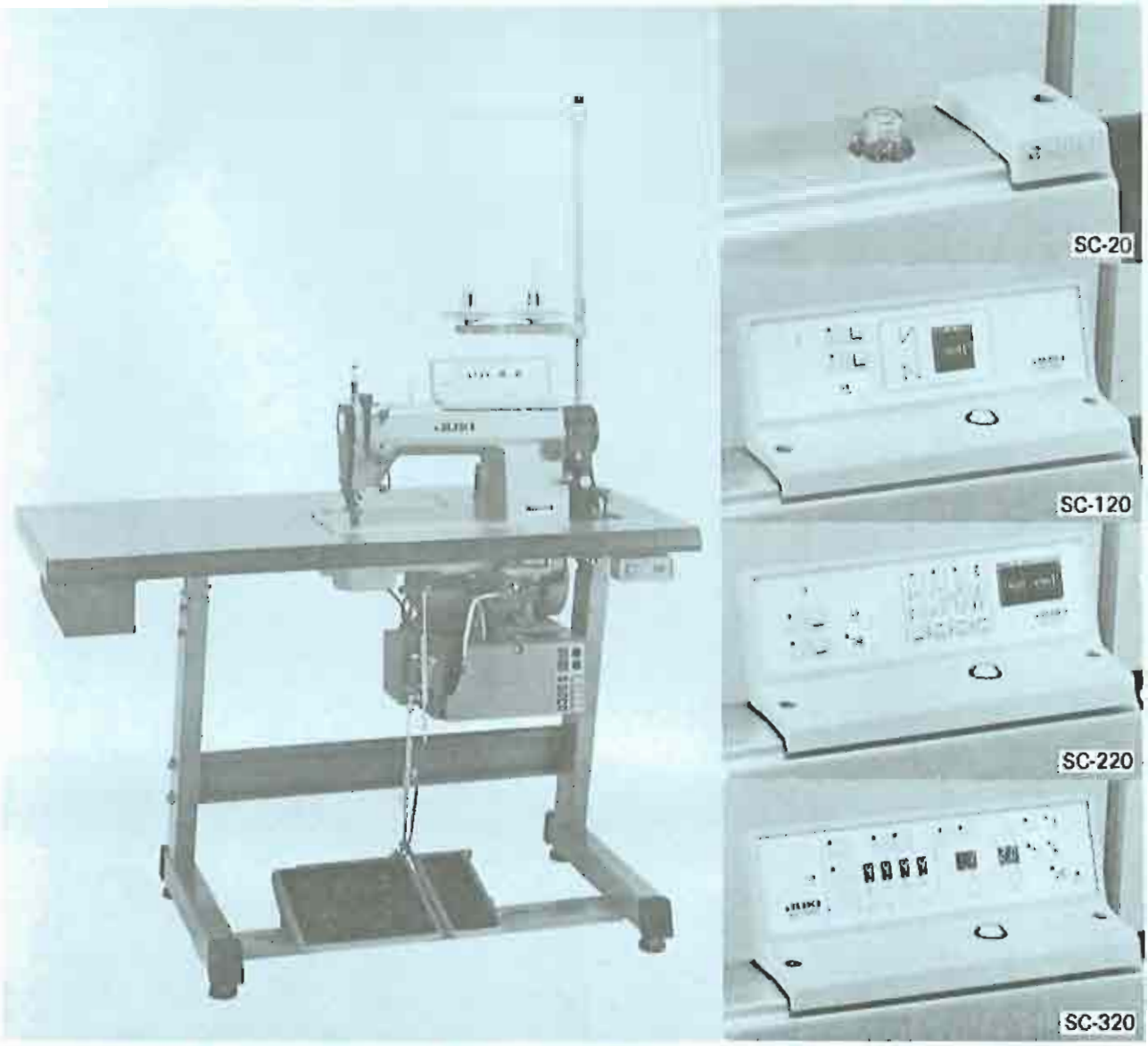
No. I-36
1987. 7

JUKI®

SC-20/SC-120
SC-220/SC-320

Sewing Machine Controller

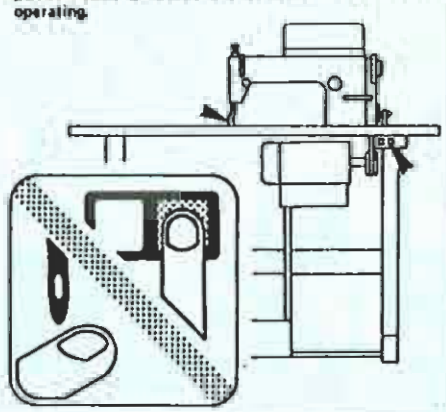
ENGINEER'S MANUAL



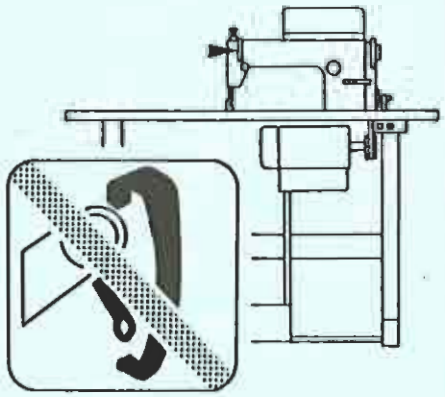
TOKYO JUKI INDUSTRIAL CO., LTD.
FOREIGN TRADE BUSINESS DIV.

OPERATION PRECAUTIONS

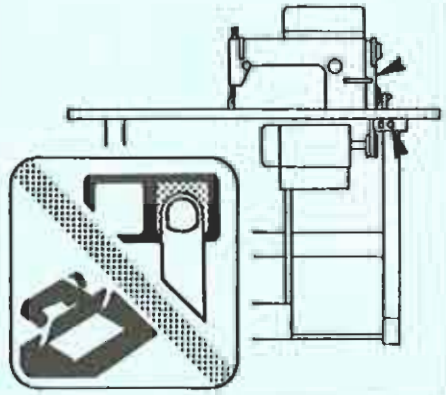
1. Keep your hands away from the needle when the power switch is turned ON or while the machine is operating.



2. Do not put your fingers into the thread take-up cover while the machine is operating.

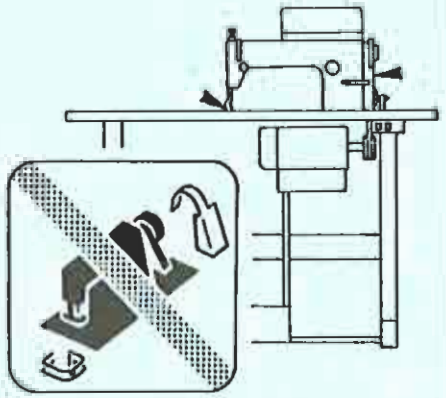


3. Be sure to turn the power switch OFF before tilting the machine head or removing the V belt.

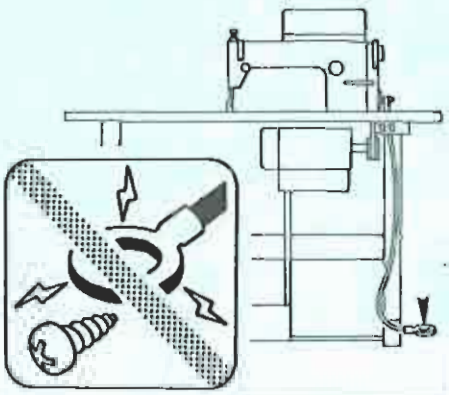


4. During operation, be careful not to allow your or any other person's head or hands to come close to the handwheel, V belt, bobbin winder or motor. Also, do not place anything close to them. Doing so may be dangerous.

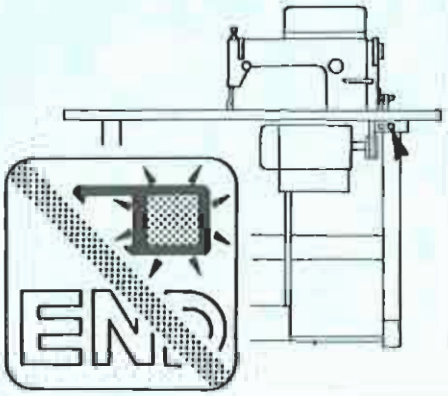
5. If your machine is provided with a belt cover, finger guard or any other protectors, do not operate your machine with any of them removed.



6. To achieve security, be sure that the power supply earth wire has been connected before operating the sewing machine.



7. No motor sound is heard when the sewing machine is not operating. So, do not forget to turn the power OFF at the end of work.



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1. GENERAL

1-1. Features

1) Use of an AC servomotor provides the following major advantages:

(1) No noise or vibration while the machine is at rest.

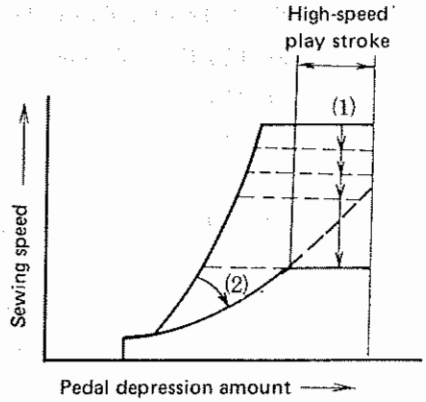
(2) The power consumption is 40% to 60% compared with the conventional power consumption.

(3) The motor weight has been almost halved, permitting easier layout change.

(4) The absence of a clutch (no brake in case of N company's motor) makes the unit virtually maintenance-free. (H company's brake is good for more than 10 years under normal operation.) Unlike the DC servomotor, there is no brush.

2) Pedal operation features

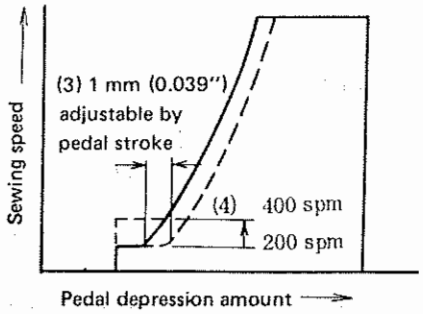
(1) You can set the maximum sewing speed in 400 s.p.m. steps with fingertip control according to the type of operation and your level of proficiency. (In the conventional unit, the motor pulley had to be changed to alter the maximum sewing speed.) Further, you can get the same speed at any time.



(2) The conventional speed limit knob is also provided. So, by combining the knob with the function mentioned in (1) above, high-speed play stroke can be provided. This eliminates the need for large pedaling force to maintain high speed, significantly reducing operator foot fatigue.

(3) The speed acceleration starting point can be adjusted about 1 mm (0.039") by pedal stroke to suit with each operator.

(4) In addition to the thread trimming speed adjustment, the minimum speed for depressing the front part of the pedal can be changed (from 200 s.p.m. to 400 s.p.m.).



3) Reverse feed stitching features

(1) As in the conventional model, you can select either the mode in which priority is given to pedaling for the starting reverse feed stitching or the mode in which the machine performs nonstop reverse feed stitching at a preset speed.

(2) The reverse feed stitching speed has been increased from 1,700 s.p.m. to 1,900 s.p.m. (about 12% increase). Furthermore, the speed can be adjusted from 1,000 s.p.m. to 3,500 s.p.m., using the variable resistor.

(3) The speed control circuitry has been improved to prevent overrun or 1-stitch error when the reverse feed stitching speed is changed.

4) The soft start speed has been increased.

The soft start speed for assuring properly interlaced threads of a starting stitch has been increased from 200 s.p.m. to 800 s.p.m.

The soft start speed is now adjustable within a range of 200 s.p.m. to 2,000 s.p.m., so you do not have to drop the speed more than necessary.

5) **Enhanced series with easy upgrading**
The controller comes in the SC-20, SC-120, SC-220 and SC-320 series, and you can easily upgrade them simply by replacing their control panels.

6) **A manual count-down capability has been added.**
As an additional capability, the manual count-down capability has been added to the one-touch type reverse feed switch to provide the control based of a preset number of stitches.

	Description	Applications
Count back	When the one-touch type reverse feed switch is pressed, the preset number of stitches is counted down.	Sewing pleats
Count back + Thread trim	When the one-touch type reverse feed switch is pressed, the preset number of stitches is counted down, and threads are trimmed.	Replaces the reverse feed stitching at a seam end. (This feature is especially useful in a sewing machine for standing work because the need for operating the thread trimmer switch is eliminated.)

7) **Even if a material overlap at sewing start or end is thick, the needle will not be caught in the thick overlap.**
(After thread trimming, you can turn the handwheel in the reverse direction to bring the needle bar up to its highest position.)

8) **A connector for standing work has been provided as a standard item.**

9) **A terminal for connection to a sewing control system has been provided.**

10) **The automatic presser foot lifting capability can be added simply by adding the AK auto-lifter and a transistor circuit board.**

11) **The control panel is very easy to operate and the slant panel surface makes it easier to see indication on the panel.**

12) **To ensure easier operation of the control panel, each key has been assigned to only one function.**

13) **You can set the lifting duration of the Auto-lifter after thread trimming for 60 sec. or unlimited time.**
(For a sewing machine for standing work, it is advisable to set the lifting duration for unlimited time.)

14) **The output transistor has been designed to be a unit circuit board to make it a common part. If any trouble should occur, the minimum function is assured.**
(Example : If the thread trimmer transistor fails, the wiper transistor will work to permit thread trimming and reverse feed stitching.)

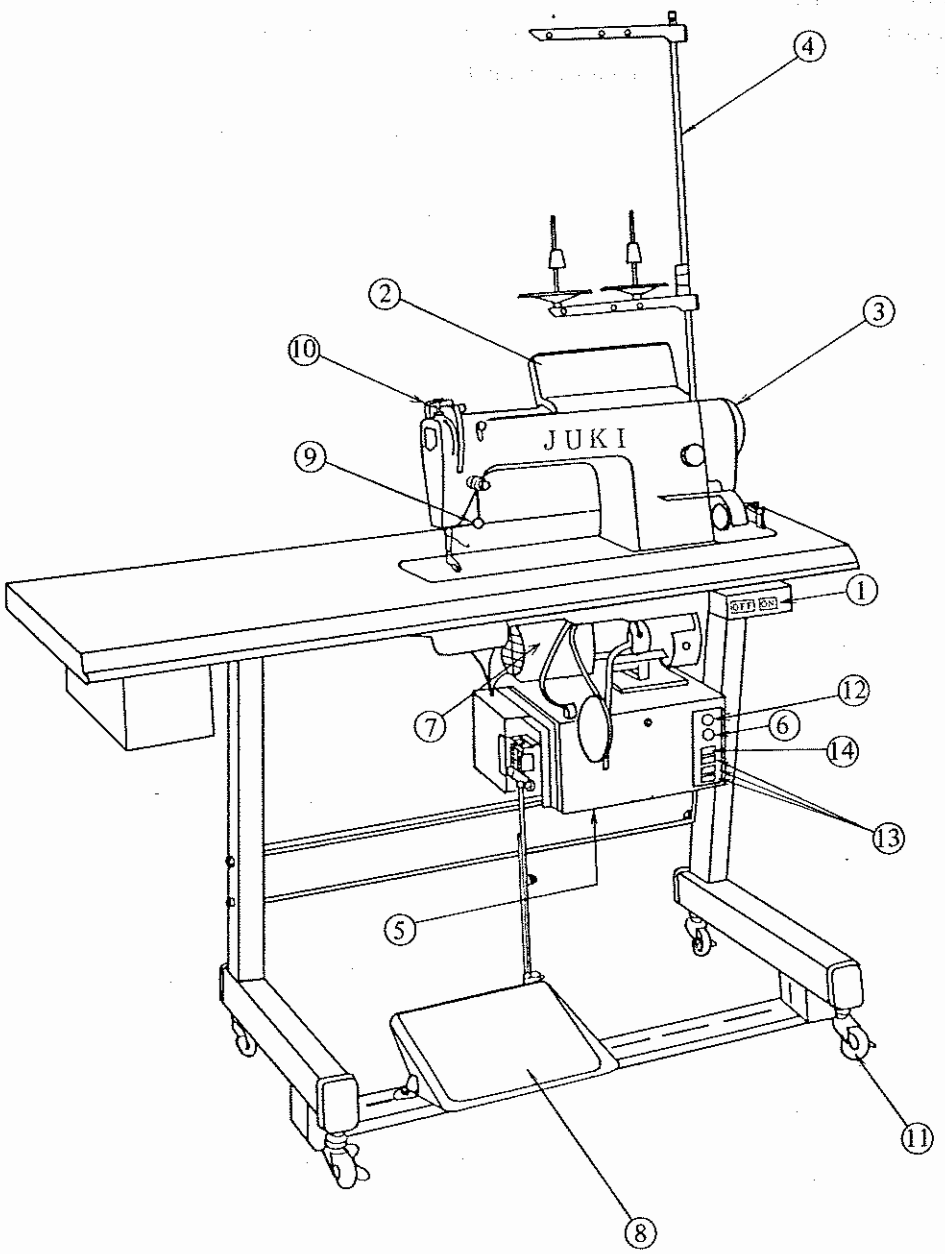
15) **The trouble checking feature for the output system (output monitor LED) has been added to the conventional input system. This enables you to quickly and easily identify defective parts.**

16) **Reliability**
The machine uses only the components which have passed our reliability test conducted on each discrete component.

17) **We are planning to provide the following options in the future:**
(1) Sewing control counter (of low cost)
(2) Cloth edge stop device

2. OPERATION

2-1. Name of part



① Power switch
② Control box
③ Synchronizer
④ L-shaped thread stand
⑤ PSC box
⑥ Max. speed control knob
⑦ Motor
⑧ Pedal
⑨ One-touch type reverse feed switch
⑩ Wiper
⑪ Stand levelling screw or caster
⑫ 400 s.p.m.-step speed control knob
⑬ Connector for standing operation
⑭ Connector for production control system

① Power switch
Power switch for the motor, PSC and control box.

② Control box
Used to make settings for automatic reverse feed stitching, the number of stitches for pattern sewing or other sewing conditions.

③ Synchronizer
Incorporated in the machine pulley, the synchronizer detects the needle position (up or down) and the sewing speed, then sends a resultant input signal to the main circuit board in the PSC box.

④ L-shaped thread stand

⑤ PSC box
Comprises a circuitry to control the sewing machine and motor, an output circuitry to operate the elements (thread trimming solenoid, reverse feed solenoid, etc.), a pedal sensor to detect pedal position, and a power circuitry to actuate the elements.

⑥ Max. speed control knob
Allows analog adjustment of the maximum sewing speed without changing the motor pulley.

⑦ Motor
Operates the machine at high speed ↔ medium speed ↔ low speed in response to a signal received from the PSC box. (An H company's motor is provided with a brake.)

⑧ Pedal
The front and back parts of the pedal are depressed to control the sewing speed and to actuate the thread trimmer, presser foot lifter (only for a version with AK-31), etc.

⑨ One-touch type reverse feed switch
Used by hand to perform reverse feed stitching.

⑩ Wiper
Wipes the needle thread off the material after thread trimming in response to a wiper signal received from the PSC box.

⑪ Stand levelling screw (or caster)
Used to perform adjustment so that the stand rests flatly on the floor to minimize vibration during operation.

⑫ 400 s.p.m.-step speed control knob
This switch has 16 steps from 1 to 16 in order to digitally set the maximum speed in 400 s.p.m. steps. The maximum speed will be 4,000 s.p.m. when the switch is set to 10. The maximum speed will be 4,000 s.p.m. even if the switch is set for 11 to 16.

⑬ Connector for standing operation
Used for a sewing machine designed for standing operation.

⑭ Connector for production control system
Used to connect the machine to a production control system.

2-2. Test Run

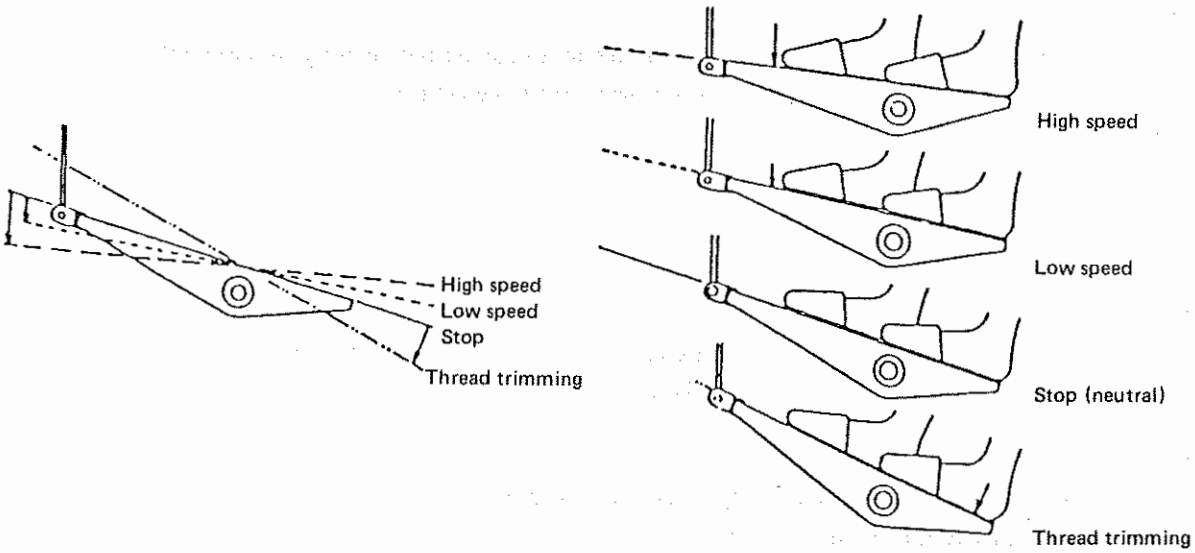
1) Operation when the power switch is turned ON

When the power switch is turned ON, if the needle is not in its upper stop position, the machine rotates until its needle reaches the upper stop position, and then stops with its needle in that position.

If the needle is already in its upper stop position when the power switch is turned ON, the sewing machine stays stationary.

2) Pedal operation

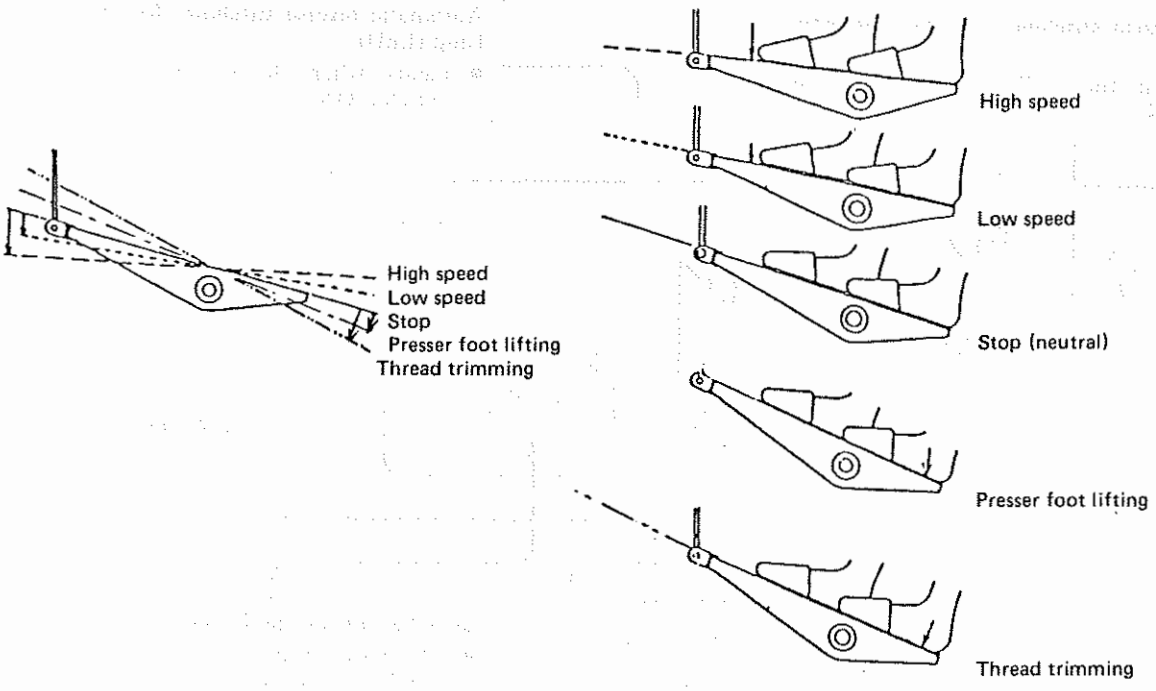
(1) The pedal is operates in the following four steps. (except for a version with AK-31)



- ○ The sewing machine runs at low speed when you depress the front part of the pedal.
- ○ The sewing speed changes from low to high when the front part of the pedal is further depressed. (However, if the automatic reverse feed stitching switch has been set, the machine will not run at high speed until it completes reverse feed stitching.)
- ○ When the pedal is returned to the neutral position (stop position), the machine will stop with needle down.
- ○ When the back part of the pedal is depressed, the thread trimmer is actuated and the needle goes up and stops in its upper position.
  (When the wiper switch has been set to ON, the wiper is actuated.)

(2) In case of a version with AK-31

The pedal is operated in the following five steps:

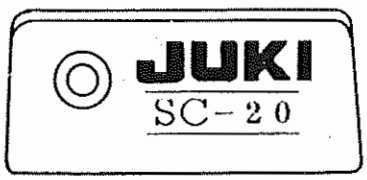


- The sewing machine starts at low speed when the front part of the pedal is lightly depressed.
- The sewing speed changes from low to high when the front part of the pedal is further depressed. (However, if the automatic reverse feed stitching switch has been set, the sewing speed will not change to high until reverse feed stitching is completed.)
- When the pedal is returned to the neutral (stop) position, the machine stops with its needle down.
- When the back part of the pedal is lightly depressed, the presser foot will go up.
- When the back part of the pedal is further depressed, the presser foot comes down, thread trimmer is actuated, and the machine stops with its needle up. (If the wiper switch has been set to ON, the wiper is actuated.)
- Between the low and high sewing speed positions, the machine runs at a speed corresponding to the pedal depression amount. (The speed is infinitely variable.)
- The proper thread trimming action will not be disturbed even if the pedal is returned to the neutral position immediately after the machine starts thread trimming. At this time, the thread trimmer properly operates even if the front part of the pedal is depressed, however, the safety circuitry is put in operation so that the machine will not run after thread trimming is completed. Therefore, the pedal must be returned to the neutral position once.

2-3. SC-20 Power Indicator Box

1) Power indicator LED

- Lights up when the power switch is turned ON.
- This light stays ON for a while after the power is turned OFF. It is dangerous to carry out maintenance or adjustment with the PSC box cover open. Be sure that the LED is OFF before starting maintenance such as part replacement.

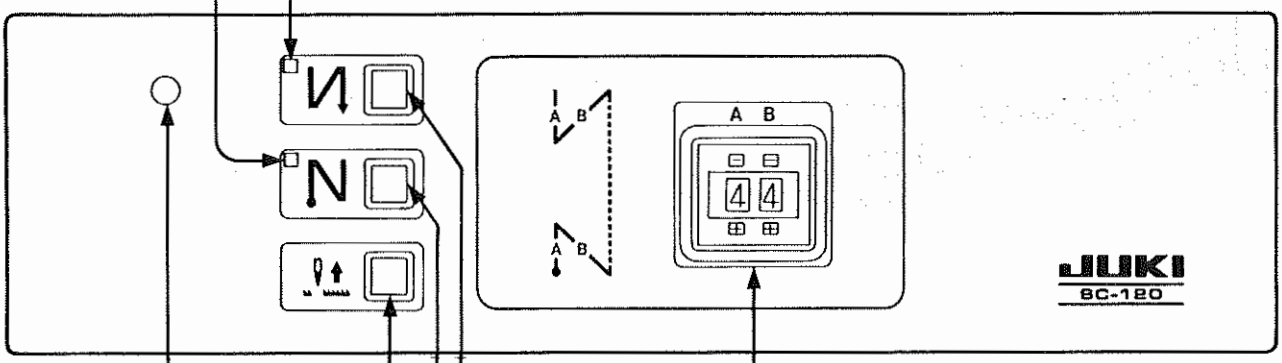


2-4. SC 120 Control panel

1) Control panel

Automatic reverse stitching (for end) indicator lamp (LED)
- Lights when the ending reverse stitching switch is ON.

Automatic reverse stitching (for start) indicator lamp (LED)
- Lights when the starting reverse stitching switch is ON.



Switches for setting the number of stitches
- These are pushbutton switches for setting the numbers of stitches for steps A and B. The setting range is from 0 to 9.
  ⊞ . . . .Increases the number of stitches
  ⊟ . . . .Decreases the number of stitches

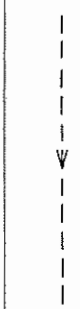
Power indicator lamp (LED)
- Lights up when the power switch is turned ON.
- Stays ON for a while immediately after the power switch is turned OFF.
  It is dangerous to perform any maintenance work with the PSC box cover open.
  Be sure that the lamp is OFF before performing maintenance work such as parts replacement.

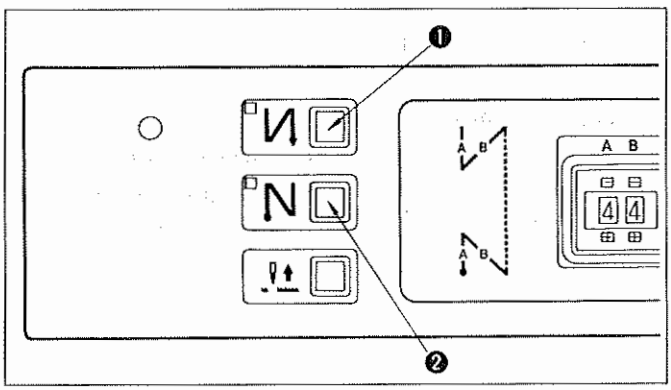
Automatic reverse stitching (for start) switch
- Used to turn ON or OFF automatic reverse stitching at sewing start.
- Each time this switch is pressed, it alternately turns ON or OFF. (This switch is rendered invalid when the number of stitches for step B has been set to "0".)

Switch for raising the needle.
- If this switch is turned ON when the machine stops with its needle down, the needle goes up and stops in its upper position.
- By depressing the back part of the pedal, the thread trimmer may be actuated.
  (Note that this switch will be invalid when the needle has been moved down by hand.)

Automatic reverse stitching (for end) switch
- Used to turn ON or OFF automatic reverse stitching at sewing end.
- Each time this switch is pressed, it alternately turns ON or OFF. (This switch is rendered invalid when the number of stitches for step B has been set to "0".)

2) How to use the automatic reverse stitching patterns

Automatic reverse switching (for start) switch ❶	OFF	ON	OFF	ON
Stitching pattern				
Automatic reverse stitching (for end) switch ❷	OFF	OFF	ON	ON



By combining ON and OFF conditions of automatic reverse stitching (for start) switch ❶ and automatic reverse stitching (for end) switch ❷ , four different stitching patterns are available.

2-5. SC-220 Control panel

1) Control panel

Automatic reverse stitching (for end) indicator lamp (LED)
- Lights when the ending reverse stitching switch is ON.
- When pattern 4 has been selected, this lamp does not light.

Automatic reverse stitching (for start) indicator lamp (LED)
- Lights when the starting reverse stitching switch is ON.
- When pattern 4 has been selected, this lamp does not light.

Power indicator lamp (LED)
- Lights when the power switch is turned ON.
- Stays ON for a while immediately after the power switch is turned OFF.
  It is dangerous to perform any maintenance work with the PSC box cover open.
  Be sure that the lamp is OFF before performing maintenance work such as parts replacement.

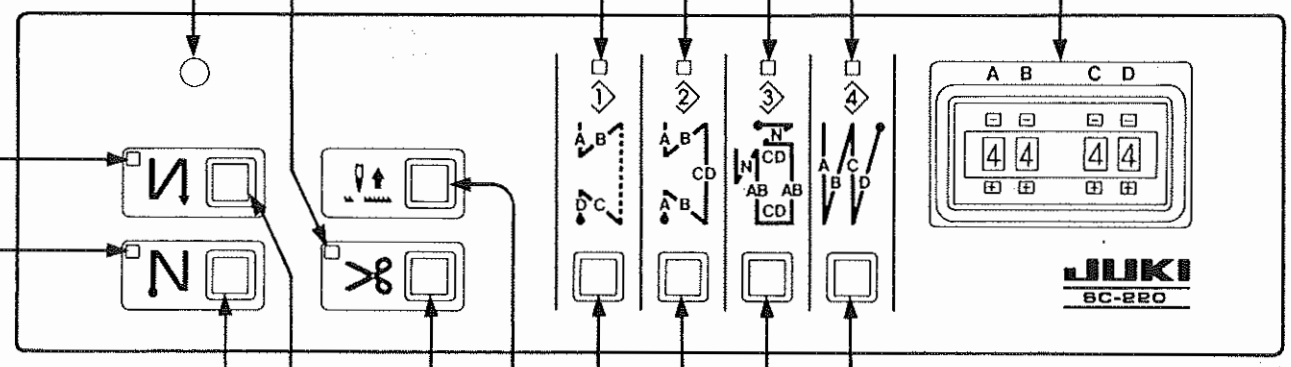
Automatic thread trimming indicator lamp (LED)
- Lights when the automatic thread trimming switch is ON.
- Lights whenever pattern 4 has been selected.
- When pattern 1 has been selected, this lamp does not light.

