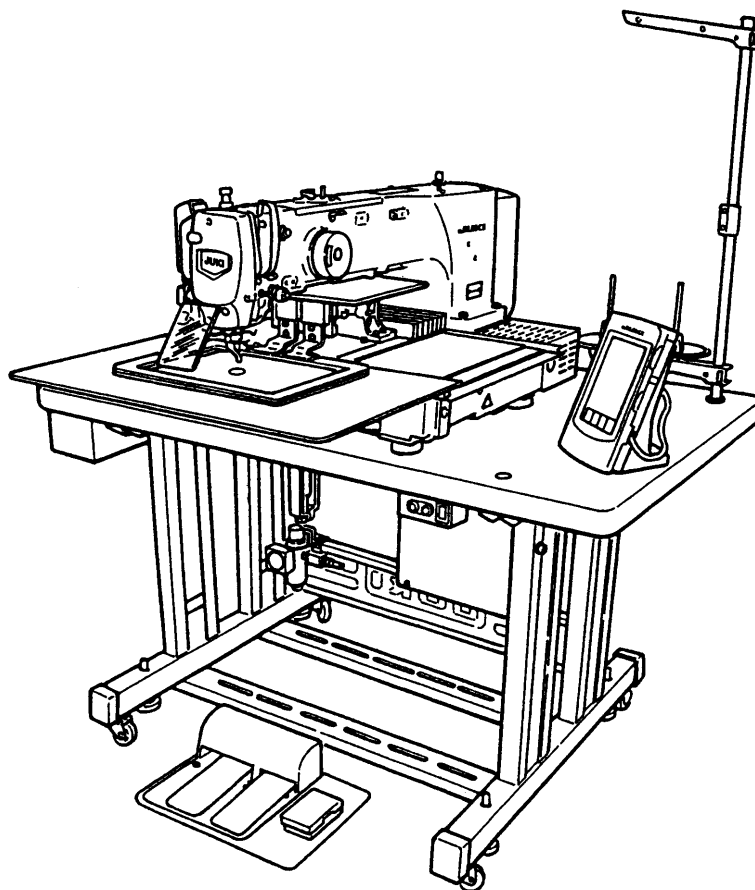


Computer-controlled, Cycle Machine
With Input Function

AMS-221E Series

ENGINEER'S MANUAL



PREFACE

This Engineer's Manual is written for the technical personnel who are responsible for the service and maintenance of the machine.

The Instruction Manual for these machines intended for the maintenance personnel and operators at an apparel factory contains operating instruction in detail. And this manual describes "Standard Adjustment", "Adjustment Procedures", "Results of Improper Adjustment", and other important information which are not covered in the Instruction Manual.

It is advisable to use the Input Instruction Manual, relevant Instruction Manual and Parts List together with this Engineer's Manual when carrying out the maintenance of these machines.

In addition, for the motor for the sewing machine with thread trimmer, refer to the separate Instruction Manual or This manual gives the "Standard Adjustment" on the former page under which the most basic adjustment value is described, and on the latter page "Results if Improper Adjustment" under which stitching errors and troubles arising from mechanical failures and "How to adjust" are described.

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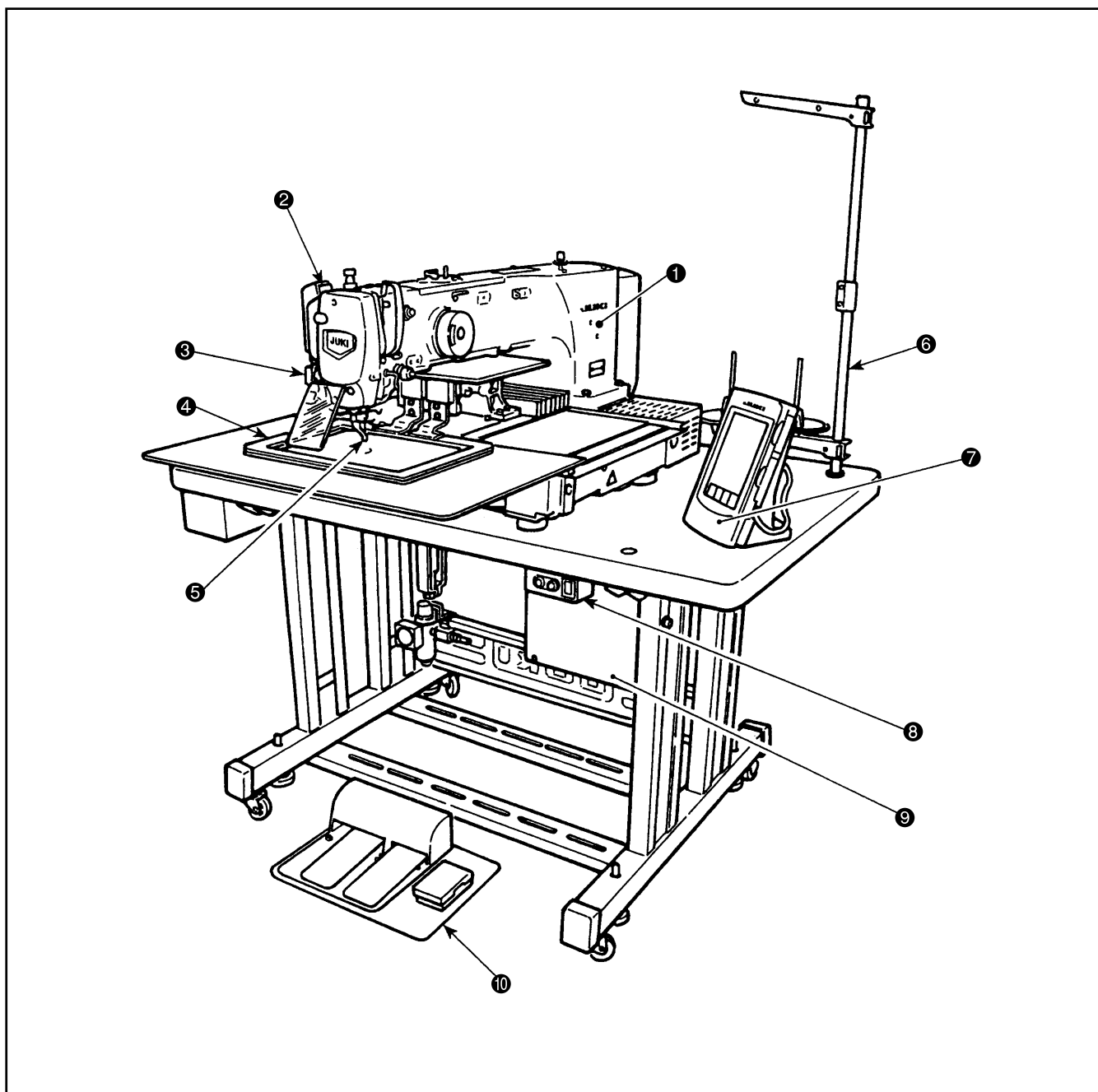
1. Specifications

No.	Model name Item		Application		
			AMS-221EHS	AMS-221EHL	AMS-221ESL
	Sub-class		2516		
1	Sewing area		X-Direction (right, left) 250mm; Y-Direction (forward, backward) 160mm		
2	Max. sewing speed		2700rpm (when sewing pitch is 3mm or less)		
3	Stitch length		0.1 to 12.7mm (Min. resolution : 0.05mm)		
4	Feed motion of feeding frame		intermittent feed (2-shaft drive by stepping motor)		
5	Needle bar stroke		41.2mm		
6	Needle		H type: DP x 17 # 18		S type: DP x 5 # 14
7	Method to lift feeding frame		Air		
8	Feeding frame shape		Right and left united	Right and left separated	
9	Lift of feeding frame		Standard 25mm, Max. 30mm		
10	Intermediate presser stroke		Standard 4mm (0 to 10mm)		
11	Lift of intermediate presser		20mm		
12	Intermediate presser DOWN position variable		Standard 0 to 3.5mm (Max. 0 to 7.0mm)		
13	Needle thread clamp device		H type		S type
14	Needle thread tension		Active tension (electronic thread tension control mechanism)		
15	Hook		2-fold semi-rotary hook		
16	Lubrication		Plane part: grease, hook part: minute volume lubrication (tank type)		
17	Lubricating oil		JUKI NEW Defrix oil (equivalent to ISO VG32) (Lubrication system)		
18	Grease		1. Penetration No. 2 lithium grease, 2. Templex N2, 3. Juki Grease A, 4. Juki Grease B (Caution) 1.		
19	Memory of pattern data		EEP-ROM, Media (Compact flash) •EEP-ROM : Max. 200 patterns (Max. 20,000 stitches/1pattern) • Media : Max. 999 patterns (Max. 50,000 stitches/1pattern)		
20	Temporary stop facility		Used to stop machine operation during a stitching cycle.		
21	Enlarging/Reducing function		Allows a pattern to be enlarged or reduced on the X axis Y axis independently when sewing a pattern. 1% to 400% times (0.1% steps)		
22	Enlarging/Reducing method		Pattern enlargement / reduction can be done by increasing / decreasing either stitch length or the number of stitches. (When the pattern button is selected, the function available is only the adjustment of stitch length.)		
23	Sewing speed limitations		200 to 2,700 rpm (Scale : 100 rpm steps)		
24	Pattern selector facility		Pattern No. selection method (EEP-ROM : 1 to 200, Media : 1 to 999)		
25	No. of sheets counter		Up/Down method (0 to 9,999)		
26	Sewing counter (Bobbin thread counter)		Up/Down method (0 to 9,999)		
27	Memory back-up		In case of a power interruption, the pattern being used will automatically be stored in memory.		
28	2nd origin setting facility		Using jog keys, a 2nd origin (needle position after a sewing cycle) can be set in the desired position within the sewing area. The set 2nd origin is also stored in memory.		
29	Sewing machine motor		Small-sized servomotor		
30	External dimensions		W: 1,200mm L: 1,000mm H: 1,200mm (Excluding thread stand)		
31	Weight (gross weight)		197kg		
32	Power consumption		700VA		
33	Working temperature/humidity		Temperature: 5°C to 35°C, Humidity: 35 to 85% (no condensation)		
34	Supply voltage/frequency		Rated voltage ±10% , 50 / 60Hz		
35	Air pressure used		Standard: 0.5 to 0.55MPa, Max. 0.55MPa		
36	Air consumption		1.8dm³ /min (ANR)		
37	Needle highest position stop facility		After the completion if sewing, the needle can be brought up to its highest position.		

(Caution) Grease type, refer to (3) Greasing • lock-tite parts of [10] Maintenance

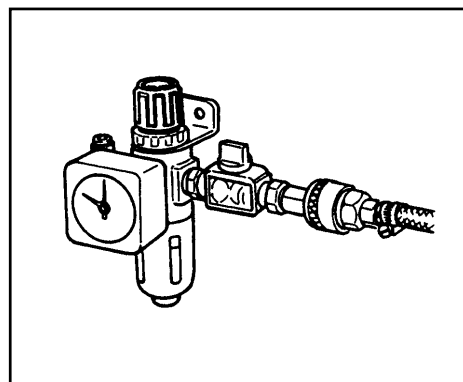
2. Configuration

(1) Names of main unit

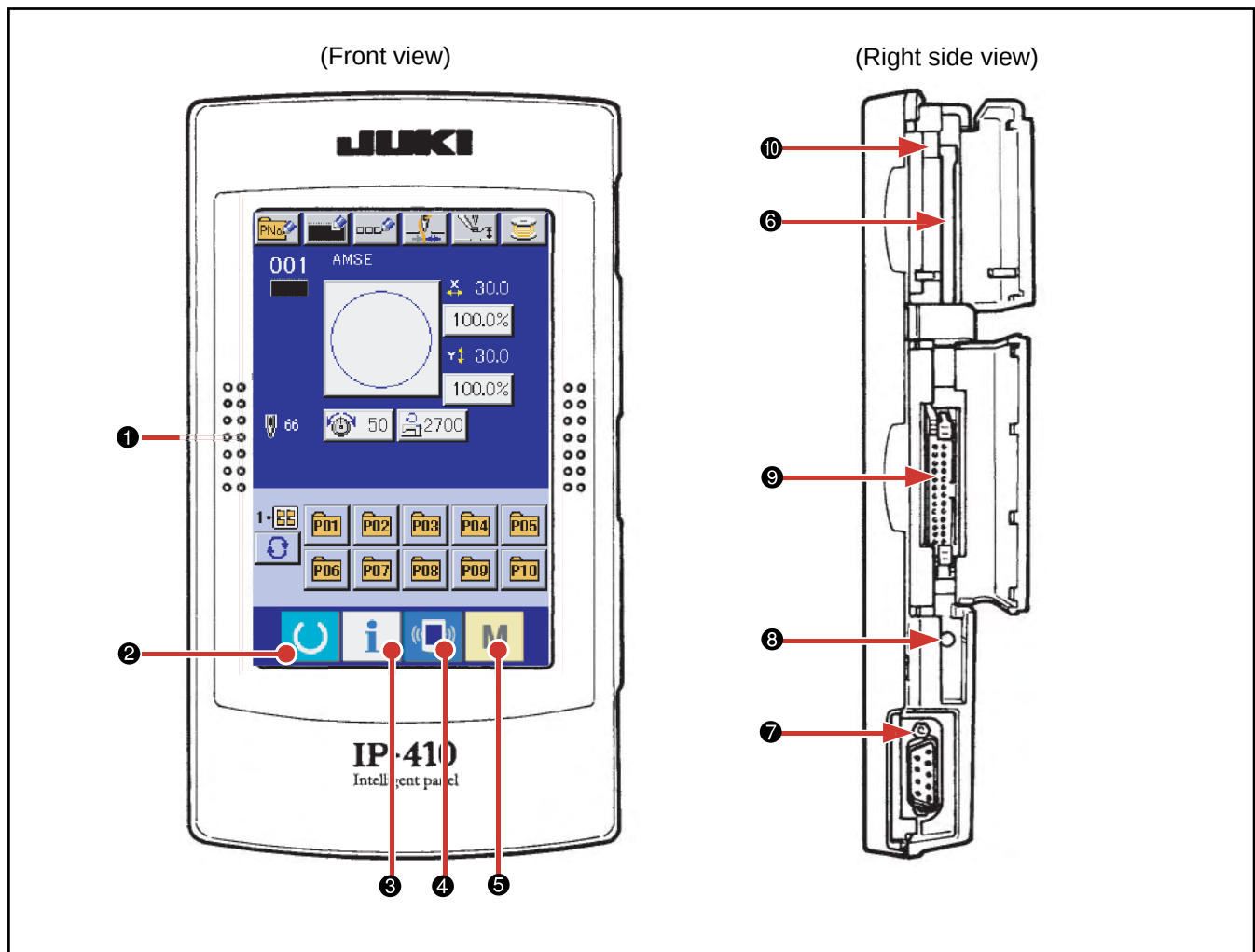


- ❶ Machine head
- ❷ Wiper switch
- ❸ Temporary stop switch
- ❹ Feeding frame
- ❺ Intermediate presser
- ❻ Thread stand
- ❼ Operation panel (IP-410)
- ❽ Power switch
- ❾ Control box
- ❿ Foot pedal

Air regulator



(2) IP-410 operation panel



❶ Touch panel • LCD display section

- ❷  READY key → Changeover of the data input screen and the sewing screen can be performed.
- ❸  INFORMATION key → Changeover of the data input screen and the information screen can be performed.
- ❹  COMMUNICATION key → Changeover of the data input screen and the communication screen can be performed.
- ❺  MODE key → Changeover of the data input screen and the mode changeover screen which performs various detail settings can be performed.

❻ Media card slot (Close the cover for use.)

❼ Connector for RS-232C communication

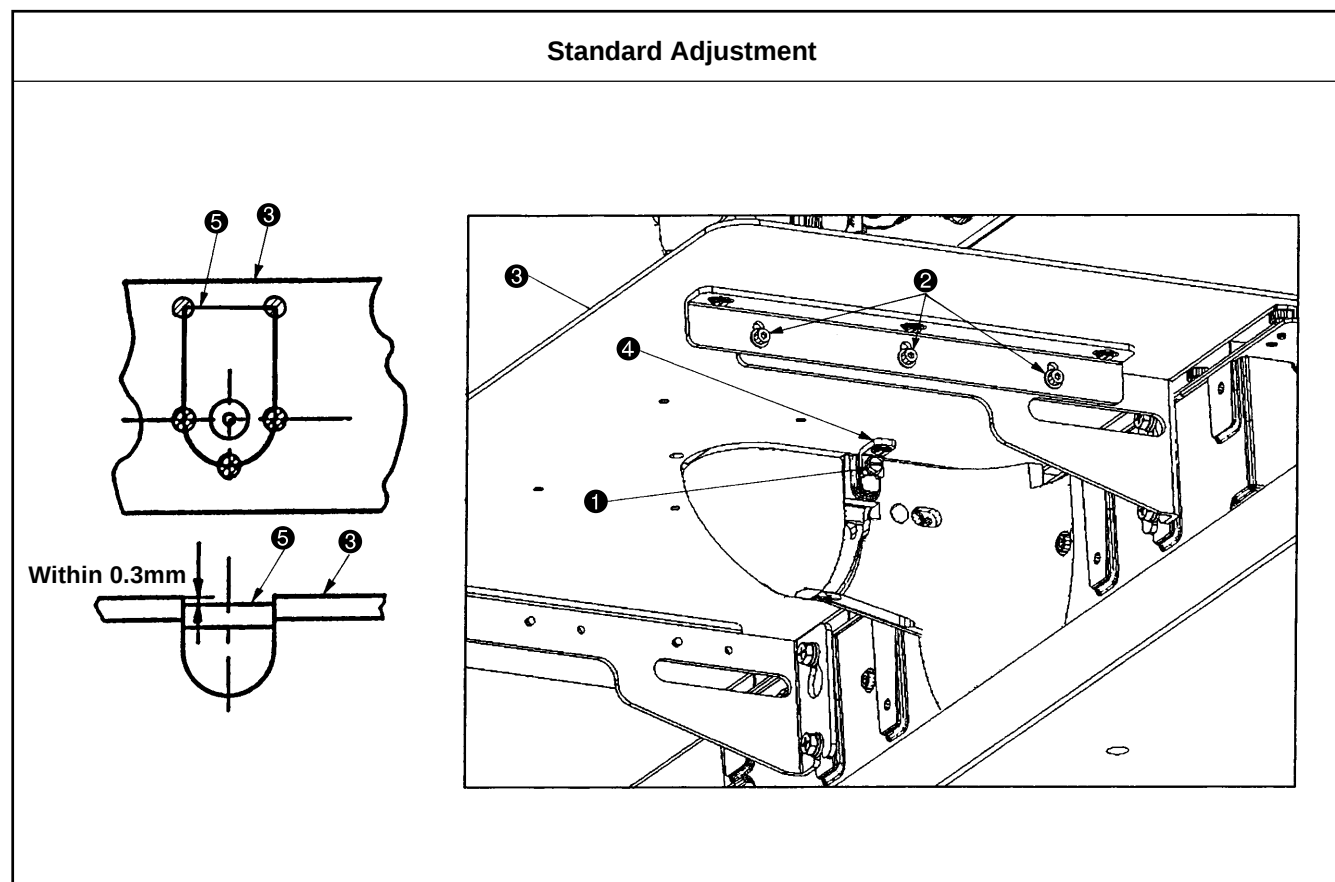
❽ Variable resistor for color LCD → Screen contrast can be adjusted. Adjust it as you desire.

❾ Connector for external input

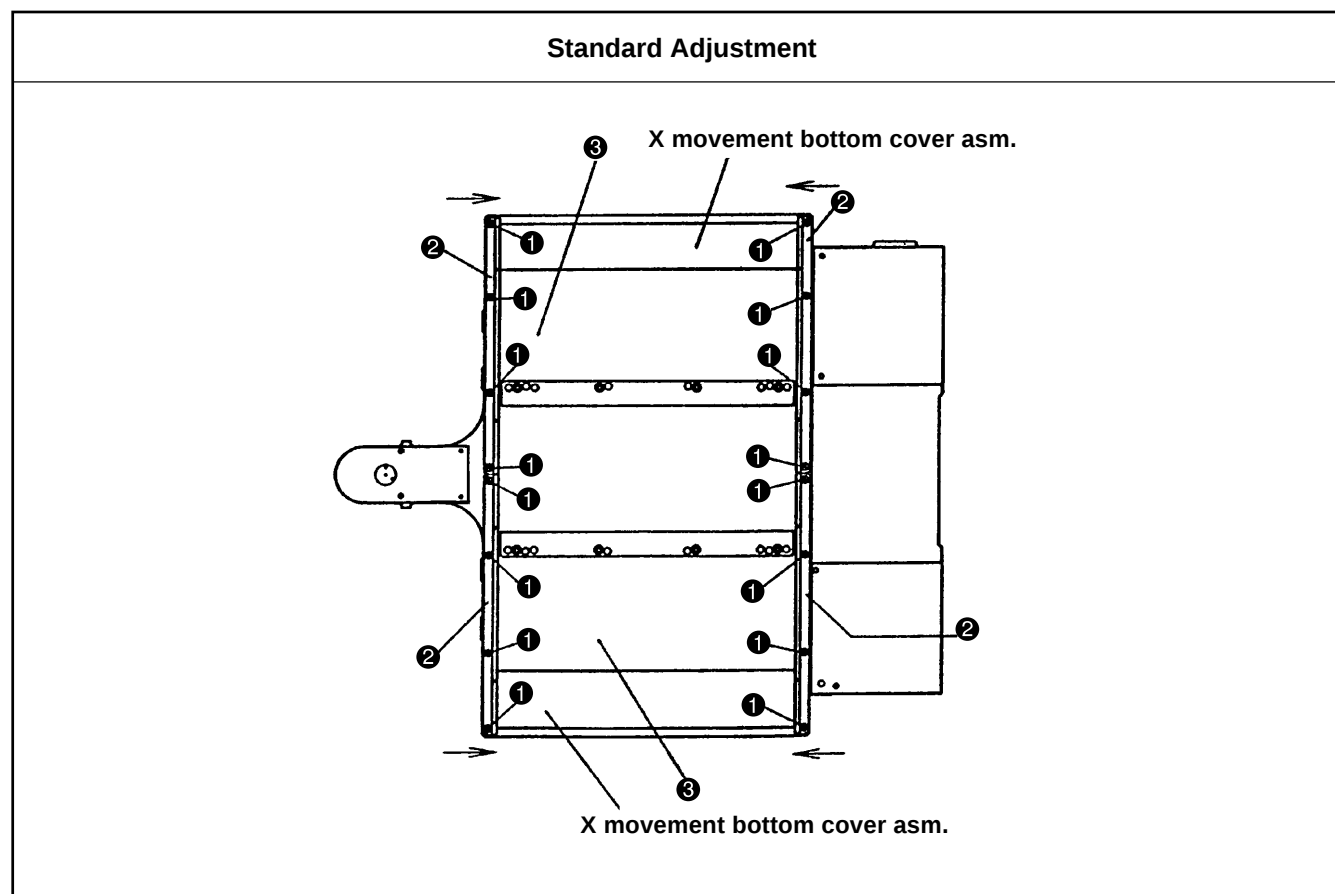
❿ Media removing lever

3. Standard adjustment

(1) Adjustment of the throat plate auxiliary cover height



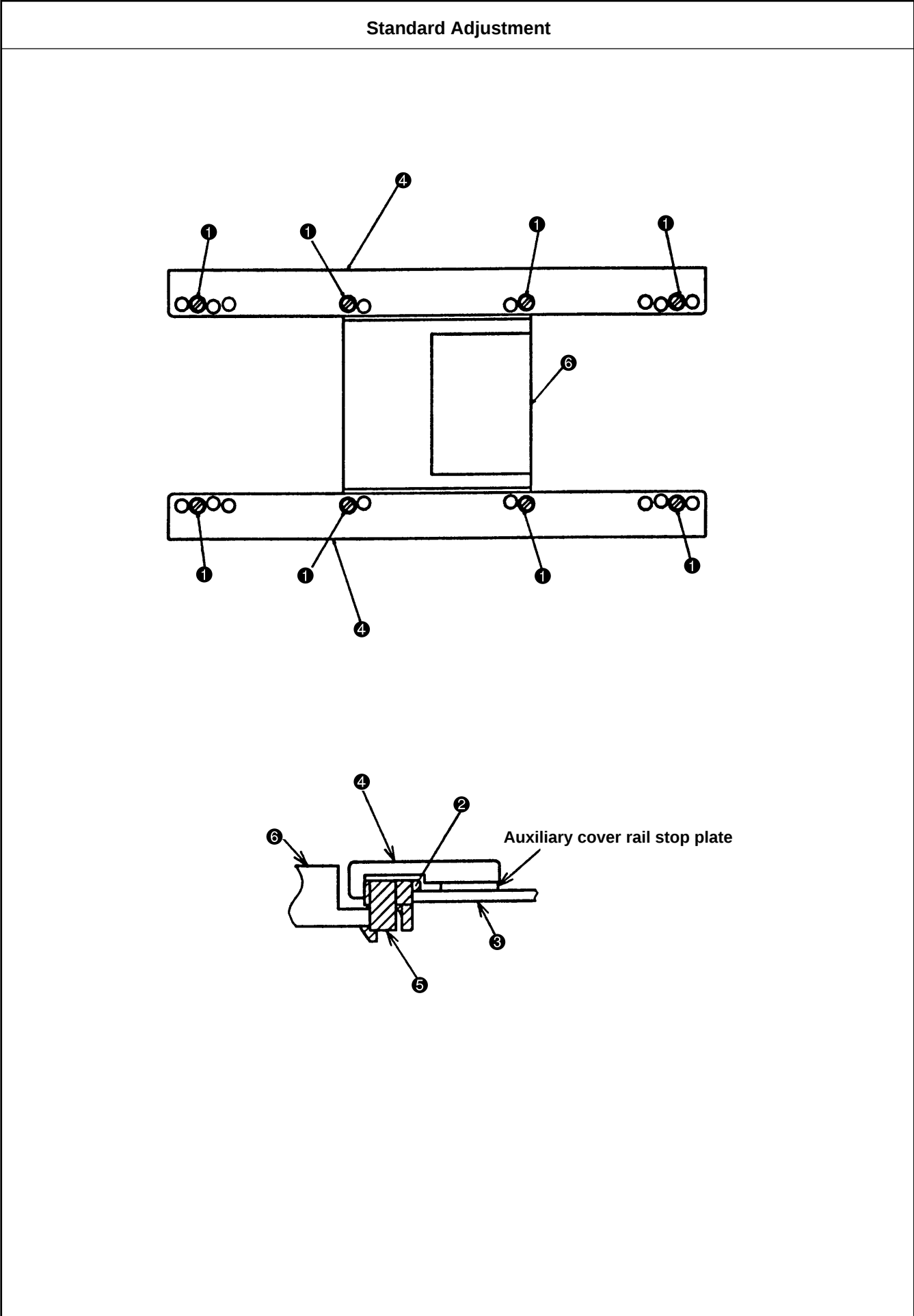
(2) Adjustment of the feed bar auxiliary cover rail X



Adjustment Procedures	Results of Improper Adjustment
1. Loosen 2 setscrews ❶ and 6 setscrews ❷. 2. Vertically move the throat plate auxiliary cover ❸ and the throat plate auxiliary cover support ❹ to make adjustments so that the throat plate auxiliary cover ❸ is positioned higher than the throat plate ❺ and that the vertical difference between two is kept within 0.3mm. Since then, fix them by means of 2 setscrews ❶ and 6 setscrews ❷.	- o The feed plate is caught by the stepped part of the throat plate ❺ and the throat plate auxiliary cover ❸, thus causing deformation of shape. - o Bending is caused in the feed plate.

Adjustment Procedures	Results of Improper Adjustment
1. Loosen 16 setscrews ❶. 2. Lightly push the feed bar auxiliary cover rail X ❷ in the direction of the arrow and adjust the X movement top cover asm. ❸ so that it can move smoothly without causing rattles. Since then, tighten 16 setscrews ❶.	o If there is any rattling, this can be a cause of noise.

(3) Adjustment of the X movement top cover

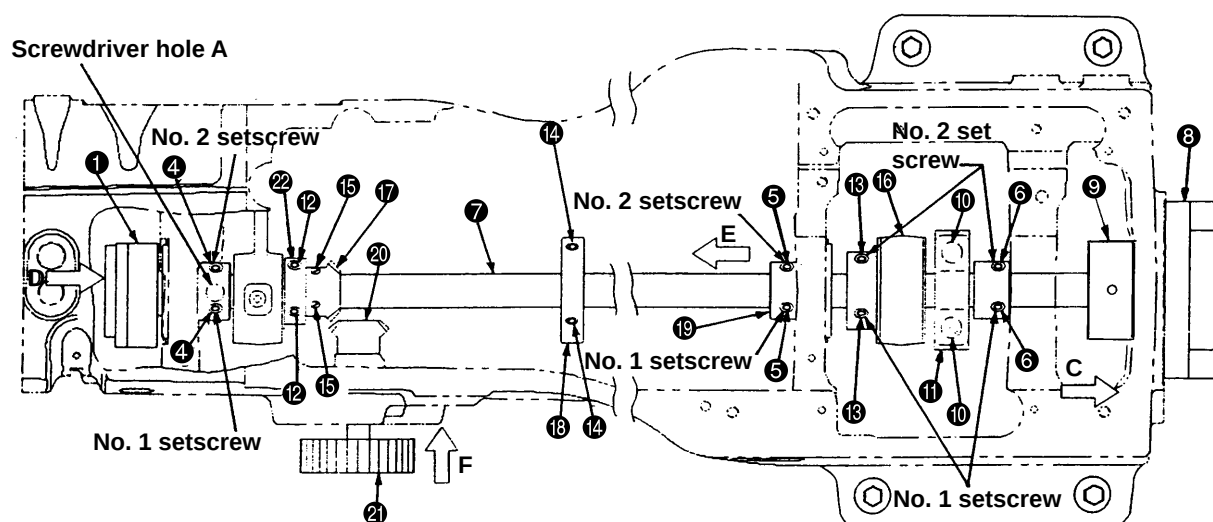
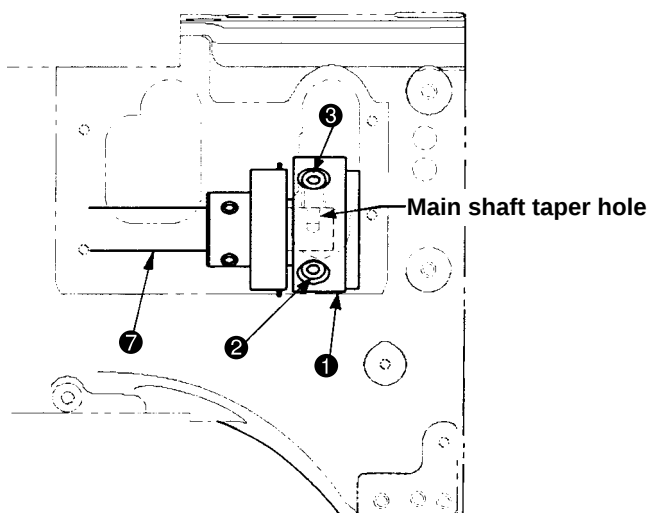


Adjustment Procedures	Results of Improper Adjustment
1. Loosen 8 setscrews ❶. 2. Lay the X movement top cover asm. ❸ beneath the embossed part ❷ of the Y guide rail. 3. Let the Y guide rail holder ❺ be pinched by the feed bar auxiliary cover rail Y ❹ and the X movement top cover asm. ❸ in order to remove rattling. At that time, 8 setscrews ❶ should be tightened tentatively to move the X movement base ❻ forward and backward while removing rattles uniformly. 4. Regularly tighten 8 setscrews ❶. (Caution) Apply a proper amount of grease on the sliding parts of the Y guide rail holder ❺.	- o If there is any rattling, this can be a cause of noise. - o If the rattling condition is removed extremely, this can be a cause of abrasion developed in the X movement top cover asm. ❸.

(4) Main shaft connection/disconnection

Procedures of disassembling

1. Loosen the setscrew ② securing the main shaft counterbalance ①, and remove the taper screw ③.
2. Loosen 2 setscrews ④ (through the screwdriver hole A), 2 setscrews ⑤, and 2 setscrews ⑥.
On this occasion, loosen No. 2 setscrew first, and completely remove No. 1 setscrew from the flat part of the main shaft ⑦.
3. Remove the main shaft motor ⑧.
Refer to "3.-(5) Removal of the main shaft motor and coupling".
4. Loosen 2 setscrews ⑩.
On this occasion, be aware that the balancer ⑪ may rotate due to loosened setscrews ⑩.
5. Loosen 2 setscrews ⑫.
6. Loosen 2 setscrews ⑬.
On this occasion, completely remove No. 1 setscrew of the setscrews ⑬ from the flat part of the main shaft ⑦.
7. Loosen 2 setscrews ⑭ and 2 setscrews ⑮.
8. Pull out the main shaft ⑦ in the direction of Arrow C.



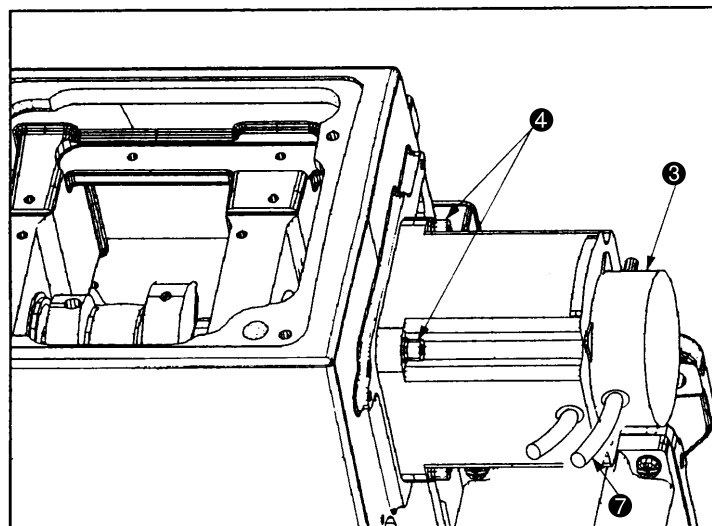
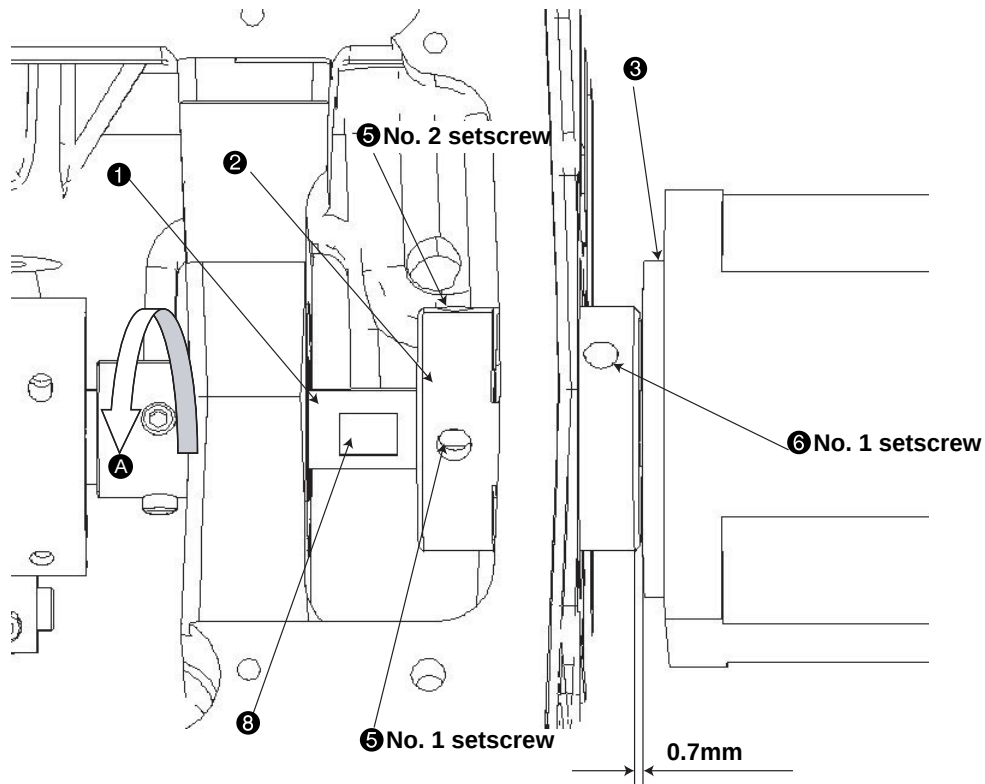
Procedures of assembling

1. Insert the main shaft ⑦ into the balancer ⑪, crank rod ⑩, bobbin winding drive wheel ⑬, hand pulley gear A ⑭, intermediate presser eccentric cam ⑮, and the main shaft counterbalance ① in this order, and mount this assembly on the frame.
2. Tighten the taper screw ③ into the taper hole of the main shaft ⑦, and tighten the setscrew ② to secure the main shaft counterbalance ①.
3. Lightly press the main shaft counterbalance ① in the direction of Arrow D and the middle metal ⑫ in the direction of Arrow E, and tighten 2 setscrews ⑤.
(Tighten No. 1 setscrew so that it touches the flat part of the main shaft ⑦. Then, tighten No. 2 setscrew. Same procedure hereafter)
4. Tighten 2 setscrews ④ and 2 setscrews ⑥. (Make sure that No. 1 setscrew touches the flat part of the main shaft ⑦.)
5. Mount the main shaft motor ⑧ and coupling ⑨.
Refer to "3.-(5) Removal of main shaft motor and coupling".
6. Secure the eccentric cam of the intermediate presser ⑮ with 2 setscrews ⑫. Refer to "3.-(8) Adjustment of intermediate presser cam".
7. Press the hand pulley ⑰ in the direction of Arrow F to engage the hand pulley gear A ⑭ with the hand pulley gear B ⑱, and secure them with 2 setscrews ⑬.
8. Secure the crank rod ⑩ with 2 setscrews ⑭. Refer to "3.-(6) Crank rod connection/disconnection".
9. Secure the balancer ⑪ with 2 setscrews ⑯. Refer to "3.-(7) Crank balancer positioning".
10. Secure the bobbin winding drive wheel ⑬ with 2 setscrews ⑮. Refer to "3.-(42) Adjustment of the bobbin winder driving wheel position".
 - * Make sure that no torque is applied by rotating the main shaft ⑦.

(5) Removal of main shaft motor and coupling

Procedures of disassembling

1. For removal of the main shaft with the coupling,
Loosen 2 setscrews **⑤** on the main shaft side of the coupling **②**, and remove 4 setscrews **④** securing the motor.
 2. For removal of the coupling **②** from the main shaft motor **③**, loosen 2 setscrews **⑥** on the main shaft motor side.
- (Caution)** The screw (hole) that can be seen first is No. 1 setscrew **⑥** when the main shaft **①** is turned in the forward direction **A**. For loosening, loosen No. 2 setscrew first, and for tightening, tighten No. 1 setscrew **⑥** first.



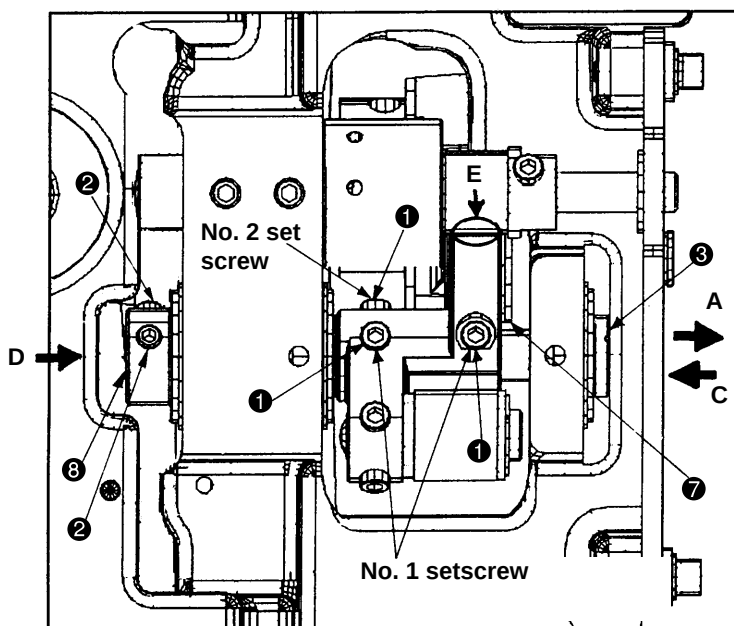
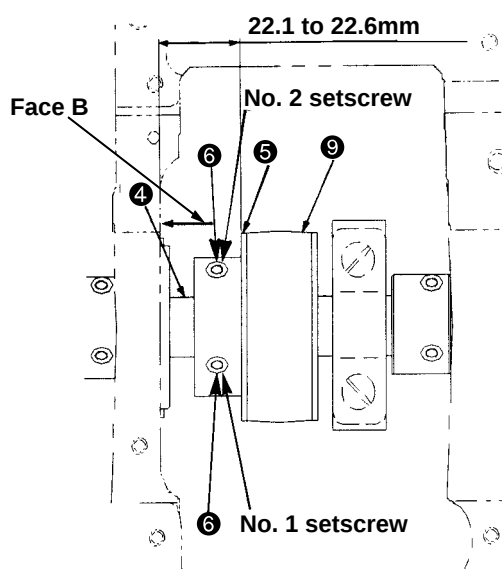
Procedures of assembling

1. For mounting the main shaft motor with the coupling,
 - (1) Tighten 4 setscrews ④ that securing the motor, and tighten 2 setscrews ⑤ on the main shaft side of the coupling ②.
 - (2) The cords ⑦ of the main shaft motor ③ should be positioned in the lateral direction.
2. For connecting the coupling to the main shaft motor,
 - (1) Provide a clearance of 0.7 mm between the coupling ② and main shaft motor ③.
 - (2) Apply No. 1 setscrew ⑤ of the coupling ② to the flat section ③ of the main shaft motor ③, the main shaft ① and secure it.
3. For engaging the coupling,
 - (1) Position the setscrew ⑥ (No. 1 setscrew) on the main shaft motor side between 2 setscrews ⑤ on the main shaft side, and engage the coupling.

(6) Crank rod connection/disconnection

Procedures of disassembling

1. Loosen 3 setscrews ❶ and 2 setscrews ❷. On this occasion, loosen No. 2 setscrews first, and completely disengage No. 1 setscrews from the flat section of the oscillator shaft ❸.
2. Pull out the oscillator shaft ❸ in the direction of Arrow A.
3. Remove the main shaft ❹ according to “3.-(4) Main shaft connection/disconnection”, and remove the crank rod unit ❾.



Procedures of assembling

1. Mount the main shaft ④ according to “3.-(4) Main shaft connection/disconnection”, and mount the crank rod unit ⑨.
 2. Adjust the clearance to 22.1 to 22.6 mm between the under cam ⑤ of the crank rod unit ⑨ and Face B (middle metal bearing mounting face) of the frame, and secure the cam with the setscrew ⑥.
(Apply No. 1 setscrew to the flat section of the main shaft ④ and tighten it first, then tighten No. 2 setscrew. Same procedure hereafter)
 3. Pass the oscillator ⑦ through the oscillator shaft ③, and mount them on the frame.
 4. Pass the thrust collar ⑧ through the oscillator shaft ③. Lightly press the oscillator shaft ③ in the direction of arrow C and the thrust collar ⑧ in the direction of Arrow D, and tighten 2 setscrews ②. Make sure that No. 1 setscrew touches the flat section of the oscillator shaft ③.)
 5. Secure the oscillator ⑦ according to “3.-(14) Oscillator gear positioning”.
- (Caution)**
1. Make sure that no torque is applied by rotating the main shaft ④.
 2. When the crank rod unit ⑨ is connected, disconnected, or positioned, or the oscillator ⑦ is positioned, be sure to grease two specified positions and the gear section (E) of the oscillator ⑦.
 3. After positioning the crank rod unit ⑨ (under cam ⑤), be sure to perform “3.-(14) Oscillator gear positioning”. Wrong positioning of the under cam ⑤ or oscillator ⑦ may cause frictional wear or lock-up.

(7) Crank balancer positioning

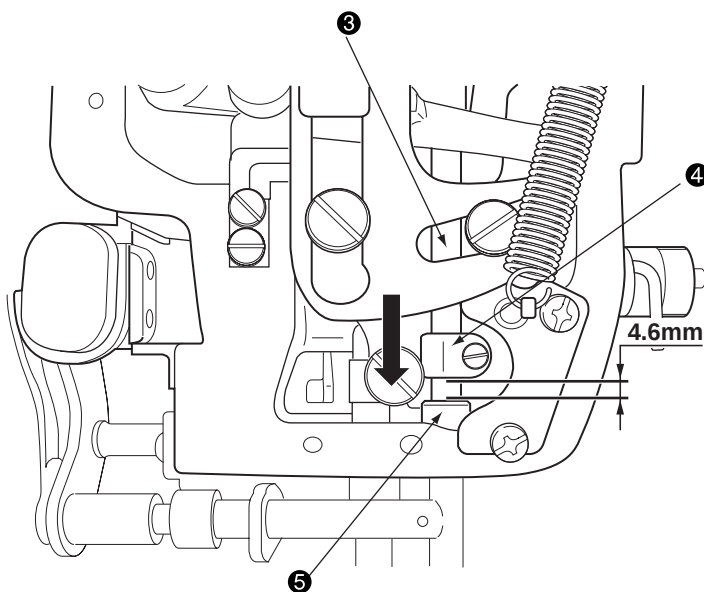
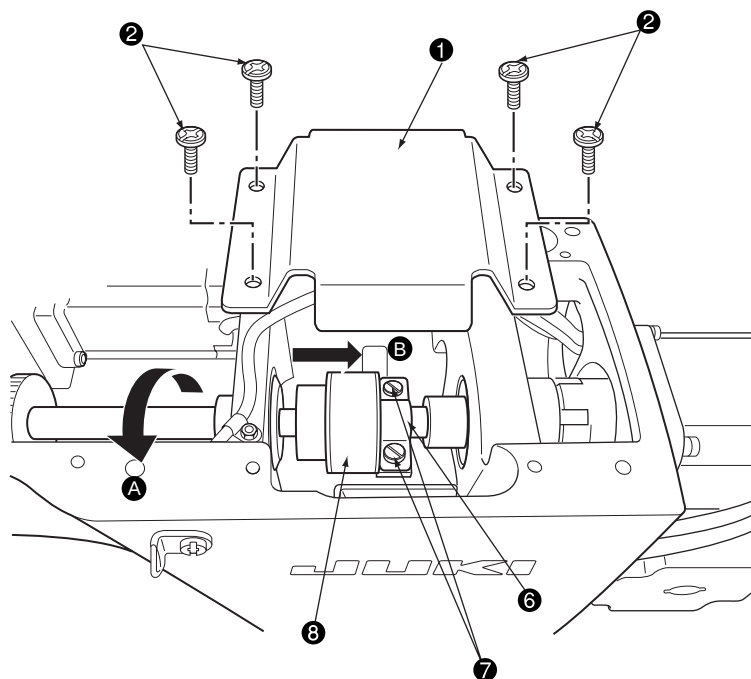
Standard Adjustment

[Rotating direction]

When the needle bar **③** lowers and the clearance between the needle bar connecting **④** and needle bar lower bushing **⑤** is 4.6 mm, 2 setscrews **⑦** of the crank balancer **⑥** becomes horizontal position.

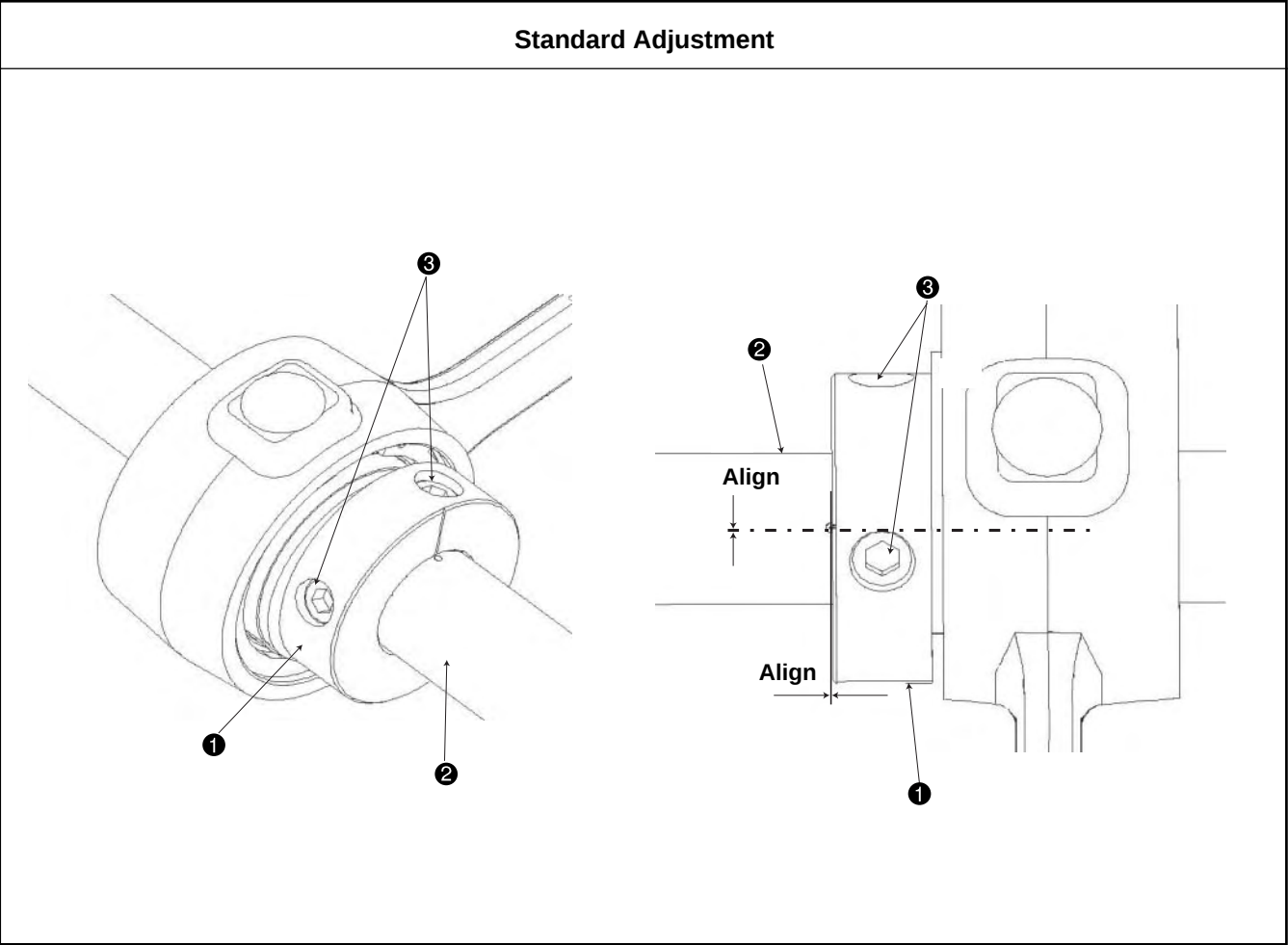
[Axial direction]

Bring the main shaft eccentric cam **⑧** into contact with the crank balancer **⑥**.

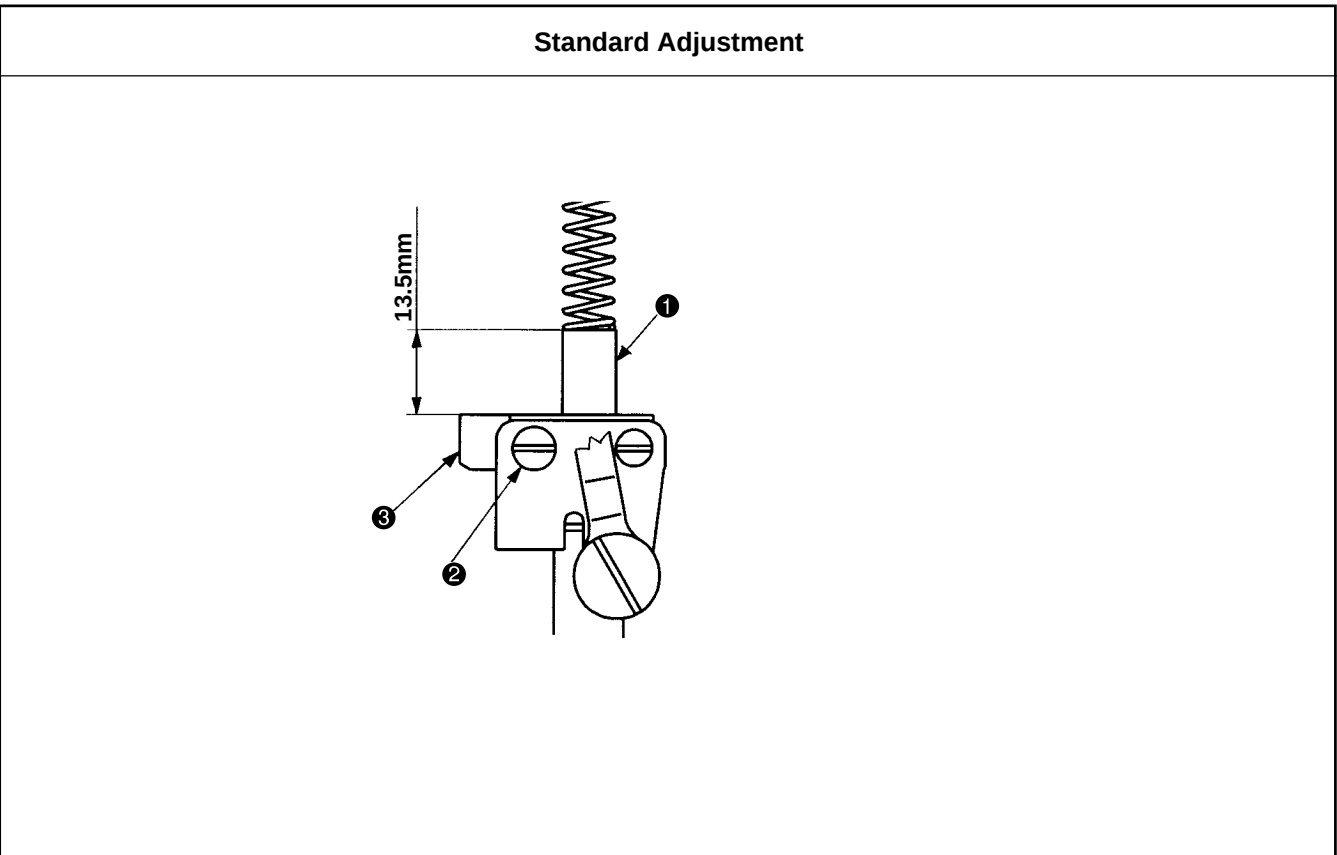


Adjustment Procedures	Results of Improper Adjustment
If the main shaft eccentric cam ⑧ is not secured, the main shaft eccentric cam ③ should be positioned first. 1. Remove 4 setscrews ②, then remove the crank rod cover ①. 2. Loosen 2 setscrews ⑦ securing the crank balancer ⑥. 3. Turn the main shaft in the forward direction ④ so that the needle bar ③ lowers and the clearance between the needle bar connecting ④ and needle bar lower bushing ⑤ is 4.6 mm. 4. Secure the crank balancer ⑥ with 2 setscrews ⑦ under the conditions that 2 setscrews ⑦ securing the balancer ⑥ are horizontally positioned and the balancer ⑥ is moved in the direction of Arrow ② to make it into contact with the main shaft eccentric cam ⑧. For tightening 2 setscrews ⑦, tighten them alternately.	- o If the mounting angle of the crank balancer ⑥ is wrong, vibration during sewing will be intensified. - o If the sewing machine is used for a long time under the condition of wrong securing position, the life of main shaft bearing may be shortened.

(8) Adjustment of intermediate presser cam



(9) Adjustment of intermediate presser bar



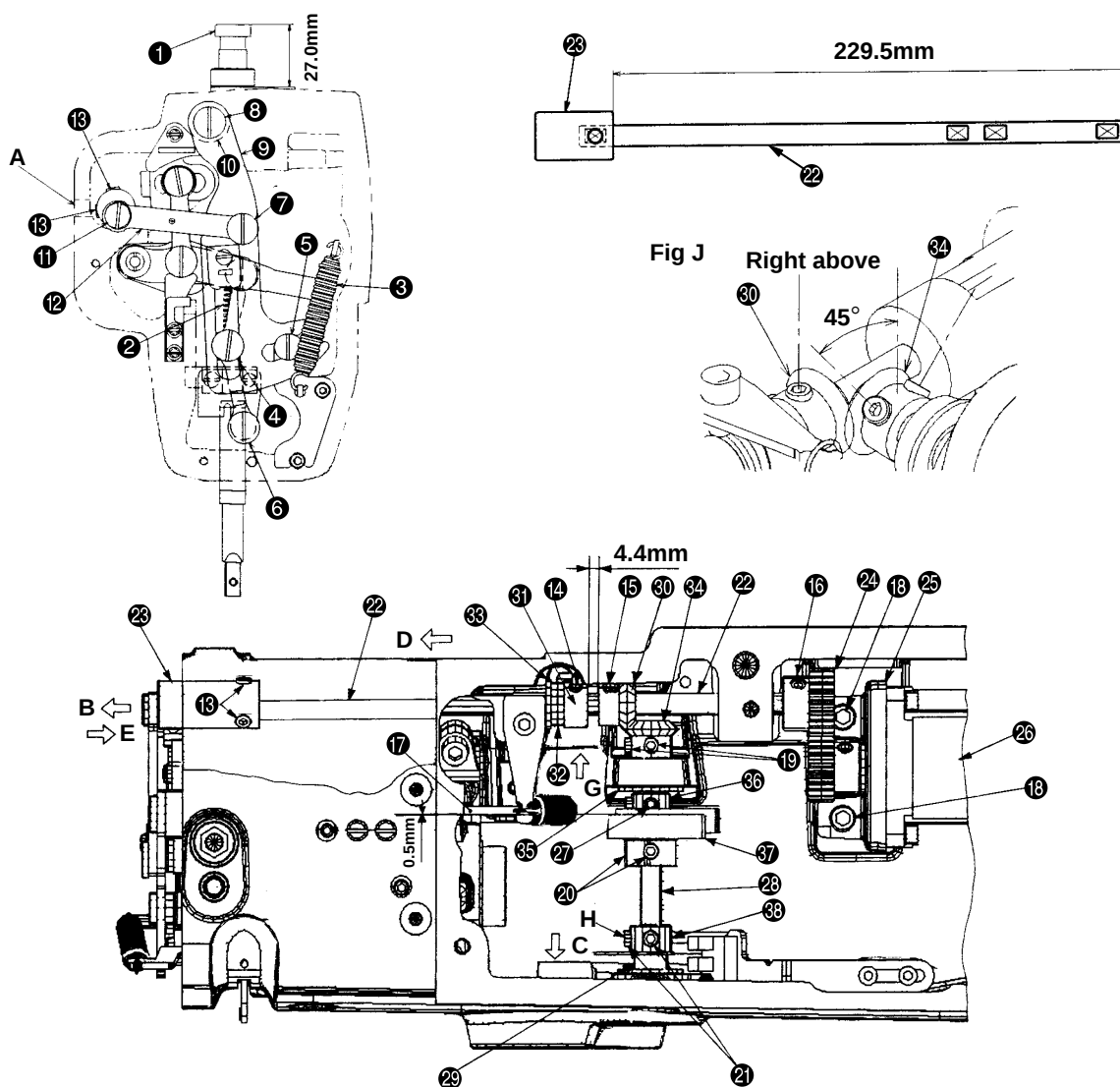
Adjustment Procedures	Results of Improper Adjustment
1. Align the edge of the intermediate presser cam ❶ with the center of the engraved point on the main shaft ❷, align the engraved line on the intermediate presser cam ❶ with the engraved point on the main shaft ❷, and tighten the setscrew ❸.	o Stitch skipping and poor tense stitch may occur.

Adjustment Procedures	Results of Improper Adjustment
1. Adjust the thrusting distance of the intermediate presser bar ❶ to 13.5 mm, and tighten the setscrew ❷ after ensuring that the needle passes through the center of the intermediate pressure. (Caution) Be aware that the tightening pressure of the setscrew ❷ should be from 2.16 to 2.75 N•m (22 to 28 kgf•cm).	- o An excessive thrusting distance of the intermediate presser bar ❶ may damage the intermediate presser spring or cause poor presser lifting. - o Excessive tightening pressure may deform the intermediate pressure bar ❶ or intermediate presser bar connecting ❸ resulting in malfunction.

(10) Intermediate presser variable connection/disconnection

Procedures of disassembling

1. Remove the presser adjusting screw ①. Then, remove the intermediate presser spring ② and the guide shaft.
2. Remove the intermediate presser auxiliary spring ③.
3. Remove the stepscrews ④, ⑤, and ⑥.
4. Remove the stepscrew ⑦.
5. Remove the stepscrew ⑧, and then the intermediate presser variable plate ⑨ and the variable plate spacer ⑩.
6. Remove the stepscrew ⑪, and then the intermediate presser variable link ⑫.
(At that time, insert a hexagonal wrench through the arm screw hole A and apply it to the setscrew ⑬ as a means of turn stop for the intermediate presser variable arm ⑬.)
7. Loosen 2 each of the setscrews ⑭, ⑮, and ⑯.
At that time, the second screw should be loosened first. The first screw of the setscrew should be removed, completely separate from the flat part of the intermediate presser variable shaft ⑲.
8. After the intermediate presser variable arm ⑬ and the intermediate presser variable shaft ⑲ have been pulled out in the direction of the Arrow B, loosen the setscrew ⑮ and pull out the intermediate presser variable shaft ⑲ from the intermediate presser variable arm ⑬.
At that time, both of the setscrews ⑮ should be separated completely from the flat parts (2 positions) of the intermediate presser variable shaft ⑲.
9. Loosen the 2 setscrews ⑰ and remove the trailing gear ⑲, the intermediate presser motor installing base ⑳, and the intermediate presser motor ㉑.
10. Loosen 2 each of the setscrews ㉒, ㉓, ㉔ and ㉕.
At that time, the second screws of the setscrews ㉒ and ㉓ should be loosened first. The first screw of the setscrew should be removed, completely separate from the flat part of the intermediate presser lifting shaft ㉖.
11. Remove the E ring ㉗ and pull out the intermediate presser lifting shaft ㉖ in the direction of the Arrow C.



Procedures of assembling

1. Fix the intermediate presser variable shaft ②② to the intermediate presser variable arm ②③ by means of the 2 setscrews ①⑧ so that the length of the shaft section becomes 229.5mm.
(Both setscrews ①⑧ should be adjusted level to the intermediate presser variable shaft ②②.)
2. Insert the washer ③③, thrust bearing ③②, thrust collar ③①, and the drive bevel gear ③① in the intermediate presser variable shaft ②② in this order, and mount this assembly on the frame.
3. Pressing the intermediate presser variable arm ②③ in the direction of the Arrow E, secure a proper thrust by pressing the thrust collar ③① in the direction of the Arrow D and tighten the two setscrews ①④. (Tighten the first screw first so that it is fixed level to the intermediate presser variable shaft ②②. Then, tighten the second screw. To be done in the same manner hereafter.)

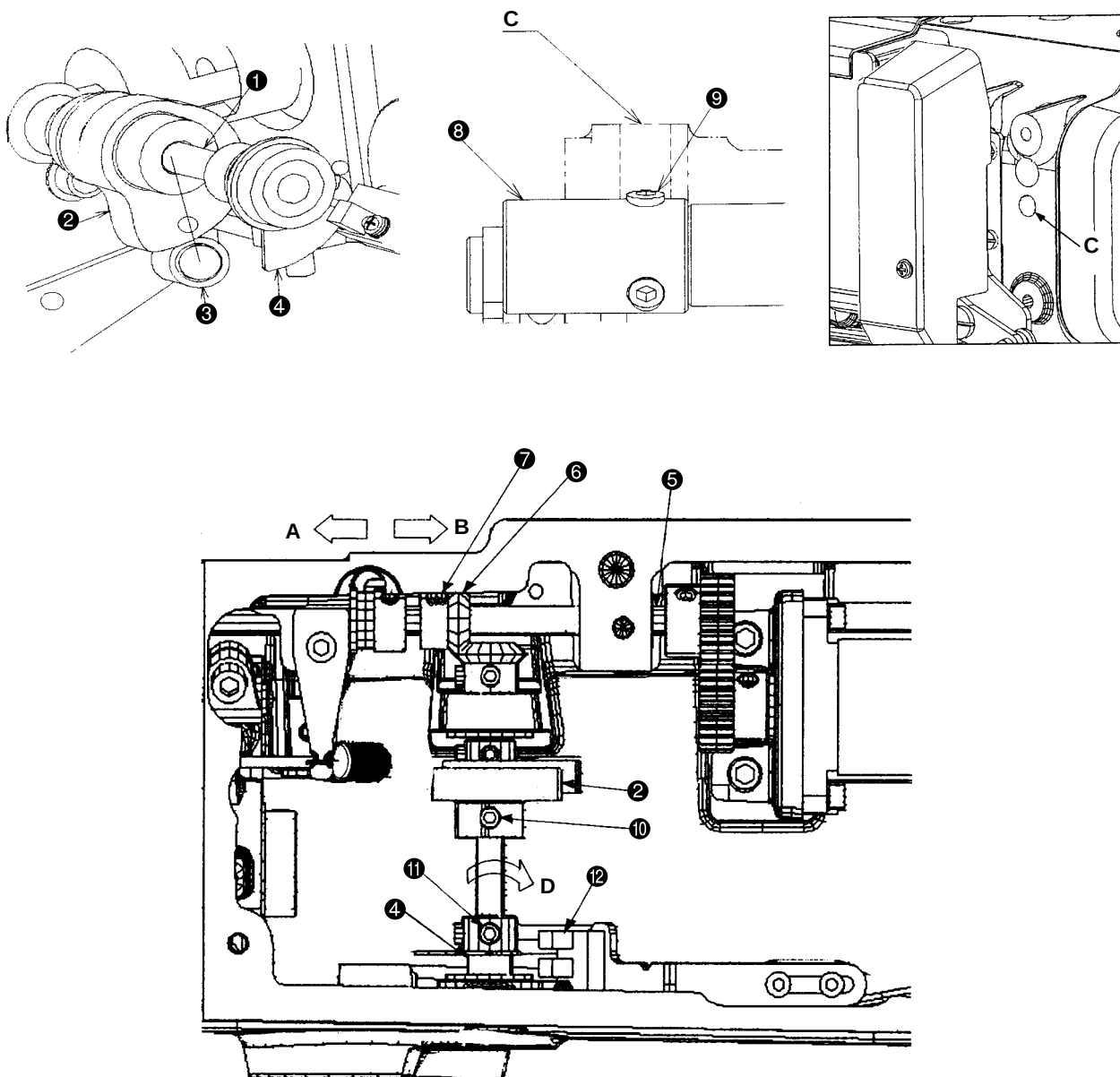
(Caution) If there is rattle in the variable shaft of the intermediate presser ②② in the forward and backward directions, this can be a cause of intermediate presser step-out. Be careful when you try to fix the thrust collar ③①.

4. Adjust the distance to 4.4mm between the thrust collar ③① and the drive bevel gear ③①. Tighten the first screw of the setscrew ①⑤ and fasten the trailing bevel gear ②④ with the setscrew ①⑥.
(Tightened till the completion of intermediate presser sensor adjustment)
5. When the intermediate presser motor ②⑥ is fixed to the intermediate presser motor installing base ②⑤, tentatively fix it to the frame with 2 setscrews ①⑧. Turn the trailing bevel gear ②④ and adjust the intermediate presser motor asm. to the position where the amount of backlash becomes zero. Since then, tighten 2 setscrews ①⑧.
6. Insert the sensor slit ③③, intermediate presser lifting cam ②⑦, thrust collar ③⑥, and the wave washer ③⑤ in the intermediate presser lifting shaft ②③ in this order, and pass this assembly through the frame. Mount the E ring ②⑨ on the intermediate presser lifting shaft ②③.
7. Pressing the intermediate presser lifting shaft ②③ in the direction of the Arrow C, press the thrust collar ③⑥ in the direction of the Arrow G and tighten the two setscrews ②⑦.
8. Fix the intermediate presser lifting cam ②⑦ by means of the 2 setscrews ②① so that the clearance becomes 0.5mm between both end planes of the intermediate presser lifting cam ②⑦ and the intermediate presser lifting link ①⑦.
9. Turn the intermediate presser variable shaft ②② and the intermediate presser lifting shaft ②③ so that the trailing bevel gear ③④ and the drive bevel gear ③① are positioned as shown in Fig. J. Since then, fix them by means of the 2 setscrews ①⑨ while the trailing bevel gear ③④ is pressed in the direction of the Arrow G (in order to reduce the backlash to zero).
10. Press the sensor slit ③③ in the direction of the Arrow C and turn the setscrew ②① so that its H comes in the section toward the setscrew ②① of the intermediate presser lifting cam ②⑦. Then, fix H of the setscrew ②① tentatively.
11. According to adjustments of intermediate presser variable as described in 3-(11), make adjustments of intermediate presser variable and fasten the setscrews of the drive bevel gear ③① and the sensor slit ③③.
12. Using the stepscrew ①①, mount the intermediate presser variable link ①② on the intermediate presser variable arm ②③.
13. Using the stepscrew ⑧, mount the intermediate presser variable plate ⑨ and the variable plate spacer ⑩.
14. Mount the stepscrews ④, ⑤, and ⑥.
15. Using the stepscrew ⑦, mount the intermediate presser variable link ①② on the intermediate presser variable plate ⑨.
16. Mount the intermediate presser auxiliary spring ③.
17. Mount the intermediate presser spring ② and the guide shaft from above the frame. Then, mount the presser adjusting screw ①.
(27.0mm from the upper plane of the arm to that of the presser adjusting screw ①)

(11) Intermediate presser variable adjustments

Standard Adjustment

Start the test mode I10 (IP-410). When  is pressed twice after the completion of origin retrieval, there is coincidence between the center of left hole C in the arm and the second screws ⑨ of the intermediate presser movable arm ⑧.

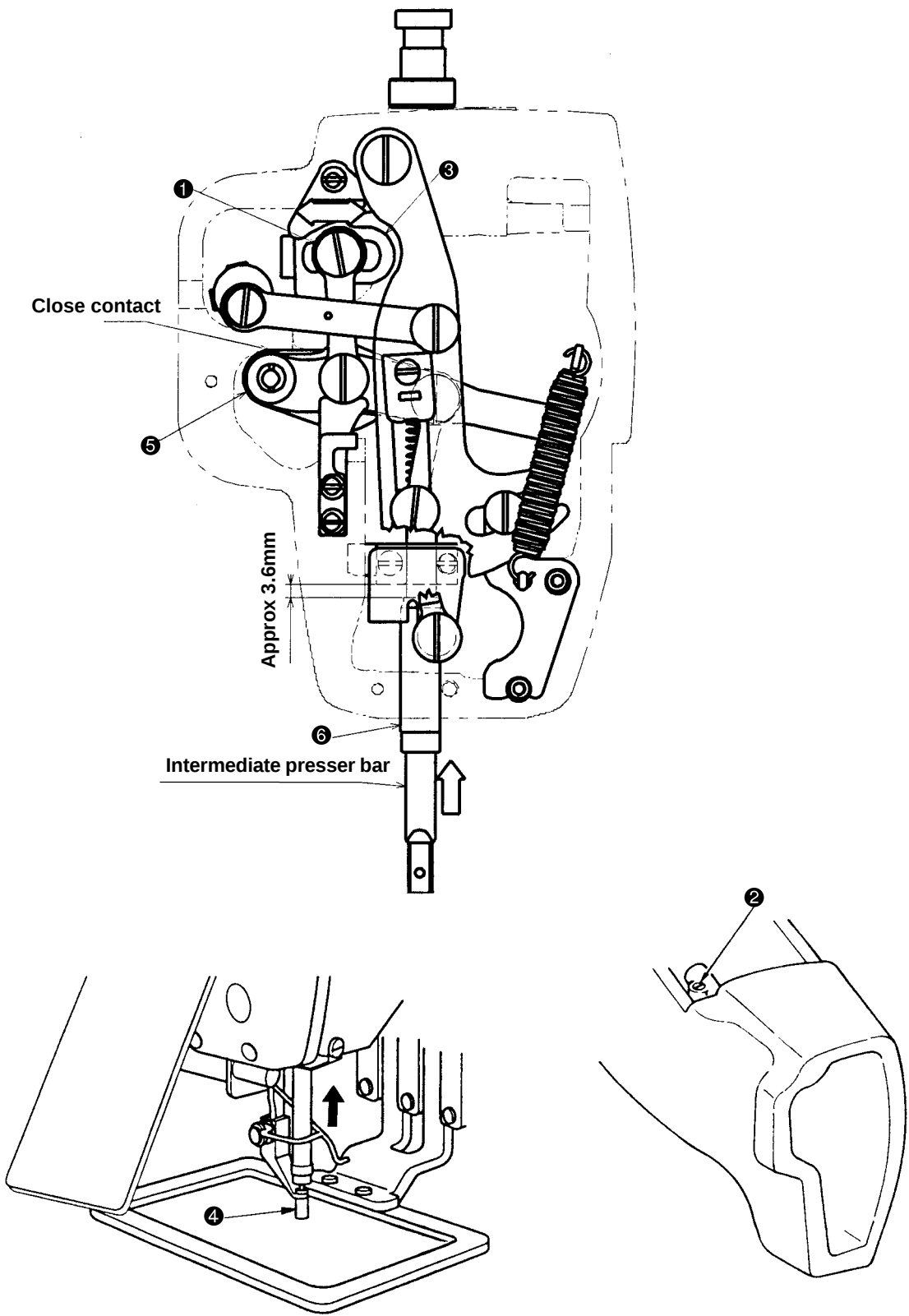


Adjustment Procedures	Results of Improper Adjustment
1. Start the Test Mode I10 (IP-410). 2. Tread on the start pedal for origin retrieval, and make adjustments by turning the sensor slit ④ so that the lines combining the center of the intermediate presser lifting shaft ①, the standard hole of the intermediate presser lifting cam ②, and the center of the cam follower ③ become almost a straight line. 3. Press  of the panel three times. Loosen the first screw ⑦ of the drive bevel gear ⑥ of the intermediate presser variable shaft ⑤. Take out the drive bevel gear ⑥ from the flat part of the intermediate presser variable shaft ⑤ and move it in the direction of the Arrow A. 4. Using the [+] key or the [-] key, turn the intermediate presser variable shaft ⑤ until the second screw ⑨ of the intermediate presser variable arm ⑧ settles in the center of the arm's left-side hole C. (Insert a hexagonal wrench to adjust positioning so that the arm comes in the center of backlash deflection.) 5. Turn the intermediate presser lifting shaft ① so that the second screw ⑩ of the intermediate presser lifting cam ② comes just above. Press the drive bevel gear ⑥ of the intermediate presser variable shaft ⑤ in the direction of the Arrow B to fix it. 6. After the completion of second origin retrieval, press  of the panel twice to secure the [timing adjustment position]. In this case, confirm that the second screw ⑨ of the intermediate presser variable arm ⑧ is positioned in the center of the arm's left-side hole C or below it. (If the screw seems to have been positioned above the center, return to Step 4 and repeat the above-mentioned adjustments.) 7. If the second screw ⑨ of the intermediate presser variable arm ⑧ is not positioned in the center (or lower), loosen the setscrew ⑪ of the sensor slit ④ and turn this sensor slit ④ in the direction of the Arrow D for fine adjustments. 8. Make origin retrieval and confirm that the the cam follower ③ is located in the parallel section of the intermediate presser lifting cam ②. When the condition has been found normal, fasten the setscrew ⑦ of the drive bevel gear ⑥ and the setscrew ⑪ of the sensor slit ④ regularly. (Caution) For the prevention of the sensor ⑫ from destruction, make origin retrieval after confirming that the slit of the sensor slit ④ is positioned in the center of the sensor ⑫.	- o There will be a displacement between the variable value of the intermediate presser lower position and the panel setup value. - o If there is no cam follower ③ in the parallel section of the intermediate presser lifting cam ② at the time of origin retrieval, stepping out may occur in the intermediate presser motor, thus causing defective stitches, generation of sound from the face plate section, and destruction of parts. - o If adjustments of backlash are insufficient for the drive bevel gear ⑥, stepping out may occur in the intermediate presser motor, thus causing defective stitches, generation of sound from the face plate section, and destruction of parts. .

