

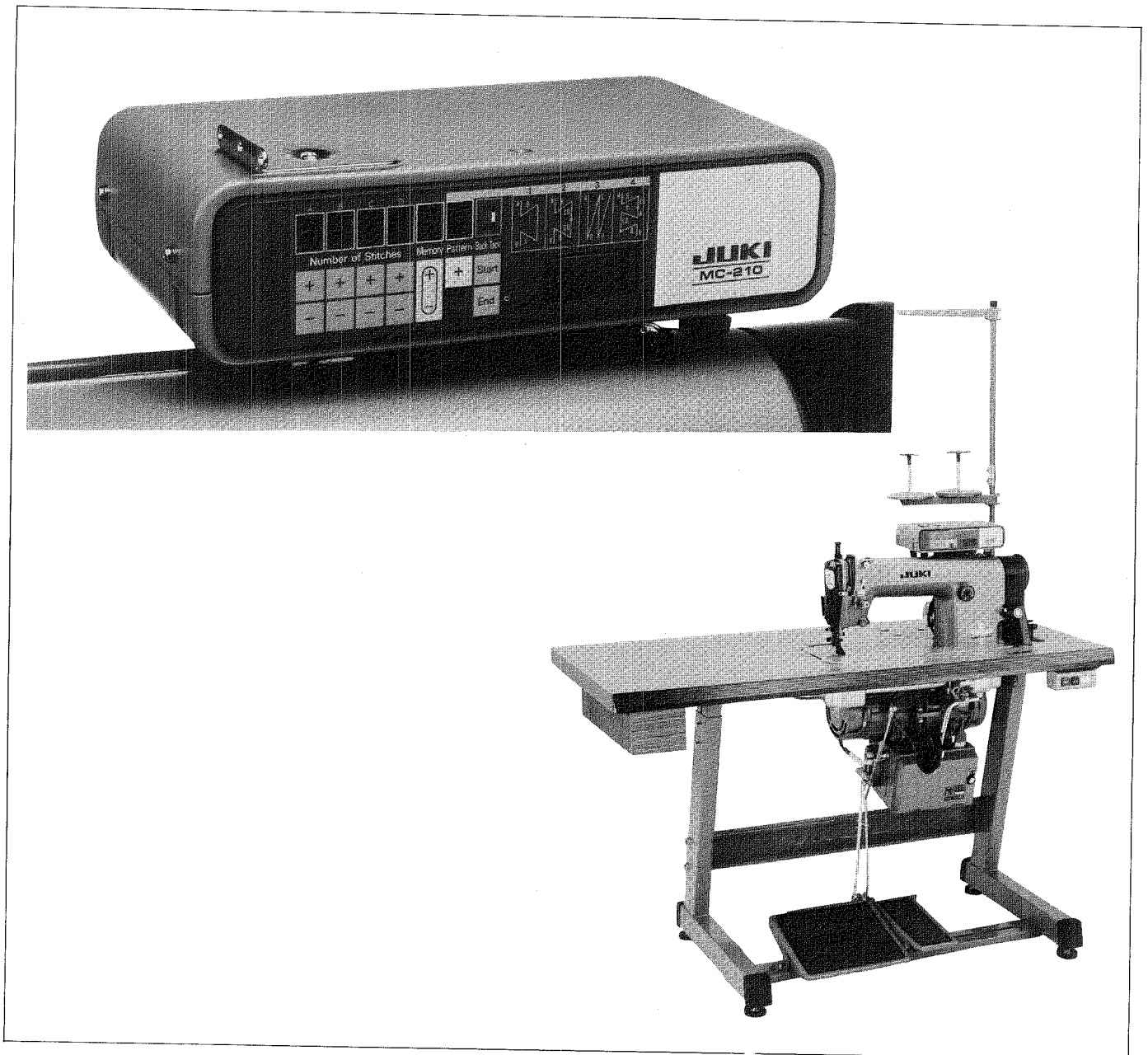
JUKI®

MC-110

MC-210

Control Equipment for Industrial Sewing Machine

ENGINEER'S MANUAL



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

PREFACE

This engineer's manual is written for the technical personnel who are responsible for the service and maintenance of the sewing machines. This manual presents detailed explanation of the adjusting procedures, etc. which are not covered by the INSTRUCTION BOOK intended for the maintenance personnel and operators at a garment factory.

It is advisable to use this engineer's manual in combination with the pertinent INSTRUCTION BOOK and PARTS BOOK when servicing the sewing machines of these models.

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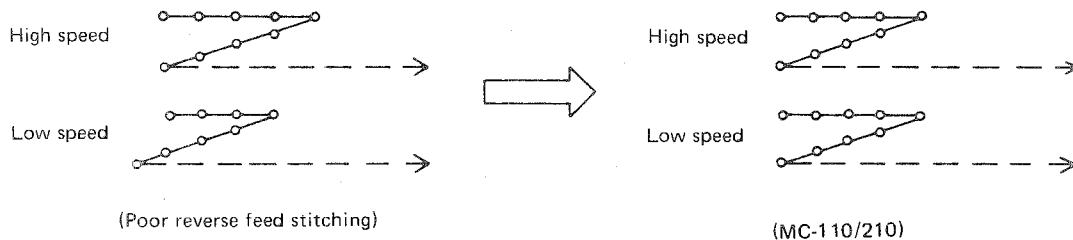
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1. GENERAL

1-1. Features

(1) Features common to MC-110 and MC-210

- 1) The sewing speed can be changed continuously from the low to high speed by controlling the tread on the pedal, contributing to easier operation.
- 2) Automatic reverse feed stitching is provided at the start and end of a seam line.
Formation uniform reverse stitches is ensured regardless of the sewing speed, leading to improved quality of workpieces.



- 3) The pedaling pressure can be adjusted to suit each operator.
- 4) A CPU box provided on the machine head allows easy checking of ON/OFF of the power switch or the automatic reverse feed stitching at the start/end of seam line to eliminate the chance for operational mistakes.
- 5) The pulley of the machine can be turned by hand when the machine is in halt. In addition, the pulley contains a synchronizer for ease of operation.
- 6) The maximum sewing speed can be changed by the adjusting control on the PSC box without the need for change of the motor pulley.
- 7) In case the machine is locked, the clutch coil will be automatically de-energized in 2 sec. to minimize the possible damages such as burning of the motor and failures in the machine.
- 8) A microcomputer will detect a failure of the upper or lower detector of the synchronizer, and cause the motor to continue to operate as an ordinary clutch motor.
- 9) If the CPU box has failed, the machine can be used as a sewing machine with thread trimmer by changing the connection of the connectors within the PSC box.
- 10) In order to meet also the European standards, the magnet driving power has been reduced from 31 VAC to 24 VAC to ensure higher safety.
- 11) The number of reverse feed stitches can be easily set (0 to 9 stitches for steps A to D, respectively) from outside for easier operation.
- 12) The needle up/down stop selector switch, Auto-lifter, wiper and other attachments can be mounted for functional upgrading.
- 13) The same PSC box can be used for MC-110 and MC-210, therefore upgrading will be accomplished simply by replacing the CPU box.
- 14) The PSC box is commonly usable for the 100V and 200V zones, therefore both voltage ratings can be met simply by replacing the voltage selector circuit board.
- 15) A panel cover has been added to the CPU control panel to concentrate main functional selector switches in it. This permits easy functional selection merely by removing the panel cover, eliminating the need for removal of the CPU box cover. (Main functions include stitching start reverse feed speed control, needle stop position selector, and soft starter.)

(2) Features available only with MC-210

- 1) There are four basic stitching patterns. A set number of stitches and a set pattern are indicated on the LED displays. Compensation stitching can be done.
- 2) The memory capacity has been increased so that up to nine different patterns and settings of number of stitches may be stored in memory. This feature makes it possible to deal with many different operations by easy operation.
- 3) The digital LED display can be used for the self-measurement of sewing speed and the input switch self-check, contributing to better maintainability.

2. OPERATION

2-1. Main Components

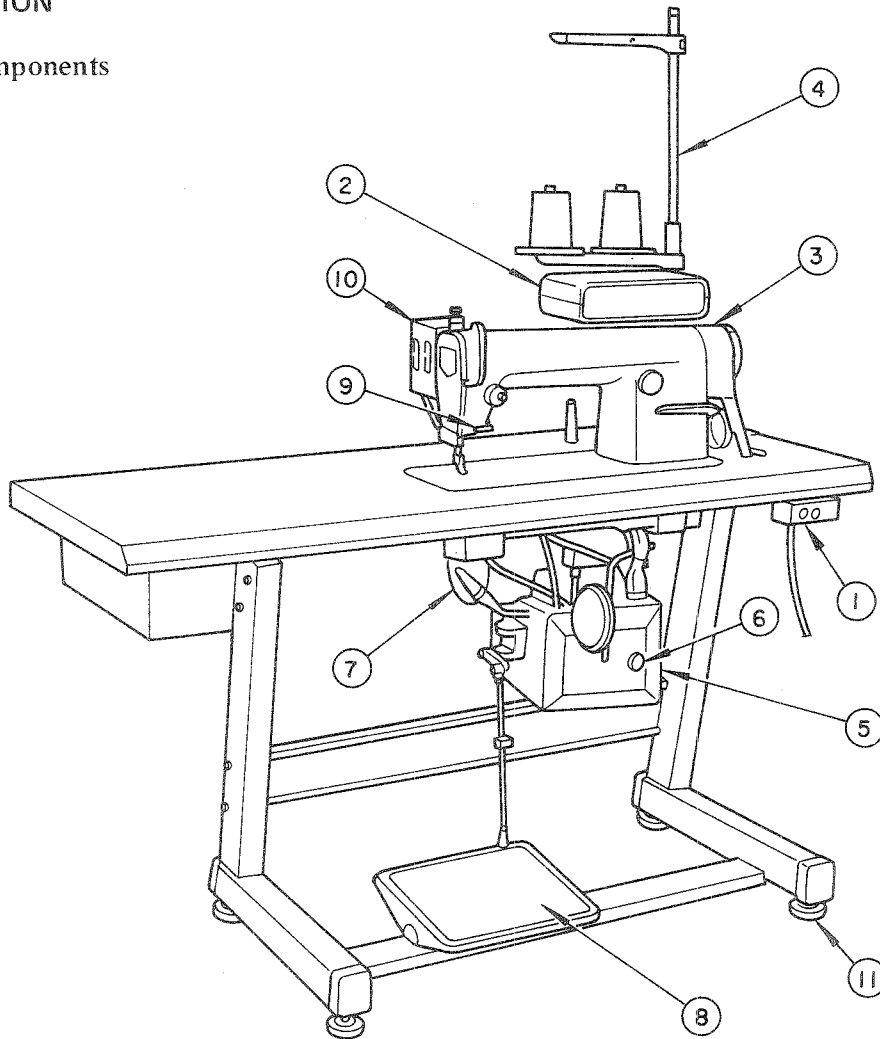


Fig. 1

- | | |
|---------------------------|---|
| ① Power switch | ⑦ Electronic-stop motor |
| ② CPU box | ⑧ Pedal |
| ③ Synchronizer | ⑨ One touch reverse feed switch lever |
| ④ Thread stand | ⑩ Wiper |
| ⑤ PSC box | ⑪ Adjusting screw for the flatness of the cable |
| ⑥ Max. speed control knob | |

- ① Power switch
Power switch of the motor, PSC box, and CPU box.
- ② CPU (Central Processing Unit) box
Electronic brain which controls the sewing machine and the motor. The CPU box incorporates a CPU board consisting of a microcomputer, IC and various control switches, and is provided with a CPU panel.
- ③ Synchronizer
Built-in the machine pulley, the synchronizer detects the position (up or down) of the needle and the sewing speed, and then sends the resultant input signals to the PSC and CPU boards.
- ④ Thread stand
- ⑤ PSC (Power and Speed Controller) box
Comprises a circuit to control the sewing speed in response to the commands received from the microcomputer in the CPU box, an output circuit to operate each element (thread trimming solenoid, reverse feed solenoid, etc.), a pedal sensor to sense the operation of the pedal, and a power circuit to actuate each function.
- ⑥ Max. speed control knob
Allows control of the maximum sewing speed without the need for change of the motor pulley.
- ⑦ Electronic-stop motor
Operates the machine at high speed ↔ medium speed ↔ low speed in response to the clutch and brake signals sent from the PSC box.
- ⑧ Pedal
By depressing this pedal forward (toe down) or backward (heel down), the control of sewing speed and the operation of the thread trimmer and Auto-lifter can be performed.
- ⑨ One touch reverse feed switch lever
Used to perform reverse feed stitching.
- ⑩ Wiper
Wipes out needle thread after thread trimming in response to the wiper signals given by the PSC box.
- ⑪ Adjusting screw for the table
Used to perform adjustment so that the table stands on the floor flatly to minimize vibration during operation.

2-2. Test run

1) Operation at the time of turning on the power switch.

When the power switch is turned on, the pulley rotates until the needle reaches the upper position, and then stops with the needle up. However, when the needle is at its upper position from the beginning, the pulley does not rotate.

2) How to operate the pedal

When the machine is provided with Auto-lifter, the pedal is operated in five steps.

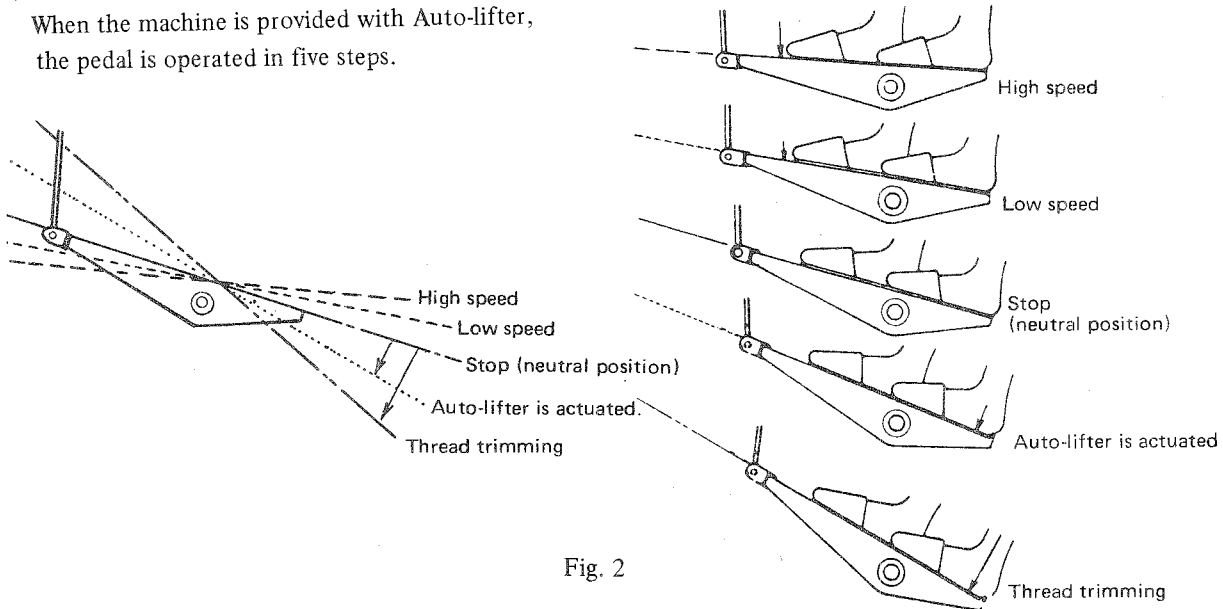


Fig. 2

- ① When the pedal is trodden lightly forward (toe down), the machine will start to run at low speed.
- ② When the pedal is trodden further forward (toe down), the machine will increase its speed. (However, when the automatic reverse feed switch has been turned on, the machine will not run at high speed until the reverse feed is completed.)
- ③ When the pedal is returned to the stop (neutral) position, the machine will stop with its needle down.
- ④ When the pedal is depressed backward (heel down), the presser foot lifter is actuated. (provided that the machine is equipped with Auto-lifter.)
- ⑤ When the pedal is further depressed backward (heel down), the thread trimmer is actuated and then the machine stops with its needle up. (At this time, if the wiper switch has been turned ON, the wiper is actuated.)
 - The machine will run at a speed in response to the treading force. (The speed can be changed continuously.)
 - The proper thread trimming action will not be disturbed even when the pedal is returned to the neutral position immediately after the machine started thread trimming. When the pedal is trodden forward (toe down) immediately after the machine started thread trimming, the proper thread trimming action will not be prevented either. However, in this case, the safety circuit will operate to cause the machine not to run even after the thread trimming has been completed, and therefore, the pedal must be returned to the neutral position once.

