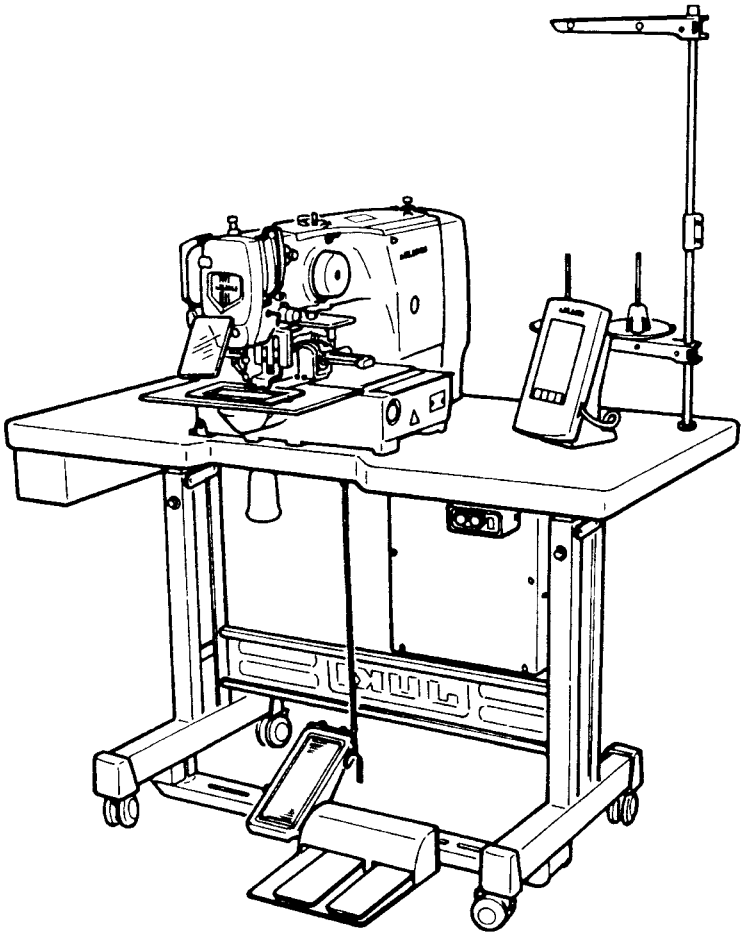
JUKI®

Computer-controlled, Cycle Machine
With Input Function

AMS-210E Series

ENGINEER'S MANUAL



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No.E369-02

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 derail. 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 “Hoe to adjust” are described.

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1. Specifications

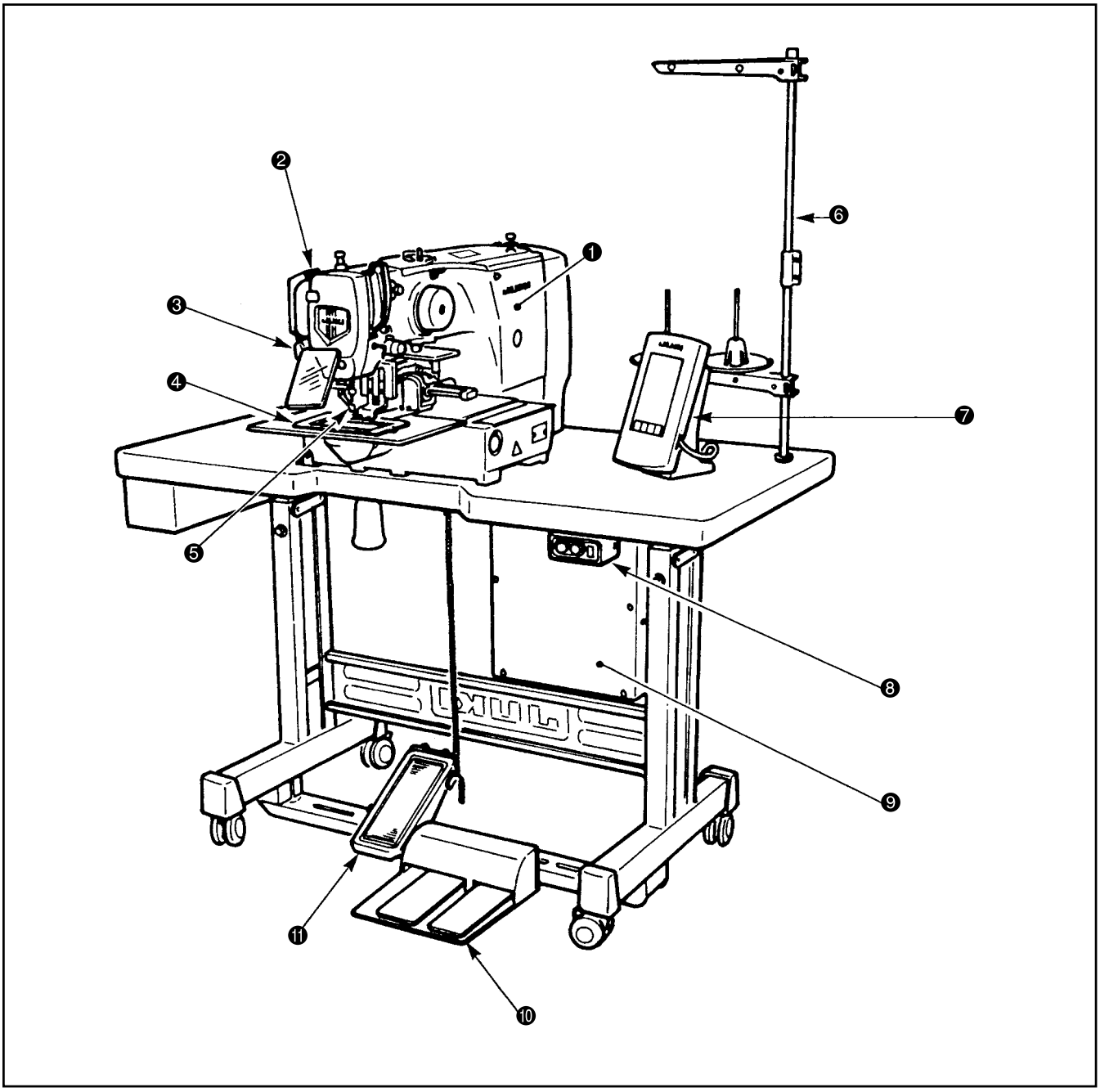
No.	Model name / Item	Application									
		AMS-210EHS	AMS-210ESS	AMS-210EHL	AMS-210ESL	AMS-210EHL	AMS-210ESL	AMS-210EHL	AMS-210ESL	AMS-210EHL	AMS-210ESL
	Sub-class	1306				1510		2206		2210	
1	Sewing area	X-Direction (right, left) 130mm; Y-Direction (forward, backward) 60mm				X-Direction (right, left) 150mm; Y-Direction (forward, backward) 100mm		X-Direction (right, left) 220mm; Y-Direction (forward, backward) 60mm		X-Direction (right, left) 220mm; Y-Direction (forward, backward) 100mm	
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	S type: DP x 5 # 14, H type: DP x 17 # 18									
7	Method to lift feeding frame	Pulse motor		Air							
8	Feeding frame shape	Right and left united		Right and left separated		Right and left united					
9	Lift of feeding frame	Standard 25mm, Max. 30mm		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	H type	S type	H type	S type	H type	S type	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, Smart media • EEP-ROM : Max. 200 patterns (Max. 20,000 stitches/pattern) • Smart media : Max. 999 patterns (Max. 50,000 stitches/pattern)									
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. Scale : 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. (Only increase/decrease of stitch length when pattern button is selected and CP-20 is used)									
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, Smart media : 1 to 999) (CP-20 is the scroll type.)									
25	No. of sheets counter	Up/Down method (0 to 9,999) (IP-400 only)									
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 asewing cycle) can be set in the desired position within the sewing area. The set 2nd origin is also stored in memory. (IP-400 only)									
29	Sewing machine motor	Servomotor 550W									
30	External dimensions	1,200mm (W) x710mm (L) x 1,200mm (H) (Excluding thread stand)				1,200mm (W) x770mm (L) x 1,200mm (H) (Excluding thread stand)		1,200mm (W) x710mm (L) x 1,200mm (H) (Excluding thread stand)		1,200mm (W) x770mm (L) x 1,200mm (H) (Excluding thread stand)	
31	Weight (gross weight)	Machine head : 69kg, Control box : 16.5kg				Machine head : 73kg, Control box : 16.5kg		Machine head : 75kg, Control box : 16.5kg		Machine head : 77kg, Control box : 16.5kg	
32	Power consumption	500VA									
33	Working temperature/humidity	Temperature: 5-35°C, Humidity: 35-85% (no condensation)									
34	Supply voltage/frequency	Rated voltage ±10% 50 / 60Hz									
35	Air pressure used	—		Standard: 0.35 to 0.4MPa, 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

MEMO

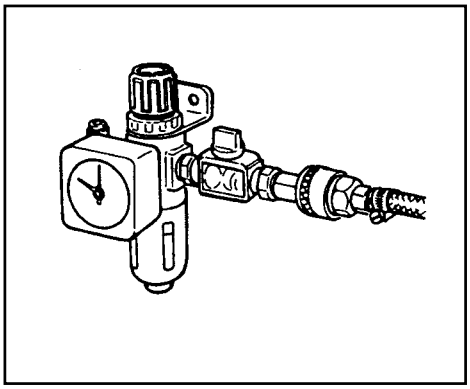
2. Configuration

(1) Names of main unit

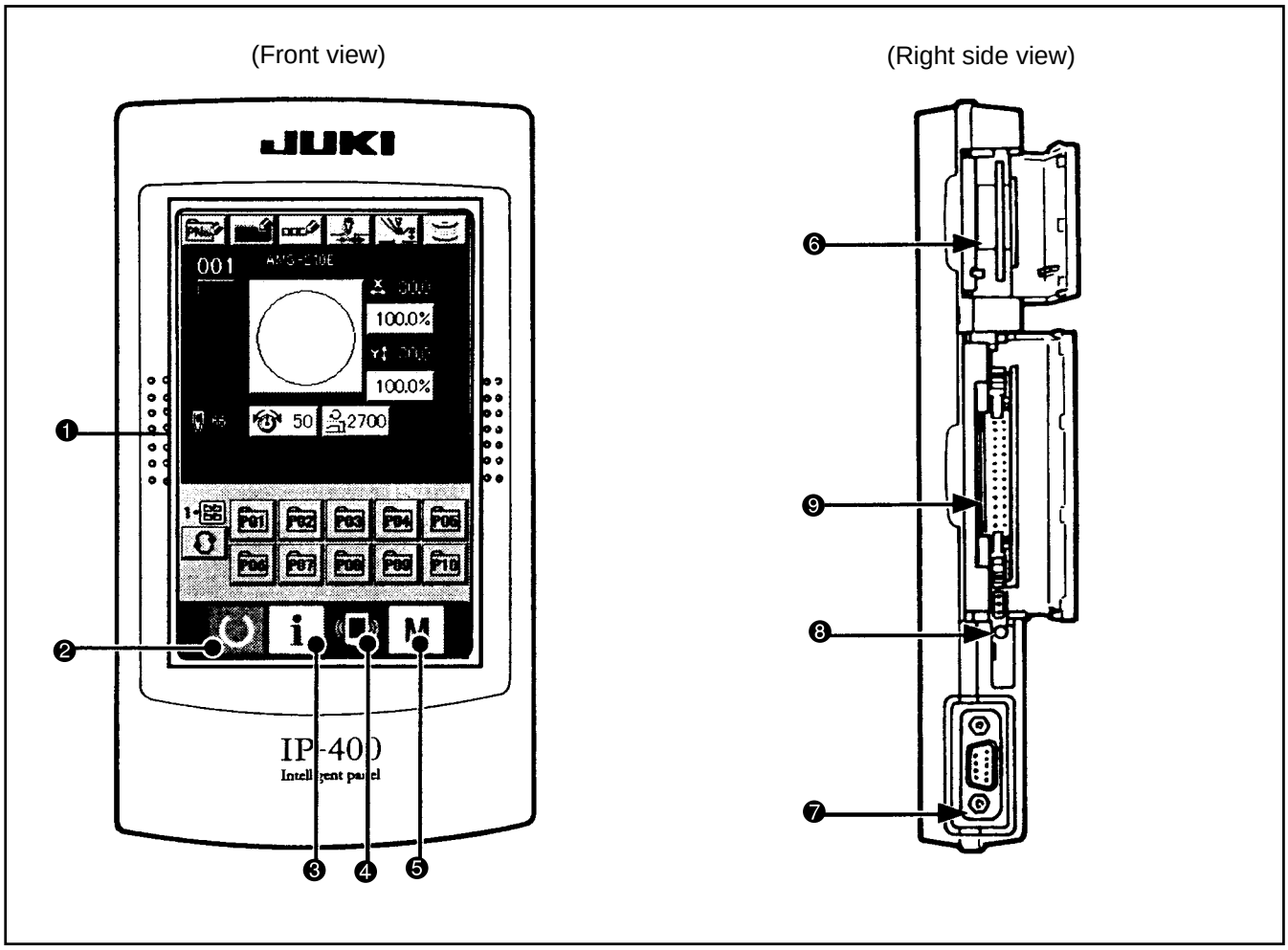


❶ Machine head
❷ Wiper switch
❸ Temporary stop switch
❹ Feeding frame
❺ Intermediate presser
❻ Thread stand
❼ Operation panel (IP-400 or CP-20)
❽ Power switch
❾ Control box
❿ Foot pedal
⓫ Manual pedal (Excluding pneumatic type)

Air regulator
(for pneumatic type only)



(2) IP-400 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.

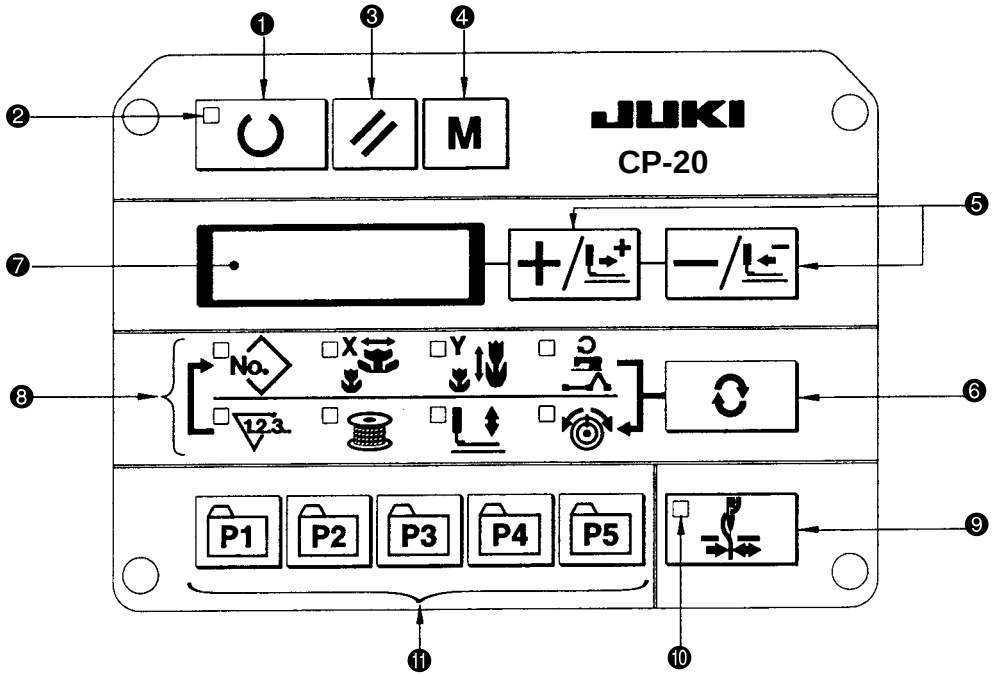
❻ Smart media card slot (Close the cover for use.)

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

(3) CP-20 operation panel



❶ **"Ready" key**
This key changes over the setting state from the panel to the sewing state where the sewing machine actually operates.

❷ **Sewing LED**
This LED goes off at the time of setting state and lights up at the time of sewing state. Changeover can be performed with "Ready" key.

❸ **"Reset" key**
This key is used for canceling error or returning the set value to the initial value.

❹ **"Mode" key**
This key makes the setting mode of the memory switch.

❺ **"+ / Feed forward" key and "- / Feed backward" key**
This key is used for changing pattern No. and X/Y scale, and feed forward/feed backward.

❻ **"Selection" key**
This key selects the item to be set. Item selection LED of the selected item and the set value are displayed.

❼ **Data indication LED**
This LED indicates the set values of the selected items such as pattern No., X/Y scale, etc.

❽ **Item selection LED**
LEDs of the selected items light up.


Pattern No.


X scale


Y scale


Max. speed limitation


Sewing counter


Bobbin winder


Intermediate presser height


Thread tension

❾ **Needle thread clamp ON/OFF key**
This key selects effective/ineffective of needle thread clamp. When it is effective, needle thread clamp disply LED lights up.

❿ **Needle thread clamp display LED**
When this LED lights up, needle threas clamp operaters.

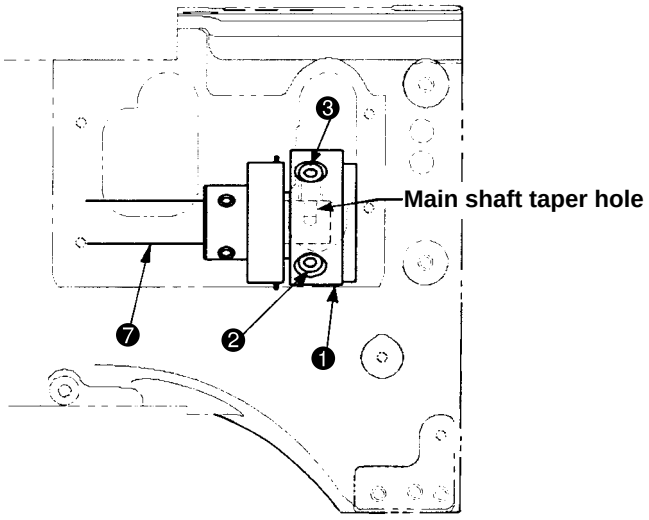
⓫ **Pattern registration key**
This key registers the pattern. When this key is pressed, the pattern registered here can sew immediately.
X/Y scale, sewing position. etc. can be changed and registered.

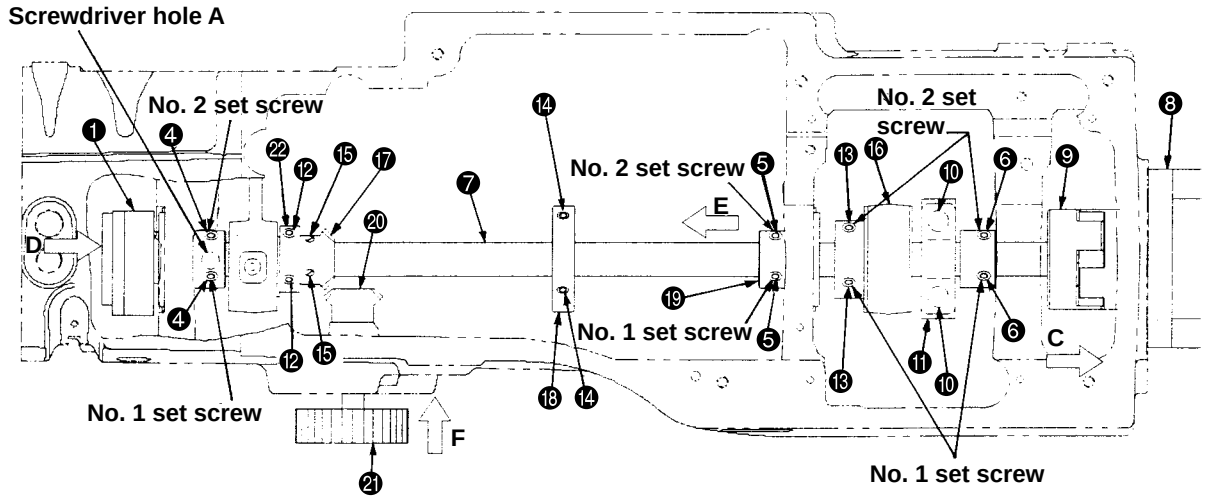
3. Standard adjustment

(1) Main shaft connection/disconnection

Procedures of disassembling

1. Loosen the set screw ❷ securing the main shaft counterbalance ❶, and remove the taper screw ❸.
2. Loosen 2 set screws ❹ (through the screwdriver hole A), 2 set screws ❺, and 2 set screws ❻.
   On this occasion, loosen No. 2 set screw first, and completely remove No. 1 set screw from the flat part of the main shaft ❼.
3. Remove the main shaft motor ❽.
   Refer to “3.-(2) Removal of the main shaft motor and coupling”.
4. Loosen 2 set screws ❿.
   On this occasion, be aware that the balancer ⓫ may rotate due to loosened set screws ❿.
5. Loosen 2 set screws ⓬.
6. Loosen 2 set screws ⓭.
   On this occasion, completely remove No. 1 set screw of the set screws ⓭ from the flat part of the main shaft ❼.
7. Loosen 2 set screws ⓮ and 2 set screws ⓯.
8. Pull out the main shaft ❼ in the direction of Arrow C.





Procedures of assembling

1. Insert the main shaft ❼ into the crank rod ⓰, balancer ⓫, hand pulley gear A ⓱, bobbin winding drive wheel ⓲, and main shaft counterbalance ❶ in this order, and mount this assembly on the frame.
2. Tighten the taper screw ❸ into the taper hole of the main shaft ❼, and tighten the set screw ❷ to secure the main shaft counterbalance ❶.
3. Lightly press the main shaft counterbalance ❶ in the direction of Arrow D and the middle metal ⓳ in the direction of Arrow E, and tighten 2 set screws ❺.
   (Tighten No. 1 set screw so that it touches the flat part of the main shaft ❼. Then, tighten No. 2 set screw. Same procedure hereafter)
4. Tighten 2 set screws ❹ and 2 set screws ❻. (Make sure that No. 1 set screw touches the flat part of the main shaft ❼.)
5. Press the hand pulley ㉑ in the direction of Arrow F to engage the hand pulley gear A ⓱ with the hand pulley gear B ⓴, and secure them with 2 set screws ⓯.
6. Mount the main shaft motor ❽ and coupling ❾.
   Refer to “3.-(2) Removal of main shaft motor and coupling”.
7. Secure the eccentric cam of the intermediate presser ㉒ with 2 set screws ⓬. Refer to “3.-(5) Adjustment of intermediate presser cam”.
8. Secure the crank rod ⓰ with 2 set screws ⓭. Refer to “3.-(3) Crank rod connection/disconnection”.
9. Secure the balancer ⓫ with 2 set screws ⓾. Refer to “3.-(4) Crank balancer positioning”.
10. Secure the bobbin winding drive wheel ⓲ with 2 set screws ⓮. Refer to “3.-(34) Adjustment of the bobbin winder driveing wheel poition”.

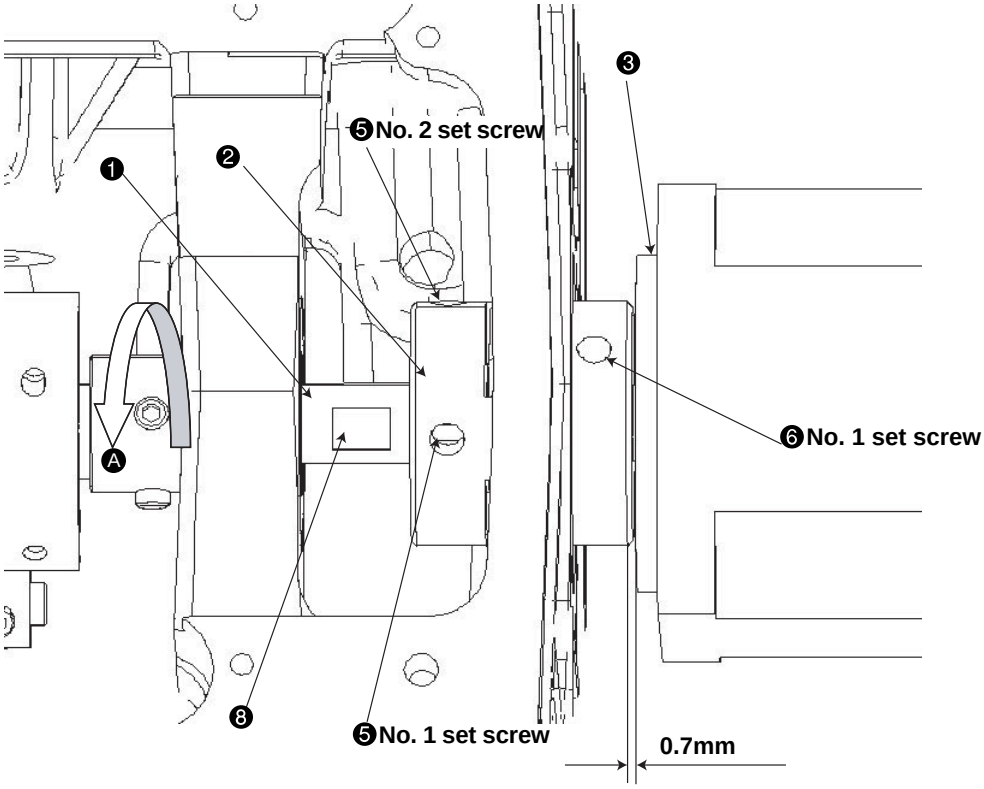
* Make sure that no torque is applied by rotating the main shaft ❼.

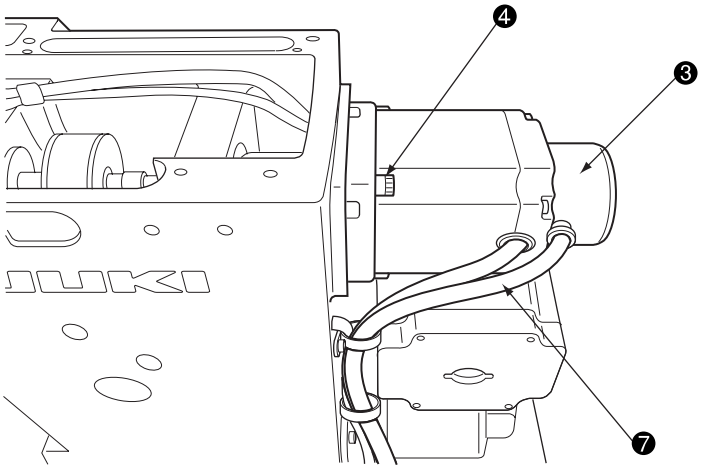
(2) Removal of main shaft motor and coupling

Procedures of disassembling

1. For removal of the main shaft with the coupling,
   Loosen 2 set screws ❺ on the main shaft side of the coupling ❷, and remove 4 set screws ❹ securing the motor.
2. For removal of the coupling ❷ from the main shaft motor ❸, loosen 2 set screws ❻ on the main shaft motor side.

(Caution) The screw (hole) that can be seen first is No. 1 set screw ❻ when the main shaft ❶ is turned in the forward direction Ⓐ. For loosening, loosen No. 2 set screw first, and for tightening, tighten No. 1 set screw ❻ first.





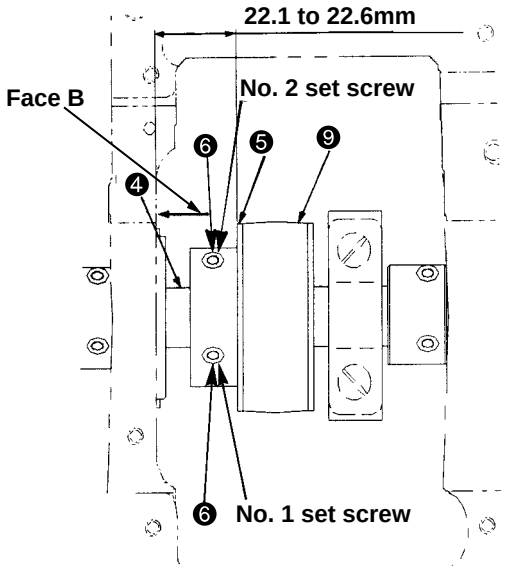
Procedures of assembling

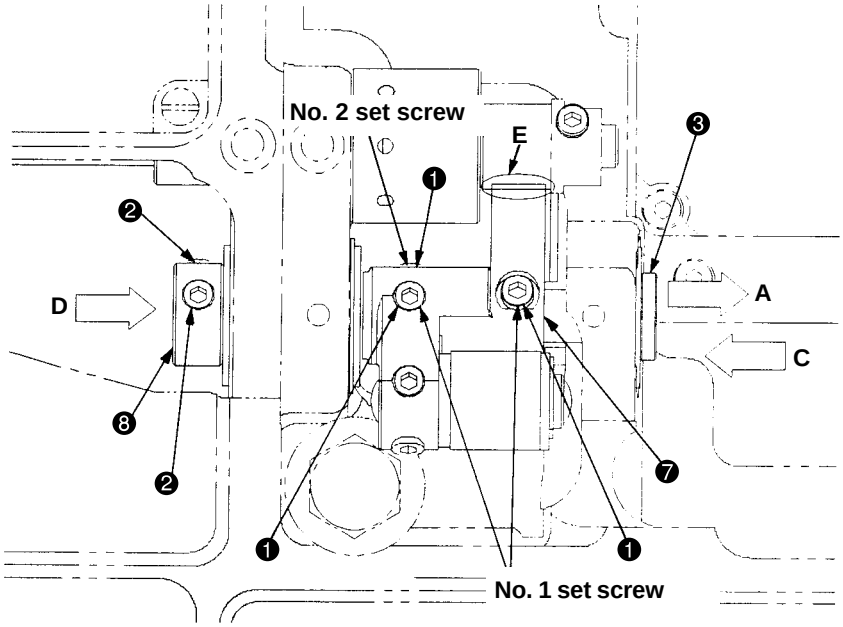
1. For mounting the main shaft motor with the coupling,
   (1) Tighten 4 set screws ❹ that securing the motor, and tighten 2 set screws ❺ on the main shaft side of the coupling ❷.
   (2) The cords ❼ of the main shaft motor ❸ should be positioned in the lateral direction.
2. For connecting the coupling to the main shaft motor,
   (1) Provide a clearance of 0.7 mm between the coupling ❷ and main shaft motor ❸.
   (2) Apply No. 1 set screw ❺ of the coupling ❷ to the flat section ❽ of the main shaft motor ❸, the main shaft ❶ and secure it.
3. For engaging the coupling,
   (1) Position the set screw ❻ (No. 1 set screw) on the main shaft motor side between 2 set screws ❺ on the main shaft side, and engage the coupling.

(3) Crank rod connection/disconnection

Procedures of disassembling

1. Loosen 3 set screws ❶ and 2 set screws ❷. On this occasion, loosen No. 2 set screws first, and completely disengage No. 1 set screws 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.-(1) Main shaft connection/disconnection", and remove the crank rod unit ❾.





Procedures of assembling

1. Mount the main shaft ❹ according to “3.-(1) Main shaft connection/disconnection”, and mount the crank rod unit ❾.
2. Adjust the clearance to 22.1 to 22.6 mm between the under cam ❺ of the crank rod unit ❾ and Face B (middle metal bearing mounting face) of the frame, and secure the cam with the set screw ❻.
   (Apply No. 1 set screw to the flat section of the main shaft ❹ and tighten it first, then tighten No. 2 set screw. Same procedure hereafter)
3. Pass the oscillator ❼ through the oscillator shaft ❸, and mount them on the frame.
4. Pass the thrust collar ❽ through the oscillator shaft ❸. Lightly press the oscillator shaft ❸ in the direction of arrow C and the thrust collar ❽ in the direction of Arrow D, and tighten 2 set screws ❷. Make sure that No. 1 set screw touches the flat section of the oscillator shaft ❸.)
5. Secure the oscillator ❼ according to “3.-(11) Oscillator gear positioning”.

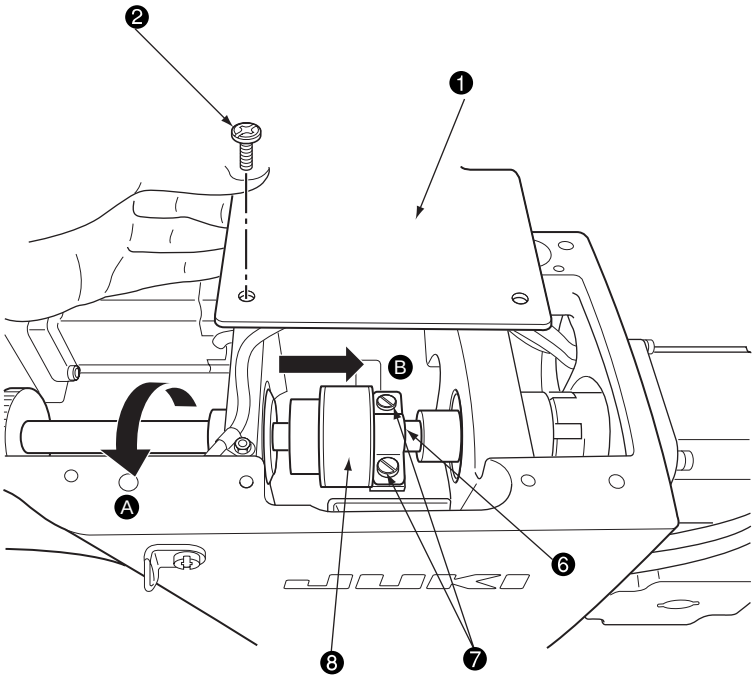
(Caution) 1. Make sure that no torque is applied by rotating the main shaft ❹.
2. When the crank rod unit ❾ is connected, disconnected, or positioned, or the oscillator ❼ is positioned, be sure to grease two specified positions and the gear section (E) of the oscillator ❼.
3. After positioning the crank rod unit ❾ (under cam ❺), be sure to perform “3.-(11) Oscillator gear positioning”. Wrong positioning of the under cam ❺ or oscillator ❼ may cause frictional wear or lock-up.

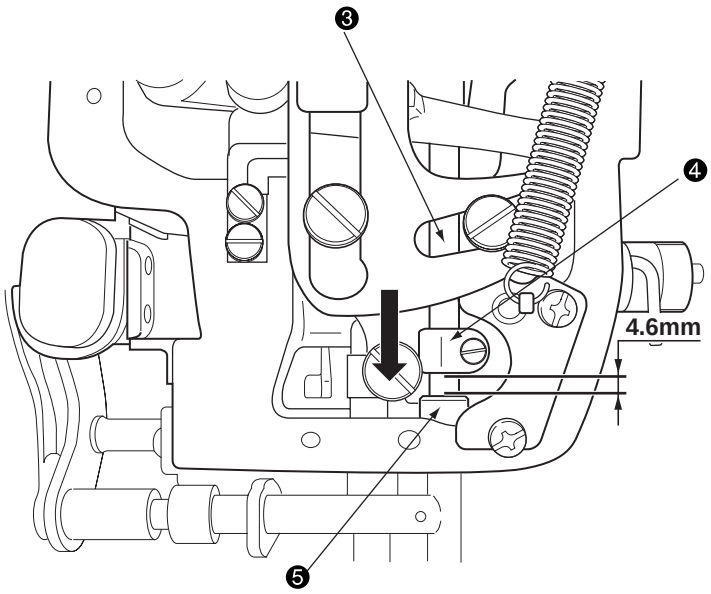
(4) Crank balancer positioning

Standard Adjustment

[Rotating direction]
When the needle bar ❸ lowers and the clearance between the needle bar connecting ❹ and needle bar lower bushing ❺ is 4.6 mm, 2 set screws ❼ of the crank balancer ❻ becomes horizontal position.

[Axial direction]
Bring the main shaft eccentric cam ❽ into contact with the crank balancer ❻.

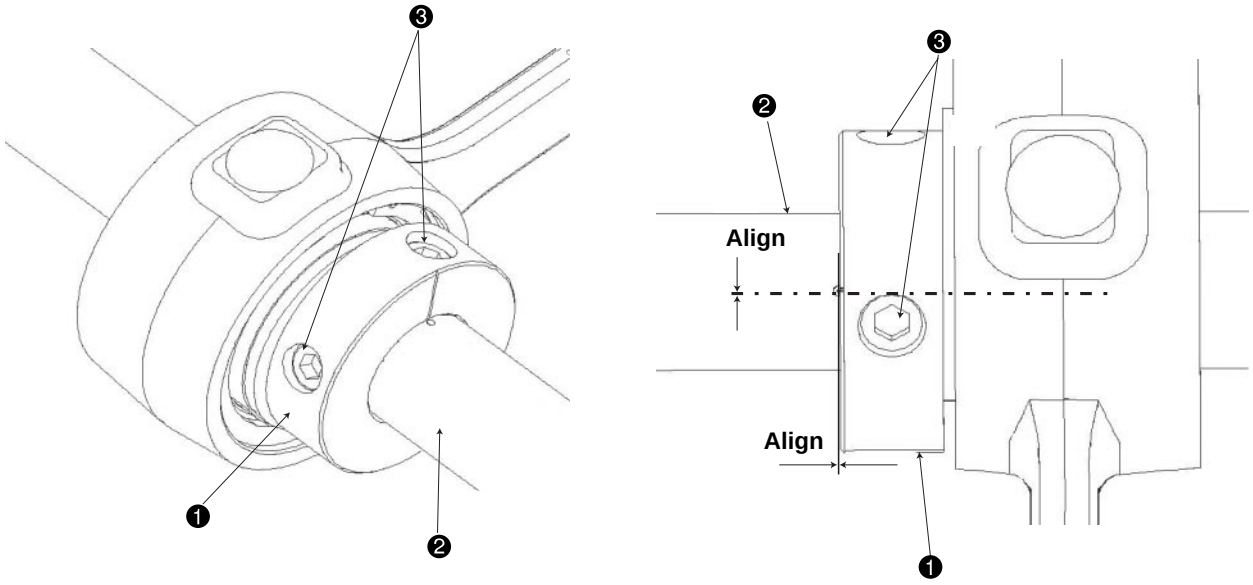




Adjustment Procedures	Results of Improper Adjustment
If the main shaft eccentric cam ❽ is not secured, the main shaft eccentric cam ❽ should be positioned first. 1. Loosen 2 set screws ❼ securing the crank balancer ❻. 2. Remove 4 set screws ❷, then remove the crank rod cover ❶. 3. Turn the main shaft in the forward direction Ⓐ so that the needle bar ❸ lowers and the clearance between the needle bar connecting ❹ and needle bar lower bushing ❺ is 4.6 mm. 4. Secure the crank balancer ❻ with 2 set screws ❼ under the conditions that 2 set screws ❼ securing the balancer ❻ are horizontally positioned and the balancer ❻ is moved in the direction of Arrow Ⓑ to make it into contact with the main shaft eccentric cam ❽. For tightening 2 set screws ❼, tighten them alternately.	o If the mounting angle of the crank balancer ❻ 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. o If the crank balancer ❻ is not moved in the direction of Arrow Ⓑ, it may interfere with the sewing machine frame.

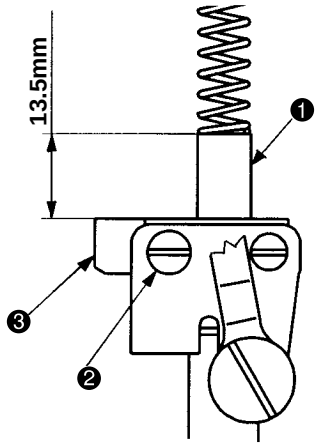
(5) Adjustment of intermediate presser cam

Standard Adjustment



(6) Adjustment of intermediate presser bar

Standard Adjustment



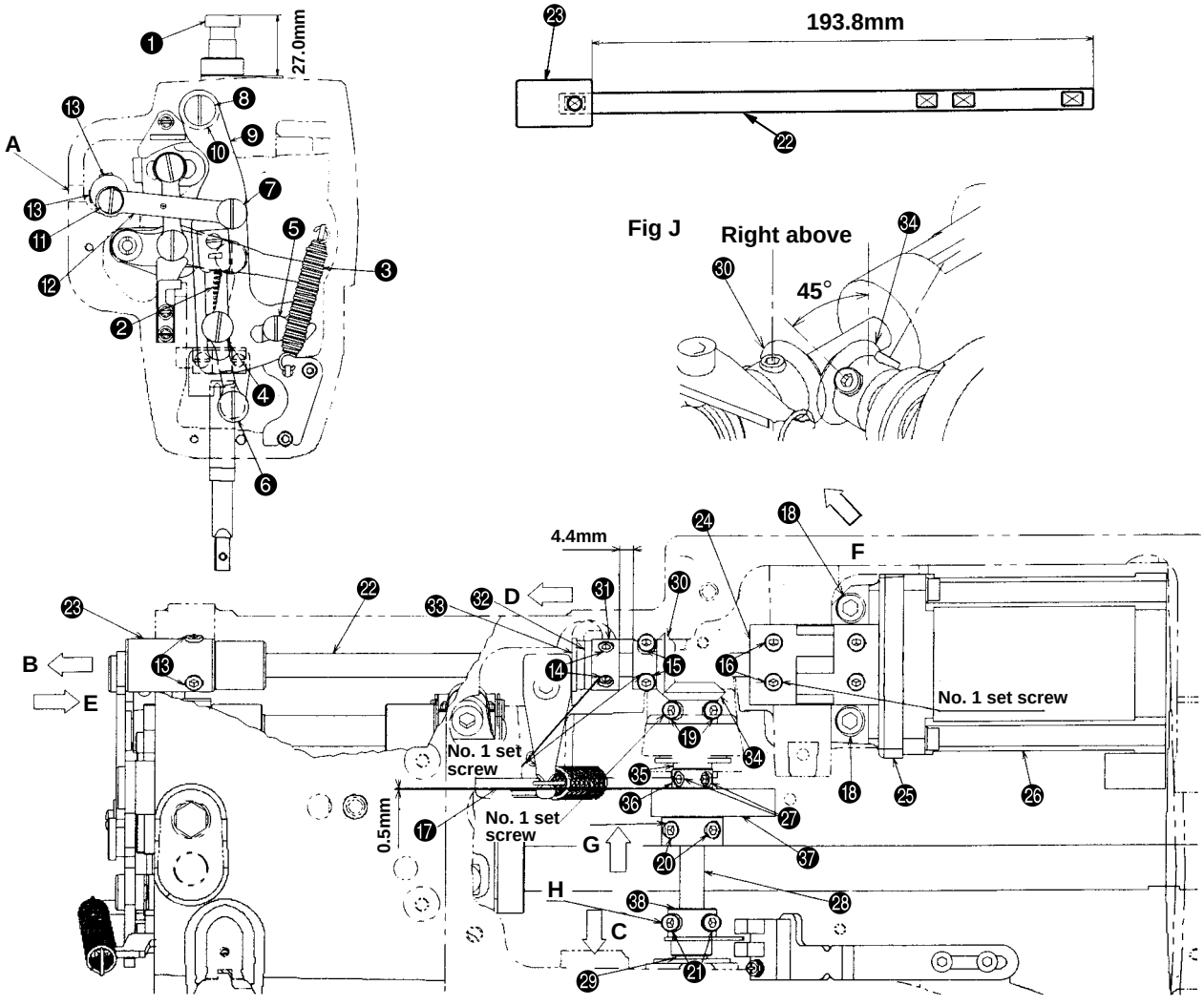
Adjustment Procedures	Results of Improper Adjustment
1. Align the edge of the intermediate presser cam ❶ with the center of the engraved point on the main shaft ❷, align the engraved line on the intermediate presser cam ❶ with the engraved point on the main shaft ❷, and tighten the set screw ❸.	o Stitch 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 set screw ❷ after ensuring that the needle passes through the center of the intermediate pressure. **(Caution) Be aware that the tightening pressure of the set screw 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.

(7) Intermediate presser variable connection/disconnection

Procedures of disassembling

1. Remove the presser adjusting screw ❶. Then, remove the intermediate presser spring ❷ and the guide shaft.
2. Remove the intermediate presser auxiliary spring ❸.
3. Remove the step screws ❹, ❺, and ❻.
4. Remove the step screw ❼.
5. Remove the step screw ❽, and then the intermediate presser variable plate ❾ and the variable plate spacer ❿.
6. Remove the step screw ⓫, and then the intermediate presser variable link ⓬.
   (At that time, insert a hexagonal wrench through the arm screw hole A and apply it to the setscrew ⓭ as a means of turn stop for the intermediate presser variable arm ㉘.)
7. Loosen two each of the setscrews ⓮, ⓯, and ⓰.
   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 ㉜.
8. After the intermediate presser variable arm ㉘ and the intermediate presser variable shaft ㉒ have been pulled out in the direction of the Arrow B, loosen the setscrew ⓭ and pull out the intermediate presser variable shaft ㉒ from the intermediate presser variable arm ㉘.
   At that time, both of the setscrews ⓭ should be separated completely from the flat parts (2 positions) of the intermediate presser variable shaft ㉒.
9. Loosen the two setscrews ⓲ and remove the intermediate presser coupling ㉔, the intermediate presser motor mounting plate ㉕, and the intermediate presser motor ㉖.
10. Loosen two each of the setscrews ⓳, ⓴, ㉑ and ㉗.
    At that time, the second screws of the setscrews ⓳ and ㉙ 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 ㉘.
11. Remove the E ring ㉙ and pull out the intermediate presser lifting shaft ㉘ 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 two setscrews ⑱ so that the length of the shaft section becomes 193.8mm.
   (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 ㉚ 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.)

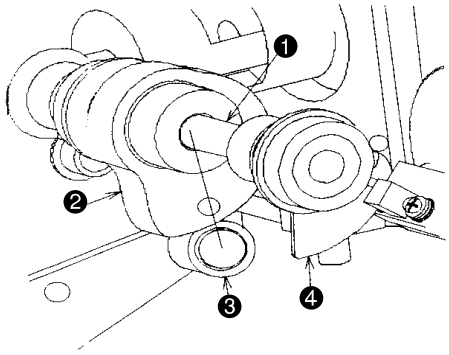
(Caution) If there is rattle in the variable shaft of the intermediate presser ㉒ in the forward and backward directions, this can be a cause of intermediate presser step-out. Be careful when you try to fix the thrust collar ㉛.

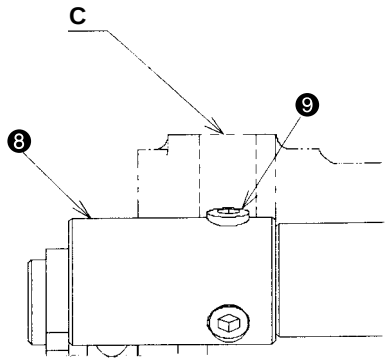
4. Adjust the distance to 4.4mm between the thrust collar ㉛ and the drive bevel gear ㉚. Tighten the first screw of the setscrew ⑮.
   (Tentatively tightened till the completion of intermediate presser sensor adjustments)
5. Fix the intermediate presser motor ㉖ to the intermediate presser motor mounting plate ㉕ and mount the intermediate presser coupling ㉔ on the motor shaft. Since then, press the intermediate presser motor assembly in the direction of the Arrow F and tentatively fix it to the frame by means of the two setscrews ⑱. Adjust the positioning of the intermediate presser motor assembly where the intermediate presser coupling ㉔) can be turned without any resistance, and tighten the two setscrews ⑱.
6. Insert the sensor slit ㊳, intermediate presser lifting cam ㉗, thrust collar ㊱, and the wave washer ㉟ in the intermediate presser lifting shaft ㉘ in this order, and pass this assembly through the frame. Mount the E ring ㉙ on the intermediate presser lifting shaft ㉘.
7. Pressing the intermediate presser lifting shaft ㉘ 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 ㊲ by means of the two setscrews ⑳ so that the clearance becomes 0.5mm between both end planes of the intermediate presser lifting cam ㊲ and the intermediate presser lifting link ⑰.
9. Turn the intermediate presser variable shaft ㉒ and the intermediate presser lifting shaft ㉘ so that the trailing bevel gear ㉞ and the drive bevel gear ㉚ are positioned as shown in Fig. J. Since then, fix them by means of the two 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 ㊳ in the direction of the Arrow C and turn the setscrew ㉑ so that its H comes in the section toward the setscrew ⑳ of the intermediate presser lifting cam ㊲. Then, fix H of the setscrew ㉑ tentatively.
11. According to adjustments of intermediate presser variable as described in 3-(8), make adjustments of intermediate presser variable and fasten the setscrews of the drive bevel gear ㉚ and the sensor slit ㊳.
12. Using the step screw ⑪, mount the intermediate presser variable link ⑫ on the intermediate presser variable arm ㉓.
13. Using the step screw ❽, mount the intermediate presser variable plate ❾ and the variable plate spacer ❿.
14. Mount the step screws ❹, ❺, and ❻.
15. Using the step screw ❼, mount the intermediate presser variable link ⑫ on the intermediate presser variable plate ❾.
16. Mount the intermediate presser auxiliary spring ❸.
17. Mount the intermediate presser spring ❷ and the guide shaft from above the frame. Then, mount the presser adjusting screw ❶.
    (27.0mm from the upper plane of the arm to that of the presser adjusting screw ❶)

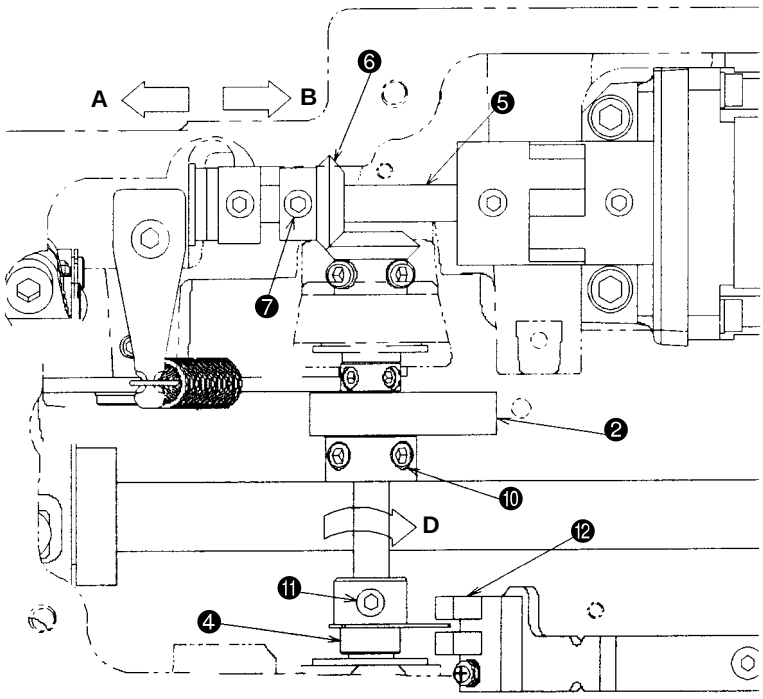
(8) Intermediate presser variable adjustments

Standard Adjustment

Start the Test Mode I10 (IP-400) or CP-8 (CP-20) and press [↻] twice after the completion of origin retrieval. At that time, there shall be coincidence between the center of the arm's left-side hole C and the second screw ❾ of the intermediate presser variable arm ❽.





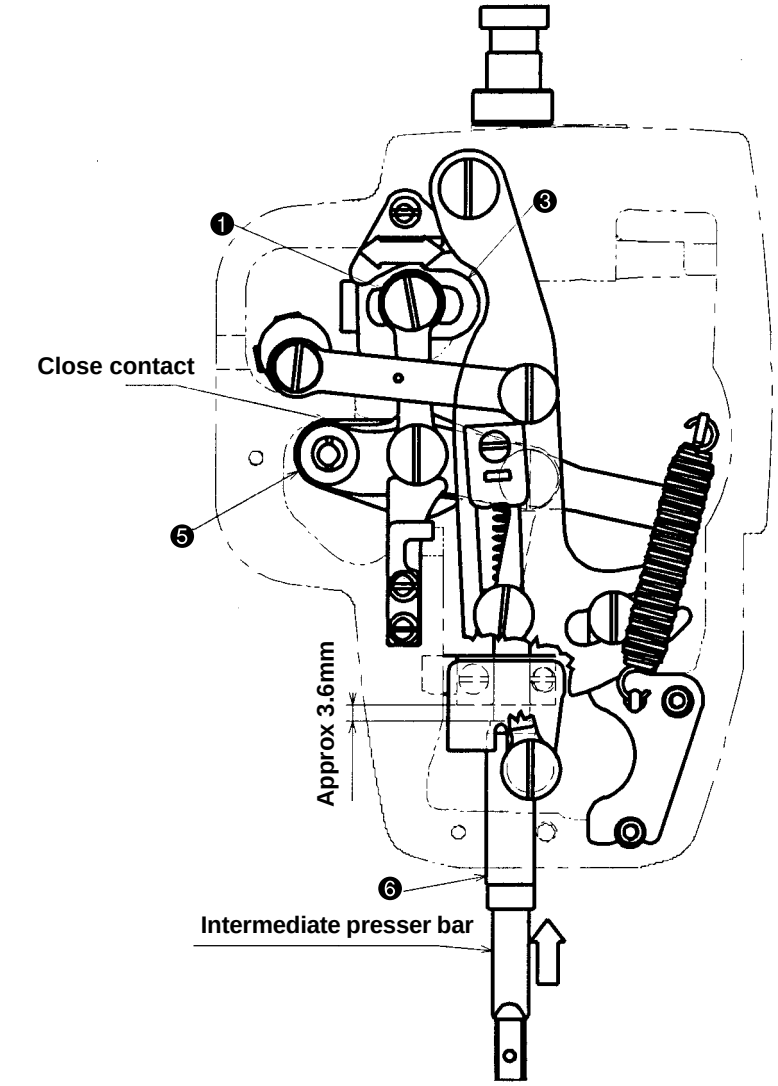


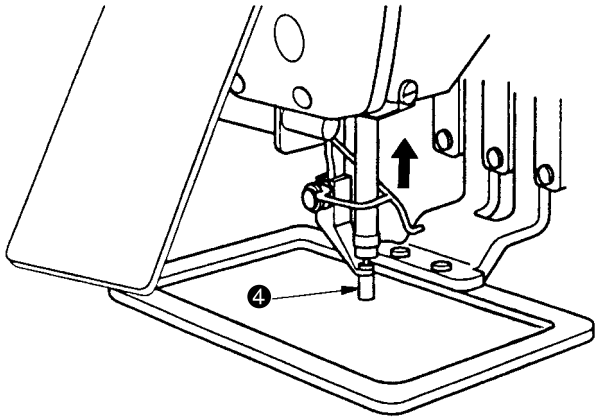
Adjustment Procedures	Results of Improper Adjustment
1. Start the Test Mode I10 (IP-400) or CP-8 (CP-20). 2. Tread on the start pedal for origin retrieval, and make adjustments by turning the sensor slit ❹ so that the lines combining the center of the intermediate presser lifting shaft ❶, the standard hole of the intermediate presser lifting cam ❷, and the center of the cam follower ❸ become almost a straight line. 3. Press [↻] of the panel three times. Loosen the first screw ❼ of the drive bevel gear ❻ of the intermediate presser variable shaft ❺. Take out the drive bevel gear ❻ from the flat part of the intermediate presser variable shaft ❺ and move it in the direction of the Arrow A. 4. Using the [+] key or the [–] key, turn the intermediate presser variable shaft ❺ until the second screw ❾ of the intermediate presser variable arm ❽ 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 ❶ so that the second screw ❿ of the intermediate presser lifting cam ❷ comes just above. Press the drive bevel gear ❻ of the intermediate presser variable shaft ❺ 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 ❾ of the intermediate presser variable arm ❽ 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 ❾ of the intermediate presser variable arm ❽ is not positioned in the center (or lower), loosen the setscrew ⓫ of the sensor slit ❹ and turn this sensor slit ❹ in the direction of the Arrow A for fine adjustments. 8. Make origin retrieval and confirm that the the cam follower ❸ is located in the parallel section of the intermediate presser lifting cam ❷. When the condition has been found normal, fasten the setscrew ❼ of the drive bevel gear ❻ and the setscrew ⓫ of the sensor slit ❹ regularly. **(Caution) For the prevention of the sensor ⓬ from destruction, make origin retrieval after confirming that the slit of the sensor slit ❹ is positioned in the center of the sensor ⓬.**	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 ❸ in the parallel section of the intermediate presser lifting cam ❷ 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 ❻, 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. .

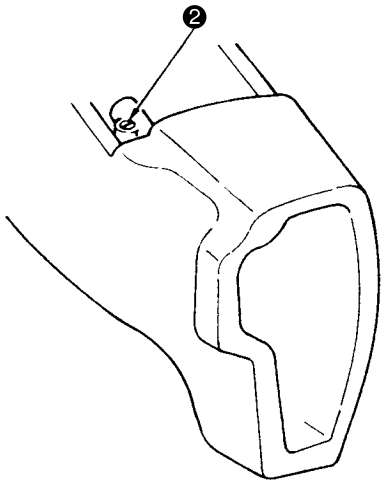
(9) Intermediate presser drive arm

Standard Adjustment

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





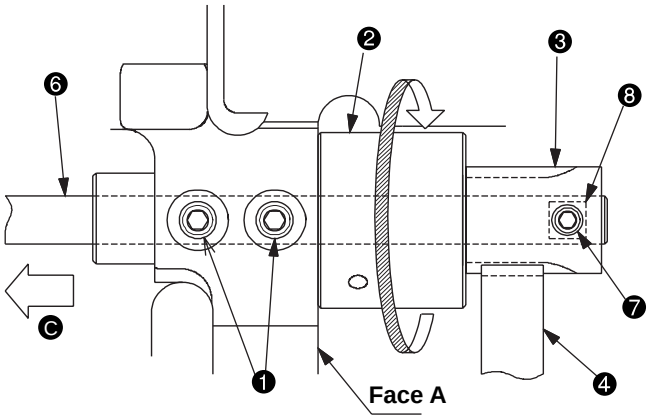


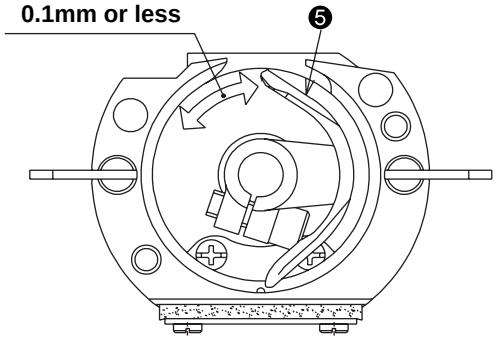
Adjustment Procedures	Results of Improper Adjustment
1. Turn ON the power supply and set the height of the intermediate presser ❹ to 0mm. Turn OFF the power supply in the state that the intermediate presser ❹ has been lowered. 2. Loosen the intermediate presser stroke adjusting screw ❶. 3. Turn the pulley and move the needle bar to the lower dead point. When the intermediate presser ❹ is lifted and the intermediate presser stroke adjusting screw ❶ is moved to the right or left, confirm that the intermediate presser adjusting arm ❸ is positioned not to move vertically and that the intermediate presser positioning link ❺ keeps a close contact with the arm. In this state, tighten the setscrew ❷ 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 ❻.) 4. After the setscrew ❷ has been tightened, confirm that there is no backlash in the intermediate presser adjusting arm ❸ 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 ❻ 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 ❸ 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 ❹ may be changed as a result of intermediate presser stroke adjustments.

(10) Lower shaft backlash adjustment and connection/disconnection

Standard Adjustment

1. Size of lower shaft backlash is 0.1mm at the tip of the driver ❺. The shaft is required to rotate smoothly.
2. Define the stop position of the lower shaft ❻ so that the set screw ❼ settles almost in the center of the flat section ❽ of the lower shaft ❻.

