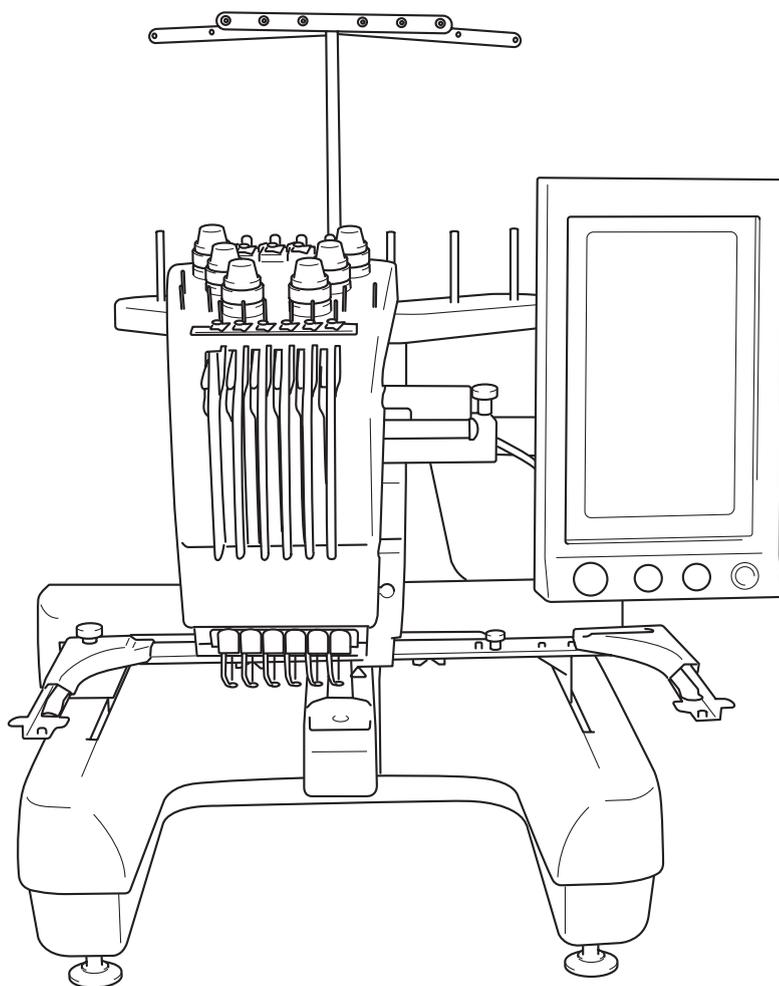


**brother**®

# *SERVICE MANUAL FOR HOME EMBROIDERY MACHINE*



## ***PR-650/PR-650C***

**CONFIDENTIAL**

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# GENERAL INFORMATION

This service manual has been compiled for explaining repair procedures of this MODEL.

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

**CAUTION** <To do the adjustment and the repair safely and surely, follow the instructions below. >

1. Do the adjustment and the repair according to operation procedure of this service manual.
2. When you attach or remove parts, turn off a power switch and then pull out a power supply plug from outlet.
3. When you replace parts, use regular parts.
4. Do not remodel a sewing machine.
5. Always use earth band when handling printed circuit boards to exclude damage of printed circuit boards by static electricity.
6. Pack printed circuit boards in antistatic packaging and avoid subjecting them to any from of impact during storage or transportation.
7. 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.
8. Insert removed connectors into the proper position according to special instructions of wiring for this service manual at the repair, the adjustment and replace printed circuit boards.
9. When you remove a connector from printed circuit boards, remove it while having a connector part.  
(When you pull out a connector while having a lead wire part, there is a risk that a lead wire get broken.)
10. Do not damage lead wires, when you cut a band that bind up lead wires.



<b>1. Outline of Mechanism .....</b>	<b>1 - 1</b>
Main Mechanisms .....	1 - 2
Driveline .....	1 - 3
Positions of electronic components .....	1 - 5
Control system block diagram .....	1 - 7
Layout for P.C.B. connectors .....	1 - 8
Operation of other electronic components .....	1 - 10
<b>2. Disassembly .....</b>	<b>2 - 1</b>
Main parts .....	2 - 2
Motor cover and carriage cover removal .....	2 - 3
Bed cover removal .....	2 - 4
Arm cover R removal .....	2 - 5
Arm cover L removal .....	2 - 6
Base cover R removal .....	2 - 7
Base cover L removal .....	2 - 8
LED drive PCB removal .....	2 - 8
LED PCB plate removal .....	2 - 9
Main PCB assembly removal .....	2 - 9
Spool stand frame final assembly removal .....	2 - 9
Operation panel assembly removal .....	2 - 10
Thread take-up cover removal .....	2 - 10
Tension base removal .....	2 - 11
Needle plate removal .....	2 - 11
Needle plate base assembly removal .....	2 - 12
Needle plate base disassembly .....	2 - 12
Picker bracket removal .....	2 - 12
Picker bracket disassembly .....	2 - 13
Rotary hook removal .....	2 - 13
Cutter unit final assembly and picker final assembly removal .....	2 - 14
Feed unit .....	2 - 15
T-belt (Y-guide) removal .....	2 - 16
Feed final assembly removal .....	2 - 17
Y-motor final assembly removal .....	2 - 18
Y-motor disassembly .....	2 - 18
Y-driving shaft assembly removal .....	2 - 19
Cord grip removal .....	2 - 19
FFC and X-area sensor assembly removal .....	2 - 20
Y-frame spacer and X-belt presser removal .....	2 - 20
X-feed frame B removal .....	2 - 20
X-carriage A assembly and X-carriage B assembly removal .....	2 - 21
X-sensor dog removal .....	2 - 21
Hoop sensor removal .....	2 - 22
X-guide shaft removal .....	2 - 22
T-belt (Y-drive) removal .....	2 - 23
Feed frame disassembly .....	2 - 23
Y-carriage L disassembly .....	2 - 24
Y-carriage R disassembly .....	2 - 25
Connect PCB disassembly .....	2 - 25

<b>Needle thread unit</b> .....	<b>2 - 26</b>
Needle thread assembly removal .....	2 - 27
Hook holder assembly removal .....	2 - 27
Rack and hook holder link removal .....	2 - 28
TH motor assembly and LED light assembly removal .....	2 - 28
<b>Needle bar change unit</b> .....	<b>2 - 29</b>
Change box center cover removal .....	2 - 30
Change box removal .....	2 - 30
Change box disassembly (Step 1) .....	2 - 31
Change box disassembly (Step 2) .....	2 - 32
<b>Thread wiper unit</b> .....	<b>2 - 33</b>
LED unit left assy removal .....	2 - 34
LED unit right assy removal .....	2 - 34
Thread presser base removal .....	2 - 34
Thread presser base disassembly .....	2 - 34
Wiper set assembly removal .....	2 - 35
Wiper guide and wiper sensor removal .....	2 - 35
Wiper set disassembly .....	2 - 36
<b>Needle bar unit</b> .....	<b>2 - 37</b>
LED unit left assy disassembly .....	2 - 38
LED unit right assy disassembly .....	2 - 38
LED cord guide removal .....	2 - 39
Needle bar case final assembly removal .....	2 - 39
Change roller base assembly removal .....	2 - 39
Case guide D removal .....	2 - 39
Thread take-up lever assembly removal .....	2 - 40
Thread take-up lever disassembly .....	2 - 40
Needle bar removal .....	2 - 41
Needle bar case disassembly .....	2 - 41
Case positioning plate assembly removal .....	2 - 42
Case positioning plate disassembly .....	2 - 42
Case bracket assembly removal .....	2 - 43
Case bracket disassembly .....	2 - 44
Case guide UL disassembly .....	2 - 44
<b>Upper shaft unit</b> .....	<b>2 - 45</b>
Main motor final assembly removal .....	2 - 46
Main motor disassembly .....	2 - 47
Driving jump assembly removal .....	2 - 47
Driving jump disassembly .....	2 - 48
Base needle bar removal .....	2 - 49
J-clamp disassembly .....	2 - 49
Presser foot vertical base disassembly .....	2 - 50
Thread take-up driving lever final assembly removal .....	2 - 50
Thread take-up driving lever disassembly .....	2 - 51
Main shaft sensor final assembly removal .....	2 - 52
Crank rod removal .....	2 - 52
Pressure foot driving shaft assembly removal .....	2 - 53
Presser foot driving shaft disassembly .....	2 - 53
Upper shaft assembly removal .....	2 - 54
Upper shaft disassembly .....	2 - 54
<b>Lower shaft unit</b> .....	<b>2 - 55</b>
Arm bed and base frame disconnection .....	2 - 56
Idle pulley assembly removal .....	2 - 56

Idle pulley disassembly .....	2 - 56
Lower shaft removal .....	2 - 57
<b>Power unit .....</b>	<b>2 - 58</b>
Power switch assembly and inlet removal .....	2 - 59
USB PCB assembly and Y-area sensor assembly removal .....	2 - 60
Power PCB assembly removal .....	2 - 60
Power PCB disassembly .....	2 - 61
Adjust-bolt removal .....	2 - 62
<b>Thread cut unit .....</b>	<b>2 - 63</b>
Picker disassembly .....	2 - 64
Cutter unit disassembly (Step 1) .....	2 - 65
Cutter unit disassembly (Step 2) .....	2 - 66
<b>Thread tension unit .....</b>	<b>2 - 67</b>
Loosen the tension nut removal .....	2 - 68
Tension base bracket removal .....	2 - 68
Inner thread eyelet base removal .....	2 - 69
Thread sensor PCB assembly and head PCB assembly removal .....	2 - 69
Upper thread eyelet base removal .....	2 - 70
Antenna assembly removal .....	2 - 70
Antenna disassembly .....	2 - 71
Spool stand frame disassembly (Step 1) .....	2 - 72
Spool stand frame disassembly (Step 2) .....	2 - 72
Thread take-up lever cover disassembly (Step 1) .....	2 - 73
Thread take-up lever cover disassembly (Step 2) .....	2 - 74
Thread take-up bracket disassembly .....	2 - 75
<b>Operation panel .....</b>	<b>2 - 76</b>
Operation panel lever assembly removal .....	2 - 77
Operation panel lever C removal .....	2 - 77
Panel holder removal .....	2 - 78
Operation panel lever A removal .....	2 - 78
USB cord holder removal .....	2 - 78
Panel rear cover removal .....	2 - 79
Lead wire assy panel removal .....	2 - 79
Communication relay PCB assy removal .....	2 - 80
Card cover removal .....	2 - 80
Pen holder removal .....	2 - 80
Inverter removal .....	2 - 81
Panel PCB case removal .....	2 - 81
Panel PCB supply assy removal .....	2 - 82
USB cover removal .....	2 - 82
Board supporter removal .....	2 - 82
PCB base plate removal .....	2 - 83
SS PCB assy removal .....	2 - 83
Buttons removal .....	2 - 84
Speaker set removal .....	2 - 84
LCD assy removal .....	2 - 85
Touch panel assy removal .....	2 - 85

### **3. Assembly .....3 - 1**

<b>Operation panel .....</b>	<b>3 - 2</b>
Touch panel assy attachment .....	3 - 3
LCD assy attachment .....	3 - 3

Speaker set attachment .....	3 - 3
Buttons attachment .....	3 - 4
SS PCB assy attachment .....	3 - 4
PCB base plate attachment .....	3 - 5
Board supporter attachment .....	3 - 5
USB cover removal .....	3 - 5
Panel PCB supply assy attachment .....	3 - 6
Panel PCB case attachment .....	3 - 6
Inverter attachment .....	3 - 7
Pen holder attachment .....	3 - 7
Card cover attachment .....	3 - 7
Communication relay PCB assy attachment .....	3 - 8
Lead wire assy panel attachment .....	3 - 8
Panel rear cover attachment .....	3 - 9
USB cord holder attachment .....	3 - 9
Operation panel lever A attachment .....	3 - 10
Panel holder attachment .....	3 - 10
Operation panel lever C attachment .....	3 - 10
Operation panel lever assembly attachment .....	3 - 11
<b>Thread tension unit .....</b>	<b>3 - 12</b>
Thread take-up bracket assembly .....	3 - 13
Thread take-up lever cover assembly (Step 1) .....	3 - 14
Thread take-up lever cover assembly (Step 2) .....	3 - 15
Spool stand frame assembly (Step 1) .....	3 - 16
Spool stand frame assembly (Step 2) .....	3 - 16
Antenna assembly (Step 1) .....	3 - 17
Antenna assembly (Step 2) .....	3 - 17
Antenna assembly attachment .....	3 - 18
Upper thread eyelet base attachment .....	3 - 18
Thread sensor PCB assembly and head PCB assembly attachment .....	3 - 19
Inner thread eyelet base attachment .....	3 - 20
Tension base bracket attachment .....	3 - 20
Tension base lead wire assembly attachment .....	3 - 21
Tension nut attachment .....	3 - 22
<b>Thread cut unit .....</b>	<b>3 - 23</b>
Cutter unit assembly (Step 1) .....	3 - 24
Cutter unit assembly (Step 2) .....	3 - 25
Picker assembly .....	3 - 26
<b>Power unit .....</b>	<b>3 - 27</b>
Adjust bolt attachment .....	3 - 28
Power PCB assembly .....	3 - 29
Power PCB assembly attachment .....	3 - 30
USB PCB holder assembly and Y-area sensor assembly attachment .....	3 - 31
Power switch assembly and inlet attachment .....	3 - 32
<b>Lower shaft unit .....</b>	<b>3 - 33</b>
Lower shaft attachment .....	3 - 34
Idle pulley assembly .....	3 - 35
Idle pulley assembly attachment .....	3 - 35
Connection of arm bed and base frame .....	3 - 36
<b>Upper shaft unit .....</b>	<b>3 - 37</b>
Upper shaft assembly .....	3 - 38
Upper shaft assembly attachment .....	3 - 39
Presser foot driving shaft assembly .....	3 - 40

Presser foot driving shaft assembly attachment .....	3 - 41
Crank rod assembly attachment .....	3 - 42
Main shaft sensor final assembly attachment .....	3 - 43
Thread take-up driving lever final assembly .....	3 - 44
Thread take-up driving lever final assembly attachment .....	3 - 45
Presser foot vertical base final assembly .....	3 - 45
Vertical set assembly .....	3 - 46
Base needle bar attachment .....	3 - 47
Driving jump assembly (1) .....	3 - 48
Driving jump assembly (2) .....	3 - 49
Driving jump assembly attachment .....	3 - 50
Tension pulley assembly attachment .....	3 - 50
Main motor final assembly .....	3 - 51
Main motor final assembly attachment .....	3 - 51
<b>Needle bar unit .....</b>	<b>3 - 52</b>
Case guide UL assembly .....	3 - 53
Case bracket assembly .....	3 - 54
Case bracket assembly attachment .....	3 - 55
Case positioning plate assembly .....	3 - 56
Case positioning plate assembly attachment .....	3 - 56
Needle bar case final assembly .....	3 - 56
Needle bar attachment .....	3 - 57
Thread take-up lever assembly .....	3 - 58
Thread take-up lever assembly attachment .....	3 - 59
Case guide D attachment .....	3 - 60
Change roller base assembly attachment .....	3 - 60
Needle bar case final assembly attachment .....	3 - 61
LED cord guide attachment .....	3 - 62
LED unit right assy assembly .....	3 - 62
LED unit left assy assembly .....	3 - 63
<b>Thread wiper unit .....</b>	<b>3 - 64</b>
Wiper set assembly .....	3 - 65
Wiper guide and wiper sensor attachment .....	3 - 66
Wiper set assembly attachment .....	3 - 67
Thread presser base assembly .....	3 - 68
Thread presser base attachment .....	3 - 68
LED unit right assy removal .....	3 - 68
LED unit left assy removal .....	3 - 68
<b>Needle bar change unit .....</b>	<b>3 - 69</b>
Change box assembly (Step 1) .....	3 - 70
Change box assembly (Step 2) .....	3 - 71
Change box assembly (Step 3) .....	3 - 72
Change box assembly attachment .....	3 - 72
Change box center cover attachment .....	3 - 73
<b>Needle thread unit .....</b>	<b>3 - 74</b>
Thread motor assembly attachment .....	3 - 75
Rack assembly and hook holder link attachment .....	3 - 75
Hook assembly .....	3 - 76
Needle thread assembly attachment .....	3 - 76
<b>Feed unit .....</b>	<b>3 - 77</b>
Connect PCB final assembly .....	3 - 78
Y-carriage R assembly .....	3 - 79

Y-carriage L assembly .....	3 - 80
Feed frame assembly attachment .....	3 - 81
T-belt (X-drive) attachment .....	3 - 82
X-guide shaft attachment .....	3 - 83
Hoop sensor attachment .....	3 - 84
X-sensor dog attachment .....	3 - 85
X-carriage A assembly and X-carriage B assembly attachment .....	3 - 86
X-feed frame B attachment .....	3 - 87
Y-frame spacer and X-belt presser attachment .....	3 - 88
FFC and X-area sensor assembly attachment .....	3 - 89
Cord grip attachment .....	3 - 90
Y driving shaft assembly attachment .....	3 - 91
Y-motor final assembly .....	3 - 91
Y motor final assembly attachment .....	3 - 92
Feed final assembly attachment .....	3 - 93
T-belt (Y-guide) attachment .....	3 - 94
<b>Main unit .....</b>	<b>3 - 95</b>
Cutter unit final assembly and picker final assembly attachment .....	3 - 96
Rotary hook attachment .....	3 - 97
Picker bracket final assembly .....	3 - 97
Picker bracket final assembly attachment .....	3 - 97
Needle plate base assembly .....	3 - 98
Needle plate base assembly attachment .....	3 - 99
Needle plate attachment .....	3 - 99
Tension base attachment .....	3 - 100
Thread take-up lever cover attachment .....	3 - 101
Operation panel assembly attachment .....	3 - 102
Spool stand frame final assembly attachment .....	3 - 102
Main PCB assembly attachment .....	3 - 103
LED PCB plate attachment .....	3 - 104
LED drive PCB assembly attachment .....	3 - 104
Base cover L attachment .....	3 - 105
Base cover R attachment .....	3 - 106
Arm cover L attachment .....	3 - 107
Arm cover R attachment .....	3 - 108
Bed cover attachment .....	3 - 109
Motor cover / carriage cover attachment .....	3 - 110

#### **4. Adjustment .....**

Needle point damage .....	4 - 2
Starting test mode .....	4 - 3
Selecting test mode .....	4 - 4
Input needle bar data for adjustment .....	4 - 13
Motor belt tension .....	4 - 15
Timing belt tension .....	4 - 16
Needle drop (front/back) .....	4 - 17
Needle position (left/right) .....	4 - 19
Needle bar rising and Needle clearance .....	4 - 20
Needle bar height .....	4 - 22

Rotary hook stopper clearance .....	4 - 24
Presser foot height .....	4 - 25
Needle bar top dead center .....	4 - 26
Needle threader (up/down) .....	4 - 27
Needle threader (left/right) .....	4 - 29
Y belt tension .....	4 - 30
X belt tension .....	4 - 31
Picker activation .....	4 - 32
Movable knife initial position .....	4 - 33
Thread presser base up/down position .....	4 - 34
Hoop sensor (A/D value) .....	4 - 35
Upper shaft encoder phase .....	4 - 37
X, Y carriage initial position .....	4 - 38
Cutter knife engagement load .....	4 - 39

**5. Failure Investigation for Electronic Parts .....5 - 1**

Error message list .....	5 - 2
The power is not turned on. ....	5 - 3
The touch panel does not work. ....	5 - 6
The panel switch does not work. ....	5 - 7
The needle bar does not move normally. ....	5 - 8
Thread breakage detection does not function normally. ....	5 - 9
The hoop does not move normally. ....	5 - 10
The main shaft does not rotate normally. ....	5 - 12
Thread is not cut normally. ....	5 - 13
The wiper does not function normally. ....	5 - 14
A needle is not threaded normally. ....	5 - 15
The picker does not function normally. ....	5 - 16
LED light does not turn ON. ....	5 - 17
USB function and USB media cannot be used normally. ....	5 - 19
The hoop sensor does not function normally. ....	5 - 20
Sound does not work .....	5 - 23
Error message .....	5 - 24

**6. Maintenance & Replacement .....6 - 1**

How to reset the counter of the maintenance .....	6 - 2
Necessary grease & oil .....	6 - 3

Maintenance point (Every 1,500 hours) .....	6 - 4
Maintenance point (Every 500 hours) .....	6 - 10
Maintenance point (Every day) .....	6 - 11
Replacement parts location .....	6 - 12
Main PCB assy .....	6 - 13
Power supply PCB unit .....	6 - 16
Main motor assy .....	6 - 19
Panel PCB and LCD module .....	6 - 22
Head unit .....	6 - 23
Hook holder .....	6 - 24

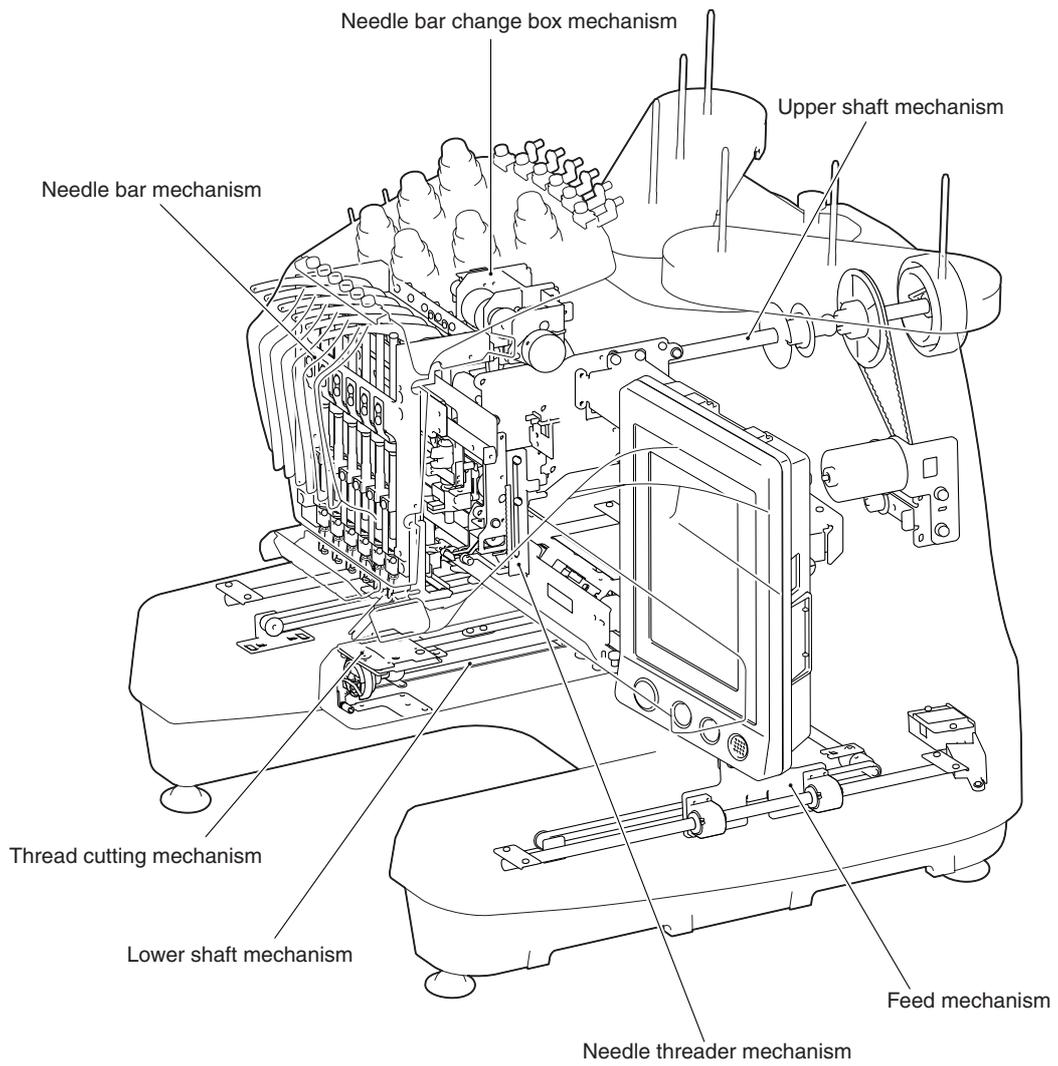
**7. Special Instructions of Wiring ..... 7 - 1**

Head wiring .....	7 - 2
LED unit wiring .....	7 - 3
Arm wiring .....	7 - 10
Base frame wiring .....	7 - 17
Main PCB wiring .....	7 - 19
Y-feed cable wiring .....	7 - 20
X-feed cable wiring .....	7 - 22
Panel wiring .....	7 - 25

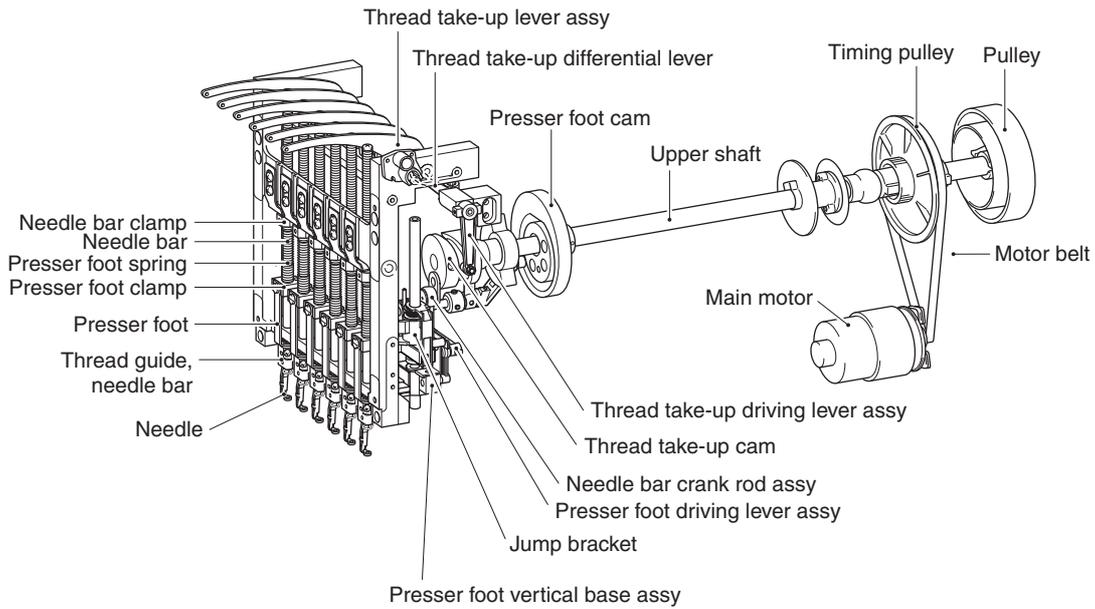
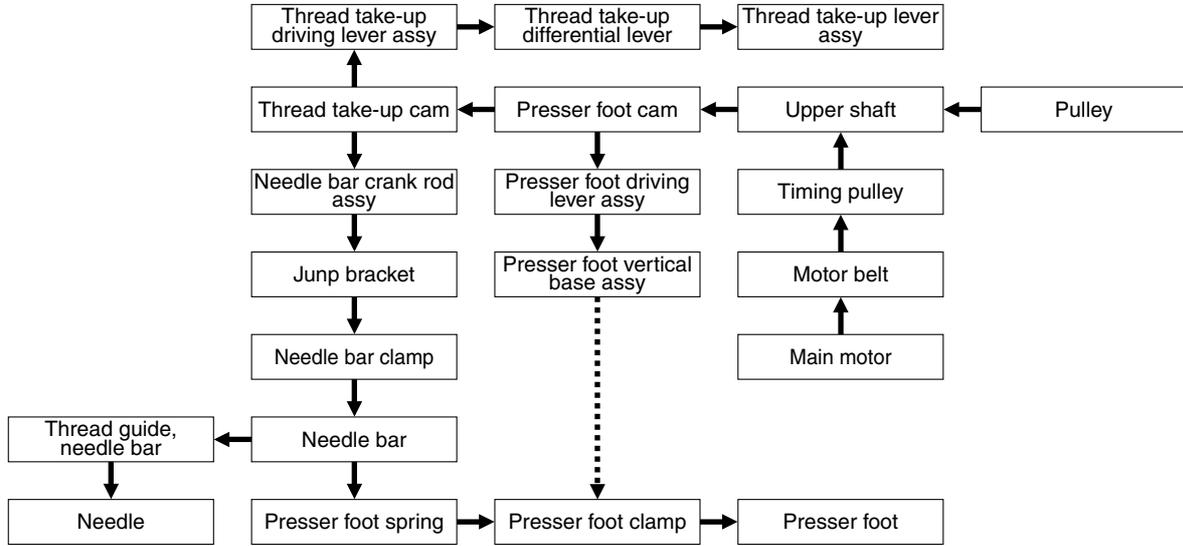
# 1 Outline of Mechanism

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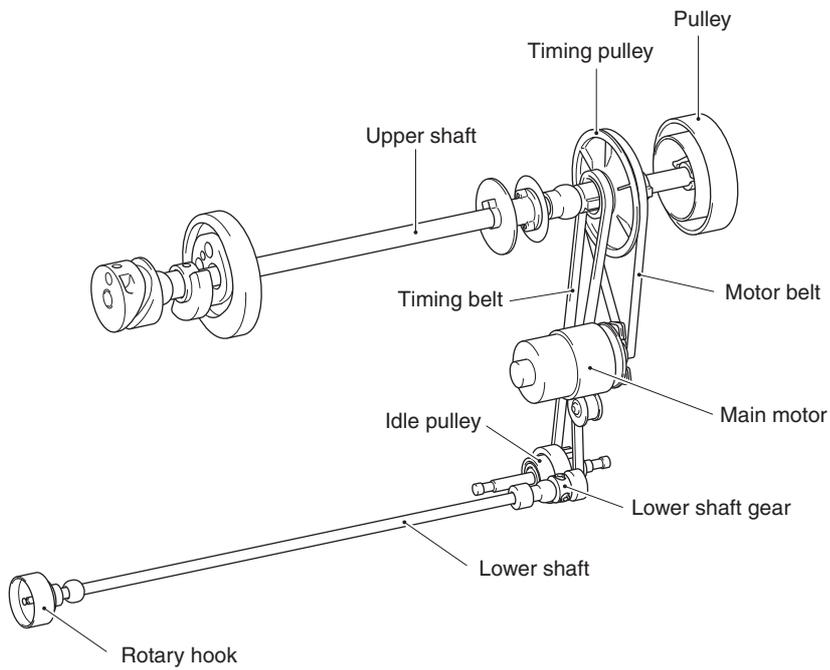
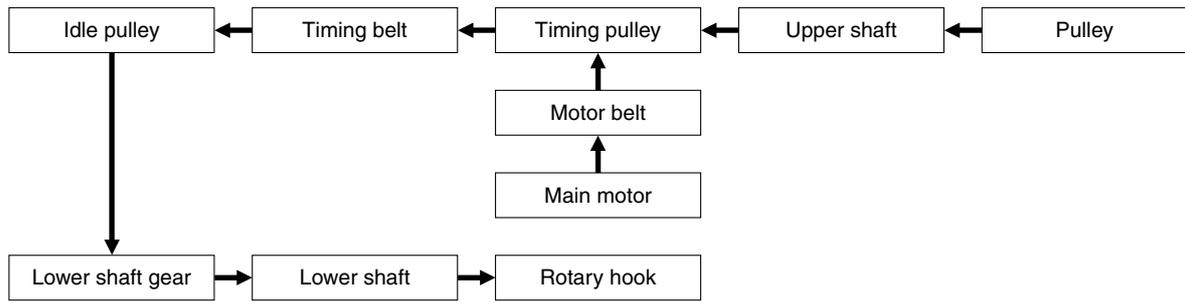
Main Mechanisms .....	1 - 2
Driveline .....	1 - 3
Positions of electronic components.....	1 - 5
Control system block diagram.....	1 - 7
Layout for P.C.B. connectors .....	1 - 8
Operation of other electronic components .....	1 - 10

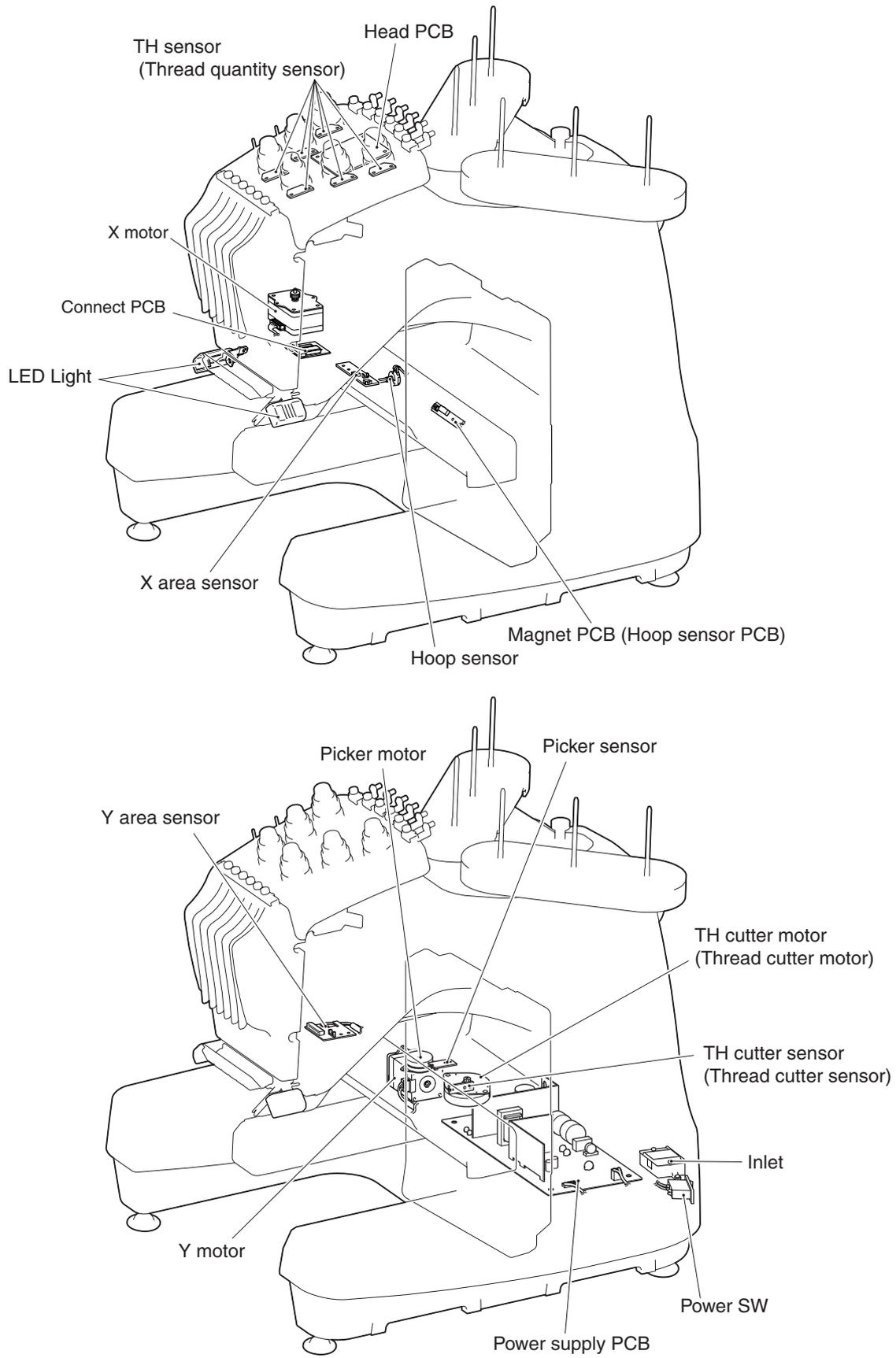


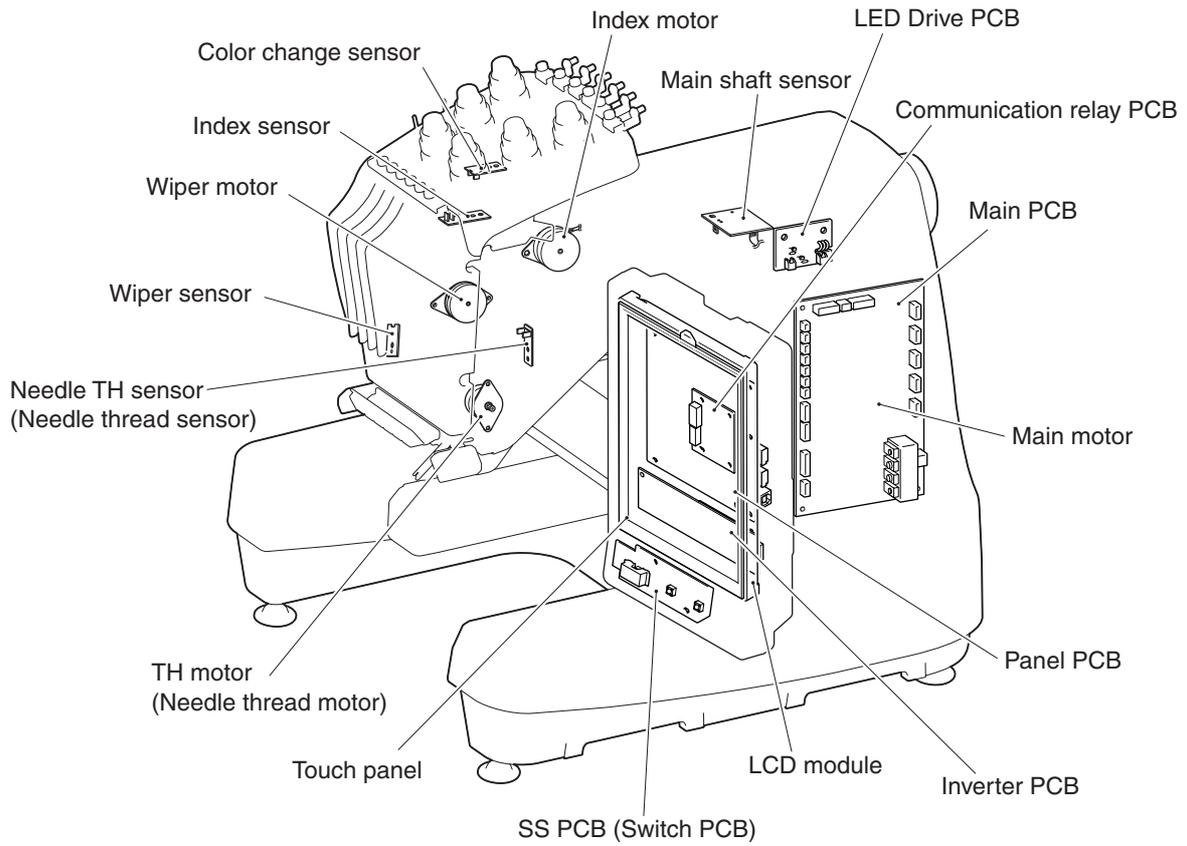
A) Up and down movement of needle bar, movement of presser foot thread take-up mechanism

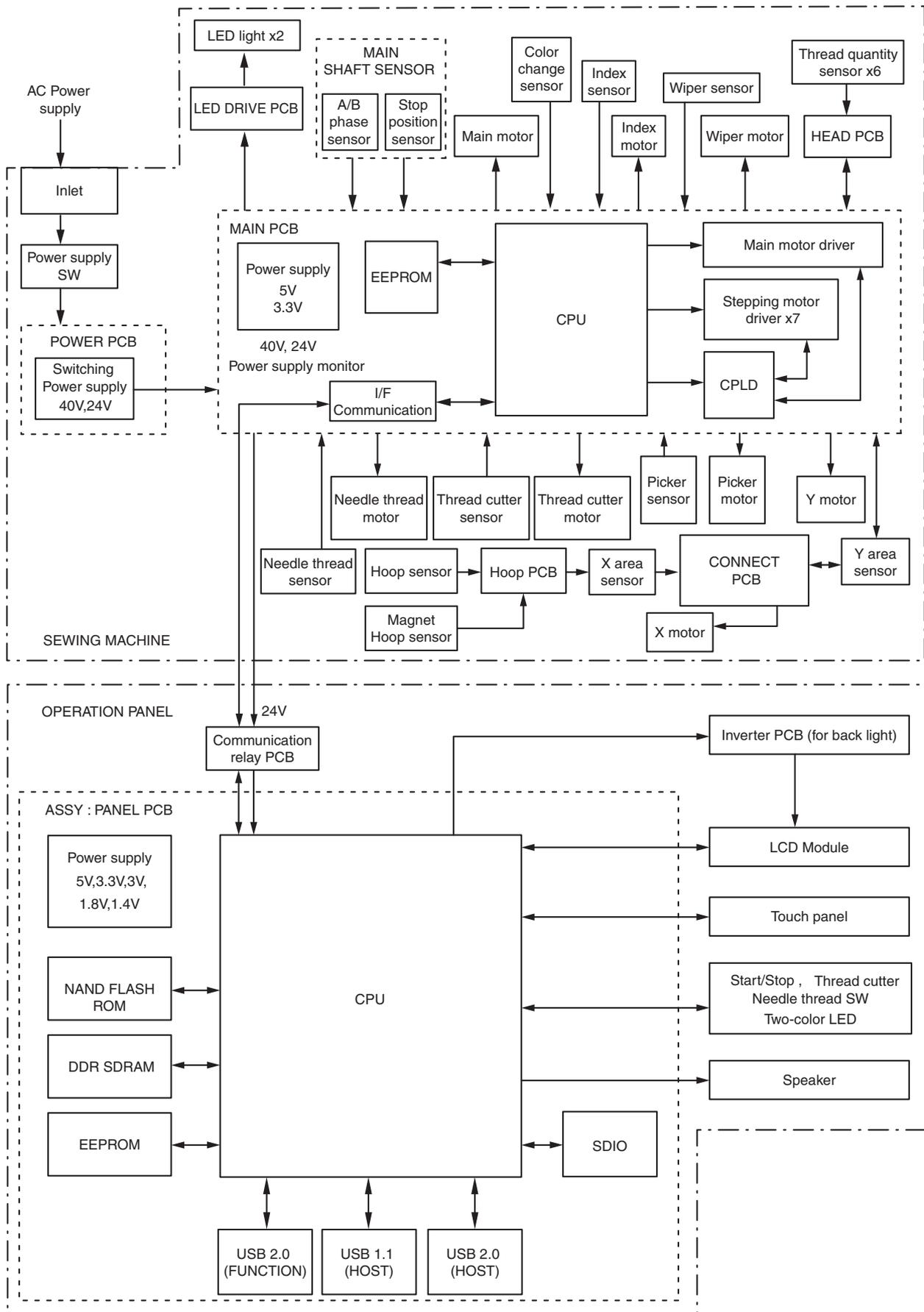


B) Movement of rotary hook





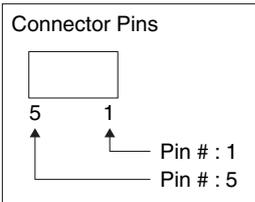
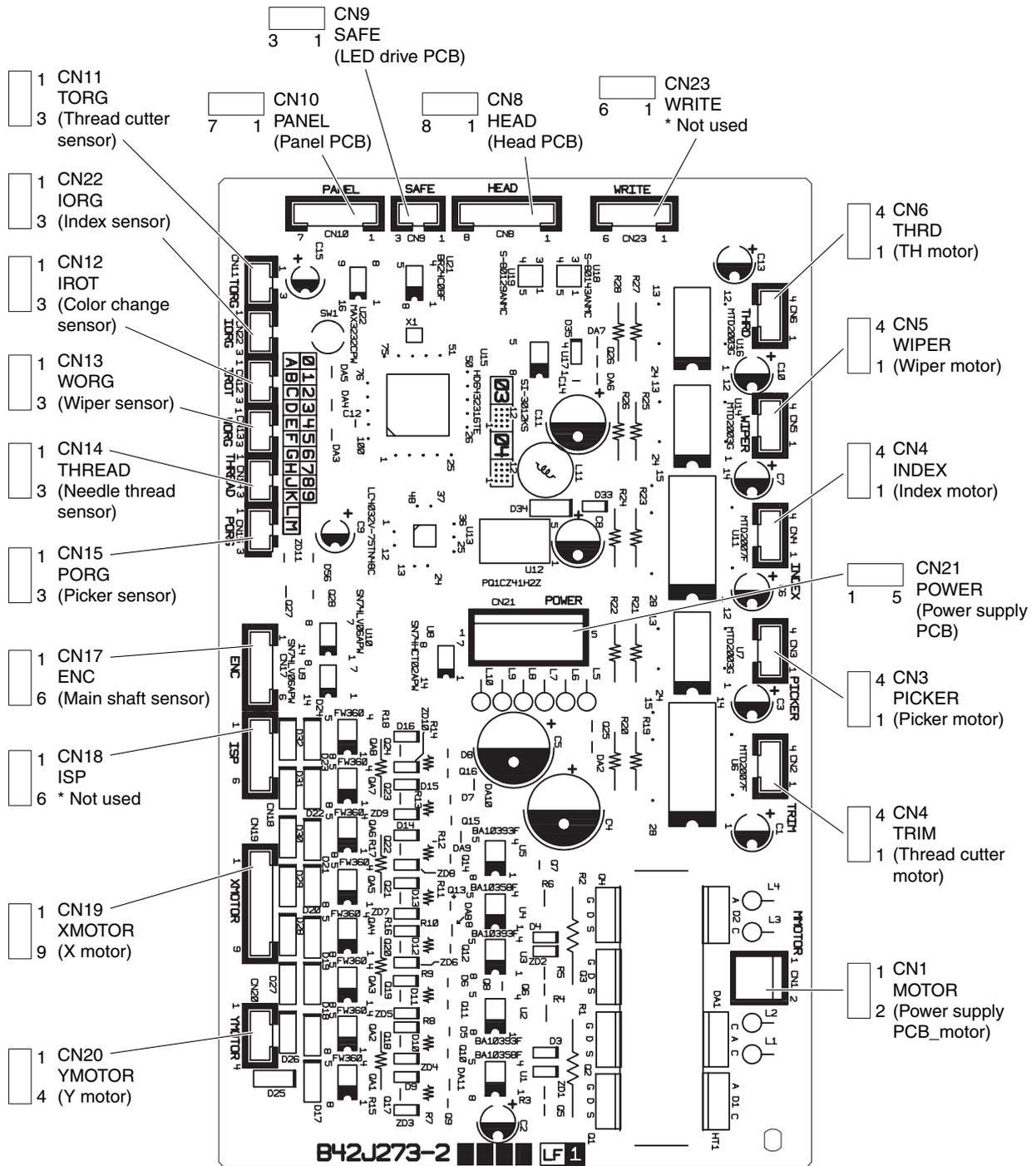




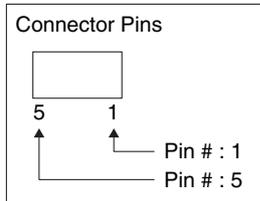
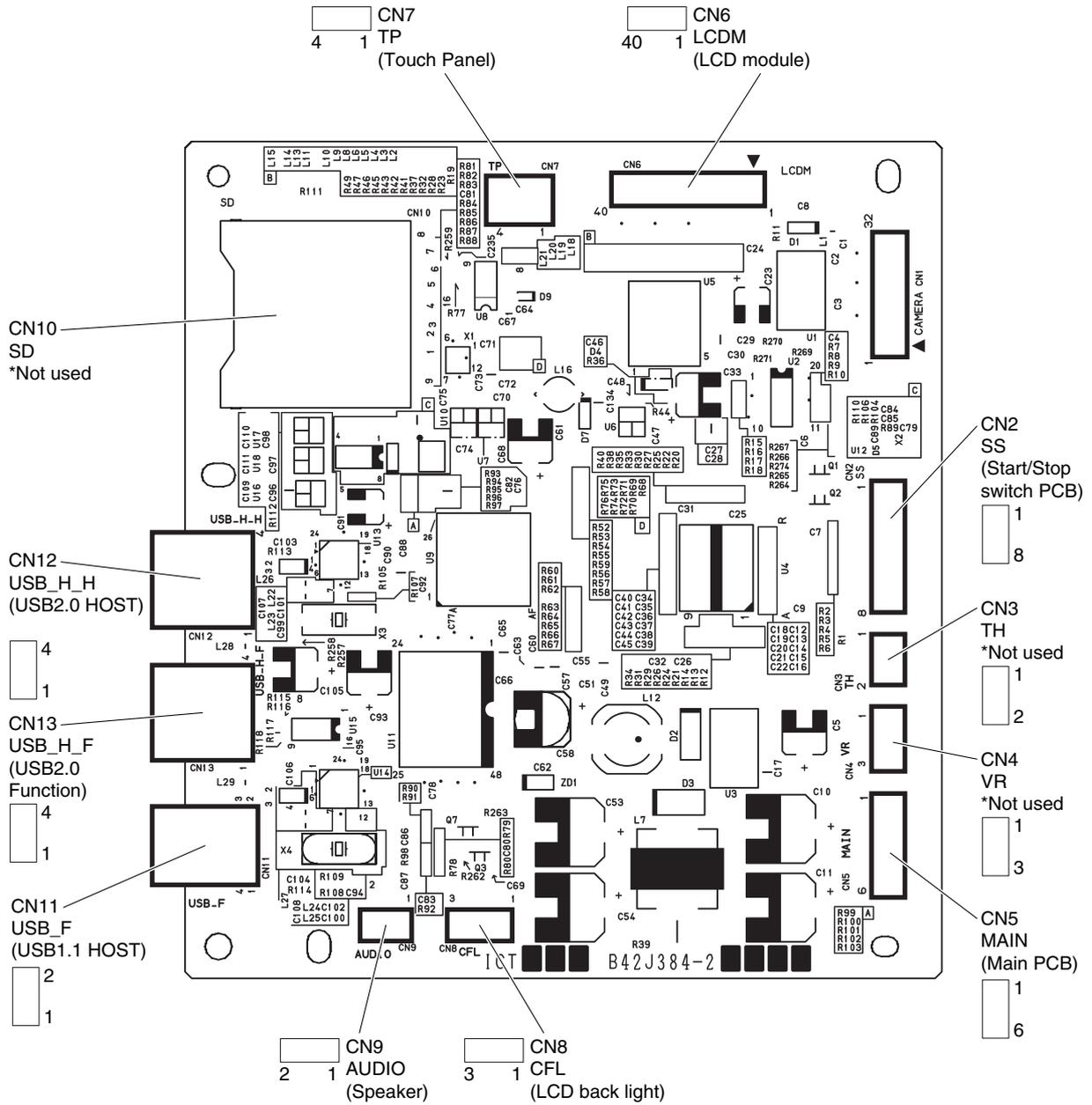
# Outline of Mechanism Layout for P.C.B. connectors

The illustration below shows layout for Printed Board connectors.

## ■ Main P.C.B.



■ Panel P.C.B.



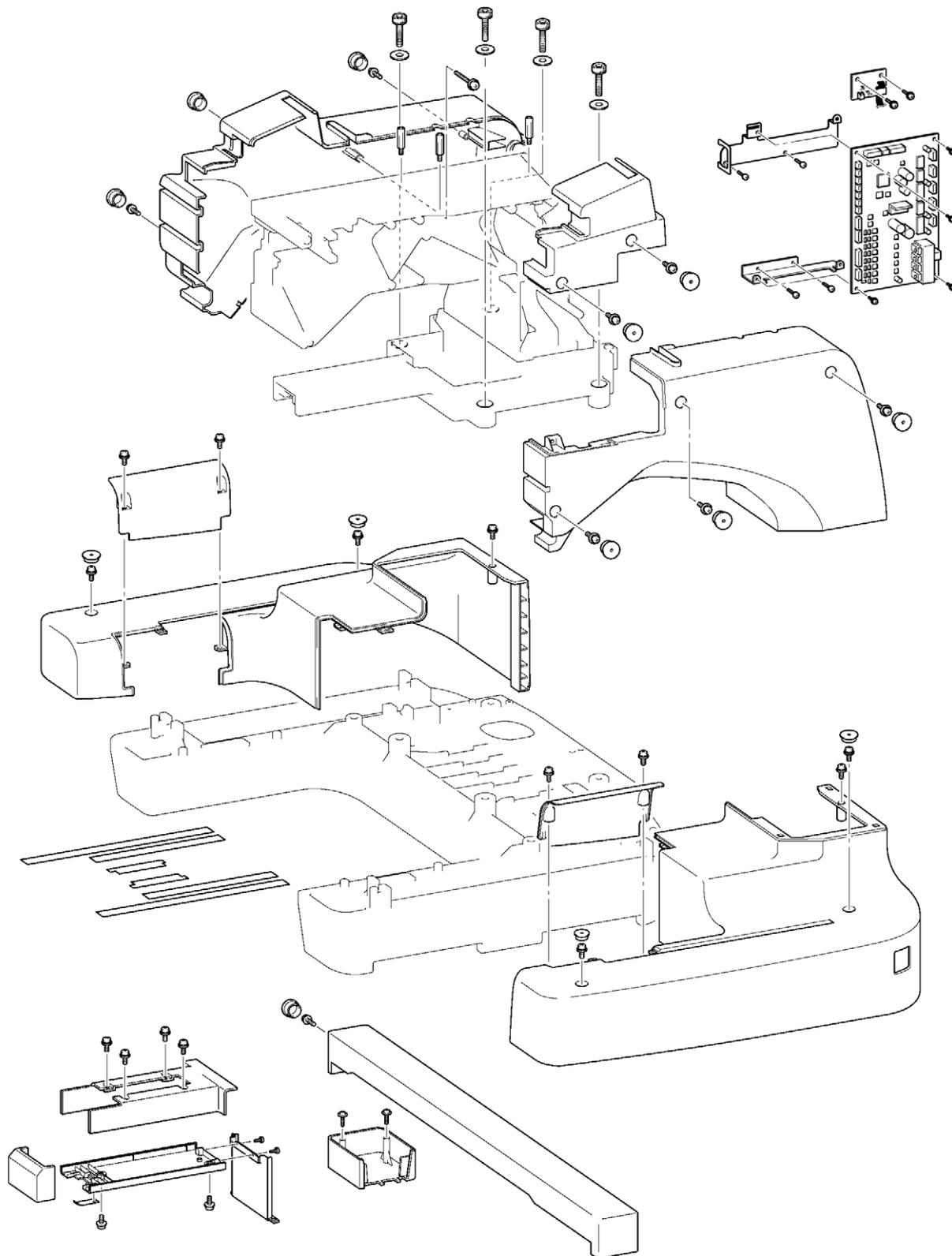
Start/stop switch . . . . .	This switch is used to start and stop the sewing machine.
Thread cutter switch . . . . .	This switch is used to cut thread. Pressing this switch starts the sewing machine, cuts thread, and stops the machine at the position where the spindle stops.
Needle thread switch . . . . .	This switch is used to thread a needle. Pressing this switch moves the needle bar to the thread guide position, and pressing it again threads the needle and then returns the needle bar to its original position.
Hoop sensor . . . . .	This sensor detects the position of the arm when attaching the hoop, in order to identify the hoop.
Stop position sensor, A/B phase sensor . . . . .	These sensors detect the angle of the main shaft and the rotational speed.
Index sensor, color change sensor . . . . .	These sensors detect the color change position.
Thread quantity sensor . . . . .	This sensor detects the consumption of upper thread. It also detects upper/lower thread breakage indicated by the consumption of upper thread.
Wiper sensor . . . . .	This sensor detects the position of the wiper.
Picker sensor . . . . .	This sensor detects the position of the picker.
Thread cutter sensor . . . . .	This sensor detects the position of the movable knife that cuts the thread.
Needle thread sensor . . . . .	This sensor detects the position of the thread guide.
X sensor (Y sensor) . . . . .	This sensor detects the position of the X (Y) guide to move the hoop.
LED light (L/R) . . . . .	White LED lights for illuminating the work space.
Touch Panel . . . . .	Used to select and edit patterns and input test mode number by touching the display on the panel.

# 2 Disassembly

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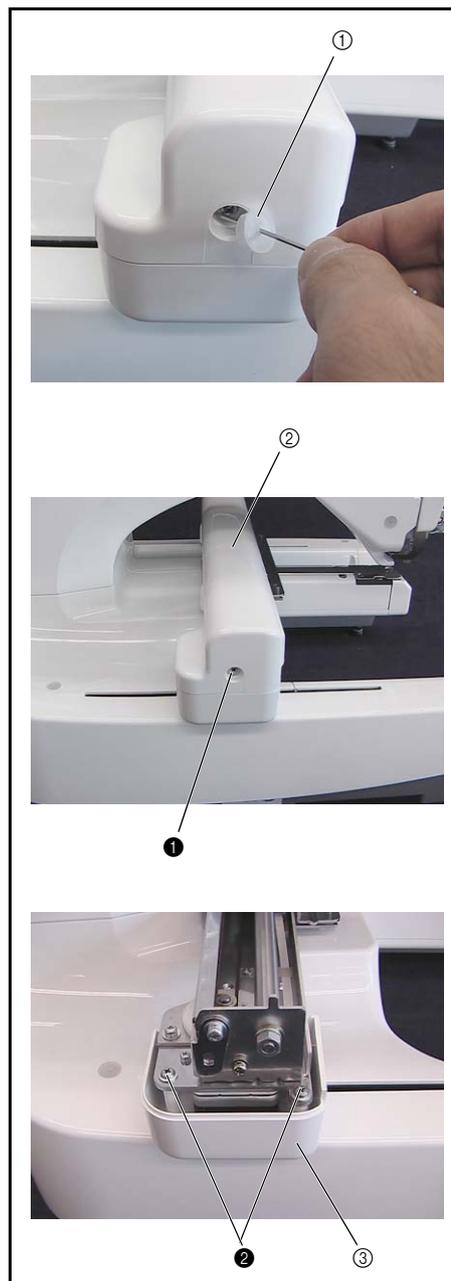
Main unit	Main parts .....	2 - 2
	Feed unit.....	2 - 15
	Needle thread unit .....	2 - 26
	Needle bar change unit .....	2 - 29
	Thread wiper unit.....	2 - 33
	Needle bar unit .....	2 - 37
	Upper shaft unit .....	2 - 45
	Lower shaft unit .....	2 - 55
	Power unit.....	2 - 58
	Thread cut unit.....	2 - 63
	Thread tension unit.....	2 - 67
	Operation panel .....	2 - 76

Main parts



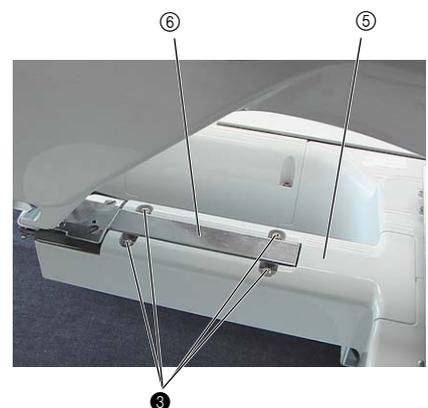
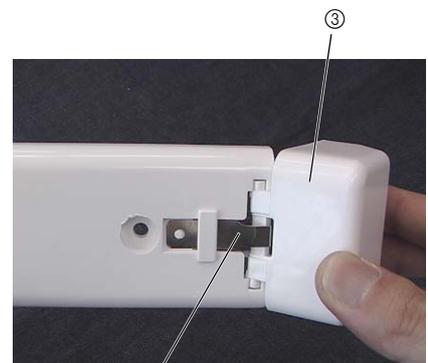
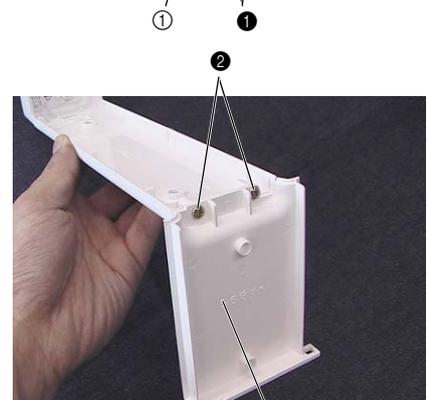
**1** Motor cover and carriage cover removal

1. Remove the screw cover ①.
2. Remove the screw ①, and then remove the carriage cover ②.
3. Remove the 2 screw ②, and then remove the motor cover ③.



## 2 Bed cover removal

1. Remove the 2 screws ①, and then remove the bed cover bottom assembly ①.
2. Remove the 2 screws ②, and then remove the bed cover lid ② from the bed cover bottom assembly.
3. Remove the hinged door ③ and the spring ④ from the bed cover bottom assembly.
4. Remove the 4 screws ③, and then remove the bed cover top ⑤ and the bed cover ⑥.

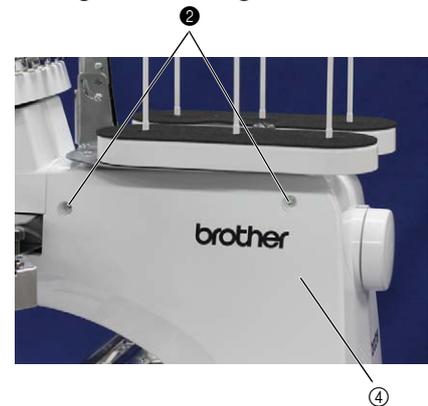
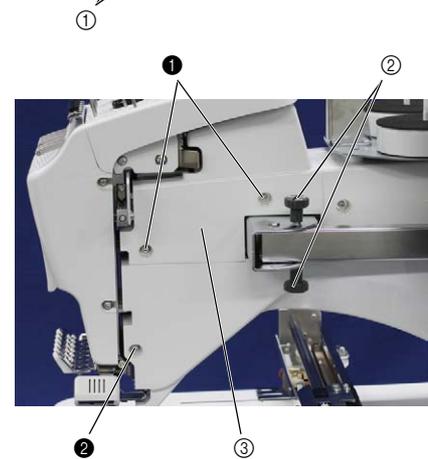
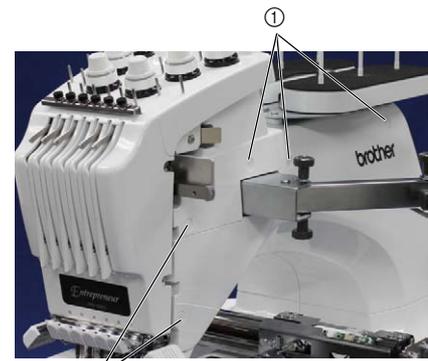


### 3 Arm cover R removal

1. Remove the 5 screw covers ①.
2. Remove the 2 thumb bolts (M4S) ②, the 2 washer springs (2-4) and the 2 washer plains (M4) from the operation panel assembly.

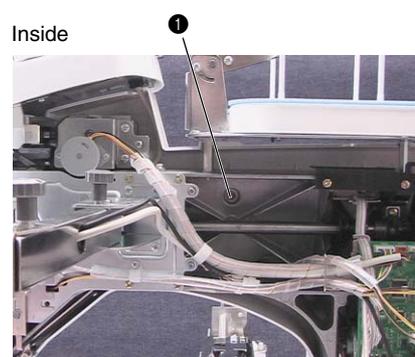
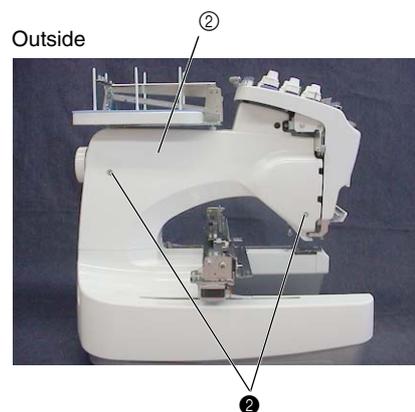
**\*Key point**

- When remove the thumb bolt (M4S), be careful not to lose the washer spring (2-4) and the washer plain (M4).
3. Remove the 2 screws ①, and then remove the arm cover R lid ③.
  4. Remove the 3 screws ②, and then remove the arm cover R ④.



#### 4 Arm cover L removal

1. Remove the 3 screw covers ①.
2. Remove the screw inside the cover ① and the 2 screws outside the cover ②, and then remove arm cover L ②.

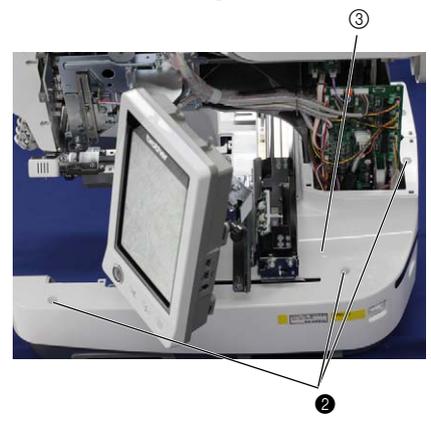


## 5 Base cover R removal

1. Remove the 2 screws ❶, and then remove the base cover R lid ❶.
2. Remove the 2 screw covers ❷.
3. Removes the 3 screws ❸, and then remove the base cover R ❸.

### \*Key point

- Fully draw the feed final assembly toward you before removing the base cover R.

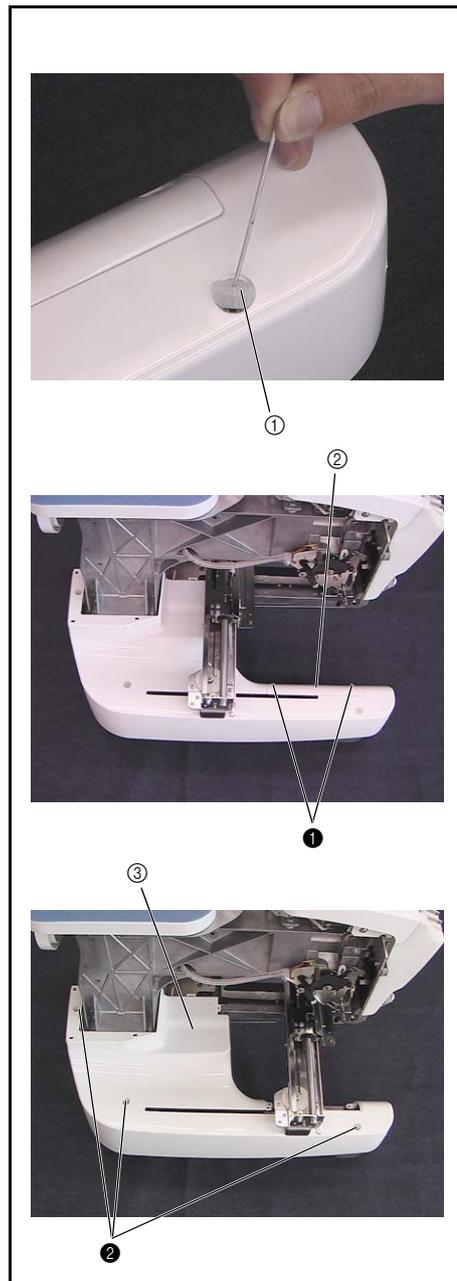


## 6 Base cover L removal

1. Remove the 2 screw covers ①.
2. Remove the 2 screws ❶, and then remove the base cover L lid ②.
3. Remove the 3 screws ❷, and then remove the base cover L ③.

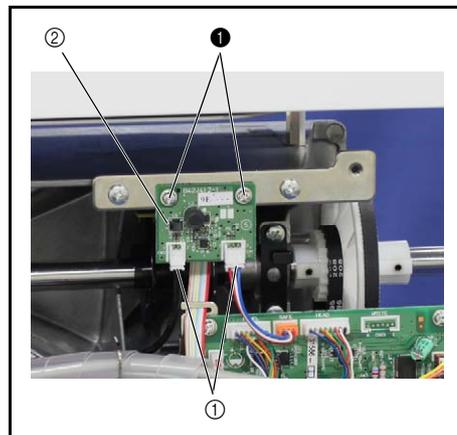
### \*Key point

- Fully draw the feed final assembly toward you before removing the base cover L.



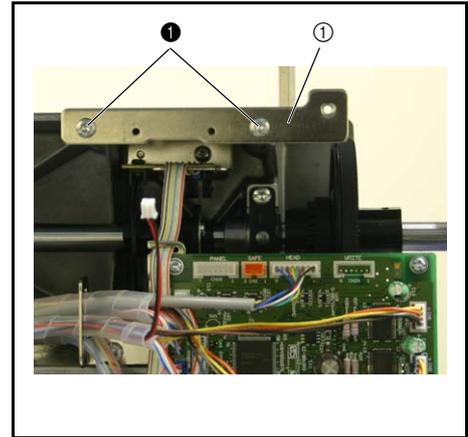
## 7 LED drive PCB removal

1. Disconnect the 2 connectors ① from the LED drive PCB assembly ②.
2. Remove the 2 screws ❶, and then remove the LED drive PCB assembly ②.

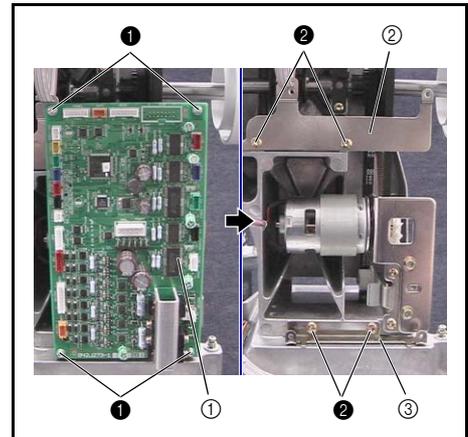


**8** LED PCB plate removal

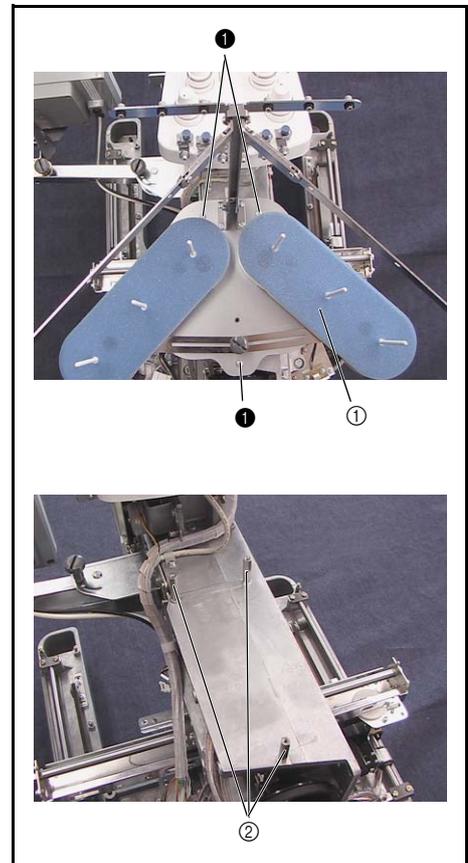
1. Remove the 2 screws ❶, and then remove the LED PCB plate ❶.

**9** Main PCB assembly removal

1. Disconnect all connectors from the main PCB.
2. Remove the 4 screws ❶, and then remove the main PCB assembly ❶.
3. Remove the 4 screws ❷, and then remove board holder U ❷ and board holder D ❸.

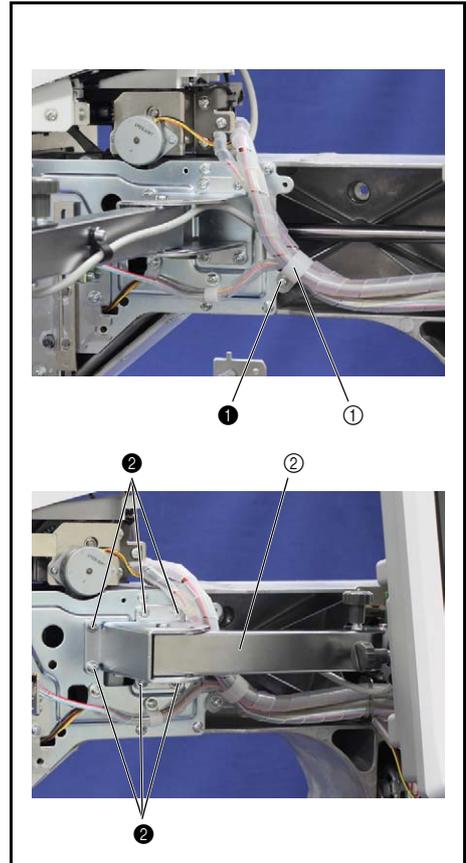
**10** Spool stand frame final assembly removal

1. Remove the 3 screws ❶, and then remove the spool stand frame final assembly ❶.
2. Remove the 3 studs ❷.



## 11 Operation panel assembly removal

1. Remove the screw ❶, and then remove the cord clamp ①.
2. Remove the 6 screws ❷, and then remove the operation panel assembly ②.

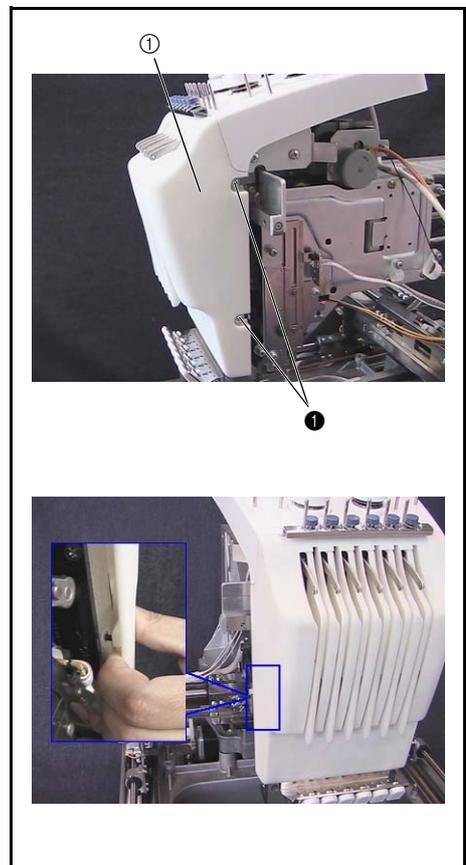


## 12 Thread take-up cover removal

1. Remove the 2 screws ❶, and then remove the thread take-up cover ①.

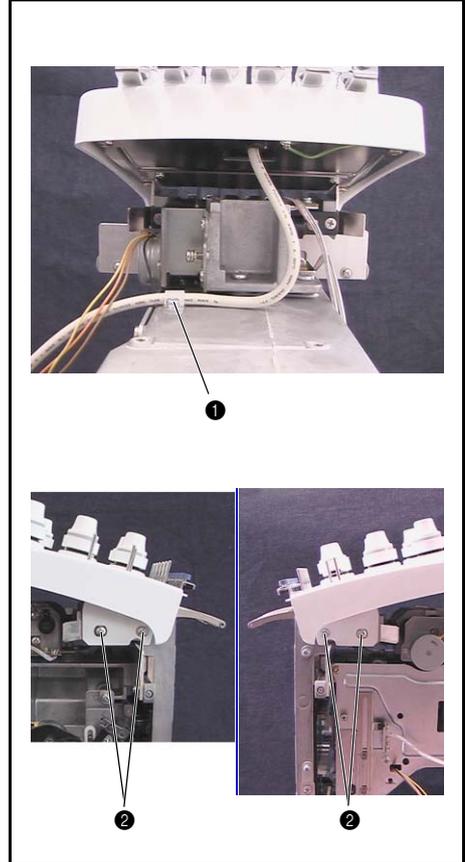
### \*Key point

- The pin protruding from the needle bar case final assembly rests on the inner left side of the thread take-up cover.



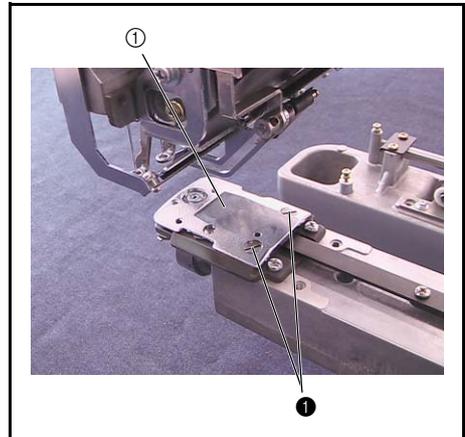
### 13 Tension base removal

1. Remove the lead wires from the spiral tube.
2. Remove the screw ①, and then remove the cord clamp NK-4N from the arm bed.
3. Remove the 4 screws ②, and then remove the tension base assembly.



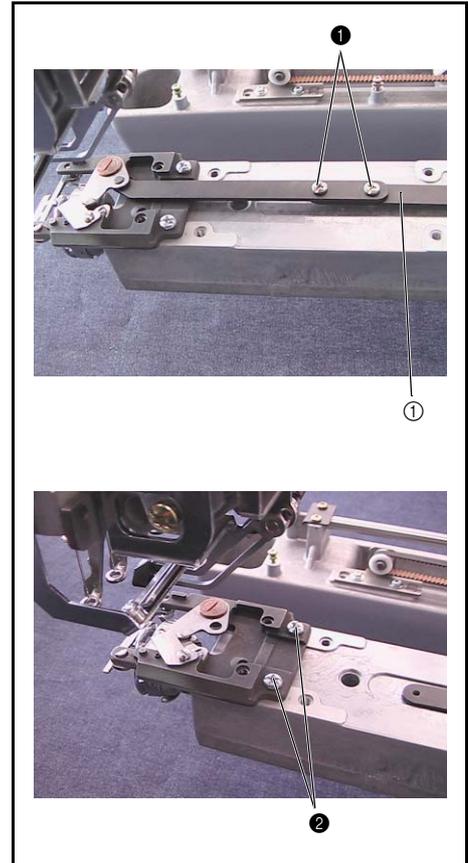
### 14 Needle plate removal

1. Remove the 2 screws ①, and then remove the needle plate ①.



## 15 Needle plate base assembly removal

1. Remove the 2 screws ❶ to disconnect the cutter link assembly ①.
2. Remove the 2 screws ❷, and then remove the needle plate base assembly.



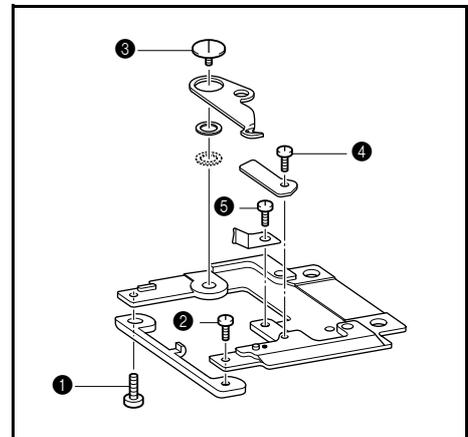
## 16 Needle plate base disassembly

1. Remove the screws ❶, ❷, and then remove the rotary hook stopper.
2. Remove the screw ❸, and then remove the movable knife and the movable knife collar.

### \*Caution

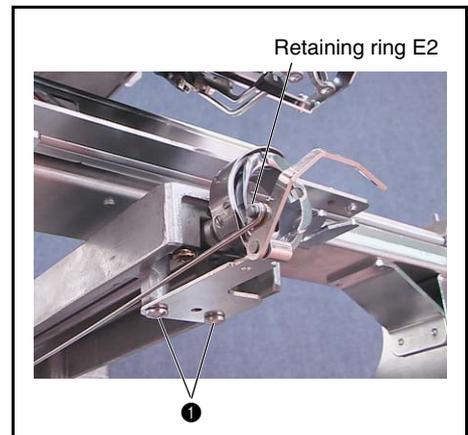
- If there's a spacer under the movable knife collar, remove it too.

3. Remove the screw ❹, and then remove the fixed knife.
4. Remove the screw ❺, and then remove the thread holding plate.



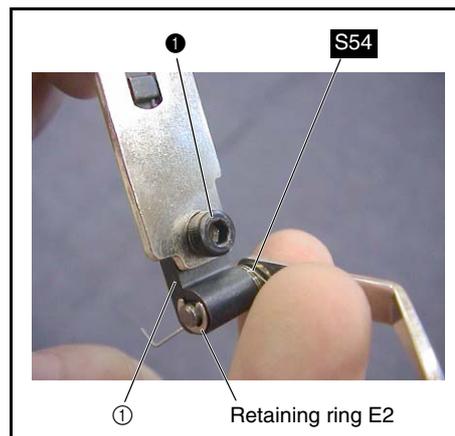
## 17 Picker bracket removal

1. Remove the retaining ring E2, and then remove the picker link.
2. Remove the 2 screws ❶, and then remove the picker bracket final assembly.



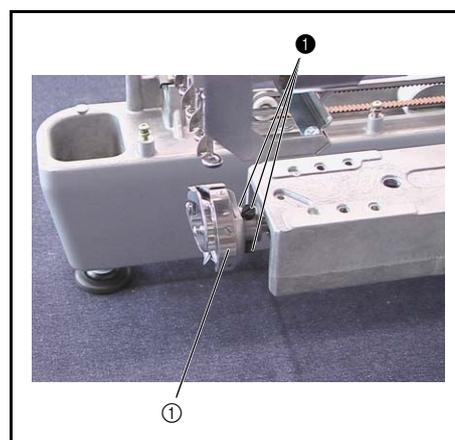
## 18 Picker bracket disassembly

1. Remove the retaining ring E2, and then remove the picker assembly and the spring S54.
2. Remove the screw ①, and then remove the picker holder ① from the picker bracket.



## 19 Rotary hook removal

1. Remove the 3 screws ①, and then remove the rotary hook ① from the lower shaft.

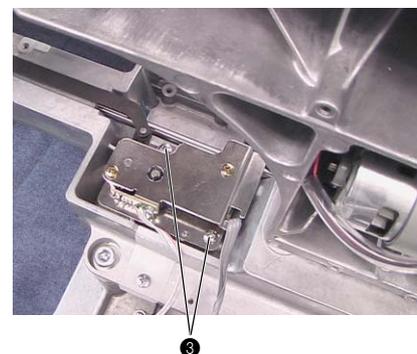
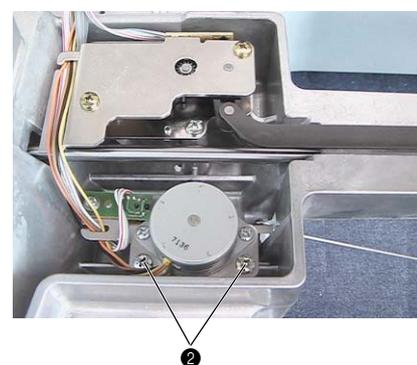
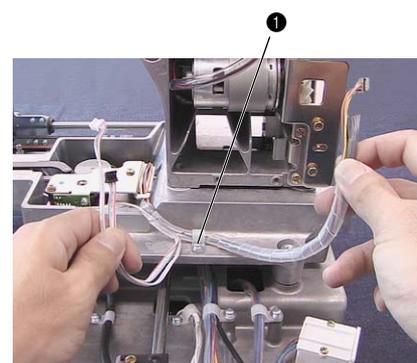


**20** Cutter unit final assembly and picker final assembly removal

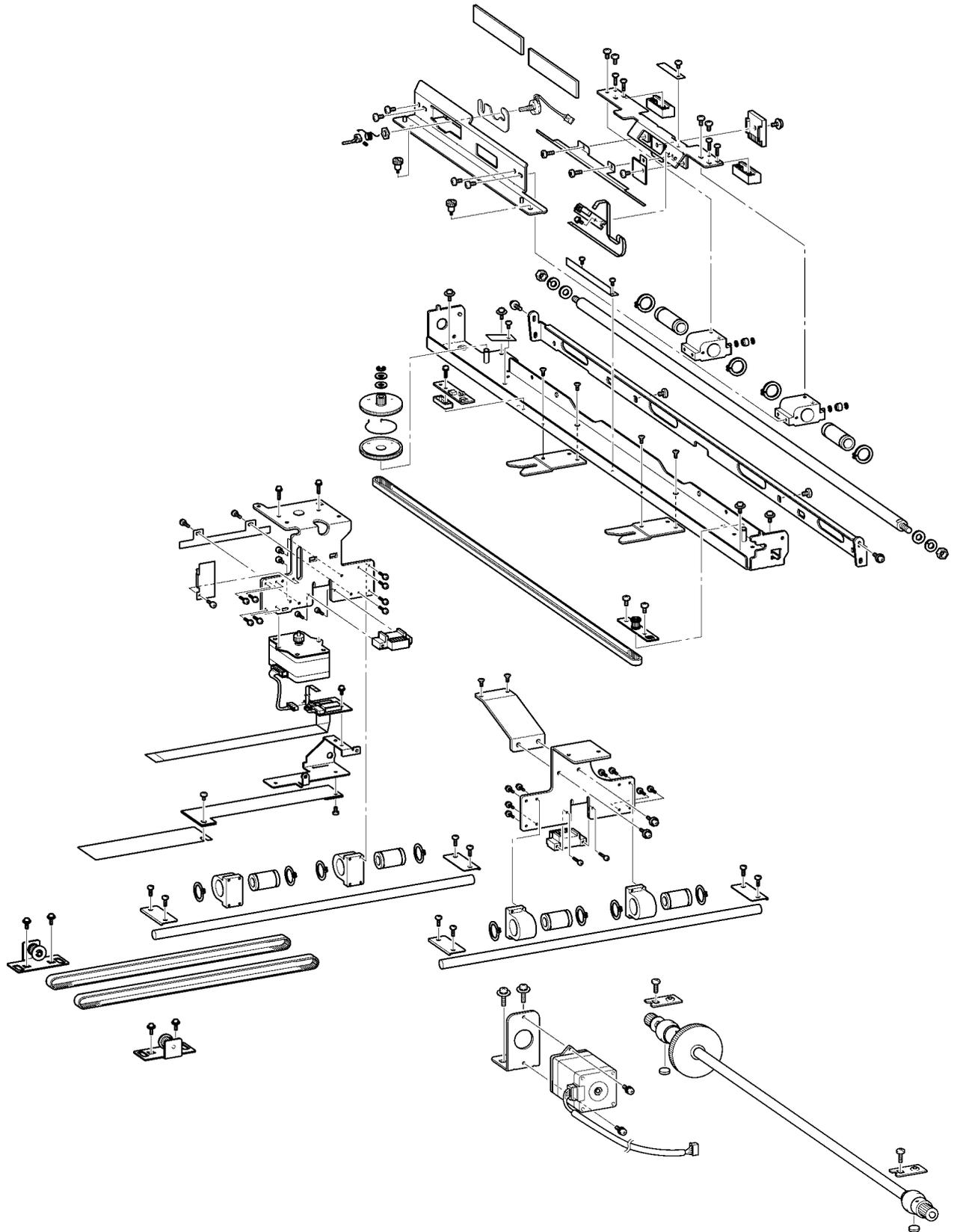
1. Remove the screw ❶, and then remove the cord clamp NK-5N and the lead wire from the arm bed.
2. Remove the 2 screws ❷, and then remove the picker final assembly.

**\*Key point**

- Fully draw the feed final assembly toward you before removing the cutter unit final assembly and the picker final assembly.
  - Be careful not to bend the picker link.
3. Remove the 2 screws ❸, and then remove the cutter unit assembly.

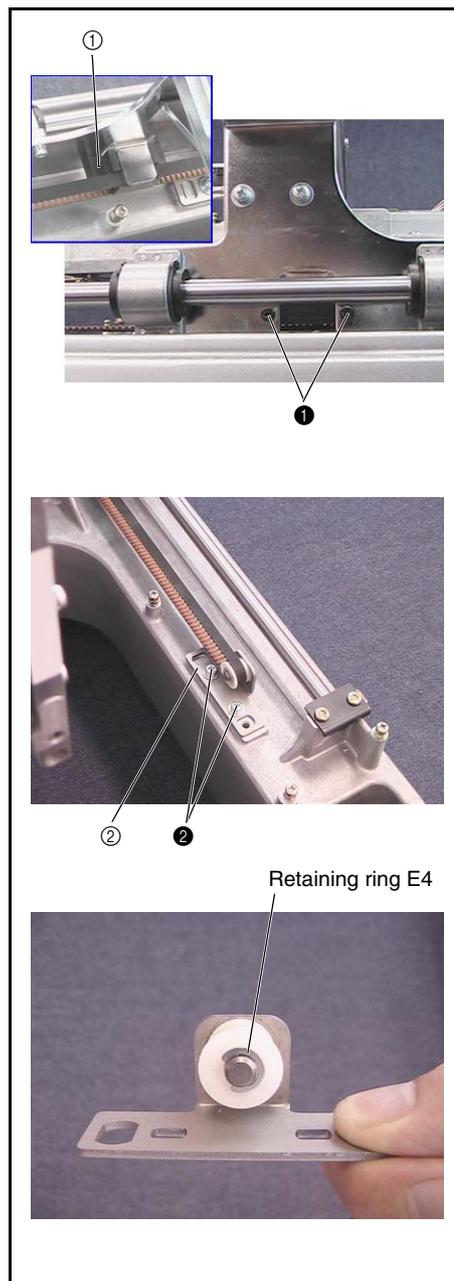


Feed unit



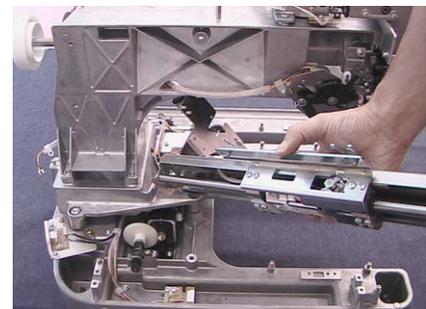
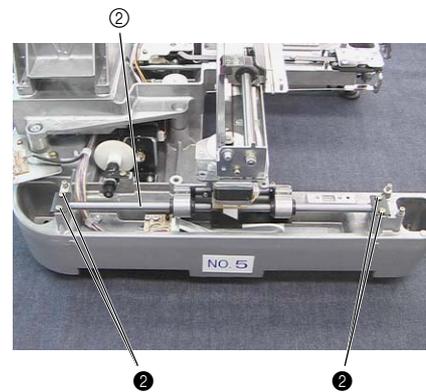
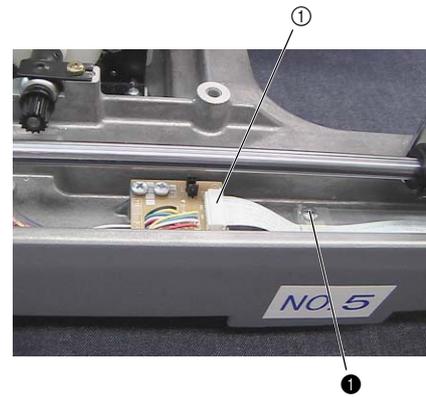
**1** T-belt (Y-guide) removal

1. Remove the 2 screws ❶, and then remove the Y-belt presser ❶ (one each on left and right).
2. Remove the 2 screws ❷, and then remove the Y-tension plate assembly ❷ and T-belt (one each on left and right).
3. Remove the retaining ring E4, and then remove the Y-tension pulley and the washer 7 X 2 from the Y-tension plate assembly.



## 2 Feed final assembly removal

1. Draw the feed final assembly toward you.
2. Unlock the connector of the Y-area sensor assembly, and then remove the FFC SML2CD-Y ① from the Y-area sensor assembly.
3. Remove the screw ①, and then remove the FFC SML2CD-Y and Y cable protection sheet A.
4. Remove the 4 screws ②, and then remove the 2 fixed Y-shaft plates (one each on left and right).
5. Remove the feed final assembly and the 2 Y-guide shafts ②.



### 3 Y-motor final assembly removal

1. Remove the screw ❶, and then remove the cord clamp NK-4N and the Y-motor assembly's lead wire from the base frame.
2. Remove the 2 screws ❷, and then remove the Y-motor final assembly.



❶



❷

### 4 Y-motor disassembly

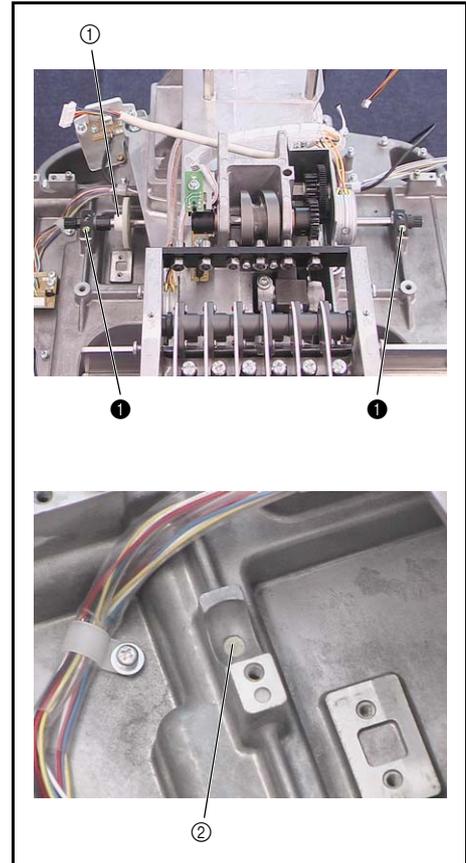
1. Remove the 2 screws ❶, and then remove the Y-motor assembly from the Y-motor stay.



❶

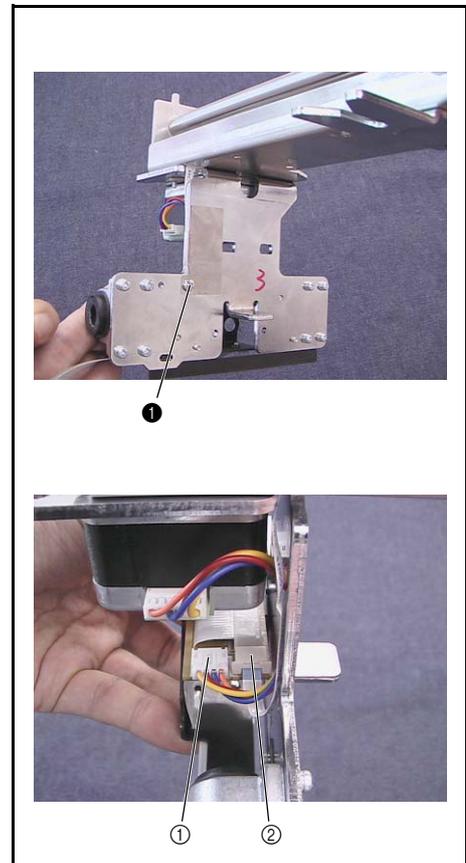
## 5 Y-driving shaft assembly removal

1. Remove the 2 screws ❶, and then remove the 2 bushing pressers A.
2. Remove the Y-driving shaft assembly ❶.
3. Remove the 2 felts ❷.



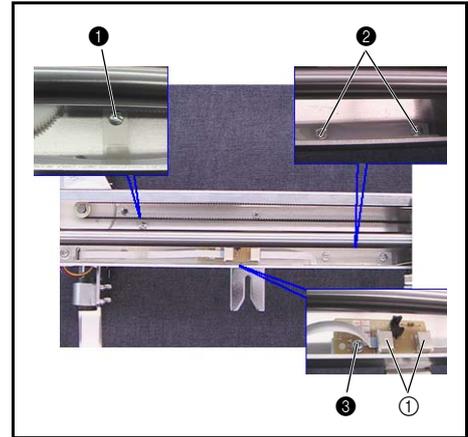
## 6 Cord grip removal

1. Remove the screw ❶, and then remove the cord grip.
2. Disconnect the X-feed motor's lead wire from the connect PCB ❶.
3. Unlock the connect PCB's connector ❷, and then disconnect the FFC (SML2CD-C) from the connect PCB.



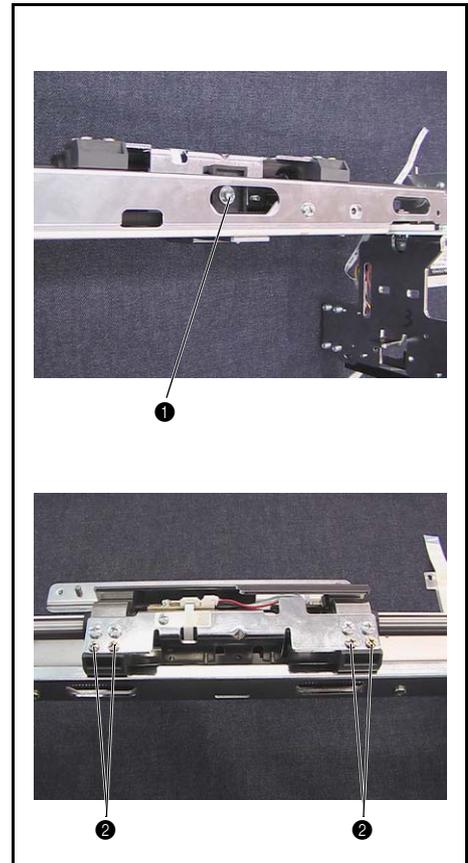
## 7 FFC and X-area sensor assembly removal

1. Remove the screw ❶, and then remove the sheet.
2. Remove the 2 screws ❷, and then remove the sheet.
3. Remove the screw ❸, and then remove the X-area sensor assembly, X-frame spacer and the insulation sheet.
4. Unlock the X-area sensor assembly's 2 connectors ❹, and then disconnect the 2 FFCs, (SML2CD-C) and (SML2CD-X), from the X-area sensor assembly.



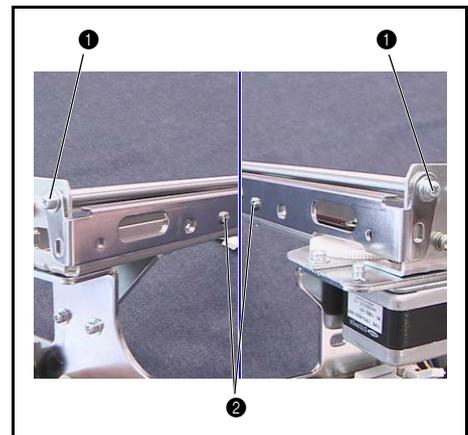
## 8 Y-frame spacer and X-belt presser removal

1. Remove the screw ❶, and then remove the X-belt presser.
2. Remove the 4 screws ❷, and then remove the 2 Y-frame spacers.



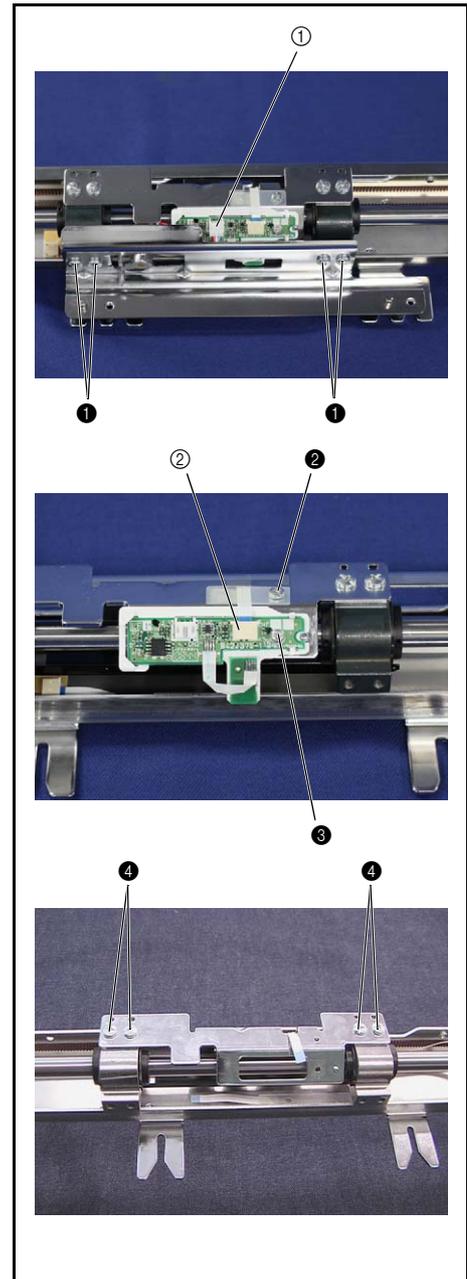
## 9 X-feed frame B removal

1. Remove the 4 screws (❶❷, 2 each), and then remove the X-feed frame B from the feed frame assembly.



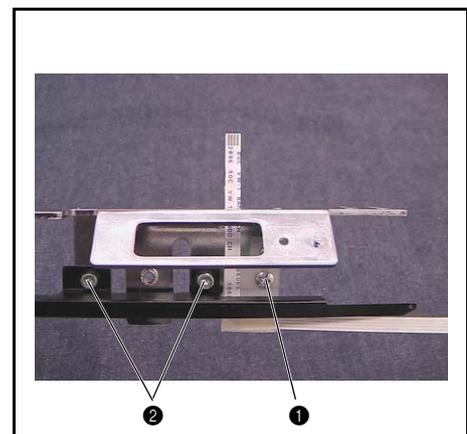
## 10 X-carriage A assembly and X-carriage B assembly removal

1. Remove the 4 screws ①, and then remove the hoop sensor assembly's lead wire connector ① from the magnet PCB assembly while removing the X-carriage A assembly.
2. Unlock the magnet PCB assembly's FFC (SML2CD-X) connector ②.
3. Disconnect the FFC (SML2CD-X) from the magnet PCB assembly, and then remove the screw ② and the sheet.
4. Remove the screw ③, and then remove the magnet PCB assembly.
5. Remove the 4 screws ④, and then remove the X-carriage B assembly.



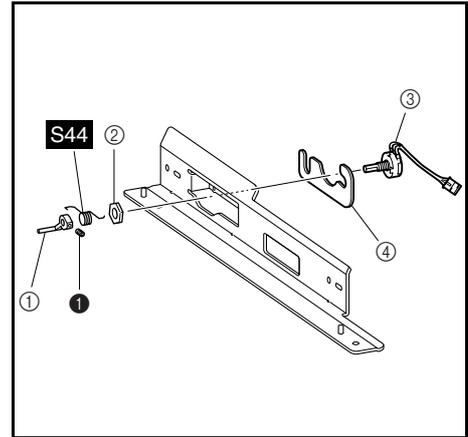
## 11 X-sensor dog removal

1. Remove the screw ①, and then remove the sheet and disconnect the FFC (SML2CD-X).
2. Remove the 2 screws ②, and then remove the X-sensor dog.



## 12 Hoop sensor removal

1. Remove the screw ❶, and then remove the hoop lever ❶.
2. Remove the nut ❷, and then remove the hoop sensor assembly ❸, PT meter plate ❹ and spring S44.



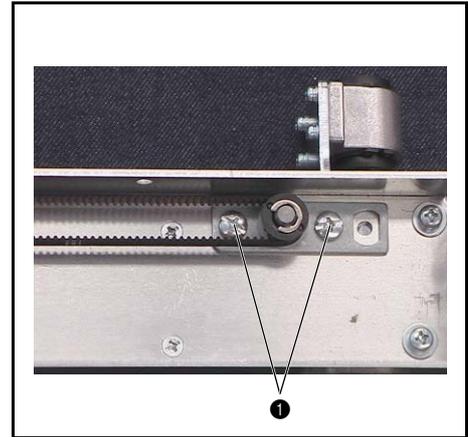
## 13 X-guide shaft removal

1. Remove the 2 nuts (2, M6) ❶ on both ends of the X-guide shaft, 2 plain washers (6) ❷, and 2 spring washers (2-6) ❸. Then remove the X-guide shaft and the 2 bearing case X assemblies from the feed frame assembly.
2. Remove the retaining ring E4, and then remove the X-roller from the bearing case X assembly (2 sets).
3. Remove the 2 external retaining rings C21, and then remove the linear bearing (12) from the bearing case X assembly (2 sets).



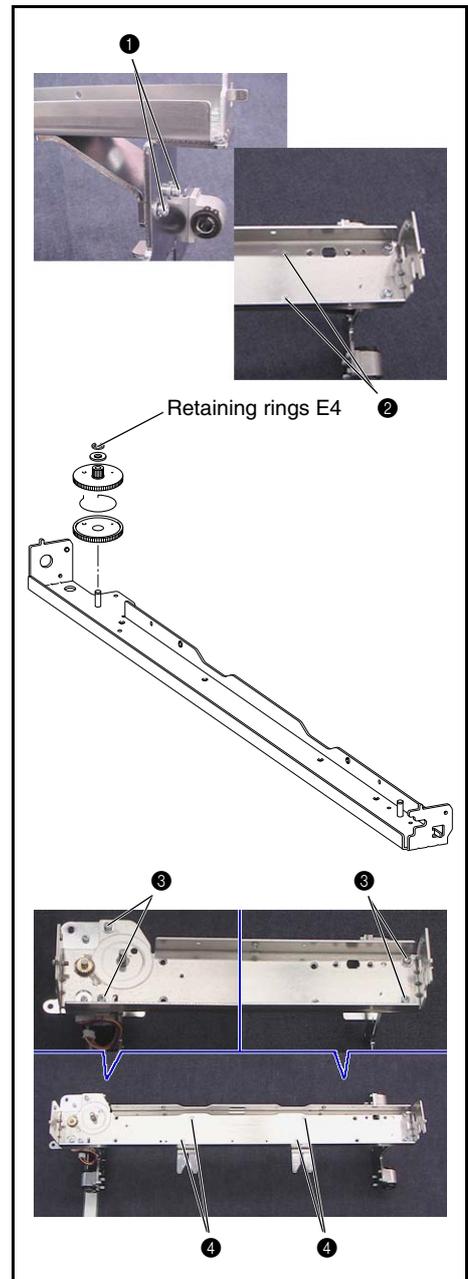
## 14 T-belt (Y-drive) removal

1. Remove the 2 screws ❶, and then remove the tension pulley plate assembly and the T-belt.



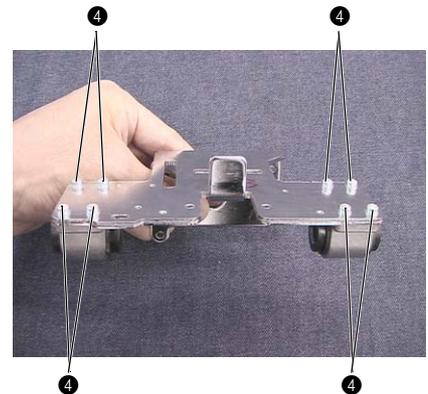
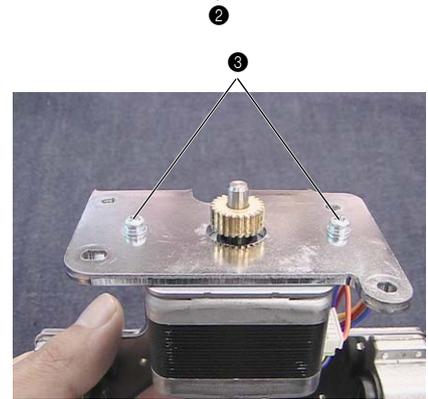
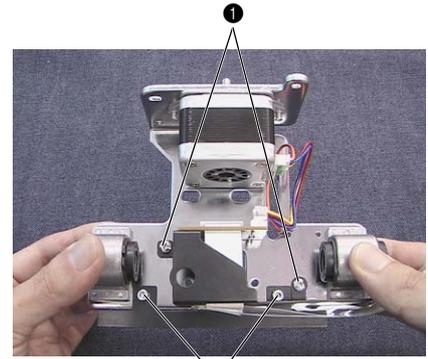
## 15 Feed frame disassembly

1. Remove the 4 screws (❶ ❷, 2 each), and then remove the Y-carriage RB.
2. Remove the retaining ring E4, plain washer (M6), washer, Y-driving gear pulley A, spring for gear, and Y-driving gear pulley B.
3. Remove the 4 screws ❸, and then remove the Y-carriage R assembly and the Y-carriage L assembly.
4. Remove the 4 screws ❹, and then remove the 2 cap connections.

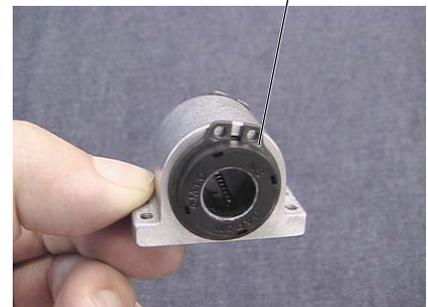


## 16 Y-carriage L disassembly

1. Remove the 2 screws ❶, and then remove the connect PCB final assembly.
2. Remove the 2 screws ❷, and then remove the Y-sensor dog.
3. Remove the 2 screws ❸, and then remove the X-motor assembly.
4. Remove the 4 screws ❹, and then remove the bearing case Y assembly (2 sets).
5. Remove the 2 external retaining rings C19, and then remove the linear bearing (10) from the bearing case Y assembly (2 sets).

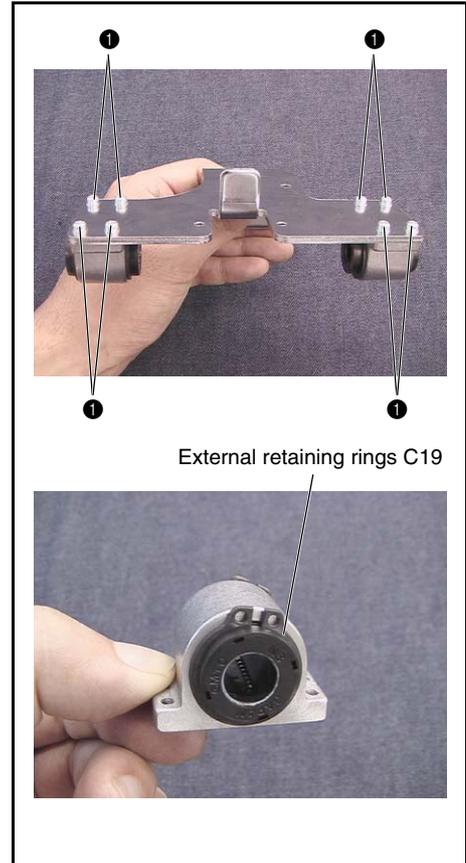


External retaining rings C19



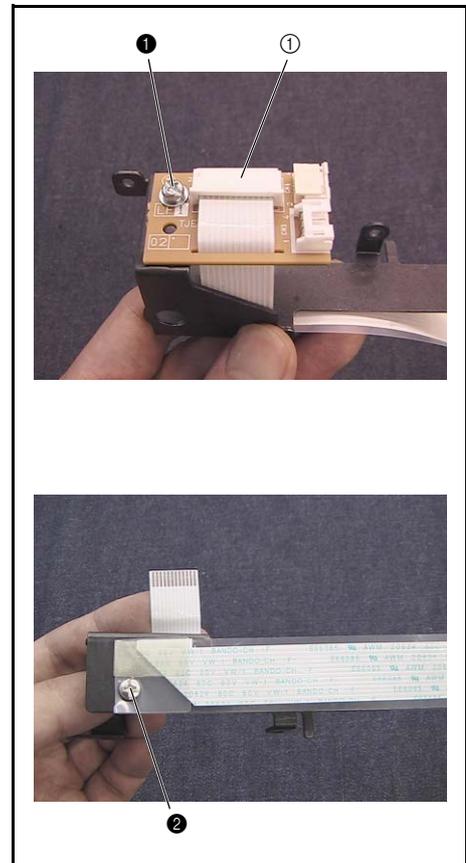
## 17 Y-carriage R disassembly

1. Remove the 4 screws ❶, and then remove bearing case Y from the Y-carriage R (2 locations).
2. Remove the 2 external retaining rings C19, and then remove the linear bearing (10) from the bearing case Y assembly (2 sets).

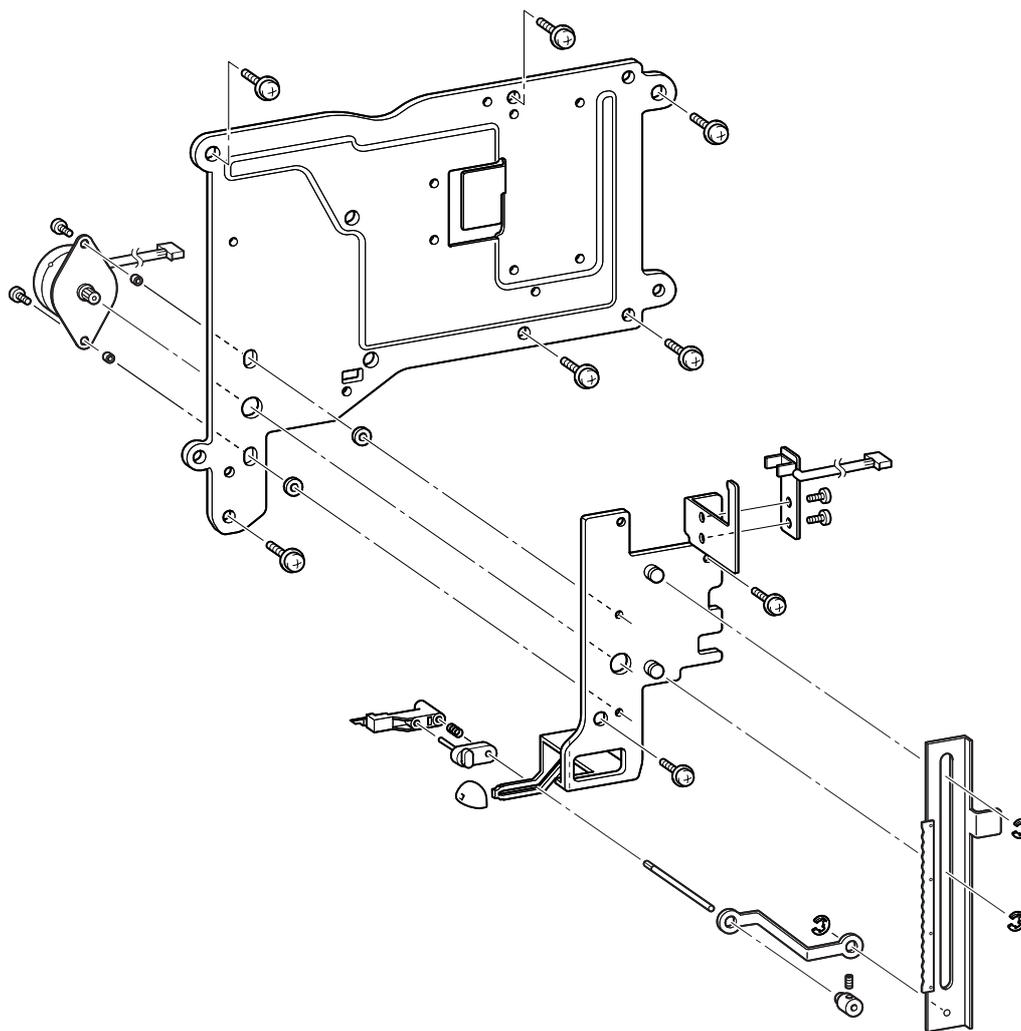


## 18 Connect PCB disassembly

1. Unlock the connect PCB assembly's connector, and then disconnect the FFC (SML2CD-Y) ❶.
2. Remove the screw ❶, and then remove the connect PCB from the PCB holder.
3. Remove the screw ❷, and then remove the FFC (SML2CD-Y) and the sheet from the PCB holder.

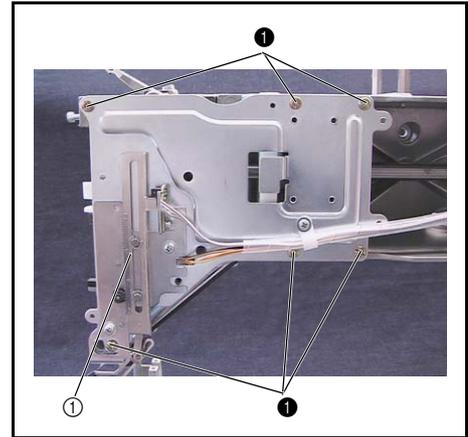


Needle thread unit



## 1 Needle thread assembly removal

1. Remove the 6 screws ❶, and then remove the needle thread assembly ❶.

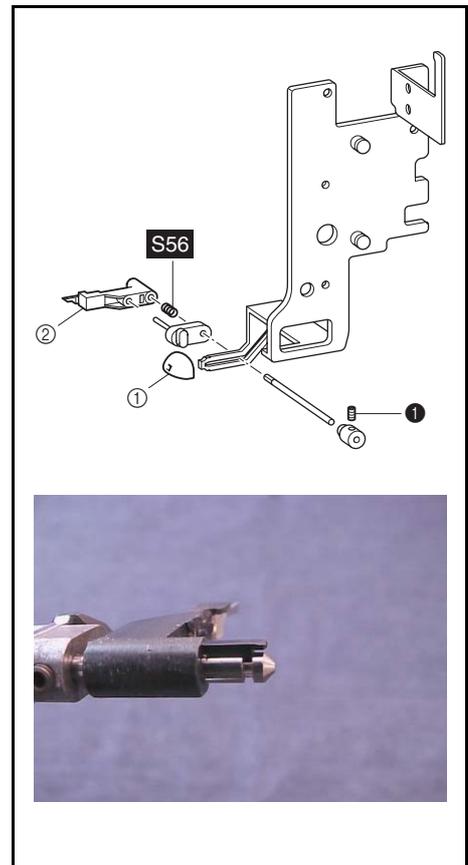


## 2 Hook holder assembly removal

1. Remove the cap ❶.
2. Remove the hook holder assembly ❷, and then remove the spring S56 and the hook holder axis B assembly.

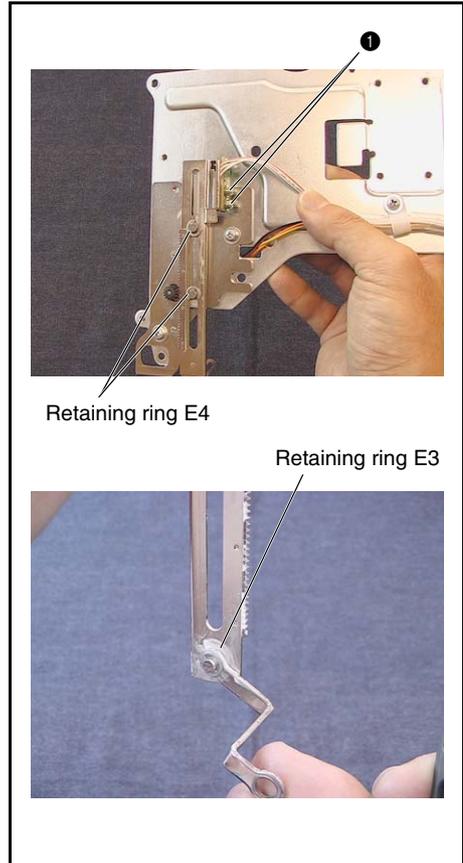
### \*Key point

- The hook holder assembly's tab is engaged in the groove on the hook holder axis B.
3. Remove the set collar assembly.
  4. Remove the screw ❶ from the hook holder axis B, and then remove the bush.



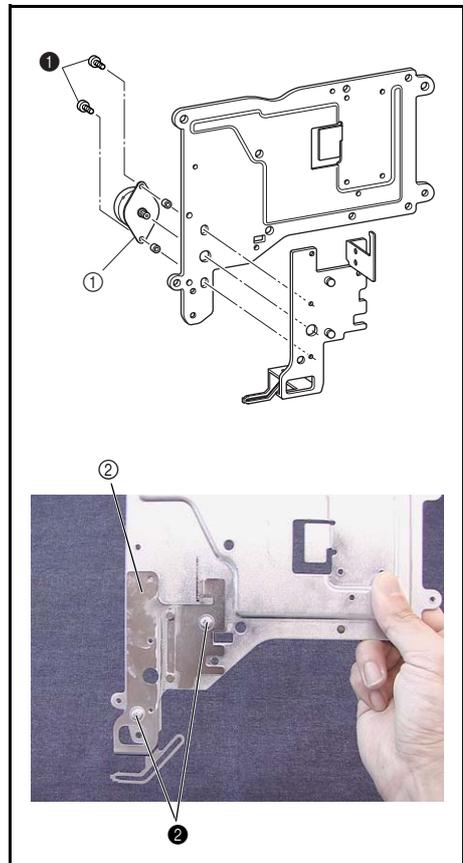
### 3 Rack and hook holder link removal

1. Remove the 2 screws ❶, and then remove the needle thread sensor assembly.
2. Remove the 2 retaining rings E4, and then remove the rack assembly.
3. Remove the retaining ring E3, and then remove the hook holder link from the rack assembly.

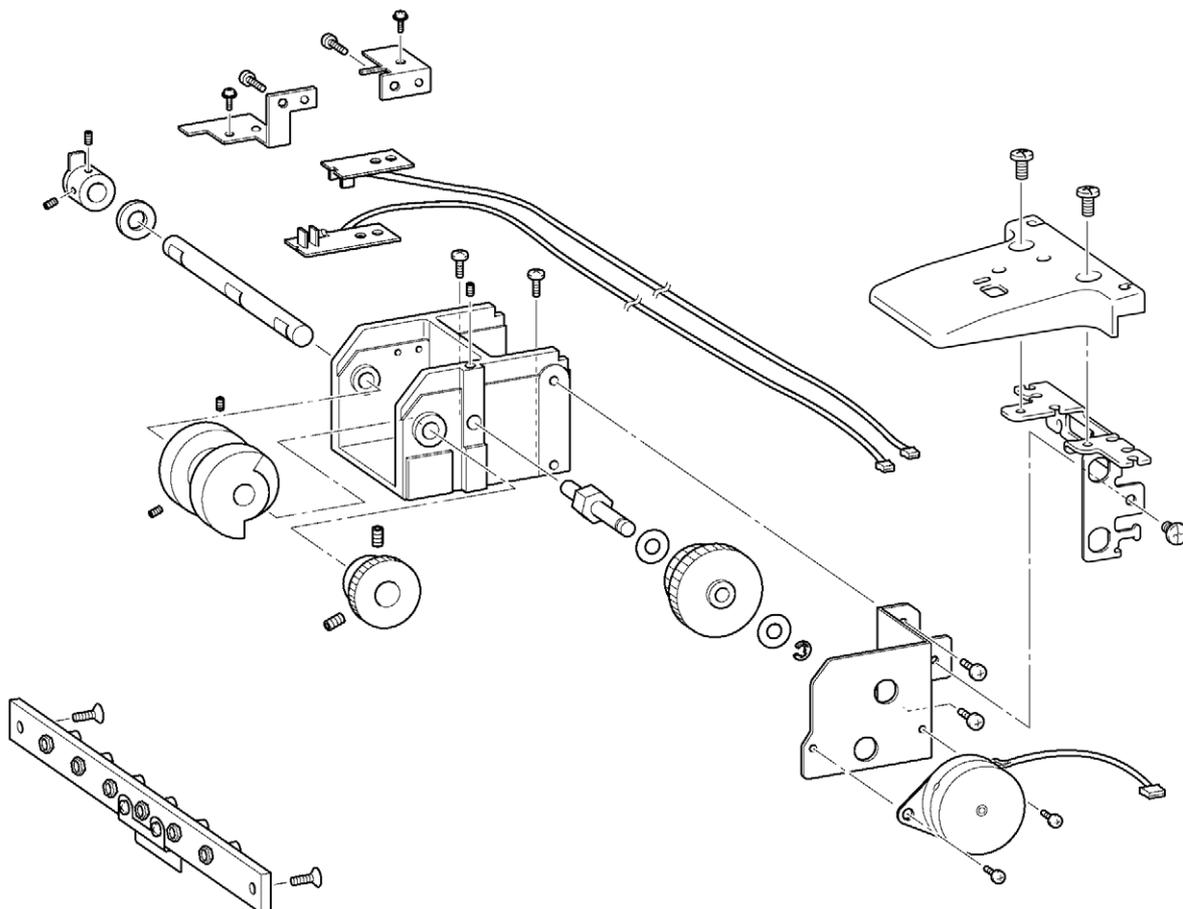


### 4 TH motor assembly and LED light assembly removal

1. Remove the 2 screws ❶, and then remove the TH motor assembly ❶ and 2 spacers.
2. Remove the 2 screws ❷, and then remove the base plate assembly ❷ from the thread guide base.

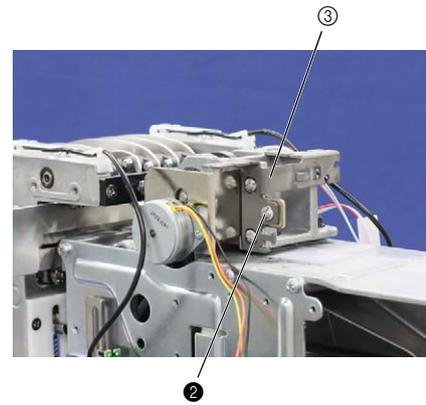
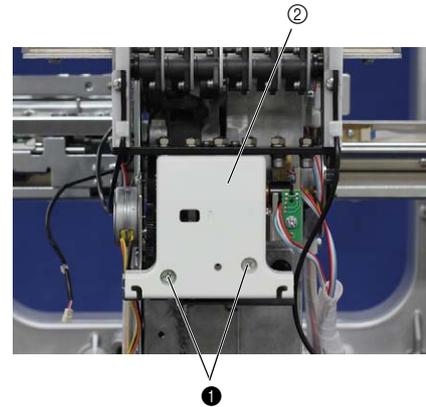
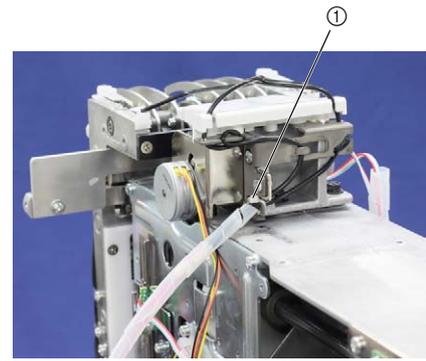


Needle bar change unit



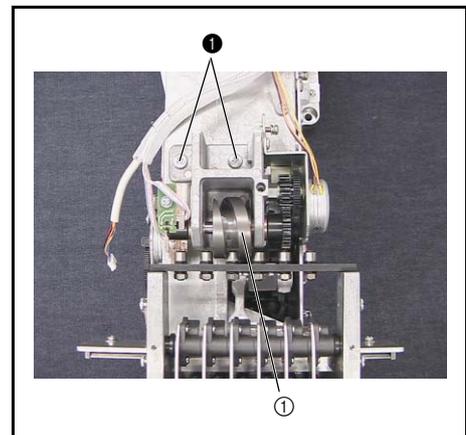
## 1 Change box center cover removal

1. Remove the spiral tube from the lead wires.
2. Cut the band ①, and then remove the lead wires from the guide parts.
3. Remove the 2 screws ❶, and then remove the change box center cover ❷.
4. Remove the screw ❸, and then remove the LED cord holder ③.



