SunStar

Version 1.0

USER'S MANUAL
PARTS BOOK

FORTUNA

series 6

ISO 9001 Certification of Quality System

CE

1) FOR AT MOST USE WITH EASINESS, PLEASE CERTAINLY READ THIS MANUAL BEFORE STARTING USE.
2) KEEP THIS MANUAL IN SAFE PLACE FOR REFERENCE WHEN THE MACHINE BREAKS DOWN.

SunStar CO., LTD.

MEE-091201

1. **Thank you for purchasing our product. Based on the rich expertise and experience accumulated in industrial sewing machine production, SUNSTAR will manufacture industrial sewing machines, which deliver more diverse functions, high performance, powerful operation, enhanced durability, and more sophisticated design to meet a number of user's needs.**
2. **Please read this user's manual thoroughly before using the machine. Make sure to properly use the machine to enjoy its full performance.**
3. **The specifications of the machine are subject to change, aimed to enhance product performance, without prior notice.**
4. **This product is designed, manufactured, and sold as an industrial sewing machine. It should not be used for other than industrial purpose.**

SUNSTAR CO., LTD.

DAS
Certification

Scope of Quality Approval

The following Company

SUNSTAR ELECTRIC CO., LTD.

The Company has been approved for the following scope of operation:

Manufacture, Sale and Servicing of Motors and Controllers for Sewing Machines and Embroidery Machines

Scope of approval: **NACE 19**, Electrical and optical equipment

Date of Certificate Issue: 26th November 2003
Certificate Valid until: 26th November 2006
Certificate Number: K01-1714

Authorized D.A. Smiles

Date 03rd December 2003

DAS CERTIFICATION Ltd.
Company Number: 3384526
6 Amber Court, Crich Lane,
Belper,
Derbyshire DE56 1 HG
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DAS
Certification
ISO 9001: 2000
Approval

UKAS
QUALITY
MANAGEMENT
127-A

USER'S MANUAL

CONTENTS

1

SAFETY INSTRUCTION

Be sure to read and keep in mind the following instructions before you install and use thr FORTUNA SERVO MOTOR.

1) Use and Purpose

This product is designed, manufactured, and sold as an industrial sewing machine. It should not be used for other than industrial purpose.

2) Working Environment

① Power Source
- It is desirable that voltage of the power source be kept within the range of ±10% of the rated voltage.
- It is desirable that frequency of the power source be kept within the rage of ±10% of the rated frequency. (50/60㎐)
- The SERVO MOTOR can be expected to work normaly only in case the foregoing things are kept.

② Electromagnetic Noise
- It is desirable that those equipments causing strong electromagnetic field or high frequency not use the same electrical outlet as this on and stay away from it.

③ Temperature and Humidity
- Keep the ambient temperature above 5 degrees and below 40 degrees Centigrade.
- Never use it outdoors and avoid direct ray of light.
- Keep it away from an hot object like a stove.
- Keep the ambient humidity above 30% and below 95%.

④ Never use it near gases and explosives.

⑤ Do not use it at a spot located 1,000m or higer above sea-level.

⑥ Keep the storage temperature higher than 25 degrees below zero and lower than 55 degrees Centigrade when not in use.

3) Installation

Follow the instruction carefully when installing it.

① Be sure to start installing it after pulling the power plug off the outlet.

② Fix the cable so that it may not move, and do not allow the moving parts like belts to be interfered with.(keep distance of at least 25mm from them.)

③ Be sure to have the Controller, the Motor and the sewing Machine grounded.

④ Be sure that the voltage of power source fits the specification of the Controller before the power is on

⑤ Be sure to use Safety Extra Low Voltage when an extra item or an accessory is fitted into the Controller.

4) Disassembly

① Indisassembling it, be sure to wait at least 360 seconds before taking any action after pulling the plug off the power source after turning it off.

② When pulling off the plug from the power source, be sure to hole the plug itself instead of the wire connected to the plug.

5) Service and Maintenance

① Make sure that service and maintenance are carried out by a skilled technician.
② Never try to operate with the Motor and the Controller open.
③ When inserting a thread into or touching the machine, be sure to turn the power off and step down from the platform.
④ Be sure to use standard products specified for replacement of parts.

6) Other Safety Instructions

① Tack care not to let your fingers touch any moving parts including belts.
② In case of remodelling or fitting of additional device, be sure to follow safety standards and do not ever try to go ahead based on your own judgments.
③ Do not try to operate with the safety device removed.
④ Take care not to let water or coffee or something like those admitted into the Controller or the Motor.
⑤ Never drop the Controller or the Motor to the ground.

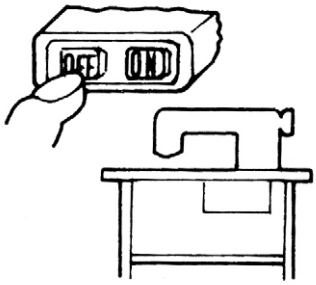
※The instructions presented above are for the safer and more proper operation of the Fortuna Servo Motor. Ignoring such instructions could cause damage to the machine or physical injury of the user. Please follow all the instructions when operating the machine.

2

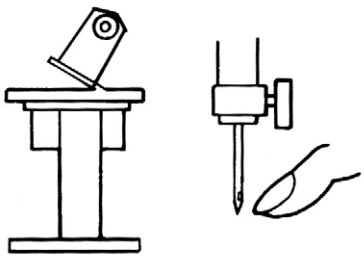
PRECAUTIONS BEFORE USE

1. Do not turn on the power while stepping on the pedal.

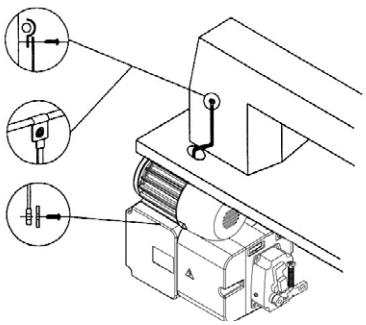
2. Turn off the power when leaving the servomotor overnight.



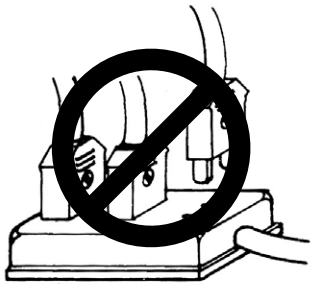
3. Turn off the power when servicing the servomotor or changing the needle.



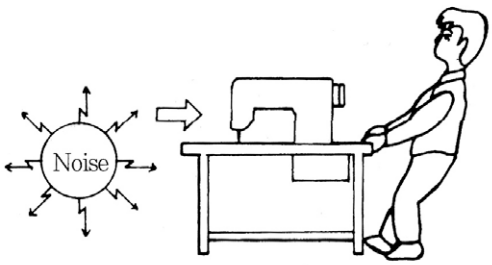
4. Be sure to keep the servomotor securely grouned.



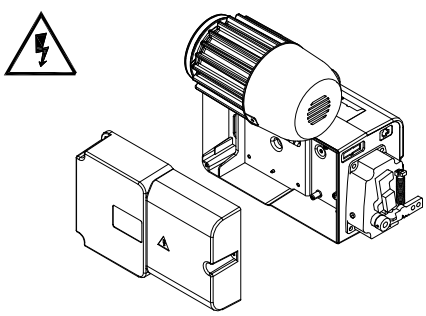
5. Do not connect multiple servomotor power plugs to the same power strip.



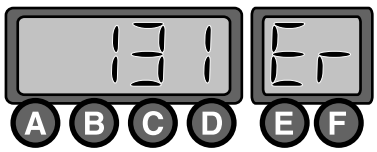
6. Install the servomotor away from noise sources, such as high-frequency equipments and welding machines.



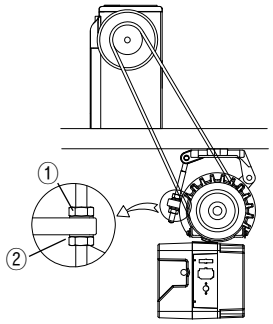
7. Avoid electrical shock when servicing the controller box. (Wait for 6 minutes before opening the cover after turning off the power.)



8. When an error message "Er" sppears on the digital display, take a note of the "Er" code, and then turn on and off before resuming operation(Contact the local dealer if "Er" message persists on the display)

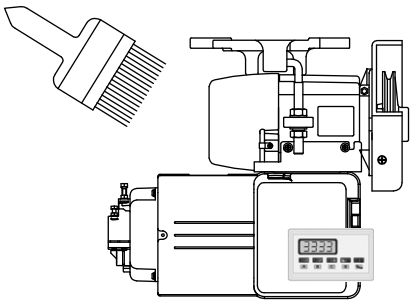


9. Adjust the belt tension to the optimum level.

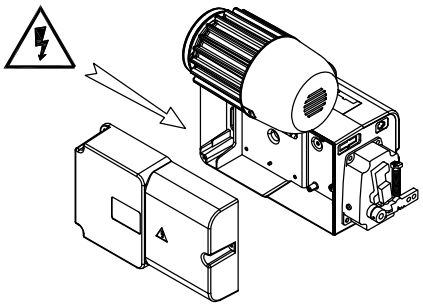


Belt-tension adjustment should be performed after the motor is mounted on the table : First, loosen both the upper and lower anchoring bolts(①, ②). The belt tension will then be adjusted by the weight of servo motor itself. Fasten both anchoring bolts.

10. Clean it every two or three weeks so that no dirt or a dirty substance may be piled up.

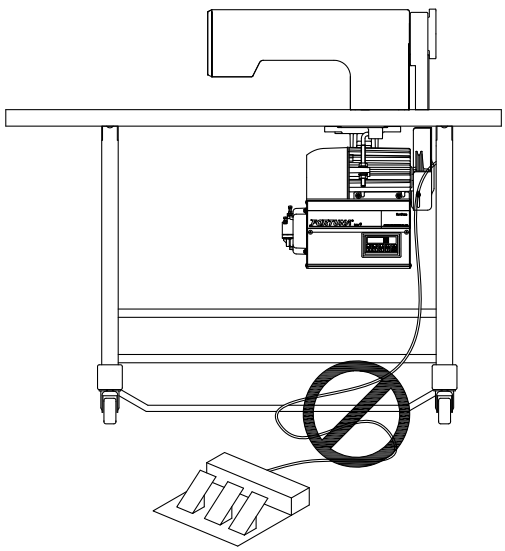


11. When replacing the fuse, use a standard item, opening the cover as shown in the diagram.



Digital board	F1	250[V]/1[A]
Filter board	F2. F3	250[V]/6.3[A]

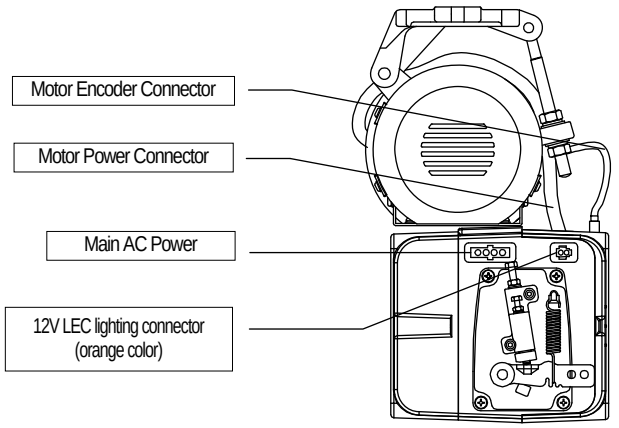
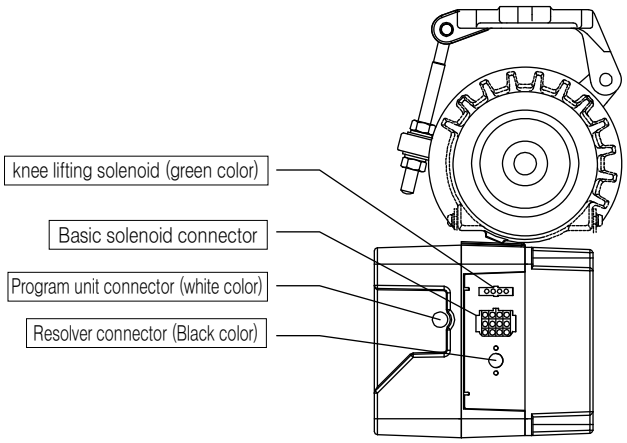
12. Make the length of the cable connected with an outside parts like stand-up pedal as short as possible.