2-3. CPU control panel for MC-110

(1) Operation of the automatic reverse feed stitching switch

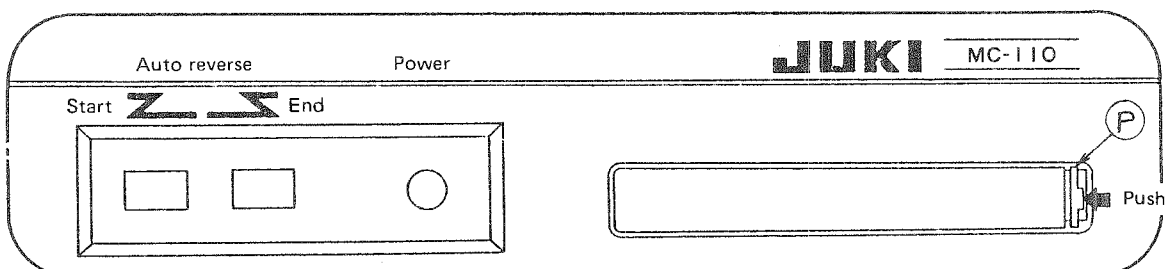


Fig. 3

- Automatic reverse feed stitching at start or end can be selected by pushing either of the two pushbuttons on the CPU control panel.













“Start” switch	 (ON)	 (ON)	 (OFF)	 (OFF)
“End” switch	 (ON)	 (OFF)	 (ON)	 (OFF)
Sewing pattern				

Table 1

Auto reverse switches vs. Sewing patterns

- ① Note that the one-touch type reverse feed switch is inoperative during step A (reverse feed stitching at seam start) and step D (reverse feed stitching at seam end).
- ② For steps A and B, either nonstop stitching or pedal-controlled stitching can be selected by turning ON or OFF a DIP switch in the panel cover. (For more detail, refer to 4-2-(1)). If the back part of the pedal is depressed during step A or B, the thread trimmer is immediately actuated.
- ③ If the thread trimmer is actuated within the beginning three stitches, with “Start” auto reverse switch OFF, the machine will perform thread trimming without giving reverse feed stitches at the seam end even if “End” auto reverse switch has been ON.

- ④ The machine performs automatic reverse feed stitching at the seam end at a fixed speed.

(2) How to set the number of automatic reverse feed stitches

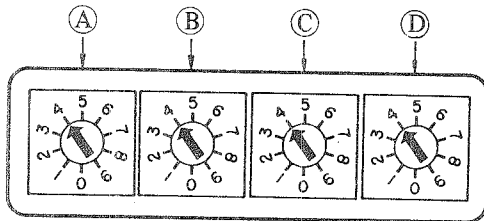


Fig. 4

The number of automatic reverse feed stitches can be adjusted from 0 to 9 by setting the rotary switches as follows :

- ① Turn the power switch OFF.
 - ② Push “P” in the direction of the arrow to remove the CPU control panel cover. (See Fig. 3)
 - ③ When the cover is removed, the rotary DIP switches shown in Fig. 4 are accessible. Using a flat bit screwdriver, set the point of the arrow on each of the rotary DIP switches A to D, which correspond to steps A to D, at the desired number of stitches.
 - ④ Reinstall the CPU control panel cover.
 - ⑤ Turn the power switch ON.
- (Caution) Be sure to turn the power switch OFF before changing the setting of a rotary DIP switch, otherwise the number of stitches cannot be changed.

2-4. CPU control panel for MC-210

(1) Functional description of CPU control panel

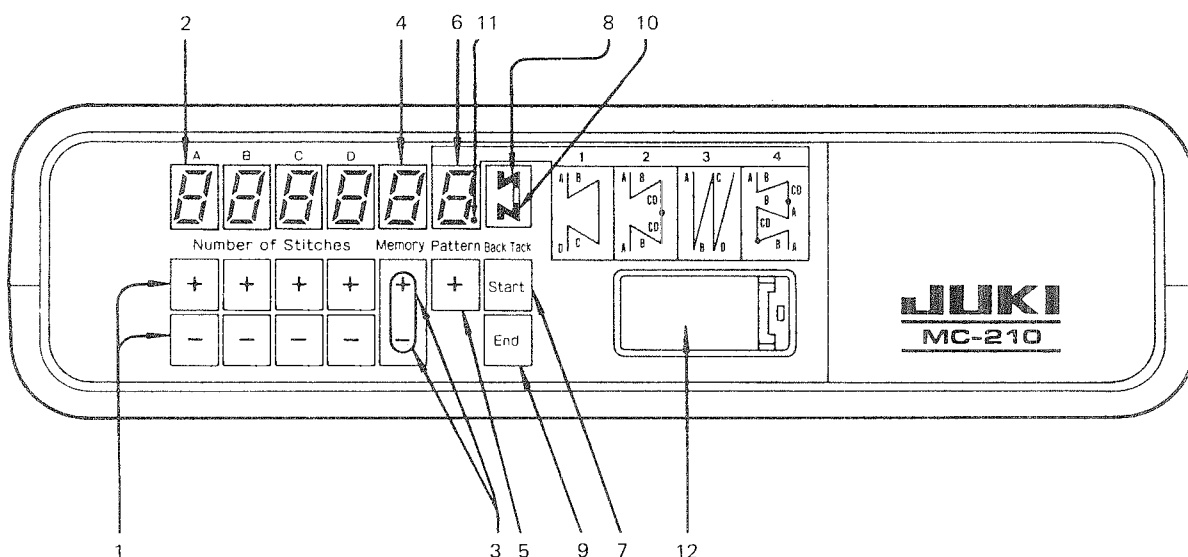


Fig. 5

1) Switches for setting the number of stitches

These switches are used to set the number of stitches for each step A to D. The number of stitches can be set to 0 through 9.

- key switch : Used to increase the number of stitches
- key switch : Used to decrease the number of stitches

2) Number of stitch indicator LEDs (Light Emitting Diode)

Indicate the number of stitches set for each step (A to D).

3) Memory setting switch

Used to indicate the storing location (memory No.) and the stored contents of a sewing pattern, number of stitches, and ON/OFF of automatic reverse feed stitching.

- key switch : Used to increase memory No.
- key switch : Used to decrease memory No.

4) Memory indicator LED

Indicates a memory No.

5) Pattern setting switch

Used to select and set one of the four different stitching patterns shown at right.

When this switch is kept ON for more than 0.5 sec., the patterns are repeatedly displayed in the order of 1 to 4.

6) Pattern indicator LED

Indicates the pattern No. which has been selected.

Pattern No.	1	2	3	4
Stitching pattern				

Table 2

7) Switch of automatic reverse feed stitching at sewing start

Used to turn On or OFF the automatic reverse feed stitching at sewing start. It turns ON or OFF alternately each time it is depressed. (This switch is effective for pattern Nos. 1, 2 and 4, but it is ineffective when the number of stitches for step B is set for "0".)

- 8) LED indicator of automatic reverse feed stitching at sewing start
Lights up when the switch of automatic reverse feed stitching at sewing start is turned ON.
- 9) Switch of automatic reverse feed stitching at sewing end
Used to turn ON or OFF the automatic reverse feed stitching at sewing end. It turns ON or OFF alternately each time it is depressed. (This switch is effective for pattern Nos. 1, 2 and 4, but it is ineffective when the number of stitches for step C in pattern No. 1 or for step B in pattern No. 2 or 4 is set to "0".)
- 10) LED indicator of automatic reverse feed stitching at sewing end
Lights up when the switch of automatic reverse feed stitching at sewing end is turned ON.
- 11) Battery replacement time telling LED indicator
Tells the time to replace the battery for storing a set pattern, number of stitches, etc. in memory. Replace the battery as soon as possible when this dot lights up.
(For battery replacement, refer to 5-4.)
- 12) CPU control panel cover
This cover is removed when changing the functions of the CPU.

(2) How to set a sewing pattern

Memory Nos. 1 to 9 are provided as locations for storing sewing patterns. The memory contents include the type of pattern, the numbers of stitches for steps A to D, and ON/OFF of reverse stitching. By specifying the memory No. of the desired sewing pattern stored, sewing operation can be done according to the setting shown on the CPU control panel.

The table below shows an example of stored contents and corresponding sewing patterns.

(Several sewing patterns are set at the factory to check for proper operation before delivery.)




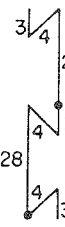

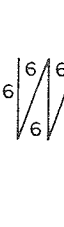




Memory No.	0	1	2	3	4	5	6	7	8	9	
Sewing patterns produced according to memory contents											
Memory contents	Pattern No.	—	1	1	4	1	3	1	1	1	1
	Number of stitches A	—	4	4	3	0	6	0	0	0	0
	Number of stitches B	—	3	5	4	0	6	0	0	0	0
	Number of stitches C	—	5	4	2	0	6	0	0	0	0
	Number of stitches D	—	0	3	8	0	6	0	0	0	0
	Automatic reverse feed stitching at start	—	ON	ON	ON	OFF	—	OFF	OFF	OFF	OFF
	Automatic reverse feed stitching at end	—	ON	ON	ON	OFF	—	OFF	OFF	OFF	OFF

Table 3

- * 1 Memory No. 0 is exclusively used for sewing without automatic reverse feed stitching and inching.
- * 2 Memory Nos. 4, 6, 7, 8 and 9 have no set sewing patterns.
- * 3 The memory contents enclosed with the bold line can be freely set.

1) How to call set sewing pattern

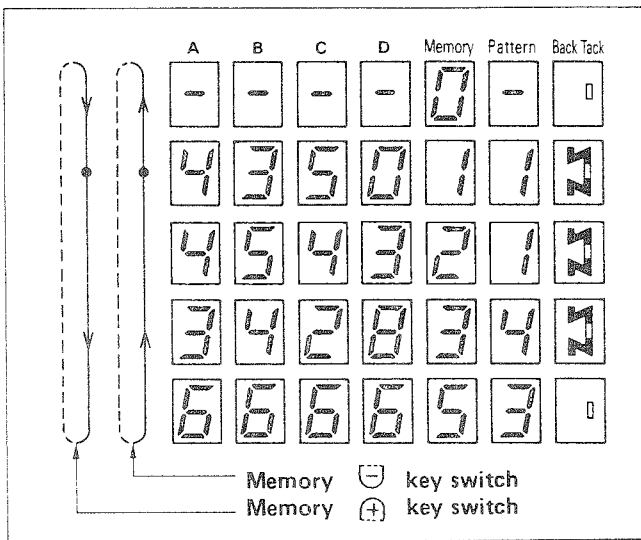


Fig. 6

A set sewing pattern can be called by operating the memory (⊕) key switch and the memory (⊖) key switch. When the setting is as shown in Table 1, the memory No. changes 1 → 2 → 3 → 5 → 0 → 1 as illustrated when the memory (⊕) key switch is depressed. At this time, the memory contents of each memory No. will be shown. When the memory (⊖) key switch is depressed, the change goes like 1 → 0 → 5 → 3 → 2 → 1. (A memory No. with no set sewing pattern is automatically skipped.) Keep on depressing either memory switch until the desired sewing pattern is reached.

2) How to change the number of stitches for a set sewing pattern

The number of stitches for a set sewing pattern can be changed by depressing the ⊕ or ⊖ number of stitches setting key switch for the step (A to D) whose number of stitches is to be changed. (The ⊕ key switch increases the number of stitches, while the ⊖ key switch decreases it. When either of these switches is continuously depressed, the number of stitches will also change continuously.)

3) How to change ON/OFF of automatic reverse feed stitching of a set sewing pattern

The switches of automatic reverse feed stitching at sewing start and end turn ON or OFF alternately each time they are depressed.

- (Caution) *
- * If the number of stitches for step B is set for "0", the automatic reverse feed stitching at sewing start cannot be engaged.
 - * If the number of stitches for step C is set for "0", the automatic reverse feed stitching at sewing end cannot be engaged.
 - * In the case of pattern 3, the automatic reverse feed stitching at sewing start or end cannot be engaged.

4) How to change the pattern shape of a set sewing pattern

When the pattern switch is kept depressed for more than 0.5 second, the pattern indication changes. Keep on depressing the pattern switch until the pattern No. having the desired pattern shape is reached. (The pattern Nos. 1 to 4 are repeatedly indicated.) When the pattern No. has been changed, all the numbers of stitches which have previously been set will be cleared to "0". Therefore, it is necessary to set the numbers of stitches again.

5) How to erase set sewing patterns

Call the memory No. (3, for instance) to be erased using the memory switch. Next, keep on depressing the pattern switch for more than 0.5 second. The pattern No. indication will change and at the same time the numbers of stitches will be all reset to "0". This erases the contents of the specified memory No. (3 in this case). Now, you can change it to the desired memory No.

6) How to set a new sewing pattern

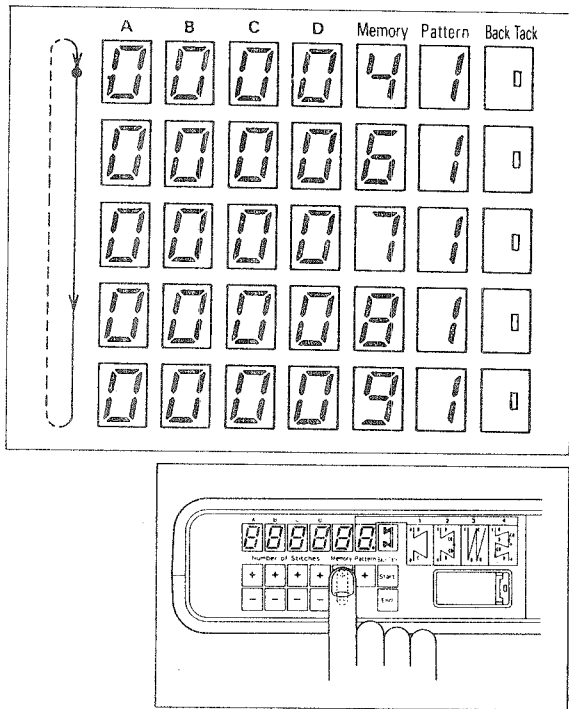


Fig. 7

① When the memory (⊕) and (⊖) key switches are depressed at the same time, memory Nos. (1, 2, -- 9) which have not been set will be automatically indicated in sequence. When the setting is as shown in Table 1, memory Nos. will be indicated in the order illustrated when you keep on depressing the memory switches. Release the switches at the moment the desired memory No. appears.

② Next, if the desired pattern shape belongs to a pattern No. other than "1", depress the pattern switch for more than 0.5 second to change the indication to the desired pattern No.

③ Using the number of stitch setting switches, set the number of stitches for each step (A to D).

(Note) Depress the memory (⊕) and (⊖) key switches at the same time as illustrated.

3. ADJUSTMENT

3-1. Adjusting the belt tension

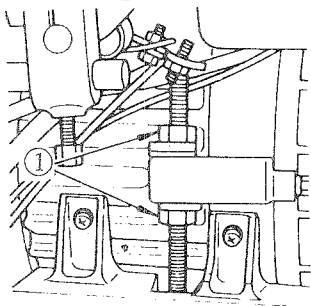


Fig. 8

An excessive belt tension would damage the main shaft bushing of the machine or the motor bearing, while an insufficient belt tension would cause the belt to slip with consequent shortened life of the belt, and also cause other faults such as overrun after thread trimming and uneven needle stop height at the time of machine stop.

Accordingly, use a belt of the appropriate length as specified in INSTRUCTION BOOK. Adjust the belt tension by adjusting nut ① so that the belt gives a 10 ~ 15 mm (0.394" ~ 0.59") slack when you push the middle of the belt.

3-2. Checking and changing the direction of rotation

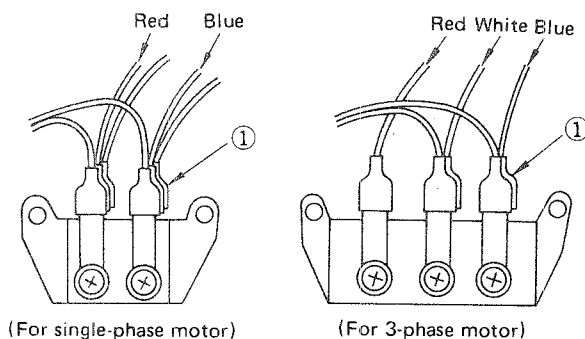


Fig. 9

Turn the handwheel by hand to lower the needle. Then turn on the power switch, and check the direction of rotation of the handwheel.

The handwheel should rotate counterclockwise as observed from the handwheel side. If the handwheel rotates in the opposite direction, change the connection of fasten terminals ① on the rear of the motor as follows:

(For 3-phase motor)

Change the connection of two terminals of the cords (red, white, and blue) coming out from the main motor.

(For single-phase motor)

Change the connection of the cords (red and blue) coming out from the main motor.

- (Caution)
1. Always unplug the motor from the receptacle and make sure that the main motor has stopped running before changing the connection of the fasten terminals.
 2. Motors rated 150 volt or more are provided with ground wires. Be sure to ground these motors before running them.