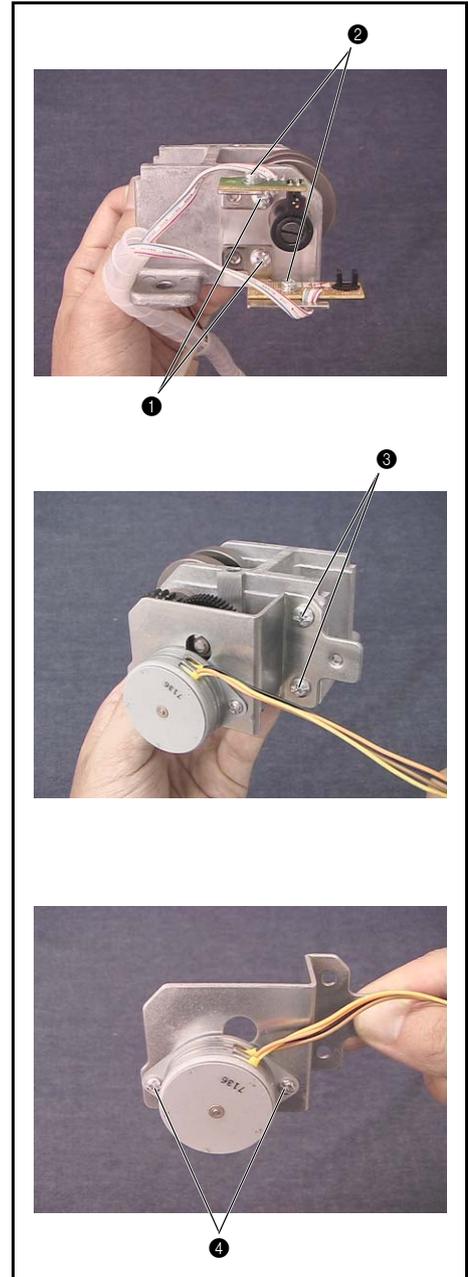
## 2 Change box removal

1. Remove the 2 screws ❶, and then remove the change box assembly ①.



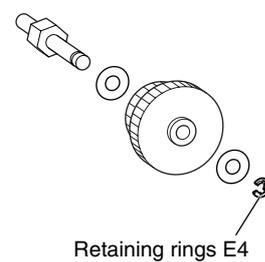
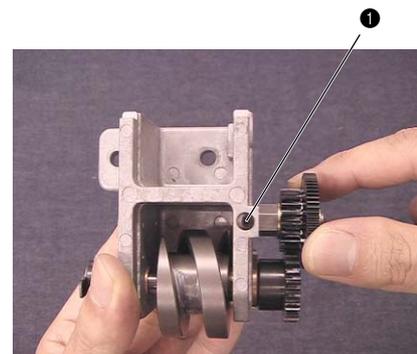
**3** Change box disassembly (Step 1)

1. Remove the 2 screws ❶, and then remove the C sensor bracket assembly and the C sensor bracket assy lower.
2. Remove the 2 screws ❷, and then remove the color change sensor assembly and the index sensor assembly from the C sensor bracket assembly and the C sensor bracket assy lower.
3. Remove the 2 screws ❸, and then remove the change motor base assembly.
4. Remove the 2 screws ❹, and then remove the index sensor assembly from the change motor base.

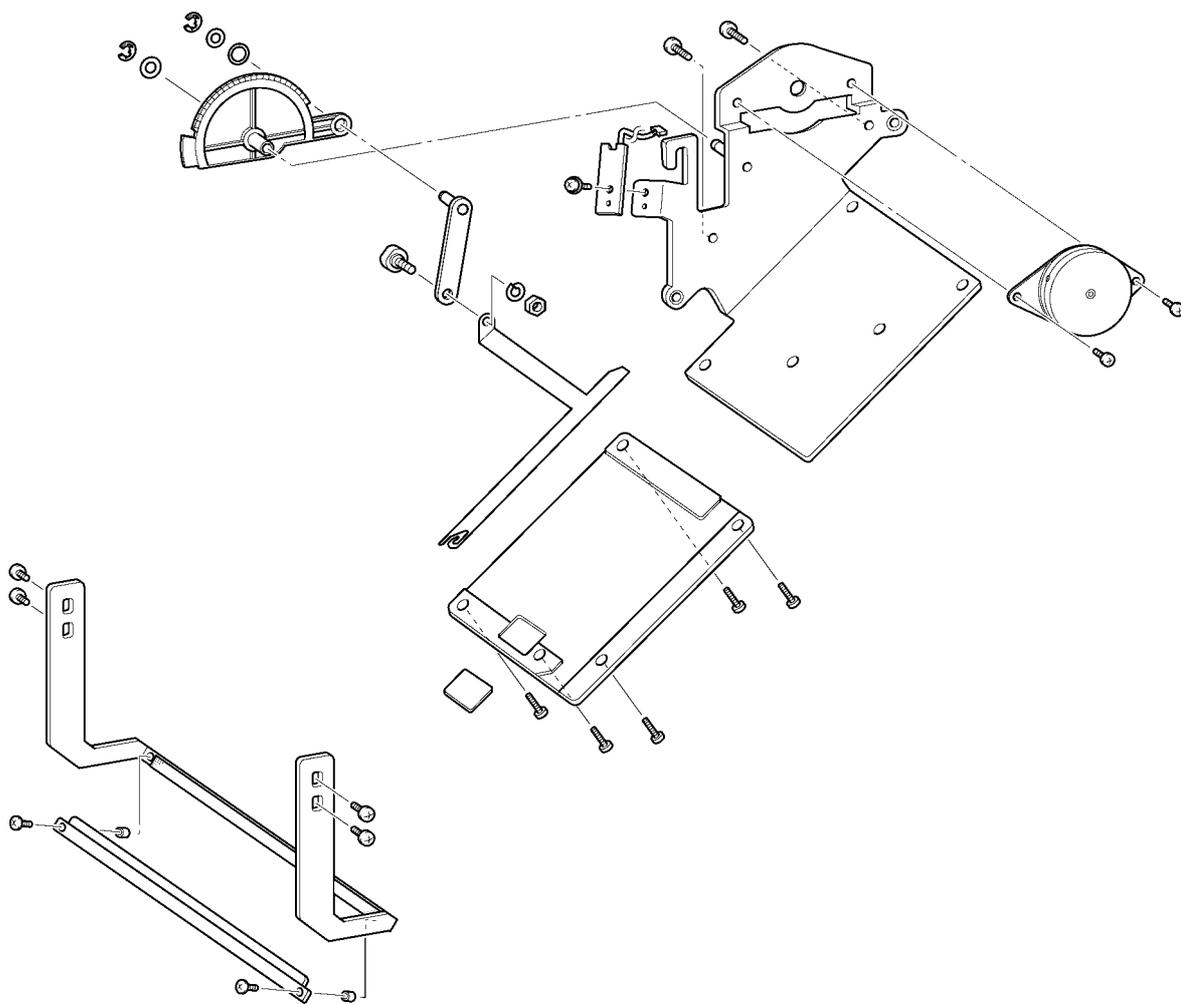


#### 4 Change box disassembly (Step 2)

1. Remove the screw ❶, and then remove the differential gear shaft assembly.
2. Remove the retaining ring E4, and then remove the plain washer (M6), C differential gear, and second plain washer (M6) from the differential gear shaft.
3. Remove the 2 screws ❷, and then remove the change gear.
4. Remove the 2 screws ❸, and then remove the change camshaft assembly, thrust washer, and change cam.
5. Remove the 2 screws ❹, and then remove the C stop position dog from the change camshaft.

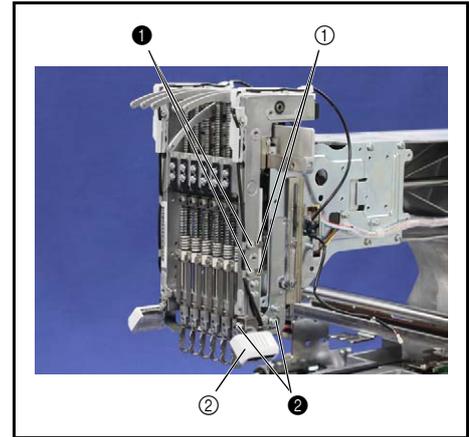


Thread wiper unit

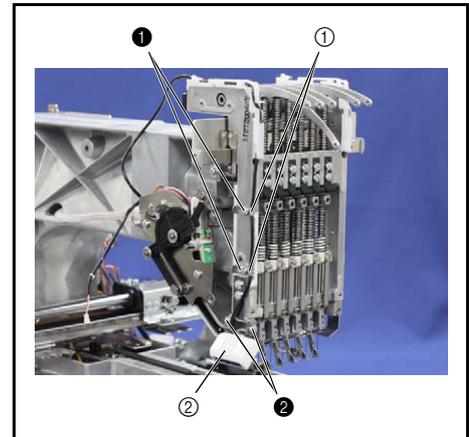


**1 LED unit left assy removal**

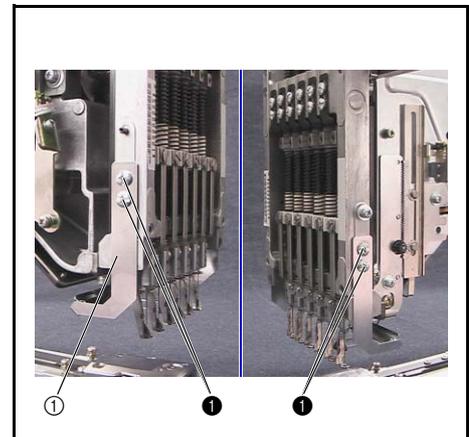
1. Remove the 2 screws ❶, and then remove the 2 cord clamps ①.
2. Remove the lead wire from the guide parts.
3. Remove the 2 screws ❷, and then remove the LED unit left assy ②.

**2 LED unit right assy removal**

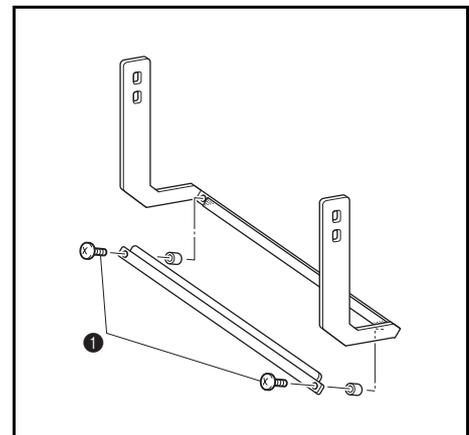
1. Remove the 2 screws ❶, and then remove the 2 cord clamps ①.
2. Remove the lead wire from the guide parts.
3. Remove the 2 screws ❷, and then remove the LED unit right assy ②.

**3 Thread presser base removal**

1. Remove the 4 screws ❶, and then remove the thread presser base assembly ① from the needle bar case final assembly.

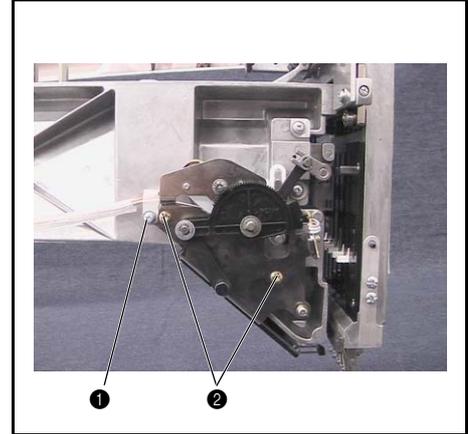
**4 Thread presser base disassembly**

1. Remove the 2 screws ❶, and then remove the thread presser cover assembly and the 2 thread presser spacers from the thread presser base assembly.



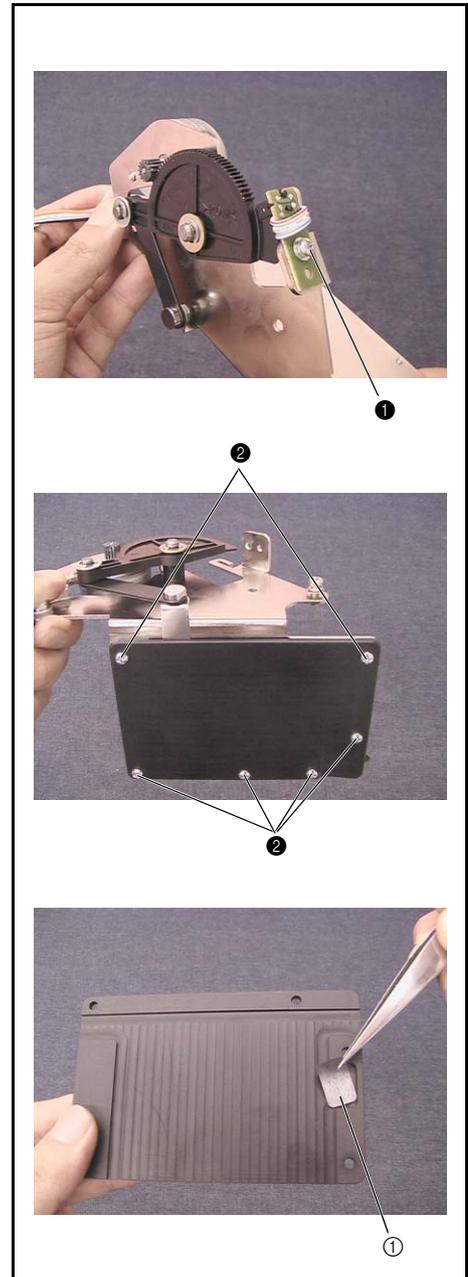
## 5 Wiper set assembly removal

1. Remove the screw ①, and then remove the cord clamp NK-5N.
2. Remove the 2 screws ②, and then remove the wiper set assembly.



## 6 Wiper guide and wiper sensor removal

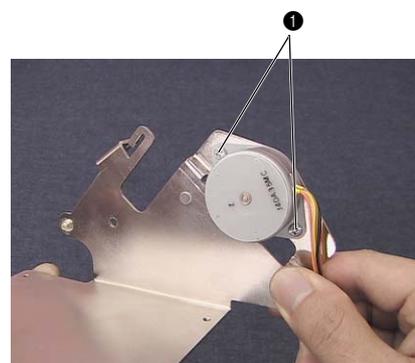
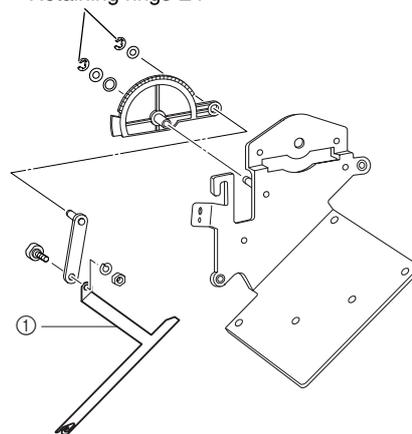
1. Remove the screw ①, and then remove the wiper sensor assembly.
2. Remove the 6 screws ②, and then remove the wiper guide assembly.
3. Remove the wiper cushion ① from the wiper guide assembly.



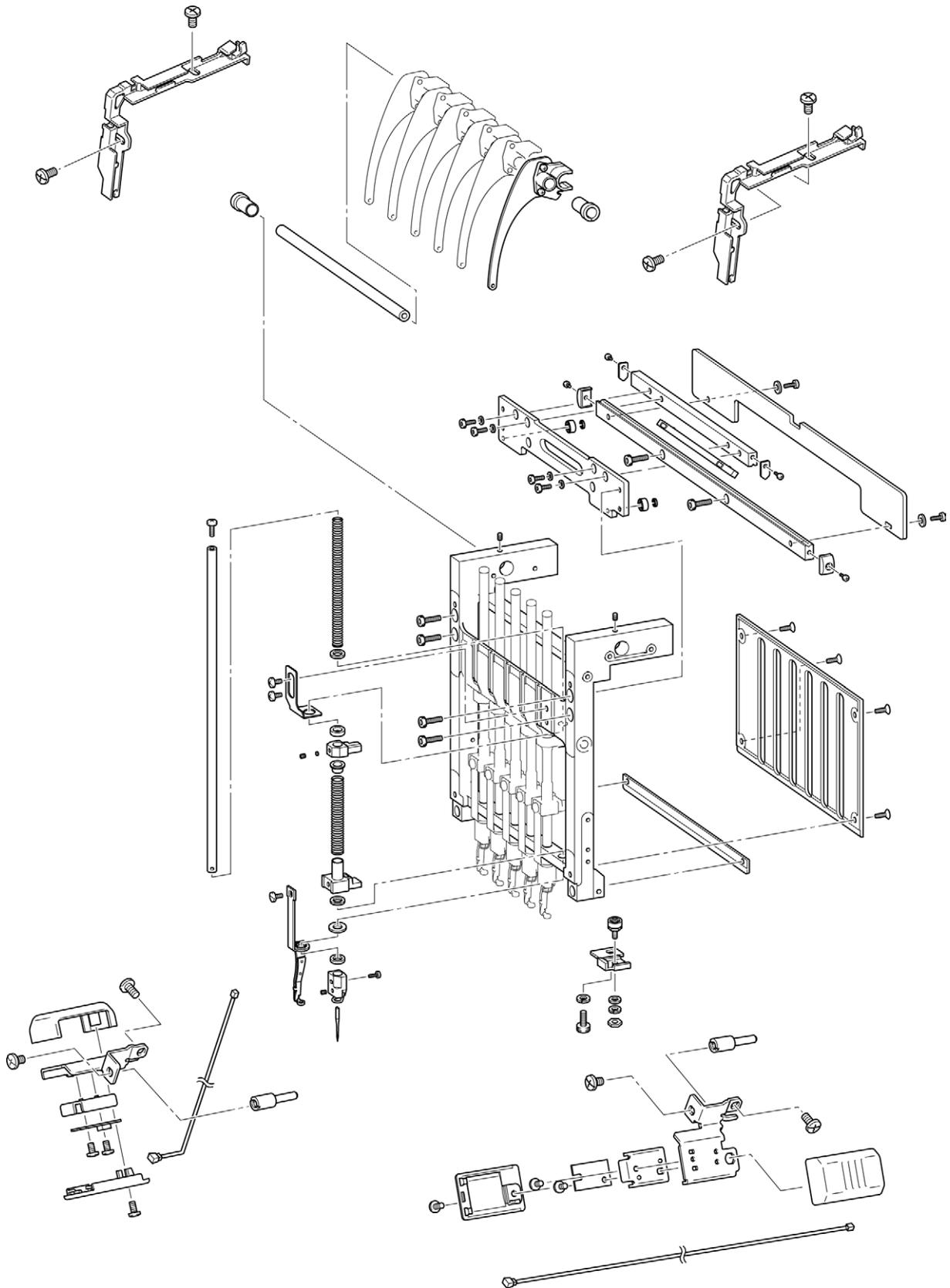
## 7 Wiper set disassembly

1. Remove the nut (3, M4), spring washer (2-4), and wiper shoulder screw, and then remove the wiper hook ①.
2. Remove the retaining ring E4, plain washer (M6), and washer, and then remove the wiper lever assembly.
3. Remove the retaining ring E4 and plain washer (M5), and then remove the wiper link assembly from the wiper lever.
4. Remove the 2 screws ❶, and then remove the wiper motor assembly.

Retaining rings E4

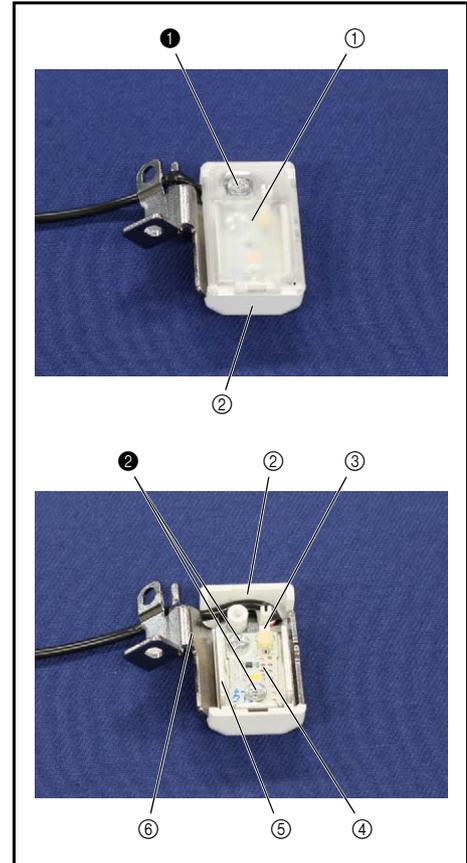


Needle bar unit

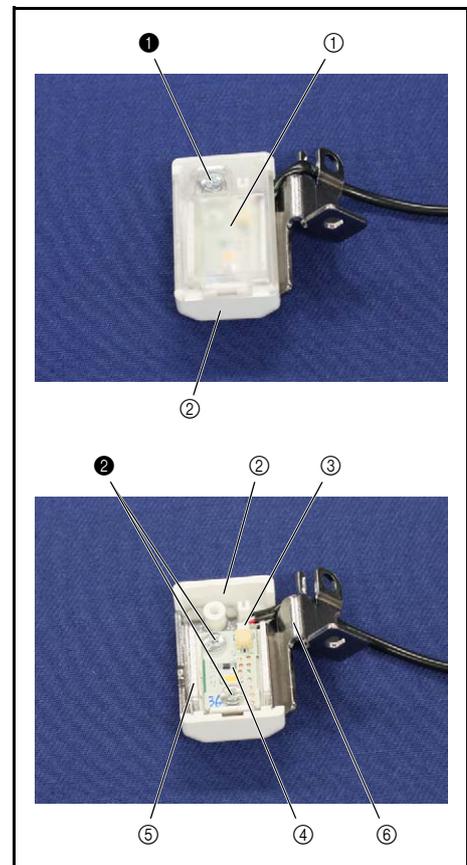


**1 LED unit left assy disassembly**

1. Remove the screw ❶, and then remove the LED lower cover left ❶ from the LED upper cover ❷.
2. Disconnect the connector of the LED wire assy LED2 ❸ from the LED PCB supply assy ❹.
3. Remove the 2 screws ❷, and then remove the LED PCB supply assy ❹, LED light base ❺ and the LED base plate left ❻ from the LED upper cover ❷.

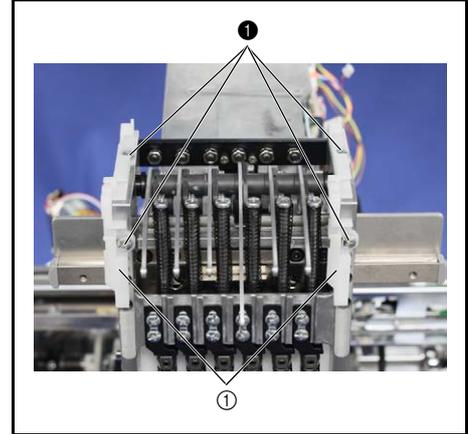
**2 LED unit right assy disassembly**

1. Remove the screw ❶, and then remove the LED lower cover right ❶ from the LED upper cover ❷.
2. Disconnect the connector of the LED wire assy LED2 ❸ from the LED PCB supply assy ❹.
3. Remove the 2 screws ❷, and then remove the LED PCB supply assy ❹, LED light base ❺ and the LED base plate right ❻ from the LED upper cover ❷.

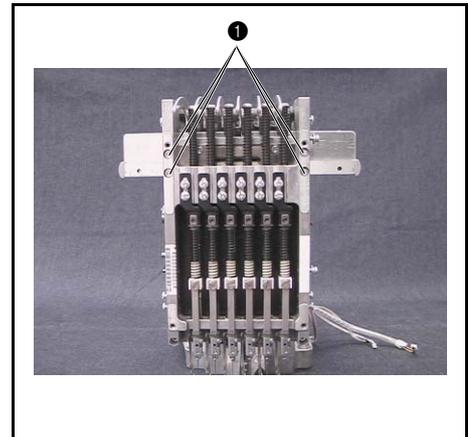


**3** LED cord guide removal

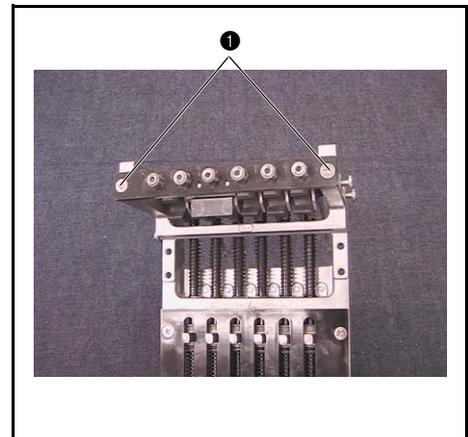
1. Remove the 4 screws ❶, and then remove the 2 LED cord guides ①.

**4** Needle bar case final assembly removal

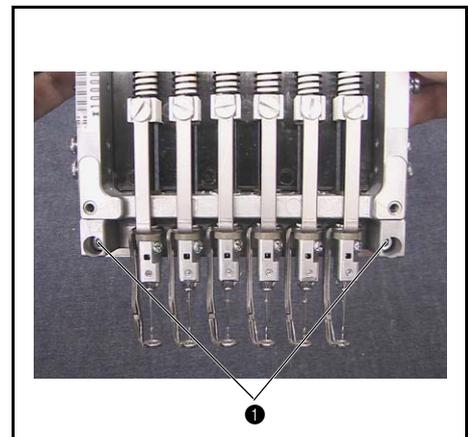
1. Remove the 4 screws ❶, and then remove the needle bar case assembly.

**5** Change roller base assembly removal

1. Remove the 2 screws ❶, and then remove the change roller base assembly.

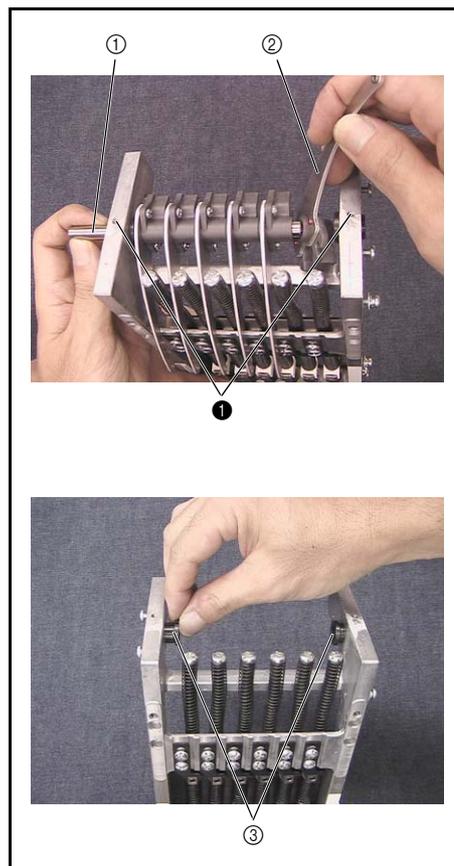
**6** Case guide D removal

1. Remove the 2 screws ❶, and then remove the case guide D.



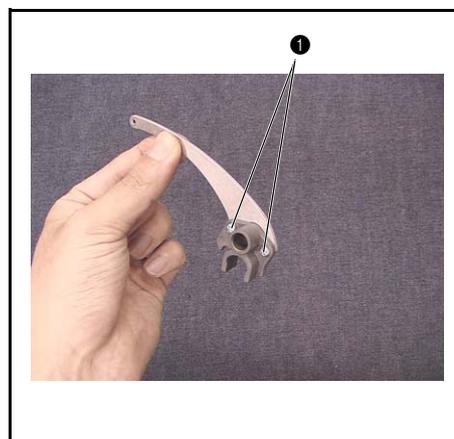
## 7 Thread take-up lever assembly removal

1. Remove the 2 screws ❶, and then remove the thread take-up shaft ❶ and the 6 thread take-up lever assemblies ❷.
2. Remove the 2 thread take-up bushes ❸.



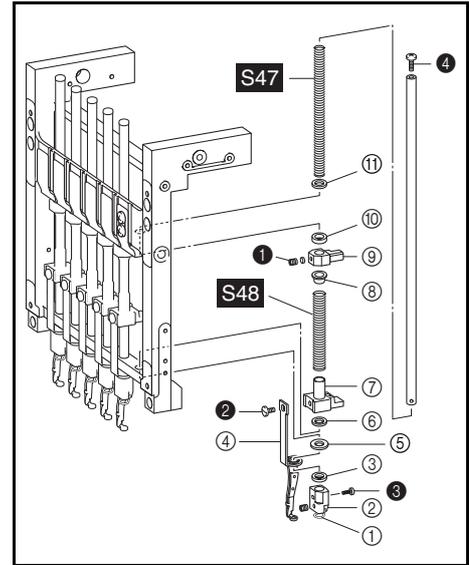
## 8 Thread take-up lever disassembly

1. Remove the 2 screws ❶, and then remove the thread take-up boss from the thread take-up lever. (6 sets)



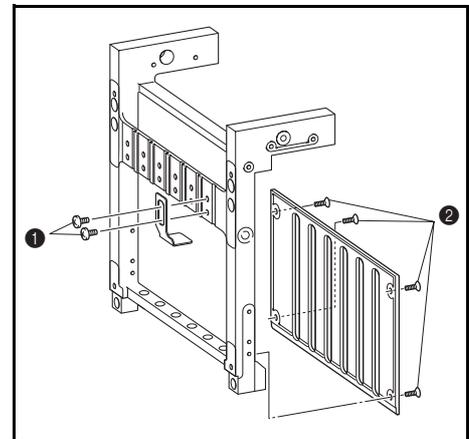
## 9 Needle bar removal

1. Remove the screw ① and the washer. (6 locations)
2. Remove the screw ②. (6 locations)
3. Remove the screw ③, and then remove the thread guide ①, needle bar thread guide ②, presser foot cushion ③, presser foot assembly ④, and felt ⑤.
4. Remove the felt (S, hard) ⑥, presser foot clamp ⑦, spring S48, presser foot spring collar ⑧, needle bar clamp ⑨, cushion rubber ⑩, washer ⑪, and spring S47 while pulling the needle bar upward. (6 locations)
5. Remove the screw ④ from the needle bar. (6 sets)



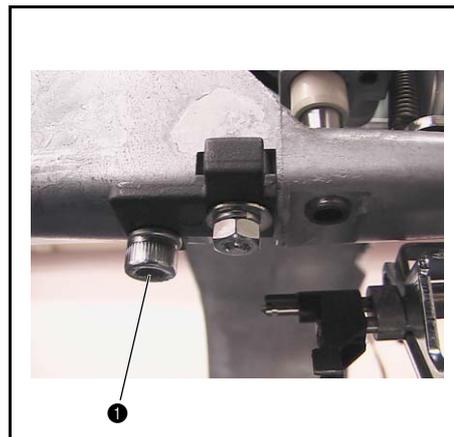
## 10 Needle bar case disassembly

1. Remove the 2 screws ①, and then remove the top dead center plate. (6 locations)
2. Remove the 4 screws ②, and then remove the needle bar guide rail.



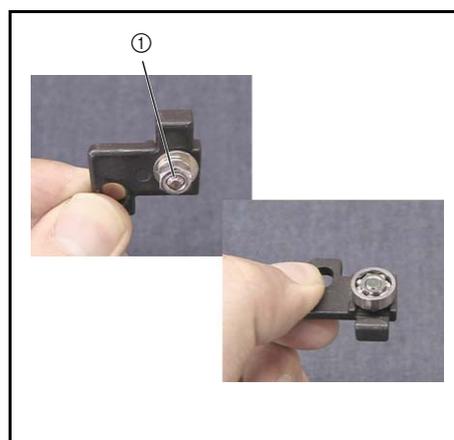
## 11 Case positioning plate assembly removal

1. Remove the screw ① and spring washer (2-5), and then remove the case positioning plate assembly.



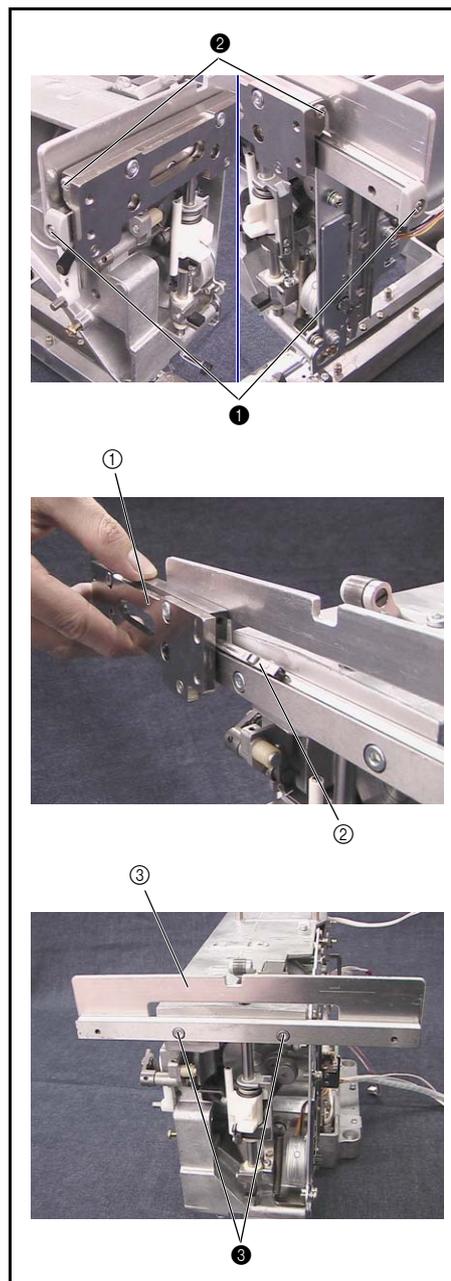
## 12 Case positioning plate disassembly

1. Remove the nut (2, M4) ①, spring washer (2-4), and plain washer (M4), and then remove the ball bearing (694) and the case positioning shaft from the case positioning plate.



### 13 Case bracket assembly removal

1. Remove the screw ①, and then remove the case guide cover UL. (2 locations)
2. Remove the screw ②, and then remove the slide roller stopper. (2 locations)
3. Remove the case bracket assembly ① and the slide roller ②.
4. Remove the 2 screws ③, and then remove the case guide UL assembly ③.



## 14 Case bracket disassembly

1. Remove the 4 screws ❶, and then remove the case guide US and the case bracket assembly.
2. Remove the 2 retaining rings E3, and then remove the 2 ball bearings (694) from the case bracket assembly.



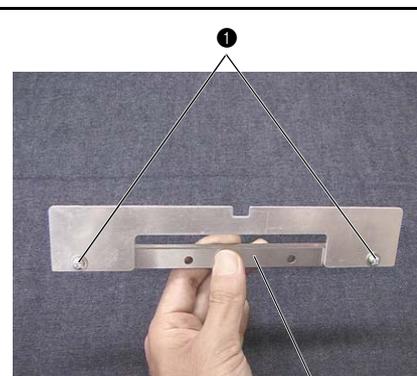
❶



Retaining ring E3

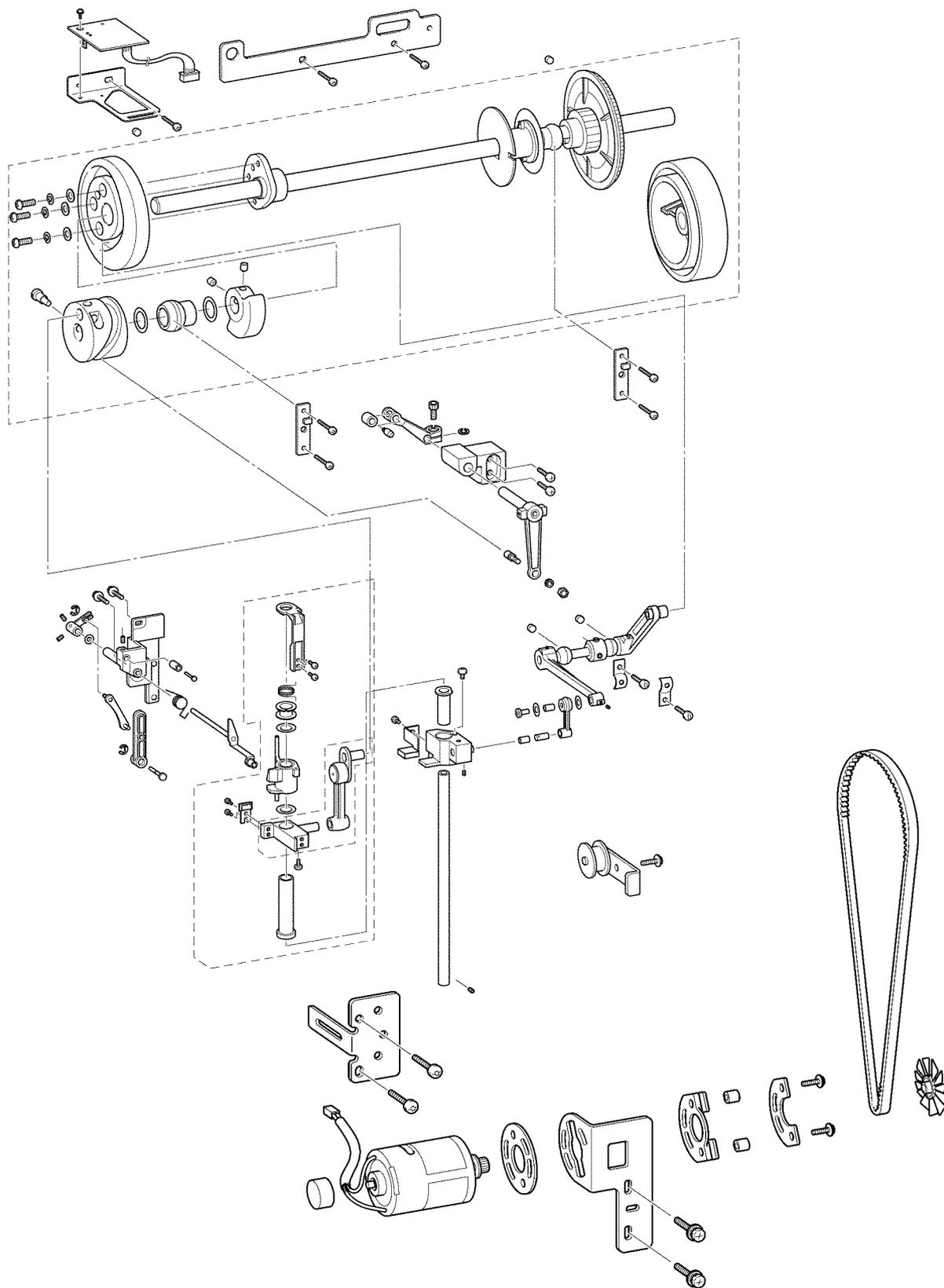
## 15 Case guide UL disassembly

1. Remove the 2 screws ❶, and then remove the case guide UL ① and the thread take-up guide.



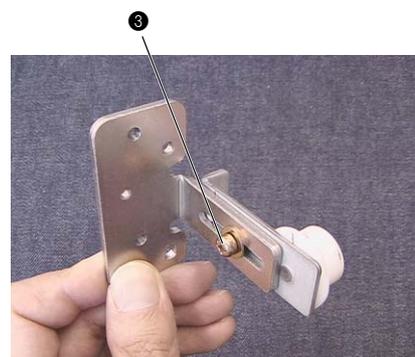
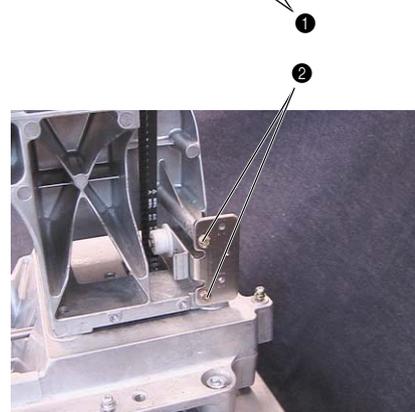
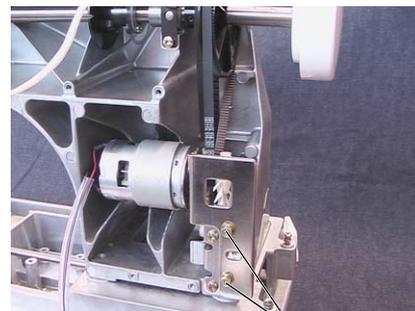
①

Upper shaft unit



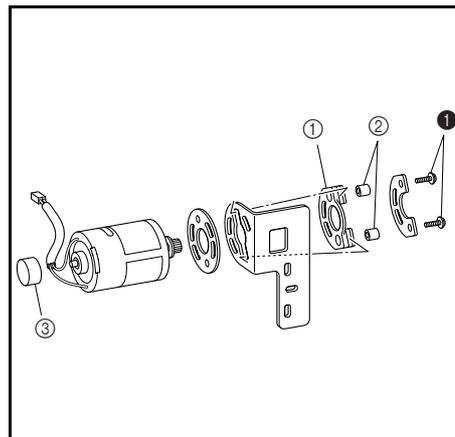
## 1 Main motor final assembly removal

1. Remove the 2 screws ❶, and then remove the main motor final assembly and the T-belt (XA9644-050).
2. Remove the motor fan from the main motor final assembly.
3. Remove the 2 screws ❷, and then remove the tension pulley final assembly.
4. Remove the screw ❸, and then remove the tension pulley assembly.



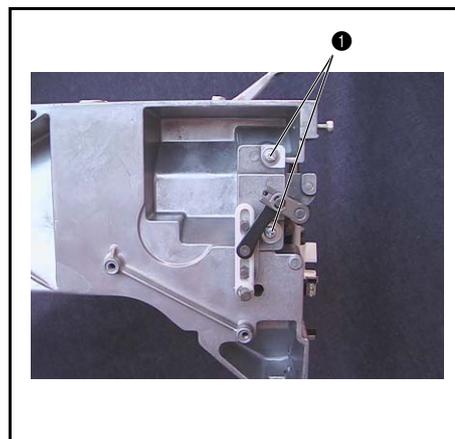
## 2 Main motor disassembly

1. Remove the 2 screws ❶, and then remove the main motor assembly, motor holder spacer, and motor spacer presser from the motor holder.
2. Remove the fender rubber ❶ from the motor holder.
3. Remove the 2 spacers (4 x 7) ❷ from the fender rubber.
4. Remove the motor cap ❸ from the main motor assembly.



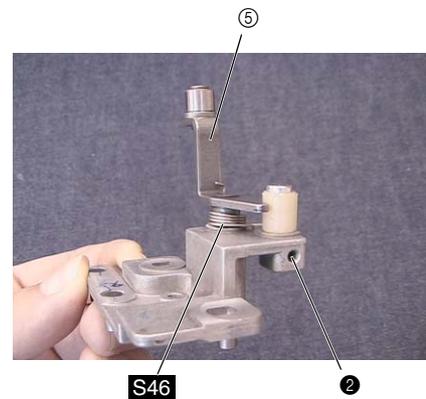
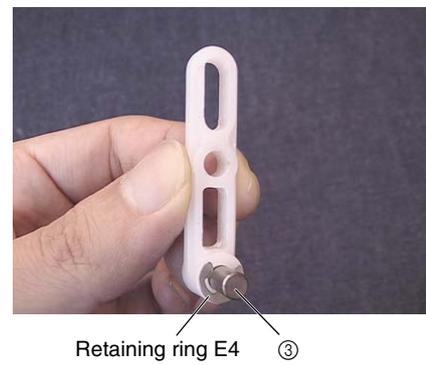
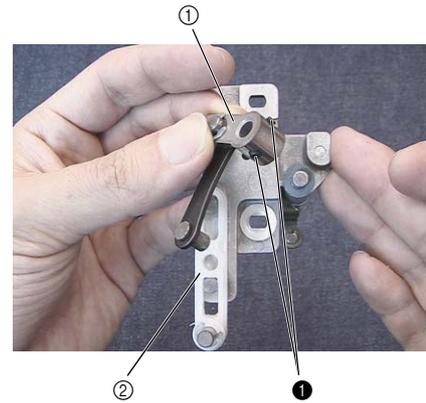
## 3 Driving jump assembly removal

1. Remove the 2 screws ❶, and then remove the driving jump assembly.



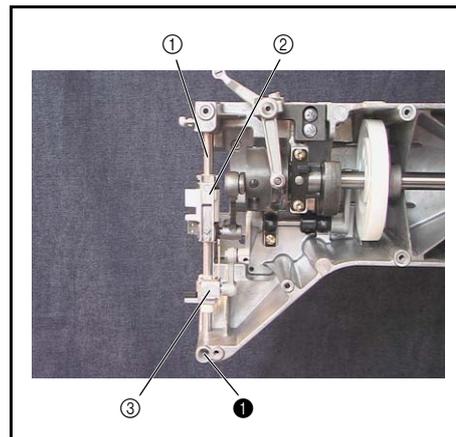
#### 4 Driving jump disassembly

1. Remove the 2 screws ❶, and then remove the J differential lever ❶, thrust washer, and J slide lever assembly ❷.
2. Remove the retaining ring E4, and then remove the J slide lever shaft ❸ from the J slide lever.
3. Remove the retaining ring E4, and then remove the J differential lever ❹ from the J link assembly.
4. Remove the J driving lever ❺ and the spring S46 from the J base assembly.
5. Remove the screws ❷, and then remove the J cushion pin and the J cushion.



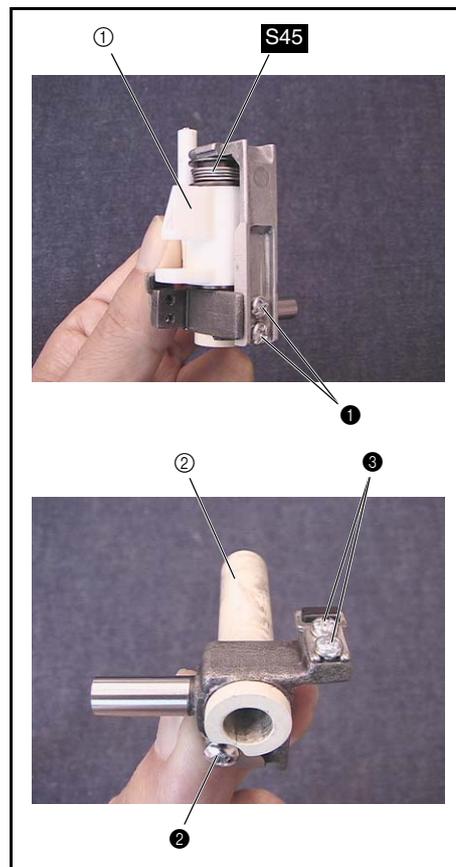
## 5 Base needle bar removal

1. Remove the screw ①, and then remove the J-clamp final assembly ② and the presser foot vertical base assembly ③ while pulling the base needle bar ① upward.



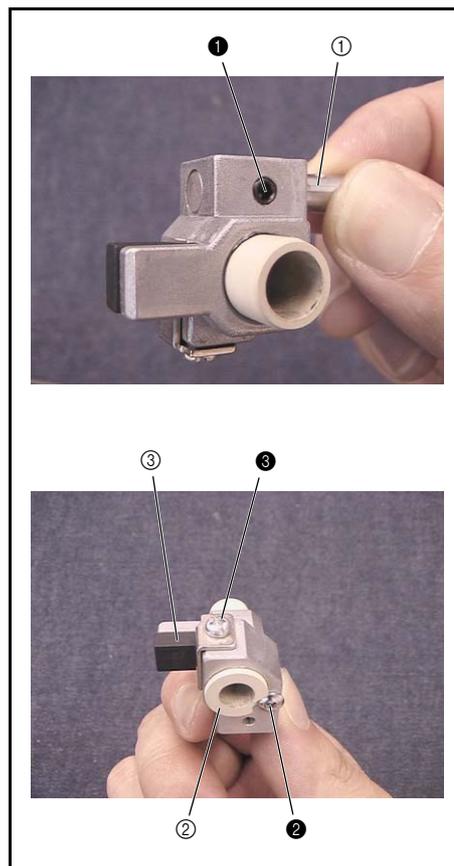
## 6 J-clamp disassembly

1. Remove the 2 screws ①, and then remove the J-clamp.
2. Remove the J-spring collar and the spring S45.
3. Remove the thrust washer, jump bracket ①, and thrust washer.
4. Remove the screw ②, and then remove the J vertical bush ② from the J bracket assembly.
5. Remove the 2 screws ③, and then remove the J cushion base.



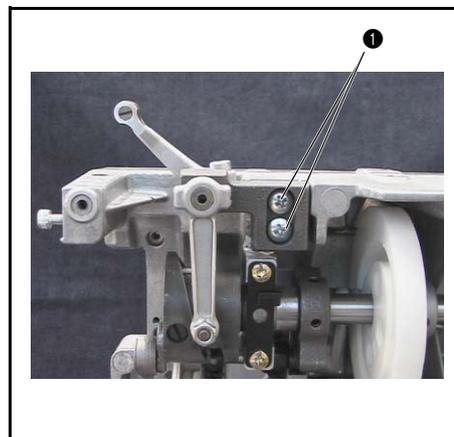
## 7 Presser foot vertical base disassembly

1. Remove the screw ❶, and then remove the presser foot vertical pin ❶.
2. Remove the screw ❷, and then remove the presser foot vertical bush ❷.
3. Remove the screw ❸, and then remove the presser foot cushion base ❸.



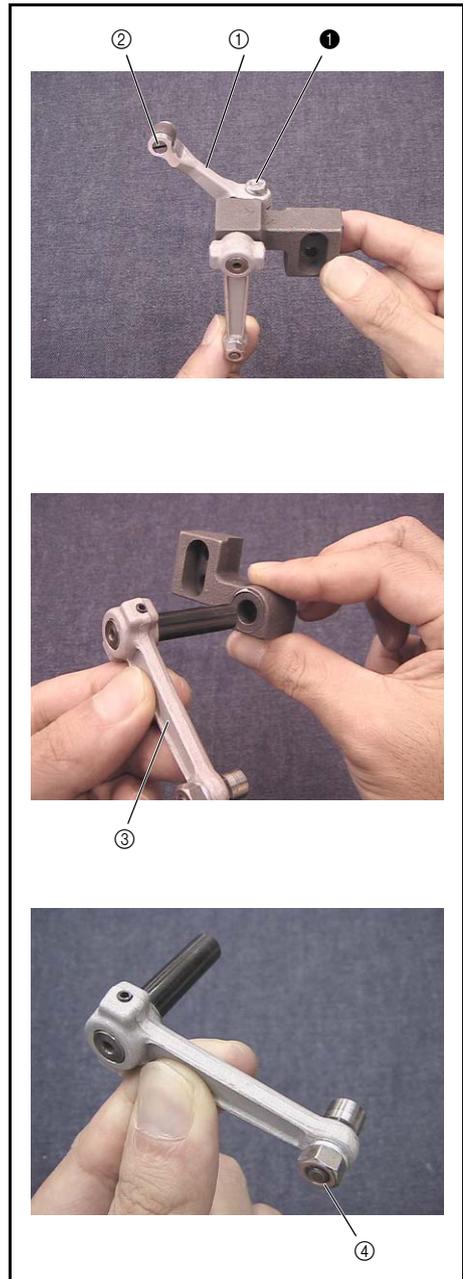
## 8 Thread take-up driving lever final assembly removal

1. Remove the 2 screws ❶, and then remove the thread take-up driving lever final assembly.



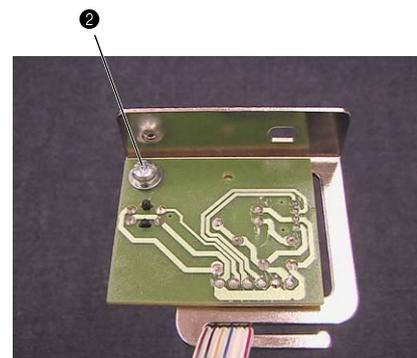
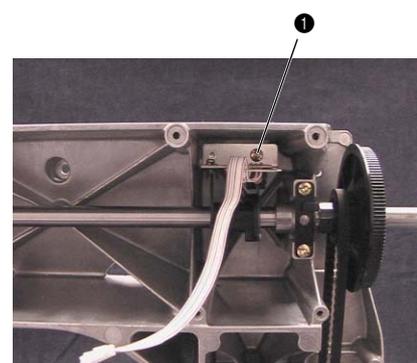
## 9 Thread take-up driving lever disassembly

1. Remove the screw ❶, and then remove the thread take-up differential lever ❶ and the spacer.
2. Remove the thread take-up roller pin ❷ from the thread take-up differential lever assembly, and then remove the roller.
3. Remove the thread take-up driving lever assembly ❸ from the thread take-up bearing.
4. Remove the nut (1, M5) ❹ and the spring washer (2-5), and then remove the roller shaft assembly from the thread take-up driving lever assembly.



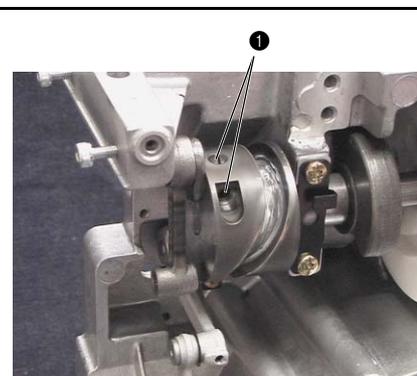
## 10 Main shaft sensor final assembly removal

1. Remove the screw ❶, and then remove the main shaft sensor final assembly.
2. Remove the screw ❷, and then remove the main shaft sensor assembly from the sensor holder.



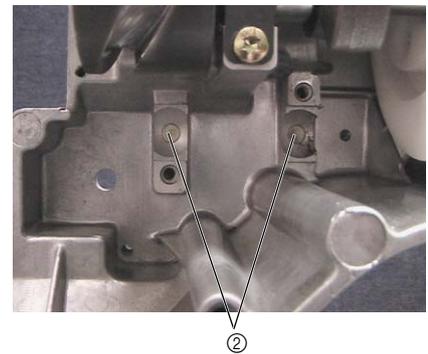
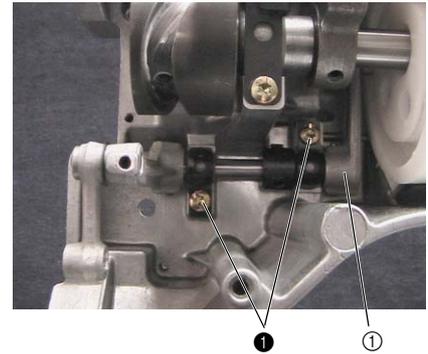
## 11 Crank rod removal

1. Remove the 2 screws ❶, and then remove the crank rod assembly from the thread take-up cam.



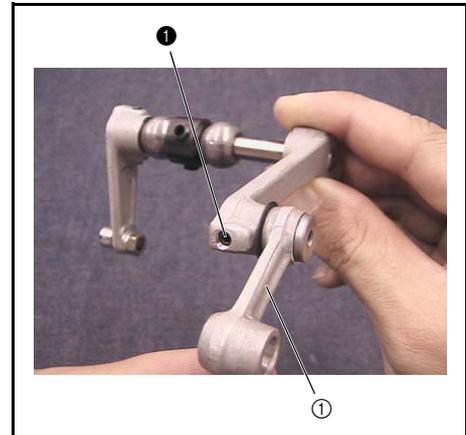
## 12 Pressure foot driving shaft assembly removal

1. Remove the 2 screws ❶, and then remove the 2 bushing pressers.
2. Remove the pressure foot driving shaft assembly ❶.
3. Remove the 2 felts ❷ from the metal collar on the arm bed.



## 13 Presser foot driving shaft disassembly

1. Remove the screw ❶, and then remove the presser foot lever shaft, presser foot connecting rod ❶, and thrust washer from the presser foot differential lever.

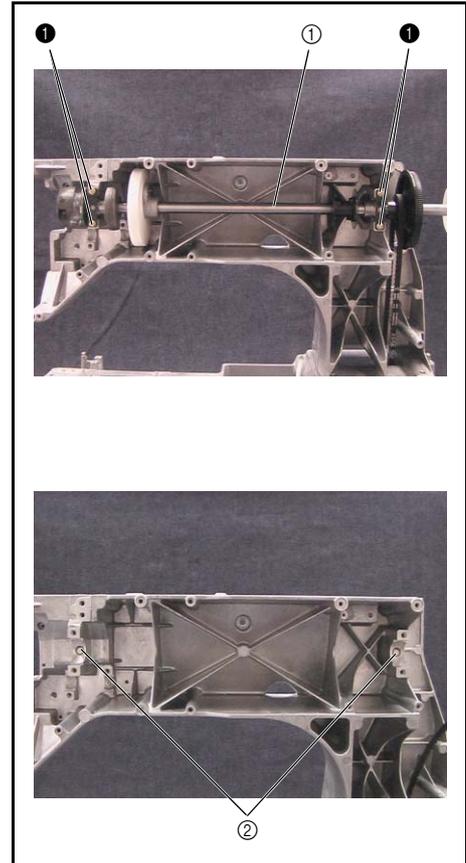


## 14 Upper shaft assembly removal

1. Remove the 4 screws ❶, and then remove the 2 metal pressers.
2. Remove the upper shaft final assembly ❶.

### \*Key point

- Be careful not to damage the encoder.
3. Remove the 2 felts ❷ from the metal collar on the arm bed.
  4. Remove the pulley from the upper shaft final assembly.



## 15 Upper shaft disassembly

1. Remove the screw ❶ from the thread take-up cam ❶.
2. Remove the screw ❷, and then remove the thread take-up cam ❶.

❷ Flat-blade screwdriver

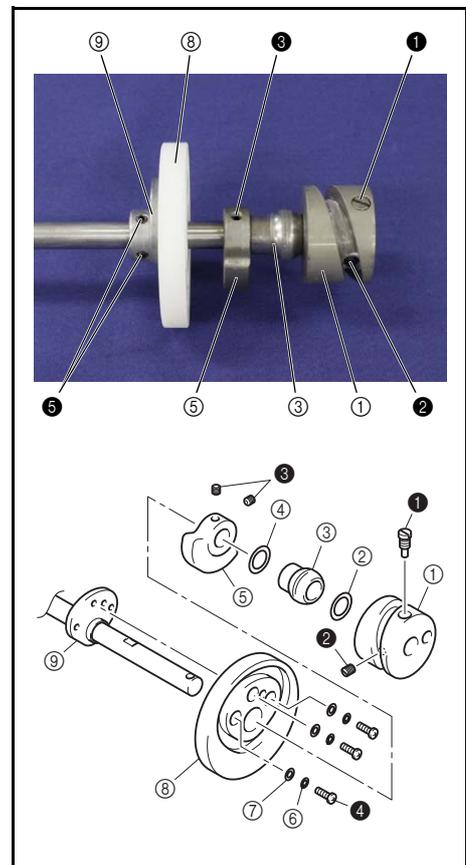
3. Remove the washer, thrust ❷, the upper shaft metal ❸ and the washer, thrust ❹.
4. Remove the 2 screws ❸, and then remove the balancer ❺.

❸ Hex wrench 2.0 mm

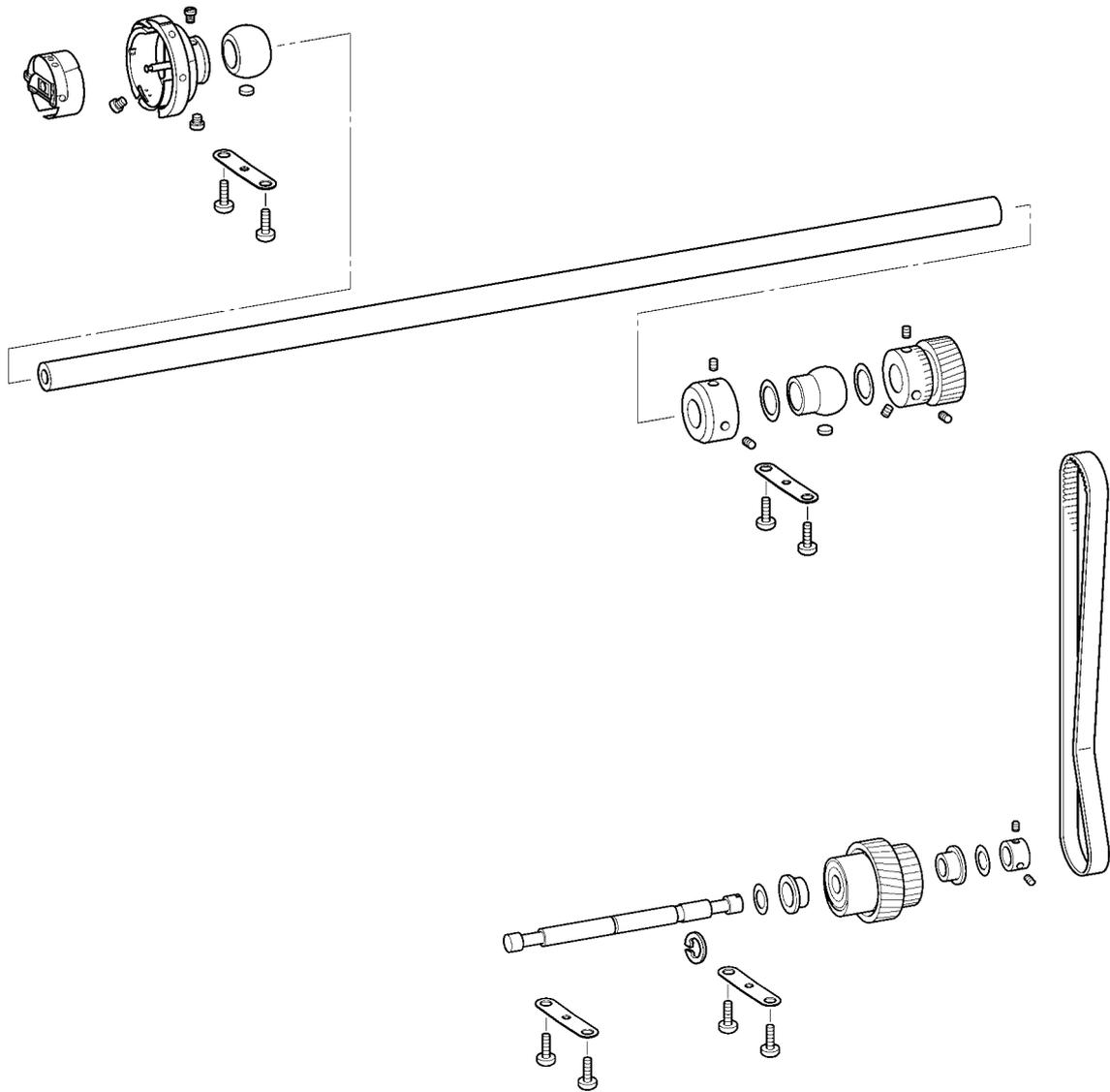
5. Remove the 3 screws ❹, and then remove the 3 spring washers ❻ and the 3 washer plains S4 ❼, and then remove the presser foot cam ❸ from the presser foot cam collar ❾.

### CAUTION:

**DO NOT** remove the screw ❺ of the presser foot cam collar ❾.  
If remove the screw ❺, need the adjustment to the position of the presser foot cam ❸.



Lower shaft unit

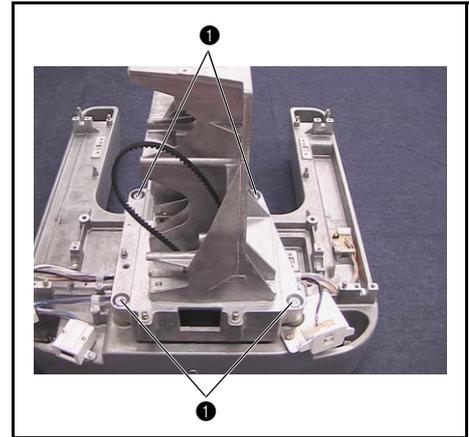


## 1 Arm bed and base frame disconnection

1. Mark the position where the arm bed is attached to the base frame. Mark the position on the base frame.

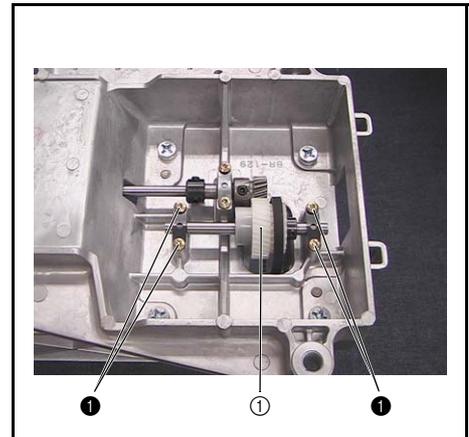
### \*Key point

- Marking prevents miss-location during re-assembly.
2. Remove the 4 screws ❶ and the 4 plain washers (M8), and then remove the arm bed from the base frame.



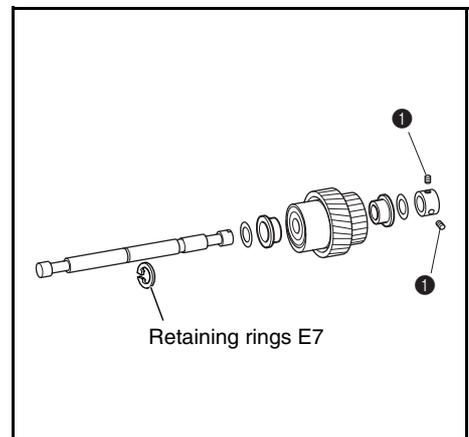
## 2 Idle pulley assembly removal

1. Remove the 4 screws ❶, and then remove the 2 bushing pressers.
2. Remove the idle pulley assembly ❶.



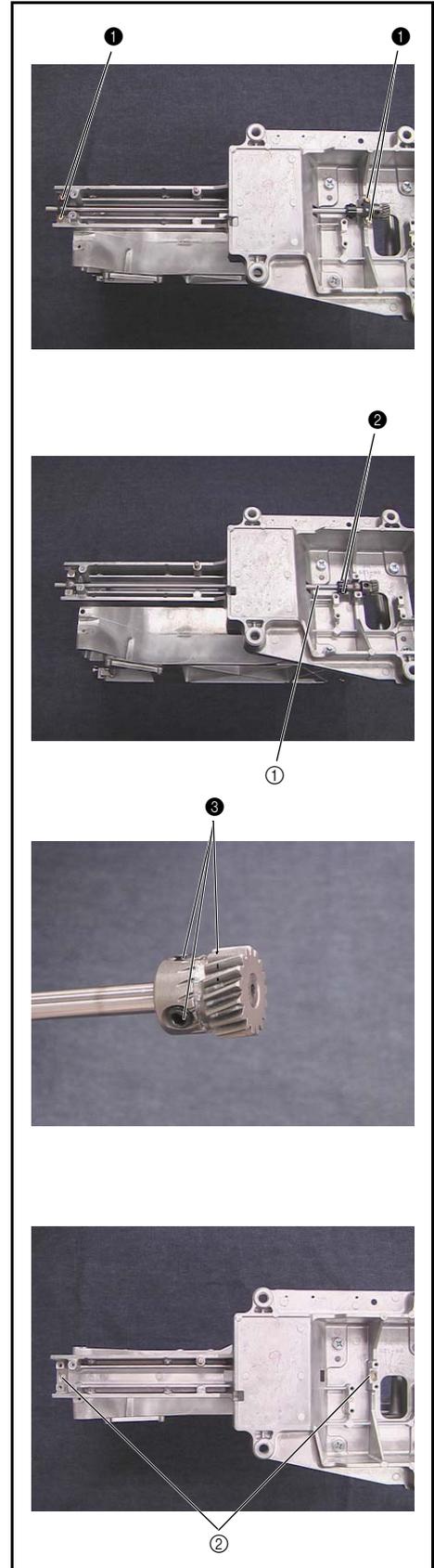
## 3 Idle pulley disassembly

1. Remove the 2 screws ❶, and then remove the set screw collar, thrust washer, idle pulley, and second thrust washer.
2. Remove the retaining ring E7 from the idle pulley shaft.
3. Remove the 2 ball bearings from the idle pulley.

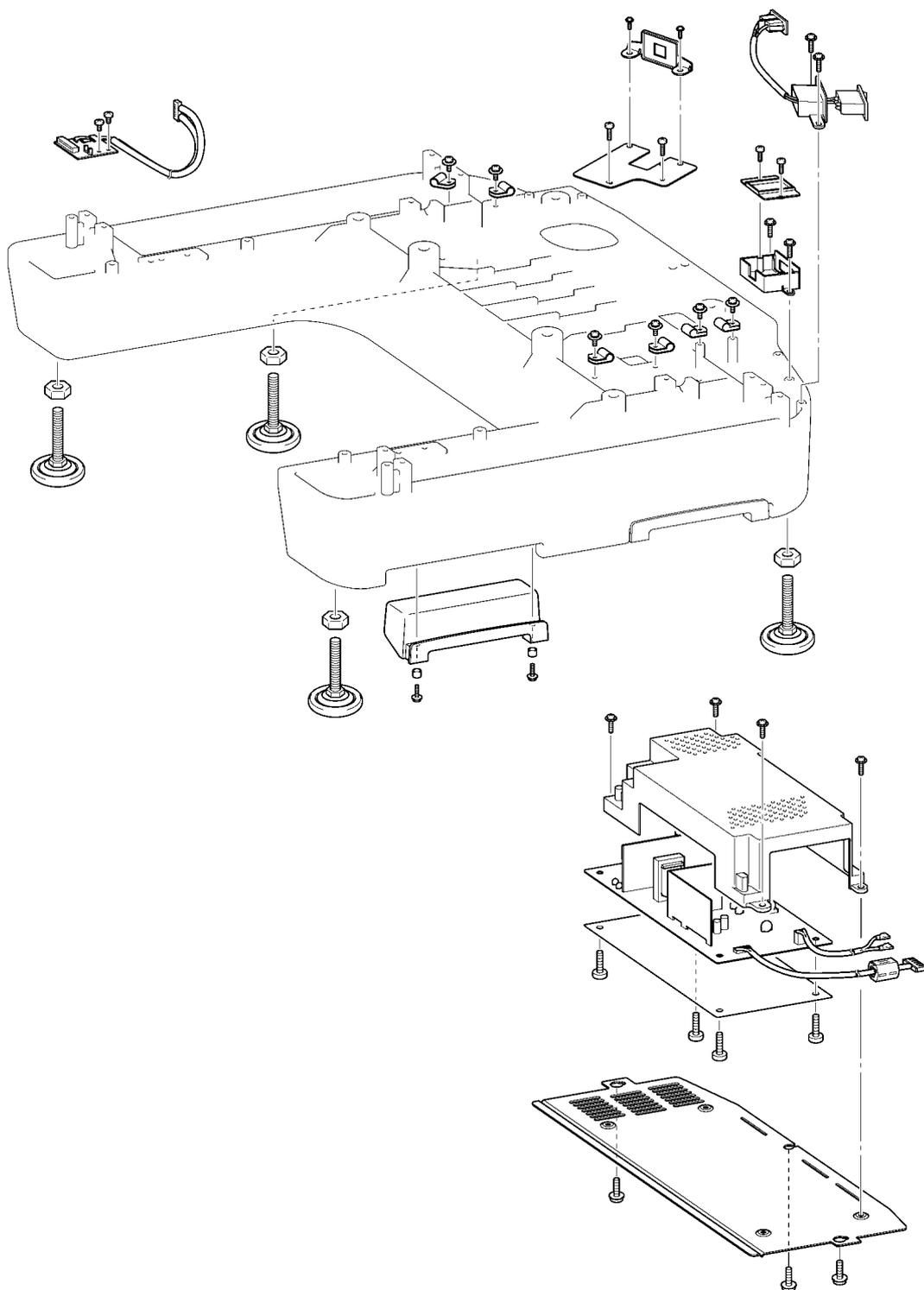


#### 4 Lower shaft removal

1. Remove the 4 screws ①, and then remove the 2 bushing pressers.
2. Remove the 2 collar screws ②, and then remove the lower shaft ①, lower shaft metal F, set collar, thrust wafer 7.24, lower shaft metal R, and second thrust wafer 7.24.
3. Remove the 3 screws ③, and then remove the lower shaft gear from the lower shaft.
4. Remove the 2 felts ② from the metal collar on the arm bed.

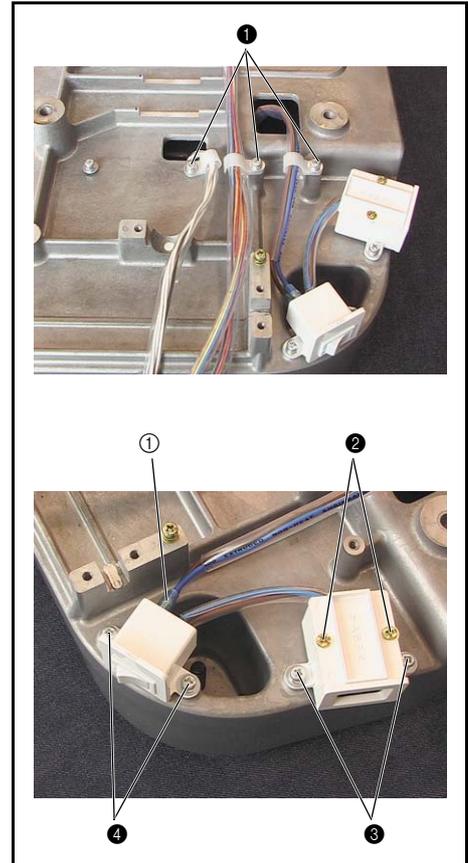


Power unit



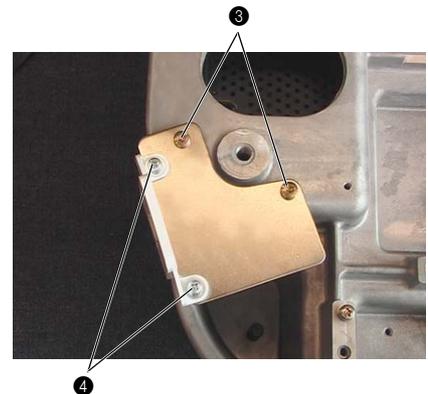
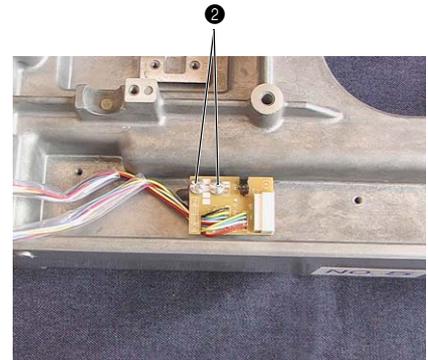
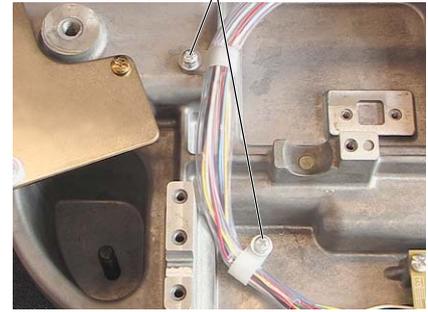
## 1 Power switch assembly and inlet removal

1. Remove the 3 screws ① and the 3 cord clamps (NK-6N), and then remove the power PCB assembly's lead wire, USB lead wire assembly, Y-area sensor assembly's lead wire, and power unit lead wire assembly from the base frame.
2. Remove the 2 screws ② and remove the inlet cover lid, and then remove the rocker switch on the power switch assembly from the inlet cover.
3. Remove the 2 screws ③, and then remove the inlet cover.
4. Remove the 2 screws ④, and then remove the power switch assembly.
5. Remove the 2 power lead wire assemblies ① from the power switch assembly.



## 2 USB PCB assembly and Y-area sensor assembly removal

1. Remove the 2 screws ❶ and the 2 cord clamps (NK-6N), and then remove the Y-area sensor's lead wire from the base frame.
2. Remove the 2 screws ❷, and then remove the Y-area sensor assembly.
3. Remove the 2 screws ❸, and then remove the USB PCB holder assembly.
4. Remove the 2 screws ❹, and then remove the USB PCB cover from the USB PCB holder assembly.



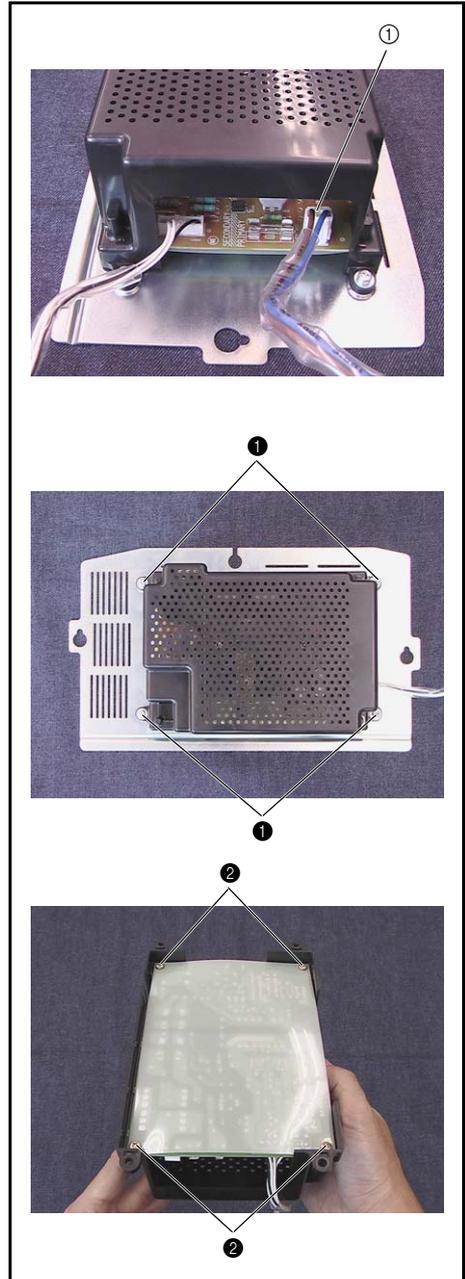
## 3 Power PCB assembly removal

1. Remove the 3 screws ❶, and then remove the PCB holder final assembly.



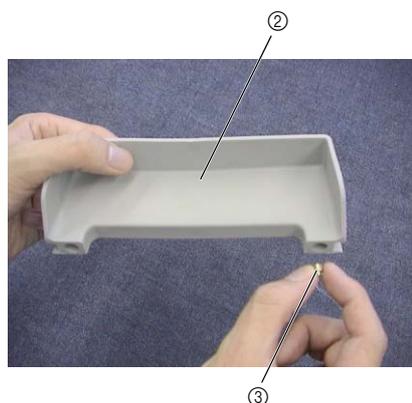
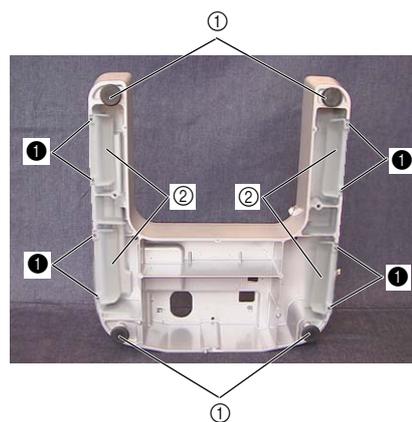
#### 4 Power PCB disassembly

1. Disconnect the power lead wire assembly ① from the power PCB assembly 100 (or 200).
2. Remove the 4 screws ①, and then remove the power unit cover assembly from the power unit stay.
3. Remove the 4 screws ②, and then remove the insulation sheet and the power PCB assembly from the power unit cover assembly.

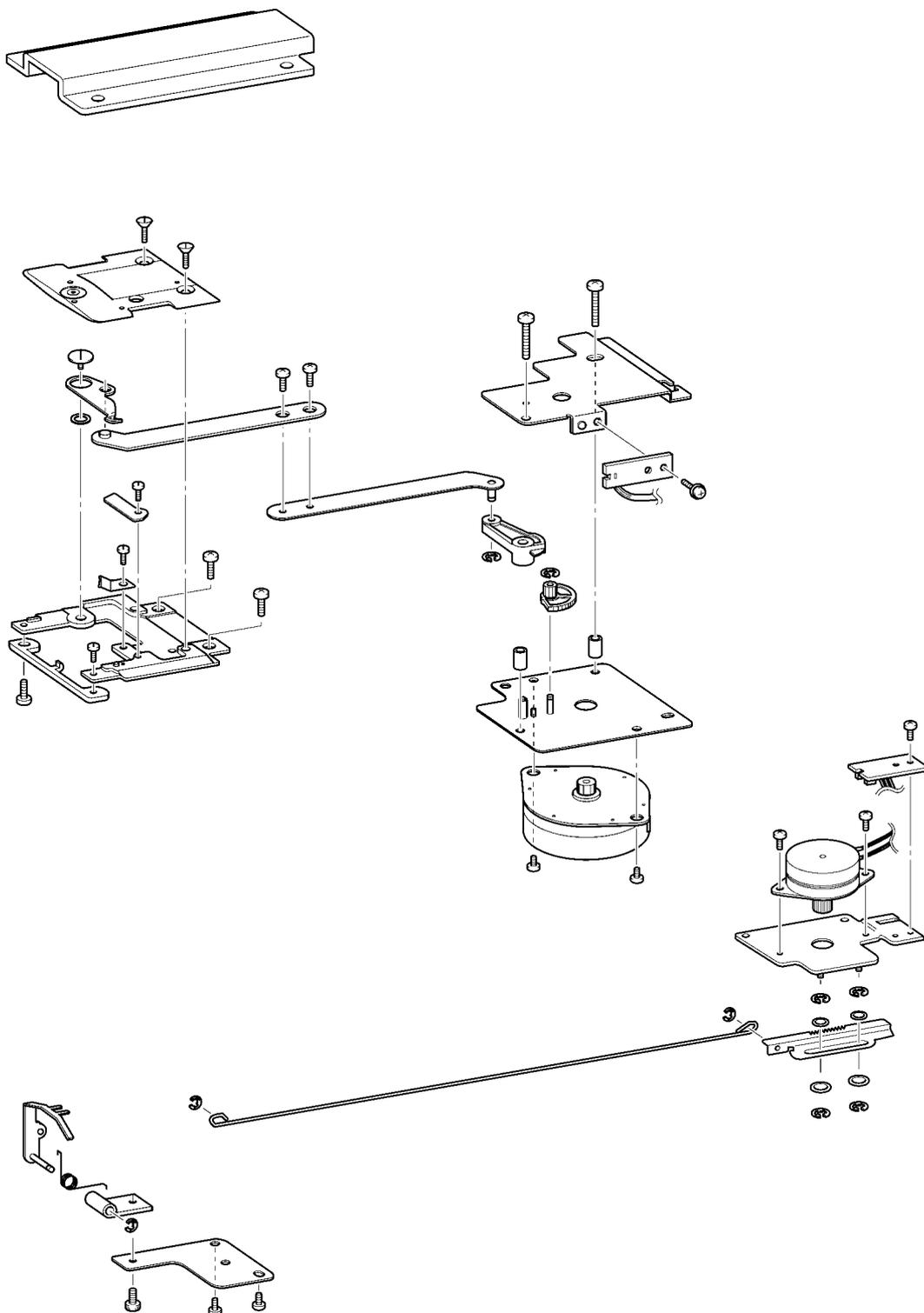


## 5 Adjust-bolt removal

1. Remove the 4 adjust-bolt assemblies ① from the base frame.
2. Remove the 4 nuts (2, M8) from the 4 adjust-bolt assemblies.
3. Remove the 2 screws ❶, and then remove the handle ②. (4 locations)
4. Remove the 2 bushes ③ from the handle ②. (4 locations)

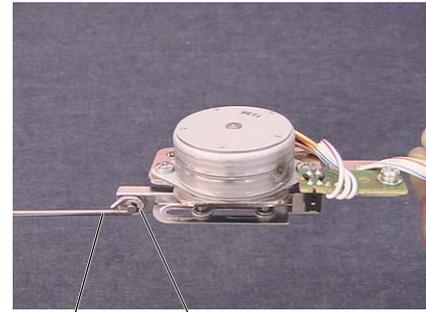


Thread cut unit

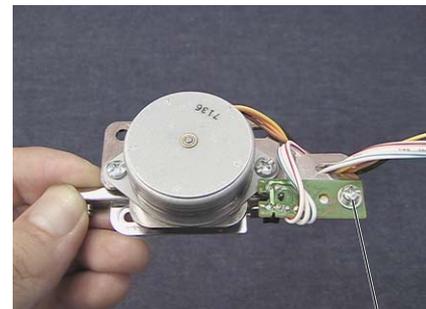


## 1 Picker disassembly

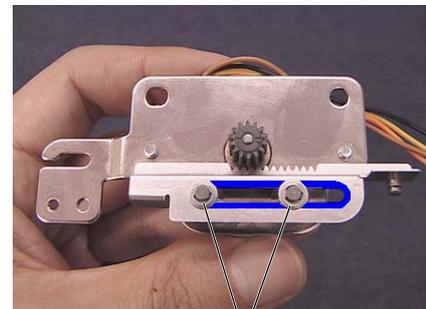
1. Remove the retaining ring E2, and then remove the washer and the picker link ①.
2. Remove the screw ①, and then remove the picker sensor assembly.
3. Remove the 2 retaining rings E2, 2 plain washers S3, rack assembly, and 2 plain washers S3.
4. Remove the 2 retaining rings E2.
5. Remove the 2 screws ②, and then remove the picker motor assembly.



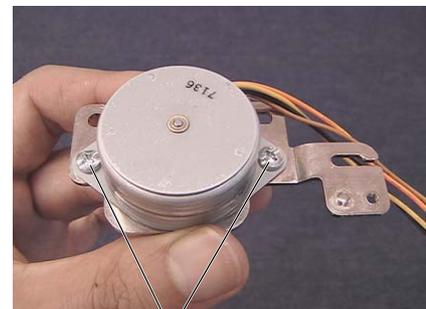
① Retaining ring E2



①



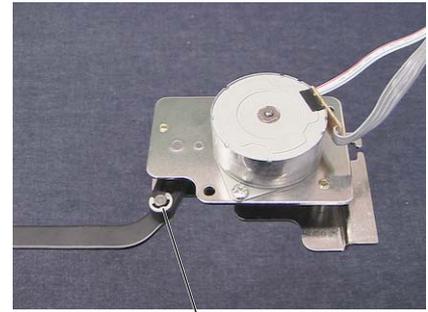
Retaining ring E2



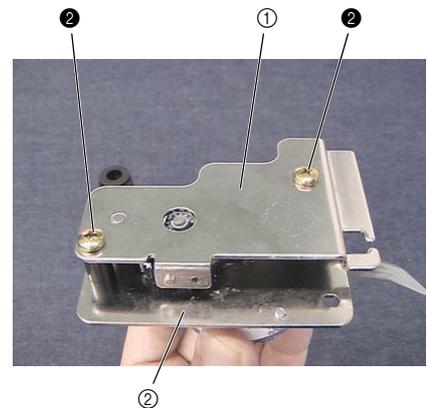
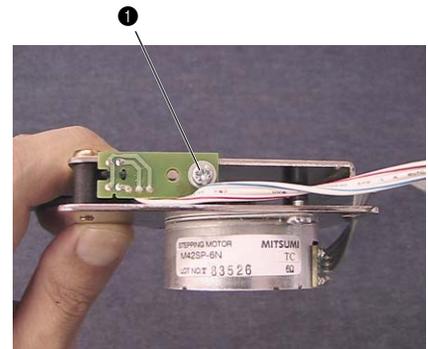
②

## 2 Cutter unit disassembly (Step 1)

1. Remove the retaining ring E2, and then remove the lever link assembly.
2. Remove the screw ①, and then remove the thread cutter sensor assembly (white).
3. Remove the 2 screws ②, separate the cutter bracket ① from the CT motor bracket assembly ②, and then remove the 2 collars.

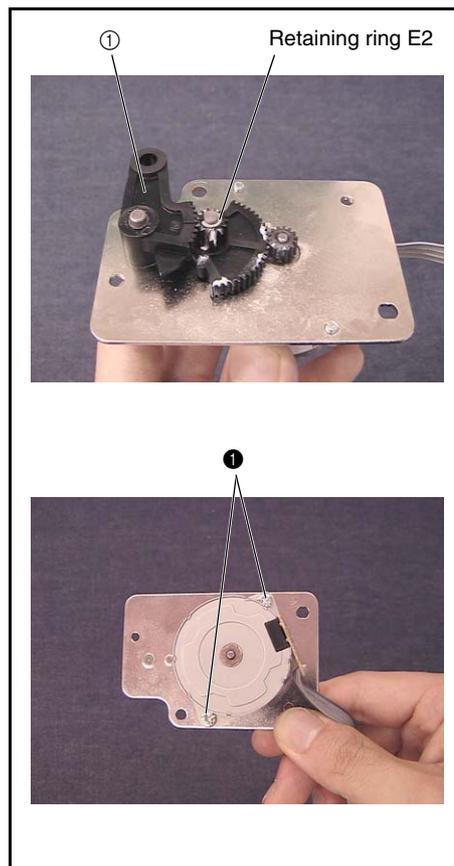


Retaining ring E2

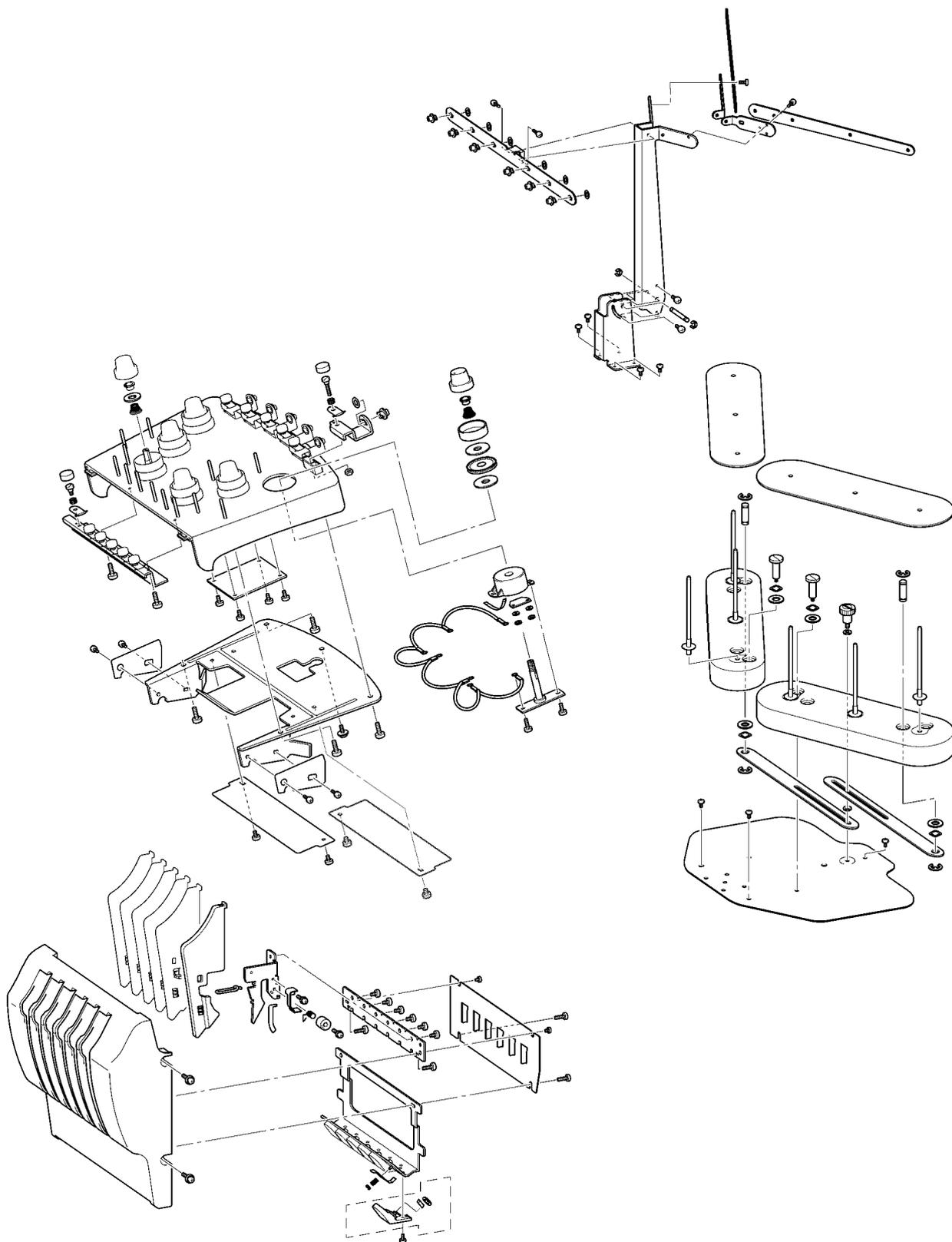


**3** Cutter unit disassembly (Step 2)

1. Remove the lever gear ①.
2. Remove the retaining ring E2, and then remove the initial gear.
3. Remove the 2 screws ❶, and then remove the thread cutter motor assembly.



Thread tension unit

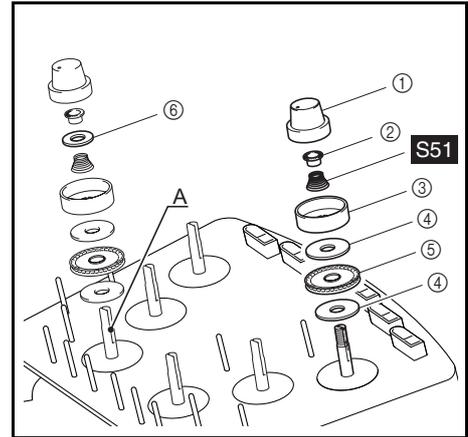


## 1 Loosen the tension nut removal

1. Loosen the tension nut ①, and then remove the washer ②, spring **S51**, tension disc presser ③, tension disc felt ④, rotary disc assembly ⑤, and second tension disc felt ④. (6 locations)

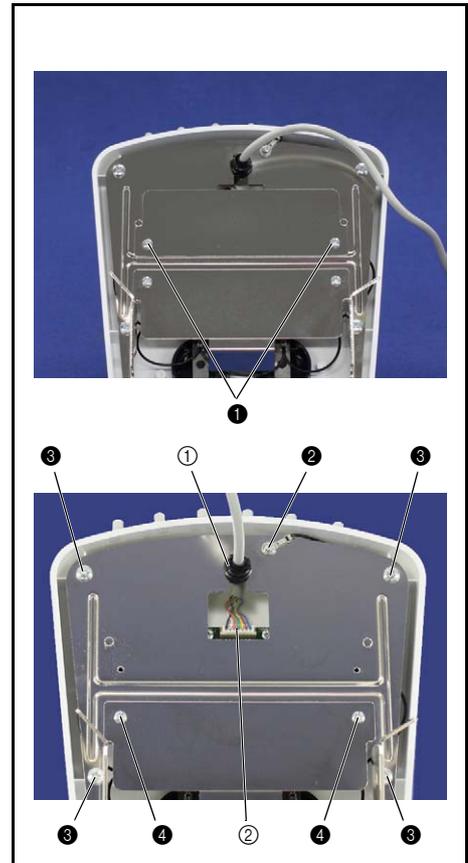
### NOTE

- The thread tension washer ⑥ is inserted between the washer ② and the spring **S51** only for thread tension A.



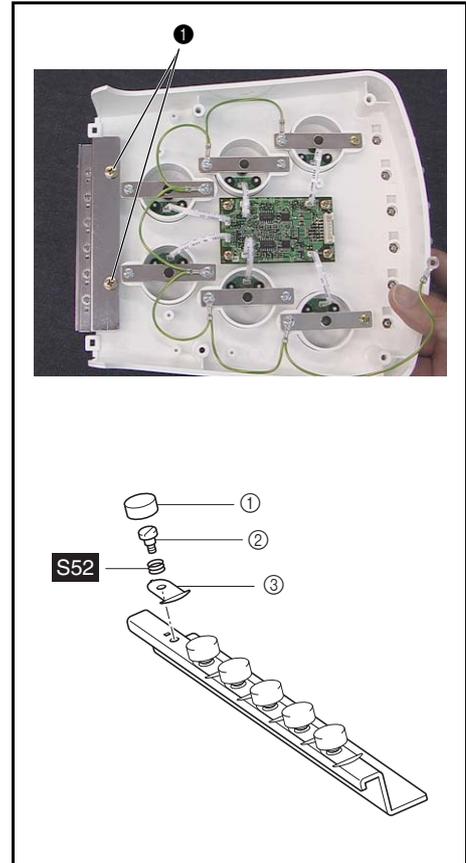
## 2 Tension base bracket removal

1. Remove the 2 screws ①, and then remove the bracket cover from the tension base bracket.
2. Remove the cord bush (KR51) ① from the tension base bracket, and then remove the tension base lead wire assembly ② from the head PCB assembly on the tension base.
3. Remove the screw ②, and then remove the head grounding wire.
4. Remove the 4 screws ③, and then remove the tension base bracket.
5. Remove the 2 screws ④, and then remove the bracket cover from the tension base bracket.



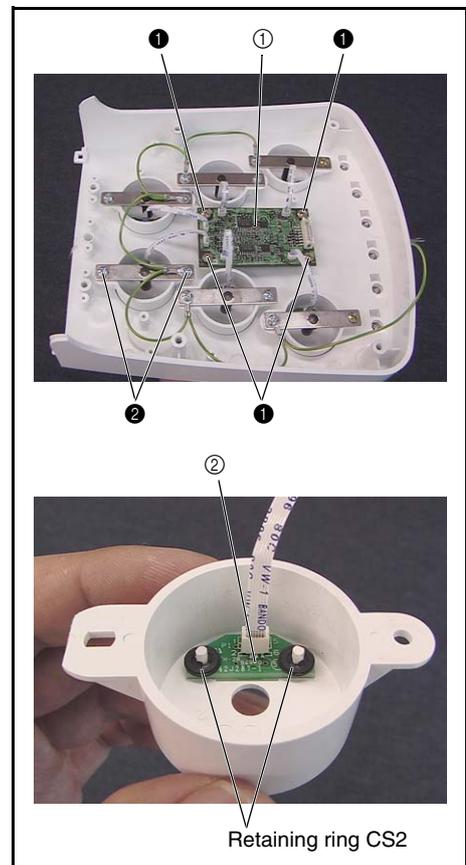
### 3 Inner thread eyelet base removal

1. Remove the 2 screws ❶, and then remove the inner thread eyelet base assembly from the tension base assembly.
2. Remove the tension axis cap ❷. (6 locations)
3. Loosen the thread guide tension axis ❸, and then remove the spring S52 and the thread guide tension plate ❹. (6 locations)



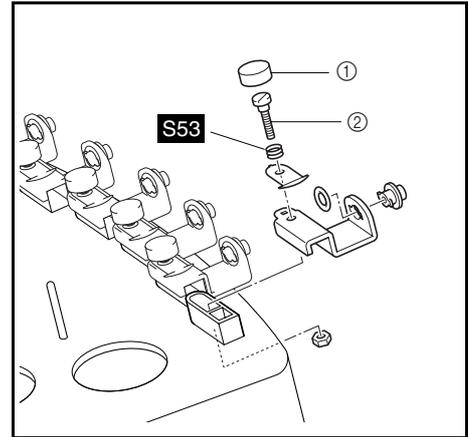
### 4 Thread sensor PCB assembly and head PCB assembly removal

1. Disconnect the FFC (SML2CD-H) from the head PCB assembly ❶. (6 locations)
2. Remove the 4 screws ❶, and then remove the head PCB assembly.
3. Remove the 2 screws ❷, and then remove the thread tension bracket, thread quantity sensor cover, and head grounding wire assembly. (6 locations)
4. Remove the 2 retaining rings CS2, and then remove the 2 rubber washers and the thread sensor assembly ❷ from the thread quantity sensor cover. (6 locations).
5. Remove the FFC (SML2CD-H) from the thread sensor assembly.



## 5 Upper thread eyelet base removal

1. Remove the tension axis cap ①. (6 locations)
2. Loosen the thread guide tension screw ②, and remove the nut (2, M3). Then remove the thread guide tension plate, spring **S53**, and upper thread eyelet base. (6 locations)



## 6 Antenna assembly removal

1. Remove the 4 screws ①, and then remove the antenna assembly from the thread stand base assembly.

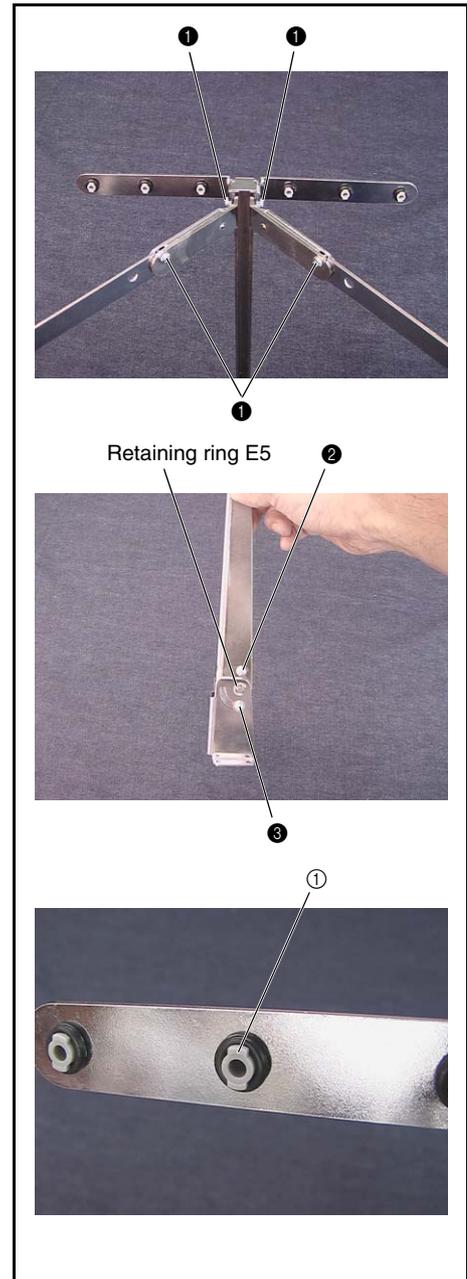


## 7 Antenna disassembly

1. Remove the 4 screws ①, and then remove the 2 antennas A, 2 antennas B, and antenna E assembly from the antenna C assembly.
2. Remove the screws ②③ from the antenna C assembly.
3. Remove the retaining ring E5, separate the antenna C assembly from the antenna D, and then remove the antenna shaft.
4. Remove the retaining ring E5 from the antenna shaft.
5. Remove the 6 O-rings (P5) from the tip of the 6 pipe bushes A ① attached to the antenna E assembly, and then remove the 6 pipe bushes from the antenna E assembly.

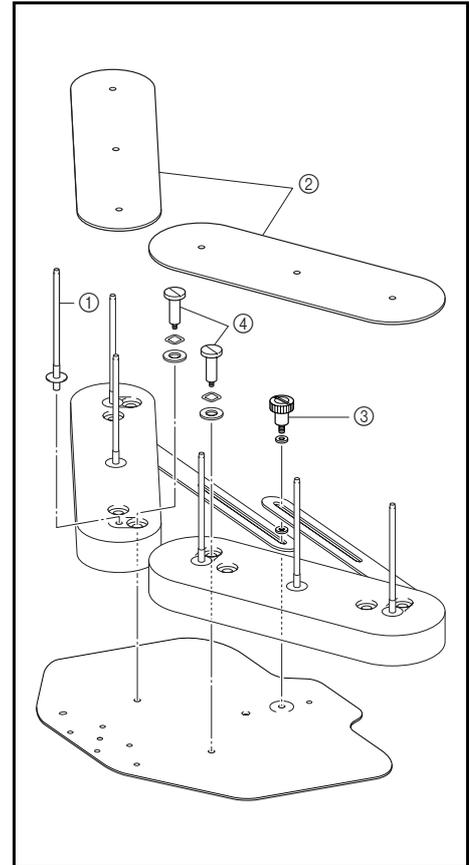
**\*Key point**

- Turn the pipe bush 90 degrees to remove it.

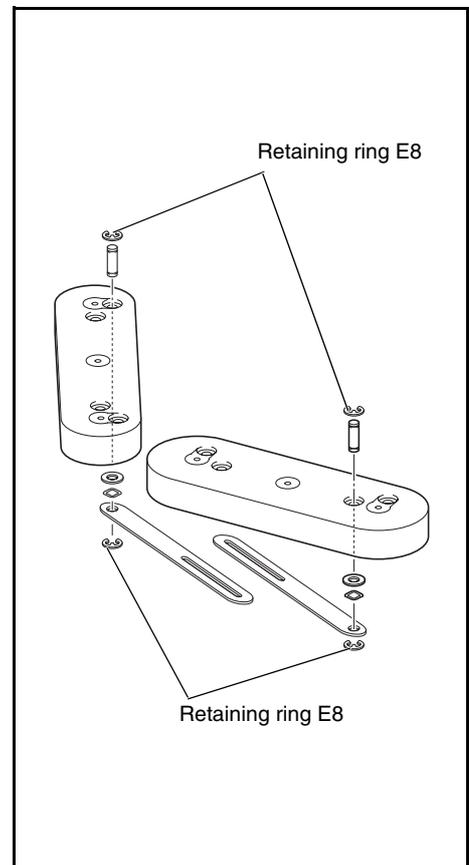


**8** Spool stand frame disassembly (Step 1)

1. Remove the 6 spool pins ① and the 2 sponges ② from the spool frame stand R and spool frame stand L.
2. Remove the thumb bolt (M4L) ③ and the 2 washers, and then disconnect the spool stand link R from the spool link L.
3. Remove the 2 stud screws ④, 2 spring washers, and 2 plain washers (S10), and then remove the spool stand frame L and spool stand frame R from the spool stand base.

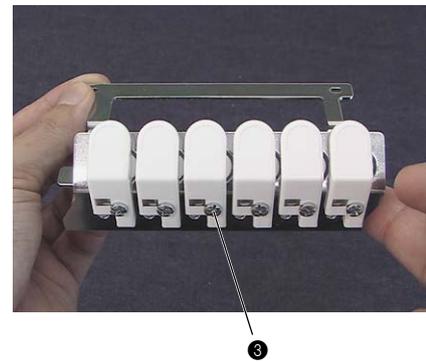
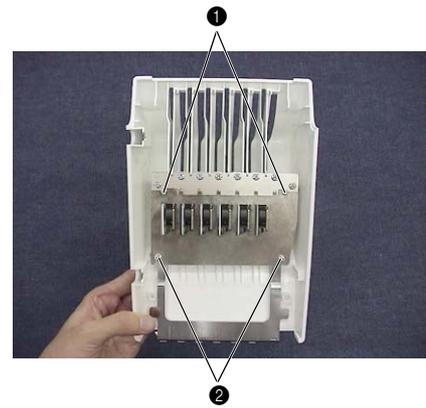
**9** Spool stand frame disassembly (Step 2)

1. Remove the retaining ring E8, and then remove the spool stand link, spring washer, plain washer (S10), and spool stand stud from the spool stand frame L assembly.
2. Remove the retaining ring E8, and then remove the spool stand link, spring washer, plain washer (S10), and spool stand stud from the spool stand frame R assembly.
3. Remove the retaining ring E8 from the spool stand stud. (2 sets)



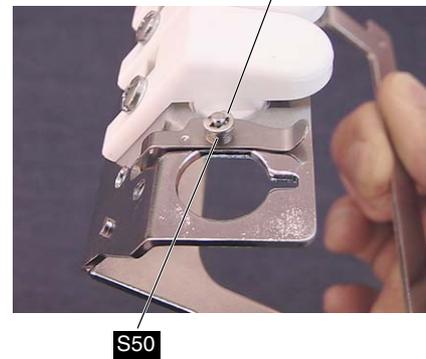
**10** Thread take-up lever cover disassembly (Step 1)

1. Remove the 4 screws (① ②, 2 each), and then remove the thread holder base assembly and the thread guide back cover.
2. Remove the screw ③, and then remove the cutter cover assembly from the thread holder base assembly. (6 locations)
3. Remove the retaining ring CS5 from the cutter cover assembly, and then remove the 6 NT lower thread cutters.
4. Remove the 6 retaining rings E1.5, and then remove the 6 needle thread presser plates and the 6 springs S50 from the thread holder base.



Retaining ring CS5

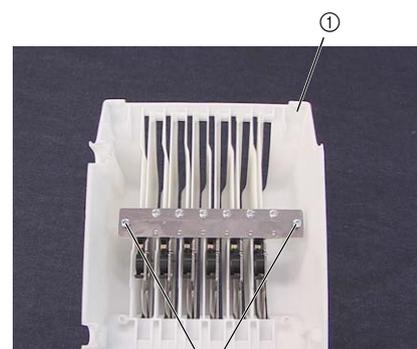
Retaining ring E1.5



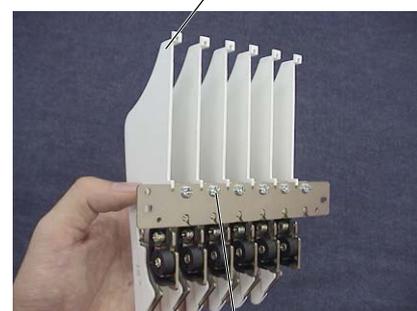
S50

**11** Thread take-up lever cover disassembly (Step 2)

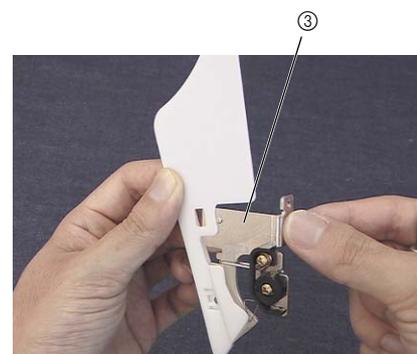
1. Remove the 2 screws ①, and then remove the thread tension bracket base.
2. Remove the 6 screws ②, and then remove the thread tension bracket base.
3. Remove the 6 thread guide cover assemblies ② from the thread take-up lever cover ①.
4. Remove the thread take-up bracket assembly ③ from the thread guide cover assembly. (6 sets)



①



②

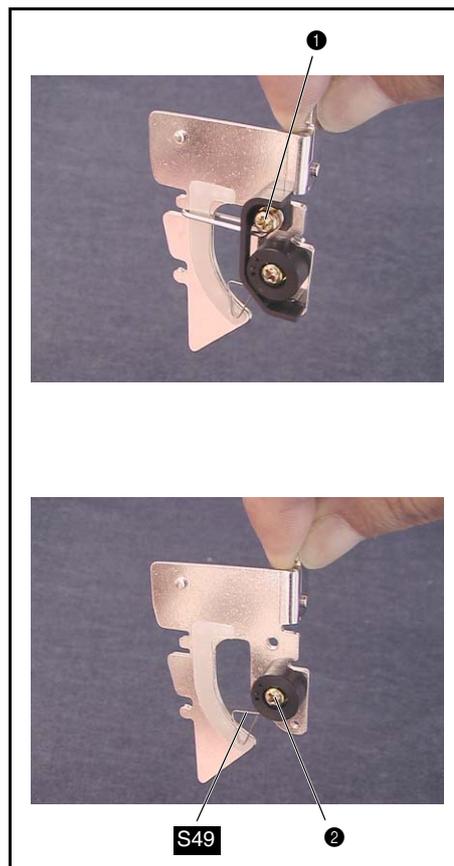


③

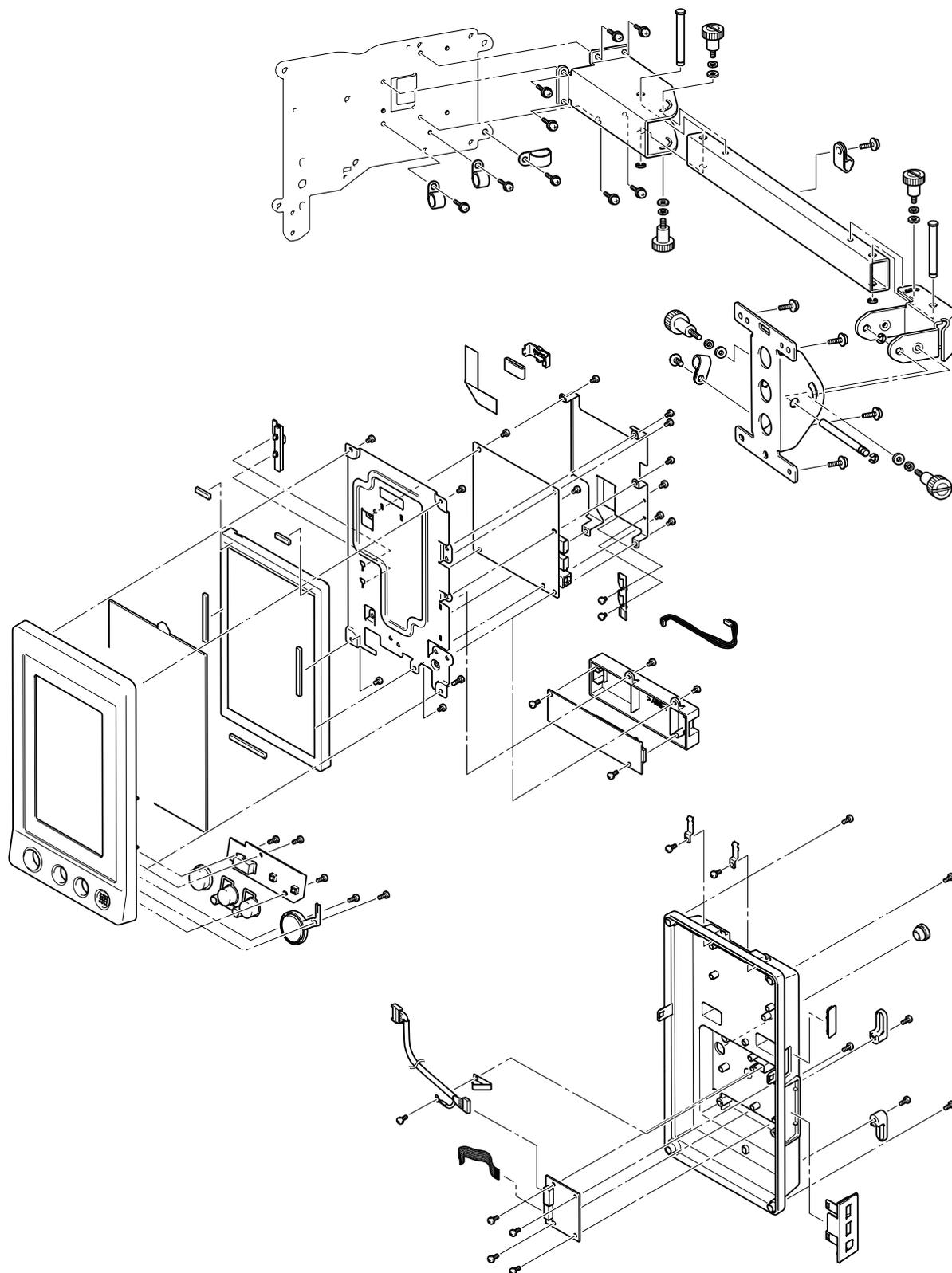
## 12 Thread take-up bracket disassembly

### \*Key point

- Disassemble the six thread take-up bracket assemblies.
1. Remove the screw ①, and then remove the thread guide wire and the thread guard.
  2. Remove the screw ②, and then remove the thread catching spring case assembly.
  3. Remove the spring S49 from the thread catching spring case.

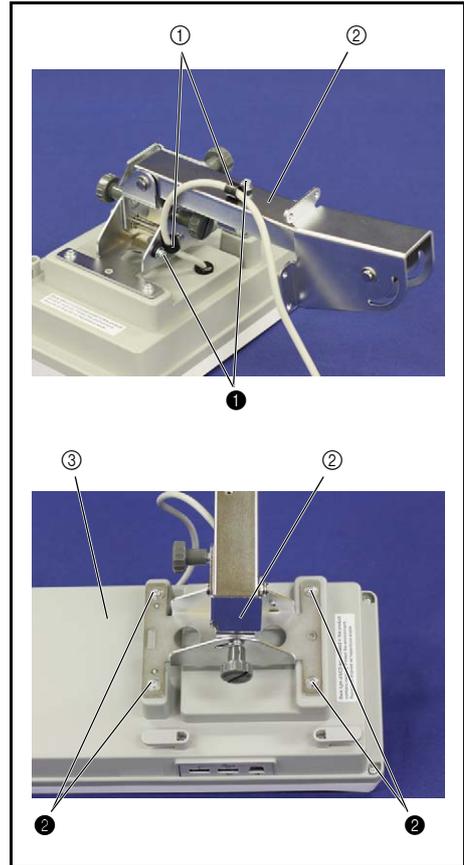


Operation panel



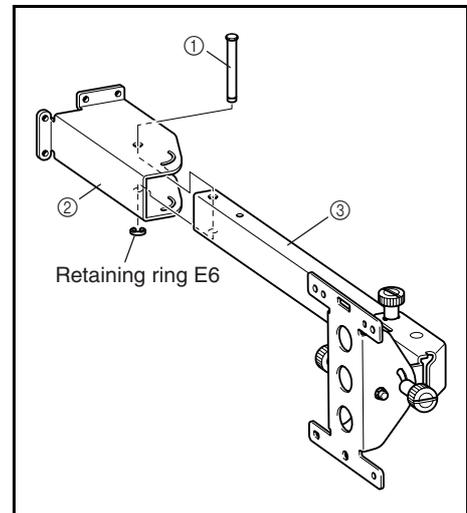
## 1 Operation panel lever assembly removal

1. Remove the 2 screws ①, and then remove the 2 cord clamps ① from the operation panel lever assembly ②.
2. Remove the 4 screws ②, and then remove the operation panel lever assembly ② from the panel rear cover ③.



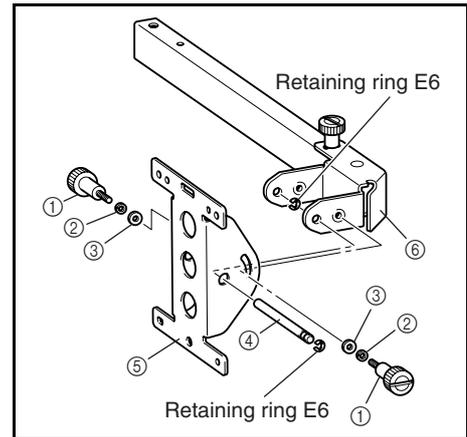
## 2 Operation panel lever C removal

1. Remove the retaining ring E6, and then remove the operation panel lever shaft ① and the operation panel lever C ② from the operation panel lever B ③.



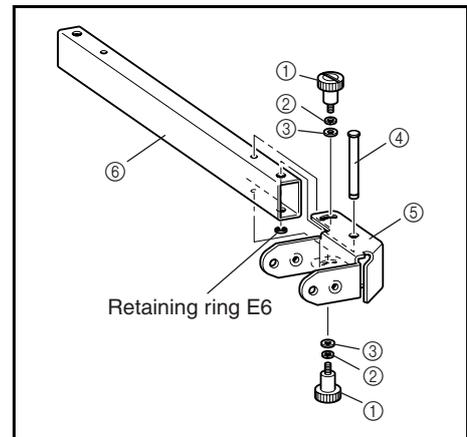
### 3 Panel holder removal

1. Remove the 2 thumb bolts (M4L) ①, the 2 washer springs (2-4) ② and the 2 washer plains (M4) ③.
2. Remove the 2 retaining rings E6, and then remove the operation panel holder shaft ④ and the panel holder ⑤ from the operation panel lever A ⑥.



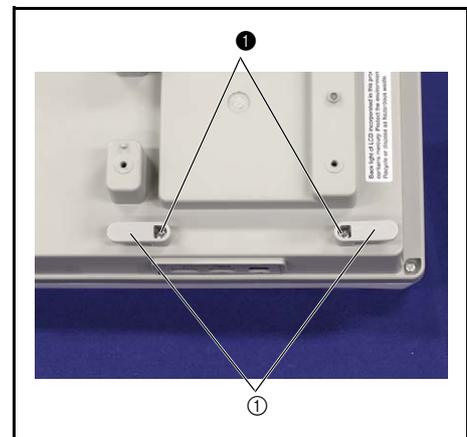
### 4 Operation panel lever A removal

1. Remove the 2 thumb bolts (M4L) ①, the 2 washer springs (2-4) ② and the 2 washer plains (M4) ③.
2. Remove the retaining ring E6, and then remove the operation panel lever shaft ④ and the operation panel lever A ⑤ from the operation panel lever B ⑥.



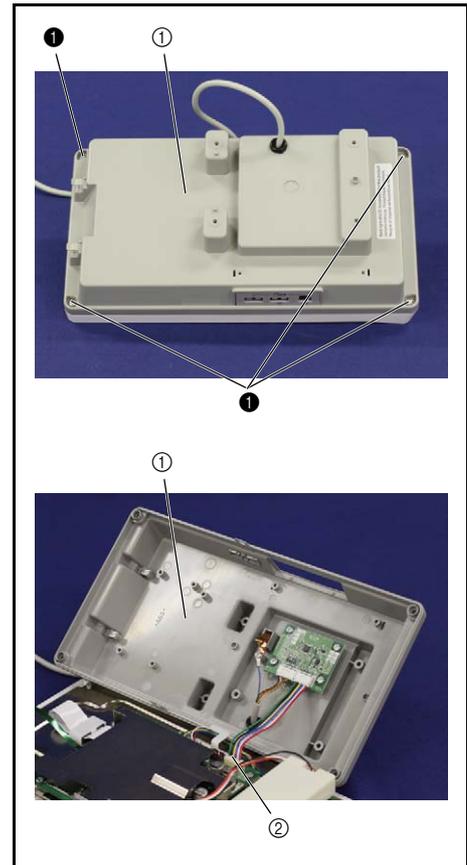
### 5 USB cord holder removal

1. Remove the 2 screws ①, and then remove the 2 USB cord holders ①.



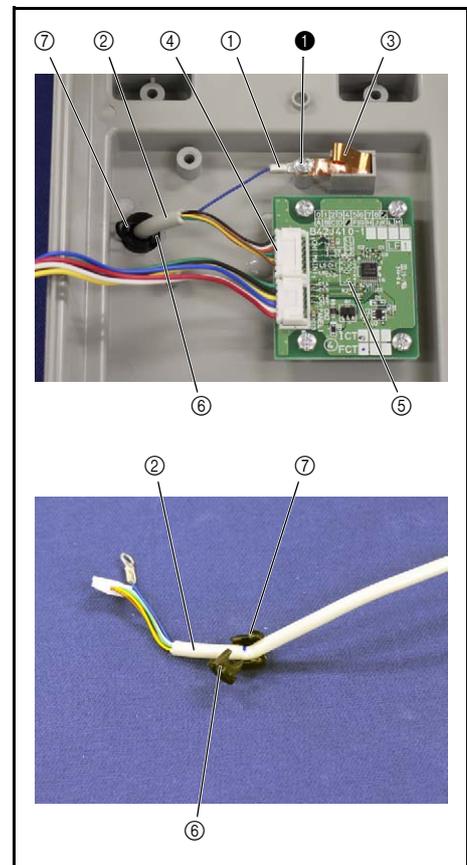
## 6 Panel rear cover removal

1. Remove the 4 screws ①.
2. Remove the panel rear cover ①, and then disconnect the connector ②.



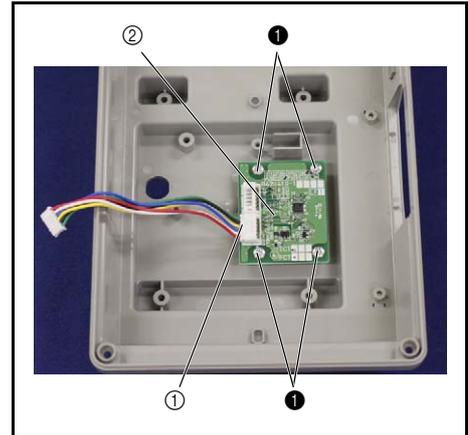
## 7 Lead wire assy panel removal

1. Remove the screw ①, and then remove the ground wire ① of the lead wire assy panel ② and the ground spring ③ from the panel rear cover.
2. Disconnect the connector ④ of the lead wire assy panel ② from the communication relay PCB assy ⑤.
3. Push the lock part ⑥ of the cord bushing ⑦, and then pull out the lead wire assy panel ② from the panel rear cover.
4. Open the lock part ⑥, and then remove the cord bushing ⑦ from the lead wire assy panel ②.



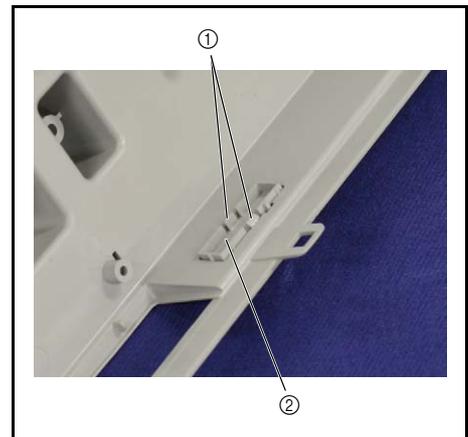
## 8 Communication relay PCB Assy removal

1. Disconnect the connector of the lead wire Assy com-panel ① from the communication relay PCB Assy ②.
2. Remove the 4 screws ①, and then remove the communication relay PCB Assy ② from the panel rear cover.