Pattern indicator lamps (LEDs)
- When a pattern (1 to 4) has been selected, the corresponding lamp lights.

Switches for setting the number of stitches
- These are pushbutton switches for setting the numbers of stitches for steps A to D. The setting range is from 0 to 9.
  (When pattern 2 or 3 has been selected, the number of stitches can be set for 0 to 99 for C and D together.)

  ⊞ ..... Increases the number of stitches

  ⊟ ..... Decreases the number of stitches



Pattern selector switches
- Used to select one of the four patterns displayed on the panel.

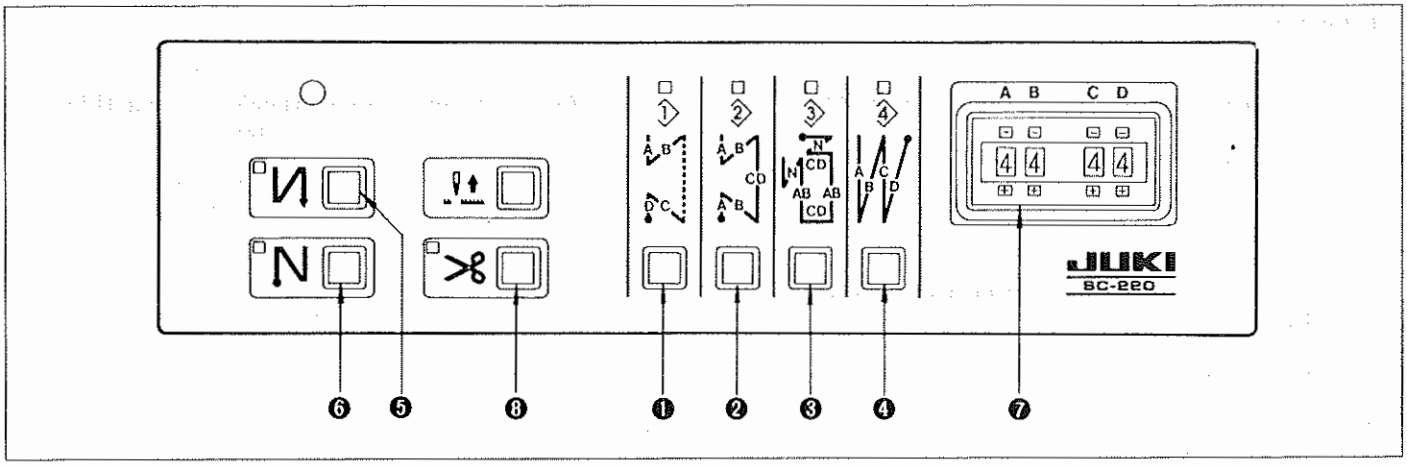
Automatic reverse stitching (for start) switch
- Used to turn ON or OFF automatic reverse stitching at sewing start.
- Each time this switch is pressed, it alternately turns ON or OFF. (This switch is valid for patterns 1, 2 and 3. For patterns 1 and 2, the switch is invalid for step B. For pattern 3, it is invalid when the rotary switch **"SW1. SNUMA~D"** in the PSC box has been set to **" 0 "**.)

Switch for raising the needle
- If this switch is turned ON when the machine stops with its needle down, the needle goes up and stops in its upper positions.
- By depressing the back part of the pedal, the thread trimmer may be actuated.
  (Note that this switch will be invalid when the needle has been moved down by hand.)

Automatic reverse stitching (for end) switch
- Used to turn ON or OFF automatic reverse stitching at sewing end.
- Each time this switch is pressed, it alternately turns ON or OFF. (This switch is valid for patterns 1, 2 and 3. The switch is invalid for step C in pattern 1 and step B in pattern 2. It is also invalid when the rotary switch **"SW1. SNUMA~D"** in the PSC box has been set to **" 0 "**.)

Automatic thread trimming switch
- This is a selector switch to cause the machine to automatically trim threads upon completion of the last sewing step even with the front part of the pedal depressed.
- For patterns 2 and 3, this switch turns ON or OFF alternately each time it is pressed.
- For pattern 4, the indicator is always ON regardless of the switch ON/OFF condition.

2) How to use each stitching pattern



1. Pattern ①

Automatic reverse stitching (for start) switch ❺	OFF	ON	OFF	ON
Stitching pattern		A B	C D	A B C D
Automatic reverse stitch (for end) switch ❻	OFF	OFF	ON	ON

1. Turn pattern selector ❶ ON.
2. By combining ON and OFF settings of automatic reverse stitching (for start) switch ❺ and automatic reverse stitching (for end) switch ❻ , four different stitching patterns are available.
3. For the starting automatic reverse stitching, set the number of stitches using A and B of switch ❼ . For the ending automatic reverse stitching, set the number of stitches using C and D of switch ❼ .

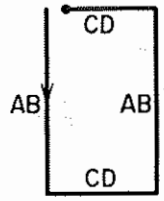
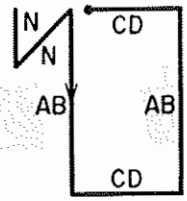
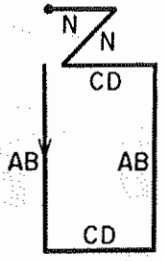
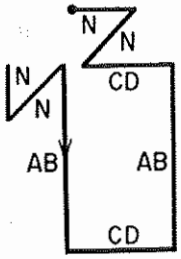
(Precaution) Be sure that, when you select a pattern selector switch, the corresponding pattern indicator lamp lights up.

2. Pattern ②

Automatic reverse stitching (for start) switch ❺	OFF	ON	OFF	ON
Stitching pattern	CD	A B CD	CD B A	A B CD B A
Automatic reverse stitch (for end) switch ❻	OFF	OFF	ON	ON

1. Turn pattern selector switch ❷ ON.
2. By combining ON and OFF conditions of automatic reverse stitching (for start) switch ❺ and automatic reverse stitching (for end) switch ❻ , four different stitching patterns are available.
3. For both starting and ending automatic reverse stitchings, set the numbers of stitches using A and B of switch ❼ .
4. The numbers of stitches for the intermediate steps can be set within the range of 0 to 99, using C and D of switch ❼ .
5. When automatic thread trimming switch ❽ has been turned ON, the thread trimmer will automatically be actuated upon completion of steps C and D or the ending reverse stitching.
6. When automatic thread trimming switch ❽ has been turned OFF, the machine stops with its needle down upon completion of steps C and D. At this time, if you operate the one-touch type reverse feed switch, the machine runs at low speed (for compensative stitching). Further, if you return the pedal to its neutral position before you depress the front part of the pedal again, you can resume sewing operation regardless of the preset number of stitches.

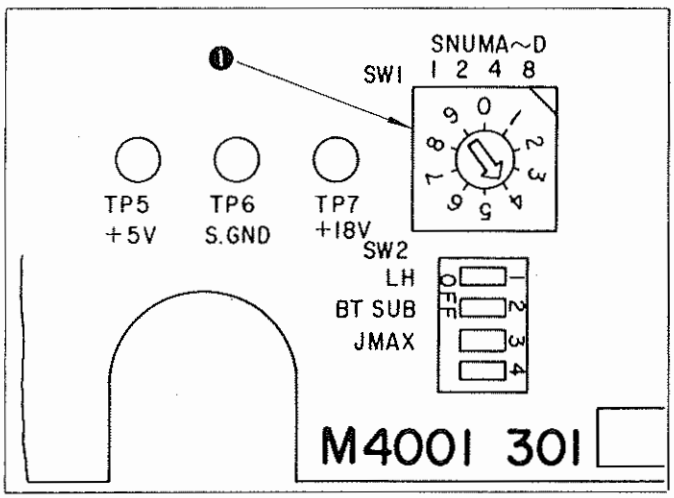
3. Pattern ③

Automatic reverse stitching (for start) switch ❺	OFF	ON	OFF	ON
Stitching pattern				
Automatic reverse stitch (for end) switch ❻	OFF	OFF	ON	ON

1. Turn pattern selector switch ❸ ON.
2. By combining ON and OFF conditions of automatic reverse stitching (for start) switch ❺ and automatic reverse stitching (for end) switch ❻ , four different stitching patterns are available.
3. Set the numbers of stitches for steps AB and CD within the range of 0 to 99, using A to D of switch ❼ .
4. Set numbers of stitches N for the starting and ending automatic reverse stitching steps. (See the setting method described below.)
5. Upon completion of each step, the machine stops with its needle down even when you depress the front part of the pedal. At this time, if you operate the one-touch type reverse feed switch, the machine will perform compensative stitching.
6. If you depress the back part of the pedal during intermediate AB or CD steps, the machine will immediately trim the threads. If you depress the back part of the pedal during the last CD step, the machine will trim the threads either immediately or upon completion of the ending automatic reverse stitching.
7. When automatic thread trimming switch ❽ has been turned ON, if you depress the front part of the pedal after completion of the last step, the machine will trim the threads either immediately or upon completion of the ending automatic reverse stitching.
8. When automatic thread trimming switch ❽ has been turned OFF, the machine will stop with its needle down upon completion of the last step. When the machine stops, the pedal is in its neutral position. If you depress the front part of the pedal, you can continue sewing operation. At this time, if you return the pedal to its neutral position before you depress the back part of the pedal, the machine will trim the threads either immediately or upon completion of reverse stitching.

(Note) For a machine equipped with an Auto-lifter, the Auto-lifter is actuated when the machine stops with its needle down upon completion of a step or when the machine stops with its needle down in compensative stitching operation.

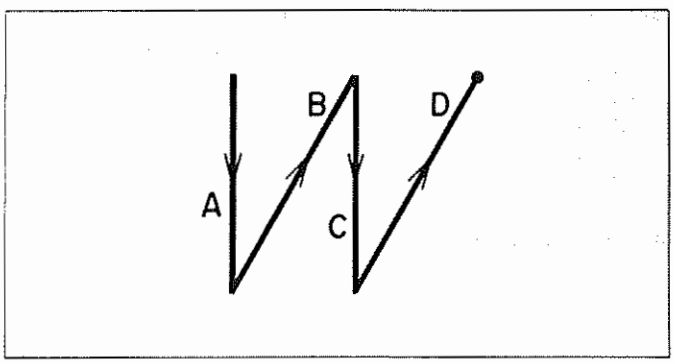
★ How to set number of stitches N for starting and ending automatic reverse stitching steps



1. Turn the power switch OFF.
2. Open the PSC box cover.
3. Using a flat-bit screwdriver, set the arrow on rotary switch (SW1) ❶ on the main circuit board to the desired number of stitches.
4. Close the PSC box cover.
5. Turn the power switch ON again. This completes the setting of number of stitches N.

(Note) Both starting and ending automatic reverse stitching steps will have the same number of stitches.

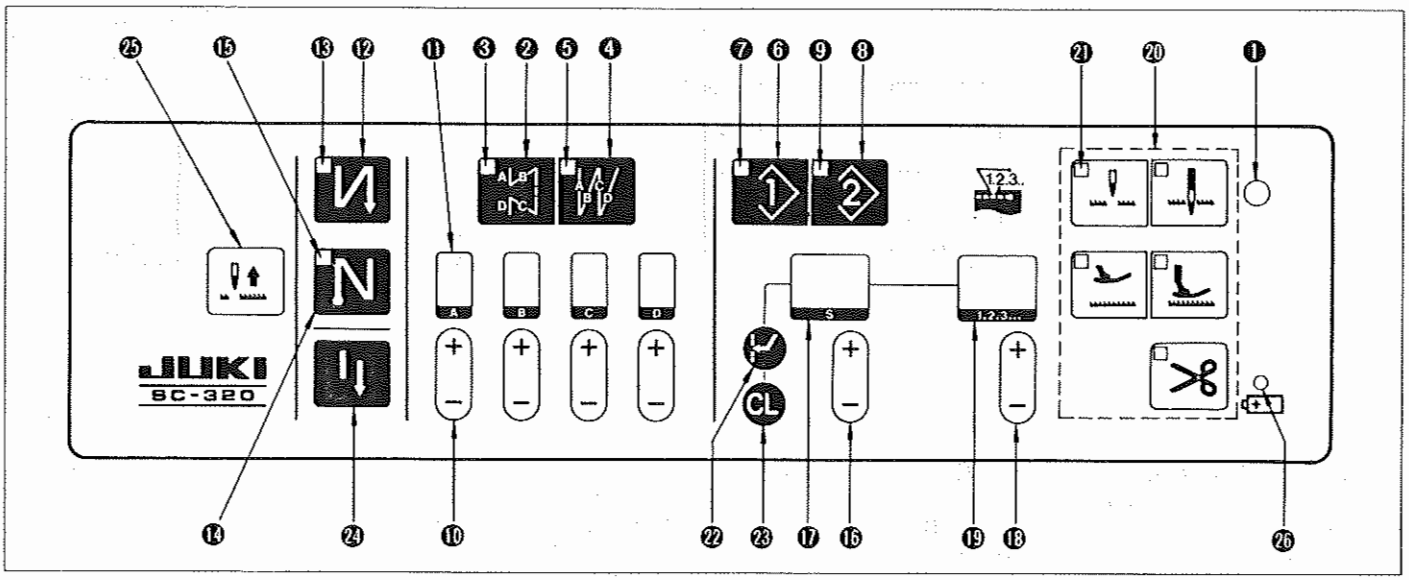
4. Pattern ④



1. Turn pattern selector switch ❹ ON.
   (At this time, the automatic thread trimming indicato lamp lights up.)
2. Set the numbers of stitches for steps A to D, using A to I of switch ❼ .
3. By depressing the front part of the pedal once, you ca make the machine perform a series of operations fron sewing steps A to D to trimming the threads.

2-6. SC-320 Control panel

1) Control panel



❶ Power indicator lamp (LED)
- Lights up when the power switch is turned ON.
- Stays ON for a while immediately after the power switch is turned OFF.

❷ Reverse stitching pattern switch
- Used to select a reverse stitching pattern.
- When this switch is turned ON, lamp ❸ comes ON, while overlapping stitch indicator lamp ❺ goes OFF. Also, all indicator lamps associated to programmed stitching will go OFF.

❸ Reverse stitching pattern indicator lamp (LED)
- Lights up when the reverse stitching pattern switch is turned ON.

❹ Overlapping stitch pattern selector switch
- Used to select an overlapping stitch pattern. When this switch is turned ON, lamp ❺ lights up, while reverse stitching indicator lamp ❸ goes OFF. Also, all indicator lamps associated to programmed stitching will go OFF.

❺ Overlapping stitch indicator lamp (LED)
- Lights up when the overlapping stitch pattern switch is turned ON.

❻ Programmed stitching pattern ① switch
- Used to select the programmed stitching pattern 1.
- When this switch is turned ON, lamp ❼ lights up.

❼ Programmed stitching pattern ① indicator lamp (LED)
- Lights up when the programmed stitching pattern 1 switch is turned ON.

❽ Programmed stitching pattern ② switch
- Used to select the programmed stitching pattern 2.
- When this switch is turned ON, lamp ❾ lights up.

❾ Programmed stitching pattern ② indicator lamp (LED)
- Lights up when the programmed stitching pattern 2 switch is turned ON.

❿ Switches for setting the number of stitches
- Used to set the number of stitches within the range of 0 to 9 for steps A to D.
- "+" : Increases the number of stitches.
- "–" : Decreases the number of stitches.

⓫ Stitch number displays (LED)
- Indicates the number of stitches for each step (A to D).

⓬ Automatic reverse stitching (for start) switch
- Used to turn ON or OFF automatic reverse stitching at sewing start.
- Each time this switch is pressed, it alternately turns ON or OFF. (When step B has been set to "0", the automatic reverse stitching at sewing start cannot be set.)

⓭ Automatic reverse stitching (for start) indicator lamp (LED)
- Lights up when the automatic reverse stitching (for start) switch is turned ON.

⓮ Automatic reverse stitching (for end) switch
- Used to turn ON or OFF automatic reverse stitching at sewing end.
- Each time this switch is pressed, it alternately turns ON or OFF. (When step C has been set to "0", the automatic reverse stitching for sewing end cannot be set.)

⓯ Automatic reverse stitching (for end) indicator lamp (LED)
- Lights up when the automatic reverse stitching (for end) switch is turned ON.

⑯ Step setting switch

- Used to make a step change in order to set the number of stitches, needle stop position, presser foot lifter ON/OFF, thread trimming or other sewing conditions for each step in programmed stitching.
- The step can be changed from 1 to 15. (If there are steps for which the numbers of stitches have not been set, only the step of the lowest number will be displayed.)
- "+" : Increases the step No.
  "–" : Decreases the step No.

⑰ Step display (LED)

- Displays a step (1 to 15).

⑱ Step stitch number setting switch

- Used to set the number of stitches within the range of 0 to 99 for each sewing step.
- "+" : Increases the number of stitches.
  "–" : Decreases the number of stitches.
- When the "+" or "–" side of the switch is held depressed, the number of stitches continues to increase or decrease.

⑲ Step stitch number display (LED)

- Displays the number of stitches for a step within the range of 0 to 99.

⑳ Machine stop mode selector switches

- Used to select the following machine stop modes at the time when a step has been sewn:
  - ○ The machine will stop with the needle up.
  - ○ The machine will stop with the needle down.
  - ○ The machine will stop with the presser foot up.
  - ○ The machine will stop with the presser foot down.
  - ○ The machine will stop after thread trimming.

㉑ Indicator lamps (LED) for showing the selected machine stop modes:

- The machine will stop with the needle up.
- The machine will stop with the needle down.
- The machine will stop with the presser foot up.
- The machine will stop with the presser foot down.
- The machine will stop after thread trimming.

㉒ Step insertion switch

- Used to insert a new sewing step in preset sewing steps.

㉓ Step deletion switch

- Used to delete a particular one from the preset sewing steps.

㉔ Restart switch

- Used to restart sewing a programmed stitch step after an empty bobbin has been replaced.

㉕ Switch for raising the needle

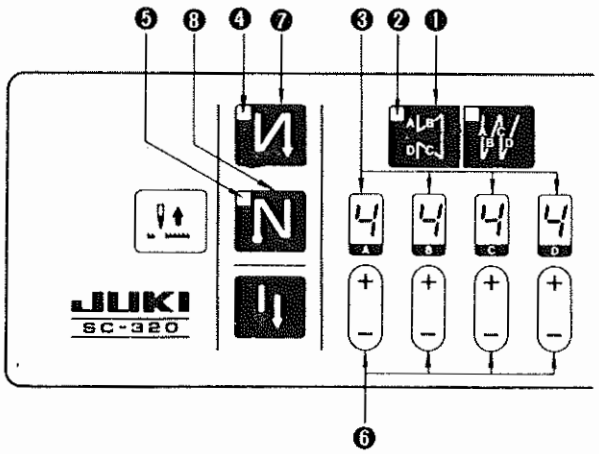
- If the machine has stopped with its needle down, the needle goes up and stops in its highest position when this switch is turned ON.

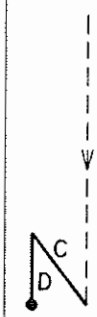
㉖ Memory battery exhaustion monitor lamp (LED)

- This lamp may light up if the machine has been unused for an extended period of time and the battery has been exhausted.

2) How to use each stitching pattern

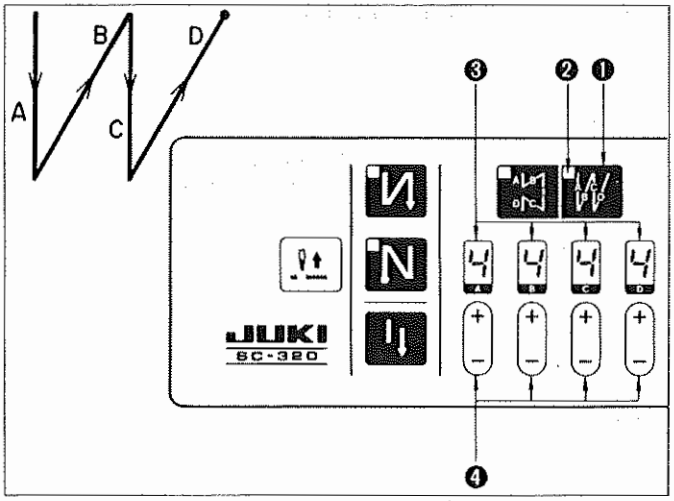
(1) Reverse stitching pattern



Automatic reverse stitching (for start) switch ❼	OFF	ON	OFF	ON
Stitching patterns				
Automatic reverse stitching (for end) switch ❽	OFF	OFF	ON	ON

1. Press reverse stitching pattern switch ❶ .
2. Reverse stitching pattern indicator lamp ❷ lights up, and stitch number displays (LEDs) ❸ for steps A to D indicate the preset numbers of stitches. Also, automatic reverse stitching (for start) indicator lamp ❹ and automatic reverse stitching (for end) indicator lamp ❺ show the ON and OFF conditions of automatic reverse stitching (for start) switch ❼ and automatic reverse stitching (for end) switch ❽
3. To change the numbers of stitches, press the "+" or "–" sides of switches ❻ for setting the numbers of stitches located under stitch number displays ❸ for steps A to D.
4. By combining ON and OFF settings of automatic reverse stitching (for start) switch ❼ and automatic reverse stitching (for end) switch ❽ , four different stitching patterns are available.

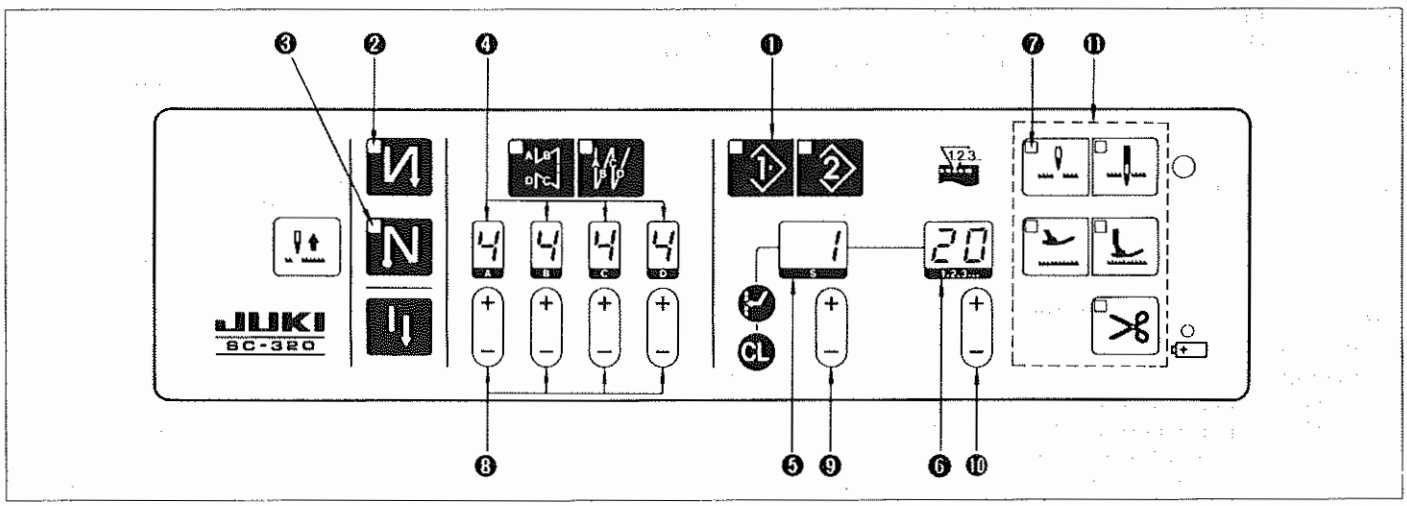
(2) Overlapping stitch pattern



1. Press overlapping stitching pattern switch ❶ .
2. Overlapping stitch pattern indicator lamp ❷ lights up, and stitch number displays ❸ indicate the preset numbers of stitches.
3. To change the numbers of stitches, press the "+" or "–" sides of switches ❹ for setting the numbers of stitches located under stitch number displays ❸ for steps A to D.
4. By depressing the front part of the pedal once, you can cause the machine to sew steps A to D in sequence and then to actuate its thread trimmer.

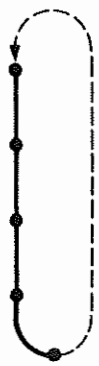
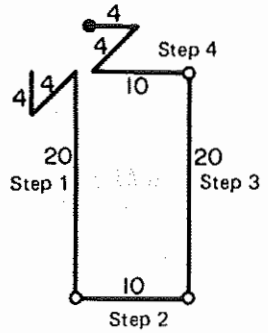
(Precaution) **The numbers of stitches which have been set for steps A to D are stored in memory separately from the numbers of stitches for a reverse stitching pattern.**

(3) Programmed stitching pattern ①



1. Checking and changing the programmed stitching pattern ①

1. Press programmed stitching pattern 1 switch ❶ .
2. Automatic reverse stitching (for start) indicator lamp ❷ and automatic reverse stitching (for end) indicator lamp ❸ light up, and stitch number displays ❹ for steps A to D show 4 4 4 4 .
3. Step display ❺ shows 1 , and step stitch number display ❻ shows 2 0 .
4. The needle-down stop lamp and the presser-foot-up stop lamp of indicator lamps ❼ (for showing the selected machine stop modes at the time when a step has been completed) light up.
5. If any of stitch number displays (A to D) ❹ for the reverse stitching pattern indicates a number of stitches other than 4, then you can change it to 4 by pressing the "+" or "–" side of the corresponding switch ❽ for setting the number of stitches.

The "+" side of switch ❾ is pressed once at a time	Indication on display ❺	Indication on display ❻	Indicator lamps ❼ The following lamps light up	Pattern
	1	20		
	2	10		
	3	20		
	4	10		
	5	0		

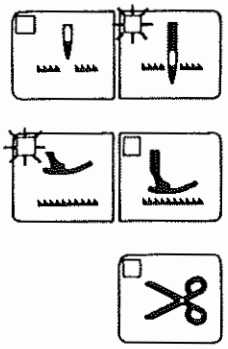
6. Each time the "+" side of step setting switch ❾ is pressed, the indications will change as illustrated above.
7. If the number of stitches shown on step stitch number display ❻ is different from those given in the table above, change it by pressing the "+" or "–" side of switch ❿ for setting the number of stitches for a step.
8. If a machine stop mode is different from those given in the table above, set it using switches ⓫ for selecting the machine stop modes.
9. With these settings, you can sew the pattern illustrated at left by repeating the series of operations → Depressing the front part of the pedal → Automatic stop based on the preset number of stitches → Setting the pedal to its neutral position → Depressing the front part of the pedal. At this time, the step display indicates the step No. being sewn, while the stitch number display and the machine stop mode indicator lamps stay OFF.

★ Selecting a machine stop mode

You can make the machine stop with its needle up after trimming the threads, or stop with its needle down or up without trimming the threads, or stop with its presser foot up or down.

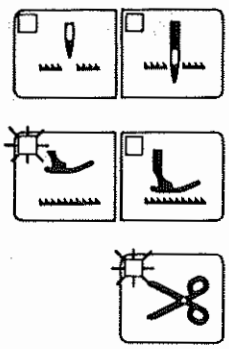
How to set the desired machine stop mode

Example 1 : Setting for making the machine stop with its needle down and presser foot up



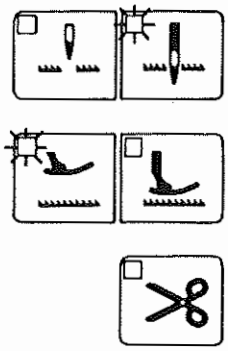
Press the switches and . This will cause the corresponding indicator lamps to light up.

Example 2 : Setting for making the machine stop with its presser foot up after thread trimming

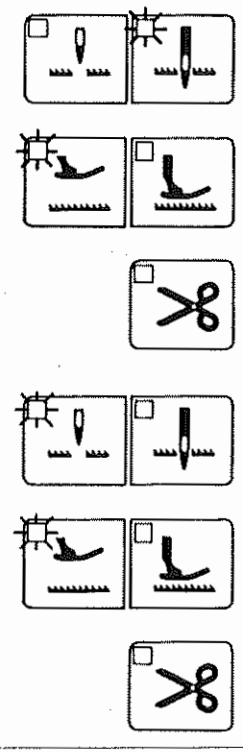


Press the switches and . This will cause the corresponding indicator lamps to light up.
In this case, the needle-up stop lamp and the needle-down stop lamp stay OFF.

* **How to release the thread trimming switch .....** The following two methods are available:



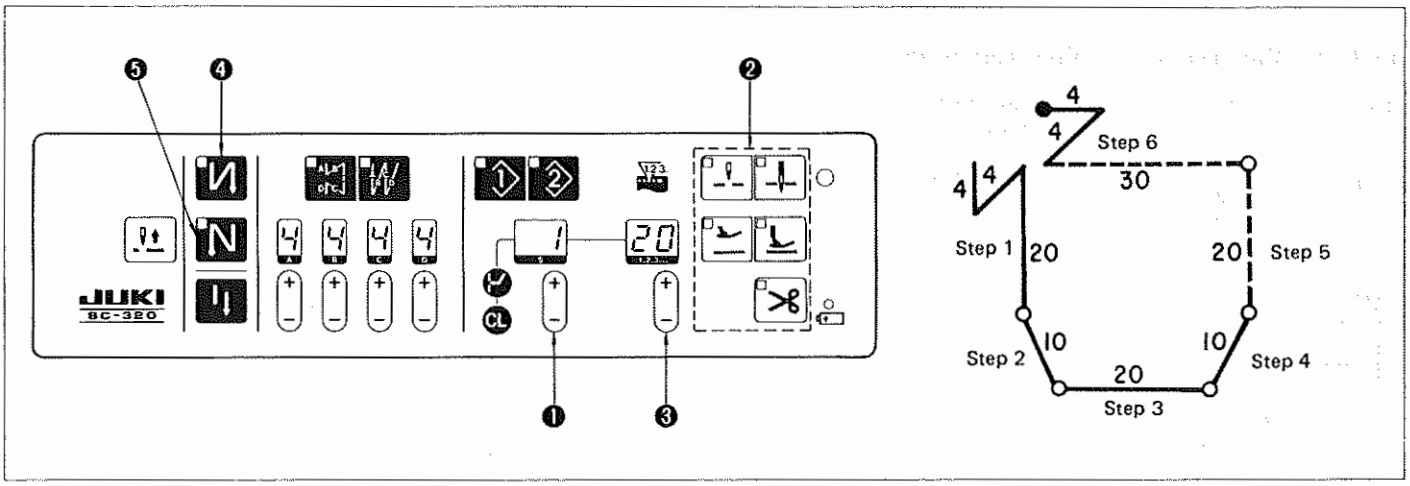
① Press switch again. This will place the machine in the needle-down stop mode, and the corresponding indicator lamp will light up. (The indicator lamp for machine stop after thread trimming goes OFF.)



② Press the switch or the switch . This will cause the corresponding indicator lamps to light up. (The indicator lamp for machine stop after thread trimming goes OFF.)

• Adding steps to the programmed stitching pattern 1

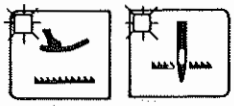
The following procedure shows how to add two steps to the programmed stitching pattern 1 in order to sew the pattern illustrated below:



1) Press the "+" side of step setting switch ❶ three times.

Indication on the panel

2) Press the switch and the switch of machine stop mode selector switches ❷ .

Indication on the panel 

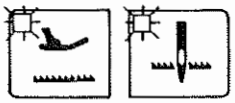
3) Press the "+" side of step setting switch ❶ once.

Indication on the panel

4) Keep on pressing the "+" side of step stitch number setting switch ❸ until 20 stitches are reached.

Indication on the panel

5) Press the switch and the switch of machine stop mode selector switches ❷ .

Indication on the panel 

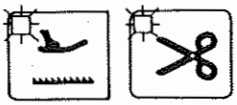
6) Press the "+" side of step setting switch ❶ again.

Indication on the panel

7) Keep on pressing the "+" side of step stitch number setting switch ❸ until 30 stitches are reached.

Indication on the panel

8) Press the switch and the switch of machine stop mode selector switches ❷ .