3-3. Adjusting the pedal

(1) Adjusting the pedal pressure

- 1 Forward (toe down) pedaling pressure
Hook pedal pressure adjusting spring (a) on the right side to increase the pressure, or on the left side to decrease it.
- 2 Backward (heel down) pedaling pressure
Screw backward (heel down) pedaling pressure adjusting screws (b) and (c) in to increase the pressure required to actuate the Auto-lifter and thread trimmer, respectively, or screw them out to decrease it.
The adjustable range of (b) and (c) is as shown at right.

Note : After adjustment, lightly tighten the stoppers of (b) and (c) with your fingers.

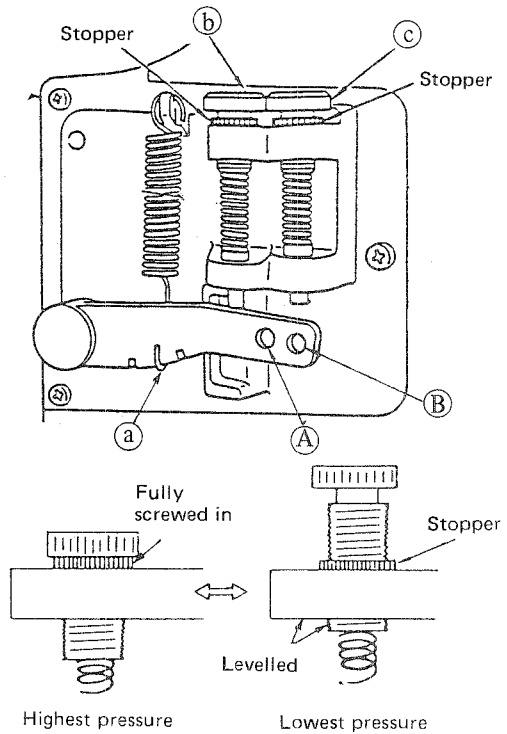


Fig. 10

(2) Adjusting the pedal stroke

The pedal stroke varies depending upon whether the connecting rod is attached to (A) or (B) in Fig. 10. The pedal stroke becomes smaller when the connecting rod is attached to (A) than when attached to (B), with resultant increase in the forward or backward treading pressure. Accordingly, when only the pedal stroke is required to be changed, perform adjustment of the pedal pressure after changing the installation position ((A) or (B)) of the connecting rod.

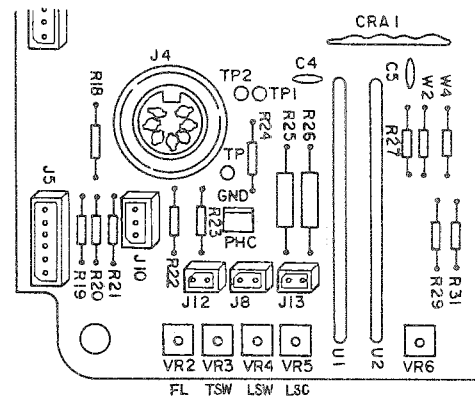
(3) Adjustment of the stroke play for starting the machine or thread trimming

In the predecessor models, the point at which the machine is started when the pedal is trodden on forward (toe down) is adjusted by moving the switch in the pedal sensor. In MC-110 and MC-210, the above-mentioned point can be adjusted electrically by means of a semi-fixed resistor on the PSC board.

1) How to adjust the stroke for starting the machine

The stroke for starting the machine can be adjusted by VR4 (LSW) shown in the figure right. Using a screwdriver, turn this knob clockwise to increase the stroke, or counterclockwise to decrease the stroke. (Take care not to turn the knob excessively, or else the machine will not stop when it should or will not run even when the pedal is trodden on forward).

- The standard value is 3 mm (0.118") at the attaching point of the connecting rod.



2) How to adjust the stroke for actuating Auto-lifter (for a machine equipped with Auto-lifter)

The stroke for actuating Auto-lifter can be adjusted by control knob VR2 shown at right. Turn this control knob clockwise to increase the stroke or counterclockwise to decrease it. (Be careful not to excessively turn it, otherwise Auto-lifter is falsely actuated when the pedal is set in the neutral position or it cannot be actuated even when the pedal is depressed backward (heel down).)

- The standard value is 3 mm (0.118") at the attaching point of the connecting rod.

4) WHEN OPERATING THE MACHINE WITHOUT AUTO-LIFTER

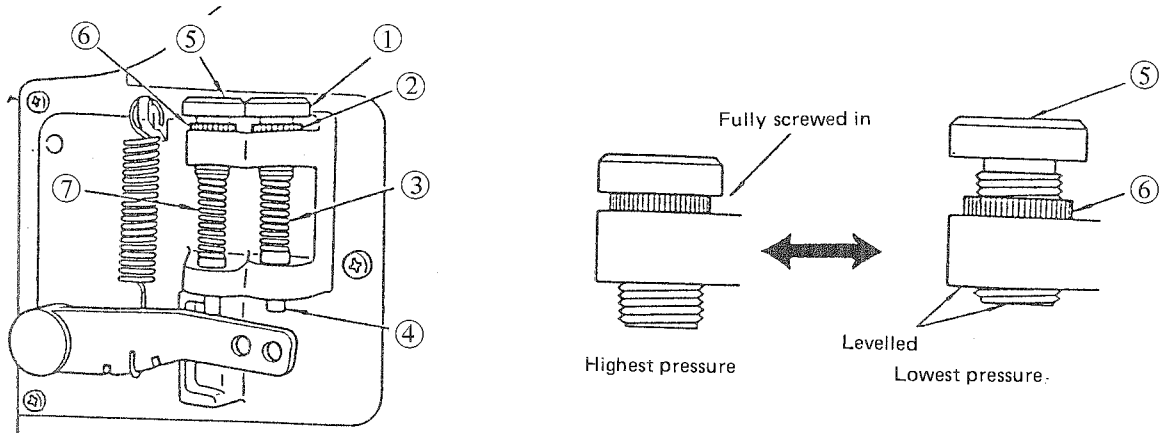


Fig. 11

The PSC box incorporates a spring for an Auto-lifter.

If no Auto-lifter is used, replace the spring by the one (M2007110A00) supplied with the unit in the following procedure :

1. Remove stopper ② and adjusting screw ① .
Then, remove spring ③ and the spring shaft ④ .
2. Remove spring ⑦ in the same way as described in Step 1, and replace it by the spring supplied with the unit.
3. Adjust the pedaling (heel down) pressure by turning adjusting screw ⑤ in or out.
(As the adjusting screw is turned in, more pedaling pressure is required, and vice versa. See the figure for the adjustment.)
4. After adjustment, tighten stopper ⑥ to secure the adjustment.

3-4. Adjusting the needle stop position

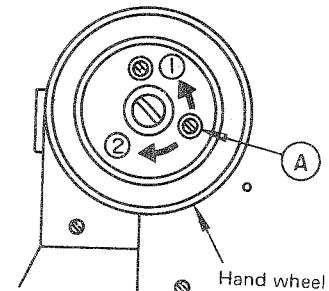
(1) For built-in synchronizer

1) How to adjust the upper stop position (after thread trimming)

The standard needle stop position is such that the red dot engraved on the arm aligns with the white dot engraved on the hand wheel when the needle stops after thread trimming.

With the needle stopped in the upper position, loosen screw (A) shown in the figure right to perform adjustment within the slit.

- Move (A) toward ① for a lower stop position.
- Move (A) toward ② for a higher stop position.



2) How to adjust the lower stop position

To adjust the lower stop position of the needle at the time when the pedal is set to the neutral position after forward depressing, bring the needle in its lower stop position, and loosen screw (B) (see figure on the right) to make adjustment within the slit.

- Move (B) toward ① for a higher stop position.
- Move (B) toward ② for a lower stop position.

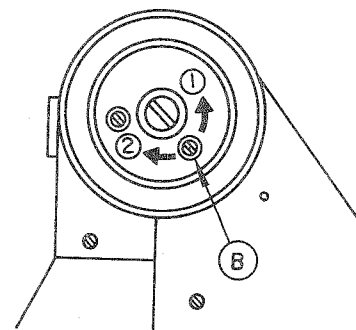


Fig. 12

Note : Do not run the machine with (A) and (B) loosened while making the above adjustment.

Screws (A) and (B) should be just loosened, and should not be removed.

(2) For synchronizer mounted outside

1) How to adjust the upper stop position

- ① Loosen the two screws ①, and align the red dot engraved on the synchronizer with the white dot engraved on the flange (or the dot engraved on the handwheel if the model does not have a flange). Then, tighten the two screws. (See Fig. 13)
- ② Operate the machine to move the needle to its upper stop position. If the red dot on the arm is between the two white dots on the handwheel, loosen the two screws ① and perform fine adjustment of the stop position.

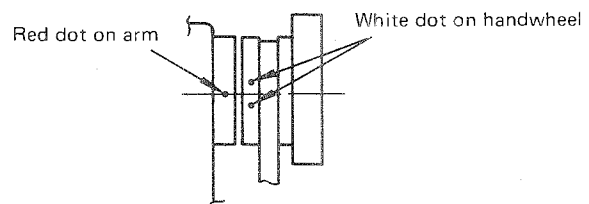
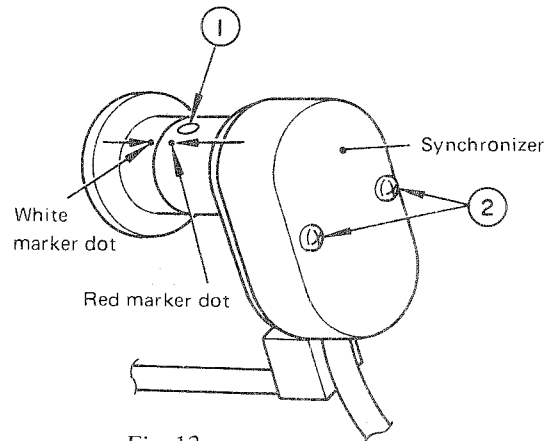


Fig. 14

2) How to adjust the lower stop position

The synchronizer is usually factory-adjusted so that the lower stop position will be correct if only the upper stop position is adjusted correctly. However, if there should be a case in which the lower stop position is not correct, whereas the upper stop position is correct, adjust the lower stop position as follows :

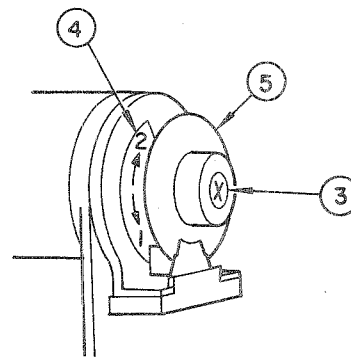


Fig. 15

- ① Remove the two screws ② shown in Fig. 13, and take the cover off.
- ② Loosen screw ③ of Fig. 15, and turn the inner disc as described below. At this time, be careful not to accidentally allow outer disc ⑤ and the handwheel to turn.
 - * Turn disc ④ in the direction of ① to advance the lower position stop timing.
 - * Turn disc ④ in the direction of ② to delay the lower position stop timing.
- ③ Tighten screw ③ to fix the disc, and reinstall the cover with screws ②. Then, operate the machine to check the stop position.

- Cautions
- 1) Do not operate the machine with screw ③ loosened or with the cover open.
 - 2) If disc ⑤ should be accidentally turned while making adjustment of the lower stop position, the upper stop position will be disturbed. In this case, remove the cover again and readjust disc ⑤. The direction in which the disc should be turned is the same as that for the adjustment of the lower stop position.

3-5. Adjusting the max. sewing speed

In MC-110 or MC-210, the sewing speed can be easily adjusted from a low speed of approx. 500 s.p.m. to the maximum speed by the control knob on the PSC box, eliminating the need for changing the motor pulley.

Turn max. speed limit control knob ① on the front of the PSC box counterclockwise to decrease the max. speed.

(Pedal depression vs. Speed vs. Max. speed limit)

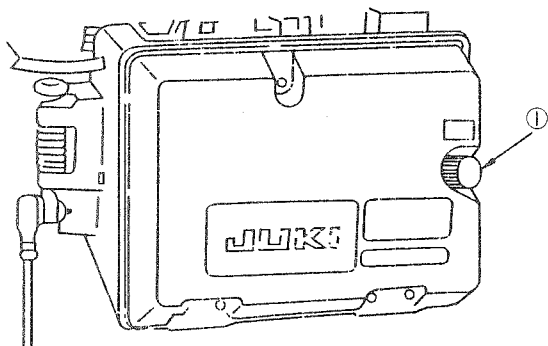
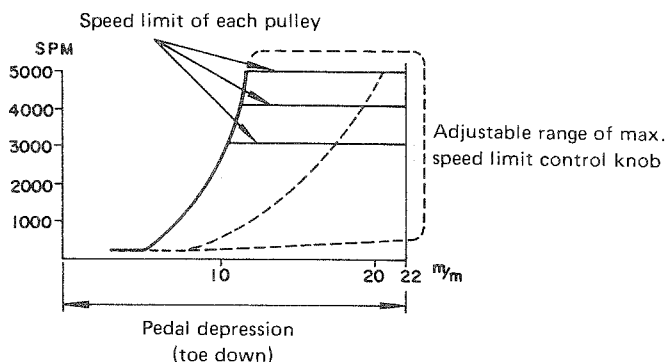


Fig. 16



3-6. Adjusting Auto-lifter

Auto-lifter is available as an option. Auto-lifter is designed to automatically raise and hold the presser foot up for 60 sec. after completion of thread trimming.

MC-110 or MC-210 is provided with an Auto-lifter control circuit. The auto-lifter function is engaged when DIP switch 2 on CPU box is turned on.

If Auto-lifter should be operated with DIP switch 2 OFF, the presser foot falsely goes up during a sewing cycle.. So, be sure to set DIP switch 2 to ON when using Auto-lifter.

(1) How to operate Auto-lifter

If it is necessary to stop the machine temporarily and lift the presser foot during a sewing cycle, lightly depress the pedal backward (be careful not to depress the pedal too much, otherwise the thread trimmer will be actuated). When the pedal is released, the presser foot immediately comes down. If it is necessary to immediately lower the presser foot which has just been raised by Auto-lifter, depress the pedal forward or depress it backward again and then return it to the neutral position.

(2) Adjusting the presser lifter stroke

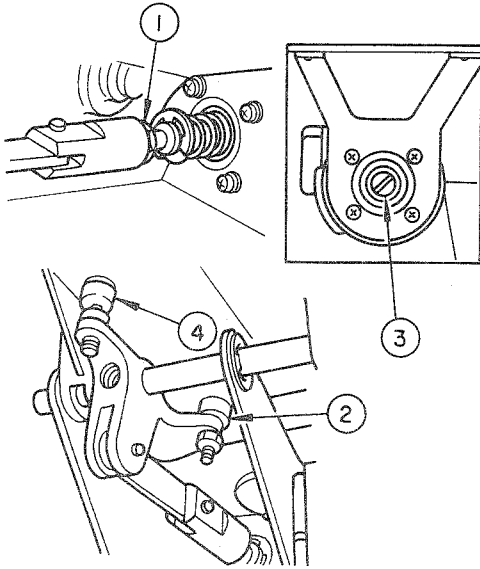


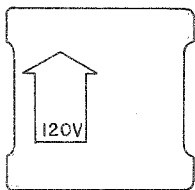
Fig. 18

1. Loosen lock nut ① of the coupler.
2. Lower presser lifter stopper (A) ② fully by loosening the lock nut.
3. Push the knee switch to drive the solenoid.
4. To increase the presser foot lift, turn plunger ③ on the far side of the solenoid clockwise, and turn the plunger counter-clockwise to decrease the lift. (The maximum presser foot lift is about 8 mm (0.315").)
5. Raise stopper (A) until it comes in contact with the oil reservoir by activating the solenoid.
6. Further raise stopper (A) by giving it another half turn after releasing the knee switch.
7. Retighten the lock nuts of stopper (A) and the coupler, respectively.
8. Loosen the lock nut of stopper (B) ④, push the presser lifter lever toward the solenoid by hand, and adjust the height of stopper (B) ④ so that the playing gap between the top end of the knee lifter rod and the knee lifter connecting rod located on the machine head becomes about 1 mm (0.039"). Then retighten each lock nut.

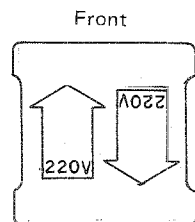
4. FUNCTION

4-1. Line Voltage

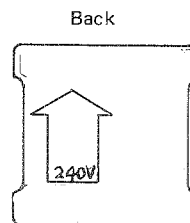
The same one box can provide as many as four different line voltages simply by changing the inserting direction of its voltage selector circuit board. The voltage selector circuit board comes in two types; single-phase 120V and 3-phase 200/220/240V. Select an appropriate circuit board according to the line voltage of your area.



