MITSUBISHI

Industrial Sewing Machine

TECHNICAL MANUAL MECHANICAL VERSION

Electronic Pattern Sewing Machine Model PLK-E4519 PLK-E6019

FOR YOUR SAFETY !

If you operate the sewing machine first time, please make sure to read the following instructions for your safety and proper operation.

In this technical manual, the notice **CAUTION** is mentioned at some paragraph to attract your attention for the safety. Please keep it in mind whenever you work with the sewing machine.

CAUTION is used as the notice to warn a possible danger to cause a wound.

- ★ This technical manual explains the instructions how to operate and maintain the sewing machine.
- \star All information in this technical manual are subject to change without notice.
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No	Warning sign	Meanings of warning sign		
1	Do not operate without finger guard and safety device. Before threadming,changing boblin and needle,cleaning etc,switch off main switch. en	Caution for sewing machine operation: Warning to operate the sewing machine without safety guards and to prohibit doing any operation except sewing while the power is turned ON.		
2		Caution for a wound on the fingers: Warning to a possible danger to cause a wound on the fingers under the specified operation.		
3	And a	Caution for the fingers to be caught in the machine: Warning to a possible danger to be caught the fingers in the machine under the specified operation.		
4		Direction of pulley rotation: Indicating the proper rotating direction of the sewing machine pulley.		

Explanations for the warning signs

ENVIRONMENT STANDARD

Caution

★For avoiding the sewing machine from the troubles, please do not operate the sewing machine under the following conditions.

(1) Temperature and humidity

- (a) During operating : The atmosphere temperature should not exceeded more 35°C (95°F) or less 5°C (41°F).
- (b) During transportation : The atmosphere temperature should not exceeded more 55°C (131°F) or less -10°C (18°F).
- (c) The relative humidity in the atmosphere should not exceeded more 85% or less 45%.
- (2) $\angle !$ Atmosphere for the machine operation
 - (a) In the atmosphere filled with dust or corrosive gas.
 - (b) In the atmosphere filled with flammable or explosive gas.

(3) **Power source voltage**

- (a) In the place where the power fluctuation exceeds more or less 10 % of the fixed power voltage.
- (b) In the place where the power source can not supply enough voltage to keep the motor running.
- (4) Power source voltage
 - (a) In the place where the power fluctuation exceeds more or less 10 % of the fixed power voltage.
 - (b) In the place where the power source can not supply enough voltage to keep the motor running.
- (5) \Lambda Noise
 - (a) In the place near a high frequency transmitter or a high frequency welder.
 - (b) In the place filled with strong electromagnetic radiation or magnetic field.

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1. STRUCTURE OF THE SEWING MACHINE

PLK-E4519 / E6019 electronic bar tack machine is constructed with the following main parts.



2. SPECIFICATION

(1) Specification of mechanism

Model		PLK-E4519	PLK-E6019	
Sewing	X-Direction (left/right)	450 mm	600 mm	
area	Y-Direction (fore/backward)	190 mm ^{*1}		
Maximur	n sewing speed	2,300 rpm		
Sewing	speed	10 steps variable from 200 to	2,300 rpm	
Ctitab lay	- eth	0.1 to 12.7 mm		
Stitch ler	ngth	(Adjustable from 0.1mm to 12.7mm by 0.1mm resolution)		
Stitch typ	De	Single needle lock stitch		
Needle b	oar stroke	41.2 mm		
Thread ta	ke up lever stroke	68 mm		
Class of	needle	DP × 17 # 18 (the standard	d specification)	
Wiper sy	stem	Back to forward wiping syste	m	
Presser	foot lift *2	15mm (18mm max.)		
Presser	foot stroke *3	Variable from 4 mm to 10 mm (4 mm is standard)		
Work holder lift		30 mm		
Hook		Shuttle hook		
Bobbin case		With non racing spring		
Bobbin		Large size aluminum bobbin		
Thread trimmer system		Horizontal engagement with fixed knife and movable knife		
Lubricati	an avatam	Manual oiling and replenishment with the oil braids from		
Lubrication system		the oil tanks		
Lubrication oil		White machining oil		
X V driv	a cyctom	Stepping motor and timing belt drive		
		Intermittent or continuous feeding		
Drive source pneumatic pressure		Primary side 0.5 MPa (5 kgf/cm ²)		
		/ Secondary side 0.4 MPa (4 kgf/cm²)		
Machine	dimension	1,310 × 1,160 × 1,184 mm		
Weight		300 Kg	320 Kg	
Type of controller		PLK-E-CU-20		

(2) Specification of main motor

Type of motor : XL-554-20

*1 : According to the shape of the feed plate, when this side full of Y direction area is sewn, the feed plate will be possible to interfere with film sheet.

- *2 : Stepping foot lift means the clearance between the bottom of the stepping foot and the surface of the sliding plate when the sewing machine is stopped running.
- *3 : Stepping foot stroke means the vertical movement of the stepping foot during the sewing operation.

3. INSTALLATION

- \triangle Caution

- ★ The machine should be installed by the specialists who have enough experience for the sewing machine installations.
- ★ All the necessary electric wiring should be done by electric engineers who are qualified for the electric wiring.
- ★ If any damage or fault is found on the machine at the installation, please do not operate until it is repaired.
- ★ Please do not operate the sewing machine with excessive modifications from the standard specification.
- 3-1. Connection of the foot switch

Connect the foot switch to the connector I (NO.9) of the control box.

The foot switch is enclosed in the accessory box.