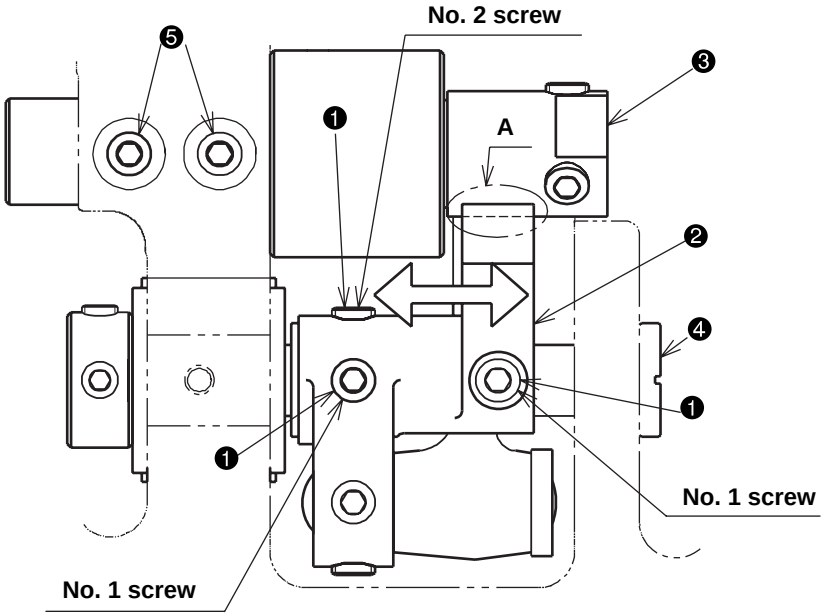




(11) Oscillator gear positioning

Standard Adjustment

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

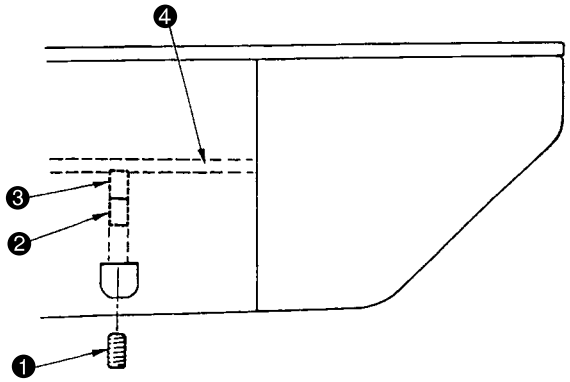


Adjustment Procedures	Results of Improper Adjustment
1. Lower shaft backlash 1) Loosen the two set screws ❶. 2) Turn the lower shaft rear metal ❷ in the direction of the arrow and adjust the backlash, keeping the metal to contact closely with Face A. Size of backlash is 0.1mm at the tip of the driver ❺. The shaft is required to rotate smoothly. 3) Tighten the two set screws ❶. **(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 two set screws ❼. 2) The lower shaft ❻ can be taken out if it is pulled in the direction Ⓒ of the arrow. 3) When mounting the lower shaft ❻, insert it in the lower shaft rear metal ❷ and the lower shaft gear ❸. Apply one of the set screws ❼ to the flat section ❽ of the lower shaft ❻ and tighten it approximately in the center. Tighten the remaining set screw ❼. * Connection and disconnection of the lower shaft ❻ become easy if the above-mentioned backlash has been relieved in advance. In this case, backlash adjustment must be done after the lower shaft ❻ 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 ❸ or the oscillator ❹ 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 ❹ or the crank rod.

Adjustment Procedures	Results of Improper Adjustment
1. Loosen the two set screws ❺ and increase the backlash of the lower shaft gear ❸. **(Caution) 1. If the lower shaft gear ❸ has insufficient backlash, the oscillator ❷ does not swing correctly. In such a case, refer to [(10) Lower shaft backlash adjustment and connection/disconnection] and provide a sufficient backlash.** 2. The three set screws ❶ should have been loosened in advance. In this case, the second screw of the set screws ❶ should be loosened first. Then, the first one can be loosened. 3. Lightly swing the whole body of the oscillator ❷ with a finger in the direction of the arrow. Decide the positioning of the oscillator ❷ so that it stays in the center of swinging. 4. Loosen the three set screws ❶ and then fix them so that the oscillator ❷ is not displaced from the center of swinging. (Tighten the first screw first so that it comes in contact flatly with the oscillator shaft ❹. Then, tighten the second one.) 5. Make backlash adjustment for the lower shaft gear ❸, according to [(10) 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 ❷.** **2. When the crank rod (under-cam) is removed, actions for under-cam positioning must be taken, without fail. Refer to [(3) Crank rod connection/ disconnection].**	o If the position for fixing the oscillator ❷ 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.

(12) Adjustment of hook oil amount

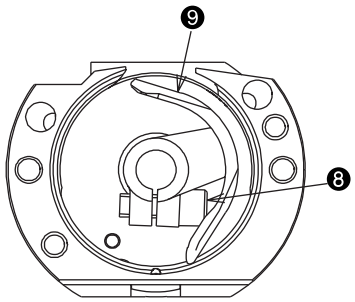
Standard Adjustment

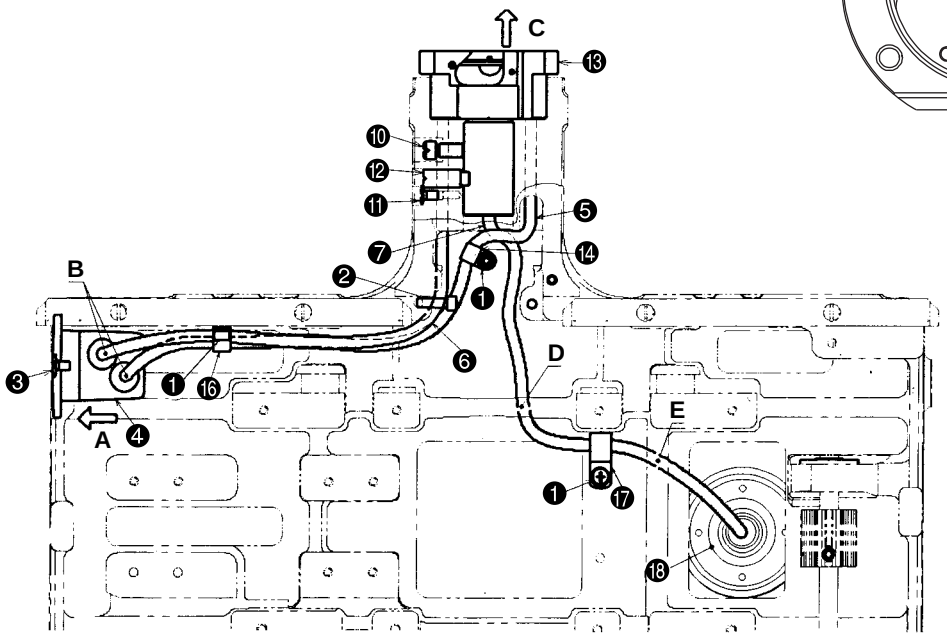


(13) Shuttle connection / disconnection and oil wick piping

Procedures of disassembling

1. Loosen the three set screws ❶.
2. Cut the harness bands ❷.
3. Remove the set screw ❸ and pull the oil tank ❹ in the direction of the arrow A.
4. Pull Part B upwards of the two lubrication pipes ❺ and ❻. Take them out of the oil tank ❹.
5. Release the clamp ⓱ of the oil drain pipe ❼.
6. Loosen the set screw ❽ and take out the driver ❾.
7. Loosen the set screw ❿.
8. Remove the set screw ⓫ and pull out the shuttle race adjust shaft ⓬.
9. Pull the shuttle ⓭ in the direction of the arrow C and take it out.





Adjustment Procedures	Results of Improper Adjustment
1. Loosen the set screw 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 set screw 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 then 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.

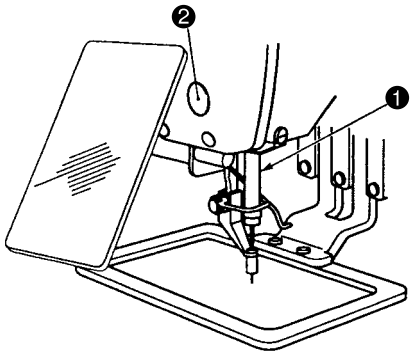
Procedures of assembling

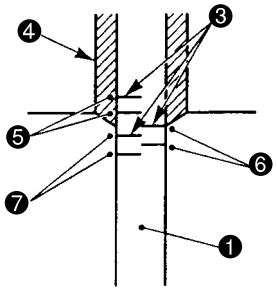
1. Pass the two lubrication pipes ❺ and ❻ and the oil drain pipe ❼ through the frame, and mount the shuttle ⓲.
2. Pass the lubrication pipe ❺ along the upper side of the oil drain pipe ❼. Hold the lubrication pipe ❺ with the pipe holder ⓮ and fix it with the set screw ❶.
   At that time, make sure not to let the lubrication pipe ❺ and the oil drain pipe ❼ come in contact with the thread cutter connector rod and the lower shaft.
3. Fix the lubrication pipe ❻ to the bed by means of the harness band ❷.
4. Fix the two lubrication pipes ❺ and ❻ with the cord clamps ⓰ and the set screws 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.
5. Insert the two lubrication pipes ❺ and ❻ in the oil tank ❹ and fix this oil tank ❹ to the frame with the set screws ❸.
6. Fix the needle thread clamp sensor cord and the oil drain pipe ❼ with the cord clamp ⓱.
   At that time, pass the oil drain pipe through the head holes in two positions D and E.
7. Insert the oil drain pipe ❼ in the oil reservoir ⓲.
8. Fix the shuttle ⓲ and mount the driver ❾ with the set screw ❽. Refer to [(15) Hook adjustment].

* Harness bands ❷ : Part No. EA9500B0100

(14) Adjusting the height of the needle bar

Standard Adjustment





❺ : **Marker line for DP x 5**

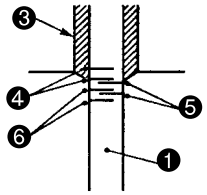
❻ : **Marker line for DP x 17**
(with needle count higher than #22)

❼ : **Marker line for DP x 17**
(with needle count lower than #22)

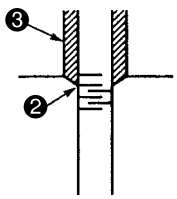
Adjustment Procedures	Results of Improper Adjustment
*** Turn ON the power once, and turn OFF the power again after making the intermediate presser in the lowered state.** 1. Bring the needle bar ❶ down to the lowest position, loosen the needle bar connection screw ❷ and align the upper engraved line 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.**	

(15) Hook adjustment

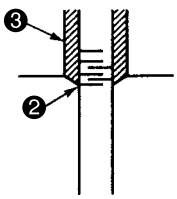
Standard Adjustment



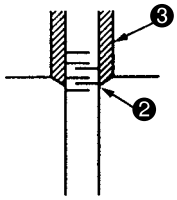
❹: Marker line for DP x 5 needle
❺: Marker line for DP x 17 needle (with needle count higher than #22)
❻: Marker line for DP x 17 needle (with needle count lower than #22)



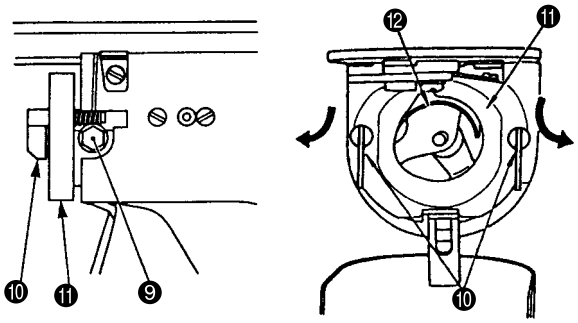
When a DP x 5 needle is used

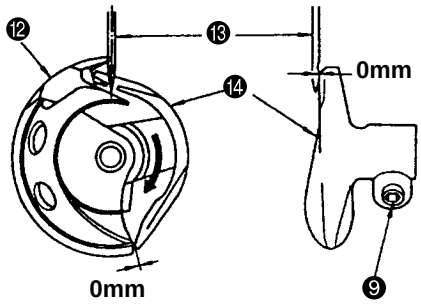


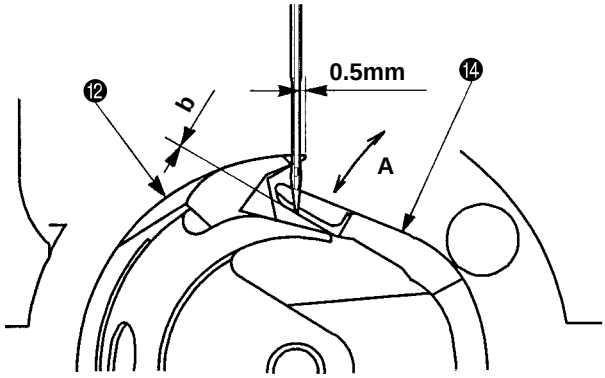
DP x 17 needle (of which needle count is lower than #22) is used.

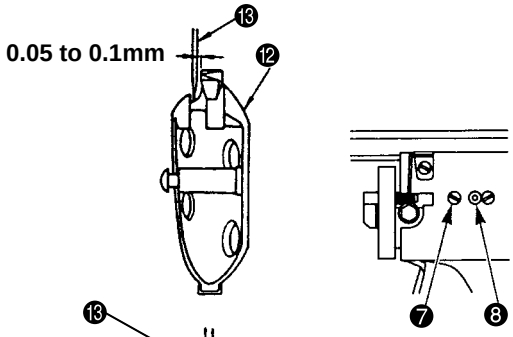


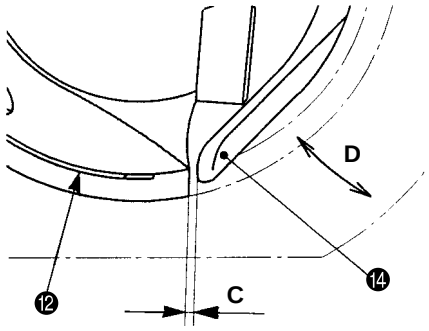
DP x 17 needle (of which needle count is higher than #22) is used.

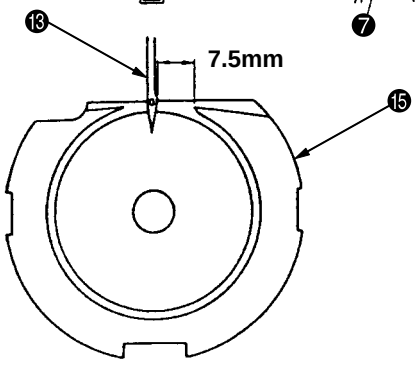










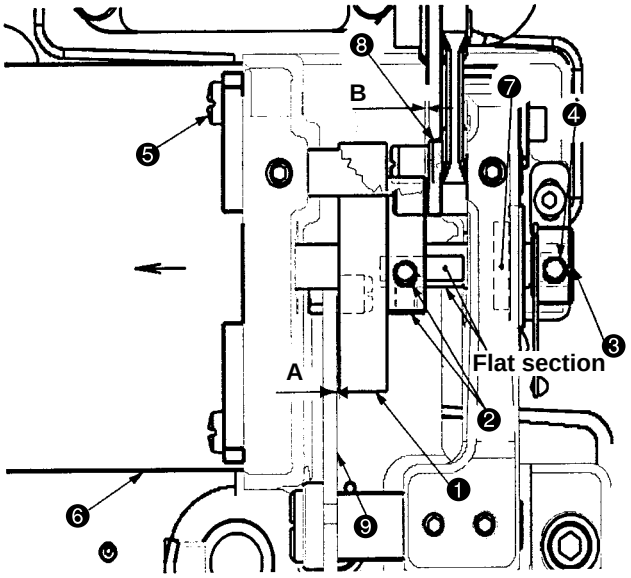


Adjustment Procedures	Results of Improper Adjustment
*** Turn ON the power once, and turn OFF the power again after making the intermediate presser in the lowered state.** 1. Turn hand wheel by hand to ascend the needle bar ❶. Adjust so that lower marker line ❷ on the ascending needle bar aligns with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

(16) Thread trimmer presser lifter cam connection/disconnection

Procedures of disassembling

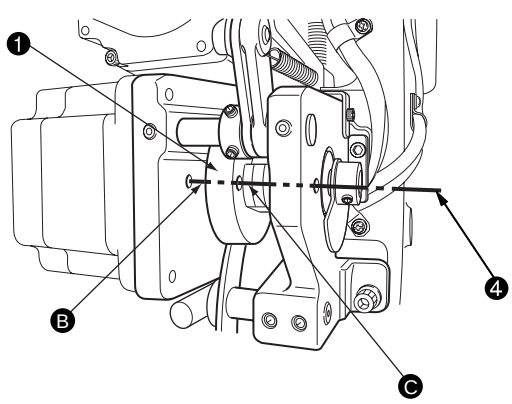
1. Loosen 2 set screws ❷ securing the presser lifter and thread trimmer cam (hereafter called “cam”)❶.
2. Loosen the two set screws ❹ and remove the sensor slit ❸.
3. Remove the four set screws ❺ and take out the presser lifting motor ❻ in the direction of the arrow. In some cases, the bearing ❼ and 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 ❼.
   At that time, the cam ❶ may come down. Handle it with care, not to damage it.

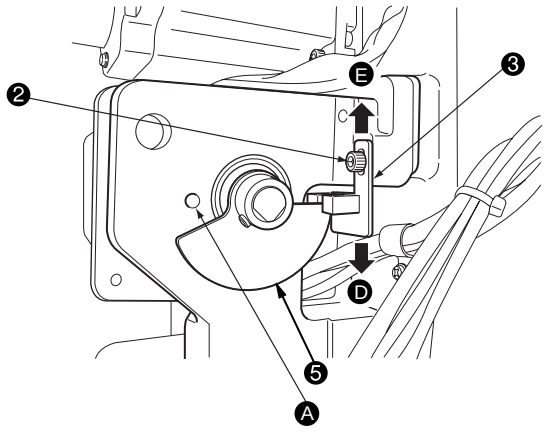


(17) Thread trimmer and presser origin sensor adjustment

Standard Adjustment

When origin retrieval (at start switch on) is conducted in the test mode I07 (IP-400) or CP-6 (CP-20), the standard holes of the sewing machine frame (Ⓐ and Ⓑ) are aligned with the standard hole Ⓒ of the thread trimmer and presser lifter cam ❶.





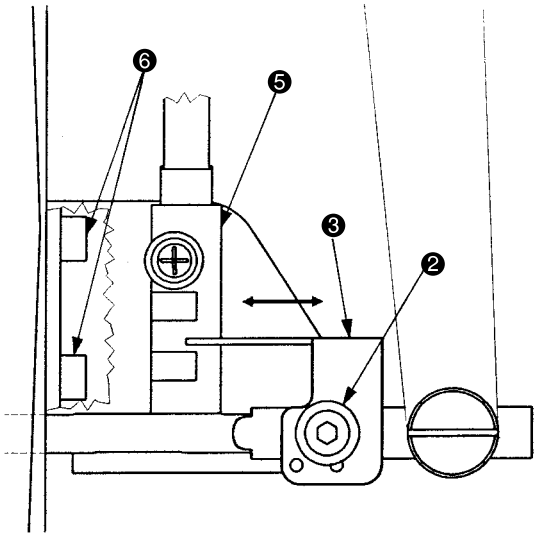
Procedures of assembling
1. Apply a proper amount of grease (Juki Grease A) to the grooved cam block of the cam ❶, the peripheral cam block, and the rollers of the presser bar lifter link ❽ and the thread trimmer link ❾. Refer to “10.-(4) Parts to which grease • lock-tight is applied o TENSION RELEASE & THREAD TRIMMER MECHANISM COMPONENTS.” 2. While the cam ❶ is being inserted in the shaft of the presser lifting motor ❻, mount the assembly on the sewing machine frame and tighten the four set screws ❺. The insertion of the cam should be done gently in order not to hurt the bearing ❼. 3. Clearance B toward the presser bar lifter link ❽ and Clearance A toward the thread trimmer link ❾ should be equally distributed. For this purpose, adjust the position of the cam ❶ and fix it with the use of the two set screws ❷. (Apply the screws to the flat section at both ends of the shaft.) * If it is difficult to examine Clearance B, Clearance A should be adjusted to 0.5mm ~ 0.7mm during assembly. 4. Mount the sensor slit ❸ with the two set screws 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.-(17) Thread trimmer and presser origin sensor adjustment” and make sensor adjustments.

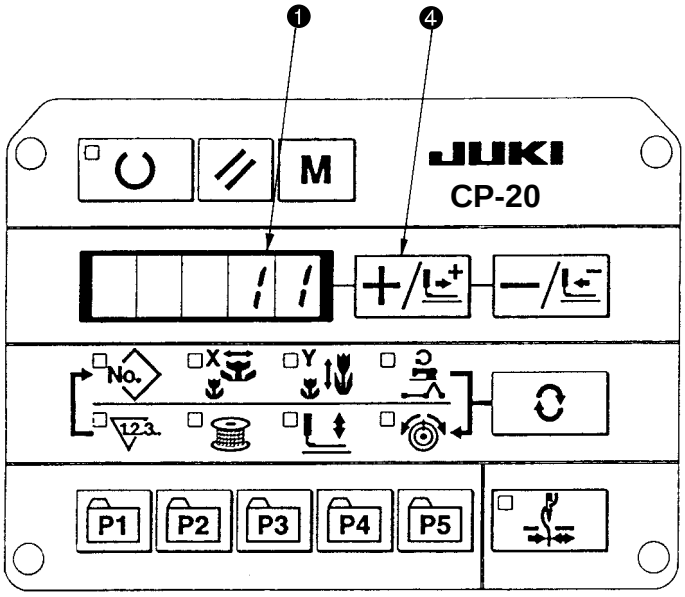
Adjustment Procedures	Results of Improper Adjustment
1. Start the test mode I07 (IP-400) or CP-6 (CP-20). 2. Tread on the pedal for the retrieval of the thread trimmer and presser bar lifter (cam) origin. 3. Make sure that the standard holes (Ⓐ and Ⓑ) of the thread trimming motor stand are aligned with the standard hole Ⓒ of the thread trimmer and presser lifter cam ❶ using a bar ❹. 4. If the standard hole Ⓒ of the thread trimmer and presser lifter cam ❶ is too high (Ⓔ direction), loosen the set screw ❷ and move the sensor mounting plate ❸ upward (Ⓔ direction) and secure it. If the standard hole Ⓒ of the thread trimmer and presser lifter cam ❶ is too low (Ⓓ direction), loosen the set screw ❷ and move the sensor mounting plate ❸ downward (Ⓓ 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 set screw ❷ after confirming that there is no interference between the sensor slit plate ❺ 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.

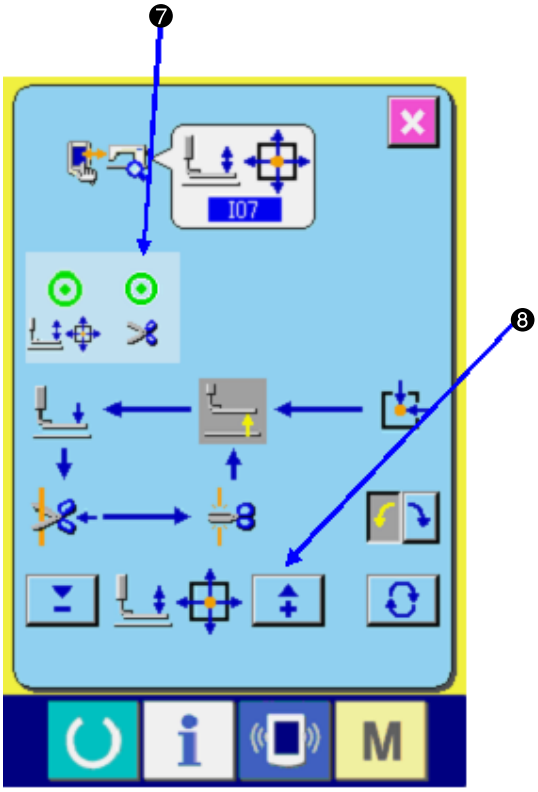
(18) Adjusting the thread trimmer sensor

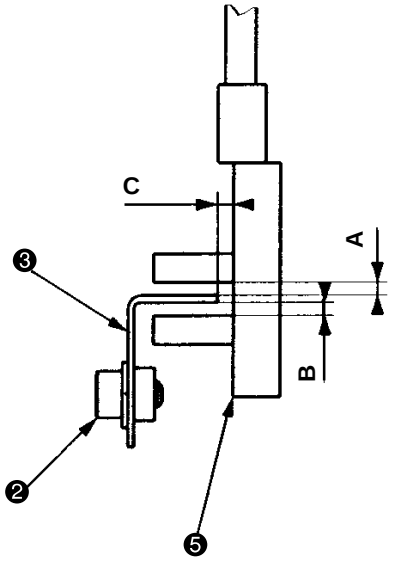
Standard Adjustment

After completion of origin retrieval (at start switch on) in the test mode I07 (IP-400) or CP-6 (CP-20), press the + key ❹ 6 to 8 times, and the thread trimmer sensor is turned off (IP-400: The contents ❼ on the operation panel change from “ ” to “ ”, CP-20: The display ❶ of 10th digit on the operation panel changes from “1” to “0”.)







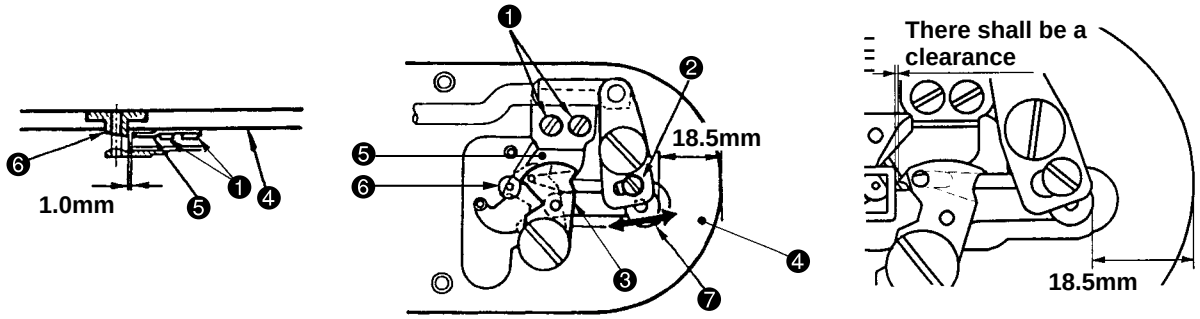


Adjustment Procedures	Results of Improper Adjustment
1. Start the test mode I07 (IP-400) or CP-6 (CP-20). 2. Tread on the pedal to perform origin retrieval for the thread trimmer cam. (Confirm that the origin is in the correct position. Then, proceed to the procedures shown below. Refer to "(17) Thread trimmer and presser origin sensor adjustment.") 3. Press the + key ❽ (IP-400) or ❹ (CP-20). Make sure that the contents ❼ (IP-400) on the operation panel change from "  " to "  " or that the value ❶ (CP-20) on the operation panel changes from "11" to "01" after pressing the + key 6 to 8 times. 4. If the change occurs by pressing the + key other than 6-8 times, or the change does not occur, loosen the set screw ❷ and adjust the sensor slit ❸ finely in the arrow direction. 5. After the sensor slit ❸ 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. ~ 5. above until the coincidence is secured. **(Caution) During adjustments, check the clearances A, B, and C of the sensor slit ❸ and the sensor ❺. If the clearances seem to be insufficient, use the set screws ❷ and ❻ 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 ❸ has no clearance against the sensor ❺, this can be a cause of destruction in the sensor slit ❸ or the sensor ❺.

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

Standard Adjustment

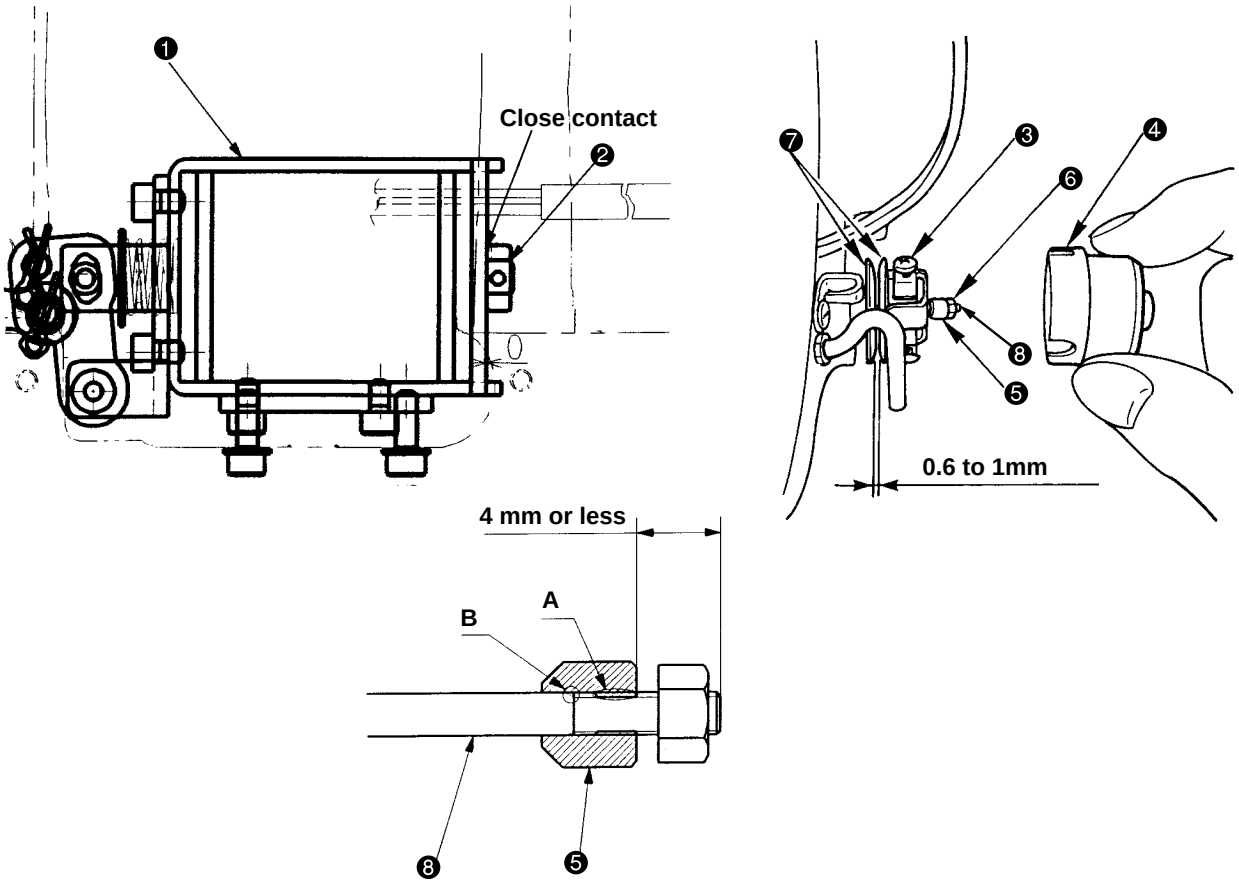
Counter knife position : The clearance between the counter knife ❺ and the needle hole guide ❻ is 1.0mm.
Moving knife position : Before thread trimmer operation (standby state), the distance from the throat plate ❹ front end to the tip of the thread cutter lever (small) ❼ is 18.5mm.
However, there shall be a proper clearance toward the moving knife tip during needle thread clamp and feed forward.



(20) Floating amount of the thread tension disk

Standard Adjustment

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



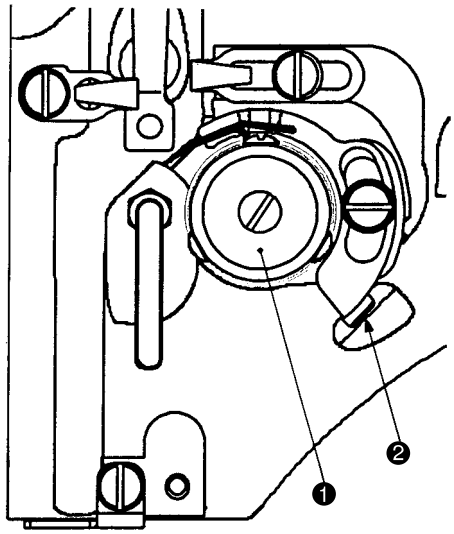
Adjustment Procedures	Results of Improper Adjustment
1. Counter knife position Loosen the counter knife set screw ❶ to adjust the position. 2. Moving knife position Loosen the screw ❷ to adjust the position.	o If the clearance is less than 1.0mm, thread may be cut by the counter knife ❺ blade when the 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.

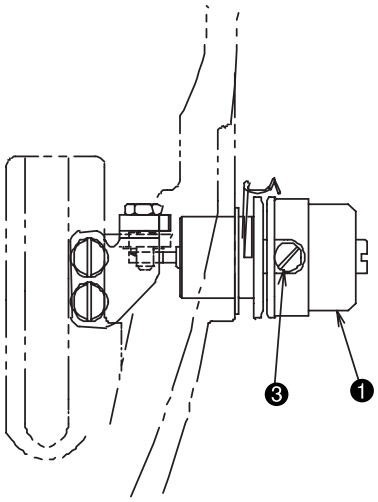
Adjustment Procedures	Results of Improper Adjustment
1. Turn off the power supply and look for any close contact between the AT solenoid ❶ and the thrust collar ❷. 2. Loosen the three set screws ❸ and remove the thread tension cap ❹. 3. Hold the tension releasing pin adjust collar ❺ not to let it rotate, and loosen the nut ❻. 4. Turn the tension releasing pin adjust collar ❺ and adjust the gap between the thread tension disk ❼. (Adjustment of thread tension disc floating) 5. Hold the tension releasing pin adjust collar ❺ and tighten the nut ❻. Mount the thread tension cap ❹ by means of the set screw ❸. 6. 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 ❽. (The thrusting distance of the thread tension releasing pin ❽ 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 set screw ❸ and adjust the AT link unit (front) in the right-left direction.** **Refer to "(22) 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 ❽ , the thread tension releasing pin ❽ may be damaged.

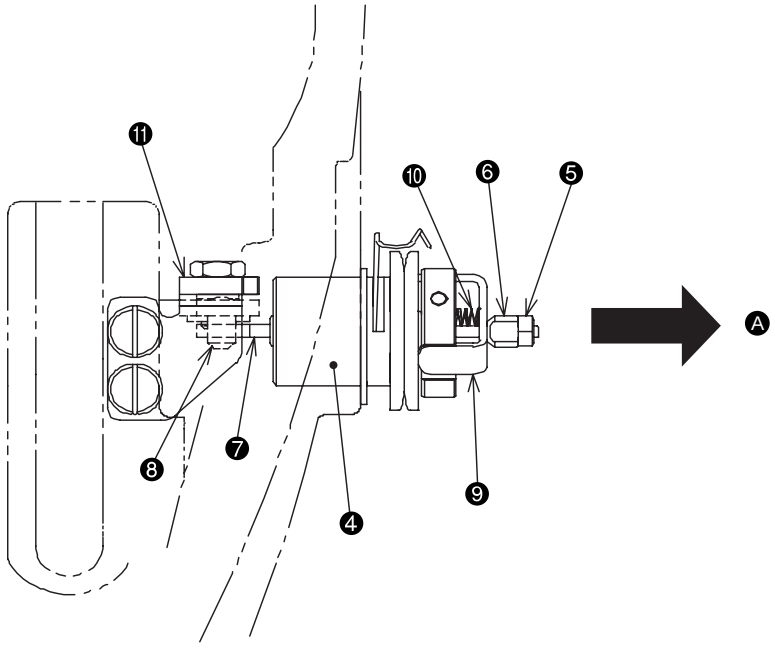
(21) Second thread tension connection / disconnection

Procedures of disassembling

1. Loosen the set screw ❷.
2. Remove three setscrews ❸ and take out the thread tension cap ❶.
3. Remove the nut ❺ and the tension releasing pin adjusting collar ❻. Then take out the thread tension disc pressing plate ❾ and three thread tension disc return springs ❿.
4. Pull out the second thread tension ❹ to remove it. (Arrow Ⓐ)
5. For reassembly, follow the steps of 4. to 1. above.







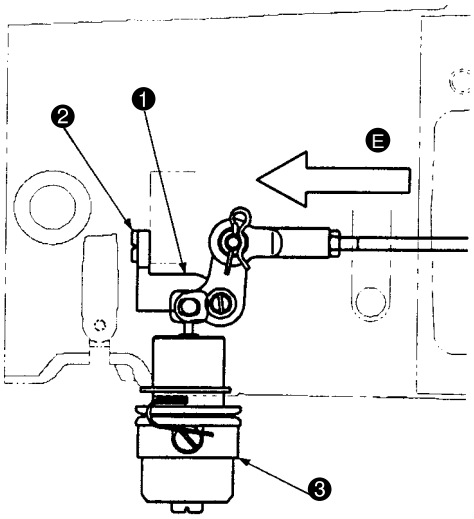
Procedures of assembling

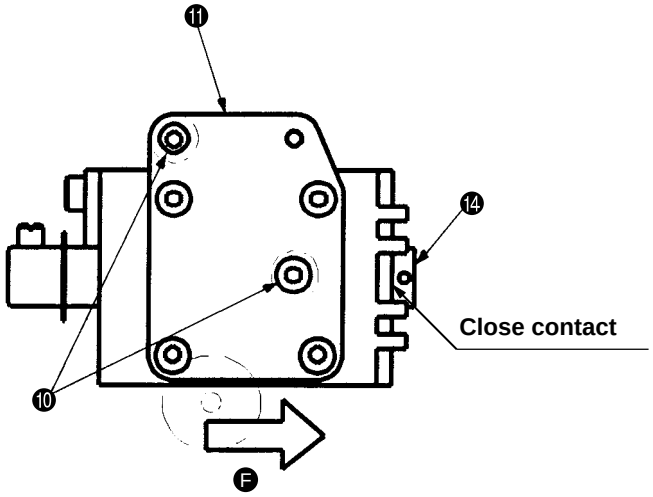
1. When mounting the second thread tension ❹, confirm in advance that the pin block ❽ of the AT link unit (front) ⓫ is exactly settling in the hole of the thread tension pressing pin ❼. If you try to mount the second thread tension ❹ forcedly with the pin area left disengaged, this may result in breakage in the thread tension pressing pin ❼ or malfunction.
2. After the completion of mounting, make adjustments of (20) Floating amount of the thread tension disk and (39) Adjustment of thread take-up spring; 1) Stroke adjustments.

(22) AT unit connection / disconnection

Procedures of disassembling

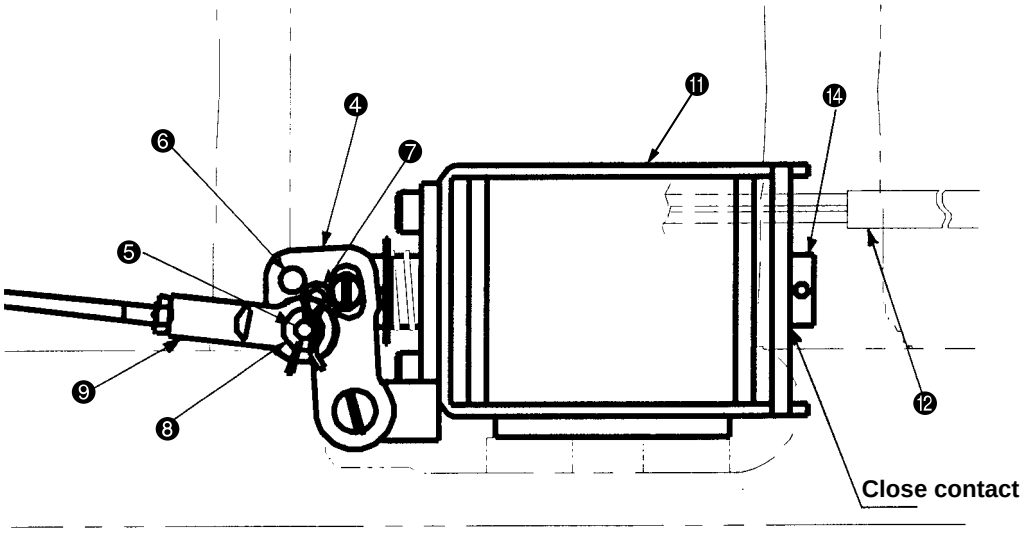
1. Remove the set screw ❷ of the AT link unit (front) ❶ and take out the second thread tension ❸. ((21) Refer to “Second thread tension connection / disconnection.”)
2. Draw out the cotter pin ❼ from the pin block ❺ (H type) or ❻ (S type) of the AT link unit (rear) ❹. Be careful not to drop the washer ❽ at that time.
3. Lift the AT joint block ❾ of the AT unit upward to remove the block from the pin block ❺ (H type) or ❻ (S type) of the AT link unit (rear) ❹.
4. Draw out the AT link unit (front) ❶ from the plane side (in the direction of the arrow Ⓔ) and remove it.
5. Remove the two set screws ❿ and take out the AT solenoid unit ⓫.
6. For reassembly, follow the steps of 5. to 1. above.

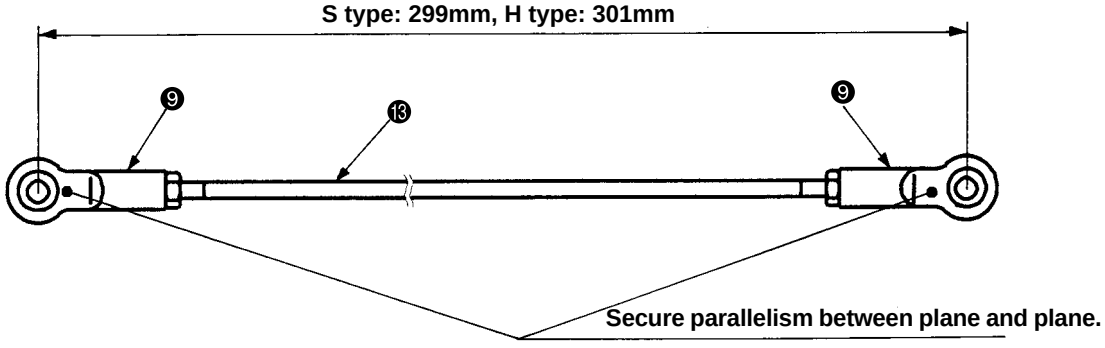




Procedures of assembling

1. For incorporating the AT solenoid unit ⓫ into the system, run the solenoid cable ⓬ 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 ❾ of the AT connector rod ⓭ is 299 mm for S type and 301 mm for H type.
   When the AT joints ❾ are disassembled or assembled, make sure that the center-to-center distance is correct, and that the front and rear of the AT joints ❾ are parallel. Failure to observe this may cause AT malfunction resulting in incorrect thread tension.
   (When the AT joint ❾ is turned 4 times, the feed move amount comes to attain 2mm.)
3. For the pin block of the AT link unit (rear) ❹, use the pin block ❺ for H type and the pin block ❻ 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 ⓮ closely contacts with the AT solenoid unit ⓫. If there is a clearance between them, loosen 2 set screws ⓾ and move the AT solenoid unit ⓫ to the rear (Arrow Ⓕ) and secure it again.
   * If the above-mentioned center-to-center distance is great between the AT joints ❾, the clearance will be opened wider.

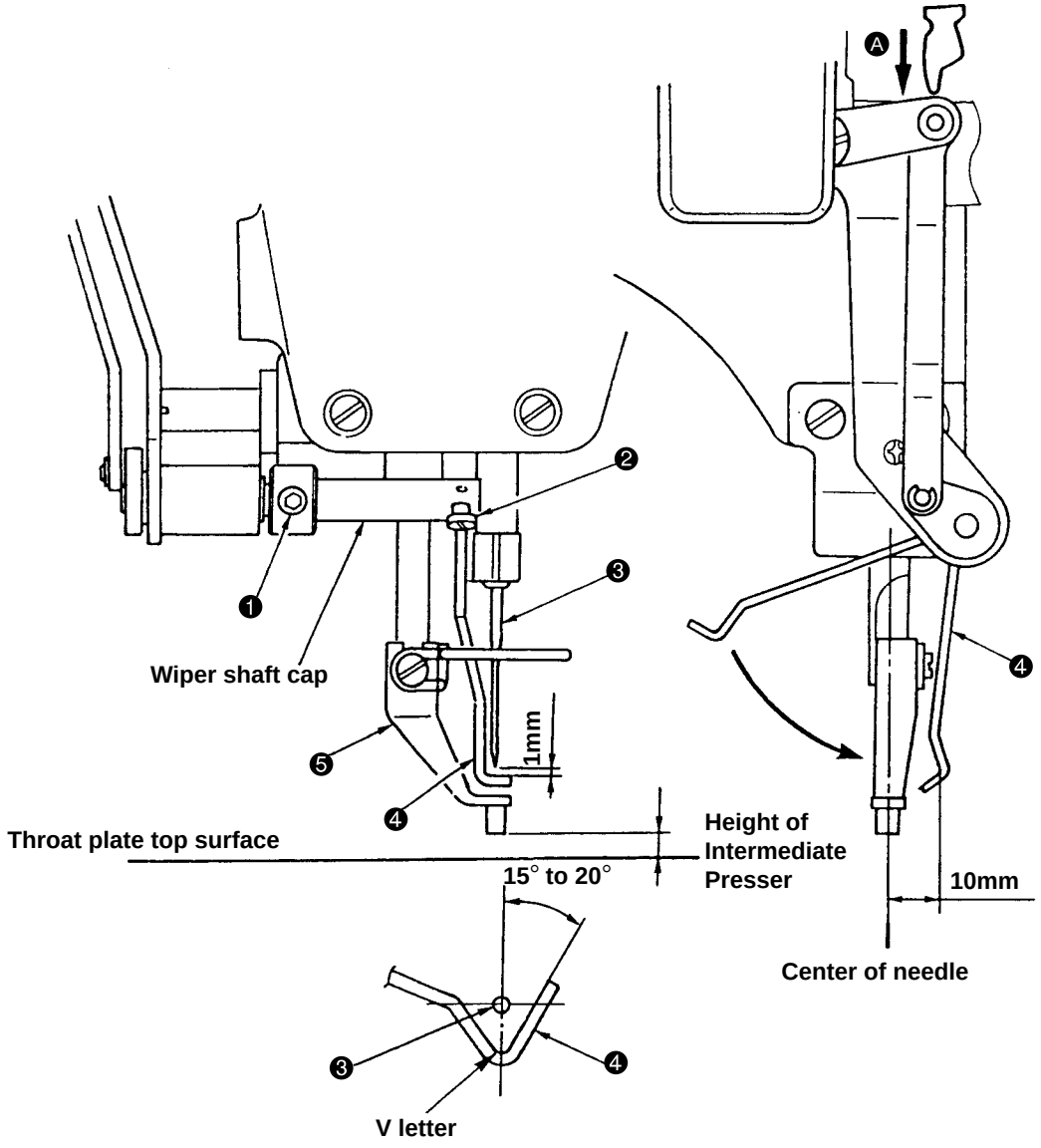




(23) Wiper adjustment

Standard Adjustment

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



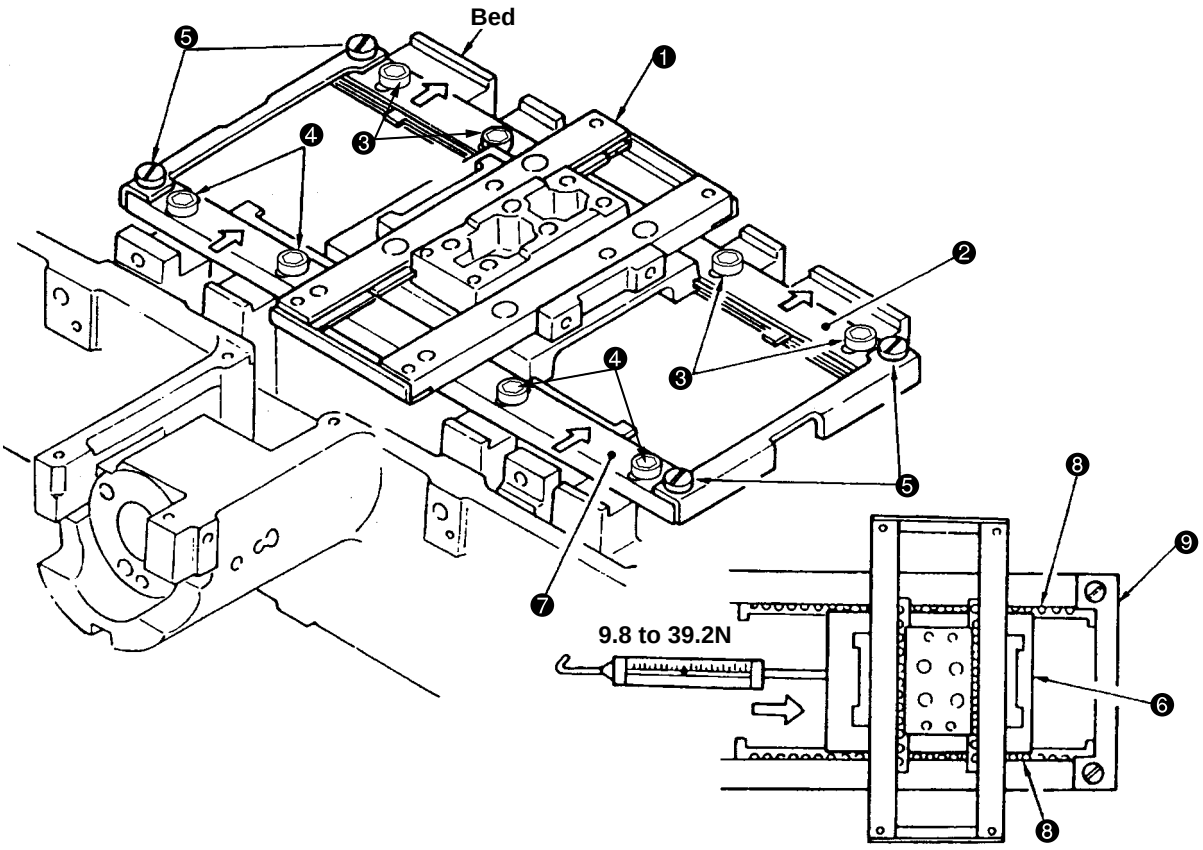
(Caution) The intermediate presser supplied as standard accessory is available up to 5 mm material thickness.
However, the intermediate presser can not be used for the 3 mm material thickness or more since the wiper can not pass the space between the tip of needle and the intermediate presser.
Turn OFF 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 ❺. **(Caution) As for the height of needle ❸ when adjusting the wiper ❹, set the height when the sewing machine stopped after trimming the thread actually.** 2. Push wiper link section Ⓐ and move the top end of the wiper ❹ to the under side of the needle. 3. In the state of the above item 2. , loosen setscrew ❷ 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 ❷ . 4. Push wiper link section Ⓐ to the last and loosen setscrew ❶ . 5. In the state of the above item 4. , adjust the longitudinal (10 mm) and lateral positions of the wiper ❹. Then tighten setscrew ❶ .	o If the clearance between the wiper ❹ and needle ❸ is too small, the wiper comes in contact with the needle ❸ due to uneven stop position of the main shaft, causing needle breakage. o If the clearance between the wiper ❹ and needle ❸ is excessive, the wiper comes in contact with the intermediate presser ❺ and the wiper will damage the intermediate presser ❺. Also, the intermediate presser ❺ can not go up. o If a clearance of 10 mm between the inside of V letter of the wiper ❹ and the center of needle ❸ 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 ❹, the wiper fails to spread the thread. o If the opening angle of the wiper ❹ is excessive, thread sweeping failure will occur.

(24) Adjusting the pre-load of the X-Y table

Standard Adjustment

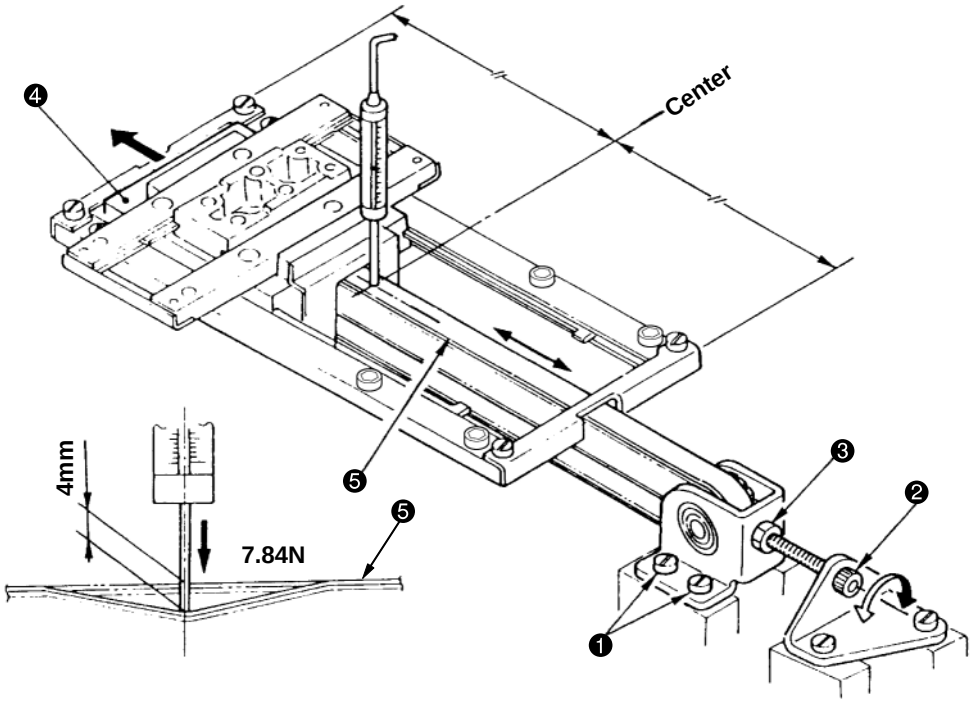
When removing the X-Y table assy ❶ from the sewing machine, re-adjustment of the pre-load is necessary for the X axis only.



Adjustment Procedures	Results of Improper Adjustment
1. Hold down the X fixed race (rear) ❷ in the direction of the arrow to tighten 4 set screws ❸. 2. Loosen 4 set screws ❺. 3. Hold down the X fixed race (front) ❼ in the direction of the arrow to tighten 4 set screws ❹. * Then, adjust the retainer compensating torque between 9.8 to 39.2 N (1 to 4 kgf) on both right and left sides. 4. Tighten 4 set screws ❺. * Retainer compensating torque: This is a load necessary to move the race table ❻ after the retainer ❽ has come in contact with the X stopper ❾. This torque should be measured when the belt is slack before pulse motor installation.	

(25) Adjustment of the tension of the X timing belt

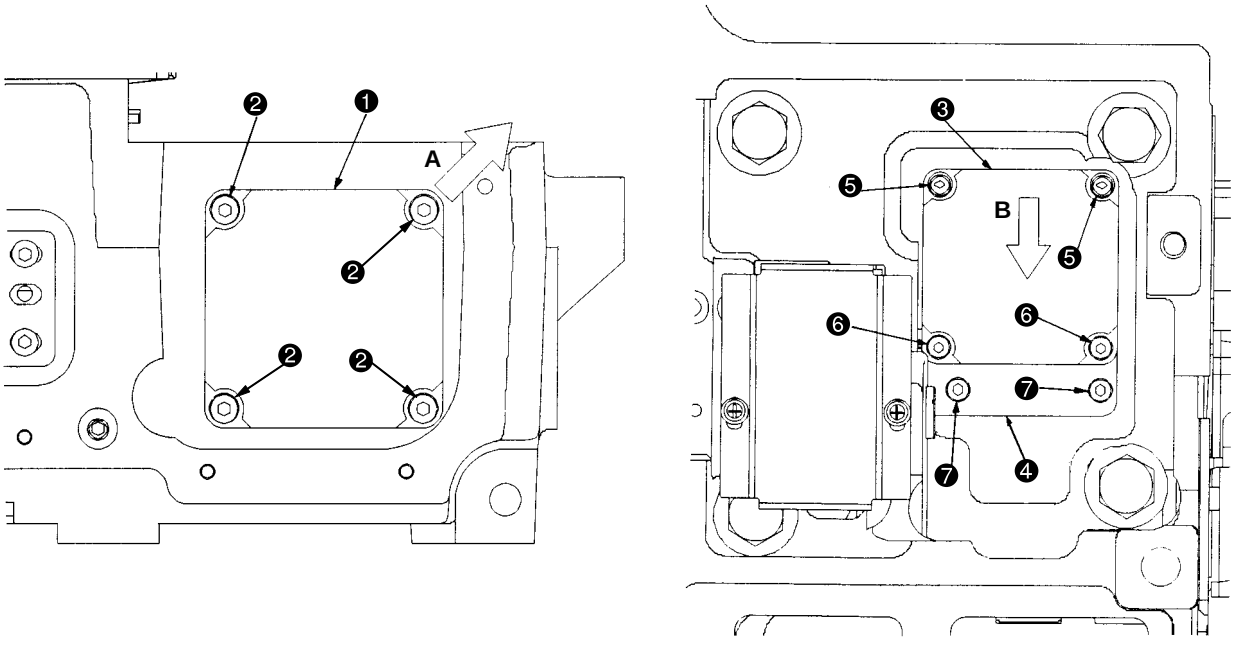
Standard Adjustment



(26) Adjustment to positions of X-motor and Y-motor (Backlash adjustment to gear)

Standard Adjustment

1. Hold down the X motor ❶ in the direction of Arrow A and secure it.
2. Hold down the Y motor ❸ in the direction of Arrow B and secure it.

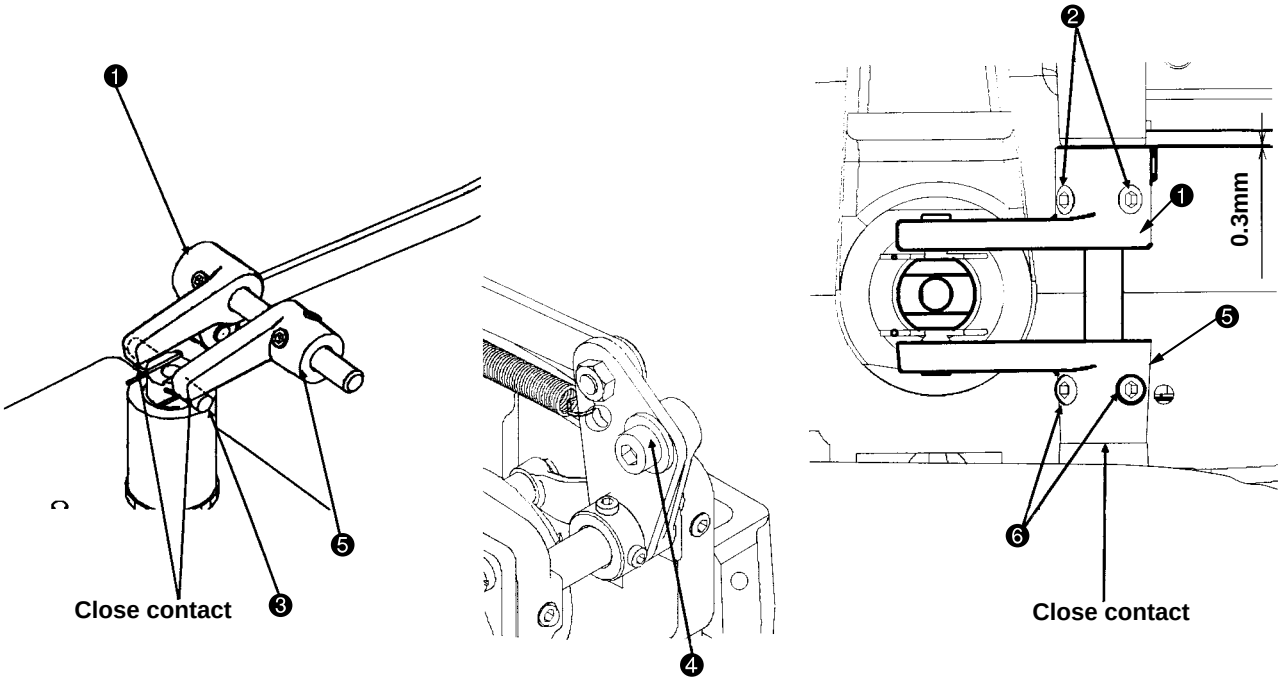


Adjustment Procedures	Results of Improper Adjustment
1. Move the race table ❹ to the left end (in the direction of the arrow). 2. Tighten the adjusting screw ❷ and fix the nut ❸ so that the load point makes a warp of 4mm when a load of 7.84N (800gf) measured by a spring balance is applied to the timing belt ❺. 3. Tighten the set screw ❶ and check the amount of deflection again.	o If the tension is excessive, it will cause timing belt ❺ breakage. o If the tension is too low, it will cause failure of the feed.