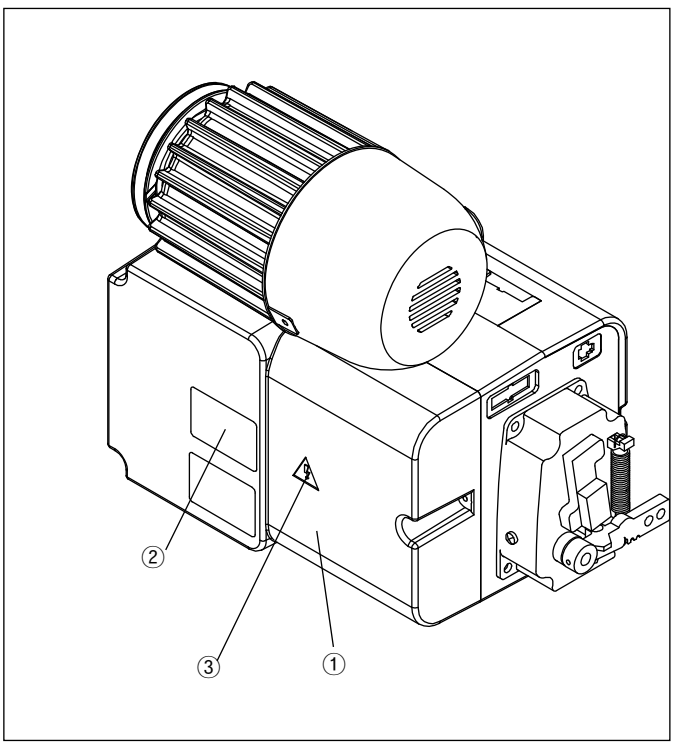
3

LOCATING AND USING PARTS OF THE CONTROLLER BOX

1) Left and right side of control box

Control box left side	Control box right side
	

2) Rear panel



① Caution

② Motor

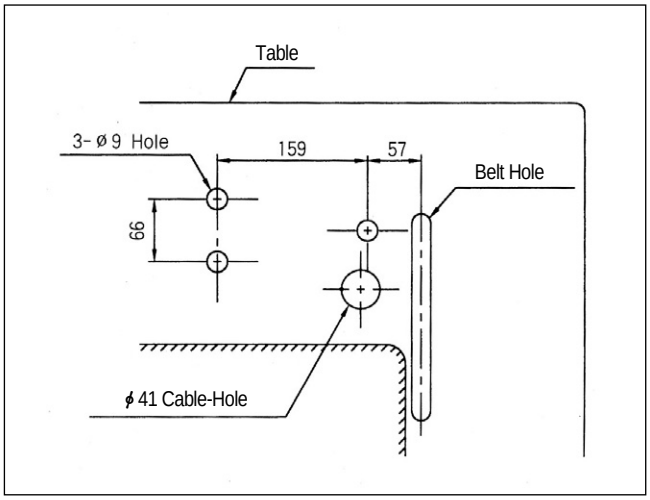
③ AC INPUT

4

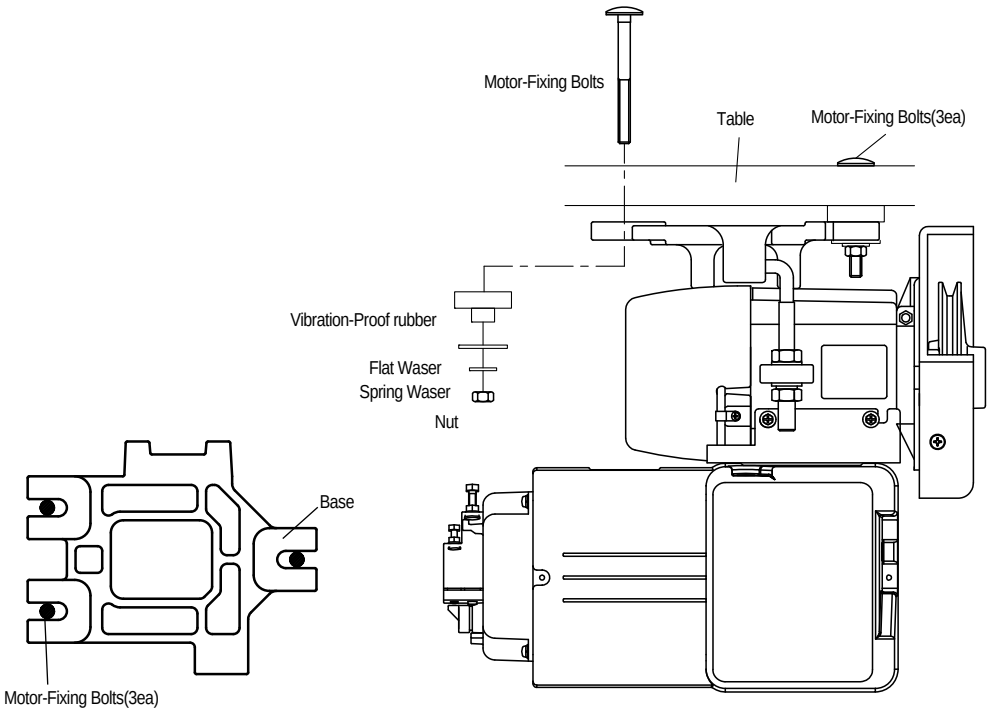
INSTALLATION

1) Mounting your Servo Motor on the table

① Make sure that the holes are bored on the table as shown in the figure.



② Insert three motor-fixing bolts through the three holes on the table. Attach the motor base padded with vibration-proof rubber, and slide flat and spring washers over the bolt stems, and then fasten the bolts with nuts.

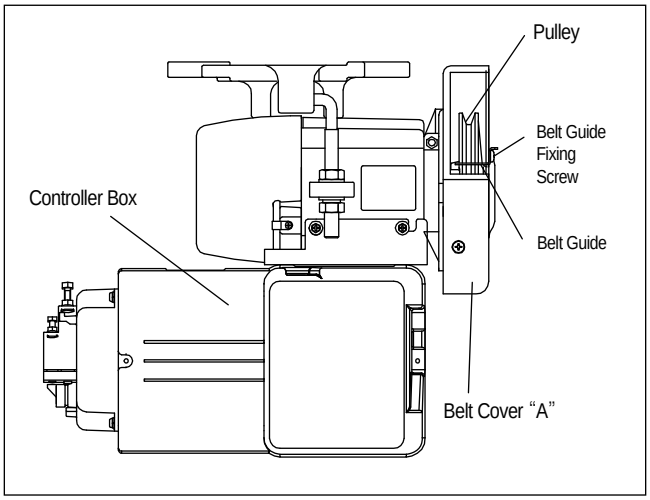


③ Make sure that the center of motor pulley is matched to that of the sewing machine before tightening the motor-fixing bolts and nuts.

2) Assembling the belt cover and adjusting the belt tension

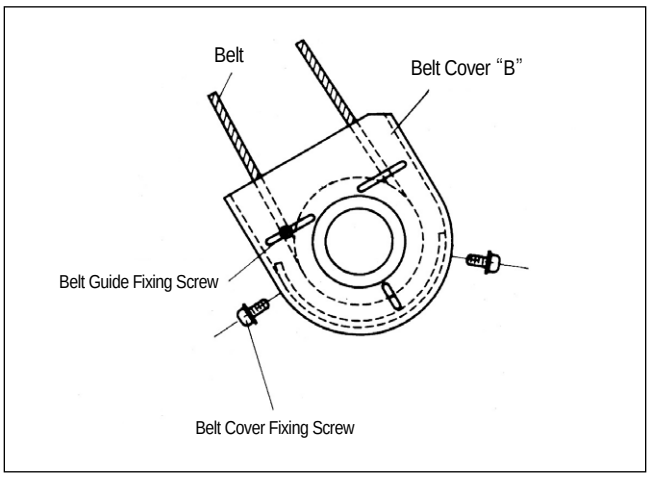
(1) Belt cover assembling procedure

① Upon the completion of the motor mounting, bring the two pulleys of motor and sewing machine closer to each other, by pulling back the sewing machine. You can then mount the belt easily as shown in the figure.



Warning	Make sure that the power is off before assembly.

② Place the belt cover 'B', making sure that the belt cover does not contact the belt, and then fasten the cover with the fixing screw.

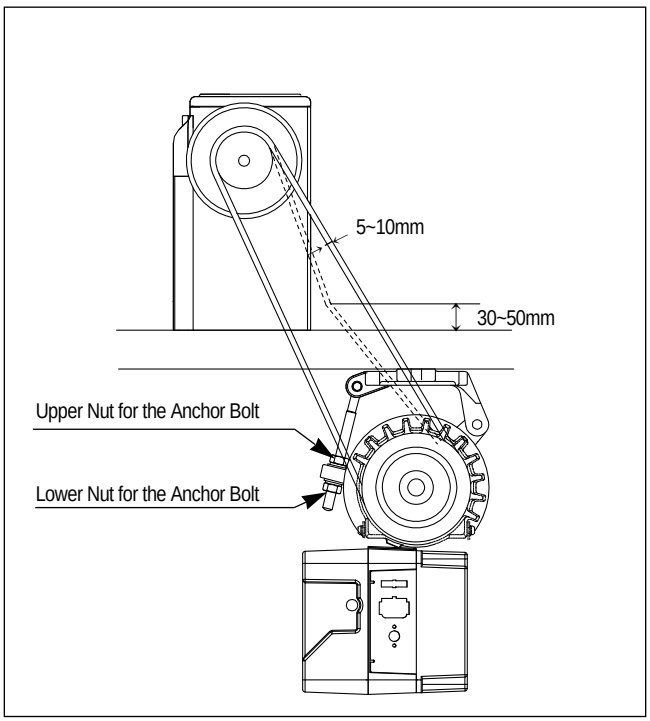


Warning	Do not remove the belt cover. If a finger slips into the belt, it might be broken or cut off.

(2) Adjusting the belt tension

① Optimum Tension Level : The optimum tention level is achieved when the belt is pushed by 5-10mm when the top surface portion of the belt at about 30-50mm above the tabletip is pressed by a finger with a force of~1㎏m/sec² or 1 Newton.

② Adjusting the Tension Level : If the tension level is out of the optimum range, adjust the tension as follows. First, loosen both the upper and lower nuts for the anchor bolt, letting the belt be stretched by the motor weight itself. Second, tighten the upper nut only to the extent that the motor does not move. Third, fasten the bottom nut tightly so that the motor is securely fixed.



3) Mounting and adjusting the foot-lift solenoid

(1) SunStar KM-250 Model

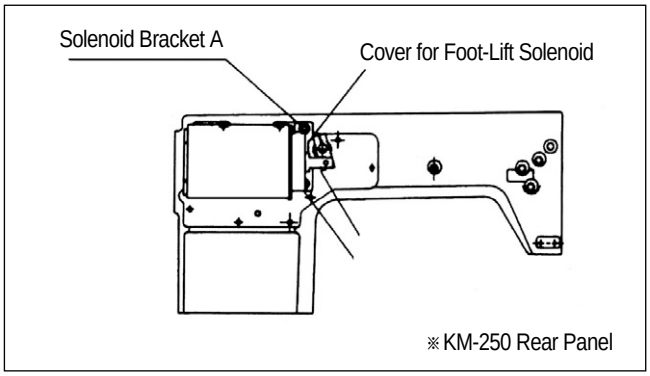
① First, assemble a panel for the attachment of presser foot solenoid on the back of KM-250.

② Attach the presser foot solenoid to a bracket "A".

③ Attach the bracket "A" with the presser foot solenoid to the panel above.

④ Attch a crank to a solenoid shaft and then connect it to a sewing machine.

⑤ Place a cover on the solenoid.



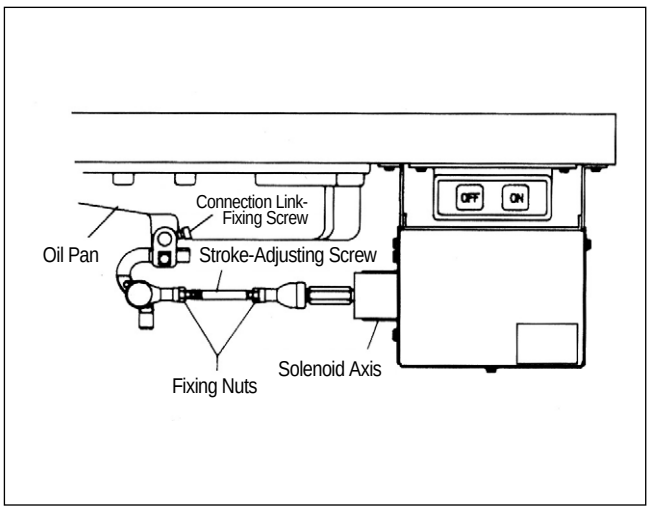
(2) Adjusting the stroke(Gap) of the automatic foot-lift solenoid

① Check point

Check to make sure that the stroke-adjusting screw is located at the center of the solenoid axis, i.e., the solenoid should be assembled in parallel with the bottom surface of the table. If the solenoid is not in paralle, make an adjustment so that the screw is in parallel with the center of the solenoid axis using the connection link-fixing screw.

② Adjusting Procedure

The verical travel distance of the presser foot can be adjusted by the stroke-adjusting screw. First, Loosen the two fixing screws, and adjsut the vertical stroke using the stroke-adjusting screw. loosening and tightening the stroke-adjusting screw will decrease and increase the verical stroke of the presser foot respectively. After the adjustment, fasten the fixing screw tightly.

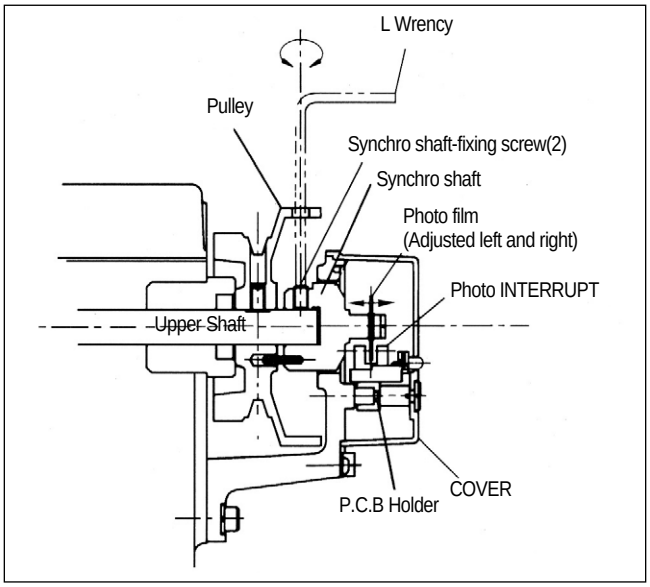


4) Mounting the position sensor (Synchronizer) and setting the film

(1) Mounting the position sensor(Synchronizer)

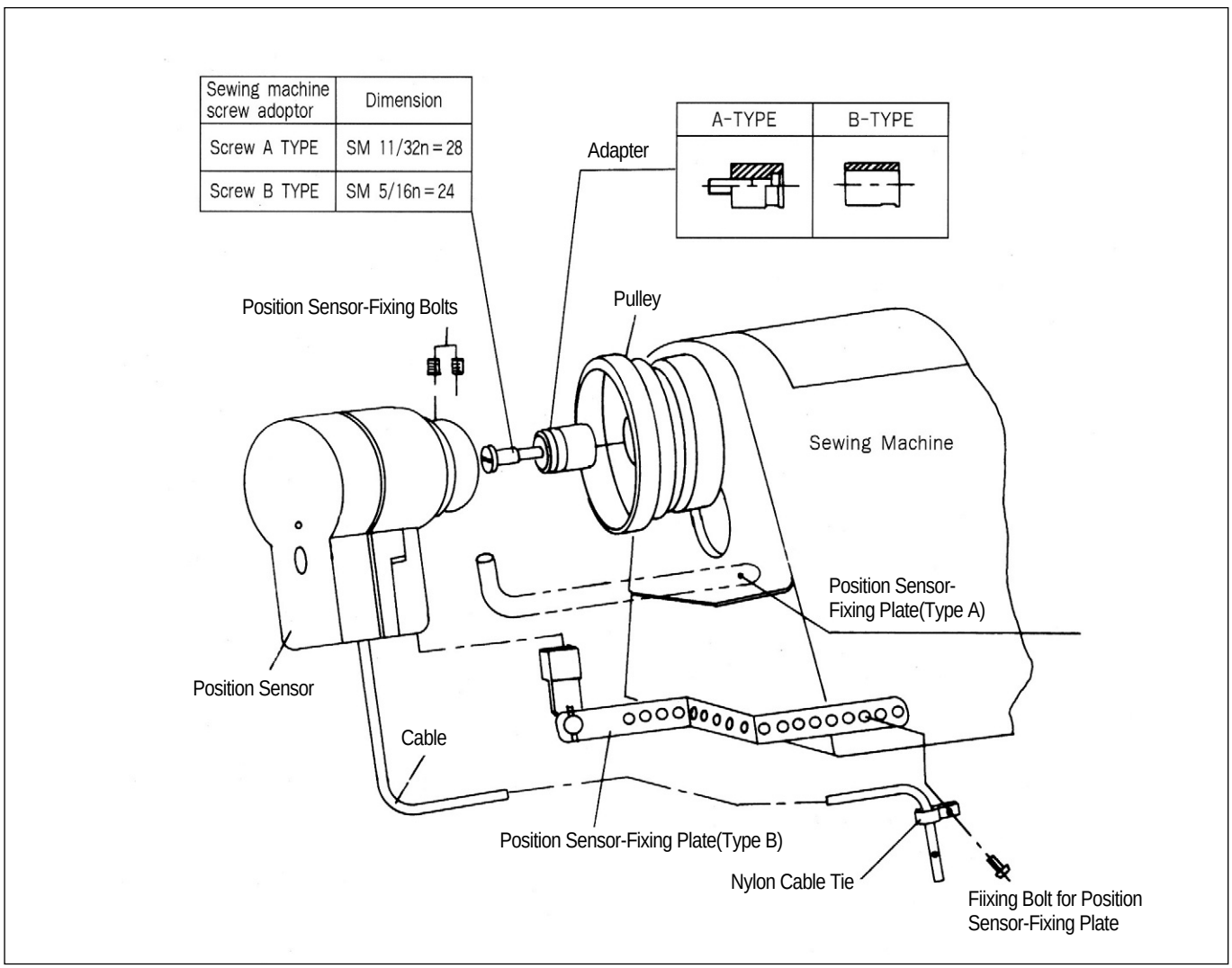
① SunStar thread-cutting sewing machine.