Fig	Con	Connect with	
1	A	Main motor cable	
2	В	Power supply cable	
3	С	Stepping motor cable	
4	D	Solenoid output cable	
5	E	RS-232C (optional use)	
6	F	Operation panel cable	
7	G	Extension I/O cable	
8	Н	Input signal cable	
9	I	Foot switch cable	

3-2. Connection of the air tube

Insert the one end of the air tube (8mm Diameter) into the intake air fitting of the filter regulator (NO.1) then, join the other end of the air tube with the suitable air coupling to be adopted with the air supply source provided in your factory. One of the air couplings (NO.2) is enclosed in the accessory box.



3-3. Installation of the thread stand

- Assemble the thread stand with the instructions enclosed in the packing.
- (2) Fit the thread stand (NO.1) in the thread stand hole on the table.
- (3) Fix the thread stand (NO.1) firmly from the rear side of the table with tightening the nut (NO.5), washers (NO.4), spring washers (NO.3) and collar (NO.2).



4. LUBRICATION

⚠ Caution

- \star Please make sure to turn power switch OFF before oiling.
- ★ Please make sure to put some oil before starting the operation of the brand new machine or when the sewing machine is resumed the operation after along interval.

NOTE Please use high quality white machining oil.

4-1. Filling the oil tank

Pour the oil through the oil hole (NO.1) to the oil tank (NO.2) on the machine arm. Pour the oil through the oil hole (NO.3) to the oil tank (NO.4) on the machine bed.

Please fill with the oil over the level mark (NO.5) of the oil tank.

4-2. Oiling

Put some oil to the red marked oil holes (NO.6 ~ 12).



5. PROPER OPERATION

5-1. Loading the system software to the control box

When the brand new machine is operated first time or when the control box is adjusted for the repairing, the system software has to be loaded to the control box.

For this loading, please take the following procedure.



- Insert the system floppy disc printed
 [F1] (NO.2) into the disc drive (NO.3) of the control box. The system floppy discs are enclosed in the accessory box.
- (2) While holding down the F key on the setting panel of the control box, turn the power switch (NO.1) ON.
- (3) Load the system software with following the instructions [System installation method] on the technical manual CONTROL UNIT.
- (4) After loading the system software, keep the system floppy disks with in care.

5-2. Installation of the needle

✓ Caution

★Please make sure to turn the power switch OFF before installing or replacing the needle.★Please pay attention for the fingers not to be wounded by the needlepoint.



- Loosen the needle set screw (NO.1) then, insert the new needle (NO.2) until the needle head is reached the end of the hole of the needle bar (NO.3).
- (2) Fasten the setscrew (NO.1) with facing the needle groove (NO.4) to the front.

5-3. Threading the upper thread

✓! Caution

 \star Please make sure to turn the power switch OFF before threading the upper thread.

Please thread the upper thread with referring to the below figures.



5-4. Winding the bobbin thread

!\ Caution

★Please make sure to pull the upper thread out of the needle before winding the bobbin thread.

- (1) Turn the power switch ON.
- Press the key on the operation panel to enter the second operation window.
- (3) Pass through the thread from the thread stand (NO.1) as shown on the below figure then, wind the thread to the empty bobbin (NO.2) in the arrow mark "a" direction couple times and insert the bobbin (NO.3) into the bobbin winder (NO.4).
- (4) Push the adjust lever (NO.6) in the arrow mark "b" direction.
- (5) Step on the black color foot switch (NO.5) then work holder goes down.
- (6) Press the key, then work holder moves to home position.



- (7) Press key on the operation panel.
 Then presser foot goes down automatically, and wind mode window will be appeared.
- (8) Step on the black color foot switch (NO.5) again to make work holder down.
- (9) Step on the gray color start foot switch (NO.6). The thread is kept winding to the bobbin (NO.2) while the gray color start switch is stepping on.
- (10) When the bobbin becomes full of the thread, the adjust lever (NO.4) is returned to the original position.
- (11) Stop to step the gray foot switch and press

the key to exit winding mode, and press the key, to back to the standard operation windows will be appeared.

(12) To wind the bobbin thread during the sewing operation, carry out above (3) and(4) procedure then, the bobbin winding is performed automatically.



(13) Regarding the adjustment for the bobbin thread winding volume, please refer to the instructions in the paragraph [7-8 Adjustment of the bobbin winder] in the following page.



5-5. Settling the bobbin

- (1) Set the bobbin (NO.2) into the bobbin case (NO.1).
- (2) Pull the bobbin thread (NO.3) into the slit (NO.4) and pass the thread through the thread hole (NO.5).
- (3) At this time, pull the bobbin thread (NO.3) then, check with the bobbin (NO.2) if it is rotated to the arrow direction. If it is not, set the bobbin (NO.2) into the bobbin case (NO.1) over again to get the proper rotation.



5-6. Setting the bobbin case

- (1) Set the needle bar to its highest position then, open the cylinder cover (NO.1).
- (2) Open the bobbin case latch lever (NO.2) fully then, fit it securely in the inner hook (NO.3).

NOTE Please pull the bobbin thread about 2.5cm out of the thread hole (NO.4) of the bobbin case.



6. PROPER SEWING

6-1. Operation of the halt switch

If an incident such as a thread breakage, needle breakage and any other incidents are happened during the sewing operation, please hit immediately the halt switch. The sewing machine running is stopped instantly.

-\land Caution-

★Before start the sewing operation, please make sure the location of the halt switch and keep it in mind the function and how to use it.

 \star Please keep away the hands and the face from the needle during the sewing operation.

