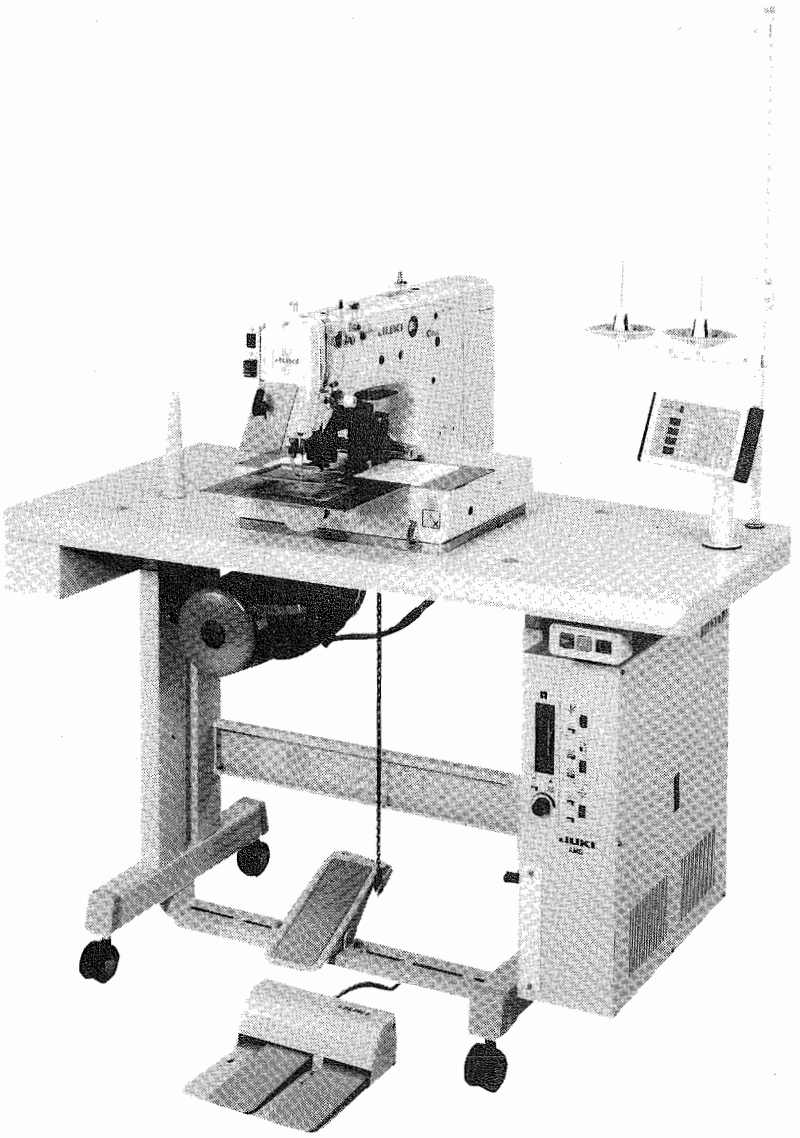
JUKI

1-Needle Cylinder-bed, Lockstitch Computer Control Cycle Machine

AMS-210C
AMS-212C

ENGINEER'S MANUAL



IV-61
1992. 11

PREFACE

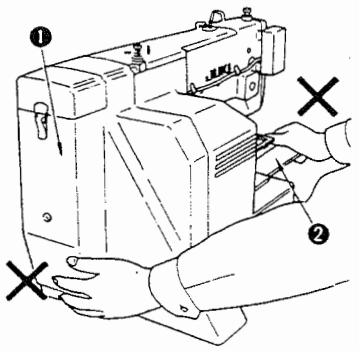
This Engineer's Manual is written for the technical personnel who are responsible for the service and maintenance of the machines.
The Instruction Manual for these machines intended for the maintenance personnel and operators at an apparel factory contains detailed operating instructions. And this manual describes "How to Adjust", "Results of Improper Adjustment", and other information which are not covered by the Instruction Manual.
It is advisable to use the pertinent Instruction Manual and Parts List together with this Engineer's Manual when carrying out the maintenance of these machines.
This manual mainly consist of three sections; the first section presents "Standard Adjustment", the second section, "How to Adjust", and the third, "Results of Improper Adjustment".
This Engineer's Manual explains about the AMS-210C Series and AMS-212C Series. For simplified description, the subclass model names are briefly given as follows (unless otherwise the subclass model name is specified, the description is common to all the models):

- AMS-210 (212) CSS
  AMS-210 (212) CHS
  (magnetic standard monolithic feeding frame type) ..... S type
- AMS-210 (212) CST
  AMS-210 (212) CHT
  (magnetic inverting feeding frame type) ..... T type
- AMS-210 (212) CSL
  AMS-210 (212) CHL
  AMS-210 (212) CGL
  (pneumatic separately drive feeding frame type) ..... L type
- In the case of limited use for sewing heavy-weight materials
  AMS-210 (212) CGL (pneumatic separately drive feeding frame type for heavy-weight materials)
  ..... GL type

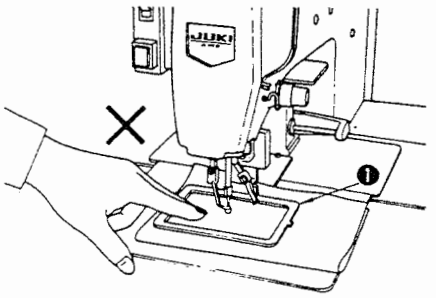
(Example) The description "L type excluding GL type" represents the following models.

{ AMS-210 (212) CSL
{ AMS-210 (212) CHL

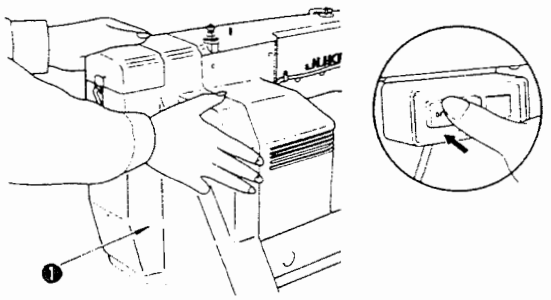
CAUTION



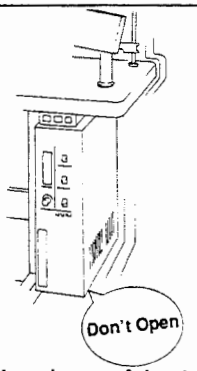
1. Do not hold belt cover ❶ or throat plate auxiliary cover ❷ when carrying your AMS-210C/212C.



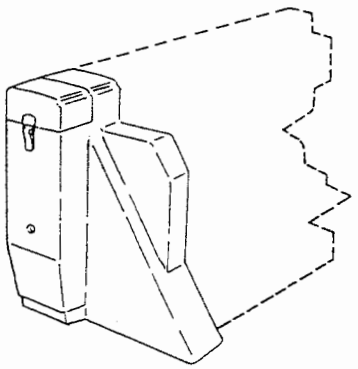
2. When a pattern change is made, or the bobbin winder switch or the feeding frame switch is turned ON, feeding frame ❶ comes down automatically. So, never put your fingers under the feeding frame. Be sure to keep your fingers away from the feeding frame while the machine is in operation.

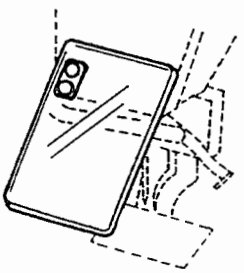


3. Be sure to turn the power switch OFF before removing belt cover ❶.
   Do not operate the machine with the belt cover removed.



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 near any of these parts while the machine is in operation. Doing so may be dangerous.

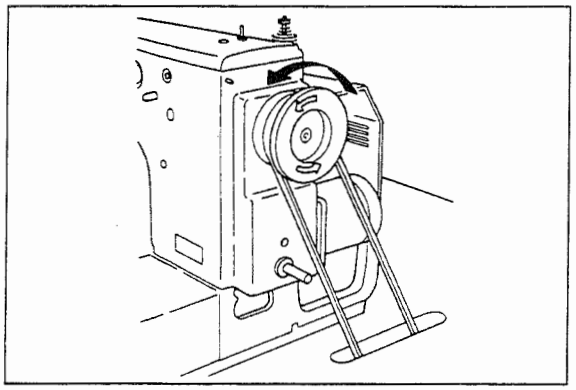




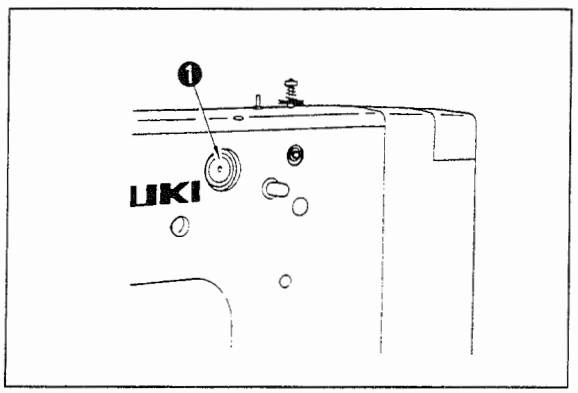
5. If your machine is equipped with a belt cover, eye guard or any other protections, do not operate your machine with any of them removed.

6. During operation , be careful not to allow your or any other person's head or hands to come close to the handwheel, V belt or motor. Also, do not place anything near any of these parts while is in operation. Doing so may be dangerous.

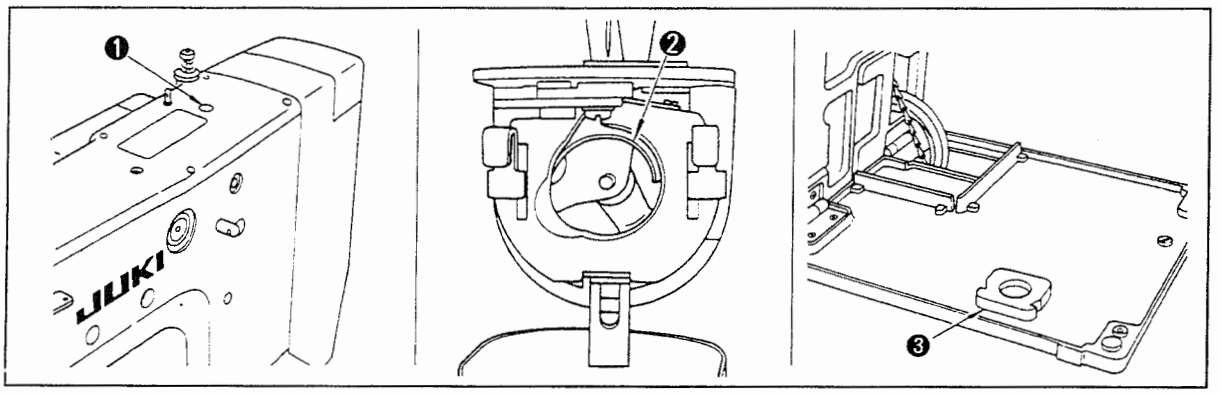
Cautions before operation



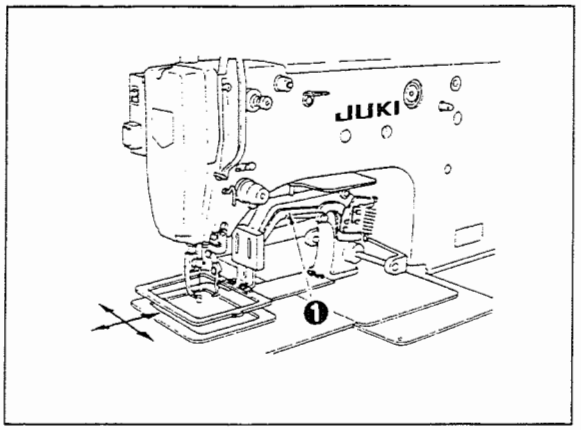
1. The sewing machine should run counterclockwise (in the direction of the arrow) as observed from the pulley side. Never allow the machine to run in the reverse direction.



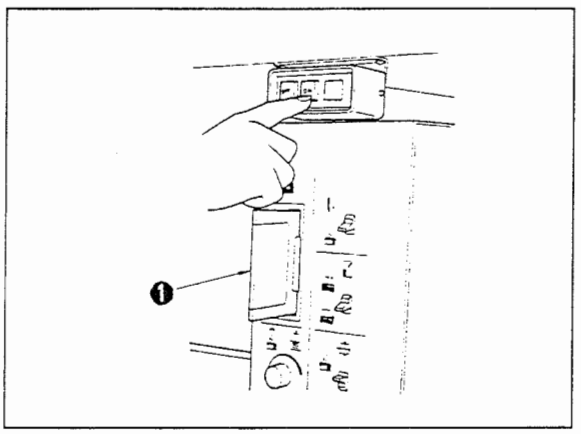
2. Be sure to supply oil until the oil level reaches the red mark of oil gauge ❶. After that, refill the machine with oil up to the red mark once a day.



3. Before starting the machine which has been newly set up or has not been used for a long period of time, apply a few drops of the lubricating oil to the crank assembly through hole ❶, one drop to racing surface ❷, and infiltrate sufficient amount of the lubricating oil to machine bed oil felt ❸.



4. To prevent troubles of the feed components, be sure to push feed bracket ❶ by hand fully forward and backward, then fully to the right and left once every day before turning ON the power to the sewing machine.
   For this machine, the "automatic retainer compensation function" which makes the machine perform the aforementioned performance automatically is available. (Refer to "Automatic retainer compensation function" on page 148.)



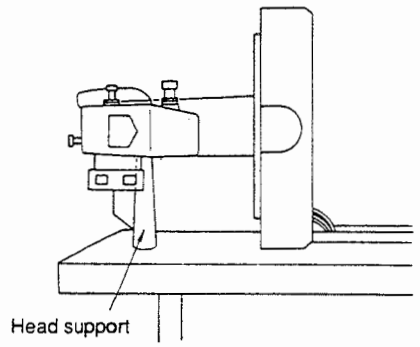
5. Be sure to load or unload floppy disk ❶ while the power is ON. If the power switch should be turned ON or OFF with the floppy disk mounted, the data stored in the disk may be destroyed.

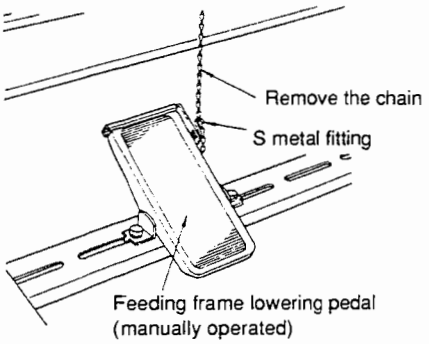
6. The AMS-210C is provided with the sewing machine main unit input function as its standard feature. However, the sewing machine is not capable of sewing a pattern of which size exceeds 100 mm (3.937") × 60 mm (2.362") (T type 100 (3.937") × 56 (2.205")) even if such a pattern has been inputted using this function.
   Also, the AMS-212C is provided with the sewing machine main unit input function as its standard feature, however, the sewing machine is not capable of sewing a pattern of which size exceeds 125 mm (4.921") × 60 mm (2.362") (T type 125 (4.921") × 56 (2.205")) even if such a pattern has been inputted using this function.

   ※ **Since the moving limit of sewing area can hardly be detected when the sewing data entered using the input function of the main unit of the sewing machine, the data which exceed the sewing area may be created.**

7. If a 2nd origin is set outside the sewing area, the lifting amount of the feeding frame and that of the intermediate presser foot may be smaller than the specified values.

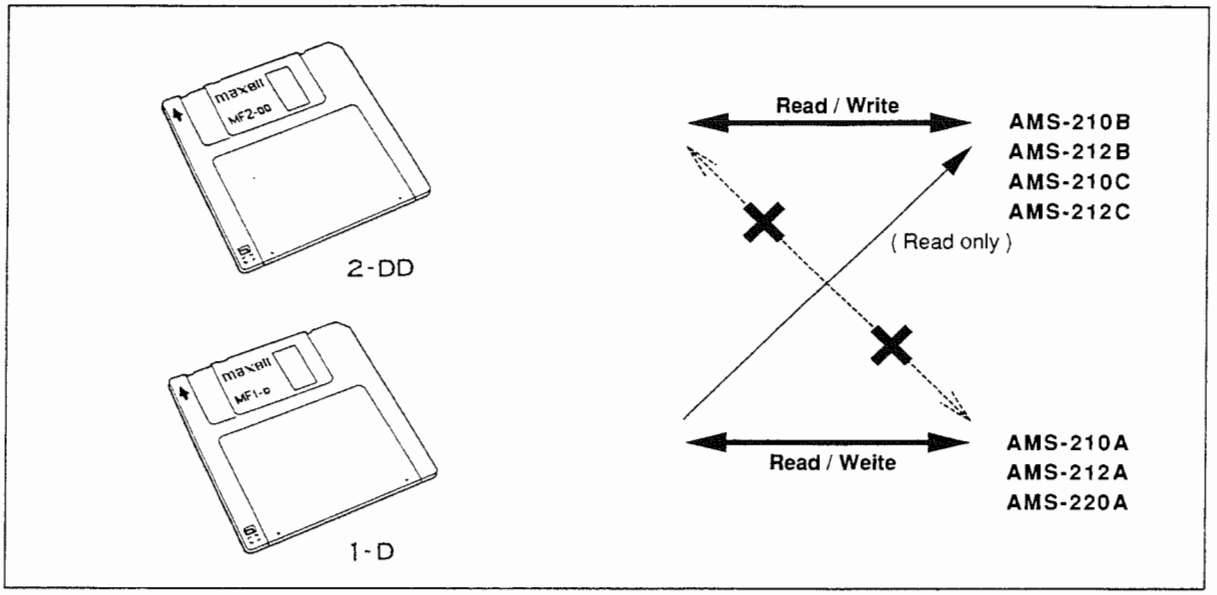
S, T types only





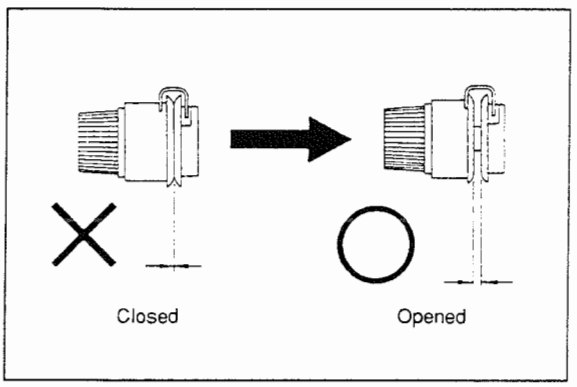
8. When tilting the machine head, be sure to remove the chain which connects the sewing machine with the feeding frame lowering pedal (manually operated).

9. Compatibility of floppy disks

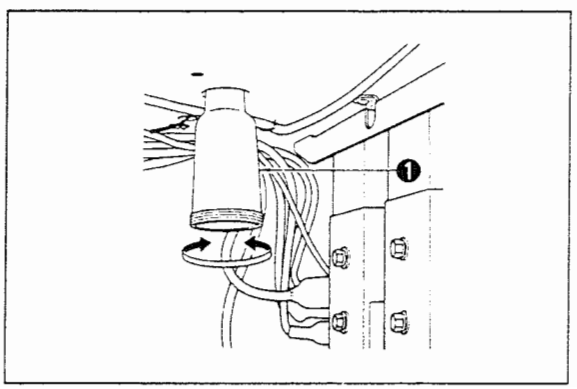


The AMS-210C/-212C uses a 2DD floppy disk same as that used with the AMS-210B/-212B (2DD)
※ The floppy disk used has been changed from the 1D type to the 2DD type due to the change in model from the AMS-210A/-212A to the AMS-210B/-212B.

Machine \ Floppy disk	1D	2DD
AMS-210A / 212A / 220A	○	×
AMS-210B / 212B AMS-210 / 212C	△ (Read-out only)	○



10. When the threader and sewing machine are switched ON, sew the desired sewing pattern with the thread tension disk closed. Once you have completed the thread trimming, the thread tension disk will open.



11. When polyethylene oiler ❶ becomes filled with oil, remove it and drain the oil.

CONTENTS

1. FEATURES

1. **Easy pattern change**
   The feeding frame is driven by a stepping motor. You can change the stitching pattern by simply specifying the pattern number.

2. **Wide-range pattern scale**
   The X and Y scale can be independently set 0.01 to 4 times the size of the original pattern.
   This is further supported by the machine's unique function whereby pattern enlargement/reduction is done by increasing or decreasing the stitch length or the number of stitches. The combination of these functions permits highly flexible pattern enlargement and reduction.

3. **Capable of inputting various patterns**
   Pattern data can be easily entered in a simple procedure using either the operation box (panel), which is mounted on the main unit of the sewing machine as a standard device, or a JUKI compact type programming device, which is available as an option. When pattern data are entered under the main unit input feature, input is made in accordance with the sewing product by moving the feed using the switch in the operation box (panel), taking the needle as a reference. The main unit input feature also permits test sewing.
   - Programming devices which are separately available
     PGM-1 ..... Used with connected to the sewing machine. A small pattern can be input with enlarged using the digitizer input function.
     PGM-5 ..... Used with connected to the sewing machine. This high-performance device enables the operator to input data only following the procedure same as the main unit input function.
     PGM-10B .... Used independently. It is a personal computer type high-performance programming device, allowing the operator to input data while checking the created pattern on the display.

4. **Micro floppy disk to store sewing pattern data**
   A 3.5-inch micro floppy disk is used, accommodating 44 to 691 patterns. However, the 1-D floppy disks for the AMS-210A/-212A can only be read, not written onto.

5. **Easy operation and better design**
   Key switches are used for easier operation. The table is equipped with a operation box (panel) that is compact in size. This allows the operator to input data using the operation box (panel) located near the needle of the sewing machine, achieving both easy operation and finely-designed appearance of the sewing machine.

6. **Consistent sewing quality**
   A stepping motor is used to feed the material, allowing for precise control according to the thickness of the material. The feed timing can be changed using the DIP switches in the control box, which permits optimum feed timing selection in accordance with each sewing product.

7. **A pattern which contains many stitches can be sewn.**
   The 16-bit microprocessor for memory storage enables the machine to sew a pattern with a maximum of 4,000 stitches※. If using the combination feature, you can sew as many as 16,000 stitches at a time.
   ※ The number of stitches is a value calculated while assuming general input pattern. When inputting actual data for sewing, the number of stitches may change in accordance with the jump length and kinds of element to be used.

8. **The maximum stitch length can be increased.**
   The stitch length can be increased to a maximum of 10 mm (0.394").

9. **Patterns used for the conventional B type of AMS Series can be used for the AMS-210C, -212C Series.**
   The AMS-210C, -212C Series is capable of reading and writing pattern data used for the AMS-210B, -212B and -220B. (Provided with interchangeability) Note that the AMS-210C, -212C Series is incapable of sewing a pattern which is larger than the specified sewing size.

10. **Patterns used for the conventional A type of AMS Series can be used for the AMS-210C, -212C Series.**
    The patterns for the AMS-210A, AMS-212A and AMS-220A can be read and used as they are. However, they cannot be written onto. If you wish to write data use the specified floppy disks (2DD).

11. Assures stable stitch length regardless of sewing speed changes.

The AMS-210C, -212C Series is designed to adjust the sewing speed for each stitch before feeding the material so as to provide the optimum feed timing for the sewing speed.
This ensures consistent stitch lengths for any sewing speed.

12. Safety and testing facilities

This machine is designed to indicate an error message upon the detection of a malfunction, enabling you to identify the problem at a glance. In addition, a facility for testing the switches and other functions has been incorporated into the machine. This facility is useful for fast troubleshooting.

13. The machine comes with a semi-rotary large shuttle. (Excluding GL type)

All the models included in the AMS-210C, -212C Series (except GL type for heavy-weight materials) are equipped with a semi-rotary large shuttle, thereby reducing the frequency of replacing the bobbin.

14. Cylinder bed sewing

The AMS-210C, -212C Series can be used for cylinder bed sewing by removing the throat plate auxiliary cover.

15. Flexible response to material changes

A DP×17 needle is used to sew heavy-weight material, while a DP×5 needle is used to sew light-weight material. The needle can be changed with the face cover installed. Furthermore, the same needle bar can be used regardless of the type of needle.

16. Easy winding of the bobbin thread

Since the bobbin winder is located close to the operator, the operator is able to easily wind the bobbin thread.

17. Various sewing features facilitates sewing.

The machine is provided with many helpful features including the needle thread breakage detection function to enable detection of a needle thread breakage and the bobbin thread replacement indicating function to allow the operator to replace the bobbin when the bobbin thread runs out. You may set the respective functions as desired in accordance with the application of your sewing machine.

18. Shorter the time required for sewing

At the end of sewing, the feeding frame automatically returns to the sewing start position, allowing for a quick sewing operation. The jump speed has been increased to 208 mm / sec. which is 1.7 times as high as the conventional speed.

19. Easy workpiece setting

In addition to the second origin setting function, the lift of the feeding frame is as high as 20 mm (0.787") (standard), which allows a workpiece to be set easily.

20. The lifting amount of the right- and left-hand sections of the feeding frames can be separately adjusted. (Only for the L type machine equipped with pneumatic feeding frame)

The lifting amount of the right- and left-hand sections of the feeding frames can be separately adjusted in accordance with the shape of the sewing product. The operating method of the feeding frame can be specified in various ways including the order in which the right- and left-hand side feeding frames are lowered.

21. The one-touch type clamp unit can be attached to the machine after the set-up.

The one-touch type clamp unit which is optionally available facilitates the replacement of the feeding frame or feed plate. (No tool is necessary when replacing the feeding frame or feed plate.)

22. The compressor unit can be attached to the sewing machine after the set-up. (Only for the L type machine 22. equipped with pneumatic feeding frame)

The compressor unit is optionally available. You may attach it to your AMS-210C, -212C with no additional machining.

23. The milling unit can be attached to the machine after the set-up.

The milling unit is optionally available. By attaching the milling unit to your AMS-210C, -212C, a plastic or aluminum feeding frame can be machined with ease.

For sewing heavy-weight materials (AMS-210CGL, -212CGL)

1. **Semi-rotary, double-capacity shuttle has been adopted.**
   The machine comes with a semi-rotary, double-capacity shuttle, thereby further reducing the frequency of replacing the bobbin.

2. **The machine is ideally suited for sewing heavy-weight materials.**
   Thanks to the improved thread take-up lever, the machine is capable of sewing heavy-weight materials; sheet belt, leather etc. more smoothly.

3. **The machine is equipped with a thread trimmer which is designed to cut thick threads.**
   The thread trimmer is capable of cutting thick needle thread and thick bobbin thread. (Thick thread equivalent to Spun #2, Ticket #6 or Tex #440 by English yarn count)

4. **The machine comes with a large silicon oil tank.**
   The machine is equipped with a large silicon oil tank as a standard accessory.

※ Semi-rotary large shuttle ..... The size of bobbin used with the semi-rotary large shuttle is 1.4 times as large as that used with the standard shuttle.
Semi-rotary double-capacity shuttle ..... The size of bobbin used with the semi-rotary double-capacity shuttle is 1.8 times as large as that used with the standard shuttle.

2. SPECIFICATIONS

1. Sewing range	X (lateral) direction × Y (longitudinal) direction • AMS-210C : 100 mm (3.937")×60 mm (2.362") • AMS-210C (Inversion): 100 mm (3.937")×56 mm (2.205") • AMS-212C : 125 mm (4.921")×60 mm (2.362") • AMS-212C (Inversion): 125 mm (4.921")×56 mm (2.205")
2. Max. sewing speed	2,000 s.p.m. (provided that the stitch length is 3 mm (0.118") or less)
3. Jump speed	208 mm/sec. or more (automatically changes in accordance with the degrees of an angle)
4. Stitch length	Max. 10 mm (0.394") (adjustable in 0.16 mm (0.006") steps)
5. Feeding frame feed mechanism	Intermittent feed (5-phase, stepping motor, 2-axle drive method)
6. Needle bar stroke	41.2 mm (1.622")
7. Needles	DP×5, DP×17
8. Lift of the feeding frame	20 mm (0.787") (standard) 22 mm (0.866") (max.)
9. Stroke of the intermediate presser foot	6 mm (0.236") (standard)
10. Lift of the intermediate presser foot	9.5 mm (0.374") 14.0 mm (0.551") (GL type only)
11. Shuttle	Models excluding GL type : Semi-rotary large shuttle (automatic lubrication) GL type only : Semi-rotary, double-capacity shuttle (automatic lubrication)
12. Bobbin case	Models excluding GL type : Bobbin case for the semi-rotary large shuttle GL type only : Bobbin case for the semi-rotary, double-capacity shuttle.
13. Bobbin	Models excluding GL type : Bobbin for the large shuttle GL type only : Bobbin for the double-capacity shuttle
14. Lubricating oil	New Defrix Oil No. 2 (supplied by an oiler)
15. Thread trimmer	Consists of a moving knife and counter knife (driven by a grooved cam) (Exclusive knife for GL type)
16. Wiper	Magnetically driven (with a release switch)
17. Intermediate presser foot lifting method	Models excluding GL type : Magnetically driven vertical movement (provided with the release switch) GL type only : Air cylinder-driven vertical movement (provided with the release switch)
18. Feeding frame driving method	Models excluding L type : Magnetically driven feeding frame (provided with the feeding frame lowering pedal) L type only : Air cylinder-driven feeding frame (the right- and left-hand sections of the feeding frame are separately driven)
19. Feeding frame	Comes down when the foot switch is depressed and goes up when the switch is depressed again or keeps coming down as far as the foot switch is depressed. (Provided with the function selector switch)
20. Start	The machine is started by turning ON the start switch with the feeding frame down.
21. Sewing start / end	The machine starts or ends at the sewing start or the 2nd origin.
22. Memory storage	2DD 3.5-inch micro floppy disk Memory capacity : 691K Memory pattern : 44 - 691 pattern/floppy disk

23. Stop function	This function is used to stop machine operation during a stitching cycle. After stop, the feeding frame can be started along the stitching line by operating the "Backward" or "Forward" switches. The interrupted stitching cycle can be completed by pressing the start switch. Alternatively, the "Return to origin" switch may be pressed for a quick move to the sewing start point or the 2nd origin after stop.
24. Enlarging / Reducing	A pattern can be enlarged or reduced on the X and Y axes, independently when sewing a pattern. 0.01 to 4 times (in 0.01 step)
25. Enlarging / Reducing method	A pattern can be enlarged/reduced by increasing/decreasing either the stitch length or the number of stitches.
26. Sewing speed limitation	180 to 2,000 s.p.m. Provided with an externally accessible variable resistor that is capable of limiting the sewing speed as desired within the max. sewing speed predetermined by stitch lengths. (The sewing speed can also be controlled in the sewing pattern data.)
27. Pattern selection	1 to 999 patterns can be selected by specifying the desired pattern Nos.
28. Pattern shape checking facility	A sewing pattern configuration can be checked by setting the sewing machine ON/OFF switch to its OFF side. Jog switches are used to check the sewing pattern shape stitch by stitch.
29. Error indication	17 types of error indication are shown on the operation box (panel).
30. Programming	For point/linear/arc numerical data, a temporary stop, thread trimming, jump data, sewing speed, and the stitch length data.
31. Bobbin thread counter	Indicates when to replace the bobbin. If this function is not used, it works as a 0 to 999 ring counter with a reset function.
32. Data backup	When the power is turned OFF, the patterns in current use are automatically stored in memory. The stored patterns can be sewn when the "Set ready" switch is pressed after the power switch has been turned ON. At this time, it is not necessary to use a floppy disk. The data stored in memory is retained for 100 hours.
33. Setting of the 2nd origin	Immediately before starting sewing, a 2nd origin (turnout point) can be set at any desired position using jog switches. (It can be stored in memory for backup.)
34. Moving the sewing start point	Immediately before starting sewing, the sewing pattern can be shifted in parallel to any desired position using jog switches. (It can be stored in memory for backup.)
35. Stop function with the needle up	If the needle is not at its highest position, the machine can be stopped with the needle raised by turning ON/OFF the needle threading switch. (This function is valid while the sewing LED is lit up.)
36. Sewing machine motor	Models excluding GL type : 400W, 4-pole electronic stop motor GL type only : 550W, 2-pole electronic stop motor
37. Dimensions (excluding the thread stand)	1,200 mm (47.244") (W)×660 mm (25.984") (L)×1,130 mm (44.488") (H)
38. Gross weight	148.5 kg
39. Power consumption	1 KVA
40. Operating temperature range	5 to 40°C
41. Operating humidity range	20 to 80% (no dew condensation)
42. Line voltage	Rated voltage ±10% 50/60Hz
43. Compressed air pressure	(Provided with a detecting function) L type models excluding GL type : 2 to 2.5 kg/cm^2 GL type only : 5 to 5.5 kg/cm^2

<table>
<tr><td>44. Air consumption</td><td>L type models excluding GL type : 0.8ℓ/min.
GL type only : 1.8ℓ/min.</td></tr>
<tr><td>45. Main unit input function</td><td>Refer to the table below.
<table>
<tr><td rowspan="4">Input / Creation</td><td>Normal sewing</td><td>Linear (polygon), spline, arc, circle, point, jump</td></tr>
<tr><td>Zigzag stitching</td><td>Linear (polygon), spline, arc, circle</td></tr>
<tr><td>Offset sewing</td><td>Linear (polygon), spline, arc, circle</td></tr>
<tr><td>Sewing machine control</td><td>Thread trimming, 2nd origin, temporary stop, speed changing, inversion</td></tr>
<tr><td colspan="2">Modification</td><td>Point deletion, point movement, point addition, element (part) deletion</td></tr>
<tr><td colspan="2">Others</td><td>Pattern reading (enlargement / reduction is possible), pattern writing, input of reference point for pattern enlargement / reduction, checking the set value, etc.</td></tr>
</table>
※ It is possible to input data to be added to the completed pattern, to combine completed patterns and etc.</td></tr>
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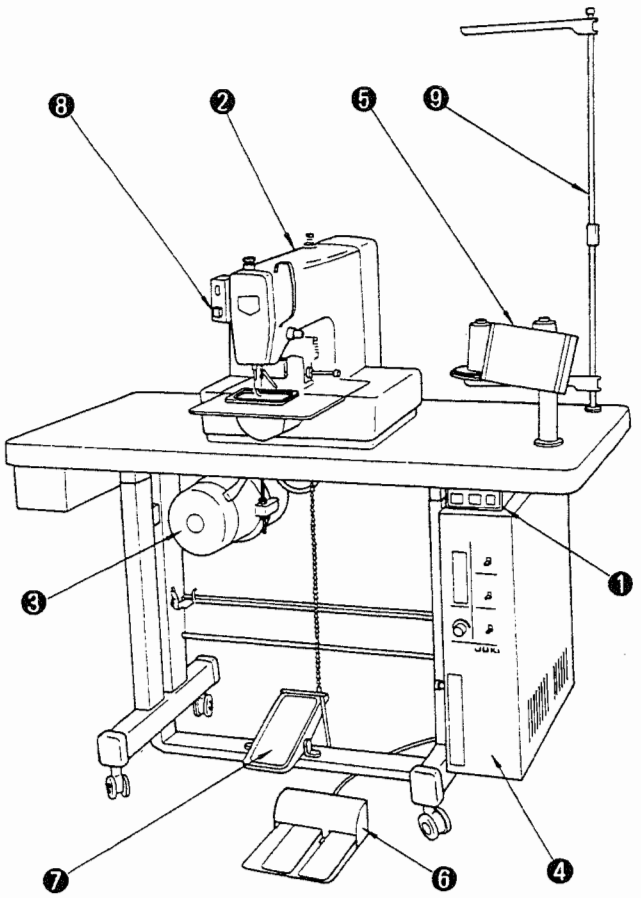
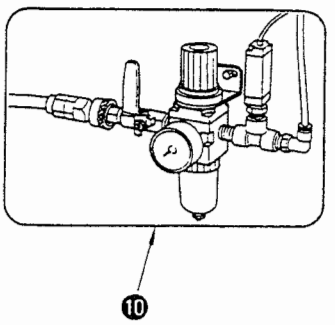
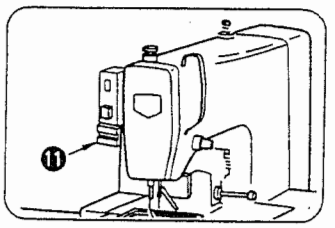
3. HOW TO USE THE AMS-210C, -212C

3-1. Names of the main components







❶ Power switch
❷ Sewing machine head
❸ Sewing machine motor
❹ Control box
❺ Operation box (panel)
❻ Foot switch
❼ Feeding frame lowering pedal (excluding L type)
❽ Machine head switches
❾ Thread stand
❿ Air regulating device (L type only)
⓫ Intermediate presser foot lifter cylinder (only for the GL type)

❶ **Power switch**
To turn ON/OFF the sewing machine motor, control box and operation box (panel).

❷ **Sewing machine head**
The feeding frame, which is driven by the stepping motor, moves a workpiece in synchronization with the vertical motion of the needle bar. This mechanism permits complicated pattern sewing.

❸ **Sewing machine motor**
The use of an electronic stop motor allows sewing at the desired speed under the control of the clutch and brake. (400 W, 4P (500 W, 2P only for GL type)).

❹ **Control box**
Acts as the brain which controls the sewing machine. Electronic components are incorporated, including printed circuit boards and transformers, and sends out various output commands to other components.

❺ **Operation box (panel)**
Consists mainly of switches, digital displays and a buzzer. It receives commands from the control box, and outputs display data and switch information. The main unit input operation is performed whereby the pattern is input while moving the feed so as to adjust the needle point.

❻ **Foot switch**
This is the feeding frame switch. When it is depressed, the feeding frame solenoid (S or T type) or the air cylinder (L type) is turned ON/OFF at the specified timing to lift / lower the feeding frame. If the start switch is then depressed, the sewing machine will start sewing.

❼ **Feeding frame lowering pedal**
By depressing the pedal, the feeding frame is interlocked when it comes down. Used for positioning the material.

❽ **Machine head switches**
Consist of the Stop switch and the wiper switch.

❾ **Thread stand**

❿ **Air regulating device (pneumatically driven specifications L type only)**
Consists of the filter regulator, pressure gauge, air cock, pressure switch and other parts. It detects a drop in the air source pressure, indicating it with an error code. The device is also used to adjust the operating air pressure during installation of the sewing machine.

⓫ **Intermediate presser foot lifting cylinder (only for the GL type)**
This machine uses an air cylinder so as to increase the pressure of the intermediate presser foot and the lifting amount of it.

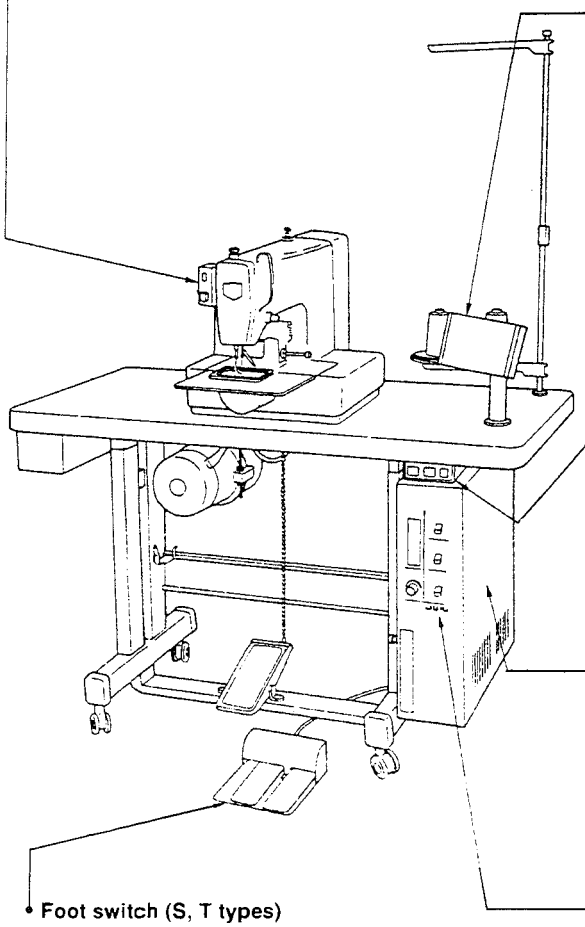
3-3. Operation and switches of the AMS-210C / -212C

1) Operation switches arrangement

Switches are arranged in six different locations in consideration of frequency of operating each of them.

• Switches on the machine head

NO.	Name	Time for operation	Page for reference
①	Stop switch	Sewing mode	P27
②	Wiper switch	Sewing mode	P27



• Switches on the operation box (panel)

NO.	Name	Time for operation	Page for reference
①	Operation switches (Forward switch)	Sewing mode	P21
②	Setting switches (Pattern No. switch, etc.)	Data setting mode	P20
③	Set ready switch	When changing over the sewing mode and data setting mode.	P21

• Power switch

NO.	Name	Time for operation	Page for reference
①	Power switch	When turning ON / OFF the power to the machine.	P15

• DIP switches (switches on the circuit board)

NO.	Name	Time for operation	Page for reference
①	DIP switches	While the power to the machine is OFF.	P138

• Foot switch (S, T types)

NO.	Name	Time for operation	Page for reference
①	Feeding frame switch	Sewing mode	P26
②	Start switch	Sewing mode	P26

• Foot switch (L type)

NO.	Name	Time for operation	Page for reference
①	Feeding frame switch 1	Sewing mode	P25
②	Feeding frame switch 2	Sewing mode	P25
③	Start switch	Sewing mode	P25

• Switches on the (front face) of the control box

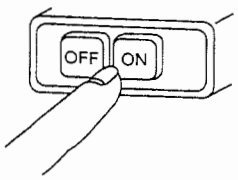
NO.	Name	Time for operation	Page for reference
①	Max. speed limitation knob / Bobbin winder ON/OFF switch	Sewing mode	P17
②	Needle threading switch	Sewing mode	P17
③	Scale setting switch for INC/DEC of the stitch length & INC/DEC of the number of stitch	Data setting mode	P18
④	Sewing machine ON / OFF switch	Sewing mode	P18

2) Basic operation

The basic operation of the AMS is to create a pattern and read out a pattern. These two kinds of operation allow the AMS to perform its minimum functions.

(Explanation of the pattern creating procedure is omitted in this Instruction Manual since it is given in the Instruction Manual for the "main unit input function" and the Instruction Manual for the PGM Series.)

• Basic operation of the AMS (reading out a pattern)

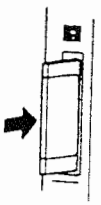


Turn ON the power switch.

⇩

Load the floppy disk into the floppy disk driver.

⇩



Switches on the operation box

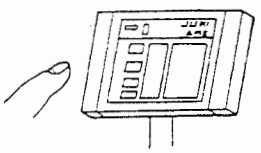
Specify a pattern No. using the [Pattern No.] switch.

Specify an X scale using the [X scale] switch.

Specify a Y scale using the [Y scale] switch.

⇩ (See page 20 for detailed information.)

Turn ON the [Set Ready] switch.

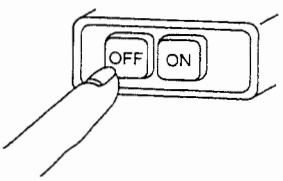


⇩ (At this time, a pattern is read out from the floppy disk.)

SEWING IS POSSIBLE

Sewing is performed by operating the feeding frame switch and start switch. (The sewing cycle is repeated until the number of materials to be sewn are finished.)

⇩



Remove the floppy disk from the machine.

⇩

Turn OFF the power switch.

3) Operation and functions of the sewing machine other than those of reading patterns

The AMS comes with automatically-performed functions including an error detecting function of reverse-rotation preventing function, etc. In the following cases, the machine should be operated (switches should be operated) in the way different from the above-stated procedure for reading out a pattern

①	When sewing troubles including thread breakage occur during sewing	..... (Stop switch, Backward switch, etc.)
②	When higher efficiency, easier operation or further convenient operation is required for sewing	..... (Needle threading switch, DIP switches for each additional function required, etc.)
③	When higher seam quality is required	..... (Wiper switch,speed adjusting, variable resistor, DIP swithes for each addtional function required etc.)
④	When performing inspection and maintenance of the sewing machine	..... (Rotary DIP switch)
⑤	When preventing sewing machine troubles	..... (Sewing machine ON/OFF switch, DIP switches of each additional function required, etc.)

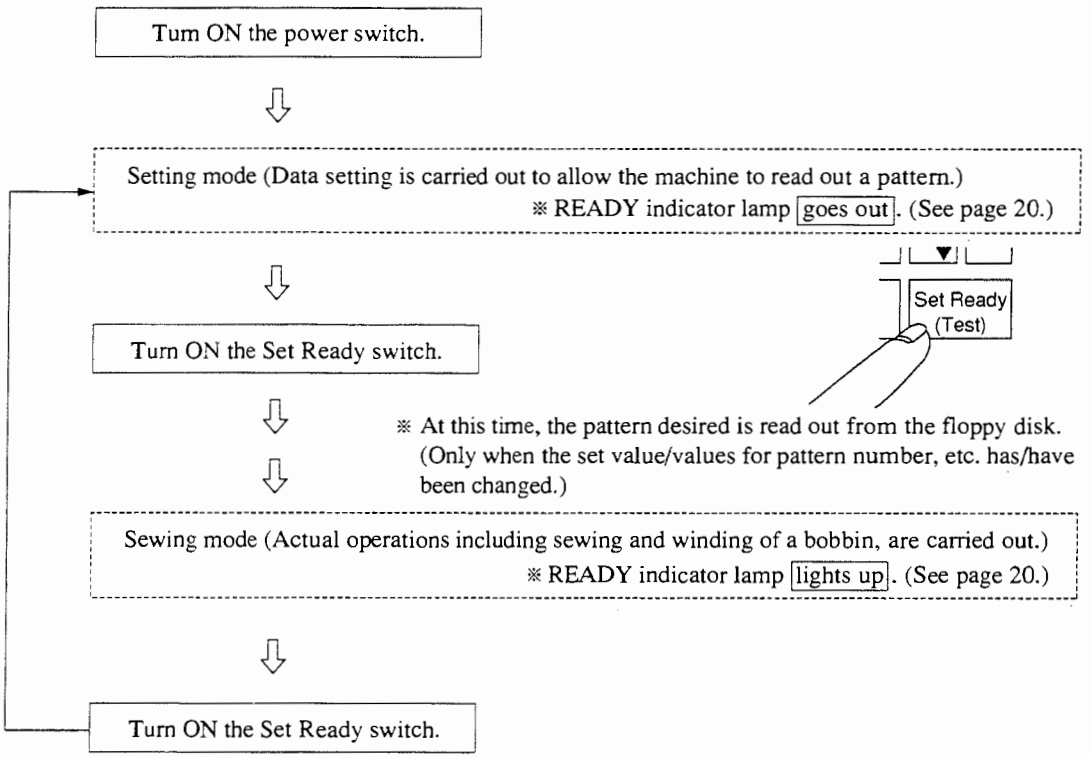
The AMS has many functions which are separately named in accordance with the respective purposes. These functions are controlled by the same switches by changing the operating method of them. Now, let's explain these functions in the form of "function" and "operating method of the relevant switches".(See the explanation of the respective functions described on and beyond page 29 and the explanation of the DIP switches described on and beyond page 138.)Switches used to control any function which has no exclusive name are separately described in the form of "function" and "operating method of the relevant switches".

4) Sewing mode/Setting mode and patten reading

The AMS can be set to two different operation modes, one is the Sewing mode under which a pattern is actually sewn, a bobbin is wound, etc., the other is the Setting mode under which a pattern number, X/Y scale, etc. are specified to enable the machine to read out a pattern desired.

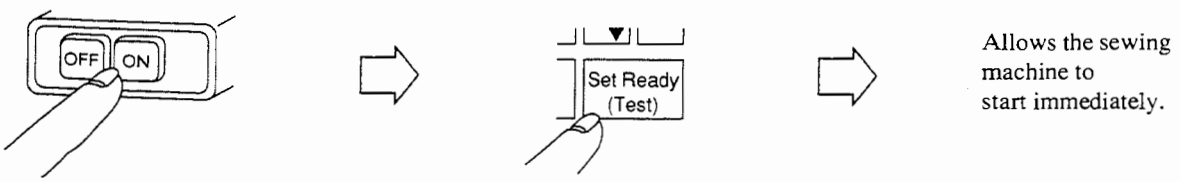
The Sewing mode and Setting mode can be changed over by operating the Set Ready switch on the operation panel (operation box). If a pattern number and X/Y scale are specified under the Setting mode , the machine will read out the pattern at the time of changing over the setting of the switch from the Setting mode to the Sewing mode , from the floppy disk loaded in the floppy disk drive.

• Sewing mode / Setting mode



※ Immediately after Power switch turned ON, the machine is set to the Setting mode, for the sake of ease of operation. This enables the operator to perform pattern changing with ease just after Power switch turned ON, if pattern to be used is frequently changed at the start of the working hours. Thanks to the "backup function", the machine stores the pattern used in memory even when the power to the machine is turned OFF.

In the case where the same pattern is used for several days, the operator can set the machine to the Sewing mode without reading out the pattern from the floppy disk if pressing the Set ready switch without changing the data specified for the pattern. (Refer to page 31 for the backup function.)



5) Relationship between the sewing mode/ setting mode and the switches

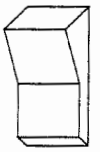
Under the [Sewing mode], the machine is actually operated. On the other hand, preparation for reading of a pattern is carried out under the [Setting mode]. This means that the machine functions in the two different ways in accordance with the mode to which the machine is set. Consequently, switches of the machine are divided into the two groups, one is the group of the switches used under the [Sewing mode] and the other is the group of the switches used under the [Setting mode].

Switches used under the [Setting mode]	[Pattern No.] switch/ [X scale] switch, etc.
Switches used under the [Sewing mode]	[Forward] switch/ [Backward] switch, etc. on the operation panel, [Needle threading] switch, etc. on the front face of the control box

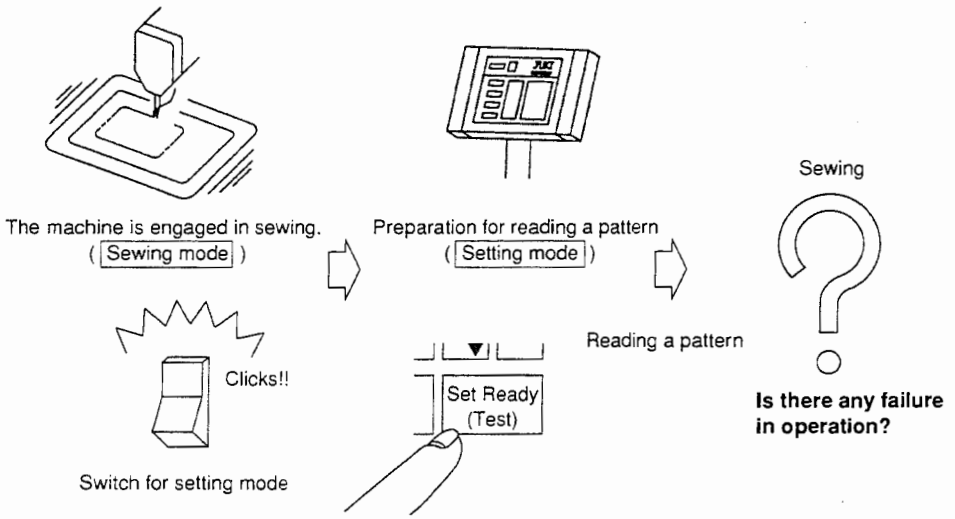
Even if any of the switches used under the [Sewing mode] is used under the [Setting mode] by mistake , or any of those used under the [Setting mode] is used under the [Sewing mode] by mistake, no trouble may result since the switches are inoperative under the wrong mode.

(Cautions)

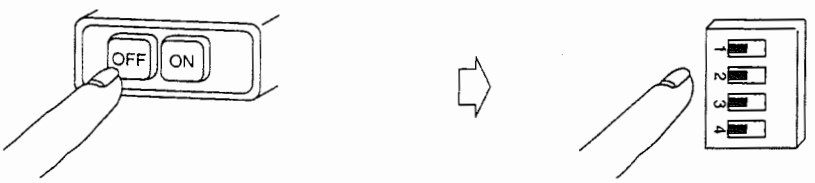
• The switches on the control box are seesaw switches.
So, the following precautions should be taken when operationg these switches.



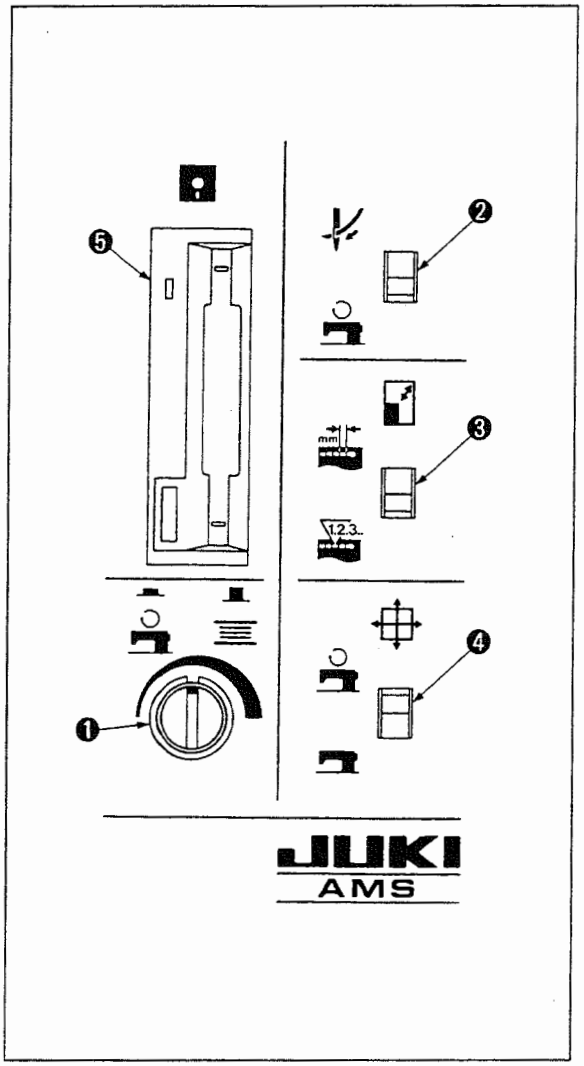
Operating the switches used under the [Setting mode] including scale setting switch for [INC/DEC of the stitch length & INC/DEC of the number of stitches] in the [Sewing mode] by mistake will not adversely affect on the sewing as long as the machine operates under the [Sewing mode].
However, the operated switch will function when reading a pattern after changing over the mode of the machine from the [Sewing mode] to the [Setting mode].



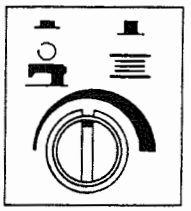
• Changeover of the DIP switch is ineffective while the power switch is turned ON regardless of the mode of the sewing machine, i.e., in the [Sewing mode] and in the [Setting mode].
Be sure to change the setting of the DIP switches with the [Power switch turned OFF]. (The setting of the DIP switches are read by the machine simultaneiusly with turning ON of the power switch.)



3-3. Description of the control box and its functions



❶ Max. speed limitation knob/Bobbin winder ON/OFF switch (used under the Sewing mode)



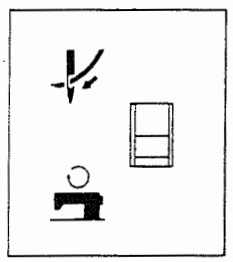
- **Max. speed limitation knob (used under the Sewing mode)**
  Normally, the sewing speed is automatically adjusted according to the stitch length. If a slower speed is required, however, turn the knob counterclockwise.

- **Bobbin winder ON/OFF switch (used under the Sewing mode)**
  Pull the knob toward you (The Bobbin winder ON/OFF switch is turned OFF) while the sewing machine is stopped , and the feeding frame will automatically come down.
  Then Turn ON the Start switch , and the sewing machine will run at a constant speed winding the bobbin. The machine can be stopped in the following three different methods.

① Press the knob back to its home position.
(The Bobbin winder ON/OFF switch is turned ON .)
② Press the Start switch again.
③ Turn ON the Stop switch.
If the machine is stopped by taking method ② or ③, it is necessary also to take method ① "press the knob back to its home position".

(Caution) Before bobbin winding, make sure that there is nothing under the needle. Then, remove the needle thread and the bobbin thread.

❷ Needle threading switch (used under the Sewing mode)

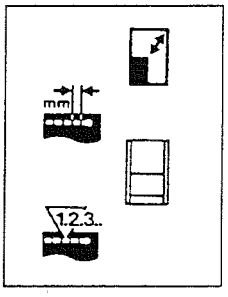


- Set the needle threading switch to the side when the sewing machine is stopped, and the intermediate presser foot and feeding frame will automatically come down , upon which the needle will be threaded. When the machine is doing the adove job , the Start switch will not work even if it is turned ON.

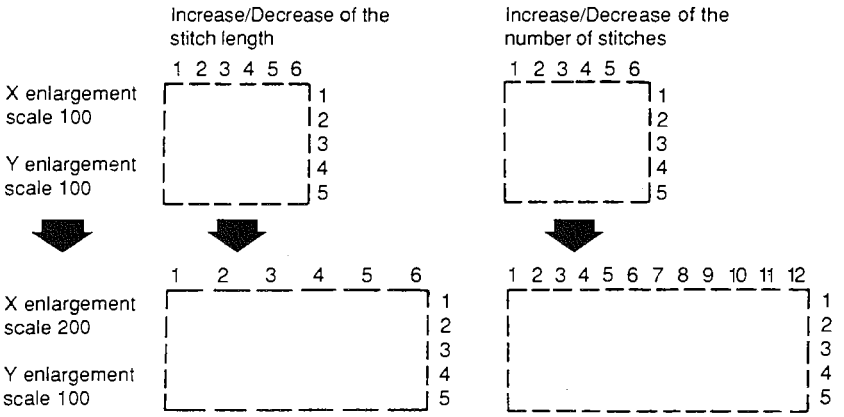
- Move the Needle threading switch up and down when the Stop switch is turned ON and sewing machine is stopped , and thread trimming will be done. The Return to Origin , Forward and Backward keys will now become effective. (See " ② Stop switch " on page 27.)

- If the Needle threading switch is moved up and down when the needle is not in its upper resting position (error message " 3 ") , the sewing machine will automatically rotate and stop in the needle-up stop position. At this time, make sure that there is nothing under the needle.
  (See " Needle-up stop function ".)

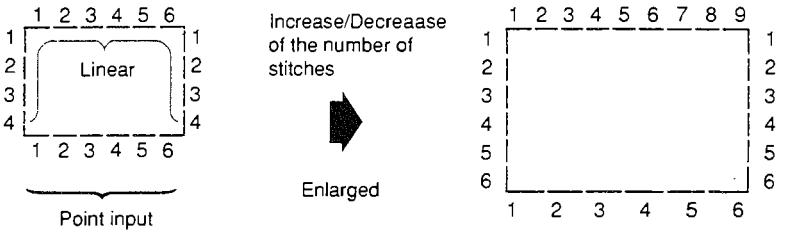
❸ Scale setting switch (INC/DEC of the stitch length & INC/DEC of the number of stitches) (used under the Setting mode)



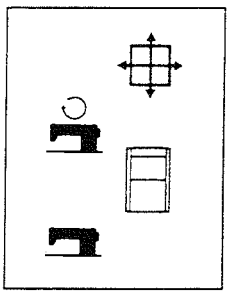
Set the scale setting switch to INC/DEC of the Stitch Length or IND/DEC of the Number of Stitches to enlarge/reduce a pattern.
When the switch is set to the side, the stitch length can be increased/decreased, and when set to the side, the number of stitches can be increased/decreased. (See "enlargement/reduction function".)



(Caution) **Pattern data created by point input function function can only be enlarged/reduced by increasing/decreasing the stitch length. Spline pattern data or zigzag pattern data created by main unit input functions other than linear (polygon) input function, circle input function and arc input function are taken as pattern data created by point input function. So, these pattern data can only be enlarged/reduced by increasing/decreasing the stitch length.**



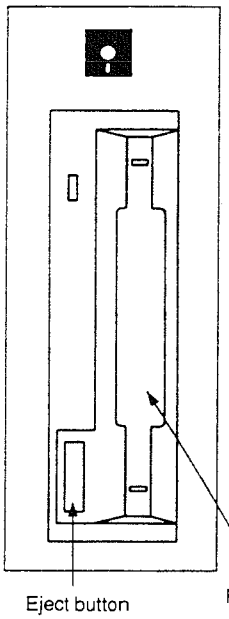
❹ Sewing machine ON/OFF switch (used under the Sewing mode)



When this switch is set to , the sewing machine perforns its normal operation.
When this switch is set to , only the feed mechanism will work.
This switch is set to the side to check the shape of pattern after reading the pattern, to check the feeding frame against the pattern desired, to check the size of the pattern after enlarging it and to perform other operations.
The sewing machine is started in the normal operation steps, i.e.,
The feeding frame comes down → Turn ON the Start switch.

(Caution)
- **It is advisable to set this switch to side for checking a pattern, which is to be used for the first time, before sewing it or enlarging/reducing a pattern.**
- **You may also check the pattern configuration using the Forward switch and Backward switch. When you creating a pattern using the main input function, you may check the pattern configuration after lowering the needle using the aforementioned switches. (Note that the intermediatepresser foot cannot be lowered.)**

❺ Floppy disk driver



1) Loading the floppy disk

After turning the power switch ON, slowly insert the floppy disk, with its face A pointing away from you, until the eject pushbutton pops out.

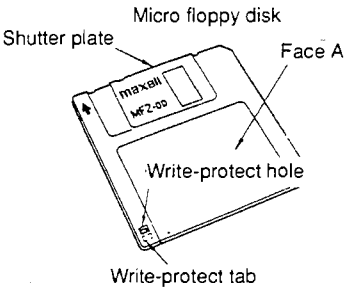
2) Unloading the floppy disk

Before turning the power switch OFF, press the eject pushbutton and take out the floppy disk.

3) Write - protect hole

When the write-protect tab is moved to open the write-protect hole, no data is allowed to be written into the micro floppy disk. Do this for storing program data. For writing data into the micro floppy disk, move the write-protect tab until it is exposed.

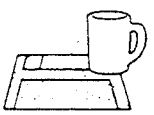
(Caution) Never turn the power switch ON or OFF with the floppy disk mounted.



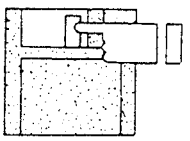
4) Micro floppy disk

Precautions when handling and storing the floppy disk

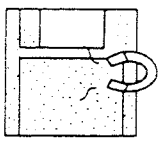
1. Do not open the shutter at the micro floppy disk and do not touch the magnetic surfaces.
2. Do not apply pressure on the shutter plate or the opening / closing spring (slider), or else the floppy disk may become damaged.
3. Do not allow the hub to become damaged and do not use the micro floppy disk with dust on the hub, or else errors may occur. Always keep the hub clean.
4. Do not use thinner, alcohol or freon gas on the micro floppy disk.
5. Do not use erasers on the micro floppy disk.
6. Do not eat or drink near the micro floppy disk.
7. Do not store the micro floppy disk in a place where there is a magnetic field.
8. Do not store the micro floppy disk in a dusty place.



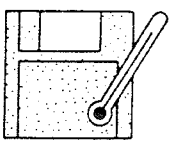
Do not place the floppy disk near an ashtray or food and drink.



Do not touch the exposed parts of the floppy disk.



Do not bring the floppy disk close to a magnetized material.



Do not place the floppy disk in a hot place (51°C or higher) or a place exposed to direct sunlight.

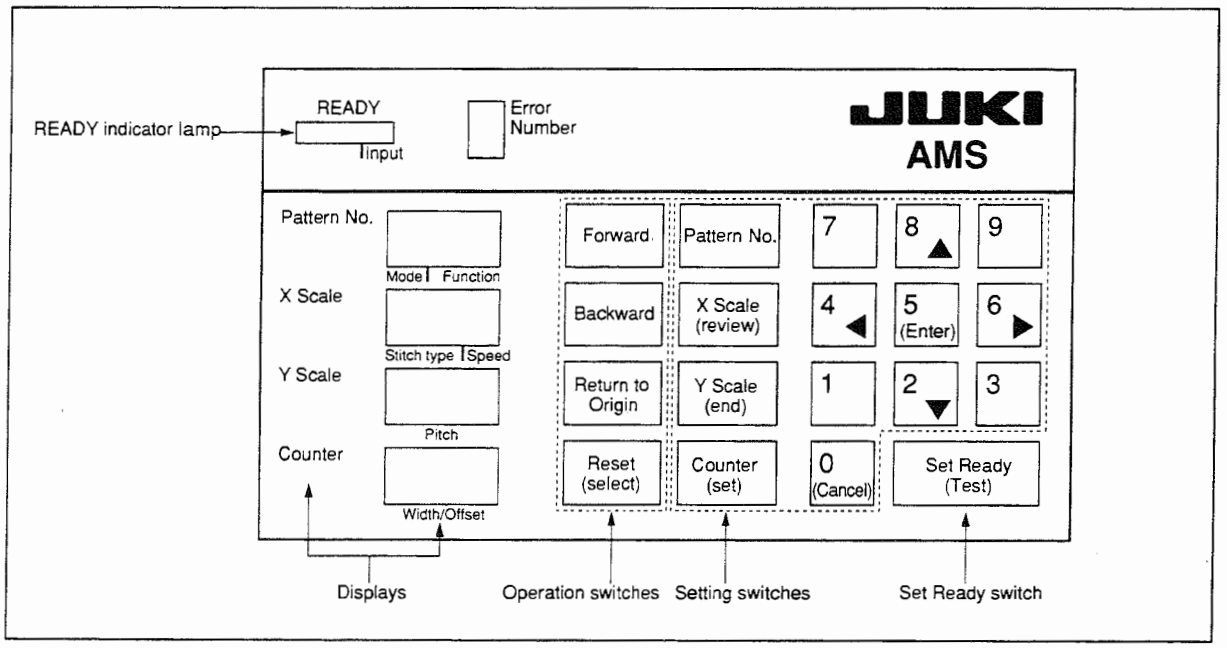
3-4. Description of the operation box (panel) and its functions

The sewing machine is operated under two different [Operation modes]. The switches on the operation box are arranged in accordance with the [Operation mode] of the sewing machine. The [Operation mode] of the sewing machine is changed over between these two modes every time the Set Ready switch is pressed. (The machine is in the [Setting mode] just after the power to the machine has been turned ON.

State	READY indicator lamp	Sewing machine	Switch on the operation box to be used
Setting mode	Goes out	Inoperative	Setting switches (Note 1)
Sewing mode	Lights up	Operative (sewing, winding a bobbin)	Operation switches

(Note 1) Among the setting switches, only the [4◀], [6▶], [8▲] and [2▼] switches can be used as jog switches under the [Sewing mode].

(Note 2) Every press on the respective switches on the operation box generates a beep.



1) Function and operating method of the setting switches . . . . . Used only when the machine is set to the [Setting mode] (the READY indicator lamp goes out).

Name of switch	Function	Operating method
[Pattern No.]	• Used to change the number representing pattern number indicated on the display. • Changes pattern No. at the time of reading out the indicated pattern using the [Pattern No.] switch and, [0 Cancel] [1] through [9] (numeric switches). (A number of three figures) • A number of three figures is used as the pattern number to read out the pattern from the floppy disk. • The number of significant digits is three. If a number of four or more figures is input, the last three figures will be effective. This is applied commonly to the switches described below. **(Caution) If setting a pattern No. that has not been in the floppy disk, error " 1 " will be shown on the Error Number display on the operation box, and the pattern No. will flash on and off.**	To make the display indicate [123], follow the procedure below. Press the [Pattern No.] switch. ⇩ Continuously press the [1], [2▼] and [3] switches. **(Caution) Be sure to input a pattern number of three figures.** **Example : Pattern No. 1 → 001** **Pattern No. 10 → 010** **Pattern No. 100 → 100**

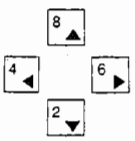
Name of switch	Function	Operating method
X Scale (review) Y Scale (end)	• Used to change the X scale or Y scale on the displays. Respective numbers of three figures on the displays are changed by operating the X Scale(review) or the Y Scale (end) switch and the number switches. • Respective numbers of three figures are used as X scale and Y scale when reading out a pattern from the floppy disk. **(Caution) The range of number of three figures that can be specified is 001(%) to 400(%) while the size of pattern stored in the floppy disk is taken as 100(%).** • Refer to "Scale setting switch (INC/DEC of the stitch length & INC / DEC of the number of stitches)" on page 18 and "Enlargement / reduction function" on page 32.	To make the X scale display indicated 230, follow the procedure below. press the X Scale (review) switch. ⇩ Continuously press the 2 ▼, 3 and 0 (Cancel) switches. ※ Similarly, the Y scale can be changed by pressing the Y Scale (end) switch first and than the number switches.
Counter (set)	• Used to change the number shown on the counter display. • The number of three figures on the display is changed by using the Counter (set) switch and the number switches. • This number is necessary when designating the "bobbin replacement setting function" using the relevant DIP switch. Refer to description on the "SW6-3" and "SW6-2" given on page 143 for the details of the "bobbin replacement setting function". • This number is not related to the function of reading out a pattern from the floppy disk. **(Caution) The range of number of three figures that can be specified is 001 to 999.**	To make the counter display indicate 052, follow the procedure below. Press the Counter (set) switch. ⇩ Continuously press the 0 (Cancel), 5 (Enter) and 2 ▼ switch.
(Number switches) 7 8 ▲ 9 4 ◀ 5 (Enter) 6 ▶ 1 2 ▼ 3 0 (Cancel)	• Used as number switches to change (specify) the numbers given on the pattern No., X/Y Scale and Counter. **(Caution) The 4 ◀, 6 ▶, 8 ▲ and 2 ▼ switches can also be used as jog switches. The function and operation method of the jog switches are to be described in "3) Operation swithes".**	

2) Function and operating method of the Set ready switch . . . . . This switch is used both under the [Setting mode] and [Sewing mode].

Name of switch	Function	Operating method
Set Ready (Test)	• Used to change over the mode of the machine between the [Sewing mode] (the READY indicator lamp lights up) and the [Setting mode] (the READY indicator lamp goes out). • If any of the numbers shown on the displays (excluding the Counter display) is changed under the [Setting mode], the machine will read out a pattern from the floppy disk when changing over the mode of the machine from the [Setting mode] to the [Sewing mode]. (When enlarging/reducing a pattern, the READY indicator lamp (LED) flashes on and off.) **(Caution) Whenever changing over the mode of the machine from the setting mode to the sewing mode, the feeding frame will perform below mentioned operation regardless of reading of a pattern from the floppy disk. So be sure to keep your hands away from the feeding frame. Operations to allow the machine to be set ready for sewing :** **① The feeding frame comes down.** **② The origin is retrieved. (The feeding frame moves to the origin.)** **③ The feeding frame moves to the sewing start position or to the second origin.** **④ The feeding frame goes up.**	[Sewing mode] ⇩ Press the [Set Ready (Test)] switch. ⇩ [Setting mode] ⇩ (Change the numbers shown on the displays.) Press the [Set Ready (Test)] switch. ⇩ Pattern is read from the floppy disk. ⇩ Operation to allow the machine to be set ready for sewing are performed. ⇩ [Sewing mode]

3) Function and operating method of the operation switches . . . . . Only used the [Sewing mode] (the READY indicator lamp lights up).

Name of switch	Function	Operating method
Forward Backward	• When the Forward/Backward switch is pressed with the feeding frame down, the material is fed forward/backward by one stitch. • When the Forward/Backward switch is kept pressed, the material is fed forward/backward at slow speed for the first one stitch, after which it is automatically fed forward/backward continuously at high speed. • The state under which the feeding frame is lowered represents any of the following states, etc. ① When the feeding frame is lowered by operating the feeding frame switch. ② After the Stop switch is used to stop the sewing machine while the machine is in operation or after thread trimming (when the needle threading switch is moved up and down). ③ After the machine has automatically stopped in an error (error message " 9 ") during sewing due to needle thread breakage. (Refer to "Stop switch" on page 27.) • Example of operations ① When checking the shape of pattern newly read out from the floppy disk. ② When you wish to sew the material again from the position where the sewing is automatically interrupted by needle thread breakage.	To continue sewing after thread breakage, follow the procedure below. The machine automatically stops due to thread breakage. ⇩ Return the feed mechanism to the stitch where the sewing has been interrupted using the [Backward]. ⇩ Depress the start switch. (The sewing is re-started.) The material is fed forward. ⇨ Sewing start ⇦ The material is fed backward. Sewing end

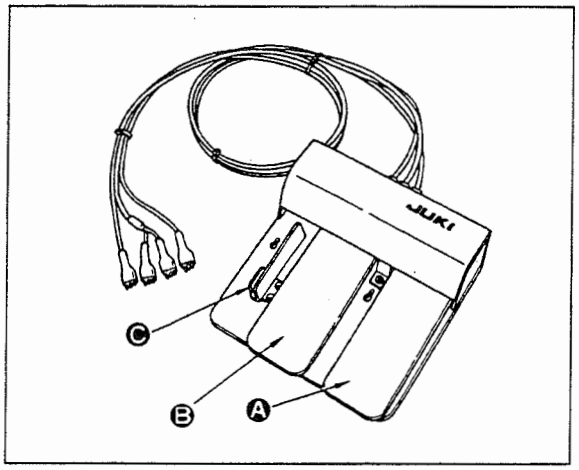
Name of switch	Function	Operating method
Return to Origin	• When this switch is pressed with the feed frame lowered, the feed mechanism will automatically move straight to the sewing start point or the 2nd origin regardless of the pattern shape. This switch is operative after operating the Forward or Backward switch. (Caution) **If any special type of feeding frame such as the inverting feeding frame is used and an obstruction exists on the way to the sewing start point or the 2nd origin, the feeding frame may come in contact with the needle, etc. while it returns to the origin. In this case, return the feeding frame to the sewing start point or the 2nd origin by operating the Backward switch. (Refer to page 28.)**	
Reset (select)	• Used to resed the number shown on the Counter display when the machine is stopped. • This is the switch to re-start the sewing machine after the machine is stopped by the " bobbin replacement setting function". Refer to description on the " SW6-3 " and " SW6-2 " given on page 143 for the details of the " bobbin replacement setting function".	The number of pieces of material specified to be sewn is finished. ⇩ The sewing machine is stopped by the "bobbin replacement setting function". (Indicator lamp flashes on and off) ⇩ Press the Reset (select) switch. ⇩ The number shown on the Counter display is reset. (The machine is set to the state under which it is allowed to re-start sewing.)
Jog switches 	• They are used to move the sewing position or to specify the 2nd origin. (This function is selected using the relevant DIP switch. See the description on "SW5-3" on page 141.) • If any of the switches 2, 4, 6 and 8, is pressed immediately after lowering the feeding frame, the feed mechanism will move in the direction shown by the arrow on the pressed switch. The destination is used as the position to start sewing (sewing start point) or the 2nd origin. • The movement of the feed mechanism is kept stored in memory unless another movement is specified or the operation mode of the machine is once changed over to the Setting mode. • Thanks to the "backup function" (refer to page 31) the movement of the feed mechanism is automatically stored in memory together with the data on the pattern used even if turning OFF the power to the sewing machine.	