(12) Intermediate presser drive arm

Standard Adjustment

* Refer to Instruction Manual, 4-7. Intermediate presser height.

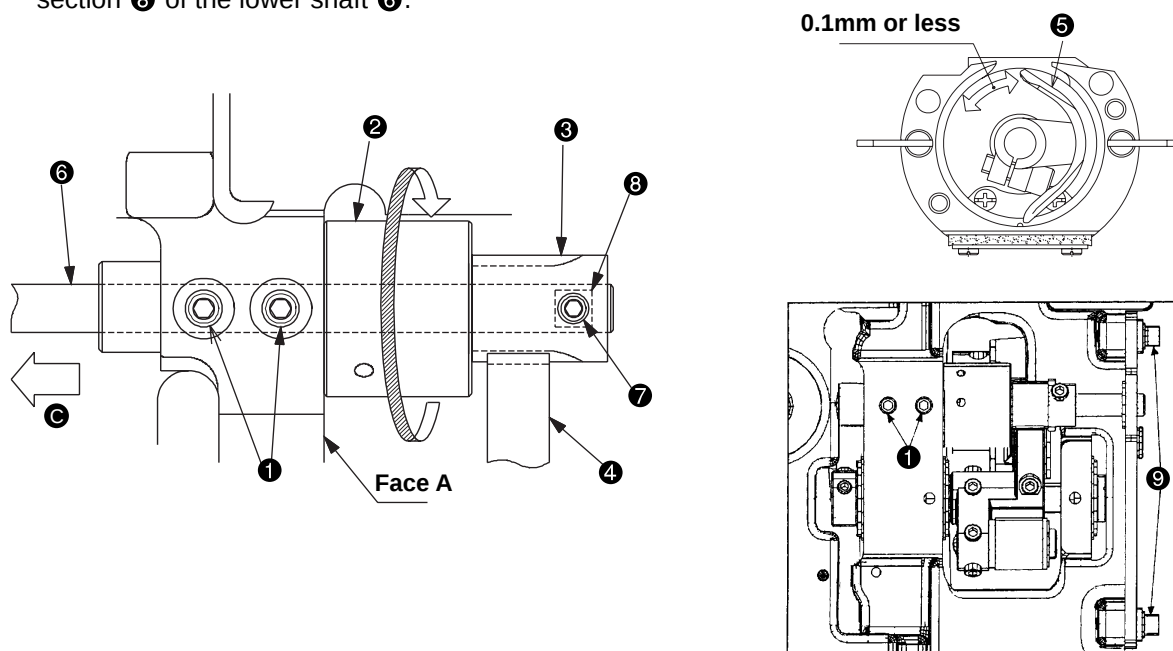


Adjustment Procedures	Results of Improper Adjustment
1. Turn ON the power supply and set the height of the intermediate presser ④ to 0mm. Turn OFF the power supply in the state that the intermediate presser ④ has been lowered. 2. Loosen the intermediate presser stroke adjusting screw ①. 3. Turn the pulley and move the needle bar to the lower dead point. When the intermediate presser ④ is lifted and the intermediate presser stroke adjusting screw ① is moved to the right or left, confirm that the intermediate presser adjusting arm ③ is positioned not to move vertically and that the intermediate presser positioning link ⑤ keeps a close contact with the arm. In this state, tighten the setscrew ② of the intermediate presser drive arm. (The clearance is approximately 3.6mm between the intermediate presser needle bar connection and the intermediate presser bar metal ⑥.) 4. After the setscrew ② has been tightened, confirm that there is no backlash in the intermediate presser adjusting arm ③ in the forward and backward directions. 5. Finally, make adjustments of the intermediate presser stroke. (Refer to Instruction Manual III. MAINTENANCE OF SAWING MACHINE, 1-4. Adjusting the vertical stroke of the intermediate presser.)	- o If there is no clearance, there will be interference between the intermediate presser bar metal ⑥ and the intermediate presser needle bar connection during sewing machine operation, and this will generate abnormal sound as a result. - o If there is too much clearance, there will be interference between the intermediate presser adjusting arm ③ and the arm during sewing machine operation, thus generating abnormal sound as a result. - o If there is too much or too less clearance, the lower dead-point height of the intermediate presser ④ may be changed as a result of intermediate presser stroke adjustments.

(13) Lower shaft backlash adjustment and connection/disconnection

Standard Adjustment

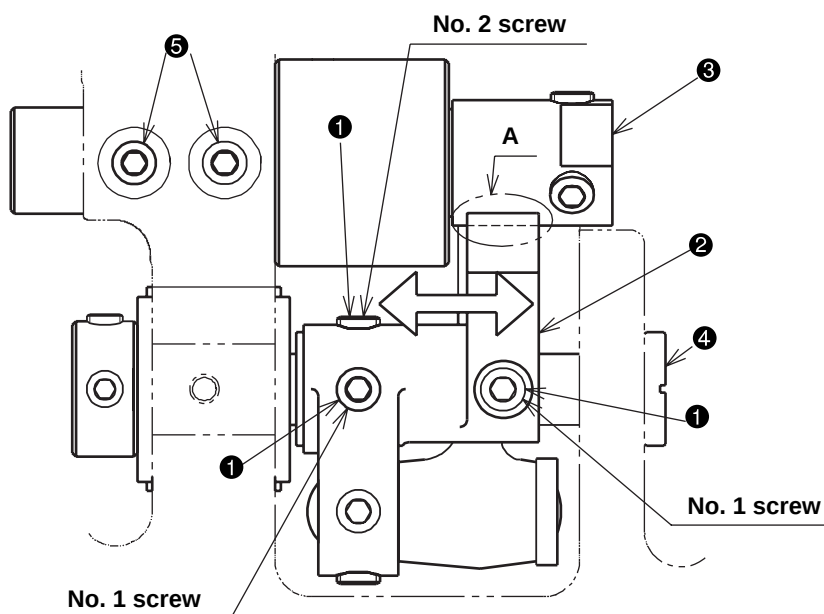
1. Size of lower shaft backlash is 0.1mm at the tip of the driver ⑤. The shaft is required to rotate smoothly.
2. Define the stop position of the lower shaft ⑥ so that the setscrew ⑦ settles almost in the center of the flat section ⑧ of the lower shaft ⑥.



(14) Oscillator gear positioning

Standard Adjustment

1. When the oscillator is lightly swung by a finger in the direction of the arrow, the oscillator ② is fixed in the center position of swinging.

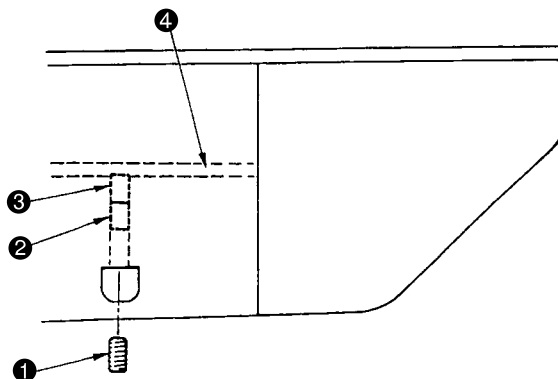


Adjustment Procedures	Results of Improper Adjustment
1. Lower shaft backlash 1) Loosen 2 setscrews ❶ and 2 setscrews ❹. 2) Turn the lower shaft rear metal ❷ in the direction of the arrow and adjust the backlash, keeping the metal to contact closely with Face A. Size of backlash is 0.1mm at the tip of the driver ❺. The shaft is required to rotate smoothly. 3) Tighten the 2 setscrews ❶. 4) Tighten the 2 setscrews ❹. (Caution) When eliminate the backlash, the direction of rotation should always be kept in the direction of the arrow. 2. Lower shaft connection/disconnection 1) Loosen the 2 setscrews ❷. 2) The lower shaft ❸ can be taken out if it is pulled in the direction ❸ of the arrow. 3) When mounting the lower shaft ❸, insert it in the lower shaft rear metal ❷ and the lower shaft gear ❹. Apply 1 of the setscrews ❷ to the flat section ❸ of the lower shaft ❸ and tighten it approximately in the center. Tighten the remaining setscrew ❷. * Connection and disconnection of the lower shaft ❸ become easy if the above-mentioned backlash has been relieved in advance. In this case, backlash adjustment must be done after the lower shaft ❸ has been installed.	- o If the backlash is excessive, the hook noise will be increased. - o If backlash is too small, the lower shaft gear ❹ or the oscillator ❺ will give rise to frictional wear. In addition, this can be a cause of crank rod lock-up. - o If the front or rear position of the lower shaft rear metal ❷ is displaced at the time of backlash adjustment, this can also be a cause of the lock-up of oscillator ❺ or the crank rod.

Adjustment Procedures	Results of Improper Adjustment
1. Loosen the 2 setscrews ❶ and increase the backlash of the lower shaft gear ❹. (Caution) 1. If the lower shaft gear ❹ has insufficient backlash, the oscillator ❺ does not swing correctly. In such a case, refer to [(13) Lower shaft backlash adjustment and connection/disconnection] and provide a sufficient backlash. 2. The 3 setscrews ❶ should have been loosened in advance. In this case, the second screw of the setscrews ❶ should be loosened first. Then, the first one can be loosened. 3. Lightly swing the whole body of the oscillator ❺ with a finger in the direction of the arrow. Decide the positioning of the oscillator ❺ so that it stays in the center of swinging. 4. Loosen the 3 setscrews ❶ and then fix them so that the oscillator ❺ is not displaced from the center of swinging. (Tighten the first screw first so that it comes in contact flatly with the oscillator shaft ❺. Then, tighten the second one.) 5. Make backlash adjustment for the lower shaft gear ❹, according to [(13) Lower shaft backlash adjustment and connection/ disconnection]. (Cautions) 1. In the case of disassembly and adjustment, grease-up treatment is always needed for the specified places (2 positions) and the gear area A of the oscillator ❺. 2. When the crank rod (under-cam) is removed, actions for under-cam positioning must be taken, without fail. Refer to [(6) Crank rod connection/ disconnection].	o If the position for fixing the oscillator ❺ is inadequate, this can also be a cause of the frictional wear or lock-up of the oscillator pin, crank rod lid, under-cam, and the crank rod.

(15) Adjustment of hook oil amount

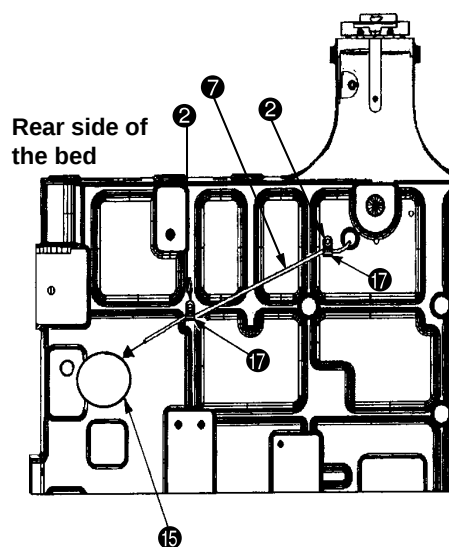
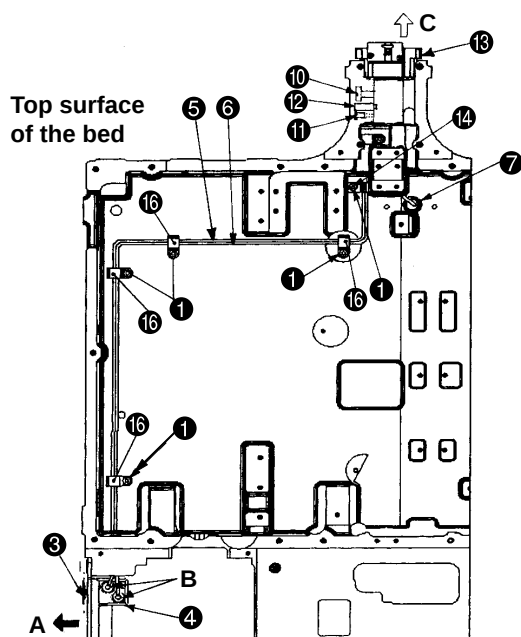
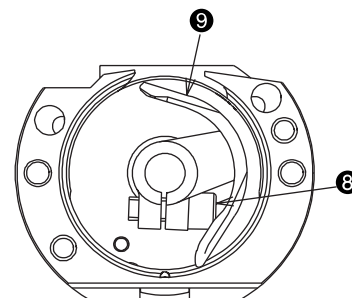
Standard Adjustment



(16) Shuttle connection / disconnection and oil wick piping

Procedures of disassembling

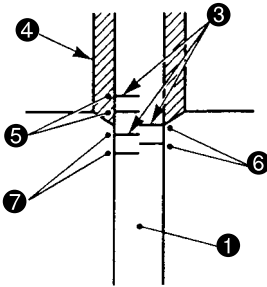
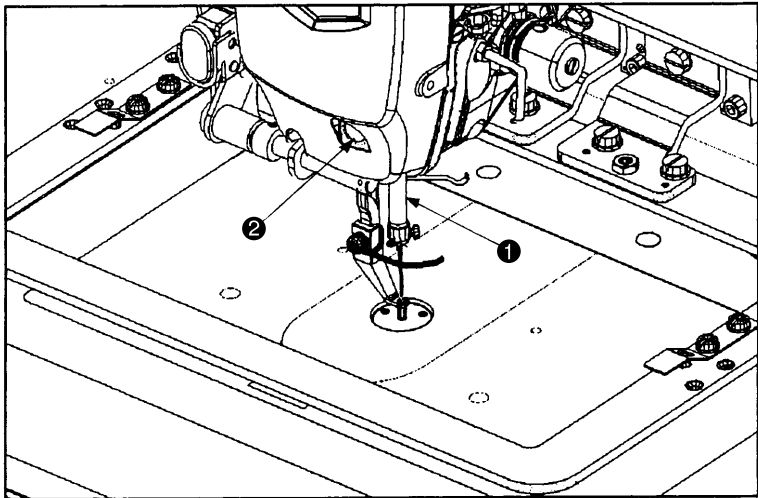
1. Loosen the 5 setscrews ①.
2. Remove the setscrew ③ and pull the oil tank ④ in the direction of the arrow A.
3. Pull Part B upwards of the two lubrication pipes ⑤ and ⑥. Take them out of the oil tank ④.
4. Loosen 2 setscrews ② of the clamp ⑦ in the waste oil pipe ⑦, and remove the clamp ⑦ and the setscrew ②.
5. Loosen the setscrew ⑧ and take out the driver ⑨.
6. Loosen the setscrew ⑩.
7. Remove the setscrew ⑪ and pull out the shuttle race adjust shaft ⑫.
8. Pull the shuttle ⑬ in the direction of the arrow C and take it out.



Adjustment Procedures	Results of Improper Adjustment
1. Loosen the setscrew ❶ and remove it. 2. When the adjusting screw ❷ is tightened, the quantity of oil can be regulated for the lubrication pipe left ❹. 3. After adjustments, tighten the setscrew ❶ to fix it. (Cautions) 1. In the state of standard shipping, the hook lubrication reducer ❸ is positioned so that it is lightly tightened and the adjusting screw ❷ is return-loosened by 4 turns. 2. When reducing the oil amount, the screw should not be tightened up fully. Tighten the hook lubrication reducer ❸ and then return it by two turns. In this position, wait for half a day to see how it goes. Too much reduction can be a cause of hook wear.	o If the amount of hook lubricant is reduced too much, this can be a cause of frictional wear of the hook race plane or lock-up.

Procedures of assembling
1. Pass the two lubrication pipes ❺ and ❻ and the oil drain pipe ❼ through the frame, and mount the shuttle ❸. 2. Hold the lubrication pipes ❺ and ❻ with the pipe holder ❹ and fix them with the setscrews ❶. 3. Fix the two lubrication pipes ❺ and ❻ with the cord clamps ❶ and the setscrews ❶. At that time, make sure not to permit the lubrication pipes ❺ and ❻ to come in contact with the needle thread clamp connector link. 4. Insert the two lubrication pipes ❺ and ❻ in the oil tank ❹ and fix this oil tank ❹ to the frame with the setscrews ❸. 5. Fix the waste oil pipe ❼ with 2 setscrews ❷ in two positions by means of the cord clamps ❶. 6. Insert the oil drain pipe ❼ in the oil reservoir ❶. 7. Fix the shuttle ❸ and mount the driver ❶ with the setscrew ❸. Refer to [(18) Hook adjustment].

Standard Adjustment

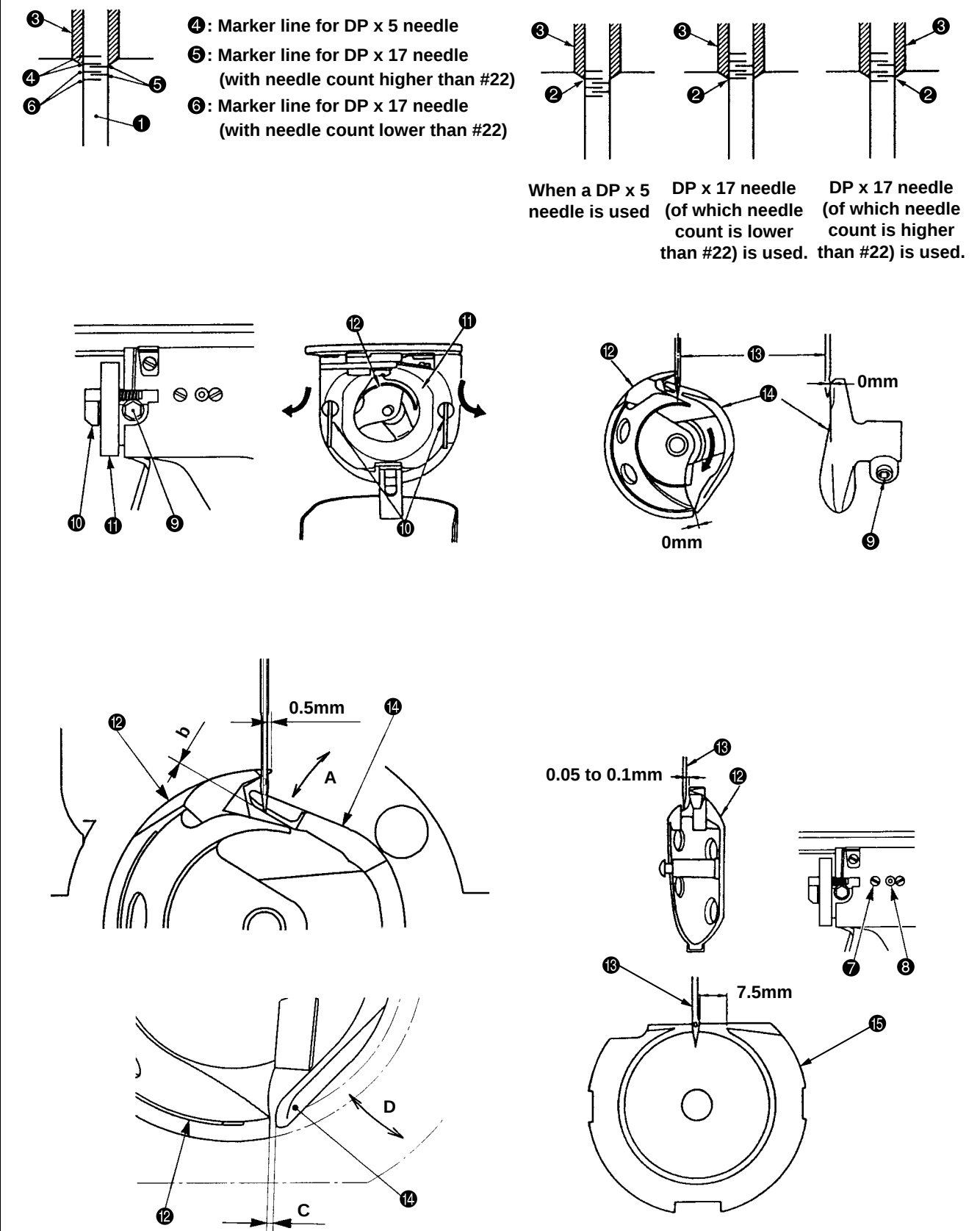


- ⑤ : Marker line for DP x 5
- ⑥ : Marker line for DP x 17
(with needle count higher than #22)
- ⑦ : Marker line for DP x 17
(with needle count lower than #22)

Adjustment Procedures	Results of Improper Adjustment
* Turn ON the power once, and turn OFF the power again after making the intermediate presser in the lowered state. 1. Bring the needle bar ❶ down to the lowest position, loosen the needle bar connection screw ❷ and align the upper engraved line ❸ on the needle bar with the bottom end of the needle bar lower bushing ❹. 2. Change the adjusting position according to needle sizes. (Caution) Be sure that torque is even after adjustment.	

(18) Hook adjustment

Standard Adjustment

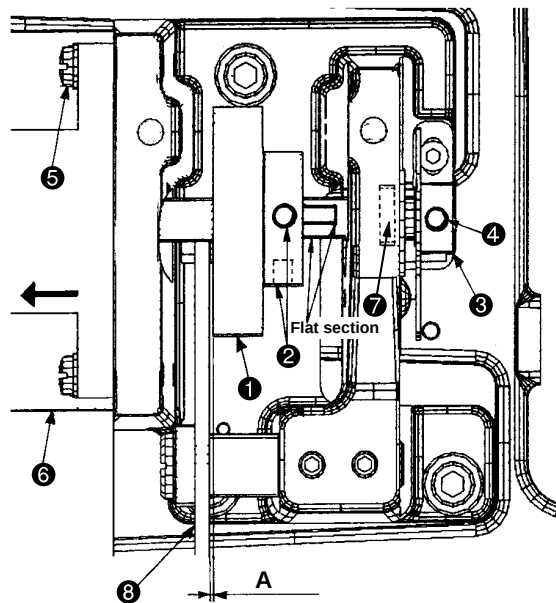


Adjustment Procedures	Results of Improper Adjustment
* Turn ON the power once, and turn OFF the power again after making the intermediate presser in the lowered state. 1. Turn hand wheel by hand to ascend the needle bar ❶. Adjust so that lower marker line ❷ on the ascending needle bar aligns with the bottom end of the needle bar bushing lower ❸. 2. Loosen setscrew ❹ in the driver. Drawing bobbin case opening lower hook ❺ toward you, open it to the right and left until bobbin case opening lower ❻ comes off. (Caution) At this time be careful not to let inner hook ❿ come off and fall. 3. Refer to 5. below and make tentative adjustments of timing for the inner hook ❿. 4. Turn the pulley by hand and make adjustments for the needle location block of the driver ⓫ by bending it in the direction of Arrow A so that the clearance b attains 0mm to 0.5mm between the needle tip and the lowest end of the needle location block of the driver ⓫ when the needle tip of the inner hook ❿ is protruded by 0.5mm from the right end of the needle ⓬. 5. Make an adjustment so that the blade point of the inner hook ❿ is aligned with the center of the needle ⓬, and that the clearance between the front end of the driver ⓫ and the needle ⓬ is 0 mm because the front end of the driver ⓫ receives the needle to prevent needle bending. Then, tighten the setscrew ❹ securing the driver. 6. Make adjustments so that the clearance (C) in the revolving direction attains 0.3mm to 0.6mm between the inner hook ❿ and the driver ⓫ by bending the inner hook holder block (reverse side of the needle location block) of the driver ⓫ in the direction of the arrow (D). (Caution) Make sure not to damage the shuttle ⓭ race plane while making adjustment of the driver ⓫. 7. Loosen the setscrew ❼ securing the shuttle ⓭, and adjust the front-rear position of the shuttle by rotating the shuttle adjusting shaft ❽ so that the clearance between the needle ⓬ and the blade point of the inner hook ❿ becomes 0.05 to 0.1 mm. 8. After adjusting the front-rear position of the shuttle ⓭, set the clearance between the needle ⓬ and the shuttle ⓭ to 7.5 mm by adjusting the rotating direction, and tighten the setscrew ❼ securing the shuttle.	

(19) Thread trimmer presser lifter cam connection/disconnection

Procedures of disassembling

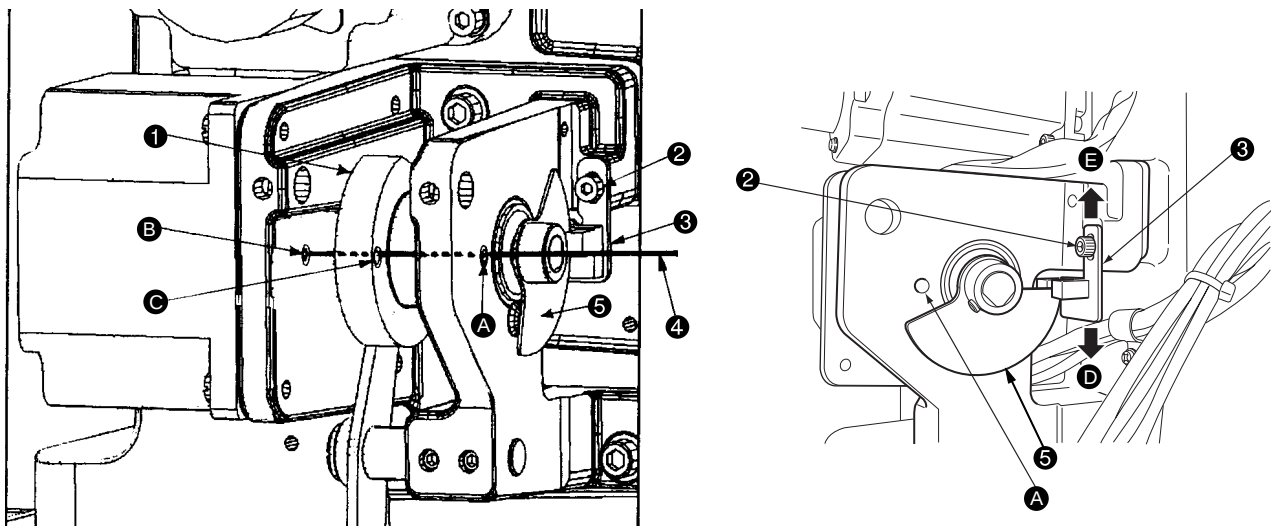
1. Loosen 2 setscrews ② securing the presser lifter and thread trimmer cam (hereafter called "cam") ①.
2. Loosen the 2 setscrews ④ and remove the sensor slit ③.
3. Remove the 4 setscrews ⑤ and take out the presser lifting motor ⑥ in the direction of the arrow. In some cases, the bearing ⑦ and the motor shaft seem to be tightly coupled. Pull out the motor shaft in the direction of the arrow straightforward in order not to hurt the bearing ⑦.
At that time, the cam ① may come down. Handle it with care, not to damage it.



(20) Thread trimmer and presser origin sensor adjustment

Standard Adjustment

At the time of origin retrieval (Start Switch ON) in the test mode I07 (IP-410), the reference holes ① and ② of the sewing machine frame come in coincidence with the reference hole ③ each of the thread trimming and presser lifter cam ①.



Procedures of assembling

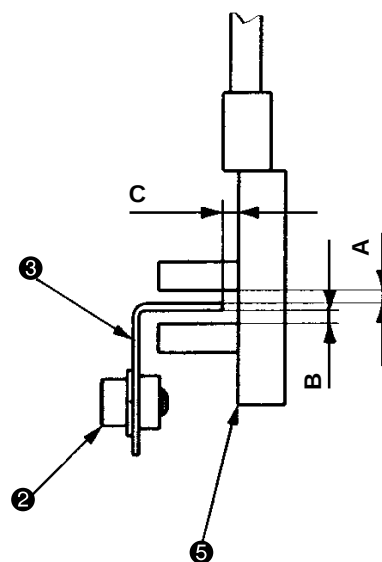
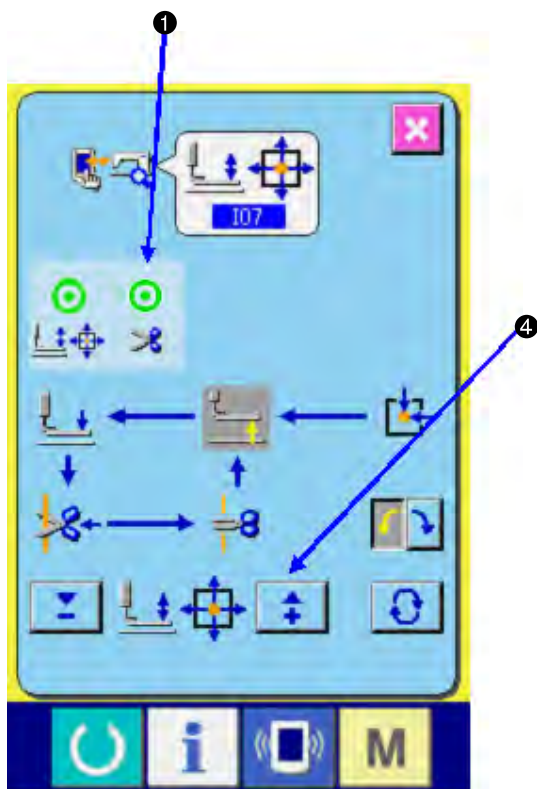
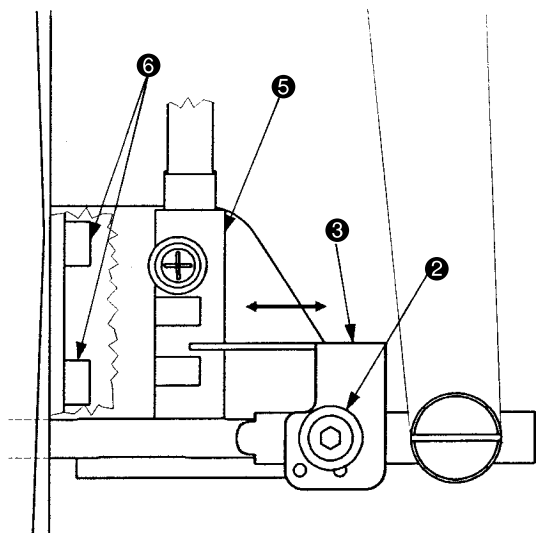
1. Apply a proper amount of grease (Juki Grease A) to the grooved cam block of the cam ❶, the peripheral cam block, and the rollers of the presser bar lifter link ❸ and the thread trimmer link ❸. Refer to "10.-(4) Parts to which grease • Locktight is applied o TENSION RELEASE & THREAD TRIMMER MECHANISM COMPONENTS."
2. While the cam ❶ is being inserted in the shaft of the presser lifting motor ❹, mount the assembly on the sewing machine frame and tighten the four setscrews ❺. The insertion of the cam should be done gently in order not to hurt the bearing ❷.
3. Adjust the position of the cam ❶ so that Clearance A of 0.5 to 0.7mm is secured between the cam ❶ and the thread trimmer link ❸. Since then, fix the cam ❶ with 2 setscrews ❷. (Adjust the screw to the flat parts on both ends of the shaft.)
4. Mount the sensor slit ❸ with the 2 setscrews ❹ so that the end plane of the motor shaft can approximately coincide with that of the sensor slit ❸. (Join the flat section for installation.)
* Confirm that the slit plate of the sensor slit ❸ does not interfere with the presser bar lifter sensor.
5. Refer to "3.-(20) Thread trimmer and presser origin sensor adjustment" and make sensor adjustments.

Adjustment Procedures	Results of Improper Adjustment
1. Start the test mode I07 (IP-410). 2. Tread on the pedal for the retrieval of the thread trimmer and presser bar lifter (cam) origin. 3. Make sure that the standard holes (A and B) of the thread trimming motor stand are aligned with the standard hole C of the thread trimmer and presser lifter cam ❶ using a bar ❹. 4. If the standard hole C of the thread trimmer and presser lifter cam ❶ is too high (E direction), loosen the setscrew ❷ and move the sensor mounting plate ❸ upward (E direction) and secure it. If the standard hole C of the thread trimmer and presser lifter cam ❶ is too low (D direction), loosen the setscrew ❷ and move the sensor mounting plate ❸ downward (D direction) and secure it. After securing the sensor mounting plate ❸, conduct origin retrieval by pressing the pedal to make sure that the standard holes are aligned. 5. Repeat the above steps 2 to 4 until the coincidence is confirmed. (Caution) Tighten the setscrew ❷ after confirming that there is no interference between the sensor slit plate ❸ and the sensor.	o If the standard holes are not aligned, the thread trimming timing error occurs and defective thread trimming and unthreading at the beginning of sewing may be caused.

(21) Adjusting the thread trimmer sensor

Standard Adjustment

After origin retrieval (Start Switch ON) in the test mode I07 (IP-410), press the + key ④ 6 to 8 times until the thread trimmer sensor is turned OFF. (IP-410: Control panel display ① changed to  → )



Adjustment Procedures	Results of Improper Adjustment
1. Start the test mode I07 (IP-410). 2. Tread on the pedal to perform origin retrieval for the thread trimmer cam. (Confirm that the origin is in the correct position. Then, proceed to the procedures shown below. Refer to “(20) Thread trimmer and presser origin sensor adjustment.”) 3. Press the + key ④ (IP-410). Confirm that the control panel display ① is changed from  to  within the frequency of 6 to 8 times. 4. If the change occurs by pressing the + key other than 6 to 8 times, or the change does not occur, loosen the setscrew ② and adjust the sensor slit ③ finely in the arrow direction. 5. After the sensor slit ③ has been fixed, tread on the pedal and make origin retrieval for the thread trimmer cam. Examine the sensor changeover position in the steps 3. and 4. above. 6. Repeat the steps 2. to 5. above until the coincidence is secured. (Caution) During adjustments, check the clearances A, B, and C of the sensor slit ③ and the sensor ⑤. If the clearances seem to be insufficient, use the setscrews ② and ⑥ to correct the gradient. While taking this action, continue to work on the steps above.	- o If the thread trimmer sensor changeover takes place outside the range, the moving knife may interfere with the needle. This will be a cause of injury or the breakage of parts. - o If the thread trimmer sensor changeover does not take place, Error 305 occurs and the sewing machine fails to start operating. - o If the sensor slit ③ has no clearance against the sensor ⑤, this can be a cause of destruction in the sensor slit ③ or the sensor ⑤.

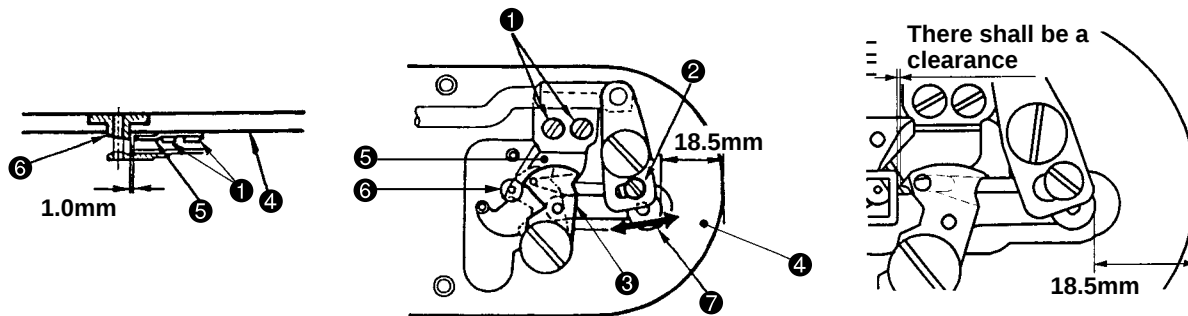
(22) Adjustment of the moving knife and counter knife position

Standard Adjustment

Counter knife position : The clearance between the counter knife ⑤ and the needle hole guide ⑥ is 1.0mm.

Moving knife position : Before thread trimmer operation (standby state), the distance from the throat plate ④ front end to the tip of the thread cutter lever (small) ⑦ is 18.5mm.

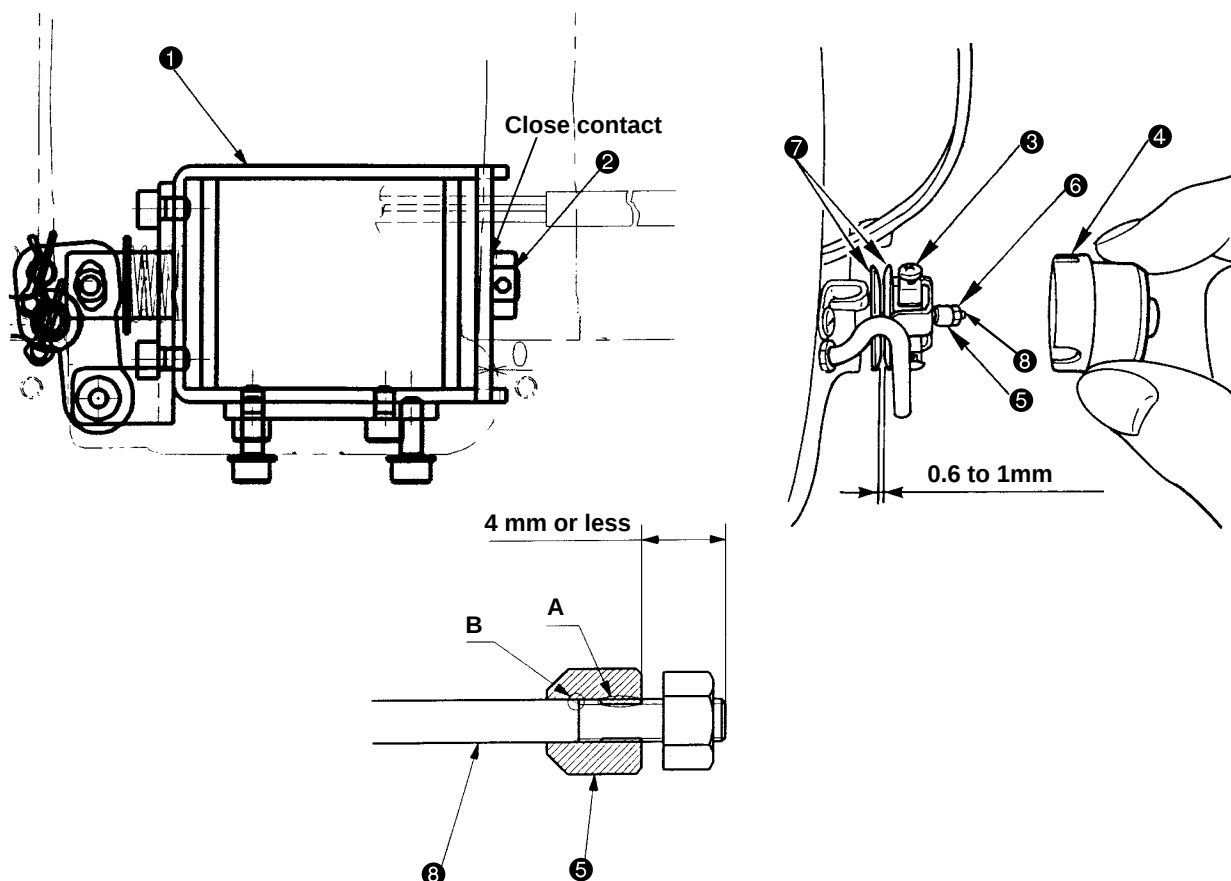
However, there shall be a proper clearance toward the moving knife tip during needle thread clamp and feed forward.



(23) Floating amount of the thread tension disk

Standard Adjustment

When the sewing machine power supply is turned off (AT solenoid ① is OFF), the gap between AT thread tension disk ⑦ is 0.6 to 1mm.



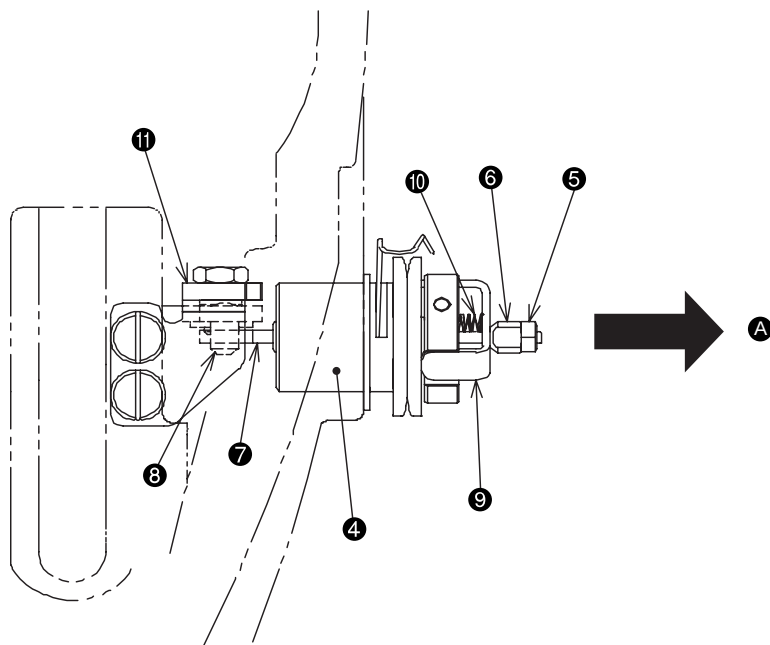
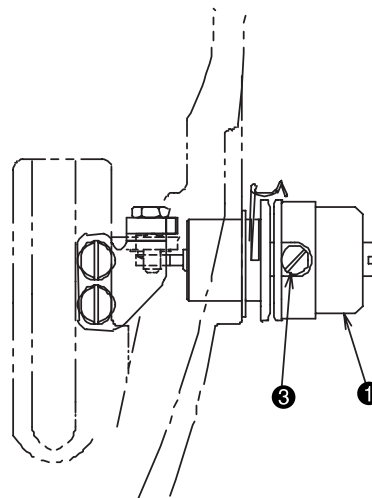
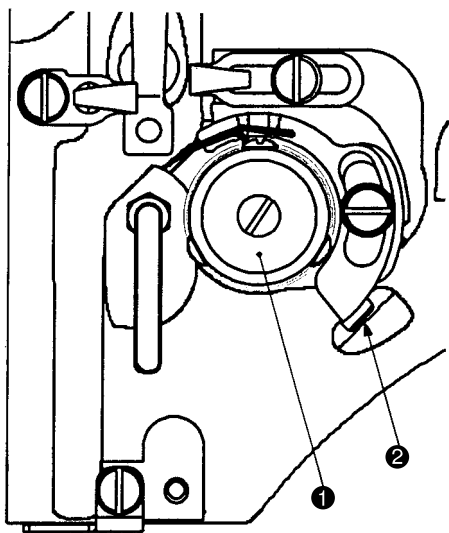
Adjustment Procedures	Results of Improper Adjustment
- Counter knife position Loosen the counter knife setscrew ❶ to adjust the position. - Moving knife position Loosen the screw ❷ to adjust the position.	- o If the clearance is less than 1.0mm, thread may be cut by the counter knife ❺ blade when the thread is pulled with the moving knife ❸. In this case, upper and lower threads are cut into short pieces. - o If the clearance is more than 1.0mm, the residual thread length after thread cutting operation becomes longer beneath the work.

Adjustment Procedures	Results of Improper Adjustment
- Turn off the power supply and look for any close contact between the AT solenoid ❶ and the thrust collar ❷. - Loosen the three setscrews ❸ and remove the thread tension cap ❹. - Hold the tension releasing pin adjust collar ❺ not to let it rotate, and loosen the nut ❻. - Turn the tension releasing pin adjust collar ❺ and adjust the gap between the thread tension disk ❼. (Adjustment of thread tension disc floating) - Hold the tension releasing pin adjust collar ❺ and tighten the nut ❻. Mount the thread tension cap ❹ by means of the setscrew ❸. - Turn on the power supply and set up the thread tension. Confirm that the thread tension disk ❼ are closed. (Caution) When the tension releasing pin adjusting collar ❺ is rotated, the thread section should not be engaged with the incomplete thread section of the thread tension releasing pin ❸. (The thrusting distance of the thread tension releasing pin ❸ should be 4 mm or less from the tension releasing pin adjusting collar ❺.) * If the amount of disc floating cannot be adjusted properly under the condition that the thrusting distance is 4 mm or less, loosen the setscrew ❸ and adjust the AT link unit (front) in the right-left direction. Refer to “(25) AT unit connection/disconnection”.	- o If the amount of disc floating is too less, the residual thread length can be changed or shortened when the thread is thick. - o If the amount of disc floating is too much, the thread tension discs ❼ cannot close completely and normal thread tension may fail to be chosen. This can be a cause of imperfect sewing. - o If the thread section of the tension releasing pin adjusting collar ❺ is engaged with the incomplete thread section of the thread tension releasing pin ❸, the thread tension releasing pin ❸ may be damaged.

(24) Second thread tension connection / disconnection

Procedures of disassembling

1. Loosen the setscrew ②.
2. Remove 3 setscrews ③ and take out the thread tension cap ①.
3. Remove the nut ⑤ and the tension releasing pin adjusting collar ⑥. Then take out the thread tension disc pressing plate ⑨ and three thread tension disc return springs ⑩.
4. Pull out the second thread tension ④ to remove it. (Arrow A)
5. For reassembly, follow the steps of 4. to 1. above.



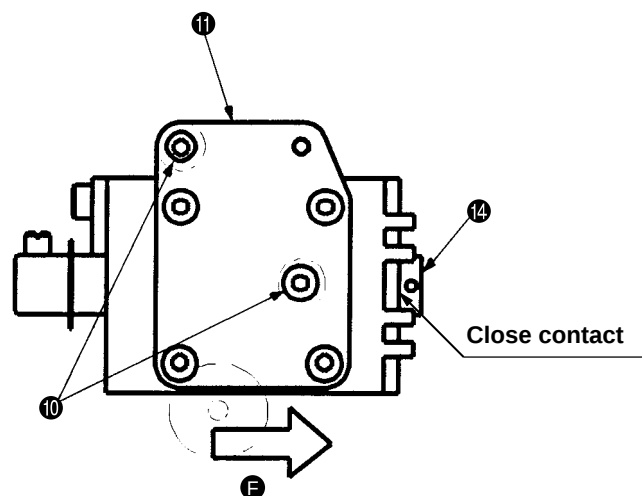
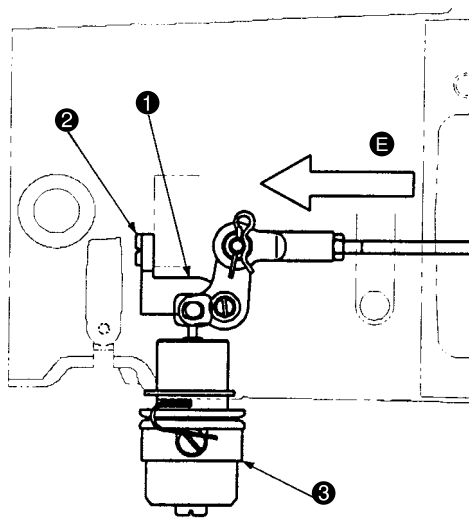
Procedures of assembling

1. When mounting the second thread tension ④, confirm in advance that the pin block ⑧ of the AT link unit (front) ⑪ is exactly settling in the hole of the thread tension pressing pin ⑦. If you try to mount the second thread tension ④ forcedly with the pin area left disengaged, this may result in breakage in the thread tension pressing pin ⑦ or malfunction.
2. After the completion of mounting, make adjustments of (23) Floating amount of the thread tension disk and (47) Adjustment of thread take-up spring; 1) Stroke adjustments.

(25) AT unit connection / disconnection

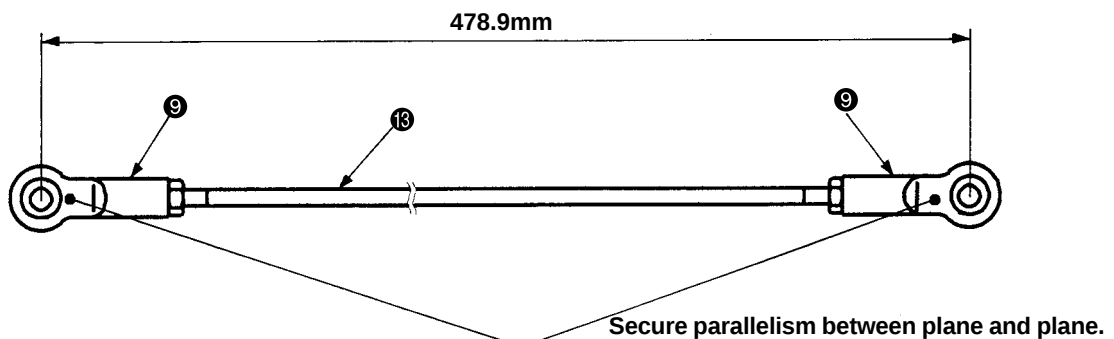
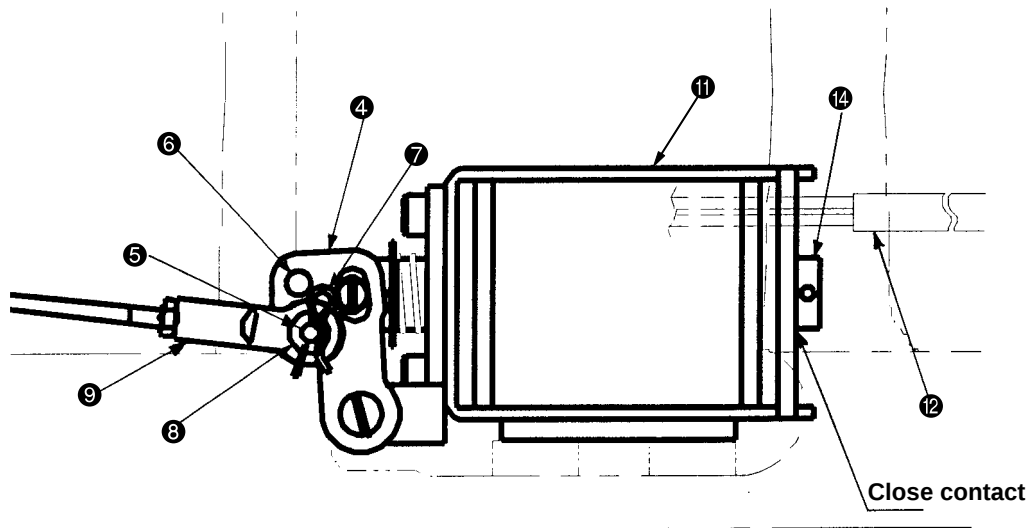
Procedures of disassembling

1. Remove the setscrew ② of the AT link unit (front) ① and take out the second thread tension ③. ((24) Refer to "Second thread tension connection / disconnection.")
2. Draw out the cotter pin ⑦ from the pin block ⑤ (H type) or ⑥ (S type) of the AT link unit (rear) ④. Be careful not to drop the washer ⑧ at that time.
3. Lift the AT joint block ⑨ of the AT unit upward to remove the block from the pin block ⑤ (H type) or ⑥ (S type) of the AT link unit (rear) ④.
4. Draw out the AT link unit (front) ① from the plane side (in the direction of the arrow ⑤) and remove it.
5. Remove the 2 setscrews ⑩ and take out the AT solenoid unit ⑪.
6. For reassembly, follow the steps of 5. to 1. above.



Procedures of assembling

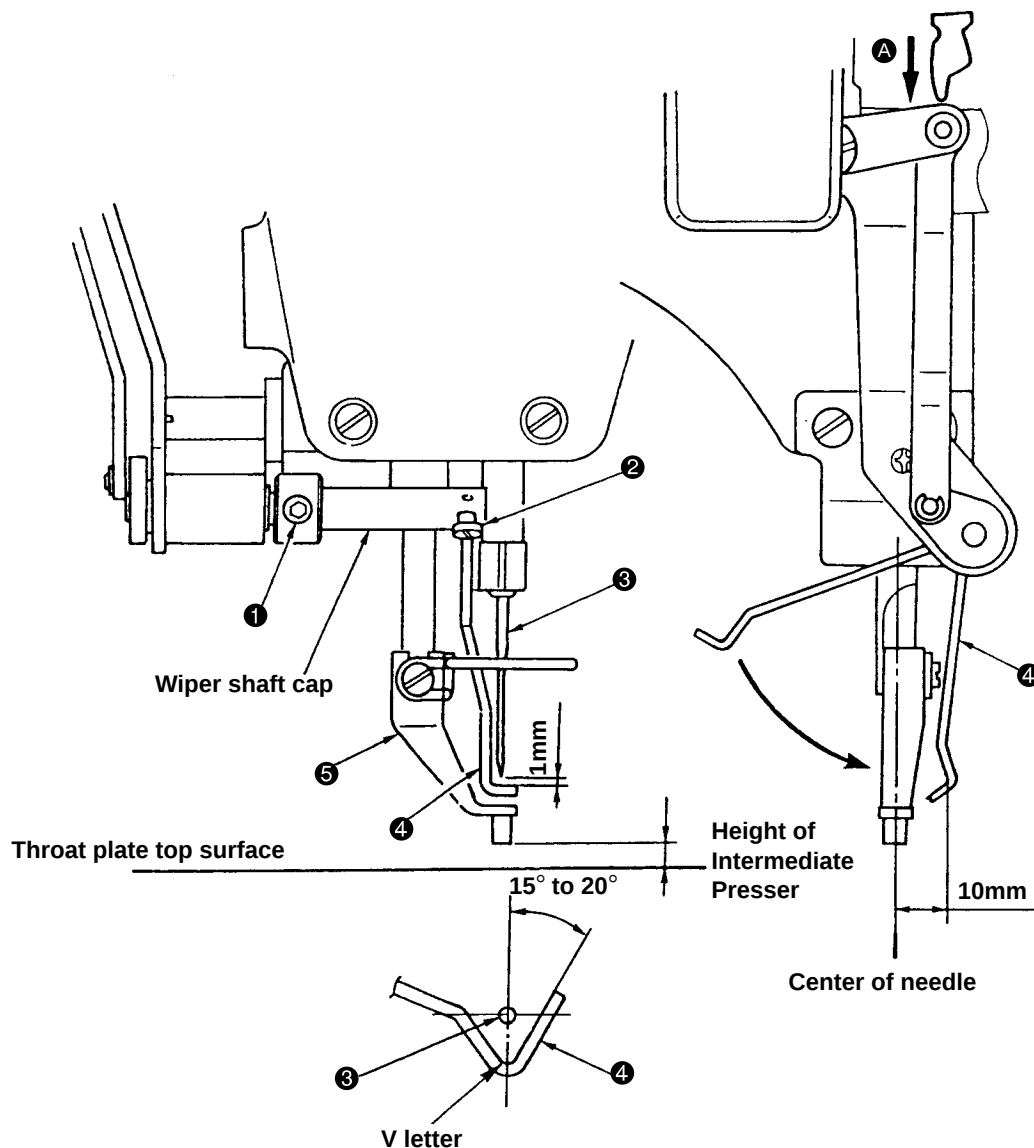
1. For incorporating the AT solenoid unit ⑪ into the system, run the solenoid cable ⑫ from the rear of the AT solenoid unit to the rear end of the machine arm.
 2. The center-to-center distance between the AT joints ⑨ of the AT connector rod ⑬ is 478.9 mm.
When the AT joints ⑨ are disassembled or assembled, make sure that the center-to-center distance is correct, and that the front and rear of the AT joints ⑨ are parallel. Failure to observe this may cause AT malfunction resulting in incorrect thread tension.
(When the AT joint ⑨ is turned 4 times, the feed move amount comes to attain 2mm.)
 3. For the pin block of the AT link unit (rear) ④, use the pin block ⑤ for H type and the pin block ⑥ for S type. The wrong pin position may cause AT malfunction resulting in incorrect thread tension.
 4. After completion of all assembly work, make sure that the thrust collar ⑭ closely contacts with the AT solenoid unit ⑪. If there is a clearance between them, loosen 2 setscrews ⑩ and move the AT solenoid unit ⑪ to the rear (Arrow ㊦) and secure it again.
- * If the above-mentioned center-to-center distance is great between the AT joints ⑨, the clearance will be opened wider.



(26) Wiper adjustment

Standard Adjustment

1. When lowering the intermediate presser at the stop position after thread trimming (needle ③ height from the top surface of throat plate is 17.7 mm.) and pressing wiper link section A, adjust the clearance between the center of needle ③ and the inside of V letter of the wiper ④ to 10 mm.
2. Press wiper link section A on the way and when the wiper ④ has come to the underside of needle, adjust the clearance to 1 mm.
3. The opening angle of the top end of the wiper ④ is 15° to 20°.



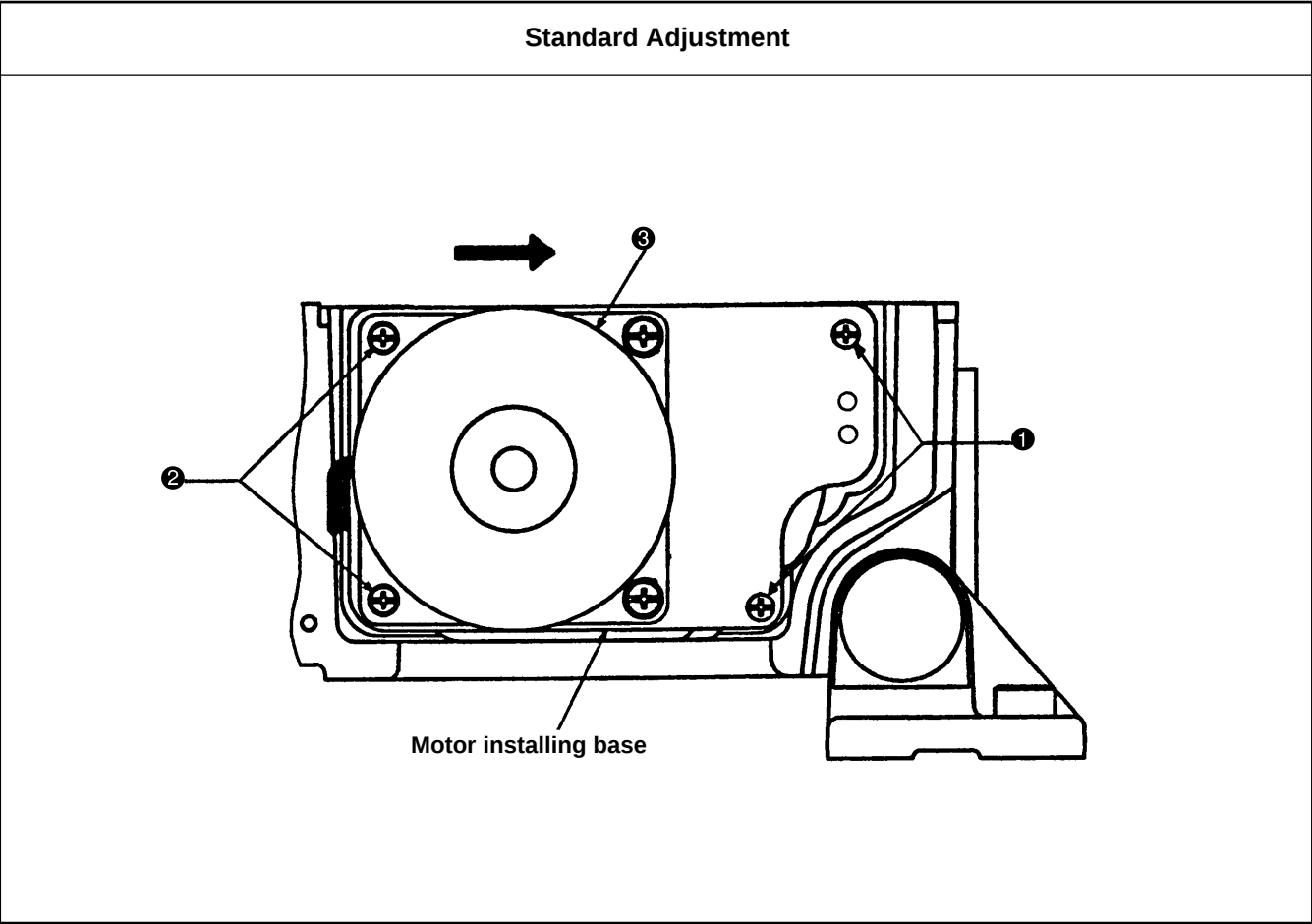
(Caution) The intermediate presser supplied as standard accessory is available up to 5 mm material thickness.

However, the intermediate presser can not be used for the 3 mm material thickness or more since the wiper can not pass the space between the tip of needle and the intermediate presser.

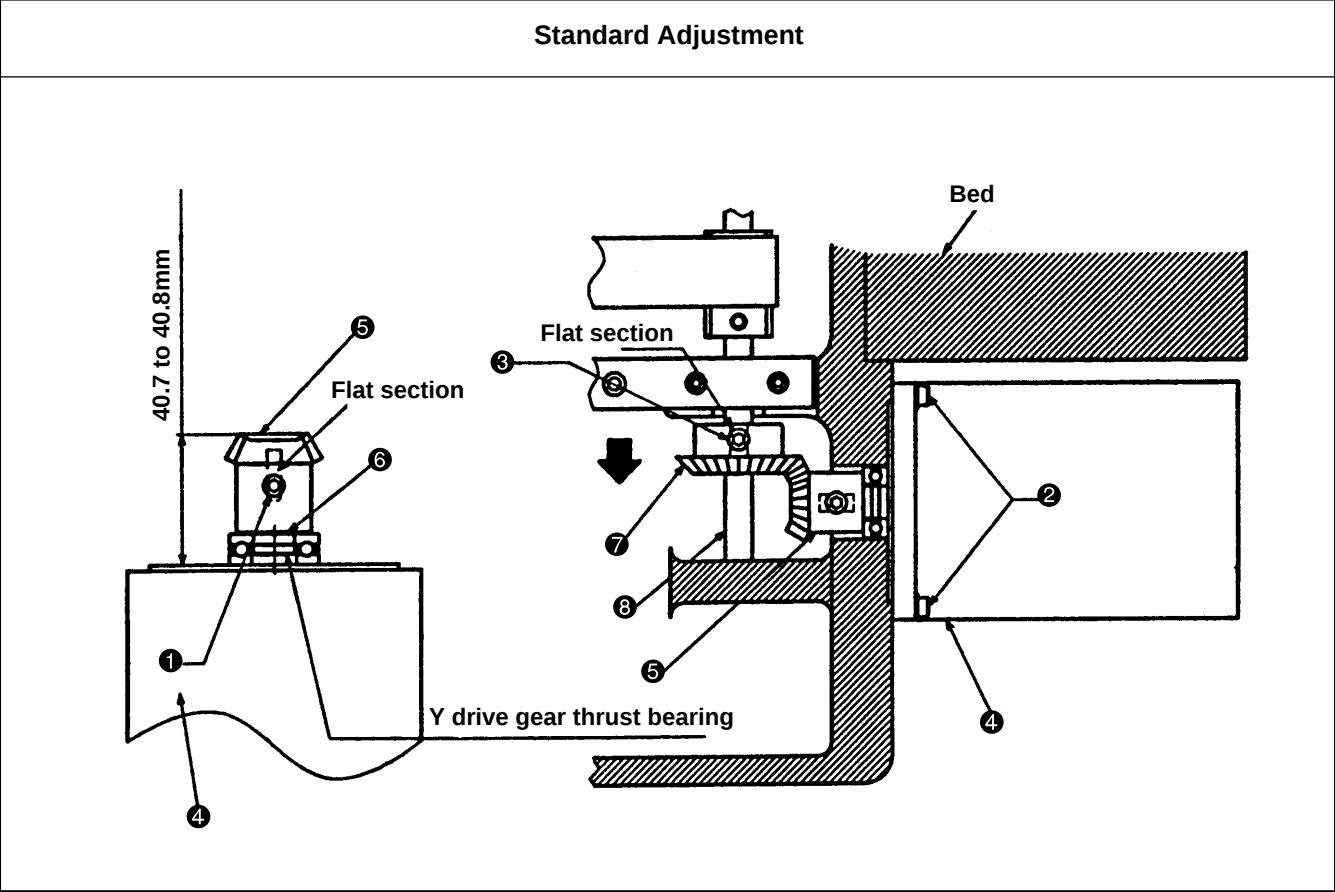
Turn OFF the wiper switch in case of 3 mm material thickness or more.

Adjustment Procedures	Results of Improper Adjustment
1. Turn OFF the power after stopping the thread trimming, or turn ON the threading switch and lower the intermediate presser ⑤. (Caution) As for the height of needle ③ when adjusting the wiper ④, set the height when the sewing machine stopped after trimming the thread actually. 2. Push wiper link section ① and move the top end of the wiper ④ to the under side of the needle. 3. In the state of the above item 2. , loosen setscrew ② and adjust the clearance between the wiper and the tip of the needle should be (1 mm) and the opening angle should be (15° to 20°). Then tighten setscrew ② . 4. Push wiper link section ① to the last and loosen setscrew ① . 5. In the state of the above item 4. , adjust the longitudinal (10 mm) and lateral positions of the wiper ④. Then tighten setscrew ① .	- o If the clearance between the wiper ④ and needle ③ is too small, the wiper comes in contact with the needle ③ due to uneven stop position of the main shaft, causing needle breakage. - o If the clearance between the wiper ④ and needle ③ is excessive, the wiper comes in contact with the intermediate presser ⑤ and the wiper will damage the intermediate presser ⑤. Also, the intermediate presser ⑤ can not go up. - o If a clearance of 10 mm between the inside of V letter of the wiper ④ and the center of needle ③ is mistakenly set, the wiper fails to spread the thread. - o Similarly, If the center of needle does not align with the V letter of the wiper ④, the wiper fails to spread the thread. - o If the opening angle of the wiper ④ is excessive, thread sweeping failure will occur.

(27) Backlash adjustment for the X motor



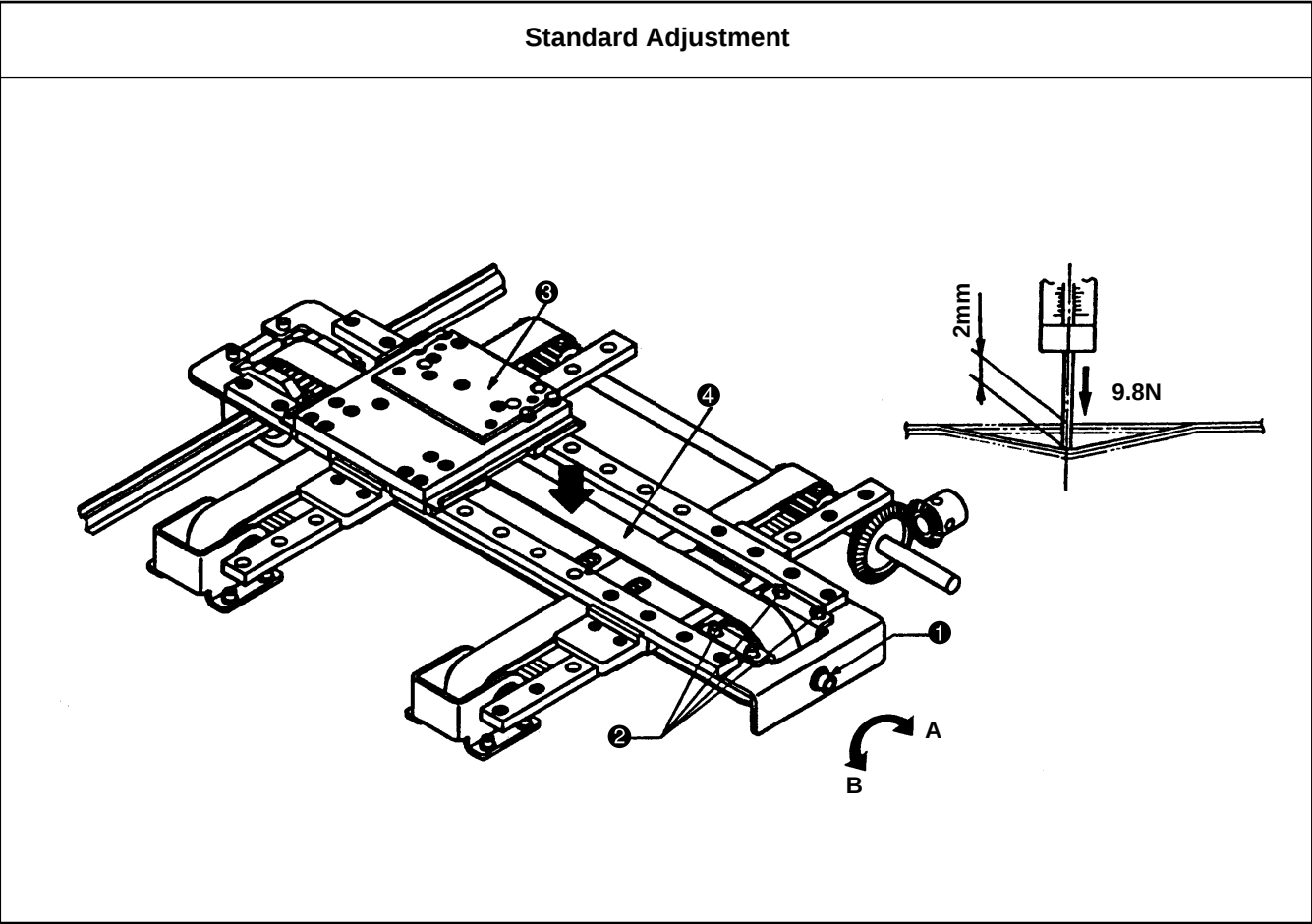
(28) Backlash adjustment for the Y motor



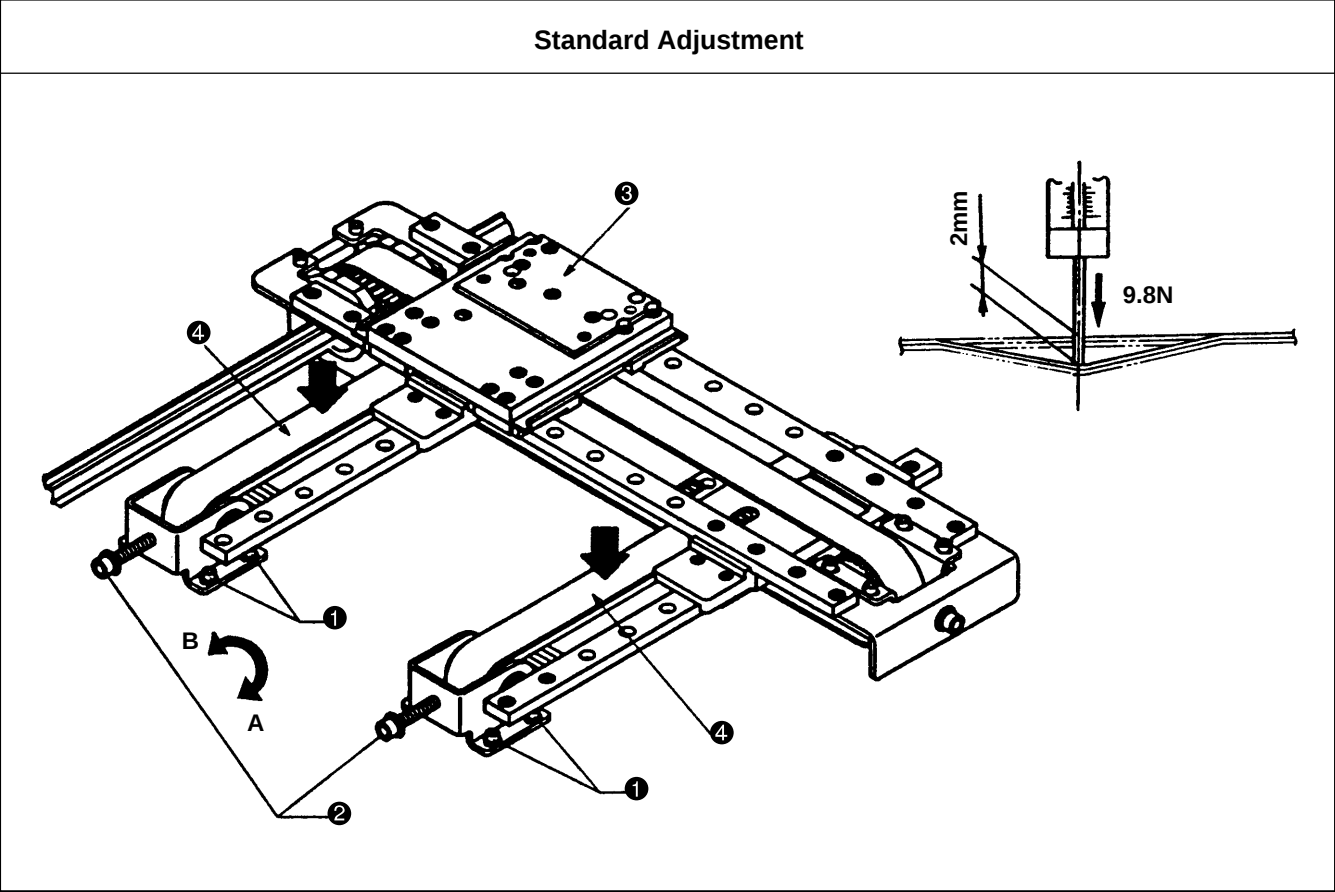
Adjustment Procedures	Results of Improper Adjustment
1. Loosen 2 each of the setscrews ❶ and setscrews ❷. 2. Press the X feed stepping motor ❸ in the direction of the arrow to reduce the backlash to zero. 3. Tighten the setscrews ❶ and setscrews ❷.	- o If there is any backlash, needle entry accuracy is lowered. This can also be a cause of feed error. - o Too much pressing may result in an increase in the feed load, thus causing feed error.