- (1) Press the HALT switch (No.1). All operations will stop, and the sewing machine will stop at the needle UP state without trimming the thread.
- (2) Remove the cause of the abnormality.
- (3) To continue sewing, turn the HALT switch (No.1) to the right, and unlock the switch. Next, when the start switch (No.3) (gray foot switch) is pressed again, the operation will resume from the halted position.
- (4) To cancel sewing, turn the HALT switch (No.1) to the right, and unlock the switch.

Then, press the key on the operation panel (No.2).

The work holder $\overline{(No.4)}$ will return to the home position from the stopped position and will stop.





★ Depending on the shape of the work holder, the collision may be happened with the work holder (No.5) and the presser foot (No.6) while the work holder is on the way back to the home position. For avoidance of this accident, before starting the sewing operation, program the work holder returning home with the operation panel of the control box to trace the sewing pattern.

For this setting, refer to the [Wiper Setting] in the [PROGRAM MODE] on the operation panel.



6-2. The sewing operation



★It is very dangerous to operate the sewing machine without the safety guards (Eye guard, Belt cover, Finger guard etc.).

Please make sure to always operate the sewing machine with the safety guards.

- \star Please do not put unnecessary articles except for the sewing operation on the table top.
- \star Please keep the hands and the face away from the needle.
- (1) Turn the power switch (No.1) ON.
 - NOTE The collision may be happened with the work holder and the presser foot depending on the work holder shape when the work holder is moved to original position.
 - a) Press the key at the normal mode condition, then MENU MODE is appeared.
 - Press the Program key.

b) Press the home position key.

- c) And then press the [HPF] key and select the [ON] key.
- (2) Program or select the required sewing pattern by selecting following icon.



The sewing pattern programming or selecting can be performed with the operation panel. For the details, please refer to the instructions on the technical manual Operation Panel.

(3) Set the sewing speed by selecting $\mathbb{E} \to \mathbb{E}$ or $\mathbb{E} \to \mathbb{E}$ icon.

(4) Insert the sewing material under the work holder (No.3) then, step on the black color foot switch (NO.4). The work holder comes down to press the sewing material.
 NOTE If the sewing material has to be reset, step the black color foot switch (No.4) again

then, the work holder (No.3) goes up to release the sewing material.

- (5) Step on the gray color start switch (No.5). The sewing machine starts the sewing.
- (6) After finished the sewing, the work holder is lifted automatically then, the sewing material is released.



6-3. Adjustment of the thread tension

The thread tension between the upper and bottom thread should be balanced in the best condition.

When the upper thread tension is well balanced with the bobbin thread tension, both threads are interlocked along the centerline of fabric layers as shown on the below figures.

NOTE Normally weaker bobbin thread tension brings better sewing quality.

So it is prefer to set bobbin thread tension first and then set upper thread tension.



(1) Bobbin thread tension

Adjust the bobbin thread tension with the thread tension adjusting screw (No.2) on the bobbin case (No.1). The thread tension becomes loose if turn the thread tension adjusting screw (No.2) to the counterclockwise, and the thread tension becomes tight if turn it to the clockwise.

(2) Upper thread tension

Adjust the upper thread tension based on the bobbin thread tension.

For this adjustment, turn the thread tension adjusting nut (No.3). The upper thread tension becomes tight if turn the thread tension adjusting nut (No.3) to the clockwise, and the upper thread tension becomes loose if turn it to the counterclockwise.

7. STANDARD ADJUSTMENT

NOTE If the needle class is DP×5, match the needle bar timing mark B to the needle bar bushing bottom line (No.4).

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- 7-2. Adjustment of the position between the needle and the shuttle hook
 - (1) Turn the power switch OFF.
 - (2) Turn the sewing machine pulley by hand then, move up the needle bar (No.1) from the lowest position and stop it at the position (No.2) where the needle bar timing mark C is matched to the needle bar bushing bottom line.
 - NOTE If the needle class is DP×5, match the needle bar timing mark D to the needle bar bushing bottom line (No.2).
 - (3) Open the cylinder cover (No.3).
 - (4) Remove the bobbin case (No.4).
 - (5) Turn the hook retainer lever (No.5) then, remove the hook retainer (No.6).
 - (6) Loosen the driver setscrew (No.9) then, move the driver (No.10) and adjust the shuttle hook point (No.7) to be matched with the center line (No.8) of the needle.
 - (7) After the adjustment, tighten the driver setscrew (No.9) and put the bobbin case (No.4), the hook retainer (No.6) and the hook retainer lever (No.5) back to the original location then, close the cylinder cover (No.3).

- 7-3. Adjustment of the clearance between the shuttle hook and the needle
 - (1) Please take the same procedures as above paragraph 7-2. from (1) to (5).
 - (2) Loosen the outer hook setscrew (No.3) and turn the eccentric pin (No.4) so that the clearance between the shuttle hook point and the needle becomes 0.05~0.1mm.
 - (3) After the adjustment, securely tighten the outer hook setscrew (No.3) and put the hook retainer and the bobbin case back to the original location then, close the cylinder cover (No.5).

7-4. Adjustment of the clearance between the driver and the needle

- (1) Please take the same procedures as above paragraph 7-2. from (1) to (5).
- (2) Please make sure the clearance between the shuttle hook point and the needle has been adjusted 0.05~0.1mm at above procedure 7-3 Adjustment of the clearance between the shuttle hook and the needle.
- (3) Loosen the driver setscrew (No.1) and turn the eccentric pin (No.2) so that the clearance between the driver (No.3) and the needle (No.4) can become 0.
- (4) After the adjustment, securely tighten the driver setscrew (No.1) and put the hook retainer and the bobbin case back to the original location then, close the cylinder cover (No.5).