3-5. Error indications

Error No.	Indicator lamp	Error description	Action to be taken
1	ON	Comes on if a malfunction has resulted in a data read-out error.	Press the Set Ready key to read out the data again.
	ON The pattern No. indicator lamp flashes on and off	Starts when there is no data for the relevant number.	Set the correct Pattern No. again.
	Flash	A floppy disk is no inserted.	Insert a floppy disk.
2	ON	Comes on if the stitch length exceeds 10 mm (0.394") over the computable range in an attempt to enlarge a pattern based on the number of stitches.	Correctly reset the X-and/on Y-scale.
3	ON	Comes on if the needle is not in its highest position.	Turn the handwheel until error No. "3" disappears. Or turn ON/OFF the Needle Threading switch to raise the needle to its highest position.
4	ON	Comes on if the maximum sewing area is exceeded.	During a sewing cycle: Press the Return to Origin key. While setting the 2nd origin: Press the Jog key.
5	Flash	Starts when the Stop switch is turned ON.	Press the start switch to actuate the sewing machine again. Turn ON/OFF the Needle Threading switch, and the thread will be trimmed. (The lamp display changes from "Flash" to "ON".)
	ON	Comes on when the emergency switch is turned ON while only the feeding frame is moving.	Turn ON the start switch after pressing the Return to Origin and the Forward or Backward keys.
6	Flash (slowly)	Starts when approximately 1,000 stitches remain for the pattern to be made.	When using the PGM-1 together with the machine.
	Flash (fast)	Starts when approximately 500 stitches remain for the pattern to be made.	When using the PGM-1 together with the machine.
7	ON	Comes on if a malfunction has caused the machine to lock, or if there has been a failure in the needle position detector.	Turn OFF the power switch. Replace the defective parts or eliminate the cause of the machine locking. Then turn ON the power switch.
8	ON	Comes on if a poor connection of a solenoid connector is detected.	Turn OFF the power switch, and check for the loose solenoid connection.
9	ON	Comes on if the needle thread is broken.	Re-thread the machine head, press the Return to Origin key and the Forward or Backward keys to move the feeding frame backward. Then press the start switch.
0	Flash	The write-protect tab is moved to open the write-protect hole when formatting the floppy disk loaded in the floppy disk driver.	Move the write-protect tab until it is exposed.
	ON	Comes on when trying to format a defective floppy disk.	Replace the floppy disk.
A	ON	Air pressure is low. Air is not supplied to the sewing machine. Connector of the junction cable for the air valve disconnects.	Turn OFF the power switch. Set the air pressure to 2 - 2.5 kg/cm^2 (5 -5.5 kg/cm^2 for only GL type). Connect the connector.
E	ON	Comes on when the sewing machine rotates in the reverse direction.	Turn OFF the power switch. Change the rotation direction of the motor.

3-6. Description of the foot switch

a) How to operate the foot switch (PK-47 three-pedal unit) (for the L type only)



The switches correspond to the connectors as stated below.

Ⓐ is the single-step pedal switch : Connector No. 1

Ⓑ is the double-step pedal switch :

First step : Connector No. 2

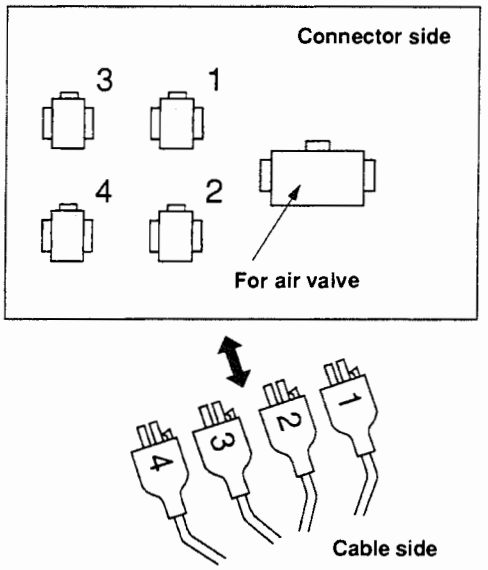
Second step : Connector No. 3

Ⓒ is the single-step lever switch : Connector No. 4

You can use these switches as desired by changing the connecting method of these connectors and changing the setting of the relevant DIP switches (SW5-7 and SW5-6).

Example of connectors and corresponding swith assignments.

Connector side — Cable side	Feeding frame 1 switch	Feeding frame 2 switch	Start switch
1 — 1 2 — 2 3 — 3 4 — 4	Ⓐ	Ⓑ First step	Ⓑ Second step
Setting of DIP switches	SW5-7ON	SW5-6OFF	
1 — 1 2 — 2 3 — 3 4 — 4	Ⓐ	Ⓑ First step	Ⓒ
Setting of DIP switches (at the time of delivery)	SW5-7ON	SW5-6ON	
1 — 1 2 — 2 3 — 3 4 — 4	Ⓑ First step	Ⓑ Second step	Ⓒ
Setting of DIP switches	SW5-7OFF	SW5-6OFF	



(The number 1 to 4 represent the connector numbers.)

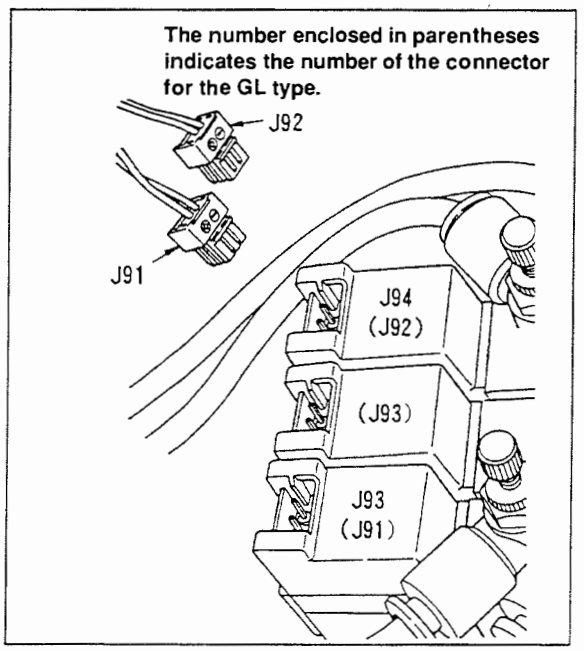
(Caution)

- **The PK-47 changes its performance in accordance with the ON/OFF setting of the DIP switches, SW5-7 (pedal selecting feature A) and SW5-6 (pedal selecting feature B) on the I/F circuit board in the control box.**

> **ON : One depress on the pedal will lower the feeding frame and another depress on the pedal will raise it.**
> **OFF: The feeding frame comes down as long as the pedal is kept depressed.**

- **The SW5-7 (pedal selecting feature A) corresponds to the Feeding frame 1 switch and the SW5-6 (pedal selecting feature B) corresponds to the Feeding frame 2 switch. (We recommend to set the DIP switches as shown in the above table.)**
- **The sewing machine will start running when pedal Ⓑ is depressed to its second step after the right- and left sections of the feeding frame have come down, or when pedal Ⓒ is depressed. Pedal Ⓐ is exclusively used for raising/lowering the feeding frame.**
- **If setting the SW6-1 (separately driven feeding frame operation sequence changing over function) to its ON position, the operation order of the Feeding frame 1 SW and the Feeding frame 2 SW will be changed over. So, change round the connection of the connectors No. 1 and No. 2 on the cable side.**

(Changing over the performance of the feeding frame by changing the connection of the connectors)



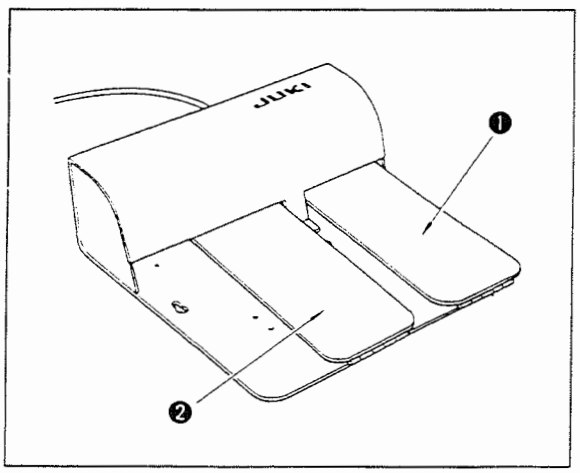
When a PK-47 or PK-48 is connected with an AMS-210C, -212C of the sewing machine, the relationship between the foot switch and the right- and left-hand sections of the feeding frame may change according to the connecting method of the solenoid valve connectors. Operate your sewing machine changing the connecting method as desired in accordance with the application.

(Caution) 1. The sewing machine will start running when pedal Ⓑ is depressed to the second step after the right- and left-hand sections of the feeding frame have come down, or when pedal Ⓒ is depressed. Pedal Ⓐ is exclusively used for raising/lowering the feeding frame.

2. (J93) is the solenoid valve for lifting the intermediate presser foot in GL type of the sewing machine. L type (excluding GL type) is not provided with it.

Connector connecting method The number enclosed in parentheses indicates the number of the connector for the GL type.		PK-47	PK-48
1	J93 (J91) — J91 J94 (J92) — J92	Ⓐ Right-side pedal—Raises/lowers the right-hand section of the feeding frame Ⓑ Left-side pedal—Raises/lowers the First step left-hand section of the feeding frame	First step : Raises/lowers the left-hand section of the feeding frame Second step : Raises/lowers the right-hand section of the feeding frame
2	J93 (J91) — J92 J94 (J92) — J91	Ⓐ Right-side pedal—Raises/lowers the left-hand section of the feeding frame Ⓑ Left-side pedal—Raises/lowers the First step right-hand section of the feeding frame	First step : Raises/lowers the right-hand section of the feeding frame Second step : Raises/lowers the left-hand section of the feeding frame

b) How to operate the foot switch (for the S type and T type only)

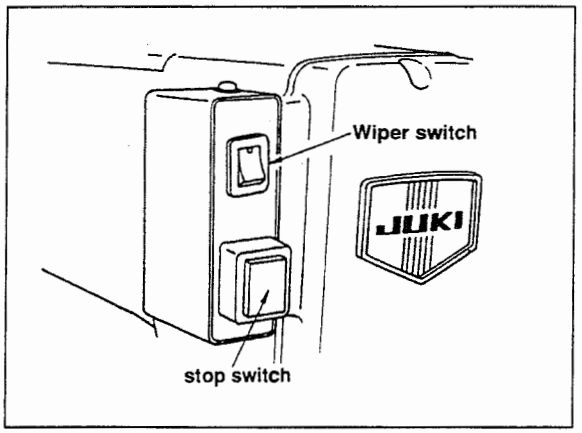


1) When feeding frame switch ❶ is depressed, the feeding frame will come down. Another depress on the switch makes the feeding frame go up.
2) When start switch ❷ is depressed with the feeding frame down, the machine will start sewing.

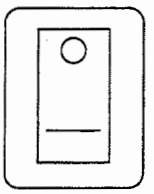
(Caution) 1. The inverting intermediate presser foot comes down with the feeding frame when operating the feeding frame switch. If you wish to operate the inverting intermediate presser foot and the feeding frame independently, use the feeding frame lowering pedal.

2. When the red and black pedal unit, the black pedal is used to control the feeding frame and the red one is used to start the sewing machine.

3-7. Description of the switches on the machine head



① Wiper switch (used under the Sewing mode)



ON	The wiper actuates after thread trimming to sweep the thread.
OFF	The wiper is inoperative.

(Caution) 1. In addition to the wiper switch, the machine comes with the wiper selector switch (DIP switch) to control the "wiper prohibition function". (See the description on the SW6-7 on page 145.)
2. The wiper switch has been designed to operate under the Sewing mode, however, the switch itself can be operated under the Setting mode since it is mechanically a seesaw switch.

② Stop switch (used under the Sewing mode)

If this push-button switch is pressed while the machine is running under the Sewing mode, the machine will stop giving an error message on the display.

(Error message)

Stop switch is pressed during sewing. ON → Error 5 flashes on and off. → Move up/down the Needle threading switch on the control box. → Error 5 lights up.

(See also the description on the SW7-3 on page 147.)

Stop switch is pressed during jump. → Error 5 lights up.

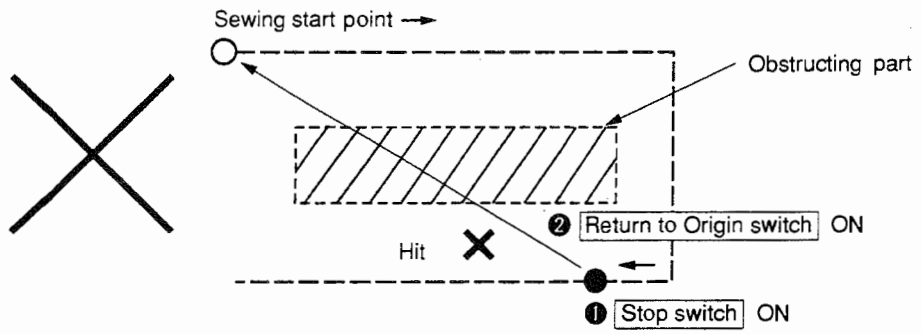
(Operation after an emergency stop)

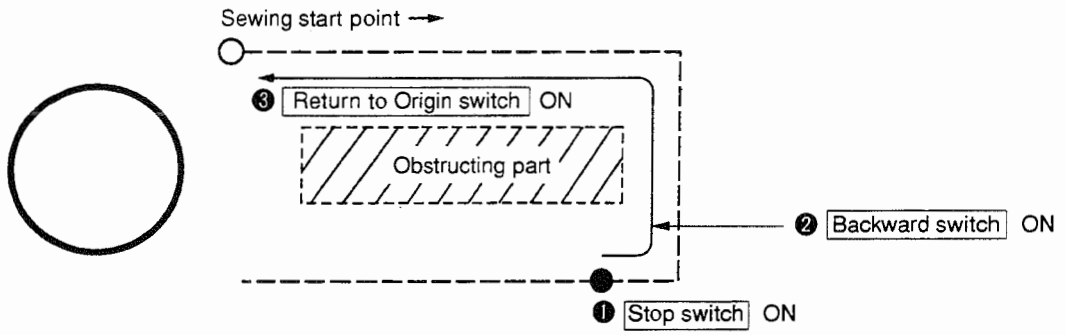
1. **To re-start the sewing machine without operating any other switch**
   → The [Start switch] is operative in the both cases where Error 5 [flashes on and off] and Error 5 [lights up]. So turn ON the [Start switch].
2. **To re-start the sewing machine after changing the sewing start point (stitch) using the [Forward/Backward switch]**
   → Move up/down the [Needle threading switch] (to make the thread trimmer actuate). Then the Error 5 will [light up] instead of flashing on and off. Then move the needle the position from which you wish to re-start sewing using the [Forward/Backward] switch, and turn ON the [Start switch].

   (Caution) Moving the [Needle threading] switch up and down will make the sewing machine turn by one revolution, during which the needle will go up and come down. Never place your hands, etc. under the needle when operating the Needle threading switch.
3. **To return the needle to the sewing start point (or the 2nd origin)**

   Move up/down the [Needle threading switch] to make the Error 5 [light up] instead of flashing on and off. Then turn ON the [Return to Origin switch]. (The needle returns to the sewing start point (or the 2nd origin) and the feeding frame goes up.)

   (Caution) If your machine (T type) is equipped with an inverting clamp or if you use a special type of feeding frame, the inverting clamp or feeding frame may partly protrude from the needle.
   In this case, if turning ON the [Return to Origin switch] to make the needle return to the sewing start point, the needle may hit against the protruded section of the inverting clamp or feeding frame on the way to the sewing start point. This is very dangerous since needle breakage, etc. may result. Consequently, in the aforementioned case, return the needle to the sewing start point (or the 2nd origin) by keeping pressing the [Backward switch], and reise the feeding frame using the [Return to Origin switch].





3-8. Description of functions and operating methods

3-8-1. Table of functions to be set with DIP switches

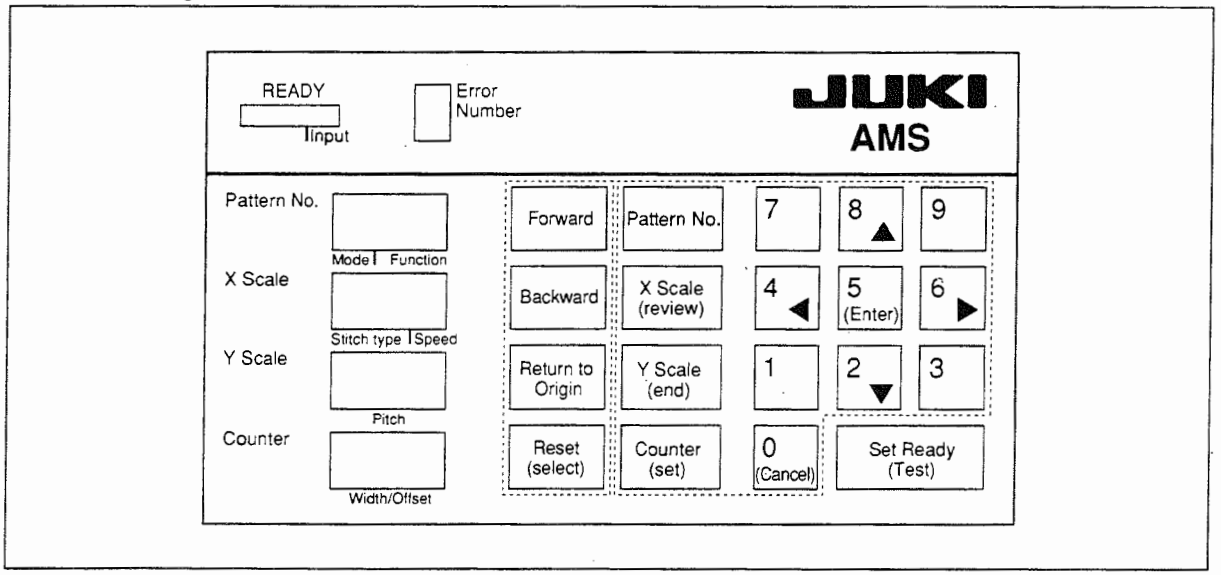
The following table shows the functions of the DIP switches. Refer to pages 138 for the explanation of the respective functions.

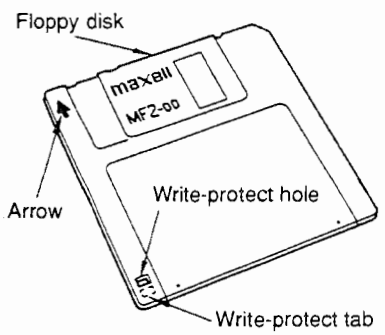
Function	DIP switch
Feed timing is selected in accordance with the material thickness.	SW4-3, -4
"Cycle stitching function B" (Raising/lowering of the feeding frame selection B)	SW5-1
"Cycle stitching function A" (Raising/lowering of the feeding frame selection A)	SW5-2
Selection between "2nd origin setting function"/"Sewing start point moving function"	SW5-3
"Wiper actuating point selecting function"	SW5-4
Origin detection selector switch	SW5-5
"Pedal change-over function B"	SW5-6
"Pedal change-over function A"	SW5-7
"Monolithic feeding frame/separately driven feeding frame change over function"	SW5-8
"Separately driven feeding frame operation sequence change over function"	SW6-1
Setting the "Bobbin thread counting function"	SW6-2
Setting the "Bobbin replacement setting function"	SW6-3
Setting the "Enlargement/reduction function"	SW6-4
Setting the "Thread breakage detection function"	SW6-5
Setting the "Thread trimmer prohibition function"	SW6-6
Setting the "Wiper prohibition function"	SW6-7
Setting the "Intermediate presser foot stop function"	SW6-8
Setting the "Air pressure detection function"	SW7-1
Setting the "Automatic thread trimming function at the time of stop"	SW7-3
Setting the sewing speed at the start of sewing	SW7-4, -5
Setting the "Feeding frame position at sewing end change-over function"	SW7-6
Setting the "Automatic retainer compensation function"	SW7-7

3-8-2. Disk formatting function

Any new disk must be formatted (on the ※MS-DOS) before use. All patterns stored in a disk can also be erased by formatting.

*** MS-DOS is a registered trademark of Microsoft Inc., in the U.S.A.**





1) Turn ON the power switch while pressing switches 4 ◀ and 6 ▶ .
   This makes the machine ready for formatting a disk At this time the Pattern No. display will show "FFF".
2) Insert a disk into which data can be written (a disk with its write-protect hole closed) into the disk drive, and press the Set Ready switch .
3) The Pattern No. display indicates the format track Nos., and tracks from 0 to 79 are formatted. After the completion of formatting the disk, the Pattern No. display will show "FFF".
4) When the disk has been formatted, turn OFF the power to the machine once and turn ON it again. This will allow the machine to exit from the disk formattting mode.

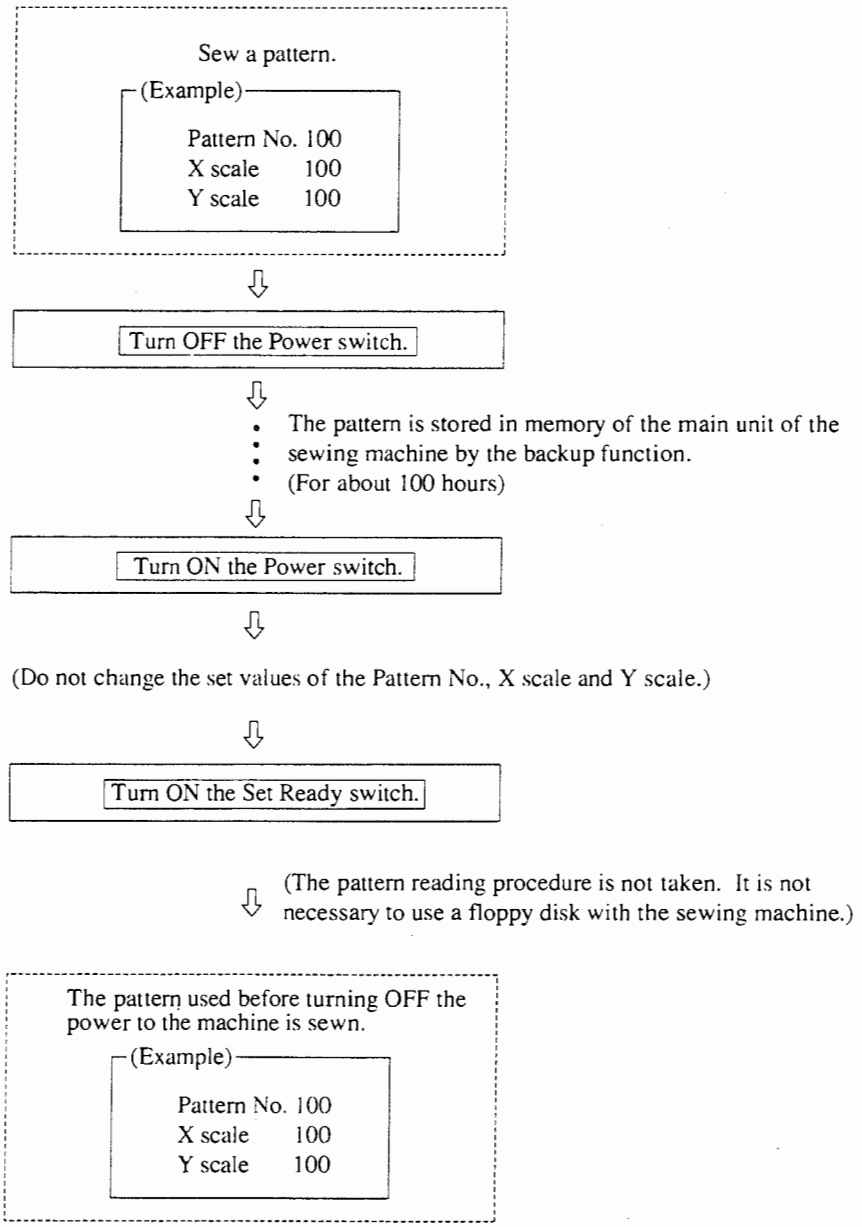
(Caution) 1. If you should take the disk out or turn the power OFF during formatting, the disk cannot be used. The disk must be formatted again.
If an error 0 is displayed, it means the disk is defective. Do not use the disk.
2. Use a floppy disk marked with "2DD." You may sometimes use (read/write data from/into) a floppy disk other than the 2DD type one after formatting it. In this case, always remember that a trouble is likely to occur during operation. Normal operation is not ensured unless a 2DD floppy disk is used.

3-8-3. Data backup function

In order to operate your AMS sewing machine, it is necessary to read a pattern you wish to sew in the main unit of the sewing machine after energizing the sewing machine (Turning ON the Power switch).
However, if you use the same pattern repeatedly, you can omit the aforementioned procedure when actuating the sewing machine (Turnung ON the power switch) after Turning OFF the Power switch once.

(Operating procedure)

- When you Turn OFF the power switch after completing the sewing, the currently used pattern which has been read in the main unit of the sewing machine is automatically stored in memory built in the main unit of the sewing machine.
- Then, Turn ON the Power switch , and Turn ON the Set Ready switch without changing the set values for the "Pattern No.", "X scale" and "Y scale" under the Setting mode. This will change over the operation mode of the sewing machine to the Sewing mode without taking the pattern read-in procedure. As a result, you can use the pattern used before turning OFF the power switch for sewing again. (In this case, there is no need for a floppy disk.)



(Caution) 1. The 2nd origin and sewing start point which are set by Jog switches are also stored in memory together with the pattern.

2. Even if setting the Pattern No., X scale and Y scale to the values same as those used before turning OFF the power switch, the machine does not perform the pattern read-in operation.

(Caution) 3. If you want to read the pattern No. same as the one used in the previous sewing from another floppy disk while using the X-scale and Y-scale same as the one used in the previous sewing, first read another pattern No. and then read the desired pattern No.

4. The scale setting switch for INC/DEC of the stitch length & INC/DEC of the number of stitches mounted on the front face of the control box, as well as the Pattern No., etc., is also related to the pattern reading function. So, if changing the set value of the scale setting switch, the data backup function will be ineffective.

3-8-4. Needle-up position stop function

In the AMS machines, when the needle is not at its highest position, error No. "3" will be indicated on the display. In this case, the foot switch, etc. are inoperative and the sewing machine cannot be operated. If the needle is not in its highest position under the Sewing mode, you can bring the needle to its highest position by operating this switch instead of manually turning the pulley.

(Operating procedure)

If the needle is not in its highest position under the Sewing mode, move the Needle threading switch mounted on the front face of the control box up and down after confirming there is nothing under the tip of needle.

① Move up the Needle threading switch : The feeding frame and the intermediate presser foot come down.

② Move down the Needle threading switch : The sewing machine makes one revolution (the needle goes up and comes down), and stops with its needle up. → The feeding frame and the intermediate presser foot go up.

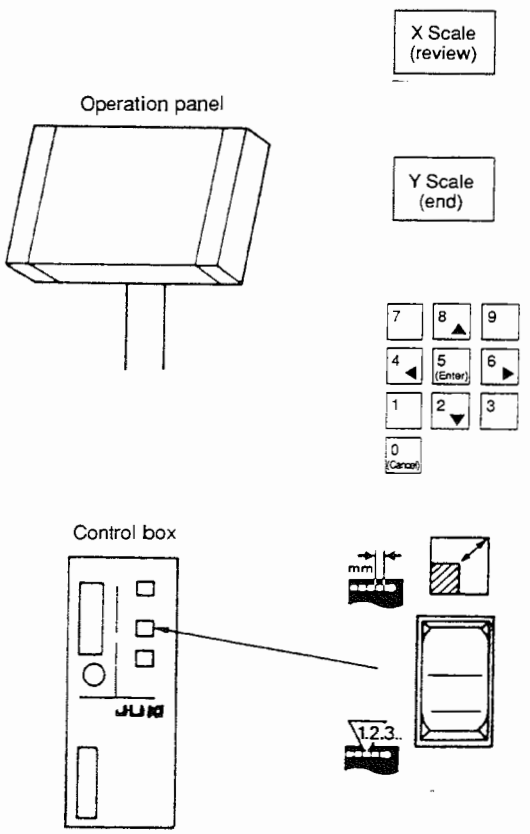
(Caution) The feeding frame, intermediate presser foot and needle moves up and down. It is very dangerous, therefore, to perform the above-stated operation with your hands, etc. placed under the feeding frame, intermediate presser foot and the tip of needle. So be careful.

3-8-5. Enlargement/reduction function

The AMS machine is capable of enlarging/reducing a pattern when reading the pattern from the floppy disk.

The pattern can be enlarged/reduced in the range of 1% to 400% (1/100 to 4 times of the original size) while the size of pattern written in the floppy disk is taken as 100%.

1) Switches used for the enlargement/reduction function



It is used to specify the scale (%) for enlargement/ reduction of a pattern in the X direction (widthwise direction). It is pressed first.

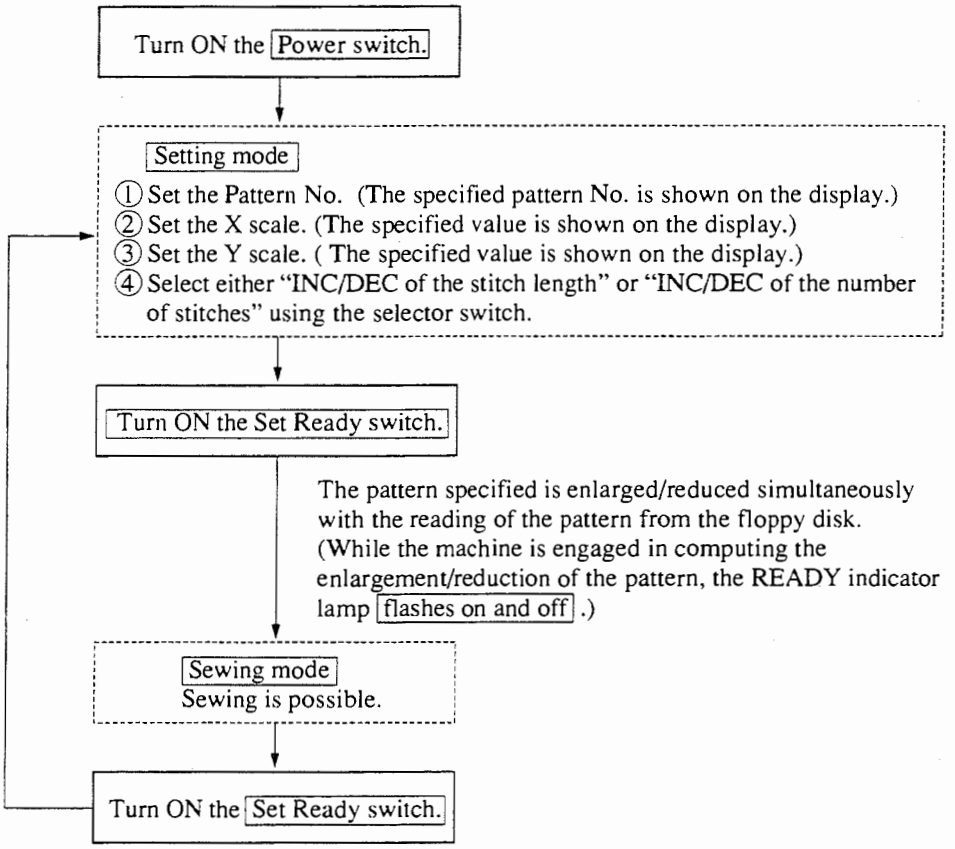
It is used to specify the scale (%) for enlargement/ reduction of a pattern in the Y direction (lengthwise direction). It is pressed first.

These switches are used to set the X scale and Y scale. Taking the size of pattern written in the floppy disk as 100%, set the scale within the range of 1% to 400% (1/100 to 4 times as large as the original size).

Scale setting switch for INC/DEC of the stitch length & INC/DEC of the number of stitches

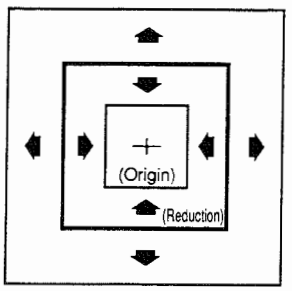
This switch is used to select either to increase/decrease the stitch length in accordance with the enlargement/ reduction scale or increase/decrease the number of stitches without changing the stitch length, when the pattern is enlarged / reduced as desired using the switches mounted on the aforementioned operation panel.

2) Operating procedure



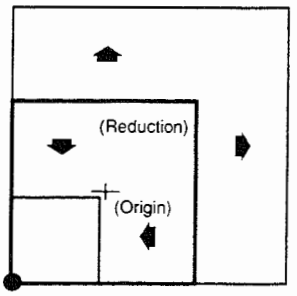
3) Reference point for pattern enlargement/reduction (center point)

- Normally, the AMS enlarges/reduces a pattern using its origin (mechanical origin) as the reference point (center point).



(Enlargement) Normal enlargement/reduction (normal pattern)

- However, if a "reference point for enlargement/reduction" has been entered in the programmed pattern, this "reference point for enlargement/reduction" is used as the reference point (center point) when enlarging/reducing the pattern.



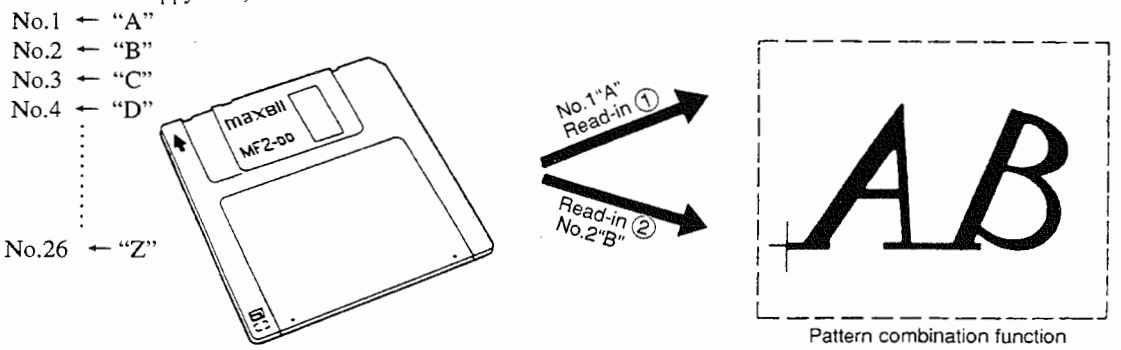
(Reference point for enlargement/reduction)

(Enlargement) A pattern is enlarged/reduced centering the reference point for enlargement/reduction (for a pattern provided with a reference point for enlargement/reduction)

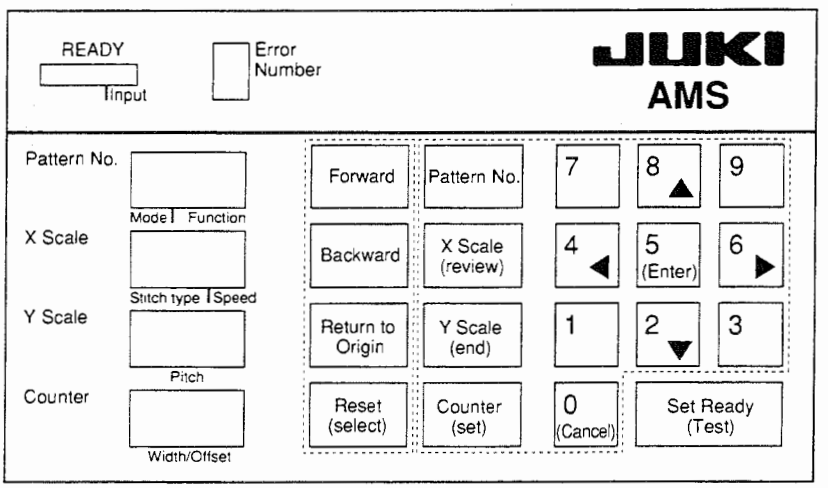
3-8-6. Pattern combination function

This function enables the machine to read only the desired parts of the patterns stored in the floppy disk to combine them for sewing. The total number of stitches that can be combined is 16,000 stitches at the maximum. As long as the total number of stitches does not exceed 16,000, you need not care about the number of patterns.
If you have created embroidery patterns of all the alphabets respectively in the floppy patterns beforehand, you can combine some of these patterns to sew initials. This allows you to sew many different persons' names using a considerably small number of patterns (only 26 different patterns from A through Z).

(Patterns stored in the floppy disk)



(Operating procedure)



This function is operated in the special way which is different from the other functions.

❶ Actuating the "pattern combination function"

Basically, the function is actuated by pressing the power switch while pressing the switches on the operation box (panel), as in the case of actuating the "disk formatting function" (see page 30).

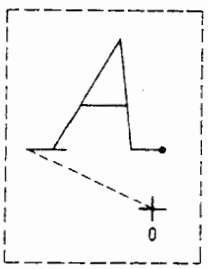
The "pattern combination function" can be actuated in the four different ways in accordance with the pattern combining methods.

	Actuating method	Pattern combining method
1	Turn ON the Power switch while pressing the 0 (Cancel) and 2 ▼ switches.	The patterns are overlapped. (Fig. 1) (The origins of the respective pattern read in the machine are aligned.)
2	Turn ON the Power switch while pressing the 0 (Cancel) and 5 (Enter) switches.	The patterns are spliced. (Fig. 2) (The sewing end of the pattern read first is aligned with the origin of the pattern to be read next.)
3	Turn ON the Power switch while pressing the 0 (Cancel) and 3 switches.	The patterns are overlapped while inserting a "temporary stop (pause)" between them. (Fig. 3)
4	Turn ON the Power switch while pressing the 0 (Cancel) and 6 ▶ switches.	The patterns are spliced while inserting a "temporary stop (pause)" between them. (Fig. 4)

— Example of pattern combination —

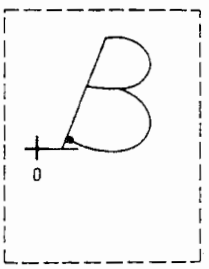
Patterns stored in the floppy disk

No.1 "A"



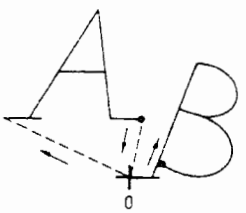
[+ / 0 } represents the origin.
• represents the sewing end.]

No.2 "B"

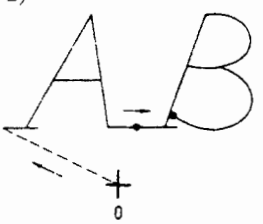


For all the combination of patterns, pattern No. 1 is read in first, and pattern No. 2 is read next.

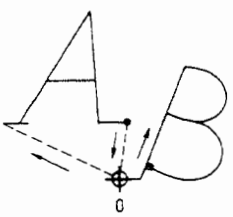
(Fig. 1)



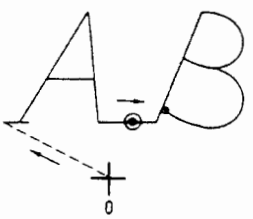
(Fig. 2)



(Fig. 3)



(Fig. 4)

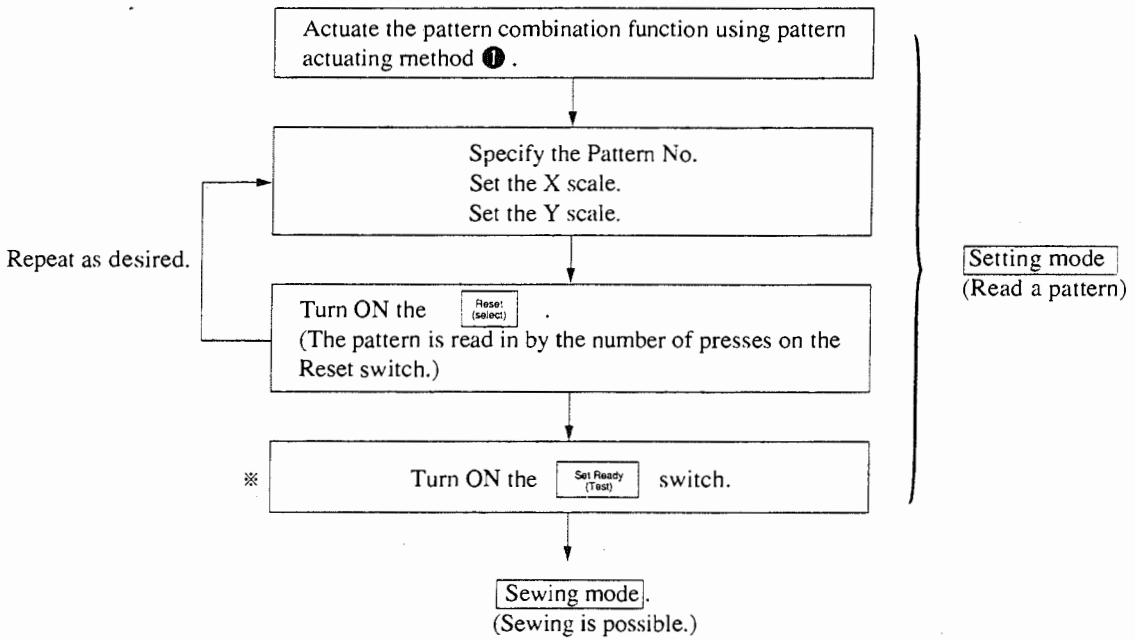


"○" represent the "temporary stop (pause)".

(Caution) Refer to the description on the SW5-2 on page 154 for the function of the "temporary stop (pause)".

❷ Reading in a pattern

Normally, the pattern created under the [Setting mode] is automatically read in at the moment when the [Setting mode] is changed over to the [Sewing mode] by turning ON the [Set Ready switch]. However, the pattern is read under the [Setting mode] when actuating the "pattern combination function". Use the [Reset (select)] to read in the pattern.



※ When the data reading operation has been completed, turn ON the [Set Ready switch]. This will make the [Sewing mode] for sewing and to allow you to sew the combined patterns.

❸ Erasing the pattern read in

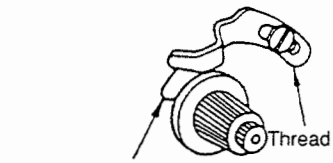
If you have read in the pattern which is not necessary for your sewing by mistake and combine it with the other patterns, you cannot erase the wrong pattern. So, if you have made a mistake in the pattern reading operation, it is necessary for you to re-actuate the function and carry out the pattern reading operation from the very start.
(This is also applied to the case where you wish to make a new combination of patterns after completing the previous sewing.)

❹ Storing the patterns combined in memory

The patterns you have combined are stored in memory in the main unit of the sewing machine by turning OFF the [power switch] under the [Sewing mode] (when the READY indicator lamp [lights up]) by means of the backup function described on page 31.
If you use the combined patterns again for the next sewing, actuate the machine by turning ON the [Power switch] as in the normal operation.

(Caution)
- The Counter display (bobbin thread counter) on the operation box (panel) does not count up/down until all the patterns combined have been finished. (Refer to the explanation of the SW6-2 on page 143 for the Counter.)
- Be sure to start sewing the patterns combined after confirming that the combined patterns do not exceed the predetermined sewing area.

3-8-7. Thread breakage detection function (Error No. "9")



The thread breakage detector detects the breakage of the needle thread by checking the contact between the thread take-up spring and the thread breakage detecting plate. While sewing, the motion of the thread take-up spring is synchronized with the motion of the needle bar. If the needle thread is lost due to breakage, the thread plate when it should leave the detecting plate. This makes it possible to detect the thread breakage. Upon detection of the thread breakage, the machine will slow down and trim the thread before it stops.
The machine stops after it sews 10 stitches when the thread breaks at sewing start, or after it sews 5 stitches when the thread breaks during a stitching cycle. Error No. "9" will be indicated.

After threading the machine head, the thread breakage detecting function is released by re-starting sewing using the Forward, Backward switch or Start switch or by moving the feeding frame to the sewing start point using the Return to Origin switch.

(Caution) The thread breakage detection function can be set inoperative using the DIP switch (SW6-5). (See page 145.)

3-8-8. Travel end detection function (Error number "4")

The travel end of the feeding frame is limited by the sensor. The travel end detection function automatically detects the boundary if the feeding frame moves beyond the predetermined travel end due to excessive enlargement of a pattern, and stops the sewing machine and the feeding frame giving the error indication 4 on the display. At this time, the stop state can be reset using the Return to Origin switch during sewing, or using the Jog switches while a 2nd origin is being specified.

(Caution) 1. Travel range of the feeding frame

The travel range of the feeding frame is determined as follows by the size of the XY table and the attaching position of the sensor. AMS-210C 100 mm (3.937") x 60 mm (2.362")
AMS-212C 125 mm (4.921") x 60 mm (2.362")
Actually, the travel range has an approximately 1 mm (0.039") allowance from the sensor which detects the travel end of the feeding frame to the mechanical travel end (stopper).

2. Sewing range

The travel range of the feeding frame is determined by the sensor, however, the sewing range is limited by the size, shape, height and other specifications of the feeding frame. The sensor does not work to stop the sewing machine even if the size of a pattern exceeds the predetermined sewing range.
So, it is necessary to check the performance of the sewing machine before actually sewing the pattern.
(See "Forward/Backward switches" on page 22.)

3. Inverting type (T type)

For the inverting type machines, in particular, the top side of a pattern in terms of the longitudinal (Y) direction is limited by the position of the inverting clamp. As a result, the max. sewing size in terms of Y direction is 56 mm (2.205"). (See page 197.)

3-8-9. Second origin setting function and the sewing start point moving function

1. Second origin setting function (SW5-3 has been set to its OFF position at the time of delivery.)

Normally the needle stays at the "sewing start point" before starting sewing. To facilitate the setting of a material on the sewing machine, the 2nd origin (also called "turnout point") is specified to allow the needle to move to a point (position) where the material can be set on the machine with ease.

The 2nd origin can be input (specified) when creating a pattern. It can also be specified just before starting sewing. (Note that the 2nd origin cannot be specified when reading an inversion pattern in which the command for inversion has been input. Refer to page 198 or the "Instruction Manual for the Input Functions of the Main Unit" for the command for inversion or the related information.)

(Operating procedure)

① Start the sewing machine, and load a floppy disk in the sewing machine.

② Set the pattern No. desired and other data required for sewing.

③ Turn ON the Set Ready switch.

The feeding frame comes down. → The needle moves to the "sewing start point." → The feeding frame goes up.

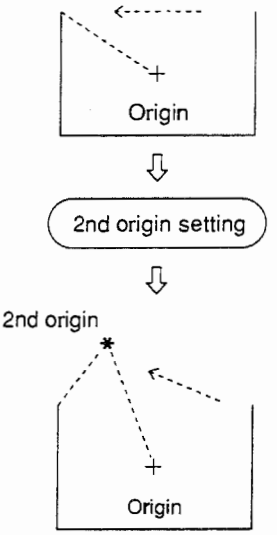
④ Turn ON the Feeding frame switch to make the feeding frame comes down.

⑤ Move the feed using the jog switches (△▽◁▷) until the needle tip is brought to the appropriate position. "2nd origin setting"

⑥ Turn ON the Start switch.

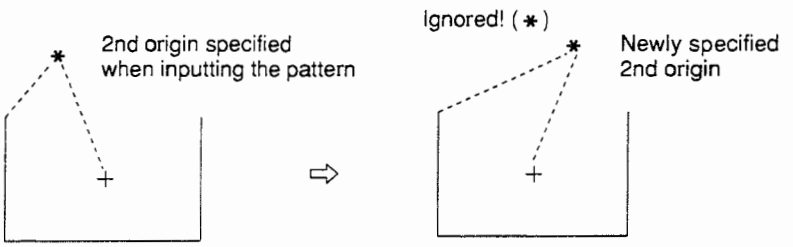
The needle moves to the sewing start point by means of the jump function. Then the machine starts sewing.

⑦ The thread trimmer actuates to cut the threads. Then the needle moves to the 2nd origin by means of the jump function. The feeding frame goes up.



- As long as the position of the 2nd origin specified is acceptable, continue sewing.

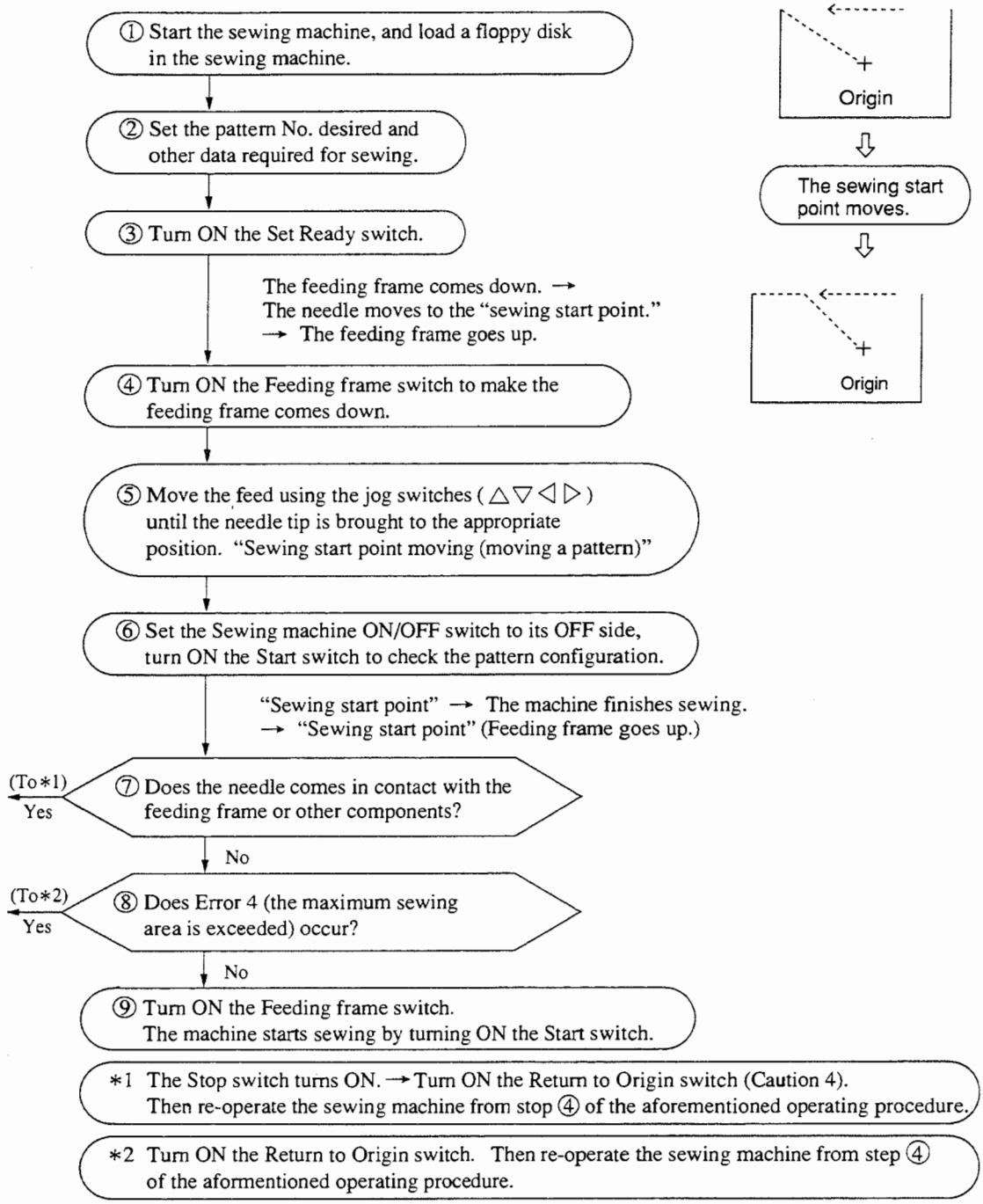
(Caution)
1. **Turn OFF the power to the machine after completing the sewing. Then the input data will be stored in memory by the data backup function.**
2. **To delete the 2nd origin setting position, turn ON the Set Ready switch twice.**
3. **To change the 2nd origin setting position, re-specify a new one following the aforementioned operating procedure from step ④.**
4. **See the description of the DIP switch SW5-3 on page 141.**
5. **If specifying a 2nd origin in a pattern using this function, the conventional 2nd origin that has been already input when creating the pattern will be ignored.**



2. "Sewing start point moving function" (SW5-3 is set to its ON position)

This function is used to move a pattern, which is read out from a floppy disk, in parallel.

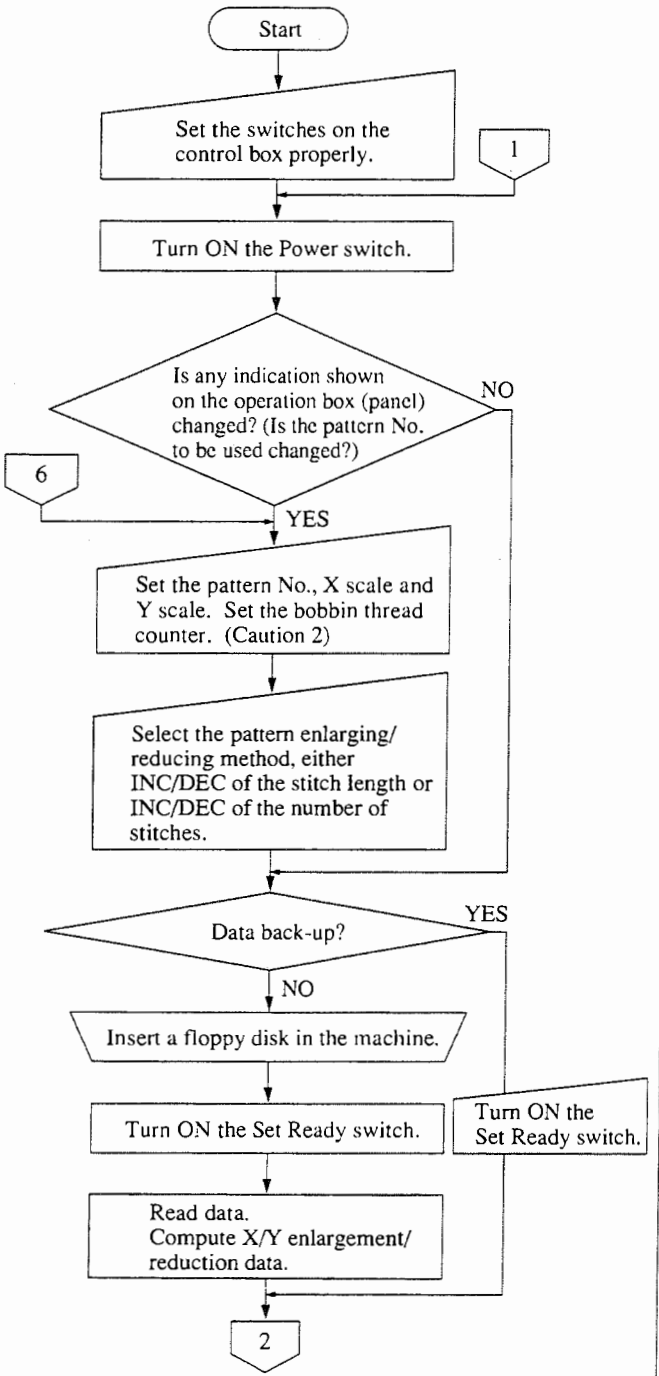
(Operating procedure)

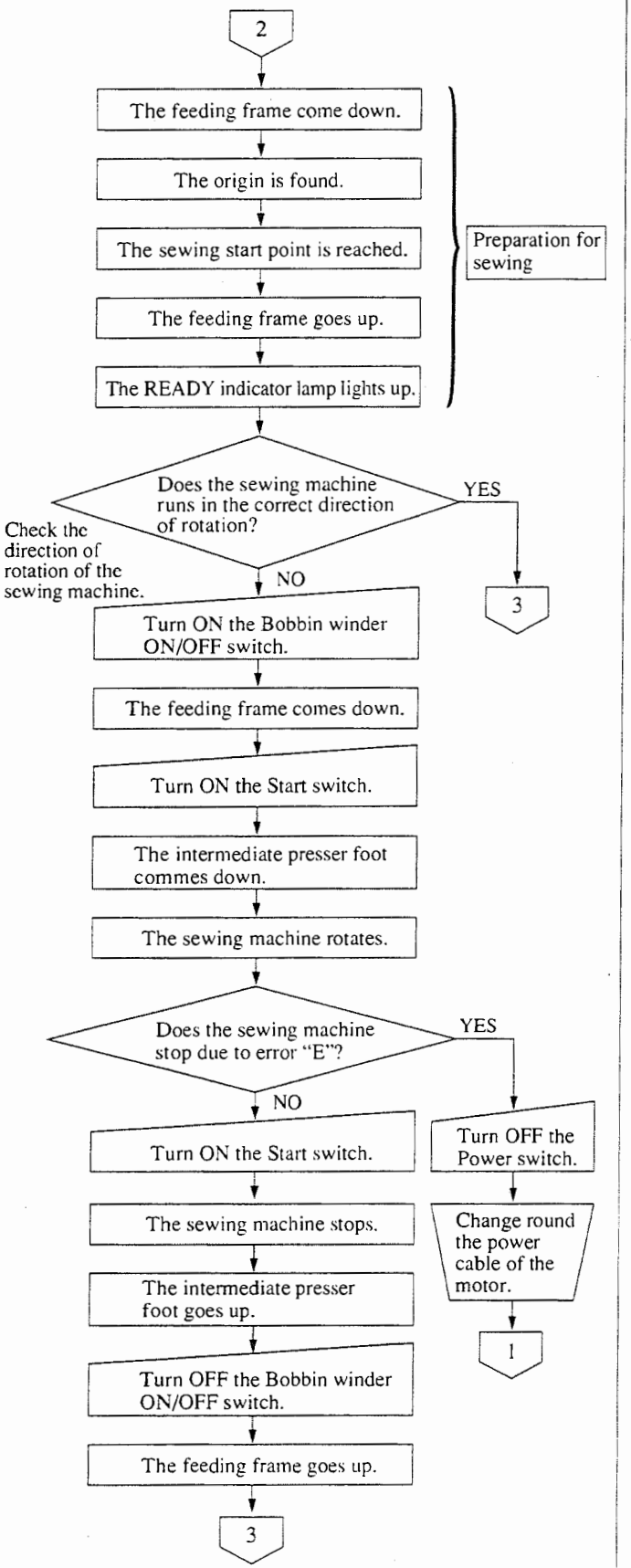


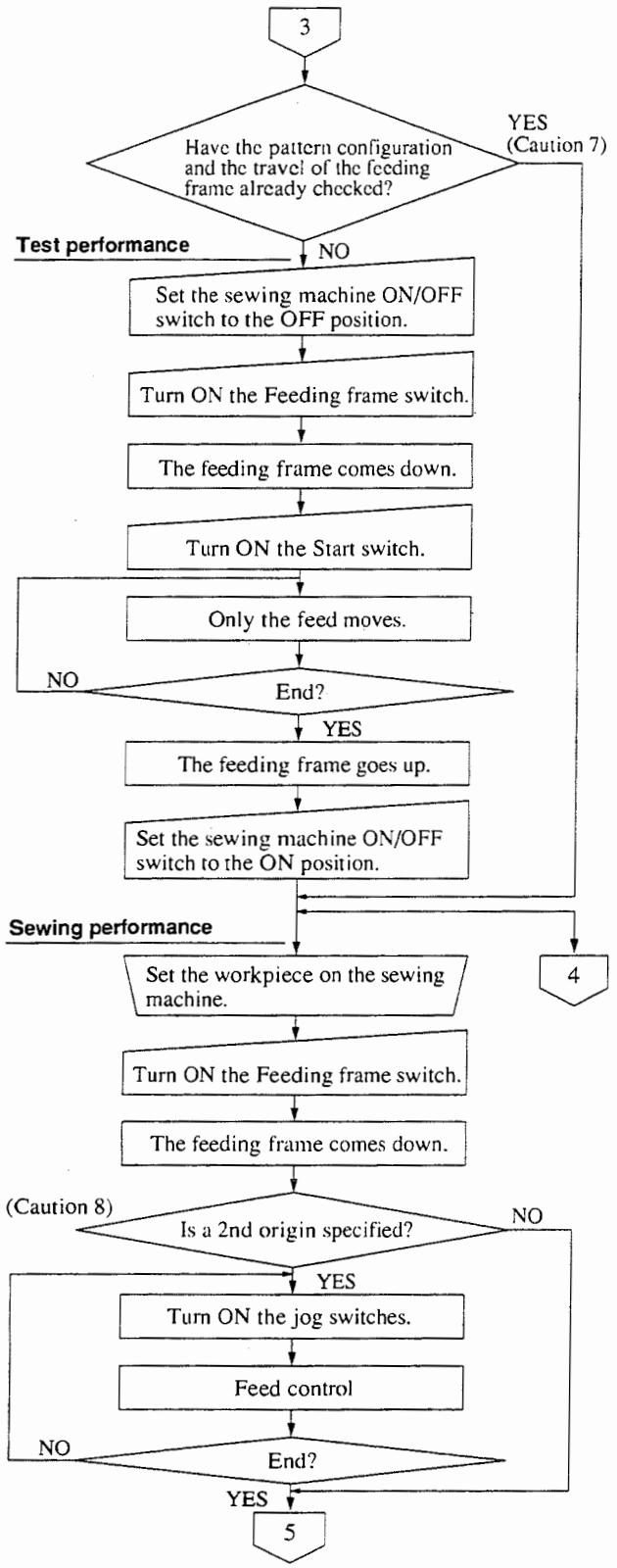
(Caution)

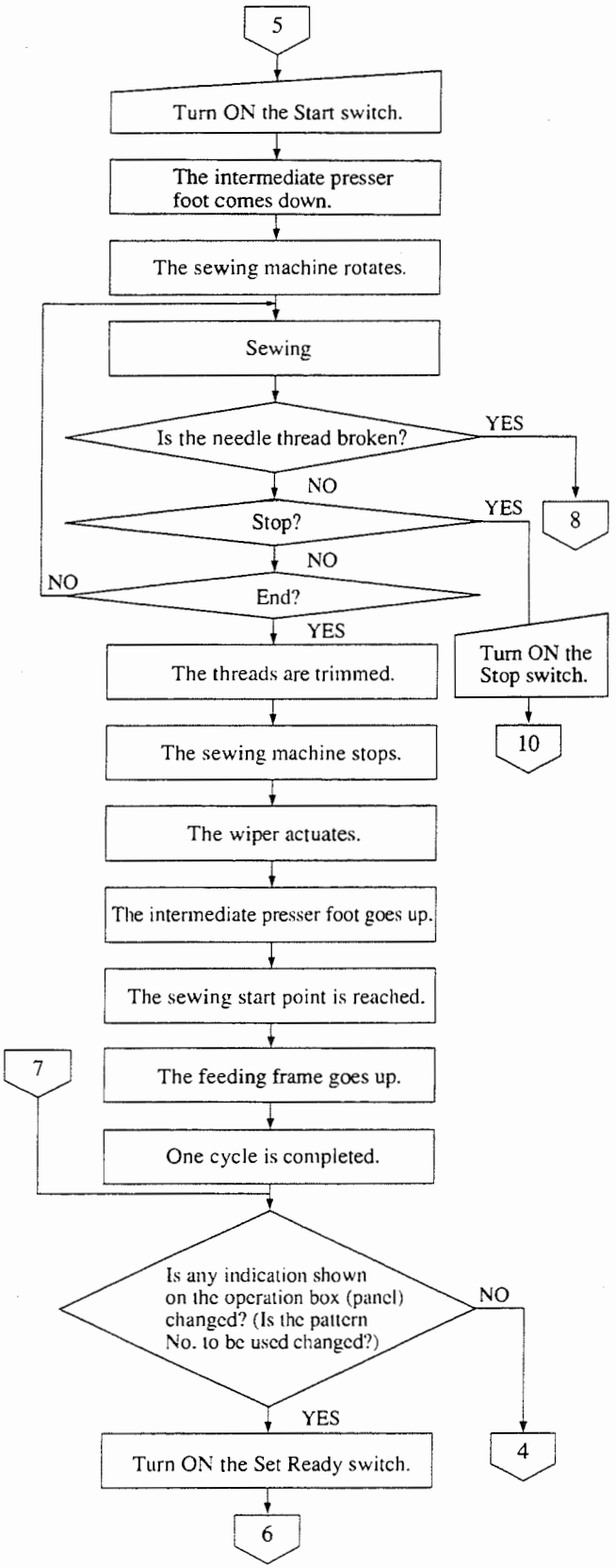
1. **Turn OFF the power to the machine after completing the sewing. Then the input data will be stored in memory by the data backup function.**
2. **To delete the sewing start point which has been changed using the "sewing start point moving function," turn ON the Set Ready switch twice.**
3. **To re-change the sewing start point, move the sewing start point as desired following the aforementioned operating procedure from step ④.**
4. **When using the Return to Origin switch, the needle moves straight to the sewing start point. So, the Return to Origin switch can be used as far as the tip of needle does not come in contact with the feeding frame and other components. (See page 28.)**
5. **If making this function operative by setting the DIP switch SW5-3 to its ON position, the conventional 2nd origin that has been already input when creating the pattern will be ignored. (Whether the sewing start point is moved or not.)**

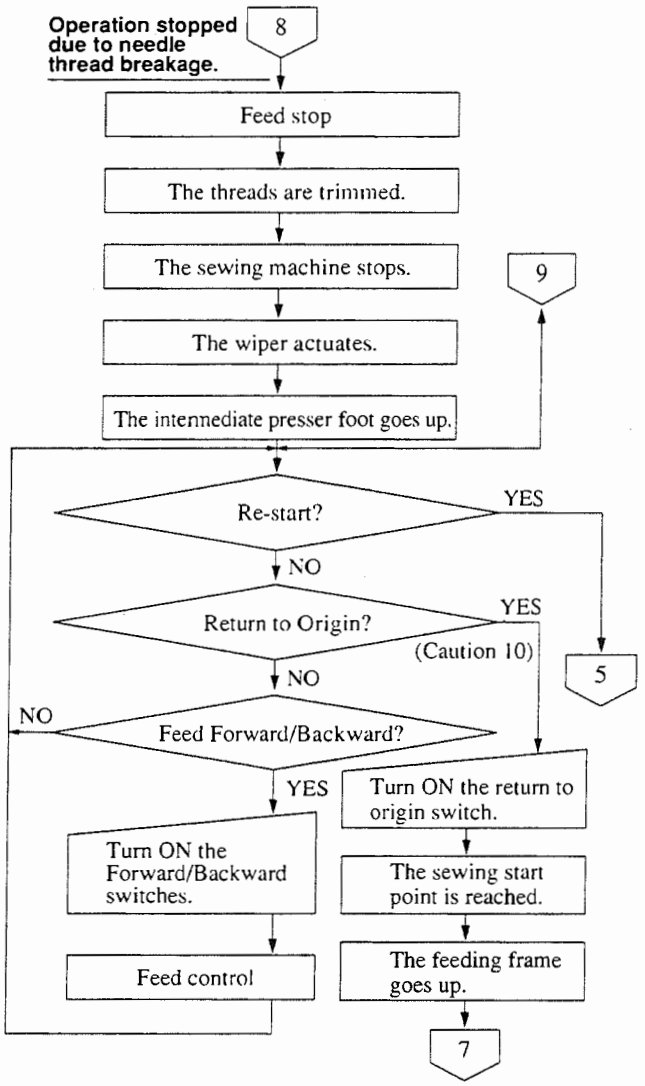
3-9. Explanation of the operating procedure

Mode	Operation procedure flow chart	Remarks and caution
Power OFF Setting mode Sewing mode		• Bobbin winder ON/OFF switch →Set it to its OFF position. (Press the switch.) • Needle threading switch →Set the switch to its OFF position. (Set it to the ▬ side.) **(Caution) 1. Change round the connection of the DIP switches and foot switches, if necessary.** • The sewing machine motor starts rotating. • Indicator lamp (LED) on the operation box (panel) lights up. • The stepping motor is excited. • Pattern No. : 001 to 999 • X (Y) scale : 001 to 400 (%) **(Caution) 2. The bobbin counter should be set when the "Bobbin replacement setting function (DIP switch SW6-3)" is set to effective. (See page 144.)** **3. Error related to pattern No. : "1" Error related to pattern enlargement/ reduction : "2"** **4. The sewing data can be stored in memory for 100 hours by means of the data back-up function.** • While the enlargement/reduction data is computed, the READY indicator lamp flashes on and off.

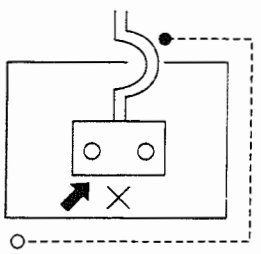
Mode	Operation procedure flow chart	Remarks and caution
Sewing mode		**(Caution) 5. Keep your hands away from the feeding frame since the feeding frame comes down.** • If a 2nd origin has been set, it will be reached instead of the sewing start point. (See the description of SW5-3 on page 141.) • When the machine performs preparation for sewing for the first time after the power to the machine has been turned ON with the automatic retainer compensation function (DIP switch SW7-7) selected, the machine performs the retainer compensation in addition to the normal preparation for sewing. • Check the area under the needle for any obstacles. • Remove the needle thread. • Error "7" is shown when the sewing machine is locked or the belt comes off. • The sewing machine stops when turning ON the Start switch or turning ON the Stop switch. It is also possible to stop the sewing machine by directly turns OFF the Bobbin winder ON/OFF switch. (See page 17.) **(Caution) 6. Be sure to change round the connection of the power cable (connector) of the motor after turning OFF the power to the machine. (See page 165.)**

Mode	Operation procedure flow chart	Remarks and caution
Sewing mode		(Caution) **7. In the following cases, the test performance (confirmation of the pattern configuration) should be carried out.** **① Before using a pattern which has never been used.** **② When enlarging/ reducing a pattern.** **③ Before using an exclusive feeding frame.** **④ After adjusting the feed components or performing maintenance of them.** • You can also carry out the test performance (confirmation of the pattern configuration) using the Forward and Backward switches. • Travel limit error : "4" • The needle does not move up or down, and only the feeding frame moves at a constant speed. • Is the workpiece correctly positioned? • Is the workpiece securely clamped? • Is the height of the intermediate presser foot correct? (See page 54.) • The operating method of the Feeding frame switch changes in accordance with the type of the sewing machine, i.e., S, T and L types. ※ DIP switches related to the feeding frame SW5-6, SW5-7, SW5-8, SW7-6, etc. (Caution) **8. "Sewing start point moving function" is also provided for the machine. (See page 39.)**

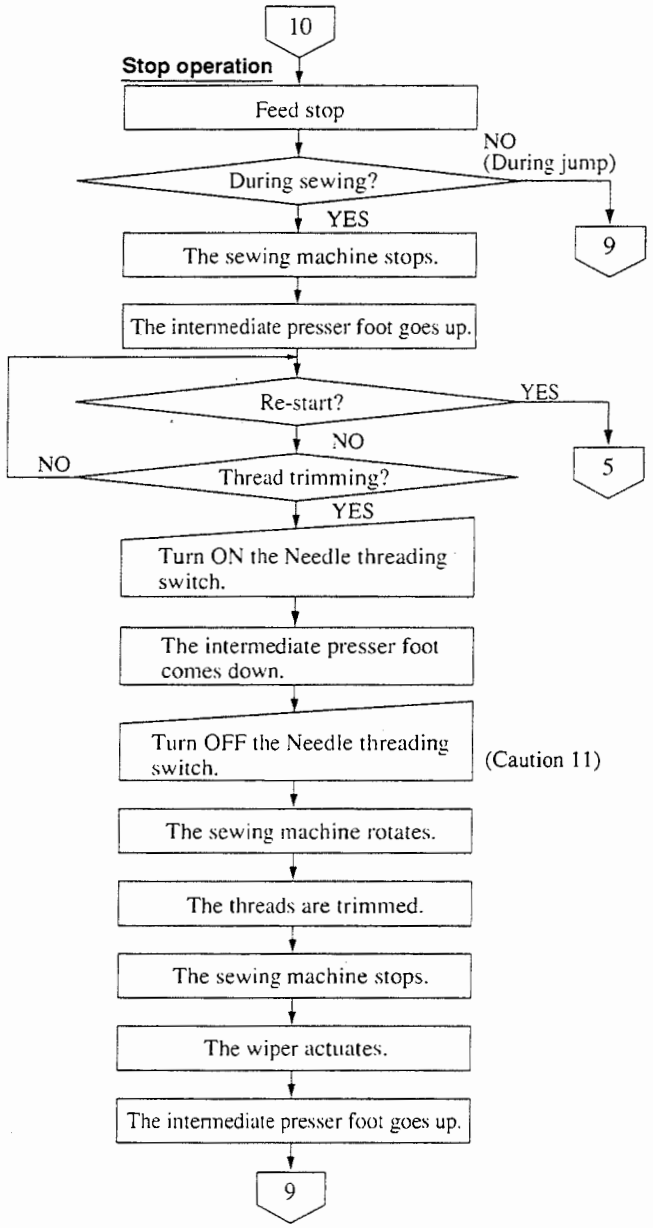
Mode	Operation procedure flow chart	Remarks and caution
Sewing mode Setting mode		• The intermediate presser foot is not used in the T type (standard) machines. • Is the thread tension appropriate? • Needle thread breakage detection : "9" • Stop : "5" (flashes on and off or lights up) • Making the thread trimmer invalid (page 145), making the wiper invalid (page 145), prohibiting the intermediate presser foot (page 146). • For the GL type, the intermediate presser foot goes up , then the wiper actuates . • If the machine stops in its pause state, the machine will operate from 5 . (See pages 153.) • When a 2nd origin has been specified, the 2nd origin is reached instead of the sewing start point. • The feeding frame can be kept in its lowest position. (See page 156 "SW7-6".) • Reset the Counter display. (See page 144 for the explanation in detail.)

Mode	Operation procedure flow chart	Remarks and caution
Sewing mode		(Caution) 9. It is also possible to make the "thread breakage detection function" ineffective. (See page 145.) • Threading the machine. • When a 2nd origin has been specified, the 2nd origin is reached instead of the sewing start point.

(Caution 10) **In the "Return to origin" is pressed, the needle moves from the current position directly to the sewing start point or the 2nd origin.**
If the inverting crank shaft or other components rests on the course that is taken by the needle, a needle breakage or other component may break.
At this time, press the [Backward switch] to bring the needle back to the sewing start point or the 2nd origin.



● **Sewing start point**
○ **Current position of the needle**

Mode	Operation procedure flow chart	Remarks and caution
Sewing mode		• Refer to "② Stop switch" on page 27. • Error indications During sewing : "5" flashes on and off. During jump : "5" lights up. • Eliminate the cause of the stop. • Needle threading switch ON :  OFF :  **(Caution) 11. Keep your hands away from the underside of the needle since the needle moves up or down.**

3-10. Precautions during operation

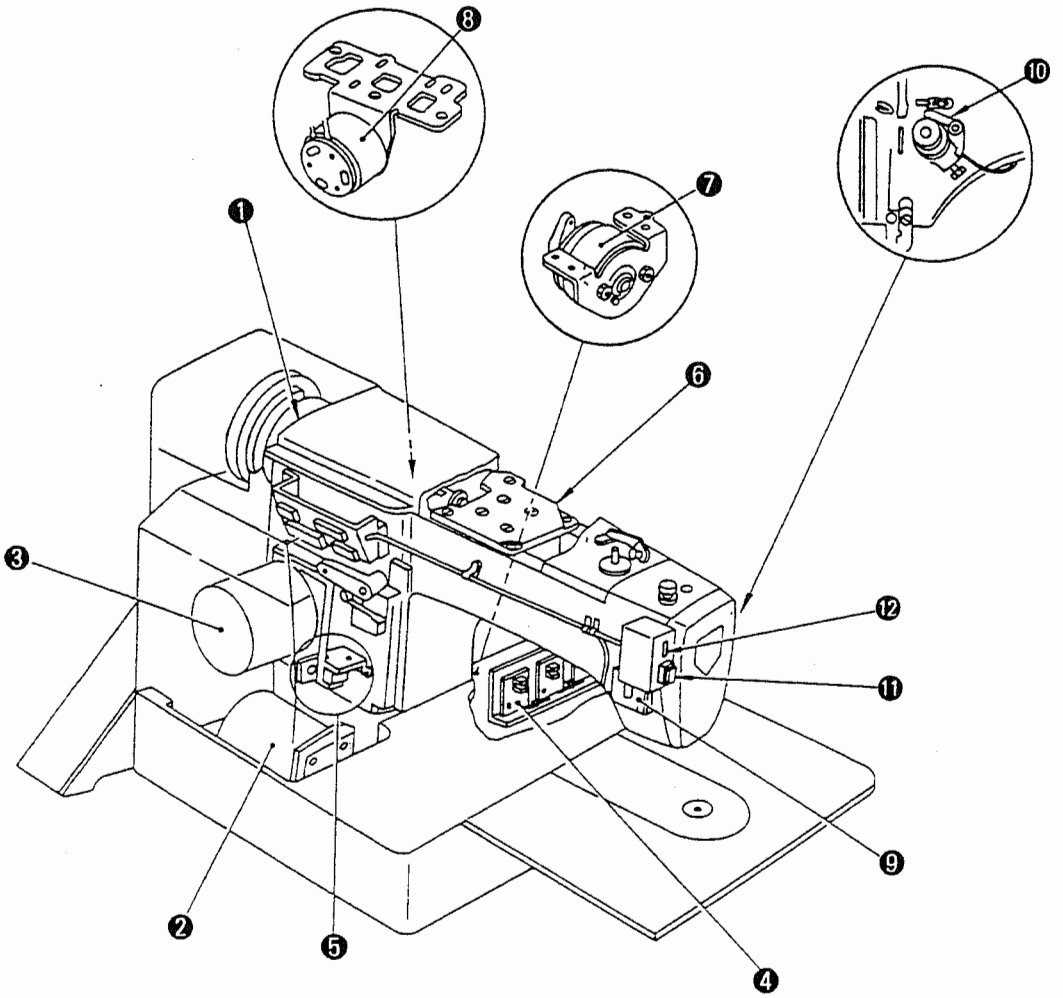
1. Before sewing a new pattern or a newly enlarged/reduced pattern, be sure to carry out trial sewing to check the pattern size with respect to the feeding frame.
2. The maximum sewing speed varies according to the stitch length. The maximum sewing speed is automatically limited as shown in the table below according to the stitch length. If necessary, the maximum sewing speed can also be limited manually using the max. speed control knob. Be sure to select the optimum sewing speed according to the type of material. The maximum sewing speed can also be limited in advance in the pattern data inputting stage. See the Instruction Manual for the Input Functions of the Main Unit for the explanation in detail.