Single-phase voltage selector circuit board



3-phase voltage selector circuit board



Voltage selector circuit board

Set the line voltage as follows :

- ① Turn the power switch OFF.
- ② Remove the cover retaining screw from the PSC box, and open the PSC box cover.
- ③ Draw voltage selector circuit board A out in the direction of the arrow. (In Fig. 20, the line voltage is set for 120V.)
- ④ Now, change the orientation of the circuit board and push it back into the box so that the marking of the desired voltage is exposed and seen as illustrated. (In Fig. 21, the line voltage is set for 220V.)
- ⑤ Close the PSC box cover.

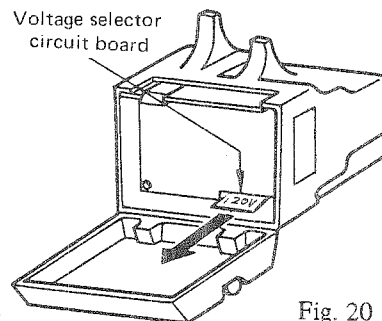


Fig. 20

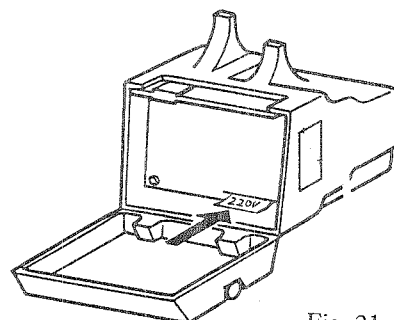


Fig. 21

Note 1: The line voltage of the box can be changed as shown above, however, it should be noted that the motor unit differs according to the line voltage used.

4-2. Function selector switches

(1) Functions of the CPU box DIP switches (MC-110)

Push (P) in the direction of the arrow to remove CPU control panel cover (1), then DIP switches (DSW1 to 6) (2) will become accessible.

The following describes the functions of the individual DIP switches.

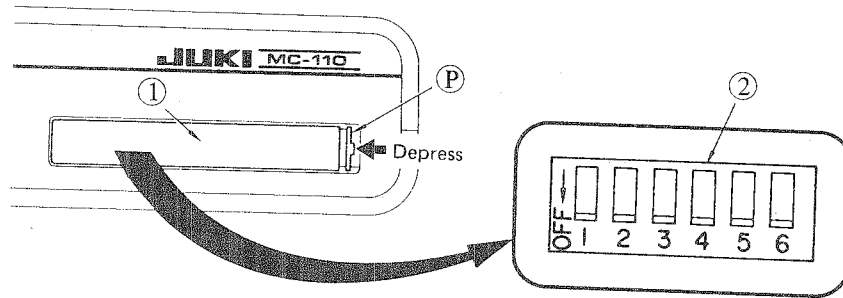


Fig. 22

(Caution) Be sure to turn the power switch OFF before changing the setting of a DIP switch, otherwise the function of the DIP switch cannot be changed.

1) DIP switch DSW. (1) Selects the speed of reverse feed stitching at sewing start.
Selector switch to set for priority given to pedal operation or for nonstop sewing based on program in controlling the reverse feed stitching speed at sewing start.
OFF : Priority is given to pedal operation (MC-100 type)
ON : Nonstop reverse feed stitching based on program (MC-200 type)

2) DIP switch DSW. (2) For Auto-lifter
This switch is turned ON when using an Auto-lifter.

(Caution) Do not use an Auto-lifter with this switch OFF, otherwise the presser foot falsely goes up even while the sewing machine is in operation.

3) DIP switch DSW. (3) Used to correct the reverse feed timing in a needle-feed sewing machine.
In a needle-feed type sewing machine, this switch serves to prevent a needle from breaking, by correcting the automatic reverse feed stitching timing at sewing start. Turn this switch ON for the following models :
DLN-415-5, DLN-415H-5, DMN-530-5, LH-1152-5, LH-1162-5, LH-1172-5, LH-1182-5, LU-1114-5

- 4) DIP switch DSW. ④ Compensates automatic reverse feed stitches.
Used to make the number of automatic reverse feed stitches coincide with a set number of stitches. Turn this switch OFF for normal operation.
- 5) DIP switch DSW. ⑤ Selects needle stop position.
Used to select the position of needle stop when the pedal is set at the neutral position.
OFF : The sewing machine always stops with its needle down.
ON : The sewing machine always stops with its needle up.
- 6) DIP switch DSW. ⑥ For soft start
Used to start the sewing machine at low speed for a beginning stitch. The slow start (soft start) is engaged by turning this switch ON. The soft start function is very useful for sewing heavy-weight materials, in which the needle thread and bobbin thread often fail to interlace with each other for the first few stitches.

(2) Functions of the CPU box DIP switches (MC-210)

Of the eight DIP switches (DSW.1 to 8) of MC-210, DIP switches DSW.1 to 6 have the same functions as those of MC-110. (Refer to the preceding paragraphs, 4-2-(1)-1) to 6.)

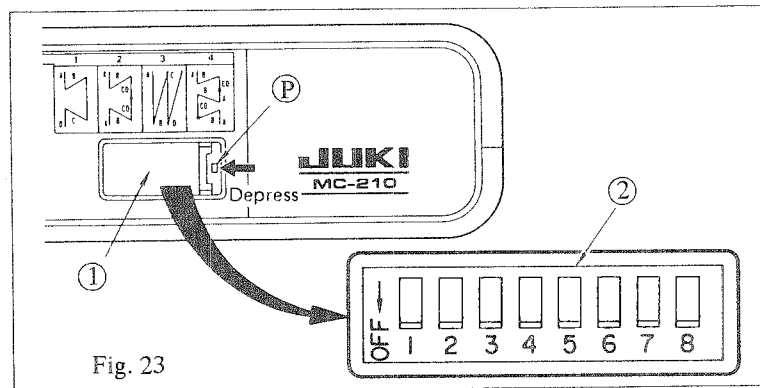


Fig. 23

Insert a small flat-bit screwdriver into ① and depress it in the direction of the arrow to remove CPU control panel cover ①, and DIP switches 1 to 8 ② will become accessible.

- 1) DIP switch DSW. ⑦ Sets the number of soft start stitches
Used to start the sewing machine at low speed for the beginning one or two stitches. This switch is ineffective when DIP switch DSW.⑥ is OFF.
OFF : Soft start for one stitch
ON : Soft start for two stitches
- 2) DIP switch DSW. ⑧ Checks input signals
This switch is used to check on the CPU control panel display whether the signals from the input switches are properly read into the microprocessor of the CPU box. When this switch is turned ON before the power switch is turned ON, the indication on the display will be as illustrated below. (At this time, the sewing machine will not work at all, but this is not a failure.)

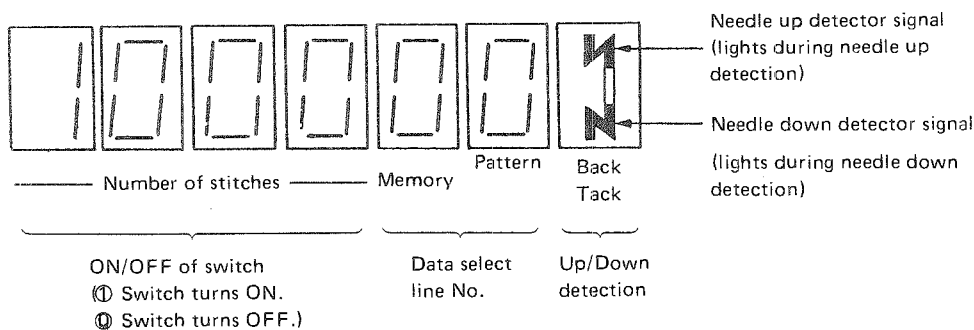


Fig. 24

The individual switches and the corresponding indications are as shown in Table 3.

The data select line No. changes from 00 to 10, and it can be updated by OFF → ON of the needle up detector, which is effected by manual turning of the handwheel.

The OFF → ON of the needle up detector can be confirmed by the OFF → ON of the needle up detection signal indicator.

After check, turn the power switch OFF, then turn the DIP switch DSW.8 OFF.

Reinstall the CPU control panel cover. Now, the sewing machine is ready for normal operation when the power switch is turned ON.

Indication of step A	Indication of step B	Indication of step C	Indication of step D	Memory	Pattern
Input switch or input signal				Data select No.	
Toe-down pedaling signal	Heel-down pedaling Signal	One-touch reverse feed SW	Presser foot lifter SW	00	
USW (option)	“Start” reverse stitch SW	“End” reverse stitch SW	Cloth edge detect input signal	01	
PSC DIP SW1	Always “1” indication	CPU DIP SW4	CPU DIP SW3	02	
CPU DIP SW2	CPU DIP SW1	CPU DIP SW6	CPU DIP SW5	03	
Memory (+) key SW	Memory (-) key SW	No. of stitches A (+) key SW	No. of stitches A (-) key SW	04	
No. of stitches B (+) key SW	No. of stitches B (-) key SW	No. of stitches C (+) key SW	No. of stitches C (-) key SW	05	
No. of stitches D (+) key SW	No. of stitches D (-) key SW	Pattern (+) key SW	CPU DIP SW8	06	
CPU DIP SW7	*	*	*	07	

Table 4

Note 1) The needle up detector signal or the needle down detector signal is always ON during detection.

Note 2) The indication of the conditions of the switches for data select line No. 08, 09 or 10 will be always “0” because these inputs are not used yet. The same applies to the columns marked with asterisks.

(3) DIP switches on PSC circuit board

Open the PSC box cover, and you will find the DIP switches (DSW.1 to 5) at the bottom right.

(Be sure to turn the power switch OFF before changing the setting of any of the DIP switches, otherwise the function of the DIP switch cannot be changed.)

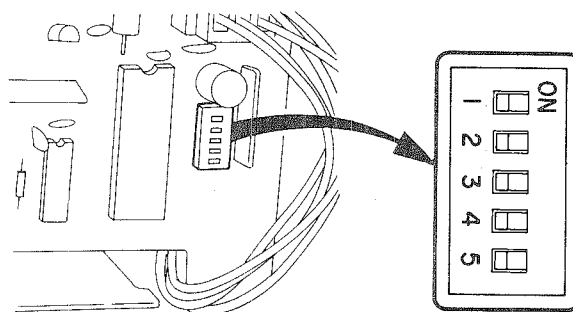


Fig. 25

1) DIP switch DSW. 1 Starts the speed test program.

Used to initiate the speed test program for adjusting the low sewing speed or the reverse feed stitching speed of a sewing machine. For more detail, refer to 4-4.

2) DIP switches DSW.2 and DSW.3 Selects thread trimmer control suited to each type of machine head.

Set the DIP switches according to Table 4 so that thread trimmer control best suited for each type of machine head is obtained.

DIP SW 1	DIP SW 2	DIP SW 3	DIP SW 4	DIP SW 5	Function
×	×	×	△	×	1-needle lockstitcher : General sewing machine with thread trimmer
×	×	○	△	×	DMN-530 : 530-type sewing machine with thread trimmer
* ×	○	×	△	×	Extra heavy-weight materials : For sewing extra heavy-weight material

○ : ON

△ : Either

×

Table 5

* Use this mode if the clutch disc produces a loud noise when the sewing machine is running at low speed in sewing heavy-weight material. In this mode, however, the noise will be reduced, but the low sewing speed will be also reduced about 20%.

3) DIP switch DSW.4 Provides thread trimming function when the stand-by circuitry operates.

This switch is effective only when DIP switch DSW.5 is ON. When this switch is turned ON, the thread trimmer can be actuated by only PSC box. In this mode, the thread trimming control selected by DIP switch DSW.2 or DSW.3 will remain effective.

4) DIP switch DSW.5 Used for shift to stand-by circuitry

The PSC circuit board has a stand-by circuitry that is capable of controlling the sewing speed, needle up/down stop and thread trimmer without the CPU circuit board if the CPU circuit board should fail. (In this case, however, the automatic reverse feed stitching mechanism, switch lever reverse feed stitching mechanism, wiper and presser foot lifter will not work.) This switch is used to put the stand-by circuitry into operation.

A) How to shift to the stand-by circuitry

- a) Turn the power switch OFF. Open the PSC box cover, and disconnect plug J3 from the connector.
- b) Turn DIP switch DSW.5 ON. If thread trimming is necessary, also turn DIP switch DSW.4 ON.
- c) Close the box cover, with plug J3 left disconnected.

B) How the sewing machine operates after the shift

The sewing machine starts when the front part of the pedal is depressed. The sewing speed can be adjusted. When the pedal is returned to the neutral position, the sewing machine stops with its needle down. If DIP switch DSW.4 has been turned ON, the thread trimmer can be actuated when the back part of the pedal is depressed. If DIP switch DSW.4 is OFF, the sewing machine stops with its needle up when the back part of the pedal is depressed.

4-3. Safety circuits

The MC-110 and MC-210 are equipped with safety circuits explained below :

(1) Safety circuit against machine locking

< Function > If the machine stops for more than 2 sec. during operation due to some mechanical or electrical failure, the safety circuit causes the clutch coil to be de-energized, and also prohibits any pedal inputs, thereby protecting the motor from burning, and minimizing damage to the machine.

< Circuit operation > When the safety circuit has been put into operation, any inputs and outputs are prohibited, and therefore the machine will not run even when the pedal is depressed. Also, the reverse feed solenoid will not work, since the reverse stitching lever switch is rendered inoperative.

< How to reset > Turn the power switch OFF. Remove the cause for the machine locking, and then turn the power switch ON again.

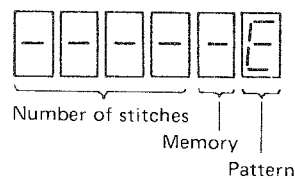
(2) Safety circuit against detector failure

< Function > If the detector for sensing the position (up to down) of the machine's needle fails, the needle stops at any position other than the uppermost or lowermost position, or the machine keeps on running when it should stop, or the thread trimmer is damaged.

To prevent these troubles, the microcomputer constantly checks the signals of the upper or lower detector. And if any trouble with the detector signals is found, the microcomputer will cause the machine to continue to operate as a machine without the thread trimming feature controlled by a clutch motor.

< Circuit operation > If any of the above troubles has been detected during machine operation, the machine is brought to a halt even when the pedal is being depressed (toe down). After this halt, when the pedal is returned to the neutral position, and then depressed (toe down) again, the machine will be operated and controlled by a clutch motor without thread trimming and automatic reverse feed stitching features. (The reverse stitching lever switch and the knee lifter are effective.)

In case of MC-210, the display pattern will give "E" and the other displays, "-".



< How to reset > Turn the power switch OFF and replace or repair the detector. Then turn the power switch ON again.

(3) Safety circuit for thread trimming

The machine will not run after thread trimming even when the pedal is depressed (toe down) during the reverse feed stitching at the end of a seam line, or during thread trimming action, and therefore troubles such as needle or knife breakage are prevented.

< How to reset > Return the pedal to the neutral position once before depressing it with toe down again, and the normal operation will be restored.

(4) Turning the power switch ON with the pedal depressed (toe down)

Even when the power switch is turned on with the pedal depressed (toe down) the machine runs only to move up the needle and stops, or the machine does not run at all when the needle is in the upper position from the beginning. The machine operates in the same manner as when the pedal is set to the neutral position.

< How to reset > Return the pedal to the neutral position once before depressing it with toe down, and the normal operation will be restored.

(5) Safety circuit for the reverse feed solenoid

If the reverse stitching lever switch stays "ON" for 12 sec. or more, the reverse feed solenoid will be de-energized. However, the automatic reverse feed stitching at the start/end of a seam line can be performed even when this safety circuit is in operation. When thread trimming action takes place with the above switch continuously on, the reverse feed solenoid will be de-energized at that point.

< How to reset > Turn the reverse stitching lever switch OFF once.

(6) Safety circuit for Auto-lifter

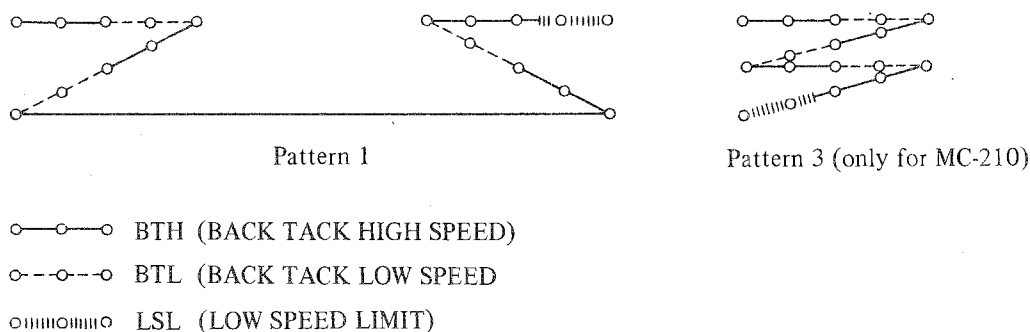
If the presser foot is raised and held up by the Auto-lifter for a minute, the presser foot lifting solenoid will be automatically de-energized, and the presser foot comes down.