Adjustment Procedures	Results of Improper Adjustment
1. Loosen 4 set screws ❷ securing the X motor ❶. 2. Hold down the X motor ❶ in the direction of Arrow A and tighten 4 set screws ❷ to secure the X motor ❶. 3. Loosen 2 set screws ❺, 2 set screws ❻, all of which secure the Y motor ❸, and 2 set screws ❼ securing the Y motor mounting plate ❹. 4. Hold down the Y motor ❸ in the direction of Arrow B and tighten 2 set screws ❺ that are positioned upper. Then, tighten 2 set screws ❻ that are positioned lower and 2 set screws ❼ securing the Y motor mounting plate ❹.	o If the X motor or Y motor is held down inadequately, feeding gear backlash is increased and needle location accuracy may be reduced. In addition, feeding error may be caused resulting in needle breakage, and other problems. o If the pushing is excessive, the load of the feed will become large, causing the failure of the feed.

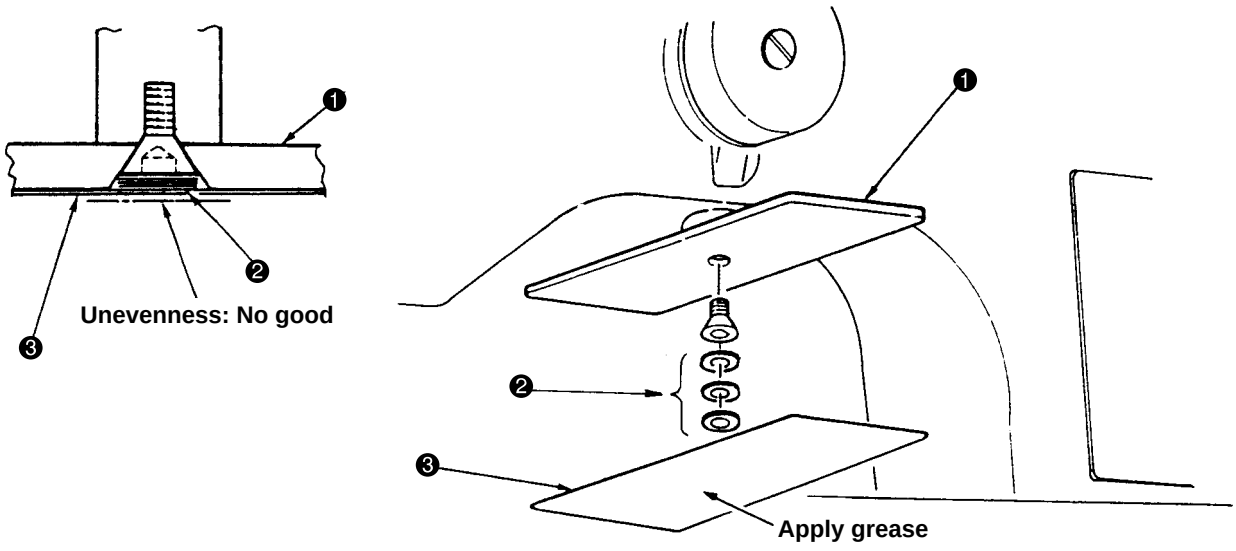
(27) Adjusting of the presser lower arm (Motor type only)

Standard Adjustment



(28) Adjustment when the presser plate sheet is replaced (Motor type only)

Standard Adjustment



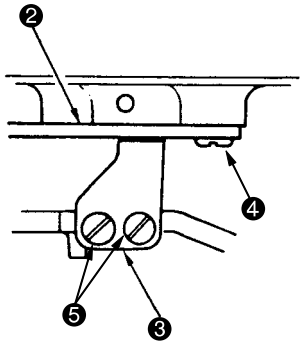
Adjustment Procedures	Results of Improper Adjustment
1. Secure the presser lower arm A ❶ so that the clearance between the holding arm and machine arm becomes 0.3 mm with 2 set screws ❷. 2. Use the adjusting screw ❹ to make sure that the presser lower arm A ❶ closely contacts with the holding pin ❸ under the condition of the presser lifted. 3. Make the angle between the presser lower arm B ❺ and pressing pin ❸ the same as the angle between the presser lower arm A ❶ and pressing pin ❸, and keep the machine arm to contact closely with the presser lower arm B ❺, and tighten the two set screws ❻.	o If the angle of the presser lower arm A❶ and B❺ is not equal, it will cause loosening the arm asm. screws or the breakage. o If the clearance is too small between the presser lower arm A ❶ and the arm, this can be a cause of maloperation during pushing down.

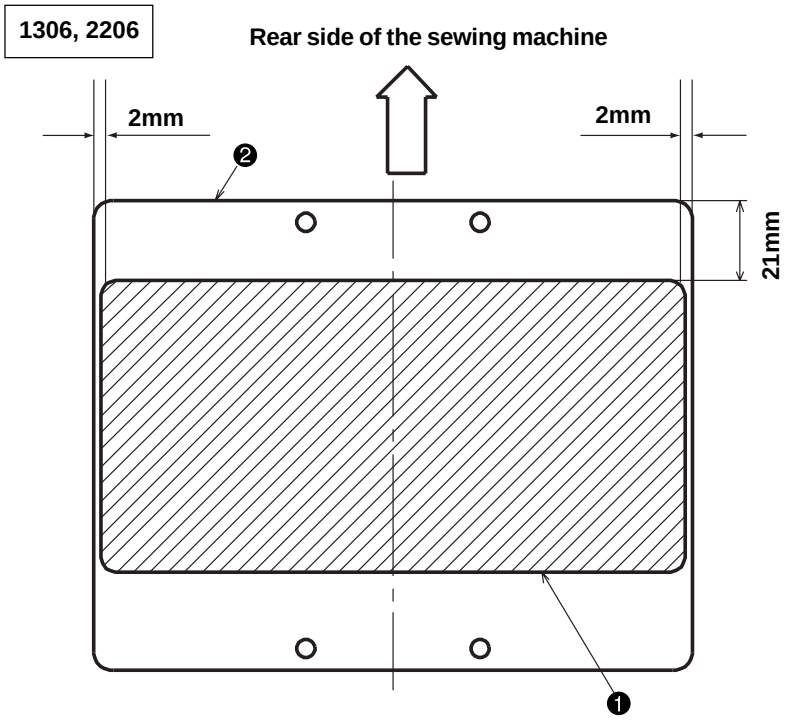
Adjustment Procedures	Results of Improper Adjustment
1. Put an appropriate number of the spacers ❷ into the presser plate ❶ to make the presser plate sheet ❸ even. 2. In regard to the application of grease, refer to “PRESSER PLATE & MANUAL PRESSER MECHANISM COMPONENTS” described in 10.-(4) Parts to which grease•lock-tight is applied.	o The step difference will cause malfunction of the feed.

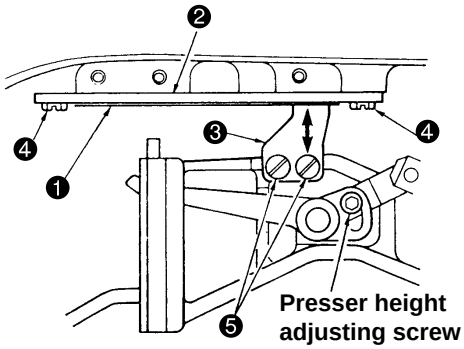
(29) Height of the slider and pasting of the presser plate sheet (Pneumatic type only)

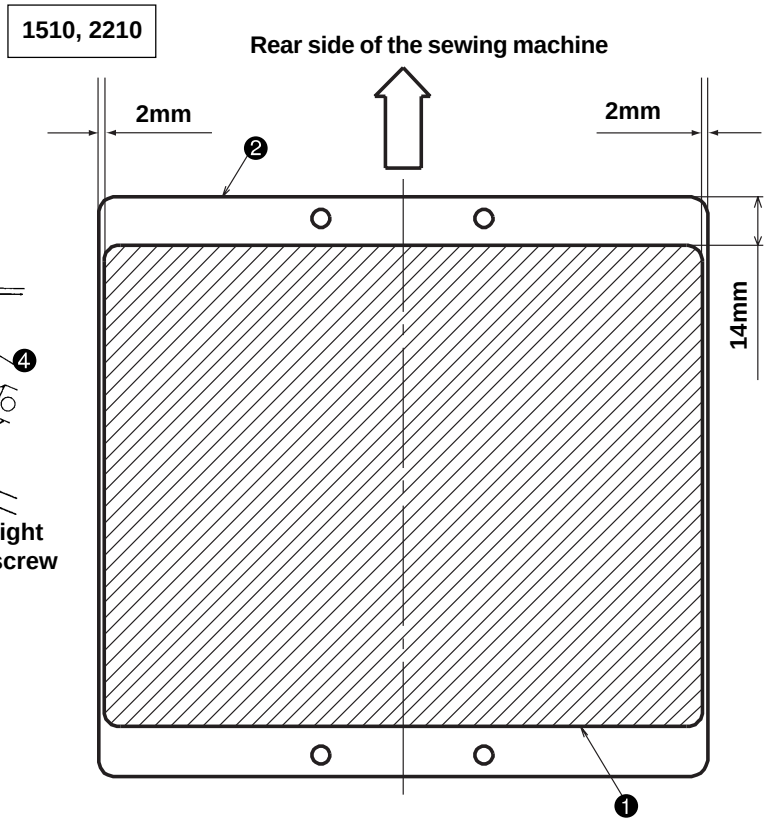
Standard Adjustment

1. Follow the dimensions in the drawing below for pasting the presser plate sheet ❶ on the presser plate ❷. Apply grease after pasting the sheet.
2. Bring the upper end of the slider ❸ into close contact with the presser plate ❷.







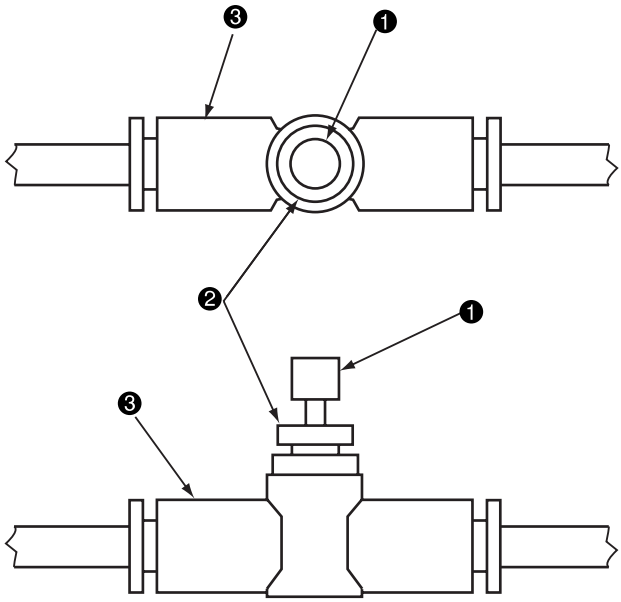


Adjustment Procedures	Results of Improper Adjustment
1. Remove 4 set screws ❹ to remove the presser plate ❷, and replace the old presser plate sheet ❶ with new one. 2. After mounting the presser plate ❷, adjust the height of the slider ❸ with 4 set screws ❺. To position the height, lightly press the slider ❸ to the presser plate ❷ when the presser goes up.	o If the position where the presser plate sheet ❶ was pasted is wrong, abrasion of related components or peeling of the presser plate sheet ❶ may occur resulting in a feed error due to direct contact between the slider ❸ and presser plate ❷. o Wrong slider ❸ height may cause a feed error.

(30) Adjusting the speed of the work clamp feet (Pneumatic type only)

Standard Adjustment

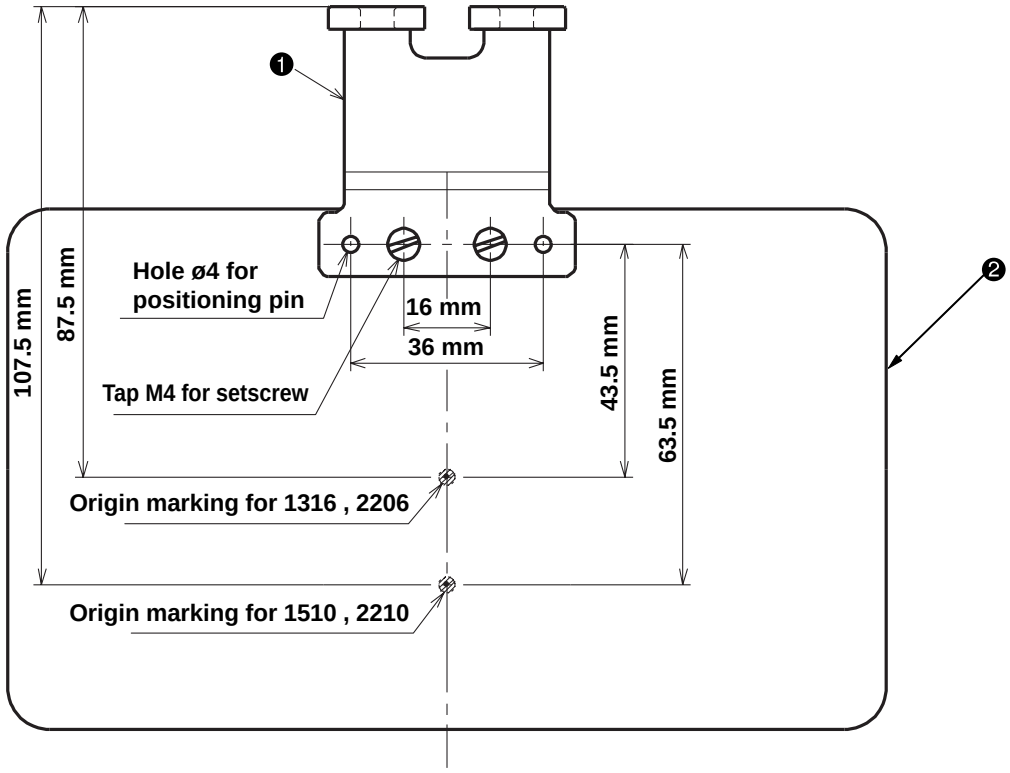
1. Adjust the knob 1 ❶ and the knob 2 ❷ of the speed controller ❸ mounted on the solenoid valve and make adjustments as described below.
   - Presser lifting (tube label: 1-A, 2-A) and presser lowering (tube label: 1-B, 2-B).
   - Loosen the knob 2 ❷ and turn the knob 1 ❶ once fully to the right in order to make 3 turns to the left. Since then, tighten the knob 2 ❷.



Adjustment Procedures	Results of Improper Adjustment
1. Adjust the speed referring to Standard Adjustment. 2. To increase the speed of lowering/raising the work clamp foot, turn the knob 1 ❶ counterclockwise. 3. To decrease the speed, turn the knob 1 ❶ clockwise.	o When the work clamp foot comes down, the noise is big. o The work clamp foot fails to rise.

(31) Making the origin setting gauge

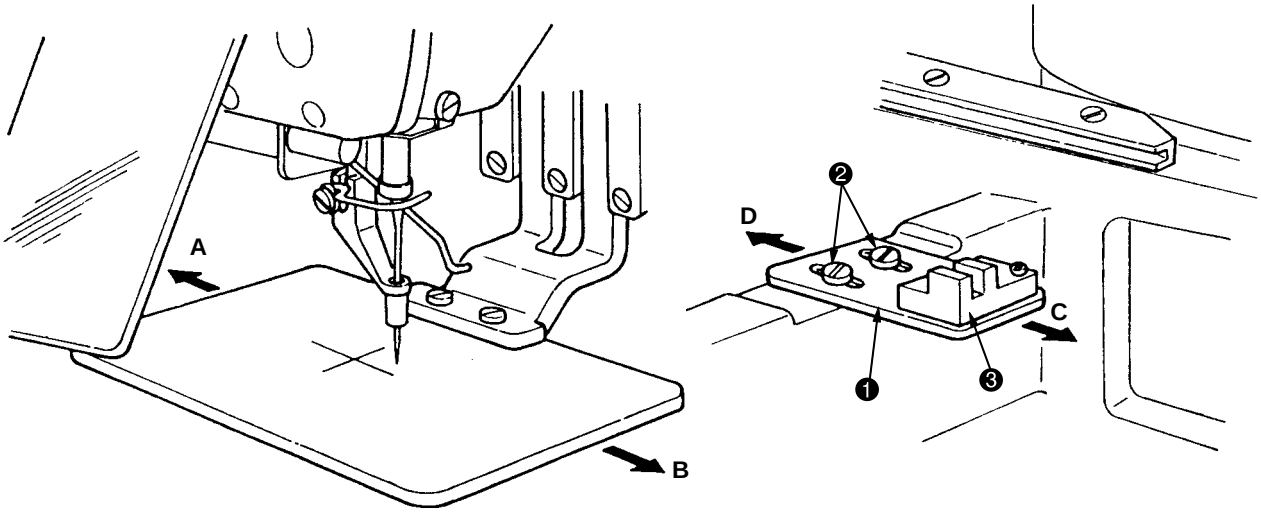
Standard Adjustment



(32) Adjusting the X origin sensor

Standard Adjustment

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



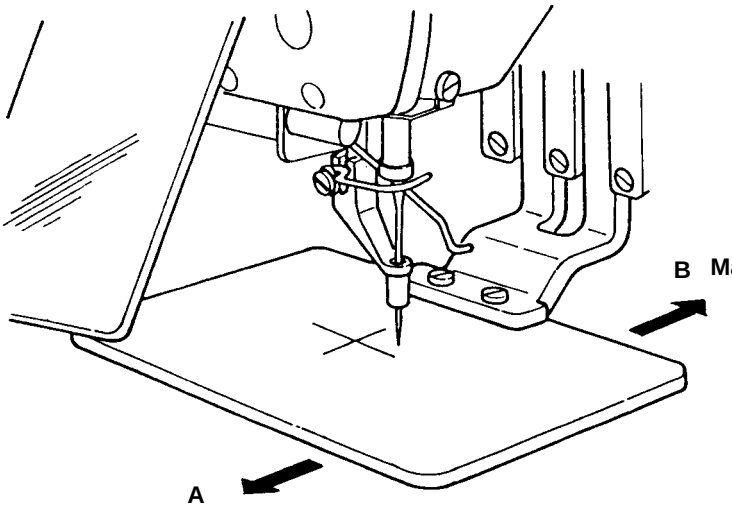
Adjustment Procedures	Results of Improper Adjustment
1. Make an origin setting gauge ❷ as shown in the figure, and attach it to the work clamp foot ❶.	

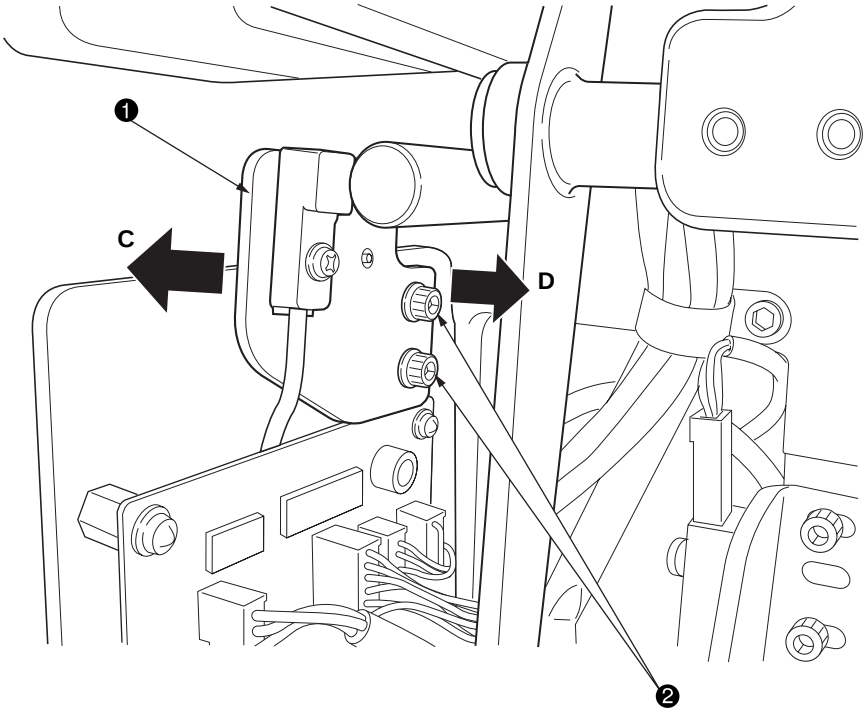
Adjustment Procedures	Results of Improper Adjustment
1. Start the test mode I06 (IP-400), or CP-2 (CP-20). 2. When the star pedal is depressed, the feed moves to the mechanical origin and stops. 3. Lower the needle and check the right and left displacement based on the engraved marking of the origin. 4. When the engraved marking of the origin is found to be displaced in Direction A from the needle tip, loosen the two set screws ❷ and adjust the sensor mounting plate ❶ in Direction C. After adjustments, tighten the two set screws ❷. 5. When the engraved marking of the origin is found to be displaced in Direction B from the needle tip, loosen the two set screws ❷ and adjust the sensor mounting plate ❶ in Direction D. After adjustments, tighten the two set screws ❷. **(Caution) After the adjustment, make sure that the slit plate does not interfere with the sensor ❸.**	

(33) 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.



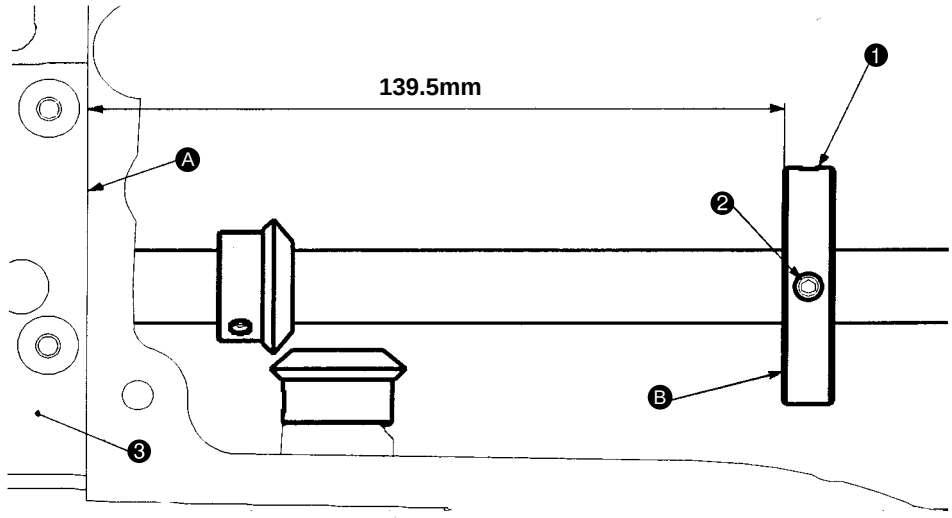


Adjustment Procedures	Results of Improper Adjustment
1. Start the test mode I06 (IP-400) or CP-2 (CP-20). 2. When the pedal is trodden on, the feed moves to the mechanical origin and then stops. 3. Lower the needle and check the front-rear displacement from the engraved marking of the origin. 4. When 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 set screws ❷ and fix the set screws 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 set screws ❷ and fix the set screws ❷ after adjustments.)	

(34) Adjustment of the bobbin winder driving wheel position

Standard Adjustment

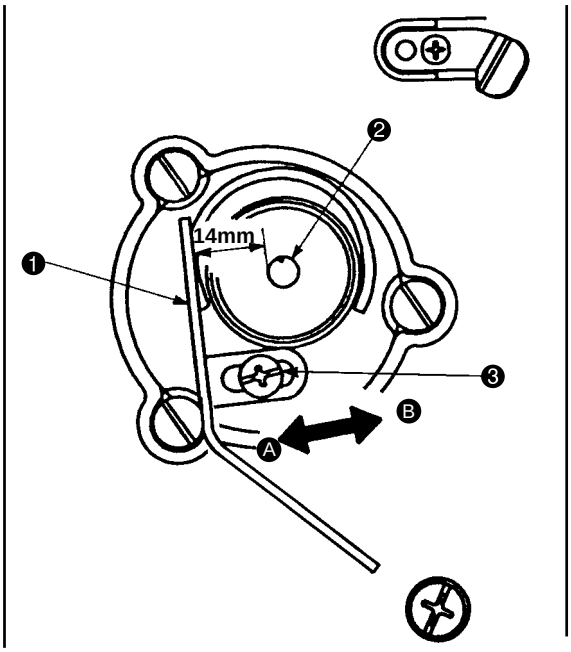
The distance is 139.5 mm between the measuring plane ❽ of the bobbin winder driving wheel ❶ and the cover mounting plane ❹ of the sewing machine frame ❸ .

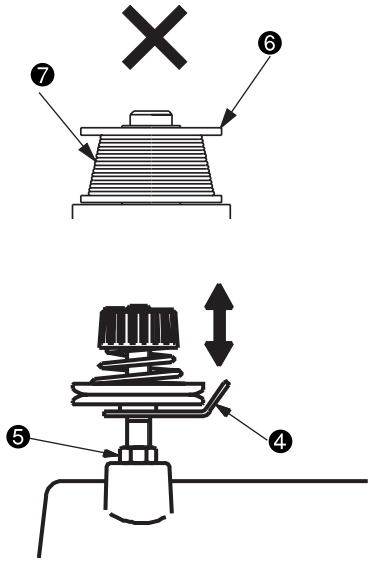


(35) Adjusting the bobbin winder amount

Standard Adjustment

The position of the bobbin winder lover ❶ is based on the standard that it is 14 mm apart from the bobbin winder shaft ❷ . Try to perform bobbin winding actually and make fine adjustments of the bobbin lever set screw ❸ in the directions of the arrows ❹ and ❽ 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 two set screws ❷ to adjust the position (139.5mm) of the bobbin winder driving wheel ❶ and fix it with the two set screws 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.

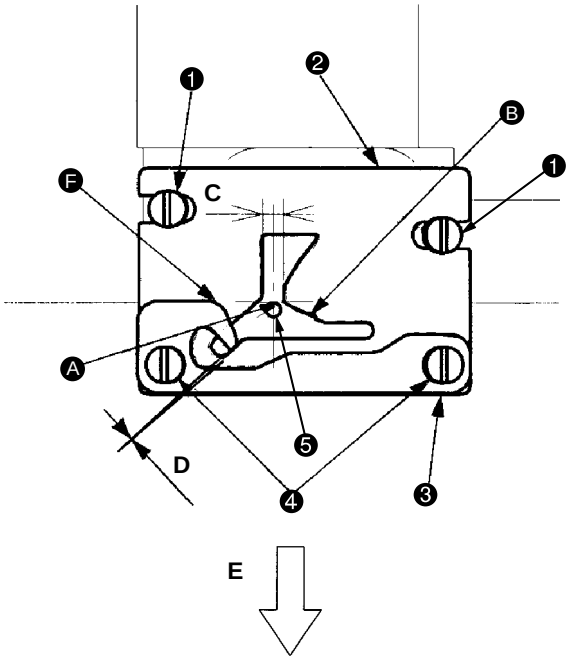
Adjustment Procedures	Results of Improper Adjustment
1. Loosen the set screw ❸ of the bobbin winder lever and adjust the distance to 14mm between the bobbin winder lever ❶ and the bobbin winder shaft ❷. After that, tighten the set screw ❸ of the bobbin winder lever. 2. Start the sewing machine and wind 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 Ⓑ. 2) If the amount of winding seems to be too less, adjust the bobbin winder lever ❶ in the direction of the arrow Ⓐ. 3. If the winding state of the thread ❼ around the bobbin winder ❻ seems to be uneven, loosen the nut ❺ and adjust the height of the thread tension control ❹. (Example) If the amount of the wound thread is less on the upper side of the bobbin winder ❻ as illustrated, adjust the thread tension control ❹ upwards.	o If too much thread is wound (thread protruded from the bobbin winder ❻), the thread ❼ 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 ❻, stitch perforation may become irregular.

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

Standard Adjustment

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

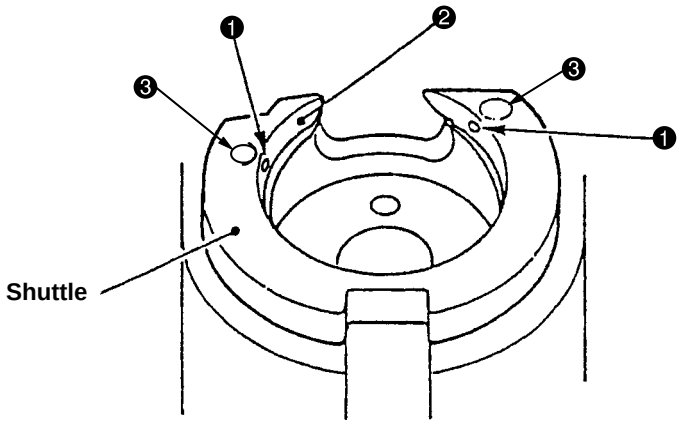
(Caution) If Part Ⓑ and Ⓕ is damaged, this is the cause of thread breakage, hangnail of thread, stain on thread, etc. Therefore, this part should be polished by the use of a buff or the like. In particular, the rear side should be handled with care.



(37) Shuttle felt

Standard Adjustment

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



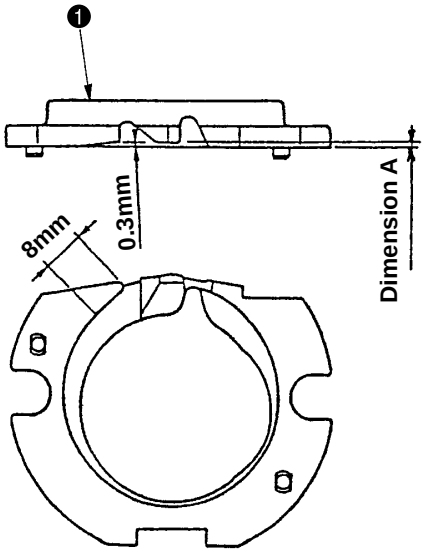
Adjustment Procedures	Results of Improper Adjustment
1. Remove the work feed bar, feed plate, and the throat plate. Adjust the positioning of shuttle upper spring ❷ with the set screws ❶ (2 pcs.). 2. Using the set screw ❹, adjust the amount of overlapping D for the lower thread holder ❸ and the shuttle upper spring ❷. **(Caution) The right and left positions can also change during (15) hook adjustments. Position adjustment for the shuttle upper spring ❷ 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 ❶ 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 ❷.** 2. Confirm that the shuttle packing ❸ has been mounted assuredly.	o If the shuttle felt ❶ is protruded, this will be turned into a rotary load of the inner hook, causing a sewing error. o If the shuttle felt ❶ is missing or pushed in too much, this will result in hook lubrication deficiency, causing hook overheating and wear. o If the shuttle packing ❸ has been missing, the shuttle felt ❶ and others may be lost, and this can be a cause of shuttle heating and wear.

(38) 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.

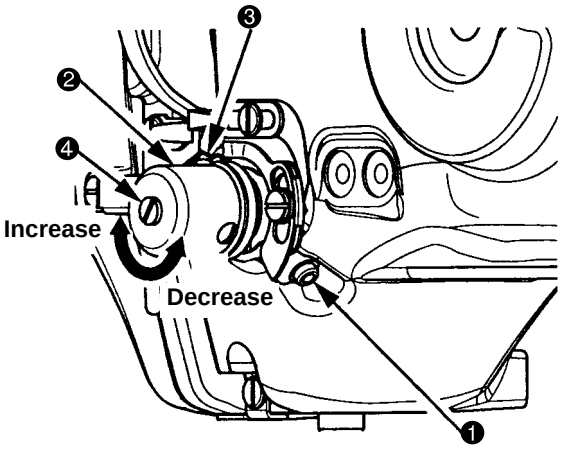


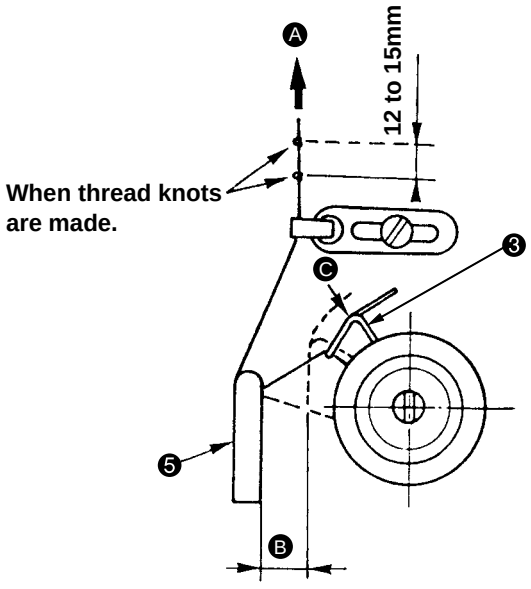
(39) Adjustment of thread take-up spring

Standard Adjustment

Stroke : The movable distance of the needle thread when the needle thread is pulled in the direction Ⓐ 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.	

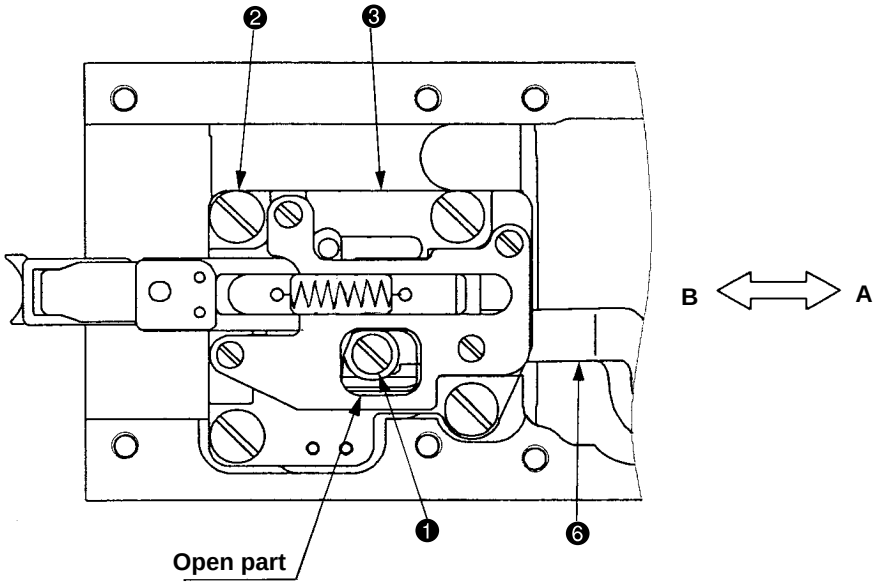
Dimension A (mm)	Part No.	Name of part	Remarks
0.8	14103253	Shuttle race ring A	Optional
1.3	14103352	Shuttle race ring B	Standard
1.7	14103659	Shuttle race ring C	Optional
1.9	B1817210DAD	Shuttle race ring D	Optional

Adjustment Procedures	Results of Improper Adjustment
1) Stroke adjustment Loosen the set screw 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 set screw 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 Ⓒ of the thread take-up spring ❸ to widen the clearance Ⓑ.**

(40) 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 ❻ by hand in the direction of A or B.
2. Remove the four set screws ❷ of the needle thread clamp base and take out the needle thread clamp device ❸.

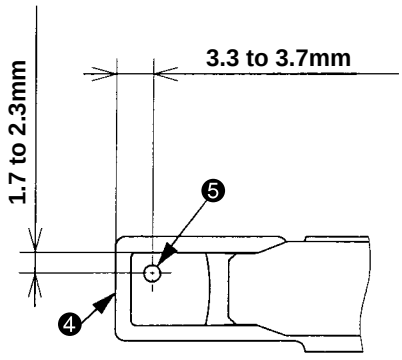


Procedures of assembling

1. Push the needle thread clamp device ❸ in the direction of A and fix it with the four set screws ❷. Tighten the hinge screw ❶.
2. Turn on the power supply and press the [ ] key twice so that the needle thread clamp support plate complete ❹ is positioned at the far advanced end.
   Confirm that the distance between the needle thread clamp support plate complete ❹ and the needle ❺ is 3.3 to 3.7mm and 1.7 to 2.3mm, respectively.
3. If the distance seems to be inadequate, loosen the four set screws ❷ and move the needle thread clamp device ❸ for adjustment.

(Caution) For the prevention of injury, the distance should be checked only if the sewing LED is unlit.
(Press the [ ] key twice after the power supply has been turned on.)

4. After the completion of the above-mentioned reassembly, make adjustments according to "(41) Adjusting the needle thread clamp sensor."



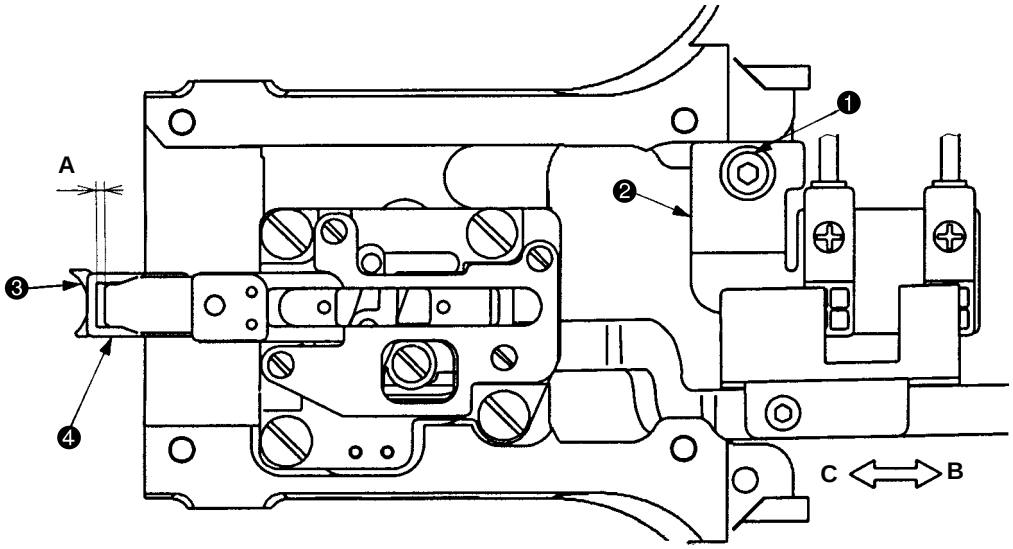
(41) Adjusting the needle thread clamp sensor

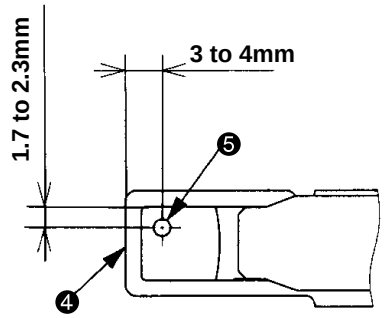
Standard Adjustment

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

(Caution) 1. The needle thread clamp position is known as the position returned by one step from the most advanced position when the [ ] key is pressed after the origin retrieval by the Test Mode I08 (IP-400) or CP-7 (CP-20).

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-400) or CP-7 (CP-20). 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 sensor mounting plate 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 sensor mounting plate ❷ after moving it in the direction C. After the sensor mounting plate 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 to 4mm 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 (40) 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.

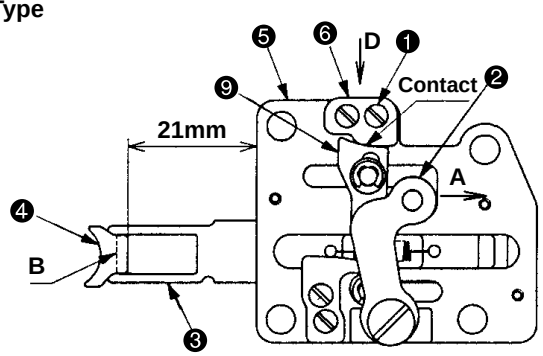
(42) Adjusting the needle thread clamp notch

Standard Adjustment

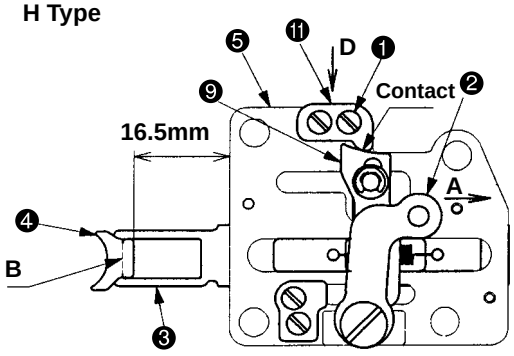
1. Needle thread clamp notch R position

- When the needle thread clamp link complete ❷ is pressed in Direction A, and Part B of the needle thread clamp support plate complete ❸ and the needle thread clamp ❹ begins to open, 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.

S Type



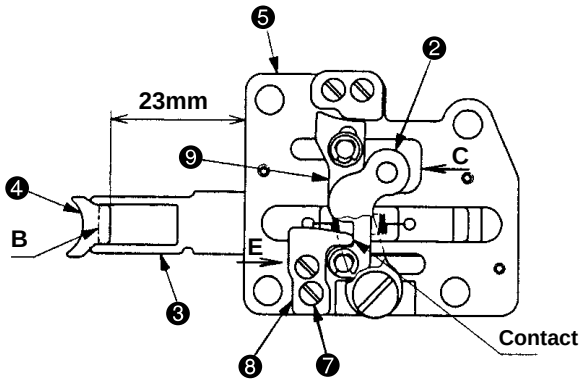
H Type



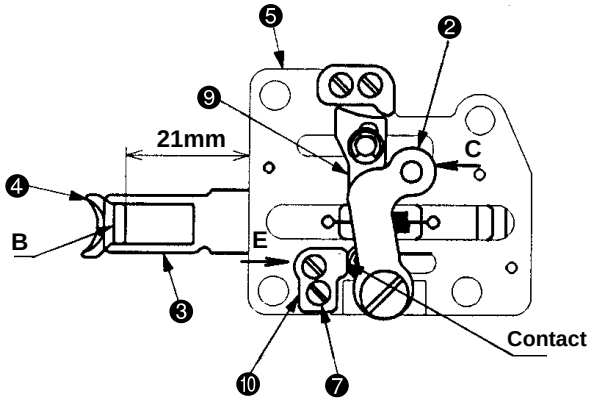
2. Needle thread clamp notch F position

- When the needle thread clamp link complete ❷ is pressed in Direction C, and Part B of the needle thread clamp support plate complete ❸ and the needle thread clamp ❹ begins to open, 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.

S Type



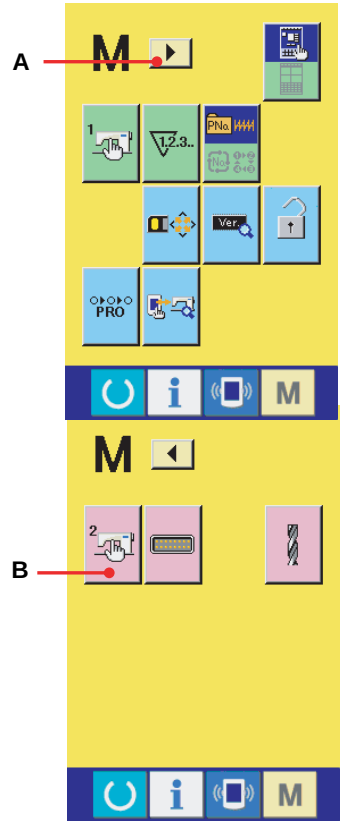
H Type

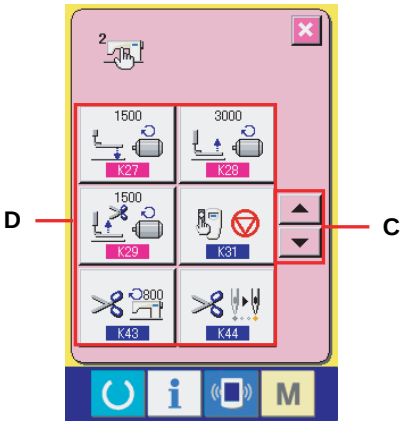


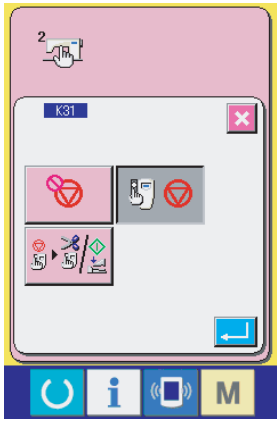
Adjustment Procedures	Results of Improper Adjustment
1. Needle thread clamp notch R adjustment 1) Loosen the two set screws ❶. 2) Press the needle thread clamp link complete ❷ in Direction A so that the distance between the needle thread clamp ❹ and the needle thread clamp base ❺ becomes 21mm for S Type and 16.5mm for H Type. Move the needle thread clamp notch R ❻ (S Type) or the needle thread clamp notch RH ⓫ (H Type) in Direction D, lightly press it toward the needle thread clamp cam plate ❾, 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 two set screws ❼. 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 ❽ (S Type) or the needle thread clamp notch FH ⓾ (H Type) in Direction E, lightly press it toward the needle thread clamp cam plate ❾, and tighten the two setscrews ❼.	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-400:

(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).

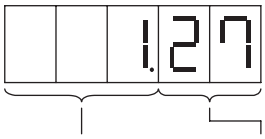
(2) To select the memory switch button to be changed:

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

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

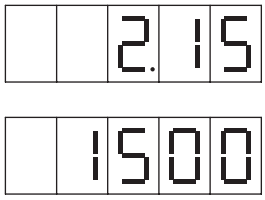
Memory switch data (level 2) has 2 types of data items: one is where a value is changed, and the other is where a pictograph is selected. The data items where a value is changed are colored pink and numbered such as K27 and the value can be changed with + and – buttons shown on the screen. The data items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



Upper 3 figures indicate a memory switch number.

Lower 2 figures indicate setting contents.



2. For CP-20:

1. Press the [M] key when the sewing LED is off to activate the user setting mode (Level 1)of the memory switch.
   Hold down the [M] key for 6 seconds to activate the service setting mode (Level 2) of the memory switch.
   (Caution) A 3-second and a 6-second buzzers sound when the key is held down. The 3-second buzzer informs users of activation of the test mode.

2. Change the memory switch number with the [+/] and [−/] keys.

3. Press the [□○] key when the memory switch number to be changed appears. On this occasion, the sewing LED is turned on.

4. Change the contents of the memory switch with the [+/] and [−/] keys.

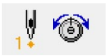
5. The factory settings can be restored with the [//] key.

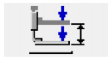
6. Press the [□○] key to register the changes. The sewing LED is turned off and the screen returns to the one where the memory switch number is selected.

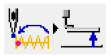
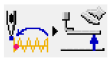
7. Press the [M] key to end the memory switch setting mode and to return to the regular mode.

(2) Function list

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

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
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 too2700rpm	100rpm	1500									
14	U14	Sewing speed of 5th stitch In case of without thread clamp		200 to 2700rpm	100rpm	2000									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
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	17	Operation panel key lock mode (CP-20 only)		0: Normal 1: X enlarging/ Y enlarging/speed-Item skip	–	0									
18	18	Counter motion selection (CP-20 only)		0: Sewing up counter 1: Bobbin thread Down counter	–	0									
19	U26	Height of presser at the time of 2-step stroke		50 to 90	1	70									
20	U32	Buzzer sound can be prohibited	  	0: Without buzzer sound 1: Panel operating sound 2: Panel operating sound + error	–	2									
21	U33	Number of stitches of thread clamp release is set		1 to 7 (stitches)	1	2									
22	U34	Clamping timing of thread clamp can be delayed		–10 to 0	1 (4°)	0									
23	U35	Thread clamp control can be prohibited	 	0: Normal 1: Prohibition	–	0									

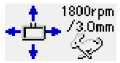
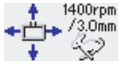
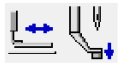
No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
24	U36	Feed motion timing is selected Set the timing in "–" direction when stitch is not well-tightened.		-8 to 16 (4º in steps of, 140 to 44°)	1 (4°)	3									
25	U37	State of the presser after end of sewing is selected		0: Presser goes up after moving at start of sewing	–	0									
				1: Presser goes up immediately afterend of sewing											
				2: Presser goes up by pedal operation after moving at start of sewing											
26	U38	Presser lifting motion at the end of sewing can be set		0: With presser up	–	0									
				1: Wuthout presser up											
27	U39	Origin retrieval can be performed every time after end of sewing (other than cycle sewing)		0: Without origin retrieval	–	0									
				1: With origin retrieval											
28	U40	Origin retrieval in cycle sewing can be set		0: Without origin retrieval	–	0									
				1: Every time 1 pattern is finished											
				2: Every time 1 cycle is finished											
29	U41	Start of presser when sewing machine stops by temporary stop command can be selected		0: Presser rise	–	0									
				1: Presser rise with presser switch											

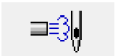
No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
30	U42	Needle stop position is set		0: Up position	–	0									
				1: Upper dead point											
31	U46	Thread trimming can be prohibited		0: Normal	–	0									
				1: Thread trimming prohibited											
32	U48	Route of return to origin by return to origin button can be selected		0: Disabled	–	0					1				
				1: Pattern data reverse tracing											
				2: Origin retrieval → sewing start position											
33	U49	Bobbin winding speed can be set		800 to 2000rpm	100rpm	1600									
34	U51	Motion method of wiper can be selected		0: Disabled	–	1									
				1: Enabled											
35	U64	Unit of sewing shape size change can be selected Function for IP-400 only		0: % input	–	0									
				1: Actual size input											
36	U68	Thread tension output time when needle thread tension setting can be set		0 to 20 (1sec) (0: No thread tension output)	1sec	0									
37	U69	Bend position of thread clamp is selected		0: S type 1: H type thin thread (#50 to #8) 2: H type intermediate 3: H type thick threas (#5 to #2)	1	S type: 0/H type: 1									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
38	U70	Thread clamp and thread clamp position selection		0: Standard (front) 1: Rear	–	0									
39	U71	Thread breakage detection selection		0: Disabled 1: Enabled	–	1									
40	U72	Number of invalid stitches at the start of sewing of thread breakage detection		0 to 15 stitches	1	8									
41	U73	Number of invalid stitches during sewing of thread breakage detection		0 to 15stitches	1	3									
42	U81	Feeding frame control/pedal open-close		(For motor-driven frame) 0: 1 step 1: 2-step stroke (move downward to the owest point with presser SW) 2: 2-step stroke (start to move down-ward to the lowest point with start SW) 3: 2-step stroke (With presser SW1: mid-point, lowermost position, rise) 4-99: 1 step (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	1	0		2				

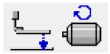
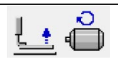
No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
43	U82	Feeding frame control: midway stop time open/close		(For motor-driven frame) 0: 1 step 1: 2-step stroke (move downward to the lowest point with presser SW) 2: 2-step stroke (start to move down-ward to the lowest point with start SW) 3-99: 1 step (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	1	0			2			
44	U84	Pedal SW 1 with/without latch		0: Without	–	1									
				1: With											
45	U85	Pedal SW 2 with/without latch		0: Without	–	1									
				1: With											
46	U86	Pedal SW 3 with/without latch		0: Without	–	1									
				1: With											

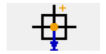
No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
47	U87	Pedal SW 4 with/without latch		0: Without	–	1									
				1: With											
48	U88	Enlarging/reducing function mode (Pattern button, CP-20:increasing/ decreasing of pitch only)		0: Prohibition	–	1									
				1: Stitch count enlargement/ reduction (pitch fixed)											
				2: Pitch enlargement /reduction (stitch count fixed)											
49	U89	Jog move function mode		0: Prohibition	–	2									
				1: Parallel move											
				2: Second origin specified later											
50	U91	Retainer compensation motion: selection of motion		0: Without motion	–	0									
				1: With motion											
51	U94	Selection of needle upper dead point at the time of origin retrievaly/ return to origin		0: Without	–	0					1				
				1: With											
52	U97	Temporary stop, thread trimming operation		0: Automatic thread trimmer	–	1									
				1: Manual thread trimmer (by pressing stop SW again)											

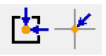
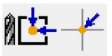
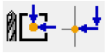
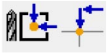
No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
53	U101	Main motor X/Y feed synchronized control, speed/pitch		0: 2700rpm/3.0mm	–	0									
				1: 2200rpm/3.0mm											
				2: 1800rpm/3.0mm											
				3: 1400rpm/3.0mm											
54	U103	Intermediate presser with/without control		0: Disabled (lowering fixed)	–	1									
				1: Enabled (lowering with sewing data during operation)											
				2: Enabled (lowering during feeding front and feeding back)											
55	U104	Intermediate presser lowering timing		0: Immediately before sewing machine head activation	–	0									
				1: Synchronization with last feeding frame											
56	U105	Intermedia presser : wiper sweeping position (side-sweeping wiper wearing)		0: Above intermediate presser	–	0									
				1: Above intermediate presser (intermediate presser lowest position)											
				2: Below intermediate presser											
57	U108	With/without air pressure detection		0: without	–	0	1								
				1: with											

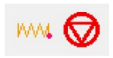
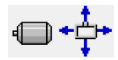
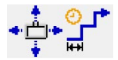
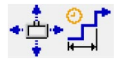
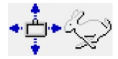
No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
58	U112	Intermediate presser down position setting Refer to Instruction Manual, “I-4-7. Intermediate presser height”.		0 to 7.0mm	0.1	3.5									
59	U129	With/without needle cooler control		0: Without	–	1									
				1: With											
60	U245	Greas-up error Clearing of number of stitches of grease-up is performed		Counted by 1 stitch Only “clear” is available.	–	–									
61	U500	Language selection	日本語	1: Japanese	1	1									
			English	2: English											
			中文	3: Chinese											

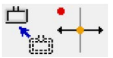
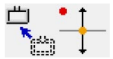
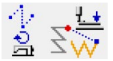
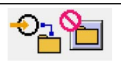
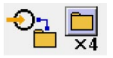
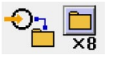
• Level 2

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
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									
10	K53	Delayed time of magnet wiper off		10 to 500ms	10ms	80									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
11	K54	Wiper output timing select at upper dead point stop		0: Up position	–	0									
				1: Upper dead point											
12	K56	Moving limit range in +X direction		0 to 819mm	1	+66		+76	+111	+111	+66		+76	+111	+111
13	K57	Moving limit range in –X direction		-819 to 0mm	1	–66		–76	–111	–111	–66		–76	–111	–111
14	K58	Moving limit range in +Y direction		0 to 819mm	1	+31		+51	+31	+51	+31		+51	+31	+51
15	K59	Moving limit range in –Y direction		–819 to 0mm	1	–31		–51	–31	–51	–31		–51	–31	–51
16	K62	Selection of automatic preparation at power on		0: Ineffective	–	0									
				1: Effective											
17	K63	Selection of needle bar stop holding mode		0: Ineffective	–	1									
				1: Effective											
18	K67	Thread tension output while wiper output is active		0: No output (with thread trimming tension kept)	–	0									
				1: Maximum output											
19	K74	Selection between motor presser and pneumatic presser		0: Motor presser	–	0		1			0		1		
				1: Pneumatic presser											
20	K75	Pneumatic presser lowering delayed time (Disabled with motor presser selected)		0 to 1000ms	10ms	100									
21	K80	Control of feeding frame/ automatic opening and closing		0-99: Full open, full holding	1	0									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
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 1: Stroke position 2 to 99: Full open	–	0									
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: 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: 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 Smart Media		0: Disabled (backup data enabled)	–	0									
				1: Enabled											

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
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 to10000ms	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	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
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 change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
53	K131	Presser lifting at temporary stop error Y/N		0: Without 1: With	–	1	0								
54	K150	Prohibition selection of machine head safety switch		0: Normal 1: Prohibition	–	0									
55	K241	Model classification		0 to 19	1	0/1	2/3	4/5	6/7	8/9	10/11	12/13	14/15	16/17	18/19
No. 300 to 401 items are applicable only to the simplified panel. For IP-400, the port setting screen is available for input.															
56	300	Input terminal 1 assignment		0 to 199	1	0									
57	301	Input terminal 1 active		0: LOW 1: HIGH	–	0									
58	302	Input terminal 2 assignment		0 to 199	1	0									
59	303	Input terminal 2 active		0: LOW 1: HIGH	–	0									
60	304	Input terminal 3 assignment		0 to 199	1	0									
61	305	Input terminal 3 active		0: LOW 1: HIGH	–	0									
62	306	Input terminal 4 assignment		0 to 199	1	0									
63	307	Input terminal 4 active		0: LOW 1: HIGH	–	0									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
64	308	Input terminal 5 assignment		0 to 199	1	0									
65	309	Input terminal 5 active		0: LOW 1: HIGH	–	0									
66	310	Input terminal 6 assignment		0 to 199	1	0									
67	311	Input terminal 6 active		0: LOW 1: HIGH	–	0									
68	312	Input terminal 7 assignment		0 to 199	1	0									
69	313	Input terminal 7 active		0: LOW 1: HIGH	–	0									
70	314	Input terminal 8 assignment		0 to 199	1	0									
71	315	Input terminal 8 active		0: LOW 1: HIGH	–	0									
72	316	Input terminal 9 assignment		0 to 199	1	0									
73	317	Input terminal 9 active		0: LOW 1: HIGH	–	0									
74	318	Input terminal 10 assignment		0 to 199	1	0									
75	319	Input terminal 10 active		0: LOW 1: HIGH	–	0									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
76	320	Input terminal 11 assignment		0 to 199	1	0									
77	321	Input terminal 11 active		0: LOW 1: HIGH	–	0									
78	322	Input terminal 12 assignment		0 to 199	1	0									
79	323	Input terminal 12 active		0: LOW 1: HIGH	–	0									
80	324	Input terminal 13 assignment		0 to 199	1	0									
81	325	Input terminal 13 active		0: LOW 1: HIGH	–	0									
82	326	Input terminal 14 assignment		0 to 199	1	0									
83	327	Input terminal 14 active		0: LOW 1: HIGH	–	0									
84	328	Input terminal 15 assignment		0 to 199	1	0									
85	329	Input terminal 15 active		0: LOW 1: HIGH	–	0									
86	330	Input terminal 16 assignment		0 to 199	1	0									
87	331	Input terminal 16 active		0: LOW 1: HIGH	–	0									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
88	332	Output terminal 1 assignment		0 to 199	1	1									
89	333	Output terminal 1 active		0: LOW 1: HIGH	–	0									
90	334	Output terminal 2 assignment		0 to 199	1	2									
91	335	Output terminal 2 active		0: LOW 1: HIGH	–	0									
92	336	Output terminal 3 assignment		0 to 199	1	4									
93	337	Output terminal 3 active		0: LOW 1: HIGH	–	0									
94	338	Output terminal 4 assignment		0 to 199	1	7									
95	339	Output terminal 4 active		0: LOW 1: HIGH	–	0									
96	340	Output terminal 5 assignment		0 to 199	1	9									
97	341	Output terminal 5 active		0: LOW 1: HIGH	–	0									
98	342	Output terminal 6 assignment		0 to 199	1	0									
99	343	Output terminal 6 active		0: LOW 1: HIGH	–	0									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
100	344	Output terminal 7 assignment		0 to 199	1	0									
101	345	Output terminal 7 active		0: LOW 1: HIGH	–	0									
102	346	Output terminal 8 assignment		0 to 199	1	0									
103	347	Output terminal 8 active		0: LOW 1: HIGH	–	0									
104	348	Output terminal 9 assignment		0 to 199	1	0									
105	349	Output terminal 9 active		0: LOW 1: HIGH	–	0									
106	350	Output terminal 10 assignment		0 to 199	1	0									
107	351	Output terminal 10 active		0: LOW 1: HIGH	–	0									
108	352	Output terminal 11 assignment		0 to 199	1	0									
109	353	Output terminal 11 active		0: LOW 1: HIGH	–	0									
110	354	Output terminal 12 assignment		0 to 199	1	0									
111	355	Output terminal 12 active		0: LOW 1: HIGH	–	0									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
112	356	Output terminal 13 assignment		0 to 199	1	0									
113	357	Output terminal 13 active		0: LOW 1: HIGH	–	0									
114	358	Output terminal 14 assignment		0 to 199	1	0									
115	359	Output terminal 14 active		0: LOW 1: HIGH	–	0									
116	360	Output terminal 15 assignment		0 to 199	1	0									
117	361	Output terminal 15 active		0: LOW 1: HIGH	–	0									
118	362	Output terminal 16 assignment		0 to 199	1	0									
119	363	Output terminal 16 active		0: LOW 1: HIGH	–	0									
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 1: Output	–	0									
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 1: Output	–	0									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
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 1: Output	–	0									
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 1: Output	–	0									
128	372	Virtual I/O terminal 5 assignment		0 to 199	1	0									
129	373	Virtual I/O terminal 5 I/O selection		0: Input 1: Output	–	0									
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 1: Output	–	0									
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 1: Output	–	0									
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 1: Output	–	0									

No.		Item	Setting range	Smallest change-able unit	Initial value									
					SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
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 1: Output	–	0									
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 1: Output	–	0									
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 1: Output	–	0									
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 1: Output	–	0									
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 1: Output	–	0									
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 1: Output	–	0									

No.		Item		Setting range	Smallest change-able unit	Initial value									
						SS/HS 1306	SL/HL 1306	SL/HL 1510	SL/HL 2206	SL/HL 2210	SS/HS 1306 FU05	SL/HL 1306 FU05	SL/HL 1510 FU05	SL/HL 2206 FU05	SL/HL 2210 FU05
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 1: Output	–	0									
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 1: Output	–	0									
152	396	Pedal SW1 active		0: LOW 1: HIGH	–	0									
153	397	Pedal SW2 active		0: LOW 1: HIGH	–	0									
154	398	Pedal SW3 active		0: LOW 1: HIGH	–	0									
155	399	Pedal SW4 active		0: LOW 1: HIGH	–	0									
156	400	Start SW active		0: LOW 1: HIGH	–	0									
157	401	Temporary stop SW active		0: LOW 1: HIGH	–	1									

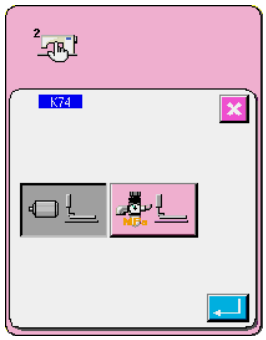
5. Supplemental remarks of each function number and explanation of each function

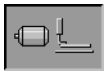
(1) Feeding frame operational sequence setup

For the AMS-210E, 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.