All SunStar thread-cutting sewing machines are equipped with a position sensor. Users, therefore, are required to the adjust the film position, if necessary, as shown in the figure.



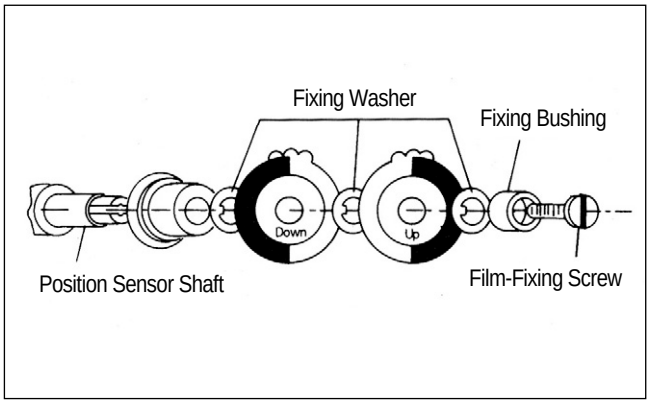
② All other sewing machines(including other manufacturers' brands)

First, attach the position sensor-mounting adapter to the upper shaft of the sewing machine. Second, attach the position sensor-fixing plate to the body of the sewing machine as shown below in the figure. Third, secure the position sensor to the adapter with the fixing screws.

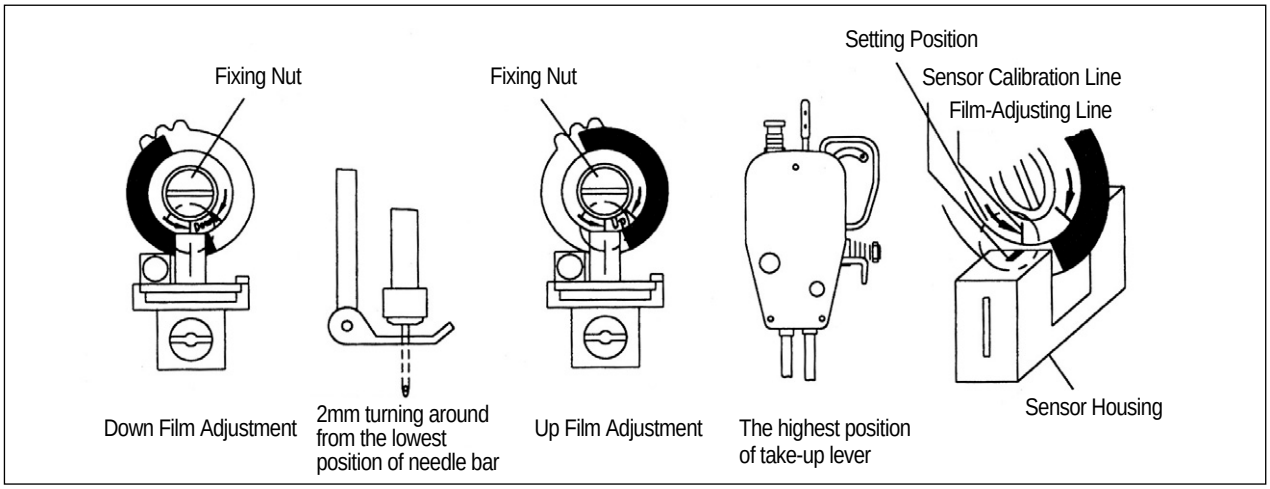


(2) Adjusting the film of the position sensor

① Assemble the films and position sensor in the order as shown in the figure.

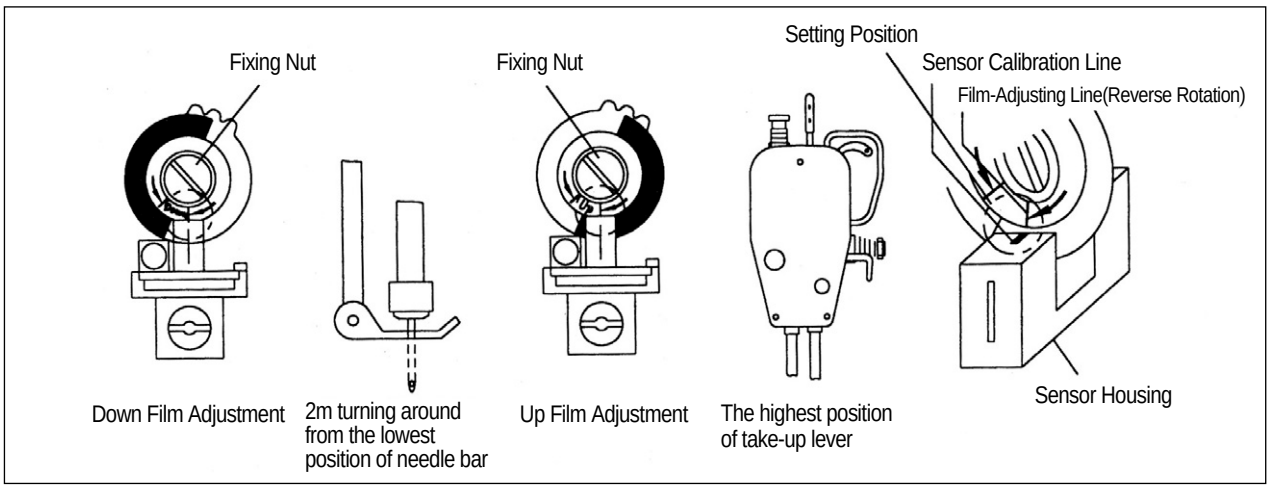


② Upon the completion of the assembling, position the needle shaft tight at the rising point from the lowest needle position by manually rotating the pulley. Loosen the film-fixing screw, and adjust the DOWN film so that the film-adjsting line and the sensor housing calibration line are matched. Tighten the film-fixing screw just to the extent that the film can not be rotated. Likewise, position the thread take-up at the highest position. Loosen the film-fixing screw, and adjust the UP film as shown in the figure, while using caution not to move the DOWN film which is already adjusted earlier. Tighten the adjusted film with the fixing screw.



(3) Adjustion the films of reverse rotation sewing machines

※For reverse-rotation sewing machines, the film-adjusting lines located at right edge of the "UP" and "DOWN" film should be matched to the center line of the sensor.



Caution

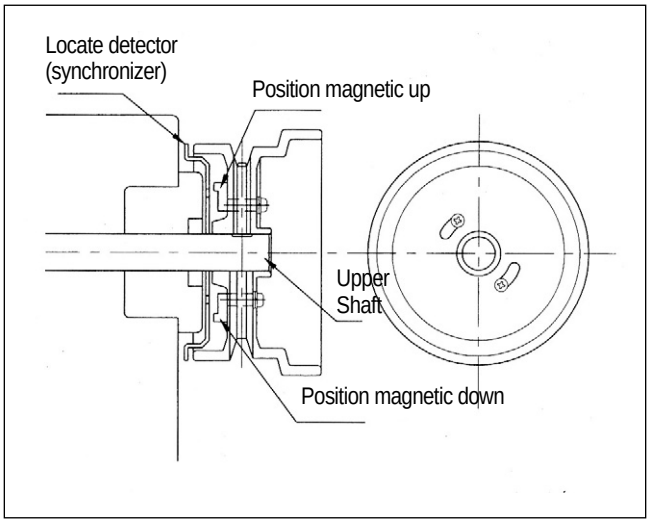
After adjustment the film of the position detector, be sure to rotate the motor for 3~5 seconds by pedalling so that the Controller may remember location of the film.

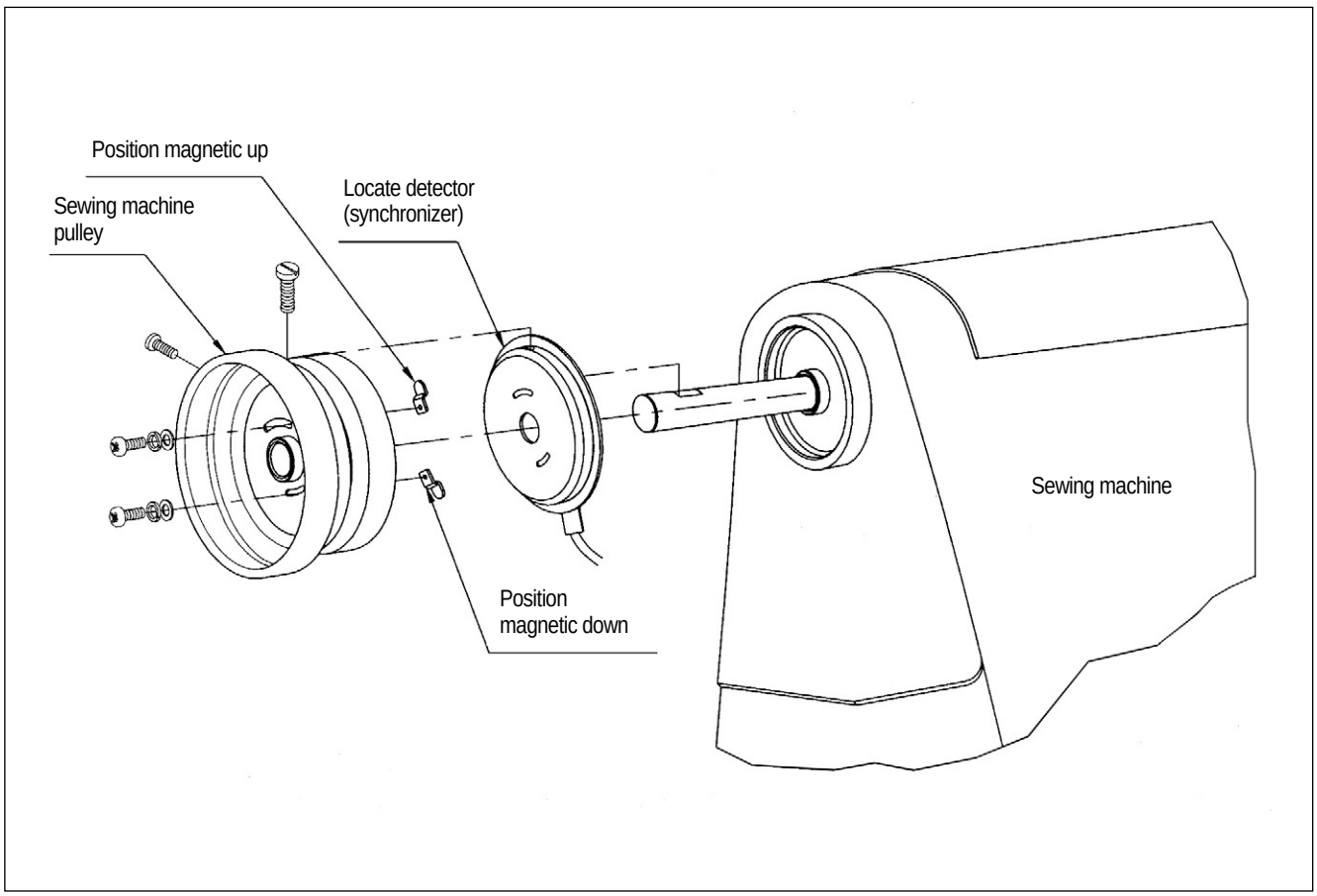
5) How to equip and adjust a built-in location detector(synchronizer)

(1) How to equip the built-in location detector (synchronizer)

▶ In case of a SunStar thread trimmer

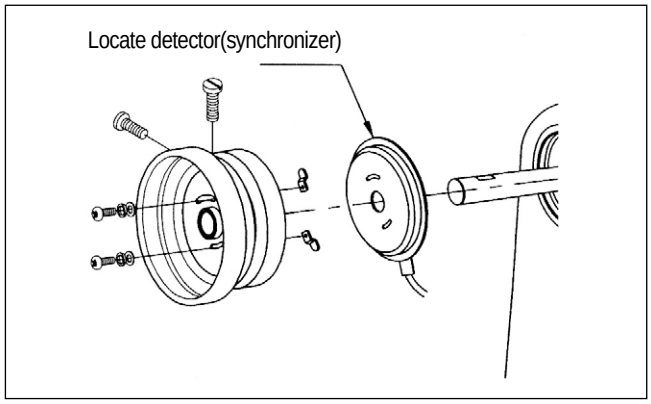
When a built-in location detector(synchronizer) for the sewing machine with the SunStar thread trimmer is equipped, all that the users need to do is to simply adjust the location of magnetic for detection according to their needs.



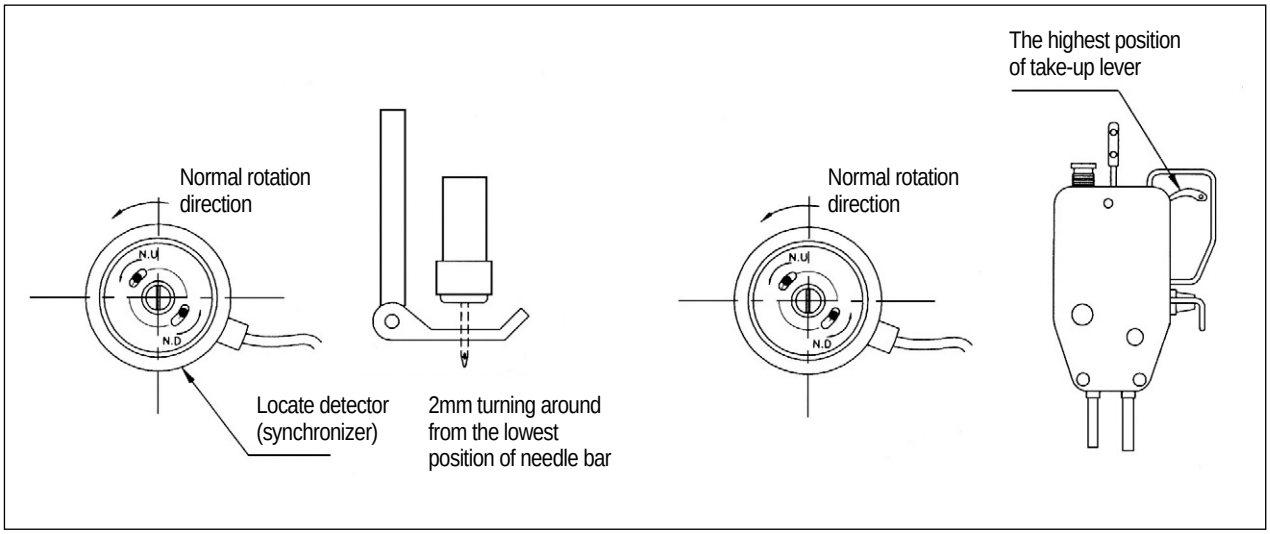


(2) How to adjust the magnet of the location detector

① Assemble the detector in order following the pictures.