< How to reset > The machine will be initialized when the presser foot has come down.

Therefore, the presser foot will go up following the subsequent thread trimming or it can be raised by slightly depressing the pedal, backward (heel down).

4-4. Adjustment of low-speed s.p.m. and reverse feed stitching s.p.m.

(Test program)



The MC-110 and MC-210 are so designed that they slow down immediately before the reverse feed solenoids turns ON or OFF as illustrated above in order to ensure accurate stitching.

The s.p.m. is factory-adjusted, but if it is necessary to readjust it, do as instructed by the adjustment procedure given below.

If no accurate tachometer is available, do not perform the adjustment of MC-110 because the adjustment of the low speed limit (LSL) requires a high setting accuracy (200 ± 20 s.p.m.), but, LH or LU series except LH-1152 requires 155 ± 10 s.p.m. The adjustment of MC-210 may be performed as it has a built-in tachometer.

Adjust the reverse feed stitching s.p.m. (BTH and BTL) so that they permit easy sewing. Be careful, however, not to set it too high, otherwise the machine may produce one or two more reverse stitches than required.

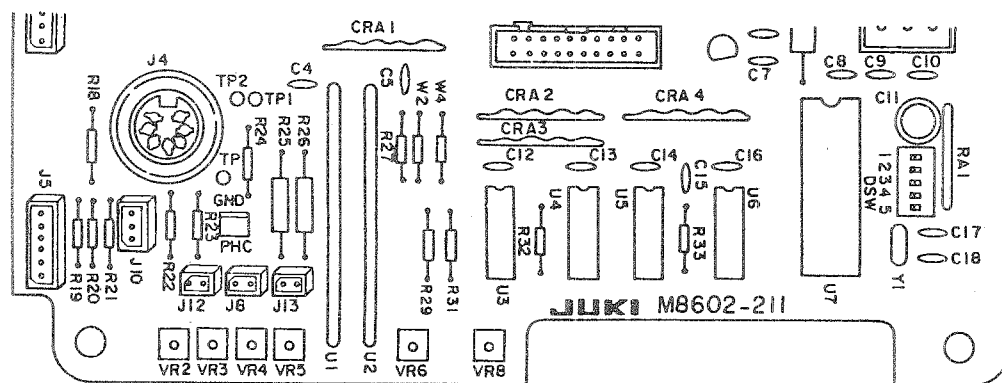


Fig. 26

- | |
|---|
| <p>Tools required for adjustment</p> <ol style="list-style-type: none"> 1. Tachometer (Unnecessary for MC-210) 2. Small flat-bit screwdriver 3. Large flat-bit screwdriver |
|---|

< Adjustment procedure >

- ① Turn the motor power switch OFF. Apply a reflective tape for r.p.m. measurement onto the handwheel. (This step is unnecessary for MC-210.)
- ② Using the large flat-bit screwdriver, remove the screw retaining the PSC box cover. Open the box.
- ③ Turn DIP switch DSW.1 on the PSC circuit board ON.
- ④ Raise the presser foot of the machine head by the hand lifter.
- ⑤ Turn the power switch ON. (At this time, the sewing machine will give no action even if its needle is not in the upper fixed position. This is because of the speed test program and not a failure.)
- ⑥ When toe-down pedaling and heel-down pedaling are repeated, the sewing machine runs at the s.p.m. shown in Table 5:

Heel-down pedaling	1st	2nd	3rd	4rd	5th
Output signal	LSI	LSL	SOFT	BTL	BTH
s.p.m.	200 ~ MAX (155 ~ MAX)	200 ± 20 (155 ± 10)	200 (155 ± 10)	1500 ± 200 (1300 ± 200)	1700 ± 200 (1500 ± 200)
Control knobs to be adjusted	Varies according to pedal	VR5	VR5	VR8	VR8

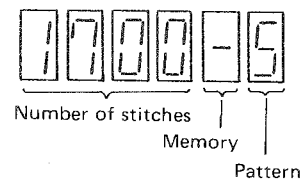
Note: The parenthesized speeds apply to LH and LU series except LH-1152.

Table 6

Note) When the automatic reverse feed stitching low speed (BTL) is adjusted by VR8, the automatic reverse feed stitching high speed (BTH) will be changed at the same time. Adjustable range of BTH : 1300 to 2600 s.p.m.

* On completion of the 5th cycle, the machine returns to the 1st cycle.

In MC-210, the s.p.m. is shown on the display of the number of stitches. The pattern display indicates what number of the test program is on.



- ⑦ After completion of the s.p.m. adjustment, turn the power switch OFF.
- ⑧ Turn DIP switch DSW.1 on the PSC circuit board OFF.
- ⑨ Close the PSC box cover with care taken not to pinch the cord, and fix the cover with the screw.
Remove the reflective tape from the handwheel.
- ⑩ Turn the power switch ON again, and the sewing machine should restore the normal program.
Check the machine for proper operation.

4-5. Needle-up stop switch (S116)

The needle-up stop switch is an option, and it is designed to stop the sewing machine with its needle up without thread trimming during a stitching cycle.

Order this switch S116 by part No. MAS116000A0.

(1) Attaching the needle-up stop switch to the machine table

- ① Using wood screw (B) supplied with the switch, fix needle-up stop switch (A) to the table.
- ② Fix the switch cord with the four staples.

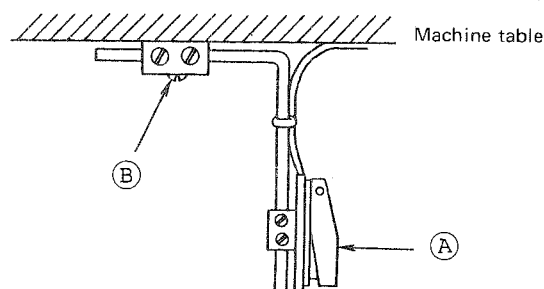


Fig. 27

(2) Connection to connector J8

- ① Open the PSC box cover.
- ② Cut in cord bushing (A) as illustrated, using a knife.
- ③ Remove the rubber film from the cut in portion, and make a hole for passing the cord through.
- ④ Pass the needle-up stop switch cord through the hole made in the preceding step, and fit the cord bushing into the grooves of the PSC circuit board so that the nylon clip is in the PSC box.
- ⑤ Connect the switch cord connector to connector J8 (see the PSC circuit board diagram) on the PSC circuit board.
- ⑥ Close the PSC box cover.

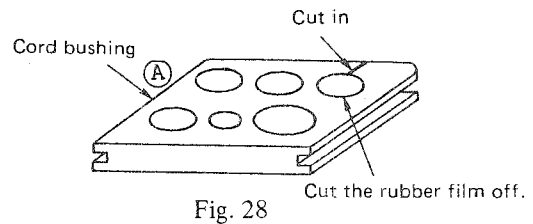


Fig. 28

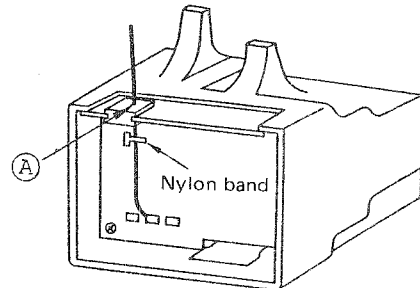


Fig. 29

5. MAINTENANCE AND INSPECTION

5-1. How to replace the fuse

When the power switch is turned ON, if no indicator on the CPU panel lights up or if the sewing machine fails to work even if the indicators light, check for blown fuses.

If a blown fuse is found, replace it in the following procedure :

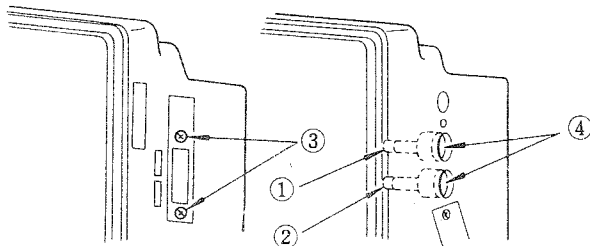


Fig. 30

If a new fuse blows immediately, identify the cause.

Do not replace a blown fuse with a new one with a larger capacity.

1. Turn the power of the sewing machine OFF.
2. Loosen screws 3, and remove the cover.
3. Using a Phillips screwdriver, turn fuse holder caps 4 in the direction of the arrows to remove them. Then, take the blown fuse out.
4. Put in a new fuse. Be sure to use the following fuses.

Fuse 1 ... 125V6AT (Time lag melting fuse)

Fuse 2 ... 250V4A (Ordinary melting fuse)

5-2. How to replace the sensor control knob asm. (M85211100A0)

If the sewing speed drops suddenly or the machine stops suddenly while treading on the pedal forward, it is due the expiry of the service life of the sensor control knob asm. (M85211100A0). In this case, replace the sensor control knob asm. in accordance with the following procedure :

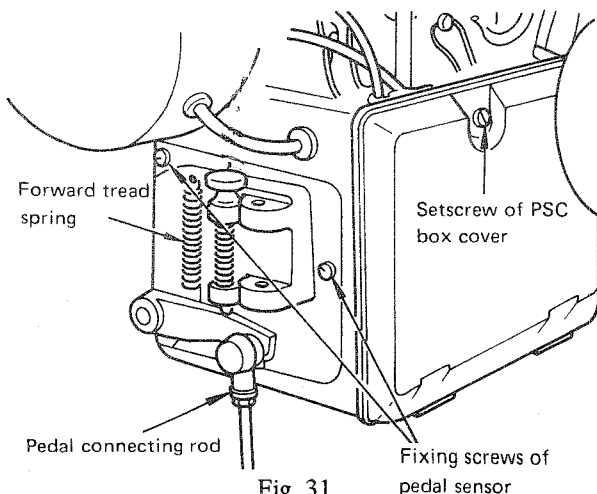


Fig. 31

- 1) At the pedal lever, remove the pedal connecting rod.
- 2) Open the PSC box cover by removing its setscrew.
- 3) Disconnect the 6P connector trailing from the sensor control knob from the PSC board. (The connector housing is provided with a lock. Depress this lock by finger to release the lock, and draw it out while depressing it.)
- 4) Remove the three fixing screws of the pedal sensor to remove the pedal sensor asm.

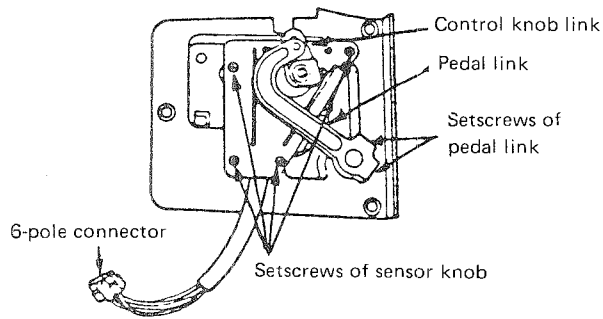


Fig. 32

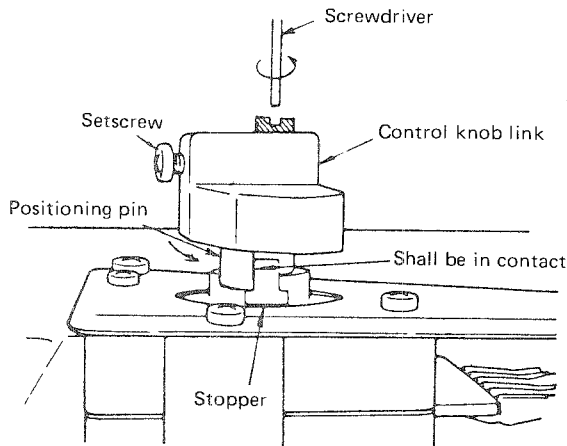


Fig. 33

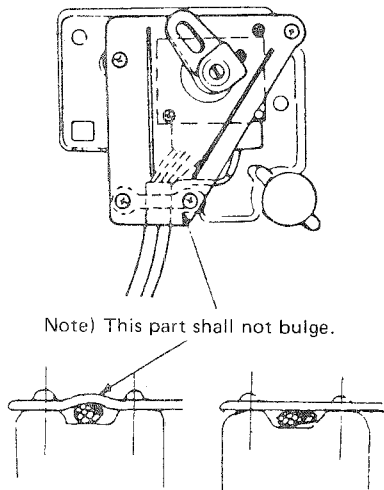


Fig. 34

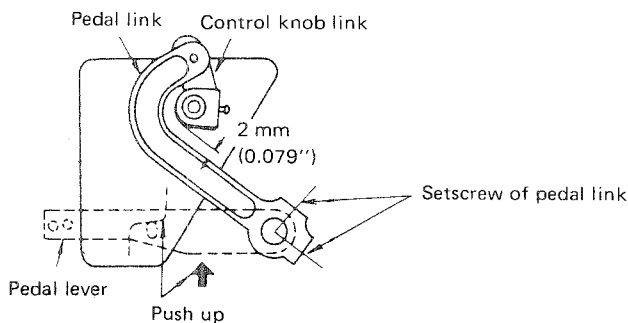


Fig. 35

- 5) Loosen the two setscrews of the pedal link by an L-shaped hexagon wrench, and remove the pedal link. (Do not remove the pedal lever.)
- 6) Unscrew the four setscrews of the sensor control knob to remove the sensor control knob asm.
- 7) Remove the control knob from the sensor control knob asm.
- 8) Install the removed control knob link on the new sensor control knob asm. as follows:
With the stopper of the sensor control knob in contact with the positioning pin of the control knob link as shown in the figure right, turn the control knob shaft counterclockwise until it stops, and retighten the setscrew with a tightening torque of 8 to 10 kg.cm.
- 9) Fix the sensor control knob asm. by four screws.
Note: At this time, install the sensor control knob asm. so that the lead wire does not cause the installing plate to bulge.
- 10) Install the pedal link so that its pin is inserted to the slot of the control knob link.
- 11) Tighten the setscrews of the pedal link for preliminary installation, and remove the forward/backward tread springs.
- 12) Turn the pedal lever in the arrow direction to make it come in contact with the stopper. At this time, position the pedal lever to provide a 2 mm (0.079") clearance between the pedal link and the control knob link as shown in the figure, and an axial play of 0.05 to 0.1 mm (0.002" to 0.004"). Then firmly tighten the setscrews of the pedal link.
Note: After installation, be sure that the pedal lever moves smoothly without play.
- 13) Install the pedal sensor asm. with the 6 pin output cord drawn out to the left edge of the PSC board to prevent the cord from being pinched.
- 14) Reverse the removing order to proceed with further installation. On completion of the installation, adjust the stroke before the machine starts and the stroke before the thread trimmer is actuated, by VR4 and VR3, respectively.

5-3. How to replace the synchronizer

(1) For built-in synchronizer

If the synchronizer fails, the needle of the machine will not stop at the upper or lower position when the machine stops, and the safety circuit will be put into operation, or the machine will keep on running at a high speed. Replace a faulty synchronizer in the following sequence.

- 1) Removing the belt cover, loosen the setscrews of the pulley to remove the pulley.
- 2) Unscrew the cord setscrew and the four setscrews of the stator mounting base to remove the stator.
- 3) Fix a new stator by the setscrews so that the stator is pressed against the side of the rear bushing of the machine without any clearance left, and that one of the setscrews is positioned right above.
The stator mounting base is made of plastic tighten the setscrews with approx. 6 kg.cm. torque (it is advisable to use the 7 cm (2.756") small screwdriver supplied with the machine).
- 4) Retighten the cord setscrew.
- 5) Install the pulley so that the screw No. 1 contacts the flat part of the main shaft, and $1 \text{ mm} \pm 0.5 \text{ mm}$ ($0.04'' \pm 0.02''$) clearance is provided between the stator mounting base and the position detector magnet as shown in the figure right.
- 6) Turn the pulley by hand to check it for freedom of rotation.
- 7) Install the cord, and attach the V belt to the pulley.
Then confirm that there is no contact between the V belt and the cord.
- 8) With the needle set at the lower position, turn on the power switch. The machine will then operate until the needle has gone up fully. If the needle stop position at that time is considerably out of position, check the position of the pulley setscrews.
- 9) Run the machine at a low speed to check for any frictional noise. After reinstalling the belt cover, check for frictional noise again.
- 10) Adjust the needle up/down stop positions by the setscrew of the magnet mounting base of the pulley.