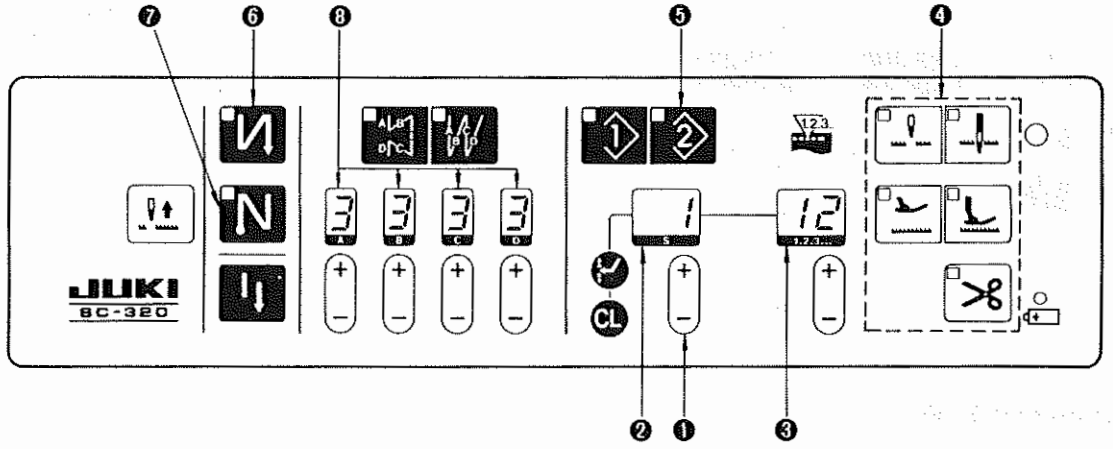
Indication on the panel 

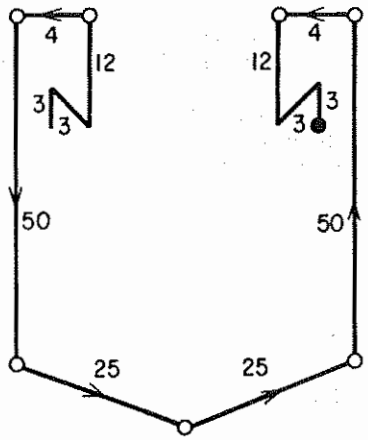
9) You can set up to 15 steps.

10) By turning ON or OFF automatic reverse stitching (for start) switch ❹ and automatic reverse stitching (for end) switch ❺ , you can make the machine perform reverse stitching at the sewing start and/or end.
(This cannot be programmed for each step.)

(4) Programmed stitching pattern ②

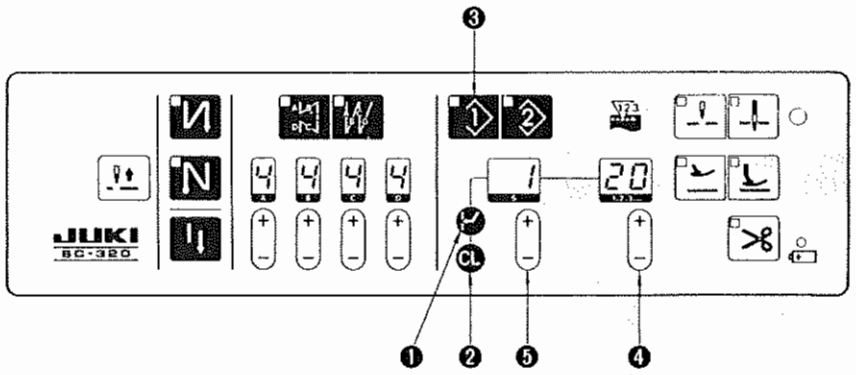
By pressing programmed stitching pattern 2 switch ❺, you can perform check and change just as in the programmed stitching pattern 1.
The panel indications and stitching pattern stored in memory are as shown below.
Automatic reverse stitching (for start) switch ❻ and automatic reverse stitching (for end) switch ❼ are ON, and stitch number displays (A to D) will show 3 3 3 3 .

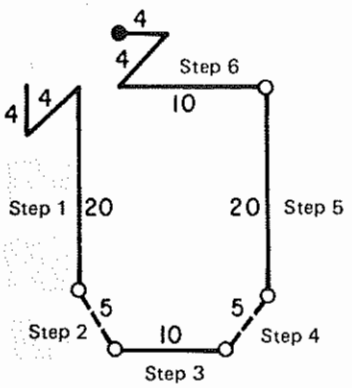


The "+" side of switch ❶ is pressed once at a time	Indication on display ❷	Indication on display ❸	Indicator lamps ❹ The following lamps light up	Stitching pattern
	1 2 3 4 5 6 7 8 9	12 4 50 25 25 50 4 12 0		

(5) Inserting or deleting a stitching pattern

Based on the programmed stitching pattern 1, you can modify your stitching pattern using step insertion switch ❶ and step deletion switch ❷ .





1. Step insertion switch ❶

1) Press programmed stitching pattern 1 switch ❸ .

Indication on the panel

2) Press step insertion switch ❶ once.

Indication on the panel

3) Keep on pressing the "–" side of step stitch number setting switch ❹ until 5 stitches are reached.

Indication on the panel

* By so doing, 5 stitches have been set for step 2, and the machine stop mode for stopping with the presser foot up and needle down has been inserted.

4) Press the "+" side of step setting switch ❺ once.

Indication on the panel

5) Press step insertion switch ❶ once.

Indication on the panel

6) Keep on pressing the "–" side of step stitch number setting switch ❹ until 5 stitches are reached.

Indication on the panel

* By so doing, 5 stitches have been set for step 4, and the machine stop mode for stopping with the presser foot up and needle down has been inserted.

7) Press the "+" side of step setting switch ❺ twice.

1st indication on the panel

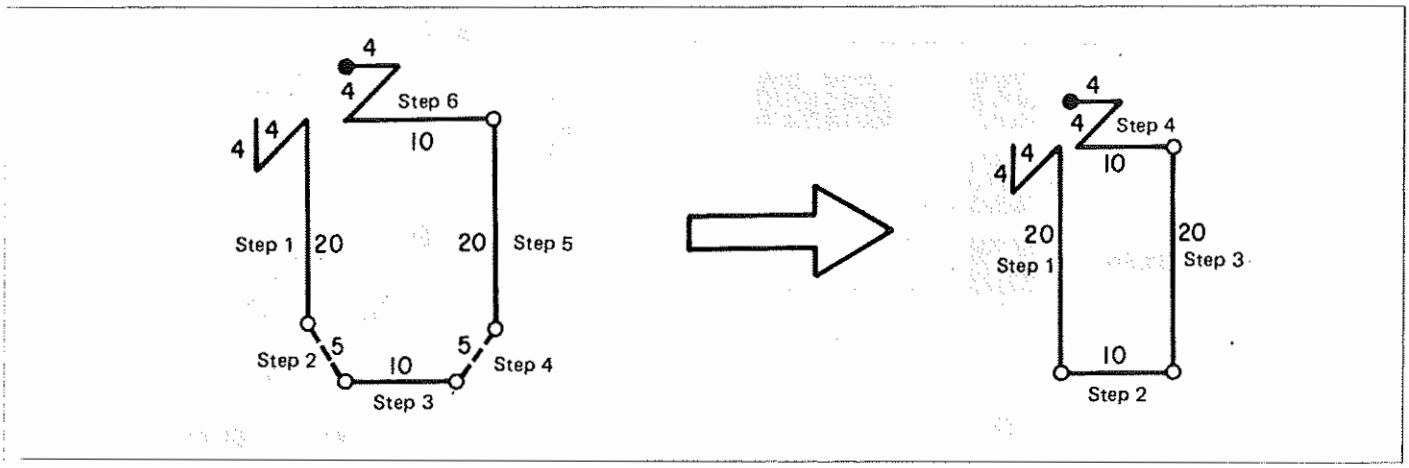
2nd indication on the panel

8) By depressing the front part of the pedal, you can sew the pattern illustrated above.

* If the number of stitches and the machine stop mode are the same, you can set the desired number of steps of the same sewing conditions by pressing step insertion switch ❶.

Step deletion switch ❷

The following procedure is used to delete a step, which has been inserted using step insertion switch ❶ , in order to restore the stitching pattern 1.



1) Press the "+" or "–" side of step setting switch ❺ to set it to step 1.

Indication on the panel

* If the machine is sewing a step, depress the back part of the pedal to trim the threads before working on this operation.

2) Press the "+" side of step setting switch ❺ once.

Indication on the panel

3) Press step deletion switch ❷ once.

Indication on the panel

* The 5 stitches in step 2 and the machine stop mode (machine stop with the presser foot up and needle down) are deleted.
Instead, the subsequent step 3 with 10 stitches and the same machine stop mode becomes step 2.

4) Press the "+" side of step setting switch ❺ once.

Indication on the panel

* By this deletion of one step, step 4 with 5 stitches is replaced by step 3 with 5 stitches (the number of stitches remains unchanged).

5) Press step deletion switch ❷ once.

Indication on the panel

* The 5 stitches in the previous step 4 (replaced by step 3 in 3) above) are deleted, and the subsequent step 5 with 20 stitches is replaced by step 3.

6) Press the "+" side of step setting switch ❺ once.

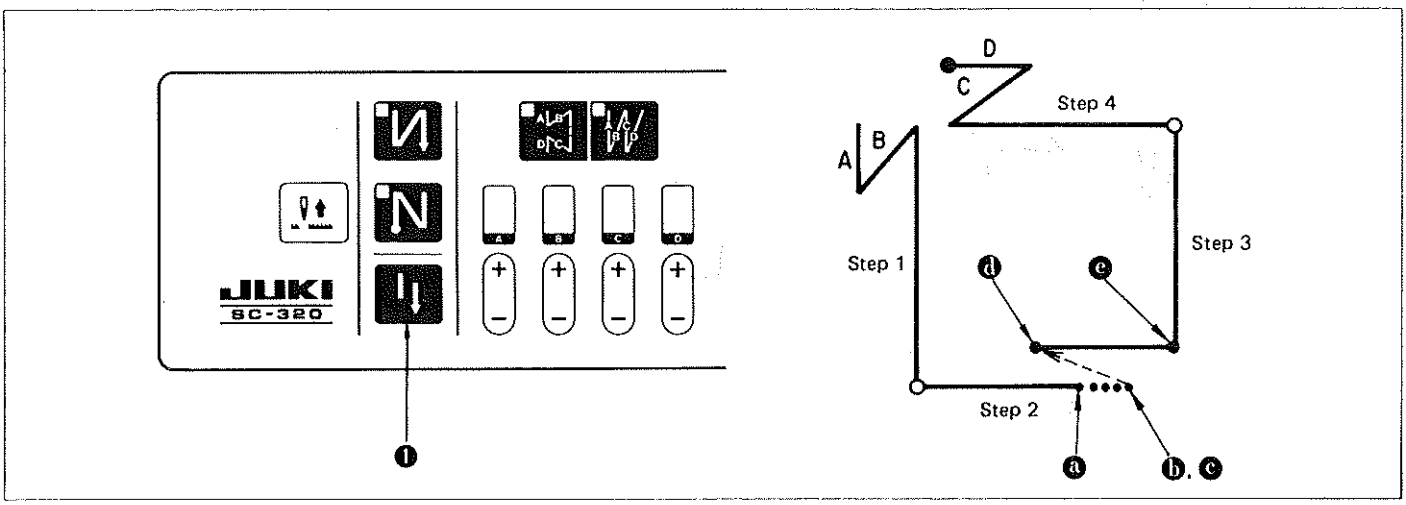
Indication on the panel

* As a result of the deletion of the two steps, step 6 with 10 stitches is replaced by step 4 with 10 stitches (the number of stitches remains unchanged).

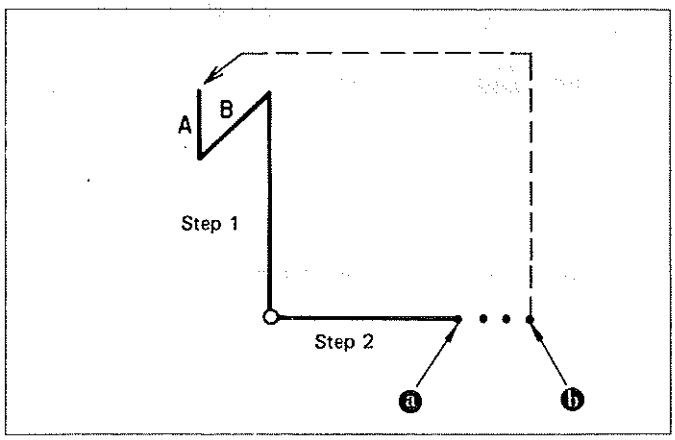
7) By depressing the front part of the pedal, you can sew the stitching pattern 1 (shown at top right).

(6) How to operate the restart switch

The restart switch is typically used to restart sewing a step after an empty bobbin has been replaced.



1) The bobbin thread has run out while sewing a step. ⓐ
2) Set the pedal to the neutral position to stop sewing, and depress the back part of the pedal to trim the threads. ⓑ
3) Press restart switch ❶ . ⓒ
4) Replace the empty bobbin, route the bobbin thread, and move the material back a little to overlap the sewn stitches in step 2. ⓓ
5) Depress the front part of the pedal. Hold the pedal depressed until stop point ⓔ of step 2 is reached.



6) At stop point ⓔ , press restart switch ❶ . This causes the next step to be displayed as [3] , and the programmed stitching pattern will go on.

* If a thread breaks during the free sewing operation initiated by restart switch ❶ (ⓓ → ⓔ), set the pedal back to its neutral position, and then depress the back part of the pedal to actuate the thread trimmer. Re-thread the machine, and move the material back a little before pressing restart switch ❶ . By so doing, you can resume the free sewing operation. After that, perform steps 5) and 6).

(Note) Follow the procedure shown below when going back to the first step without using restart switch ❶ :

1) The bobbin thread has run out while sewing step 2. ⓐ
2) Set the pedal back to its neutral position to stop sewing, and depress the back part of the pedal to trim the threads. ⓑ
3) The step display will show [1] , enabling you to start from the beginning.

3. ADJUSTMENT

3-1. Belt Tension

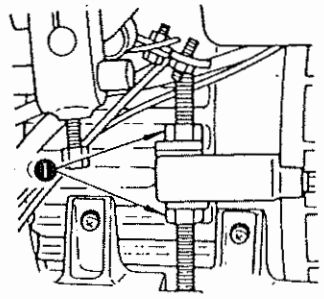


Fig. 3-1

An excessive belt tension may damage the main shaft bushing of the machine or the motor bearing. On the contrary, an insufficient belt tension may cause the belt to slip with consequent shortened life of the belt, and also cause other failures such as overrun after thread trimming and machine stops with uneven needle stop height.
To avoid such problems, use a belt of the appropriate length as specified in the instruction book. Adjust the belt tension using nut ❶ so that the center of the belt slacks about 18 mm (0.709″) when it is pressed with a finger.

3-2. Prevention Motor Vibration

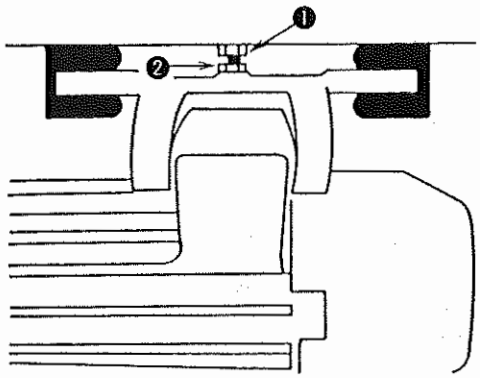


Fig. 3-2

At the rear of the motor, there are hexagon bolt ❶ and nut ❷ for preventing motor vibration between the table and motor base. Adjust the hexagon bolt so that it touches the table, then lock it with the nut.

3-3. Checking and Correcting the Rotational Direction of Sewing Machine

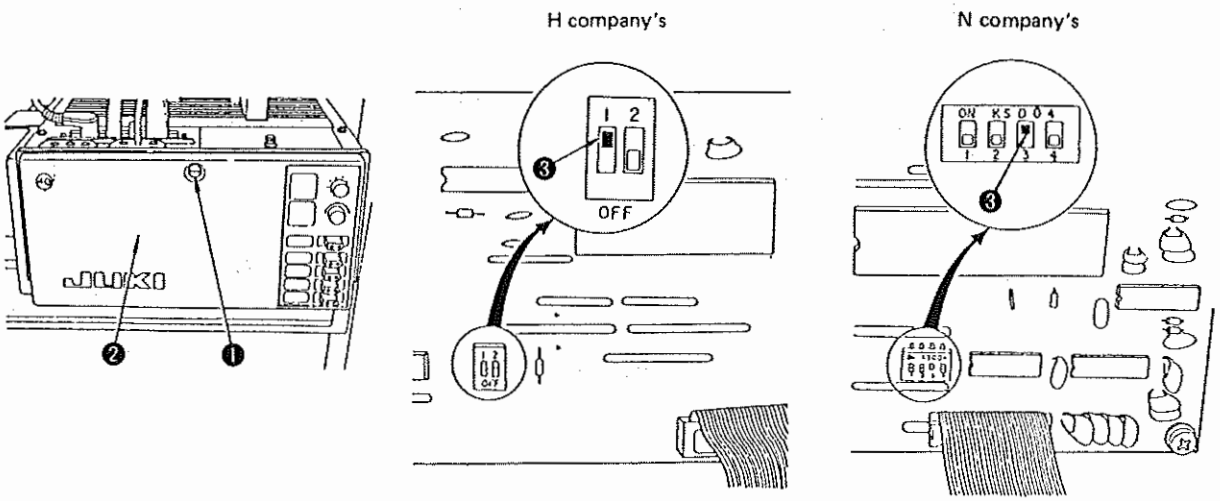


Fig. 3-3

Turn the handwheel by hand to bring the needle down. Turn the power switch ON, and observe the rotational direction of the handwheel. The handwheel should rotate counterclockwise as observed from the handwheel side. If it rotates in the reverse direction, turn the power OFF, remove screw ❶ from the PSC box to open cover ❷, and change the setting of switch ❸ mounted on the circuit board located on the farther side from you. (ON to OFF, or OFF to ON)

(Note) There are two types of printed circuit boards as shown above.

3-4. Pedal

1) Adjusting the pedaling pressure

(1) Pressure required to depress the front part of the pedal
Hook pedal pressure adjusting spring ⓐ on the right side to increase the pressure, or hook it on the left side to decrease the pressure.

(2) Pressure required to depress the back part of the pedal screw adjusting screw ⓑ in to increase the pressure, or screw it out to decrease the pressure within the adjusting range shown at right.

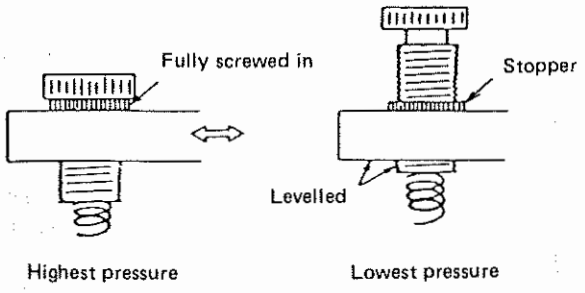


Fig. 3-4

(Note) After adjustment, lightly retighten the stopper with fingers.

2) Adjusting the pedal stroke

The pedal stroke depends whether the connecting rod is attached to position Ⓐ or Ⓑ . The stroke will be smaller when the connecting rod is fixed in position Ⓐ than when it is fixed in position Ⓑ . In this case, the pressure required to depress the front and back parts of the pedal increases. When you want to change only the stroke, adjust the pedaling pressure after fixing the connecting rod.

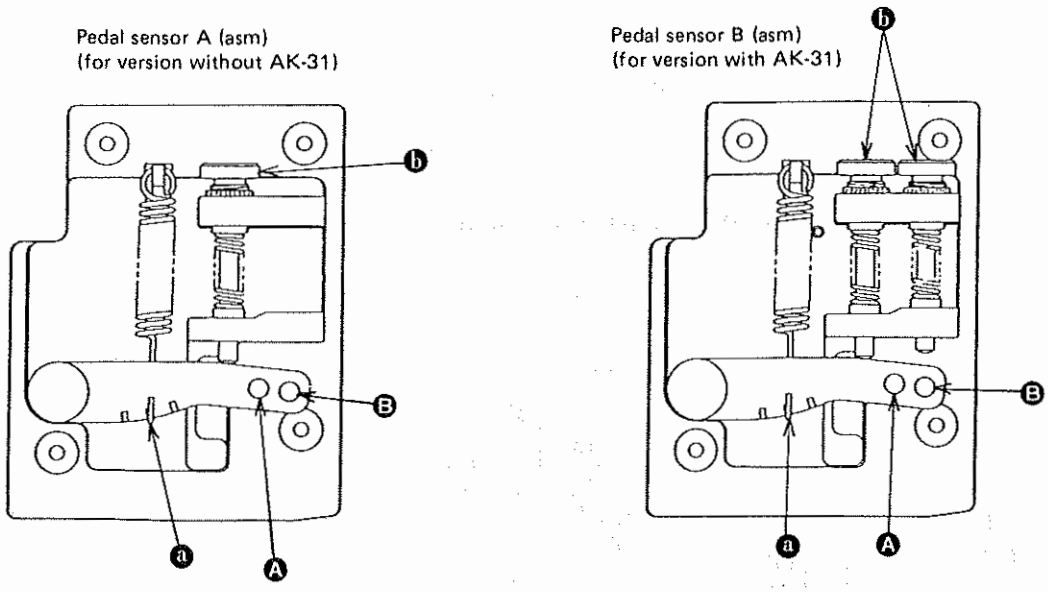


Fig. 3-5

3) Adjusting variable resistors and adjustment range table Table 3-1 below shows the adjusting variable resistors, adjustment ranges and functions.

Table 3-1

	VR No.	VR symbol	Function	Adjustment range
Speed adjusting VR	VR1	BT	Used to control the reverse stitching speed at sewing start/end. The BTVR alone controls both BTL and BTM. (The difference is always 200spm.	1000 ~ 3500 spm. Standard: BTH 1700spm. BTH 1900spm. Counterclockwise: Decreases Clockwise: Increase
	VR 2	SOFT	Used to adjust the speed of soft start for ensuring interlaced threads of beginning stitches.	200 ~ 2000spm. Standard: 800spm. Counterclockwise: Decreases Clockwise: Increases
	VR 3	LSH	Used to increase, independently of the thread trimming speed, the minimum speed controlled by depressing the front part of the pedal.	200 ~ 400 spm. Standard: 200spm. Counterclockwise: Decreases Clockwise: Increases
	VR 4	LSL	Used to limit low speed when the speed must be reduced for thread trimming independently of pedal operation. Normally, it is fixed. (If the LSL is changed, the LSH is also changed.)	150 ~ 300 spm. Standard: Fixed to 200spm. Counterclockwise: Decreases Clockwise: Increases
	VR 5	MIN	Used to change the accelerating point from low speed by about 1 mm (0.039") through pedal stroke.	About 1 mm (0.039") Standard: Fully clockwise Counterclockwise: Low speed stroke, long Clockwise: Low speed storke, short
Pedal stroke adjusting VR	VR 6	FLSW	Used to adjust the position where the presser foot is raised by depressing the back part of the pedal in a version with AK-31.	Standard: 1.8 mm ± 1 mm (0.071" ± 0.039") Measured at the pedal connecting hole (inside) Clockwise : Increases stroke Counterclockwise: Decreases stroke
	VR 7	TSW	Used to adjust the position where the thread trimmer is actuated by depressing the back part of the pedal.	Standard: Version with AK-31 5.2 mm ± 1 mm (0.205" ± 0.039") Version without AK-31 3.5 mm ± 1 mm (0.138" ± 0.039") Clockwise: Increases stroke Counterclockwise: Decreases stroke
	VR 8	LSW	Used to adjust the stroke for starting sewing by depressing the front part of the pedal.	Standard: 3 ± 1 mm (0.118" ± 0.039") Clockwise : Increases stroke Counterclockwise: Decreases stroke

4) Pedal adjusting VR and its function

(1) Adjusting the pedal stroke

○ How to adjust the stroke for sewing start

Using a small screwdriver, turn VR8 (LSW) clockwise ❶ to increase the stroke, or turn it counterclockwise ❷ to decrease the stroke. (Be careful not to turn it excessively, otherwise the sewing machine fails to stop when the pedal is returned to its neutral position or to start even when the front part of the pedal is depressed.)

(Standard: 3 mm (0.118″) at the connecting rod mounting point)

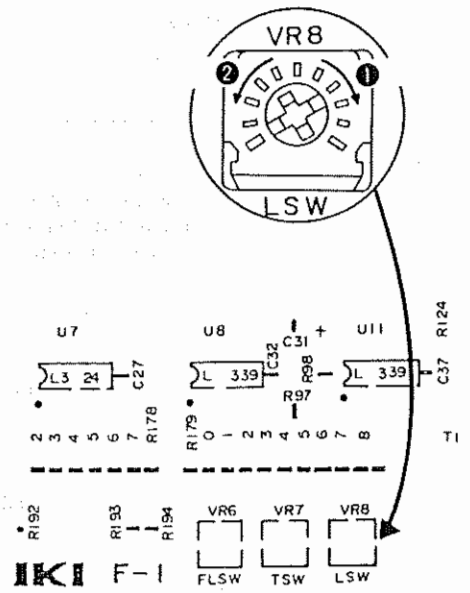


Fig. 3-6

○ Adjusting the stroke for actuating the thread trimmer

Turn VR7 (TSW) shown in Fig. 3-6 clockwise to increase the stroke, or turn it counterclockwise to decrease the stroke. Be careful not to turn it excessively, otherwise the thread trimmer is actuated immediately when the pedal is set in its neutral position or the thread trimmer fails to operate even when the back part of the pedal is depressed.

(Standard: 3.5 mm (0.138″) at the connecting rod mounting point for a version without AK-31
5.2 mm (0.205″) at the connecting rod mounting point for a version with AK-31)

○ Adjusting the stroke for actuating AK-31 Auto-lifter

In a version with the AK-31, depressing the back part of the pedal raises the presser foot just as with the knee switch. Turn VR6 (FLSW) shown in Fig. 3-6 clockwise to increase the stroke for actuating the Auto-lifter, or turn it counterclockwise to decrease the stroke. (Be careful not to turn it excessively, otherwise the Auto-lifter will act as if the knee switch were kept ON when the pedal is returned to its neutral position.)

(Standard: VR6 fully counterclockwise for a version without AK-31 1.8 mm (0.071″) at the connecting rod mounting point for a version with AK-31)

○ Adjusting the accelerating point (from 200spm)

As shown in Fig. 3-7, the accelerating point can be adjusted about 1 mm (0.039″). When VR5 (MIN) shown in Fig. 3-8 is turned fully clockwise, the low speed stroke shown by the solid line (Fig. 3-7) is shortened, resulting in an earlier accelerating timing. When VR5 is turned counterclockwise, the low speed stroke is lengthened as shown by the broken line, resulting in a later accelerating timing.

(Normally, VR5 is turned fully clockwise before shipment.)

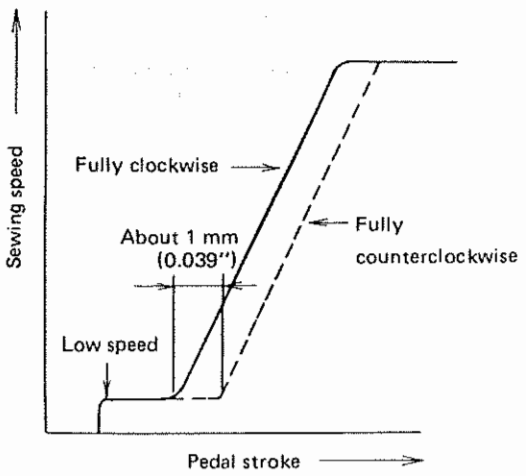


Fig. 3-7

3-5. Maximum Sewing Speed

1) Adjusting the low speed
In the conventional low sewing speed is determined by the thread trimming speed. As shown in Fig. 3-8, only the low speed controlled by depressing the front part of the pedal can be increased using VR3 (LSH) shown in Fig. 3-8 without changing the thread trimming speed. Turn VR3 clockwise to increase the sewing speed, or turn it counterclockwise to decrease the speed. The adjustable range is from the thread trimming speed to the thread trimming speed plus about 200spm. (Normally, it is turned fully counterclockwise before shipment.)

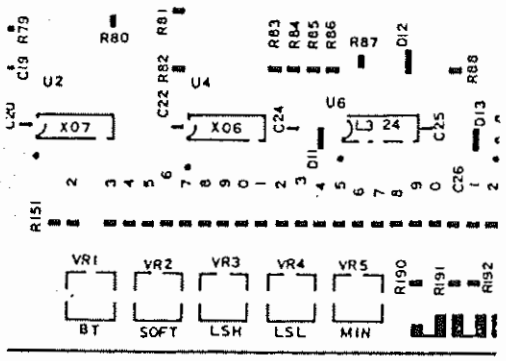


Fig. 3-8

2) How to adjust the maximum speed
speed limitation switch (Fig. 3-9 ❷ , replaces the max. speed limitation based on pulley change) and the maximum speed limitation knob (Fig. 3-9 ❶ , same as the conventional max. speed control knob). The maximum speed limitation switch functions to limit only the maximum speed without changing the relationship between the sewing speed and pedal stroke (hereinafter referred to as "acceleration"). The maximum speed limitation knob functions to limit the maximum speed by controlling the acceleration. A value set using ❶ or ❷ , whichever is smaller, is adopted for limitation.

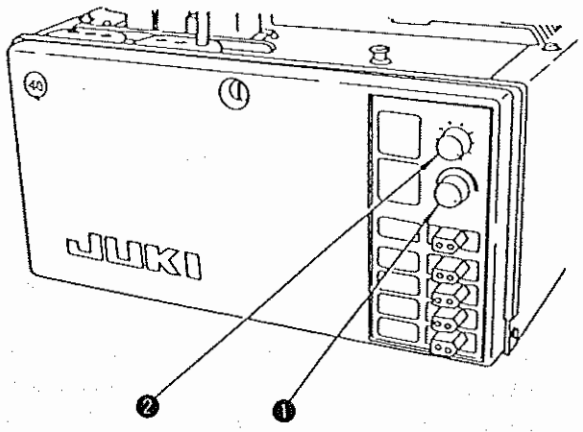


Fig. 3-9

(1) Maximum speed limitation switch
The maximum speed limitation switch can be set from 1 to 16 in 400spm. The adjustable range is 400 to 4000 spm.
As shown by the arrows in Fig. 3-10, this limitation controls only the maximum speed without changing acceleration. This allows the desired speed to be reached quickly even when a low speed has been set.
Table 3-2 shows the numbers on the switch vs. sewing speeds.
A speed setting is changed after thread trimming or when the power is turned ON again after it is turned OFF once. Therefore, any switch setting changes are invalid until thread trimming is completed.

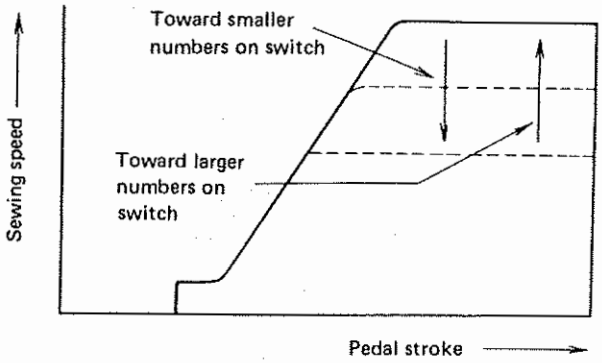


Fig. 3-10

Table 3-2

Number of switch	1	2	3	4	5	6	7	8	9	10	11 ~ 16
Max. sewing speed	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4000

(2) Maximum speed limitation knob

This knob has the same function as the conventional maximum speed control knob. Turn the knob clockwise to increase the speed, or turn it counterclockwise to decrease the speed. The adjustable range is 200 to 4000spm. This knob is different from the switch described in ❶ above in that it controls speed by reducing acceleration as illustrated in Fig. 3-11. As the knob is turned counterclockwise, the acceleration reduces in the order of ❶ , ❷ and ❸ , and the maximum speed reduces accordingly. Although the operator has to fully depress the pedal to reach a preset speed, he can adjust more easily the speed before reachin that preset speed since the acceleration is controlled. By properly adjusting both ❶ and ❷ , an ideal acceleration can be obtained for each operator or operation.

