MITSUBISHI
Industrial Sewing Machine
INSTRUCTION MANUAL
Model PLK-2520A
Single-Needle Lockstitch
Electronic Pattern Sewing Machine
In order to operate the sewing machine in the best condition at all times, please read this Instruction Manual carefully and properly handle and maintain the sewing machine.

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1. CONSTRUCTION

PLK-2520A consists of the parts shown below.
2. FEATURES

(1) Easy pattern change
Pattern data can be stored up to 10 patterns within 1,000 stitches in the PROM cassette. By using the data input device, pattern data can be easily stored in PROM.
Memory size can be expanded up to 4,000 stitches when the data input device PTN-4000, PTN-4000A or PTN-1000-OL is used together with optional PROM cassette.

(2) High-performance work holder mechanism
Stepping motors and belts used to drive the work holder assure high-speed stitching and increased productivity.

(3) Unique presser foot capable of moving vertically
The presser foot moves up and down, being synchronized with needle bar movement, thus preventing floating of fabrics and securely holding a given part, applique and heavy material.

(4) Changeable pattern start position
Pattern start position may be determined by the position detector on the XY table, or located to any desired spot.

(5) Finely adjustable pattern size (SCALE function)
Size of pattern stored in PROM can be finely adjusted within ±4% independently in X and Y directions by means of digital switches.

(6) Easy stitch aligning ..... HALT switch and JOG switch
Stitching can be suspended and amended or aligned in inching (stitch by stitch) operation.
By continuously operating ±JOG switches, pattern checking and stitching from any part of pattern are possible.

(7) Various safety functions
Error lamps are provided facilitating tracing back of trouble if occurs.

(8) Compact and reliable design ..... full-electronic control system
8-bit microcomputer is used in the control circuit.

(9) Automatic thread trimmer
Powerful thread trimmer permits failure-free thread trimming.
Since exceptionally large hook is used, frequency to replace the bobbin will be decreased.
Mirror image
With simple switch operation, symmetrical pattern is easily stitched.

Easy machine maintenance
LIMIT-STOP Z motor equipped with clutch featuring almost permanent life is used to drive the sewing machine, requiring almost no maintenance. The XY table is easily accessible for maintenance by removing the XY table cover.
3. SPECIFICATIONS

3.1 General specifications

<table>
<thead>
<tr>
<th>Stitching type</th>
<th>Single-needle lockstitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewing machine</td>
<td>Model DY-359-22, Automatic thread trimmer equipped</td>
</tr>
<tr>
<td>Needle bar stroke</td>
<td>40 mm</td>
</tr>
<tr>
<td>Take-up lever stroke</td>
<td>72 mm</td>
</tr>
<tr>
<td>Applicable needle</td>
<td>DP x 17 #23 (Standard)</td>
</tr>
<tr>
<td>Work holder lift</td>
<td>70 mm (Standard), adjustable</td>
</tr>
<tr>
<td>Presser foot lift</td>
<td>10 mm</td>
</tr>
<tr>
<td>Presser foot stroke</td>
<td>4 - 10 mm (set to 4 mm at shipping)</td>
</tr>
<tr>
<td>Hook</td>
<td>Full-rotation, automatic lubrication (large type for thread trimmer use)</td>
</tr>
<tr>
<td>Bobbin case</td>
<td>Equipped with racing prevention spring</td>
</tr>
<tr>
<td>Bobbin</td>
<td>Steel bobbin for thread trimmer use</td>
</tr>
<tr>
<td>Lubrication</td>
<td>Manual oiling</td>
</tr>
<tr>
<td></td>
<td>Screw pump for lubrication of hook</td>
</tr>
<tr>
<td>Applicable oil</td>
<td>White spindle oil, #2</td>
</tr>
<tr>
<td>Thread trimmer</td>
<td>Rotary scissoring by left movable knife and right fixed blade</td>
</tr>
<tr>
<td>Control system</td>
<td>Full electronic, microprocessor incorporated control</td>
</tr>
<tr>
<td>Sewing area</td>
<td>240mm x 200mm (X - Y dual axial drive by stepping motor)</td>
</tr>
<tr>
<td>Max. sewing speed</td>
<td>2,000 spm (intermittent feed)</td>
</tr>
<tr>
<td>Stitch length</td>
<td>0.2 - 6.2 mm</td>
</tr>
<tr>
<td>Sewing pattern</td>
<td>Pattern is reproduced with data stored in PROM (replaceable). Maximum 10 pattern (1,000 stitches) can be stored in each PROM.</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sewing operation</td>
<td>Pattern start position may be set at user's discretion as home position or any desired spot.</td>
</tr>
<tr>
<td>Return to home position</td>
<td>This function is used if X and/or Y positions is out of alignment. The work holder returns to the home position in X axis and Y axis direction after the needle stops at UP position.</td>
</tr>
<tr>
<td>START operation</td>
<td>Stitching starts when START switch is depressed to &quot;ON&quot;.</td>
</tr>
<tr>
<td>Work holder</td>
<td>The work holder goes down when the WORK HOLDER switch is pressed down for the first time, and goes up when pressed down again.</td>
</tr>
<tr>
<td>HALT operation</td>
<td>Sewing operation can be suspended by depressing the HALT switch. After the suspension, the work holder can be moved stitch by stitch along the sewing pattern in inching operation. By depressing the START switch again, the sewing operation can be started again.</td>
</tr>
<tr>
<td>Pattern size fine adjustment (SCALE function)</td>
<td>Size of pattern stored in PROM can be finely adjusted within a range of ±4% (±1% increment) in X axis and Y axis independently.</td>
</tr>
<tr>
<td>Pattern select function</td>
<td>Any one of 10 patterns stored in PROM can be selected.</td>
</tr>
<tr>
<td>Sewing speed setting</td>
<td>Sewing speed can be set in nine steps within a range from 180 spm to 2,000 spm. (about 200 spm increment)</td>
</tr>
</tbody>
</table>
Stitch correcting function | Stitches can be corrected or amended by moving the work holder stitch by stitch forward or backward along the pattern by operating ±JOG switches.
---|---
Test function | This function is used to check work holder movement without actual sewing.
Mirror image | A symmetrically turned over pattern can be stitches.
Error indicator | Trouble or failure is immediately identified.
Main drive motor | LIMI-STOP Z motor
Work holder | Pneumatic Type (5kg/cm²)
Power source | Frequency(Hz) | Voltage(V) | INPUT(KVA) | Phases
| 50 | 200,220, | 1 | Three Phase
| 60 | 380,415 | |
Dimensions (mm) | 1,150 mm (width) x 1,020 mm (length) x 1,200 mm (height) (cotton stand is not included in the height)
Weight | 350 kg (including weight of machine head)

Table 3.1

3.2 Replacement parts for medium and heavy fabrics

<table>
<thead>
<tr>
<th>Specification</th>
<th>For medium fabric</th>
<th>For heavy fabric (standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of part</td>
<td>For L5₂ standard application (option) (W346065G02)</td>
<td>A131C513G01</td>
</tr>
<tr>
<td>Thread tension regulator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretensioner</td>
<td></td>
<td>(W487036G03)</td>
</tr>
<tr>
<td>Component</td>
<td>Measurement 1</td>
<td>Measurement 2</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Needle plate</td>
<td>$\phi 2$ (furnished)</td>
<td>$\phi 3$</td>
</tr>
<tr>
<td></td>
<td>(W349841H02)</td>
<td>(W349841H01)</td>
</tr>
<tr>
<td>Presser foot</td>
<td>$\phi 3.5$ (furnished)</td>
<td>$\phi 4.5$</td>
</tr>
<tr>
<td></td>
<td>(Inner dia.: $\phi 2$)</td>
<td>(Inner dia.: $\phi 3$)</td>
</tr>
<tr>
<td></td>
<td>(A130C201H02)</td>
<td>(A130C201H01)</td>
</tr>
<tr>
<td>Hook</td>
<td></td>
<td>For DY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(P975040X02)</td>
</tr>
<tr>
<td>Bobbin case</td>
<td></td>
<td>For DY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(A190D175P01)</td>
</tr>
</tbody>
</table>

Table 3.2
4. INSTALLATION

4.1 Caster is locked when its lever is pressed down.
For transference of the sewing machine, pull up the lever of each caster.