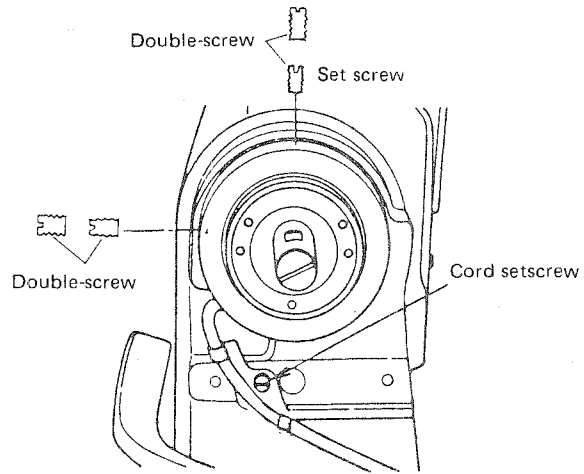


Fig. 36

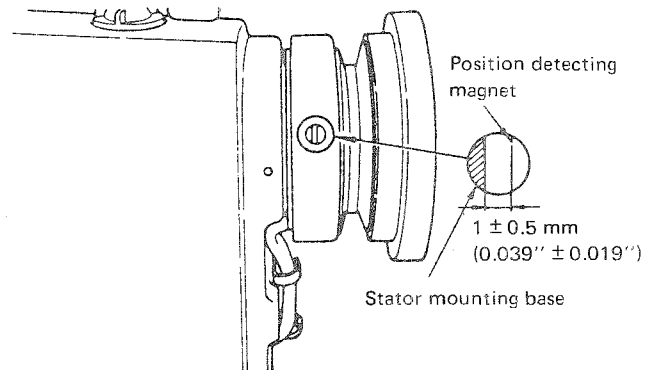


Fig. 37

(2) For BB-type synchronizer

- 1) How to install

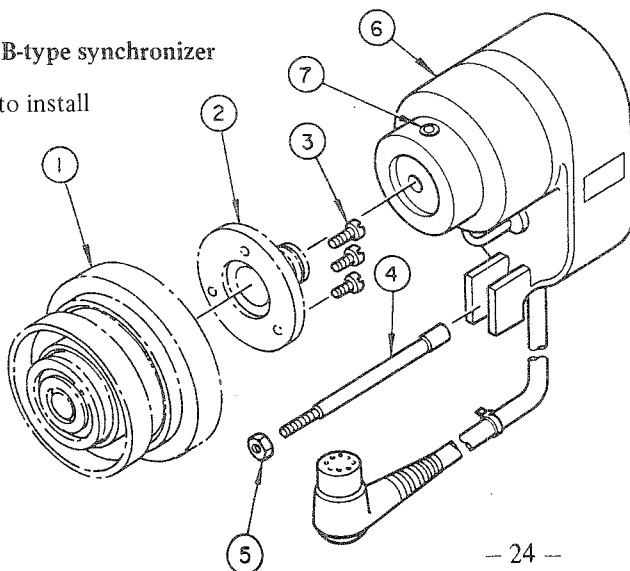


Fig. 38

1. Attach flange ② to handwheel ① with three screws ③ furnished with the synchronizer. (Flange ② is unnecessary for some models.)
2. Insert detector fixing shaft ④ into the tapped hole in the machine head, and lock it with nut 5.
3. Fit detector ⑥ onto detector fixing shaft ④ so that the end of the shaft meets the groove of the detector, then attach them to flange 2.

2) How to adjust

Loosen screw ⑦ and perform fine adjustment by the synchronizer so that, when the machine stops with its needle up, the white marker dot on the handwheel meets the red marker dot on the machine head.

5-4. How to replace the sewing pattern memory battery (applicable only to MC-210)

When the decimal point at the bottom right of the pattern indicator LED (Light Emitting Diode) of the CPU control panel, it shows that the sewing pattern memory battery is almost running out. When this happens, replace the battery by a new one (part No. M8501-221-0A0) within a month.

If the old battery is not replaced, a stored pattern will pass out of the memory in a few hours after the power is turned OFF. And the next time when the power is turned ON, the test pattern appears in place of the stored pattern.

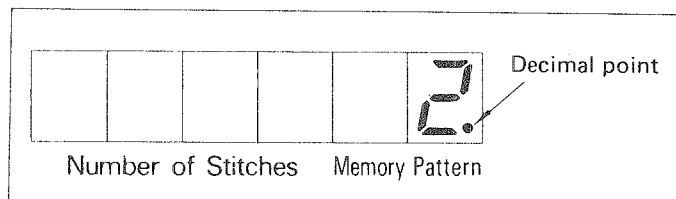


Fig. 39

(1) How to replace a battery

- ① Write all patterns presently in use on paper.
- ② Turn the power OFF.
- ③ Remove the six screws retaining the CPU box cover, and lightly lift the panel side of the CPU box cover to remove the CPU panel from the cover grooves. Then, slide the CPU box cover back until connector J22 appears as illustrated. (At this time, do not forcibly remove the CPU box cover because the CPU box cover is connected with the CPU circuit board through connector J22.)
- ④ Hold the lock tab of the battery connector J22 and draw the connector out.
- ⑤ Remove the battery from the rear of the CPU box cover by cutting the nylon band of the battery.
- ⑥ Fix the new battery with the nylon band supplied with the battery. (See Fig. 42.)
- ⑦ Cut off the excess of the nylon band as shown in Fig. 42.
- ⑧ Connect the connector of the new battery to J22.
- ⑨ Fit the control panel into the grooves of the CPU box cover, and fix the cover with the six screws. (At this time, be careful not to leave any clearances around the periphery of the cover. See Fig. 43.)
- ⑩ Turn the power ON, and check each pattern. (If the battery replacement is completed within 30 min., all patterns are still in memory.) If any of the patterns is not correct, reset the patterns.

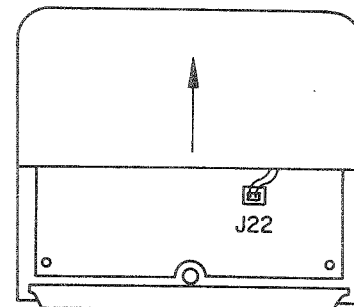


Fig. 40

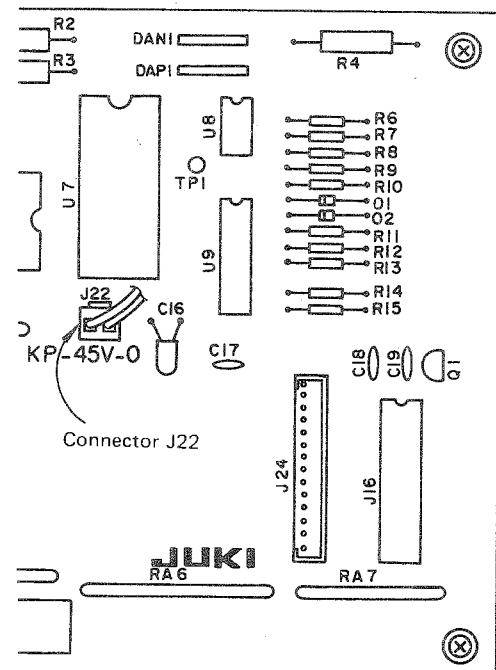


Fig. 41

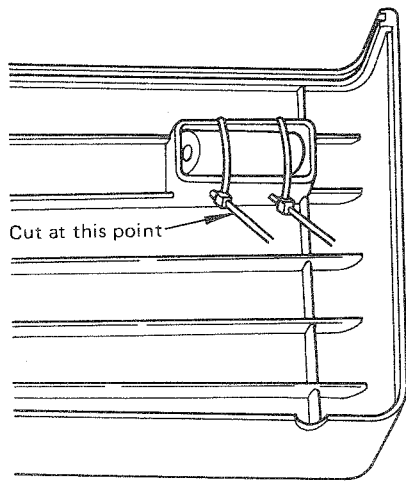


Fig. 42

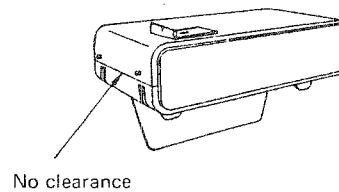


Fig. 43

5-5. Supply of the lining lubricant

Supply the lubricant exclusively used for the linings once a year for prolonged service life of the linings. Supply the lubricant also when the clutch brake produces creaks or material feed is not smooth.

Never use any other lubricant than that exclusively used for the linings. It is advisable to leave the lubricated linings as they are overnight before starting the unit again. By doing this, the lubricant will infiltrate into the linings, making them more lasting. Do the lubricant supply as follows:

1. Disassemble the motor in the same manner as when replacing the movable discs.
2. Remove fibrous wastes on the movable discs, clutch bracket, etc.
3. Use a soft, dry rag to wipe out fibrous wastes or stains on the movable disc lining surfaces.
4. Apply eight drops (each drop being as large as a small bean) of the lubricant to one lining surface as shown above.
5. Tightly press the lubricated lining surface against the other lining surface without the lubricant.
6. Turn the movable discs in the direction opposite from each other to rub them together.
7. Wipe out any excess lubricant.
8. Wipe out fibrous wastes on the splines of the clutch shaft, and supply the lubricant to them.
9. Reassemble the motor, and repeat a hundred start/stop operations for break-in before starting the unit. For a 100V motor, set the needle at its upper point before turning on the power switch.
10. Excessive lubricant supplied may cause the motor not to start. Confirm that the motor runs after the power switch is turned on.
11. The tube contains the lubricant for four supplied. Use one fourth for each lubricant supply.

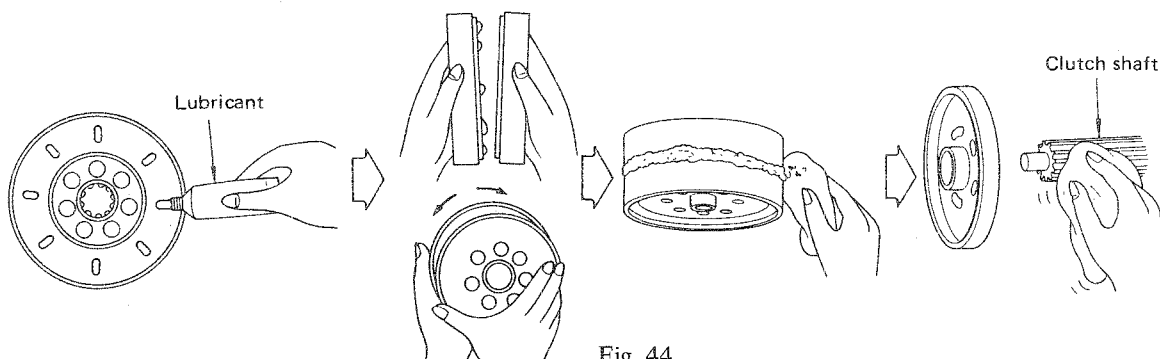


Fig. 44

5-6. Principle of operation

The electro-magnetic clutch and brake consists of the clutch coil and brake coil assemblies, the output shaft, the clutch end cover, and two moving discs which slide on the output shaft. (Fig. 45) When the clutch coil is energized by operating the treadle, the moving disc is engaged with the friction disc affixed on the flywheel. And then the rotation is transferred to the output shaft. When the brake coil is energized, by removing the force on the treadle, the moving disc is engaged with the friction disc affixed on the clutch end cover. And it stops the rotating output shaft.

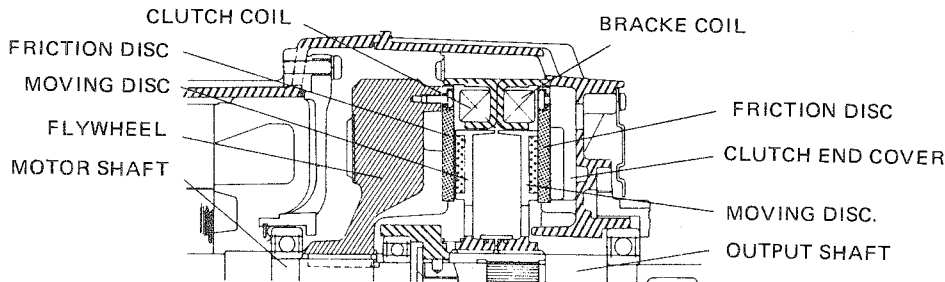


Fig. 45

5-7. Adjusting the clutch gap

If the motor pulley can not be turned smoothly by hand or when the clutch moving disk has been replaced, adjust the clearance at the clutch as follows: Slowly turn clockwise adjust screw ① which has been turned fully counter-clockwise, until the adjust screw reaches a point at which it presents considerable resistance. Then further turn the adjust screw clockwise by 8 steps (120°).

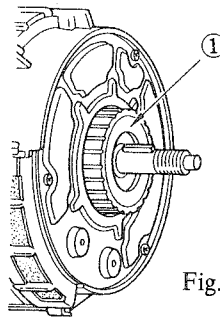


Fig. 46

5-8. Replacing the clutch ring and brake ring

A worn clutch lining may lead to faulty motor stopping or unusual noise produced by metallic friction. Replace the moving disk in accordance with the following procedure before such failures occur.

1. Disconnect clutch bracket ① and PSC box ② connectors.
2. Remove pulley cover ③ and belt ④ .
3. Removing screw ⑤ to release the clutch bracket, take off the clutch bracket from the motor.
4. Remove screw ⑦ , washer ⑧ , presser plate ⑨ , housing cover ⑩ , spring ⑪ , moving disk ⑫ , and buffer disc ⑬ from clutch bracket.

(Caution) At this time, be careful not to lose cylindrical key ⑭ fitted to the clutch shaft.

5. Replace the moving disk with a new one, and assemble the above components. Then adjust the clearance at the clutch.

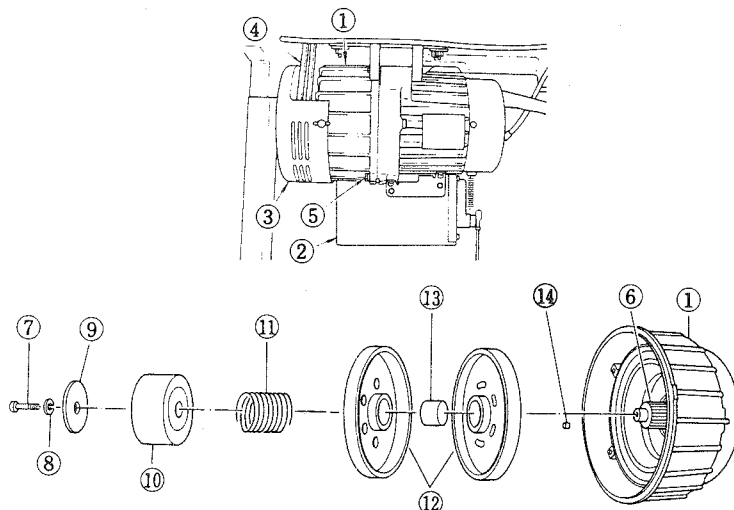


Fig. 47

5-9. Cleaning the motor

If the motor is allowed to run with its filter clogged with fibrous wastes, the motor will overheat, possibly resulting in considerably shortened life of its lining. Clean the filter once a month or every other month. The filter can be removed by pulling ① toward you.

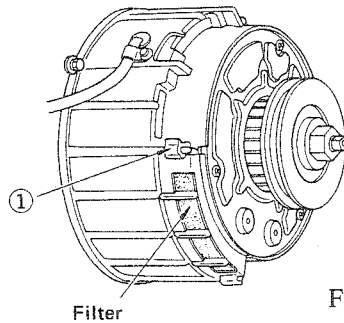


Fig. 48

5-10. Troubleshooting

If a failure occurs during machine operation, carry out troubleshooting as follows :

(1) First, check to identify whether it is a mechanical or electrical failure as exemplified below :

Example 1 : Once the reverse feed stitching switch is pressed, the sewing machine fails to go back to forward feed stitching even when the switch is released.

→ Check whether the reverse feed stitching mechanism sticks.

Example 2 : While the machine is running at high speed, the machine suddenly slows down.

→ Adjust the clutch gap of the motor, then check if the same trouble occurs again.

Example 3 : When the presser foot is raised by Auto-lifter, the presser foot once goes up but falsely comes down again immediately.

→ It is due to maladjustment of the stroke of the presser lifting solenoid.

Example 4 : The sewing machine overruns and fails to stop when it should. In other words, the sewing machine nearly stops with its needle up or down, but falsely keeps on running.

→ Check whether the clearance at the synchronizer is too large or not.

(2) Turn the power switch OFF, then ON.

