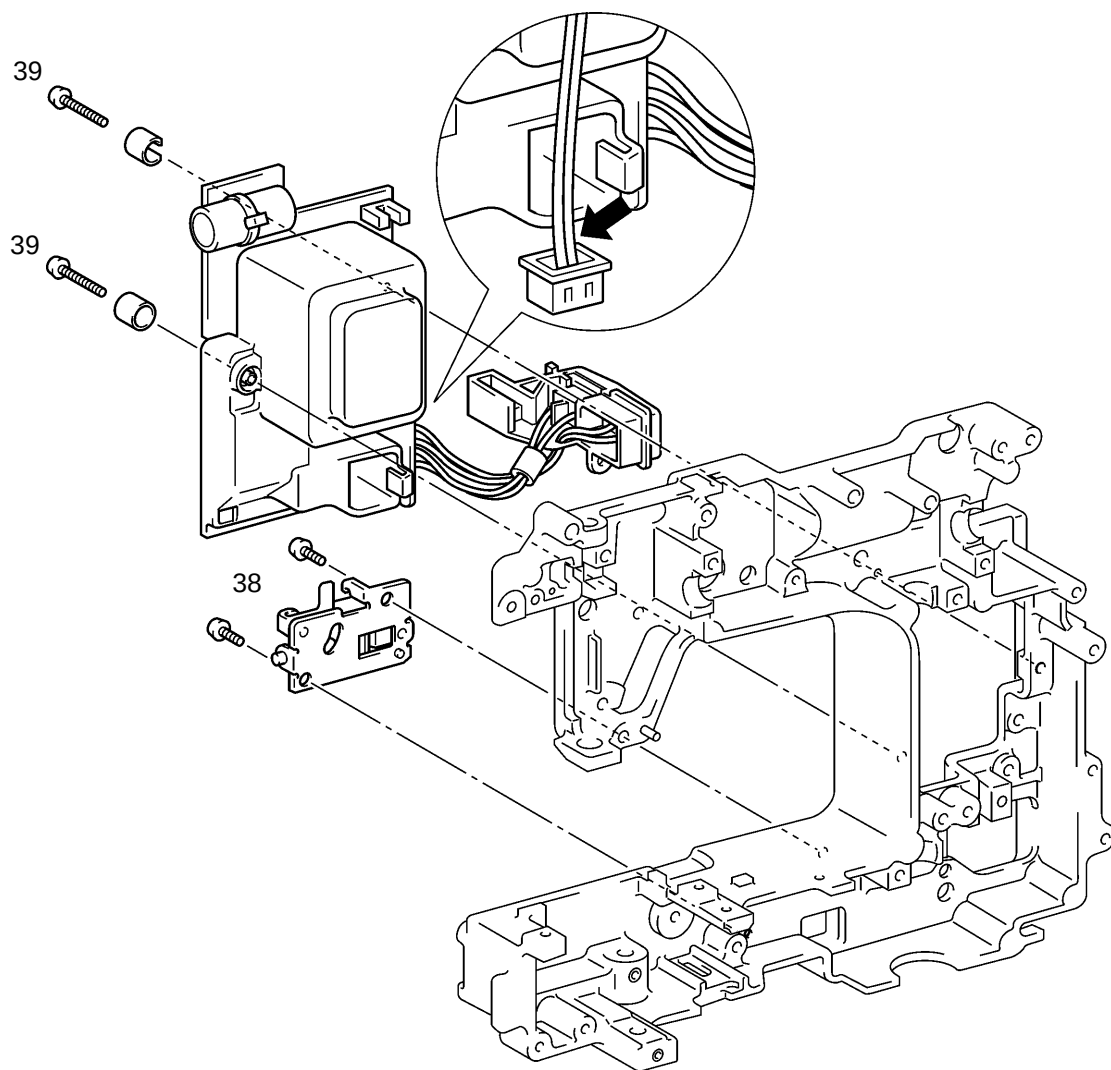
29. When removing outer rotary hook assembly, take care not to lose or misplace washers (1 upper washer and 2 lower washers).
32. When removing feed link assembly, take care not to lose or misplace poly washer (one upper and one lower washer).
36. When removing presser bar, take care not to let the spring fly across the room.



38. Remove both screws and remove drop holder assembly.
39. Remove both screws and remove power supply unit.

Disassembly Points

39. First disconnect electrical connector lead wire of NP (needle position) board in front of machine from guide of power unit cover.



Assembly

40. Align hole of presser foot lift with hole in the arm bed, attach presser foot lift shaft so that it catches onto guide of presser foot lift.
41. Attach thread tension plate B to arm bed and attach spring.
42. While attaching spring and presser bar bracket, insert presser bar from the top. Loosely fasten screw on presser bar bracket.
43. Attach drop holder assembly with 2 screws.
44. Use one screw to attach bobbin winder assembly.
45.
 - 1. While attaching bobbin winder spring between bobbin winder plate and bobbin winder spring plate, screw on bobbin winder spring plate.
 - 2. Screw on set plate.
46. Use 2 screws to attach ZPM assembly (without Z gear).
47. Attach upper shaft assembly using two bushing presser, with one screw each.
48. Attach thread take-up lever shaft to thread take-up lever. Attach to arm bed using presser plate and screw.
49. Attach shaft of needle bar crank to groove of thread take-up lever and thread take-up crank. Fix in place with thread take-up crank screw.
50. After setting needle bar supporter shaft into hole in arm bed, attach needle bar clamp shaft to needle bar crank rod and attach needle bar supporter assembly. Attach spring between needle bar supporter and arm bed.
51. Attach needle bar supporter arm to needle bar supporter pin. While keeping held in position, attach H shaft holder with screw.
52. Line up indicator marks on ZPM gear and Z gear (see page 42 of adjustment procedures), attach Z gear (with zigzag connecting rod attached) and fasten on with retaining ring.
53. Attach zigzag nut to zigzag connecting rod, screw zigzag connecting rod and needle bar supporter together.

Assembly Points

41. Make sure that spring is lined up in correct direction.
42. Take care that the spring doesn't fly across the room.
47. After fastening screws, check to make sure the upper shaft rotates freely.
49. When D-cut face of needle bar crank shaft is in uppermost position of thread take-up crank, attach so that it comes toward the front. While gently pushing needle bar crank with your hand, secure front with screw. Then fasten top screw. After fastening screws, check to make sure that upper shaft rotates as smoothly as it did before screws were fastened.
51. Attach H shaft holder with arm bed pin in center of oblong hole. (see diagram A)

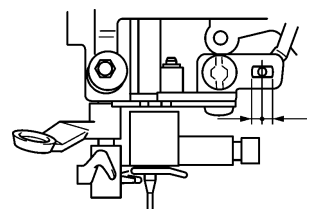
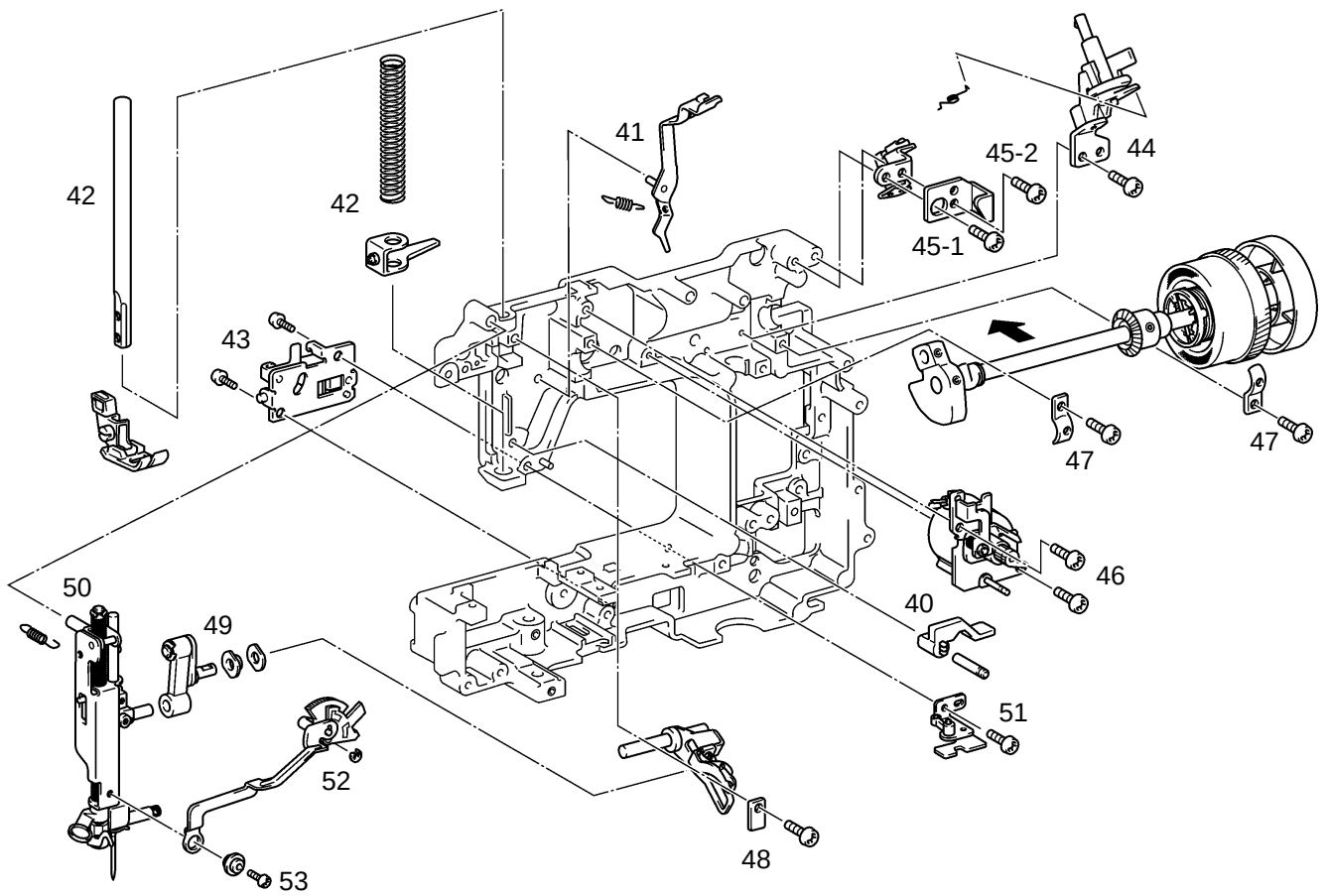


Diagram A

54. Attach tension pulley assembly with Allen screw.
55. Set feed link assembly into arm. Attach horizontal feed shaft and fasten with screw. (Be sure to attach one poly washer each to both top and bottom of feed gear.)
56. Insert guide pin holder assembly pin into groove of vertical feed stand. Attach guide pin holder assembly with screw. After assembling, attach spring between the recessed part of the guide pin holder and the hole on the horizontal feed stand.
57. Attach eccentric collar to up-down feed arm assembly. Secure with screw. (Be sure to add poly washer between up-down feed arm and eccentric collar.)
58. Attach drop lever spring between lever and hook of drop holder.
59. Run timing belt between initial plate and FPM gear shaft. Line up indicator marks on FPM gear and feed gear, and set gears. Attach FPM assembly with 2 screws. (see page 43 of adjustment procedures.)
60. Run timing belt to outer rotary hook assembly. Add washers (2 on bottom and one on top), insert outer rotary hook shaft and fasten with screw.
61. Run timing belt around vertical shaft assembly and attach vertical shaft assembly with 2 bushing presser and 2 screws.
62. Position so that both base line of outer rotary hook pulley and foundation hole of vertical shaft pulley are faced towards front of sewing machine and attach timing belt. (see page 31 of adjustment procedures)
63. Adjust tension of timing belt. (see page 30 of adjustment procedures)
64. Screw on A and B set plates.
65. Attach thread tension unit holder (with thread tension assembly and handle attached) with 2 screws.
66. Attach needle plate. Adjust height and alignment of presser foot. (see page 37 of adjustment procedures)
After completing adjustments, remove needle plate.

Assembly Points

54. Loosely fasten tension pulley to line up with center of screw.
56. Move feed gears back and forth. Make sure that movement is smooth.
57. Attach eccentric collar so that the long slit is level with the right side.
60. Make sure that outer rotary hook assembly rotates freely.
61. Lift out timing belt and make sure that vertical shaft rotates freely.
65. Fix point of thread tension plate A of thread tension assembly into rectangular hole of thread tension plate B. (see diagram A)
After putting together, raise and lower presser foot lift to check that thread tension disk opens and closes.

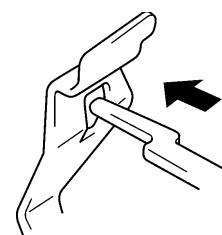
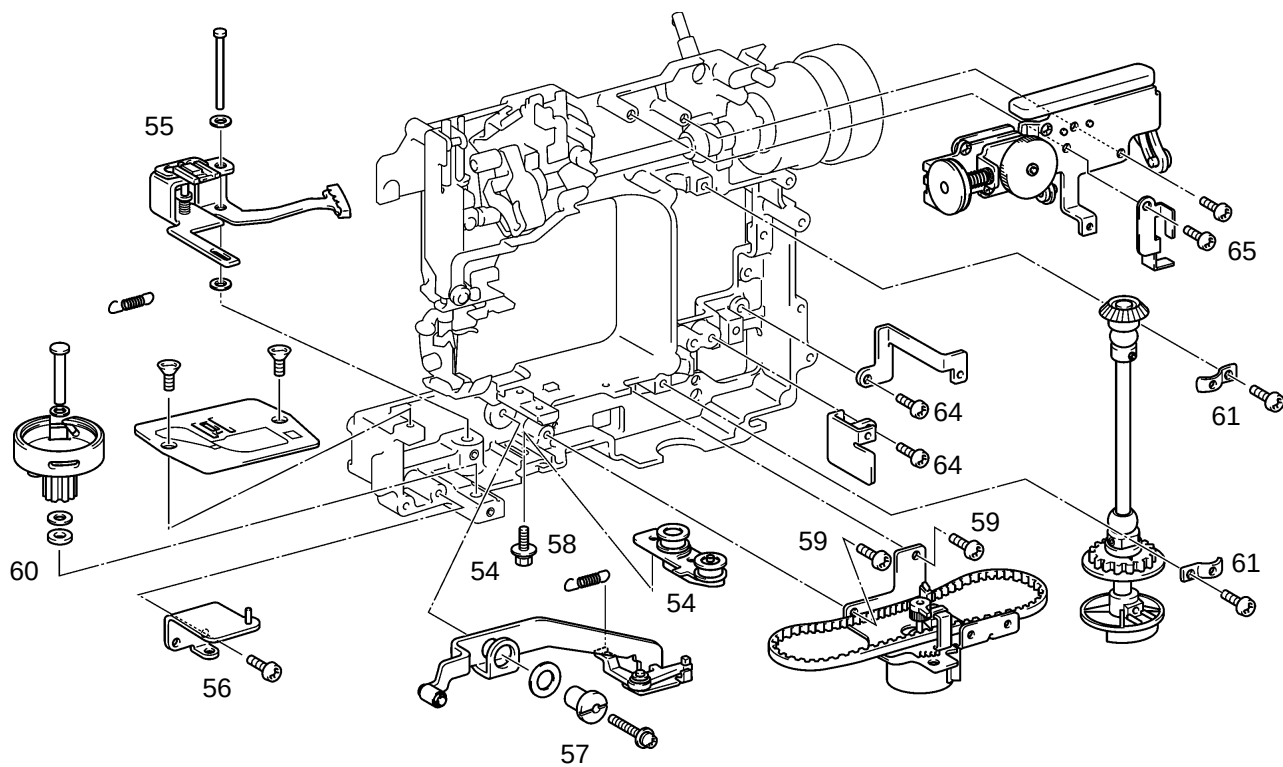


Diagram A

67. Screw B and C power unit covers to power supply.
68. Screw on BH switch baseboard (with BH switch assembly and sewing light assembly attached) and attach sewing light connectors.
69. Attach rear cover to machine with 4 screws.
70. Line plug case up to grooves of rear cover and attach. Use one screw to attach.
71. Adjust backlash of upper and vertical shaft gears. Attach upper shaft gear using 2 screws.
72. While adjusting backlash of upper shaft driving gear, attach idle pulley assembly using 2 screws.
73. Adjust tension of idle pulley and motor pulley belt, and attach main motor assembly with 2 screws. (see page 30 of adjustment procedures)
74. Attach main motor connector to power supply board. Pin down lead wire with clip.
75. Attach set plate C (while attached to NP board) to grooves of rear cover, attach FPM holder using 2 screws.
76. Attach both NP board connectors.