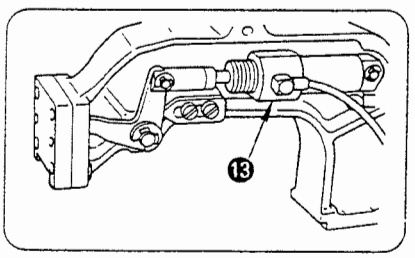
Stitch length (mm)	Max. sewing speed (s.p.m.)
8.8 ~ 10.0	600
7.8 ~ 8.6	700
7.0 ~ 7.6	800
5.0 ~ 6.8	900
4.6 ~ 4.8	1,200
4.2 ~ 4.4	1,300
3.8 ~ 4.0	1,500
3.2 ~ 4.6	1,700
0.2 ~ 3.0	2,000

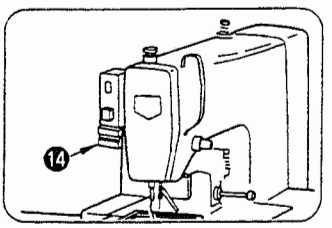
3. When an error indication is given, be sure to identify the cause and take corrective action. (See page 24.)
4. Prior to operation, be sure to close the control box cover in order to prevent dust from getting into the control box. Dust into the control box may lead to malfunctions or failures. Clean the fan filter once every week.
5. Be sure to turn the power OFF before opening the control box cover.
6. Avoid checking the control circuitry by a tester, or else the tester voltage may be applied to a semiconductor component, and the component may be damaged.
7. Be sure that there is no obstacle under the needle before depressing the start switch to wind a bobbin.
8. Do not put your fingers or any other things under the feeding frame when the machine is computing (this is indicated by the READY lamp flashing ON and OFF), since the feeding frame comes down automatically upon completion of the computation. (If turnin ON the [Stop switch] while the sewing machine is computing, error "2" will be shown on the panel.)
9. Avoid pulling the workpiece while sewing. This may prevent correct needle entry. If X or Y needle entry point should be dislocated, [press the Set Ready switch] twice to go back to the correct sewing start point.
10. The T type machine is equipped with an inverting device. So, setting a second origin and moving the sewing start point, using the jog switches, may break the inverting intermediate presser foot or other components. Be sure to operate the T type machine with the inverting components removed. (See the description of DIP switch SW5-3 on page 141.) Note that a 2nd origin cannot be set during reading out inverting pattern data from a floppy disk.

4. DESCRIPTION OF EACH MAIN COMPONENT UNIT

4-1. Sewing machine







❶ Synchronizer
❷ X-direction stepping motor
❸ Y-direction stepping motor
❹ X-direction sensor
❺ Y-direction sensor
❻ Work clamp solenoid (excluding L type)
❼ Intermediate presser foot (excluding GL type)
❽ Thread trimmer solenoid
❾ Wiper solenoid
❿ Thread breakage detector
⓫ Stop switch
⓬ Wiper switch
⓭ Work clamp cylinder (only for the L type)
⓮ Intermediate presser foot lifting cylinder (only for the GL type)

❶ **Synchronizer (generator stator)**
Mainly consists of a generator stator and position detecting solenoid included in the sewing machine pulley. It detects whether the needle is in its upper position or lower position, and also detects the sewing speed, then sends input signals based on the detection results to the control box.

❷ **X-direction stepping motor**
Synchronizes with the pulses received from the feed pulse generator, and feeds material in the X direction according to the pattern data given by the control box.

❸ **Y-direction stepping motor**
Synchronizes with the pulses received from the feed pulse generator, and feeds material in the Y direction according to the pattern data given by the control box.

❹ **X-direction sensor**
Mainly consists of an X-direction slit disk, X-direction origin sensor, and X-direction travel limit sensor. It functions to detect the origin in the X direction within the sewing area and the boundary of the limited sewing area. It sends the input signals based on the detection results to the control box.

❺ **Y-direction sensor**
Mainly consists of a Y-direction slit disk, Y-direction origin sensor, and Y-direction travel limit sensor. It functions to detect the origin in the Y direction within the sewing area and the boundary of the limited sewing area. It sends input signals based on the detection results to the control box.

❻ **Work clamp solenoid (excluding L type)**
Moves the feeding frame up or down as the feeding frame switch is turned ON or OFF. While sewing, the solenoid is activated to hold a workpiece in place.

❼ **Intermediate presser foot solenoid (excluding GL type)**
The solenoid is actuated during a sewing operation, thereby enabling the intermediate presser foot to go up and come down.

❽ **Thread trimmer solenoid**
Actuates the thread trimming clutch mechanism to link the thread trimming cam to the thread trimming mechanism according to the commands received from the synchronizer.

❾ **Wiper solenoid**
Actuates the wiper after thread trimming.

❿ **Thread breakage detector**
Detects the connection between the thread take-up spring and the thread breakage detecting plate each time a stitch is formed, and sends the result in terms of input signal to the control box. When needle thread breakage is detected, the sewing machine will slow down, trim the thread, and stop.

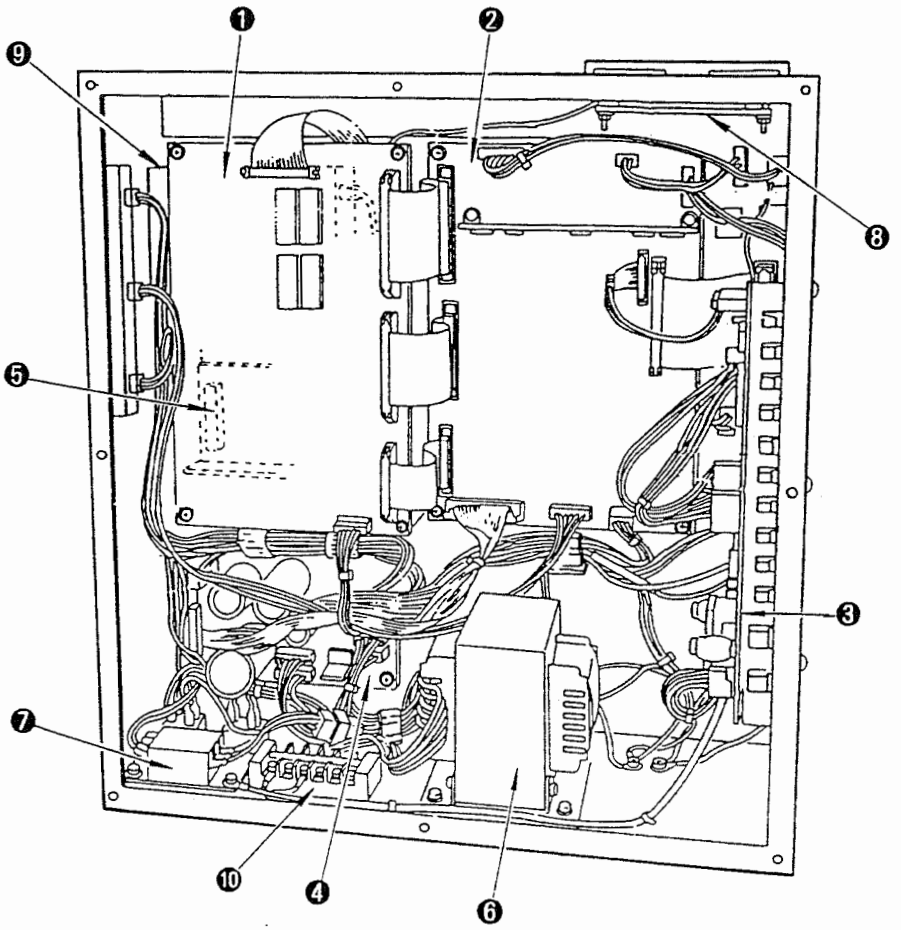
⓫ **Stop switch**
Used to stop the sewing machine and the feed mechanism during a sewing cycle. When this switch is pressed, the machine will slow down, trim the thread, and stop.

⓬ **Wiper switch**
Used to specify the actuation of the wiper after thread trimming.

⓭ **Work clamp cylinder (only for the L type)**
Moves the feeding frame up and down by turning ON/OFF the Feeding frame switch to clamp the material securely. The cylinder action can be separately controlled for the right- and left-hand sections of the feeding frame. When comparing with the magnet type work clamp, the cylinder provides a higher clamping pressure. The clamping pressure can be pneumatically controlled.

⓮ **Intermediate presser foot lifting cylinder (only for the GL type)**
During sewing, the cylinder is drawn in to allow the intermediate presser foot to move up and down. When compared with the magnet type intermediate presser foot, the cylinder provides the intermediate presser foot with a higher clamping pressure and a higher lifting amount.

4-2. Control box



❶ CPU circuit board
❷ I/F circuit board
❸ PMDC circuit board
❹ POWER circuit board
❺ Switching regulator
❻ Transformer
❼ Fuse box
❽ Cooling fan
❾ Floppy disk driver
❿ Transformer receptacle (terminal board)

❶ CPU circuit board

The centerpiece of the control unit. When the power switch is turned ON, it actuates the control unit after receiving the reset signal from the I/F circuit board. It mainly consists of a microprocessor and electronic parts, including ICs.

- Floppy disk drive control circuit
- Microprocessor control circuit
- Input circuits for the switches
- Switch signal output circuit

❷ I/F circuit board

Activates the sewing machine, magnet, and air cylinder solenoid valve after receiving signals from the CPU circuit board. It transmits the signals from the sewing machine or operation box to the CPU circuit board. The following circuits are mounted:

- Magnet actuating circuit
- Display actuating circuit
- Solenoid valve actuating circuit
- Sewing machine motor actuating circuit

❸ PMDC circuit board

Activates the stepping motor after receiving the control signal from the CPU circuit board through the I/F circuit board. It includes:

- Current limiter circuit (provided with a protection fuse)
- Stepping motor driving circuit

❹ POWER circuit board

Rectifies and stabilizes the outputs received from the secondary transformer to provide the power supply, and includes the following circuits:

- Unstable power circuit for driving the solenoids
- Unstable power circuit for driving the stepping motor
- +24V stable power circuit for the PMDC circuit board
- +5V, +12V, -12V wiring circuits

❺ Switching regulator

Receives a 100V output from the secondary transformer and outputs +5V, +12V and -12V.

❻ Transformer

Delivers 24V AC to drive the solenoids, 24V AC for the stepping motor actuator, 100V AC for the cooling fan and switching regulator, and 4.5V AC (provided with a fuse) for the marking light.

❼ Fuse box

Contains a 7A time lag fuse to protect the solenoids, a 10A fuse to protect the stepping motor and switching regulator, and a 1A fuse to protect the cooling fan.

❽ Cooling fan

Used to cool the elements, taking in fresh air from outside the machine. (A filter is set on the cooling fan.)

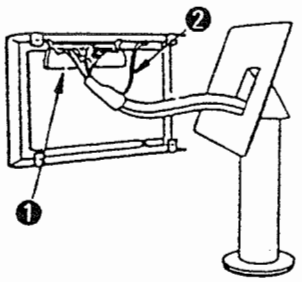
❾ Floppy disk driver

Reads the data stored in the floppy disk (2DD, 1D), and writes data on to the floppy disk (2DD) after receiving a signal from the CPU circuit board.

❿ Transformer receptacle (terminal board)

Change the receptacle of the power cable according to the input of the transformer.

4-3. Operation box



❶ Operation circuit board
❷ Operation box relay cable

❶ Operation circuit board
On this circuit board are mounted display parts which receive commands from the control box and switch parts which send switch data to the control box.

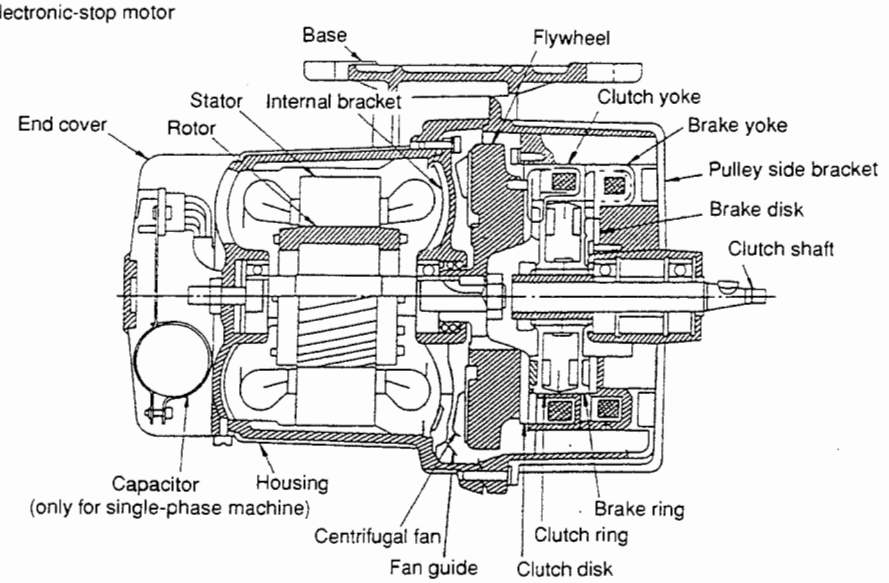
❷ Operation box relay cable
This is a 50-core cable which connects the operation circuit board with the control box for transfer of signals.
(Caution) Refer to the "7-5. Replacing the printed circuit boards" on page 169. (Interchangeability of the printed circuit board is also described.)

4-4. Motor

A 400W, 4-pole (GL type; 2-pole 550W) electronic-stop motor is used for the sewing machine motor.
The clutch brake disk components are compatible with a general lockstitch sewing machine motor.

1. Structure of the motor and how the motor speed is changed.
The following diagram shows the structure of the electronic-stop motor. As long as the power of the machine stays ON, the motor (rotor, flywheel, and clutch disk) runs constantly. The clutch ring is connected to the output shaft through the splines, so it rotates together with the output shaft, and can slide crosswise. When the clutch coil is energized, lines of magnetic force are produced as shown by the solid line arrow, and the clutch ring is pressed against the clutch disk, thereby transmitting the motor rotation to the output shaft. When the brake coil is energized, lines of magnetic force are produced as shown by the broken line arrow, and the clutch ring is pressed against the clutch disk (constructed integral with the pulley side bracket, and does not turn), thus stopping the rotation of the output shaft. At medium speed, the clutch coil and the brake coil are energized for a short period of time alternately for rotation.

Structure of electronic-stop motor



5. ADJUSTMENT

5-1. Mechanical parts

STANDARD ADJUSTMENTS

(1) Checking the rotational direction of the handwheel

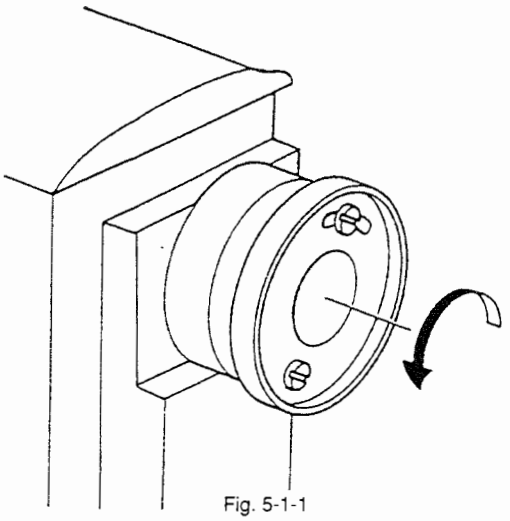


Fig. 5-1-1

After confirming that the READY indicator lamp is ON, set the Bobbin Winder ON/OFF switch to "ON", then depress the start switch. At this time, the handwheel should turn counterclockwise as observed from the handwheel side.

(Caution) Be sure to check the direction of rotation of the handwheel after completing the power wiring of the machine.
Do not start sewing unless the direction of rotation of the handwheel has been confirmed to be correct.

(2) Height of the needle bar

Bring the needle bar to the lowest point of its stroke. Adjust so that the bottom end of the needle bar lower bushing aligns with the upper marker line engraved on the needle bar (Fig. 5-2-1).

(Relationship between the needle and marker lines engraved on the needle bar)

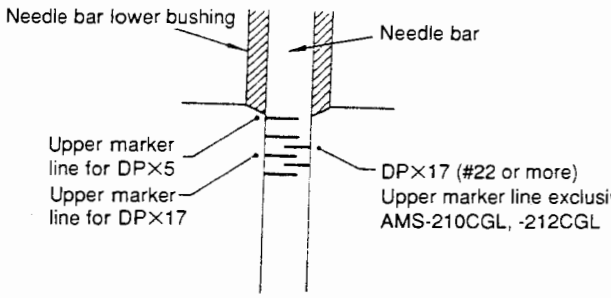


Fig. 5-2-1

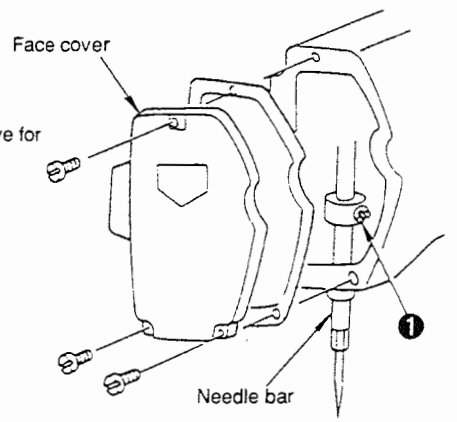
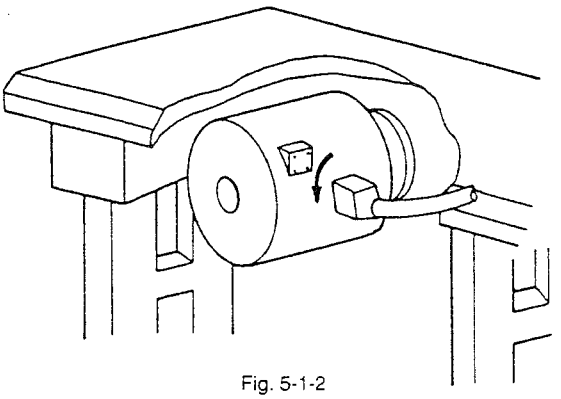
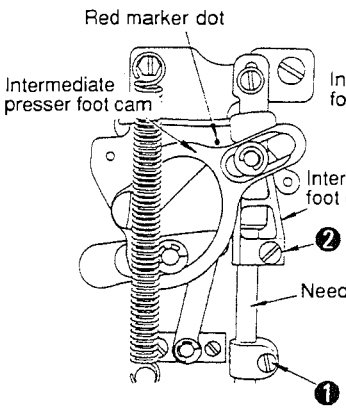
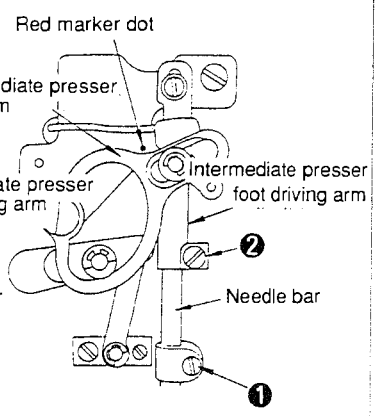


Fig. 5-2-2

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
• If the handwheel rotates in the reverse direction, disconnect the motor power plug, and re-connect the plug while turning it upside down.  Fig. 5-1-2	• If the handwheel turns in the wrong direction, stitch knots will not be formed. • If the machine is allowed to start sewing with the handwheel running in the wrong direction, the tension release parts may be damaged. • Even if the start switch is depressed in the case where the connector of the sewing machine motor has been connected so that the handwheel will stop rotating after making one or two turns and an error message will be shown on the display.
1) Turn the handwheel by hand until the needle bar reaches the lowest point of its stroke. 2) Remove the face cover. 3) Loosen setscrew ❶ and setscrew ❷, and move the needle bar up or down to adjust the height of the needle bar. 4) After adjustment, securely tighten setscrew ❶. 5) Turn the handwheel by hand to bring the needle bar up to the highest point of its stroke. 6) Move the intermediate presser foot driving arm up or down so that the red marker dot contacts the periphery of the intermediate presser foot cam. 7) After adjustment, securely tighten setscrew ❷.  Excluding GL type Fig. 5-2-3  GL type Fig. 5-2-4 (Caution) **When tightening setscrew ❷, be sure that the roller of the intermediate presser foot driving arm does not stick against the slot in the intermediate presser foot cam. Also, turn the main shaft by hand to check for smooth rotation.**	• Stitch skipping or thread breakage may occur.

(3) Stop position of the main shaft

When the main shaft stops, the marker dot on the machine arm should be between the marker dots No. 1 and No. 2 on the handwheel.

(Caution) Carry out this adjustment in the sewing state.

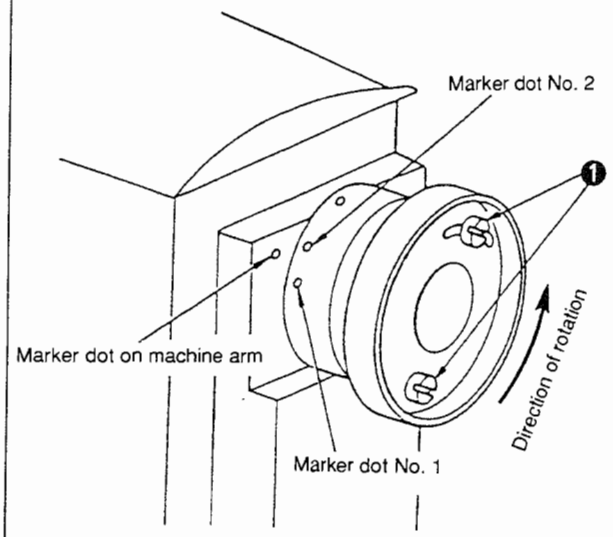
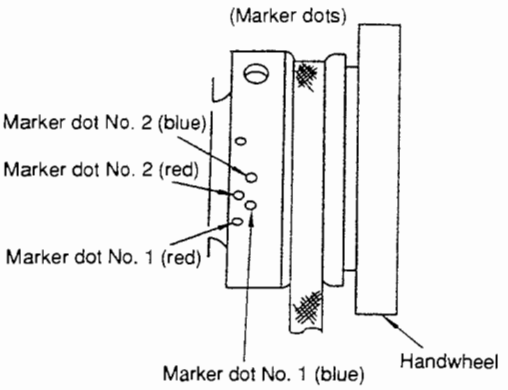


Fig. 5-3-1



- **Use the red marker dots for the S, T or L (excluding GL) type of the sewing machine.**
- **Use the blue marker dots for the GL type of the sewing machine.**

(4) Height of intermediate presser foot

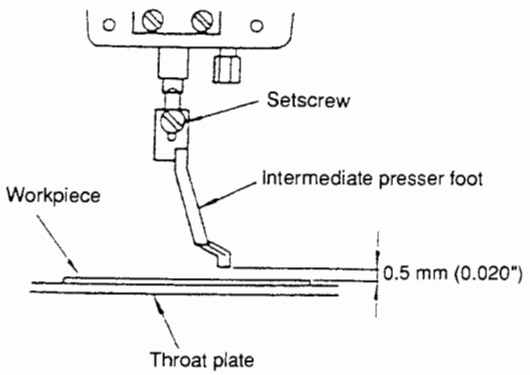
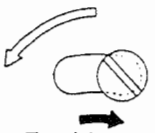
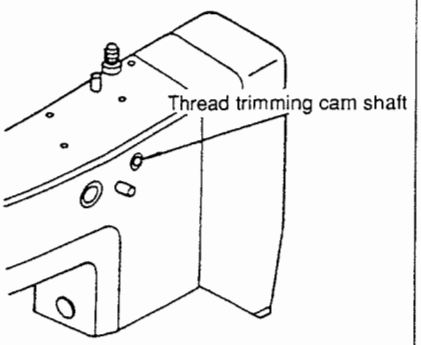


Fig. 5-4-1

1) Be sure that the sewing pattern has been red and the READY indicator lamp is ON before setting a workpiece.
2) Set the Needle threading switch to ON to lower the feeding frame and the intermediate presser foot.
3) Turn the handwheel by hand until the needle bar reaches the lowest position of its stroke. Adjust so that the clearance between the end of the intermediate presser foot and the workpiece is 0.5 mm (0.020") (standard adjustment).

(Caution) The intermediate presser foot used with the GL type is different from the intermediate presser foot used with the other types including S type. If the intermediate presser foot is not correctly selected, it may break. Refer to the"Options."

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENTS
1) Loosen setscrews ❶. 2) If the main shaft stops prematurely before the marker dot No. 1 reaches the marker dot on the machine arm, move setscrews ❶ to the right and tighten it in that position. On the contrary, if the main shaft stops after the marker dot No. 2 passes beyond the marker dot on the machine arm, move setscrews ❶ to the left and tighten it in that position. 3) Repeat steps 2) and 3) until the marker dot on the machine arm is located between the marker dots No. 1 and No. 2 when the main shaft stops. 4) Securely tighten the setscrews ❶. Direction of rotation  The rightmost position The handwheel stops before marker dot No. 1 engraved on the handwheel reaches the marker dot engraved on the machine arm. Direction of rotation  The leftmost position The handwheel stops after marker dot No. 2 engraved on the handwheel has passes the marker dot engraved on the machine arm.	• If the main shaft is allowed to stop before marker dot No. 1 reaches the marker dot on the machine arm, the thread trimming cam shaft will be unable to return to its home position after the thread trimming operation (Fig. 5-3-2), and a thread trimming failure, loose stitches at the sewing start, or a machine lock may result.  Fig. 5-3-2 • If the main shaft is allowed to stop after the marker dot No. 2 passes beyond the marker dot on the machine arm, the wiper will come into contact with the needle when the wiper is actuated. This may lead to thread wiping failure, needle bend or breakage.
• Loosen the intermediate presser foot setscrew, and perform adjustment according to the procedure described at the left. (Adjust according to the material thickness and the type of thread used so as not to allow a workpiece to flutter while sewing.)	• If an excessive clearance is provided, stitch skipping may result. • If an inadequate clearance is provided, loose stitches may result.

(5)-1. Feed bracket (Standard type: S type)

Fix the right and left pressure adjusting plates and work clamp stopper at the middle of their adjustable range.

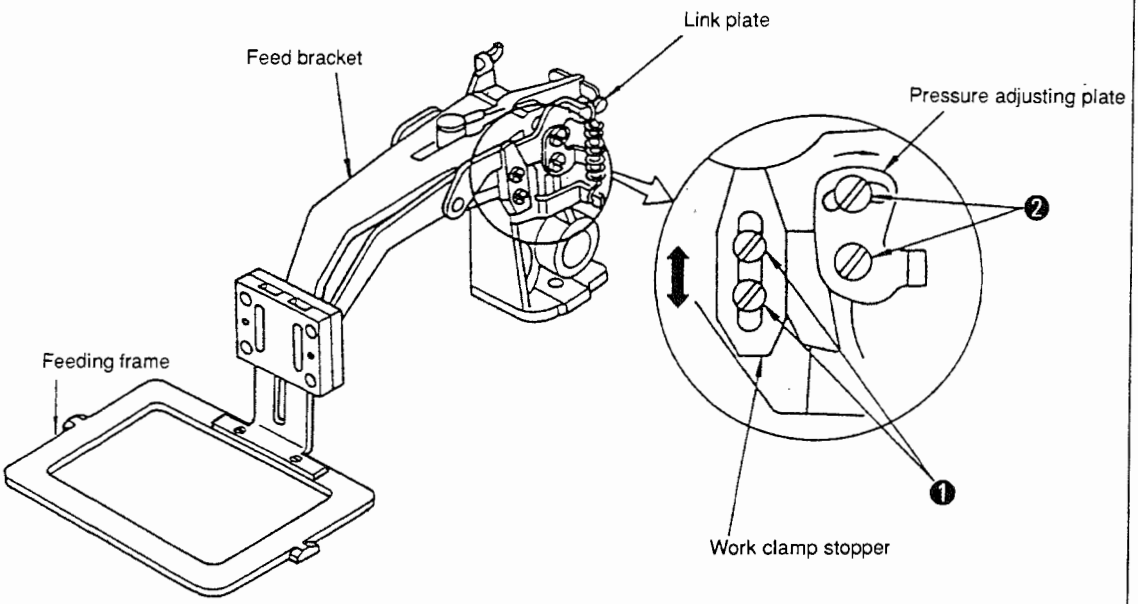
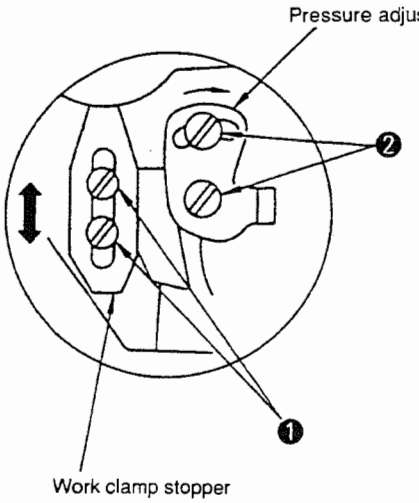


Fig. 5-5-1

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
1) Loosen setscrew ❶, and move the work clamp stopper up to increase the lift of the feeding frame. Move the work clamp stopper down to decrease the lift of the feeding frame. 2) Loosen setscrew ❷, and move the pressure adjusting plate in the direction of the arrow to increase the work clamp pressure, or move it in the opposite direction to decrease the pressure. 3) To perform the standard adjustment, loosen setscrews ❶ and ❷, and follow the steps shown at left (intermediate position). After adjustment, securely tighten the setscrews. [Upon completion of the above adjustment, move the feed bracket all over the sewing area, and make sure that a clearance is provided between the bottom surface of the presser plate and the link plate spring hook.]	• Inadequate lift of the feeding frame will result. • Inadequate feeding frame clamp pressure will result.

(5)-2. Feed bracket (Magnetically inverting clamp: T type) Fix the right and left pressure adjusting plates at the middle of their adjustable range. Adjust the position of the right and left work clamp stoppers so that the inverting intermediate presser foot goes up as high as 18 ± 0.5 mm (0.709" ± 0.020") above the throat plate surface and the feeding frame goes up as high as 10^{+1}_{0} mm ($0.394"^{+0.039"}_{0}$) above the throat plate surface.

[At this time, confirm that a clamping pressure of 3 kg or more is provided for both the intermediate presser foot and the feeding frame when they start going up.)]



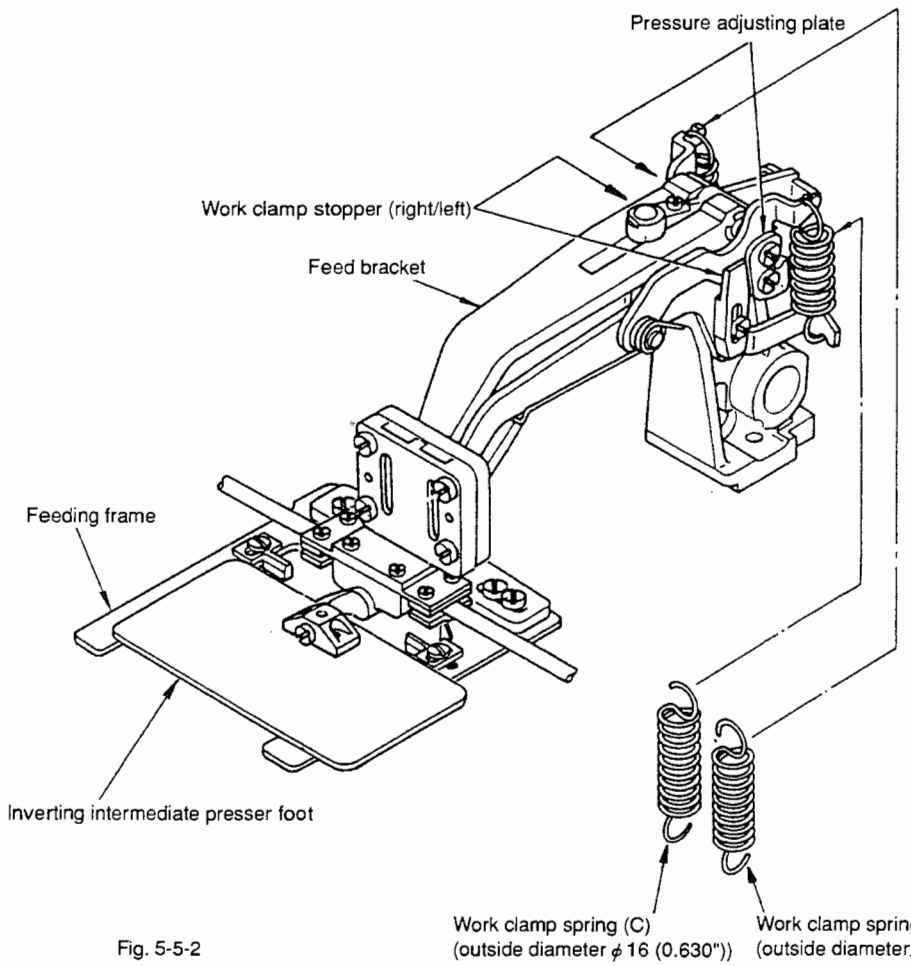


Fig. 5-5-2

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
1) Loosen setscrew ❶, and move the work clamp stopper up to increase the lift of the feeding frame. Move the work clamp stopper down to decrease the lift of the feeding frame. 2) Loosen setscrew ❷, and move the pressure adjusting plate in the direction of the arrow to increase the clamp pressure, or move it in the opposite direction to decrease the pressure. 3) To perform the standard adjustment, loosen setscrews ❶ and ❷, and follow the steps shown at left. After adjustment, securely tighten the setscrews. [Upon completion of the above adjustment, move the feed bracket all over the sewing area, and make sure that a clearance is provided between the bottom surface of the presser place and the link plate spring hook.)] (Caution) **For the inverting type machines (T type), the work clamp spring for the inverting intermediate presser foot is different from the work clamp spring for the feeding frame.**	• Inadequate lift of the feeding frame will result. • Inadequate feeding frame clamp pressure will result. • The lifting amount of the inverting intermediate presser foot is not enough. • The pressure of the inverting intermediate presser foot is too low.

(5)-3. Feed bracket (Pneumatic separately driven feed frame type: L type)

• The standard lifting amount of feeding frame ❶ is 20 mm (0.787") above the throat plate surface. (Max. 22 mm (0.866"))

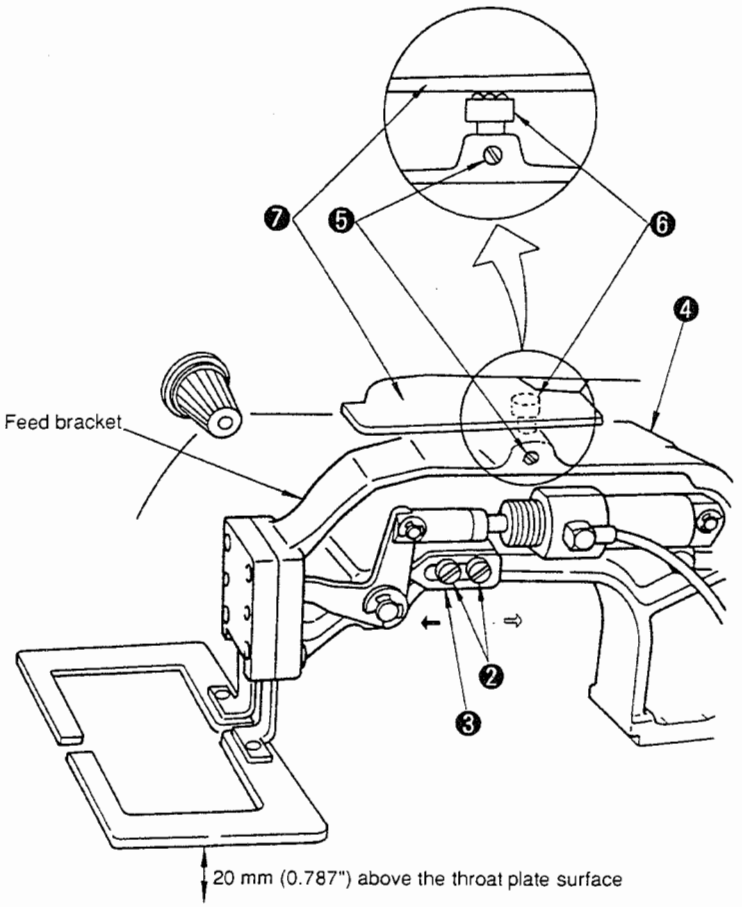


Fig. 5-5-3

• Adjust so that the ball of work clamp slider ❻ lightly touches presser plate ❼ when feed bracket ❹ is in the middle of its travel range.

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
1) Loosen screws ❷ in the work clamp stopper. Move clamp stopper ❸ in the direction of the arrow ⇨ to increase the lifting amount of feeding frame ❶, or in the direction of the arrow ⇦ to decrease it. 2) After the adjustment, tighten screws ❷.	• The lifting amount of the feeding frame is not enough. • The lifting amount of the right-hand section of the feeding frame and that of the left-hand section of the feeding frame are not equal.
1) Move feed bracket ❹ to the center of its travel range. 2) Loosen screw ❺ in work clamp slider. Then adjust the height of the slider so that the ball of work clamp slider ❻ lightly touches presser plate ❼. 3) After the height of the slider has been properly adjusted, tighten screw ❺. (The shaft of work clamp slider ❻ has a flat part. Tighten the screw while facing the flat part toward the screw.)	• Defective feed (step-out) of the stepping motor will result. • The X-Y table will be overloaded, resulting in breakage of the X-Y table.

(6) Shuttle race spring

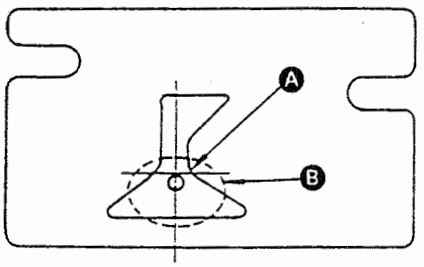
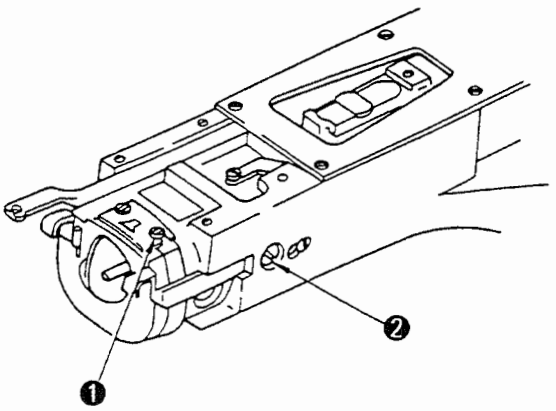


Fig. 5-6-1

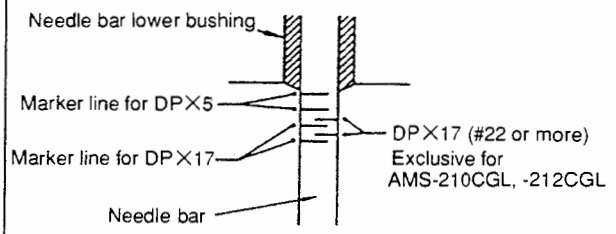
The shuttle race spring should be positioned equidistantly on the right and left. The shuttle race spring should be positioned longitudinally so that the trailing edge of the needle meets corner Ⓐ.

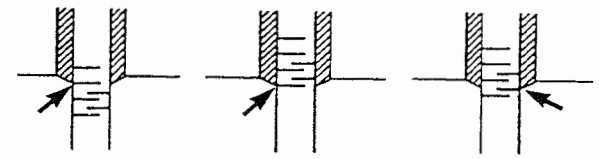
(Caution) Scratches within area Ⓑ would cause bobbin thread breakage. So, eliminate scratches if any. The shape of the upper spring of the shuttle race for the GL type is different from the shape of the spring for the other types (S, T and L) of the sewing machine, however, all the springs can be adjusted in the same procedure.

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
Remove throat plate, and perform adjustment using screw ❶. **(Note) The lateral position also depends on the fixing position of shuttle race setscrew ❷.**  Fig. 5-6-2	• Lateral or longitudinal dislocation will cause the needle thread to bite into the shuttle. • If the shuttle race spring is located too deep, the moving knife may fail to hook the needle thread.

(7) Timing between the needle and the shuttle

1) Needle bar timing





The marker line located at the lower position between the pair of lines is taken as the lower marker line.

Fig. 5-7-1

1) Needle bar timing
Bring the needle bar to the lowest dead point. The lower marker line engraved on the ascending needle bar (the position of the marker line changes by the needle size) should align with the end face of the needle bar lower bushing. (Fig. 5-7-1)

2) Shuttle timing
Under the condition described in the above step 1), the center of the needle meets the point of the shuttle. (Ⓐ in Fig. 5-7-2)

3) Clearance between the needle and the shuttle driver
Under the condition described in the above step 2), the clearance between the needle and the shuttle driver is 0 mm. (Fig. 5-7-3)

4) Clearance between the needle and the point of the shuttle
Under the condition described in the above step 2), clearance Ⓑ between the needle and the point of the shuttle is 0.05 to 0.1 mm (0.002" to 0.004"). (Fig. 5-7-4)

5) Clearance between the needle and the shuttle race
The clearance between the edge of the needle and the shuttle race is 7.5 ± 0.2 mm (0.295" ±0.008"). (Fig. 5-7-5)

6) Clearance between the shuttle and the shuttle driver
The clearance between the shuttle and the shuttle driver is 0.5 to 0.7 mm (0.020" to 0.028") (0.6 to 0.8mm (0.024" to 0.031") for the GL type). (Fig. 5-7-2)

2) Shuttle timing

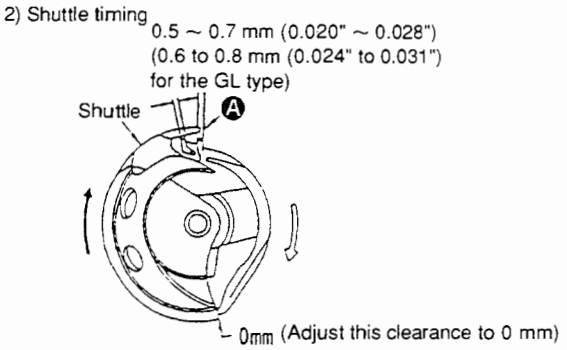


Fig. 5-7-2

3) Clearance between the needle and the shuttle driver

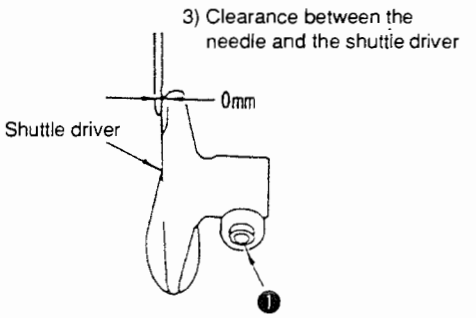


Fig. 5-7-3

4) Clearance between the needle and the point of the shuttle

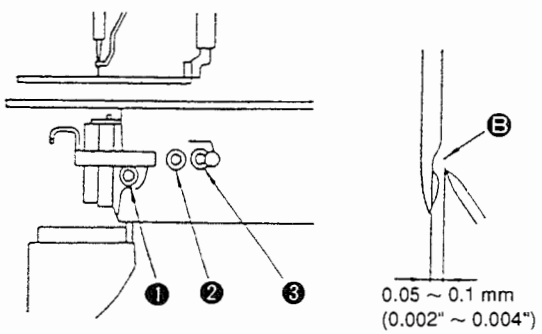


Fig. 5-7-4

5) Clearance between the needle and the shuttle race

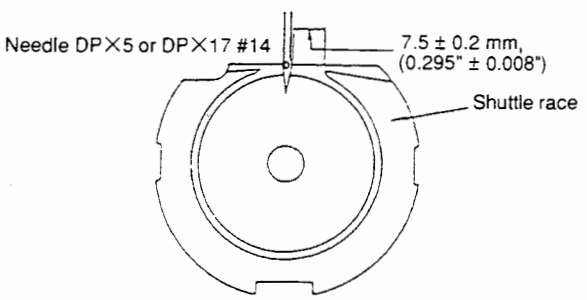
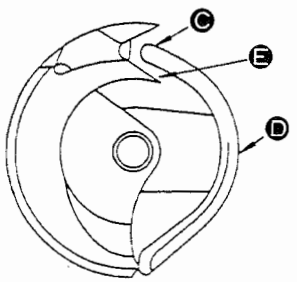


Fig. 5-7-5

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
1) Turn the handwheel in the normal direction of rotation, and adjust so that the bottom end of the needle bar lower bushing aligns with the upper marker line. 2), 3) Loosen setscrew ❶, and adjust the direction of rotation and the longitudinal direction. **(Caution) When adjusting the shuttle timing, be sure to turn the shuttle in the direction of the arrow shown in Fig. 5-7-2.** 4) Loosen setscrew ❷, and turn eccentric shaft ❸ to adjust. 5) Loosen setscrew ❷, and adjust. Use great care when adjusting the clearance between the needle and the point of the shuttle described in step 4). **(Caution) Strike portion Ⓓ to adjust the clearance between the shuttle and the shuttle driver to 0.5 to 0.7 mm (0.020" to 0.028") shown in Fig. 5-7-2. (0.6 to 0.8 mm (0.024" to 0.031") for the GL type)** **After adjustment, be sure that portion Ⓒ is equidistantly positioned vertically with respect to the shuttle.** **(Excluding GL type) For the GL type, adjust so that an approximately 1 mm (0.039") clearance is provided in section Ⓔ.**  Fig. 5-7-6	1), 2) For sewing floppy materials, slightly lower the needle bar (upper marker line) to adjust shuttle timing. For sewing heavy-weight materials, slightly increase the height of the needle bar to adjust shuttle timing in order to prevent stitch skipping. 3) If the clearance is more than 0 mm, the needle is bent by the point of the shuttle, resulting in scratches on the point of the shuttle and the needle. On the contrary, if the needle comes in excessive contact with the shuttle driver, stitch skipping may occur. 4) If the clearance exceeds the specified range (0.05 to 0.1 mm (0.002" to 0.004")), stitch skipping may occur. If the clearance is inadequate, the needle hits the point of the shuttle, causing scratches on the needle and the shuttle point. The scratches may cause the thread to break or split finely. 5) If the clearance is less than 7.5 mm (0.295"), poor needle thread spreading may result, often leading to needle thread biting into the shuttle. • If the clearance between the shuttle driver and the shuttle exceeds the specified range (0.5 to 0.7 mm (0.020" to 0.028"), 0.6 to 0.8 mm (0.024" to 0.031") for the GL type), the shuttle produces loud noises. On the contrary, if the clearance is inadequate, the needle thread fails to smoothly leave the shuttle when sewing with a thick thread. The result is loose stitches.

(8) Height of the intermediate presser foot adjusting screw

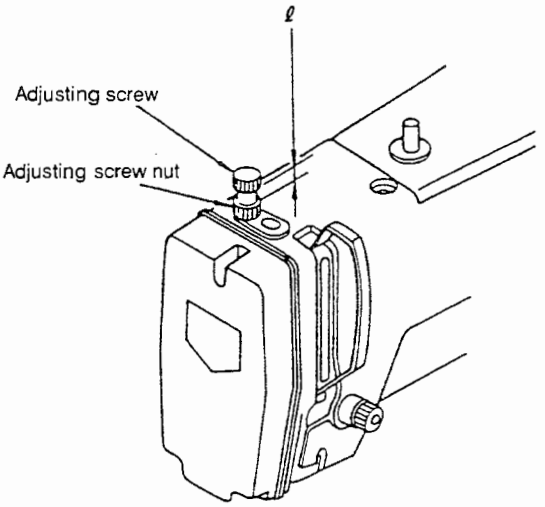


Fig. 5-8-1

The following table shows the clearance (ℓ) between the bottom of the intermediate presser foot adjusting screw and the top of the intermediate presser foot adjusting screw nut.

Type	ℓ (mm)
S, T, L (excluding GL)	6 ~ 11
GL	0 ~ 11

(9) Position of the wiper

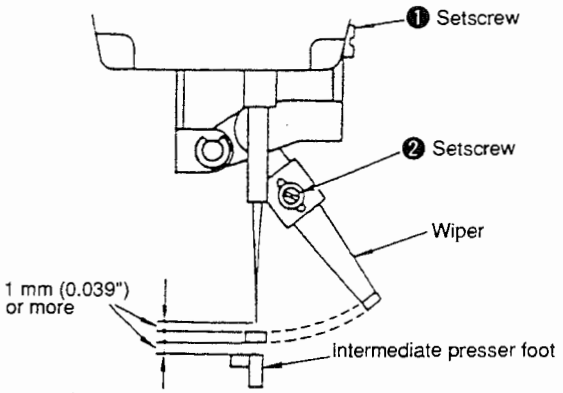


Fig. 5-9-1

1) With the sewing machine in a stop state with its needle up, confirm that the READY indicator lamp is ON, and set the thread threading switch to "ON" to lower the intermediate presser foot. (Fig. 5-9-1) The wiper passes the space between the intermediate presser foot and the material in the GL type of sewing machine. Adjust the position of the wiper with the intermediate presser foot held lifted. (Fig. 5-9-2)

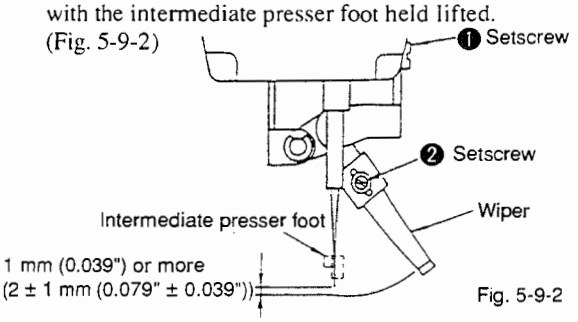
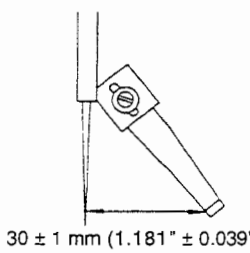


Fig. 5-9-2

2) Adjust the position of the wiper so that the value shown in the table below is satisfied.



S type, etc.	The wiper passes between the intermediate presser foot and the tip of needle. (SW5-4 OFF)	A clearance of 1 mm (0.039") or more should be provided between the wiper and the needle tip and between the wiper and the intermediate presser foot. (Fig. 5-9-1)
GL type, etc.	The wiper passes between the intermediate presser foot and the sewing product. (SW5-4 ON)	A clearance of 1 mm (0.039") or more should be provided between the wiper and the needle tip. (Fig. 5-9-2)
T type, etc.	When the intermediate presser foot is not used. (SW6-8 ON)	A clearance of 2 ± 1 mm (0.079" ± 0.039") should be provided between the wiper and the needle tip. (Fig. 5-9-2)

For any type of the sewing machine shown in the table, a lateral clearance of 30 ± 1 mm (1.181" ± 0.039") should be provided between the wiper and the tip of needle.

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
• Loosen the adjusting screw nut, and turn the adjusting screw to make adjustment. After adjustment, securely tighten the adjusting screw nut.	• Stitch skipping will occur. • The intermediate presser foot will fail to go up upon completion of a sewing cycle.
• Loosen setscrew ❶ or ❷, and make adjustment according to the procedure given at left. After adjustment, securely tighten the setscrew.	• The end of the wiper may come in contact with the needle or the intermediate presser foot preventing proper thread wiping. • The needle may break or bend.

(10) Length of thread remaining on the needle

The length of the thread which remains on the needle after thread trimming is 35 to 40 mm (1.378" to 1.575") measured from the needle eye. For synthetic thread, the length of thread which remains on the needle should be increased.

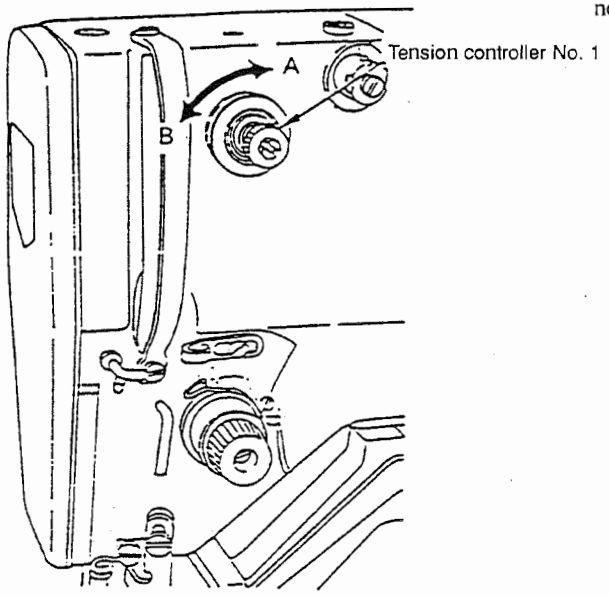


Fig. 5-10-1

(11) Thread take-up spring

Stroke: 6 to 8 mm (0.236" to 0.315") (10 to 15 mm (0.394" to 0.591") only for the GL type) from the horizontal L-shaped thread guide

Tension: Should be adjusted while checking the sewing results. (Adjust the tension of the thread take-up spring, using the trial and error procedure.)

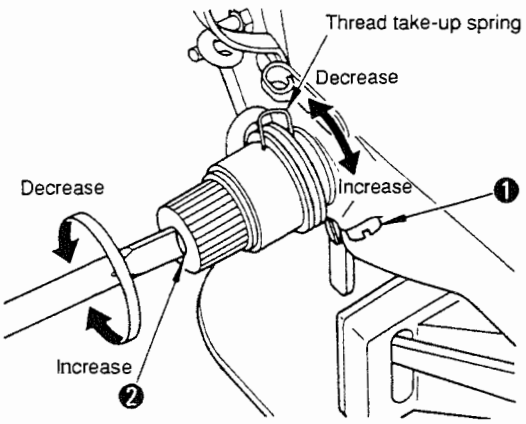


Fig. 5-11-1

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
Adjust the tension controller No. 1. • Turning it in the direction A decreases the length of the thread which remains on the needle. • Turning it in the direction B increases the length of the thread which remains on the needle. **(Caution) If the tension release timing is delayed at the time of thread trimming, the thread which will remain on the needle will be cut too short. Refer to Standard Adjustment of (17).**	• If the thread remaining on the needle is too short, the thread may slip off the needle at sewing start. • If the thread remaining of the needle is too long, the needle thread may appear on the right side of the material, or make the wrong side of the material look messy.
1) Adjusting the stroke Loosen setscrew ❶, and insert a screwdriver into tension controller No. 2 ❷ and turn it to adjust the stroke. 2) Adjusting the tension Be sure that the setscrew ❶ has been securely tightened. Insert a screwdriver into tension controller No. 2 ❷, and turn it to adjust the tension.	• If the stroke of the thread take-up spring is too large, the thread remaining on the needle will be too short, resulting in the thread slipping off the needle at sewing start.

(12) Thread breakage detector

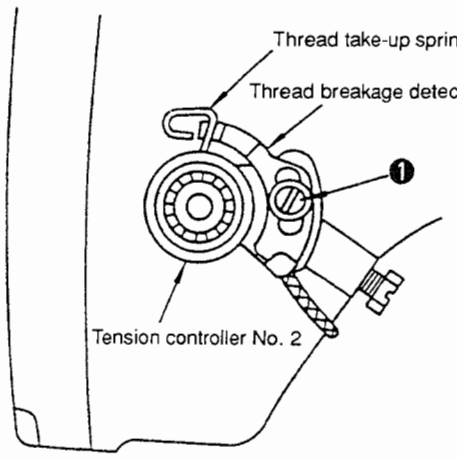


Fig. 5-12-1

1) The thread breakage detecting plate should be always in contact with the thread take-up spring in the absence of thread on the machine head. (The slack of the thread take-up spring should be about 0.5 mm (0.020").)
2) The thread breakage detecting plate should not be in contact with any other metallic parts except the thread take-up spring.

(Caution) Whenever the stroke of the thread take-up spring has been changed, the thread breakage detecting plate must be readjusted.

(13) Moving knife and counter knife

1) When the sewing machine is in a stop state with its needle up, the clearance between the thread spreading point of the moving knife and the edge of the needle hole is 3.5 mm (0.138") (5 mm (0.197") for the GL type), provided play has been eliminated by pushing the thread trimming lever in the direction of the arrow.
2) The clearance between the counter knife and the needle hole guide is 0.8 to 1 mm (0.031" to 0.039") (1.5 mm (0.059") for the GL type).

(Excluding GL type)

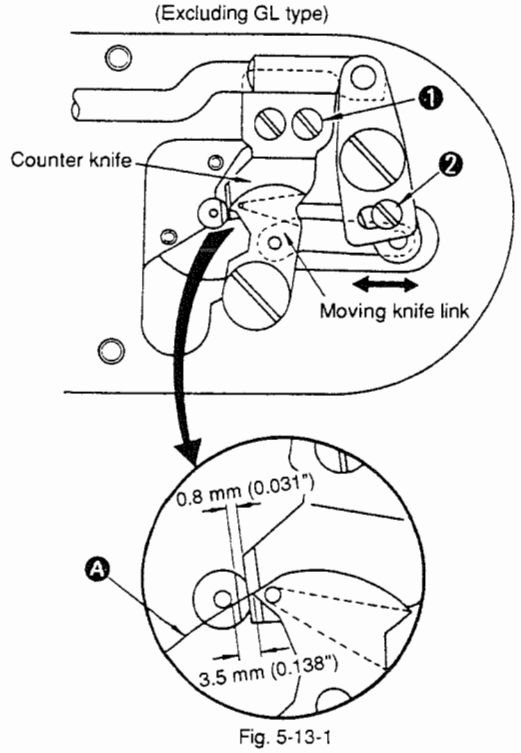


Fig. 5-13-1

(GL type)

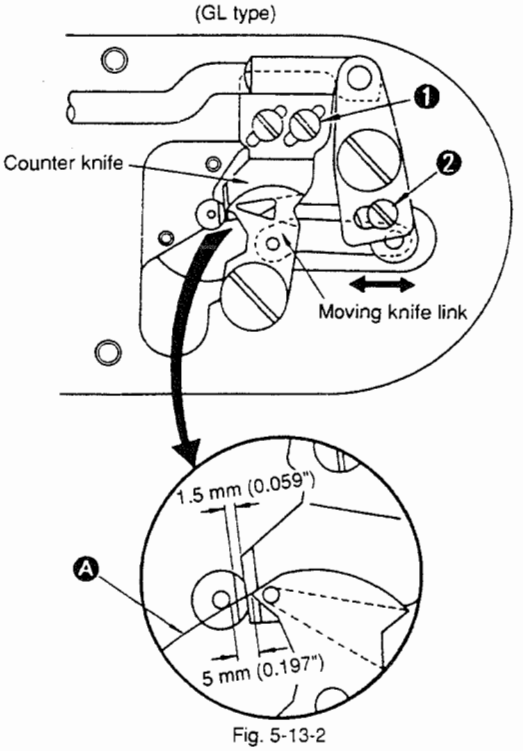


Fig. 5-13-2

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
1) Loosen setscrew ❶. 2) Move the thread breakage detecting plate to achieve adjustment as described at left. After adjustment, tighten the setscrew.	1) If the thread breakage detecting plate is not in proper contact with the thread take-up spring, the sewing machine would fail to stop even when the thread breaks. 2) If the thread breakage detecting plate is falsely in contact with a metallic part other than the thread take-up spring, the sewing machine would stop immediately even when it is started.
1) Positioning the counter knife Loosen setscrew ❶, and perform adjustment. 2) Positioning the moving knife Loosen screw ❷, and perform adjustment. After adjustment, manually actuate the thread trimmer twice or three times to check for proper positioning. **(Note) Be sure that the moving knife follows the correct path indicated by Ⓐ.**	• If the clearance between the counter knife and the needle hole guide is less than 0.8 mm (0.031"), the threads may be falsely trimmed by the blade point of the counter knife when they are pulled by the moving knife. As a result, both the needle and bobbin threads would be trimmed too short. • If the clearance between the counter knife and the needle hole guide exceeds 0.8 mm (0.031"), longer thread may be left on the fabric after thread trimming, the thread trimmer may fail to trim the threads. • If the clearance between the needle hole guide and the moving knife exceeds 2 mm (0.079"), unreliable thread spreading may result with consequent thread trimming failures. • If the clearance between the needle hole guide and the moving knife is less than 2 mm (0.079"), thread trimming failures may result. The needle thread may be caught on the end of the moving knife preventing the proper stitch formation. The needle may hit the moving knife and may break.

(14) Height of the moving knife and the counter knife

(Excluding GL type)

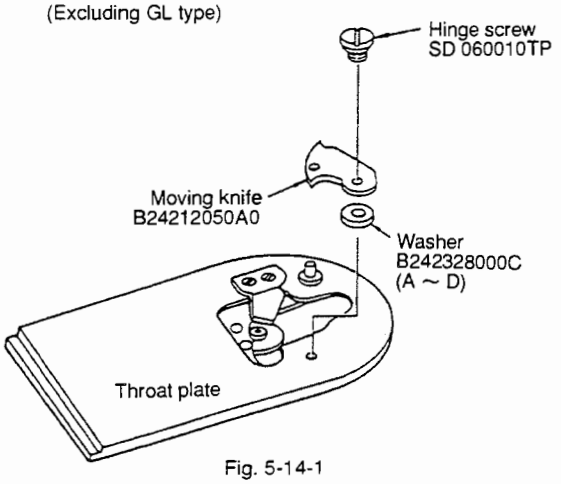


Fig. 5-14-1

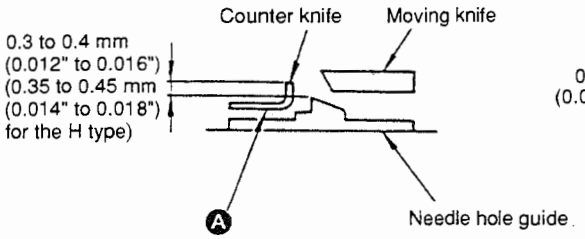


Fig. 5-14-2

(GL type)

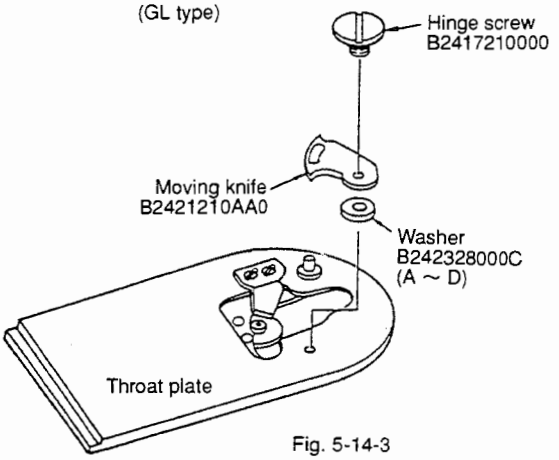


Fig. 5-14-3

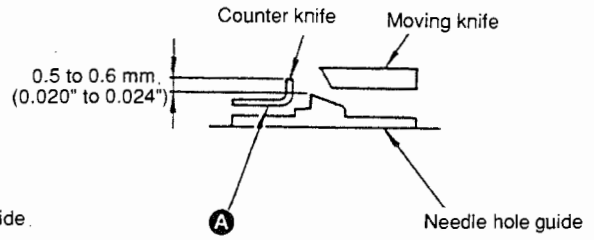


Fig. 5-14-4

Parallelism of the counter knife blade point

The counter knife blade should be parallel to the throat plate mounting surface in order to cut a pair of threads (needle and bobbin threads) evenly.

[The difference in level between Ⓑ and Ⓒ is within 5/100.)]

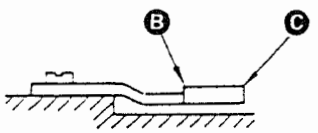


Fig. 5-14-5

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
1) After the trial thread trimming: A) If the outer thread as observed from the moving knife pivot cannot be trimmed, replace the washer with a thicker one. B) If the inner thread as observed from the moving knife pivot cannot be trimmed, replace the washer with a thinner one.	Thread trimming failures may occur.

Part No.	Name of part	Thickness
B242328000A	washer	0.4 mm
B242328000B	washer	0.5 mm
B242328000C	washer	0.6 mm
B242328000D	washer	0.7 mm

※ If you need a washer of which plate thickness is 0.8 mm (0.031") or more for the GL type of sewing machine, select two washers from among the available ones in the aforementioned table in accordance with the thickness desired and use them with overlapped.

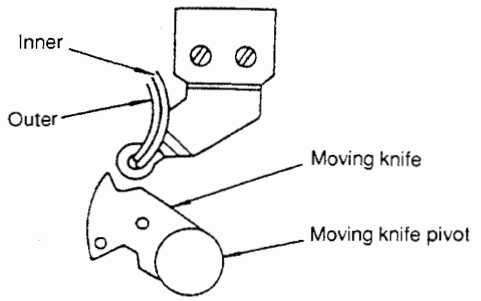


Fig. 5-14-6

2) If the above adjustment fails to correct the thread trimming failure:
A) If the specified difference in height is not obtained between the needle hole guide and the counter knife blade, pry part Ⓐ (Figs. 5-14-2, 5-14-4) out using a screwdriver to adjust the height of the needle hole guide with respect to the counter knife blade. (At this time, be sure that the blade point is parallel to the throat plate mounting surface.)
B) If the angle of the counter knife blade illustrated below is larger than 90 degrees, cut the blade.

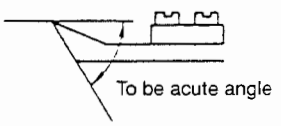
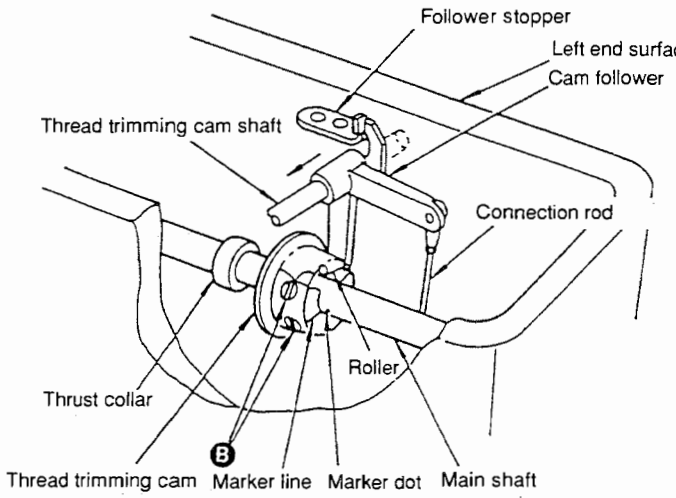


Fig. 5-14-7

3) If the corrective measures described in 1) and 2) above fails to correct the trouble, replace the moving knife or the counter knife.

(15) Thread trimming cam

1) When part Ⓐ of the cam follower is pushed down to maximize the clearance between the follower stopper and the cam follower, the clearance should be 0.2 mm (0.008"). (Fig. 5- 15-2)
2) The marker line on the thread trimming cam should align with the marker dot on the main shaft. (Fig. 5-15-1)
3) At the time of thread trimming, the thread trimming cam shaft moves in the direction of the arrow. Upon completion of the thread trimming, the thread trimming cam shaft goes back to its home position with its left end surface flush with the machine arm.



See 4) on the right-hand side page.

Fig. 5-15-1

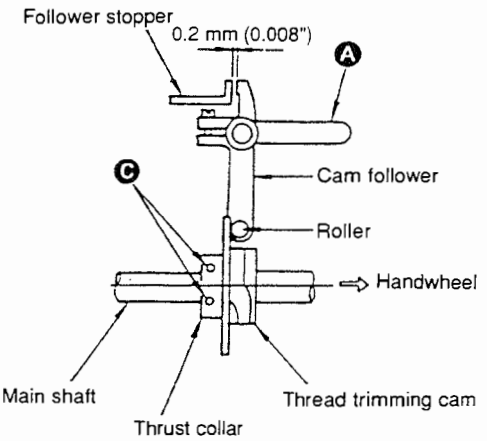


Fig. 5-15-2

(16) Thread trimmer mounting base

1) When the cam follower is pushed inward (in the direction of the arrow), clearance Ⓐ between the edge of the thread trimming cam and the tension release shaft arm should be 0.8 to 1.0 mm (0.031" to 0.039").
2) Clearance Ⓑ between the tension release arm driving shaft and the tension release arm should be 0.1 to 0.3 mm (0.004" to 0.012").

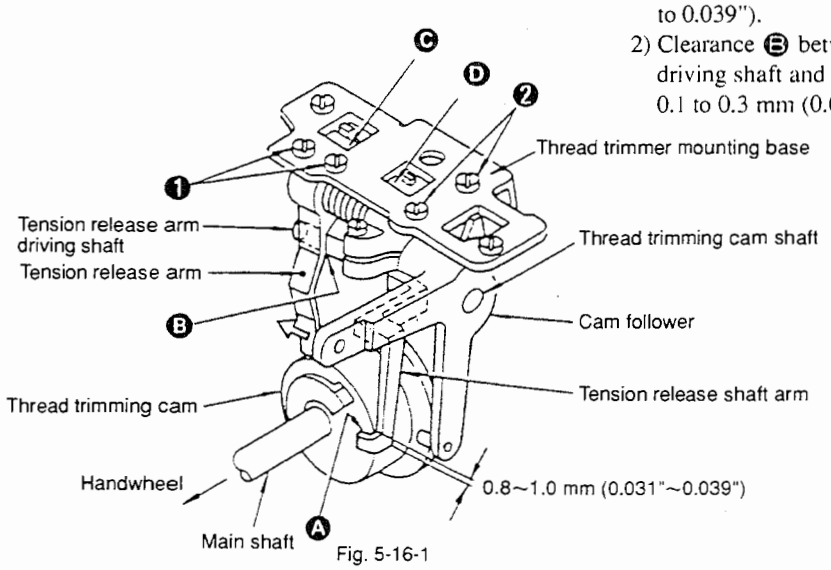
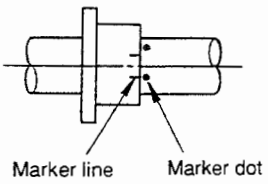
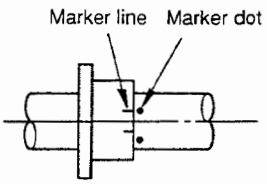


Fig. 5-16-1

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
1) Loosen setscrew Ⓑ and setscrew Ⓒ. 2) Insert a 0.2 mm (0.008") spacer between the follower stopper and the hook of the cam follower, and pull up portion Ⓐ of the cam follower so that the follower stopper, spacer, and the cam follower will come in close contact. 3) Press the thread trimming cam and the thrust collar against the cam follower roller in the direction of the handwheel. Screw the thrust collar onto the main shaft. (The main shaft has a flat portion on it, so be careful.) 4) Align the marker line on the thread trimming cam with the marker dot on the main shaft. Screw the thread trimming cam onto the main shaft while pressing the thread trimming cam against the thrust collar. (Excluding GL type)  (GL type)  	1) Thread trimming failure may occur. 2) The machine may lock at the time of sewing start or thread trimming. 3) The thread trimming cam shaft will fail to return, resulting in loose stitch at the sewing start.
1) Loosen setscrew ❷. Move plate Ⓓ, which retains the tension release shaft arm, forward or backward so that clearance Ⓐ between the edge of the thread trimming cam and the tension release shaft arm becomes 0.8 to 1.0 mm (0.031" to 0.039"). After adjustment,securely tighten setscrew ❷. 2) Loosen setscrew ❶. Move stopper Ⓒ forward or backward so that clearance Ⓑ between the tension release arm driving shaft and the tension release arm becomes 0.1 to 0.3 mm (0.004" to 0.012"). After adjustment, securely tighten setscrew ❶.	1) The thread trimming cam will fail to engage with the cam follower at the time of thread trimming, resulting in a thread trimming failure. 2) After completion of thread trimming, the thread trimming cam shaft will fail to return. As a result, machine lock or loose stitch at sewing start will occur.

(17) Adjusting the tension release notch

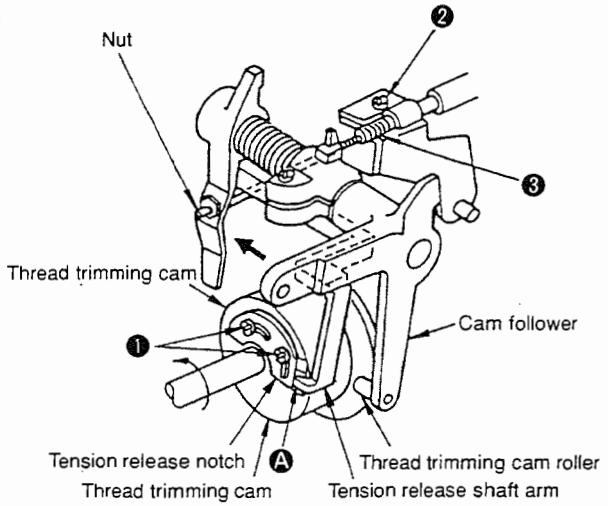


Fig. 5-17-1

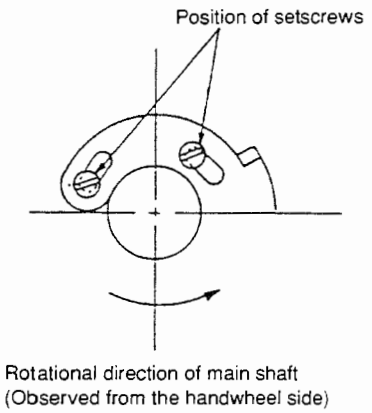


Fig. 5-17-2

Fix the leftmost end (toward counterclockwise direction) of the slit in the tension release notch closely with the outside diameter of tension release notch setscrews ❶ on the thread trimming cam. Then tighten the setscrews. (Fig. 5-17-2)

(Caution) After adjustment, press he thread trimming cam shaft toward the direction of the arrow (➡) (Fig. 5-17-1) so that the thread trimmer clutch components are engaged. And then turn the handwheel by hand in the normal rotational direction until the thread take-up exceeds its highest dead point and confirm that the tension release shaft arm comes off from the tension release notch and that the tension disc of the thread tension controller No. 2 closes simultaneously the cam follower returns to the end face of the arm. The adjusting procedure of tension release notch for the conventional AMS-210A, -212A type of the sewing machine is described in (17)-Ref. on page 78.
The tension release notch in the conventional AMS-210B, -212B type of the sewing machine can be adjusted following the procedure described on this page

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
• Loosen tension release notch setscrews ❶ and make adjustment. After adjustment be sure to securely tighten tension release notch setscrews ❶.	• The length of the needle thread remaining on the needle after thread trimming is too short or not consistent. • Thread may slip off from the needle at the time of sewing start.

(17)-Ref. Adjusting the tension release notch
(for the conventional AMS-210A, -212A type, serial No. Q02376 (manufactured on Jan. 22, 1988) and preceding numbers)

1) Push the cam follower in the direction of the arrow (➡). Turn the handwheel in the normal direction by hand.
2) Stop pressing the cam follower when it begins to move. Further turn of the handwheel will cause the cam follower to return to its home position.
3) The tension disks of the tension controller No. 2 should be released before the cam follower returns to its home position, and then they are closed at the moment the cam follower reaches its home position.