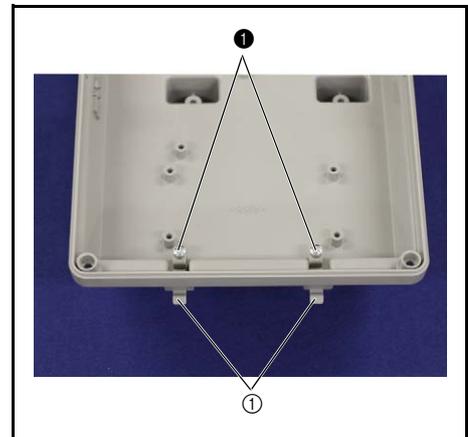
## 9 Card cover removal

1. Release the 2 hooks ①, and then remove the card cover ② from the panel rear cover.



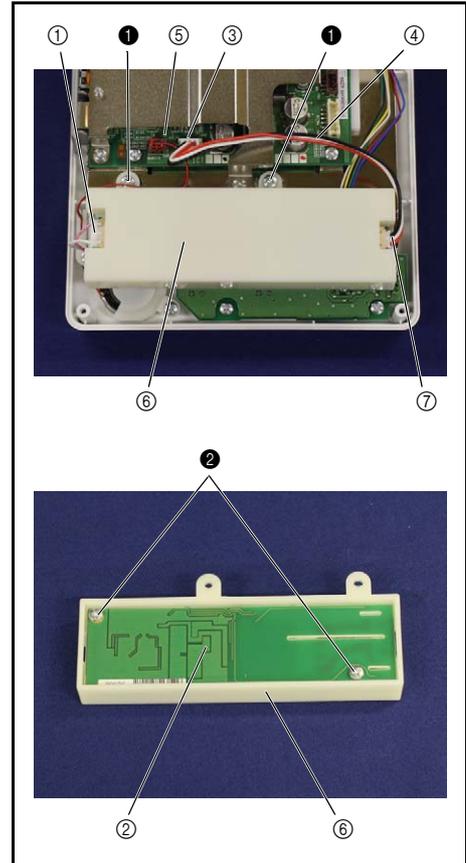
## 10 Pen holder removal

1. Remove the 2 screws ①, and then remove the 2 pen holders ① from the panel rear cover.



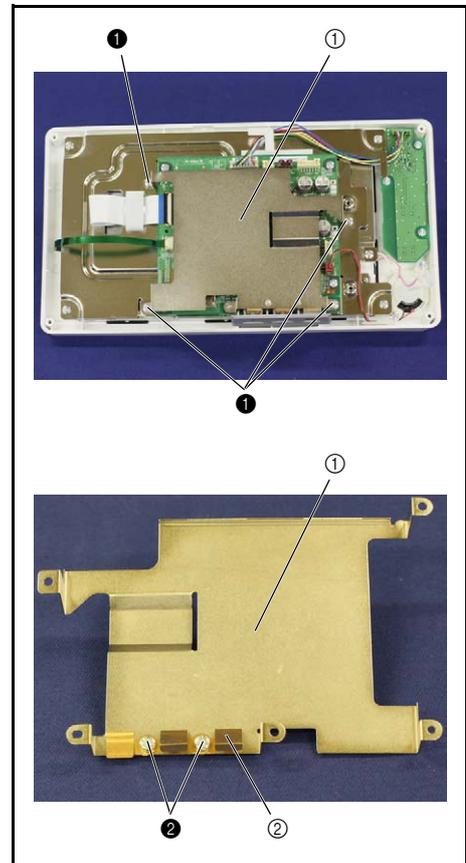
## 11 Inverter removal

1. Disconnect the connector ① from the inverter ②.
2. Disconnect the connector ③ of the lead wire assy ④ from the panel PCB supply assy ⑤.
3. Remove the 2 screws ①, and then remove the inverter cover ⑥.
4. Disconnect the connector ⑦ of the lead wire assy ④ from the inverter ②.
5. Remove the 2 screws ②, and then remove the inverter ② from the inverter cover ⑥.



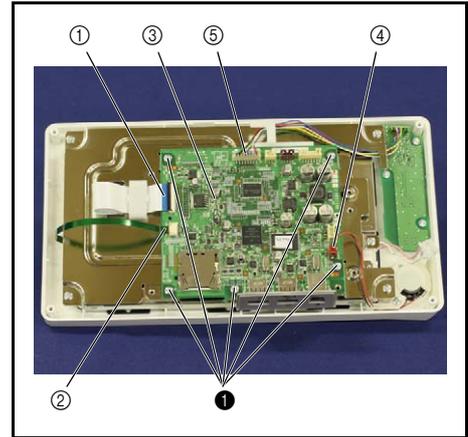
## 12 Panel PCB case removal

1. Remove the 4 screws ①, and then remove the panel PCB case ①.
2. Remove the 2 screws ②, and then remove the ground plate USB ② from the panel PCB case ①.



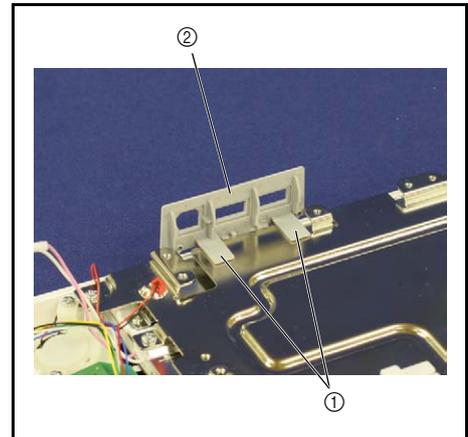
### 13 Panel PCB supply assy removal

1. Remove the FFC ① and the FFC ② from the panel PCB supply assy ③.
2. Disconnect the connector ④ and connector ⑤ from the panel PCB supply assy ③.
3. Remove the 5 screws ①, and then remove the panel PCB supply assy ③.



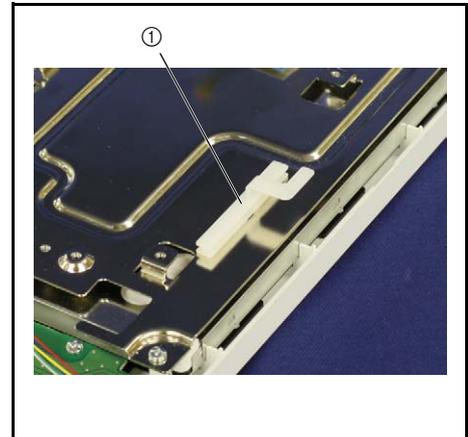
### 14 USB cover removal

1. Release the 2 hooks ①, and then remove the USB cover ② from the PCB base plate.



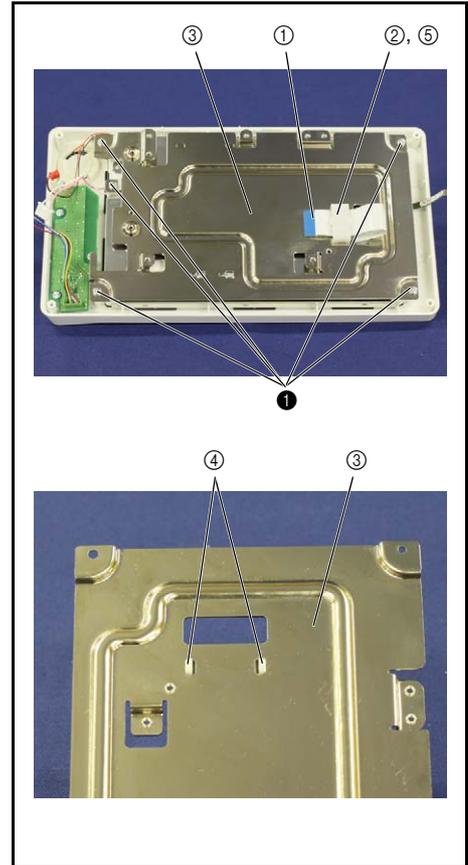
### 15 Board supporter removal

1. Push up the board supporter ①, and remove it from the PCB base plate.

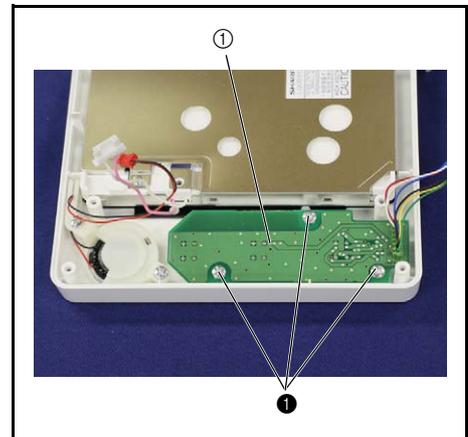


**16** PCB base plate removal

1. Pull out the FFC ① from the ferrite core ②.
2. Remove the 5 screws ❶, and then remove the PCB base plate ③.
3. Release the 2 hooks ④, and then remove the ferrite holder ⑤ and the ferrite core ② from the PCB base plate ③.

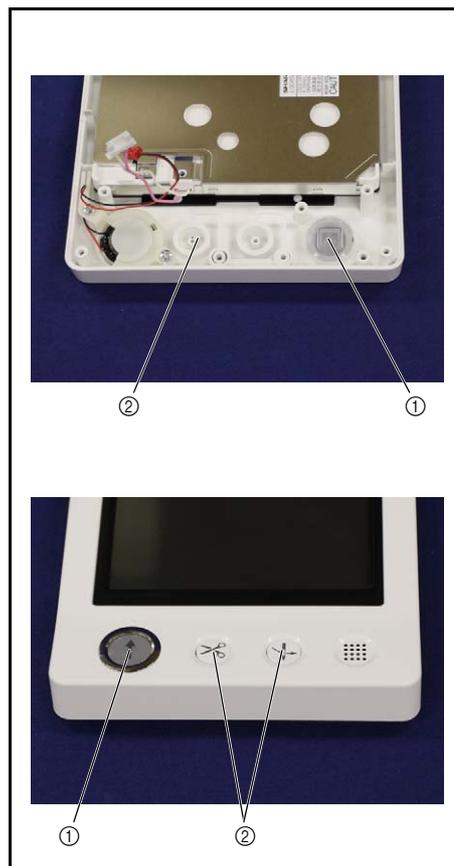
**17** SS PCB assy removal

1. Remove the 3 screws ❶, and then remove the SS PCB assy ① from the panel front cover.



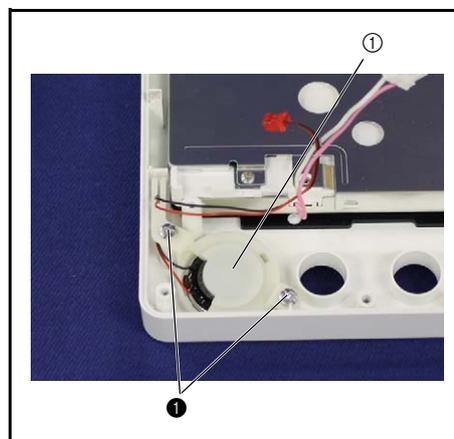
## 18 Buttons removal

1. Remove the SS button ① and the operation button ② from the panel front cover.



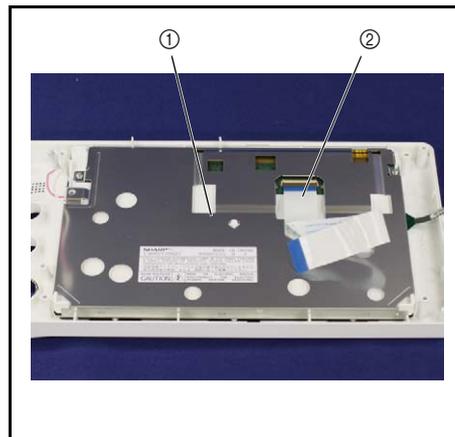
## 19 Speaker set removal

1. Remove the 2 screws ❶, and then remove the speaker set ① from the panel front cover.

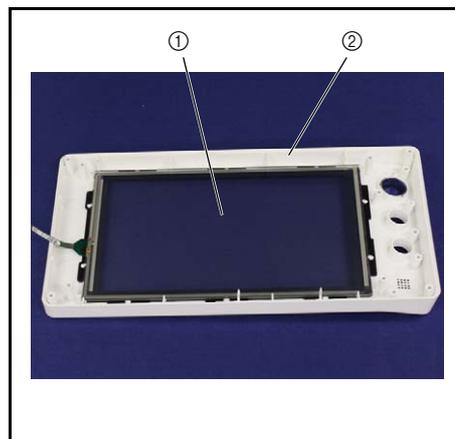


**20** LCD assy removal

1. Remove the LCD assy ① from the panel front cover.
2. Remove the flexible flat cable ② from the LCD assy ①.

**21** Touch panel assy removal

1. Remove the touch panel assy ① from the panel front cover ②.



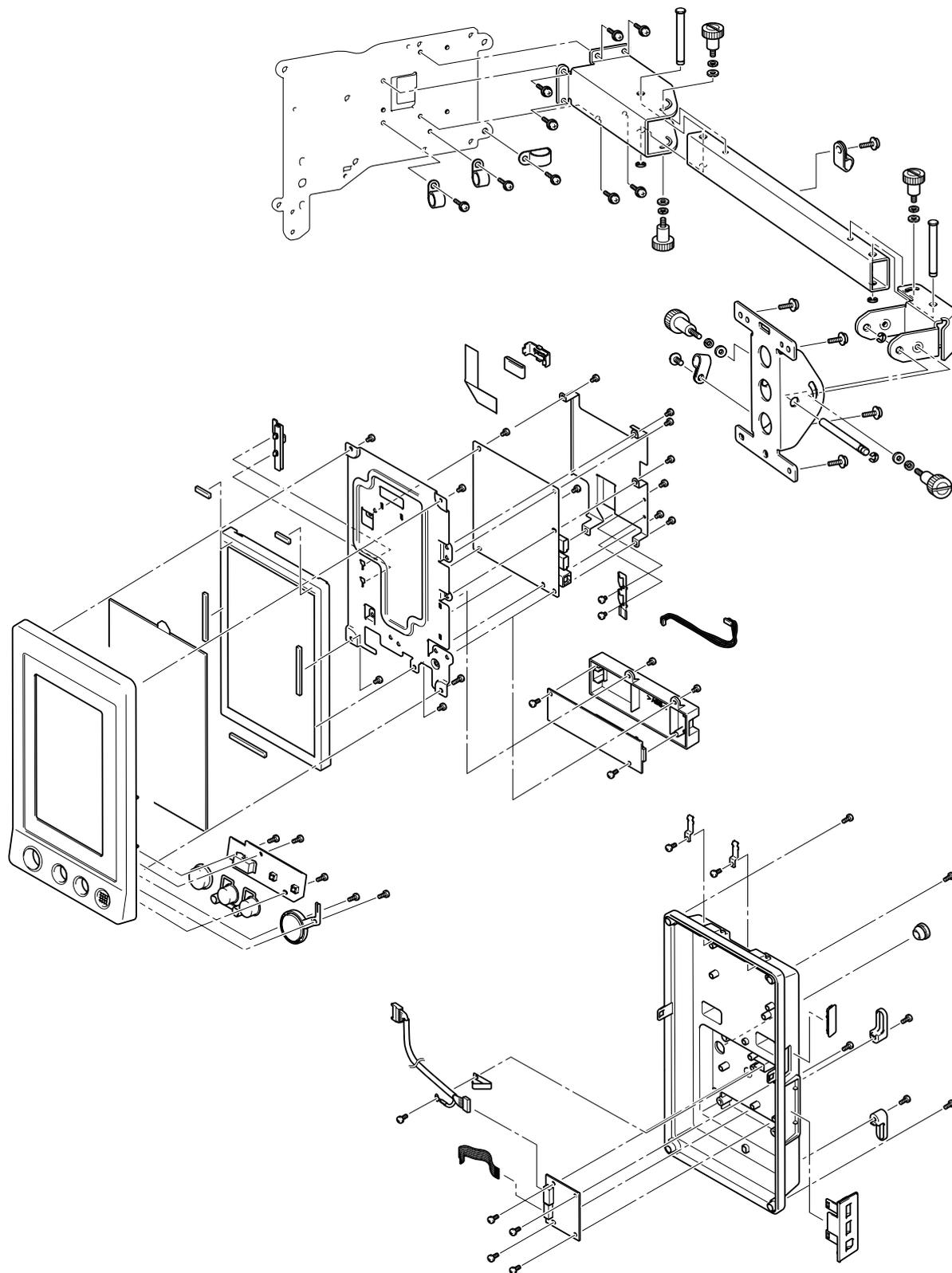


# 3 Assembly

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Main unit	Operation panel .....3 - 2
	Thread tension unit.....3 - 12
	Thread cut unit.....3 - 23
	Power unit.....3 - 27
	Lower shaft unit .....3 - 33
	Upper shaft unit .....3 - 37
	Needle bar unit .....3 - 52
	Thread wiper unit.....3 - 64
	Needle bar change unit .....3 - 69
	Needle thread unit .....3 - 74
	Feed unit.....3 - 77
	Main unit .....3 - 95

Operation panel

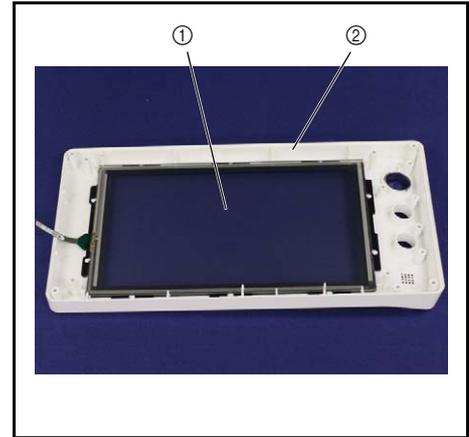


**1 Touch panel assy attachment**

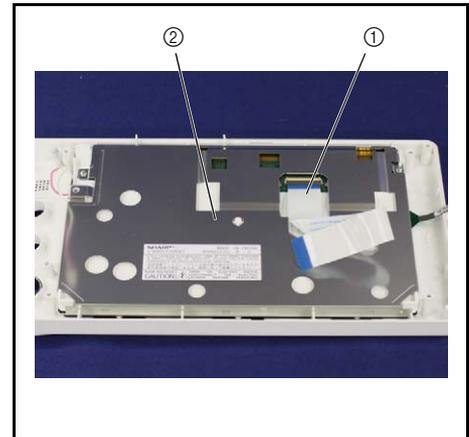
1. Attach the touch panel assy ① to the panel front cover ②.

**\*Key point**

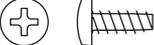
- Attach the touch panel so that the face with the flat cable connected is on the front side.

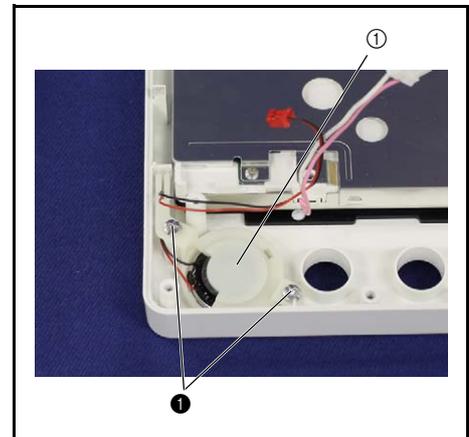
**2 LCD assy attachment**

1. Attach the flexible flat cable ① to the LCD assy ②.
2. Attach the LCD assy ③ to the panel front cover.

**3 Speaker set attachment**

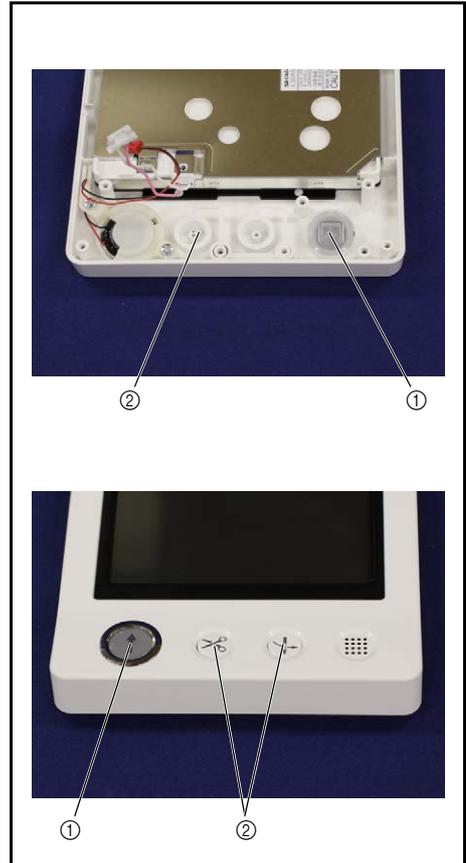
1. Attach the speaker set ① to the panel front cover with the 2 screws ①.

①		Taptite, Bind B M3X8	Torque 0.59 – 0.78 N-m
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#### 4 Buttons attachment

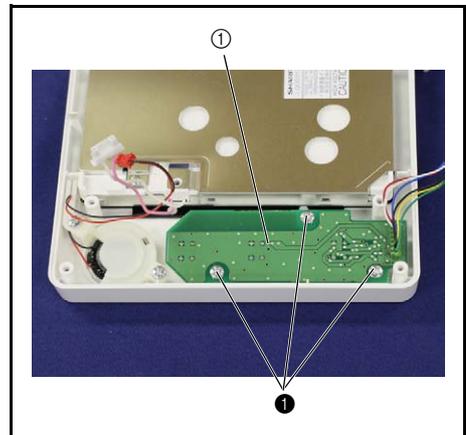
1. Attach the SS button ① and the operation button ② to the panel front cover.



#### 5 SS PCB Assy attachment

1. Attach the SS PCB Assy ① to the panel front cover with the 3 screws ❶.

❶	 	Taptite, Bind B M3X8	Torque 0.59 – 0.78 N·m
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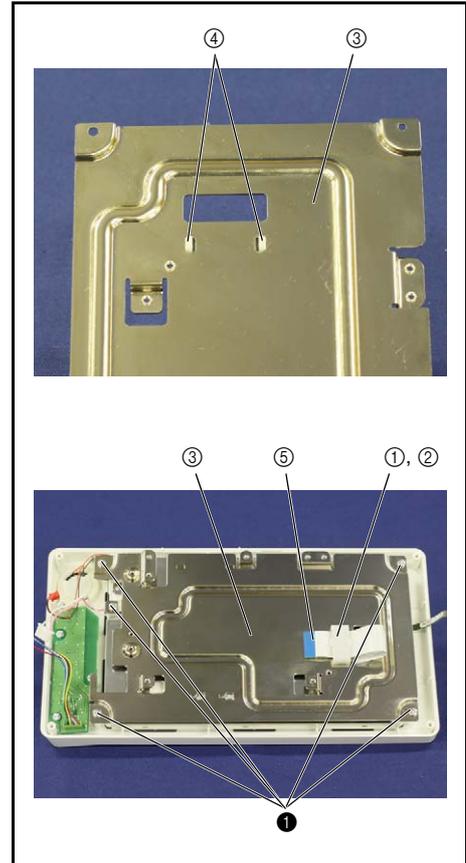
## 6 PCB base plate attachment

1. Attach the ferrite core ① and the ferrite holder ② to the PCB base plate ③.

### \*Key point

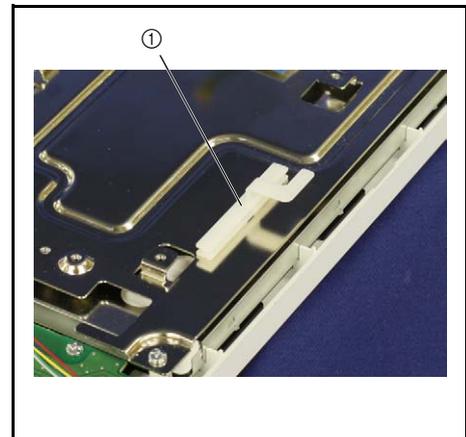
- Check that the hook ④ of the ferrite holder ② hang on the PCB base plate ③.
2. Attach the PCB base plate ③ to the panel front cover with the 5 screws ①.
  3. Insert the FFC ⑤ into the ferrite core ①.

①		Taptite, Bind B M3X8	Torque 0.59 – 0.78 N-m
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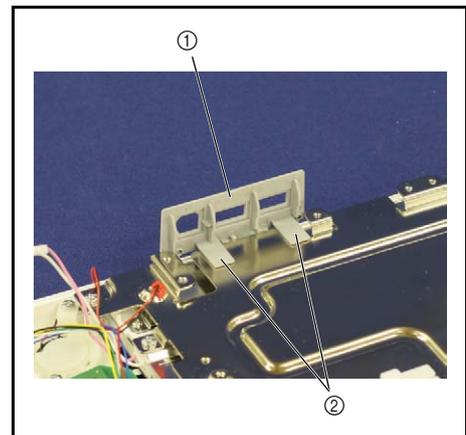
## 7 Board supporter attachment

1. Attach the board supporter ① to the positioning part of the PCB base plate.



## 8 USB cover removal

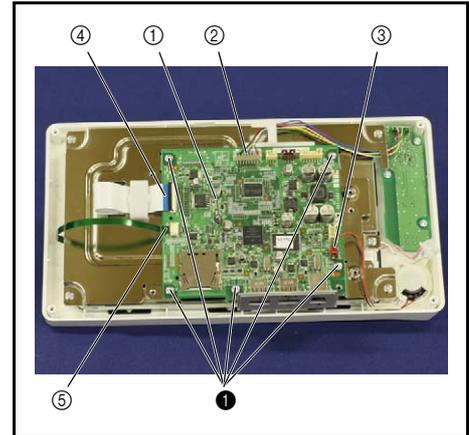
1. Attach the USB cover ① to the positioning part of the PCB base plate, and then hang the hook ②.



## 9 Panel PCB supply assy attachment

1. Attach the panel PCB supply assy ① to the PCB base plate with the 5 screws ①.
2. Connect the connector ② and the connector ③ to the panel PCB supply assy ①.
3. Attach the FFC ④ and the FFC ⑤ to the panel PCB supply assy ①.

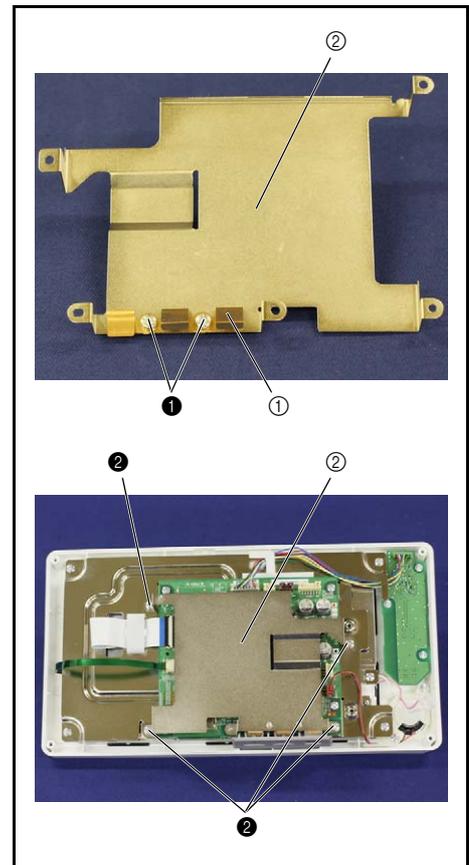
①		Screw, Bind M3X5	Torque 0.59 – 0.78 N-m
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## 10 Panel PCB case attachment

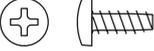
1. Attach the ground plate USB ① to the panel PCB case ② with the 2 screws ①.
2. Attach the panel PCB case ② to the PCB base plate with the 4 screws ②.

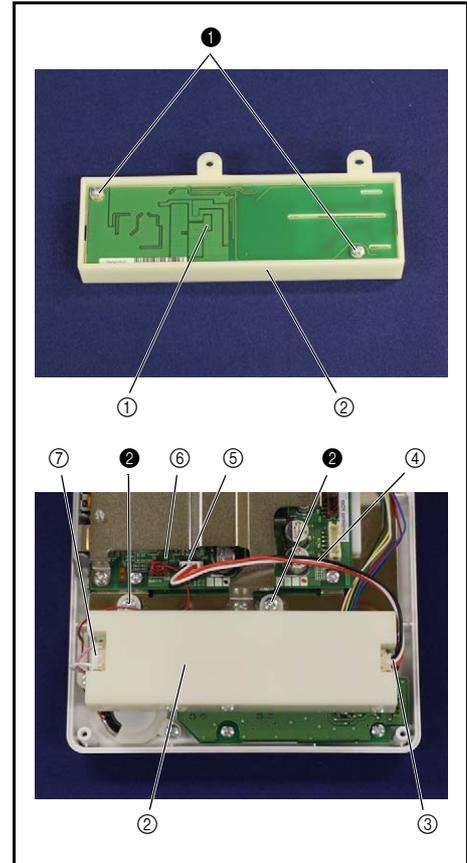
①		Screw, Bind M3X5	Torque 0.59 – 0.78 N-m
②			



## 11 Inverter attachment

1. Attach the inverter ① to the inverter cover ② with the 2 screws ①.
2. Connect the connector ③ of the lead wire assy ④ to the inverter ①.
3. Attach the inverter cover ② to the PCB base plate with the 2 screws ②.
4. Connect the connector ⑤ of the lead wire assy ④ to the panel PCB supply assy ⑥.
5. Connect the connector ⑦ to the inverter ①.

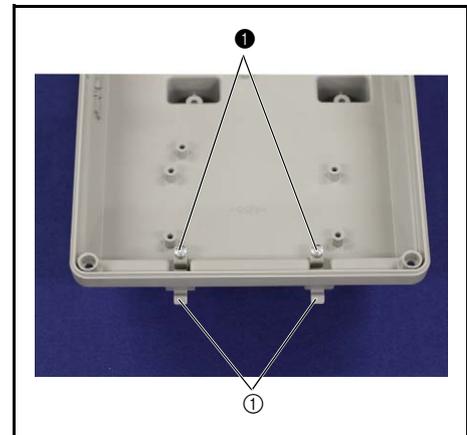
①		Taprite, Bind B M3X8	Torque 0.59 – 0.78 N-m
②		Screw, Bind M3X5	Torque 0.59 – 0.78 N-m



## 12 Pen holder attachment

1. Attach the 2 pen holders ① to the panel rear cover with the 2 screws ①.

①		Taprite, Bind B M3X8	Torque 0.59 – 0.78 N-m
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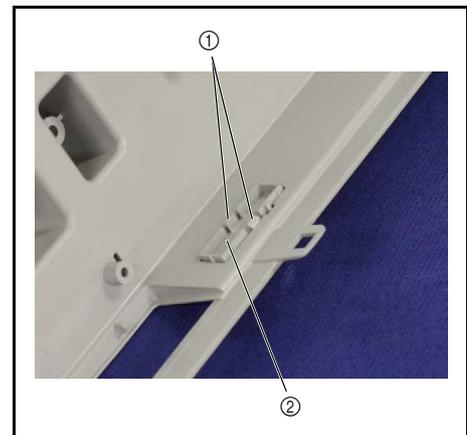


## 13 Card cover attachment

1. Attach the card cover ① to the panel rear cover.

### \*Key point

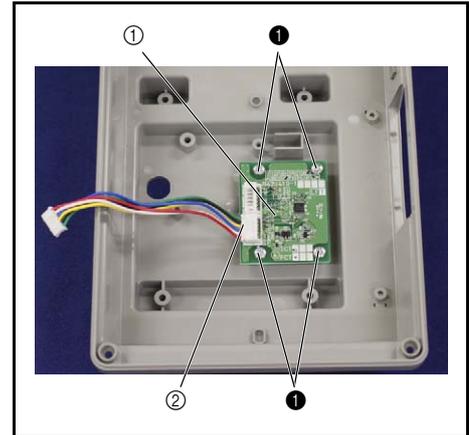
- Check that 2 hooks ② of the card cover ① hang on the panel rear cover.



## 14 Communication relay PCB assy attachment

1. Attach the communication relay PCB assy ① to the panel rear cover with the 4 screws ①.
2. Connect the connector of the lead wire assy com-panel ② to the communication relay PCB assy ①.

①		Taptite, Bind B M3X8	Torque 0.59 – 0.78 N-m
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## 15 Lead wire assy panel attachment

1. Attach the cord bushing ① to the lead wire assy panel ②.

### \*Key point

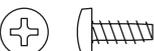
- Open the lid of the cord bushing ①, attach the cord bushing to the lead wire, and then close the lid.

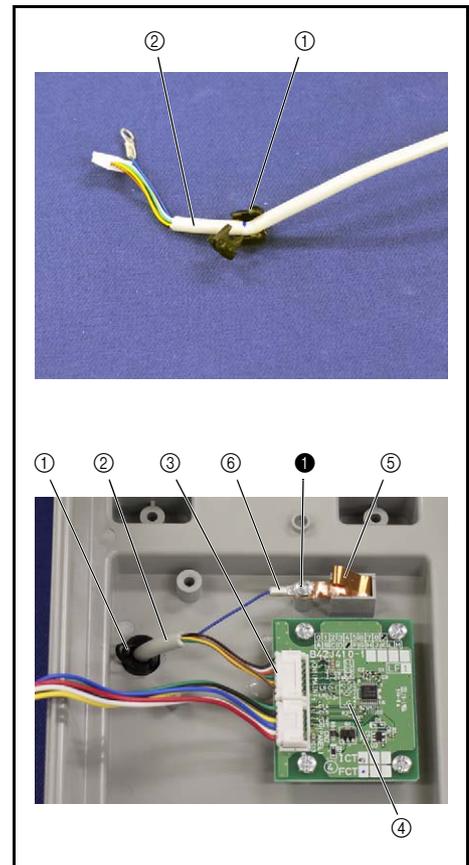
2. Insert the lead wire assy panel ② from the back of the panel rear cover as shown in the photo on the right.

### \*Key point

- Make sure that the lock holding the cord bushing ① completely passes through the hole until it reaches the inside of the panel rear cover.

3. Connect the connector ③ of the lead wire assy panel ② to the communication relay PCB assy ④.
4. Attach the ground spring ⑤ and the ground wire ⑥ of the lead wire assy panel ② to the panel rear cover with the screw ①.

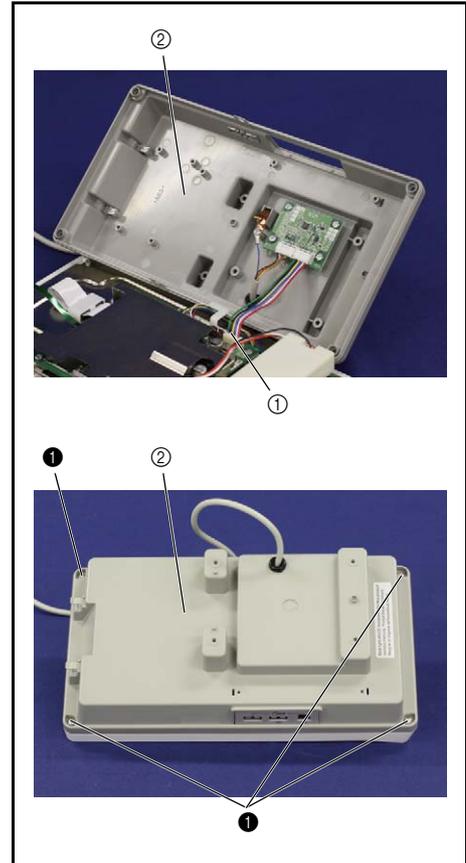
①		Taptite, Bind B M3X8	Torque 0.59 – 0.78 N-m
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## 16 Panel rear cover attachment

1. Connect the connector of the lead wire assy com-panel ① to the panel PCB supply assy.
2. Attach the panel rear cover ② to the panel front cover with the 4 screws ①.

①		Taptite, Bind B M3X10	Torque 0.59 – 0.78 N-m
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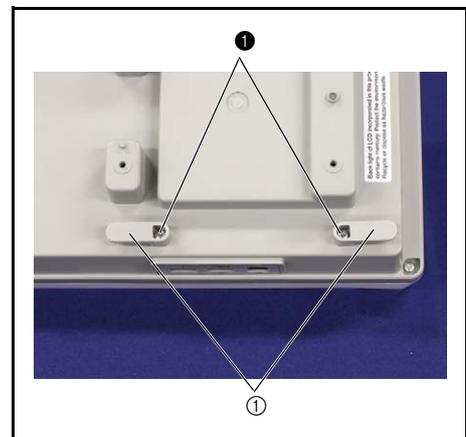
## 17 USB cord holder attachment

1. Attach the 2 USB cord holders ① to the panel rear cover with the 2 screws ①.

### \*Key point

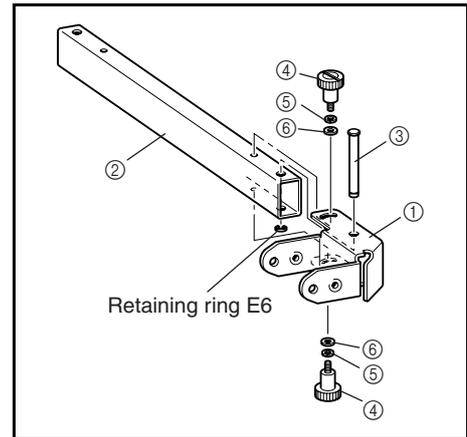
- Insert the lug on the USB cord holder ① into the positioning hole on the panel rear cover.

①		Taptite, Bind B M3X10	Torque 0.59 – 0.78 N-m
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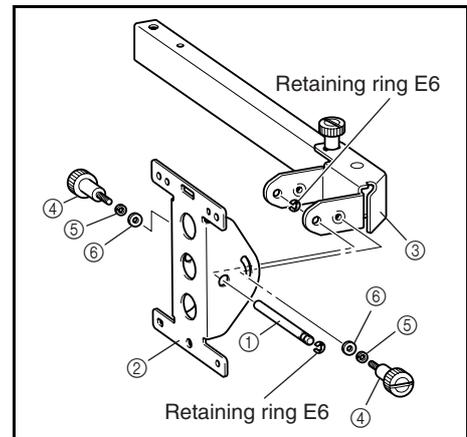
### 18 Operation panel lever A attachment

1. Set the operation panel lever A ① to the operation panel lever B ②, and then insert the operation panel lever shaft ③ into the operation panel lever A ① and the operation panel lever B ②, and then secure them with the retaining ring E6.
2. Tighten the thumb bolt (M4 L) ④, spring washer (2-4) ⑤, and plain washer (M4) ⑥. (2 locations)



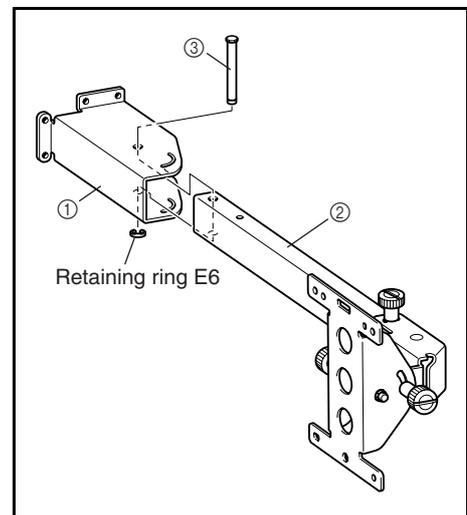
### 19 Panel holder attachment

1. Attach the retaining ring E6 to the operation panel holder shaft ①.
2. Set the panel holder ② to the operation panel lever A ③, and then insert the operation panel holder shaft ① into the panel holder ② and the operation panel lever A ③, and then secure them with the retaining ring E6.
3. Tighten the thumb bolt (M4 L) ④, spring washer (2-4) ⑤, and plain washer (M4) ⑥. (2 locations)



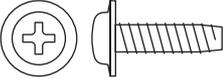
### 20 Operation panel lever C attachment

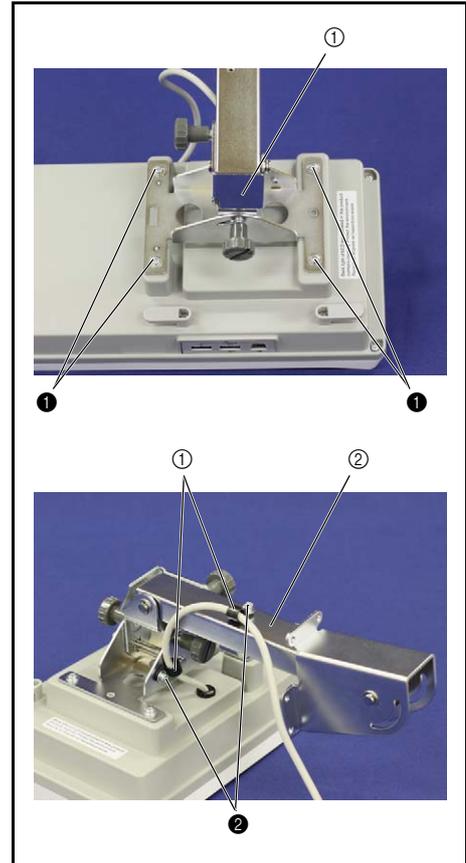
1. Set the operation panel lever C ① to the operation panel lever B ②, and then insert the operation panel lever shaft ③ into the operation panel lever C ① and the operation panel lever B ②, and then secure them with the retaining ring E6.



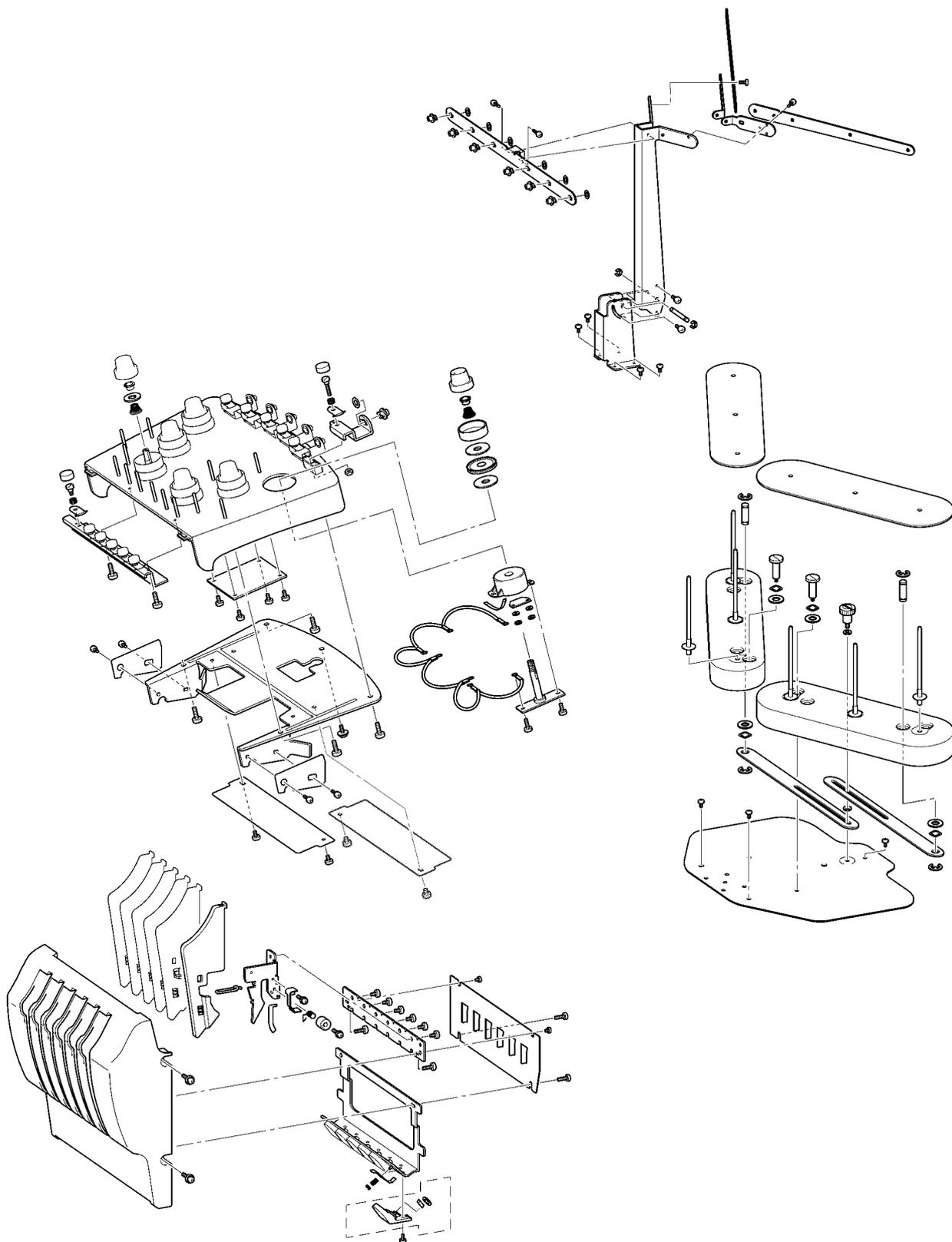
## 21 Operation panel lever assembly attachment

1. Attach the operation panel lever assembly ① to the panel rear cover with the 4 screws ①.
2. Set the 2 cord clamp ② to the cord, and then attach the 2 cord clamp ② to the operation panel lever assembly ① with the 2 screws ②.

①		Taprite, Cup B M4X14	Torque 0.78 – 1.18 N-m
②		Screw, Pan (S/P washer) M4X12	Torque 0.78 – 1.18 N-m



Thread tension unit



## 1 Thread take-up bracket assembly

### \*Key point

- Make 6 thread take-up bracket assemblies.

1. Attach the spring **S49** to the thread catching spring case ①.

### \*Key point

- There are 4 holes on the spring case. Insert the tip of the spring **S49** into the hole indicated by the arrow in the figure.

2. Attach the thread catching spring case assembly to the thread take-up bracket with the screw ①.

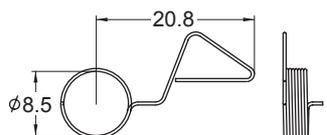
### \*Key point

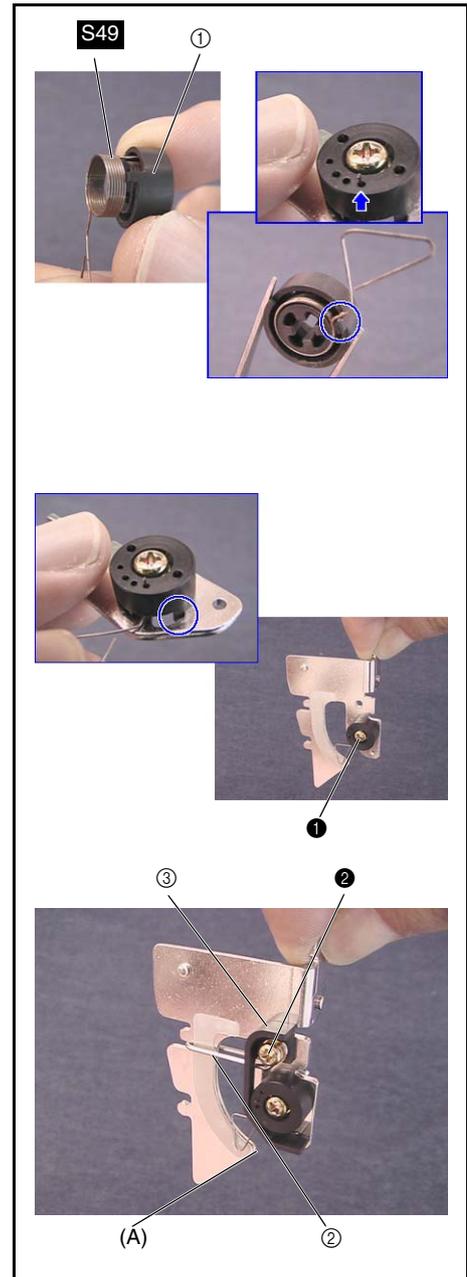
- Align the protrusion on the thread catching spring case assembly with the hole on the thread take-up bracket, and turn them counterclockwise until they stop. Then tighten the screw ①.

3. Attach the thread guide wire ② and the thread guard ③ to the thread take-up bracket with the screw ②.

### \*Key point

- Check that the spring **S49** does not extend beyond line A.

<p>① ②</p>		<p>Screw, Pan (S/P washer) M3X6</p> <p>Torque 0.59 – 0.78 N·m</p>
<p>S49</p>		<p>THREAD TAKE-UP SPRING XC5926***</p>



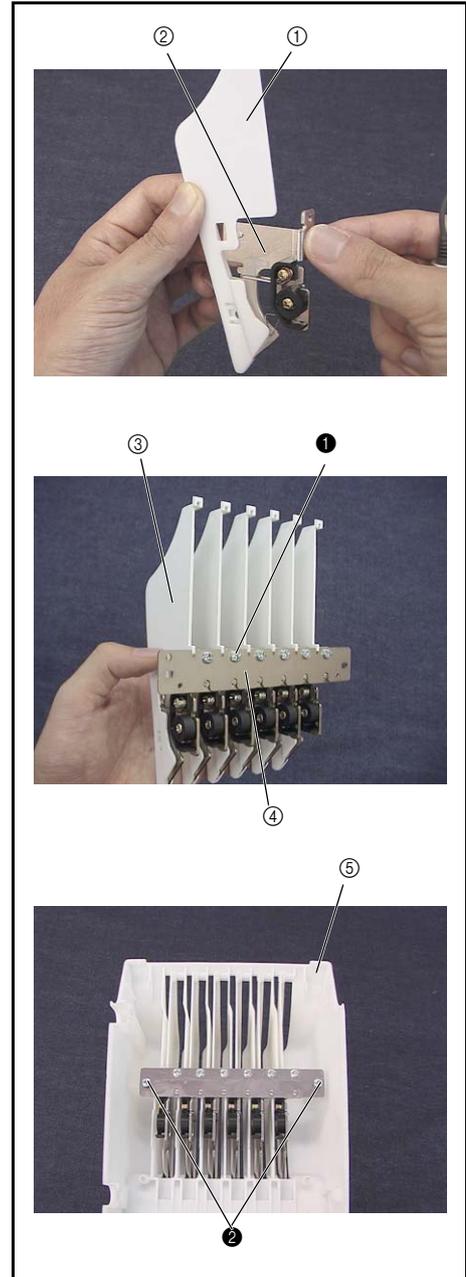
## 2 Thread take-up lever cover assembly (Step 1)

1. Attach the thread take-up bracket assembly ② to the thread guide cover ①. (6 sets)
2. Attach the 6 thread guide cover assemblies ③ to the thread tension bracket base ④ with the 6 screws ①.
3. Secure the thread tension bracket base assembly to the thread take-up lever cover ⑤ with the 2 screws ②.

### \*Key point

- Attach the thread tension bracket base assembly so that the clearance in each slot is equal when viewed from the front of the assembly.

①		Screw, Bind M3X4	Torque 0.78 – 1.18 N·m
②		Tapite, Bind B M3X10	Torque 0.59 – 0.78 N·m

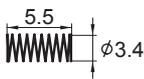


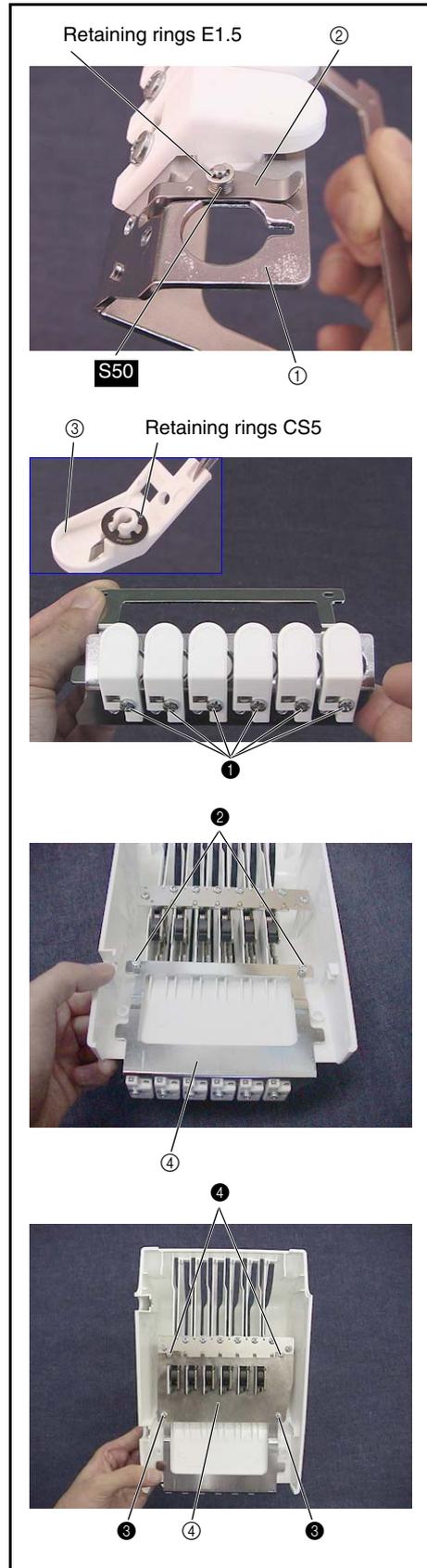
### 3 Thread take-up lever cover assembly (Step 2)

1. Attach the 6 needle thread presser plates ② and the 6 springs S50 to the thread holder base ①, and then attach the 6 retaining rings E1.5.
2. Attach the NT lower thread cutter to the cutter cover ③, and then attach the 6 retaining rings CS5.
3. Attach the cutter cover assembly to the needle thread presser plates with the screw ①. (6 locations)
4. Temporarily secure the thread holder base to the thread take-up lever cover with the 2 screws ②.
5. Attach the rear cover ④ with the 4 screws (③ ④, 2 each).

#### \*Key point

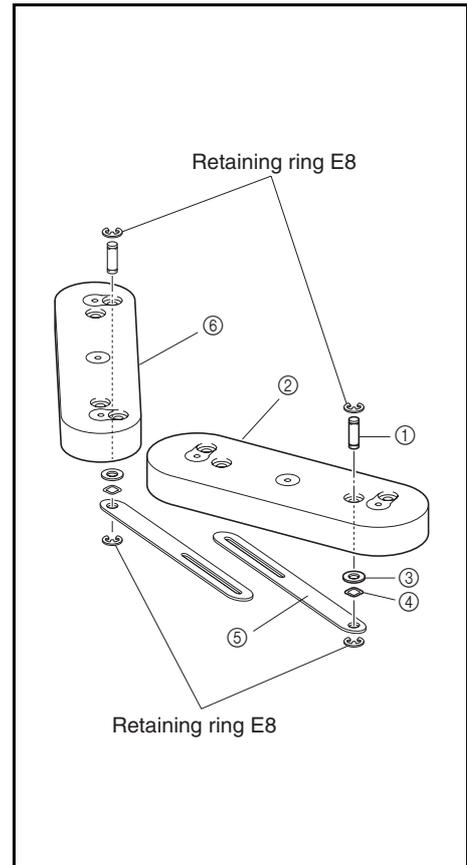
- Lift the rear cover ④ and secure it.

①		Screw, Pan (S/P washer) M3X6	Torque 0.59 – 0.78 N-m
② ③		Tapite, Bind B M3X10	Torque 0.59 – 0.78 N-m
④		Screw, Bind M2.6X3	Torque 0.39 – 0.78 N-m
S50			SPRING XC5962***



#### 4 Spool stand frame assembly (Step 1)

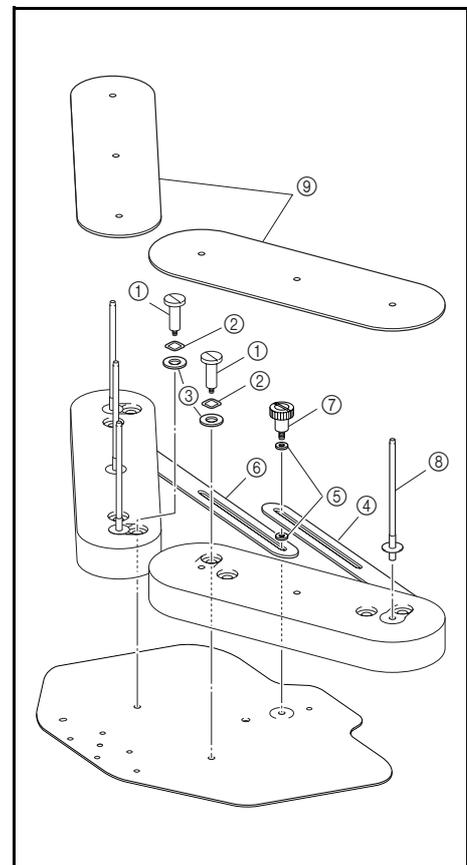
1. Attach the retaining ring E8 to the spool stand stud ①. (2 sets)
2. Attach the spool stand stud to spool stand frame R ②, attach the plain washer (S10) ③, spring washer ④, and spool stand link ⑤ to the tip of the spool stand stud, and then attach the retaining ring E8.
3. Attach the spool stand stud to spool stand frame L ⑥, attach the plain washer (S10) ③, spring washer ④, and spool stand link ⑤ to the tip of the spool stand stud, and then attach the retaining ring E8.



#### 5 Spool stand frame assembly (Step 2)

1. Attach spool stand frames L and R to the spool stand base with the 2 stud screws ①, 2 spring washers ②, and 2 plain washers (S10) ③.
2. Put spool stand link R ④, the washer ⑤, spool stand link L ⑥, and the other washer ⑤ together, and then attach them to the spool stand base with the thumb bolt (M4L) ⑦.
3. Attach the 6 spool pins ⑧ and the 2 sponges ⑨ to spool frame stands R and L.

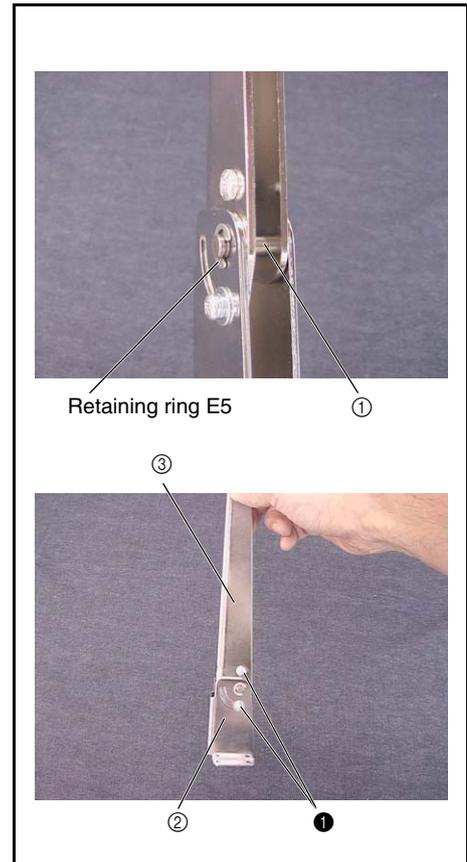
①	Tightening torque of stud screw	1.18 - 1.57 N-m
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## 6 Antenna assembly (Step 1)

1. Attach the retaining ring E5 to the antenna shaft ①.
2. Attach the antenna C assembly ③ to antenna D ②, thread the antenna shaft assembly through them, and then attach the retaining ring E5.
3. Secure the antenna C assembly with the screws ❶.

❶		Screw, Blind M4X6	Torque 1.18 – 1.57 N-m
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## 7 Antenna assembly (Step 2)

1. Attach pipe bush A ② to antenna E ①, and then attach the O-ring (P5) ③ to the tip of pipe bush A. (6 locations)

### \*Key point

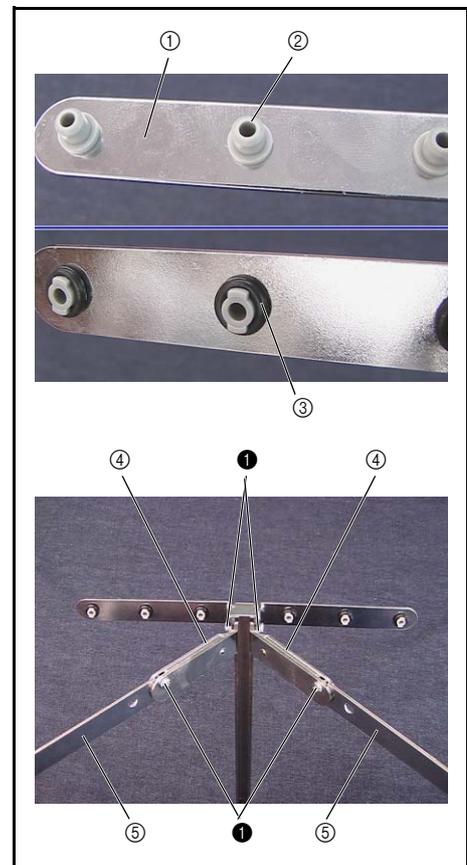
- Turn pipe bush A 90 degrees after it has been attached to antenna E.

2. Attach the 2 antennas A ④, 2 antennas B ⑤, and the antenna E assembly to the antenna C assembly with the 4 screws ❶.

### \*Key point

- Tighten the antenna E assembly together with antenna A.

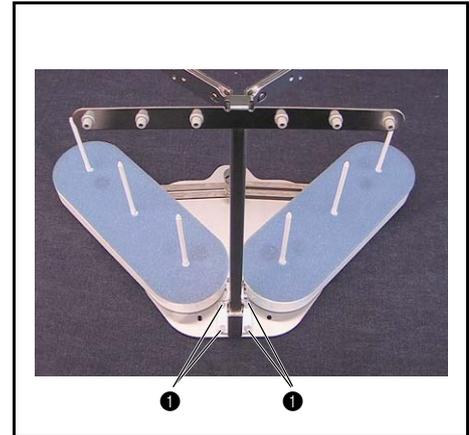
❶		Screw, Blind M3X6	Torque 0.78 – 1.18 N-m
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## 8 Antenna assembly attachment

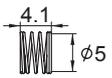
1. Attach the antenna assembly to the thread stand base assembly with the 4 screws ①.

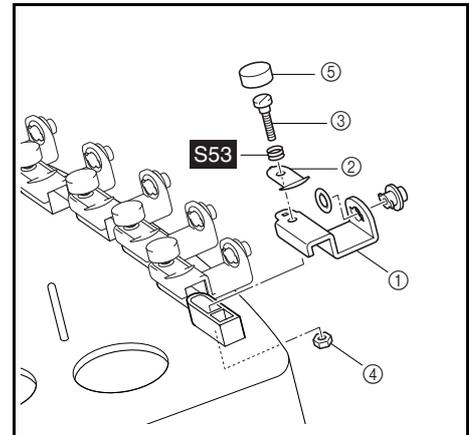
①		Screw, Bind M4X6	Torque 1.18 – 1.57 N-m
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## 9 Upper thread eyelet base attachment

1. Attach the upper thread eyelet base ① and the thread guide tension plate ② to the tension base assembly. (6 locations)
2. Thread the thread guide tension screw ③ through the spring S53, attach the nut (2, M3) ④ from the rear side of the tension base assembly, and then tighten the thread guide tension screw. (6 locations)
3. Attach the tension axis cap ⑤ to the thread guide tension screw. (6 locations)

S53		THREAD GUIDE COMPRESSION XC6231***
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## 10 Thread sensor PCB assembly and head PCB assembly attachment

1. Connect the FFC (SML2CD-H) ② to the thread sensor assembly ①. (6 locations)

**\*Key point**

- Connect the FFC (SML2CD-H) so that the blue surface is facing the thicker portion of the thread sensor assembly's connector.

2. Attach the thread sensor assembly and the 2 rubber washers to the thread quantity sensor cover ③, and then attach the 2 retaining rings CS2. (6 sets)
3. Attach the thread tension bracket assembly ④, thread quantity sensor cover assembly ⑤, and head grounding wire assembly ⑥ to the tension base assembly with the 2 screws ① and the 10 screws ②. (6 locations)

**\*Key point**

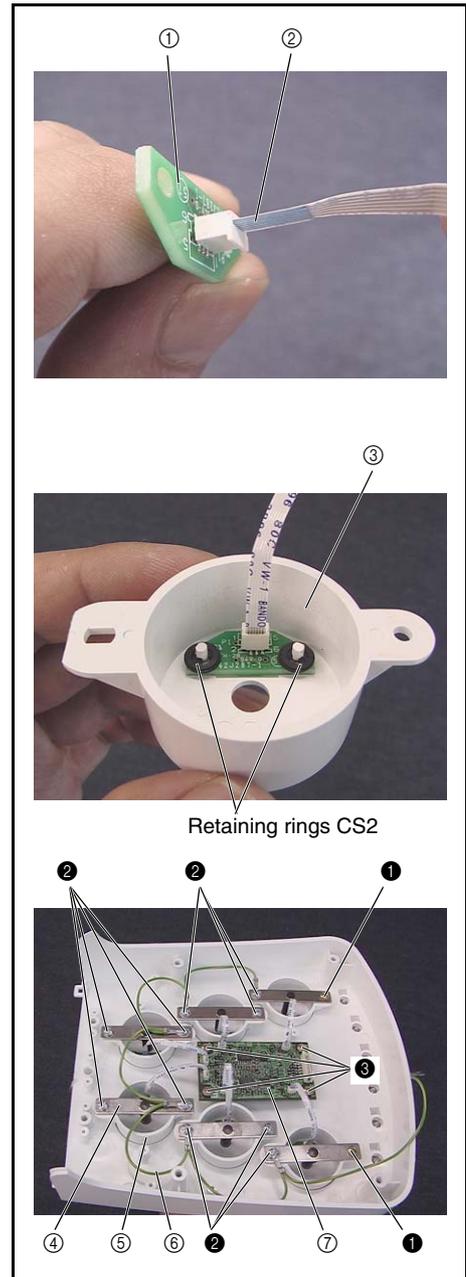
- Tighten the head grounding wire assembly together with the thread tension bracket assembly. (6 locations)

4. Attach the head PCB assembly ⑦ to the tension base assembly with the 4 screws ③, and then connect the 6 FFCs (SML2CD-H) to the head PCB assembly.

**\*Key point**

- Connect the FFC (SML2CD-H) so that the blue surface is facing the thicker side of the head PCB assembly's connector.

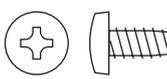
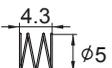
①		Taprite, Bind B M3X8	Torque 0.59 – 0.78 N-m
②		Taprite, Bind B M3X10	Torque 0.59 – 0.78 N-m
③		Taprite, Bind B M3X8	Torque 0.59 – 0.78 N-m

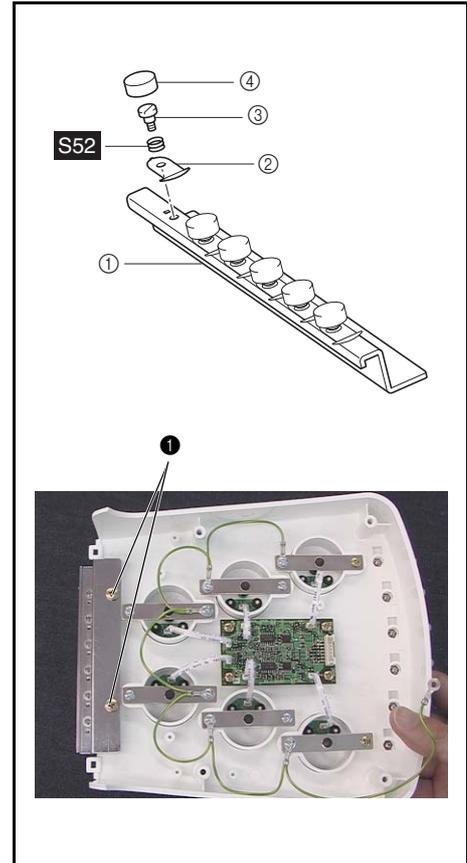


## 11 Inner thread eyelet base attachment

1. Attach the thread guide tension plate ② to the inner thread eyelet base ①. (6 locations)
2. Thread the thread guide tension axis ③ through the spring **S52**, and then secure the guide tension axis to the inner thread eyelet base with the screw. (6 locations)
3. Attach the tension axis cap ④ to the thread guide tension axis. (6 locations)
4. Attach the inner thread eyelet base assembly from the tension base assembly with the 2 screws ①.

Tightening torque of thread guide tension axis	0.59 - 0.78 N-m
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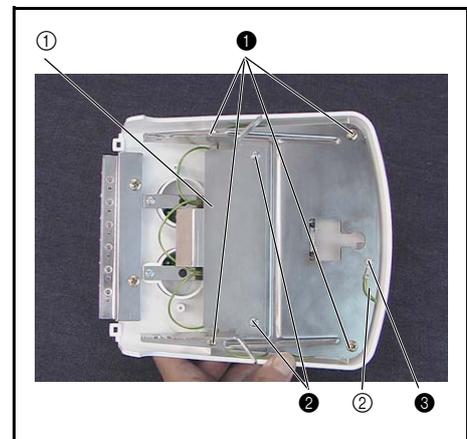
①		Taprite, Bind B M4X8	Torque 0.39 - 0.78 N-m
S52		BOBBIN WINDER GUIDE COMPRESSION X56456***	



## 12 Tension base bracket attachment

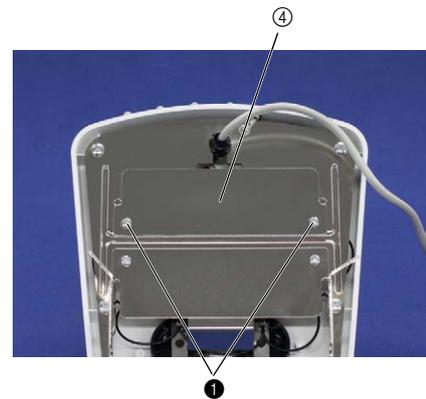
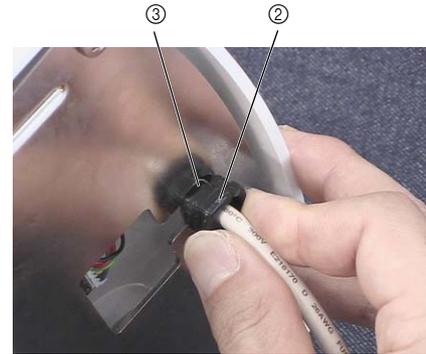
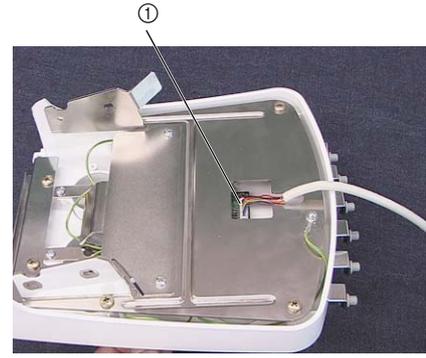
1. Attach the tension base bracket to the tension base assembly with the 4 screws ①.
2. Attach the bracket cover ① to the tension base bracket with the 2 screws ②.
3. Attach the head grounding wire ② to the tension base assembly with the screw ③.

①		Taprite, Bind B M4X14	Torque 0.78 - 1.18 N-m
②		Screw, Bind M3X4	Torque 0.78 - 1.18 N-m
③		Screw, Pan (SIP washer) M3X6	Torque 0.78 - 1.18 N-m



### 13 Tension base lead wire assembly attachment

1. Connect the tension base lead wire assembly ① to the head PCB assembly.
2. Attach the cord bush (KR51) ② to the tension base lead wire assembly, and then push it into the groove ③ on the tension base bracket.
3. Attach the bracket cover ④ to the tension base bracket with the 2 screws ①.



①		Screw, Bush M3X4	Torque 0.78 – 1.18 N-m
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## 14 Tension nut attachment

1. Attach the tension disc felt ①, rotary disc assembly ②, tension disc felt ①, tension disc presser ③, spring **S51**, washer ④, and tension nut ⑤. (6 locations)

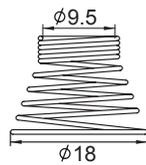
### NOTE

- Insert the thread tension washer ⑥ between the spring **S51** and the washer ④ only for thread tension A.

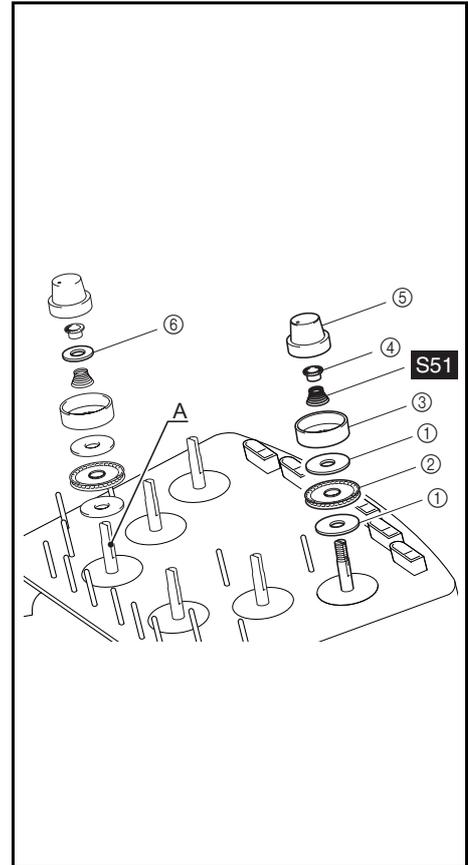
### \*Key point

- Attach the rotary disc assembly ② so that the magnetic surface is facing down.
- Attach the spring **S51** so that the larger diameter end is at the bottom.
- Tighten the tension nut ⑤ two turns clockwise.

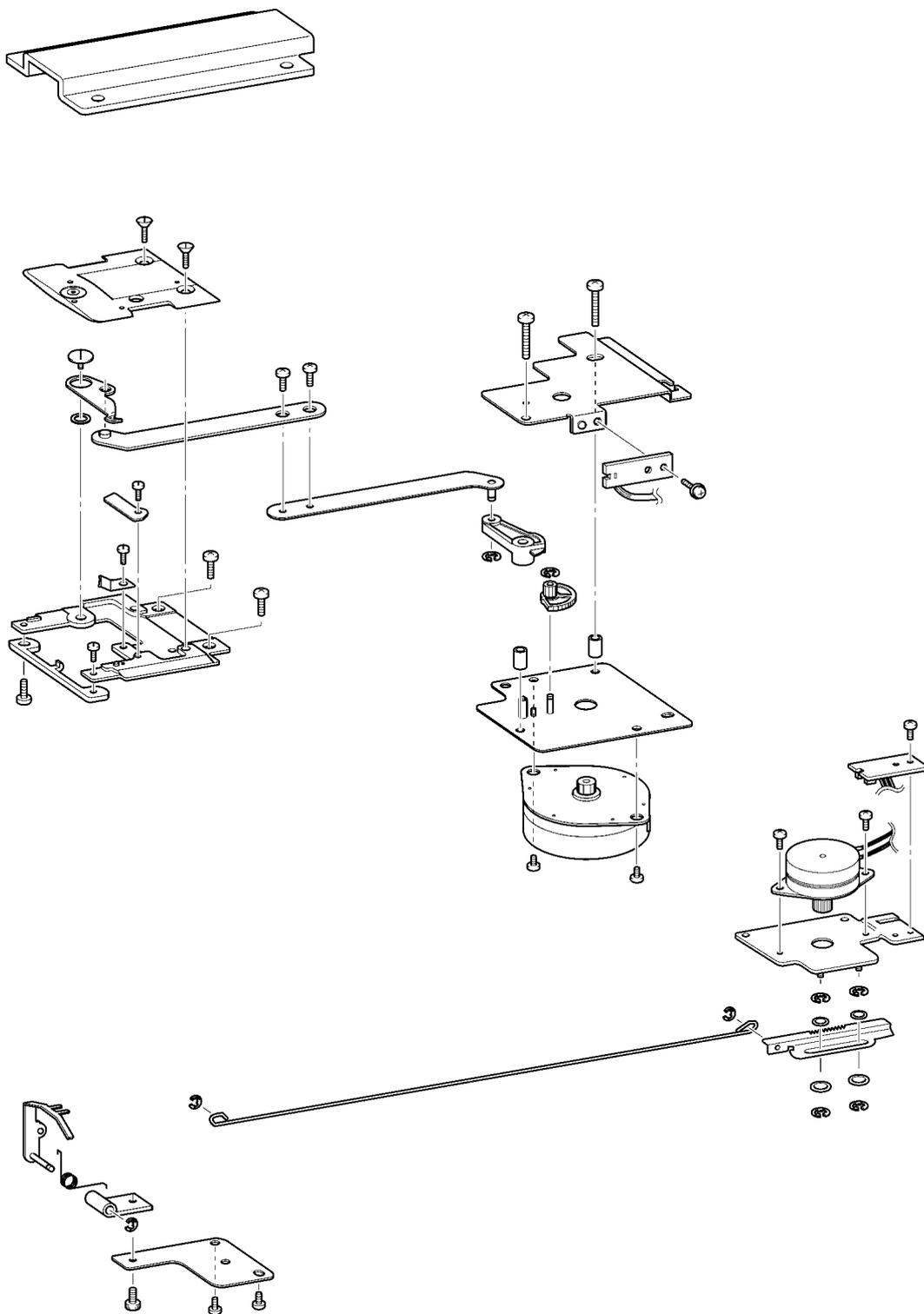
S51



THREAD SPRING  
XC6232\*\*\*



Thread cut unit



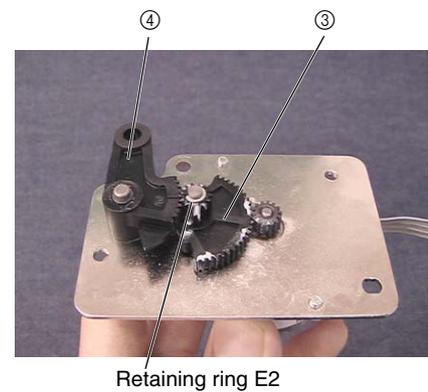
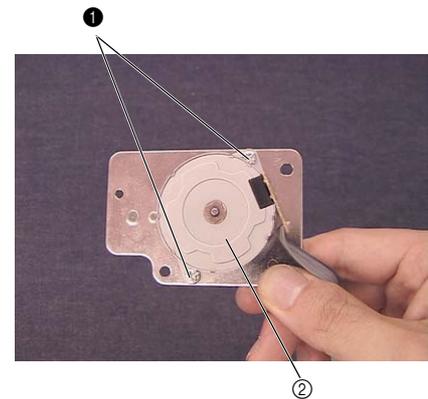
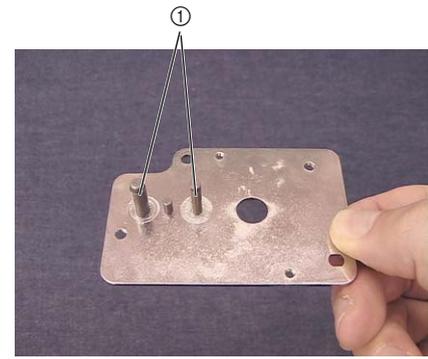
## 1 Cutter unit assembly (Step 1)

1. Apply MOLYKOTE EM-30L to the CT motor bracket assembly's shaft ①.
2. Attach the thread cutter motor assembly ② to the CT motor bracket assembly with the 2 screws ❶.
3. Attach the initial gear ③ to the motor bracket assembly's shaft, and then attach the retaining ring E2.
4. Attach the lever gear ④ to the motor bracket assembly's shaft, and then apply MOLYKOTE EM-30L to the gear.

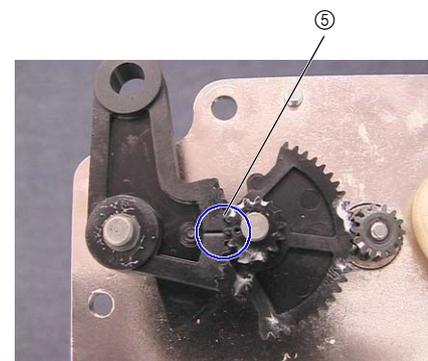
### \*Key point

- Align the marking ⑤ on the lever gear with the marking on the initial gear.

Apply MOLYKOTE EM-30L to the CT motor bracket assembly's shaft.	Size of a grain of rice
Apply MOLYKOTE EM-30L to the lever gear.	Size of a grain of rice



Retaining ring E2



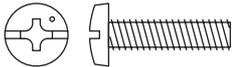
❶		Screw, Bind M3X4	Torque 0.78 – 1.18 N-m
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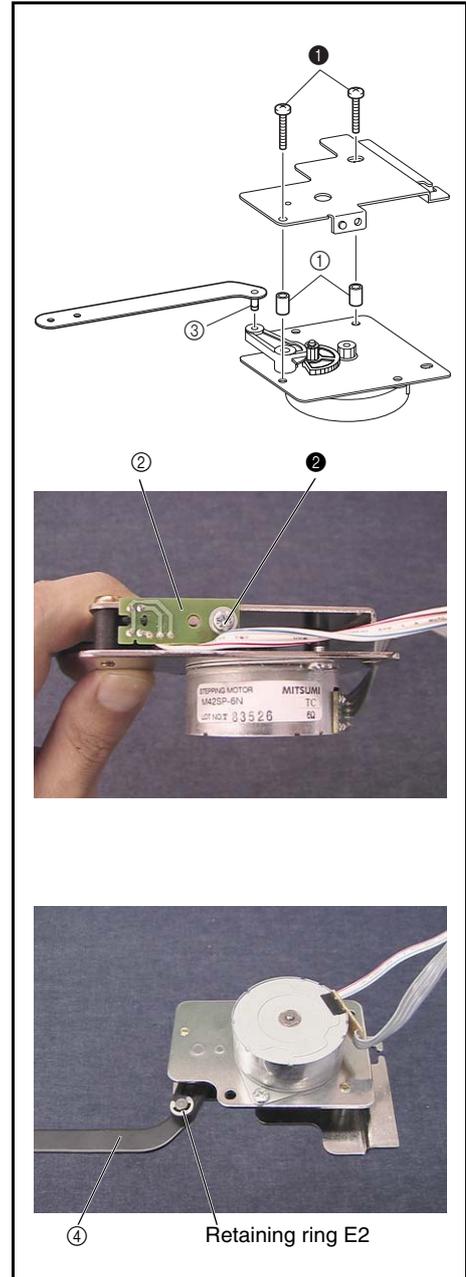
## 2 Cutter unit assembly (Step 2)

1. Attach the cutter bracket assembly and the 2 collars ① to the CT motor bracket assembly with the 2 screws ①.
2. Attach the thread cutter sensor assembly (white) ② to the CT motor bracket assembly with the screw ②.
3. Apply MOLYKOTE EM-30L to the level link assembly's shaft ③.
4. Attach the lever link assembly ④ to the lever gear, and then attach the retaining ring E2.

Apply MOLYKOTE EM-30L to the lever link assembly's shaft.

Size of a grain of rice

①		Screw, Blind M4X16	Torque 1.18 – 1.57 N-m
②		Screw, Pan (S/P washer) M3X6	Torque 0.57 – 0.78 N-m

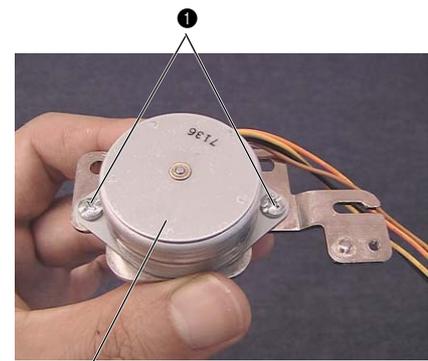


### 3 Picker assembly

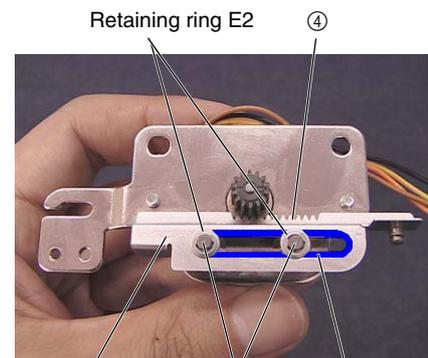
1. Attach the picker motor assembly ① to the PK motor bracket assembly with the 2 screws ①.
2. Attach the 2 retaining rings E2 to the PK motor bracket's shaft ② (2 locations).
3. Apply MOLYKOTE EM-30L to the rack assembly's moving surface ③ and the gear ④.
4. Attach the 2 plain washers (S3), rack assembly ⑤, and 2 plain washers (S3) to the PK motor bracket assembly's shaft (2 locations), and then attach the 2 retaining rings E2.
5. Attach the picker sensor assembly to the PK motor bracket assembly with the screw ②.
6. Place the washer and the picker link's slot ⑥ on the rack assembly's shaft, and then attach the retaining ring E2.
7. Paint the picker motor assembly's connector black.

Apply MOLYKOTE EM-30L to the rack assembly's moving surface and the gear.
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Size of a grain of rice
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①

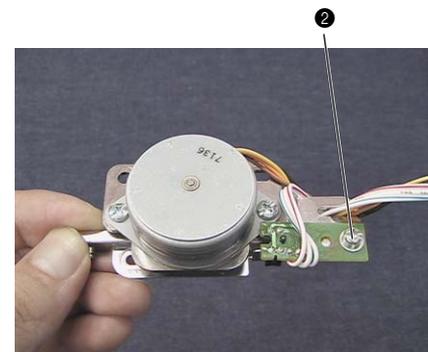


Retaining ring E2

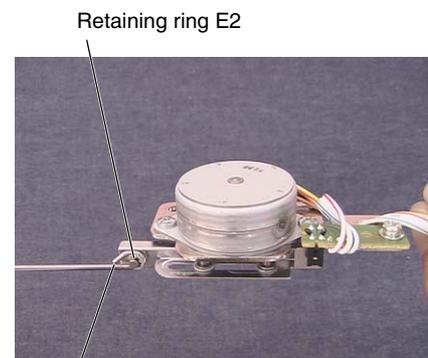
⑤

②

③



②

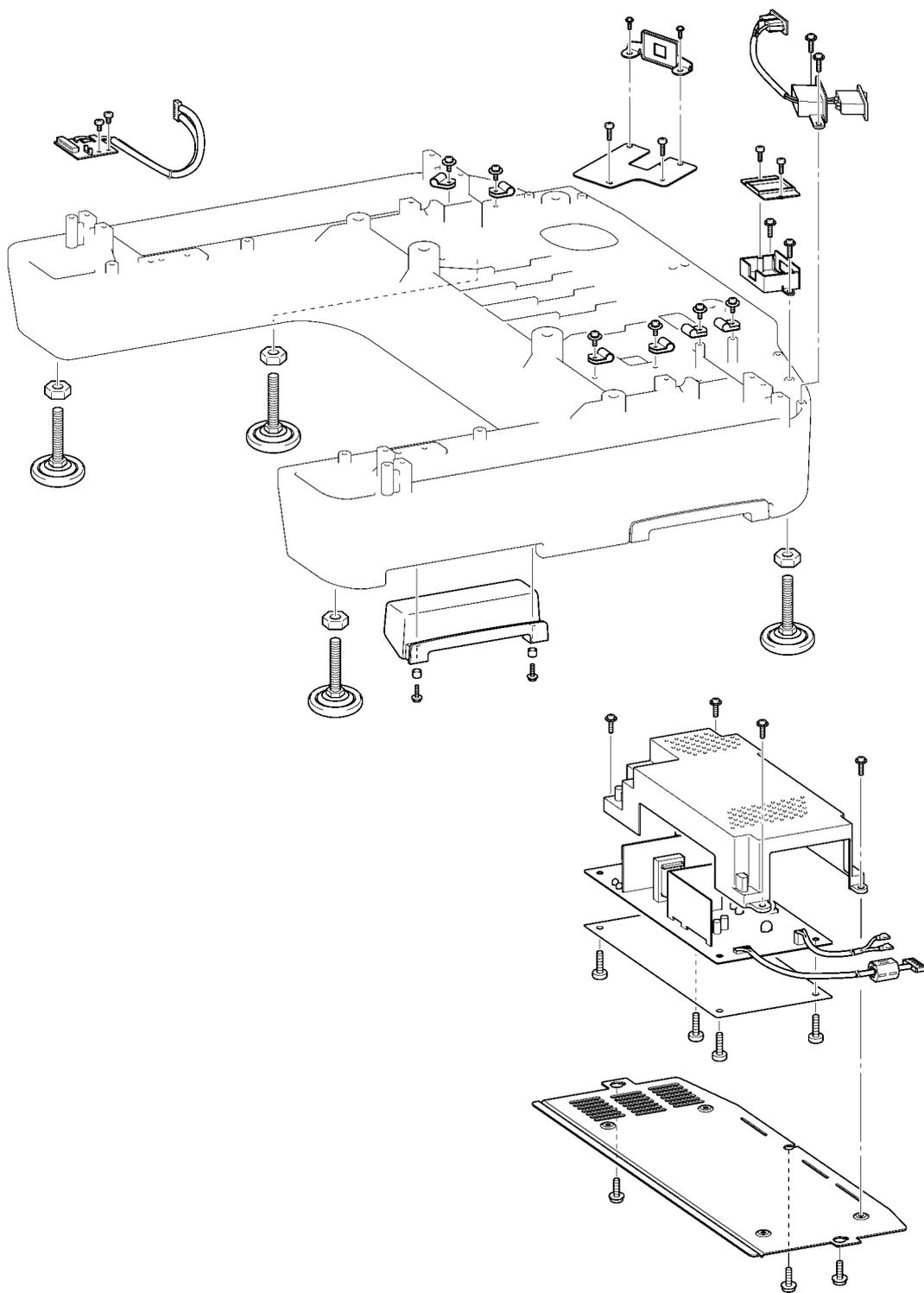


Retaining ring E2

⑥

①		Screw, Bind M3X4	Torque 0.78 – 1.18 N-m
②		Screw, Pan (S/P washer) M3X6	Torque 0.59 – 0.78 N-m

Power unit



## 1 Adjust bolt attachment

1. Attach the 2 bushes ② to the handle ①. (4 locations)
2. Attach the handle to the base frame with the 2 screws ❶. (4 locations)
3. Attach the 4 nuts (2, M8) ④ to the 4 adjust bolts (M8) ③.

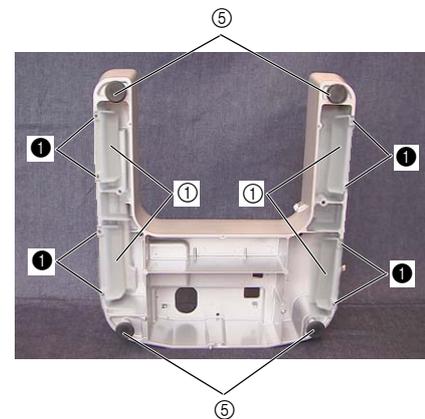
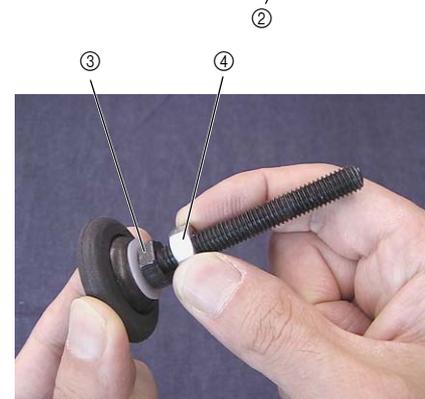
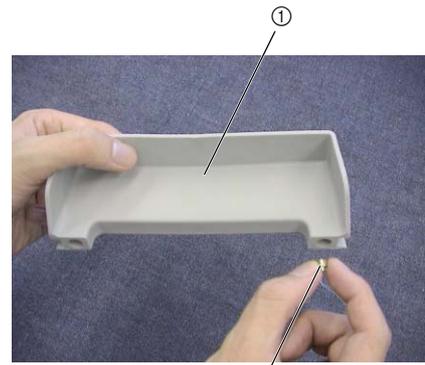
### \*Key point

- Lightly tighten the nut (2, M8) against the head of the adjust bolt (M8).

4. Attach the 4 adjust bolt assemblies ⑤ to the base frame.

### \*Key point

- Lightly tighten the adjust bolt assembly 5 against the base frame.

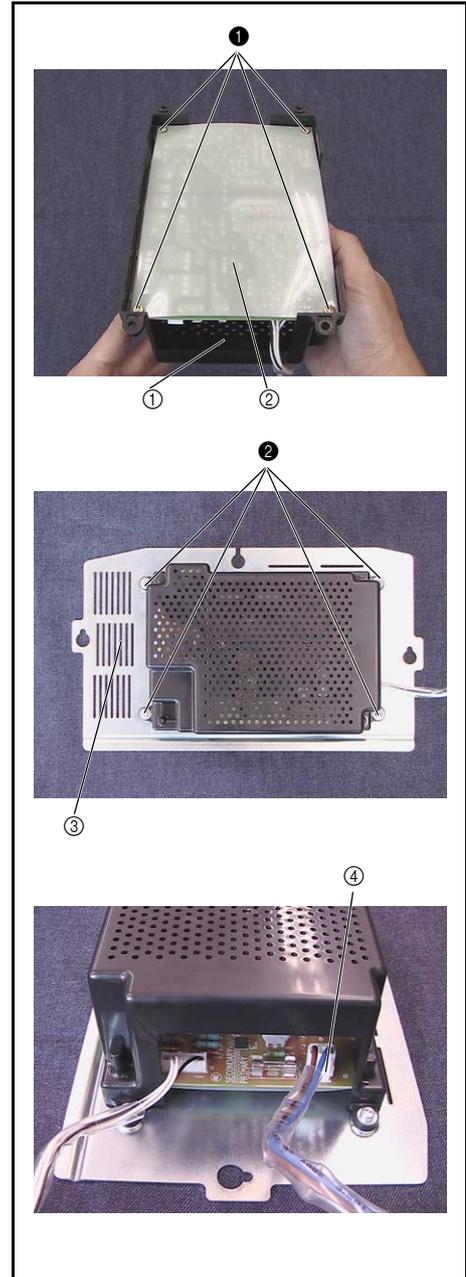


❶		Screw, Pan (S/P washer) M3X10	Torque 0.59 – 0.78 N·m
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## 2 Power PCB assembly

1. Attach the power PCB assembly and the insulation sheet ② to the power unit cover ① with the 4 screws ①.
2. Attach the power unit cover assembly to the power unit stay ③ with the 4 screws ②.
3. Connect the power lead wire assembly ④ to the power PCB assembly.

①		Taptite, Bind B M3X14	Torque 0.49 – 0.78 N-m
②		Screw, Pan (SIP washer) M4X12	Torque 0.78 – 1.18 N-m

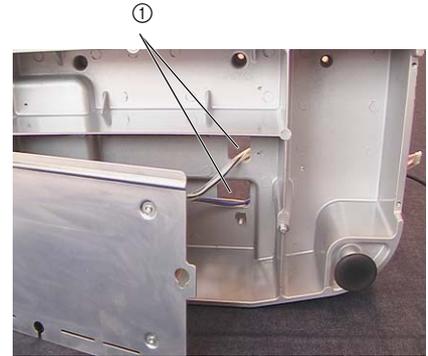


### 3 Power PCB assembly attachment

1. Temporarily tighten the 3 screws ❶ in the attachment holes on the PCB holder at the bottom of the base frame.
2. Run the PCB holder final assembly's lead wire and the power supply's lead wire through the 2 cord holes ❶ on the base frame, and route them along the upper section of the base frame so that the PCB holder final assembly is aligned with the 3 screws ❶, and attach it to the base frame.
3. Firmly tighten the 3 screws ❶.



❶



❶



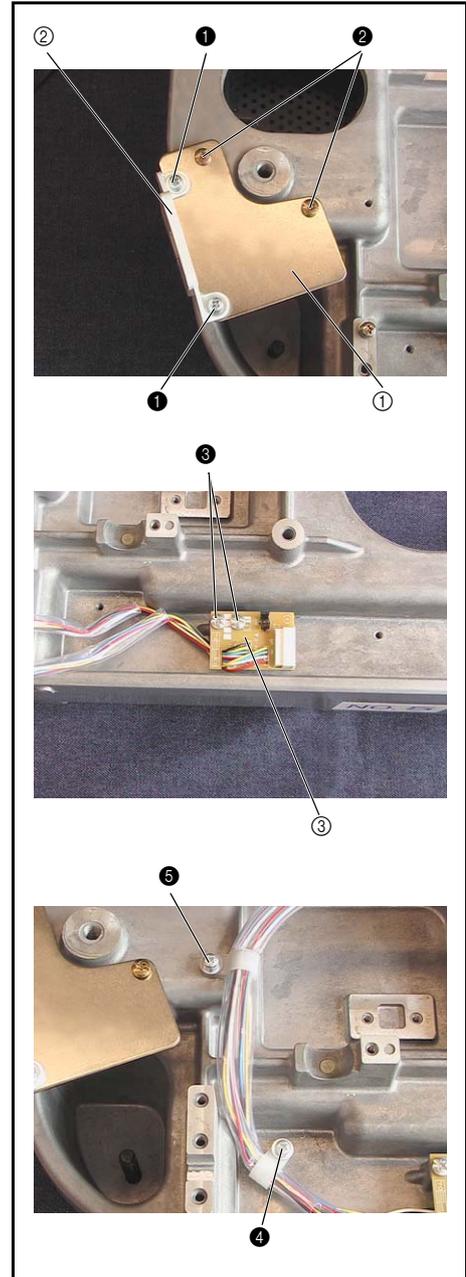
❶

❶		Screw, Pan (S/P washer) M4X10	Torque 1.18 – 1.57 N-m
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#### 4 USB PCB holder assembly and Y-area sensor assembly attachment

1. Attach the USB PCB cover ② to the USB PCB holder ① with the 2 screws ①.
2. Attach the USB PCB holder assembly to the base frame with the 2 screws ②.
3. Attach the Y-area sensor assembly ③ to the base frame with the 2 screws ③.
4. Attach the Y-area sensor's lead wire to the base frame with the screw ④ and the cord clamp (NK-6N).
5. Attach the Y-area sensor assembly's lead wire to the base frame with the screw ⑤ and the cord clamp (NK-6N).

①		Screw, Pan (S/P washer) M4X8	Torque 0.78 – 1.18 N-m
②		Tapite, Bind S M4X10	Torque 1.47 – 1.96 N-m
③		Screw, Bind M4X6	Torque 1.18 – 1.57 N-m
④ ⑤		Screw, Pan (S/P washer) M4X8	Torque 0.78 – 1.18 N-m

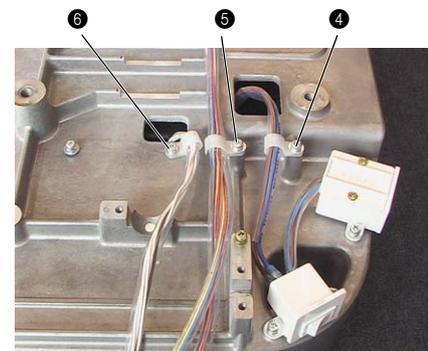
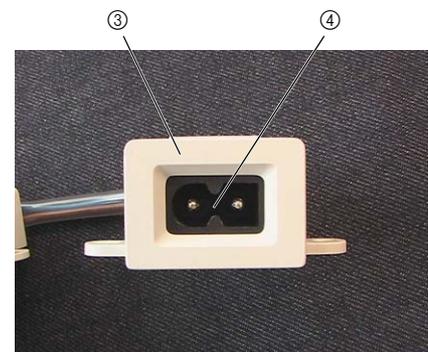
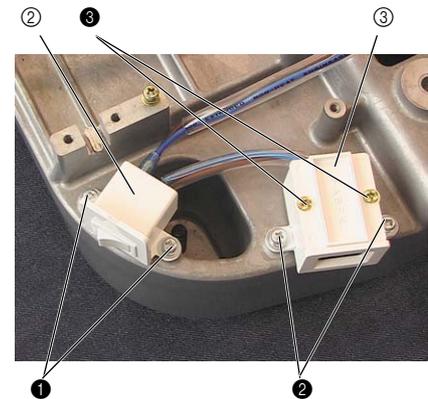
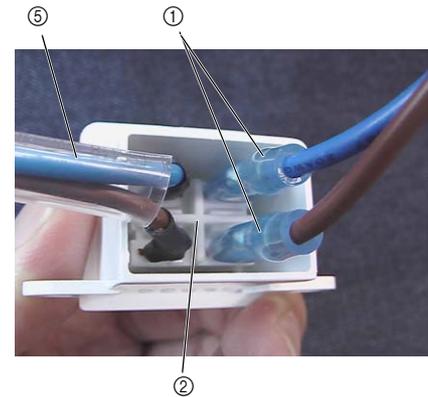


## 5 Power switch assembly and inlet attachment

1. Connect the free end of the 2 power lead wire assemblies ① (one end is connected to the power PCB assembly) to the power switch assembly ②.

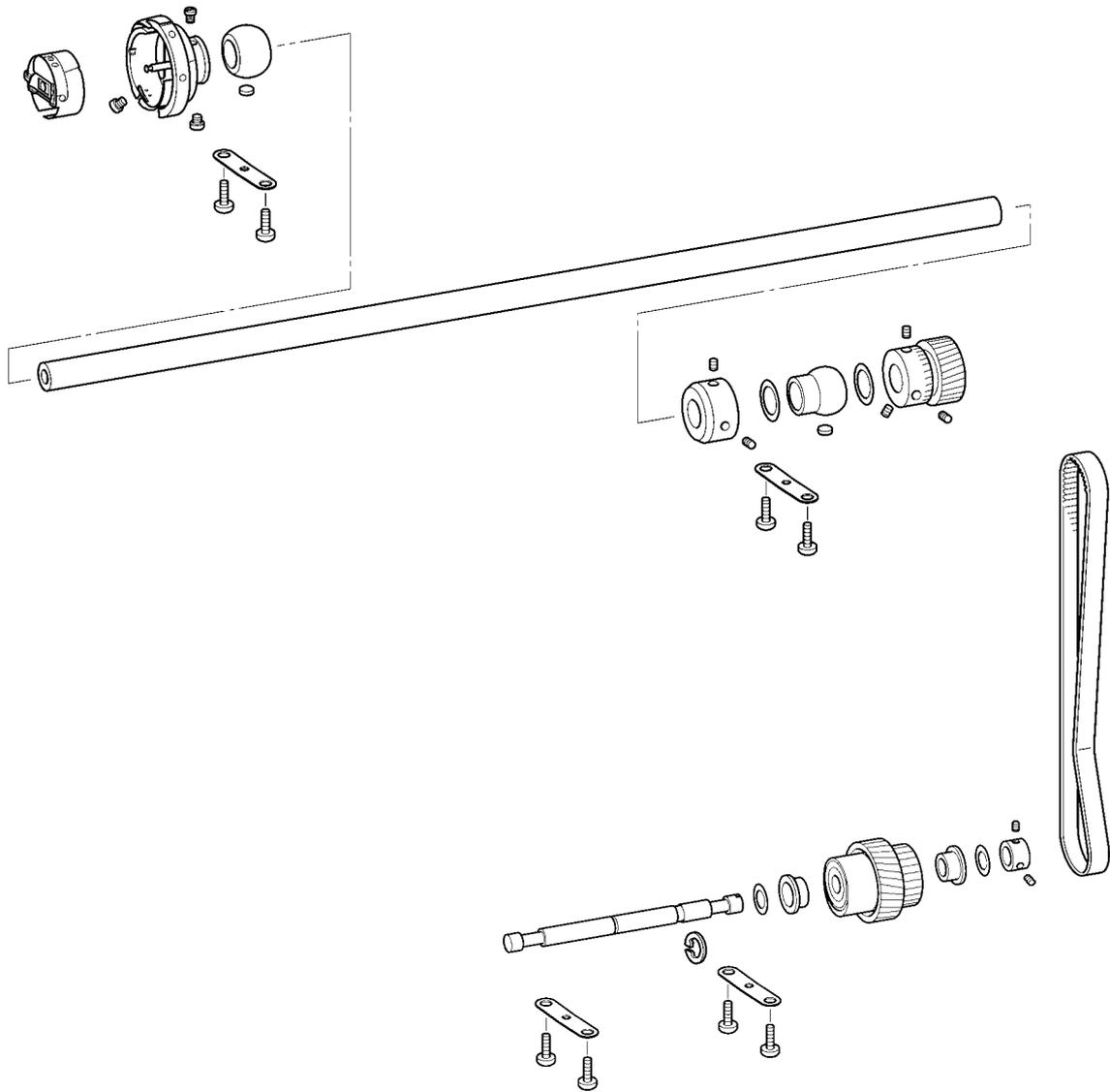
### \*Key point

- Connect each of the power lead wires to the terminal adjacent to the rocker switch lead wire ⑤ of the same color.
2. Attach the power switch assembly ② to the base frame with the 2 screws ①.
  3. Attach the inlet cover ③ to the base frame with the 2 screws ②.
  4. Place the power switch assembly's rocker switch ④ in the inlet cover ③ (pay attention to the direction), and then attach the inlet cover lid with the 2 screws ③.
  5. Attach the power lead wire assembly to the base frame with the screw ④ and the cord clamp (NK-6N).
  6. Attach the Y-area sensor assembly's lead wire to the base frame with the screw ⑤ and the cord clamp (NK-6N).
  7. Attach the power PCB assembly's lead wire to the base frame with the screw ⑥ and the cord clamp (NK-6N).



①		Screw, Pan (S/P washer) M4X8	Torque 0.78 – 1.18 N-m
②		Tap (T), Bind B M3X10	Torque 0.39 – 0.78 N-m
④		Screw, Pan (S/P washer) M4X8	Torque 0.78 – 1.18 N-m
⑤		Screw, Pan (S/P washer) M4X8	Torque 0.78 – 1.18 N-m
⑥		Screw, Pan (S/P washer) M4X8	Torque 0.78 – 1.18 N-m

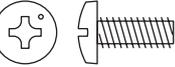
Lower shaft unit

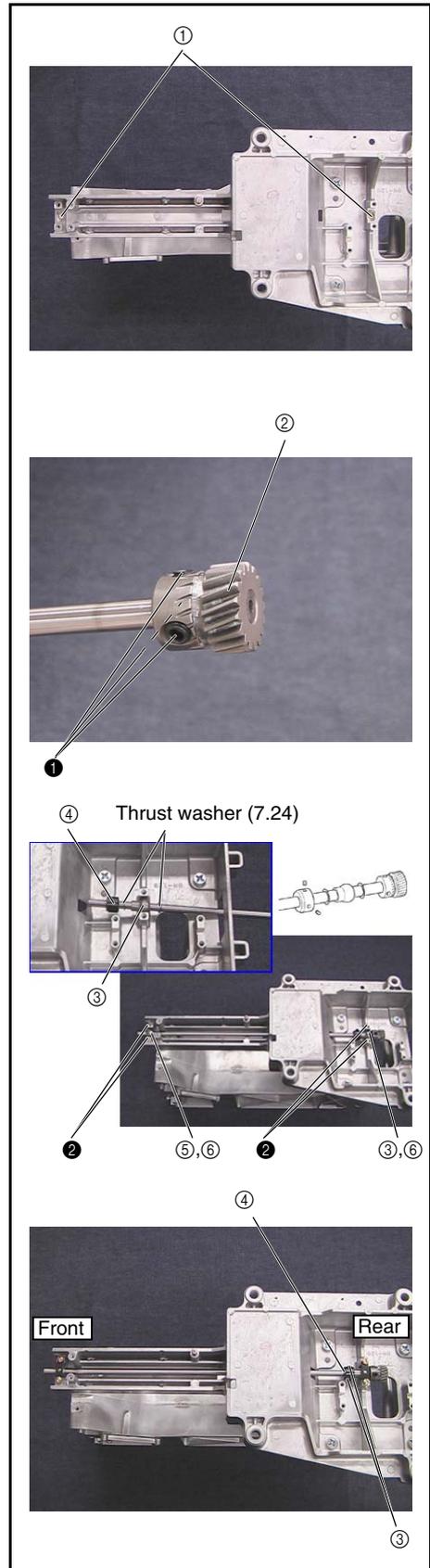


## 1 Lower shaft attachment

1. Apply FBK OIL RO100 to the 2 felts ①.
2. Attach the felt to the lower shaft metal collars on the arm bed. (2 locations)
3. Thread the lower shaft gear ② through the lower shaft, align the lower shaft end face with the lower shaft gear end face, and tighten the 3 screws ①.
4. Insert the lower shaft into the hole of the arm bed, and then insert the thrust washer (7.24), lower shaft metal R ③, thrust washer (7.24) and the collar ④ into the lower shaft.
5. Insert the lower shaft into the hole of the arm bed, and then insert the lower shaft metal F ⑤ into the lower shaft.
6. Secure the 2 lower shaft metal pressers ⑥ with the 4 screws ②.
7. Move the lower shaft to the front and the collar ④ to the rear, and then secure the collar ④ with the 2 screws ③.

Apply FBK OIL RO100 to the 2 felts.	Soak the felts in FBK OIL RO100.
Apply oiler to the lower shaft metal.	1 to 2 drops

① ③		Set Screw, Socket (CP) M6X6	Torque 1.18 – 1.57 N-m
②		Tapite, Bind S M4X10	Torque 1.47 – 1.96 N-m

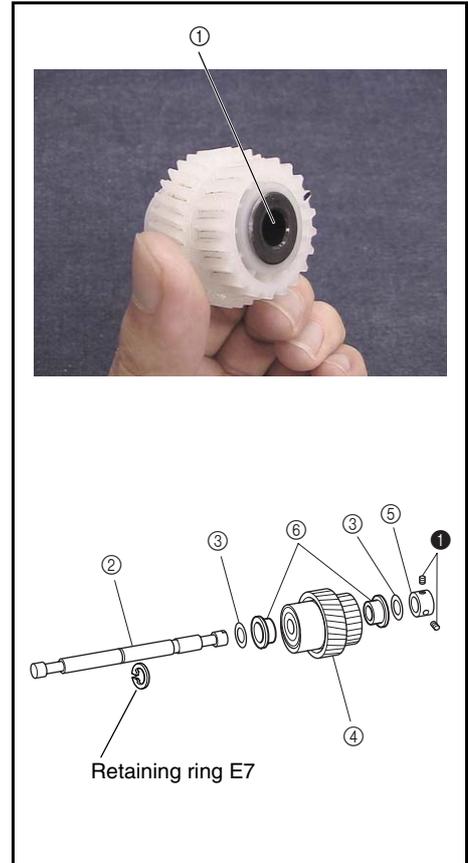


### 2 Idle pulley assembly

1. Apply FBK OIL RO100 to the shaft hole ① on the idle pulley.
2. Attach the 2 ball bearings ⑥ to the idle pulley.
3. Attach the retaining ring E7 to the idle pulley shaft ②.
4. Attach the thrust washer ③, idle pulley ④, thrust washer ③, and set collar ⑤ to the idle pulley shaft.
5. Draw the set collar toward the idle pulley, and secure the set collar with the 2 screws ①.

Apply FBK OIL RO100 to the shaft hole on the idle pulley.	1 drops
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①		Set Screw, Socket (CP) M4X4	Torque 0.78 – 1.18 N-m
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### 3 Idle pulley assembly attachment

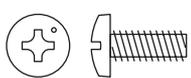
1. Hang the T-belt (S5M-525) ② over the idle pulley assembly ①, and attach the idle pulley assembly's 2 lower shaft metals so that they are aligned with the lower shaft metal collars of the arm bed.
2. Attach the 2 bushing pressers and temporarily tighten them with 4 screws ①.
3. Insert a flat screwdriver from the rear, rotate the idle pulley shaft ③, and adjust the backlash between the lower shaft gear ④ and the idle pulley ⑤.
4. Firmly tighten the 4 screws ① securing the 2 bushing pressers.

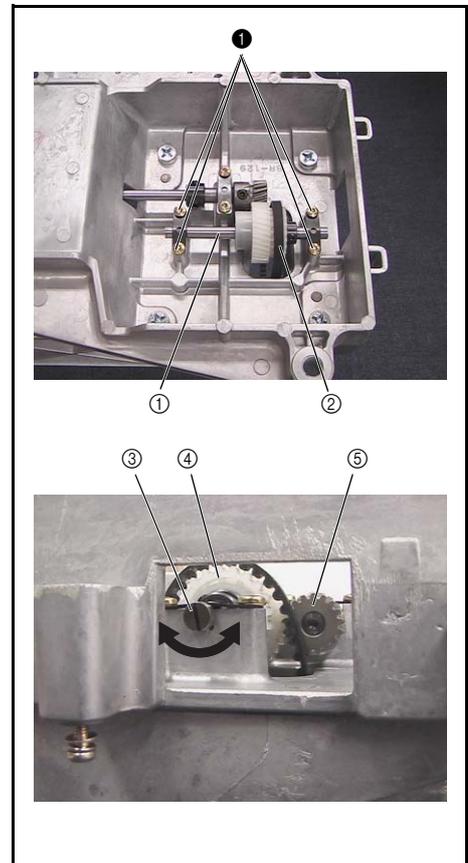
**\*Key point**

- Check that there is no backlash in the lower shaft.

5. Apply MOLYKOTE EM30L to the lower shaft gear.

Backlash between lower shaft gear and idle pulley:	0.03 mm
Apply MOLYKOTE EM30L to the lower shaft gear.	Gear circumference

①		Taprite, Bind S M4X10	Torque 1.47 – 1.96 N-m
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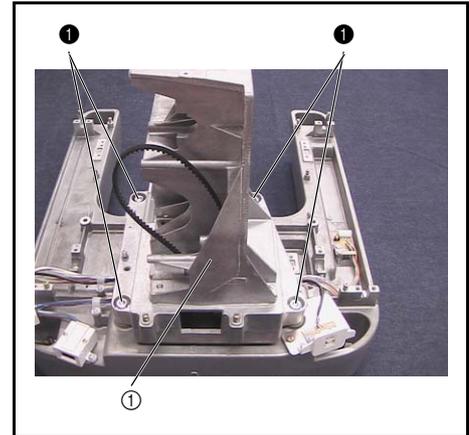
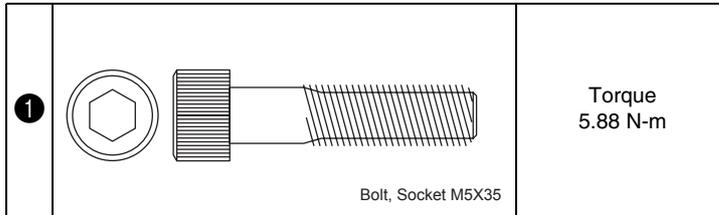


#### 4 Connection of arm bed and base frame

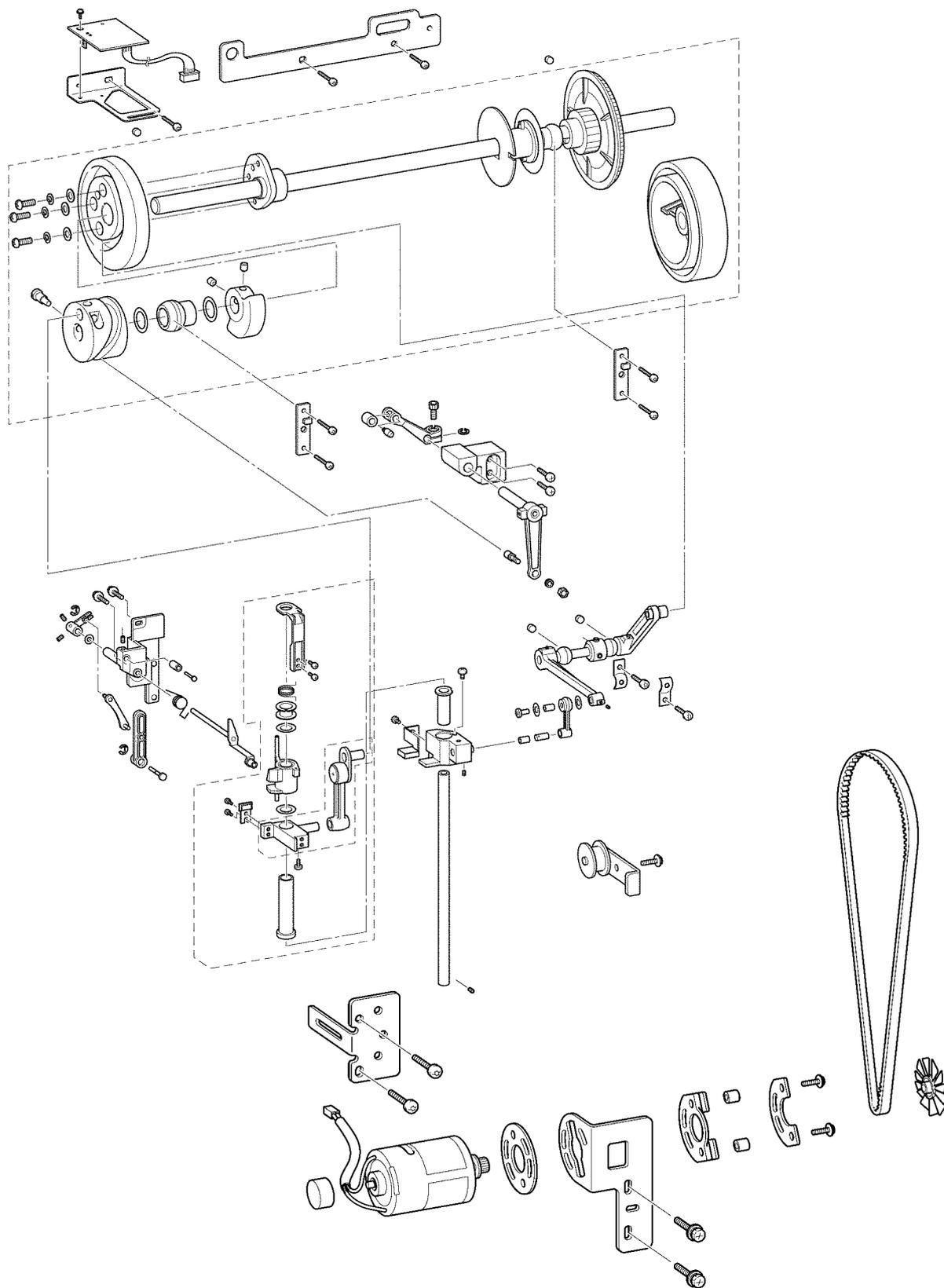
1. Attach the arm bed ① to the base frame, and temporarily tighten the 4 screws ① and 4 plain washers M8.
2. Align the arm bed with the marking on the base frame, and firmly tighten the 4 screws ①.

**\*Key point**

- Attach the arm bed so that it is parallel to the base frame.



Upper shaft unit

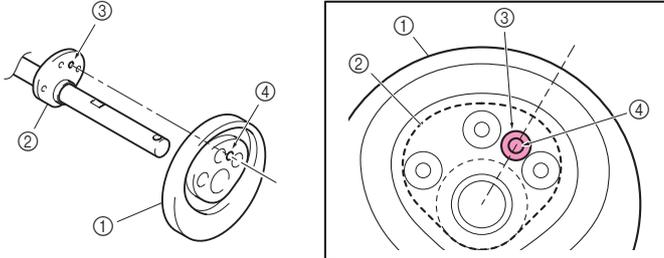


### 1 Upper shaft assembly

1. Set the presser foot cam ① to the presser foot cam collar ②.

**\*Key point**

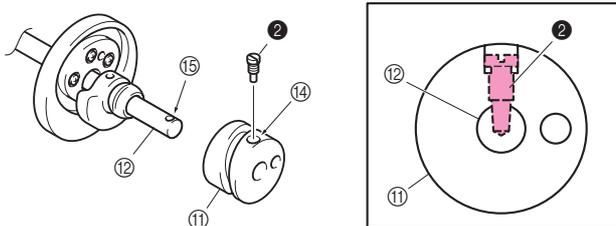
- Check that the center of the positioning hole ③ of the presser foot cam ① is the same as the center of the positioning hole ④ of the presser foot cam collar ②.



2. Secure the presser foot cam ① and the presser foot cam collar ② with the 3 washer plains S4 ⑤ the 3 spring washers ⑥ and the 3 screws ①.
3. Insert the balancer ⑦, the washer, thrust ⑧, the upper shaft metal ⑨, the washer, thrust ⑩ and the thread take-up cam ⑪ into the upper shaft ⑫ in this order.

**\*Key point**

- Check that the cut surface ⑬ of the balancer ⑦ is the direction side of the upper shaft metal ⑨.
4. Align the positioning hole ⑭ of the thread take-up cam ⑪ with the positioning hole ⑮ of the upper shaft ⑫, and then insert the shaft position of the screw ② into the positioning hole ⑮, and then tighten the screw ②.



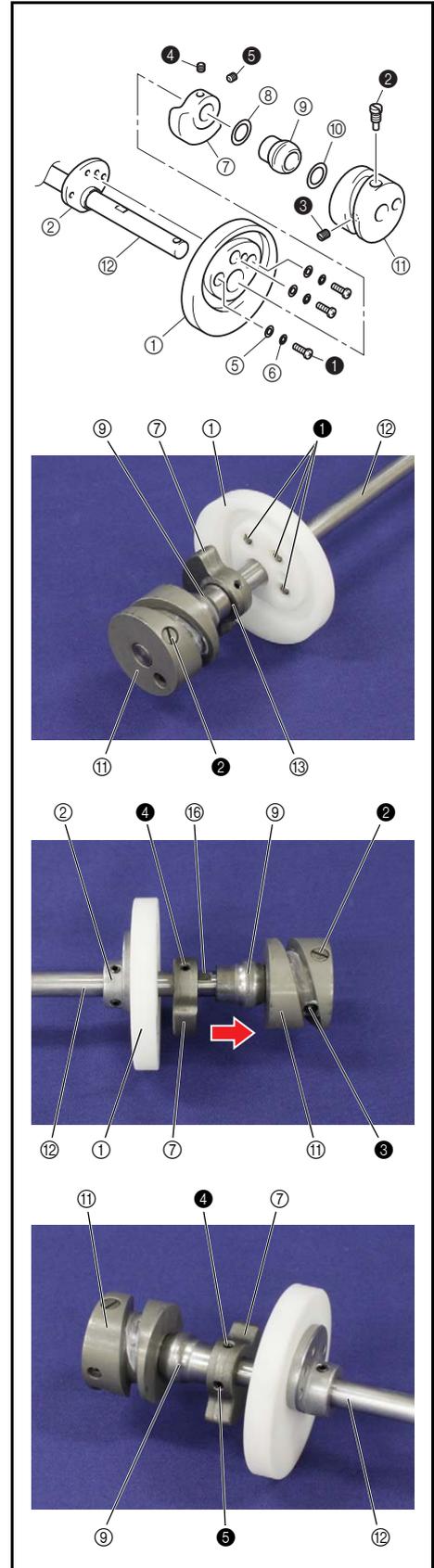
5. Tighten the screw ③.
6. Slide the balancer ⑦ to the direction of the allow, and then secure it with the screw ④.

**\*Key point**

- Check that align the screw ④ with the D cut surface ⑯ of the upper shaft ⑫.
- Check that the upper shaft metal ⑨ is not a wobble, and it moves smoothly.

7. Tighten the screw ⑤.

①		Screw, Pan M4X12	Torque 2.15 N-m
②		Screw	Torque 2.94 – 3.92 N-m
③		Set Screw (CP) SM6.35	Torque 1.97 – 1.76 N-m
Flat-blade screwdriver			
④		Set Screw, Socket (CP) M4X4	Torque 0.49 N-m
⑤		Hex wrench 2.0 mm	



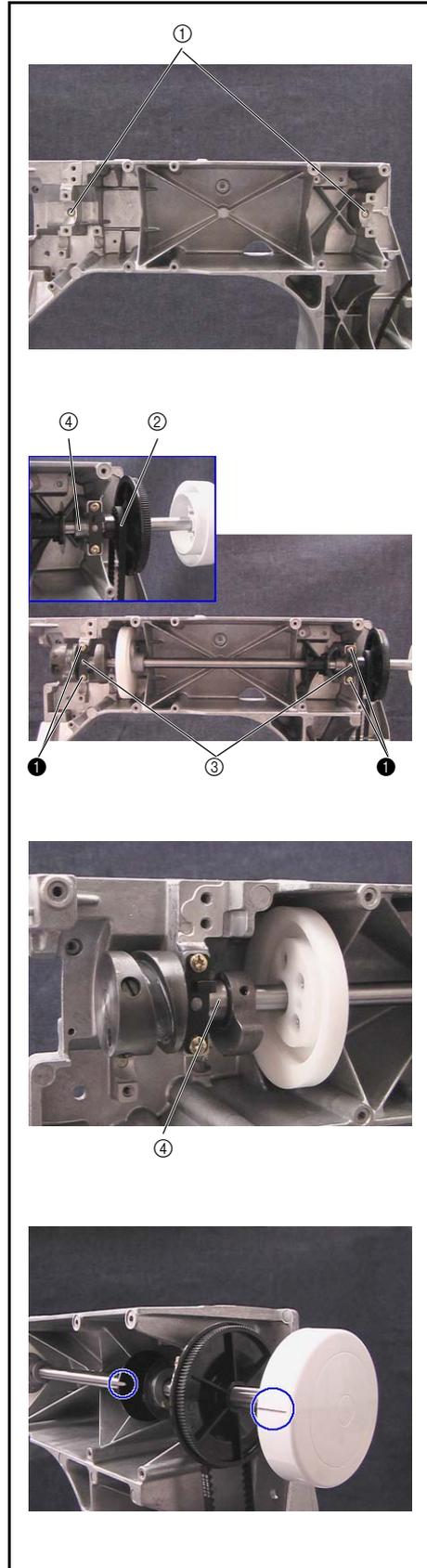
## 2 Upper shaft assembly attachment

1. Apply FBK OIL RO100 to the 2 felts ①.
2. Attach the felts to the lower shaft metal collars on the arm bed. (2 locations)
3. Hang the T-belt (S5M-525) currently on the lower shaft over the timing pulley of the upper shaft final assembly ②. Align the upper shaft final assembly's 2 upper shaft metals with the upper shaft metal collars on the arm bed, and attach the upper shaft to the arm bed.