- 7-5. Adjustment of the thread guide
 - (1) Remove the E-shaped snap ring (No.3) which is engaging the movable knife (No.2) and the link (No.1) then, loosen the setscrews (No.4) and remove the sliding plate (No.5).
 - (2) Loosen the setscrews (No.10) and move the thread guide (No.6) to the position where the needle center line (No.8) divides the needle groove (No.7) evenly and the rear side line (No.9) of the needle is aligned with the shoulder (No.9) of the thread guide (No.6). At this time, make sure that there is some clearance between the hook retainer and the thread guide (No.6) at least the upper thread can be passed smoothly through it (standard clearance is 0.8mm).

If this clearance is too wide, it causes the trimming failure and if this clearance is too narrow, it causes the sewing condition disturbance, the trimmed upper thread tail uneven and the locking up the hook with the upper thread.

(3) After the adjustment, engage the link (No.1) of the trimmer mechanism with the movable knife (No.2) with the E-shaped snap ring (No.3) and put the sliding plate (No.5) back on the original location then, tighten the setscrews (No.4). At this time, set the sliding plate (No.5) so that the needle (No.11) can come down to the center (No.12) of the needle hole of the needle plate.

7-6. Adjustment of the presser foot

- **NOTE** The presser foot is a very important part to form the fine stitches. It moves simultaneously with the needle and stabilize the needle penetrating area of the sewing material with pressing down it, when the needle sticks into or pulls out the sewing material and prevent the skip stitch or the over penetration happening. Please adjust the presser foot properly to the sewing materials with the following instructions.
- 7-6-1. Adjustment of the presser foot position

NOTE Please always adjust the presser foot position when the thickness of the sewing material is changed.

(1) Turn the power switch OFF.

- (2) Remove the face plate (No.1) and the cover (No.2).
- (3) Turn the sewing machine pulley by hand and stop the needle bar (No.3) at the lowest position. At this time, make sure the setscrew (No.5) of the eccentric cam (No.4) is positioned right beside the center line of the upper shaft. This is the standard position of the eccentric cam (No.4). If the eccentric cam (No.4) is off from this position, set it back to the standard position with the instructions in the paragraph [7-6-3. Adjustment of the presser foot timing] in the following page.
- (4) Turn the sewing machine pulley by hand and stop the needle at the highest position (this is also the thread take up lever's highest position). At this time, loosen the setscrew (No.9) of the upper feed lock crank shaft (No.8) and adjust the center line of the bell crank (No.6) to be parallel with the presser foot bar (No.7).
- (5) Insert the sewing material (No.10) under the work holder (No.11) and turn the sewing machine pulley by hand then, stop the presser foot (No.12) at the lowest position.
- (6) Loosen the presser foot bar setscrew (No.14) and move the presser foot bar (No.7) then, adjust the presser foot (No.12) position to be become the clearance between the bottom surface of the presser foot (No.12) and the surface of the sewing material 0~0.5mm. At the same time, rotate the presser foot bar (No.7) for the needle (No.15) to come down to the center of the needle hole of the presser foot (No.12).
- (7) After the adjustment, put the face plate (No.1) and the cover (No.2) back on the original location.
- NOTE The lower position of the presser foot, the more effective for the skip stitches. However, if the presser foot becomes to press the sewing material, the movement of the presser foot mechanism generates a slight noise. And also, the presser foot stays longer to hold the sewing material, so the upper thread tension becomes loose or the sewing pattern forming gets out of shape because the presser foot catches the surface of the sewing material. For avoiding these troubles, please lower the presser foot as small as possible.

NOTE If the thickness of the sewing material changes very often, it is recommended to take the easy way for the adjustment of the presser foot position with the method that change only the fixed position of the presser foot after fixed the presser foot bar at higher position.

For this adjustment, loosen the setscrew (NO.16) then, move the presser foot (NO.12) up and down.

7-6-2. Adjustment of the presser foot lift during the sewing

NOTE The presser foot lift during the sewing can be adjusted 0 and 2~10mm.

- (1) The presser foot lift during the sewing becomes 4~10mm at the condition which the connection of the link (No.2) and the lever (No.3) with the shoulder screw (No.1) is as shown on the figure and it becomes 2~4mm if the connection is made with A hole, and it becomes 0mm if the connection is made with B hole.
- (2) The stepping lift is adjusted 4mm when the sewing machine is shipped from the factory.
- (3) For the adjustment at the each range of the presser foot lift, remove the cover (No.4) then, loosen and move the adjust bolt (No.5).
- (4) If the link (No.2) connection is changed to A or B hole, the presser foot position is also changed. So reset the presser foot position with adjusting the position of the presser foot bar or the presser foot itself with loosing their setscrews (No.6) or (No.7).
- (5) Regarding the running noise and the vibration, the higher lift effects worse. So adjust the presser foot lift during the sewing as small as possible.
- (6) After the adjustment, put the cover (No.4) and the face plate (No.8) back on the original location.