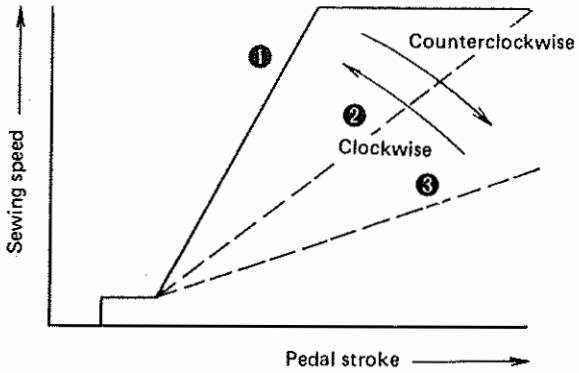


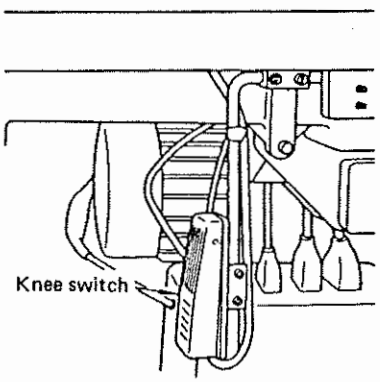
Fig. 3-11

3-6. Auto-lifter

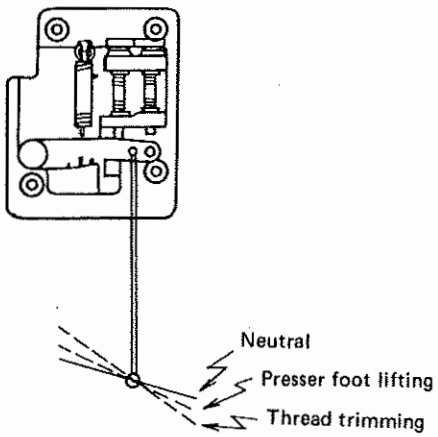
The Auto-lifter is available as an option.
It is designed to automatically raise and hold the presser foot for 60 seconds or for an unlimited time after completion of thread trimming.
To operate the Auto-lifter, the function selector switch on the main circuit board should be set to ON.
(When the Auto-lifter is added to a version which was not originally designed for the AK-30 or AK-31, the transistor circuit board assembly and pedal spring (AK-31) in addition to the AK-30 or AK-31).

1) How to use the Auto-lifter

The Auto-lifter comes in two different types, AK-30 and AK-31.



AK-30



AK-31

Fig. 3-12

When it is necessary to stop sewing and raise the presser foot during sewing, depress the knee switch (depress the back part of the pedal for the AK-31). The moment you release the switch, the presser foot comes down. To lower the presser foot immediately after it has been raised automatically, depress the front part of the pedal or release the knee switch after depressing it (for the AK-31, depress the back part of the pedal).

2) Adjusting the Auto-lifter stroke

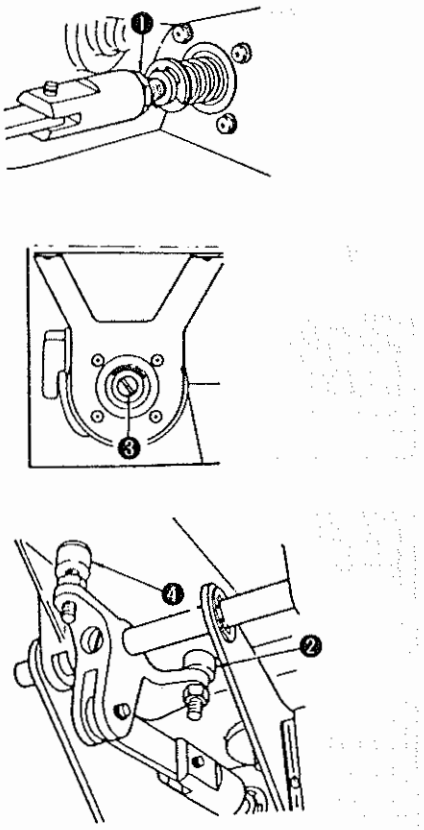


Fig. 3-13

1. Loosen locknut ❶ .
2. Loosen the locknut of stopper (A) ❷ , and fully lower the stopper (A).
3. Depress the knee switch to actuate the solenoid.
4. Turn plunger ❸ at the rear of the solenoid clockwise to increase the presser foot lift, or turn it counterclockwise to decrease the lift.
   (Max. presser foot lift : About 10 mm (0.394″)
5. Actuate the solenoid to move the stopper (A) up until it touches the oil pan.
6. Turn the knee switch OFF, then further move the stopper (A) up a half turn.
7. Tighten the locknut of the stopper (A) and locknut ❶ .
8. Loosen the locknut of stopper (B) ❹ , and pull the lifting lever by hand in the solenoid actuating direction. Then, adjust the height of stopper (B) ❹ so that a 1 mm (0.039″) play is provided for the knee lifter pushing rod to come in contact with the knee lifter connecting rod of the machine head. After adjustment, tighten the locknut of the stopper (B).

4. Functions

4-1. Power supply voltage

There are two types of PSC box, one for use with a power supply voltage of about 100V and one for about 200V. They can be told apart as shown in Fig. 4-1, from the numbers following "Volts" on the name plate on the side of the PSC box.
For the 200V-band box the numbers are 200 220 240.
For the 100V-band box the numbers are 100 110 120.
For each box any of 3 actual power supply voltages can be selected. In the 200V-band 200V, 220V or 240V can be selected. In the 100V-band 100V, 110V or 120V can be selected. The switching is done as follows.

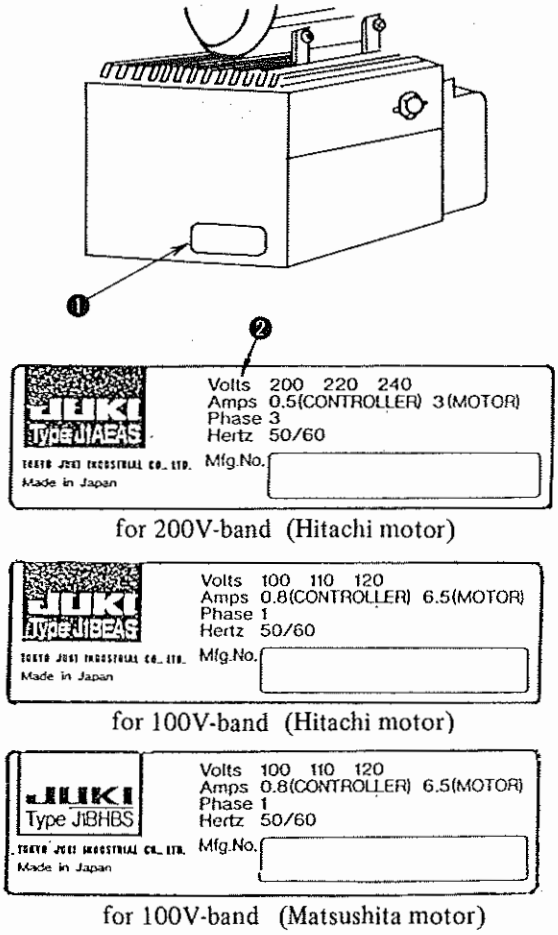


Fig. 4-1

< How to switch the power supply voltage >

① Turn the power OFF.

② Turn the fuse holder cap in Fig. 4-2 in the direction shown by the arrow, using a coin, then remove the cap. (Do not use a screwdriver to remove the cap. Use a coin.)

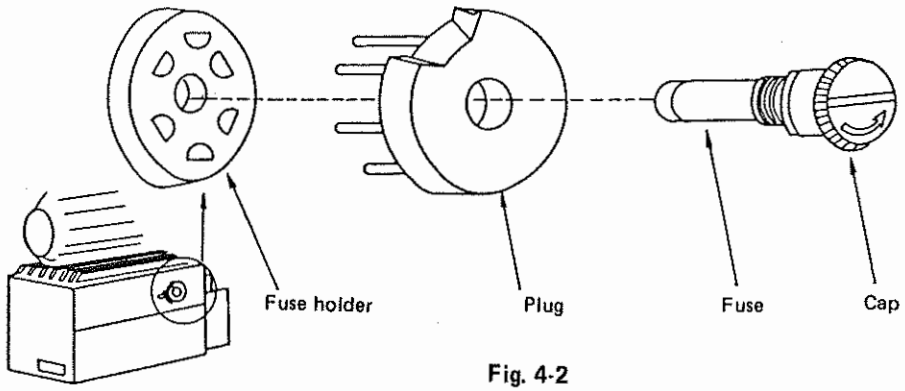


Fig. 4-2

③ Unplug the plug shown in Fig. 4-2, change the play angle until the desired voltage indication becomes visible, then plug it back in.

④ Tighten the cap with a coin.

Note 1) Any of 3 power supply voltages can be selected with one PSC box. It is not necessary to change the fuse when changing voltage on one box.

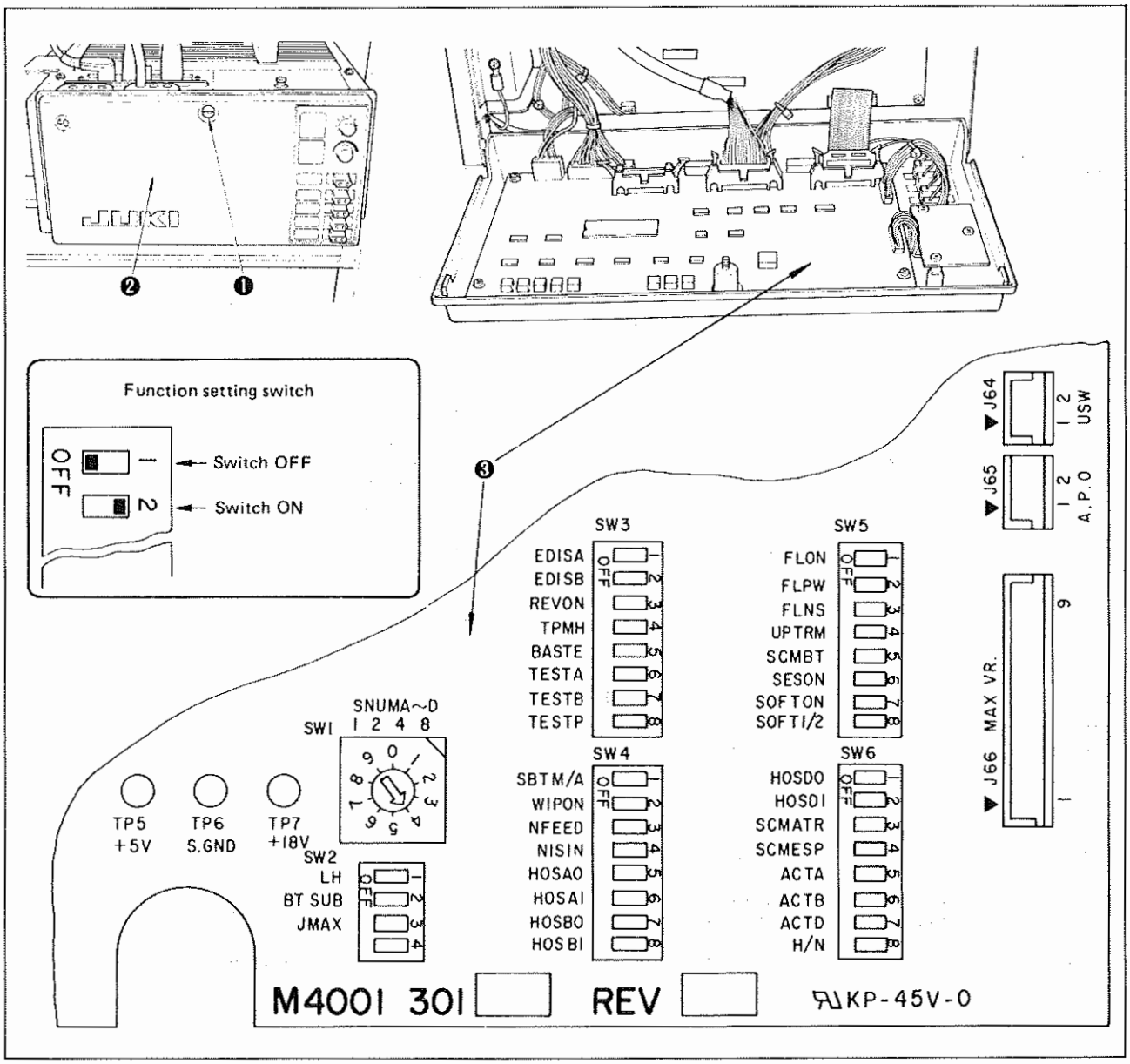
Note 2) The fuse capacities for the 100V band and the 200V band are given in Table 4-1.

Table 4-1.

Voltage band	Operating voltages	Fuse capacity
100V band	100V 110V 120V	8A 250V
200 band	200V 220V 240V	5A 250V

4-2. Functions selection switches

1) Main circuit board dip switches
Remove set screws ❶ on PSC box front cover ❷ and remove the front cover. Then dip switches 1 to 6 are visible on the front right part of main circuit board ❸ .
(There is danger when front cover ❷ is opened, so always turn the power OFF. Also, turn the power OFF when resetting the switches. The function will not change, even if a switch is reset, as long as the power is ON.)



DDL-5570, 5580 is shown as set at the time of factory shipment.

Fig. 4-3.

2) Table of dip switches and their selection functions

The names of the dip switches and their functions are summarized in Tables 4-2-1 and 4-2-2.

Table 4-2-1

Dip switch No.	Switch abbreviation	Official switch name	Summary of functions
SW1	SNUMA ~ D	Stitch Number A ~ D	Manual countback, setting of SC-220 pattern 3 number of stitches N.
SW3 – 3	REV ON	Reverse On	Selection of reverse rotation for raising the needle after thread trimming
SW3 – 6 7	TEST A TEST B	TEST A TEST B	Selection of one of three test programs by combination of A and B. 1. Speed test 2. Input check 3. Synchro check
SW4 – 1	SBT M/A	Start Back Tack Manual/Auto	Reverse stitching for sewing start, speed control selection.
SW4 – 2	WIP ON	Wiper On	Wiper program selection
SW5 – 1 2 3	FL ON FL PW FL NS	Foot Lifter On Foot Lifter Power Mitigation Foot Lifter Non Switching	Auto-lifter selection Lifter pedal pressure decreasing unit selection Presser foot lifting, switching control OFF selection If 1 or 2 is selected, after thread trimming, the presser foot is lifted automatically, and there is no time limit (if 1 is selected the time limit is 60 seconds).
SW5 – 4	UP TRM	Up to Trimmer	The machine stops with its needle up when the pedal is set to the neutral position. Needle-up stop, thread trimming selection.
SW5 – 5 SW6 – 3 4	SCM BT SCM ATR SCM ESP	Simple Count Back Tack Simple Count Back Auto Trimmer Simple Count Back Enable Stop	Manual countback selection. Selection of thread trimming after manual countback. Selection of manual countback even when the sewing machine is at rest.

Table 4-2-2

Dip switch No.	Switch abbreviation	Official switch name	Summary of functions
SW5 – 7 8	SOFT ON SOFT 1/2	Soft Start On Soft Start 1 or 2	Soft start selection 1-stitch Soft start 1-stitch, 2-stitch selection
SW6 – 5	ACT A	Active Timing A	SBT, reverse feed solenoid ON timing correction selection
SW4 – 5 6	HOSA 0 HOSA 1	Correction A 0 Correction 1	Selection of correction amount
SW6 – 6	ACT B	Active Timing B	SBT, reverse feed solenoid OFF timing correction selection
SW4 – 7 8	HOSB 0 HOSB 1	Correction B 0 Correction 1	Selection of correction amount
SW6 – 7	ACT D	Active Timing B	EBT, reverse feed solenoid OFF timing correction selection
SW6 – 1 2	HOSD 0 HOSD 1	Correction D 0 Correction 1	Selection of correction amount
SW6 – 8	H/N	Hitachi/National	Hitachi, Matsushita, reduction curve selection

Notes) ○ If any dip switches other than those in the tables (SW2-1, 2, 3, SW3-1, 2, 4, 5, 8, SW4-3, 4, SW5-6) are turned ON, there is a danger that the sewing machine head will be damaged. Absolutely do not touch them.

○ Select functions with the power OFF. (While the power is ON the function selections will not change.)

3) Detailed explanations of functions

(1) Starting automatic reverse stitching speed selection

Select whether the starting reverse stitching speed is to vary with the amount the pedal is depressed or to depend solely on the speed setting. This selection is made with SW4-1 (SBT M/A).

ON: The set number of stitches are all sewn at the speed set by BT VR and LSL VR regardless of how far the pedal is depressed (consequently, sewing cannot be stopped in the middle even when the pedal is in neutral).

OFF: The speed depends on how far the pedal is depressed (except that the speed cannot exceed the upper limit set by BT VR). In pedal priority operation, sewing can be stopped in the middle by putting the pedal in neutral (during reverse stitching step, turn the solenoid OFF while sewing is stopped).

(2) Wiper control selection

Select whether or not wiper control is to be applied (when wiper control is to be not applied temporarily, this can be accomplished with the switch on the head).

Make this selection with SW4-2 (WIP ON).

ON: After thread trimming the wiper solenoid comes ON for about 45ms and the wiper operates. Also, when the Auto-lifter has been selected, there is a delay of about 30ms before the shift to presser foot lifter control (to allow time for the wiper to return).

OFF: Wiper is not actuated (For this reason, when there is an Auto-lifter it takes 45 ms for suction and 30 ms for return for a fast total time of 75 ms, then the presser foot rises automatically.

(3) Selection of back-up needle raising after thread trimming

When the presser foot is raised after thread trimming, when the needle tip gets in the way below the presser foot the sewing machine can be backed up to the vicinity of the needle upper dead point. Make this selection with switch 3-3.

ON: Needle can be raised by backing sewing machine up (but in this position the balance is lowered quite far, so the needle thread should be drawn out farther than normal from the needle tip).

OFF: Back-up control is not applied after thread trimming.

(4) Selection of routine needle-up stop function

When this function is selected, whenever the needle is stopped by putting the pedal in neutral it stops in the upper position.

ON: Needle routinely stops in upper position (in this case, run the sewing machine one cycle by pedal return, trim the thread and then stop it again in the upper position).

OFF: Needle stops in lower position.

(5) Selection of soft start function

When the sewing pitch is fine or the needle is thick, when the needle thread and bobbin thread fail to interlace at the start of sewing the sewing stability can be improved by limiting the sewing machine speed during the first or second stitch at the start of sewing.

Make this selection with combination of switch 5-7 (SOFT ON) and switch 5-8 (SOFT 1/2).
(refer to Table 4-3).

Table 4-3

Name of switch		Output function
SW5 – 7 SOFT ON	SW5 – 8 SOFT 1/2	
OFF	OFF	Soft start function does not operate.
OFF	ON	
ON	OFF	Soft start function operates during first stitch.
ON	ON	Soft start function operates during second stitch.

(6) Selection of manual countback control function

Number of stitches limitation and thread trimming command functions can be added to the touchback switch on the head.

The number of stitches is set by the rotary switches (SW1, SNUM A to D) on the main circuit board.

This selection is made using switch 5-5 (SCMBT), switch 6-3 (SCMATR) and switch 6-4 (SCMESP) (refer to Table 4-5).

Table 4-5

Application	Name of switch			Output function
	SW5 – 5 SCMBT	SW6 – 3 SCMATR	SW6 – 4 SCMESP	
❶	OFF	ON or OFF	ON or OFF	Manual countback function does not operate.
❷	ON	OFF	OFF	When the pedal is depressed and one-touch type reverse feed switch is operated, the number of switches set by the rotary switches (SW 1 SNUM A to D) are reverse-stitched.
❸	ON	OFF	ON	Even when the sewing machine is stopped, when the pedal is depressed and the one-touch type reverse feed switch operated the number of stitches set by the rotary switches (SW1 SNUM A to D) are reverse-stitched.
❹	ON	ON	OFF	When the pedal is depressed and the one-touch type reverse feed switch operated, the number of stitches set by the rotary switches (SW 1 SNUM A to D) are reverse-stitched, and then the thread is trimmed.
❺	ON	ON	ON	Even when the sewing machine is stopped, when the pedal is depressed and the one-touch type reverse feed switch operated the number of stitches set by the rotary switches (SW1 SNUM A to D) are reverse-stitched, and then the thread is trimmed.

❶ ..... Used as a regular one-touch type reverse feed switch.
❷ ..... Used for reinforcement stitching of pleats. (only operates while the sewing machine is running).
❸ ..... Used for reinforcement stitching of pleats (operates whether the sewing machine is running or stopped).
❹ ..... Used as start switch for terminal reverse stitching (used instead of thread trimming engaged by depressing the back part of the pedal; operates only while the sewing machine is running; particularly useful with a standing sewing machine).
❺ ..... Used as start switch for terminal reverse stitching (used instead of thread trimming engaged by depressing the back part of the pedal; operates whether the sewing machine is running or stopped; particularly useful with a standing sewing machine).

In the following cases, manual countback control is inoperative.

- ○ During number of stitches count control
- ○ During stop after thread trimming
- ○ While TSW is ON (when TSW is turned ON while manual countback is in progress, thread is trimmed immediately)
- ○ When BT switch is turned ON during countback control

★ On switches SNUM A to D

Switches SNUM A to D are used to set the number of stitches when either of the following two functions is selected.

○ When manual countback is selected, the number of stitches is indicated.

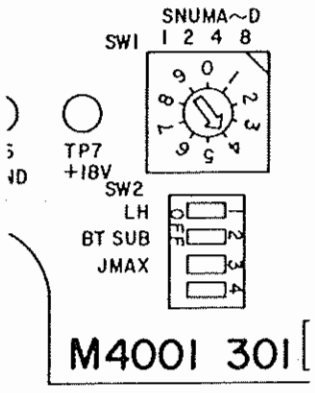


Fig. 4-4

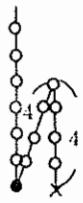


Fig. 4-5

When 4 is set, as shown in Fig. 4-4, the number of stitches is as follows.

Here, when the number of stitches is 0, manual countback is not performed.

○ : Needle entry point
● : One-touch type reverse feed switch ON
x : Thread trimming

○ When the SC-220 panel is used, when pattern No. 3 is selected the number of stitches for start reverse stitching and finish reverse stitching is indicated.

When 4 is set as shown in Fig. 4-4, the stitching is done as shown in Fig. 4-6.

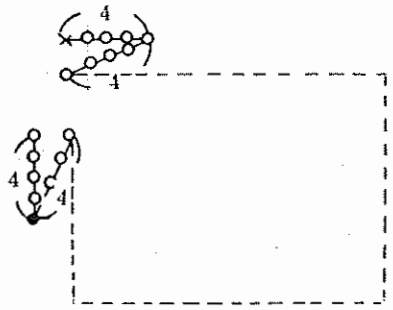


Fig. 4-6

Notes) 1. The number of reverse stitches is the same in both forward and reverse.
2. Insert a screwdriver into the groove shown by the arrow to change the number of stitches.

(7) Selection of automatic presser foot lifting function

The presser foot is operated automatically by a solenoid without need to use the lifter lever, when the automatic presser foot lifting function is selected.

Make this selection using a combination of switch 5-1 (FL ON) and switch 5-2 (FL PW) (refer to Table 4-6).

Table 4-6

FL ON	FL PW	Control applied
OFF	OFF	Operation independent of thread trimming and sewing machine operation. When there is no Auto-lifer, use these settings.
OFF	ON	Not used
ON	OFF	Auto-lifter control (raised automatically for 60 seconds after thread trimming).
ON	ON	Auto-lifter control (after thread trimming, ralsed indefinitely until there is some input, for example from the FL switch or L switch).

In addition, by setting switch 5-3 (FL NS) the above combination can be made to correspond to valve control.

ON: Pneumatic or hydraulic valve control (the signal that holds the presser foot becomes a non-switching output).

OFF: Solenoid control (the signal that holds the presser foot becomes a 25 ms ON/OFF switching output).

Note) During solenoid control, make sure that FL NS is OFF. If FL NS is left ON the solenoid will burn out.

(8) Test program selection

Any of 3 test programs can be selected by a combination of switch 3-6 (TEST A) and switch 3-7 (TEST B) settings as in the table below. (refer to Table 4-7).

Table 4-7

TEST A	TEST B	Test	Applicable units
ON	OFF	Speed test (SC-320 indicates rpm)	SC-20, 120, 220, 320
OFF	ON	Switch input test	SC-320 (but applies to all units if an SC-320 is used as the checker)
ON	OFF	Synchro test	SC-320 (but applies to all units if an SC-320 is used as the checker)

* Make sure TEST P is OFF.

★ Speed test program

This test is used to make certain adjustments such as the low-speed rpm and automatic reverse stitching rpm.

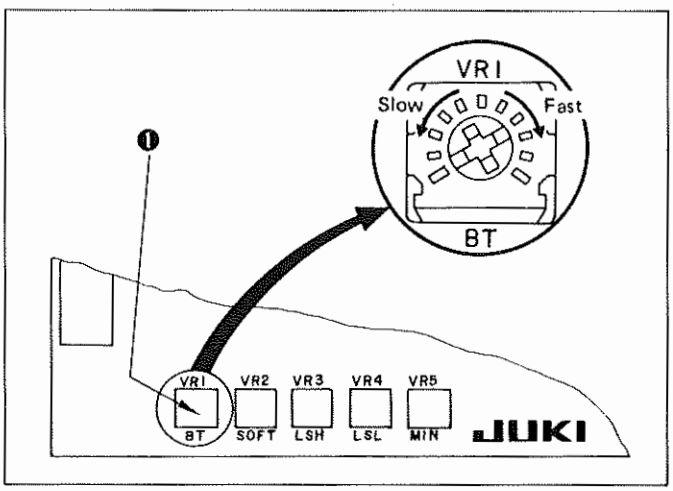


Fig. 4-7

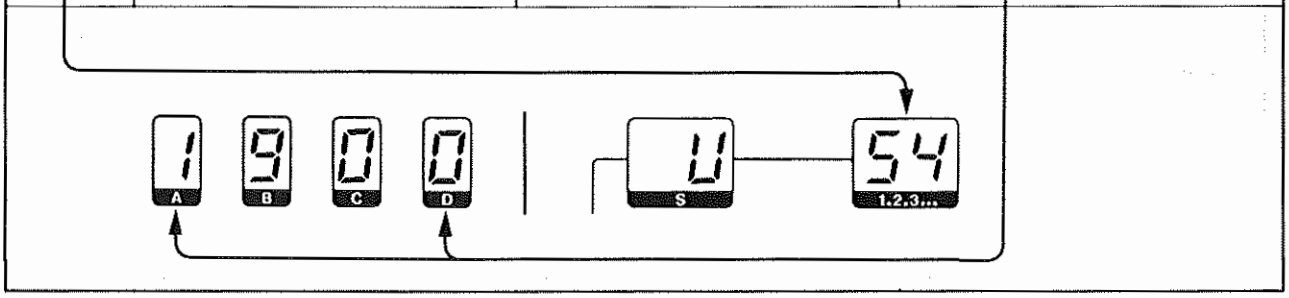
Five different speeds can be adjusted by repeatedly depressing and releasing the pedal, as shown in Table 4-8.

The speeds are adjusted as shown in Fig. 4-7, with the 4 potentiometers on the main circuit board inside the PSC front cover.

BT	:	Reverse feed speed
SOFT	:	Soft start speed
LSH	:	Pedal minimum speed
LSL	:	Thread trimming speed

Table 4-8

Indicator No.	Check item	Adjustment method	Standard sewing speed
50	Low speed ⟷ High speed ↓ Stop	High speed can be adjusted using the pedal, maximum speed adjustment dial and 400 s.p.m. adjustment dial.	200 ± 20 s.p.m. → maximum sewing speed (LSH)
51	Low speed (thread trimming) ↓ Stop	200 to 400 s.p.m. with LSH VR; 150 to 300 s.p.m. with LSL VR (depending on the mechanism might be fixed at 200 s.p.m.)	200 ± 20 2. s.p.m. (fixed) (LSL)
52	Soft start ↓ Stop	200 to 2000 s.p.m. with SOFT VR	800 ± 100 s.p.m. (SOFT)
53	Automatic reverse feed low speed ↓ Stop	1000 to 3500 s.p.m. with BT VR (when automatic reverse feed low speed is adjusted, the fast speed changes at the same time)	1,700 ± 200 s.p.m. (BT) ↓ High speed also changes at the same time, with a difference of about 200 s.p.m.
54	Automatic reverse feed high speed ↓ Stop		1,900 ± 200 s.p.m.



Notes) 1. When the SC-320 is used, the panel switches to rpm indication as shown above.

2. Before operating the sewing machine, always remove the needle thread and raise the presser foot with the lifter lever.

★ Switch input test program (using SC-320 panel)

This is a test of whether the various input switch signals are being correctly read into the PSC box microcomputer, using the SC-320 indicators to check (while testing is in progress the sewing machine will not run; this is not a malfunction.)

Fig. 4-8 shows which signal appears on each indicator.

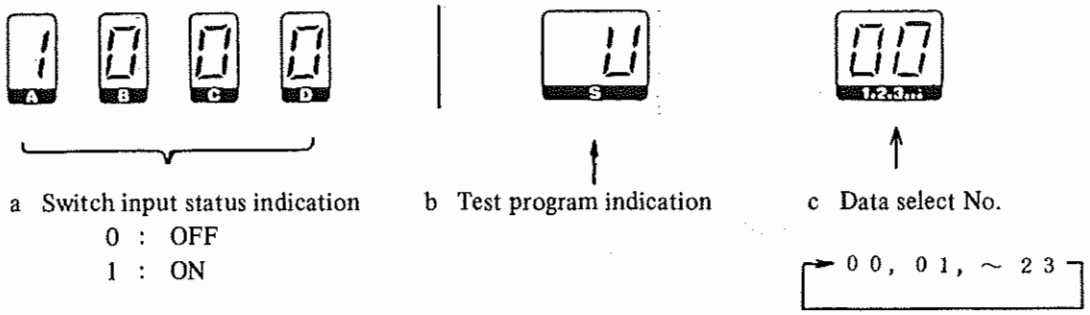


Fig. 4-8

Note) To change the data select No., turn the upper detection signal ON/OFF by turning the sewing machine pulley by hand.

Table 4-9 gives the list of switches for which the input can be checked.
Among these, data select No 04 to 09 are switches on the SC-120 and SC220 control boxes (the SC-320 panel switches cannot be checked). When a check is necessary, while the SC-120 or SC-220 is being used open the PSC box front cover and plug the SC-320 connector into connector J61 (SC-320, 420) on the main circuit board. The SC-320 will funtion as an input checker.

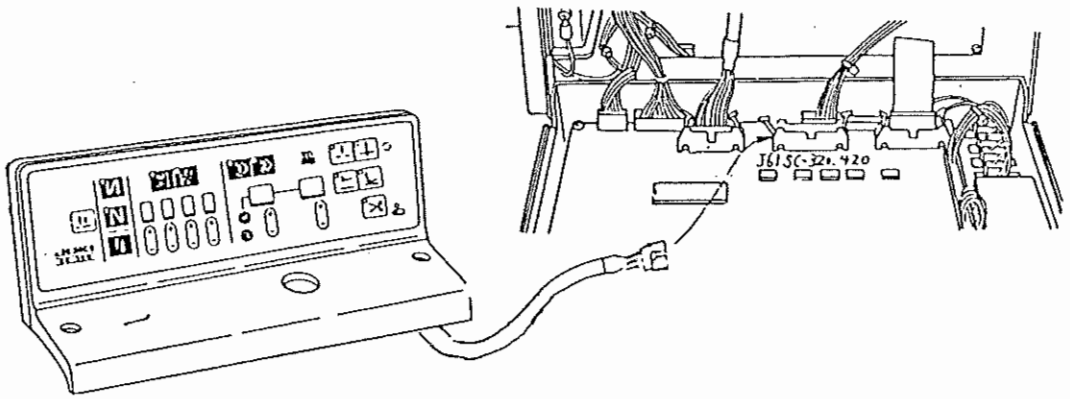


Fig. 4-9

Table 4-9

	A Work step indication	B Work step indication	C Work step indication	D Work step indication	Number of stitches indication
	Input switch or input signal				Data select No.
Head	Pedal depress signal	Pedal depress signal	One-touch type reverse feed switch	Lifter switch	00
	–	–	–	–	01
	–	–	–	–	02
Maximum speed limit switch	SPDET A	SPDET B	SPDET C	SPDET D	03
	Pattern 1 ①	Pattern 2 ②	Pattern 3 ③	Pattern 4 ④	04
SC-120, SC-220 panel switches	SBT SW	EBT SW	ATRM SW	UP SW	05
	Step A bit 1	Step A bit 2	Step A bit 3	Step A bit 4	06
	Step B bit 1	Step B bit 2	Step B bit 3	Step B bit 4	07
	Step C bit 1	Step C bit 2	Step C bit 3	Step C bit 4	08
	Step D bit 1	Step D bit 2	Step D bit 3	Step D bit 4	09
Dip switches on main circuit board	–	–	–	–	10
	–	–	–	–	11
	EDISA (SW3-1)	EDISB (SW3-2)	REVON (SW3-3)	TPMH (SW3-4)	12
	BASTE (SW3-5)	TESTA (SW3-6)	TESTB (SW3-7)	TESTP (SW3-8)	13
	FLON (SW5-1)	FLPW (SW5-2)	FLNS (SW5-3)	UPTRM (SW5-4)	14
	SCMST (SW5-5)	SESON (SW5-6)	SOFTON (SW5-7)	SOFT1/2 (SW5-8)	15
	SNUMA (SW1-1)	SNUMB (SW1-2)	SNUMC (SW1-4)	SNUMD (SW1-8)	16
	SBTM/A (SW4-1)	WIPON (SW4-2)	NFEED (SW4-3)	NISIN (SW4-4)	17
	–	–	–	–	18
	–	–	–	–	19
	HOSA 0 (SW4-5)	HOSA 1 (SW4-6)	HOSB 0 (SW4-7)	HOSB 1 (SW4-8)	20
	HOSD 0 (SW6-1)	HOSD 1 (SW6-2)	SCMATR (SW6-3)	SCMESP (SW6-4)	21
	–	–	–	–	22
	ACT A (SW6-5)	ACT B (SW6-6)	ACT D (SW6-7)	H/N (SW6-8)	23

Remarks

Bit 1 to bit 4 in data select No. 03 A, B, C, D and 05 to 09 bit 1 to bit 4 are in binary.