4.2 Remove the eye bolts to replace them with furnished flathead screws (standard accessories).

4.3 Loosen wing bolts on the left and right sides of the XY table cover and remove the XY table cover.
The XY table cover is provided with detachable hinge (Fig. 1.1).

4.4 Loosen four hexagon socket head bolts, used to secure the work holder, with furnished hexagon key wrench and turn counter-clockwise the work holder (Fig. 4.1).

4.5 Place the machine head on the table. Connect the 20-circuit flat cable (standard accessory) to the operation panel on the machine head, passing it through the cable hole in the table.
The synchronizer cable and tension release connector should be also passed through the cable hole (Fig. 4.2).

4.6 Loosen the six right side cover mounting screws to remove the right side cover (Fig. 1.1).
- The connectors of synchronizer cable, tension release cable, 20-circuit flat cable from the operation panel on the machine head, and the power cable should be installed as shown in Fig. 4.3.

Caution: The power cable should be installed so that it cannot be tensed.

- Install the V-belt between the machine head pulley and LIMI-STOP Z motor pulley. V-belt tension should be that the belt is sunken by about 10 mm when it is depressed at its center of the span by finger.
Caution: Care should be taken to avoid contact of any cable with the V-belt.

- Take out the foot switches from the pocket on the front cover of control box, pass their cables through the bottom to brought them outside (Fig. 4.4).

![Foot switch Control box](Fig. 4.4)

- Install the furnished cotton stand on the table (Fig. 1.1).

**4.7 Air piping** (See Fig. 4.6)
Install the right side cover to the machine, pass furnished air tube through the air tube hole (see Fig. 1.1) and connect it to the quick tube joint.

Air pressure should be set to 5 kg/cm². To set air pressure, pull the pressure control knob and turn it.

After the setting, be sure to lock the knob. To disconnect the air tube, push the sleeve of quick tube joint and pull the tube outward.

Speed controller is provided to regulate air supply to each cylinder, permitting speed control of cylinder.

![Air tube Rear cover Pressure control knob Pressure gauge Sleeve Filter regulator Quick tube joint Drain knob](Fig. 4.5 View when the rear inspection window is removed)
4.8 Turn the work holder until it strikes the positioning pin and fully tighten hexagon socket head bolts (Fig. 4.7).

4.9 Install the XY table cover (see Fig. 1.1).
5. PREPARATION BEFORE STARTING THE OPERATION

5.1 Make sure the power source meets the specification (see Table 3.1).

5.2 Make sure PROM cassette has be properly put into the PROM cassette slot.

5.3 Move and locate the work holder by hand so that the needle is always found within the frame of work holder.

5.4 Make sure the needle comes at the center of the presser foot.

5.5 Make sure the air pressure is 5 kg/cm².

5.6 Check the rotational direction of the LIMI-STOP Z motor as follows:

- Locate the needle bar to UP position.
- Depress the WORK HOLDER switch (brack) to lower the work holder.
- Turn on the power.
- Depress the UP switch of the operation panel on the machine head. The sewing machine will start and stop with the needle bar located at the UP position.
- Turn the balance wheel by hand so that the needle bar is away from the UP position.

When the LIMI-STOP Z motor is properly wired, the balance wheel rotate counter-clockwise, view from the balance wheel side.

- To change rotational direction of the motor, change power cable connection between two of three wires.

5.7 Before disconnecting the power cable, be sure to turn off the power switch and make sure the pilot lamp does not light.

5.8 The dimensional relationship between the work holder and its home position is shown in Fig. 5.2.
6. CONTROL SWITCHES AND FUNCTIONS

6.1 Switch panel

6.1.1 POWER ON and OFF

(1) When the POWER ON switch (green pushbutton) is depressed, the pilot lamp (PL) lights.

(2) When the POWER OFF switch (red pushbutton) is depressed, the pilot lamp goes out. The work holder goes up when it is at lowered position.

6.1.2 SCALE switches

(1) Size of pattern stored in PROM can be adjusted within ±4% of the real size (stored in PROM) in X axis direction and Y axis direction independently.

(2) This scale adjustment is made in reference to the home position.
6.1.3 PATTERN select switch

Any one of desired pattern can be selected from 10 different patterns by operating the PATTRN select switch (setting ranges from "0" to "9").

6.1.4 SPEED setting dial

Sewing speed can be set by this dial.
(See Table 8.1.)

6.1.5 RESET/HOME select switch

(1) RESET ..... When this toggle switch is set upward, the brake works stopping all movements.

Caution: Do not set the switch to RESET position while stitching is going on.

(2) HOME ..... When this toggle switch is set downward, the work holder automatically returns to the home position.
When the needle position is other than UP position, the needle automatically goes up and the work holder returns to the home position (see Fig. 5.2).
In usual operation, the switch is set at HOME position.

6.1.6 MIRROR IMAGE X, Y switches

A pattern can symmetrically turned over in X direction and Y direction by operating these switches.
The switch setting does not affect axial movement of the work holder (MOVE ... para. 6.3.2.) and work holder traverse direction at home return (refer to para. 6.1.5).
Since the mirror image conditions are initially set, change of mirror image switch setting during stitching or test operation is ignored.
Pattern changes as shown in Fig. 6.2.

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>2</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td>3</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>4</td>
<td>Positive</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Fig. 6.2

6.1.7 ERROR indication lamps

When an error lamp lights, the sewing machine stops with the needle at UP position and proceeding of operation becomes impossible.

(1) When ERROR 1 lights in green ... Sewing mattern is not stored or stored data are improper.
   ➞ Use correctly programmed PROM cassette.

(2) When ERROR 1 lights in red ... Stitch length is larger than 6.2 mm resulting from excessively enlarged pattern.

(3) When ERROR 2 lights in green ... The work holder moves beyond the sewing area. The movable range of work holder is set by the XY table position detector and detector plate (refer to section 11.).
   ➞ Move the work holder into the movable range of work holder using MOVE function (refer to para. 6.3.2).

(4) When ERROR 2 lights in red ... PROM cassette is not loaded.
   ➞ Turn off the power and properly load PROM cassette.

(5) When ERROR 1 and ERROR 2 light in red ... The needle is not at UP position when the power is turned on.
   ➞ Set the RESET/HOME select switch to "HOME" position. The work holder will return to the home position and the sewing machine stops with the needle at UP position.

(6) When ERROR 1 and ERROR 2 flicker in red ... Motor or sewing machine is blocked or V-belt leaves pulley.
   ➞ Turn off the power, remedy and turn on the power again.

(7) When ERROR 1 and ERROR 2 light in green ... PATTERN select switch setting is changed while the 2nd home position is used.
   ➞ Operate the RESET/HOME select switch.
6.2 Foot switches (Fig. 1.1)

6.2.1 WORK HOLDER switch

The work holder goes down when the WORK HOLDER switch (brack) is depressed, and goes up when the switch is depressed again.

6.2.2 START switch

The sewing machine starts stitching when the START switch (red) is depressed.
It does not start, however, if the work holder is not at DOWN position and the needle is not UP position.

6.3 Operation panel on machine head

![Operation panel diagram]

6.3.1 COARSE/FINE select switch

With this switch set at "FINE" position, the work holder moves by 0.2 mm every when a MOVE switch is depressed. With this switch set at "COARSE" position, the work holder goes on moving as long as a MOVE switch is held down.
When switch setting is changed from "COARSE" to "FINE" before pattern stitching starts, the presser foot lowers.

6.3.2 MOVE switches

The movement of WORK HOLDER resulting from MOVE switch operation is as follows:

+X: Rightward movement, viewed from the front (leftward stitching)
-X: Leftward movement, viewed from the front (rightward stitching)
+Y: Upward movement, viewed from the front (downward stitching)
-Y: Downward movement, viewed from the front (upward stitching)
For this operation, the needle and the work holder should be at UP position and DOWN position respectively.
6.3.3  +JOG switches

(1) TEST function

Only the work holder advances in the stitching direction at a fixed speed while the +JOG switch is held down after the work holder is returned to the home position.

When the -JOG switch is depressed, the work holder moves in the opposite direction.