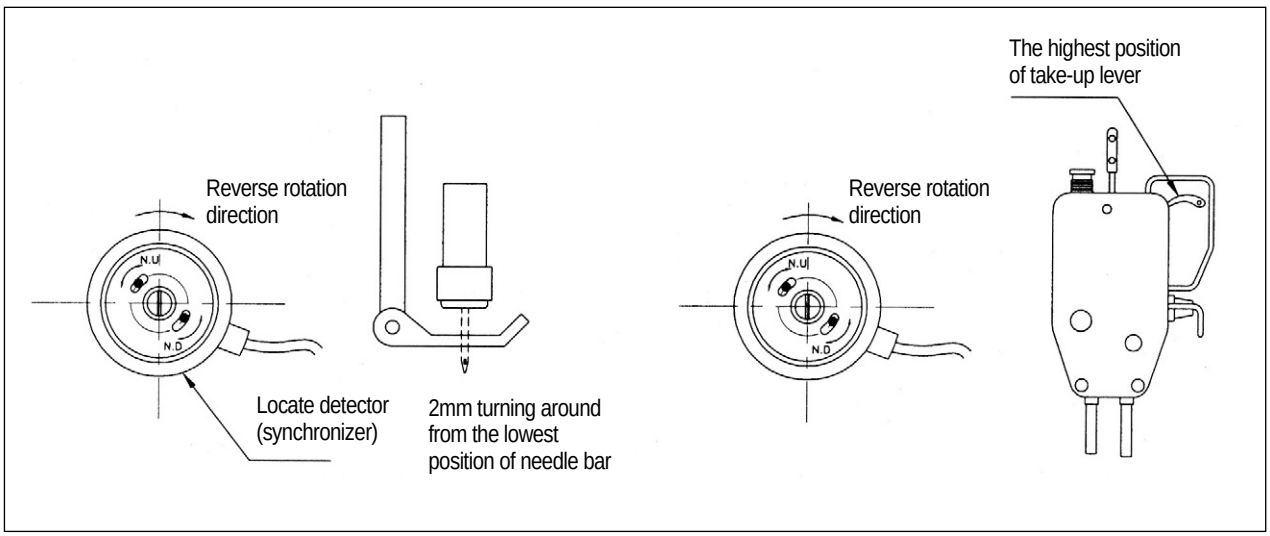


② Once assembling is completed, power the controller on and step on the pedal. At this time, make sure that the needle moves up and down. Stop the needle at a desired location by moving the magnet back and forth along the location where the needle stops.



(3) How to adjust a location detector in case of a reverse rotation sewing machine

※ It is the same as that used for the normal rotation direction



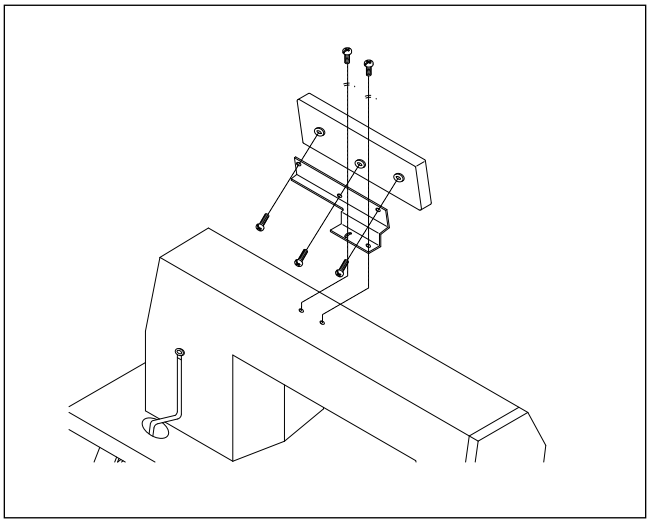
Caution

After adjusting a location detector, rotate the motor by stepping on the pedal for 3~5 seconds so that a controller can remember the location.

6) Mounting the Program Unit(P/U)

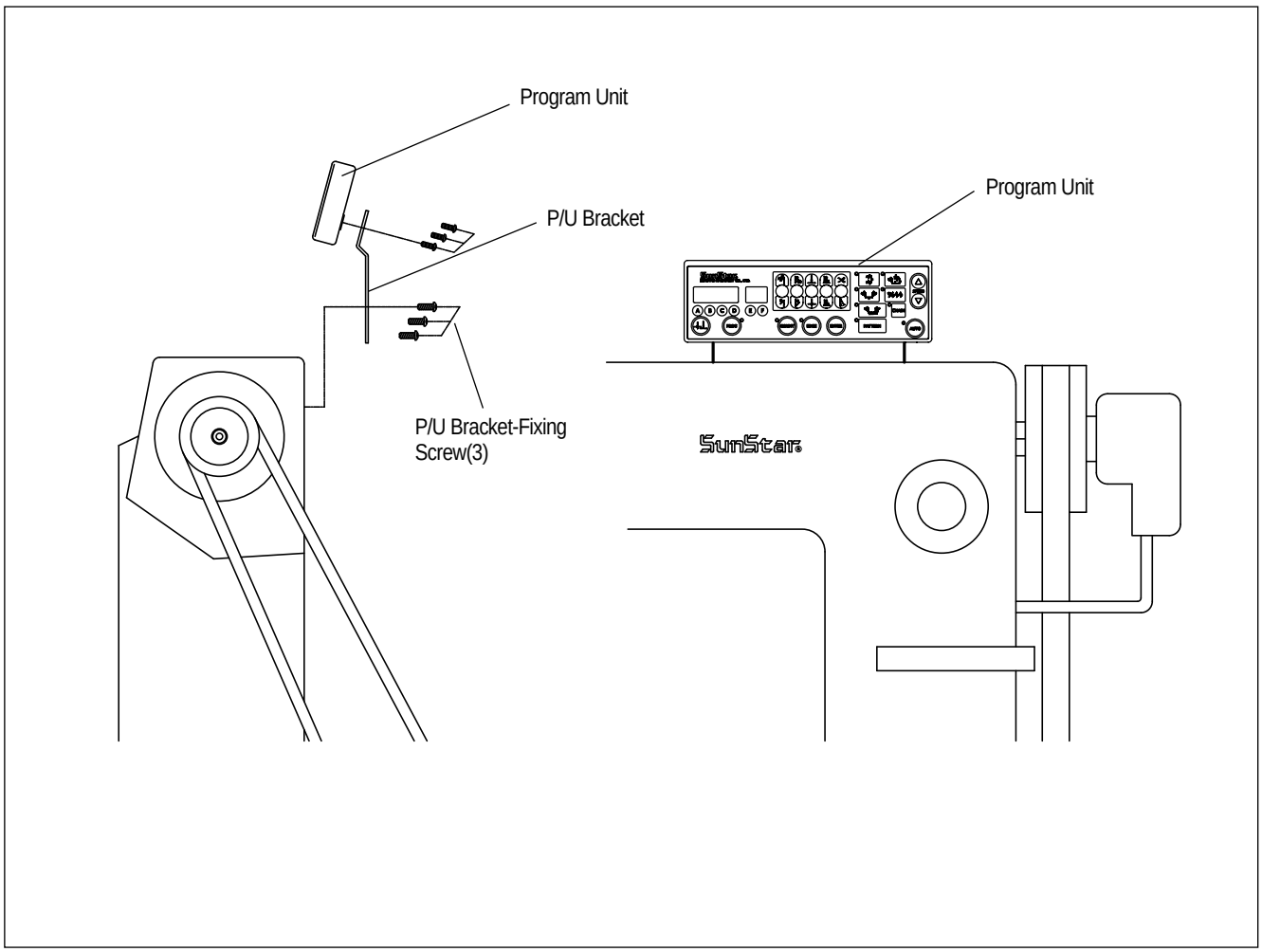
(1) SunStar KM-235 Sewing Machine

First, attach the P/U bracket to the P/U using three fixing screws and a supporting bolt with nut attached on it as shown in the figure. Second, securely attach the P/U to the head of the sewing machine using two fixing screws and washers, keeping a 3~4mm distance between the bottom surface of the nut and the base of the supporting bolt.



(2) Other SunStar thread-machine

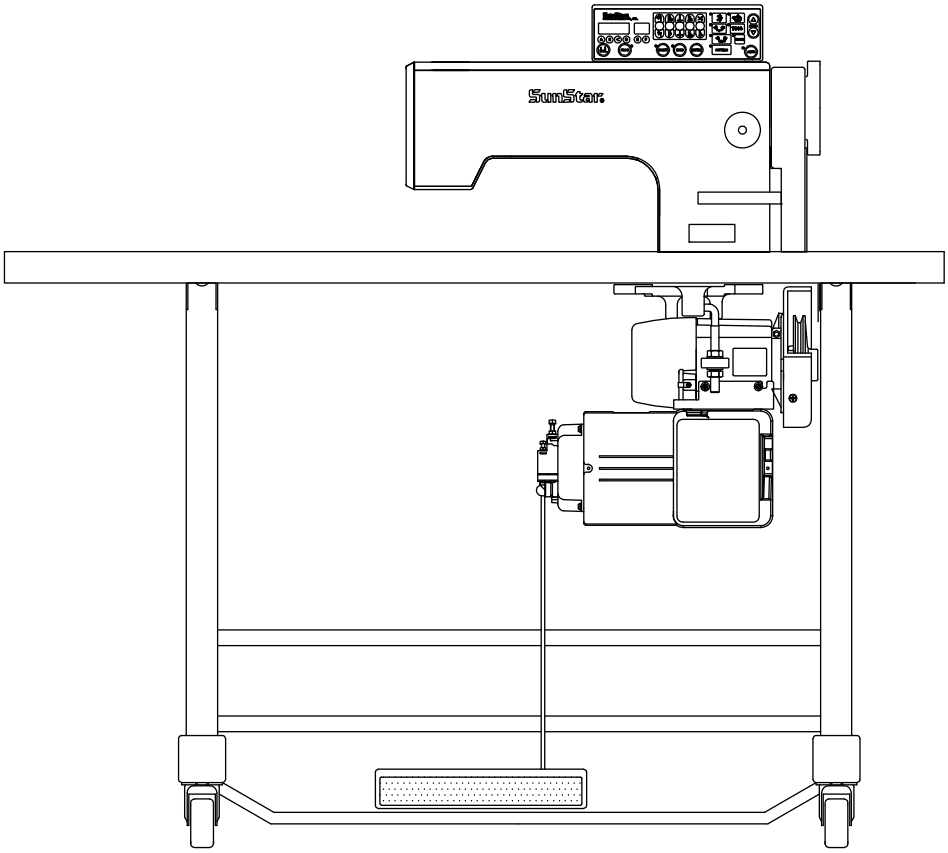
First, attach the P/U bracket to the P/U using the four fixing screws. Second, attach the P/U to the main body of the sewing machine using the three bracket-fixing screws as shown in the figure.



Caution

Fix the cable using the cable tie so that cable is not in the way of the belt.

7) An example of installing the SunStar sewing machine

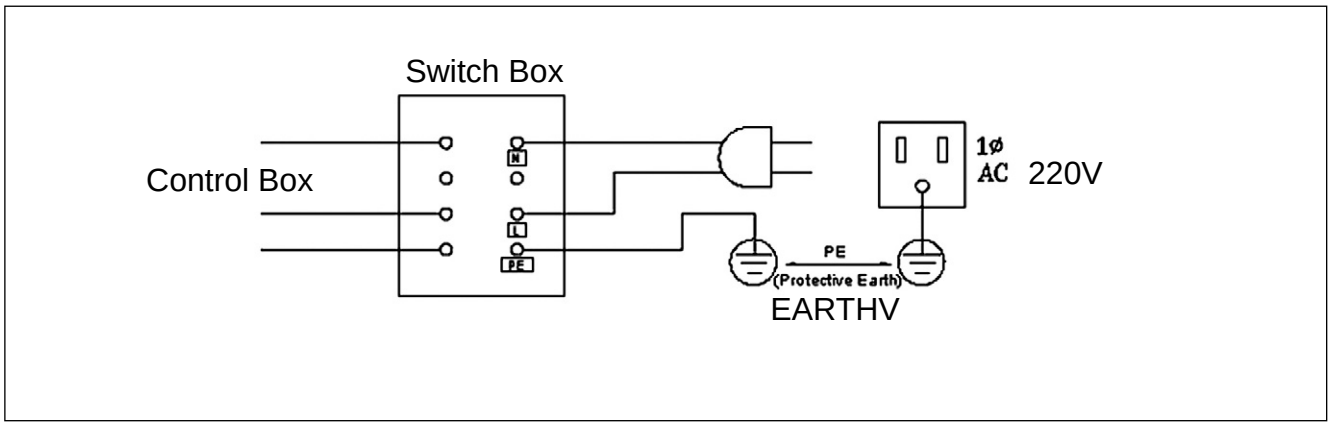


5

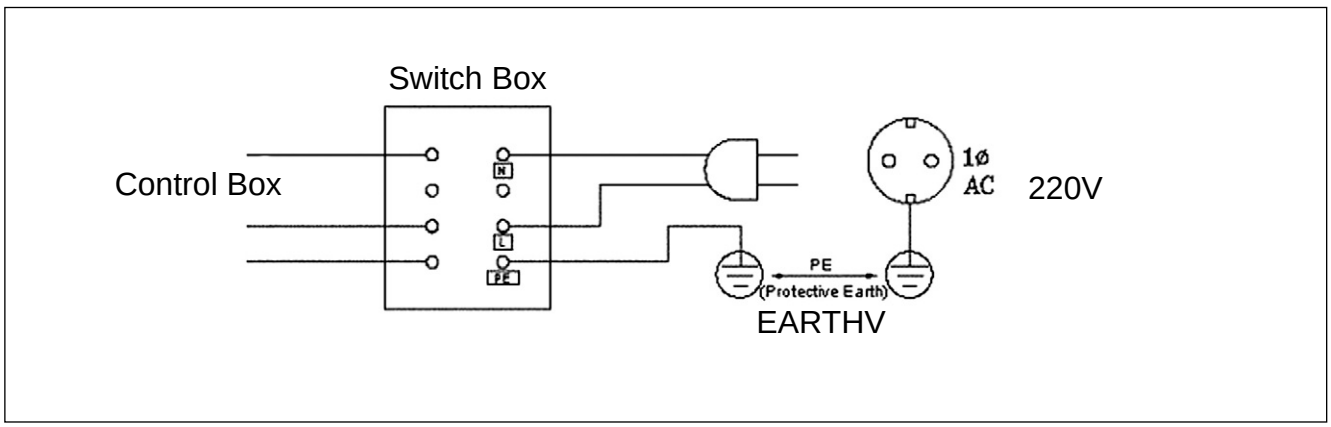
WIRING AND GROUNDING

1) Specification of the power plug

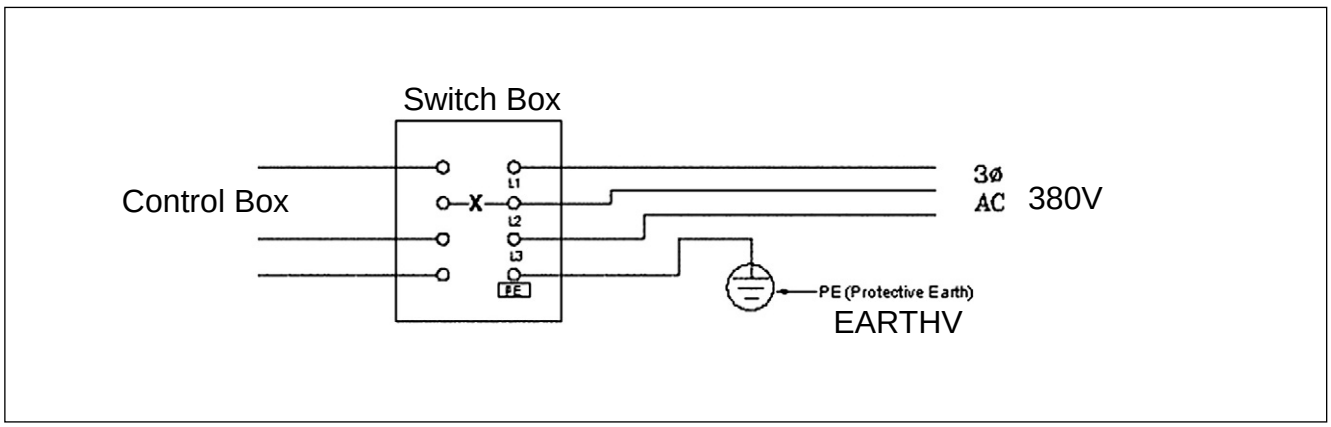
(1) Single phase 200V~240V



(2) Three phase 200V~240V



(3) Three phase 380V



※Be sure to connect Protective Earth

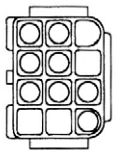
2) Specification of electric current in wiring of power plug

Be sure to use wiring materials which can stand electric current of higher than 15A.