Assembly Points

67. Line up notched section of power unit cover B with rib of power unit cover A and attach. (see diagram A)
69. First insert bobbin winder shaft and handle arm into appropriate hole and groove in rear cover. Then set presser foot lifter in rear cover, taking care that it does not catch onto bed section of rear cover. Line up of arm of sewing machine with rib of rear cover (move towards the left of the machine). Fasten with screws.
71. When doing this, set so that vertical shaft pulley hole is lined up with the top of the needle bar. Adjust timing of up-down feed. (see page 31 of adjustment procedures)
72. Adjust backlash so that rotation clearance of idle pulley is 0.02-0.5 at the speed shutter and silted section on the idle pulley when upper shaft driving gear is attached.
75. Turn upper shaft, and attach when needle bar is in its lowermost position (rotation shutter screw should be facing rear of sewing machine).

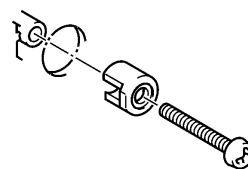
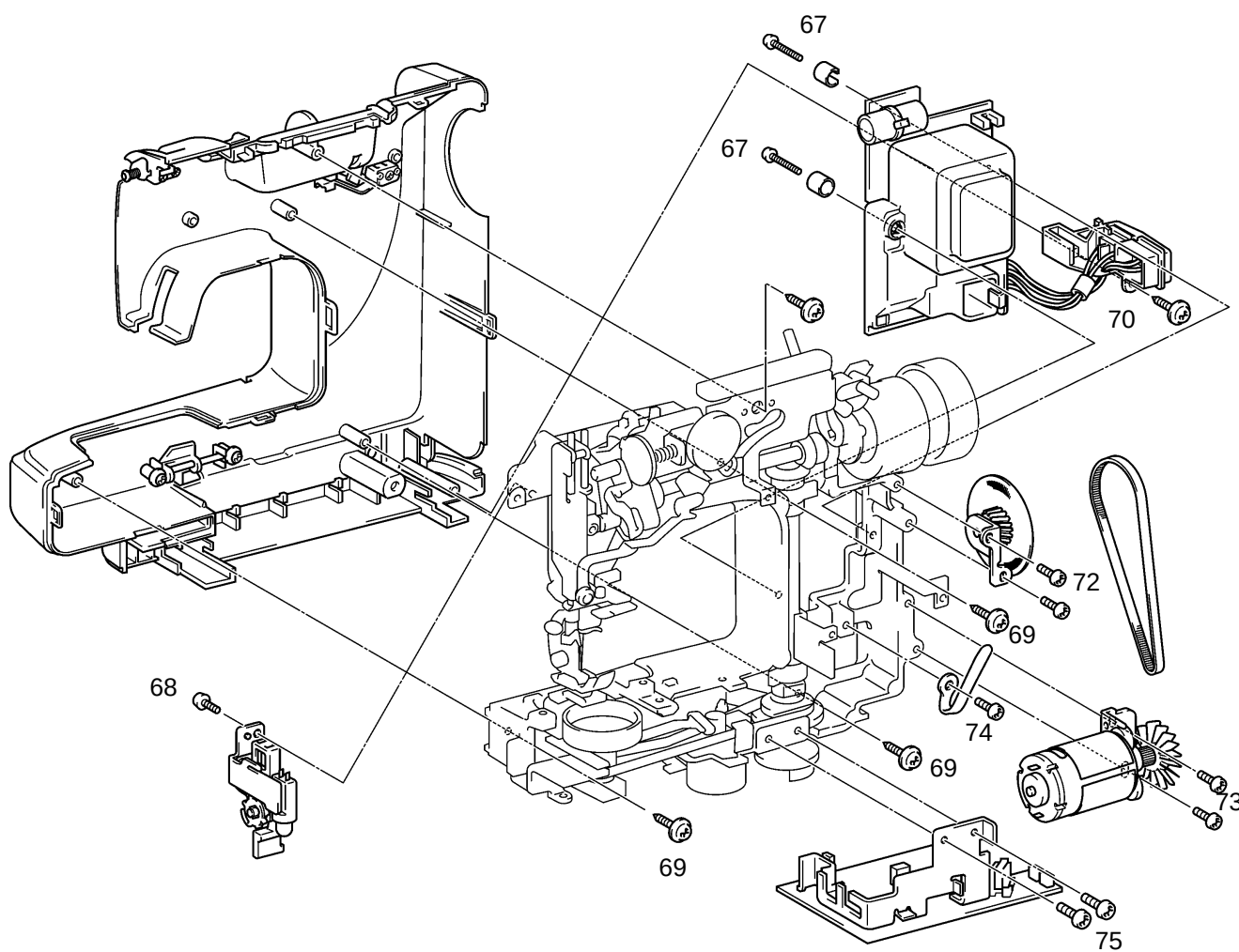


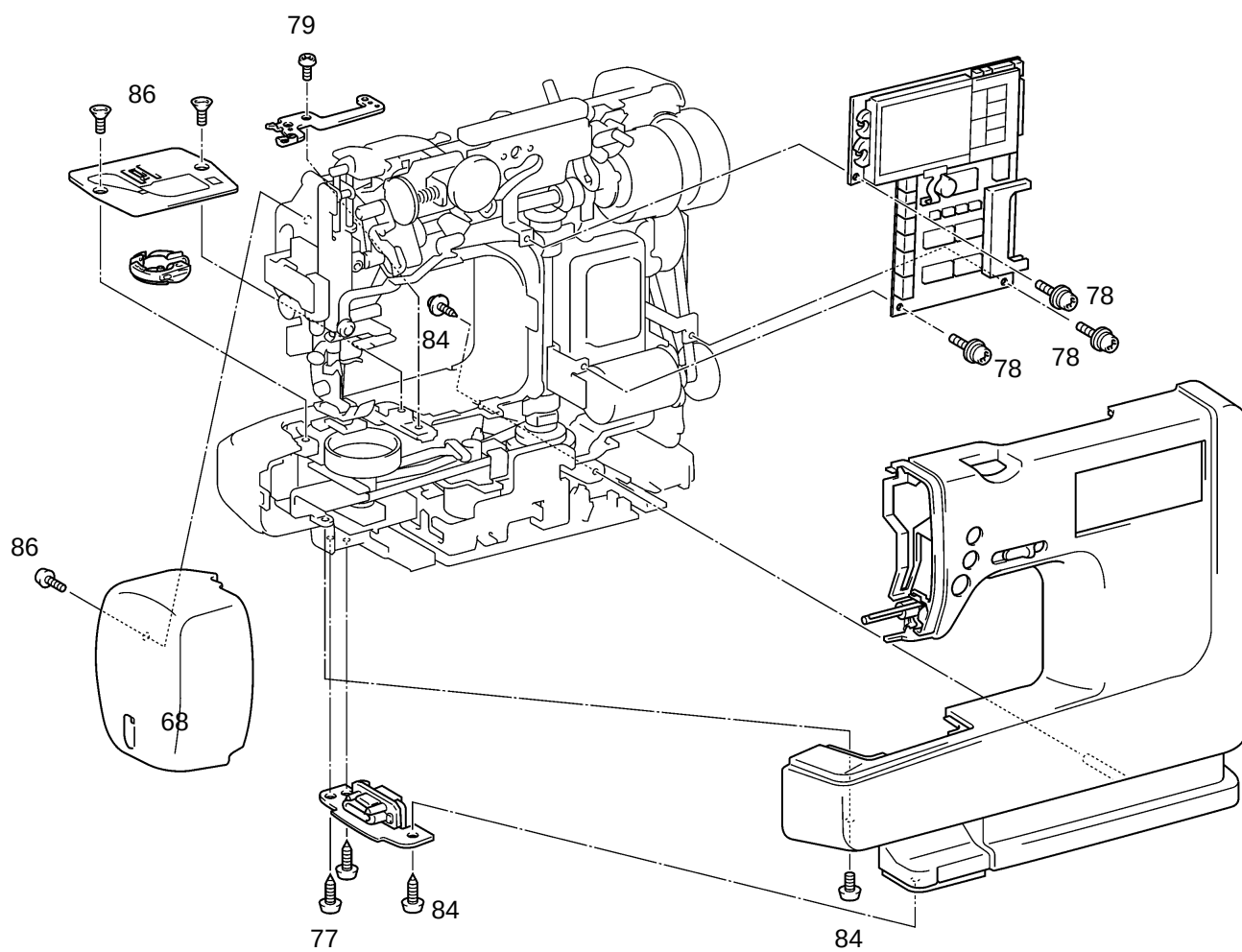
diagram A



77. Attach connector set plate assembly to rear cover using 2 screws. Run lead wire through grooves in rear cover and set plate guide.
78. Use 3 screws to attach main PC board assembly. Attach connectors in all 10 places.
79. While adjusting the overlap of inner rotary hook bracket, attach inner rotary hook bracket assembly using 1 screw.
80. Attach needle plate. Adjust height and position of feed dog. (see pages 35-36 of adjustment procedures)
81. Adjust needle drop position using zigzag nut. (see page 32 of adjustment procedures)
82. Adjust space between needle and outer rotary hook point, and adjust timing of needle and rotary hook. (see pages 33-34 of adjustment procedures)
83. Adjust upper and lower tension. (see page 41 of adjustment procedures)
84. Attach SS (start/stop) VR board connectors. Line front cover up to rear cover and fasten together using 3 screws.
85. Attach face plate with 1 screw.
86. Set inner rotary hook into outer rotary hook. Attach needle plate using 2 needle plate screws.

Assembly Points

78. After assembling main PC board, and attach front cover. Make sure that display window and touch panel are properly aligned. If they are not lined up properly, readjust position of main PC board.
84. To attach front cover, first insert thread tension dial into appropriate hole, then attach upper-right guide to rear cover. Next turn and attach to rear cover. Then hold bed section of front cover and attach guide to thread guide plate hole. After properly setting guide of front and rear covers (in 5 places), fasten with 3 screws.



2. ASSEMBLY AND DISASSEMBLY OF THE EMBROIDERY UNIT

Disassembly

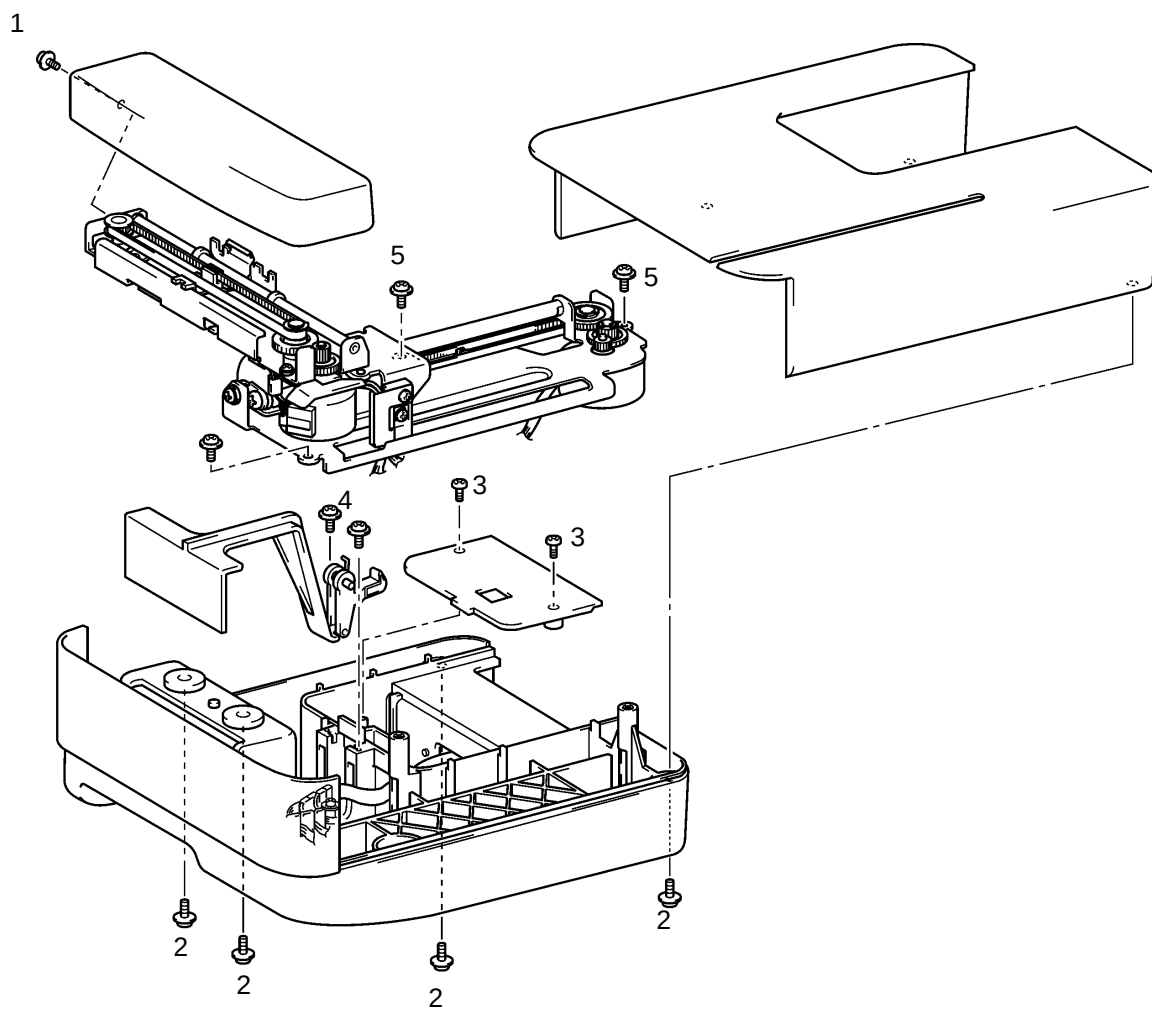
1. Remove screw, and remove X carriage cover.
2. Move X carriage towards the left edge, remove all 4 screws, and remove top cover to the right side.
* When doing this, gently slide frontal upper surface of top cover with finger.
3. Remove both screws. Remove bottom cover.
4. Remove all 4 screws. Remove fixed guide assembly.
5. Remove all 3 screws of main frame. Separate X carriage, Y carriage and bottom cover.