When the +JOG switch is held down and the work holder reaches the end of pattern, the work holder goes up and then returns to the home position.

When the -JOG switch is held down and the work holder reaches the home position, it stops there permitting start of stitching (when the START switch is depressed), or test (the +JOG switch is operated). During the test, the presser foot goes down for stitching, and goes up for work holder traversing (the work holder moves without stitching operation).

(2) Stitch correct function

For correction or amendment of stitches, the work holder can be moved in forward or backward direction stitch by stitch along the pattern by operating the +JOG or -JOG switch after stitching is suspended by depressing the STOP switch (refer to para. 6.3.5).

This inching motion is same as that of test function, but differs in that the work holder moves at a speed lower than the speed in test operation.

6.3.4  UP switch

When the sewing machine stops with the needle at a position other than the UP position, this switch is depressed to locate the needle to the UP position.

This function can be used only when the work holder is at the DOWN position.

6.3.5  STOP switch

When the sewing machine must be stopped for thread breakage or for replenishment of bobbin thread, this switch is used.

Stitching can be resumed by depressing the START switch (red).

It is also possible to move the work holder by operating the +JOG or -JOG switch.
7. OPERATION

7.1 Loading the PROM cassette

Open the switch panel front cover and insert a PROM cassette in which necessary pattern data have been stored into the cassette slot, using care not to insert it in wrong direction. After the insertion, do not fail to install the front cover again.

For pattern writing and erasure to and from PROM, optionally available PROM writer (PT-100, PT-100A, PTN-4000, PTN-4000A, PTN-1000-OL) is necessary. For selection of PROM, refer to Table 7.1. For handling of PROM cassette, refer to section 13.

7.2 Switch setting on switch panel

In order to check each function, set each switch on the switch panel as follows:

Set the SCALE X and Y switches to "G", the PATTERN select switch to any one of 10 positions ("0" - "9"), the SPEED setting dial to "4", and the RESET/HOME switch to "HOME" position.

7.3 Switch function checking

When the above-mentioned preparatory operation has been completed, turn on the power and check each function as follows:

(1) Home return

Set the RESET/HOME to "RESET" position and then to "HOME" to make sure the work holder returns to the home position (refer to para. 6.1.5).

(2) Work holder lowering motion

The work holder should go down when the WORK HOLDER switch is depressed (it goes up when the switch is depressed again).

(3) Work holder movement

The work holder should move tracing the given pattern when the +JOG switch id depressed.

When the work holder reaches the end of the pattern, it will go up to the UP position, and return to the home position (the work holder stops at the UP position when the +JOG switch is released while the work holder is moving ... refer to para. 6.3.3).
When the test is made, only the work holder moves and stitching motion does not occur.
By performing the test, check the dimensions and location of the work holder. To check stitching condition, set stitching speed to "low speed" and proceed as instructed in para. 7.4.

7.4 Sewing operation

(1) Refering to Fig. 6.1., properly set switches on the switch panel.

(2) Set up a fabric and depress the WORK HOLDER switch to let down the work holder. Then depress the START switch, the sewing machine will start stitching.
Once stitching starts, it continues even when the START switch is released, and stops with the work holder at the UP position after thread trimming.

7.5 STOP switch operation

To suspend stitching, depress the STOP switch (see Fig.6.3).
Stitching stops with the work holder at the DOWN position after thread trimming.
To start stitching again, adjust the stitching start position by operating the +JOG and/or -JOG switches and depress the START switch again. The sewing machine starts and sews the remaining pattern.

Note: In order to make yourself familiar with each switch function, it is recommended to operate switches on the switch panel without needle thread.

<table>
<thead>
<tr>
<th>PROM x Q'ty</th>
<th>Number of stitches</th>
<th>Number of patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>2716 x 1</td>
<td>1000</td>
<td>10</td>
</tr>
<tr>
<td>2716 x 2</td>
<td>2000</td>
<td>10</td>
</tr>
<tr>
<td>2732 x 1</td>
<td>2000</td>
<td>10</td>
</tr>
<tr>
<td>2732 x 2</td>
<td>4000</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 7.1 (PROM combination)

Note: For use of two PROMs, a P.C. board of Cassette case having two PROM sockets should be used.
7.6 Operation procedure and checking

The sewing machine should be operated and checked in accordance with the following flow chart:

**Checking before starting operation**

1. Is the power cable plugged in power source outlet and connector?
2. Are all other cables properly plugged?
3. Is PROM cassette loaded on the machine?
4. Are fuses not blown out?

**Preparation start**

- Check power cable connection.
- Depress POWER ON switch.
- Does LIMI-STOP Z motor start?
  - Yes: Set RESET/HOME switch to "HOME" position.
  - No: Depress WORK HOLDER switch to "ON".

**Judgement**

- Does the work holder return to its home position?
  - Yes: Set RESET/HOME switch to "RESET" position.
  - No: Depress WORK HOLDER switch again to "OFF".

**Check direction of rotation.**

- Depress POWER ON switch.
- Change phase reversing plug setting (180°).
- Depress UP switch.
- Does the sewing machine start?
  - Yes: Adjust the work holder mechanism.

Check

To the next page
Depress POWER OFF switch.

Is direction of rotation correct?

No

Adjust the synchronizer setting.

No

Does the needle stop at UP position?

Yes

Test operation

Set PATTERN No.

Set SCALE switch.

Depress +JOG switch.

Does the work holder MOVE?

No

Depress POWER OFF switch.

Yes

Set RESET/HOME switch to "HOME" position.

Set RESET/HOME switch to "RESET" position.

set JOG switch to "OFF".

Is the work holder properly positioned in reference to the pattern?

Yes

Does the work holder go up?

No

Preparation completed

To the next page

Check drive mechanism and control circuit.

Adjust work holder mechanism.
Automatic sewing operation

Sewing start

- Set stitching speed.
- Set up a fabric(s).
- Depress WORK HOLDER switch to "ON".

Is the fabric securely held in position?

Yes
- Depress START switch to "ON".

No
- Depress WORK HOLDER switch again to "OFF".

Does the sewing machine start running?

Yes
- Depress STOP switch to "ON".

No
- PROM data input
- 6.1.7

Are the threads correctly aligned?

Yes
- Depress START switch to "ON".

No
- De oppress STOP switch to "ON".

Are the threads trimmed at the end of stitching?

Yes
- Is the thread trimmer operation satisfactory?

Yes
- Is thread tension well balanced?

Yes
- Adjust the sewing machine.

No
- Depress POWER OFF switch.

No
- Operate JOG switches to align stitches.

No
- Depress POWER OFF switch.
8. CAUTIONS ON USE

(1) Before replacement of PROM in PROM cassette, carefully read section 13 "REPLACING THE PROM". The power should be turned off before PROM cassette is loaded or unloaded.

(2) If any ERROR lamp lights, trace its cause referring to the description in para. 6.1.7.

(3) When a new pattern is stitched for the first time, or pattern size is finely adjusted, be sure to perform test operation to check the relationship between the work holder movement and the pattern.

(4) Maximum sewing speed depends on stitch length. 
   (Refer to item 12.4 for detail)

(5) Dust in the control unit might cause malfunction or trouble. During operation, the control box cover should be kept close.

(6) When the power is turned on, foot should not be placed on the START switch.

(7) When adjustment is made on the sewing machine, be sure to turn off the power before gaining access to the mechanisms or control box interior.

(8) Do not apply a multimeter to the control circuit for checking or adjustment. Otherwise semiconductors in the circuit might be damaged due to voltage from the multimeter.

(9) Since air fed to the pneumatic line contains moisture, depress the drain knob of filter regulator to eliminate accumulated water (see Fig. 4.5).
9. HANDLING THE SEWING MACHINE HEAD

9.1 Installation of needle (Fig. 9.1)

Caution: Before installing or removing the needle, turn off the power for safety.

Fully insert the needle, turn the prime groove to the left side and tighten set screw.