The correspondence between decimal and binary numbers is given in Table 4-10.

Table 4-10

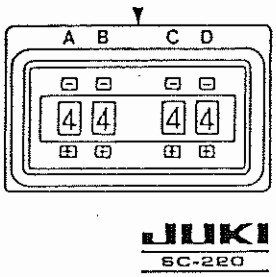
Decimal	SPDET D bit 4	SPDET C bit 3	SPDET B bit 2	SPDET A bit 1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

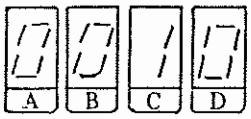
Note)

In maximum speed limit switch read-in, 0 is taken to be 1, so the decimal-binary correspondence is displaced by 1.

Decimal		Binary
1	→	0000
16	→	1111

Examples:

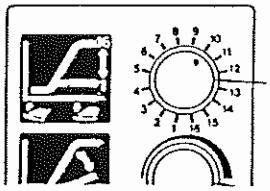


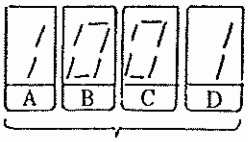


Step A, for 4 stitches

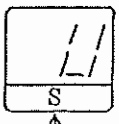
Test program

Step A check

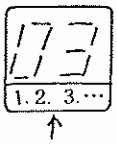




Indicator shows 10, but since 0 is taken to be 1 the actual number is 9.



Test program



Maximum speed limit switch check

★ Synchro test program (using SC-320 panel)

When this function is used, the control box indicator section is used and indications are output from the synchronizer. This test checks whether the upper/lower position detection signal and rotation detection tachometer signal are being input correctly (during testing the sewing machine will not run; this is not a malfunction).

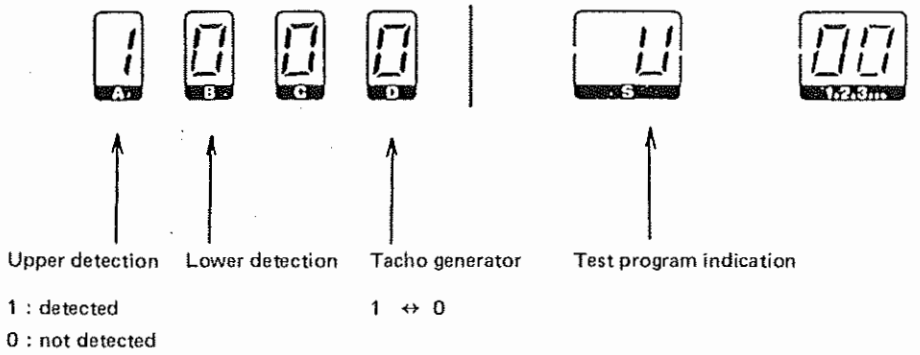


Fig. 4-10

When the upper position is detected by turning the pulley by hand, the step A indicator switches from 0 to 1. While detection continues it keeps indicating 1. If the pulley is turned farther by hand and the position is no longer detected, the indicator switches back from 1 to 0. The lower position detection can be checked in a similar manner by using the step B indicator section.

If the pulley turning is speeded up slightly and continued, the step D indicator change from 0 to 1 and 1 to 0 in succession. This is because pulses are generated by the generator incorporated into the pulley. This repeated changing of the indication confirms that the rotation detection signal is being output normally.

(9) Reverse stitching solenoid timing correction

In automatic reverse stitching, if the forward and reverse stitches are not properly aligned this function will correct for this by changing the reverse feed solenoid ON/OFF timing (this is only effective when there are at least 3 stitches in each step).

When the stitches are off due to such causes as change of automatic reverse stitching speed or change of head, use this function to make the necessary adjustment.

★ Automatic start reverse stitching solenoid ON timing correction

Make the correction as in Table 4-11 using a combination of switch 6-5 (ACTA), switch 4-5 (HOSA 0) and switch 4-6 (HOSA 1).

Table 4-11

ACTA	HOSA 0	HOSA 1	Correction
ON	OFF	OFF	−1
ON	ON	ON	−0.5
OFF	ON or OFF	ON or OFF	0
ON	OFF	ON	0.5
ON	ON	ON	1

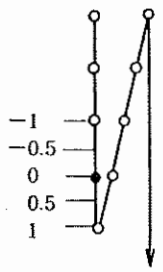
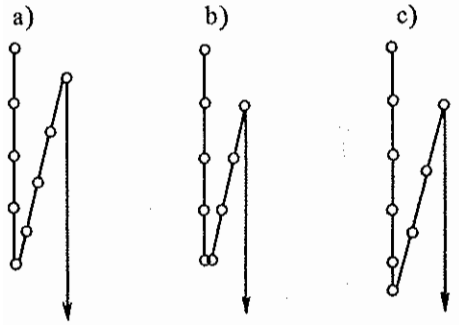


Fig. 4-11

* Assuming the point, which is one stitch before, as zero, correction can be made one stitch before or after that zero.

Note) The solenoid is actuated one stitch before to produce a time delay between the electrical signal and the mechanical operation.

Example 1) With the setting in Fig. 4-4, stitching will not be done in the reverse direction.



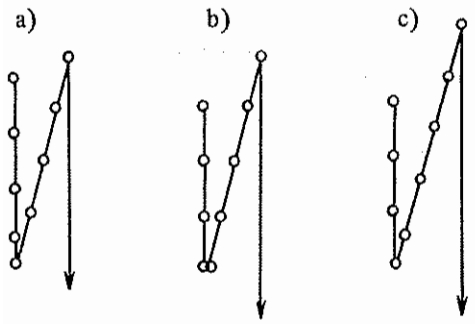
a) The pitch is too small in the first stitch in the reverse direction.
b) The needle enters one point twice.
c) There is one stitch too many in the forward direction.

— These situations can occur when the backstitching speed is increased.

Fig. 4-12

If situation a), b) or c) above occurs, reset so that the reverse feed solenoid will be actuated faster (– direction).

Example 2) With the setting in Fig. 4-4 stitching is not done in the forward direction.



a) The pitch is too small on the 4th stitch in the forward direction.
b) The needle enters the same point twice.
c) There is one stitch too many in the reverse direction.

Fig. 4-13

Situations a), b) and c) can occur when the reverse stitching speed is too slow. In such a case reset so that the reverse feed solenoid will be actuated later (+ direction).

○ Automatic start reverse stitching solenoid OFF timing correction
Make the necessary correction as in Table 4-12 using a combination of switch 6-6 (ACT B), switch 4-7 (HOSB 0) and switch 4-8 (HOSB 1).

Table 4-12

ACTB	HOSB 0	HOSB 1	Correction
ON	OFF	OFF	−1
ON	ON	OFF	−0.5
OFF	ON or OFF	ON or OFF	0
ON	OFF	ON	0.5
ON	ON	ON	1

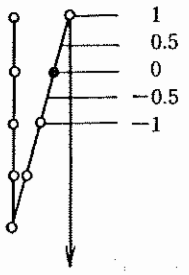
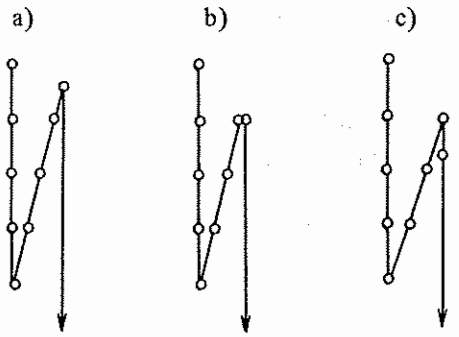


Fig. 4-14

Example 1) With the setting in Fig. 4-4 there are too few stitches in the reverse direction.



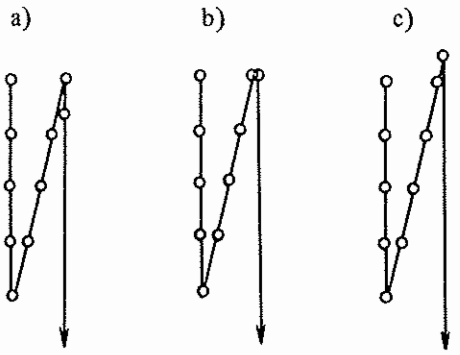
a) The pitch of the last stitch is too short.
b) The needle enters the same point twice.
c) There is one stitch too few in the reverse stitching (one is carried over into the free sewing).

These situations can occur when the reverse stitching speed is too slow.

Fig. 4-15

In such a case, reset so that the reverse feed solenoid goes OFF later (+ direction).

Example 2) With the settings in Fig. 4-4 there are too many stitches in the reverse direction.



a) The pitch is too short in the first stitch of the free sewing.
b) The needle enters the same point twice at the end of the reverse stitching.
c) The first stitch of the free sewing is sewn in the reverse direction.

These situations can occur when the reverse stitching speed is too fast.

Fig. 4-16

In such a case, reset so that the reverse feed solenoid goes OFF earlier (− direction).

○ Automatic terminal reverse stitching solenoid OFF timing correction
Make this correction as shown in Table 4-13 using a combination of switch 6-7 (ACT D), switch 6-1 (HOSD 0) and switch 6-2 (HOSD 1).

Table 4-13

ACTD	HOSD 0	HOSD 1	Correction
ON	OFF	OFF	−1
ON	ON	OFF	−0.5
OFF	ON or OFF	ON of OFF	0
ON	OFF	ON	0.5
ON	ON	ON	1

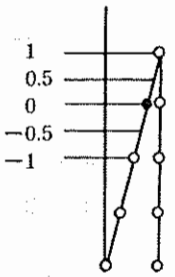


Fig. 4-17

Example 1) With the setting in Fig. 4-4, there are too many stitches in the reverse direction.

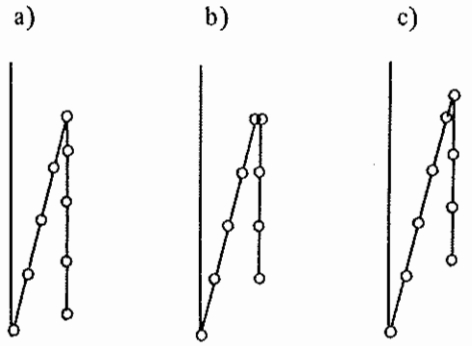


Fig. 4-18

a) The pitch of the first forward stitch is too short.
b) The needle enters the same point twice at the change from forward to reverse.
c) There are too many stitches in the reverse direction.

These situation can occur when the reverse stitching speed is too fast.

In such a case reset so that the reverse feed solenoid goes OFF sooner (– direction).

Example 2) With the setting in Fig. 4-4 there are too few stitches in the reverse direction.

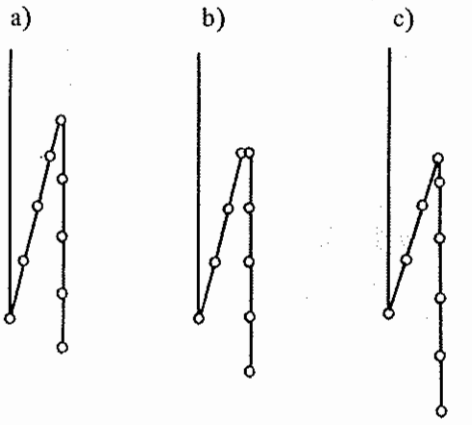


Fig. 4-19

a) The pitch of the last stitch in the reverse direction is too short.
b) The needle enters the same point twice at the change from forward to reverse.
c) There are too many stitches in the forward direction.

These situations can occur when the reverse stitching speed is too slow.

In such a case reset so that the reverse feed solenoid goes OFF later (+ direction).

Note) Since the automatic terminal reverse stitching solenoid ON timing is such that actuation is done from low speed, and on a command from free sewing, corrections are not made.

4-3. Increase of control panel functions

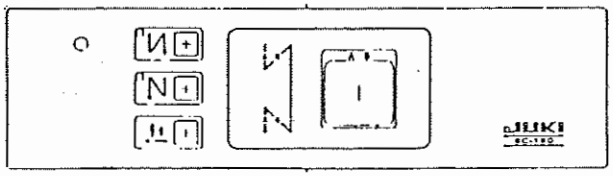
The number of functions can be increased by changing the control box. Depending on the type of control box, the functions given in Table 4-14 are available.

Table 4-14

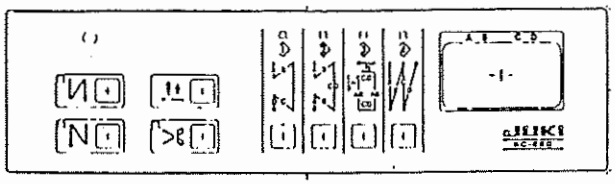
Control box	Model	Principal functions
No box	SC–20	Thread trimming, wiper, reverse stitching
SC–110	SC-110	Thread trimming, wiper, reverse stitching, SBT, EBT
SC–220	SC–220	Thread trimming, wiper, reverse stitching, SBT, EBT, pattern sewing, overlap sewing
SC–320	SC–320	Thread trimming, wiper, reverse stitching, SBT, EBT, pattern sewing (programmed), overlap sewing

The SC-120, SC-220 and SC-320 control boxes are shown in Fig. 4-20.

SC–120



SC–220



SC–320

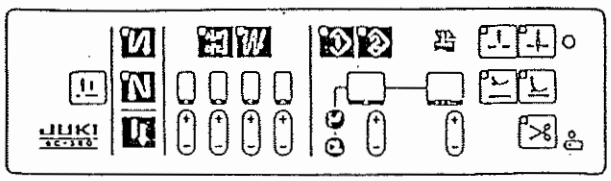


Fig. 4-20

1) How to remove the control box

① Remove the 2 screws ❷ on control box ❶ in Fig. 4-21 with a screwdriver.

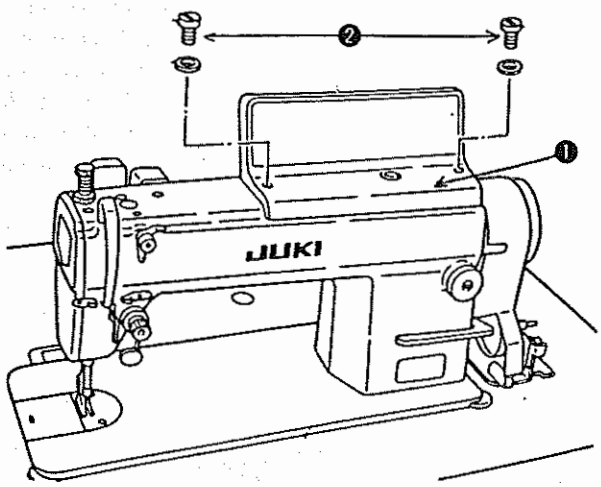


Fig. 4-21

② Next, open the PSC box front cover ❸ , unplug cord connector ❺ connected to connector J60 or J61 on main circuit board ❹ , and remove the cord from rubber bushing ❻ .

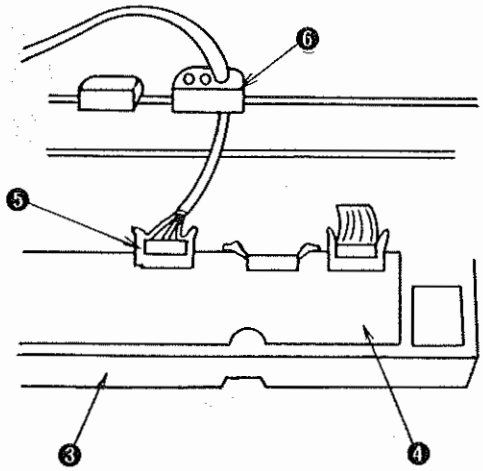


Fig. 4-22

③ As shown in Fig. 4-23, remove the cord from hole ❼ in the table along the wiring route, then remove the control box.

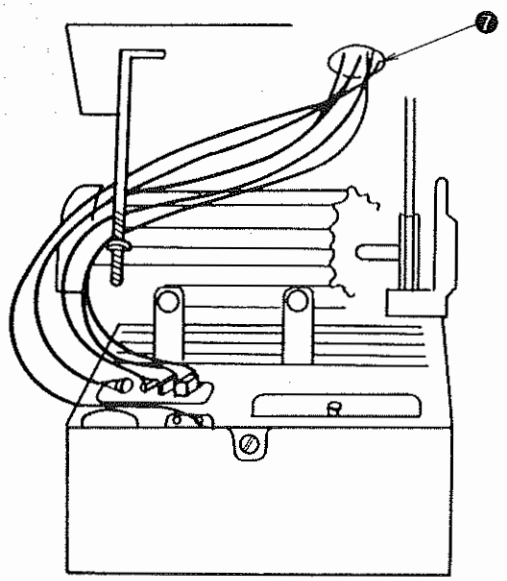


Fig. 4-23

2) Control box mounting

(1) Place the new control box in the correct box mounting position on the top surface of sewing machine head and mount it with the 2 accessory screws (Fig. 4-21).

(2) Bring the cord to the PSC box position along the wiring route in Fig. 4-23.

(3) Open the PSC box front cover. Connect the type of connector specified for the type of box being mounted (SC-20, J67 2P, SC-120, SC-220, J60 16P, SC-320 J61 20P.)

(4) Finally, connect the cord to the type of rubber bushing specified for the type of box being mounted. [so that the cord bundling band fits inside the rubber bushing (inside the box)], and close the front cover to complete the mounting.
The position specified for the rubber bushing is shown in Fig. 4-24.

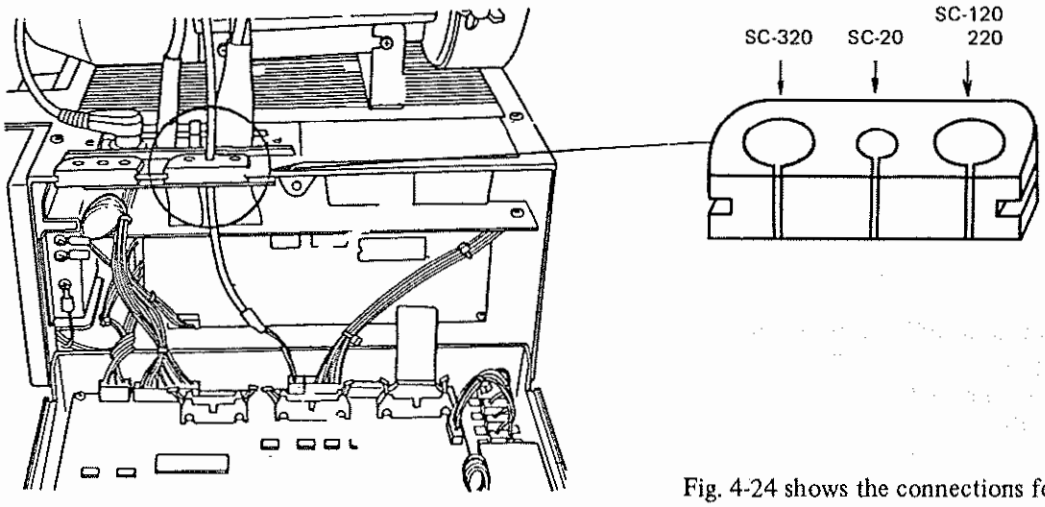


Fig. 4-24 shows the connections for the SC-20.

Fig. 4-24

4-4. Safety circuit

The SC-20, SC-120, SC-220 and SC-320 all have safety circuits such as the following. Here we explain their functions, circuit operation and resetting.

1) Sewing machine lock safety circuit

< Purpose >

If the sewing machine should lock in place due to some mechanical or electrical malfunction or if it idles due to the V-belt coming loose, after 2 seconds (0.1 second in case of a sudden sewing machine lock) power to the motor and pedal input are shut off to protect the motor from burn out and reduce damage to the sewing machine to a minimum.

< Circuit operation >

All input and output is prohibited. Even if the pedal is depressed the sewing machine will not run. Manual reverse stitching also becomes inoperative as does the reverse feed solenoid.

< Resetting >

Turn the power switch OFF, remove the cause of the sewing machine stopping and turn the power back ON.

2) Synchronizer malfunction safety circuit

< Purpose >

When the synchronizer that detects the needle position (up or down) malfunctions, or if the needle stopping position becomes indeterminate (it stops anywhere) or it fails to stop and keeps running, the thread trimming mechanism could be damaged, which would make the sewing machine unusable.
To prevent this, the microprocessor constantly checks the synchronizer up and down signals. If an abnormality occurs in the signals the sewing machine continues to work its motor functioning as a clutch motor without thread trimming.

< Circuit operation >

If an abnormality is detected during sewing machine operation, even if the pedal is depressed the sewing machine stops. After that, when the pedal is returned to neutral and depressed again the unit works as a clutch motor, so sewing can be done with it operating as a clutch motor without thread trimming or automatic reverse stitching (reverse stitching by the manual switch and presser foot lifting by the knee switch can be done).

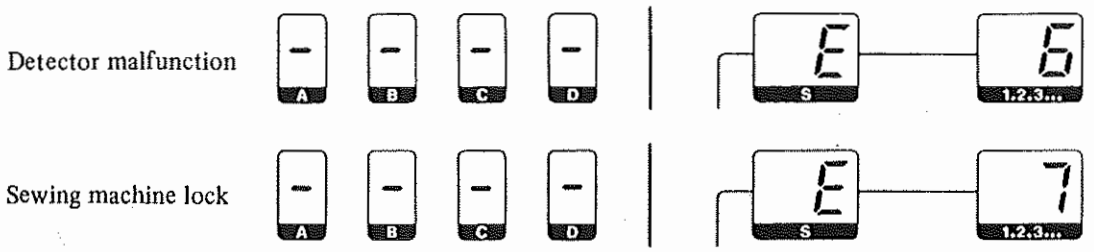
< Resetting >

Turn the power switch OFF, replace or repair the synchronizer and turn the power switch back ON.

< Error indication >

In the case of the SC-320, when the sewing machine locks or the synchronizer malfunctions an indication appears on the control box as shown in Fig. 4-25.

(1) When the sewing machine locks or the detector malfunctions the nature of the trouble can be determined from the control panel indicators.



(2) A panel error can be identified from the control panel indicators (when a panel error is indicated, turn the power switch OFF and back ON).

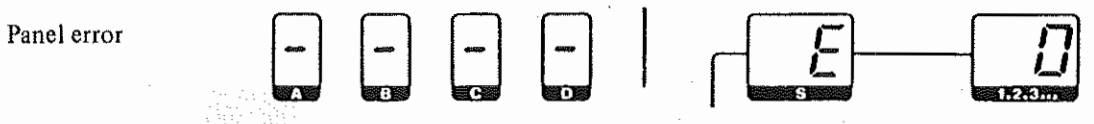


Fig. 4-25

(3) Every time a control panel switch is turned ON a beep sound is produced for confirmation (if an inoperative switch is pressed no sound is produced).
(4) If the pedal is depressed and the sewing machine fails to operate, a beep sound is produced. Example : if all steps have not been set in a programmed sewing pattern.

3) Thread trimming in progress/completed safety circuit

If the pedal is depressed while terminal reverse stitching or thread trimming is in progress, after the sewing machine has completed thread trimming it remains stopped to prevent needle breakage or blade damage.

< Resetting > Return the pedal to neutral, then depress it again and the sewing machine will return to normal operation.

4) If power is turned ON while pedal is depressed
If the power switch is turned ON while the pedal is depressed, if the needle is down it goes to the up position, if up it just stays there. Operation is the same as when the pedal is in neutral.
< Resetting > Return the pedal to neutral, then depress it again and the sewing machine will return to normal operation

5) Reverse feed solenoid safety circuit
If the manual reverse stitching switch is held ON continuously for 12 seconds or more, power to the reverse feed solenoid is shut off, except that automatic start and finish reverse stitching proceed normally even while this safety circuit is operating. If thread trimming takes place while this switch is held ON continuously, power to the reverse feed solenoid is shut off.
<Resetting > Turning the manual reverse stitching switch OFF releases the safety circuit.

6) Auto-lifter safety circuit
After the thread is trimmed, the presser foot is raised by the automatic lifting function, but if it stays up for 1 minute, the power to the presser foot lifting solenoid is automatically shut off and the presser foot is lowered. However, as discussed in the explanation of dip switches FLON and FLPW on Item 4-2-(7), when both FLON and FLPW are ON it stays up.
< Resetting > After the presser foot is lowered the system returns to the initial condition, and the presser foot can be raised at any time by thread trimming or the knee switch.

7) Needle position detector loose connector safety circuit
If this needle position detector connector becomes disconnected and then the power is turned ON, the motor will not operate.
< Resetting > Turn the power OFF, plug the connector in correctly as shown in Fig. 4-26 and turn the power back ON.

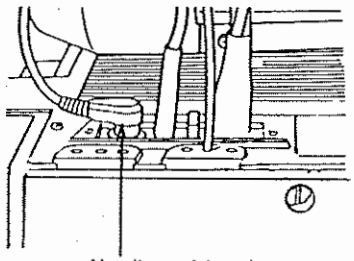

Needle position detector connector

Fig. 4-26

4-5. Connectors for standing work

On the SC20, SC-120, SC-220 and SC-320, 4 connectors for use in standing work are on the front after PSC box as standard equipment. When the pedal switch is connected to the pins of these connectors and turned ON, the following operations are carried out.

1) Connector ❶ ..... Auto-lifter (operative only for a machine with an automatic presser foot lifting function)

2) Connector ❷ ..... for actuating the thread trimmer (valid after low-speed or high-speed sewing operation)

3) Connector ❸ ..... for high-speed sewing operation (the sewing speed in this case is determined by the 400 spm step speed control dial; cannot be changed by the conventional maximum speed adjustment dial ❻).

4) Connector ❹ ..... for low-speed sewing

Note) Automatic presser foot lifting operation (when connector ❶ switch is turned ON) is as described in 4-2 3) (7) Explanation of dip switch FLON (SW5-1) and FLPW (SW5-2). This operation is summarized in Table 4-15 below.

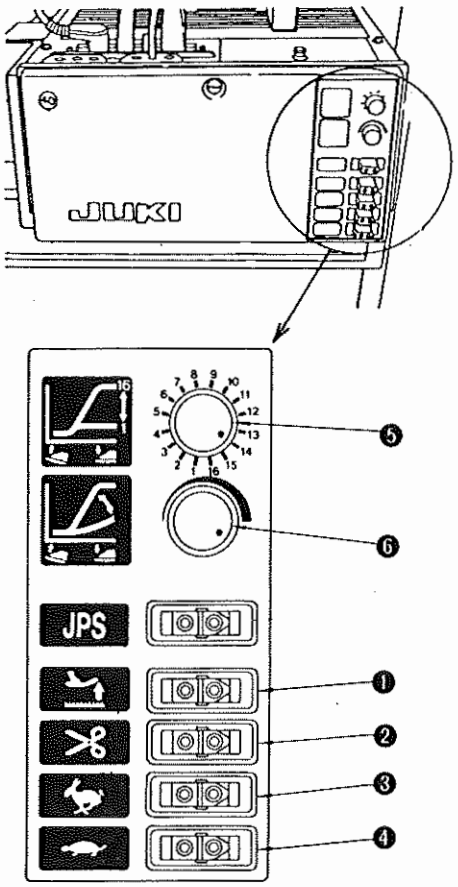


Fig. 4-27

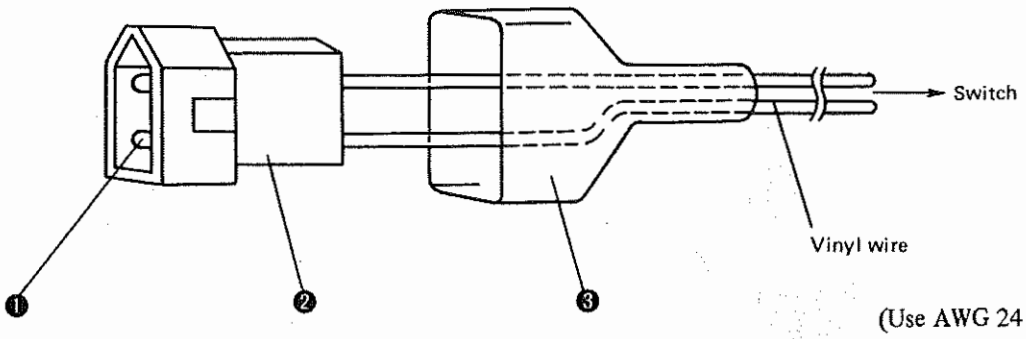
Table 4-15

FLON (SW5-1)	FLPW (SW5-2)	Control
ON	OFF	When connector ❶ switch is turned ON the presser foot is automatically raised; if there is no input for 60 seconds after that it is automatically lowered.
ON	ON	After the presser foot is automatically raised; even if there is no input it stays up.

Note) In standing sewing machine operation, if connector ❶ is used set FLON (SW-5) to ON.

< Standing work cable > (S134) MAS134000A0

The standing work cable can be connected to the various switches of the different section using the adapters in Table 4-16, which can be ordered. (Since one cable is needed for each connector, four cables are needed to connect to four connectors.)



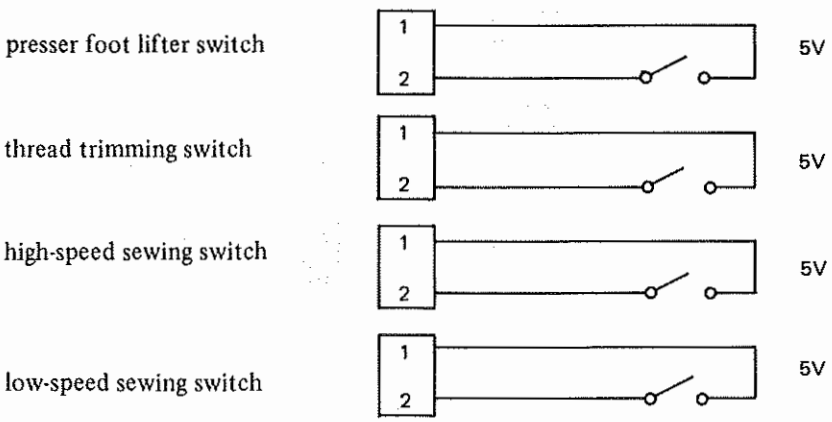
(Use AWG 24 to 18)

Fig. 4-28

Table 4-16

Symbol	Part name	Part number
❶	male pin terminal	D6043555B00
❷	plug 2P	HK017400020
❸	connector cover	MAT81126T00

< Wiring to external switches >



4-6. Production control system and needle-up stop switch functions

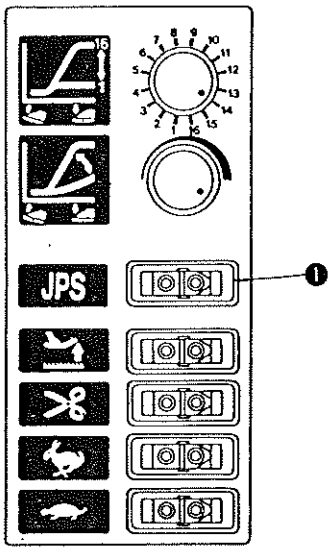


Fig. 4-30

When a cable is connected to connector ❶ in Fig. 4-30, either the (1) production control system function or the (2) upper stop function can be operated. To operate these functions it is necessary to reconnect the connectors on the rear of the front cover.
These functions are explained below.