- A : Is the power lamp (the number of stitches indicator LED in case of MC-210) ON?
→ If it is not ON, check the fuse or the 3-pole connector of the power input cord of the PSC box.
- B : Check the operation. In case of the following troubles, the safety circuit is in operation.
- a : After the power switch is turned ON, the machine continues reverse feed stitching for the first sewing cycle. But, after the thread trimmer is actuated once, the machine resumes normal operation. In this case, however, the one-touch type reverse feed stitching mechanism does not work.
→ The one-touch type reverse feed stitching switch has been left ON. Adjust the microswitch for reverse feed stitching.
- b : The machine suddenly stops with its needle in a position other than specified (lower position), and the machine fails to perform thread trimming and automatic reverse feed stitching. However, the one-touch type reverse feed mechanism and the knee-switch presser lifter can be operated, and the sewing speed can be changed.
→ It is due to false needle position detecting signal. Turn the power switch OFF, and reverse the connection of the synchronizer connector before restarting the machine. If this does not correct the trouble, the possible cause is due to the failure of the synchronizer itself.
- c : When the machine is powered up or the front of the pedal is depressed after the power switch is turned ON, the machine suddenly runs at high speed and stops in about 2 seconds. After that, the machine performs no operation even when the pedal is depressed.
→ It is due to a false sewing speed signal produced by the synchronizer. Turn the power switch OFF, and reverse the connection of the synchronizer connector before restarting the machine. If this does not correct the trouble, it is due to the failure of the synchronizer or the PSC box.
- d : The sewing machine will not start even when the front part of the pedal is depressed, but it runs at low speed when the back part of the pedal is depressed once before the pedal is returned to the neutral position.
→ It is due to maladjustment of control knob VR4 LSW in the PSC box.
- e : When the pedal is returned to the neutral position, the thread trimmer is actuated.
→ It is due to maladjustment of control knob VR3 TSW in the PSC box.

(3) In case of failures other than the above

Shift to the PSC box control in the following procedure :

(Shifting procedure)

- a. Turn the power OFF.
- b. Using a flat-bit screwdriver, open the PSC box cover.
- c. Remove connector J3 (40-pole) trailing from the CPU box.
- d. Turn DSW ON at the bottom of the DIP switch row consisting of five switches located at bottom right on the PSC circuit board.

Now, turn the power switch ON, and check the following :

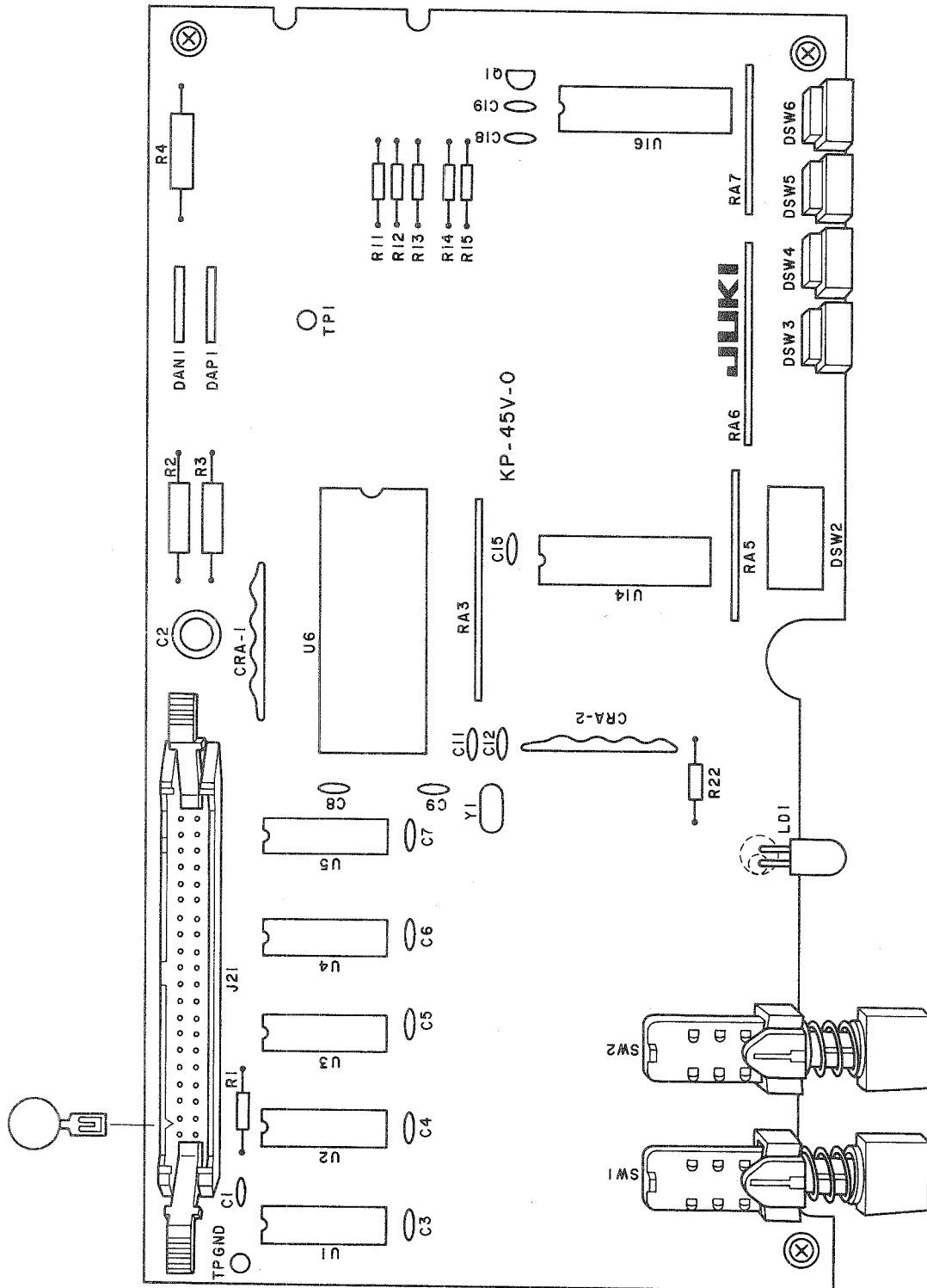
- a. The handwheel cannot be turned by hand. → Failure with PSC (Failure of the transistor for brake)
- b. The sewing machine starts at high speed. → Failure with PSC (Failure of the transistor for clutch)
- c. The solenoids falsely work. → Failure with PSC (Failure of output transistors)

Then, depress the front part of the pedal, and check the following :

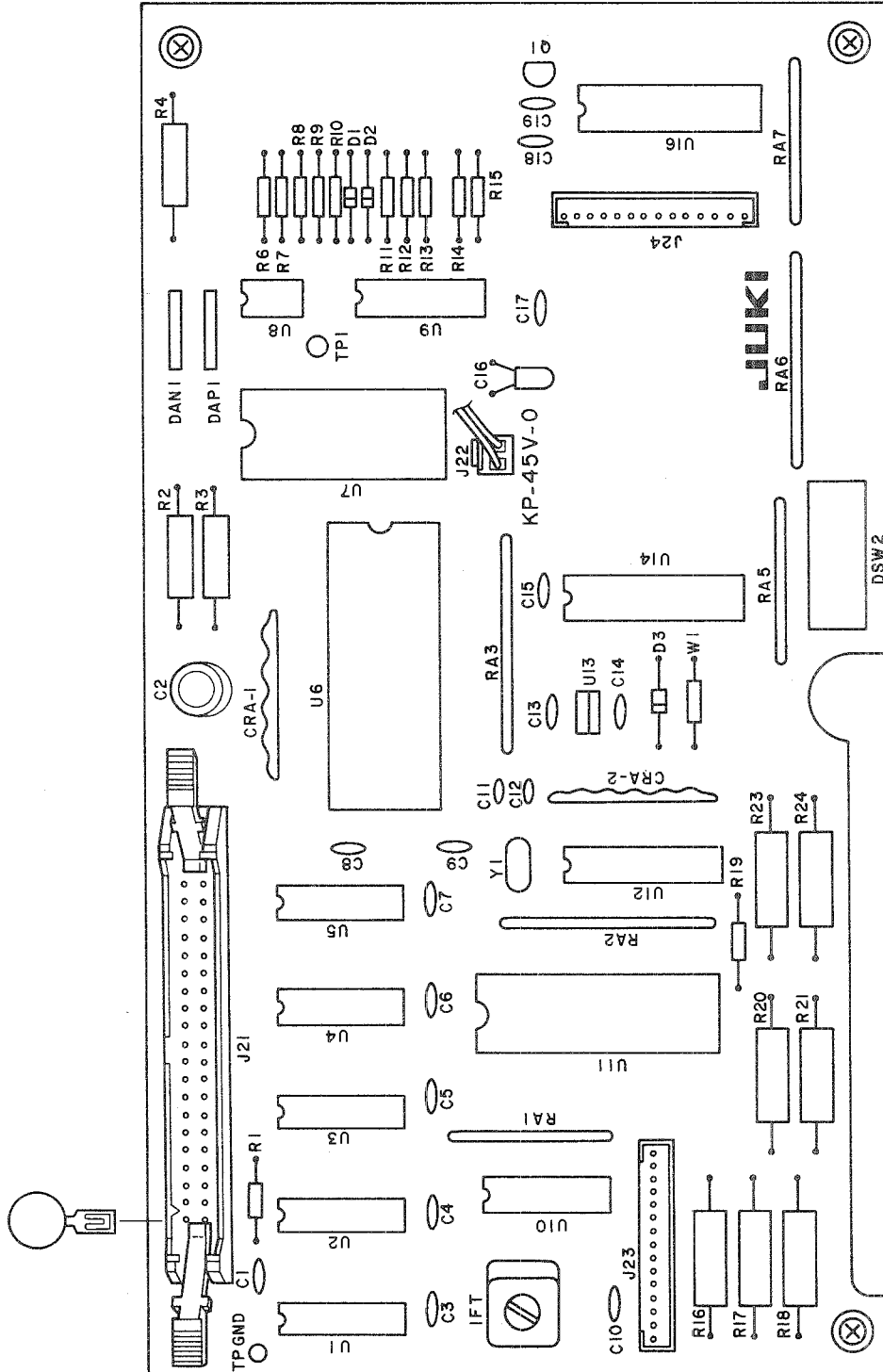
- a. The sewing machine will not start. → Disconnection of the clutch connector or failure with PSC.
- b. Medium speed is not given. → Failure with PSC
- c. High speed is not given. → Disconnection of the speed limit control knob or failure with PSC

- (4) If no failure is observed in the above check, whereas troubles occur only when the CPU is used in combination with the PSC, it is probably due to a failure with the CPU box.**

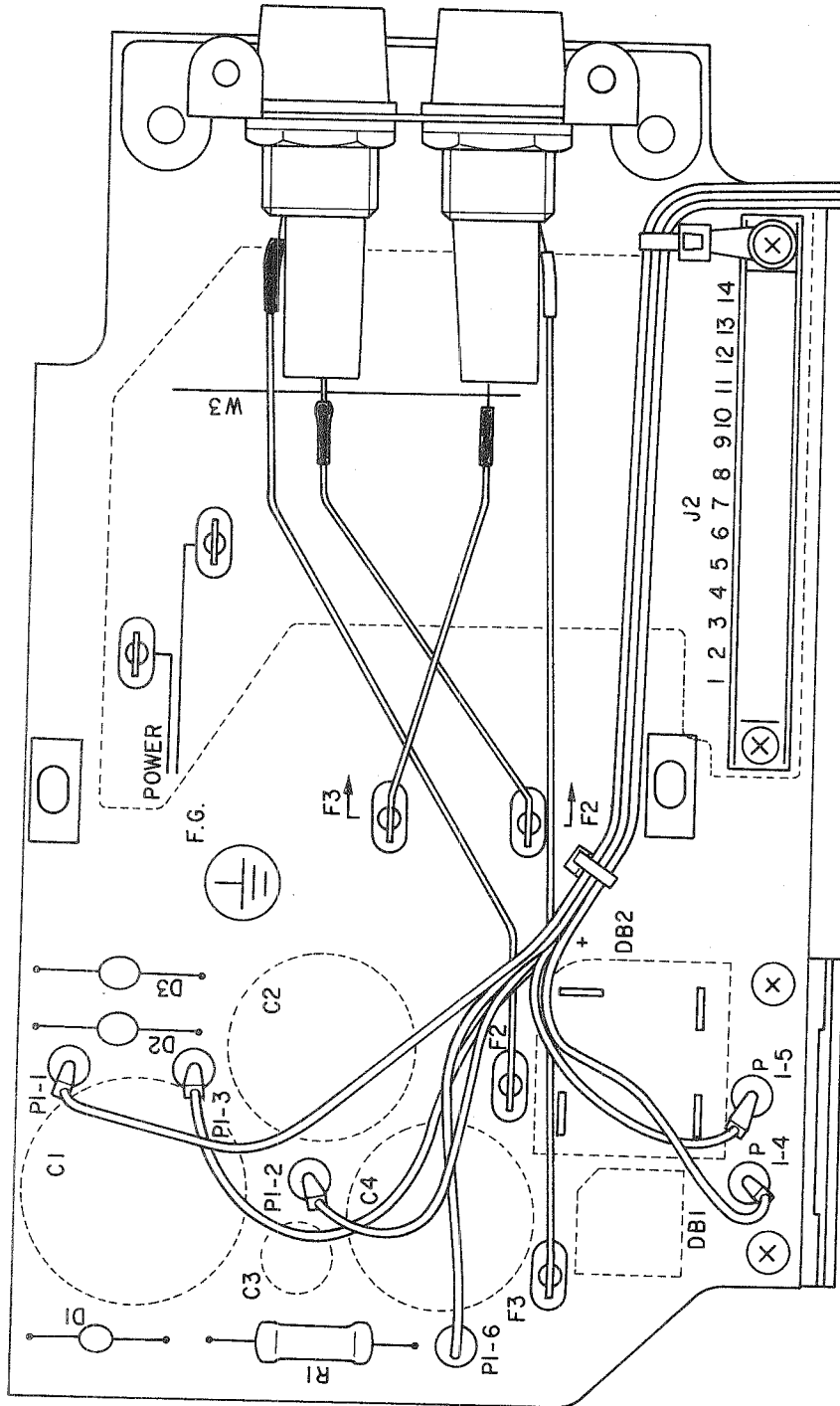
CPU circuit board (MC-110)



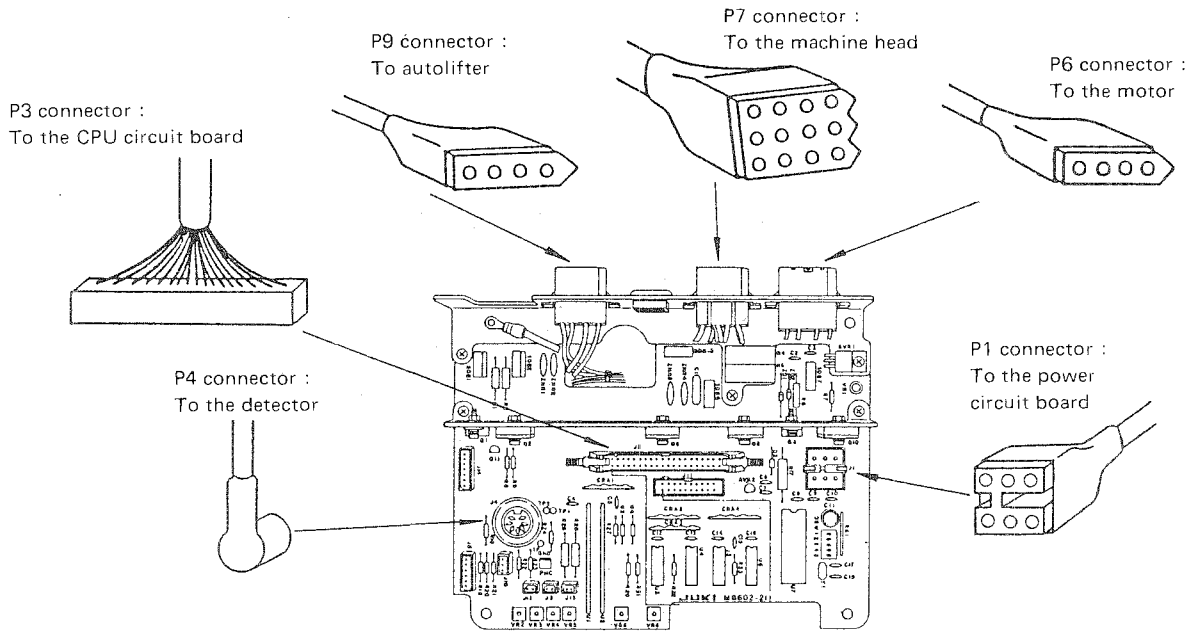
CPU circuit board (MC-210)



Power circuit board



5-12. Connection diagram of the connectors of MC-110/210



(P1 connector)

2	1	2 - 4	.....	10VDC	4	.....	S GND
4	3	1 - 5	.....	33VDC	5	.....	P GND
6	5	3 - 5	.....	34VDC			
		6 - 5	.....	31VDC			

(P6 connector)