Assembly

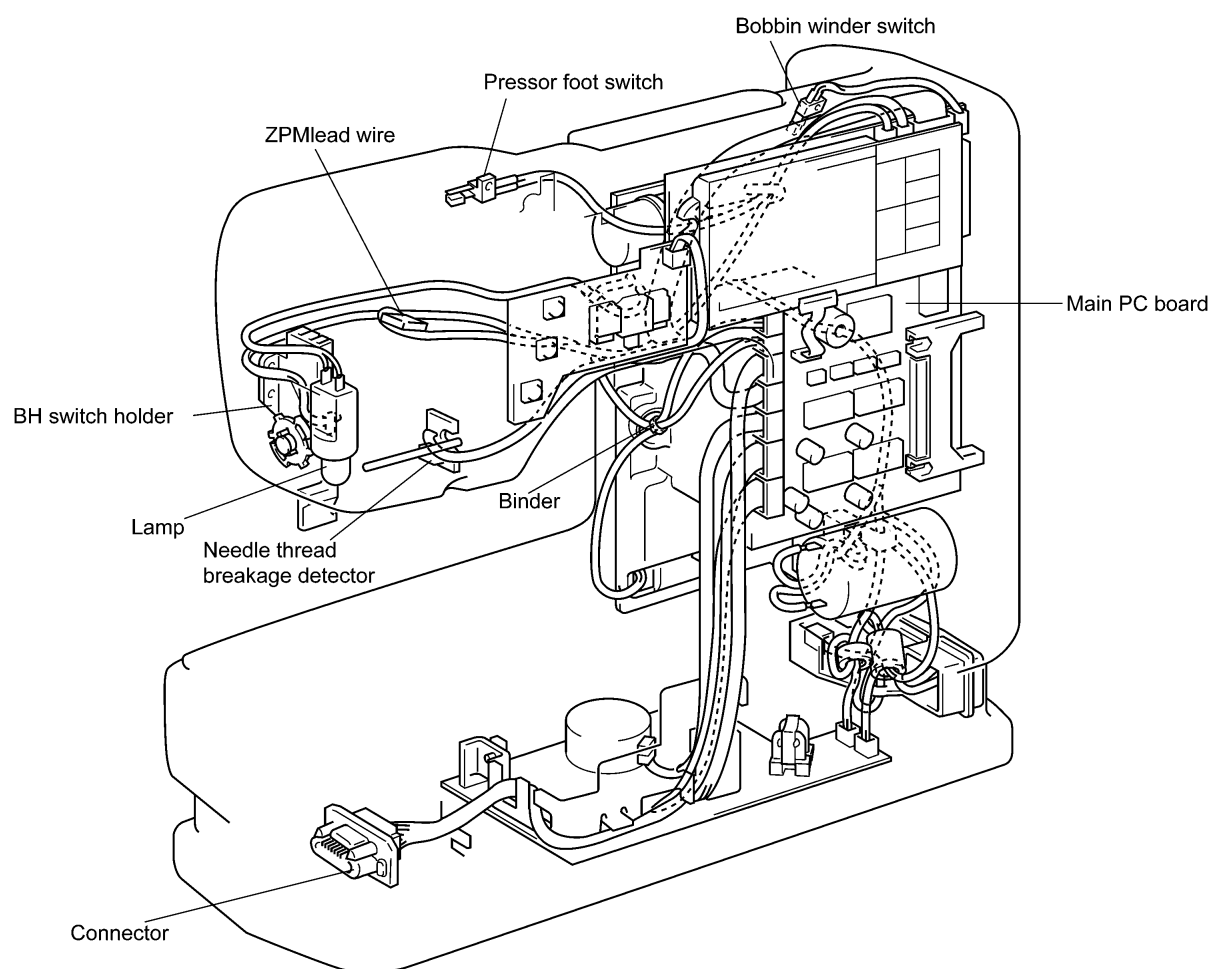
Assemble in the reverse order of disassembly.

Assembly Points

- Make sure there is space between the sensors on the X and Y shutters.
- Make certain there is no slack between the X sensor lead wire and XPM lead wire, and attach section A of bottom cover.
- Move X carriage to the right. Attach Y sensor and YPM lead wires to B section of bottom cover.
- When attaching top cover, move X carriage to the left, slide cover on from the right, and attach to rectangular hole in top of bottom cover.
* When doing this, gently slide top cover towards you with finger.



3. LEAD WIRE ARRANGEMENT



III. HOW TO ADJUST MECHANICAL ELEMENTS

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1. POSITION OF TOUCH PANEL

(BE SURE TO ADJUST THE TOUCH PANEL AFTER RECONNECTING THE TOUCH PANEL CONNECT.)

STANDARD

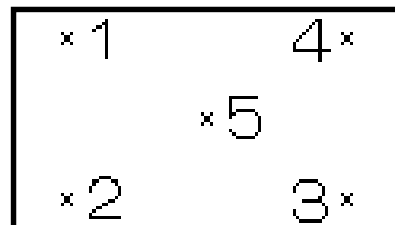
The deviation between the liquid crystal display and touch panel should be within 1 mm when the touch panel is pressed.

ADJUSTMENT

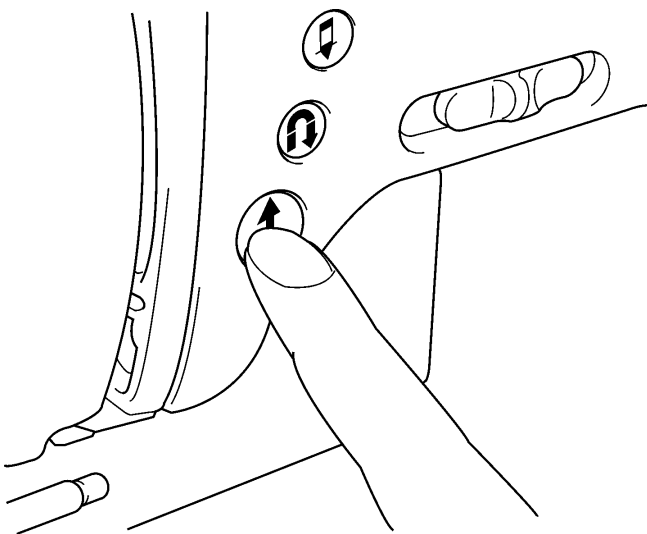
1. While pressing the start/stop, reverse stitch and needle positions buttons, turn on the power to display the screen for the touch panel adjustment mode.
2. While pressing the start/stop button, touch the touch panel at the positions marked by crosses (+) in order from 1 to 5.
(When touching the touch panel, use an object with a rounded tip such as a pencil or matchstick. Never use a hard or sharp-pointed object.)
If the buzzer sounds once when cross number 5 is touched, the adjustment has been made correctly.
If the buzzer sounds four when cross number 5 is touched, an error has occurred. In this case, touch the crosses on the touch panel again in order from 1 to 5.
Never press the thread cutter button during this time. (Doing so may cause a malfunction.)
3. Turn the power off, then on again and check that the screen display and the touch panel positions are aligned.

Adjustment Points

If the buzzer sounds more than twice while making adjustment (2), perform the procedure again from the beginning since the position has not been correctly set.



Touch panel adjustment item



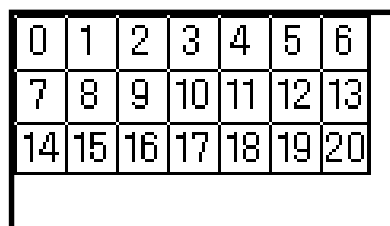
2. SETTING THE TEST MODE

BASIC TEST MODE

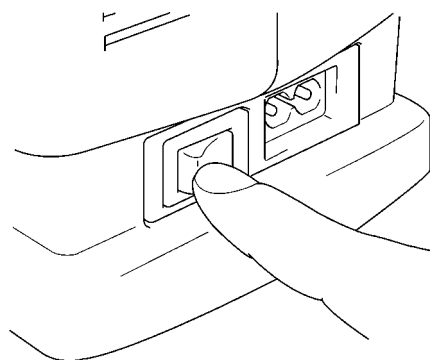
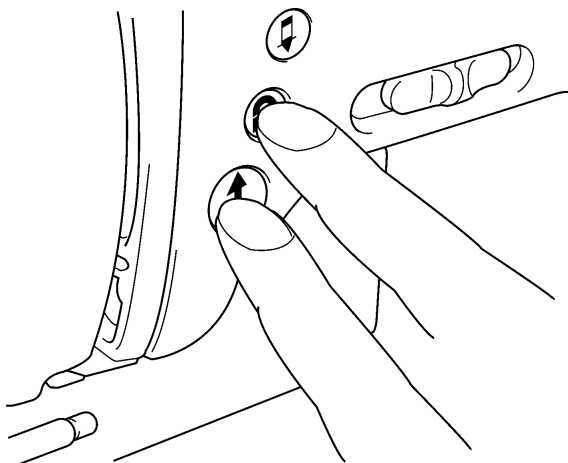
To set the test mode, turn on the power switch while holding down the start/stop button and backtick button simultaneously. Numerals will appear on the touch panel. The respective test mode will be entered when the numeral is pressed.

Test mode NO.	Test mode display	Adjustment item	page
3	3-point needle drop	Needle down position	33
		Timing of needle and rotary hook	33
		Needle bar height	35
5	Feed dog	position feed dog positions	35
		feed adjustment (gear backlash)	43
6	Initial feed position	feed adjustment (gear backlash)	43

The other test modes are used for factory adjustments.



Test mode screen



3. TENSION OF MOTOR BELT AND TIMING BELT

STANDARD

When gently pressing the center of the driving belt with a finger tip, there should be about 4-4.5mm of slack. (Press using approximately 0.6N(60g) of force.)

When gently pressing the center of the timing belt with a fingertip, there should be 4-4.6mm of slack. (Press using approximately 2N(200g) of force.)

ADJUSTMENT

- Motor belt

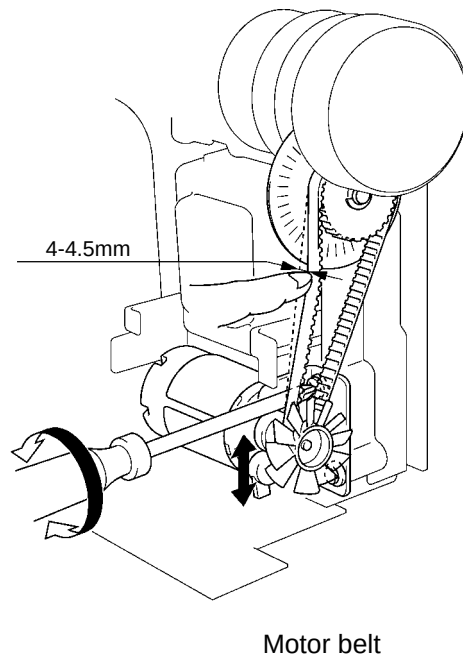
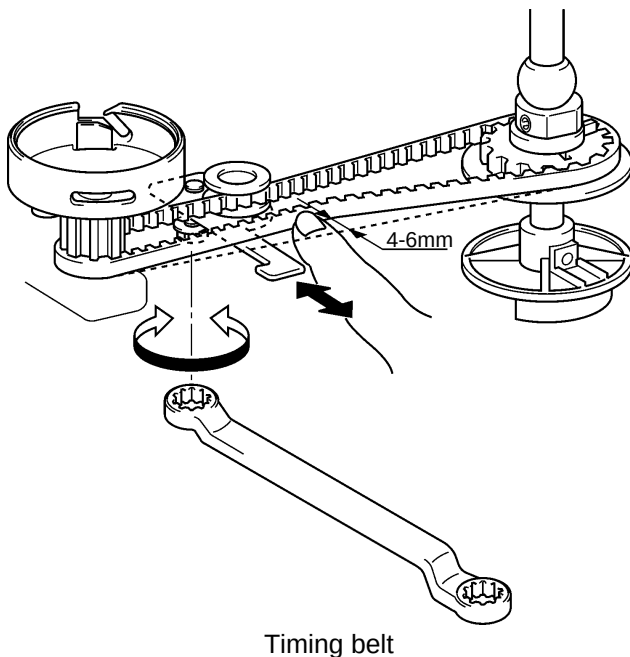
1. Loosen both screws on the motor holder.
2. Move the motor holder up and down, and adjust belt tension.
* Keep main motor level when carrying out adjustments.
3. Tighten both motor holder screws.

- Timing belt

1. Loosen Allen screw on tension pulley assembly.
2. Move tension pulley assembly forward and backward, and adjust belt tension.
3. Tighten Allen screw on tension pulley assembly

Adjustment Points

- 1 If motor belt tension is too tight, there would be too much torque, causing the motor to rotate slower and generate an irregular noise.
- 2 If the motor belt tension is too loose, the belt may jump and the upper shaft may not rotate smoothly while sewing on denim and other thicker fabrics or overlapping fabrics, the motor may not rotate smoothly, or the upper shaft may not rotate.
- 3 If timing belt tension is too weak, the needle could jump when sewing heavyweight fabrics such as denim, or when overlapping fabrics, or the closeness of the needle and rotary hook may err, making sewing impossible.



4. TIMING OF ROTATION SHUTTER AND UP-DOWN FEED CAM

STANDARD

When needle bar is in highest position, foundation hole of vertical shaft pulley should be facing front of sewing machine.

At this time, base line of outer rotary hook pulley should also be facing front of sewing machine.

Phases of base line of rotation shutter even with screw hole and foundation hole of vertical shaft pulley should be the same.

ADJUSTMENT

- Vertical shaft and outer rotary hook pulleys

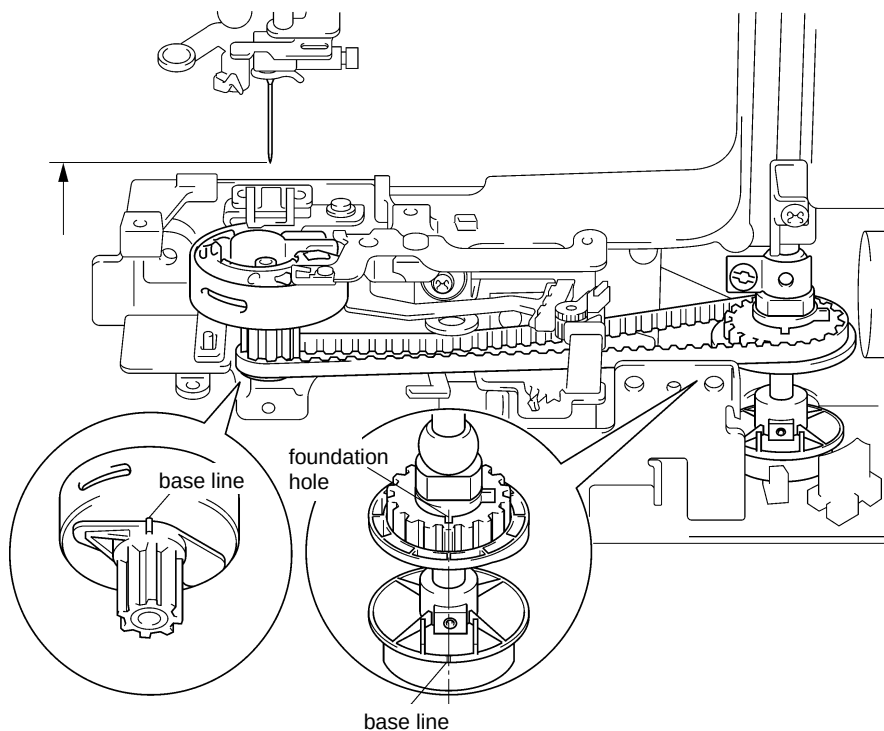
1. Position so that base lines of vertical shaft and outer rotary hook pulleys are facing front of sewing machine. Attach timing belt.
2. Loosen both screws of the upper shaft gear.
3. Turn pulley to raise needle bar to its uppermost position.
4. Make sure that vertical shaft and outer rotary hook pulleys are positioned as indicated in 1. Then tighten both upper shaft gear screws.