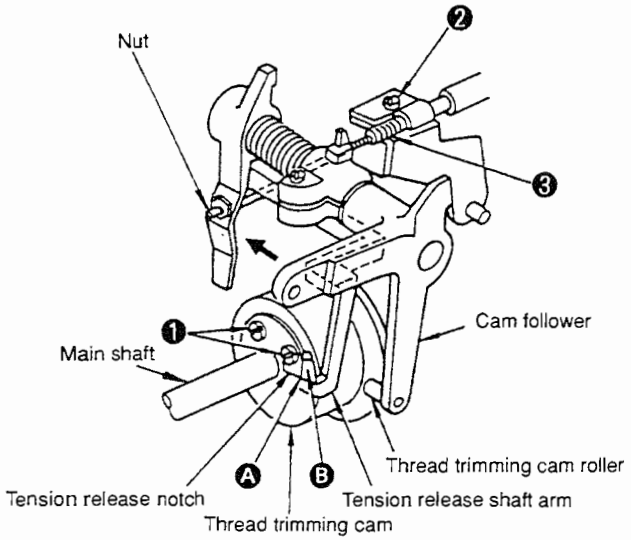


Fig. 5-17-3

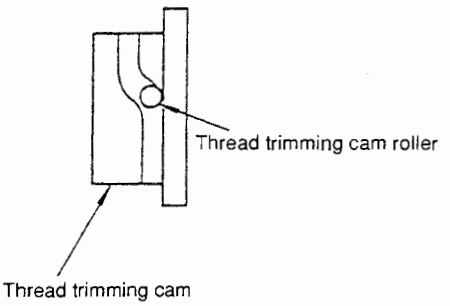


Fig. 5-17-4

(18) Amount of release of the tension disks

Press the cam follower in the direction of the arrow (➡), and turn the handwheel in the normal direction by hand. When the tension release shaft arm rides on stepped portion Ⓑ of the tension release notch, the tension disks of the tension controller No. 2 should be released by 0.6 to 0.8 mm (0.024" to 0.031") (0.8 to 1.0 mm (0.031" to 0.039") only for the GL type). (Figs. 5-17-1, 5-18-1 and 5-18-2)

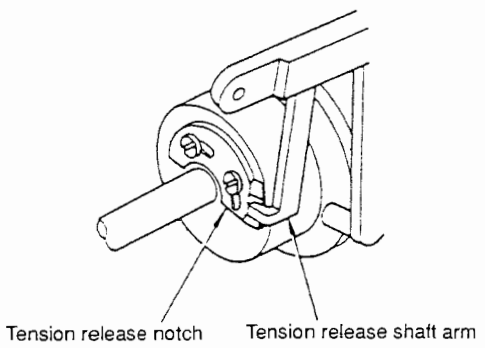


Fig. 5-18-1

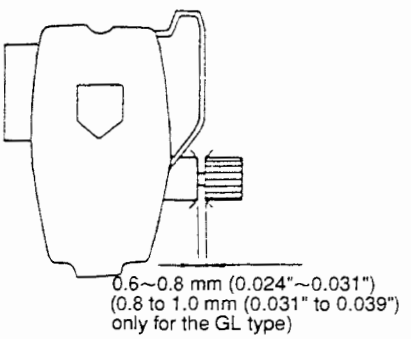


Fig. 5-18-2

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
1) Loosen setscrew ❶. 2) Press the cam follower in the direction of the arrow (➡), and turn the handwheel by hand in the reverse direction. 3) Adjust so that, when the thread trimming cam roller reaches the curve of the thread trimming cam groove (the cam follower starts to move at this point), clearance Ⓐ between the tension release notch and the end of the tension release shaft arm becomes 0 mm. After adjustment, tighten setscrew ❶. (Fig. 5-17-4)	• The length of thread which remains on the needle after thread trimming would be too short or inconsistent.
1) Under the condition described at left, loosen setscrew ❷ of the tension release wire clamp. (Fig. 5-17-1) 2) Adjust the fixing position of portion ❸ of the wire tube so that the tension disks are released by 0.6 to 0.8 mm (0.024" to 0.031") (0.8 to 1.0 mm (0.031" to 0.039") only for the GL type). After adjustment, tighten setscrew ❷. (Figs. 5-17-1, 5-18-2)	• The length of thread which remains on the needle after thread trimming would be too short or inconsistent.

(19)-1. Intermediate presser foot (excluding GL type)

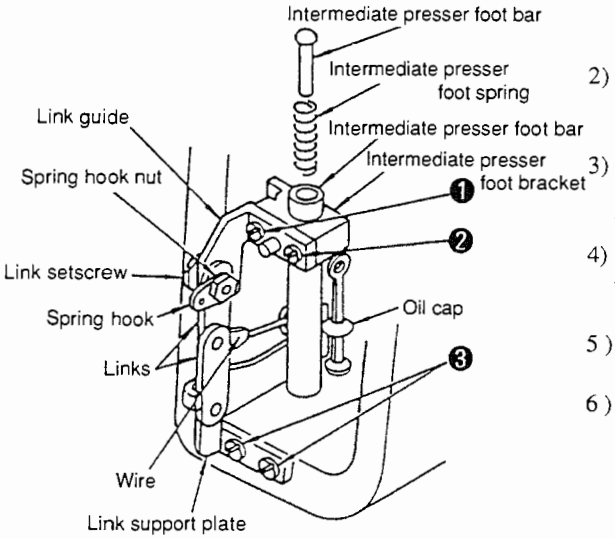


Fig. 5-19-1

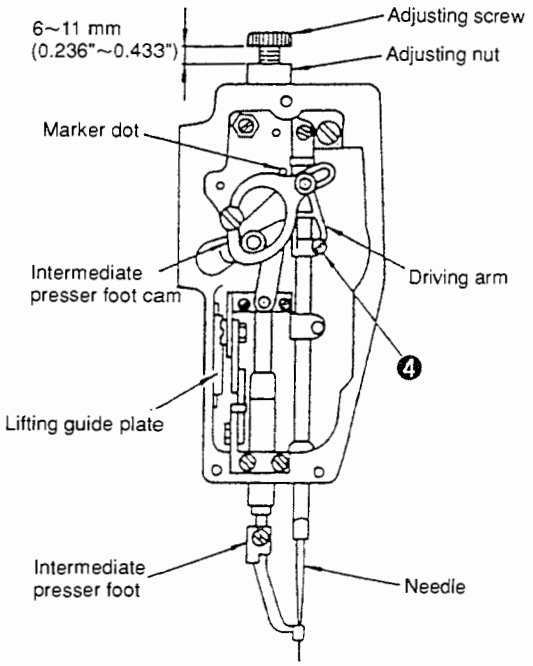


Fig. 5-19-2

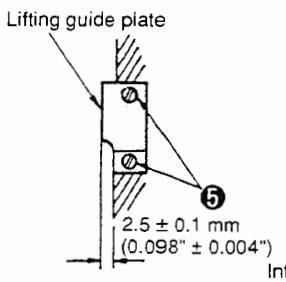


Fig. 5-19-3

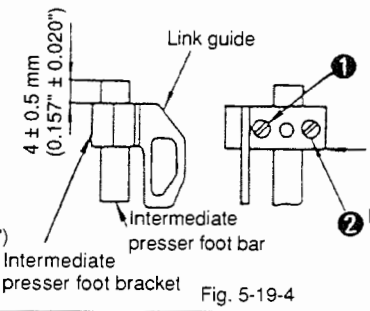


Fig. 5-19-4

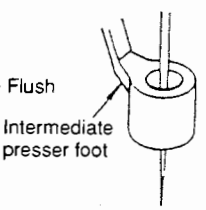


Fig. 5-19-5

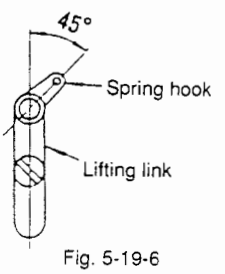
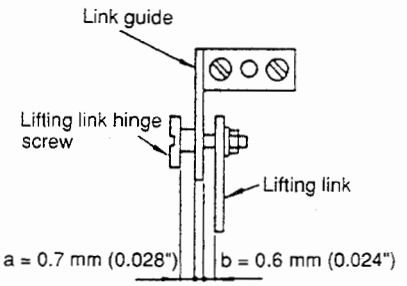


Fig. 5-19-6

1) After confirming that the READY lamp is ON, turn the Bobbin winder switch ON and OFF several times, and check that the intermediate presser foot smoothly moves up and down.
2) The edge surface of the lifting guide plate extends 2.5 ± 0.1 mm (0.098" ± 0.004") beyond the edge surface of the machine arm. (Fig. 5-19-3)
3) The bottom face of the link guide is flush with the bottom face of the intermediate presser foot bracket. (Fig. 5-19-4)
4) The intermediate presser foot bar projects 4 ± 0.5 mm (0.157" ± 0.020") from the top end of the intermediate presser foot bracket. (Fig. 5-19-4)
5) The spring hook is fixed at an angle of 45 degrees against the lifting link. (Fig. 5-19-6)
6) Clearance a of 0.7 mm (0.028") should be provided between the lifting link and the link guide and clearance b of 0.6 mm (0.024") should be provided between the hinge screw of the lifting link and the link guide. (Fig. 5-19-7)
7) The needle should enter the center of the hole in the intermediate presser foot. (Fig. 5-19-5)
8) When the main shaft is turned by hand until it reaches its highest position, the periphery of the intermediate presser foot cam should meet the bottom edge of the marker dot. (Fig. 5-19-2)
9) When the main shaft is turned by hand, the intermediate presser foot cam should not stick against the driving arm.
10) The clearance between the adjusting screw and the adjusting nut should be 6 to 11 mm (0.236" to 0.433"). (Fig. 5-19-2)
11) When the wiper is actuated, the oil cap should not come in contact with the link support plate. (Fig. 5-19-1)

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
2) Loosen setscrew ❺, and adjust so that the edge of the lifting guide plate extends 2.5 ± 0.1 mm (0.098" ± 0.004") beyond the machine arm. After adjustment, tighten setscrew ❺. (Fig. 5-19-3) 3) Loosen setscrew ❶ and ❷, and adjust so that the bottom face of the link guide becomes flush with the bottom face of the intermediate presser foot bracket. Tighten setscrew ❷. (Fig. 5-19-4) 4), 7) Further adjust so that the intermediate presser foot bar protrudes 4 ± 0.5 mm (0.157" ± 0.020") from the top edge of the intermediate presser foot bracket and also the needle point enters the center of the hole in the intermediate presser foot. After adjustment, tighten setscrew ❶. (Figs. 5-19-4, 5-19-5) 6), 11) Loosen setscrews ❸ in the link support plate, and adjust clearance a between the link guide and the lifting link and clearance b between the link guide and the hinge setscrew of the lifting link to the values given below. Then tighten the setscrews. (Fig. 5-19-7) At this time, check that the oil cap does not come in contact with the link support plate when the wiper is actuated by hand. (Figs. 5-19-1, 5-19-7) 8), 9) Loosen setscrew ❹. Turn the main shaft by hand until the needle bar reaches its highest position. Move the driving arm up or down to make the periphery of the intermediate presser foot cam contact the lower edge of the red marker dot. After adjustment, tighten setscrew ❹. (Fig. 5-19-2) **(Caution) When tightening setscrew ❹, be sure that the roll of the driving arm does not stick against the slot in the intermediate presser foot cam. Also, check the main shaft for smooth rotation by turning it by hand after adjustment.** 5) Loosen the spring hook nut. Adjust so that the spring hook is set at 45 degrees against the link, then tighten the nut. (Fig. 5-19-6) 10) Adjust to provide a clearance of 6 to 11 mm (0.236" to 0.433") between the adjusting screw and the adjusting nut. (Fig. 5-19-2) **(Caution) When performing the adjustments described in steps 1) through 6), be very careful never bend the wire, or else the wire may be damaged.**	• The intermediate presser foot may fail to go up after completion of a sewing cycle. • The needle would fail to enter the center of the hole in the intermediate presser foot, resulting information of loose stitches or the needle touching the intermediate presser foot. • Inadequate pressure of the intermediate presser foot would lead to stitch skipping trouble. • Oil would ooze out through the wiper link plate.  Fig. 5-19-7

(19)-2. Intermediate presser foot (GL type)

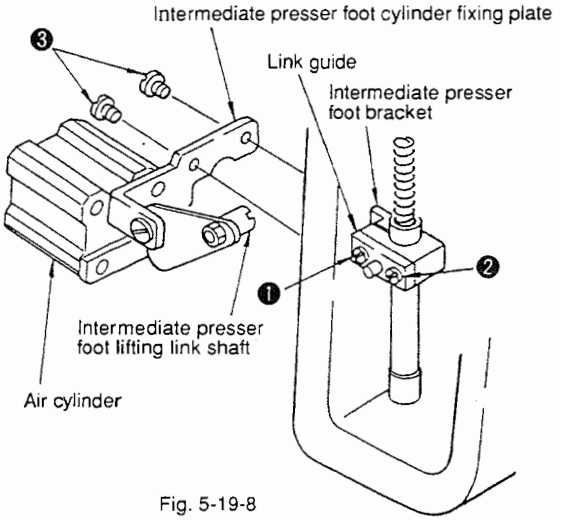


Fig. 5-19-8

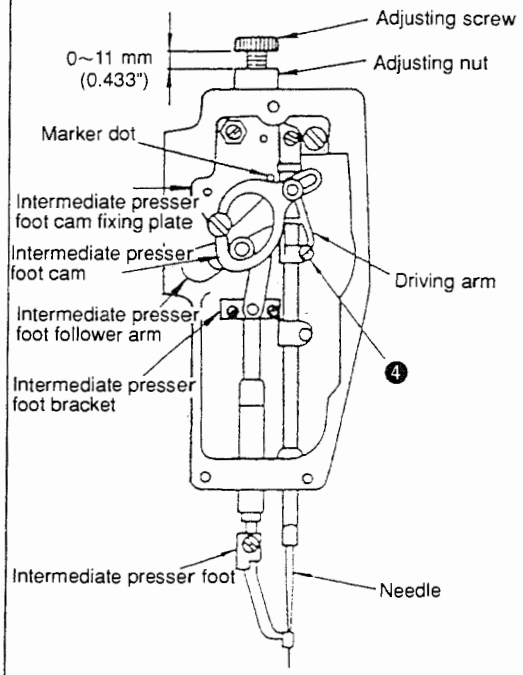
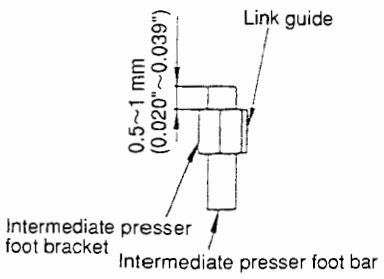
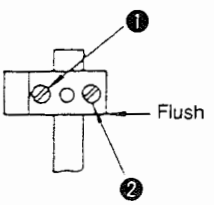


Fig. 5-19-9





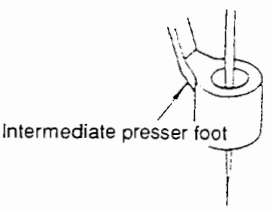


Fig. 5-19-10

Fig. 5-19-11

1) After confirming that the READY lamp is ON, turn the Bobbin winder switch ON and OFF several times, and check that the intermediate presser foot smoothly moves up and down.
2) The bottom face of the link guide is flush with the bottom face of the intermediate presser foot bracket. (Fig. 5-19-10)
3) The intermediate presser foot bar projects 0.5 to 1 mm (0.020" to 0.039") from the top end of the intermediate presser foot bracket. (Fig. 5-19-10)
4) The needle should enter the center of the hole in the intermediate presser foot. (Fig. 5-19-11)
5) When the main shaft is turned by hand until it reaches its highest position, the periphery of the intermediate presser foot cam should meet the bottom edge of the marker dot. (Fig. 5-19-9)
6) When the main shaft is turned by hand, the intermediate presser foot cam should not stick against the driving arm.
7) The clearance between the adjusting screw and the adjusting nut should be 0 to 11 mm (0.433"). (Fig. 5-19-9)
8) A clearance is provided between the bottom face of the intermediate presser foot bracket and the intermediate presser foot lifting link shaft when the intermediate presser foot is in its lowest dead point. (Fig. 5-19-8)
9) The lifting amount of the intermediate presser foot measured from its lowest dead point to its highest position (the air cylinder projects) should be 14 mm (0.551").
10) When the intermediate presser foot is brought to its highest position (the air cylinder projects), the intermediate presser foot cam fixing plate should not come in contact with the intermediate presser foot follower arm. (Fig. 5-19-9)

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
2) Loosen setscrew ❶ and ❷, and adjust so that the bottom face of the link guide becomes flush with the bottom face of the intermediate presser foot bracket. Tighten setscrew ❷. (Fig. 5-19-10) 3), 4) Further adjust so that the intermediate presser foot bar protrudes 0.5 to 1 mm (0.020" to 0.039") from the top edge of the intermediate presser foot bracket and also the needle point enters the center of the hole in the intermediate presser foot. After adjustment, tighten setscrew ❶. (Figs. 5-19-10, 5-19-11) 5), 6) Loosen setscrew ❹. Turn the main shaft by hand until the needle bar reaches its highest position. Move the driving arm up or down to make the periphery of the intermediate presser foot cam contact the lower edge of the red marker dot. After adjustment, tighten setscrew ❹. (Fig. 5-19-9) **(Caution) When tightening setscrew ❹, be sure that the roll of the driving arm does not stick against the slot in the intermediate presser foot cam. Also, check the main shaft for smooth rotation by turning it by hand after adjustment.** 7) Adjust to provide a clearance of 0 to 11 mm (0.433") between the adjusting screw and the adjusting nut. (Fig. 5-19-9) 8) Loosen setscrews ❸, and adjust the attaching position of the intermediate presser foot cylinder fixing plate so that the bottom of the intermediate presser foot bracket does not come in contact with the intermediate presser foot link shaft when the intermediate presser foot is in its lowest dead point. (Fig. 5-19-8) 9) Loosen setscrews ❸, and adjust the attaching position of the intermediate presser foot cylinder fixing plate so that the max. lifting amount of the intermediate presser foot becomes 14 mm (0.551"). (Fig. 5-19-8) **(Caution) The max. lifting amount of the intermediate presser foot is the difference in height between the lowest dead point and the highest point of the intermediate presser foot.** 10) Loosen setscrew ❸, and adjust the attaching position of the intermediate presser foot cylinder fixing plate so that the intermediate presser foot cam fixing plate does not come in contact with the intermediate presser foot follower arm when the intermediate presser foot is brought to its highest position. (Fig. 5-19-8)	• The intermediate presser foot may fail to go up after completion of a sewing cycle. • The needle would fail to enter the center of the hole in the intermediate presser foot, resulting information of loose stitches or the needle touching the intermediate presser foot. • Inadequate pressure of the intermediate presser foot would lead to stitch skipping trouble. • Oil would ooze out through the wiper link plate. • The lifting amount of the intermediate presser foot is insufficient. • Metallic noise (like click-clack) is heard while the intermediate presser foot actuates.

(20) Intermediate presser foot wire (excluding GL type)

The clearance between the lifting link and the link support plate should be 0.5 to 1.0 mm (0.020" to 0.039"). (Fig. 5-20-1)

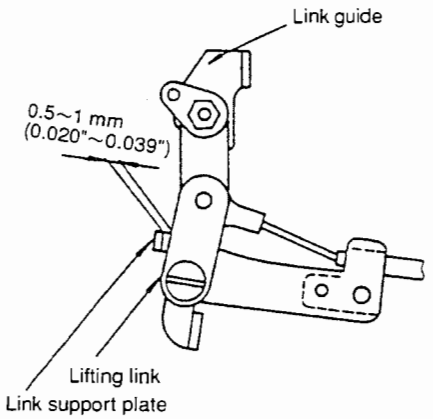


Fig. 5-20-1

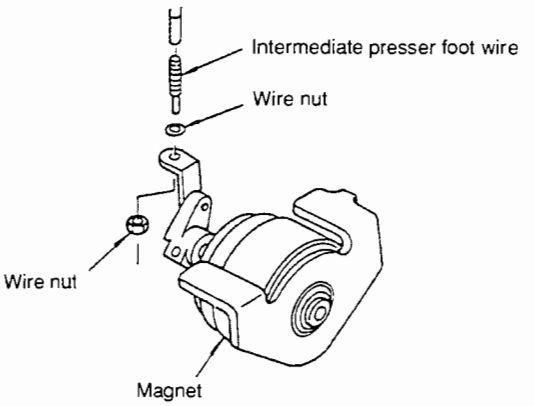


Fig. 5-20-2

(21) Feeding frame lowering pedal and tension release mechanism (excluding GL type)

When the feeding frame lowering pedal is depressed, causing lowering arm (A) to come in contact with the stopper, the feeding frame should come in close contact with the feed plate. The moment the feeding frame comes in close contact with the feed plate, the limit switch is turned on and an emergency stop occurs. (Only the A type or the earlier B type machine head is equipped with the limit switch.)

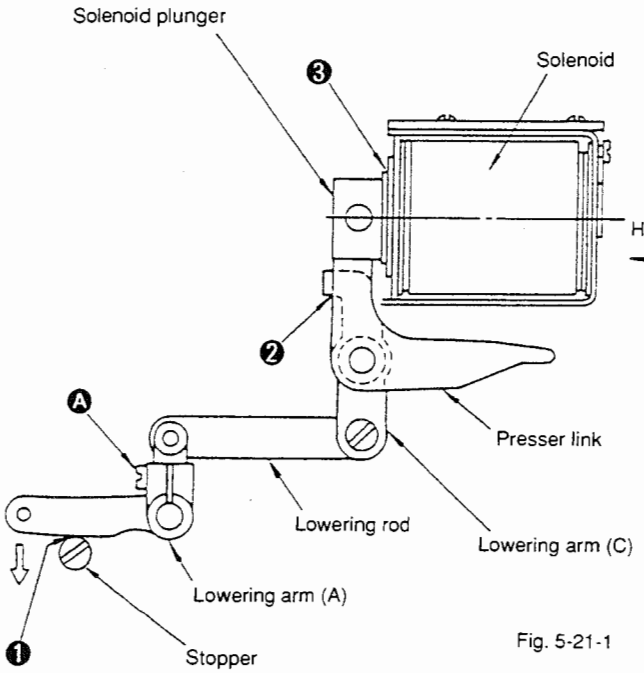


Fig. 5-21-1

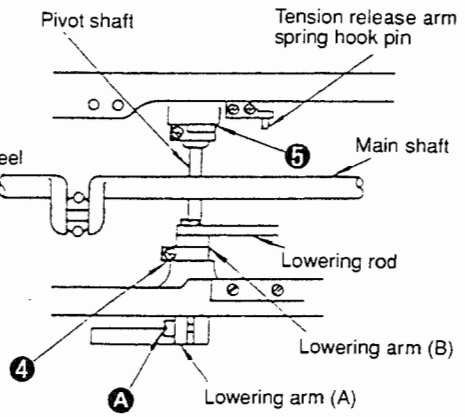


Fig. 5-21-2

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
• Loosen the wire nuts connected to the intermediate presser foot solenoid located at the bottom of the machine bed. Adjust so that a clearance of 0.5 to 1.0 mm (0.020" to 0.039") is provided between the lifting link and the link support plate. Tighten the nuts.	• The link guide hits the link setscrew, preventing proper vertical motion of the intermediate presser foot. As a result, stitches may be skipped. [Abnormal sound would be heard. The wire may be damaged.]
1) Loosen setscrew Ⓐ of the lowering arm (A). 2) Actuate the solenoid plunger, and adjust the clearances at ❶, ❷ and ❸ to 0 mm. Tighten setscrew Ⓐ. 3) Loosen limit switch setscrew Ⓒ. 4) Depress the feeding frame lowering pedal. Adjust so that the limit switch clicks the moment the feeding frame comes in close contact with the feed plate. Then tighten setscrews Ⓒ.	1) When the feeding frame lowering pedal is depress; a) The feeding frame fails to come in close contact with the feed plate. b) An emergency stop will not be engaged. 2) The lift of the feeding frame will be inadequate when the feeding frame lowering pedal is released. (Improper clearance between the spring hook pin and the tension release arm)

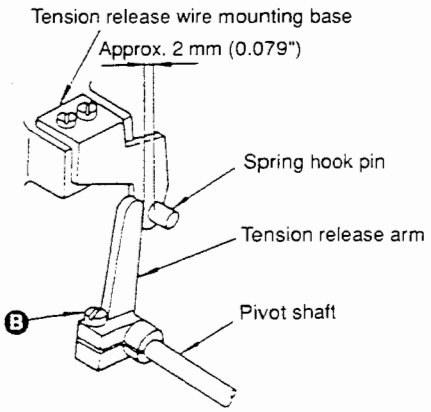


Fig. 5-21-3

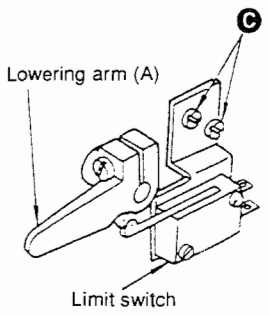


Fig. 5-21-4

(Caution) **Only the A type or the earlier B type machine head is equipped with the limit switch and the tension release arm.**

(22) Bobbin winding

• The bobbin holder should release the bobbin when the bobbin has been wound 80% full.

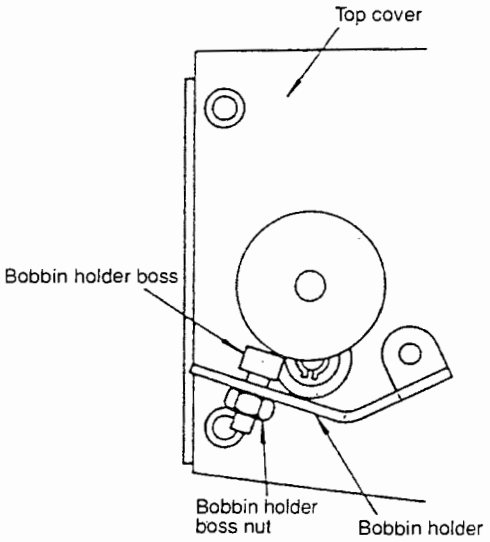


Fig. 5-22-1

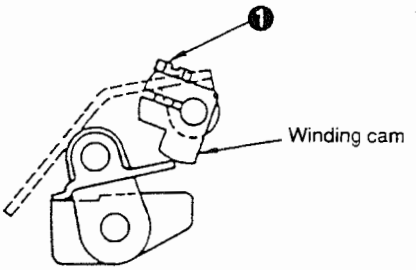


Fig. 5-22-2

(23) Bobbin winder driving wheel

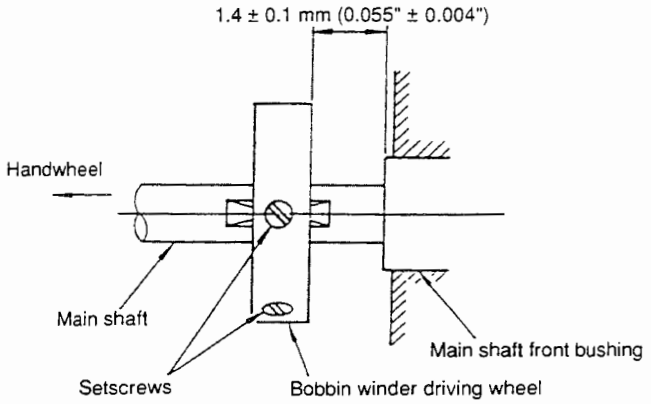


Fig. 5-23-1

(24) Height of the throat plate auxiliary cover

The throat plate surface should be flush with the top surface of the throat plate auxiliary cover.

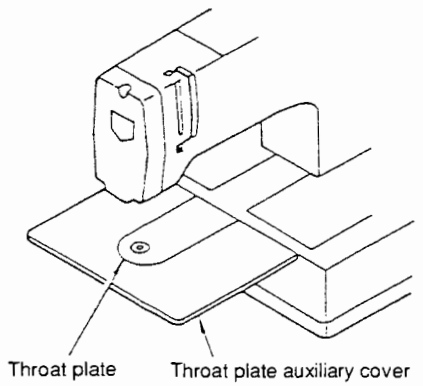


Fig. 5-24-1

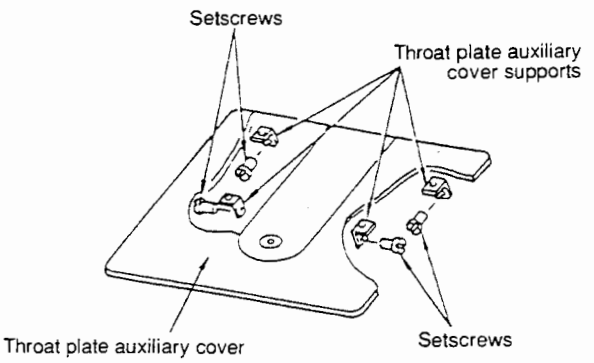


Fig. 5-24-2

HOW TO ADJUST	RESULTS OF IMPROPER ADJUSTMENT
1) Loosen the bobbin holder boss nut. Turn the bobbin holder boss to adjust so that the bobbin holder releases the bobbin when the bobbin has been wound 80% full. After adjustment, tighten the nut. 2) If the above adjustment does not work, loosen setscrew ❶ at the rear of the top cover, and adjust the angle of the bobbin holder. After adjustment, tighten setscrew ❶ .	Improper amount of thread would be wound on the bobbin.
Loosen the setscrews. Adjust to provide a clearance of 1.4 ± 0.1 mm (0.055" ± 0.004") between the edge face of the bobbin winder driving wheel and the edge face of the main shaft front bushing.	The bobbin fails to spin even if it is set on the bobbin winder.
1) Loosen the setscrews of the throat plate auxiliary cover supports. 2) Move the throat plate auxiliary cover up or down to adjust so that the throat plate surface becomes flush with the top face of the throat plate auxiliary cover. Tighten the setscrews.	The feed plate would be caught by the stepped part formed by the throat plate and the throat plate auxiliary cover, resulting in deformed pattern.

(25) Height of the presser plate (S, T types only)

The clearance between the presser plate bearing and the presser plate should be 1.0 mm (0.039").

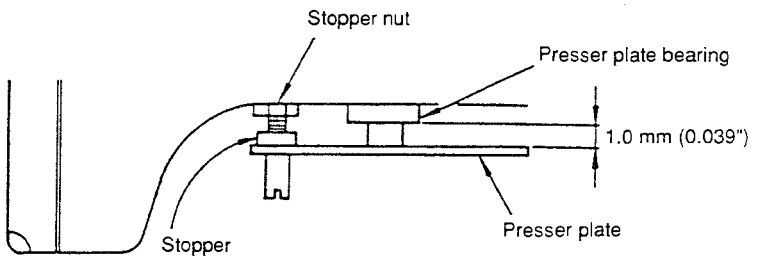


Fig. 5-25-1

(26) Feed bracket auxiliary cover

When the feed bracket is moved laterally and longitudinally by hand, the feed bracket should move smoothly without sticking against the feed bracket auxiliary cover, and the throat plate auxiliary cover should not stick against the feed bracket auxiliary cover. At this time, the Y movable cover should move smoothly.

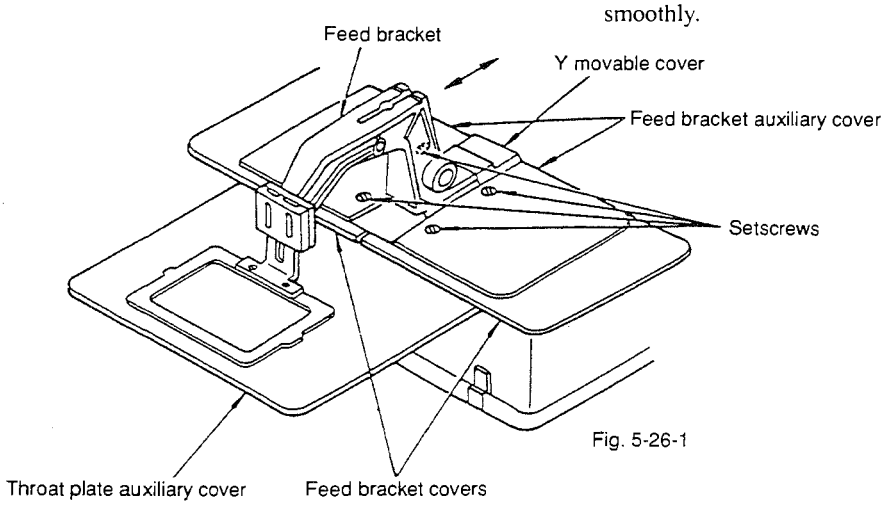


Fig. 5-26-1

(27) X guide shaft support

When the feed bracket is moved laterally by hand, both ends of the X guide shaft support should not move up and down.

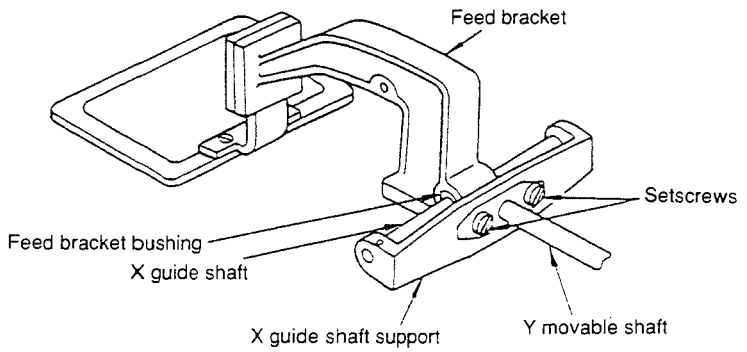
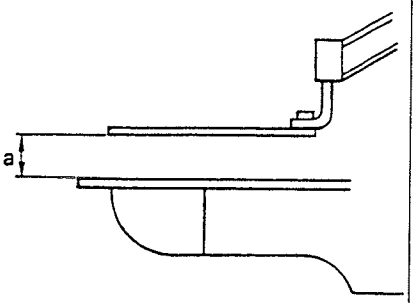


Fig. 5-27-1

HOW TO ADJUST	Results of Improper Adjustment
• Loosen the stopper nut. Turn the stopper to adjust the clearance between the presser plate bearing and the presser plate to the specified value. Tighten the nut.	Lift "a" of the feeding frame will be reduced.  Fig. 5-25-2
• Loosen the setscrews of the feed bracket auxiliary cover. Move the feed bracket auxiliary cover to achieve the adjustment as described at left. After adjustment, tighten the setscrews.	The pattern may be deformed.
• Loosen the setscrews of the Y movable shaft. Adjust to make the X guide shaft parallel to the hole in the feed bracket bushing. Tighten the setscrews.	The pattern may be deformed.

(28) X-axis feed belt tension

Move the feed bracket fully to the left. Adjust so that the X-axis feed belt slacks 1.5 to 2.0 mm (0.059" to 0.079") when a load of 700 to 900 g is applied to the middle (shown by the arrow) of the right belt.

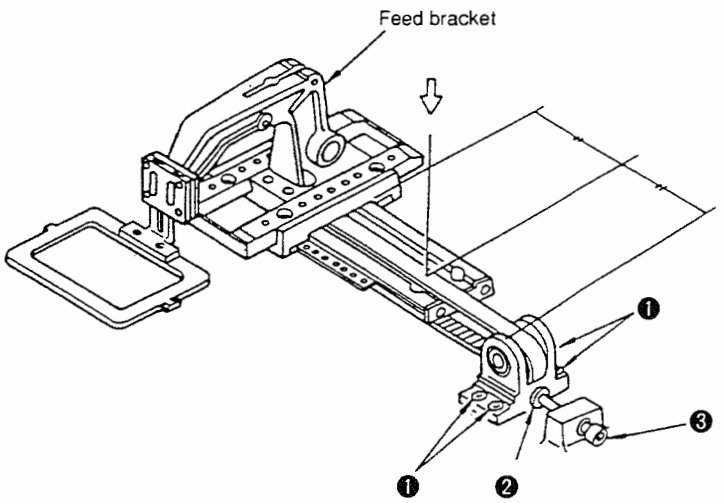


Fig. 5-28-1

(29) Y-axis feed belt tension

Adjust so that the Y-axis feed belt slacks 1.8 mm (0.071") when a 900 g load is applied to the middle (indicated by the arrow) of the Y-axis feed belt located inside the machine arm.

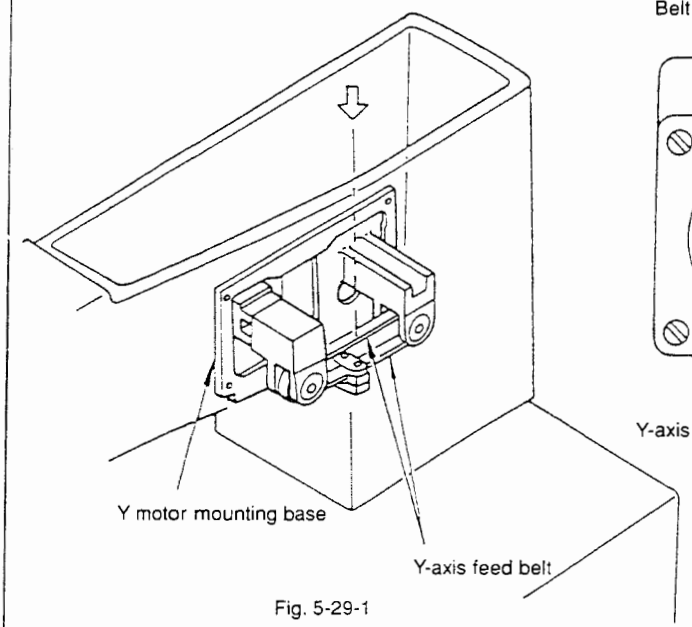


Fig. 5-29-1

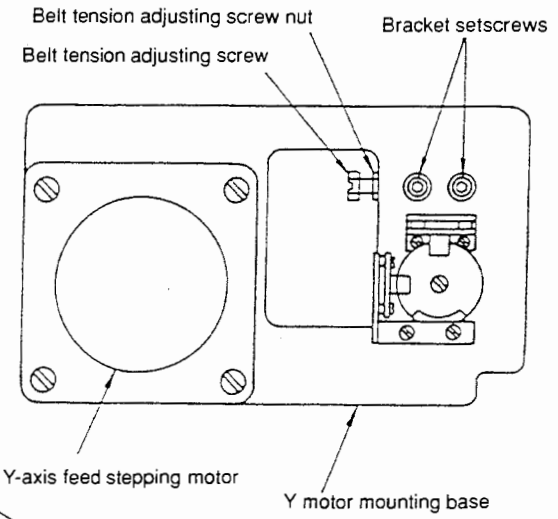


Fig. 5-29-2

HOW TO ADJUST	Results of Improper Adjustment
Loosen screw ❶ and nut ❷. Turn tension adjusting screw ❸ to adjust the belt tension. Tighten screw ❶ and nut ❷. **(Caution)** **Tightening screw ❶ will affect the belt tension. So, check the belt slack again after tightening the screw ❶.**	The pattern would be deformed.
1) Remove the Y motor mounting base cover. 2) Loosen the bracket setscrews and belt tension adjusting screw nut. Turn the belt tension adjusting screw, using a spanner, to adjust the belt tension. 3) Tighten the bracket setscrews and belt tension adjusting screw nut. Reinstall the Y motor mounting base cover. **(Caution)** **Tightening the bracket setscrews will affect the belt tension. So, check the belt slack again after tightening the bracket setscrews.**	The pattern would be deformed.

(30) Adjusting the pneumatic components

(A) Adjusting the air supply (L type only)

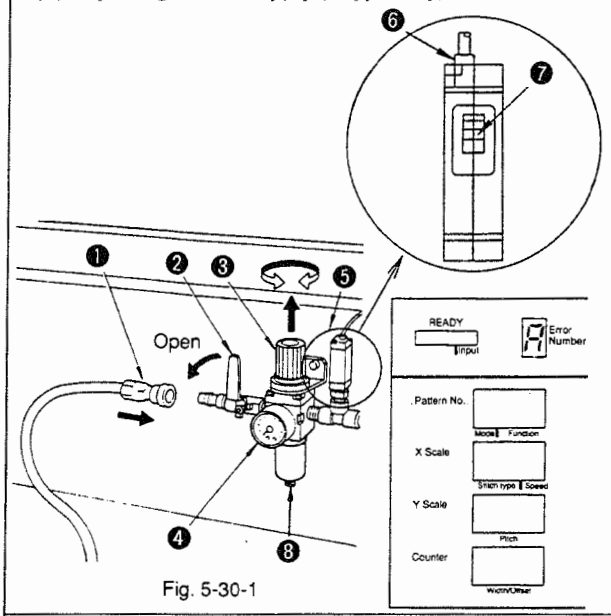


Fig. 5-30-1

1) Connect quick-coupling socket joint plug ❶ to the air source. When you open air cock ❷, pressure gauge ❹ will indicate value A. (Fig. 5-30-1)

2) If pressure gauge ❹ indicates a value smaller than B, the machine will stop showing error "A" on the operation box (panel). (Fig. 5-30-1)

	A	B
L type	2～2.5kg/cm²	1kg/cm²
GL type	5～5.5kg/cm²	4kg/cm²

(B) Adjusting the pressure reducing valve (GL type only)

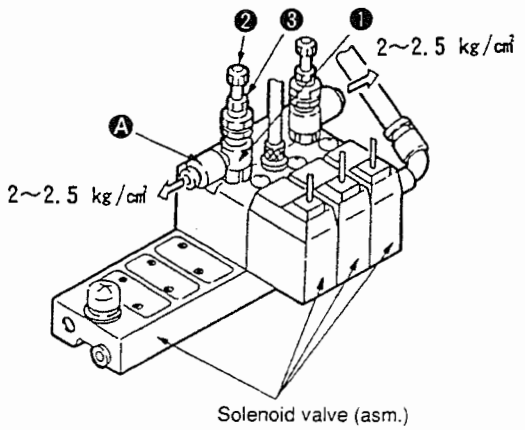
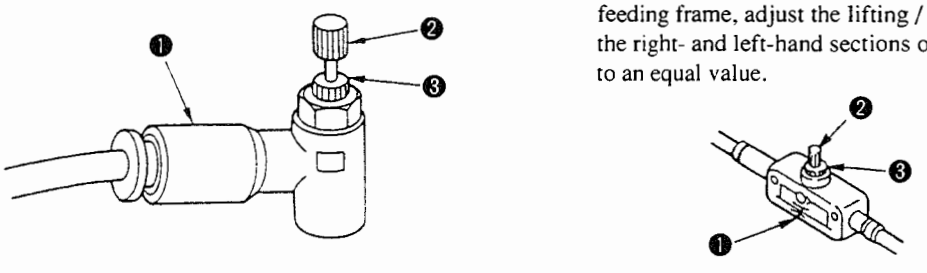


Fig. 5-30-2

1) The compressed air on the push-out side of the work clamp cylinder is reduced to 2 to 2.5 kg/cm²

(C) Adjusting the speed controller (L type only)



L type GL type

Fig. 5-30-3

1) Adjust the lifting/lowering speed of the feeding frame properly.
2) If using your machine with a separately driven feeding frame, adjust the lifting / lowering speed of the right- and left-hand sections of the feeding frame to an equal value.

HOW TO ADJUST	Results of Improper Adjustment
1) Open air cock ❷. Then pull up air regulator knob ❸ and turn it until pressure gauge ❹ indicates value A. Then push the knob down to fix it at that position. (Fig. 5-30-1) 2) Adjust so that the pressure gauge indicates a value lower than B following the procedure same as 1). Turn adjusting screw ❻ of pressure switch ❺ until pointer ❼ indicates value B. (Fig. 5-30-1) Turn ON the power to the sewing machine. Press the Set Ready switch on the operation box panel, and confirm that error "A" is indicated on the panel when making the machine read out a pattern. **(Caution)** **After the adjustment, re-set the value indicated on pressure gauge ❹ to value A and confirm that error "A" is no longer indicated on the panel.**	1) Malfunction related to the feeding frame or the intermediate presser foot will result. The sewing machine stops while indicating error "A" on the operation box panel. 2) The machine fails to detect a drop of the compressed air pressure. The sewing machine stops showing error "A" on the operation box panel even if the normal operating pressure (value A) is obtained. * To set the air pressure to 0 kg/cm², close air cock ❷ and press push-button ❽.
1) Under the sewing mode, remove the air hose by pressing section Ⓐ of pressure reducing valve ❶ that is fixed on the solenoid valve (asm.). Then connect a pressure gauge which is commercially available. (Fig. 5-30-2) Depress the feeding frame switch five times or more, and turn needle knob ❷ of pressure reducing valve ❶ until the pressure gauge connected to the pressure reducing valve indicates a pressure of 2 to 2.5 kg/cm². Then fix the needle knob at the adjusted position with nut ❸. Then, securely connect the air hose to the solenoid valve (asm.) that has been removed before the adjustment. (Fig. 5-30-2)	1) An adequate clamping pressure will not be provided. 2) The feeding frame may fail to go up to the highest position of its stroke.
1) Adjust needle knob ❷ of speed controller (A) ❶, then fix the knob at the adjusted position with nut ❸.	1) The lifting/lowering speed of the feeding frame will be too fast or too slow. 2) The intermediate presser foot may fail to go up smoothly. High-pitch metallic noise may sound when the intermediate presser foot actuates.

(31) Adjusting the X/Y origins and travel limit sensor

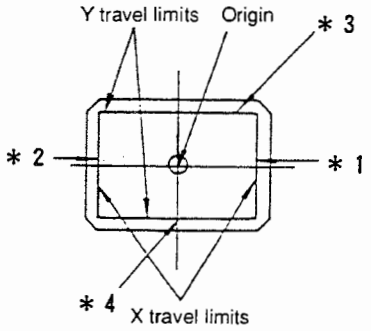
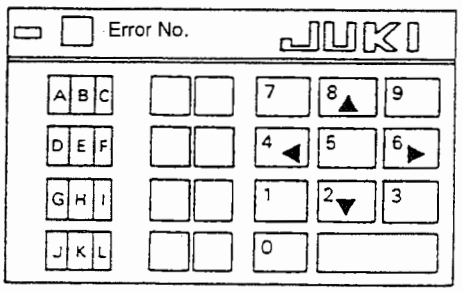


Fig. 5-31-1

A) Adjusting the origin

1) Mount the origin gauge on the feed bracket.
2) Open the cover of the control box and set rotary DIP switch (SW2) ❹ on the I/F circuit board to No. 5.
3) Turn ON the power switch, lower the feeding frame by pressing the feeding frame switch, and press the start switch.
4) The feed will operate and stop after the origin has been retrieved. In this case, lower the needle by turning the handwheel manually, and check that the needle point is located over the hole at the center of the origin gauge. (Fig. 5-31-1)

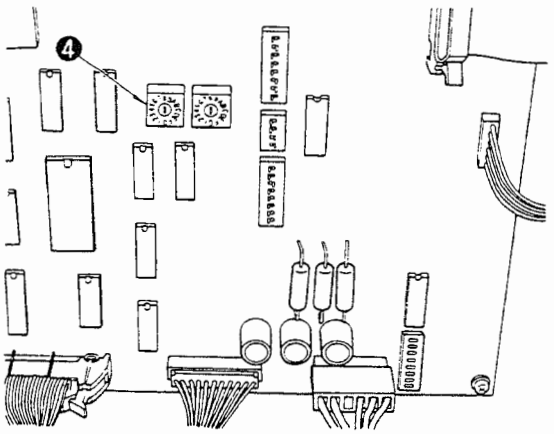


Operation box (panel)

Fig. 5-31-2

X axis
D: Travel limit *2
E: Origin
F: Travel limit *1

Y axis
G: Travel limit *4
H: Origin
I : Travel limit *3



HOW TO ADJUST	Results of Improper Adjustment
A) Adjusting the X axis origin and travel limit sensor 1) Remove the side cover, feed bracket auxiliary cover (right), throat plate auxiliary cover and feed bracket cover (right). 2) Remove the control box cover and set rotary DIP switch (SW-2) on the I/F circuit board to No. 5. 3) Turn ON the power switch. Then press the feeding frame switch and start switch in that order. The feeding frame will now retrieve the origin at the current position of the sensor before stopping. 4) Press switches [4], [6], [8] and [2] in the operation box (panel) so that the hole in the origin gauge attached to the feeding bracket coincides with the needle point. 5) Loosen the setscrew for the X sensor circuit board (assy.) (Fig. 5-31-5 (P. 96)), move the X sensor circuit board (assy.) to the left and right, and tighten the setscrews the moment the display (E portion) of the X origin changes from 1 to 0. 6) Check the travel limit to the right using switch [6] in the operation box (panel) and also the travel limit to the left using switch [4]. (If the result is ± 0.4 mm (0.016") from the reference marking, it is correct.) **(Caution)** **• After making the adjustment, when the X axis slit disk passes through the X axis sensor (in 3 positions), be sure to confirm that the slit disk passes through the center of the clearance of the sensor photo coupler, and is extended over the tip of the photo coupler of the sensor by 5 mm (0.197") or more.** **• The origin gauges are listed on the page describing "Options."**	• If the origin has been adjusted incorrectly, the origin of the stored pattern will be unable to match the sewing origin. • If the travel limit is adjusted incorrectly, the sewing area may be reduced, or the motor may fail to stop even when the travel limit in the feeding mechanism has been exceeded.

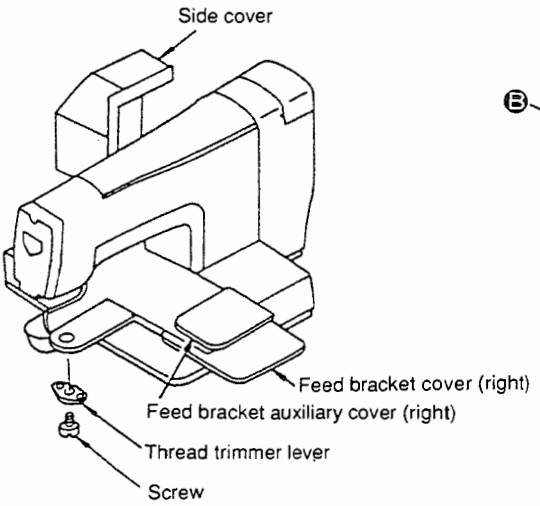


Fig. 5-31-3

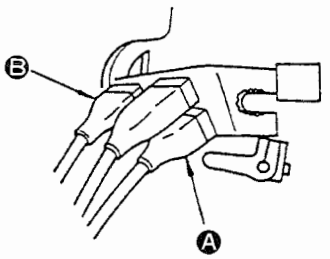


Fig. 5-31-4

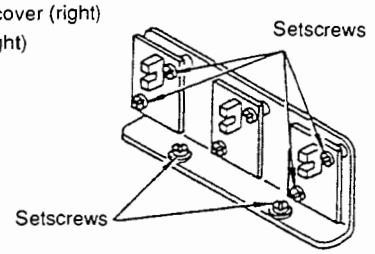


Fig. 5-31-5

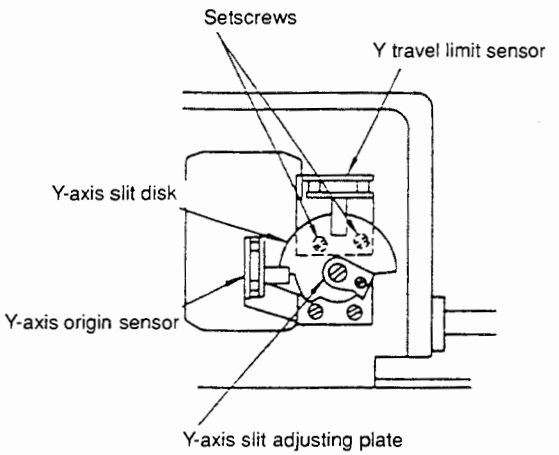


Fig. 5-31-6

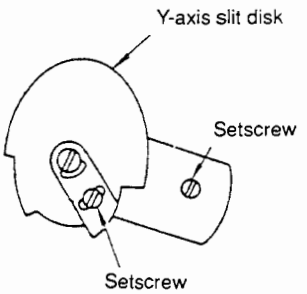


Fig. 5-31-7

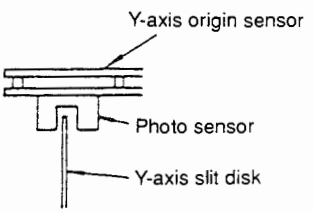


Fig. 5-31-8

HOW TO ADJUST	Results of Improper Adjustment
B) Adjusting the Y-axis origin and travel limit sensor 7) Same as paragraphs 1) through 4). 8) Loosen the setscrews in the Y-axis slit disk, position the Y-axis slit disk so that the indication of display H on the operation box (panel) (Fig. 5-31-2) changes from 0 to 1 or from 1 to 0, and tighten the setscrews for the Y-axis slit disk (Fig. 5-31-7) (accuracy of adjustment : ± 0.2 mm (0.008")). **(Caution)** **Make sure that the Y-axis slit disk is positioned at the center of the slit in the photo sensor located above the Y-axis origin sensor. (Fig. 5-31-8)** 9) Being dependent on switch [8], allow the needle to enter the Y travel limit of origin gauge (*4). (Figs. 5-31-1, 5-31-2) 10) Loosen the setscrews, position the Y travel limit sensor by moving it forward and backward so that the indication of display I on the operation box (panel) (Fig. 5-31-2) changes from 0 to 1 or from 1 to 0 before tightening the setscrews for Y travel limit sensor (Fig. 5-31-6) (accuracy of adjustment : ± 0.4 mm (0.016")). 11) Being dependent on switch [2], allow the needle to enter the Y travel limit of origin gauge (*3). (Figs. 5-31-1, 5-31-2) 12) Loosen the setscrews in the slit adjusting plate. Position the slit adjusting plate so that the indication of display I on the operation box (panel) (Fig. 5-31-2) changes from 1 to 0 before tightening the setscrews (Fig. 5-31-7) (accuracy of adjustment : ± 0.4 mm (0.016")). **(Caution)** **After making the adjustment, return the rotary DIP switch (SW-2) to No. 0.**	

(32) Shuttle race ring

If the shuttle point wears out severely, remove the shuttle race ring and check whether or not the hatched portion illustrated has a dimension of 0.2 mm x 8 mm (0.008" x 0.315").

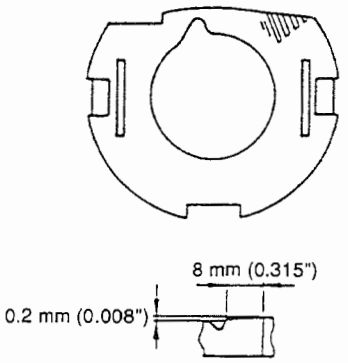


Fig. 5-32-1

(33) Removing the play from the shuttle driver shaft

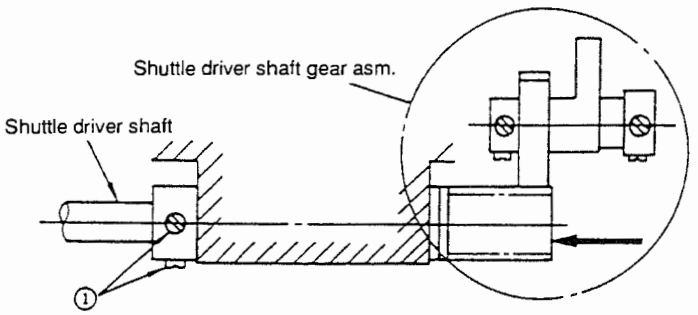


Fig. 5-33-1

(34) Providing the main shaft with proper play

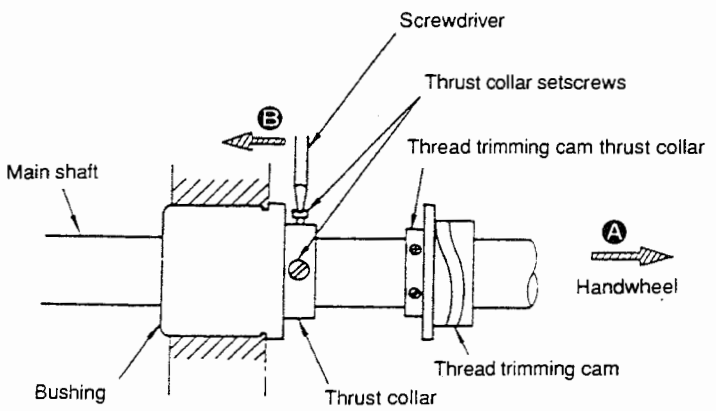


Fig. 5-34-1

HOW TO ADJUST	Results of Improper Adjustment
• If the hatched portion does not have the 0.2 mm x 8 mm (0.008" x 0.315") dimension, correct it using an oilstone.	
• Axial play Loosen two setscrews ❶, and push the shuttle driver shaft in the direction of the arrow, then tighten the setscrews. • Rotational play Select the proper shuttle driver shaft gear assembly from those listed below: o B18112050AY Shuttle driver shaft gear asm. (Y) (0.2 mm (0.008") dia. small) o B18112050AZ Shuttle driver shaft gear asm. (Z) (0.1 mm (0.004") dia. small) o B18112050AA Shuttle driver shaft gear asm. (A) (standard) o B18112050AB Shuttle driver shaft gear asm. (B) (0.1 mm (0.004") dia. large) o B18112050AC Shuttle driver shaft gear asm. (C) (0.2 mm (0.008") dia. large)	
• Push the thrust collar in the direction of the arrow Ⓑ while pulling the handwheel in the direction of the arrow Ⓐ, then fix the thrust collar.	

(35) Belt tension

The middle of the belt shown by the arrow should slack 10 mm (0.394") when it is subjected to a 1 kg load.

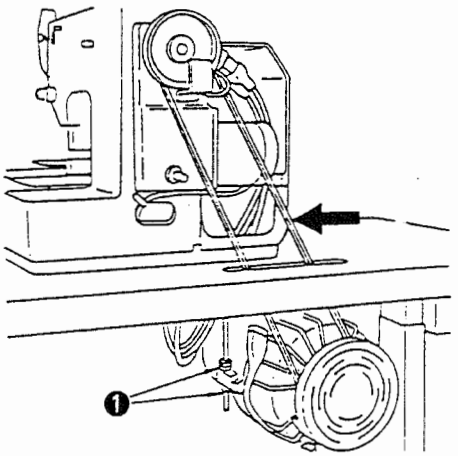


Fig. 5-35-1

HOW TO ADJUST	Results of Improper Adjustment
Loosen nuts ❶, and move the motor up or down to obtain the proper belt tension. After adjustment, tighten the nuts.	• The vibration of the belt may increase, resulting in larger vibration of the sewing machine.

(36) Removing the handwheel and generator stator

1) Loosen two setscrews ❶, and remove the handwheel.
2) Remove one of the setscrews ❷ of the generator stator, and loosen the two inner setscrews.
3) Remove the generator stator (synchronizer).

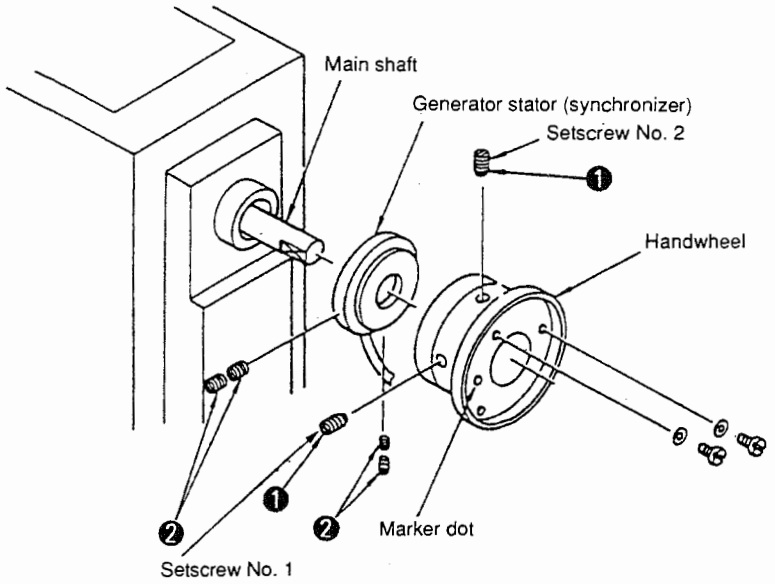


Fig. 5-36-1

(37) Removing the shuttle driver shaft

1) Loosen setscrew ❶, and remove the shuttle driver.

2) Loosen setscrew ❷, and draw the shuttle driver shaft off backward.

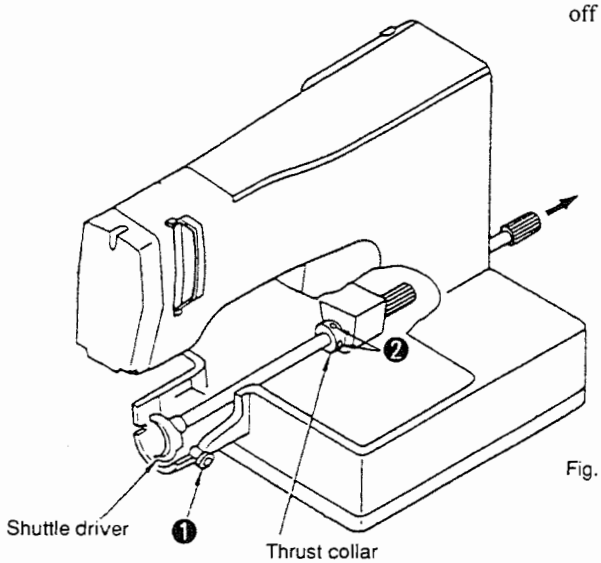
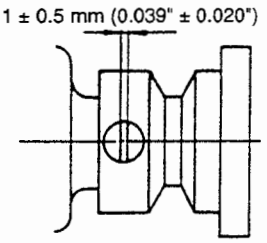
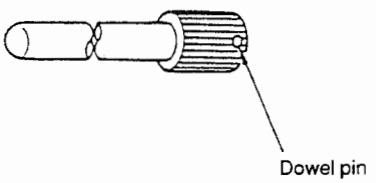


Fig. 5-37-1

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
 Fig. 5-36-2	• When installing the generator stator, be sure that its setscrews face just to the left side and just below. When fixing the handwheel, be sure that the setscrew No. 1 is located on the flat part of the main shaft (viewed from counterclock direction). At this time, adjust the clearance between the generator stator and the handwheel to 1 mm ± 0.5 mm (0.039" ± 0.020"). (Fig. 5-36-2)
• When removing the shuttle driver shaft, never remove the dowel pin from the shuttle driver shaft gear, otherwise the shuttle driver shaft needle bearing will be damaged.  Fig. 5-37-2	• When assembly the same gear assembly, be sure to assembly it so that the teeth contact exactly in the same manner as before in order to prevent loud gear noise.

(38) Removing the oscillating rock and crank rod

1) Loosen setscrew ❶.
2) Loosen two setscrews ❷ and two setscrews ❸.
3) Remove the oscillating rock backward.
4) Remove setscrews ❹, and remove the crank rod and the oscillating rock.

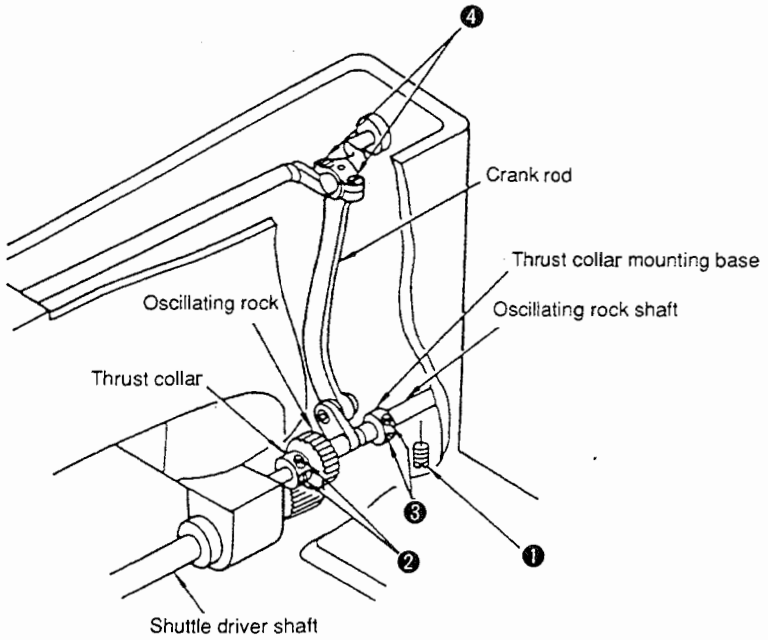


Fig. 5-38-1

(39) Removing the thread trimmer mounting base and thread trimming solenoid

1) Remove setscrews ❶.
2) Remove the thread trimmer mounting base.
3) Loosen setscrew ❸ to release the thread trimming solenoid bracket.
4) Remove the thread trimming solenoid bracket.
5) Remove lock nuts ❷ to release the thread trimming solenoid.
6) Remove the thread trimming solenoid.
7) Disconnect the lead wire of the thread trimming solenoid from the connector.

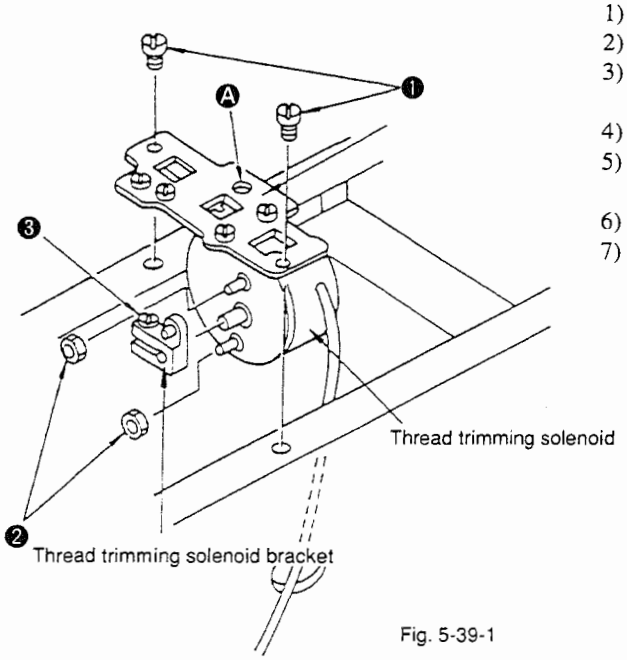
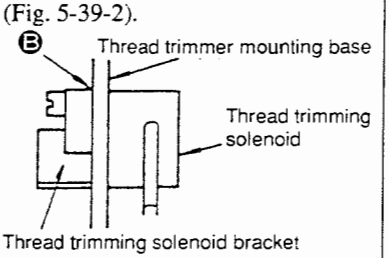


Fig. 5-39-1

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
• Pay attention to the orientation of the cap of the crank rod.	• Be sure that the oscillating rock is free from axial play. • If the main shaft does not turn smoothly, correct the mounting position of the thrust collar and the thrust collar mounting base.
• Note that the thread trimming solenoid lock nuts are fixed using the LOCK-TITE paint. • For removing the thread trimming solenoid terminal from the connector, see the solenoid connection diagram. (See page 207.)	• Fix the thread trimming solenoid lock nuts by applying LOCK-TITE No. 242 after defatting them. • To fix the thread trimming solenoid bracket, press the tension release shaft arm against the cam follower after fixing the thread trimmer mounting base . Then, insert a screwdriver through Ⓐ of the thread trimmer mounting base, and tighten setscrew ❸ (Fig. 5-39-1). At this time, adjust the clearance Ⓑ between the thread trimming solenoid bracket and the thread trimmer mounting base to 0 mm. (Fig. 5-39-2).  Fig. 5-39-2 • For the adjustment of the thread trimmer mounting base, refer to Standard Adjustment (16).

(40) Removing the tension release arm components

1) Remove the thread trimmer mounting base. (Refer to (39).)
2) Loosen setscrew ❶.
3) Draw out the thread trimming cam shaft in the direction of the arrow. Remove the resetting spring (large), resetting spring (small), and tension release shaft arm.

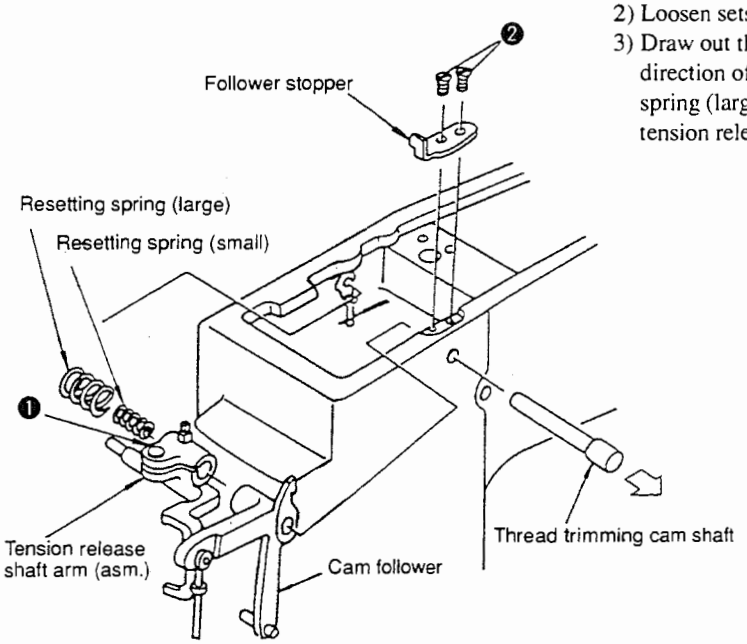


Fig. 5-40-1

(41) Removing the work clamp solenoid (S-, T-type only)

1) Remove the solenoid link shaft stopper ring, and draw out the solenoid link shaft.
2) Loosen the vinyl pipe holder setscrew, and move the vinyl pipe holder to remove the vinyl pipe.
3) Remove the four setscrews of the work clamp solenoid mounting plate, and remove the work clamp solenoid.
4) Disconnect the lead wire of the work clamp solenoid from the connector.

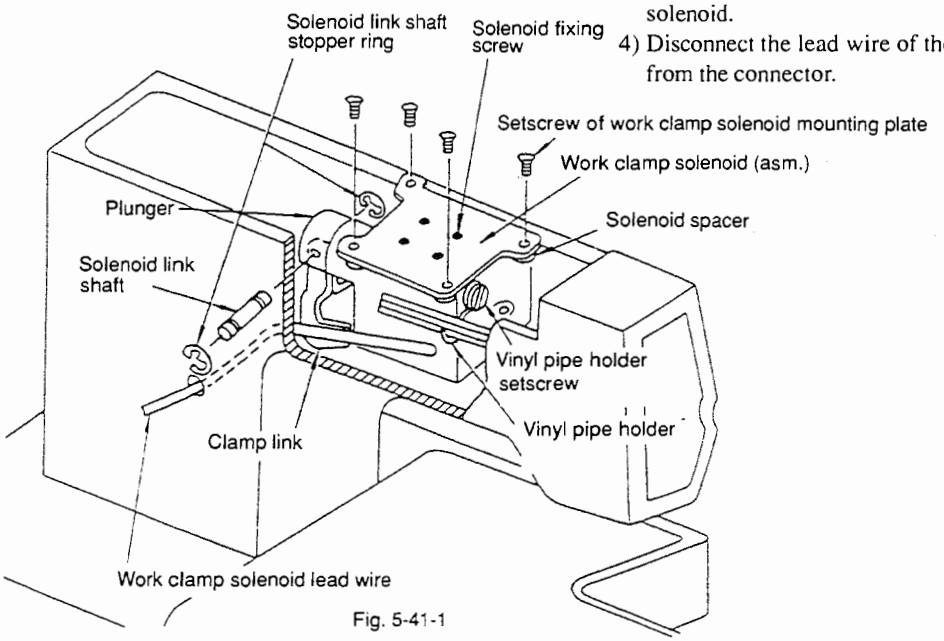
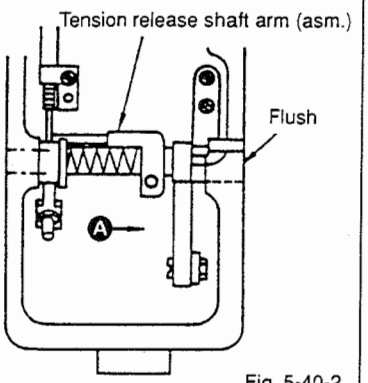
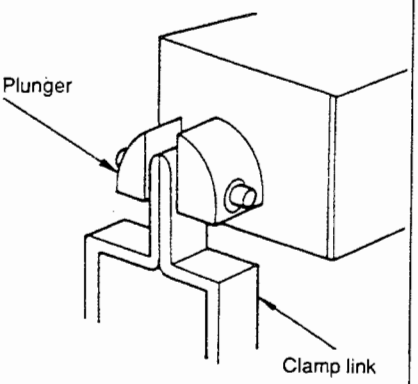


Fig. 5-41-1

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
	• Make the left edge of the thread trimming cam shaft (as observed from the face plate) flush with the side face of the machine arm. Press the tension release shaft arm in the direction of the arrow Ⓐ before tightening setscrews ❷.  Fig. 5-40-2 (Perform adjustment in the thrusting direction so that the tension release shaft arm assembly and the cam follower turn smoothly and independently.)
• Be careful not to lose the solenoid link shaft stopper ring. • Refer to the solenoid connection diagram for disconnecting the work clamp solenoid terminal from the connector.	• Be sure that the cut face of the plunger faces downward.  Fig. 5-41-2

(42) Removing the intermediate presser foot solenoid (excluding the GL type)

1) Remove the intermediate presser foot wire setting screw nuts.
2) Remove the solenoid mounting base setscrews.
3) Disconnect the intermediate presser foot solenoid lead wire from the connector.
4) Loosen the setscrews of the intermediate presser foot solenoid bracket, and remove the intermediate presser foot solenoid bracket.

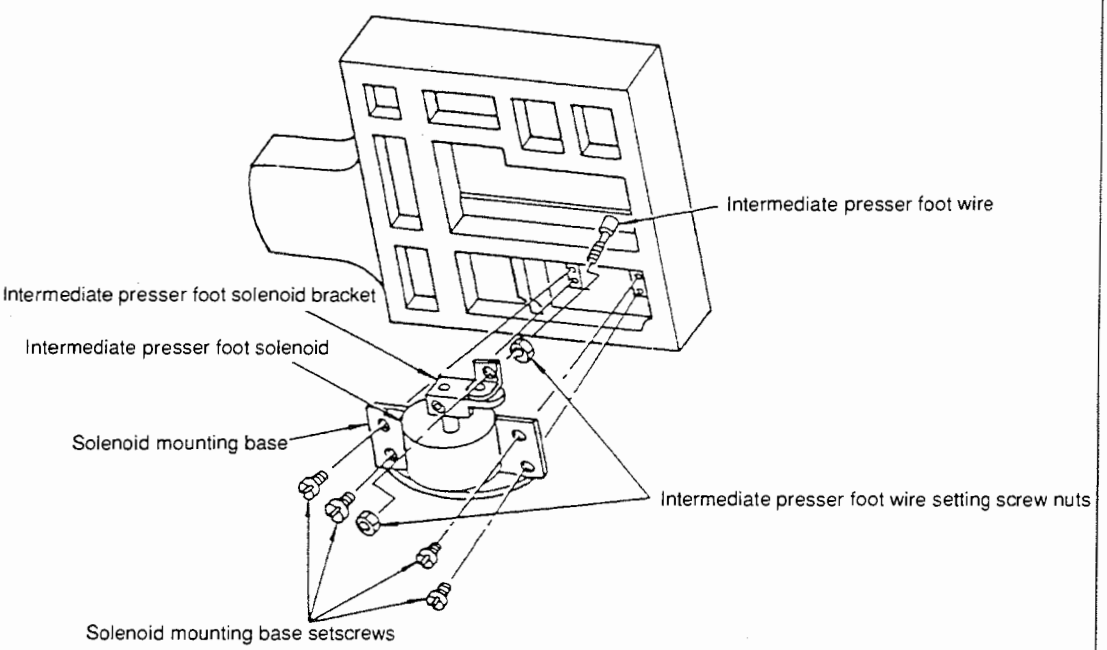
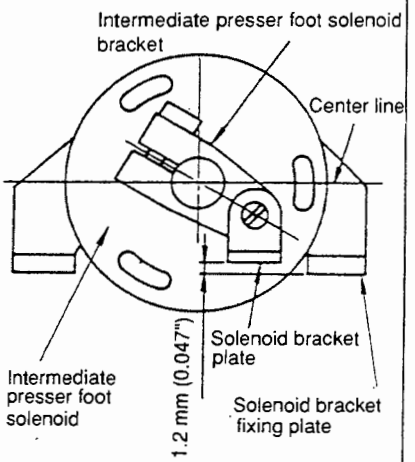


Fig. 5-42-1

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
1) When removing the intermediate presser foot wire setting screw nuts, be careful not to bend the intermediate presser foot wire. 2) For disconnection of the intermediate presser foot solenoid terminal from the connector, refer to the solenoid connection diagram.	1) The rotational angle of the intermediate presser foot solenoid is 45 degrees. In the initial state, the difference in level between the solenoid bracket plate and the solenoid bracket fixing plate is 1.2 mm (0.047") as illustrated. 2) For the locking position of the intermediate presser foot wire setting screw nuts, refer to step (20) of Standard Adjustment. 3) When tightening the intermediate presser foot wire setting screws, be careful not to allow the intermediate presser foot wire to bend.  Fig. 5-42-2

(43) Intermediate presser foot components (excluding the GL type)

A) How to remove the wire mounting plate

1) Remove the intermediate presser foot wire setting screw nuts. (See Disassembly/Assembly Procedures (42).)
2) Remove the wire mounting plate setscrews, and remove the wire mounting plate.
3) Loosen the wire clamp setscrew, and remove the intermediate presser foot wire.