- Needle not fully inserted in wrong direction
- Prime groove facing in wrong direction

Prime groove should come to the left side

Fig. 9.1

9.2 Winding the bobbin thread (Fig. 9.2)

[Adjustment] - Tension of wound thread .... Small tension is recommended for polyester and nylon thread.
- Conically wound thread ..... Move the thread guide toward smaller diameter of wound thread layers.
- Length of wound thread ..... Tighten the thread length adjusting screw to increase length of wound thread, and loosen the screw to decrease.
9.3 Threading the needle thread (Fig. 9.3, 9.4)

With the takeup lever set at the uppermost position, pass the needle thread in the order numbered in Fig. 9.3.

9.4 Thread tension (Fig. 9.5)

Balanced needle thread tension and bobbin thread tension

Tight needle thread tension, or loose bobbin thread tension

Loose needle thread tension, or tight bobbin thread tension

Fig. 9.5
9.5 Installing the bobbin

9.5.1 Put the bobbin (B) into the bobbin case (A).

9.5.2 Put the thread in the slit (C) and lead it out from the hole (D).

9.5.3 Pull the thread (E) downward to make sure the bobbin (B) rotates clockwise. If the bobbin rotates counter-clockwise, reverse the bobbin (B).

9.6 Installing the bobbin case

9.6.1 Locate the needle bar to its uppermost position and open the lower cover.

9.6.2 Fully open the bobbin case latch (A) and, holding the latch, put it into (B).

9.7 Adjusting the needle thread tension.

Needle thread tension can be adjusted by turning the thread tension regulating thumb nut (A).

Tension increases when it is turned clockwise.
Tension decreases when it is turned counter-clockwise.
9.8 Adjusting the bobbin thread tension

Bobbin thread tension can be adjusted by turning the thread adjusting screw (A).

Tension increases when it is turned clockwise.
Tension decreases when it is turned counter-clockwise.

Fig. 9.9

9.9 Lubrication

9.9.1 To fill the oil tank with the machine head leaned backward ....

(1) Lean the machine head and pour oil through the oiling hole (A) until level reaches the red line (B).

(2) Oiling rate has been factory-adjusted, requiring readjustment in usual operation. If it must be adjusted, refer to para. 9.25.

Oil used: White spindle oil, #2

9.9.2 To fill the oil tank without leaning the machine head ....

(1) Loosen and remove the oil gauge found on the top of machine bed.

(2) When the oil gauge is oiled up to the lower end of white paint, the oil tank is filled with sufficient amount of oil (Fig. 9.11).

Oil gauge

White paint

Fig. 9.11
(3) If oil is not sufficient, pour suitable quantity of oil through the threaded hole for oil gauge (Fig. 9.12).

9.10 Timing adjustment between needle motion and hook motion

Needle bar position can be adjusted as follows:

9.10.1 Turn the balance wheel to located the needle bar (C) to the lowermost position.

9.10.2 Remove the rubber plug from the face plate (A).

9.10.3 Loosen the needle bar bracket set screw (B).

9.10.4 Vertically move the needle bar (C) to adjust timing of needle bar motion*.

9.10.5 After the adjustment, tighten the set screw (B).

* Timing of needle bar motion
  - When the needle bar (C) is at the lowermost position, the needle bar timing mark (B) must be in line with the lower edge of the needle bar bushing (A).
  - With the adjustment at the above step, the inside surface (E) of hook should be aligned with the center (D) of needle eye.
  - There are four timing marks and one of them should be selected for the needle used.

9.11 Adjusting the hook position

9.11.1 Loosen the hook screw (A).

9.11.2 Turn and position the hook (B) to adjust timing of motion of hook point*.
9.11.3 Gap between the needle (D) and the hook point (C) should be about 0.05 mm.

* Timing of hook point motion

The standard timing is as follows:

When the needle bar (B) is lifted by 2.4 mm from the lowermost position (refer to timing marks (A) put on the needle bar at an interval of 2.4 mm), the following conditions should be satisfied.

1. The hook point (D) should meet the center (C) of needle.
2. The gap between the needle eye upper edge (E) and the hook point (D) should be within a range from 1.0 mm to 1.5 mm.

9.11.4 Location of hook positioner

Position of the hook positioner (A) should be adjusted so that the side surface of needle (B) is in line with the side surface of hook stopper point (A) as shown to the right.
9.12 Thread tensions

Needle thread tension should be adjusted in reference to bobbin thread tension.

9.12.1 Bobbin thread tension can be adjusted by changing intensity of bobbin case thread tension spring.

9.12.2 Needle thread tension can be adjusted by changing (1) intensity of thread takeup spring (B) of needle thread tension regulator, (2) movable range (A) of thread takeup spring (B), and (3) pressure of tension discs (C).

9.13 Adjusting the bobbin thread tension

9.13.1 Put the bobbin with polyester thread #30 into the bobbin case (A) and lead out the thread (C) through the slit (B).

9.13.2 Tie furnished hexagon key wrench (small) (D) to the thread (C) to hang the key wrench, as shown in Fig. 9.18.

9.13.3 The standard bobbin thread tension* is that the thread is gradually unwound when the bobbin case is slowly swung up and down.

Standard bobbin thread tension: 40 - 50g

*The bobbin thread tension can be adjusted by turning the screw (B) of bobbin case thread tension spring (A). Thread tension increases when the screw is turned clockwise, and decreases when turned counter-clockwise.
9.14 Adjusting the needle thread tension
(Adjusting the intensity of thread takeup spring)

9.14.1 Loosen the tension stud set screw and turn tension stud (B) counter-clockwise until intensity of thread takeup spring (A) reaches zero.

9.14.2 Turn the thread stud (B) clockwise until the takeup spring (A) comes into contact with the spring stopper and then further turn the tension stud (B) about 3/4 round.

The needle thread tension will be adjusted to the standard tension.

Standard needle thread tension: About 40 - 50g
9.15 Adjusting the intensity of thread takeup spring

9.15.1 Loosen the tension stud set screw (A).

9.15.2 Intensity of thread takeup spring can be adjusted by turning the tension stud (B). Spring intensity increases when the tension stud is turned clockwise, and decreases when it is turned counterclockwise.

9.15.3 After the adjustment, tighten the set screw (A).

9.16 Adjusting the movable range of takeup spring

9.16.1 Loosen the needle thread tension stud set screw (B).

9.16.2 Turn the tension regulating thumb nut (C) clockwise or counter-clockwise to adjust movable range of takeup spring*.

9.16.3 The movable range increases when the thumb nut is turned clockwise, and decreases when turned counterclockwise.

*The standard movable range of takeup spring (gap between the takeup spring (A) and the thread guide (D)) ranges from 9mm to 10mm.
9.17 Adjusting the thread tension discs

9.17.1 Lift the presser foot.

9.17.2 Loosen the thread tension regulator set screw.

9.17.3 Move the tension regulator bushing (B)* in the direction indicated by arrow in Fig. 9.23, and position it so that the opening of the tension discs (A) is within a range from 0.8mm to 1.0mm.

9.17.4 After the adjustment, be sure to tighten the set screw.

*Whenever the needle thread tension regulator set screw is loosened, make sure the opening of tension discs (A) is within a range from 0.8mm to 1.0mm.

9.18 Adjusting the hook oiling rate

9.18.1 Tighten oiling adjusting screw (A) by fingers or small screwdriver until it stops.

9.18.2 Loosen the adjusting screw within a range of one turn to adjust oiling rate.

Fig. 9.24

Fig. 9.25
9.18.3 Hook oiling rate can be checked by observing the oil trace, splashed from the hook, on a test paper (B).

Caution: Do not excessively tighten the oiling adjusting screw (A).

Max. oiling rate (about 250mg/min) Standard oiling rate Min. oiling rate

Fig. 9.25 Oil splashed from hook (for 10 sec.)

Fig. 9.26
9.19 Adjusting the presser foot

9.19.1 Adjusting the height of presser foot
Height of the presser foot should be adjusted so that the lower end surface of presser foot comes into slight contact with fabric (0 - 0.5mm) when the balance wheel is turned by hand to locate the presser foot at the lowermost position of its stroke.
To adjust, loosen the presser foot set screw or presser bar set screw shown in Fig. 9.27 and move the presser foot.
Note that the presser foot adjusted too high or low may cause stitching trouble.
After the adjustment, make sure the needle passes the center of presser foot end bore.

Note: When thickness of fabric changes, height of the presser foot should be changed.