Adjustment Procedures	Results of Improper Adjustment
1. Remove 4 setscrews ❷ and take out the Y feed stepping motor ❹. 2. Confirm that distance is kept 40.7 to 40.8mm between the tip of the Y drive bevel gear ❺ and the spigot joint of the Y feed stepping motor ❹. If this distance is not secured, loosen 2 setscrews ❶ to remove the Y drive bevel gear ❺ and adjust the number of teeth of the Y drive bevel gear spacer ❻. (The spacer thickness is 0.1mm. Usually, two pieces are used.) (Caution) When tightening the setscrews ❶, try to join the flat section of the shaft of the Y feed stepping motor ❹ with the position of the setscrew ❶. At that time, confirm that the Y drive bevel gear ❺ does not move in the axial direction. 3. Install the Y feed stepping motor ❹ on the bed. 4. Press the Y trailing gear ❼ in the direction of the arrow to reduce the backlash to zero and tighten 2 setscrews ❸. At that time, join the flat section of the Y drive shaft ❸ with the position of the setscrew ❸.	- o If there is any backlash, needle entry accuracy is lowered. This can also be a cause of feed error. - o Too much pressing may result in an increase in the feed load, thus causing feed error.

(29) Tension adjustment for the X timing belt



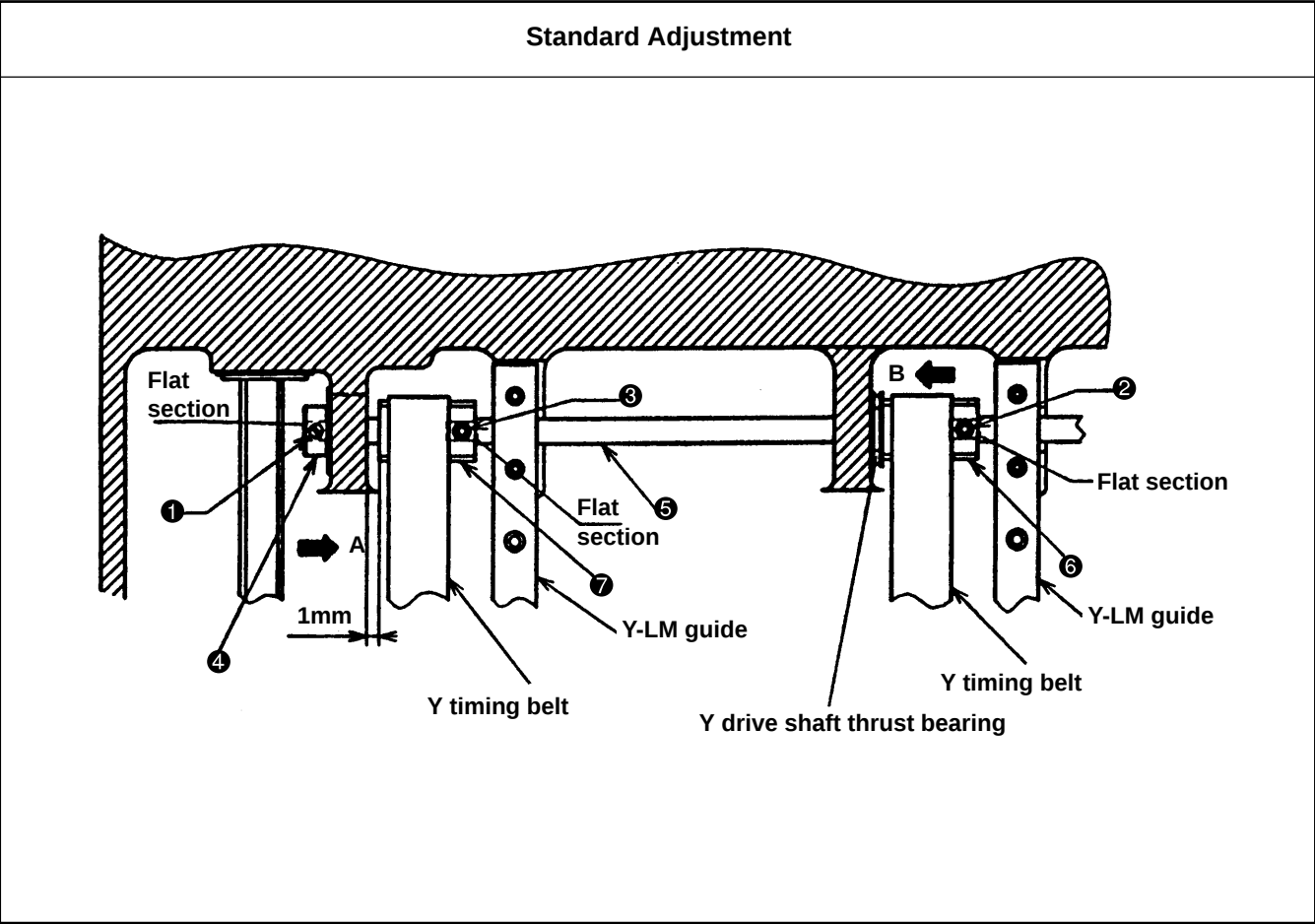
(30) Tension adjustment for the Y timing belt



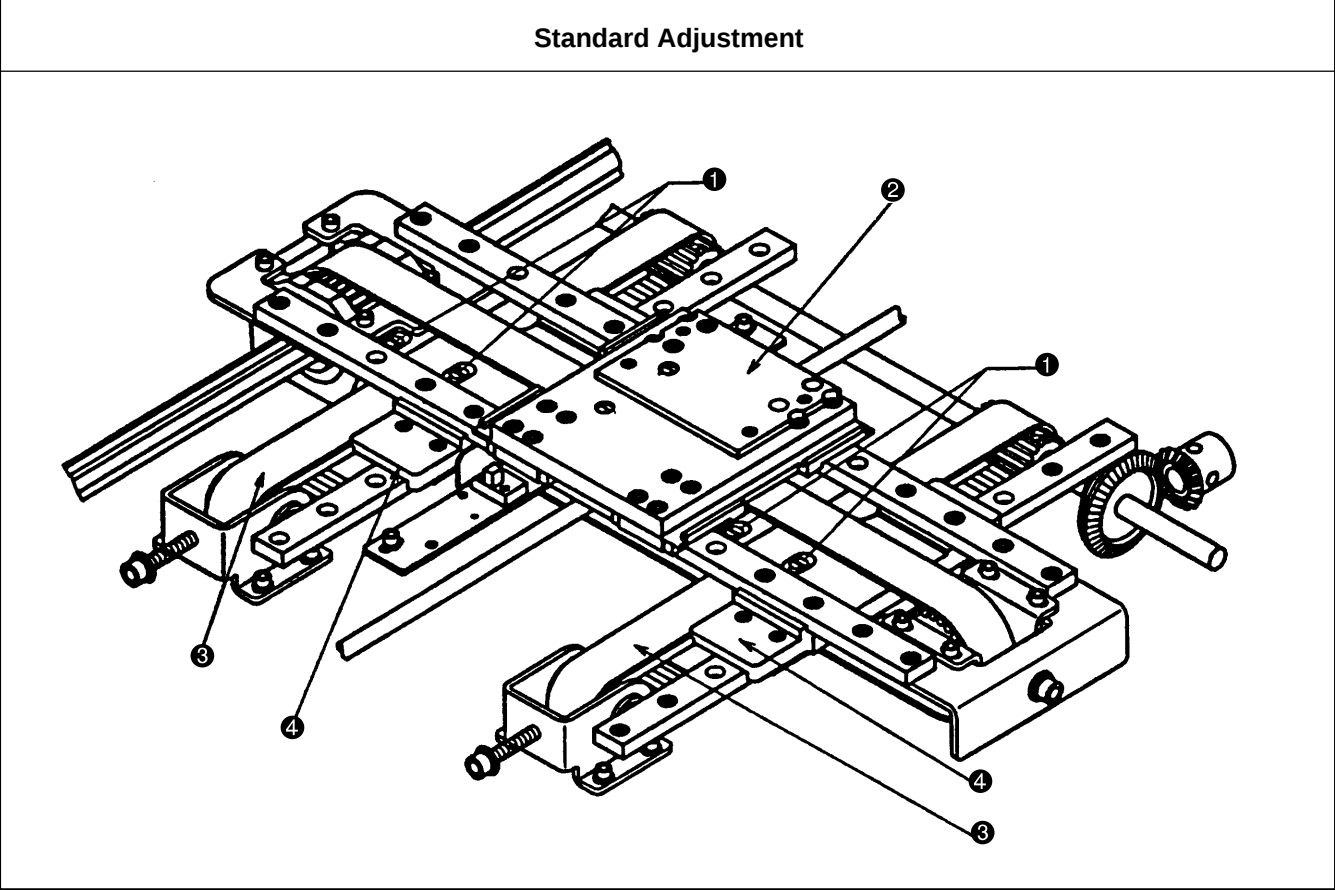
Adjustment Procedures	Results of Improper Adjustment
1. Move the X movement base ❸ to left side. 2. Move the X movement base ❸ forward and backward, and let the right side hole of the bed coincide with the position of the adjusting screw ❶. 3. Loosen 4 setscrews ❷. 4. Turn the adjusting screw ❶ to secure a warp of 2mm at the load point when a load of 9.8N (1kg) is applied to the center of the X timing belt ❹ by means of a spring balance. Turning the setscrew ❶ in Direction A causes the warp to decrease, and turning it in Direction B causes the warp to increase. 5. Tighten the setscrew ❷ and check the amount of warp again.	- o If the tension is too much, this can cause destruction in the X timing belt ❹. - o If the tension is too less, this can be a cause of feed error.

Adjustment Procedures	Results of Improper Adjustment
1. Move the X movement base ❸ to the extreme inner part. 2. Loosen 4 setscrews ❶. 4. Turn the adjusting screw ❷ to secure a warp of 2mm at the load point when a load of 9.8N (1kg) is applied to the center of the Y timing belt ❹ by means of a spring balance. Turning the setscrew ❷ in Direction A causes the warp to decrease, and turning it in Direction B causes the warp to increase. 5. Tighten the setscrew ❶ and check the amount of warp again.	- o If the tension is too much, this can cause destruction in the Y timing belt ❹. - o If the tension is too less, this can be a cause of feed error.

(31) How to remove rattles from the Y drive shaft



(32) Phase adjustment for the Y timing belt



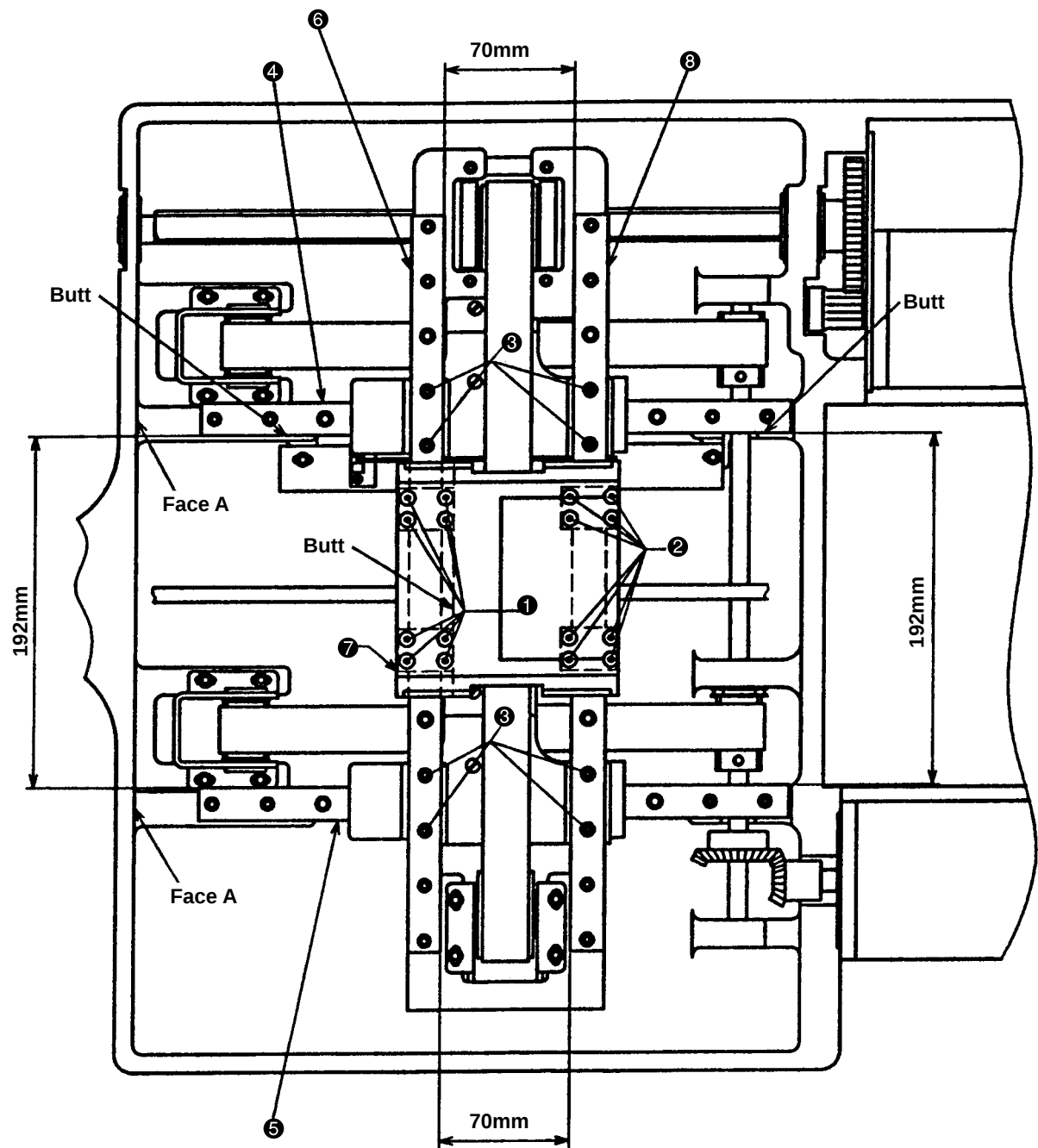
Adjustment Procedures	Results of Improper Adjustment
1. Align the Y drive shaft thrust collar ④ with the flat section of the Y drive shaft ⑤. Then, tighten two setscrews ①. 2. Lightly press the Y drive shaft thrust collar ④ in Direction A, and also the Y drive sprocket A ⑥ in Direction B. Since then, tighten 2 setscrews ②. At that time, 1 of the setscrews ② should be aligned with the flat section of the Y drive shaft ⑤. (Caution) Confirm that there is no rattling in axial direction in the Y drive shaft ⑤. 3. Separate the Y drive sprocket B ⑦ by 1mm from the processed face of the bed and stop it. Then, tighten 2 setscrews ③. At that time, 1 of the setscrews ③ should be aligned with the flat section of the Y drive shaft ⑤.	o If there is any rattling, this can be a cause of feed error.

Adjustment Procedures	Results of Improper Adjustment
1. Loosen 4 setscrews ①. 2. Move the X movement base ② forward and backward two or three times. 3. Tighten 4 setscrews ①. * When the Y timing belt ③ is adjusted, phase adjustments of this Y timing belt ③ should be carried out, without fail. (Caution) If the Y timing belt ③ is kept contact with the Y movement base ④, phase adjustments cannot be carried out even though the Y movement base ④ is moved forward and backward.	o Incorrect phase matching can be a cause of feed error.

(33) Adjustment of the X-Y mechanism

Standard Adjustment

Make adjustments to the dimensions specified below.

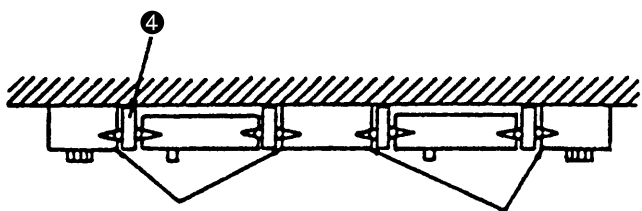
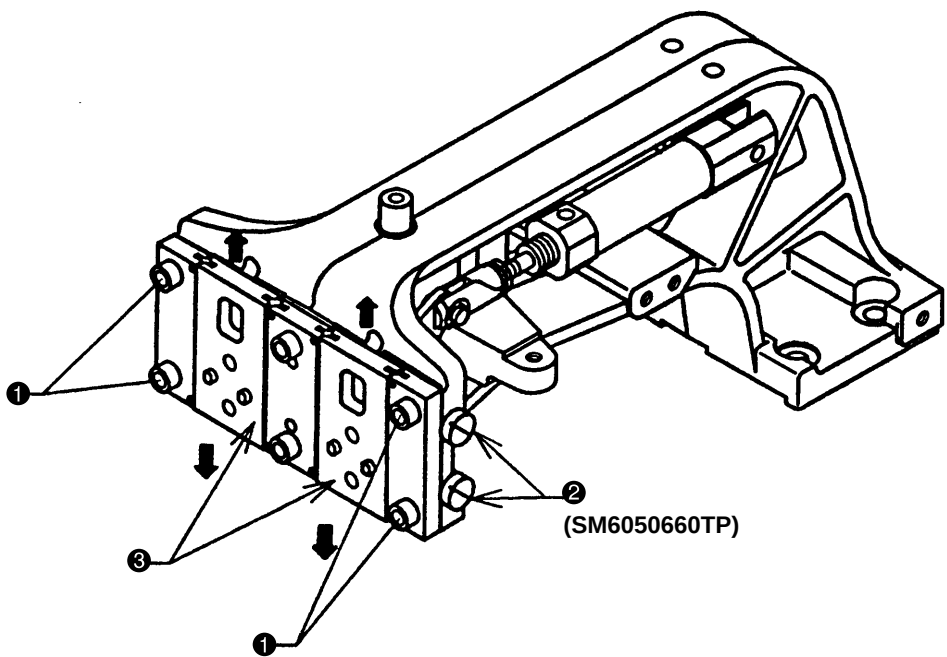


Adjustment Procedures	Results of Improper Adjustment
How to install the Y-LM guide 1. Butt the Y-LM guide A ④ to the bed and fasten it with screws. 2. Adjust the distance to 192mm between the Y-LM guide A ④ and the Y-LM guide B ⑤, and secure parallelism. 3. Fasten the Y-LM guide B ⑤ with screws. How to install the X-LM guide 1. Butt the X-LM guide A ⑥ to the X movement base ⑦ and tighten 8 setscrews ①. 2. Adjust the distance to 70mm between the X-LM guide A ⑥ and the X-LM guide B ⑧, and secure parallelism. Then, tighten 8 setscrews ②. 3. Secure parallelism between the bed processing face A and the X-LM guide A ⑥. Then, tighten 8 setscrews ③.	- o If no parallelism is secured, this can be a cause of feed error. - o If no parallelism is secured, needle entry accuracy will be lowered.

(34) Pressure adjustment for the face plate bearing

Standard Adjustment

When the presser foot face plate ③ is moved vertically and then the face plate bearing ④ comes in contact with the spring pin, the startup torque (slippage torque) will be 0.98 to 7.84N (100 to 800g).



The thinner side should be positioned toward the front.

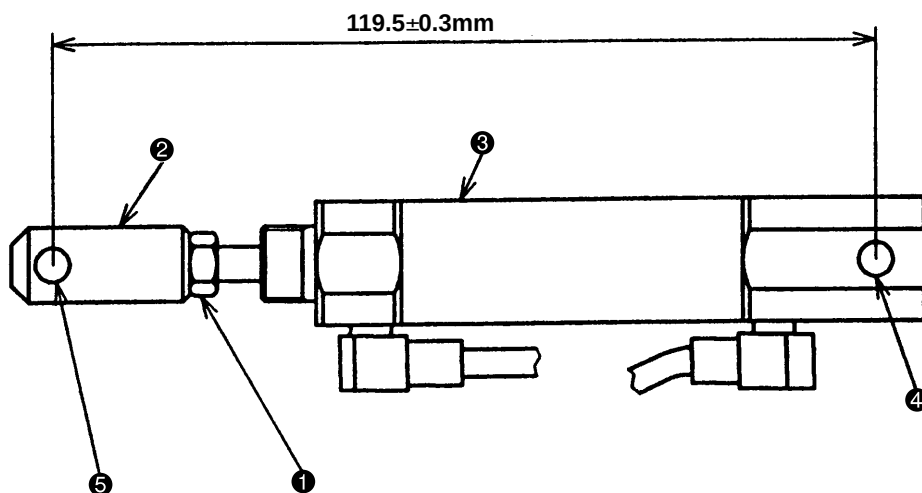
The thinner side should be positioned toward the front.

Adjustment Procedures	Results of Improper Adjustment
1. Loosen the setscrew ❶. 2. Lightly tighten the pressure adjusting screw ❷ and give a pressure to the face plate bearing ❹. At that time, move the presser foot face plate ❸ vertically, making sure that uneven application of torque can be avoided. 3. Tighten the setscrew ❶. (Caution) 1. When the setscrew ❶ is tightened, pressure kept applied to the face plate bearing ❹ is changed. Therefore, when the setscrew ❶ is tightened, examine the amount of the slippage torque. 2. The pressure adjusting screw ❷ is not attached to the sewing machine.	- o If normal pressure is not applied, vertical movement of the presser cannot be accomplished normally. - o If normal pressure is not applied, rattling will be generated and accuracy will be lowered.

(35) Initial length of the presser cylinder

Standard Adjustment

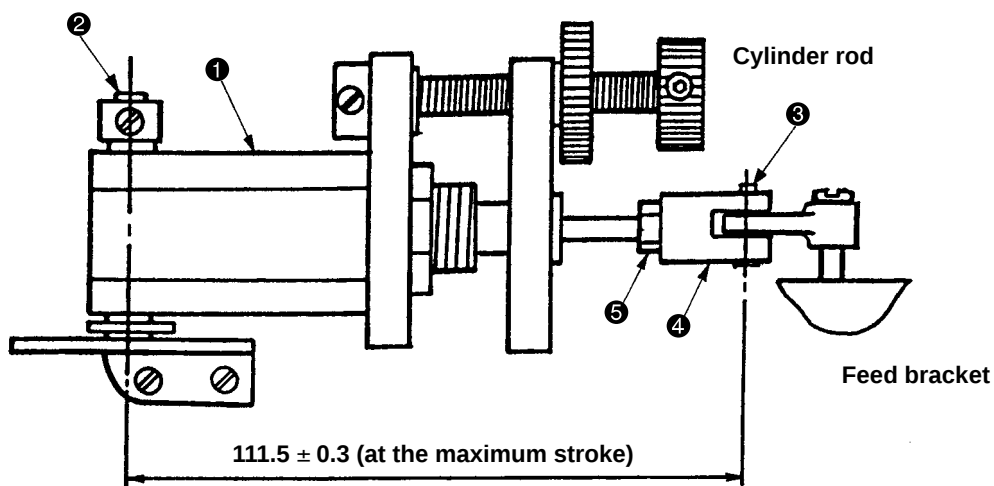
When the shaft section of the presser cylinder ③ assumes a state of maximum suction, the center-to-center distance is $119.5 \pm 0.3\text{mm}$ between the $\varnothing 5$ hole ④ of the presser cylinder ③ and the $\varnothing 5$ hole ⑤ of the cylinder knuckle.



(36) Initial length of the 2-step stroke cylinder

Standard Adjustment

Adjust the center-to-center distance to $111.5 \pm 0.3\text{mm}$ between the 2-step stroke fulcrum shaft ② and the connecting shaft ③ of the intermediate stop cylinder knuckle when the intermediate stop cylinder (2-step stroke cylinder) ① assumes a state of maximum stroke.



Adjustment Procedures	Results of Improper Adjustment
1. Tighten the nut ❶. 2. Turn the cylinder knuckle ❷ and adjust the center-to-center distance to $119.5 \pm 0.3\text{mm}$. 3. Securely fix the nut ❶.	- o If the distance is greater than $119.5 \pm 0.3\text{mm}$, the feeding frame cannot attain the maximum rising distance of 30mm. - o If the distance is too less than $119.5 \pm 0.3\text{mm}$, the feeding frame cannot come down completely. As a result, the material cloth cannot be held tight and displacement of materials can occur.

Adjustment Procedures	Results of Improper Adjustment
1. Pull the knuckle ❹ so that the 2-step stroke cylinder ❶ can attain the maximum stroke. 2. Loosen the nut ❺ and turn the knuckle ❹ so that the center-to-center distance is adjusted to $111.5 \pm 0.3\text{mm}$. 3. Fix the nut ❺ assuredly.	o If the center-to-center distance is insufficient, the amount of presser rise cannot attain the maximum value of 30mm.

(37) Adjustment of the speed controller

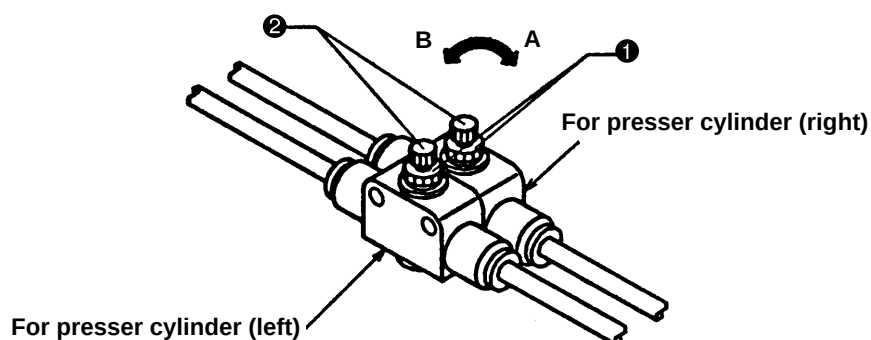
Standard Adjustment

Standard adjusting value of the speed controller for the presser cylinder

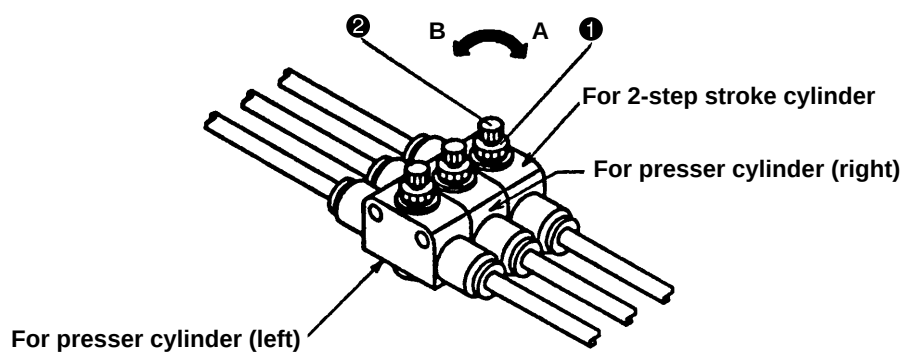
1. Loosen the nut ❶ and once turn the knob ❷ fully in Direction A. Then, turn this knob in Direction B by one turn and tighten the nut ❶.

Standard adjusting value of the speed controller for the 2-step stroke cylinder

1. Loosen the nut ❶ and once turn the knob ❷ fully in Direction A. Then, turn this knob in Direction B by one turn and tighten the nut ❶.



Type L (2-step presser with 2-step stroke)



Adjustment Procedures	Results of Improper Adjustment
Make adjustments according to the standard adjusting values. - o To increase the vertical presser speed, turn the knob ② in Direction B. - o To decrease the vertical presser speed, turn the knob ② in Direction A.	- o Too much noise is generated when the presser is lowered. - o The presser does not rise.

(38) Adjustment of the pressure reducer

Standard Adjustment

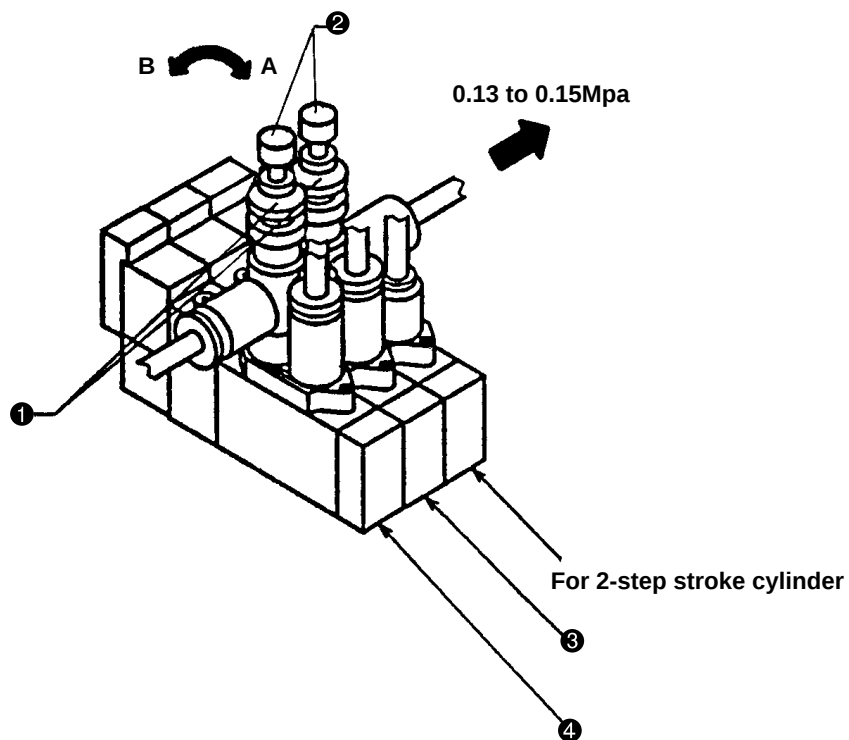
Standard adjusting value of the pressure reducer for the presser cylinder (left)

1. Loosen the nut ❶ and turn the knob ❷ to adjust the air pressure so that it is reduced to 0.13 to 0.15Mpa. Then, tighten the nut ❶.

Standard adjusting value of the pressure reducer for the presser cylinder (right)

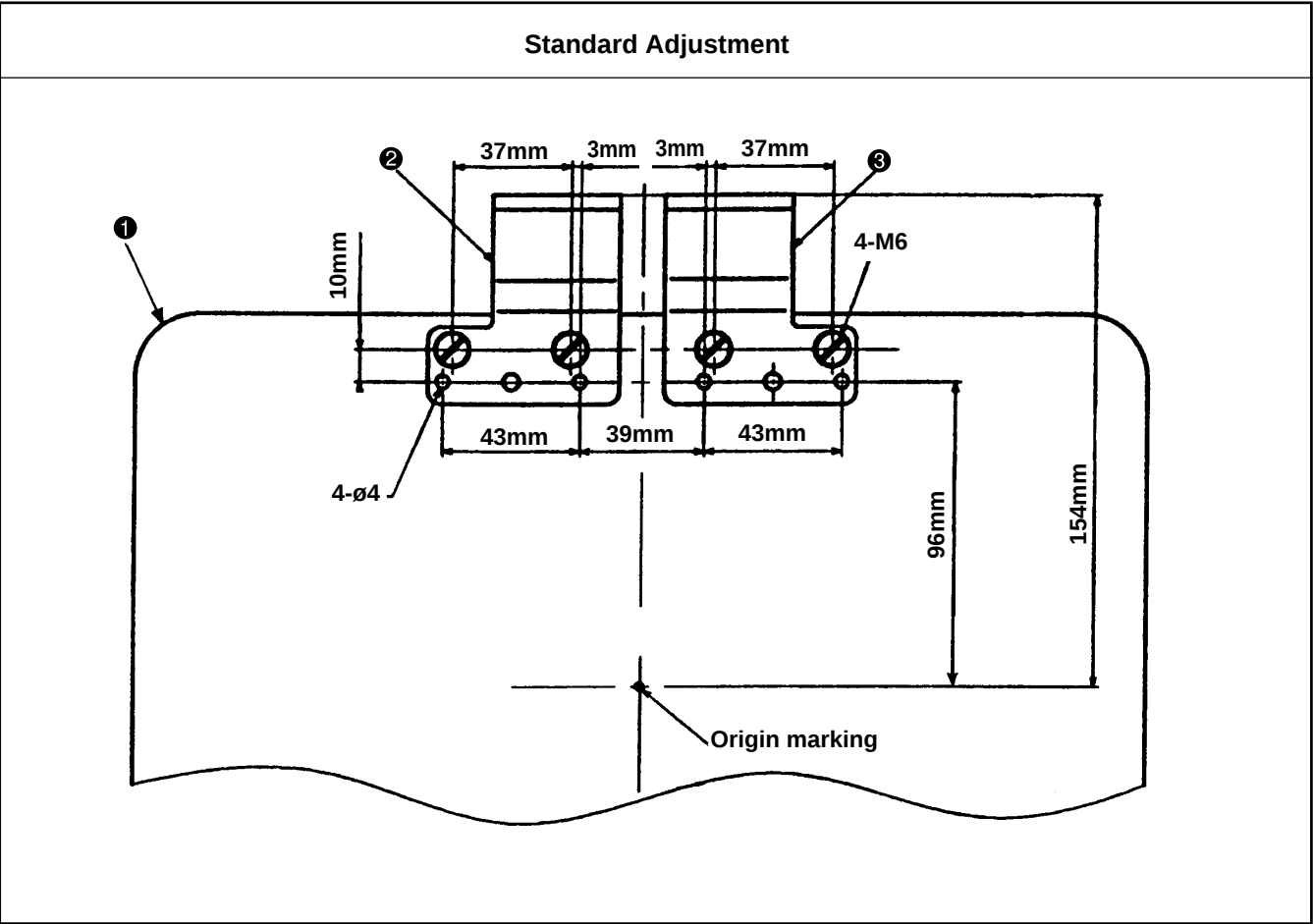
1. Loosen the nut ❶ and turn the knob ❷ to adjust so that ❸ for the presser cylinder (left) and ❹ for the presser cylinder (right) can rise at the same time. Then, tighten the nut ❶.
2. At that time, confirm that the pressure reducer of ❹ for the presser cylinder (right) has reduced the pressure to 0.10 to 0.17Mpa. If the pressure seems to deviate from this range, check the torque at the working section of the feed bracket and readjust this deviation.

(Caution) For Type S (specification for united presser), only the pressure reducer of ❹ for the presser cylinder (right) is available. Adjust the pressure reducer of ❹ for the presser cylinder (right) until its pressure is reduced to 0.13 to 0.15Mpa.

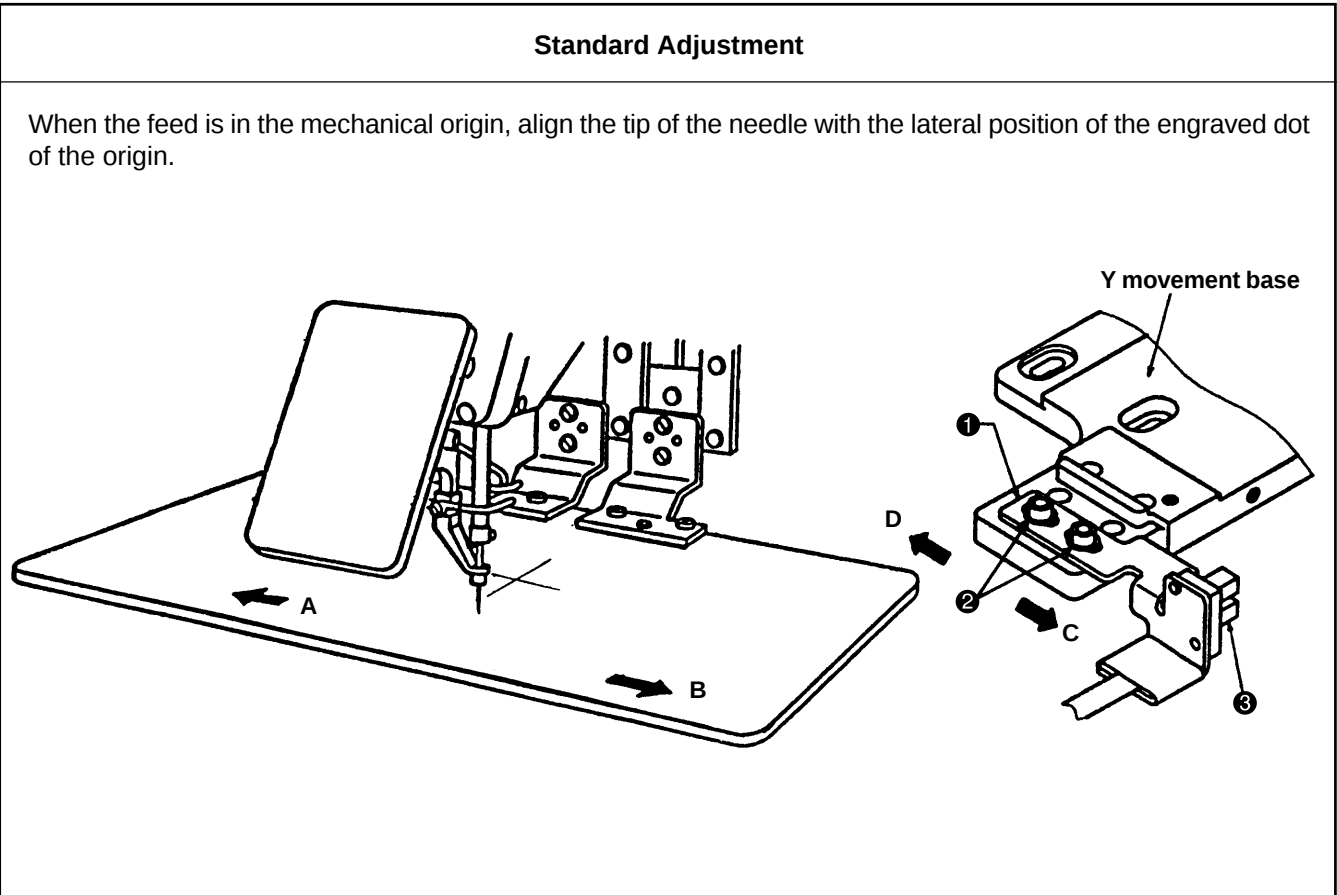


Adjustment Procedures	Results of Improper Adjustment
Make adjustments according to the standard adjusting values. - o To reduce the pressure, turn the knob ❷ in Direction B. - o To raise the pressure, turn the knob ❷ in Direction A.	o The presser cannot be lowered by hand.

(39) Making the origin setting gauge



(40) Adjusting the X origin sensor



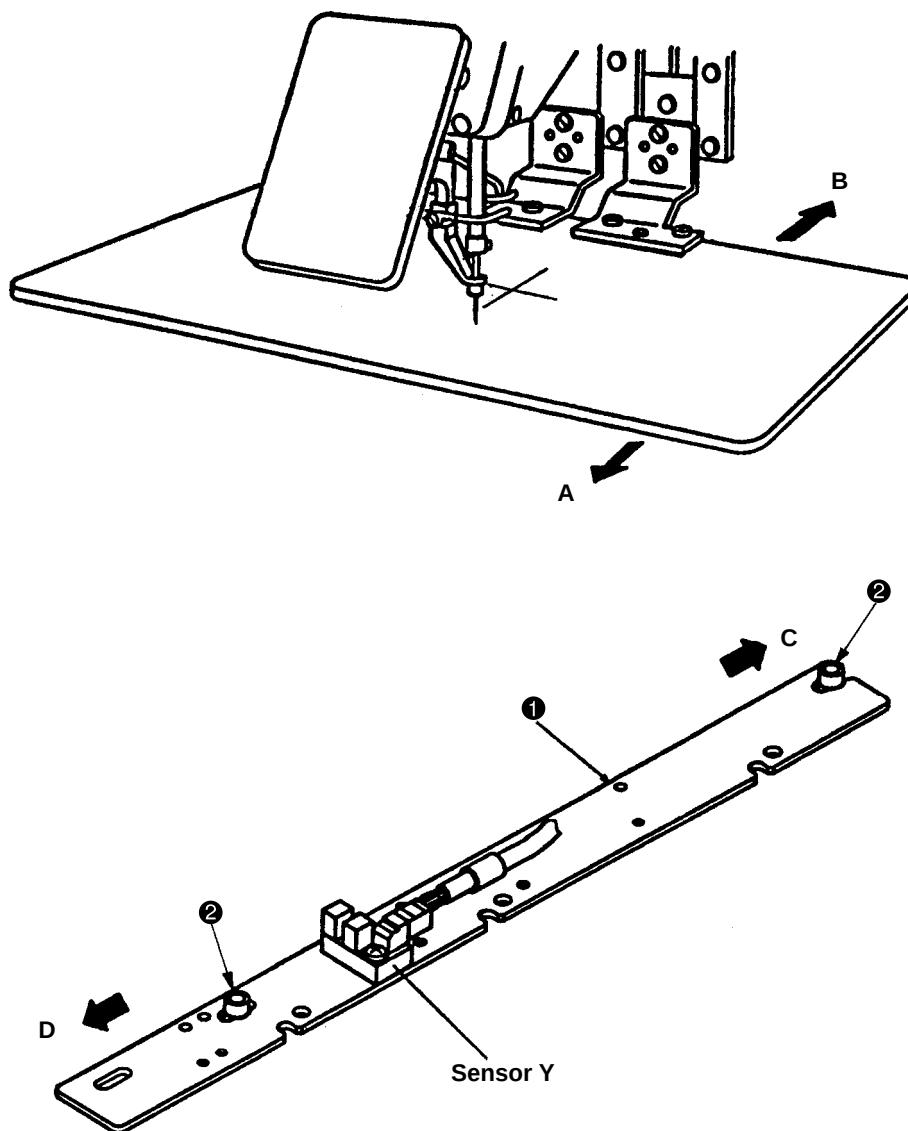
Adjustment Procedures	Results of Improper Adjustment
1. According to the illustration, produce an origin adjustment gauge ❶ and mount it on the presser foot left ❷ and right ❸.	

Adjustment Procedures	Results of Improper Adjustment
1. Start the test mode I06 (IP-410). 2. When the star pedal is depressed, the feed moves to the mechanical origin and stops. 3. Lower the needle and check the right and left displacement based on the engraved marking of the origin. 4. When the engraved marking of the origin is found to be displaced in Direction A from the needle tip, loosen the 2 setscrews ❷ and adjust the sensor mounting plate ❶ in Direction C. After adjustments, tighten the 2 setscrews ❷. 5. When the engraved marking of the origin is found to be displaced in Direction B from the needle tip, loosen the 2 setscrews ❷ and adjust the sensor mounting plate ❶ in Direction D. After adjustments, tighten the 2 setscrews ❷. (Caution) After the adjustment, make sure that the slit plate does not interfere with the sensor ❸.	

(41) Adjusting the Y origin sensor

Standard Adjustment

When the feed is in the mechanical origin, align the tip of the needle with the longitudinal position of the engraved dot of the origin.

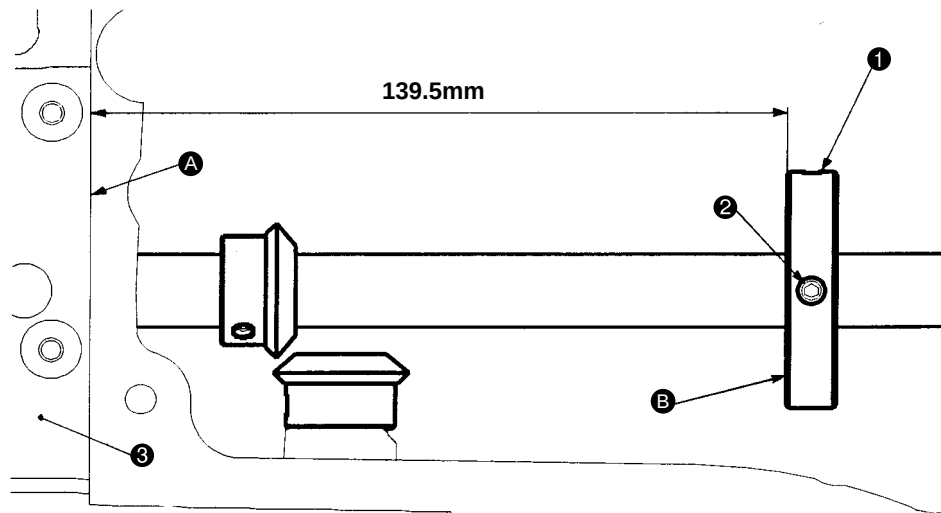


Adjustment Procedures	Results of Improper Adjustment
1. Start the test mode I06 (IP-410). 2. When the pedal is trodden on, the feed moves to the mechanical origin and then stops. 3. Lower the needle and check the front-rear displacement from the engraved marking of the origin. 4. When the engraved marking of the origin is found to be displaced in Direction A from the needle tip, adjust the sensor mounting plate ❶ in Direction C. (Loosen the setscrews ❷ and fix the setscrews ❷ after adjustments.) 5. When the engraved marking of the origin is found to be displaced in Direction B from the needle tip, adjust the sensor mounting plate ❶ in Direction D. (Loosen the setscrews ❷ and fix the setscrews ❷ after adjustments.)	

(42) Adjustment of the bobbin winder driving wheel position

Standard Adjustment

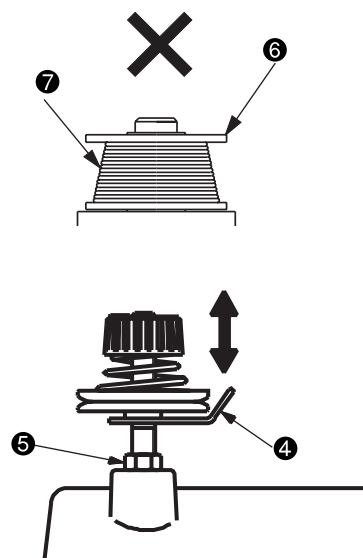
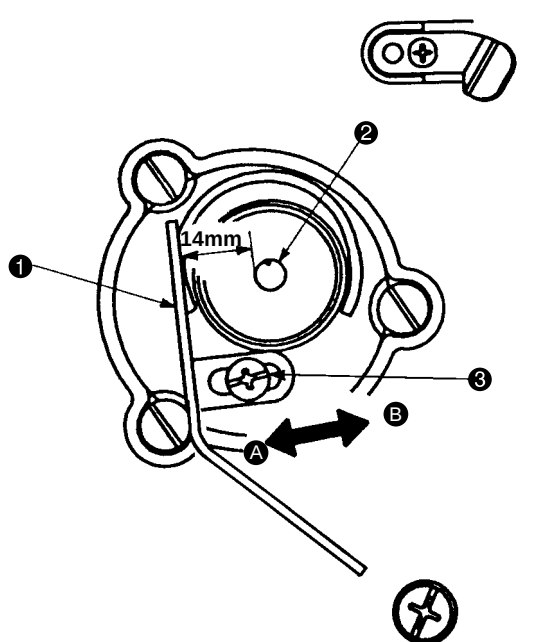
The distance is 139.5 mm between the measuring plane **B** of the bobbin winder driving wheel **1** and the cover mounting plane **A** of the sewing machine frame **3**.



(43) Adjusting the bobbin winder amount

Standard Adjustment

The position of the bobbin winder lever **1** is based on the standard that it is 14 mm apart from the bobbin winder shaft **2**. Try to perform bobbin winding actually and make fine adjustments of the bobbin lever set screw **3** in the directions of the arrows **A** and **B** so that the amount of thread winding becomes adequate (recommended value: 80 to 90% of the bobbin.)



Adjustment Procedures	Results of Improper Adjustment
1. Loosen the 2 setscrews ❷ to adjust the position (139.5mm) of the bobbin winder driving wheel ❶ and fix it with the 2 setscrews ❷.	- o If the distance of 139.5mm is insufficient, rubber ring wear may occur in the bobbin winder unit. In addition, the bearing life may be reduced in the bobbin winder unit. - o If the distance of 139.5mm is excessive, normal thread winding may fail. In addition, this will also cause rubber ring slippage in the bobbin winder unit and give rise to wear.

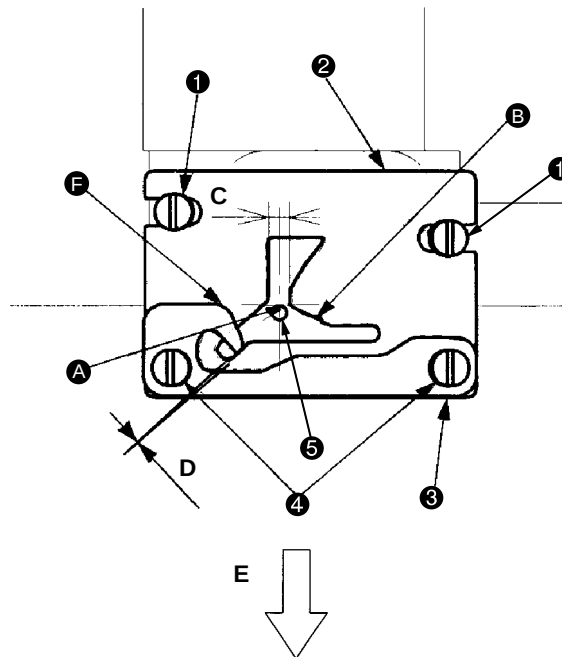
Adjustment Procedures	Results of Improper Adjustment
1. Loosen the setscrew ❸ of the bobbin winder lever and adjust the distance to 14mm between the bobbin winder lever ❶ and the bobbin winder shaft ❷. After that, tighten the setscrew ❸ of the bobbin winder lever. 2. Start the sewing machine and wind the thread at the bobbin winder. Confirm the amount of winding. 1) If the amount of winding seems to be too much, adjust the bobbin winder lever ❶ in the direction of the arrow B. 2) If the amount of winding seems to be too less, adjust the bobbin winder lever ❶ in the direction of the arrow A. 3. If the winding state of the thread ❷ around the bobbin winder ❸ seems to be uneven, loosen the nut ❹ and adjust the height of the thread tension control ❺. (Example) If the amount of the wound thread is less on the upper side of the bobbin winder ❸ as illustrated, adjust the thread tension control ❺ upwards.	- o If too much thread is wound (thread protruded from the bobbin winder ❸), the thread ❷ will come in contact with the inside of the bobbin case and this can be a cause of sewing deficiency. - o If the amount of thread winding is uneven at top and bottom of the bobbin winder ❸, stitch perforation may become irregular.

(44) Adjustment of the shuttle upper spring and lower thread holder position

Standard Adjustment

1. Shuttle upper spring ② : In regard to the right and left positioning, secure coincidence between the center of the needle ⑤ and that of the groove width C. For the front-rear positioning, join the needle rear end and the corner ④ block.
2. Lower thread holder ③ : The amount of overlapping with the shuttle upper spring ② should be adjusted so that the thread of Vinyon #8 can pass smoothly when it is pulled in the direction of the arrow E. After the best positioning has been secured, fasten the 2 setscrews ④.

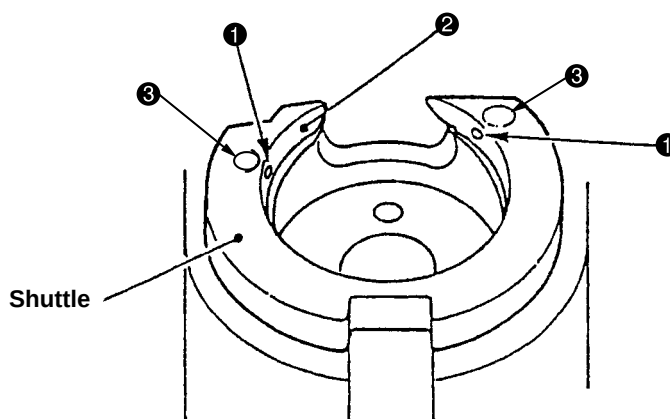
(Caution) If Part ② and ⑤ is damaged, this is the cause of thread breakage, hangnail of thread, stain on thread, etc. Therefore, this part should be polished by the use of a buff or the like. In particular, the rear side should be handled with care.



(45) Shuttle felt

Standard Adjustment

- Two pieces of the shuttle felt ① are inserted in the holes of the shuttle race ②. Confirm that the shuttle felts ① are not overloaded when the inner hook is set and turned along the shuttle race ②.
- Shuttle packing ③ has been inserted in the hole of the shuttle race ②.



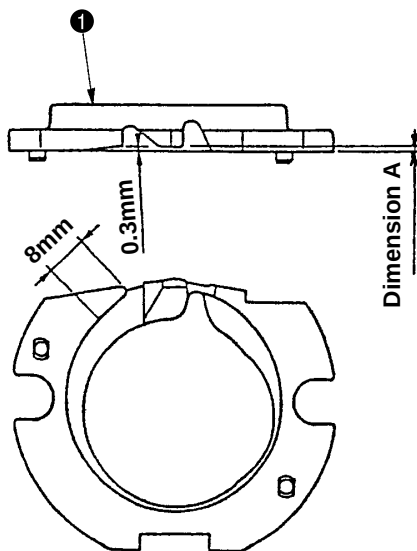
Adjustment Procedures	Results of Improper Adjustment
1. Remove the work feed bar, feed plate, and the throat plate. Adjust the positioning of shuttle upper spring ② with the setscrews ① (2 pcs.). 2. Using the setscrew ④, adjust the amount of overlapping D for the lower thread holder ③ and the shuttle upper spring ②. (Caution) The right and left positions can also change during (18) hook adjustments. Position adjustment for the shuttle upper spring ② should be done after the completion of standard hook adjustment, without fail.	- o If there is a front and rear displacement or a right and left displacement, needle thread biting may occur into the hook. Too much motion to the rear side will cause the moving knife to fail to hook the needle thread. - o Too much motion to the rear side will cause the moving knife to fail to hook the needle thread. - o Too much motion to the left side will cause the moving knife to fail to hook the bobbin thread.

Adjustment Procedures	Results of Improper Adjustment
1. If the shuttle felt ① seems to be protruded or it has been replaced with a new one, push it in by means of tweezers or the like. (Caution) Do not push it in excessively. Align the height and the plane of the shuttle race ②. 2. Confirm that the shuttle packing ③ has been mounted assuredly.	- o If the shuttle felt ① is protruded, this will be turned into a rotary load of the inner hook, causing a sewing error. - o If the shuttle felt ① is missing or pushed in too much, this will result in hook lubrication deficiency, causing hook overheating and wear. - o If the shuttle packing ③ has been missing, the shuttle felt ① and others may be lost, and this can be a cause of shuttle heating and wear.

(46) Shape of the shuttle race ring

Standard Adjustment

If wear seems to be too much around the pointed tip of the inner hook, release the shuttle race ring ❶ and confirm that the dimensions of the hatched area on the rear side are 0.3 x 8mm.

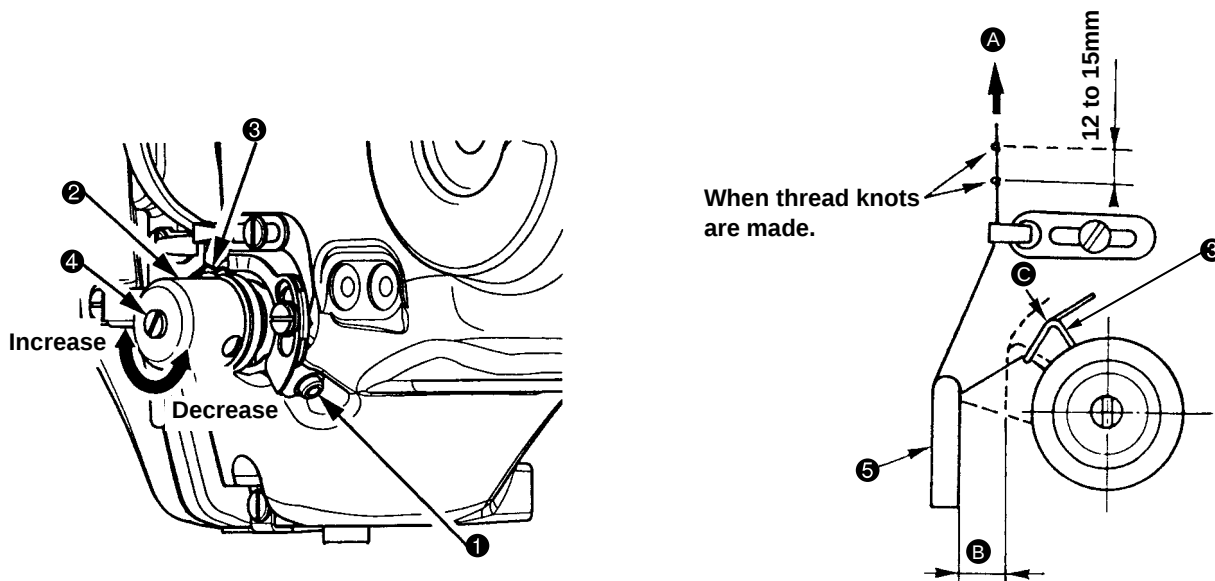


(47) Adjustment of thread take-up spring

Standard Adjustment

Stroke : The movable distance of the needle thread when the needle thread is pulled in the direction ❶ until the thread take-up spring ❸ stops. 12 to 15 mm for S type, 12 to 18 mm for H type.

Tension : Adjust the thread take-up spring tension in accordance with the thread tension. (Actually sew a material and adjust the thread take-up spring tension to an appropriate value.)



Adjustment Procedures				Results of Improper Adjustment
1. If the dimensions of 0.3 x 8mm are not secured, retouching is required with the aid of an oil stone.				
Dimension A (mm)	Part No.	Name of part	Remarks	
0.8	14103253	Shuttle race ring A	Optional	
1.3	14103352	Shuttle race ring B	Standard	
1.7	14103659	Shuttle race ring C	Optional	
1.9	B1817210DAD	Shuttle race ring D	Optional	

Adjustment Procedures		Results of Improper Adjustment
1) Stroke adjustment Loosen the setscrew ❶, and turn the thread tension assembly ❷. Turning it clockwise increases the movable distance and thread drawing amount. 2) Adjustment of thread take-up spring tension Turn the thread tension post ❹ using a thin driver with the setscrew ❶ tightened to adjust the thread take-up spring ❸ tension. Turning it clockwise increases the thread take-up spring ❸ tension, and turn it counterclockwise decreases the tension. (Caution) Set the stroke of the thread take-up spring ❸ shorter for thin threads with thread number #50 or higher.		o If the stroke of the thread take-up spring is larger than the specified value: Length of remaining needle thread is shortened, causing the needle thread to slip off the needle at the sewing start. o If the stroke of the thread take-up spring is smaller than the specified value: Needle thread breakage will occur at the time of thread trimming when using a thin thread. (Caution) If the thread take-up spring ❸ interferes with the L-shaped thread guide ❺, the thread take-up spring ❸ may fail to return to the initial position before thread trimming, and the length of remaining needle thread may be short. If such a trouble occurs, bend the section ❸ of the thread take-up spring ❸ to widen the clearance ❷.

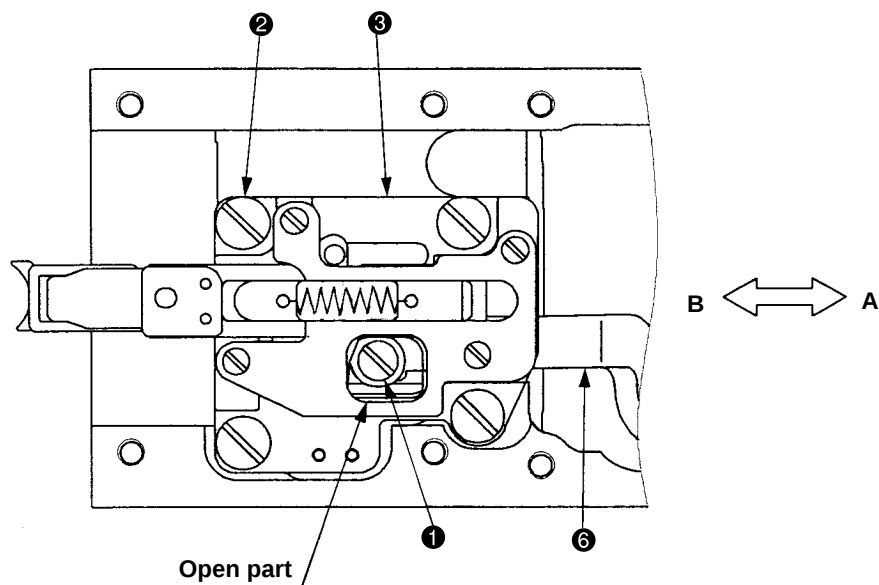
(48) Needle thread clamp device connection/disconnection

Procedures of disassembling

1. Remove the hinge screw ❶.

* If the hinge screw ❶ cannot be seen from the open part of the needle thread clamp device ❸, try to move the needle thread clamp connector link ❹ by hand in the direction of A or B.

2. Remove the 4 setscrews ❷ of the needle thread clamp base and take out the needle thread clamp device ❸.

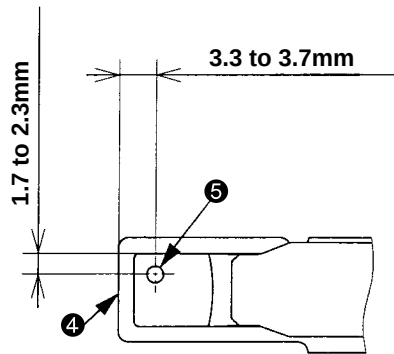


Procedures of assembling

1. Push the needle thread clamp device ③ in the direction of A and fix it with the four setscrews ②. Tighten the hinge screw ①.
2. Start the test mode I08.
3. Tread on the pedal for origin retrieval.
4. Press the  key once so that the needle thread clamp support plate asm. ④ is moved to the most advanced position.

Confirm that the distance to the needle thread clamp support plate asm. ④, and also to the needle ⑤, is 3.3 to 3.7mm and 1.7 to 2.3mm, respectively.

5. If the distance seems to be inadequate, loosen the four setscrews ② and move the needle thread clamp device ③ for adjustment.
6. After the completion of the above-mentioned reassembly, make adjustments according to “(49) Adjusting the needle thread clamp sensor.”



(49) Adjusting the needle thread clamp sensor

Standard Adjustment

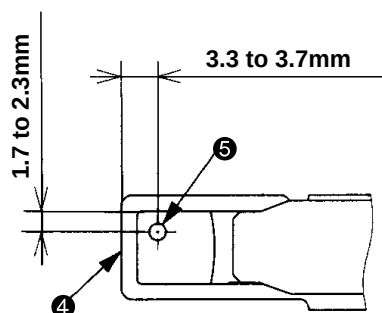
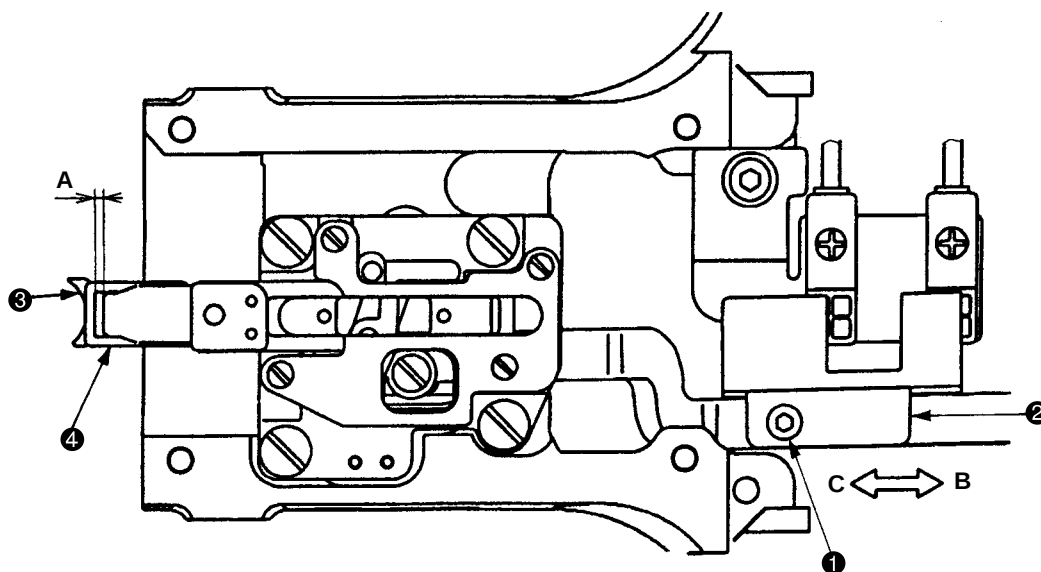
When the needle thread clamp support plate complete ④ is withdrawn by 3 to 4 pulses from the needle thread clamp position (**Caution 1., 2.**) the clearance A toward the needle thread clamp ③ becomes 0.

(Caution) 1. The needle thread clamping position is defined by pressing the  key after origin retrieval in the test mode I08 (IP-410). This position is defined where it is returned by one step from the most advanced position.

2. According to the thread clamp specifications, the memory switch U69 may change.

S Type → 0

H Type → 1



Adjustment Procedures	Results of Improper Adjustment
In the first place, confirm that the setting value of the memory switch U69 is [0] for S Type and [1] for H Type. Since then, make the adjustments as specified below. 1. Start the test mode I08 (IP-410). 2. Tread on the pedal for needle thread clamp ❸ origin retrieval. 3. Press the  key twice and set the needle thread clamp support plate complete ❹ in the needle thread clamp position. 4. Confirm that the clearance A becomes 0 between the needle thread clamp ❸ and the needle thread clamp support plate complete ❹ when the [-] key is pressed 3 to 4 times (for 3 to 4 pulses), and that both the needle thread clamp ❸ and the needle thread clamp support plate complete ❹ move together when the [-] key is pressed again. 5. If the clearance A becomes 0 with 5 or more pulses, loosen the set screw ❶ and fix the slit ❷ after moving it in the direction B. If the clearance A becomes 0 with less than 3 pulses, loosen the set screw ❶ and fix the slit ❷ after moving it in the direction C. After the slit ❷ has been fixed, check the above-mentioned steps 2. to 4. 6. Using 3 to 4 pulses, repeat the steps 2. to 5. above until the clearance A becomes 0. 7. Tread on the pedal for needle thread clamp ❸ origin retrieval and define the most advanced position by pressing the  key once. 8. Confirm that the distances between the needle thread clamp support plate complete ❹ and the needle ❺ are kept at 3.3 to 3.7mm and 1.7 to 2.3mm, respectively. 9. If the distance is found to be inadequate, adjust the position toward the needle ❺ according to (48) Needle thread clamp device connection/disconnection. Since then, make the above-mentioned sensor adjustments again.	- o If there are too many pulses used until the clearance A becomes 0, this can be a cause of unthreading at the beginning of sewing. - o If the number of pulses is too small until the clearance A becomes 0, the resistance toward the needle thread becomes large and this can be a cause of thread breakage at the beginning of sewing. - o If the distance is improper between the needle thread clamp support plate complete ❹ and the needle ❺, this will give rise to interference between the needle thread clamp ❸ and the needle ❺.

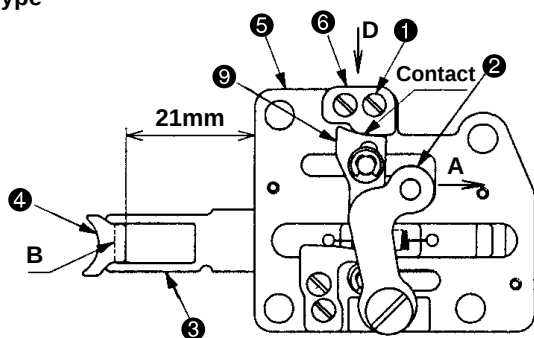
(50) Adjusting the needle thread clamp notch

Standard Adjustment

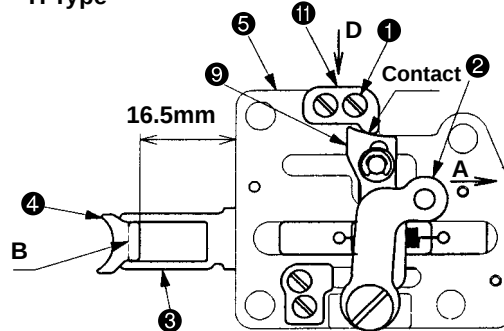
1. Needle thread clamp notch R position

- When the needle thread clamp link complete ② is pressed in Direction A, and Part B of the needle thread clamp support plate complete ③ and the needle thread clamp ④ begins to open, the distance between the needle thread clamp ④ and the needle thread clamp base ⑤ becomes 21mm for S Type and 16.5mm for H type.

S Type



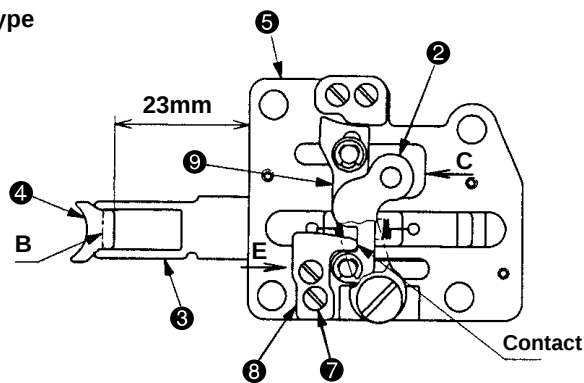
H Type



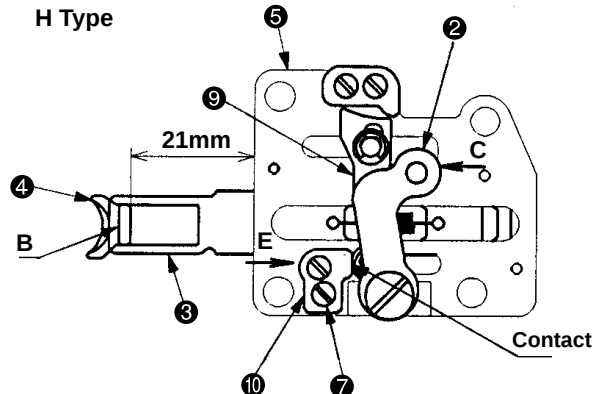
2. Needle thread clamp notch F position

- When the needle thread clamp link complete ② is pressed in Direction C, and Part B of the needle thread clamp support plate complete ③ and the needle thread clamp ④ begins to open, the distance between the needle thread clamp ④ and the needle thread clamp base ⑤ becomes 23mm for S Type and 21mm for H Type.

S Type



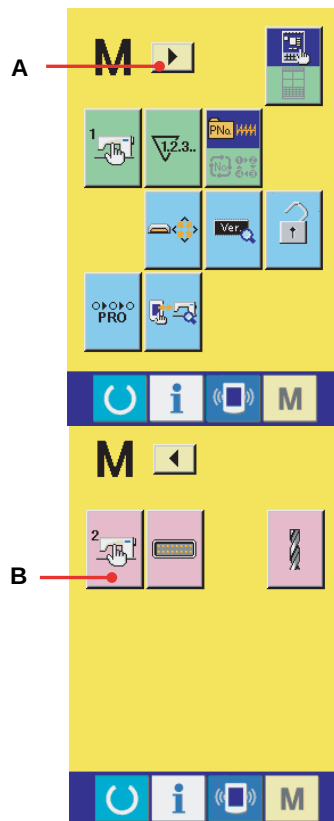
H Type



Adjustment Procedures	Results of Improper Adjustment
1. Needle thread clamp notch R adjustment 1) Loosen the 2 setscrews ❶. 2) Press the needle thread clamp link complete ❷ in Direction A so that the distance between the needle thread clamp ❹ and the needle thread clamp base ❺ becomes 21mm for S Type and 16.5mm for H Type. Move the needle thread clamp notch R ❸ (S Type) or the needle thread clamp notch RH ❹ (H Type) in Direction D, lightly press it toward the needle thread clamp cam plate ❺, and tighten the two setscrews ❶.	- o If the distance is too long between the needle thread clamp ❹ and the needle thread clamp base ❺, the needle thread release timing becomes earlier and this can be a cause of unthreading at the beginning of sewing. - o If the distance is too short between the needle thread clamp ❹ and the needle thread clamp base ❺, the needle thread release timing is delayed and this can be a cause of needle thread end remaining on the rear side of the material.
2. Needle thread clamp notch F adjustment 1) Loosen the 2 setscrews ❷. 2) Press the needle thread clamp link complete ❷ in Direction C so that the distance between the needle thread clamp ❹ and the needle thread clamp base ❺ becomes 23mm for S Type and 21mm for H Type. Move the needle thread clamp notch F ❸ (S Type) or the needle thread clamp notch FH ❹ (H Type) in Direction E, lightly press it toward the needle thread clamp cam plate ❺, and tighten the 2 setscrews ❷.	- o If the distance is too long between the needle thread clamp ❹ and the needle thread clamp base ❺, the needle thread release timing becomes earlier and this can be a cause of needle thread end remaining on the rear side of the material or jamming of needle thread into the needle thread clamp ❹. - o If the distance is too short between the needle thread clamp ❹ and the needle thread clamp base ❺, the needle thread clamp timing is delayed and this can be a cause of failure in needle thread clamping. - o Adjustments should conform to the adjustment values according to the needle thread clamp specifications (S Type or H Type). Otherwise, this can be a cause of failure in needle thread clamping operation.