1) Production control system
Connect J58 MANU.C on the main circuit board to connector ❶ as shown in Fig. 4-31 (this is how the machine is wired at the time of factory shipment) and also connect connector ❶ to an external cable to make the production control system usable. When the wiring is done this way, a signal is output at the time of thread trimming.

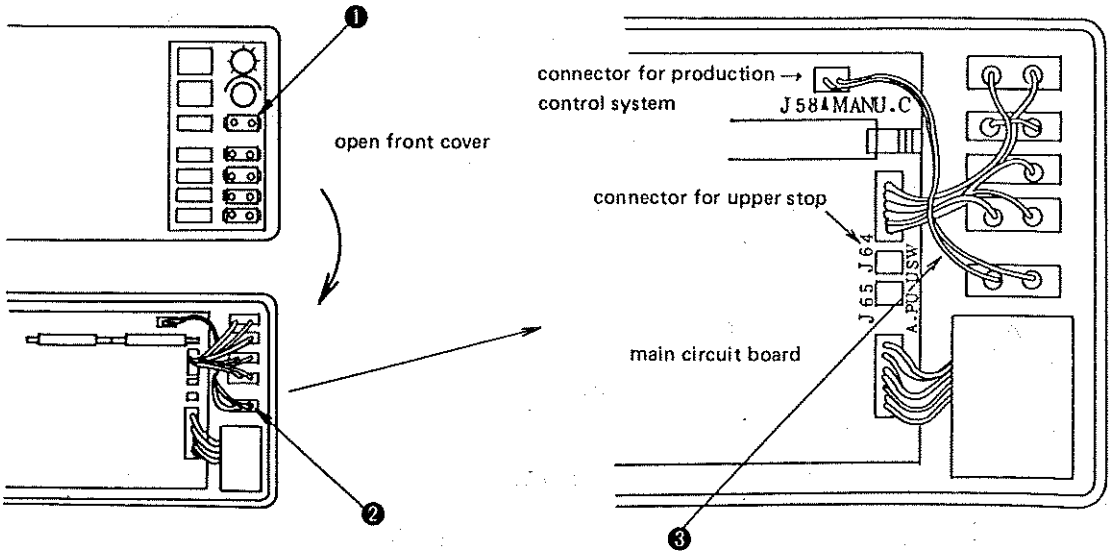


Fig. 4-31

2) Upper stop switch
When connector ❸ in Fig. 4-31 is connected to J64 USW on the main circuit board, and the special order upper stop switch is connected to connector ❶ , the needle is stopped in the upper stop position without thread being trimmed during the sewing operation.

< Attachment to table >
① Fix upper stop switch Ⓐ in place with the wood screws that come packed with it.
② Next, fix the switch cord in place with 4 staples.
③ Connect the cable to connector ❶ in Fig. 4-31.

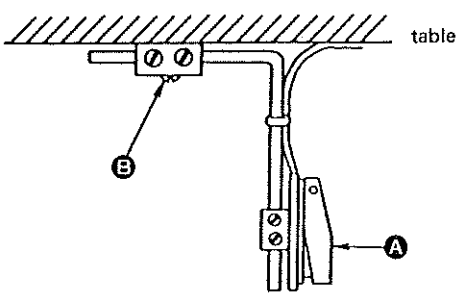
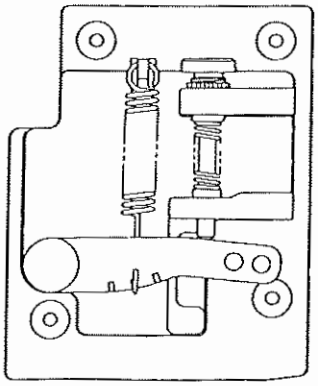


Fig. 4-32

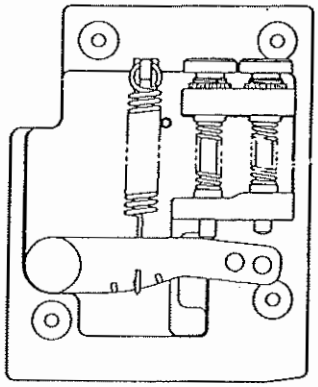
5. MAINTENANCE AND INSPECTION

5-1. How to replace the sensor potentiometer set

If the sewing speed of the machine decreases suddenly or the machine stops while the front part of the pedal is depressed, replace it because it has reached end of its service life. There are two types of the pedal sensors A and B as shown in Fig. 5-1 (a) and (b). However, they are different from each other only in their pedaling springs, so replace them the same way.



(a) Pedal sensor type A
(except AK-31)



(b) Pedal sensor type B
(for AK-31)

Fig. 5-1

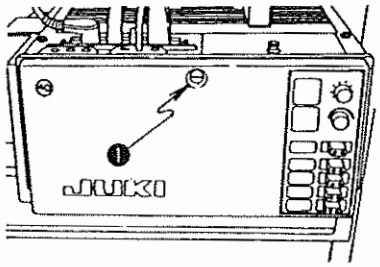


Fig. 5-2

1) Remove the front cover setscrew (Fig. 5-2 ❶) in the PSC box, and open the front cover.

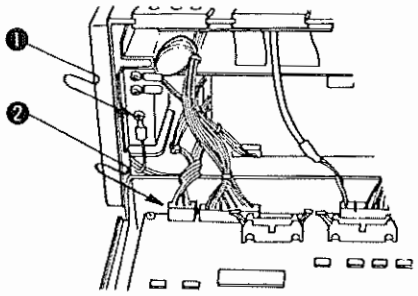


Fig. 5-3

2) Disconnect the 6P connector of the sensor potentiometer set (Fig. 5-3 ❶) from the main circuit board. (The locking device is installed in the connector housing, so push it open by hand, and pull it out.)

3) Remove the FG cord of the pedal (Fig. 5-3 ❷) screwed on the main frame.

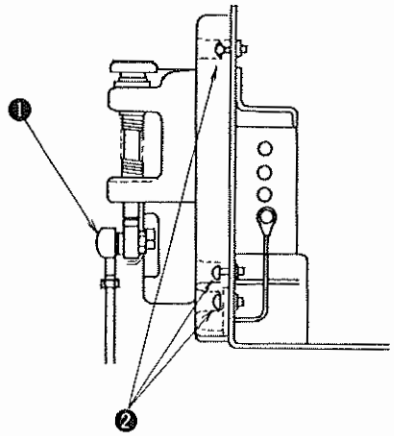


Fig. 5-4

4) Remove the pedal connecting bar (Fig. 5-4 ❶) from the pedal lever (using two hexagon spanners for M10).

5) Remove the four screws attaching the pedal sensor (Fig. 5-4 ❷), then remove the pedal sensor set from the PSC box.

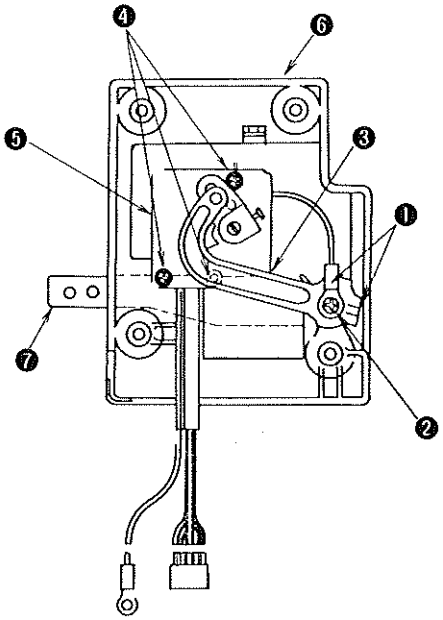


Fig. 5-5

6) Loosen the two pedal link setscrews (Fig. 5-5 ❶) with an L type hexagon wrench. Then, remove the pedal FG cord setscrew (Fig. 5-5 ❷) and remove the pedal link (Fig. 5-5 ❸). (Do not remove pedal lever ❼).

7) Remove the three sensor potentiometer setscrews (Fig. 5-5 ❹), then remove the sensor potentiometer set (Fig. 5-5 ❺).

8) Loosen the potentiometer link setscrew (Fig. 5-6 ❶) of the sensor potentiometer set, then remove the potentiometer link (Fig. 5-6 ❷).

9) Assemble the removed potentiometer link on the new sensor potentiometer set.

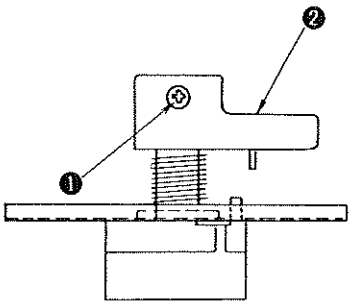


Fig. 5-6

10) Turn the potentiometer shaft counterclockwise until it stops, contacting the potentiometer link positioning pin (Fig. 5-7 ❶) to that in the sensor potentiometer mounting position (Fig. 5-7 ❷). Then, tighten the setscrew at that position (tightening torque 8 ~ 10 kgcm).

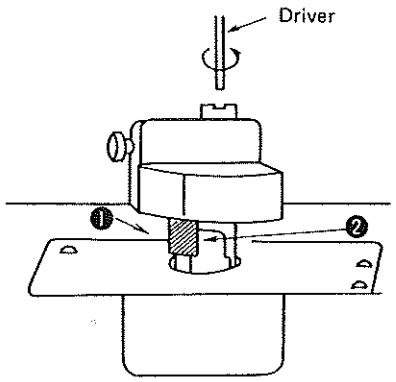


Fig. 5-7

11) Install the sensor potentiometer set in the pedal sensor mount (Fig. 5-5 ❻) with the four setscrews (Fig. 5-5 ❹).
(**Note:** Install it after arranging the lead wires properly so that the mounting plate does not bulge. Fig. 5-8 ❶)

12) Insert the pedal link pin into the potentiometer link slot to assemble.

13) Temporarily set the pedal link setscrew (Fig. 5-9 ❶) and install the springs for depressing the front and back parts of the pedal. (pedal sensors type A: 1, type B: 2).

14) Turn the pedal lever (Fig. 5-9 ❷) in the arrow direction until it contacts the stopper. Tighten the link setscrew where the clearance between the lever and the potentiometer link becomes 2 mm (0.079″) and the axial looseness becomes 0.05 ~ 0.1 mm (0.002″ ~ 0.004″).
(**Note:** At this time, check that the pedal lever operates easily without looseness.)

15) Finally, assemble in the reverse order of disassembly. Using VR6, VR7 and VR8, adjust the operating positions of the presser foot lifter (pedal sensor type B only) and the thread trimming and stroke position starting rotation.

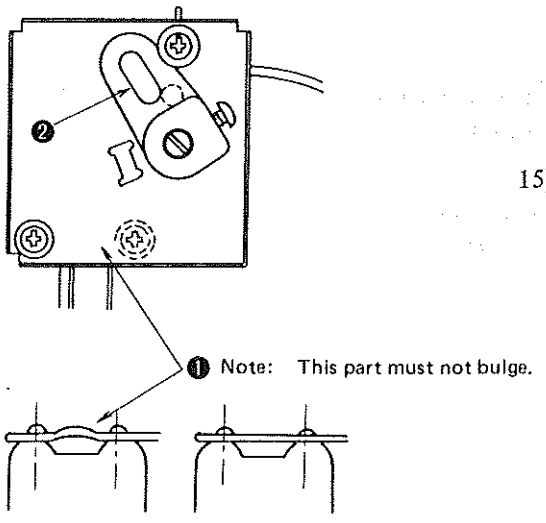


Fig. 5-8

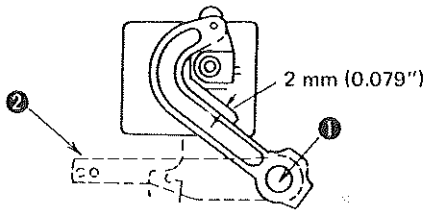


Fig. 5-9

5-2. Memory battery charging monitor LED (SC-320 only)

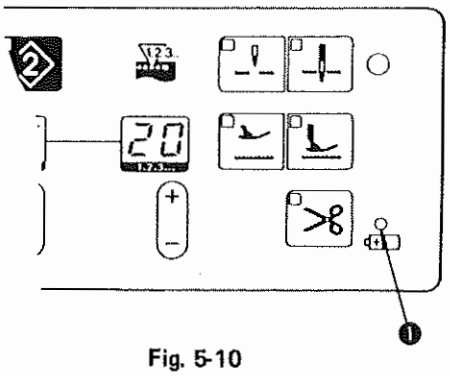


Fig. 5-10

If the sewing machine is not operated for a long time, it can lose charge, and LED 1 may light.
When the LED lights, all the patterns in internal memory are lost.
If necessary, set the memory again.
However, this does not cause trouble in sewing, so continue to work.

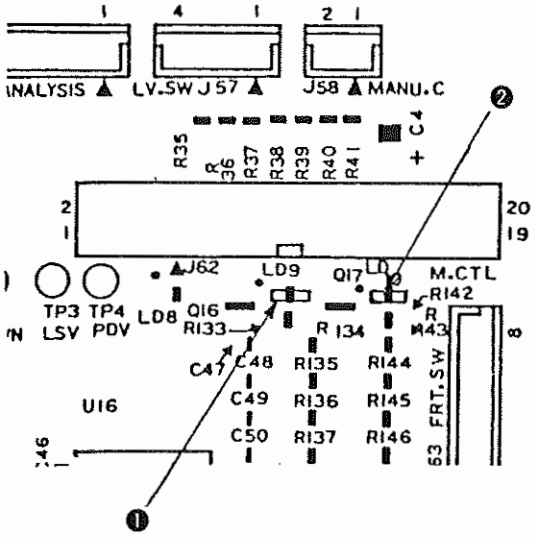
< For reference >

1. Time required to charge.
   4 ~ 5 hours (enough for one day of operation)
2. Backup period
   Since semiconductors are used, the backup period varies according to the operating conditions.
   It is calculated as follows;

   Standard : approx. 600 days
   Worst case : approx. 6 days

Judging from the above results, the backup should last more than three months in an ordinary location.

5-3. Motor malfunction detector LED



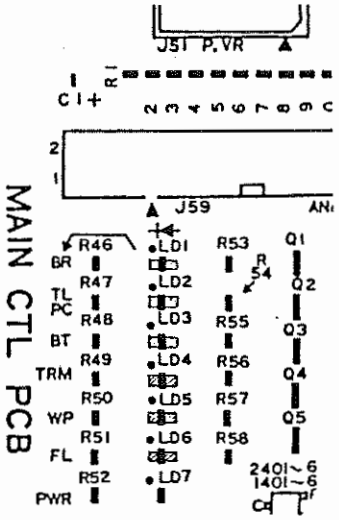
The LED on the main circuit board inside the front cover detects overvoltage, overcurrent or low voltage applied to the motor in sewing.
The explanation of each dectector LED is as follows;

(1) LD9 ❶ (MTL 3)
When the overcurrent (more than 20A) is continuously applied to the motor for 100 ms or more, turn LD9 "ON", put the motor controller in an unenergized state and then completely stop the motor within 300 ms. Reset the motor when it is in a operable state by turning the power switch ON again. Consequently, once the motor is locked, do not reset it until the power switch is again turned ON even if the troubles have been solved.

(2) LD10 ❷ (MTL 2)
When the supply voltage becomes too high or low for the motor condition, turn LD10 "ON", put the motor controller in an unenergized state and then completely stop the motor within 300 ms. Reset the motor when the supply voltage becomes one of the following normal values at the time of next turning the power switch back ON. Once the motor is locked, do not reset until the power switch is turned ON again.

Rated voltage	Over voltage	Low voltage	Normal voltage
2φ200 ~ 240V	300V Min.	140V Max.	140 ~ 300V
1φ100 ~ 120V	150V Min.	70V Max.	70 ~ 150V
1φ200 ~ 240V	300V Min.	140V Max.	140 ~ 300V

5-4. Solenoid monitor LED

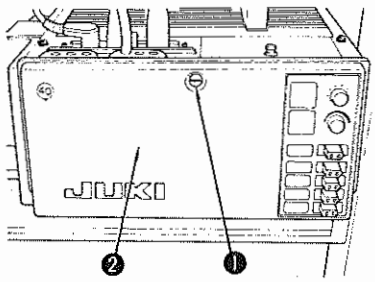


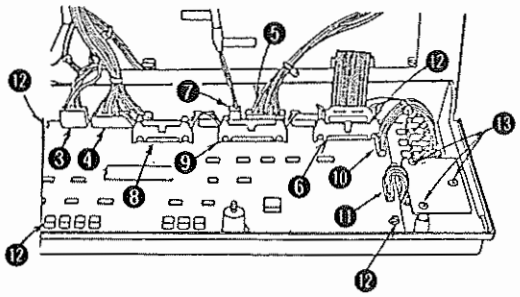
1) If malfunction of trimming (TRM), wiper (WP), presser foot lifting (FL), reverse feed (BT), brake (BR), etc. has occurred in ordinary operation, troubleshoot according to the following procedure.
   (1) After turning the power "OFF", loosen the PSC front cover setscrew and open the cover.
   (2) Then, turn the power "ON", check the solenoid operation and the main circuit board LED brightness and find the failure.

Solenoid	LED	Location of failure	Checking method
Does not operate	Does not light	Function selection switch is not set (FL, WP), Main circuit board is defective.	Check with the manual Replace the board.
	Dark	Incorrect wiring system (imperfect contact, coming out and disconnection of J52 connector) Power circuit board is defective. Transistor circuit board is not set. Transistor circuit board is defective (imperfect contact, breakage).	Reinsert connector and check conduction. Replace or add the board. Use another transistor board.
	Bright	Defective J49 (12P) connector (coming out, imperfect contact, disconnection) Defective solenoid Defective circuit J41 connector power board (coming out, imperfect contact, disconnection)	Reinsert connector and check conduction. Measure resistance. BR, LED ON (BR solenoid OFF)
Continues to operate light	Does not light	Transistor circuit board is defective.	Use another transistor board.
	Dark	Main circuit board is defective. Wiring system or power circuit board is defective. Transistor circuit board is defective. (Defects triplicated)	Replace box.
	Bright	Main circuit board is defective.	Replace main circuit board.

5-5. How to replace each circuit board

1) Main circuit board set [M4001301AAO]
   (1) Loosen setscrew ❶ on the front cover in the PSC box and remove the front cover ❷ .
   (2) Next, disconnect the connectors attached to the main circuit board (J51-P.VR ❸ , J52-SOL ❹ , J55-POWER ❺ , J62-M. CTL ❼ , J60-SC-220 ❽ , SC-220, J61-SC-320 ❾ , 66-MAX VR ❿ , J63-FRT.SW ⓫).
   (3) Remove the four main circuit board setscrews ⓬ and remove the old main circuit board from the front cover.
   (4) Mount the new main circuit board on the front cover in the reverse order to that of removal.
   (5) Finally, adjust the pedal stroke and the speed as prescribed in the previous clause. With this, the replacement is completed.





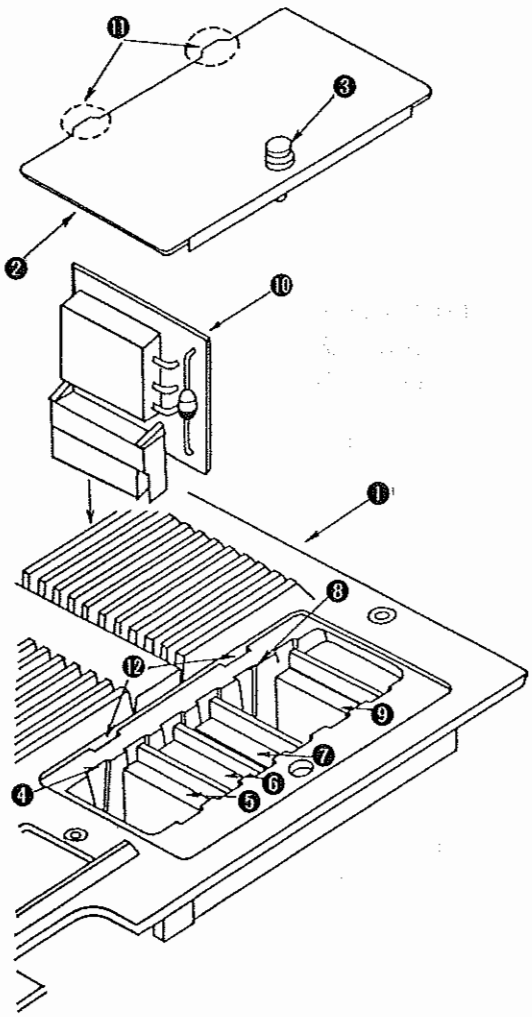
2) Speed limiting circuit board assembly [M4301301AAA]

(1) Disconnect connector J63-FRT.SW after completing the above procedure 1)-(1).

(2) Remove the three circuit board setscrews ⓭ , remove the old speed limiting circuit board from the front cover and replace it with a new one.

(3) Finally, assemble the new one in the reverse order to that of removal. With this, the replacement is completed.

3) Replacement of transistor circuit boards assembly [M4201301OAO]



(1) Push up latch ❸ to open PSC box top cover ❶ and upper right transistor circuit board cover assembly ❷ .

(2) Next, pull the transistor circuit board assembly ❿ corresponding to the location of the malfunction up and out. [BR= ❹ (none in case of Company N), FL= ❺ (none in case of AK), WP= ❻ , TRM= ❼ , TL, PC (none in case of lockstitch specification), = ❽ , ST= ❾]

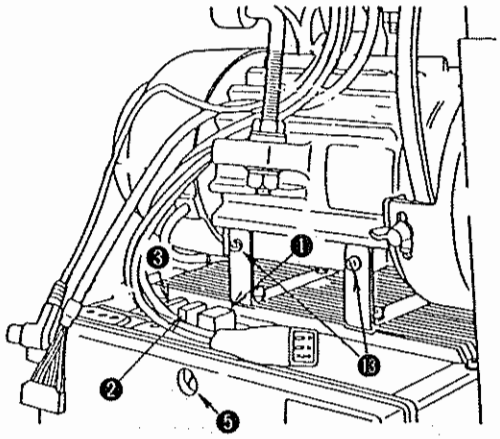
(3) Next, pass a new transistor circuit board assembly through the slit in the PSC box top cover and fit securely onto power supply circuit board A and B assemblies.

(4) Last, fit transistor circuit board group protrusion ⓫ to PSC box top cover guide ⓬ , close the cover, and lock the latch to complete the replacement.

It position at which the transistor is to be pushed in, marked by a symbol on the front right part of the power supply circuit board inside the opened front cover (only in case of Company H).

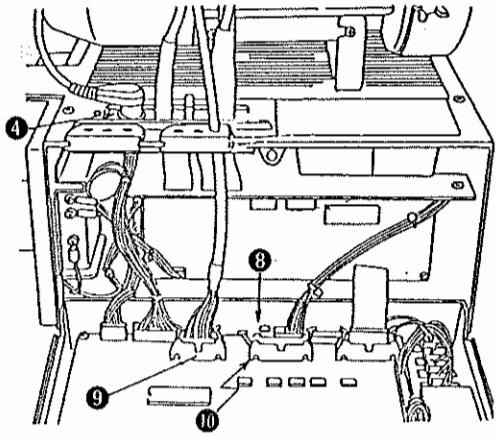
BR : brake transistor
FL : presser foot lifter transistor
WP : wiper transistor
TRM : thread trimmer transistor
BT, PC, TL : not used
BT : backtack (reverse feed) transistor

4) Replacement of power supply circuit board assembly A (Company H; one and three-phase; Company N; three-phase) [M4101301AAO], assembly B (Company N; one-phase) [M4101301BAO]

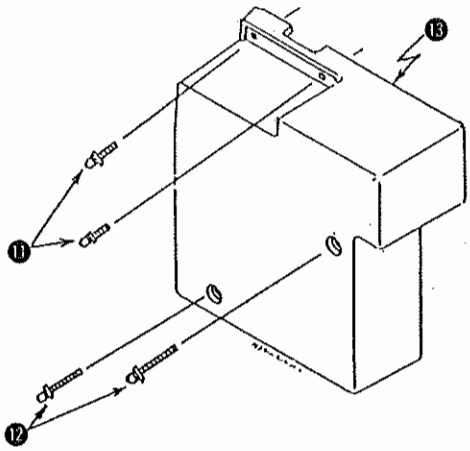


(1) Remove connectors J49 (12P) ❶ , J48 (4P) (only the one with AK) ❷ , J47 (3P) (only in case of Company H) ❸ , and J46 (7P) ❹ , which are mounted on the PSC box.

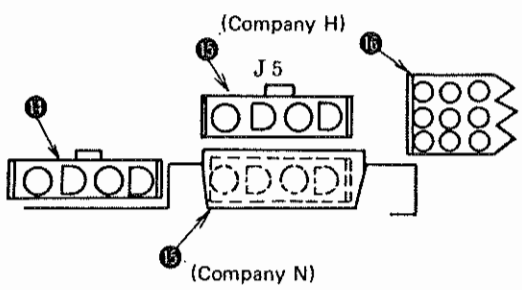
(2) Loosen PSC box cover setscrew ❺ , open the box cover and remove the connector. (J67 ❽ for the SC-20, J60 ❾ for the SC-120 and 220, J61 10 for the SC-320)



(3) Next, remove the 4 PSC box side power pack cover ⓭ setscrews ⓫ (M4 x 16) and ⓬ (M4 x 32), remove the power pack cover and remove connectors J1 ⓮ , J5 ⓯ and J23 ⓰ .

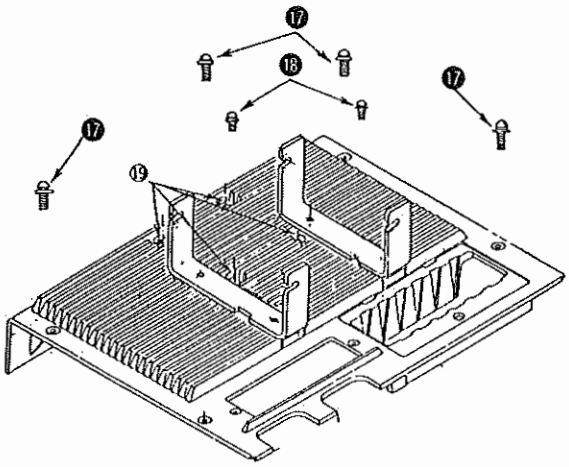


(4) Next, remove the pedal coupling rod from the pedal sensor.



PSC box side view

(5) Loosen the 4 motor box coupling screws (M5 x 14) and remove the PSC box from the motor.

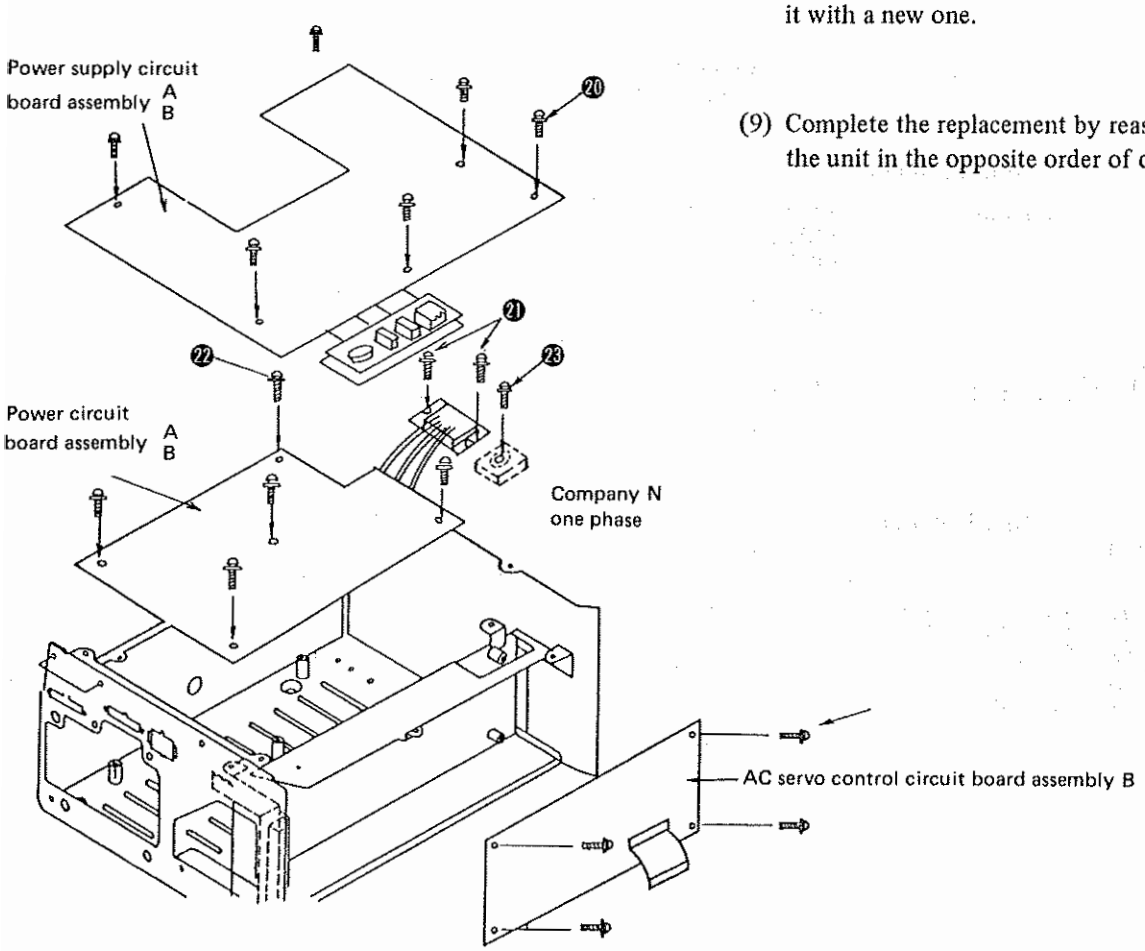


(6) Remove all of the transistor circuit board assembly, loosen the 6 screws ⑰ (M4 x 8 with teeth) and ⑱ (M3 x 8), and remove the PSC box top cover from the main frame. Absolutely do not remove screws ⑲ at this time. (Please refer to section 5-9 [3] for instructions on how to remove the transistor circuit board assembly.)

(7) Next, remove J41 (4P), J31 (3P), J32 (11P), J52 (SOL-15P) on the main circuit board, J55 (POWER-10P) and J24 (5P) on the AC servo control circuit board from power supply circuit board assembly $\frac{A}{B}$ [J13 (5P) in case of Company N.]

(8) Next, loosen the 6 screws (M4 x 8) ⑳ holding power supply circuit board assembly $\frac{A}{B}$ in place, remove the circuit board and replace it with a new one.

(9) Complete the replacement by reassembling the unit in the opposite order of disassembly.



5) Power circuit board assembly B [Company H M7201301BBO, Company N M7601301BBO], power circuit board assembly A [Company H M7201301ABO]

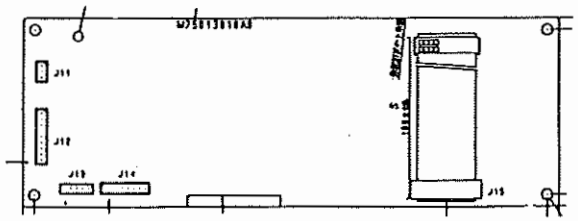
(1) After completion of step (1) to (8) in section 5-5 4), loosen the 6 power supply circuit board assembly A B setscrews ⑳ (M4 x 8) and remove the circuit board.

(2) Company H
① Remove J5 (4P) and J1 (4P) from the main frame.
② Remove J4 (6P) and J2 (4P) from the power circuit board.
③ Remove J21 (3P) from the AC servo control circuit board.
④ Loosen the 2 screws ㉑ (M5 x 10), and remove the rectifier from the main frame.
⑤ Loosen the 5 setscrews ㉒ (M4 x 8) on the circuit board, remove the circuit board and replace it with a new one.
⑥ Complete the replacement by reassembling in the reverse order of disassembly.

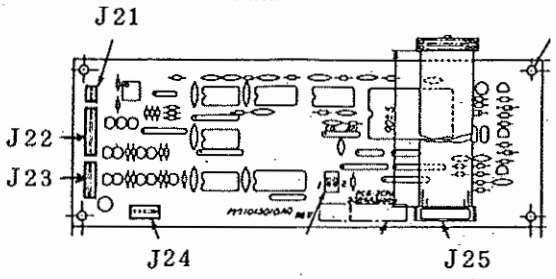
(3) Company N
① Remove J4 (4P) from the main frame.
② Remove J3 (4P), and J2 (3P) from the power circuit board.
③ Remove J11 (3P) from the AC servo control circuit board.
④ Loosen screws ㉓ (M4 x 16) and remove the rectifier from the main frame.
⑤ Same as step ⑤ and ⑥ for Company H.