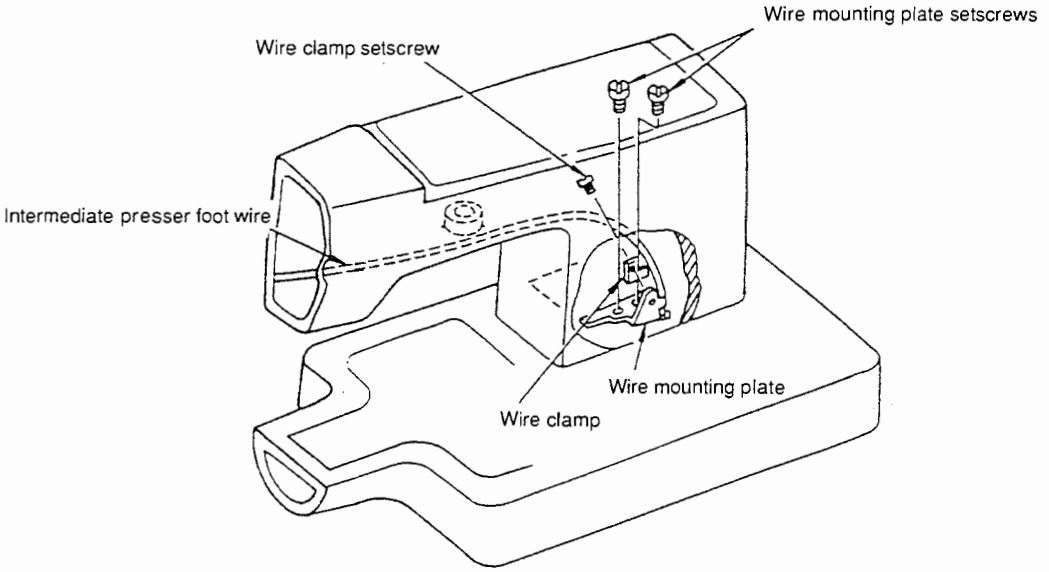


Fig. 5-43-1

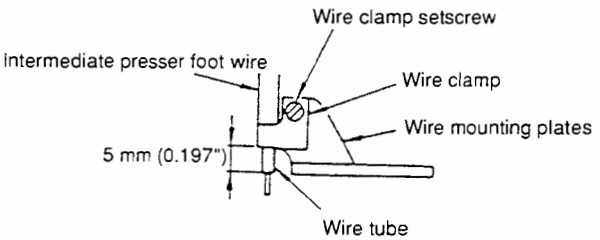


Fig. 5-43-2

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
• Be careful not to allow the portion near the intermediate presser foot wire terminal to bend.	• When fixing the intermediate presser foot wire to the wire mounting plate, allow the end of the wire tube to extrude 5 mm (0.197") from the wire clamp before fixing it. (Fig. 5-43-2)

B) How to remove the intermediate presser foot cam and intermediate presser foot wire (excluding the GL type)

1) Remove the presser spring regulator, and detach the guide bar and spring.
2) Remove the lifting spring.
3) Remove snap ring ❹.
4) Loosen nut ❷, remove screw ❶, setscrew ❸, then detach the intermediate presser foot cam (asm.).
5) Remove snap ring ❽, hinge screw ❺, and detach the presser follower arm.
6) Remove setscrew ⓫, clamp screw ⓾, and setscrew ❾, then detach the connecting link plate.
7) Remove hinge screw ❼, and setscrew ❻, and detach the intermediate presser foot wire.

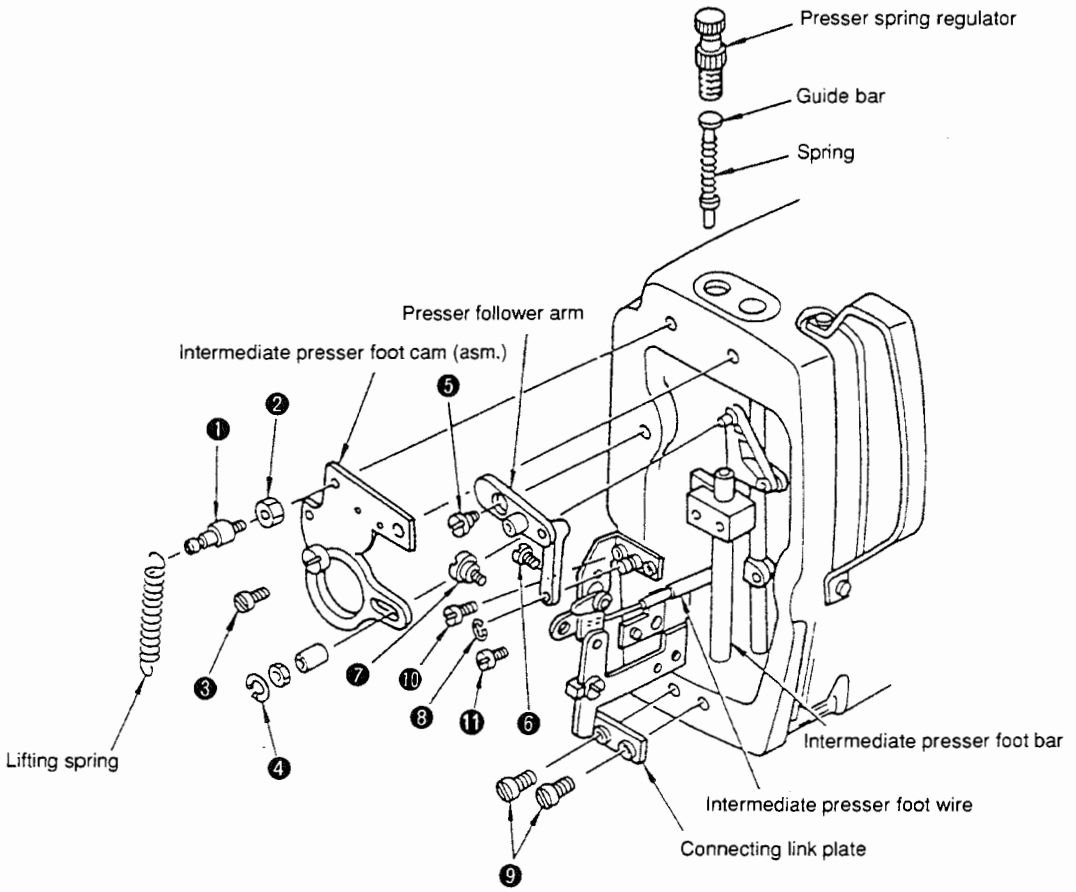


Fig. 5-43-3

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
Be careful not to bend the part near the intermediate presser foot wire terminal, otherwise the wire may be damaged when it is in service.	For the adjustment after reassembly, refer to Standard Adjustment (19) and (20).

(44) Removing the wiper and wiper solenoid

1) Remove the intermediate presser foot bar. (See Standard Adjustment (19).)
2) Remove snap ring ❸.
3) Remove four setscrews ❶ which retain the solenoid installing plate. Then, remove the wiper solenoid assembly.
4) Disconnect the wiper solenoid lead wire from the connector.
5) Loosen setscrew ❷, and remove the wiper solenoid bracket.
6) Remove setscrew ❹, and draw the wiper assembly down to remove it.

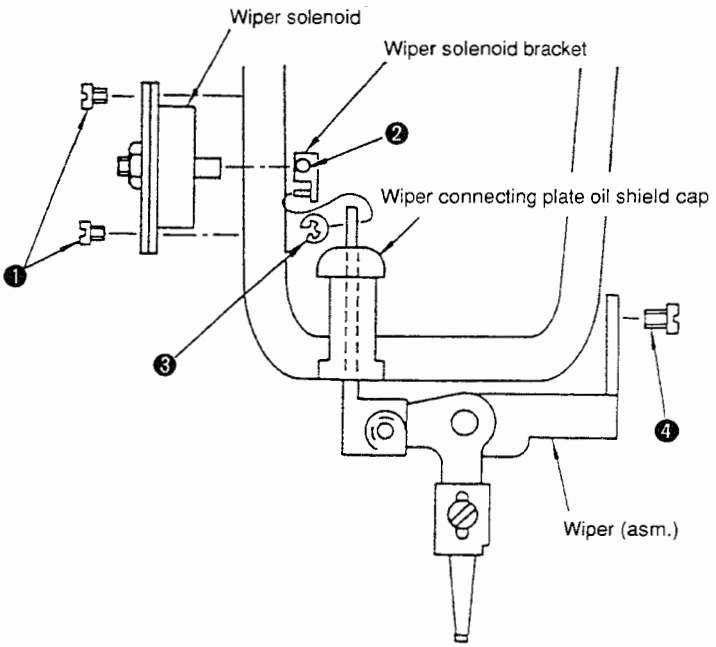
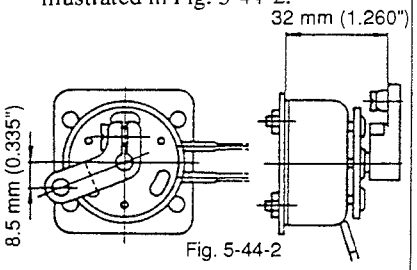
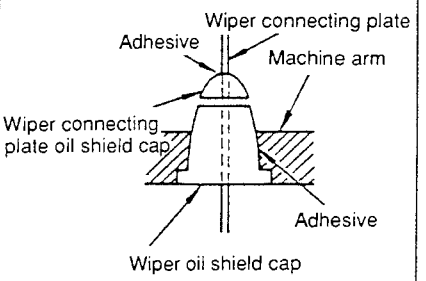


Fig. 5-44-1

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
• The wiper connection plate oil shield cap is adhered to the wiper assembly. • When disconnecting the wiper solenoid terminal from the connector, see the solenoid connection diagram. • The wiper oil shield cap is adhered to the machine arm. (Fig. 5-44-3)	1) Install the wiper solenoid bracket as illustrated in Fig. 5-44-2.  Fig. 5-44-2 2) Place the wiper connecting plate oil shield cap over the wiper oil shield cap, and fix the wiper connecting plate oil shield cap to the wiper connecting plate, using a rubber-based adhesive.  Fig. 5-44-3

(45) Removing the X-Y table

1) Remove the shuttle driver shaft.
   (See Disassembly/Assembly Procedure (37).)
2) Remove the feed bracket from the X-Y table.
   (Two setscrews)
3) Remove eight bracket fixing screws ❶, four setscrews ❷, belt tension adjusting screw ❹, and nut ❸.
4) Remove the X-Y table in the direction of the arrow so that the bottom of the X-Y table timing belt passes under the thread trimming link rod.

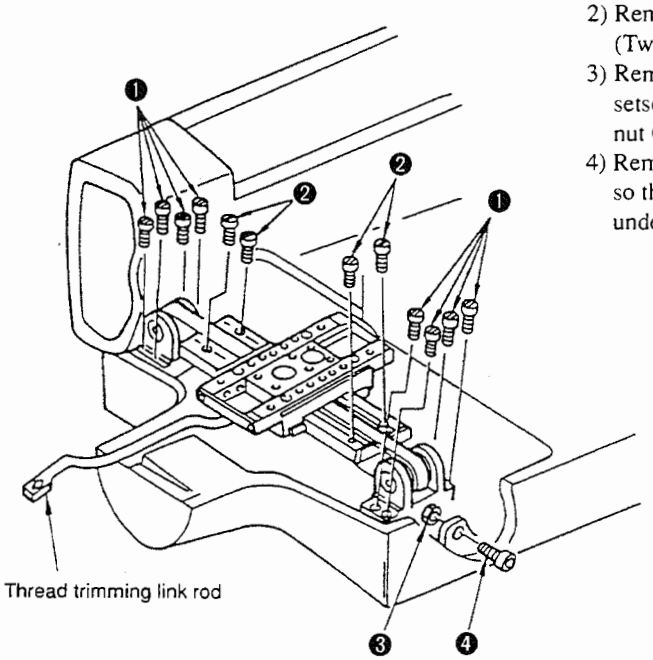


Fig. 5-45-1

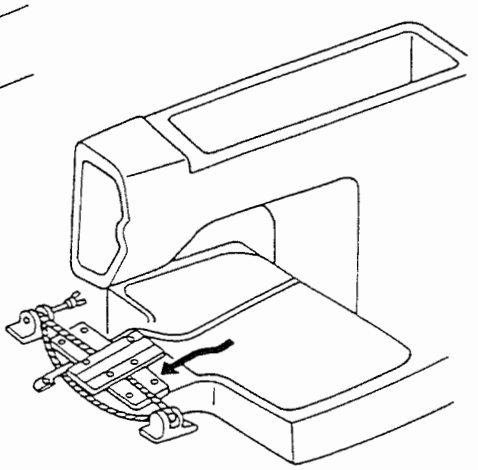


Fig. 5-45-2

(46) Removing the cam follower assembly

1) Remove the thread trimming cam shaft.
   (See Disassembly/Assembly Procedure (40).)
2) Remove the throat plate.
3) Remove the X-Y table.
   (See Disassembly/Assembly Procedure (45).)
4) Remove the thread trimming link hinge screw.
5) Remove the cam follower under the machine bed while slightly bending it.

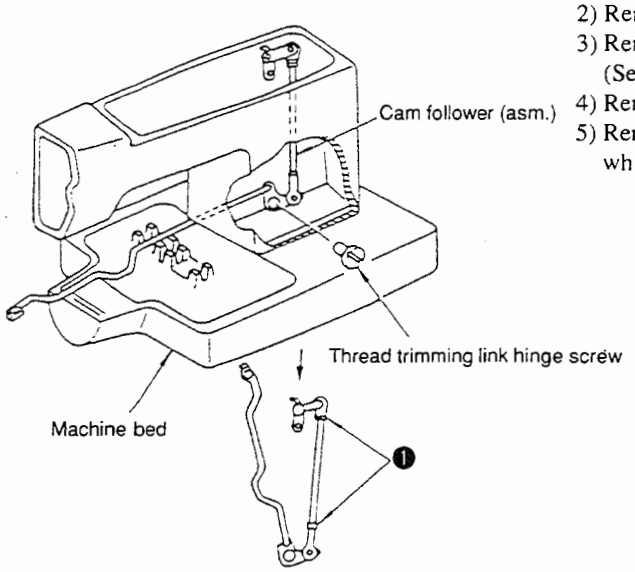
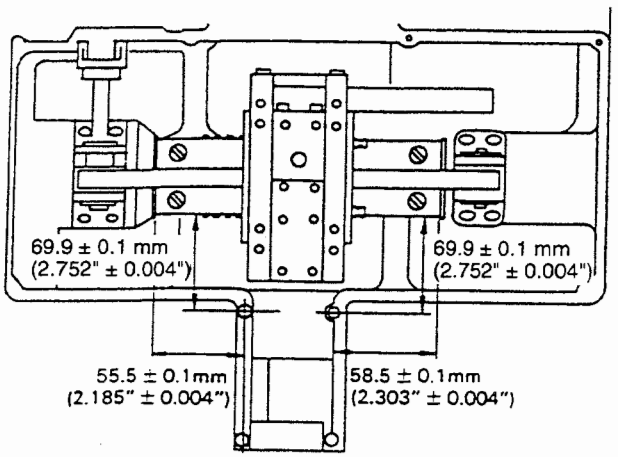
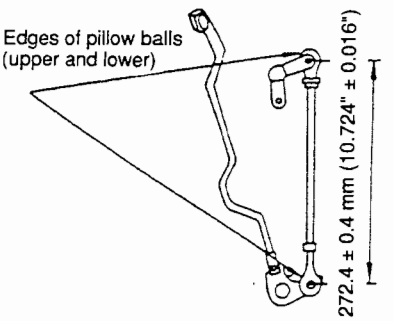


Fig. 5-46-1

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
1) Be careful not to scratch or lose the X-Y table bearing.  Fig. 5-45-3	1) Position and fix the X-Y table according to Fig. 5-45-3. (Standard throat plate setscrew hole dia.: Setscrew hole dia. 11/64 pitch 40) 2) For the belt tension adjustment, see Standard Adjustment (28).
• Do not loosen rod length adjusting screw nut ❶.	• When the cam follower assembly has been disassembled, be sure to adjust the center-to-center distance of the pillow balls to 272.4 ± 0.4 mm (10.724" ± 0.016"). (At this time, make sure that the edges of the upper and lower pillow balls are in parallel.)  Fig. 5-46-2

(47) Removing the Y motor base

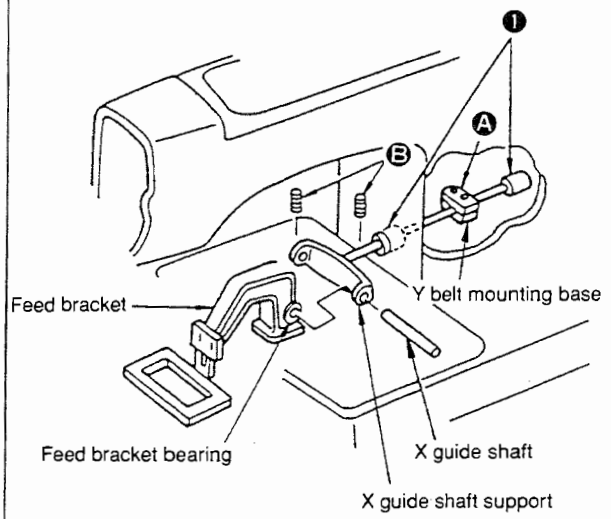


Fig. 5-47-1

1) Remove the two setscrews of the feed bracket.
2) Loosen X guide shaft setscrews Ⓑ, remove the X guide shaft, and remove the feed bracket.
3) Loosen clamp screw Ⓐ, and remove the X guide shaft support.
4) Remove the crank rod. (See Disassembly/Assembly Procedure (38).)
5) Remove the cam follower. (See Disassembly/Assembly Procedure (46).)
6) Remove the X feed stepping motor.
7) Remove the Y feed stepping motor.
8) Remove fixing screws Ⓒ, and detach the Y motor base.

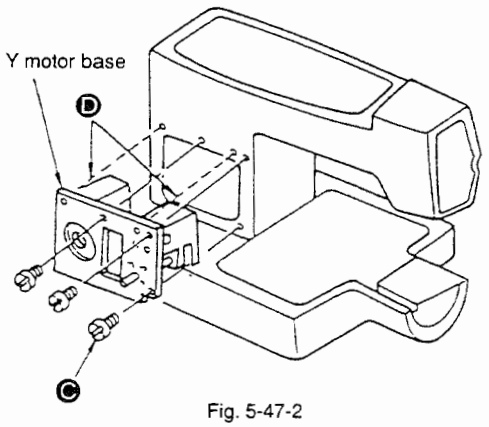
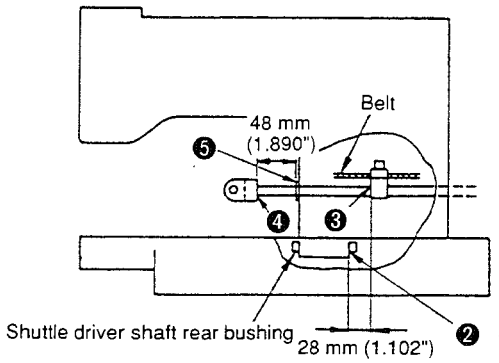


Fig. 5-47-2

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
• When removing the X guide shaft and the X guide shaft support, be careful not to allow the steel balls in feed bracket bearing and Y travel shaft bearing ❶ to fall.  Fig. 5-47-3	• When fixing the Y motor base, be sure to align positioning pins Ⓓ with the positioning holes. • Before passing the X guide shaft and X guide shaft support through feed bracket bearing and Y travel shaft bearing ❶, apply grease to the inside of the bearings to prevent the steel ball from slipping out from the bearings. • When fixing the Y belt base to the X guide shaft support, be sure to provide a 28 mm (1.102") clearance between shuttle driver shaft rear bushing edge ❷ and Y belt base edge ❸, and a 48 mm (1.890") clearance between X guide shaft support edge ❹ and Y travel shaft bearing edge ❺. Also, make sure that the X guide shaft support is levelled. • After mounting the feed bracket, perform fine adjustment of the horizontality of the X guide shaft support according to Standard Adjustment (27).

(48) Removing the tension release wire

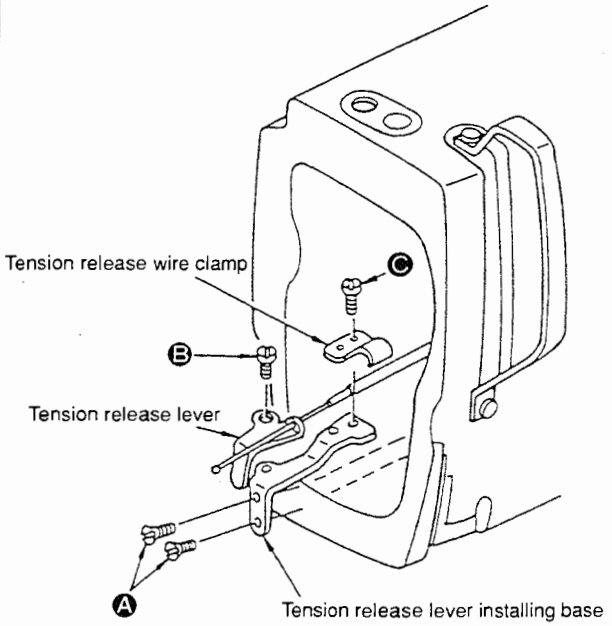


Fig. 5-48-1

1) Remove the tension release wire fixing screw nut, loosen setscrew ❷, then detach the tension release wire from the wire clamp. (Figs. 5-17-1, -2)
2) Remove setscrews Ⓐ.
3) Remove hinge screw Ⓑ.
4) Remove setscrew Ⓒ, and detach the tension release wire.

(49) Removing the main shaft

1) Remove the handwheel and the generator stator. (See Disassembly/Assembly Procedure (36).)
2) Remove two setscrews ❶ of the counterweight.
3) Remove the crank rod cover. (See Disassembly/Assembly Procedure (38).)
4) Loosen two setscrews ❷, two setscrews ❸, two setscrews ❹, and two setscrews ❺.
5) Apply a brass rod to portion Ⓐ, and tap Ⓐ lightly to remove the main shaft together with the main shaft rear bushing.

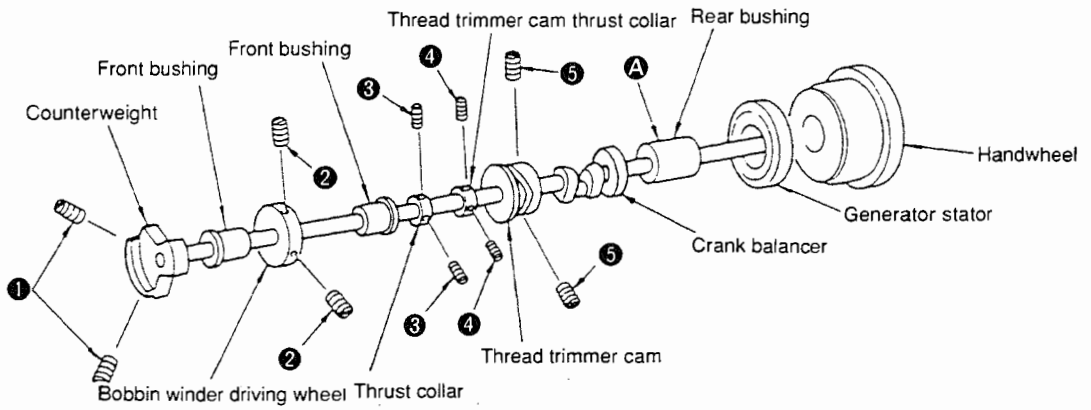
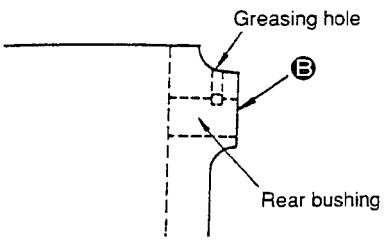


Fig. 5-49-1

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
	• Adjust the degree of release of the tension disks according to Standard Adjustment (18).
• Be sure to use a soft metal like a brass rod for tapping portion Ⓐ.  Fig. 5-49-2	1) When driving the rear bushing in, be sure to align the greasing hole in the machine arm with the greasing hole in the rear bushing. Also, be sure that the end face of the rear bushing is flush with the end face of the machine arm at face Ⓑ. 2) See Standard Adjustment (23) for the mounting position of the bobbin winder driving wheel. 3) See Standard Adjustment (34) for the installation of the main shaft thrust collar. 4) See Standard Adjustment (15) for the installation of the thread trimmer cam and the thread trimmer cam thrust collar. Also, perform the check described in (16), (17) and (18) of Standard Adjustment. 5) See Disassembly/Assembly Procedure (38) for the installation of the crank rod cover.

(50)-1. How to assemble the pneumatic circuits (L type excluding the GL type)

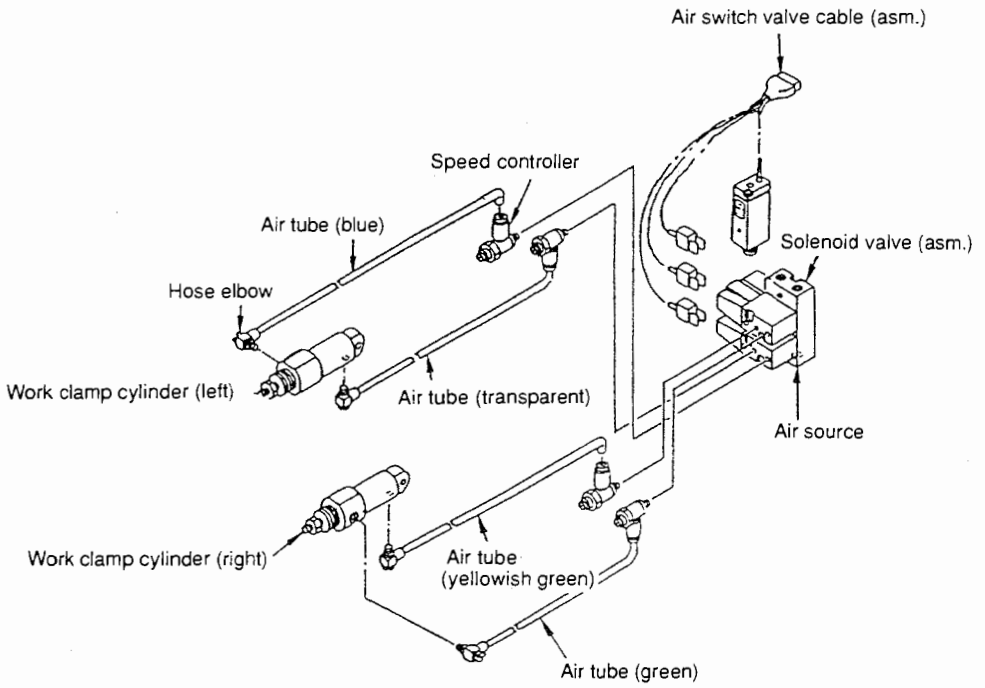


Fig. 5-50-1

(50)-2. How to assemble the pneumatic circuits (GL type)

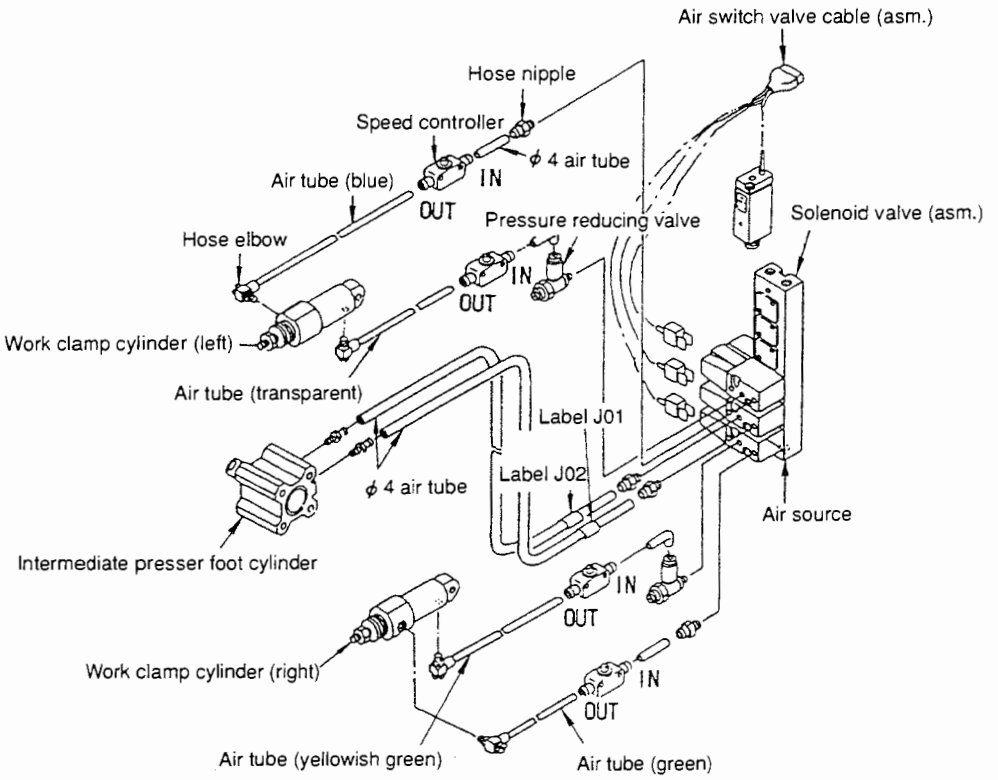
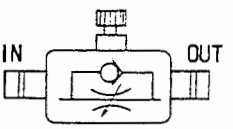


Fig. 5-50-2

CAUTIONS IN DISASSEMBLY	CAUTIONS IN ASSEMBLY
	• One of the connectors of the air switch valve cable (asm.) will remain unused. Do not take this as a failure. • Refer to page 26 for how to connect the air switch valve cable (asm.) to the solenoid valve.
	• Refer to page 26 for how to connect the air switch valve cable (asm.) to the solenoid valve. • The attaching direction of the speed controller is as shown in Fig. 5-50-3.  Fig. 5-50-3

5-2. Parts to be fixed by LOCK-TITE paint

The machine is subjected to frequent start and stop, therefore, LOCK-TITE paint is used to securely fix the screws which are likely to loosen easily.
When an assembly which includes the above-mentioned screws has been disassembled, remove the residual paint thoroughly using paint thinner, and assemble it using LOCK-TITE No. 242 after removing the moisture from the mating surfaces.
If the screw which has been fixed using the paint is hard to remove, it is advisable to warm it using a torch lamp.
The following components use the LOCK-TITE paint:

(1) X-Y table components

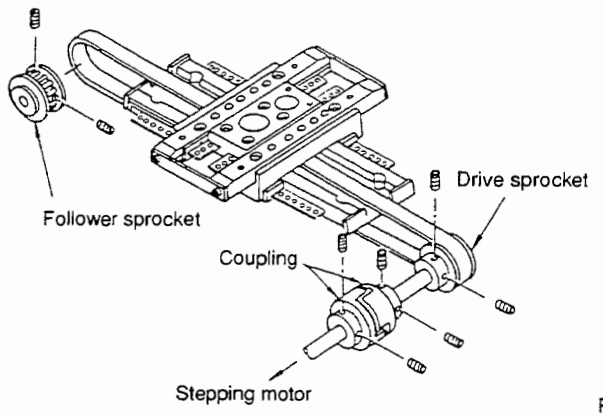


Fig. 1

- Coupling setscrews
- Drive sprocket setscrews
- Follower sprocket setscrews

(2) Y motor base components

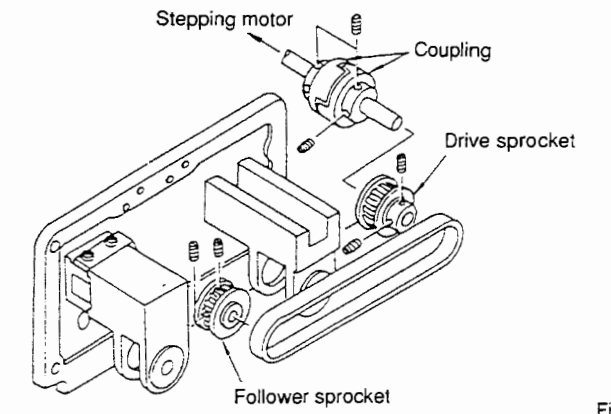


Fig. 2

- Coupling setscrews
- Drive sprocket setscrews
- Follower sprocket setscrews

(3) Shuttle driver shaft gear

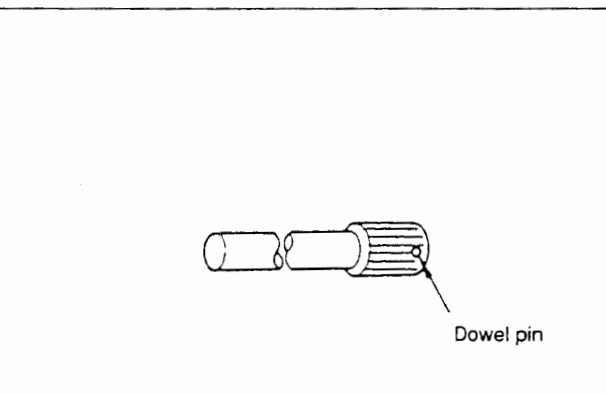


Fig. 3

- Gear dowel pin assembly

(4) X guide shaft setscrews

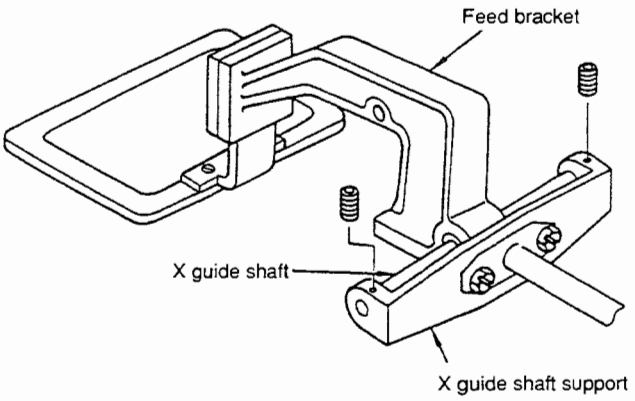


Fig. 4

(5) Bearing components (S-, T-type only)

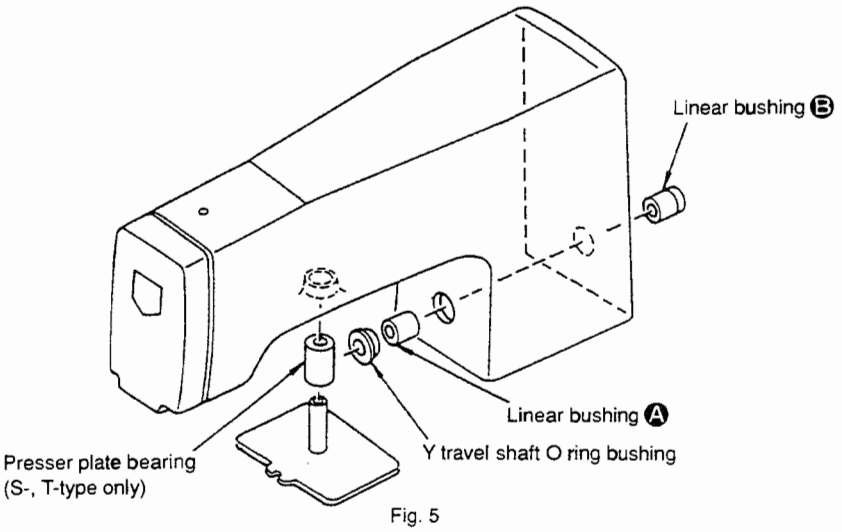


Fig. 5

(Caution)
Never allow the LOCK-TITE paint to get into the bearings, or else the proper function of the bearings may be prevented.

(6) Wiper solenoid lock nut

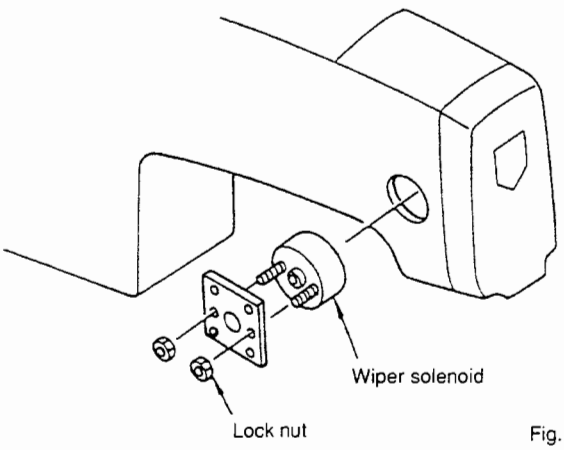


Fig. 6

(7) Thread trimmer solenoid lock nut

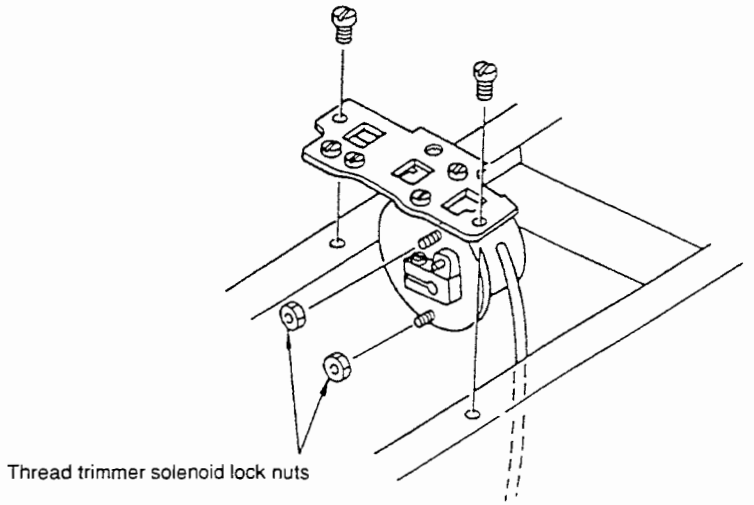


Fig. 7

(8) Intermediate presser foot follower arm pivot hinge screw

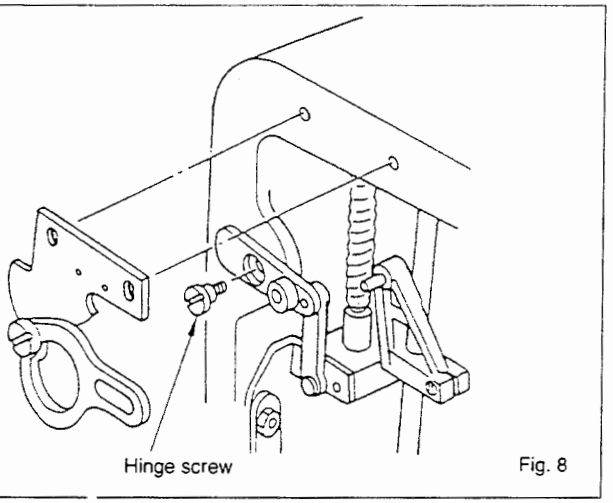


Fig. 8

(Caution)
Be very careful not to allow the LOCK-TITE paint to adhere to the shank of the hinge screw.

(9) Screw and nut of the intermediate presser foot lifting link shaft (GL type only)

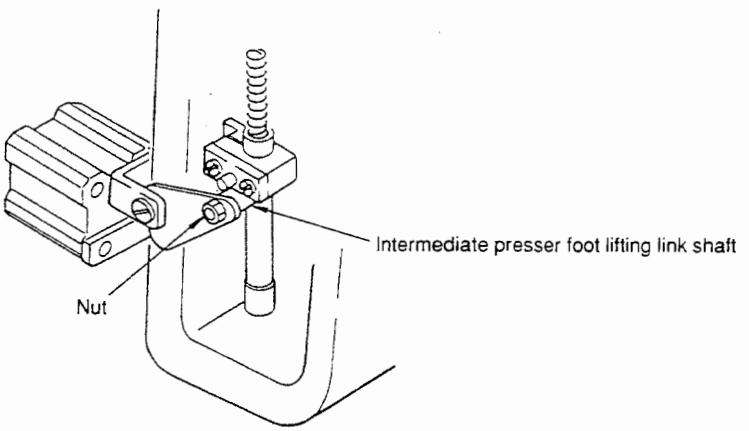


Fig. 9

5-3. Greasing parts

- Supply grease when a grease-involving part has been disassembled or one every other year.
- Grease to be used
  Lithium-based grease No. 2

Manufacturer	Name of grease
ESSO	Listan 2, Beacon 2
SHELL	Albania
NIPPON SEKIYU	Multinock 2, Epinock 2
KYODO SEKIYU	Rezonix 2
IDEMITSU KOSAN	Koronex 2

- Parts to be greased
  If no grease pump is available, it is advisable to use a plastic oiler or an injector with the needle removed.

(1) Screw stud and the bottom face of the feed plate carrier bar (S-, T-type only)

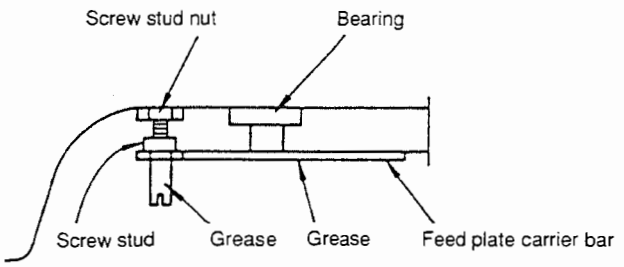


Fig. 1

(2) X-Y table retainer assembly

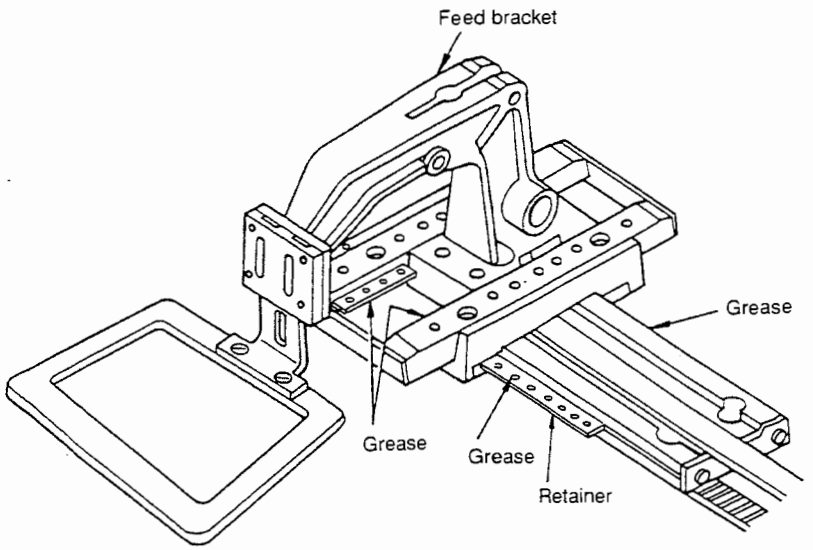


Fig. 2

(3) Feed bracket (S-, T-type only)

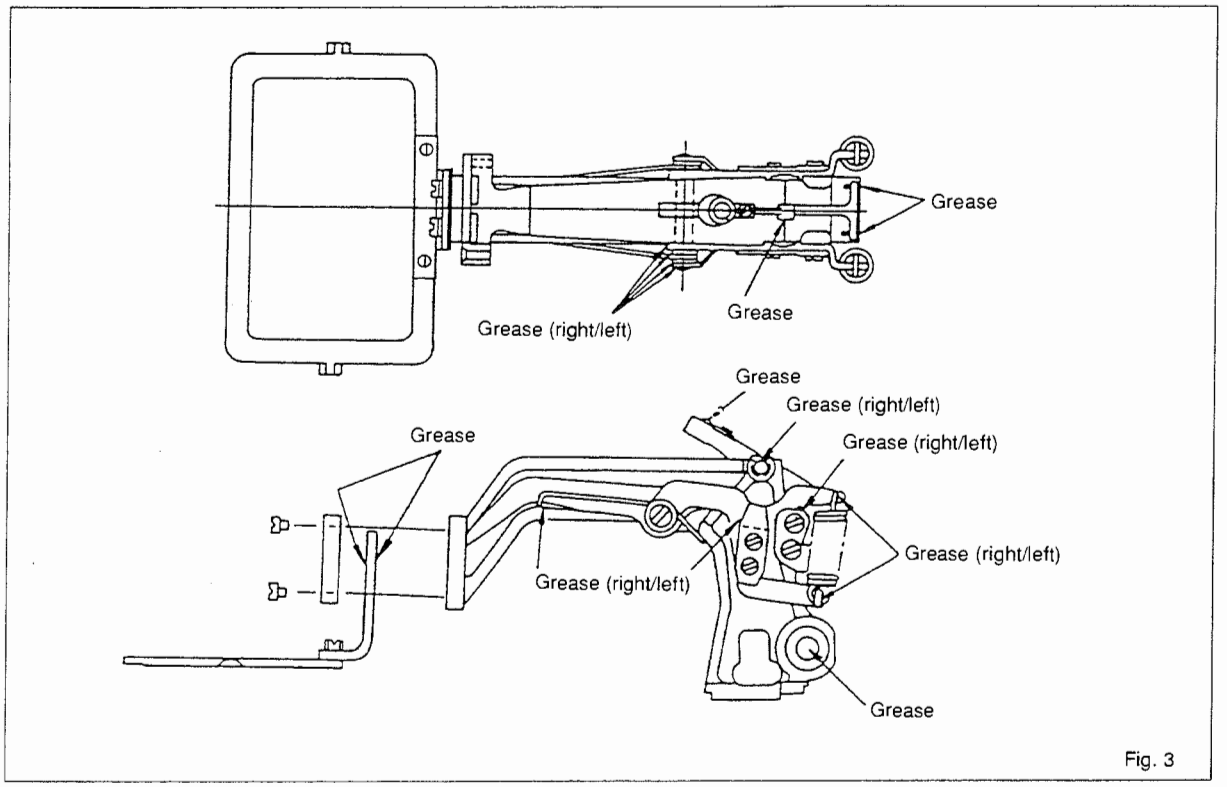


Fig. 3

(4) Intermediate presser foot cam

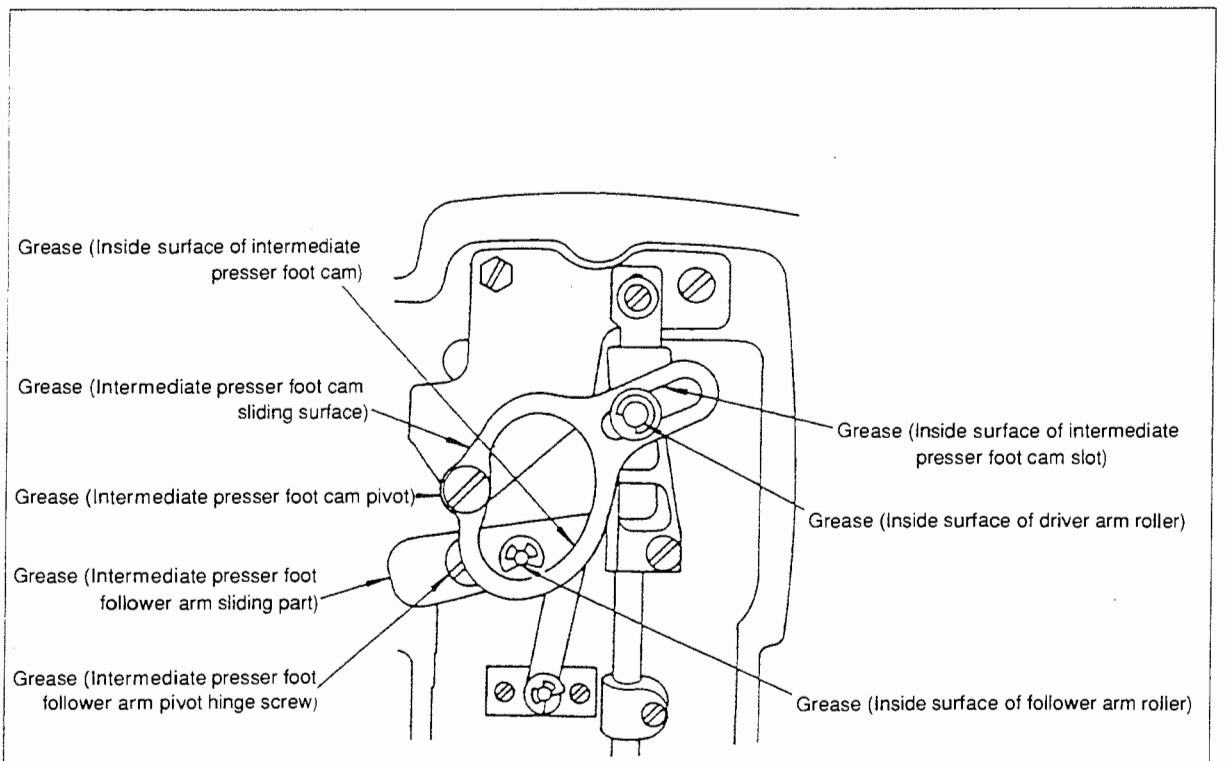


Fig. 4

(5) Main shaft rear bushing

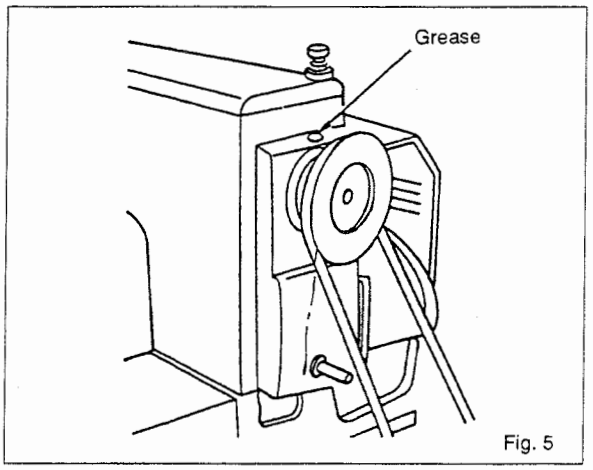


Fig. 5

(6) Bobbin winder base bearing of bobbin winder

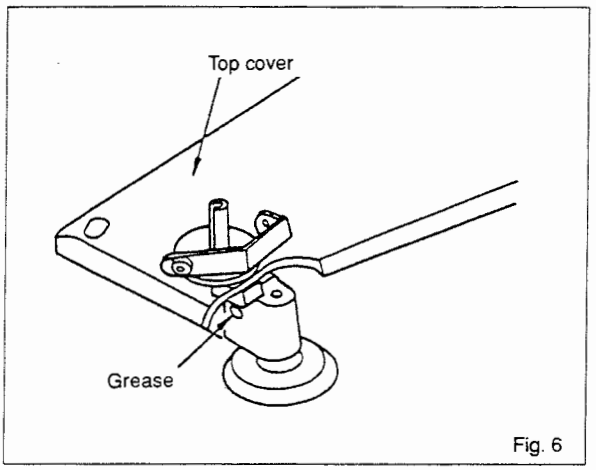


Fig. 6

(7) Feed bracket (L type only)

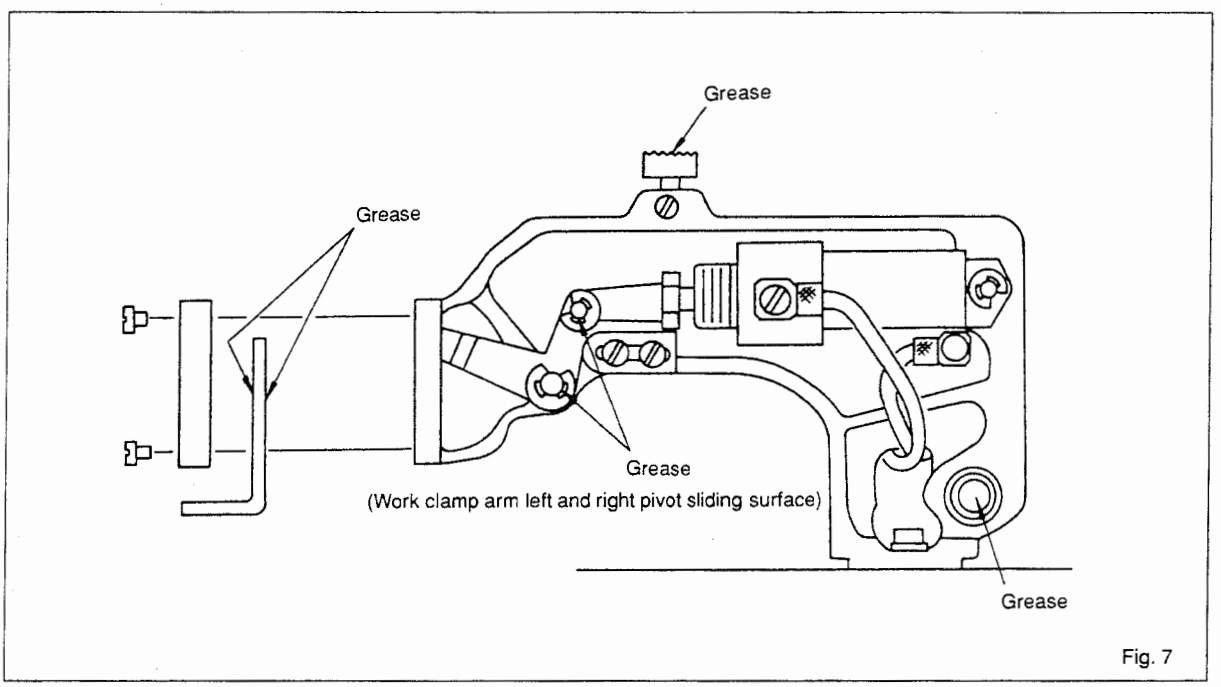


Fig. 7

(8) Intermediate presser foot (GL type only)

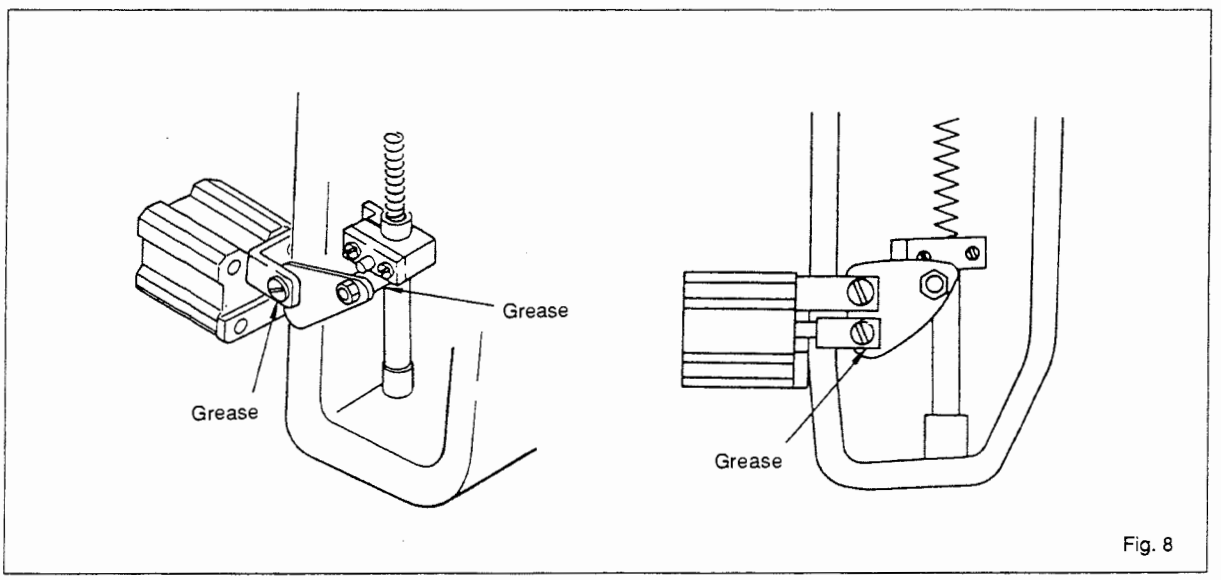
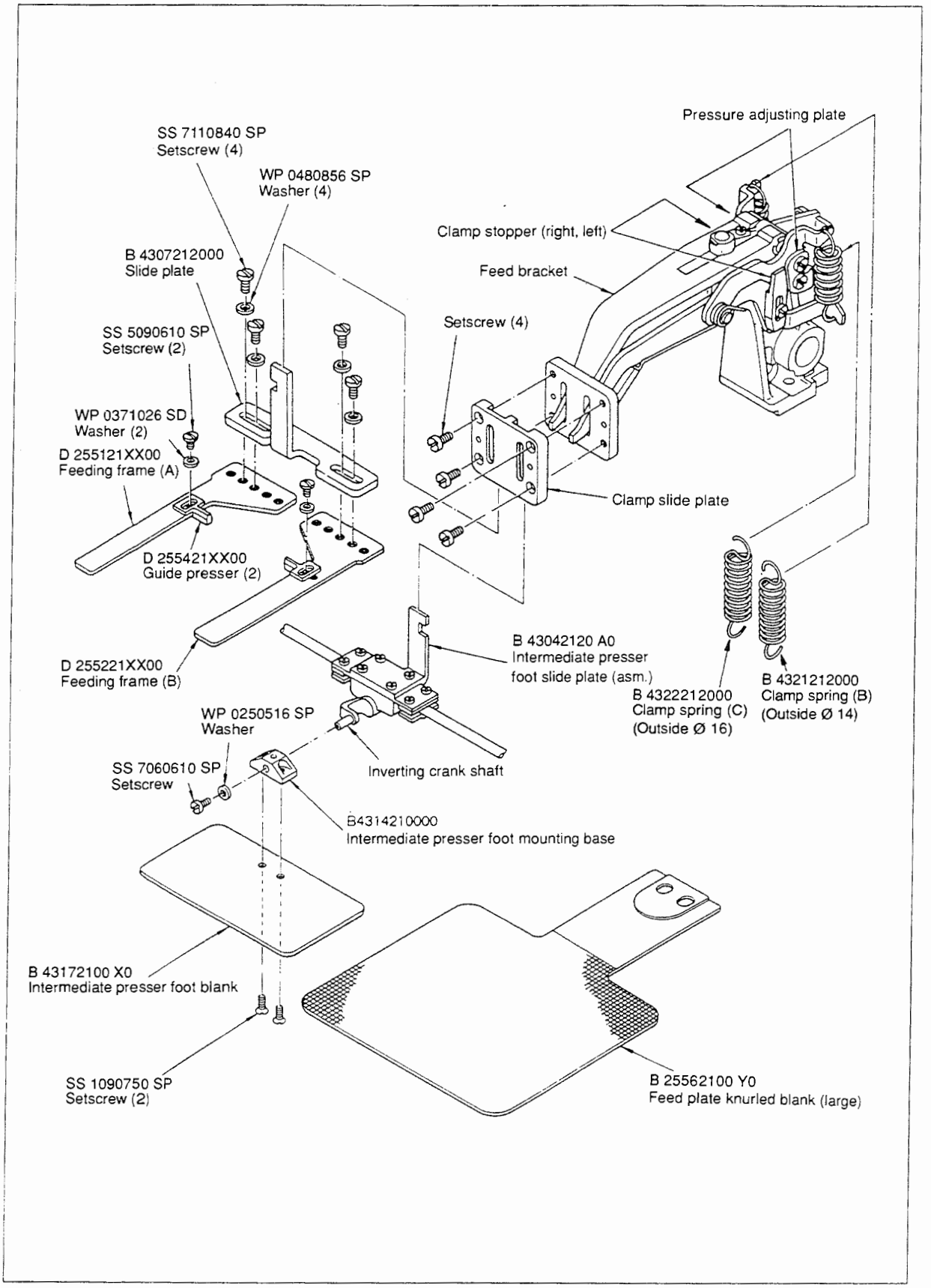


Fig. 8

5-4. How to install the inverting device

(Model AMS-210CST, AMS-210CHT, AMS-212CST, AMS-212CHT)

(1) Installing the work clamp components

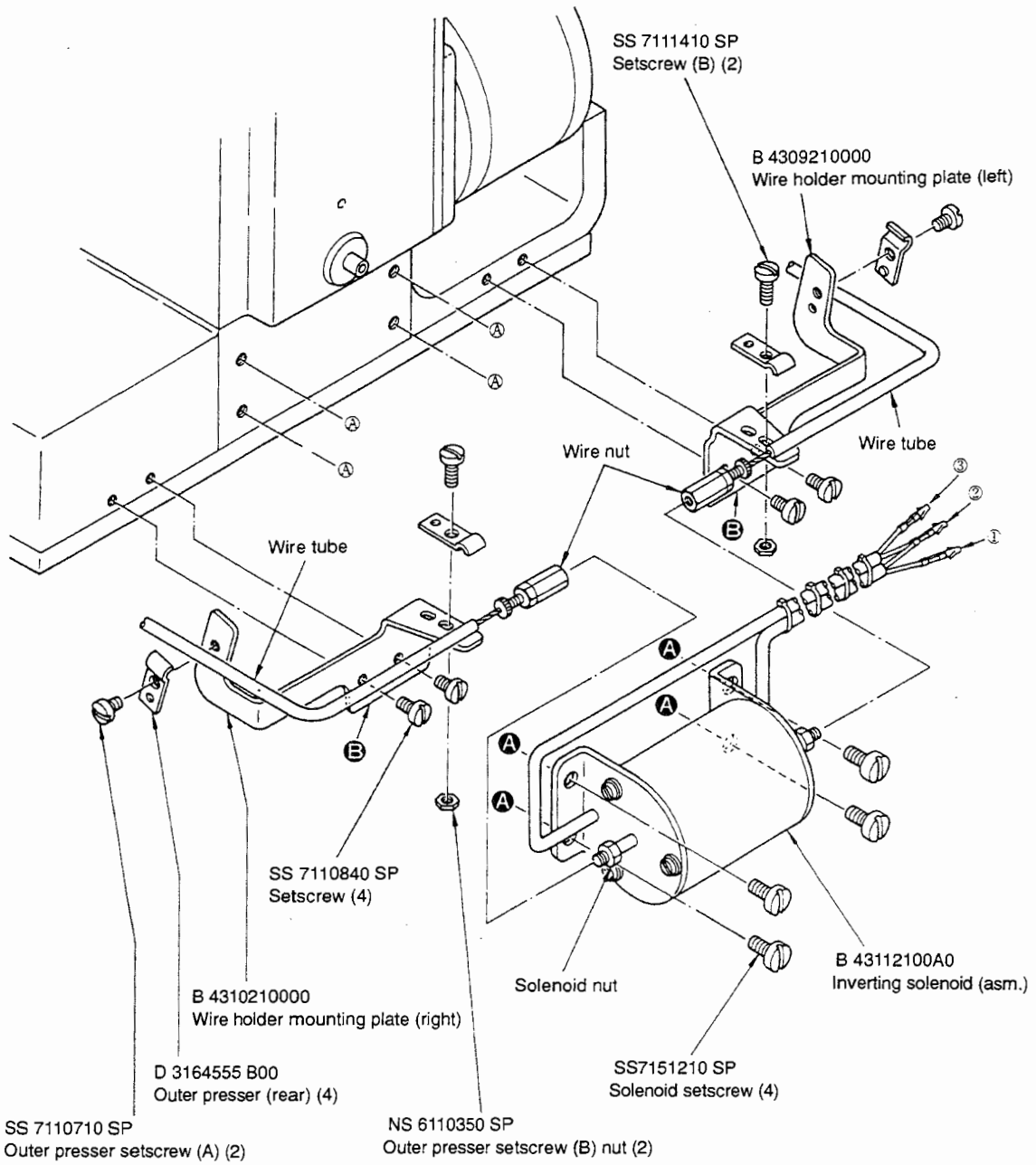


① Attach feeding frames (A) and (B) to the feeding frame slide plate for inverting.
② Fix the intermediate presser foot to the mounting base of the intermediate presser foot using screw.
③ Apply grease on the sliding faces of the intermediate presser foot slide plate for inverting (asm.) and feeding frame slide plate for inverting (asm.) and fit them in the groove of the work clamp slide plate. Then fix them to the feed blacket using the four setscrews of the work clamp slide plate.
④ Apply grease to the shaft of the inverting crank shaft, then insert the mounting base of the intermediate presser foot for inverting into the inverting crank shaft. Then fasten the mounting base with the inverting crank shaft using the setscrew washer of the inverting crank shaft and setscrew of the inverting crank shaft.
(At this time, check the inverting crank shaft and the mounting base of the intermediate presser foot for inverting for smooth rotation.)
⑤ Attach work clamp springs (B) (left) and (right).
⑥ Adjust the right and left work clamp stoppers so that the following distances are obtained when the intermediate presser foot goes up.

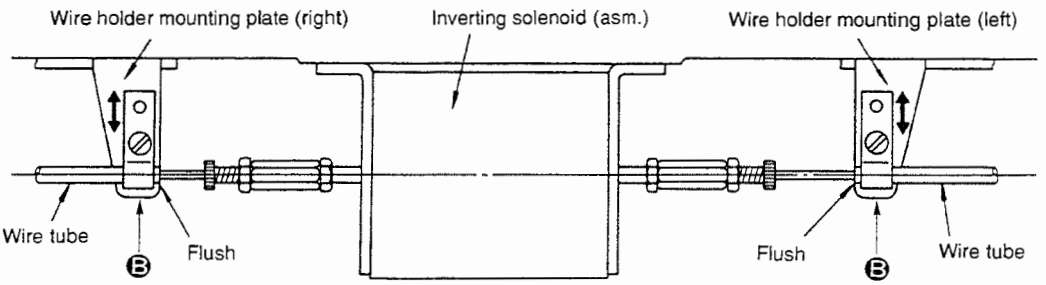
{ The lifting amount of the intermediate presser foot: 18 ± 0.5 mm (0.709" ± 0.020")
{ The lifting amount of the feeding frame: $10\ ^{+1}_{0}$ mm ($0.394"\ ^{+0.039"}_{0}$)

(At this time, be sure that the pressure of the intermediate presser foot and feeding frame is 3 kg or more when they start going up.)
* The pressure adjusting plates (left) and (right) should be fixed so that the screw of each adjusting plate is brought to the center of the slot in the plate.
(Refer to Fig. 5-5-2 in " Standard adjustment (5) - 2 . ")

(2) Installing the inverting solenoid and wire components



① Make bottom face Ⓑ section of the wire holder mounting plate (left) flush with the bottom face of the machine bed, and fix it to the bed, using the two setscrews.
② Make bottom face Ⓑ section of the wire holder mounting plate (right) flush with the bottom face of the machine bed, and fix it to the bed, using the two setscrews.
③ Attach the inverting solenoid assembly to the bed, using the four setscrews for preliminary installation.
④ Connect the right and left wire nuts to the inverting solenoid. Fix the right and left wire tubes, using the outer presser (rear), setscrews (B) and setscrew (B) nuts so that the wire tubes are aligned with the center of the inverting solenoid and also flush with the edges of the right and left wire holder mounting plates.



⑤ Be sure that the inverting solenoid axis is aligned with the center of the right and left wire tubes. Then securely tighten the four setscrews of the inverting solenoid assembly.
⑥ Attach the right and left wire tubes to the side faces of the right and left wire holder mounting plates, respectively, using setscrews (B) for the outer pressers (rear).
⑦ Adjust the wire lengths, using the right and left wire nuts so that, when the inverting crank shaft is actuated by the inverting solenoid, the angle of rotation becomes 90 degrees or more on both right and left sides.
※ The moving torque of each inverting solenoid shaft while it travels the predetermined stroke (8 mm (0.315")) should not exceed 700 g when the inverting solenoid is not magnetized.
※ The moving torque of the intermediate presser foot for inverting should not exceed 3.5 kg when it is operated by the presser switch (pressing pressure is 3 kg or more).
⑧ After the wire lengths have properly been adjusted, securely lock the wire nuts, using the inverting solenoid nuts.
⑨ Connect pins 1, 2 and 3 of the inverting solenoid assembly to pins 8, 9 and 10 of the machine head connector (15-pole nylon receptacle).

Inverting solenoid pin No.	Color of lead wire	Head connector pin No.
1	1-wire caulked lead - black	8
2	2-wire caulked lead - white and black	9
3	1-wire caulked lead - white	10

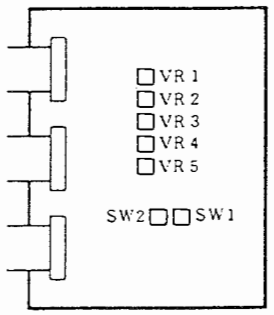
⑩ Secure the cabtyre cable of the inverting solenoid assembly together with the head cords so that they do not come in contact with the machine belt.
⑪ Actuate the inverting solenoid by pressing the Forward or Backward key switch, and check the crank shaft for proper angle of inverting rotation. If the angles of rotation in the clockwise and counterclockwise directions are not identical, perform readjustment.

5-5. Electrical parts

5-5-1. Adjusting the sewing speed

The sewing speed is automatically changed according to the stitch length. However, if the sewing speed is increased to more than the specified speed, defective feed (deformed pattern) will result. If this happens, check the speed according to the Speed check (See page 160), and readjust the sewing speed, if it has been found to be too fast, using the control knob (VR1 to VR5) on the I/F circuit board.

I/F circuit board



(Fig. 1)

(Initial setting of the knobs)

VR1  (Top)

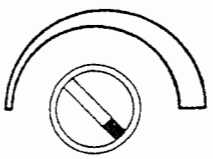
VR2  (Left) (Note 1)

VR3  (Top)

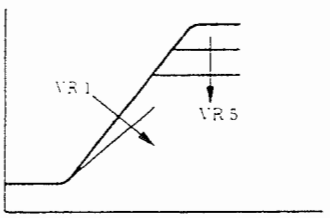
VR4  (Top)

VR5  (To the end of the counterclockwise turn) (Fig. 2)

Maximum speed limitation knob/Bobbin winder switch



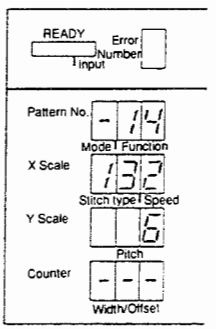
(To the end of the clockwise turn) (Fig. 3)



(Fig. 4)

1) Set switch SW2 on the I/F circuit board (Fig. 1) to 3 on the scale.
2) Set control knobs VR1 to VR5 as shown in the Fig. 2. The external maximum speed limitation knob (Fig. 3) should be set to MAX. (Note 1)
3) When the power switch is turned ON, all of the numerical displays will show "-", and the speed check program will be executed.
4) Lower the feeding frame by depressing the Feeding frame switch. Then depress the Start switch so that the sewing machine starts running.
5) Indication "02" will be shown on the operation box (panel).
6) Adjust the sewing speed to 180 ± 2 s.p.m. using control knob VR3.
7) The machine stops when the Emergency stop switch is pressed.
8) Carry out the procedures described in steps 4) and 7) so that indication "20" is shown on the operation box (panel).
9) Adjust the sewing speed to 1,950 ± 10 s.p.m. using control knob VR1.
10) Carry out the procedure described in step 7) so that the machine stops. Then carry out the procedures described in steps 4) and 7) so that indication "14" is shown on the operation box (panel).
11) Adjust the sewing speed to 1,325 ± 10 s.p.m. using control knob VR2.
12) Carry out the procedure described in step 7) so that the machine stops. Then carry out the procedures described in steps 4) and 7) so that the indication "20" is shown on the operation box (panel).
13) Adjust the sewing speed to 1,925 ± 10 s.p.m. using control knob VR5.
14) Carry out the procedure described in step 7) so that the machine stops. Then carry out the procedures described in steps 4) and 7) so that the indication "04" is shown on the operation box (panel).
15) Adjust the sewing speed to 325 ± 10 s.p.m. using control knob VR4.
16) Check whether the specified sewing speed is obtained at each indication on the operation box (panel) as shown in the table below. This completes the sewing speed adjustments.

Numeric indication	Sewing speed (s.p.m.)
02	180±2
04	350^{+0}_{-50}
06	550^{+0}_{-50}
11	$1{,}050^{+0}_{-50}$
14	$1{,}350^{+0}_{-50}$
16	$1{,}550^{+0}_{-50}$
18	$1{,}750^{+0}_{-50}$
20	$1{,}950^{+0}_{-50}$



(In the case of 1,326 s.p.m.)

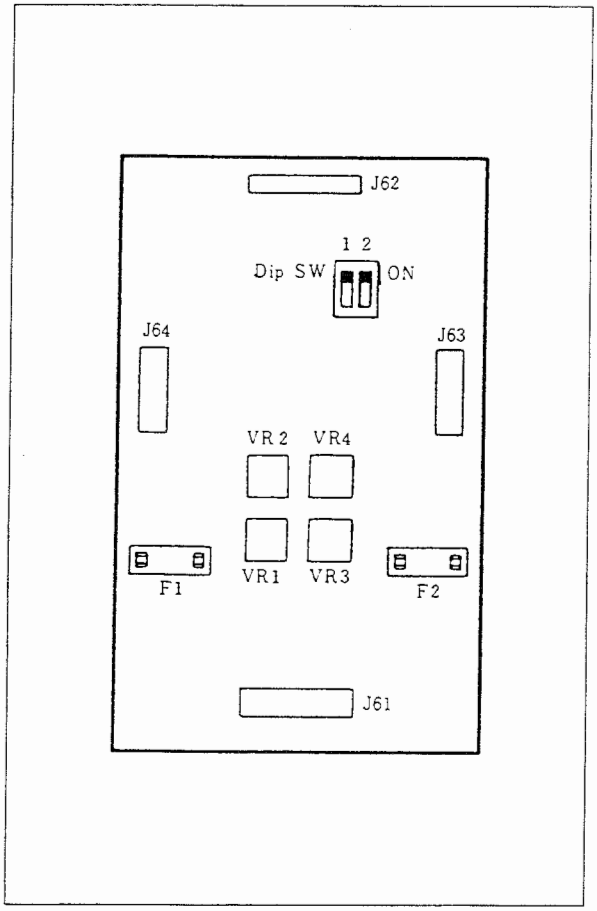
Adjust control knob VR1 to decrease the whole range of speed, and adjust control knob VR5 to decrease the maximum speed. (Fig. 4)

(Note 1) If the value of adjustment is not available, adjust by sliding the position of the VR2 to the right one scale after another. (Fig. 2)

5-5-2. Adjusting the PMDC circuit board current

Two stepping motors are incorporated in the machine to actuate the feed mechanism, one for the X-axis feed, the other for the Y-axis feed. Each motor is independently adjusted on the PMDC circuit board. If the current is not properly adjusted, the power of the stepping motor may drop or generate excessive heat, the PMDC circuit board may generate heat or break, or the fuse may blow.

(1) Checking the current



Do not turn the control knobs (VR1 to VR4) when only the checking procedure is being carried out.
The connectors of jumper plugs J61, J63 and J64 have to be connected. The connector for J62 does not have to be connected when checking the current.

1) X-axis stepping motor

(The X-axis stepping motor current flows through fuse F2).

① Be sure that the power switch has been turned OFF, and DIP switches SW1 and SW2 have been set to their ON side.
② Remove fuse F2. (Be careful not to remove circuit revision silk F-1 in place of fuse F2. They look similar and are likely to cause confusion.)
③ Connect the ammeter (10 A dc class) to the fuse box of fuse F2. (Connect the minus ⊖ terminal to the VR3 side and the plus terminal ⊕ to the opposite side.)
④ Be sure that DIP switches SW1 and SW2 are set to their ON side, and then turn ON the power switch.
⑤ If the ammeter indicates a current value within the range 2 ± 0.1 A, the electric current value of the X-axis stepping motor is normal.
⑥ Step DIP switch SW2 to its OFF side.
⑦ If the ammeter indicates a current value within the range 5 ± 0.1 A, the electric current value of the X-axis stepping motor is normal.
⑧ Set DIP switch SW2 once more to its ON side, and check for the specified value 2 ± 0.1 A on the ammeter.