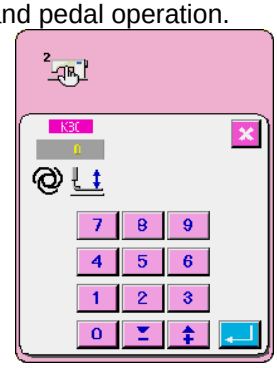
Setup	Contents	Explanation
 CP20: 0	Pulse motor driving	AMS210ESS/EHS-1306
 CP20: 1	Air driving	AMS210ESL/EHL-1306/1510/2206/2210

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.

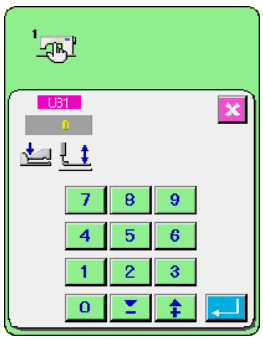


Setup	Contents	Explanation
0 to 99	All lowering, all lifting	All lowering, all lifting only

(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.

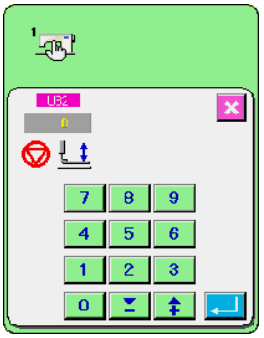
In regard to the setup items, refer to the [(5) List of feeding frame and pedal setup].



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

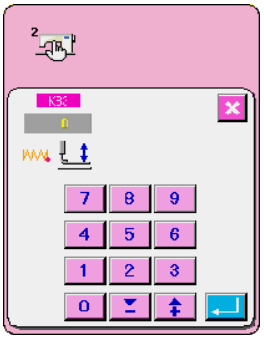
Using the memory switch U82, it is possible to set up the operational sequence of the feeding frame by pedal operation while the feeding frame is lifted by a temporary stop command in the pattern data.

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 pulse motor driving

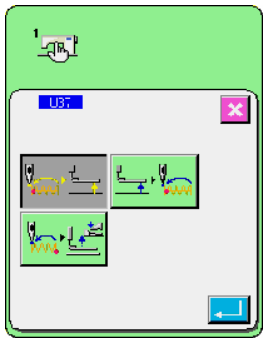
Setup	Contents	Preference	Explanation
0	United clamp	–	Lowered to the bottom by Pedal 1.
1	United clamp, 2-step stroke	–	Lowered to the intermediate position by Pedal 1 (right). Lowered to the bottom by Pedal 2 (left).
2	United clamp, 2-step stroke	–	Lowered to the intermediate position by Pedal 1. Lowered to the bottom by the start pedal to start sewing.
3	United clamp 2-step stroke	–	Lowered to the mid-point position by the first action of the presser pedal 1. Lowered to the bottom position by the second action. Raised by the third action.
4 to 99	United clamp	–	Lowered to the bottom by Pedal 1.

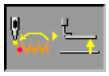
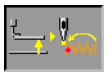
For air driving

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

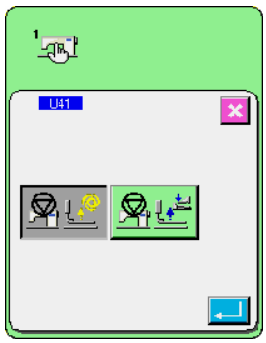
Using the memory switch U37, it is possible to set up the timing for feeding frame lifting at the end of sewing.



Setup	Contents	Explanation
 CP20: 0	After the start of sewing reset	The feeding frame is lifted after the movement from the end of sewing to the start of sewing.
 CP20: 1	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.
 CP20: 2	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

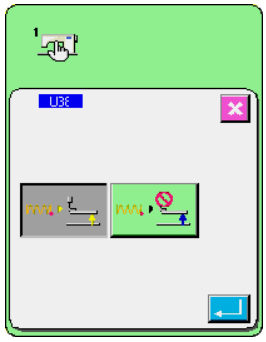
Using the memory switch U41, it is possible to set up the timing for feeding frame lifting when it has been set up with a temporary stop command in the pattern data.

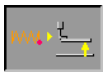


Setup	Contents	Explanation
 CP20: 0	Lifting	The feeding frame is lifted immediately with the temporary stop command.
 CP20: 1	Pedal operation	Lifted by pedal operation with the temporary stop command. Sewing is started by the start pedal with the feeding frame left lowered.

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
 CP20: 0	Pedal operation	It is possible to lift or lower the feeding frame by pedal operation.
 CP20: 1	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

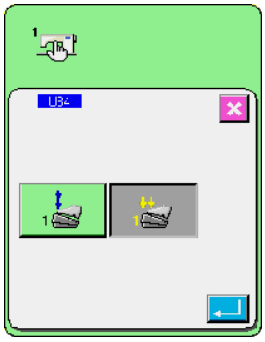
Using the memory switches U84 ~ U87 below, it is possible to set up the method of pedal operation.

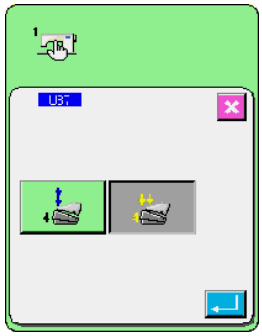
U84 : Used to set up the method of pedal operation for Pedal 1.
(Standard pedal, PK47 right)

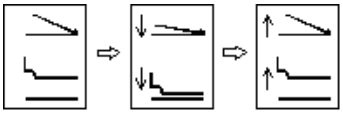
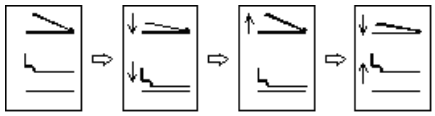
U85 : Used to set up the method of pedal operation for Pedal 2.
(PK47 left intermediate)

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)





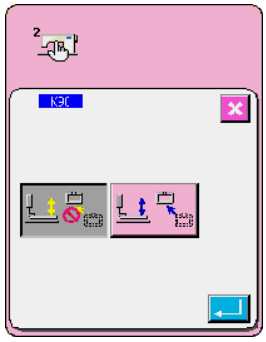
Setup	Contents	Explanation
 CP20: 0	Non-latch	The feeding frame is lowered only if the pedal is trodden on. It is lifted when the pedal is released. 
 CP20: 1	Latch	The feeding frame is lowered when the pedal is trodden on once. It is left lowered ven when the pedal is released. It is lifted when the pedal is trodden on secondly. 

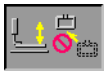
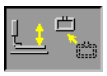
(2) Fixed refuge position setup

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

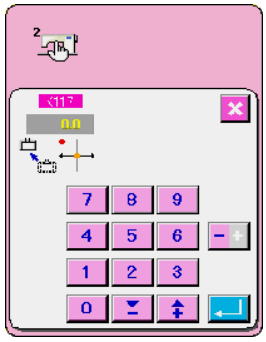
Using the memory switch K90, it is possible to set up the fixed refuge position.



Setup	Contents	Explanation
 CP20: 0	Fixed refuge position disabled	The fixed refuge position is not used.
 CP20: 1	Fixed refuge position enabled	The fixed refuge position is used.

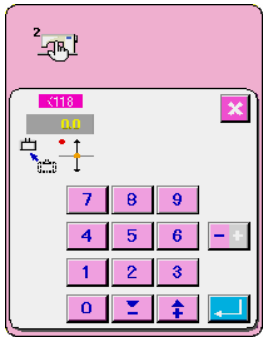
2. Fixed refuge position coordinates setup

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



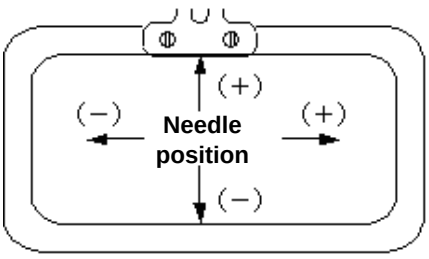
Setup	Contents	Explanation
Coordinate X	Coordinate X of the fixed refuge position	Coordinate X of the fixed refuge position is set up within the feeding frame in the unit of 0.1mm.

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

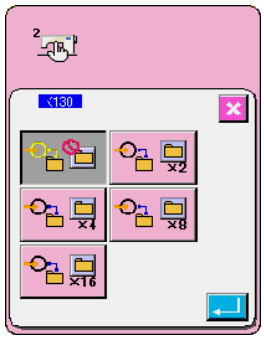
The bank function means a function of sewing effected through changeover to a pattern by an external signal, which is registered in multiple pattern buttons in cases of cassette discrimination and others.
For sewing by the bank function, an external signal input is entered before the feeding frame is 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).

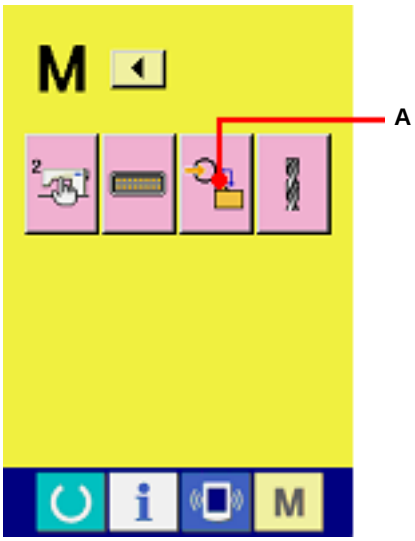
Setup	Contents	Explanation
 CP20: 0	Bank disabled	The bank function is not used.
 CP20: 1	No. of banks 2	Two patterns are set for the number of banks. One Input Terminal 0 is used.
 CP20: 2	No. of banks 4	Four patterns are set for the number of banks. Two Input Terminal 0 to 1 are used.
 CP20: 3	No. of banks 8	Eight patterns are set for the number of banks. Three Input Terminal 0 to 2 are used.
 CP20: 4	No. of banks 16	Sixteen patterns are set for the number of banks. Four Input Terminal 0 to 3 are used.

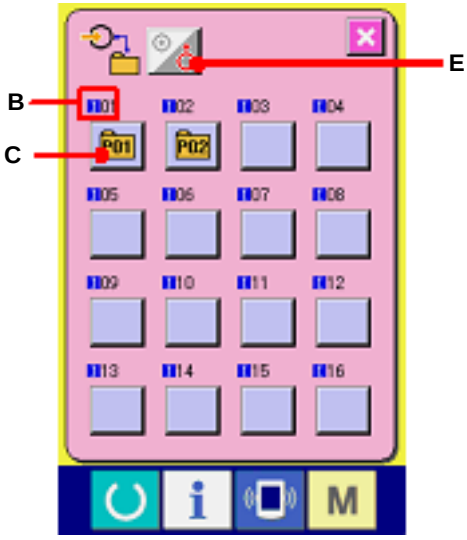


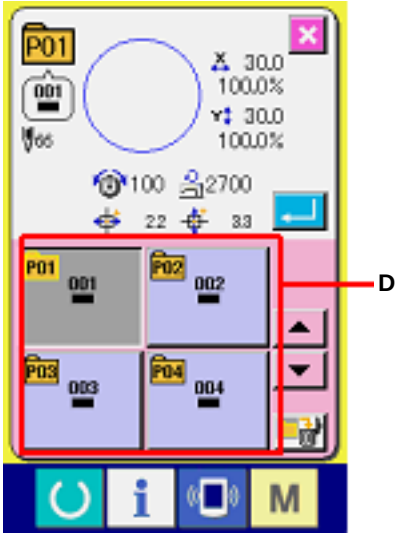
(2) External input terminal setup

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

1. IP-400







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

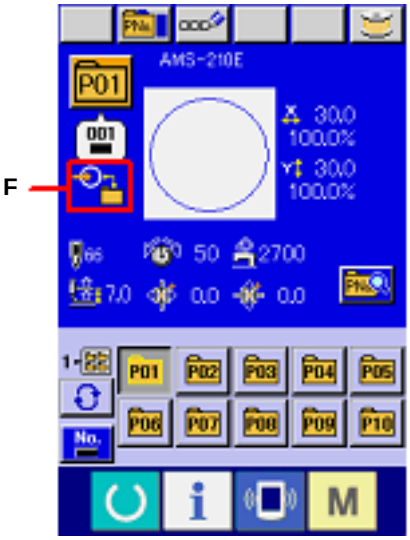
When the direct pattern number registration button (C) is pressed for a setting input terminal number (B), the direct pattern number selection screen is displayed. However, the selectable direct pattern numbers are limited only for the individual sewing. The direct pattern number to be registered for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

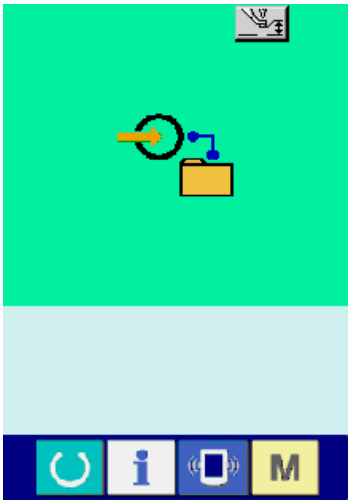
: Bank function turned ON

: Bank function turned OFF

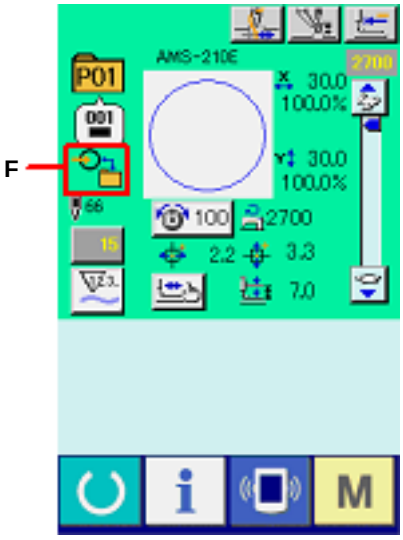


When the bank function setup screen is closed and the data input screen is displayed, a pictograph (F) for indicating the ON status is displayed if the bank function is turned ON.

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.



2. CP-20

The bank input terminals 0 to 3 (input Nos. 3 to 6) are assigned to arbitrary input terminals of the memory switches Nos. 300 ~ 331.

1) When the [M] key is continuously pressed for 6 seconds in the state that the sewing LED is unlit, the service setup mode is assumed for the memory switches and the bank mode is set up.
   → In regard to the method of memory switch setup, refer to the section of memory switch data change of the Instraction Manual.
2) Using the [+/▲] and [−/▼] keys, select the bank mode and press the [P] key. The sewing Led is then lit up.
3) Make [+/▲] and [−/▼] key setting for bank mode ON or OFF. Press the [P] key.
4) Register the direct pattern number for the input terminal. Input terminal changeover is possible with the [↻] key. The direct pattern number can be selected with the [+/▲] and [−/▼] keys.
5) Press the [P] key to register the contents of setup. The sewing LED is unlit and the status of memory number selection is recovered.
6) Press the [M] key to close the memory switch setup mode. The normal status is then recovered.

The upper 2 digits denote the input terminal number. **The lower 3 digits denote the pattern number.**

Relationship between bank input terminals and bank numbers

Input terminal 3 2 1 0	Bank number	Input terminal 3 2 1 0	Bank number	Input terminal 3 2 1 0	Bank number	Input terminal 3 2 1 0	Bank number
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

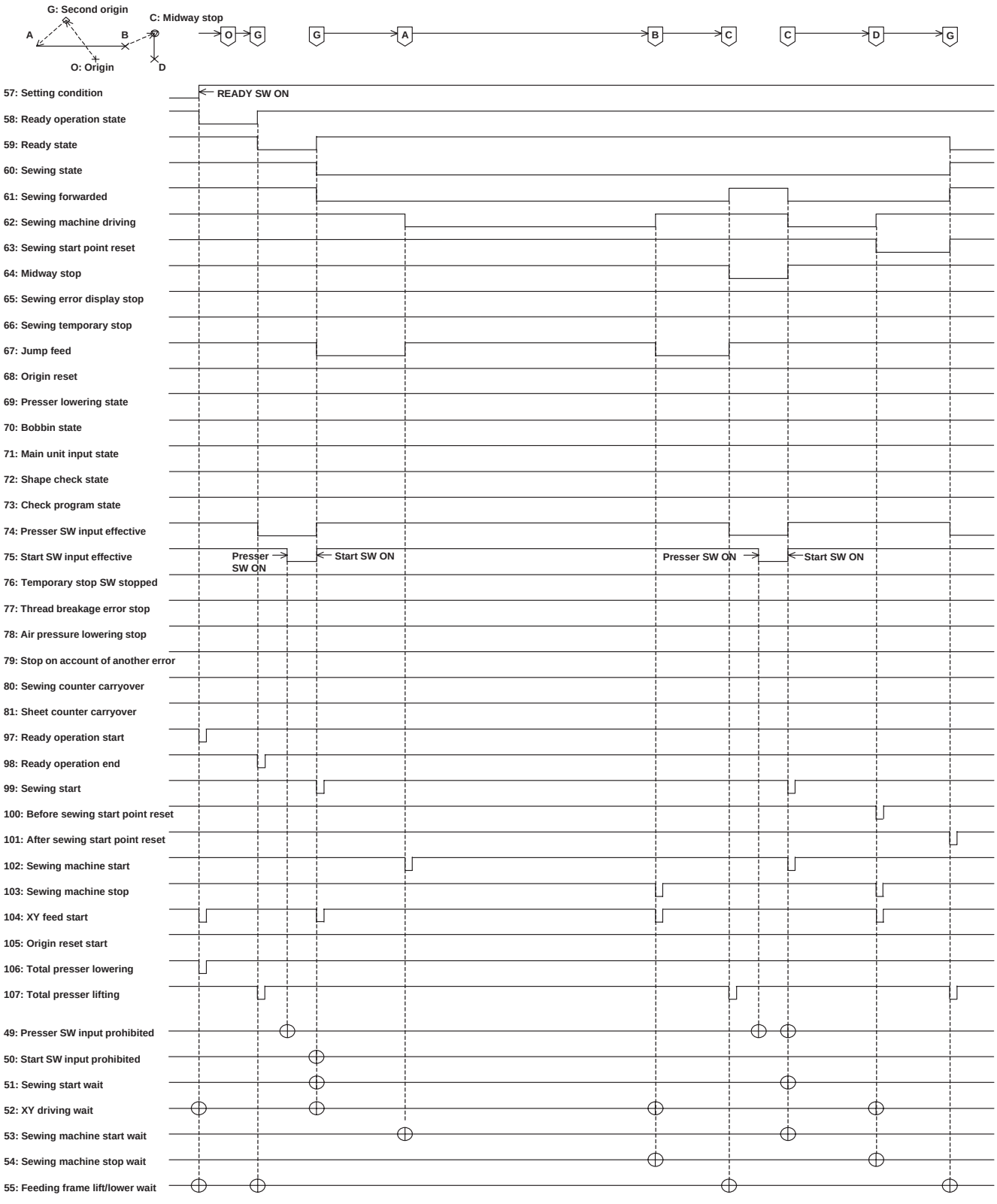
Input No.	Contents	Explanation
0	Nil	No input
For the actuator		
1	Void	
2	Detection of material end sensor	Detection of material end is enabled with the first Mark 1 command of the pattern data. When the input terminal becomes active, the section to the second Mark 1 command is skipped.
3	Bank input 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

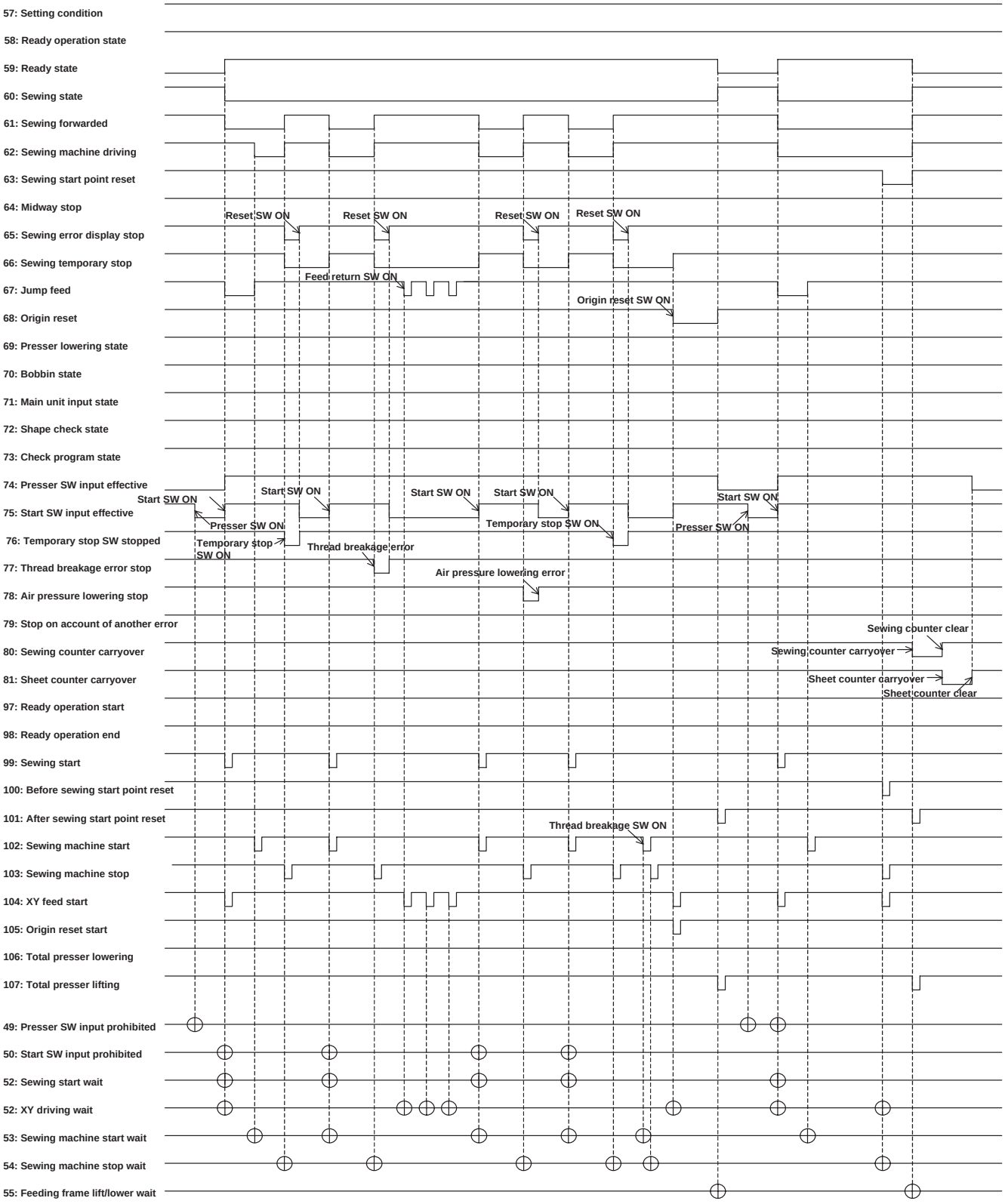
Output No.	Contents	Explanation
0	Nil	No output
For the actuator		
1	Feeding frame 1	Feeding frame right lifting
2	Feeding frame 2	Feeding frame left lifting
3	Feeding frame 3	(Feeding frame right 2-stage stroke)
4	Feeding frame 4	Feeding frame left 2-stage stroke
5	(Intermediate presser)	(Signal output)
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	Last mode status	Last 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.

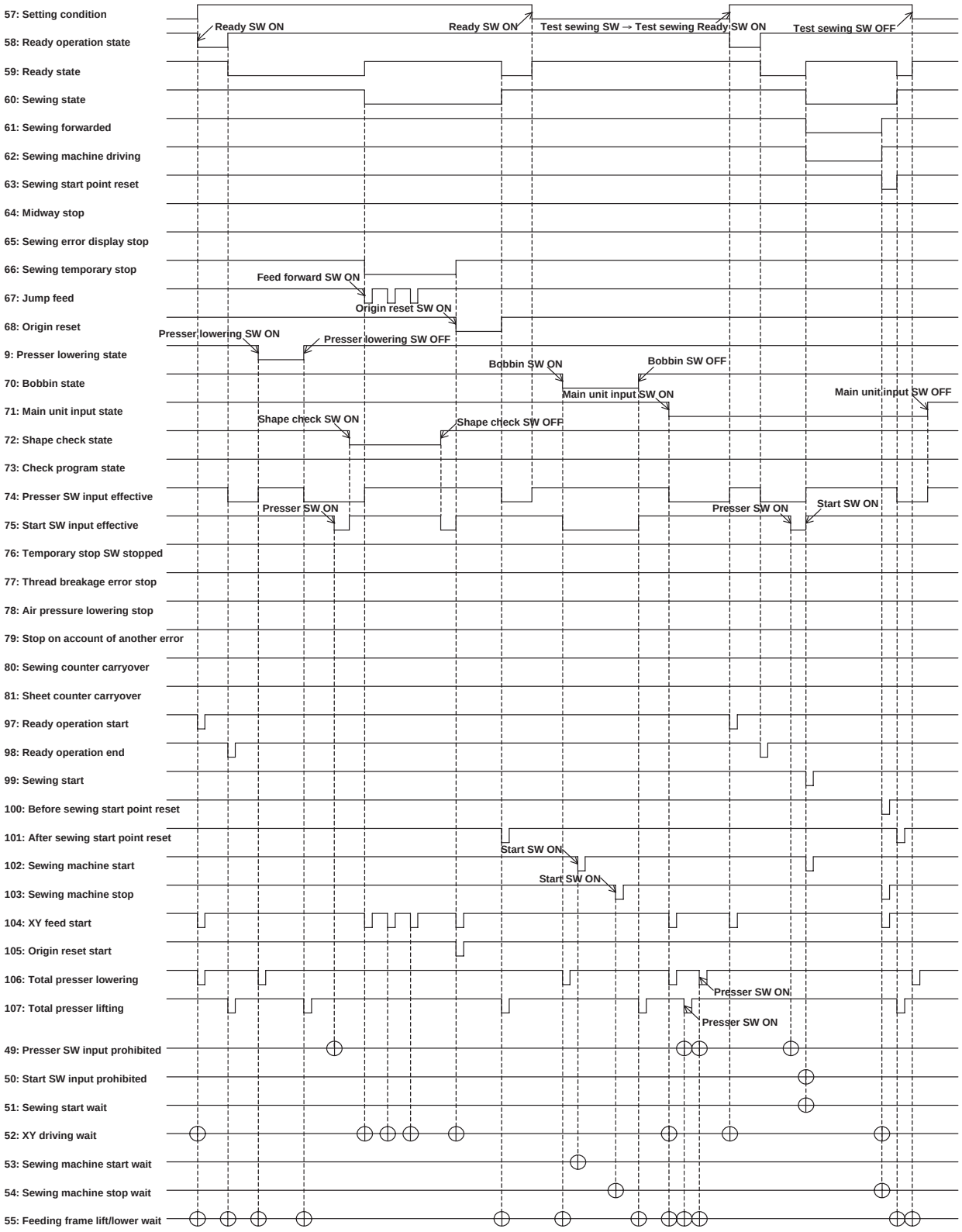
[Normal Status Diagram of the Port I/O]



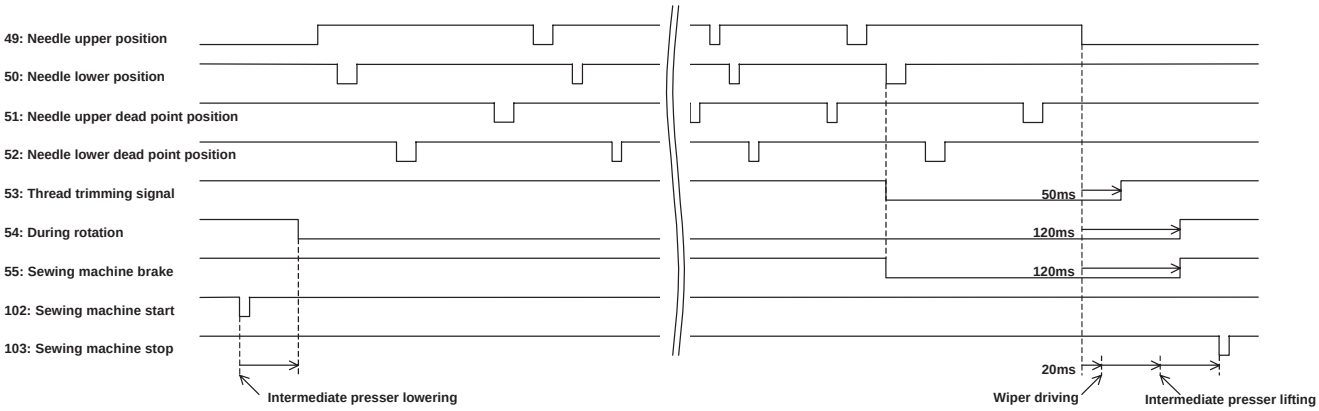
[Error Status Diagram of the Port I/O]



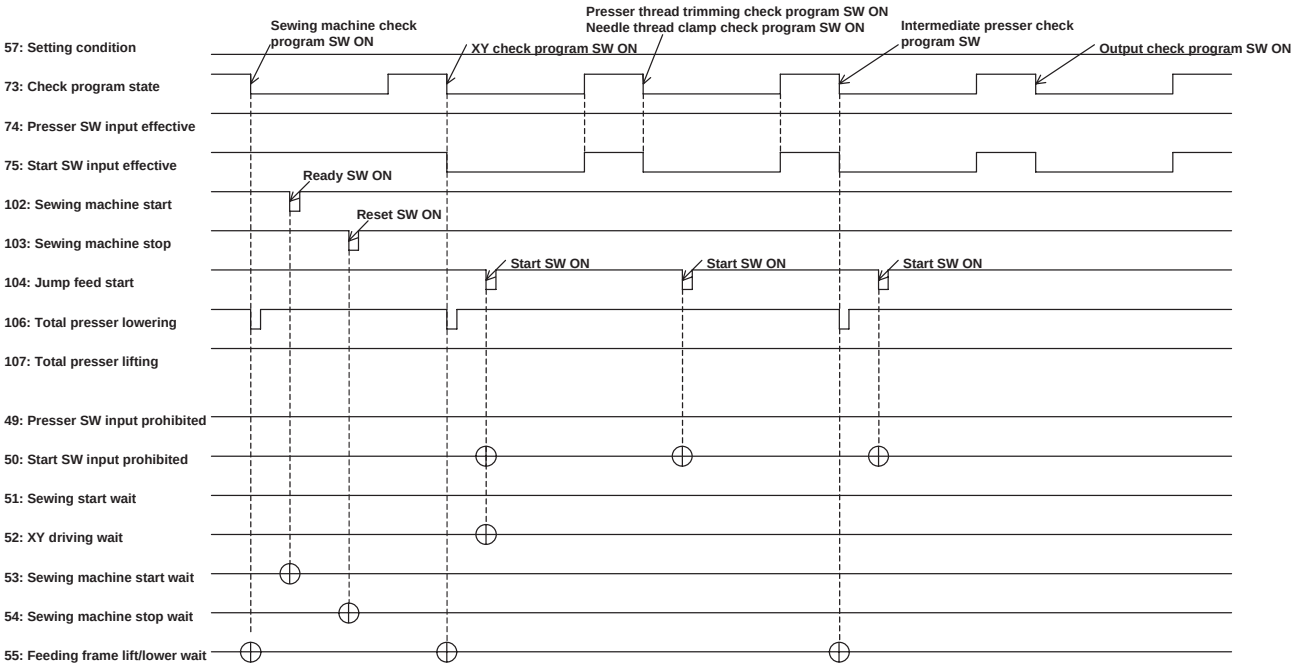
[Miscellaneous Status Diagram of the Port I/O]

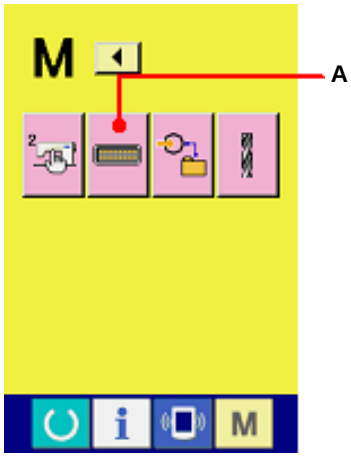


[Sewing Machine Driving Status Diagram of the Port I/O]



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



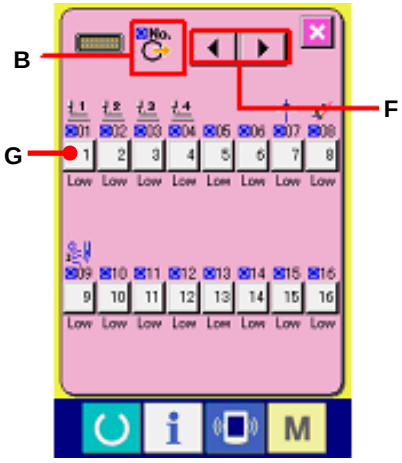


3. Setup procedures

(1) IP-400

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.

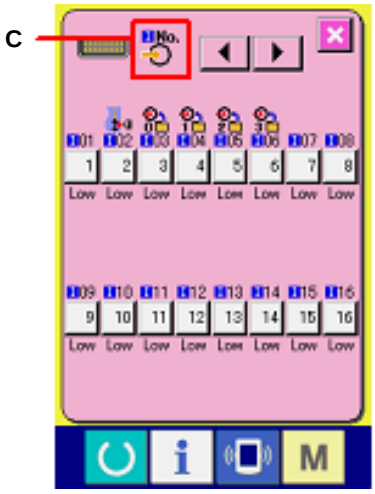
B : Output number setting

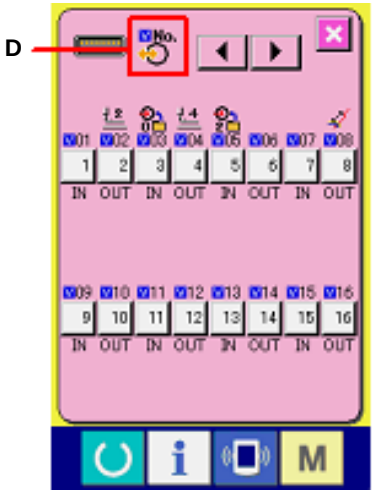
C : Input number setting

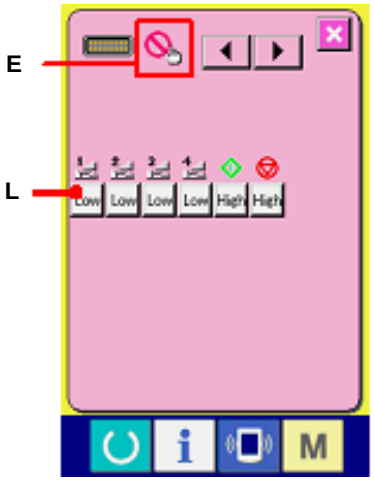
D : Virtual I/O number setting

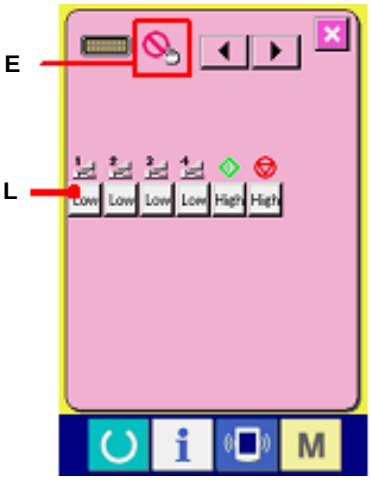
E : Switch operation prohibition setting

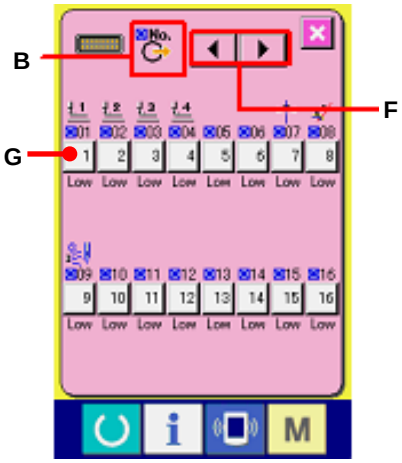
Setup screen changeover is possible with the right and left scroll buttons (F) located on the top of each screen.

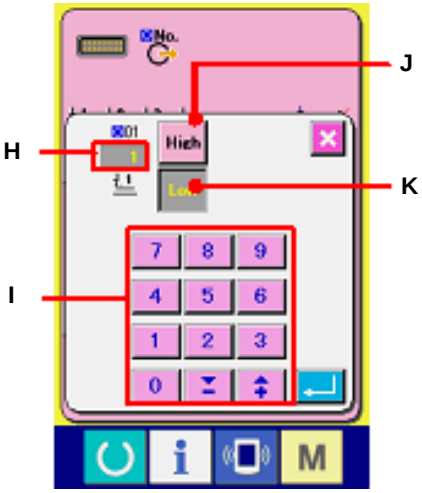






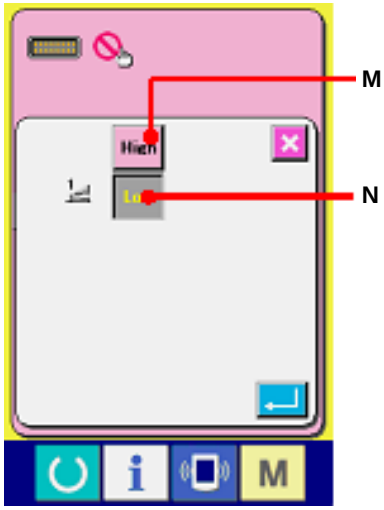






3) Port I/O setup

To make output number setting, input number setting, and virtual I/O number setting, the setup button 1 (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 OUT and input IN. To make switch operation setting, the setup button Low (L) is pressed to select the signal type from High (M) and Low (N).

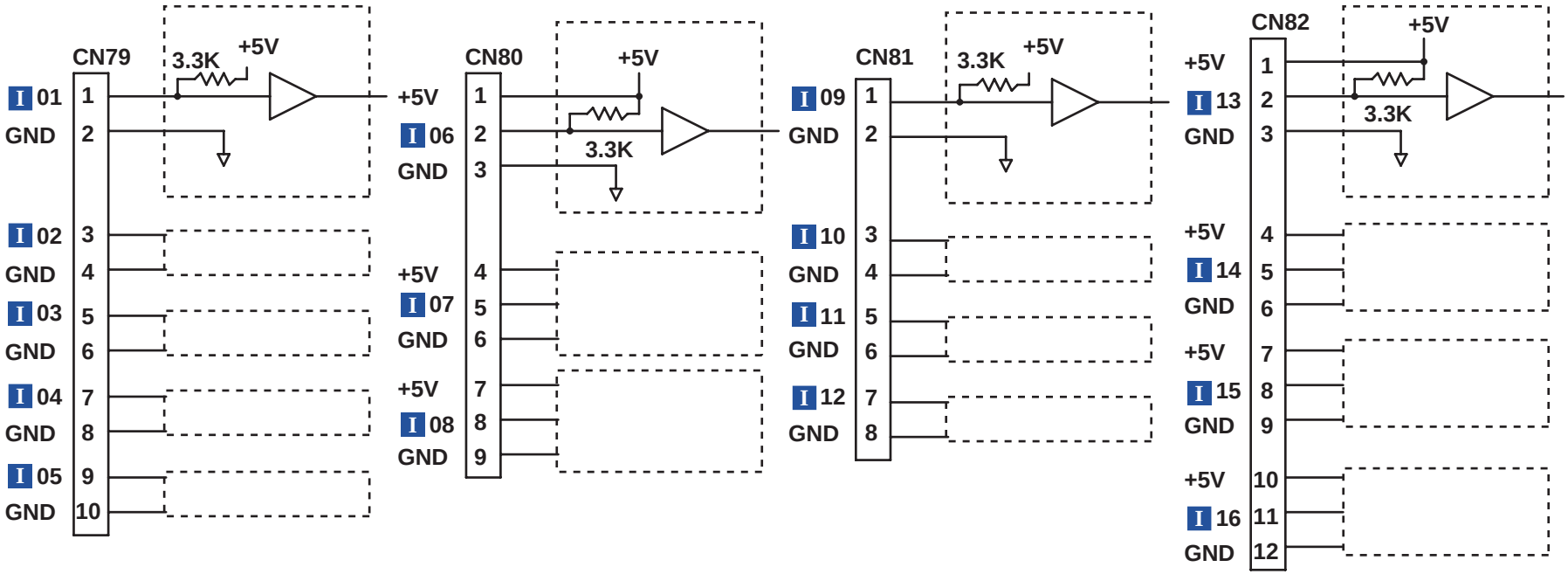


(2) CP-20

It is possible to make setting with the memory switches (Level 2) No. 300 to 401.

In regard to the method of input entry, refer to 4. Memory Switches, (2) Function list , • Level 2 (Simplified panel).

4. Input for sequence

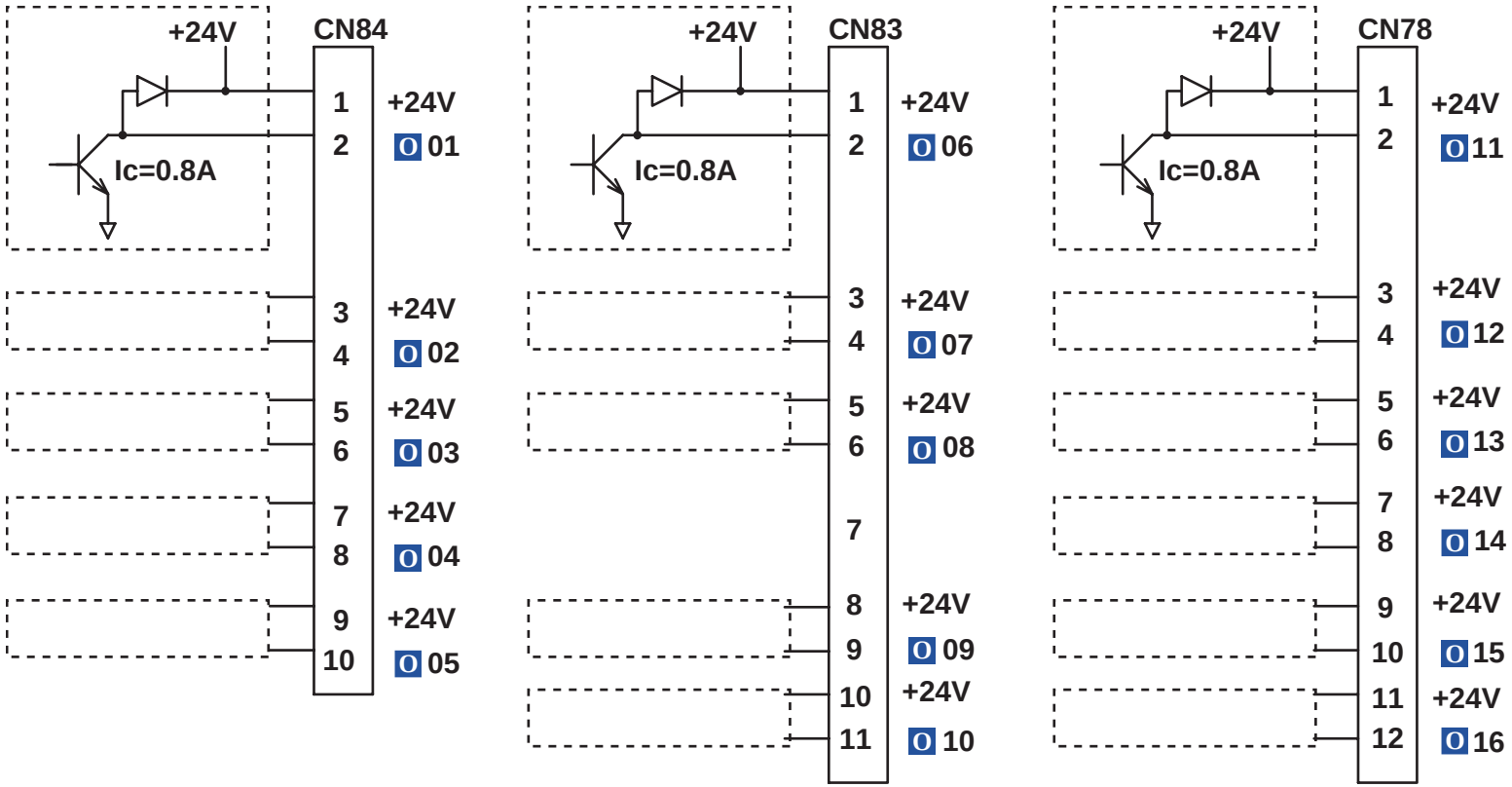


CN80, CN81, and CN82 are not integrated at shipment.
To use those connectors, mount those first.
CN80: HK01650009B (ELCO: 00 8263 0912 00 002)
CN81: HK01650008B (ELCO: 00 8263 0812 00 002)
CN82: HK01650012B (ELCO: 00 8263 1212 00 002)

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.

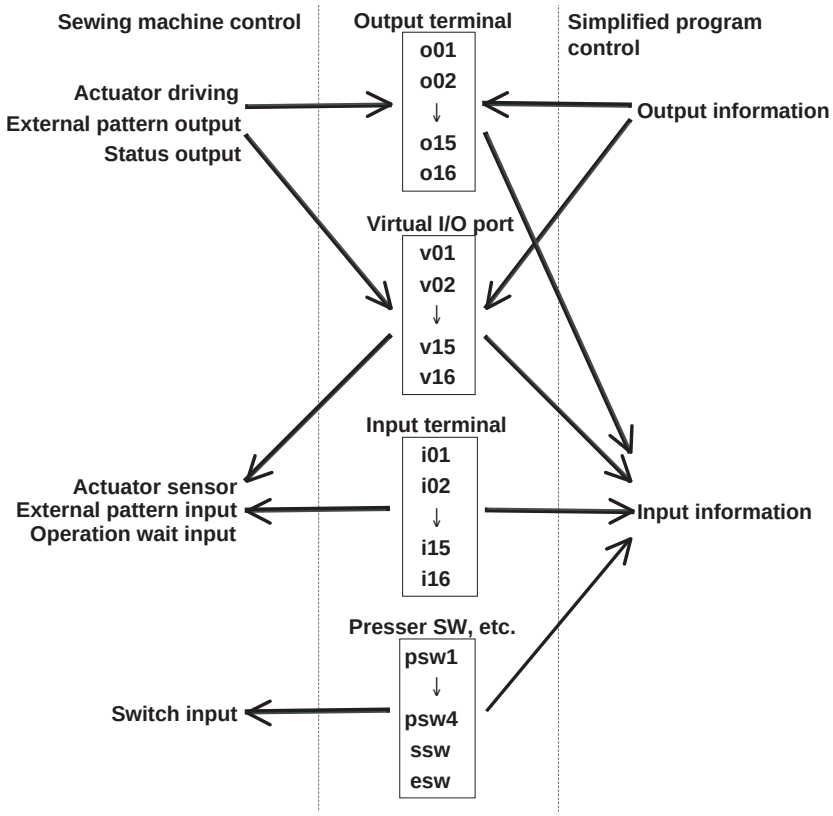
The virtual I/O port is provided for an interface to be used for sewing machine control and simplified program control. In the case of port I/O setup, either an input or output is set up as seen from the sewing machine control side.

(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)

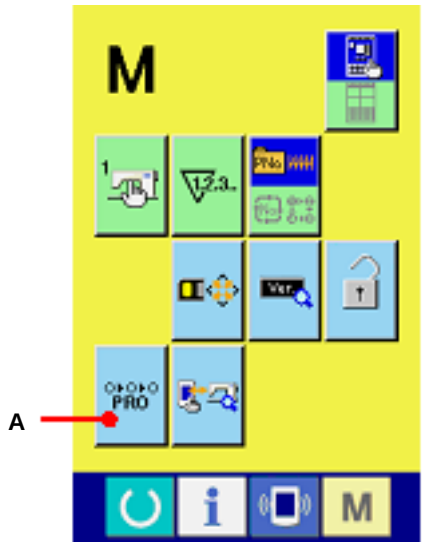
In the simplified program control, the I/O terminals and others are directly controlled based on the output and input information, irrespective of the result of port I/O setup.

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.

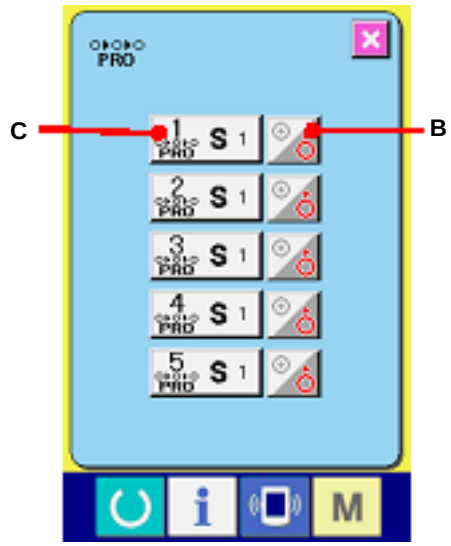


(2) Simplified program effective / ineffective

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.

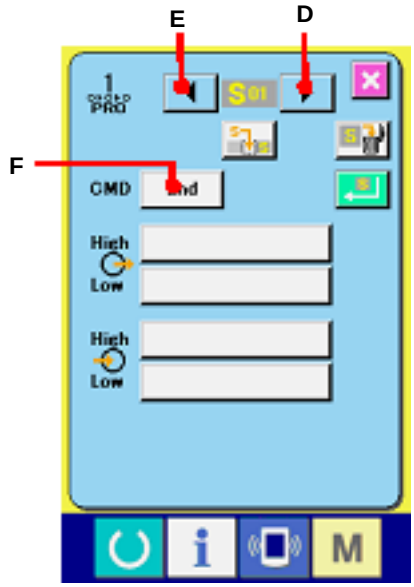
: Simplified program effective

: Simplified program ineffective

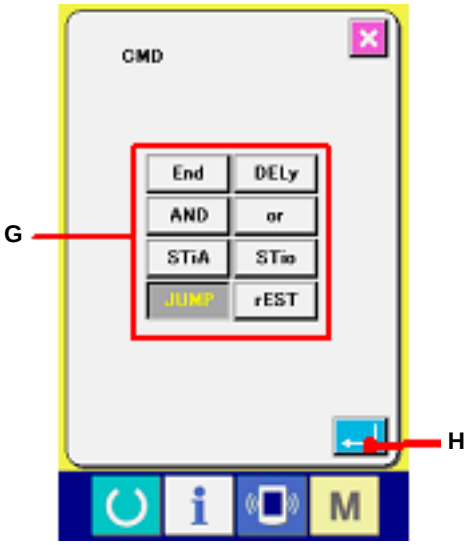


(3) Simplified program editing

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



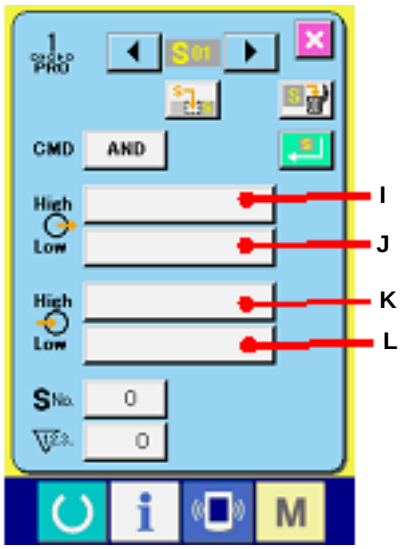
In the simplified program editing screen, the editing step is selected with the use of the step forwarding button (D) and the step return button (E). For each selected step, it is possible to carry out command port I/O setting and parameter setting.
A maximum of 99 steps can be entered.



1) Command selection

When the command selection button End (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.

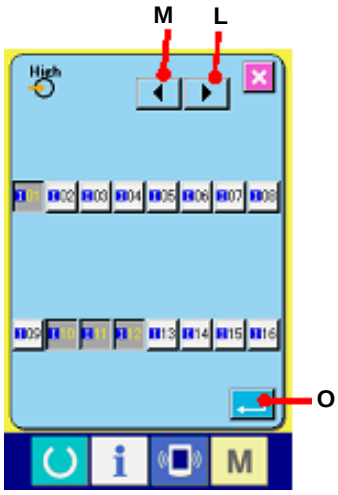
On the command selection screen, the command button (G) is displayed. Press the selecting command button and then press the Enter button (H).
In regard to command descriptions, refer to (4) list of simplified program commands.



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

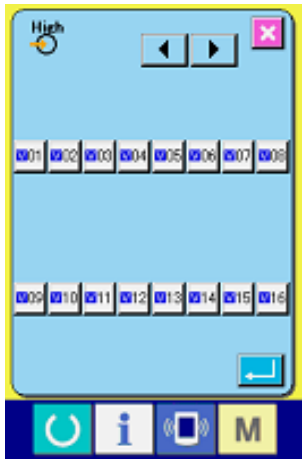
Using the page turning buttons (M, L), the displayed port type can be changed.
The port comes in the four types as specified below.

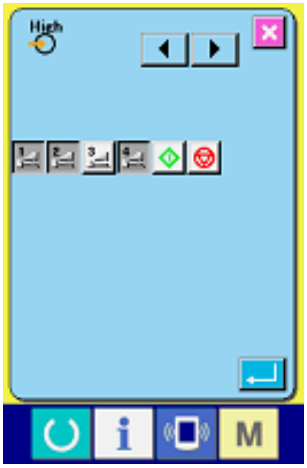
: Output port No.

: Input port No.

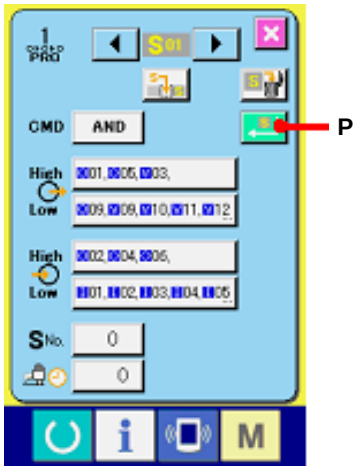
: Virtual I/O port No.

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

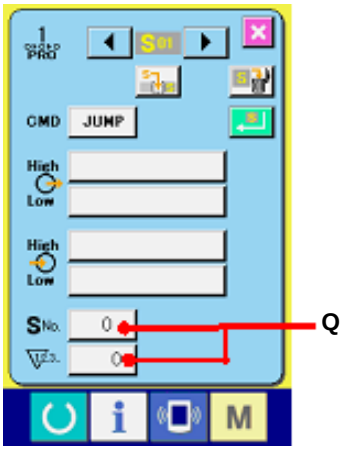




The port No. button is displayed on the screen. Press the button that corresponds to current setting.
The selection status button is displayed in gray.
After selection, press the Enter button (O).



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.



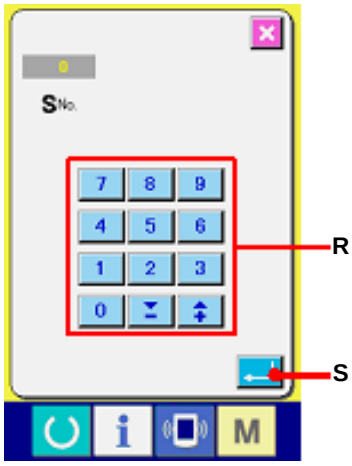
3) Parameter input

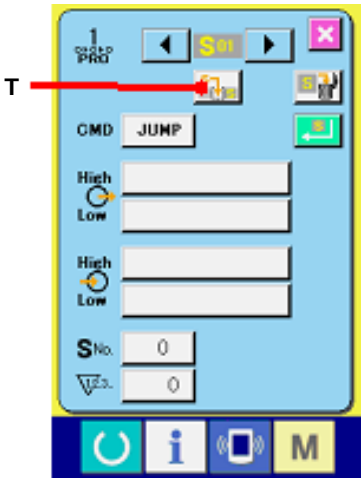
Corresponding to the selected command, the parameter input button is displayed.

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.



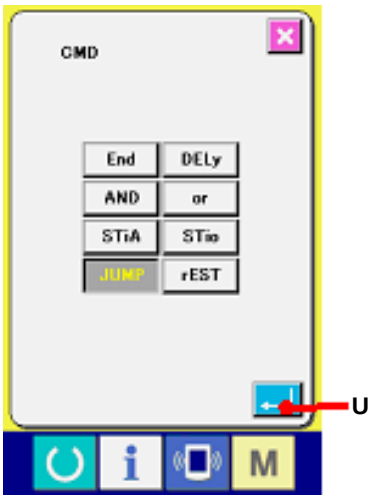


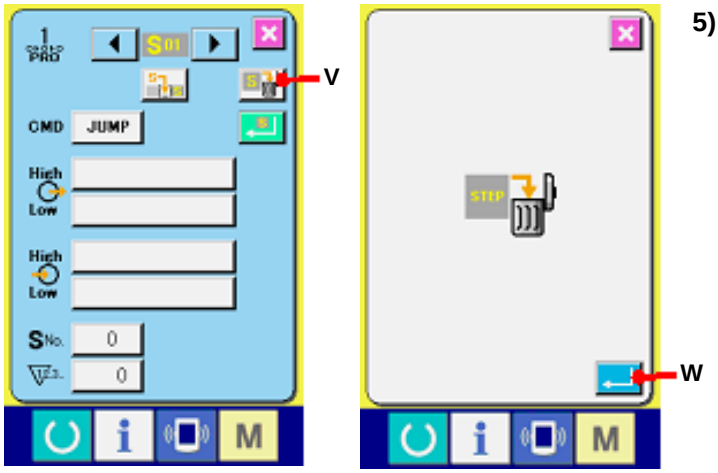
4) Step insertion

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.

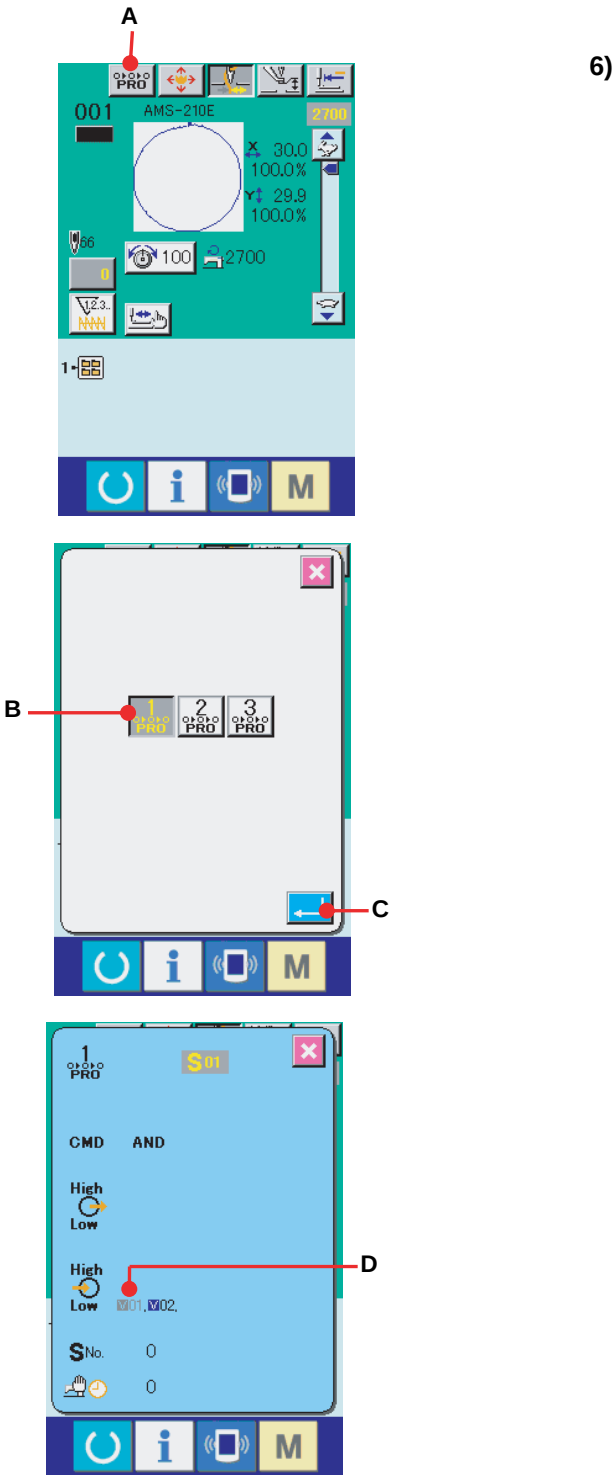




5) Step deletion

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).