4. Memory switch

(1) Start and change



To change the memory switch (level 2):

The sewing machine operation can be changed by changing the setting of the memory switch.

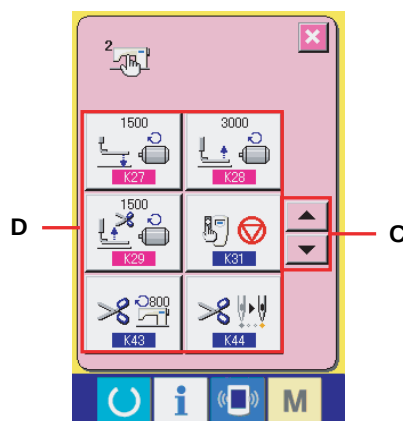
1. For IP-410:

(1) To call up the screen showing the memory switch data (level 2) list:

Hold down the **M** switch for approx. 6 seconds, and the page change button **▶** (A) appears at the top of the screen. Press the page change button to call up the next page, and the memory switch (level 2) button **◀** (B) appears. Press the memory switch (level 2) button to call up the screen that shows the list of memory switch data (level 2).

(2) To select the memory switch button to be changed:

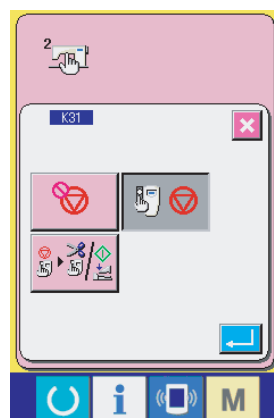
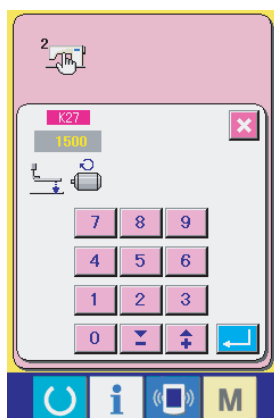
Select the data item (D) to be changed using the up and down scroll buttons **▲** **▼** (C).



(3) To change memory switch data (level 2):

Memory switch data (level 2) has 2 types of data items: one is where a value is changed, and the other is where a pictograph is selected. The data items where a value is changed are colored pink and numbered such as **K27** and the value can be changed with + and – buttons shown on the screen. The data items where a pictograph is selected are colored blue and numbered such as **K31** and pictographs shown on the screen where data items are changed are selectable.

Refer to “4.-(2) Function list” for further information about memory switch data (level 2).

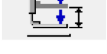
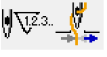


(2) Function list

Level 1 (Refer to the instruction manual for changing procedure.)

* This model requires restructuring separately.

No.	Item	Setting range	Smallest changeable unit	Initial value							
				SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
1	U01	Maximum sewing speed 	200 to 2700rpm	100rpm	2700						
2	U02	Sewing speed of 1st stitch In case of with thread clamp 	200 to 1500rpm	100rpm	1500						
3	U03	Sewing speed of 2nd stitch In case of with thread clamp 	200 to 2700rpm	100rpm	2700						
4	U04	Sewing speed of 3rd stitch In case of with thread clamp 	200 to 2700rpm	100rpm	2700						
5	U05	Sewing speed of 4th stitch In case of with thread clamp 	200 to 2700rpm	100rpm	2700						
6	U06	Sewing speed of 5th stitch In case of with thread clamp 	200 to 2700rpm	100rpm	2700						
7	U07	Thread tension of 1st stitch In case of with thread clamp 	0 to 200	1	200						
8	U08	Thread tension setting at the time of thread trimming 	0 to 200	1	0						
9	U09	Thread tension changeover timing at the time of thread trimming 	-6 to 4	1 (4°)	0						
10	U10	Sewing speed of 1st stitch In case of without thread clamp 	200 to 1500rpm	100rpm	200						
11	U11	Sewing speed of 2nd stitch In case of without thread clamp 	200 to 2700rpm	100rpm	600						
12	U12	Sewing speed of 3rd stitch In case of without thread clamp 	200 to 2700rpm	100rpm	1000						
13	U13	Sewing speed of 4th stitch In case of without thread clamp 	200 to 2700rpm	100rpm	1500						
14	U14	Sewing speed of 5th stitch In case of without thread clamp 	200 to 2700rpm	100rpm	2000						

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
15	U15	Thread tension of 1st stitch In case of without thread clamp		0 to 200	1	0							
16	U16	Thread tension changeover timing at the sewing start In case of without thread clamp		−5 to 2	1	−5							
17	U26	Height of presser at the time of 2-step stroke		50 to 90	1	70							
18	U32	Buzzer sound can be prohibited		0: Without buzzer sound	—	2							
				1: Panel operating sound									
				2: Panel operating sound + error									
19	U33	Number of stitches of thread clamp release is set		1 to 7 (stitches)	1	2							
20	U34	Clamping timing of thread clamp can be delayed		−10 to 0	1 (4°)	0							
21	U35	Thread clamp control can be prohibited		0: Normal	—	0							
				1: Prohibition									

[illegible]

[illegible]

No.	Item	Setting range	S m a l l e s t changeable unit	Initial value							
				SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
36	U70 Thread clamp and thread clamp position selection	 0: Standard (front)	—	0							
		 1: Rear									
37	U71 Thread breakage detection selection	 0: Disabled	—	1							
		 1: Enabled									
38	U72 Number of invalid stitches at the start of sewing of thread breakage detection	 0 to 15 stitches	1	8							
39	U73 Number of invalid stitches during sewing of thread breakage detection	 0 to 15stitches	1	3							
40	U81 Feeding frame control/pedal open-close		(For pneumatic frame) 0: Integrated type frame 1: Right-left separate type frame, no preference between right and left 2: Right-left separate type frame, order: right → left 3: Right-left separate type frame, order: left → right 4: Integrated type stroke 5: Right-left separate type left stroke, no preference between right and left 6: Right-left separate type left stroke, order: right → left 7: Right-left separate type left stroke, order: left → right 8-99: Integrated type frame	1	0	5		0		6	

No.		Item	Setting range	S m a l l e s t changeable unit	Initial value								
					SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *	
41	U82	Feeding frame control: midway stop time open/close		(For pneumatic frame) 0: Integrated type frame 1: Right-left separate type frame, no preference between right and left 2: Right-left separate type frame, order: right →left 3: Right-left separate type frame, order: left → right 4: Integrated type frame stroke 5: Right-left separate type left stroke, no preference between right and left 6: Right-left separate type left stroke, order: right → left 7: Right-left separate type left stroke, order: left → right 8-99: Integrated type frame	1	0	5	0	6				
42	U84	Pedal SW 1 with/without latch		0: Without	—	1							
				1: With									
43	U85	Pedal SW 2 with/without latch		0: Without	—	1	0	1	0				
				1: With									
44	U86	Pedal SW 3 with/without latch		0: Without	—	1							
				1: With									

[illegible]

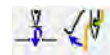
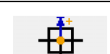
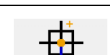
[illegible]

[illegible]

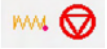
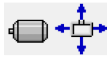
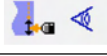
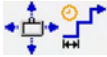
• Level 2

* This model requires restructuring separately.

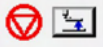
No.	Item	Setting range	Smallest changeable unit	Initial value							
				SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
1	 K27	Motor presser presser lowering drive speed		100 to 1500pps	10pps	1500					
2	 K28	Motor presser presser rising drive speed		100 to 3000pps	10pps	3000					
3	 K29	Thread trimming drive speed (+ presser rising)		100 to 1500pps	10pps	1000					
4	 K31	Temporary stop input selection		0: Ineffective	—	1					
				1: Effective							
				2: Thread trimming with temporary stop switch or start with start pedal after temporary stop							
5	 K43	Thread trimming speed		0: 400rpm	—	1					
				1: 800rpm							
6	 K44	Selection of thread trimming jump feed control		0: Ineffective	—	1					
				1: Effective							
7	 K45	Needle hole guide diameter at controlling thread trimming jump feed		1.6 to 4.0mm	0.2mm	S tyoe: 1.6/H type: 2.0					
8	 K47	Thread trimmer control prohibition selection		0: Normal operation	—	0					
				1: Prohibited to use							
9	 K52	Output time of magnet wiper on		10 to 500ms	10ms	50					

No.		Item	Setting range	S m a l l e s t changeable unit	Initial value								
					SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *	
10		Delayed time of magnet wiper off		10 to 500ms	10ms	80							
11		Wiper output timing select at upper dead point stop		0: Up position	—	0							
				1: Upper dead point									
12		Moving limit range in +X direction		0 to 819mm	1	+127			+152		+127		
13		Moving limit range in −X direction		− 819 to 0mm	1	−127			−152		−127		
14		Moving limit range in +Y direction		0 to 819mm	1	+82			+102		+82		
15		Moving limit range in −Y direction		−819 to 0mm	1	−82			−102		−82		
16		Selection of automatic preparation at power on		0: Ineffective	—	0							
				1: Effective									
17		Selection of needle bar stop holding mode		0: Ineffective	—	0							
				1: Effective									
18		Thread tension output while wiper output is active		0: No output (with thread trimming tension kept)	—	0							
				1: Maximum output									
19		Selection between motor presser and pneumatic presser		0: Motor presser	—	1							
				1: Pneumatic presser									
20		Pneumatic presser lowering delayed time (Disabled with motor presser selected)		0 to 1000ms	10ms	100							

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
21	K80	Control of feeding frame/ automatic opening and closing		0-99: Full open, full holding	1	0							
22	K83	Feeding frame control and closure at sewing end (enabled only if U37 lift of work clamp foot is selected at sewing end (=1))		0: Full open	—	0							
				1: Stroke position									
				2 to 99: Full open									
23	K90	Selection of the fixed refuge position		0: Nonuse	—	0							
				1: Use									
24	K92	Origin retrieval under normal conditions/origin reset route selection		0: Standard	—	0						1	
				1: Inversion									
				2: Y-axis → X-axis									
				3: X-axis → Y-axis									
25	K93	Origin retrieval at mealing/ origin reset route selection		0: Standard	—	0						1	
				1: Inversion									
				2: Y-axis → X-axis									
				3: X-axis → Y-axis									
26	K95	Thread trimming timing		-2 to 2	1	0							
27	K96	Constant reading of pattern in Media		0: Disabled (backup data enabled)	—	0							
				1: Enabled									

No.	Item	Setting range	Smallest changeable unit	Initial value							
				SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
28	 K98	Jump command/top position rest time		0 to 100ms	10ms	20					
29	 K99	Input command/timeout period		0 to 10000ms (0: No timeout)	100ms	0					
30	 K100	End command/stop control		0: Ineffective	—	0					
				1: Effective							
31	 K102	Main motor XY feed synchronizing control/extension		0: Standard	—	0					
				1: Extension unit							
32	 K106	Intermediate presser lowering speed		100 to 3000pps	10pps	3000					
33	 K107	Intermediate presser rising speed		100 to 3000pps	10pps	3000					
34	 K109	Material end detection control Y/N		0: Without	—	1					
				1: With							
35	 K110	Inversion device control Y/N		0: Without	—	1					
				1: With							
36	 K111	Automatic inversion device Y-axis		0 to 100.0mm	0.1mm	17.0					
37	 K114	XY inching control/first step time		100 to 10000ms	10ms	400					
38	 K115	XY inching control/second step time		100 to 10000ms	10ms	1200					
39	 K116	XY inching control/max. speed		100 to 2000pps	10pps	1000					

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
40	K117	Fixed move-aside position, X-axis		-800.0 to 800.0mm	0.1mm	0							
41	K118	Fixed move-aside position, Y-axis		-800.0 to 800.0mm	0.1mm	0							
42	K119	XY feed move speed/origin. origin → sewing start		100 to 10000pps	10pps	10000							
43	K120	XY feed speed/sewing end point → sewing start point/at work clamp foot closed		100 to 10000pps	10pps	10000							
44	K121	XY feed speed/sewing end point → sewing start point/at work clamp foot opened		100 to 10000pps	10pps	2000							
45	K122	XY feed moving speed/forward/backward		100 to 10000pps	10pps	2000							
46	K123	XY feed moving speed/return-to-origin		100 to 10000pps	10pps	2000							
47	K124	XY feed speed/retainer compensation		100 to 10000pps	10pps	2000							
48	K125	XY feed moving speed/at origin retrieval		100 to 10000pps	10pps	2000							
49	K126	XY feed moving speed/direction dependence, first region (X-axis neighborhood)		100 to 10000pps	10pps	10000							
50	K127	XY feed moving speed/direction dependence, second region (Y-axis neighborhood)		100 to 10000pps	10pps	10000							
51	K128	XY feed moving speed/direction dependence, third region (45° neighborhood)		100 to 10000pps	10pps	10000							
52	K130	Bank connection selected terminal count		0: None	—	0							
				1: 2 patterns recognition									
				2: 4 patterns recognition									
				3: 8 patterns recognition									
				4: 16 patterns recognition									

No.		Item		Setting range	Smallest changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
53		Presser lifting at temporary stop error Y/N		0: Without	—	0							
				1: With									
54		Prohibition selection of machine head safety switch		0: Normal	—	0							
				1: Prohibition									
55		Model classification		0 to 7	1	0	1	2	3	4	5	6	7
The port setting screen is available for inputting.													
56	300	Input terminal 1 assignment		0 to 199	1	0							
57	301	Input terminal 1 active		0: LOW	—	0							
				1: HIGH									
58	302	Input terminal 2 assignment		0 to 199	1	0							
59	303	Input terminal 2 active		0: LOW	—	0							
				1: HIGH									
60	304	Input terminal 3 assignment		0 to 199	1	0							
61	305	Input terminal 3 active		0: LOW	—	0							
				1: HIGH									
62	306	Input terminal 4 assignment		0 to 199	1	0							
63	307	Input terminal 4 active		0: LOW	—	0							
				1: HIGH									

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
64	308	Input terminal 5 assignment		0 to 199	1	0							
65	309	Input terminal 5 active		0: LOW	—	0							
				1: HIGH									
66	310	Input terminal 6 assignment		0 to 199	1	0							
67	311	Input terminal 6 active		0: LOW	—	0							
				1: HIGH									
68	312	Input terminal 7 assignment		0 to 199	1	0							
69	313	Input terminal 7 active		0: LOW	—	0							
				1: HIGH									
70	314	Input terminal 8 assignment		0 to 199	1	0							
71	315	Input terminal 8 active		0: LOW	—	0							
				1: HIGH									
72	316	Input terminal 9 assignment		0 to 199	1	0							
73	317	Input terminal 9 active		0: LOW	—	0							
				1: HIGH									
74	318	Input terminal 10 assignment		0 to 199	1	0							
75	319	Input terminal 10 active		0: LOW	—	0							
				1: HIGH									

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
76	320	Input terminal 11 assignment		0 to 199	1	0							
77	321	Input terminal 11 active		0: LOW	—	0							
				1: HIGH									
78	322	Input terminal 12 assignment		0 to 199	1	0							
79	323	Input terminal 12 active		0: LOW	—	0							
				1: HIGH									
80	324	Input terminal 13 assignment		0 to 199	1	0							
81	325	Input terminal 13 active		0: LOW	—	0							
				1: HIGH									
82	326	Input terminal 14 assignment		0 to 199	1	0							
83	327	Input terminal 14 active		0: LOW	—	0							
				1: HIGH									
84	328	Input terminal 15 assignment		0 to 199	1	0							
85	329	Input terminal 15 active		0: LOW	—	0							
				1: HIGH									
86	330	Input terminal 16 assignment		0 to 199	1	0							
87	331	Input terminal 16 active		0: LOW	—	0							
				1: HIGH									

No.		Item		Setting range	Smallest changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
88	332	Output terminal 1 assignment		0 to 199	1	1							
89	333	Output terminal 1 active		0: LOW	—	0							
				1: HIGH									
90	334	Output terminal 2 assignment		0 to 199	1	2							
91	335	Output terminal 2 active		0: LOW	—	0							
				1: HIGH									
92	336	Output terminal 3 assignment		0 to 199	1	4							
93	337	Output terminal 3 active		0: LOW	—	0							
				1: HIGH									
94	338	Output terminal 4 assignment		0 to 199	1	7							
95	339	Output terminal 4 active		0: LOW	—	0							
				1: HIGH									
96	340	Output terminal 5 assignment		0 to 199	1	9							
97	341	Output terminal 5 active		0: LOW	—	0							
				1: HIGH									
98	342	Output terminal 6 assignment		0 to 199	1	0							
99	343	Output terminal 6 active		0: LOW	—	0							
				1: HIGH									

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value						
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06
100	344	Output terminal 7 assignment		0 to 199	1	0						
101	345	Output terminal 7 active		0: LOW	—	0						
				1: HIGH								
102	346	Output terminal 8 assignment		0 to 199	1	0						
103	347	Output terminal 8 active		0: LOW	—	0						
				1: HIGH								
104	348	Output terminal 9 assignment		0 to 199	1	0						
105	349	Output terminal 9 active		0: LOW	—	0						
				1: HIGH								
106	350	Output terminal 10 assignment		0 to 199	1	0						
107	351	Output terminal 10 active		0: LOW	—	0						
				1: HIGH								
108	352	Output terminal 11 assignment		0 to 199	1	0						
109	353	Output terminal 11 active		0: LOW	—	0						
				1: HIGH								
110	354	Output terminal 12 assignment		0 to 199	1	0						
111	355	Output terminal 12 active		0: LOW	—	0						
				1: HIGH								

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
112	356	Output terminal 13 assignment		0 to 199	1	0							
113	357	Output terminal 13 active		0: LOW	—	0							
				1: HIGH									
114	358	Output terminal 14 assignment		0 to 199	1	0							
115	359	Output terminal 14 active		0: LOW	—	0							
				1: HIGH									
116	360	Output terminal 15 assignment		0 to 199	1	0							
117	361	Output terminal 15 active		0: LOW	—	0							
				1: HIGH									
118	362	Output terminal 16 assignment		0 to 199	1	0							
119	363	Output terminal 16 active		0: LOW	—	0							
				1: HIGH									
120	364	Virtual I/O terminal 1 assignment		0 to 199	1	0							
121	365	Virtual I/O terminal 1 I/O selection		0: Input	—	0							
				1: Output									
122	366	Virtual I/O terminal 2 assignment		0 to 199	1	0							
123	367	Virtual I/O terminal 2 I/O selection		0: Input	—	0							
				1: Output									

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
124	368	Virtual I/O terminal 3 assignment		0 to 199	1	0							
125	369	Virtual I/O terminal 3 I/O selection		0: Input	—	0							
				1: Output									
126	370	Virtual I/O terminal 4 assignment		0 to 199	1	0							
127	371	Virtual I/O terminal 4 I/O selection		0: Input	—	0							
				1: Output									
128	372	Virtual I/O terminal 5 assignment		0 to 199	1	9							
129	373	Virtual I/O terminal 5 I/O selection		0: Input	—	0							
				1: Output									
130	374	Virtual I/O terminal 6 assignment		0 to 199	1	0							
131	375	Virtual I/O terminal 6 I/O selection		0: Input	—	0							
				1: Output									
132	376	Virtual I/O terminal 7 assignment		0 to 199	1	0							
133	377	Virtual I/O terminal 7 I/O selection		0: Input	—	0							
				1: Output									
134	378	Virtual I/O terminal 8 assignment		0 to 199	1	0							
135	379	Virtual I/O terminal 8 I/O selection		0: Input	—	0							
				1: Output									

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
136	380	Virtual I/O terminal 9 assignment		0 to 199	1	0							
137	381	Virtual I/O terminal 9 I/O selection		0: Input	—	0							
				1: Output									
138	382	Virtual I/O terminal 10 assignment		0 to 199	1	0							
139	383	Virtual I/O terminal 10 I/O selection		0: Input	—	0							
				1: Output									
140	384	Virtual I/O terminal 11 assignment		0 to 199	1	0							
141	385	Virtual I/O terminal 11 I/O selection		0: Input	—	0							
				1: Output									
142	386	Virtual I/O terminal 12 assignment		0 to 199	1	0							
143	387	Virtual I/O terminal 12 I/O selection		0: Input	—	0							
				1: Output									
144	388	Virtual I/O terminal 13 assignment		0 to 199	1	0							
145	389	Virtual I/O terminal 13 I/O selection		0: Input	—	0							
				1: Output									
146	390	Virtual I/O terminal 14 assignment		0 to 199	1	0							
147	391	Virtual I/O terminal 14 I/O selection		0: Input	—	0							
				1: Output									

No.		Item		Setting range	S m a l l e s t changeable unit	Initial value							
						SS 2516 *	HS 2516	SL 2516	HL 2516	SS 3020 *	HS 3020	SL 2516 FU06	HL 2516 FU06 *
148	392	Virtual I/O terminal 15 assignment		0 to 199	1	0							
149	393	Virtual I/O terminal 15 I/O selection		0: Input	—	0							
				1: Output									
150	394	Virtual I/O terminal 16 assignment		0 to 199	1	0							
151	395	Virtual I/O terminal 16 I/O selection		0: Input	—	0							
				1: Output									
152	396	Pedal SW1 active		0: LOW	—	0							
				1: HIGH									
153	397	Pedal SW2 active		0: LOW	—	0							
				1: HIGH									
154	398	Pedal SW3 active		0: LOW	—	0							
				1: HIGH									
155	399	Pedal SW4 active		0: LOW	—	0							
				1: HIGH									
156	400	Start SW active		0: LOW	—	0							
				1: HIGH									
157	401	Temporary stop SW active		0: LOW	—	1							
				1: HIGH									

5. Supplemental remarks of each function number and explanation of each function

(1) Feeding frame operational sequence setup

For the AMS-221E, it is possible to change the method of feeding frame and pedal operation by means of a memory switch.

1. Presser driving type setup

Using the memory switch K74, it is possible to set up the feeding frame of the pulse motor driving type and the air driving type.

(1) Do not set up K74 for the AMS-221E.

(Never fail to set up the air drive type feeding frame.)

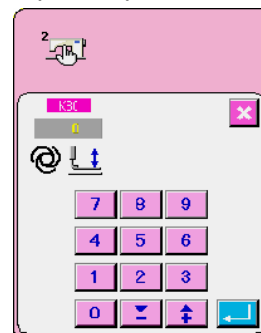
2. Feeding frame driving way setup

By changing the memory switches K80 and K83, it is possible to set up feeding frame and pedal operation.

(1) Automatic lowering or lifting

The memory switch K80 is used to set up the operational sequence of the feeding frame, irrespective of pedal operation at the time of READY key ON, feeding frame lifting with a temporary stop command in the pattern data, presser lowering key ON, and so on.

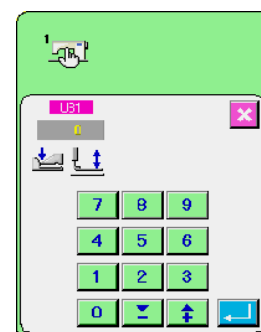
Setup	Contents	Explanation
0 to 99	All lowering, all lifting	All lowering, all lifting only



(2) Feeding frame ON/OFF operational sequence by ordinary pedal operation

Using the memory switch U81, it is possible to set up the operational sequence of the feeding frame by ordinary pedal operation.

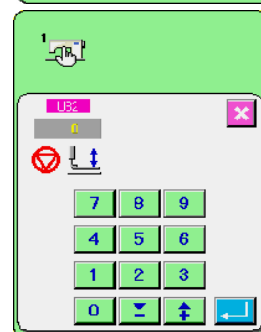
In regard to the setup items, refer to the [(5) List of feeding frame and pedal setup].



(3) Feeding frame ON/OFF operational sequence by a temporary stop command

Using the memory switch U82, it is possible to set up the operational sequence of the feeding frame by pedal operation while the feeding frame is lifted by a temporary stop command in the pattern data.

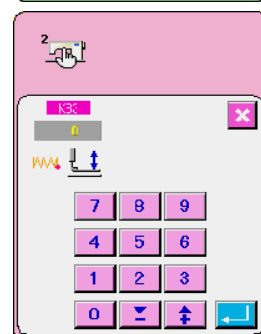
In regard to the setup items, refer to the [(5) List of feeding frame and pedal setup].



(4) Feeding frame lifting at the end of sewing

Using the memory switch K83, it is possible to set up the feeding frame lifting position in the returning phase from the end of sewing position (end of pattern data) to the start of sewing position.

Setup	Contents	Explanation
0	Lifting position	The feeding frame is lifted to the top.
1	2-step stroke position	The feeding frame is lifted to the intermediate position
2 to 99	Lifting position	The feeding frame is lifted to the top.



(Caution) This function is enabled with the memory switch U37 when feeding frame lifting has been set up at the end of sewing.

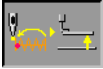
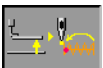
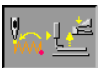
[(5) List of feeding frame and pedal setup].

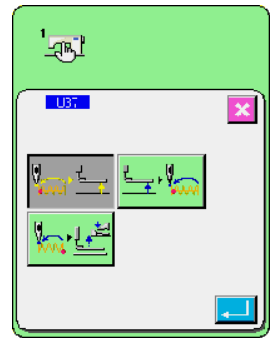
For air driving

Setup	Contents	Preference	Explanation
0	United clamp	–	Lowered to the bottom by Pedal 1.
1	Right/left separation clamp	Lowering enabled from the right or left	The right feeding frame is lowered to the bottom by Pedal 1 (right). The left feeding frame is lowered to the bottom by Pedal 2 (left).
2	Right/left separation clamp	Lowered from the right.	The right feeding frame is lowered to the bottom by Pedal 1 (right), then the left feeding frame is lowered to the bottom by Pedal 2 (left). The left feeding frame is not lowered unless the right feeding frame has been lowered.
3	Right/left separation clamp	Lowered from the left.	The left feeding frame is lowered to the bottom by Pedal 2 (left), then the right feeding frame is lowered to the bottom by Pedal 1 (right). The right feeding frame is not lowered unless the left feeding frame has been lowered.
4	United clamp, 2-step stroke	–	The feeding frame is lowered to the intermediate position by Pedal 2 (left), then lowered to the bottom by Pedal 3 (left treading-on).
5	Right/left separation clamp, left 2-step stroke	Lowering enabled from the right or left	The right feeding frame is lowered to the bottom by Pedal 1 (right), then the left feeding frame is lowered to the intermediate position by Pedal 2 (left intermediate). The left feeding frame is lowered to the bottom by Pedal 3 (left treading-on).
6	Right/left separation clamp, left 2-step stroke	Lowered from the right.	The right feeding frame is lowered to the bottom by Pedal 1 (right), then the left feeding frame is lowered to the intermediate position by Pedal 2 (left intermediate). The left feeding frame is lowered to the bottom by Pedal 3 (left treading-on). The left feeding frame is not lowered unless the right feeding frame has been lowered.
7	Right/left separation clamp, left 2-step stroke	Lowered from the left.	The left feeding frame is lowered to the intermediate position by Pedal 2 (left intermediate), then lowered to the bottom by Pedal 3 (left treading-on). Since then, the right feeding frame is lowered to the bottom by Pedal 1 (right). The right feeding frame is not lowered unless the left feeding frame has been lowered.
8 to 99	United clamp	–	Lowered to the bottom by Pedal 1.

3. Feeding frame lifting setup at the end of sewing

Using the memory switch U37, it is possible to set up the timing for feeding frame lifting at the end of sewing.

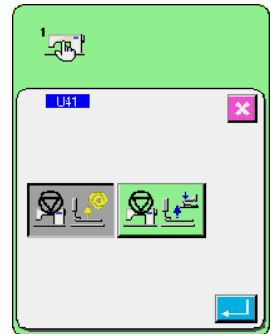
Setup	Contents	Explanation
	After the start of sewing reset	The feeding frame is lifted after the movement from the end of sewing to the start of sewing.
	Before the start of sewing reset	The feeding frame is lifted at the end of sewing. The movement is forwarded from the end of sewing to the start of sewing with the feeding frame left lifted.
	Pedal operation after the start of sewing reset	The feeding frame is lifted by the pedal after the movement from the end of sewing to the start of sewing.



4. Feeding frame lifting setup at the time of temporary stop

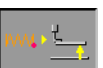
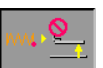
Using the memory switch U41, it is possible to set up the timing for feeding frame lifting when it has been set up with a temporary stop command in the pattern data.

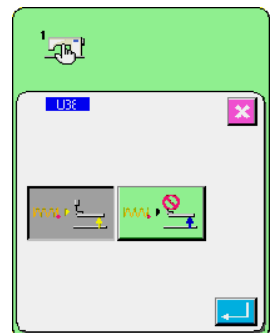
Setup	Contents	Explanation
	Lifting	The feeding frame is lifted immediately with the temporary stop command.
	Pedal operation	Lifted by pedal operation with the temporary stop command. Sewing is started by the start pedal with the feeding frame left lowered.



5. Feeding frame lifting prohibition setup

Using the memory switch U38, it is possible to make setting up with the feeding frame kept lowered at all times.

Setup	Contents	Explanation
	Pedal operation	It is possible to lift or lower the feeding frame by pedal operation.
	Always lowered	The feeding frame is kept lowered even after origin retrieval and moving at the sewing start. Lifting and lowering of the feeding frame by pedal operation are also disabled.



6. Presser pedal setup

Using the memory switches U84 ~ U87 below, it is possible to set up the method of pedal operation.

U84: Used to set up the method of pedal operation for Pedal 1.

(Standard pedal, PK47 right)

U85: Used to set up the method of pedal operation for Pedal 2.

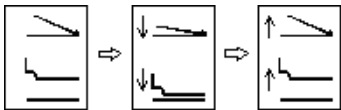
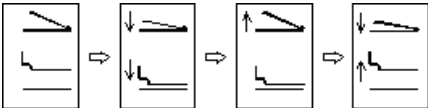
(PK47 left intermediate)

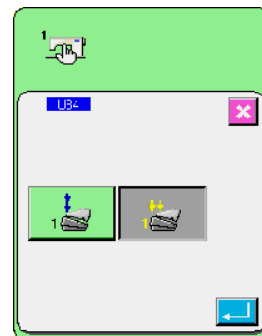
U86: Used to set up the method of pedal operation for Pedal 3.

(PK47 left treading-on)

U87: Used to set up the method of pedal operation for Pedal 4.

(Not used)

Setup	Contents	Explanation
	Non-latch	The feeding frame is lowered only if the pedal is trodden on. It is lifted when the pedal is released. 
	Latch	The feeding frame is lowered when the pedal is trodden on once. It is left lowered even when the pedal is released. It is lifted when the pedal is trodden on secondly. 



1



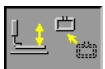
(2) Fixed refuge position setup

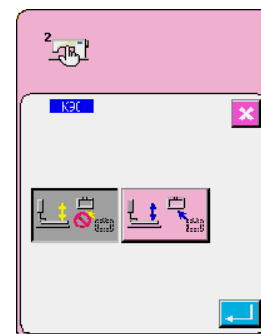
Irrespective of the second origin in the pattern data, a memory switch is available to set up the second origin (fixed refuge position) that is common to each pattern.

When the use of the fixed refuge position has been set up with the memory switch K90, the fixed refuge position becomes enabled, which has been set up with the fixed refuge position Coordinate X of Memory Switch K117 and the fixed refuge position Coordinate Y of Memory Switch K118. In this state, the feeding frame can be ready in the same position even though any pattern is used for sewing.

1. Selection of the fixed refuge position

Using the memory switch K90, it is possible to set up the fixed refuge position.

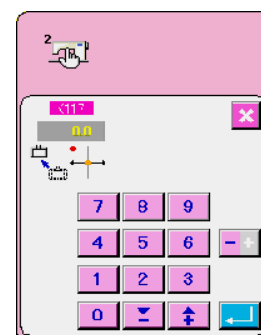
Setup	Contents	Explanation
	Fixed refuge position disabled	The fixed refuge position is not used.
	Fixed refuge position enabled	The fixed refuge position is used.



2. Fixed refuge position coordinates setup

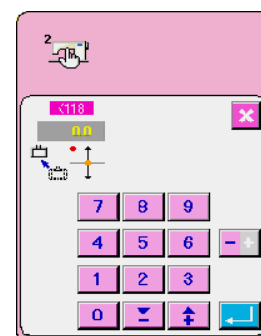
Using the memory switch K117, it is possible to set up the fixed refuge position Coordinate X.

Setup	Contents	Explanation
Coordinate X	Coordinate X of the fixed refuge position	Coordinate X of the fixed refuge position is set up within the feeding frame in the unit of 0.1mm.



Using the memory switch K118, it is possible to set up the fixed refuge position Coordinate Y.

Setup	Contents	Explanation
Coordinate Y	Coordinate Y of the fixed refuge position	Coordinate Y of the fixed refuge position is set up within the feeding frame in the unit of 0.1mm.

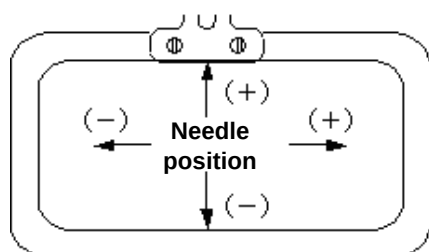


(Caution) Coordinate X is (+) when the needle position is right of the origin.

It is (-) when the needle position is left of the origin.

Coordinate Y is (+) when the needle position is behind the origin.

It is (-) when the needle position is in front of the origin.



(3) Bank function setup

The bank function means a function of sewing effected through changeover to a pattern by an external signal, which is registered in multiple pattern buttons in cases of cassette discrimination and others.

For sewing by the bank function, an external signal input is entered before the feeding frame is lowered at the time of pedal treading-on. According to the input condition, a maximum of 16 patterns can be used for changeover. When the bank function is used, the fixed refuge position preset in regard to "5.-(2) Fixed escape position setting" is automatically enabled.

The reason is that the feeding frame in ordinary operation is made ready at the start of sewing (or the second origin). This function is always possible if there is only one sewing pattern. In the case of the bank function, however, the next sewing pattern is not always coinciding with the previous sewing pattern (or the second origin) at the start of sewing. Therefore, it is necessary to use this refuge position function to secure the same standby position for the feeding frame.

1. It is not always necessary to set up the memory switch K90 because the fixed refuge position mode is automatically secured for the bank function.
2. The fixed refuge position, defined by the fixed refuge position Coordinate X of Memory Switch K117 and the fixed refuge position Coordinate Y of Memory Switch K118, is regarded as the standby position of the feeding frame for the bank function.

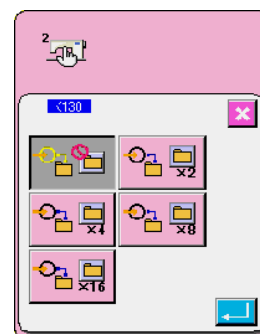
In standard setting, the feeding frame stops at the origin because the conditions are set at X:0 and Y:0. An arbitrary position can be set up with the memory switches K117 and K118.

The bank functions and the input terminals can be set up with the following memory switches:

(1) Bank function setup

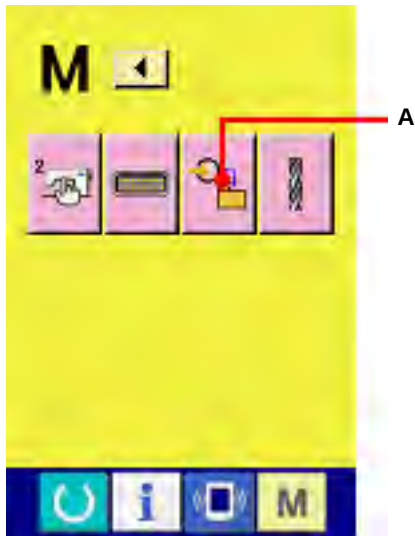
The memory switch K130 is used to set up the number of banks (quantity of input terminals).

Setup	Contents	Explanation
	Bank disabled	The bank function is not used.
	No. of banks 2	Two patterns are set for the number of banks. One Input Terminal 0 is used.
	No. of banks 4	Four patterns are set for the number of banks. Two Input Terminal 0 to 1 are used.
	No. of banks 8	Eight patterns are set for the number of banks. Three Input Terminal 0 to 2 are used.
	No. of banks 16	Sixteen patterns are set for the number of banks. Four Input Terminal 0 to 3 are used.



(2) External input terminal setup

The input terminal numbers to be used for the bank function are set up.

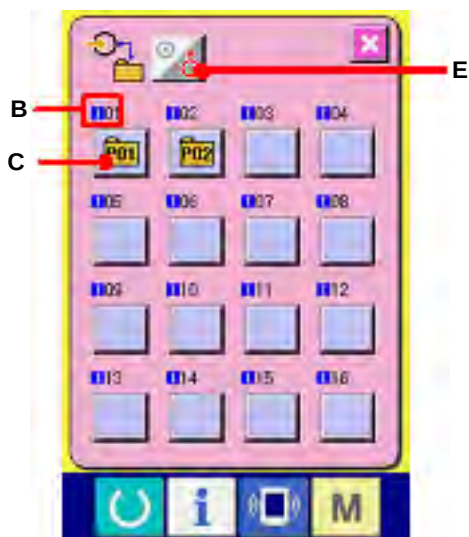


1) Bank function setup screen display

When the number of **K130** bank connection select terminals is preset for the memory switch data (Level 2), the bank function button  (A) is displayed on the mode changeover screen. When this button is pressed, the bank function setup screen is displayed.

2) Registration of the direct pattern number

When the direct pattern number registration button  (C) is pressed for a setting input terminal number (B), the direct pattern number selection screen is displayed. However, the selectable direct pattern numbers are limited only for the individual sewing. The direct pattern number to be registered for the input terminal is selected as indicated by (D).



3) Bank function setup

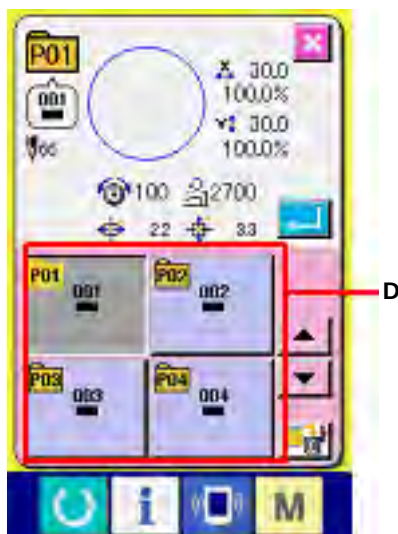
The bank function can be set up through changeover operation of the bank function setup button  (E).

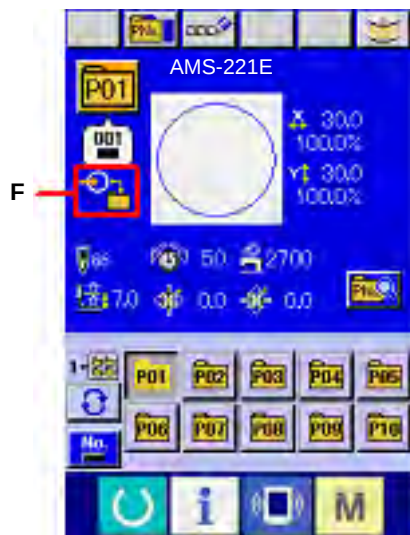


: Bank function turned ON



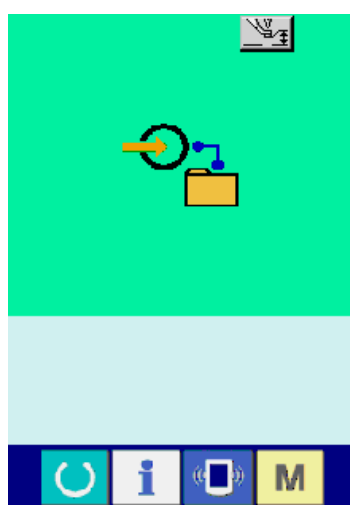
: Bank function turned OFF





When the bank function setup screen is closed and the data input screen is displayed, a pictograph (F) for indicating the ON status is displayed if the bank function is turned ON.

When the  key is pressed, the bank mode screen is displayed.



When the presser is lowered, the direct pattern sewing screen is displayed and sewing can be carried out.



For the direct patterns to be displayed on the sewing screen, the pattern numbers are automatically changed over if there is coincidence of an input with the relevant input terminal.

Relationship between bank input terminals and bank numbers

Input terminal	Bank number	Input terminal	Bank number	Input terminal	Bank number	Input terminal	Bank number
3 2 1 0		3 2 1 0		3 2 1 0		3 2 1 0	
H H H H	Bank No. 1	H L H H	Bank No. 5	L H H H	Bank No. 9	L L H H	Bank No. 13
H H H L	Bank No. 2	H L H L	Bank No. 6	L H H L	Bank No. 10	L L H L	Bank No. 14
H H L H	Bank No. 3	H L L H	Bank No. 7	L H L H	Bank No. 11	L L L H	Bank No. 15
H H L L	Bank No. 4	H L L L	Bank No. 8	L H L L	Bank No. 12	L L L L	Bank No. 16

H: High, L: Low (when bank input active = Low)

(4) Port I/O setup

This sewing machine is provided with the machine control functions that are enabled only by the machine main body through the generation of signal outputs to the outside and the reception of signal inputs from the outside, without the intervention by any appropriative I/O unit and other devices.

By making connections with proper external sequencers (programmable controllers) or using the simplified sequencer functions that are available at the main body, the machine is possible to be modified into a mechanical system of various annex units.

1. Input terminal setup

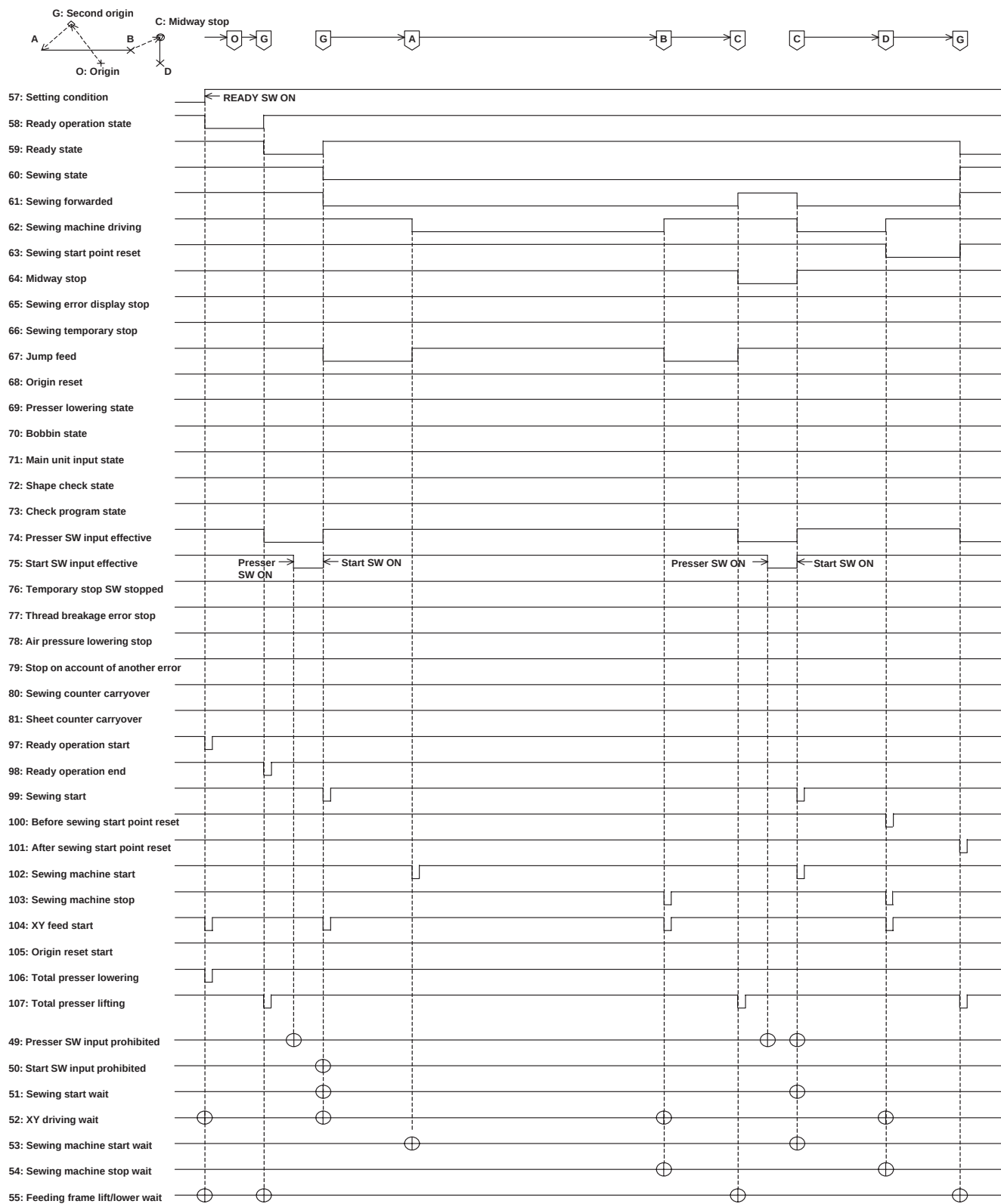
Input No.	Contents	Explanation
0	Nil	No input
For the actuator		
1	Void	
2	Detection of material end sensor	Detection of material end is enabled with the first Mark 1 command of the pattern data. When the input terminal becomes active, the section to the second Mark 1 command is skipped.
3	Bank input 0	Input terminal 0 when the bank function is selected
4	Bank input 1	Input terminal 1 when the bank function is selected
5	Bank input 2	Input terminal 2 when the bank function is selected
6	Bank input 3	Input terminal 3 when the bank function is selected
For pattern data inputs		
33	External input 0	Sewing is suspended until the input terminal becomes active with the External Input 0 command of the pattern data.
34	External input 1	Sewing is suspended until the input terminal becomes active with the External Input 1 command of the pattern data.
35	External input 2	Sewing is suspended until the input terminal becomes active with the External Input 2 command of the pattern data.
36	External input 3	Sewing is suspended until the input terminal becomes active with the External Input 3 command of the pattern data.
37	External input 4	Sewing is suspended until the input terminal becomes active with the External Input 4 command of the pattern data.
38	External input 5	Sewing is suspended until the input terminal becomes active with the External Input 5 command of the pattern data.
39	External input 6	Sewing is suspended until the input terminal becomes active with the External Input 6 command of the pattern data.
40	External input 7	Sewing is suspended until the input terminal becomes active with the External Input 7 command of the pattern data.
41	External input 8	Sewing is suspended until the input terminal becomes active with the External Input 8 command of the pattern data.
42	External input 9	Sewing is suspended until the input terminal becomes active with the External Input 9 command of the pattern data.
43	External input 10	Sewing is suspended until the input terminal becomes active with the External Input 10 command of the pattern data.
44	External input 11	Sewing is suspended until the input terminal becomes active with the External Input 11 command of the pattern data.
45	External input 12	Sewing is suspended until the input terminal becomes active with the External Input 12 command of the pattern data.
46	External input 13	Sewing is suspended until the input terminal becomes active with the External Input 13 command of the pattern data.
47	External input 14	Sewing is suspended until the input terminal becomes active with the External Input 14 command of the pattern data.
48	External input 15	Sewing is suspended until the input terminal becomes active with the External Input 15 command of the pattern data.
Operation prohibit / weight request		
49	Presser SW input prohibited	Entry of presser switch 1 to 4 inputs is prohibited in active phase.
50	Start SW input prohibited	Entry of start switch inputs is prohibited in active phase.
51	Sewing start wait	Start of sewing start switch operation is waited in active phase. Sewing is started in non-active phase. This signal is disregarded in the middle of sewing.
52	XY motor start wait	Start of XY motor driving is waited in active phase. The XY motor driving is started in non-active phase. This signal is disregarded in the middle of XY motor driving.
53	Sewing machine start wait	Start of sewing machine head rotation is waited in active phase. Intermediate presser lowering and sewing machine head rotation are started in non-active phase. Upper position reset is not included. This signal is disregarded in the middle of sewing machine head driving.
54	Sewing machine stop wait	Operation is suspended after the stoppage of sewing machine head rotation and wiper and intermediate presser lifting operation in active phase. Subsequent operation is started in non-active phase. Upper position reset is not included. This signal is disregarded in the middle of sewing machine head driving.
55	Feeding frame vertical motion wait	Total lifting and lowering of the feeding frame is suspended in active phase. Total lifting and lowering of the feeding frame is performed in non-active phase. Feeding frame lifting and lowering are not included at the time of presser pedal operation.

2. Output terminal setup

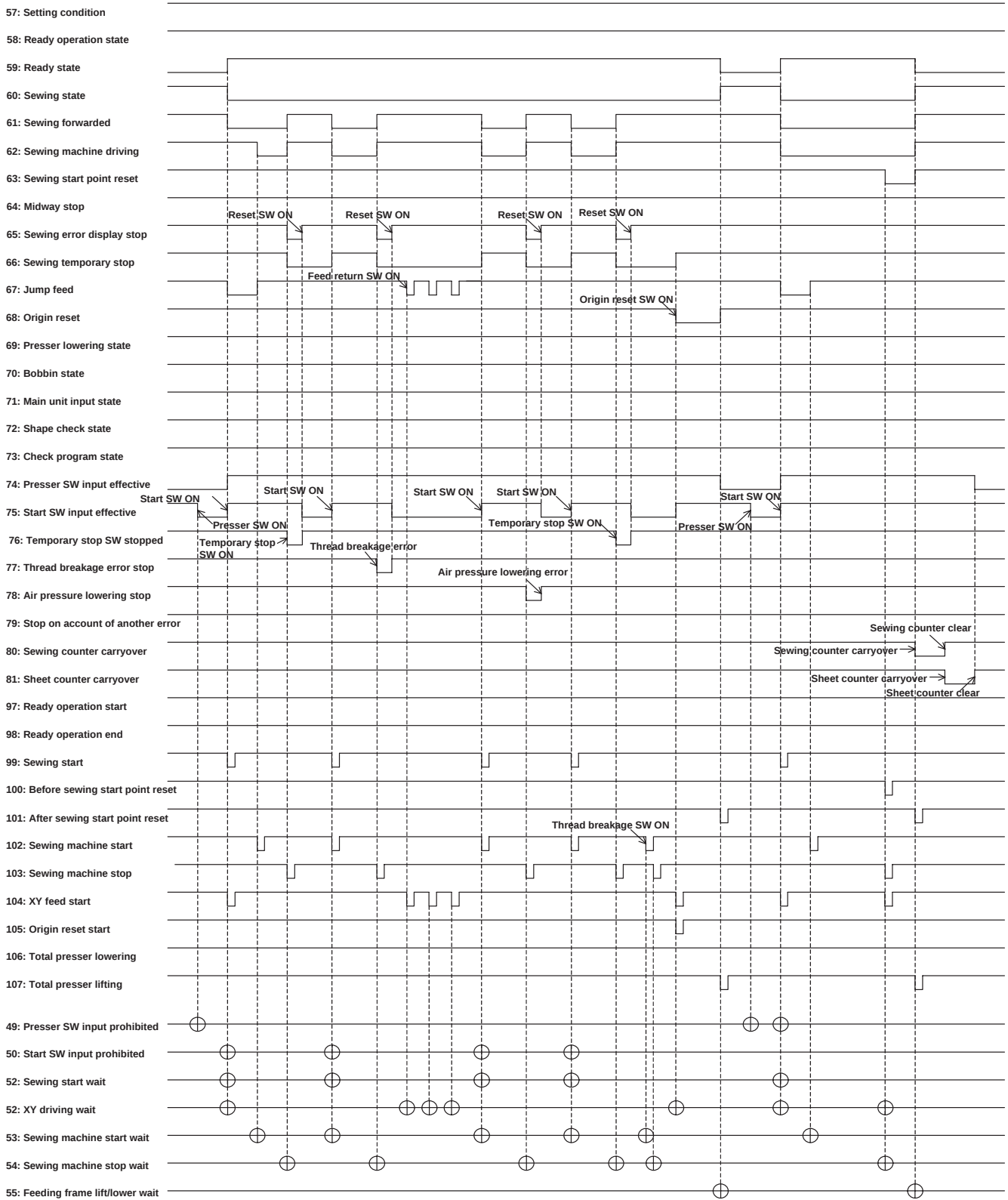
Output No.	Contents	Explanation
0	Nil	No output
For the actuator		
1	Feeding frame 1	Feeding frame right lifting
2	Feeding frame 2	Feeding frame left lifting
3	Feeding frame 3	(Feeding frame right 2-stage stroke)
4	Feeding frame 4	Feeding frame left 2-stage stroke
5	(Intermediate presser)	(Signal output)
6	Void	
7	Reverse shaft	Reverse shaft setting side
8	Third thread tension	Third thread tension closed
9	Needle cooler	Needle cooler air output
For pattern data outputs		
33	External output 0	Reverse signal output with the External Output 0 command of the pattern data
34	External output 1	Reverse signal output with the External Output 1 command of the pattern data
35	External output 2	Reverse signal output with the External Output 2 command of the pattern data
36	External output 3	Reverse signal output with the External Output 3 command of the pattern data
37	External output 4	Reverse signal output with the External Output 4 command of the pattern data
38	External output 5	Reverse signal output with the External Output 5 command of the pattern data
39	External output 6	Reverse signal output with the External Output 6 command of the pattern data
40	External output 7	Reverse signal output with the External Output 7 command of the pattern data
41	External output 8	Reverse signal output with the External Output 8 command of the pattern data
42	External output 9	Reverse signal output with the External Output 9 command of the pattern data
43	External output 10	Reverse signal output with the External Output 10 command of the pattern data
44	External output 11	Reverse signal output with the External Output 11 command of the pattern data
45	External output 12	Reverse signal output with the External Output 12 command of the pattern data
46	External output 13	Reverse signal output with the External Output 13 command of the pattern data
47	External output 14	Reverse signal output with the External Output 14 command of the pattern data
48	External output 15	Reverse signal output with the External Output 15 command of the pattern data
Status of sewing machine head		
49	Needle upper position	Upper stop position 40 to 62° (Always ON shortly after Power ON)
50	Needle lower position	(Internal signal) 80 to 123° (Always OFF shortly after Power ON)
51	Needle upper dead point position	Reverse rotation needle lifting position 5 to 30° (Always OFF shortly after Power ON)
52	Needle lower dead point position	Lower stop position 209 to 239° (Always OFF shortly after Power ON)
53	Thread trimming signal	During thread trimming stop (not used) ON beneath the needle shortly before stoppage → OFF at +70ms above the needle
54	During rotation	In the middle of sewing machine driving ON at the start of rotation → OFF at +120ms above the needle
55	Sewing machine brake signal	During sewing machine stop ON beneath the needle shortly before stoppage → OFF at +120ms above the needle
56	Void	
Status of sewing machine unit		
57	Status of setup	In the setup condition
58	Status of READY operation	Ready key → Origin retrieval → Moving to the sewing start point and thereafter
59	READY status	In the ready condition
60	Sewing status	From the start of sewing to the feeding frame lifting after moving to the sewing start point. Feed forward included.
61	During sewing	From the start of sewing to the end of pattern data. Jump feed included.
62	Sewing machine in driving	In the middle of sewing machine head driving during sewing. Bobbin and needle lifting reset not included.
63	Resetting to the sewing start point	From the end of pattern data to the reset of the sewing start point.
64	Sewing being stopped on the way	Stopped with a midway stop command of the pattern data.
65	Stop with sewing error display	Error display being presented because of error stop during sewing.
66	Temporary stop of sewing	Error stop during sewing or temporary stop after the promotion of stitching due to pattern check, etc.
67	XY feeding operation	Jump feed during sewing, pattern check, feed forward/return motion, and others.
68	Origin reset	Origin reset key → Reset to the sewing start point
69	Presser lowering status	Presser lowering key → Presser lowering status

Output No.	Contents	Explanation
70	Bobbin status	Bobbin key → Bobbin status
71	Main unit input status	Main unit input key → Main unit input status
72	Pattern check status	Pattern check, thread tension / intermediate presser height command setup
73	Test mode status	Test mode status (Sewing machine revolutions / output / XY / presser thread cutter / thread clamp / intermediate presser test mode)
74	Presser SW input effective	When the presser switch input is effective
75	Start SW input effective	When the start switch input is effective
76	Temporary stop SW turned OFF	Temporary stop switch error (E050) being displayed (E050). OFF by reset.
77	Thread breakage error OFF	Thread breakage error (E052) being displayed. OFF by reset.
78	Air pressure being lowered	Air pressure low error (E031) being displayed. OFF by reset.
79	Other errors being present	Errors other than 76 to 78 being displayed. OFF by reset.
80	Sewing counter carryover	Sewing counter carryover being displayed. OFF by counter reset.
81	Sheet counter carryover	Sheet counter carryover being displayed. OFF by counter reset.
For the trigger		
97	READY operation start	When the READY key is accepted. ON for 100ms.
98	READY operation end	After moving to (READY key →) sewing start point. ON for 100ms.
99	Sewing start	When the Start switch is accepted. (Normal / Midway stop / Temporary stop). ON for 100ms.
100	Before sewing start point reset	Before sewing start point reset (after pattern data end). ON for 100ms. Origin reset not included.
101	After sewing start point reset	After sewing start point reset (before feeding frame lifting). ON for 100ms. Origin reset included.
102	Before sewing machine start	Before sewing machine head driving (before feeding frame lowering). ON for 100ms.
103	After sewing machine stop	After sewing machine head stop (after wiper and before feeding lifting). ON for 100ms.
104	Before jump feed start	Jump feed operation / Feed forward / Return operation. ON for 100ms.
105	Before origin reset start	When the origin reset key is accepted. ON for 100ms.
106	Before total presser lowering	At the time of total presser lowering (Ready, threading, bobbin, etc.). ON for 100ms.
107	Before total presser lifting	At the time of total presser lifting (Ready, threading, bobbin, etc.). ON for 100ms.

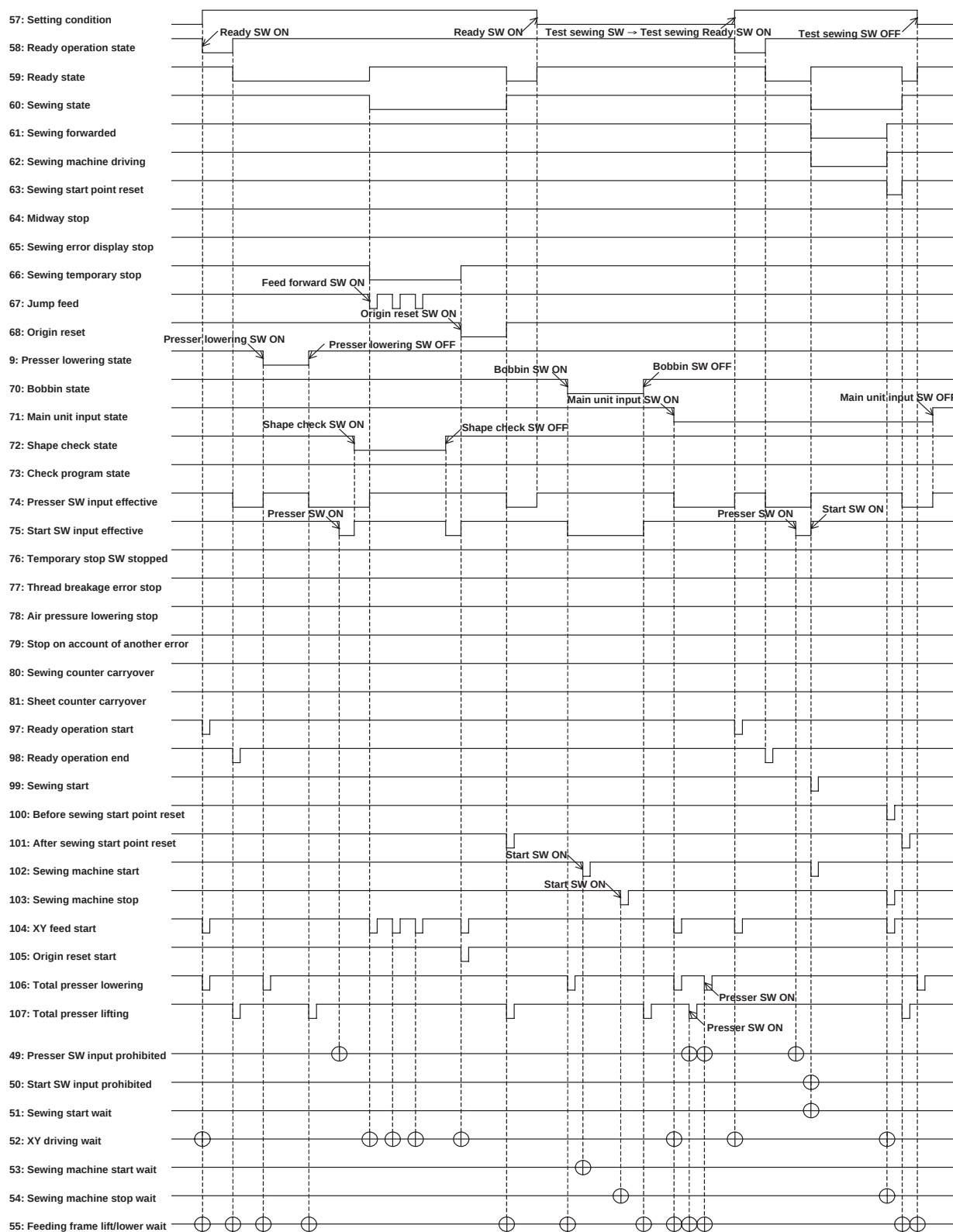
[Normal Status Diagram of the Port I/O]



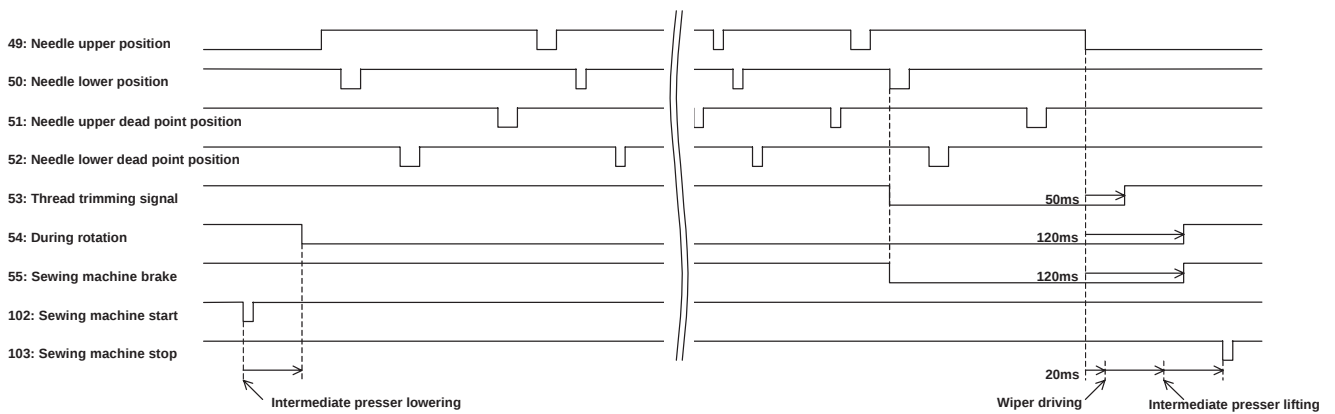
[Error Status Diagram of the Port I/O]



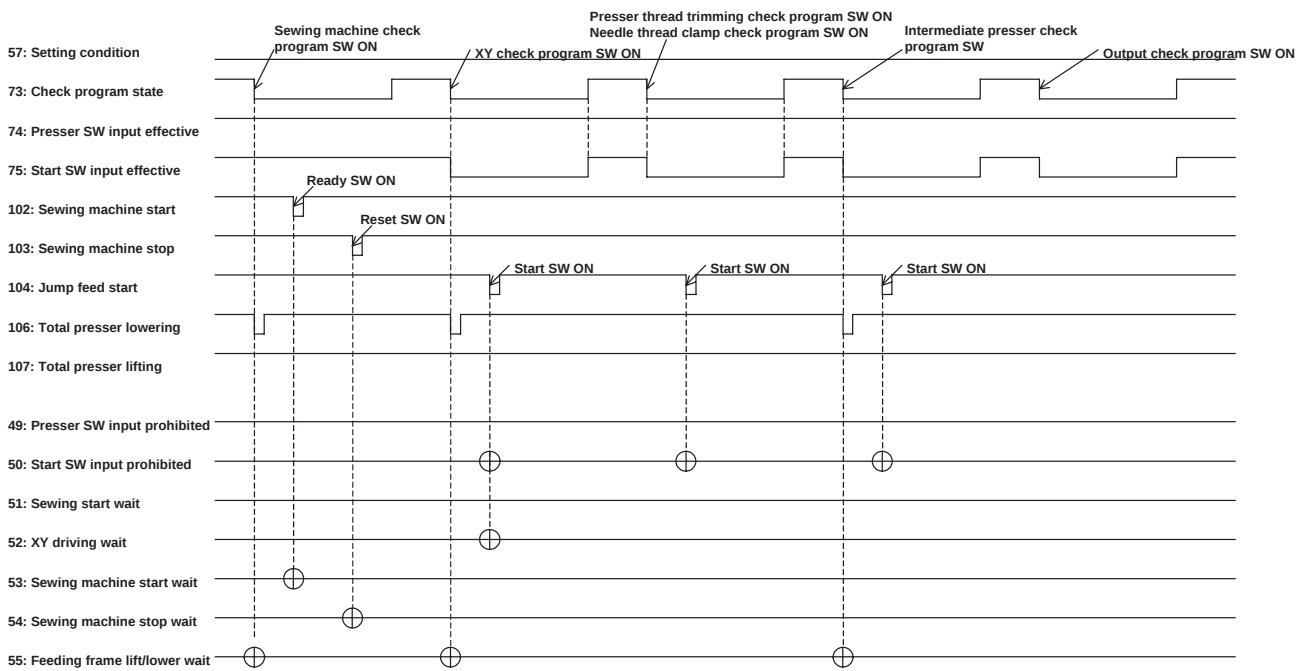
[Miscellaneous Status Diagram of the Port I/O]

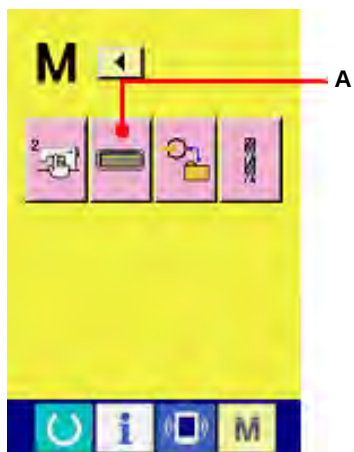


[Sewing Machine Driving Status Diagram of the Port I/O]



[Check Program Status Diagram of the Port I/O]

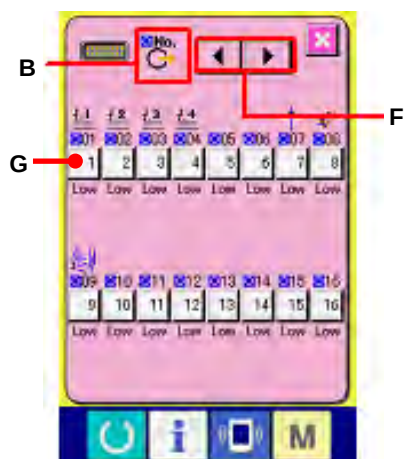




3. Setup procedures

1) Display of the port I/O screen

When the **M** switch is continuously pressed for about 6 seconds and the page changeover button  is pressed, the port I/O setup button  (A) is displayed. When this button is pressed, the port I/O setup screen is displayed.



2) Selection of the port I/O screen

For port I/O setup, four I/O setup screens are available. A required function number can be set on a relevant screen.

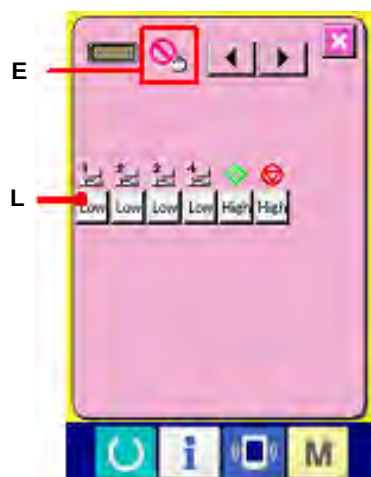
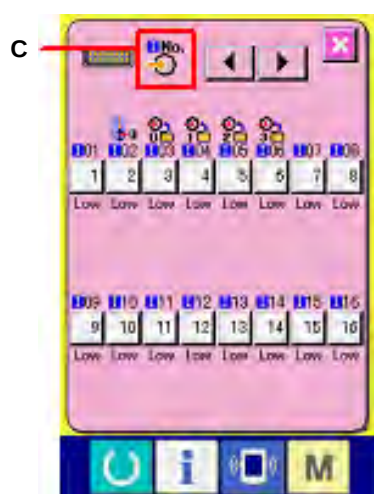
B : Output number setting

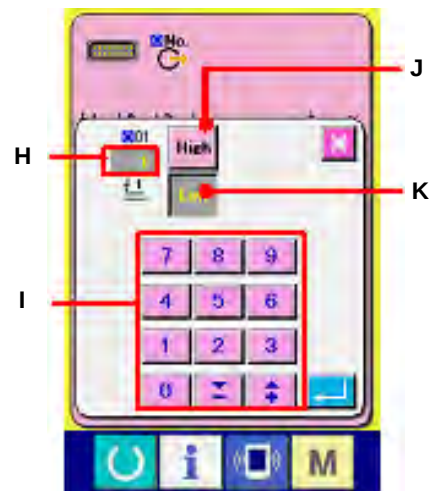
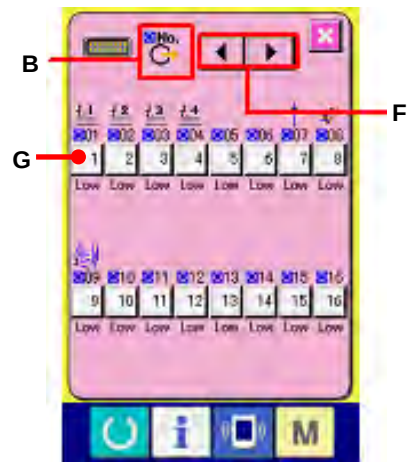
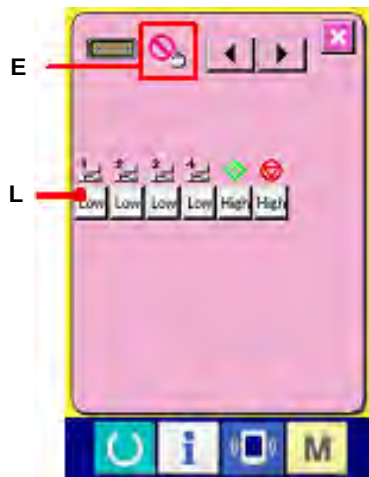
C : Input number setting

D : Virtual I/O number setting

E : Switch operation prohibition setting

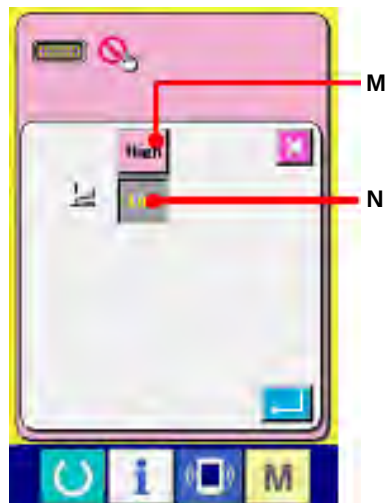
Setup screen changeover is possible with the right and left scroll buttons   (F) located on the top of each screen.