(Caution)
For normal operation, DIP switches SW1 and SW2 should be set to their ON side.

This completes the checking of the electric current of the X-axis stepping motor.
If the electric current value is out of the specified range, follow the procedure described in step (2)-1) "Adjusting the electric current and making an adjustment."

2) Y-axis stepping motor (The Y-axis stepping motor current flows through fuse F1.)

① Be sure that the power switch has been turned OFF, and DIP switches SW1 and SW2 have been set to their ON side.
② Remove fuse F1. (Be careful not to remove circuit revision silk F-1 in place of fuse F1. They look similar and are likely to cause confusion.)
③ Connect the ammeter (10 A dc class) to the fuse box of fuse F1. (Connect the minus ⊖ terminal to the VR1 side and the plus terminal ⊕ to the opposite side.)
④ Be sure that DIP switches SW1 and SW2 are set to their ON side, and then turn ON the power switch.
⑤ If the ammeter indicates a current value within the range 2 ± 0.1 A, the electric current value of the Y-axis stepping motor is normal.
⑥ Set DIP switch SW1 to its OFF side.
⑦ If the ammeter indicates a current value within the range 5 ± 0.1 A, the electric current value of the Y-axis stepping motor is normal.
⑧ Set DIP switch SW1 once more to its ON side, and check for the specified value 2 ± 0.1 A on the ammeter.

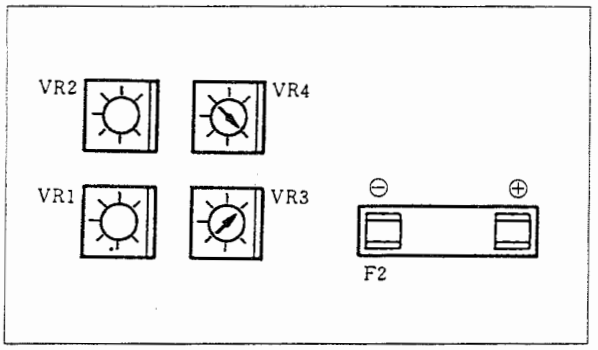
(Caution)
For normal operation, DIP switches SW1 and SW2 should be set to their ON side.

This completes the checking of the electric current of the Y-axis stepping motor.
If the electric current value is out of the specified range, follow the procedure described in step (2)-2) "Adjusting the electric current and making an adjustment."

(2) Adjusting the electric current

The connectors of jumper plugs J61, J63 and J64 have to be connected. The connector for J62 does not have to be connected when only the adjusting procedure is being carried out.

1) Adjusting the electric current of the X-axis, stepping motor



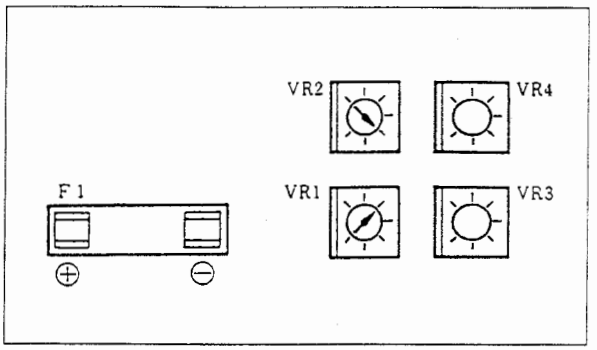
① Make sure that the power switch has been turned OFF, and DIP switches SW1 and SW2 have been set to their ON position.
② Use control knobs VR3 and VR4 to adjust the electric current of the X-axis stepping motor. Turn control knob VR3 clockwise until it will go no further, and then turn control knob VR4 counterclockwise until it will go no further (initial setting).
③ Remove fuse F2 (7A), and then connect the ammeter (10 A dc class) to the fuse box of fuse F2. (Connect the minus ⊖ terminal to the VR3 side and the plus ⊕ terminal to the opposite side.)
④ Turn ON the power switch.
⑤ The value indicated on the ammeter is from approximately 0.5 to 0.7 A. If the ammeter indicates 0 A or more than 1 A, the circuit board can be regarded as defective. Replace the circuit board.
⑥ Set DIP switch SW2 to its OFF position. Then turn control knob VR4, and adjust the current so that it is within 5 ± 0.1 A.
⑦ Set DIP switch SW2 to its ON position. Then turn control knob VR3, and adjust the current so that it is within 2 ± 0.1 A.
⑧ Reset DIP switch SW2 to its OFF position so as to check whether the specified range of the current value 5 ± 0.1 A has been obtained. Once again reset DIP switch SW2 to its ON position so as to check whether the specified range of the current value 2 ± 0.1 A has been obtained.
This completes the adjustment.
Turn the power OFF, then set the F2 fuse (7A) to the fuse box.

(Caution)

Be sure to make the adjustment for 2A after completing the adjustment for 5A. If you make the adjustments in the reverse order, the value adjusted may change.

After making the adjustment, be sure to set DIP switch SW2 to its ON position. Otherwise, heat may be generated, the fuse may blow, or the circuit board may become damaged.

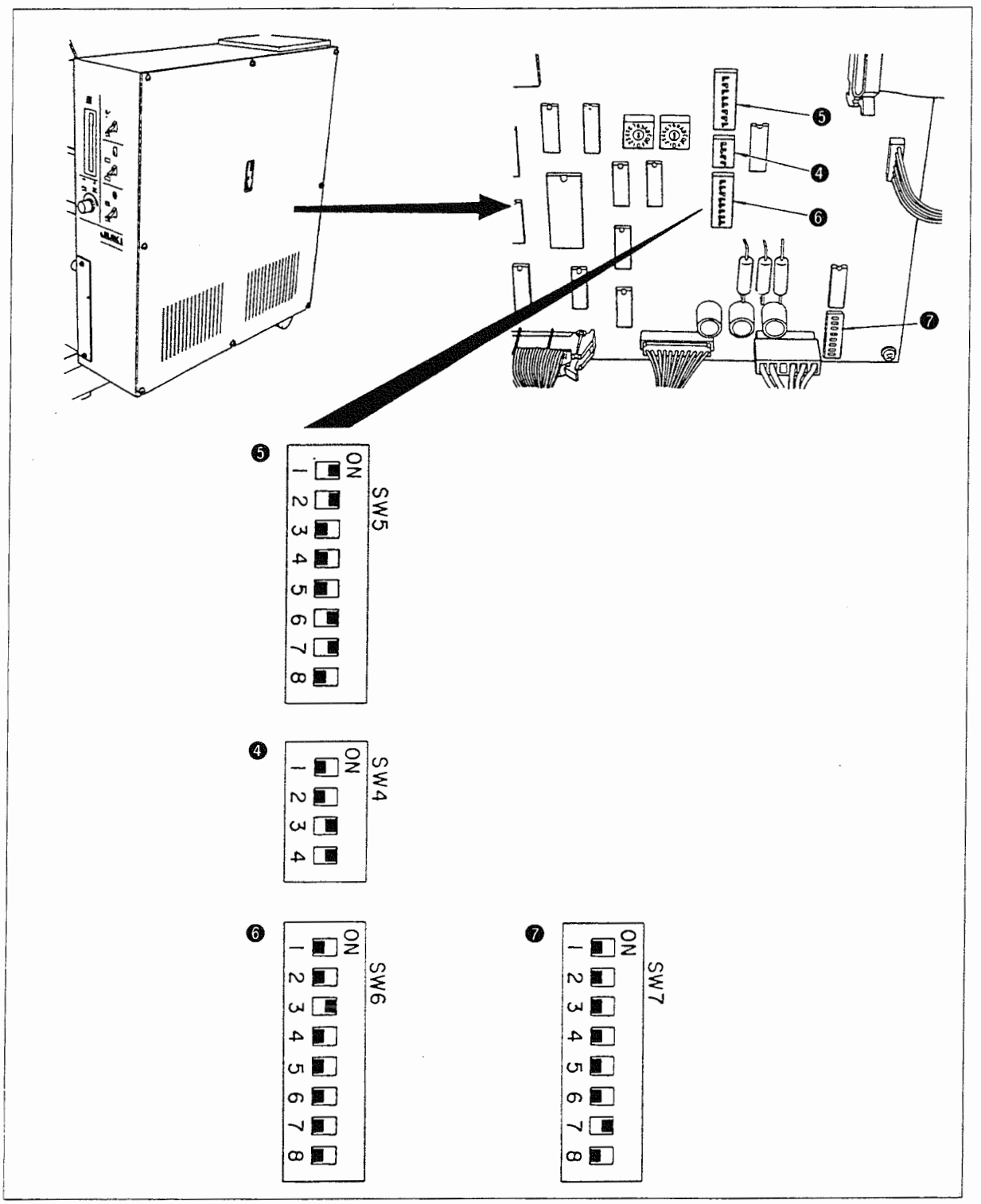
2) Adjusting the electric current of the Y-axis stepping motor



① Make sure that the power switch has been turned OFF, and DIP switches SW1 and SW2 have been set to their ON position.
② Use control knobs VR1 and VR2 to adjust the electric current of the Y-axis stepping motor. Turn control knob VR1 clockwise until it will go no further, and then turn control knob VR2 counterclockwise until it will go no further (initial setting).
③ Remove fuse F1 (7A), and then connect the ammeter (10 A dc class) to the fuse box of fuse F1. (Connect the minus ⊖ terminal to the VR1 side and the plus ⊕ terminal to the opposite side.)
④ Turn ON the power switch.
⑤ The value indicated on the ammeter is from approximately 0.5 to 0.7 A. If the ammeter indicates 0 A or more than 1 A, the circuit board can be regarded as defective. Replace the circuit board.
⑥ Set DIP switch SW1 to its OFF position. Then turn control knob VR2, and adjust the current so that it is within 5 ± 0.1 A.
⑦ Set DIP switch SW1 to its ON position. Then turn control knob VR1, and adjust the current so that it is within 2 ± 0.1 A.
⑧ Reset DIP switch SW1 to its OFF position so as to check whether the specified range of the current value 5 ± 0.1 A has been obtained. Once again reset DIP switch SW1 to its ON position so as to check whether the specified range of the current value 2 ± 0.1 A has been obtained.
This completes the adjustment.
Turn the power OFF, then set the F1 fuse (7A) to the fuse box.

(Caution)
Be sure to make the adjustment for 2 A after completing the adjustment for 5 A. If you make the adjustments in the reverse order, the value adjusted may change.
After making the adjustment, be sure to set DIP switch SW1 to its ON position. Otherwise, heat may be generated, the fuse may blow, or the circuit board may become damaged.

6. EXPLANATION OF THE DIP SWITCHES



DIP switches, SW5 (8P), SW4 (4P), SW6 (8P) and SW7 (8P) for changing the functions, are located on the I/F circuit board.

(Caution)

1. **When the power supply is turned ON, the current positions of the switches are valid. Therefore, be sure to turn OFF the power supply before operating the switches.**
2. **The switch setting illustrated in the above is that of S type at the time of delivery.**
   The setting states (at the time of delivery) of the switches for the S, T and L types of the sewing machine are illustrated on the pages describing the respective switch settings.

6-1. List of DIP switches

DIP switch	Function	Remarks	Feeding frame
SW 4 - 1		For maintenance	
2			
3	Feed timing is selected in accordance with the material thickness.		
4			
SW 5 - 1	"Cycle stitching function B" (Raising/lowering of the feeding frame selection B)	Used to L type only	●
2	"Cycle stitching function A" (Raising/lowering of the feeding frame selection A)		●
3	Selection between "2nd origin setting function"/"Sewing start point setting function"		
4	"Wiper actuating point selecting function"		
5	Origin detection selector switch		
6	"Pedal selecting function B"	Used to L type only	●
7	"Pedal selecting function A"		●
8	"Monolithic feeding frame/separately driven feeding frame change over function"	Used to L type only	●
SW 6 - 1	"Separately driven feeding frame operation sequence change over function"	Used to L type only	●
2	Setting the "Bobbin thread counting function"		
3	Setting the "Bobbin replacement setting function"		
4	Setting the "Enlargement/reduction function"		
5	Setting the "Thread breakage detection function"		
6	Setting the "Thread trimmer prohibition function"		
7	Setting the "Wiper prohibition function"		
8	Setting the "Intermediate presser foot stop function"	Mainly used to T type	
SW 7 - 1	Setting the "Air pressure detection function"	Used to L type only	●
2		Used to other AMS models	
3	Setting the "Automatic thread trimming function at the time of a stop"		
4	Setting the sewing speed at the start of sewing		
5			
6	Setting the "Feeding frame position at sewing end selecting function"		●
7	Setting the "Automatic retainer compensation function"		
8		Not used	

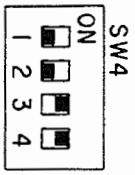
(Caution)

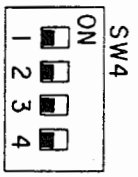
1. Switches that have a black circle in [•] the column of the "Feeding frame" are described together afterwards.

2. The setting state of the switches (at the time of delivery) may change by the type of the sewing machines (S, T, L and GL).

3. S type represents the magnet standard feeding frame type, T type represents the magnet inverting feeding frame type, L type represents the separately driven feeding frame (including GL type) and GL type represents the separately driven feeding frame type for heavy-weight materials.

6-2. Function of the DIP switches that are not related to the feeding frame components

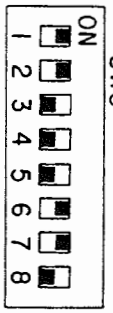
<table>
<tr><th>Switch name</th><th>Function</th></tr>
<tr><td>❹ DIP switch 4 (SW4)
 

• Setting state of the switches of the S, T and L types (excluding the GL type) at the time of delivery
 

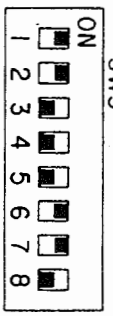
• Setting state of the switches of the GL type at the time of delivery</td><td>• SW4-3, 4 ... The optimum feeding timing can be selected according to the thickness of the material.
<table>
<tr><th>SW4 - 3</th><th>SW4 - 4</th><th>Material thickness</th></tr>
<tr><td>ON</td><td>ON</td><td>Less than 2 mm</td></tr>
<tr><td>OFF</td><td>ON</td><td>2 mm or more to less than 3 mm</td></tr>
<tr><td>ON</td><td>OFF</td><td>3 mm or more to less than 4 mm</td></tr>
<tr><td>OFF</td><td>OFF</td><td>4 mm or more</td></tr>
</table>
(Caution)
• The feed timing may change in accordance with the sewing material and sewing method to be used. So, select the best-suited combination of the switch settings in accordance with the sewing product to be sewn.
• Only for the GL type, the switches have been factory-set to OFF, OFF that is suited to sewing heavy-weight materials at the time of delivery.

• SW4-1 and 2 are used for maintenance purposes only.
They should therefore remain turned OFF. (Common to the S, T and L types)</td></tr>
</table>

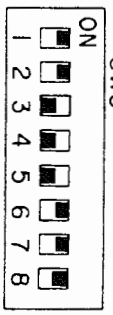
Switch name	Function
❺ DIP switch 5 (SW5)	• SW5-3 ... Used to select either the "2nd origin setting function" or the "sewing start point moving function"



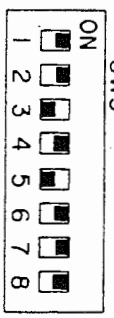
• S type
At the time of delivery



• T type
At the time of delivery



• L type
(excluding GL type)
At the time of delivery



• GL type
At the time of delivery

OFF (This switch has been set to the OFF position at the time of delivery.)	A 2nd origin can be newly set using the jog switches (The "2nd origin setting function") (The location of the pattern is not changed.) **(Caution)** **If the 2nd origin is specified within the pattern, note the followings.** **① If a 2nd origin is newly specified using the jog switches, the conventional 2nd origin located in the pattern is ignored and the newly specified 2nd origin becomes effective.** **② If the jog switches are not operated, the 2nd origin located in the pattern remains effective.**
ON	The location of the pattern can be changed by operating the jog switches. (The "sewing start point moving function") (The 2nd origin located within the pattern is ignored, and the machine does not stop at the 2nd origin.)

Set the switches immediately after lowering the feeding frame. Refer to the description of the jog switches on page 23 and the operation flow chart on pages 38 and 39.

※ 2nd origin

It is also called "turnout point". It means a point where the tip of needle rests when setting the workpiece to be sewn on the machine.
Normally, the tip of needle of an AMS sewing machine rests at the sewing start point (the first stitch of a pattern) before starting sewing. However, a 2nd origin is used whenever the needle resting at the sewing start point becomes an obstruction to the setting of a workpiece on the machine.
In this case, the location of the pattern does not change.
(Note that only one 2nd origin can be specified in the single pattern.)

※ How to reset/change the specified point (the 2nd origin or the sewing start point) and how to store it in memory

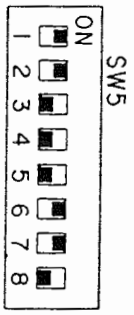
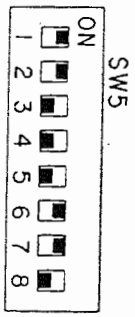
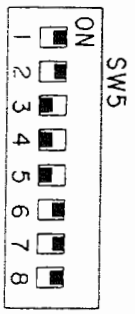
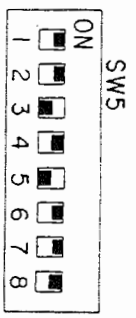
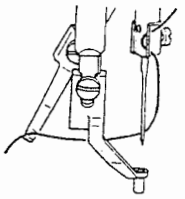
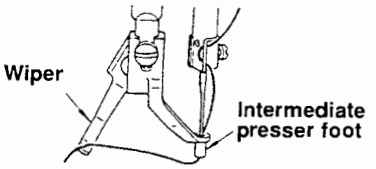
Reset (Cancel) ..... To reset (cancel) the point specified using the jog switches, press the Set Ready switch twice. The specified point is also canceled when reading out another pattern from the floppy disk.
At this time, the feeding frame comes down and the origin is retrieved. So be careful not to allow your hands to be caught under the feeding frame.
(If you wish to reset (ignore) the 2nd origin located within a pattern, set the SW5-3 to the ON position.)

Change ..... A point specified using the jog switches is automatically replaced by a newly specified point. So specify a new point at any desired position without canceling the conventional point.

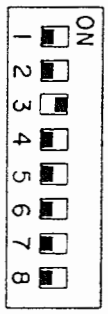
Store in memory ..... When turning OFF the power to the machine under the sewing mode, the "backup function" works to store the specified point as well as the pattern in memory.

(Caution)

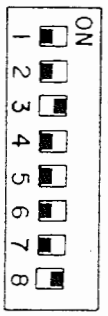
1. **The T type machine is equipped with an inverting device. So the needle may come in contact with the inverting device when using the "sewing start point changing function." Be sure to use the function with the inverting device removed.**
2. **Not only in the case of the T type, but also in the case where a pattern in which an inversion command has been input is read out, the "2nd origin setting function" will be ineffective.**

DIP switch name	Function
❺ DIP switch 5 (SW5)  • S type At the time of delivery  • T type At the time of delivery  • L type (excluding GL type) At the time of delivery  • GL type At the time of delivery	**• SW5-4 ... Wiper actuating point selecting function** Normally, the wiper sweeps across the clearance between the intermediate presser foot and the needle. When sewing heavy-weight material, the clearance may be too small for the wiper to work. In this case, the wiper will be able to sweep across the clearance between the intermediate presser foot and the work-piece after the intermediate presser foot has reached the highest position in its stroke. ON: The wiper sweeps between the intermediate presser foot and the workpiece after the intermediate presser foot has reached the highest position in its stroke. OFF: The intermediate presser goes up after the wiper has swept across the clearance between the needle and the intermediate presser foot.  **(OFF)** **Material thickness: up to 3 mm (0.118")**  **(ON)** **Material thickness: 3 to 5 mm (0.118" to 0.197")** ※ Only for the GL type, this switch has been factory-set to the ON position to allow the machine to sew heavy-weight materials. Change over the setting of this switch in accordance with the material thickness. Not only in the case of the GL type but also in the case where the setting of this switch is changed over, adjust the position of the wiper referring to page 66. **• SW5-5 ... Origin detection selector switch** This switch enables the machine to move to the sewing start point (or the 2nd origin) by way of the mechanical origin after the completion of sewing (thread trimming). ON: After the completion of sewing, the machine returns to the sewing start point or the 2nd origin after detecting the origin. OFF (This switch has been set to the OFF position at the time of delivery.): After the completion of sewing, the machine returns to the sewing start point or the 2nd origin. ※ When a feeding fault occurs during a sewing operation due to the workpiece getting caught or an excessive load, in the next sewing operation the needle and feeding frame may come in contact with each other or the sewing form may become dislocated. When this switch is set to its ON position, the machine retrieves the origin to perform compensation after the completion of each sewing. Even if a step-out occurs, the machine will be capable of performing the next sewing without being adversely affected by the step-out. **(Caution)** **For the T type, be careful not to allow the needle to come in contact with the feeding frame.**

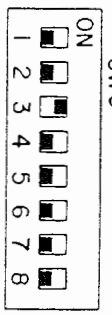
DIP switch name	Function
⑥ DIP switch 6 (SW6)	• **SW6 - 2 ... The setting of the Bobbin thread counter**



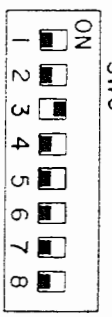
• S type
At the time of delivery



• T type
At the time of delivery



• L type
(excluding GL type)
At the time of delivery

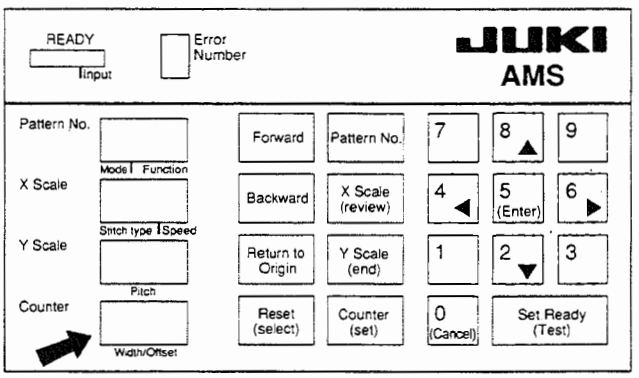


• GL type
At the time of delivery

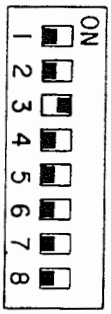
When the bobbin thread counting function is specified by setting the SW6-3 to the OFF position, the Counter counts the number of finished pieces until the set value is reached. This switch is used to select the counting method to be employed between subtraction and addition.
When the SW6-3 has been set to its ON position, the SW6-2 becomes ineffective. In this case, the Counter display functions as a mere adding counter. ("999" is followed by "000." The Counter can be reset.)
The following description should be referred when the SW6-3 is set to its OFF position.

ON	Subtraction counter Set the number of workpieces to be sewn beforehand, which is shown on the Counter first. After one piece of workpiece has been finished, "1" will be subtracted from the value set on the Counter display. When the value indicated on the Counter display is "000", it will flash on and off, and sewing will no longer possible. Turning ON the [Reset switch] will reset the Counter, and the predetermined number of workpieces to be sewn will appear again on the Counter. At this time, the machine can start sewing.
OFF (This switch has been set to the OFF position at the time of delivery.)	Addition counter The Counter starts counting up the number of workpieces finished from "000". After one piece of workpiece has been finished, "1" will be added to the value shown on the Counter display. When the value indicated on the Counter display is the predetermined number of workpieces to be sewn, it will flash on and off, and sewing will no longer possible. Turning ON the [Reset switch] will reset the Counter, and "000" will appear again on the Counter. At this time, the machine can start sewing. **(Caution)** **After inputting a set value of the Counter under the [setting mode], the Counter display flashes on and off immediately after pressing the [Set Ready switch] though the machine has not yet sewn any workpiece. In this case, press the [Reset switch] once to reset the value indicated on the Counter, then start sewing.**

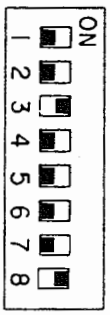
Refer to the explanation of the "SW6-3" on page 144 for the detailed description of the "bobbin thread counting function".



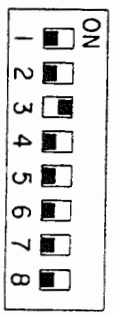
DIP switch name	Function
⑥ DIP switch 6 (SW6)	• SW6 - 3 ... Selection of the "bobbin replacement setting function"



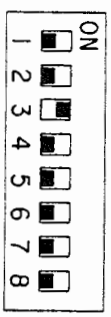
• S type
At the time of delivery



• T type
At the time of delivery



• L type
(excluding GL type)
At the time of delivery



• GL type
At the time of delivery

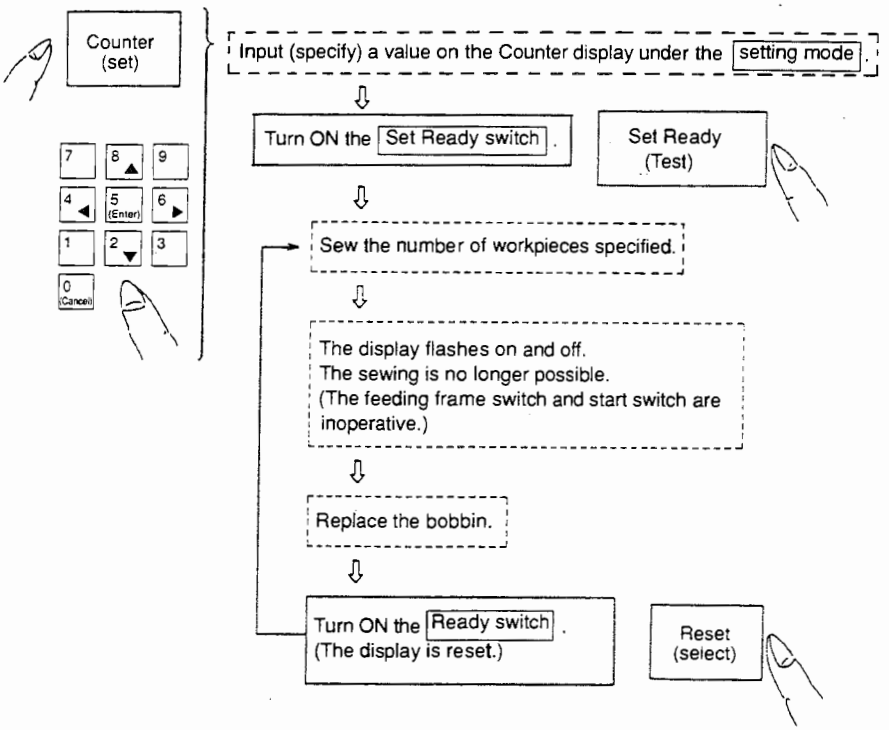
OFF	The bobbin replacement setting function is operative. (The function works.)
ON (This switch has been set to the ON position at the time of delivery.)	The bobbin replacement setting function is inoperative. The Counter display on the operation box (panel) works at the addition counter which counts up from "000" to "999". (When "999" is reached, the number on the display returns to "000".) The number on the Counter display is reset to "000" whenever pressing the [Reset switch].

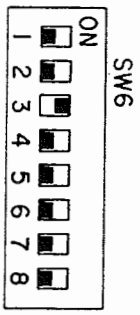
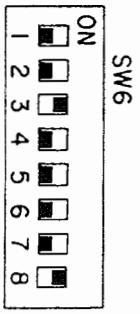
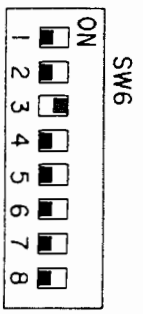
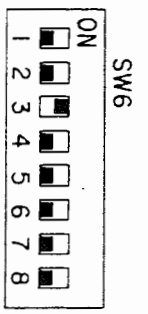
※ **Bobbin replacement setting function**

This is the function to make the number shown on the Counter display flash on and off to warn the operator that it is the time to stop the sewing machine (the [feeding frame switch] and [start switch] become inoperative) and to change the bobbin after the completion of sewing the pattern on the predetermined number of workpieces.

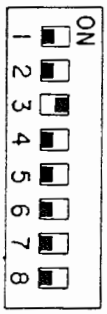
- Count the number of workpieces that can be sewn with one bobbin by pattern beforehand, and set the number on the Counter under the [setting mode]. (See the explanation of the switches on the operation box (panel) on page 21.)
- Depressing the [Reset switch] make the feeding frame switch and start switch operative again allowing the sewing machine to continue sewing.
  (At this time, the number indicated on the Counter display will return to the initial value.)
- The two types of indicating method (counting method) are available for the Counter display, one is addition and the other is subtraction. Refer to the description on the SW6-2.

• Bobbin replacement setting function flow

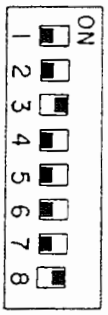


DIP switch name	Function
⑥ DIP switch 6 (SW6)  • S type At the time of delivery  • T type At the time of delivery  • L type (excluding GL type) At the time of delivery  • GL type At the time of delivery	**• SW6 - 4 ... Selection of the "enlargement / reduction function"** ON: The pattern cannot be enlarged/reduced. The [X/Y scale] switches in the operation box (panel) are made inoperative and the scale is fixed at 100%. OFF (This switch has been set to the OFF position at the time of delivery.): The pattern is enlarged/reduced when reading in the pattem from the floppy disk. Refer to the explanation of the "[X scale] switch" and "[Y scale] switch" for how to specify the X/Y scale. **• SW6 - 5 ... Selection of the "thread breakage detection function"** ON: The "thread breakage detection function" is not effective. Set the SW6-5 to the ON position when the sewing machine is idling. OFF (This switch has been set to the OFF position at the time of delivery.): The "thread breakage detecting function" works. When a thread breakage occurs, the machine automatically performs thread trimming, and stops running indicating error "9". **• SW6 - 6 ... Selection of the "thread trimmer prohibition function"** This switch is used to make the machine perform sewing without actuating the thread trimmer even if the thread trimming command has been entered in a pattern. ON: Thread trimmer does not work. Set the SW6-6 to the ON position when the thread trimmer components may be damaged by an excessive load if the thread trimmer is actuated in the case where a thick thread is used. OFF (This switch has been set to the OFF position at the time of delivery.): The thread trimmer is actuated by the "thread trimming command". **• SW6 - 7 ... Selection of the "wiper prohibition function"** The switch mounted on the machine head can be used to stop the wiper but the SW6-7 is used to make the wiper inoperative in the state of function setting. This shortens the time required for sewing by a certain degree. ON: The wiper does not work. OFF (This switch has been set to the OFF position at the time of delivery.): The wiper actuates after thread trimming. (When the wiper switch is ON)

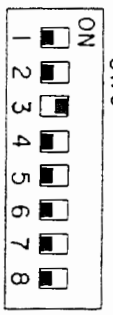
DIP switch name	Function
⑥ DIP switch 6 (SW6)	• SW6-8 ... Selection of the "intermediate presser foot stop function"



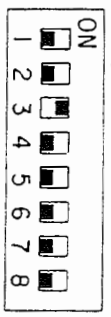
• S type
At the time of delivery



• T type
At the time of delivery



• L type
(excluding GL type)
At the time of delivery



• GL type
At the time of delivery

This switch is used to make the intermediate presser foot inoperative.

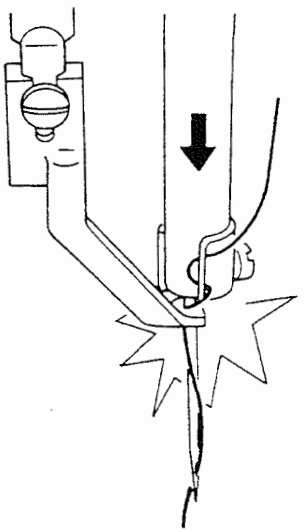
ON	The intermediate presser foot does not work. **(Caution)** **If the intermediate presser foot is set to inoperative with the intermediate presser foot attached on the machine, the needle bar may hit against the intermediate presser foot, resulting in breakage of the related components.**
OFF	The intermediate presser foot actuates.

(Caution)

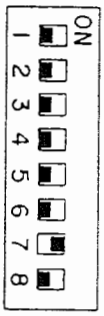
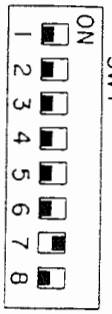
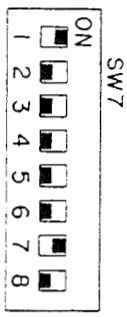
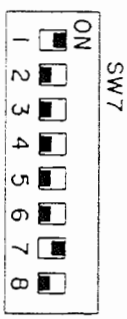
1. Set this switch to its OFF position when using the intermediate presser foot for normal operation. (For the S, L type)

2. The T type machine is equipped with an inverting device, which means that the machine has been delivered without an intermediate presser foot. Consequently, the "SW6-8" has been set to its ON position (intermediate presser foot is inoperative).
If you use the intermediate presser foot, set the switch to its OFF position.

3.

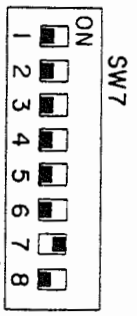


If using the intermediate presser foot with the SW6-8 set to its ON position, the intermediate presser foot or the needle may break.

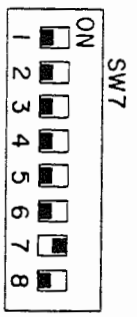
DIP switch name	Function
❼ DIP switch 7 (SW7)  • S type At the time of delivery  • T type At the time of delivery  • L type (excluding GL type) At the time of delivery  • GL type At the time of delivery	**• SW7 - 3 ... Selection of the "thread trimming after stop function"** This switch is used to make the machine automatically actuate the thread trimmer after pressing the [Stop switch] on the machine head. **ON**: When the [Stop switch] is turned ON, the machine automatically actuates the thread trimmer and stops with its needle up. Since the machine performs thread trimming, the error indication [5 lights up] instead of [flashing on and off]. Consequently, you can operate the [Forward switch], [Backward switch] and [Return to Origin] switch immediately after the aforementioned operation. **OFF** (This switch has been set to the OFF position at the time of delivery.): When the [Stop switch] is turned ON, the machine will stop with its needle up. The error indication [5 flashes] on and off. To make the [Forward] and [Backward] switches and [Return to Origin] switch operative, move the [Needle threading] switch up and down once (to turn it ON and OFF) so that the error indication [5 lights up]. Refer to the description on the switches on the operation box (panel) for the function and operation of the [Forward] and [Backward] switches and [Return to Origin] switch. **• SW7 - 4, - 5 ... Selection of the sewing speed at sewing start** The rotational speed (sewing speed) of the sewing machine at the start of sewing can be set to one of the following four different speeds. SW7 - 4 / SW7 - 5 / 1st stitch 2nd stitch 3rd stitch 4th stitch 5th stitch 6th stitch OFF / OFF: 200 → 600 → 1000 → 1400 → 1800 → 2000 ON / OFF: 600 → 600 → 1000 → 1400 → 1800 → 2000 OFF / ON: 200 → 2000 ON / ON: 2000 → **(Caution)** These two switches have been set to the [OFF] position at the time of delivery. **(Caution)** **The sewing speed is not automatically limited.** **Set the sewing speed according to the sewing product at the time of inputting a pattern.** **The sewing speed can be input using the main unit input function or the PGM-1, etc.** ※ Sewing speed In the AMS machines, the sewing speed is limited by stitch length. For example, the maximum sewing speed is 2,000 s.p.m. when sewing a pattern with the stitch length of 3 mm (0.118") as shown in the table above. However, the maximum sewing speed for a pattern with the stitch length of 4 mm (0.157") is 1,500 s.p.m., which means that the sewing speed cannot be set to a value exceeding 1,500 s.p.m. (5th stitch). (Refer to page 46.) ※ Cycle time When comparing the cycle time with respect to the settings of the SW7-4 and -5 between their [ON] [OFF] settings and their [OFF] [ON] settings, the [ON] [OFF] settings require a shorter cycle time.

DIP switch name	Function
❼ DIP switch 7 (SW7)	• **SW7 - 7 ... Selection of the "automatic retainer compensation function"** This switch is used to select either automatically or manually correct the position of the retainer.

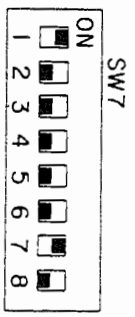
OFF	The "automatic retainer compensation function" works.
ON (This switch has been set to the ON position at the time of delivery.)	The "automatic retainer compensation function" does not work.



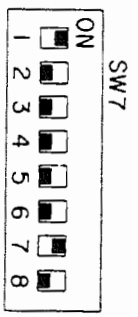
• S type
At the time of delivery



• T type
At the time of delivery

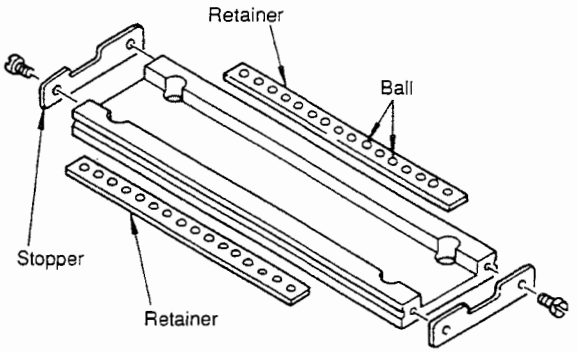


• L type
(excluding GL type)
At the time of delivery



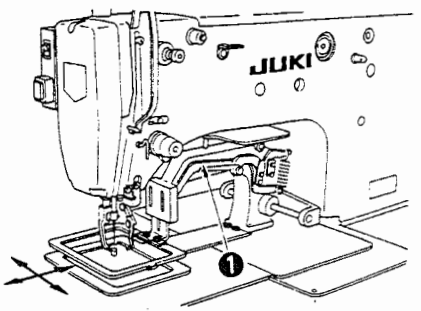
• GL type
At the time of delivery

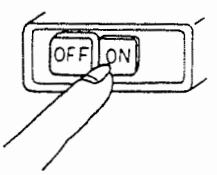
• Retainer compensation
The X-Y table buit in the sewing machine uses the component called "retainer" which moves together with the feed mechanism.
It may shift from it predetermined position after a long period of usage, resulting in deformed shape of sewing pattern or an error in the origin retrieval.
So, it is necessary to correctly position the retainer approximately once a day.



① Automatic compensating operation
The automatic retainer compensation function works when turning ON the Set Ready switch for the first time after turning ON the power to the machine.
The feeding frame comes down, and the feed mechanism travels back and forth until its stroke end is reached.
(Then, the feed mechanism moves to the sewing start point or the 2nd origin as in the case of normal sewing, and the feeding frame goes up. This completes the automatic retainer compensating action.)
※ The automatic retainer compensation is not performed when the Set Ready switch is pressed for the second time and afterward.

② How to manually correct the position of the retainer
Turn OFF the power to the sewing machine. Then gradually move the feed mechanism ❶ by hand, back and forth and to the right and left until it will go no further. (About once a day)
(Caution)
This machine is equipped with an inverting clamp device as standard. If performing the automatic retainer compensation (SW7-7 OFF), the needle may break.
So, be sure to manually perform the retainer compensation.
When manually performing the retainer compensation, take care of the position of the needle.





• Since the SW7-2 is used in the other types of AMS machines, set it to its OFF position.

6-3. Functions of the DIP switches used to control the feeding frame components

The following table shows the functions of the DIP switches used to control the feeding frame components.

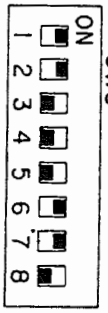
○ : Available × : Not available

Name of function (name of switch)	S, T type	L type
Monolithic feeding frame/separately driven feeding frame changing-over function (SW5-8) • Used to change over the function of the feeding frame between "making the right- and left-hand sections of the feeding frame operate together" and "making the right- and left-hand sections of the feeding frame operate independently."	×	○
Separately-driven feeding frame operation sequence changing-over function (SW6-1) • Used to select either the right-hand or the left-hand section of the feeding frame comes down first, when the right- and left-hand sections of the feeding frame operate independently.	×	○
Pedal selecting function A, B (SW5-7, SW5-6) • Used to change over the function of the pedal of the foot switch between "lowering the feeding frame as long as the pedal is kept depressed" and "lowering the feeding frame continuously after depressing the pedal once."	Function A only ○	○
Cycle stitching facility A, B (SW5-2, SW5-1) • Used to select either "stopping the sewing machine with its feeding frame lowered" or "stopping the sewing machine with its feeding frame raised" at the position in a pattern where a temporary stop command has been entered.	Function A only ○	○
Feeding frame position at sewing end selecting function (SW7-6) • Used to change over the position of the feeding frame after the machine completes the sewing and moves to the sewing start point (2nd origin) between "keeping the feeding frame in its lowest position" and "making the feeding frame go up."	○	○
Change-over of the air pressure detecting function (SW7-1) • Used to change over the function to detect the air pressure of the air (air source) used, between "stopping the sewing machine when a drop of the compressed air pressure is detected" and "not detecting a drop of the compressed air pressure."	×	○

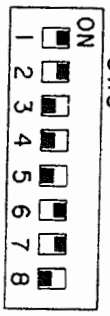
(Caution)

1. **When using the L type machine (including the GL type) that uses a separately driven feeding frame, set the DIP switches (excluding the SW7-1 for changing over of the air pressure detecting function accordance with the settings for the S or T type shown in the table above, if the "monolithic feeding frame/separately driven feeding frame changing-over function" is set to the "monolithic feeding frame."**
2. **The functions will be described in the next page and beyond in no special order for convenience of explanation.**

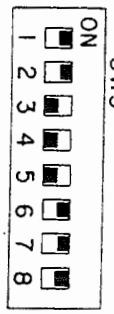
DIP switch name	Function
❺ DIP switch 5 (SW5)	• **SW5 - 8 ... Monolithic feeding frame/separately driven feeding frame changing-over function (SW5-8)** Used to change over the function of the feeding frame between "making the right- and left-hand sections of the feeding frame go up/come down simultaneously (monolithic feeding frame)" and "making the right- and left-hand sections of the feeding frame go up/come down independently (separately driven feeding frame)."



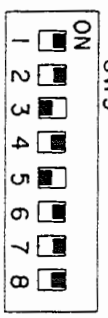
• S type
At the time of delivery



• T type
At the time of delivery

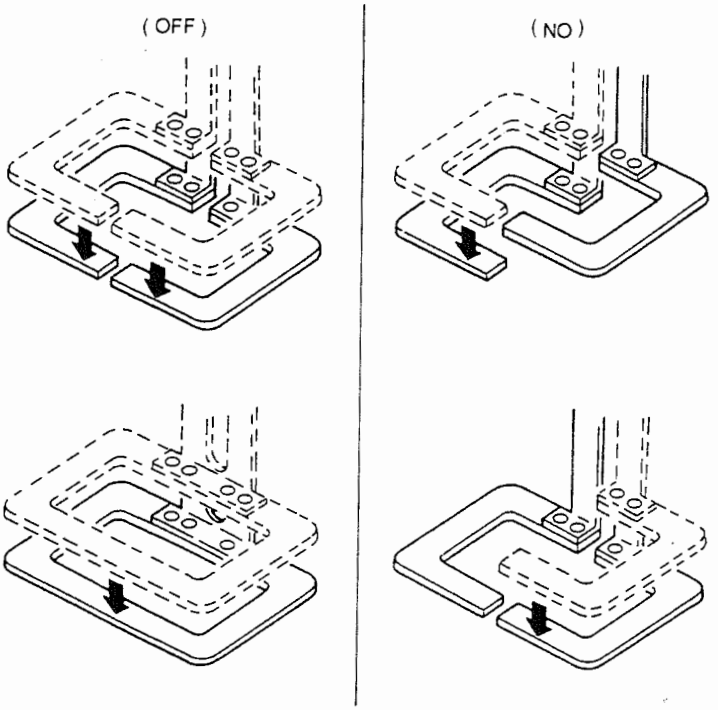


• L type
(excluding GL type)
At the time of delivery



• GL type
At the time of delivery

ON	The right- and left-hand sections of the feeding frame go up/come down independently. (Separately driven feeding frame)
OFF	The right- and left-hand sections of the feeding frame go up/come down simultaneously. (Monolithic feeding frame)



(Caution)

1. This function is available in the L type.

When operating the feeding frame as a monolithic feeding frame (with the SW5-8 set to its OFF position), the following functions will be rendered ineffective.

(Table 1)

Separately-driven feeding frame operation sequence changing-over function	SW6-1
Pedal selecting function B	SW5-6
Cycle stitching facility B	SW5-1

2. For the S or T type, be sure to set the SW5-8 to its OFF position.

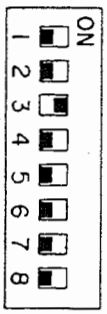
If this switch is set to its ON position, the functions shown in Table 1 will be operative, resulting in sewing machine start failure.

3. Pedal switches that can be used

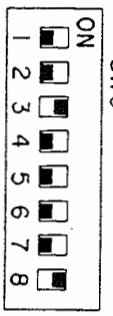
When the feeding frame is used as a separately driven feeding frame (the SW5-8 is set to its ON position)..... 3-step, 3-pedal units including PK-47 and -48

When the feeding frame is used as a monolithic feeding frame (the SW5-8 is set to its OFF position)..... 2-step, 2-pedal units including, PK-49, standard pedal and red & black pedal

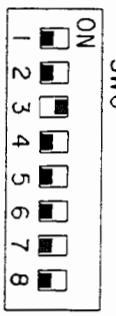
DIP switch name	Function
⑥ DIP switch 6 (SW6)	• **SW6 - 1 ... Separately-driven feeding frame operation sequence changing-over function** Used to select either the right-hand or the left-hand section of the feeding frame comes down first, when the feeding frame is operated as a separately driven feeding frame (SW5-8 is set to its ON position). (Only when a PK-47 is used with the sewing machine.)



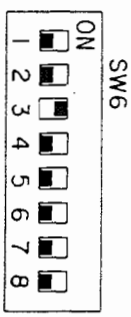
• S type
At the time of delivery



• T type
At the time of delivery

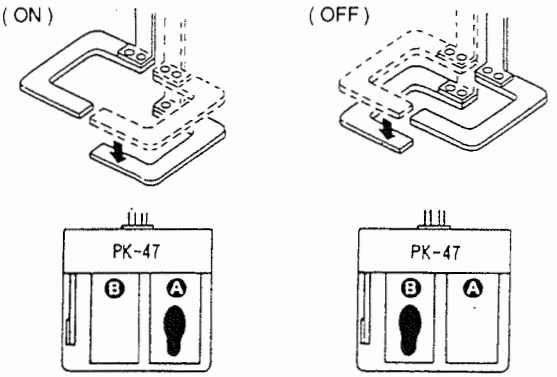


• L type
(excluding GL type)
At the time of delivery



• GL type
At the time of delivery

ON	The right-hand section of the feeding frame comes down first.
OFF (This switch has been set to the OFF position at the time of delivery.)	The left-hand section of the feeding frame comes down first.

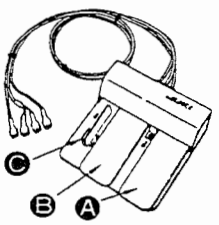


(Caution)

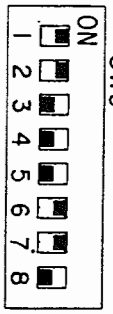
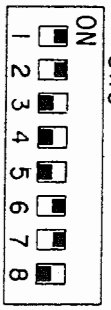
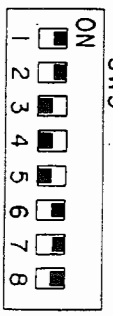
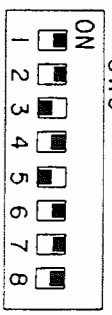
1.It is necessary to set the feeding frame 2 switch (shown in the table below) to its ON position in advance so as to turn OFF then ON the DIP switch SW6-1 and lower the feeding frame (right) in prior to the feeding frame (left). This means that the machine cannot be operated (the pedal cannot be depressed) when the switches are set as shown in the column of the table marked with a cross ☒. (The second step of B cannot be depressed first. The DIP switches in the PK - 48 foot pedal unit are set as shown in the column of the table marked with a cross ☒, which means that the second step of B cannot be depressed first.)

• If you wish to lower the feeding frame (right) first when using the PK-48 or using the PK-47 with the DIP switches set as shown in the column of the table marked with a cross ☒ , refer to " Change - over of the feeding frame by connection of connectors" in " 3-7 . a) Operating the foot switch (PK-47)."

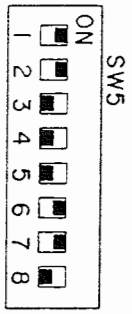
Example of connection of the connectors and corresponding switch assignments



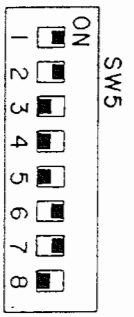
Connector side — Cable side	Feeding frame 1 switch	Feeding frame 2 switch	Start switch
1 — 1 2 — 2 3 — 3 4 — 4	Ⓐ	Ⓑ First step	Ⓑ Second step
Setting of DIP switches	SW5-7 ON	SW5-6 OFF	
1 — 1 2 — 2 3 — 4 4 — 3	Ⓐ	Ⓑ First step	Ⓒ
Setting of DIP switches (at the time of delivery)	SW5-7 ON	SW5-6 ON	
~~1 — 1~~ ~~2 — 2~~ ~~3 — 4~~ ~~4 — 3~~ Cannot be used in this way.	Ⓑ First step	Ⓑ Second step	Ⓒ
Setting of DIP switches	SW5-7 OFF	SW5-6 OFF	

DIP switch name	Function
❺ DIP switch 5 (SW5)  • S type At the time of delivery  • T type At the time of delivery  • L type (excluding GL type) At the time of delivery  • GL type At the time of delivery	• **SW5 - 7 ... Pedal selecting function A** Used to control the feeding frame switch (feeding frame 1 switch). The function of this switch depends on the "separately driven feeding frame function." When the "separately driven feeding frame function" is specified (effective) ... The SW5-8 is set to its ON position. [L type] ※ When the feeding frame is used as a separately driven feeding frame to make the right- and left-hand sections of the feeding frame independently go up and come down, the DIP switch SW5-7 facilitates operation if using in combination with the SW5-6 (Pedal selecting function B). ON: When the [Feeding frame (left-side) switch] is depressed, the left-hand section of the feeding frame comes down. Another depress on the [same pedal] makes the left-hand section of the feeding frame go up. OFF: The left-hand section of the feeding frame keeps coming down as long as the [Feeding frame (left-side) switch] is kept depressed. **(Caution)** **The aforementioned relationship between the switch and the performance of the feeding frame is provided when the connectors are connected as ① .** **If the connectors are connected as ② , the right-hand section of the feeding frame actuates instead of the left-hand section of it.** When the "separately driven feeding frame function" is ineffective) ... The SW5-8 is set to its OFF position. ※ When the feeding frame is used as a monolithic feeding frame ON: When the [Feeding frame switch] is depressed, the feeding frame (both the left- and right-hand sections) comes down. Another depress on the [same pedal] makes the feeding frame (both the left- and right-hand sections) go up. OFF: The feeding frame (both the left- and right-hand sections) keeps coming down as long as the [Feeding frame switch] is kept depressed. • **SW5 - 6 ... Pedal selecting function B** Used to control the feeding frame switch (feeding frame 2 switch). The function of this switch depends on the "separately driven feeding frame function."(The SW5-6 is used in combination with the SW5-7.) When the "separately driven feeding frame function" is specified (effective) ... The SW5-8 is set to its ON position. [L type] ※ When the feeding frame is used as a separately driven feeding frame to make the right- and left-hand sections of the feeding frame independently go up and come down, the DIP switch SW5-6 facilitates operation if using in combination with the SW5-7 (Pedal selecting function A). ON (This switch has been set to the ON position at the time of delivery.): When the [Feeding frame (right-side) switch] is depressed, the right-hand section of the feeding frame comes down. Another depress on the [same pedal] makes the right-hand section of the feeding frame go up. OFF: The right-hand section of the feeding frame keeps coming down as long as the [Feeding frame (right-side) switch] is kept depressed. **(Caution)** **The aforementioned relationship between the switch and the performance of the feeding frame is provided when the connectors are connected as ① .** **If the connectors are connected as ② , the left-hand section of the feeding frame actuates instead of the right-hand section of it.** When the "separately driven feeding frame function" is ineffective) ... The SW5-8 is set to its OFF position. ※ When the feeding frame is used as a monolithic feeding frame The SW5-6 is rendered ineffective.

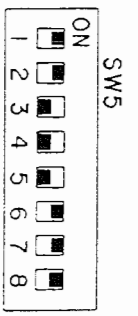
DIP switch name	Function
❺ DIP switch 5 (SW5)	• SW5 - 2 ... Cycle stitching function A (Raising/lowering of the feeding frame selection A)



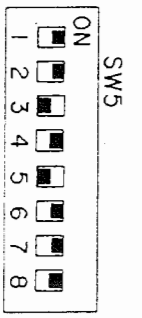
• S type
At the time of delivery



• T type
At the time of delivery



• L type
(excluding GL type)
At the time of delivery

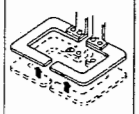


• GL type
At the time of delivery

Used to specify the performance (up/down) of the right-hand section of the feeding frame at the position in a pattern where a "temporary stop" command (pause) has been entered.
Note that the function of this switch depends on the "separately driven feeding frame function" (ON/OFF setting of the SW5-8).

(Table 1)

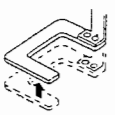
When the "separately driven feeding frame function" is ineffective) ... The SW5-8 is set to its OFF position
※ When the feeding frame is used as a monolithic feeding frame



ON (the setting of the switch at the time of delivery)	The sewing machine temporarily stops with the feeding frame (both the right-and left-hand sections) raised, at the position in a pattern where a temporary stop command has been entered. (Cycle stitching function) Turn ON the Feeding frame switch. → Turn ON the Start switch. This makes the machine start the next stitching cycle.
OFF	The sewing machine temporarily stops with the feeding frame (both the right- and left-hand sections) lowered, at the position in a pattern where a temporary stop command has been entered. Turning ON the Start switch makes the machine start the next stitching cycle.

(Table 2)

When the "separately driven feeding frame function" is specified (effective) ... The SW5-8 is set to its ON position. (L type)
※ When the feeding frame is used as a separately driven feeding frame to make the right- and left-hand sections of the feeding frame independently go up and come down.
• The DIP switch SW5-2 facilitates operation if using in combination with the SW5-1.

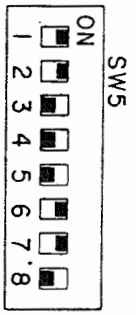


ON (the setting of the switch at the time of delivery)	The sewing machine temporarily stops with the left-hand section of the feeding frame raised, at the position in a pattern where a temporary stop command has been entered. (Cycle stitching function) Turn ON the Feeding frame (left-side) switch. → Turn ON the Start switch. This makes the machine start the next stitching cycle.
OFF	The sewing machine temporarily stops with the left-hand section of the feeding frame lowered, at the position in a pattern where a temporary stop command has been entered. Turning ON the Start switch makes the machine start the next stitching cycle.

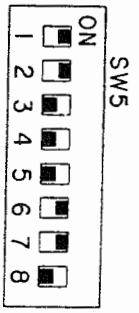
(Caution)

1. **Refer to the table of "Combination of the SW5-2 and the SW5-1" on page 155.**
2. **The switch controls the left-hand section of the feeding frame as shown in Table 2 when connectors are connected as ① in page 26. If the connectors are connected as ②, the switch will control the right-hand section of the feeding frame. (Since the relationship between the connectors and solenoid valves are changed over.)**

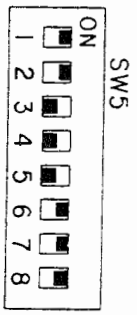
DIP switch name	Function
❺ DIP switch 5 (SW5)	※ Temporary stop command This command is used to temporarily stop the machine in a pattern. This command can be entered at a desired position (two or more positions) in a pattern to allow you to create (modify) it with ease when using the main unit input function/PGM-1, etc. ※ Cycle sewing Several sewing processes (cycles) are continuously sewn. A pattern can be divided by the temporary stop command so that the material may be turned or changed while the feeding frame is raised. **(Caution)** **When the machine is in the cycle sewing mode, be sure to take note of the following points :**



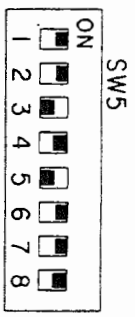
• S type
At the time of delivery



• T type
At the time of delivery



• L type
(excluding GL type)
At the time of delivery



• GL type
At the time of delivery

Forward

Backward

When the Forward or Backward key is pressed, the machine halts at the predetermined temporary stop point where the feeding frame can be raised or lowered using the feeding frame switch. (Only when the cycle stitching function is set to ON state.)
If you wish to feed the material forward or backward continuously, the feeding frame should be kept lowered.

Return to Origin

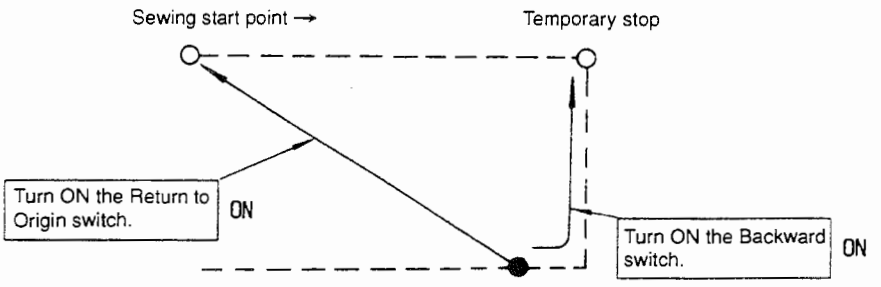
When the Return to Origin switch is pressed, the machine goes back to the beginning of the first cycle of the pattern. If you want to go back to the beginning of the cycle being sewn, use the Backward key. (Refer to the figure below.)

Bobbin thread counter

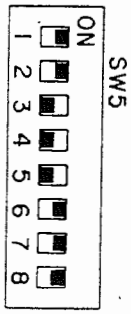
The counter counts up upon the completion of one pattern.
If a pattern includes 3 cycles, the counter is incremented when the 3 cycles have been sewn.

Set Ready (Test)

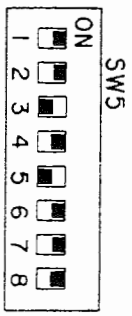
The Set Ready switch is rendered ineffective while sewing a pattern (between cycles) even if the feeding frame goes up.
Press the Set Ready switch after pressing the Return to Origin switch or after completion of the pattern.



DIP switch name	Function
❺ DIP switch 5 (SW5)	• **SW5 - 1 ... Cycle stitching function B (Raising/lowering of the feeding frame selection B)**



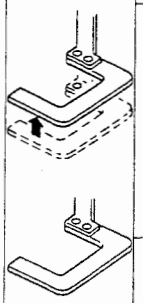
• L type
(excluding GL type)
At the time of delivery



• GL type
At the time of delivery
(Refer to the previous page for the switch setting for the S or T type at the time of delivery)

Used to specify the performance of the right-hand section of the feeding frame at the position in a pattern where a "temporary stop" command (pause) has been entered.
Note that the SW5-1 is effective only when the "separately driven feeding frame function" has been specified (effective) (the SW5-8 is set to its ON position).
(Table 1)

When the "separately driven feeding frame function" is specified (effective) ... The SW5-8 is set to its ON position. [L type]
※ When the feeding frame is used as a separately driven feeding frame to make the right- and left-hand sections of the feeding frame independently go up and come down.
• The DIP switch SW5-1 facilitates operation if using in combination with the SW5-2.



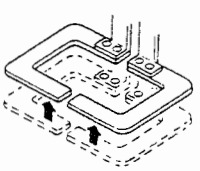
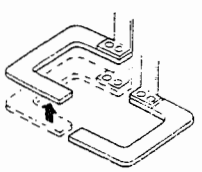
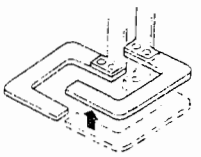
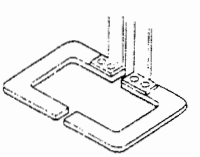
ON	The sewing machine temporarily stops with the right-hand section of the feeding frame raised, at the position in a pattern where a temporary stop command has been entered. (Cycle stitching function) Turn ON the Feeding frame (right-side) switch. → Turn ON the Start switch. This makes the machine start the next stitching cycle.
OFF	The sewing machine pauses with the right-hand section of the feeding frame lowered, at the position in a pattern where a temporary stop command has been entered. Turning ON the Start switch makes the machine start the next stitching cycle.

(Caution)

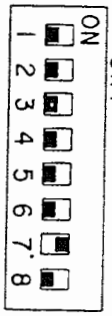
1. **When the "separately driven feeding frame function" is ineffective (the SW5-8 is set to its OFF position) to allow the right- and left-hand sections of the feeding frame to go up/come down simultaneously, the ON/OFF state of the SW5-1 does not affect the operation of the sewing machine at all. Refer to the description of the SW5-2.**
2. **Refer also to the "Caution" for the SW5-2.**
3. **The switch controls the right-hand section of the feeding frame as shown in Table 2 when connectors are connected as ① in page 26. If the connectors are connected as ② , the switch will control the left-hand section of the feeding frame.**
   (Since the relationship between the connectors and solenoid valves are changed over.)

※ Combination of the SW5 - 2 (cycle stitching function A) and the SW5 - 1 (cycle stitching function B)
When the "separately driven feeding frame function" is specified (effective) the SW5-8 is set to its ON position and connectors are connected as ① on page 26. L type

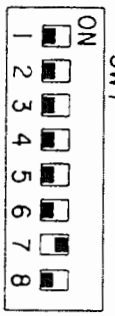
(Table 2)

SW5 - 2 (left)	ON		OFF	
SW5 - 1 (right)	ON	OFF	ON	OFF
Performance of the feeding frame at the position in a pattern where a "temporary stop" command has been entered	Both the right- and left-hand sections of the feeding frame go up.	Only the left-hand section of the feeding frame goes up.	Only the right-hand section of the feeding frame goes up.	Both the right- and left-hand sections of the feeding frame are kept lowered.
				

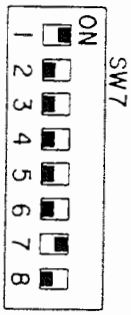
DIP switch name	Function
❼ DIP switch 7 (SW7)	• **SW7-1 ... Change-over of the air pressure detecting function (SW7-1)** If the specifications of the sewing machine is changed over between the S or T type and the L type, or if you wish to make the air pressure detecting function inoperative due a certain reason, use the SW7-1 to select the air pressure detecting function.



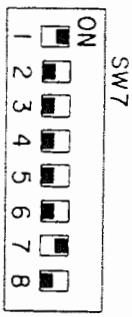
• S type
At the time of delivery



• T type
At the time of delivery



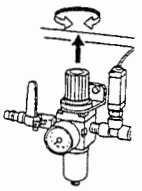
• L type
(excluding GL type)
At the time of delivery

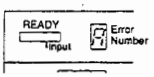


• GL type
At the time of delivery

ON	When the feeding frame is pneumatically driven, the machine detects a drop of the compressed air pressure then stops showing error indication "A" on the operation box (panel).
OFF	When the magnet actuates, the air pressure detecting function is made ineffective. The S or T type of sewing machine will not run unless the SW7-1 is set to its OFF position.

(Caution)



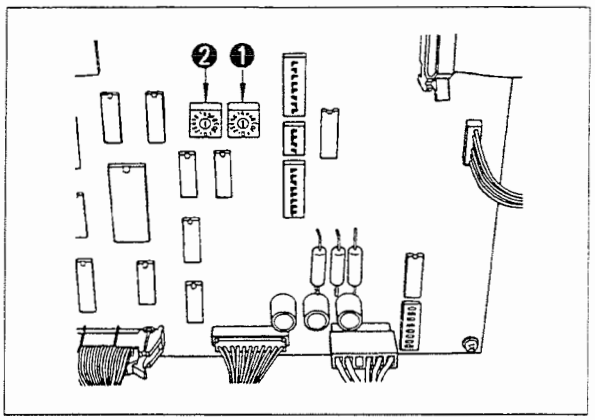


1. **Be sure to set the SW7-1 to its ON position for the L type (the feeding frame is pneumatically driven) unless there is a special reason for making the air pressure detecting function ineffective. If the SW7-1 is set to its OFF position, defective feed of the material (step-out) or material clamping failure may result due to a drop of the compressed air pressure.**
2. **The lowest limit of the pressure detectable range of the air pressure detecting function depends on the setting of the pressure sensor. Refer to page 92 "30. Adjusting the pneumatic components".**
3. **If a pressure sensor error (error indication "A" will not go out) occurs, the sewing operation can be interrupted by setting the SW7-1 to its OFF position. In this case, however, a spare sensor should be attached to the sewing machine as soon as possible because of the reason described in "Caution 1."**

• **SW7-6 ... Setting the "feeding frame position at sewing end selecting function"**

ON	The feeding frame does not go up upon completion of sewing and the material is kept clamped. If you wish to raise the feeding frame, depress the feeding frame switch. **(Caution)** **The sewing machine cannot start the next sewing unless the feeding frame is raised once.**
OFF (the setting of the switch at the time of delivery)	The feeding frame goes up upon completion of sewing. (Normal sewing)

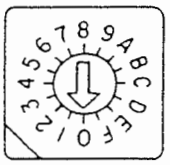
6-4. Functions of the rotary DIP switches



The rotary DIP switches, SW1 and SW2 which are used to set the function, are mounted on the I/F circuit board.

(Caution)

When the power switch is turned ON, the machine will perform reading out the setting of the switches. So, be sure to change the setting of the switches after the power switch has been turned OFF.

Switch name	Function
❶ **Rotary DIP switch 1 (SW1)**	• This switch is not used. Set this switch to "0". (It has been set to "0" at the time of delivery.)
❷ **Rotary DIP switch 2 (SW2)** 	• **Set value "0" ... Normal operation (at the time of delivery)** The normal operation is performed in the sewing mode selected using DIP switches (SW4, 5, 6 and 7) on the I/F circuit board.

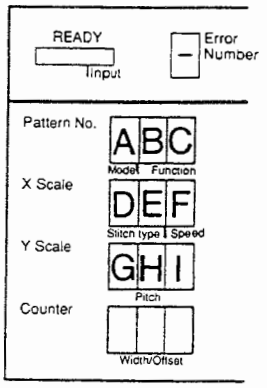
• Set value "2" Serves to check the input of the switches.

The performance of the switches and sensors can be checked.

The switches and sensors can be checked for the normal operation.

1. Operating procedure

("Table of correspondence between the steps and the switches and sensors" is shown on the next page.)



(1) Set the rotary DIP switch (SW2) at "2" and turn ON the power to the sewing machine.

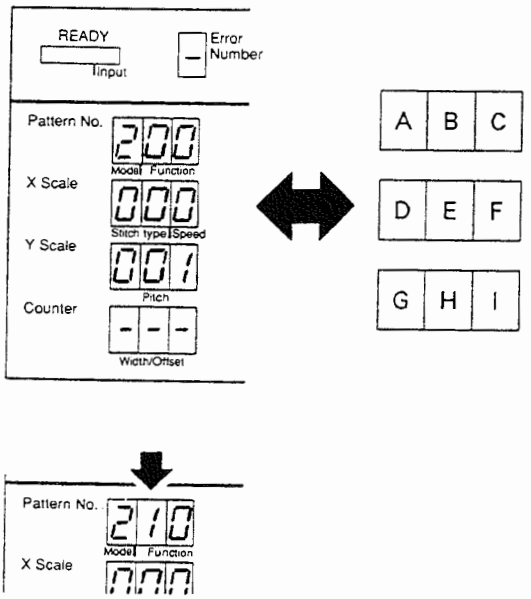
(2) All the digital displays on the operation box (panel) will indicated "8."

(3) Depress the foot switch (Start switch or Feeding frame switch) until the step you want to check is specified.
The step is indicated at the pattern No. display column corresponding to the hundreds digit
(A in the figure on the right).

(4) Turn ON/OFF the switch or the sensor you wish to check. If the switch or the sensor operates normally, the specified indication will change over to "1" or "0."

2. Example of operation

To check the Reset switch (Display "B" of the step "2" See the next page)



Set the SW2 at "2", and turn ON the power to the sewing machine.

⬇

All the digital displays on the operation box (panel) will indicated 8

⬇

Depress the foot switch three times (the foot switch is turned ON) until the step 2 is specified. (Fig. 2)

⬇

Press the Reset (select) switch.

If the indication on display "B" changes to "1," the Reset switch operates normally.
If the indication given on display B remains "0," suppose that the switch, junction cable, circuit board, or other components may be defective.

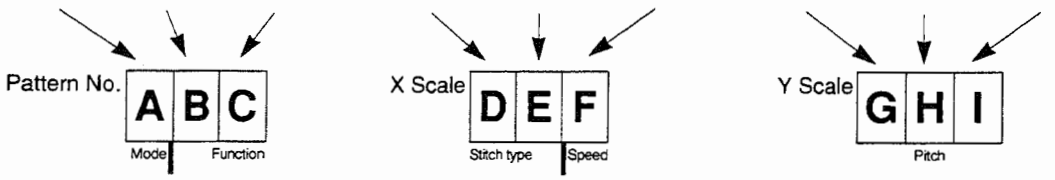
(Caution)

For some switches and sensors, the indication changes from "0" to "1" when they are turned ON, and for other switches and sensors, the indication changes from "1" to "0" when they are turned ON.

3. Table of correspondence between the steps and the switches and sensor

Foot switch ON

Display / Step A	B	C	D	E	F	G	H	I
0	0 (Operation switch)	1 (Operation switch)	2 (Operation switch)	3 (Operation switch)	4 (Operation switch)	5 (Operation switch)	6 (Operation switch)	7 (Operation switch)
1	8 (Operation switch)	9 (Operation switch)	Pattern No. (Operation switch)	X-Scale (Operation switch)	Y-Scale (Operation switch)	Bobbin counter (Operation switch)	Forward (Operation switch)	Backward (Operation switch)
2	Reset (Operation switch)	Return to Origin (Operation switch)	Ready (Operation switch)	Stop thread trimming SW 7-3	Sewing machine speed 1 SW 7-4	Sewing machine speed 2 SW 7-5	Sewing end feeding frame ON/OFF SW 7-6	Initial feed Operation SW 7-7
3	Material thickness SW 4-4	Material thickness SW 4-3	SW 4-2	SW 4-1	Air sensor	SW 7-1	SW 7-2	Needle threading switch (Control box)
4	Start switch	Feeding frame switch 1	Feeding frame switch 2	stop switch	Bobbin winder (Control box)	Sewing machine ON/OFF switch (Control box)	INC/DEC of the stitch length or No. of stitches switch (Control box)	PGM-1
5	Standard / separately driven feeding frame SW 5-8	Change-over pedals SW 5-7	Separately driven feeding frame pedal changeover SW 5-6	Origin detection SW 5-5	Wiper actuating position selection function SW 5-4	Sewing start point travel,Second origin setting SW 5-3	Cycle sewing function SW 5-2	Separately driven feeding frame cycle sewing function SW 5-1
6	Intermediate presser foot stop function SW 6-8	Wiper prohibition SW 6-7	Thread trimmer inoperative SW 6-6	Needle thread breakage detection function SW 6-5	Enlargement / reduction prohibition SW 6-4	Reset function SW 6-3	Counter function SW 6-2	Separately driven feeding frame sequence changeover SW6-1
7	SW 1-8	SW 1-4	SW 1-2	SW 1-1	SW 2-8	SW 2-4	SW 2-2	SW 2-1
8			Thread breakage detector	Down detection signal	Up detection signal	Solenoid slip - off signal	T / G pulse signal	
9	X origin	Y origin	+X limit	-X limit	±Y limit			



(Caution)

1. • **The "operation switch" shown in the table above indicates the switches on the operation box (panel).**
   • **SW4-1 to SW7-7 are the DIP switches.**
   • **SW1-1 to SW2-8 are the rotary DIP switches.**
   • **Steps "8" and "9" are input signals of the sensors.**
2. **To check the sensor of step "9," remove the junction cable of the stepping motor (when the power to the machine has been turned OFF). Then check the sensor by moving the feed by hand.**
3. **The start switch and the feeding frame switch of step "4" change over to step "5" immediately after turning them ON.**
   So, check the switches by depressing the foot switch (the start switch or feeding frame switch) checked at step "3." If the step changes from "3" to "4," the start switch and the feeding frame switch are normal.

• **Set value "3" Sewing speed check program is selected.**

This switch serves to check the specified sewing speed and the actual sewing speed.
(No speed indicator is required.)

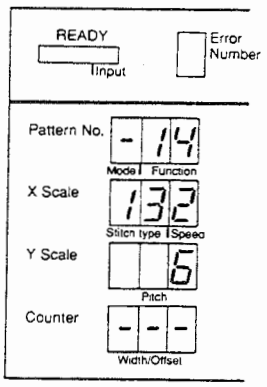
(1) When the power switch is turned ON, all numerical displays will give "-". At this time, turn the max. speed limit knob fully clockwise.
(2) When the start switch is depressed after the feeding frame switch is depressed to lower the feeding frame, the displays will give "02", and the sewing machine will start to run at a low speed.
(3) When the stop switch is pressed, the sewing machine will stop.
(4) Each time steps (2) and (3) above are repeated, the sewing speed is updated. By so doing, the sewing machine speed for each stitch length can be checked.

(Table 1)

Pattern No. indication			Sewing speed (specified range)
-	0	2	180 ± 2
-	0	4	350^{+0}_{-50}
-	0	6	550^{+0}_{-50}
-	1	1	$1{,}050^{+0}_{-50}$
-	1	4	$1{,}350^{+0}_{-50}$
-	1	6	$1{,}550^{+0}_{-50}$
-	1	8	$1{,}750^{+0}_{-50}$
-	2	0	$1{,}950^{+0}_{-50}$

The sewing speed will be shown in the operation box (panel) as follows:

(Example)



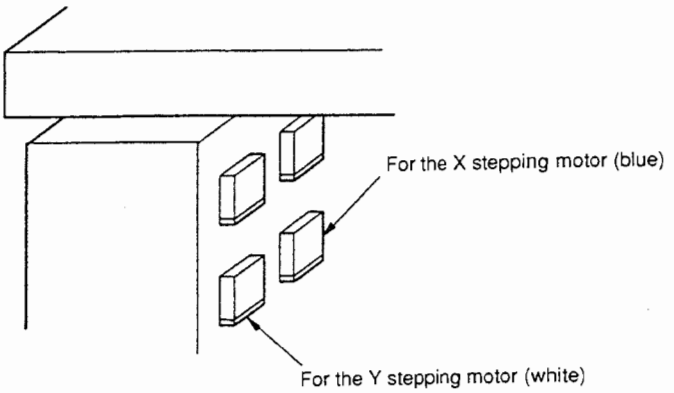
} These figures indicate that the sewing speed of the machine is 1,326 s.p.m.

(Caution)
The actual speed is specified for the AMS machines against the indicated speed codes (02 to 20). If the sewing speed is out of the specified range shown in Table 1 during the aforementioned checking procedure, adjust the sewing speed referring to "Adjusting the sewing speed" on page 134.
In the case where the sewing speed exceeds the highest limit of the specified range, in particular, defective feed (step-out) may result. So be careful.

• **Set value "4" The sensor check program is selected.**

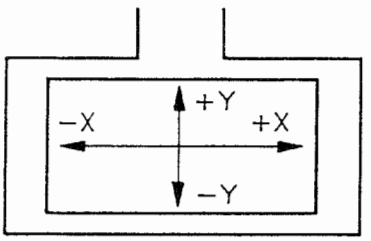
The condition of the individual sensors can be checked.

(1) Remove the cables of X/Y stepping motors from the control box.
(Or else, the stepping motors will be excited and the feed bracket will not be allowed to be moved by hand.)



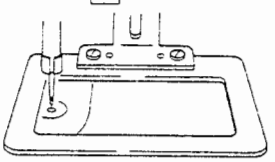
(2) When the power switch is turned ON, the condition of the sensors for the X/Y origin (X0, Y0) and X/Y limits (+X, -X, +Y, -Y) will be shown on the display of the X/Y scale on the operation box (panel).