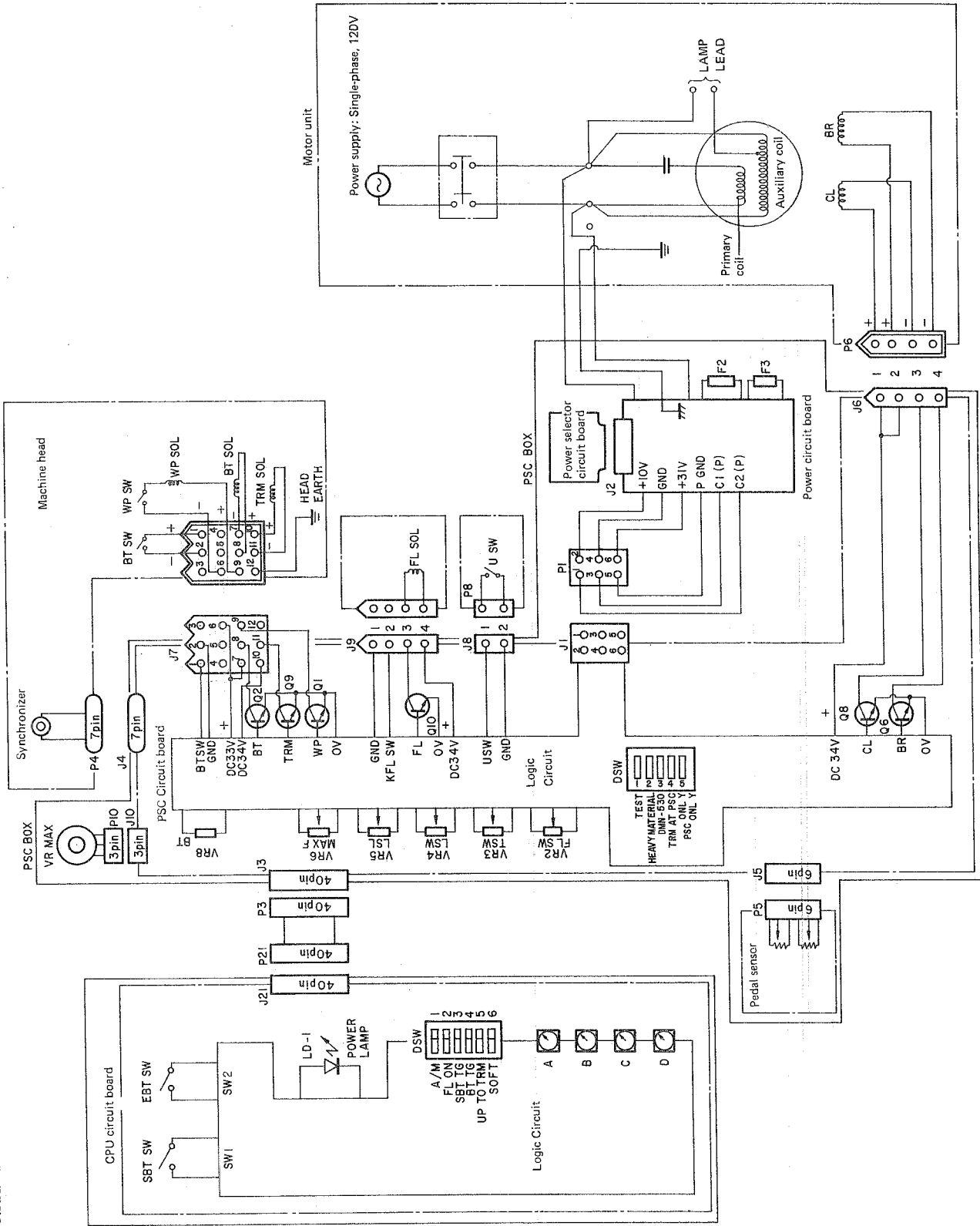
1	1. CL. COM		CL. solenoid : Approx. 12Ω
2	2. CL. DR		Working voltage ... Approx. 34VDC
3	3. BR. COM		BR. solenoid : Approx. 3Ω
4	4. BR. DR		Working voltage ... Approx. 34VDC

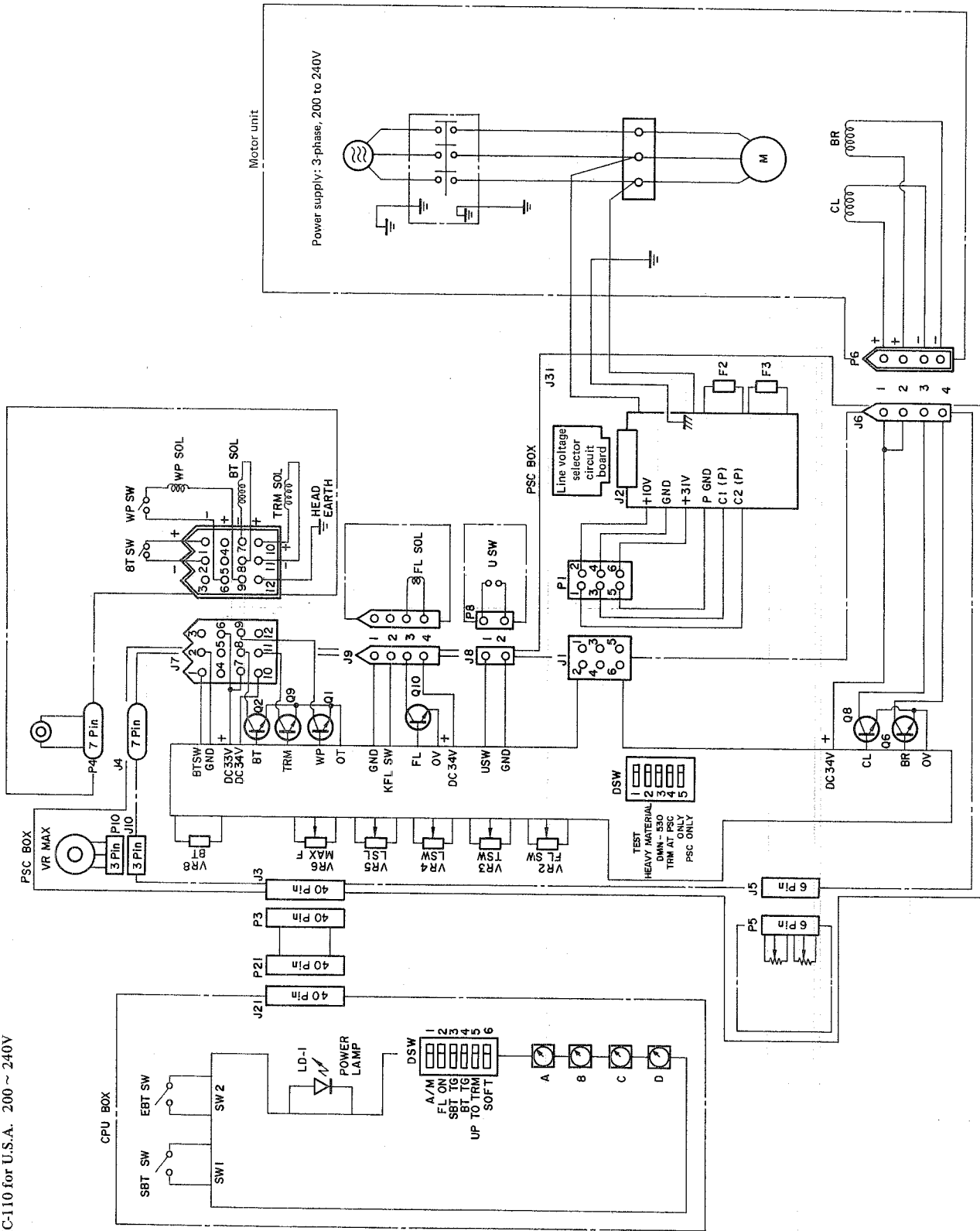
(P7 connector)

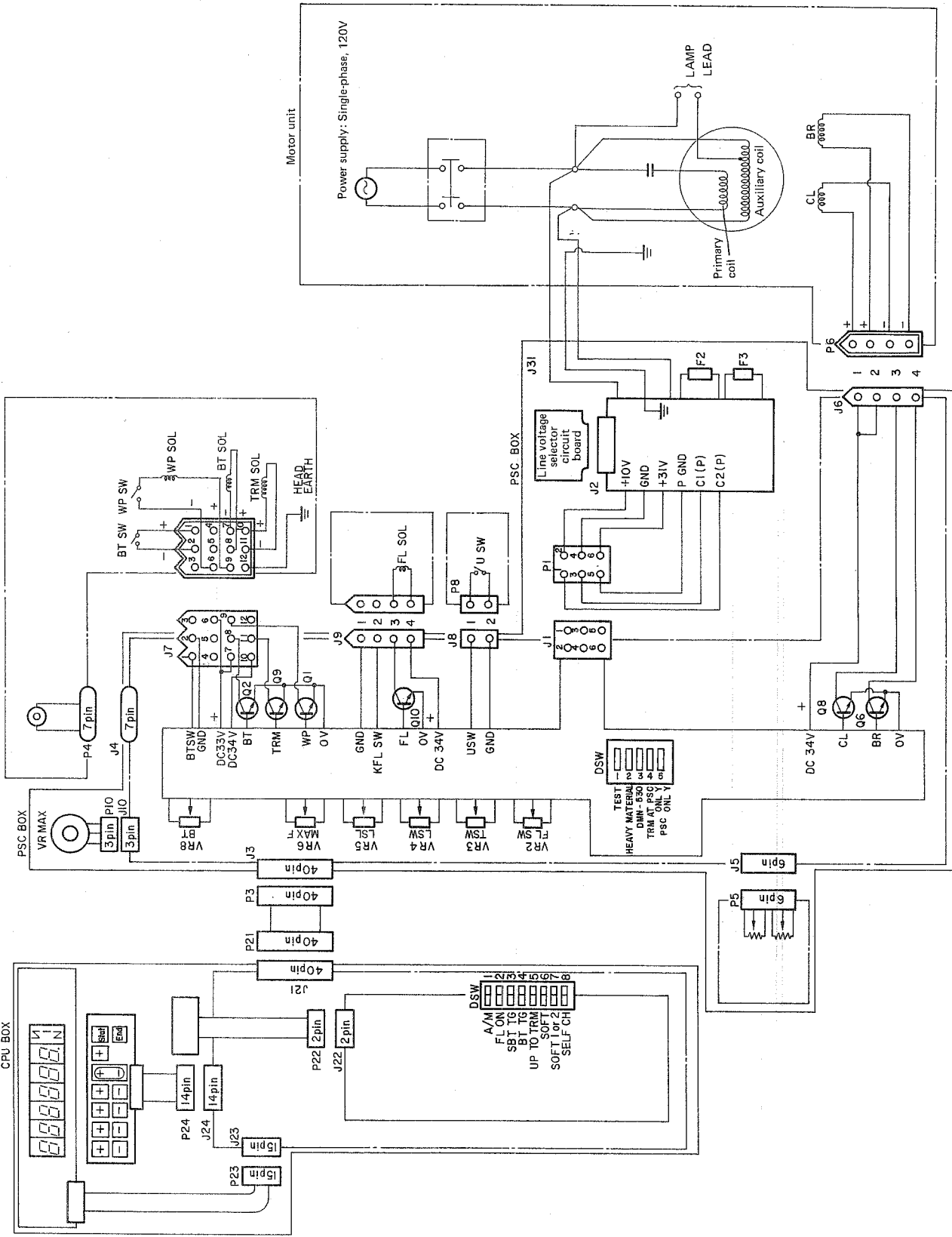
1	1. BT. SW		B.T. switch
2	2. BT. RTN		W.P. switch
3	3. WP. COM		WP. solenoid : Approx. 12Ω
4	4. WP. DR		Working voltage ... Approx. 34VDC
5	5. BT. COM		B.T. solenoid : Approx. 5Ω
6	6. BT. DR		Working voltage ... Approx. 34VDC
7	7. TRM. COM		TRM solenoid : Approx. 11Ω
8	8. TRM. DR		Working voltage ... Approx. 34VDC
9	9. HEAD EARTH		
10	10. TRM. COM		
11	11. TRM. DR		
12	12. HEAD EARTH		

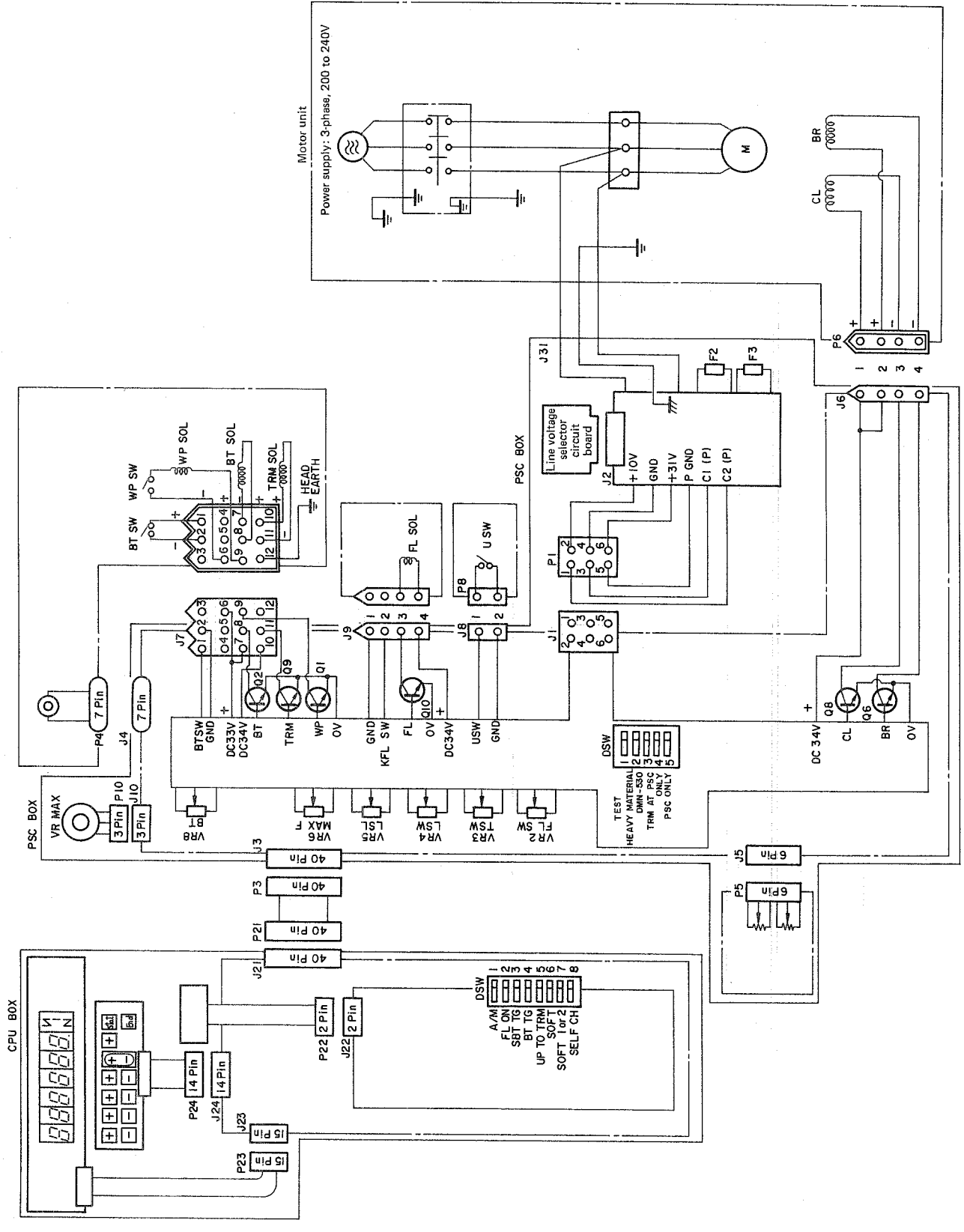
(P9 connector)

1	1. KFL SW RTN		F. L. switch
2	2. KFL SW		F. L. solenoid: Approx. 6Ω
3	3. FL. DR		Working voltage ... Approx. 34VDC
4	4. FL. COM		



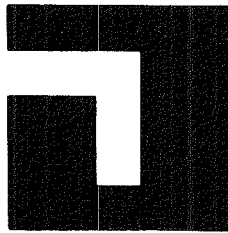






MOTOR/SWITCH CONNECTION TABLE

Motor side	
For UL single-phase	<p style="text-align: right;"> IC552-M IU552-M (1∅ 115V) UL. CSA </p>
For UL 3-phase	<p style="text-align: right;"> 3C552-M 3U552-M (3∅ 220V) UL. CSA </p>



JUKI®

TOKYO JUKI INDUSTRIAL CO., LTD.

Address : 23-3, Kabuki-cho 1-chome, Shinjuku-ku,
Tokyo 160, Japan
Cable : JUKI TOKYO
Telex : J22967, 232-2301
Phone : 03 (205) 1188, 1189, 1190