### \*Key point

- Be careful not to damage the encoder.
4. Secure the 2 metal pressers ③ with the 4 screws ①.
  5. Apply MOLYKOTE EM-30L to the groove on the presser foot cam and thread take-up cam.
  6. Apply oiler to the upper shaft metal ④.
  7. Align the notch on the encoder base with the pulley's base line, and attach the pulley to the upper shaft assembly.

Apply MOLYKOTE EM-30L to the groove on the presser foot cam and thread take-up cam.	Cam groove circumference
Apply oiler to the upper shaft metal.	1 to 2 drops

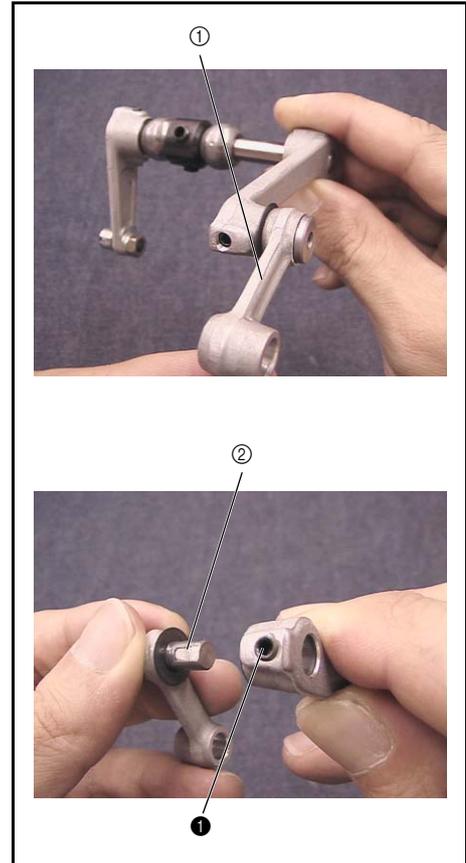


①		Taptite, Bind S M4X10	Torque 1.47 – 1.96 N-m
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### 3 Presser foot driving shaft assembly

1. Attach the thrust washer and the presser foot lever shaft to the presser foot connecting rod ①.
2. Align the screw hole on the presser foot driving shaft assembly with the presser foot lever shaft's D-cut face ②, and secure the presser foot driving shaft assembly with the screw ①.

①		Set Screw, Socket (CP) M4X4	Torque 0.78 – 1.18 N-m
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#### 4 Presser foot driving shaft assembly attachment

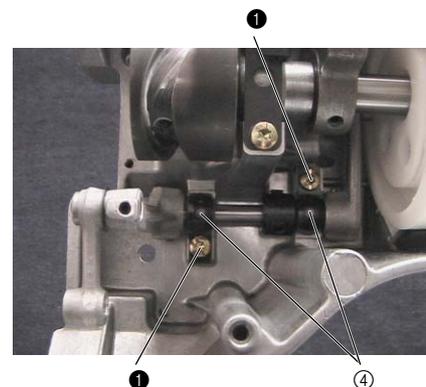
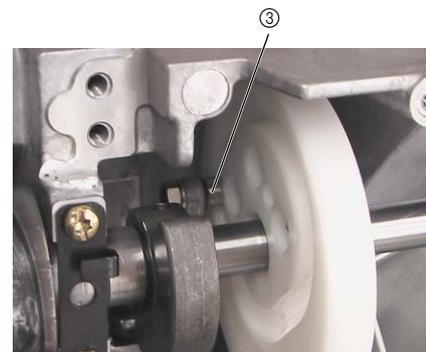
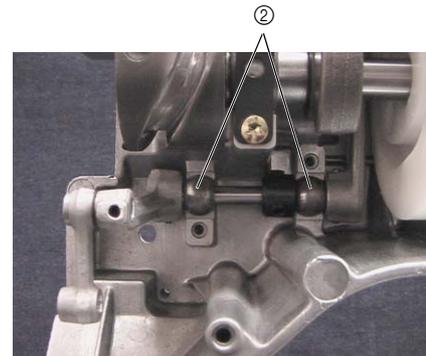
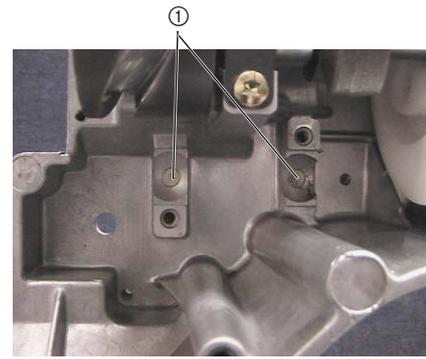
1. Apply FBK OIL RO100 to the 2 felts ①.
2. Attach the felts to the lower shaft metal collars on the arm bed. (2 locations)
3. Align the presser foot driving shaft assembly's 2 lower shaft metals ② with the lower shaft metal collar on the arm bed, and then attach the presser foot driving shaft assembly to the arm bed.

**\*Key point**

- Place the presser foot driving shaft assembly's roller ③ into the groove on the presser foot cam.
4. Secure the 2 bushing pressers with the 2 screws ④.
  5. Apply oiler to the presser foot driving shaft assembly's metal ④.

Apply oiler to the presser foot driving shaft assembly's metal.
---

1 to 2 drops
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①		Taptite, Bind S M4X10	Torque 1.47 – 1.96 N-m
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## 5 Crank rod assembly attachment

1. Attach the crank rod assembly ② to the thread take-up cam ①, and secure them with the 2 screws ①.

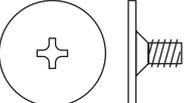
**\*Key point**

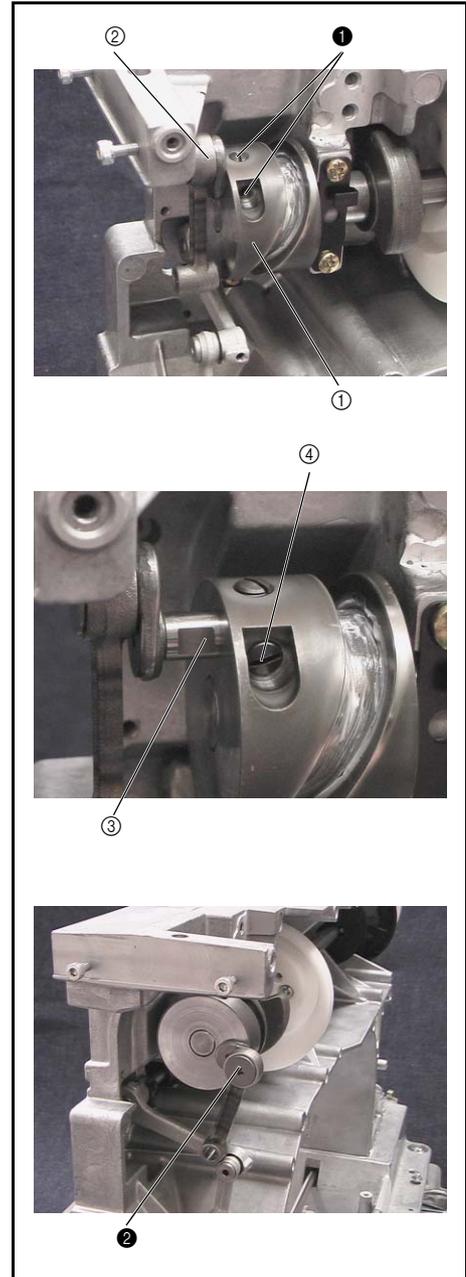
- Align the crank rod assembly's D cut face ③ with screw hole ④.

2. Firmly tighten the screw ②.

**\*Key point**

- Screw ② is a left hand thread.

①		Set Screw (CP) SM6.35	Torque 1.57 – 1.96 N-m
②		Screw SM3.57-40X6 L	Torque 1.18 – 1.57 N-m



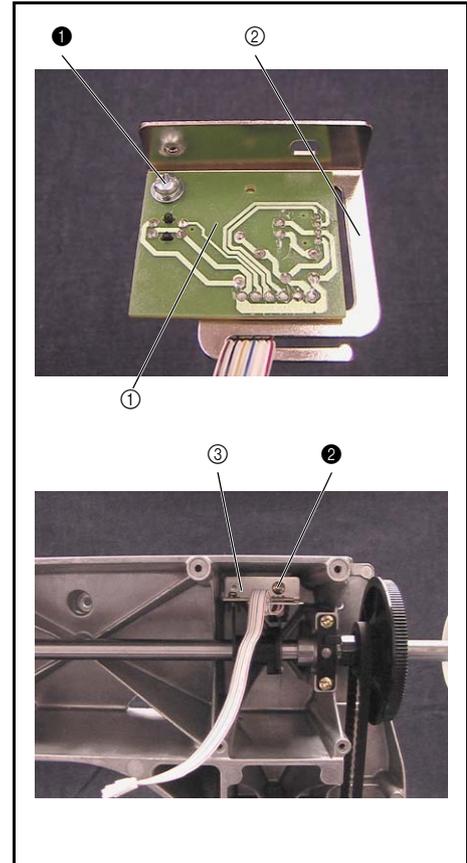
## 6 Main shaft sensor final assembly attachment

1. Attach the main shaft sensor assembly ① to the sensor holder ② with the screw ①.
2. Attach the main shaft sensor final assembly ③ to the arm bed with the screw ②.

### \*Key point

- Rotate the pulley 360 degrees, and check that the photo diode does not contact the 150DPI encoder (transparent disk on the upper shaft final assembly).

①		Screw, Pan (SIP washer) M3X6	Torque 0.59 – 0.78 N-m
②		Screw, Pan (SIP washer) M4X10	Torque 1.47 – 1.96 N-m



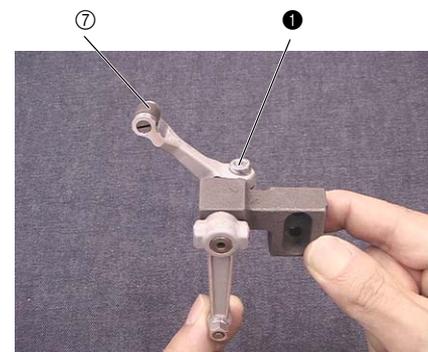
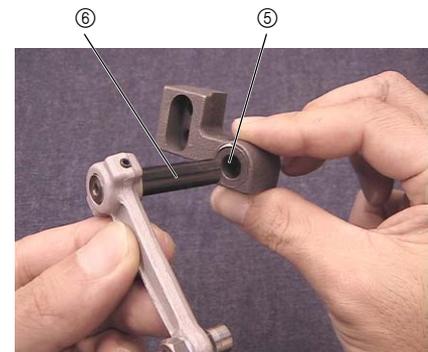
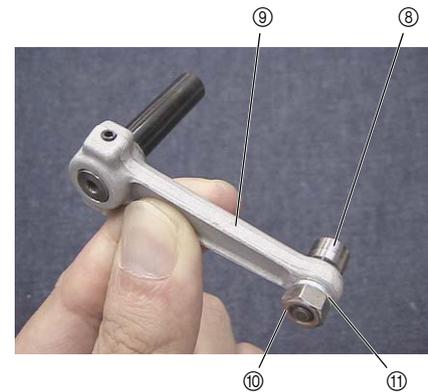
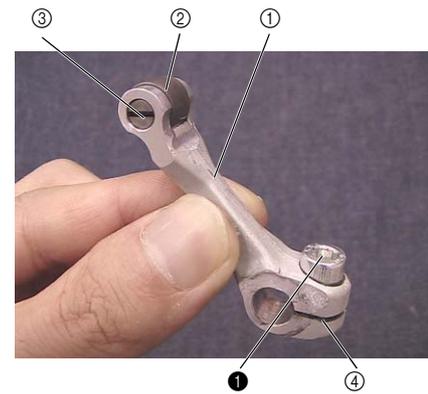
## 7 Thread take-up driving lever final assembly

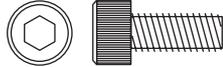
1. Attach the roller ② to the thread take-up differential lever ①, and tighten the thread take-up roller pin ③.
2. Attach the spacer ④ to the thread take-up differential lever, and temporarily tighten the screw ❶.
3. Attach the roller shaft assembly ⑧ to the thread take-up driving lever ⑨ with the nut (1, M5) ⑩ and the spring washer (2-5) ⑪.
4. Apply MOLYKOTE EM-30L to the shaft hole ⑤ on the thread take-up bearing.
5. Thread the thread take-up lever assembly's shaft ⑥ through the hole on the thread take-up bearing, attach the thread take-up differential lever assembly to the tip of the thread take-up driving lever assembly's shaft, and temporarily tighten the screw ❶.

### \*Key point

- Temporarily tighten the screw ❶ first. Firmly tighten it after completing thread take-up differential lever height adjustment in 3 - 61 "Needle bar case final assembly attachment".
6. Apply MOLYKOTE EM-30L to the thread take-up differential lever's roller ⑦.

Apply MOLYKOTE EM-30L to the shaft hole on the thread take-up bearing.	Size of a grain of rice
Apply MOLYKOTE EM-30L to the thread take-up differential lever's roller.	Size of a grain of rice
Tightening torque of thread take-up roller pin:	0.78 - 1.18 N-m



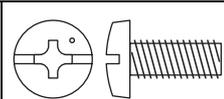
❶		Bolt, Socket M5X12	Torque Hand start
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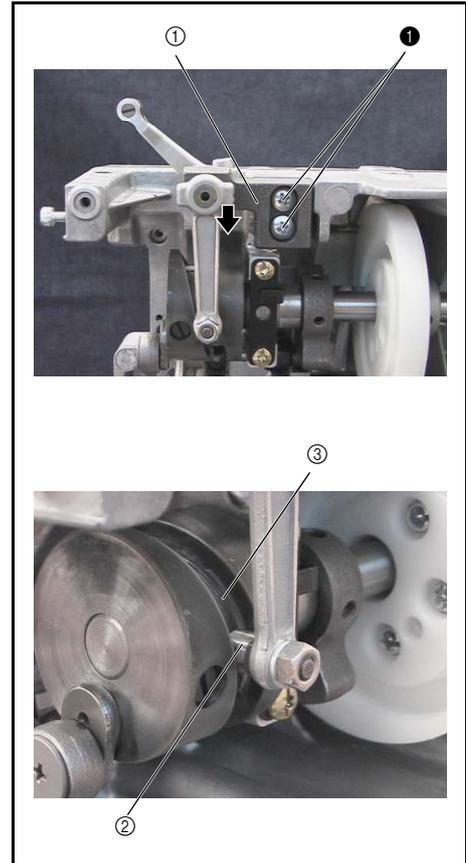
## 8 Thread take-up driving lever final assembly attachment

1. Attach the thread take-up driving lever final assembly ① to the arm bed with the 2 screws ①.

### \*Key point

- Align the roller ② with the groove ③ on the thread take-up cam.
- Press the bottom of the thread take-up driving lever final assembly against the arm bed, and then secure them with the 2 screws ①.

①		Screw, Bind M5X12	Torque 1.57 – 1.96 N-m
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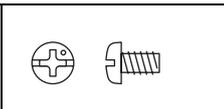
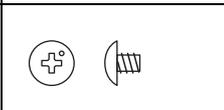
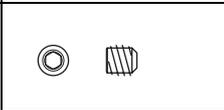


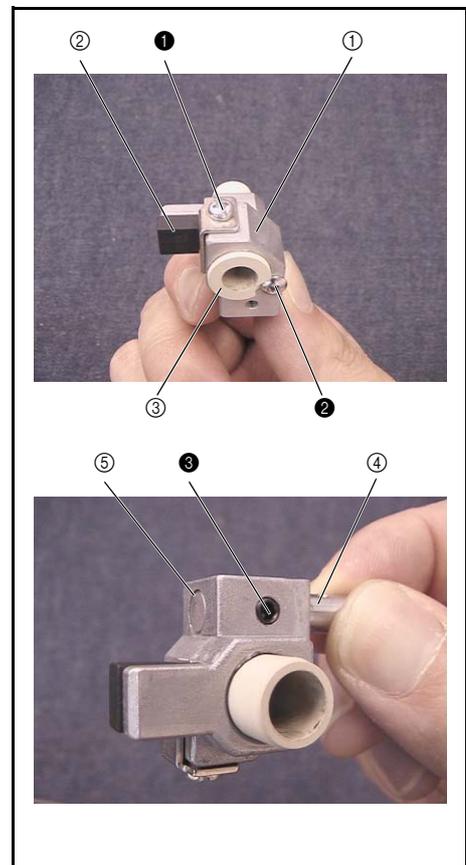
## 9 Presser foot vertical base final assembly

1. Attach the presser foot cushion base ② to the presser foot vertical base ① with the screw ①.
2. Thread the presser foot vertical bush ③ through the presser foot vertical base assembly, and then tighten the screw ②.
3. Attach the presser foot vertical pin ④ to the presser foot vertical base assembly, and tighten the screw ③.

### \*Key point

- Align the presser foot vertical pin with the end face ⑤ of the presser foot vertical base.

①		Screw, Pan M3X5	Torque 0.78 – 1.18 N-m
②		Screw, Truss M2.6X3	Torque 0.59 – 0.78 N-m
③		Set Screw, Socket (CP) M4X4	Torque 1.37 – 1.57 N-m



## 9 Vertical set assembly

1. Attach the J cushion base ② to the J bracket ① with the 2 screws ①.
2. Thread the J vertical bush ③ through the J bracket assembly, and then tighten the screw ②.
3. Apply MOLYKOTE EM-30L to the circumference of the J vertical bush.
4. Attach the thrust washer, jump bracket ④, and second thrust washer to the J vertical bush assembly.
5. Attach the spring S45 to the J spring collar ⑤.

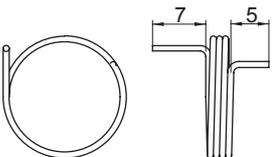
### \*Key point

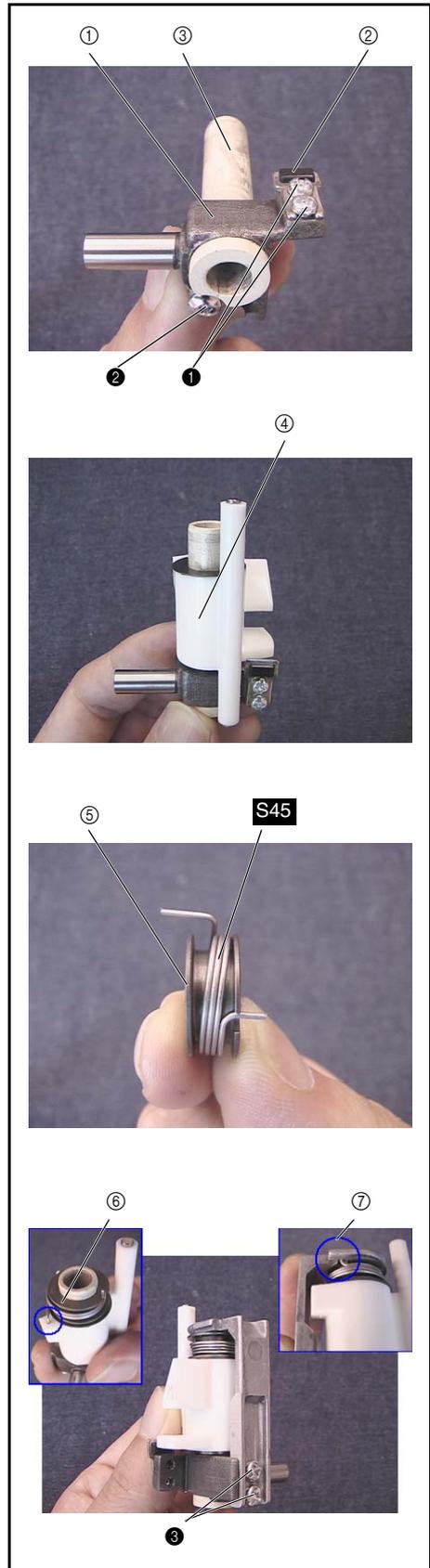
- Hang the shorter hook of the J spring over the notch on the J spring collar.
6. Attach the J spring collar assembly to the J vertical bush assembly, and insert the longer J spring hook into the hole ⑥ on the jump bracket.
  7. Insert the shorter J spring hook into the hole ⑦ on the J clamp while aligning the spring hook with the notch on the J spring collar, and then tighten the 2 screws ③.

### \*Key point

- Check that there is no axial backlash in the J bracket.

Apply MOLYKOTE EM-30L to the circumference of the J vertical bush.	Size of a grain of rice
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①		Screw, Pan M2.6X3	Torque 0.59– 0.78 N-m
②		Screw, Truss M2.6X3	Torque 0.59 – 0.78 N-m
③		Screw, Pan M3X4	Torque 0.78 – 1.18 N-m
S45		J SPRING XC5617***	



## 10 Base needle bar attachment

1. Apply MOLYKOTE EM-30L to the shaft ① and the hole ② of the J-clamp final assembly and the presser foot vertical base assembly.
2. Attach the base needle bar ③, J vertical set assembly ④, and presser foot vertical base assembly ⑤.

### \*Key point

- Insert the shaft ① of the J vertical set assembly to the crank rod ⑥.
- Insert the shaft ① of the presser foot vertical base assembly to the presser foot connecting rod ⑦.

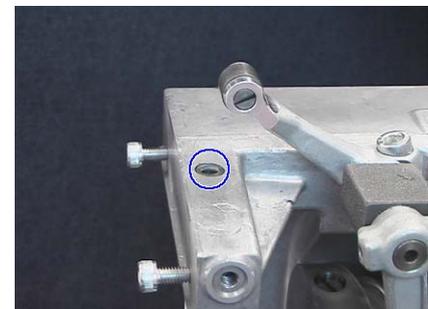
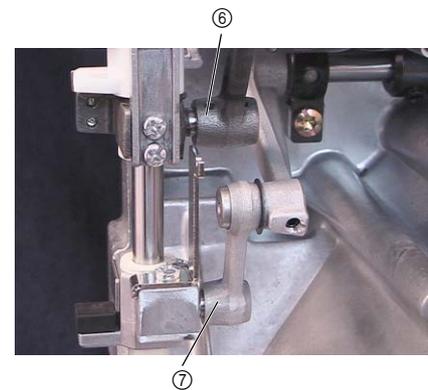
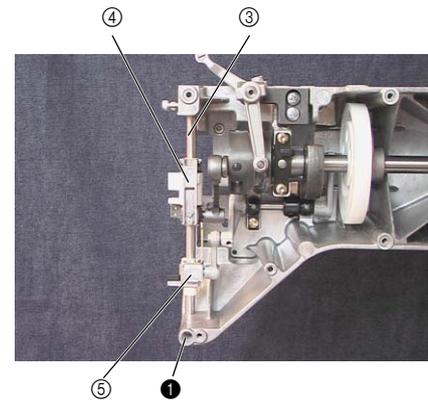
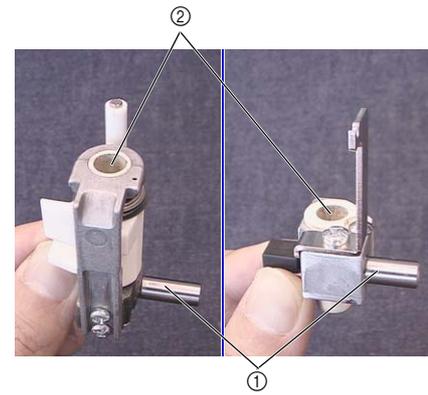
3. Tighten the screw ❶.

### \*Key point

- Align the needle bar with the top face of the arm bed.

Apply MOLYKOTE EM-30L to the shaft and the hole of the J vertical set assembly and the presser foot vertical base assembly.
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Size of a grain of rice
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❶		Set Screw, Socket (CP) M5X8	Torque 1.18 – 1.57 N-m
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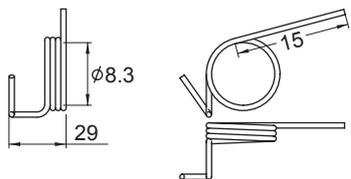
## 11 Driving jump assembly (1)

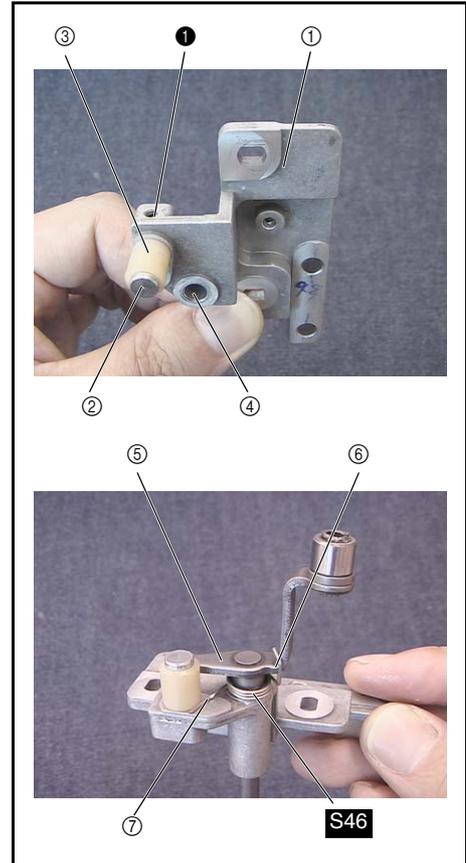
1. Attach the J cushion pin ② and the J cushion ③ to the J base assembly ①, and then tighten the screw ①.
2. Apply MOLYKOTE EM-30L to the shaft hole ④ on the J base assembly.
3. Thread the spring S46 through the shaft of the J driving level assembly ⑤, and insert the J driving lever assembly to the J base assembly.

### \*Key point

- Hang the U-shaped hook ⑥ of the spring S46 over the J driving lever assembly, and then the other hook ⑦ over the J cushion.

Apply MOLYKOTE EM-30L to the shaft hole on the J base assembly.	Size of a grain of rice
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①		Set Screw, Socket (FT) M3X4	Torque 0.59 – 0.78 N-m
S46		J LEVER SPRING XC5665***	



## 12 Driving jump assembly (2)

### \*Key point

- Use a positioning pin (one of adjustment jigs).

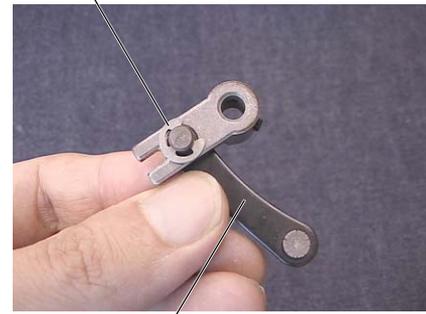
1. Thread the plain washer M5 through the differential lever, attach the differential lever to the J link assembly ①, and then attach the retaining ring E4.
2. Thread the J slide lever shaft ③ through the J slide lever ②, and then attach the retaining ring E4.
3. Apply MOLYKOTE EM-30L to the 3 holes ④ on the J slide lever assembly.
4. Attach the J slide lever assembly to the 2 shafts of the J base assembly.
5. Thread the thrust washer onto the shaft ⑤ of the J driving lever, and attach the J differential lever assembly while aligning it with the shaft of the J driving lever and the hole on the J slide lever.
6. Thread the positioning pin ⑧ through the positioning hole ⑥ of the J base assembly and the positioning groove ⑦ of the J link assembly, and then tighten the 2 screws ① to secure the J link assembly.

Apply MOLYKOTE EM-30L to the 3 holes on the J slide lever assembly.

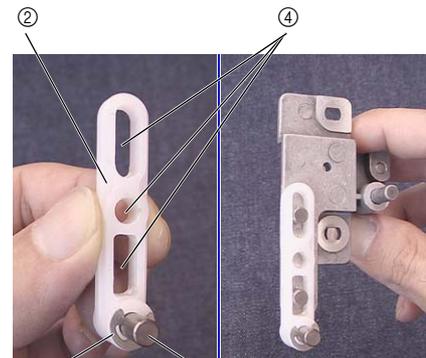
Size of a grain of rice

①	 	Set Screw, Socket (CP) M3X4	Torque 0.59 – 0.78 N-m
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Retaining ring E4

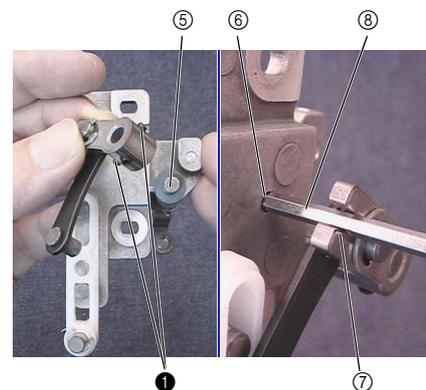


①



Retaining ring E4

③



①

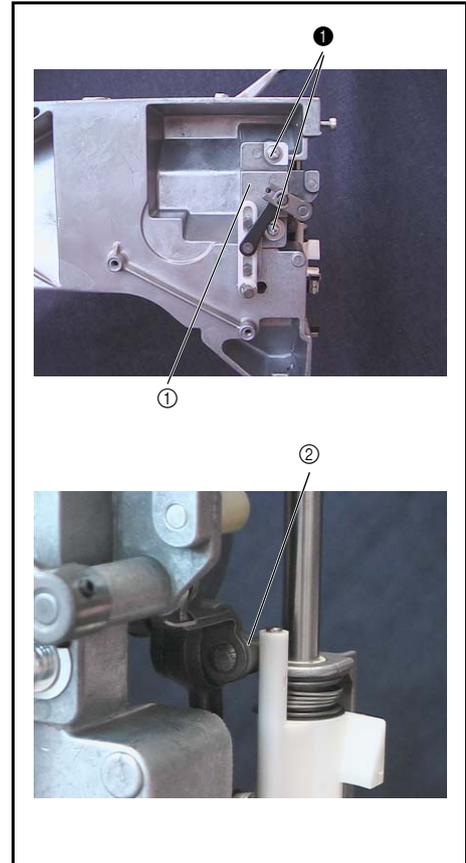
### 13 Driving jump assembly attachment

1. Attach the driving jump assembly ① to the arm bed with the 2 screws ①.

**\*Key point**

- Adjust the attachment position of the driving jump assembly so that the clearance ② between the driving jump assembly's J driving lever bearing and the J-clamp final assembly's jump bracket is 0 to 0.2 mm.

①		Screw, Pan (SIP washer) M4X10	Torque 1.18 – 1.57 N-m
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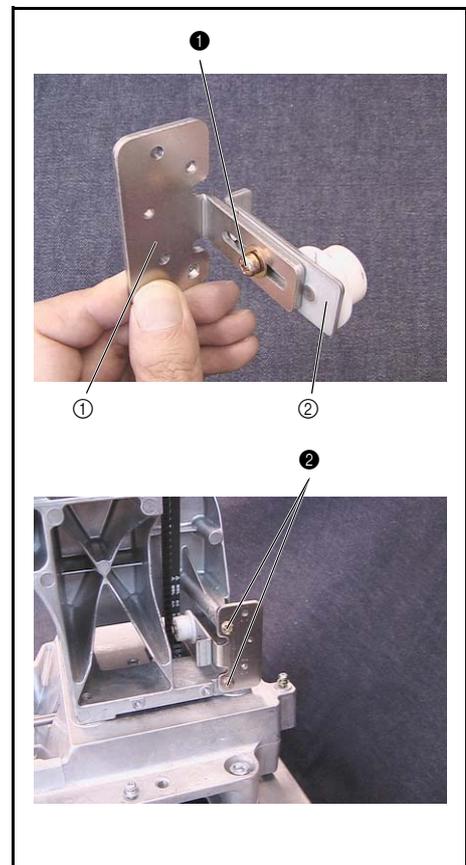
### 14 Tension pulley assembly attachment

1. Attach the tension pulley assembly ② to the motor holder base ① with the screw ①.

**\*Key point**

- Temporarily tighten the screw ① first. Firmly tighten it after completing 4 - 16 "Timing belt tension."
2. Attach the tension pulley final assembly to the arm bed with the 2 screws ②.

①		Screw, Pan (SIP washer) M4X10	Torque Hand start
②		Tapite, Bind S M4X10	Torque 1.47 – 1.96 N-m

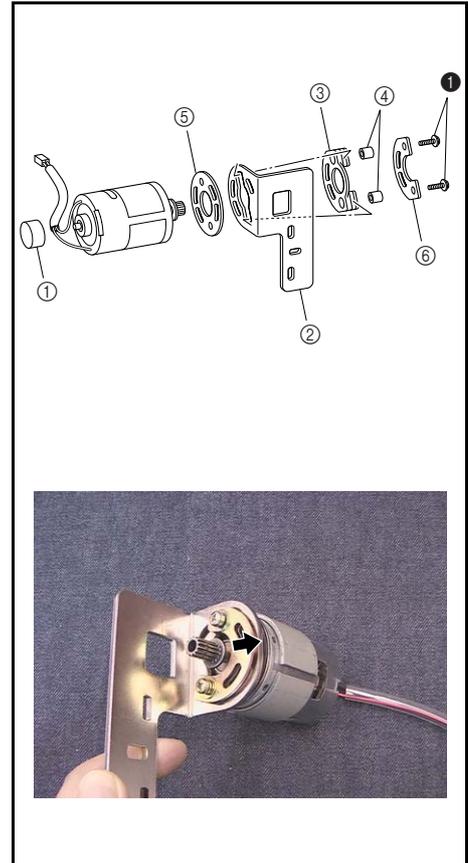


## 15 Main motor final assembly

1. Attach the motor cap ① to the main motor assembly.
2. Attach the fender rubber ③ to the motor holder ②.
3. Attach the 2 spacers (4 x 7) ④ to the fender rubber.
4. Attach the motor holder spacer ⑤, motor holder assembly, and motor spacer presser ⑥ to the main motor assembly with the 2 screws ①.

### \*Key point

- Tighten the screw ① with the main motor moved in the direction of the arrow.



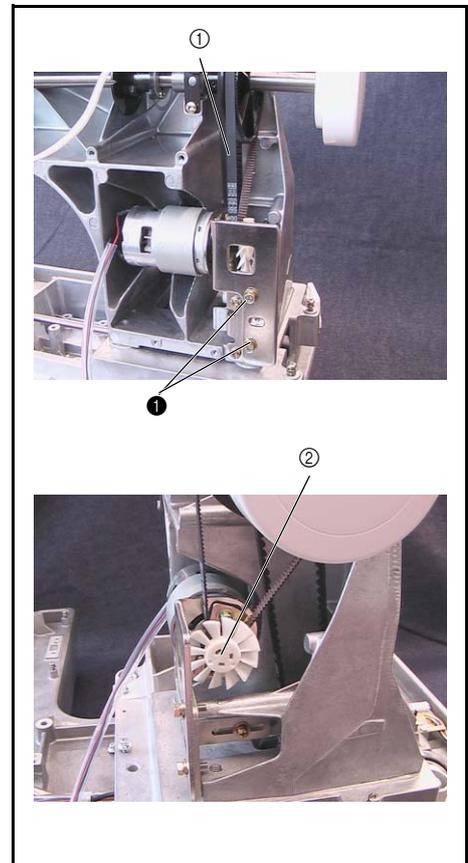
①		Screw, Pan (S/P washer) M4X16	Torque 1.18 – 1.57 N-m
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## 16 Main motor final assembly attachment

1. Hang the T belt (XA9644-050) ① over the pulley on the main motor assembly and the pulley on the upper shaft assembly, and then attach the main motor final assembly to the arm bed with the 2 screws ①.

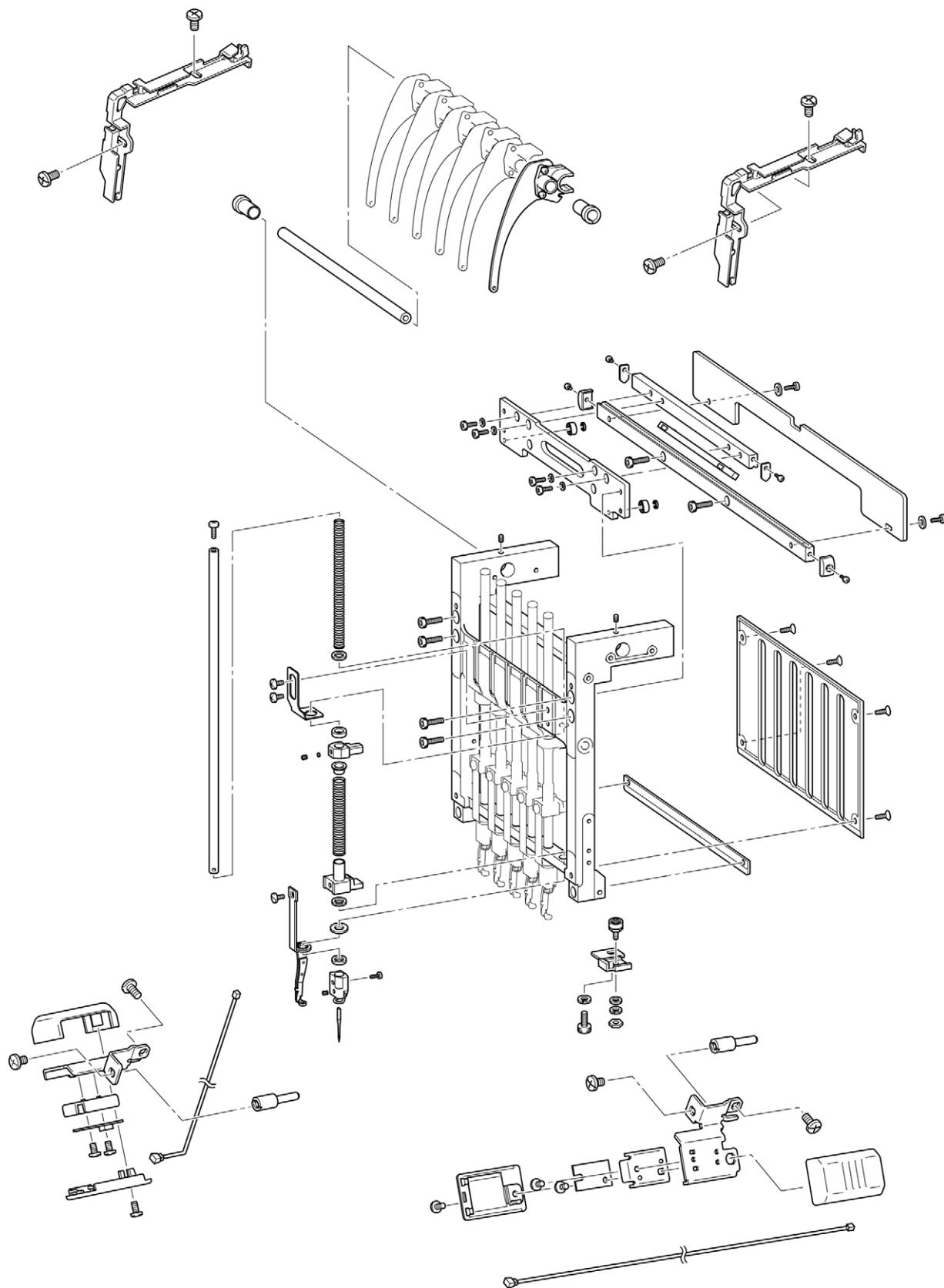
### \*Key point

- Temporarily tighten the screw ① first. Firmly tighten it after completing 4 - 15 "Motor belt tension."
2. Attach the motor fan ② to the pulley on the main motor assembly.



①		Upset 4X14DB	Torque Hand Start
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Needle bar unit



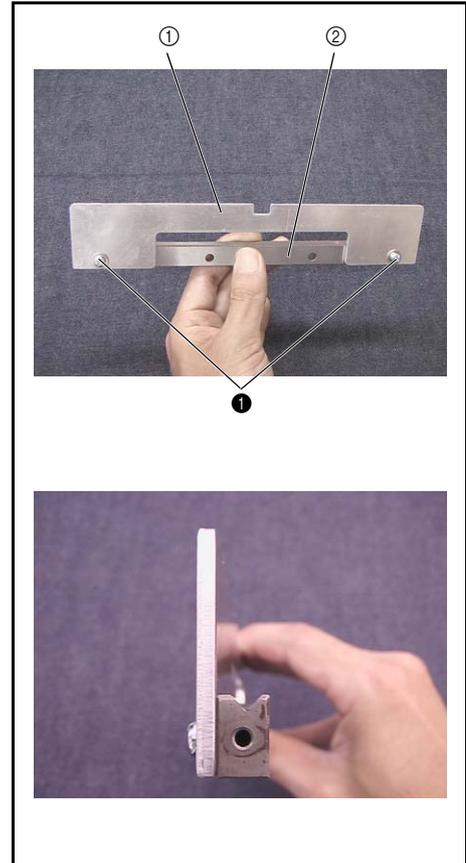
## 1 Case guide UL assembly

1. Attach the thread take-up guide ① to the case guide UL ② with the 2 screws ③.

**\*Key point**

- Check that these are attached in the direction shown in the photo.

③	 	Screw, Pan M4X8	Torque 1.18 – 1.57 N-m
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## 2 Case bracket assembly

1. Attach the 2 ball bearings 694 to the case bracket assembly ①, and attach the 2 retaining rings E3.
2. Place the 4 washers (plain S, 4) in the case bracket assembly ①, and then attach the case guide US ② with the 4 screws ❶.

### \*Key point

- Temporarily tighten the screw ❶ first. Firmly tighten it after completing 3 - 55 "Case bracket assembly attachment."



❶



Retaining ring E3

②



❶		Bolt, Socket M4X8	Torque Hand start
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### 3 Case bracket assembly attachment

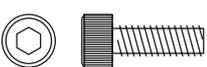
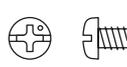
1. Attach the case guide UL assembly ① to the arm bed with the 2 screws ①.
2. Apply MOLYKOTE EM - 30L to the slide roller ② (4 locations).
3. Place the slide roller ② in the V groove on the case bracket assembly, slide the case bracket assembly horizontally to attach it to the case guide UL assembly ①, and then firmly tighten the 2 screws ② of the case bracket assembly.

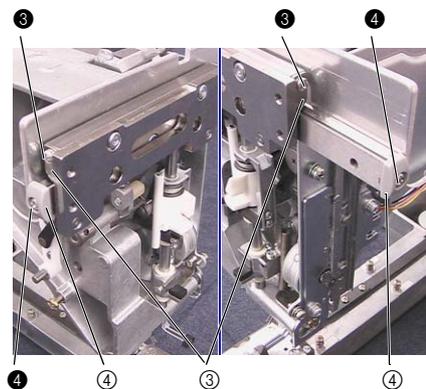
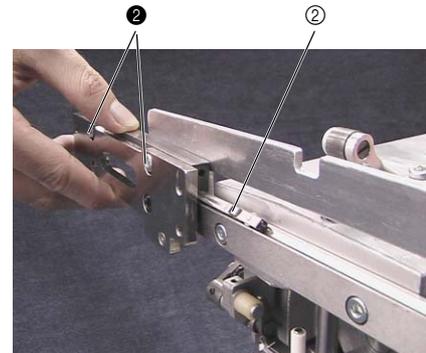
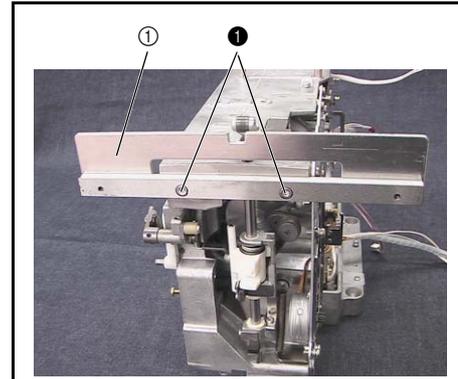
**\*Key point**

- Adjust the attachment position of the case bracket assembly vertically so that the clearance between the 2 ball bearings 694 of the case bracket assembly and the case guide UL assembly is zero.
4. Attach the 2 slide roller stoppers ③ to both ends of case guide US with the 2 screws ③.
  5. Attach the 2 case guide UL lids ④ to both ends of the case guide UL assembly with the 2 screws ④.

Apply MOLYKOTE EM-30L to the 4 slide rollers.
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Size of a grain of rice
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①		Bolt, Socket M4X12	Torque 1.18 – 1.57 N-m
②			
③		Screw, Pan M3X4	Torque 0.59 – 0.78 N-m
④			



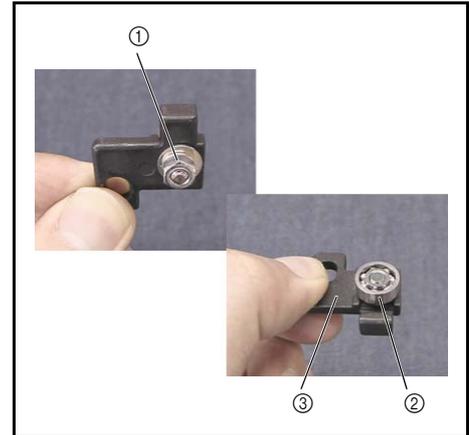
#### 4 Case positioning plate assembly

1. Attach the ball bearing 694 assembly ② to the case positioning plate ③ with the nut 2, M4 ①, spring washers 2-4, and plain washers M4.

**\*Key point**

- Temporarily tighten the nut 2, M4 ① first. Firmly tighten them after completing 3 - 61 "Needle bar case final assembly attachment."

Tightening torque of nut (2, M4):	Torque
Temporary tightening:	Hand start

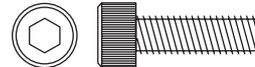


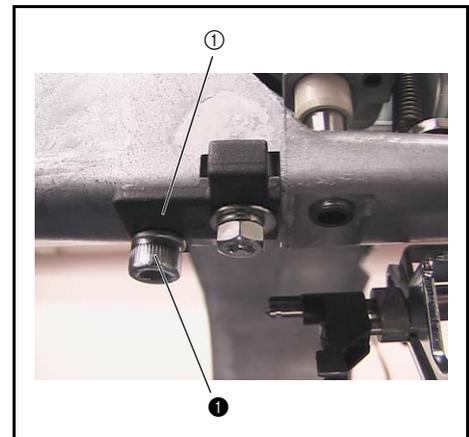
#### 5 Case positioning plate assembly attachment

1. Attach the case positioning plate assembly ① to the arm bed with the screw ① and the spring washer 2-5.

**\*Key point**

- Temporarily tighten the screw ① first. Firmly tighten it after completing 4 - 17 "Needle drop (front/back)."

①		Bolt, Socket M5X16	Torque 1.18 – 1.57 N-m
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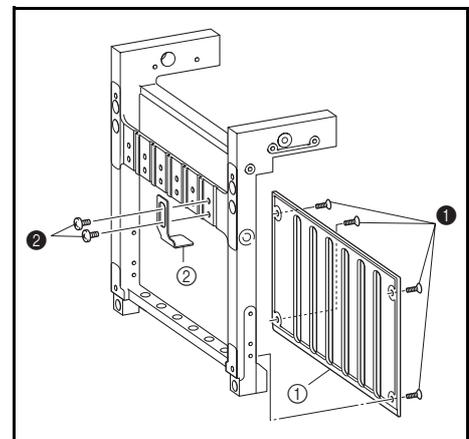
#### 6 Needle bar case final assembly

1. Attach the needle bar guide rail ① to the needle bar case assembly with the 4 screws ①.
2. Attach the top dead center plate ② to the needle bar case assembly with the 2 screws ②. (6 locations)

**\*Key point**

- Temporarily tighten the screw ② first. Firmly tighten it after completing 4 - 26 "Needle bar top dead center."

①		Screw, Flat M4X10	Torque 1.18 – 1.57 N-m
②		Screw, Blind M4X6	Torque Hand start



## 7 Needle bar attachment

1. Attach a screw ① to each of the 6 needle bars ①.
2. Apply MOLYKOTE EM-30L to the 12 insertion holes ② on the needle bar case.
3. Attach the spring [S47] and the washer to the needle bar, and then thread the needle bar through the upper hole on the needle bar case assembly. (6 needle bars)
4. Attach the cushion rubber ③, needle bar clamp ④, presser foot spring collar ⑤, spring [S48], presser foot clamp ⑥, and felt (S, hard) ⑦ to the needle bar, and then thread the needle bar through the lower hole on the needle bar case assembly. (6 needle bars)
5. Attach the felt (S) ⑧, presser foot assembly ⑨, presser foot cushion ⑩ (with indentation facing up), and needle bar thread guide ⑪, and then secure the thread guide ⑫ with the screw ②. (6 needle bars)
6. Secure the presser foot assembly to the presser foot clamp with the screw ③. (6 locations)

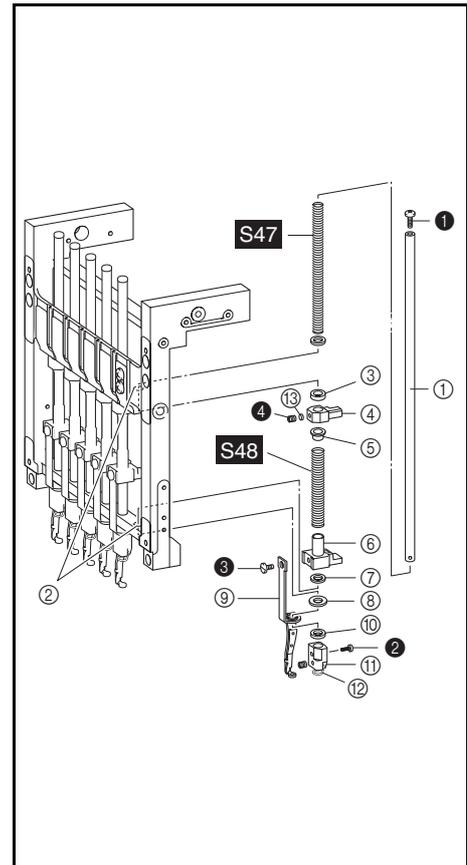
### \*Key point

- Temporarily tighten the screw ③ first. Firmly tighten it after completing 4 - 25 "Presser foot height".

7. Place the washer ⑬ on the screw hole on the needle bar clamp, and tighten the screw ④. (6 locations)

### \*Key point

- Temporarily tighten the screw ④ first. Firmly tighten it after completing 4 - 22 "Needle bar height".



Apply MOLYKOTE EM-30L to the insertion holes on the needle bar case.	Size of a grain of rize
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①		Screw, Pan M5X8	Torque 1.18 – 1.57 N-m
②		Screw SM2.38	Torque 0.29 – 0.49 N-m
③		Screw, PF	Torque Hand start
④		Set Screw, Socket SM4.37-40X4	Torque Hand start
S47		SPRING, NEEDLE BAR XC5680***	
S48		PRESSER FOOT SPRING XC5683***	

## 8 Thread take-up lever assembly

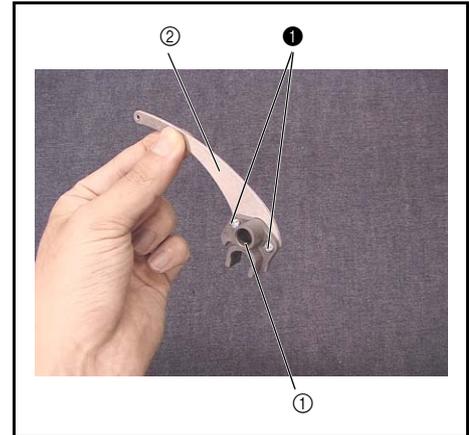
1. Attach the thread take-up boss ① to the thread take-up lever ② with the 2 screws ①. (6 sets)

**\*Key point**

- Apply ThreeBond 1401 to the screw ① and then tighten it.

Apply ThreeBond 1401.	Size of a grain of rice
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①		Screw, Pan M3X6	Torque 0.59 – 0.78 N-m
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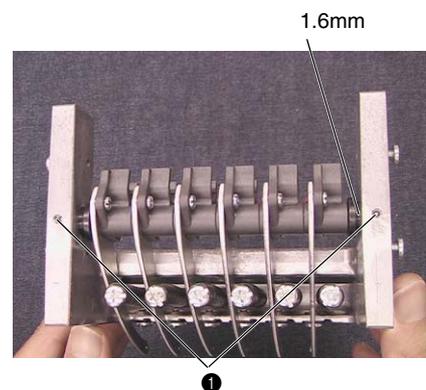
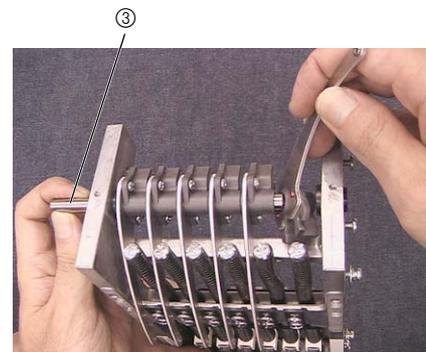
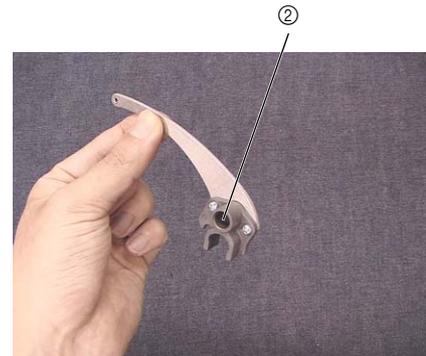
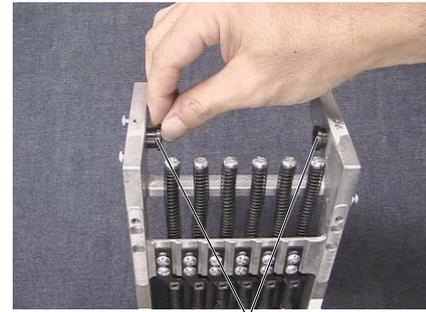


## 9 Thread take-up lever assembly attachment

1. Attach the 2 thread take-up bushes ① to the needle bar case assembly.
2. Apply MOLYKOTE EM-30L to the 6 shaft holes ② on the thread take-up lever assembly.
3. Thread the thread take-up shaft ③ through the thread take-up bush, and then attach the 6 thread take up lever assemblies.
4. Adjust the clearance between the right thread take-up bush and the needle bar case to 1.6 mm, and then secure the thread take-up bush with the screw ①.
5. Move the left thread take-up bush to the right, and then secure the bush with the screw ①.

Apply MOLYKOTE EM-30L to the shaft holes on the thread take-up lever assembly.

Size of a grain of rice

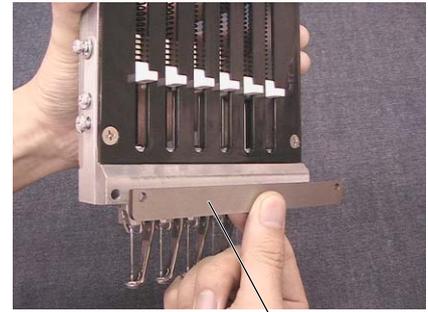


①		Set Screw, Socket (FT) M4X4	Torque 0.78 – 1.18 N-m
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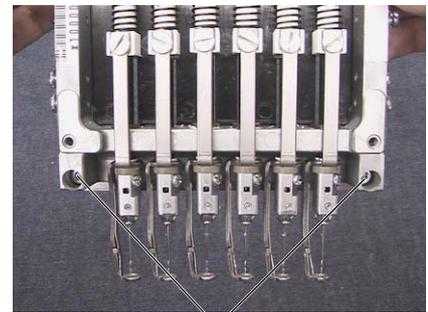
## 10 Case guide D attachment

1. Attach the case guide D ① to the needle bar case assembly with the 2 stud bolt M4 ②.

Tightening torque of stud bolt M4 ②	1.18 - 1.57 N·m
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①

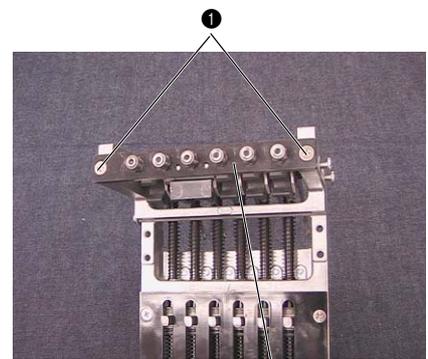


②

## 11 Change roller base assembly attachment

1. Attach the change roller base assembly ① to the needle bar case assembly with the 2 screws ①.

①		Screw, Flat M4X10	Torque 0.78 – 1.18 N·m
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①

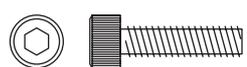
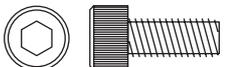
## 12 Needle bar case final assembly attachment

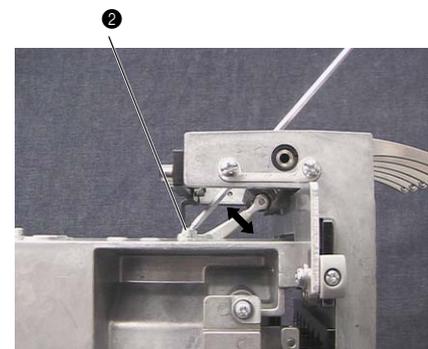
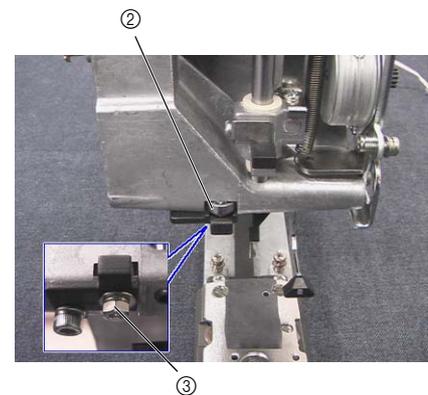
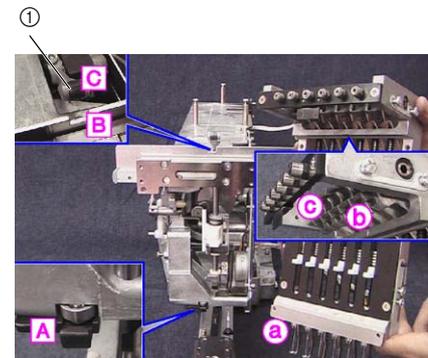
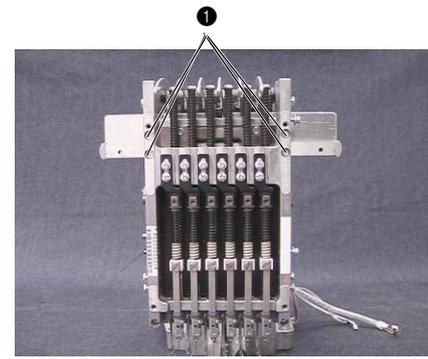
1. Rotate the pulley until the base line on the pulley is at the top.
2. Apply MOLYKOTE EM-30L to the roller ① of the thread take-up differential lever.
3. Attach the needle bar case final assembly to the case bracket assembly with the 4 screws ①.

### \*Key point

- Align the thread take-up boss ⑥ on the thread take-up lever assembly with [B] on the case guide UL assembly, and then align the thread take-up boss ⑦ with the roller [C] on the thread take-up differential lever.
  - Align the case guide D ⑧ with the case positioning plate assembly [A]
4. Move the ball bearing 694 assembly ② on the case positioning plate assembly toward you, and firmly tighten the nut 2, M4 ③.
  5. Adjust the vertical position of the thread take-up differential lever so that the needle bar case final assembly lightly moves right and left. Firmly tighten the screw ②.

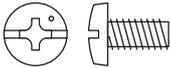
Apply MOLYKOTE EM-30L to the roller on the thread take-up differential lever.	Size of a grain of rice
Tightening torque of nut (2, M4):	1.18 - 1.57 N-m

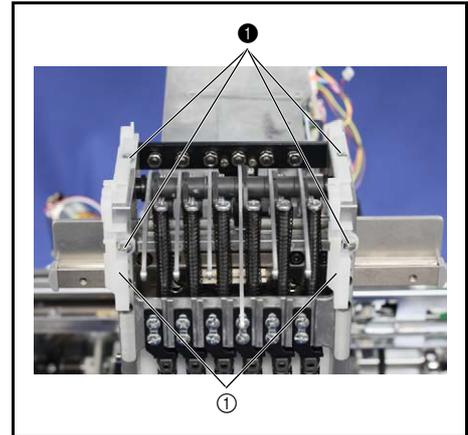
①		Bolt, Socket M4X16	Torque 1.18 - 1.57 N-m
②		Bolt, Socket M5X12	Torque 2.94 - 3.43 N-m



### 13 LED cord guide attachment

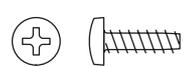
1. Attach the 2 LED cord guide ① with the 4 screws ①.

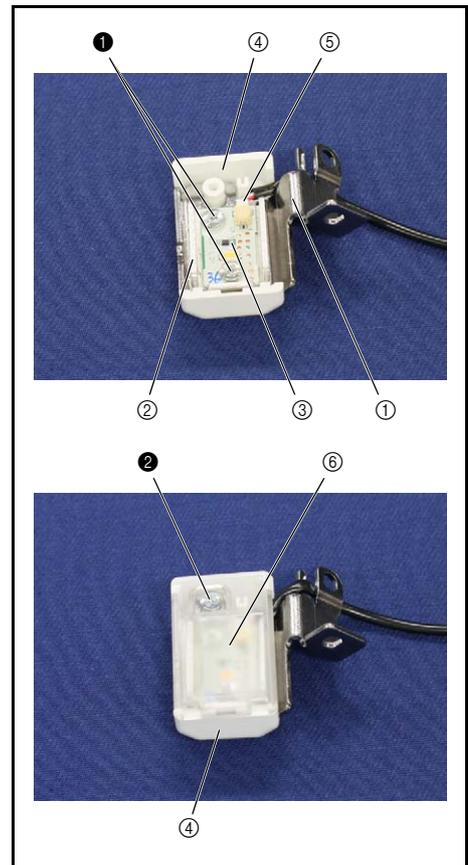
①		Screw, Bind M4X8	Torque 0.78 – 1.18 N-m
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### 14 LED unit right assy assembly

1. Set the LED base plate right ①, the LED light base ② and the LED PCB supply assy ③ to the LED upper cover ④, and then secure them with the 2 screws ①.
2. Connect the connector of the LED wire assy LED2 ⑤ to the LED PCB supply assy ③.
3. Attach the LED lower cover right ⑥ to the LED upper cover ④ with the screw ②.

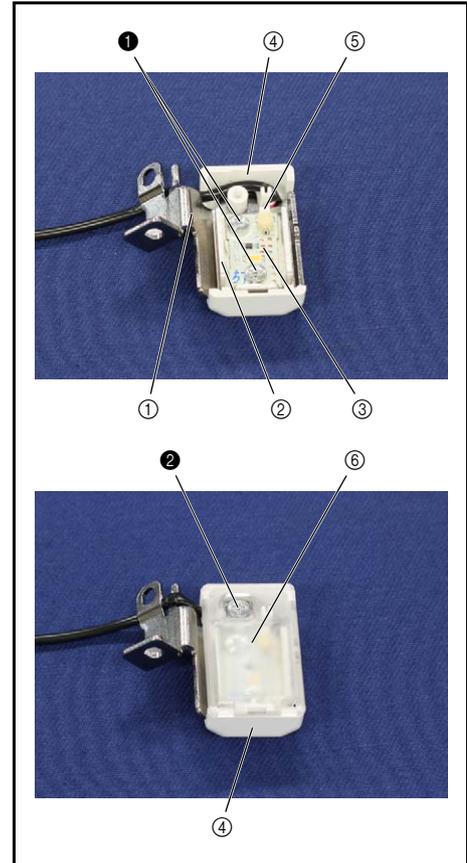
①		Taptite, Bind B M3X5	Torque 0.59 – 0.78 N-m
②		Taptite, Bind B M3X10	Torque 0.59 – 0.78 N-m



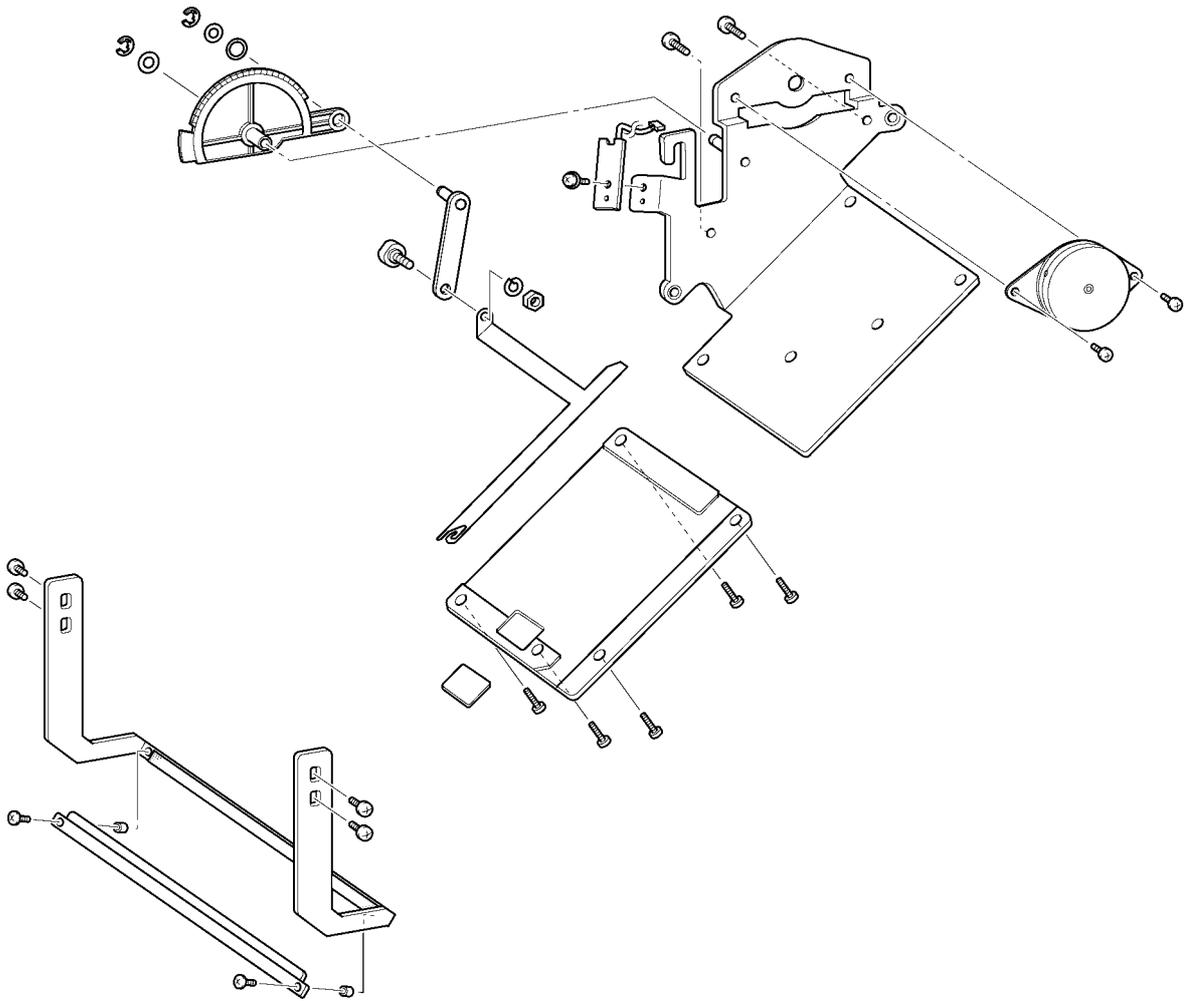
## 15 LED unit left assy assembly

1. Set the LED base plate left ①, the LED light base ② and the LED PCB supply assy ③ to the LED upper cover ④, and then secure them with the 2 screws ①.
2. Connect the connector of the LED wire assy LED2 ⑤ to the LED PCB supply assy ③.
3. Attach the LED lower cover left ⑥ to the LED upper cover ④ with the screw ②.

①		Tapite, Bind B M3X5	Torque 0.59 – 0.78 N-m
②		Tapite, Bind B M3X10	Torque 0.59 – 0.78 N-m



Thread wiper unit



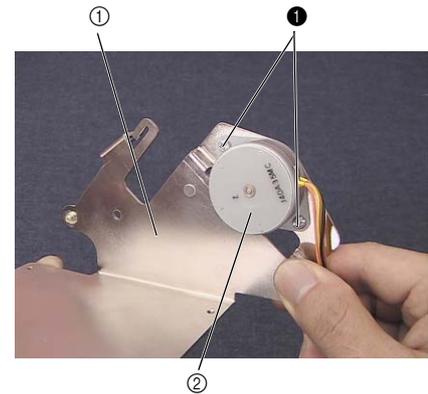
## 1 Wiper set assembly

1. Attach the wiper motor assembly ② to the wiper base assembly ① with the 2 screws ①.
2. Attach the wiper link assembly ④, washer ⑧, and the plain washer (M5) ⑨ to the wiper lever ③, and then attach the retaining ring E4.
3. Attach the wiper lever assembly, and plain washer (M6) ⑩ to the wiper base assembly's shaft, and then attach the retaining ring E4.

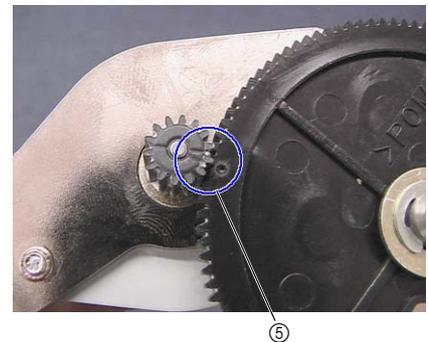
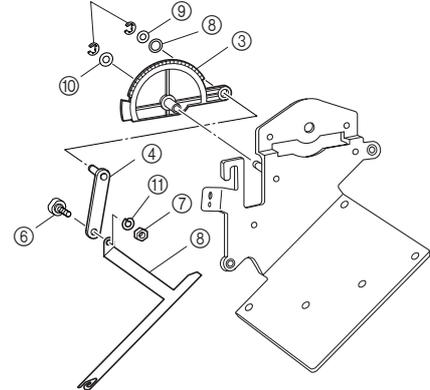
### \*Key point

- Align the mark ⑤ on the wiper motor's gear with the mark on the wiper lever assembly.
4. Attach the wiper hook ⑧ to the wiper link with the wiper shoulder screw ⑥, spring washer (2-4) ⑪, and the nut (3, M4) ⑦.
  5. Paint the wiper motor assembly's connector blue.

Tightening torque of nut (3, M4):	1.18 - 1.57 N-m
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Retaining rings E4



①		Screw, Pan M3X4	Torque 0.78 - 1.18 N-m
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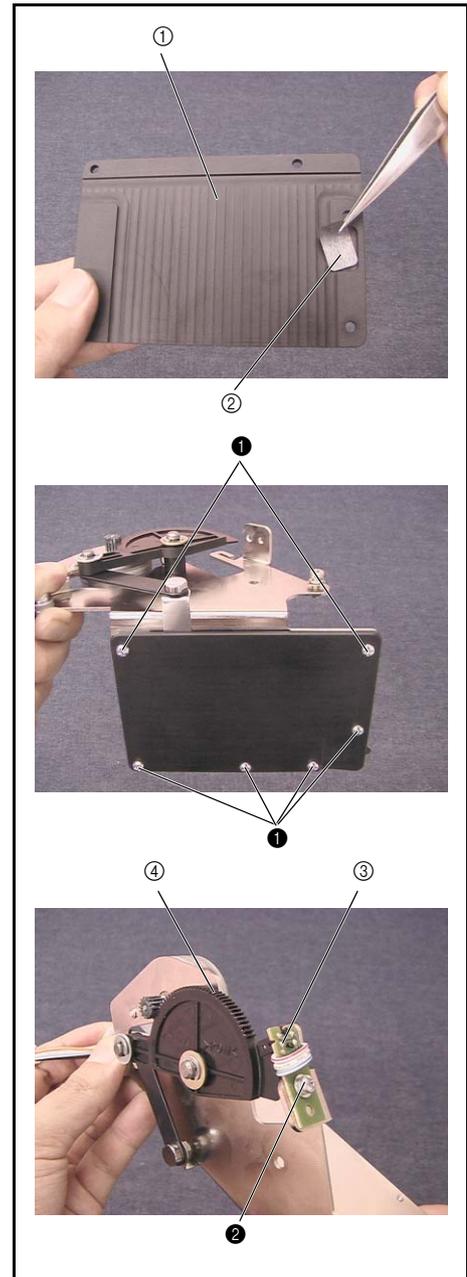
## 2 Wiper guide and wiper sensor attachment

1. Attach the wiper cushion ② to the wiper guide ①.
2. Attach the wiper guide assembly to the wiper base assembly with the 6 screws ①.
3. Attach the wiper sensor assembly ③ to the wiper base assembly with the screw ②.
4. Apply MOLYKOTE EM-30L to the wiper lever gear ④.

Apply MOLYKOTE EM-30L to the wiper lever gear.
--

Size of a grain of rice
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①		Screw, Pan M3X6	Torque 0.59 – 0.78 N-m
②		Screw, Pan (SIP washer) M3X6	Torque 0.59 – 0.78 N-m

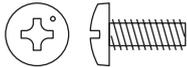


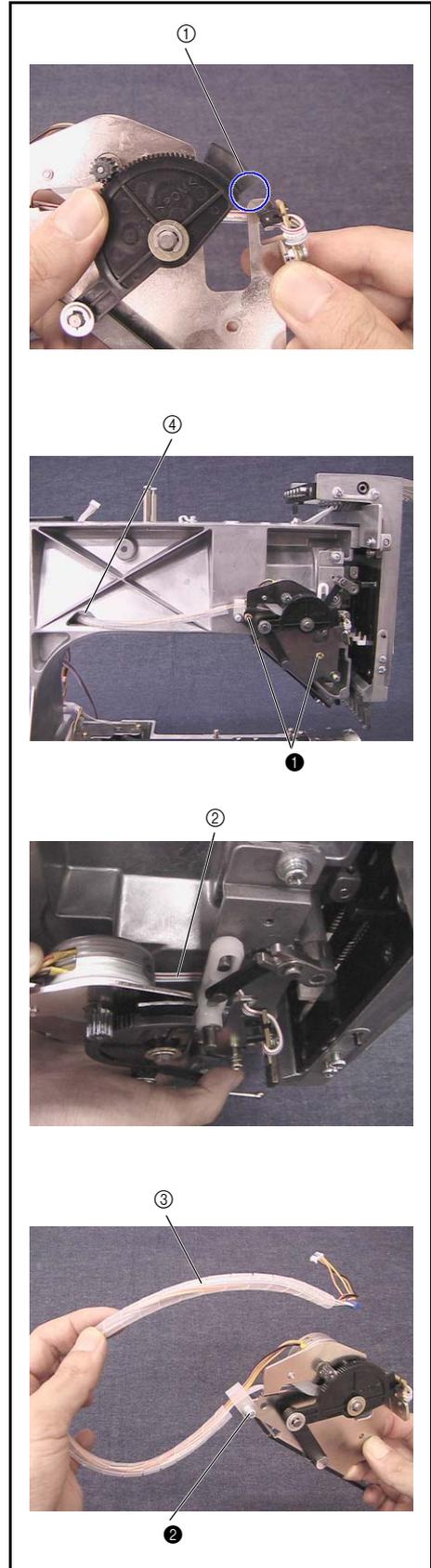
### 3 Wiper set assembly attachment

1. Slightly rotate the wiper lever counterclockwise to create a clearance between the wiper lever dog and the wiper sensor assembly ①.
2. Attach the wiper set assembly to the arm bed with the 2 screws ①.

**\*Key point]**

- Route the wiper sensor assembly's lead wire ② behind the driving jump assembly's J slide lever and the J base.
3. Thread the wiper sensor assembly's lead wire and the wiper motor assembly's lead wire through the spiral tube B ③, and then attach them to the wiper base assembly with the screw ② and the cord clamp NK-5N.
  4. Thread the wiper sensor assembly's lead wire and the wiper motor assembly's lead wire through the hole ④ on the arm bed until they come out from the right side of the arm bed.

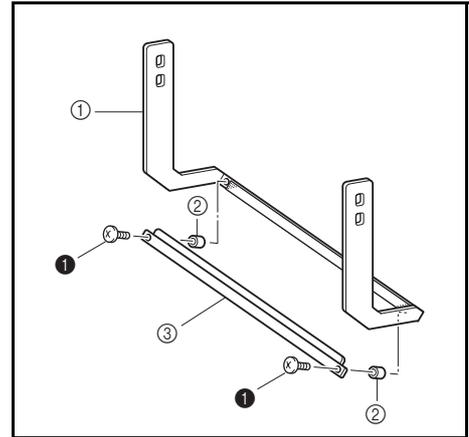
①		Taptite, Bind S M4X10	Torque 1.47 – 1.96 N-m
②		Screw, Pan (S/P washer) M4X10A	Torque 0.78 – 1.18 N-m



#### 4 Thread presser base assembly

1. Attach the 2 thread presser spacers ② and the thread presser cover assembly ③ to the thread presser base assembly ① with the 2 screws ①.

①		Screw, Pan M3X7	Torque 0.78 – 1.18 N-m
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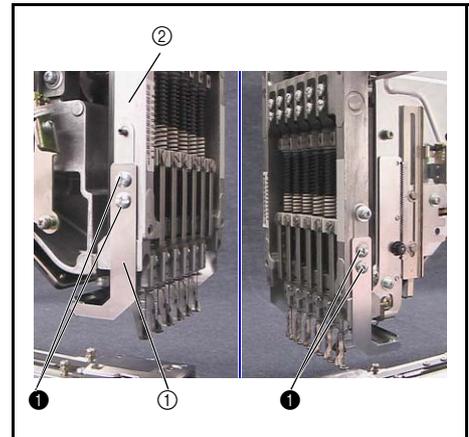
#### 5 Thread presser base attachment

1. Attach the thread presser base assembly ① to the needle bar case ② with the 4 screws ①.

**\*Key point**

- Temporarily tighten the screws ① first. Firmly tighten them after completing 4 - 34 "Thread presser base up/down position."

①		Screw, Bind M4X6	Torque Hand start
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#### 6 LED unit right assy removal

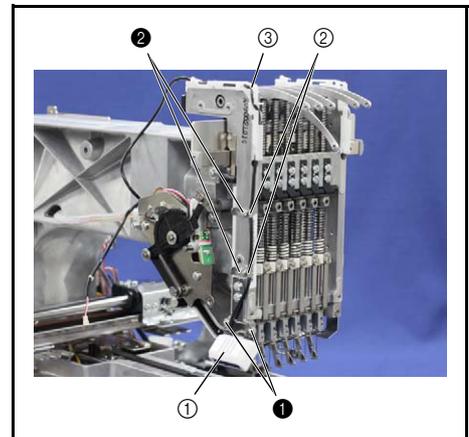
1. Attach the LED unit right assy ① with the 2 screws ①.
2. Hold the cord with the 2 cord clamps ②, and secure it with the 2 screws ②.

**\*Key point**

- Check that the boss of the cord clamp ② engage with the positioning hole.

3. Pass the cord through the guide parts of the LED cord guide ③.

① ②		Screw, Bind M4X8	Torque 0.78 – 1.18 N-m
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#### 7 LED unit left assy removal

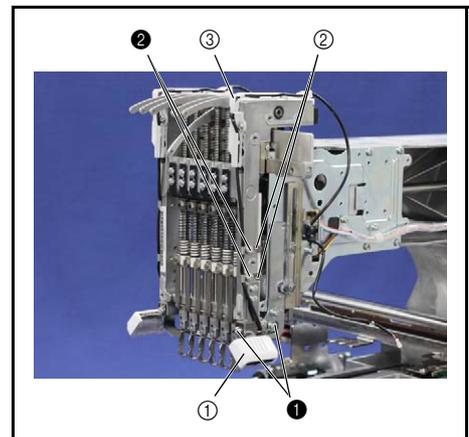
1. Attach the LED unit left assy ① with the 2 screws ①.
2. Hold the cord with the 2 cord clamps ②, and secure it with the 2 screws ②.

**\*Key point**

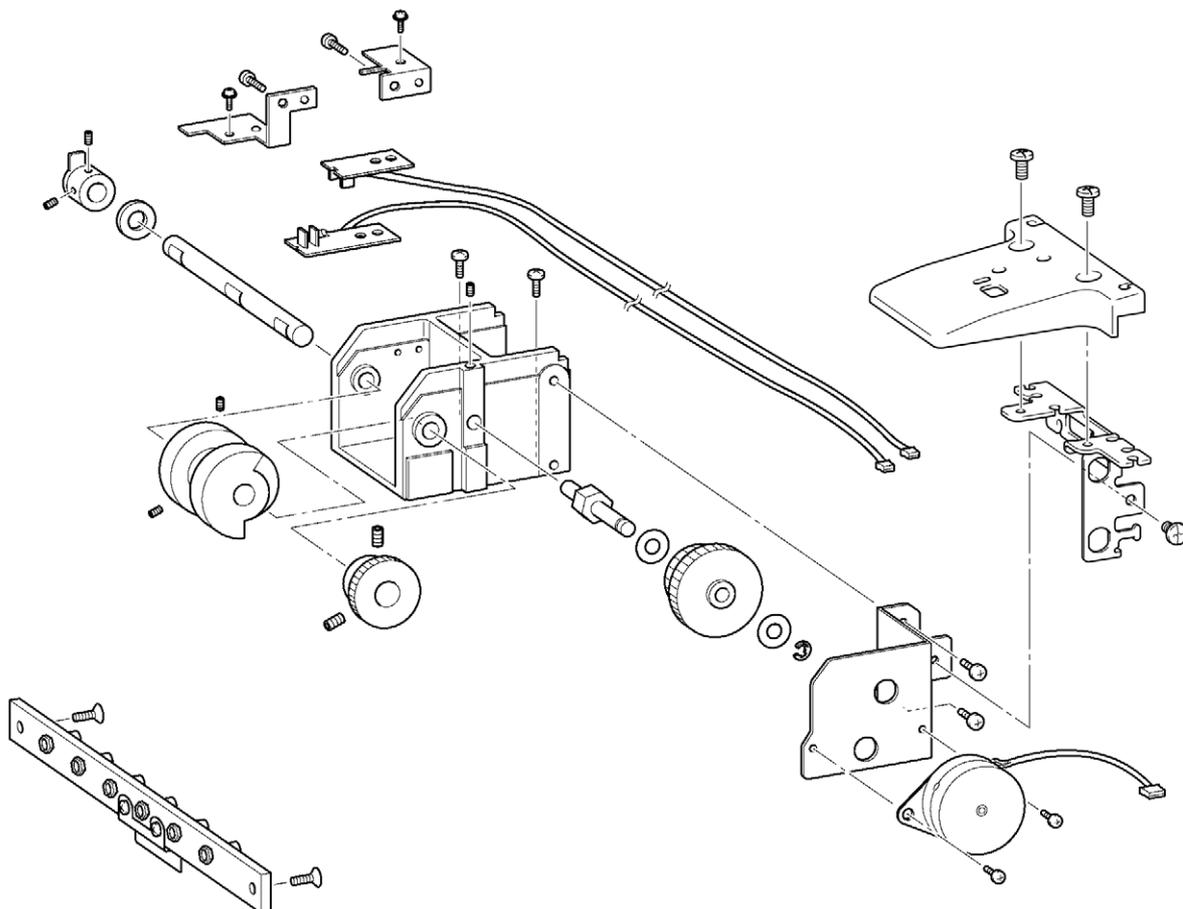
- Check that the boss of the cord clamp ② engage with the positioning hole.

3. Pass the cord through the guide parts of the LED cord guide ③.

① ②		Screw, Bind M4X8	Torque 0.78 – 1.18 N-m
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Needle bar change unit



## 1 Change box assembly (Step 1)

1. Attach the C stop position dog ① to the change camshaft ② with the 2 screws ①.

### \*Key point

- Align the change camshaft's end face (grooved) with the C stop position dog's end face.
- Align the D-cut face ③ on the change camshaft with the screw hole positioned 90-degrees to the right when the C stop position dog is at the top.

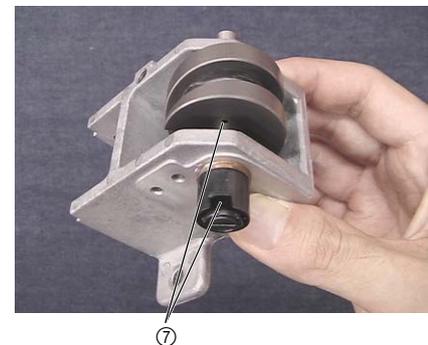
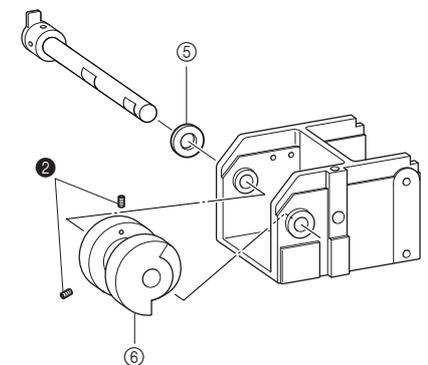
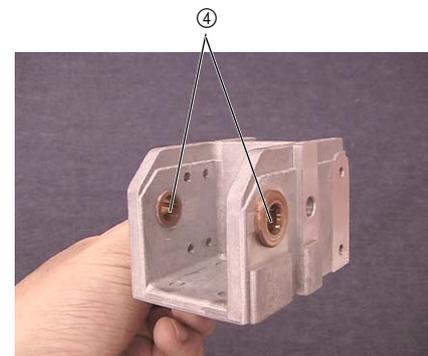
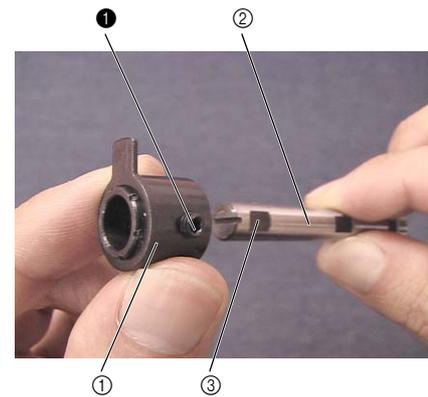
2. Apply MOLYKOTE EM-30L to the 2 shaft holes ④ on the change box assembly.
3. Attach the change camshaft assembly, thrust washer ⑤, and change cam ⑥ to the change box assembly, and then secure the change cam with the 2 screws ②.

### \*Key point

- Align the C stop position dog with the mark ⑦ on the change cam.

Apply MOLYKOTE EM-30L to the shaft holes on the change box assembly.
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Size of a grain of rice
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①		Set Screw, Socket (CP) M4X4	Torque 0.78 – 1.18 N-m
②		Set Screw, Socket (CP) M5X6	Torque 1.18 – 1.57 N-m

## 2 Change box assembly (Step 2)

1. Attach the change gear ① to the change camshaft.
2. Move the change gear toward the change cam, and secure it with the 2 screws ①.

**\*Key point**

- Align the screw hole on the change gear with the D-cut face on the change camshaft.

3. Attach the plain washer (M6) ⑤, C differential gear ③, and plain washer (M6) ⑤ to the differential gear shaft ②, and then attach the retaining ring E4.
4. Attach the differential gear shaft assembly to the change gear box, and then tighten the screw ②.

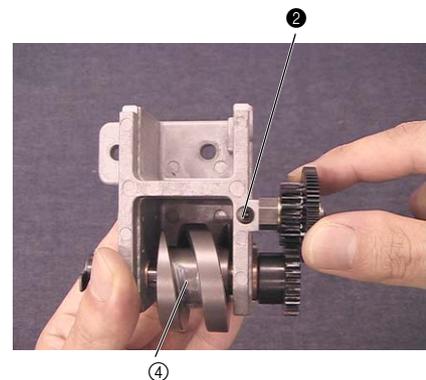
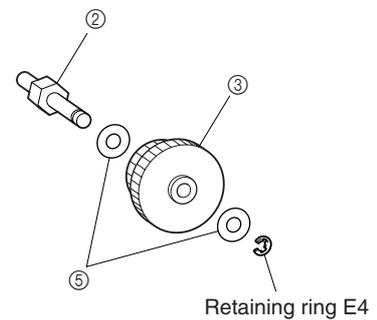
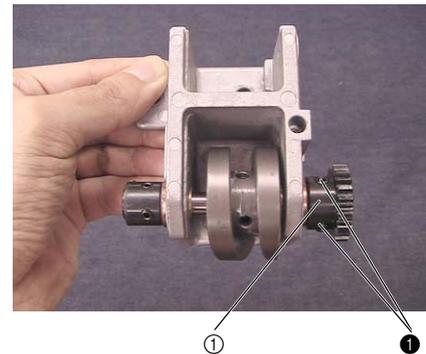
**\*Key point**

- Turn the differential gear shaft to adjust the backlash of the C differential gear.

5. Apply MOLYKOTE EM-30L to the groove ④ on the change cam.

Apply MOLYKOTE EM-30L to the groove on the change cam.
--

Size of a bean
----------------



①		Set Screw, Socket (CP) M5X6	Torque 1.18 – 1.57 N-m
②		Set Screw, Socket (FT) M4X4	Torque 0.78 – 1.18 N-m

### 3 Change box assembly (Step 3)

1. Attach the index motor assembly ① to the change motor base ② with the 2 screws ①.
2. Attach the change motor base assembly to the change box assembly with the 2 screws ②.

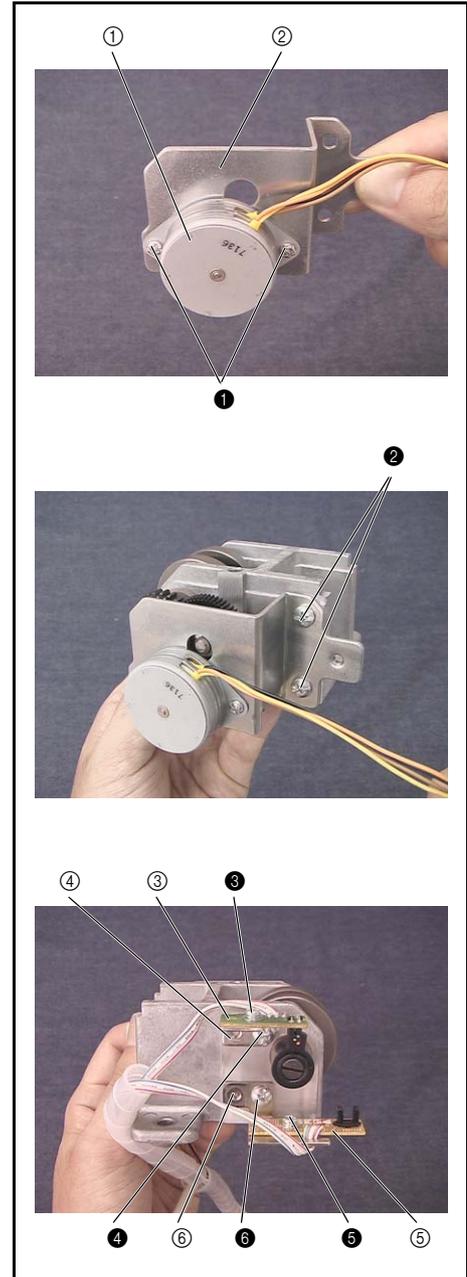
**\*Key point**

- Move the change motor base assembly up and down to adjust the backlash of the index motor assembly's gear and the C differential gear.
3. Apply MOLYKOTE EM-30L to the index motor gear and the C differential gear.
  4. Attach the index sensor assembly ③ to the C sensor bracket ④ with the screw ③.
  5. Attach the C sensor bracket assembly to the change box assembly with the screw ④.
  6. Attach the color change sensor assembly ⑤ to the C sensor bracket lower ⑥ with the screw ⑤.
  7. Attach the C sensor bracket assy lower to the change box with the screw ⑥.
  8. Paint the index motor assembly's connector green.

Apply MOLYKOTE EM-30L to the index motor gear and the C differential gear.

Size of grain of rice

①		Screw, Pan M3X4	Torque 0.78 – 1.18 N-m
② ④ ⑥		Screw, Blind M4X8	Torque 1.18 – 1.57 N-m
③ ⑤		Screw, Pan (S/P washer) M3X6	Torque 0.59 – 0.78 N-m



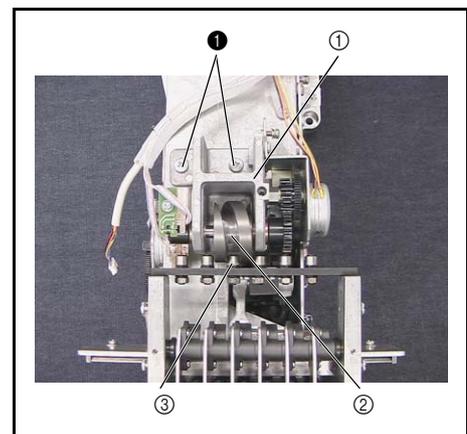
### 4 Change box assembly attachment

1. Attach the change box assembly ① with the 2 screws ①.

**\*Key point**

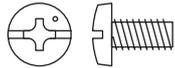
- Align the change roller ③ with the cam groove ② on the change cam.
- Temporarily tighten the screws ① first. Firmly tighten them after completing 4 - 19 "Needle position (left/right)".

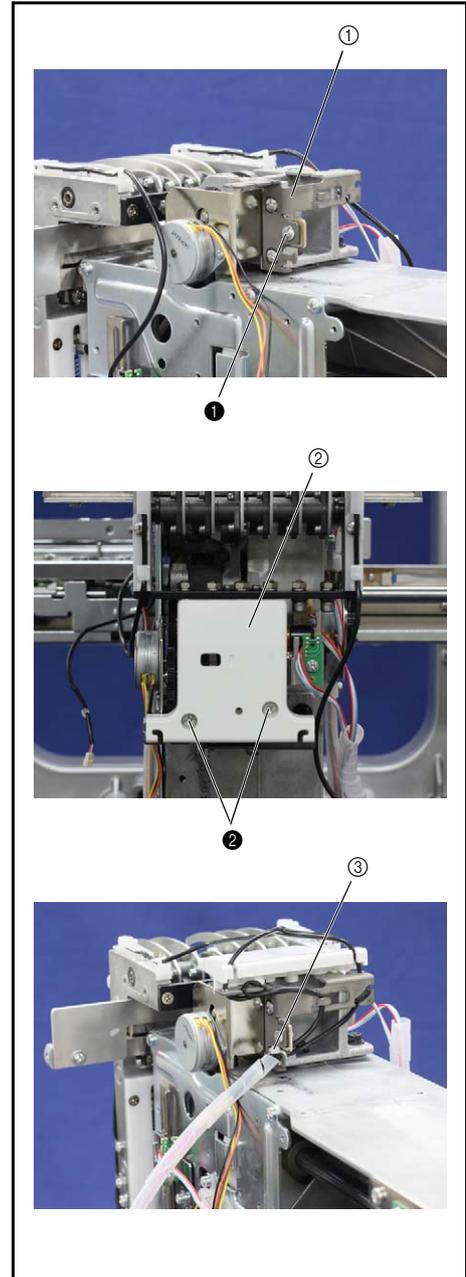
①		BOLT (S/P WASHER) M5X16	Torque Hand start
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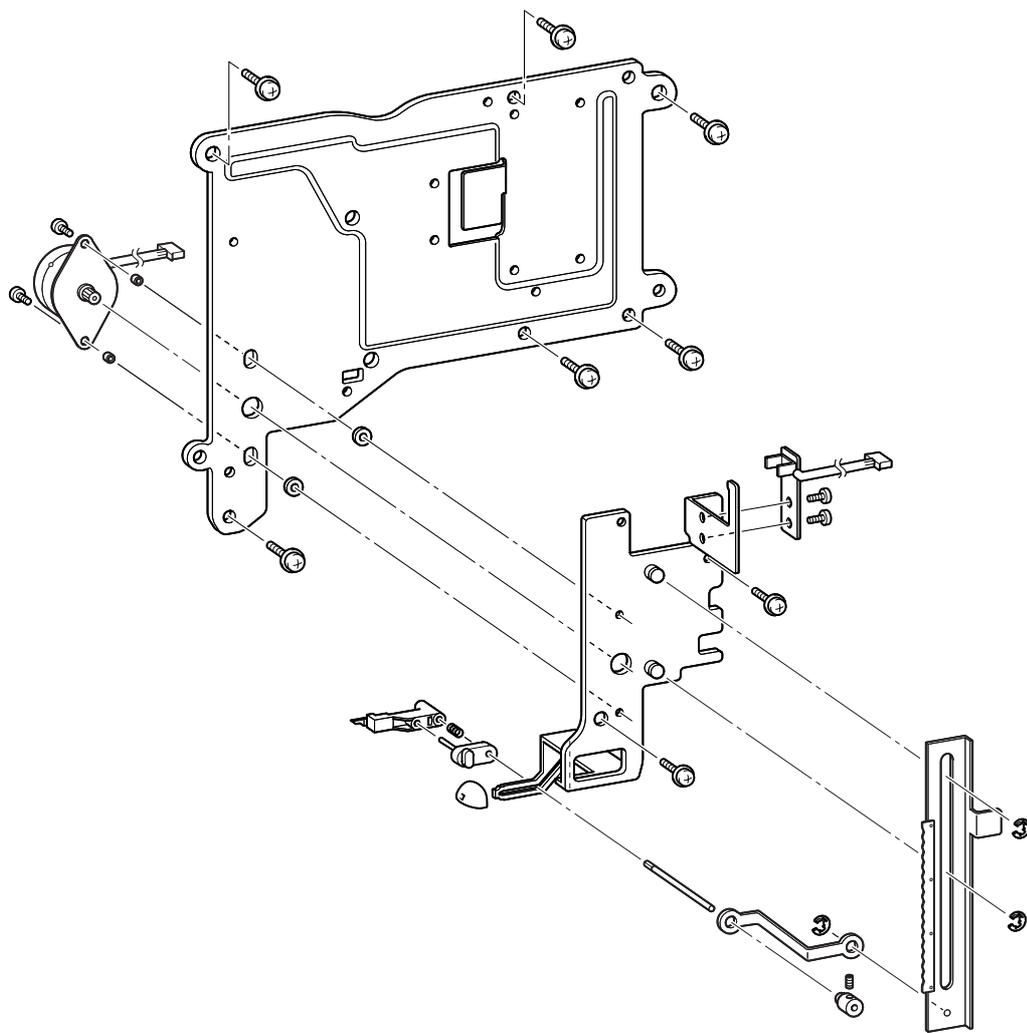
## 5 Change box center cover attachment

1. Attach the LED cord holder ① with the screw ❶.
2. Attach the change box center cover ② with the 2 screws ❷.
3. Secure the lead wires to the LED cord holder ① with the band ③.
4. Attach the spiral tube to the lead wires

❶		Screw, Bind M4X8	Torque 1.18 – 1.57 N-m
❷		Screw, Bind M4X8	Torque 0.78 – 1.18 N-m



Needle thread unit

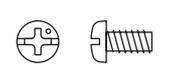


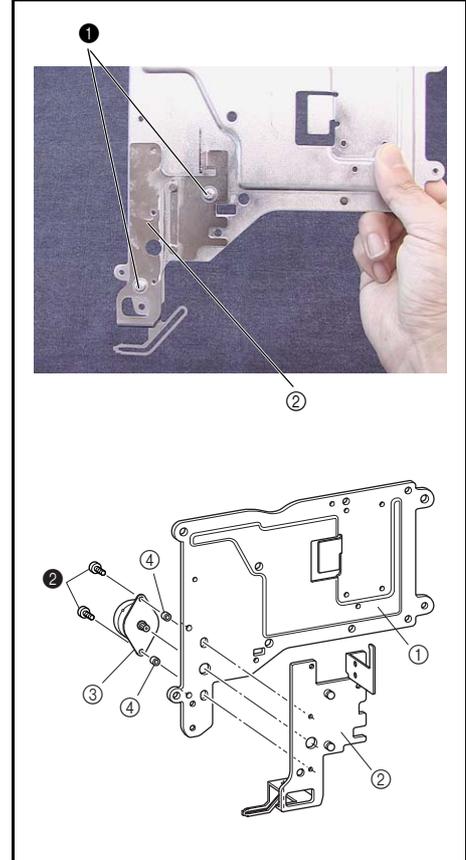
## 1 Thread motor assembly attachment

1. Attach the base plate assembly ② to the thread guide base ① with the 2 screws ①.

### \*Key point

- Firmly tighten the 2 screws ① after completing 4 - 27 "Needle threader (up/down)."
2. Attach the thread motor assembly ③ and the 2 spacers ④ to the base plate assembly ③ with the 2 screws ②.
  3. Paint the thread motor's connector red.

①		Screw, Pan (S/P washer) M4X8	Torque Hand start
②		Screw, Pan M3X6	Torque 0.78 – 1.18 N-m



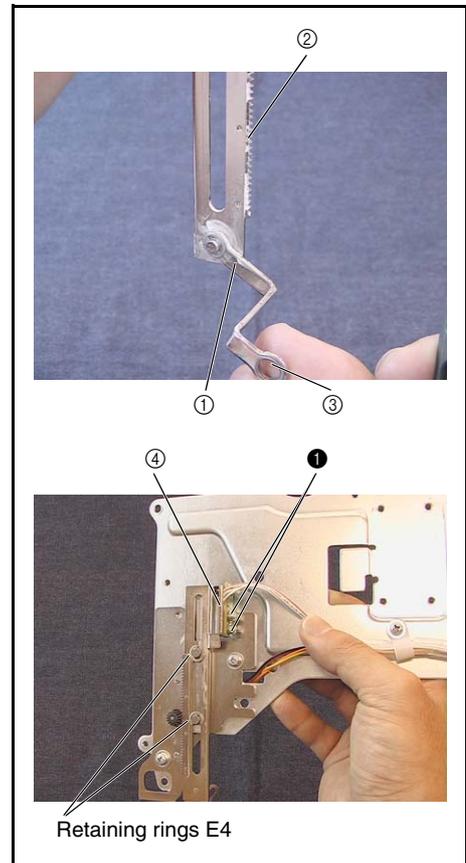
## 2 Rack assembly and hook holder link attachment

1. Attach the hook holder link ① to the rack assembly's shaft, and then attach the retaining ring E3.
2. Apply MOLYKOTE EM-30L to the gear face ② and the connecting face on the rack assembly, and the hook holder shaft attachment hole ③ on the hook holder link.
3. Attach the rack assembly to the base plate assembly's 2 shafts, and then attach the 2 retaining rings E4.
4. Attach the needle thread sensor assembly ④ to the base plate assembly with the 2 screws ①.

Apply MOLYKOTE EM-30L to the gear face and the connecting face on the rack assembly, and the hook holder shaft attachment hole on the hook holder link.

Size of a grain of rice

①		Screw, Pan (S/P washer) M3X6	Torque 0.59 – 0.78 N-m
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### 3 Hook assembly

1. Attach the bush ② to the hook holder axis B ① with the screw ①.

**\*Key point**

- Temporarily tighten the screw ① first. Firmly tighten it after completing 4 - 29 "Needle threader (left/right)".

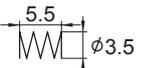
2. Attach the set collar assembly ③ to the base plate assembly.

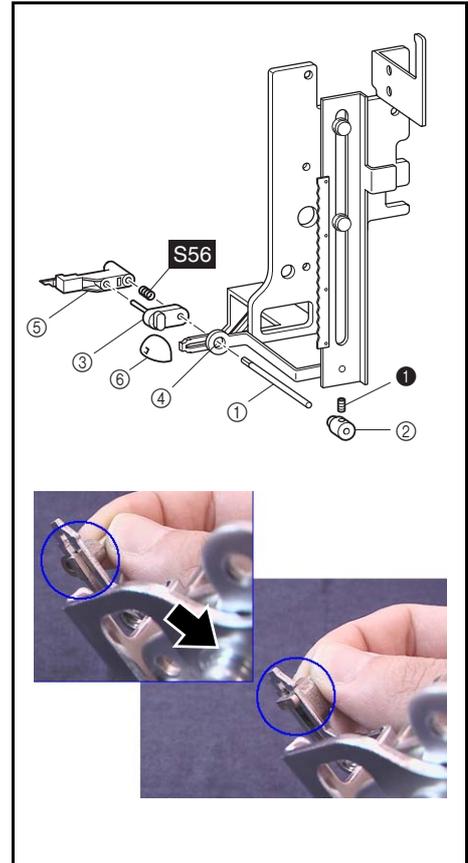
**\*Key point**

- Thread the set collar assembly through the slot on the base plate, and turn it 90 degrees.

3. Thread the hook holder axis B assembly through the hole ④ on the hook holder link, the groove on the base plate assembly, the set collar assembly, and the spring S56, and then attach the hook holder assembly ⑤ to the hook holder axis B assembly and the set collar assembly's axis.

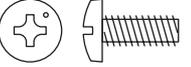
4. Attach the cap ⑥ to the tip of the slot on the base plate assembly.

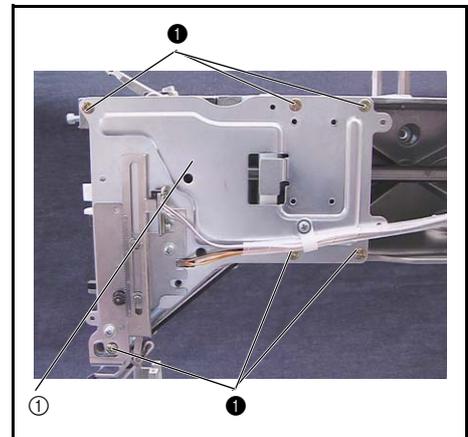
①		Set Screw, Socket (CP) M3X3	Torque Hand start
S56		HOOK HOLDER SPRING XC7375***	



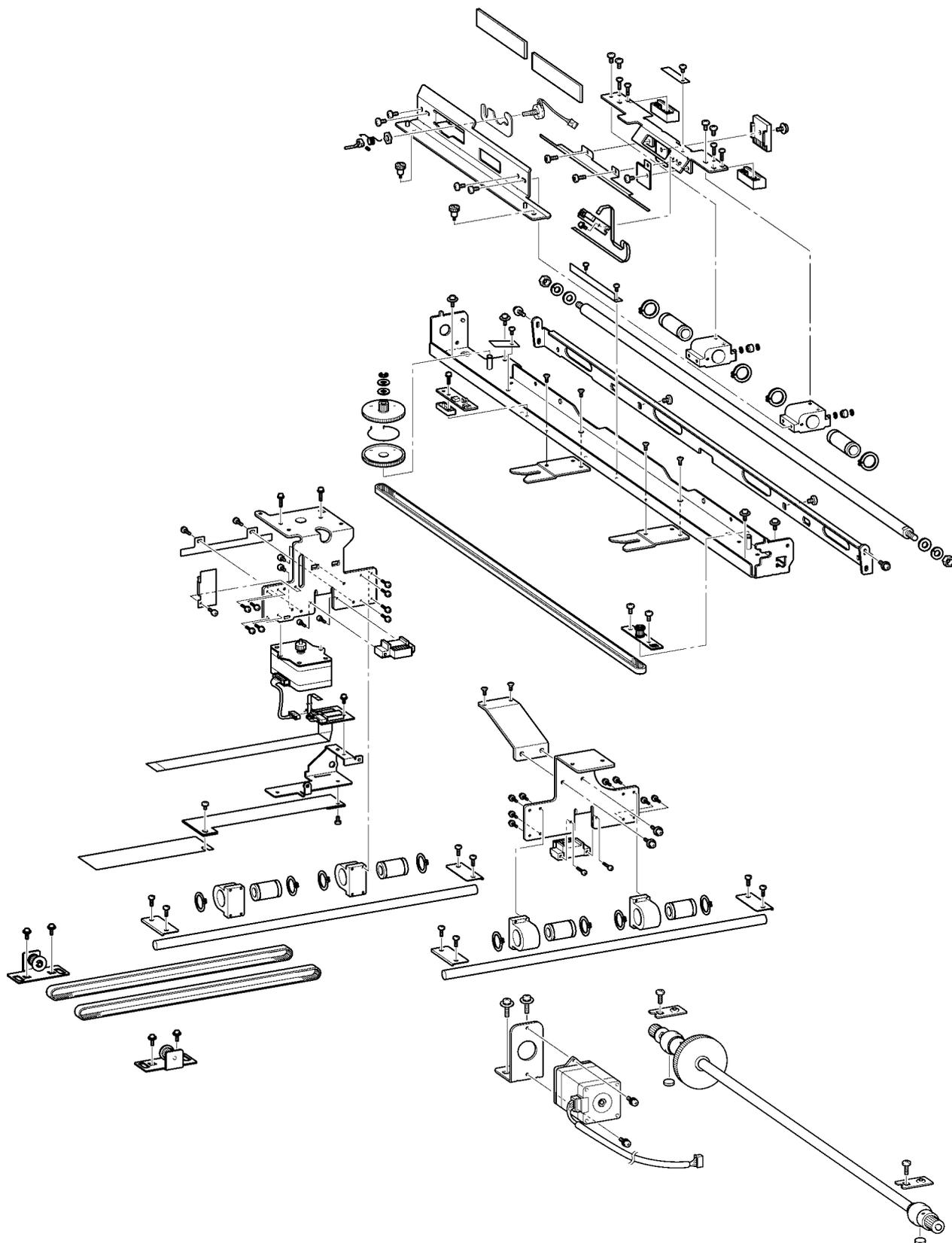
### 4 Needle thread assembly attachment

1. Attach the needle thread assembly ① with the 6 screws ①.

①		Taptite, Bind S M4X10	Torque 1.47 – 1.96 N-m
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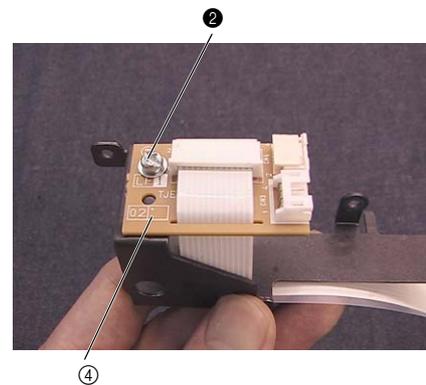
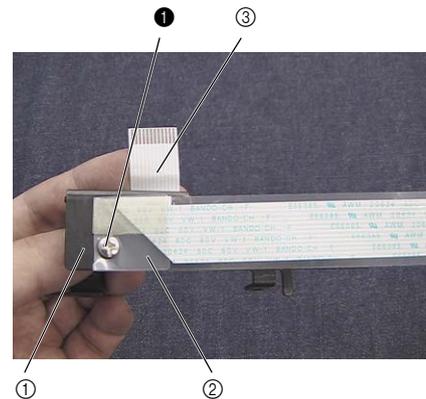
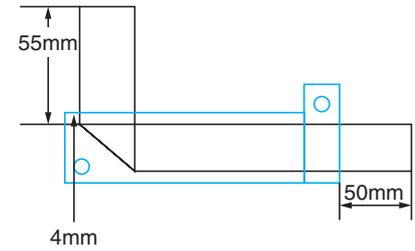


Feed unit



## 1 Connect PCB final assembly

1. Bend the FFC (SML2CD-Y) 90 degrees at a point 55 mm from the tip.
2. Attach the sheet ② and the FFC (SML2CD-Y) ③ to the PCB holder ① with the screw ①.
3. Attach the connect PCB assembly ④ to the PCB holder assembly with the screw ②.
4. Connect the FFC (SML2CD-Y) to the connect PCB assembly, and then lock the connector.

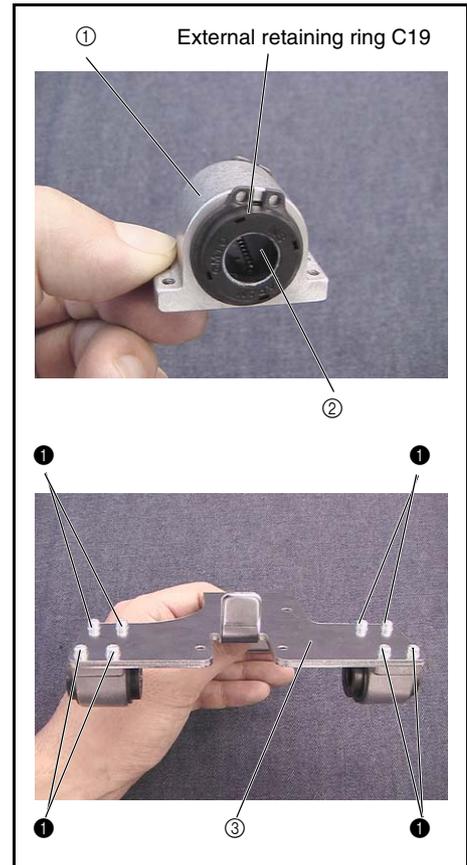


①		Screw, Bind M3X4	Torque 0.59 – 0.78 N-m
②		Screw, Pan (SIP washer) M3X6	Torque 0.59 – 0.78 N-m

## 2 Y-carriage R assembly

1. Attach the linear bearing 10 ② to bearing case Y ①, and then attach the 2 external retaining rings C19.
2. Attach the 2 bearing case Y assemblies to Y-carriage R ③ with the 8 screws ①.

①		Screw, Pan (S/P washer) M3X10	Torque 0.78 – 1.18 N-m
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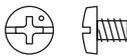


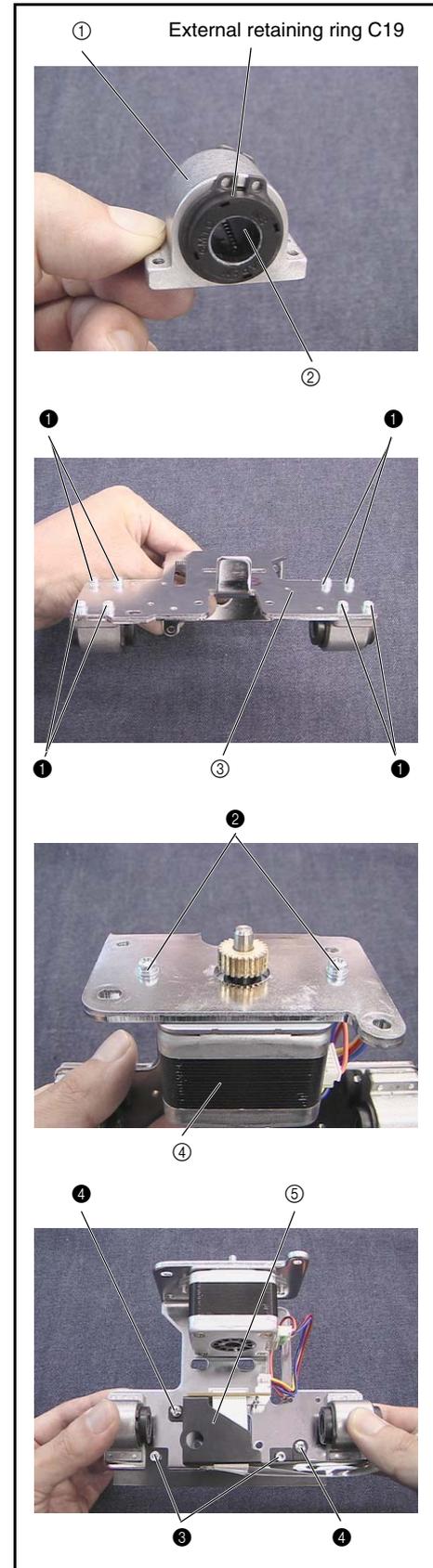
### 3 Y-carriage L assembly

1. Attach the linear bearing 10 ② to bearing case Y ①, and then attach the 2 external retaining rings C19. (2 sets)
2. Attach the 2 bearing case Y assemblies to Y-carriage L ③ with the 8 screws ①.
3. Attach the X-motor assembly ④ to Y-carriage L with the 2 screws ②.
4. Attach the caution (easy to bend) Y-carriage L with the 2 screws ③.

#### NOTE

- The Y sensor dog bends easily. Handle it carefully.
5. Attach the connect PCB finial assembly ⑤ to Y-carriage L with the 2 screws ④.

①		Screw, Pan (S/P washer) M3X10	Torque 0.78 – 1.18 N-m
②		Bolt, Socket M3X5	Torque 0.59 – 0.78 N-m
③		Screw, Bind M3X4	Torque 0.59 – 0.78 N-m



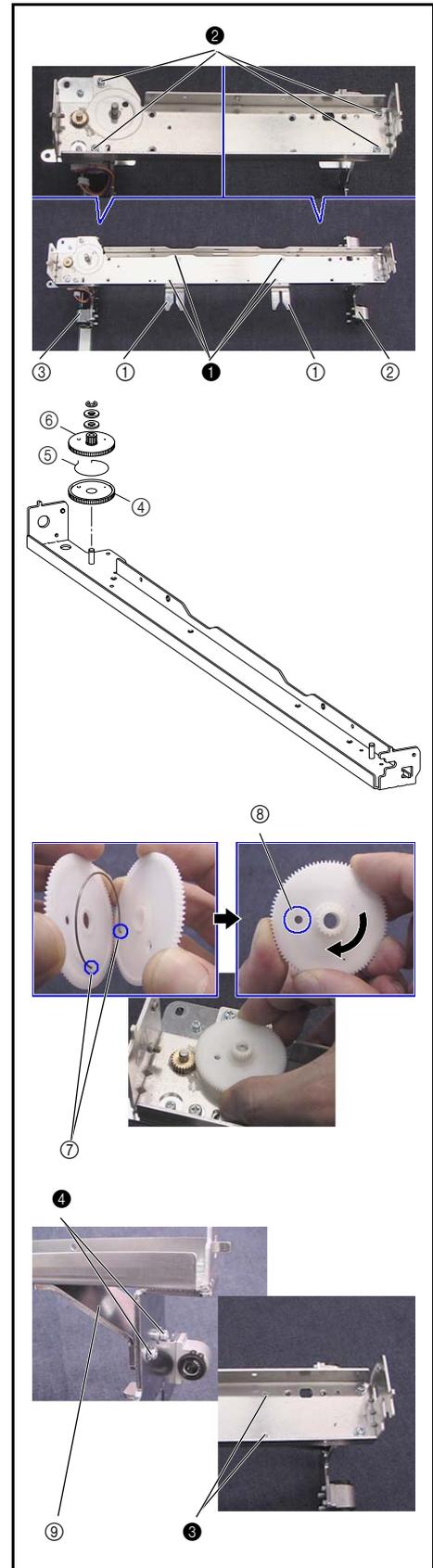
#### 4 Feed frame assembly attachment

1. Attach the 2 cap connections ① to the feed frame with the 4 screws ①. (2 locations)
2. Temporarily attach the Y-carriage R assembly ② and the Y-carriage L assembly ③ to the feed frame assembly with the 4 screws ②.
3. Attach the Y-driving gear pulley B ④, gear spring ⑤, Y-driving gear pulley A ⑥, washer, and plain washer (M6) (2 sets) to the gear pulley shaft, and then attach the retaining ring E4.

##### \*Key point

- Attach the gear spring to the small hole ⑦ on Y-driving gear pulleys B and A.
  - Turn Y-driving gear pulley A clockwise until the large hole ⑧ on Y-driving gear pulley A is aligned with the large hole on Y-driving gear pulley B. Engage the pulleys with the X-motor gear, and attach them to the shaft.
4. Temporarily attach Y-carriage RB ⑨ to the feed frame and Y-carriage R with the 2 screws (③ ④, 2 each).
  5. Adjust the position of the X-motor assembly so that the backlash of the X-motor gear and the Y-driving gear pulley assembly is zero.

① ③		Screw, Flat M3X6	Torque 0.78 – 1.18 N-m
② ④		Screw, Pan (S/P washer) M4X8	Torque 1.18 – 1.57 N-m



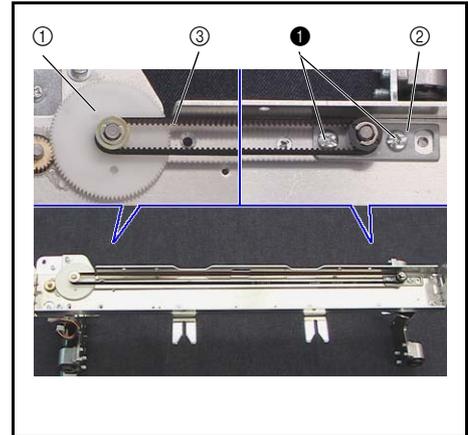
## 5 T-belt (X-drive) attachment

1. Hang the T-belt B60S796 ③ over the Y driving gear pulley assembly ① and the tension pulley plate final assembly ②, and then secure the tension pulley plate final assembly to the feed frame assembly with the 2 screws ①.

### \*Key point

- Temporarily tighten the screws ① first. Firmly tighten them after completing 4 - 31 "X belt tension."

①		Screw, Pan (S/P washer) M4X8	Torque Hand start
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## 6 X-guide shaft attachment

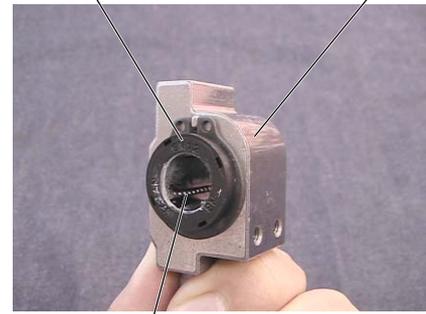
1. Attach the linear bearing (12) ② to bearing case X ①, and then attach the 2 external retaining rings C21. (2 sets)
2. Attach the X-roller ③ to the bearing case X assembly, and then attach the retaining ring E4. (2 sets)
3. Apply MOLYKOTE EM-30L to the shaft hole ④ on the bearing case.
4. Thread the 2 bearing case X final assemblies through the X-guide shaft ⑤, and then tighten the 2 nuts (2, M6) ⑥, 2 plain washers ⑦, and 2 spring washers (2-6) ⑧ to both ends of the X-guide shaft.

### \*Key point

- Attach the X-guide shaft so that the end with a cut to prevent turning together is on the right side (Y-carriage R assembly side).

Apply MOLYKOTE EM-30L to the shaft hole on the bearing case	Size of a bean
Tightening torque of nut (2, M6):	4.41 - 4.90 N·m

External retaining rings C21 ①



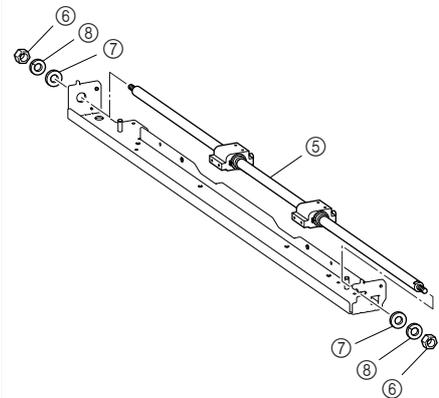
②

Retaining ring E4



④

③



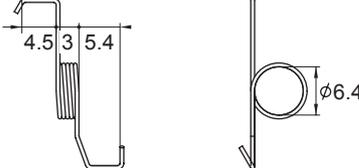
## 7 Hoop sensor attachment

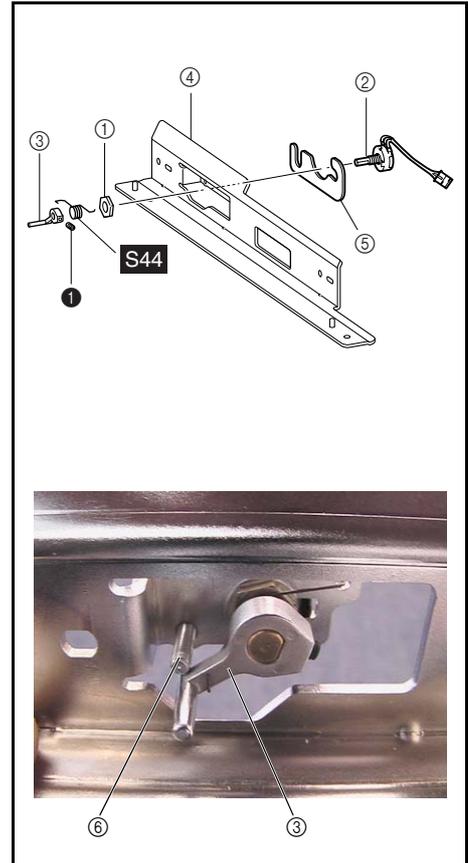
1. Attach the hoop sensor assembly ② to the X-carriage A assembly ④, and then tighten the nut ① temporarily.
2. Attach the PT meter plate ⑤, and then fully tighten the nut ①.
3. Insert the spring S44 into the shaft of the hoop sensor assembly ②.
4. Attach the hoop lever ③ to the hoop sensor shaft, hanging the spring S44 over the hoop lever ③, and then tighten the screw ①.

### \*Key point

- Tighten the screw ① with the hoop lever pushed down so that it contacts the screw ⑥ from the beneath after the screw ① has been tightened.
- Check operation after attachment.