7-6-3. Adjustment of the presser foot timing

- **NOTE** The presser foot up and down movement during the sewing synchronizes with the needle up and down movement. With changing this synchronized timing to the sewing materials, the skip stitches can be prevented or the seam tightness can be improved. For example, the delay of the presser foot timing against the needle movement prevents the skip stitches especially to the thin materials, and the advance of the presser foot timing can improve the seam tightness especially to the thick materials.
- (1) Remove the cover (No.1).
- (2) Loosen the setscrew "C" of the eccentric cam (No.2).
- (3) Turn the sewing machine pulley by hand and stop the needle bar (No.3) at the lowest position. At this stage, the setscrew "A" of the eccentric cam (No.2) is positioned right beside the center line of the upper shaft. This is the standard position for the eccentric cam (No.2).
- (4) Loosen the setscrew "A" of the eccentric cam (No.2).
- (5) Hold the eccentric cam (No.2) and turn the sewing machine pulley slowly by hand. If turn the sewing machine pulley to the arrow direction "D", the presser foot timing against the needle movement is delayed, and if turn the pulley to the opposite direction, the timing of the presser foot is advanced.
- (6) After the adjustment, tighten the setscrew "A" and "C" in turn with slightly pushing the eccentric cam (No.2) to the arrow direction "E".
- (7) Put the cover (No.1) back on the original location.

7-7. Adjustment of the wiper

(1) Loosen the wiper setscrew (No.3) and adjust the wiper (No.1) to be positioned where the wiper (No.1) passes under the needle point (No.2) with about 2mm clearances right after the sewing machine is stopped running at the needle upper position (the thread take up lever's highest position).

NOTE When the presser foot position or the presser foot lift is changed, the wiper (No.1) may collide with the presser foot (No.4). In that case, please do not use the wiper (No.1).

- (2) If do not use the wiper (No.1), cancel the wiper function with the operation panel as follows.
 - a) Press the key at the normal mode condition, then MENU MODE is appeared.
 - b) Press the Program key. Then below screen will be appeared.
 - c) Press the key.
 - d) And then press the [WIP] key and select the [OFF] key.

- 7-8. Adjustment of the bobbin winder
 - (1) Adjustment of the winding volume

Loosen the setscrew (No.2) of the adjusting lever (No.1) and adjust the position of the adjusting lever (No.1). If move the adjusting lever (No.1) to the arrow direction "a", the winding volume is reduced, and if move the adjusting lever (No.1) to the arrow direction "b", the winding volume is increased. The winding volume is adjusted 80% of the full volume when the sewing machine is shipped from the factory.

(2) Adjustment of the proper position of the bobbin winder Firstly, loosen the setscrews (No.3) and (No.4) of the bobbin winder and put the empty bobbin (No.5) on the rotating shaft (No.6) then, push the adjusting lever (No.1) to the arrow direction "a". Secondary, move the whole bobbin winder to the arrow direction "c" and stop it at the position where the empty bobbin is rotated then, tighten the setscrews (No.3) and (No.4) of the bobbin winder. This is the proper position of the bobbin winder.

7-9. Adjustment of the work holder7-9-1. Adjustment of the work holder presser

Caution -

★ If the secondary side air pressure is set too high, trouble such as operation faults may occur. Always set the pressure to within 0.4Mpa.

The work holder presser is generated by air pressure. Control the air pressure with the adjusting knob (No.1) of the air regulator located underneath the table.

If turn the adjusting knob (No.1) to the clockwise, the air pressure is increased and the work holder pressure Is also increased simultaneously. If turn the adjusting knob (No.1) to the counterclockwise, the air pressure is decreased and the work holder pressure is also decreased simultaneously.

0.4MPa (4kgf/cm²) is the standard air pressure as a normal sewing operation.

7-9-2. Changing the work holder

(1) Loosen the setscrew (No.3) and remove the work holder stopper (No.4) then, remove the work holder (No.1) by pressing it down from the engaged area with the pin (No.6) of the work holder arm (No.5).

 (2) Prepare another work holder and securely engaged its U shaped ditch (No.2) with the pin (No.6) of the work holder arm (No.5). At this time, make sure that there is no play in the ←→ arrow direction.

- 7-10. Adjustment of the trimmer cam follower
 - (1) Turn the power switch OFF and remove the top cover.
 - (2) Under the sewing machine regular stop condition (the needle stop position is upper and the take up lever stop position is highest), loosen the setscrew (No.5) of the cam follower lever (No.4) and adjust the cam follower (No.2) to be positioned to contact with the shoulder portion (No.3) of the trimmer cam (No.1) with having about 1mm clearance between the cam follower (No.2) and the trimmer cam (No.1). After this adjustment, tighten the setscrew (No.5) of the cam follower lever (No.4).
 - (3) Push the cam follower lever (No.4) by hand to the ← arrow direction and make sure that the cam follower (No.2) is engaged into the cam groove (No.3) smoothly.
 - (4) If the cam follower (No.2) is not engaged smoothly, under confirming with the condition which the cam follower (No.2) contacts with the shoulder portion (No.3) of the trimmer cam (No.1), loosen the nut (No.7) and tighten the stopper screw (No.8) until it touches with the stopper (NO.9) of the cam follower lever (No.4) then, loosen the stopper screw (No.8) back about 1/3 turn and fix the nut (No.7) firmly.

- 7-11. Adjustment of the position for the movable knife point
 - (1) Tilt the sewing machine head to the left to be able to see the bottom component parts.
 - (2) Open the cylinder cover.
 - (3) Check with the point (No.1) of the movable knife whether it is located at the position apart 0.5mm from the front face of the hook retainer (No.2).
 - (4) For the adjustment of the movable knife point (No.1), loosen the adjusting screw (No.3) and move the rod end (No.4) right and left then, adjust the position of the movable knife point.
 - (5) After the adjustment, tighten the adjusting screw (No.3) securely.