5. To use the simplified program with CP-20

(1) Simplified program ON/OFF

1) When the power supply is turned on with the key kept pressed, the unit is started in simplified program mode.

2) When the P1 key is pressed, the simplified program number and the ON/OFF status are displayed.

Using the , key, it is possible to select the simplified program number.

Using the key, ON/OFF changeover is possible.

Upon the completion of modification, turn off the power supply.

(2) Write/read of the simplified program data with the smart media

1) When the power supply is turned on with the key kept pressed, the unit is started in simplified program mode.

2) When the P2 key is pressed, write/read of the simplified program data becomes possible with the smart media.

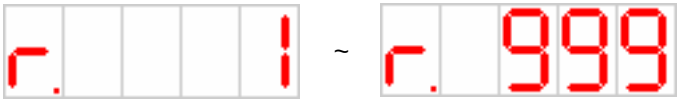
3) Select data Write or Read with the key.

: Reading : Writing

4) Using the , key, it is possible to select the file number.

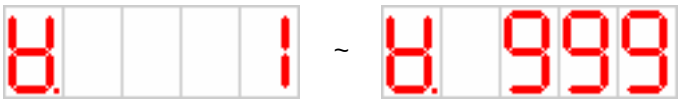
1. For data reading

It is possible to select only the file number registered in the smart media.



2. For data writing

It is possible to select only the file number that is not registered in the smart media.



5) When the key is pressed, reading or writing is started. During data reading or writing, the File No. is indicated in blinking mode. When the Power OFF is indicated, data writing is finished. Ordinary operation is recovered when the power supply is turned on again.

(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 pre-set 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 forcedly returned to the initial steps.

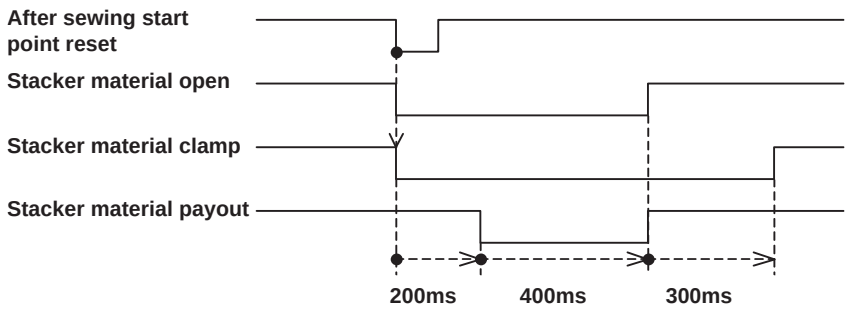
Input information setup range	Contents
o01H to o16H	High output of external output terminals 01 to 16
v01H to v16H	High output of virtual I/O ports 01 to 16
o01L to o16L	Low output of external output terminals 01 to 16
v01L to v16L	Low output of virtual I/O ports 01 to 16

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

his 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			

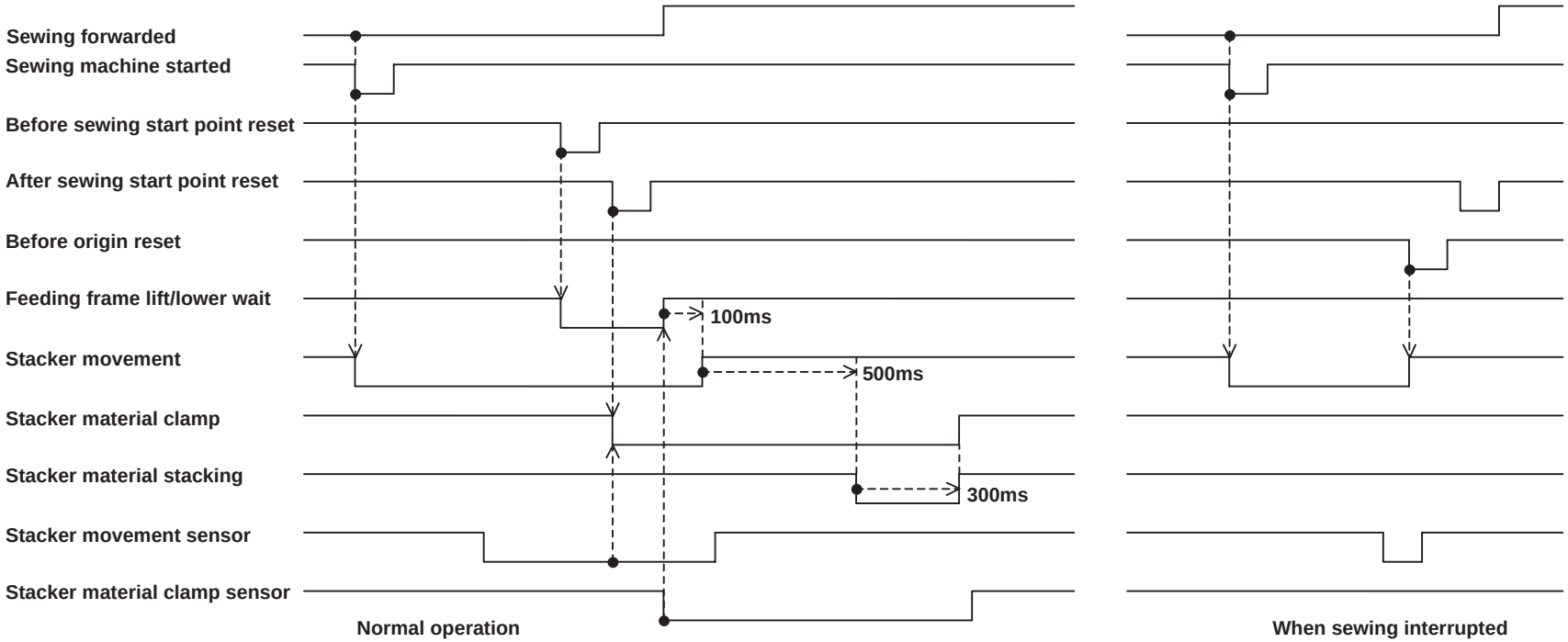
(Caution) For the descriptions in the parentheses ( ) of o06 ~ o08 above, the terminals directly generate outputs with the aid of the simplified program. Port I/O setting is disabled.

[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		

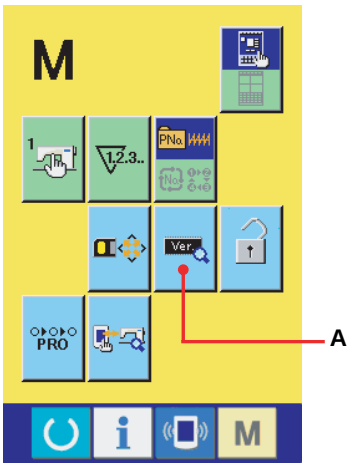
Terminal input	Contents	Remarks
i01		
i02		
i03		
i04		
i05		
i06		
i07		
i08		
i09		
i10		
i11		
i12		
i13		
i14		
i15		
i16		

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

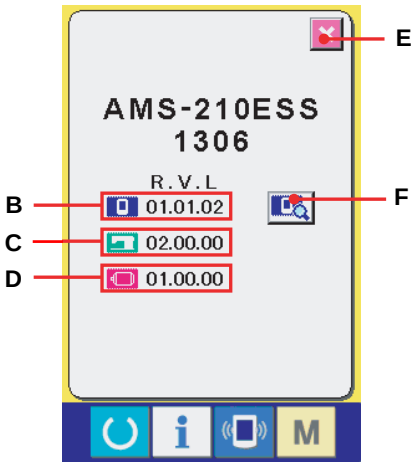
(7) Simplified program setup sheet

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



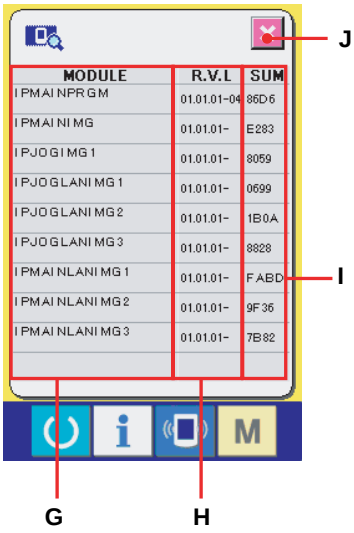
1. To display the version information screen:
Hold down the M key for 3 seconds to call up the version information button, (A) on the screen. Press this button to display the version information screen.



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.



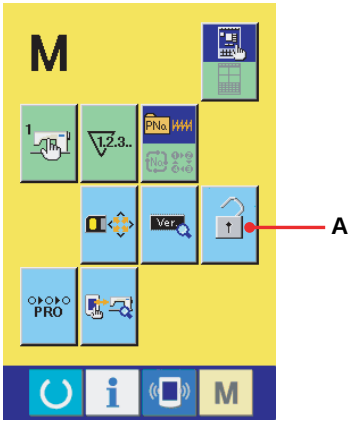
2. To display the detail screen:
Press the detail screen button, (F) to call up the panel program detail screen.

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.

* The check program allows you to see version information on the simplified panel.

(7) Keylock setup



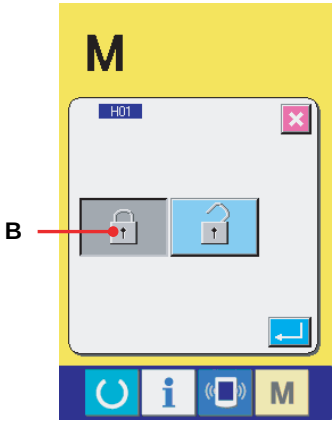
1. To call up the keylock screen:

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.

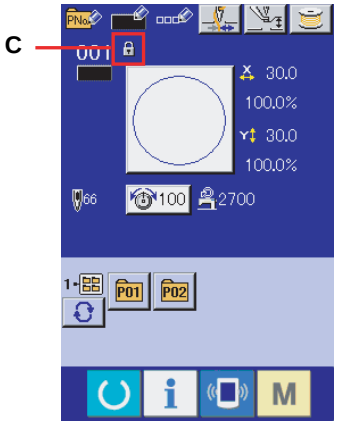
: Keylock is inactivated.

: Keylock is activated.



2. To select keylock and activate it:

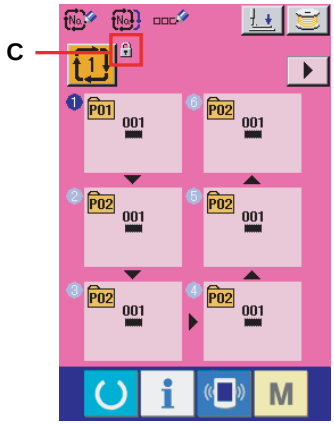
Select the keylock activation button, (B) on the keylock setting screen and press . Then, the keylock setting screen closes and keylock becomes activated.



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.



* Memory switch No. 17 allows you to activate keylock on the simplified panel.

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

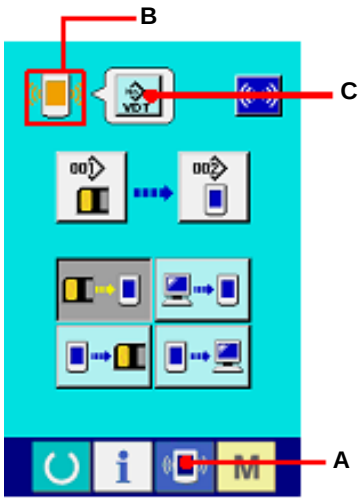
The data types allowed to be handled in the communication screens can differ according to the ordinarily used levels and the specific levels that are used by the maintenance personnel.

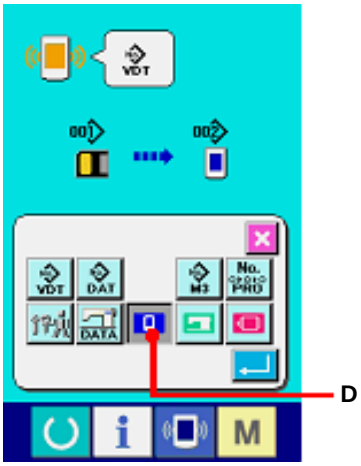
1. Types of data that can be handled

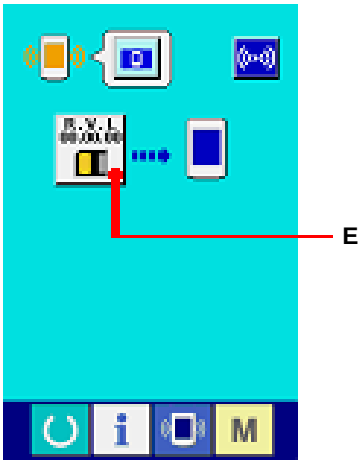
In addition to the four ordinary data types, the five more data types can be used for the maintenance personnel level. Each data type is as specified below.

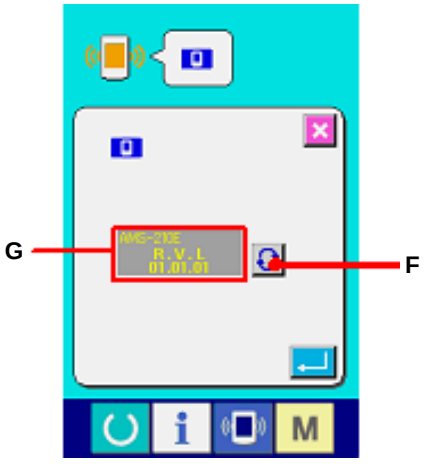
Data name	Pict	Extension	Contents of data
Adjustment data		Model name +00XXX.MSW Example) AMS00001.MSW	Data of the memory switches 1 and 2
All sewing machine data		Model name +00XXX.MSP Example) AMS00001.MSP	All data maintained by the sewing machine
Panel program data		IP + RVL (6 digits).HED IP + RVL (6 digits).PXX IM + 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-400)

(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-400)

(1) Selection of the data type

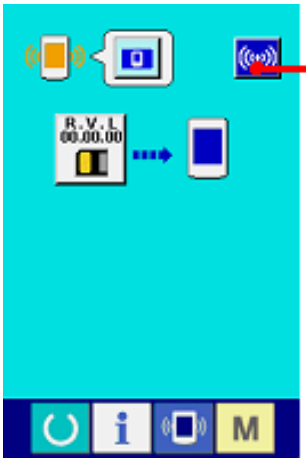
When the data classification button (C) is pressed in a communication screen of the maintenance personnel level, the data selection screen is displayed.

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.

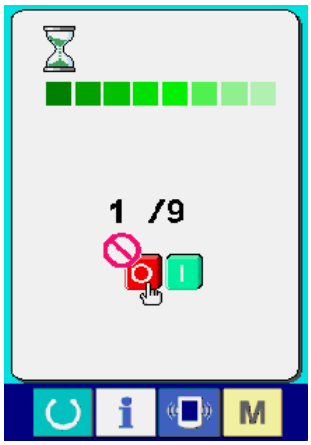


(3) Program rewrite start

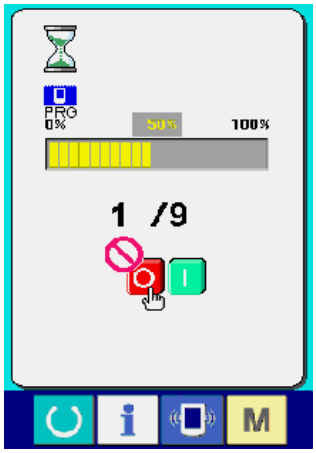
When the start of communication button (H) is pressed, program rewriting is started.

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

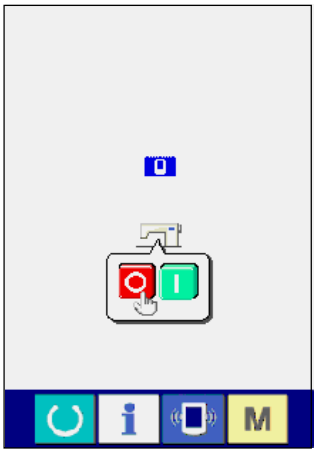
Data deleting screen



Data writing screen

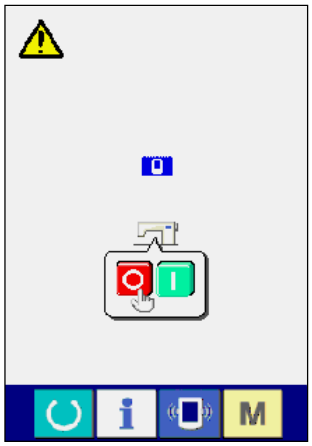


Ending screen



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

Data writing error screen



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

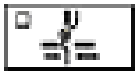
4. Reading/Writing of the adjustment data and all sewing machine data in the smart media (For the CP-20)

(1) When the power is turned on with the [P1] key kept pressed, the adjustment data mode is started. When the adjustment data mode is started, the pattern number LED is lit up.
When the power is turned on with the [P2] key kept pressed, the all sewing machine data mode is started. When the all sewing machine data mode is started, the X scale LED is lit up.

: Adjustment data mode


: All sewing machine data mode

(2) Select data reading or writing with the  key


: Reading


: Writing

(3) Select the fine number with the  and  keys.

1) For reading
Selection is made possible only for the file number that is registered in the smart media.

to


2) For writing
Selection is made possible only for the file number that is not registered in the smart media.

to


(4) When the  key is pressed, reading or writing of each data block is started. In the middle of data reading or writing, the file number is displayed in the blinking mode. When Power OFF is displayed, reading or writing has been completed.

(5) When the power supply is turned on again, normal operation is recovered.

5. Program rewriting (For the CP-20)

(1) When the power is turned on with the [P3] key kept pressed, the rewriting mode of the simplified panel program is started. When the rewriting mode of the simplified panel program is started, the Y scale LED is lit up.
When the power is turned on with the [P4] key kept pressed, the rewriting mode of the main program is started. When the rewriting mode of the main program is started, the max. number of rotation LED is lit up.
When the power is turned on with the [P5] key kept pressed, the rewriting mode of the servo program is started. When the rewriting mode of the servo program is started, the tension LED is lit up.

 : Panel program  : Main program  : Servo program

(2) Using the [ ] key, select the program file for the panel, which is kept in the smart media. In regard to the file display, the [ ] key can be used for changeover between the RVL display and the model code display.

 : RVL display  : Model code display

For RVL display, five digits of R (1 digit), V (2 digits), and L (2 digits) are displayed.
The non-display portion (RVL + α) can be displayed with the use of the [+/] and [−/] keys.

Example) RVL 01-03-02 

For model code display, the five continued characters from the head are displayed.
The model code of the non-display portion can be displayed with the use of the [+/] and [−/] keys.

Example) AMS-210E 

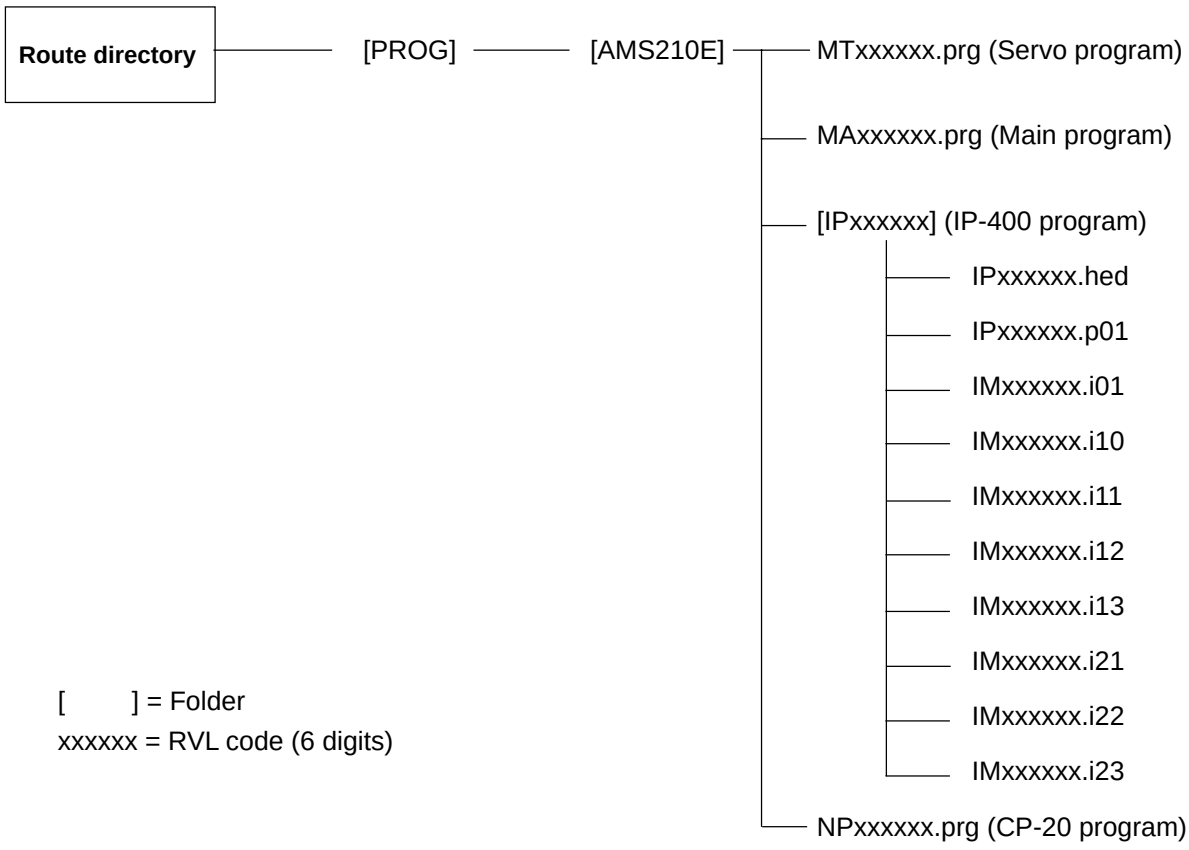
(3) When the [ ] key is pressed, writing of the simplified panel program is started. When Power OFF is displayed, writing has been completed.

When the power supply is turned on again, normal operation is recovered.

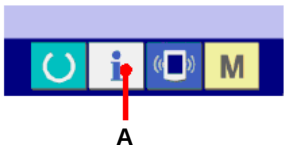
6. Use of smart media other than those packed together

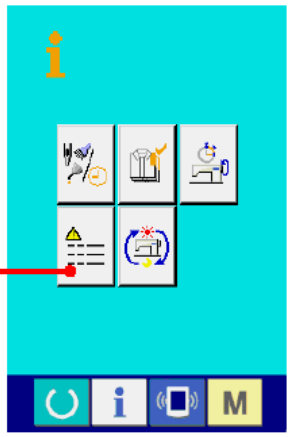
When the contents of the smart media card packed together are going to be copied on another smart media card, the smart media card of the copying destination should be formatted with IP400. Since then, the following directory configuration should be established with a personal computer.

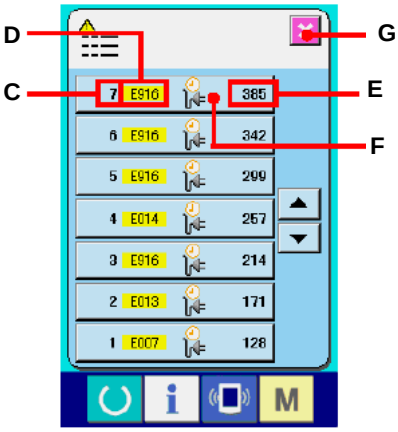
Information about the method of smart media card formatting is obtainable from the Instruction Manual, [2-25. How to Use the Communication Functions].

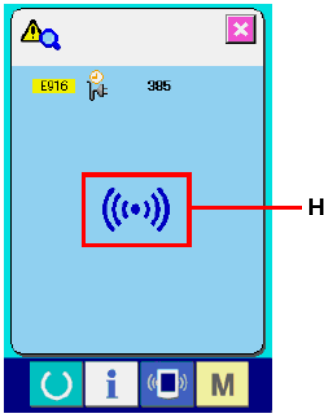


(9) Information screen at the maintenance personnel level









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)

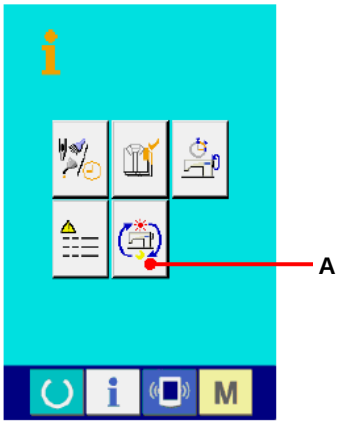
Pressing the cancel button, (G) closes the error history screen and calls up the information screen.

(3) To display details:

For detailed information about errors, press the error button, 7 E916 385 (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.

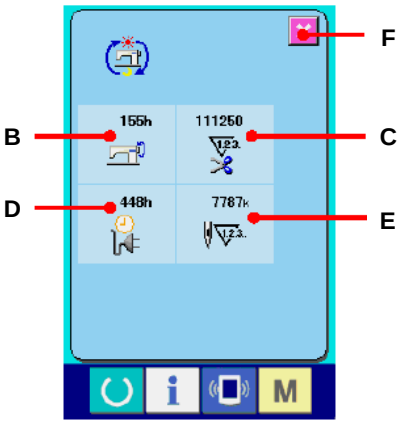
→ Refer to the “11. ERROR CODE LIST”.

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.

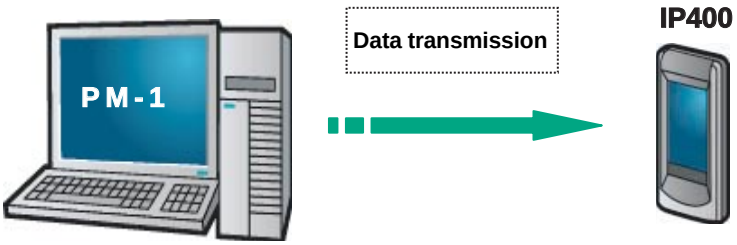
The following 4 items are indicated on the cumulative operating information screen.

B: Cumulative operating time (hour)
C: Cumulative thread trimming count
D: Cumulative energizing time (hour)
E: Cumulative stitch count (x1000 stitches)

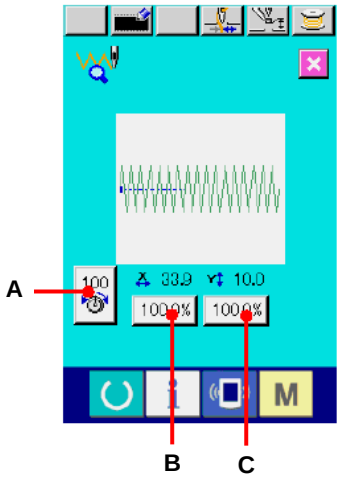
Pressing the cancel button, (F) closes the cumulative operating information screen and calls up the information screen.

(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-400 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

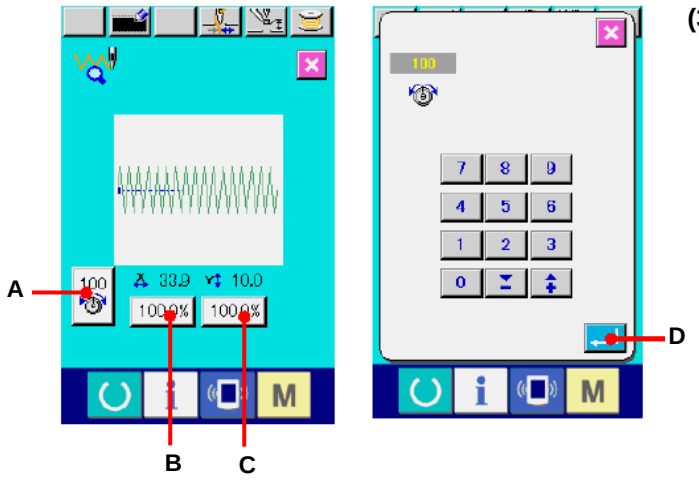
When data (vector type) for test sewing is transmitted from PM-1, the screen shown at right appears, and a needle positioning drawing of transmitted data appears in the center of the screen.
The color of the needle positioning drawing changes depending on thread tension. If the stitch count of transmitted 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.

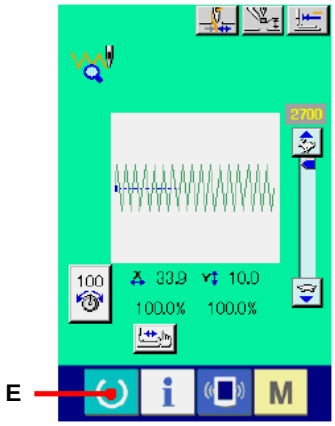
A: Thread tension
B: X-axial enlargement/reduction ratio or actual value
C: Y-axial enlargement/reduction ratio or actual value

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



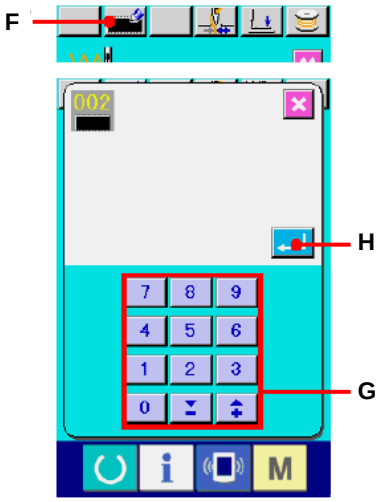
(3) Modification to data

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.

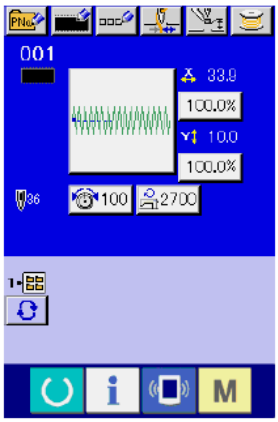


(5) Data registration to user pattern

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	: Yellowish green
121 to 140	: Orange
141 to 160	: Red
161 to 180	: Pink
181 to 200	: Black

6. Test mode

(1) Start (CP-20)

When the check program is started, maintenance and inspection can be carried out.

1) Check program start

1. When the [M] key is continuously pressed for 3 seconds in the state that the sewing LED is unlit, a buzzer sound is heard and the user setup mode is assumed for the memory switch. In this state, ìcheck program startî can be selected.
   (Caution) The check program cannot be selected unless this key is continuously pressed for 3 seconds.
2. Change the memory switch number with the [+/↑] and [−/↓] keys to select the check program.
3. Press the [□/○] key to move to the check program. Start the display output test. Refer to the next page in regard to the contents of the display output test.
4. Press the [□/○] key to complete the display output test. Move to the selection of another test function.

5. Select the check program number with the [+/↑] and [−/↓] keys.

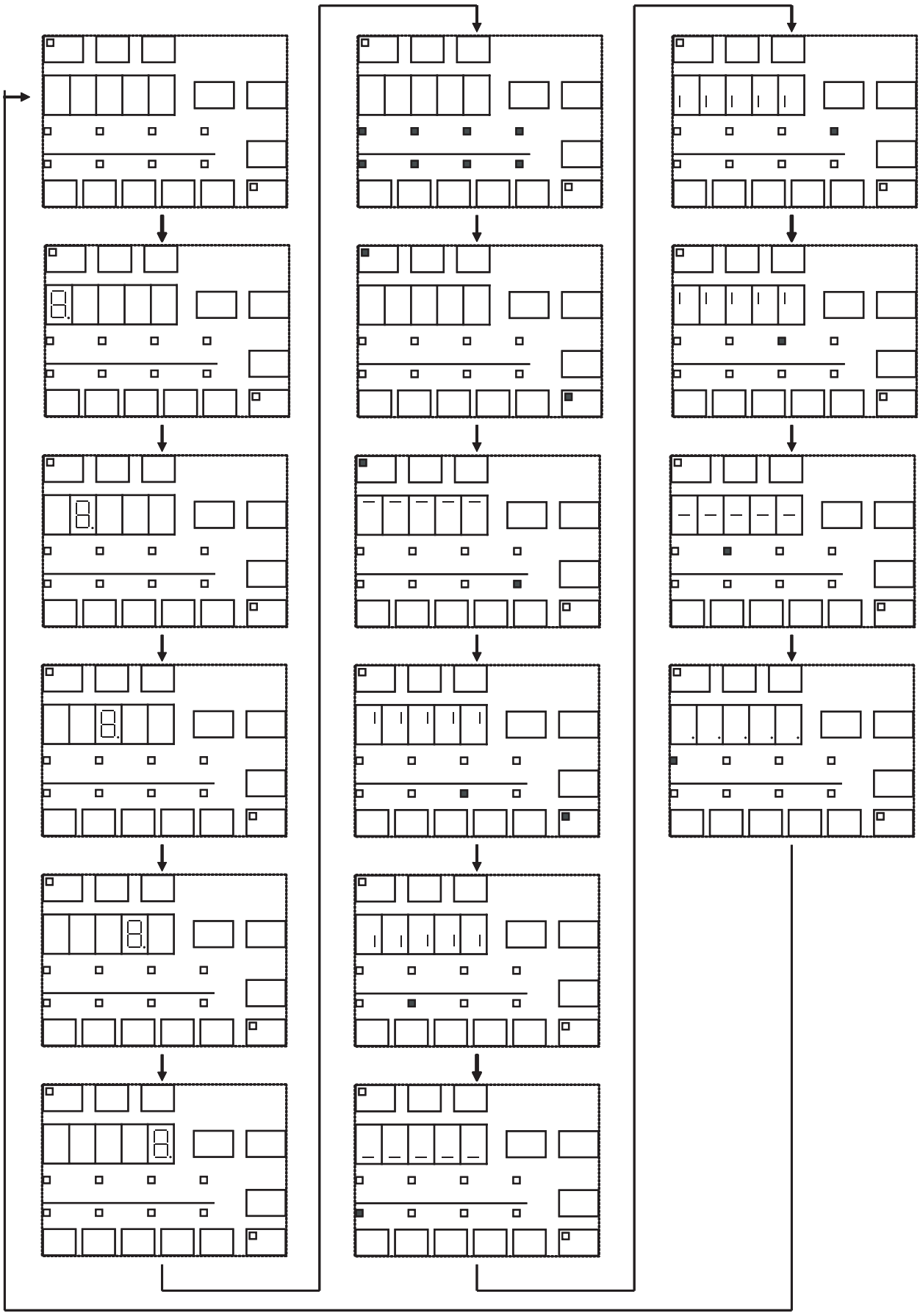
Check program number	Check program	Contents
	Input signal check	The status of the switch and sensor inputs is displayed at LED.
	XY motor / origin sensor check	The status of inching operation of the X/Y motor, operation of origin retrieval, and the X/Y origin sensors is displayed.
	Continuous operation	After the conditions of continuous operation have been et up, the operational mode moves to the continuous operation mode.
	Main motor rpm check	The sewing machine is started at the preset rpm level nd the measured rpm number is displayed.

Check program number	Check program	Contents
	Output check	The wiper and air outputs are generated.
	Presser, thread cutter motor/ origin sensor check	The status of inching operation of the presser and thread trimmer motor, operation of origin retrieval, and he presser origin / presser sensors is displayed.
	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 sensors is displayed.
	Intermediate presser adjustment	The status of inching operation of the intermediate presser motor, operation of origin retrieval, and the intermediate presser origin sensors is displayed.
	Software version display	The software versions of the MAIN and SDC boards are displayed.

6. Press the [↻] key to define the check program number.
7. When the [M] key is pressed for each check program, the current check program is completed and the status of 5. is recovered.
   Once the continuous operation mode is started, it cannot be canceled. To complete it, however, it is necessary to turn the power supply OFF.

(2) Display output test (CP-20)

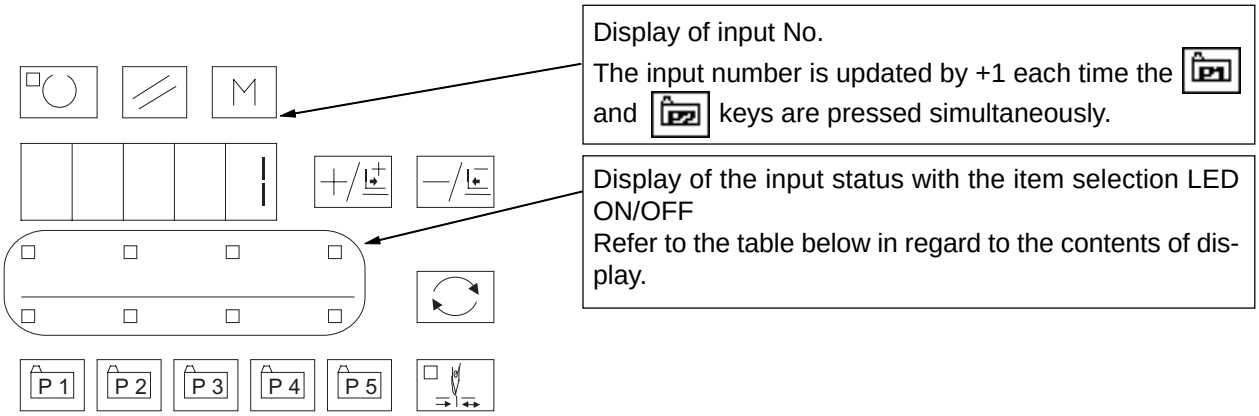
After the movement to a check program, the display output test is started.
The following LEDs are lit at the intervals of one second.



(3) Method of confirmation according to each test program No. (CP-20)

1) CP-1 (Input signal check)

It is possible to check the input status of the operation panel keys, pedal switches, and various sensors.



Contents of Display for each Input No.

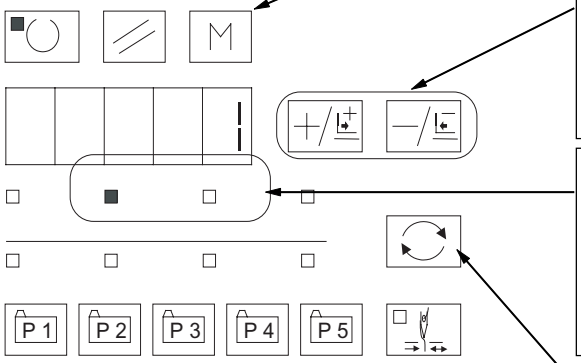
	Pattern LED	X enlarge LED	Y enlarge LED	Speed LED	Counter LED	Bobbin LED	Threading LED	Thread tension LED	Ready LED	Thread clamp LED
1			Key	Key	Key	Key	Key	Key		
2			Key	Key	Key	Key	Key	Key		
3	DIPSW2 -1	DIPSW2 -2	DIPSW2 -3	DIPSW2 -4	Start SW	Presser 1SW	Presser 2SW	Presser 3SW	Presser 4SW	Temporary stop SW
4	AUDET Sensor	ADDET Sensor	DDET Sensor	UDET Sensor	TG Sensor	PDET Sensor	SDET Sensor	Head fall SW	Air pressure SW	X motor origin Sensor
5	Y motor origin sensor	Presser motor origin sensor	Thread clamp motor origin sensor	Intermediate presser motor origin sensor	Presser motor sensor	Thread clamp motor sensor	External input 1	External input 2	External input 3	External input 4
6	External input 5	External input 6	External input 7	External input 8	External input 9	External input 10	External input 11	External input 12	External input 13	External input 14
7	External input 15	External input 16								
8										

DIPSW2 is a dip switch located on the MAIN board.

2) CP-2 (XY motor / origin sensor check)

The status of inching operation of the X/Y motor, operation of origin retrieval, and the X/Y origin sensors is displayed.

1. In the first place, press the key to carry out needle thread clamping and origin retrieval for the presser and thread trimmer motor. The presser assumes the lowering condition.
   After the completion of preparation, the sewing LED is lit.
2. Operation



According to the status of the selected X/Y origin sensor, “0” or “1” is displayed. The key is pressed to make changeover.

Using the and keys, drive the selected X/Y motor in the direction of +/– by 0.1mm each time.
(Caution) Since the circular interpolation system is used, any motor not selected is also driven.

The selection status of the X motor (X origin sensor) or the Y motor (Y origin sensor) is displayed. The key is pressed to make changeover.
X enlargement/reduction scale rate LED lit: X motor (X origin sensor)

Using the key, the selection status of the X motor (X origin sensor) or the Y motor (Y origin sensor) is changed over.

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

3) CP-3 (Continuous operation)

After the conditions of continuous operation have been set, the operational mode moves to the continuous operation mode.
To cancel the continuous operation mode, it is necessary to turn the power supply OFF.

1. Rest time setting
   Press the and keys to set up the rest time.
   Setting is possible within the range of 0 to 9900ms in the unit of 100ms.
   (Initial value 2000ms)
   After the completion of setting, press the key.

2. Setting for the presence of origin retrieval at the end of sewing
   Press the and keys to set up the presence of origin retrieval at the end of sewing.
   A0: Ineffective (Initial value)
   A1: Every 100 sewing cycles
   A2: Every sewing cycle

3. Presser lifting, Lowering frequency vertical times setup
   Press the [+/↓+] and [−/↓−] keys to set up the presser vertical times.

   B0: Ineffective (Initial value)
   B1 ~ B10: 1 to 10 times

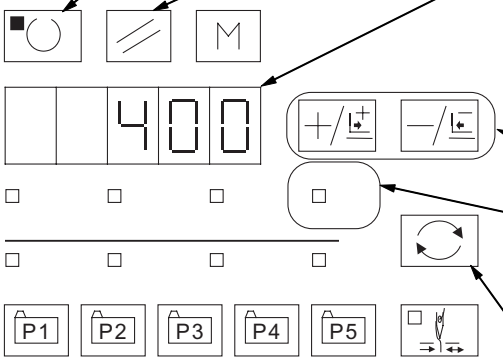
After setting, press the [□◯] key. The ordinary display is recovered.

4. Continuous operation
   After the completion of setting, regular operation like pattern number setup and others should be carried out. At the end of sewing, origin retrieval of each motor is carried out for the X/Y / presser and thread trimmer / needle thread clamp if “origin retrieval effective” has been selected as per 2. Then, automatic sewing is restarted after the lapse of the rest time preset as per 1. above.
   To stop continuous operation, the start switch should be turned ON during the rest time. [E 50] is displayed and the machine is stopped.

4) CP-4 (Main motor rpm check)

Set up the rpm number of the sewing machine, drive only the main motor of the sewing machine at the preset rpm level, and display the measured rpm number.

1. READY operation
   In the first place, press the key for the origin retrieval of the needle thread clamp and the presser and thread trimmer motor. After operation for preparation, the sewing LED is lit.
2. Operation



When the key is pressed, the sewing machine is actuated at the preset rpm level.
If the rpm number is changed in the middle of sewing machine operation, the speed can be changed by pressing the key.

When the key is pressed, the sewing machine stops.

The preset rpm number or the actually measured rpm number is displayed. Changeover is possible by pressing the key.

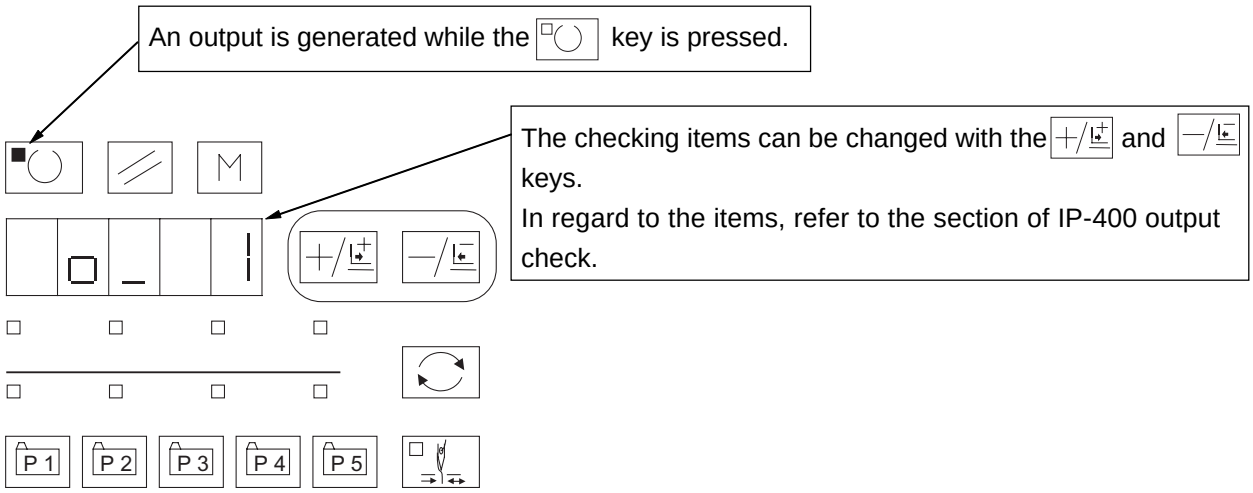
Using the and keys, the rpm number can be preset within the range of 400 to 2700 rpm. This setting is possible even in the middle of sewing machine operation.

The speed LED is unlit while the preset rpm number is displayed, and is lit while the measured number is displayed. Changeover can be made by pressing the key.

With the key, the speed display can be changed over between the preset and the measured rpm number.

5) CP-5 (Output check)

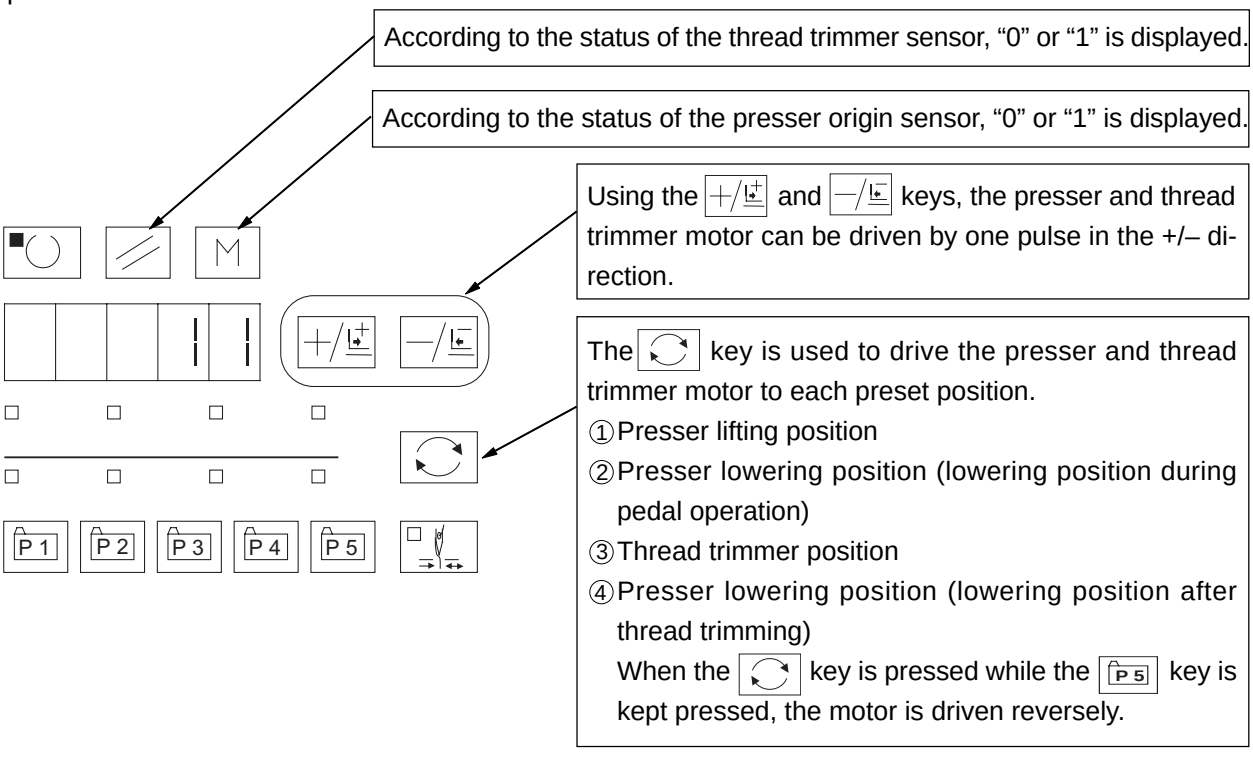
1. Operation



6) CP-6 (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 thread trimmer sensors is displayed.

1. READY operation
   In the first place, press the key for the origin retrieval of the needle thread clamp.
   After operation for preparation, the sewing LED is lit.
2. Operation

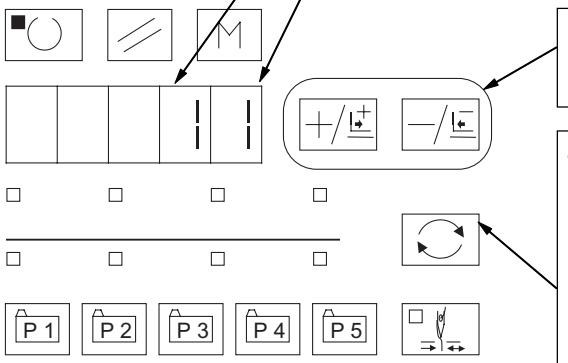


The START Switch is used for the origin retrieval of the presser and thread trimmer motor.

7) CP-7 (Needle thread clamp motor / origin sensor check)

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

1. Operation



According to the status of the needle thread clamp sensor, “0” or “1” is displayed.

According to the status of the thread clamp origin sensor, “0” or “1” is displayed.

Using the [+/↓+] and [–/↓–] keys, the needle thread clamp motor can be driven by one pulse in the +/– direction.

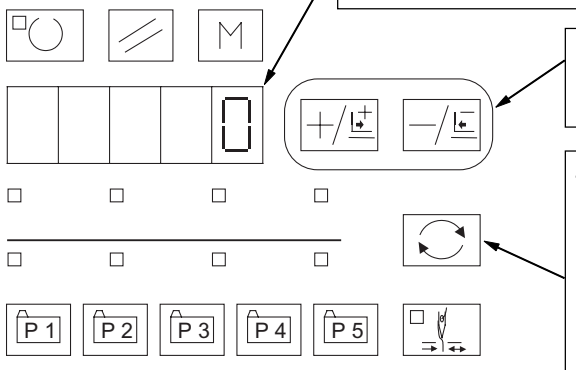
The [↻] key is used to drive the needle thread clamp motor to each preset position.
①Standby position (front side)
②Needle thread bending position
③Needle thread clamp position
④Refuge position (rear side)

The START Switch is used for the origin retrieval of the needle thread clamp motor.

8) CP-8 (Intermediate presser adjustment)

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

1. Operation



According to the status of the intermediate presser origin sensor, “0” or “1” is displayed.

Using the [+/↓+] and [–/↓–] keys, the needle thread clamp motor can be driven by one pulse in the +/– direction.

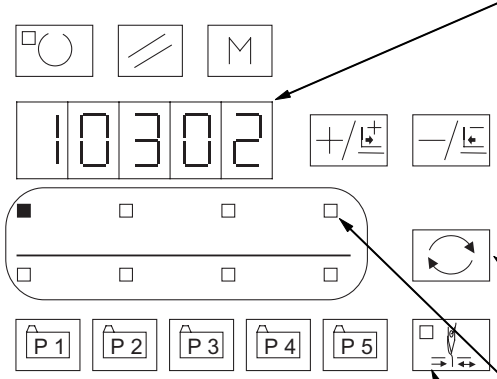
The [↻] key is used to drive the needle thread clamp motor to each preset position.
①Lower position at the height of 7mm during lowering
②Timing adjustment position
③Lower position at the height of 0mm during lowering
④Intermediate presser bar adjustment position

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

9) CP-9 (Software version display)

The software versions of the PANEL Board, the MAIN Board, and the SDC Board are displayed.
Each version is expressed in a format of RR, VV, LL-xx. xx is used to indicate the specifications for special orders, etc. Therefore, it is not indicated usually.

1. Operation



According to the item selection LED, the RVL display (RR, VV, LL-xx) for the PANEL Board, the MAIN Board, and the SDC Board, and also the model code display is presented. The [+/] and [−/] keys can be used for the scroll display.

Example) RVL 01.03.02 10302

Example) AMS-210E AMS-2

The [ ] key is used for the cyclic display of the PANEL Board, the MAIN Board, and the SDC Board.

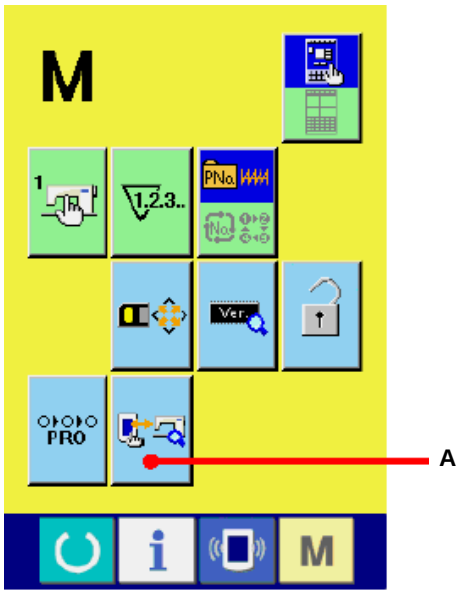
: Panel program

: Main program

: Servo program

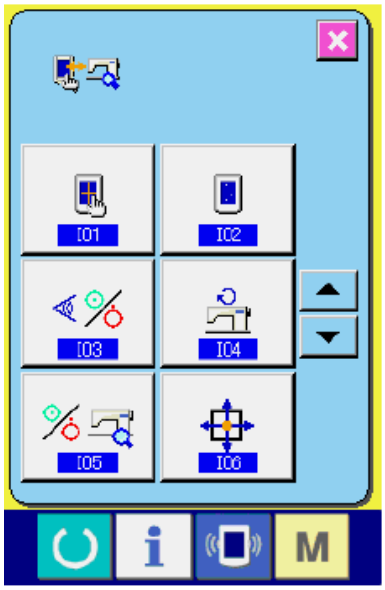
The [ ] key is used for the cyclic display of the RVL display and the model code display.
When the LED is unlit: RVL display
When the LED is lit: Model code display

(4) For IP-400



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

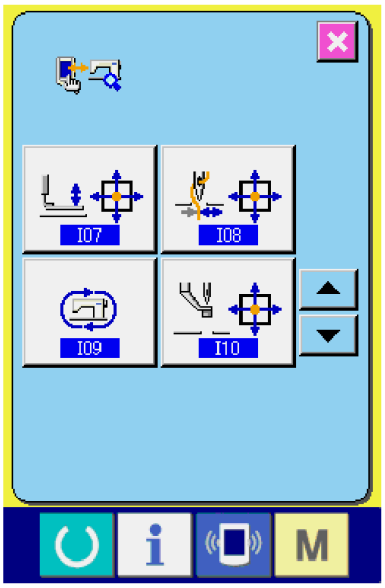
→ When the sewing machine is started at the preset rpm level, the measured rpm value is displayed.

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

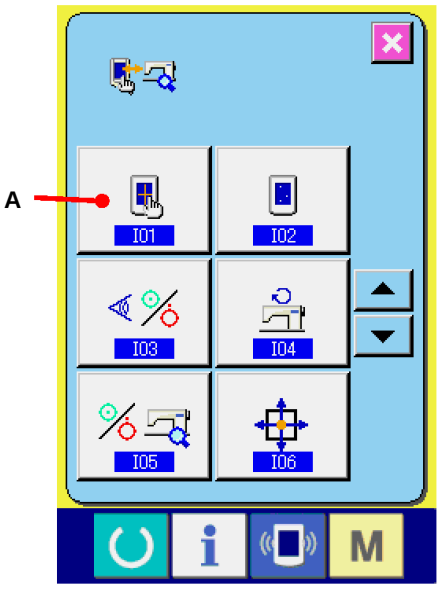
→ The status of inching operation of the needle thread clamp motor, operation of origin retrieval, and the needle thread clamp origin and needle thread clamp sensor is displayed.

I09 Continuous operation

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

I10 Intermediate presser adjustment

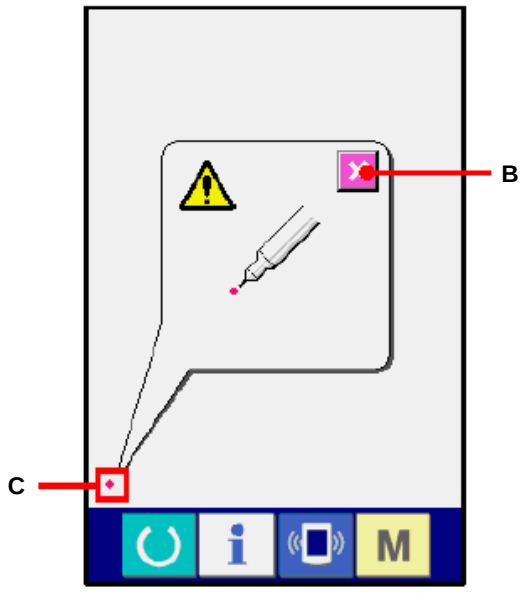
→ The status of inching operation of the intermediate presser motor, operation of origin retrieval, and the intermediate presser origin sensor is displayed.



2) Touch panel correction

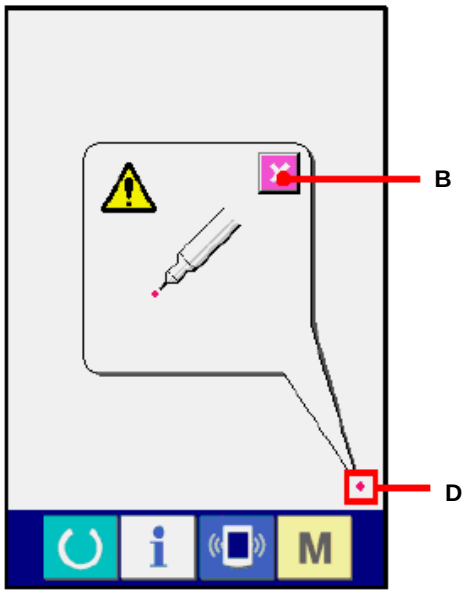
1. Display of the touch panel correction screen

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



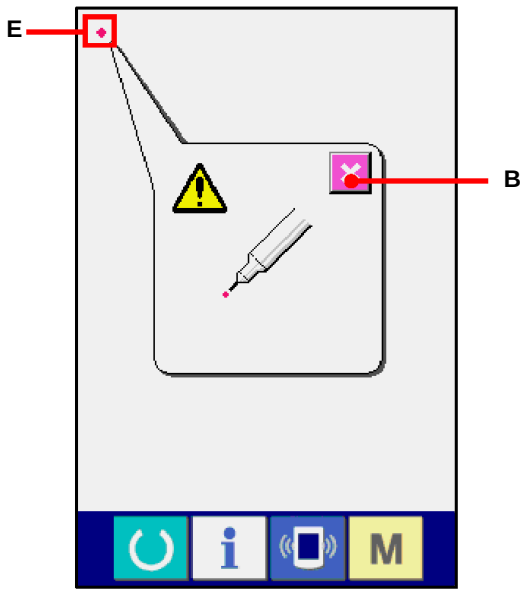
2. Pressing the bottom left position

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



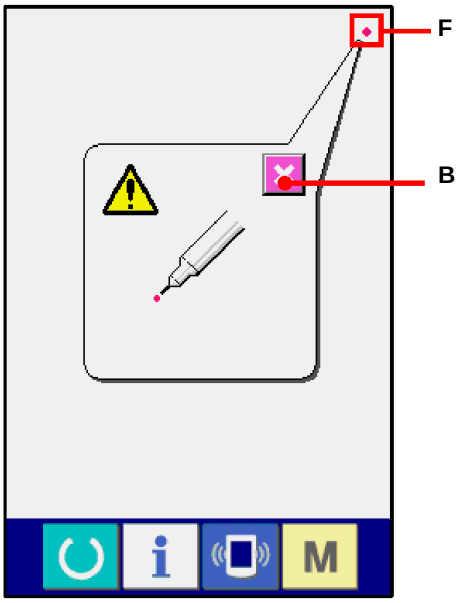
3. Pressing the bottom right position

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



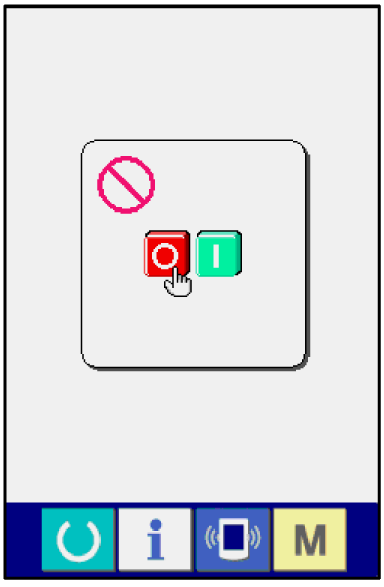
4. Pressing the top left position

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 left of the screen. To complete correction, press the cancel button (B).