3) Name and description on the outside connector of control box

① Standard solenoid connector

[Shape of pin]



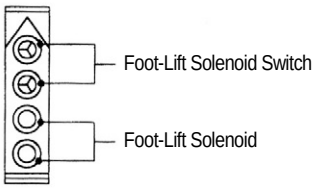
[No. of pin]

1, 5 : Back Tack Solenoid
2, 6 : Thread-Cutting Solenoid
3, 7 : Wiper Solenoid

11, 12 : Button Ⓐ for manual back-tack operation

② Foot-lift solenoid

Connector Color : Green

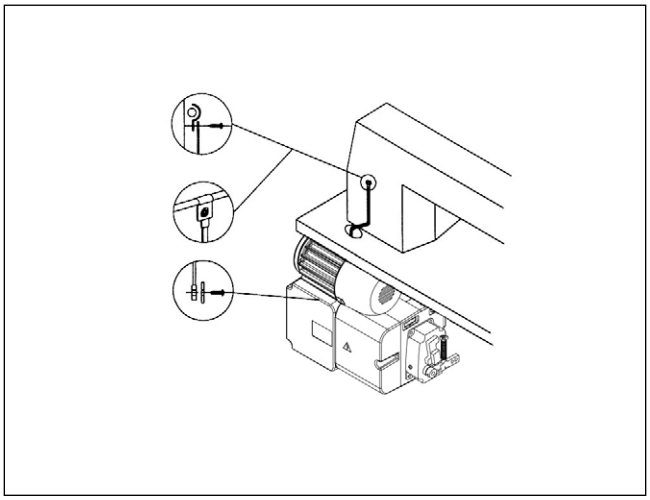


6

CONNECTION THE EARTH WIRE OF THE SEWING MACHINE AND MOTOR

▶ Method

Connect the motor and sewing machine using the ground wire (green, green/yellow) as shown in the figure. Make sure that the factory-connected ground wire between the controller box and motor is securely in place.



Caution Failure to ground the motor can cause abnormal operations, such as overspeed rotation or unwanted stitching.

7

THINGS TO BE CHECKED AFTER INSTALLATION

1) Before the power is on...

① Make sure that the incoming voltage is in accordance with that shown in the name plate of the Control box.

② Check whether the following connectors are connected.

- Connector for incoming AC power source
- Connector for motor power
- Connector for motor encoder
- Connector for pedal
- Connector for position detector
- Connector for others (option, knee-lift, program unit etc.)

③ Check to see whether the belts are in touch with the wiring.

④ Check the tensile strength of the belts.

⑤ Check to see the fixing nuts for pulley are tightly fastened.

2) After the power is on...

① Check whether the lamp for the position detector is on. (Except in the case of built-in position detector)

② Check whether the program unit is working.

③ Check the direction of rotation of the Sewing Machine.

- In case the direction of rotation is not right, action shall be taken to change set it right, referring to "the methods of changing the program and the list of changing functions"(N. 65 in Group "A")

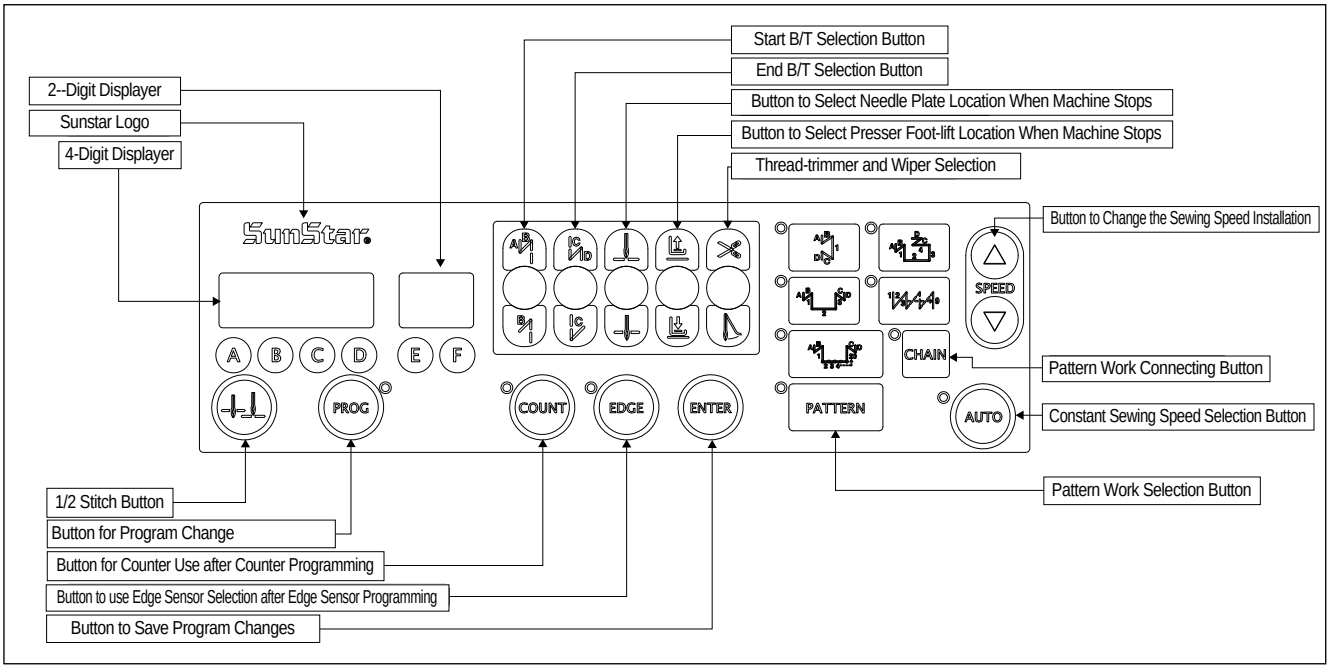
④ Check to see whether there are abnormal heat, smell or noise nearby.

- In case there are, turn the power off and call our regional office.

8

PROGRAM UNIT PART NAMES AND METHOD OF USE

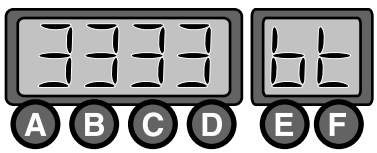
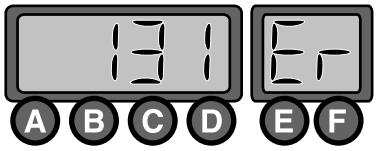
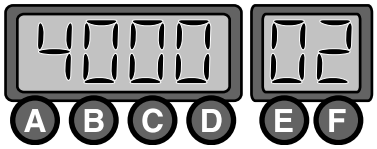
1) Program unit part names



2) Program Unit Method of Use

(1) 4-Digit Displayer and 2-Digit Displayer Functions and Method of Use

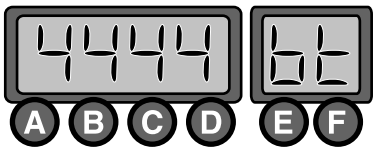
A. 4-Digit Displayer and 2-Digit Displayer Functions

① When you turn the power on, you will see a screen as shown in the figure. The 4-digit displayer shows the start and end B/T sewing and the 2-digit displayer shows the current abbreviation for the letters or numbers shown in the 4-digit displayer (bt: the abbreviation for back tack),	<Initializing screen> 
② The 4-digit displayer shows the error number for each type of error discovered and also shows the programmed value after it has been programmed. The 2-digit displayer shows the number of the parameter specific item's content or name which is shown in the 4-digit displayer.	<Example of error detection>  <Example of selection of number 2 item in Group A> 

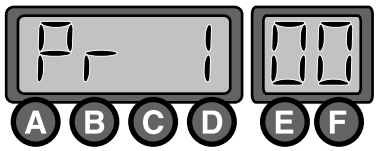
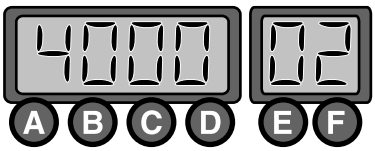
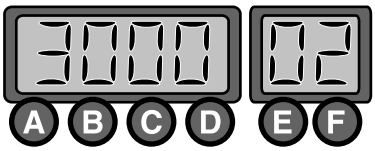
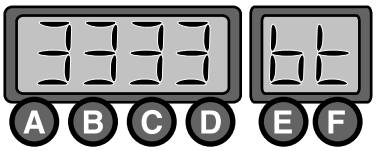
Caution The 4-digit displayer and 2-digit displayer show the current condition. Therefore the user should always check it before using the machine.

B. Method of Use: 4-Digit Displayer and 2-Digit Displayer

a. Method to change the start and end B/T stitch numbers

In order to change the start B/T stitch numbers which is programmed when you first purchase this machine, you must use the (A), (B) buttons. If you want to change the end B/T stitch numbers, you must use the (C), (D) buttons. • The program range is from 0 to 9. (Ex: How the screen looks when changing both start and end B/T stitch numbers to 4).	

b. Method to check or change the specifics of the parameter

① Press the (PROG) button and as you press it, also press the (A) button. Then you can either check or change the programming items for the parameter of group A. (A group : (A), B group : (B), C group : (C), D group : (D)) ※ Users should turn the machine off to select B, C, or D group. While pressing the (PROG) button, turn the power switch on. The screen will be changed to the initial screen after showing the "PrEn" message. Then, the users can select B, C, or D group by pressing B, C, or D button while holding program (PROG) button.	
② You can move to the parameter item you want with the (E) and (F) buttons. The parameter item number will appear in the 2-digit displayer and the wanted value will appear in the 4-digit displayer. (Ex) Screen showing the maximum speed limit preset in the item 2 of A group)	
③ After using the (C) (increase) button and (D) (decrease) button to choose the value you want, press the (ENTER) (Enter) button and save the value you chose. (Ex: Reducing the maximum sewing speed limit from 4000RPM to 3000RPM).	
④ After saving, press the (PROG) button and go back to the initial screen.	

Caution

- Be aware that if you don't press (ENTER) after changing the programmed value for the parameter item, the value will not be saved.
- When the B, C, or D group selection is completed, users should turn off the machine first and restart to secure the selected group.
- If the user changes the programmed value from the parameter specifics carelessly, the user may cause break down or physical damage to the machine. The user must therefore be well-trained before changing the parameter group.

(2) Method of Use : ½ Stitch Button Function

① When necessary, make ½ stitches by pressing the ½ stitch ((½)) button.

② When the needle plate makes a down stop, shortly press the ½ stitch ((½)) button once and the needle plate will make an up stop.

And when the needle plate makes an up stop, shortly press the ½ stitch ((½)) button once and the needle plate will make a down stop.

Caution

Be aware that if you are continuously pressing the ½ ((½)) button, the machine will keep on moving at the ½ stitch ((½)) speed.

(3) Method of Use: Start B/T Button

This button is used when the user wants to prevent threads from loosening at the end of the sewing work. If the user presses this button in sequence, the location on the lights will change. This button offers the following three functions.

When sewing starts, B/T sewing does not operate.

When sewing starts, B/T sewing is operated with the

button.

When sewing starts, B/T sewing is operated with the

button.

Using the A, B buttons in the 4-digit displayer, the user can program the B/T number of stitches he/she wants.

Caution

Be aware that if the start B/T stitch is set to '0' in the 4-digit displayer, the start B/T sewing is impossible.

(4) Method of use: End B/T Button

This button is used when the user wants to prevent threads from loosening at the end of the sewing work. If the user presses this button in sequence, the location on the lights will change. This button offers the following three functions.

When sewing ends, B/T sewing does not operate.

When sewing ends, B/T sewing can be operated with the

button.

When sewing ends, B/T sewing can be operated with the

button.

Using the C, D buttons in the 4-digit displayer, the user can program the B/T number of stitches he wants.

Caution

Be aware that if the end B/T stitch is set to '0' in the 4-digit displayer, the start B/T sewing is impossible.

(5) Method of Use: The Needle Plate Position Selection Button When the Sewing Machine Stops

When the user turns the power on, one of the up stop or down stop lights in the program unit panel needle plate is always left on. The user can change the stop location by pressing the button.

When machine stops while sewing, the needle plate makes an up stop.

When machine stops while sewing, the needle plate makes a down stop.

(6) Method of Use: The Presser Foot-lift Location Selection Button When the Sewing Machine Stops

When the user turns the power on, one of the up stop or down stop lights in the program unit panel pressser foot-lift is always left on. The user can change the stop location by pressing the button.

When the machine stops while sewing, the presser foot-lift stops at the top.

When the machine stops while sewing, the presser foot-lift stops at the bottom.

Caution

If the user uses the automatic up stop function of the presser foot-lift when the sewing machine stops while sewing, it may cause damage to it because it has been left up for an unnecessarily long time. Be aware that to prevent the foot-presser solenoid from being damaged, it is programmed to automatically come down when a certain amount of time passes.

(7) Method of Use: Automatic Thread Trimmer and Wiper Selection Buttons

These buttons offer the function of automatic trimming and wiping after sewing. By pressing these buttons in sequence, the user can use one of the following three functions. The light shows the function that is currently being used.

Automatic trimmer and wiper do not operate

Only automatic trimmer function is operate

Both automatic trimmer and wiper operate

(8) How to use product counter and bobbin counter

① How to set product counter and bobbin counter

A. Set/clear product counter and bobbin counter using the  button in the program unit

Repeatedly press the () button in the program unit to change the status of the lamp and functions as below.

① When product counter and bobbin counter are not used	 <When the lamp is off>
② When product counter function is set	 <When the lamp is on>
③ When bobbin counter function is set	 <When the lamp is flashing>

※ To use the counter function, set the detailed functions under parameter B-Group.

② How to use detailed functions of product counter and bobbin counter

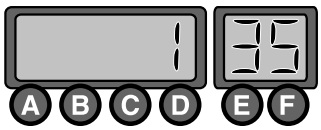
A. How to use the detailed functions of product counter

To use the counter function, set the detailed functions beforehand.

① To use the product counter function, first set the value of the parameter **B-35** (group B, item 35) as desired.