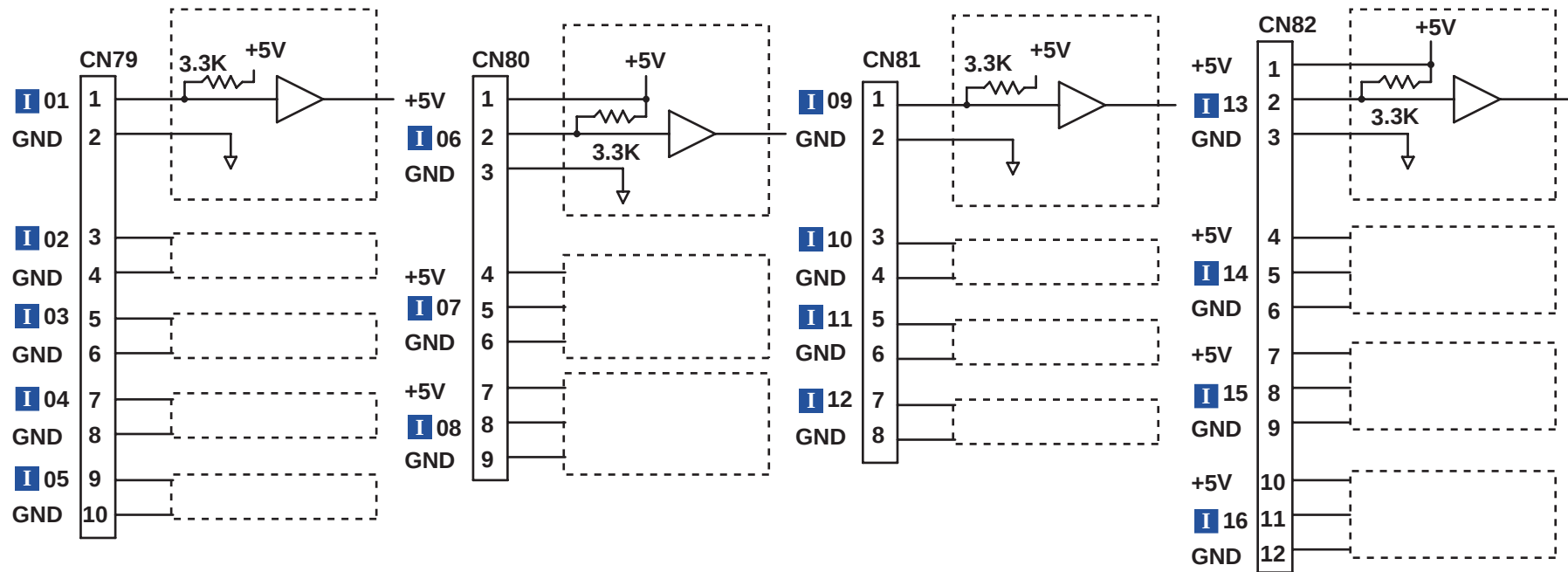


3) Port I/O setup

To make output number setting, input number setting, and virtual I/O number setting, the setup button  (G) is pressed to enter an input of the setting function number (H) in the selected terminal through the ten key (I). The signal type is selected from High (J) and Low (K). In the case of virtual I/O number setting, it is selected from output  and input . To make switch operation setting, the setup button  (L) is pressed to select the signal type from High (M) and Low (N).



4. Input for sequence



CN80, CN81, and CN82 are not integrated at shipment.

To use those connectors, mount those first.

CN80: HK01650009B (ELCO: 00 8263 0912 00 002)

CN81: HK01650008B (ELCO: 00 8263 0812 00 002)

CN82: HK01650012B (ELCO: 00 8263 1212 00 002)

Cord side

Pin: HK016540000 (ELCO: 60 8263 0513 00 808)

8P housing: HK01651008B (ELCO: 60 8263 3088 15 002)

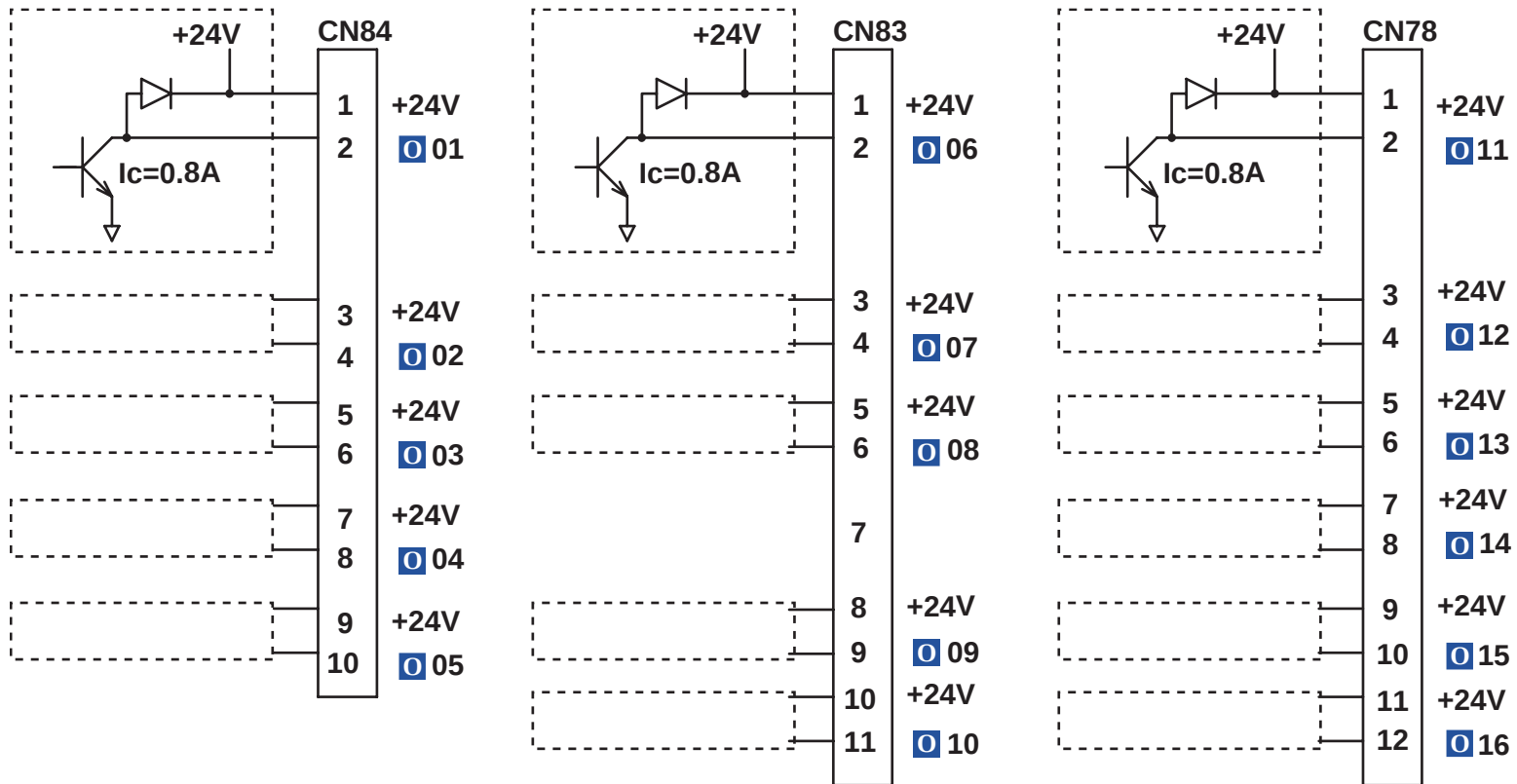
9P housing: HK01651009B (ELCO: 60 8263 3098 15 002)

12P housing: HK01651012B (ELCO: 60 8263 3128 15 002)

Use CN79 and CN81 for switch input.

Use CN80 and CN82 for sensor or switch input.

5. Output for sequence



CN83 and CN78 are not integrated at shipment.

To use those connectors, mount those first.

CN83: HK01650011A (ELCO: 00 8263 1112 00 001)

CN78: HK01650012A (ELCO: 00 8263 1212 00 001)

Cord side

Pin: HK016540000 (ELCO: 60 8263 0513 00 808)

11P housing: HK01651011A (ELCO: 60 8263 3118 15 001)

12P housing: HK01651012A (ELCO: 60 8263 3128 15 001)

It is recommended to use the drive transistor with 0.5 A or less even though the rated current is 0.8 A.

Make sure that the total current is equal or less than 1 A.

(5) Simplified program setup

This machine is provided with the simplified program functions, which can make the programming of various additional devices (stacker, unit, etc.) according to sewing machine operation. In conjunction with the port I/O output functions, modification into such additional devices can be carried out in the main unit of the sewing machine.

1. Specifications

- (1) Operation by a maximum of five programs is possible.
- (2) Inputs of a maximum of 99 steps can be entered per program.
- (3) Interactive operation is possible among the five programs.

2. Setting items

The simplified program specifies the following five items per step.

No.	Setting item	Contents
1	Command	The method of step execution is displayed.
2	Output information	Contents of multiple outputs are set up for High and Low of the respective 16 output terminals and 16 virtual I/O ports.
3	Input information	Multiple input conditions are set up for High and Low of the respective 16 output terminals, 16 input terminals, 16 virtual I/O ports, and 6 operation switches.
4	Parameter ①	Skip destination step No. or program No. is set up.
5	Parameter ②	The input conditions of delay time, No. of stitches, No. of repetition times, etc. are set up.

The virtual I/O port is provided for an interface to be used for sewing machine control and simplified program control. In the case of port I/O setup, either an input or output is set up as seen from the sewing machine control side.

(Caution) The virtual I/O port is an internal signal of the sewing machine. It cannot be brought out directly to the outside.

3. Control operation

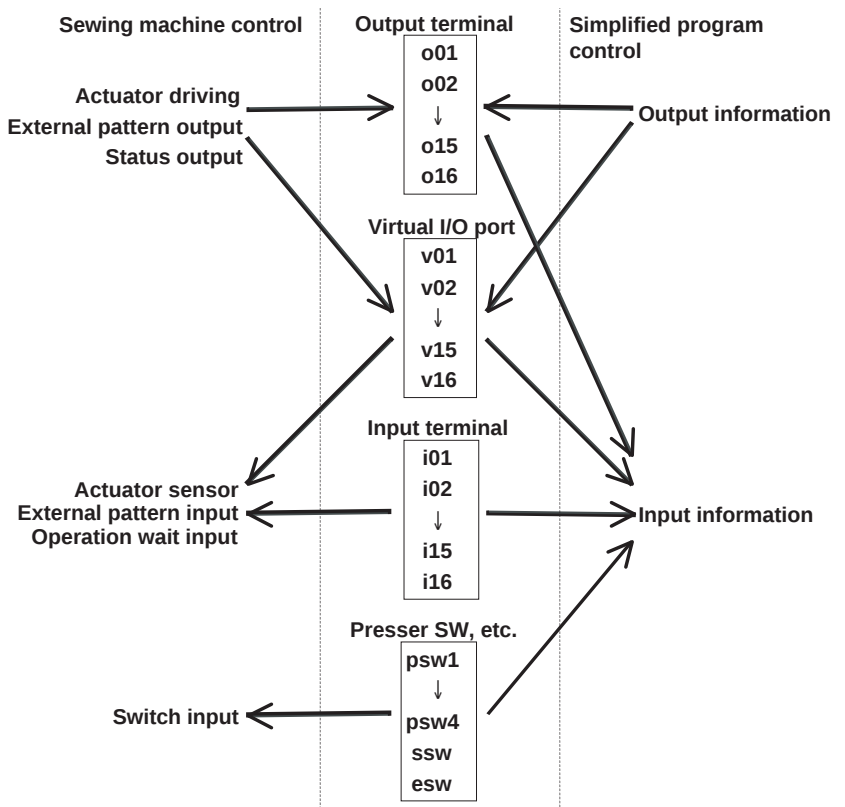
At the start of simplified program execution, operation is sequentially carried out starting from Step No. = 1, at the intervals of 1ms for each step.

At the beginning of step execution, the contents of output information setup are generated. Operation is suspended (with the execution step No.) until the setup conditions for the input information or Parameter ② have been established. When these conditions are established, operation is forwarded to the next step No. or the skip destination step No. defined by Parameter ①. Such a sequential operation is repeated till the completion command.

(Caution)

In the simplified program control, the I/O terminals and others are directly controlled based on the output and input information, irrespective of the result of port I/O setup.

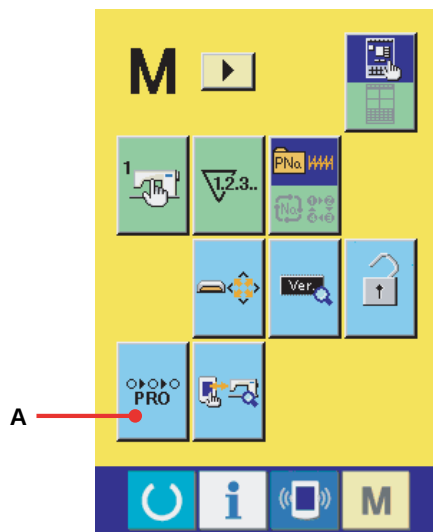
In particular, the output data are immediately generated at the beginning of step execution for the output terminals and virtual I/O ports. In regard to I/O mismatching and synchronization for sewing machine control, therefore, programs have to be established carefully on the side of simplified program.



4. Operational Procedures

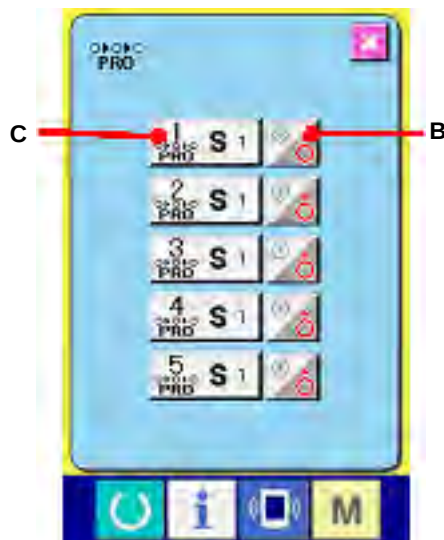
(1) Simplified program selection screen display

When the **M** key is continuously pressed for 3 seconds, the simplified program button  (A) is displayed on the mode changeover screen. When this button is pressed, the simplified program selection screen is displayed.



(2) Simplified program effective / ineffective

The simplified program comes in five patterns. In the initial state, all the patterns are set at OFF. When the simplified program setup button (B) is used, each program can be made effective or ineffective.



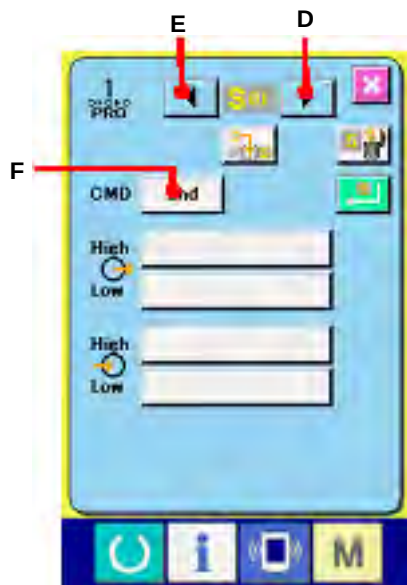
: Simplified program ineffective



: Simplified program effective

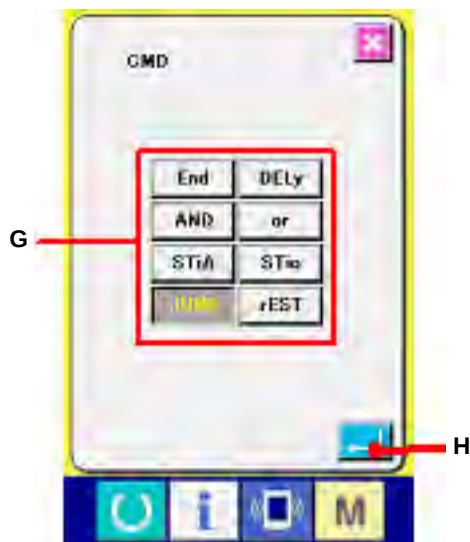
(3) Simplified program editing

Simplified program No.  and the registered number of steps **S 1** are displayed on the program editing button  (C). When this button is pressed, the simplified program editing screen is displayed, which corresponds to the simplified program editing button.



In the simplified program editing screen, the editing step is selected with the use of the step forwarding button  (D) and the step return button  (E). For each selected step, it is possible to carry out command port I/O setting and parameter setting.

A maximum of 99 steps can be entered.



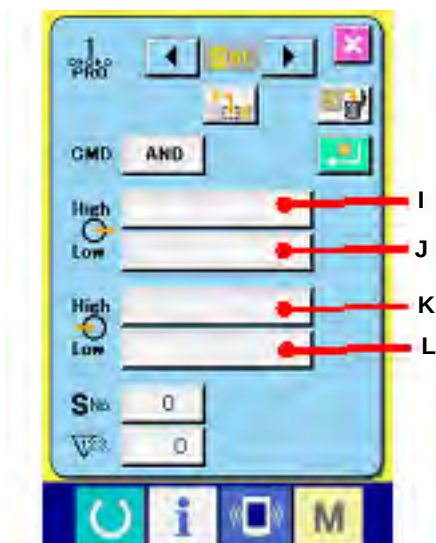
1) Command selection

When the command selection button  (F) is pressed on the simplified program editing screen, the command selection screen is displayed.

The command that is being selected is displayed on the button.

On the command selection screen, the command button (G) is displayed. Press the selecting command button and then press the Enter button  (H).

In regard to command descriptions, refer to (4) list of simplified program commands.



2) Port I/O information setup

The port status can be set up for the four items as specified below.

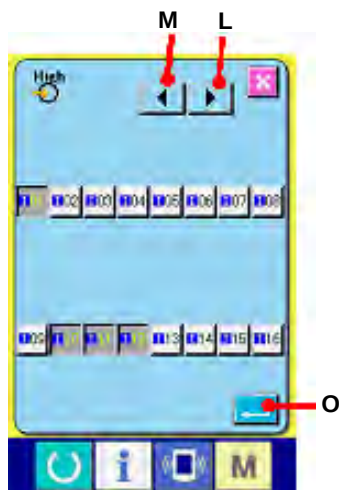
(I) Output information (High) setup button

(J) Output information (Low) setup button

(K) Input information (High) setup button

(L) Input information (Low) setup button

When the setting button is pressed, the I/O data selection screen is displayed.



On the port setup screen, current setting items are displayed at the top left of the screen.

-  : Output information (High) setup screen
-  : Output information (Low) setup screen
-  : Input information (High) setup screen
-  : Input information (Low) setup screen

Using the page turning buttons   (M, L), the displayed port type can be changed.

The port comes in the four types as specified below.

 01 : Output port No.

 01 : Input port No.

 01 : Virtual I/O port No.

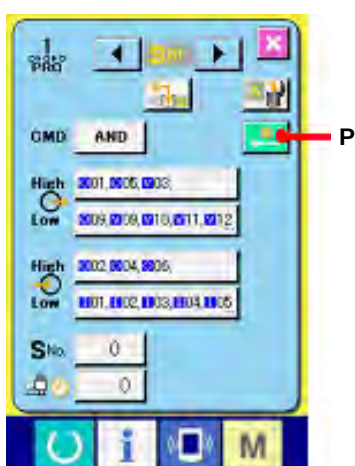
 etc.: Presser SW 1 to 4, Start SW, Temporary stop SW



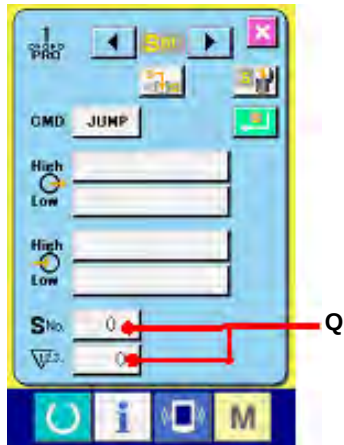
The port No. button is displayed on the screen. Press the button that corresponds to current setting.

The selection status button is displayed in gray.

After selection, press the Enter button  (O).



For output setting, press the output button  (P) to obtain the item for which the displayed step has been set up. Therefore, this item can be examined.



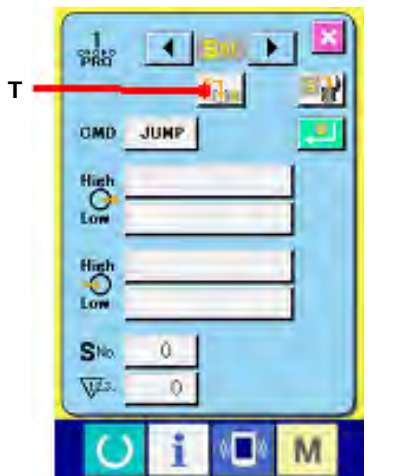
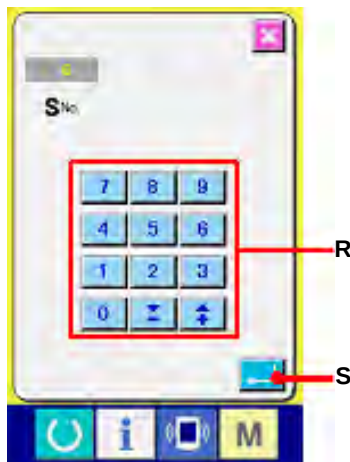
3) Parameter input

Corresponding to the selected command, the parameter input button is displayed.

When the parameter input button (Q) is pressed, the parameter input screen is displayed.

Enter a numerical input through the ten key (R) and press the Enter button  (S).

In regard to the parameters that correspond to the commands, refer to (4) list of simplified program commands.



4) Step insertion

It is possible to insert a step before the displayed step.

When the step insertion button  (T) is pressed, the command selection screen is displayed.

Select the command that is required to be inserted, and press the Enter button  (U). Then, the required step is inserted.

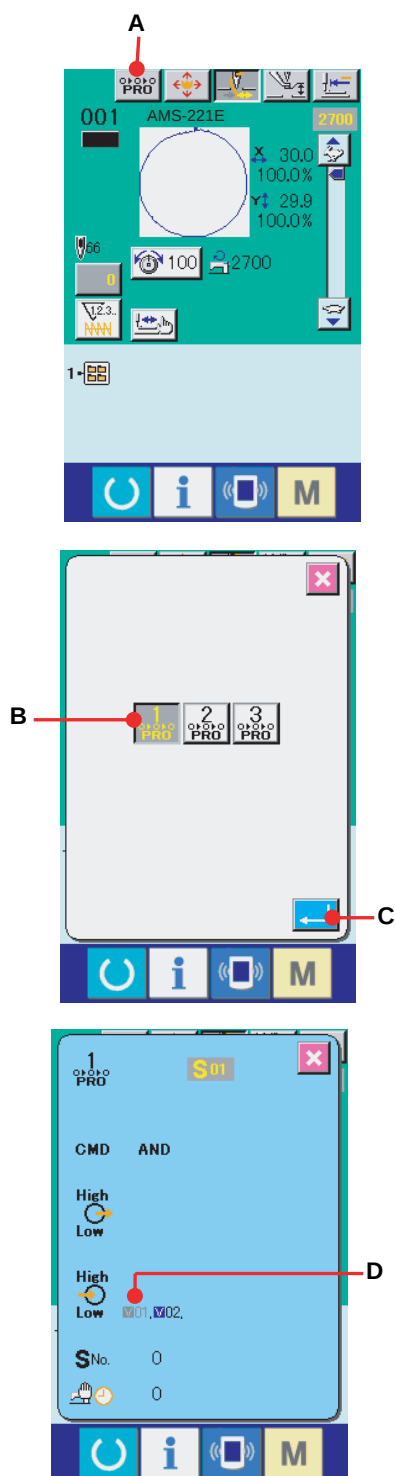




5) Step deletion

It is possible to delete the step that has been displayed.

When the step deletion button  (V) is pressed, the deletion check screen is displayed. When the Enter button  (W) is pressed, the displayed step is deleted and the step standing behind is shifted forward.



6) Checking the status of the simplified program in the sewing screen

The simplified program button  (A) is displayed in the sewing screen if this simplified program is available. The simplified program select screen is presented and the effective simplified program button  (B) is displayed.

Select the simplified program number the status of which is being checked, and press the ENTER button  (C).

The simplified program confirmation screen is presented and the present step number and the status of I/O are displayed.

The port number without I/O confirmation is displayed in gray (D).

(4) List of Simplified Program Commands

No.	Function code	Command	Output information	Input information	Parameter ①	Setting range	Parameter ②	Setting range	Remarks
1	End	Complete	Effective	Ineffective	Ineffective	—	Ineffective	—	Program execution is finished.
2	DEly	Delay	Effective	Ineffective	Ineffective	—	Delay time	0 to 9999ms	Moving to the next step after the lapse of a delay time.
3	And	Branch with AND condition	Effective	Effective	Skip destination No.	1 to 99 steps	Delay time	0: Input waiting till the condition established 1 to 9999ms	Moving to the next step when all conditions specified by input setting are satisfactory (AND input). Jumping to the step preset by skip destination No. after the lapse of a delay time as a result of failure in establishing the input conditions.
4	or	Branch with OR condition	Effective	Effective	Skip destination No.	1 to 99 steps	Delay time	0: Input waiting till the condition established 1 to 9999ms	Moving to the next step when either condition specified by input setting is satisfactory (OR input). umping to the step preset by skip destination No. after the lapse of a delay time as a result of failure in establishing the input conditions.
5	STiA	Branch with AND condition for No. of stitches	Effective	Effective	Skip destination No.	1 to 99 steps	Number of stitches	0 to 9999 stitches	Moving to the next step after the lapse of the preset number of stitches. Jumping to the step specified by the skip destination No. within the range of the preset number of stitches when all conditions specified by input setting are satisfactory (AND input).
6	STio	Branch with OR condition for No. of stitches	Effective	Effective	Skip destination No.	1 to 99 steps	Number of stitches	0 to 9999 stitches	Moving to the next step after the lapse of the preset number of stitches. Jumping to the step specified by the skip destination No. within the range of the preset number of stitches when either condition specified by input setting is satisfactory (OR input).
7	JUMP	Jump repetition counter	Effective	Ineffective	Skip destination No.	1 to 99 steps	Repetition counting value	0: Infinite 1 to 9999 times	Repeated in the range of skip destination steps specified by Jump till repetition counter carryover. Infinite loop is performed when setting is made at 0. Moving to the next step after repetition counter carryover. (Caution) Do not perform nest input of this command.
8	rEST	Program reset	Effective	Ineffective	Program No.	1 to 5 programs	Ineffective	—	In the case of the step initialization of the specified program number, the specified program steps are forcibly returned to the initial steps.

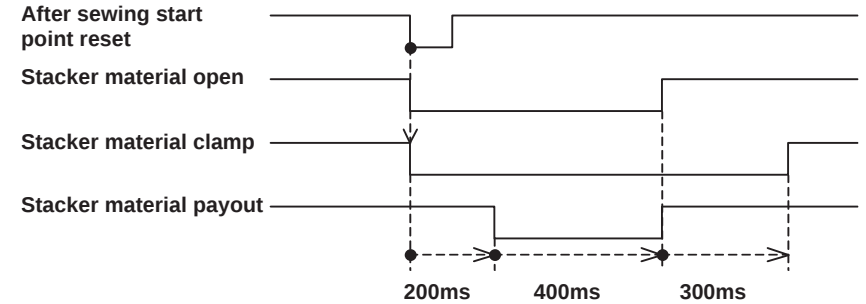
Input information setup range	Contents
o01H to o16H	High output of external output terminals 01 to 16
v01H to v16H	High output of virtual I/O ports 01 to 16
o01L to o16L	Low output of external output terminals 01 to 16
v01L to v16L	Low output of virtual I/O ports 01 to 16

Input information setup range	Contents
o01H to o16H	High status input of external output terminals 01 to 16
i01H to i16H	High status input of external input terminals 01 to 16
v01H to v16H	High status input of virtual I/O ports 01 to 16
p1H to p4H,sH,eH	High status input of presser SW1 to 4 (p), Start SW (s), Temporary stop SW (e)
o01L to o16L	Low status input of external output terminals 01 to 16
i01L to i16L	Low status input of external input terminals 01 to 16
v01L to v16L	Low status input of virtual I/O ports 01 to 16
p1L to p4L,sL,eL	Low status input of presser SW1 to 4 (p), Start SW (s), Temporary stop SW (e)

(5) Program sample

1) Simplified stacker program 1

This is an example of program establishment intended to make material stacking, to be done simultaneously with feeding frame lifting after the completion of sewing.



[Port I/O Setup]

Terminal output	Contents	Remarks
o01	1: Feeding frame right	Standard
o02	2: Feeding frame left	Standard
o03	4: Feeding frame 2-step stroke	Standard
o04	7: Inverting shaft	Standard
o05	9: Needle cooler	Standard
o06	(Stacker material open)	Simplified program output
o07	(Stacker material clamp)	Simplified program output
o08	(Stacker material payout)	Simplified program output

Terminal output	Contents	Remarks
i01		
i02		
i03		
i04		
i05		
i06		
i07		
i08		

Virtual I/O	I/O	Contents	Remarks
v01	Output	101: After sewing start point reset	
v02			
v03			
v04			
v05			
v06			
v07			
v08			

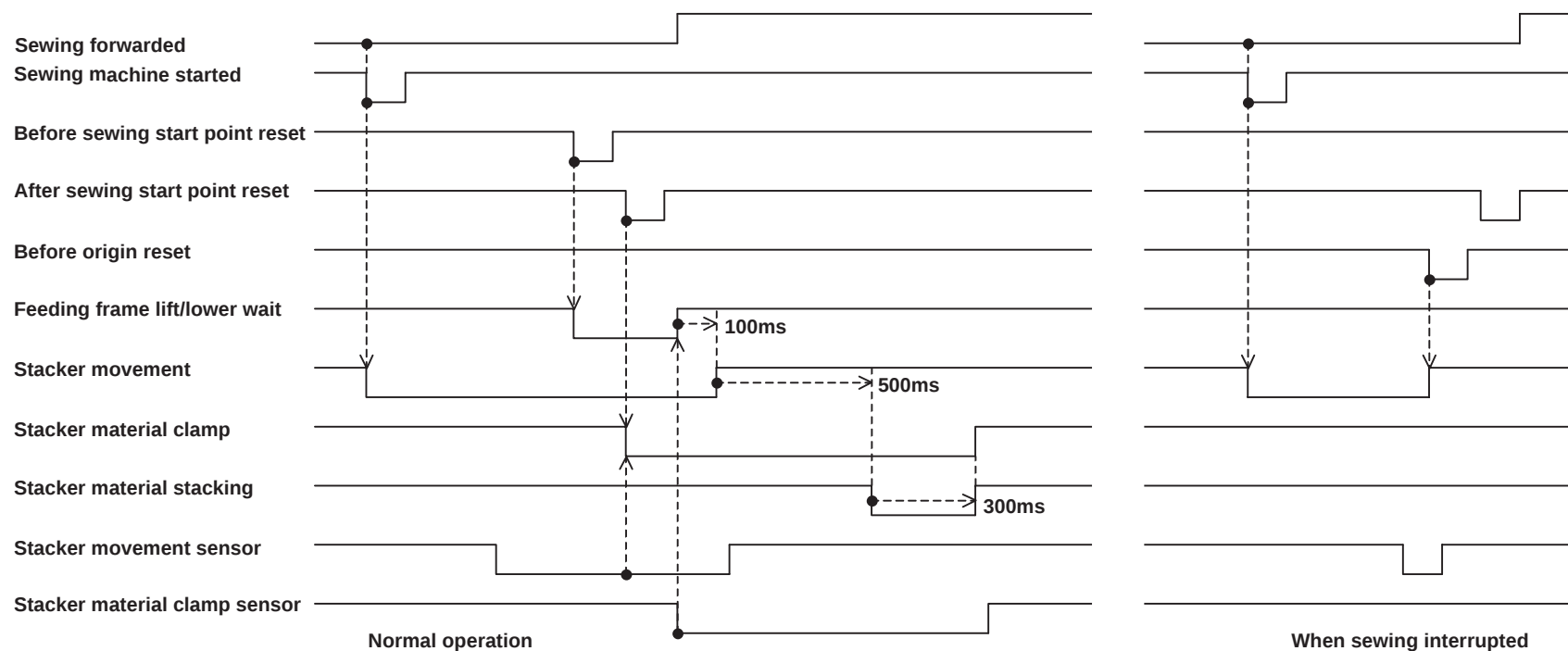
(Caution) For the descriptions in the parentheses () of o06 ~ o08 above, the terminals directly generate outputs with the aid of the simplified program. Port I/O setting is disabled.

[Simplified Program Setup]

Step	End, DELy, And, or, STIA, Stio, JUMP, Rest	o01H to o16H v01H to v16H	o01L to o16L v01L to v16L	o01H to o16H i01H to i16H v01H to v16H p1H to p4H, sH, eH	o01L to o16L i01L to i16L v01L to v16L p1L to p4L, sL, eL	Pn. Program No. Sn, Step No	d. Delay time c. Number of stitches r. Repetition counter	Delay time: Unit of 1ms Number of stitches: Unit of 1 stitch
No.	Command	Output information High	Output information Low	Input information High	Input information Low	Parameter ①	Parameter ②	Remarks
1	And				v01L		d.0	Waiting till sewing start point reset
2	DELy		o06L, o07L				d.200	Stacker material open / material clamp ON. 200ms delay.
3	DELy		o08L				d.400	Stacker material payout ON. 400ms delay.
4	DELy	o06H, o08H					d.300	Stacker material open / material payout OFF. 300ms delay.
5	JUMP	o07H				Sn.1	r.0	Stacker material clamp OFF. To Step 1.
6	End							

2) Stacker program 2

This is an example of program establishment intended to make material stacking, to be done after the material cloth has been clamped before feeding frame lifting at the time of the completion of sewing.



[Port I/O Setup]

Terminal output	Contents	Remarks
o01	1: Feeding frame right	Standard
o02	2: Feeding frame left	Standard
o03	4: Feeding frame 2-stage stroke	Standard
o04	7: Reverse shaft	Standard
o05	9: Needle cooler	Standard
o06	(Stacker move)	Simplified program output
o07	(Stacker material clamp)	Simplified program output
o08	(Stacker material stack)	Simplified program output

Terminal input	Contents	Remarks
i01		
i02		
i03		
i04		
i05		
i06	(Stacker movement sensor)	Simplified program input
i07	(Stacker material clamp sensor)	Simplified program input
i08		

Virtual I/O	I/O	Contents	Remarks
v01	Output	61: Sewing forwarded	
v02	Output	102: Sewing machine started	
v03	Output	100: Before sewing start point reset	
v04	Output	101: After sewing start point reset	
v05	Output	105: Before origin reset	
v06	Input	55: Feeding frame lift/lower wait	
v07			
v08			

(Caution) For the descriptions in the parentheses () of o06 ~ o08 and i06 ~ i07 above, the terminals directly generate outputs with the aid of the simplified program. Port I/O setting is disabled.

[Simplified Program Setup]

Step	End,DELy, And,or, STiA,Stio, JUMP,Rest	o01H to o16H v01H to v16H	o01L to o16L v01L to v16L	o01H to o16H i01H to i16H v01H to v16H p1H to p4H,sH,eH	o01L to o16L i01L to i16L v01L to v16L p1L to p4L,sL,eL	Pn. Program No. Sn, Step No	d. Delay time c. Number of stitches r. Repetition counter	Delay time: Unit of 1ms Number of stitches: Unit of 1 stitch
No.	Command	Output information High	Output information Low	Input information High	Input information Low	Parameter ①	Parameter ②	Remarks
1	And				v01L , v02L		d.0	Waiting till sewing machine start.
2	or		o06L,		v03L, v05L		d.0	Stacker movement ON. Waiting till sewing start point reset or origin reset.
3	And				v03L	Sn.11	d.1	To Step 11 if there is no sewing start point reset.
4	And		v06L		v04L		d.0	Feeding frame lifting wait ON. Waiting till sewing start point reset.
5	And				i06		d.0	Waiting till stacker movement sensor ON.
6	And		o07L		i07		d.0	Stacker material clamp ON. Waiting till stacker material clamp sensor ON.
7	DELy	v06H					d.100	Feeding frame lifting wait ON. 100ms delay.
8	DELy	o06H					d.500	Stacker movement OFF. 500ms delay.
9	DELy		o08L				d.300	Stacker material stacking ON. 300ms delay.
10	JUMP	o07H, o08H				Sn.1	r.0	Stacker material clamp / material stacking OFF.
11	JUMP	o06H				Sn.1	r.0	Stacker movement OFF. To Step 1.
12	End							

(6) Port I/O setup sheet

Terminal output	Contents	Remarks
o01		
o02		
o03		
o04		
o05		
o06		
o07		
o08		
o09		
o10		
o11		
o12		
o13		
o14		
o15		
o16		

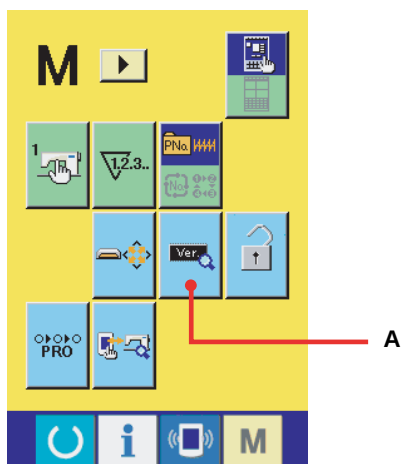
Terminal input	Contents	Remarks
i01		
i02		
i03		
i04		
i05		
i06		
i07		
i08		
i09		
i10		
i11		
i12		
i13		
i14		
i15		
i16		

Virtual I/O	I/O	Contents	Remarks
v01			
v02			
v03			
v04			
v05			
v06			
v07			
v08			
v09			
v10			
v11			
v12			
v13			
v14			
v15			
v16			

(7) Simplified program setup sheet

Step	End,DELY, And,or, STiA,Stio, JUMP,Rest	o01H to o16H v01H to v16H	o01L to o16L v01L to v16L	o01H to o16H i01H to i16H v01H to v16H p1H to p4H,sH,eH	o01L to o16L i01L to i16L v01L to v16L p1L to p4L,sL,eL	Pn. Program No. Sn, Step No	d. Delay time c. Number of stitches r. Repetition counter	Delay time: Unit of 1ms Number of stitches: Unit of 1 stitch
No.	Co. Command	Output information High	Output information Low	Input information High	Input information Low	Parameter ①	Parameter ②	Remarks
1								
2								
3								
4								
5								
6								
7								
8								
9								
0								
1								
2								
3								
4								
5								
6								
7								
8								
9								
0								

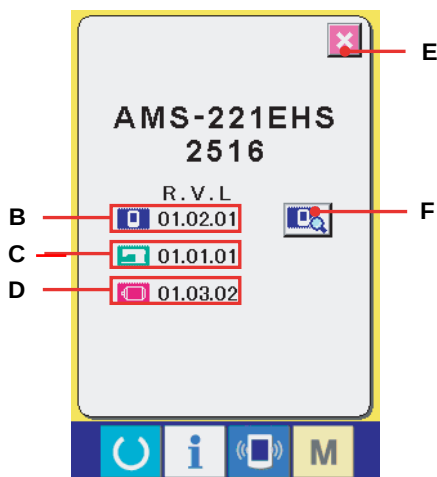
(6) Version display



1. To display the version information screen:

Hold down the **M** key for 3 seconds to call up the version information button,  (A) on the screen. Press this button to display the version information screen.

The version information screen shows the version information of your sewing machine.

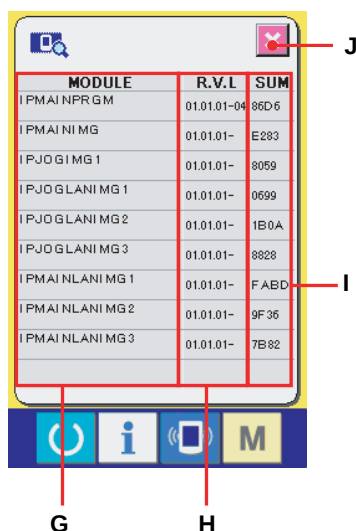


B: Panel program version

C: Main program version

D: Main shaft program version

Pressing the cancel button,  (E) closes the version information screen and calls up the mode screen.



2. To display the detail screen:

Press the detail screen button,  (F) to call up the panel program detail screen.

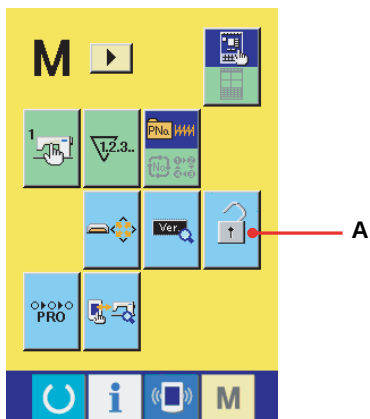
G: Module

H: RVL

I: Checksum

Pressing the cancel button,  (J) closes the detail screen and calls up the version information screen. Pressing the **M** key closes the detail screen and calls up the data input screen which you have selected.

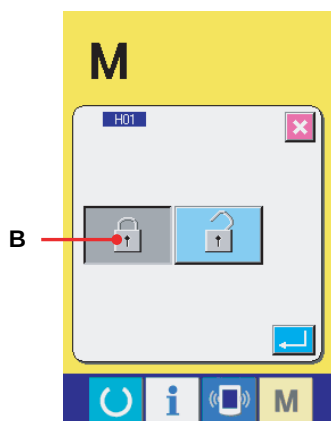
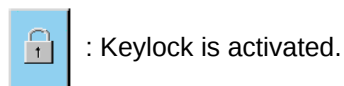
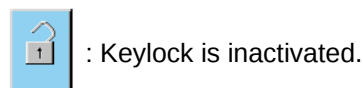
(7) Keylock setup



1. To call up the keylock screen:

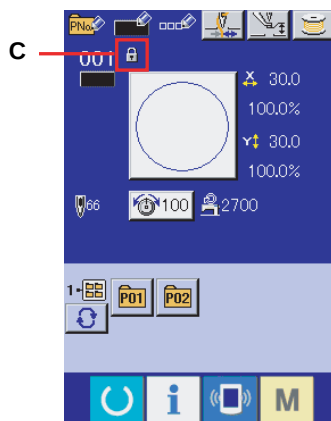
Hold down the **M** key for 3 seconds to call up the keylock button,  (A) on the screen. Press this button to display the keylock setting screen.

The current status appears on the keylock button.



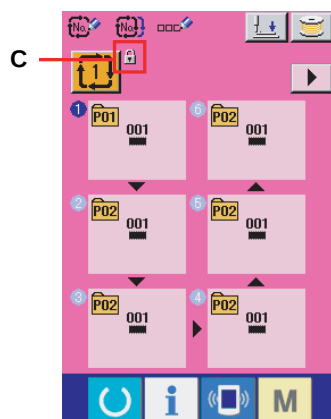
2. To select keylock and activate it:

Select the keylock activation button,  (B) on the keylock setting screen and press . Then, the keylock setting screen closes and keylock becomes activated.



3. After closing the mode screen and calling up the data input screen:

After closing the mode screen and calling up the data input screen, PICT C indicating that keylock is activated appears on the right of the pattern number. Only available buttons appear when keylock is activated.



(8) Communication screens of the maintenance personnel level (Program rewrite)

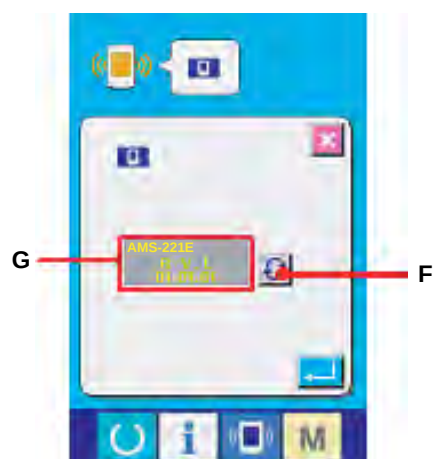
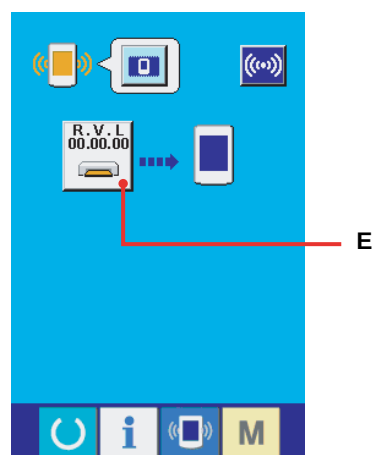
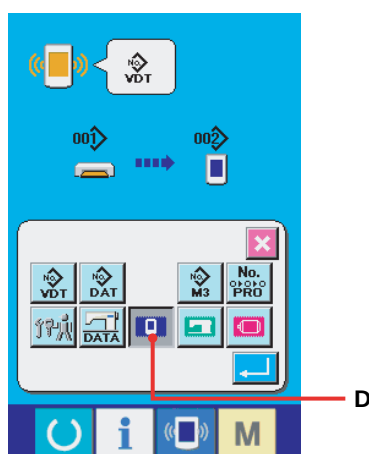
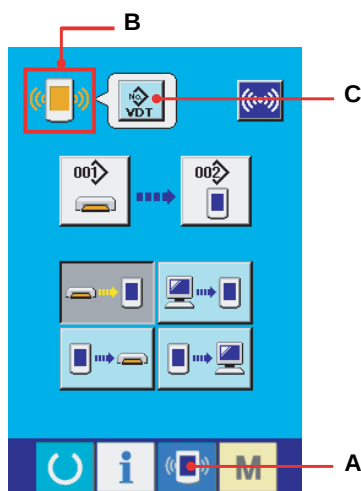
The data types allowed to be handled in the communication screens can differ according to the ordinarily used levels and the specific levels that are used by the maintenance personnel.

1. Types of data that can be handled

In addition to the four ordinary data types, the five more data types can be used for the maintenance personnel level. Each data type is as specified below.

Data name	Pict	Extension	Contents of data
Adjustment data		Model name +00XXX.MSW Example) AMS00001.MSW	Data of the memory switches 1 and 2
All sewing machine data		Model name +00XXX.MSP Example) AMS00001.MSP	All data maintained by the sewing machine
Panel program data		AP + RVL (6 digits).HED AP + RVL (6 digits).PXX AM + RVL (6 digits).IXX	Program data and display data of the panel
Main program data		MA + RVL (6 digits).PRG	Main program data
Servo program data		MT + RVL (6 digits).PRG	Servo program data

XXX: File No.



2. Reading/Writing of adjustment data and all sewing machine data (For the IP-410)

(1) Display of the communication screen of the maintenance personnel level

When the  key (A) is continuously pressed for 3 seconds, the top left image is turned into the orange color (B) and a communication screen of the maintenance personnel level is displayed.

 (C) is pressed in a communication screen of the maintenance personnel level, the data selection screen is displayed.

In this state, it becomes possible to select the adjusting data and all sewing machine data.

3. Program rewriting (For the IP-410)

(1) Selection of the data type

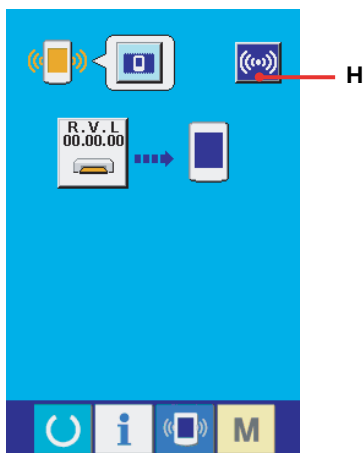
When the data classification button  (C) is pressed in a communication screen of the maintenance personnel level, the data selection screen is displayed.

In this state, select the panel program data  (D).

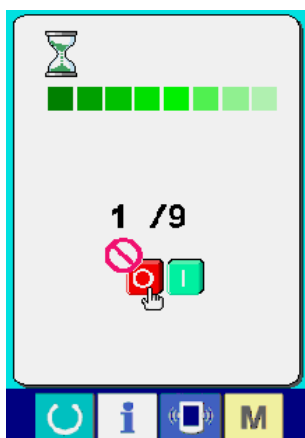
(2) Selection of a file

When the file selection button  (E) is pressed in a communication screen, the file selection screen is displayed.

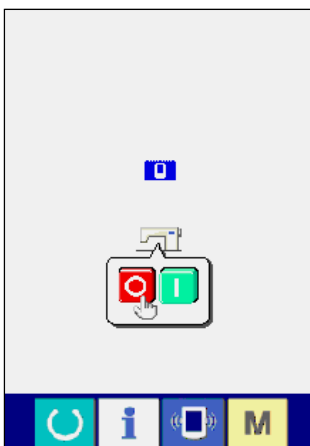
Press the file retrieval button  (F) to select the download program (G), and press the  button.



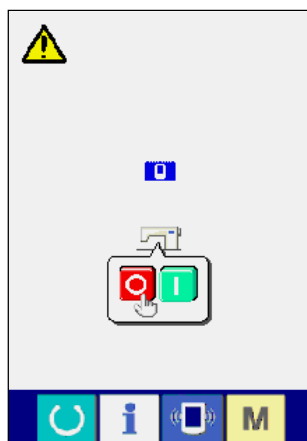
Data deleting screen



Ending screen



Data writing error screen

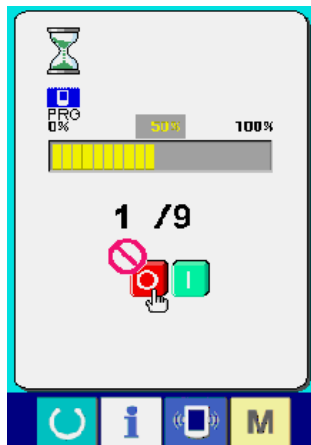


(3) Program rewrite start

When the start of communication button  (H) is pressed, program rewriting is started.

(Caution) Never turn off the power or open/shut the media cover during the work. Otherwise, the main body can be destroyed.

Data writing screen



When the ending screen is displayed, the replacement work for the application software has been completed.

If any data writing error screen should be displayed, immediately turn off the power supply and check the [checking items] specified below. Then, take the setup actions again.

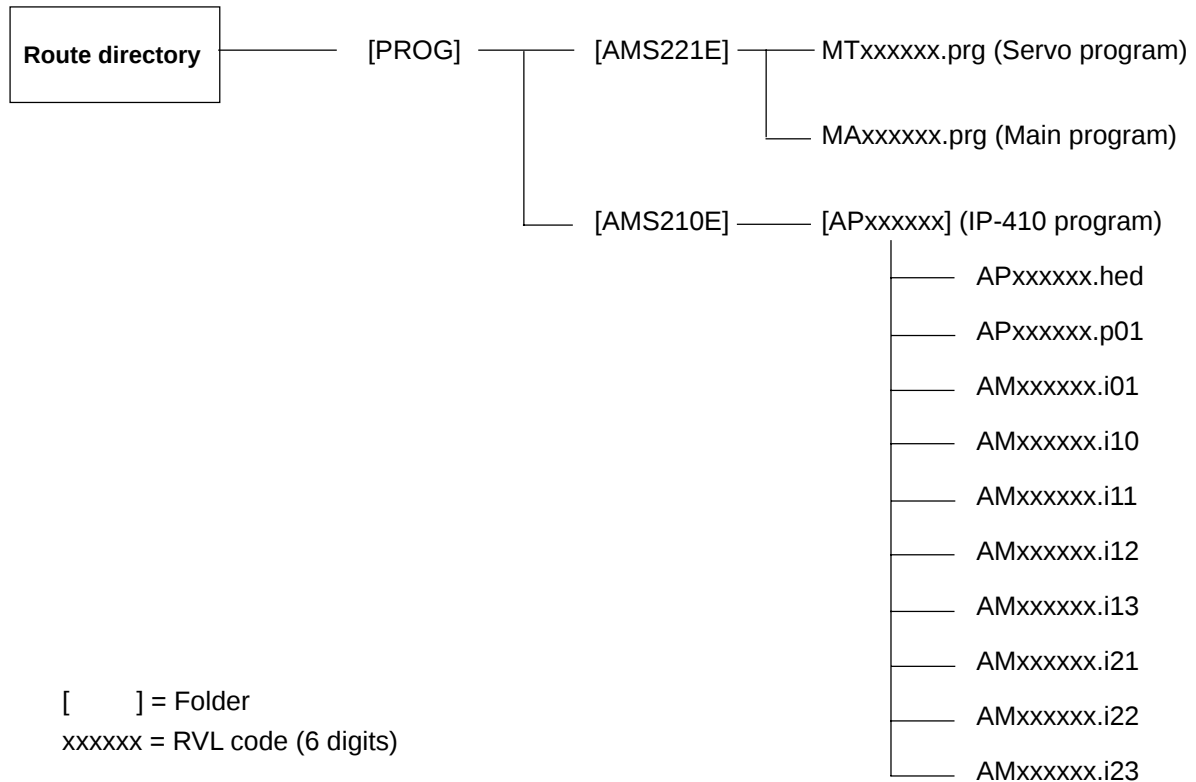
[Checking items]

- 1) Did you open the media cover in the middle of data communication from the media card.
- 2) Data of the media card are incorrect, or there is no data file.
- 3) The contact point of the media card is contaminated, or suffering from poor contact.

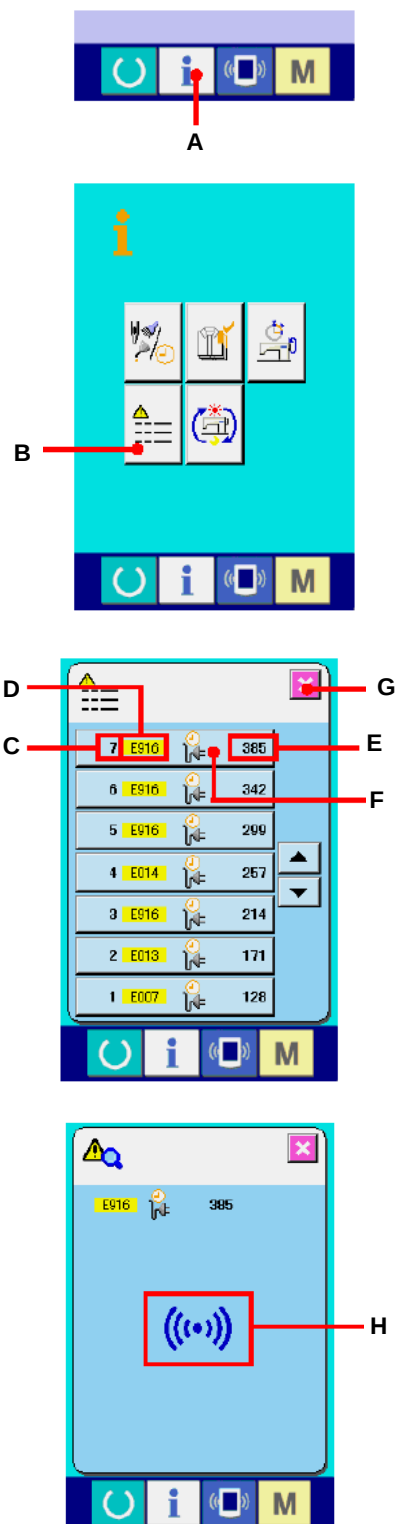
4. Use of media other than those packed together

When the contents of the media card packed together are going to be copied on another media card, the media card of the copying destination should be formatted with IP410. Since then, the following directory configuration should be established with a personal computer.

Information about the method of media card formatting is obtainable from the Instruction Manual, [2-25. How to Use the Communication Functions].



(9) Information screen at the maintenance personnel level



1. Error history

(1) To display the information screen at the maintenance personnel level:

Hold down the information key,  (A) for approx. 3 seconds in the switch sheet section on the data input screen to call up the information screen at the maintenance personnel level. On the information screen at the maintenance personnel level, the color of PICT at the upper left changes from blue to orange, and there are 5 buttons.

(2) To call up the error history screen:

Press the error history button,  (B) on the information screen to call up the error history screen.

The error history screen shows the error history of your sewing machine.

C: Chronological recording number

D: Error code

E: Cumulative energizing time during error (hour)

Pressing the cancel button,  (G) closes the error history screen and calls up the information screen.

(3) To display details:

For detailed information about errors, press the error button,  (F) that you would like to see to call up the error detail screen.

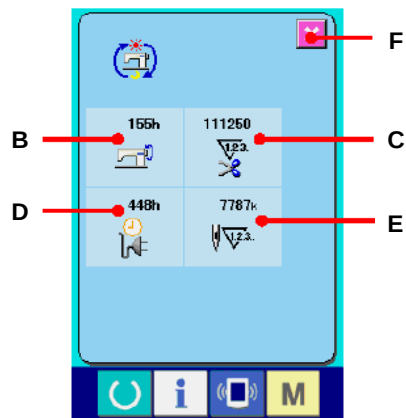
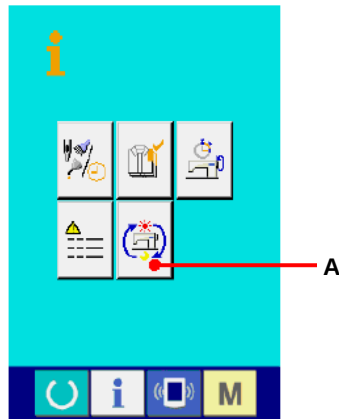
PICT (H) in response to error codes appears on the error detail screen.

→ Refer to the “11. Error code list”.

2. Cumulative operating information

(1) To call up the information screen at the maintenance personnel level:

Hold down the information key  , i for approx. 3 seconds in the switch sheet section on the data input screen to call up the information screen at the maintenance personnel level. On the information screen at the maintenance personnel level, the color of PICT at the upper left changes from blue to orange, and there are 5 buttons.



(2) To display cumulative operating information:

Press the cumulative operating information button,  (A) on the information screen to call up the cumulative operating information screen.

The following 4 items are indicated on the cumulative operating information screen.

B: Cumulative operating time (hour)

C: Cumulative thread trimming count

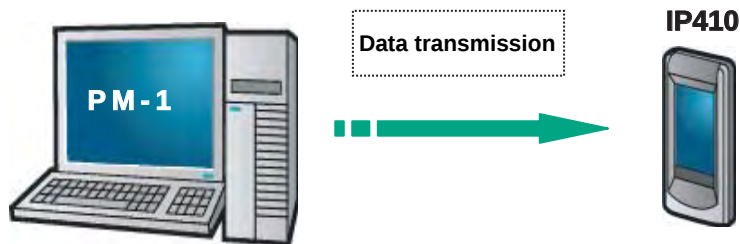
D: Cumulative energizing time (hour)

E: Cumulative stitch count (x1000 stitches)

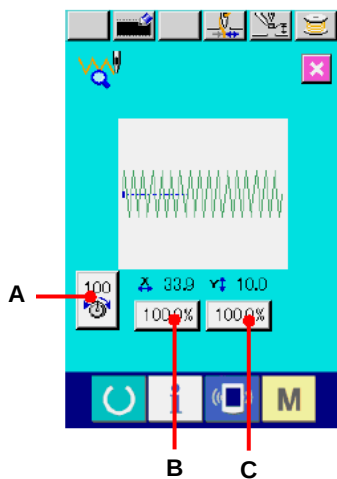
Pressing the cancel button,  (F) closes the cumulative operating information screen and calls up the information screen.

(10) Test sewing function

Connecting your PC to the sewing machine allows you to perform test sewing based on data created with PM-1 (sewing data creating and editing software).



Connect your PC and transmit data to the sewing machine after creating it with PM-1, and IP-410 automatically shows the test sewing screen when the data input screen is called up. Refer to the help screen or the like for how to operate PM-1.



1. To perform test sewing:

(1) Reception of data for test sewing from PM-1

When data (vector type) for test sewing is transmitted from PM-1, the screen shown at right appears, and a needle positioning drawing of transmitted data appears in the center of the screen.

The color of the needle positioning drawing changes depending on thread tension. If the stitch count of transmitted data is too large, a needle positioning drawing does not appear.

(2) Edit of vector parameter

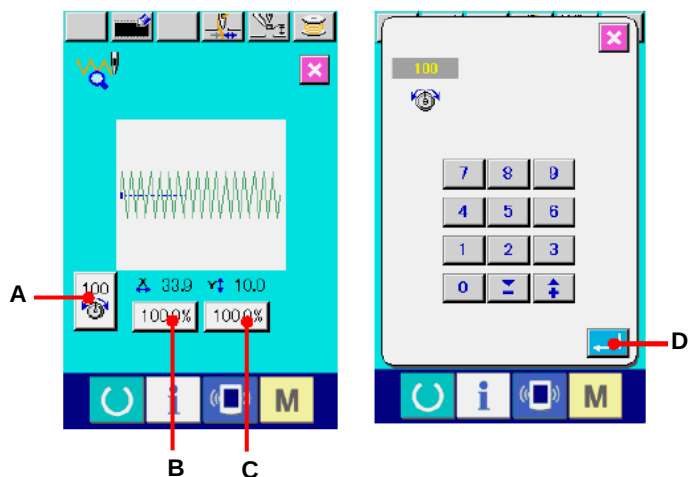
The following 3 items are configurable on data transmitted from PM-1.

A: Thread tension

B: X-axial enlargement/reduction ratio or actual value

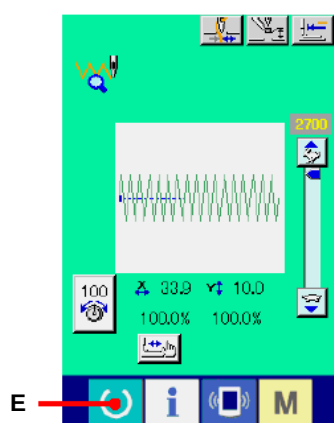
C: Y-axial enlargement/reduction ratio or actual value

* The memory switch, U64, provides selection between an enlargement/reduction ratio and an actual value.



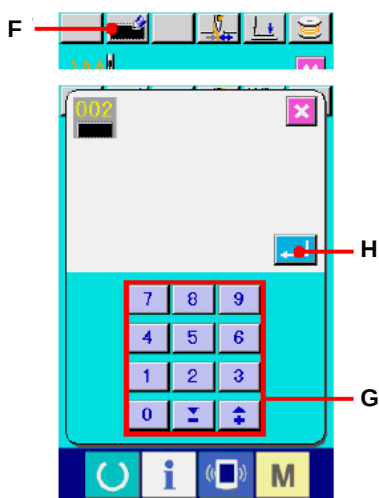
(3) Modification to data

Press the button, A, B, or C to be changed to call up the numeric keypad. Enter a new value and press the enter button  (D).



(4) Test sewing

Press the ready-to-go switch  (E) to call up the test sewing screen. Test sewing is ready.

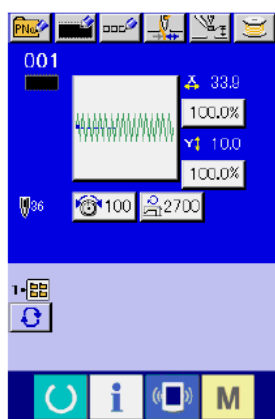


(5) Data registration to user pattern

To register test sewing data to the sewing machine, press the registration button  (F) shown on the test sewing screen to call up the registration screen. Enter the user pattern number to which the test sewing data is registered with the numeric keypad (G).

(6) Confirmation of data registration

Press the enter button  (H) to close the registration screen, and registration is completed.



(7) data entry screen

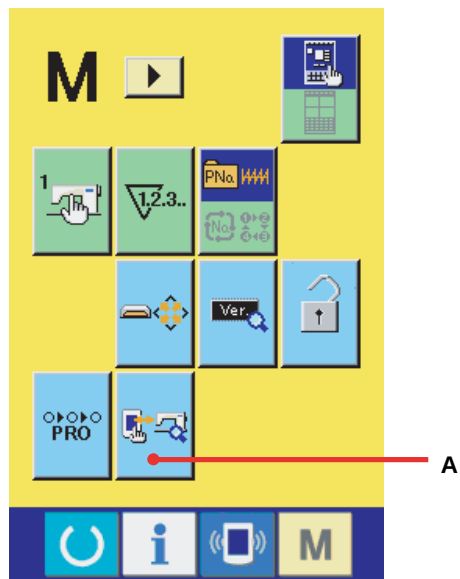
After data registration, the data entry screen automatically appears.

2. Color chart indicating thread tension values

An indicated needle positioning drawing varies with thread tensions adjusted for needle entry positions. The following chart shows the colors of lines for thread tensions.

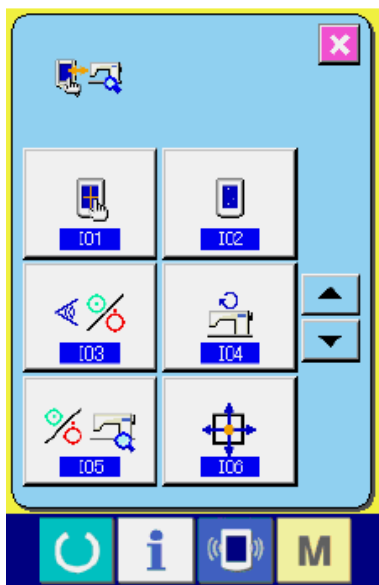
Thread tension	Color
0 to 20	 : Gray
21 to 40	 : Purple
41 to 60	 : Blue
61 to 80	 : Light blue
81 to 100	 : Green
101 to 120	 : Yellow green
121 to 140	 : Orange
141 to 160	 : Red
161 to 180	 : Pink
181 to 200	 : Black

6. Test mode



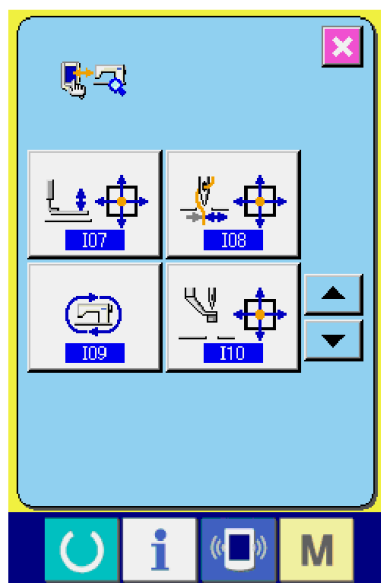
1) Display of the check program screen

When the **M** key is continuously pressed for 3 seconds, the check program  (A) is displayed on the screen. When this button is depressed, the check program screen is displayed.



The check program comes in the ten items as specified below.

- I01** Touch panel correction screen
→ The touch panel and button display positions are corrected.
- I02** LCD check
→ Presence of any dot missing is checked for the liquid crystal display.
- I03** Input signal check
→ The status of switches and sensor inputs is displayed.
- I04** Main motor rpm check
→ When the sewing machine is started at the preset rpm level, the measured rpm value is displayed.
- I05** Output check
→ Wiper and air output check is carried out.
- I06** XY motor / origin sensor check
→ The status of inching operation of the X/Y motor, operation of origin retrieval, and the X/Y origin sensor is displayed.



I07 Presser and thread trimmer motor / origin sensor check

- The status of inching operation of the presser and thread trimmer motor, operation of origin retrieval, and the presser origin and presser sensor is displayed.

I08 Needle thread clamp motor / origin sensor check

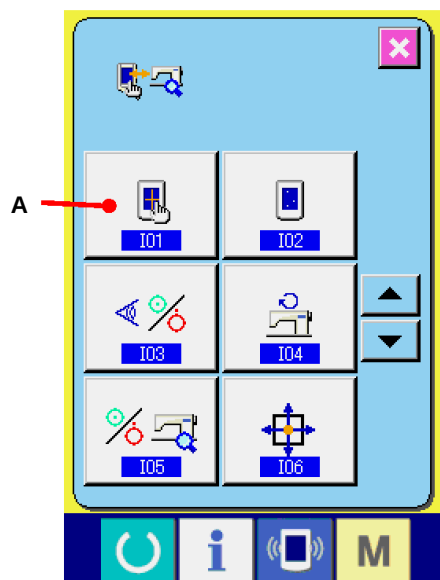
- The status of inching operation of the needle thread clamp motor, operation of origin retrieval, and the needle thread clamp origin and needle thread clamp sensor is displayed.

I09 Continuous operation

- When the conditions of continuous operation have been set up, the continuous operation mode is assumed.

I10 Intermediate presser adjustment

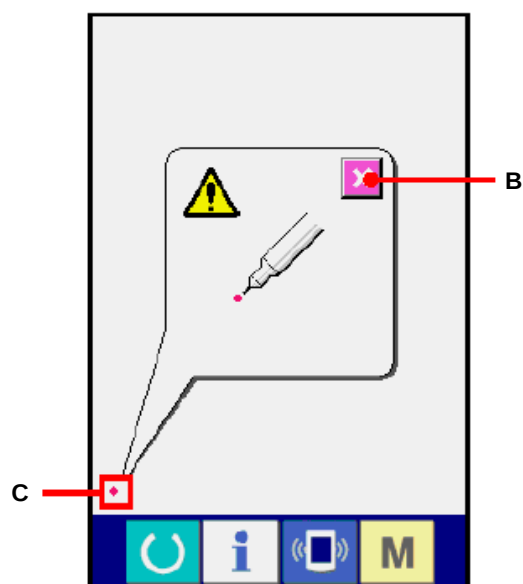
- The status of inching operation of the intermediate presser motor, operation of origin retrieval, and the intermediate presser origin sensor is displayed.



2) Touch panel correction

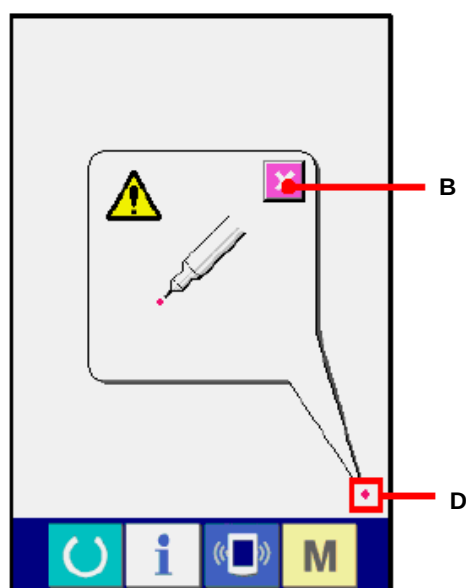
1. Display of the touch panel correction screen

When the touch panel correction button  (A) of the check program screen is pressed, the touch panel correction screen is displayed.



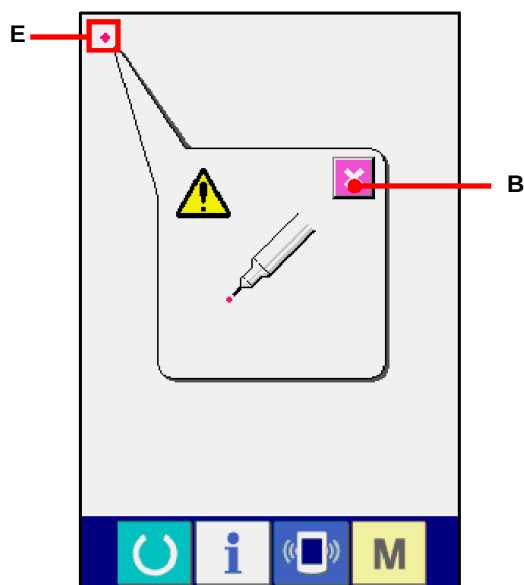
2. Pressing the bottom left position

Press the red circle  (C) located at the bottom left of the screen. To complete correction, press the cancel button  (B).



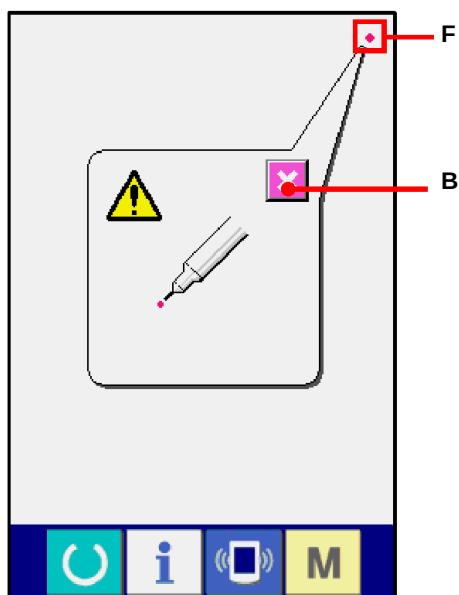
3. Pressing the bottom right position

Press the red circle  (D) located at the bottom right of the screen. To complete correction, press the cancel button  (B).



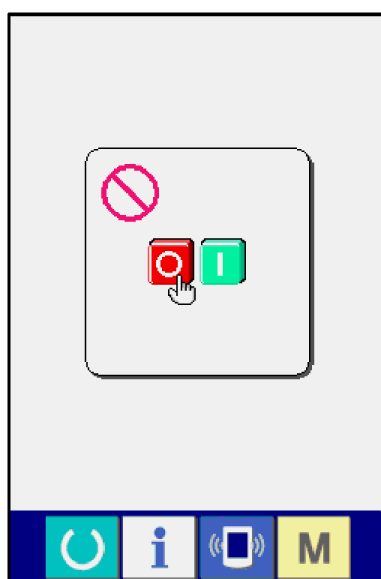
4. Pressing the top left position

Press the red circle  (E) located at the top left of the screen. To complete correction, press the cancel button  (B).



5. Pressing the top right position

Press the red circle  (F) located at the top right of the screen. To complete correction, press the cancel button  (B).



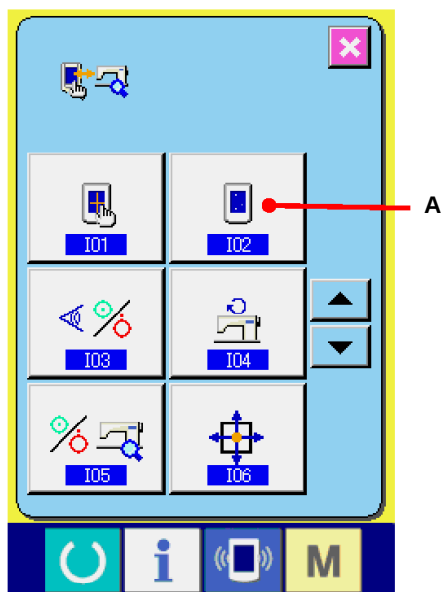
6. Data saving

When all the four points have been pressed, the correction data are saved. At that time, the Power OFF Prohibition screen is displayed.

The power supply must not be turned off while the above-mentioned screen is displayed.

If the power supply is carelessly turned off, no correction data are saved.

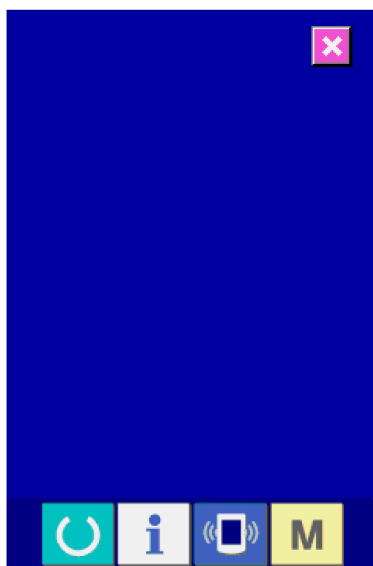
After data saving, the check program screen is automatically displayed.