Tightening torque of nut:	0.78 - 0.98 N-m
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①		Set Screw, Socket (FT) M3X6  Torque 0.59 – 0.78 N-m
S44		SPRING XC5802***



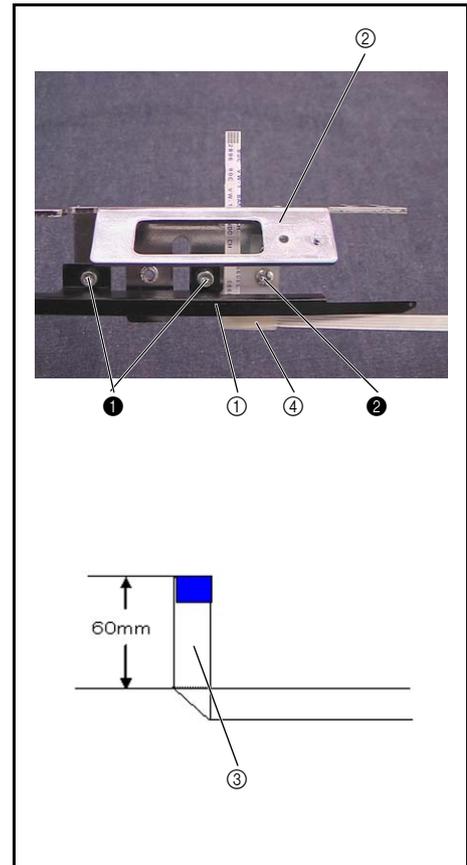
## 8 X-sensor dog attachment

1. Attach the caution ① to the X-carriage ② with the 2 screws ①.

### NOTE

- The X sensor dog bends easily. Handle it carefully.
2. Bend the FFC (SML2CD-X) ③ 90 degrees at a point 60 mm from the tip.
  3. Attach the FFC (SML2CD-X) and the sheet ④ to X-carriage B with the screw ②.

①		Bolt, Socket M3X5	Torque 0.59 – 0.78 N-m
②		Screw, Bind M3X4	Torque 0.59 – 0.78 N-m



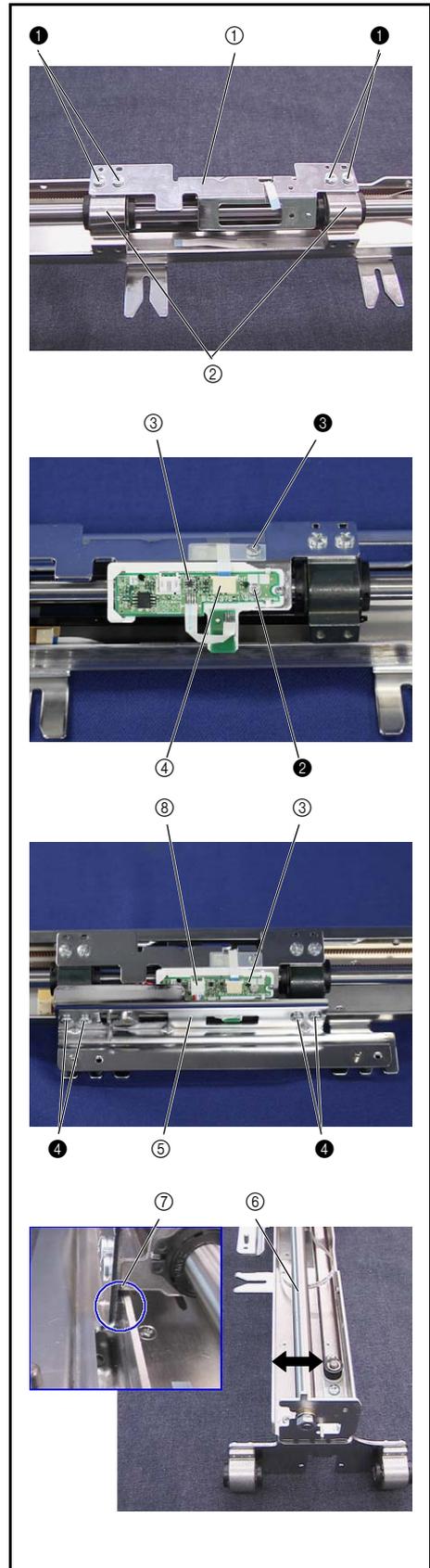
## 9 X-carriage A assembly and X-carriage B assembly attachment

1. Attach the X-carriage B assembly ① to the 2 bearing case X final assemblies ② attached to the X-shaft with the 4 screws ①.
2. Attach the magnet PCB assembly ③ to the X-carriage B assembly with the screw ②.
3. Connect the FFC (SML2CD-X) ④ to the magnet PCB assembly ③, hold the FFC (SML2CD-X) with sheet C, and then tighten the screw ③.

### \*Key point

- After the FFC (SML2CD-X) has been connected to the magnet PCB assembly ③, lock the connector.
4. Attach the X-carriage A assembly ⑤ to the bearing case X final assembly (2 locations) with the 4 screws ④.
  5. Connect the hoop sensor assembly's lead wire ⑧ to the magnet PCB assembly ③.
  6. Adjust the X-guide shaft ⑥ back and forth so that the X-carriage A assembly's sheet ⑦ contacts the feed frame.

① ④		Screw, Bind M4X6	Torque 1.18 – 1.57 N-m
②		Screw, Pan (S/P washer) M3X8	Torque 0.59 – 0.79 N-m
③		Screw, Bind M3X4	Torque 0.59 – 0.78 N-m



## 10 X-feed frame B attachment

1. Apply MOLYKOTE EM-30L to the surface ① where the X-feed frame contacts the X-roller.
2. Attach the X-feed frame B ② to the feed frame assembly with the 4 screws (① ②, 2 each).

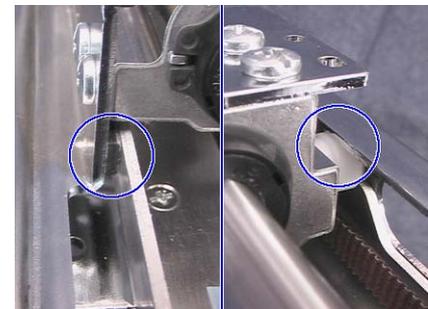
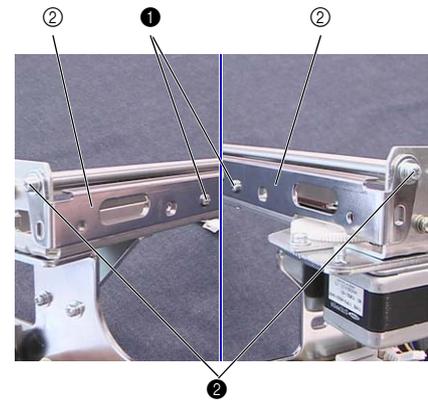
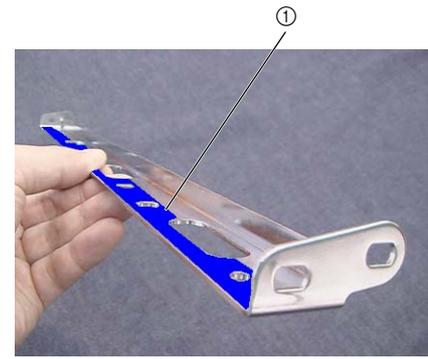
### \*Key point

- No clearance is allowed between X-carriage A and the feed frame.
- No clearance is allowed between the X-roller and X-feed frame B.

Apply MOLYKOTE EM-30L to the surface where the X-feed frame contacts the X-roller.
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Size of a bean
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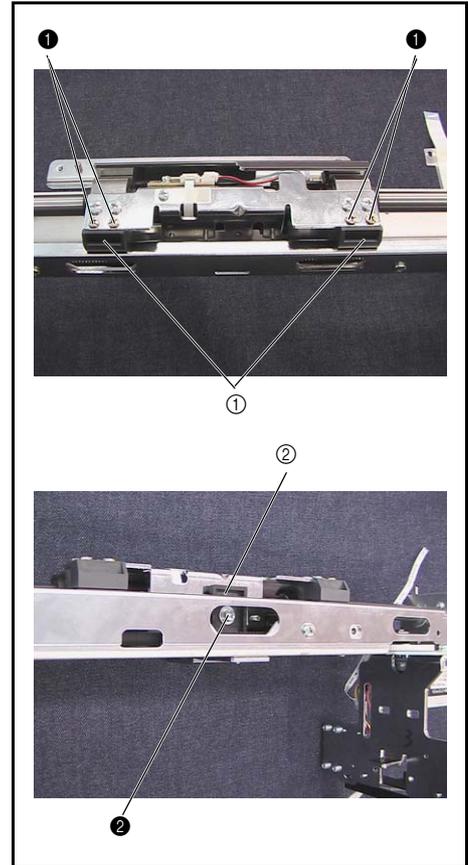
①		Screw, Bind M4X6	Torque 1.18 – 1.57 N-m
②		Screw, Pan (S/P washer) M4X8	Torque 1.18 – 1.57 N-m



## 11 Y-frame spacer and X-belt presser attachment

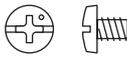
1. Attach the 2 Y-frame spacers ① to X-carriage B with the 4 screws ①.
2. Align the X-belt presser ② with the highest point of the T-belt, and then attach the X-belt presser to X-carriage B. Secure them with the screw ②.

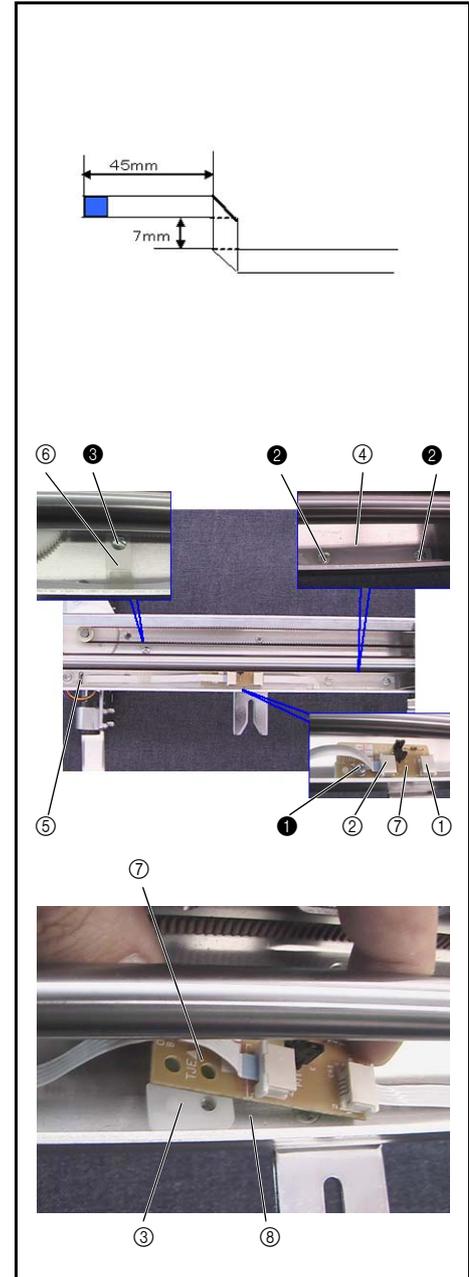
①		Taptite, Bind B M3X10	Torque 0.39 – 0.78 N-m
②		Screw, Pan (S/P washer) M4X8	Torque 0.78 – 1.18 N-m



## 12 FFC and X-area sensor assembly attachment

1. Bend the free end of the FFC (SML2CD-X) ① connected to the hoop PCB assembly 90 degrees at two points, connect it to the X-area sensor assembly ⑦, and lock the connector.
2. Connect the FFC (SML2CD-C) ② to the X-area sensor assembly ⑦, and lock the connector.
3. Attach the insulation sheet ⑧, X-frame spacer ③ and X-area sensor assembly ⑦ to the feed frame assembly with the screw ①.
4. Hold the FFC (SML2CD-X) with sheet B ④, and secure the FFC to the feed frame assembly with the 2 screws ②.
5. Thread the FFC (SML2CD-C) through the slot ⑤ on the feed frame assembly.
6. Hold the FFC (SML2CD-C) with sheet C ⑥, and secure the FFC to the feed frame assembly with the screw ③.

①		Screw, Pan (S/P washer) M3X10	Torque 0.59 – 0.78 N-m
② ③		Screw, Bind M3X4	Torque 0.59 – 0.78 N-m

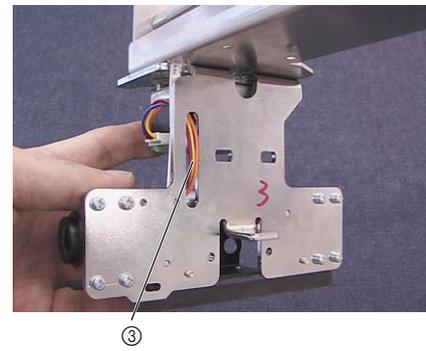
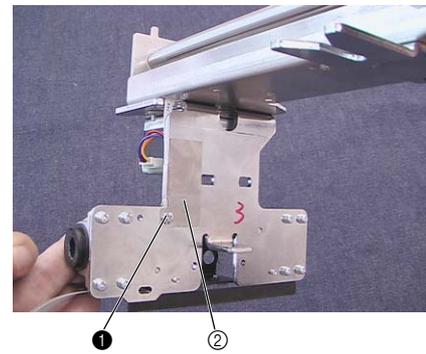
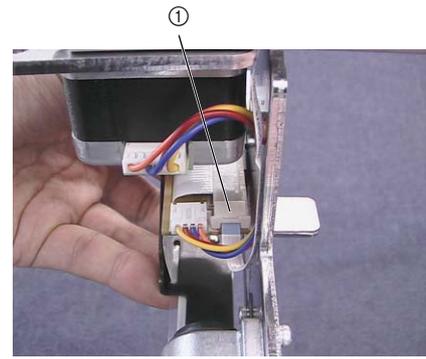


### 13 Cord grip attachment

1. Connect the FFC (SML2CD-C) ① to the connect PCB, and lock the connector.
2. Connect the X-feed motor's lead wire to the connect PCB.
3. Bind the X-feed motor's lead wire and the FFC (SML2CD-C) with the cord grip ②, and then tighten the screw ①.

**\*Key point**

- Insert the X-feed motor's lead wire into the groove ③ on Y-carriage L.

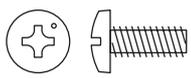


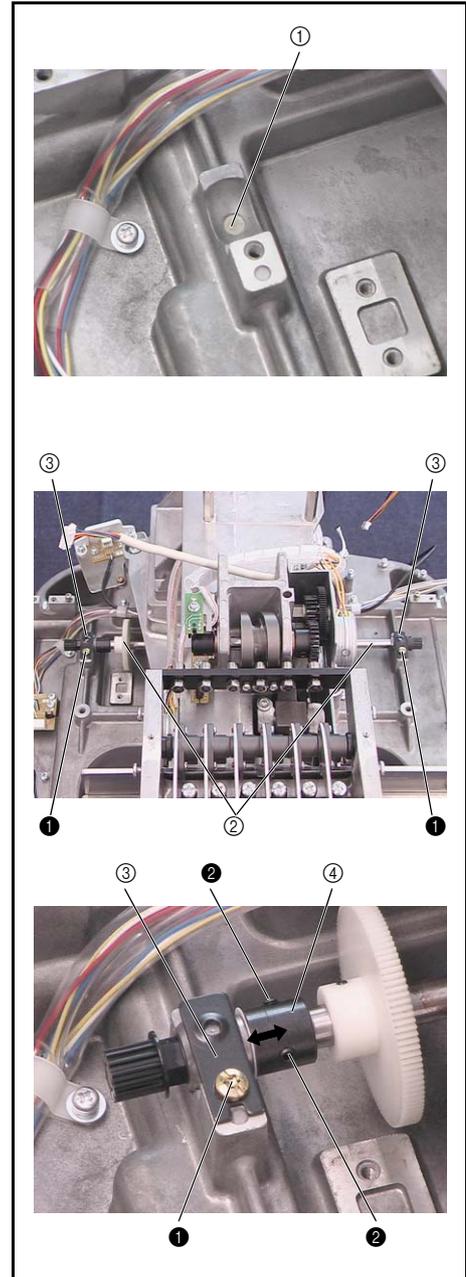
①		Screw, Bind M3X4	Torque 0.59 – 0.78 N-m
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## 14 Y driving shaft assembly attachment

1. Apply FBK OIL RO100 to the 2 felts ①.
2. Attach the felts ① to the metal collars on the base frame. (2 locations)
3. Attach the Y driving shaft assembly ② to the base frame.
4. Secure the 2 metal pressers A ③ with the 2 screws ①.
5. Adjust the collar's ④ position (right/left) to eliminate any backlash in the shaft direction, and then secure the collar with the 2 screws ②.
6. Apply oiler to the Y driving shaft's 2 metals.

Apply FBK OIL RO100 to the felts.	Soak the felts in FBK OIL RO100.
Apply oiler to the Y driving shaft's metals.	1 to 2 drops

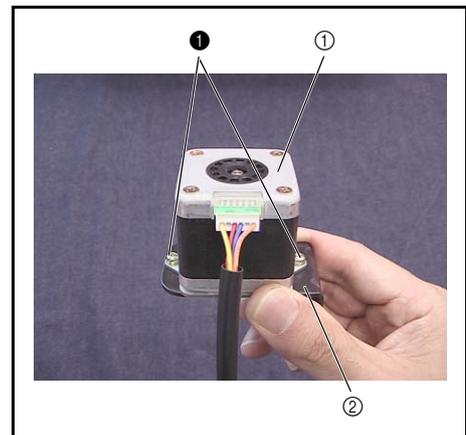
①		Tapite, Bind S M4X10	Torque 1.47 – 1.96 N-m
②		Set Screw, Socket (CP) M4X4	Torque 0.78 – 1.18 N-m



## 15 Y-motor final assembly

1. Attach the Y-motor final assembly ① to the Y-motor stay ② with the 2 screws ①.

①		Screw, Pan (SIP washer) M3X6	Torque 0.59 – 0.78 N-m
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## 16 Y motor final assembly attachment

1. Attach the Y motor final assembly ① to the base frame with the 2 screws ①.

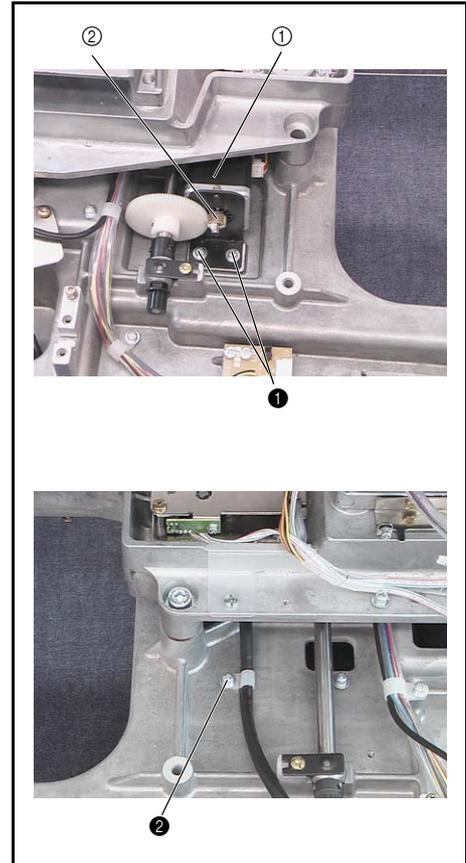
### \*Key point

- Adjust the backlash of the Y motor gear and the Y-guide shaft gear to zero.
  - Make sure the Y motor gear and the Y-guide shaft gear are parallel.
2. Apply MOLYKOTE EM-30L to the Y motor gear ②.
  3. Secure the Y motor final assembly's lead wire and the cord clamp NK-4N to the base frame with the screw ②.

Apply MOLYKOTE EM-30L to the Y motor gear.

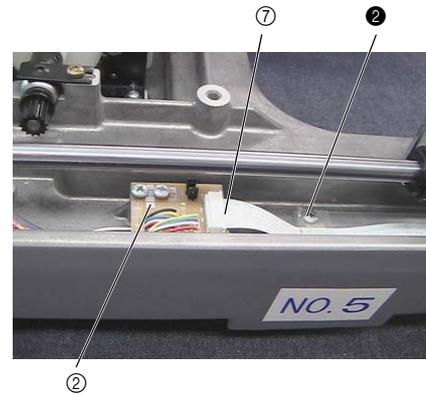
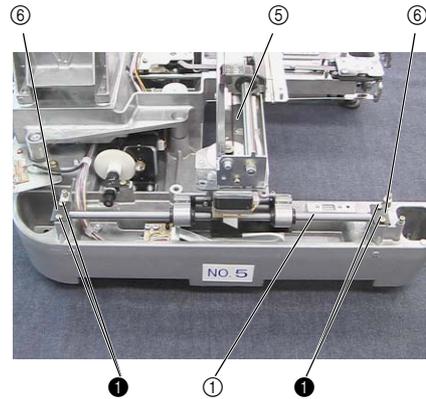
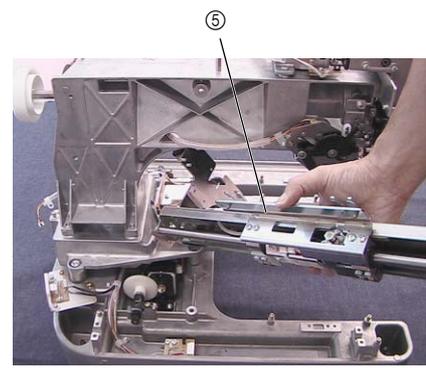
Size of a grain of rice

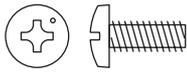
①		Screw, Pan (S/P washer) M4X10	Torque 1.18 – 1.67 N·m
②		Screw, Pan (S/P washer) M4X8	Torque 1.18 – 1.57 N·m



## 17 Feed final assembly attachment

1. Attach the 2 Y-guide shafts ① to the feed final assembly ⑤, and then attach the feed final assembly ⑤ to the base frame.
2. Secure the 2 fixed Y-shaft plates ⑥ with the 4 screws ① (one each on left and right).
3. Pull the feed final assembly toward you.
4. Connect the FFC (SML2CD-Y) ⑦ connected to the feed final assembly's connect PCB to the Y-area sensor assembly ②, and lock the connector.
5. Attach the sheet ③, FFC (SML2CD-Y) ⑦, and sheet B ④ to the base frame with the screw ②.



①		Taptite, Bind S M4X10	Torque 1.47 – 1.96 N-m
②		Screw, Bind M4X6	Torque 1.18 – 1.57 N-m

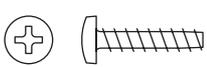
## 18 T-belt (Y-guide) attachment

1. Attach the Y tension pulley ① and the plain washer 7 X 2 to the Y tension plate assembly, and then attach the 2 sets of retaining rings E4.
2. Loosen the 2 screws ① securing the Y driving shaft pulley ②.
3. Hang the T-belt B60S3M579 over the Y tension plate assembly's Y tension pulley ③ and the Y driving shaft pulley ②, and then attach the Y tension plate assembly to the base frame with the 2 screws ② (one each on left and right).

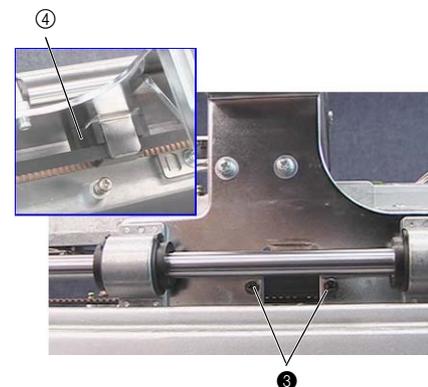
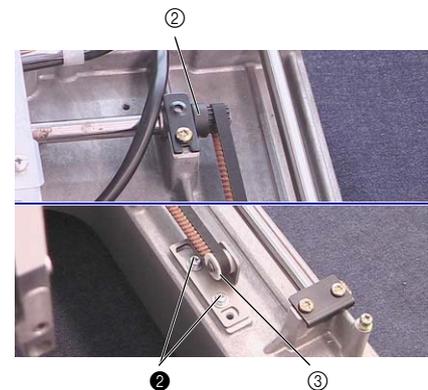
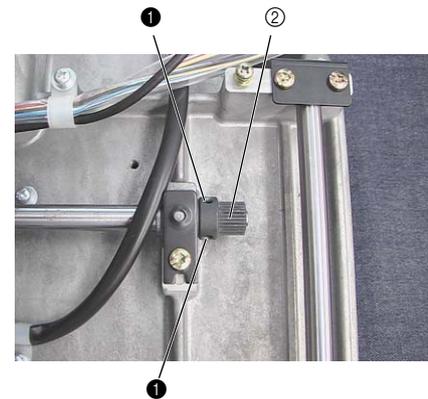
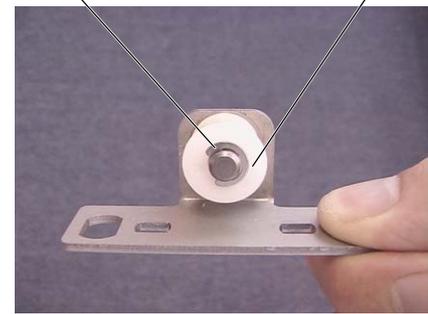
### \*Key point

- Temporarily tighten the screws ② first. Firmly tighten them after completing 4 - 30 "Y belt tension".
4. Align the Y-belt presser ④ with the T-belt's highest point, attach the Y-belt presser to the Y-carriage, and then secure them with the 2 screws ③.
  5. Firmly tighten the 2 screws to secure the Y driving shaft pulley.

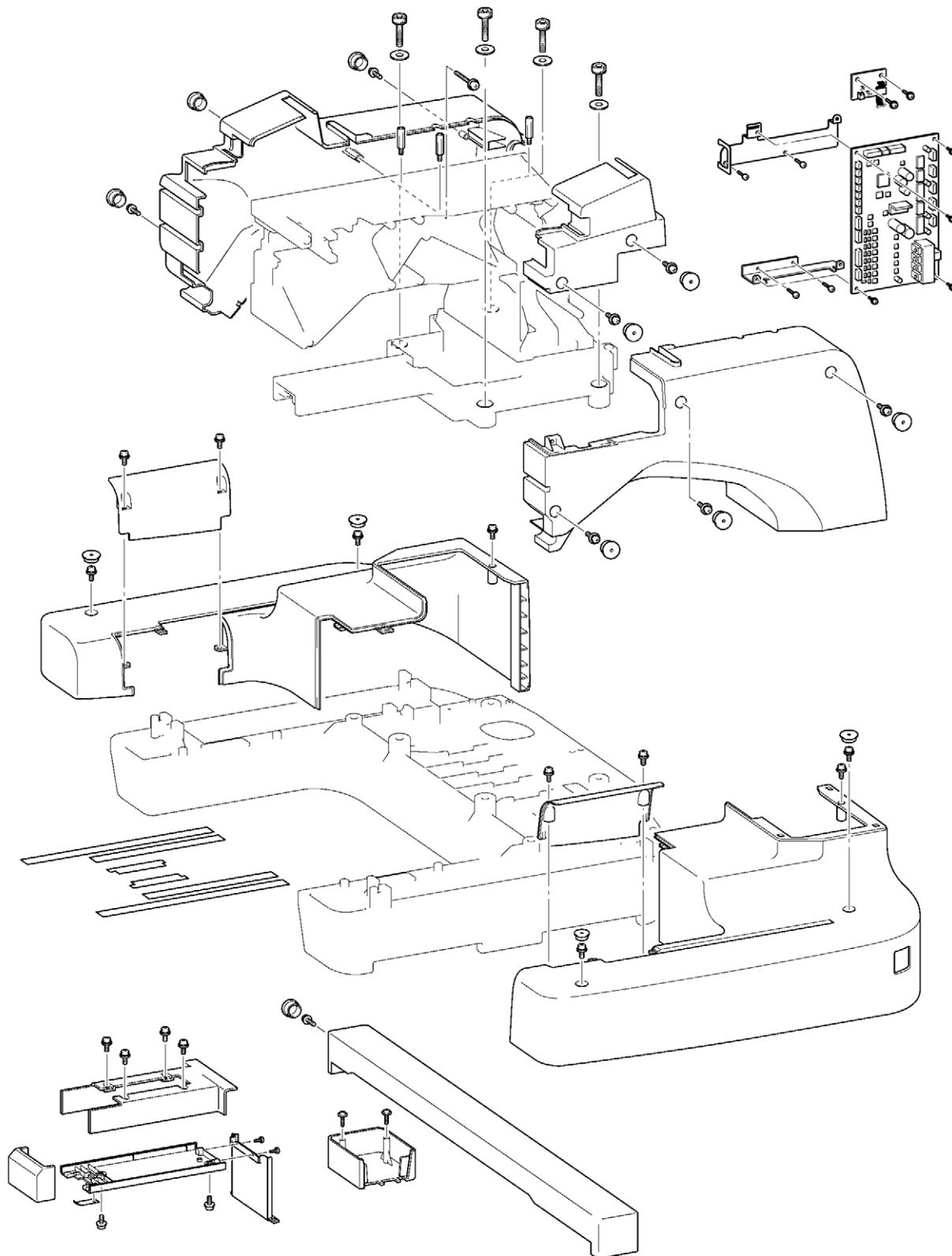
Tightening torque of screw:	0.78 - 1.18 N-m
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①		Set Screw, Socket (CP) M3X3	Torque 0.78 - 1.18 N-m
②		Screw, Pan (S/P washer) M4X10	Torque Hand start
③		Tapite, Bind P M3X14	Torque 0.59 - 0.78 N-m

Retaining rings E4



Main unit

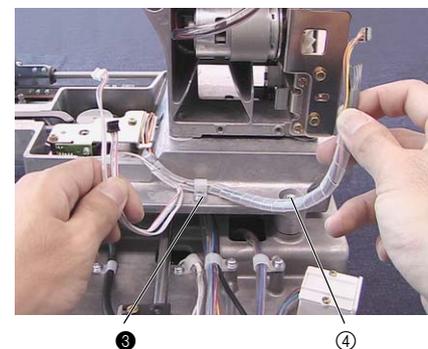
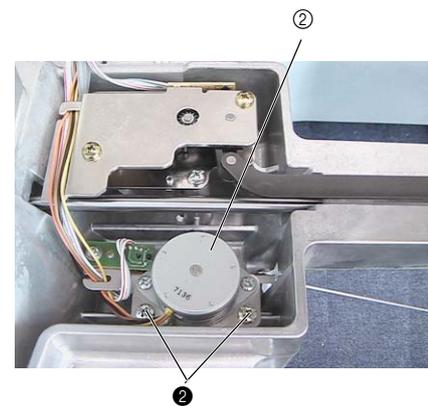
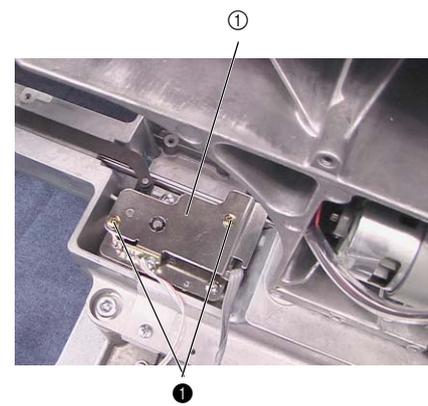


## 1 Cutter unit final assembly and picker final assembly attachment

1. Attach the cutter unit final assembly ① to the arm bed with the 2 screws ①.
2. Attach the picker final assembly ② to the arm bed with the 2 screws ②.

### \*Key point

- Fully draw the feed final assembly toward you before attaching the cutter unit final assembly and the picker final assembly.
  - Be careful not to bend the picker link ③ when threading it through the hole on the arm bed to the needle plate side.
3. Thread the cutter unit final assembly's lead wire and the picker final assembly's lead wire through the spiral tube D ④, and then attach them to the arm bed with the screw ③ and cord clamp NK-5N.



①		Screw, Bind M4X6	Torque 1.18 – 1.57 N-m
②		Screw, Pan (S/P washer) M4X10	Torque 0.78 – 1.18 N-m

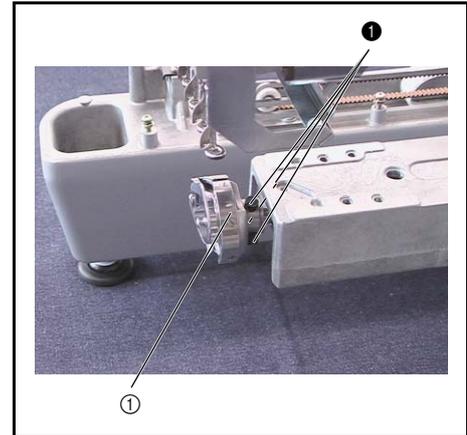
## 2 Rotary hook attachment

1. Attach the rotary hook ① to the lower shaft with the 3 screws ①.

### \*Key point

- Temporarily tighten the screws ① first. Firmly tighten them after completing 4 - 20 "Needle bar rising and Needle clearance".

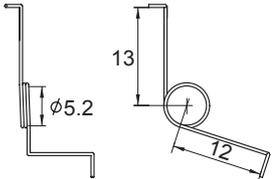
①		Hook set screw 4.46	Torque Hand start
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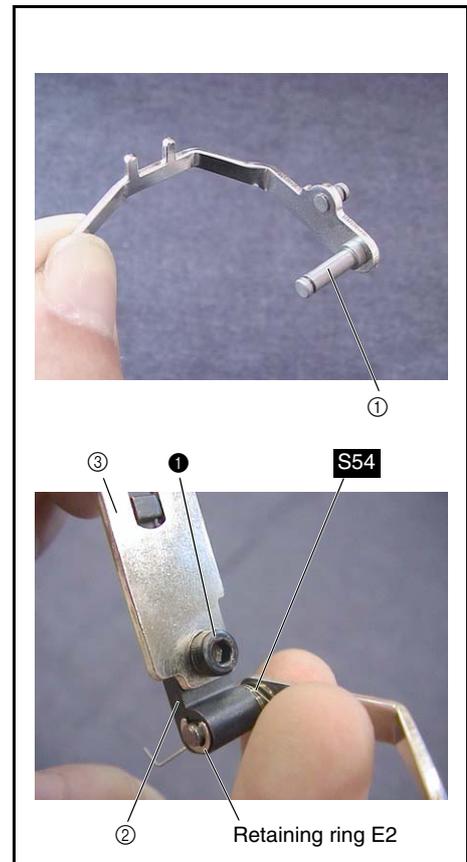


## 3 Picker bracket final assembly

1. Apply MOLYKOTE EM-30L to the picker assembly's shaft ①.
2. Attach the picker holder ② to the picker bracket with the screw ①.
3. Attach the picker assembly and the spring S54 to the picker bracket, ③ and then attach the retaining ring E2.

Apply MOLYKOTE EM-30L to the picker assembly's shaft.	Size of a grain of rice
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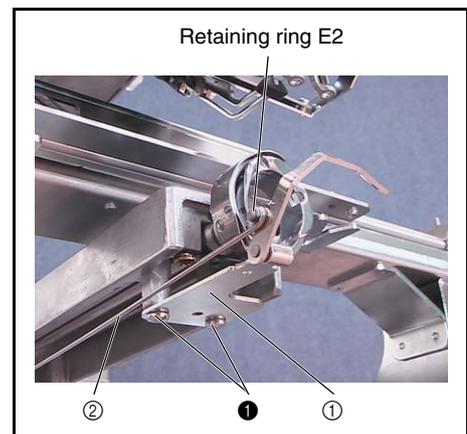
S54		PICKER SPRING XC5853***	
①		Bolt, Socket M3X5	Torque 0.59 – 0.78 N-m



## 4 Picker bracket final assembly attachment

1. Attach the picker bracket final assembly ① to the arm bed with the 2 screws ①.
2. Attach the picker link ② to the picker assembly's picker link attachment shaft, and then attach the retaining ring E2.

①		Screw, Blind M4X6	Torque 1.18 – 1.57 N-m
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## 5 Needle plate base assembly

### \*Key point

- After assembling the needle plate base, be sure to do 4 - 39 "Cutter knife engagement load".

1. Attach the thread holding plate ① to the needle plate base assembly with the screw ①.
2. Attach the fixed knife ② to the needle plate base assembly with the screw ②.

### \*Key point

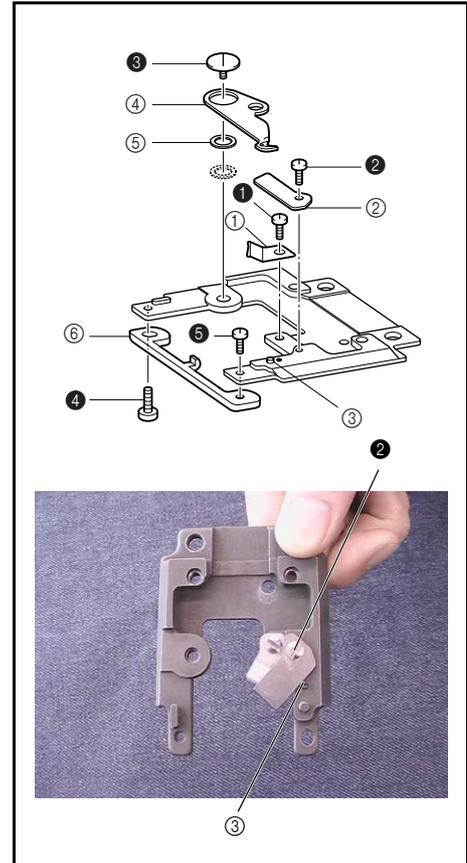
- Tighten the screw ② while pushing the fixed knife against the pin ③ on the needle plate base assembly.

3. Attach the movable knife ④ and the movable knife collar ⑤ to the needle plate base assembly with the screw ③.
4. Attach the rotary hook stopper ⑥ to the needle plate base assembly with the screws (④ ⑤).

### \*Key point

- Temporarily tighten the screws ④ and ⑤ first. Firmly tighten them after completing 4 - 24 "Rotary hook stopper clearance".

① ② ⑤		Screw	Torque 0.78 – 1.18 N-m
③		Screw M4	Torque 0.78 – 1.18 N-m
④		Bolt, Socket M3X6	Torque Hand start



## 6 Needle plate base assembly attachment

1. Attach the needle plate base assembly ① to the arm bed with the 2 screws ①.

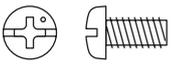
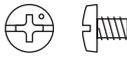
**\*Key point**

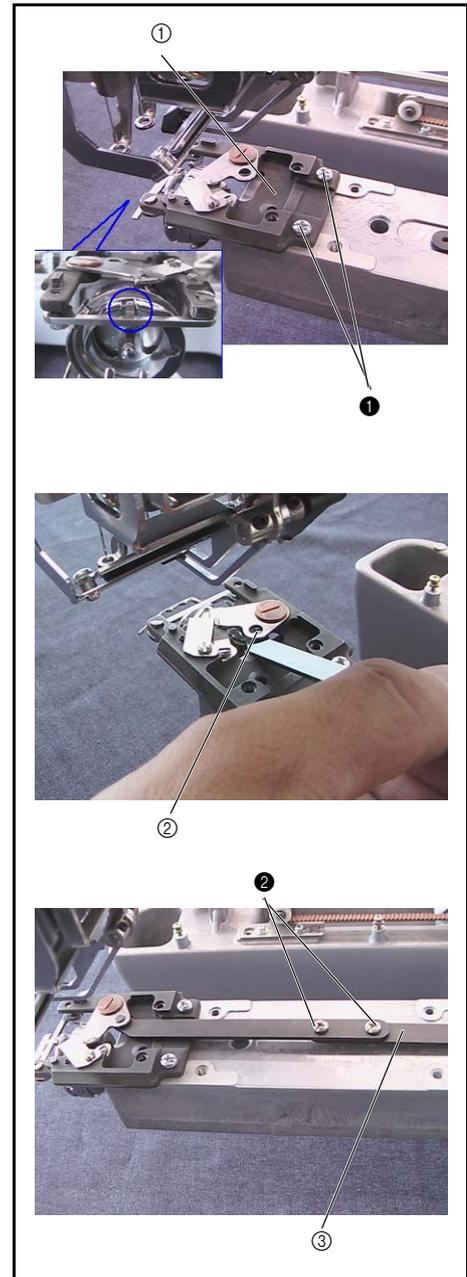
- Attach the needle plate base assembly ① so that it is parallel to the arm bed.

2. Attach the cutter link assembly's shaft ② while aligning it with the hole on the movable knife.
3. Connect the cutter unit's lever link assembly ③ to the cutter link assembly with the 2 screws ②.

**\*Key point**

- Temporarily tighten the screws ② first. Firmly tighten them after completing 4 - 33 "Movable knife initial position."

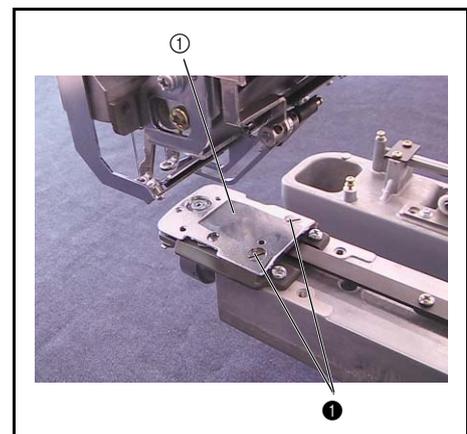
①		Screw, Pan M4X8	Torque 1.18 – 1.57 N-m
②		Screw, Bind M3X4	Torque Hand start



## 7 Needle plate attachment

1. Attach the needle plate ① to the needle plate base assembly with the 2 screws ①.

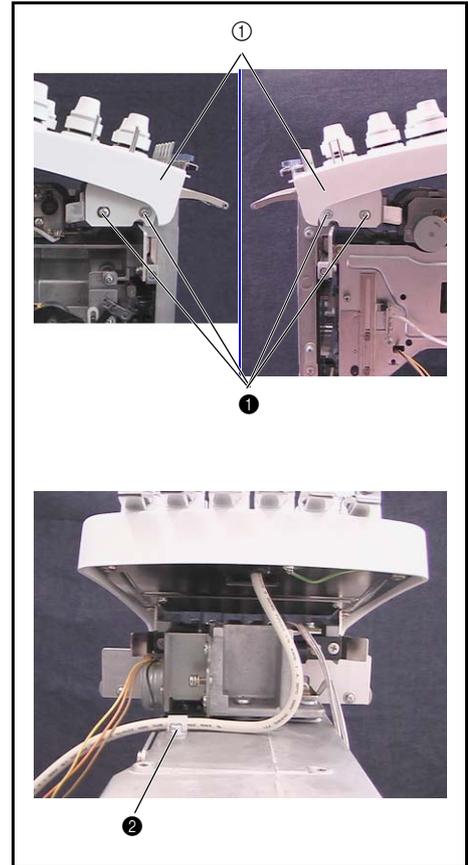
①		Screw Flat M4	Torque 0.78 – 1.18 N-m
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## 8 Tension base attachment

1. Attach the tension base assembly ① to the needle bar case final assembly with the 4 screws ①.
2. Attach the cord clamp (NK-4N) to the tension base cord at a point 125 mm from the tension base, and secure it to the arm bed with the screw ②.

①		Screw, Blind M4X8	Torque 1.18 – 1.57 N-m
②		Screw, Pan (S/P washer) M4X10	Torque 0.78 – 1.18 N-m

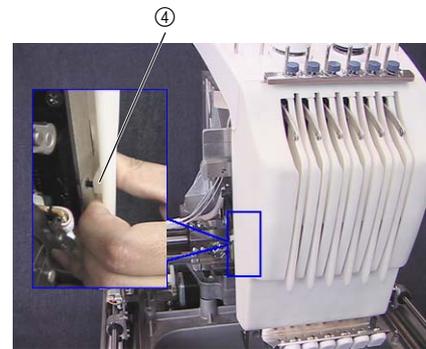
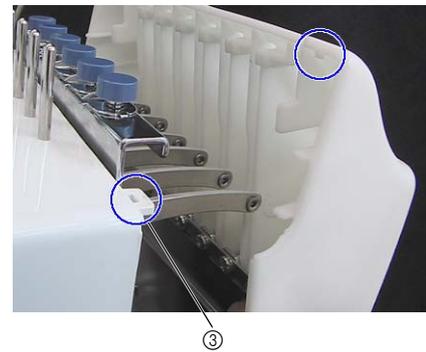
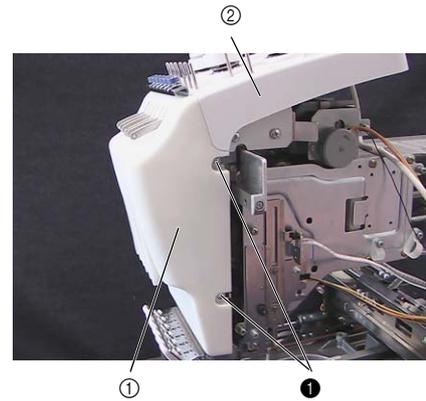


## 9 Thread take-up lever cover attachment

1. Attach the thread take-up lever cover ① to the tension base assembly ② with the 2 screws ①.

### \*Key point

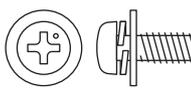
- Place the 2 tabs on the upper section of the thread take-up lever cover over the 2 holes ③ on the operator's side of the tension base assembly, and then align the pin on the left side of the needle bar case final assembly with the groove ④ on the inner left side of the thread take-up lever cover.

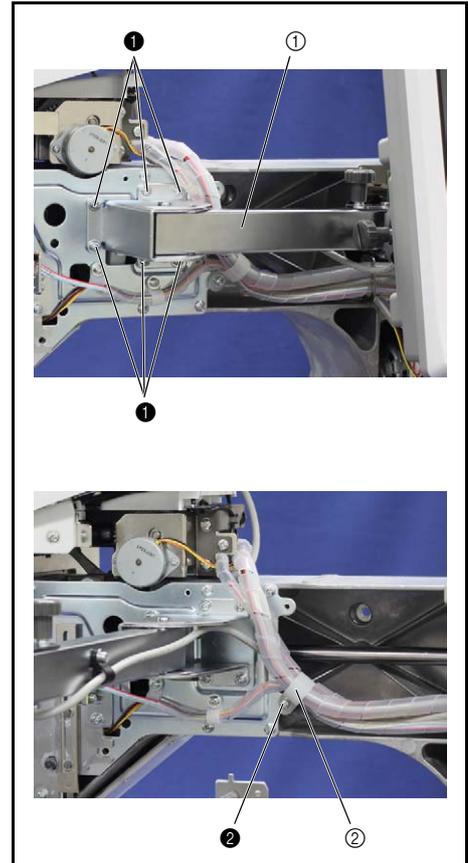


①		Screw, Pan (S/P washer) M4X10	Torque 1.18 – 1.57 N-m
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## 10 Operation panel assembly attachment

1. Attach the operation panel assembly ① with the 6 screws ①.
2. Set the cord clamp ② to the lead wires, and then attach the cord clamp ② with the screw ②.

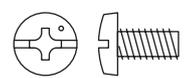
①		Screw, Pan (S/P washer) M4X8	Torque 1.18 – 1.57 N-m
②		Screw, Pan (S/P washer) M4X10	Torque 0.78 – 1.18 N-m

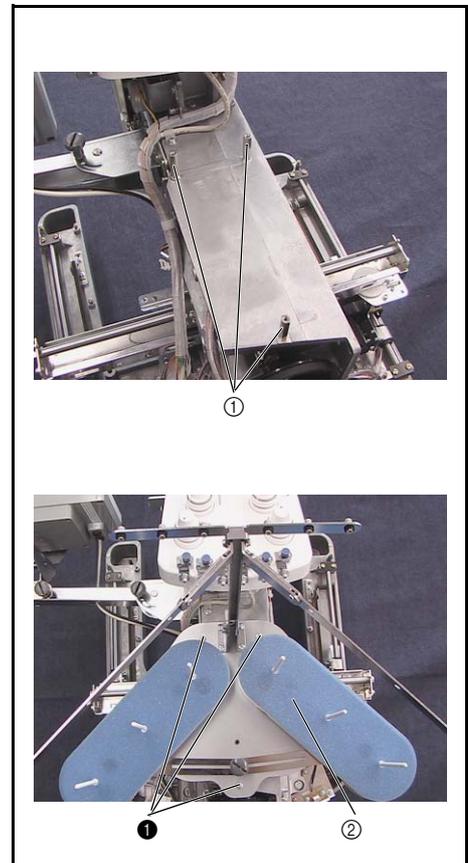


## 11 Spool stand frame final assembly attachment

1. Attach the 3 studs ① to the top face of the arm bed.
2. Attach the spool stand frame final assembly ② to the 3 studs with the 3 screws ①.

Tightening torque of stud:	1.18 - 1.57 N-m
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①		Screw, Bind M4X8	Torque 1.18 – 1.57 N-m
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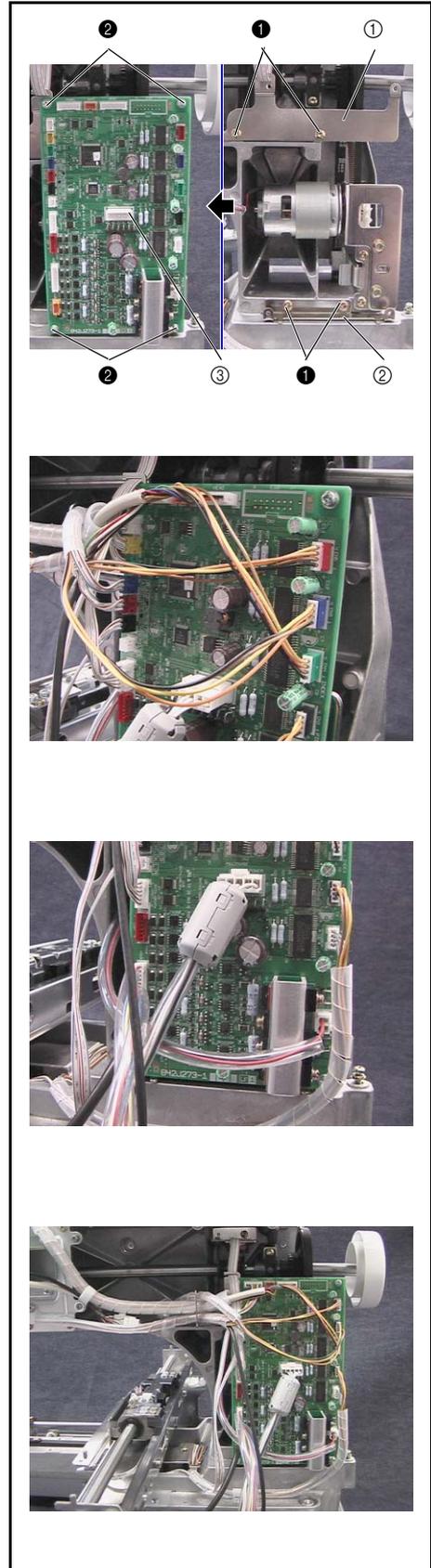


## 12 Main PCB assembly attachment

1. Attach the board holder U ① and the board holder D ② with the 4 screws ①.
2. Attach the main PCB assembly ③ with the 4 screws ②.
3. Connect the lead wires.

### \*Key point

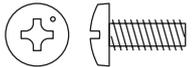
- Refer to "Special Instructions of Wiring".

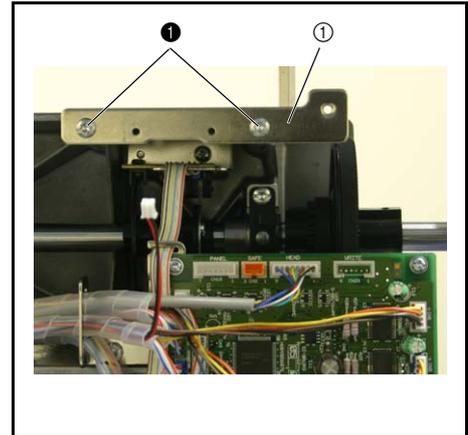


①		Taptite, Bind S M4X10	Torque 1.47 – 1.96 N-m
②		Screw, Pan (S/P washer) M3X6	Torque 0.59 – 0.78 N-m

### 13 LED PCB plate attachment

1. Attach the LED PCB plate ① to the arm bed with the 2 screws ①.

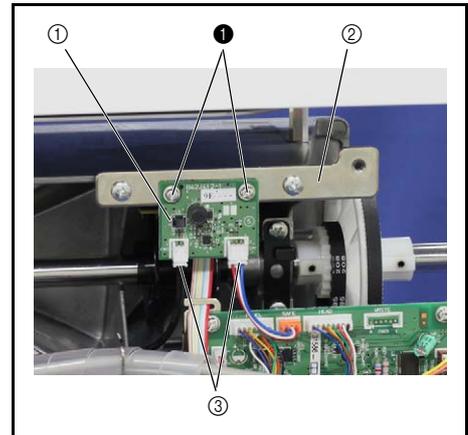
①		Taprite, Bind S M4X10	Torque 1.47 – 1.96 N-m
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### 14 LED drive PCB assembly attachment

1. Attach the LED drive PCB assembly ① to the LED PCB plate ② with the 2 screws ①.
2. Connect the 2 connectors ③ to the LED drive PCB assembly ①.

①		Screw, Pan (S/P washer) M3X6	Torque 0.59 – 0.78 N-m
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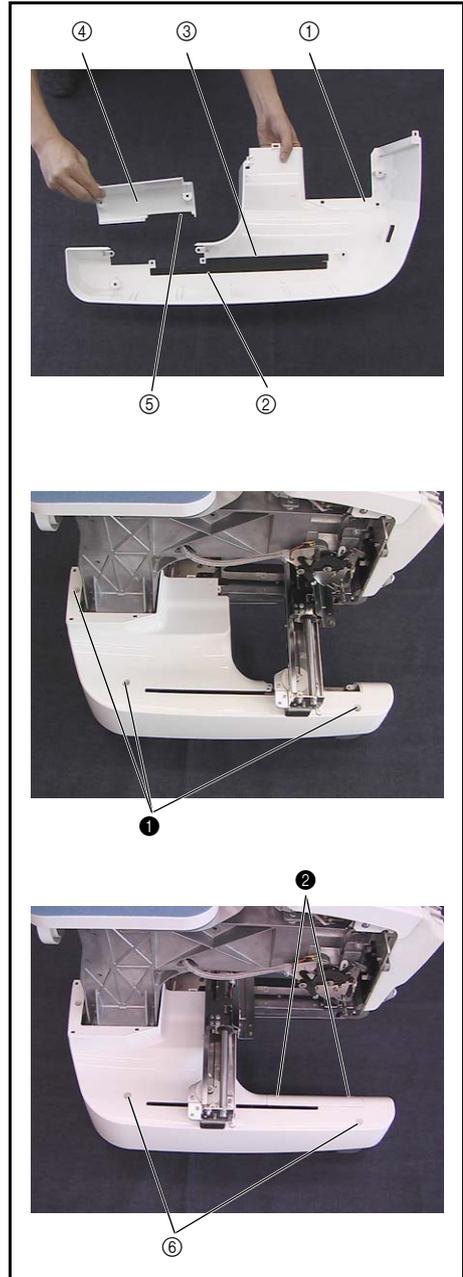


## 15 Base cover L attachment

1. Attach the groove cover A ② and the groove cover B ③ to the rear of the base cover L ①.
2. Attach the groove cover C ⑤ to the rear of the base cover L lid ④.
3. Attach the base cover L with the 3 screws ①.

### \*Key point

- Fully draw the X-guide toward you before attachment.
4. Attach the base cover L lid to the base cover L with the 2 screws ②.
  5. Attach the 2 screw covers ⑥.



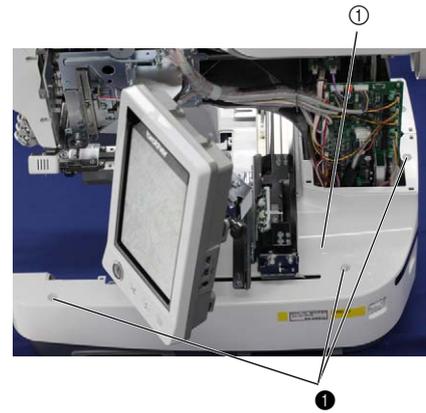
<b>1</b> <b>2</b>		Screw, Pan (S/P washer) M4X10	<b>Torque</b> 0.78 – 1.18 N-m
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## 16 Base cover R attachment

1. Attach the base cover R ① with the 3 screws ①.

### \*Key point

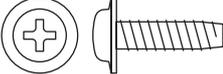
- Fully draw the X-guide toward you before attachment.
2. Attach the 2 screw covers ②.
  3. Attach the base cover R lib ③ with the 2 screws ②.



①		Screw, Pan (S/P washer) M4X10	Torque 0.78 – 1.18 N-m
②			

## 17 Arm cover L attachment

1. Attach the arm cover L ① with the 3 screws ① and ②.
2. Attach the 3 screw covers ②.

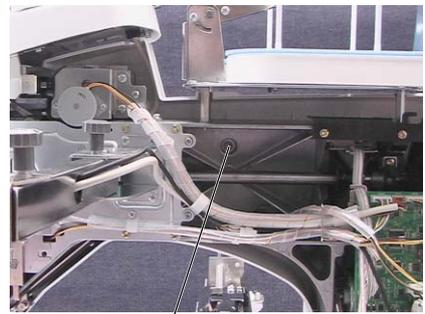
①		Tapite, Cup B M4X14	Torque 0.78 – 1.18 N-m
②		Screw, Pan (S/P washer) M4X10	Torque 0.78 – 1.18 N-m

Outside



②, ②

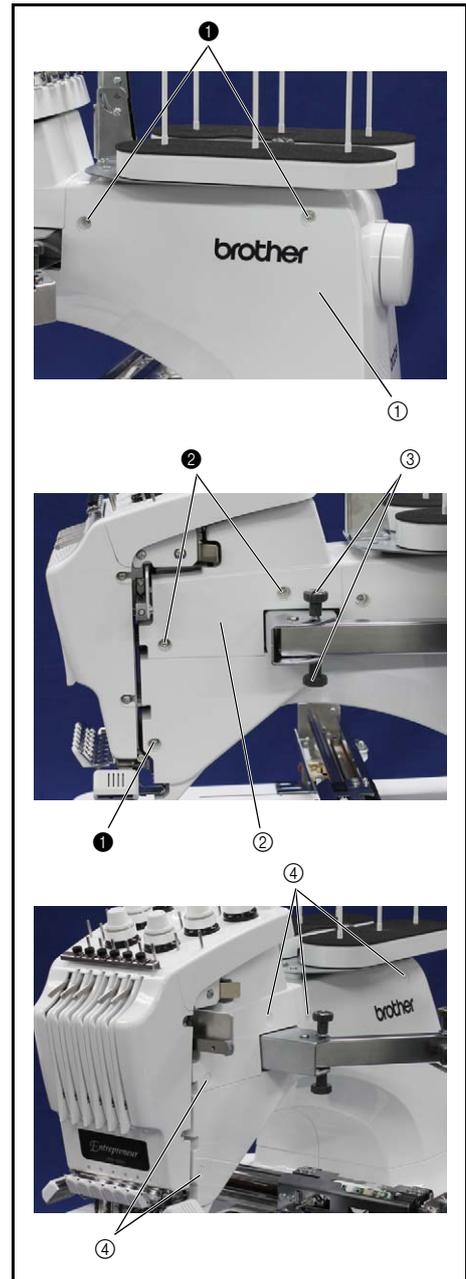
Inside



①

## 18 Arm cover R attachment

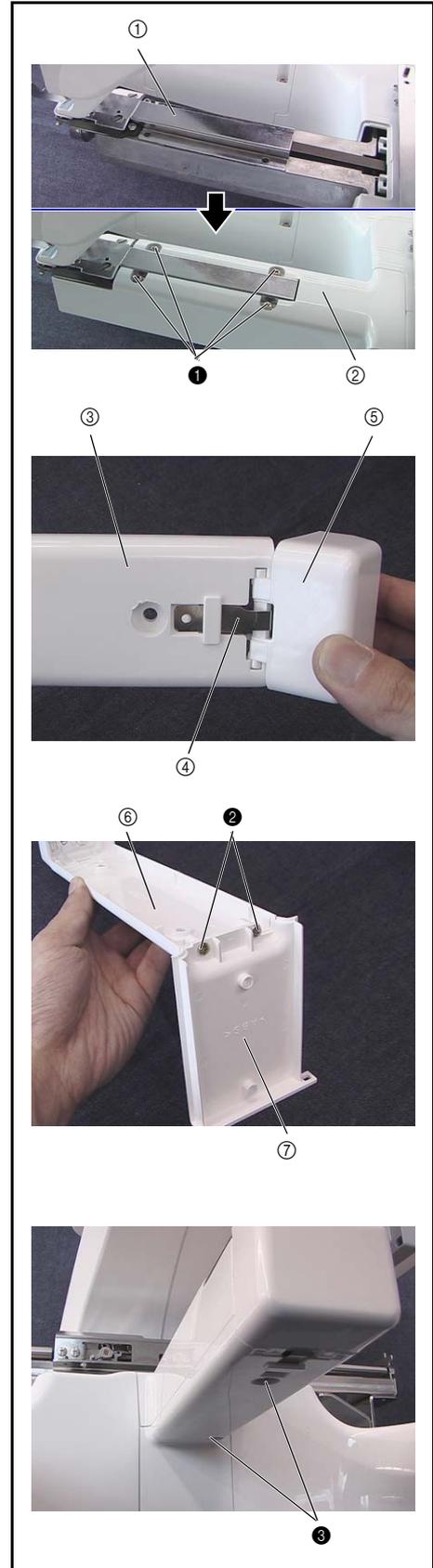
1. Attach the arm cover R ① with the 3 screws ①.
2. Attach the arm cover R lib ② with the 2 screws ②.
3. Tighten the thumb bolt (M4 L), spring washer (2-4), and plain washer (M4) ③. (2 locations)
4. Attach the 5 screw covers ④.

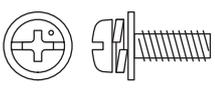
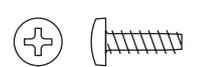


①		Screw, Pan (S/P washer) M4X10	Torque 0.78 – 1.18 N-m
②			

## 19 Bed cover attachment

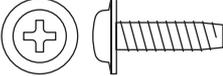
1. Attach the bed cover ① and the bed cover top ② to the arm bed with the 4 screws ①.
2. Attach the spring ④ and the hinged door ⑤ to the bed cover bottom ③.
3. Attach the bed cover lid ⑦ to the bed cover bottom assembly ⑥ with the 2 screws ②.
4. Attach the bed cover bottom assembly to the arm bed with the 2 screws ③.

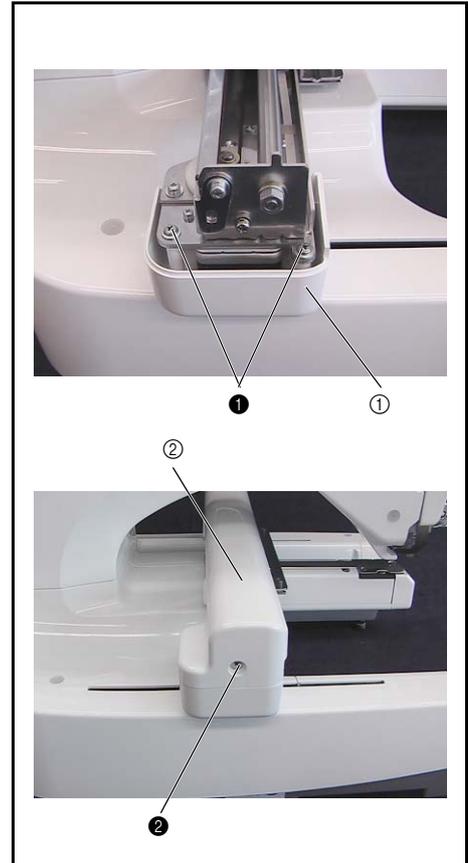


① ③		Screw, Pan (S/P washer) M4X10	Torque 0.78 – 1.18 N-m
②		Tapite, Bind B M3X10	Torque 0.39 – 0.78 N-m

## 20 Motor cover / carriage cover attachment

1. Attach the motor cover ① with the 2 screws ①.
2. Attach the carriage cover ② to the X-guide with the screw ②.
3. Attach the screw cover.

<b>①</b>		Tapite, Cup B M4X14	Torque 0.78 – 1.18 N-m
<b>②</b>		Screw, Pan (S/P washer) M4X10	Torque 0.78 – 1.18 N-m



# 4 Adjustment

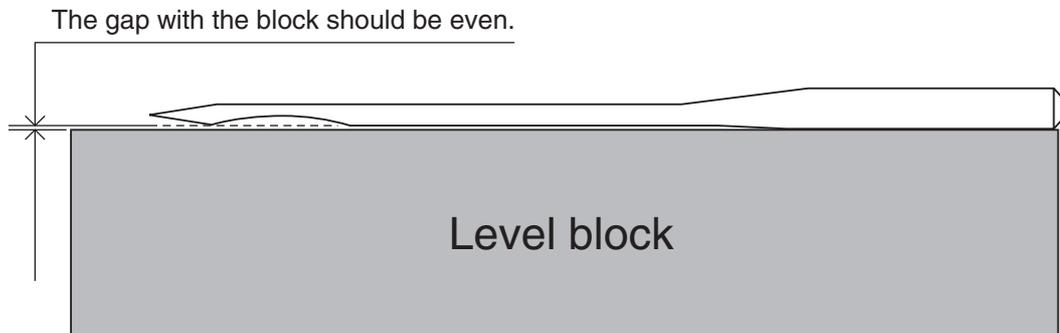
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Inspection	Needle point damage .....	4 - 2
Test mode	Starting test mode .....	4 - 3
	Selecting test mode .....	4 - 4
	Input needle bar data for adjustment...	4 - 13
Adjustment	Motor belt tension .....	4 - 15
	Timing belt tension .....	4 - 16
	Needle drop (front/back) .....	4 - 17
	Needle position (left/right) .....	4 - 19
	Needle bar rising and Needle clearance ..	4 - 20
	Needle bar height .....	4 - 22
	Rotary hook stopper clearance .....	4 - 24
	Presser foot height .....	4 - 25
	Needle bar top dead center .....	4 - 26
	Needle threader (up/down) .....	4 - 27
	Needle threader (left/right) .....	4 - 29
	Y belt tension .....	4 - 30
	X belt tension .....	4 - 31
	Picker activation .....	4 - 32
	Movable knife initial position .....	4 - 33
	Thread presser base up/down position ..	4 - 34
	Hoop sensor (A/D value) .....	4 - 35
	Upper shaft encoder phase .....	4 - 37
	X, Y carriage initial position .....	4 - 38
	Cutter knife engagement load .....	4 - 39

1. Put needle on a level block, and check a needle is not bent.

**\*Key point**

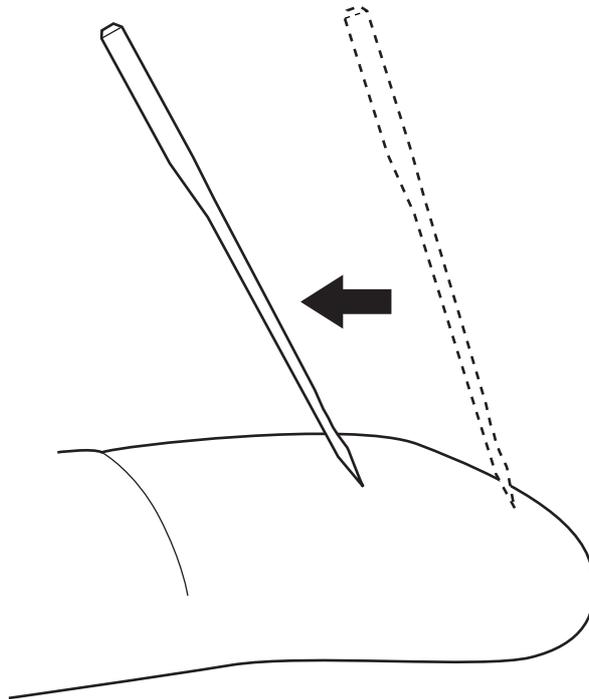
- Check all needles.



2. Slide a needle on your finger and check if moves smoothly (no damage on needle point).

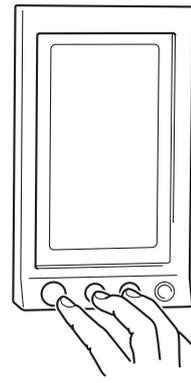
**\*Key point**

- Check all needles.



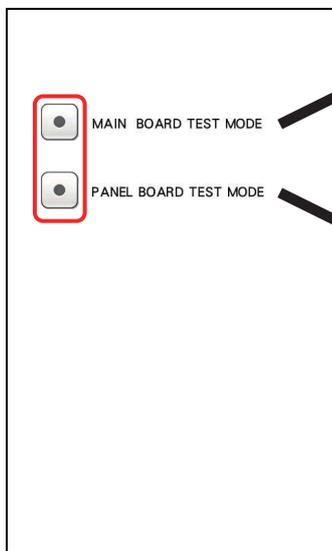
### 1. Starting test mode

Turn on the power while pressing the [Start/Stop] button, [Thread trimming] button and the [Automatic needle-threading] button.

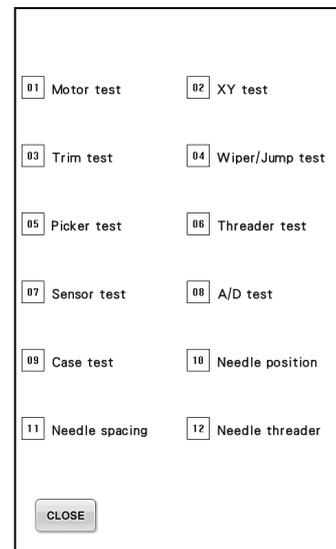


### 2. Selecting test mode

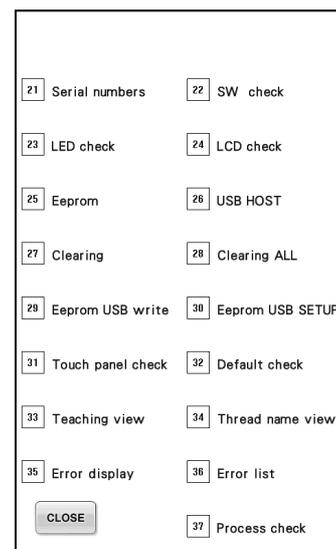
1) Press the  button on the screen, and select the test mode.



MAIN / PANEL BOARD TEST MODE SELECTION SCREEN



MAIN BOARD TEST MODE SELECTION SCREEN



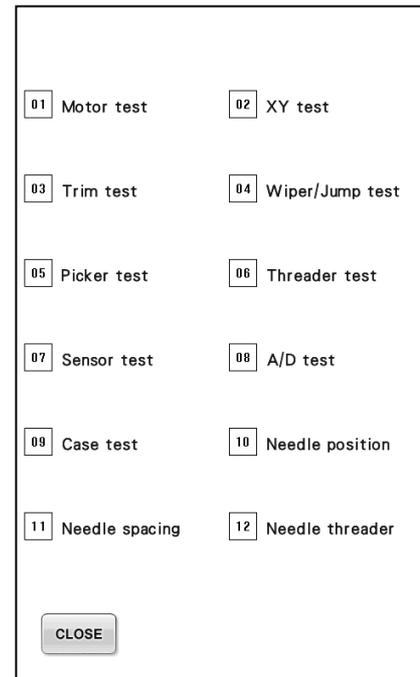
PANEL BOARD TEST MODE SELECTION SCREEN

After replacing the main PCB, you must set the picker motor over-pulses (Test mode #05) and adjust the frame sensor (Test mode #08).

2) Press the number on the screen, and select the test mode.

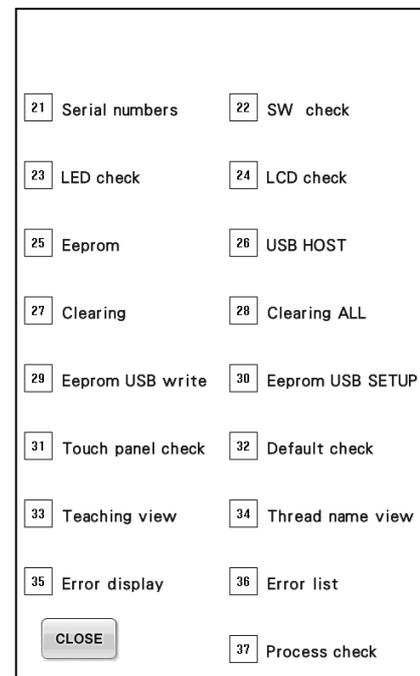
#### ■ MAIN BOARD TEST MODE SELECTION SCREEN

- [01]. Motor test: Main shaft motor test
- [02]. XY test: X/Y motor test
- [03]. Trim test: Trim (thread cut) motor test
- [04]. Wiper/Jump test: Wiper and jump bracket motor test
- [05]. Picker test: Picker motor test
- [06]. Threader test: Thread motor test
- [07]. Sensor test: Sensor test
- [08]. A/D test: A/D conversion value test
- [09]. Case test: Needle bar case motor test
- [10]. Needle position: Needle position adjustment
- [11]. Needle spacing: Needle and rotary hook timing adjustment and needle space adjustment
- [12]. Needle threader: Needle threader adjustment



#### ■ PANEL BOARD TEST MODE SELECTION SCREEN

- [21]. Serial numbers: Serial numbers display
- [22]. SW check: Switch checking
- [23]. LED check: Sewing light, Speaker and S/S LED checking
- [24]. LCD check: LCD checking
- [25]. Eeprom: (Not used)
- [26]. USB HOST: USB HOST checking
- [27]. Clearing: Flash memory area/Service counter clearing
- [28]. Clearing ALL: (Not used)
- [29]. Eeprom USB write: EEPROM/USB media writing (Not used)
- [30]. Eeprom USB SETUP: (Not used)
- [31]. Touch panel check: Touch panel adjustment checking
- [32]. Default check: Parameter default checking
- [33]. Teaching view: (Not used)
- [34]. Thread name view: (Not used)
- [35]. Error display: (Not used)
- [36]. Error list: Error list display
- [37]. Process check: (Not used)



### 3) Test mode Manual

This section primarily explains only the test modes used for checking the state of the sewing machine.

For more detailed descriptions of the test modes used for each adjustment, refer to the pages containing instructions for each specific adjustment.

#### #07. Sensor test

The status of each sensor (including Encoder A, Encoder B, and Test SW) is indicated using “H” or “L”.

**\*Key point**

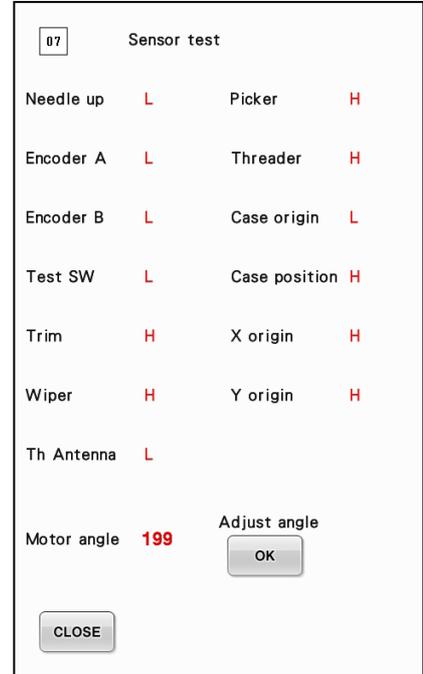
- A buzzer goes off when the sensor status changes (excluding Encoder A and Encoder B).

Although the current angle of the main shaft is displayed at the right side of the “Motor angle”.

**\*Key point**

- “?” is displayed until the status of the Needle up sensor changes after power has been turned on.

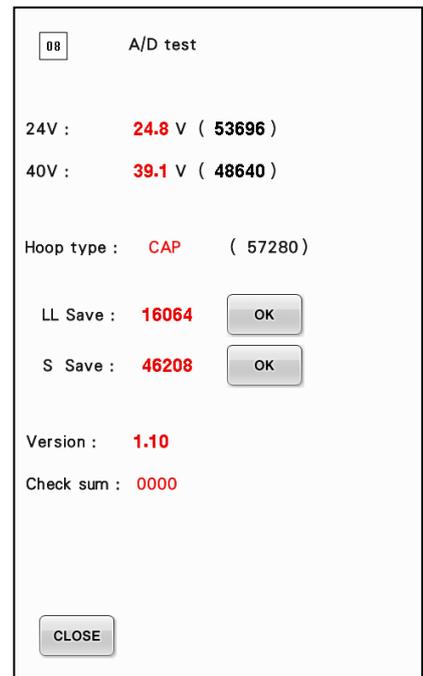
Adjust angle [OK]: Press the [OK] button of the “Adjust angle”, and moves the angle of the main shaft to the initial adjustment position (approx. 350 deg.). (Not used)



#### #08. A/D conversion value test

The embroidery hoop holder type and the embroidery hoop type attached on the sewing machine and the frame sensor A/D value are displayed.

[Hoop type]: The embroidery hoop type and the frame sensor A/D value are displayed.



**#09. Needle bar case motor test**

When the needle bar data has been read to the sewing machine, the needle bar data is displayed below “Read needle date”.

(13 characters)

The status of the thread breakage sensor is indicated using “H” or “L” at the right side of the “Thread breakage”.

**\*Key point**

- A buzzer goes off when the status of the thread breakage sensor changes.

[Origin]: Returns the needle bar case to its origin. (Not used)

[Loop]: Moves the needle bar case continuously. (Not used)

[Read needle data]: Reads the needle bar data via USB and registers it to the sewing machine (EEPROM).

**\*Key point**

- Refer to “4-13 Input needle bar data for adjustment” about the needle bar date entry

[Case Move]: Moves the needle bar case to the left and right.

**\*Key point**

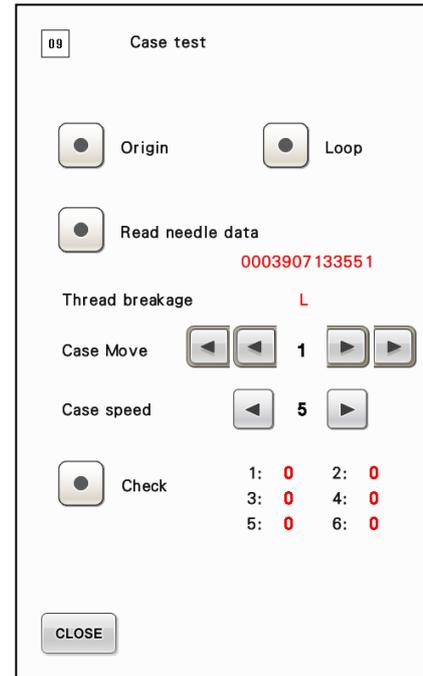
- Position parameter: 1 to 10 (Needle bar number position)
  - (Outside position of needle bar case: 2 locations on both side)
  - C (Camera shooting position)

[Case speed]: Sets the needle bar case speed.

**\*Key point**

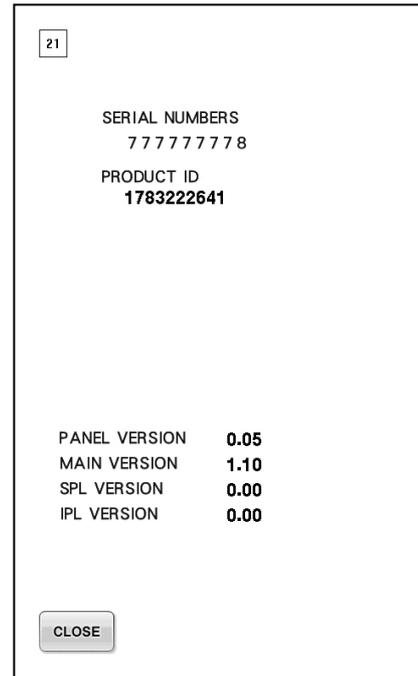
- Needle bar speed parameter: 1 [lowest] to 9 [highest]

[Check]: Not used



### #21. Serial numbers display mode

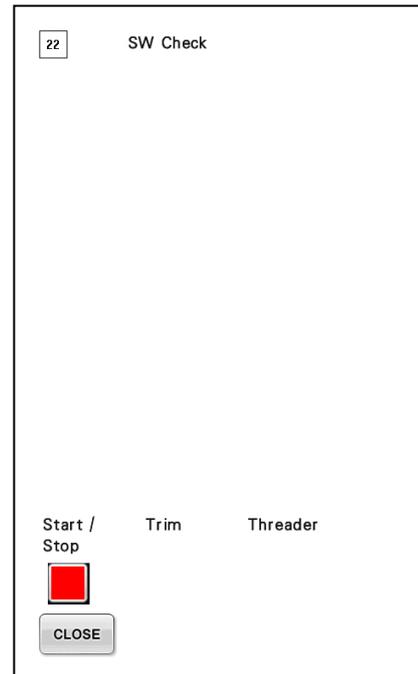
The stored serial numbers and product ID in EEPROM of the sewing machine are displayed, and the installed program version in the sewing machine is displayed at the bottom side.



### #22. Switch checking

Check whether the [Start/Stop] button, [Thread trimming] button and the [Automatic needle-threading] button are operating correctly.

The  (color: red) is displayed under the switch name while pressing each switch.



### #23. Sewing light, Speaker and S/S LED checking

Select this mode to check whether the Sewing light, Speaker and the Start/ Stop LED are operated correctly.

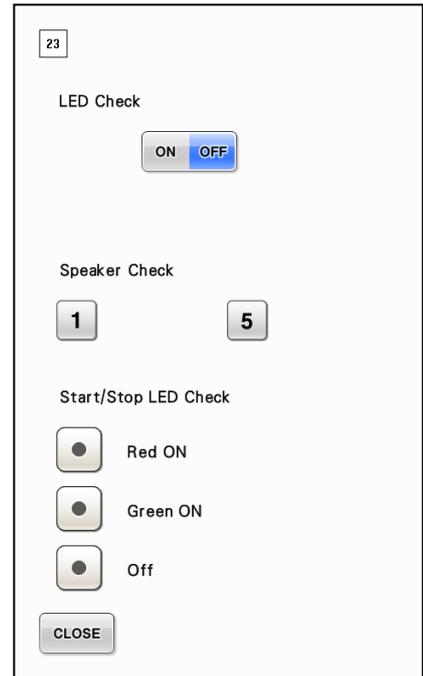
[LED Check]: Turn the LED lamp off to press [ON] button.  
: Turn the LED lamp on to press [OFF] button.

[Speaker Check]: Speaker sounds minimum volume to press [1] button.  
: Speaker sounds minimum volume to press [5] button.

[Start/Stop LED Check] : S/S switch LED red lights to press  button of “Red ON”.

: S/S switch LED green lights to press  button of “Green ON”.

: S/S switch LED lights off to press  button of “OFF”.

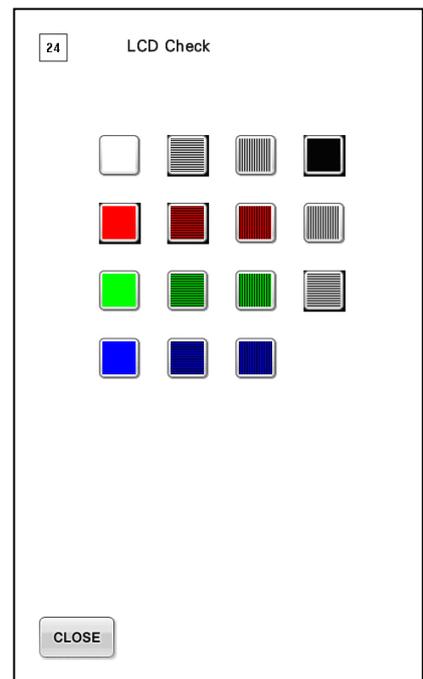


### #24. LCD checking mode

Check the state of the LCD.

Press the button, and the button color or pattern is displayed on the LCD.

When touch the screen in the state that the color or pattern is displayed on the LCD, return to the test mode #24 screen.



**#26. USB HOST checking**

Select this mode to check the USB HOST function.

[USB HOST 1]: USB port of the upper side of the side surface of the panel

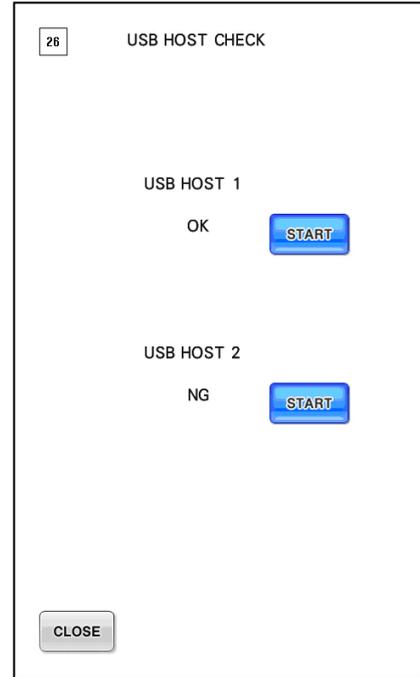
[USB HOST 2]: USB port of the lower side of the side surface of the panel

Insert the USB media into the USB port, and then press the [START] button.

- When the USB media is recognized correctly, “OK” is displayed.
- When the USB media is not recognized correctly, “NG” is displayed.

**\*CAUTION**

- Do not insert the USB media into the two USB ports at the same time.



**#27. Flash memory area/Service counter clearing**

[Clearing Memory]: When press the [OK] button, the flash memory area is cleared.

**\*Key point**

- The stored sewing pattern in the machine is cleared.

[Clearing Counter]: When press the [OK] button, the service stitch counter/service stitch time is cleared.

**\*Key point**

- The service stitch counter/service stitch time is cleared .The total stitch counter/service stitch time is not cleared.

[Maintenance Start Time]: When press the [+] button or the [-] button, the service stitch time for the maintenance message indication is set.

**\*Key point**

- The factory default setting of the service stitch time is 1,500 hours.
- It is configurable at 100 hours intervals until 1,000 hours from 500 hours.



**#31. Touch panel adjustment checking**

Select this mode to check that there is no gap in the touch panel and LCD.

Touch the center of the [+] symbol with a touch pen.  
The gap (dots) of X or Y is displayed.

When the gap is within an allowance, "OK" is displayed.

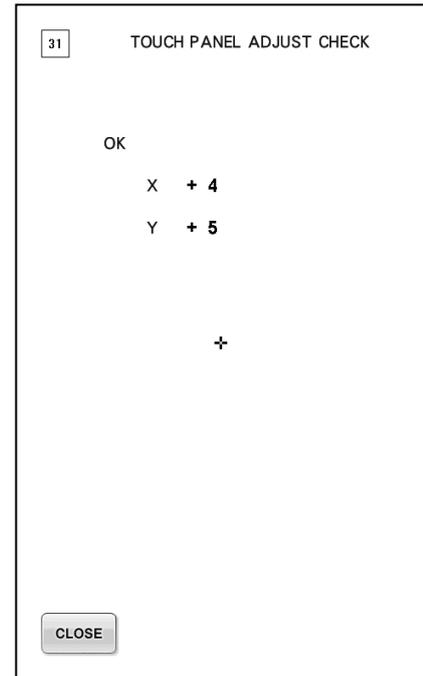
When the gap is not within an allowance, "ERROR" is displayed.

**\*Key point**

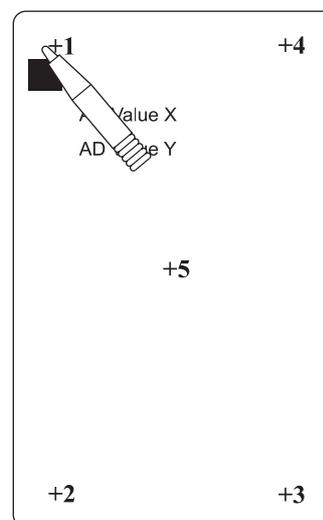
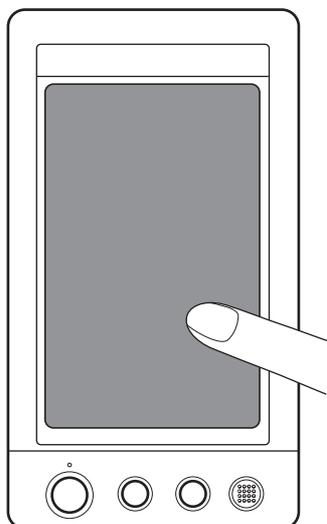
- Within an allowance of X is  $\pm 5$ dots
- Within an allowance of Y is  $\pm 5$ dots

**\*Note**

- When the "ERROR" is displayed, adjust the touch panel again following procedure.

**Adjustment of touch panel**

1. Touch anywhere inside the touch panel, and turn the machine off, then on again.
  - Continue touching the touch panel until the adjustment screen appears.
  - The start/stop button is red.
2. Use the included touch pen to touch the center of the numbered crosses on the screen, from 1 to 5.
  - AD Value X and AD Value Y numbers change with the touch of each numbered cross to show variables.
  - If the buzzer sounds when cross number 5 is touched, an error occurred during setting, and "ERROR" appears on the screen. Touch the crosses again, starting from 1 to 5.
3. After making the necessary touch panel adjustment, "SUCCESS" will show on the screen.
4. Turn the machine off, and on again.



### #32. Parameter default checking

When the all displayed parameters are default, “OK” is displayed.  
 When there is parameter that is not default, “NG” is displayed.

**\*Key point**

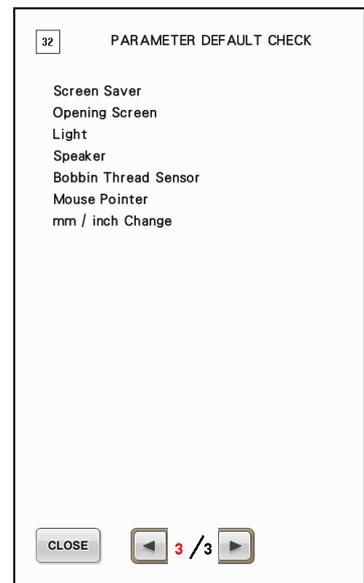
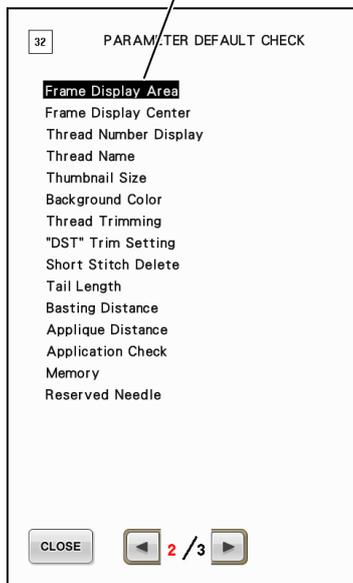
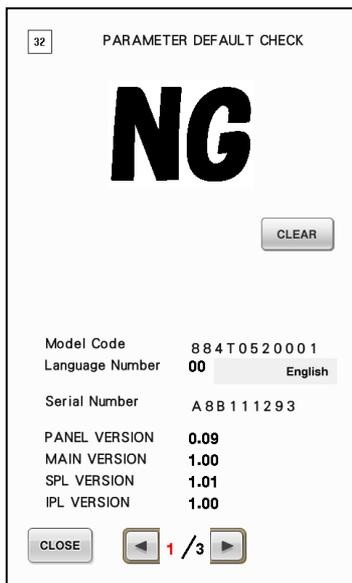
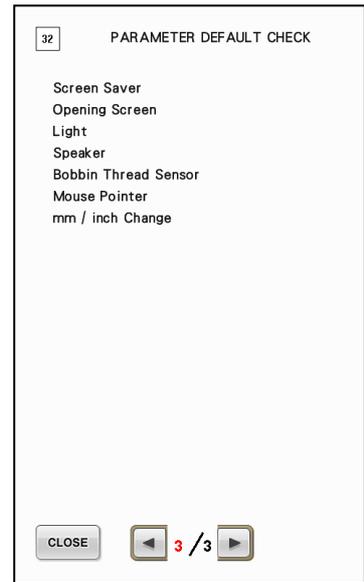
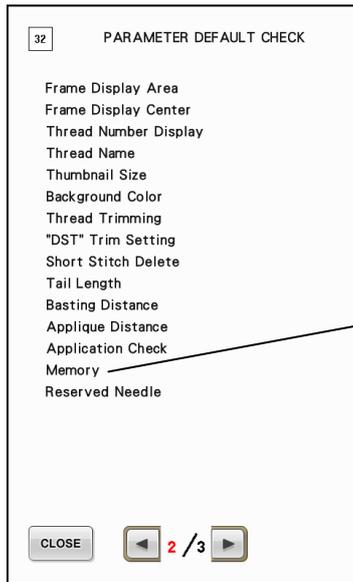
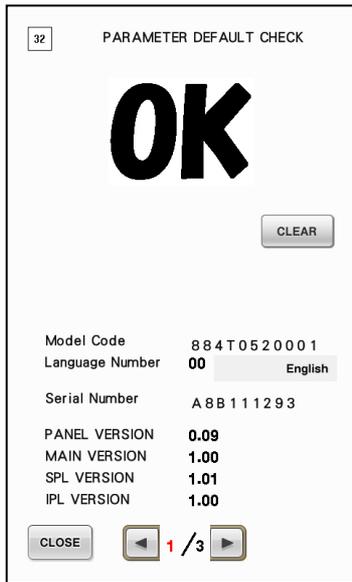
- The parameter that is not default is reversed display (Refer to ①).

[CLEAR] : The all displayed parameters is default value.

**\*CAUTION**

- “Memory” (Refer to ②) check the flash memory of the sewing machine.  
 Press the [CLEAR] button, and then the stored all sewing pattern in the sewing machine are cleared.

[<] \* / 3 [>]: Press the [<] and [>] button, feeds the screen.



**#36. Error list display**

The maximum of 30 error messages displayed while in use in the sewing machine are saved.

When press the [+] button, the error message that one old is displayed.

When press the [-] button, the error message that one new is displayed.

**\*Key point**

- The list number of the newest error message is 1.

[<] [>]: When press the [<] button and the [>] button, changes the language of the error message.

**\*Key point**

- The changing of the language is effective until turning off.
- Other test mode is change only the language on the button.

[COUNT]: When there is the same error in the stored errors (30 cases), the number is displayed.

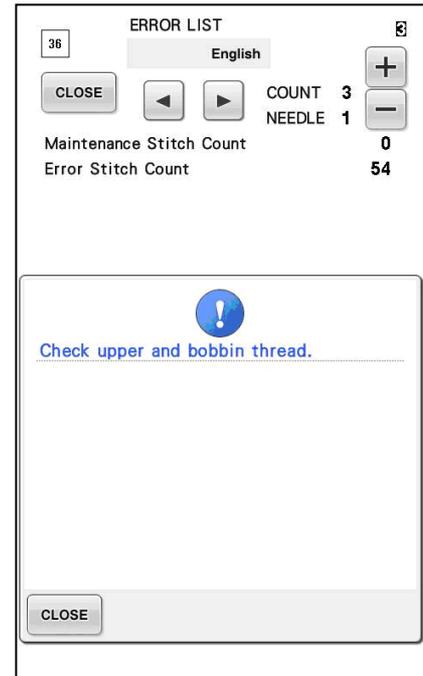
**\*Key point**

- When the only one case, "1" is displayed.

[NEEDLE]: The needle number that the error occurred is displayed.  
(only some error message)

[Maintenance Stitch Count]: The total stitch count of the point in time when maintained in the last time is displayed.

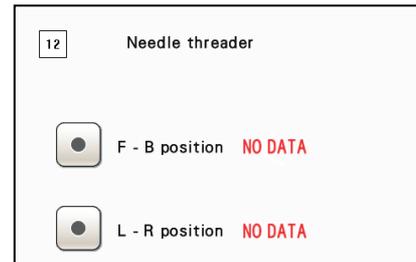
[Error Stitch Count]: The total stitch count number of the point in time when displayed the error is displayed.



When replacing the needle bar case assy. perform the following steps to save the “needle bar data” to the sewing machine's flash memory.

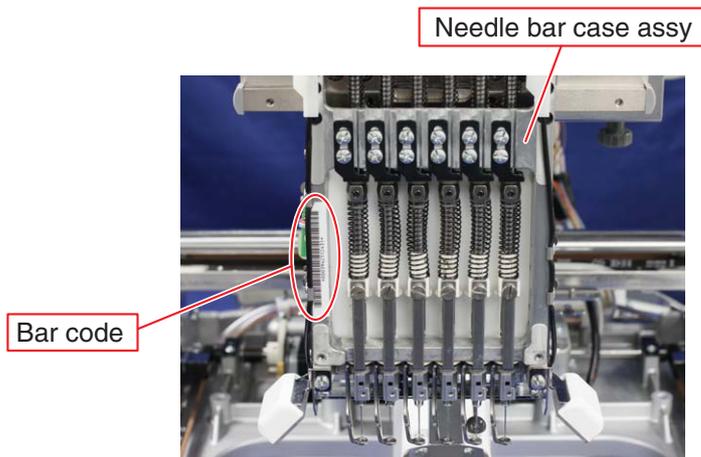
**\*Key point**

- If the needle bar data is not saved to the sewing machine “NO DATA” will be displayed to the right of “F-B position” and “L-R position”. (Fig. 1)

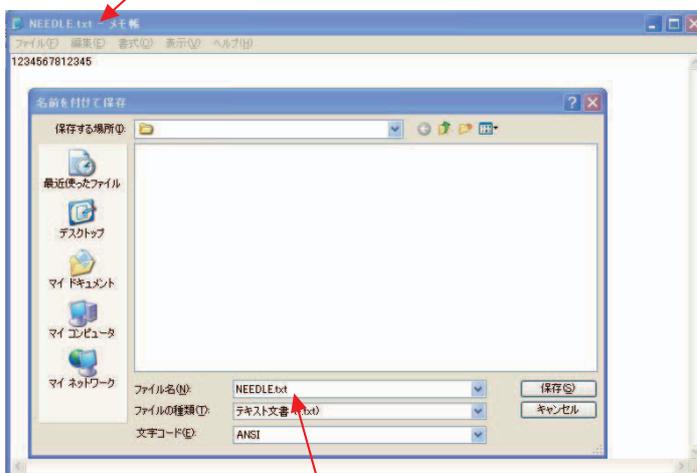


**Inputting Needle Bar Data**

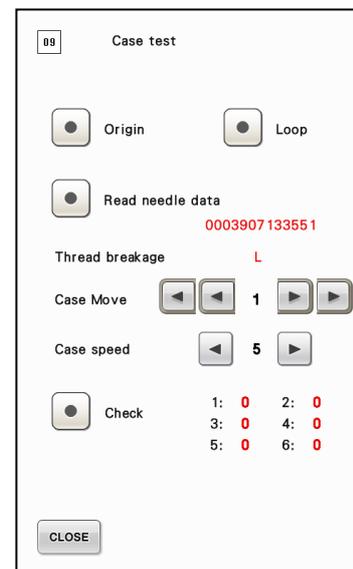
1. Launch any program capable of saving a file in plain text format. Enter the 13-digit barcode on the needle bar case and save the file as “NEEDLE.txt”. (Fig. 2)
2. Connect the sewing machine to a PC via USB cable and start the sewing machine in test mode.
3. Transfer the “NEEDLE.txt” file to the sewing machine from the PC.
4. Press the [Read needle data] button from test mode #09. (Fig. 3)
5. Check to ensure that the number (13-digit) displayed on the screen matches the barcode number on the needle bar case.



Enter the needle bar date (13 digit).



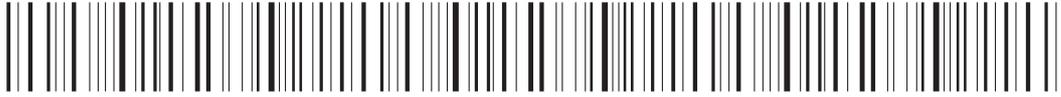
Save the file as "NEEDLE.txt".



■ Reference: How to read the barcode data

You can also select the standard needle bar and perform any necessary adjustments from the barcode data (13-digit) found on the needle bar case assy.

Needle bar data on Bar code



\*1234567812345\*

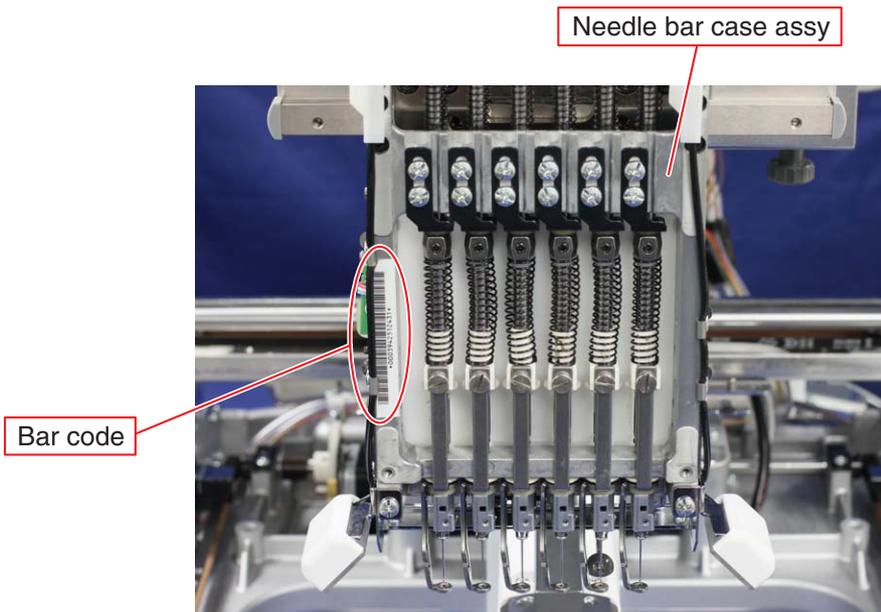
Production NO. (8-digit)

④ Needle threader adjustment (right/left)

③ Needle bar rising length and  
Needle space adjustment

② Needle position adjustment (right/left)

① Needle position adjustment (front/back)

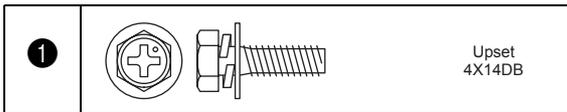


## [Standard]

The belt slack should be 1.5 to 3.5 mm when pushing the center of the motor belt with a force of 0.98N (100g).

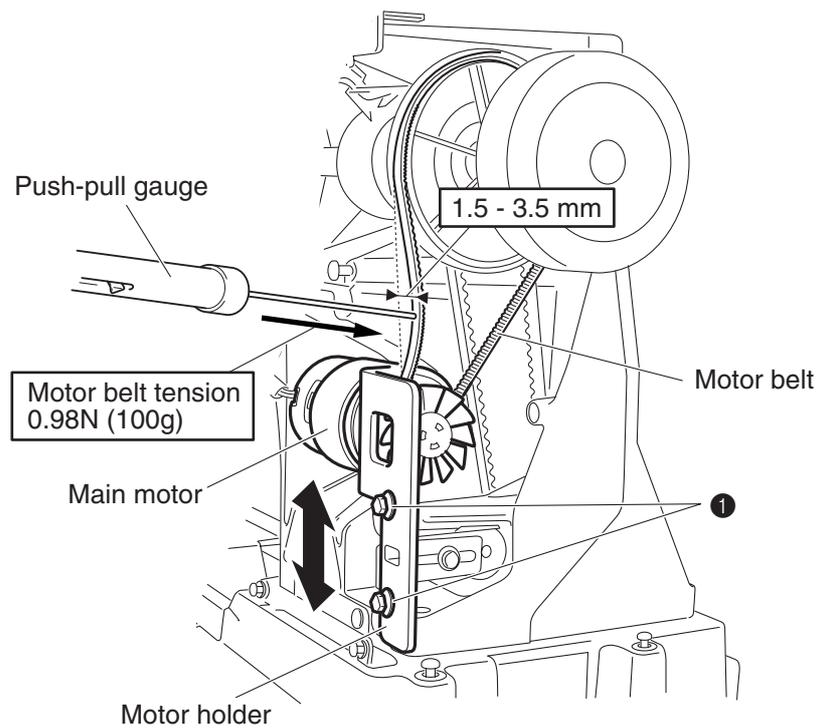
## [Adjustment]

1. Remove the 4 screws of the main PCB and the 2 PCB supporters to remove the main PCB.
2. Loosen the 2 screws ❶ of the motor holder.
3. Adjust the tension on the motor belt by moving the position of the motor holder up or down.
4. Tighten the 2 screws ❶ of the motor holder to secure the motor holder.
5. Attach the main PCB with the 4 screws and the 2 PCB supporters.



XC2277001

Push-pull gauge (5N)

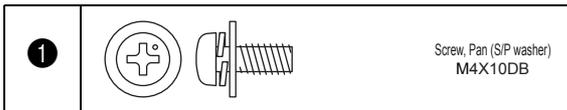


## [Standard]

The belt slack should be 3.5 to 4.0 mm when pushing the center of the timing belt with a force of 1.96N (200g).

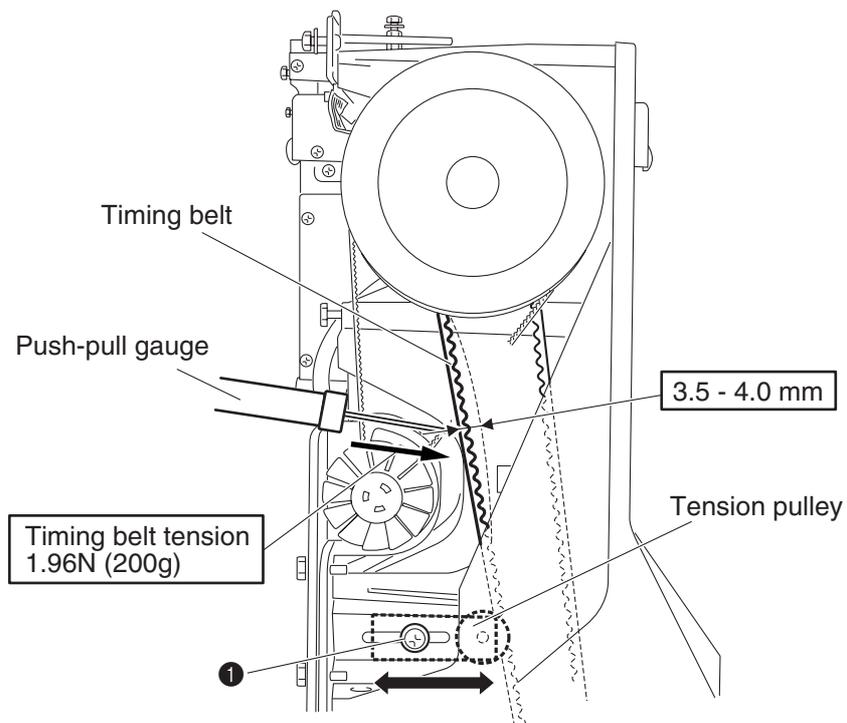
## [Adjustment]

1. Remove the 4 screws of the main PCB and the 2 PCB supporters to remove the main PCB.
2. Loosen the screw ❶ of the tension pulley.
3. Adjust the tension on the timing belt by moving the position of the motor holder left or right.
4. Tighten the screw ❶ of the tension pulley to secure the tension pulley.
5. Attach the main PCB with the 4 screws and the 2 PCB supporters.



XC2277001

Push-pull gauge (5N)



## [Standard]

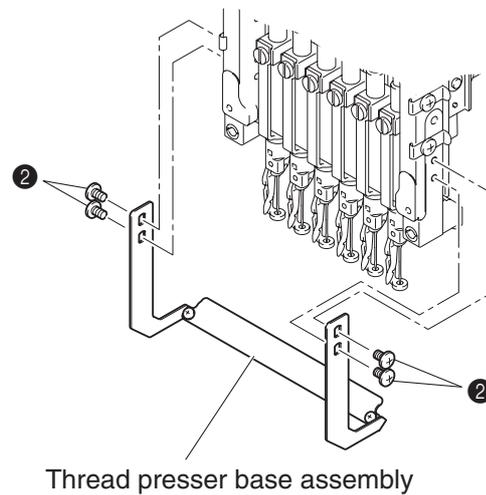
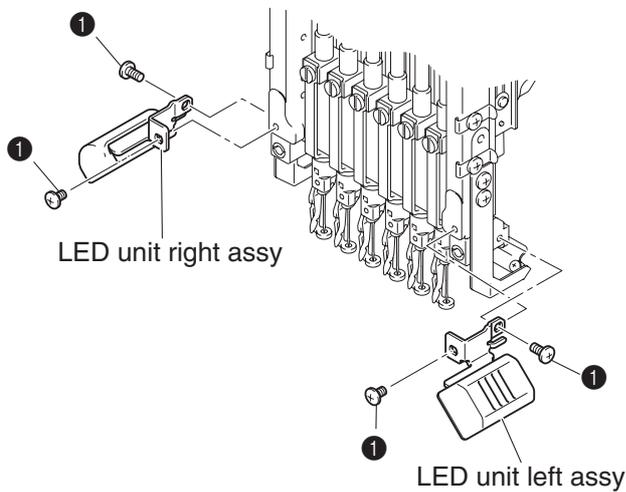
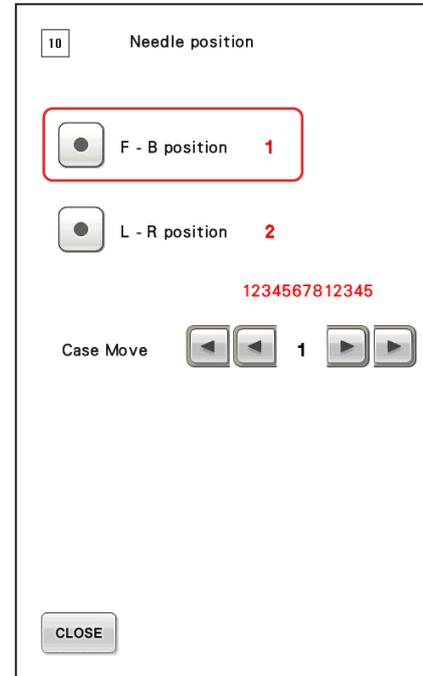
The clearance between the needle and the needle plate hole in the front/back direction should be more than 0.3 mm.

## [Adjustment]

1. Remove the 4 screws ① of the LED unit right assy and the LED unit left assy to remove the LED unit right assy and the LED unit left assy.
2. Remove the 4 screws ② of the thread presser base assembly to remove the thread presser base assembly.

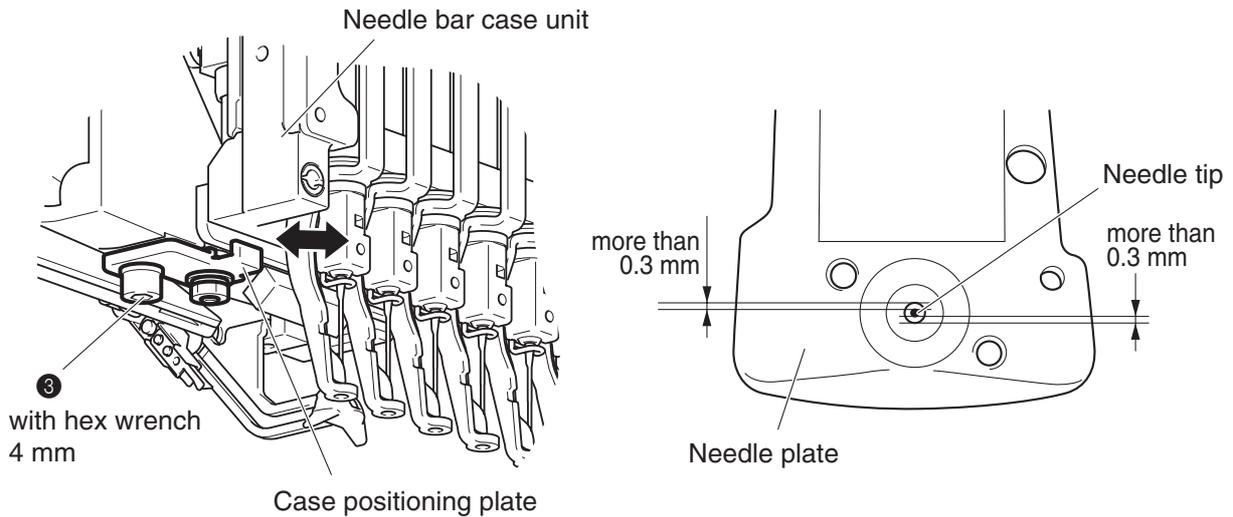
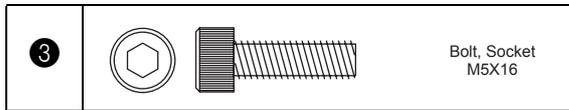


3. Start the test mode and select [#10: Needle position] under [MAIN BOARD TEST MODE].
4. Press the [F-B position] and the standard needle bar for adjustment will be selected automatically. The needle bar case unit will move to the left and right.
5. Turn the pulley by hand and lower the needle bar until the needle tip enters the needle eye of the needle plate.



To next page

6. Loosen the screw ③ of the case positioning plate on the lower section of the needle bar case unit.
7. Move the case positioning plate to either the front or back to adjust the needle front/back position.
8. Tighten the screw ③ of the case positioning plate on the lower section of the needle bar case unit to secure the case positioning plate.

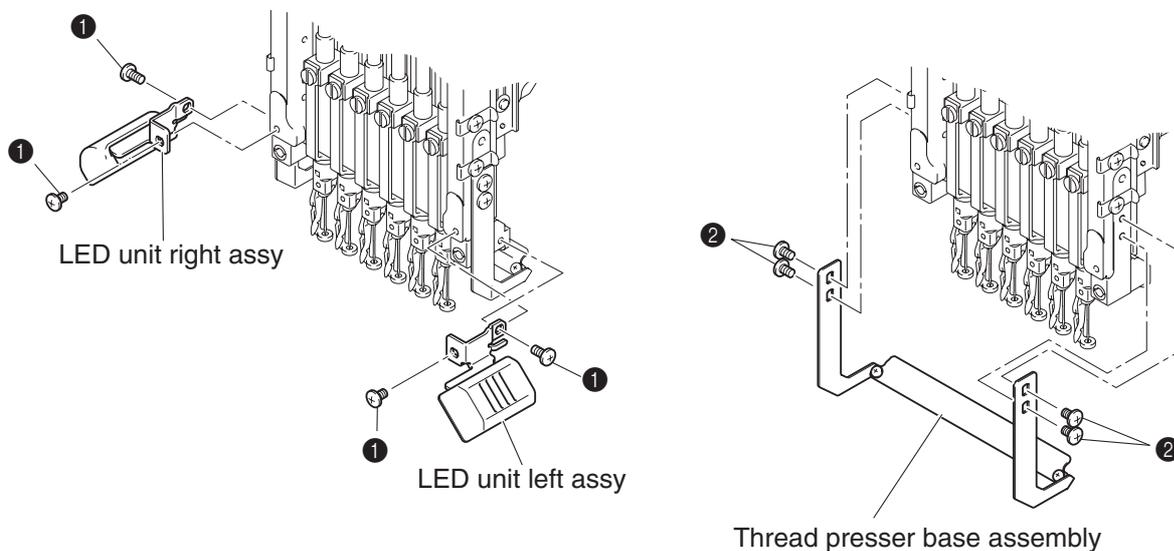
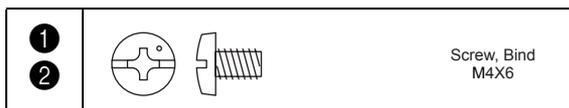


9. Check the front/back (needle drop) for all other needle bars using these same steps.
10. Attach the 4 screws ② to secure the thread presser base assembly.

**\*Key point**

- When securing the thread presser base assembly, make adjustments following the guidelines in section “4-34 Thread presser base up/down position”.

11. Attach the 4 screws ① to secure the LED unit right assy and the LED unit left assy.



## [Standard]

The clearance between the needle and the needle plate hole in the front/back direction should be more than 0.3 mm.

And the needle bar case unit should move smoothly when the change box gear is rotated.

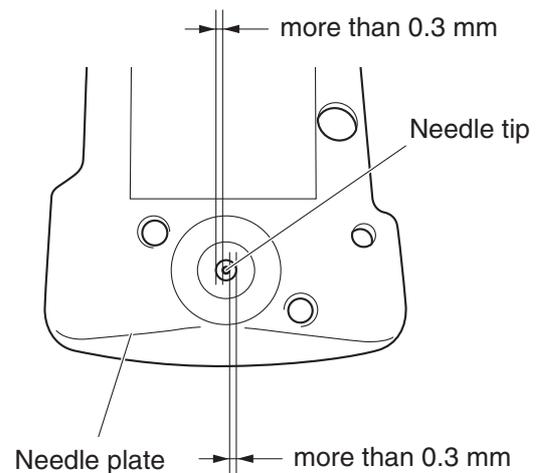
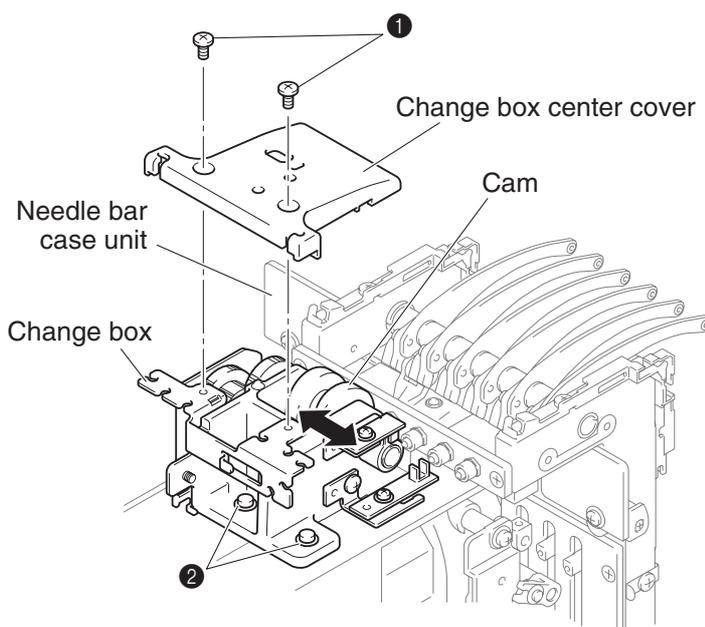
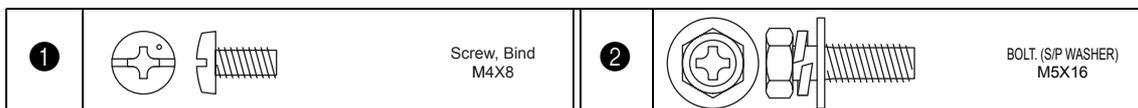
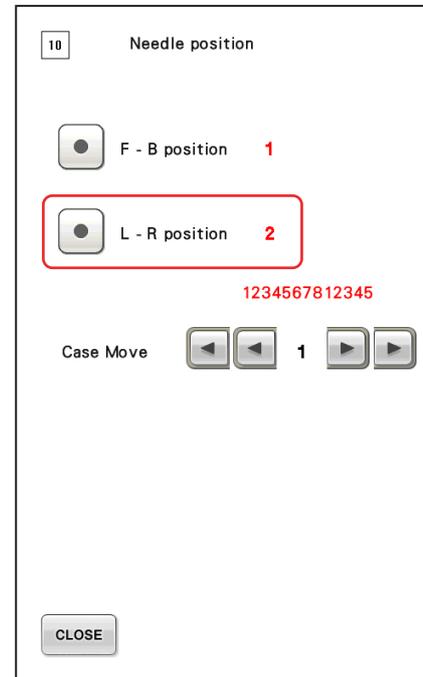
## [Adjustment]

1. Start the test mode and select [#10: Needle position] under [MAIN BOARD TEST MODE].
2. Press the [L-R position] and the standard needle bar for adjustment will be selected automatically. The needle bar case unit will move to the left and right.
3. Turn the pulley by hand and lower the needle bar until the needle tip enters the needle eye of the needle plate.
4. Remove the 2 screws ❶ to remove the change box center cover.
5. Loosen the 2 screws ❷ of the change box.
6. Move the change box to either the left or right to adjust the needle left/right position.
7. Tighten the 2 screws ❷ of the change box temporarily.
8. Check the left/right (needle position) for all other needle bars using these same steps.
9. Secure the change box in place such that it is positioned parallel to the needle bar case unit by tightening the 2 screws ❷ of the change box securely.

**\*Key point**

- After securing the change box check to ensure that the needle bar case unit moves smoothly by rotating the change box gear which in turn rotates the cam.

10. Attach the 2 screws ❶ to secure the cover of the change box center cover.



## [Standard]

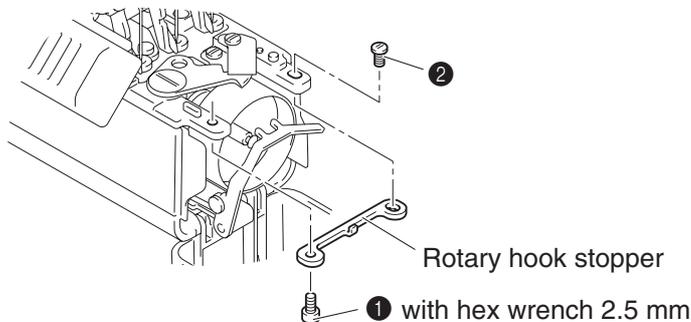
The right edge of the needle matches up with the outer rotary hook point when the needle bar is raised 1.8 to 2.2 mm from its lowest point.

And the clearance between the scarf of the needle and the outer rotary hook point in the front/back direction should be 0 to 0.4 mm.

## [Adjustment]

1. Remove the 2 screws of the needle plate to remove the needle plate.
2. Remove the screw ① and screw ② of the rotary hook stopper to remove the rotary hook stopper.

①		Bolt, Socket M3X6
②		Screw



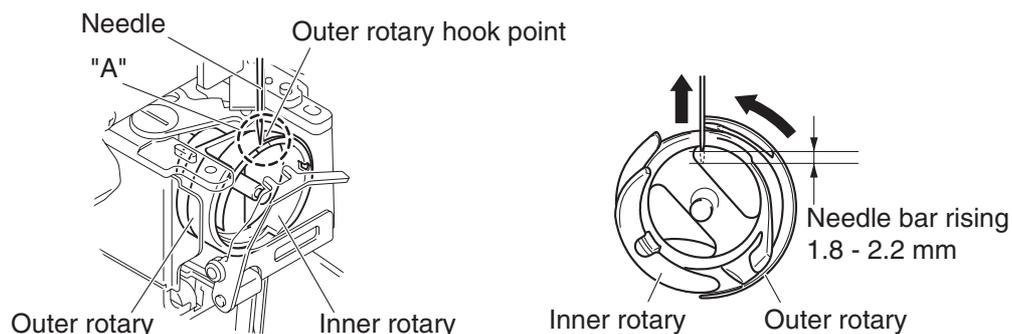
3. Start the test mode and select [#11: Needle spacing] under [MAIN BOARD TEST MODE].
4. Press the [Spacing position] and the standard needle bar for adjustment will be selected automatically. The needle bar case unit will move to the left and right.
5. Turn the inner rotary by hand until it reaches a position (A) such that the right edge of the needle and the outer rotary hook point look like they match up with each other.
6. Hold the inner rotary and turn the pulley by hand to lower the needle bar to its lowest point. Now slowly raise the needle bar until the number displayed to the right of "Motor angle" reads 199.

**\*Key point**

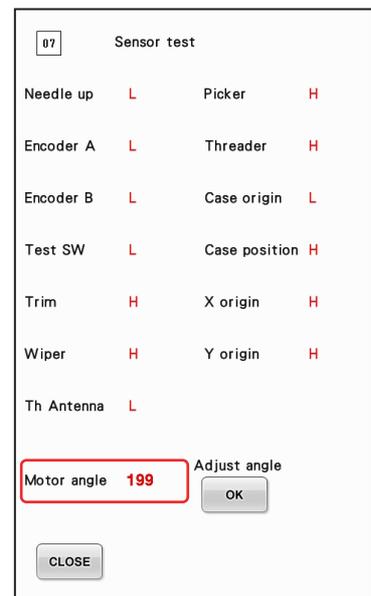
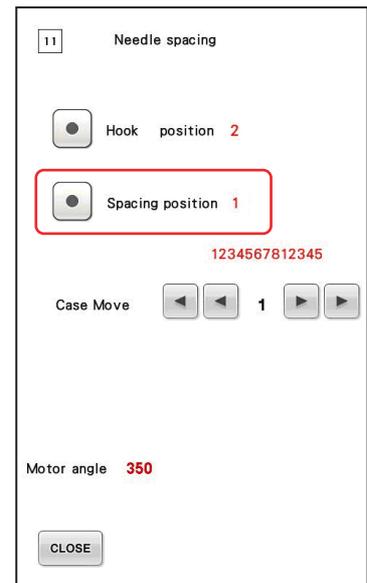
- The "Motor angle" will equal 199 when the needle bar is raised between 1.8 and 2.2 mm from its lowest point.

**\*CAUTION**

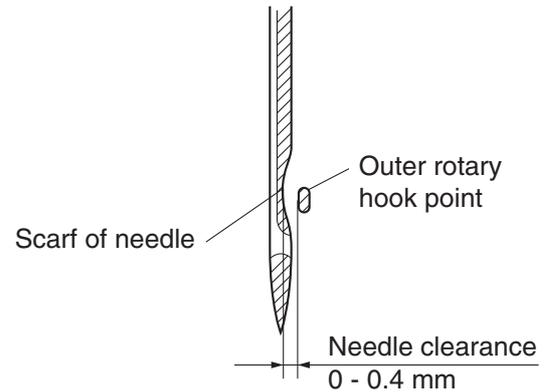
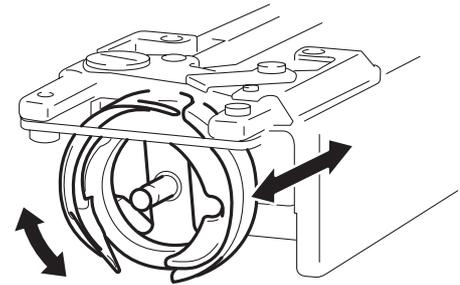
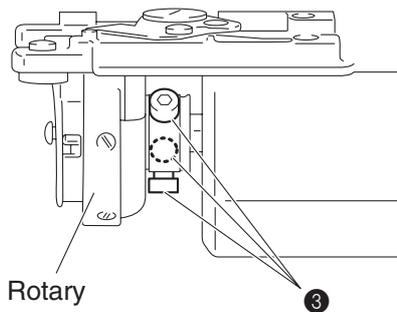
- When rotating the pulley by hand be careful not to pierce your finger with either the outer rotary hook point or the needle tip.