* After completing adjustments, make absolutely sure to check the backlash of the upper and vertical shaft gears.

- Rotation shutter

1. Loosen rotation shutter screw.
2. Adjust phases of base line of rotation shutter even with screw hole and foundation hole of vertical shaft pulley.
3. Tighten rotation shutter screw.

* Use only 2-4kg-cm of torque when tightening rotation shutter screw. Applying too much pressure could wear out grooves in top of screw, making it impossible to fasten securely.



5. NEEDLE DOWN POSITION ADJUSTMENT

STANDARD

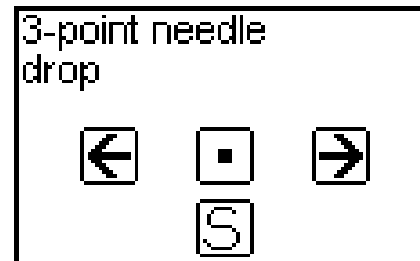
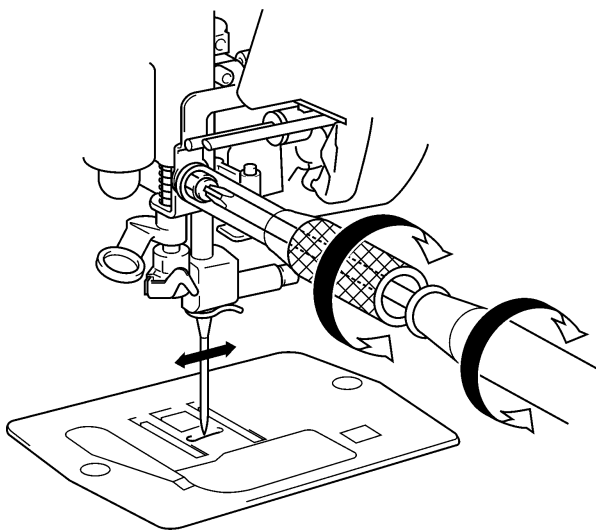
Set machine to test mode and select (3) 3-point needle drop. The needle should straight come down through the middle of the left, right and center needle plate holes.

ADJUSTMENT

1. Set machine to test mode and select (3) 3-point needle drop.
2. Press the $\leftarrow \bullet \rightarrow$ marks on the screen, and watch needle drop position in regards to eye of the needle.
3. Loosen zigzag nut screws, turn eccentric nut, and adjust needle drop position.
4. Fasten zigzag nut screws.
5. Press the $\leftarrow \bullet \rightarrow$ marks on the screen, and check needle drop position in regards to eye of the needle.

Adjustment Points

3. With eccentric nut, the part of most eccentricity will rise towards to the top (see diagram A). When needle drop position is set to left needle drop position, needle should be positioned slightly to the right of the center of the notched section of the needle hole in the needle plate. (see diagram B)



3-point needle drop screen



Diagram A

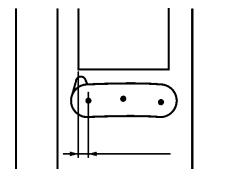
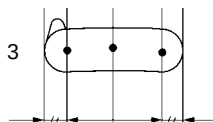


Diagram B

6. TIMING OF NEEDLE AND ROTARY HOOK (CLEARANCE BETWEEN THE NEEDLE AND THE ROTARY HOOK POINT)

STANDARD

While in test mode (3) 3-point needle drop, select left needle drop. When the needle is raised 2.75-3.15mm from its lowest position, the rotary hook point should clear the outer side of the needle. When using a #11 needle, the clearance between the needle and outer rotary hook point should be under 0.1mm.

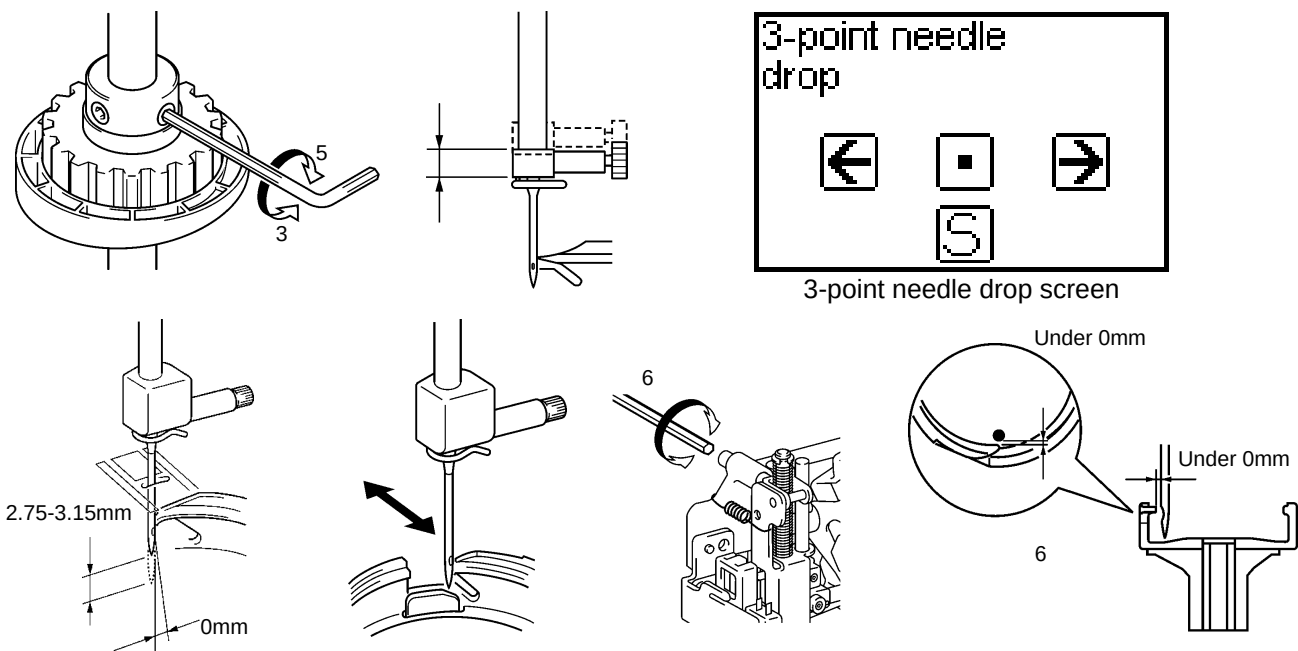
ADJUSTMENT

1. Set machine to test mode and select (3) 3-point needle drop.
2. Press the  mark on the screen to move the needle drop position to the left.
3. Loosen both vertical shaft pulley screws.
4. Adjust so that when needle (#11 needle) is raised 2.75-3.15mm from lowest position, outer rotary hook point clears outside of needle.
5. Tighten both vertical shaft pulley screws.
6. Turn needle clearance adjusting screw, and adjust clearance between back of needle and point so that it is under 0.1mm.
7. Turn balance wheel with your hand, and check that needle does not come into contact with point when needle is dropped in any position; left, right or center.

Adjustment Points

* Make absolutely sure to check needle clearance in both left and right needle drop positions. If there is a difference in needle clearance between left and right positions, move the H shaft holder to the left or right to adjust.

- If needle clearance is greater in the left drop position than the right, slide the H shaft holder to the left.
 - If needle clearance is greater in the right drop position than the left, slide the H shaft holder to the right.
- (1) If needle clearance is too great, skipped stitches may result.
 - (2) If needle clearance is too narrow, an abnormal metallic noise and needle breakage could result.
 - (3) If needle does not rise high enough, skipped stitches, split thread and thread breakage could result.
 - (4) If the needle rises too far, loops may form in the thread resulting in skipped stitches, split thread and thread breakage.



7. NEEDLE BAR HEIGHT

STANDARD

While in test mode (3) 3-point needle drop, select left needle drop, turn balance wheel with your hand so needle (#11 needle) meets that outer rotary hook point. At this time, the distance between the top of the needle eye and the bottom of the rotary hook point should be 1.0-1.4mm.

ADJUSTMENT

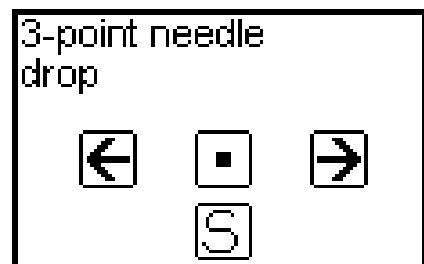
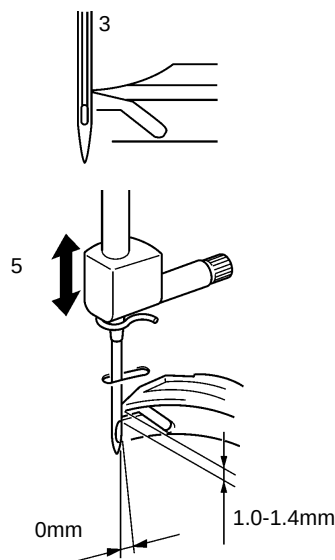
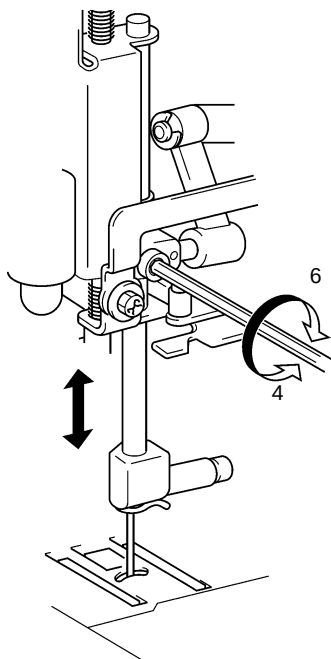
1. Set machine to test mode and select (3) 3-point needle drop.
2. Press the ← mark on the screen to move the needle position to the right.
3. Turn balance wheel so that needle meets outer rotary hook point.
4. Loosen needle bar clamp screw.
5. Raise and lower needle bar and adjust distance between top of needle eye and bottom of outer rotary hook point so that it is between 1.0-1.4mm.
6. Tighten needle bar clamp screw.

Adjustment Points

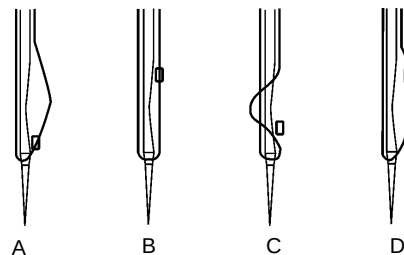
* When adjusting needle bar height, needle bar may turn easily, this could make sewing difficult. When making these adjustments, make sure that front of needle clamp and feed dog grooves of needle plate meet at a 90 degree angle.

* After adjusting needle bar height, check the vertical position of needle threading hook.

- (1) If needle bar is set at wrong height, skipped stitches, split thread, and thread breakage may result. (see illustration below)



3-point needle drop screen



8. FRONT/BACK, LEFT/RIGHT POSITION OF FEED DOGS

STANDARD

Select test mode (5) feed dog position. When feed dog moves back and forth, they should not come into contact with needle plate. Regarding feed dog position, when feed dog is in the forward position, there should be 0.5-1.1mm of clearance between center feed dog and grooves in needle plate.

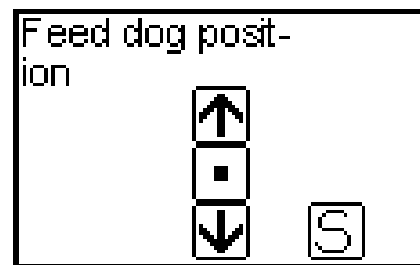
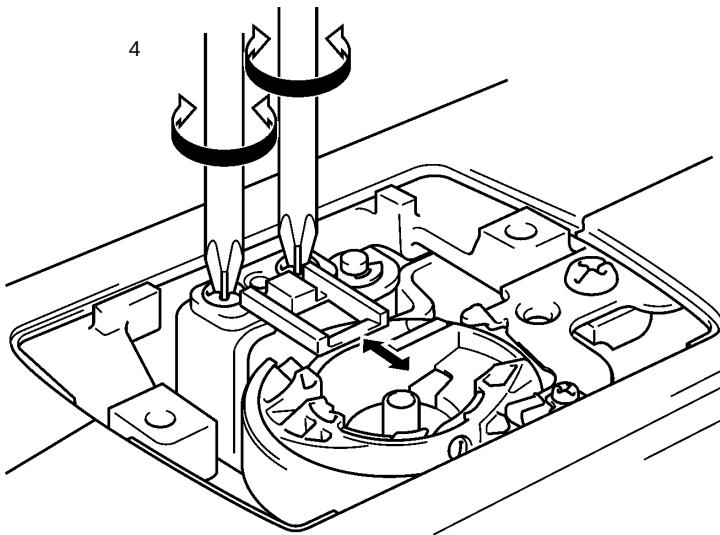
ADJUSTMENT

1. Set machine to test mode and select (5) feed dog position.
2. Press the ↓ mark on the screen to position feed dog forward.
3. Make sure that there is between 0.5-1.1mm of clearance between center feed dog and grooves of needle plate.
4. If the clearance is not within the accepted range, remove needle plate, loosen feed dog screw, and reattach feed dog.
5. Press the ↑ ↓ marks on the screen, and check to make sure that the feed dog does not come into contact with the needle plate.
6. If feed dog does come into contact with needle plate, remove needle plate, reattach feed dog, and repeat steps 2-5.

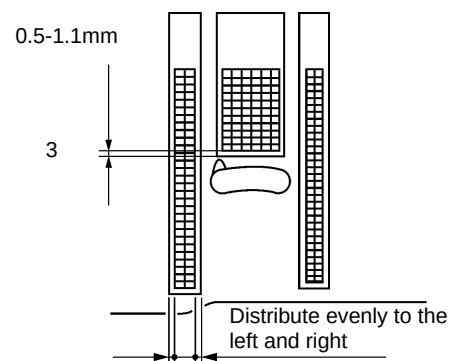
Adjustment Points

* Feed dog should be attached so that they are parallel with grooves of needle plate.

- (1) If feed dog is not parallel to grooves, fabric will not feed properly.
- (2) Attachment of needle plate, positioning and adjustments can be carried out with greater ease if feed dog screw is loosely attached.



Feed dog position screen



9. FEED DOG HEIGHT

STANDARD

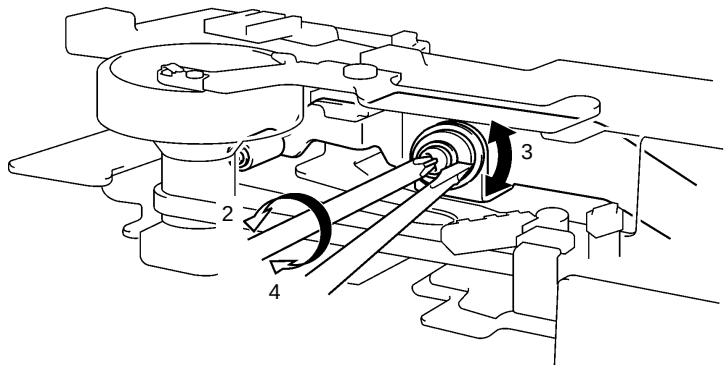
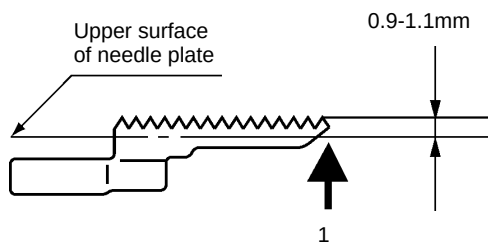
Feed dog should come 0.9-1.1mm above top of needle plate when feed dog is in their highest position.