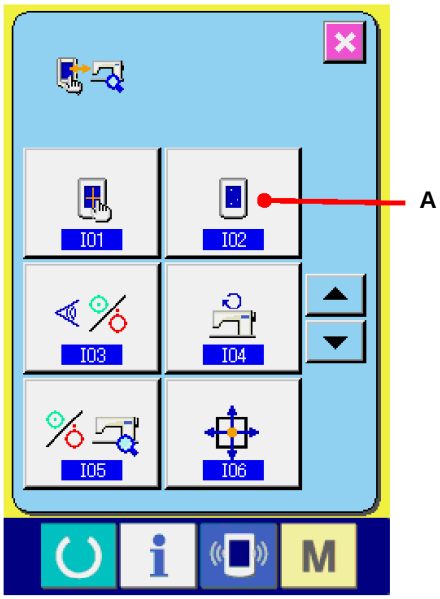
6. Data saving

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.

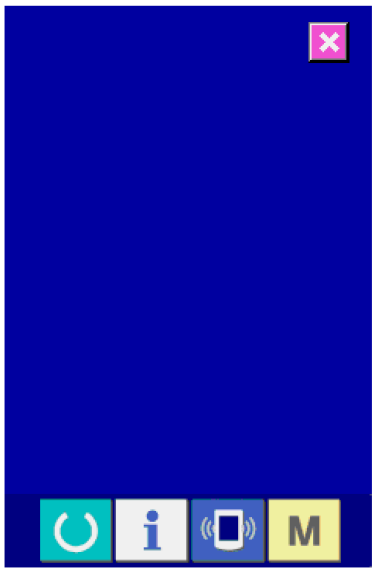
After data saving, the check program screen is automatically displayed.



3) LCD check

1. Display of the LCD check screen

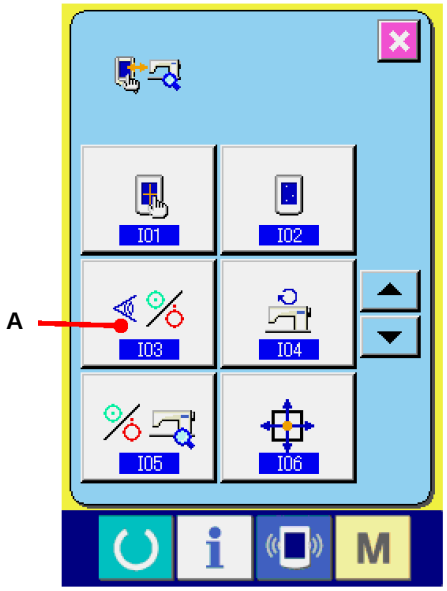
When the LCD check button  (A) is pressed on the check program screen, the LCD check screen is displayed.



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.

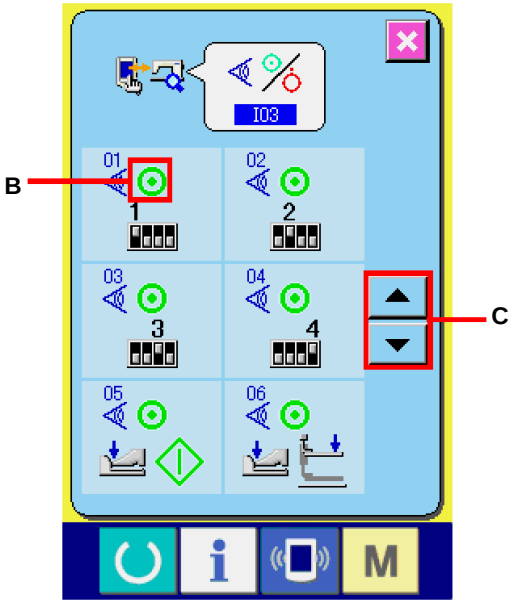
After this confirmation, press a proper position on the screen. The LCD check screen is closed and the check program screen is displayed.



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.

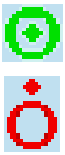


2. Input signal check

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.

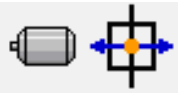
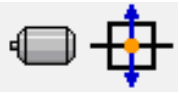
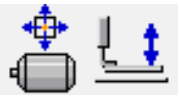
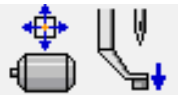
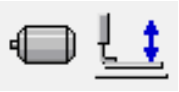
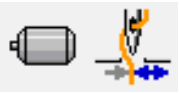
The ON/OFF conditions are displayed as shown below.

 : ON condition

: OFF condition

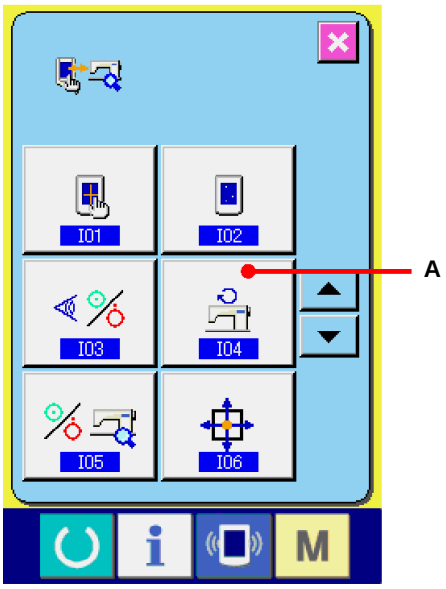
Using the UP-DOWN buttons  (C), display the sensor that has been confirmed.

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.

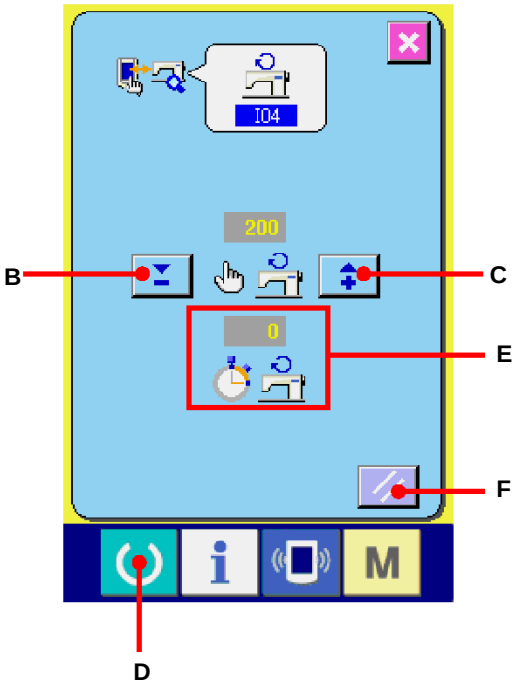
No.	Pictograph	Contents of sensor	No.	Pictograph	Contents of sensor
33		External input 6	39		External input 12
34		External input 7	40		External input 13
35		External input 8	41		External input 14
36		External input 9	42		External input 15
37		External input 10	43		External input 16
38		External input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



5) Main motor rpm check

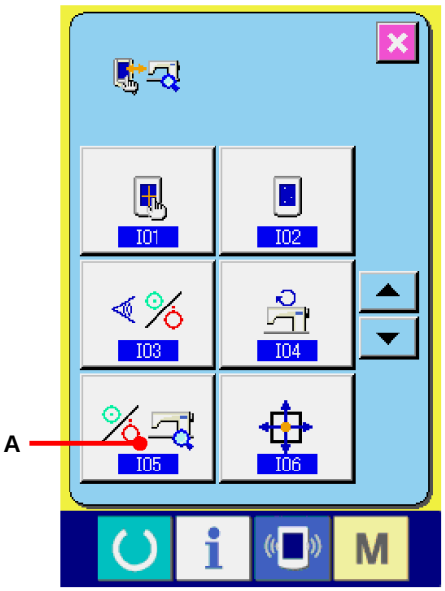
1. Display of the main motor rpm check screen

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

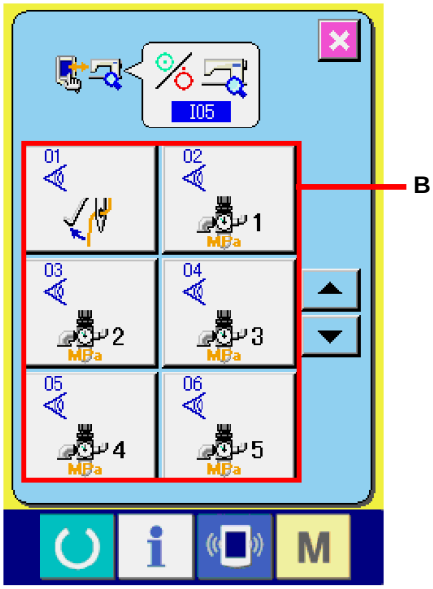
Using the –/+ buttons   (B, C), the rpm number can be set up. When the button (D) is pressed, the sewing machine is operated at the pre-set speed. At that time, the measured rpm value is displayed at  (E). When the SET button  (F) is pressed, the sewing machine is stopped.



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.

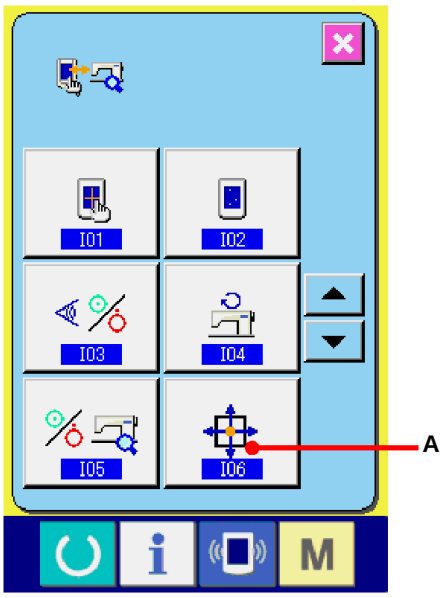


2. Output check

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:

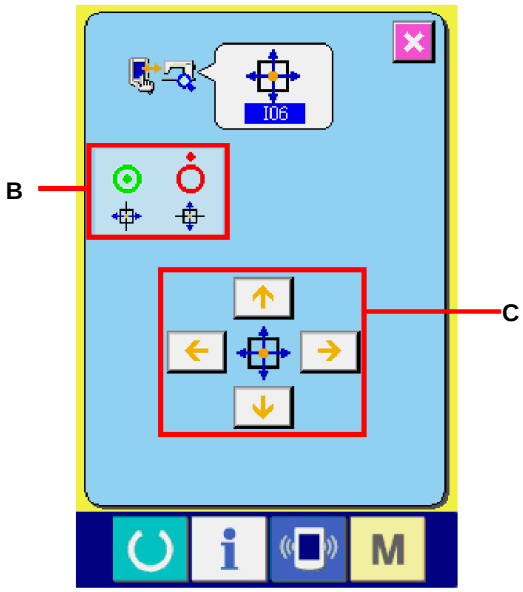
No.		Pictograph	Contents	No.		Pictograph	Contents
01	o_0		Wiper	10	o_9	9 MPa	Air output 9
02	o_1	1 MPa	Air output 1	11	o_10	10 MPa	Air output 10
03	o_2	2 MPa	Air output 2	12	o_11	11 MPa	Air output 11
04	o_3	3 MPa	Air output 3	13	o_12	12 MPa	Air output 12
05	o_4	4 MPa	Air output 4	14	o_13	13 MPa	Air output 13
06	o_5	5 MPa	Air output 5	15	o_14	14 MPa	Air output 14
07	o_6	6 MPa	Air output 6	16	o_15	15 MPa	Air output 15
08	o_7	7 MPa	Air output 7	17	o_16	16 MPa	Air output 16
09	o_8	8 MPa	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.

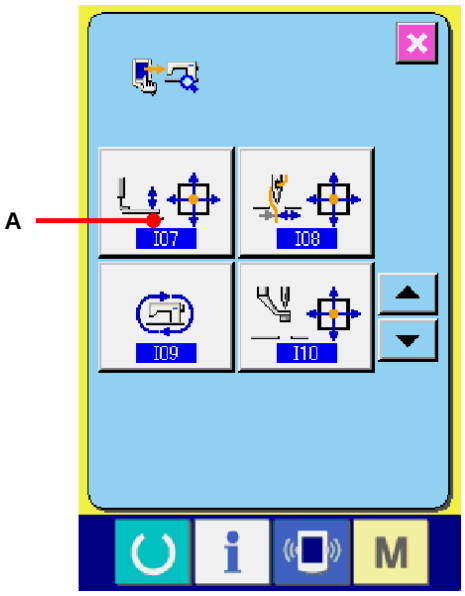


2. XY motor / origin sensor check

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.

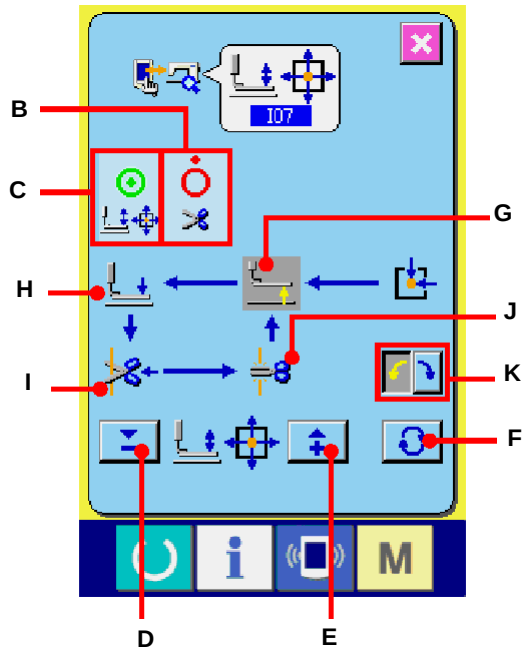
(Caution) 1. Using the Start SW, origin retrieval of the X/Y motors is effected for both shafts.



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.

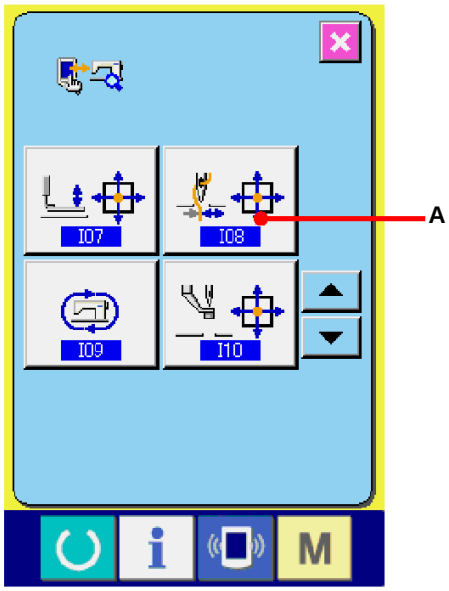
Using the [+] and [–] keys   (D, E), the presser / thread trimmer motor can be driven by one pulse.

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.

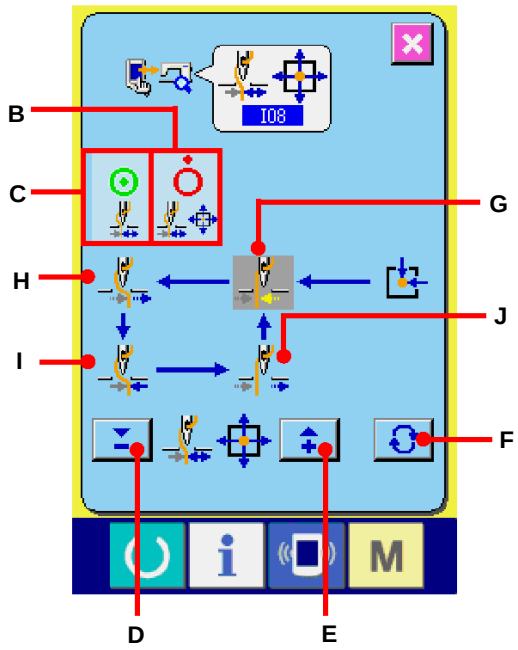
(Caution) The Start Switch becomes effective after the completion of origin retrieval for the presser / thread trimmer motor.



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.

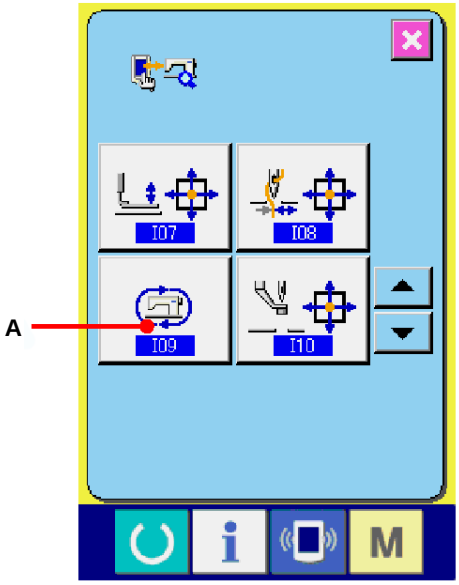
Using the [+] and [–] buttons   (D, E), the needle thread clamp motor can be driven by one pulse.

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.

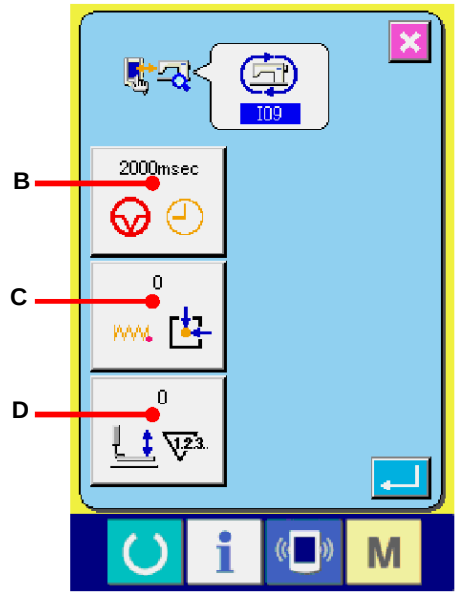
(Caution) The Start Switch becomes effective after the completion of origin retrieval for the needle thread clamp motor.



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

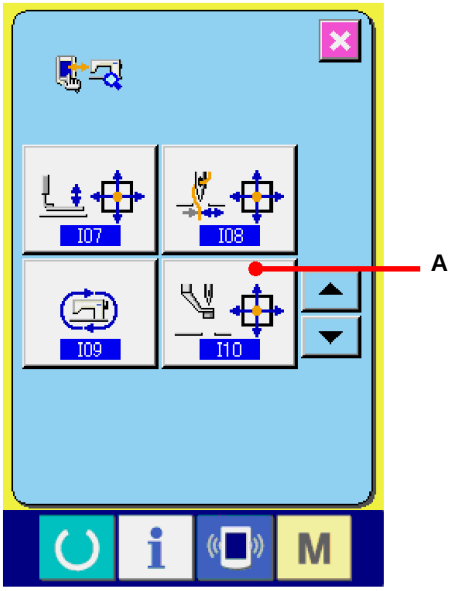
1 : Every 100 runs

2 : Every time

D : Presser lifting, lowering (frequency)

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

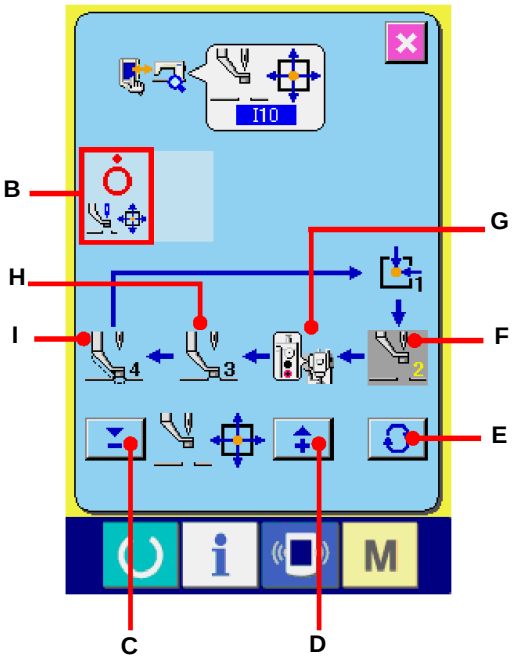
If the READY key is turned ON again in the middle of continuous operation, continuous operation is stopped.



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

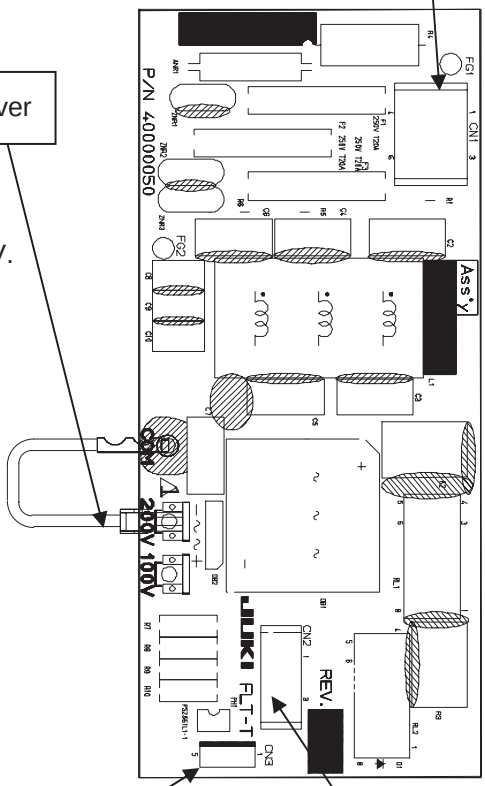
(1) Various printed wiring boards

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

CN1 : Power input ← Power switch

In the signal-phase mode, the power supply is connected to Pins 4-5. In the 3-phase mode, the power supply is connected to Pins 4-5-6.



Voltage changeover

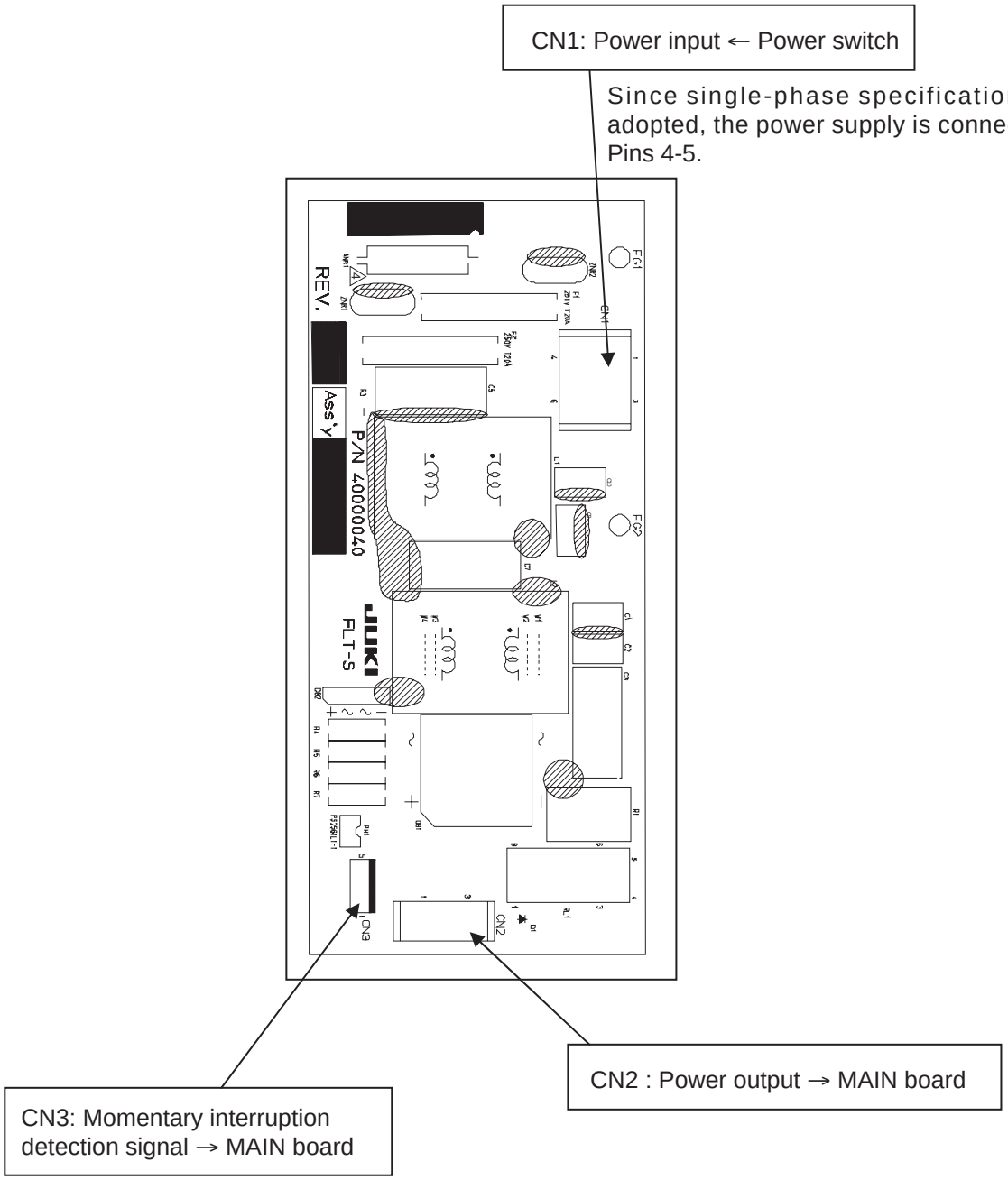
Connected to 100V side for 100V~120V or to 200V side for 200V~240V.

CN2 : Power output → MAIN board

CN3: Momentary interruption detection signal → MAIN board

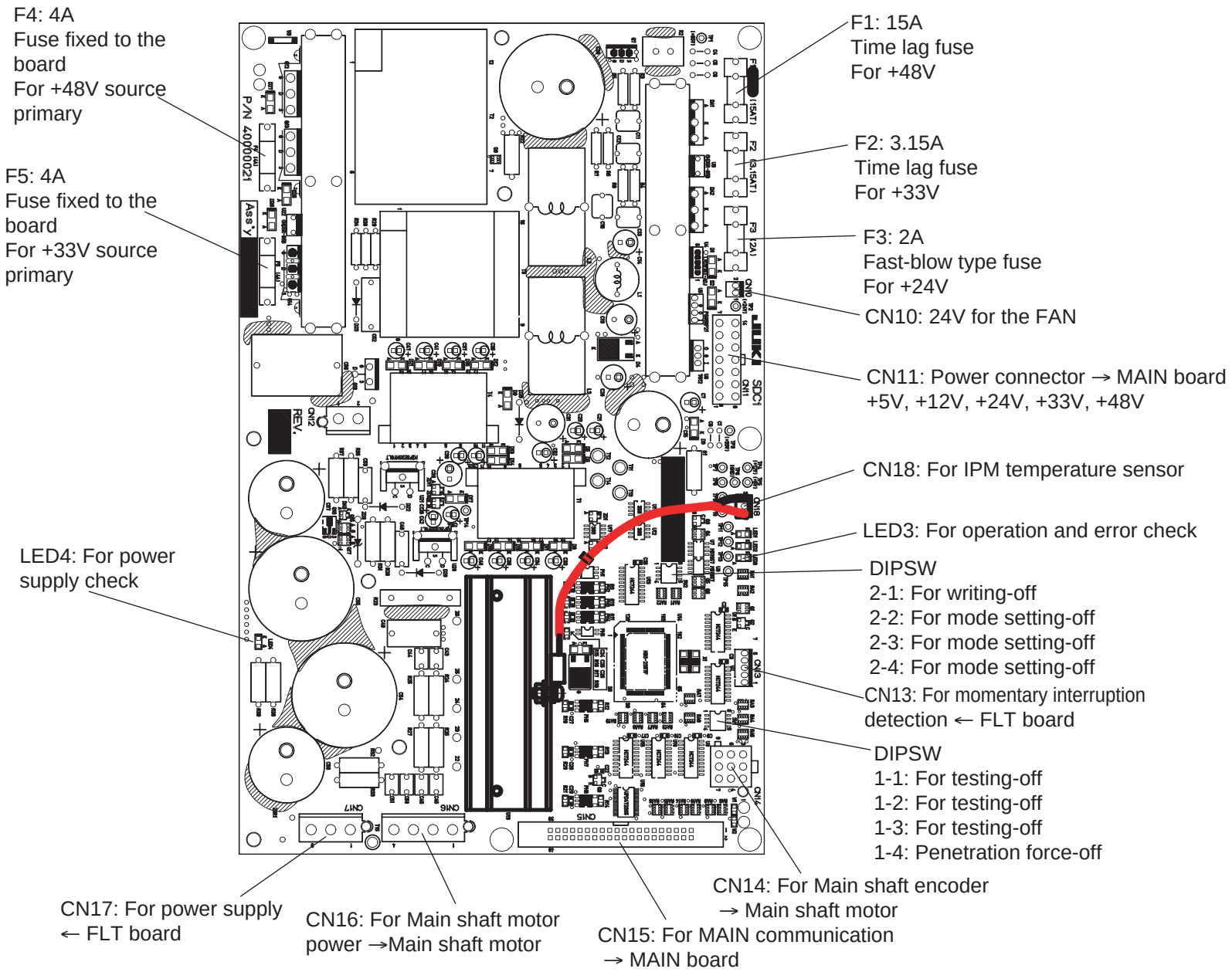
2) FLT-S board Single-phase 200V~240V

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.

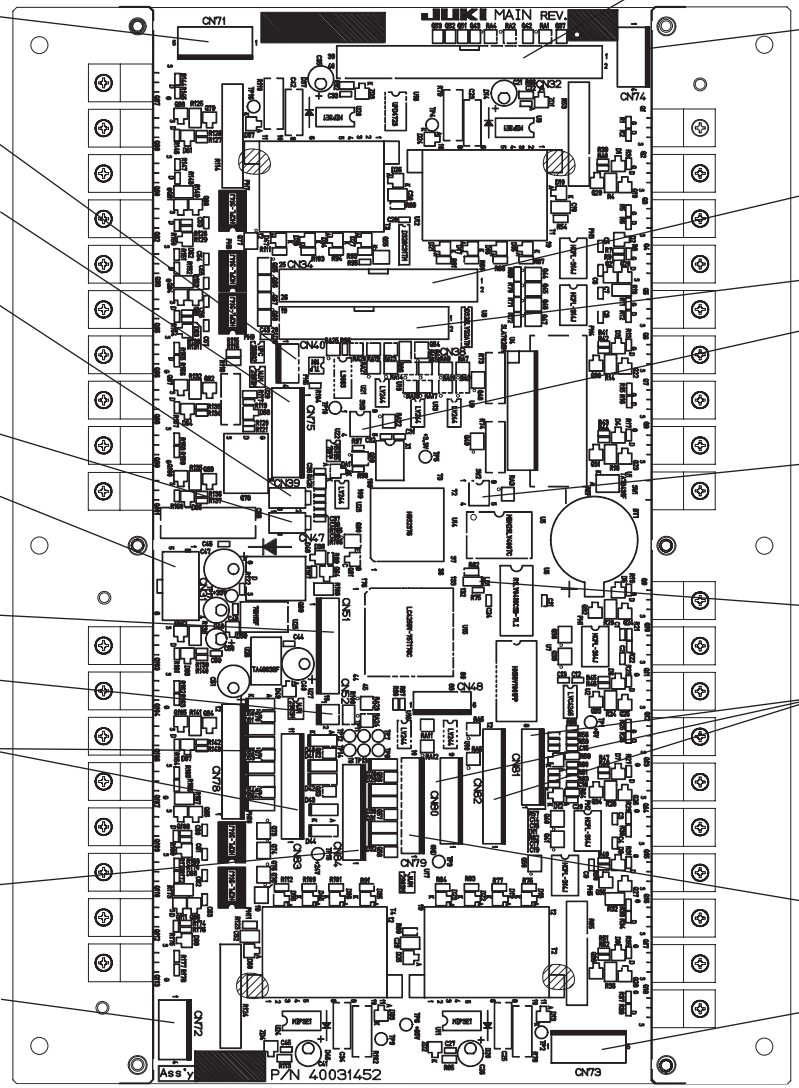


4) LED3 for SDC board error check

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	Overheasting	E905	Radiator panel of SDC boaed heated at 85°C or higher
14	Not used		
15	Communication erroe	E916	Failure in comminication 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.



CN32: For the SDC circuit board

CN71: X feed pulse motor (Red)

CN74: Feeding frame/thread trimmer pulse motor (White)

CN40: For analog pedal (not integrated)

CN34: Operation panel IP-400/CP-20

CN75: Thread clamp pulse motor (White)

CN38: For INT circuit board (machine head)

CN39: Active tension (Yellow)

DIPSW 3-1: For writing-off
3-2: For writing-off
3-3: For writing-off
3-4: Not connected-off

CN47: Wiper (White)

DIPSW 2-1: Not used-off
2-2: Not used-off
2-3: Not used-off
2-4: For EE-PROM clearing-off

CN31: Power ← SDC circuit board
+5V, +12V, +24V, +33V, +48V

CN51: Foot switch (White)

LD1: For operation display ON to Model communication : lights up

CN52: For pneumatic switch (White)

CN80, CN81, CN82: Switch input (option) (not integrated)

CN78, CN83: Pneumatic output (option) (not integrated)

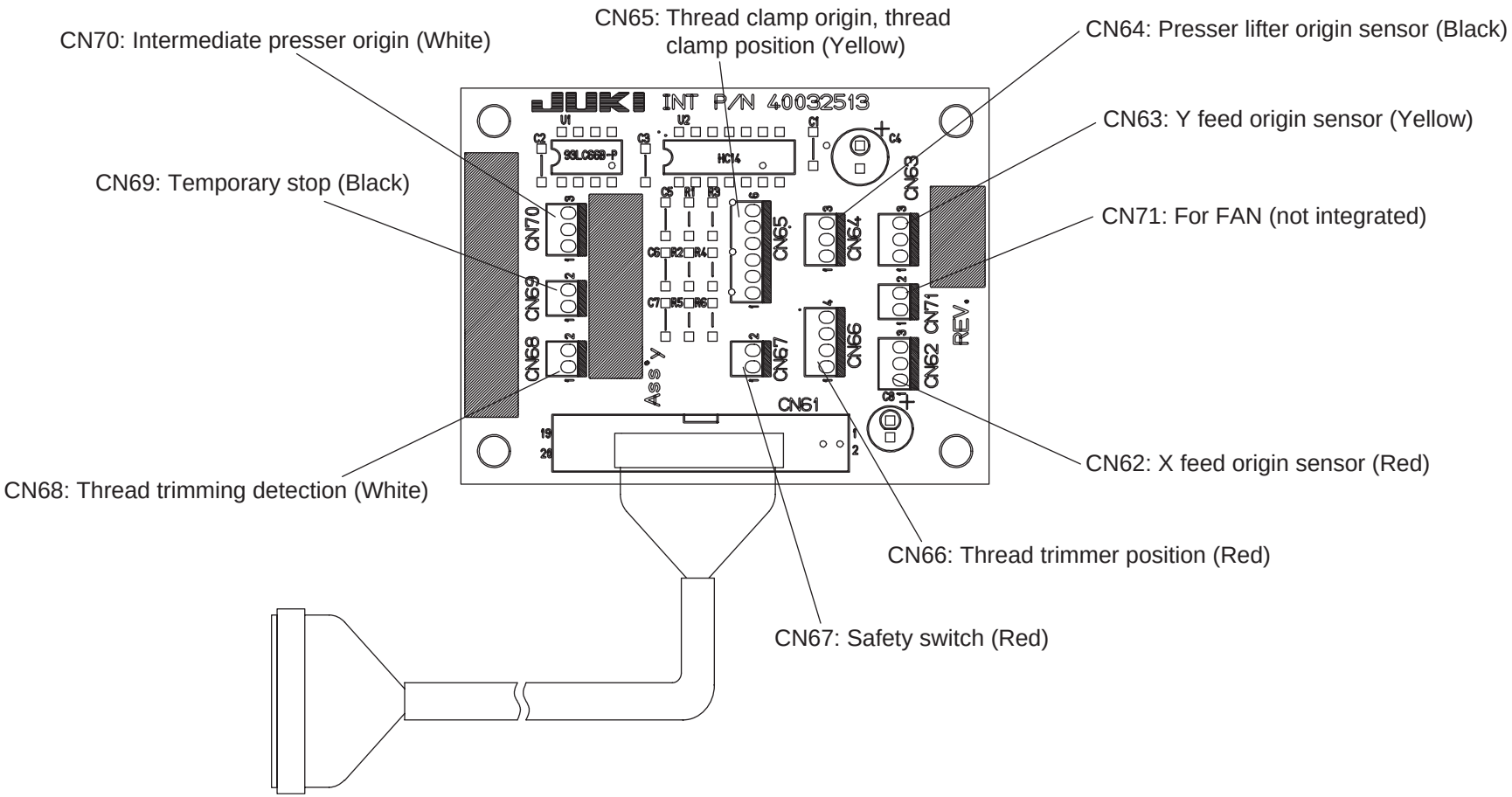
CN84: Pneumatic output (Black)

CN79: Optional switch input (Red)

CN72: Intermediate presser pulse motor (Blue)

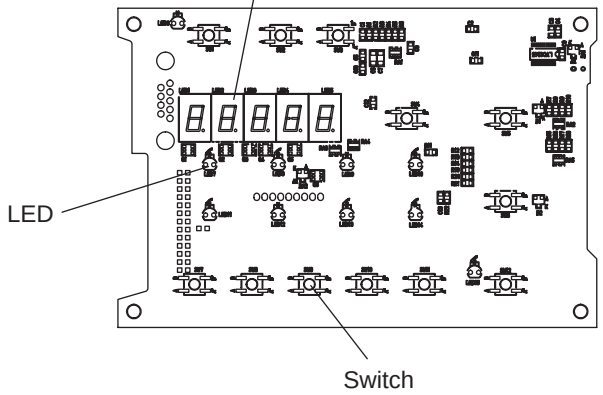
CN73: Y-axis pulse motor (White)

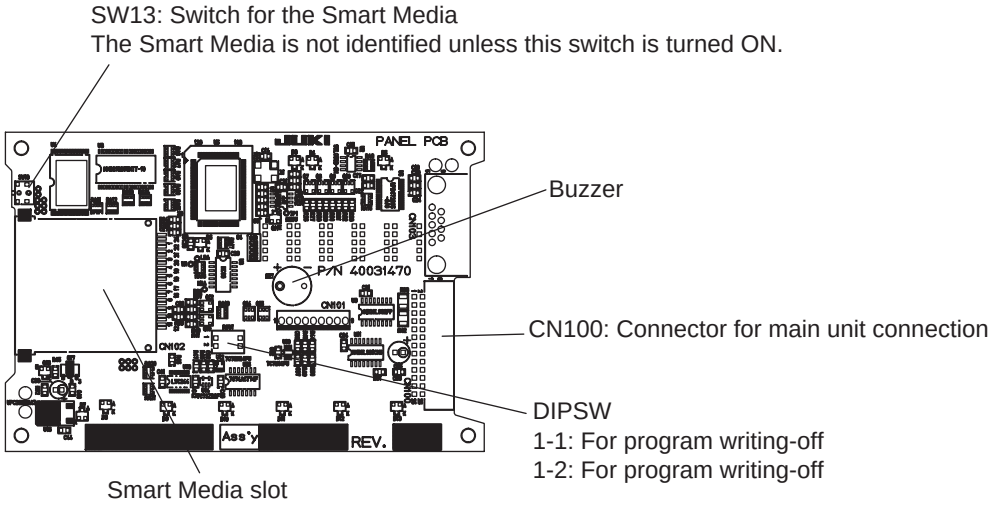
6) INT board
The board relays head sensor signals and transmits head model information to the MAIN board.



7) CP-20 Panel Board

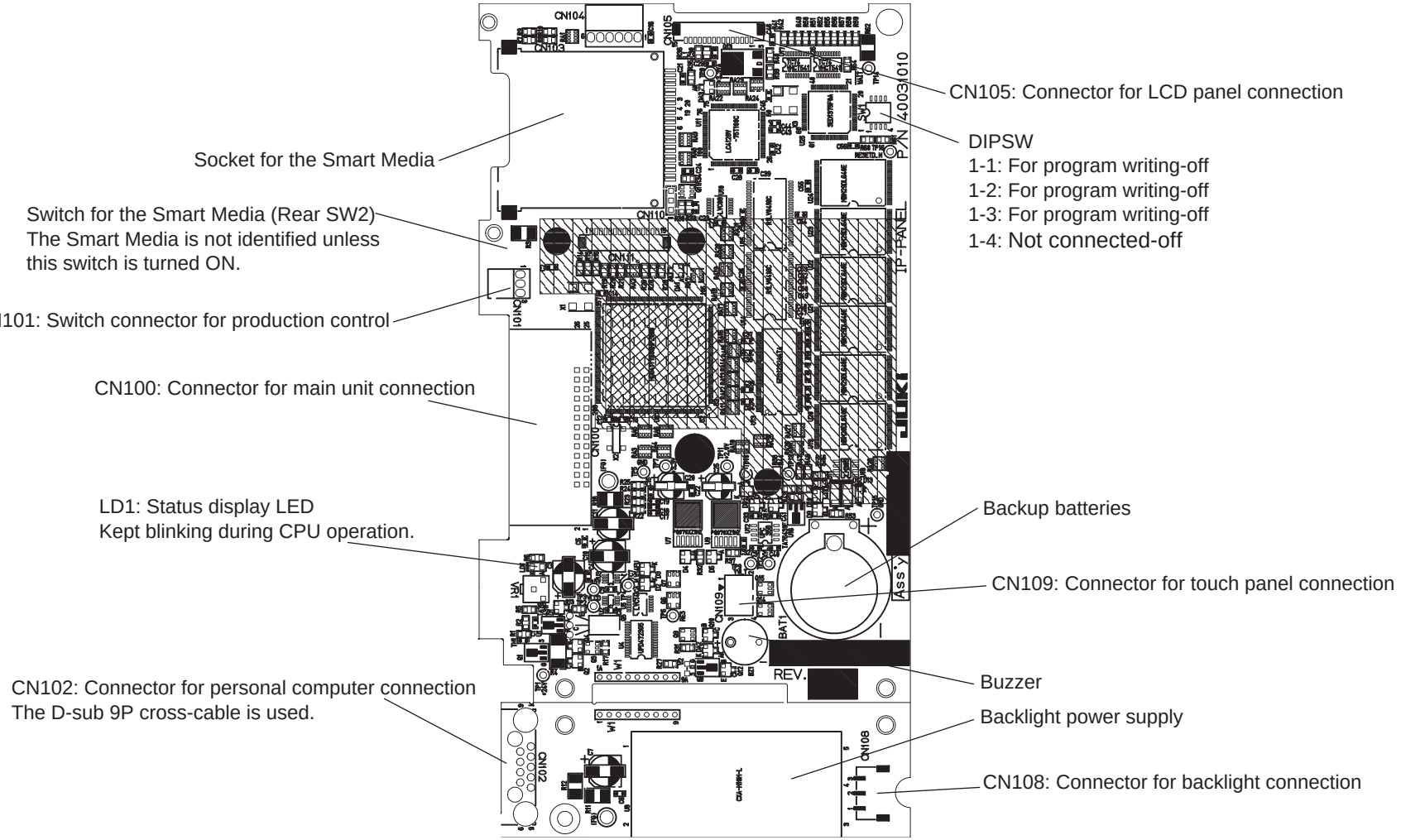
The Panel board accommodates the display LEDs, switch buzzer, etc. together with the Smart Media sockets.





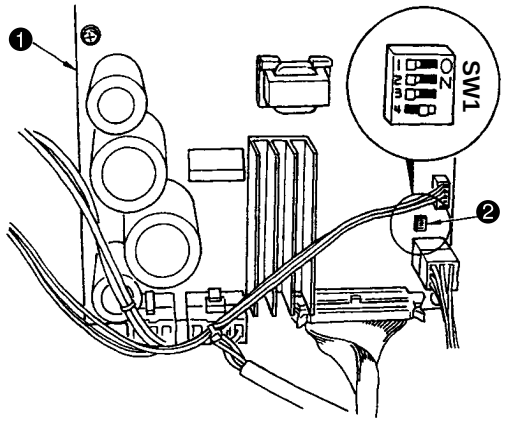
8) IP-400 Panel Board

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

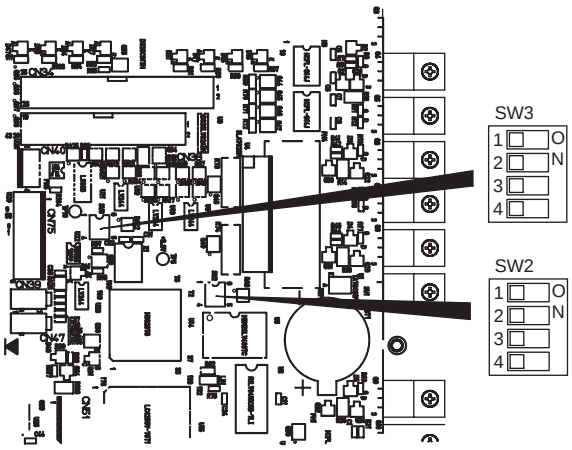
SDC board



1. The penetration force is increased when “4” of Dipswitch SW1 ❷ is turned ON on the SDC board ❶.
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.

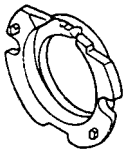
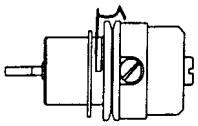
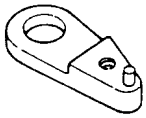
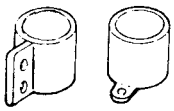
MAIN board



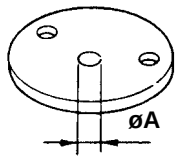
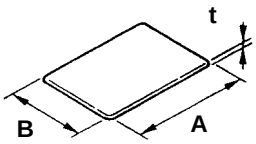
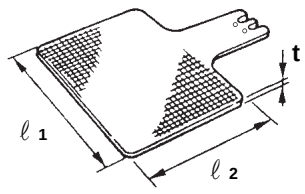
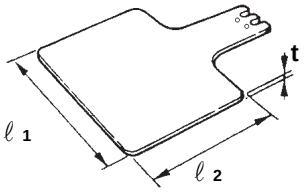
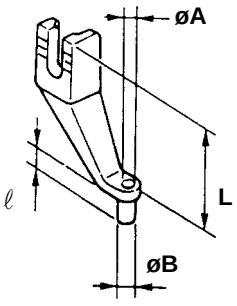
4. All dipswitches on the MAIN board are turned OFF.

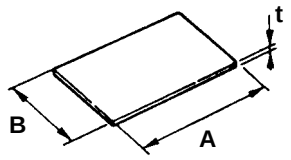
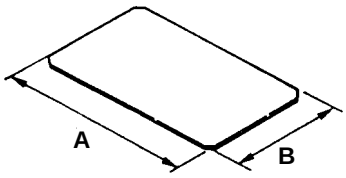
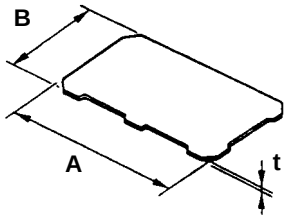
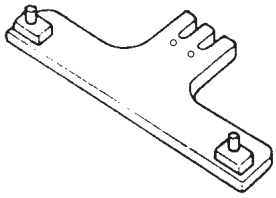
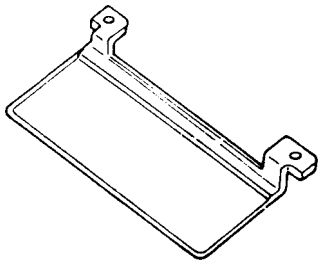
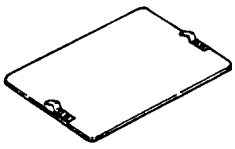
8. Table of exchanging gauge parts according to sewing specifications and needle size used

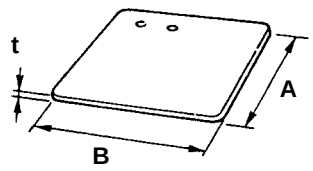
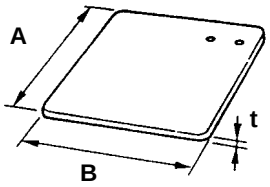
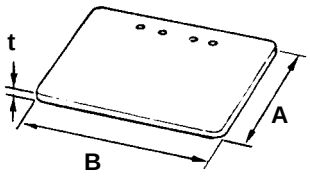
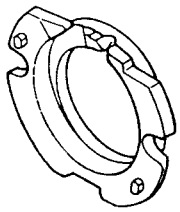
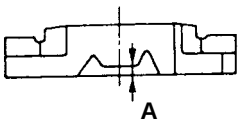
In accordance with the sewing condition, exchange the gauges referring to the following table.

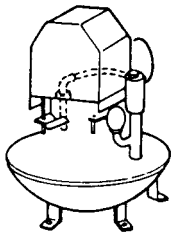
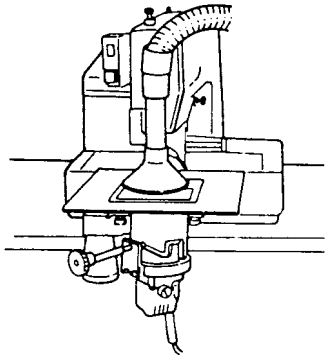
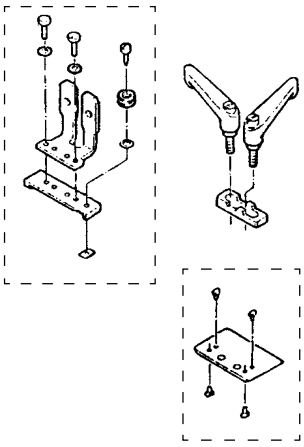
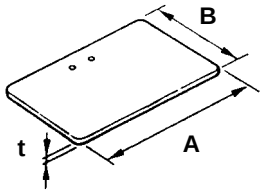
<table>
<tr><th>Sewing spec. and needle size used
Gauge</th><th>S type when delivered.
#11 to #14</th><th>Knit. foundation garment</th><th>H type when delivered
#16 to #20</th><th>#21 to #22</th><th>#23 to #26</th><th>When thick needle like MR type is used.</th></tr>
<tr><td>Needle hole guide
  </td><td>B242621000A
ø1.6</td><td>B242621000C
ø1.6
(For knit)</td><td>B242621000B
ø2.0</td><td>B242621000D
ø2.4</td><td colspan="2">B242621000F
ø3.0
B242621000G
ø3.0
(With counter bore)</td></tr>
<tr><td>Shuttle race ring
  </td><td colspan="4">14103352
Needle guard 1.3 mm</td><td>14103659
Needle guard
1.7 mm</td><td>B1817210DAD
Needle guard
1.9 mm</td></tr>
<tr><td>Shuttle
  </td><td colspan="2">40014964</td><td colspan="4">40014965</td></tr>
<tr><td>Intermediate presser
  </td><td colspan="3">40023632
ø2.2</td><td>B1601210D0B
ø2.7</td><td colspan="2">B1601210D0C
ø3.5</td></tr>
<tr><td>Tension controller No.2 asm.
  </td><td colspan="2">40010508</td><td colspan="4">40029411</td></tr>
<tr><td>Thread trimmer lever (small) asm.
  </td><td colspan="6">B24152800A0</td></tr>
<tr><td>Needle bar thread guide
  </td><td colspan="2">40026883
2-hole</td><td colspan="4">40026884
One hole</td></tr>
</table>

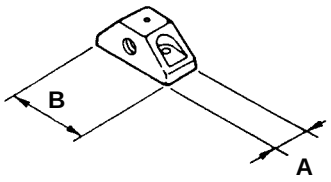
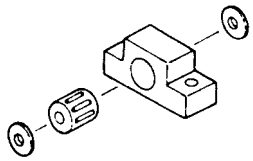
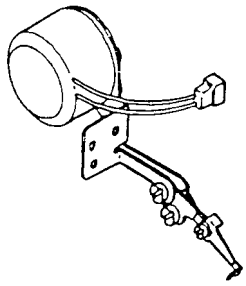
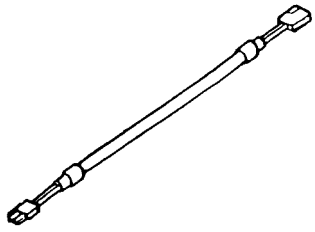
9. Option list

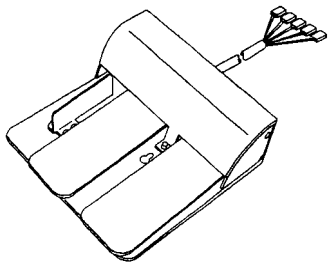
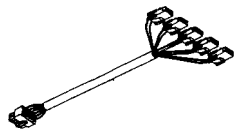
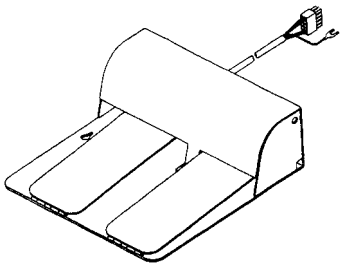
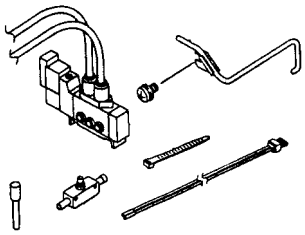
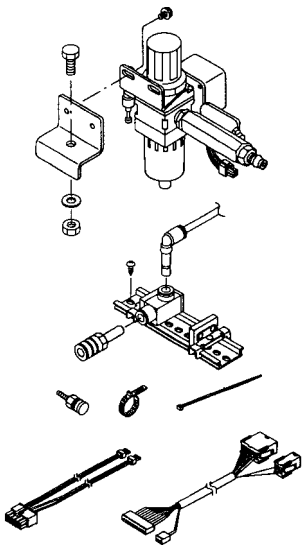
Name of parts	Type	Part No	Size (mm)
1. needle hole guide 	Needle hole guide (A) for light-weight material Needle hole guide (B) for medium-weight material Needle hole guide (C) for knitwear Needle hole guide (D) for heavy-weight material Needle hole guide (F) for heavy-weight material Needle hole guide (G) for heavy-weight material Needle hole guide (H) for heavy-weight material 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 B2564215000 B2587220000 B2588220000	A x B x t 250 x 200 x1.5 A x B x t 300 x 200 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	B2556210D0A	ℓ 1 x ℓ 2 x t 168 x 131 x 1.2
	Feed plate blank without knurl	B2556210D0B	ℓ 1 x ℓ 2 x t 168 x 131 x 1.2
4. Intermediate presser 	Intermediate presser (A) Intermediate presser (B) Intermediate presser (C) Intermediate presser (E) Intermediate presser (F)	40023632 B1601210D0BA B1601210D0CA B1601210D0E B1601210D0FA	øA x øB x ℓ x L 2.2 x 3.6 x 6 x 29.5 øA x øB x ℓ x L 2.7 x 4.1 x 6 x 29.5 øA x øB x ℓ x L 3.5 x 5.5 x 6 x 29.5 øA x øB x ℓ x L 1.6 x 2.6 x 6 x 29.5 øA x øB x ℓ x L 2.2 x 3.6 x 9 x 29.5

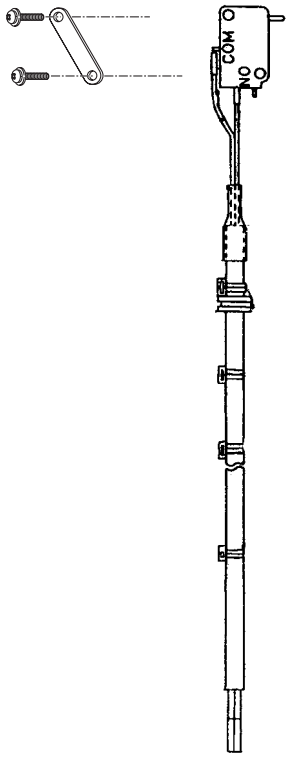
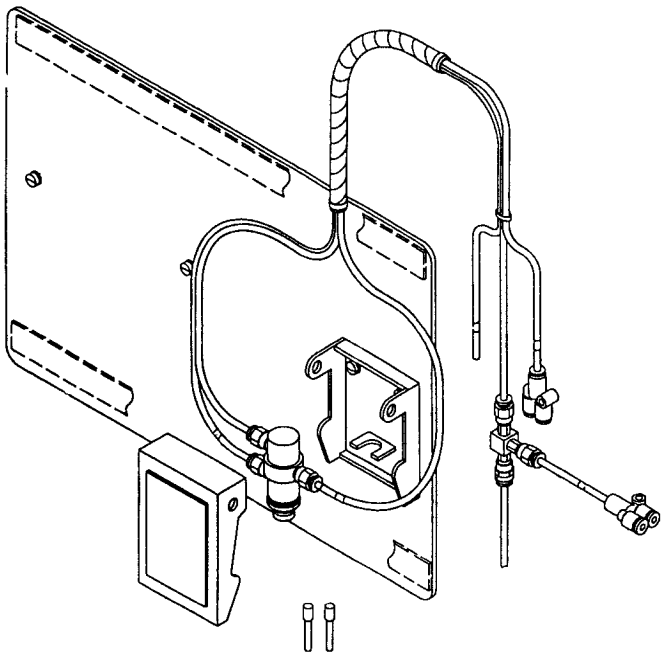
Name of parts	Type	Part No	Size (mm)
5. Feed plate blank 	Sheet A for work clamp (Velboren) (Velboren) Sheet B for work clamp (Velboren) Sheet C for work clamp (Velboren)	B259522000A B259522000B B259522000C	A x B x t 1,000 x 675 x 1 A x B x t 1,000 x 675 x 3 A x B x t 1,000 x 675 x 2
	Plastic feed plate inner plate	GMU12038000	A x B x t 140.8 x 72.5 x1
	Aluminum feed plate inner plate	GMU12037000	A x B x t 140.6 x 72.5 x 1
6. Cassette holder 	Cassette holder installing base	B2593210DA0	
	Cassette holder assy	B2594210DA0	
7. Feeding frame blank 	Plastic blank Aluminum blank	B2557210DA0 GMU120350A0	

Name of parts	Type	Part No	Size (mm)
8. Blank for processing  	Separated type right blank of outer frame with knurl Separated type outer frame blank without knurl (Left and right are common.)	40035609 40035608	A x B x t 97 x 81.5 x 4 A x B x t 97 x 81.5 x 4
 	Separated type left blank of outer frame with knurl	40035610	A x B x t 97 x 81.5 x 4
 	Presser blank of outer frame with knurl Presser blank of outer frame without knurl	40035606 40035607	A x B x t 97 x 164 x 4 A x B x t 97 x 164 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. Compressor unit 		CU-01	
11. Economy type presser milling unit 		MU-12	
12. Inverting clamp unit	**(Caution) For the head of S type, it is necessary to provide for the AMS-210E air set separately.**	FU-05 40036596	
13. One-touch clamp device 	For S type For L type	B2585210DB0 B2586210DB0	
14. Inverting intermediate presser blank 	Metal Plastic	B43172100X0 162371T3	A x B x t 135 x 58 x 3.2 A x B x t 100 x 50 x4

Name of parts	Type	Part No	Size (mm)
15. Inverting intermediate presser installing base 	Without bearing	D431421WJ0B D430121XB00 D431421WZ00 D431421WK00 D431421YF00 D4314210000	A x B 5 x 24 A x B 7 x 20 A x B 7 x 24 A x B 8 x 24 A x B 10 x 20 A x B 10 x 24
		Installing base B4314210A00 Bearing SB304000200 Washer B4328210000	
16. Wiper 	Side-sweeping wiper assy	40035867	
	Side-sweeping wiper repeater cable assy	40036668	

Name of parts	Type	Part No	Size (mm)
17. Pedal switch 	3-step pedal (PK47)	GPK470010AB	
	Relay cable for 3-step pedal	40033875	
	2-step pedal (PK78)	40033831	
18. Needle cooler 	**(Caution) For the head of S type, it is necessary to provide for the AMS-210E air set separately.**	40035692	
19. AMS-210E air set 	To be exclusively used for Type S	40035693	

Name of parts	Type	Part No	Size (mm)
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.
21. Mechanical valve unit 	This unit is not applicable to the machine head of Specification S.	(40042352)	(Unit Item No.) For further details, refer to [(2) Method of mechanical valve unit connections] and [23. Pedal system] of the parts list

(1) Method of pedal switch cable set connections

1. Parts

Pedal switch cable set (Item No.: 40040138)

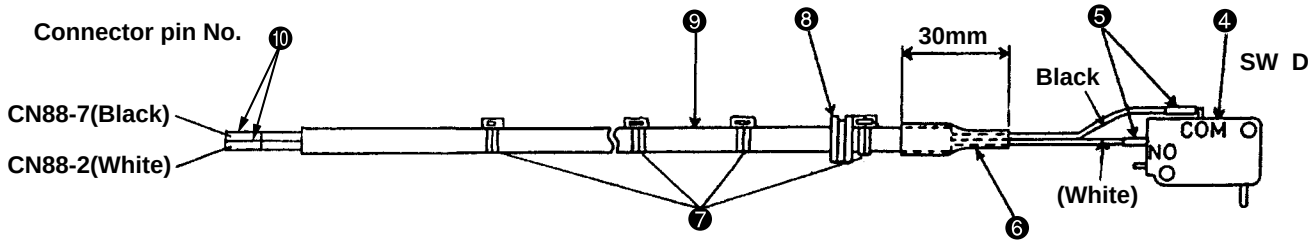
No.	Item name	Item No.	Quantity
❶	Presser micro switch plate	11102308	1
❷	Micro switch setscrew	SL4031691SC	2
❸	Switch assembly	*	1
❹	Limit switch	HA001900000	(1)
❺	Heat contraction tube ø5 (15mm)	E8760452G00	(2)
❻	Heat contraction tube ø 5 (30mm)	E8760452G00	(1)
❼	Cable clip band	EA9500B0200	(4)
❽	Cord bushing	M1013110000	(1)
❾	Cabtyre cable 2-core (1830mm)	HW500140000	(1)
❿	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

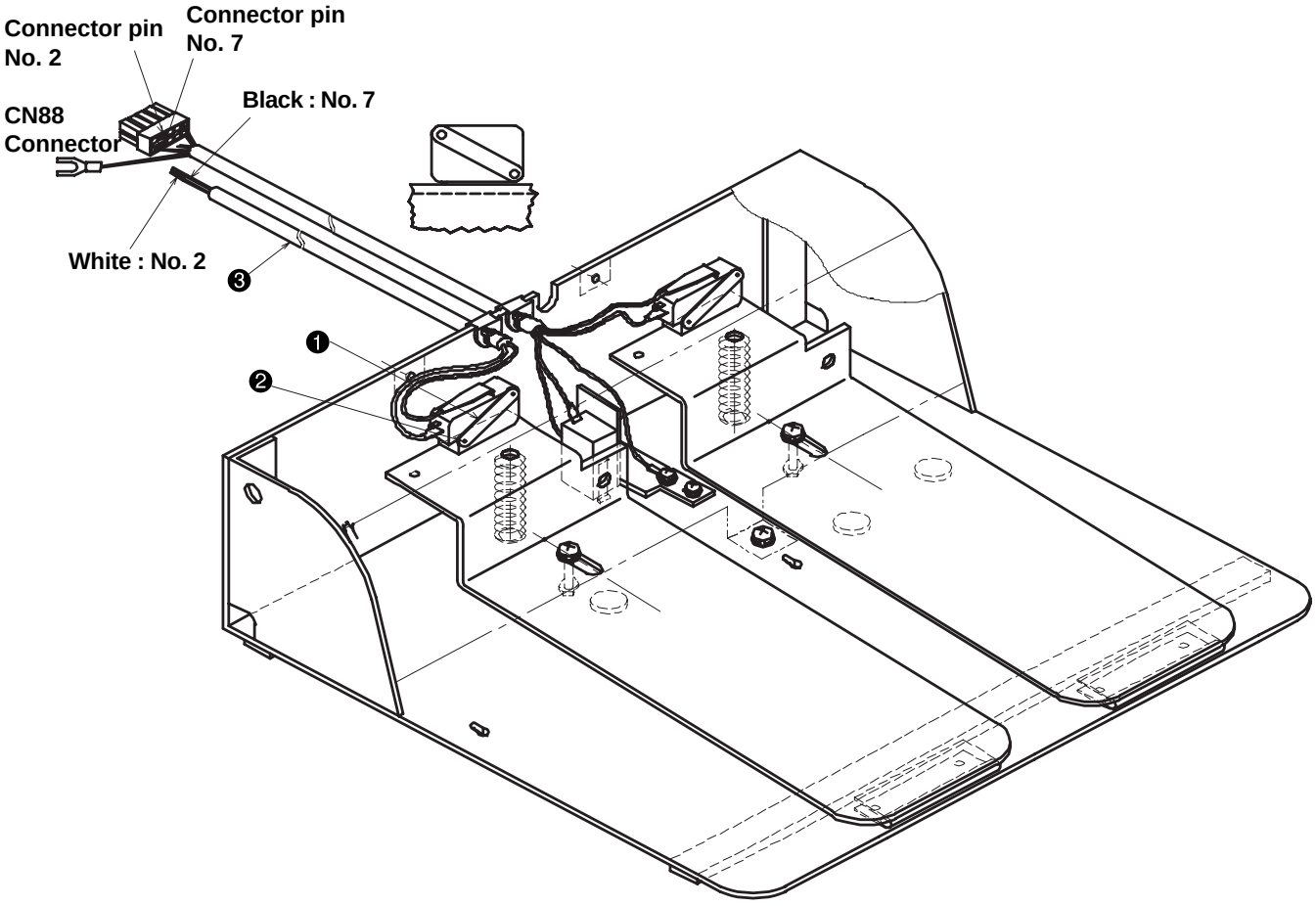
No.	Before change	After change
U81	0	1
U82	0	1
U85	1	0

5. Operation control items

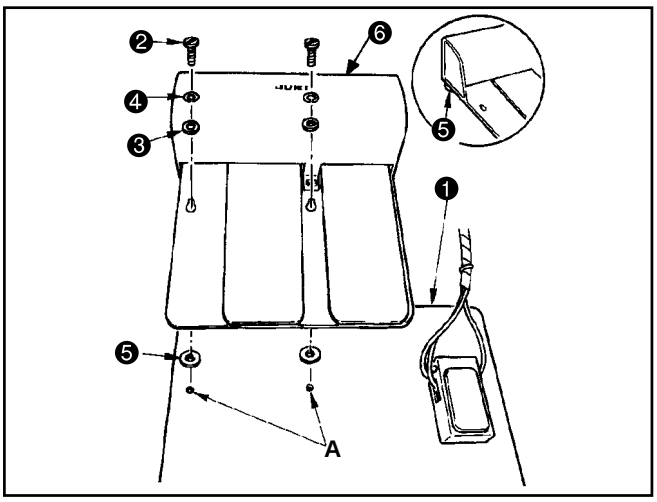
- o The moving switch does not function unless the right pedal is trodden first.
- o For more details, refer to [6. Switch mounting position diagram].