- 0: Set the external counter switch on
- 1: Set the automatic counter on after trimming

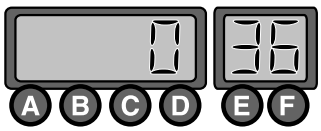
※ As the default value is set "0", the counter will not run if there is no external counter switch.



② Set the parameter **B-36** to select the type of product counter

- 1: Up counter
- 0: Down Counter

※ The default value is set at "1".

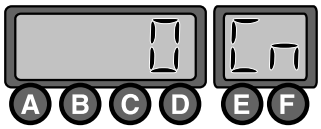


③ Press the counter (F) button to set the counter function. Press the button to check and set the detailed data of the counter.

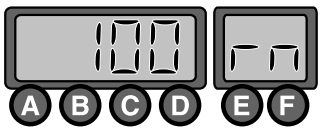
- Cn: The current counter amount
- rn: The remaining amount
- %: The progress
- tn: Total target amount (Default: 100)

※ Press (F) button repeatedly to see the above detailed data in order. The user may set up the current counter amount (Cn) and the total target amount (tn) as desired.

<The current amount>



<The remaining amount>



④ After the total target amount is set, use **B-37** and **B-38** to set the movements.

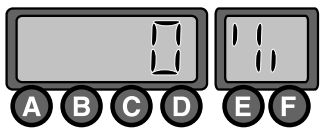
<Set value of B-37>

- 0: When work is finished, the buzzer will go off and sewing may begin
- 1: When work is finished, the buzzer will go off and sewing may begin only when the (PROG) button is pressed
- 2: When work is finished, the buzzer will not go off and sewing may begin

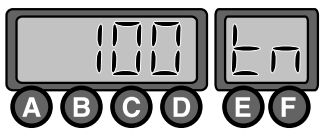
< Set value of B-38>

- 0: No returning to automatic initial value when counting is complete
- 1: Returning to automatic initial value when counting is complete

<The progress>



<Total target amount>



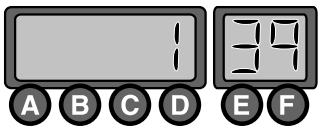
[Caution]

When B-38 is set at "0", the value will keep on going up/down even when counting is complete. The user will need to re-set the value of Cn to restart.

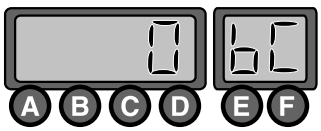
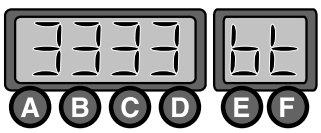
B. How to use the detailed functions of bobbin counter

Bobbin counter is designed to check the remaining amount of the lower thread.

a. To use the counter, set detailed functions beforehand.

① To use the bobbin counter function, first set the value of the parameter **B-39** (Group B, item 39). • 0: Bobbin counter function not used • 1: Bobbin counter function used ※ The default value is set at "0". At this point, the bobbin counter will not start even when the counter button in the program unit is set at bobbin counter function.	

b. Detailed functions of bobbin counter

① Select the bobbin counter function by pressing PROG button to get the lamp flashing. Press F button and the display will change as shown in the right. "bc" stands for bobbin counter.	
② At this point, press F button to change the display to "UP". Press F button again to go back to the initial display of "3333 bt". Press F again to change to "bc" as explained in ①. The display will change by pressing F button.	 

• [bc]	It stands for the Bobbin Counter; the value will be increased from "0". (Initial value: 0, Set range: 0~9999, How to set: use C / D button)
• [UP]	This value will go up in proportion to the increasing ratio of "BC(Bobbin Counter)". Use this value to get the initial value of "BC(Bobbin Counter)" (Initial value: 0, Set range: 0~9999, Set manual increase/decrease function with C/D button)
• [bt]	Back-tack function that is shown in the initial display

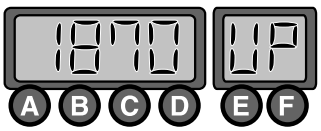
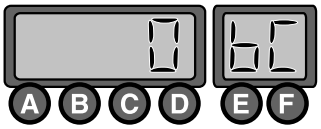
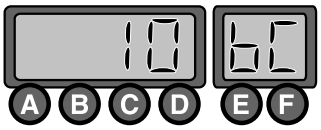
[Caution]

※ Pay caution when using and ENTER button, designed to perform special functions for bobbin counter.

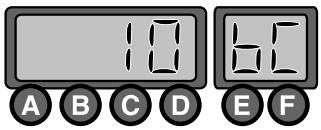
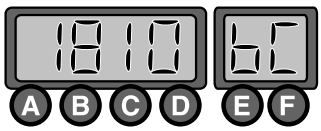
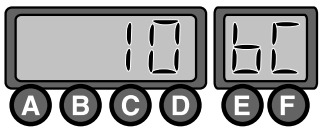
• ENTER button (Store counter value) : Press ENTER button when "bc" or "UP" is shown on the display. The current indicated value will be stored as value of bobbin counter.

c. Setting Bobbin Counter Functions

<table>
<tr>
<td>① When you start new sewing work, you must re-set the value of bobbin counter. Refer to the following if you do not know your re-set value.
• First move to “UP” display and use C, D button to change the value to “0”.
• Replace old lower thread with the new one. The amount of the lower thread must be consistent.
• Begin sewing. The more you sew, the higher the value of “UP” will be.
• Continue sewing until you run out of the lower thread.
• When there is no lower thread left during sewing, press ENTER button to store the counted value.
• Before saving, subtract some 10~20 from the value in order to reflect the counted value after the lower thread ran out.</td>
<td> 


</td>
</tr>
<tr>
<td>② When the bobbin counter setting is complete, move to “bc” display.</td>
<td> 
</td>
</tr>
<tr>
<td>③ The value of “BC(Bobbin Counter)” increases gradually when sewing begins after completing set-up.</td>
<td> 
</td>
</tr>
<tr>
<td colspan="2">[Caution]
※ Before using the bobbin counter function, move to “bc” display or initial display. If you start working from “UP” display, the value of counter will go up.</td>
</tr>
</table>

d. When bobbin counter is complete

① Replace the old lower thread with the new one and start sewing, then the value of "BC(Bobbin Counter)" will go up gradually.	
② Take note that the buzzer will go off when the value goes up, and the gap between that value and setting value narrows under 20. This is to warn that there is little lower thread left.	
③ The value of Bobbin Counter is reached at setting value, the stitching will be stopped and the buzzer will go off and the monitor will start blinking.	

④ When sewing stops after counting is complete, use the following method to return.

- Press the ENTER button to change the value of "BC" to the "0" automatically. (AUTO CLEAR/PRESET)

[Caution]

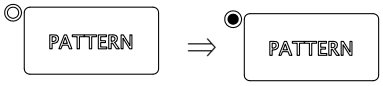
※ To use the bobbin counter function, first set B-Group 39 to "1."

※ Use F button to change the display to set/clear the value of bobbin counter during sewing.

※ Wind the lower thread with consistency to ensure the proper use of bobbin counter functions. Counter functions may work differently depending on lower thread and sewing conditions.

(9) Method of Use: Pattern Work Selection Button

A. Method to Set Up the Pattern Work Function

This function is used when you need to continuously work on a sewing material. If the light goes on after pressing the button, you can use the pattern sewing function.	

B. Method of Use of Pattern Sewing Specific Functions

① Cautionary words when using the pattern function

- Before using the pattern function, finish the trimming work and turn on the pattern switch light.
- If the user presses the pattern switch twice when he/she is not using the pattern function, the light will go off and he/she will be able to go back to normal sewing. However, if the pattern mode has not been completely finished, the pattern light will not go off.
- The pattern function sewing speed will be the programmed speed.
- The value set in each pattern mode is not erased when the power is turned off. Therefore, if you want to use the same pattern again, press the same mode again to use it. However, if the program is initialized, all the formerly programmed information will be erased and the user must reset the information again.

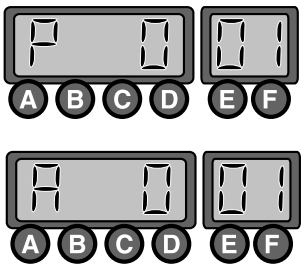
② Method of use: PATTERN function

ⓐ first press the PATTERN button and select the pattern sewing function.
ⓑ Select the pattern you want and the light will go on the pattern you selected.
ⓒ If you press the PROG button, the screen will change and you can use the stitches of each side of the pattern you chose to program the value.

< Method to program the value of each pattern side >

- Method by using the C, D buttons
  - − Inputting directly the number of stitch the user wants by using the buttons C and D. This method is used when the user already knows the length of the stitches he/she is choosing.
  - − Method using the pedal movement
  - − This is a function used when the user does not know the stitch length and sews directly to check the number of stitches for the pattern he/she wishes to program. If the user presses on the pedal after the programming screen comes on, the pedal can program the number of stitches by using the accelerating and decelerating characteristics through the pedal's sensors. The standard for choosing the number of stitches here is slower than the normal sewing speed and the programmed pattern sewing speed.
  - − Method using the A button and 1/2 stitch button
  - − This function is used when the user needs to make small adjustments at the end of the pattern work. It allows the user to check and program the pattern length while he/she sews at a slow speed or sews half stitches.

<Screen showing thef programming of stitch numbers for each side>



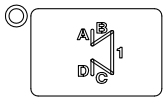
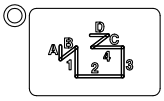
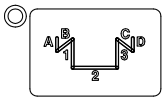
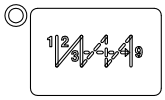
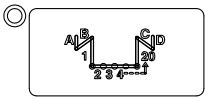
P : When the AUTO light is off, the machine stops when the pedal is released while sewing.
A : When the AUTO light is on, the machine will finish sewing the pattern section even if user releases pedal while sewing.

ⓓ After programming is finished, press the ENTER button and save the set up value. Then press the PROG button. After the stitch numbers of each side disappear from the screen, you can start sewing with the programmed value in the pattern sewing function.
ⓔ The pattern sewing speed is constant because it sews at a programmed speed not by the acceleration or deceleration of the pedal. If you press the pedal after pressing the AUTO button and see the light blink, sewing will continue until it is finished even if you release the pedal.

Caution

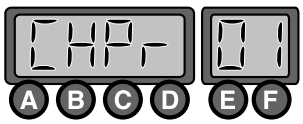
- After setting each side of the stitches, the user must press the ENTER button to save the programmed value.
- When the pattern has more than one side, the pattern work only operates for the number of stitches programmed for each side.

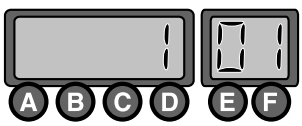
③ Specific items of each pattern

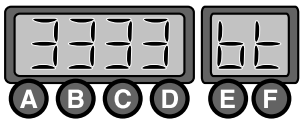
	A convenient pattern for straight sewing at constant speed for a definite length. The sides can be set from 0 to 999 stitches.
	A convenient pattern for repetitive 3-sided sewing. Each side can be set from 0 to 999 stitches.
	A convenient pattern for 4-sided sewing. Each side can be set from 0 to 999 stitches. (Used often in square sewing)
	A convenient pattern when forward/backward sewing is needed continually. forward/backward sewing is possible 9 times. Also each side can be set from 0 to 999 stitches. (This pattern is used for continuous work on back tags of leather belt rings).
	A convenient pattern when the user wants to make many-sided patterns. The user can make patterns of up to 20 sides. Each side can be set from 0~999 stitches.

④ Method of Use : Chain function (pattern linking function)

- First press the PATTERN button and select the pattern sewing function
- Next, press the CHAIN button.
- If you press the PROC button, the screen will change as the figure shows on the right. You can change the number of chains with buttons E, F.
- If you want to program the number of chains in the pattern you want, use buttons and, to go to the item you want and press the pattern button.
- At this time when you press the button A, the screen is changed like the picture and the screen for setting how many times you operate a desired pattern with a desired number is displayed.
- The performance frequency can be input by using button C and D.
  - ▶ Input range: 1~250 times (standard: 1 time)
  - ▶ Example: No.1 pattern (5 times) → No.2 pattern (10 times) → ·· ··
- After programming the chain numbers as explained above, press the ENTER button and the change of value will be saved. Then press the PROC button to come out from the chain programming screen.
- If you operate the programmed sewing work, the pattern with the blinking light is the current work being done and the pattern with the light on continuously is the next programmed pattern.







※ If the user presses the when using the pattern sewing function, the AUTO light will go on and the machine will automatically sew the programmed pattern section even if the user releases the pedal.

Caution

- After programming the chain function and pressing the ENTER button, the set up value is saved.
- If you change the pattern program while sewing, it will sew with the new programmed pattern.
- If the last chain pattern is finished, it will automatically go to the first sewing pattern.

(10) Method of Use: Constant Speed Sewing (AUTO) Selection Button

This button is used to choose the sewing speed. It offers two functions according to where the light turns on.

- When the light is blinking
  - If the user presses on the pedal, the machine will sew at the programmed sewing speed.

- When the light is off
  - The machine will sew according to the amount of pressure given to the pedal by the user.

Caution This button works in a different way when using the pattern function. Please refer to section 10).

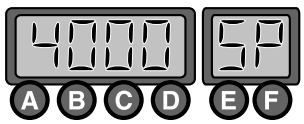
(11) Method of Use: Sewing Speed Program Changing Button

A. Method to Check Sewing Speed

If you want to check the current programmed sewing speed, you must press the 

button. If you briefly press the △ button ▽ button once, the screen shown on your right will appear briefly and then return to the initial screen.

※ The speed on the screen is the limit of the maximum sewing speed.

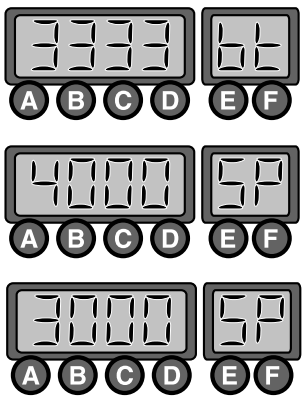


Caution The maximum speed and minimum speed limits can be changed by changing the parameter's specific items.

B. Sewing Speed Changing Method

① When you want to change the sewing speed, you can see the screen that shows the current sewing speed by pressing the △ button or ▽ button.

② If you see the current speed on the screen, you can change the speed by using the △ and ▽ button before going back to the initial screen.
- When you press the buttons twice in sequence: The sewing speed increases/decreases by 40RPM.
- When you keep pressing the button: The sewing speed increases/decreases rapidly.



Caution
-Be aware that if you don't press the △ or ▽ button, the screen will automatically go back to the initial screen.
-The maximum speed and minimum speed limits can be changed by changing the parameter's specific items.

3) Start and End Backtack Stitch Correction Method

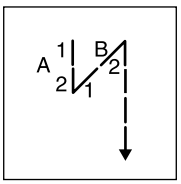
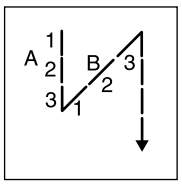
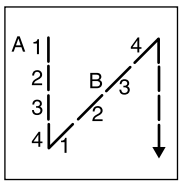
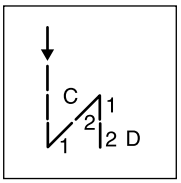
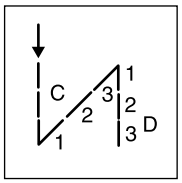
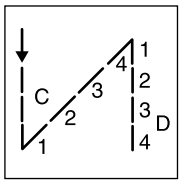
※ Since backtack stitches may vary according to the type of sewing machine, use the following stitch correction method.