ADJUSTMENT

1. Turn balance wheel until feed dog is in the highest position.
2. Loosen eccentric collar screw of up-down feed arm.
3. Turn groove of eccentric collar with the tip of a standard screwdriver, adjust height of feed dog so it comes between 0.9-1.1mm.
4. Tighten eccentric collar screw.

Adjustment Points

- (1) If feed dog comes up too high, they may scrape up against the bottom of the needle plate, resulting in an abnormal noise and poor forward-backward movement, resulting in incorrect fabric feed or possibly failure to feed fabric.
- (2) If feed dog is positioned too low, it could result in incorrect fabric feed or possibly failure to feed fabric.



10. PRESSER BAR HEIGHT

STANDARD

If presser bar is set to appropriate height and presser foot lifter is raised (up one step), the distance between top surface of needle plate and bottom of presser bar should be between 6.0-6.5mm.

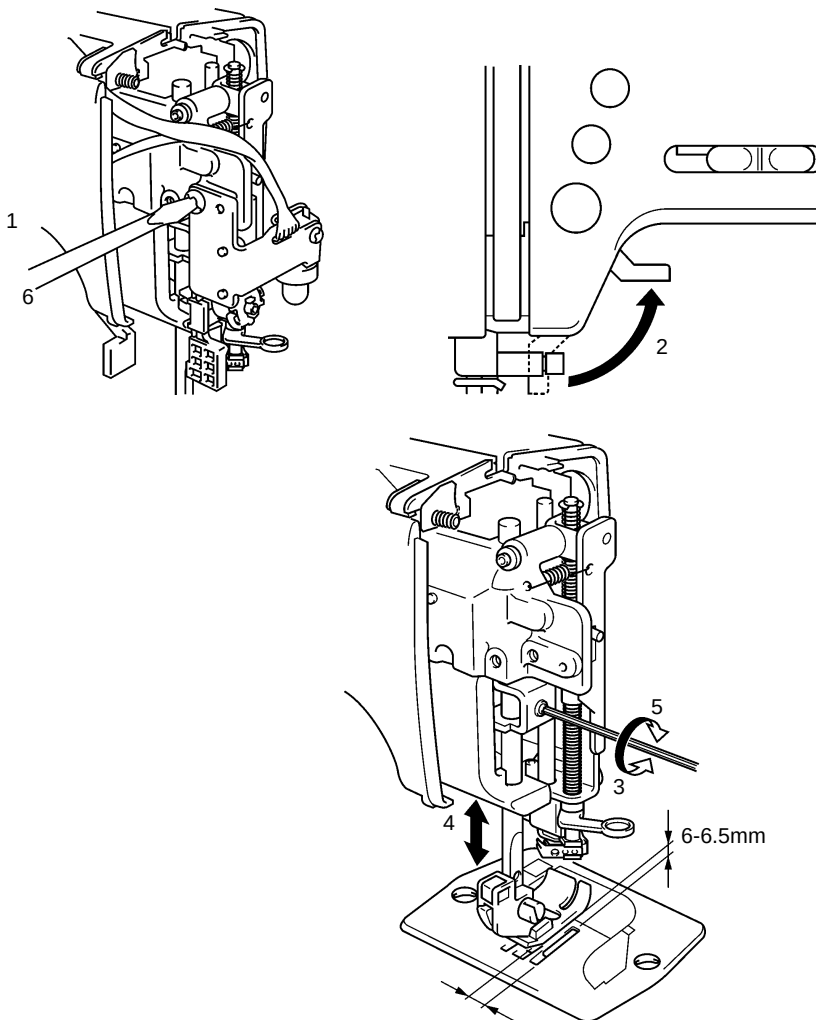
ADJUSTMENT

1. Remove BH switch base board.
2. Raise presser foot lifter up one step.
3. Loosen presser bar guide bracket screw.
4. Raise and lower presser bar, and adjust so that height is within 6.0-6.5mm.
5. Fasten presser bar guide bracket screw.
6. Attach BH switch base board.

Adjustment Points

* Check to make sure that side of presser foot is parallel with feed dog grooves of needle plate.

- (1) Use the J sewing foot.
- (2) If the presser bar is not parallel with feed dog grooves, the needle may come into contact with the presser foot or the fabric may not feed correctly when overcasting presser foot.



11. BUTTON HOLER (POSITION OF BUTTONHOLE LEVER)

STANDARD

When the BH (buttonhole) lever is lowered, the clearance of the front part of the buttonholer foot (A) should be 1.5mm, and when the presser foot lifter is lowered, BH0 should touch BH1.

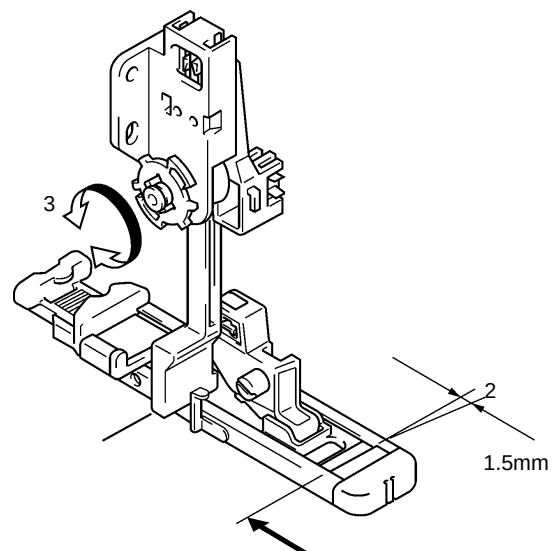
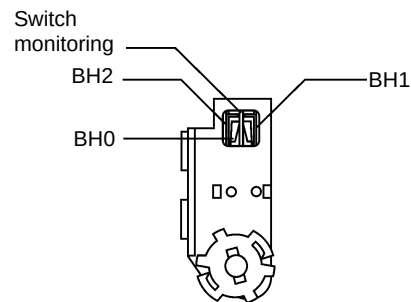
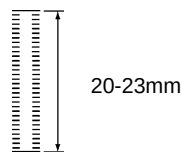
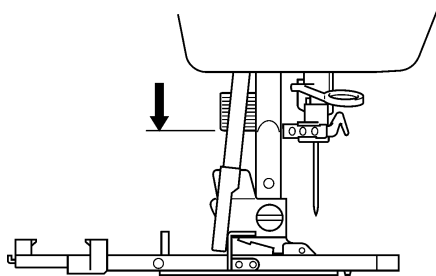
ADJUSTMENT

1. Flip on power switch, select button holing stitch (bar tack).
2. Attach Buttonholer foot (A), set clearance at front of foot to 1.5mm and lower presser foot lifter.
3. Turn BH eccentric shaft, adjust position of BH switch lever so that BH10 touches BH1.
4. To check length of finished buttonholes, set a 20mm round button in the buttonholer foot and sew a bar tack stitch.
5. Check to make sure that inside of vertical bar tacking is between 20-30mm.

Adjustment Points

* Pull buttonholer foot all the way out, and check switch operation when you sew where two notches of buttonholer foot are returned.

- (1) to set clearance at front of buttonholer foot (A) to 1.5mm, set a 1.5mm coin into front section.
- (2) Turning BH eccentric shaft clockwise will widen the clearance between BH0 and BH1.
- (3) If length of buttonhole is too short, bend BH1 so that BH2 moves further away from BH0. If too long, bend BH2 so that it comes nearer to BH0.



12. BOBBIN WINDER (ADJUST BOBBIN WINDER SWITCH)

STANDARD

Thread should be wind parallel to the bobbin and around about 75-95% of the circumference of the bobbin. During bobbin winding, loosen bobbin winder switch 1-1.2mm and switch on.

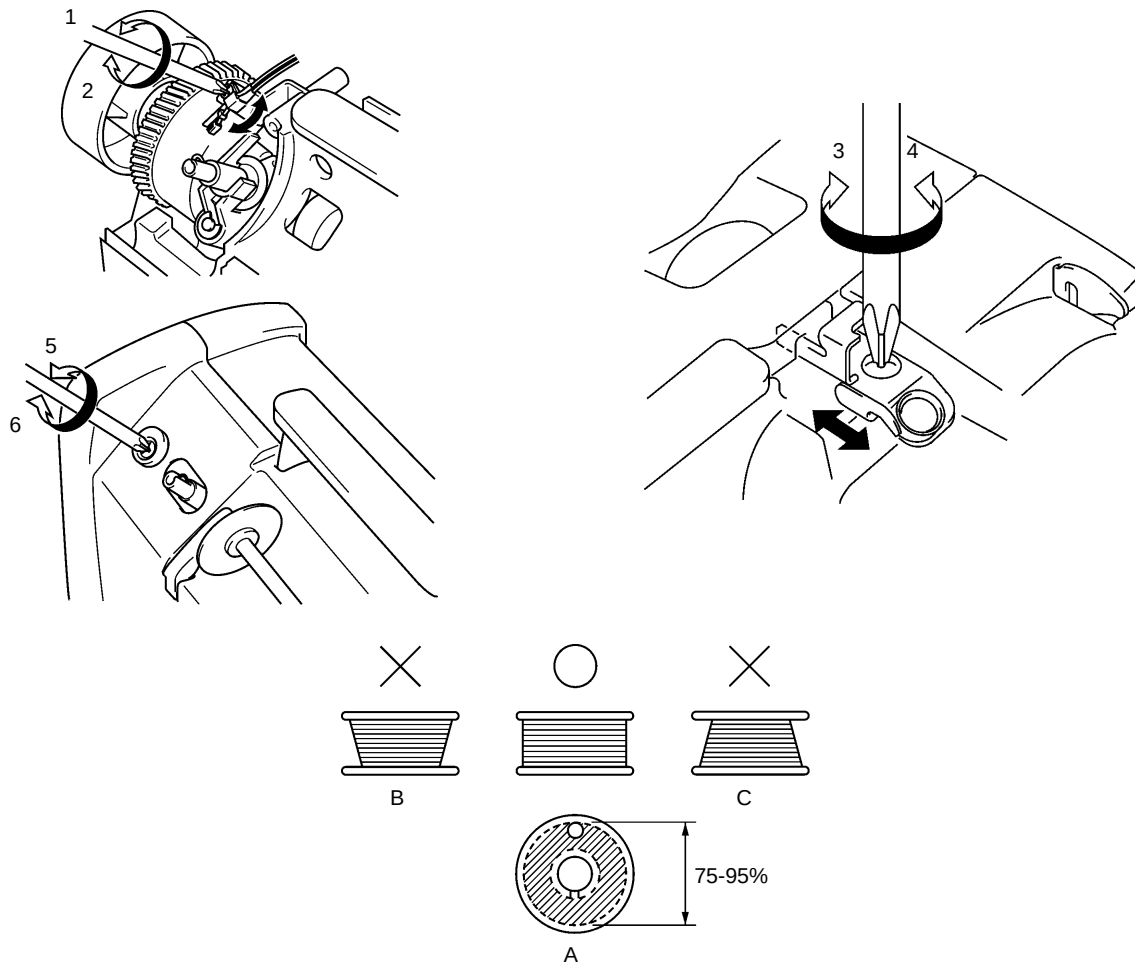
ADJUSTMENT

1. Loosen screw on bobbin winder switch and adjust the overlap of bobbin winder switch.
2. Tighten screw on bobbin winder switch.
3. Loosen bobbin winder thread guide screw a little bit. Move bobbin winder thread guide back and forth. Adjust bobbin winding.
4. Tighten bobbin winder thread guide screw.
5. Turn bobbin presser screws 2-3 revolutions, turn bobbin presser, and adjust bobbin winding volume (see diagram A)
6. Tighten bobbin presser screw.

Adjustment Points

* If bobbin winder thread guide and bobbin presser screws are not screwed on tightly enough, the nuts could fall into the inside of the sewing machine, so take care that they are fastened securely.

- (1) When adjusting bobbin winding, if bobbin winds as shown by figure (B) the spool guide should be moved forward. If it winds as shown by figure (C) the spool guide should be moved backward.



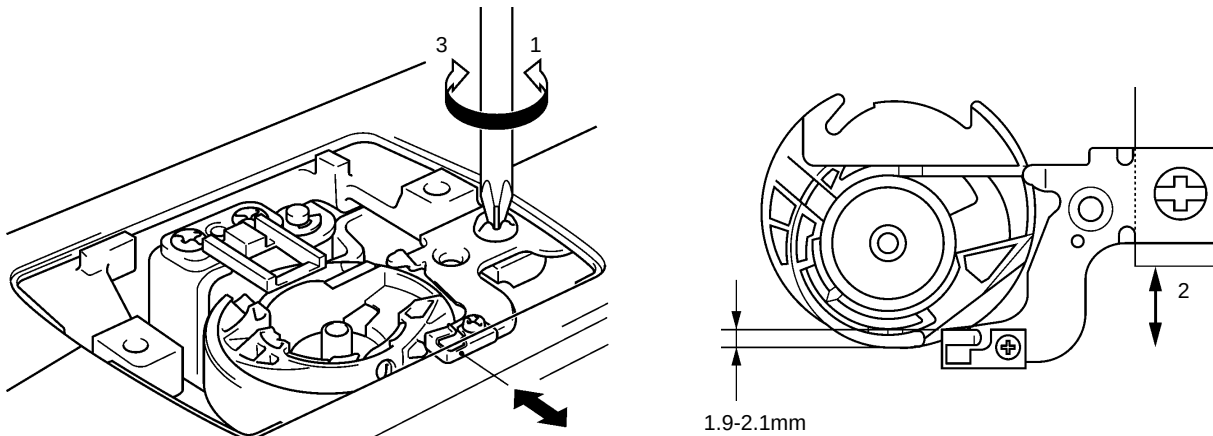
13. INNER ROTARY HOOK BRACKET POSITION

STANDARD

There should be 1.9-2.1mm overlap between inner rotary hook bracket spring and convex part of inner rotary hook.

ADJUSTMENT

1. Loosen screw on inner rotary hook bracket.
2. Adjust the overlap so that it is 1.9-2.1mm between inner rotary hook bracket spring and convex part of inner rotary hook.
3. Tighten screw on inner rotary hook bracket.



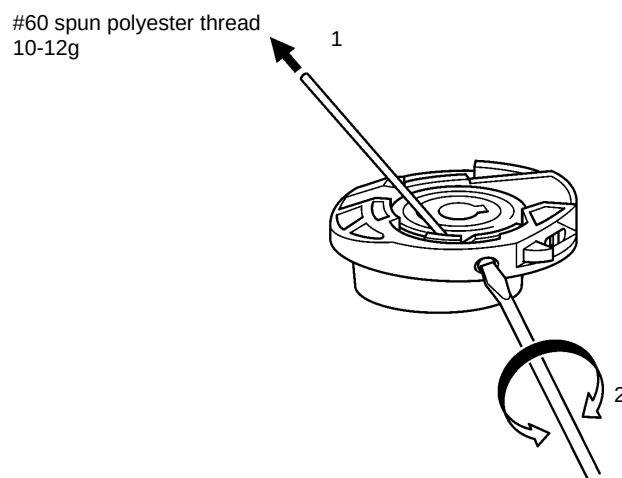
14. INNER ROTARY HOOK TENSION

STANDARD

Inner rotary hook tension should be 0.1-0.12N(10-12g) when #60 spun polyester thread is slowly pulled with a tension gauge.