- 7-12. Adjustment of the fixed knife position
 - (1) Open the cylinder cover (No.1).
 - (2) Remove the E-shaped snap ring (No.4), which engages the movable knife (No.2) and the link (No.3).
 - (3) Loosen the setscrews (No.5) then, remove the sliding plate (NO.6).
 - (4) Turn the sliding plate (No.6) upside down and loosen two setscrews (No.9) then, adjust the fixed knife (No.10) position to be positioned for the blade edge (No.7) to have the clearance 0.5mm from the edge of the needle plate (No.8).
 - (5) After the adjustment, tighten the setscrews (No.9) securely.
 - (6) Put all the parts for this adjustment back to the original locations.

- 7-13. Adjustment of the thread take up spring swing strokeLoosen the setscrew (No.2) and turn the whole thread tension regulator (No.3) then, adjust the thread take up spring swing stroke to be become 9 to 10mm.After the adjustment, tighten the setscrew (No.2) securely.
- 7-14. Adjustment of the thread take up spring tension

Insert the screw driver (No.5) into the slit (No.4) of the thread tension regulator (No.3) and adjust the thread take up spring (No.1) tension. If turn the screw driver to the clockwise, the thread take up spring tension becomes tight, and if turn the screw driver to the counterclockwise, the thread take up spring tension becomes loose.

7-15. Adjustment of the thread tail after the trimming

Adjust the thread tail (No.3) from the needle after the trimming with turning the nut (No.2) of the pre-tension (No.1).

If turn the nut (No.2) to the clockwise, the thread tail becomes shorter and if turn the nut (No.2) to the counterclockwise, the thread tail becomes longer.

7-16. Cancellation of the trimming function

If the automatic trimming is not required during the sewing operation, cancel the trimming function with the operation panel.

For the detail of this instructions, please refer to the paragraph [16.Program mode or 17.Program mode list] on the technical manual Operation Panel.

- 7-17. Adjustment of the upper thread tension release
 - NOTE (a) The upper thread tension release works when the upper thread is trimmed automatically or the presser foot is lifted during the work holder feeding.
 - (b) If the upper thread tension release does not work properly when the upper thread is trimmed automatically, the thread tail from the needle becomes shorter then, it induces the skip stitch happening or pulling the thread tail out of the needle at the start of the sewing.
 - (c) During the sewing operation, the discs (No.1) of the thread tension regulator is closed while the presser foot is moving up and down.If the discs (No.1) of the thread tension regulator is not closed, the upper thread tension becomes loose and the proper stitch condition can not be obtained.
 - (d) When the upper thread tension release is activated, the discs (No.1) the upper thread tension regulator opens 0.8~1.0mm. This is the normal condition of the discs (No.1) opening. For this adjustment, take the following procedure.

- (1) Remove the top cover.
- (2) Fully turn the crank (No.3) of the rotary solenoid (No.2) in the arrow direction. At this time, adjust the upper thread tension release for the discs to be opened 0.8 to 1.0mm.
- (3) For this adjustment, loosen the nut A then, if tighten the nut B, the discs opening becomes wider and if loosen the nut B, it becomes narrower.
- (4) If the normal opening of the discs can not be obtained with the nut adjustment, loosen the wire fix screws (No.5) and adjust the tension of the wire (No.6).
- (5) The wire (No.6) may be got longer over a long period machine operation. At that time, adjust the upper thread tension release again.

- 7-18. Adjustment of the synchronizer
 - NOTE (a) When the sewing is finished, the arm timing mark A and the pulley timing mark B are matched with each other then, the sewing machine is stopped the running. This is the normal condition.
 - (b) If theses timing mark A and B get out of the matching more than 3mm, adjust the timing mark matching.

Hold the sewing machine pulley (No.1) by hand and insert the angle adjuster (No.2) into the hole \bigcirc then, turn the angle adjuster (No.2). If turn the angle adjuster (No.2) to the clockwise, the pulley timing mark B comes down and if turn it to the counterclockwise, the pulley timing mark B goes up. The angle adjuster (No.2) is enclosed in the accessory box.

- 7-20. Adjustment of the mechanical home position
 - NOTE The mechanical home position (No.1) is fixed at the center of the sewing area when the sewing machine is shipped from the factory. However, it can be moved within the area covered with diagonal lines (No.2).

NOTE The mechanical home position is adjusted by changing the position of the X-Y home detector incorporated in the sewing machine head. However, before changing this position, the sewing area limit must be changed with the operation panel. Change the sewing area limit with the following method..

- (1) Turn the power switch ON and cancel the sewing area limit with the operation panel.
 - a) For this cancellation, press the key at the normal mode condition, then MENU MODE is appeared.

Press the Program key.

b) And press the Area limit key.

- c) If you select [ALC]=[ON], the sewing area limit control is canceled.
- (2) After the sewing area limit control is canceled, press the $\boxed{}$ key and

the two key. Window is back to the standard mode.

<mark>₽</mark> ₽ROGRAM MODE <mode< th=""><th>SELECT></th></mode<>	SELECT>
	01/04
Wiper	Area limit
Slow start	Needle position
Clamp	Thread trimming sensor
P	

- **NOTE** If do not cancel the sewing area limit, shifting the mechanical home position make the effective sewing area narrower than the original.
- (Example) If shift the mechanical home position to the X direction 120mm, the Y direction 60mm without canceling the sewing area limit, the area covered with diagonal lines becomes invalid and the effective sewing area becomes narrower as a bold rectangle shown on the figure.