9.19.2 Adjusting the presser foot stroke
Presser foot stroke can be adjusted within a range from 4mm to 10mm (factory-adjusted to 4mm).
To increase the stroke, remove the arm cover and loosen the presser foot stroke adjusting bolt shown in Fig. 9.27 to move the adjusting bolt upward.
When it is adjusted to the uppermost position, the stroke is about 10mm.
9.19.3 Adjusting the presser foot pressure
Presser foot pressure can be adjusted by turning the pressure adjusting screw after loosening the thumb nut shown in Fig. 9.27. The pressure increases when the adjusting screw is turned clockwise, and decreases when turned counter-clockwise.
The standard adjustment is shown in Fig. 9.27.

9.19.4 Adjusting the timing of presser foot motion
For this adjustment, refer to para. 9.20.

9.20 Adjusting the timing of presser foot motion
Timing of presser foot vertical movement can be adjusted through the opening that will be found after removing the arm cover.
(1) Loosen the eccentric ring set screw (C).
(2) Turn the balance wheel by hand and stop it when the needle bar reaches its lowermost position. The eccentric ring set screw (A) will come to the front (standard position).
(3) Loosen the eccentric ring set screw (A).
(4) Secure the eccentric ring (B).
Carefully turn the balance wheel to position the eccentric ring (B).
(5) Timing becomes faster when the balance wheel is turned in the direction of arrow (D).
(6) After the adjustment, while pressing the eccentric ring (B) in the direction of arrow (E), secure the set screws (A) and (C) in this order.

(7) Position and secure the upper vertical crank with the clamping screw, so that the vertical center line of the bell crank is in parallel with the presser bar when the takeup lever is at the uppermost position.

Note: For adjustment of presser foot height, vertical stroke and pressure, refer to para. 9.19.

9.21 Adjusting the needle bar stop (UP) position

After the completion of stitching, the machine should stop with the timing mark (A) on the arm positioned in line with the first timing mark (B) on the pulley. If the marks deviate more than 3 mm from each other, loosen the set screws of synchronizer coupling and, holding the coupling with one hand, move the pulley to adjust the needle stop position.

NOTE: Although the DOWN position of the needle bar is not usually required to be adjusted, the following check should be performed.

(1) Remove the synchronizer cover by pulling it toward the cable side (see Fig. 10.17).

(2) The first synchronizer disc (red) is for DOWN position detection, and the second (black) is for UP position detection.

(3) The matching mark on the first disc (red) should be at 115° on the scale of second disc (black).

If the first disc is not at 115°, turn the first disc to set to 115° (see Fig. 10.18).
10. ADJUSTING THE THREAD TRIMMER

10.1 Thread trimmer mechanism

(1) Construction

Knife bracket unit
Thread trimmer air cylinder unit
Thread guide
Fixed knife
Knife (L)
Drive crank
Knife driving cam follower crank (1)
Cam follower crank (2)
Stopper

(2) Caution at adjustment

A hook shaft drive system is employed in the trimmer mechanism. When the machine is adjusted, if the machine runs with the air cylinder engaged (the roller of cam follower crank (2) being engaged with the trimmer cam groove), the movable knife comes into contact with needle, and may be damaged. Therefore, the air cylinder should be engaged in only usual operation (from lower position to upper position) of the trimmer.

10.2 Installation of knife bracket and knife bracket unit

10.2.1 Knife bracket unit

(1) Install the knife bracket unit to hook shaft bushing (L) with screw A (see Fig. 10.2).

Fig. 10.1

Fig. 10.2
10.2.2 Knife bracket unit
Install the knife bracket unit by using screw (A) with the hook positioner removed, as shown in Fig. 10.3.

10.2.3 Relative positions of fixed knife and movable knife
(1) Standard installation of the fixed knife and movable knife is shown in Fig. 10.4.
(2) If this gap (0.3mm) is too large, the upper thread may leave the needle eye when threads are trimmed. On the other hand, if the gap is too small, thread trimming failure may occur.
(3) The gap should be adjusted when the movable knife or fixed knife is installed.

10.3 Connection of knife bracket with driving crank
Fig. 10.5 shows how to connect the knife bracket with the driving crank.
(1) When connecting, pay attention to location of the link.

10.4 Knife driving shaft
Fig. 10.6
Fig. 10.6 shows the standard installation of the knife driving shaft.

To assemble, pass the knife driving shaft through the hole of driving crank first.

Secure the cam follower crank (1) to flat part of the knife driving shaft.

Secure the stopper to the flat part of the knife driving shaft so that the knife driving shaft can rotate smoothly.

10.5 Installation of air cylinder

(1) Installation of air cylinder unit

(a) Use screws (B) and (C) to install the air cylinder unit. When the air cylinder retracts, gap of about 2.5mm should be developed at part (D). Adjust this gap by moving the mounting plate after screw (C) is loosened.

(b) When the air cylinder extends, gap of about 0.5mm should be developed between the cam follower arms (1) and (2) as shown in Fig. 10.7 (standard adjustment). To adjust this gap, loosen screw (A) and move the air cylinder in the direction of the arrow shown in Fig. 10.7.
10.6 Installation of trimming cam

1. Match the second trimming mark (A) put on the pulley to the matching mark on the arm. (see Fig. 10.8 (a))

2. With the air cylinder engaged, turn the trimmer cam in the direction proper by allow in Fig. 10.8 (b), until the roller come to be touch up by the cam, then secure the trimmer cam by tightening 2 screws (B). (see Fig. 10.8 (b))

3. When the air cylinder disengaged, the cam follower crank is in release at original position, and the gap between end face the trimmer cam and the end of roller is kept 0.5 - 1.0mm. (see Fig. 10.8 (c))

Note: Fig. 10.9 shows the standard position of the cam follower crank 2. If position of the cam follower crank 2 is changed, adjust the adjusting bolt (Fig. 10.6) and then perform steps (1) - (3) above.

![Fig. 10.8 (a)](image-url)
10.7 Adjusting the knife engagement

(1) Positions of movable and fixed knives

(1) Fig. 10.10 shows the standard installation of the knives.

Fig. 10.8 (b)  Fig. 10.8 (c)

Fig. 10.9

Fig. 10.10
(2) Adjusting the knife engagement
(1) With the air cylinder extended, turn the machine pulley and the movable knife starts rotating. When the movable knife comes to the farthest position, the knife engagement shown in Fig. 10.11 is 1.5mm - 2.0mm (standard adjustment).

(2) This adjustment should be made by changing position of the driving crank.

(3) Adjusting pressure of knife engagement
(1) The standard knife engagement is that the movable knife starts engaging with the fixed knife when they are positioned as shown in Fig. 10.12.

(2) If the threads cannot be trimmed satisfactorily, because of thickness, slightly increase pressure of the knife engagement.

(3) To adjust pressure of the knife engagement, loosen lock nut (B) shown in Fig. 10.10 and turn adjusting screw (A).
10.8 Adjusting the needle thread tension release

(1) Adjust the needle thread tension release so that the tension discs open about 1.0 mm when the tension release solenoid is actuated.

(2) To adjust, loosen nut (C) shown in Fig. 10.14 and move the flexible wire.

Note: If the discs do not open sufficiently, the needle thread may be trimmed with too short end and leave the needle eye. Too widely opened discs cannot assure suitable tension to the needle thread.

10.9 Adjusting the synchronizer discs

Usually, the synchronizer discs are not required to be adjusted, but should be checked for position as follows:

(1) Pull outward the synchronizer cover to remove.

(2) There are three synchronizer discs. The first one (red) is used for timing control of needle down position, the second one (black) for timing control of needle up position, and the third one (blue) for tension release timing control.

(3) The second disc has scale. Mark of the first disc (red) and mark of the third disc (blue) should be positioned to 115° and 175° of the scale respectively.
Red ring (For DN)  Blue ring (For IM)  Black ring (For PG, UP)

Fig. 10.15

Marking

To adjust length of trimmed thread end, position mark of third disc (blue) within the range from 175° to 275°.

10.10 Adjusting the length of needle thread end after trimming 

This adjustment can be made by turning the pretensioner nut (A).

Length of thread end becomes short when the nut (A) is turned clockwise.

Length of thread end becomes long when the nut (A) is turned counter-clockwise.