ADJUSTMENT

1. Set a bobbin would properly with #60 spun polyester thread into the inner rotary hook, and pull thread slowly with tension gauge.
2. Use a screwdriver to turn spring adjustment screw to the left and right, and adjust thread tension.
* After making adjustments, be sure to lock adjustment screw using an oil based paint.



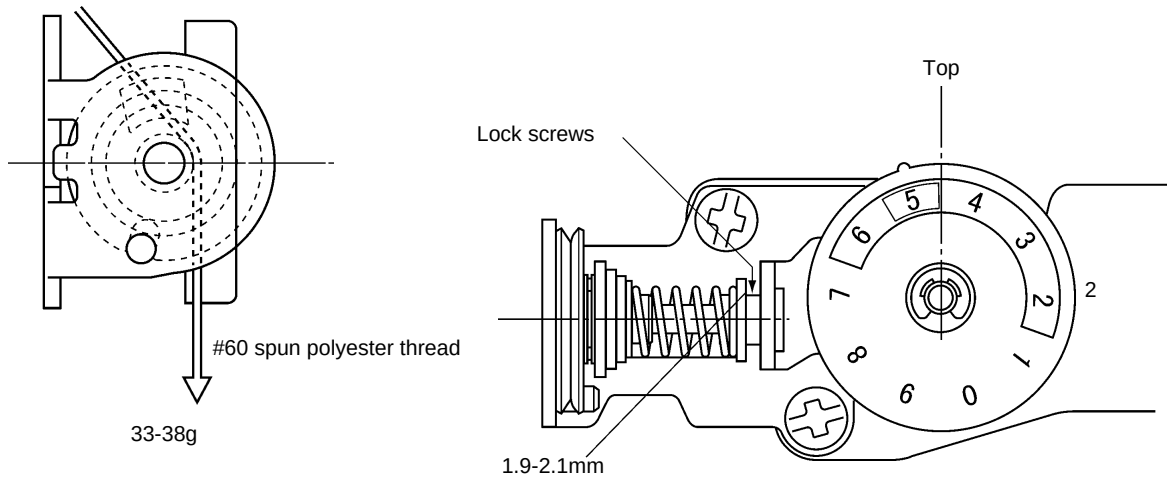
15. THREAD TENSION (UPPER THREAD TENSION)

STANDARD

Set upper thread tension dial to the right of "5". Using #60 spun polyester thread, slowly pull thread down with tension gauge using a force of 0.33-0.38N(33-38g).

ADJUSTMENT

1. Set thread tension dial so that the space to the right of "5" is in the uppermost position as shown in diagram below.
2. Raise presser foot lifter, run #60 spun polyester thread through thread tension disk.
3. Lower presser foot lifter, slowly pull thread downwards with tension gauge.
4. Turn thread tension adjusting screw, set upper thread tension so that it falls into the range of 0.33-0.38N(33-38g).
 - * When carrying out these adjustments, do not pass thread through thread guide plate. It should only pass through the thread tension disk.
 - * After making adjustments, be sure to lock thread tension adjusting screw using a liquid screwlock.



16. SETTING Z GEAR

STANDARD

Line up indicator marks on release cam and ZPM gear evenly with mark on shaft.

Line up indicator marks on ZPM and Z gears, and set gears.

ADJUSTMENT

(release cam)

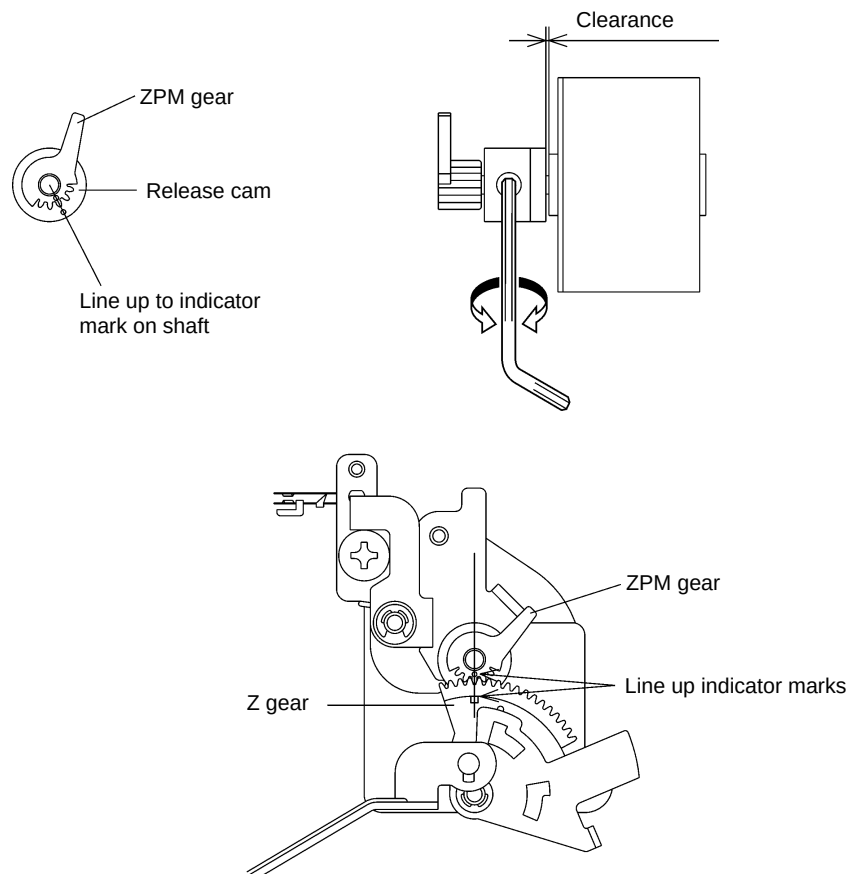
1. Loosen screw on release cam.
2. Align indicator marks on release cam and ZPM gear to mark on shaft.
3. Tighten screw on release cam.
 - * When doing this, make sure there is clearance between the release cam and Z pulse motor.

(Z gear)

4. Line up indicator marks on ZPM gear and Z gear, and attach Z gear.

Adjustment Points

- (1) If release cam indicator marks do not line up properly, thread tension disk may fail to open during long jumps in embroidery (when embroidery hoop moves over a substantial distance) resulting in possible thread and needle breakage.
- (2) If ZPM gear and Z gear indicator marks do not line up, it could result in unstable needle position, needle breakage, incorrect stitch width, and faulty embroidery.



17. FEED ADJUSTMENT (GEAR BACKLASH)

STANDARD

When test mode (6) initial feed position is selected, clearance between FPM gear and rubber stop of initial plate should be 1.0-2.0mm.

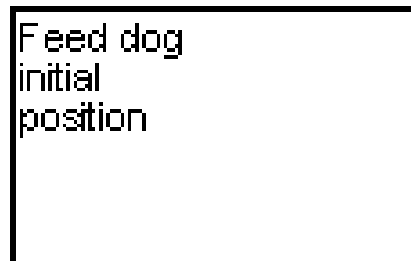
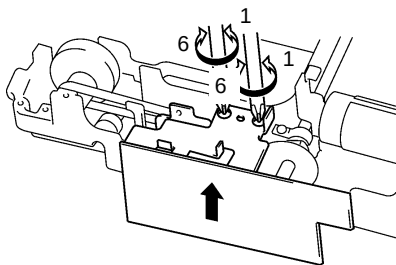
F gear and FPM gear should be set so that F gear moves freely with no clearance.

ADJUSTMENT

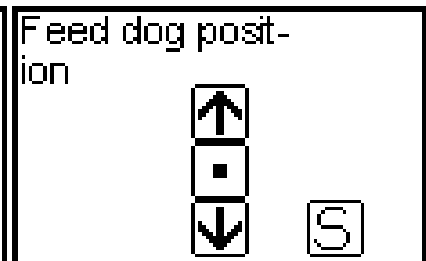
1. Remove both screws from set plate C. Remove NP (needle position) board assembly.
2. Loosen both screws on feed pulse motor (FPM) by turning them about one half rotation (180 degree).
3. Line up indicator marks on F and FPM gears. Set gears.
4. Turn initial plate. Adjust and set F and FPM gears so that they rotate freely with no clearance.
* Move F gear forwards and backwards. While checking movement, gradually move FPM gear.
5. Fasten both FPM screws.
6. Fasten both screws on set plate C (of NP board).
7. Select test mode (6) initial feed position, move feed dog back to set them in their initial position.
8. Make sure that clearance between surface of FPM gear and rubber stop of initial plate is within 1.0-2.0mm.
9. While set in test mode (5) feed dog position, repeatedly depress $\uparrow$ and $\downarrow$ marks and check that F gear moves freely.

Adjustment Points

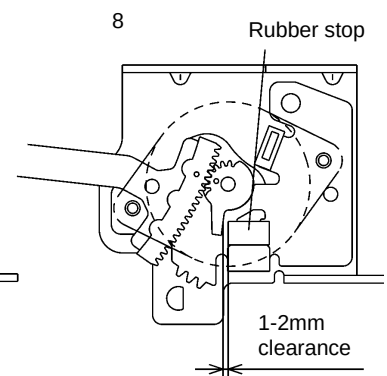
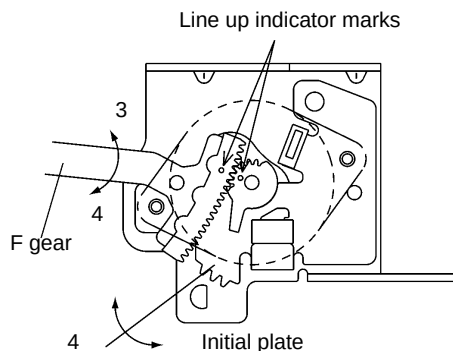
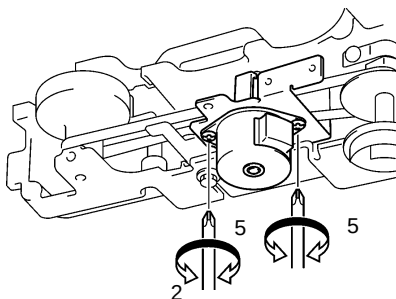
- (1) If F gear and FPM gear are not set properly, feed may be off.
- (2) If F gear and FPM gear are set too tight (so that gears come too tightly together), it could result in pulse motor and inability to feed fabric.
- (3) If setting of F gear and FPM gear is too weak (too much backlash), abnormal sounds may result, interfering with proper feed and stitching.



Feed dog initial position



Feed dog position screen



18. NEEDLE THREADER

USING THE NEEDLE THREADER

There are a wide variety of different needles and sewing machine threads available. The right ones should be selected in accordance with the sewing conditions. The accessory needle threader is designed to make threading of needles easier, but it cannot handle every single circumstance of use (combinations of needle and thread) that may occur. It can be used with some combinations but not with others, and if it can be used, the pattern may not be sewn correctly due to the particular sewing conditions. Do not use the needle threader without gaining a thorough understanding of how to use it, otherwise the needle threader may be damaged or needle threading may not be possible. Be sure to read and understand the following so that you can handle customer complaints.

<Notes>

1. Needle threader can only be used with circled needle and thread combinations on following chart. Do not use those combinations marked with an "X" when using needle threader.
2. Needle and thread combinations marked with an * on the following chart can be used, but are not recommended because they could lead to imperfect performance and possibly even breakage of needle threader itself.
3. Lower presser foot when using needle threader.
4. Nylon transparent thread can be used with #14-16 sewing machine needles regardless of what is listed on chart below.
5. Do not turn the balance wheel when using needle threader.
6. Do not lower needle threader lever when operating sewing machine. Doing so could break the needle threader rendering it unusable, or result in needle breakage and possible injury.
7. If a #9 needle is used with the needle threader, the variation in needle precision may result in the needle being slightly difficult to thread.
8. When using needle threader, tip of needle should be raised at least 10mm above top surface of needle plate or threading might not occur.
9. Use a #11 needle when doing embroidery.

Thread Needle	#30	#50	#60	#80	#100	#120
#9	×	×	×	○	○	○
#11	×	○	○	○	○	*
#14	×	○	○	○	*	*
#16	*	○	○	*	*	*
#18	*	*	*	*	*	*

19. NEEDLE THREADER (CHECKING THE HOOK POSITION IN HORIZONTAL DIRECTION)

STANDARD

The measure from inside of the hook guard to the center point of hook is 0.42mm.

CHECK

As sewing needle HA130 (#14) is standard, so prepare five brand-new sewing needles HA130 (#14) and check by changing all of these.

After Checking,

1. In case that, hook goes through eyelet of all needles There is no problem.
2. In case that, hook does not go through eyelet of all needles Adjust by bending hook.

- In case that, hook does not go through eyelet of some needles.....Needles through which the hook does not go through are defective.

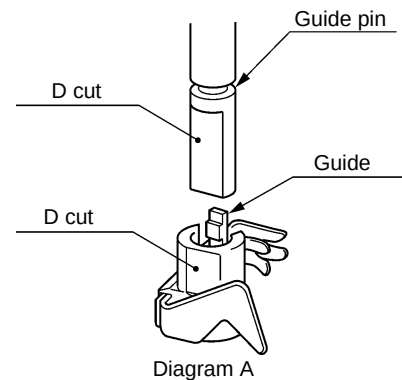
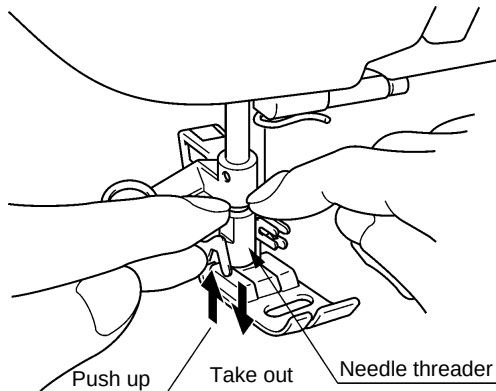
(Example for checking)

When you check five brand-new sewing needles HA130 (#9) on condition that it achieves first case, if the hook does not go through eyelet of all of these needle, all five needles are defective and you judge the hook position is not defective.

20. NEEDLE THREADER (EXCHANGE)

Follow the following procedures when changing needle threader.

- Remove needle. Lower presser foot.
- Press needle threader down using index fingers of both hands.
- Line up D-cut face of new needle threader and needle threader shaft as indicated by (A) in the diagram below.
- Attach needle threader guide so that it fits into groove of shaft.



21 NEEDLE THREADER (CHECKING THE HOOK IN STANDARD POSITION)

vertical direction in relation to eye of the needle

Clearance between top of hook and top of needle eye should be 0mm.

Needle threader can be used when needle point is raised over 10mm above top surface of needle plate.