- 7-19-1. Shifting the mechanical home position to the X direction
 - (1) Remove the X cover (right).
 - (2) Loosen the detector plate fix screws (2 pieces) (No.1). If move the detector plate (No.2) to the right, the mechanical home position is shifted to the right and if it is moved to the left, the mechanical home position is shifted to the left.
 - (3) After the mechanical home position shifting, tighten the detector plate fix screws (2 pieces) securely.
 - NOTE (a) In the case described above, available amount of adjustment of the home position is 0 to 60mm. For further adjustment, remove setscrew (No.3) and change position of the detector adapter (No.4).
 - (b) If move the detector adapter (No.4) to the right, the mechanical home position is shifted to the left.
 - (c) After the adjustment, tighten the setscrew (No.3).

- 7-19-2. Shifting the mechanical home position to the Y direction
 - (1) Remove the motor cover (right).
 - (2) Loosen screws (No.2) of the Adjuster plate (No.1). If move the Adjuster plate (No.1) to front, the mechanical home position is shifted to the backward.
 - (3) After the mechanical home position shifting, tighten the screws (No.2) securely.
 - NOTE (a) In the case described above, available amount of adjustment of the home position is about 0 to 50mm. For further adjustment, remove setscrew (No.3) and change position of the detector adapter (No.4).
 - (b) After the adjustment, tighten the setscrew (No.3).

7-20. Adjustment of the X-Y detector clearance

NOTE The work holder stop position which is the mechanical home position is detected by the X-Y detectors. If the clearance between the detector and the detector plate is changed, the mechanical home position is also changed. If such aberration is happened, make the following adjustment. Please keep it in mind if the detector senses the home position, the red pilot light of the detector goes on each time.

7-20-1. Adjustment of the X detector clearance

- (1) Remove the X cover (right).
- (2) Check the clearance between the surface of the detector (No.1) and the detector plate (No.2). If this clearance is about $1.0 \sim 1.5$ mm, it is the normal condition.
- (3) If this clearance is out of the normal condition, loosen the setscrews (No.3) and move the detector plate by hand then, adjust the clearance to be proper.
- (4) After the adjustment, make the detector surface (No.1) parallel with the detector plate (No.2) then, tighten the setscrews (No.3) securely.

7-20-2. Adjustment of the Y detector clearance

- (1) Remove the motor cover (right).
- (2) Check the clearance between the detector surface (No.4) and the Y-detector plate (No.5). If this clearance is about $1.0 \sim 1.5$ mm, it is the normal condition.
- (3) If this clearance is out of the normal condition, loosen the setscrews (No.6 or No.7) and reset to the proper position to be able to get the normal detector clearance.
- (4) After the adjustment, tighten the setscrews (No.6 or No.7) securely.

1 Caution

★If the detector clearance becomes more than 1.5mm, the work holder stop position becomes unstable, furthermore, if the clearance becomes far bigger than 1.5mm the work holder does not stop and becomes out of control.

- 7-21. Adjustment of the X-Y timing belt tension
 - **NOTE** The proper condition of the X-Y timing belt tension is standing that they will not be got any yield even it is slightly pushed by hand.
- 7-21-1. Adjustment of the X timing belt tension
 - (1) Remove the X plastic cover (left) and the X-Y metal cover (left).
 - (2) Loosen the setscrews (No.1) (4 pieces) of the bracket (No.2).
 - (3) If tighten the tension adjust screw (No.3), the X timing belt (No.4) tension will be increased.
 - (4) After the adjustment, securely tighten the setscrew (No.1) of the bracket (No.2) and put the X plastic cover (left) and the X-Y metal cover (left) back on the original locations.

- 7-21-2. Adjustment of the Y timing belt tension
 - (1) Remove motor cover (left) (right).
 - (2) Loosen setscrews (No.1) (4 pieces).
 - (3) Tighten the adjust screw (No.2) of right and left side, the Y timing belt tension will be increased.
 - (4) After the adjustment, tighten the setscrews (No.1) securely.
 - NOTE Distinct difference of the tension between the right and left timing belt will be possible to cause undesirable moving of X-Y table. Please adjust the tension of both side timing belt to be same.

7-22 Adjustment of the V belt tension

- NOTE After operated the sewing machine for a long period, the V belt tension becomes loose. Adjust the V belt tension periodically. The proper V belt tension is standing that it is bent about 10mm with the hand pressure of 0.1N as it shown on the figure.
 - (1) Turn the power switch OFF.
 - (2) Remove the V belt covers.
 - (3) Loosen two nuts (No.2, 3) on the motor position adjust bolt (No.1).
 - (4) Fix the motor (No.5) position with putting the tension to the V belt by its weight and firstly, tighten the upper nut (No.2) then secondly, tighten the lower nut (No.3).

8. MAINTENANCE

→ Caution
→ Please make sure to turn the power switch always OFF when clean up the sewing machine.

★Before or after the sewing operation, clean up the sewing machine and check the oil level in the oil tank.

- 8-1. Cleaning
 - (1) Turn the power switch OFF.
 - (2) Remove the dust and the thread waste sticking around the threading parts or the shuttle hook area.
 - (3) Check the oil level in the oil tank. If the oil is under the red mark level supply the oil to be over the red mark level.

8-2. Disposing of oil waste

If the waste oil is full filled in the oil bottle (No.1), remove the oil bottle (No.1) then, dispose of the waste oil.

9. BAD SEWING CONDITION & ITS CAUSE AND REMEDY

NOTE Please fix the troubles during the sewing machine operation with referring to the following instructions.

Beside, if the trouble conditions are not coming under these classification, please contact the sewing machine dealers nearby.