10.11 Hook, bobbin case and bobbin

(1) For hook, that for thread trimmer use (having bobbin thread guide groove (A)) should be used.

(2) For bobbin case, that having bobbin racing prevention spring (A) should be used.

When bobbin thread tension is adjusted with the bobbin case alone, the tension should be smaller than bobbin thread tension for usual single-needle lockstitch sewing machine.

(3) Use the furnished bobbin.

When aluminum bobbin is used, bobbin thread should be wound loosely to prevent deformation of the bobbin.
11. MAINTENANCE AND CHECKING

11.1 Adjusting the XY table

11.1.1 Adjusting the table drive belt tension (Fig. 11.1) The timing (toothed) belt tension can be adjusted as follows (to be adjusted at two places each for X axis and Y axis):

1. Loosen the set screw of driven pulley bracket (slotted hole is used for mounting of the driven pulley bracket).
2. Tighten the tension adjusting nut.
3. When tightening the tension adjusting nut, use care not to allow rotation of the tension adjusting bolt.
4. Loosen the bracket set screw so that the belt does not run out of line when the XY table is moved.
5. The belt tension should be that no slack is developed when the belt is depressed by finger.

![Bracket Timing belt](image)

![Tension adjusting nut](image)

![Tension adjusting bolt](image)

Fig. 11.1 Y axis side

11.1.2 Adjusting the stepping motor belt tension (Fig. 11.2) Tension of the timing belt on the pulley of stepping motor (located under the XY table) can be adjusted on the tension pulley as follows:

1. Loosen the bracket set screw.
2. To increase belt tension, tighten the tension adjusting screw (thereby the tension pulley moves and the belt is tensed).
3. To decrease belt tension, loosen the tension adjusting screw.
4. The belt tension should be that no slack is developed when the belt is depressed by finger.

![Bracket set screw](image)

![Timing belt](image)

![Tension adjusting nut](image)

![Tension adjusting bolt](image)

Fig. 11.2 X axis side
11.2 Greasing the XY table

For smooth and accurate movement of the XY table, grease the XY table carriage (4 places) and slide bracket (2 places) once every 6 months through grease nipple using a grease pump available on the market.

![Grease nipple]

Fig. 11.3

11.3 Pneumatic system

11.3.1 Apply small quantity of turbine oil to the air inlet of slim cylinders installed to the machine head and work holder once every 6 months (Fig. 11.4).

11.3.2 Before the operation of the pneumatic system, depress the drain knob of filter regulator (Fig. 4.5)

Fig. 11.4

11.4 Maintenance of machine head

The thread trimmer and hook can be maintained and adjusted as follows:

Hexagon socket head bolt

11.4.1 Move the work holder to the left extremity of its stroke by hand.

11.4.2 Using the furnished hexagon wrench key, loosen four hexagon socket head bolts of work holder.

11.4.3 Fully swing the work holder clockwise around the pivot screw (Fig. 11.5).
11.4.4 Lean the machine head backward and perform necessary maintenance or adjustment. After that, rise the machine head upright.

11.4.5 Return the work holder until it strikes the stopper screw and tighten the four hexagon socket head bolts (Fig. 11.6).

11.4.6 Adjust work holder position in reference to the machine needle.

Fig. 11.6
12. CONTROL SYSTEM

12.1 LIMI-STOP Z motor

12.1.1 Filter

Periodically clean the air filters in the end cover and on pulley side. (Note that clogged air filter may cause overheat to the motor.)

12.1.2 Motor

The motor is usually not required to be overhauled. If stop position becomes inaccurate, speed becomes unstable or metallic sound occurs when the motor is braked, check the motor as follows:

(1) Turn off the power to stop the motor (it will takes about 2 min. until the motor stops completely).

(2) Remove the belt and motor pulley.

(3) Remove the cable plug (for brake) connected to the control box from the bracket.

(4) Remove three bracket mounting screws.

(5) Remove the bracket. The brake assembly will be removed together with the bracket.

(6) Check the brake lining and brake disc for condition. If the brake lining is found worn out, replace it.

(7) Holding the clutch shaft by hand, carefully pull it out. The driven member (cup) and brake lining can be removed together with the clutch shaft.

If they cannot be removed, prepare two bolts (M5 X 0.8, Min. 45mm of thread length) and screw them into the tapped holes in the cup and boss (made of aluminum) to remove the clutch shaft.

(8) To replace the brake lining, remove the bearing on the pulley side and install a new brake lining and bearing.

When the brake lining is installed, align the tapped hole mentioned at step (7) with holes in the brake lining. (Whenever bearing is removed, install a new bearing.)

(9) Assemble each part in reverse steps to the disassembling. In assembling, if the clutch shaft cannot be set in place, lightly tap the Clutch shaft end with mallet. (Do not tap it strongly.)

(10) When the brake lining is replaced, turn the clutch shaft by hand after the assembling to make sure it can smoothly rotate and try operation for fitting.

To fit the brake lining, start the motor and operate the START switch repeatedly.
Cautions:
  o During disassembling and assembling, carefully handle the brake cup avoiding its deformation or damage.
  o Since bearing of special specification is used, address to us when it is replaced.

12.2 Grounding for prevention of malfunction due to noise

(1) Malfunction caused by noise may be eliminated to a certain extent by grounding the control box, synchronizer and sewing machine head. (When the source voltage is large than AC150V, grounding is indispensable for safety. Leave the grounding work to qualified electrician.)

(2) Do not locate the sewing machine near equipment that generate intense noise, such as high-frequency welders.

12.3 Fuses and magnetic breakers

(1) For fuse, use glass tube fuse of 10A rating (φ6.4 x 30) For location of these fuses, refer to Fig. 12.1.

(2) Magnetic breaker

  The thermal settings of magnetic breakers are as follows:
  200V - 50/60Hz ...... 2.6A
  220V - 50/60Hz ...... 2.6A
  380V - 50/60Hz ...... 2.1A
  415V - 50/60Hz ...... 2.1A
12.4 Speed select function
The clutch current control resistor (12Ω 40W) can be short-circuited or inserted by setting the switch shown in Fig. 12.1. Table 12.2 shows the relationship between switch setting and speed control knob, and stitch length.

<table>
<thead>
<tr>
<th>Switch setting</th>
<th>Faster stitching</th>
<th>Initial setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal switch SW4 (4)</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Resistor switch</td>
<td>OFF (insert)</td>
<td>ON (short-circuit)</td>
</tr>
<tr>
<td>Fabric</td>
<td>Medium</td>
<td>Heavy</td>
</tr>
<tr>
<td>Needle penetration force</td>
<td>Medium</td>
<td>Large</td>
</tr>
<tr>
<td>Speed limit</td>
<td>Increase</td>
<td>Standard</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knob setting</th>
<th>Stitch length (mm)</th>
<th>Stitch length (mm)</th>
<th>Speed (rpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6.2 - 5.4</td>
<td>6.2 - 5.6</td>
<td>200</td>
</tr>
<tr>
<td>1</td>
<td>6.2 - 5.4</td>
<td>6.2 - 5.6</td>
<td>200</td>
</tr>
<tr>
<td>2</td>
<td>6.2 - 5.4</td>
<td>6.2 - 5.6</td>
<td>380</td>
</tr>
<tr>
<td>3</td>
<td>6.2 - 5.4</td>
<td>6.2 - 5.6</td>
<td>610</td>
</tr>
<tr>
<td>4</td>
<td>5.2 - 4.8</td>
<td>5.4 - 4.8</td>
<td>850</td>
</tr>
<tr>
<td>5</td>
<td>4.6 - 4.0</td>
<td>4.6 - 3.6</td>
<td>1060</td>
</tr>
<tr>
<td>6</td>
<td>3.8 - 3.4</td>
<td>3.4 - 2.6</td>
<td>1300</td>
</tr>
<tr>
<td>7</td>
<td>3.2 - 2.8</td>
<td>2.4 - 1.8</td>
<td>1550</td>
</tr>
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<td>8</td>
<td>2.6 - 1.8</td>
<td>1.6 - 1.2</td>
<td>1780</td>
</tr>
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<td>9</td>
<td>1.6 - 0.2</td>
<td>1.0 - 0.2</td>
<td>2000</td>
</tr>
</tbody>
</table>

When the switch setting is changed, speed slightly changes. When exact speed adjustment is required, use a speed meter and turn VR2.