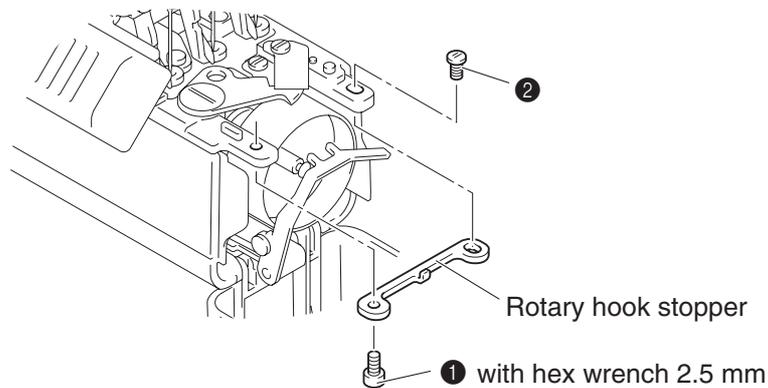
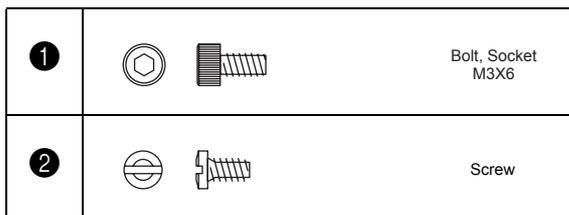
To next page



7. Loosen the 3 screws ③ at the base of the rotary and turn the outer rotary by hand until the right edge of the needle matches up with the rotary hook point of the outer rotary. Then move the outer rotary to the front or back to adjust the needle clearance and tighten the 3 screws ③ to secure the rotary when done.



8. Follow these steps to adjust the amount the needle bar rising and needle clearance for all other needle bars.  
9. Tighten the screw ① and screw ② of the rotary hook stopper to secure the rotary hook stopper.



**\*CAUTION**

- Move the inner rotary to the proper position, and then secure the inner rotary. If the inner rotary position is not correctly placed, the inner rotary may hit a needle and may break.

**\*Key point**

- When securing the rotary hook stopper, make adjustments following the guidelines in section "4-24 Rotary hook stopper clearance".

10. Tighten the 2 screws of the needle plate to secure the needle plate.

**\*Key point**

- If you are going to follow up with the adjustments in section "4-22 Needle bar height" you should not yet reattach the rotary hook stopper/needle plate.

## [Standard]

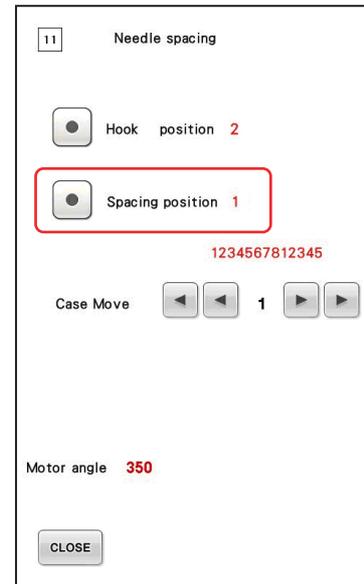
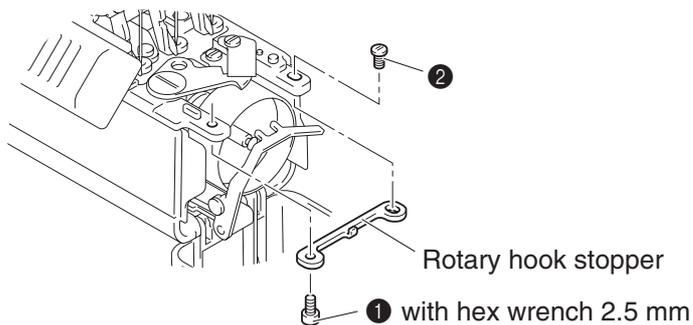
The gap between the top of needle eye and the outer rotary hook point in the up/down direction should be 1.8 to 2.2 mm when the right edge of the needle matches up with the outer rotary hook point.

The thread guide of the needle bar should be facing directly forward.

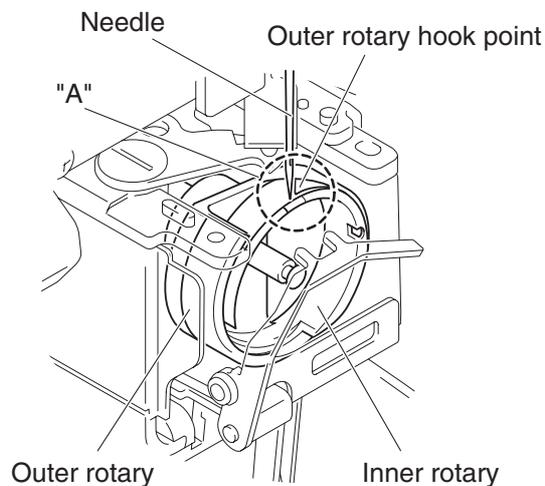
## [Adjustment]

1. Start the test mode and select [#11: Needle spacing] under [MAIN BOARD TEST MODE].
2. Press the [Spacing position] and the standard needle bar for adjustment will be selected automatically. The needle bar case unit will move to the left and right.
3. Remove the 2 screws of the needle plate to remove the needle plate.
4. Remove the screw ① and screw ② of the rotary hook stopper to remove the rotary hook stopper.

①		Bolt, Socket M3X6
②		Screw



5. Turn the inner rotary by hand until it reaches a position (A) such that the right edge of the needle and the outer rotary hook point look like they match up with each other.



To next page

6. Hold the inner rotary and turn the pulley by hand to lower the needle bar to its lowest point.

**\*CAUTION**

- When rotating the pulley by hand be careful not to pierce your finger with either the outer rotary hook point or the needle tip.

7. Hold the inner rotary and turn the pulley by hand to raise the needle bar until matching up the right edge of the needle with the outer rotary hook point.

8. Loosen the screw ③ of the needle bar clamp.

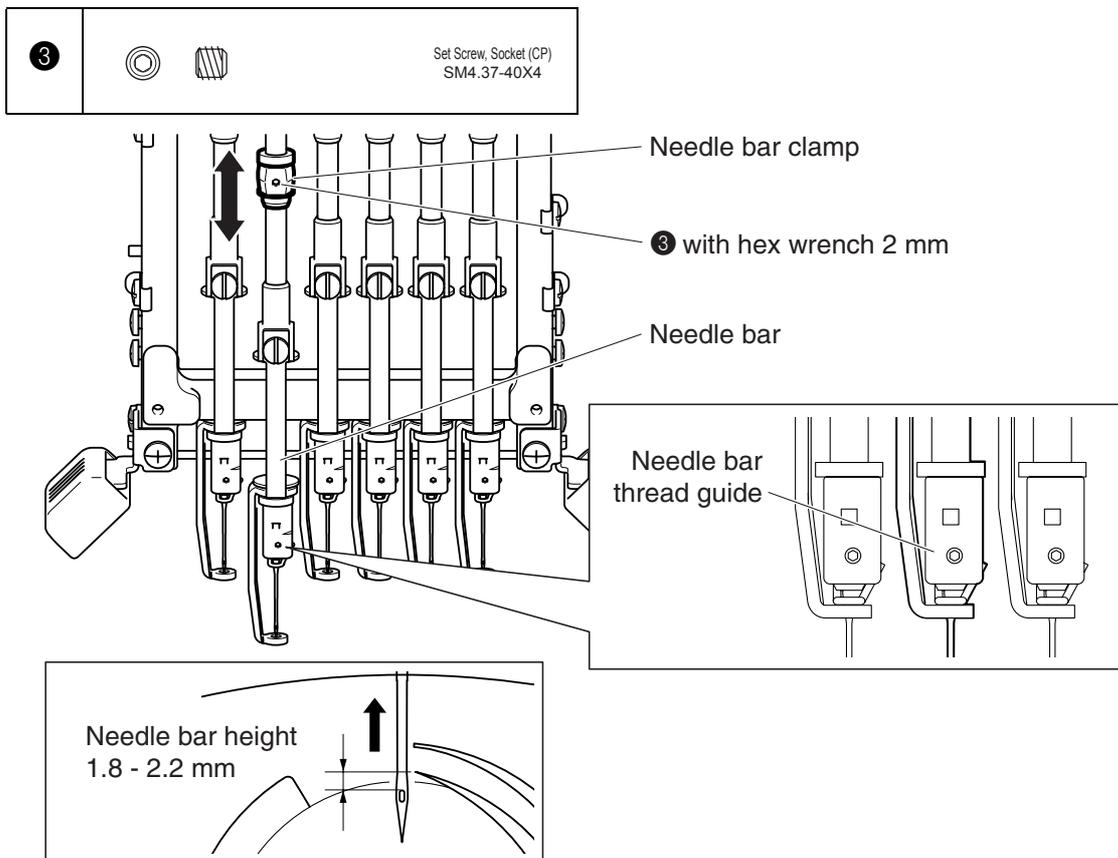
9. Adjust the height of the needle bar and the tilt of the needle bar thread guide.

**\*Key point**

- The thread guide of the needle bar should be inclined to the right at the angle of 0 to 2 degrees from an anterior view.

10. Tighten the screw ③ of the needle bar clamp to secure the needle bar.

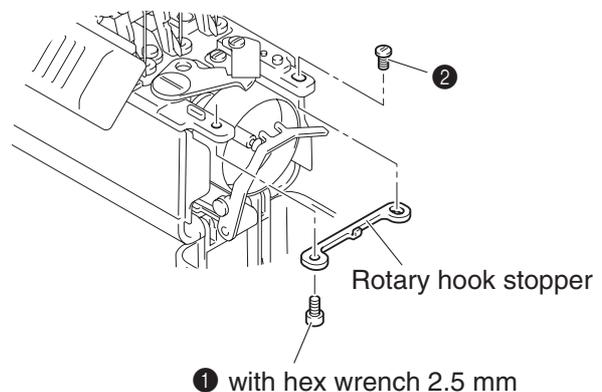
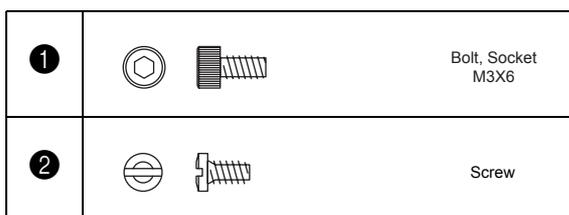
11. Check the height of all other needle bars and the tilt of all other needle bar thread guides.



12. Tighten the screw ① and screw ② of the rotary hook stopper to secure the rotary hook stopper.

**\*Key point**

- When securing the rotary hook stopper, make adjustments following the guidelines in section "4-24 Rotary hook stopper clearance".



13. Tighten the 2 screws of the needle plate to secure the needle plate.

## [Standard]

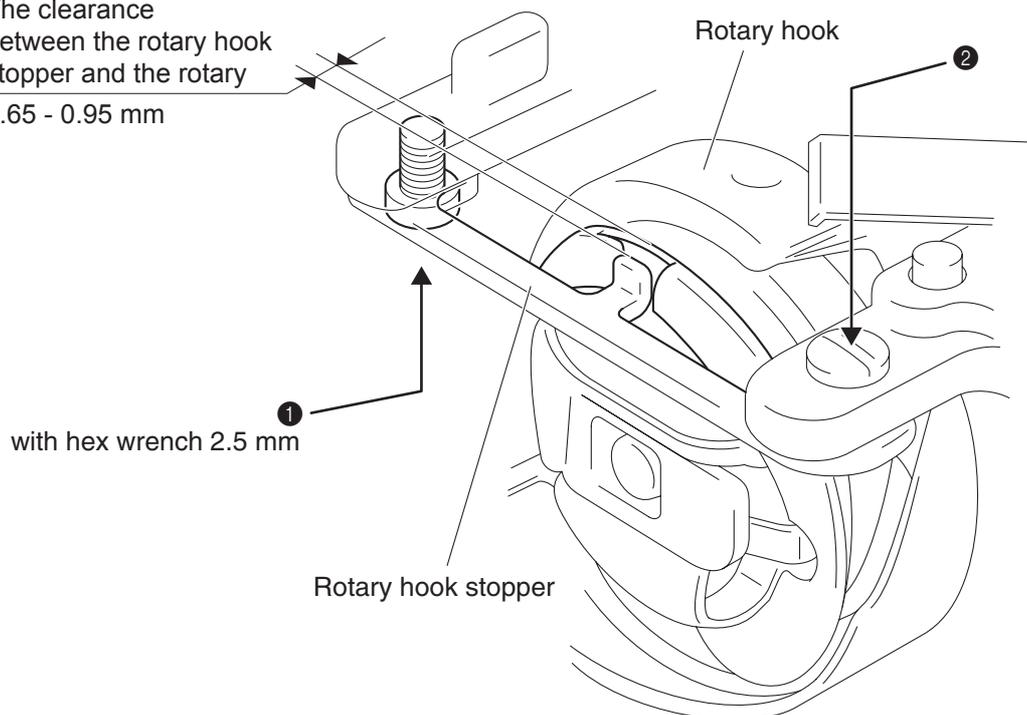
The clearance between the rotary hook stopper and the rotary hook is 0.65 should be 0.95 mm.

## [Adjustment]

1. Remove the 2 screws of the needle plate to remove the needle plate.
2. Remove the screw ❶ and screw ❷ of the rotary hook stopper to remove the rotary hook stopper.
3. Adjust the clearance between the rotary hook stopper and the rotary hook.
4. Tighten the screw ❶ and screw ❷ of the rotary hook stopper to secure the rotary hook stopper.
5. Tighten the 2 screws of the needle plate to secure the needle plate.

❶		Bolt, Socket M3X6
❷		Screw

The clearance  
between the rotary hook  
stopper and the rotary  
hook  
0.65 - 0.95 mm

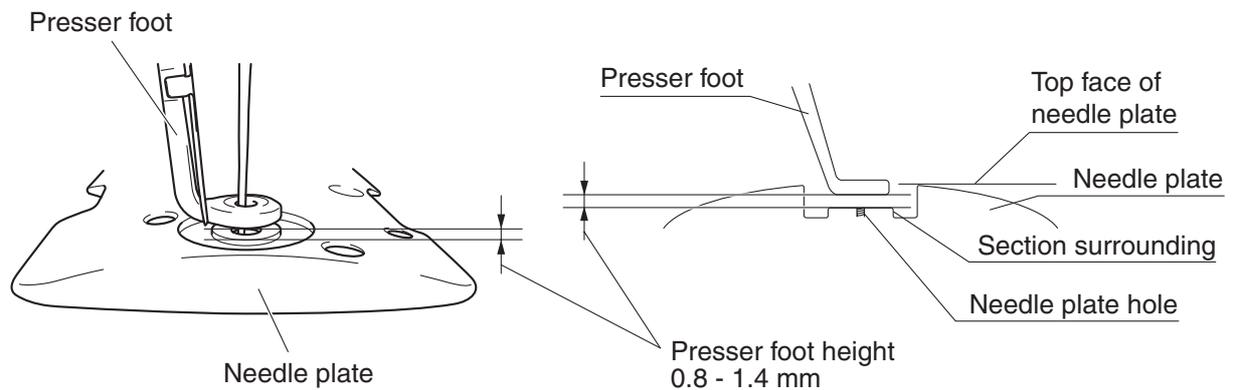
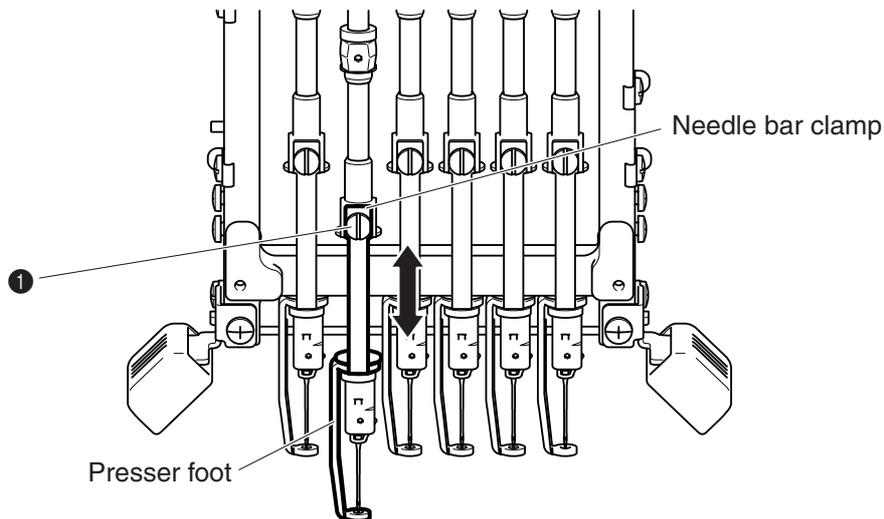
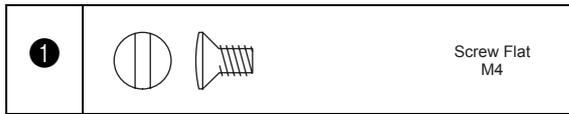


## [Standard]

The clearance between the section surrounding the needle plate hole and the bottom face of the presser foot should be 0.8 to 1.4 mm.

## [Adjustment]

1. Attach the needle plate and turn the pulley by hand to move the needle bar to its lowest position.
2. Loosen the screw ❶ of the needle bar clamp.
3. Adjust the presser foot height.
4. Tighten the screw ❶ of the needle bar clamp to secure the presser foot.
5. Repeat the same steps to adjust the presser foot height for the other needle bars.



## [Standard]

When the needle bar is in highest position, there should not be clearance between the top dead center plate and the cushion rubber. And the cushion rubber should be compressed slightly (approx. 0.3 mm).

## [Adjustment]

1. Start the test mode and select [#12: Needle threader] under [MAIN BOARD TEST MODE].
2. Press the [L-R position] and the standard needle bar for adjustment will be selected automatically. The needle bar case unit will move to the left and right.
3. Turn the pulley by hand to move the needle bar to the top point.
4. Loosen the 2 screws ❶ of the top dead center plate.
5. Push the top dead center plate towards the needle bar (downward) so that the cushion rubber is compressed slightly, and tighten the 2 screws ❶ to secure the dead center plate.
6. Check the needle threader.

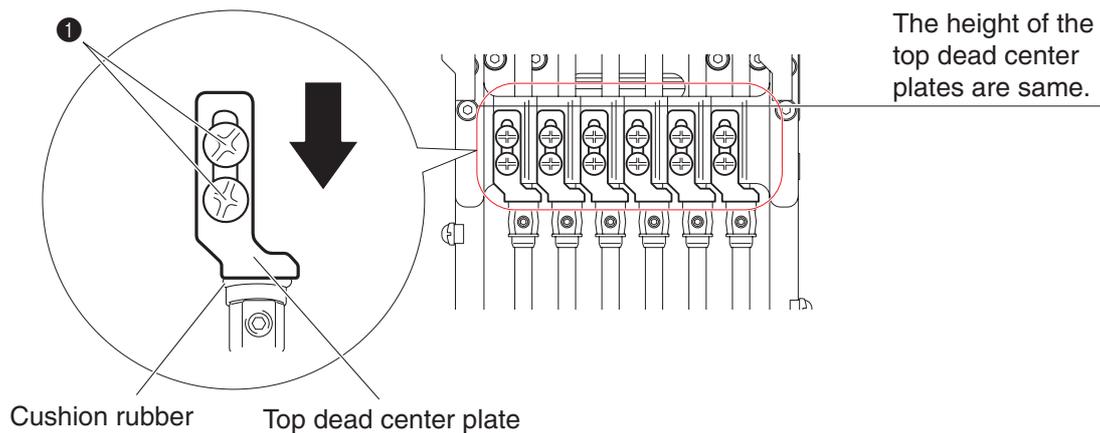
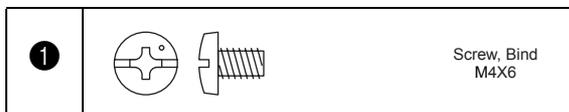
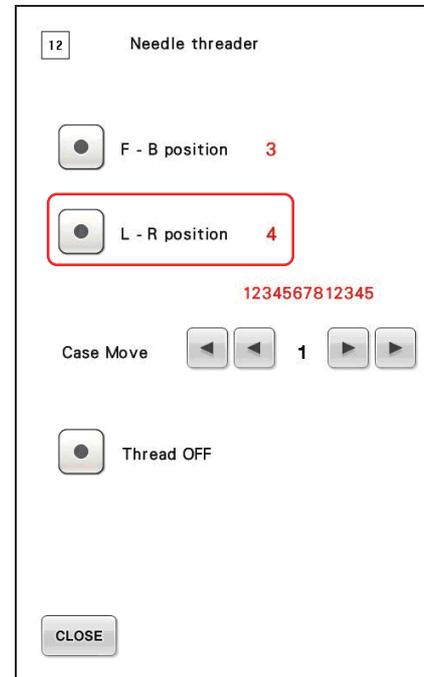
**\*Key point**

- When needing the adjustment of the needle threader, make adjustments following the guidelines in section “4-27 Needle threader (up/down)” and “4-29 Needle threader (left/right)”.

7. Move the needle bar to the top point again, check that the all top dead center plates of the needle bars are the same height.

**\*Key point**

- When differing the height of the top dead center plate, make adjustments of steps 4 to 5 above.



## [Standard]

The clearance between the top end of the hook and the top end of the needle eye is 0.1 to 0.2 mm.

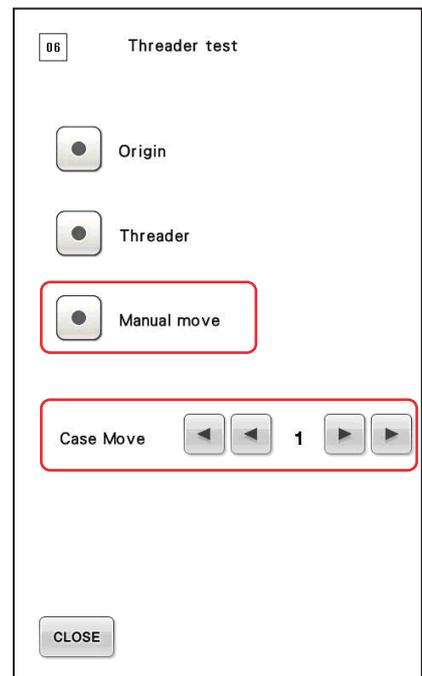
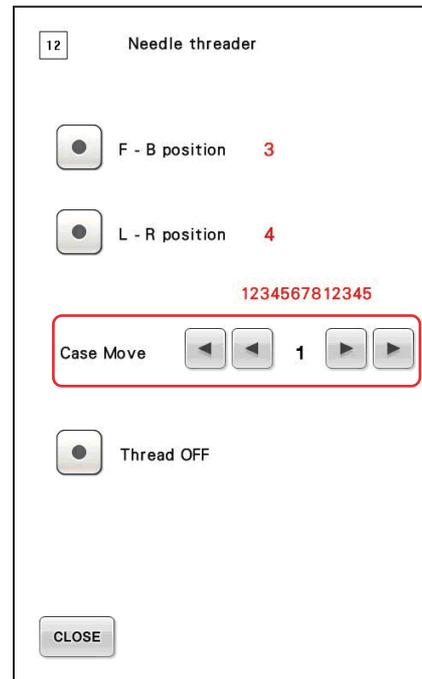
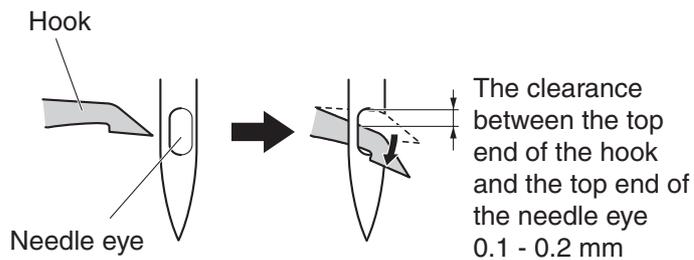
\* The top end of the hook and the top end of the needle eye should contact a little.

## [Checking]

1. Start the test mode and select [#12: Needle threader] under [MAIN BOARD TEST MODE].
2. Press [<] or [>] to select the number 1 needle bar. (The needle bar case unit moves to left or right.)
3. Press [CLOSE] to return to the test mode selection screen and select [#06: Threader test].
4. Press [Manual move] and move the hook to the front of the needle eye.
5. Check that the top end of the hook matches up with the top end of the needle eye. After checking, re-press [Manual move] to return the hook to its original position.
6. Check that the position of the needle eye and the hook for all needle bars.

**\*Key point**

- Records smallest needle bar of the clearance between the top end of the hook and the top end of the needle eye.



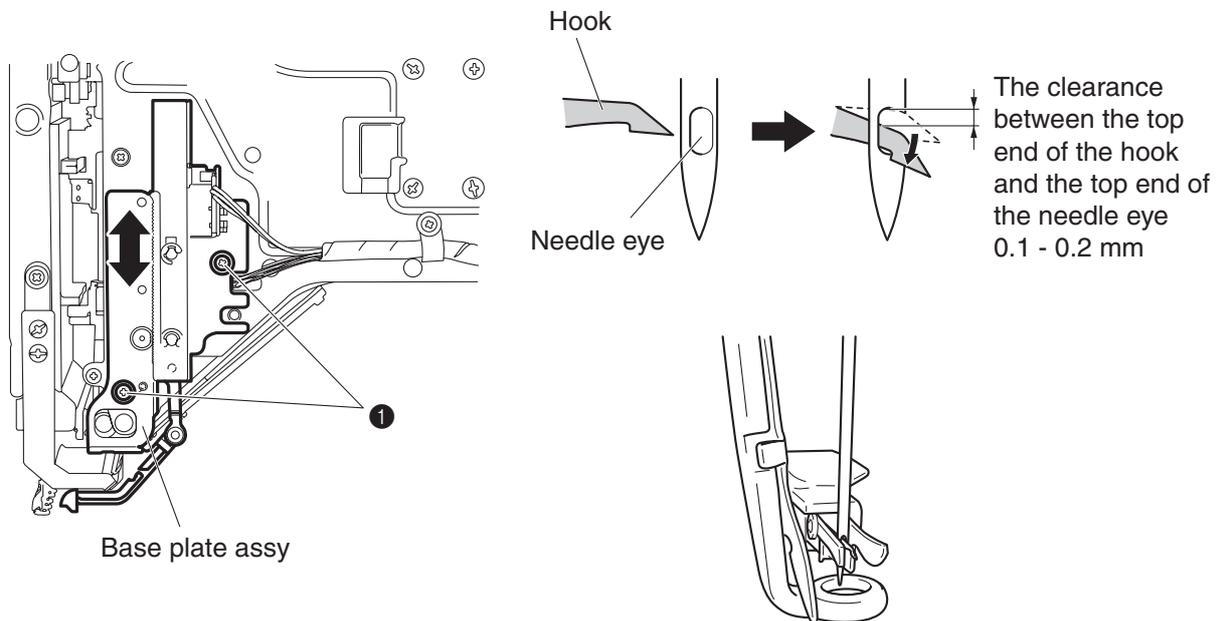
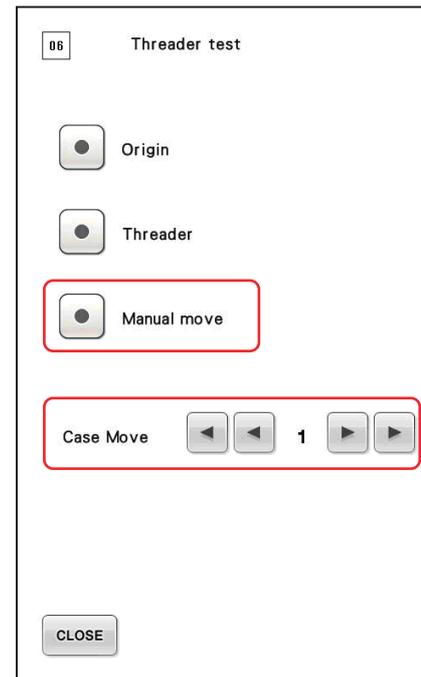
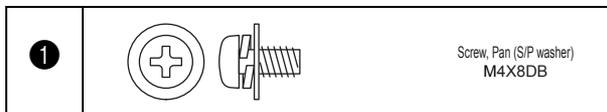
To next page

## [Adjustment]

1. Press [ $\leftarrow$ ] or [ $\rightarrow$ ] to select smallest needle bar of the clearance between the top end of the hook and the top end of the needle eye.
2. Press [Manual move] and move the hook to the front of needle eye.
3. Loosen the 2 screws ❶ of the base plate assy.
4. Adjust the height of the hook to move the base plate assy to up or down.
5. Tighten the 2 screws ❶ of the base plate assy to secure the base plate assy.
6. Re-press [Manual move] to return the hook to its original position.
7. After adjusting this steps, adjust the needle threader (left/right).

**\*Key point**

- Refer to "4-29 Needle threader (left/right)".



## [Standard]

The hook should be passed through the needle eye.

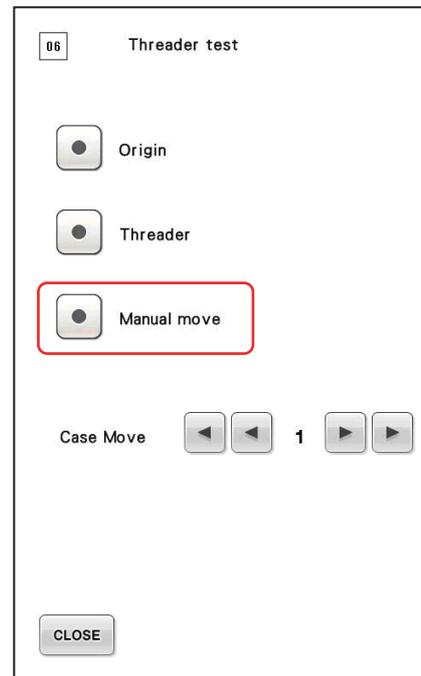
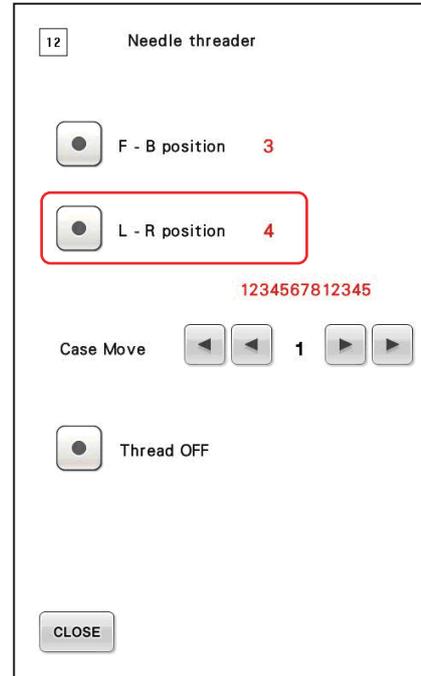
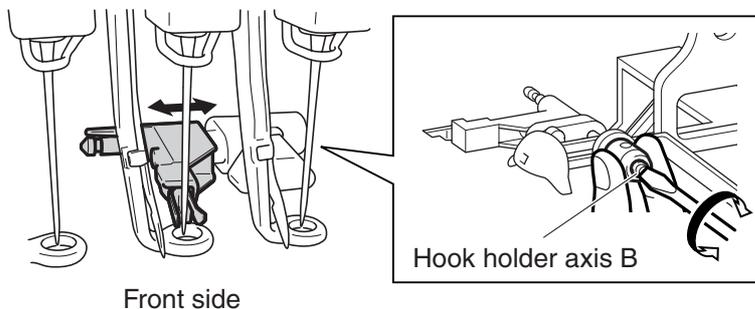
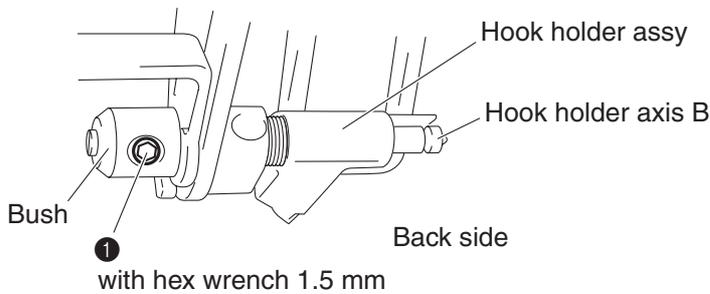
## [Adjustment]

1. Start the test mode and select [#12: Needle threader] under [MAIN BOARD TEST MODE].
2. Press the [L-R position] and the standard needle bar for adjustment will be selected automatically. The needle bar case unit will move to the left and right.
3. Press [CLOSE] to return to the test mode selection screen and select [#06: Threader test].
4. Press [Manual move] and move the hook to the front of the needle eye.
5. Loosen the screw ❶ of the hook holder assy.

**\*Key point**

- Turn the bush by hand to change the direction of the screw hole.

6. Rotate the hook holder axis B of the hook holder assy while holding the bush by hand, and adjust the left/right position of the hook.
7. Tighten the screw ❶ of the hook holder assy and secure the hook holder axis B.
8. Re-press [Manual move] to return the hook to its original position.
9. Check that the hook passes through the needle eye for all needle bars.



## [Standard]

The belt slack should be 3.9 mm when pushing the center of the Y belt with a force of 2.4 to 2.5N (245 to 255g).

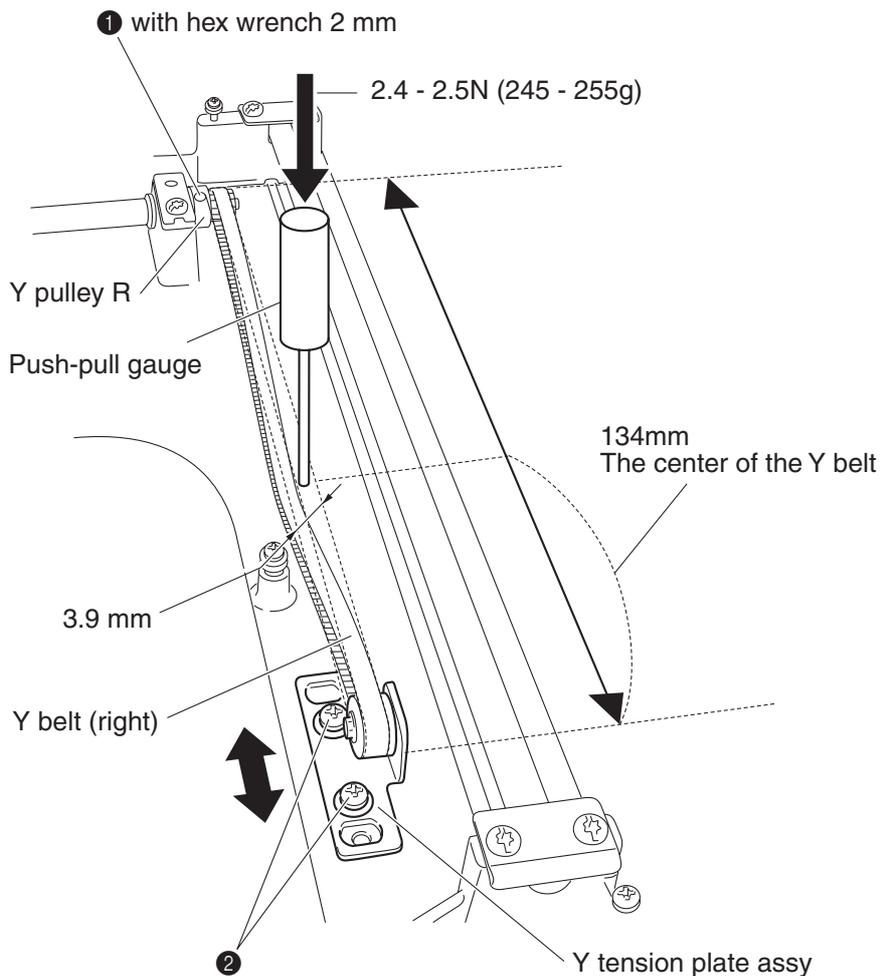
## [Adjustment]

1. Move the XY carriage to the innermost position.
2. Loosen the screw ❶ of the Y pulley R on the Y driving assy.
3. Loosen the 2 screws ❷ of the Y tension plate assy.
4. Move the Y tension plate assy back and forth to adjust the Y belt tension of the right side.
5. Tighten the 2 screws ❷ of the Y tension plate assy to secure the Y tension plate assy.
6. Repeat the same steps to adjust the Y belt tension on the other side.
7. Tighten the screw ❶ of the Y pulley R on the Y driving assy to secure the Y pulley R.

❶		Set Screw, Socket (CP) M3X3
❷		Screw, Pan (SIP washer) M4X10

XC2277001

Push-pull gauge (5N)

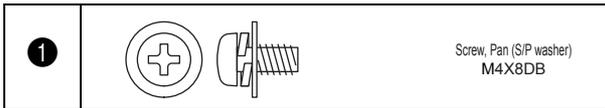


## [Standard]

The belt slack should be 5.7 mm when pushing the center of the X belt with a force of 1.75 to 1.85N (178 to 189g).

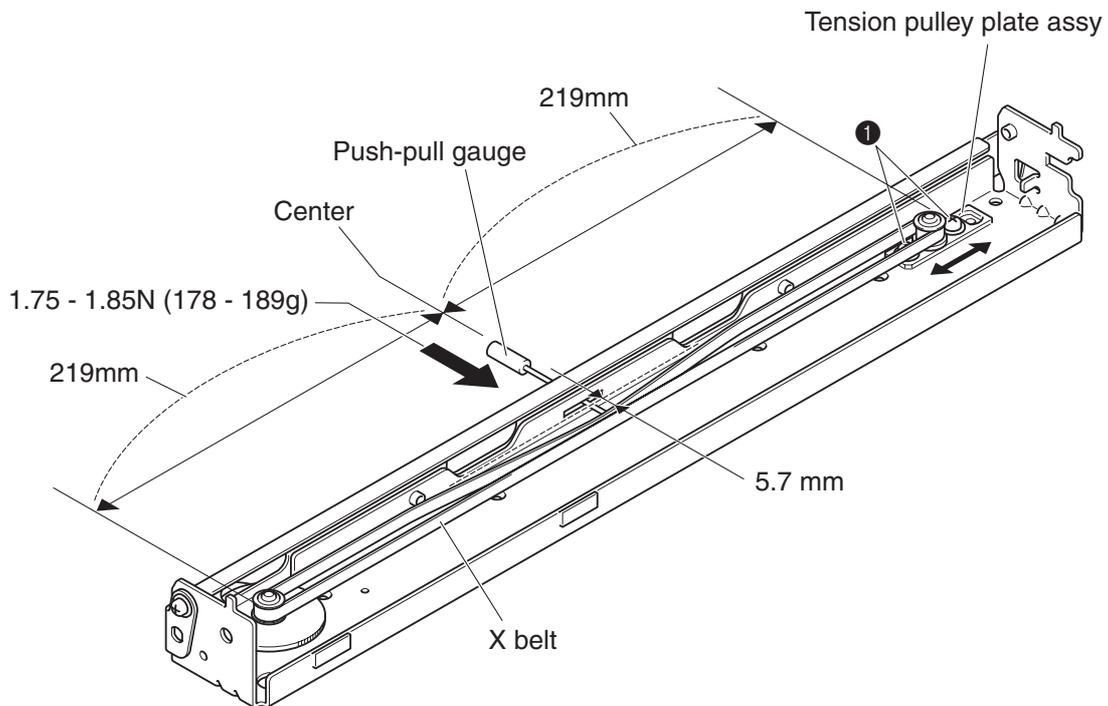
## [Adjustment]

1. Move the frame-mounting plate of the X carriage to the rightmost position.
2. Loosen the 2 screws ❶ of the tension pulley plate assy.
3. Move the tension pulley plate assy right and left to adjust the X belt tension.
4. Tighten the 2 screws ❶ of the tension pulley plate assy to secure the tension pulley plate assy.



XC2277001

Push-pull gauge (5N)



## [Standard]

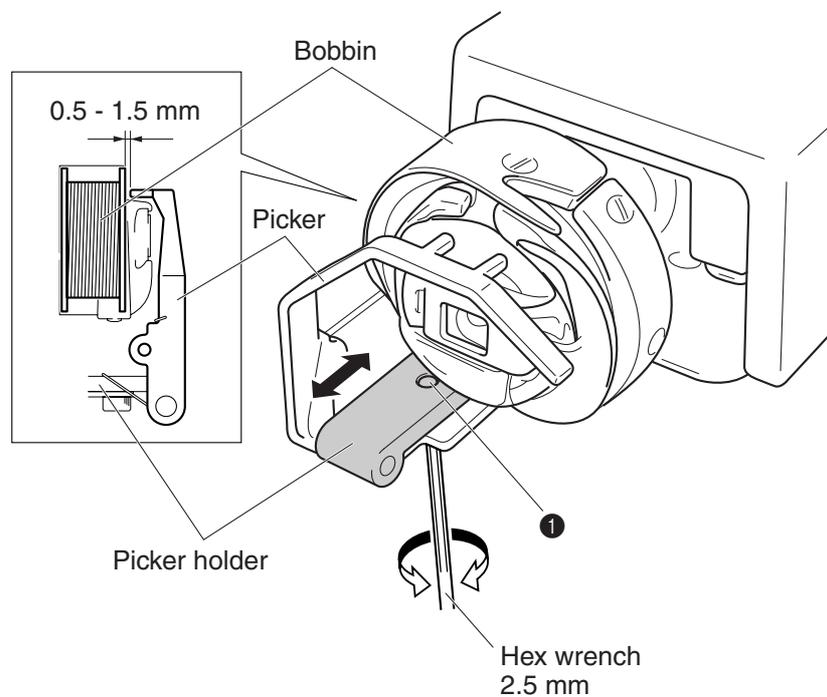
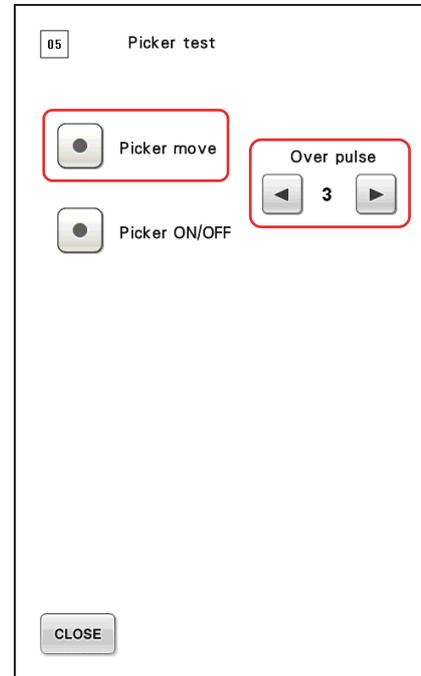
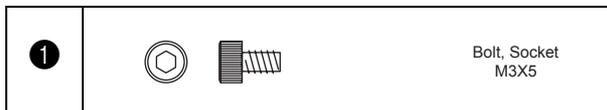
The clearance between the bobbin and the picker should be 0.5 to 1.5 mm.

## [Adjustment]

1. Remove the bobbin case from the rotary hook.
2. Start the test mode and select [#05: Picker test] under [MAIN BOARD TEST MODE].
3. Press [Picker move] to release the picker, and then attach the bobbin case with a bobbin inserted to the rotary hook.
4. Press [Picker move] to turn the picker on.
5. Press [<] or [>] (Over pulse) to adjust the clearance between the bobbin and the picker.

**\*Key point**

- If the clearance cannot be adjusted by following the above procedure, loosen the screw ❶ and move the picker holder back and forth to adjust the clearance.

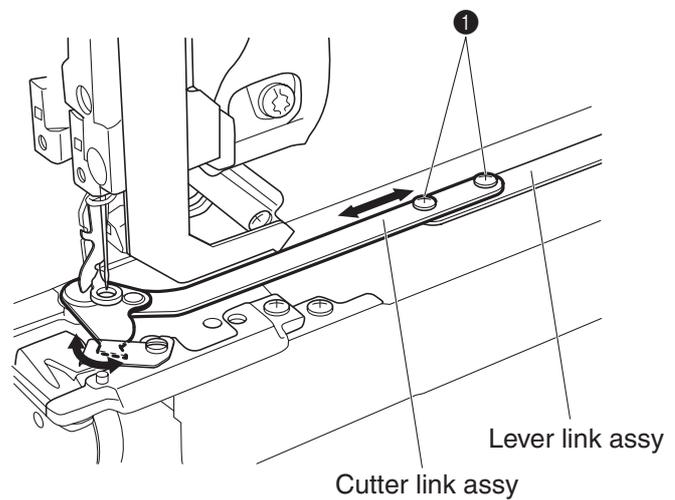
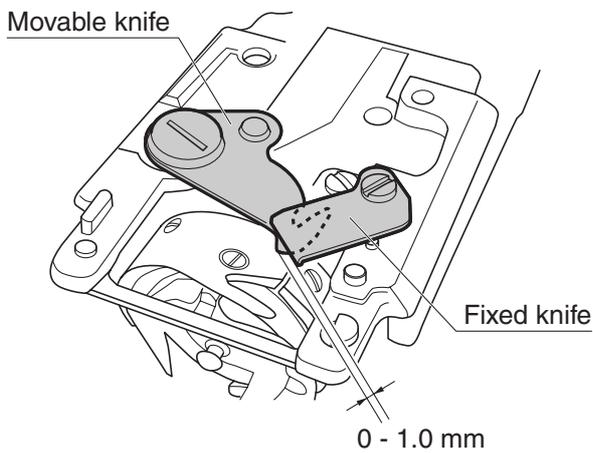
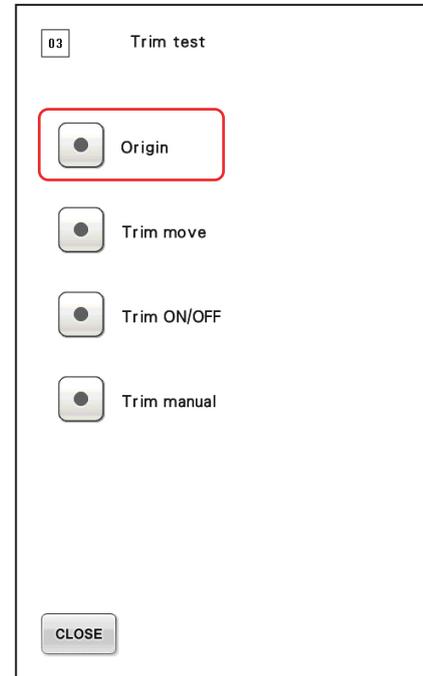


## [Standard]

The point of the movable knife should be out 0 to 1.0 mm from the fixed knife.

## [Adjustment]

1. Remove the 2 screws of the needle plate and remove the needle plate.
2. Start the test mode and select [#03: Trim test] under [MAIN BOARD TEST MODE].
3. Press [Origin] to move the movable knife to its initial position.
4. Loosen the 2 screws ❶ of the cutter link assy.
5. Adjust the initial position of the movable knife.
6. Tighten the 2 screws ❶ of the cutter link assy to secure the cutter link assy and the lever link assy.
7. Tighten the 2 screws of the needle plate to secure the needle plate.



## [Standard]

The clearance between the thread presser base upper assy and the wiper hook should be more than 0.2 mm for all needle positions.

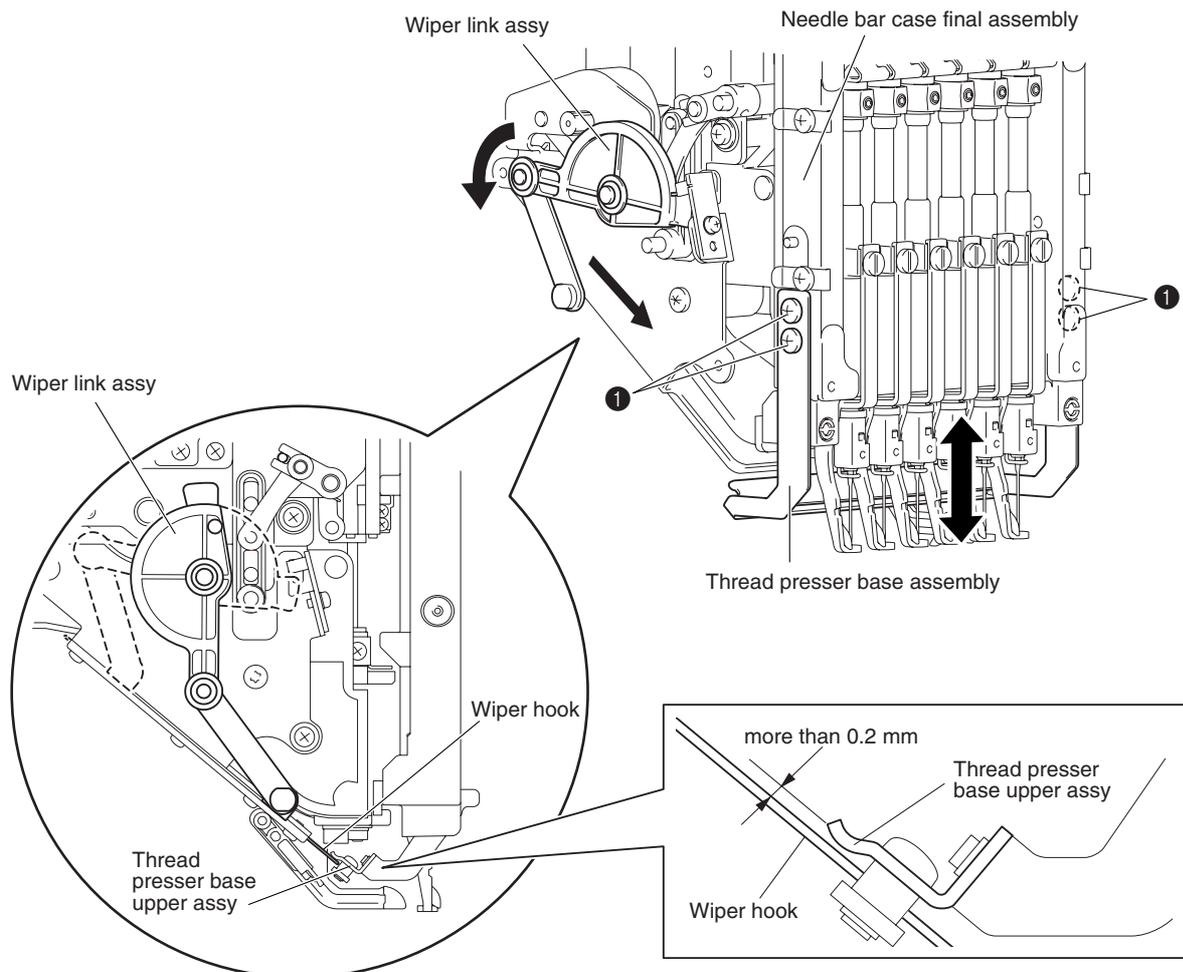
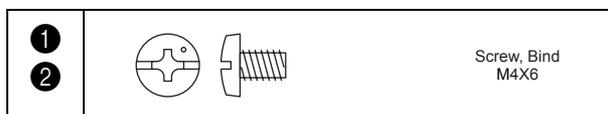
## [Adjustment]

1. Loosen the 4 screws ❶ of the thread presser base assembly.
2. When turn off the power, lower the wiper link assy of the left side of the arm bed by hand and lower the wiper hook.

**\*Key point**

- If turn on the power, the wiper link assy does not lower.

3. Move the thread presser set up and down, and adjust the clearance between the thread presser base upper assy and the wiper hook.
4. Tighten the 4 screws ❶ of the thread presser base assembly to secure the needle bar case final assembly.
5. Repeat the same step 2 to adjust the clearance between the thread presser base upper assy and the wiper hook for all needle bar position.



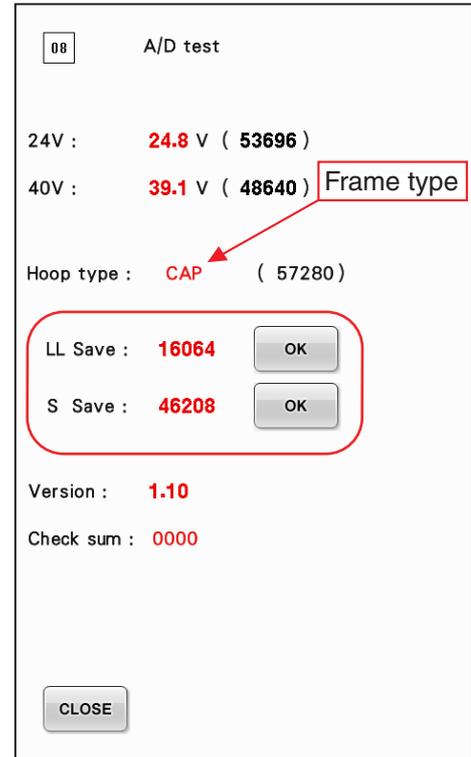
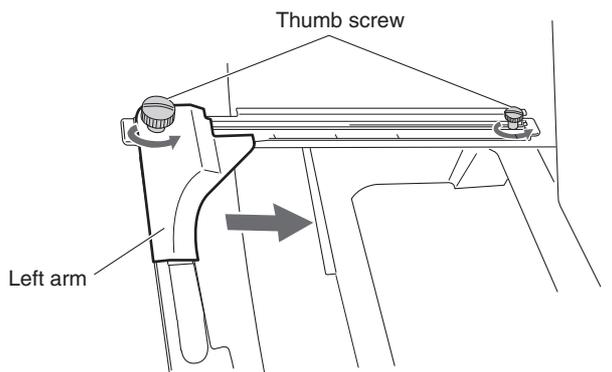
After replace the hoop lever (potentiometer) and the hoop PCB assy, need to adjust.

### [Standard]

The attached frame type and the displayed frame type on the screen are the same types.

### [Adjustment]

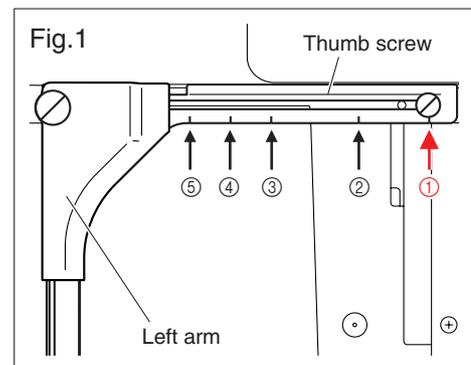
1. Attach the tubular round arm set to the carriage.
2. Start the test mode and select [#08: A/D test] under [MAIN BOARD TEST MODE].



3. Press the [LL Save] after attaching the left arm of the tubular round arm set to the position ① (refer to Fig.1) and tightening the 2 thumb screws certainty.

#### \*Key point

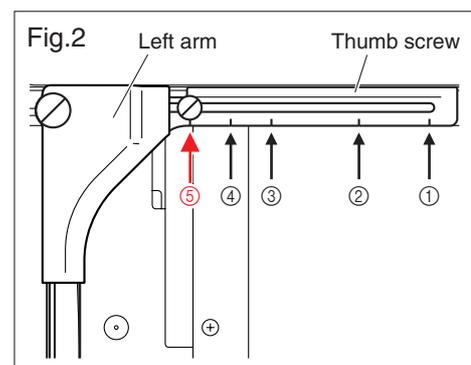
- Save the A/D value of the hoop sensor to the flash memory the sewing machine at the attachment position ① of the LL frame.



4. Press the [S Save] after attaching the left arm of the tubular round arm set to the position ⑤ (refer to Fig.2) and tightening the 2 thumb screws certainty.

#### \*Key point

- Save the A/D value of the hoop sensor to the flash memory the sewing machine at the attachment position ⑤ of the S frame.



To next page

5. Attach the other than using frame by above adjustment, and check that the displayed frame type at the right side of [Hoop type] and the attached frame type are the same types.

The screenshot displays the 'A/D test' interface. At the top left, there is a small box containing '08'. The main display area shows the following information:

- 24V : **24.8 V** ( 53696 )
- 40V : **39.1 V** ( 48640 )
- Hoop type : **CAP** ( 57280 )

A red box labeled 'Frame type' is positioned to the right of the 40V reading, with a red arrow pointing to the 'CAP' value in the 'Hoop type' line. Below this, there are two rows of 'Save' options, each with an 'OK' button:

- LL Save : **16064** [OK]
- S Save : **46208** [OK]

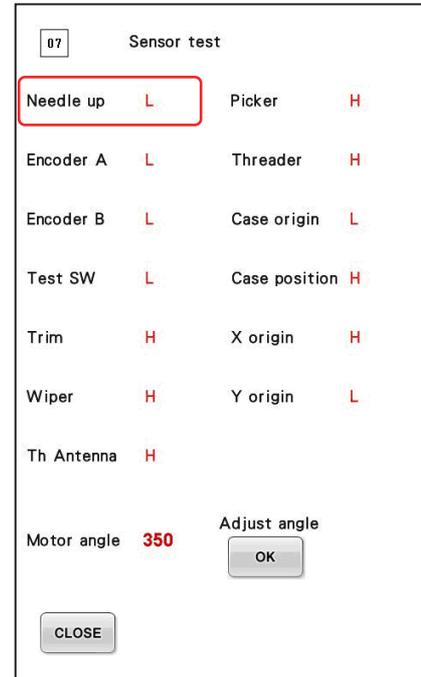
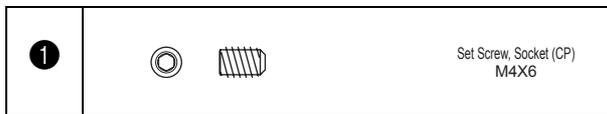
At the bottom of the interface, there is a 'Version : 1.10' and 'Check sum : 0000' line, and a 'CLOSE' button at the very bottom.

## [Standard]

When the jump bracket is lowered 19.5 to 20.0 mm from the top dead center position, [Needle up] signal display should be changed from [H] to [L].

## [Adjustment]

1. Start the test mode and select [#07: Sensor test] under [MAIN BOARD TEST MODE].
2. Turn the pulley counterclockwise by hand in view from the rear side of the machine until the jump bracket is lowered 19.5 to 20.0 mm from the top dead center position (= the crank rod is in a vertical position).
3. Loosen the screw ❶ of the encoder base.
4. Turn the encoder base clockwise (direction "A") in view from the rear side of the machine until [Needle up] signal display changes from [H] to [L], and then tighten the screw ❶ of the encoder base. (Fig.1)



Top dead center position

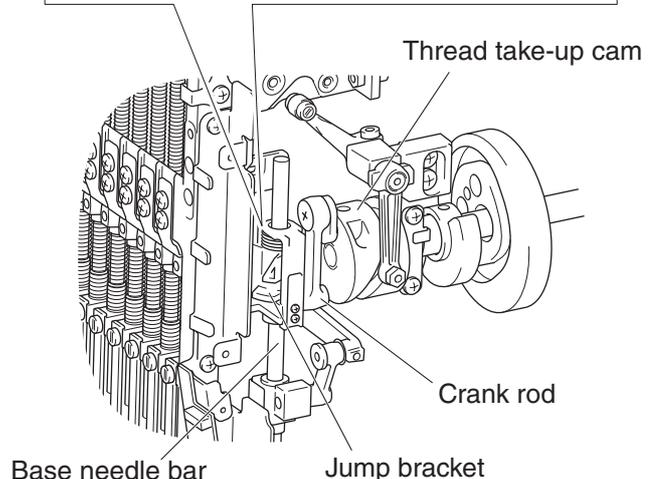
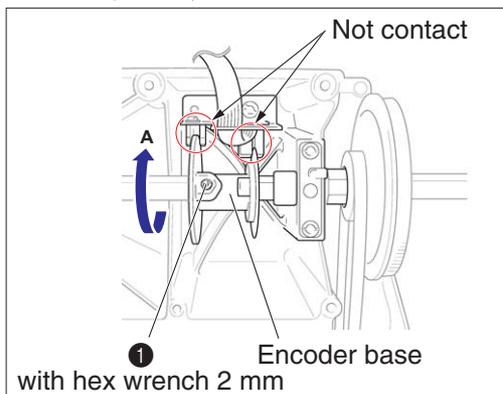
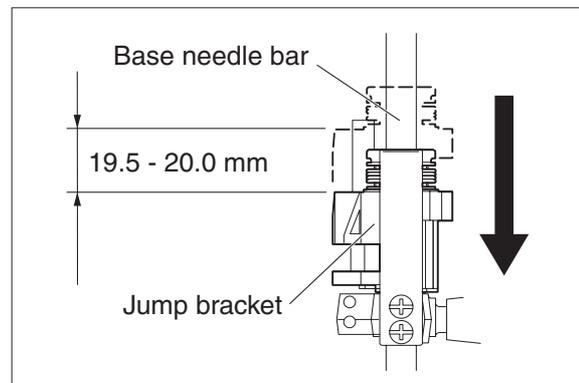
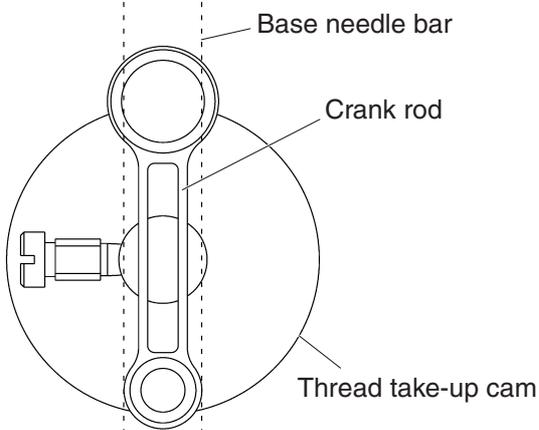


Fig.1

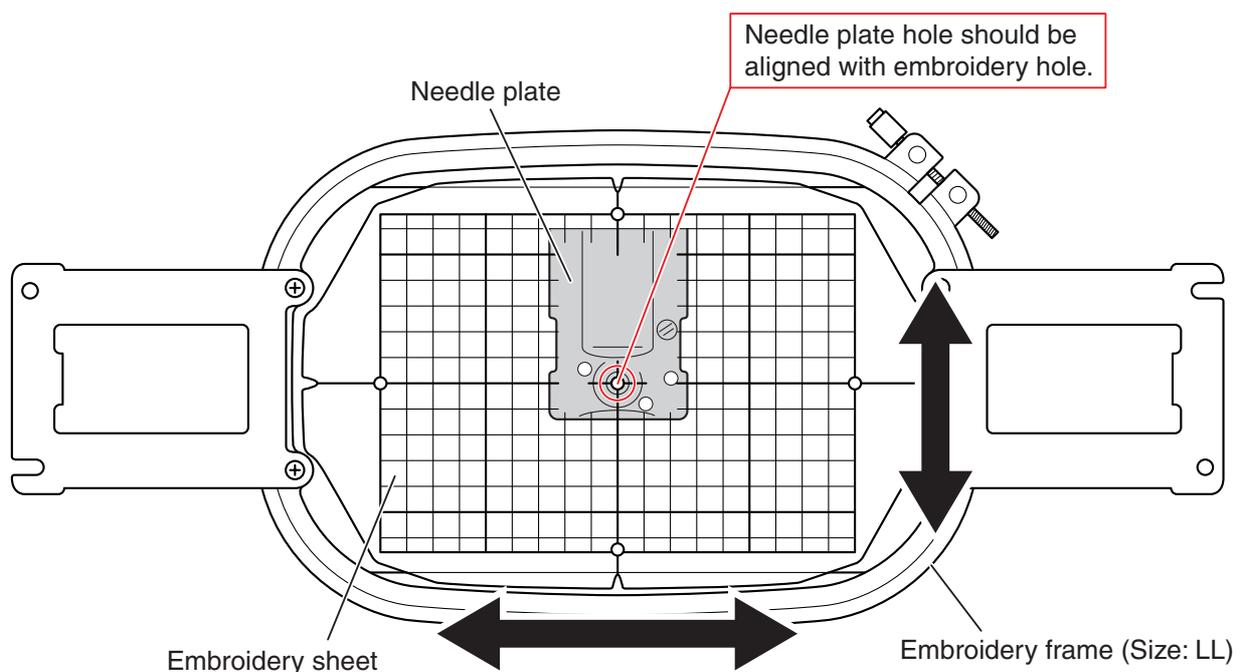
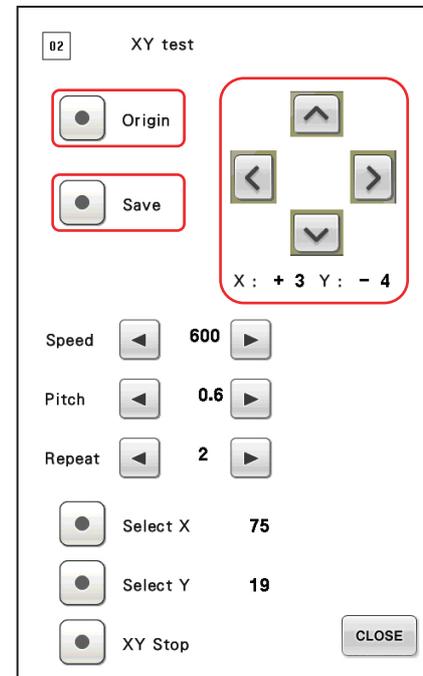
After replace the X area PCB assy and the Y area PCB assy, need to adjust.

### [Standard]

The needle plate hole should be aligned with the embroidery sheet (Size: LL) center hole.

### [Adjustment]

1. Attach the tubular round arm set to the carriage.
2. Attach the LL frame to the tubular round arm set.
  - \*Key point**
    - LL frame: 300 x 200 mm (11.8 x 7.9 inches)
3. Attach the embroidery sheet (Size: LL) to the LL frame, and secure it with the tape or other temporary.
4. Start the test mode and select [#02: XY test] under [MAIN BOARD TEST MODE].
5. Press [Origin] to move the carriage to its initial position.
6. Use the , ,  and  keys to adjust the position of the embroidery hoop so that the needle plate hole is aligned with the embroidery sheet center hole.
7. Press [Save] to save the adjusted initial position to the flash memory of the sewing machine.



## [Standard]

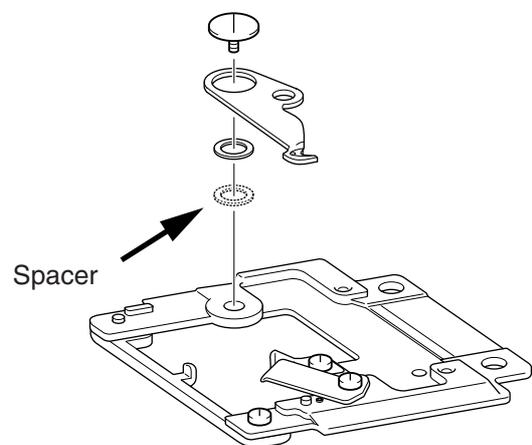
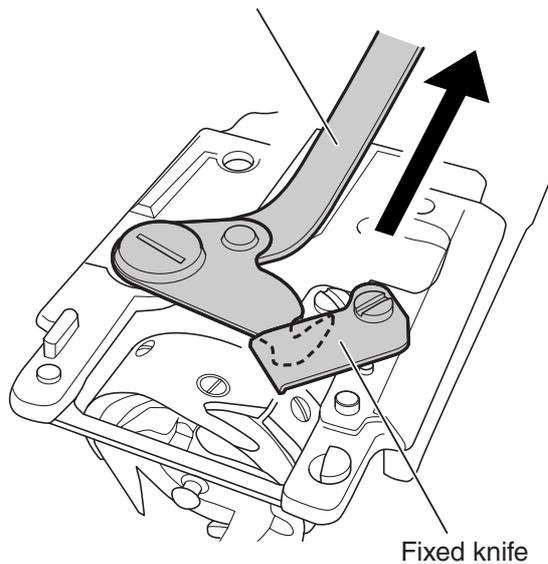
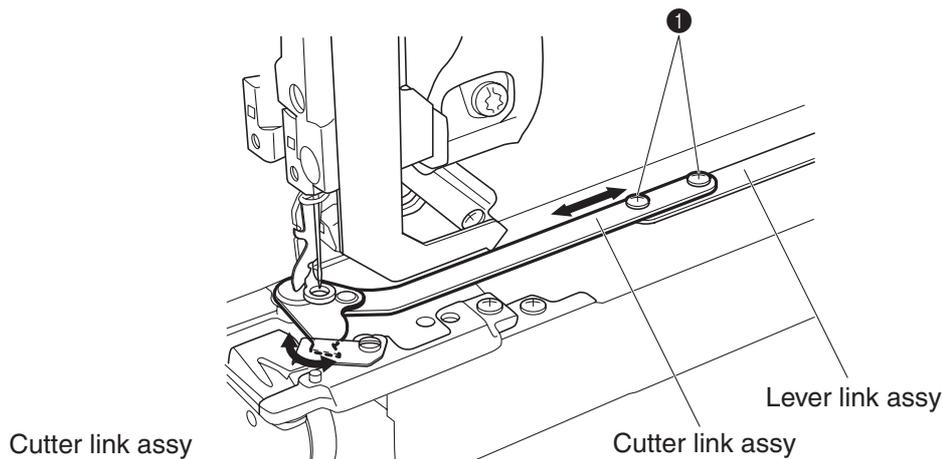
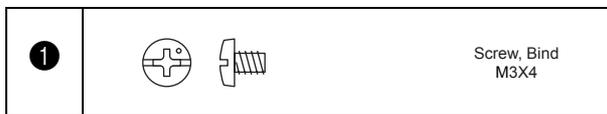
The engagement load of the movable and the fixed knife should be 4.9 to 9.8N (500 to 1000g).

## [Adjustment]

1. Remove the 2 screws of the needle plate to remove the needle plate.
2. Remove the 2 screws ❶ of the cutter link assy. (Fig.1)
3. Pull the cutter link assy to the direction of the arrow, measure the engagement load of the movable and fixed knife. (Fig.2)
4. When the engagement load is not within the specifications, insert a spacer below the collar of the movable knife. (Fig.3)
5. Measure the engagement load of the movable and fixed knife.
6. Repeat steps 3 and 4 until the engagement load is within the specifications.
7. Tighten the 2 screws ❶ of the cutter link assy to secure the cutter link assy to the lever link assy.

**\*Key point**

- When securing the cutter link assy, make adjustments following the guidelines in section "4-33 Movable knife initial position".
8. Tighten the 2 screws of the needle plate to secure the needle plate.





# 5 Failure Investigation for Electronic Parts

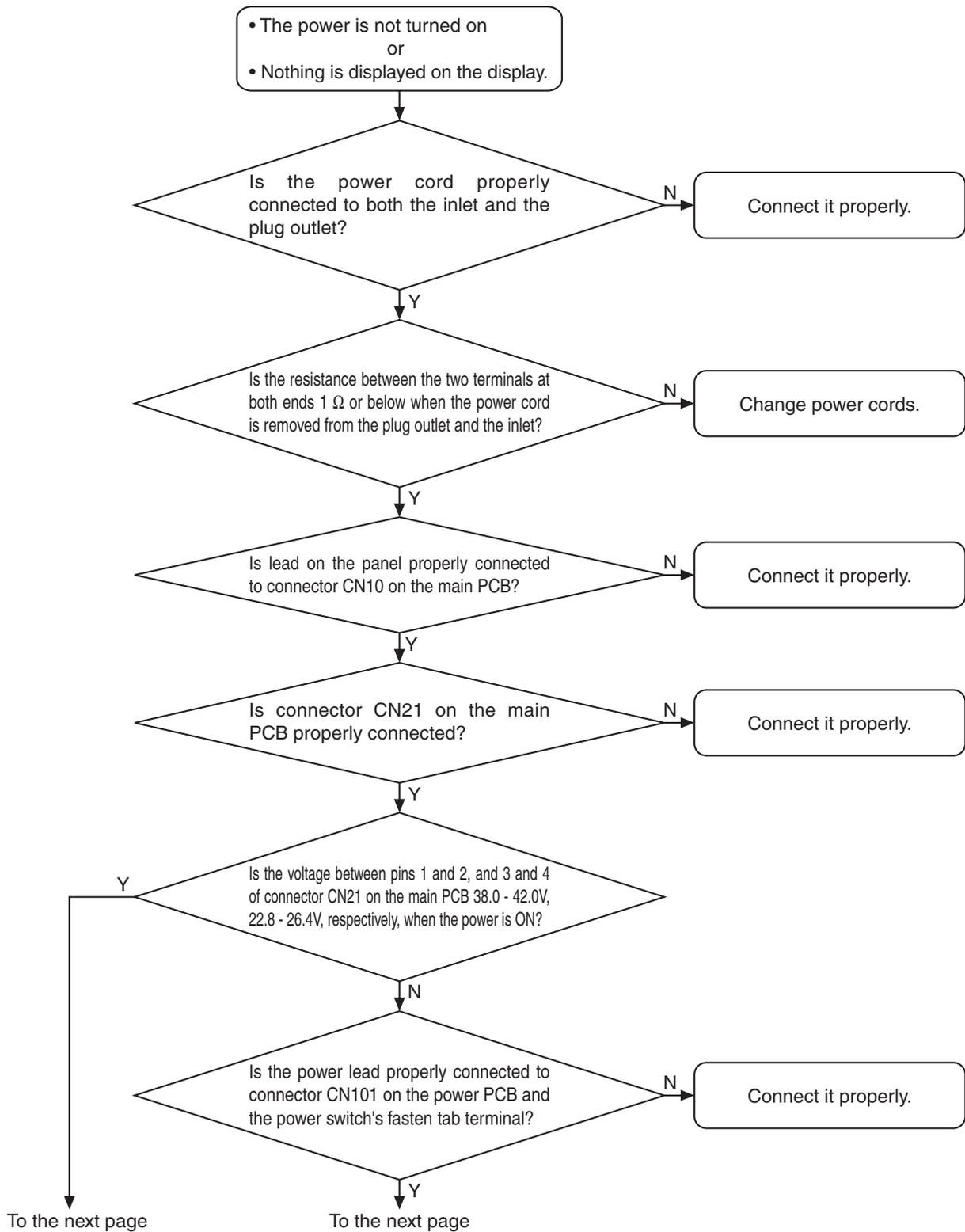
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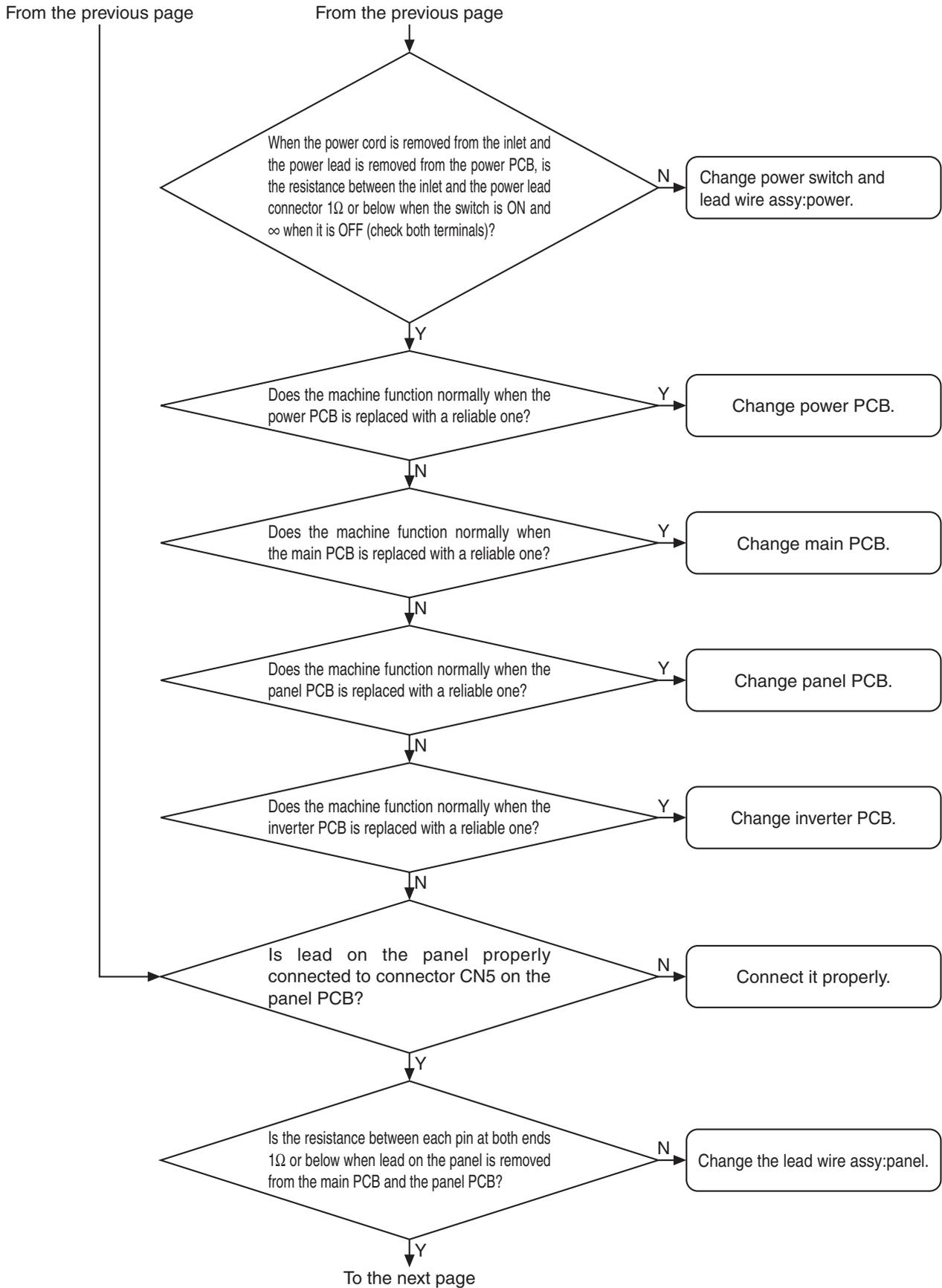
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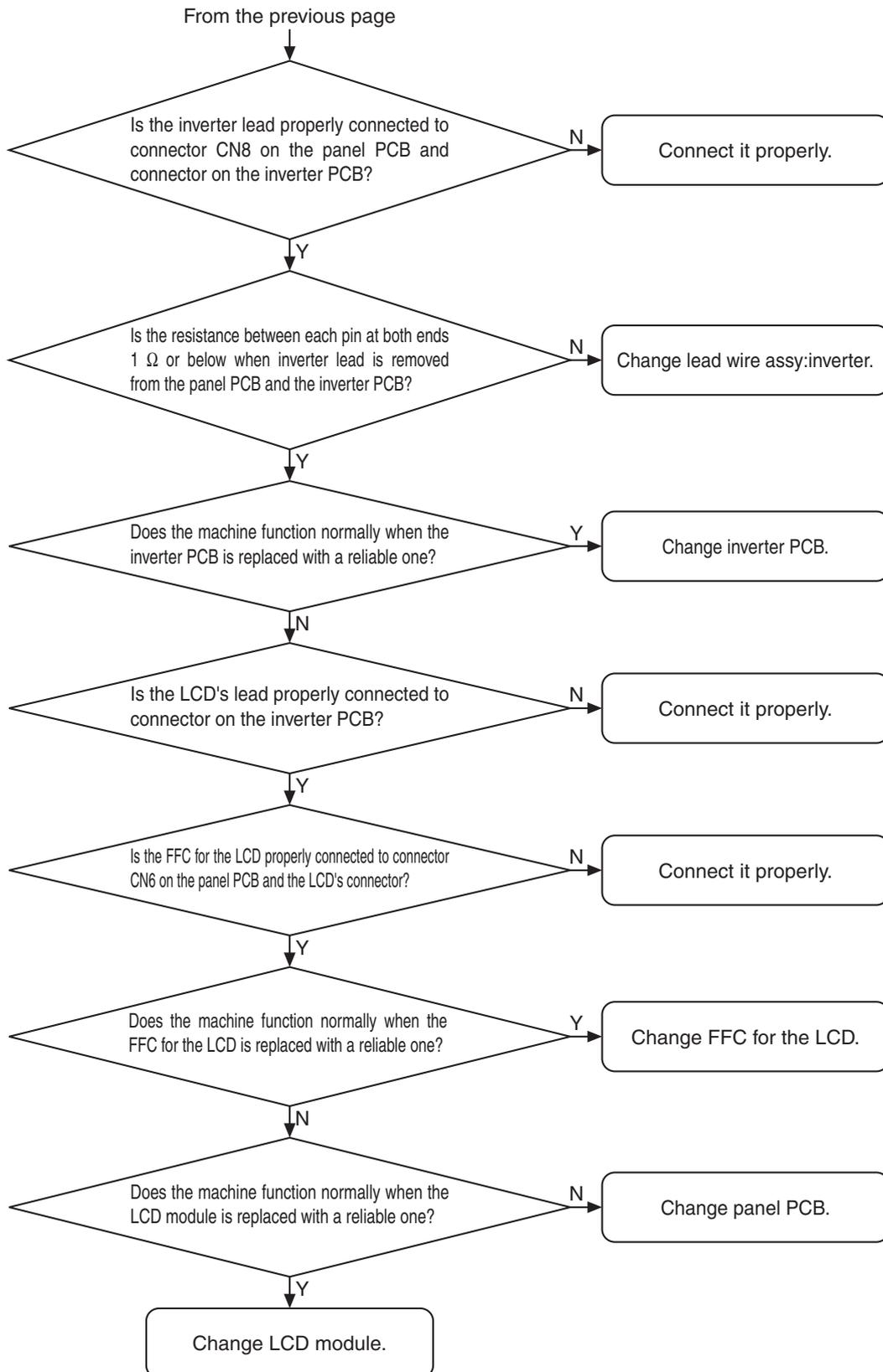
\* Perform resistance measurements after turning off the power and detaching the connectors to be measured from the PCB.

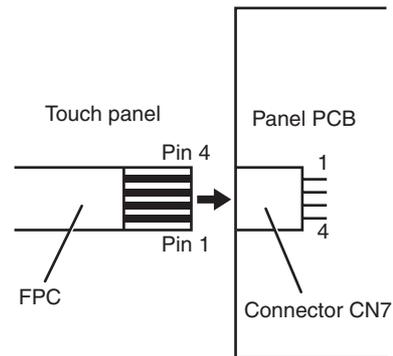
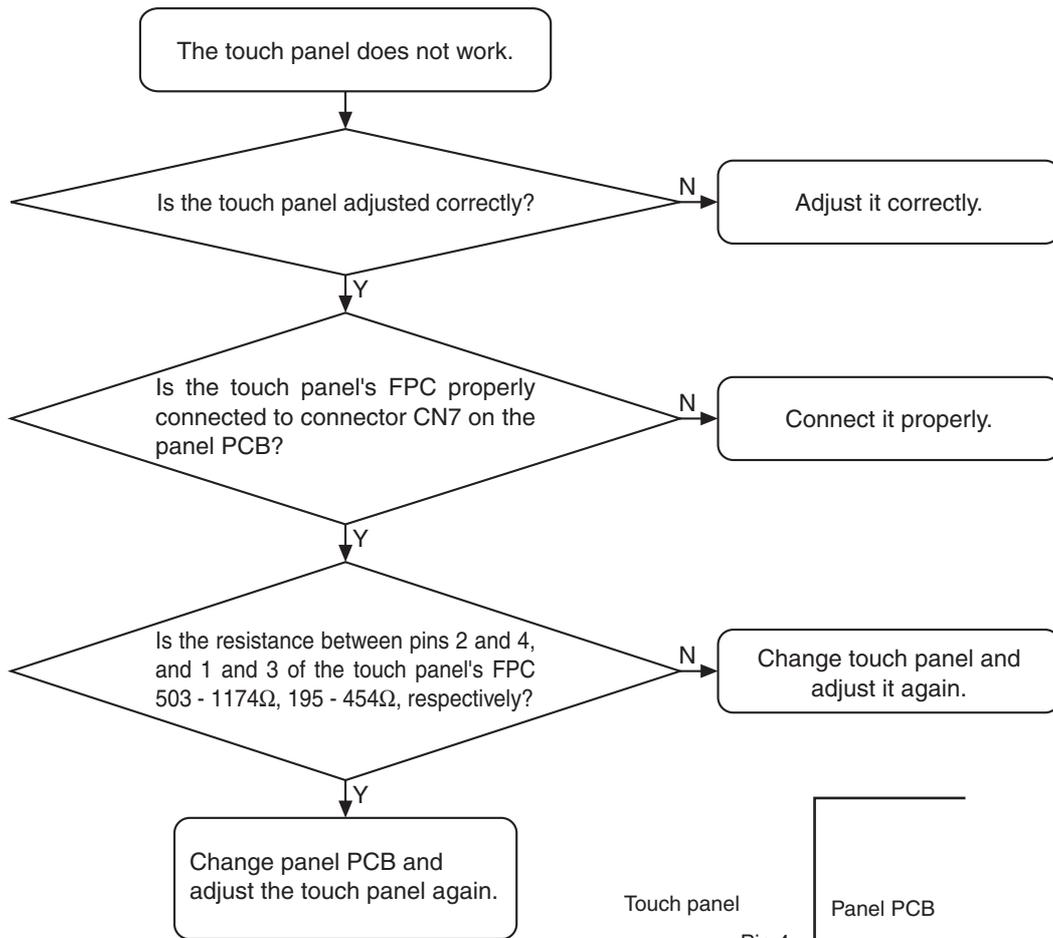
Error message list.....	5 - 2
The power is not turned on.....	5 - 3
The touch panel does not work. ....	5 - 6
The panel switch does not work. ....	5 - 7
The needle bar does not move normally. ....	5 - 8
Thread breakage detection does not function normally. .	5 - 9
The hoop does not move normally. .	5 - 10
The main shaft does not rotate normally. .	5 - 12
Thread is not cut normally. ....	5 - 13
The wiper does not function normally. ...	5 - 14
A needle is not threaded normally. .	5 - 15
The picker does not function normally. .	5 - 16
LED light does not turn ON. ....	5 - 17
USB function and USB media cannot be used normally. ...	5 - 19
The hoop sensor does not function normally. ..	5 - 20
Sound does not work.....	5 - 23
Error message .....	5 - 24

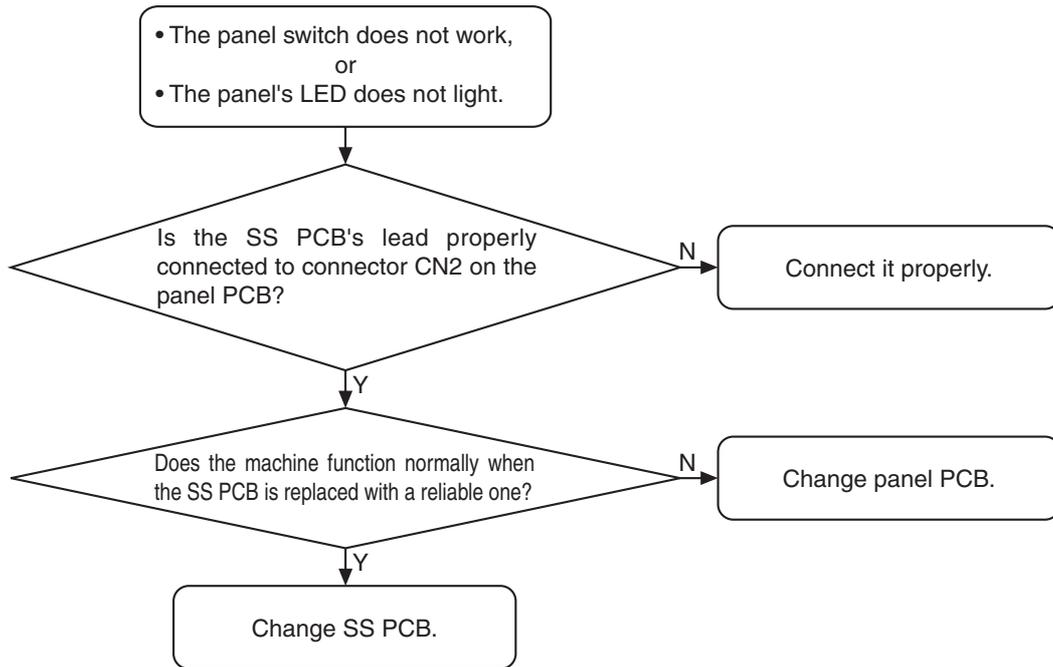
Error message list	See page	Error message list	See page
The pattern is too large for the extra large embroidery frame.	5 - 21	Main motor encoder signal error.	5 - 25
Change to a larger embroidery frame.	5 - 21	Main motor encoder connect error.	5 - 25
USB media is not loaded. Load USB media.	5 - 19	Main motor current error.	5 - 26
This USB media cannot be used.	5 - 19	Trimming sensor error.	5 - 13
Not enough space. Delete some patterns or use a different USB media.	5 - 19	Machine PCB power off.	Check Main PCB
The USB media was changed. Do not change the USB media while it is being read.	5 - 19	Wiper error.	5 - 14
The USB media is write-protected so the data cannot be saved. Cancel the write-protection before trying to save the data.	5 - 19	Needle threader error.	5 - 15
The USB media is write-protected so the data cannot be deleted. Cancel the write-protection before trying to delete the data.	5 - 19	Picker error.	5 - 16
USB media error.	5 - 19	Main motor speed error.	5 - 12
Preventive maintenance is recommended.	Chapter 6	Power supply voltage error. (24V high)	5 - 29
Machine PCB reset.	Check Main PCB	Power supply voltage error. (24V low)	5 - 29
Inappropriate needle stop position.	5 - 12	Power supply voltage error. (40V high)	5 - 29
Needle bar case position error.	5 - 8	Power supply voltage error. (40V low)	5 - 29
Needle case motor has been locked.	5 - 8	Panel communication error.	5 - 27
Needle bar case home position error.	5 - 8	Communication time out error.	5 - 27
X-axis home position error.	5 - 10	Data receiving command error.	5 - 27
Y-axis home position error.	5 - 24	Communication error.	5 - 27
XY moving error.	5 - 12	Check upper and bobbin thread.	5 - 9
EEPROM read/write error.	Check Main PCB	Preventive maintenance is recommended. 2000 hours exceeded.	Chapter 6
Main motor rotate error.	5 - 12		

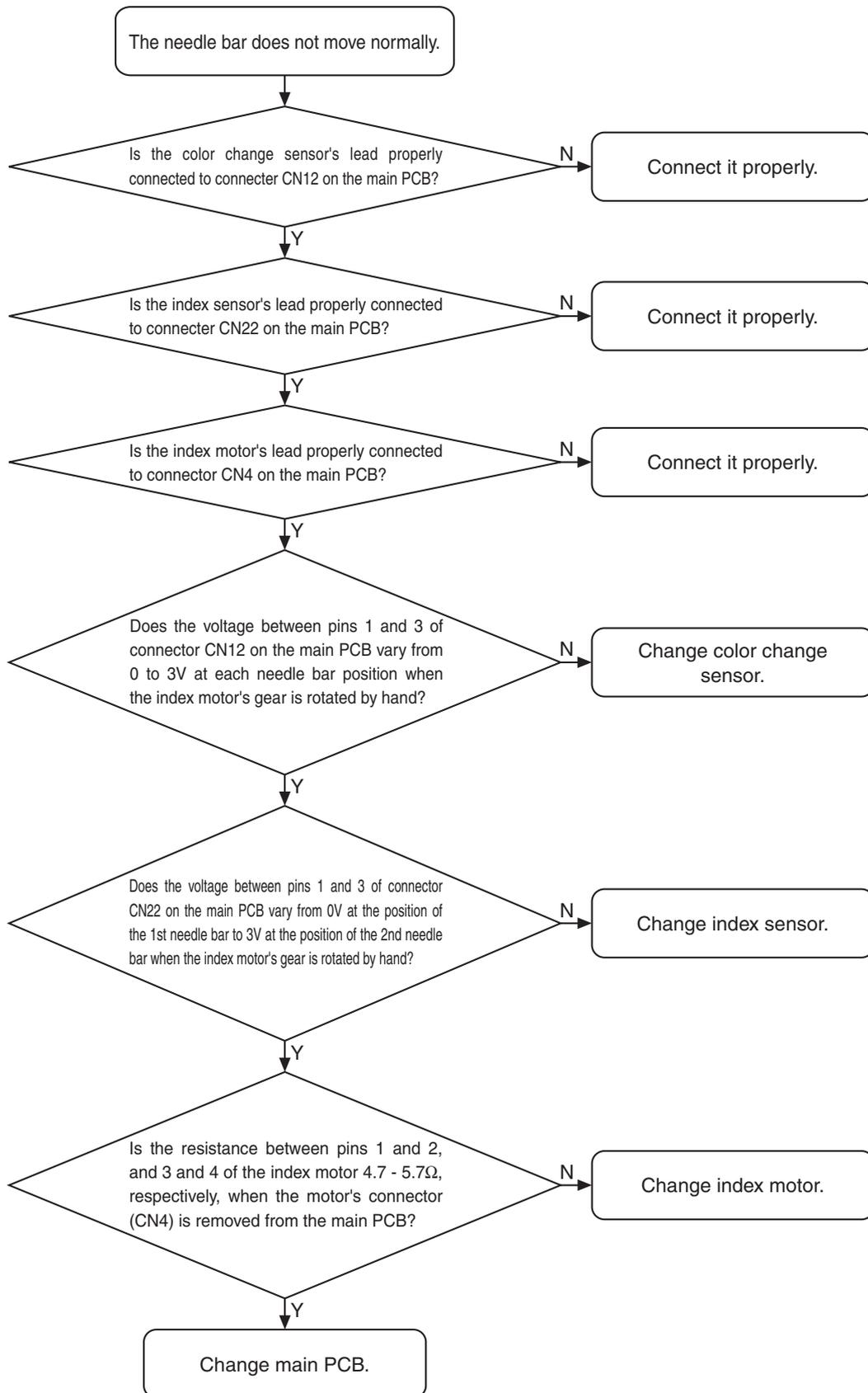


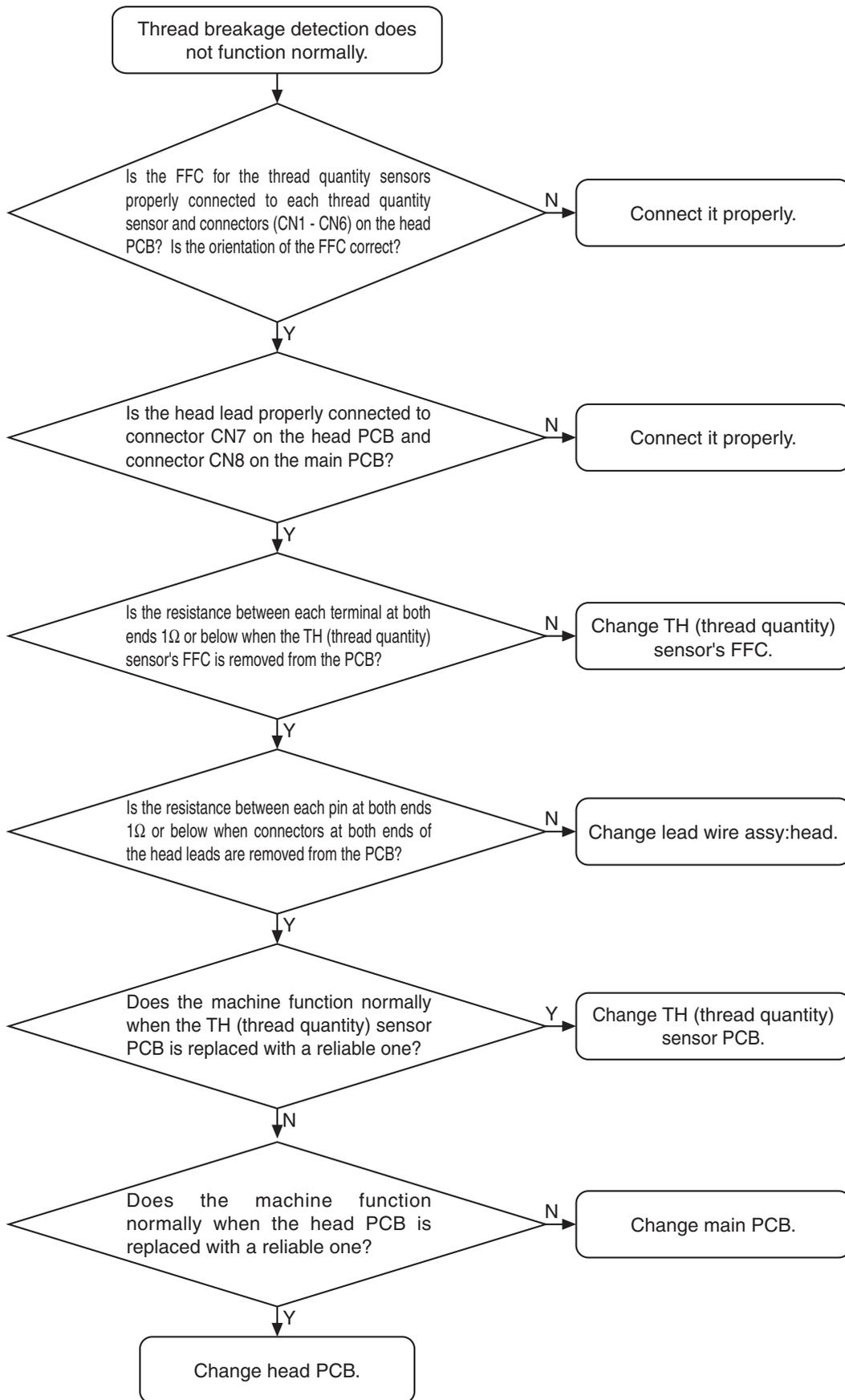


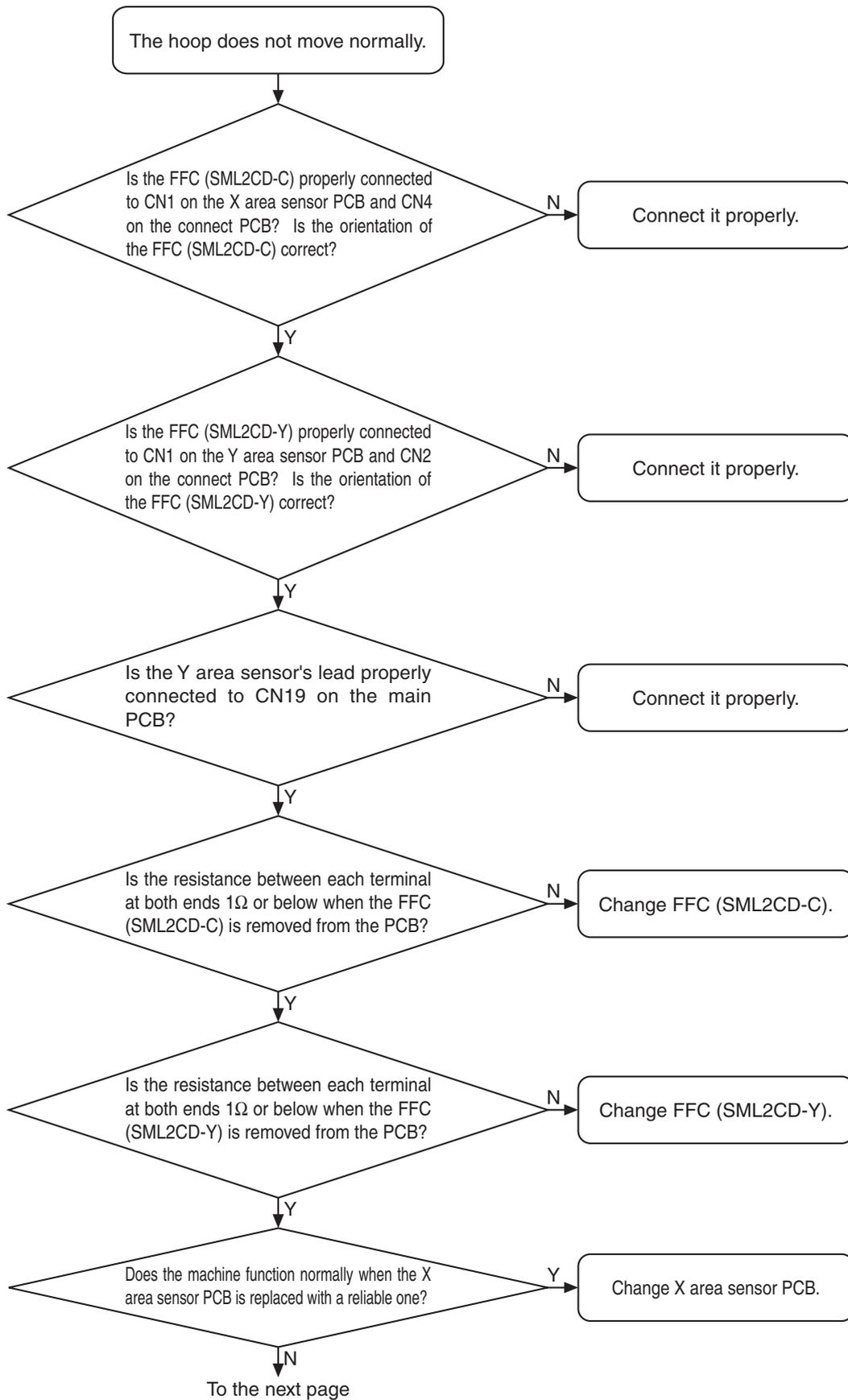


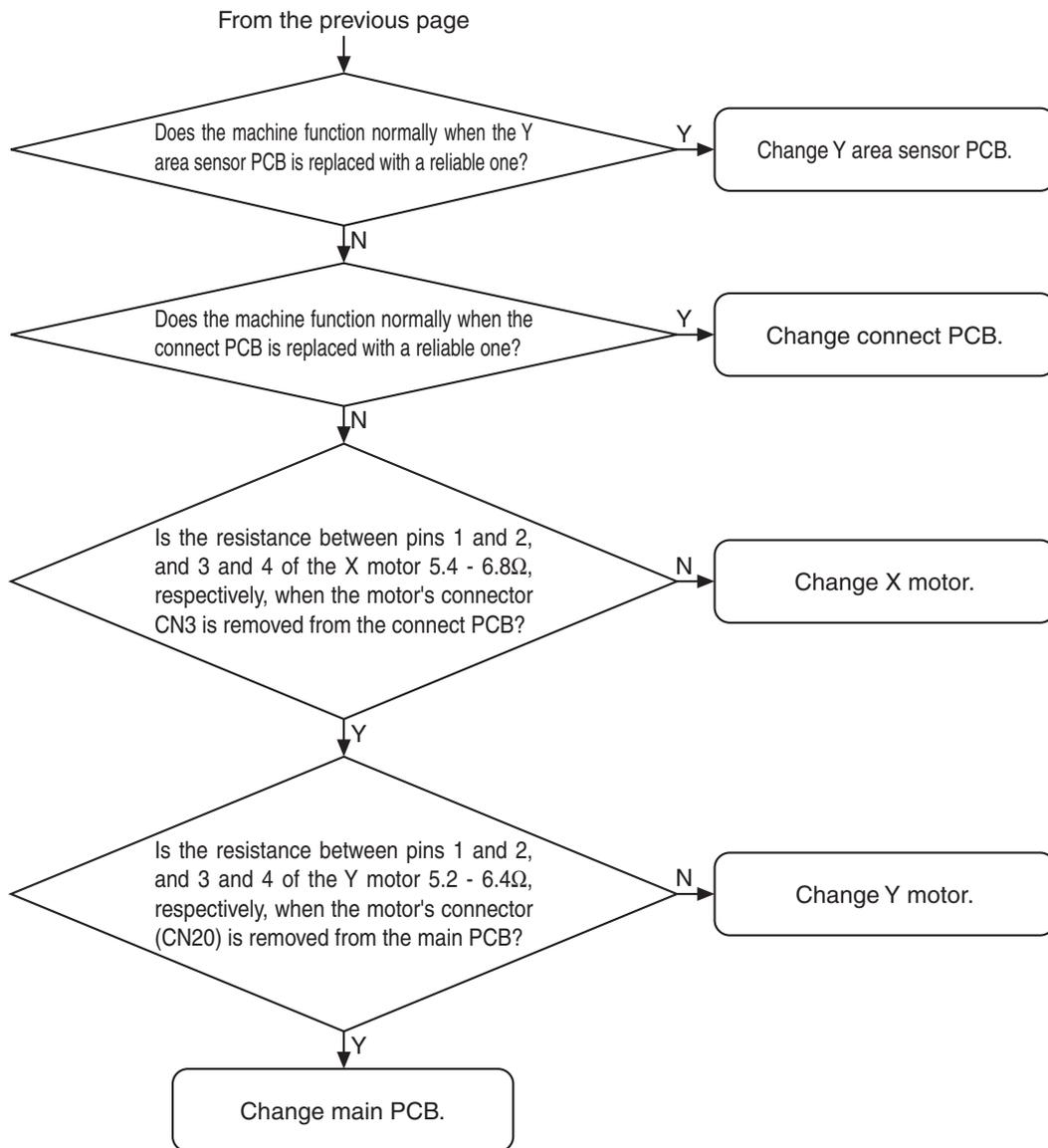


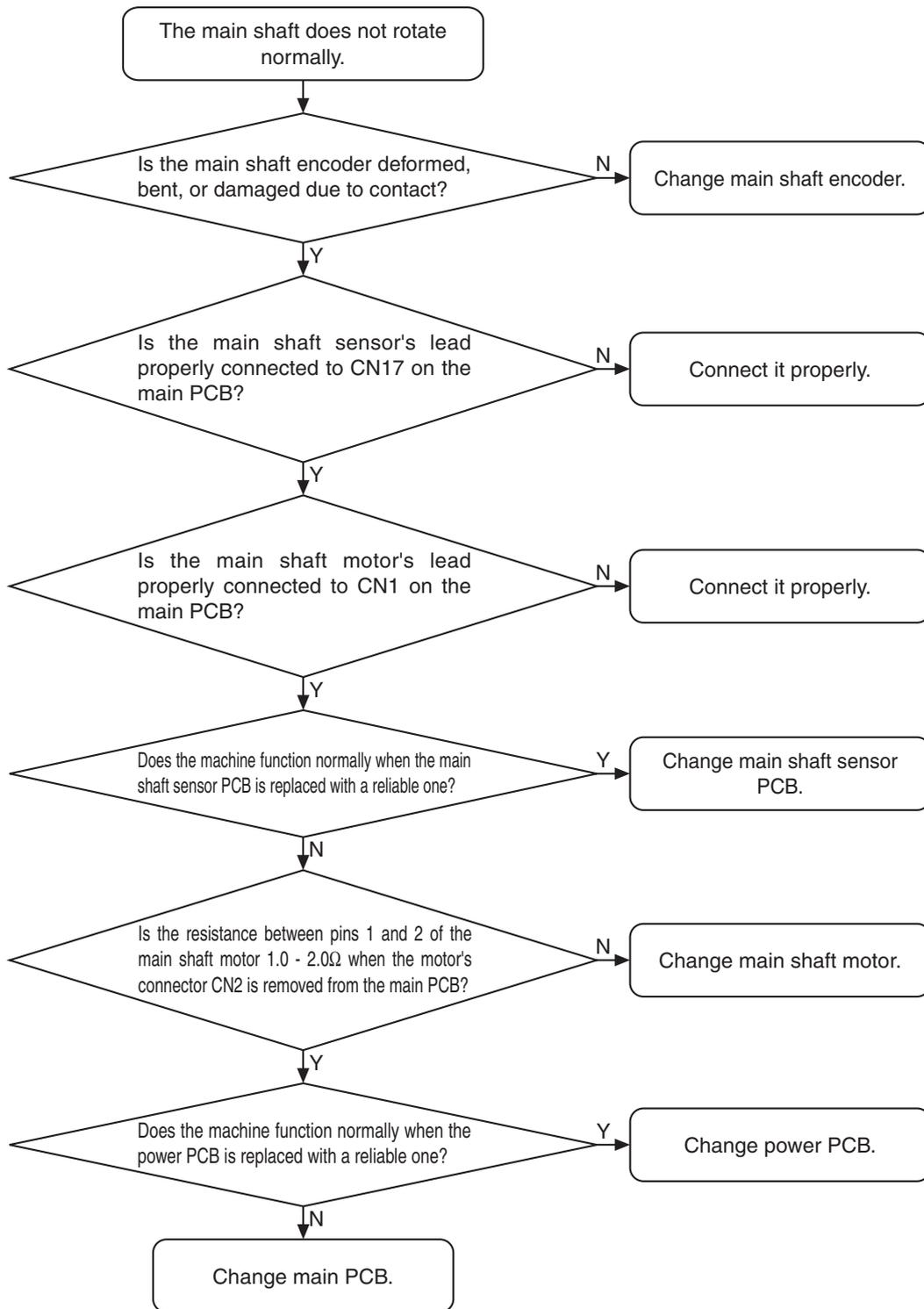


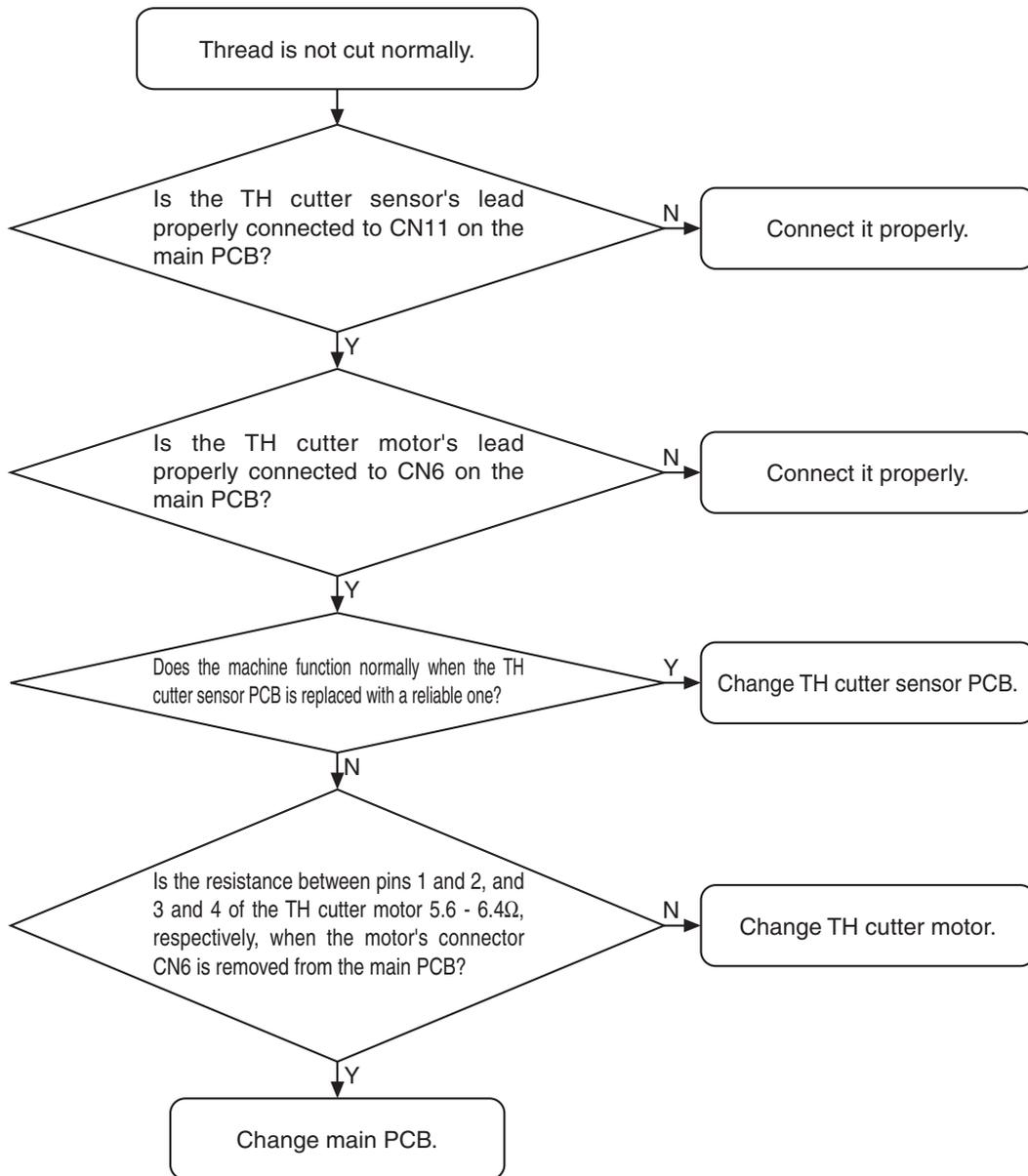


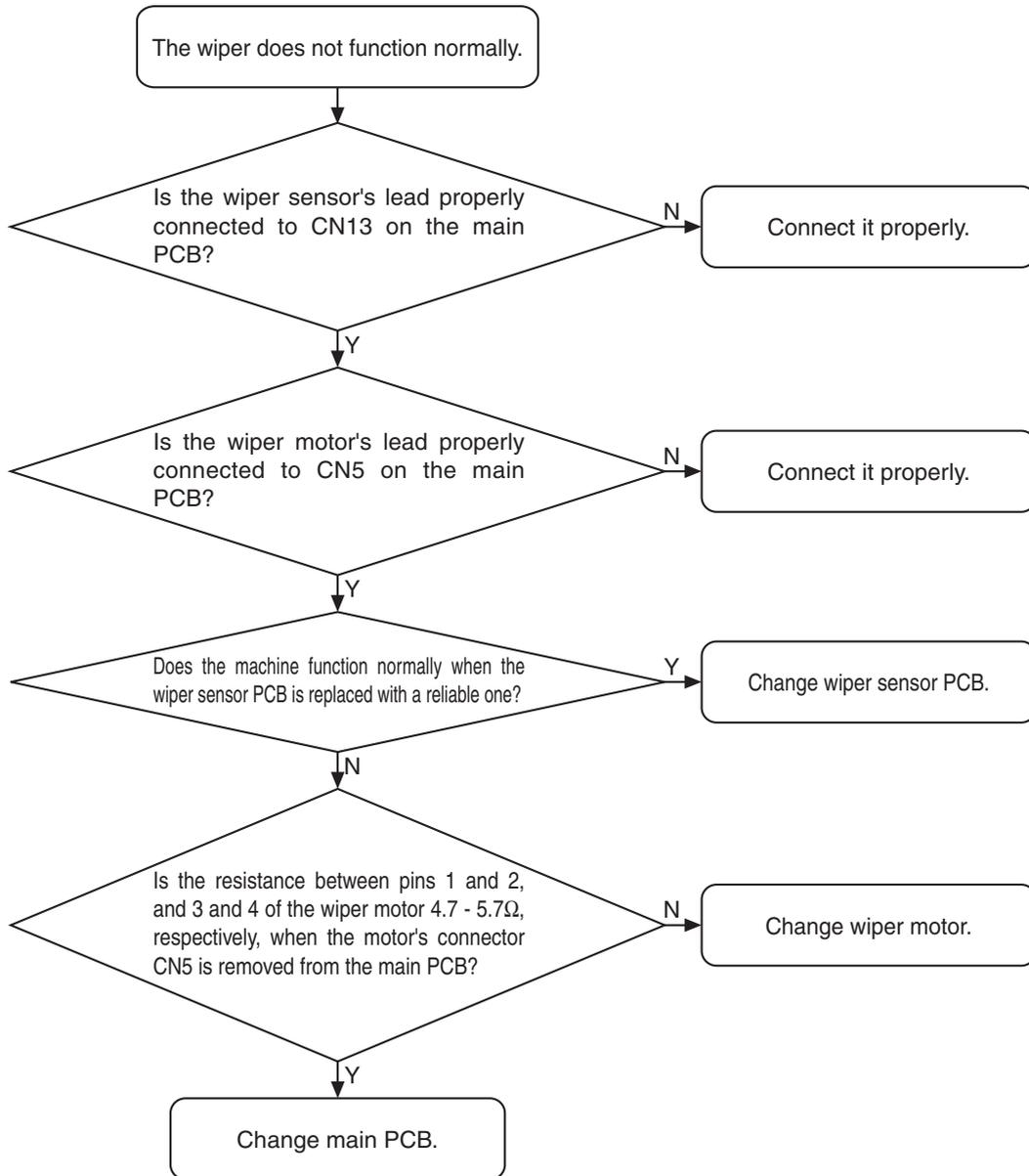


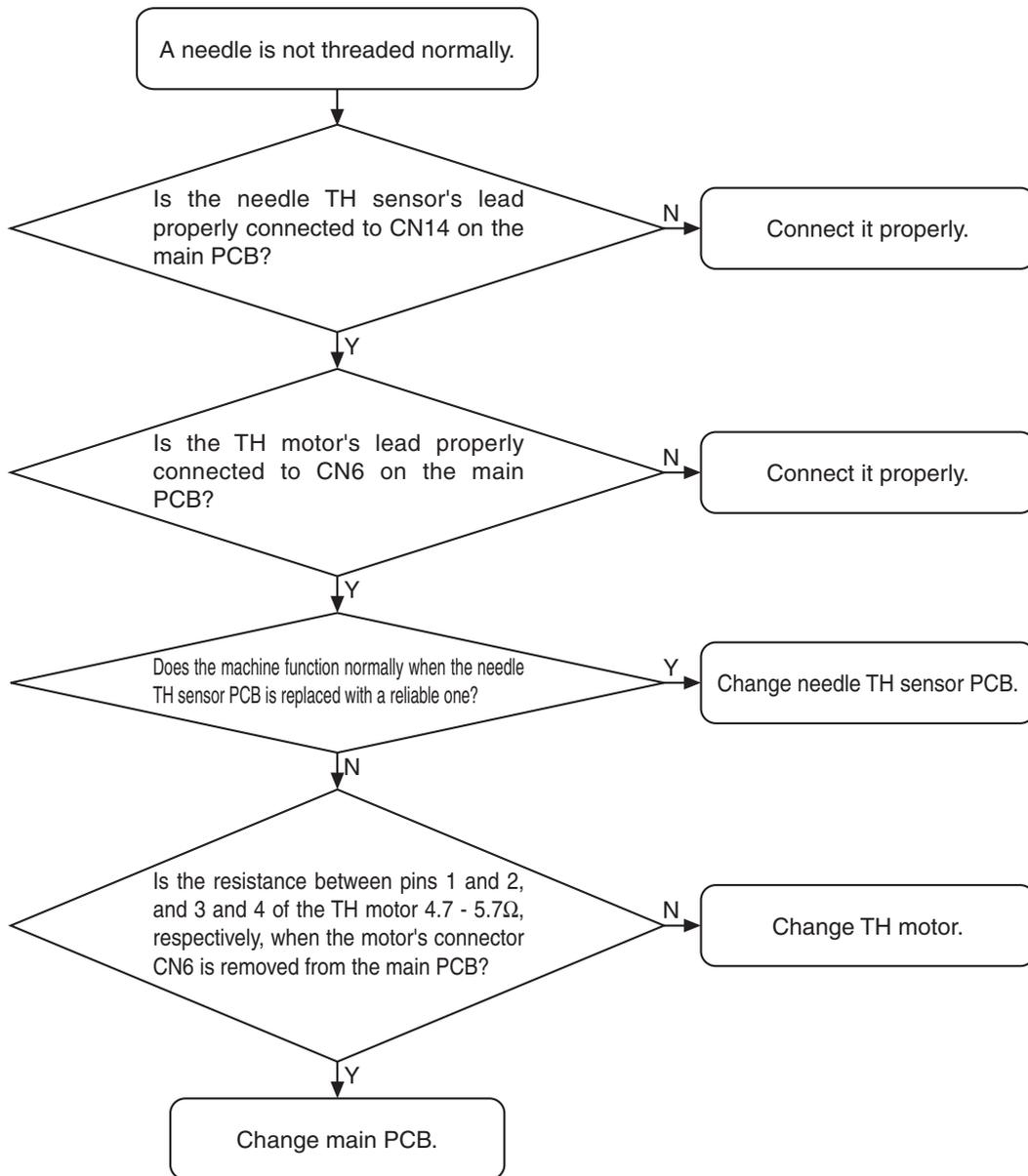


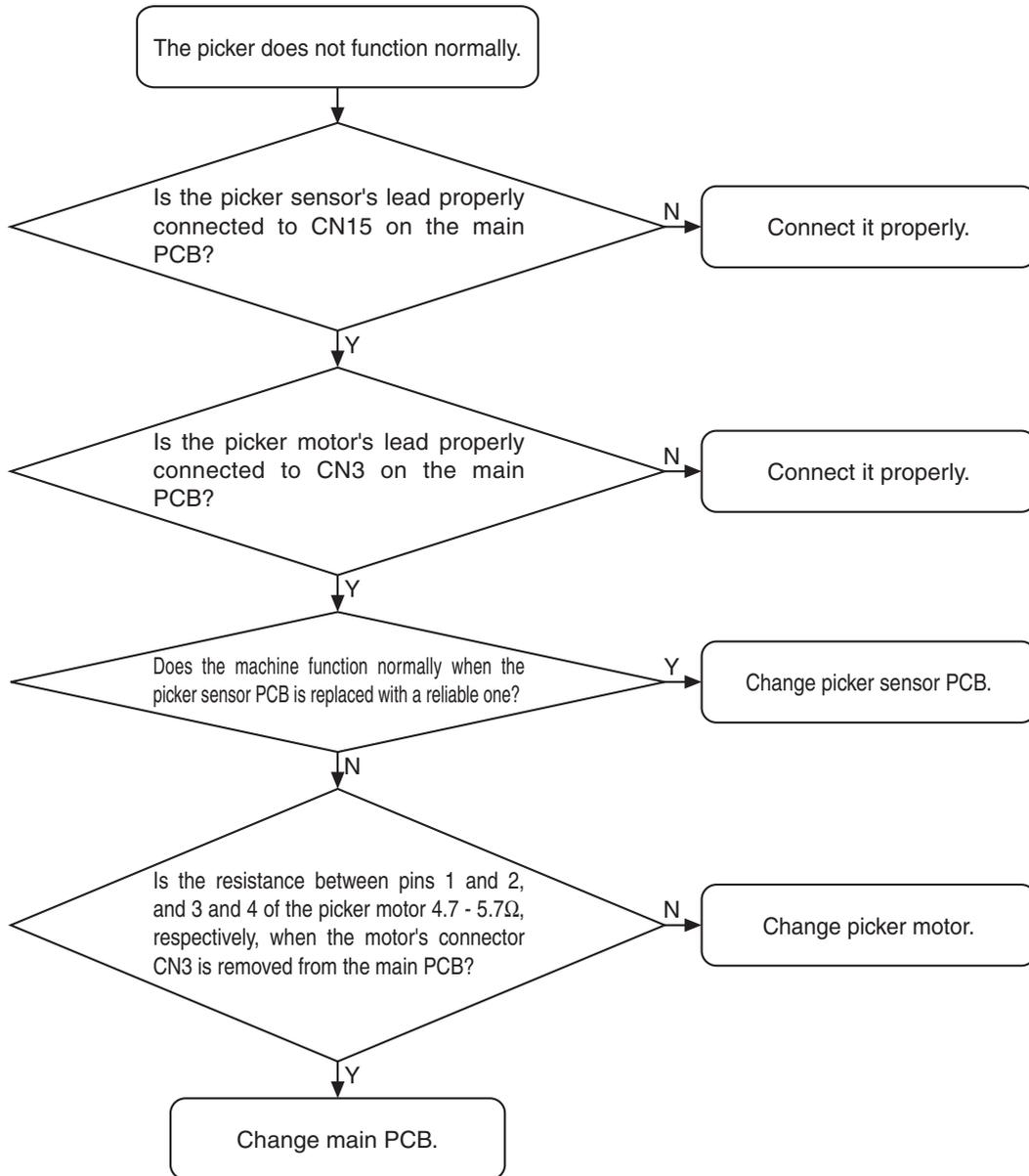


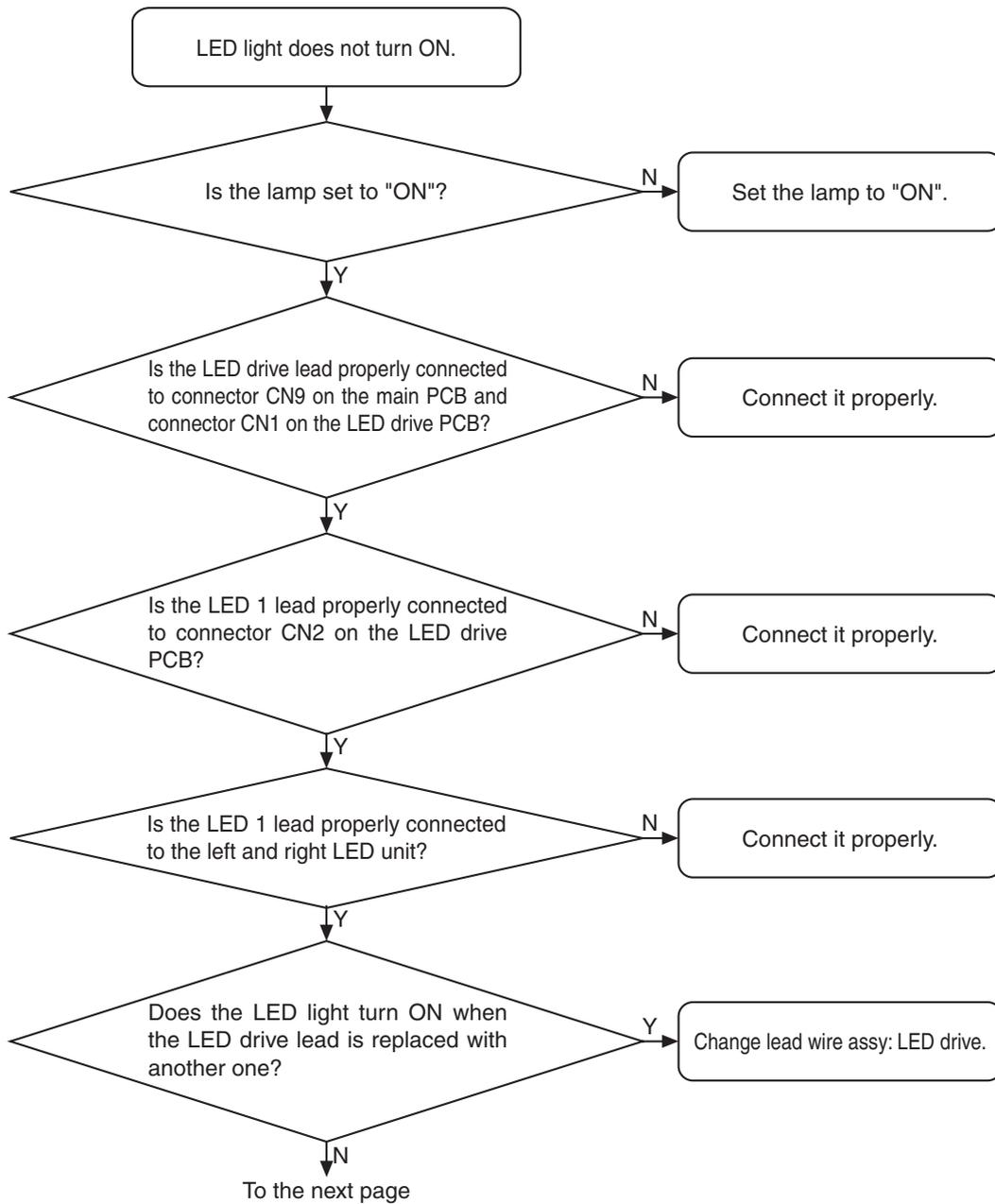


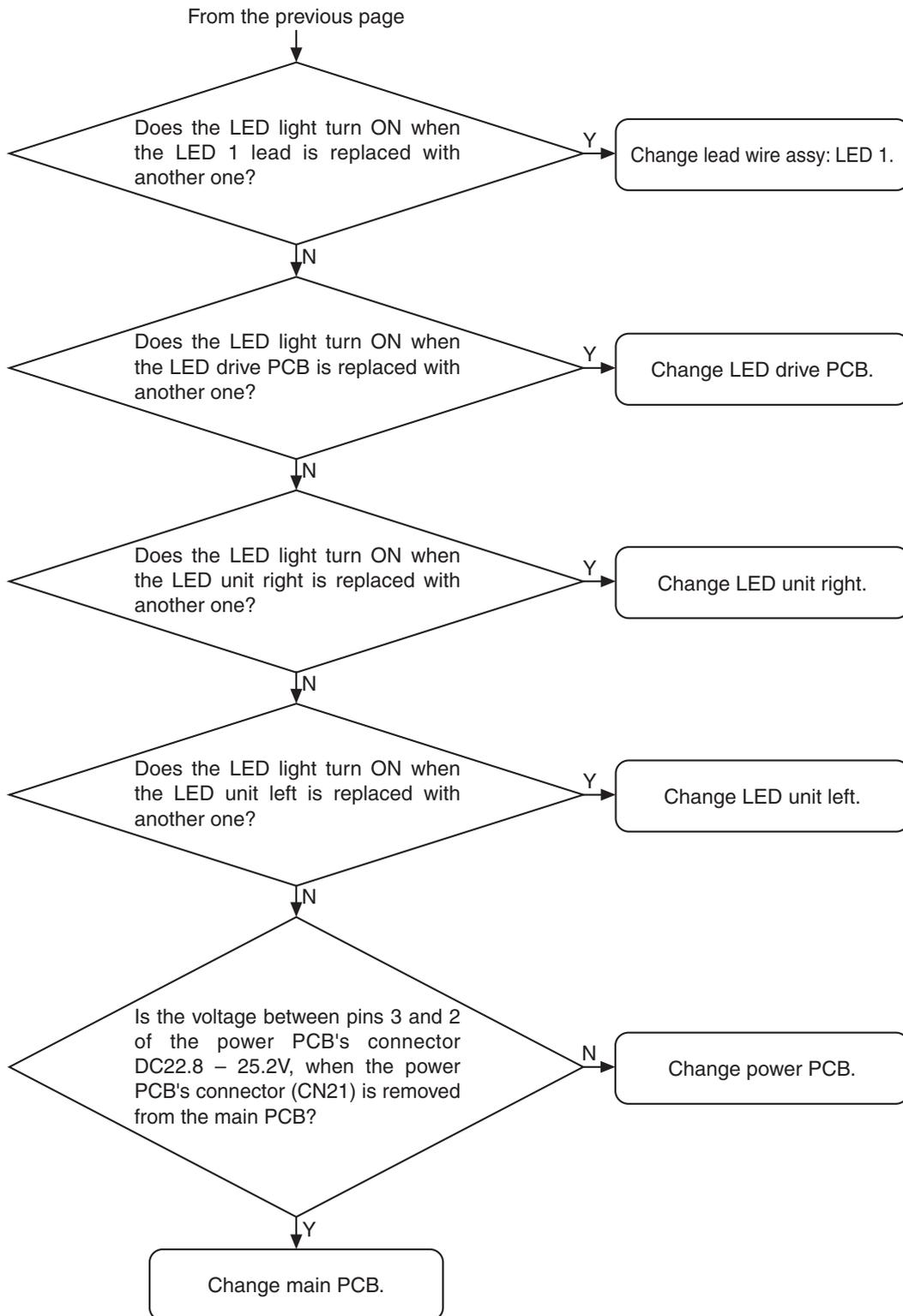


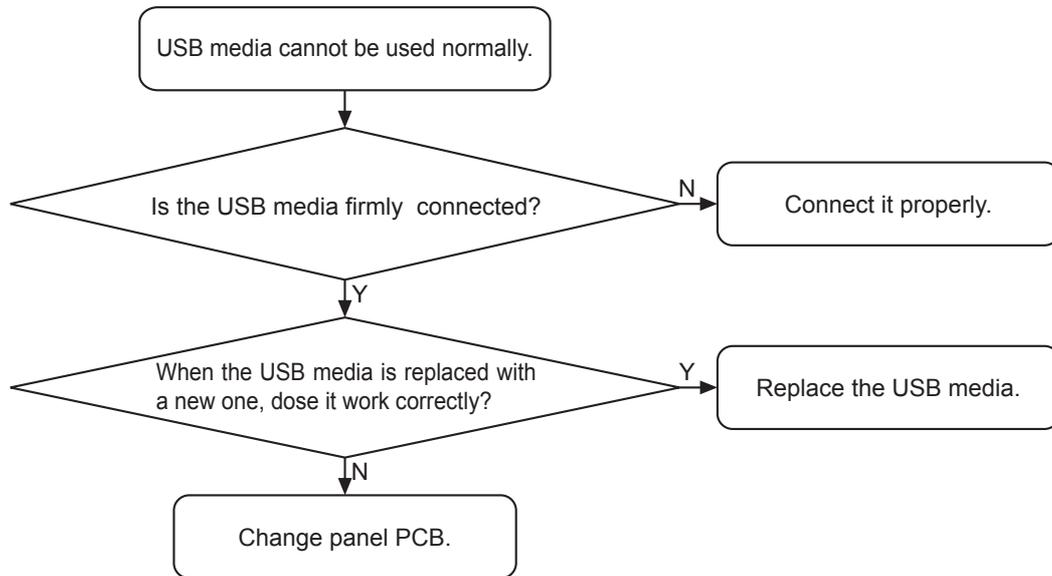
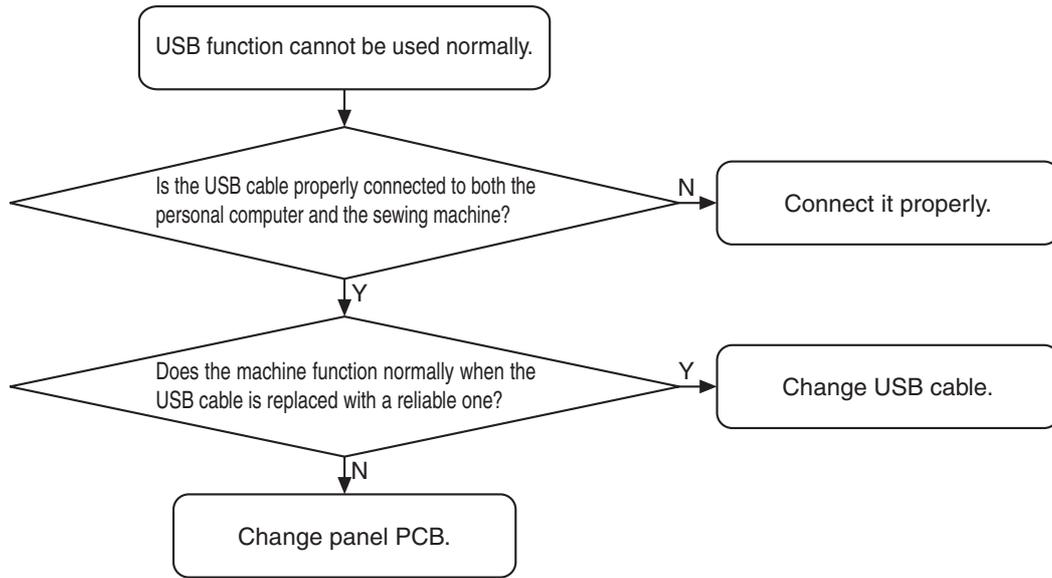