6. Switch mounting position diagram.

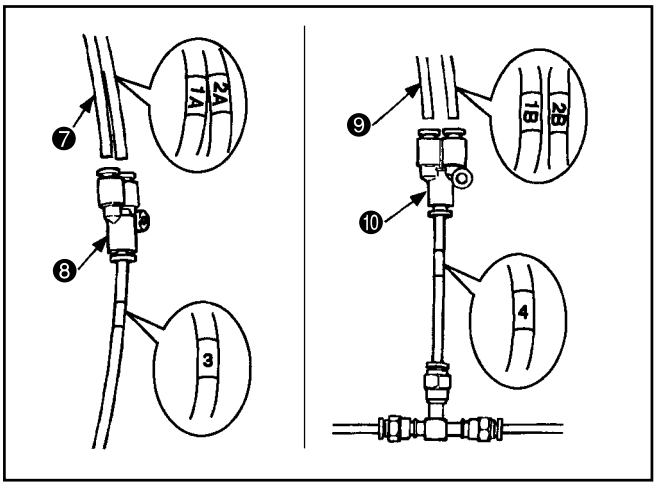
(Caution) The micro switch shall be mounted in parallel to the upper plane of the pedal.
(The switch is fixed in the ON state.)



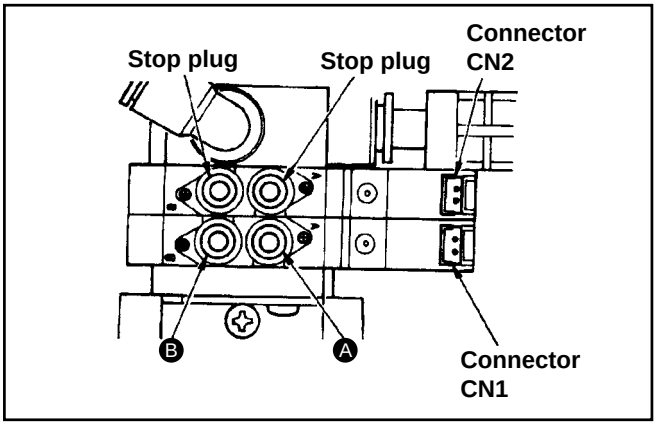
(2) Method of mechanical valve unit connections



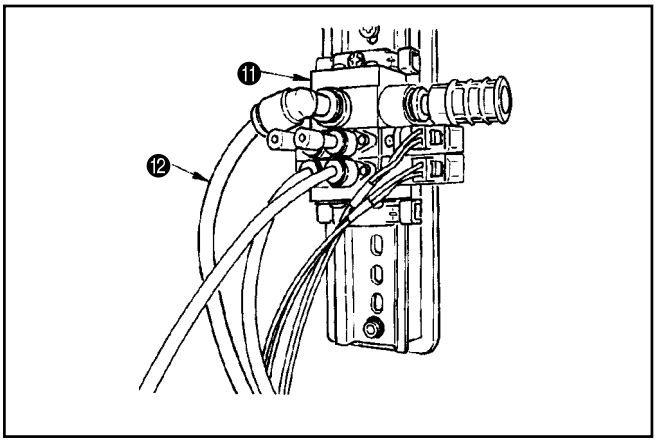
1. Remove once two setscrews ❷, two washers (small) ❸, two spring washers ❹ and two washers (large) ❺ attached to mechanical valve unit ❶. Refer to the figure, and install 2-pedal (PK78) type ❻ into hole **A** of mechanical valve unit ❶.



2. Connect the air tubes ❼, ❾ which come from the machine head, to the Y-type joint ❽, ❿ respectively.
   - o Air tube ❼ with label of “1A, 2A”
     → Y-type joint ❽ connected with the label of “3” of mechanical valve unit
   - o Air tube ❾ with label of “1B, 2B”
     → Y-type joint ❿ connected with the label of “4” of mechanical valve unit



3. Install the air tube coming from mechanical valve unit “7” to Ⓐ, and that from “8” to Ⓑ respectively.
   Attach two accessory stop plugs and the cords coming from the control box to the connectors CN1, CN2, respectively.

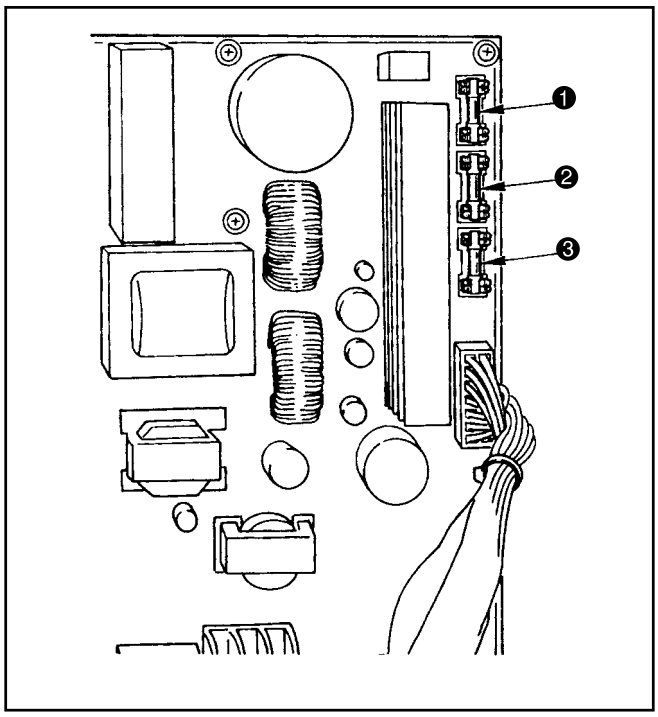


4. Connect solenoid valve asm. ⓫ and the regulator using long air tube supplied ⓬ as accessories.

(Caution) When the cable sage, fix it to the table using the staple supplied with the machine as accessories.

10. Maintenance

(1) Replacing the fuse



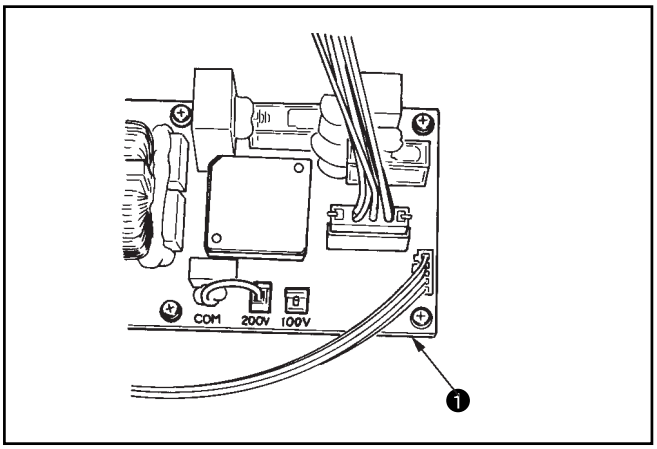
The machine uses the following three fuses: (SDC Board)

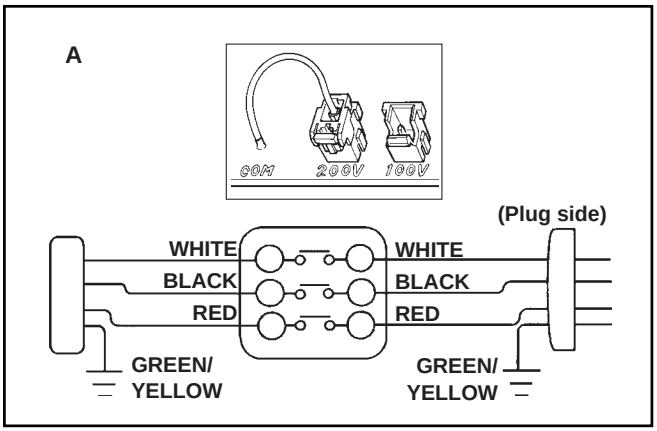
- ❶ For pulse motor power supply protection
  15A(time-lag fuse)
- ❷ For solenoid and pulse motor power supply protection
  3.15A (time-lag fuse)
- ❸ For control power supply protection
  2A (fast-blow type fuse)

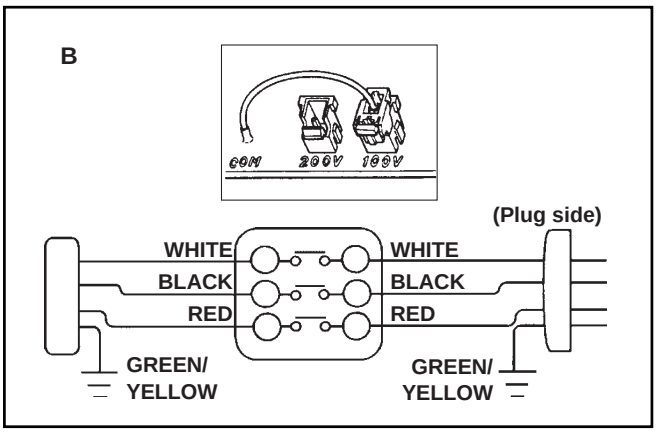
(2) Changing the voltage specification

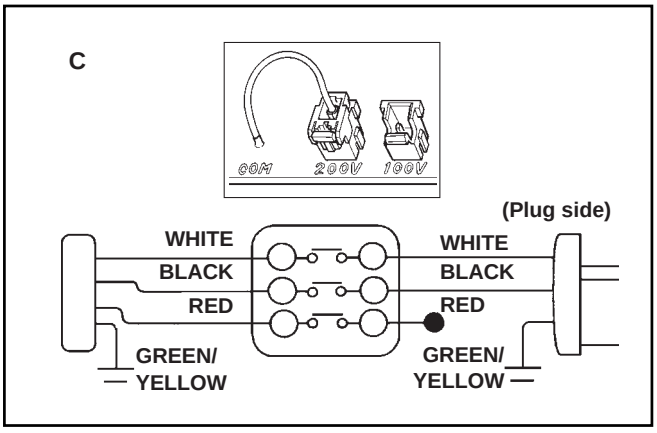
It is adaptable to the voltage of single phase 100V to 120V/3-phase 200V to 240V by changing the voltage changeover connector mounted on FLT-T p.c.b.

(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) Greasing • lock-tight parts

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•lock-tight 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•lock-tight 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 oilcan with grease. Otherwise, an injector without a needle can be conveniently used.

4. Miscellaneous

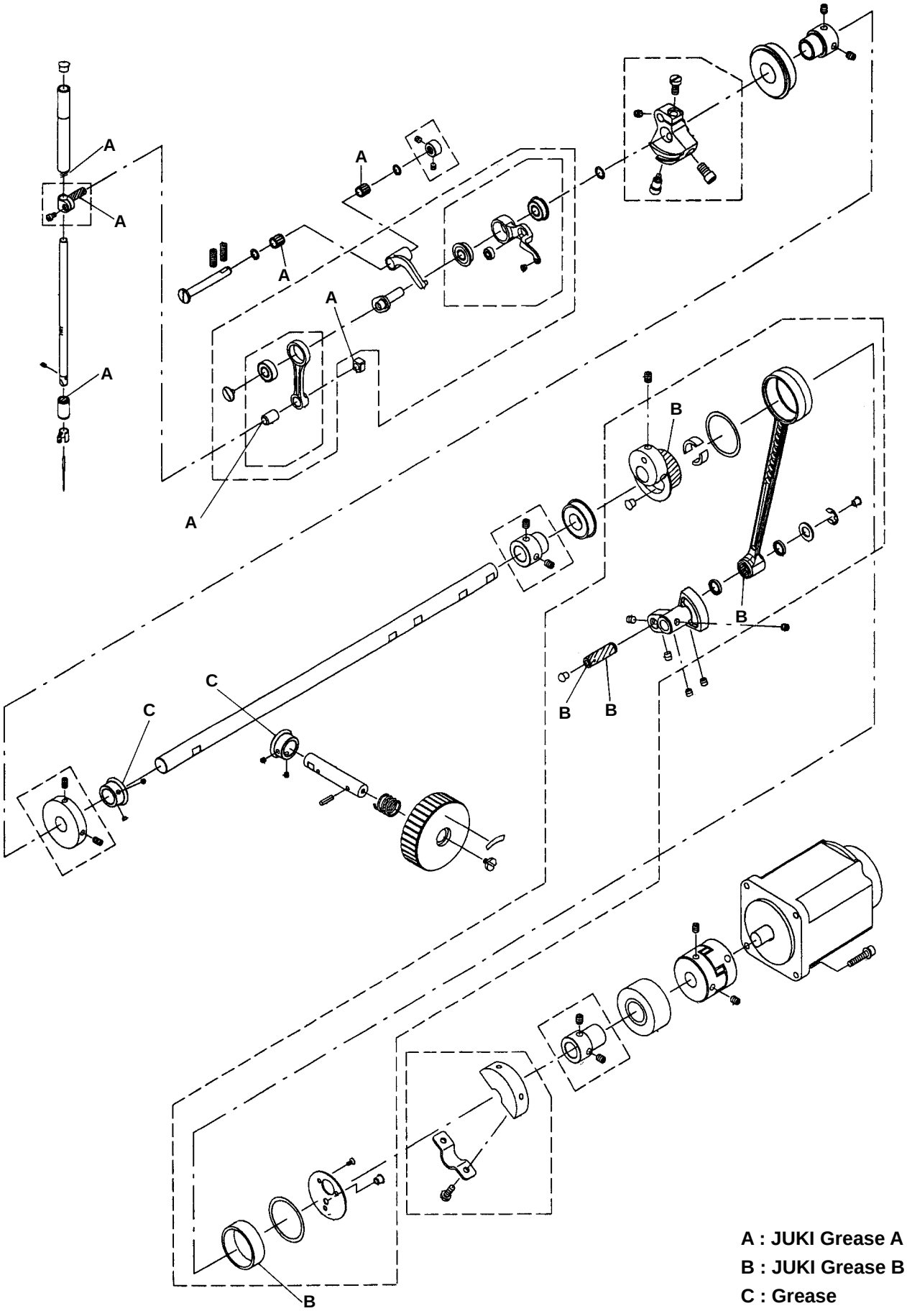
   An injector to be used exclusively for coating / JUKI Part No. : GDS01007000

5. Application of Lock Tight

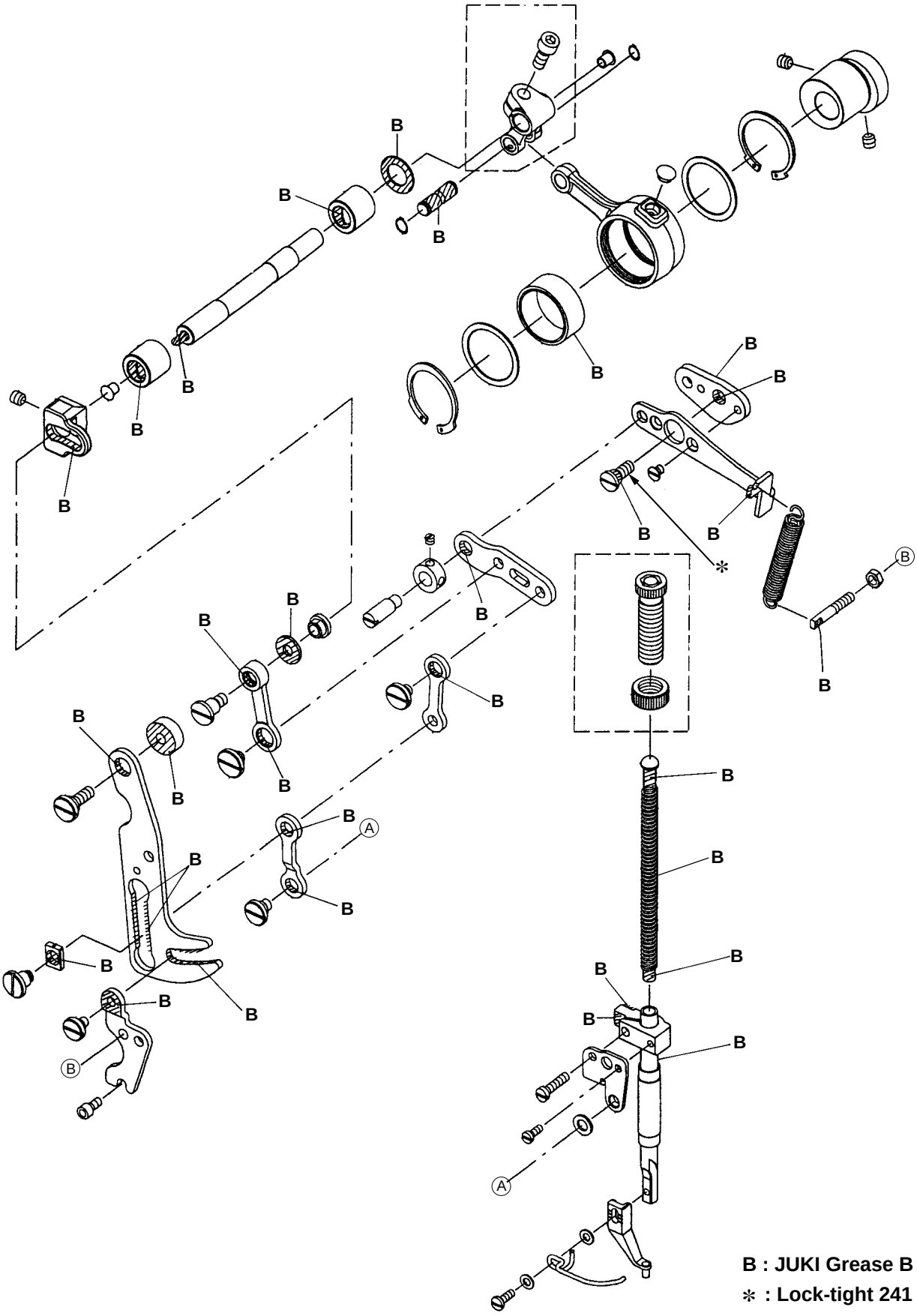
   Apply Lock Tight 241 to section with the asterisk※ .

(4) Parts to which grease • lock-tight is applied

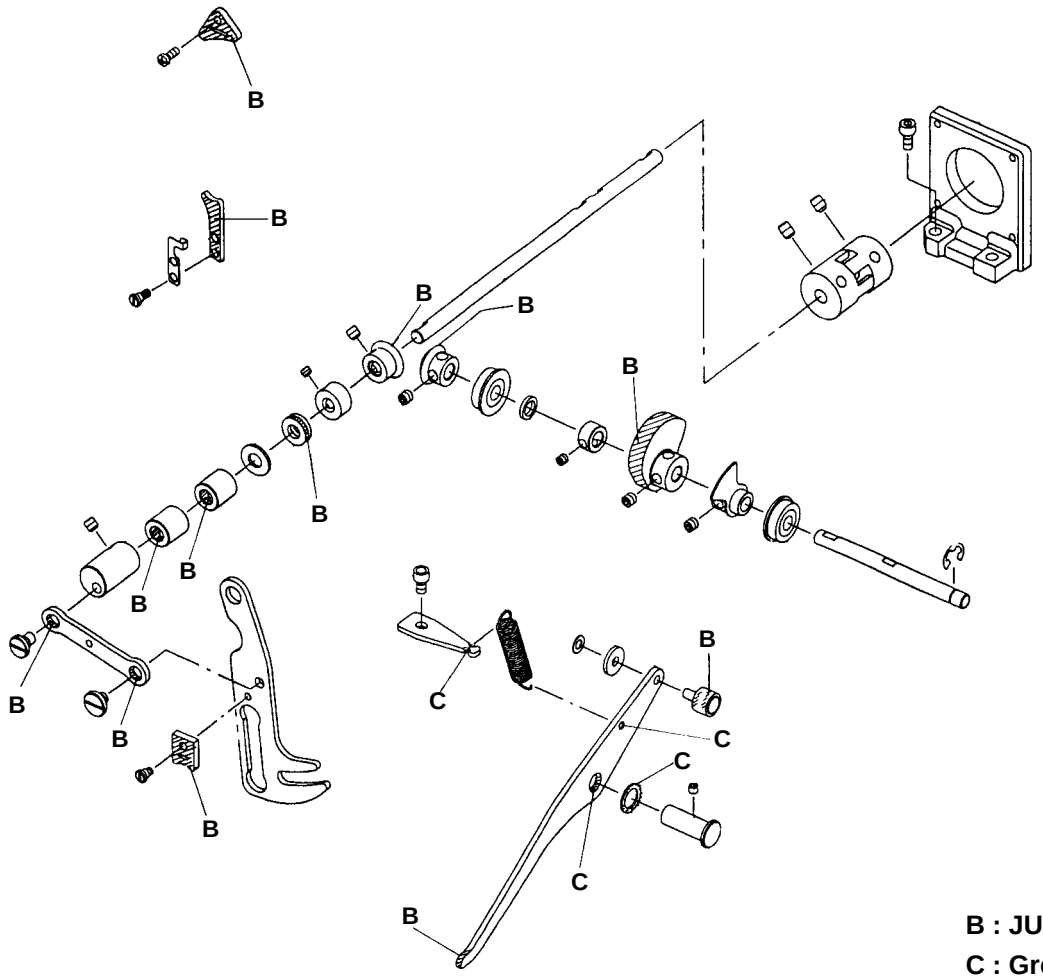
o MAIN SHAFT & NEEDLE BAR COMPONENTS



o PRESSER MECHANISM & PRESSER VARIABLE COMPONENTS (1)

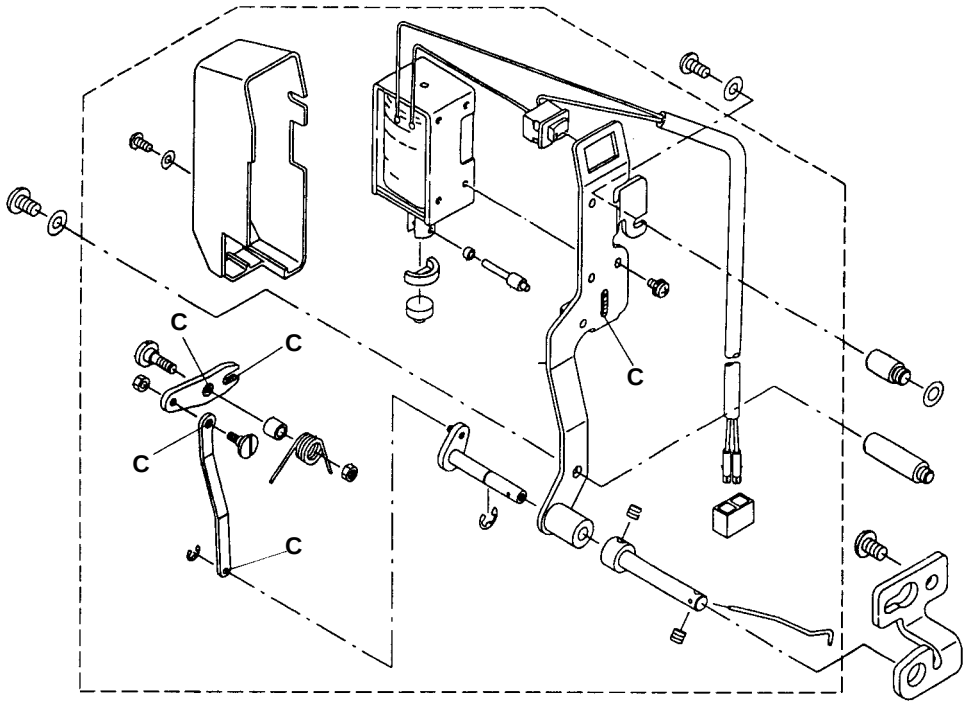


o PRESSER MECHANISM & PRESSER VARIABLE COMPONENTS (2)



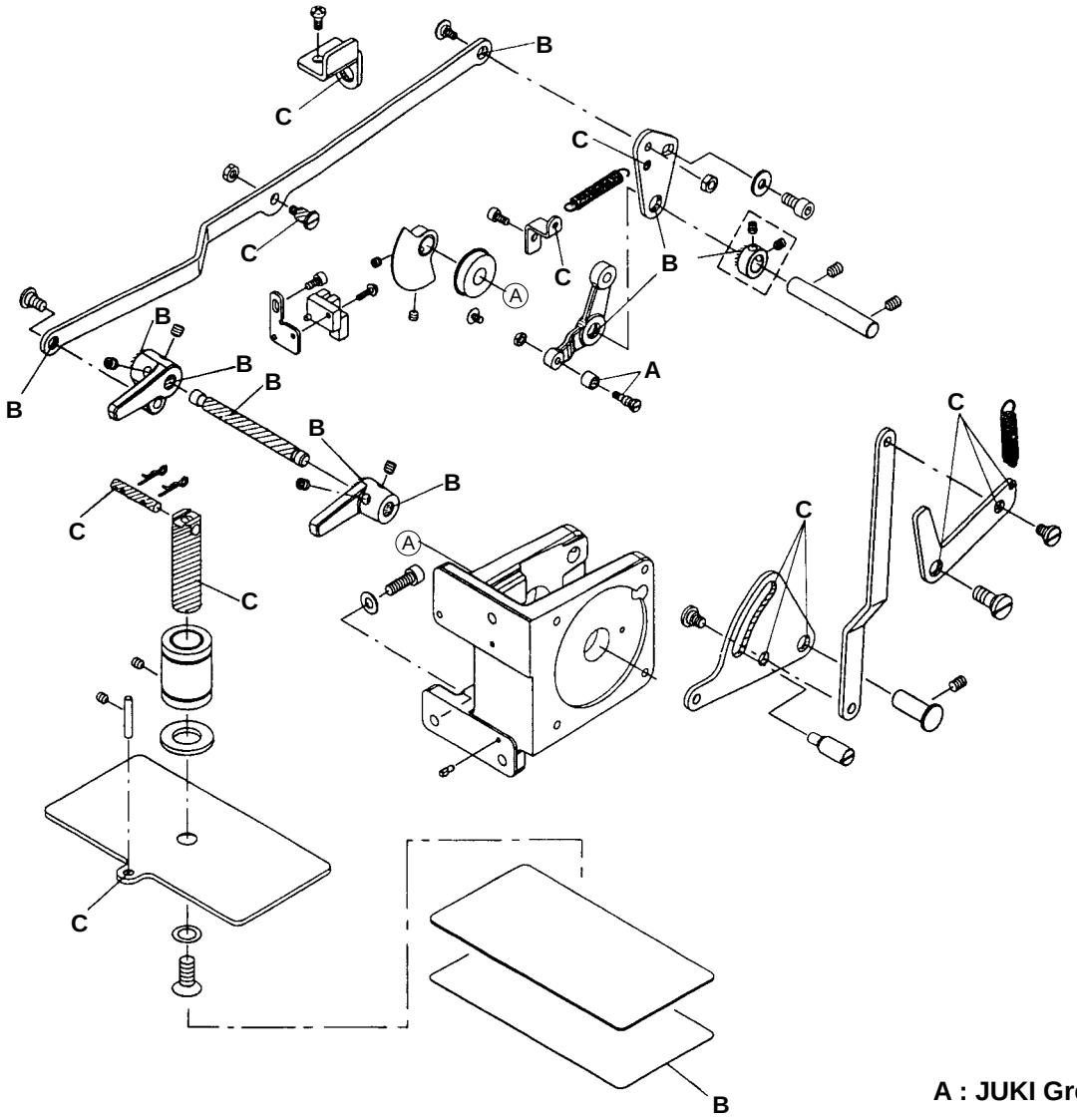
B : JUKI Grease B
C : Grease

o WIPER MECHANISM COMPONENTS



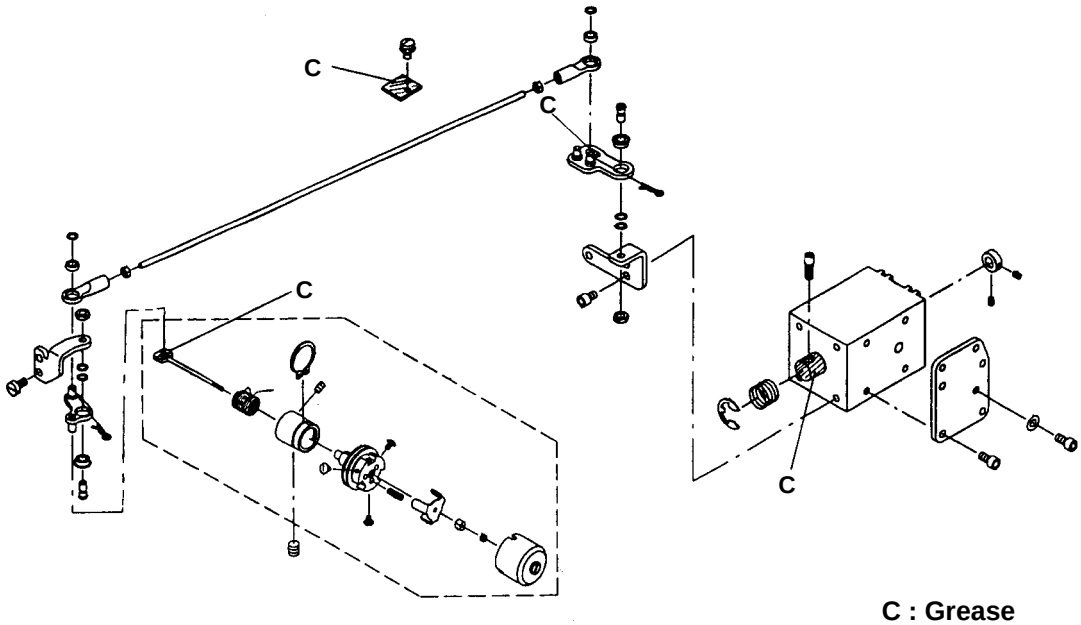
C : Grease

o PRESSER PLATE & MANUAL PRESSER MECHANISM COMPONENTS



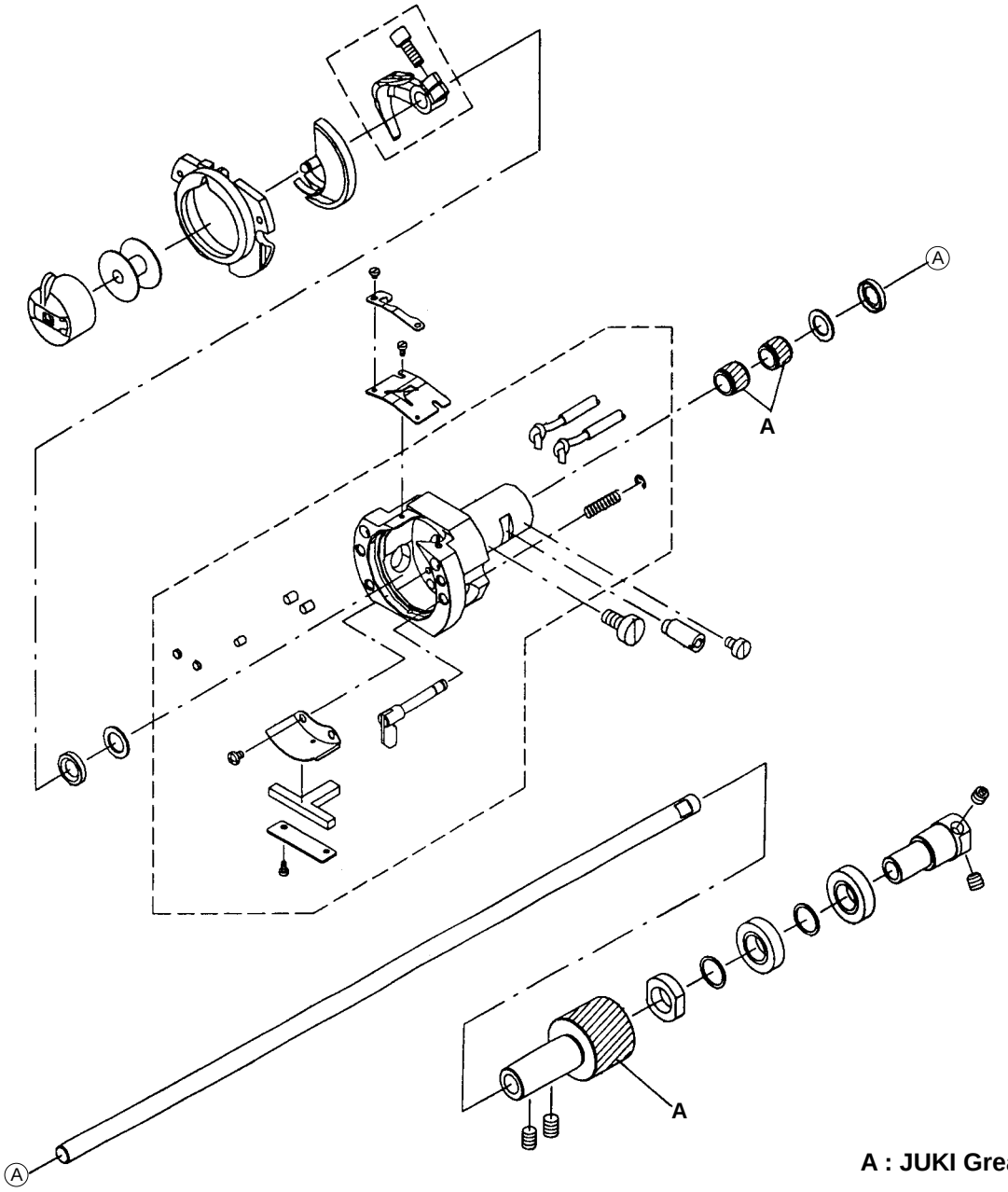
A : JUKI Grease A
B : JUKI Grease B
C : Grease

o TENSION RELESASE & THREAD TENSION COMPONENTS



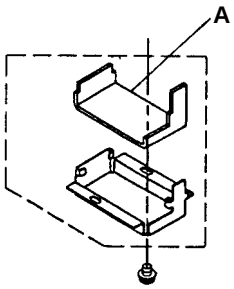
C : Grease

o SHUTTLE DRIVER SHAFT COMPONENTS



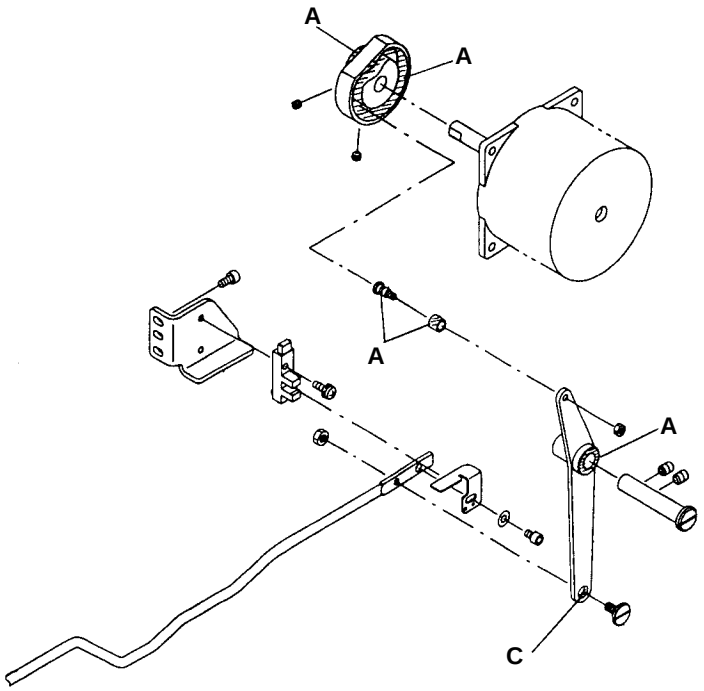
A : JUKI Grease A

o FRAME & MISCELLANEOUS COVER COMPONENTS (2)



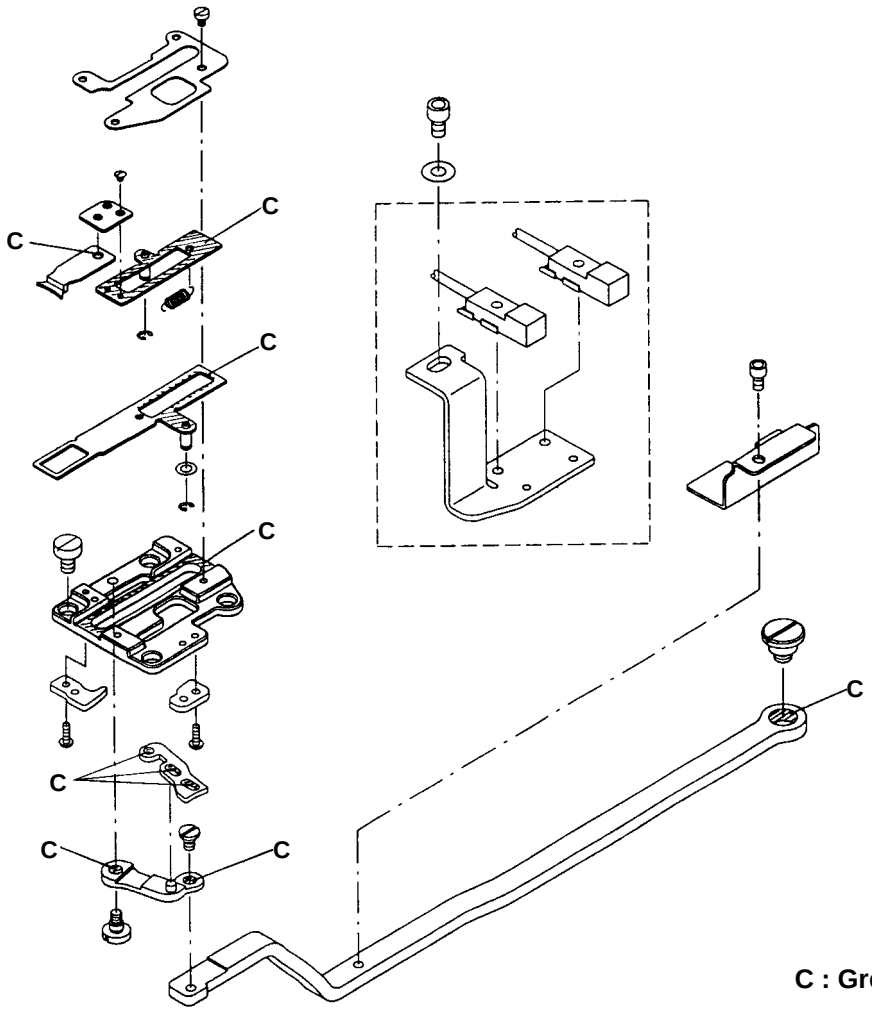
A : JUKI Grease A

o TENSION RELEASE & THREAD TRIMMER MECHANISM COMPONENTS



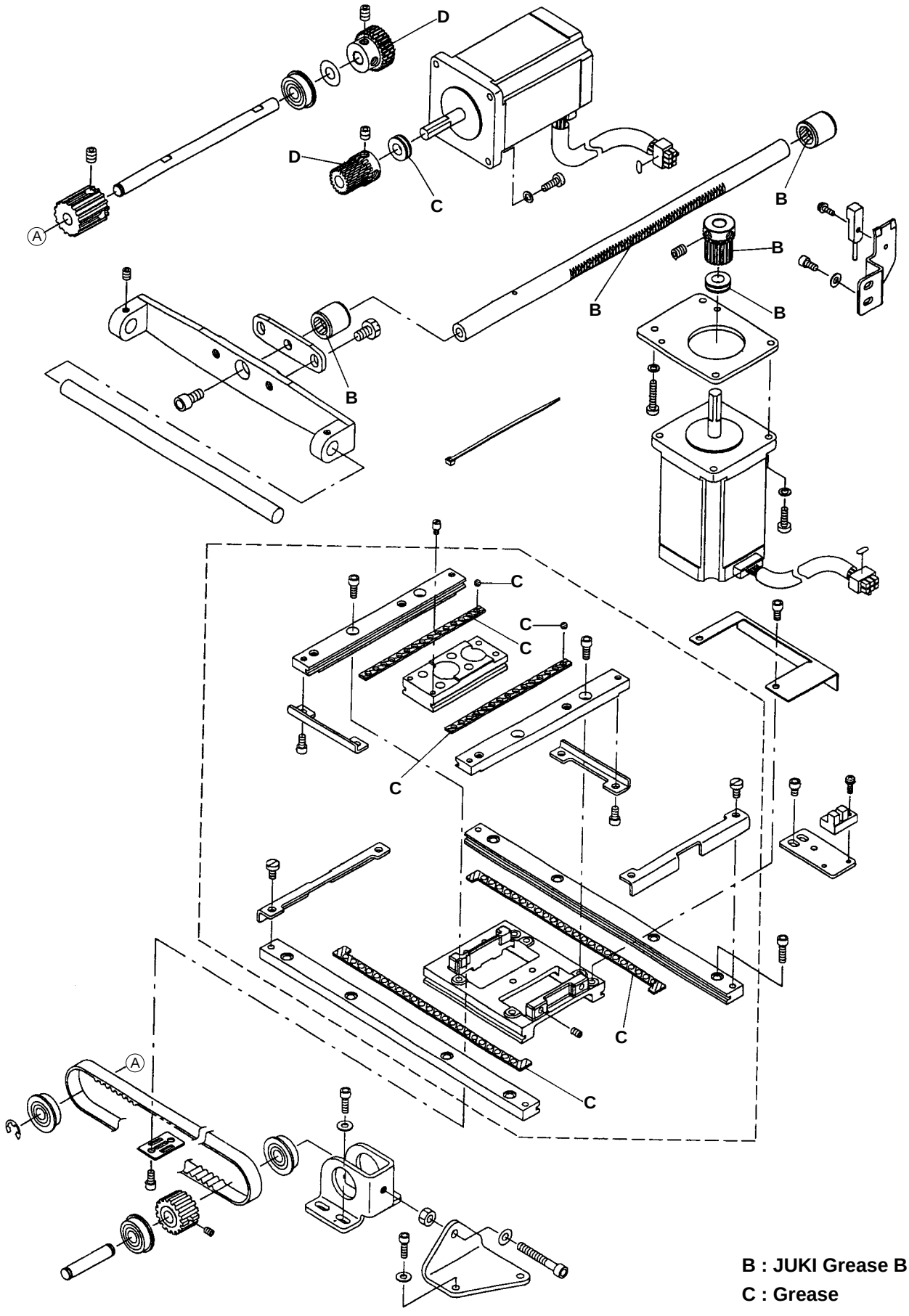
A : JUKI Grease A
C : Grease

o THREAD CLAMP COMPONENTS



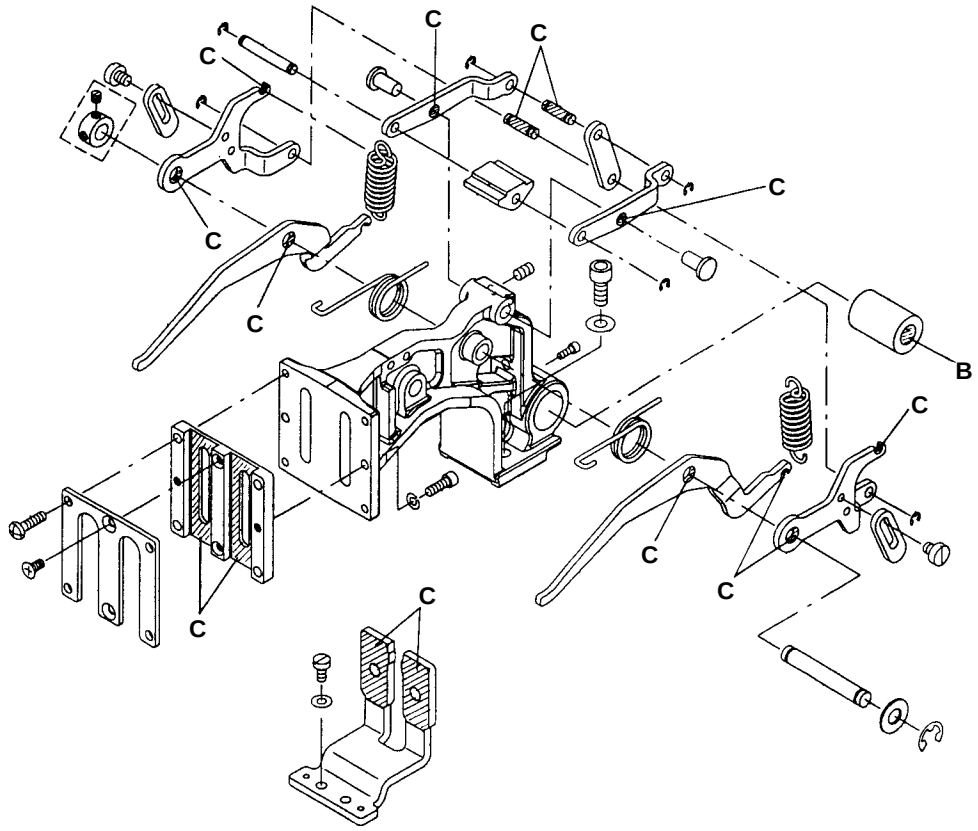
C : Grease

o X-Y COMPONENTS



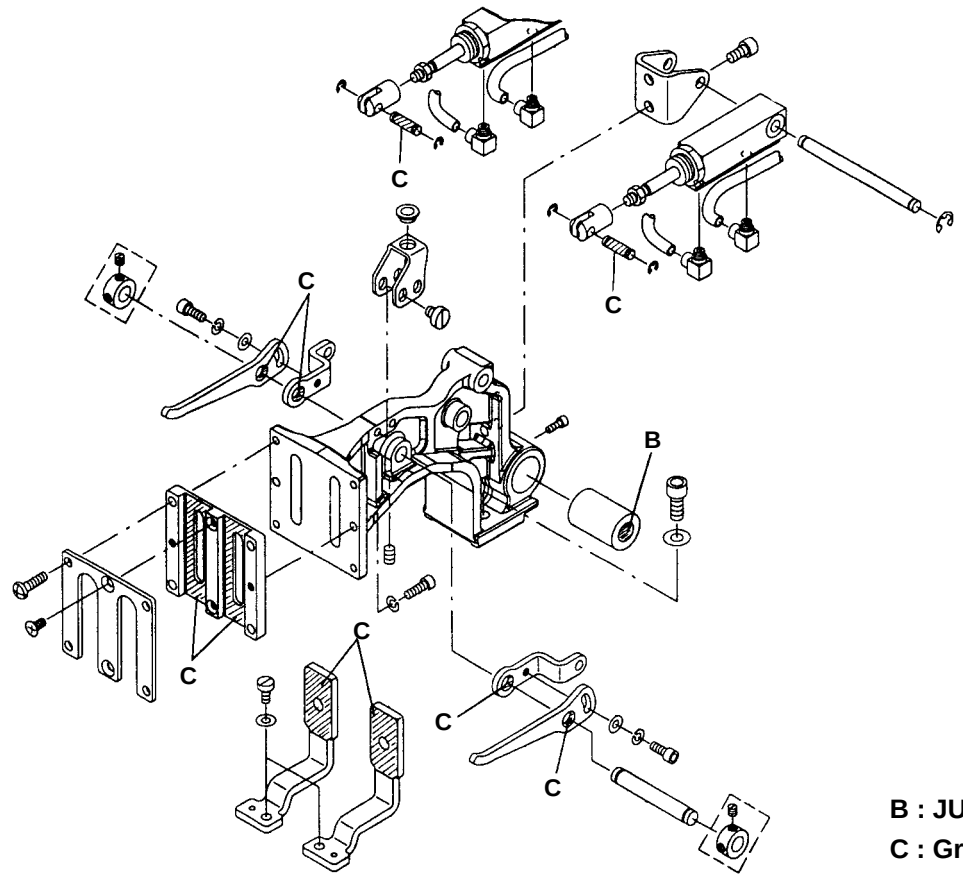
B : JUKI Grease B
C : Grease
D : Grease D

o CLOTH FEED MECHANISM COMPONENTS (FOR AMS-210EHS, ESS)



B : JUKI Grease B
C : Grease

o CLOTH FEED MECHANISM COMPONENTS (FOR AMS-210EHL, ESL)



B : JUKI Grease B
C : Grease

(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 ì0î 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 ì0î 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.

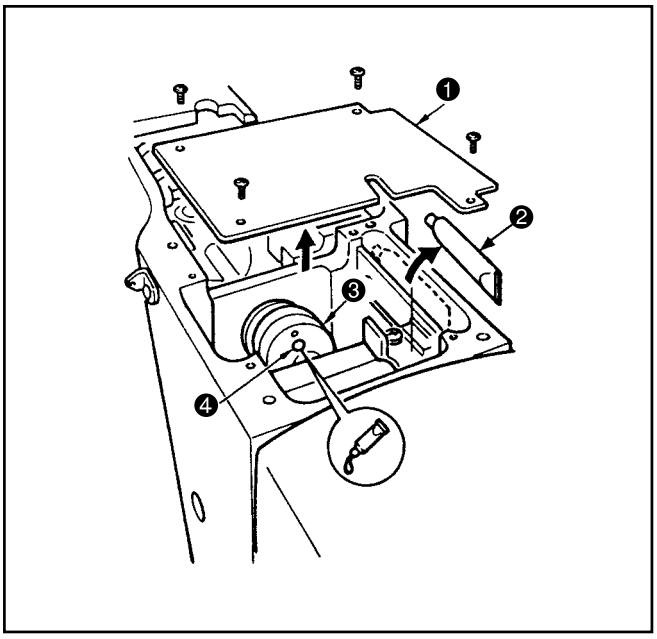
(Caution) 1. After replenishing the places with grease, the error No. E220 or No. E221 is displayed again unless the memory switch No. 245 is changed to “0”.

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:

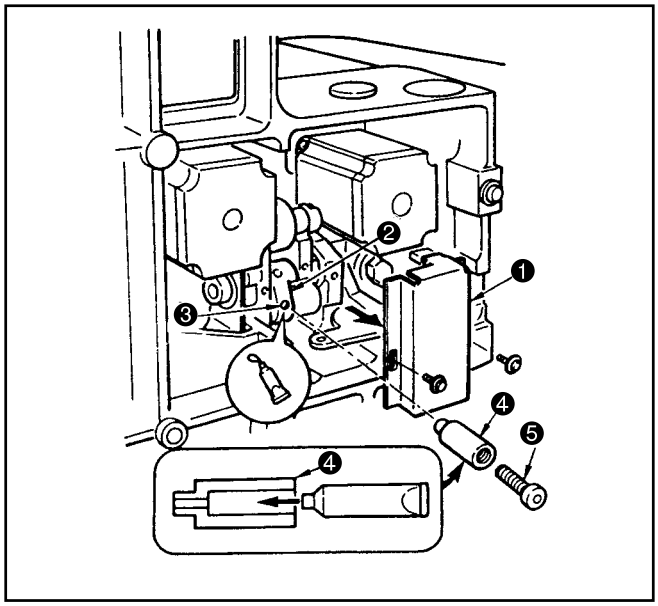
Turn OFF the power before starting the work so as to prevent accidents caused by abrupt start of the sewing machine.

1) Replenishing the eccentric cam section with grease



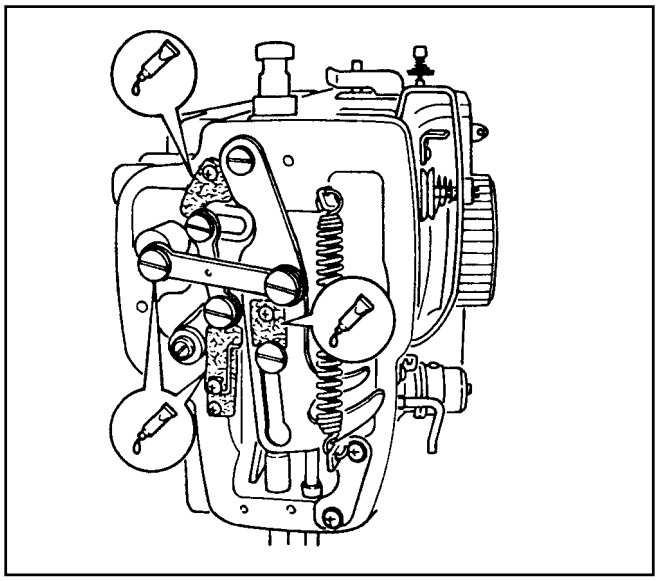
1. Open the upside cover ❶ and remove the JUKI grease B ❷.
2. Remove rubber cap ❹ located on the side of eccentric cam ❸ . Then replenish there with JUKI grease B ❷.