3) LCD check

1. Display of the LCD check screen

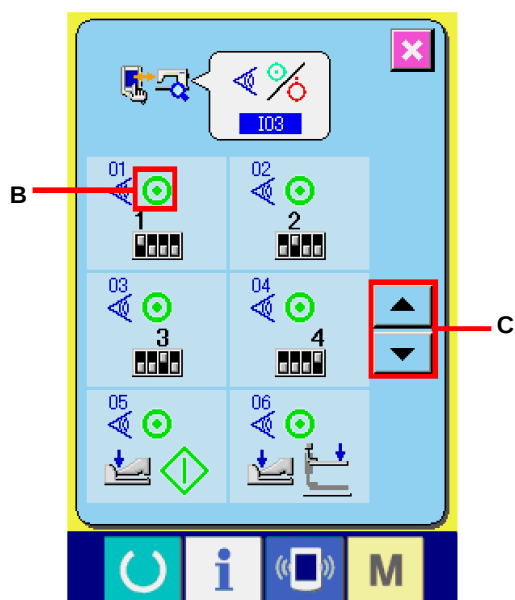
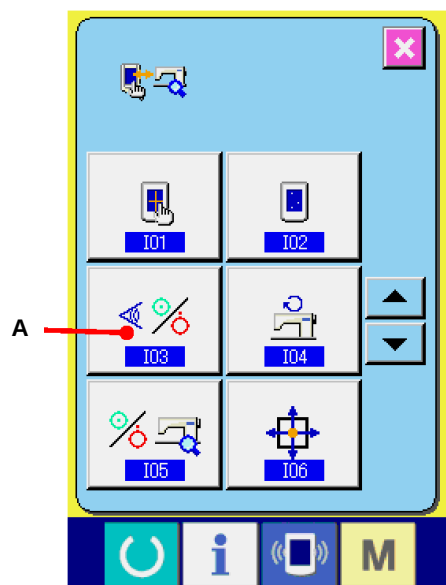
When the LCD check button  (A) is pressed on the check program screen, the LCD check screen is displayed.



2. Confirmation of LCD dot missing

The LCD check screen is displayed only in one color. In this state, the LCD should be checked to freedom from dot missing.

After this confirmation, press a proper position on the screen. The LCD check screen is closed and the check program screen is displayed.



4) Method of input signal check

1. Display of the input signal check screen

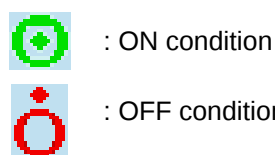
When the input signal check button  (A) is pressed on the check program screen, the sensor check screen is displayed.

2. Input signal check

In the input signal check screen, the input conditions of various sensors can be confirmed.

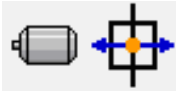
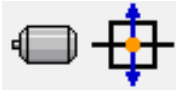
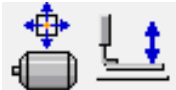
For each sensor, the input status is displayed as indicated by B.

The ON/OFF conditions are displayed as shown below.



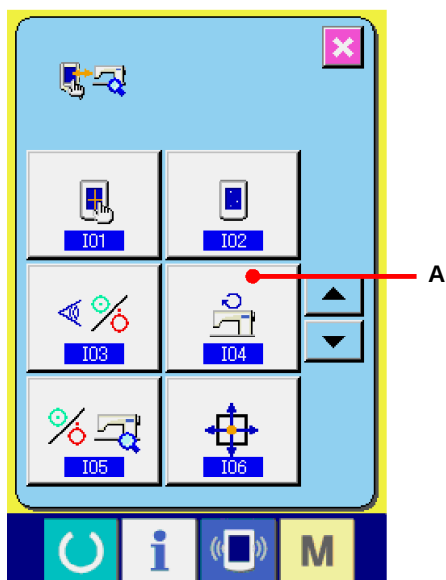
Using the UP-DOWN buttons   (C), display the sensor that has been confirmed.

The sensors provide the following 43 types of conditions:

No.	Pictograph	Contents of sensor	No.	Pictograph	Contents of sensor
01		DIPSW2-1	17		SDET sensor
02		DIPSW2-2	18		Head fall SW
03		DIPSW2-3	19		Air pressure SW
04		DIPSW2-4	20		Thread breakage sensor SW
05		Start SW (Pedal)	21		X motor origin sensor
06		Presser 1 SW (Pedal)	22		Y motor origin sensor
07		Presser 2 SW (Pedal)	23		Presser motor origin sensor
08		Presser 3 SW (Pedal)	24		Needle thread clamp motor origin sensor
09		Presser 4 SW (Pedal)	25		Intermediate presser motor origin sensor
10		Temporary stop SW	26		Presser motor sensor
11		AUDET sensor	27		Needle thread clamp motor sensor
12		ADDET sensor	28		External input 1
13		DDET sensor	29		External input 2
14		UDET sensor	30		External input 3
15		TG sensor	31		External input 4
16		PDET sensor	32		External input 5

The DIPSW2 is the DIPSW located on the MAIN Board.

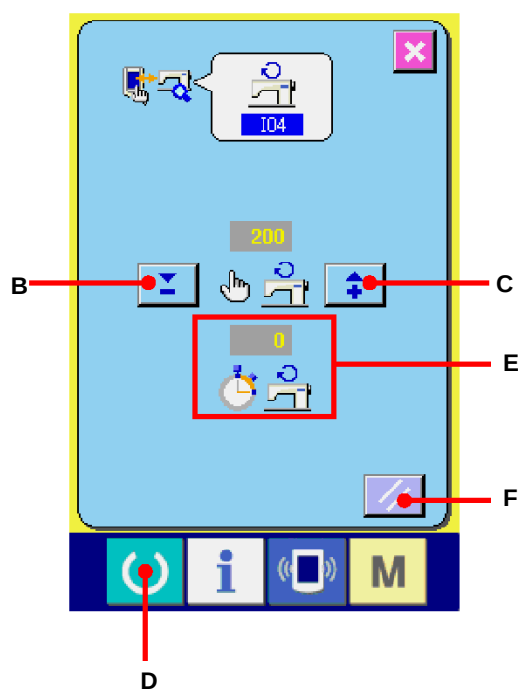
No.	Pictograph	Contents of sensor	No.	Pictograph	Contents of sensor
33 		External input 6	39 		External input 12
34 		External input 7	40 		External input 13
35 		External input 8	41 		External input 14
36 		External input 9	42 		External input 15
37 		External input 10	43 		External input 16
38 		External input 11			



5) Main motor rpm check

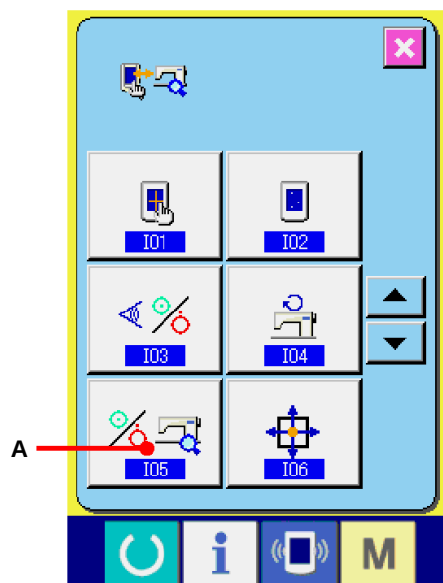
1. Display of the main motor rpm check screen

When the main motor rpm check button  (A) is pressed on the check program screen, the main motor rpm check screen is displayed.



2. Main motor operation and measured rpm value check

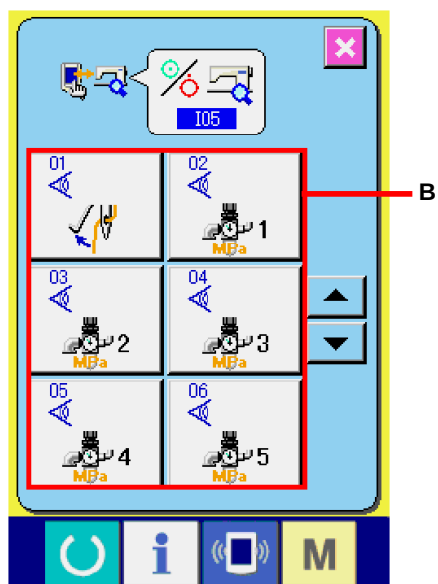
Using the $-/+$ buttons   (B, C), the rpm number can be set up. When the button  (D) is pressed, the sewing machine is operated at the pre-set speed. At that time, the measured rpm value is displayed at  (E). When the SET button  (F) is pressed, the sewing machine is stopped.



6) Method of output check

1. Display of the output check screen

When the output check button  (A) is pressed on the check program screen, the output check screen is displayed.

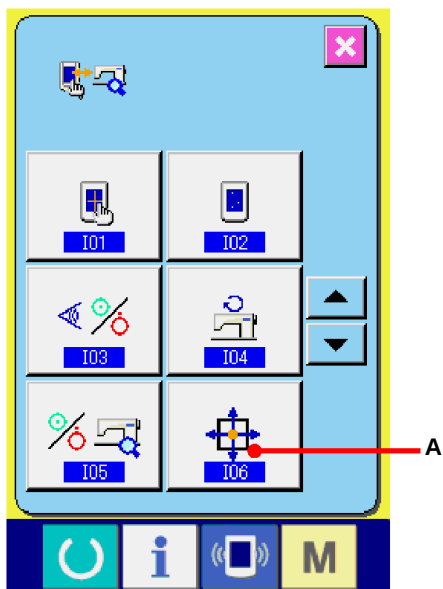


2. Output check

The output check screen can be used for the output check of each position. Try to press the output check button (B). While this button is pressed, the ON-status output is kept generated.

The output check display provides the following 17 types of positions:

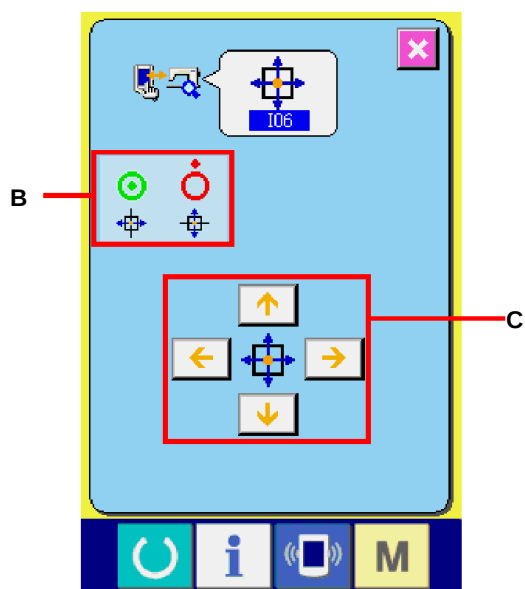
No.	Pictograph	Contents	No.	Pictograph	Contents
01		Wiper	10		Air output 9
02		Air output 1	11		Air output 10
03		Air output 2	12		Air output 11
04		Air output 3	13		Air output 12
05		Air output 4	14		Air output 13
06		Air output 5	15		Air output 14
07		Air output 6	16		Air output 15
08		Air output 7	17		Air output 16
09		Air output 8			



7) Method of XY motor / origin sensor check

1. Display of the XY motor / origin sensor check screen

When the XY motor / origin sensor check button  (A) is pressed on the check program screen, the XY motor / origin sensor check screen is displayed.

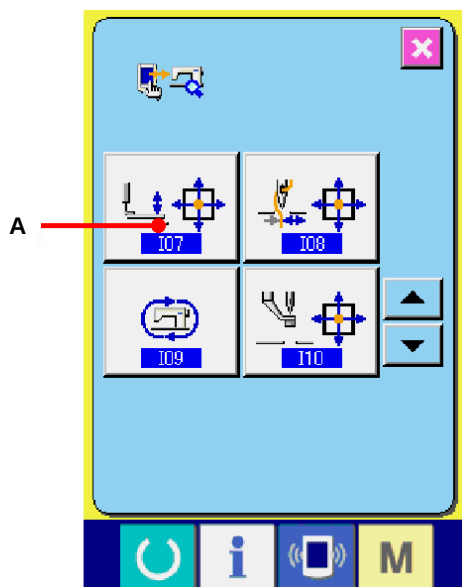


2. XY motor / origin sensor check

According to the status of the X/Y origin sensor, the ON/OFF condition of the sensor is displayed in the position of B.

When the Arrow-Mark button  (C) is pressed, the X/Y motor can be driven by 0.05mm in the +/- direction.

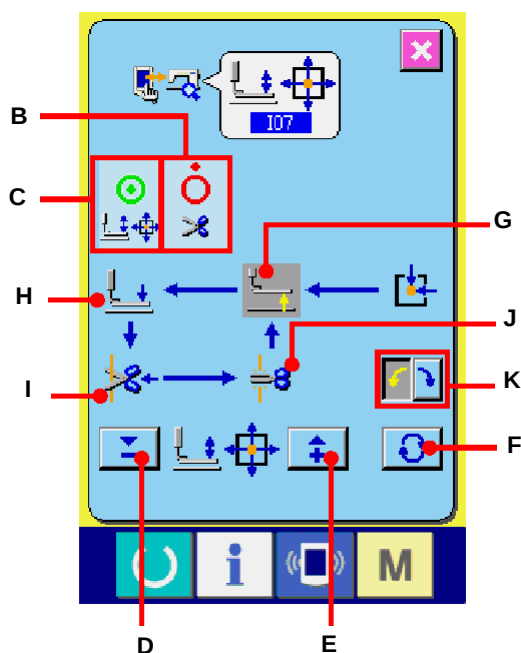
(Caution) 1. Using the Start SW, origin retrieval of the X/Y motors is effected for both shafts.



8) Method of presser and thread trimmer motor / origin sensor check

1. Display of the presser and thread trimmer motor / origin sensor check screen

When the presser and thread trimmer motor / origin sensor check button  (A) is pressed on the check program screen, the presser and thread trimmer motor / origin sensor check screen is displayed.



2. Presser and thread trimmer motor / origin sensor check

According to the status of the thread trimmer sensor, the ON/OFF condition of the thread trimmer sensor is displayed in the position of B.

According to the status of the presser origin sensor, the ON/OFF condition of the presser origin sensor is displayed in the position of C.

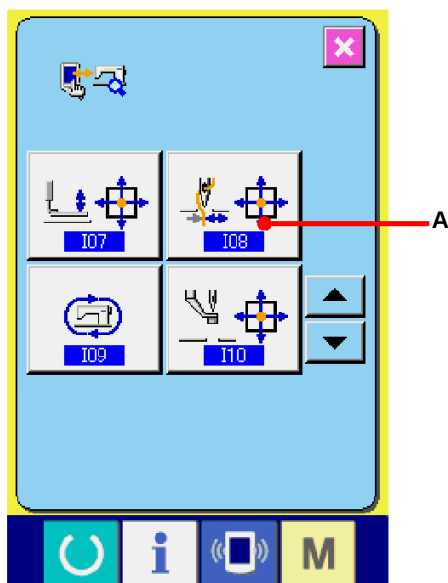
Using the [+] and [-] keys   (D, E), the presser / thread trimmer motor can be driven by one pulse.

When the fixed position moving button  (F) is pressed, the presser / thread trimmer motor is driven to any of the following fixed positions. A pictograph indicating this position is displayed in gray.

- G : Presser lifting position
- H : Presser lowering position (lowering position during pedal operation)
- I : Thread trimmer position
- J : Presser lowering position (lowering position after thread trimming)

When the reverse rotation button  (K) is pressed, driving is conducted in reverse direction. Using the Start SW, origin retrieval of the presser / thread trimmer motor is effected.

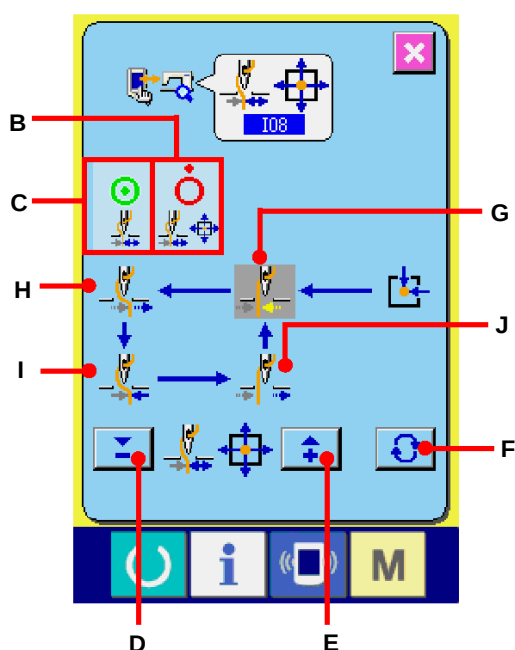
(Caution) The Start Switch becomes effective after the completion of origin retrieval for the presser / thread trimmer motor.



9) Method of needle thread clamp motor / origin sensor check

1. Display of the needle thread clamp motor / origin sensor check screen is displayed.

When the needle thread clamp motor / origin sensor check button  (A) is pressed on the check program screen, the needle thread clamp motor / origin sensor check screen is displayed.



2. Needle thread clamp motor / origin sensor check

According to the status of the needle thread clamp sensor, the ON/OFF condition of the needle thread clamp origin sensor is displayed in the position of C. According to the status of the needle thread clamp origin sensor, the ON/OFF condition of the needle thread clamp sensor is displayed in the position of B.

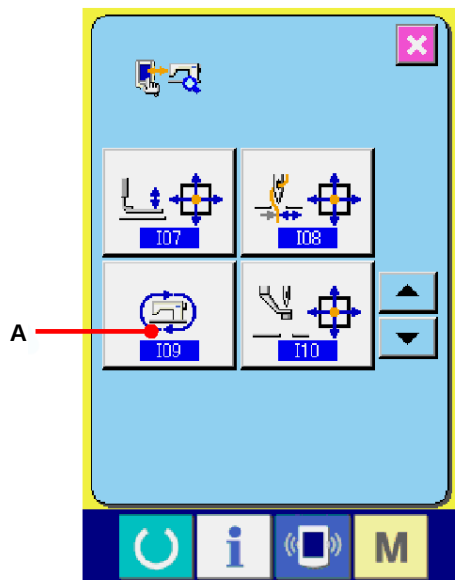
Using the [+] and [-] buttons   (D, E), the needle thread clamp motor can be driven by one pulse.

When the fixed position moving button  (F) is pressed, the needle thread clamp motor is driven to any of the following fixed positions. A pictograph indicating this position is reversed and displayed.

- G : Standby position (front side)
- H : Needle thread bending position
- I : Needle thread clamp position
- J : Refuge position (rear side)

Using the Start SW, origin retrieval of the needle thread clamp motor is effected.

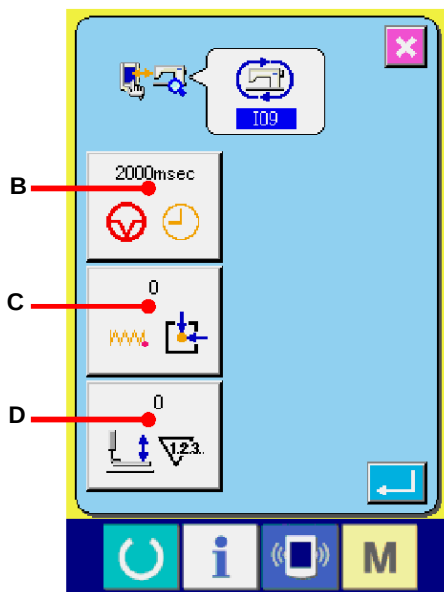
(Caution) The Start Switch becomes effective after the completion of origin retrieval for the needle thread clamp motor.



10) Method of continuous operation

1. Display of the continuous operation screen

When the continuous operation button  (A) is pressed on the check program screen, the continuous operation screen is displayed.



2. Continuous operation

In the continuous operation screen, the continuous operation mode is set up.

B : Intervals of operation (rest time)

C : Origin retrieval at the end of sewing

0 : No

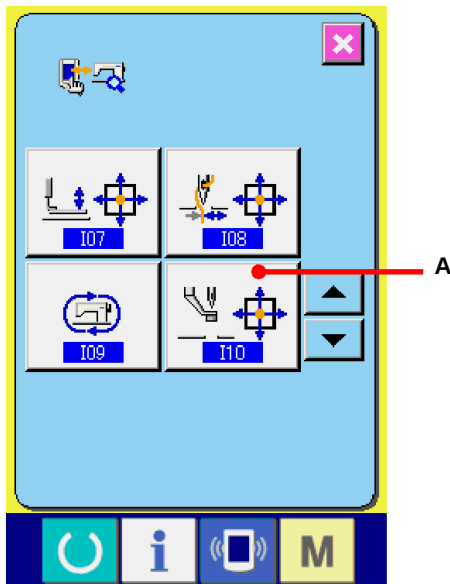
1 : Every 100 runs

2 : Every time

D : Presser lifting, lowering (frequency)

When the READY key  is turned ON, continuous operation is started.

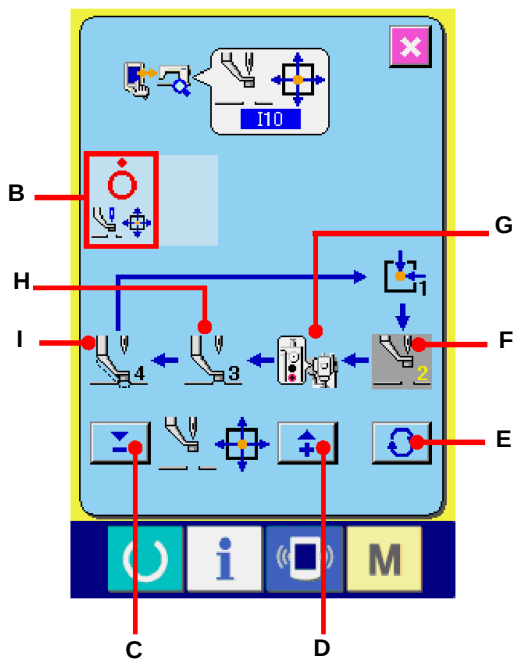
If the READY key is turned ON again in the middle of continuous operation, continuous operation is stopped.



11) Method of intermediate presser motor / origin sensor check

1. Display of the intermediate presser motor / origin sensor check screen

When the intermediate presser motor / origin sensor check button  (A) is pressed on the check program screen, the intermediate presser motor / origin sensor check screen is displayed.



2. Intermediate presser motor / origin sensor check

According to the status of the intermediate presser origin sensor, the ON/OFF condition of the intermediate presser origin sensor is displayed in the position of B.

Using the [+] and [-] buttons   (C, D), the intermediate presser motor can be driven by one pulse.

When the fixed position moving button  (E) is pressed, the intermediate presser motor is driven to any of the following fixed positions. A pictograph indicating this position is reversed and displayed.

F : Lower position at the height of 7mm during lowering

G : Timing adjustment position

H : Lower position at the height of 0mm during lowering

I : Intermediate presser bar adjustment position

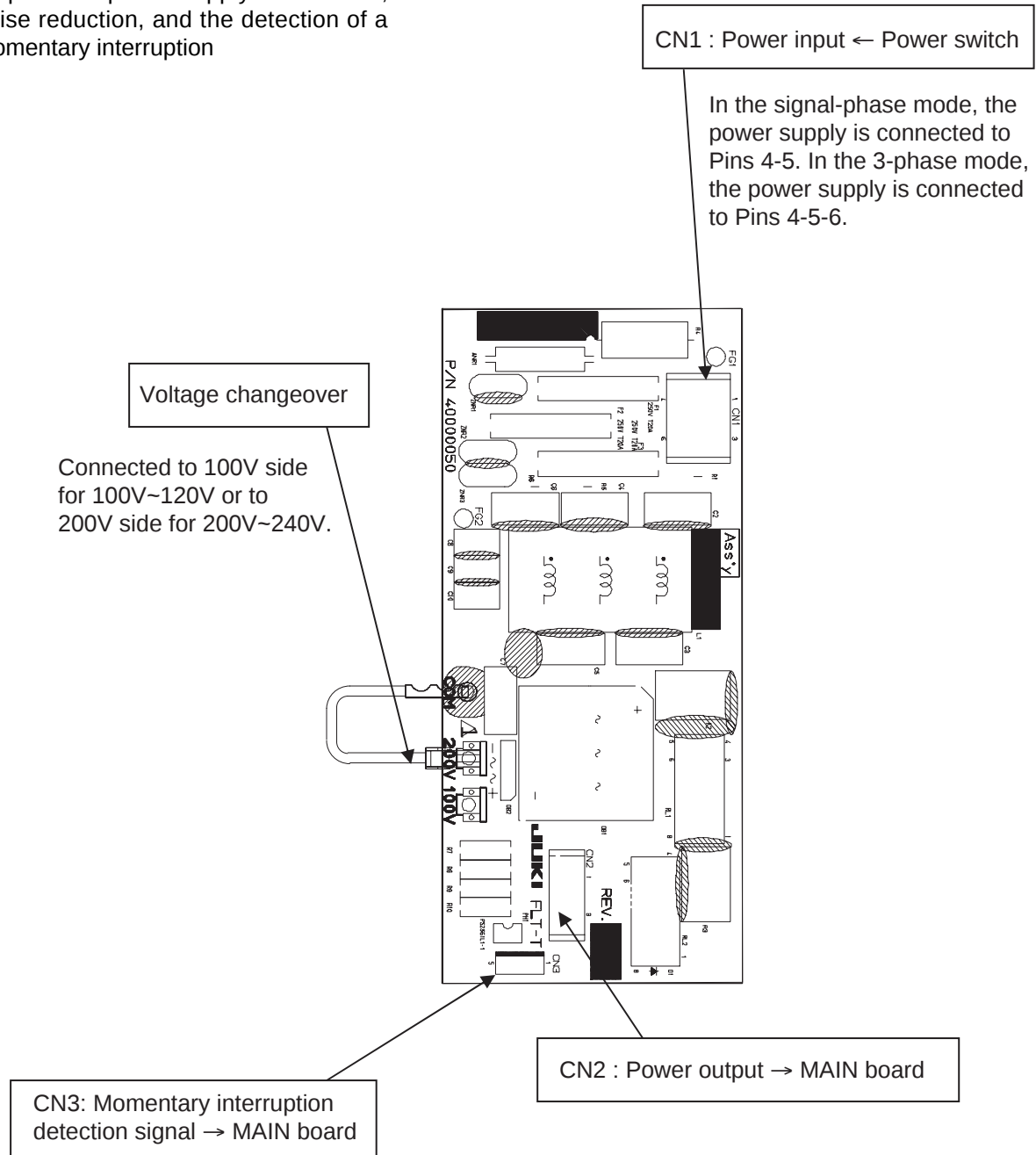
The START Switch is used for the origin retrieval of the intermediate presser motor.

7. Printed wiring board and dip switch

(1) Various printed wiring boards

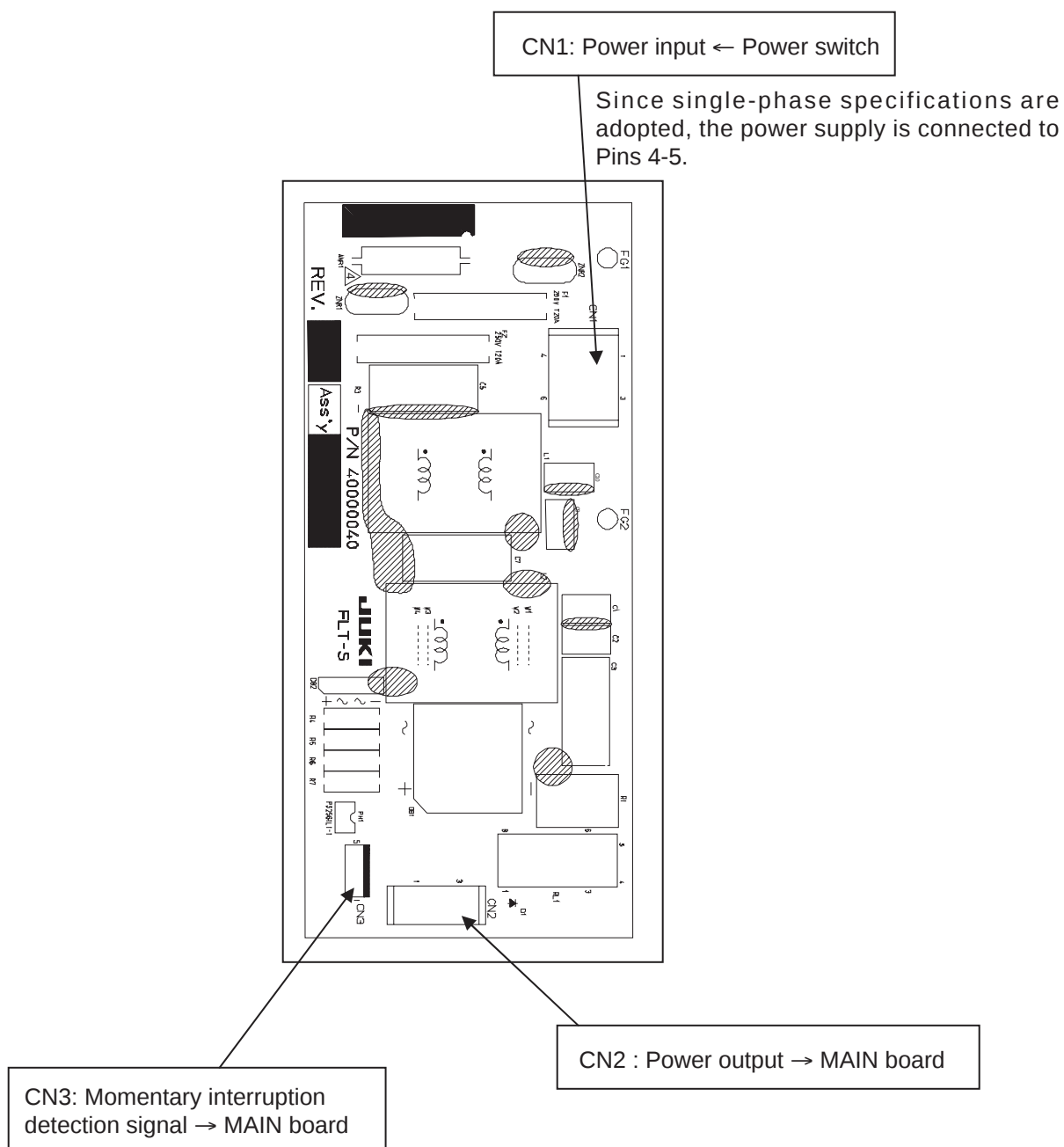
- 1) FLT-T board Single-phase 100V~120V
 3-phase 200V~240V

Pulse generation is carried out for the purposes of power supply rectification, noise reduction, and the detection of a momentary interruption



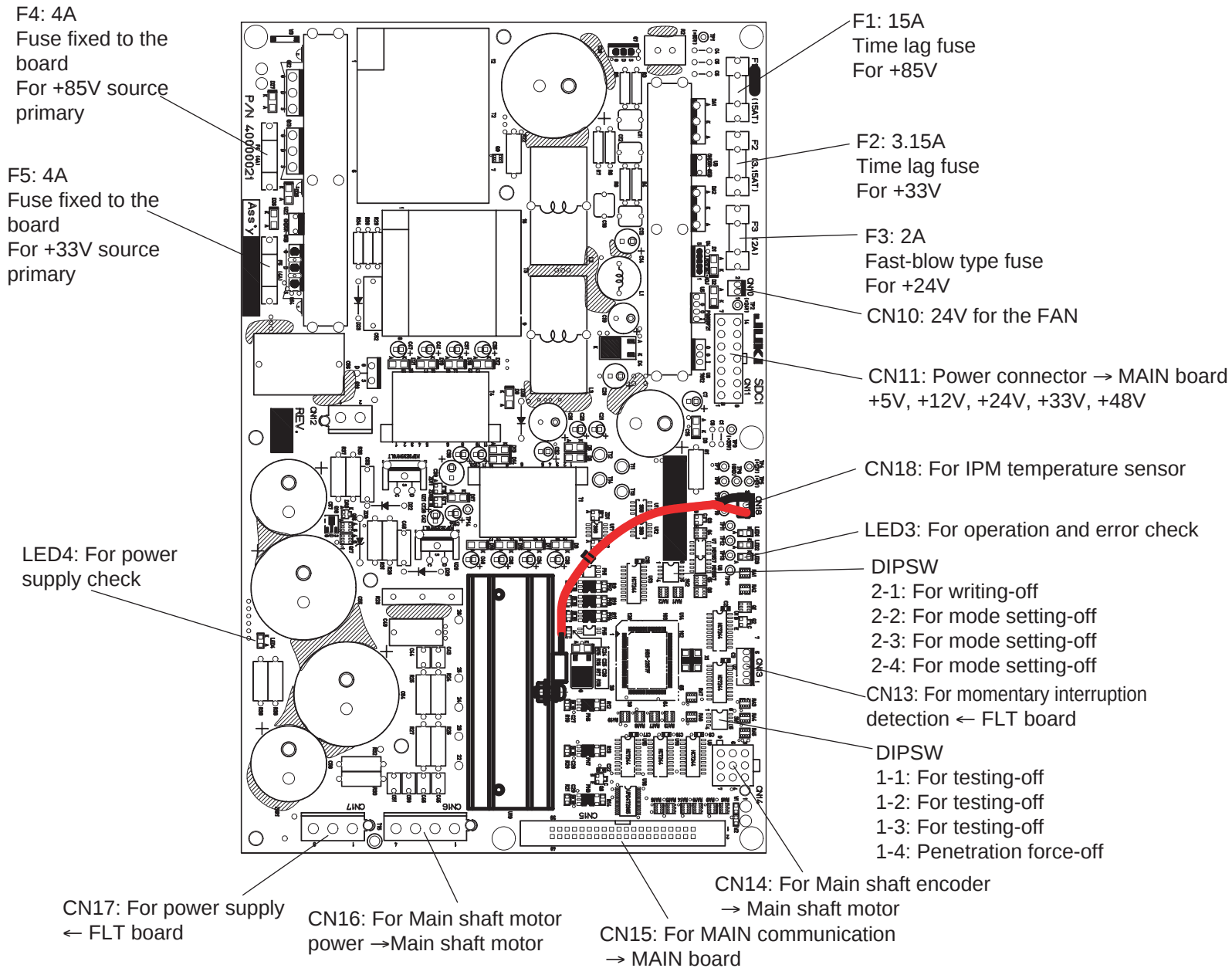
2) FLT-S board Single-phase 200V~240V

Pulse generation is carried out for the purposes of power supply rectification, noise reduction, and the detection of a momentary interruption



3) SDC board

The power supply is generated and error check is carried out. Main shaft control is effected, receiving the commands from the MAIN board.

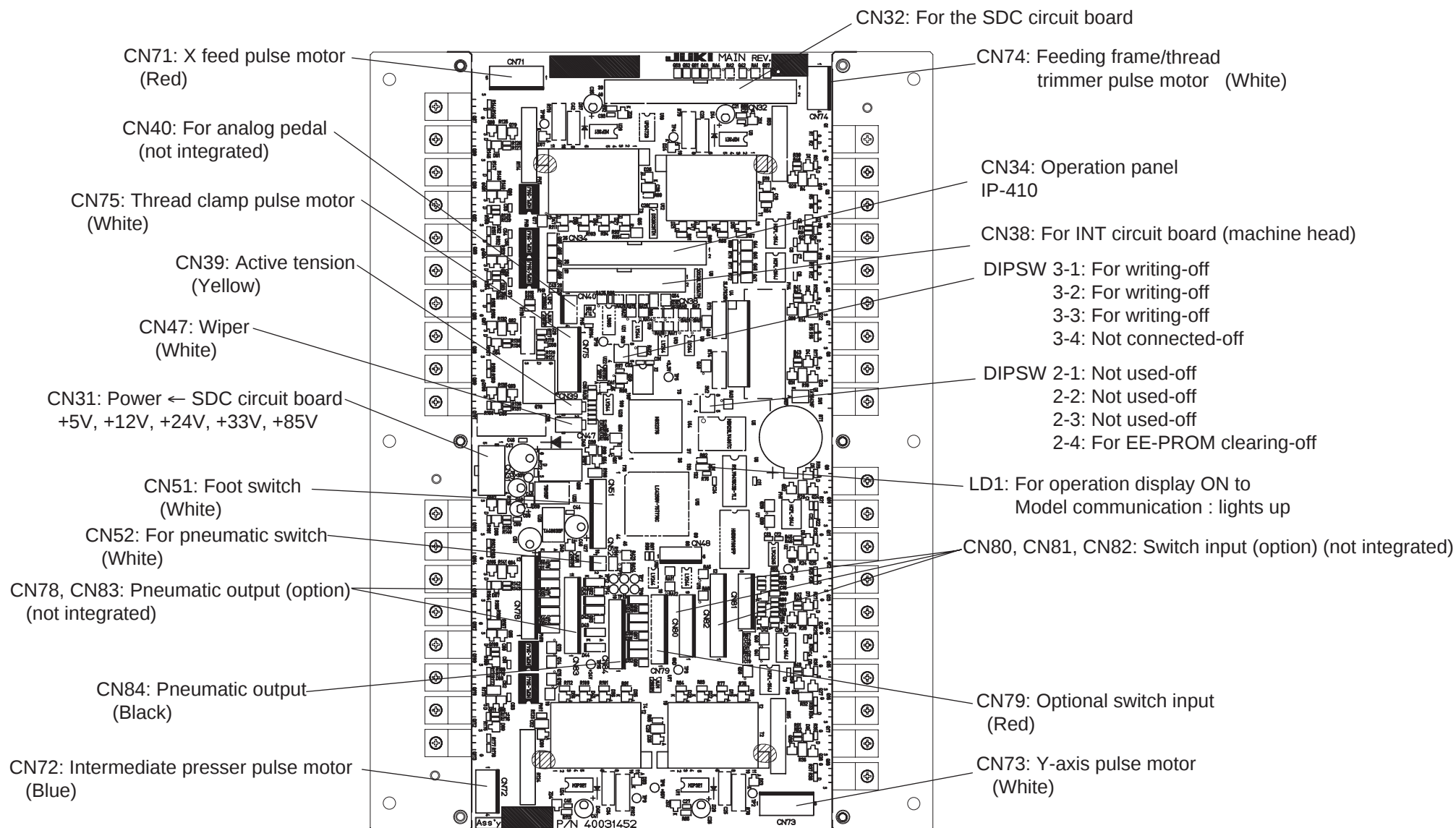


4) LED3 for SDC board error check

No. of LED3 flashes	Error description	Display of operation panel	Remarks
Turn on	Nil		Dimly turn on in ordinary state
1	Main shaft motor lock	E007	Failure in revolving for 2 seconds
2	Error in phase Z	E303	Failure in phase Z detection About 1.5 turns
3	Error in phases A and B	E730	Failure in phases A and B detection About 0.5 turns
4	Motor position sensor error	E731	Logical error in U, V, W
5	IPM error	E901	Error output generation from IPM
6	Undervoltage	E813	Source voltage -20% or more
7	Motor reverse rotation	E733	Irregular motor revolutions
8	Overvoltage	E811	Source voltage +20% or more
9	Power interruption	Display disabled	Power interruption of 40ms or more
10	Not used		
11	+85V power system error	E903	SDC board fuse F1 blow-off
12	+33V power system error	E904	SDC board fuse F2 blow-off
13	Overheating	E905	Radiator panel of SDC board heated at 85°C or higher
14	Not used		
15	Communication error	E916	Failure in communication with the MAIN board

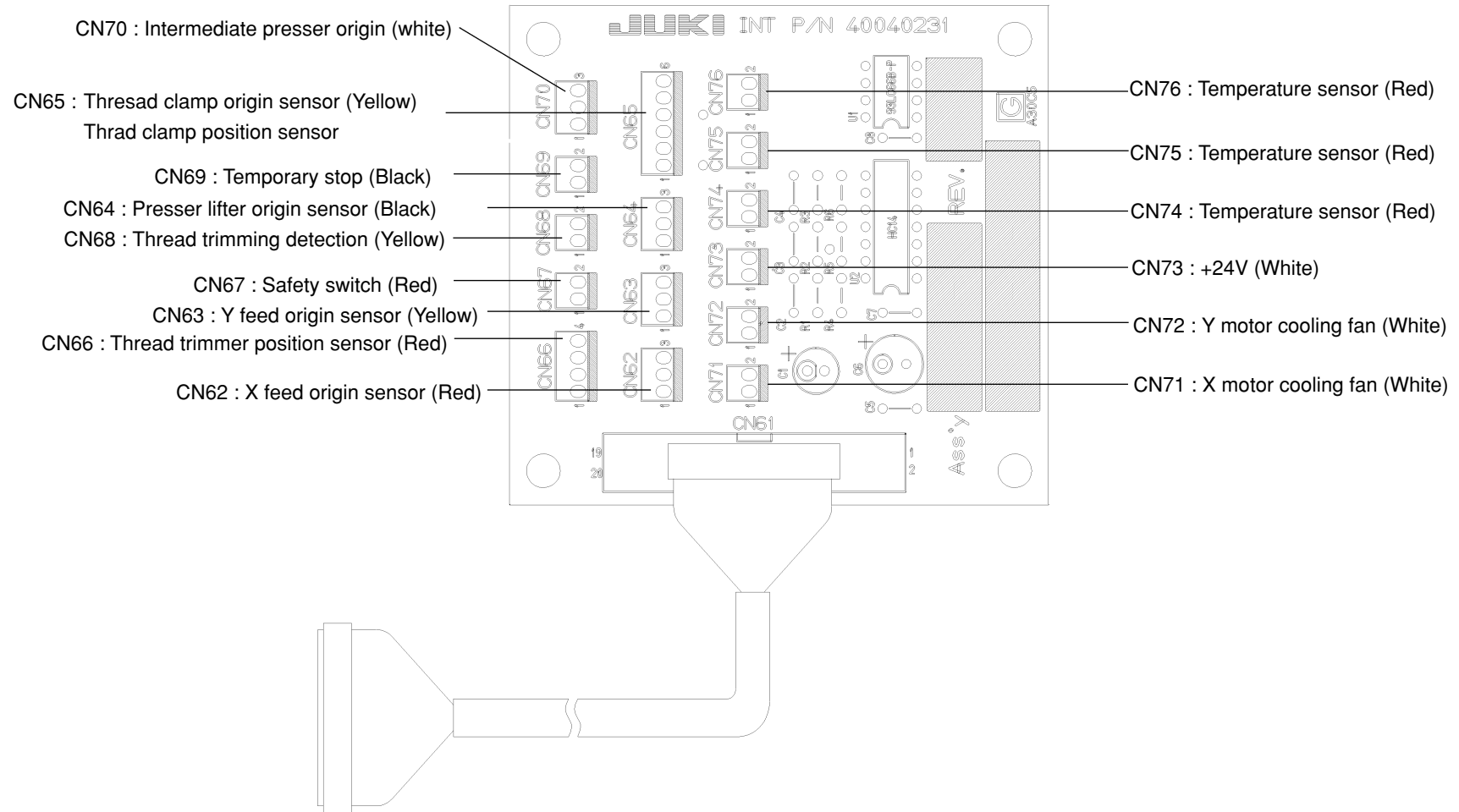
5) MAIN board

The board controls pulse motors, active tension, wipers, etc. for 5-axis separately and memory switch and other functions totally.



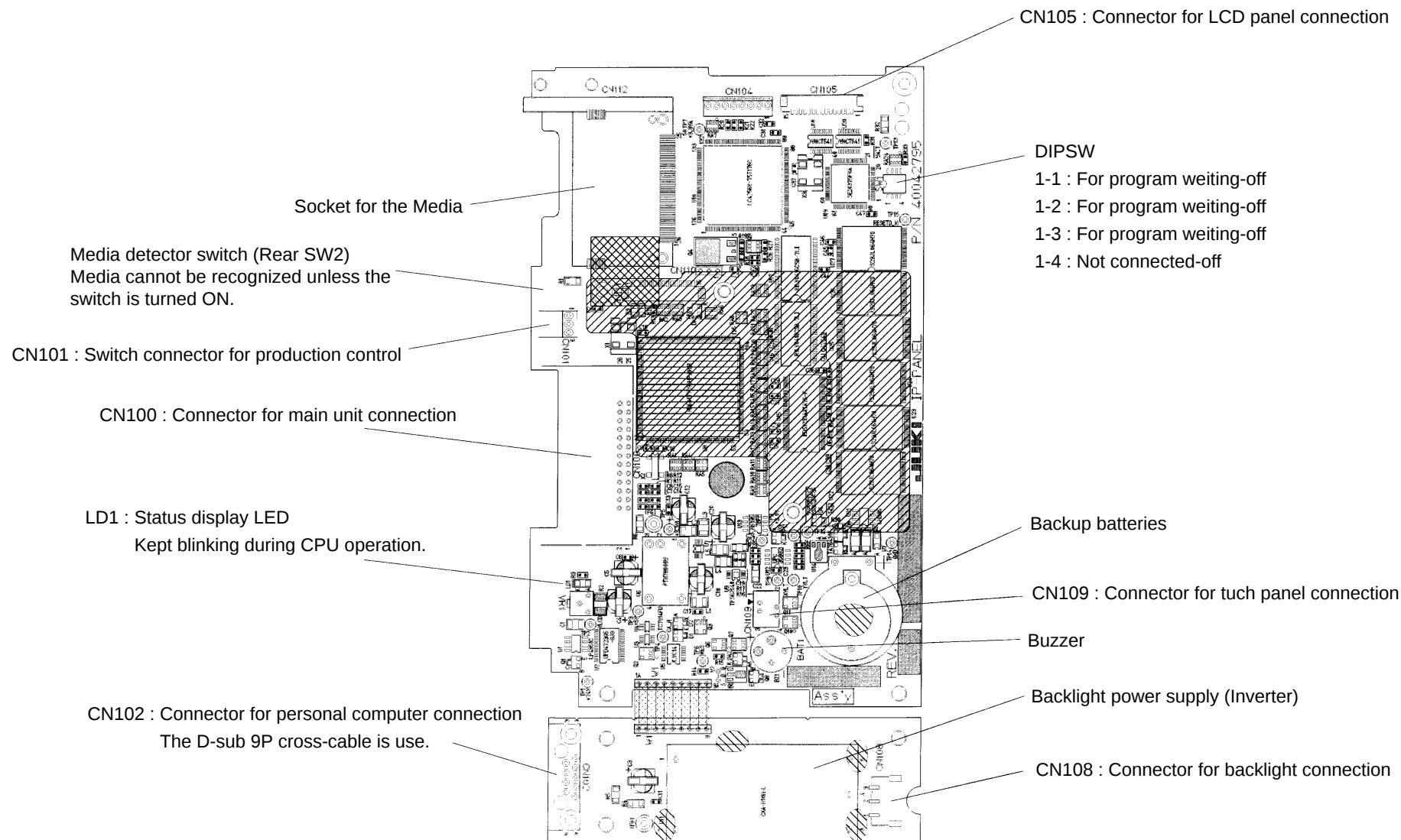
6) INT board

The board relays head sensor signals and transmits head model information to the MAIN board.



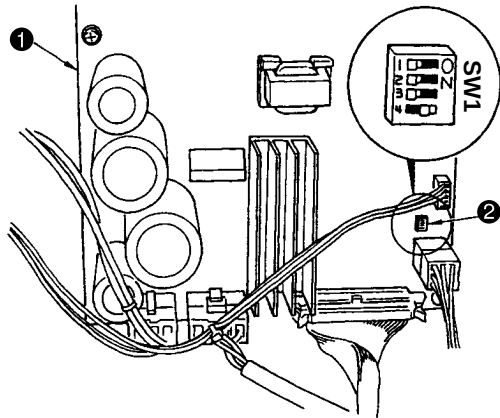
7) IP-410 Panel Board

The Panel board is provided with the color LCD driver circuit, backlight power supply, CPU memories, etc., intended to support input and production control.



(2) Dipswitch setup

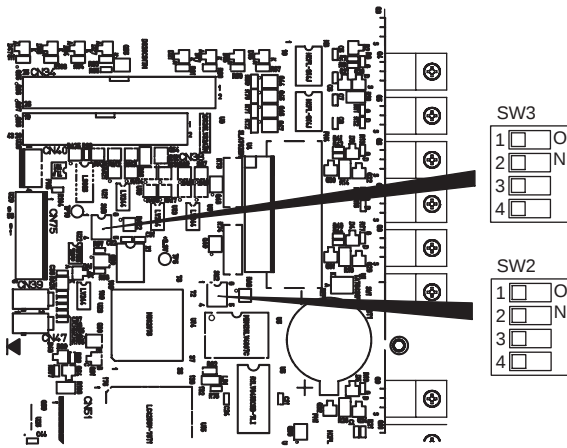
SDC board



1. The penetration force is increased when "4" of Dipswitch SW1 ② is turned ON on the SDC board ①.
2. If the penetration force is insufficient for thick materials, this switch should be turned ON.
3. All other dipswitches should be turned OFF.

(Caution) Dipswitch changeover should be done after the power supply has been turned off.

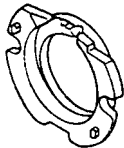
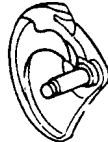
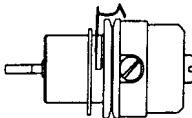
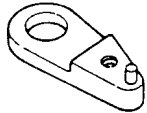
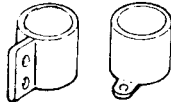
MAIN board



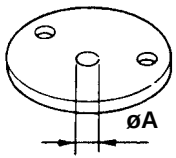
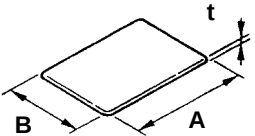
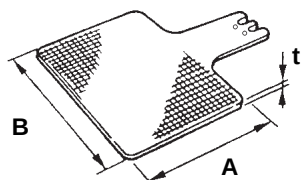
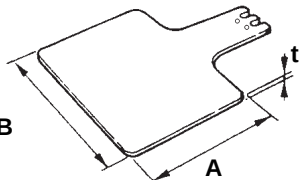
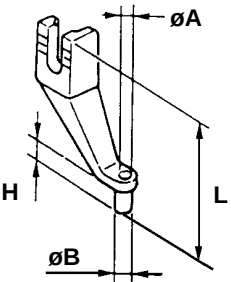
4. All dipswitches on the MAIN board are turned OFF.

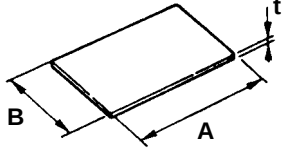
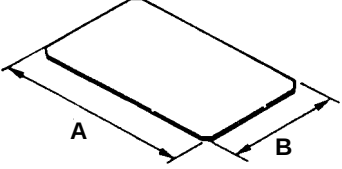
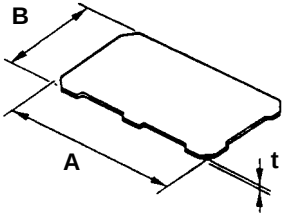
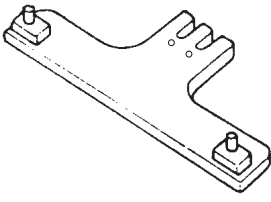
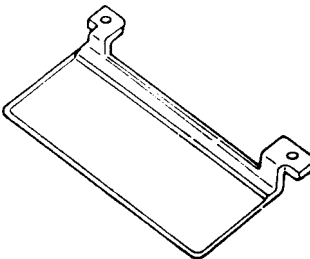
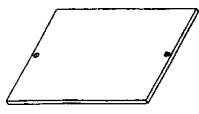
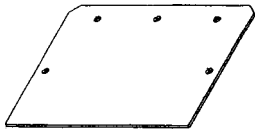
8. Table of exchanging gauge parts according to sewing specifications and needle size used

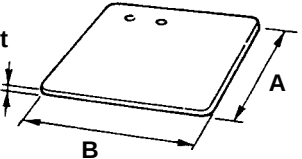
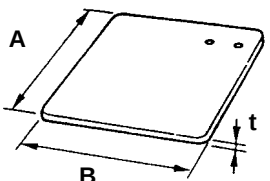
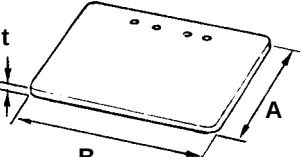
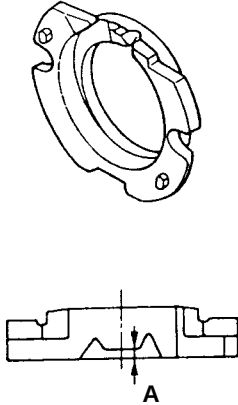
In accordance with the sewing condition, exchange the gauges referring to the following table.

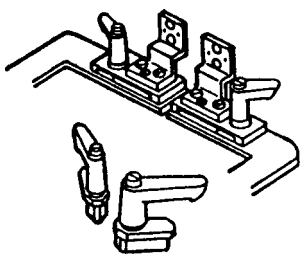
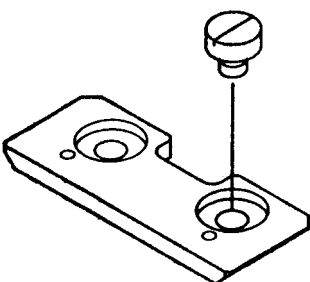
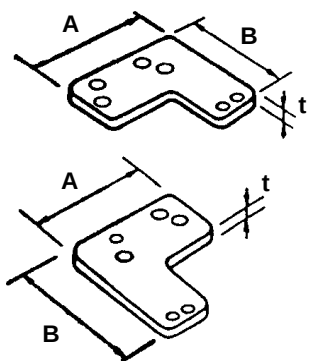
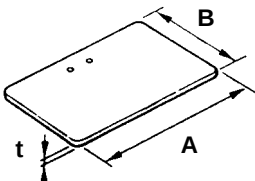
Sewing spec. and needle size used Gauge	S type when delivered. #11 to #14	Knit. foundation garment #9 to #11	H type when delivered #14 to #18	#18 to #21	#22 to #25	When thick needle like MR type is used.
Needle hole guide 	B242621000A ø1.6	B242621000C ø1.6 (For knit)	B242621000B ø2.0	B242621000D ø2.4 B242621000F ø3.0	B242621000G ø3.0 (With counter bore)	
Shuttle race ring 	14103352 Needle guard 1.3 mm				14103659 Needle guard 1.7 mm	B1817210DAD Needle guard 1.9 mm
Shuttle 	40014964		40014965			
Intermediate presser 	40023632 ø2.2			B1601210D0BA ø2.7	B1601210D0CA ø3.5	
Tension controller No.2 asm. 	40010508		40029411			
Thread trimmer lever (small) asm. 	B24152800A0					
Needle bar thread guide 	B1405210000 2-hole		40026884 One hole			

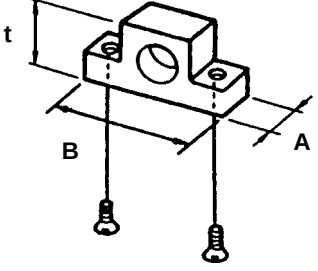
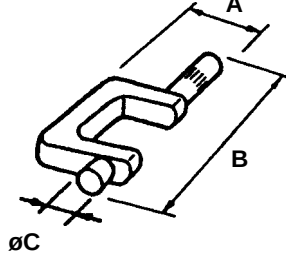
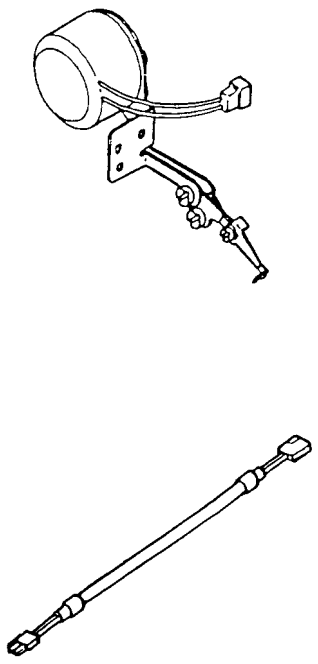
9. Option list

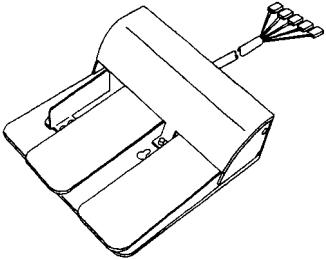
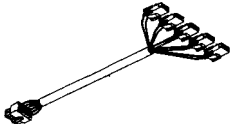
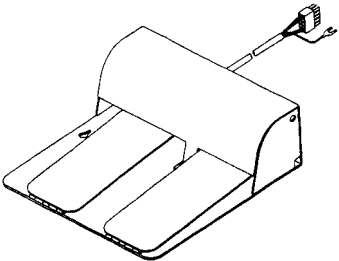
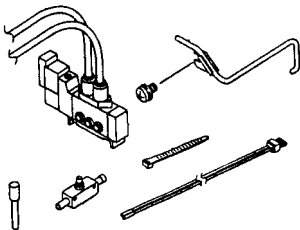
Name of parts	Type	Part No	Size (mm)
1. needle hole guide 	Needle hole guide (A) for light-weight material (Specification S) Needle hole guide (B) for medium-weight material (Specification H) Needle hole guide (C) for knitwear (Option) Needle hole guide (D) for heavy-weight material (Option) Needle hole guide (F) for heavy-weight material (Option) Needle hole guide (G) for heavy-weight material (Option) Needle hole guide (H) for heavy-weight material (Option) Needle hole guide (H) (Countermeasures against stitch skipping) Move the needle hole to have an eccentricity of 0.5mm behind the center in order to make the clearance narrower in front of the needle and wider behind it so that a loop can be established easily.	B242621000A B242621000B B242621000C B242621000D B242621000F B242621000G B242621000H	ØA=1.6 ØA=2.0 ØA=1.6 ØA=2.4 ØA=3.0 ØA=3.0 (With counter bore) ØA=3.0 (Eccentric)
2. Work clamp blank for preventing slipping 	Rubber sheet for work clamp Sponge sheet for work clamp Work clamp material (A) Work clamp material (B)	B2591220000 B2564223C00 B2587220000 B2588220000	A x B x t 250 x 200 x 1.5 A x B x t 450 x 300 x 1.5 A x B x t 380 x 240 x 1 A x B x t 380 x 240 x 1.5
3. Feed plate blank for processing 	Feed plate blank with knurl AMS-221E	40052341	A x B x t 239 x 353 x 1.2
	Feed plate blank without knurl (Thickness: 1.2mm) AMS-221E	40052342	A x B x t 239 x 353 x 1.2
	Feed plate blank without knurl (Thickness: 0.5mm) AMS-221E	40052343	A x B x t 239 x 353 x 0.5
4. Intermediate presser 	Intermediate presser (A) Intermediate presser (B) Intermediate presser (C) Intermediate presser (E) Intermediate presser (F)	40023632(Standard) B1601210D0BA B1601210D0CA B1601210D0E B1601210D0FA	ØA x ØB x H x L 2.2 x 3.6 x 5.7 x 38.5 ØA x ØB x H x L 2.7 x 4.1 x 5.7 x 38.5 ØA x ØB x H x L 3.5 x 5.5 x 5.7 x 38.5 ØA x ØB x H x L 1.6 x 2.6 x 5.7 x 37 ØA x ØB x H x L 2.2 x 3.6 x 8.7 x 41.5

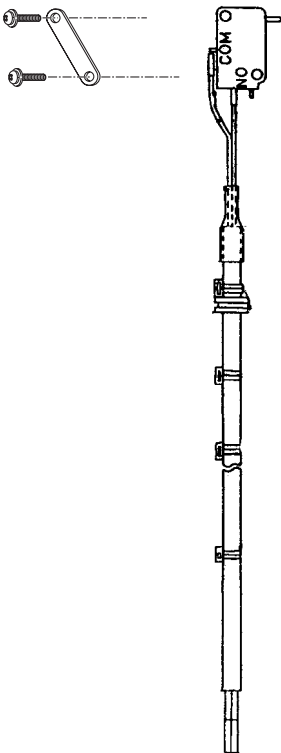
Name of parts	Type	Part No	Size (mm)
5. Feed plate blank 	Sheet A for work clamp (Velboren) (Velboren)	B259522000A	A x B x t 1,000 x 675 x 1
	Sheet B for work clamp (Velboren)	B259522000B	A x B x t 1,000 x 675 x 3
	Sheet C for work clamp (Velboren)	B259522000C	A x B x t 1,000 x 675 x 2
 	Plastic feed plate inner plate	GMU12038000	A x B x t 140.8 x 72.5 x 1
	Aluminum feed plate inner plate	GMU12037000	A x B x t 140.6 x 72.5 x 1
6. Cassette holder  	Cassette holder fixing plate asm.	40052328	
	Cassette holder assy	B25822210A0	
7. Feeding frame blank United presser  Separated presser 	Plastic blank AMS-221E-2516 For united presser AMS-221E-2516 For separated presser	40035093 40035095	

Name of parts	Type	Part No	Size (mm)
8. Blank for processing   	Outer frame right blank with knurl	40052339	A x B x t 229 x 169 x 4
	Separated type outer frame blank without knurl (Left and right are common.)	40052338	A x B x t 229 x 169 x 4
	Outer frame left blank with knurl	40052340	A x B x t 229 x 169 x 4
	Presser blank of outer frame with knurl	40052336	A x B x t 229 x 347 x 4
	Presser blank of outer frame without knurl	40052337	A x B x t 229 x 347 x 4
9. Shuttle race ring compl. 	A B (Standard) C D	14103253 14103352 14103659 B1817210DAD	A=0.8 A=1.3 A=1.7 A=1.9

Name of parts	Type	Part No	Size (mm)
10. One-touch clamp 	One-touch clamp asm. In addition, two pieces of slider asm. 40052525 and four pieces of slider installing screws SM6060550TP are required.	40052330	
11. Slider 	Slider asm. Slider installing screws When the external frame of ASM-221D is used, the slider asm. (B26412150A0) and the installing screws (SS6150610SP) are additionally needed.	40052525 SM6060550TP	
12. Intermediate presser relay metal fittings 	Specific presser foot left asm. (Relay metal fittings used to install the presser of the ASM-206 and 210) Specific presser foot right asm.	B26302150A0 B2630215AA0	A x B x t 66 x 58 x 4 A x B x t 66 x 58 x 4
13. Inverting clamp unit		FU-06 40048659	
14. Inverting intermediate presser blank 	Reversal intermediate presser blank large with knurl Reversal intermediate presser blank middle with knurl Reversal intermediate presser blank small with knurl (Reversal intermediate presser installing base B B4316220000 is required.)	B4317220000 B4318220000 B4319220000	A x B x t 206 x 122 x 2.6 A x B x t 126 x 100 x 2.6 A x B x t 80 x 50 x 2.6

Name of parts	Type	Part No	Size (mm)
15. Reversal intermediate presser installing base 	Reversal intermediate presser installing base B (This item is required when the reversal intermediate presser blank small B4319220000 is used.) Reversal intermediate presser small setscrew	B4316220000 SS1090750SP	A x B x t 8 x 24 x 15
16. Reversal crank shaft 	Reversal crank shaft B	B4326220000	A x B x ø C 26 x 71 x 7
17. Wiper 	Side-sweeping wiper assy Side-sweeping wiper repeater cable assy	40035867 40036668	

Name of parts	Type	Part No	Remarks
18. Pedal switch   	3-step pedal (PK47) Relay cable for 3-step pedal 2-step pedal (PK78)	GPK470010AB 40033875 40033831	
19. Needle cooler 		40035692	

Name of parts	Type	Part No	Remarks
20. Pedal SW cable set 	This is a kit intended to change the tandem pedal (PK78) into the 3-switch pedal. Switch assembly Micro switch plate Micro switch setscrew	(40040138) 40040130 11102308 SL4031691SC	(Set Item No.) For further details, refer to [(1) Method of pedal switch cable set connections]. 2 pcs.

(1) Method of pedal switch cable set connections

1. Parts

Pedal switch cable set (Item No.: 40040138)

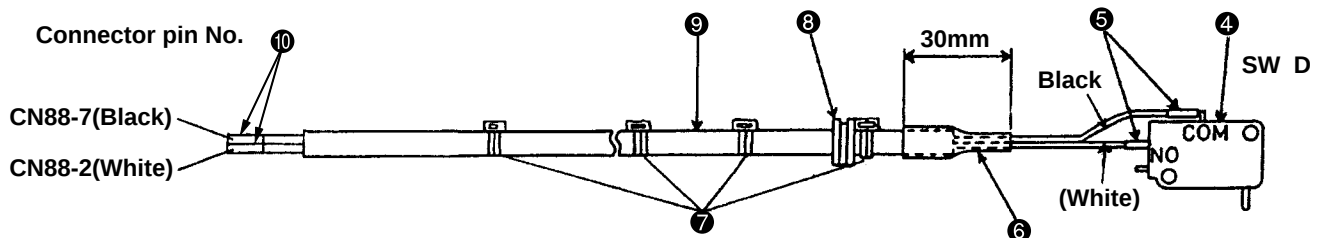
No.	Item name	Item No.	Quantity
①	Presser micro switch plate	11102308	1
②	Micro switch setscrew	SL4031691SC	2
③	Switch assembly	*	1
④	Limit switch	HA001900000	(1)
⑤	Heat contraction tube ø5 (15mm)	E8760452G00	(2)
⑥	Heat contraction tube ø 5 (30mm)	E8760452G00	(1)
⑦	Cable clip band	EA9500B0200	(4)
⑧	Cord bushing	M1013110000	(1)
⑨	Cabletyre cable 2-core (1830mm)	HW500140000	(1)
⑩	Pin terminal female	HK03464000A	(2)

- o The item number of the * switch assembly in the above table is 40040130.
- o For more details of the pedal switch cable set in the above table, refer to [3. Switch assembly] and [6. Switch mounting position diagram].

2. Switch mounting position

For more details, refer to [6. Switch mounting position diagram].

3. Switch assembly (Item No.: 40040130)



4. Memory switch modification

Level 1 change

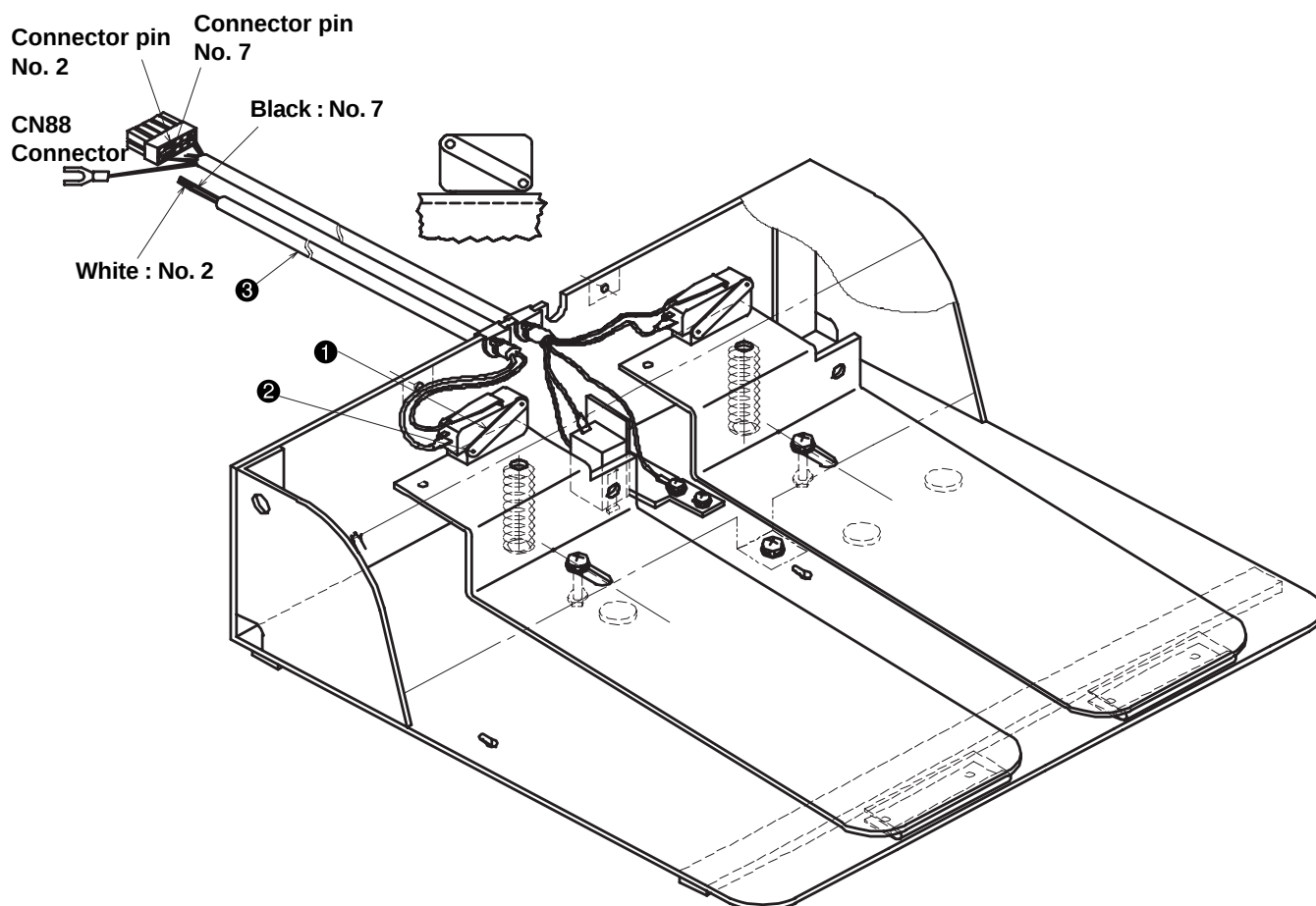
No.	Before change	After change
U81	0	1
U82	0	1
U85	1	0

5. Operation control items

- o The moving switch does not function unless the right pedal is trodden first.
- o For more details, refer to [6. Switch mounting position diagram].

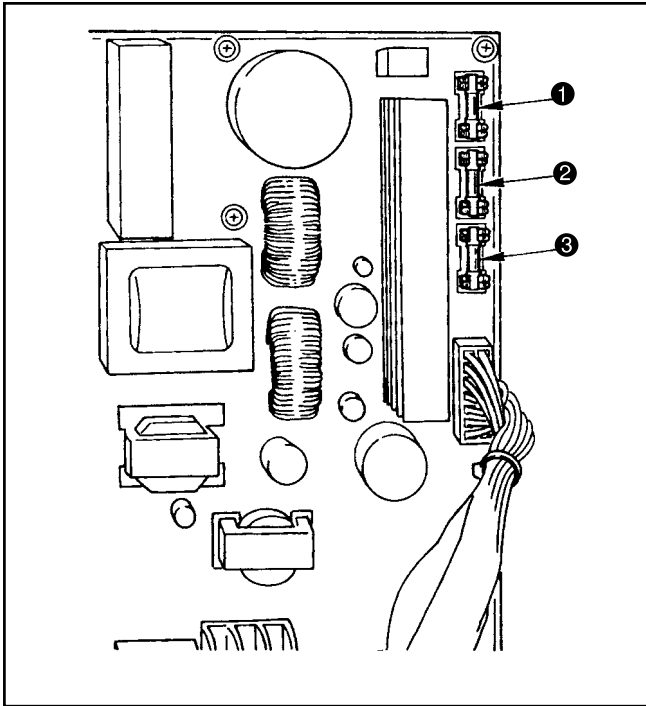
6. Switch mounting position diagram.

(Caution) The micro switch shall be mounted in parallel to the upper plane of the pedal.
(The switch is fixed in the ON state.)



10. Maintenance

(1) Replacing the fuse



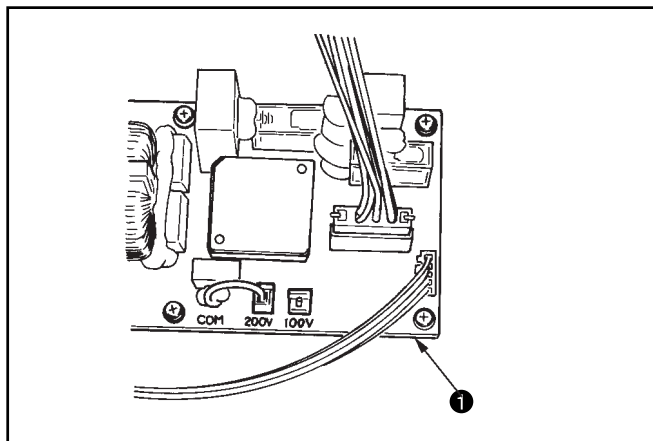
The machine uses the following three fuses: (SDC Board)

- ❶ For pulse motor power supply protection
15A(time-lag fuse)
- ❷ For solenoid and pulse motor power supply protection
3.15A (time-lag fuse)
- ❸ For control power supply protection
2A (fast-blow type fuse)

(2) Changing the voltage specification

It is adaptable to the voltage of single phase 100V to 120V/3-phase 200V to 240V by changing the voltage changeover connector mounted on FLT-T p.c.b.

(Caution) When the changing procedure is wrong, the control box will be broken. So, be very careful.



Changing procedure of the changeover connector

1. Turn OFF the power source with the power switch after confirming that the sewing machine has stopped.
2. Draw out the power cord from the power plug socket after confirming that the power switch is turned OFF. Then wait for five minutes or more.
3. Remove the front cover.
4. Remove four screws fixing the rear cover of the control box and slowly open the rear cover.

A. In case of using with 3-phase 200V to 240V

- Changing the changeover connector
Connect to 200V the 100/200V changeover connector of FLT-T p.c.b. ❶ located on the side of the Box Side of the control box.
- Connect the crimp style terminal of AC input cord to the power plug as shown in the figure.

B. In case of using with single phase 100V to 120V

- Changing the changeover connector
Connect to 100V the 100/200V changeover connector of FLT-T p.c.b. ❶ located on the side of the Box Side of the control box.
- Connect the crimp style terminal of AC input cord to the power plug as shown in the figure.