Pattern No.	—	0	1
X scale	-X	X0	+X
Y scale	—	Y0	±Y
Counter	—	—	—



The direction, + or - will be determined by the position of the needle with regard to the feed bracket.

(Example) **Display** -x



The display of the limit sensor shows "0" when the limit is detected. When the sensor senses the points other than the limit, "1" will be shown.
The display of the origin sensor shows "1" when the sensor is in the + position, and shows "0" when the sensor is in the - position.

• **Set value "5" Origin check program is selected.**

The position of the origin can be checked.

Be sure to readjust the position of the origin using this program, whenever an origin-related part has been replaced.

(1) When the power switch is turned ON, the same indications as the "sensor check program" will be shown in the display on the operation box (panel). (Refer to the previous page.)

(2) Depress the start switch after the feeding frame switch is depressed to lower the feeding frame.

(3) The feed bracket moves to the origin, and then stops.

(4) The feed bracket permits to be moved using the jog keys.

(5) Each time the start switch is depressed, the origin will be searched repeatedly.

(6) The condition of the sensors will be shown on the operation box (panel) as the sensor check program. Generally, the machine origin will be set at the point where the numerical display changes from 1 to 0. Accordingly, the displays on the operation box (panel) at the origin will be as follows:

Pattern No.	—	0	1
X scale	1	0	0
Y scale	—	0	1
Counter	—	—	—

Refer to page 94 "(31) Adjusting the X/Y origins and travel limit sensor".

• **Set value "6" Continuous sewing is selected.**

(1) At the normal sewing, the program is read from the floppy disk, when the Set Ready switch is pressed.

(2) Depress the feeding frame switch so that the feeding frame comes down.

(3) Step on the start switch, and the machine will start sewing. Upon completion of a sewing cycle, the machine will stop at the sewing start point.

(4) After the machine pauses about five seconds, the machine will automatically resume continuous sewing.

(5) After completion of sewing, stop the machine by pressing the Stop switch. Turn OFF the power switch after the origin has been retrieved.

• **Set value "7" PGM-1 LEDs check program is selected.**

(1) Connect the PGM-1 compact-type programming device.

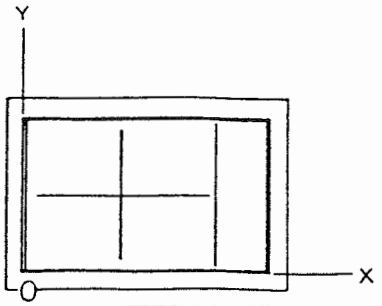
(2) Turn ON the power switch.

(3) Each of the input procedure indicating LEDs will light up for one second in sequence from the pattern input, permitting the check of the individual LEDs.

• **Set value "8" PGM-1 digitizer check program is selected.**

This switch is used to check the coordinates which have been read by the coordinated reading device (digitizer). The X coordinates will be shown on the X scale display and the Y coordinates on the Y scale display with a 0.1 mm (0.004") accuracy.

(Digitizer coordinates)



The digitizer will read within the following range, the left bottom being the origin.
$0 \leqq X \leqq 307.1$ mm (12.091")
$0 \leqq Y \leqq 204.8$ mm (8.063")

(1) Turn ON the power switch .

(2) Lightly press the digitizer, using the point of a stylus pen.
Then each of the lower three digits of the coordinates read will be shown.

• Set value "B" Output check program is selected.

The performance of the feeding frame and wiper can be checked.

(1) When the power switch is turned ON, the following displays will be shown on the operation box (panel).

Pattern No.	0 0 0
X scale	0 0 0
Y scale	— — —
Counter	— — —

(2) When the number on the operation box (panel) display is specified, the corresponding mechanism will be actuated.

[9] ... Feeding frame (Left feeding frame for L type)

[8▲] ... Feeding frame (Right) (L type only)

[7] ... Intermediate presser foot

[4◀] ... Wiper

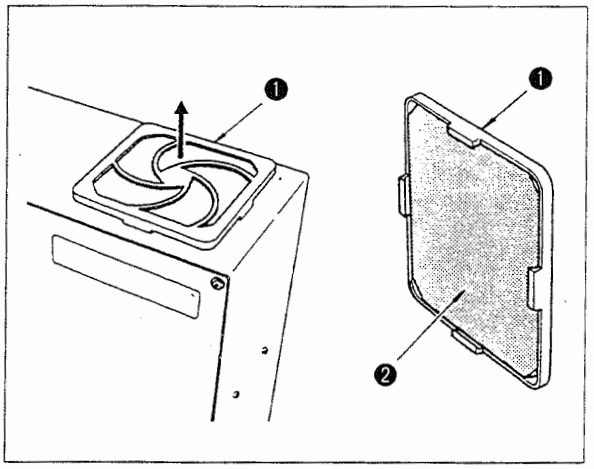
(Caution) 1. This switch cannot be used to actuate the thread trimming solenoid.
2. The L type magnet connector is connected as ① on page 26.

The set values "1" or "9", and "A" "C" "D" "E" "F" are not used.
If these are specified, the machine will run in the normal operation mode.

7. MAINTENANCE AND INSPECTION

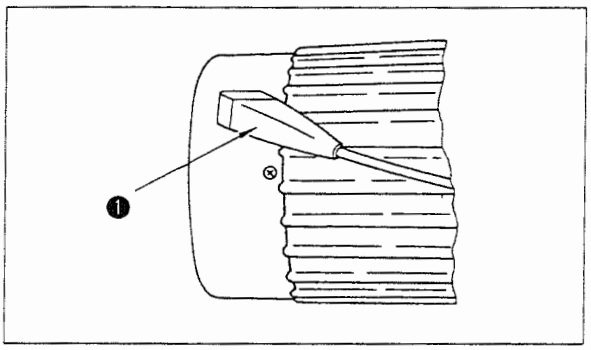
7-1. Cleaning the filter

Clean the filter of the control box fan once a week.



1) Pull screen kit ❶ in the direction of the arrow so that the kit is removed.
2) Wash filter ❷ under running water.
3) Reinstall filter ❷ and screen kit ❶ to the position where they have been installed.

7-2. Changing the direction of rotation of the sewing machine

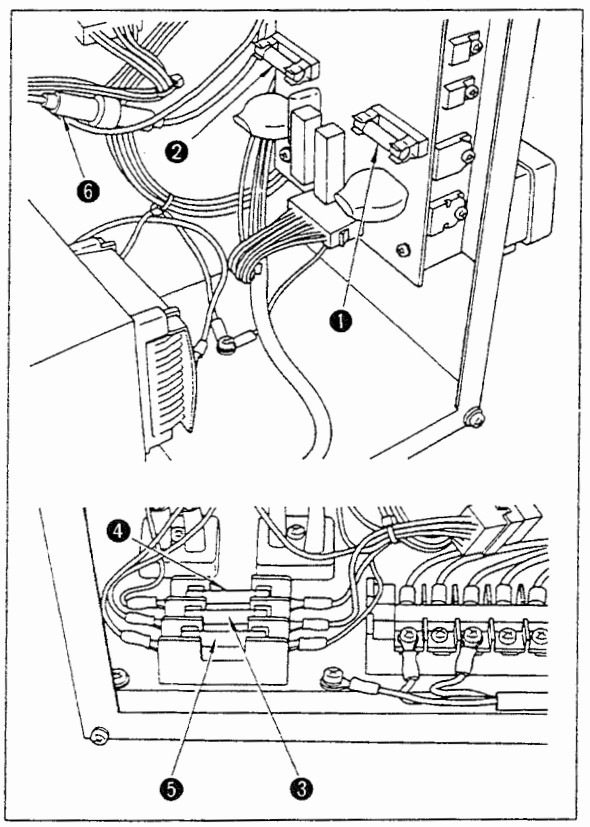


1) Turn the power switch OFF.
2) Remove connector ❶ from the rear of the motor (on the opposite side from the handwheel).
3) Reverse the connector (turn it 180 degrees) and reconnect it securely.

(Caution)

For the sewing machine that is equipped with a single-phase motor of 100 V or other voltages, turn OFF the power switch and wait for several minutes. Then turn ON the power switch.

7-3. Replacing the fuse



The machine uses the following six fuses:

❶ 7A standard melting fuse for stepping motor (X) protection E9628252000
❷ 7A standard melting fuse for stepping motor (Y) protection E9628252000
❸ 10A standard melting fuse for stepping motor power supply protection E8523304000
❹ 7AT time-lag fuse for solenoid power supply protection HF001400700
❺ 1A standard melting fuse for 100 VAC power supply protection E9611601000
❻ 2A standard melting fuse for marking light power supply protection E9613601000

(Caution)

To replace blown fuse, turn the power switch OFF, open the control box cover, and replace it with a new fuse with the specified capacity.

7-4. Adjustment and maintenance of the motors

(Turn the power OFF , and be sure that the motor has completely stopped before starting the adjustment.)

1. Adjusting the clutch gap

The clutch gap is factory-adjusted to 0.5 mm (0.020").

Readjust the clutch gap,

- When the clutch ring or brake ring has been replaced.
- When the clutch gap is too small, causing constant friction between the clutch and brake with any of the following results:

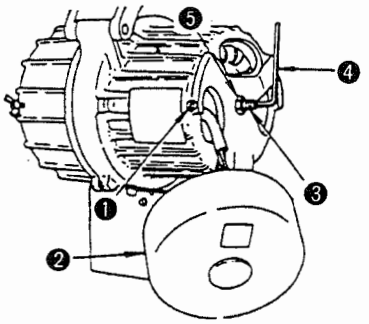
a) The main motor is overheated.

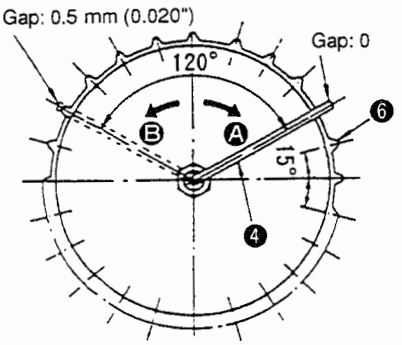
b) The motor fails to run smoothly.

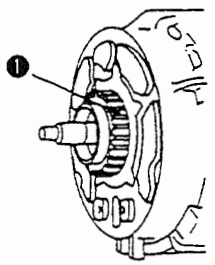
c) A scorching smell of wood is produced (from an overheated cord).

d) Even when the needle is stopped, it immediately starts to move by itself and fails to remain stationary.

<Adjusting procedure>







(1) For HITACHI motor

1) Turn the power OFF, confirm that the flywheel of the motor has completely stopped, then loosen setscrew ❶ to remove end cover ❷ of the motor.
2) Remove the pulley cover, and then the V belt.
3) Loosen lock nut ❺ using a spanner, insert L-shaped wrench key ❹ supplied with the motor into the hexagonal hole of setscrew ❸.
4) Screw in the L-shaped wrench key in direction A as illustrated while turning the pulley by finger until the inertia of the pulley can not longer driver the pulley (in other words, until the pulley's resistance is felt: 0 mm gap). Then, screw out the L-shaped wrench key in direction B for eight cooling fins ❻ of the motor. (120 degrees = 0.5 mm (0.020") gap)
5) With the wrench key held in the position mentioned above, tighten lock nut ❺ by a spanner with care taken not to move setscrew ❸.
6) After adjustment, manually turn the pulley to check it for smooth rotation. Turn the power switch ON, check the motor for proper operation, and carry out test run for 20 to 30 times.

(2) For MATSUSHITA motor

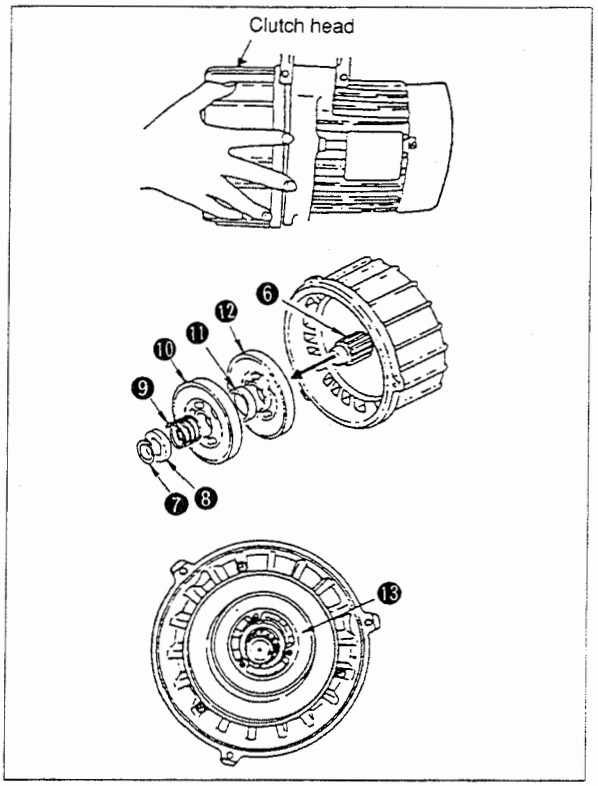
First, turn adjustment screw ❶ fully counterclockwise. Then, slowly turn it clockwise until resistance is felt. Further turn the adjusting screw clockwise by 8 steps (120 degrees).

2. Replacing the clutch ring and brake ring

When the clutch noise or brake noise has changed to a metalic noise after a long period of use, or when the motor has come to run unsmoothly, it is a sign of service life expiry of the frictional parts. Replace the clutch ring and brake ring as follows:

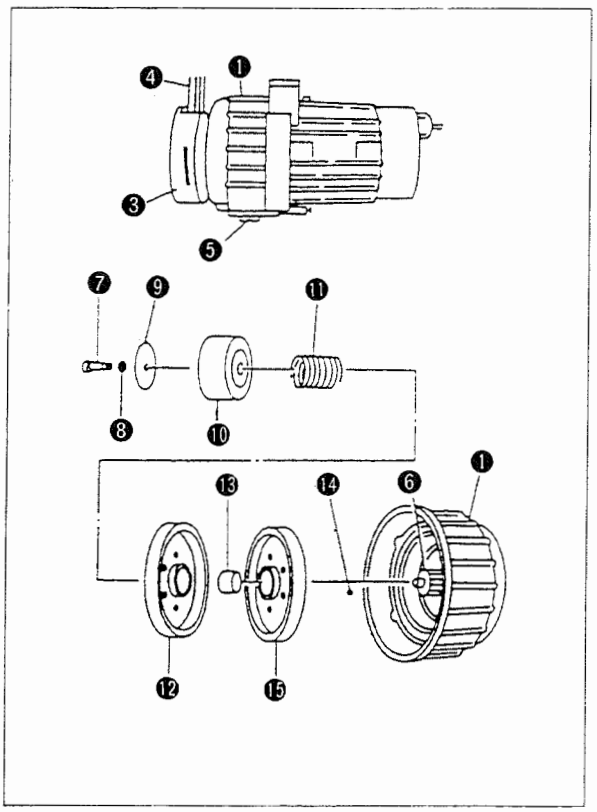
Turn the power OFF, and be sure that the motor has completely stopped before starting the replacement. (Wait for 3 to 5 minutes after turning the power OFF.)

(1) For HITACHI motor



1) Remove the connector 4P from the controller.
2) Remove the pulley cover and the V belt.
3) Unscrew the three mounting screws of the clutch head to remove the clutch head from the main body. (At this time, take care not to allow the clutch head to fall.)
4) Remove C ring ❼.
5) Take out spring bearing ❽, clutch resetting spring ❾, clutch ring ❿, spline cap ⓫, and brake ring ⓬.
6) Using a rag moistened with benzine, clean the surfaces of brake disk ⓭ and the clutch disk, and spline shaft ❻.
   If the surfaces look brown, burnish the surfaces using a commercially available metal cleaner, then wipe them with a rag with benzine.
   (Do not touch the surface of the clutch ring ❿ or brake ring ⓬ by hand, or do not clean it with benzine.)

(2) For MATSUSHITA motor



1) Remove pulley cover ❸ and belt ❹.
2) Remove screw ❺, and remove the clutch bracket from the motor.
3) Remove screw ❼ washer ❽, presser disk ❾, housing cover ❿, spring ⓫, clutch ring ⓬, brake ring ⓯, and cushion ⓭ from clutch shaft ❻ of the clutch bracket.
   (Caution)
   Be sure not to lose cylindrical key ⓮ which fits in the clutch shaft.
4) Replace with a new movable disk, then adjust the clutch clearance.

(3) Cleaning the spline assembly

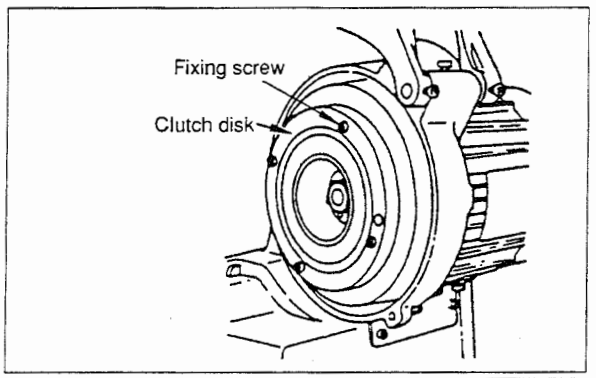
Clean the splines with a rag if they are dirty. Apply the grease supplied with the motor to a new ring. Use only "MOLY PS265" grease, and never use any other grease. At the time of reassembly remember to reinstall the spline cap, and to attach the connector from the clutch head to the PSC box. Adjust the gap whenever the rings have been replaced.

3. Replacing the clutch disk

Replace the clutch disk;

- If the lining of the clutch ring has worn out to such an extent that the clutch disk comes in contact with the metal part of the clutch ring, and burnishing with a commercially available metal cleaner can no longer correct it.
- When the clutch disk has worn out unevenly due to partial contact with the clutch ring.

<Replacement procedure>



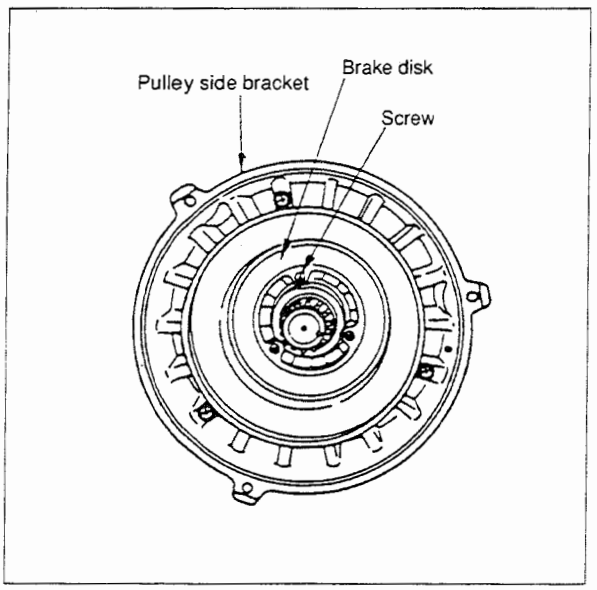
① Remove the clutch head according to the previous paragraph, "Replacing the clutch ring and brake ring."
② Loosen the four screws (M5 x 12) retaining the clutch disk, and remove the clutch disk.
③ Taking the faucet joint inside the vanes of the flywheel as the reference, fix a new clutch disk by alternately tightening the four screws (M5 x 12) gradually. At this time, be very careful not to scratch the clutch disk surface to be in contact with the friction plate.
④ Upon completion of the above step, turn the power switch ON, and check motor vibration before reinstalling the clutch head. If the vibration is severe, remove the fixing screws again, turn the clutch disk 90 degrees against the flywheel, and reinstall the clutch disk so that the motor vibration is reduced to a minimum.
⑤ After the motor has completely stopped, reinstall the clutch head, using the three screws.

4. Replacing the brake disk

Replace the brake disk;

- When the lining of the brake ring has worn out to such an extent that the brake disk comes in contact with the metallic part of the brake ring, and burnishing with a commercially available metal cleaner can no longer correct it.
- When the brake disk has worn out unevenly due to partial contact with the brake ring.

<Replacement procedure>



① Remove the clutch head.
② Pull out the ring.
③ Unscrew the three screws (M4 x 12) retaining the brake disk on the pulley side bracket to remove the brake disk.
④ Install a new brake disk on the pulley side bracket by gradually tightening the three fixing screws alternately.
At this time, be very careful not to scratch the brake disk surface which will contact the friction surface.
⑤ Finally, reinstall the ring before attaching the clutch head to the main body.

5. Cleaning the filter

If the filter is left clogged with fibrous wastes, the motor is likely to overheat, resulting in considerably shorted life of the lining. Clean the filter once a month or every other month.

7-5. Replacing the printed circuit boards

1. Types of printed circuit boards
   ① CPU circuit board (Control box)
   ② I/F circuit board (Control box)
   ③ PMDC circuit board (Control box)
   ④ POWER circuit board (Control box)
   ⑤ Operating printed circuit board (Operation panel)
   ⑥ Sensor printed circuit board (Sewing machine head)

① CPU circuit board

Acts as the brain of the AMS-210C/-212C and outputs the control signals to control the floppy disk driver unit, sewing machine head, and the PGM-1.

1) Turn OFF the power switch. Then open the control box cover.
2) Remove all connectors (J13 through J17) from the CPU circuit board.
3) Remove four setscrews retaining the circuit board. Then replace the CPU circuit board with a new one.
4) Install the new CPU circuit board by reversing the above disassembly order. Pay attention to connect the connectors matching the numbers indicated on the circuit board and the numbers attached to the connectors.

(Caution)

The battery for the data back-up is mounted on the CPU circuit board. Be sure not to place the circuit board on the metal plate or a like. Never wrap the CPU circuit board with a sheet aluminum foil.

② I/F printed circuit board

The I/F circuit board received the control signals from the CPU circuit board, and actuates the sewing machine head and the PGM-1.

1) Turn OFF the power switch. Then remove the control box cover.
2) Remove the connectors J13, J14 and J15 from the CPU circuit board.
3) Remove all connectors (J26 through J30, J32, J33, J35 through J38; installed inside of the control box) (J31 and J34; installed outside of the control box) from the I/F circuit board.
   Connector for the synchronizer J31 and connector for the pneumatic solenoid valve drive J34 are mounted on the wrong side of the circuit board, and designed to be directly connected with the connectors inserted from outside of the control box.
4) Remove six setscrews retaining the I/F circuit board so that the I/F circuit board is removed. Then replace the circuit board with a new one.
5) Install the new I/F circuit board by reversing the above disassembly order.

(Caution)

If the machine runs without the connector J31 for the synchronizer, the up position error "3" is not allowed to be reset.

If the connector J35 for the pneumatic solenoid drive is not installed, the operating air pressure drop error "A" is not allowed to be reset.

③ PMDC circuit board

The PMDC circuit board receives the stepping motor driving signals from the CPU circuit board through I/F circuit board, and acts to drive the sewing machine head, X and Y stepping motors.

1) Turn OFF the power switch. Then open the control box cover.
2) Remove all connectors (J61 through J64) from the PMDC circuit board.
3) Remove six setscrews retaining the PMDC circuit board (the setscrews are also used to fix the radiator from outside of the control box) so that the PMDC circuit board is removed. Then replace the circuit board with a new one.
4) Install the new PMDC circuit board by reversing the above disassembly order. Install the circuit board so that the connector J62 is positioned at the top.

(Caution)

Be sure to securely tighten the setscrews. The tightening torque has been specified to 14 kg/cm at the time of delivery.

④ POWER circuit board

This circuit board supplies voltage to each unit in the control box.

1) Turn OFF the power switch. Then open the control box cover.
2) Remove all connector (J51 through J59) from the POWER circuit board.
3) Remove four setscrews retaining the POWER circuit board so that the POWER circuit board and bundle wire cover are removed. Then replace the circuit board with a new one.
4) Install the new POWER circuit board by reversing the above disassembly order. Take care of connection of the connectors.

(Caution)
Time for discharge of electrolytic capacitor:
For the normal use, the time for the discharge is about five seconds after the power switch has been turned OFF. If the power is not supplied to the stepping motors or solenoids, about one and a half minutes will be required for the discharge of the POWER circuit board only.
Remove the connector after the predetermined length of time has passed.

⑤ Operating printed circuit board

This circuit board is fixed inside the operation box (panel).
The switches, buzzers, and LEDs are mounted on it.

1) Turn OFF the power switch. Remove four setscrews from the operation box (panel) rear cover.
2) Remove the connector J61 from the operating circuit board and the terminal of earth cord.
3) Remove six lock nuts for retaining the operating circuit board. Then remove the circuit board and replace with a new one.
4) Install the new operating circuit board by reversing the above procedure.

⑥ Sensor printed circuit board

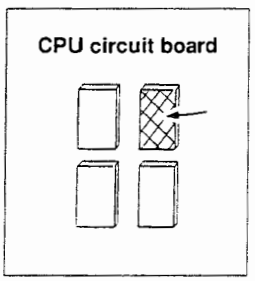
This circuit board is used for the sewing machine head, and acts to detect the X origin and the travel limit.
See page 94 to 97 for the replacement.

7-6. Interchangeability of the circuit boards

The circuit boards used for the AMS Series of the sewing machines have been designed to be interchangeable among the sewing machines included in the AMS. So, even if the circuit board of a certain type of the AMS breaks, it is possible to use the circuit board used with another type of the AMS in your plant.

① CPU circuit board

The PROM mounted on the CPU circuit board differs by the models of the control box. The CPU circuit board is provided with interchangeability by using the PROM exclusive for the respective models of the control box.



Type of sewing machine (model of the control box)	Part No. of PROM (number indicated on PROM)
AMS - 210B • 212B AMS - 210C • 212C (MC-514, magnetic feeding frame) (MC-515, pneumatic feeding frame)	HL008420017 (017*) • *The PROM with part No. which has F and beyond for the asterisk (*) section is C type.
AMS - 220B (MC-513)	HL008420013 (013*)
AMS-220C (S, B type) (MC-518)	HL008420064 (064*)
AMS-220C (L, T type) (MC-518-1)	HL008420074 (074*)
AMS-224B (MC-516)	HL008420029 (029*)
AMS-229B (MC-517)	HL008420040 (040*)

The asterisk (*) shows the revision of PROM. Be sure to use the PROM whose revision is same as the currently used PROM or the latest revision unless there is any special reason for using the other one.

② I/F circuit board, operation circuit board

The AMS-210B, -212B, -220B, -224B, -229B, -210C, -212C and -220C use the I/F circuit board and the operation circuit board of one are same kind.

③ Power circuit board, PMDC circuit board

The AMS-210B, -212B, -220B, -224B, -210C and -212C use the power circuit board and the PMDC circuit board of one are same kind.
(The AMS-229B and -220C use the different kinds of them.)

7-7. How to measure the line voltage

Printed circuit board	Tester red	Tester black	Voltage
POWER circuit board	J 51-1, -2, -3 (orange)	J 51-4, -5, -7 (black)	DC 34V
	J 52-1, -2 (orange)	J 52-6, -7 (black)	DC 34V
	-3, -4 (brown)	-6, -7 (black)	DC 33V
	J 53-1, -3, -4 (yellow)	J 53-5, -6, -7 (green) -8 (yellow/green)	DC 34V
	J 54-1, -2 (orange)	J 54-4, -5 (green)	DC 34V
	-3 (yellow)	-4, -5 (green)	DC 24V
	-7 (red)	-8 (black)	DC 5V
	J 55-1, -2 (red)	J 55-3, -5 (black)	DC 5V
	-6 (white)	-3, -5 (black)	DC 12V
	-3, -5 (black)	-7 (blue)	DC 12V
	J 56-1 (red) -2 (white) -6 (black)	J 56-6 (black) -6 (black) -3 (blue)	DC 5V DC 12V DC 12V
	J 57-1 (red)	J 57-5, -6 (black)	DC 5V
	-3 (white)	-5, -6 (black)	DC 12V
	-5, -6 (black)	-4 (blue)	DC 12V
	J 58-1 (red)	J 57-5, -6 (black)	DC 5V
	-2 (white)	-5, -6 (black)	DC 12V
	-5, -6 (black)	-4 (blue)	DC 12V
	J 59-1 (white)	J 59-2, -4 (black)	DC 12V
	-5 (red)	-2, -4 (black)	DC 5V

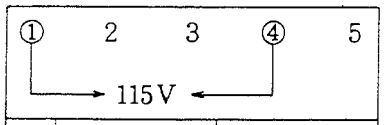
Printed circuit board	Tester red	Tester black	Voltage
CPU circuit board	J 17-1 (red)	J 17-5, -6 (black)	DC 5V
	-3 (white)	-5, -6 (black)	DC 12V
	-5, -6 (black)	-4 (blue)	DC 12V
PMDC circuit board	J 61 -1, -2 (orange)	J 61-4, -5 (green)	DC 34V
	-3 (yellow)	-4, -5 (green)	DC 24V
	-7 (red)	-8 (black)	DC 5V
I/F circuit board	J 28 -1, -2 (orange)	J 28-6, -7 (black)	DC 34V
	-3, -4 (brown)	-6, -7 (black)	DC 33V
	J 26-1 (red)	J 26-5, -6 (black)	DC 5V
	-2 (white)	-5, -6 (black)	DC 12V
	-5, -6 (brack)	-4 (blue)	DC 12V

Printed circuit board	Tester red	Tester black	Voltage
J90 (Connector 6P of the power supply for the PGM-1)	J90-1 (red)	J90-4 (black)	DC 5V
	-2 (white)	-4 (black)	DC 12V
	-4 (black)	-3 (blue)	DC 12V
J40 (Connector 6P of the transformer secondary output)	J40-1 (gray)	J40-2 (gray)	AC 24V
	-3 (purple)	-4 (purple)	AC 24V
	-5 (black)	-6 (black)	AC 100V
J85 (Connector 2P of the marking light output)	J85-1 (orange)	J85-2 (orange)	AC 4.5V

7-8. Changing over the AC input voltage (changing over the transformer taps)

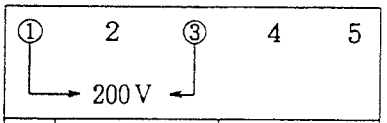
The power transformer comes in three types in voltage specifications.

(Transformer B)



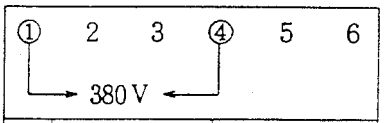
No.	AC input voltage	Terminal
1	100 V	2 – 3
2	105 V	2 – 4
3	110 V	1 – 3
4	115 V	1 – 4
5	120 V	2 – 5
6	130 V	1 – 5

(Transformer A)



No.	AC input voltage	Terminal
1	190 V	2 – 3
2	200 V	1 – 3
3	220 V	2 – 4
4	230 V	1 – 4
5	240 V	2 – 5
6	250 V	1 – 5

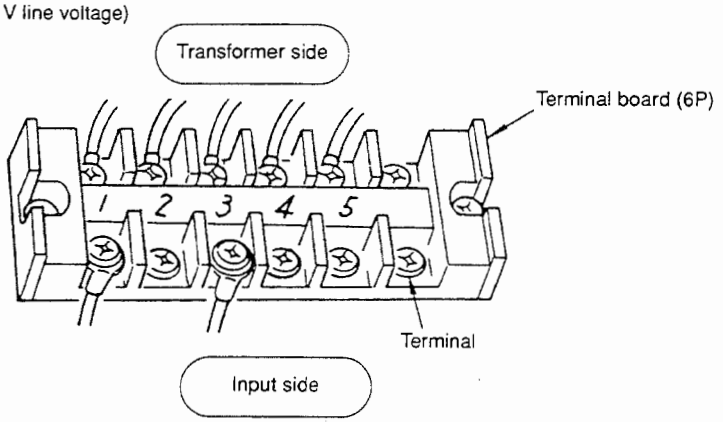
(Transformer C)



No.	AC input voltage	Terminal
1	220 V	1 – 2
2	240 V	1 – 3
3	380 V	1 – 4
4	415 V	1 – 5
5	440 V	1 – 6

Voltage selection can be made by selecting an appropriate tap.
So, confirm the desired line voltage, and connect to the voltage tap whose voltage value is close to the desired line voltage.

(Example of connection of a 200 V line voltage)



(Caution)

1. **Be sure to set the cover on the terminal board except the case where the input voltage is being changed over.**
2. **Change over the taps of the transformer after turning OFF the Power switch or disconnecting the power plug.**

8. TROUBLES AND CORRECTIVE MEASURES

8-1. Mechanical parts

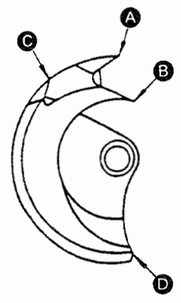
Trouble	Cause (1)	Cause (2)	Corrective measures
1. Machine lock	1-1) Improper needle-up stop position		Correct the stop position of the main shaft. (See Standard Adjustment 3.)
	1-2) Incomplete return of the thread trimming cam shaft	2)-A The thread trimmer follower sticks against the follower stopper.	Correct the clearance between the thread trimmer follower and the follower stopper. (See Standard Adjustment 15.)
		2)-B The tension release arm sticks against the tension release shaft arm.	Correct the clearance between the tension release arm and the tension release shaft arm. (See Standard Adjustment 16.)
	1-3) Inaccurate positioning of the thread trimming cam	3)-A The marker line on the thread trimming cam is not aligned with the marker dot on the main shaft.	Accurately position the thread trimming cam. (See Standard Adjustment 15.)
	1-4) Inaccurate positioning of the thread trimmer solenoid bracket	4)-A The thread trimmer solenoid bracket comes into contact with the thread trimming cam	Accurately position the thread trimmer solenoid bracket.
	1-5) The moving knife fails to move smoothly.		Correct the blade pressure of the moving knife. (See Standard Adjustment 14.)
	1-6) Inaccurate positioning of the generator stator		Accurately position the generator stator.
	1-7) Inaccurate position of the handwheel		Accurately position the handwheel.
2. Deformation in sewn patterns * The major cause is considered to be the vibration of the feed mechanism components.	2-1) Maladjustment of the X-direction feed belt tension.		Correct the belt tension. (See Standard Adjustment 28.)
	2-2) Maladjustment of the Y-direction feed belt tension		Correct the belt tension. (See Standard Adjustment 29.)
	2-3) The torque in the X-direction is large.	3)-A Improper height of the throat plate auxiliary cover	Correct the height of the throat plate auxiliary cover. (See Standard Adjustment 24.)
		3)-B Improper height of the X guide shaft support	Properly position the X guide shaft support. (See Standard Adjustment 27.)
	2-4) The torque in the Y-direction is large.	4)-A The feed bracket sticks against the feed bracket auxiliary cover.	Correctly position the feed bracket auxiliary cover. (See Standard Adjustment 26.)
	2-5) Maladjustment of clamp pressure		Correctly adjust the clamp pressure. (See Standard Adjustment

Trouble	Cause (1)	Cause (2)	Corrective measures
9. The stop mechanism fails to work even if the tension disks are falsely released during a sewing cycle.	9-1) Inaccurate positioning of the manual tension release limit switch		Accurately position the switch. (See Standard Adjustment 21.)
10. The sewing machine stops immediately after it is started.	10-1) The machine head has not been threaded.		Thread the machine head.
	10-2) Inaccurate positioning of the thread breakage detecting disk		Accurately position the switch. (See Standard Adjustment 12.)
11. Abnormal noise is heard from the face plate components.	11-1) The clearance between the shuttle and the shuttle driver is too large.		Correct the clearance. (See Standard Adjustment 7.)
	11-2) The intermediate presser link guide hits the intermediate presser link hinge screw.		Accurately adjust the intermediate presser wire. (See Standard Adjustment 20.)
	11-3) The intermediate presser is not enough.		Accurately adjust the intermediate presser adjusting screw. (See Standard Adjustment 19.)
	11-4) The intermediate presser hits the throat plate		Accurately adjust the height of the intermediate presser foot. (See Standard Adjustment 4.)
	11-5) The intermediate presser foot hits the needle bar.	5)-A Incorrect height of the intermediate presser foot	Correct the height of the intermediate presser foot. (See Standard Adjustment 4.)
		5)-B The intermediate presser solenoid switch has been set to OFF.	Set the intermediate presser solenoid switch to ON. (See "Electrical parts".)
12. Severe vibration	12-1) Maladjustment of the clearance of the bed attaching plate and table		Accurately adjust the clearance between bed attaching plate and the table.
	12-2) Improper adjustment of belt tension		Adjust the belt tension. (See Standard Adjustment 35.)
	12-3) Improper positioning of the crank balancer		Adjust the positioning the crank balancer. (See Disassembly/Assembly Procedures 38.)
13. Thread slips off the needle. (The needle thread slips off the needle within a few starting stitches and no stitch is formed.)	13-1) The 1st stitch has been skipped.		Change in sewing process. (See the Instruction Manual for main unit input function.)
		1)-A Maladjustment of the timing between the needle and shuttle	Correct the timing and clearance between them. (See Standard Adjustment 7.)
		1)-B Incorrect material feed timing	Change the feed timing by the material thickness selector DIP switch. (See "Electrical parts".)

To be continued to the next page.

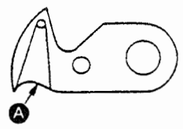
Trouble	Cause (1)	Cause (2)	Corrective measures
3. The inputted origin does not agree with the sewing origin.	3-1) Maladjustment of the X origin		Correctly adjust the X origin. (See Standard Adjustment 31.)
	3-2) Maladjustment of the Y origin		Correctly adjust the Y origin. (See Standard Adjustment 31.)
4. The feeding frame fails to stop even if the sewing area limit is exceeded, and abnormal sound is heard.	4-1) Maladjustment of the X travel limit.		Correct the X travel limit. (See Standard Adjustment 31.)
	4-2) Maladjustment of the Y travel limit.		Correct the Y travel limit. (See Standard Adjustment 31.)
	4-3) Disconnected sensor connector		Securely reconnect the sensor connector.
5. Inadequate lift of the feeding frame	5-1) Maladjustment of the feed bracket	1)-A Maladjustment of the work clamp stopper.	Correctly adjust the work clamp stopper. (See Standard Adjustment 5.)
		1)-B Maladjustment of the clamp pressure adjusting plate	Correctly adjust the clamp pressure adjusting plate. (See Standard Adjustment 5.)
	5-2) Inaccurate positioning of the presser plate stopper		Accurately position the presser plate stopper. (See Standard Adjustment 25.)
	5-3) Maladjustment of the manual thread tension release engaged by the feeding frame lowering pedal		Correctly adjust the manual thread tension release and the feeding frame lowering pedal. (See Standard Adjustment 21.)
	5-4) Unsmooth motion of the feed bracket, link, and slide plate		Apply grease.
6. The feeding frame fails to come down.	6-1) Disconnected solenoid connector		Reconnect the solenoid connector.
7. The intermediate presser foot fails to go up after sewing.	7-1) The intermediate presser link guide sticks against the intermediate presser link and the hinge screw.		Correct the clearances between the intermediate presser link guide, the link and the hinge screw. (See Standard Adjustment 19.)
	7-2) Inaccurate positioning of the intermediate presser spring hook.		Accurately position the spring hook. (See Standard Adjustment 19.)
	7-3) Maladjustment of the intermediate presser wire		Correctly adjust the wire. (See Standard Adjustment 20.)
	7-4) Inaccurate positioning of the intermediate presser adjusting screw		Accurately position the adjusting screw. (See Standard Adjustment 8.)
8. The intermediate presser foot fails to work while sewing	8-1) Disconnected solenoid connector		Securely connect the connector.
	8-2) Maladjustment of the intermediate presser wire		Accurately adjust the wire. (See Standard Adjustment 20.)
	8-3) The intermediate presser solenoid switch has been set to OFF.		Set the intermediate presser solenoid switch to ON. (Refer to "Electrical parts".)

Trouble	Cause (1)	Cause (2)	Corrective measures
	13-2) Inadequate length of thread remaining on the needle	2)-A Maladjustment of the tension controller No. 1	Properly adjust the tension controller No. 1. (See Standard Adjustment 10.)
		2)-B Maladjustment of the thread tension release	Properly adjust the thread tension release. (See Standard Adjustments 17 and 18.)
		2)-C Maladjustment of the thread take-up spring stroke	Properly adjust the stroke. (See Standard Adjustment 11.)
		2)-D Maladjustment of the difference in level between the moving knife and counter knife	Accurately adjust the height of the moving knife and counter knife. (See Standard Adjustment 14.)
	13-3) Inadequate length of bobbin thread	3)-A Maladjustment of the difference in level between the moving knife and the counter knife	Accurately adjust the height of the moving knife and counter knife. (See Standard Adjustment 14.)
		3)-B The shuttle race spring has scratches.	Remove the scratches.
		3)-C The bobbin thread tension is too high.	Properly adjust the bobbin thread tension.
	13-4) The bobbin races, causing the bobbin thread to come out.		Use the bobbin exclusively used for the semi-rotary large (double capacity) shuttle.
	13-5) Maladjustment of intermediate presser foot height		Accurately adjust the height. (See Standard Adjustment 4.)
	13-6) The needle bar thread guide has been erroneously threaded.		Correctly thread the thread guide.
14. Needle breakage	14-1) Maladjustment of the clearance between the needle and the shuttle driver		Correct the clearance between the needle and the shuttle driver. (See Standard Adjustment 7.)
	14-2) Incorrect feed timing		Change the feed timing by the material thickness selector DIP switch. (See "Electrical parts".)
	14-3) The needle hole guide has scratches.		Remove the scratches or replace the needle hole guide.
	14-4) The needle hits the moving knife.		Correct the position of the moving knife. (See Standard Adjustment 13.)
	14-5) The needle hits the intermediate presser foot.		Accurately position the intermediate presser bar bracket. (See Standard Adjustment 19.)
	14-6) The needle hits the wiper		Correct the needle-up stop position. (See Standard Adjustment 3.)
			Accurately position the wiper. (See Standard Adjustment 9.)

Trouble	Cause (1)	Cause (2)	Corrective measures
15. Stitch skipping	15-1) Incorrect timing between the needle and the shuttle.		Correct the timing and the clearance between the needle and the shuttle. (See Standard Adjustment 7.)
	15-2) The needle is bent, or the needle point is crushed, or the needle has been improperly attached.		Replace the needle, or correctly attach the needle.
	15-3) Incorrect feed timing		Change the feed timing by the material thickness selector DIP switch. (See "Electrical parts".)
	15-4) Maladjustment of the clearance between the needle and the shuttle driver		Correct the clearance between them. (See Standard Adjustment 7.)
	15-5) Maladjustment of the intermediate presser foot height		Correct the height. (See Standard Adjustment 4.)
16. Thread breakage	16-1) Scratches on the shuttle 	1)-A A scratch on portion Ⓐ (The needle hits the shuttle.)	Smooth the shuttle point using an oilstone, then polish the shuttle point with a green bar. Adjust the clearance between the needle and shuttle. (See Standard Adjustment 7.)
		1)-B A scratch on portion Ⓑ (produced when the needle bends or breaks)	Smooth the scratched portion, using an oilstone, then polish it with a green bar.
		1)-C A scratch on portion Ⓒ (scratched by the needle when removing the shuttle)	Smooth the scratched portion, using an oilstone, then polish it with a green bar.
		1)-D A scratch on portion Ⓓ	Smooth the scratched portion, using an oilstone, then polish it with a green bar.
	16-2) Thread bites into the shuttle.	2)-A Inaccurate positioning of the shuttle race spring	Accurately position the shuttle race spring. (See Standard Adjustment 6.)
		2)-B Portion Ⓐ of the shuttle point is dull.	Replace the shuttle.
		2)-C Inaccurate positioning of the shuttle race	Accurately position the shuttle race. (See Standard Adjustment 7.)
		2)-D The needle thread tension is not high enough.	Correct the needle thread tension.
	16-3) The shuttle driver has scratches.		Remove scratches.
	16-4) The clearance between the shuttle driver and the shuttle is too small.		Correct the clearance between them. (See Standard Adjustment 7.)

To be continued to the next page.

Trouble	Cause (1)	Cause (2)	Corrective measures
	16-5) The needle hole guide has scratches.		Remove the scratches, or replace the needle hole guide.
	16-6) The needle has scratches, bent, or improperly attached.		Replace or correctly attach the needle.
	16-7) Maladjustment of the thread take-up spring	7)-A The thread take-up spring stroke is too large.	Correctly adjust the stroke. (See Standard Adjustment 11.)
		7)-B The thread take-up spring tension is too high.	Correct the tension. (See Standard Adjustment 11.)
	16-8) The needle thread tension is too high.		Correct the tension.
	16-9) Unsmooth rotation of the shuttle	9)-A Fibrous wastes on the shuttle race	Remove the shuttle, and remove the fibrous wastes.
		9)-B Lack of lubrication	Lubricate the shuttle assembly.
17. Thread breaks at the time of thread trimming. (Upon completion of the last stitch, thread is not properly trimmed but it breaks instead.)	17-1) Incorrect thread tension release timing	1)-A The thread trimmer is actuated prematurely before the tension disks are released.	Correct the tension release timing. (See Standard Adjustment 17 and 18.)
	17-2) The moving knife has scratches.		Polish the moving knife with a green bar.
	17-3) The shuttle race spring has scratches.		Remove the scratches.
	17-4) Incorrect height of the counter knife	4)-A The counter knife falsely cuts thread before the thread is trimmed by the moving knife blade.	Correct the height of the moving knife and the counter knife. (See Standard Adjustment 14.)
	17-5) Unsmooth thread path at the bottom of the needle hole guide.	5)-A Thread is falsely cut by the needle hole guide .	Correct the thread path, using a green bar, or replace the needle hole guide.
	17-6) Incorrect thread spreading timing of the moving knife		Correct the position of the thread trimming cam and the moving knife. (See Standard Adjustments 13 and 15.)
	17-7) The needle thread tension is too high.		Correct the needle thread tension.

Trouble	Cause (1)	Cause (2)	Corrective measures
18. Thread trimming failure (Upon completion of sewing, the thread trimmer fails to trim the needle thread or the bobbin thread, or the needle thread after it is trimmed is extremely long or short.)	18-1) The thread trimmer is dull.	1)-A The moving knife and/or counter knife has worn out.	Replace the moving knife and/or counter knife.
		1)-B The moving knife and counter knife fail to overlap properly.	Correct the height of the moving and knife and counter knife. (See Standard Adjustment 14.)
		1)-C The moving knife blade pressure is not high enough.	Add the adjusting washer or replace the wavy washer. (See Standard Adjustment 14.)
		1)-D The counter knife blade is not parallel.	Parallel the counter knife blade point. (See Standard Adjustment 14.)
	18-2) Thread wastes are left in the shuttle cover.	2)-A Presence of a burr on portion Ⓐ of the moving knife (The shape of trimmed thread will be " ⊃ ", and thread wastes are left. 	Remove the burr(s) using a green bar, or replace the moving knife.
		2)-B Presence of a scratch on the shuttle race spring (The shape of trimmed thread will be " ⊃ ", and thread wastes are left.)	Remove the scratches.
	18-3) The moving knife fails to spread the thread.	3)-A Incorrect positioning of the moving knife	Accurately position the moving knife. (See Standard Adjustment 13.)
		3)-B Incorrect path of the moving knife	Replace the moving knife or throat plate.(See Standard Adjustments 13 and 14.)
		3)-C Inaccurate positioning of the thread trimming cam	Accurately position the thread trimming cam. (See Standard Adjustment 15.)
		3)-D Inaccurate positioning of the shuttle race spring	Accurately position the shuttle race spring. (See Standard Adjustment 6.)
	18-4) Skipping of the last stitch	4)-A Incorrect timing between the needle and the shuttle	Correct the timing and clearance between them. (See Standard Adjustment 7.)
		4)-B Incorrect height of the intermediate presser foot	Correct the height. (See Standard Adjustment 4.)
	18-5) Incorrect needle-up stop position.		Correct the needle-up stop position. (See Standard Adjustment 3.)

Trouble	Cause (1)	Cause (2)	Corrective measures
19. Loose stitches	19-1) Incorrect feed timing		Change the feed timing by the material thickness selector DIP switch. (See "Electrical parts".)
	19-2) Maladjustment of the thread tension controller No. 2	2)-A Inadequate needle thread tension	Increase the needle thread tension.
	19-3) The thread tension disks No. 2 are falsely released.		Properly install the thread tension disks No. 2.
	19-4) The needle thread crosses as illustrated below. 		Turn the needle to the left 5 to 10 degrees.
	19-5) Incorrect height of the intermediate presser foot		Correct the height. (See Standard Adjustment 4.)
	19-6) Incorrect clearance between the shuttle and the shuttle driver		Correct the clearance. (See Standard Adjustment 7.)
20. Sewing problems arise when sewing with synthetic thread.	20-1) Thread breakage due to heat generated.	1)-A The sewing speed is too high.	Reduce the speed using the speed control knob. (See "Electrical parts".)
		1)-B The needle is too thick.	Use a thinner needle, or a super needle for synthetic thread.
			Use silicone oil.
	20-2) Thread splits finely.	2)-A Unsmooth thread paths	Smooth the thread paths, using a green bar.
			Move thread guide A to the left.
	20-3) Loose stitches at sewing start	3)-A Incorrect feed timing	Set the DIP switches for thick material. DIP SW 1, 2 : OFF, OFF (See "Electrical parts".)
			Change the sewing method. (See Instruction Manual for main unit input function.)

8-2. Electrical parts

(Refer to the block diagram)

Trouble	Cause (1)	Cause (2)	Corrective measures
1. The display fails to light.	1-1) The power is not supplied to the switching regulator. (Voltage of +5V, +12V, or −12V has not been supplied.)	1)-A Disconnected J40 connector	Securely connect the connector.
		1)-B Fuse F1 has blown.	Replace the blown fuse after removing the cause. *2 (1A)
	1-2) Voltage of +5V is not supplied to the CPU circuit board.	2)-A Disconnected J57 connector (POWER circuit board) *1	Securely connect the connector.
		2)-B Disconnected J17 connector (CPU circuit board)	
		2)-C Disconnected J55 connector (POWER circuit board)	
	1-3) Voltage of +5V or +12V is not supplied to the I/F circuit board.	3)-A Disconnected J58 connector (POWER circuit board)	
		3)-B Disconnected J26 connector (I/F circuit board)	
	1-4) The switching regulator does not output.	4)-A Short-circuit in the power line	Remove the short-circuited part, or replace the short-circuited circuit board. *3
		4)-B Switching regulator failure	Replace the switching regulator. *4
	1-5) I/F circuit board ⟷ The operation box has not been connected.	5)-A Disconnected J37 connector (I/F circuit board)	Securely connect the connector.
		5)-B Disconnected J87 connector (Control box)	
		5)-C Disconnected J61 connector (Operation circuit board)	
	1-6) I/F circuit board ⟷ The CPU circuit board has not been connected.	6)-A Disconnected J15 connector (CPU board)	
	1-7) The machine is in the PGM-1 check mode (when PGM-1 is connected).	7)-A The I/F circuit board rotary SW2 is set to "7". (PGM-1 LED check mode)	Set the I/F circuit board rotary SW2 to "0".
		7)-B The I/F circuit board rotary SW2 is set to "8". (PGM-1 digitizer check mode)	
	1-8) Failure with circuit board		Replace circuit board in the order of I/F, CPU, POWER and operation circuit board.

*1 Holded in this state, the reset switch is turned ON and the brake of the machine motor comes into the energized state. This state causes that fuse F3 blows.

*2 AC100V is supplied to the switching regulator and the fan. The failure of the fan or the switching regulator in conceivable.

*3 Disconnect all the following connectors and turn the power ON. When voltage of +5V is not supplied, the POWER circuit board is defective. Connect respective connectors and detect the circuit board which does not supply 5V. (When there is a short-circuited part in the power line, the switching regulator does not supply power.)

POWER circuit board J59 (FDD power supply) / CPU circuit board J17 / I/F circuit board J58 / PMDC circuit board J61 / Control box J86

Disconnect the clutch/brake connector J71 of the machine motor in order to prevent that the trouble of *1 occurs and then perform test.

*4 Disconnect POWER circuit board J55 and turn the power ON. When +5V is not supplied, the regulator will be defective.

Trouble	Cause (1)	Cause (2)	Corrective measures
2. The displays are confused.	2-1) Voltage of +33V is not supplied to the I/F circuit board. (The normal reset signal is not outputted.)	1)-A Disconnected J51 connector (POWER circuit board)	Securely connect the connector.
		1)-B Disconnected J52 connector (POWER circuit board)	
		1)-C Disconnected J28 connector (I/F circuit board)	
		1)-D Fuse F3 has been blown.	Remove the cause and replace the blown fuse. *5 (7AT)
	2-2) The reset signal is not transferred. (I/F circuit board → CPU circuit board)	2)-A Disconnected J14 connector (CPU circuit board)	Securely connect the connector.
	2-3) Failure with circuit board		Replace circuit board in the order of I/F and CPU circuit board.
3. A key switch on the operation box (panel) fails to work.	3-1) Failure with the switch		Execute the input check program to identify the defective switch, and replace the switch or the operation circuit board.
	3-2) Failure with the circuit board		Replace circuit boards in the order of I/F and CPU circuit board.
4. After the Set Ready is turned ON, the keys fails to work, but no error indication is given. *6 (The feeding frame does not go down.) (The sewing LED has not flashed.)	4-1) The signal for the feeding frame driving is not transferred. (CPU circuit board → I/F circuit board)	1)-A Disconnected J13 connector (CPU circuit board)	Securely connect the connector.
	4-2) Failure with the circuit board		Replace circuit boards in the order of I/F and CPU circuit board.

*5 The power supply for driving the machine head solenoid (thread trimmer solenoid, wiper solennoid) and the machine motor (clutch, brake) and the power supply for the air cylinder and driving the solenoid valve.
The reduction of the solenoid resistance value → The damage of the driving transistor on the I/F circuit board is conceivable. Measure the solenoid resistance value.

*6 The feeding frame is lowered and the origin retrieval is performed. However, J13 connector is equipped with the signal for feeding frame driving and the pulse motor driving, so the machine does not work. Errors are not also outputted.

Trouble	Cause (1)	Cause (2)	Corrective measures
5. After the Set Ready switch is turned ON, the feeding frame comes down but fails to move.	5-1) Voltage of +33V is not supplied to the PMDC circuit board.	1)-A Disconnected J53 connector (POWER circuit board)	Securely connect the connectors.
		1)-B Disconnected J54 connector (PMDC circuit board)	
		1)-C Disconnected J61 connector (PMDC circuit board)	
		1)-D Fuse F2 has blown.	Remove the cause and replace the blown fuse. *7 (10A)
	5-2) I/F circuit board ⟷ PMDC circuit board cannot be connected.	2)-A Disconnected J36 connector (I/F circuit board)	Securely connect the connectors.
		2)-B Disconnected J62 connector (PMDC circuit board)	
	5-3) PMDC circuit board ⟷ X side pulse motor are not connected.	3)-A Disconnected J63 connector (PMDC circuit board)	
		3)-B Disconnected J83 (blue) connector (Control box)	
		3)-C Disconnected J74 (blue) connector (Inside the table stand)	
	5-4) The power is not supplied to the X side pulse motor.	4)-A Fuse F2 has blown. (PMDC circuit board)	Replace the blown fuse after removing the cause. *8 (7A)
	5-5) Failure with the circuit board		Replace the PMDC circuit board.

*7 The power is supplied to both X and Y axis by this. Check the current adjusted value axis on the PMDC circuit board.

*8 The power is supplied to the X axis pulse motor by this. Check the current adjusted value in the X axis on the PMDC circuit board. When the power is supplied to *8 and *9, it is the failure with the circuit board if the fuses blow immediately.

Trouble	Cause (1)	Cause (2)	Corrective measures
6. The feeding frame moves only to the X direction and stops.	6-1) PMDC circuit board ⟷ Y axis pulse motor have not been connected.	1)-A Disconnected J64 connector (PMDC circuit board)	Securely connect the connectors.
		1)-B Disconnected J84 connector (Control box)	
		1)-C Disconnected J75 connector (Inside the table stand)	
	6-2) The power is not supplied to the Y side pulse motor.	2)-A Fuse F1 has blown. (PMDC circuit board)	Replace the blown fuse after removing the cause. *9 (7A)
	6-3) Failure with the circuit board		Replace the PMDC circuit board.
7. The feeding frame fails to go up when it reaches the sewing start point.	7-1) The machine has been set to the bobbin winding mode.	1)-A The bobbin winder switch (speed VR) has been set to ON.	Set the switch to OFF.
		1)-B The bobbin winder switch is defective.	Replace the defective switch after checking the failure using the input check program.
	7-2) The machine has been set to the needle threading mode. (The intermediate presser foot has been lowered.)	2)-A The needle threading switch has been set to ON.	Set the switch to OFF.
		2)-B The needle threading switch is defective.	Replace the defective switch after checking the failure using the input check program.
	7-3) Failure with the circuit board		Replace the defective circuit boards in the order of I/F and CPU circuit boards.
	7-4) The machine has been set to the feeding frame down at the sewing end.	4)-A DIP SW7-6 on I/F circuit board has been set to ON.	Set to switch to OFF.

*9 The power is supplied to the Y axis pulse motor by this. Check the current adjusted value in the Y axis of the PMDC circuit board.
When the power supply is turned ON, it is the failure with the circuit board if the fuse blows immediately.

Trouble	Cause (1)	Cause (2)	Corrective measures
8. The feeding frame switch fails to work.	8-1) Foot switch ⟷ I/F circuit board have not been connected.	1)-A Disconnected J27 connector (I/F circuit board)	Connect the connector
		1)-B Disconnected J88 connector (Control box)	
	8-2) Failure with the foot switch		Replace the switch after checking the failure using the input check program.
	8-3) Failure with the circuit board		Replace the circuit boards in the order of I/F and CPU circuit boards.
9. The sewing machine fails to start sewing, and only the feed mechanism is actuated when the start switch is depressed.	9-1) The machine has been set to the stop mode.	1)-A The machine ON/OFF switch has been set to OFF.	Set the machine ON/OFF switch to ON.
		1)-B Disconnected J38 connector (I/F circuit board)	Connect the connector.
		1)-C The machine ON/OFF switch is defective.	Replace the switch after checking the failure using the input check program.
	9-2) Failure with the circuit board		Replace the circuit boards in the order of I/F and CPU circuit boards.
10. Error No. 1 "LIGHTING" is indicated. (Floppy read error)	10-1) The floppy disk is defective.		Replace the floppy disk. *10
	10-2) Failure with FDD		Replace FDD.
	10-3) The circuit board is defective.		Replace the CPU circuit board.

*10 For the important data, make the master disk and save them at least in two disks.

Trouble	Cause (1)	Cause (2)	Corrective measures
11. The error "1 FLASHING" cannot be cleared. (Unconnected FDD error.)	11-1) The power has not been supplied to FDD.	1-A) Disconnected J59 connector (POWER circuit board)	Connect the connectors.
		1-B) Disconnected J2 connector (FDD)	
	11-2) FDD ⟷ CPU circuit boards have not been connected.	2)-A Disconnected J16 connector (CPU circuit board)	
		2)-B J1 disconnected (FDD)	
	11-3) Failure with the circuit board		Replace the CPU circuit board.
12. Error No. "3" cannot be cleared. (Needle-up stop error)	12-1) Synchronizer ↔ I/F circuit board have not been connected.	1)-A Disconnected J31 connector (Control box on the I/F circuit board)	Connect the connector.
	12-2) The synchronizer is defective.		Replace the synchronizer after checking the failure using the input check program.
	12-3) Failure with the circuit board		Replace the I/F circuit board.
13. Error No. "4" is indicated even if the travel limit is not observed. (Travel limit error)	13-1) Malfunction of the sensor		Check how the slit plate of the sensor has been set.
14. Error No. "5" cannot be cleared. (Error No. "5" is indicated even if the stop switch has not been depressed.) (stop error)	14-1) Stop switch ⟷ I/F circuit board have not been connected.	1)-A Disconnected J35 connector (I/F circuit board) (Located on the back of J37)	Connect the connectors.
		1)-B Disconnected J86 connector (Control box)	
		1)-C Disconnected J75 connector (Inside the table stand)	
	14-2) The stop switch is defective.		Replace the switch after checking the failure using the input check program.
	14-3) Failure with the circuit board		Replace circuit boards in the order of I/F and CPU circuit boards.

Trouble	Cause (1)	Cause (2)	Corrective measures
15. The sewing machine fails to start and the error No. "7" is given when the start switch is depressed. (Machine lock error)	15-1) The machine belt has not been set.		Attach the belt.
	15-2) Machine motor ⟷ I/F circuit board have not been connected.	2)-A Disconnected J30 connector (I/F circuit board)	Connect the connectors.
		2)-B Disconnected J81 connector (Control box)	
		2)-C Disconnected J71 connector (Machine motor clutch/brake)	
	15-3) The power has not been supplied to the machine motor.	3)-A Disconnected J72 connector (Machine motor power supply)	
	15-4) Failure with the circuit board		Replace the I/F circuit board.
16. The machine rotates at high speed, and error No. "7" is indicated. (Machine lock error)	16-1) The synchronizer is defective.		Replace the synchronizer after checking the failure using the input check program.
	16-2) Failure with the circuit board.		Replace the I/F circuit board.
17. Error No. "8" cannot be cleared. (Disconnected connector error)	17-1) The thread trimmer solenoid ⟷ I/F circuit board have not been connected.	1)-A Disconnected J32 connector (I/F circuit board)	Connect the connectors.
		1)-B Disconnected J82 connector (Control box)	
		1)-C The thread trimmer solenoid disconnected	Replace the solenoid after checking the disconnection by a tester.
	17-2) Failure with the circuit board		Replace the I/F circuit board.

Trouble	Cause (1)	Cause (2)	Corrective measures
18. The thread breakage detector fails to work. (The 8 stitches at sewing start and the stitches within 3 stitches in sewing cannot be detected.)	18-1) The machine has been set to the thread breakage detection ineffective mode.	1)-A The DIP SW6-5 on the I/F circuit board has been set to ON.	Set the DIP SW6-5 on the I/F circuit board to OFF.
	18-2) The machine head has not been grounded.		Check the grounding conductor of the machine head and connect it.
	18-3) Failure with the circuit board		Replace the I/F circuit board.
19. Error "A" cannot be cleared. (Air pressure drop error)	19-1) Air sensor ⟷ I/F circuit board have not been connected.	1)-A Disconnected J34 connector (I/F circuit board, control box)	Connect the connectors.
		1)-B Disconnected J79 connector (Inside the table stand)	
	19-2) Failure with the air sensor		Replace the air sensor after checking the failure using the input check program.
	19-3) Failure with the circuit board		Replace the circuit boards in the order of I/F and CPU circuit boards.
	19-4) The machine has been set to the pneumatic mode.	4)-A DIP SW7-1 on I/F circuit board has been set to ON.	Set the DIP SW7-1 to OFF.
20. Others	20-1) The machine operation mode is improper.		Check the setting of DIP SW4, 5 and 6 for setting the operation mode on the I/F circuit board.
	20-2) The machine has been set to the test mode.		Set the rotary SW2 for the test mode selection on the I/F circuit board to "0".
	20-3) Failure with the circuit board		Defects of the feed mechanism: Replace the circuit boards in the order of PMDC, POWER and I/F circuit boards. Defects other than the feed mechanism: Replace the circuit boards in the order of I/F and CPU circuit boards.

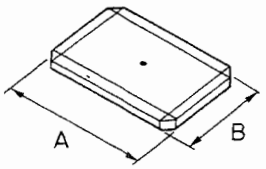
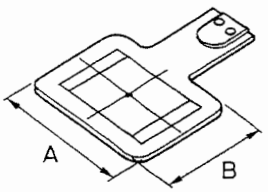
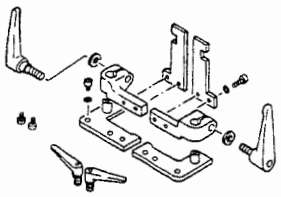
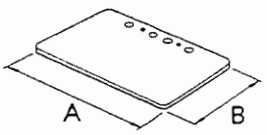
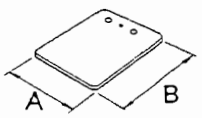
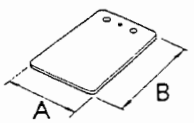
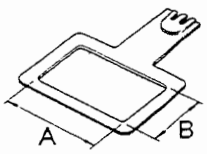
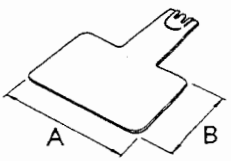
9. ADDITIONAL DATA

9-1. Changing the standard specifications (change-over the specifications of sewing machine between "for light-weight materials" and "for heavy-weight materials")

	Replacement part	Changing for light-weight material	Changing for medium-weight materials
1	Needle bar thread guide		B1406210000
2	Needle hole guide	B242621000C	B242621000B (ϕ2) or B242621000D (ϕ2.4)
3	Oscillating rock		D1805MLBH00
4	Shuttle		B181820500B
5	Thread take-up spring		D3112L4BB00
6	Tension spring		B3129053000
7	Shuttle race ring		B18172050AB (for thick needle of #23 or more)

※ In the table shown above, "changing for medium-weight materials" means the follwing specification changes.

(Standard type)		(For medium-weight materials)
AMS-210 (-212)CSS	→	CHS
AMS-210 (-212)CST	→	CHT
AMS-210 (-212)CSL	→	CHL

Name of part	Type	Part No.	
8. Origin adjusting jig 	Origin gauge (for the AMS-210) Origin gauge (for the AMS-212)	B 2561 210 000 B 2561 212 000	A A
	Feed plate for reference of origin	B 2567 210 000	A>
9. One touch clamp 	One touch clamp asm.	B 5110 210 0B0	
	Feeding frame blank with knurl for one touch clamp	B 5118 210 000	A×B=
	Feeding frame blank without knurl for one touch clamp	B 5118 210 A00	A×B=
	Separate type feeding frame (right) blank with knurl for one touch clamp	B 5119 210 000	A×B=
	Separate type feeding frame blank without knurl for one touch clamp	B 5119 210 A00	A×B=
	Separate type feeding frame (left) blank with knurl for one touch clamp	B 5120 210 000	A×B=7
	Feed plate for one touch clamp (for AMS-210) (for AMS-212)	 B 2556 210 D00 B 2556 212 D00	 A×B=11(A×B=133
	Feed plate blank with knurl for one touch clamp	B 2556 210 F00	A×B=175>
	Feed plate blank without knurl for one touch clamp	B 2556 210 E00	A×B=175×

9. ADDITIONAL DATA

9-1. Changing the standard specifications (change-over the specifications of sewing machine between "for light-weight materials" and "for heavy-weight materials")

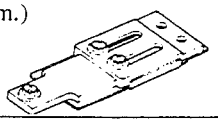
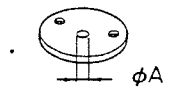
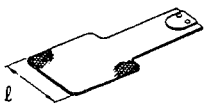
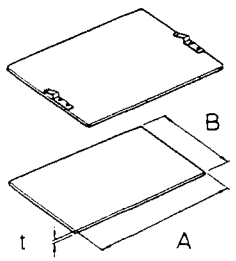
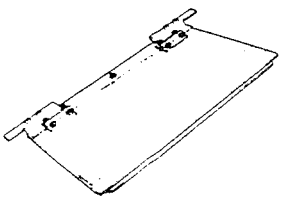
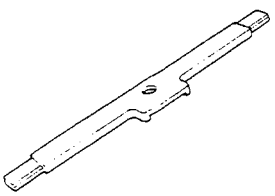
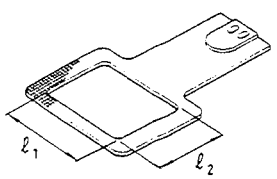
	Replacement part	Changing for light-weight material	Changing for medium-weight materials
1	Needle bar thread guide		B1406210000
2	Needle hole guide	B242621000C	B242621000B (φ2) or B242621000D (φ2.4)
3	Oscillating rock		D1805MLBH00
4	Shuttle		B181820500B
5	Thread take-up spring		D3112L4BB00
6	Tension spring		B3129053000
7	Shuttle race ring		B18172050AB (for thick needle of #23 or more)

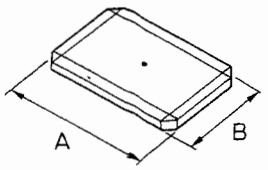
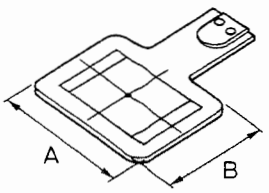
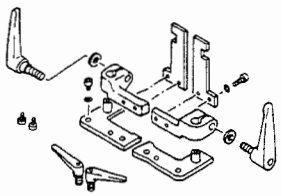
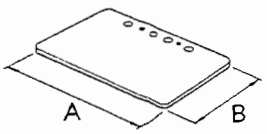
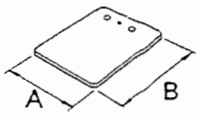
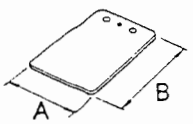
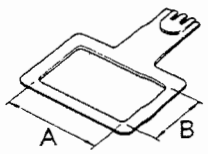
※ In the table shown above, "changing for medium-weight materials" means the follwing specification changes.

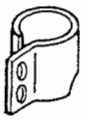
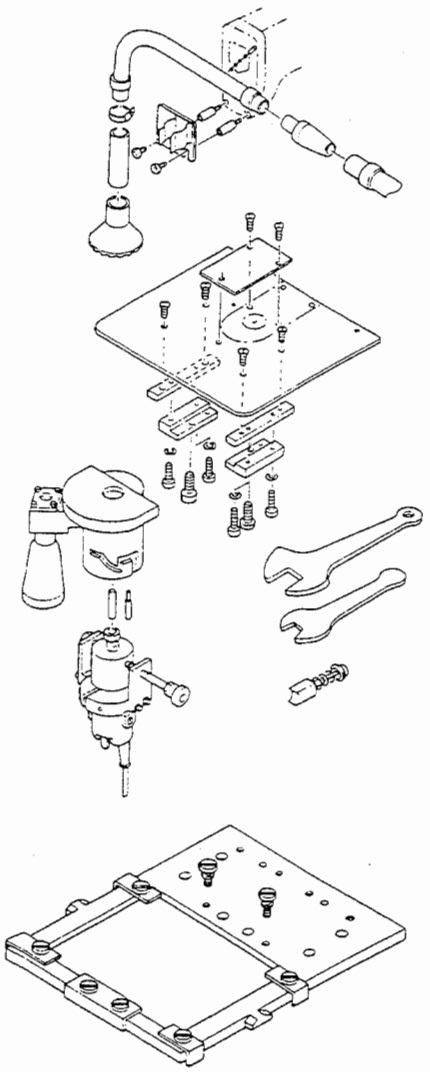
(Standard type)		(For medium-weight materials)
AMS-210 (-212)CSS	→	CHS
AMS-210 (-212)CST	→	CHT
AMS-210 (-212)CSL	→	CHL

9-2. Options

9-2-1. OPtions for common use

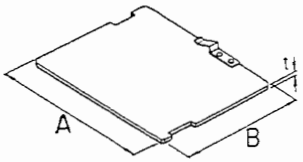
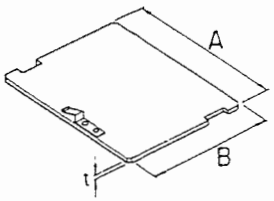
Name of part	Type	Part No.	Size (mm)
1. Auxiliary feed plate (asm.) 		B 2564 210 0A0 Used when an LK subclass feedplate is used.	
2. Needle hole guide 	Needle hole guide (B) for medium-weight material Needle hole guide (C) for knitted material Needle hole guide (D) for heavy-weight material Needle hole guide (A) for light-weight material Needle hole guide (F) for heavy-weight material Needle hole guide (G) for heavy-weight material	B 2426 210 00B B 2426 210 00C B 2426 210 00D B 2426 210 00A B 2426 210 00F B 2426 210 00G	φA = 2.0 φA = 1.6 φA = 2.4 φA = 1.6 φA = 3.0 φA = 3.0 (with a counterbore)
3. Feed plate blank 	Feed plate blank without knurl (large) Feed plate blank with knurl (small) Feed plate blank with knurl (large)	B 2556 210 0W0 B 2556 210 0X0 B 2556 210 0Y0	ℓ = 175 ℓ = 90 ℓ = 175
4. Plastic blank 	Large plastic feeding frame (asm.) AMS-210 AMS-212	 B 2557 210 0A0 B 2557 212 0A0	
	Feeding frame material (A) Feeding frame material (B)	B 2587 210 000 B 2588 210 000	A×B×t=210×150×1 A×B×t=210×150×1.5
5. Cassette holder (asm.) 		B 2594 210 0A0	
6. Cassette holder fixed plate 		B 2593 210 000	
7. Feed plate 	Feed plate blank (B) Feed plate blank (C) Feed plate blank (without knurl) (for the AMS-210) Feed plate blank (without knurl) (for the AMS-212)	B 2556 210 00B B 2556 210 00C B 2556 210 A00 B 2556 212 A00	ℓ1×ℓ2=88×74 ℓ1×ℓ2=68×62 ℓ1×ℓ2=110×74 ℓ1×ℓ2=133×74

Name of part	Type	Part No.	Size (mm)
8. Origin adjusting jig 	Origin gauge (for the AMS-210) Origin gauge (for the AMS-212)	B 2561 210 000 B 2561 212 000	A×B=110×74 A×B=133×74
	Feed plate for reference of origin	B 2567 210 000	A×B=175×221.5
9. One touch clamp 	One touch clamp asm.	B 5110 210 0B0	
	Feeding frame blank with knurl for one touch clamp	B 5118 210 000	A×B=155×97
	Feeding frame blank without knurl for one touch clamp	B 5118 210 A00	A×B=155×97
	Separate type feeding frame (right) blank with knurl for one touch clamp	B 5119 210 000	A×B=77×97
	Separate type feeding frame blank without knurl for one touch clamp	B 5119 210 A00	A×B=77×97
	Separate type feeding frame (left) blank with knurl for one touch clamp	B 5120 210 000	A×B=77×97
	Feed plate for one touch clamp (for AMS-210) (for AMS-212)	B 2556 210 D00 B 2556 212 D00	A×B=110×74 A×B=133×74
	Feed plate blank with knurl for one touch clamp	B 2556 210 F00	A×B=175×131.5
	Feed plate blank without knurl for one touch clamp	B 2556 210 E00	A×B=175×131.5

Name of part	Type	Part No.	Size (mm)
10. Thread guide 	Needle bar thread guide (standard type) Effectively prevents stitch skipping and slip-off of the thread from the needle eyelet at sewing start when used with the machine for heavy-weight materials.	B 1405 210 000	
11. Milling device 		MU01 (for 210) MU02 (for 212)	

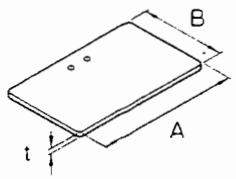
9-2-2. Options exclusive for L type (pneumatic separately driven feeding frame)

• For the AMS-210 (-212)CSL, CHL and CGL

Name of part	Type	Part No.	Size (mm)
1. Plastic blank 	Plastic feeding frame blank (left) asm. ① For AMS-210C ② For AMS-212C	 B 2557 210 0A A B 2557 212 0A A	 A×B×t 101×71×2 101×83.5×2
	Plastic feeding frame blank (right) asm. For AMS-210C For AMS-212C	 B 2557 210 0A B B 2557 212 0A B	 A×B×t 101×71×2 101×83.5×2

9-2-3. Options exclusive for the T type (with an inverting device)

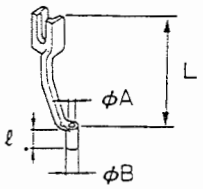
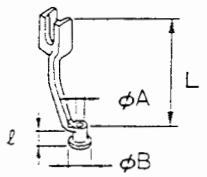
• For the AMS-210 (-212)CST and CHT

Name of part	Type	Part No.	Size (mm)
1. Machinable intermediate presser 	Intermediate presser blank	B 4317 210 0X0	A×B×t=135×58×3.2

9-2-4. Optional intermediate presser feet

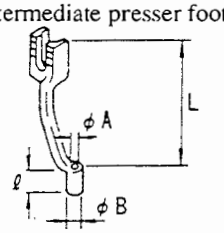
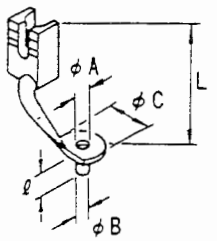
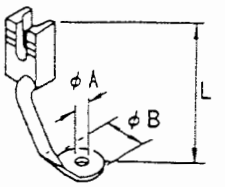
(1) Optional intermediate presser feet for the types excluding the GL
(These intermediate presser feet are interchangeable with those used with the AMS-210B, -212B and -206.)