Note: The internal switch SW4(4) and the resistor switch should be set in the combination shown in Table 1.
13. REPLACING THE PROM

PROM is installed in the socket on the printed circuit board encased in the PROM cassette.

Referring to Fig. 13.1 and 13.2, replace it as follows:
(1) Lever out the cassette cover using a small screwdriver.
(2) Take out the P.C. board from the cassette.
(3) Remove the PROM from the socket using a screwdriver.
(4) Install a new PROM to the socket. When installing, be careful not to place it in wrong direction. Otherwise the PROM might be damaged.
(5) Put the P.C. board into the cassette and install the cassette cover.
(6) Use care not to touch the P.C. board terminals (pins) with bare hand.
(7) When removing the PROM with screwdriver, carefully handle it avoiding damages to the circuit pattern. It is recommended to use a IC remover (Type P-63, TAKARA TOOL S/S, for example).
(8) Do not place the P.C. board and PROM on statically charged cloth or plastic, but place it on a metallic sheet.

(9) Optionally available PROM cassette for memory expansion should be installed as shown in Fig. 13.3.
14. AUXILIARY FUNCTIONS

The DIP switches SW1 and SW2 on the CPU card in the control box have the following functions:
(The switches are protected with a transparent cover.
After the setting, be sure to install the cover

![Diagram of DIP switches SW1 and SW2]

14.1 Repeat function

With switch (A) of SW1 set at "ON", the work holder goes up when the power is turned on, or when the WORK HOLDER switch is depressed to "ON", and, as usual, kept at down position when the stitching is completed. Stitching can be resumed only by depressing the START switch with the work holder kept at DOWN position.
The function is very useful when a pattern is sewn repeatedly, or a part or applique held by part guide plate is sewn.

14.2 Home position return cancellation when the power is turned on

With switch (B) of SW1 set at "ON", the work holder does not automatically return to the home position and the sewing machine does not start when the power is turned on.
Automatic home return becomes possible when the RESET/HOME switch is operated.
This function is used when it is desired to prohibit automatic return at the time the power is turned on (for avoiding collision of the work holder, for example).

14.3 Home position return cancellation

Home position return does not occur when switch (C) of SW1 is set at "ON", that is, stitching can be started at any position within the area of the work holder frame.
When this switch is set at "OFF", the start point and end point in pattern stitching are the home position at all times.
Since the work holder does not return to the home position when this switch is set at "ON", PRETURN and END are to be programmed.
14.4 Thread Trimming Cancel when HALT Switch is Depressed

When the switch D of SW1 is at OFF position (at shipped), the sewing machine operates as described below. When the HALT switch is depressed, the thread is trimmed and the work holder remains lowered and stops. When STOP command has been entered by the data input device, the thread is not trimmed and the work holder stops after rising. When TRIM and STOP commands have been entered by the data input device, the thread is trimmed and the work holder stops after rising. When the switch D is set to ON position, the sewing machine operates as described below. When the HALT switch is depressed, the thread is not trimmed and the work holder remaining lowered and stops. When STOP command has been entered by the data input device, the thread is not trimmed and the work holder remains lowered. When TRIM and STOP commands have been entered by the data input device, the thread is trimmed and the work holder remains lowered.

Then, lower the work holder when it is located at the upper position. When the work holder is located at the lower position, the START switch. Then, stitching operation is continued.

14.5 Adjustment of fabric feed timing

Fabric feed timing can be set on SW2 switches. The timing is as listed below.

Switch (B) and (D) are set at "OFF" when the machine is shipped, thereby the arm shaft rotates by the angle corresponding to 5 pulses (one pulse corresponds to 5.6° rotation) after the synchronizer detects needle DOWN position, and then the feed motion starts.

When switches (B) and (C) are set to "OFF", for example, feed starting timing delays by 2 pulses (4 + 2 = 6 pulses) that corresponds 5.6 arm shaft rotation as compared with shipping condition.

The feed timing can be checked as follows:

1. Locate the needle at UP position and turn on the power.
2. Depress the WORK HOLDER switch to lower the work holder.
3. Start the sewing machine and then depress the STOP switch.
4. Remove the V belt while keeping the sewing machine stopped.
5. Depress the START switch to "ON" without the V-belt.

<table>
<thead>
<tr>
<th>Switch</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)OFF</td>
<td>8 pulses</td>
</tr>
<tr>
<td>(B)OFF</td>
<td>4 pulses</td>
</tr>
<tr>
<td>(C)OFF</td>
<td>2 pulses</td>
</tr>
<tr>
<td>(D)OFF</td>
<td>1 pulse</td>
</tr>
</tbody>
</table>

Fig. 14.2
(6) In several seconds after the START switch is set to "ON", the ERROR 1, 2 lamps flicker (notifying that the V-belt leaves pulley) and the LIMI-STOP Z motor clutch is disengaged. In this condition, checking by turning the balance wheel may be made.

(7) By turning the balance wheel by hand, the work holder is driven by the stepping motors.

(8) Since the work holder movement corresponds to fabric feed timing, visually check the timing in reference to height of the needle.

14.6 Speed select function
For medium and heavy fabric, switch SW4 (A) should be set to "ON" position. For details, refer to 12.4.
### View from "B"

#### PAL connector 3 (5274-03A)

<table>
<thead>
<tr>
<th>CONN</th>
<th>Signal</th>
<th>1360-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+5V</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### PMD connector 3 (5274-03A)

<table>
<thead>
<tr>
<th>CONN</th>
<th>Signal</th>
<th>Magnet connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AC200</td>
<td>T5 (Black)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>AC100</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>AC200</td>
<td>18</td>
</tr>
</tbody>
</table>

#### R connector 3 (3191-06P)

<table>
<thead>
<tr>
<th>Signal</th>
<th>1360-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

#### Switch panel connector 3 (150-R4M)

<table>
<thead>
<tr>
<th>Signal</th>
<th>1360-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

#### Q connector 3 (150-R4M)

<table>
<thead>
<tr>
<th>Signal</th>
<th>1360-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

#### P connector 1396-P

<table>
<thead>
<tr>
<th>Signal</th>
<th>1360-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

### PLK-1-CPU ↔ PLK-1-CST N

<table>
<thead>
<tr>
<th>CPU Signal</th>
<th>PAL</th>
<th>CPU Signal</th>
<th>PAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 GND</td>
<td>A1</td>
<td>A2 ERR4</td>
<td>A2</td>
</tr>
<tr>
<td>A3 ERR2</td>
<td>A3</td>
<td>A4 +JOG</td>
<td>A4</td>
</tr>
<tr>
<td>A5 UP</td>
<td>A5</td>
<td>A6 Y mirror image A6</td>
<td>A6</td>
</tr>
<tr>
<td>A7 X mirror image A7</td>
<td>A7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A8</td>
<td>A8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A9 YPLMP</td>
<td>A9</td>
<td>A10 XNLM</td>
<td>A10</td>
</tr>
<tr>
<td>A11 XPLMP</td>
<td>A11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A12 YNLM</td>
<td>A12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A13 JOGY-</td>
<td>A13</td>
<td>A14 JOGY+</td>
<td>A14</td>
</tr>
<tr>
<td>A15 JOGX-</td>
<td>A15</td>
<td>A16 JOGX+</td>
<td>A16</td>
</tr>
<tr>
<td>A17 XSCALE8</td>
<td>A17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A18</td>
<td>A18</td>
<td>A19</td>
<td>A19</td>
</tr>
<tr>
<td>A20</td>
<td>A20</td>
<td>A21</td>
<td>A21</td>
</tr>
<tr>
<td>A22</td>
<td>A22</td>
<td>A23</td>
<td>A23</td>
</tr>
<tr>
<td>A24</td>
<td>A24</td>
<td>A25</td>
<td>A25</td>
</tr>
</tbody>
</table>