※ To adjust the stitch fast and clean, users should check the stitch condition before commencing the correction.

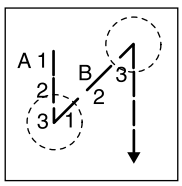
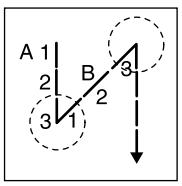
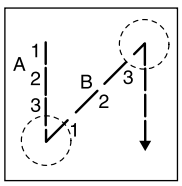
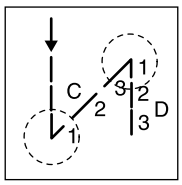
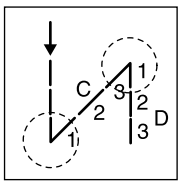
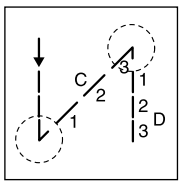
① Classification according to backtack sewing condition

※ The backtack sewing condition can be classified as follows (When A: 3 stitches, B: 3 stitches, C: 3 stitches, D: 3 stitches)

A. When one more or less stitch than the set stitch number is sewn

Classification	Sewing condition where few backtack stitches are sewn	Correct backtack sewing condition	Sewing condition where more backtack stitches are sewn
Start backtack Sewing condition	 When sides A and B each have one less stitch sewn	 When sides A and B each have 3 stitches correctly sewn	 When sides A and B each have one more stitch sewn
End backtack Sewing condition	 When sides C and D each have one less stitch sewn	 When sides C and D each have 3 stitches correctly sewn	 When sides C and D each have one more stitch sewn

B. When one more or one less stitch is sewn than the programmed stitch number

Classification	B/T condition where the stitch length comes out shorter	Correct B/T sewing condition	
Start backtack Sewing condition	 When the length of the last three stitches in sides A and B have been sewn short.	 When sides A and B have 3 stitches correctly sewn.	 When sides A and B each have 3 stitches and a half stitch (or less than one stitch) sewn
End backtack Sewing condition	 When the length of the first stitch in sides C and D have been sewn short.	 When the sides of C and D have 3 stitches correctly sewn	 When the sides of C and D each have 3 stitches and a half stitch (or less than one stitch) sewn.

Caution

The figures above show each representative sewing condition. And there may be some differences according to the conditions of the sewing machine and it is normal that two types of conditions occur at the same time.

② Start/End B/T stitch number correction method

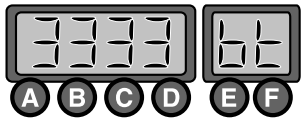
※ The method to correct B/T stitch numbers may differ according to the user. However it is basically done in the following order.

A. When the machine sews one less or one more stitch than the programmed number of stitches.

ⓐ First, fully check the B/T sewing condition

: Commence sewing and check the current sewing condition. Refer to the figure above.

<Initial screen>



ⓑ If you have checked the sewing condition, first correct the stitch number that differs by one or more stitches to the programmed stitch number.

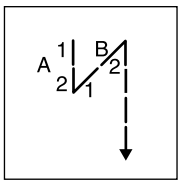
※ Correction method for stitch numbers with more than one stitch difference

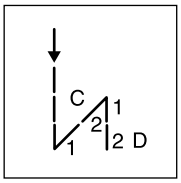
- Program range: -6 stitches ~ 6 stitches
- Program unit: 1 stitch
- Method to apply correct stitch number (program using buttons A, B, C and D).

Side A programmed value	3(programmed stitch number) + (3-actual stitch number sewn on side A)
Side B programmed value	3(programmed stitch number) + (3-actual stitch number sewn on side B)
Side C programmed value	3(programmed stitch number) + (3-actual stitch number sewn on side C)
Side D programmed value	3(programmed stitch number) + (3-actual stitch number sewn on side D)

- After programming, press the PROG and 1/2 buttons simultaneously.

Ex) When there is one less Start or End B/T stitch sewn.

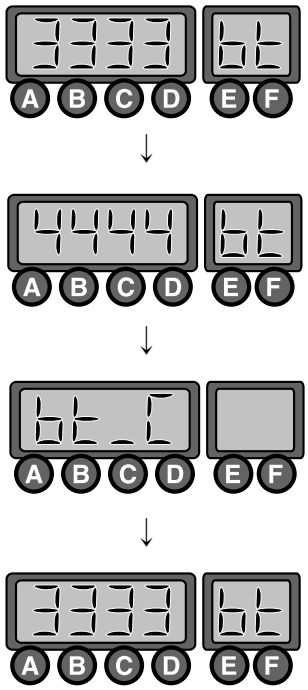




a In the initial screen use buttons A, B, C, D to change it from "3 3 3 3" to "4 4 4 4."
b After programming it to "4 4 4 4" press the PROG button. Then press the 1/2 stitch button. You will see the letters "bt-C" and the buzzer will ring three times and the screen will automatically return to the initial screen.
c The changed initial screen will continue to display the wanted B/T programmed value of "3 3 3 3."
d Recommence sewing and check the corrected stitch number
e If the corrected sewing condition continues to show more than one stitch difference, repeat steps (a~d) and make corrections.

※ The example above is an explanation of when one B/T stitch number comes less than one

※ When there is more than one stitch is added or missing, you can correct the stitch number as explained above.



Caution

※ The stitch number correction value program range is between -6 stitches to 6 stitches. You cannot see the currently applied correction value on the initial screen. If you want to see the currently applied correction value, press the PROG button and then the AUTO button and either check the programmed value of each side or check items 30(side A's correction value), 31(side B's correction value), 32(side C's correction value) and 33(side D's correction value) from Group B of the parameter.

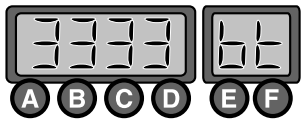
※ If each side's corrected value has been corrected to the minimum or maximum value limit (between -6 stitches to 6 stitches) and the sewing condition is still not correct, reduce the B/T sewing speed.

※ Generally, you can correct in the manner mentioned above when there is more than one stitch difference. And you can correct when there is less than one stitch difference with the item mentioned in the next page.

B. When the machine sews less than a stitch more or less than the one programmed.

ⓐ If there are still problems with the B/T sewing condition even after correcting the stitch numbers for more than one stitch difference based on item "A," refer to figure ①-B and check the sewing condition again.

<Initial screen>



ⓑ Look at the sewing condition and make the correction as follows:

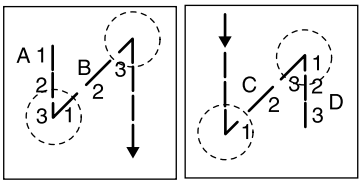
※ Program range for making stitch corrections for less than one stitch:(Prog+Auto)

- -6 stitches ~ 6 stitches
- Program unit: 0.05 stitches (Corrections are done by dividing one stitch into 20 parts).
- Initial program: A(00.30), B(00.30), C(00.40), D(00.40)
- Correct stitch number application method (use C and D buttons for programming).

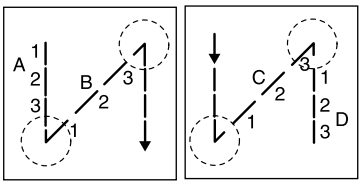
※ When the stitch length comes out short(the third stitch of sides A and B/ the 1st stitch of sides C and D)

Side A program value	□□ □□ (Currently programmed corrected value)
	+ (01.00-the length of the 3rd stitch sewn in side A)
Side B program value	□□ □□ (Currently programmed corrected value)
	+ (01.00-the length of the 3rd stitch sewn in side B)
Side C program value	□□ □□ (Currently programmed corrected value)
	+ (01.00-the length of the 1st stitch sewn in side C)
Side D program value	□□ □□ (Currently programmed corrected value)
	+ (01.00-the length of the 1st stitch sewn in side D)

<When the stitch length comes out short>



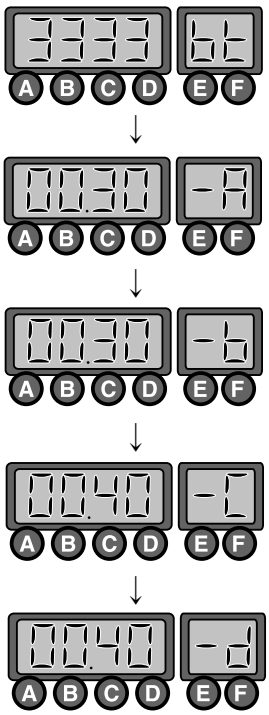
<When the stitch length is less than one stitch>



※ <When the stitch comes out less than one stitch longer> (the last stitch of sides A and B/ and the first stitch of sides C and D)

Side A program value	□□ □□ (currently programmed correction value)
	- the length of the extra part of the stitch sewn on side A
Side B program value	□□ □□ (currently programmed correction value)
	- the length of the extra part of the stitch sewn on side B
Side C program value	□□ □□ (currently programmed correction value)
	- the length of the extra part of the stitch sewn on side C
Side D program value	□□ □□ (currently programmed correction value)
	- the length of the extra part of the stitch sewn on side D

Caution: The shadowed part is the currently saved correct value.



• After programming, press the ENTER button and save the programmed value.

Ex) When the Start/End B/T stitch length is shorter than the programmed stitch length (by around half a stitch).

a In the initial screen, press the PROG button and then also press the AUTO button.

b The screen will then go to the stitch number correction screen. Using the E, F buttons you can change the length of each side (A,B,C and D) in this screen.

c If you have finished programming the new correction values to sidesA, B, C and D, press the ENTER button and save the corrected value. If you press the PROG button, you will return to the initial screen. (A:00.30, B:00.30, C:00.40, D:00.40) → (A:00.50, B:00.50, C:00.75, D:00.75)

d Commence sewing and check the B/T sewing condition.

e If the corrected sewing condition still shows differences between the programmed value, the repeat steps (a~d) and continue correction.

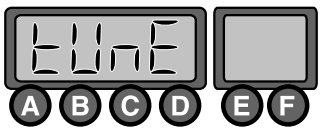
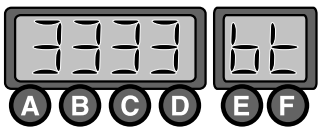
Caution

※ If each side's corrected value has been corrected to the minimum or maximum value limit (between -6 stitches to 6 stitches) and the sewing condition is still not correct, reduce the B/T sewing speed.

※ Generally, you can correct for when there is more than one stitch difference with item A. However, with item B, you can correct when there is either more or less than one stitch difference.

※ Make sure to press the ENTER button and save the programmed value when you finish programming sides A, B, C and D's new correction value.

4) Method of Use: Inertia Tuning Function

① The inertia tuning function enables the machine to save the gain value of the motor that matches the loaded inertia. If you simultaneously press buttons PROG and ENTER, you will see the inertia tuning screen. Then, you will see the words "TUNE" blinking.	<Inertia tuning initial screen> 
② When the screen changes, you must press the pedal until the buzzer rings. If you release the pedal before the buzzer rings the inertia tuning won't be completed. Therefore, you must press on the pedal until the buzzer rings. (When doing inertia tuning, the sewing machine will operate and stop 10 times).	<Initial screen> 
③ When inertia tuning is completed, the buzzer will ring and it will automatically return to the initial screen.	

Caution	Inertia tuning can only be carried out when the controller is attached to the sewing machine for the first time and when the sewing machine does not accelerate or decelerate quickly.

5) Advanced Pattern Sewing Functions

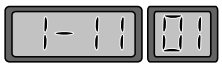
(1) Related Parameters

Parameter No	Parameter Name	Set Value
A-76	Pattern Advanced Function	0(Disable) / 1(Enable)

(2) Features of Function

Item	Description
① Supporting existing pattern functions	■ If Parameter A-76 is set at (0) for Disable, the existing pattern functions can be used as same.
② Max. Pattern Value	■ Up to 15 patterns can be used.
③ How to set	■ Parameter A-76 can be set in two ways. A. Setting by parameter adjustment a. Press PROG + A to move to Parameter Group A.  b. Use E and F to move to A-76.  c. Use C and D to change a set value.  d. Press ENTER to save a set value and press PROG to revert to the initial screen.  B. Setting with hotkeys a. Press PROG + PATTERN to move to Parameter Group A.  b. Use C and D to change a set value.  c. Press ENTER to save a set value and then press PROG to revert to the initial screen. 
④ Considerations	■ When using hotkey functions, press PATTERN to turn off LED before use. ■ When using extended pattern functions, make sure of using No. 1 pattern.

(3) Detailed Functional Setting and Use

Sequence	Description	Remarks
① Enable the Pattern Extension Function	■ Set A-76 at 1, and use hotkey functions to amend the set value from 0 to 1.	
② Check No. 1 pattern setting	■ Check if Pattern No. 1 LED is on. - In the event that LED is on for other patterns, press No. 1 PATTERN button to select.	
③ Enter the set values for pattern stitch count as many as desired among 15 patterns.	■ A / B buttons: Move around patterns from 1 to 15 to select a desired pattern. ■ C / D buttons: Enter the stitch count into the pattern number currently marked.(The set value is automatically saved) ■ "Yes" is displayed on the screen. Set 11 stitches for No. 1 pattern.  Set 10 stitches for No. 14 pattern. 	No.10 : A No.11 : B No.12 : C No.13 : D No.14 : E No.15 : F
④ When one among set patterns is used	■ Use A and B buttons to move to a desired pattern and begin sewing.	
⑤ In the event of conducting chain sewing in the set pattern order	■ Press CHAIN button to turn on CHAIN LED, and then begin sewing. - Start sewing from No.1. ■ Possible to use A and B buttons to change the start position.	
⑥ Notice	■ During the chain sewing, if an encountered pattern's stitch count is zero (0), it is automatically converted to No. 1 pattern and sewing continues. ■ When using the pattern extension function, E and F buttons indicate the pattern number currently under work. ■ To release the function, press PATTERN button to turn off PATTERN LED and set A-76 at zero(0).	

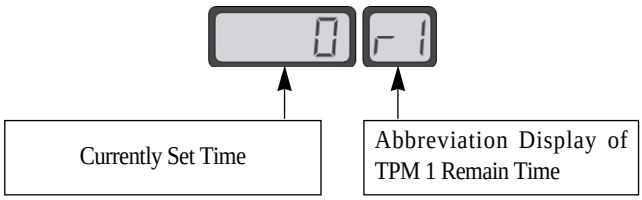
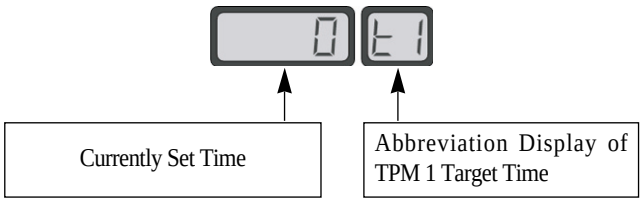
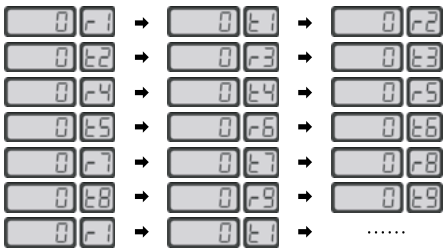
6) Use of Detailed TPM(Total Production Maintenance) Functions

(1) Activating TPM Functions

Explanation	Remarks
① Use parameters F-01 ~ F-09 to set a desired TPM number at "1."	Users can selectively set desired TPMs only. Example) Set TPM 1, TPM 3 and TPM 5 only while the rests remain unused.
② Up to 9 can be simultaneously set.	When setting multiple TPMs, alarms for each TPM could be issued simultaneously.(see the code entry function)
③ Check if F-41 Parameter is set at "1."	F-41 is 0 : TPM is unused. F-41 is 1 : Among F-01~09, the TPM set at "1." only is activated.