6) AC servo control circuit board assembly [Company H M7101301OBO, Company N M7501301OBO]

Matsushita motor



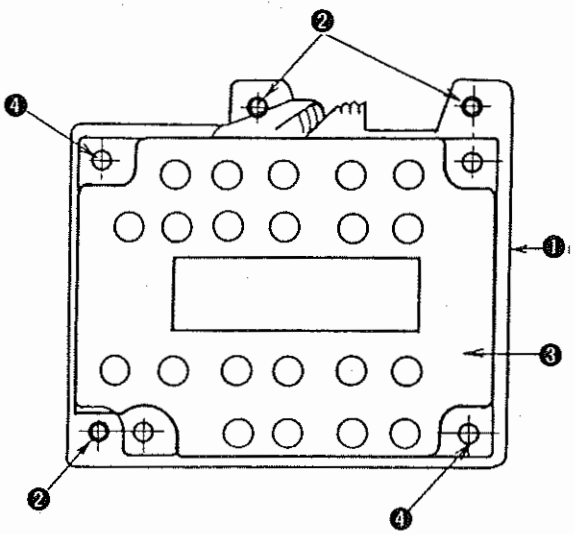
Hitachi motor



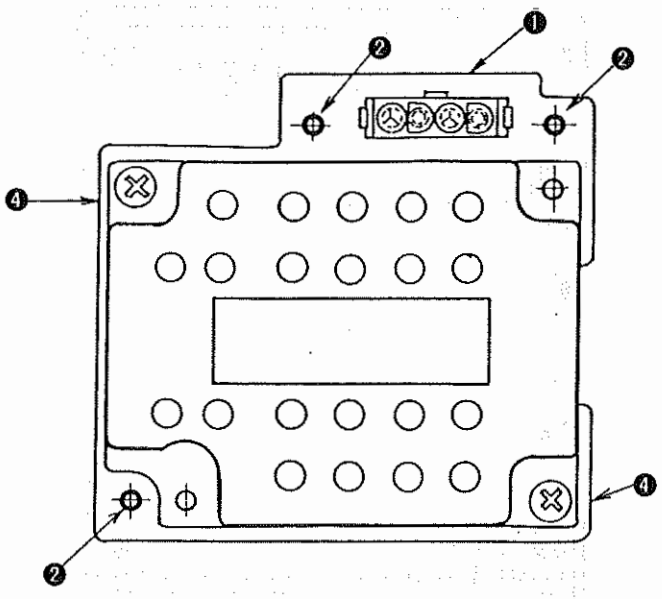
(1) Loosen the front cover setscrews on the PSC front surface, and open the front cover.
(2) There are two types of AC servo control circuit board assembly B, depending on the motor, as shown in the figure at left.
(3) Disconnect all of the connectors. Since the connectors have locks, to remove first unlock, then pull out.
(4) Next, remove the 4 circuit board setscrews (M4 x 8) and replace the circuit board by a new one.
(5) Complete the replacement by reassembling in the reverse order of disassembly.

7) Power pack replacement [Company H M7301301OBO / Company N M7701301BBO]

(1) Remove the setscrews from the power pack cover on the side of the PSC box, then remove the power pack cover.

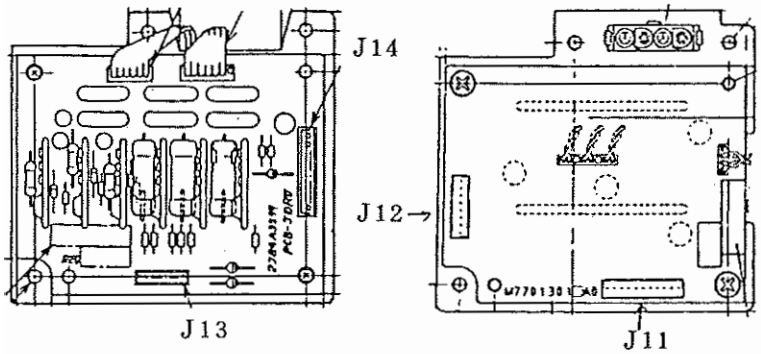


Hitachi motor



Matsushita motor

(2) Next, loosen the 2 setscrews ❹ (M4 x 10) and remove power pack safety cover ❸ .



Hitachi motor

Matsushita motor

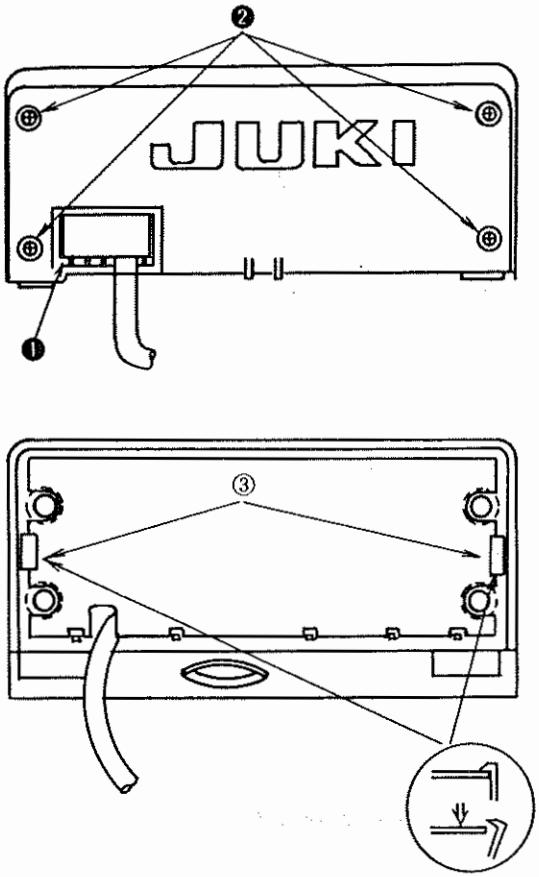
(3) Next, pull the connectors (Company H J14 and J13; Company N J11 and J12) out of the power pack circuit board.

(4) Next, loosen the 3 screws (M4 x 8) fixed to the main frame, and pull the power pack forward from the main frame.

(5) Next, remove the connectors that are connected to power circuit board assembly $\frac{A}{B}$, and remove the power pack from the PSC box.

(6) Reassemble with a new power pack in the reverse order of disassembly.

8) How to replace the SC-120, SC-220 panel circuit board assembly



(1) Remove cord opening cover ❶ .

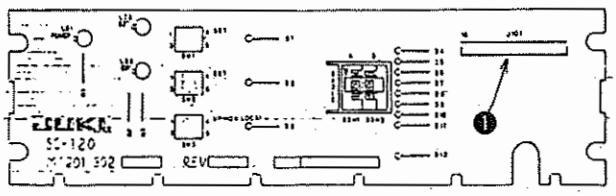
(2) Remove the 4 M3 x 10 tapping screws ❷ with washers, then separate the back panel and front panel.

(3) Open the 2 circuit board pressure locks ❸ to the outside, then remove the SC-120 or SC-220 panel assembly from the front panel.

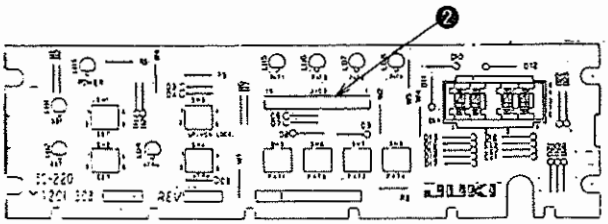
(4) Finally, pull out J101 (in case of SC-120) or J102 (in case of SC-120) and remove the circuit board to complete the disassembly.

(5) Using a new circuit board, reassemble in the reverse order of disassembly.

SC-120 circuit board assembly (M12013020A0)

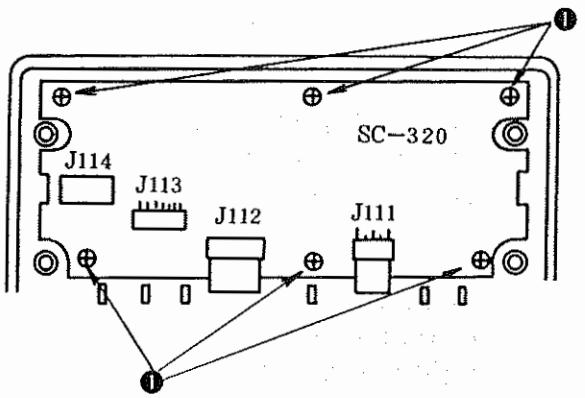


SC-220 circuit board assembly (M12013030A0)



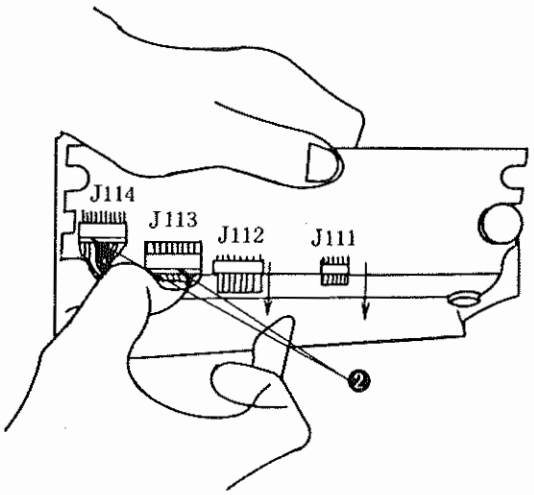
9) How to replace the SC-320 Panel circuit board assembly

(1) Remove the back panel from the front panel by the same procedure that was used in 8) SC-120, 220 circuit board assembly replacement steps (1) and (2).



(2) How to remove the connectors and membrane tail

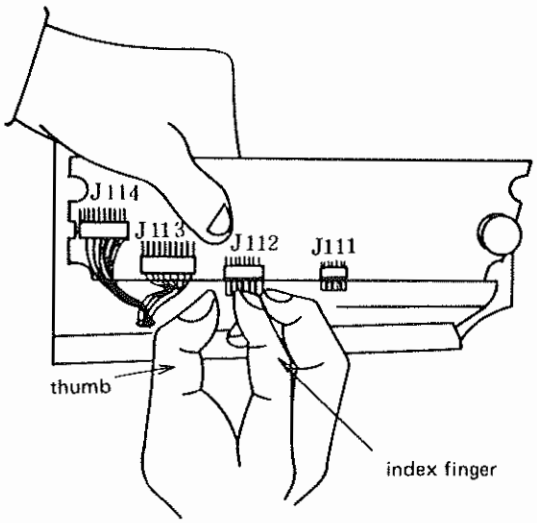
- Remove setscrew ❶ from the circuit board (separate the indicator panel from the circuit board.)
- Remove the membrane tail from J111 by hand.
- Support J112 with the left hand, suppress the membrane tail with a finger and remove the connector in the direction shown in the diagram.
- Hook a fingernail under the locations shown by ❷ to remove J113 and J114.



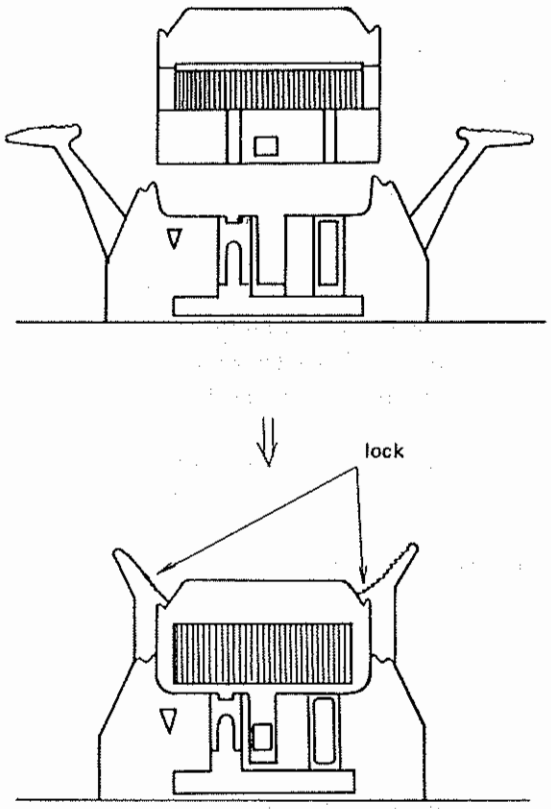
Hook a fingernail under the steps shown at ❷ to pull the connectors out.

(3) How to insert the connector and membrane switch

- Place the indicator panel and circuit board together with the front cover between them.
- Insert the J111 tail section with a thumb and index finger as shown in the diagram.
- Insert the J112 tail section the same way as for J111.
- Push one end of the plug side of J113 and J114 in strongly with an index finger, then push the other end in (do this twice).



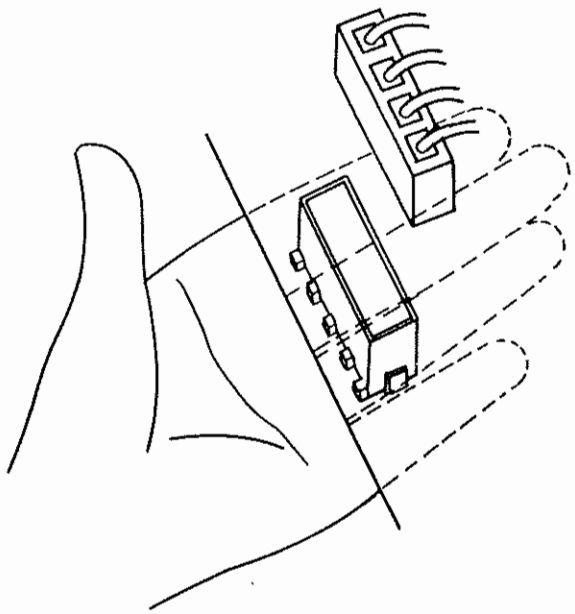
10) Precautions in inserting and removing connectors



(1) As shown at left, the main circuit board assembly connectors J60, J61 and J62 should always be locked after insertion.
When pulling these connectors out, unlock first, then hold the connector and pull out.

(2) When inserting or removing power supply circuit board assembly $\frac{A}{B}$ connector J41, always do it with a hand placed underneath the circuit board.
(It takes some force to insert or remove this connector, so if a hand is not placed underneath this circuit board, the pattern might be stripped off.)

(3) When inserting or removing any connector, always turn the power OFF and hold the connector by its main body.



5-6. Troubleshooting

1) Whenever trouble occurs, do the following first.

(1) Pull the plug out of the control unit connector, then plug it lock in securely.

(2) Check the line voltage. Confirm that it matches the value on the name plate.

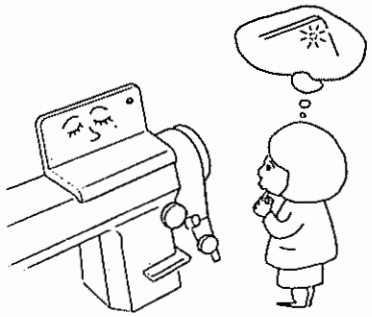
(3) Check the control unit fuse. If it is necessary to replace the fuse, replace it with the new fuse provided for this unit.

200V specification : 5A
100V specification : 8A
glass tube fuse ϕ5.4 x 3.0

(4) A sewing machine with automatic thread trimmer should operate as follows.
When trouble occurs, check the stage to which operation was normal; if it is known at what stage the trouble occured, the possible trouble spots are narrowed down, making troubleshooting easier.

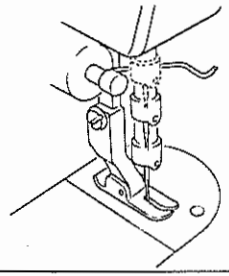
①	Power switch ON	1–1)	Power lamp lights up
		1–2)	The needle bar does not stop in its highest position.
②	Pedal depression	2–1)	Sewing machine operates (low speed → high speed)
③	Pedal neutral	3–1)	The needle bar stops in its lowest position.
④	Pedal return	4–1)	Thread is trimmed.
		4–2)	The needle bar stops in its highest position.
		4–3)	Wiper operates.
		4–4)	Presser foot is lifted.
⑤	Steps related to reverse feed stitching		
		5–1)	Automatic reverse feed stitching.
		5–2)	One-touch type reverse feed stitching.

(5) If trouble occurs, first find out whether the trouble is on the PSC box side or on the control box side. If the trouble is on the control box side, all that happens is that the control of number of stitches, such as in automatic reverse feed stitching, does not work, so it is possible to disconnect connector J60 (SC-120, SC-220) or J61 (SC-320) from the main circuit board and use the machine as a sewing machine with automatic thread trimmer.

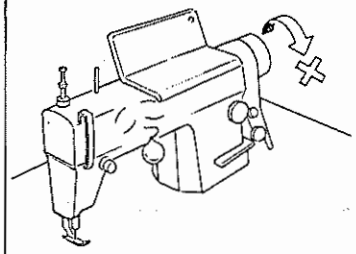
Operation	Problem	What to check	Repair
Power switch ON	1–1 Power lamp fails to light.  ○ Connectors to be checked for disconnection Power plug P1 (blue 4P inside power pack) main circuit board J55 (POWER), J67 (SC-20), J60 (SC-120 , SC-220), J61 (SC-320)	① Do the pushbutton switches operate normally? Unplug the power cord and check the electrical conduction.	No → Repair pushbutton switch.
		Yes ↓	
		② Is the input voltage correct? P1 (blue) inside power pack cover (Ex) 1 ϕ115V between 1 and 2 (115V) 3 ϕ220V between 1 and 2, 2 and 3, 3 and 1 (220V each)	No → Repair power cord and check for trouble in plant power supply.
		Yes ↓	
		③ Does Vcc appear inside the main circuit board? 5VDC between TP5 (+5V) ⊕ and TP6 (S.GND) ⊖	→ Replace PSC box.
		Yes ↓	
		④ Does Vcc appear at the control panel connector on the main circuit board? SC- 20 5VDC between 1 ⊕ and 2 ⊖ DC5V SC-120 5VDC between 1, 2 ⊖ 3 and 4 ⊕ DC5V SC-220 5VDC DC5V SC-320 5VDC between 15, 16 ⊖ and 19 ⊕ DC5V	No → Replace PSC box.
		Yes →	Replace control box.

Operation	Problem	What to check	Repair

1–2 Needle fails to stop in up position.



A) Sewing machine fails to run.



○ Check for unplugged connectors.
Synchro connector
Main circuit board
J52 (SOL),
J55 (POWER),
J62 (M. CTL)

Company H
P5 (white 4P inside power pack)
P23 (white 9P inside power pack)
J21, J22, J23, J24
(Company H control circuit board)

Company N
(white 4P inside power pack)
(white 9P inside power pack)
J11, J12, J13, J14
(Company N control circuit board)

○ Belt has come loose.

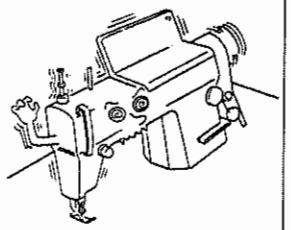
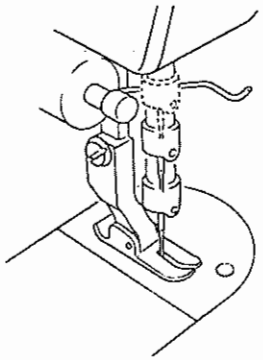
① Can the motor pulley be turned by hand?
→ Won't stop turning after BR transistor circuit board is disconnected. → Replace motor.
Yes
→ BR, LED lights up and won't go off. → Replace transistor circuit board and motor.
Yes
→ PSC box

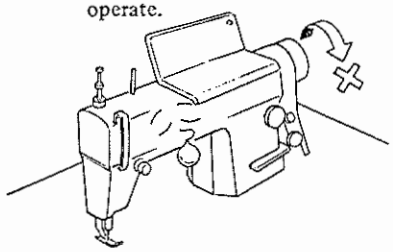
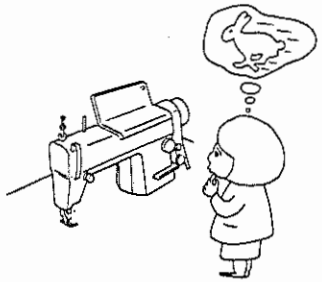
② Can the sewing machine pulley be turned by hand?
No → Repair sewing machine head, or replace.
Yes

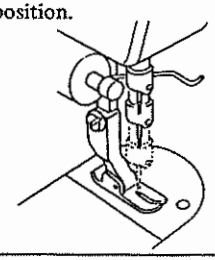
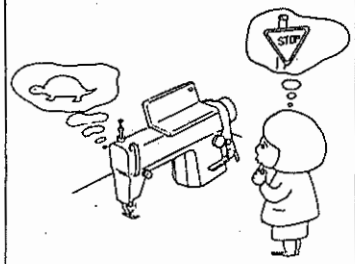
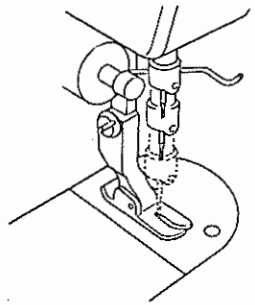
③ Is the input voltage correct?
No → Check for problem in power plug or plant power supply.
Yes

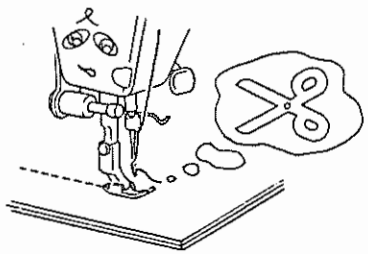
④ Has the fuse blown?
→ Replace fuse.
If main transformer is burned out, replace it.
Yes

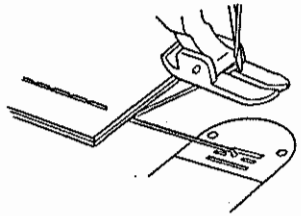
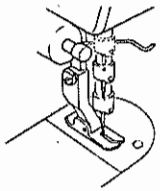
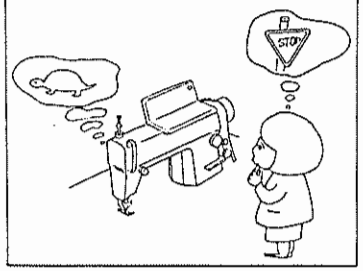
⑤ Check the test mode.
Confirm that the TEST, A, B and P dip switches on the main circuit board are OFF.
test → Replace dip switch.

Operation	Problem	What to check	Repair
		Normal mode	Replace PSC box.
	B) Sewing machine won't stop.  ○ Check for unplugged connector and brake connector.	① High speed or low speed?	Replace PSC box.
		Low speed → ② Is the brake transistor good?	Replace brake transistor.
		Yes → ③ Is the brake gap correct? It should be 0.2 ~ 0.3 mm (0.008" ~ 0.012").	No → Readjust brake gap in accordance with instructions in the relevant section.
		Yes	Replace PSC box.
	C) Stops outside the normal upper stop internal. 	① Does the one-touch type reverse feed operate? Are thread trimming and automatic reverse feed stitching done correctly?	No → Replace PSC box.
		Yes	Synchronizer up/down detection failure has been detected, causing safety circuitry to operate. Replace synchronizer.

Operation	Trouble	What to check	Repair
Front part of pedal depressed	2–1 Sewing machine fails to operate.  ○ Check for unplugged connector. J51 (P. VR) on main circuit board	① Does it operate after pedal is depressed once?	No → Replace PSC box. Replace pedal sensor. Yes → Adjust pedal spring stiffness (for depressing front part of pedal), pedal sensor angle or VR8 (LSW).
	2–2 Fails to reach high speed.  ○ Check for unplugged connector.	① Is the maximum speed limit potentiometer on the PSC box set correctly?	→ Turn the potentiometer clockwise.
		Yes ② Is the maximum speed limit switch on the PSC box set correctly? Has the switch been reset after thread trimming?	No → Repeat thread trimming and turn power On again.
		Yes	→ Replace PSC box. Replace pedal sensor.

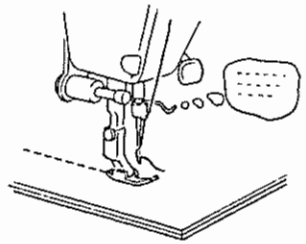
Operation	Trouble	What to check	Repair
Pedal in neutral	3–1 Needle fails to stop in down position. 		
	A) Operation at low speed fails to stop. 	① Does it stop after pedal is depressed once?	Is the BR transistor circuit board good? (Check by replacing.) → Yes → Replace BR transistor circuit board. Yes → Replace PSC box.
		Yes	Pedal spring for depressing back part of pedal is stiff. Adjust pedal sensor angle or VR8 (LSW).
	B) Stop at position other than the down position. 	① Is the stop position different from the up position?	No → Does it stop temporarily and then move to the up position? → No → Replace control panel.
		Yes	Yes → Can thread be trimmed? → No → Replace PSC box.
			Yes → Recheck main circuit board function selection switch. Replace PSC box.

Operation	Trouble	What to check	Repair
		② Does the one-touch type reverse feed operate? Are thread trimming and automatic reverse feed stitching performed?	Replace PSC box.
		Yes	Synchronizer up/down detection failure has been detected, causing safety circuitry to operate. Replace synchronizer.
	C) Thread trimmer is actuated when it should not. 	① Are pedal sensor and spring weak?	Yes → Increase spring stiffness.
		Yes	
		② Is stroke adjustment potentiometer adjusted correctly?	No → Adjust VR7 (TSW).
		Yes	Replace PSC box.

Operation	Trouble	What to check	Repair
Back part of pedal is depressed.	4–1 Thread is not trimmed.  ○ Check for unplugged connector. P49 (12P)	① Does the thread trimming solenoid fail to move?	Adjust or replace the thread trimmer moving knife and fixed knife.
		Yes ② Are the pedal stroke adjustment potentiometers (VR7, TSW) correctly adjusted? (When VR7 is turned counterclockwise with the pedal in neutral after the back part of pedal is depressed, thread trimmer is actuated.)	No → Readjust VR7 and TSW.
		Yes ③ Do the thread trimming solenoid resistance correct? The resistance between P49 (12P) 10 and 11 should be about 7.5 Ω	No → Replace the solenoid.
		Yes ④ Is a thread trimming signal being output? Is the main circuit board monitor LED (TRM) lit?	No → Replace the transistor circuit board.
		Yes	Replace the PSC box.
	4–2 Sewing machine fails to stop in up position. 		
	A) Continues to run at low speed without stopping. 	① Is a brake signal being output? Confirm that the main circuit board monitor LED is lit.	No → Replace the PSC box.
		Yes	Replace the transistor circuit board.

Operation	Trouble	What to check	Repair

4–3 Wiper fails to operate.



○ Check for unplugged connector.
P49 (12P)

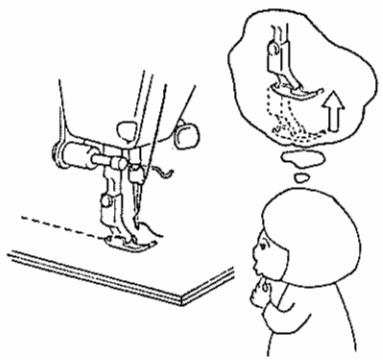
① Is the wiper function selection switch (dip switch on main circuit board) set correctly?
- No → Reset referring to the section on function selection switches.
- Yes ↓

② Is the wiper switch ON?
- → Turn ON.
- Yes ↓

③ Is the wiper solenoid good?
The resistance between connector P49 pins 6 and 9 should be about 8.5 Ω.
- No → Replace wiper switch; replace solenoid.
- Yes ↓

④ Is a wiper signal being output?
Does the monitor LED (WP) on the main circuit board light up?
- No → Replace wiper transistor circuit board.
- Yes → Replace PSC box.

4–4 Presser foot fails to rise.



○ Check for unplugged connector.
P48 (4P) (AK30)
Connector for standing sewing machine (2P).

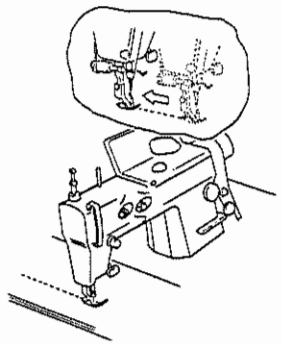
① Is the FL switch good?
P49 connector between 1 and 2 or standing sewing machine connector between 1 and 2
switch ON → 0 Ω
switch OFF → 00 Ω
- → Replace the FL switch.

If the machine has AK31 specifications, is VR6 (FL switch) on the main circuit board set correctly?
(When turned counterclockwise the presser foot rises.)
- → Adjust VR6 (FL switch).

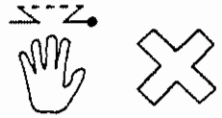
② Is the FL solenoid good?
The resistance between connector P49 3 and 4 should be about 5.4 Ω.
- → Replace the solenoid.

③ Is an FL signal being output?
Is the monitor LED (FL) on the main circuit board lit?
- → Replace the PSC box.

Replace the FL transistor circuit board.

Operation	Trouble	What to check	Repair
Reverse feed.	5–1 Fails to perform reverse feed stitching. 		

A) Automatic reverse feed stitching fails; one-touch type reverse feed does not operate.



○ Check for unplugged connector.
P49 (12P)

① Is the reverse feed solenoid good?
The resistance between connector P49 7 and 8 should be about 5 Ω.

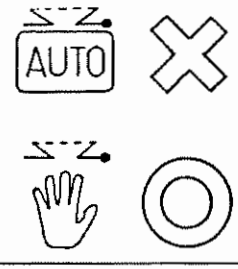
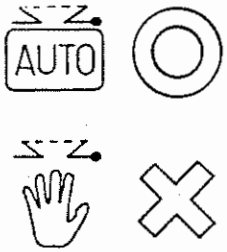
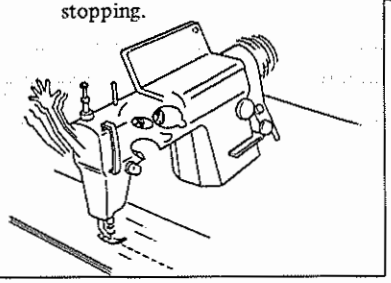
No → Replace solenoid.

Yes

② Is a reverse feed signal being output?
Is the monitor LED (BT) on the main circuit board lit?

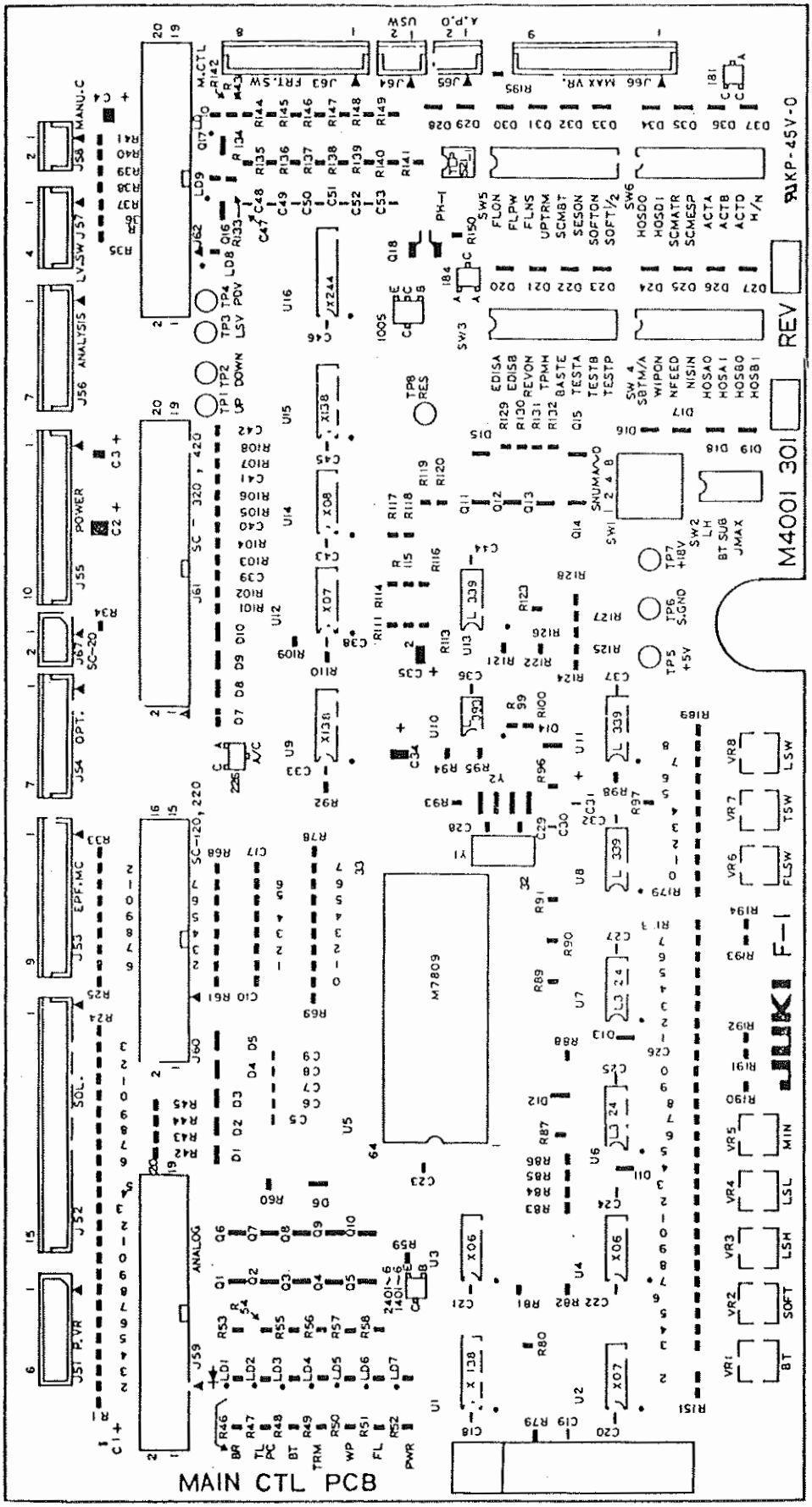
No → Replace PSC box or replace control box.