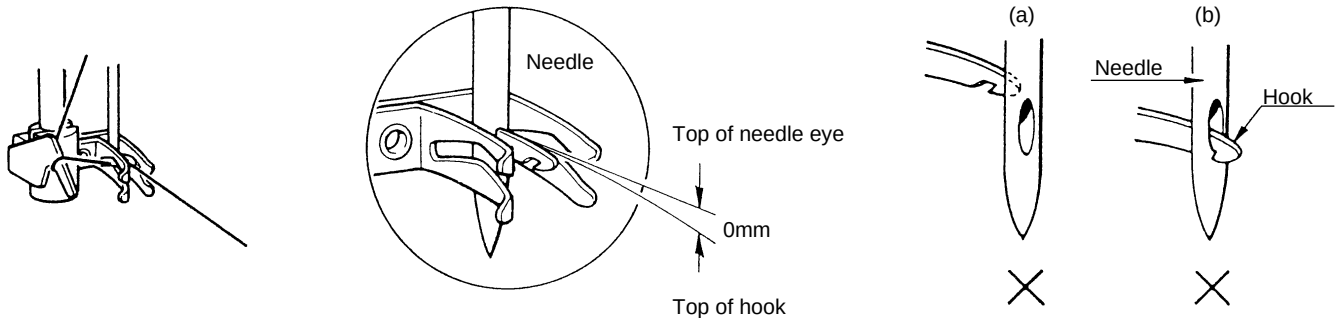
CHECK (refer to illustration)

Case A

Hook position is too high. (Hook hits needle and cannot go through needle eye.)

Case B

Hook position is too low. (Hook goes through needle eye but it catches bottom part of needle eye.)

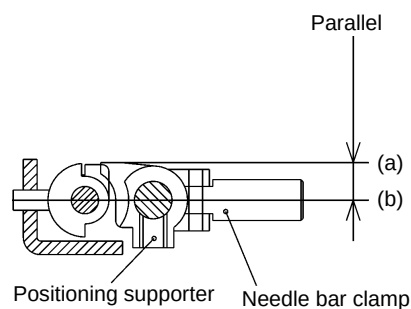
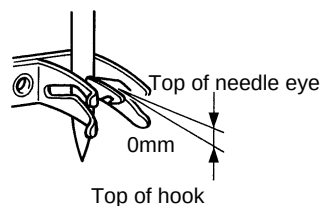
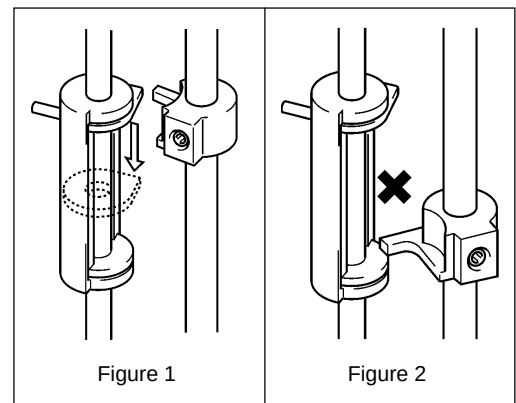
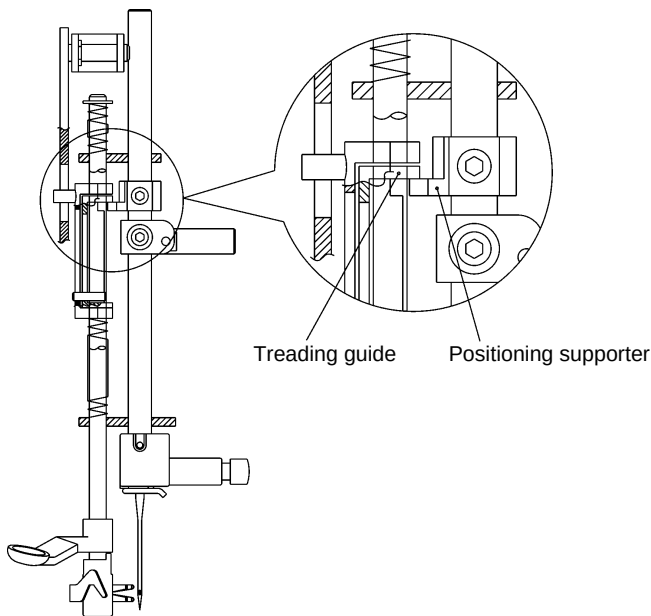


22 NEEDLE THREADER (CHECKING THE HOOK POSITION IN VERTICAL DIRECTION)

ADJUSTMENT

1. Loosen positioning supporter screw.
2. Raise and lower the positioning supporter very slightly and check that there is 0mm clearance between top of hook and top of needle eye.
 - (a) When hook point is too high
Lower positioning supporter a tiny bit.
 - (b) When hook point is too low
Raise positioning supporter a tiny bit.
3. Tighten positioning supporter screw.
4. After making adjustments, make sure that positioning supporter (a) and needle bar clamp (b) are parallel with each other as shown in the diagram below.
5. Readjust if not parallel.

* If positioning supporter and needle bar clamp are not parallel with each other:
The threading guide will not be held by the positioning supporter, so the lever will not move and thread the needle even if needle threader lever is in lowest position. (figure 1) If this is the case, loosen positioning supporter screw, move the positioning supporter slightly to the left to make it parallel. Furthermore, if positioning supporter is turned to far to the left so that it is not parallel, positioning supporter may come into contact with the threading guide and could result in damage to the needle threader, or could even have a negative impact on other parts around the needle bar which could lead to possible damage to the sewing machine itself. (figure 2) If no parts have been damaged, loosen positioning supporter screw, and move positioning supporter slightly to the right to make it parallel.



23. TIMING BELT TENSION FOR THE X DIRECTION (EMBROIDERY UNIT)

STANDARD

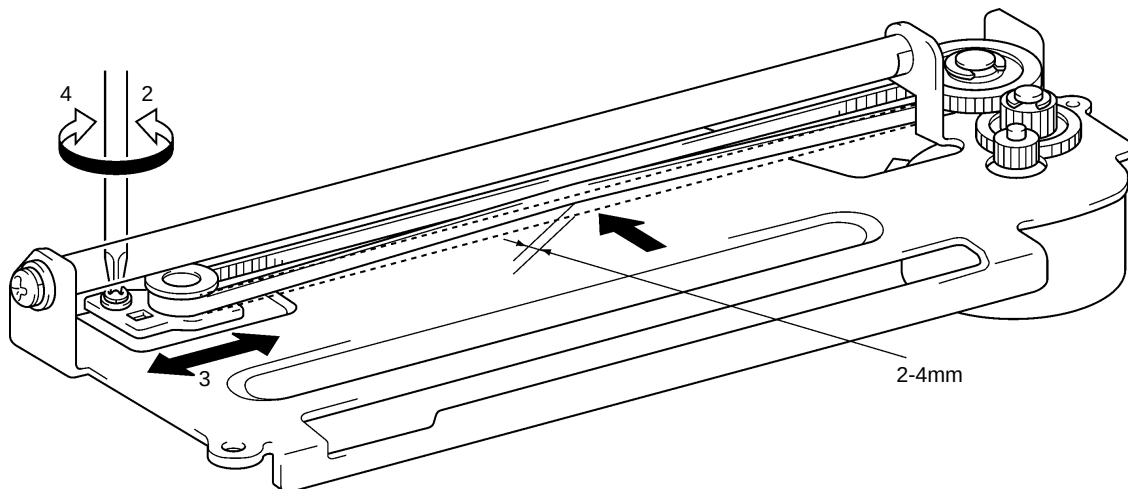
There should be 2-4mm slack in the belt when looped around the X driving pulley shaft and the X tension pulley shaft when center of the belt is pressed with a force of 100g after the X carriage unit is moved all the way to the right.

ADJUSTMENT

1. Move X carriage assembly all the way to the right.
2. Loosen screw of X tension pulley holder.
3. Move X tension pulley holder to the right and left, and adjust belt tension.
4. Tighten screw of X tension pulley holder.

Adjustment Points

* If belt tension is too loose or too tight, it could result in poor stitching or faulty embroidery.



24. TIMING BELT TENSION FOR THE Y DIRECTION (EMBROIDERY UNIT)

STANDARD

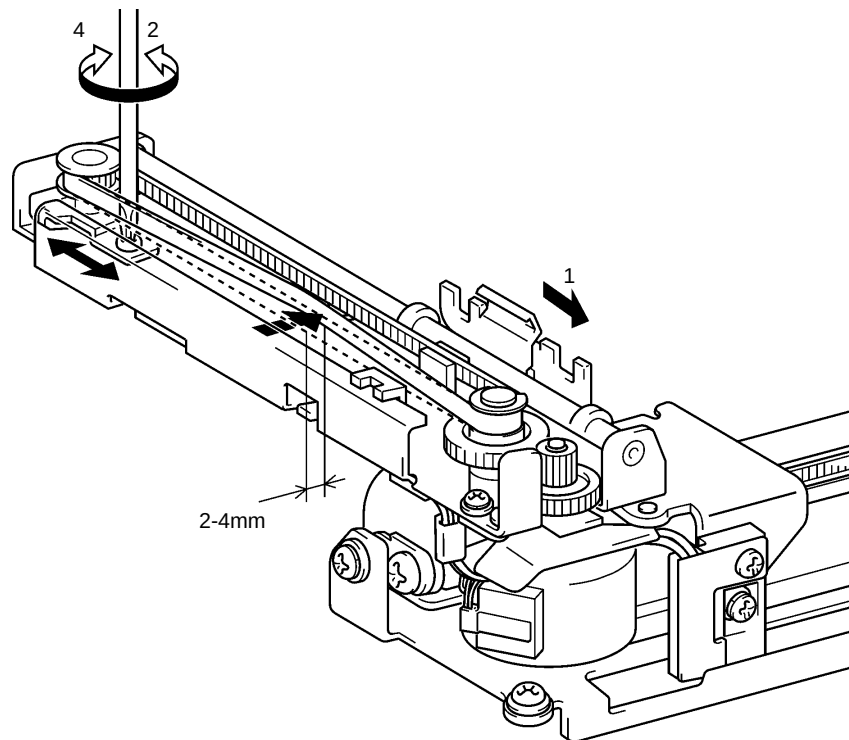
There should be 2-4mm slack in the belt when belt is looped around Y driving pulley and Y tension pulley shaft and depressed in the center with a force of 100g after the Y carriage is moved all the way forward.

ADJUSTMENT

1. Move Y carriage assembly all the way forward.
2. Loosen screw of Y tension pulley holder.
3. Move Y tension pulley holder back and forth to adjust belt tension.
4. Tighten screw of Y tension pulley holder.

Adjustment Points

* If belt tension is too weak or too strong, it could result in poor stitching or faulty embroidery.



IV. HOW TO ADJUST ELECTRONIC ELEMENTS

1. When power is turned on, buzzer does not sound and nothing appears on display	50
2. After the power is turned on, pulse motors do not return to their home positions with respect to the needle position (Zigzag pulse motor when needle is raised. Feed pulse motor when needle is lowered)	50
3. Pattern cannot be selected	50
4. Main motor does not run	50
5. Operation of main motor is not stable, maximum speed operation is not possible, or speed cannot be adjusted.....	51
6. Correct patterns are not created.....	51
7. Buttonholes are not stitched correctly.....	51
8. Manual operation of feed and zigzag pulse motors is not possible.....	51
9. Vertical movement of needle bar and backstitch operation are abnormal	51
10. Foot controller does not operate normally when depressed	52
11. LCD does not light up properly.....	52
12. Bobbin winder doesn't work	52
13. Needle thread breakage detector doesn't work correctly.....	52
14. Embroidery attachment doesn't work well	52

* Turn off the power and remove connectors from printed circuit boards before measuring resistance.

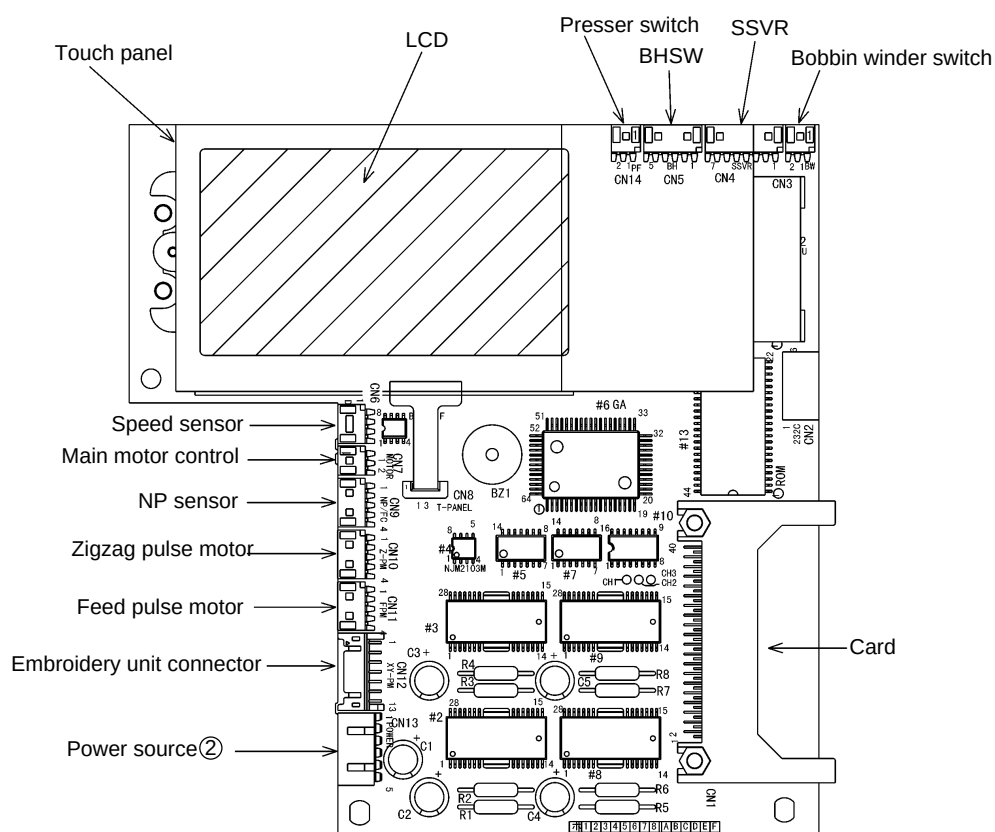
* Refer to diagrams for location of check points.