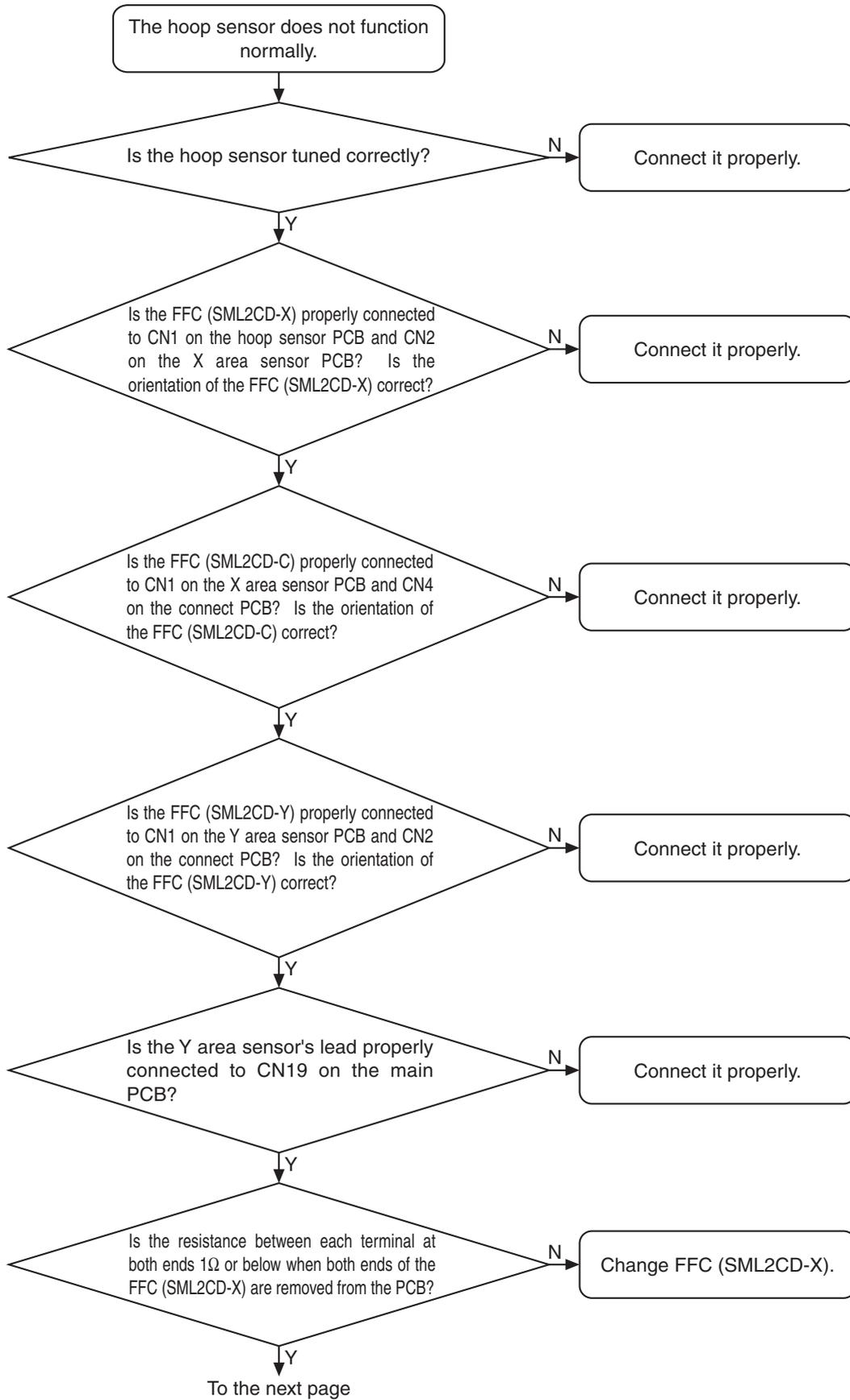


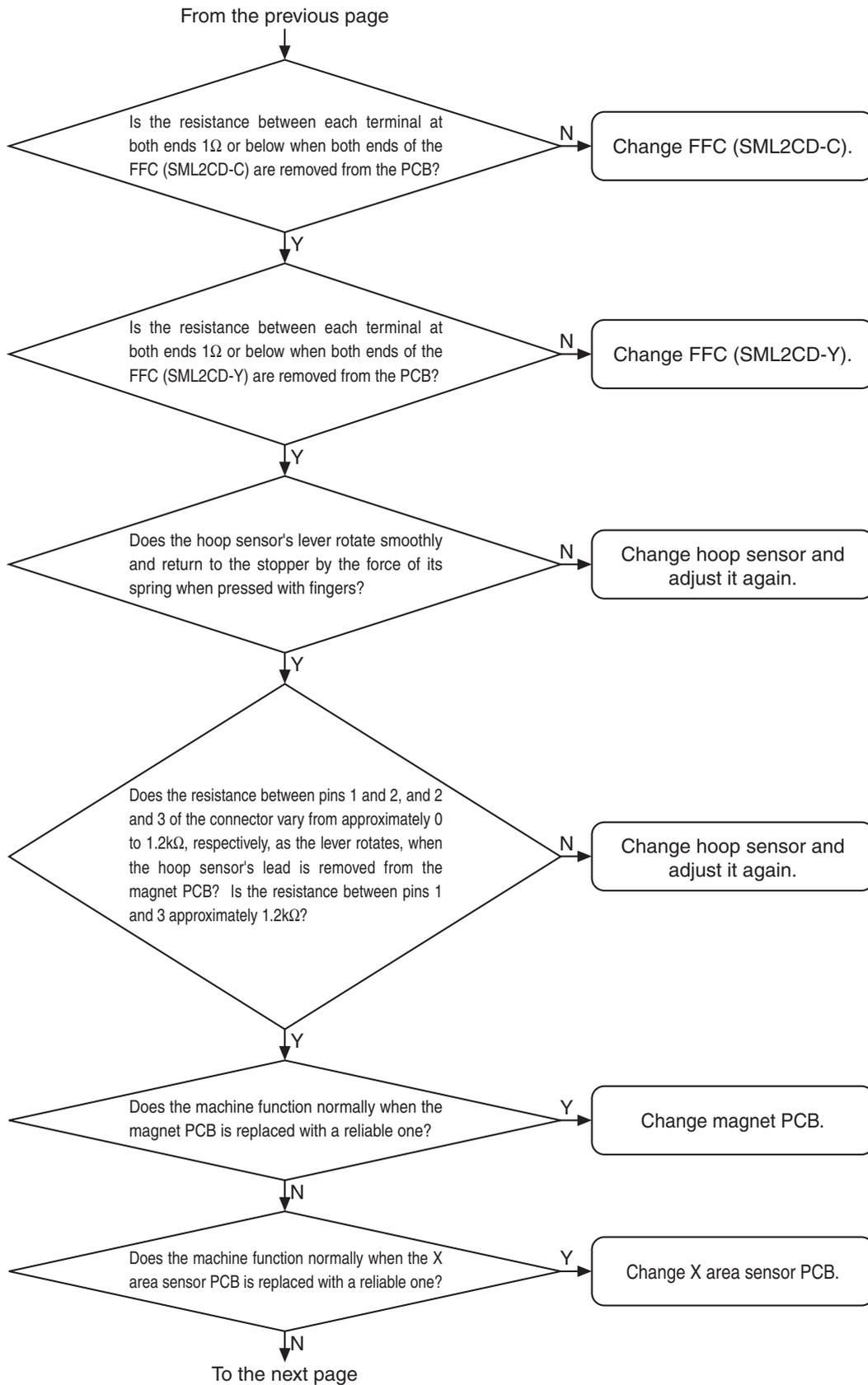


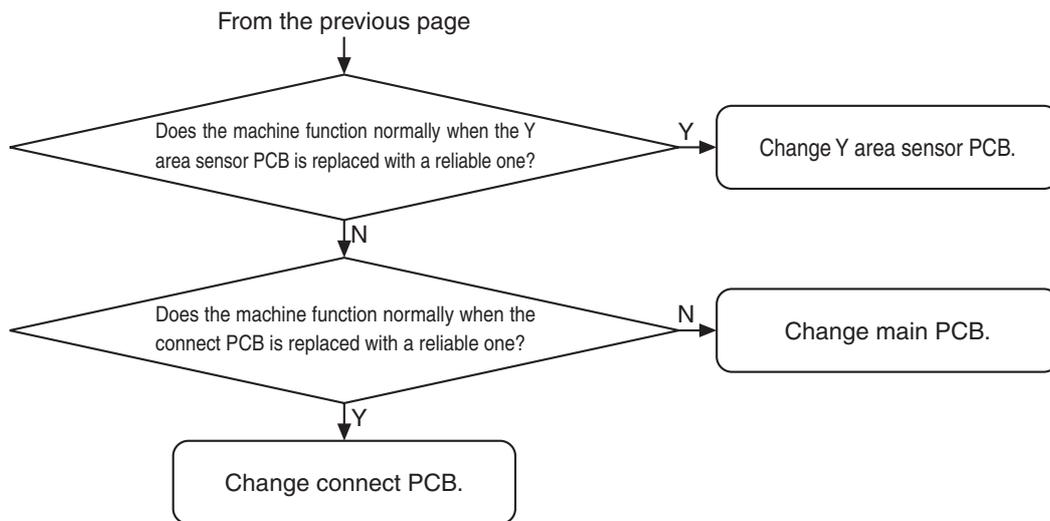


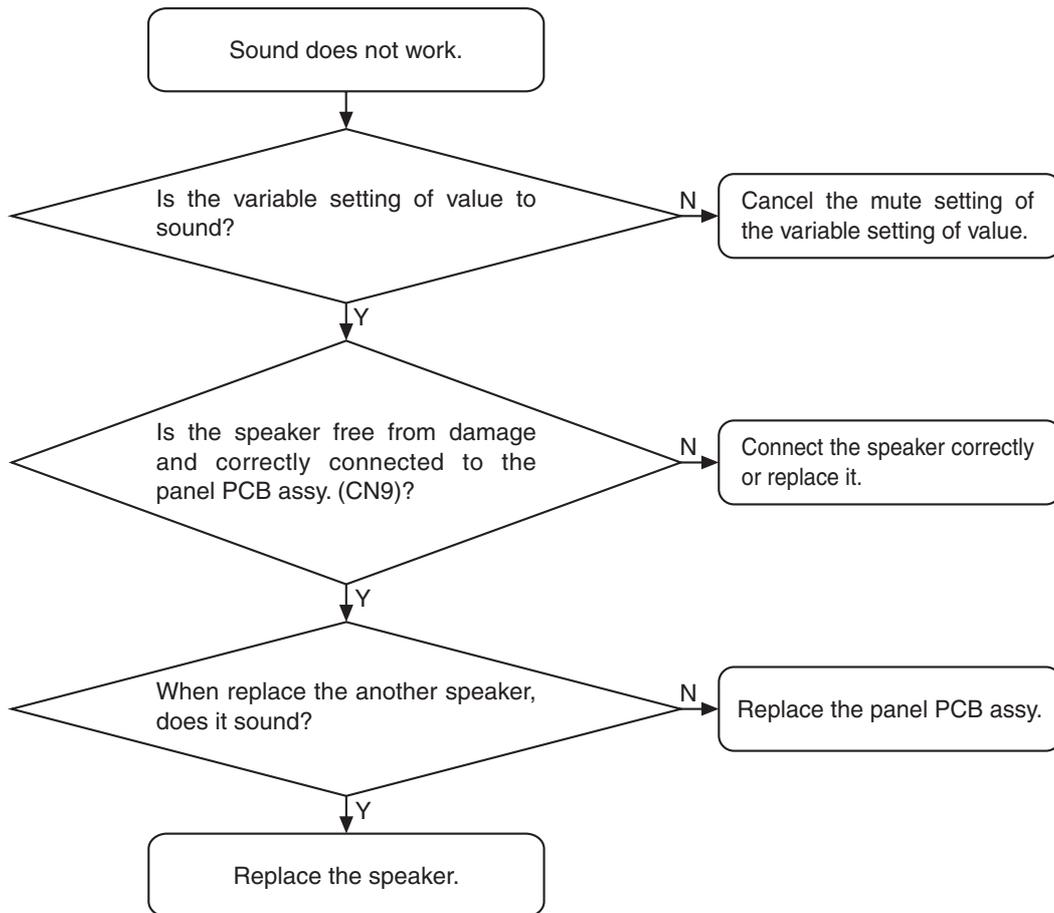


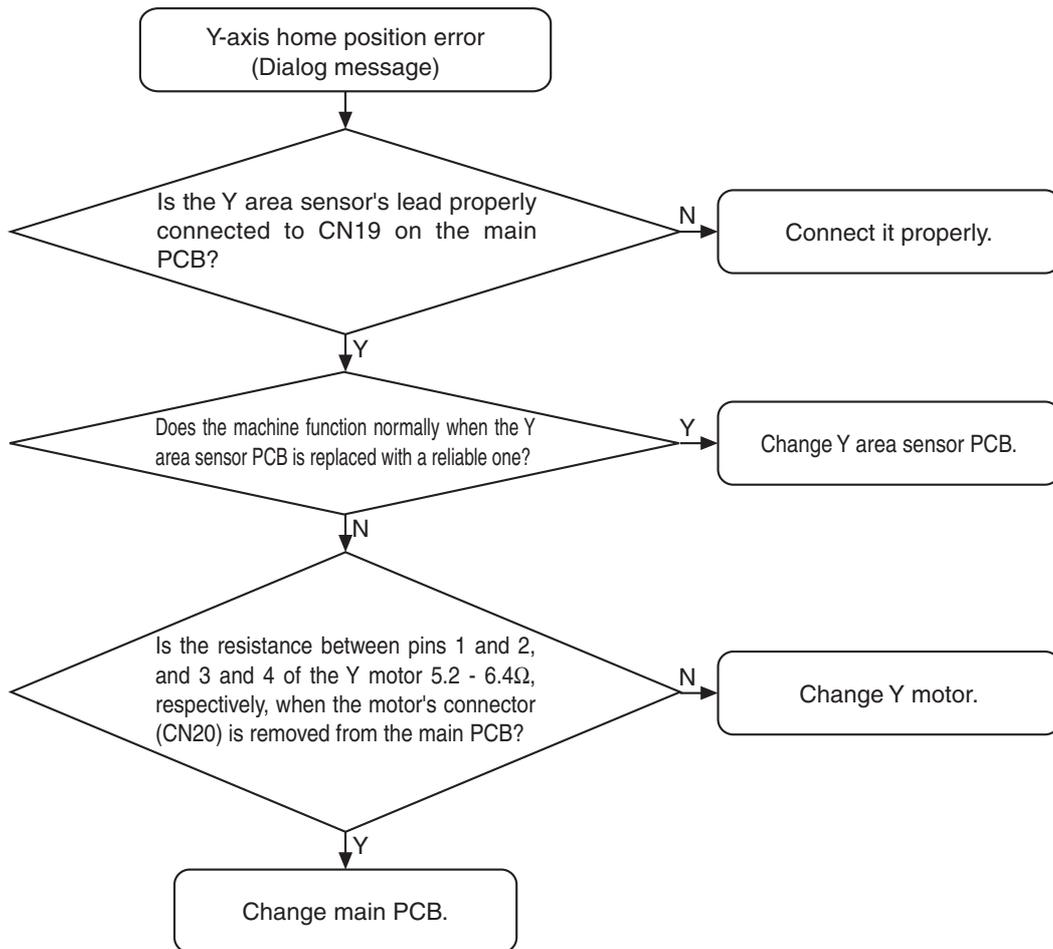


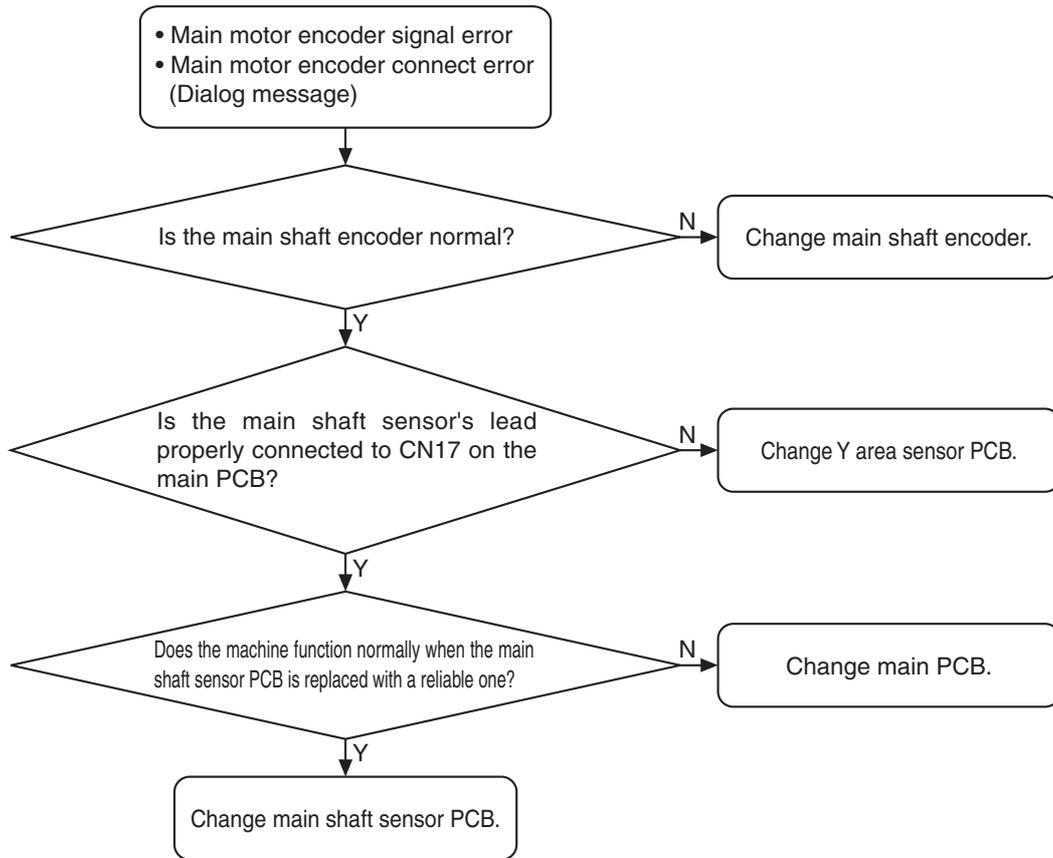


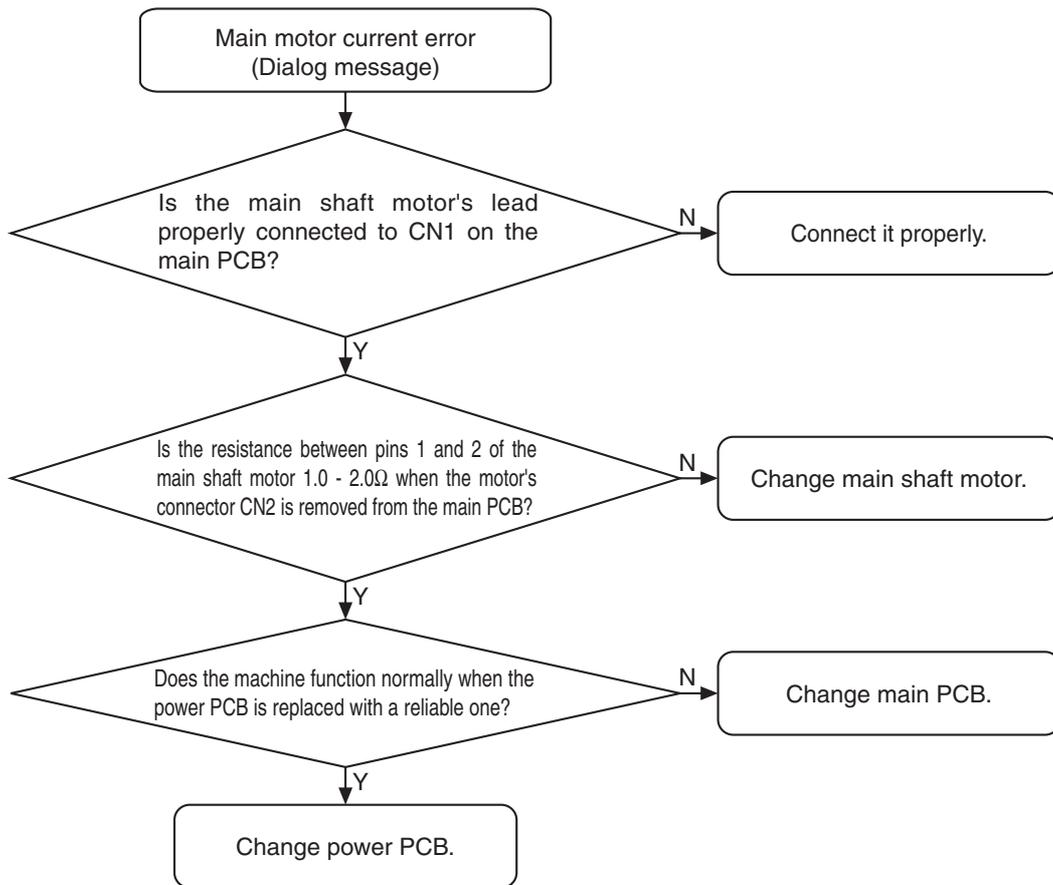


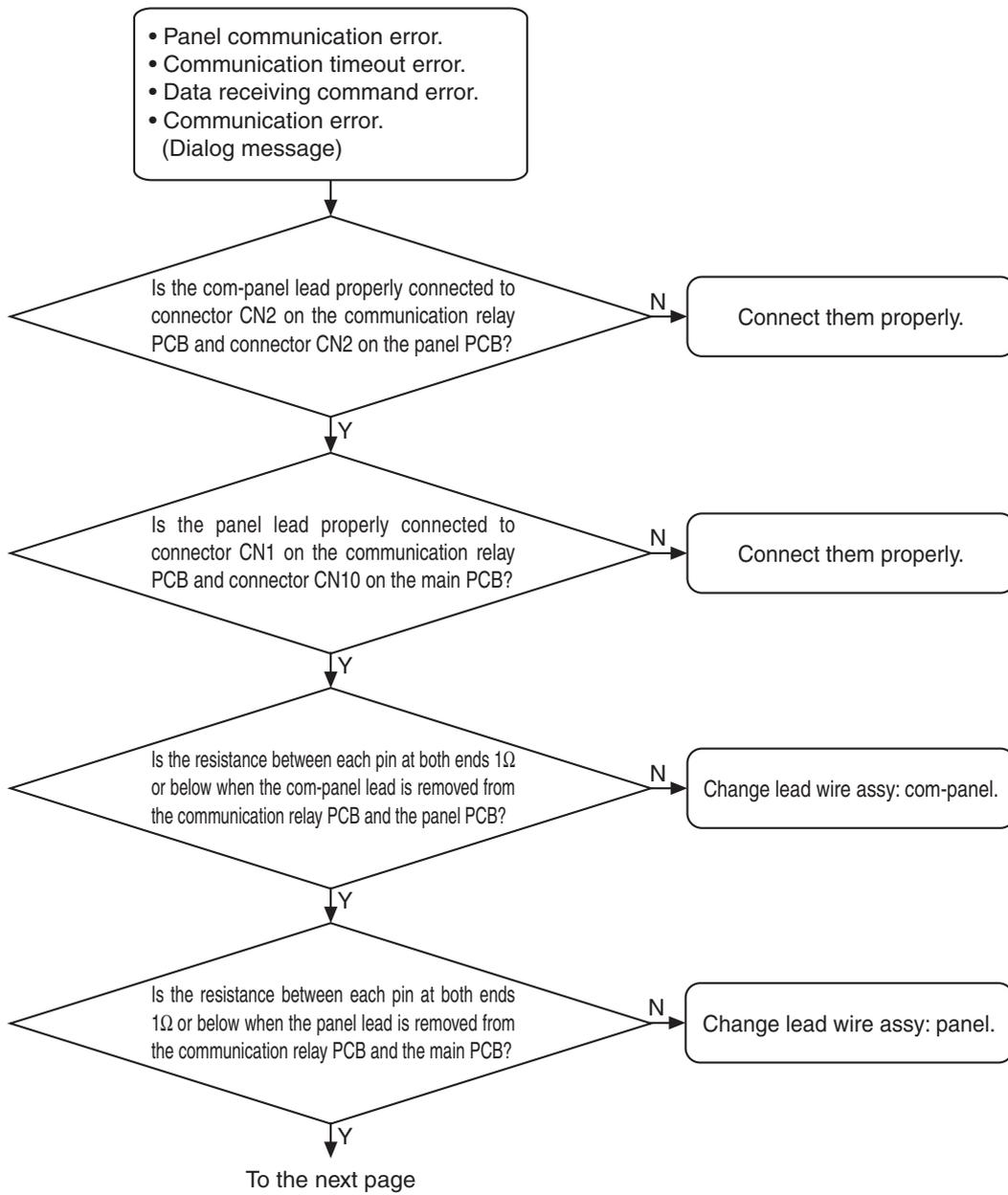


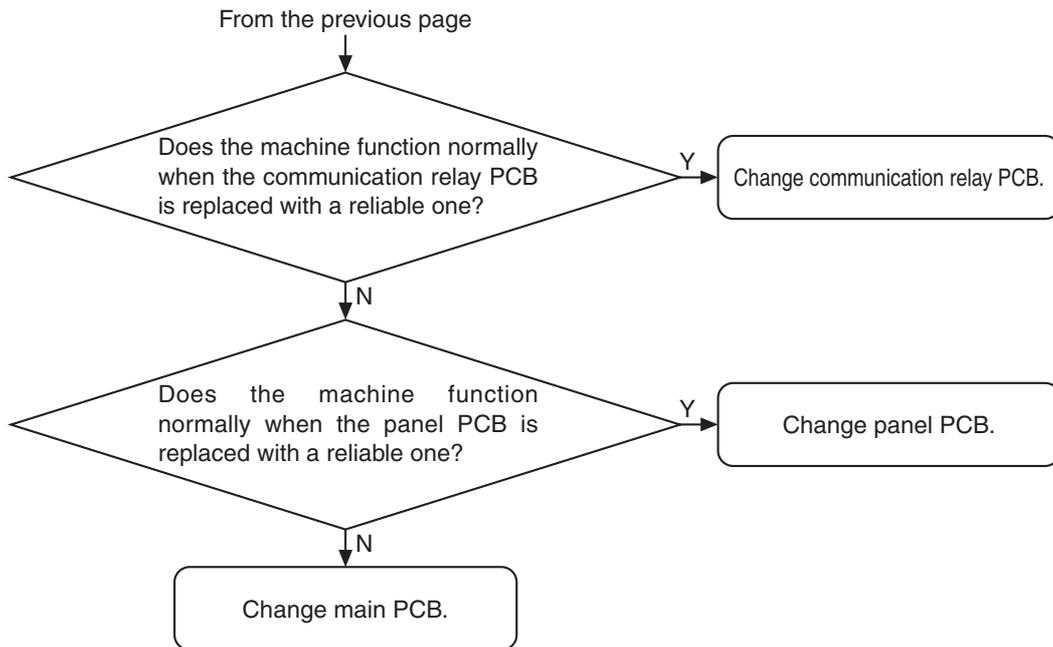


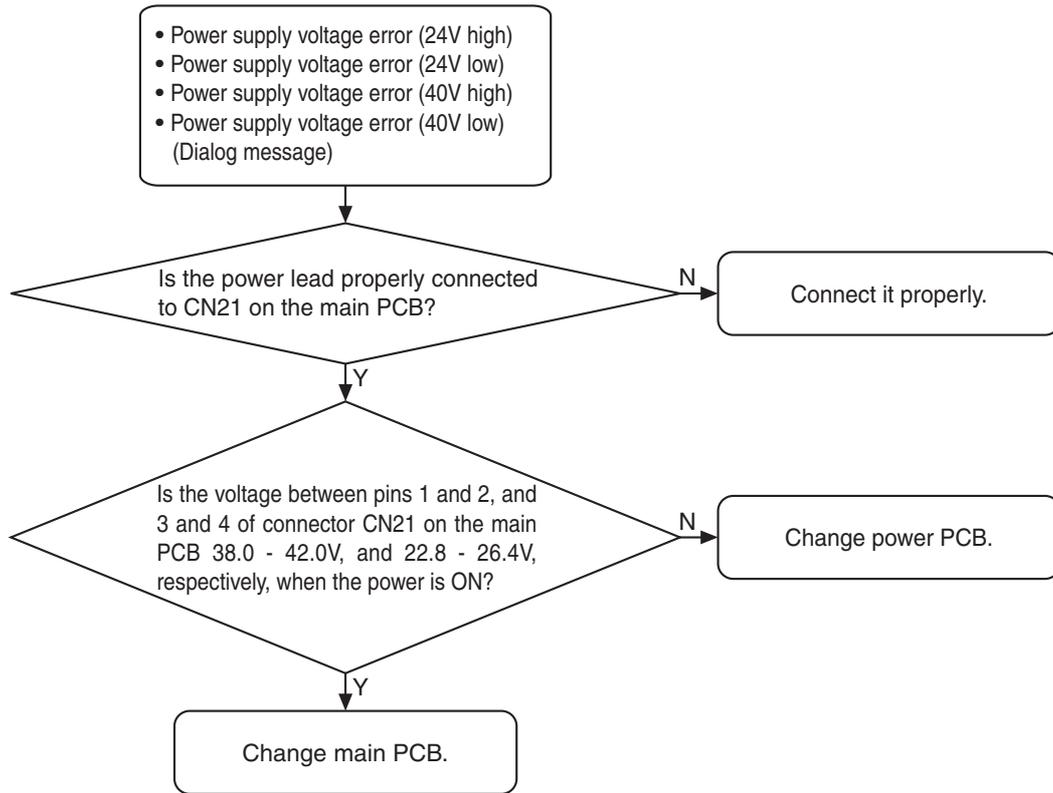














# 6 Maintenance & Replacement

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## Maintenance

How to reset the counter of the maintenance .....	6 - 2
Necessary grease & oil .....	6 - 3
Maintenance point (Every 1,500 hours) .....	6 - 4
Maintenance point (Every 500 hours) .....	6 - 10
Maintenance point (Every day) .....	6 - 11

## Replacement

Replacement parts location .....	6 - 12
Main PCB assy .....	6 - 13
Power supply PCB unit .....	6 - 16
Main motor assy .....	6 - 19
Panel PCB and LCD module .....	6 - 22
Head unit .....	6 - 23
Hook holder .....	6 - 24

When the operating time of the machine becomes 1500h, because following the MSG is displayed, and follow the following instructions. And then maintain the maintenance following by 6-4, 6-5, 6-6, and finally reset the counter.

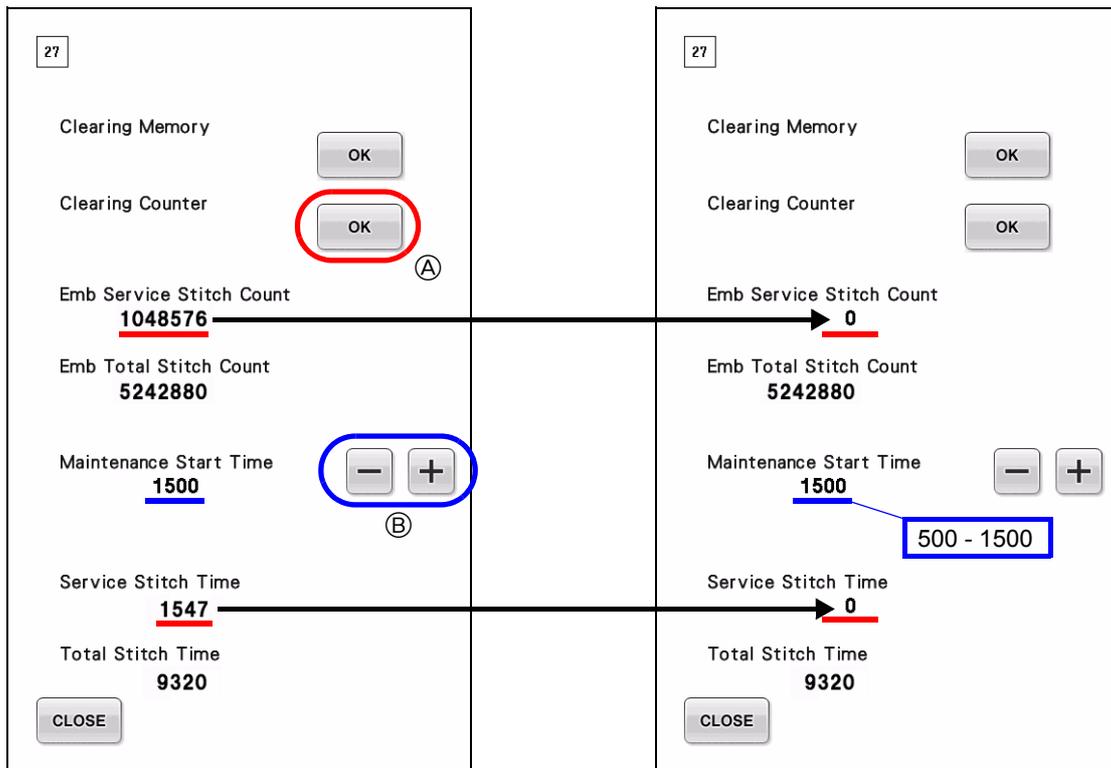
**\*Note**

- The MSG (shown right) will appear (on the LCD) when the machine is turned on after an hour counter reaches 1500 hours (\*the MSG appears up to 3 times, and will not come up when the machine is turned on for the 4th time.). If an hour counter is still not reset (any maintenance has not been done) after the MSG, the MSG will come up again at 1600 hours and 1700 hours (also up to 3 times each). When an hour counter reaches 2000 hours, "Preventative maintenance is recommended 2000 hours exceeded" MSG will appear on the LCD every time the machine is turned on until the hour counter is reset.



**How to reset counter**

1. Turn on the power while pressing the Start/Stop button, Thread trimming button, Automatic needle-threading button.
2. Run by the "TEST MODE", and then select the "PANEL BOARD TEST MODE".
3. Press the "#27 Cleaning" key on the "PANEL BOARD TEST MODE" screen.
4. Reset the "Service stitch count" and "Service stitch time" by pushing the "Clearing counter [OK]" key (A).



**How to change maintenance start time**

When press the [+] button or the [-] button (B), the "Maintenance Start Time" is set.

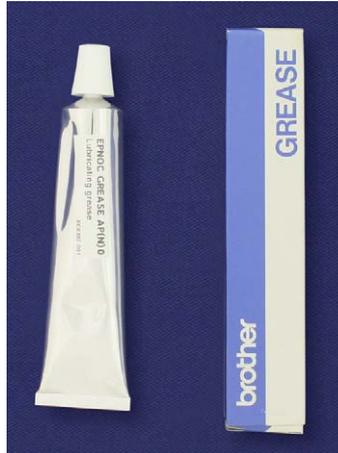
**\*Key point**

- The "Maintenance Start Time" is the service stitch time that the maintenance message (MSG) appears on the LCD.
- The default setting of the service stitch time is 1,500 hours.

## Grease



1) Name: MOLYKOTE EM30L  
Part #: XC8385001



2) Name: EPNOC AP(N) 0  
Part #: XC8387001



3) Name: MOLYKOTE M DISPERSION  
Part #: XC8386001

**Note**

This MOLYKOTE M DISPERSION  
needs to be diluted by OILER  
(Part #: XZ0206051).

Need to mix  
MOLYKOTE M DISPERSION : OILER  
= 1 : 10.

## Oil

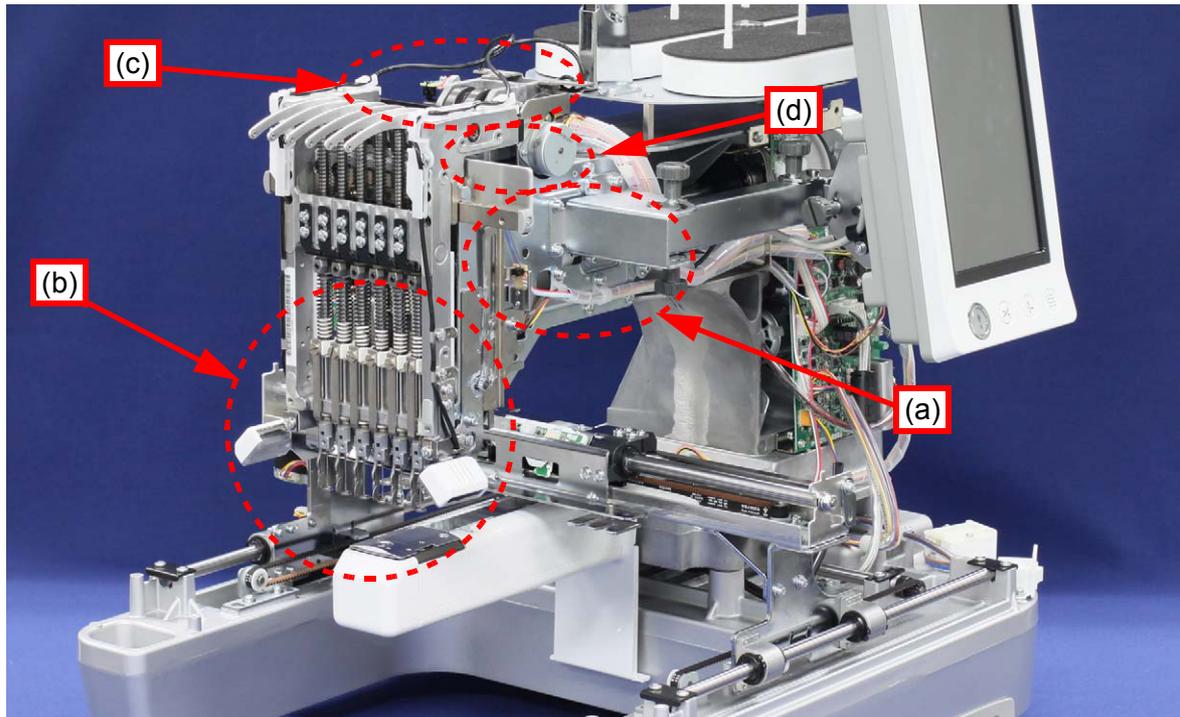


4) Name: FBK OIL RO 100  
Part #: XC8388001



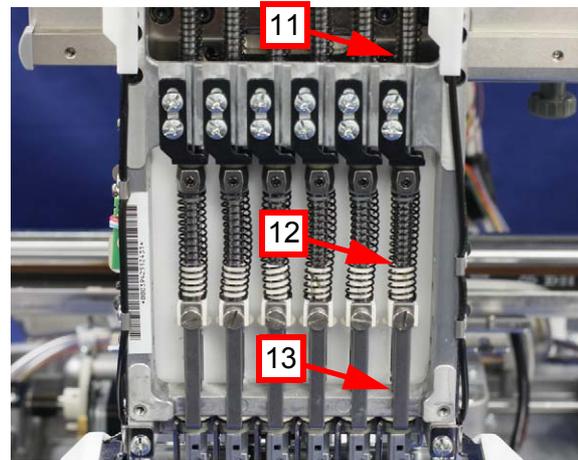
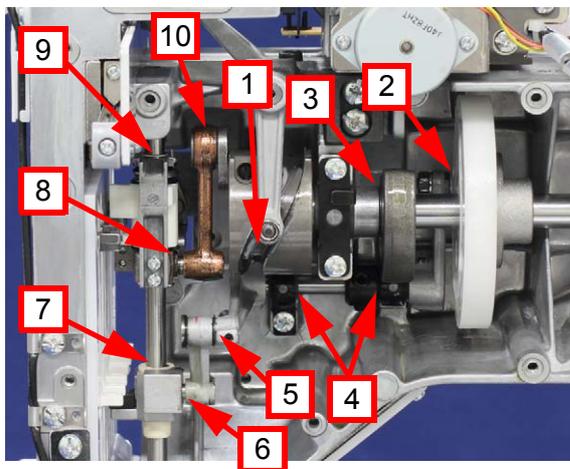
5) Name: OILER  
Part #: XZ0206051

1. Maintenance point by dealer (Every 1,500 hours)



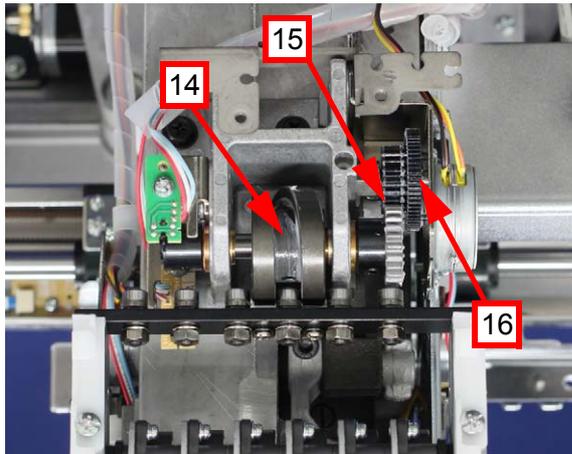
(a) Thread take-up lever and Presser foot driving cam

(b) Needle bar case

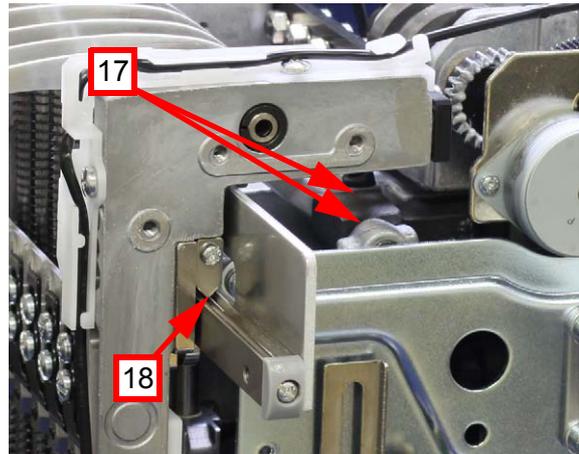


Name of grease/oil		Quantity	Check point
1	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	Check presser foot height
2	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	
3	FBK OIL RO 100	three drops	
4	FBK OIL RO 100	one drop	
5	MOLYKOTE M DISPERSION*	one drop	
6	MOLYKOTE M DISPERSION*	one drop	
7	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	
8	MOLYKOTE M DISPERSION*	one drop	
9	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	
10	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	
11	OILER	one drop	* Please mix MOLYKOTE M DISPERSION and oiler in following proportion, MOLYKOTE M DISPERSION : oiler = 1:10
12	OILER	three drops	
13	OILER	one drop	

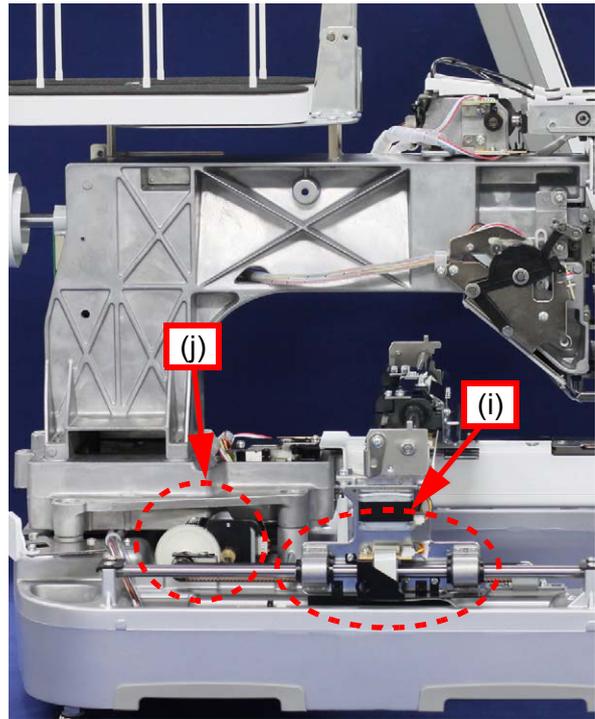
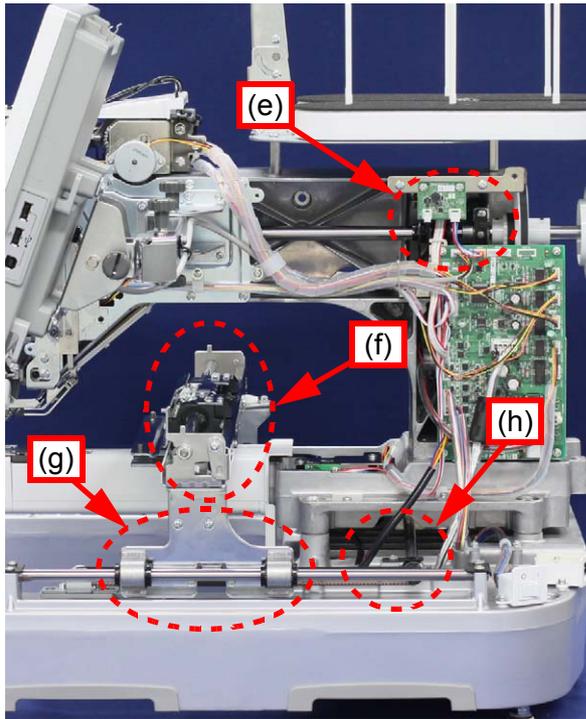
(c) Change cam



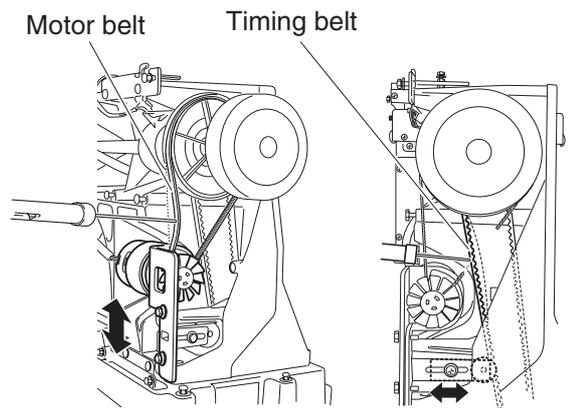
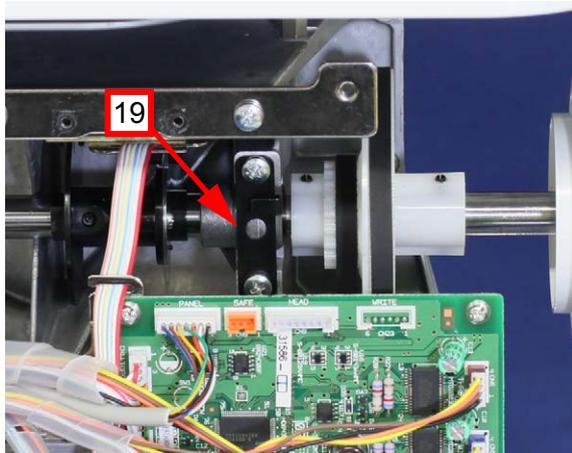
(d) Thread take-up driving lever



	Name of grease/oil	Quantity	Check point
14	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	Check presser foot height
15	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	
16	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	
17	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	
18	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	

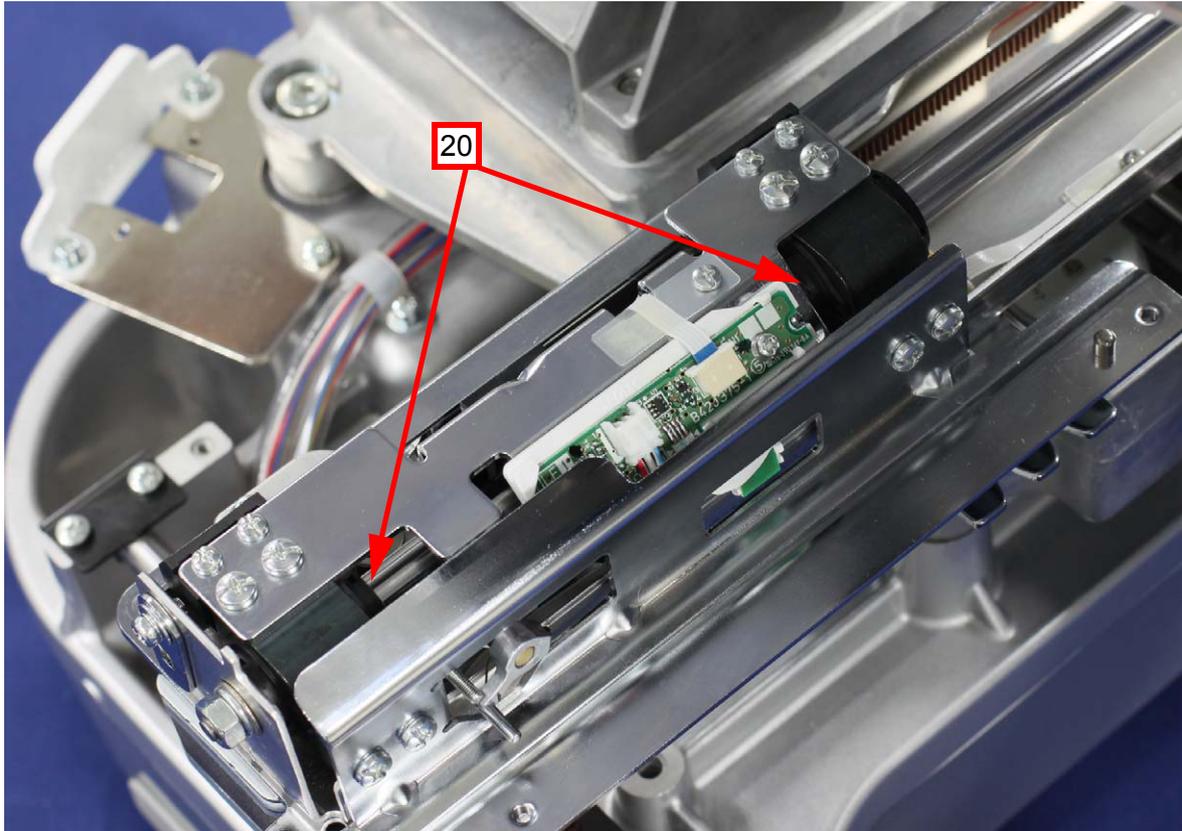


(e) Upper shaft bushing (R)

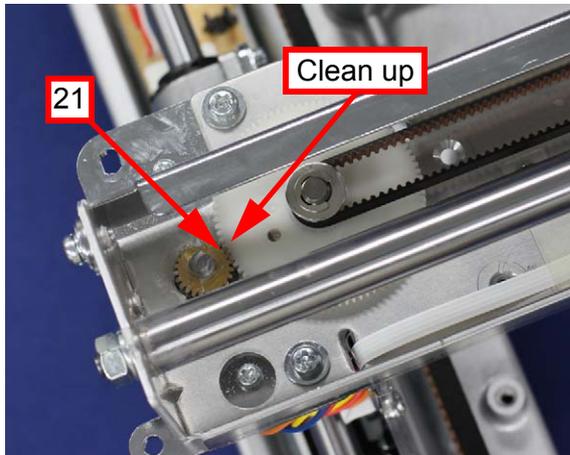


	Name of grease/oil	Quantity	Check point
19	FBK OIL RO 100	three drops	Check motor belt tension Check timing belt tension

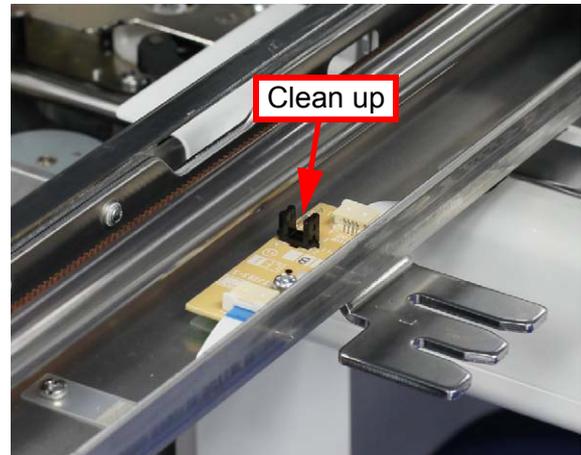
(f) X carriage



X driving gear

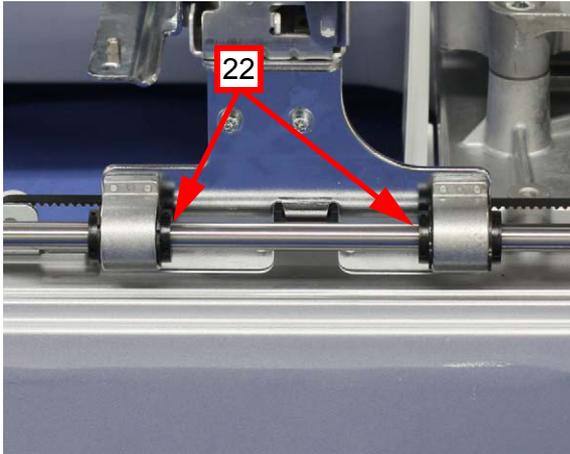


X sensor

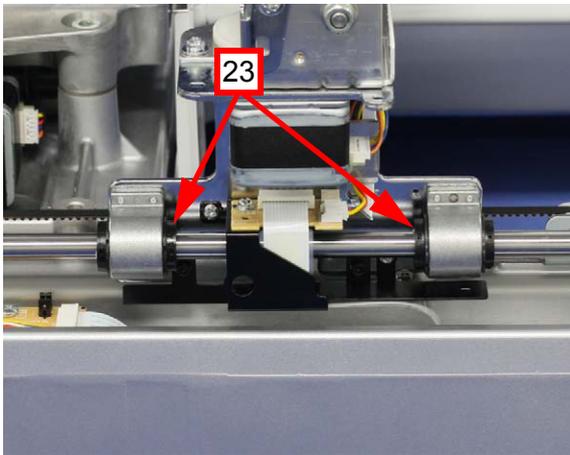


	Name of grease/oil	Quantity	Check point
20	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	Check X belt tension
21	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	Check X belt presser

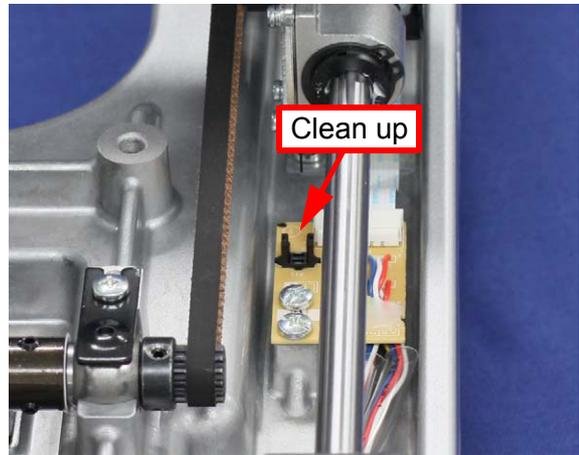
(g) Y carriage (R)



(h) Y carriage (L)

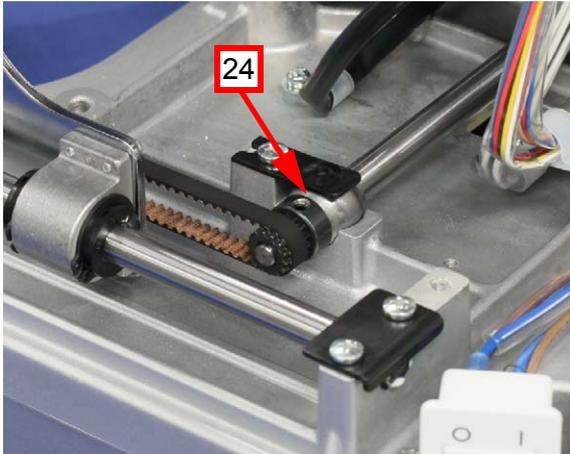


Y sensor

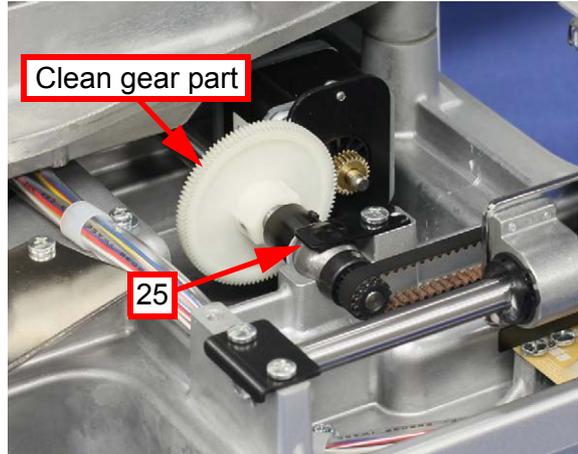


	Name of grease/oil	Quantity	Check point
22	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	Check Y belt tension
23	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	Check Y belt presser

(i) Y driving shaft (R)

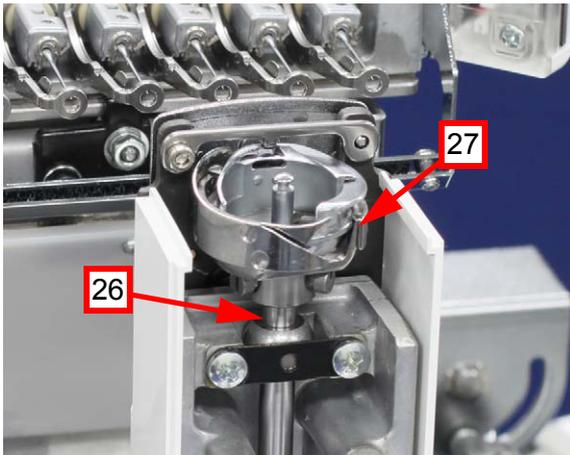


(j) Y driving shaft (L)

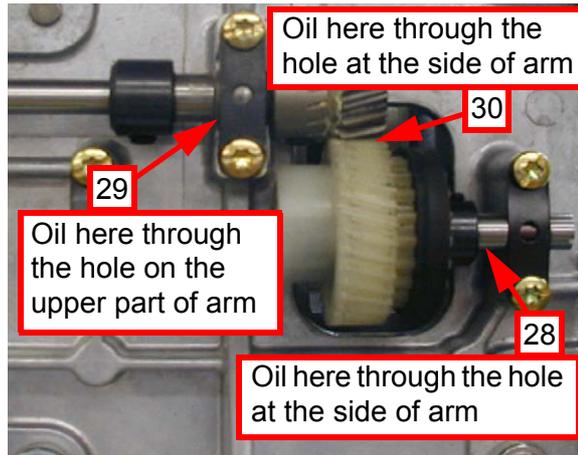


Name of grease/oil		Quantity	Check point
24	FBK OIL RO 100	one drop	
25	FBK OIL RO 100	one drop	

Rotary hook and lower shaft bushing

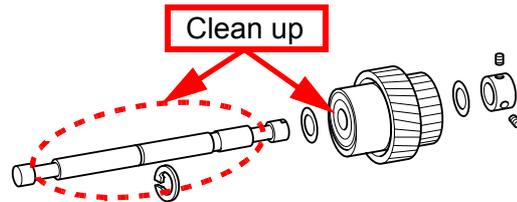


Lower shaft bushing and lower shaft gear



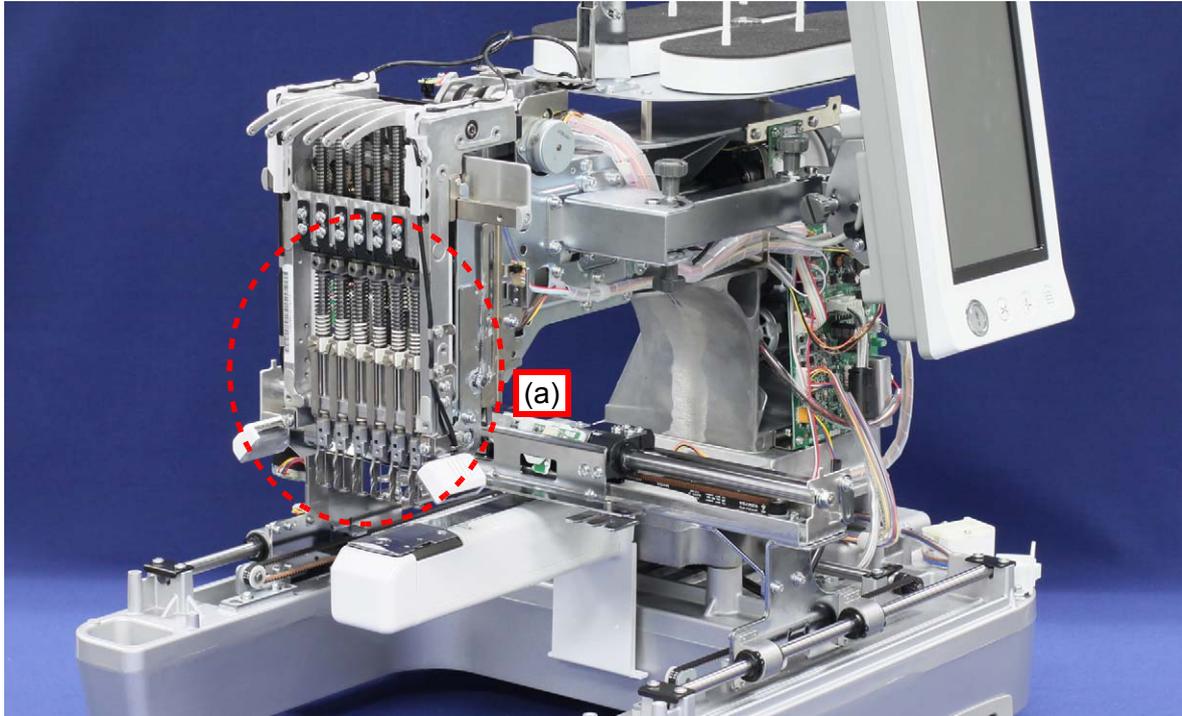
Name of grease/oil		Quantity	Check point
26	FBK OIL RO 100	one drop	Check thrust play of lower shaft.
27	OILER	one drop	
28	FBK OIL RO 100	one drop	Remove dust around rotary hook and bushing. * There should be no dust between lower shaft and bushing.
29	FBK OIL RO 100	one drop	
30	MOLYKOTE EM-30L	0.3cm <sup>3</sup>	

Idle pulley shaft

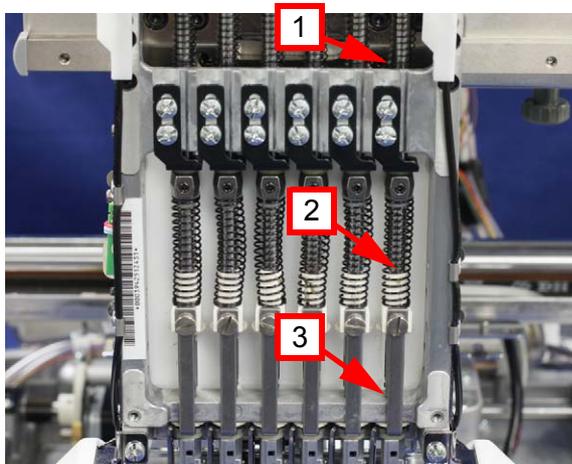


2. Maintenance point by dealer (Every 500 hours)

Maintenance needs to be carried out on a machine at 500 hours use, if the machine is used for industrial purpose.



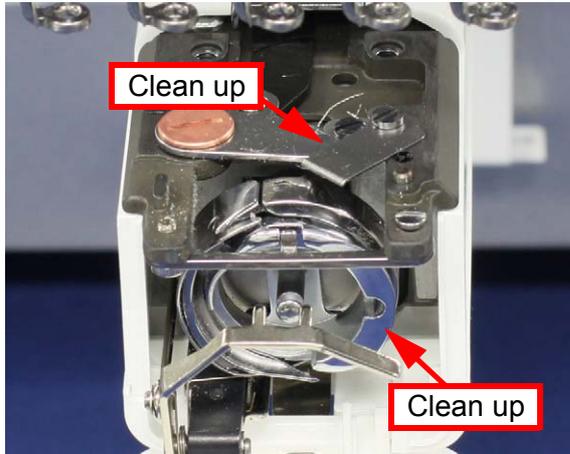
(a) Needle bar case



	Name of grease/oil	Quantity	Check point
1	OILER	one drop	
2	OILER	three drops	
3	OILER	one drop	

3. Maintenance point by end user (Every day)

Cleaning of Knives and Rotary hook



Maintenance
Remove the needle plate. Use the included cleaning brush to remove any lint and dust from knives and rotary hook.

Oil rotary hook



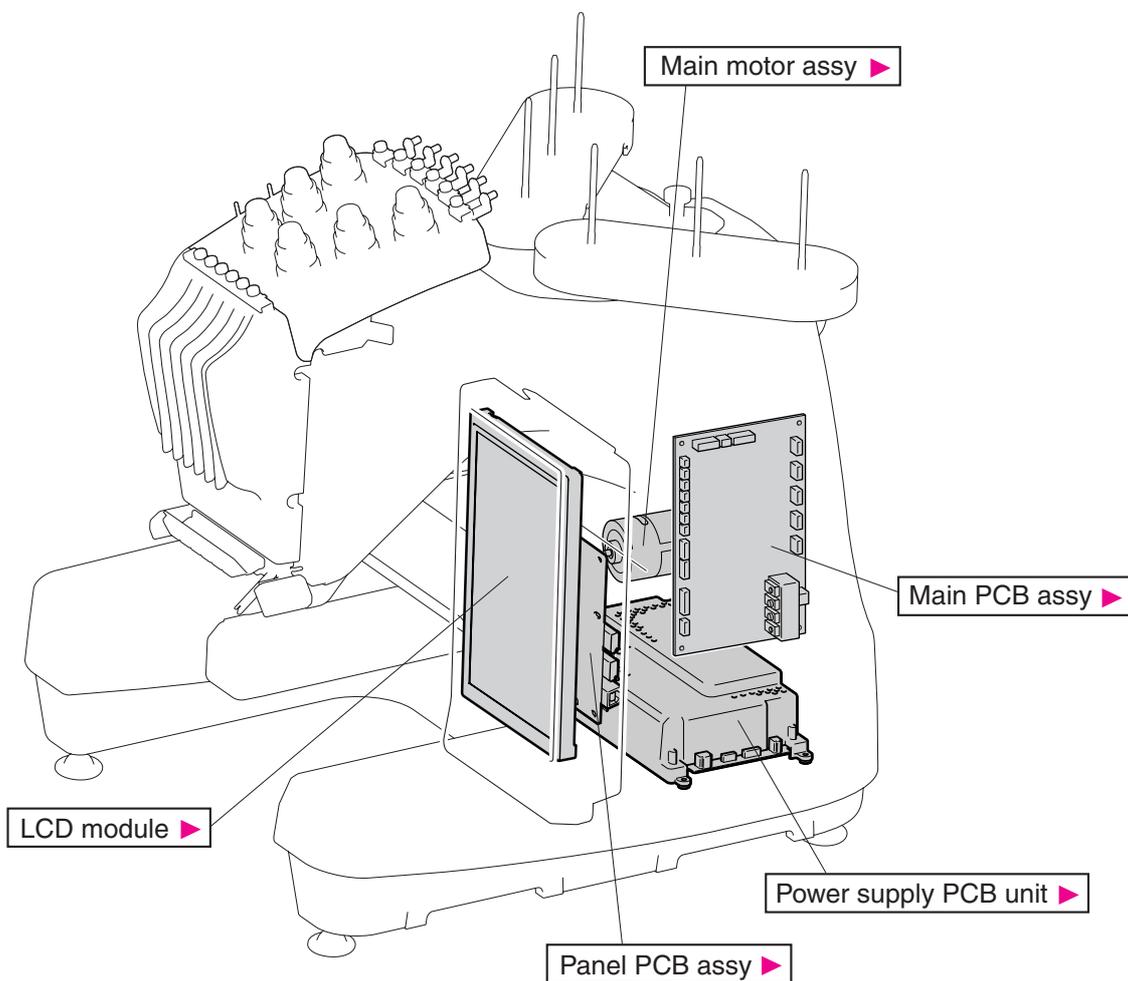
Maintenance
Remove bobbin case and apply 1 drop of oil into the hook race. Then spread it on whole hook with cloth.

Cleaning of bobbin case

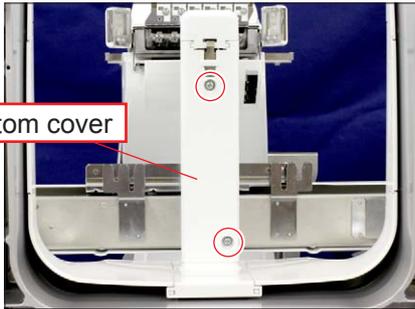


Maintenance
Remove any lint and dust between tension-adjusting spring and bobbin case, whenever one prewound bobbin (coats) is used.

- Click the parts names, and follow the each procedure.



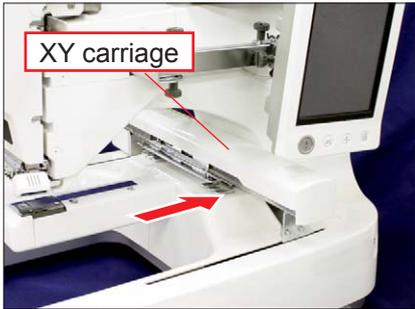
1



Bed bottom cover

- Check that the power supply cord is disconnected.
- Remove the 2 screws, and then remove the bed bottom cover.

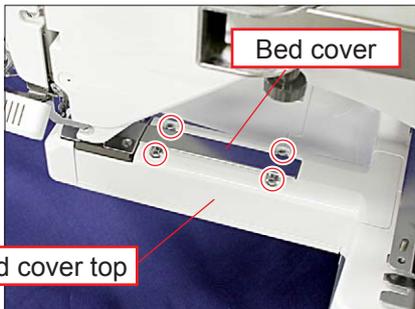
2



XY carriage

- Slide the XY carriage to the direction of the arrow.

3

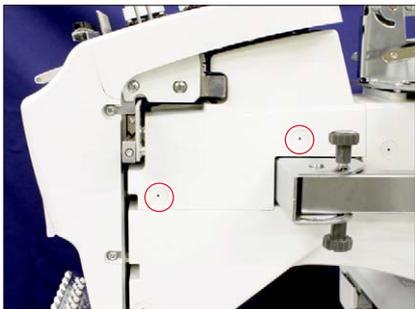


Bed cover

Bed cover top

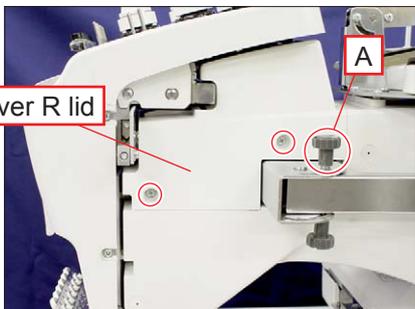
- Remove the 4 screws, and then remove the bed cover top and the bed cover.

4



- Remove the 2 screw covers.

5

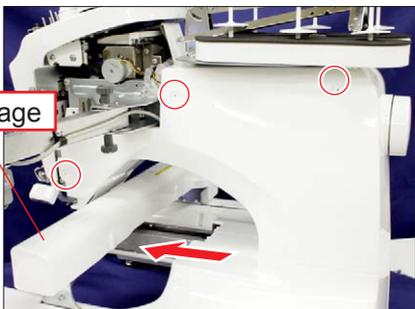


Arm cover R lid

A

- Remove the thumb bolt, the spring washer and the plain washer. "A"
- Remove the 2 screws, and then remove the arm cover R lid.
- Replace the plain washer, the spring washer and the thumb bolt to the initial position. "A"

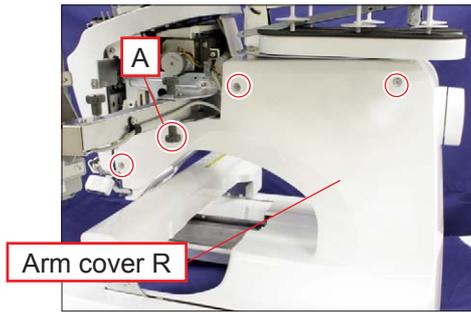
6



XY carriage

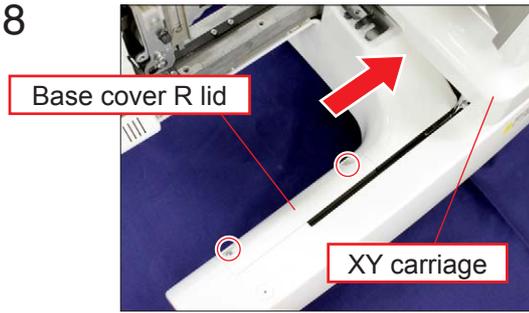
- Slide the XY carriage to the direction of the arrow.
- Remove the 3 screw covers.

7



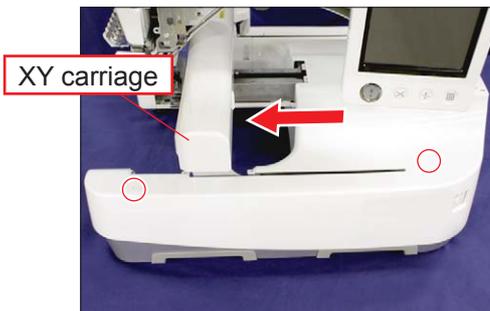
- Remove the thumb bolt, the spring washer and the plain washer."A"
- Remove the 3 screws, and then remove the arm cover R.
- Replace the plain washer, the spring washer and the thumb bolt to the initial position."A"

8



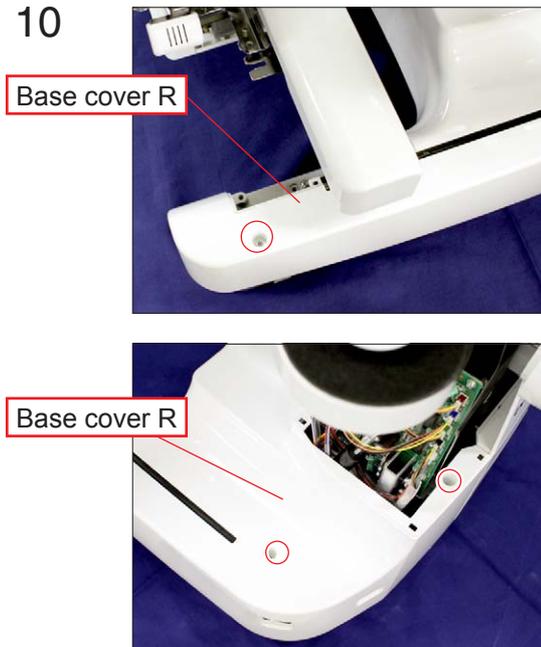
- Slide the XY carriage to the direction of the arrow.
- Remove the 2 screws, and then remove the base cover R lid.

9



- Slide the XY carriage to the direction of the arrow.
- Remove the 2 screw covers.

10



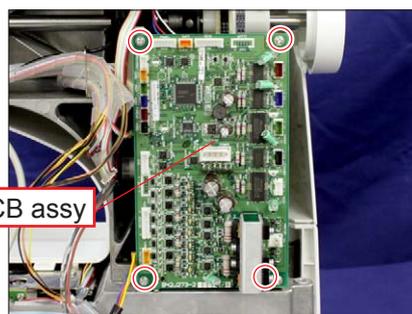
- Remove the 3 screws, and then remove the base cover R.

11



- Disconnect the all connectors on the main PCB assy.

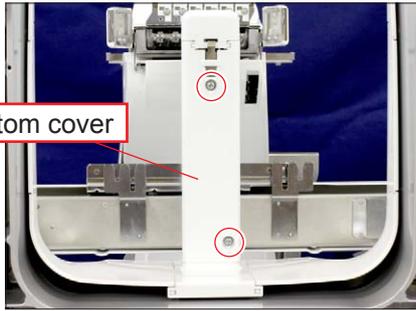
12



- Remove the 4 screws, and then remove the main PCB assy.

1

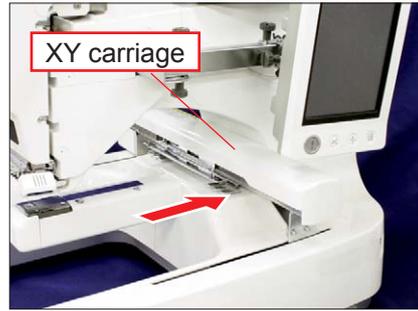
Bed bottom cover



- Check that the power supply cord is disconnected.
- Remove the 2 screws, and then remove the bed bottom cover.

2

XY carriage

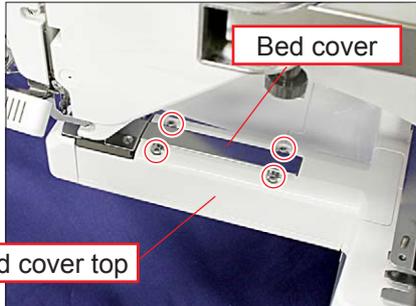


- Slide the XY carriage to the direction of the arrow.

3

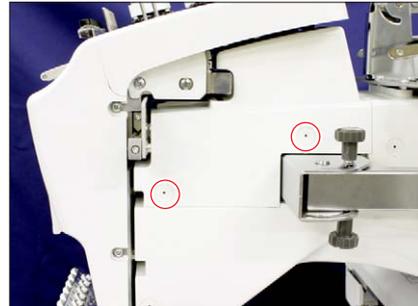
Bed cover top

Bed cover



- Remove the 4 screws, and then remove the bed cover top and the bed cover.

4

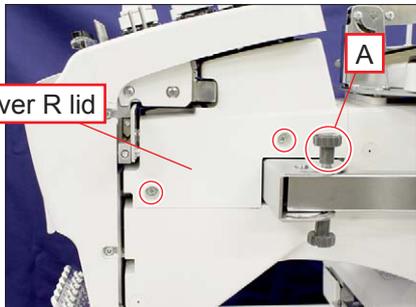


- Remove the 2 screw covers.

5

Arm cover R lid

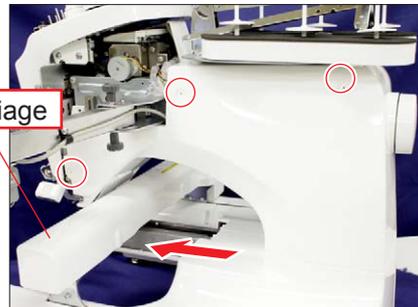
A



- Remove the thumb bolt, the spring washer and the plain washer. "A"
- Remove the 2 screws, and then remove the arm cover R lid.
- Replace the plain washer, the spring washer and the thumb bolt to the initial position. "A"

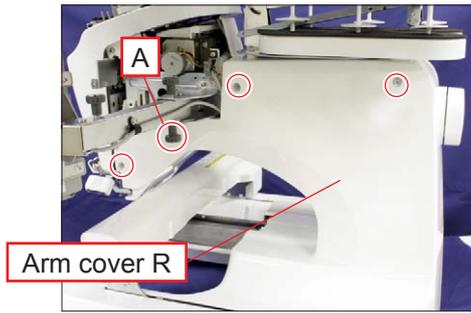
6

XY carriage



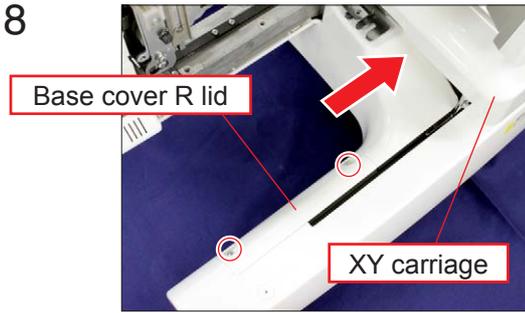
- Slide the XY carriage to the direction of the arrow.
- Remove the 3 screw covers.

7



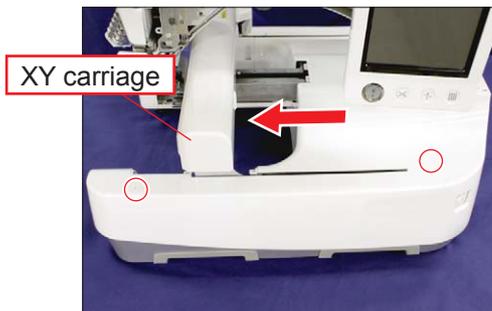
- Remove the thumb bolt, the spring washer and the plain washer."A"
- Remove the 3 screws, and then remove the arm cover R.
- Replace the plain washer, the spring washer and the thumb bolt to the initial position."A"

8



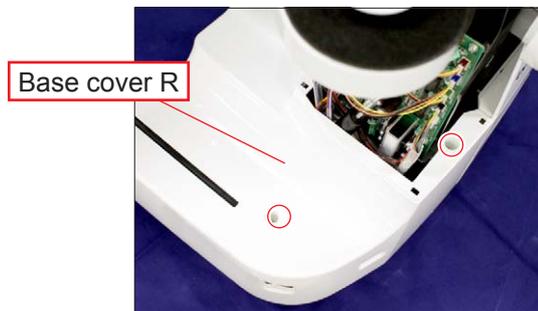
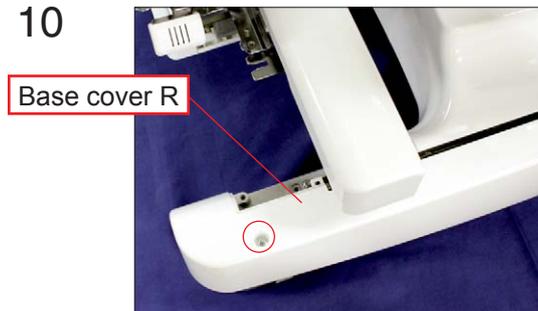
- Slide the XY carriage to the direction of the arrow.
- Remove the 2 screws, and then remove the base cover R lid.

9



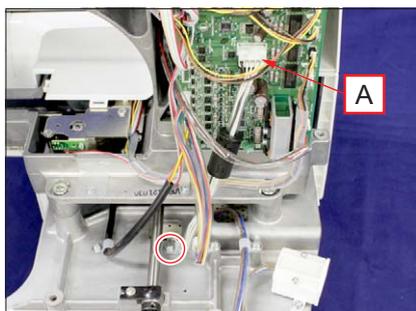
- Slide the XY carriage to the direction of the arrow.
- Remove the 2 screw covers.

10



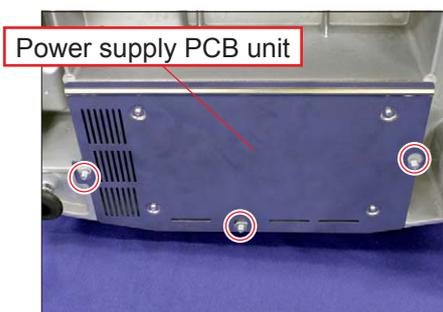
- Remove the 3 screws, and then remove the base cover R.

11



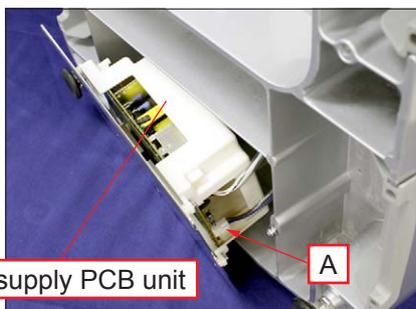
- Disconnect the connector from the main PCB assy."A"
- Remove the screw.

12



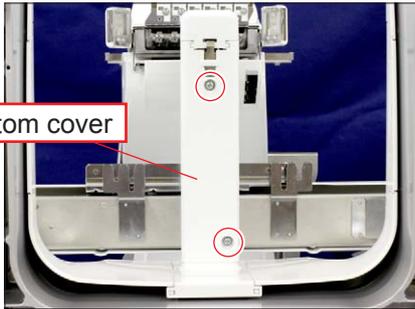
- Loosen the 3 screws, and then remove the power supply PCB unit.

13



- Disconnect the connector from the power supply PCB unit."A", and then remove the power supply PCB unit.

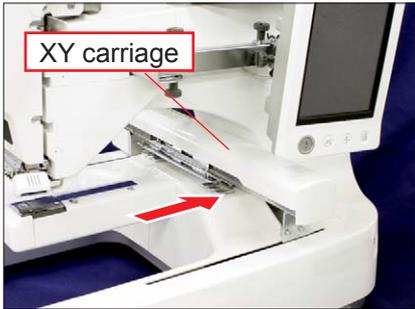
1



Bed bottom cover

- Check that the power supply cord is disconnected.
- Remove the 2 screws, and then remove the bed bottom cover.

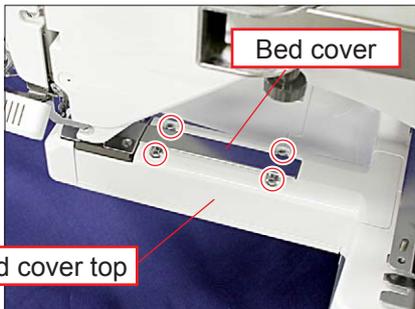
2



XY carriage

- Slide the XY carriage to the direction of the arrow.

3

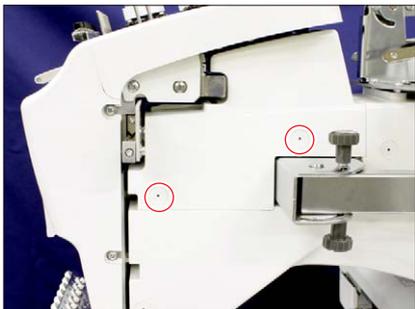


Bed cover

Bed cover top

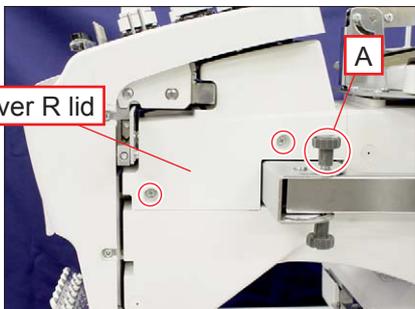
- Remove the 4 screws, and then remove the bed cover top and the bed cover.

4



- Remove the 2 screw covers.

5

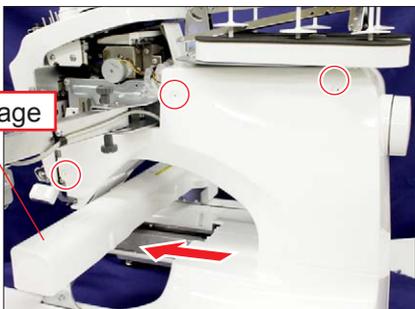


Arm cover R lid

A

- Remove the thumb bolt, the spring washer and the plain washer. "A"
- Remove the 2 screws, and then remove the arm cover R lid.
- Replace the plain washer, the spring washer and the thumb bolt to the initial position. "A"

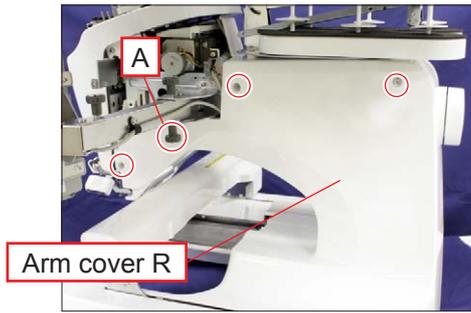
6



XY carriage

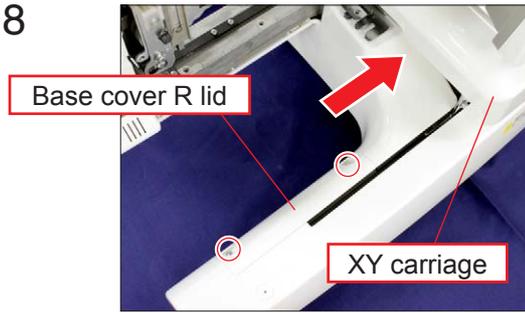
- Slide the XY carriage to the direction of the arrow.
- Remove the 3 screw covers.

7



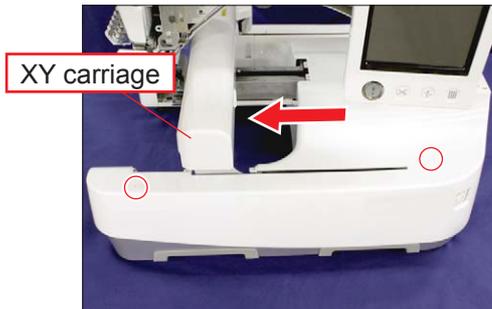
- Remove the thumb bolt, the spring washer and the plain washer."A"
- Remove the 3 screws, and then remove the arm cover R.
- Replace the plain washer, the spring washer and the thumb bolt to the initial position."A"

8



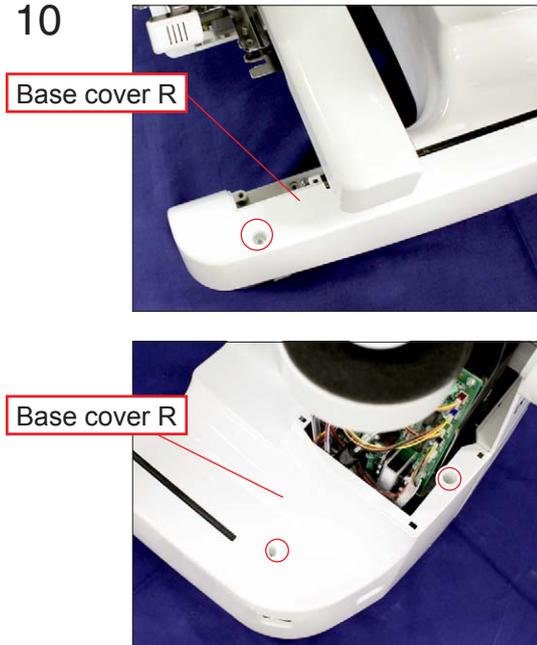
- Slide the XY carriage to the direction of the arrow.
- Remove the 2 screws, and then remove the base cover R lid.

9



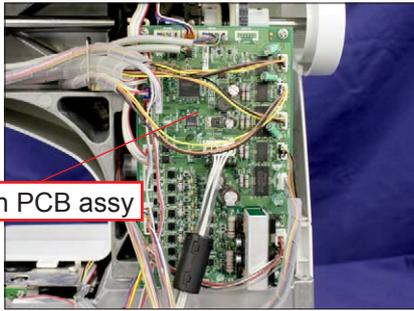
- Slide the XY carriage to the direction of the arrow.
- Remove the 2 screw covers.

10



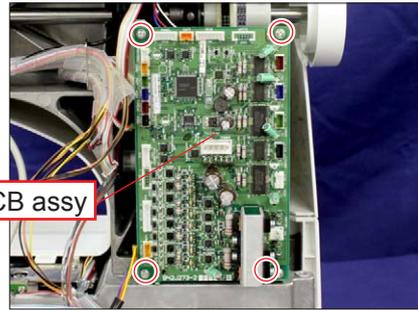
- Remove the 3 screws, and then remove the base cover R.

11



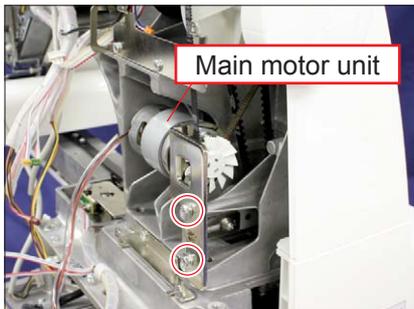
- Disconnect the all connectors on the main PCB assy.

12



- Remove the 4 screws, and then remove the main PCB assy.

13

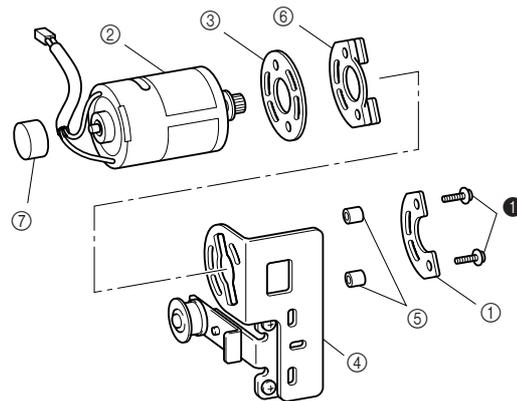


- Remove the motor fan.  
 - Remove the T-belt.  
 - Remove the 2 screws, and then remove the main motor unit.

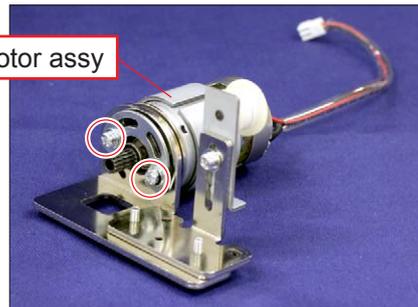
**Key point**

- When using screwdriver, be careful not to damage the head of the screw.

14



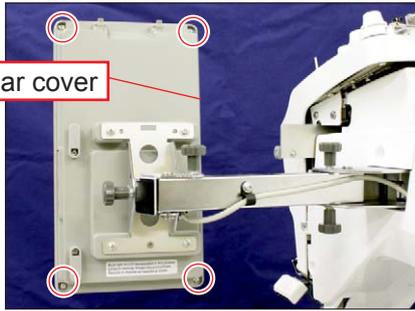
Main motor assy



- Remove the 2 screws ①, and then remove the motor spacer presser ①, the main motor assy ② and the motor holder spacer ③ from the motor holder ④.  
 - Remove the 2 spacers 4 x 7 ⑤, and then remove the fender rubber ⑥ rubber from the motor holder ④.  
 - Remove the motor cap ⑦ from the main motor assy ②.

1

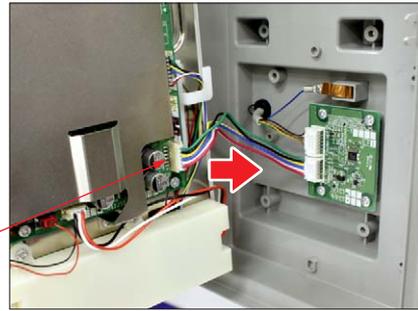
Panel rear cover



- Remove the 4 screws, and then remove the panel rear cover.

2

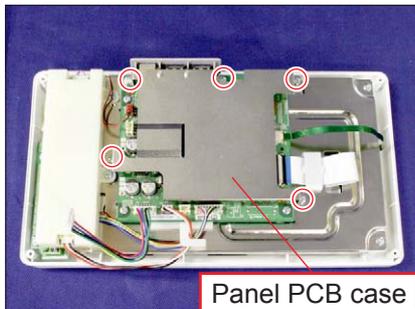
A



- Disconnect the connector of the lead wire assy. "A"

3

Panel PCB case



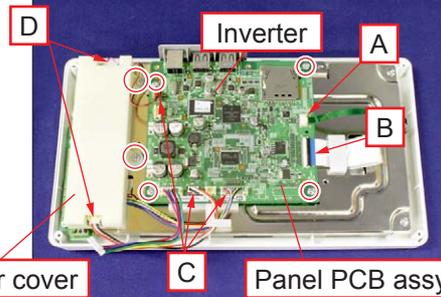
- Remove the 5 screws, and then remove the panel PCB case.

4

Inverter cover

Inverter

Panel PCB assy

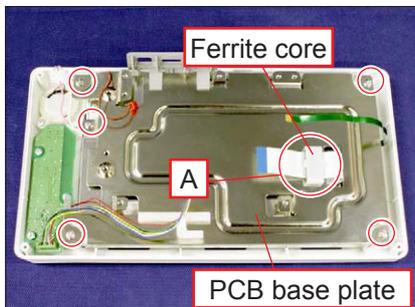


- Unlock the lock of connector, and then disconnect the FFC from the panel PCB assy. "A"  
 - Unlock the lock of connector, and then disconnect the FFC from the panel PCB assy. "B"  
 - Disconnect the 3 connectors from the panel PCB assy. "C"  
 - Remove the 4 screws, and then remove the panel PCB assy.  
 - Disconnect the connectors from the inverter. "D"  
 - Remove the 2 screws, and then remove the inverter cover.

5

Ferrite core

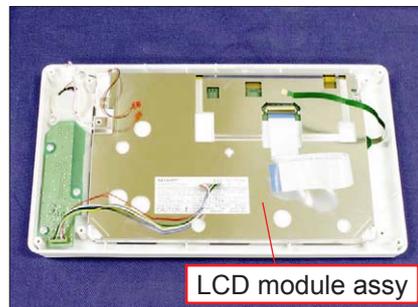
PCB base plate



- Pull out the FFC from the ferrite core. "A"  
 - Remove the 5 screws, and then remove the PCB base plate.

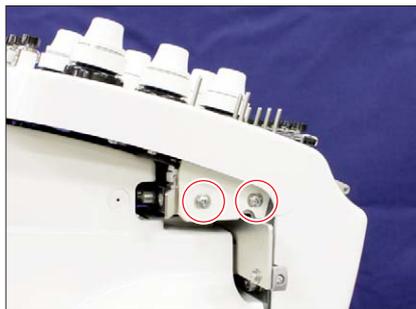
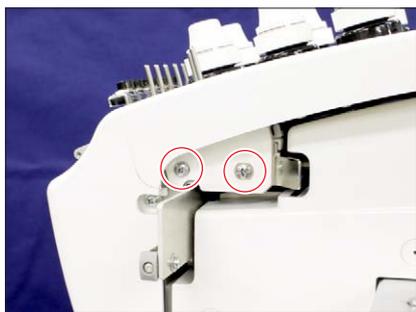
6

LCD module assy



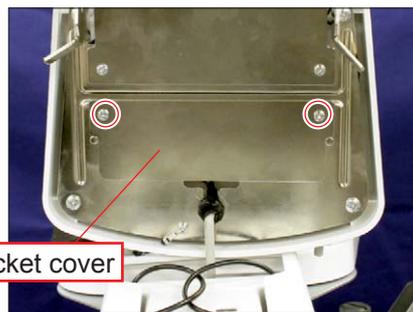
- Remove the LCD module assy.

1



- Remove the 4 screws.

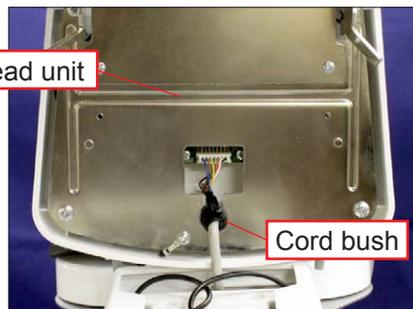
2



Bracket cover

- Put the tension base as shown in the figure.
- Remove the 2 screws, and the remove the bracket cover.

3

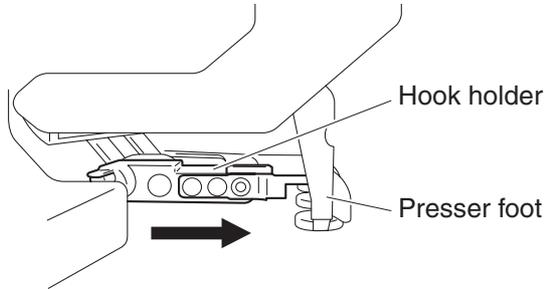
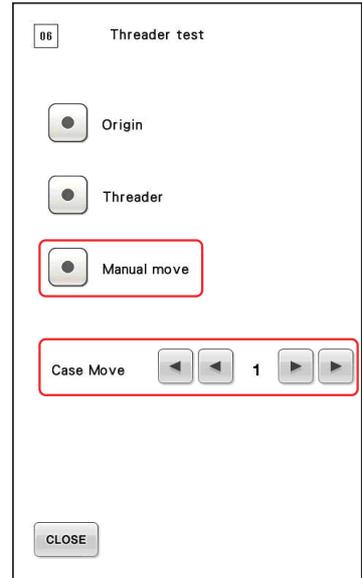


Head unit

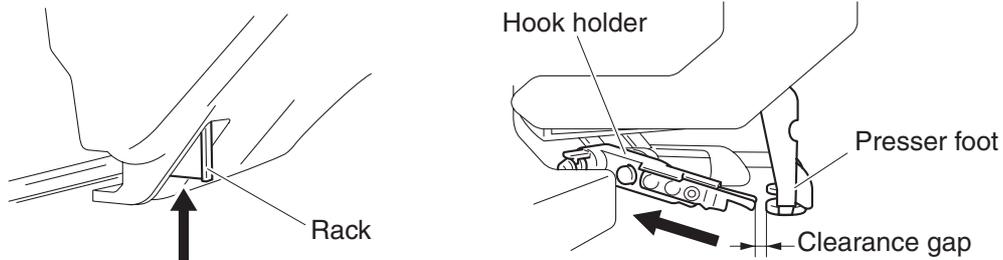
Cord bush

- Remove the cord bush.
- Disconnect the connector of the tension base lead wire assy, and then remove the head unit.

1. Start the test mode and select [#06: Threader test] under [MAIN BOARD TEST MODE].
2. Press [<] or [>] to select the number 10 needle bar.  
(The needle bar case unit moves to left or right.)
3. Press [Manual move] on the screen.  
(The hook holder stops in the state that come out toward you.)

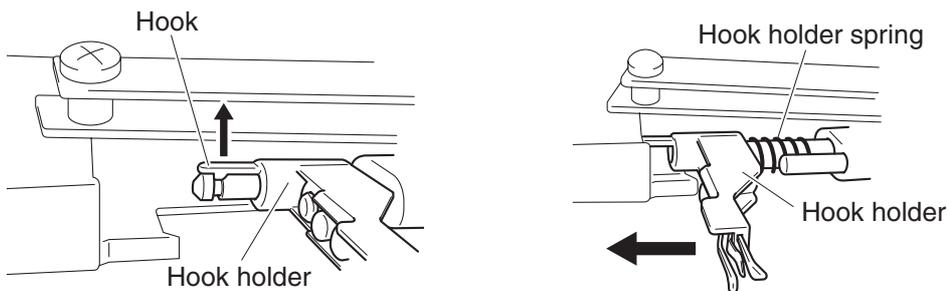


4. Push up the rack of the right rear side of the needle case cover, and the hook holder moves to the rear side.  
And moves it in the state with the clearance gap between the presser foot and the hook holder.



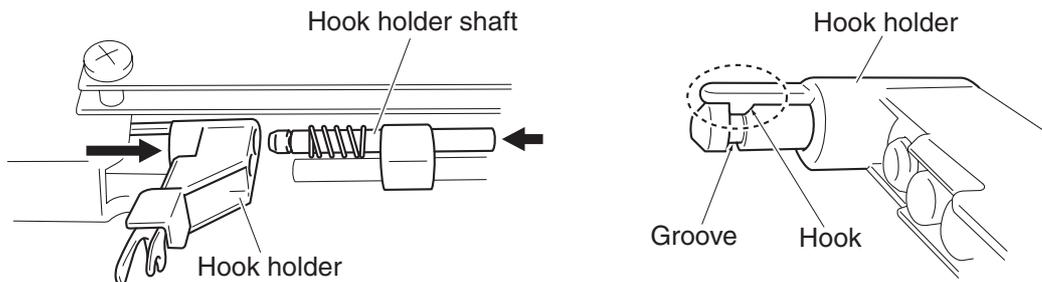
5. Bend the hook of the hook holder to the upper side, and release it from the groove of the shaft.  
And pull out the hook holder to the left side.

**CAUTION** •When remove the hook holder, be careful not to lose the hook holder spring.



6. Insert the hook holder into the hook holder shaft while pressing the right edge of the shaft to the left side by the thin flat screwdriver.

**NOTE** • Check that the hook of the hook holder engage with the groove of the shaft.

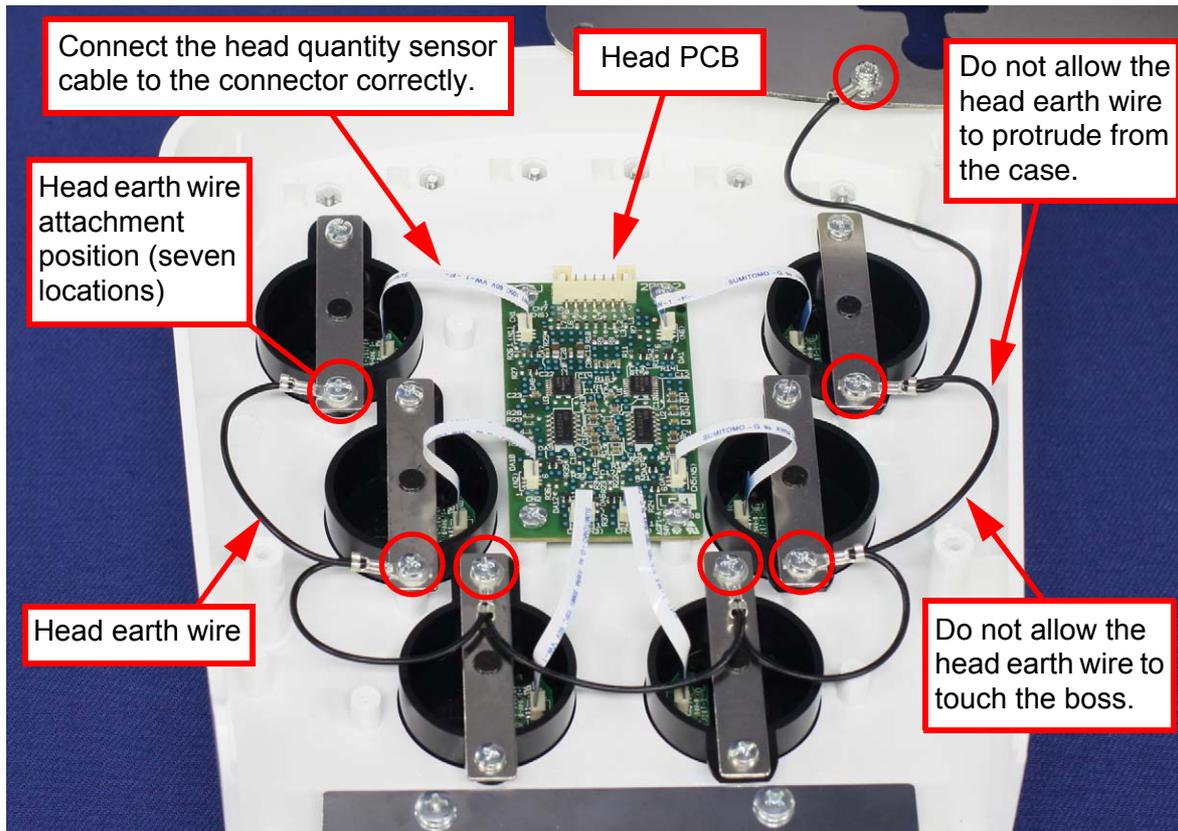


# 7 Special Instructions of Wiring

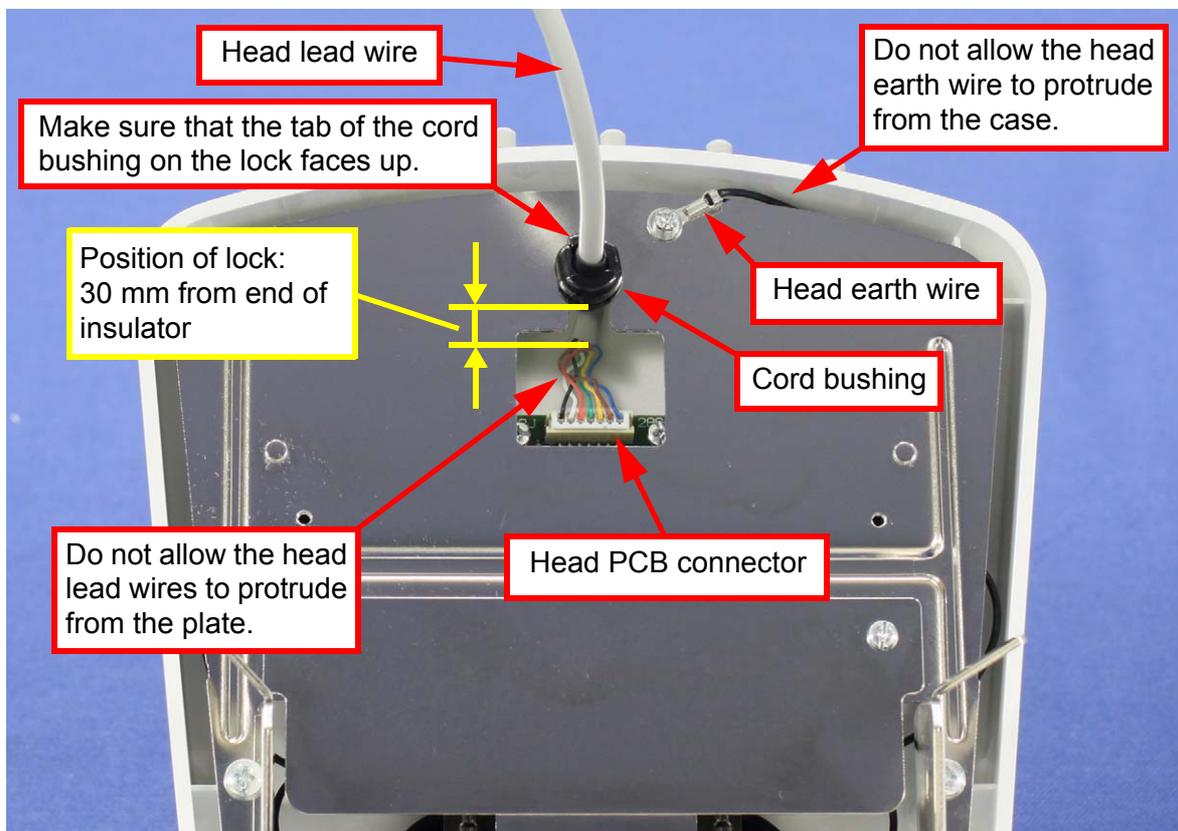
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Head wiring.....	7 - 2
LED unit wiring .....	7 - 3
Arm wiring.....	7 - 10
Base frame wiring.....	7 - 17
Main PCB wiring .....	7 - 19
Y-feed cable wiring .....	7 - 20
X-feed cable wiring .....	7 - 22
Panel wiring .....	7 - 25

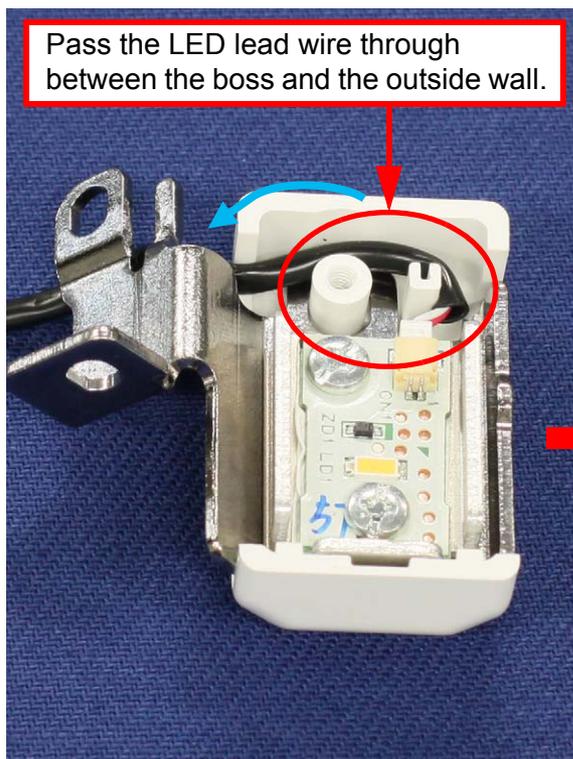
1. Inside of tension base



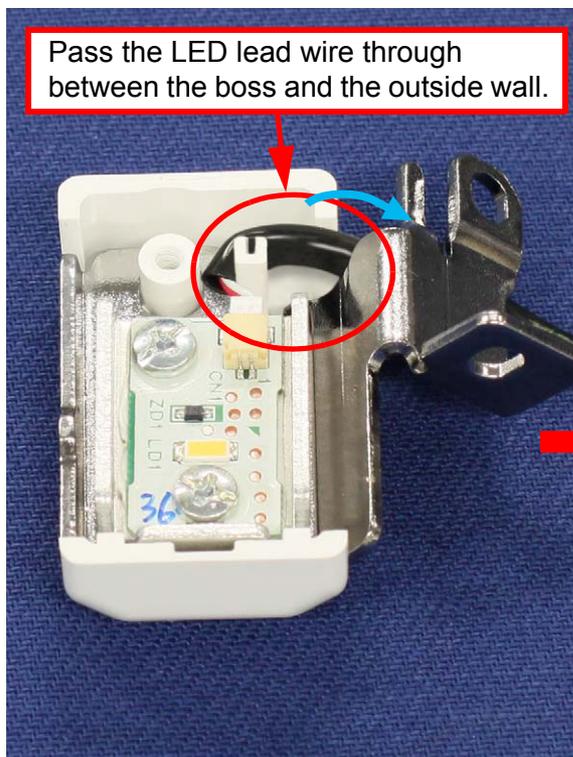
2. Back of tension base



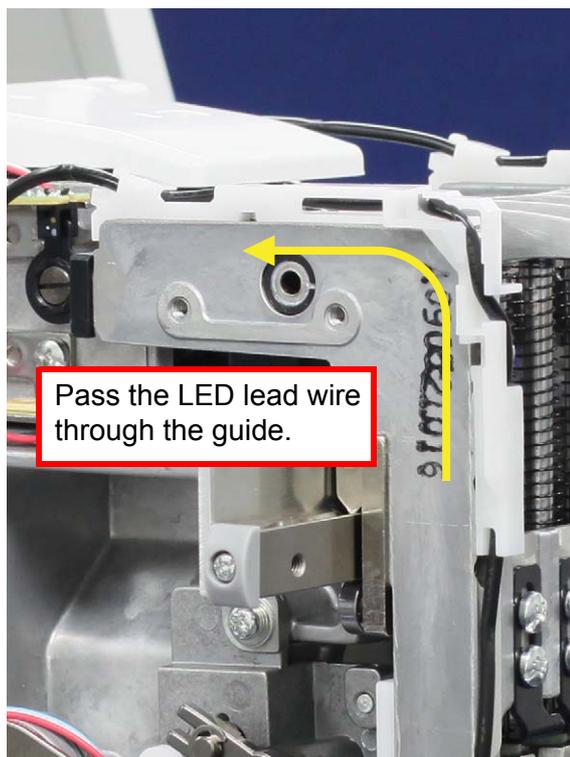
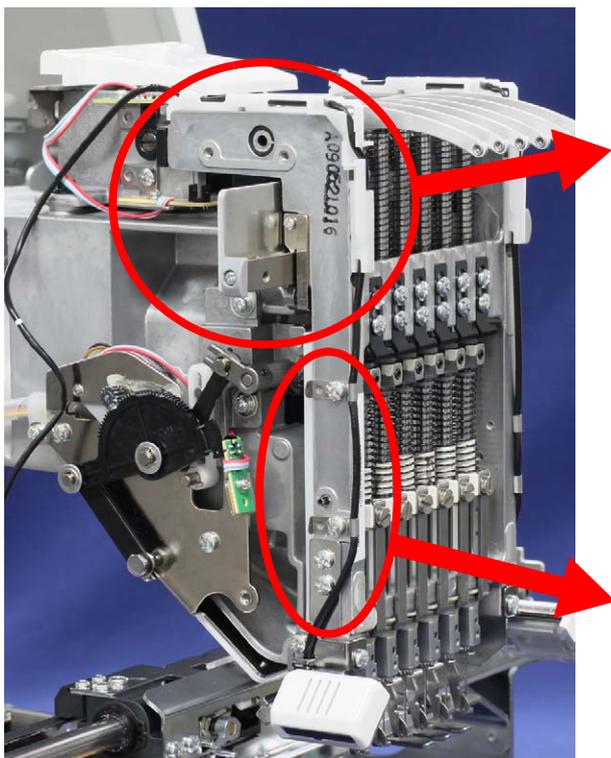
1. LED PCB (Left)



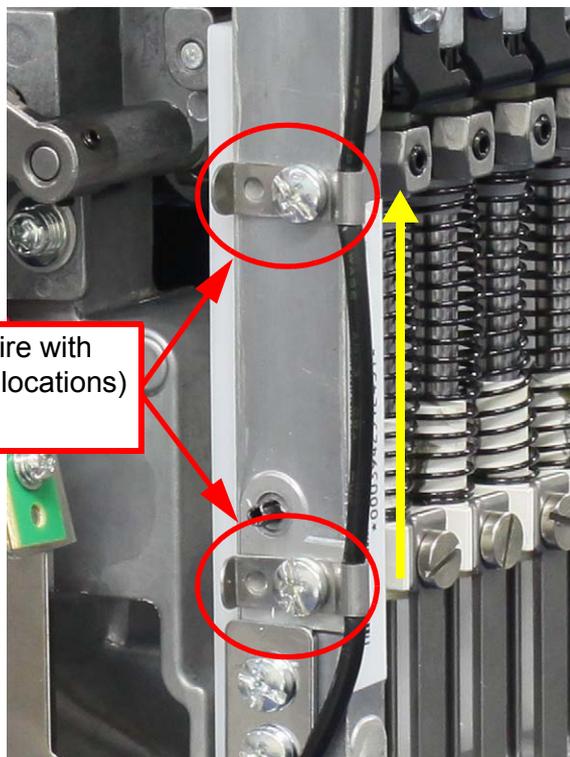
2. LED PCB (Right)



3. Left side of needle bar case

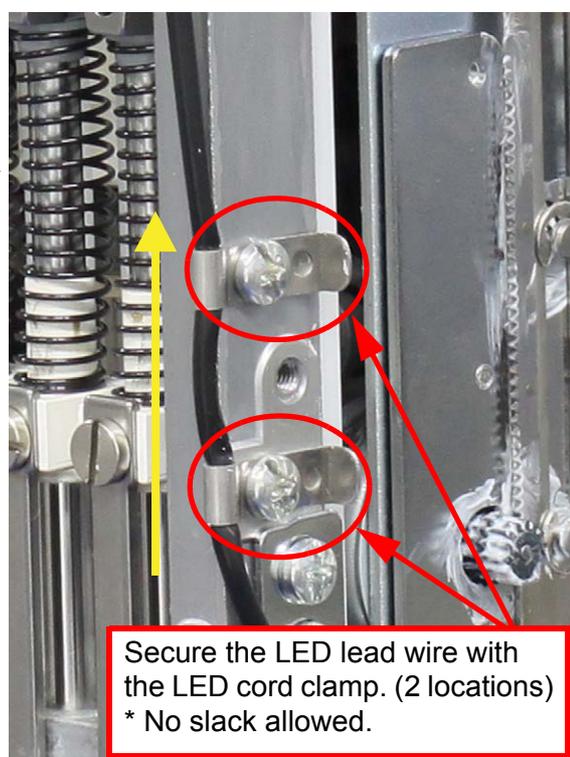
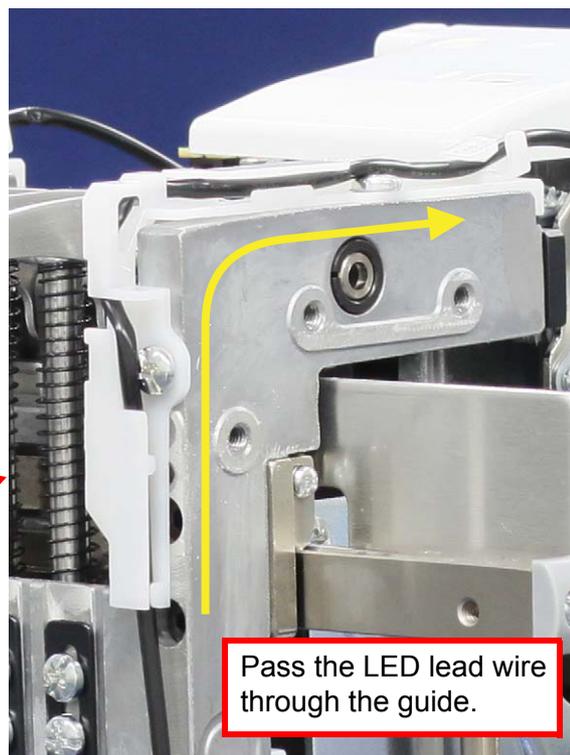
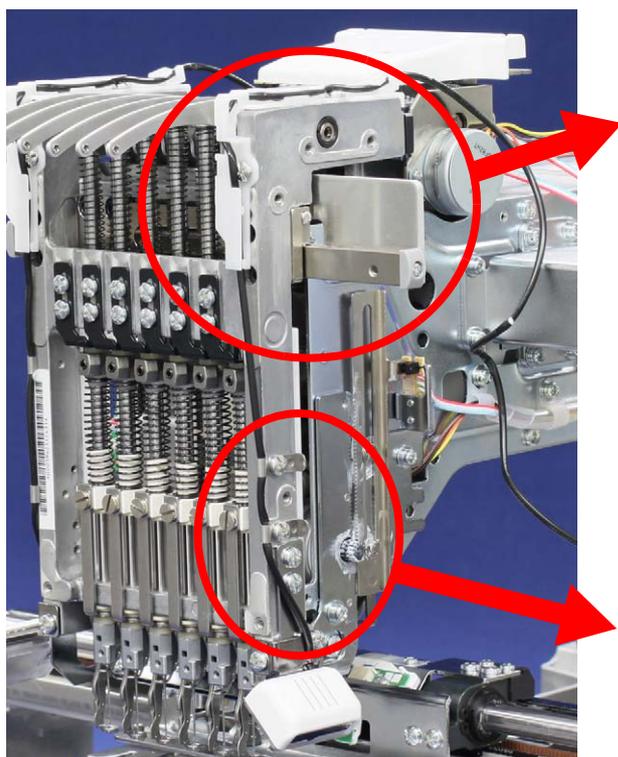


Pass the LED lead wire through the guide.