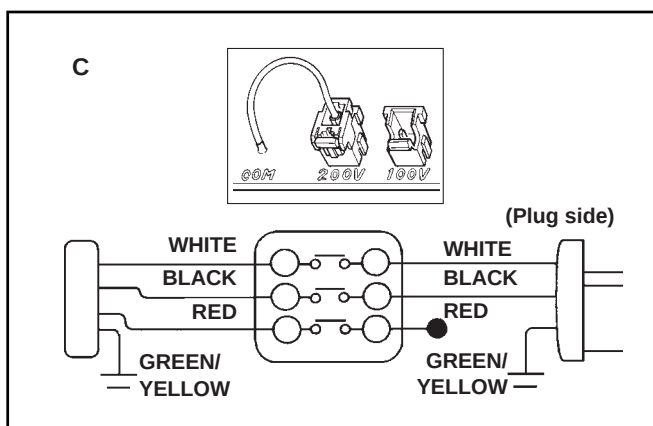
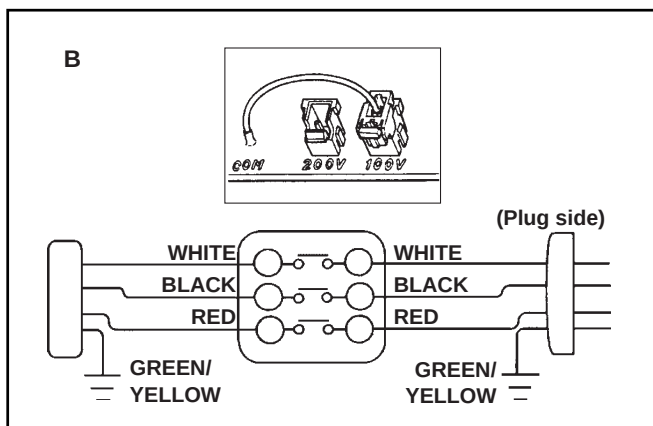
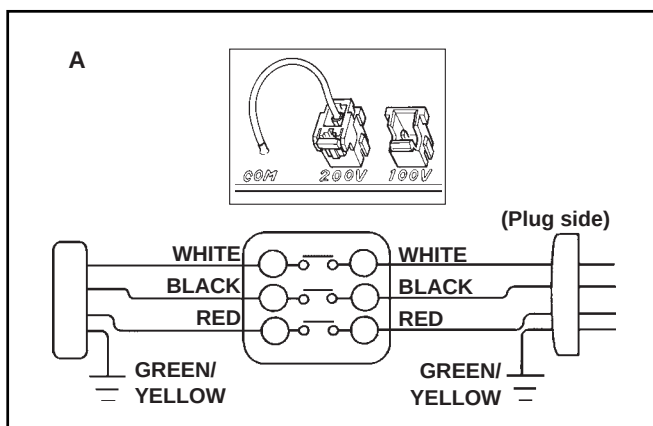
(Caution) Securely perform the insulation treatment to the red terminal which is not used with insulation tape or the like. (When the insulation is insufficient, there is a danger of electric shock or leakage current.)

C. In case of using with single phase 200V to 240V

- Changing the changeover connector
Connect to 200V the 100/200V changeover connector of FLT-T p.c.b. ❶ located on the side of the Box Side of the control box.
- Connect the crimp style terminal of AC input cord to the power plug as shown in the figure.

(Caution) Securely perform the insulation treatment to the red terminal which is not used with insulation tape or the like. (When the insulation is insufficient, there is a danger of electric shock or leakage current.)

5. Check that the change has been performed without fail before closing the rear cover.
6. Be careful that the cord is not pinched between the rear cover and the control box main unit. Close the rear cover while pressing the lower side of rear cover, and tighten four screws.



(3) Application of grease and Locktight

1. When the parts for greasing and grease sealing-in are disassembled and the operational frequency seems to be higher than usual around these parts, grease should be replenished once every two years.
2. Recommendable grease

This sewing machine uses four types of grease as specified below. The recommendable brands of grease are listed in (4) Parts to which grease•Locktight is applied. According to this information, replenish the most applicable grease to these parts.

*** Use ① Lithium Type consistency No. 2 for the parts where “Grease” is simply specified in (4) Parts to which grease•Locktight is applied.**

① Penetration No. 2 lithium grease

This type of grease is used in general sliding parts.

Maker name	Brand name
Esso:	Listan 2, Beacon 2
Shell:	Albania
Nippon Oil Co., Ltd.:	Multinok 2, Epinok 2
Kyodo Oil Co., Ltd.:	Lisonix 2
Idemitsu Petrochemical Co., Ltd.:	Coronex 2

② Templex N2 (Grease D) ••• Used for the feeding gear block.

10g tube JUKI Part No.: 13525506

③ JUKI Grease A ••• Used for high-speed sliding parts and their peripheral parts.

10g tube JUKI Part No.: 40006323

500g (IE-22) JUKI Part No.: 23640204

④ JUKI Grease B ••• Used, in particular, for the specific areas with highly loaded parts. Important: this grease must be replenished at the specified intervals of period, according to “(5) Grease-up procedures for the specified position.”

10g tube JUKI Part No.: 40013640

3. Method of greasing

If no grease pump is available, fill a plastic oiler with grease. Otherwise, an injector without a needle can be conveniently used.

4. Miscellaneous

An injector to be used exclusively for application / JUKI Part No. : GDS01007000

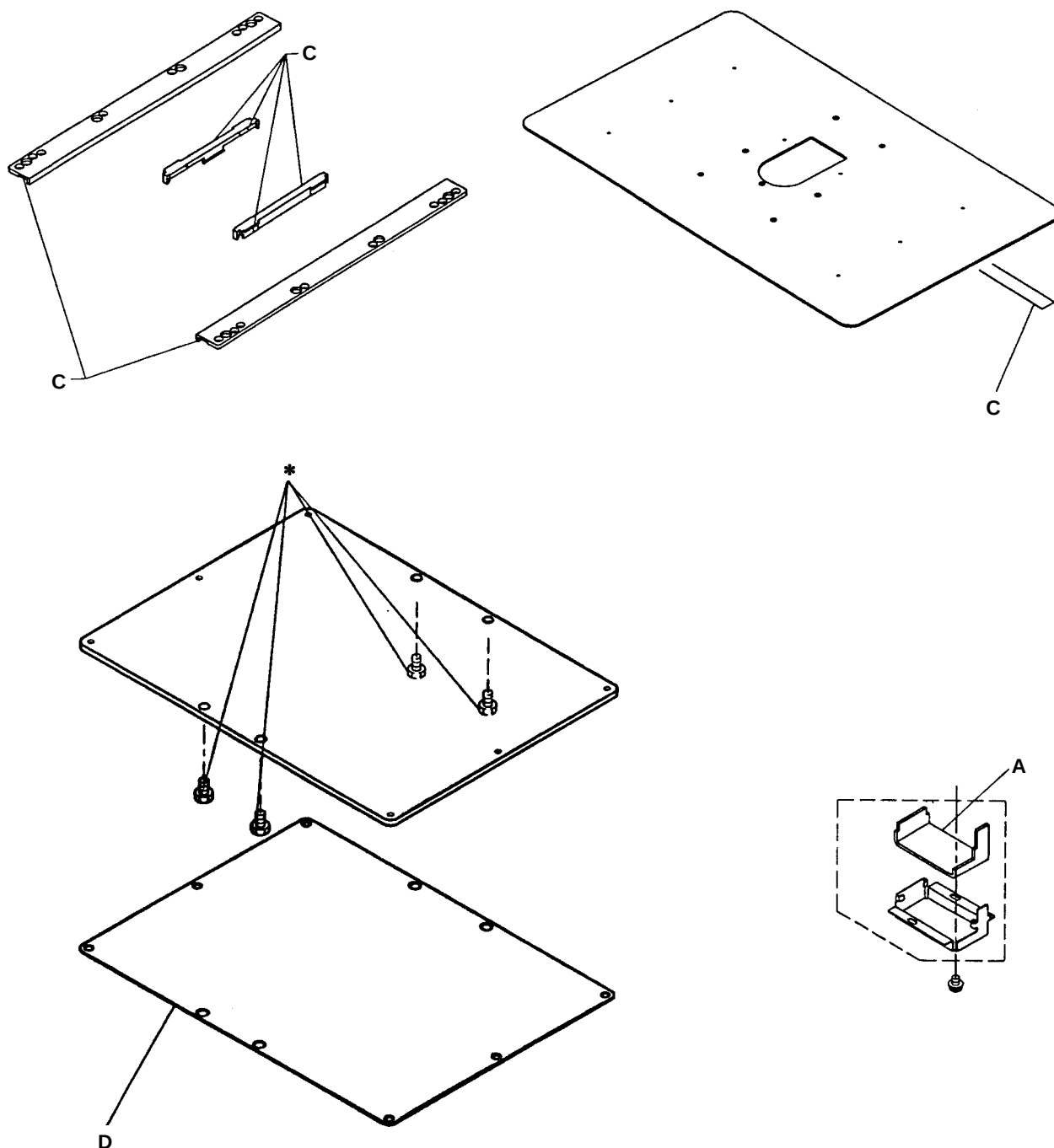
5. Application of Locktight

Apply Locktight 241 to section with the asterisk * .

Part E: Apply Three-Bond 3060G to it.

(4) Parts to which grease • Locktight is applied

o FRAME & MISCELLANEOUS COVER COMPONENTS (3)



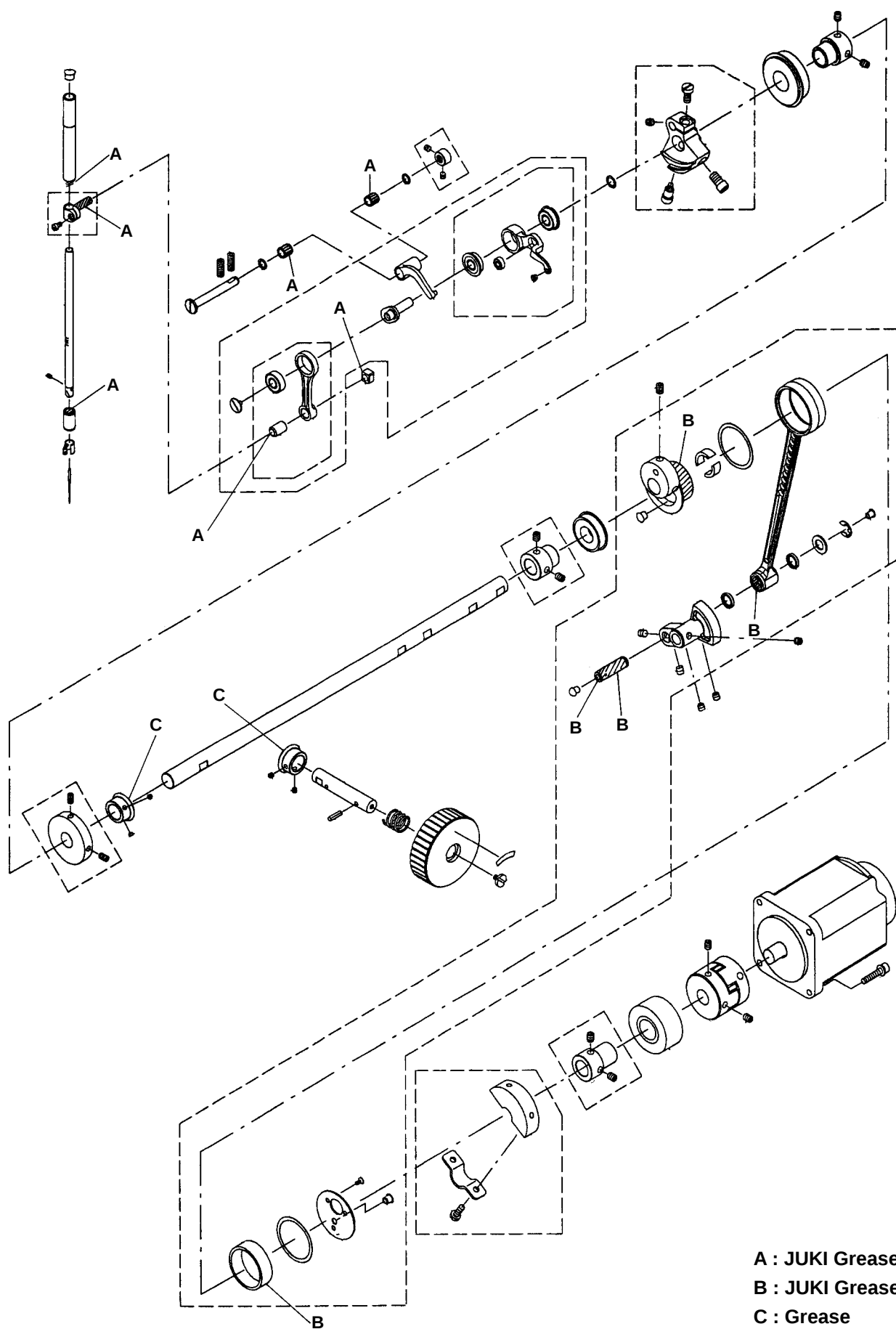
A : JUKI Grease A

C : Grease

D : Templox

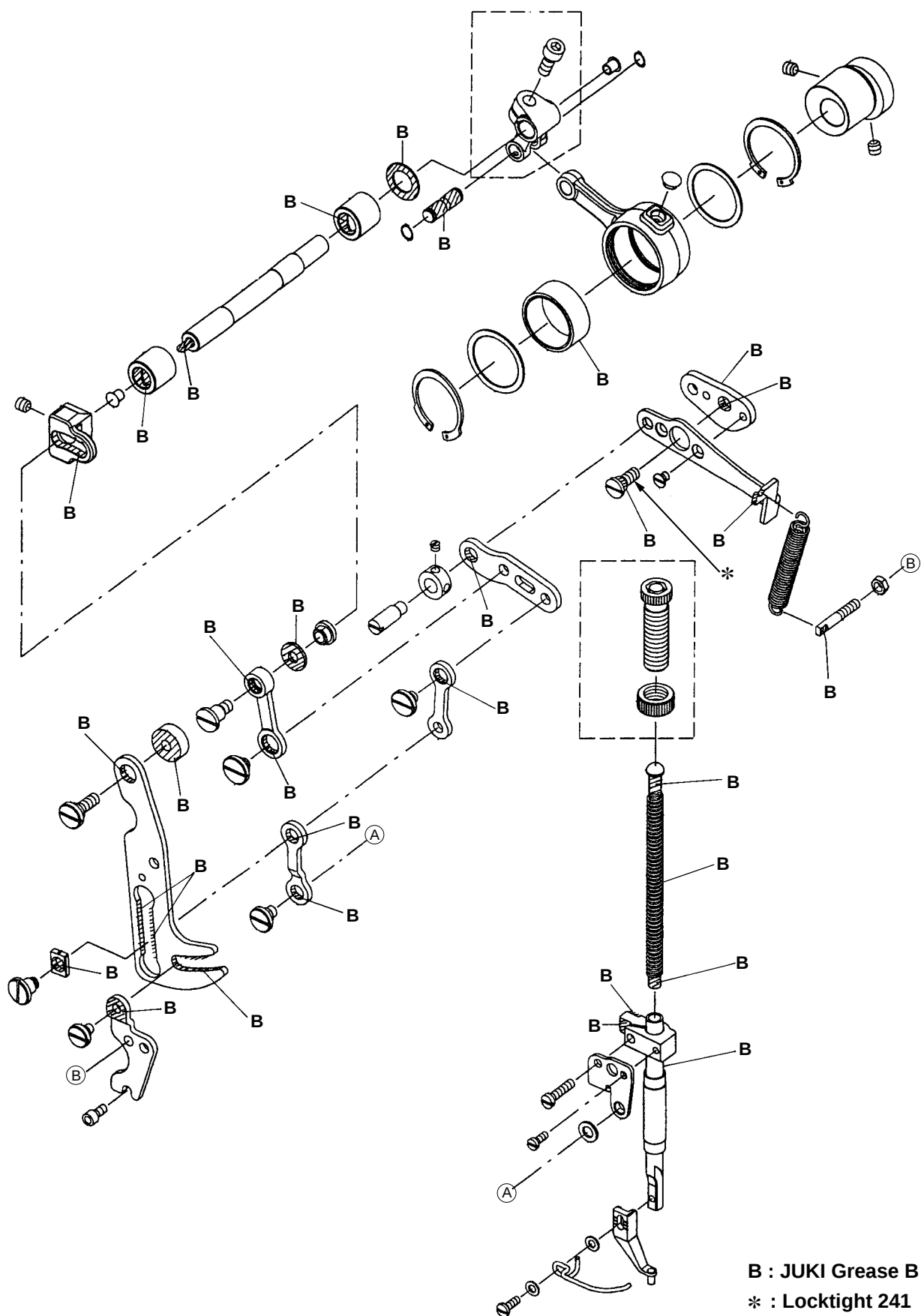
* : Locktight 241

0 MAIN SHAFT & NEEDLE BAR COMPONENTS

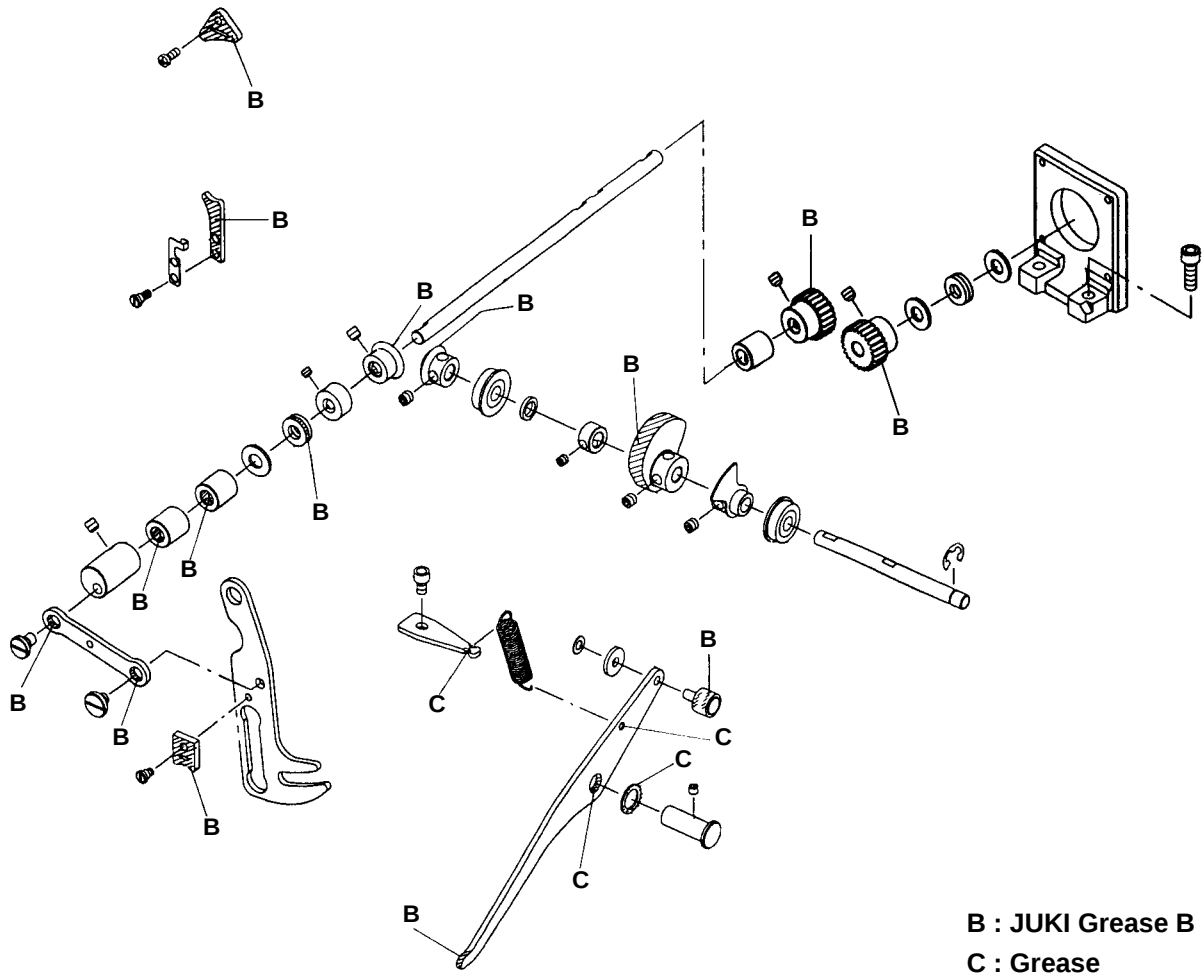


A : JUKI Grease A
 B : JUKI Grease B
 C : Grease

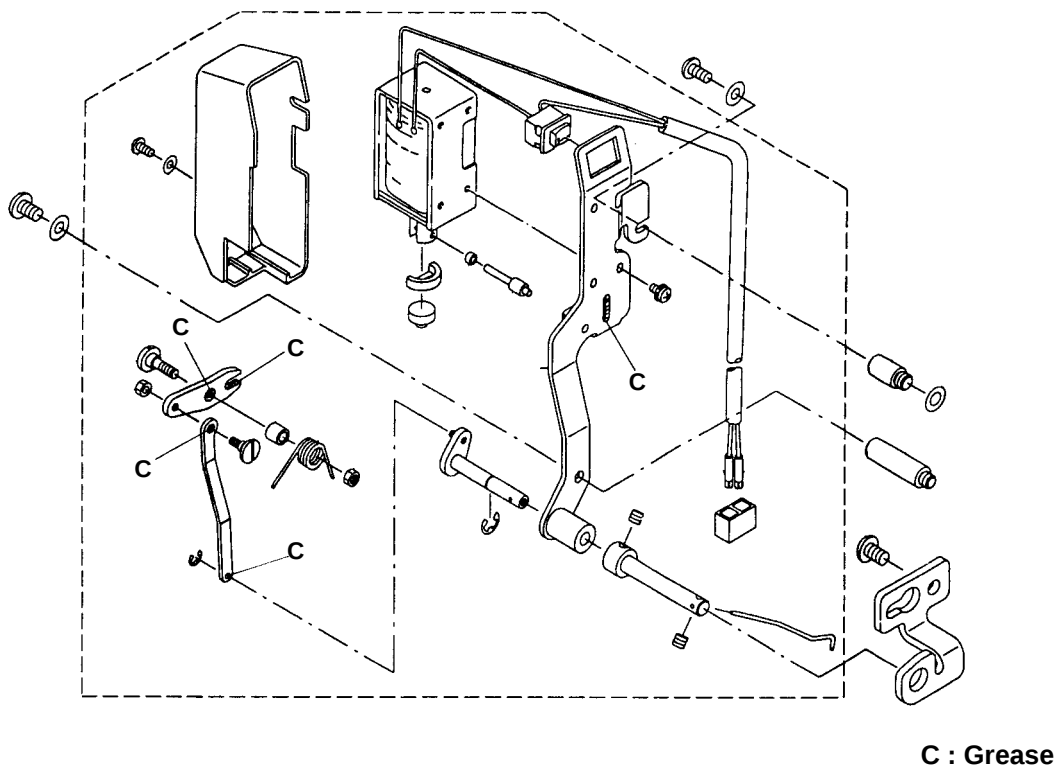
o PRESSER MECHANISM & PRESSER VARIABLE COMPONENTS (1)



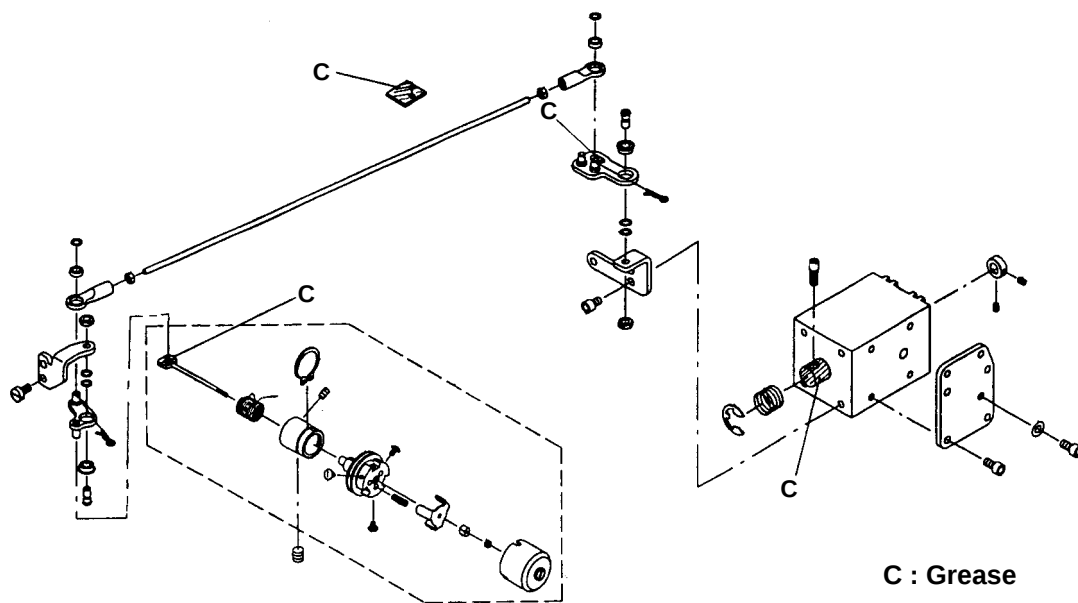
o PRESSER MECHANISM & PRESSER VARIABLE COMPONENTS (2)



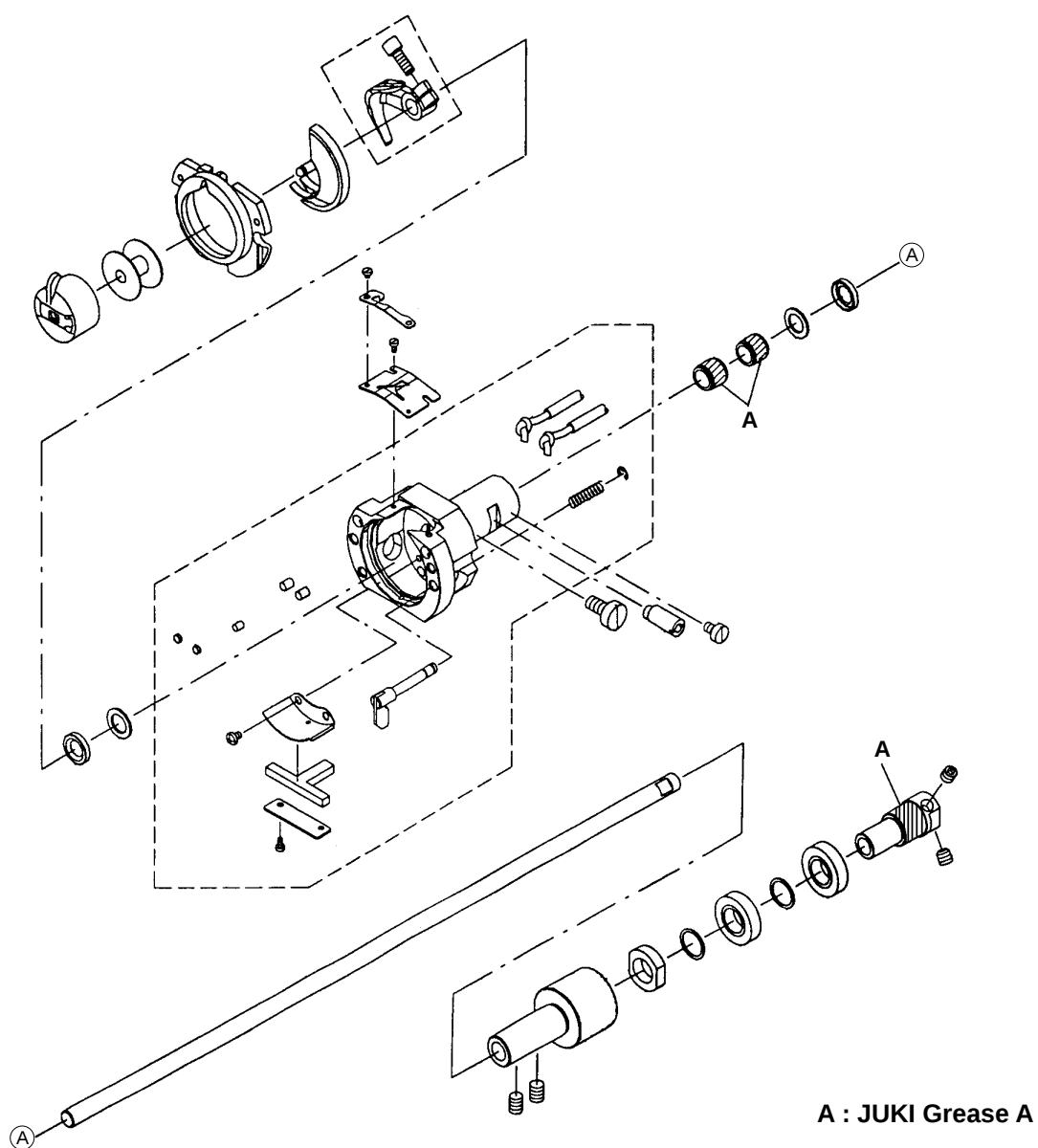
o WIPER MECHANISM COMPONENTS



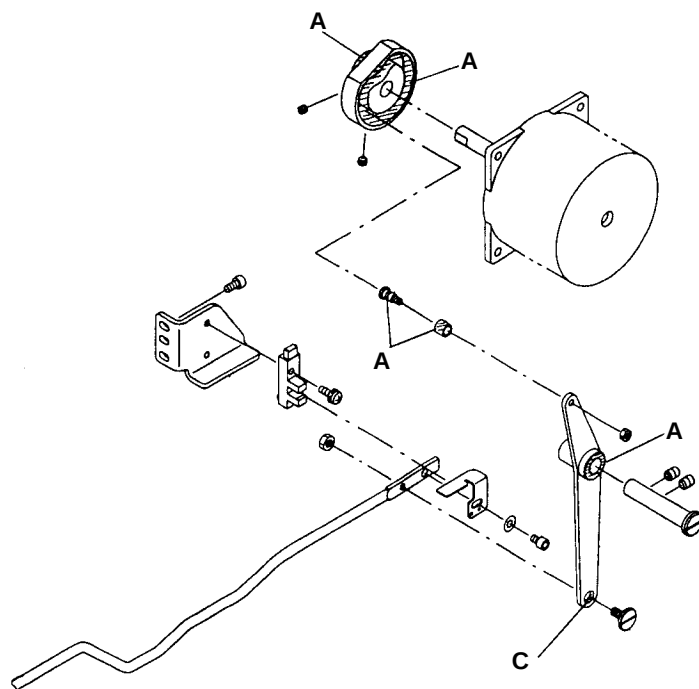
o TENSION RELEASE & THREAD TENSION COMPONENTS



o SHUTTLE DRIVER SHAFT COMPONENTS

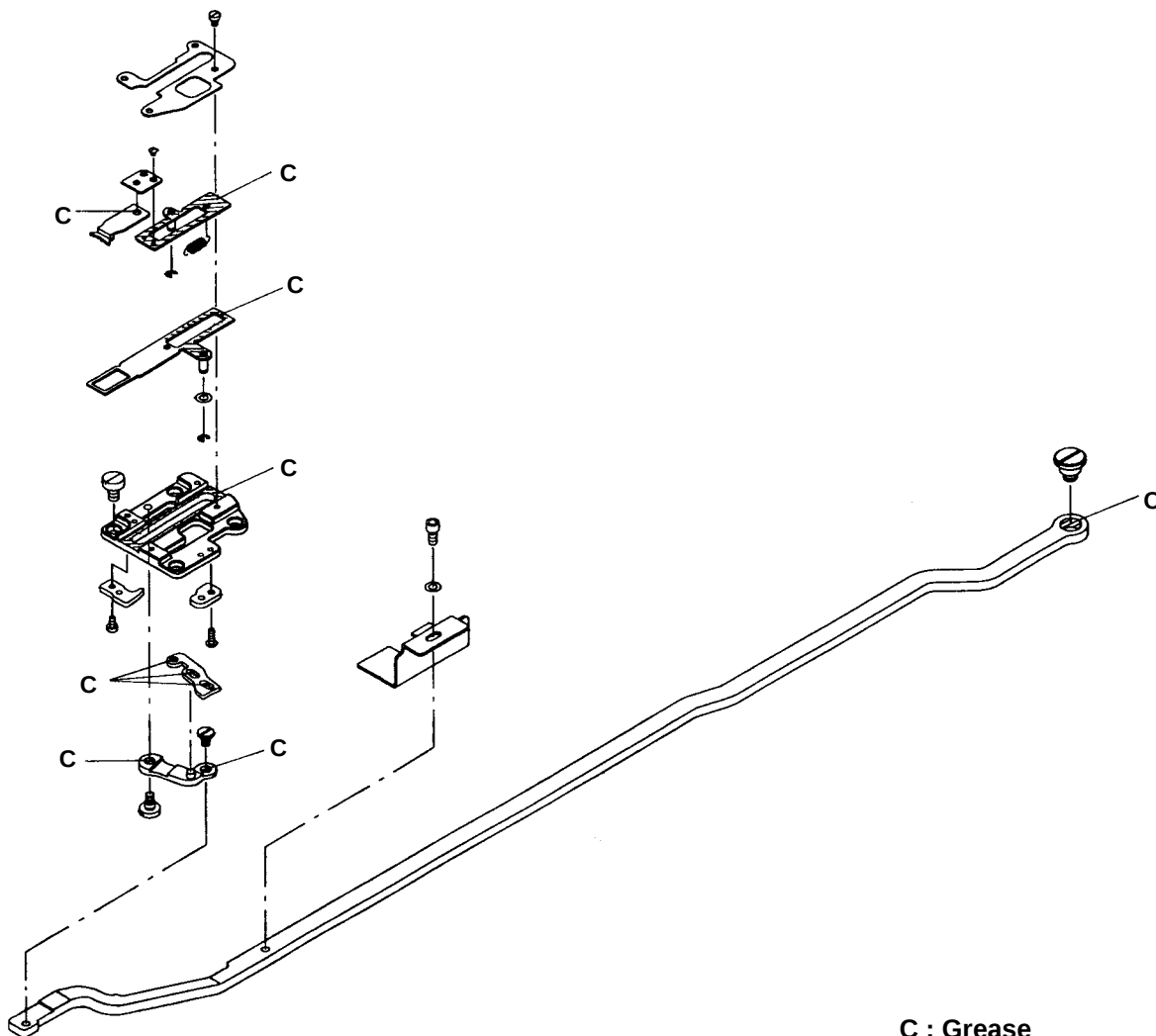


o THREAD TRIMMER MECHANISM COMPONENTS



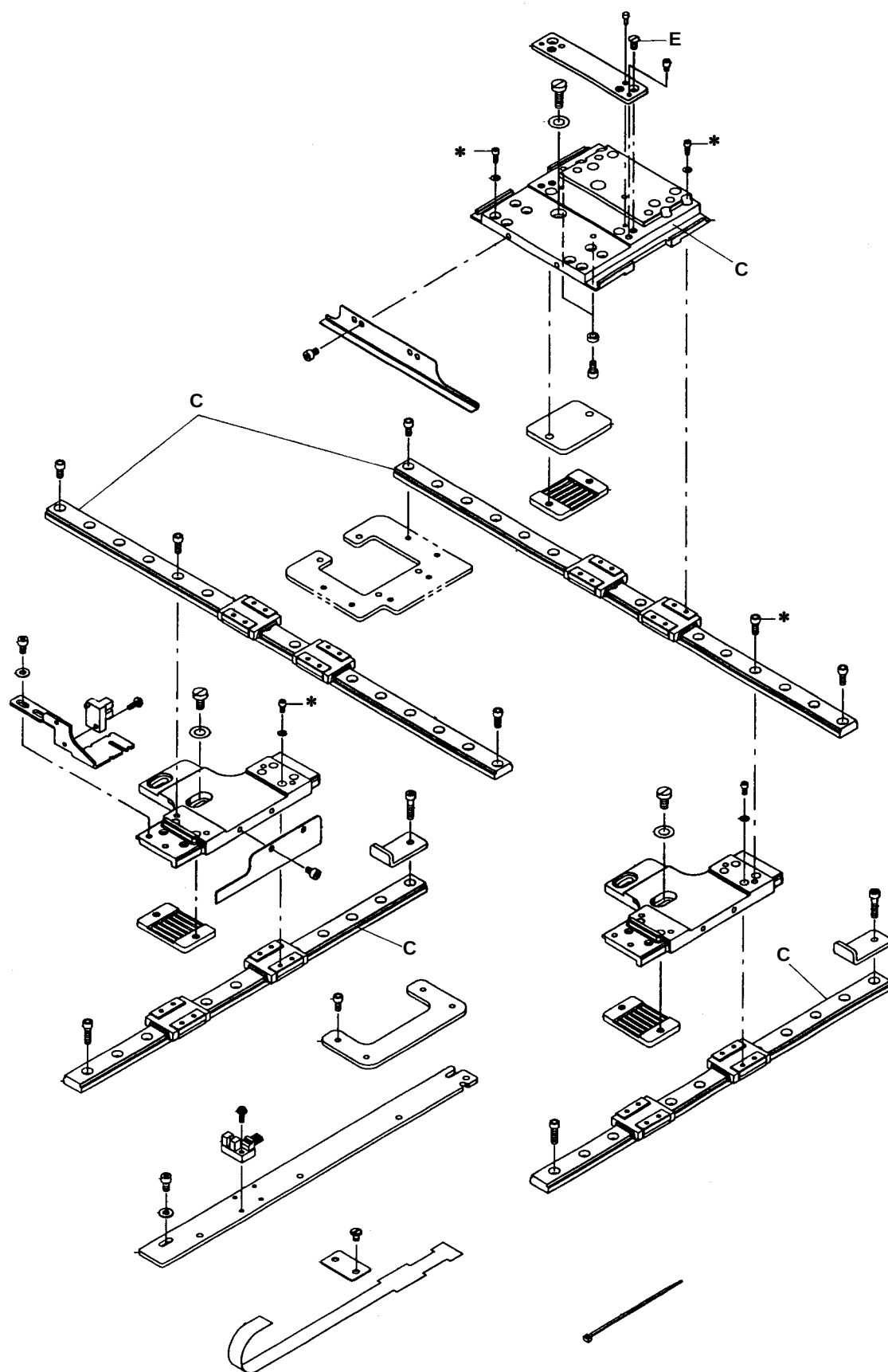
A : JUKI Grease A
C : Grease

o THREAD CLAMP COMPONENTS



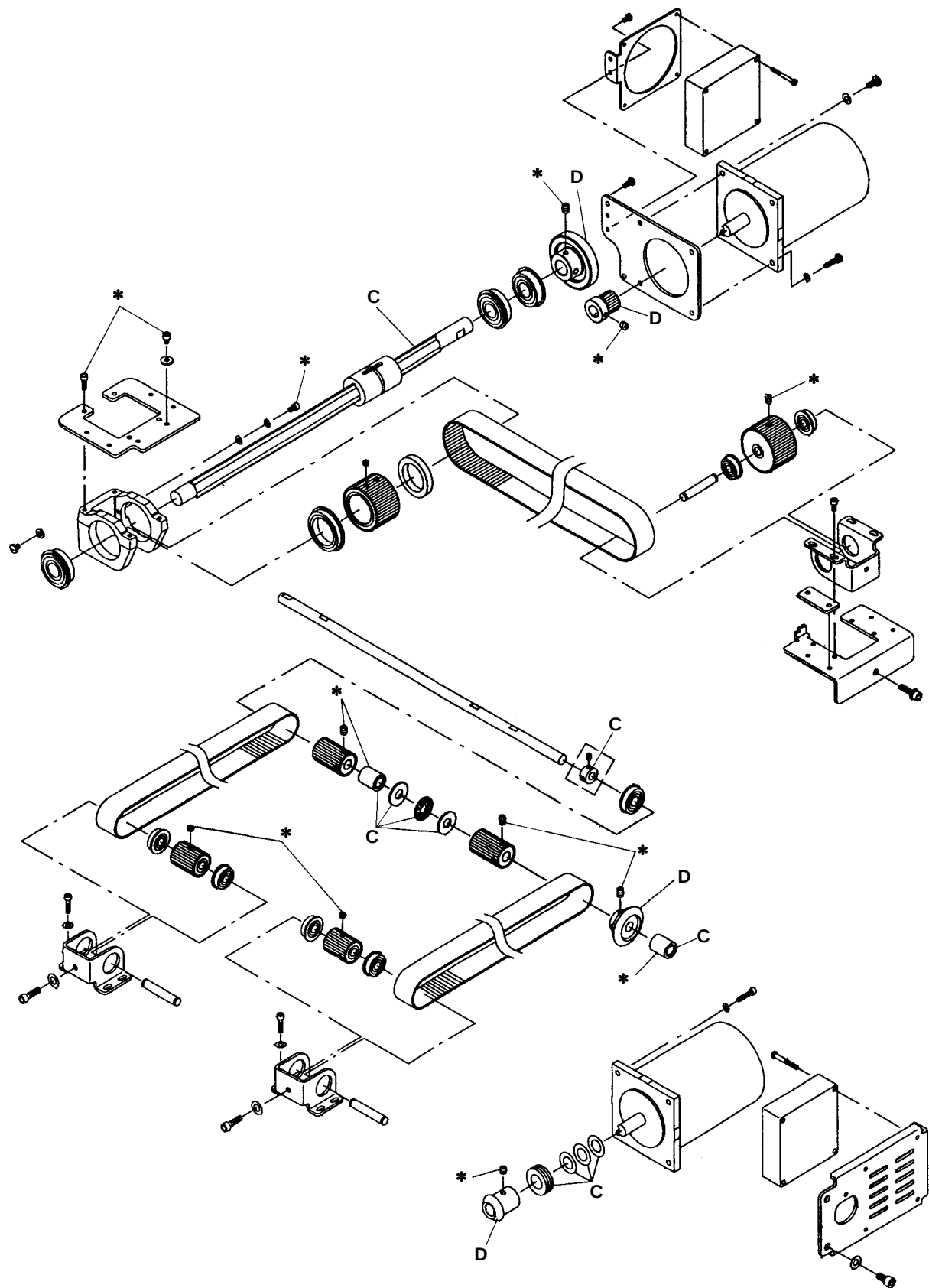
C : Grease

o X-Y COMPONENTS (1)



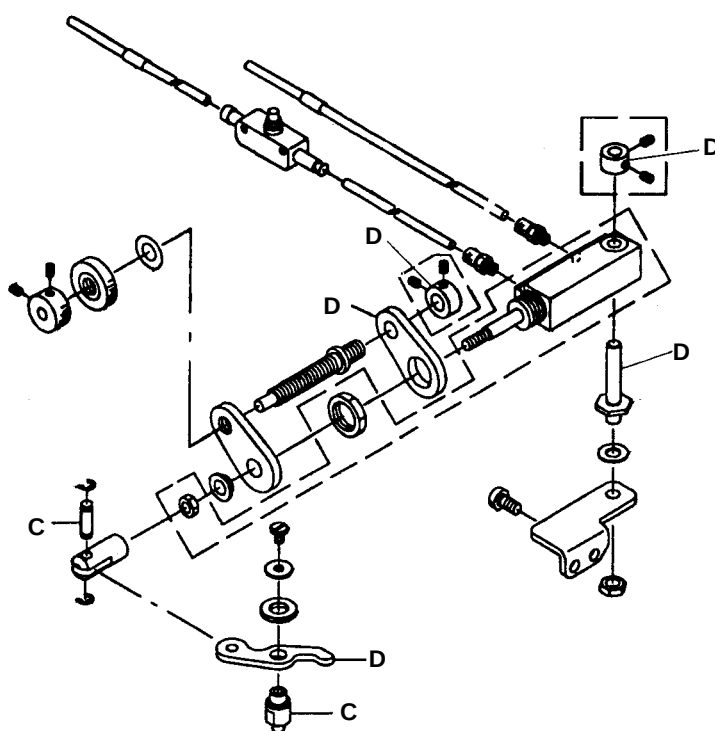
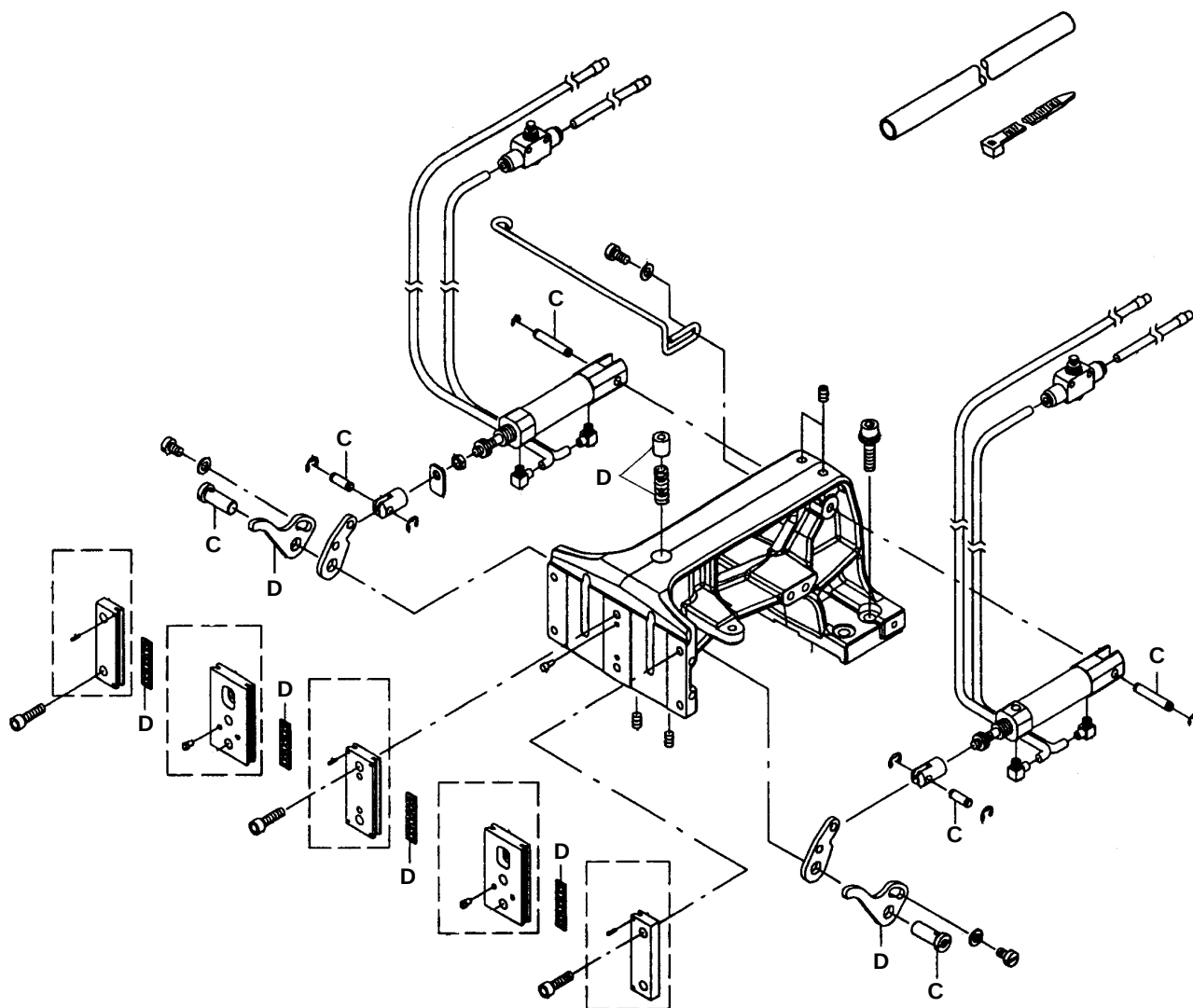
C : Grease
E : Three-Bond 3060G
***** : Locktight 241

o X-Y COMPONENTS (2)



C : Grease
D : Grease D
* : Locktight 241

o CLOTH FEED MECHANISM COMPONENTS



C : Grease
D : Grease D

(5) Replenishing the designated places with grease

- * Perform grease supplement when the errors below are displayed or once a year (either one which is earlier). After performing grease supplement, call memory switch No. 245 and set the value to 10 with the reset key.

When the sewing machine has been used for a certain number or times of sewing, error code No. E220 is displayed on the operation panel at the time of turning ON the power. This display informs the operator of the time of replenishing the designated places with grease. Be sure to replenish the places with the grease below. Then call the memory switch No. 245 and set it to "0" with the RESET key.

Even after the display of the error No. E220, when the RESET key is pressed, the error is released, and the sewing machine can be continuously used. Afterwards, however, the error No. E220 is displayed every time the power is turned ON.

In addition, when the sewing machine is used further for a certain period of time after the display of error No. E220, the error No. E221 is displayed and the sewing machine fails to operate since the error cannot be released even when the RESET key is pressed.

When the error No. E221 is displayed, be sure to replenish the designated places below with grease.

Then start up the memory switch and set No. 245 to "0" with the RESET key.

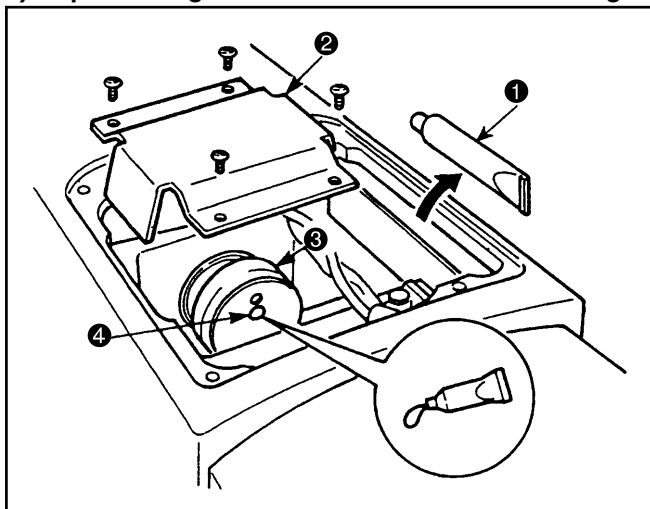
- (Caution)
1. After replenishing the places with grease, the error No. E220 or No. E221 is displayed again unless the memory switch No. 245 is changed to "0".
 2. Use grease tube (JUKI grease B Part No. : 40013640) supplied as accessories to replenish the designated places below with grease. If grease other than the designated one is replenished, damage of components will be caused.



WARNING:

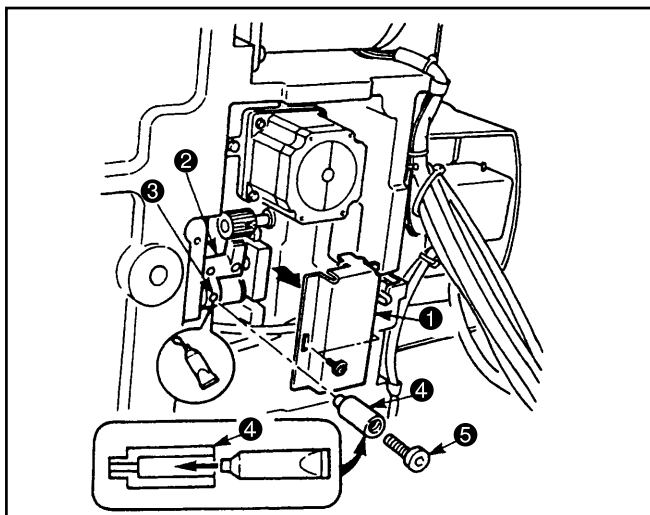
Turn OFF the power before starting the work so as to prevent accidents caused by abrupt start of the sewing machine.

1) Replenishing the eccentric cam section with grease



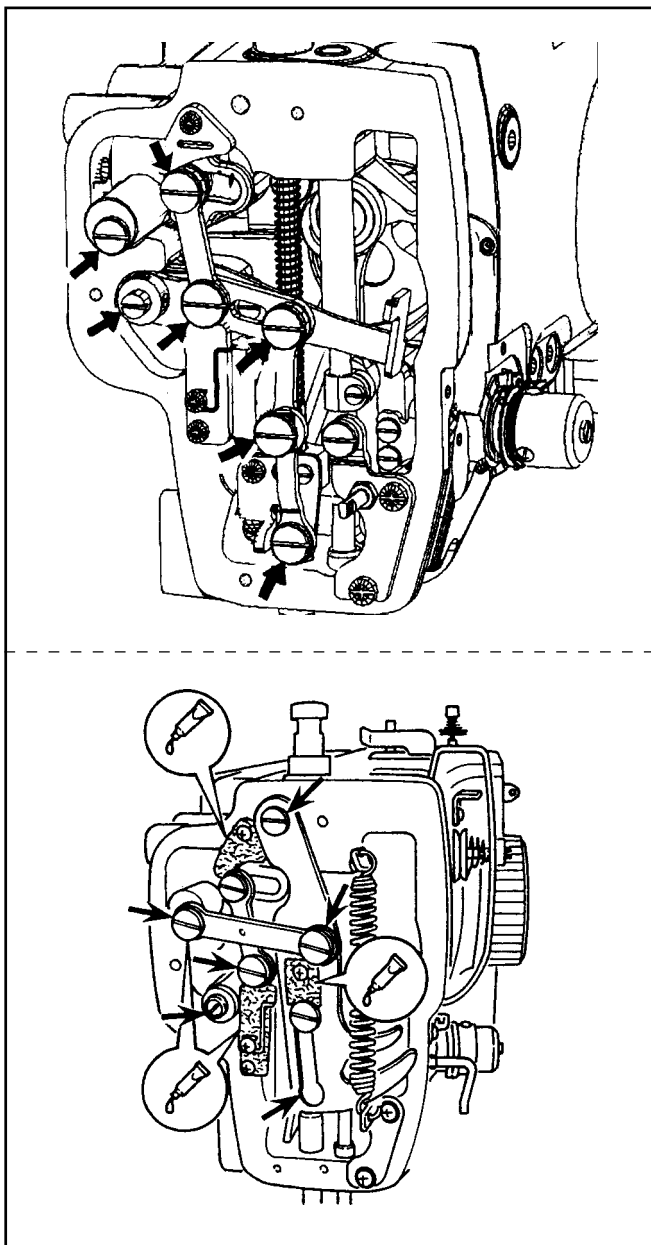
1. Open the upside cover and remove the JUKI grease B ①.
2. Open the oil cover plate ② and remove rubber cap ④ located on the side of eccentric cam ③. Then replenish there with JUKI grease B ①.

2) Replenishing the oscillator pin section with grease



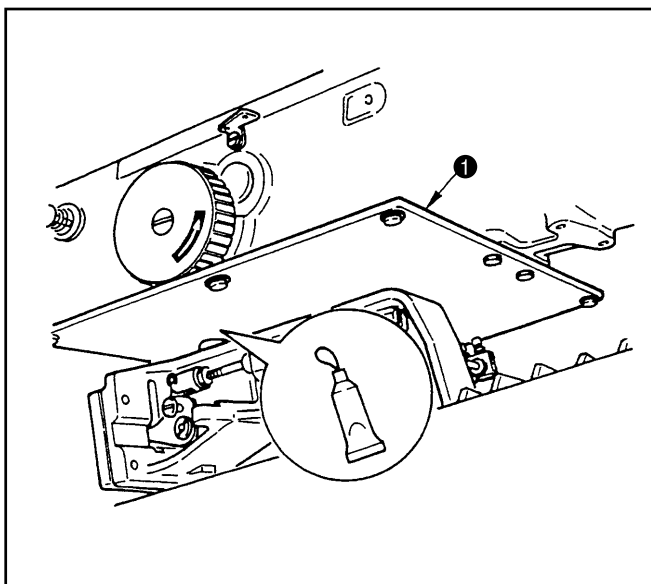
1. Tilt the machine head and remove the grease cover ①.
2. Fill joint ④ supplied as an accessory with JUKI Grease B.
3. Remove setscrew ③ in oscillator gear ② and screw in joint ④ into the screw hole.
4. Screw in screw ⑤ supplied as accessories to the joint ④ and replenish there with JUKI grease B.
5. Securely tighten setscrew ③ which has been removed after replenishing with the grease.

3) Grease supplement to the face plate section



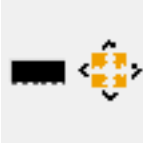
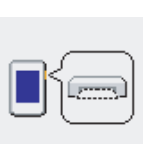
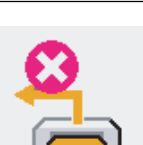
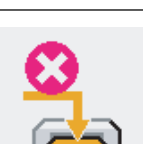
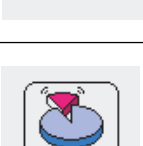
1. Open the face plate cover.
2. Replenish the Juki Grease B to the felt sections (3 positions) and their peripheral parts such as the hinge screws of the working area indicated by the arrows, and also around the grooves.

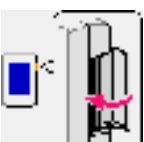
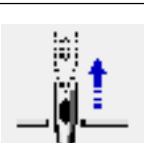
4) Grease replenishment to the holder plate

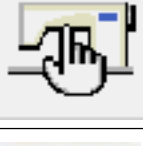


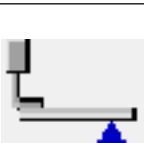
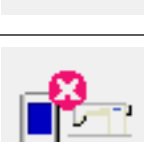
1. Apply the Juki Grease B to the rear side of the holder plate ❶.

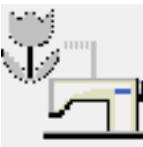
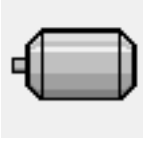
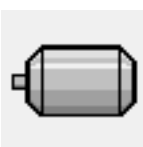
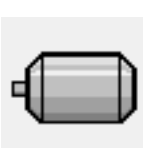
11. Error code list

Error code	Pict	Description of error	message	How to recover	Place of recovery
E001		Data is initializes (EEPROM of MAIN CPU)	Data is initialized. (EEPROM of MAIN CPU)	Turn OFF the power	
E007		Main shaft motor-lock When large needle resistance sewing product is sewn	Machine is locked.	Turn OFF the power	
E008		Head connector abnormality Memory of machine head cannot be read.	Undefined head is selected.	Turn OFF the power	
E010		Pattern No. error Pattern No. which is backed up is not registered to data ROM,or setting of reading inoperative is performed.	Specified pattern does not exist.	Possible to re-enter after reset.	Previous screen
E011		External media not inserted External media is not inserted.	Media is not inserted.	Possible to re-enter after reset.	Previous screen
E012		Read error Data read from external media cannot be performed.	Data cannot be read.	Possible to re-start after reset.	Previous screen
E013		Write error Data writing is impossible for the external media.	Data cannot be written.	Possible to re-start after reset.	Previous screen
E014		Write protect External media is in the write prohibition statere-start after	Writing is prohibited.	Possible to re-start after reset.	Previous screen
E015		Format error Format cannot be performed.	Formatting is impossible.	Possible to re-start after reset.	Previous screen
E016		External media capacity over Capacity of external media is short.	Capacity is insufficient. (Media)	Possible to re-start after reset.	Previous screen

Error code	Pict	Description of error	message	How to recover	Place of recovery
E017		EEP-ROM capacity over When the mounted EEP-ROM is different in type.	Capacity is insufficient. (MAIN EEPROM)	Possible to re-start after reset.	Previous screen
E018		Type of EEP-ROM is different. When the mounted EEP-ROM is different in type.	ROM type is different.		Previous screen
E019		File size over Pattern data size over	Pattern data is too large. (Approx. 50,000 stitches)	Possible to re-start after reset.	Previous screen
E024		Pattern data size over When sewing cannot be performed since the size of downloaded sewing data is too large.	Memory size is too large.	Possible to re-start after reset.	Data input screen
E027		Read error Data read from server cannot be performed. re-start after	Data cannot be read.	Possible to re-start after reset.	Previous screen
E028		Write error Data write to the server cannot be performed.	Data cannot be written.	Possible to re-start after reset.	Previous screen
E029		Media slot release error Lid of smart media slot is open.	Cover of Media slot is open.	Possible to re-start after reset.	Previous screen
E030		Needle bar upper position failure Turn hand pulley to bring needle bar to its UP position	Needle is not in a proper position.	Turn hand pulley to bring needle bar to its UP position.	Data input screen
E031		Air pressure drop When the air pressure is lowered.	Low air pressure.	Possible to re-start after reset.	Data input screen

Error code	Pict	Description of error	message	How to recover	Place of recovery
E032		File interchanging error File cannot be read.	File cannot be read.	Possible to re-start after reset.	Data input screen
E040		Sewing area over When the sewing area is exceeded	Move limit is exceeded.	Possible to re-start after reset.	Sewing screen
E043		Enlarging error Sewing pitch exceeds Max. pitch.	Max. Pitch is exceeded.	Possible to re-start after reset.	Data input screen
E045		Pattern data error These pattern data are not applicable.	Pattern data no good.	Possible to re-start after reset.	Data input screen
E050		Stop switch When stop switch is pressed during machine running.	Temporary stop switch is pressed.	Possible to re-start after reset.	Step screen
E052		Thread breakage detection error When thread breakage is detected.	Thread breakage is detected.	Possible to re-start after reset.	Step screen
E061		Memory switch data error Memory switch data is broken or revision is old.	Memory switch data error	Turn OFF the power.	
E220		Grease-up warning At the time of operation of 100 million stitches → Refer to "10.-(5) Replenishing the designated places with grease".	Important : Grease is running out. Replace grease machine.	Possible to re-start after reset.	Data input screen
E221		Grease-up error At he time of operation of 120 million stitches The sewing machine is put in the sewing-impossible status. It is possible to clear with memory switch U245 . → Refer to "10.-(5) Replenishing the designated places with grease".	Important : Grease has run out. Replace grease machine.	Possible to re-start after reset.	Data input screen

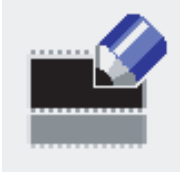
Error code	Pict	Description of error	message	How to recover	Place of recovery
E302		Confirmation of tilt of machine head When tilt of machine head sensor is OFF.	Head is tilted.	Possible to re-start after reset.	Previous screen
E305		Thread trimmer knife position error The thread trimmer knife is not in the regular position.	Thread trimmer knife sensor cannot be detected.	Turn OFF the power.	Data input screen
E306		Thread clamp position error Thread clamp unit is not in the regular position.	Thread clamp sensor cannot be detected.	Turn OFF the power	
E307		External input command time out error Input is not performed for a fixed period of time with the external input command of vector data.	There is no input for a certain period of time with external input command of vector data.	Possible to re-start after reset.	Data input screen
E308		Time-out error of wait terminal There is no input to wait terminal for a certain period of time.	There is no input from wait terminal for a certain period of time.	Turn OFF the power	
E431		Outer presser is rising.	Outer presser is rising.	Possible to re-start after reset.	Previous screen
E432		Proper operation has not been performed.	Proper operation has not been performed.	Possible to re-start after reset.	Previous screen
E433		Number of stitches has exceeded the limit.	Number of stitches has exceeded the limit.	Possible to re-start after reset.	Previous screen
E434		Hardware error has occurred.	Hardware error has occurred.	Possible to re-start after reset.	Previous screen
E437		Function cannot be selected.	Function cannot be selected.	Possible to re-start after reset.	Previous screen

Error code	Pict	Description of error	message	How to recover	Place of recovery
E438		Execution cannot be performed.	Execution cannot be performed.	Possible to re-start after reset.	Previous screen
E441		Back-up data does not exist.	Back-up data does not exist.	Possible to re-start after reset.	Previous screen
E703		Panel is connected to the machine other than supposed. (Machine type error) When machine type code of system is improper in case of initial communication.	Model of sewing machine is different from that of panel.	Possible to rewrite program after pressing down communication switch.	Communication screen
E704		Inconsistency of system version When version of system software is improper in case of initial communication.	Version of program incompatible.	Possible to rewrite program after pressing down communication switch.	Communication screen
E730		Main shaft motor encoder defectiveness or phase-out When encoder of sewing machine motor is abnormal.	Sewing machine motor is defective. (Encoder A and B phases)	Turn OFF the power	
E731		Main motor hole sensor defectiveness or position sensor defectiveness When hole sensor or position sensor of sewing machine is defective.	Sewing machine motor is defective. (Encoder U, V, and W phases)	Turn OFF the power.	
E733		Reverse rotation of main shaft motor When sewing machine motor rotates in reverse direction.	Sewing machine motor runs in the reverse direction.	Turn OFF the power.	
E802		Power instantaneous cut detection When input power is instantaneously OFF.	Power instantaneously lost.	Turn OFF the power.	
E811		Over voltage When input power is more than the specified value.	Input voltage is too high. (Check input voltage.)	Turn OFF the power.	
E813		Low voltage When input voltage is 150V or less.	Input voltage is too low. (Check input voltage.)	Turn OFF the power.	
E901		Abnormality of main shaft motor IPM When IPM of servo control p.c.b. is abnormal.	SDC p.c.b. is defective. (IPM)	Turn OFF the power.	

Error code	Pict	Description of error	message	How to recover	Place of recovery
E903		Abnormality of stepping motor power When stepping motor power of servo control p.c.b. fluctuates $\pm 15\%$ or more.	Power of SDC p.c.b. is defective. (Stepping motor power 85 V)	Turn OFF the power.	
E904		Abnormality of solenoid power When solenoid power of servo control p.c.b. fluctuates $\pm 15\%$ or more.	Power of SDC p.c.b. is defective. (Solenoid power 33 V)	Turn OFF the power.	
E905		Heat sink temperature for SERVO CONTROL p.c.b. abnormality Turn ON the power again after taking overheat time of SERVO CONTROL p.c.b.	Temperature of SDC P.C.B is to high.	Turn OFF the power.	
E907		X feed motor origin retrieval error When origin sensor signal is not inputted at the time of origin retrieval motion.	Origin of X motor cannot be found. (X origin sensor)	Turn OFF the power.	
E908		Y-feed motor origin retrieval error When origin sensor signal is not inputted at the time of origin retrieval motion.	Origin of Y motor cannot be found. (Y origin sensor)	Turn OFF the power.	
E910		Presser motor origin retrieval error When origin sensor signal is not inputted at the time of origin retrieval motion.	Origin of presser thread trimmer motor cannot be found. (Presser thread trimmer origin sensor)	Turn OFF the power.	
E913		Thread clamp origin retrieval error When origin sensor signal is not inputted at the time of origin retrieval motion.	Origin of thread clamp motor cannot be found. (Thread clamp origin sensor)	Turn OFF the power.	
E914		Feed defective error Timing lag between feed and main shaft occurs.	X/Y feed trouble is detected.	Turn OFF the power.	
E915		Abnormality of communication between operation panel and main CPU When abnormality occurs in data communication.	Communication is impossible. (Panel - MAIN p.c.b.)	Turn OFF the power.	
E916		Abnormality of communication between main CPU and main shaft CPU When abnormality occurs in data communication.	Communication is impossible. (MAIN p.c.b. - Sewing machine motor p.c.b.)	Turn OFF the power.	
E917		Failure of communication between operation panel and personal computer When abnormality occurs in data communication.	Communication is impossible. (Panel - PC)	Possible to re-start after reset.	

Error code	Pict	Description of error	message	How to recover	Place of recovery
E918		MAIN board overheat Overheat of MAIN board Turn ON the power again after taking time.	Main p.c.b. temperature to high.	Turn OFF the power.	
E925		Intermediate presser motor origin retrieval error Origin sensor of intermediate presser motor does not change at the time of origin retrieval.	Origin of intermediate presser cannot be found. (Intermediate presser origin sensor)	Turn OFF the power.	
E943		MAIN EEPROM trouble When data writing to EEPROM cannot be performed.	MAIN p.c.b. is defective. (EEPROM)	Turn OFF the power.	
E946		Defective EEPROM writing of HEAD RELAY board When data writing to EEPROM cannot be performed.	Head p.c.b. is defective. (EEPROM writing is defective.)	Turn OFF the power.	

12. Message list

Message No.	Display	Display message	Description
M520		Erasing is performed. OK ?	Erase confirmation of User's pattern Erase is performed. OK?
M521		Erasing is performed. OK ?	Erase confirmation of pattern button Erase is performed. OK?
M522		Erasing is performed. OK ?	Erase confirmation cycle pattern Erase is performed. OK?
M523		Pattern data is not stored. Erasing is OK?	Erase confirmation of backup data Pattern data is not stored in memory. Erase is OK?
M528		Overwriting is performed. OK ?	Overwriting confirmation of users' pattern Overwriting is performed. OK?
M529		Overwriting is performed. OK ?	Overwriting confirmation of media Overwriting is performed. OK?
M530		Overwriting is performed. OK ?	Overwriting confirmation of vector data of panel/M3 data/sewing standard format data/simplified program data Overwriting is performed. OK?
M531		Overwriting is performed. OK ?	Overwriting confirmation of vector data of media/M3 data/sewing standard format data/simplified program data Overwriting is performed. OK?

Message No.	Display	Display message	Description
M532		Overwriting is performed. OK ?	Overwriting confirmation of vector data on personal computer/M3 data/sewingstandard format data/simplified program data Overwriting is performed. OK?
M534		Overwriting is performed. OK ?	Overwriting confirmation of adjustment data of media and all machine data Overwriting is performed. OK?
M535		Overwriting is performed. OK ?	Overwriting confirmation of adjustment data on personal computer and all machine data Overwriting is performed. OK?
M537		Deleting is performed. OK ?	Deletion confirmation of thread tension command Deleting is performed. OK?
M538		Deleting is performed. OK ?	Deletion confirmation of intermediate presser increase/decrease value Deleting is performed. OK?
M542		Formatting is performed. OK ?	Format confirmation Formatting is performed. OK?
M544		Data does not exist.	Data corresponding to panel does not exist. Data does not exist.
M545		Data does not exist.	Data corresponding to media does not exist. Data does not exist.

Message No.	Display	Display message	Description
M546		Data does not exist.	Data corresponding to personal computer does not exist. Data does not exist.
M547		Overwriting cannot be performed since data exists.	Overwriting prohibition on pattern data Overwriting cannot be performed since data exists.
M548		Overwriting cannot be performed since data exists.	Overwriting prohibition on media data Overwriting cannot be performed since data exists.
M549		Overwriting cannot be performed since data exists.	Overwriting prohibition on data on personal computer Overwriting cannot be performed since data exists.
M550		There is back-up data of body input.	Backup data information on main body input There is back-up data of body input.
M653		Formatting is performed.	During formatting Formatting is performed.
M669		Data is being read.	During data reading Data is being read.
M670		Data is being written.	During data writing Data is being written.
M671		Data is being converted.	During data converting Data is being converted.

13. Troubles and corrective measures

(1) Mechanical parts

Trouble	Cause (1)	Cause (2)	Check and corrective measures
1. Sewing machine locked	1-1) Large needle compared with the hole diameter of the needle hole guide		Replace the needle hole guide.
2. Deformation in sewn patterns	2-1) X timing belt tension is maladjusted.		Adjust the X timing belt tension.
	2-2) Y timing belt tension is maladjusted.		Adjust the Y timing belt tension.
	2-3) Backlash of the X feed motor gear is maladjusted.		Adjust the position of X feed motor.
	2-4) Backlash of the Y feed motor gear is maladjusted.		Adjust the position of Y feed motor.
	2-5) The moving torque is strong in Direction X.	5-A) Parallelism of the X-LM guide is not secured.	Adjust the mounting position of the X-LM guide.
		5-B) The throat plate auxiliary cover height is inadequate.	Adjust the throat plate auxiliary cover height.
		5-C) Inadequate adjustment of the feeder bar auxiliary cover rail X.	Adjust the feeder bar auxiliary cover rail X.
	2-6) Traveling torque in X direction or Y direction is excessive.	6-A) Parallelism of the Y-LM guide is not secured.	Adjust the mounting position of the Y-LM guide.
		6-B) There is interference between the throat plate auxiliary cover and the throat plate.	Adjust the throat plate auxiliary cover height.
		6-C) Inadequate adjustment of the feeder bar auxiliary cover rail Y.	Adjust the feeder bar auxiliary cover rail Y.
	2-7) Pressing pressure is too low.	7-A) Inadequate adjustment of the pressure switch	Adjust the pressure switch.
		7-B) Regulator is maladjusted.	Adjust the regulator.
		7-C) Supply air pressure is too low.	Adjust the supply air pressure.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
3. There is no coincidence between the input origin and the sewing origin.	3-1) Inadequate adjustment of the X origin sensor		Adjust the position of X origin sensor.
	3-2) Inadequate adjustment of the Y origin sensor		Adjust the position of Y origin sensor.
4 Feeding action does not stop even after exceeding the sewing range.	4-1) Inadequate adjustment of the X origin sensor		Adjust the position of X origin sensor.
	4-2) Inadequate adjustment of the Y origin sensor		Adjust the position of Y origin sensor.
5. The amount of lifting is small for the outer frame of the cloth presser.	5-1) Inadequate adjustment of the height of the presser		Adjust the height of the presser.
6. The outer frame of the cloth presser cannot be lifted or lowered.	6-1) Inadequate adjustment of the pressure reducer		Adjust the pressure reducer.
	6-2) Defective board	2-A) The board is out of order.	Replace the board.
		2-B) Connector connections are improper.	Check the connector connections.
	6-3) There are inadequate fitting conditions among the work feed bar, the link, and the face plate.		Examine the positions for greasing.
			The sewing material is not pressed completely by the outer frame as a whole.
	6-4) Supply air pressure is too low.		Adjust the supply air pressure.
	6-5) Inadequate adjustment of the regulator		Adjust the regulator.
	6-6) Solenoid valve malfunction		Reolace the solenoid valve.
	6-7) Inadequate adjustment of the speed controller		Adjust the speed controller.
7. The intermediate presser does not rise after sewing.	7-1) There are some inadequate fitting conditions in the intermedi ate presser link mechanism.		Check for the inadequate fitting and rattling conditions in the link mechanism. Examine the positions for greasing.
	7-2) Intermediate presser variable is maladjusted.		Adjust the intermediate presser variable.