PROBLEM	CHECK	REMEDY
1. When power is turned on, buzzer does not sound and nothing appears on display.	1. Has the display contrast been adjusted? 2. If the voltage between both inlet terminals is measured when the power cords plugged in the standard voltage (120 VAC, 220V, 230V, 240V) displayed? 3. When power switch is set to on, is resistance between both ends less than 1 Ω ? 4. Remove power source ① connector (CN2 on the NP board) , and check to see if voltage between pins 1 and 2 is at DC 24-35V. 5. Remove power source connector (CN13) and check to see that voltage is as indicated below. Between pins 2 and 3 DC 18-30V Between pins 4 and 5 DC approx. 5V 6. With power source ② connector (CN13) attached, check that voltage between pins 1 and 4 is between DC 18-35V. 7. Others	1. Adjust the contrast. 2. Replace the power cord. 3. Replace power supply unit assembly. 4. Replace power supply unit assembly. 5. Replace NP board assembly. 6. Replace NP board assembly. 7. Replace main PC board assembly.
2. After the power is turned on, pulse motors do not return to their home positions with respect to the needle position. (Zigzag pulse motor when needle is raised. Feed pulse motor when needle is lowered.)	1. Are the resistances between the connector pins given below normal for the pulse motors which do not return to the home position? Zigzag (CN13) 1-3, 2-3, 4-5, 4-6 $\rightarrow$ 8-10 Ω Feed (CN13) 1-3, 2-3, 4-5, 4-6 $\rightarrow$ 8-10 Ω Horizontal(CN13) .1-3, 2-3, 4-5, 4-6 $\rightarrow$ 8-10 Ω 2. Set the home position for the same pulse motors irrespective of needle position. 3. Remove power source ② connector (CN13) and check that voltage between pins 2 and 3 is as indicated below. Between pins 2 and 3 DC 18-30V 4. Others	1. Replace the pulse motor which shows an abnormality. 2. Replace NP board assembly. 3. Replace NP board assembly. 4. Replace main PC board assembly.
3. Pattern cannot be selected.	1. Does switch on SS (start/stop) VR board remain depressed? 2. When the foot controller is connected, does it remain depressed? 3. Others	1. Adjust or exchange SS (VR) PC board assembly. 2. Check foot control unit operation. 3. Replace main PC board assembly.
4. Main motor does not run.	1. Does balance wheel rotate easily? 2. Is main motor connector (CN2 on power supply unit) attached properly? 3. What is the resistance between both ends of main motor? FOR 120V MOTOR.....120-180 Ω FOR 230V MOTOR.....400-800 Ω 4. Are switches operating correctly? When switch is pressed, voltage between ends of each switch should be under 1 Ω . When switch is released, voltage should be ∞ 5. When switch is pressed, voltage between ends of each switch should be under 1 Ω . When switch is released, voltage should be ∞ 6. Others	1. Adjust balance wheel position. 2. Check foot control unit operation. 3. Replace main motor. 4. Exchange SS (VR) PC board assembly. 5. Check or replace presser foot switch assembly. 6. Replace main PC board or power supply unit assembly.

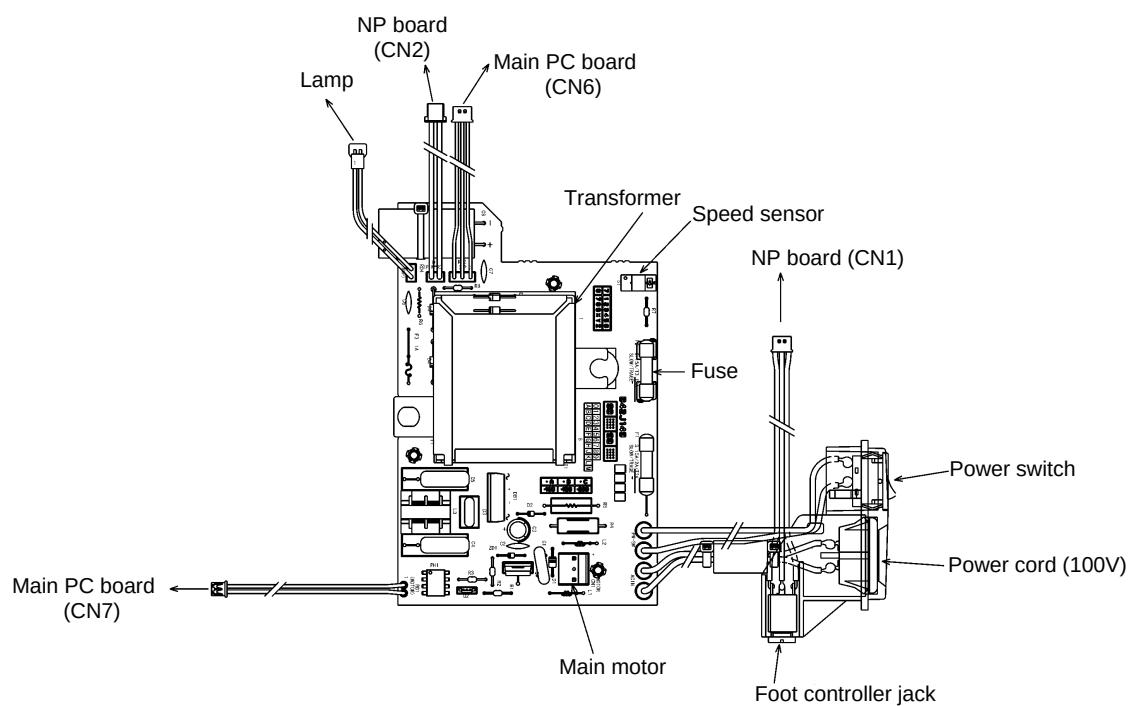
PROBLEM	CHECK	REMEDY
5. Operation of main motor is not stable, maximum speed operation is not possible, or speed cannot be adjusted.	1. When turning on power and moving speed slide, does voltage between pins 3 and 7 connector CN4 (for speed slide) change from 0 to 5 VDC? 2. When turning balance wheel opposite its normal rotation direction, do voltages between pins 1-4 and between pins 2-4 of NP sensor connector (CN9) fluctuate between DC 0-5V? 3. When turning balance wheel opposite its normal rotation, does voltages between pins 2-3 of speed sensor connector (CN6) fluctuate between DC 0-5V? 4. Others	1. Exchange SS (VR) PC board assembly. 2. Replace NP board assembly. 3. Replace power supply unit assembly. 4. Replace SS PC board assembly.
6. Correct patterns are not created.	1. Is resistance of pulse motor connector pins as follows? Zigzag (CN10) ... 1-2,3-4 → 8-10 Ω Feed (CN11) ... 1-2,3-4 → 8-10 Ω 2. Remove power source ② connector (CN13). Is voltage as follows between pins 2 and 3? Pins 2-3 DC 18-30V 3. When the balance wheel is turned slowly, do the NP sensor connector voltages fluctuate between DC 0-5V? 4. Others	1. Replace the pulse motor which shows an abnormality. 2. Replace NP board assembly. 3. Replace NP board assembly. 4. Replace main PC board assembly.
7. Buttonholes are not stitched correctly.	1. Is the stitch foot set correctly? 2. Is the resistance between pins 4-5 of the junction board BH connector (CN10) normal? When buttonhole lever is lowered 1 Ω or less When buttonhole lever is raised ∞ 3. When the buttonhole lever is lowered and in the conditions below, is the resistance between pins 1-2 and 2-3 of the junction board connector(CN10) normal. Between 1-2 Between 2-3 Button hole lever is pulled forward 1 Ω or less ∞ Buttonhole lever is pushed back ∞ 1 Ω or less 4. Others	1. Check stitch foot. 2. Adjust buttonhole lever or replace BH switch assembly. 3. Adjust buttonhole lever or replace BH switch assembly. 4. Replace main PC board assembly.
8. Manual operation of feed and zigzag pulse motors is not possible.	1. Do manual keys of feed and zigzag pulse motors operate correctly? Does the LCD change? 2. Are the resistances between pulse motor connector pins as indicated below? Zigzag (CN10) ... 1-2,3-4 → 8-10 Ω Feed (CN11) ... 1-2,3-4 → 8-10 Ω 3. Others	1. Replace main PC board assembly. 2. Replace the pulse motor which shows an abnormality. 3. Replace main PC board assembly.
9. Vertical movement of needle bar and backstitch operation are abnormal.	1. When the switches are flipped off and on, are the resistances between both sides of the SSVR board assembly switches 1 Ω or less, or over ∞? 2. When the balance wheel is turned slowly, do the voltages of pins 1-4 and 2-4 of the NP sensor connector (CN9) fluctuate between DC 0-5V? 3. Is the bobbin winder switch turned off? 4. Others	1. Exchange SS (VR) PC board assembly. 2. Replace NP board assembly. 3. Adjust the bobbin winder mechanism. 4. Replace main PC board assembly.

PROBLEM	CHECK	REMEDY
10. Foot controller does not operate normally when depressed.	1. Is resistance between pins 2-3 of foot controller connector (CN1 of NP board) 1 Ω or less when there is no pin jack and ∞ with a pin jack? 2. When there is a pin jack and the foot controller is depressed, does the resistance between pins 1-3 of the foot controller connector (CN1 of the NP board) fluctuate between several Ω -10k Ω ? 3. Others	1. Replace pin jack assembly 2. Replace foot controller. 3. Change main PC board assembly or NP (needle position) board assembly.
11. LCD does not light up properly.	1. Have you tried adjusting the contrast of the LCD? 2. Is the voltage between pins 1-4 of power source ② connector (CN13) between DC -18-35V? 3. Others	1. Adjust contrast. 2. Replace main PC board assembly. 3. Replace main PC board assembly.
12. Bobbin winder doesn't work.	1. Are both ends of BW switch connector (CN3) 1 Ω or less during bobbin winding, and ∞ at other times? 2. Has the bobbin winder been assembled correctly? 3. Others	1. Change bobbin winder switch assembly. 2. Adjust. 3. Replace main PC board assembly.
13. Needle thread breakage detector doesn't work correctly.	1. When threaded along thread paths and thread conditions are set as follows, is voltage between pins 2-3 of needle thread breakage detector connector (SSVR board connector) as follows? When thread tension is tightened ...DC 0V When thread tension is loosened ...DC 5V 2. When threaded along thread paths and thread conditions are set as follows, is voltage between pins 1-7 of SSVR board connector (CN4) as follows? When thread tension is tightened ...DC 0V When thread tension is loosened.....DC 5V 3. Others	1. If condition does not change after adjusting thread take-up spring, replace needle thread breakage detecting PC board. 2. Exchange SS (VR) PC board assembly. 3. Replace main PC board assembly.
14. Embroidery attachment doesn't work well.	1. Is the card inserted a proper embroidery card? Is the embroidery attachment connected to the sewing machine correctly? 2. Is the embroidery attachment correctly assembled? In particular, is the timing belt tension, gear settings, and code processing correct? 3. Is resistance between pins 1-2 and 3-4 of the X and Y pulse motor connectors (where the embroidery unit attaches to the sewing machine) between 9-11 Ω? 4. With the embroidery unit attached to the sewing machine, is resistance between pins 1-3, 5-7, 9-11 and 13-14 of the embroidery attachment connector (CN12) between 9-11 Ω? 5. Is the voltage between pins 6-2 of the embroidery attachment connector (CN12) as listed below? With embroidery unit attached to machine DC approx. 2V When unit is not attached to machine DC approx. 5V 6. Is initial movement correct when power is turned on? 7. Others	1. Check. 2. Adjust (torque of embroidery hoop is important). 3. Replace X or Y pulse motor, or X or Y initial sensor assembly. 4. Replace XYPM lead wire assembly or connector 176496. 5. Replace connector 176496, XYPM lead wire assembly, or X initial sensor assembly. 6. Replace X or Y initial sensor assembly. 7. Change main PC board assembly.

Main PC board

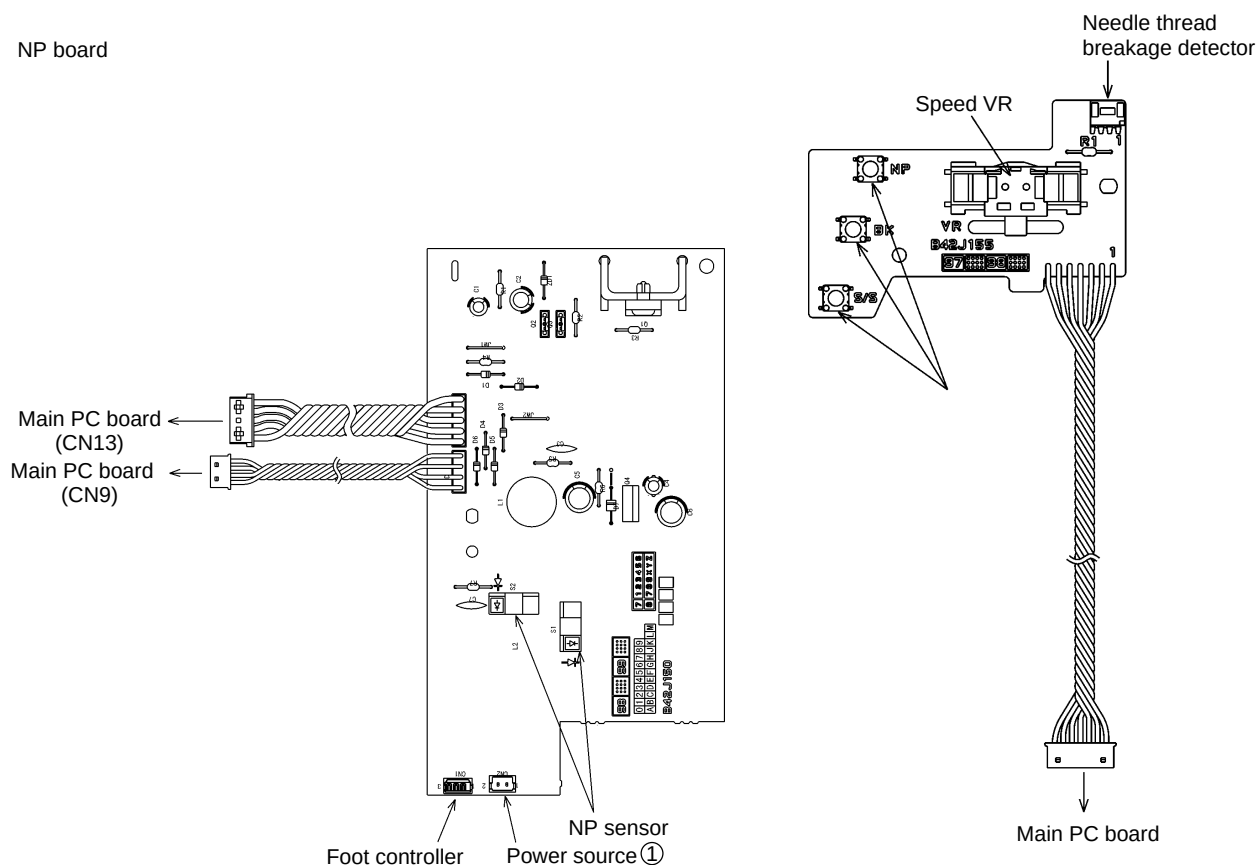


Power supply unit

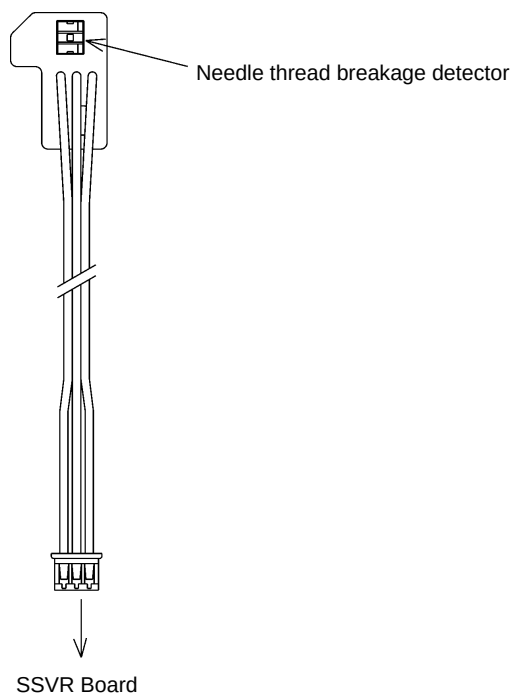


Other PC boards

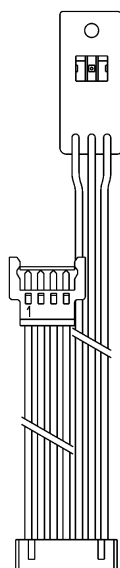
NP board



Needle thread breakage detector board



X initial sensor board



Y initial sensor board