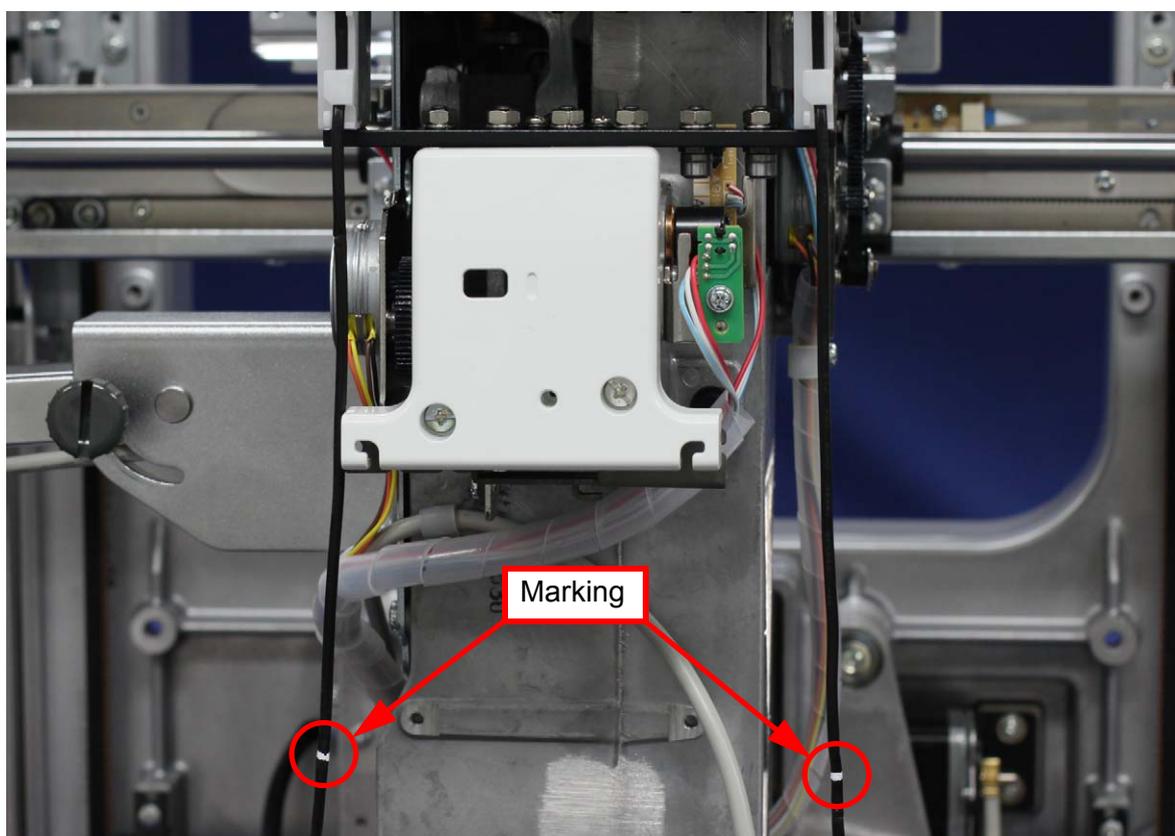
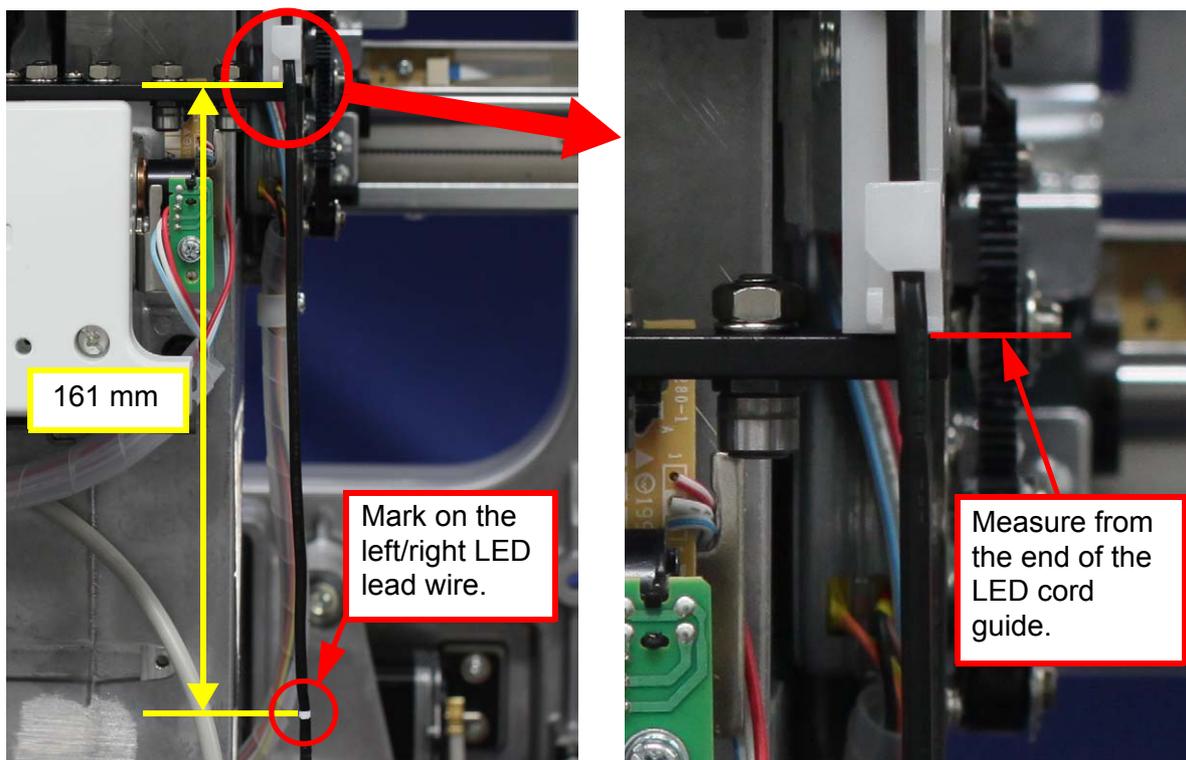


Secure the LED lead wire with the LED cord clamp. (2 locations)  
\* No slack allowed.

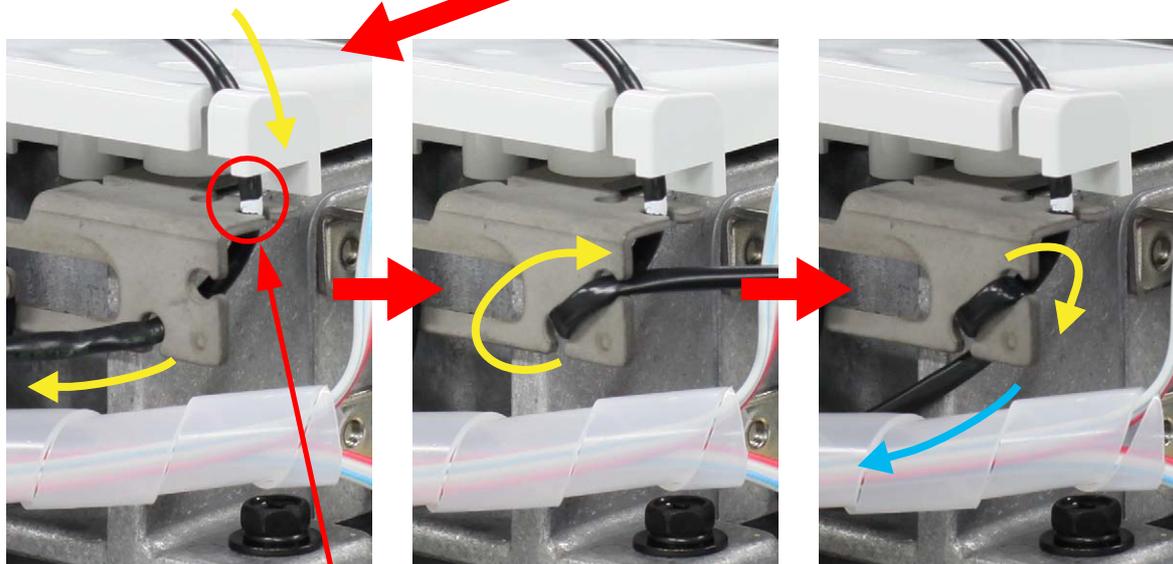
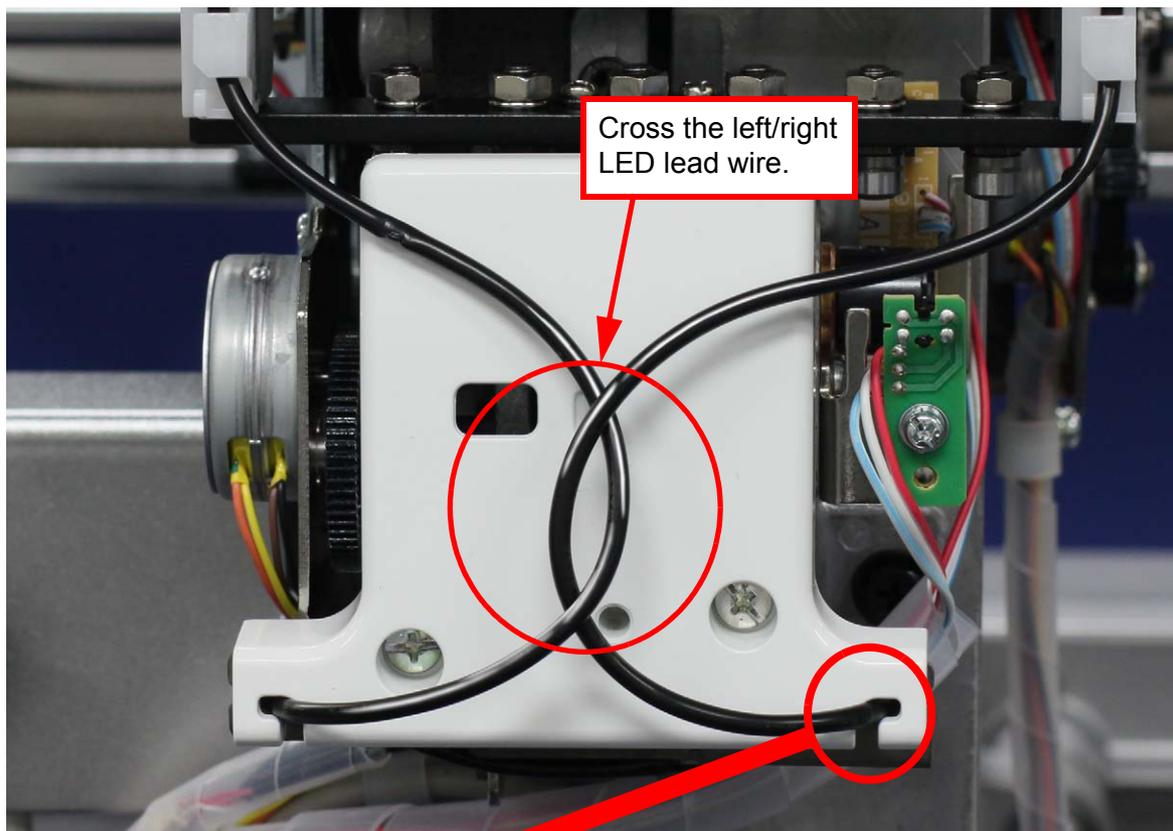
## 4. Right side of needle bar case



5. Upper side of arm (1) : Marking of LED lead wire

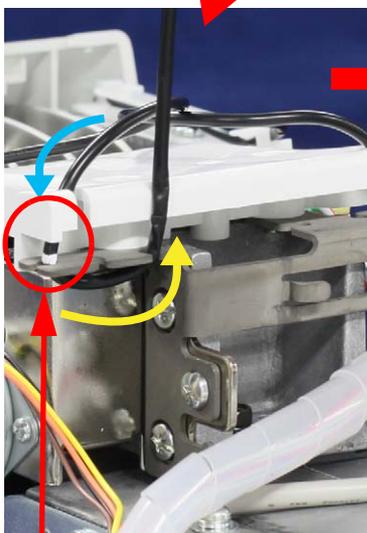
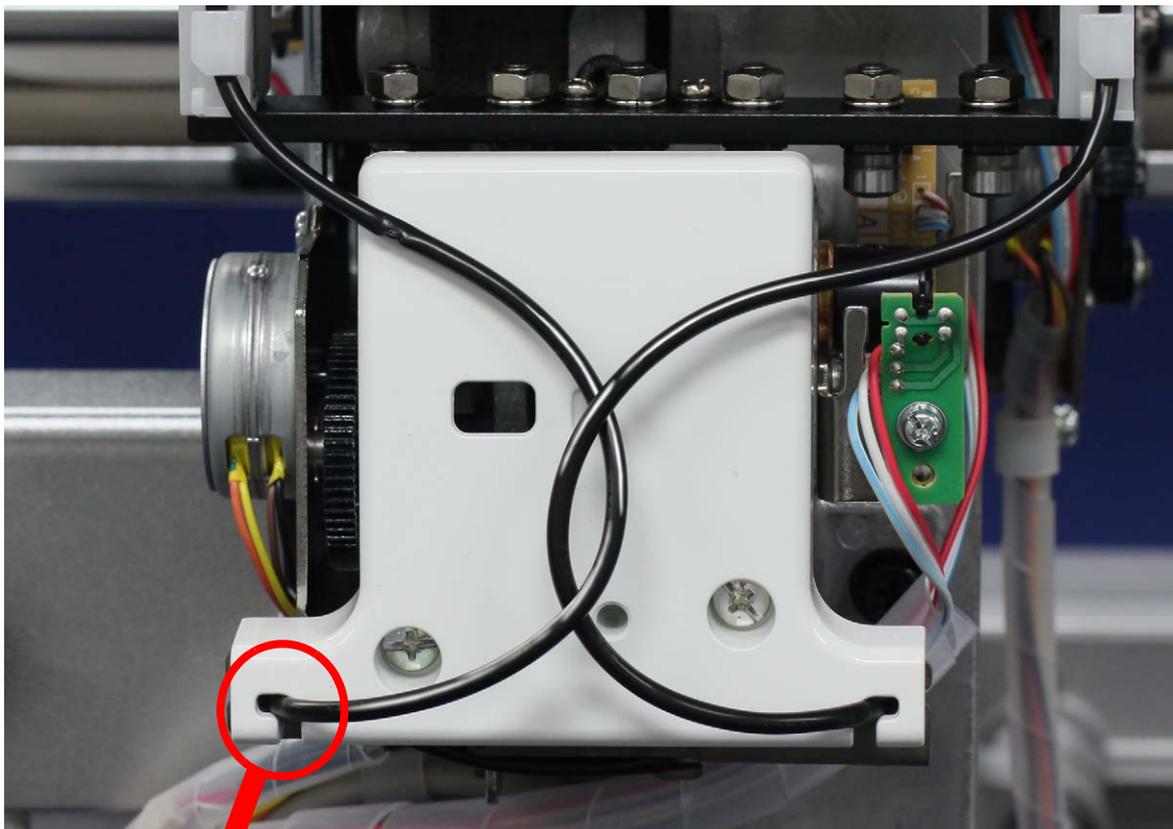


## 6. Upper side of arm (2) : Securing of LED lead wire (Left side)



Align the marking with the upper surface of the LED cord holder.

## 7. Upper side of arm (3) : Securing of LED lead wire (Right side)

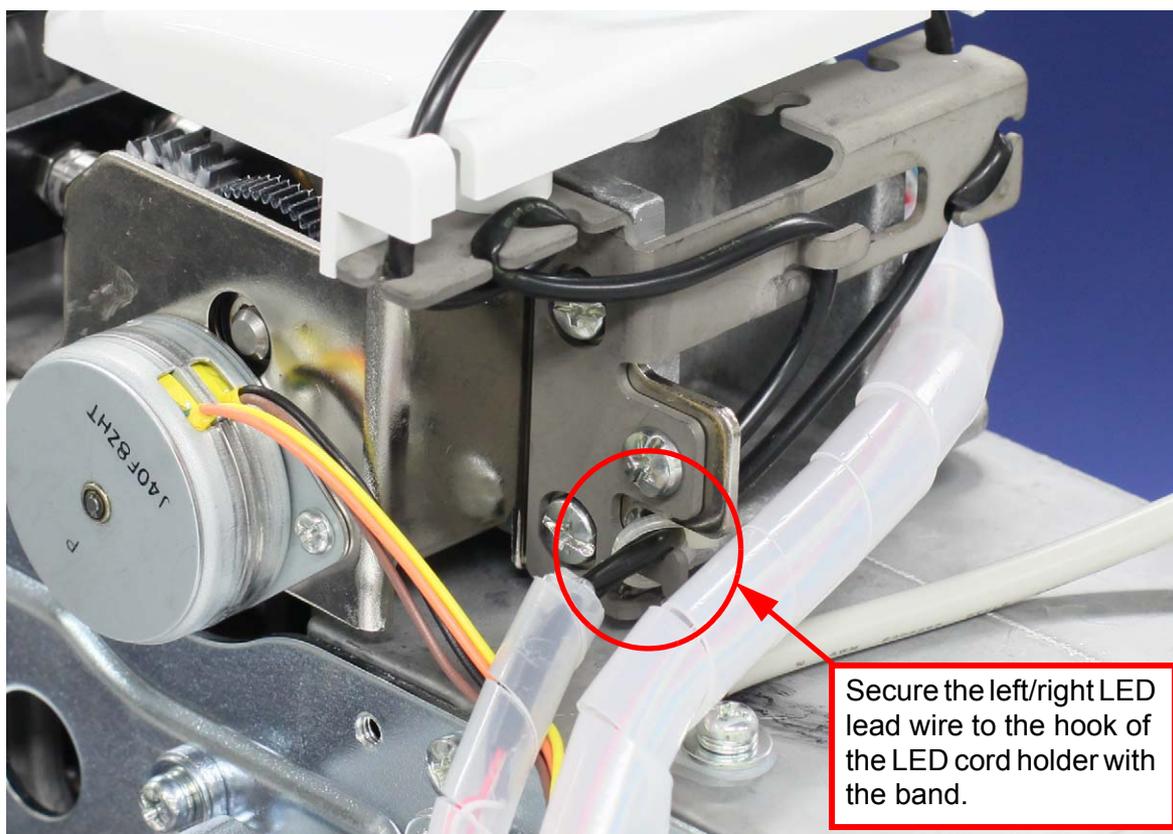


Align the marking with the upper surface of the LED cord holder.

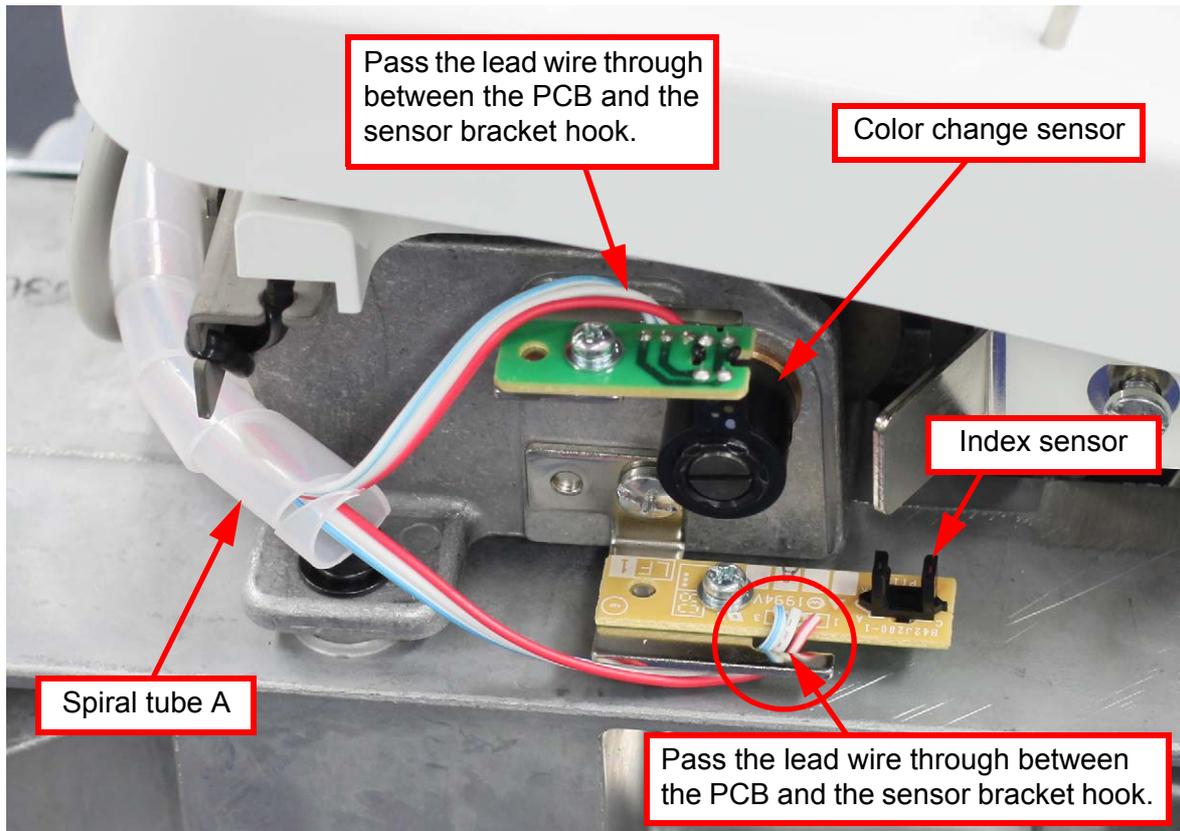


Hang the LED lead wire on the hook.

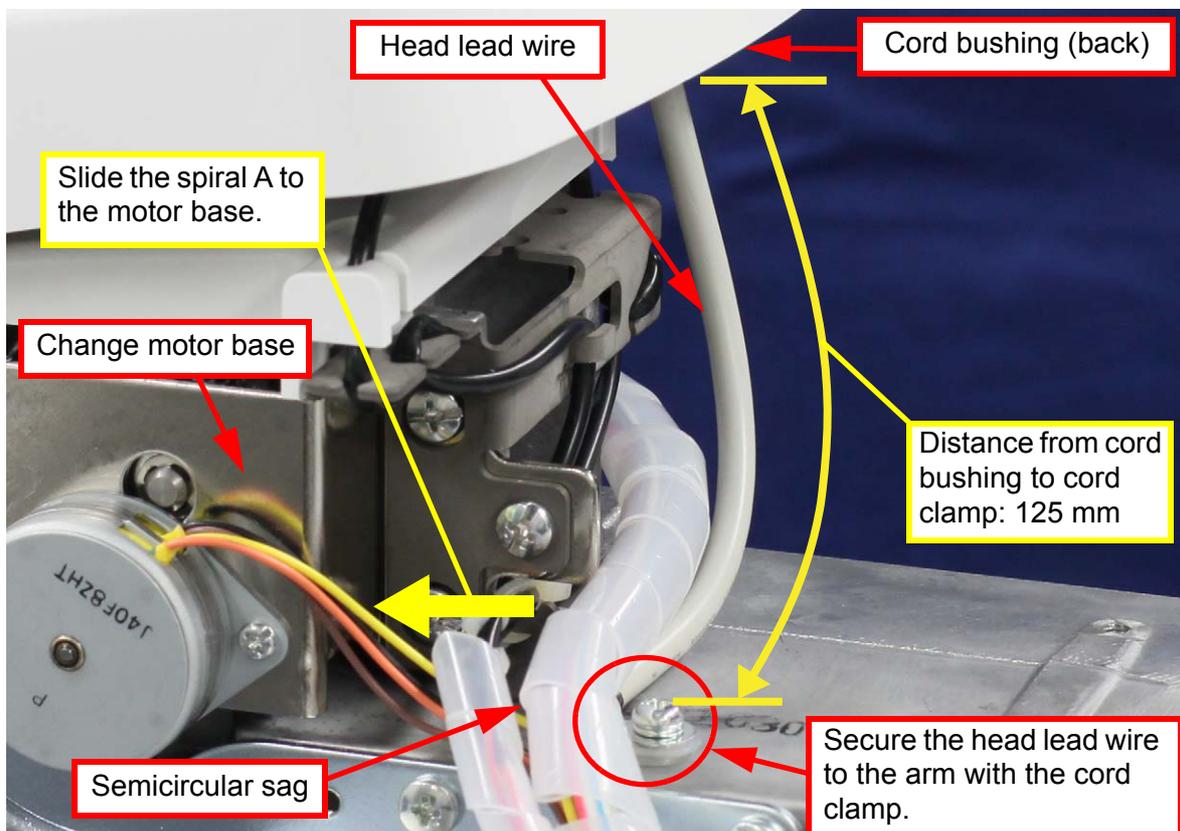
## 8. Upper side of arm (4)



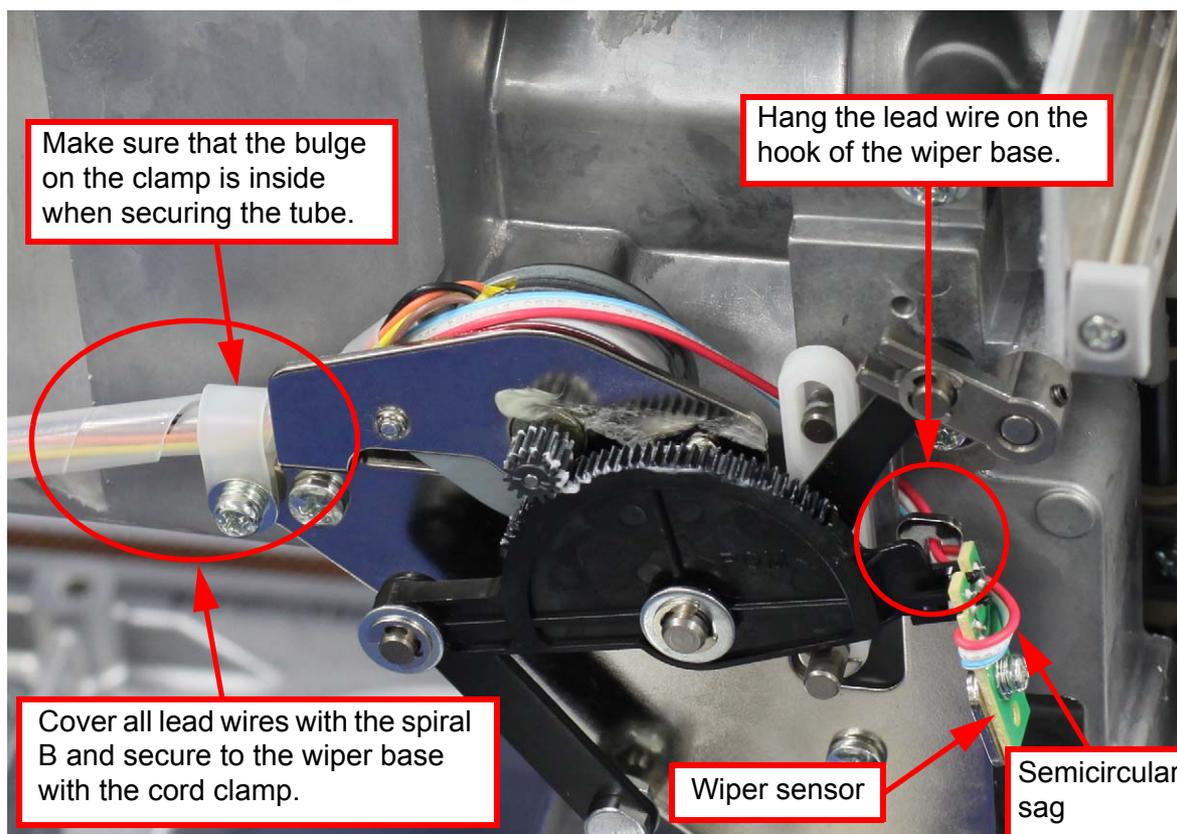
1. Upper side of arm (1)



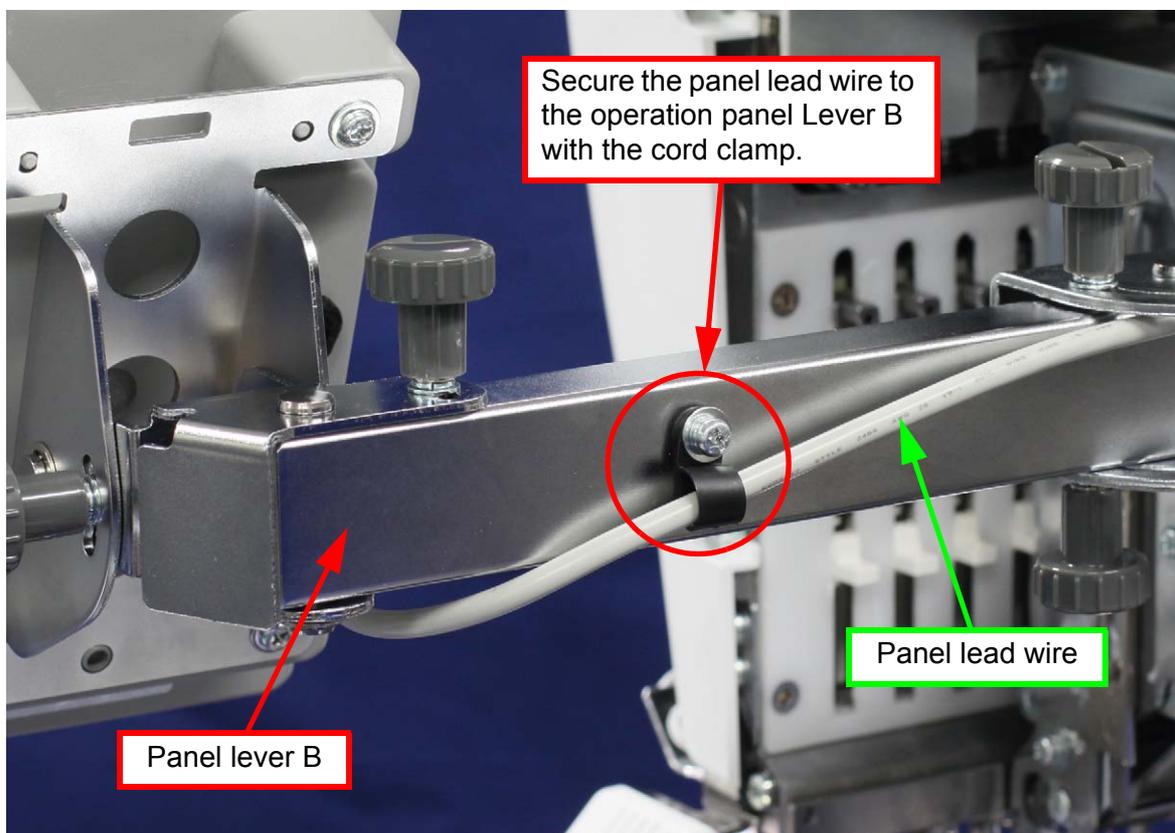
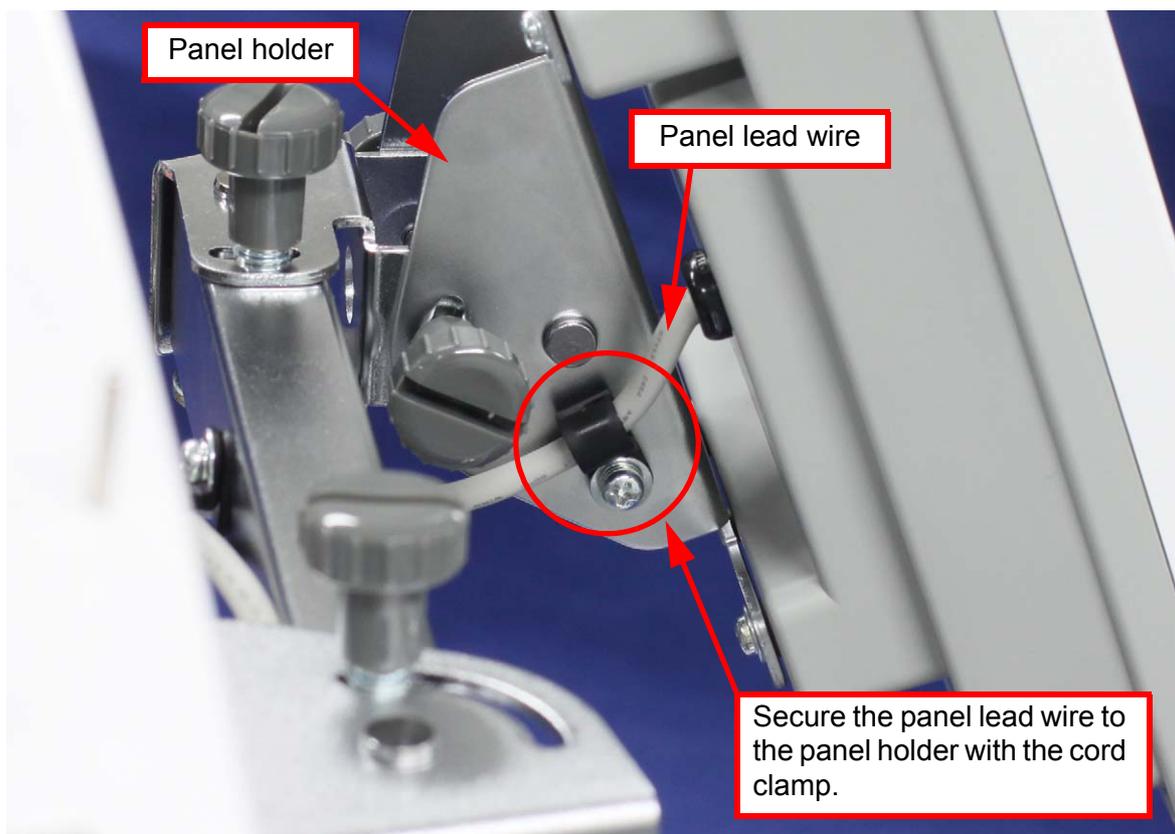
2. Upper side of arm (2)



## 3. Left side of arm (3)

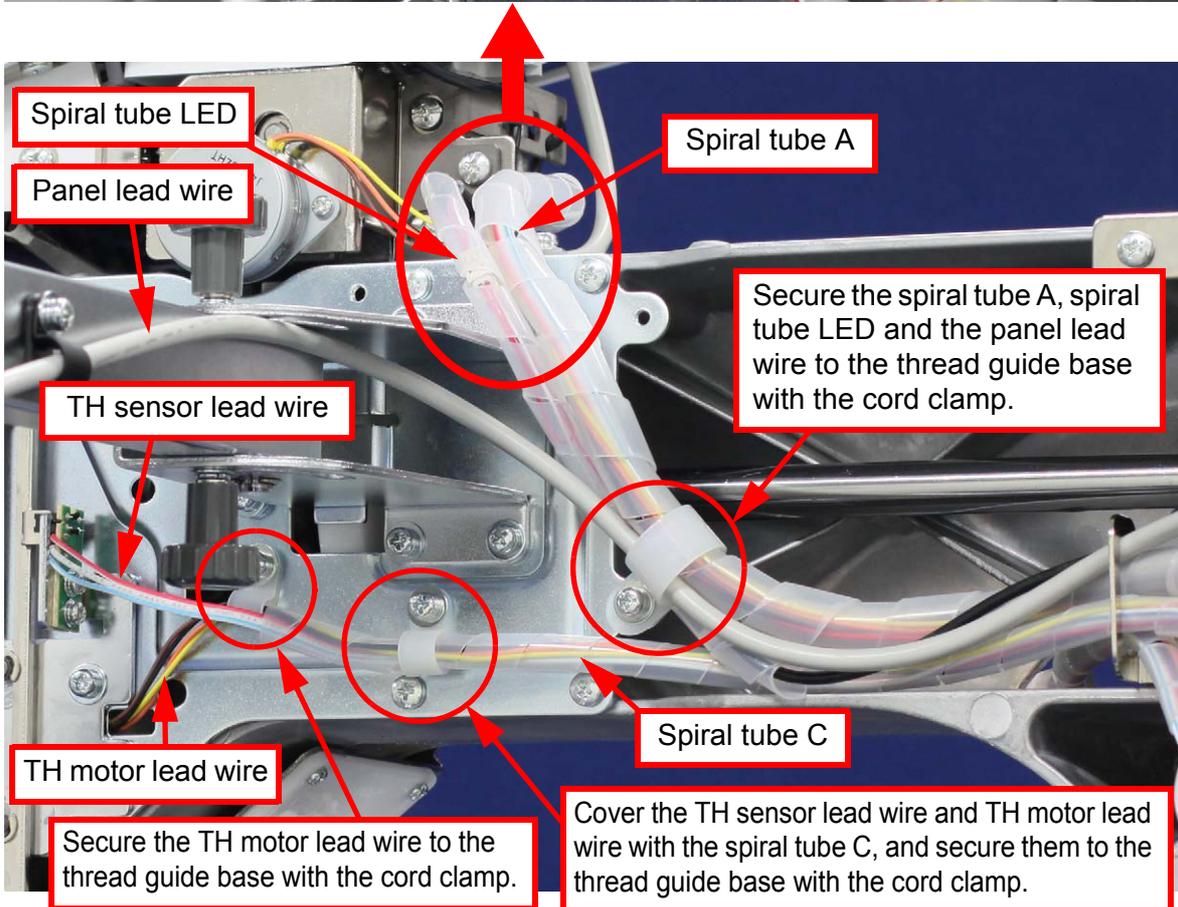
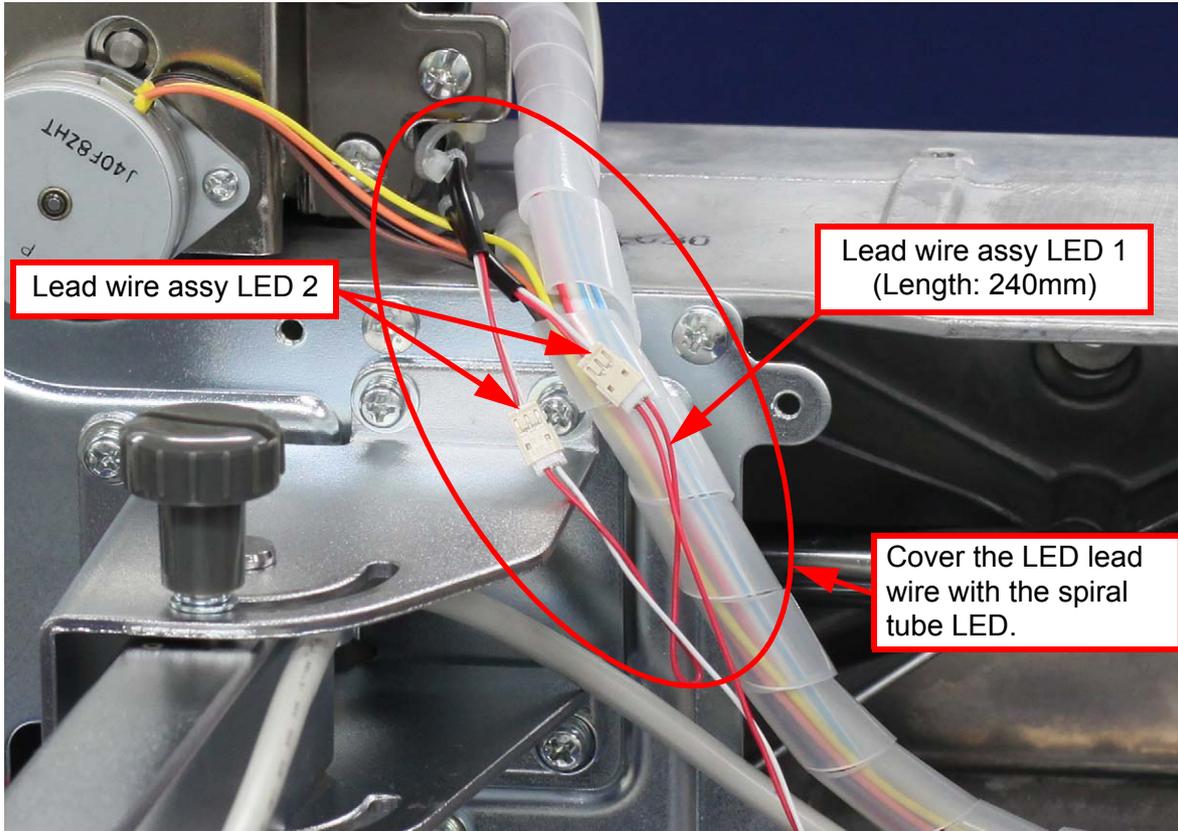


4. Wiring of panel lead wire

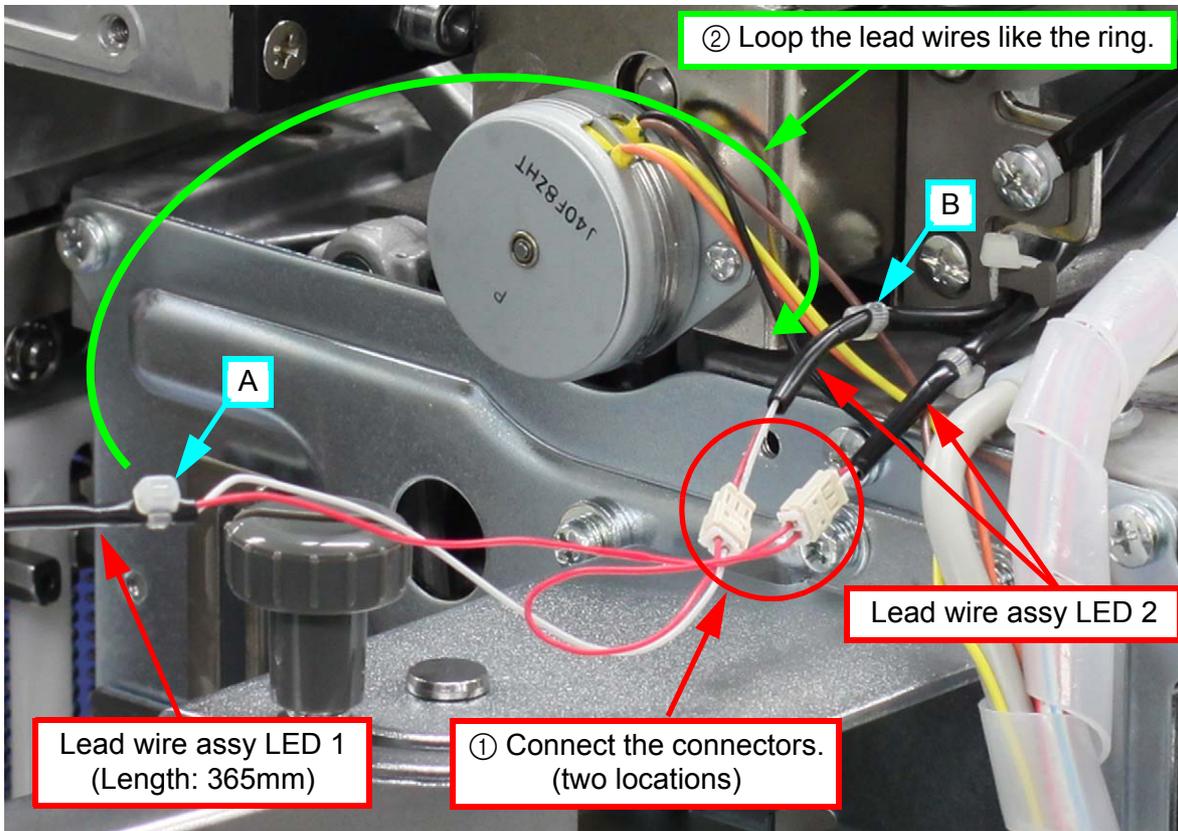
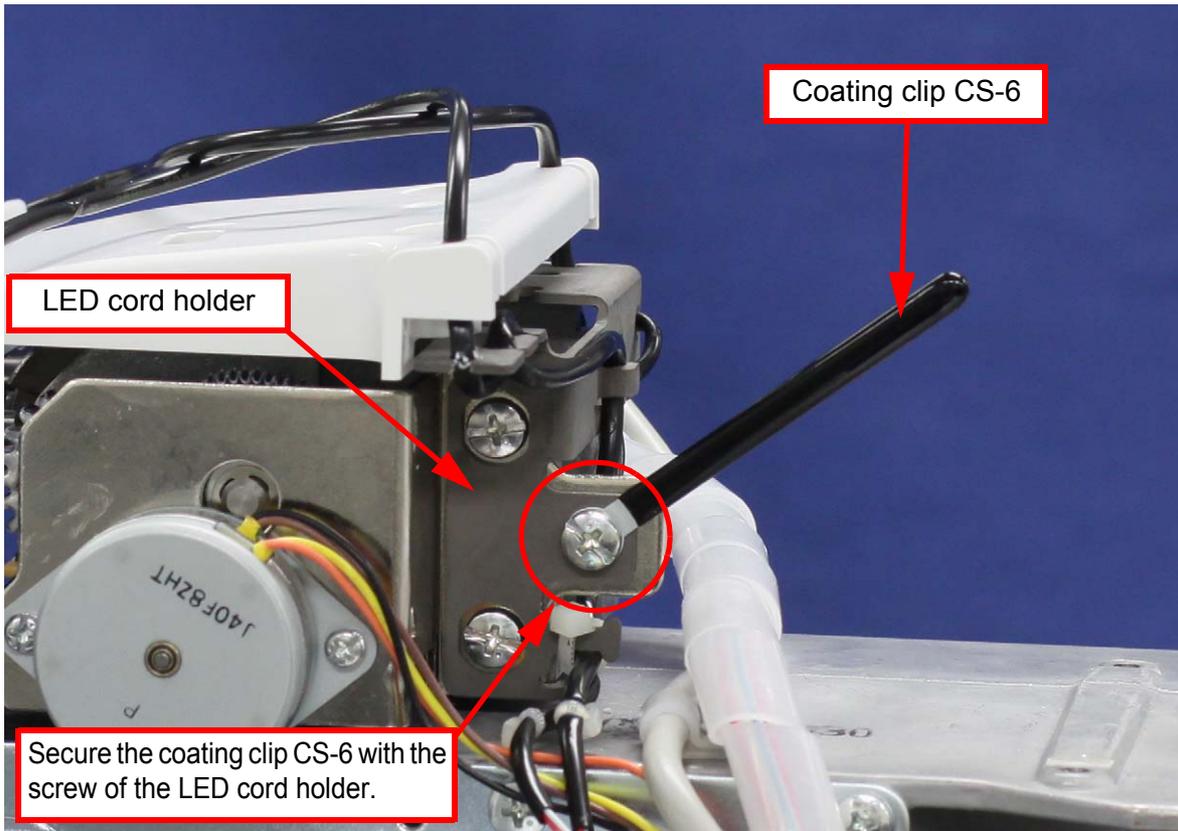


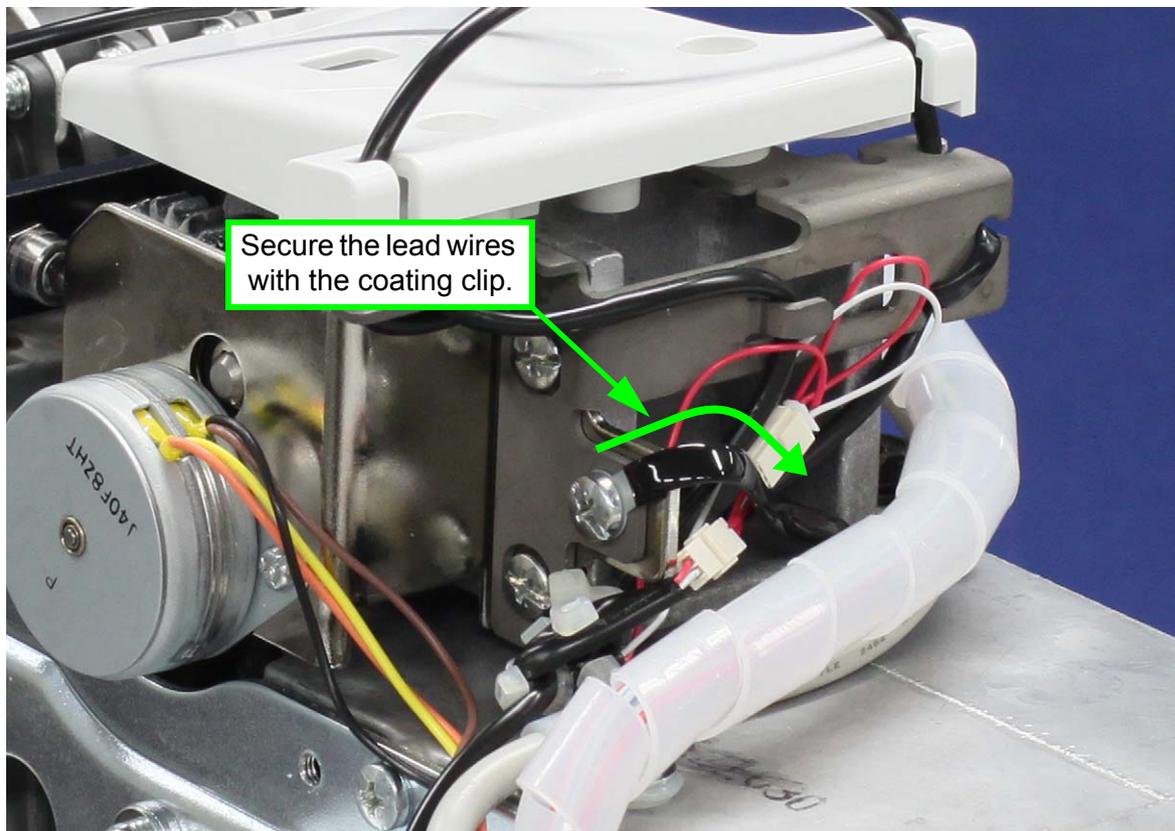
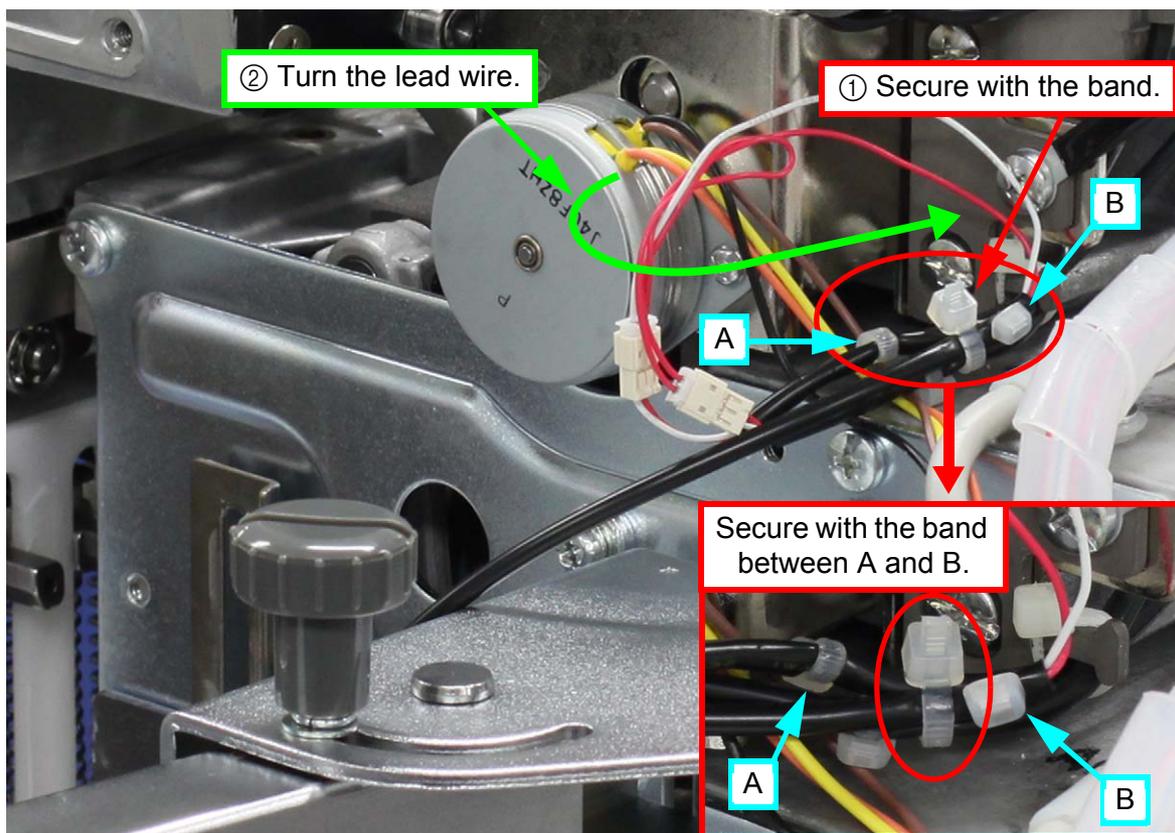
5. Right side of arm

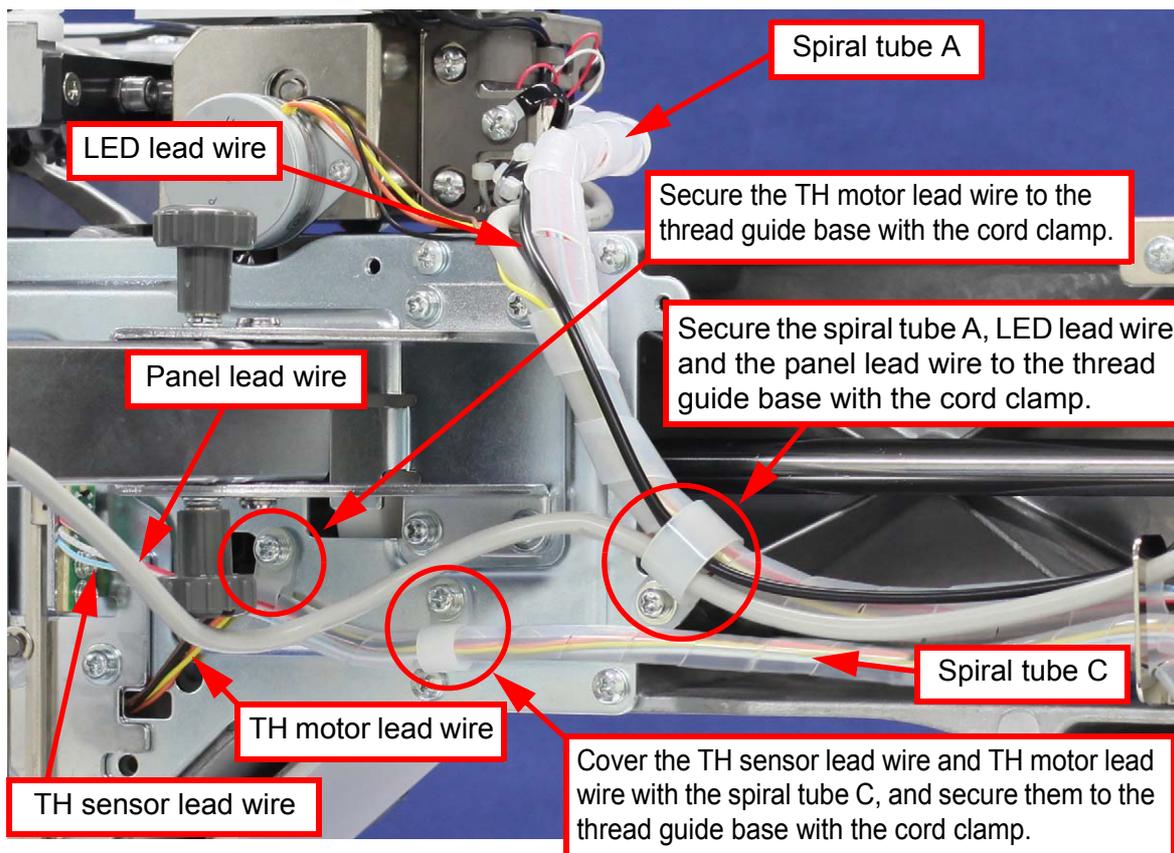
■ When length of lead wire assy LED 1 is 240 mm.



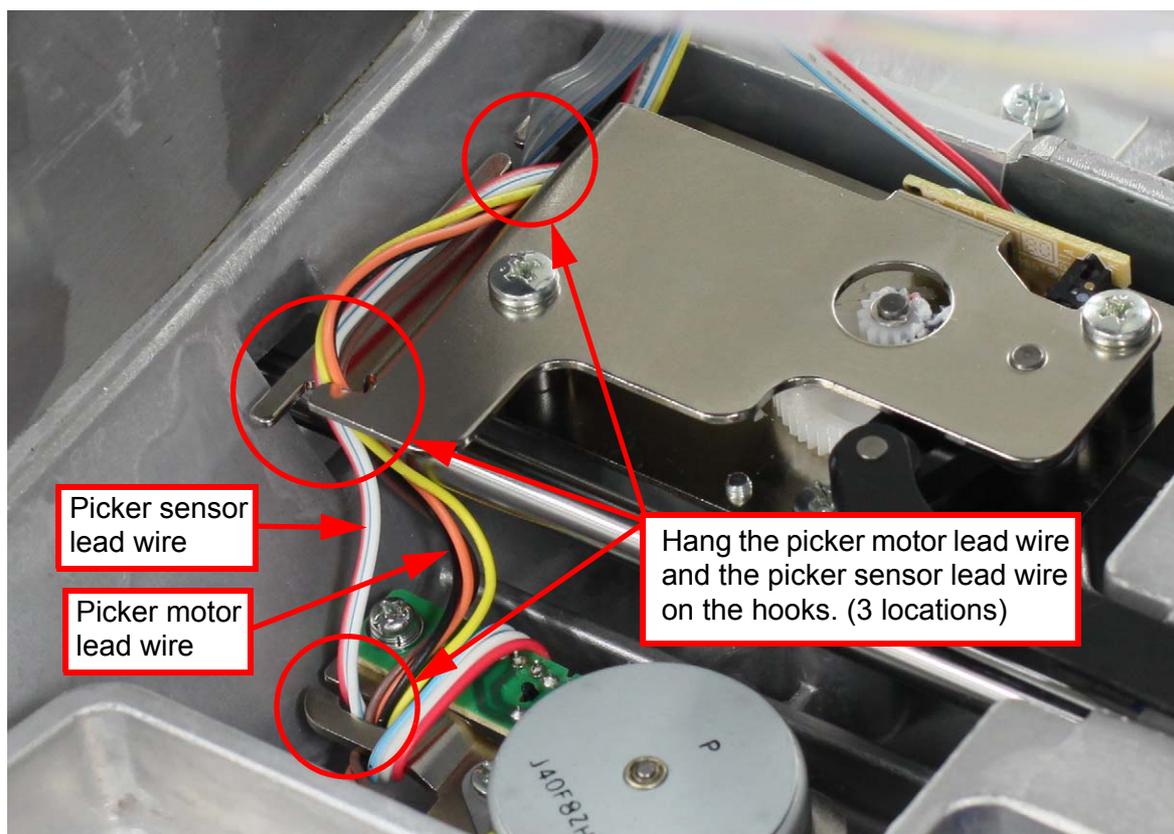
■ When length of lead wire assy LED 1 is 365 mm.



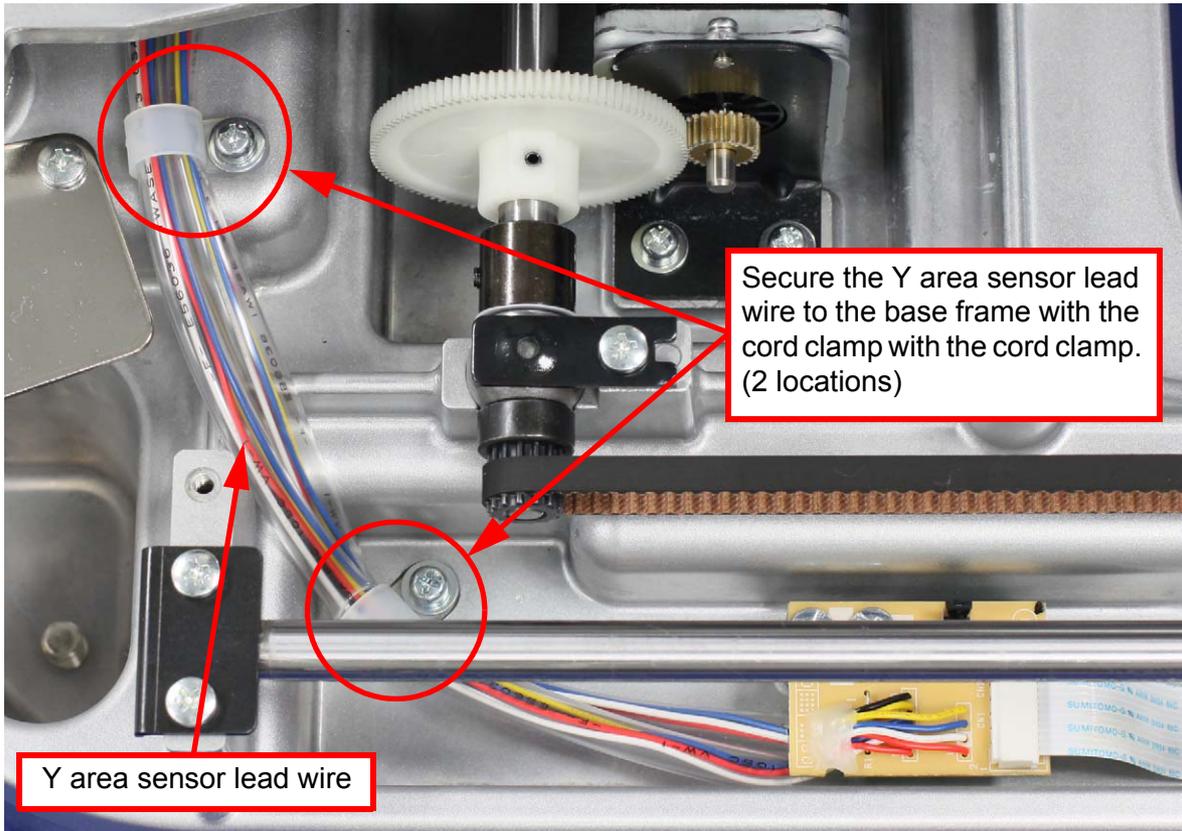




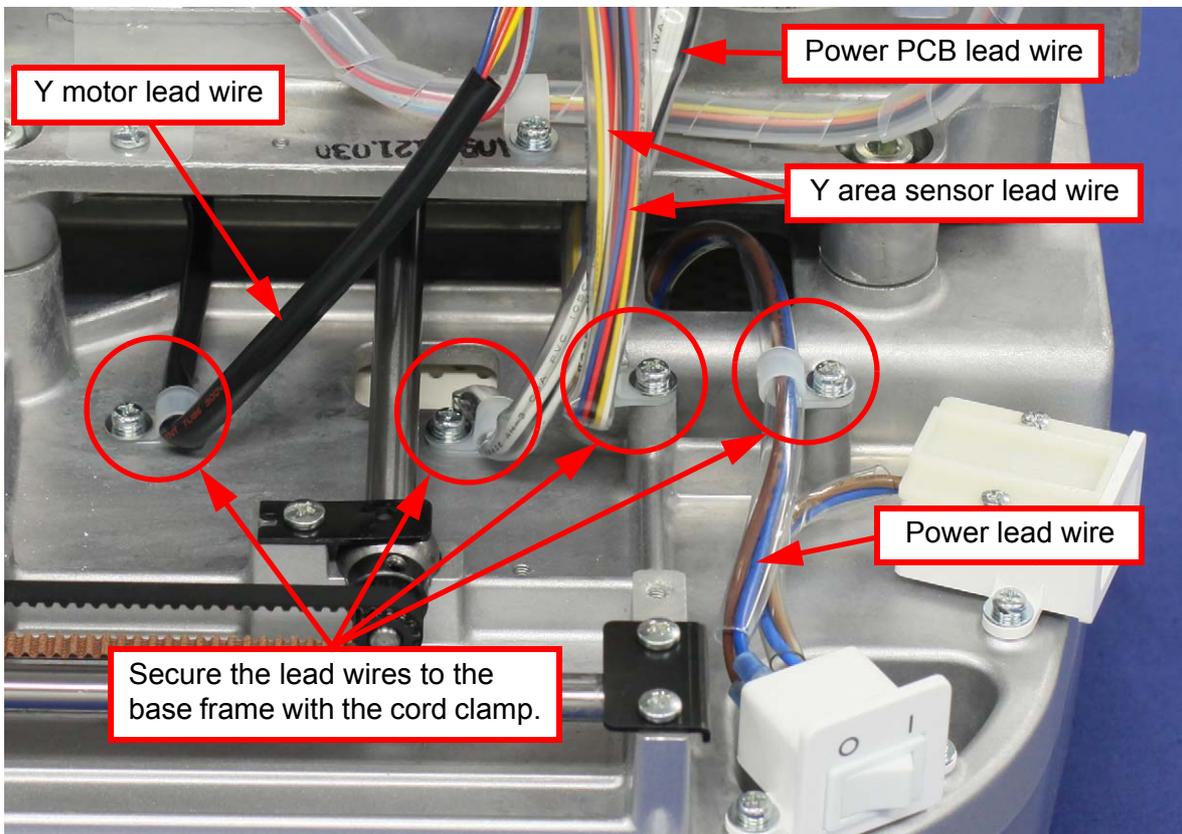
## 1. Center of the base frame



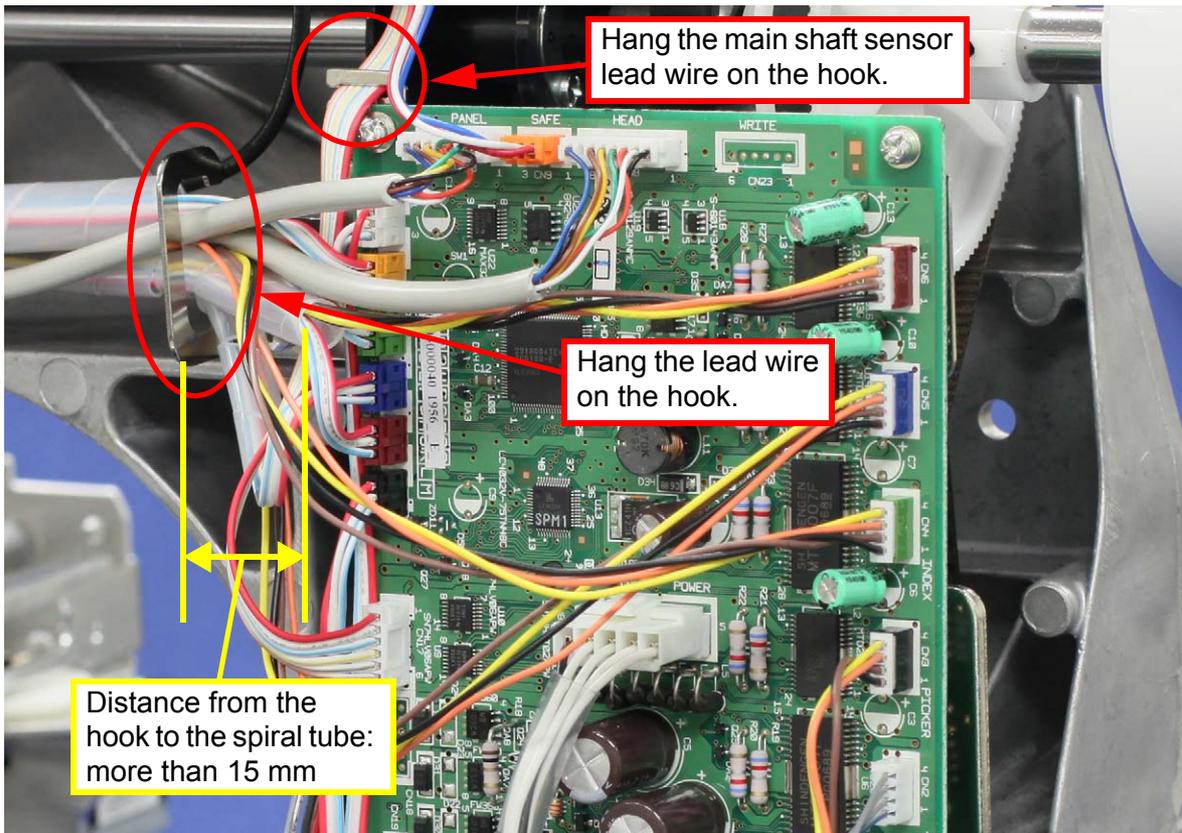
2. Left side of base frame



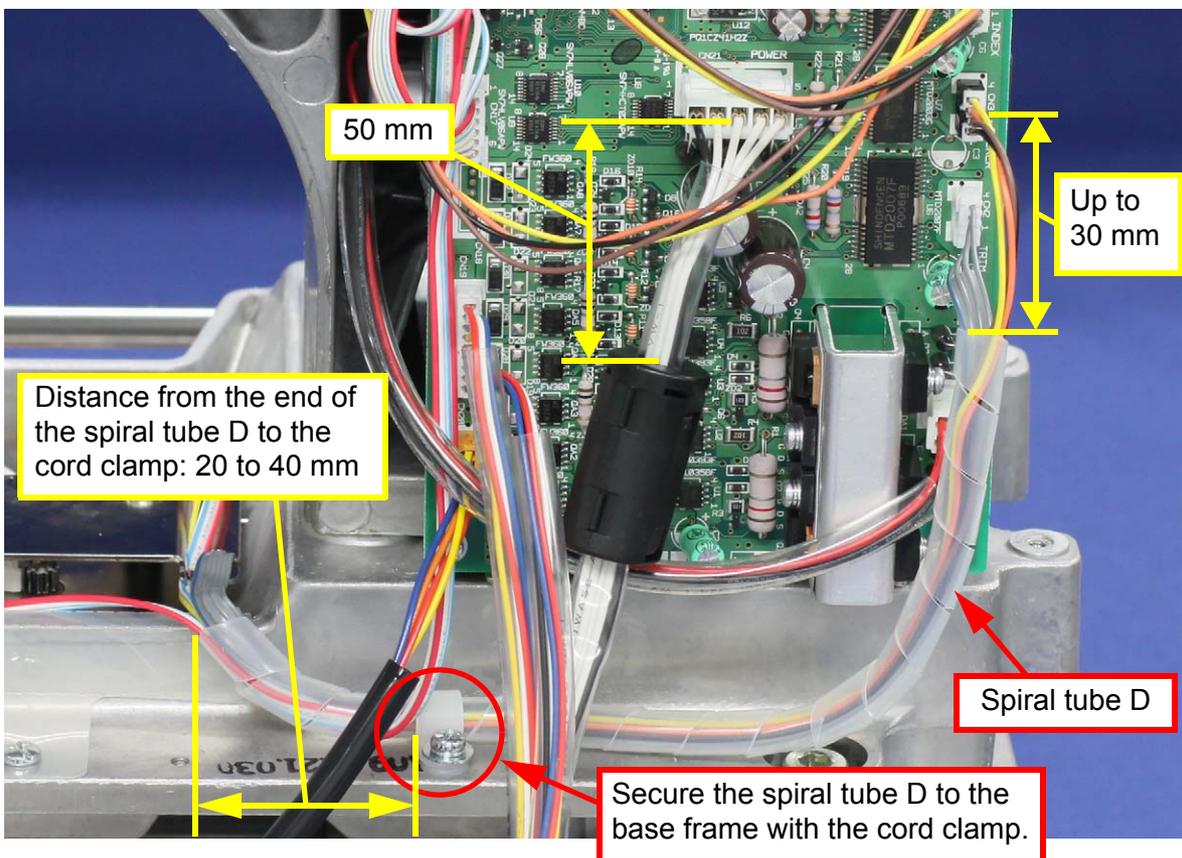
3. Right side of base frame



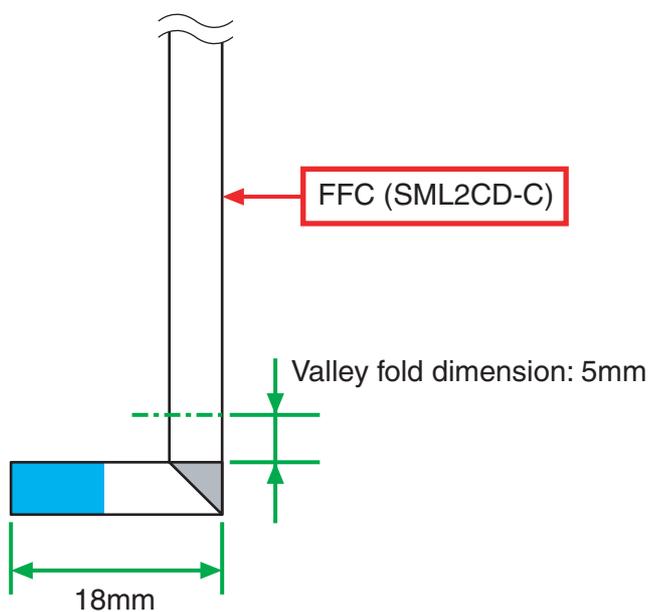
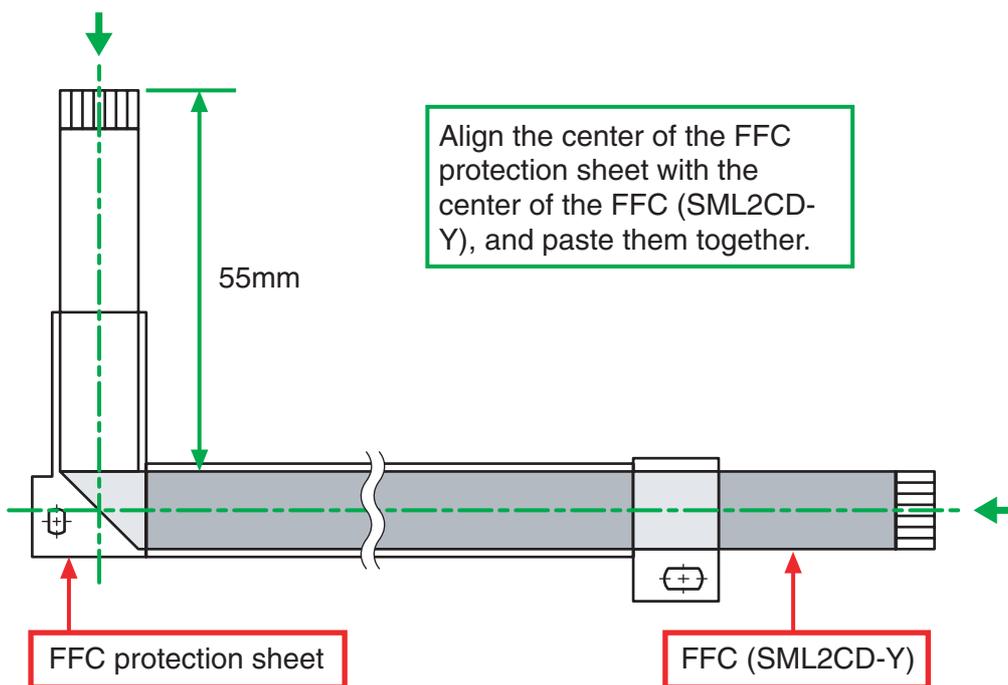
1. Upper side of main PCB



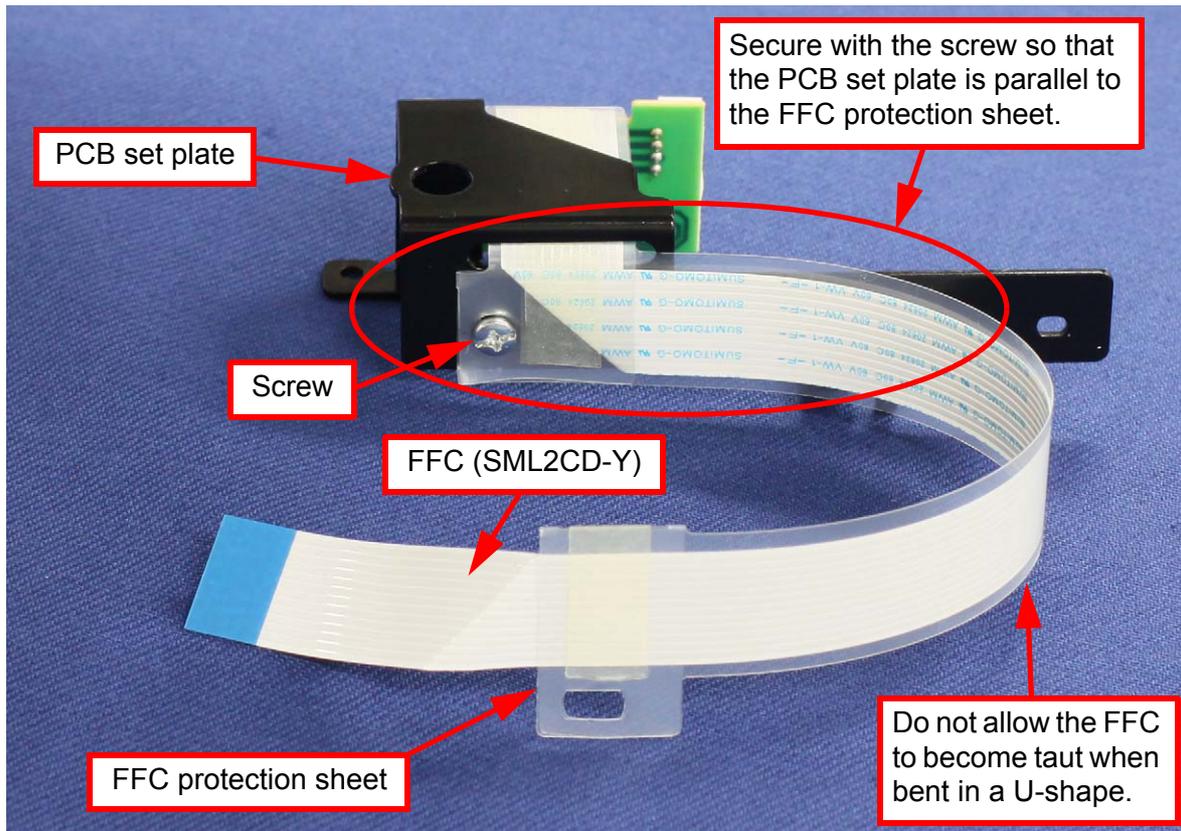
2. Lower side of main PCB



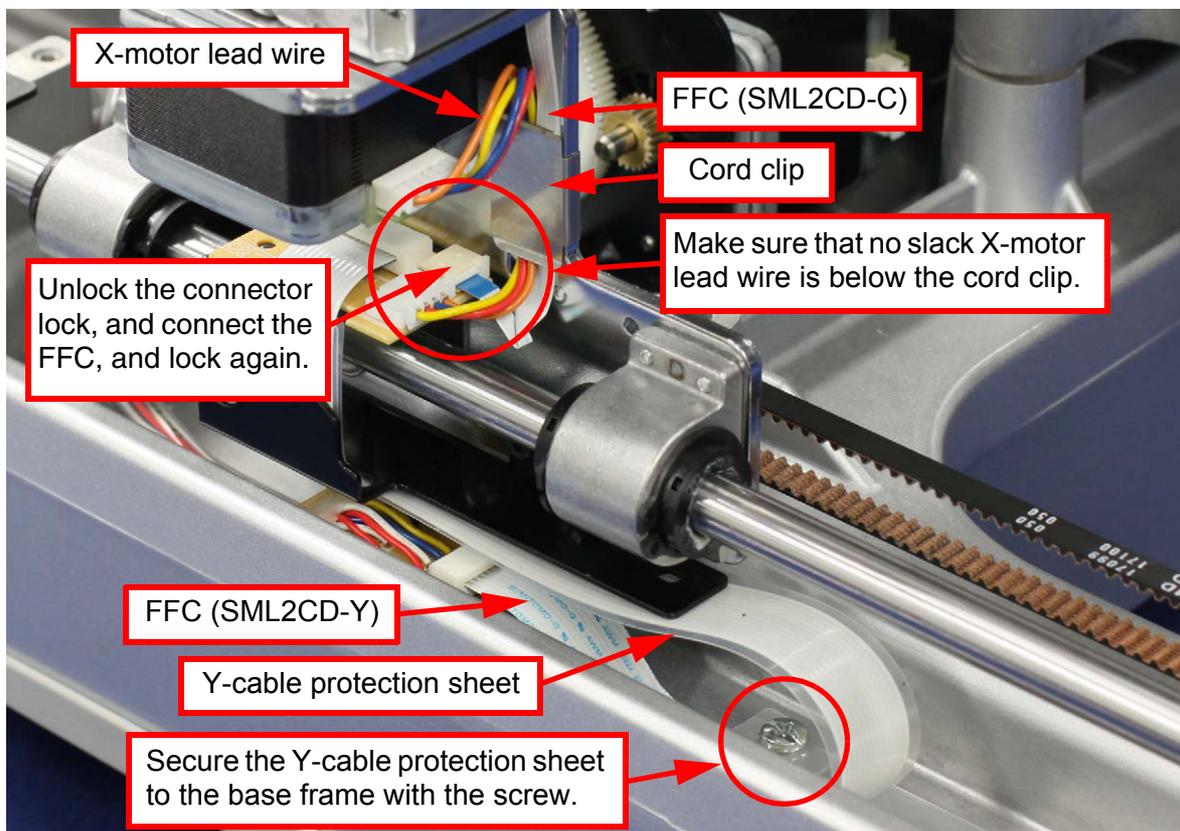
1. Y-feed cable (1)



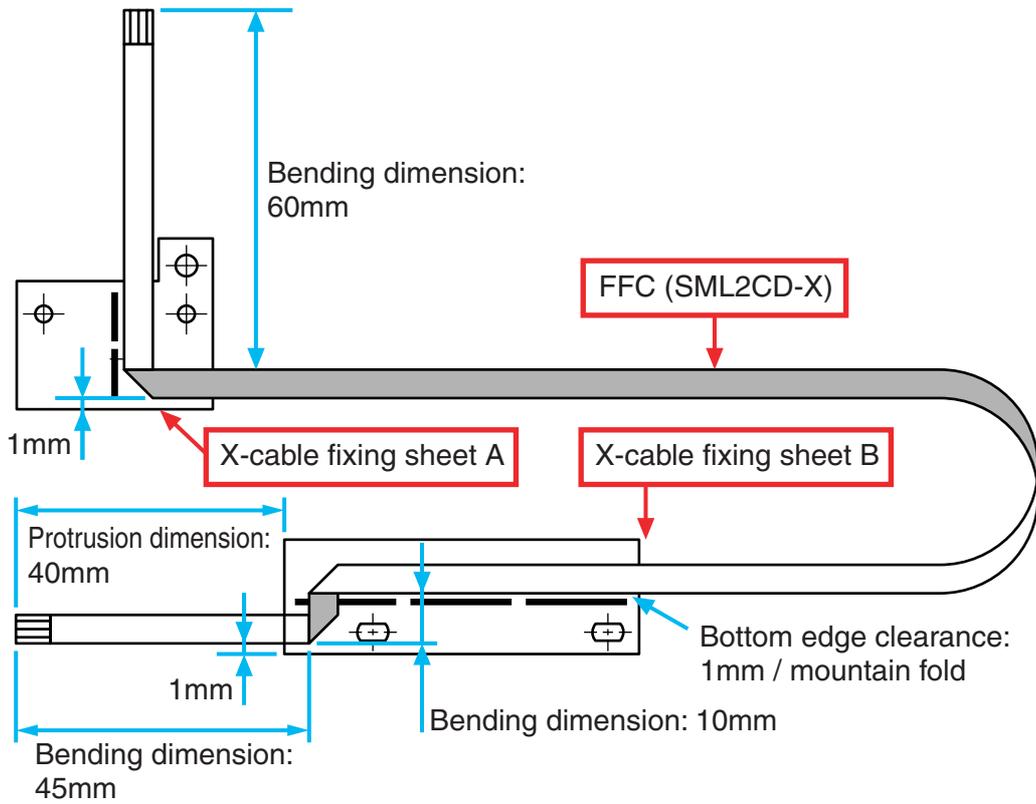
2. Y-feed cable (2)



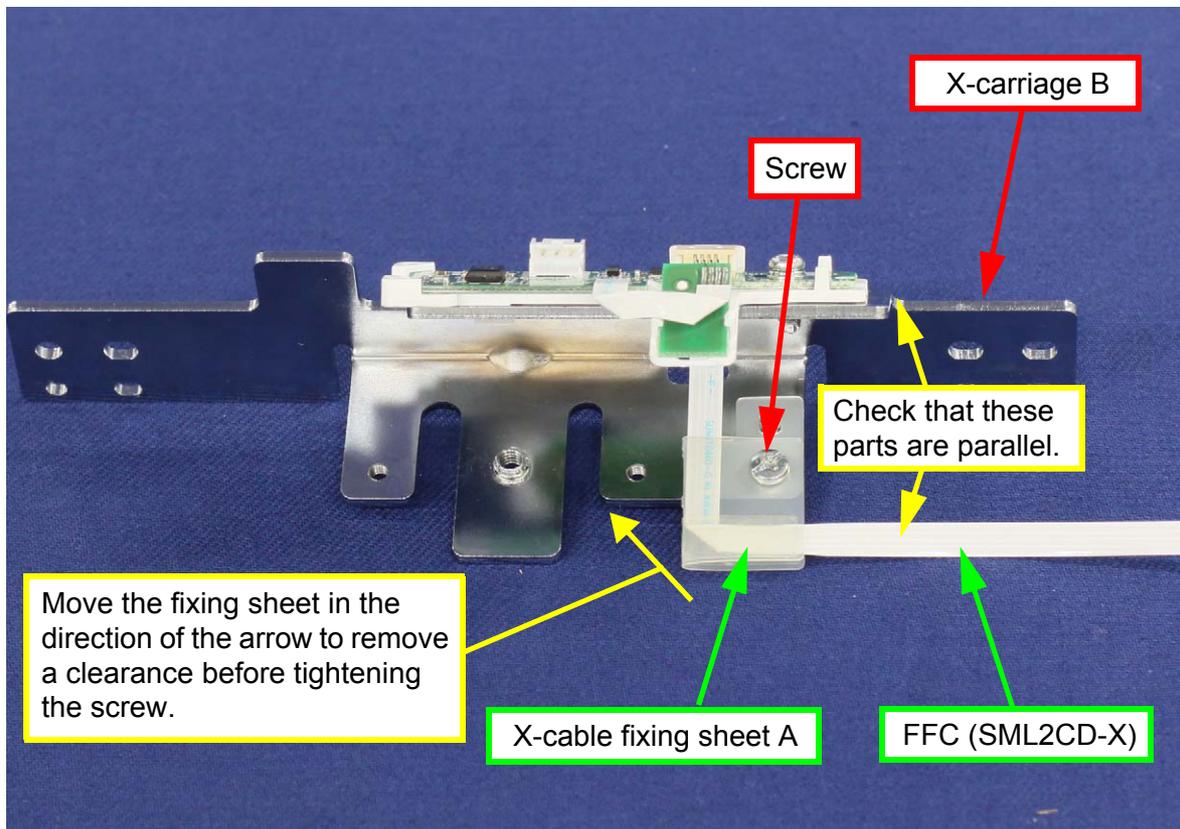
3. Y-feed cable (3)



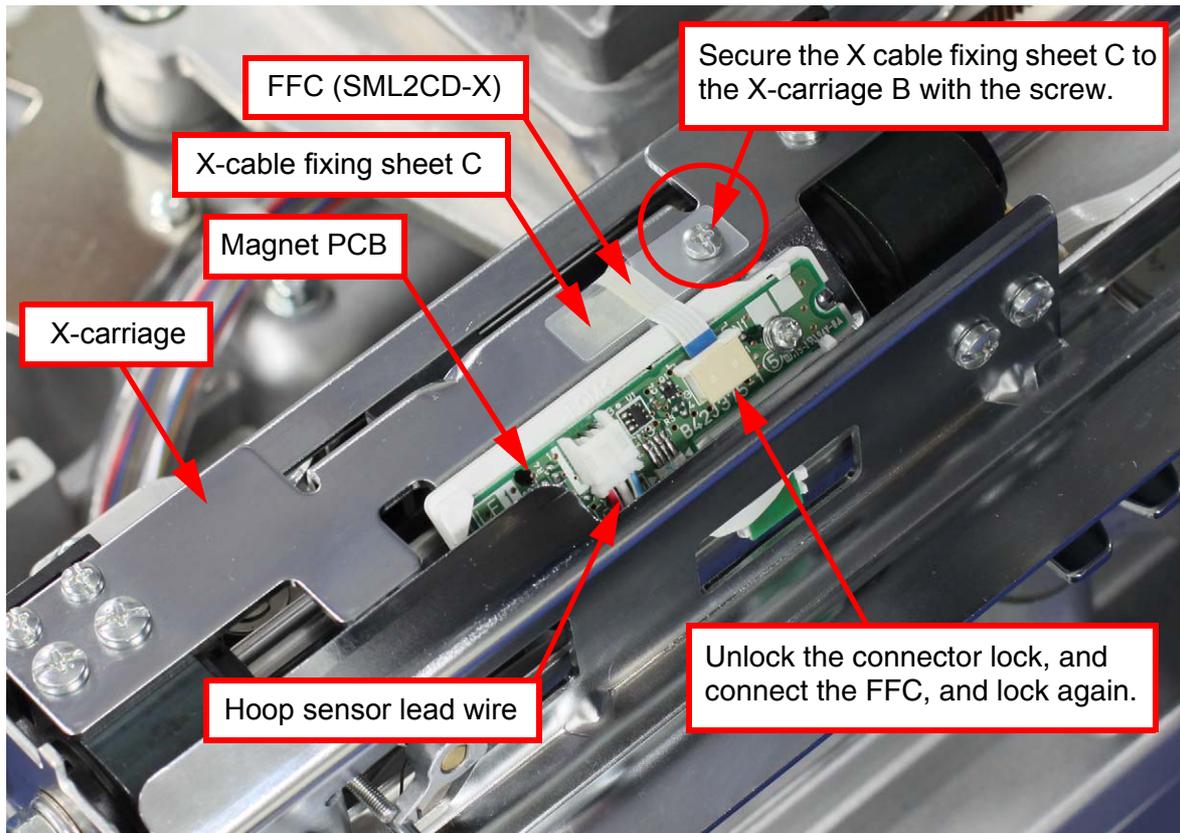
1. X-feed cable (1)



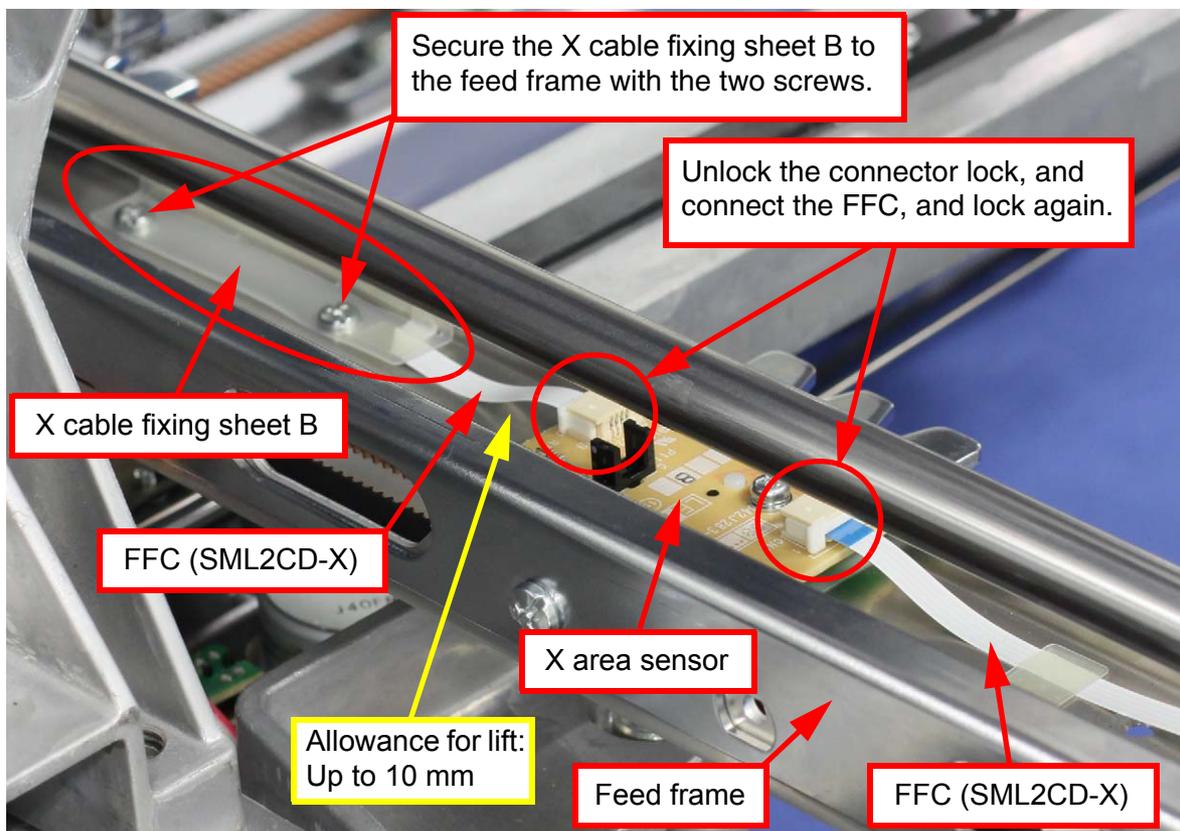
2. X-feed cable (2)



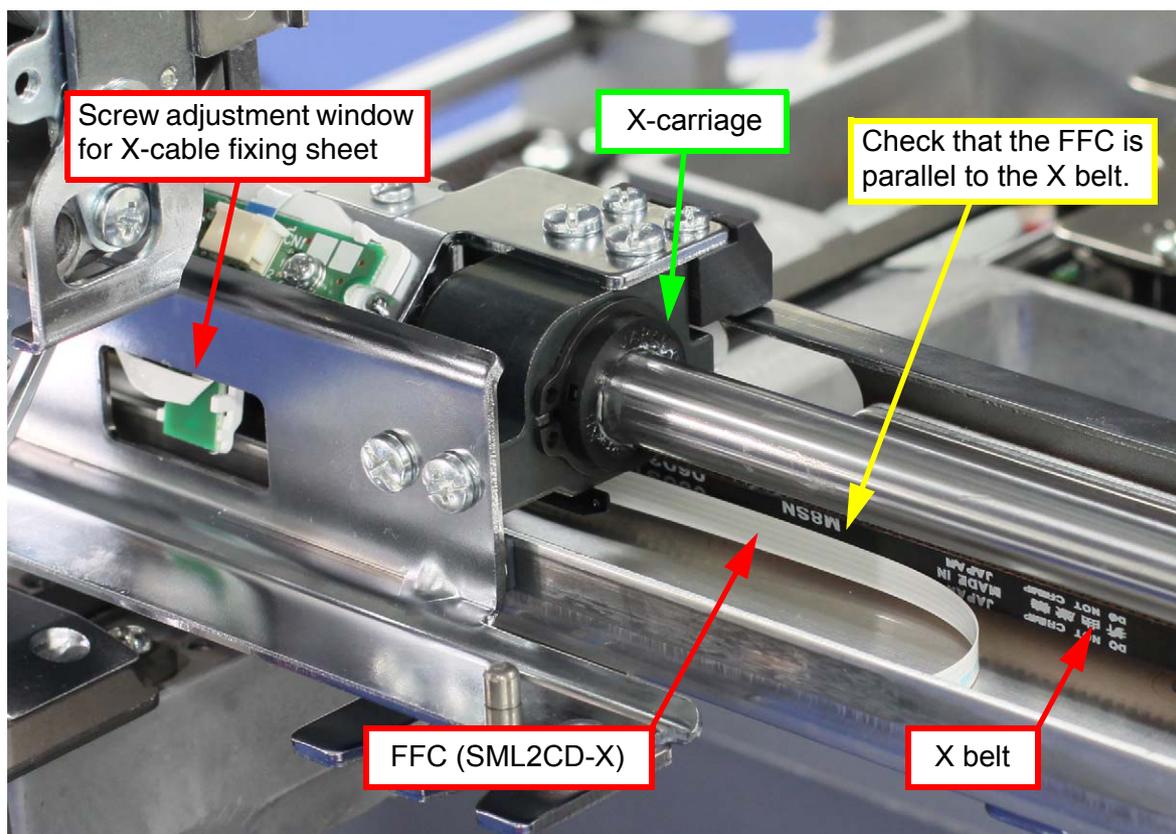
3. X-feed cable (3)



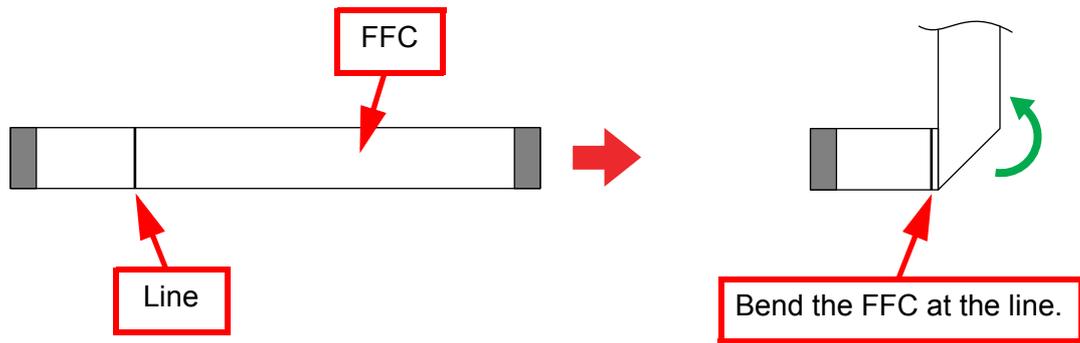
4. X-feed cable (4)



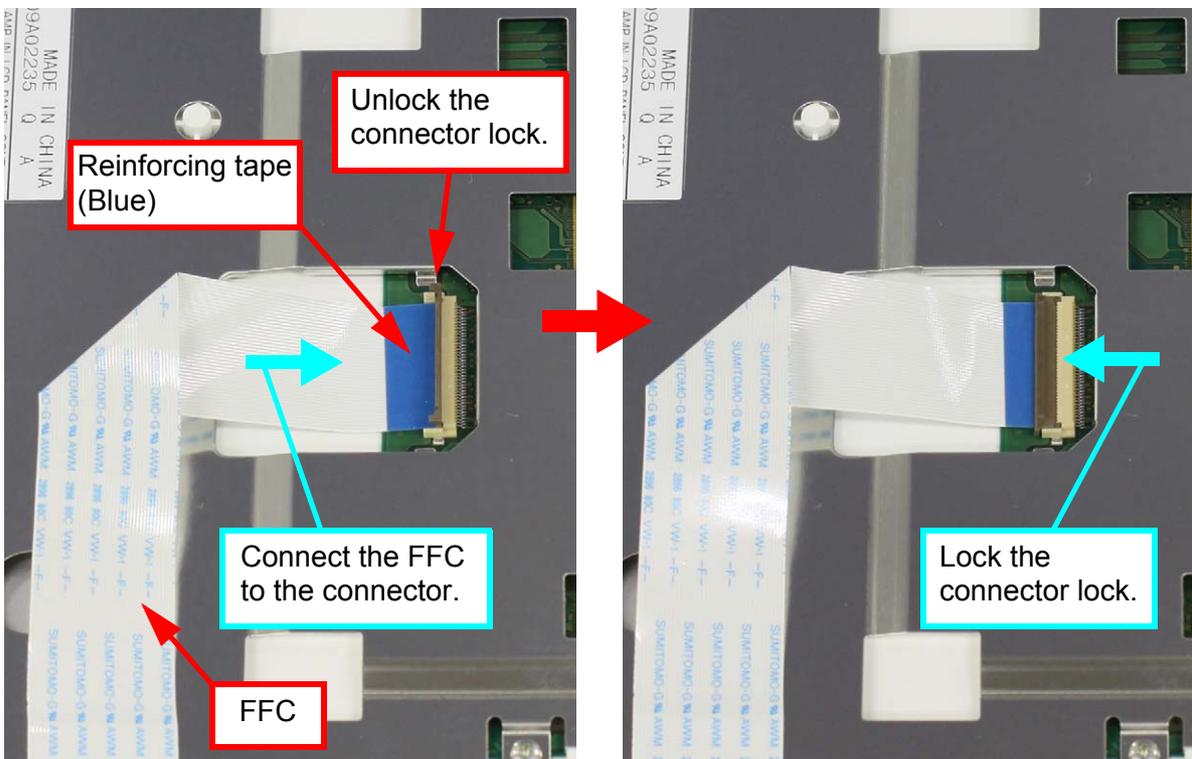
5. X-feed cable (5)



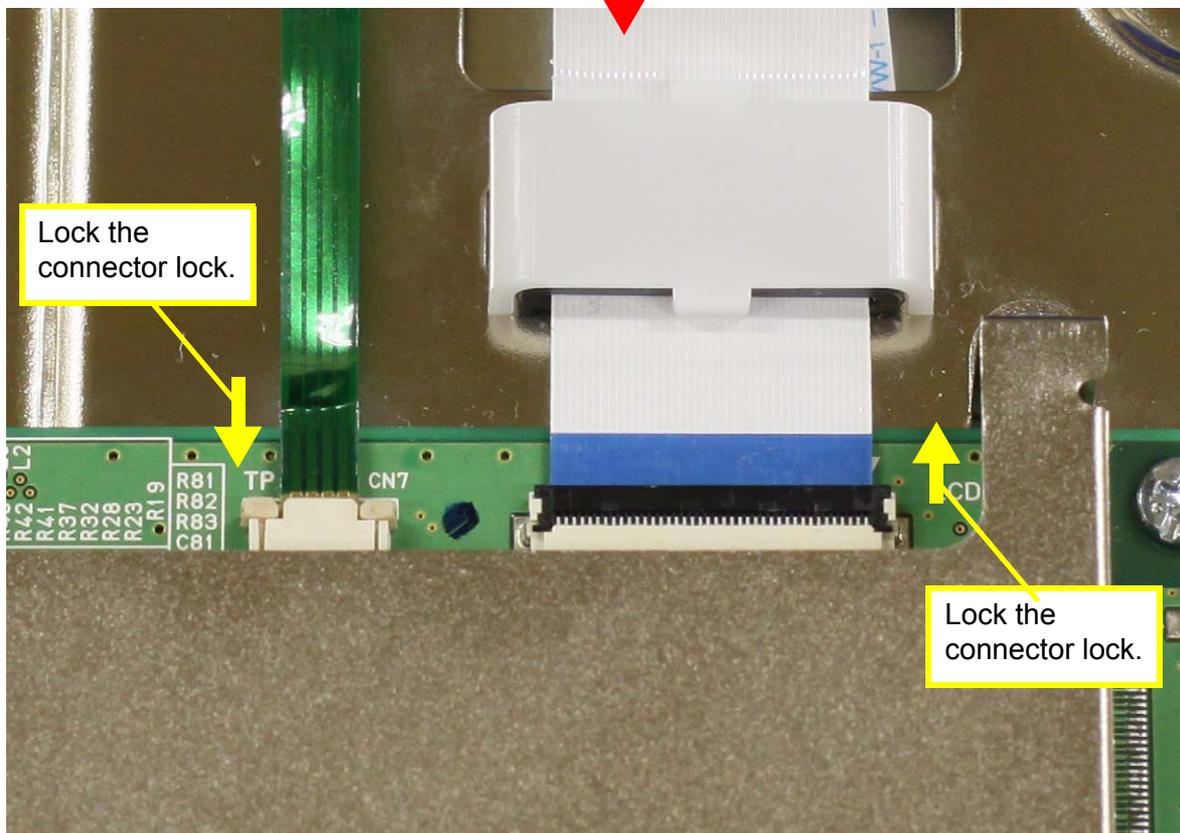
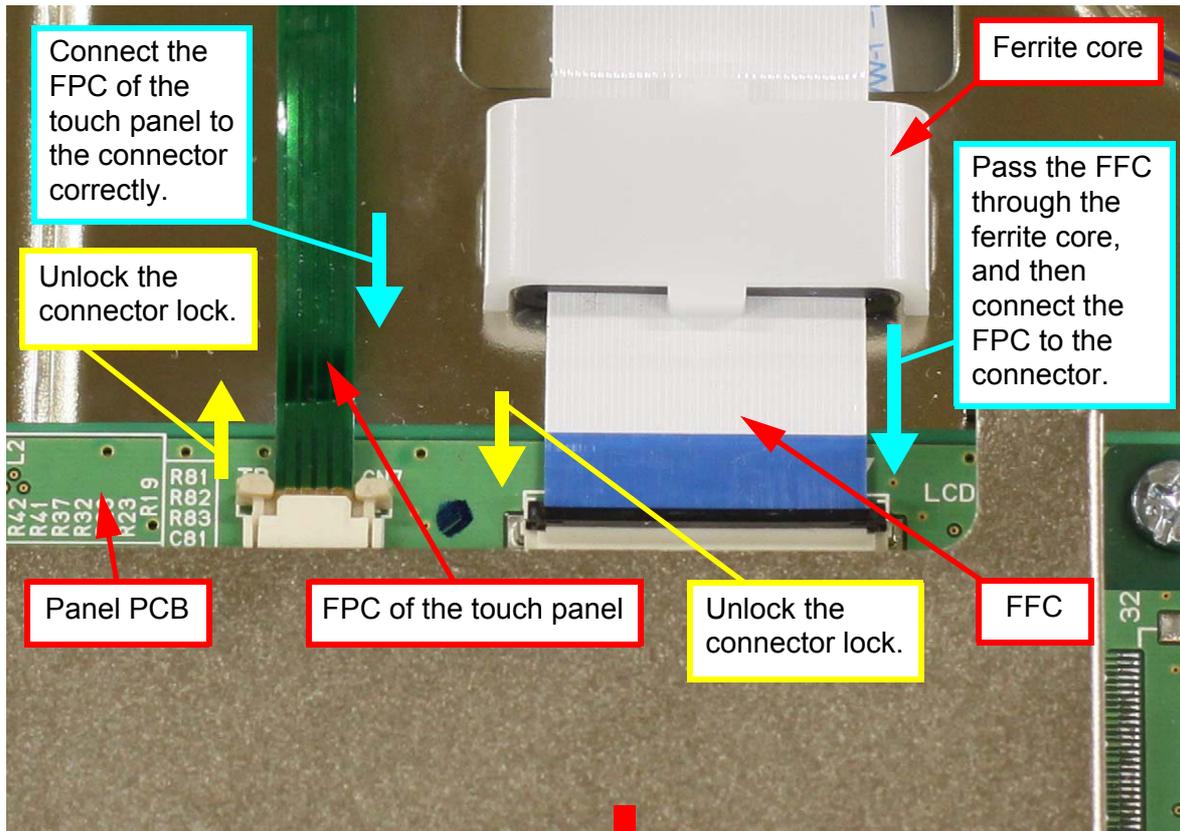
1. Wiring of FFC



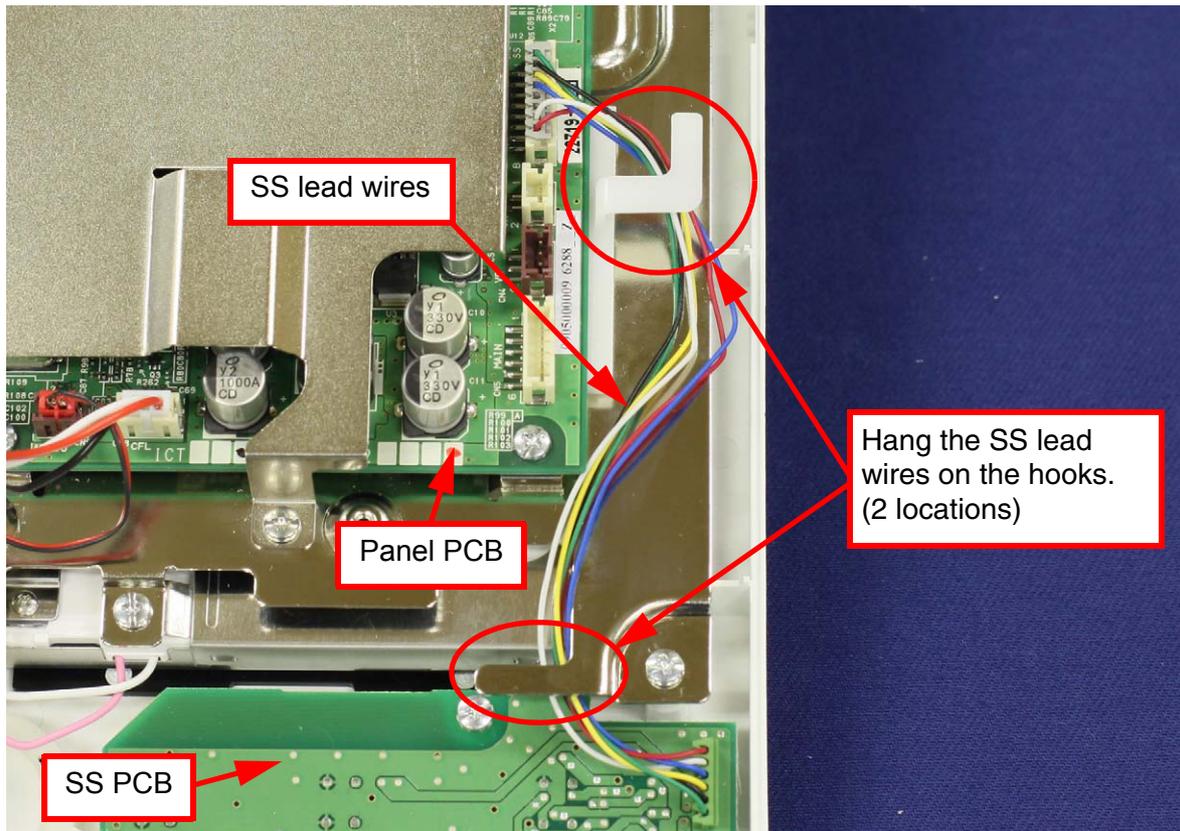
Back side of LCD module



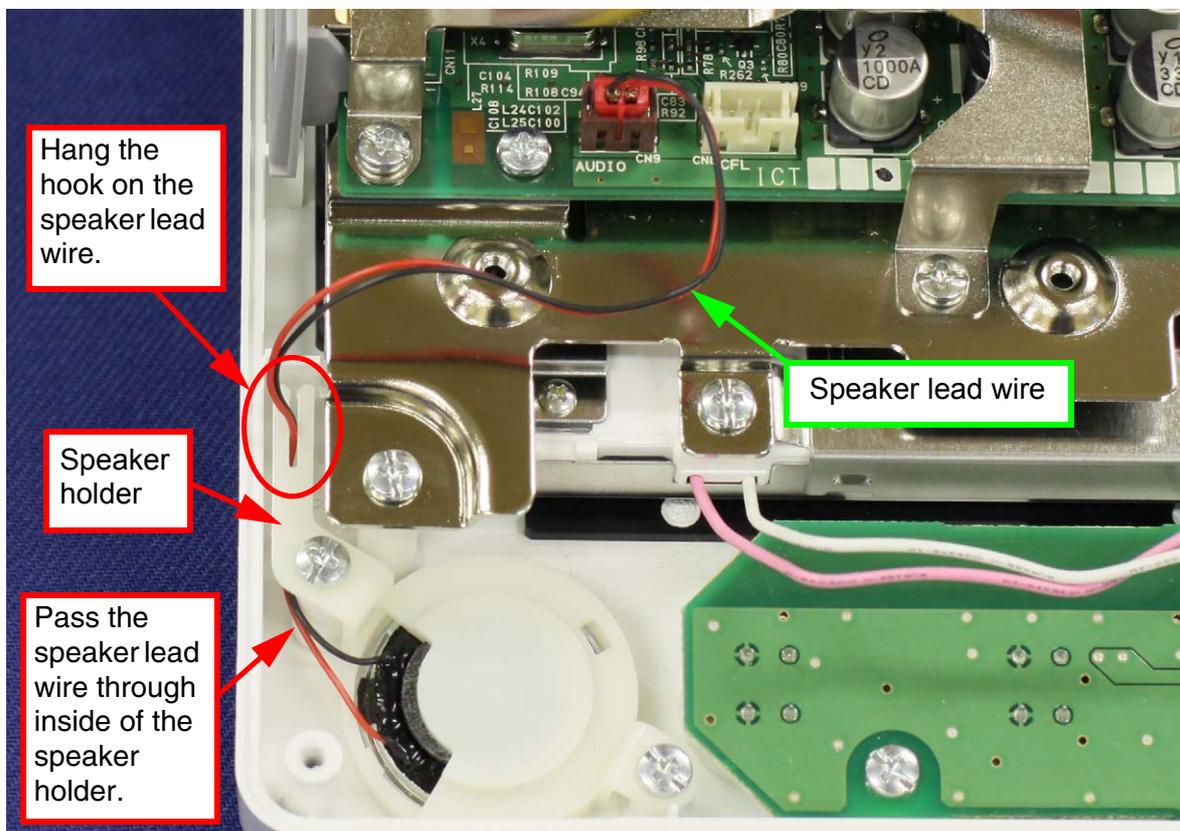
2. LCD module, touch panel wiring



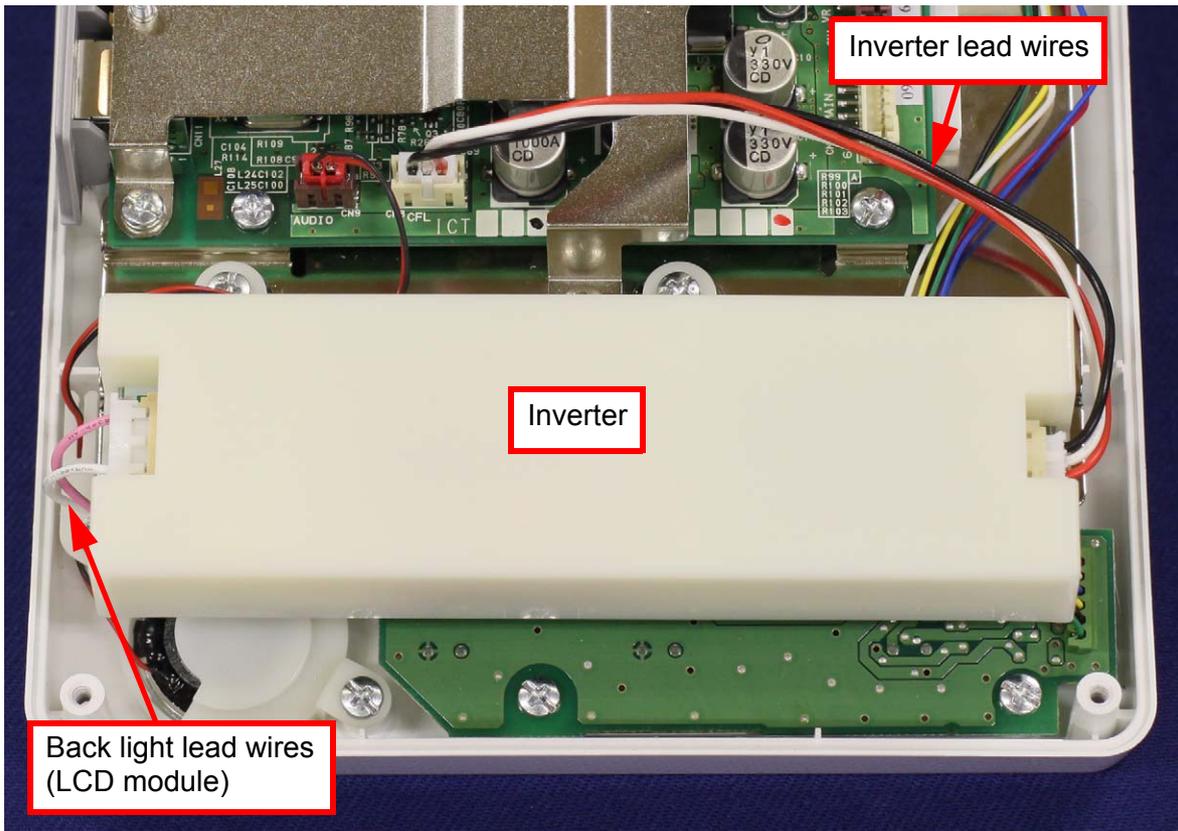
### 3. Wiring of SS PCB



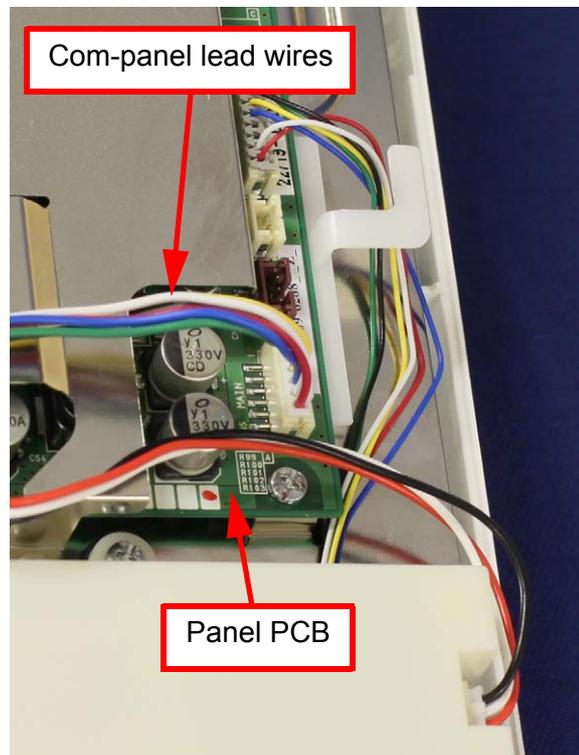
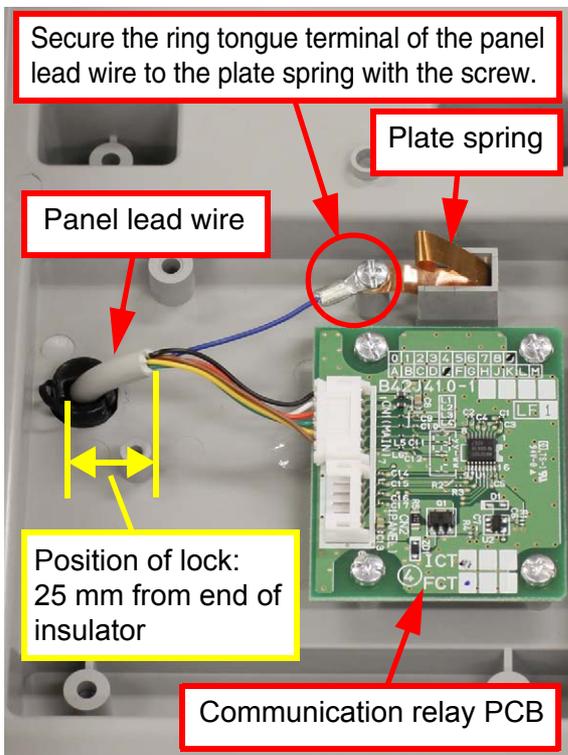
### 4. Wiring of speaker

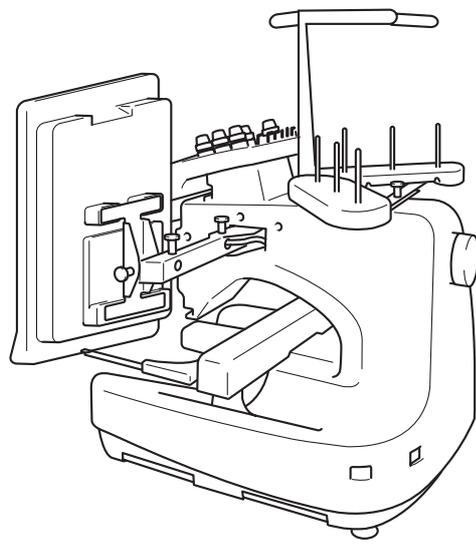


5. Wiring of inverter



6. Wiring of communication relay PCB





**PR-650/PR-650C**