• For the AMS-210 (-212)CSS, CHS, CST, CHT, CSL and CHL

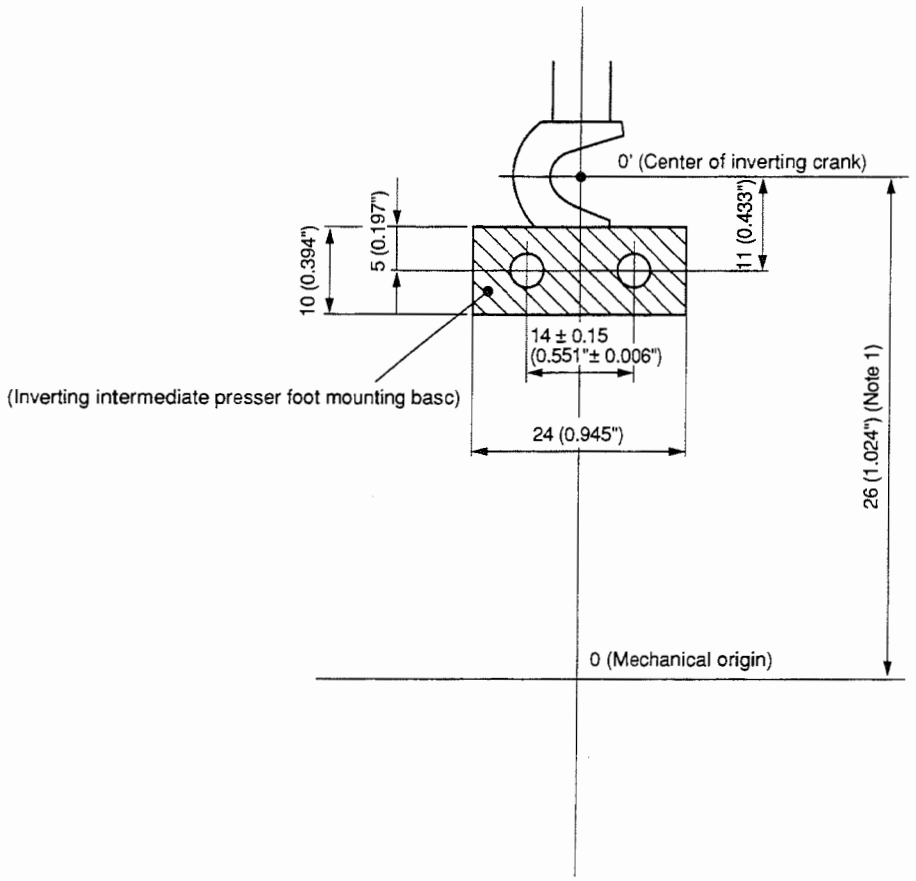
Name of part	Type	Part No.	Size (mm)
1. Intermediate presser foot 	Intermediate presser foot (B)	B 1601 210 00 B	φA×φB×ℓ×L 3.5×5.5×6×40.5
	Intermediate presser foot (D)	B 1601 210 00 D	φA×φB×ℓ×L 2.2×3.6×6×40.5
	Intermediate presser foot (E)	B 1601 210 00 E	φA×φB×ℓ×L 1.6×2.6×6×40.5
	Intermediate presser foot (G)	B 1601 210 00 G	φA×φB×ℓ×L 3×5×8×40.5
	Intermediate presser foot (A)	B 1601 210 000	φA×φB×ℓ×L 3.5×5.5×4×42.5
	Intermediate presser foot (A)	B 1601 206 000	φA×φB×ℓ×L 2.2×3.6×5×41.5
2. Compressor unit 	Intermediate presser foot (C)	B 1601 210 00 C	φA×φB×ℓ×L 3.5×10×5×41.5

(2) Option intermediate presser feet for the GL type
(These intermediate presser feet are interchangeable with those used with the AMS-220.)

• For the AMS-210 (-212)CGL

Name of part	Type	Part No.	Size (mm)
1. Intermediate presser foot   	Intermediate presser foot (A)	B 1601 220 000	φA×φB×ℓ×L 2.2×3.6×6×29.5
	Intermediate presser foot (B)	B 1601 220 00 B	φA×φB×ℓ×L 3.5×5.5×6×29.5
	Intermediate presser foot (E)	B 1601 220 00 E	φA×φB×ℓ×L 1.6×2.6×6×29.5
	Intermediate presser foot (F)	B 1601 220 00 F	φA×φB×ℓ×L 2.2×3.6×9×29.5
	Intermediate presser foot (G)	B 1601 220 00 G	φA×φB×ℓ×L 2.7×4.1×5×29.5
	Intermediate presser foot (C)	B 1601 220 00 C	φA×φB×φC×ℓ×L 2.2×3.6×12×6×29.5
	Intermediate presser foot (D)	B 1601 220 00 D	φA×φB×L 2.2×12×34.5

9-3. Dimensions for machining the inverting intermediate presser foot



(Noto 1) The dimension changes according to the adjustment of the Y origin sensor. It has been factory set to 26 mm (1.024") at the time of delivery.

Machine the inverting intermediate presser foot using the aforementioned dimensions as reference.
A machinable inverting intermediate presser foot is optionally available.

9-4. Inputting the reference point for pattern enlargement/reduction and the inversion point using a PGM-1

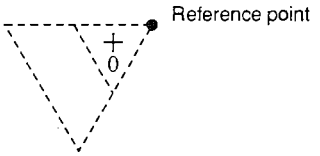
This procedure is not described in the Instruction Manual for the PGM-1. It is described respectively in the Instruction Manuals for the other programming devices.

1. Function

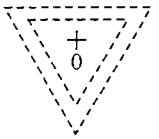
1) Inputting a reference point for normal pattern enlargement/reduction

At the time programming a pattern, by entering a point that you want to use as the reference point for enlargement or reduction, the pattern can be enlarged or reduced with that point as the reference point.

If this input is not made, the pattern enlargement or reduction will be based on the origin.



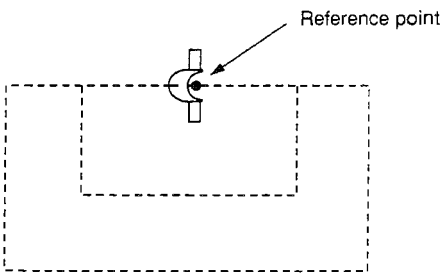
Enlargement based on the reference point input



Enlargement with no reference point input

2) Inputting a reference point for inversion pattem enlargement/reduction

As same as in the case of inputting a reference point for normal pattern enlargement/reduction, by entering an enlargement/reduction point while the Inverting Clamp indicator lamp is ON, the inversion pattern can be enlarged or reduced using the specified point as the reference point. No enlargement or reduction can be made without this input.



Enlargement based on the refence point input

N.G

No reference point input

(Caution) Be very careful with the reference point input, since an improper reference point may cause the crank shaft to interfere with the needle when the pattern is enlarged or reduced, possibly resulting in needle breakage.

3) Inputting an inversion point for an inversion pattern

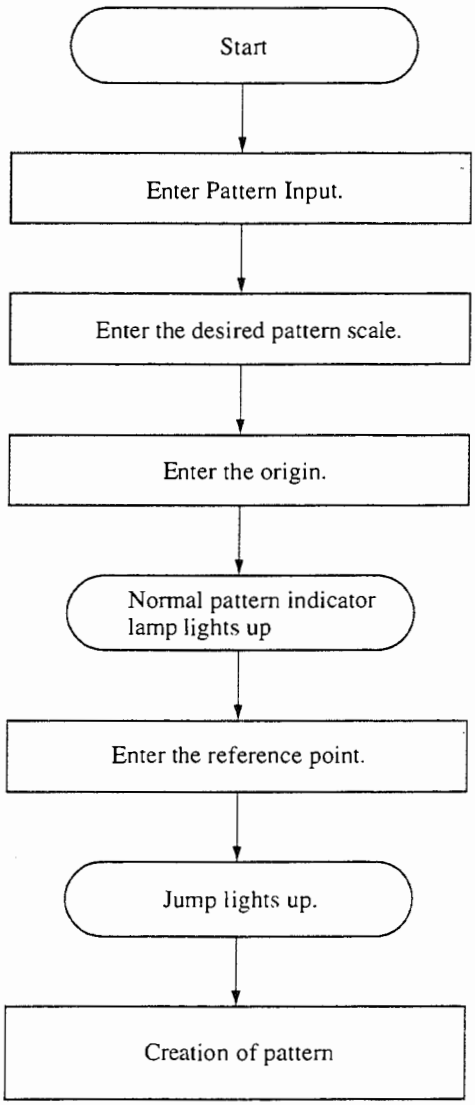
To program an inversion pattern, enter data up to a point where the inverting crank shaft is to be reverse. This makes the "Jump" indicator lamp light up. Then input "0" and enter it. This will cause the inverting crank shaft to be reversed at the specified inversion point. If no inversion point has not been entered, the inverting crank shaft will be reversed at the conventional inversion point that is 14 mm (0.551") from the center of the inverting crank.

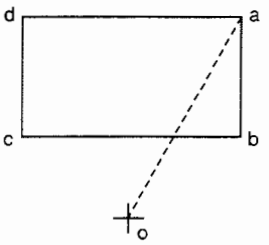
Input a small inversion pattern that does not pass over inversion line using the inverting point input function.

2. How to input

1) Entering a reference point for normal pattern enlargement/reduction

[Example]
Permits easier positioning for sewing workpieces which have the same configuration but different sizes.

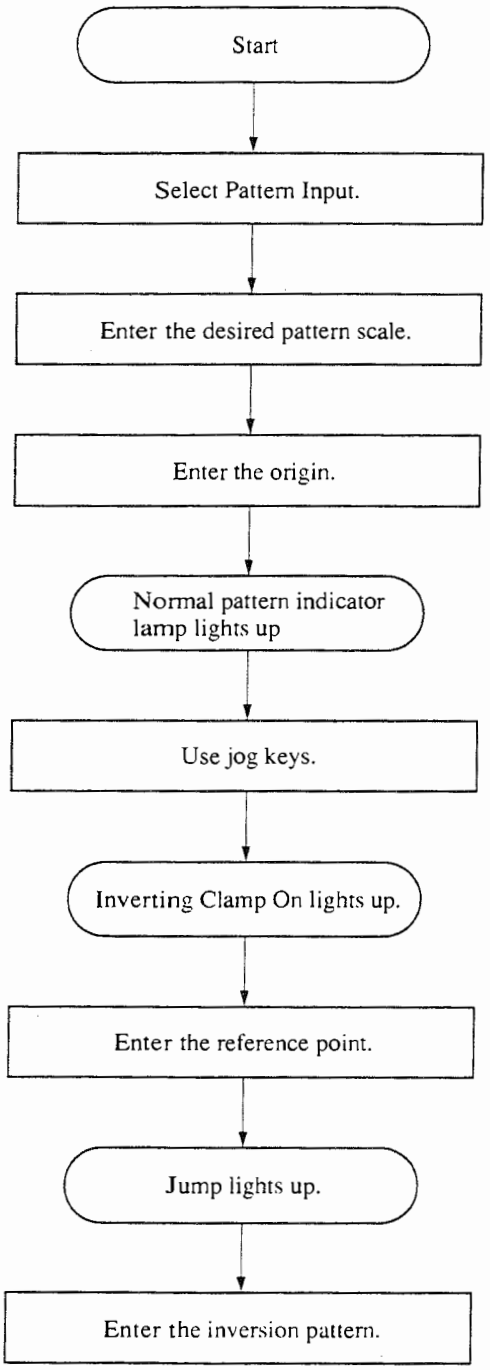


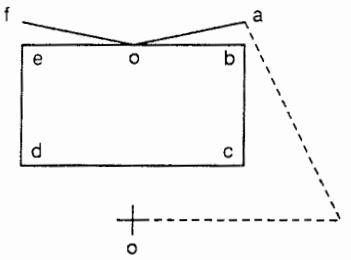


① Select Pattern Input.
② Enter the desired pattern scale.
③ Enter origin "o".
④ Hit point "a" to enter it while the normal pattern indicator lamp lights up. (Point "a" provides the reference point for enlargement/reduction.)
⑤ Enter a jump for origin "o" → "a".
⑥ Enter b → c → d → a in the Linear mode.
⑦ Enter Thread Trim.
⑧ Enter End.

2) Entering a reference point for enlargement/reduction in the inversion pattern

[Example]
For inversion patterns whose label sizes are almost the same, the same inverting intermediate presser foot is used for sewing. Inversion patterns with different label sizes may also be handled.



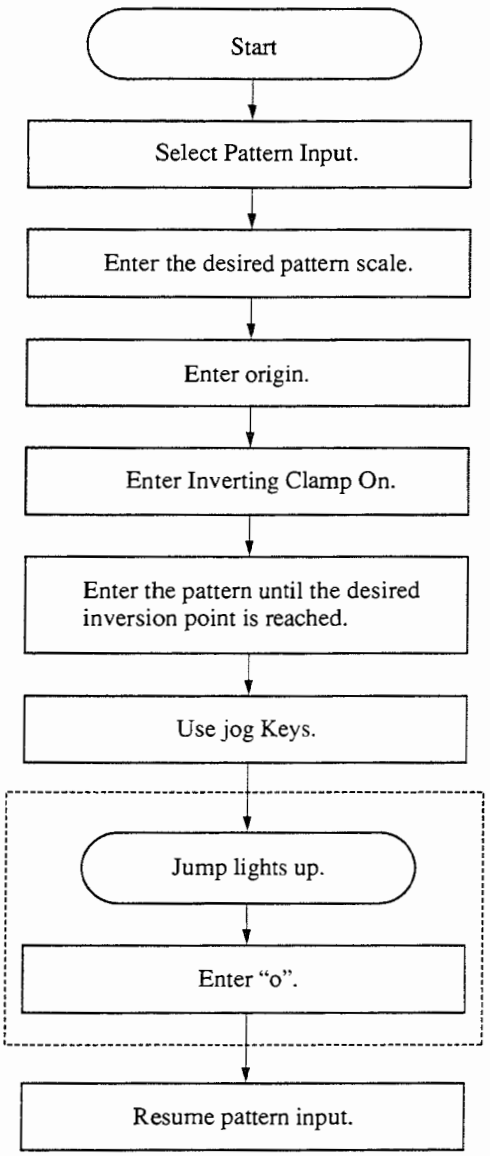


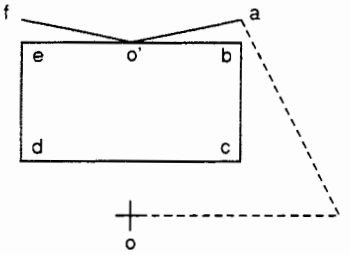
① Select Pattern Input.
② Enter the desired pattern scale.
③ Enter origin "o".
④ Light Inverting Clamp On, using jog keys.
⑤ Enter point "b" which is to provide the reference point for enlargement/reduction.
(The Jump indicator lamp lights up.)
⑥ Enter a Jump for origin "o" → "a".
⑦ Enter o' → b → c → d → e → o' → f in the Linear mode. (Point "a" has already been entered.)
⑧ Enter Thread Trim.
⑨ Enter End. (Points "a" and "b", and "e" and "f" indicate the same points.)

(Caution) 1. Both the inverting intermediate presser foot and inverting crank shaft are involved in this input. So, after enlarging or reducing the pattern, make sure that they do not come in contact with each other during forward or backward feed.
2. The aforementioned step of procedure ④ is carried out to declare that you are going to create an inverting pattern and enter the declaration as data in the pattern memory. If this declaration data is not entered, the inverting point input function (see the next page) cannot be used.

3) Entering an inverting point for an inversion pattern

[Example]
The inverting clamp can be used even for a pattern whose lable size is too small to pass over the conventional inversion line (14mm (0.551") from the center of the inverting ctank).





① Select Pattern Input.
② Enter the desired pattern scale.
③ Enter origin "o".
④ Enter Inverting Clamp On.
⑤ Enter a Jump for origin "o" → "a".
⑥ Enter o' → b → c in the Linear mode.
(Point "a" has already been entered.)

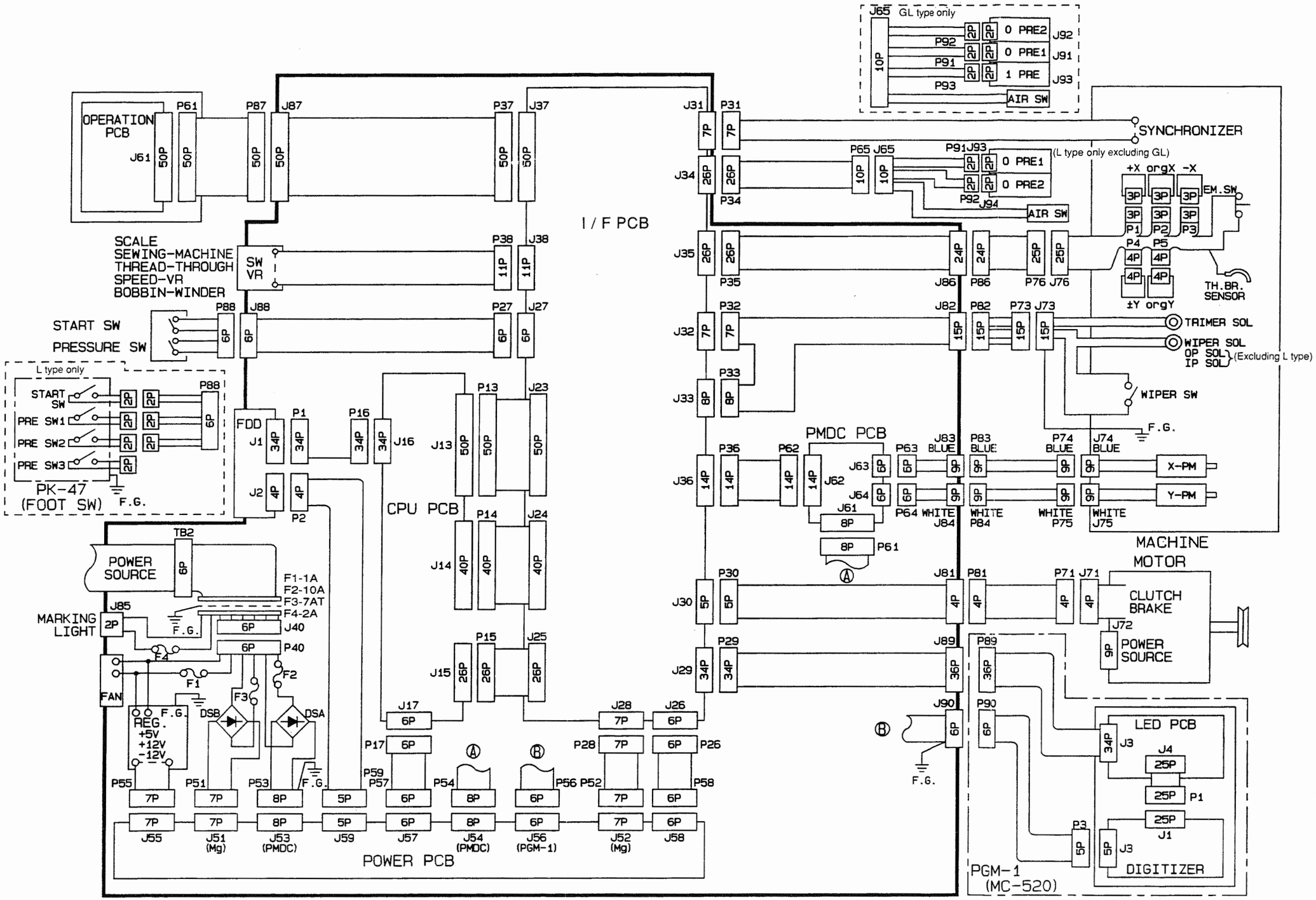
⑦ Cause the Jump to light up, using jog keys.
(For making inversion at point "c".)
⑧ Press the "o" key to specify the PGM-1 and enter it.

⑨ Enter d → e → o' → f in the Linear mode.
(Point "a" has already been entered.)
⑩ Enter Thread Trim.
⑪ Enter End. (Points "a" and "b", and "e" and "f" indicate the same points.)

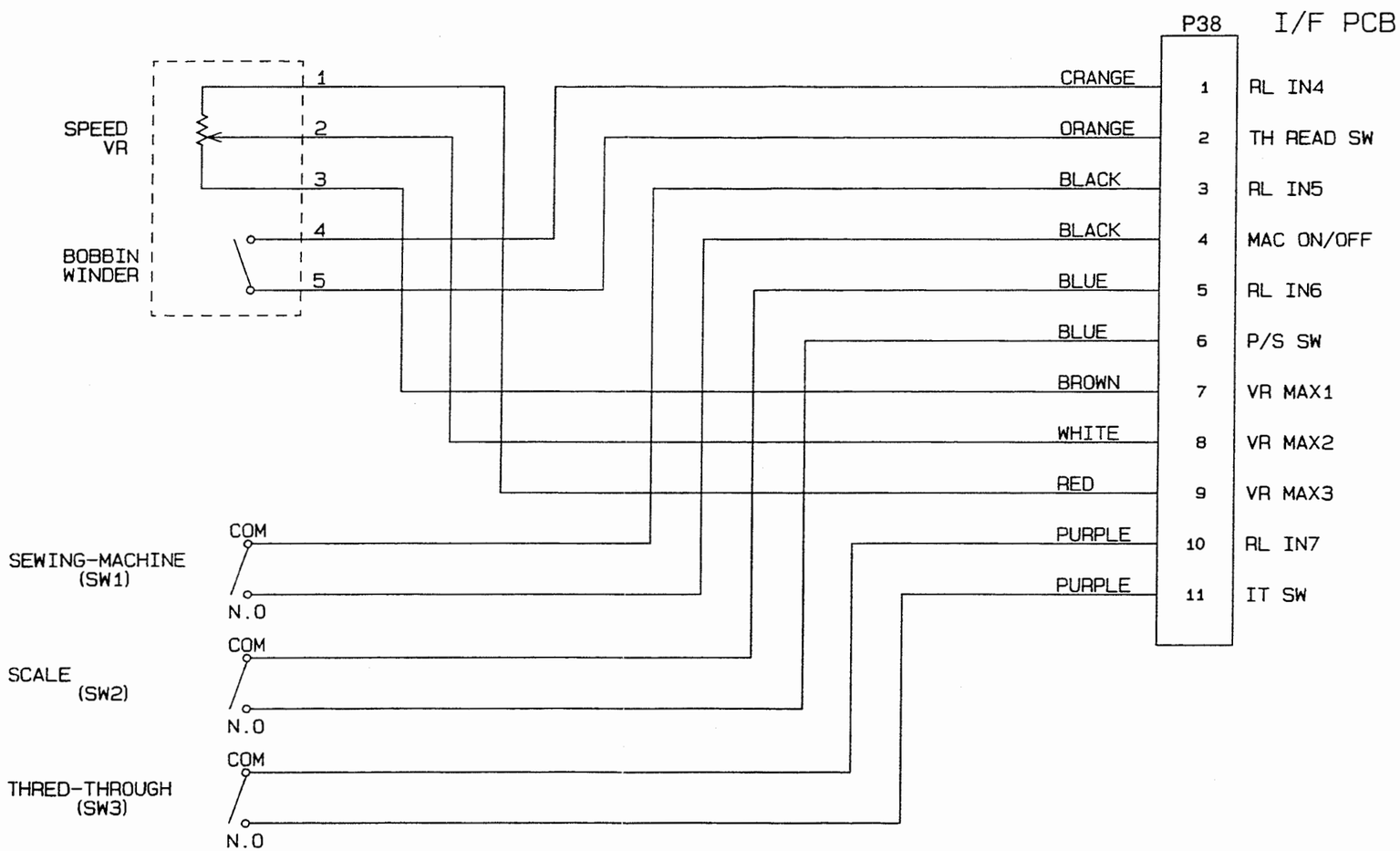
With the programming described above, you can cause the inverting crank to be reversed at point "c".

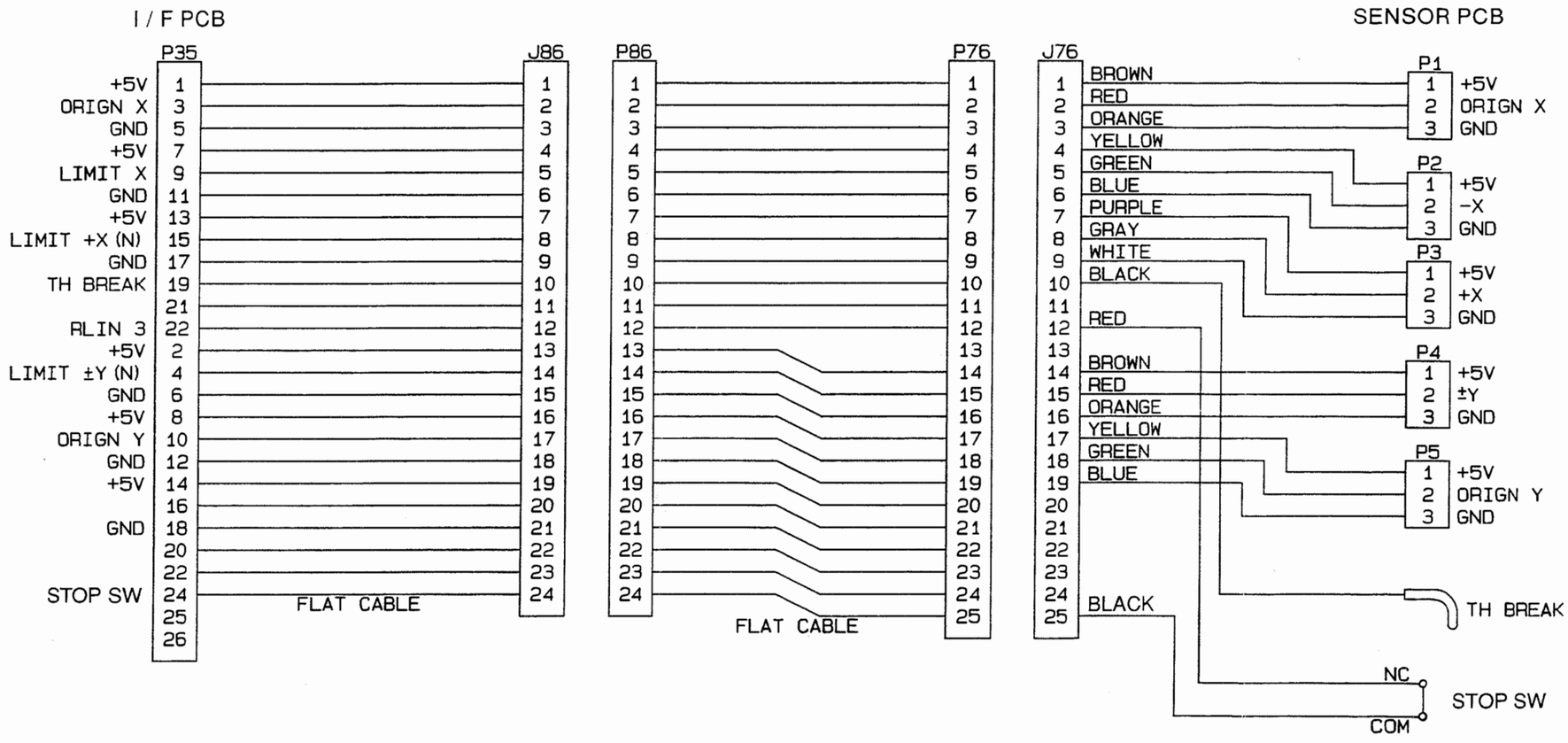
Inversion points can be set by the steps enclosed with the broken line shown above. You can set any number of inversion point desired by performing the steps in the broken-line box.
The inverting crank is oriented to the left ⟨ at the start of sewing, and shifted to the right ⟩ at an inversion point. After that, the crank is alternately shifted ⟨ , ⟩ for each inversion point. Be sure to always set an odd number of inversion points. If you should set an even number, the crank will be oriented to the left ⟨ at the end of sewing. As a result, the crank will interfere with the needle at the end, and the needle may break.
You will not be able to set any inversion points under the following conditions:

1. Jump step before reaching the sewing start point
2. Immediately after entering a 2nd origin followed by pause
   (Immediately after entering a 2nd origin at which the sewing machine pauses)
3. Immediately after entering a thread trim

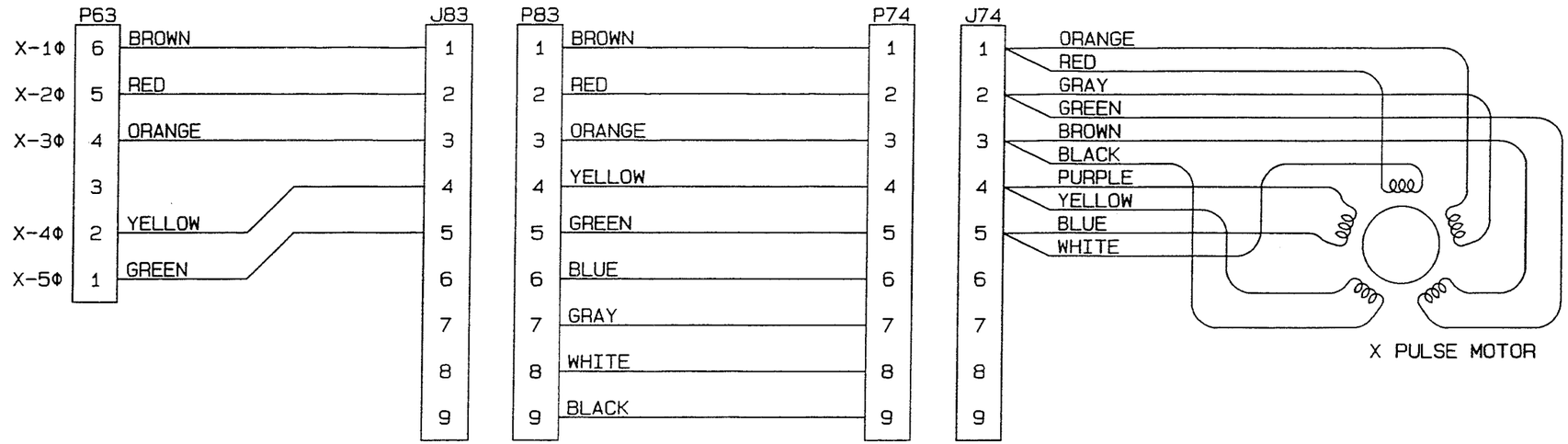

OPERATION PCB
J61
P61
P87
J87
P37
J37
SCALE
SEWING-MACHINE
THREAD-THROUGH
SPEED-VR
BOBBIN-WINDER
SW
VR
P38
J38
START SW
PRESSURE SW
P88
J88
P27
J27
L type only
START SW
PRE SW1
PRE SW2
PRE SW3
PK-47
(FOOT SW)
F.G.
FDD
J1
P1
P16
J16
J13
P13
J23
J2
P2
CPU PCB
P14
J24
J14
P15
J25
J15
TB2
POWER SOURCE
F1-1A
F2-10A
F3-7AT
F4-2A
MARKING LIGHT
J85
J40
P40
FAN
REG.
+5V
+12V
-12V
DSB
DSA
J17
P17
P59
P57
P55
P51
P53
P54
P56
P52
P28
P26
P58
J55
J51
(Mg)
J53
(PMDC)
J59
J57
J54
(PMDC)
J56
(PGM-1)
J52
(Mg)
J58
POWER PCB
I / F PCB
J31
P31
J34
P34
J35
P35
J32
P32
J33
P33
J36
P36
J30
P30
J29
P29
J65
GL type only
P92
P91
P93
0 PRE2
0 PRE1
1 PRE
AIR SW
J92
J91
J93
SYNCHRONIZER
P65
J65
(L type only excluding GL)
J94
+X orgX -X
EM.SW
P1
P2
P3
P4
P5
±Y orgY
TH.BR.
SENSOR
J86
P86
P76
J76
J82
P82
P73
J73
TRIMER SOL
WIPER SOL
OP SOL
IP SOL
(Excluding L type)
WIPER SW
F.G.
PMDC PCB
P62
J62
J63
J64
J61
P61
P63
J83
BLUE
P64
WHITE
J84
P83
BLUE
WHITE
P84
P74
BLUE
WHITE
P75
J74
BLUE
WHITE
J75
X-PM
Y-PM
MACHINE MOTOR
J81
P81
P71
J71
CLUTCH
BRAKE
J72
POWER SOURCE
J89
P89
J90
P90
LED PCB
J3
J4
P1
J1
P3
DIGITIZER
PGM-1
(MC-520)

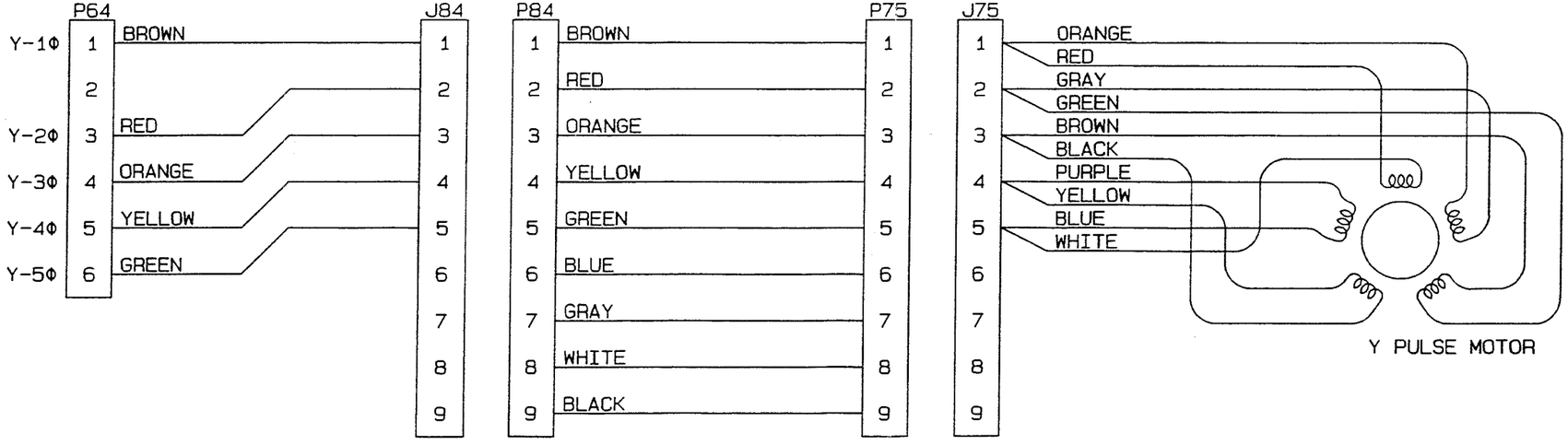
9-6. Variable resistor switch circuit diagram

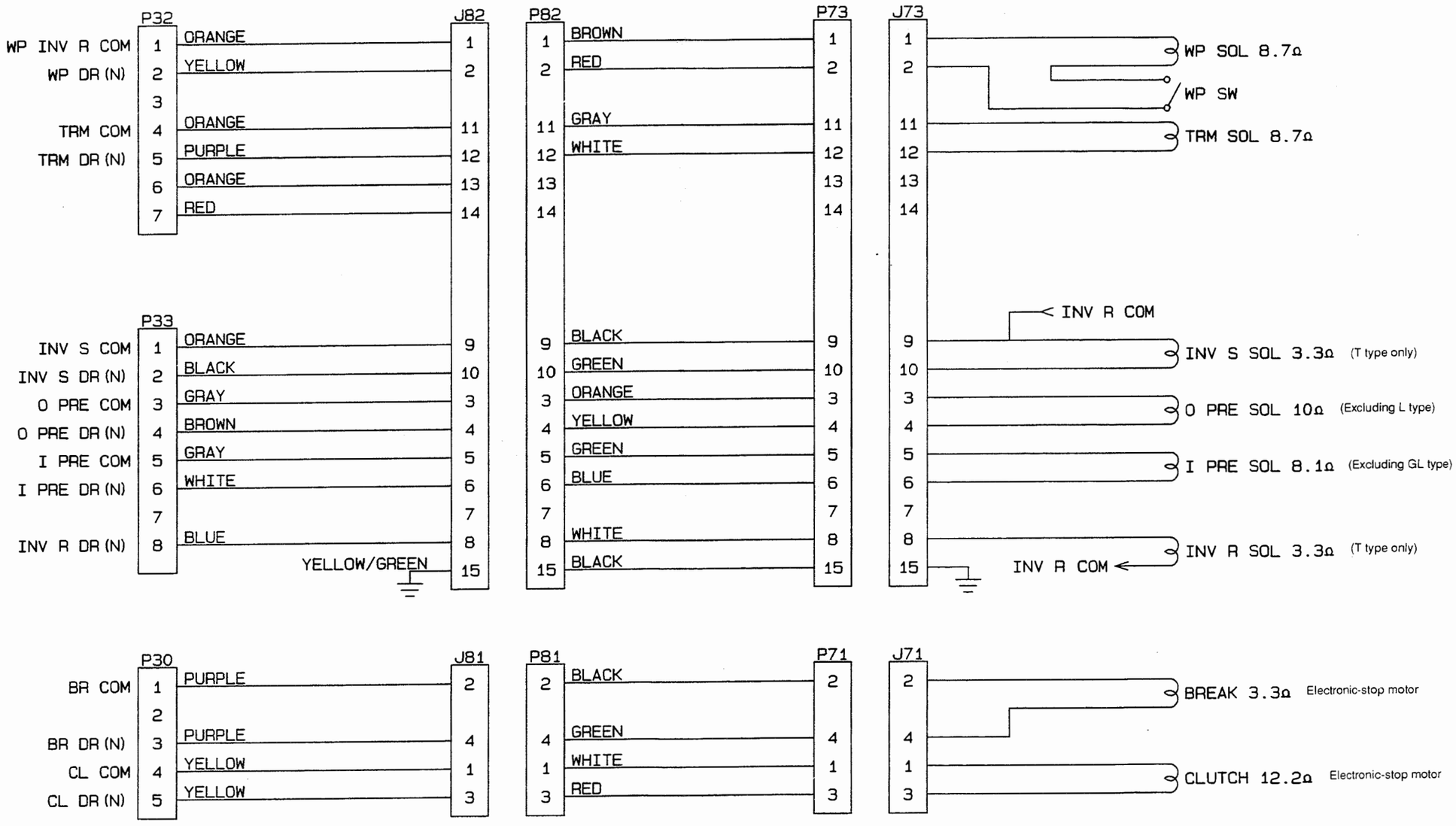



I / F PCB
P35
J86
+5V 1
ORIGN X 3
GND 5
+5V 7
LIMIT X 9
GND 11
+5V 13
LIMIT +X (N) 15
GND 17
TH BREAK 19
21
RLIN 3 22
+5V 2
LIMIT ±Y (N) 4
GND 6
+5V 8
ORIGN Y 10
GND 12
+5V 14
16
GND 18
20
22
STOP SW 24
25
26
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
FLAT CABLE
P86
P76
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
FLAT CABLE
SENSOR PCB
J76
1 BROWN
2 RED
3 ORANGE
4 YELLOW
5 GREEN
6 BLUE
7 PURPLE
8 GRAY
9 WHITE
10 BLACK
11
12 RED
13
14 BROWN
15 RED
16 ORANGE
17 YELLOW
18 GREEN
19 BLUE
20
21
22
23
24 BLACK
25
P1
1 +5V
2 ORIGN X
3 GND
P2
1 +5V
2 −X
3 GND
P3
1 +5V
2 +X
3 GND
P4
1 +5V
2 ±Y
3 GND
P5
1 +5V
2 ORIGN Y
3 GND
TH BREAK
NC
COM
STOP SW

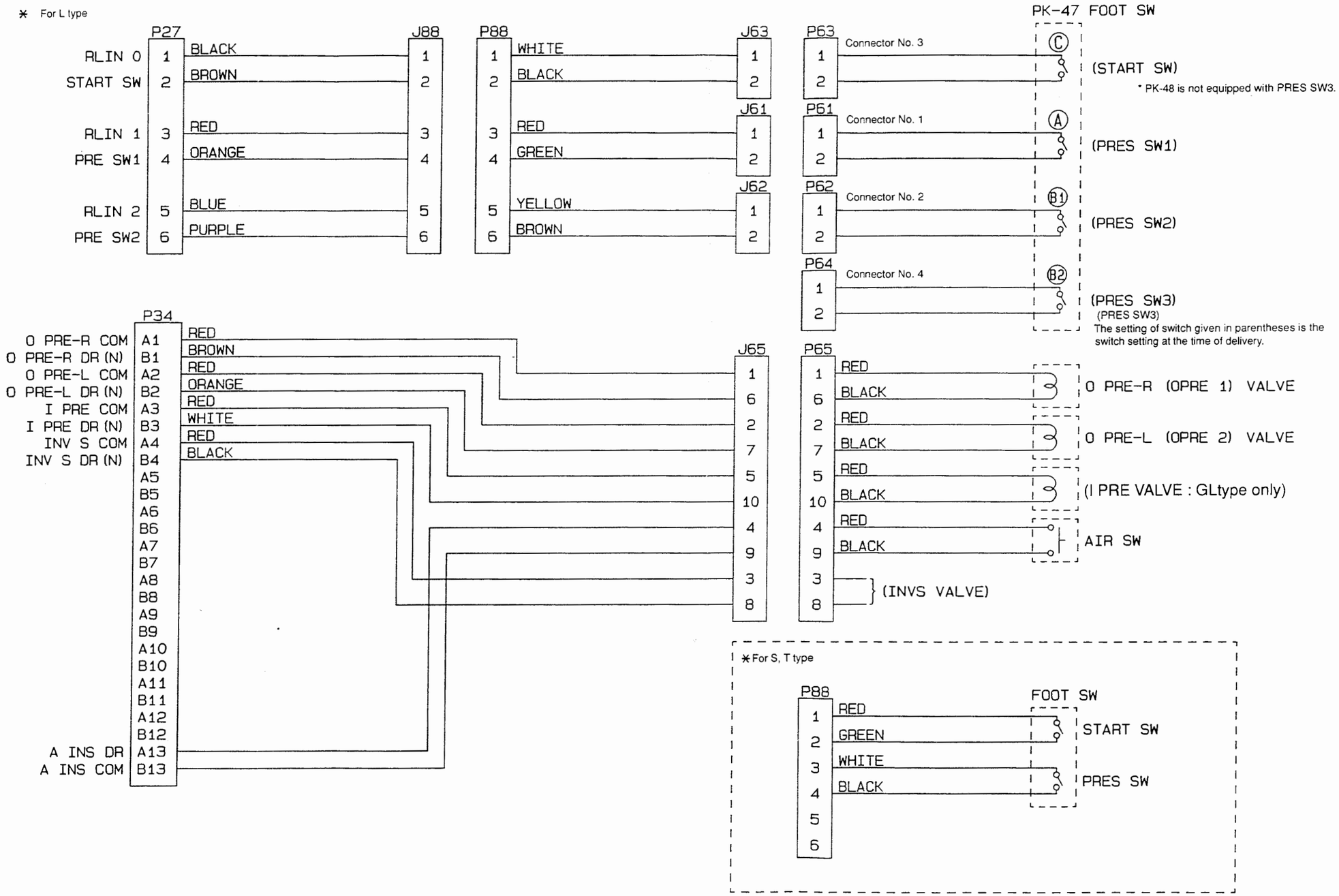
9-8. PULSE MOTOR Circuit diagram





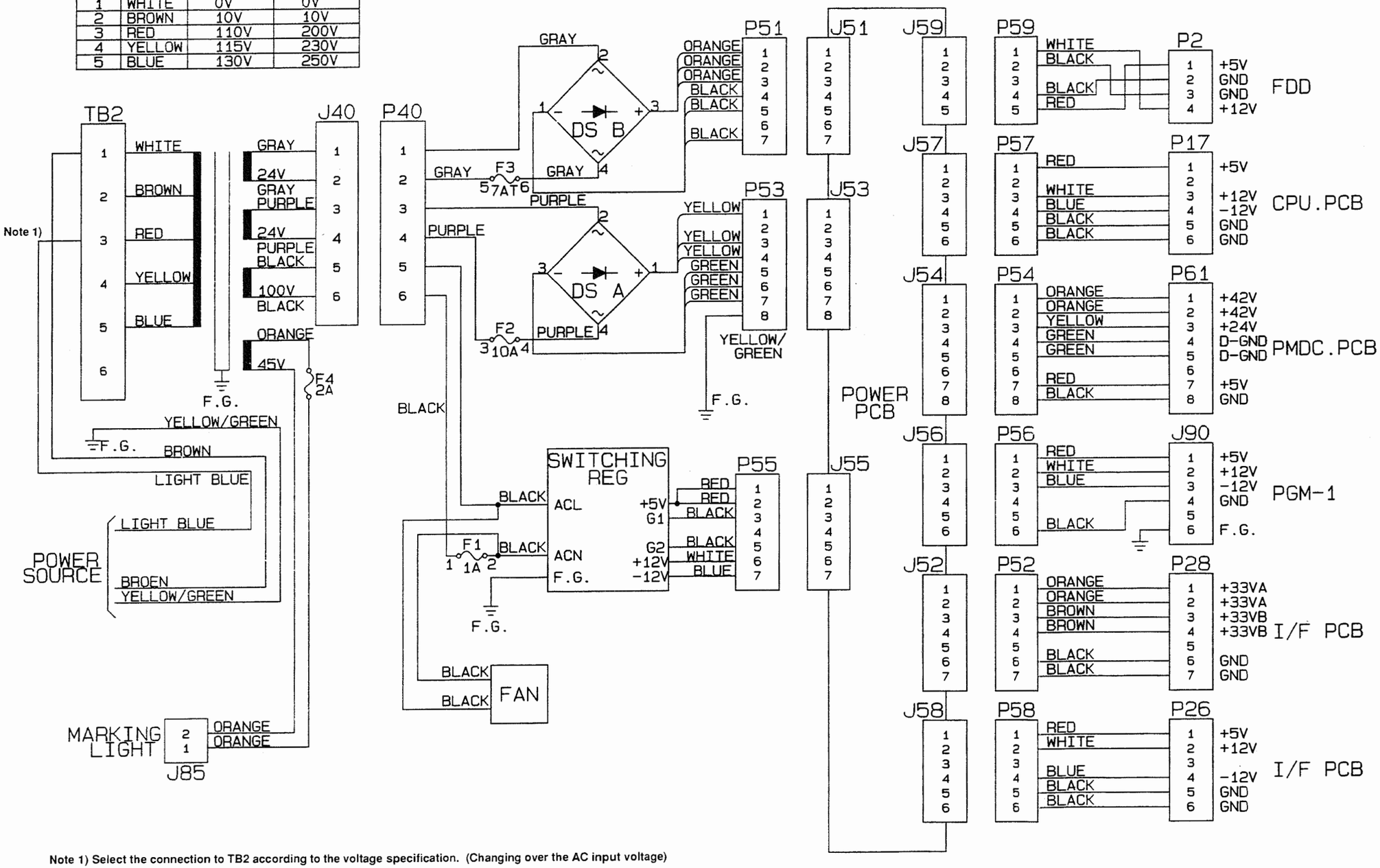

P32
J82
WP INV R COM 1 ORANGE 1
WP DR (N) 2 YELLOW 2
3
TRM COM 4 ORANGE 11
TRM DR (N) 5 PURPLE 12
6 ORANGE 13
7 RED 14
P33
INV S COM 1 ORANGE 9
INV S DR (N) 2 BLACK 10
O PRE COM 3 GRAY 3
O PRE DR (N) 4 BROWN 4
I PRE COM 5 GRAY 5
I PRE DR (N) 6 WHITE 6
7 7
INV R DR (N) 8 BLUE 8
YELLOW/GREEN 15
P82
P73
1 BROWN 1
2 RED 2
11 GRAY 11
12 WHITE 12
13 13
14 14
9 BLACK 9
10 GREEN 10
3 ORANGE 3
4 YELLOW 4
5 GREEN 5
6 BLUE 6
7 7
8 WHITE 8
15 BLACK 15
J73
1 2 WP SOL 8.7Ω
WP SW
11 12 TRM SOL 8.7Ω
13 14
INV R COM
9 10 INV S SOL 3.3Ω (T type only)
3 4 O PRE SOL 10Ω (Excluding L type)
5 6 I PRE SOL 8.1Ω (Excluding GL type)
7
8 INV R SOL 3.3Ω (T type only)
15 INV R COM
P30
J81
BR COM 1 PURPLE 2
2
BR DR (N) 3 PURPLE 4
CL COM 4 YELLOW 1
CL DR (N) 5 YELLOW 3
P81
P71
2 BLACK 2
4 GREEN 4
1 WHITE 1
3 RED 3
J71
2 BREAK 3.3Ω Electronic-stop motor
4
1 CLUTCH 12.2Ω Electronic-stop motor
3

9-10. Valve and switch circuit diagram
(circuit diagram of the foot switch and air valve for L type and circuit diagram of the foot switch for S or T type)



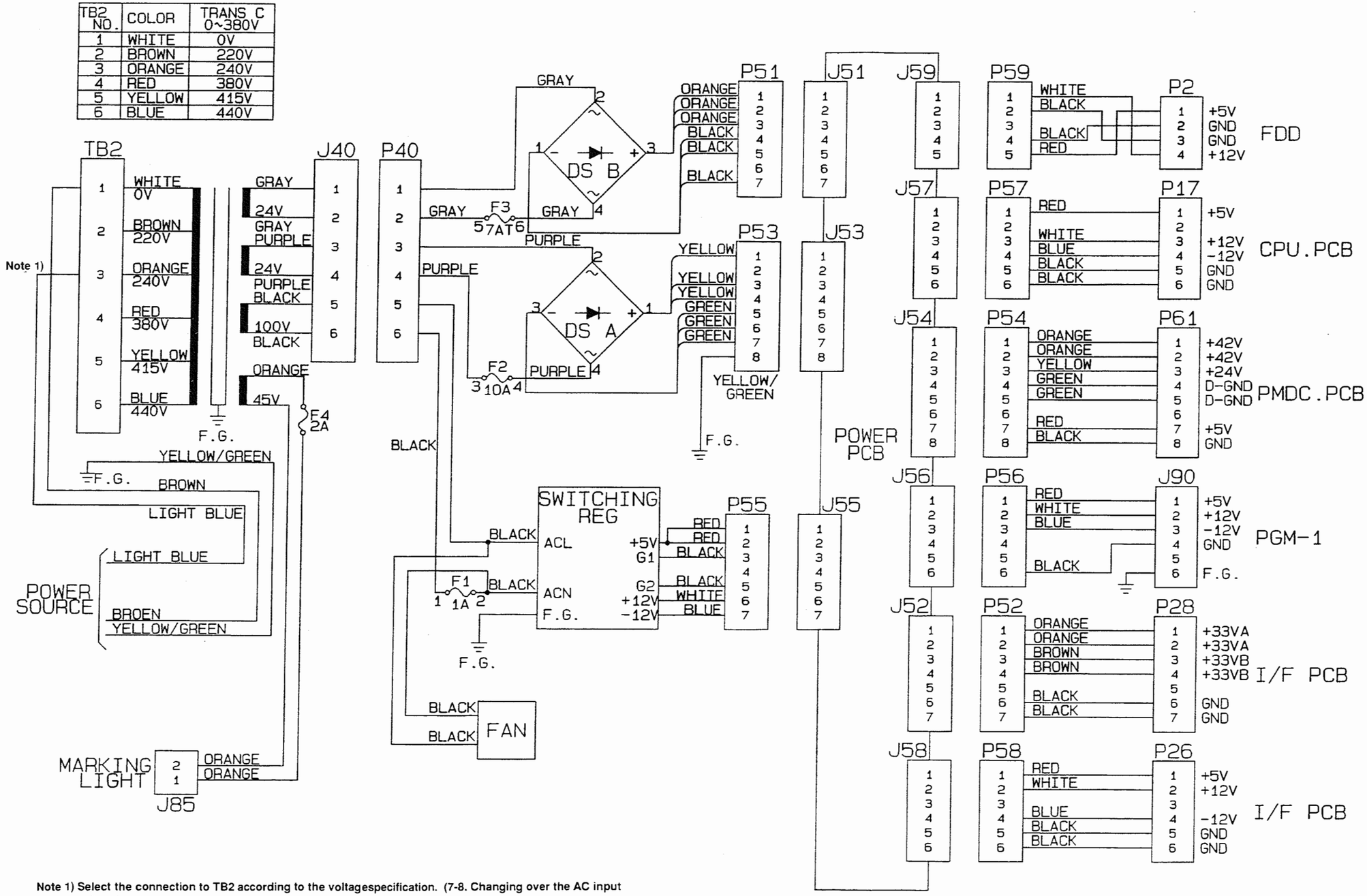
9-11. POWER circuit diagram (A) (100 V system, 200 V system)

TB2 NO.	COLOR	TRANS B 0~130V	TRANS A 0~250V
1	WHITE	0V	0V
2	BROWN	10V	10V
3	RED	110V	200V
4	YELLOW	115V	230V
5	BLUE	130V	250V



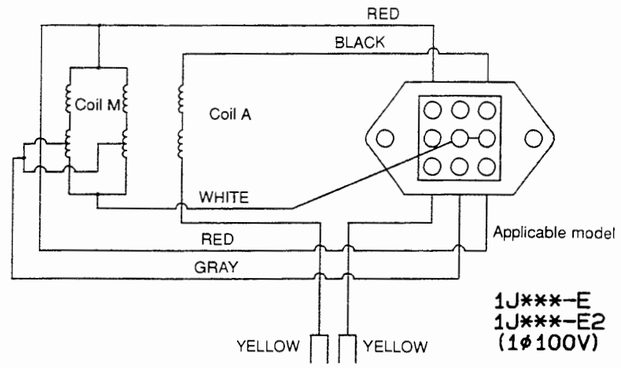
Note 1) Select the connection to TB2 according to the voltage specification. (Changing over the AC input voltage)

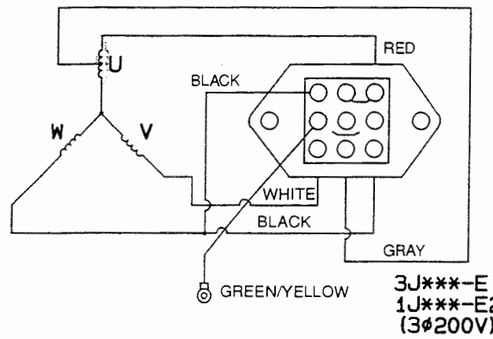
TB2 NO.	COLOR	TRANS C 0~380V
1	WHITE	0V
2	BROWN	220V
3	ORANGE	240V
4	RED	380V
5	YELLOW	415V
6	BLUE	440V

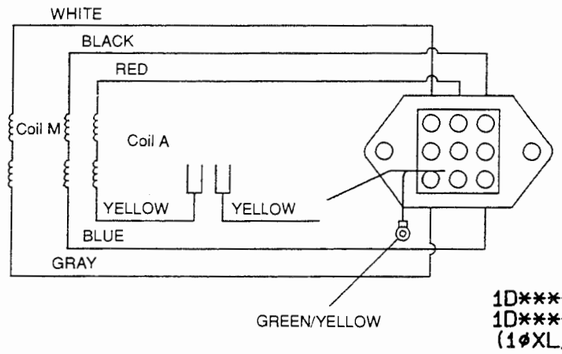


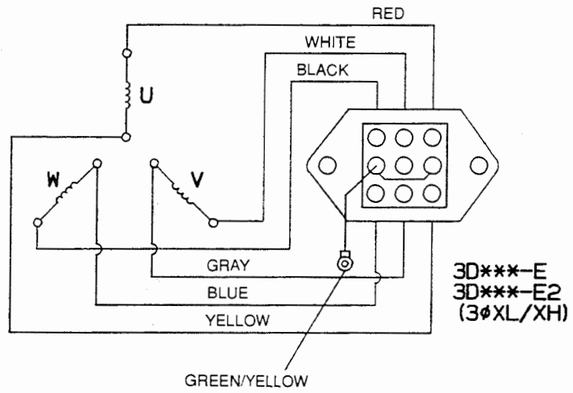
Note 1) Select the connection to TB2 according to the voltagespecification. (7-8. Changing over the AC input voltage)

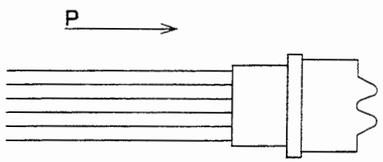
9-13. MOTOR connection diagram



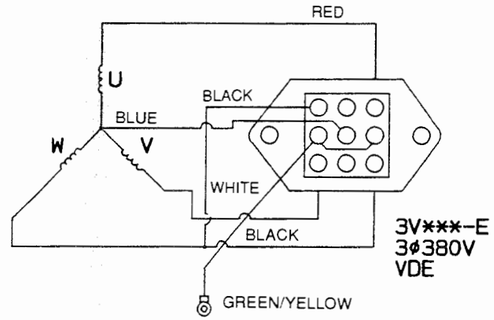


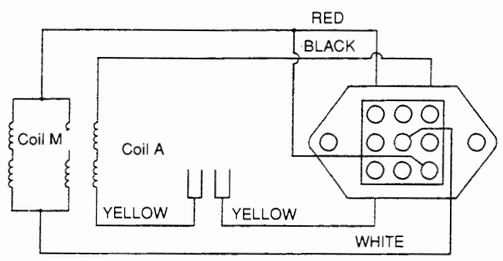


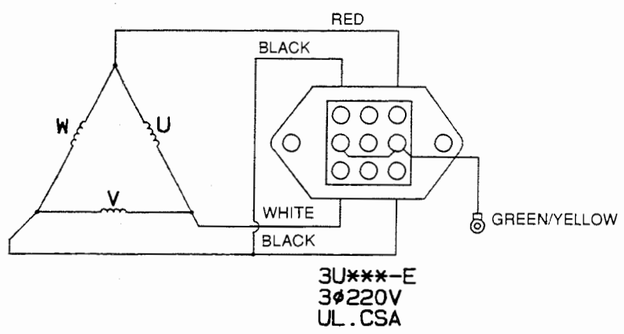




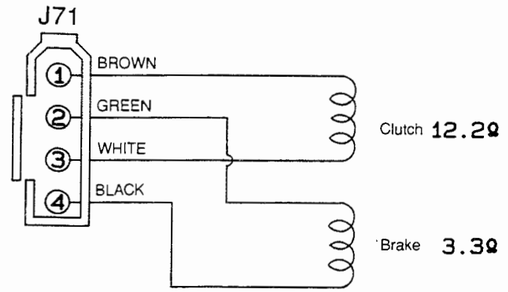
The arrangement of 9P connector pin: viewed from P



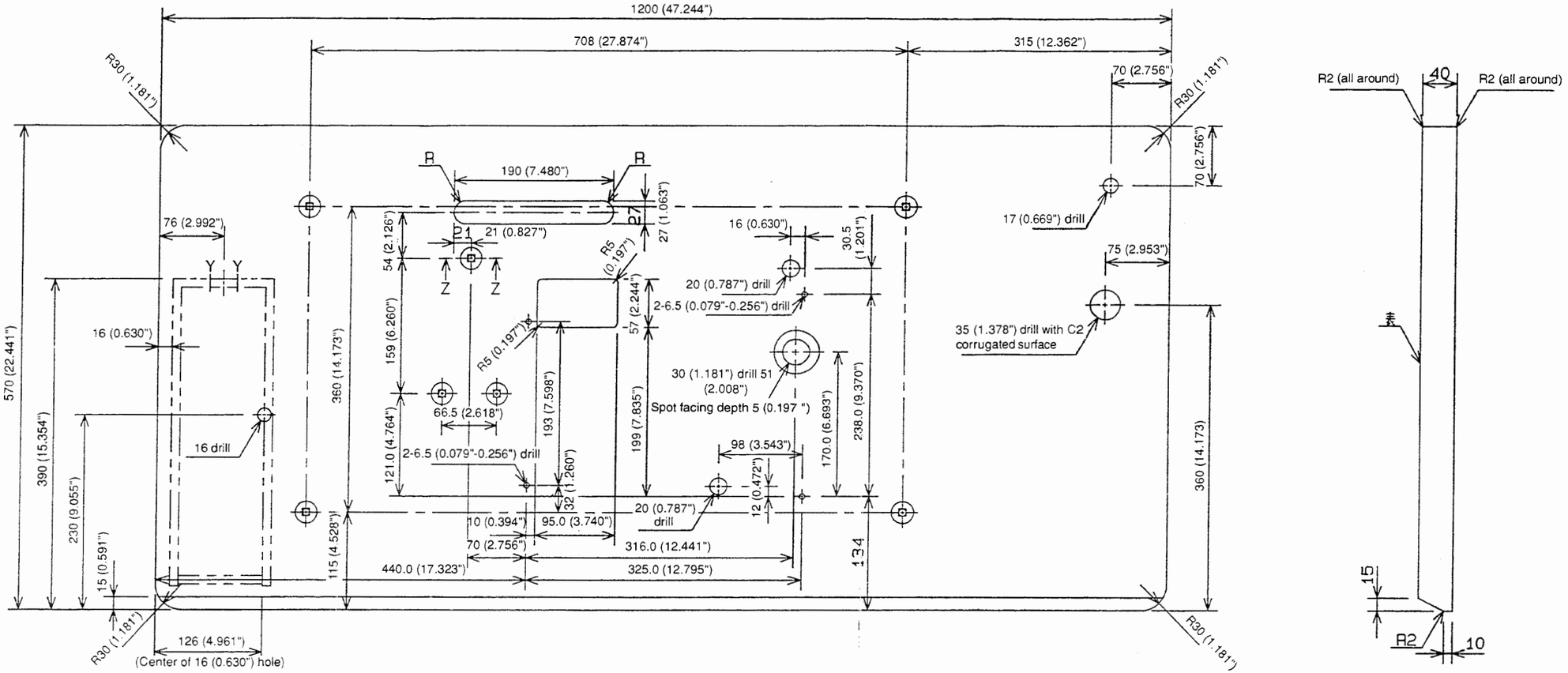




9-14. CLUTCH BRAKE connection diagram



9-15. Machine table drawing



9-16. Defective feed checking sheet

If a feeding failure (step-out, etc.) occurs, check for the following items. It is recommended to start checking from the items which can be corrected without replacing parts for highly efficient checking procedure.

1) Improper adjustment of sewing speed

Checking procedure

Set the rotary DIP switch 2 (SW2) at "3" to specify "speed check" function, and check how the sewing speed has been adjusted.

① The sewing speed is too high. ⇨ Re-adjust the sewing speed properly. "5-5-1. Adjusting the speed of sewing machine"

2) Mechanical cause

(Excessive play)

Checking procedure A

Turn ON the power to the sewing machine and lower the feeding frame. Now check for an excessive play by moving the feeding frame back and forth and to the right and left by hand.

① Screw in coupling has loosened. ⇨ Apply LOCKTITE again onto the screw and re-tighten it securely.
② Screw in sprocket has loosened. ⇨ Apply LOCKTITE again onto the screw and re-tighten it securely.
③ Excessive play at coupling (Rubber of coupling has worn out.) ⇨ Replace the coupling (rubber) with a new one.
④ Play at the other components ⇨ Remove the play.

(Hitch)

Checking procedure B

Turn OFF the power to the sewing machine and set the air pressure to 0 kgf/cm^2.Now, lower the feeding frame by hand. Then remove the junction cable (connector) of stepping motor. Now check for hitch between the components by moving the feeding frame back and forth and to the left and right by hand.
Re-connect the junction cable (connector) with the power to the sewing machine turned OFF.

⑤ Screw in needle hole guide has loosened. ⇨ Re-tighten it securely.
⑥ There is a step between throat plate and auxiliary cover of the throat plate.
(The stepped section catches the feed plate or the feeding frame.) ⇨ Adjust so that the stepped section between the throat plate and the auxiliary cover is removed. "(24) Height of the throat plate auxiliary cover"
⑦ Feed plate has excessively bent. ⇨ Correct the feed plate.
⑧ Hitch between the other components ⇨ Eliminate the hitch.

(Grease)

Checking procedure C

Check visually.

⑨ Y travel shaft and bearing are out of grease or stained with grease.
⑩ X guide shaft support is out of grease or stained with grease.
⑪ Bottom face of presser plate is out of grease or stained with grease.
⑫ Retainer is out of grease or stained with grease.
⑬ Other components are out of grease or stained with grease.

⇨ Clean the component and apply grease.
"5-3. Points to be applied with grease"

(Excessive load)

Checking procedure D

Same as checking procedure B

⑭ Tension applied to timing belt is too high.
⇨ Adjust the tension applied to the timing belt. "(28) Adjusting the tension of the X feed belt" "(29) Adjusting the tension of the Y feed belt"

⑮ Pressing pressure is too high.
⇨ Adjust the pressing pressure. "(5) Adjusting the feed bracket" "(30) Adjusting the pneumatic components"

⑯ Feeding frame (made by a user, in particular) is too heavy.
⇨ Reduce the weight of feeding frame.

⑰ Excessive load is applied to the feed bracket auxiliary cover.
⇨ Perform adjustment. "(26) Adjusting the feed bracket auxiliary cover"

⑱ X guide shaft support is pushed against the related components.
⇨ Perform adjustment. "(27) Adjusting the X guide shaft support"

⑲ Clearance provided between presser plate and work clamp slider is too small.
⇨ Perform adjustment. "(5)-3 Adjusting the feed bracket"

⑳ Shaft of stepping motor has bent.
㉑ Retainer has broken. A ball has dropped off the retainer. ⇨ Replace the defective component with a new one.
⇨ Remove the excessive load.
㉒ Travel shaft and bearing have worn out.
㉓ Excessive load on the other components

(Miscellaneous)

Checking procedure E

Check visually.

㉔ Tension applied to timing belt is too low. ⇨ Adjust the tension applied to the timing belt.
"(28) Adjusting the tension of the X feed belt"
"(29) Adjusting the tension of the Y feed belt"

㉕ Feeding frame comes in single-sided contact with the throat plate. ⇨ Correct the feeding frame.
Adhere a piece of sponge onto the underside of the feeding frame.

㉖ Pressing pressure is too low. ⇨ Adjust the pressing pressure.
"(5) Adjusting the feed bracket"
"(30) Adjusting the pneumatic components"

㉗ Miscellaneous

3) Electrical cause

① Transformer tap (terminal board) has been improperly connected.
(Check for improper connection with a tester or check for it visually.)
⇨ Change over the transformer tap. "7-8. Changing over the AC input voltage"

② Shortage of current for PMDC circuit board (Check with a tester.)
⇨ Adjust the current. "5-5-2. Adjusting the current for PMDC circuit board"

③ Screw in sensor circuit board has loosened. (Check visually.)
⇨ Perform adjustment. Re-tighten the screw securely. "(31) Adjusting the X/Y origins and travel limit sensor".

④ Disconnection of stepping motor junction cable, etc. Connector of the cable is defective.
(Check with a taster and check visually.)
⇨ Repair the cable or the connector.

⑤ Dyna-starter is defective. (Set SW2 to "2" to specify "Input check" function. Then check for failed starter.)
⇨ Replace the dyna-starter. "(36) Removing the handwheel and dyna-starter"

⑥ Stepping motor or PMDC circuit board is defective.
(Lower the feeding frame. → Check for performance of the feeding frame while moving the feeding frame stitch by stitch by turning ON a jog switch accordingly.)
⇨ Replace the defective stepping motor or PMDC circuit board with a new one.

⑦ Miscellaneous

9-17. Explanation of terminology

• Needle-up stop position ... The needle (main shaft) always stops at the predetermined position at the sewing end. This predetermined position is called the needle-up stop position. If the needle (main shaft) is not in the highest position before the sewing machine starts sewing or starts idling or other operations, an error may result. In this case, the sewing machine is inoperative. (Page 32)

• Feed ..... The AMS Series feeds the workpiece (cloth, etc.) using a stepping motor in accordance with the motion of needle in order to sew the workpiece according to the pattern desired.The components that transmit the motion of stepping motor to the workpiece are called the "feed." Generally, the feed mechanism indicates the feed bracket and feeding frame (work holder).

• Feed forward ..... **Feed backward** The feed is moved forward or backward by operating the [Forward] switch or [Backward] switch on the operation panel. The position of the needle can be moved toward the sewing end along the pattern shape by one stitch by pressing the Forward switch. On the other hand, it can be moved toward the sewing start along the pattern shape by one stitch by pressing the Backward switch. This function is conveniently used when sewing a pattern from the middle or checking a pattern shape.

• Feed timing ..... The AMS Series of sewing machine has adopted the "intermittent feed system" to feed the material. This system feeds the workpiece (cloth, etc.) while the needle comes off the workpiece. It is to say, the feed completes the feeding of the workpiece when the needle penetrates the workpiece. The relationship between the vertical stroke of the needle and the performance of the feed mechanism is called the "feed timing."

※ If the thickness of the workpiece is excessive, the needle starts penetrating tworkpiece before the feed completes the feeding of the workpiece, resulting in stitch skipping or needle breakage. In this case, adjust the feed timing using the relevant DIP switch.

• Jump feed ..... This means that the needle point moves without sewing the workpiece.
The "jump feed" is available as same as the "zigzag" input and "point sewing" input in the "Main Unit Input Function" or the "PGM Series." The "jump" is widely used to join a pattern with another or many other occasions.

• Function ..... One particular action of the machine is called "function". There are many different kinds of function including major ones such as the "pattern combining function" which are actuated by operating several switches and minor ones such as "needle-up position stop function" which are actuated by operating single switch.
These function will help you greatly as you are familiar with the operation of the AMS Series of sewing machine.
※ All the functions of this sewing machine are listed on page 217.

• Origin ..... The work "origin" indicates the following two different points according to circumstances.

① Mechanical origin ... For the AMS sewing machine, a mechanical origin is designated that can be found by the relevant sensor. The mechannical origin is the standard position of the main unit of the sewing machine.

② Origin for a pattern .. This is the standard position of the pattern created. When reading a pattern in the sewing machine, the origin for the pattern should be aligned with the mechanical origin of the sewing machine.

(The two origins may not be aligned with each other when using the pattern combining function. See page 34.)

• Origin retrieval ..... This is the performance to let the stepping motor which moves the workpiece (cloth, etc.) know the position of the origin (mechanical origin) after turning ON the power to the sewing machine.
Turning ON the [Set Ready] switch under the [setting state] makes the stepping motor retrieve the mechanical origin. After the completion of the performance of origin retrieval, the motor move to the sewing start.

(Caution) The feeding frame automatically comes down at the time of origin retrieval. So, do not put your hands, etc. under the feeding frame at that time.

- **Return to origin** ..... This function is actuated by pressing the [Return to Origin] switch on the operation panel. When the [Return to Origin] switch is pressed in the middle of a pattern, the needle position may move (return) directly to the sewing start and the feeding frame goes up.
  If the pattern has the 2nd origin, the needle point may move (return) to the 2nd origin.
- **Cycle** ..... If a pattern contains a pause (intermediate stop command), the machine automatically stops at the pause position to allow the operator to raise the feeding frame and add a workpiece (cloth, etc.) to the currently sewn one.
  The former part of a pattern and latter part of it which is divided by a pause are respectively called "cycle."
  Consequently, in this case, the pattern has two cycles.
- **Jog switches** ..... These switches are used to move the feed and the needle point as desired. They are used in the "2nd origin setting function (page 38)", "sewing start point changing function (page 39)" and "main unit input function." (See page 23)
- **Setting state** ..... This is one of the basic terms used for the AMS Series.
  The setting state is a state of the sewing machine in which the values (pattern No., etc.) required to allow the AMS to read pattern data are specified using the operation panel switches. (See page 15.)
- **Second origin** ..... The 2nd origin is a position (point) to which the needle point is moved before starting sewing regardless of the shape of pattern to be sewn. Normally, the 2nd origin is created in a pattern at the time of inputting pattern data. However, the AMS Series is capable of inputting the 2nd origin using the 2nd origin setting function of the main unit of the sewing machine just before sewing a pattern selected. (See page 38.)
- **Sewing start point** ..... This is the position of the first stitch of a pattern. If the 2nd origin has not been specified, the needle point moves to the sewing start point before starting sewing.
- **Inversion point** ..... This is the position to drive the inverting mechanism (reverse the inverting clamp). It is necessary for an inversion pattern (label attaching pattern, etc.) sewn by the AMS sewing machine with an inverting mechanism.
  There are two different methods to input an inversion point one is to input it automatically at the predetermined position and the other is to input it at a position that can be specified as desired.
- **Pattern** ..... A sewing pattern to be sewn. Generally, this word indicates the patterns that have been written in a floppy disk. If you find words "sewing pattern", suppose that the 2nd origin or jump are not contained in the words.
  However, remember that the word "pattern" includes all the data of pattern including the 2nd origin and jump.
  ※ Pattern data is sometimes called "data" in explanations.
- **Writing a pattern** ..... This is the procedure to store a pattern created using the "main unit input function" or "PGM Series" of programming devices in a floppy disk.
  To write a pattern using the "main unit input function", it is necessary for you to prepare a "2DD" floppy disk which has been formatted beforehand. (See page 30.)
- **Inputting a pattern** ..... This is the procedure to create a pattern to be sewn using the "main unit input function" or "PGM Series" of programming devices.
  After inputting a pattern, the pattern is written in a floppy disk (stored in memory). Then the actual sewing is carried out using the floppy disk with set in the sewing machine.
  ※ Refer to the Instruction manual for the "main unit input function" or that for the "PGM Series" for how to input (create) a pattern.
- **Reading a pattern** ..... This is the procedure to read a pattern stored in a floppy disk out to the memory of the main unit of the sewing machine.
  This procedure is also called "read-out of a pattern." Both words can be also used in the case of taking a pattern in the memory of the input devices including the PGM-1.
- **Disk format** ..... Any new disk cannot be used with the AMS or PGM Series as it is. It must be initialized to make it adaptable to a device with which the disk is to be used. The procedure is called "disk format" (or "format"). (See page 30.)
  ※ If you format a used-up floppy disk, all the data stored in it will be erased, as you know by the word "initialize." After the formatting, the floppy disk will be one that is same as a new floppy disk formatted.
- **Flow chart** ..... It is a chart that shows the operating procedure and the performance of the sewing machine provoked by the procedure in order. Some flow charts are inserted in this Instruction manual. They explain the aforementioned items concerning certain operations respectively in a simple way. In addition, a flow chart covering the whole operation of the sewing machine is shown on page 40.

- **Sewing size** ..... Each model of the AMS Series of sewing machine has its own sewing size within which the sewing is possible. (Refer to the "Specifications.") If the needle point excessively goes out of the specified sewing size when sewing a large pattern, the relevant sensor works to stop the sewing machine with the Error "4" indicated on the panel.
- **READY indicator LED** ..... This is the indicator lamp to discriminate the sewing state from the setting state of the sewing machine. (Refer to page 15 for each state of the sewing machine.) (Sewing state ... The READY indicator LED [lights up]. Setting state ... The READY indicator LED [goes out] .)
- **Sewing state** ..... This is one of the basic terms for the AMS Series. It is the state under which the AMS sewing machine is capable of performing normal operation (sewing, bobbin winding, etc.). (See page 15.)
- **Sewing speed** ..... The sewing speed is expressed in the unit of "s.p.m.", which indicates the number of stitches to be sewn in one minute. In the AMS Series, the maximum sewing speed is limited in accordance with the stitch length. (See page 46.) However, the sewing speed can be specified in several ways as long as the sewing speed remains within the max. sewing speed.
- **Retainter compensation**..... This is one of the maintenance procedures to help you use the AMS for a long time. See page 148.

(Major functions table)

Name of function	Page for reference	Main unit input function	Page for reference
See the separate Instruction manual for the function	Name of function	Pattern combination function	P34
Data back-up function	P31	Disk formatting function	P30
Enlargement/reduction function	P32	Needle-up stop function	P32
Second origin setting function	P38	Sewing start point moving function	P39
Wiper actuating point selecting function	P142	Pedal change-over function	P152
Bobbin replacement setting function	P144	Bobbin thread counting function	P143
Thread trimmer prohibition function	P145	Wiper prohibition function	P145
Intermediate presser stop function	P146	Thread trimming after stop function	P147
Function of changing-over the feeding frame position at the sewing end	P156	Automatic retainer compensation function	P148
Error detecting function (safety mechanism)	P24	Cycle stitching function	P153

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