Bad condition	Cause	Remedy	Ref. page & Item
	Poor thread quality	Use better quality thread	
	Tight upper thread tension	Adjust thread tension	6-3
	Strong thread take up spring	Adjust thread take up spring properly	7-14
	Upper thread is thicker than needle size	Change needle to suitable size	
1	Damages on shuttle hook or driver	Change them new ones or grind them with buffing wheel or grind stone	
Upper thread	Damages inside needle plate needle hole	Change it new one or grind it with buffing wheel	
happens	Damages inside presser foot needle hole	Change it new one or grind it with buffing wheel	
	Needle touches with presser foot needle hole	Move presser foot position	7-6-1(6)
	Needle and shuttle hook are not in proper timing	Adjust the timing	7-2
	Thread melts with needle heat	Slow down sewing speed	6-2
		Use silicon oil	
		Use needle cooler	
	Thread tension discs are not opened at trimming	Adjust thread tension release	7-17
	Thread take up spring swings too much	Adjust thread take up spring's swing stroke	7-13
	Upper thread is broken before regular trimming	Adjust fixed knife and needle plate position	7-12
2.	Needle size is bigger than thread size	Change needle to suitable size	
Upper thread is	Pre-tension is too tight	Adjust pre-tension	7-15
needle	Thread guide is in wrong position	Adjust thread guide position properly	7-5
	Needle and shuttle hook are in bad timing	Adjust the position properly	7-2
		Adjust trimmer cam position	7-10
	Trimmer timing is not correct	Adjust movable knife position	7-11
		Adjust synchronizer position	7-18

Bad condition	Cause	Remedy	Ref. page & Item
	Too short bobbin thread by bobbin spinning at trimming	Use non racing spring with bobbin	
	Bobbin thread tension is too tight Loosen bobbin thread tensior spring		6-3(1)
		Decrease pre-tension	7-15
3.		Adjust trimmer cam position	7-10
Skip stitch	Thread tail from needle is very	Adjust synchronizer position	7-18
start sewing		Make thread take up swing stroke smaller	7-13
		Advance thread tension release timing	Control unit
		Adjust thread guide position properly	7-5
		Adjust the position properly	7-2
	Pre-tension is too loose	Make pre-tension tighter	7-15
4.	Trimmen Carles is delayed	Adjust trimmer cam position	7-10
Thread tail from needle is too		Adjust synchronizer position	7-18
long after trimming	Upper thread tension release timing is too fast	Delay tension release timing	Control unit
Ŭ	Tread guide is in wrong position	Adjust thread guide position properly	7-5
	Trimmer function is canceled	Resume trimmer function	7-16
	Fixed knife is dull	Change it new knife	7-12
5.	Movable knife is in wrong position	Adjust movable knife position properly	7-11
Trimming is not	Skip stitching happens at trimming	Fix skip stitching	7-6
Tunctioned	Trimmer solenoid is out of order	Change trimmer solenoid	
	Trimmor timing is wrong	Adjust trimmer cam position	7-10
		Adjust synchronizer position	7-18
	Needle and shuttle hook clearance is too big	Adjust needle and shuttle hook timing properly	7-3
	Needle and shuttle hook timing is not correct	Adjust needle and shuttle hook timing properly	7-2
6.	Needle is bent	Change it new needle	5-2
often happens	Needle is bent by driver	Adjust needle and diver clearance properly	7-4
	Needle is in wrong position	Amend needle position	5-2
	Presser foot position is not correct	Adjust needle and diver clearance properly	7-6-1

Bad condition	Cause	Remedy	Ref. page & Item
	Upper thread tension is not tight enough	Increase upper thread tension	6-3(2)
	Thread tension regulator's discs	Adjust tension regulator position properly	7-17
7.	are opened during sewing	Adjust upper tension release position properly	7-17
loose	Presser foot position is not correct	Adjust presser foot position properly	7-6-1
	Driver and shuttle hook clearance is very small	Adjust clearance between driver and shuttle hook	
	Presser foot up and down timing is not proper	Adjust presser foot timing properly	7-6-3
8	Cables wiring is disconnected	Connect all cables precisely	3
Sewing machine does	System software is not loaded	Load system software to control box	5-1
not work even start switch is	Emergency stop switch is kept ON	Release emergency stop switch lock	6-1
turned ON	Start switch is out of order	Change it new start switch	3-1
0	Work holder activate cable is disconnected	Connect the cable precisely	
9. Work holder	Work holder pressure is not strong enough	Increase work holder pressure	7-9-1
	Work holder switch is out of order	Change it new work holder switch	3-1
	Work holder pressure is not Strong enough	Increase work holder pressure	7-9-1
10	Sewing material is too heavy	Decrease sewing speed	6-2
Sewing pattern		Decrease feeding speed	Control unit
is distorted		Select heave material setting	Control unit
	X-Y timing blts are loose	Adjust X-Y timing belt tension properly	7-21
	X or Y detector cabled are disconnected	Connect X-Y cables precisely	
11. Work holder does not stop at home position	X-Y detectors are out o order (Red pilot lamps do not go on at home position)	Change them new detectors (Make sure red pilot lamps go on at home position)	7-20
	Detector and detector plate clearance is too big	Adjust the clearance properly	
12	Detector or detector plate mounting is loose	Check setscrews and tighten them securely	7-20
Work holder stops at not original home	Detector and detector plate clearance is bigger than standard	Adjust detector and detector plate clearance properly	7-20
position	Home position correction function is in working	Cancel home position correction function	Control unit

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