### PLK-1-C-PAL ↔ PY-12PPB L

<table>
<thead>
<tr>
<th>PAL</th>
<th>Signal</th>
<th>PPB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>GND</td>
<td>1kA</td>
</tr>
<tr>
<td>2A</td>
<td>C/PCH</td>
<td>2kA</td>
</tr>
<tr>
<td>3A</td>
<td>STOP</td>
<td>3kA</td>
</tr>
<tr>
<td>4A</td>
<td>-TEST</td>
<td>4kA</td>
</tr>
<tr>
<td>5A</td>
<td>TEST</td>
<td>5kA</td>
</tr>
<tr>
<td>6A</td>
<td>JOGX+</td>
<td>6kA</td>
</tr>
<tr>
<td>7A</td>
<td>JOGX-</td>
<td>7kA</td>
</tr>
<tr>
<td>8A</td>
<td>JOGY+</td>
<td>8kA</td>
</tr>
<tr>
<td>9A</td>
<td>JOGY-</td>
<td>9kA</td>
</tr>
<tr>
<td>10A</td>
<td>UP</td>
<td>10kA</td>
</tr>
<tr>
<td>1B</td>
<td></td>
<td>1kB</td>
</tr>
<tr>
<td>2B</td>
<td></td>
<td>2kB</td>
</tr>
<tr>
<td>3B</td>
<td></td>
<td>3kB</td>
</tr>
<tr>
<td>4B</td>
<td></td>
<td>4kB</td>
</tr>
<tr>
<td>5B</td>
<td></td>
<td>5kB</td>
</tr>
<tr>
<td>6B</td>
<td>XPLMP</td>
<td>6kB</td>
</tr>
<tr>
<td>7B</td>
<td>XNLM</td>
<td>7kB</td>
</tr>
<tr>
<td>8B</td>
<td>YPLMP</td>
<td>8kB</td>
</tr>
<tr>
<td>9B</td>
<td>YNLM</td>
<td>9kB</td>
</tr>
<tr>
<td>10B</td>
<td>+5V</td>
<td>10kB</td>
</tr>
</tbody>
</table>
LIMI-STOP Z motor wiring
Motor (200V, 220V)

Fig. 15.3
16. TROUBLESHOOTING

If any trouble occurs with the sewing machine, the following checking should be performed prior to elaborate troubleshooting.

(1) Is the power source at the specified voltage?
   All all connectors, phase reversing plug and switches properly set?
(2) Are the connectors in the control box properly installed?
(3) Is the PROM cassette properly loaded in position?
   (See the pilot lamp on the cassette to check.)
(4) Does any ERROR lamp on the panel light on?
   (If any lamp is found lighting, trace the cause and remedy.)
(5) Is any fuse not blown out?
   (Two fuses are used in the sewing machine.)

16.1 The work holder does not return to the home position when the power is turned on

```
<table>
<thead>
<tr>
<th>Does LIMI-STOP Z motor run in good condition?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Is the needle at UP position?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Is stepping motor excited?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>Cause</td>
</tr>
<tr>
<td>(1) The power cable is not connected.</td>
</tr>
<tr>
<td>(2) V-belt is not installed.</td>
</tr>
<tr>
<td>(3) Synchronizer trouble</td>
</tr>
<tr>
<td>(4) Stepping motor driver trouble</td>
</tr>
<tr>
<td>(5) PROM cassette is not loaded</td>
</tr>
<tr>
<td>(6) RESET/HOME switch on switch panel remains set at &quot;RESET&quot;.</td>
</tr>
<tr>
<td>Refer to</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>4.6</td>
</tr>
<tr>
<td>9.21</td>
</tr>
<tr>
<td>6.1.7</td>
</tr>
<tr>
<td>6.1.5</td>
</tr>
</tbody>
</table>

Note: If stepping motor is not excited, the work holder may be moved by hand.
```
16.2 The work holder does not move when the START switch is operated

Does any ERROR lamp light on?

Yes  
(1) Safety means is tripped 6.1.7
(2) START switch trouble Fig. 1.1

No

16.3 Sewing machine does not run

Does work holder move properly?

Yes

(1) START switch is defective.
(2) Machine mechanism is locked.

No

(1) PROM programming error
(work holder traverse without instruction is instructed.)

Refer to the instruction manual of DATA INPUT DEVICE.

16.4 Stitched pattern deviates

Does work holder move properly?

Yes

(1) Needle stop position adjustment of synchronizer is improper.
(2) Fabric is partly in contact with machine body (particularly in the case of hard fabric).
(3) Fabric is too heavy.

No

(1) Stitching speed is too high
(2) PROM programming error
(3) X-Y feed mechanism adjustment is improper.

Refer to the instruction manual of DATA INPUT DEVICE.

-61-
16.5 Thread cannot be trimmed satisfactorily ....

Does thread trimmer solenoid work?  

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

(1) Any lead from the machine head is disconnected, or not connected  
(2) Control box trouble

16.6 HALT (stitching suspension) is impossible ....

(1) HALT switch trouble  
(2) any lead of HALT switch is disconnected, or not connected.  
(3) Control box trouble

16.7 Stitching speed is unusually low...

(1) Torque required to drive the stitching is too large due to distored mechanism.  
(2) Synchronizer trouble

16.8 Stitching speed is unusually high...

(1) Synchronizer pulse generator is disconnected  
(2) Synchronizer trouble
16.9 Troubleshooting (sewing machine mechanisms)

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Cause</th>
<th>Remedy</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread cannot be trimmed.</td>
<td>Fixed knife is not properly engaged with movable knife.</td>
<td>Adjust knife engagement.</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>Knife engagement is loose.</td>
<td>Adjust knife engagement pressure.</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>Knife blade is damaged, or worn.</td>
<td>Replace damaged knife.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Needle stops too early.</td>
<td>Adjust needle stop position.</td>
<td>9.21</td>
</tr>
<tr>
<td></td>
<td>Fixed knife is not positioned properly.</td>
<td>Adjust position of fixed knife.</td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>Movable knife motion too fast and thread cannot be trimmed properly.</td>
<td>Adjust position of thread trimming cam.</td>
<td>10.6</td>
</tr>
<tr>
<td>Needle thread comes off needle eye after thread trimming.</td>
<td>Tension discs do not open when thread is trimmed.</td>
<td>Adjust the needle thread release.</td>
<td>10.8</td>
</tr>
<tr>
<td></td>
<td>Timing of thread trimming is not proper.</td>
<td>Adjust position of thread trimming cam.</td>
<td>10.6</td>
</tr>
<tr>
<td></td>
<td>Thread is trimmed by fixed knife before scissoring. Needle is too thick for thread used.</td>
<td>Adjust position of fixed knife.</td>
<td>10.7</td>
</tr>
<tr>
<td>Pretension discs are too tight.</td>
<td>Adjust pretension discs.</td>
<td></td>
<td>10.10</td>
</tr>
<tr>
<td>Thread tension is too faint.</td>
<td>Adjust thread tension.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protector is located improperly.</td>
<td>Locate protector properly.</td>
<td></td>
<td>10.7</td>
</tr>
<tr>
<td>Trouble</td>
<td>Cause</td>
<td>Remedy</td>
<td>Refer to</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Stitches are not interlocked at start of sewing.</td>
<td>Bobbin thread extending from bobbin case becomes short due to racing of bobbin.</td>
<td>Use a bobbin case having spring for prevention of racing.</td>
<td>10.11</td>
</tr>
<tr>
<td></td>
<td>Bobbin thread tension is too high.</td>
<td>Adjust bobbin thread tension.</td>
<td>9.12</td>
</tr>
<tr>
<td></td>
<td>Length of trimmed end thread (needle thread) is too short after thread trimming.</td>
<td>1. Adjust pretension discs.</td>
<td>10.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check thread trimming cam for installation.</td>
<td>10.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check threading.</td>
<td></td>
</tr>
<tr>
<td>Trimmer end thread (needle thread) is too long.</td>
<td>Pretension discs are too faint.</td>
<td>Adjust pretension discs.</td>
<td>10.10</td>
</tr>
<tr>
<td></td>
<td>Thread trimming delays.</td>
<td>Adjust position of thread trimming cam.</td>
<td>10.6</td>
</tr>
<tr>
<td></td>
<td>Thread often leaves hook.</td>
<td>Adjust hook gap.</td>
<td>9.11</td>
</tr>
</tbody>
</table>