Yes → Replace transistor circuit board.

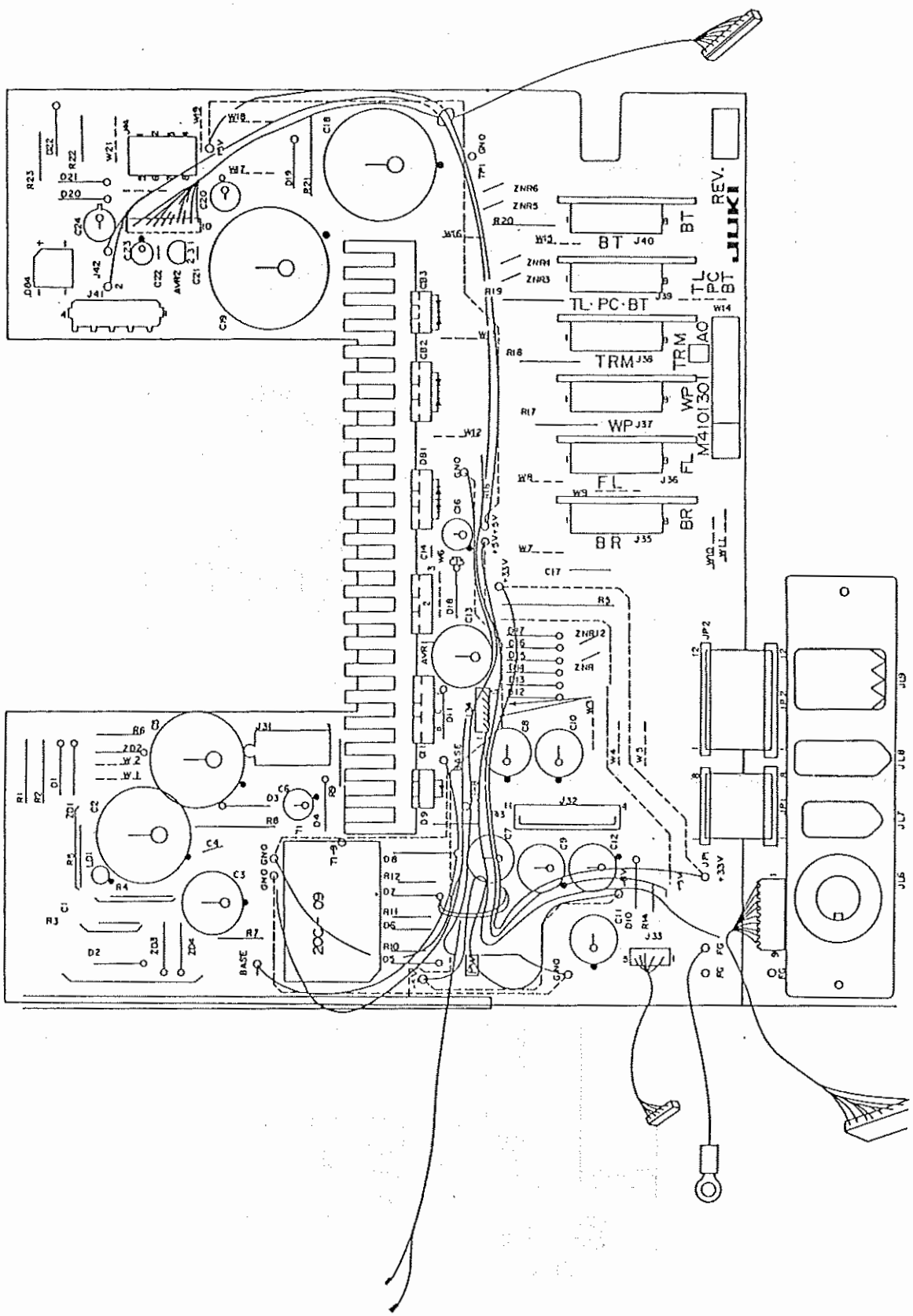
Operation	Trouble	What to check	Repair
	B) Automatic reverse feed fails but one-touch type reverse feed operates. 	① Does automatic reverse feed still fail if a new control box is installed?	No → Replace control box. Yes → Replace PSC box.
	○ Check for unplugged connector. Main circuit board J60 (SC-120, SC-220), J61 (SC-320)		
	C) Automatic reverse feed works but one-touch type reverse feed fails to operate. 	① Is the reverse feed switch good? Connector P7 1 to 2 switch ON 0 Ω switch OFF 00 Ω	No → Replace reverse feed switch. Yes → Replace main circuit board.
	5–2 Reverse feed continues without stopping. 	① Does the monitor LED (BT) fail to light up?	No → Replace PSC box. Yes ↓
		② Does replacing the transistor circuit board correct the problem?	No → Replace PSC box. Yes → BT transistor circuit board is bad.

5-7. Circuit board installment diagrams

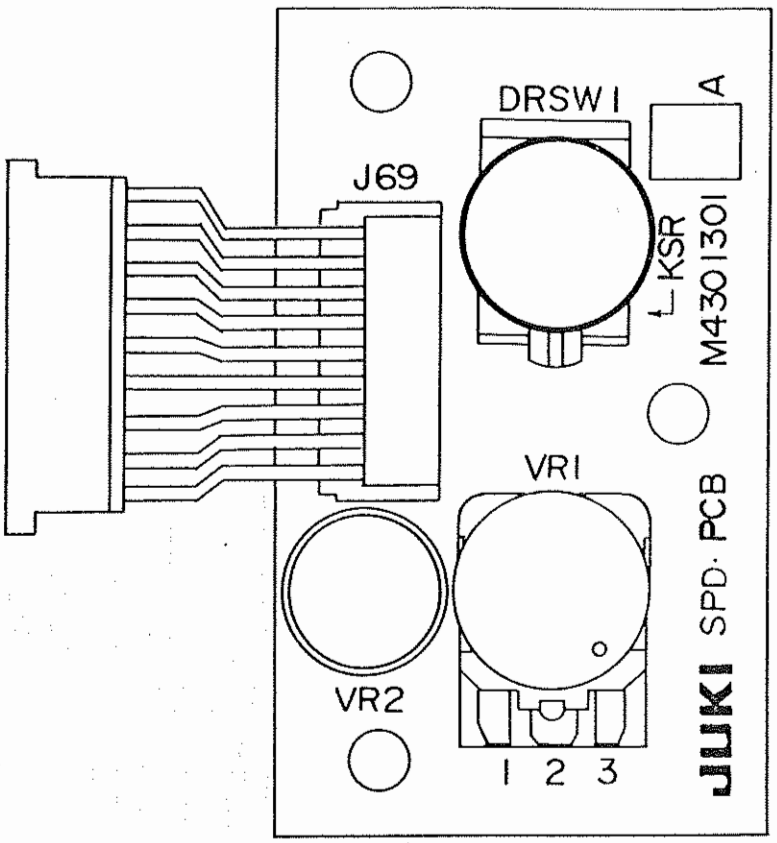
1) Main circuit board assembly [M4001301OAO]



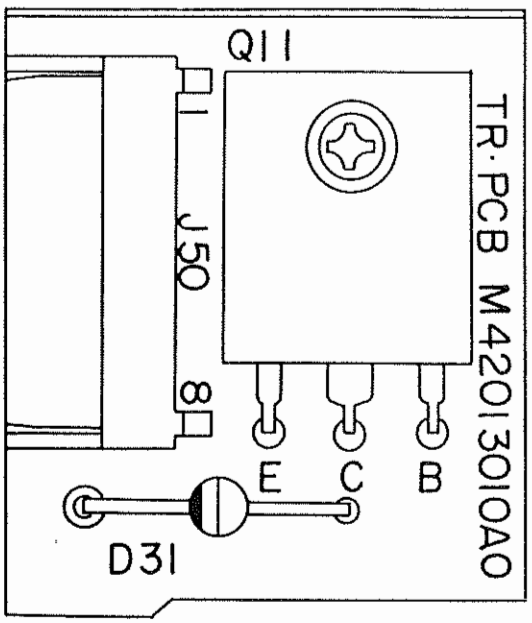
2) Power supply circuit board assembly A [M4101301AAO]



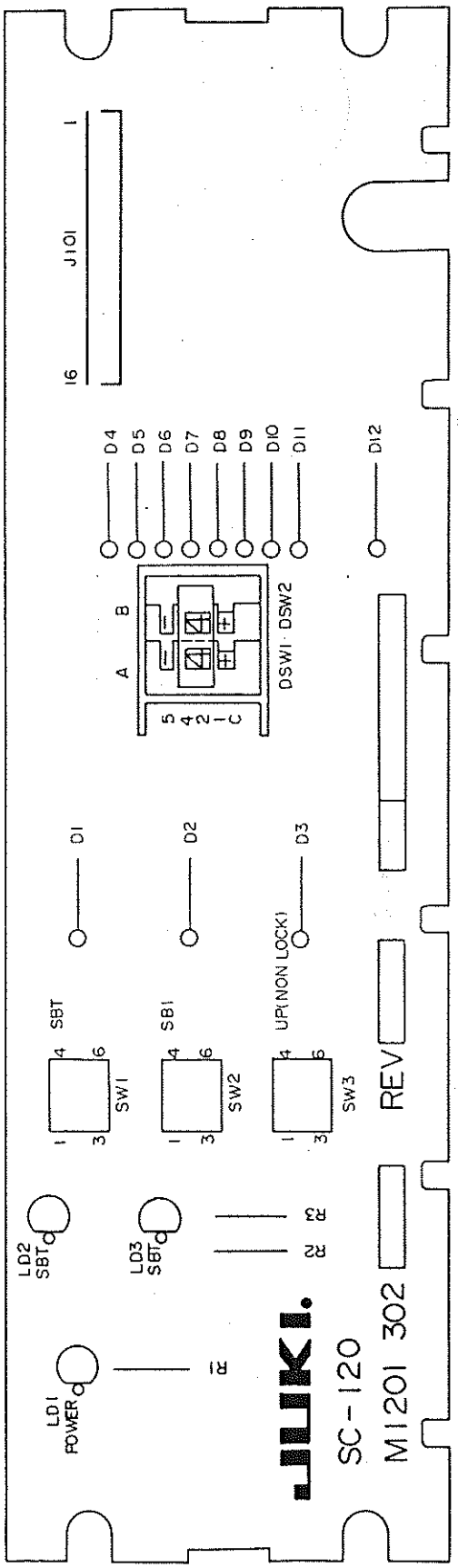
3) Speed control circuit board assembly A [M4301301AAA]



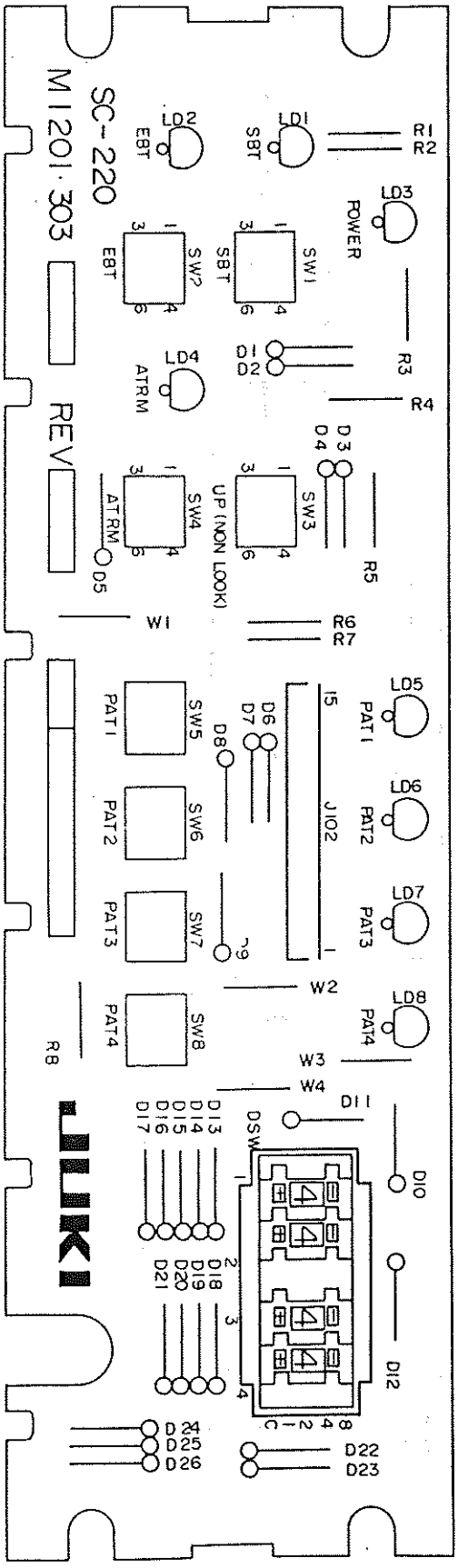
4) Transistor circuit board assembly [M4201301OAO]



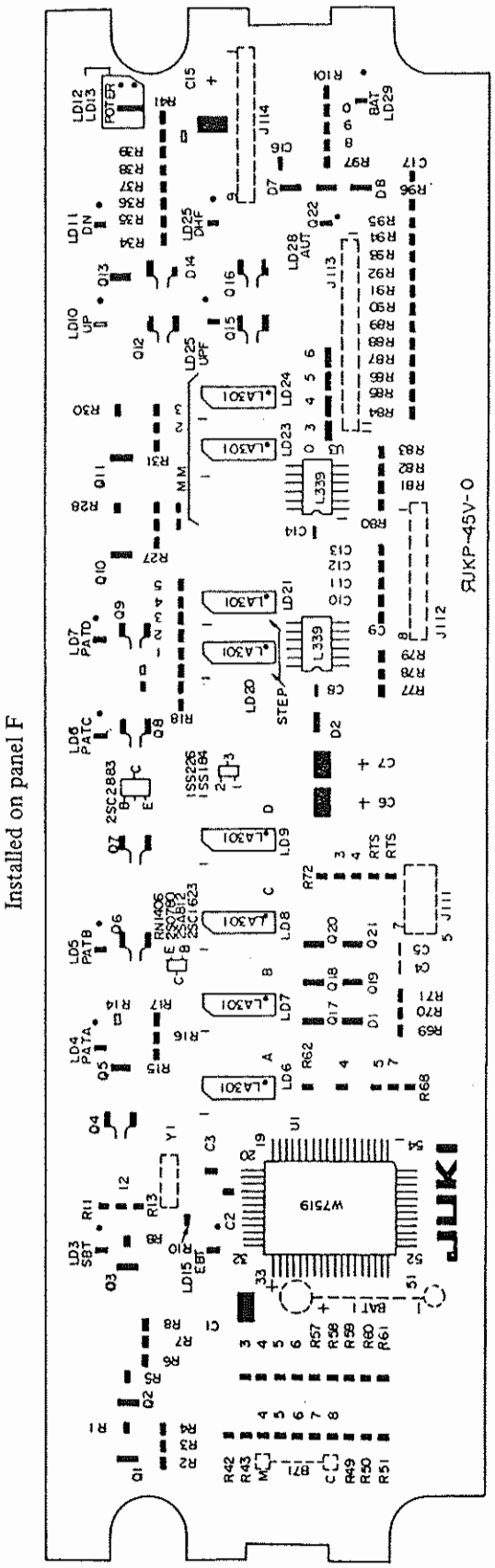
5) SC-120 panel circuit board assembly
[M1201302OAO]



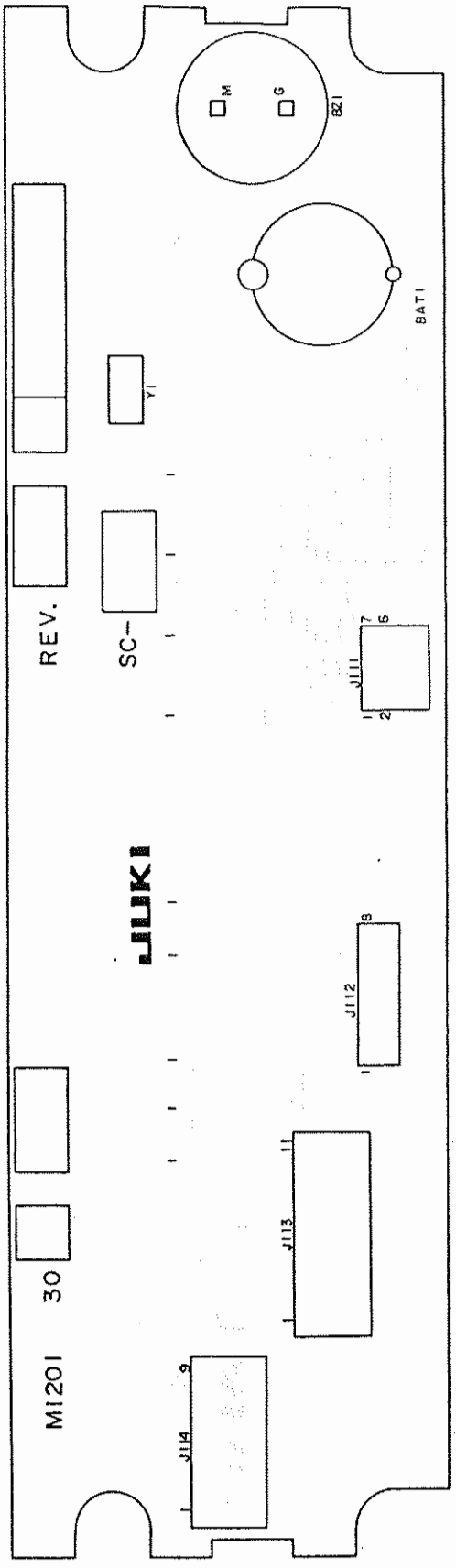
6) SC-220 panel circuit board assembly
[M1201303OAO]



7) SC-320 panel circuit board assembly
[M1201304OAO]



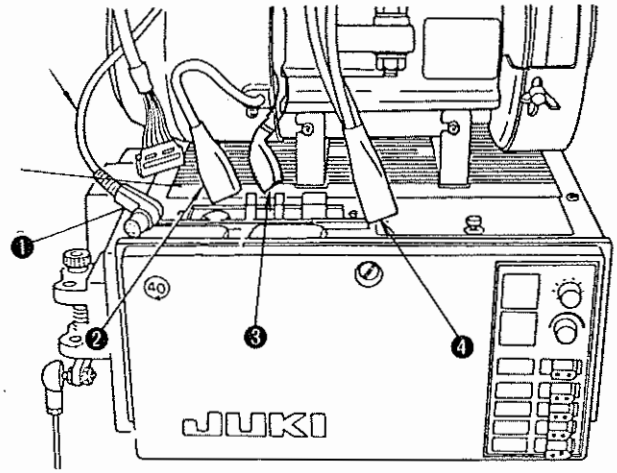
8) SC-320 panel circuit board assembly
[M1201304OAO]



5-8. Connector connection diagrams

1) SC-20, SC-120, SC-220, SC-320 connector connection diagrams

(1) Box top surface connectors.



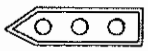
❶ : Connector P46 (synchronizer)

❷ : Connector P47 (brake)

❸ : Connector P48 (Auto-lifter)

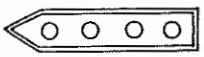
❹ : Connector P49 (solenoid head)

Connector P47



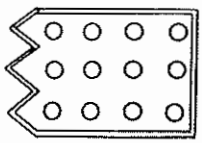
1. BR	COM	red	solenoid BR about 6.5 Ω , operating voltage 34VDC
3. BR		black	

Connector P48



1. FL	SW RTN	white	FL switch
2. FL	SW	black	
3. FL		red	FL solenoid about 5.4 Ω ,
4. FL	COM	green	operating voltage 34VDC

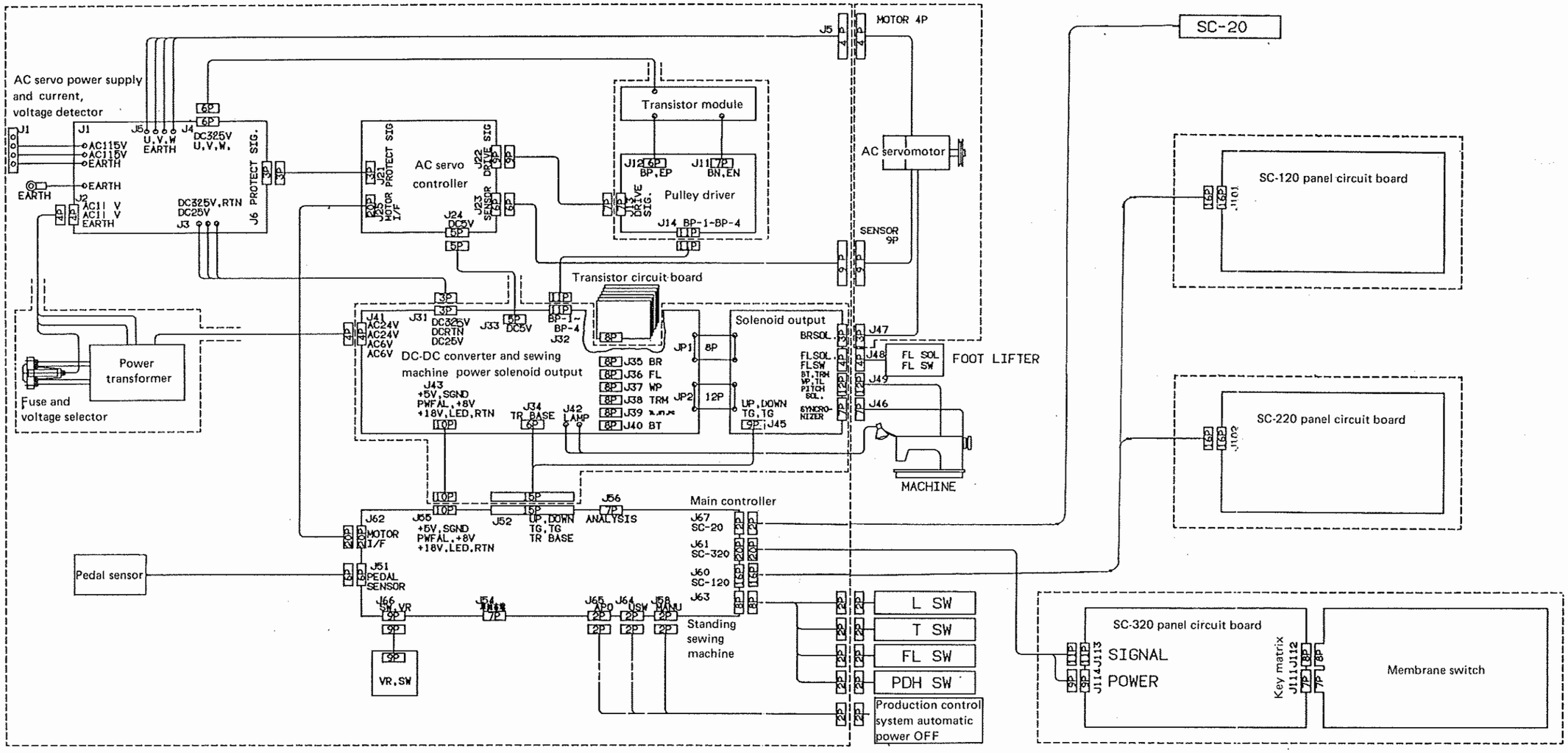
Connector P49



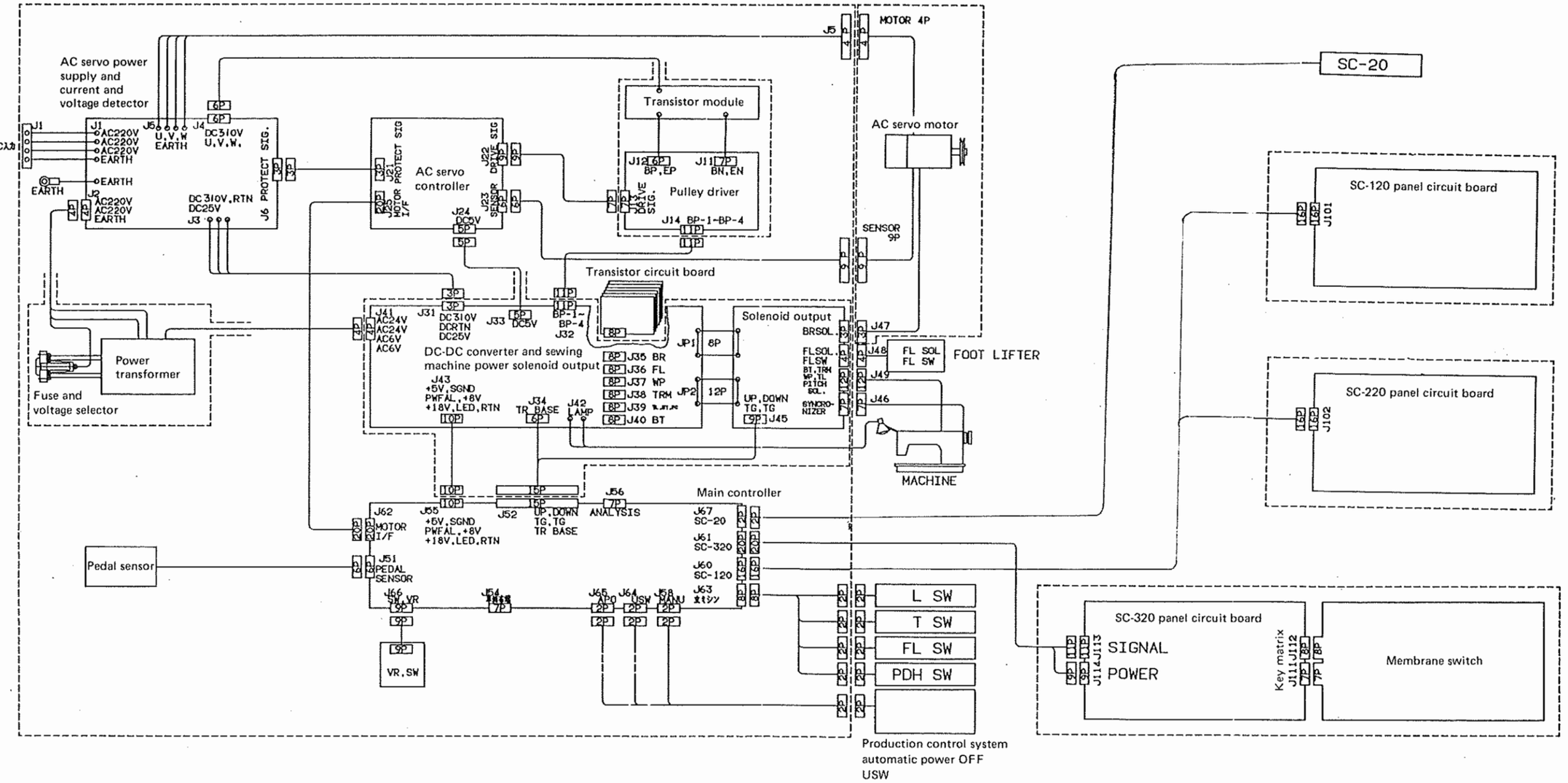
1. BT	SW	white	BT switch
2. BT	SW RTN	black	
6. WP	COM	white	WP switch,
9. WP		black	WP solenoid about 8.5 Ω ,
			operating voltage 34VDC
7. BT	COM	white	BT solenoid about 5.15 Ω ,
8. BT		black	operating voltage 34VDC
10. TRM	COM	white	TRM solenoid, about 7.5 Ω ,
11. TRM	DR	black	operating voltage 34VDC
12. FG		green/yellow	

5-9. Block diagrams

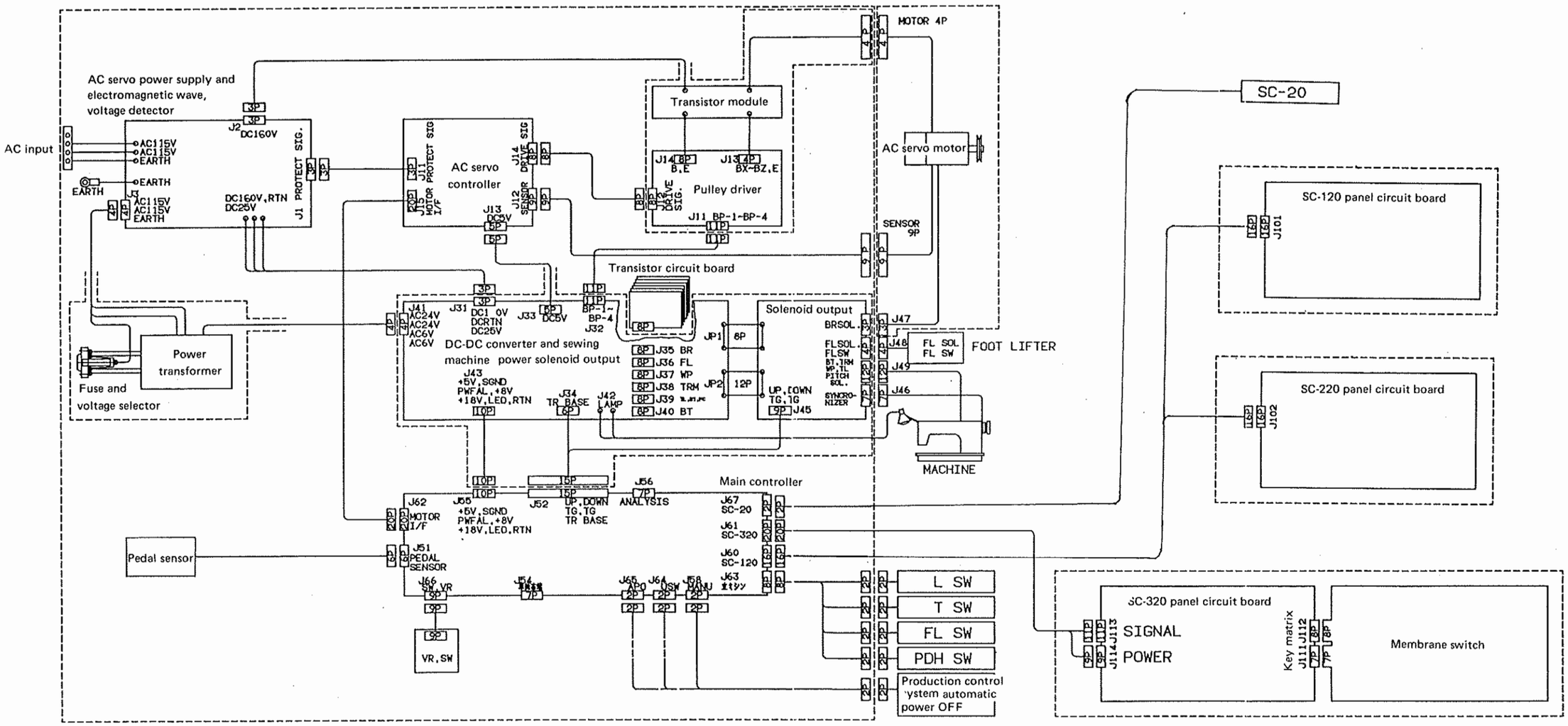
(1) Hitachi 1 ϕ 115V (Example)



(2) Hitachi 3 ϕ 220V (Example)



(3) Matsushita 1 ϕ 110V (Example)



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