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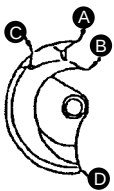
Trouble	Cause (1)	Cause (2)	Check and corrective measures
From the previous page			
8. The intermediate presser does not work during sewing.	7-3) Intermediate presser pulse motor malfunction	3-A) Intermediate presser pulse motor is out of order.	Replace the intermediate presser pulse motor.
		3-B) Connection of intermediate presser pulse motor is improper.	Check the connector connections.
	7-4) Defective board	4-A) The board is out of order.	Replace the board.
		4-B) Connector connections are improper.	Check the connector connections.
	8-1) There are some inadequate fitting conditions in the intermediate presser link mechanism.		Check for the inadequate fitting and rattling conditions in the link mechanism. Examine the positions for greasing.
	8-2) Intermediate presser variable is maladjusted.		Intermediate presser variable adjustments.
	8-3) Intermediate presser pulse motor malfunction	3-A) Intermediate presser pulse motor is out of order.	Replace the intermediate presser pulse motor.
		3-B) Connection of intermediate presser pulse motor is improper.	Check the connector connections.
	8-4) Defective board	4-A) The board is out of order.	Replace the board.
		4-B) Connector connections are improper.	Check the connector connections.
9. Unusual sound is generated from the face section.	8-5) The intermediate presser stroke has decreased to 0mm.		Adjust the intermediate presser variable stroke.
	9-1) The clearance is too much between the inner hook and the driver.		Adjust the clearance between the inner hook and the driver.
	9-2) The intermediate presser bar connection comes in contact with the lower metal of the intermediate presser needle bar.		Adjust the intermediate presser adjusting arm.
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Trouble	Cause (1)	Cause (2)	Check and corrective measures
From the previous page			
	9-3) The intermediate presser comes in contact with the throat plate.	3-A) Inadequate adjustment of the height of the intermediate presser	Adjust the height of the intermediate presser.
	9-4) The intermediate presser comes in contact with the cloth presser.		Adjust the presser.
	9-5) Intermediate presser variable is maladjusted.		Intermediate presser variable adjustments.
	9-6) Intermediate presser pulse motor malfunction	6-A) Intermediate presser pulse motor is out of order.	Replace the intermediate presser pulse motor.
		6-B) Connection of intermediate presser pulse motor is improper.	Check the connector connections.
	9-7) Defective board	7-A) The board is out of order.	Replace the board.
		7-B) Connector connections are improper.	Check the connector connections.
10. Even when the sewing machine is started, it goes to stop soon.	10-1) The needle thread is not hooked.		Pass the needle thread.
	10-2) Position of the thread breakage detecting plate is wrong.		Adjust the position of the thread breakage detecting plate.
11. Even though the needle thread is broken, the sewing machine does not stop.	11-1) Position of the thread breakage detecting plate is wrong.		Adjust the position of the thread breakage detecting plate.
12. Wiper cannot spread a thread	12-1) Interference between wiper and needle	1-A) Wiper mounting position is inadequate.	Adjust the wiper position.
	12-2) Interference between wiper and intermediate presser	2-A) Inadequate adjustment of the height of the intermediate presser	Adjust the height of the intermediate presser.
		2-B) Wiper mounting position is inadequate.	Adjust the wiper position.
	12-3) There is no clearance between the needle and intermediate presser to pass the wiper.	3-A) The cloth thickness permitting the use of a wiper is exceeded.	Use the lower wipe-out sequence.
	12-4) The wiper does not move after thread trimming.	4-A) The wiper switch is turned OFF.	Turn the wiper switch ON.
13. Severe vibration	13-1) Position of the crank balancer is wrong.		Define the correct crank balancer position.

(2) Sewing conditions

Trouble	Cause (1)	Cause (2)	Check and corrective measures
1. Thread comes off at the start of sewing	1-1) Stitch skipping at the start of sewing	1-A) Too much clearance between needle and hook.	Set the clearance at 0.05 to 0.1mm between the needle and the hook. Set up "soft start" at the beginning of sewing.
		1-B) Penetration resistance of the thread against the cloth is small.	Use a thinner needle. (Lower the needle count to be used.)
	1-2) Length of thread remaining at the needle is not sufficient.	2-A) Tension controller No. 1 provides an excessive tension.	Properly adjust the tension controller No. 1.
		2-B) Floating of the AT thread tension disc is insufficient.	Adjust the amount of AT thread tension floating.
		2-C) Stroke of the thread take-up spring is excessive.	Adjust the stroke of the thread take-up spring.
		2-D) The thread take-up spring tension is insufficient.	Adjust the thread take-up spring tension.
		2-E) Level difference between the needle hole guide and the counter knife is excessively high.	Adjust the height of the counter knife.
		2-F) Needle thread tension is high and the thread is excessively stretched.	Adjust the needle thread tension.
		2-G) Thread spreading section of the moving knife has scratches.	Polish the thread spreading section of the moving knife with buff or replace the knife.
	1-3) Length of bobbin thread remaining is not sufficient.	3-A) Level difference between the needle hole guide and the counter knife is excessively high.	Adjust the height of the counter knife. (Otherwise, widen the gap.)
		3-B) Lower face of the needle hole guide has scratches.	Polish the needle hole guide with a buff or replace it.
		3-C) Thread spreading section of the moving knife has scratches.	Polish the thread spreading section of the moving knife with buff or replace the knife.
		3-D) Shuttle upper spring has scratches.	Polish the shuttle upper race with a buff or replace it.
		3-E) The bobbin thread tension is excessive.	Adjust the bobbin thread tension.
		3-F) The bobbin or bobbin case has scratches.	Polish it with a buff or replace it.
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Trouble	Cause (1)	Cause (2)	Check and corrective measures
2. Needle breakage	From the previous page		
	1-4) Material to be sewn is not properly stretched.		Remove the slack of the material to be sewn.
	1-5) Unstable needle thread clamp	5-A) Thread tends to be extended or sliding efficiency is worse.	Increase the needle thread clamp needle number to 3~4 stitches.
			Lower the speed of the first stitch. (600 to 1000rpm)
		5-B) Pitch of the first stitch is too small.	Lower the needle thread tension of the first stitch.
			Increase the pitch of the first stitch.
	1-6) Threading the needle bar thread guide is wrong.		Refer to the item "Threading the needle bar thread Guide".
	1-7) Bobbin runs idle and the bobbin thread is drawn out.		Use a stronger idling prevention spring.
		7-A) Initial positioning of the moving knife is inadequate.	Adjust the initial position of the moving knife.
	2-1) Inadequate clearance between the shuttle driver and the needle		Adjust the clearance between needle and shuttle driver.
	2-2) Inadequate clearance between the needle and the inner hook.		Adjust the clearance between the needle and the inner hook.
	2-3) Feed timing is defective	3-A) Too late feed timing for cloth thickness	Change the feed timing by the use of the memory switch.
	2-4) Needle coming in contact with the moving knife		Adjust the moving knife position.
	2-5) Needle coming in contact with the wiper		Adjust the wiper position.
	2-6) Needle is bent	6-A) The needle thread tension is too high.	Adjust the tension to a proper level.
	2-7) Needle is too thin.		Change the needle No. to the suitable one to the material.
	2-8) Interference between work clamp foot and needle		Adjust the work clamp foot (feed bracket) position.

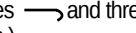
Trouble	Cause (1)	Cause (2)	Check and corrective measures
3. Stitch Skipping	3-1) Too much clearance between the needle and the inner hook.		Adjust the clearance between needle and inner hook.
	3-2) Inadequate timing adjustment for the needle and the inner hook.		Adjust timing for the needle and the inner hook.
	3-3) Inadequate clearance between the shuttle driver and the needle		Adjust the clearance between needle and shuttle driver.
	3-4) Material to be sewn is not properly stretched.	4-A) Too much clearance between the work clamp foot and sewing object	Adjust the work clamp foot height. Remove the slackness of the sewing object.
	3-5) Needle is bent or blunt.		Replace the needle.
	3-6) Loop of the needle thread falls down.		Attach the needle with the long groove orienting slightly to the right. (Approximately 20°)
4. Needle thread breakage		6-A) Feed timing is too fast.	Change the feed timing by the use of the memory switch.
	4-1) Scratches on the inner hook	1-A) Scratches on section A (Contact of the inner hook with the needle)	After polishing the blade point of the inner hook with oilstone, polish it with polishing powder. Properly adjust the clearance between the needle and the inner hook.
		1-B) Scratches on section B (Scratches occur when the needle is bent or broken.)	After polishing the blade point of the inner hook, polish it with polishing powder.
		1-C) Scratches on section C (Needle scratches the inner hook when removing the inner hook.)	After polishing the blade point of the inner hook, polish it with polishing powder.
		1-D) Scratches on section D	After polishing the blade point of the inner hook, polish it with polishing powder.
	4-2) Thread enters into the shuttle.	2-A) Position of the shuttle upper spring is wrong.	Properly adjust the position of the shuttle upper spring.
		2-B) Blade point section A of the shuttle is round. 	Replace the inner hook.
		2-C) Position of the shuttle is wrong.	Properly adjust the position of the shuttle.
		2-D) Needle thread tension is too low.	Properly adjust the needle thread tension.
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Trouble	Cause (1)	Cause (2)	Check and corrective measures
	From the previous page	From the previous page	
		2-E) Thread take-up spring tension is too low.	Adjust the thread take-up spring.
		2-F) Length of the remaining needle thread is too long.	Properly adjust the tension controller No. 1.
		2-G) The specified inner hook and shuttle driver are not used.	Use the specified parts.
	4-3) Scratches on the shuttle driver.		Remove the scratches and polish with buff, or replace the shuttle driver.
	4-4) Clearance between the shuttle driver and the inner hook is too small.		Properly adjust the clearance between the shuttle driver and the inner hook.
	4-5) Scratches on the needle hole guide.		Remove the scratches and polish with buff, or replace the needle hole guide.
	4-6) Finish of the needle hole is rough.		Replace the needle.
	4-7) Thread take-up spring is maladjusted.	7-A) Stroke of the thread take-up spring is too large.	Properly adjust the thread take-up spring.
		7-B) Thread take-up spring tension is too high.	Properly adjust the thread take-up spring.
	4-8) Rotation of the inner hook is defective.	8-A) Race face of the shuttle is clogged with thread waste.	Remove the inner hook and remove the thread waste.
		8-B) Oil amount is insufficient.	Supply oil to the shuttle components.
	4-9) Needle thread clamp device OFF	9-A) Needle thread length is inadequate.	Adjust the needle thread length and turn the needle thread clamp device ON.
	4-10) Chemical fiber thread is melted with heat from the needle.		Use of silicone oil
			Use of needle coated with fluoro carbon resin

Trouble	Cause (1)	Cause (2)	Check and corrective measures
5. Thread breakage at the time of thread trimming.	5-1) Thread release timing is defective.	1-A) Floating of the AT thread tension disk is insufficient.	Adjust the amount of AT thread tension floating.
	5-2) Thread spreading section of the moving knife has scratches.		Paying attention to the blade section, polish with polishing powder.
	5-3) Shuttle upper spring has scratches.		Remove the scratches.
	5-4) Level difference between the needle hole guide and the counter knife is too high.	4-A) Thread is cut before trimming with the blade section of the moving knife.	Properly adjust the position of counter knife.
	5-5) Clearance between the needle hole guide and the counter knife is too small.	5-A) Thread is cut before trimming with the blade section of the moving knife.	Properly adjust the position of counter knife.
	5-6) Lower face of the needle hole guide has scratches.	6-A) Thread is cut with the needle hole guide.	Remove the scratches and polish with buff, or replace the needle hole guide.
	5-7) Thread spreading timing of the moving knife is defective.		Adjust initial positions of the presser origin sensor, thread trimmer, and the moving knife.
	5-8) Thread take-up spring tension is too low.		Adjust the thread take-up spring.
	5-9) Scratched bobbin thread holder		Eliminate the scratch.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
6. Defective thread trimming	6-1) Sharpness of the knife is difective	1-A) Abrasion of moving and counter knives.	Replace the moving and counter knives.
		1-B) Engagement of the moving and counter knives is defective.	Properly adjust the heigh and position of the moving and counter knives.
		1-C) Parallel of the blade section of counter knife is defective.	Properly adjust the parallel of the blade section of counter knife.
		1-D) Attaching position of the counter knife is defective.	Properly adjust the attaching position of counter knife.
	6-2) Double cutting for the needle thread. (Thread waste remains inside the cylinder arm cap.)	2-A) There is a burr on thread spreading section A of the moving knife. The shape of the thread trimmed becomes  and thread waste remains.	Paying attention to the blade section, polish with polishing power, or replace the moving knife.
		2-B) Shuttle upper spring has scratches. (The shape of the thread trimmed becomes  and thread waste remains.)	Remove the scratches.
	6-3) Moving knife does not spread threads.	3-A) Initial position of the moving knife is maladjusted.	Adjust the initial position of the moving knife.
		3-B) Thread trimmer cam position is inadequate.	Adjust the thread trimmer cam position.
		3-C) Position of the shuttle upper spring is defective.	Adjust the position of shuttle upper spring .
	6-4) Stitch skipping at the final stitch	4-A) Timing of the needle to the inner hook and the clearance between them are defective.	Adjust the timing and the clearance.
		4-B) Work clamp foot big.	Let the biginning of stitch come closer to the presser by moving the pattern.
		4-C) Loop of the needle thread falls down.	Attach the needle with the long groove orienting slightly to the right (approximately 20°)
	6-5) Bobbin thread cannot be cut.	5-A) Bobbin thread tension is low.	Streng then the bobbin thread tension.
		5-B) Needle hole size of the needle hole guide is large.	Replace the needle hole guide with a new one having a smaller hole diameter.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
7. Poorly tense stitches	7-1) Tension controller AT is maladjusted.	1-A) Tension of the tension controller AT is low.	Properly adjust the tension of tension controller AT.
	7-2) Tension controller AT is floating.		Adjust the thread tension releasing mechanism.
	7-3) Thread take-up spring is maladjusted.		Adjust thread take-up spring tension and stroke.
	7-4) Clearance between the inner hook and the shuttle driver is defective.	4-A) The clearance between the inner hook and the shuttle driver is too small.	Properly adjust the clearance of inner hook and shuttle driver.
	7-5) Selection of the needle to be used is improper.	5-A) Needle to be used is thin.	Replace the needle with a thicker one.
	7-6) Selection of the needle hole guide is improper.	6-A) Hole diameter of the needle hole guide to the needle to be used and thread is small.	Replace the needle hole guide with a new one having a larger needle hole.
	7-7) Shape of the feed plate is defective.	7-A) Material to be sewn is stiff and closely contacted with the throat plate, and there is no clearance between them to pass the thread.	Raise the material to be sewn by means of the feed plate.
		7-B) Material to be sewn is highly elastic and closely contacted with the throat plate, and there is no clearance between them to pass the thread.	Raise the material to be sewn by means of the feed plate.
	7-8) Feed timing is defective	8-A) Feed timing is too fast.	Use the memory switch to change the feed timing.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
8. Defective stitches with the synthetic thread	8-1) Thread breakage due to heat	1-A) The sewing speed is too fast.	Slow down the maximum speed.
		1-B) The needle used is too thick.	Use a thin needle or a super needle for the synthetic thread. Use silicon. Use a needle cooler.
	8-2) Thread makes burrs.	2-A) Thread path is defective.	Polish the thread path of each component with polishing powder.
		2-B) Finish of the needle hole is defective.	Replace the needle.
		2-C) Loop of the needle thread falls down.	Move the machine arm thread guide A to the left.
	8-3) Thread floating occurs at the sewing start.	3-A) Penetration resistance of the thread against the cloth is too small.	Use a thinner needle. (Lower the number of needle to be used.) Needle thread clamp device ON.
	8-4) Stitch skipping due to the heat.	4-A) Sewing speed is too fast.	Change the maximum speed (electrical components.)
		4-B) Needle is too thin.	Use a thicker needle. (Raise the number of needle to be used.)
		4-C) Loop of the needle thread falls down.	Attach the needle with the long groove orienting slightly to the right (approximately 20°).
	8-5) Uneven stitch tightness due to the stretch of thread.	5-A) Sewing speed is too fast.	Reduce the speed by means of the speed variable resistor.
		5-B) Tension of the tension controller AT is excessive.	Decrease the tension of tension controller AT.
9. Thread chips generated in the shuttle	9-1) Long needle thread at the beginning of stitches	1-A) The thread trimmer is used for cutting.	Needle thread clamp device OFF Adjust the needle thread length to 32 to 36mm Increase the sewing length to more than 10mm.

(3) Electrical components (Refer to “14.-(1) Block diagram A” as well.)

Trouble	Cause (1)	Cause (2)	Check and corrective measures
1. No display at the operation panel.	1-1) DC power (+5 V, +24V) is not supplied.	1-A) AC power is not supplied.	Examine if a power supply is available at the power switch.
		1-B) The FLT board has no power supply.	Check whether an AC voltage is available between Pins 4-5 of CN1 in the FLT board. If no voltage is found, check the connections around the power switch or the power plug.
		1-C) The SDC board has no power supply. (The power supply is available so long as LED4 of the SDC board is lit.)	Check the connection of CN1 of SDC board.
			Check the connection between CN17 of the SDC board and CN2 of the FLT board.
			Confirm that the inrush protection resistor is normal in the FLT board. FLT-T board R2, R3 FLT-S board R1
	1-2) Detection of a momentary interruption in the SDC board LED3 on SDC board: Flashing 9 times	1-D) The MAIN board has no power supply.	Check the CN31 power supply of the MAIN board. 1, 2: +48V 3: +24V 4: +5V 5: +33V 6, 7, 8: GND Check the output voltage in the SDC board unit. Check if there is shortcircuiting in the 5V power system for the MAIN board.
		1-E) The operation panel has no power supply.	Check if there is shortcircuiting in the +5V power system for the operation panel.
			Check the connection between CN34 of the MAIN board and the panel.
		2-A) No momentary interruption sensor signal input is entered in the SDC board.	Check the connection between CN3 of the FLT board and CN13 of the SDC board.
		2-B) No AC voltage is available between Pins 4-5 of CN1 in the FLT board. (In case of FLT-T board)	When a sewing machine for 3-phase specifications is used in a 1-phase system, connect the power supply to black and white of the power cord led from the box.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
2. Key malfunction on the operation panel It does not function so effectively.	2-1) IP-410 : There is no signal from the touch panel.	1-A) Connector connection defective	Check the connection between the touch panel and CN109 of the Panel board.
		1-B) The switch position of the touch panel is displaced.	Start the Check Program I_01 and readjust the switch position.
		1-C) Touch panel fault	Replacement of the LCD assembly (40034529)
3. Error E007 Machine lock LED3 on SDC board: Flashing 1 times	3-1) The main shaft motor of the sewing machine cannot rotate.	1-A) No power is fed to the motor.	Check the connection of CN16 of SDC board.
		1-B) The mechanism is locked.	Turn it by hand in the state that the power supply is turned OFF. Confirm whether the upper shaft is locked. If there is any abnormality, remove it.
		1-C) The driver circuit is out of order.	Replace the SDC board.
		1-D) The motor is out of order.	Measure the resistance of the motor winding. If there is any abnormality, replace the motor.
4. Error E029 Media slot open error	4-1) The switch signal is not received.	1-A) The slot OPEN-OFF switch is not pressed.	Check the cover to examine whether the switch pin can be pressed. If there is any abnormality, replace the cover.
			Confirm the switch pin whether it is normal. If there is any abnormality, replace the board.
5. Error E030 Needle bar upper position displacement	5-1) It cannot stop in upper position.	1-A) The servo lock is not effective.	Turn it by hand in the state that the power supply is turned OFF. Confirm if there are large variations in the load.
			Replace the SDC board.
6. Error E031 Air pressure drop	6-1) The air sensor switch is not turned ON.	1-A) Air pressure variation or drop	Check the air pressure and the air source.
		1-B) Switch defective	Check the pressure setup value of the air sensor (0.34MPa)
			Check the air switch by means of a circuit tester. Connector check MAIN board CN52

Trouble	Cause (1)	Cause (2)	Check and corrective measures
7. Error E050 Temporary stop switch	7-1) The switch contact point is open.	1-A) Connector connection defective	Check CN69 of INT board.
		1-B) Switch defective or disconnection	Confirm the condition of the switch by using the tester. (Normal closure)
8. Error E220 Grease up alarm	8-1) The number of stitches saved in the INT board has exceeded 100 million stitches.	1-A) 100 million stitches have been exceeded.	After grease supplement, clear the memory with the memory switch U245.
9. Error E221 Grease up error	9-1) The number of stitches saved in the INT board has exceeded 120 million stitches.	1-A) 120 million stitches have been exceeded.	After grease supplement, clear the memory with the memory switch U245.
10. Error E302 Head tilt error	10-1) Detector switch contact open	1-A) Connector contact is defective.	Check CN67 of INT board.
		1-B) Disconnection	Check it by means of a circuit tester. Replace the switch.
		1-C) Switch is defective.	Check it by means of a circuit tester. Replace the switch.
		1-D) Switch fails to properly work.	Check the switch mounting conditions.
11. Error E305 Thread trimmer knife position error	11-1) Presser lifter/thread trimmer pulse motor fails to properly work.	1-A) The cam phase of the mechanical block is not in good order.	Check the operation with the check program I_07.
		1-B) The driver circuit is out of order.	Replace the MAIN board.
		1-C) Motor defective	Measure the resistance of the motor winding by means of a circuit tester.
	11-2) The sensor is not turned ON.	2-A) Sensor defective/Mounting inadequate	Check the sensor with the check program I_03.
		2-B) Disconnection of connector	Check CN66 of INT board.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
12. Error E306 Needle thread clamp position error	12-1) Needle thread clamp pulse motor fails to properly work.	1-A) There is a certain obstacle in the mechanical block.	Check the mechanical block to see if there is any position with a heavy load or any section caught by something.
		1-B) The driver circuit is out of order.	Replace the MAIN board.
		1-C) Motor defective	Measure the resistance of the motor winding by means of a circuit tester.
	12-2) The sensor is not turned ON.	2-A) Sensor defective	Check the sensor with the check program I_03.
		2-B) Disconnection of connector	Check CN66 of INT board.
		2-C) Sensor mounting inadequate	Check the operation with the check program I_08.
13. Error E730 Main shaft motor encoder error LED3 on SDC board: Flashing 3 times	13-1) Main shaft motor: No signal entry in Phase A and Phase B.	1-A) The motor is out of order.	Confirm whether each signal is delivered to CN14 of the SDC board. CN14_6: Phase A CN14_7: Phase B CN14_2: GND Replace the motor if there is no signal change as a result of manual turning.
		1-B) The signal input circuit is out of order.	Replace the SDC board.
14. Error E731 Main shaft motor encoder error LED3 on SDC board: Flashing 4 times	14-1) Main shaft motor: No signal entry in Phase U, Phase V, and Phase W.	1-A) The motor is out of order.	Confirm whether each signal is delivered to CN14 of the SDC board. CN14_3: Phase U CN14_4: Phase V CN14_5: Phase W CN14_2: GND Replace the motor if there is no signal change as a result of manual turning.
		1-B) The signal input circuit is out of order.	Replace the SDC board.
15. Error E733 Main shaft motor reverse turn error LED3 on SDC board: Flashing 7 times	15-1) The main shaft motor is reversing.	1-A) Motor revolutions are unstable.	Check whether coupling for connection of main shaft and motor is loose. Replace the motor.
16. Error E811 Overvoltage error LED3 on SDC board: Flashing 8 times	16-1) Power source voltage is beyond 280 V AC.	1-A) There are variations or unusual rise in the AC input power line.	Check the AC input power line.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
17.Error E813 Low voltage error LED3 on SDC board: Flashing 6 times	17-1)The source voltage is 160V AC or below.	1-A) There are variations or unusual drop in the AC input power line.	Check the AC input power line.
		1-B) A 100V input is entered where the FLT-T board has been set for 200V.	Check the preset voltage for the FLT-T board.
18.Error E901 IPM Error LED3 on SDC board: Flashing 5 times	18-1)Error output generation from IPM in the SDC board	1-A) IPM control voltage drop	Replace the SDC board.
		1-B) IPM overcurrent is detected.	Replace the SDC board.
			Replace the main shaft motor.
19.Error E903 Pulse motor power source error LED3 on SDC board: Flashing 11 times	19-1)No +48V power output of the SDC board available	1-A) Blown-out of the F1 fuse of the SDC board.	Check if there is shortcircuiting in the +48V power system for the MAIN board. Replace the MAIN board.
		1-B) Blown-out of the F4 fuse of the SDC board.	Replace the SDC board.
20.Error E904 Abnormal solenoid power LED3 on SDC board: Flashing 12 times	20-1)No +33V power output of the SDC board available	1-A) Blown-out of the F2 fuse of the SDC board.	Check if there is shortcircuiting in the +33V power system for the MAIN board. Replace the MAIN board.
		1-B) Blown-out of the F5 fuse of the SDC board.	Replace the SDC board.
21.Error E905 Thermal error in SDC board LED3 on SDC board: Flashing 13 times	21-1)Heat sink temperature for power supply has exceeded 85°C.	1-A) Cooling is not effective.	Check for any clogging at the suction port or examine the conditions in the fan, etc.
		2-A) Cooling is not effective.	Check for any clogging at the suction port or examine the conditions in the fan, etc.
	21-2)Temperature of main shaft IPM has exceeded 90°C.	2-B) Sensor connection defective	Check CN18 of SDC board.
		2-C) The main shaft motor is out of order.	Measure the resistance of the upper shaft motor winding. Replace the motor.

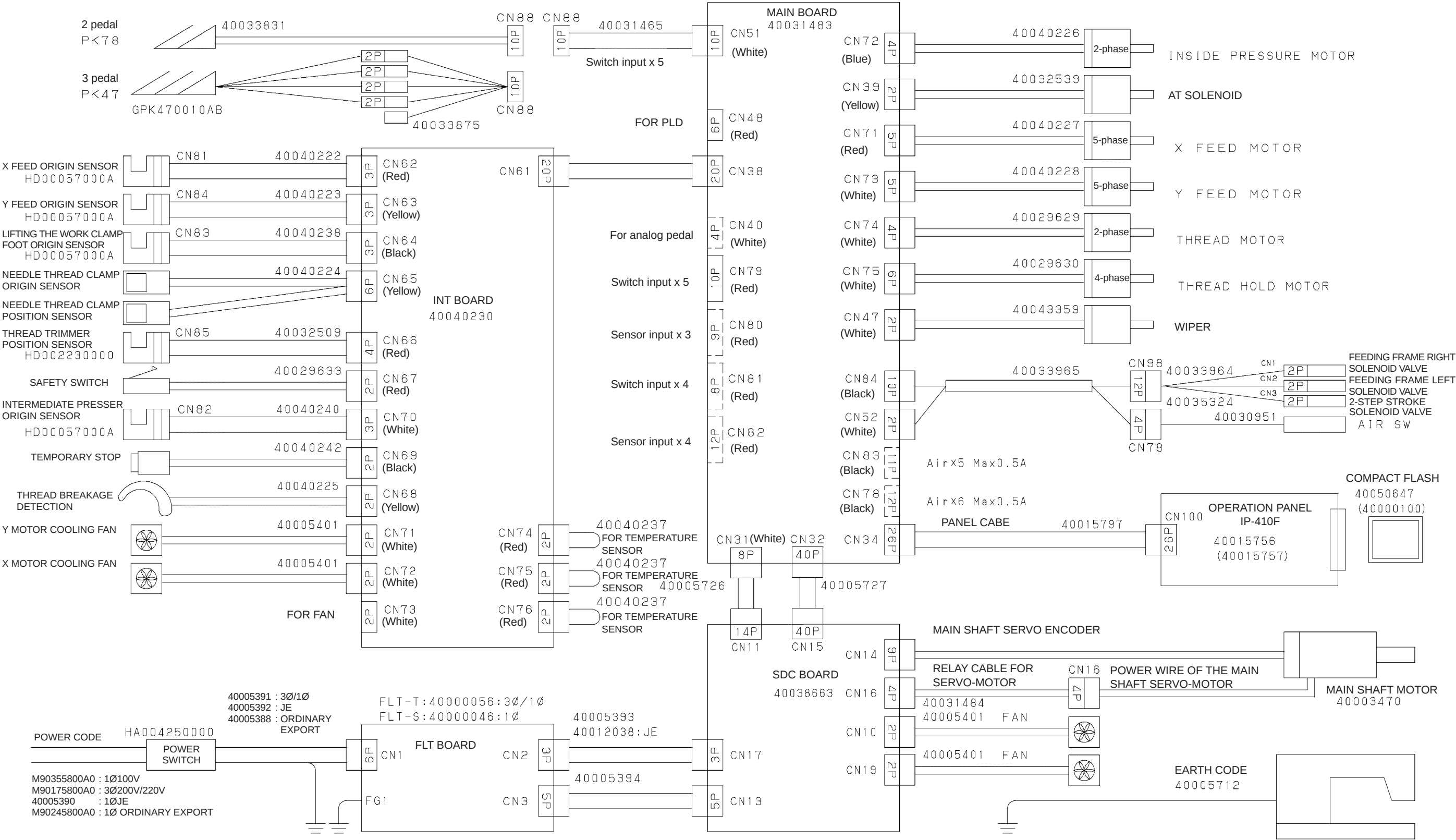
Trouble	Cause (1)	Cause (2)	Check and corrective measures
22. Error E907 X feed motor origin retrieval error	22-1)Irregular motor rotations	1-A) There are irregularities in the mechanism, such as overloading, etc.	Check the mechanism and look for the section that is particularly overloaded, that is any holdup or whether screws are loose.
		1-B) Motor leads are broken. The motor is out of order.	Check the resistance of the motor winding. Replace the motor, as required.
		1-C) The driver circuit is out of order.	Replace the MAIN board.
	22-2)No sensor signal entry	2-A) The sensor is out of order or broken.	Check the sensor with the test program I_03 or I_06.
		2-B) Connector connection defective	Check CN62 of INT board.
		2-C) Input circuit is out of order.	Replace the MAIN board.
23. Error E908 Y feed motor origin retrieval error	23-1)Irregular motor rotations	1-A) There are irregularities in the mechanism, such as overloading, etc.	Check the mechanism and look for the section that is particularly overloaded, that is any holdup or whether screws are loose.
		1-B) Motor leads are broken. The motor is out of order.	Check the resistance of the motor winding. Replace the motor, as required.
		1-C) The driver circuit is out of order.	Replace the MAIN board.
	23-2)No sensor signal entry	2-A) The sensor is out of order or broken.	Check the sensor with the test program I_03 or I_06.
		2-B) Connector connection defective	Check CN63 of INT board.
		2-C) Input circuit is out of order.	Replace the MAIN board.
24. Error E910 Presser motor origin retrieval error	24-1)Irregular motor rotations	1-A) There are irregularities in the mechanism, such as overloading, etc.	Check the mechanism and look for the section that is particularly overloaded, that is any holdup or whether screws are loose.
		1-B) Motor leads are broken. The motor is out of order.	Check the resistance of the motor winding. Replace the motor, as required.
		1-C) The driver circuit is out of order.	Replace the MAIN board.
	24-2)No sensor signal entry	2-A) The sensor is out of order or broken.	Test program I_03 or I_07
		2-B) Connector connection defective	Check CN64 of INT board.
		2-C) Input circuit is out of order.	Replace the MAIN board.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
25. Error E913 Needle thread clamp origin retrieval error	25-1)Irregular motor rotations	1-A) There are irregularities in the mechanism, such as overloading, etc.	Check the mechanism and look for the section that is particularly overloaded, that is any holdup or whether screws are loose.
		1-B) Motor leads are broken. The motor is out of order.	Check the resistance of the motor winding. Replace the motor, as required.
		1-C) The driver circuit is out of order.	Replace the MAIN board.
	25-2)No sensor signal entry	2-A) The sensor is out of order or broken.	Check the sensor with the test program I_03 or I_08.
		2-B) Connector connection defective	Check CN65 of INT board.
		2-C) Input circuit is out of order.	Replace the MAIN board.
26. Error E914 Feed trouble error	26-1)Irregular main shaft motor rotations	1-A) Motor revolutions are unstable.	Check whether coupling for connection of main shaft and motor is loose.
27. Error E915 Communication error between the PANEL and MAIN boards LED1 on MAIN board: Flashing 1 times	27-1)Data cannot be received from the MAIN board.	1-A) MAIN board fails to work.	All the dip switches of the MAIN board shall be set at OFF.
		1-B) Board defective	Replace the MAIN board or PANEL board.
28. Error E916 Communication error between the SDC and MAIN boards LED3 on SDC board: Flashing 15 times	28-1)Data cannot be received from the SDC board.	1-A) MAIN board fails to work.	All the dip switches of the MAIN board shall be set at OFF.
		1-B) SDC board fails to work.	All the dip switches (SW2) of the SDC board shall be set at OFF.
		1-C) Board defective	Replace the MAIN board or SDC board.
29. Error E918 MAIN board overheat	29-1)The heat sink for the power supply has exceeded 85°C.	1-A) Cooling is not effective.	Check for any clogging at the suction port or examine the conditions in the fan, etc.

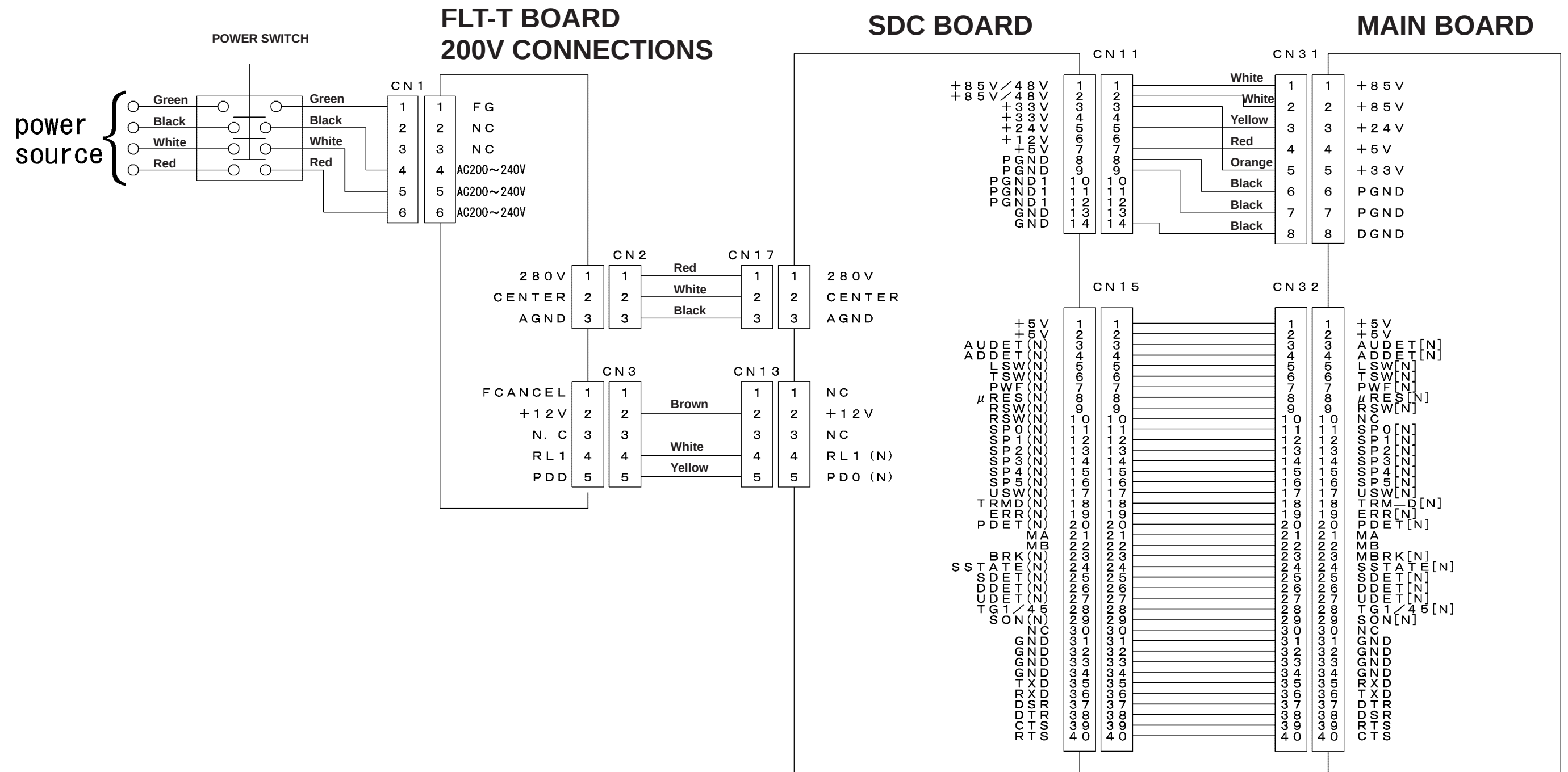
Trouble	Cause (1)	Cause (2)	Check and corrective measures
30. Error E925 Intermediate presser motor origin retrival error	30-1) Irregular motor rotations	1-A) There are irregularities in the mechanism, such as verloading, etc.	Check the mechanism and look for the section that is particularly overloaded, that is any holdup or whether screws are loose.
		1-B) Motor leads are broken. The motor is out of order.	Check the resistance of the motor winding. Replace the motor, as required.
		1-C) The driver circuit is out of order.	Replace the MAIN board.
	30-2) No sensor signal entry	2-A) The sensor is out of order or broken.	Check the sensor with the test program I_03 or I_10.
		2-B) Connector connection defective	Check CN70 of INT board.
		2-C) Input circuit is out of order.	Replace the MAIN board.
31. Error E943 MAIN board EEP-ROM write-in trouble	31-1) MAIN board EEP-ROM failingin writing	1-A) Devices defective, soldering inadequate	Replace the MAIN board.
32. Error E946 INT board EER-ROM write-in trouble	32-1) INT board EEP-ROM failing in writing	1-A) Poor connections	Check the CN38 connections of the MAIN board.
		1-B) Defective board	Replace the MAIN board and the INT board.

14. Circuit diagrams

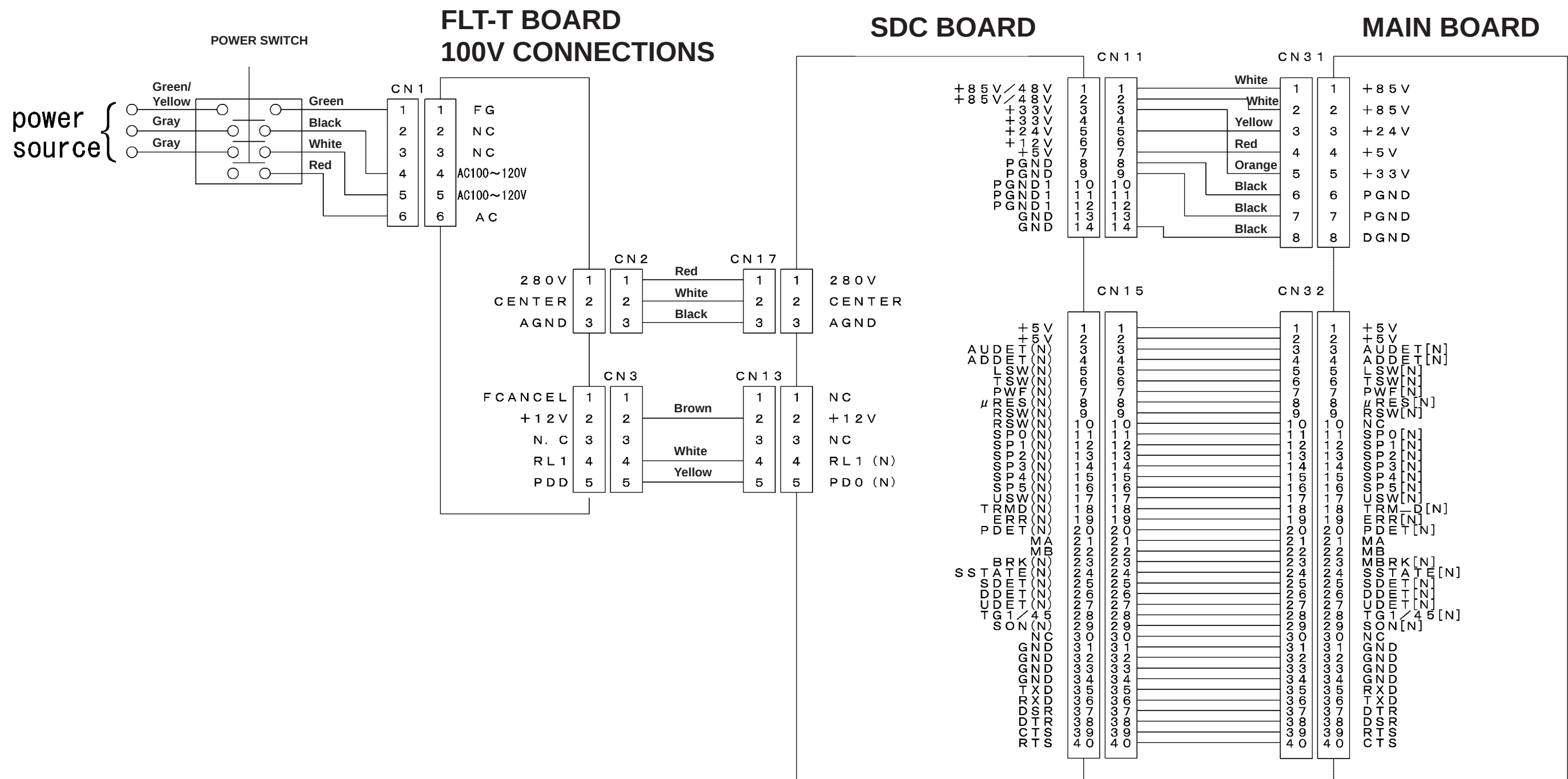
(1) Block diagram A



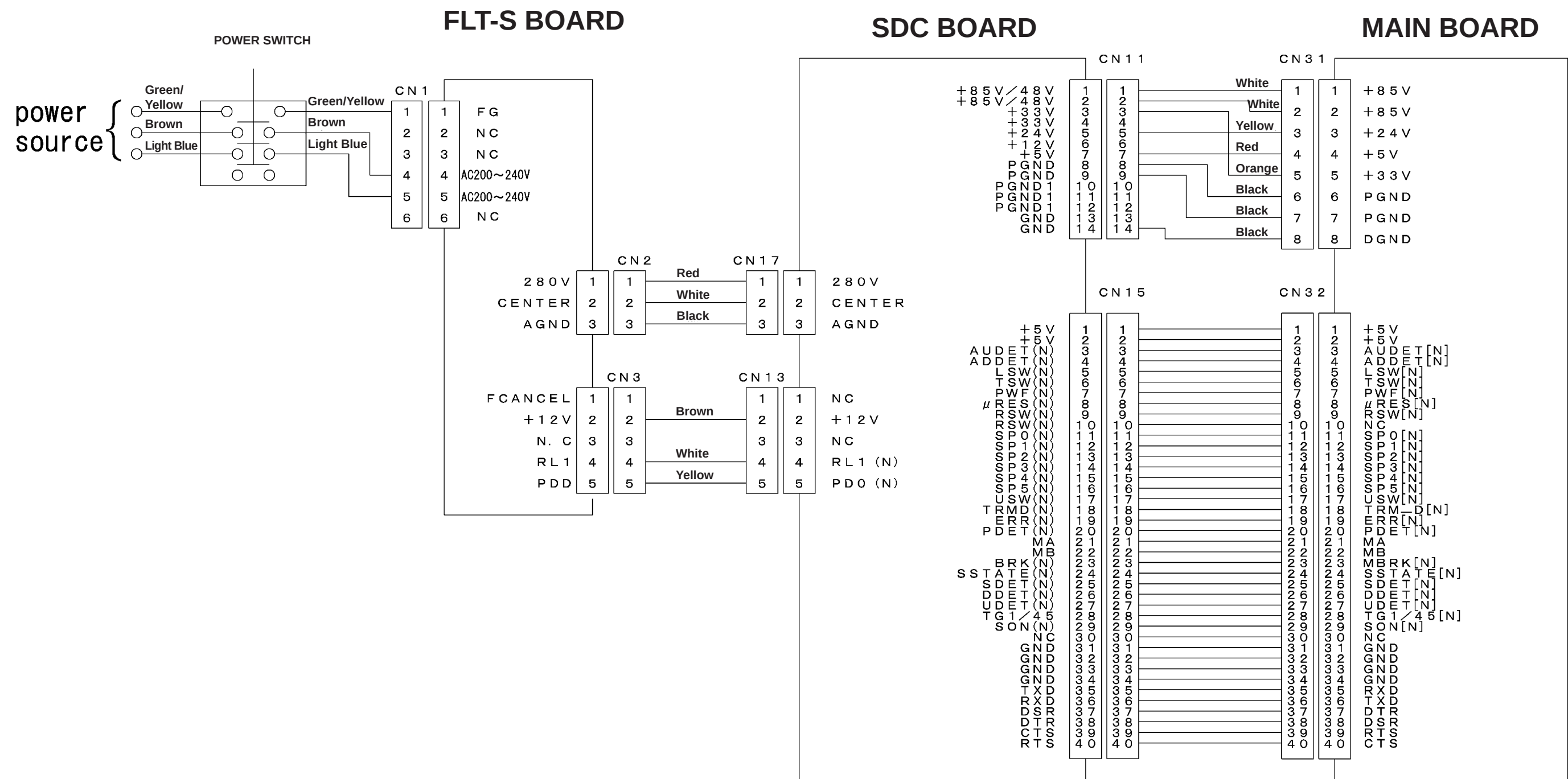
(2) Power supply circuit diagram A



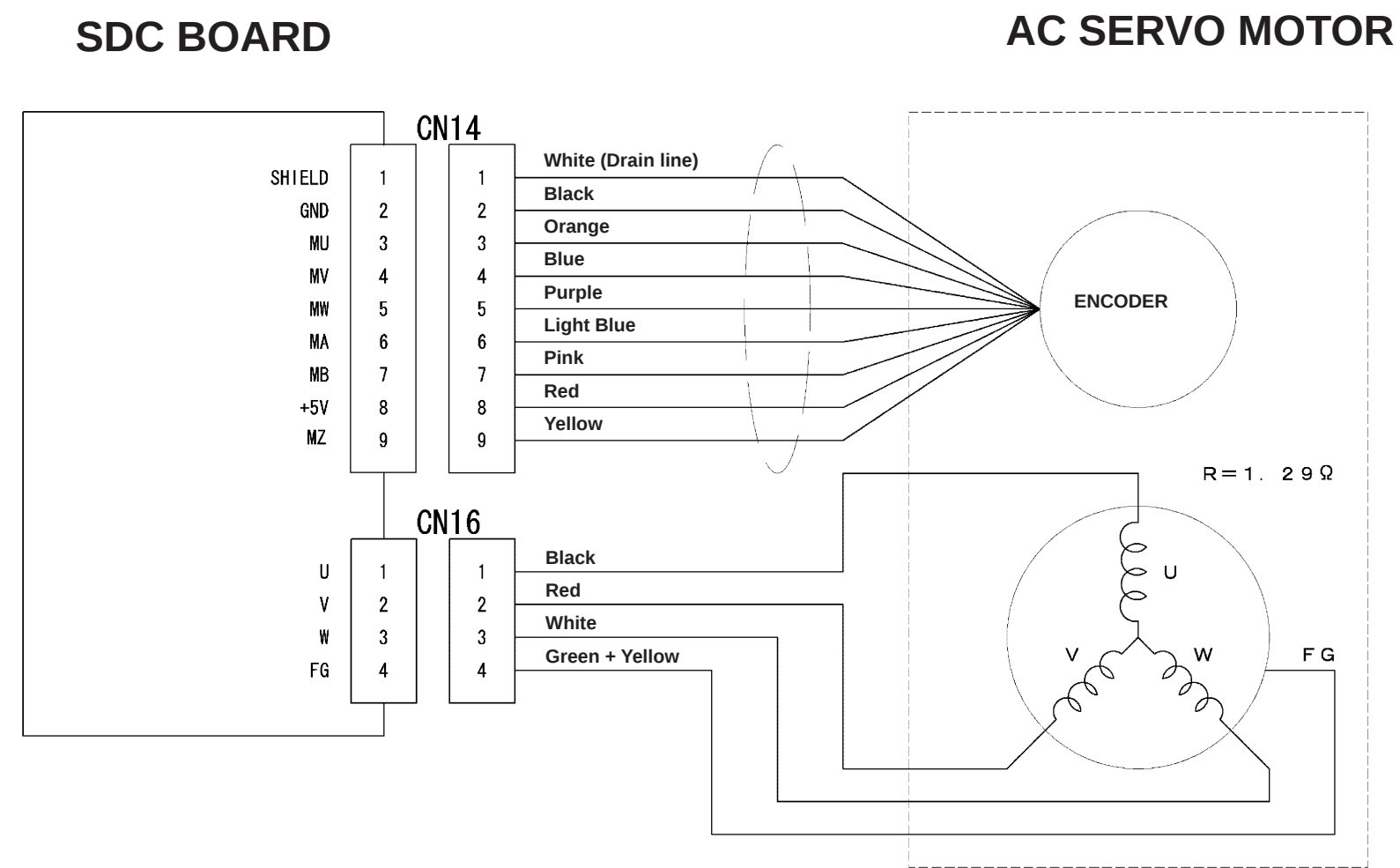
(3) Power supply circuit diagram B



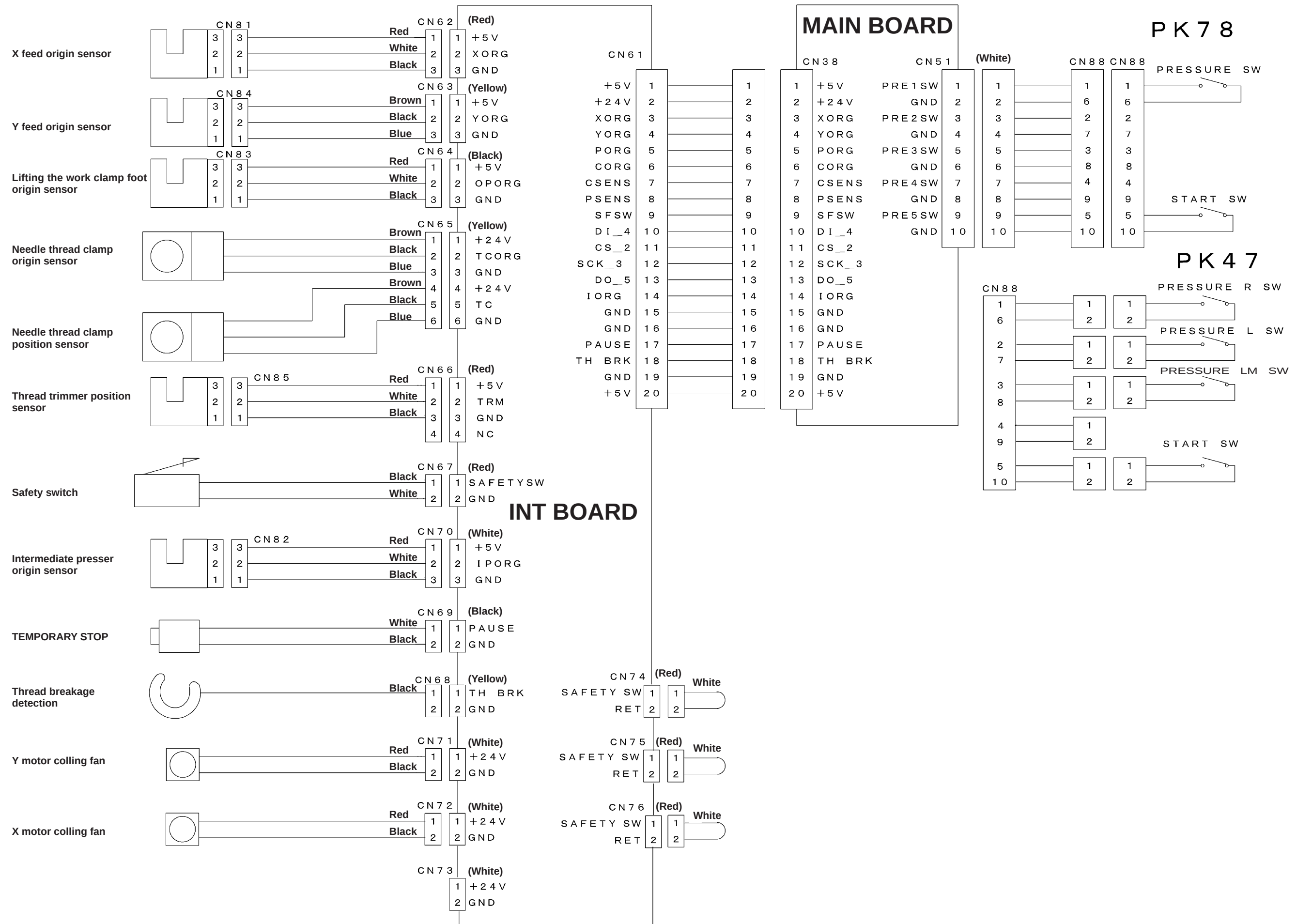
(4) Power supply circuit diagram C



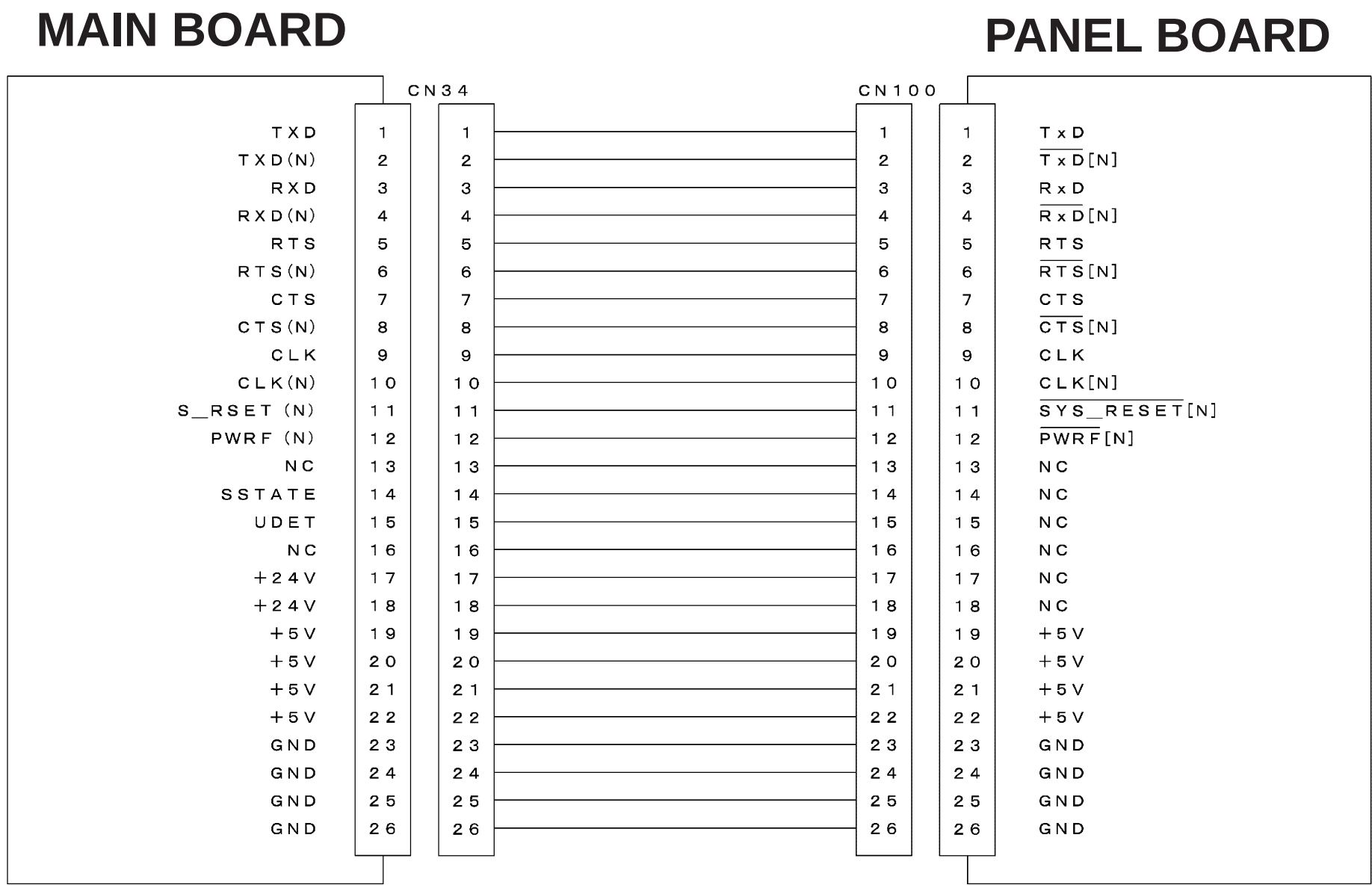
(5) Servo motor circuit diagram



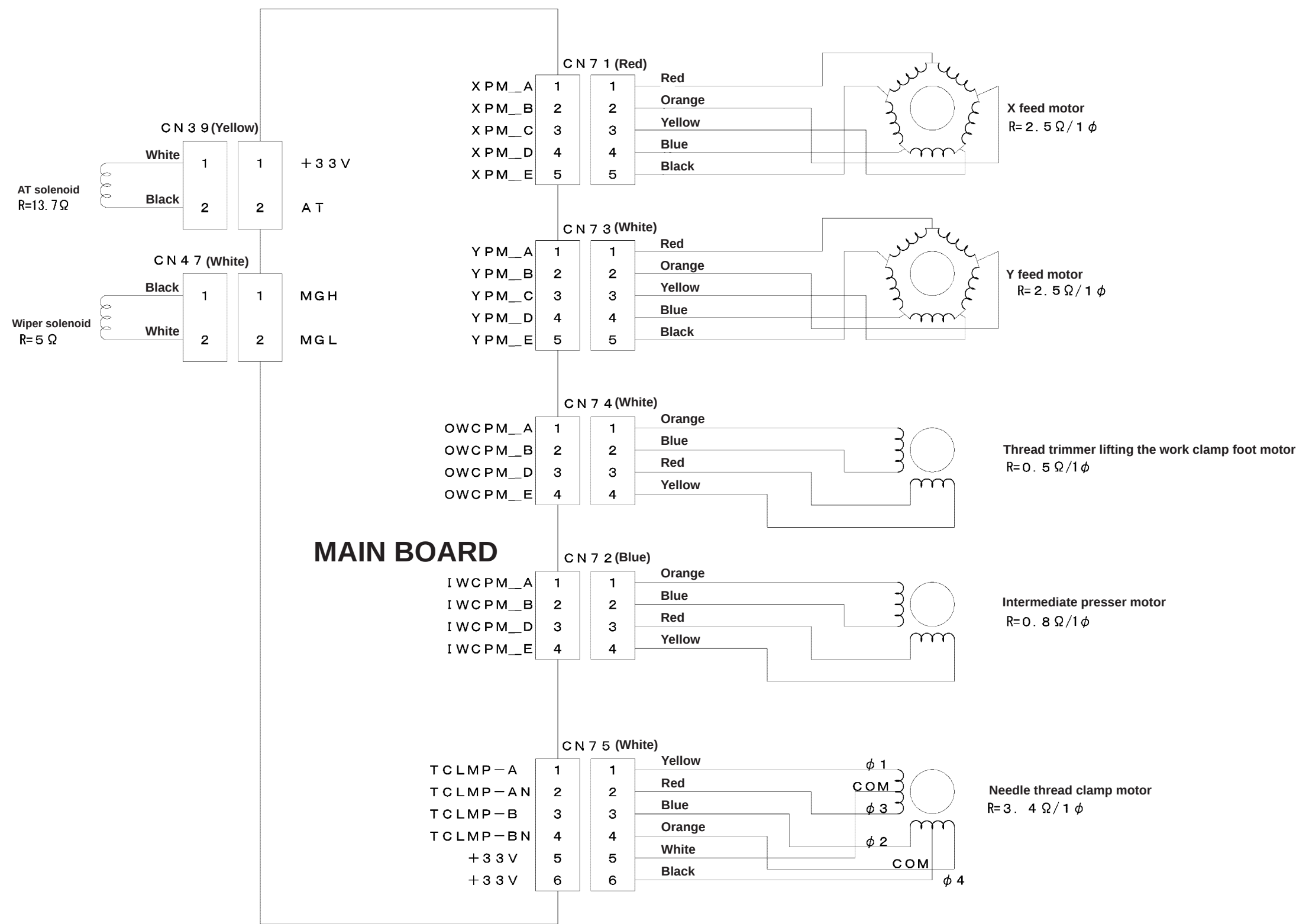
(6) Sensor-pedal circuit diagram



(7) MAIN•PANEL board circuit diagram

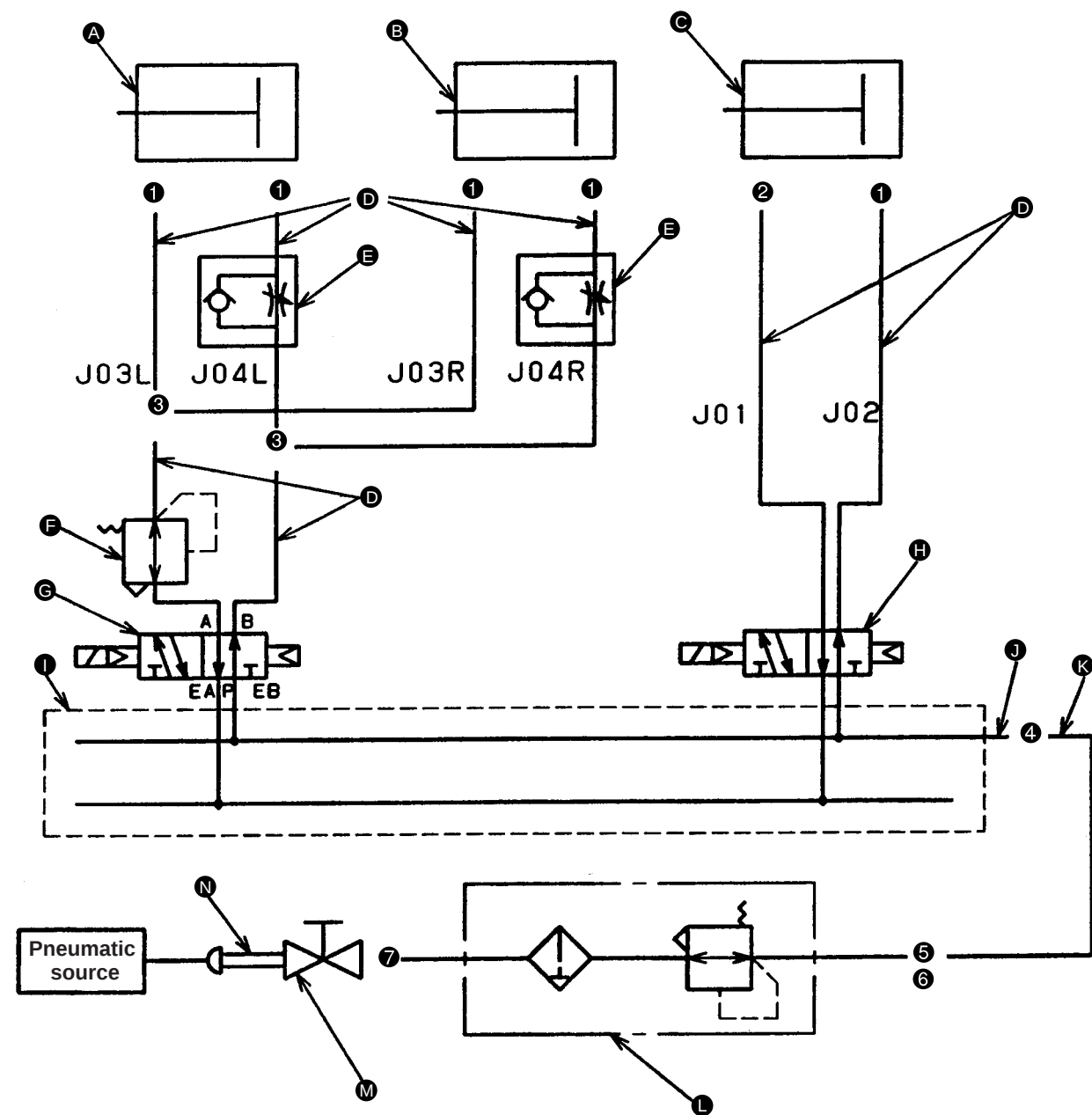


(8) Motor•solenoid circuit diagram



(9) Air system circuit diagram

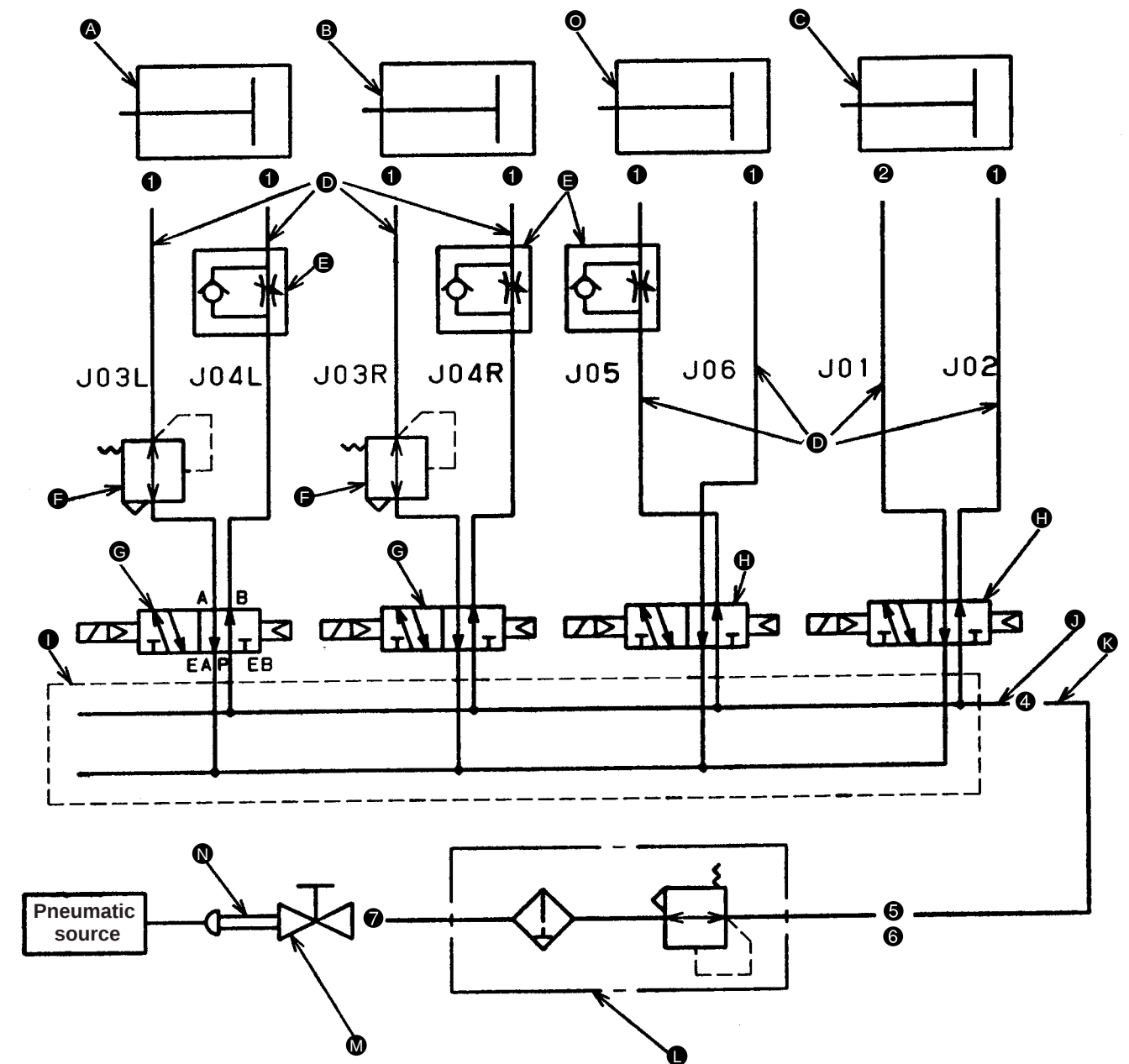
(EHS)



A	Feeding frame cylinder (left)
B	Feeding frame cylinder (right)
C	Intermediate presser lifting cylinder
D	ø 4 Air tube
E	Speed controller (A)
F	Pressure reducer
G	Solenoid valve (A)
H	Solenoid valve (B)
I	Manifold
J	ø 8 Air tube
K	ø 6 Air tube
L	Filter regulator
M	Air cock

N	One-touch joint socket
	One-touch joint plug
1	Hose elbow
2	Speed controller (B)
3	Y-shaped joint
4	Joint
5	T type tee
6	Plug
7	Barrel nipple

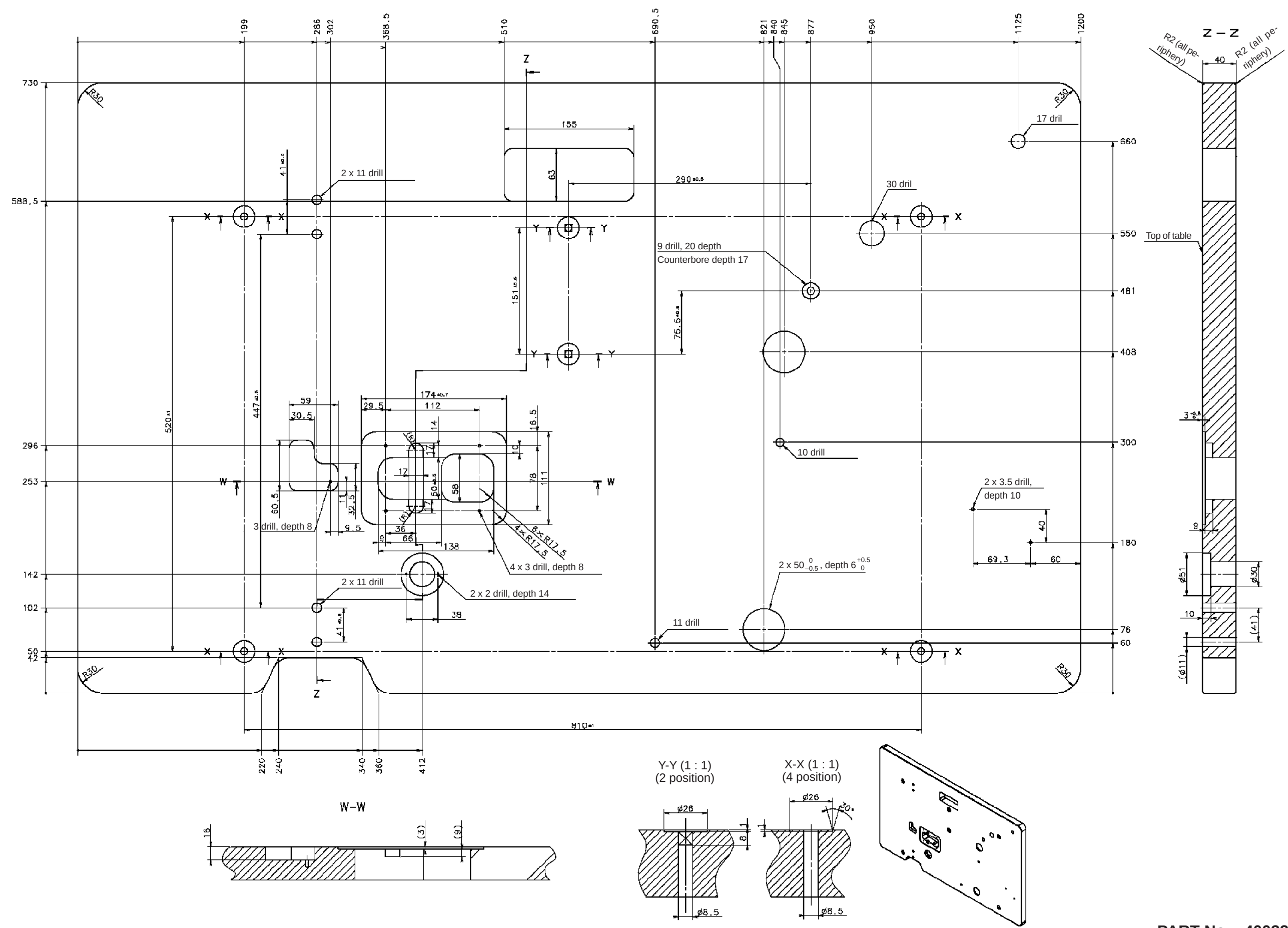
(ESL, EHL)



A	Feeding frame cylinder (left)
B	Feeding frame cylinder (right)
C	Intermediate presser lifting cylinder
D	ø 4 Air tube
E	Speed controller (A)
F	Pressure reducer
G	Solenoid valve (A)
H	Solenoid valve (B)
I	Manifold
J	ø 8 Air tube
K	ø 6 Air tube
L	Filter regulator
M	Air cock

N	One-touch joint socket
	One-touch joint plug
O	2-step stroke cylinder
1	Hose elbow
2	Speed controller (B)
4	Joint
5	T type tee
6	Plug
7	Barrel nipple

15. Drawing of the table



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②the conservation of the energy and resources, and the recycling, in the research, development, design, distribution, sale and maintenance service of the industrial sewing machines, household sewing machines and industrial-use robots, etc. and in the sale and maintenance service of data entry system and in the purchase, distribution and sale of the household commodities including the healthcare products.

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