2) Replenishing the oscillator pin section with grease



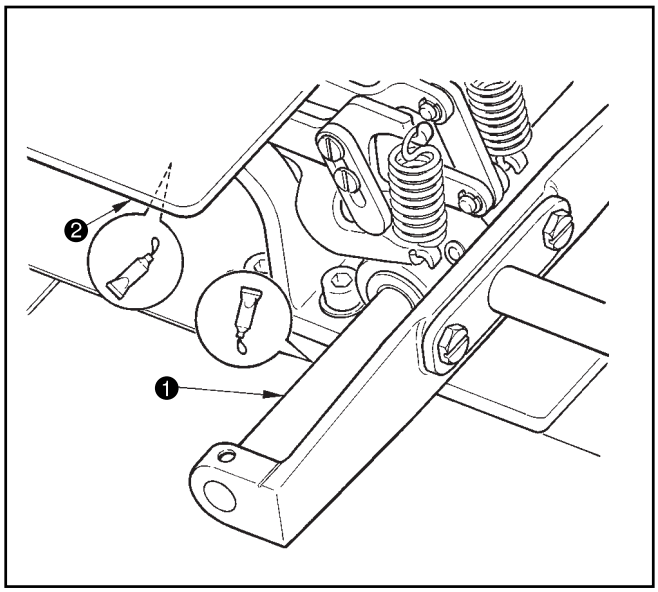
1. Tilt the machine head and remove the grease cover ❶.
2. Fill joint ❹ supplied as an accessory with JUKI Grease B.
3. Remove setscrew ❸ in oscillator gear ❷ and screw in joint ❹ into the screw hole.
4. Screw in screw ❺ supplied as accessories to the joint ❹ and replenish there with JUKI grease B.
5.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

3) Grease supplement to the face plate section



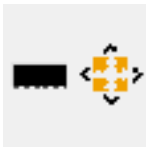
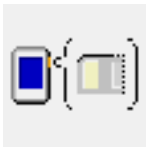
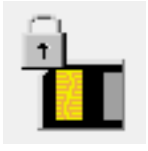
1. Open the face plate cover.
2. Supplement JUKI grease B to the felt section (3 places) and the hinge screws around them.

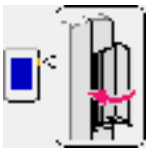
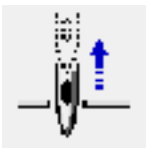
4) Grease supplement to X guide shaft bearing

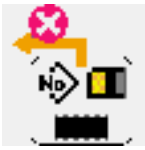
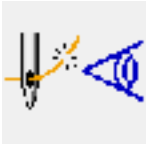


1. At the same time, apply JUKI grease B to the rear faces of X guide shaft ❶ and presser plate ❷.

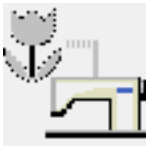
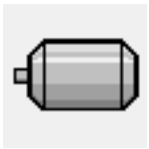
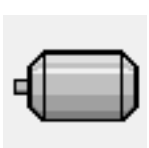
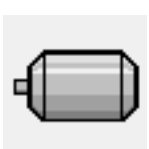
11. Error code list

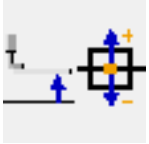
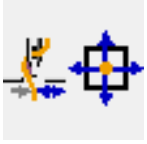
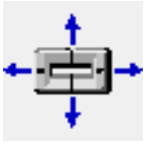
Error code	Pict	Description of error	How to recover	Place of recovery
E001		**Data is initializes** (EEPROM of MAIN CPU)	Turn OFF the power	
E007		**Main shaft motor-lock** When large needle resistance sewing product is sewn	Turn OFF the power	
E008		**Head connector abnormality** Memory of machine head cannot be read.	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.	Possible to re-enter after reset.	Previous screen
E011		**External media not inserted** External media is not inserted.	Possible to re-enter after reset.	Previous screen
E012		**Read error** Data read from external media cannot be performed.	Possible to re-start after reset.	Previous screen
E013		**Write error** Data write from external media cannot be performed.	Possible to re-start after reset.	Previous screen
E014		**Write protect** External media is in the write prohibition state	Possible to re-start after reset.	Previous screen
E015		**Format error** Format cannot be performed.	Possible to re-start after reset.	Previous screen
E016		**External media capacity over** Capacity of external media is short.	Possible to re-start after reset.	Previous screen

Error code	Pict	Description of error	How to recover	Place of recovery
E017		**EEP-ROM capacity over** When the mounted EEP-ROM is different in type.	Possible to re-start after reset.	Previous screen
E018		**Type of EEP-ROM is different.** When the mounted EEP-ROM is different in type.		Previous screen
E019		**File size over** Pattern data size over	Possible to re-start after reset.	Previous screen
E022		**File No. error** There is no designated file in the server or external media.	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.	Possible to re-start after reset.	Data input screen
E027		**Read error** Data read from server cannot be performed.	Possible to re-start after reset.	Previous screen
E028		**Write error** Data write to the server cannot be performed.	Possible to re-start after reset.	Previous screen
E029		**Smart media slot release error** Lid of smart 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	Turn hand pulley to bring needle bar to its UP position.	Data input screen
E031		**Air pressure drop** When the air pressure is lowered.	Possible to re-start after reset.	Data input screen

Error code	Pict	Description of error	How to recover	Place of recovery
E032		**File interchanging error** File cannot be read.	Possible to re-start after reset.	Data input screen
E040		**Sewing area over** When the sewing area is exceeded	Possible to re-start after reset.	Sewing screen
E042		**Operation cannot be performed.**	Possible to re-start after reset.	Previous screen
E043		**Enlarging error** Sewing pitch exceeds Max. pitch.	Possible to re-start after reset.	Data input screen
E045		**Pattern data error** These pattern data are not applicable.	Possible to re-start after reset.	Data input screen
E050		**Stop switch** When stop switch is pressed during machine running.	Possible to re-start after reset.	Step screen
E052		**Thread breakage detection error** When 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.	Turn OFF the power.	
E063		**Head discrimination error** Head discrimination and the kind of control box are different.	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”.	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”.	Possible to re-start after reset.	Data input screen

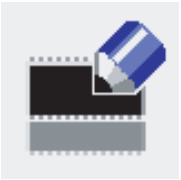
Error code	Pict	Description of error	How to recover	Place of recovery
E302		**Confirmation of tilt of machine head** When tilt of machine head sensor is OFF.	Possible to re-start after reset.	Previous screen
E303		**Phase Z detection error** Detection of the upper dead point is impossible for the sewing machine.	Turn OFF the power.	
E305		**Thread trimmer knife position error** The thread trimmer knife is not in the regular position.	Turn OFF the power.	Data input screen
E306		**Thread clamp position error** Thread clamp unit is not in the regular position.	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.	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.	Turn OFF the power	
E431		**Outer presser is rising.**	Possible to re-start after reset.	Previous screen
E432		**Proper operation has not been performed.**	Possible to re-start after reset.	Previous screen
E433		**Number of stitches has exceeded the limit.**	Possible to re-start after reset.	Previous screen
E434		**Hadware error has occurred.**	Possible to re-start after reset.	Previous screen
E437		**Function cannot be selected.**	Possible to re-start after reset.	Previous screen

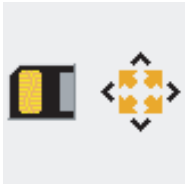
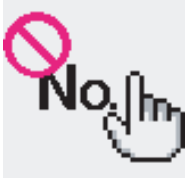
Error code	Pict	Description of error	How to recover	Place of recovery
E438		**Execution cannot be performed.**	Possible to re-start after reset.	Previous screen
E441		**Back-up data does not exist.**	Possible to re-start after reset.	Previous screen
E703		**Panel is connected to the machine other than supposed. (Machine type error)** When machine type code of system is improper in case of initial communication.	Possible to rewrite program after pressing down communication switch.	Commnunication screen
E704		**Inconsistency of system version** When version of system software is improper in case of initial communication.	Possible to rewrite program down communication switch.	Commnunication screen
E730		**Main shaft motor encoder defectiveness or phase-out** When encoder of sewing machine motor is abnormal.	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.	Turn OFF the power.	
E733		**Reverse rotation of main shaft motor** When sewing machine motor rotates in reverse direction.	Turn OFF the power.	
E802		**Power instantaneous cut detection** When input power is instantaneously OFF.	Turn OFF the power.	
E811		**Over voltage** When input power is more than the specified value.	Turn OFF the power.	
E813		**Low voltage** When input voltage is 150V or less.	Turn OFF the power.	
E901		**Abnormality of main shaft motor IPM** When IPM of servo control p.c.b. is abnormal.	Turn OFF the power.	

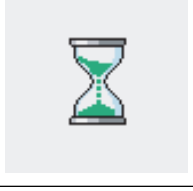
Error code	Pict	Description of error	How to recover	Place of recovery
E903		**Abnormality of stepping motor power** When stepping motor power of servo control p.c.b. fluctuates ±15% or more.	Turn OFF the power.	
E904		**Abnormality of solenoid power** When solenoid power of servo control p.c.b. fluctuates ±15% or more.	Turn OFF the power.	
E905		**Heat sink temperature for SERVO CONTROL p.c.b. fabnormality** Turn ON the power again after taking overheat time of SERVO CONTROL p.c.b.	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.	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.	Turn OFF the power.	
E910		**Presser motor origin retrieval error** When origin sensor signal is not inputted at the time of origin retrieval motion.	Turn OFF the power.	
E913		**Thread clamp origin retrieval error** When origin sensor signal is not inputted at the time of origin retrieval motion.	Turn OFF the power.	
E914		**Feed defective error** Timing lag between feed and main shaft occurs.	Turn OFF the power.	
E915		**Abnormality of communication between operation panel and main CPU** When abnormality occurs in data communication.	Turn OFF the power.	
E916		**Abnormality of communication between main CPU and main shaft CPU** When abnormality occurs in data communication.	Turn OFF the power.	
E917		**Failure of communication between operation panel and personal computer** When abnormality occurs in data communication.	Possible to re-start after reset.	

Error code	Pict	Description of error	How to recover	Place of recovery
E918		**MAIN board overheat** Overheat of MAIN board Turn ON the power again after taking time.	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.	Turn OFF the power.	
E943		**MAIN EEP-ROM trouble** When data writing to EEP-ROM cannot be performed.	Turn OFF the power.	
E946		**Defective EEP-ROM writing of HEAD RELAY board** When data writing to EEP-ROM cannot be performed.	Turn OFF the power.	
E948		**F-ROM abnormality** When erase or writing of program cannot be performed at the time of downloading program.	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 smart 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 smart media/M3 data/ sewingstandard 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 smart 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 ?	**Delection confirmation of thread tension command** Delecting is performed. OK?
M538		Deleting is performed. OK ?	**Delection confirmation of intermediate presser increase/ decrease value** Delecting 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 smart 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 smart 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) Backlash of the X feed motor gear is maladjusted.		Adjust the position of X feed motor.
	2-3) Backlash of the Y feed motor gear is maladjusted.		Adjust the position of Y feed motor.
	2-4) Traveling torque in X direction or Y direction is excessive.	4-A) Pressure of the X-Y table is too high.	Adjust the pressure of the X-Y table.
		4-B) Height or horizontality is inadequate for the needle bar auxiliary cover.	Adjust the height or the horizontality of the needle bar auxiliary cover.
	2-5) Pressing pressure is too low. (Air specification)	5-A) Regulator is maladjusted.	Adjust the regulator.
		5-B) Supply air pressure is too low.	Adjust the supply air pressure.
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.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
6. The outer frame of the cloth presser cannot be lifted or lowered.	6-1) The thread trimmer cam screw is loose. (Motor specification only)		Decide the position of the thread trimmer cam screw and fix it.
	6-2) Presser pulse motor malfunction (motor specifications only)	2-A) The presser pulse motor is out of order.	Replace the presser pulse motor.
		2-B) Connection of presser pulse motor is improper.	Check the connector connections.
	6-3) Defective board	3-A) The board is out of order.	Replace the board.
		3-B) Connector connections are improper.	Check the connector connections.
	6-4) 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.
	6-5) Supply air pressure is too low. (Air specification only)		Adjust the supply air pressure.
	6-6) Inadequate adjustment of the regulator (air specifications only)		Adjust the regulator.
	6-7) Solenoid valve malfunction (air specifications only		Reolace the solenoid valve.
	6-8) Inadequate adjustment of the speed controller (air specifications only)		Adjust the speed controller.
7. The intermediate presser does not rise after sewing.	7-1) 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.
	7-2) Intermediate presser variable is maladjusted.		Adjust the intermediate presser variable.
	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.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
8. The intermediate presser does not work during sewing.	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.
	8-5) The intermediate presser stroke has decreased to 0mm.		Adjust the intermediate presser variable stroke.
9. Unusual sound is generated from the face section.	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.
	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.

Trouble	Cause (1)	Cause (2)	Check and corrective measures
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 registance 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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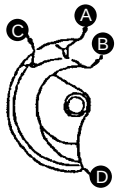
Trouble	Cause (1)	Cause (2)	Check and corrective measures
From the previous page			
	1-4) Material to be sewn is not properly stretched.		Remove the slack of the material to be sewn.
	1-5) Unstable needle thread clamp	5-A) Thread tends to be extended or sliding efficiency is worse.	Increase the needle thread clamp needle number to 3~4 stitches.
			Lower the speed of the first stitch. (600 ~ 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. Needle breakage	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°)
		6-A) Feed timing is too fast.	Change the feed timing by the use of the memory switch.
4. Needle thread breakage	4-1) Stratches on the inner hook 	1-A) Scratches on section Ⓐ (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 Ⓑ (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 Ⓒ (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 Ⓓ	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 Ⓐ of the shuttle is round. 	Replace the inner hook.
		2-C) Position of the shuttle is wrong.	Properly adjust the position od the shuttle.
		2-D) Needle thread tension is too low.	Properly adjust the needle thread tension.

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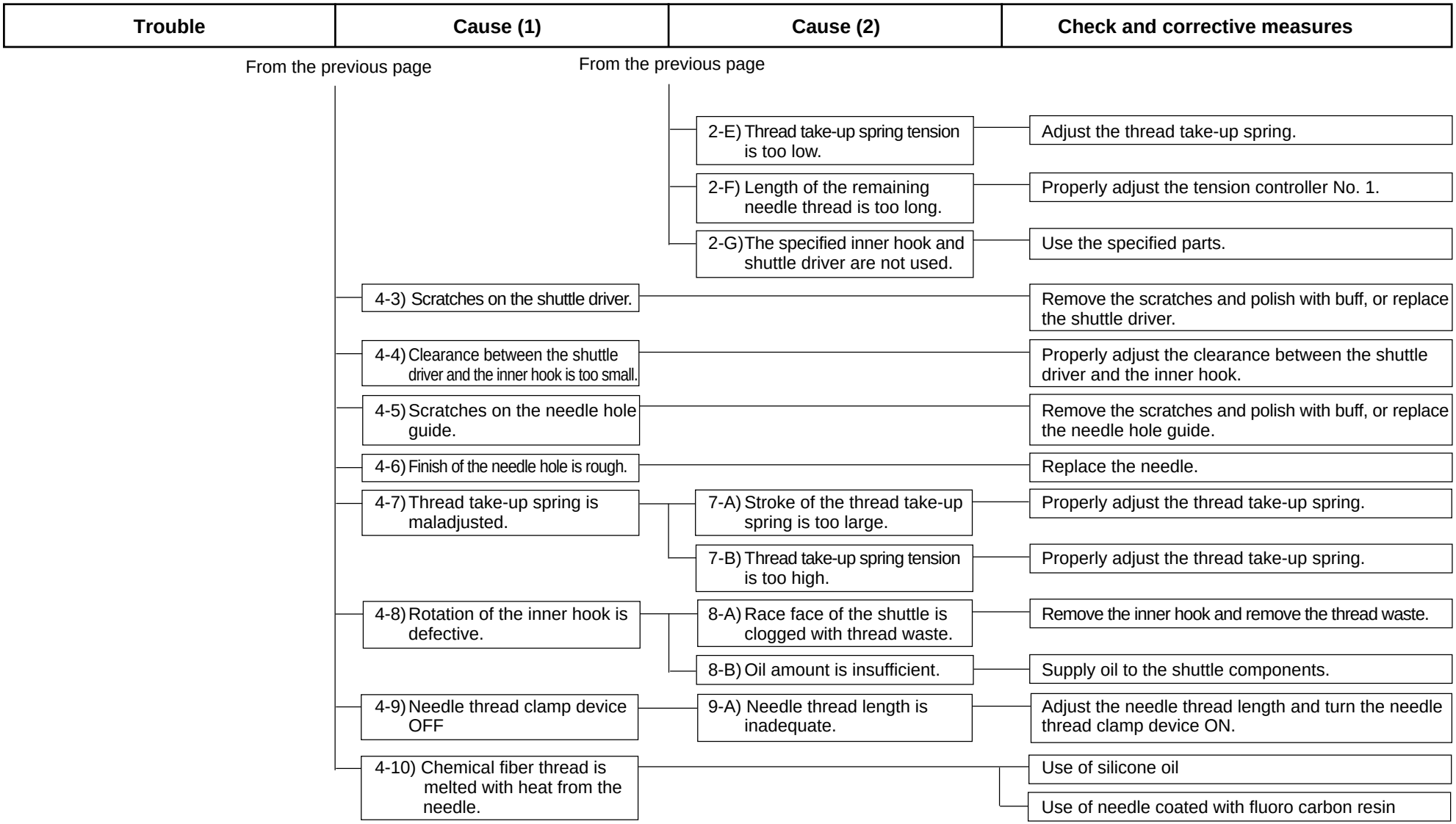
Trouble
Cause (1)
Cause (2)
Check and corrective measures
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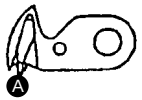
From the previous page
2-E) Thread take-up spring tension is too low.
Adjust the thread take-up spring.
2-F) Length of the remaining needle thread is too long.
Properly adjust the tension controller No. 1.
2-G) The specified inner hook and shuttle driver are not used.
Use the specified parts.
4-3) Scratches 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 Ⓐ 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 registance 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 ~ 36mm
			Increase the sewing length to more than 10mm.

(3) Electrical components (Refer to “13.-(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 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-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.
	1-2) Detection of a momentary interruption in the SDC board LED3 on SDC board: Flashing 9 times	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-400 : 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 1_01 and readjust the switch position.
		1-C) Touch panel fault	Replacement of the LCD assembly (40034529)
	2-2) CP-20: The Panel CPU does not accept the key.	2-A) The circuit is out of order.	Replace the PANEL board (40031471).
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 Smart 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.
			Check the pressure setup value of the air sensor (0.34MPa)
		1-B) Switch defective	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 E303 Upper shaft motor Phase Z sensor error LED3 on SDC board: Flashing 2 times	11-1) Phase Z signal (upper shaft motor) is not received.	1-A) The encoder cord is broken or the motor encoder circuit is out of order.	Confirm whether each signal is delivered to CN14 of the SDC board. CN14_9: Phase Z CN14_2: GND Replace the motor if there is no signal change as a result of manual turning.
		1-B) The detector circuit is out of order.	Replace the SDC board.
12. Error E305 Thread trimmer knife position error	12-1) 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.
	12-2) 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
13. Error E306 Needle thread clamp position error	13-1) 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.
	13-2) 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.
14. Error E730 Main shaft motor encoder error A LED3 on SDC board: Flashing 3 times	14-1) 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.
15. Error E731 Main shaft motor encoder error B LED3 on SDC board: Flashing 4 times	15-1) 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.
16. Error E733 Main shaft motor reverse turn error LED3 on SDC board: Flashing 7 times	16-1) 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.
17. Error E811 Overvoltage error LED3 on SDC board: Flashing 8 times	17-1) 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
18. Error E813 Low voltage error LED3 on SDC board: Flashing 6 times	18-1) 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.
19. Error E901 IPM Error LED3 on SDC board: Flashing 5 times	19-1) 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.
20. Error E903 Pulse motor power source error LED3 on SDC board: Flashing 11 times	20-1) 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.
21. Error E904 Abnormal solenoid power LED3 on SDC board: Flashing 12 times	21-1) 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.
22. Error E905 Thermal error in SDC board LED3 on SDC board: Flashing 13 times	22-1) 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.
	22-2) Temperature of main shaft IPM has exceeded 90°C.	2-A) Cooling is not effective.	Check for any clogging at the suction port or examine the conditions in the fan, etc.
		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.

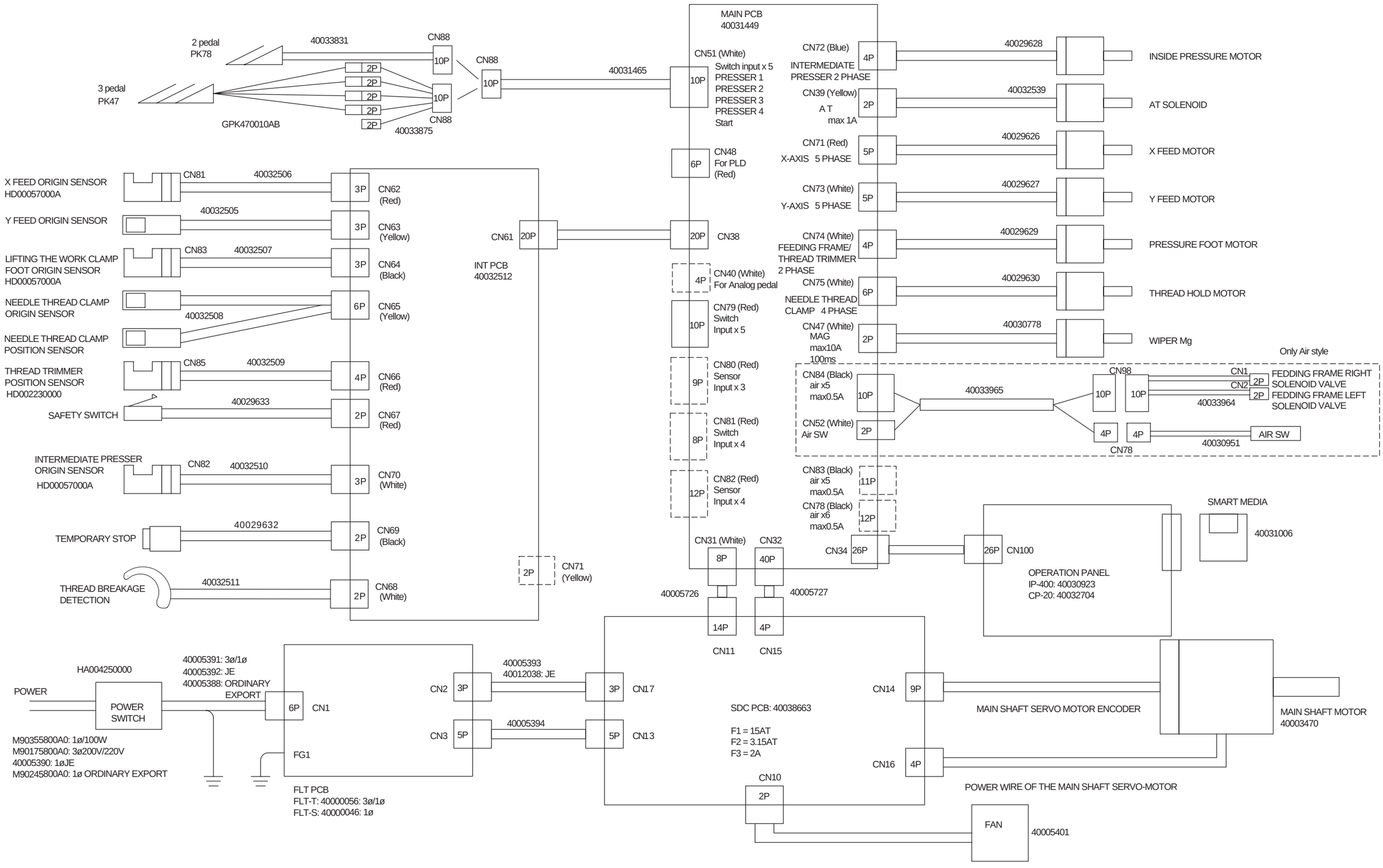
Trouble	Cause (1)	Cause (2)	Check and corrective measures
23. Error E907 X feed motor origin retrieval error	23-1) Irregular motor rotations	1-A) There are irregularities in the mechanism, such as overloading, etc.	Check the mechanism and look for the section that is particularly overloaded, that is 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 CN62 of INT board.
		2-C) Input circuit is out of order.	Replace the MAIN board.
24. Error E908 Y feed 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.	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.
25. Error E910 Presser motor origin retrival 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.	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
26. Error E913 Needle thread clamp origin retrieval error	26-1)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.
	26-2)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.
27. Error E914 Feed trouble error	27-1)Irregular main shaft motor rotations	1-A) Motor revolutions are unstable.	Check whether coupling for connection of main shaft and motor is loose.
28. Error E915 Communication error between the PANEL and MAIN boards LED1 on MAIN board: Flashing 1 times	28-1)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.
29. Error E916 Communication error between the SDC and MAIN boards LED3 on SDC board: Flashing 15 times	29-1)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 be set at OFF.
		1-C) Board defective	Replace the MAIN board or SDC board.
30. Error E918 MAIN board overheat	30-1)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.

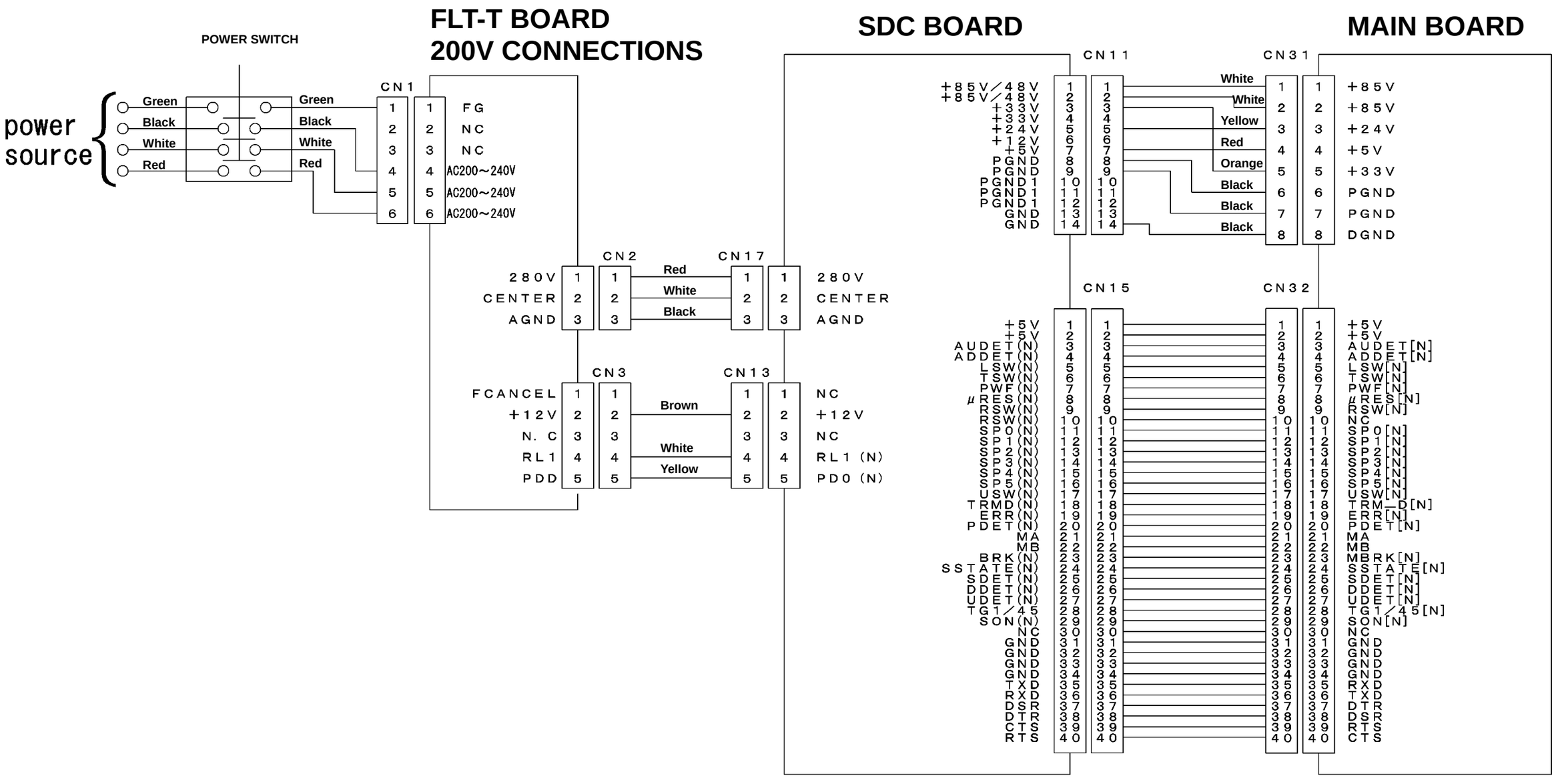
Trouble	Cause (1)	Cause (2)	Check and corrective measures
31. Error E925 Intermediate presser motor origin retrival error	31-1) Irregular motor rotations	1-A) There are irregularities in the mechanism, such as verloading, etc.	Check the mechanism and look for the section that is particularly overloaded, 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.
	31-2) 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.
32. Error E943 MAIN board EEP-ROM write-in trouble	32-1) MAIN board EEP-ROM failingin writing	1-A) Devices defective, soldering inadequate	Replace the MAIN board.
33. Error E946 INT board EER-ROM write-in trouble	33-1) 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.
34. Error E948 MAIN board F-ROM write-in trouble	34-1) MAIN board F-ROM failing in writing	1-A) Devices defective, soldering inadequate	Replace the MAIN board.

14. Circuit diagrams

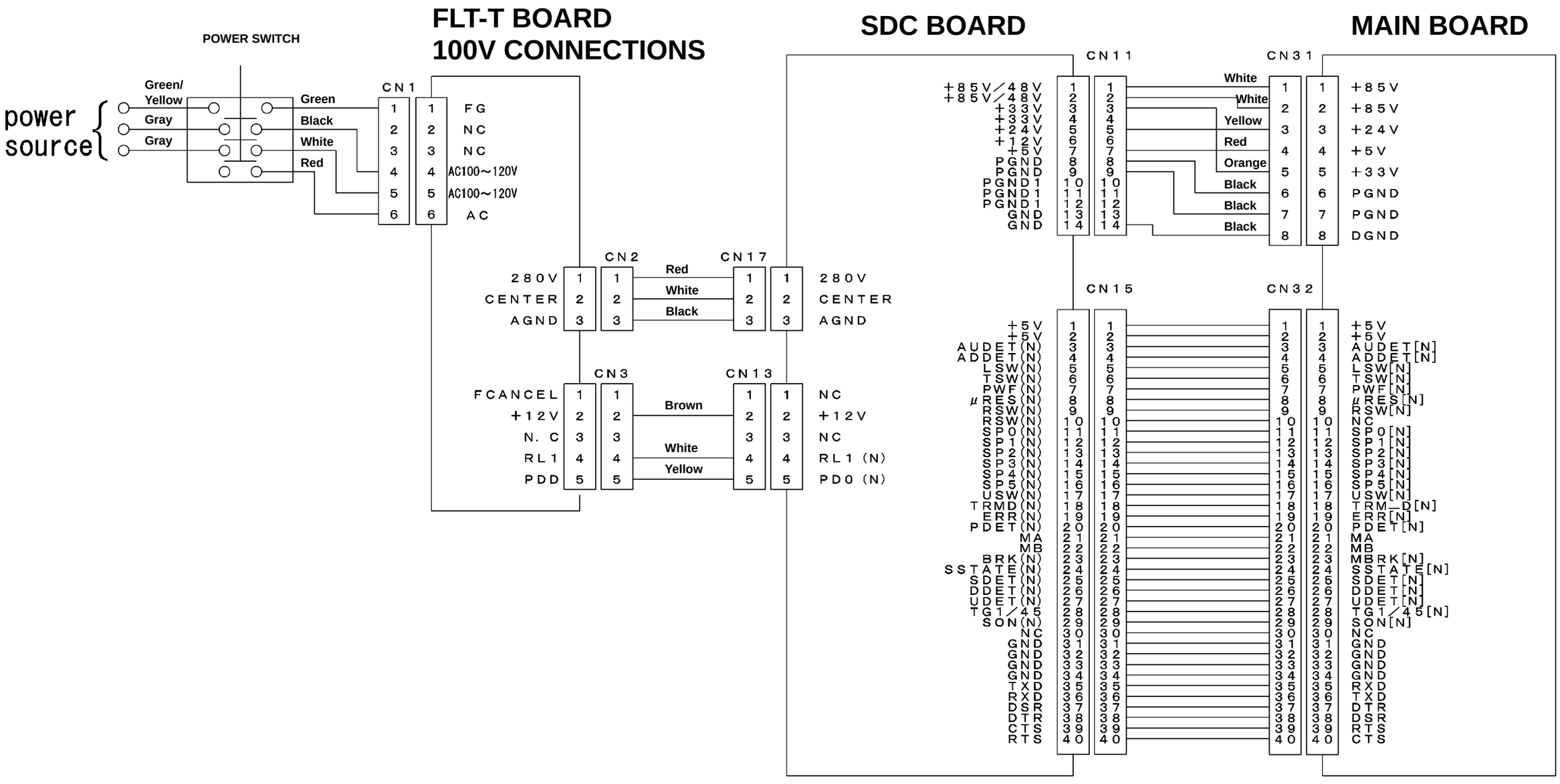
(1) Block diagram A



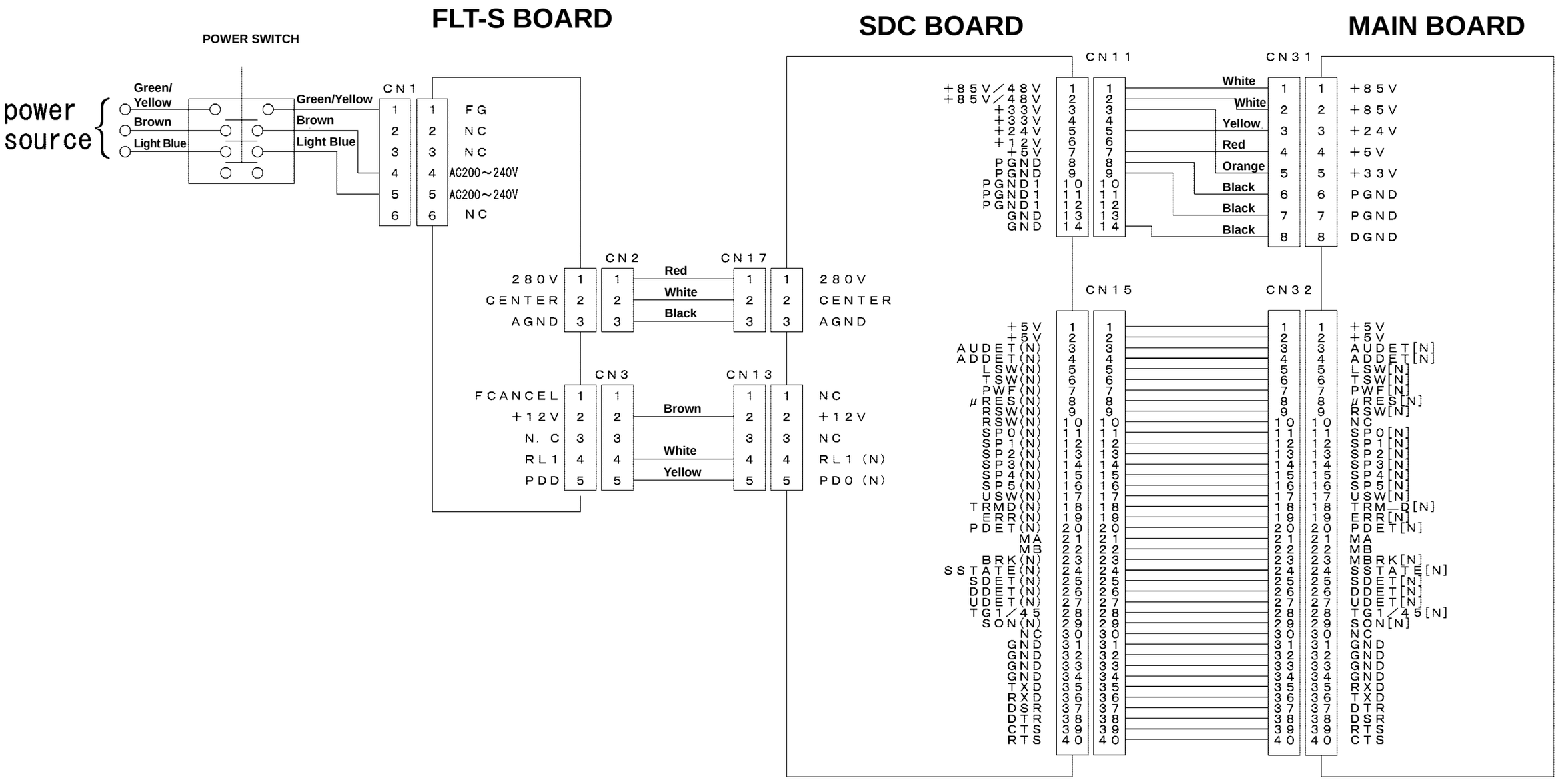
(2) Power supply circuit diagram A



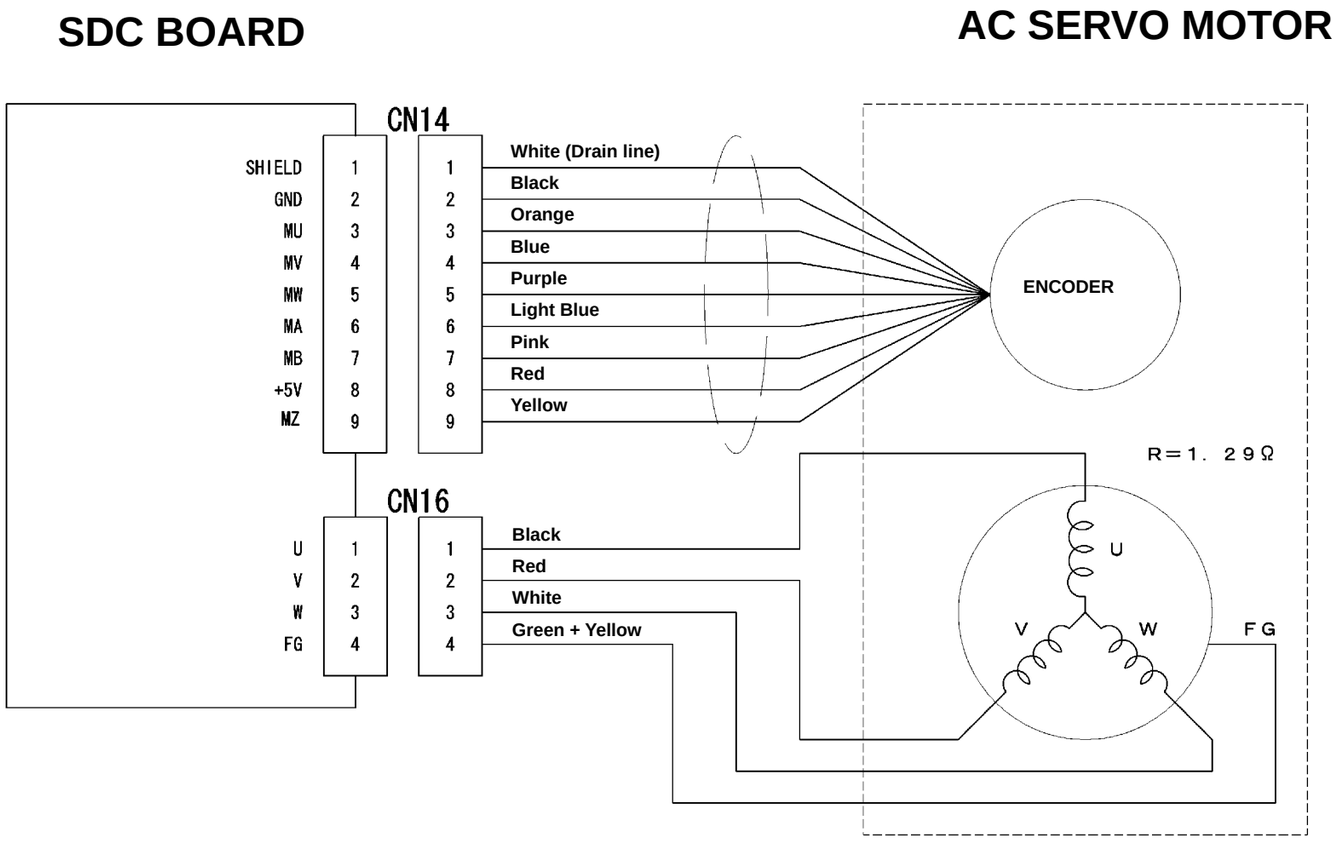
(3) Power supply circuit diagram B



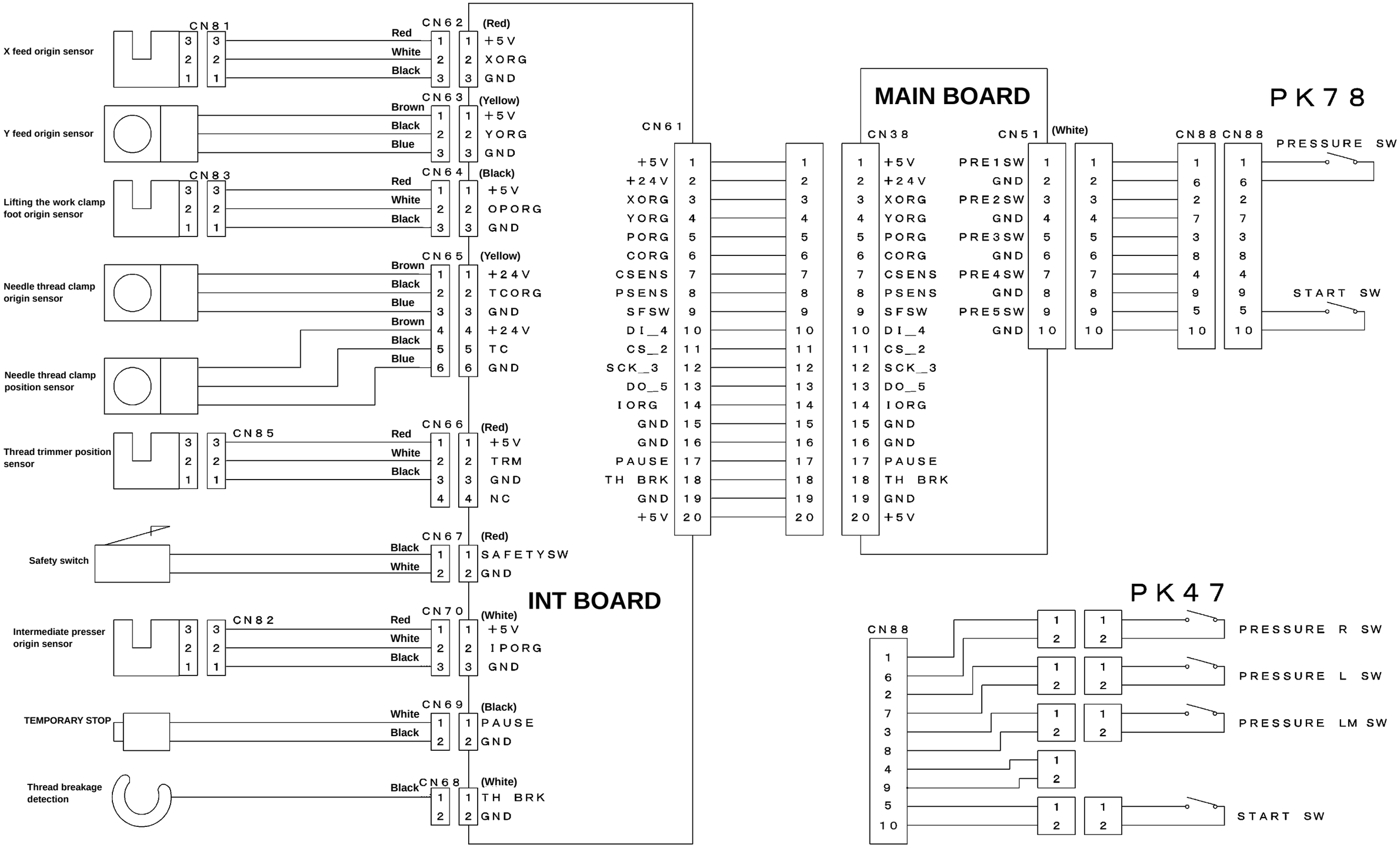
(4) Power supply circuit diagram C



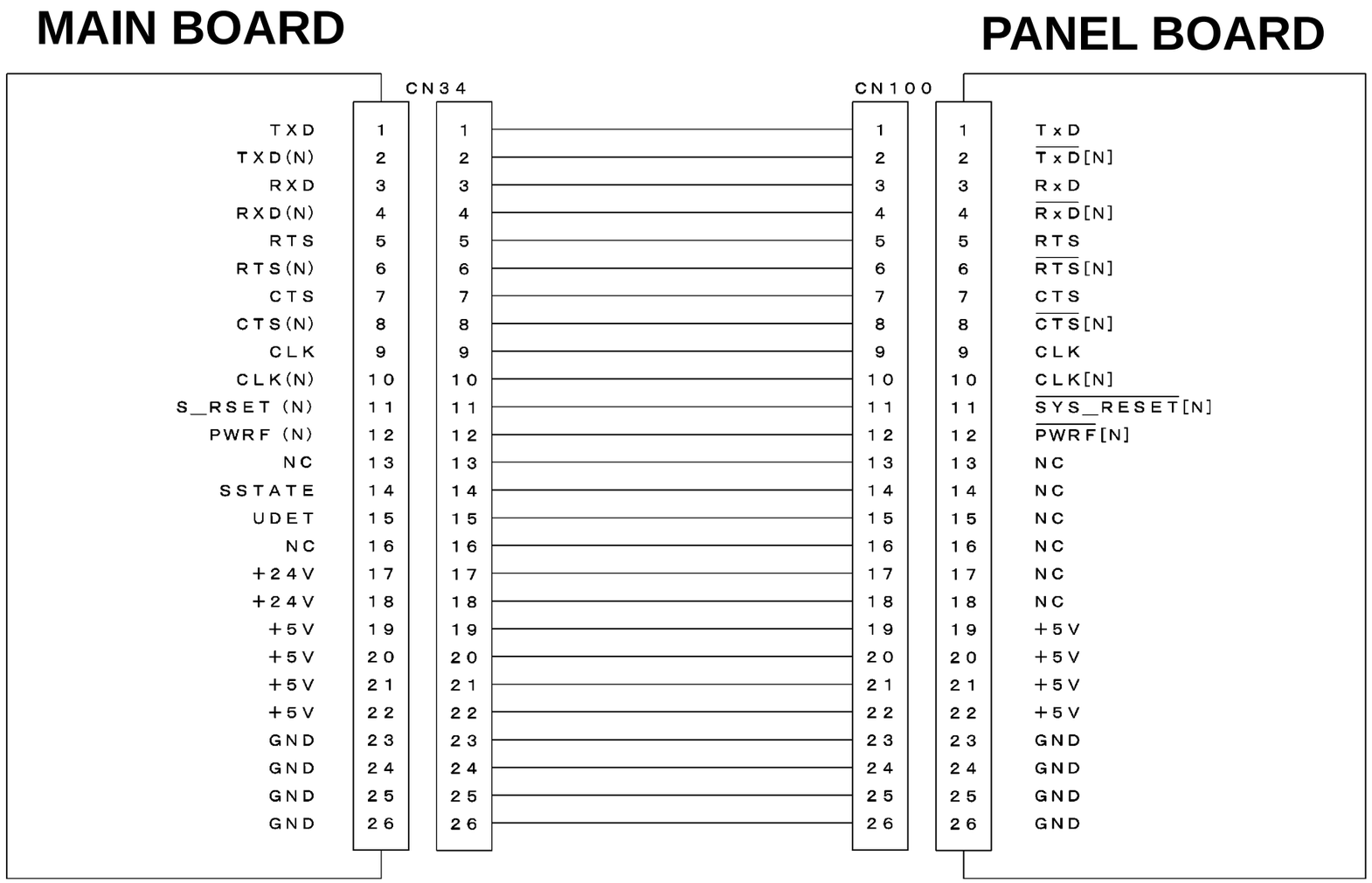
(5) Servo motor circuit diagram



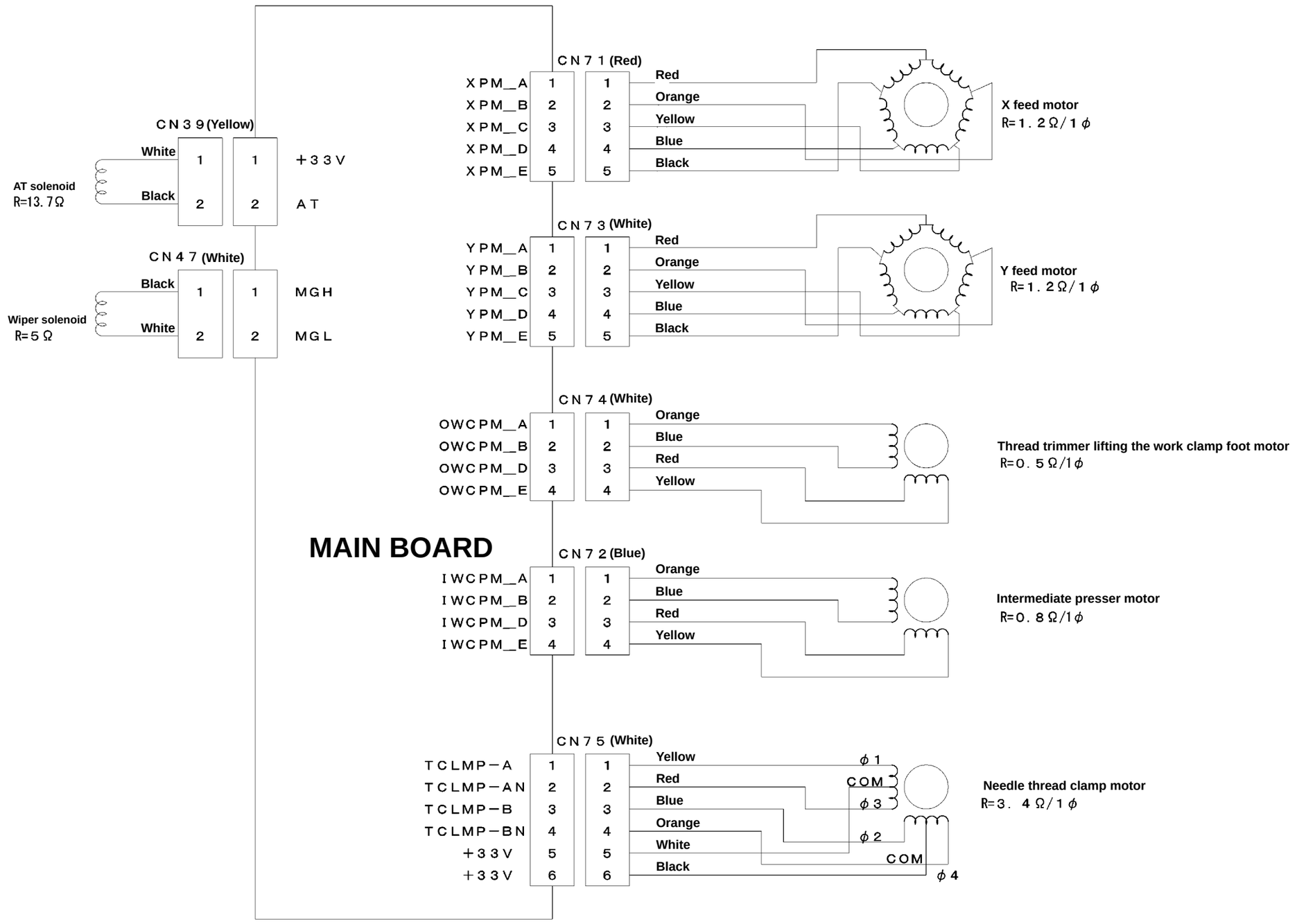
(6) Sensor-pedal circuit diagram



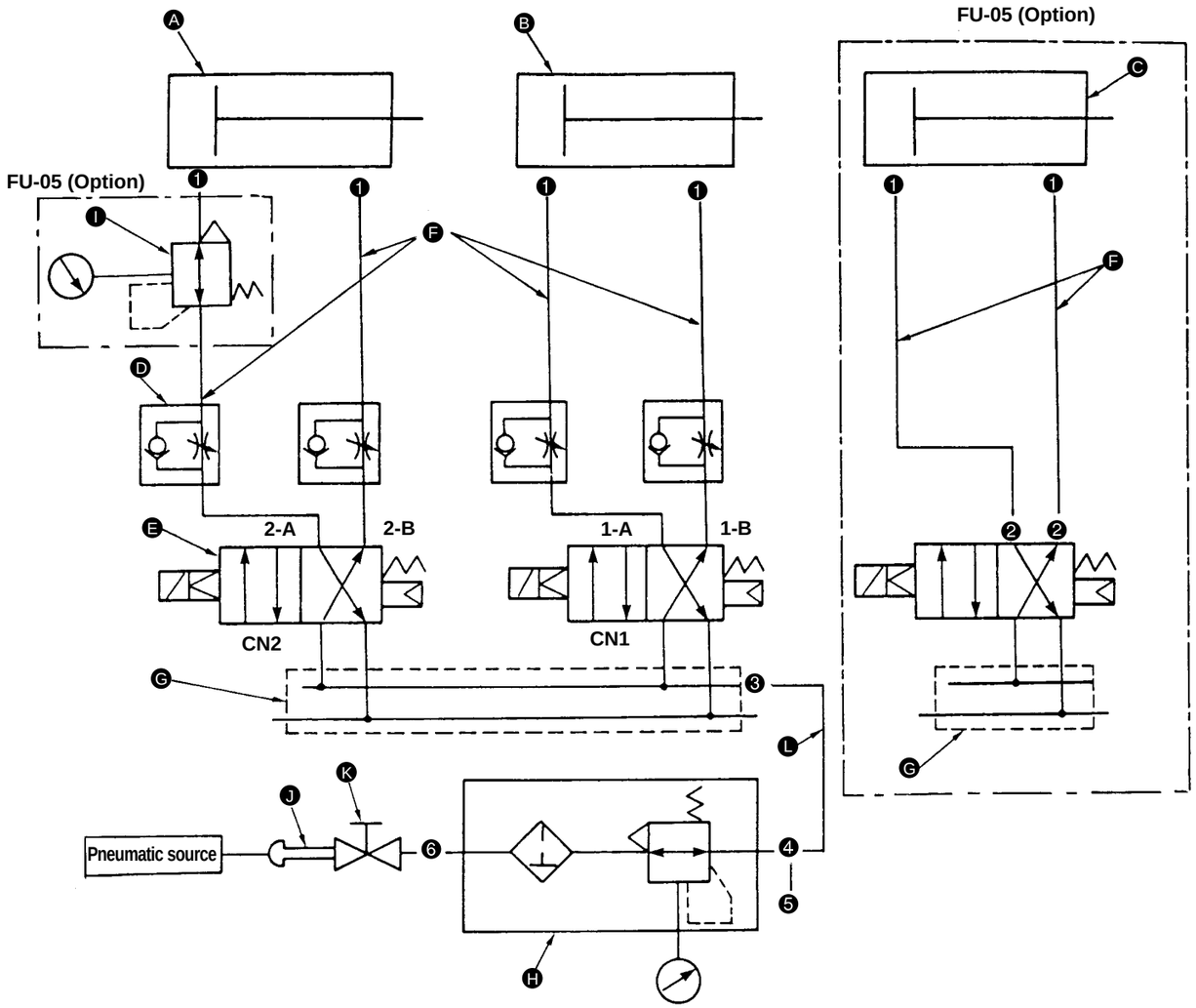
(7) MAIN•PANEL board circuit diagram



(8) Motor•solenoid circuit diagram



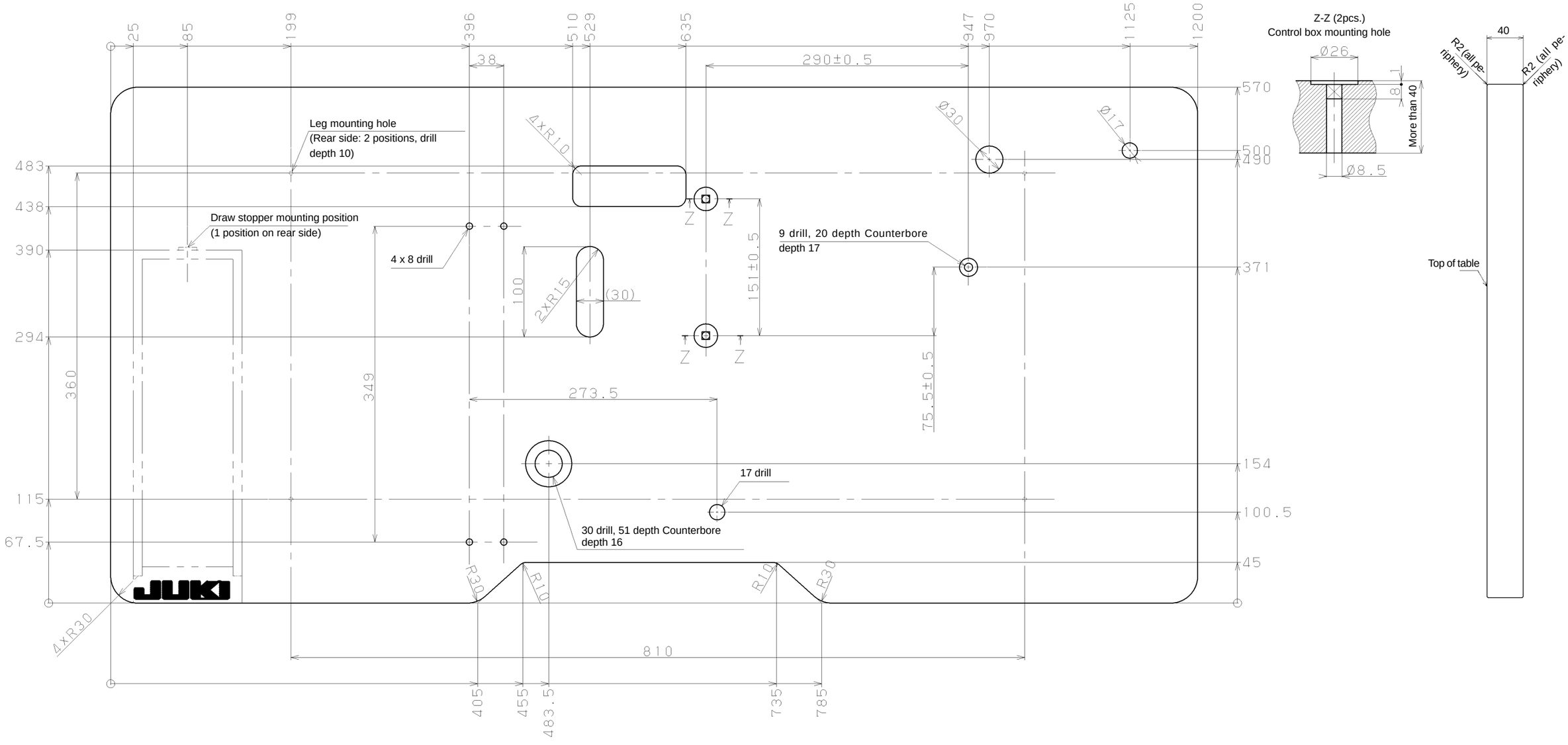
(9) Air system circuit diagram



Ⓐ	Feeding frame cylinder (left)
Ⓑ	Feeding frame cylinder (right)
Ⓒ	Inverting cylinder
Ⓓ	Speed controller
Ⓔ	Solenoid valve
Ⓕ	ø 4 Air tube
Ⓖ	Manifold
Ⓗ	Filter regulator
Ⓘ	Regulator
Ⓙ	One-touch joint plug One-touch joint socket
Ⓚ	Air cock
Ⓛ	ø 6 Air tube

❶	Hose elbow
❷	Hose nipple
❸	Elbow union
❹	T type tee
❺	Plug
❻	Barrel nipple

15. Drawing of the table



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The environmental management system to promote and conduct
①the technological and technical research, the development and design of the products in which the environmental impact is considered,
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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MARKETING & SALES H.Q.
8-2-1, KOKURYO-CHO,
CHOFU-SHI, TOKYO 182-8655, JAPAN
PHONE : (81)3-3480-2357 • 2358
FAX : (81)3-3430-4909 • 4914

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* **The description covered in this engineer's manual is subject to change for improvement of the commodity without notice.**

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