(2) Time Setting

A. Use of hot keys

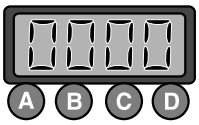
Explanation	Remarks
① When PROG button + COUNT button are pressed simultaneously, the screen displays "XXXX r1." (In the case of small-type PU, press the PROG button + ▼ button)	
② Press the E button, and the screen is changed to "XXXX r1."	
③ Continuous pressing of the E button moves up to next step. Pressing the F button moves to previous steps. (Able to check the currently set time and remain time)	- When continuously pressing the "E" button  - When continuously pressing the "F" button
④ During the moves across screens, pressing the C button increases the set value by one, while pressing the D button decreases the set value by one. (Unless Parameters F-1 ~ F-9 are set at 1(Enable), hot keys cannot be used to change target time and remain time.)	[Caution] - Changing the target time value automatically resets the remain time value to be same as the target time value. - After the target time value is changed, the screen displays the value before the change. However, after exiting the setup mode by pressing the PROG button and making re-entry, the changed value is displayed.

Caution	Unless Parameters F-1 ~ F-9 are set at 1(Enable), hot keys cannot be used to change target time and remain time.)

B. Use of Parameters

Explanation	Remarks
① With the PROG button pressed, turn on the power.	
② Press PROG + F button to move to Parameter Group F.	
③ Use the E (Up) and F (Dn) buttons to move to F-11 ~ 19.	
④ Set TPM time respectively at F-11 ~ 19.	

(3) Password Setting

Classification	Explanation	Remarks
① Password Setting	■ Move to Parameter F-50 and the screen displays "0000"(initial password). ■ Use buttons A to D to change each digit of a password from 0 to 9. ■ Replace the initial password with the desired one and press the ENTER button to save the setting.	 A Button A: Set the first digit B Button B: Set the second digit C Button C: Set the third digit D Button D: Set the fourth digit
② Enabling Password Function	■ Set Parameter F-42 to decide enable/disable of a password function. ■ Set Parameter F-31~39 to enable a password function for TPM.	When a password is unused and an alarm is issued, simply pressing "Enter" leads to the reset to default value and the alarm is stopped.
③ Features of Password Function	■ When sewing is conducted after TPM setup, TPM alarm is issued in a certain time. ■ To stop alarming by pressing ENTER, the password function is enabled. (The screen shows "PASS ED" and then "0000".) ■ If ENTER is pressed after wrong password entry, short beep sound is issued three times and the screen stands by for password entry. [Caution] In the case of using the password function, without proper password entry, the screen exit is not possible (The screen lock is not released even after power-off and power-on.)	 Displaying an alarm issued for the first TPM time  Abbreviation of Password. "E" in Ed represents "W."
④ Alarm Issuance	■ When the TPM function is used, an alarm is issued in the set time. (Displayed as "CHEC XX." "XX" represents concerned TPM number and is displayed as one among "0~9" indicating the checkup number subject to alarm.) ■ If multiple TPMs are set, over time, alarm timings could coincide to be same. In this case, the alarm of a lower number is issued first. After machine check and alarm release (Press " ENTER "), the alarm of next number is issued for checking out other parts of the machine.	

(4) Detailed Description on Time Setting

Classification	Explanation
① Related Parameters	■ F-43 : Setting the rated speed of a machine ■ F-44 : Applicable environmental variable when the set time is reduced ■ F-45 : Speed adjustment unit when adjusting time depending on current speed
② Detailed Description on F-43	■ By comparing the current speed with the rated speed, a value is set to reflect time variables against the current speed. ■ If the current speed is higher than the rated speed, the remainder of the set time is reduced, and otherwise, the remainder of the set time is increased. ■ The remainder of the set time can be increased/decreased at the degree set in F-44~45.
③ Detailed Description on F-44	■ When the remainder of the set time is reduced, the applicable environmental variable can be set at 1~20(0~50[%]). ■ The reduction ratio of a set time can be adjusted in reflection of current speed, temperature, and humidity.
④ Detailed Description on F-45	■ The parameter takes into consideration the current speed vs the rated speed as part of the time reduction factors. ■ The parameter sets the speed range.
⑤ Example	■ F-43 : Set 3000[spm] (rated speed) ■ F-45 : Set 400[spm] (When adjusting time in line with the current speed, this is the speed adjustment unit) ■ Current user speed: 2500[spm] ■ Result Between 3000 ~ 2600[spm] (Step 1 for extending the speed reduction time) and 2600 ~ 2300 (Step 2 for extending the speed reduction time), the current speed belongs to Step 2 so that the concerned amount of speed reduction time will be extended.

Caution

1. Due to the environmental factors as stated above, actually an alarm is issued not at the set time but according to the value considered at F-43/44/45.
2. Unless special change is made, F-43/44/45 is set at default values, and their values are reduced at a certain reduction ratio. In the event that mismatch between the actual checkout time and the alarming time occurs, the set time can be adjusted.

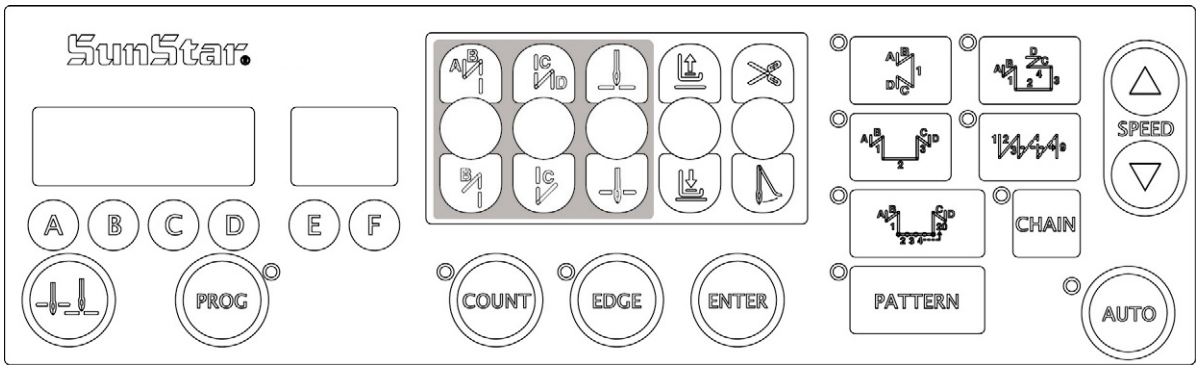
9

FORTUNA SERIES SOFTWARE METHOD OF USE

1) Basic Functions of the Fortuna Series Software

(1) Initializing

This function is used when the user randomly changes the parameter's programmed value, and forgets the original program contents.



Method of initializing: Turn the power on by simultaneously pressing the buttons in the figure above which are the start B/T button + end B/T button + needle plate up/down stop button.

Caution

- If you initialize, all the changes made by the user are changed to the original values programmed when the machine was delivered from the factory, therefore only change the value if absolutely necessary.
- After initializing, rotate the machine for 1000RPM or more for approximately 5 seconds. You must make the machine remember the location of the FILM.

(2) Sewing Machine Up/Down Stop Location Automatic Recalling Function

When first purchasing the controller, if the user steps on the pedal for 5 seconds and runs the motor before beginning the sewing work, the machine will automatically remember the sewing machine's up/down stop location. However, when using a synchronizer this step is not necessary.

(3) Method of Use and Functions of the Program Unit and the General Control Box's Simple Operation Box.

Please refer to the former explanation for details of program operation panel.

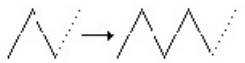
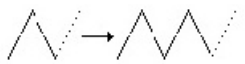
(4) Function Parameter

Parameter group	Functions
① Group A	General functions of the sewing machine
② Group B	All types of output, Full-on Time/PWM Duty, checking input/output operations, sewing machine models and thread trimming sequence programming
③ Group C	Pedal acceleration/deceleration curve, slow starting speed and input/output port change related parameters
④ Group D	All types of gain parameter related motor control
⑤ Group F	TPM(Total Production Maintenance)-related Parameters

※ If the specific items of the parameter are changed carelessly, they could cause breakdown or damage the machine. Therefore the user must be well-trained before using it.

2) Fortuna Series 6 Software Specific Parameters

(1) Group A Parameter: General functions of sewing machine

No.	Function	Initial value	Range	Step
1	Minimum speed of pedal (limit of sewing machine's minimum speed)	200spm	20~510	2spm
2	Maximum speed of pedal (limit of sewing machine's maximum speed)	4000spm	40~9960	40spm
3	Thread trimmer speed (Sewing machine speed from beginning to end of thread trimming when using CAM type)	300spm	20~510	2spm
4	Program Unit + 1 stitch speed (Key's performance speed)	100spm	20~510	2spm
5	Lifting of needle plate with button A, dropping speed ('s performance speed)	300spm	20~510	2spm
6	Pedal degree of acceleration (Pedal Curve) ( ;When the maximum speed is put in 255 steps)	255	1~255	1
7	Start Back-Tack Speed	1700spm	20~2000	10spm
8	End Back-Tack Speed	1700spm	20~2000	10spm
9	Thread trimming operation time (The A24 used in PNEUMATIC = must be 1) (The Solenoid operation time)	100ms	4~1020	(When doing an aging test, the value is equal to the running time)
10	Tension release operation time (The A24 used in PNEUMATIC = must be 1)	200ms	4~1020	(When doing an aging test, the value is equal to the thread trimming time)
11	Tension release time (In CAM type, the used A24 = must be 0) (In CAM type, the tension release is the value of the moving CAM angle)	255	0~255	
12	Waiting time for the next operation after thread trimming (This is the delaying time to carry out the next operation after thread trimming is finished)	4ms	4~1020	
13	Wiper operation time (Wiper Solenoid operating time)	48ms	4~1020	4ms
14	Waiting time after wiper operation(presser foot-lift etc.)	40ms	4~1020	4ms
15	Automatic presser foot-lift delaying time	100ms	4~1020	4ms
16	Automatic presser foot- lift maintaining time (After programmed time the presser foot-lift is automatically released)	300×0.1sec	5~1000	0.5sec
17	Automatic presser foot-lift drop waiting time for next operation (The delaying time, or the time that the foot-presser lift is maintained, the pedal is started until the presser foot-lift drops and the sewing machine is started)	100ms	4~1020	4ms
18	Selection for automatic foot-presser lift after thread trimming	0	0/1	1=lift selection
19	Selection for pedal thread trimming position	0	0/1/2	0=step backward thread trimming 1=1 step backward thread trimming 2=thread trimming at neutral position
20	The maximum sewing speed for the KM-1060BL-7 presser foot-lift with mutual crossing quantity of 4.8 ~ 7.0[mm]	2000spm	200~2000	10spm
21	Delaying time for complete release of KM-1060BL-7 B/T Solenoid	200ms	4~1020ms	4ms
22	Select to operate 2 start B/T ()	0	0/1	Choose between 1 or 2
23	Select to operate 2 end B/T ()	0	0/1	Choose between 1 or 2
24	Selection of thread trimming conditions (selection according to sewing machine type)	0	0/1/2	0=CAM type machine 1= thread trimming after up-stop 2=thread trimming after low-stop
25	Whether or not to use default sequence when A24 = 1 (This is a sequence determined on A9,A10 value)	0	0/1	0=B-55 exclusive sequence is used 1= default sequence is used

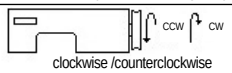
Caution

If the specific items of the parameter are changed carelessly, they could cause breakdown or damage the machine. Therefore, the user must be well-trained before using it.

No.	Function	Initial value	Range	Step
26	Selection of B/T Solenoid operation position	0	0/1	0= lower position 1= upper position
27	Setting the maximum sewing speed of the machine according to presser foot-lift height of the KM-1060BL sewing machine.	?	?	program P1xx → P2xx → P3xx in order Less than P1xx:3500[spm] Less than P2xx:3000[spm] Less than P3xx:2500[spm] More than P3xx: A20[spm]
28	Needle bar's automatic stop at the highest position	0	0/1	
29	Pedal analog filtering difference	15	1~200	1
30	When using an angle 2-needle, select the semi-automatic corner operation	0	0/1	1=selection of semi-automatic
31	Speed when selecting a semi-automatic corner (parameter used only when used after selecting number 30)	200spm	20~2000	10spm
32	After selecting the left needle the first sewing stitch (parameter used only when used after selecting number 30)	3 stitches	0~255	1 stitch
33	After selecting the left needle the second sewing stitch (parameter used only when used after selecting number 30)	3 stitches	0~255	1 stitch
34	After selecting the right needle the first sewing stitch (parameter used only when used after selecting number 30)	3 stitches	0~255	1 stitch
35	After selecting the right needle the second sewing stitch (parameter used only when used after selecting number 30)	3 stitches	0~255	1 stitch
36	Maintaining time for the left/right needle solenoid (After the programmed time the solenoid is automatically released)	450×0.1sec	50~1000	0.5sec
37	NOT USED			
38	NOT USED			
39	Stopping function during AUTO mode and while pedal is neutral	1	0/1	0=does not stop 1=stops
40	Selection of type of N-stitch Sensor	0	0 : active high	1 : active low
41	The number of stitches done after the N-stitch Sensor has finished sensing. (After sensing, it will sew the programmed number of stitches and stop)	3 stitches	0~255	1 stitch
42	N-stitch sewing speed	1000spm	20~2000	10spm
43	Selection of One Touch function → replaced by AUTO Key function (Used in the sewing mode that uses the auto function)	0	0/1	1=Auto Mode
44	Selection of One Touch function → replaced by AUTO sewing mode programming (If there is no thread trimming signal when selected, sewing will continue even if user releases pedal)	0	0/1	1=One-Shot Mode
45	One-Shot sewing speed → When using AUTO function, it is programmed with the speed Up/Dn Key	2000spm	40~9960	40spm
46	N-stitch sewing mode selection → a sewing mode that inputs a sensor signal in the edge sensor port and uses it as an edge sensor	0	0/1	1=N-stitch Mode
47	Selection of pre-stitch function (When selected it will perform only the programmed stitches before the actual sewing work starts)	0	0/1	1=selection
48	Pre-stitch number of stitches	3 stitches	0~255	1 stitch
49	Pre-stitch speed	2000spm	20~2000	10spm
50	Selection of start B/T operating conditions (0 : if pedal is released during back tack, it will stop) (1 : if pedal is released during back tack, the work will still be completed) (2 : it will perform the exact amount of back tack stitches)		0 : B/T stop function selected 1 : B/T work completion 2 : B/T exact stitch performance	
51	Selection of end back tack performance condition (It will perform the exact amount of stitches for end back tack)	0	0/1	1= exact stitch performance
52	Back tack initial first stitch speed during back tack exact performance	200spm	20~1000	10spm

Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

No.	Function	Initial value	Range	Step
53	Change between B/T and switch with buttons A or B during sewing	0	0/1	1= Select with button B
54	Selection of button A function	2	0 : Only B/T operates 1 : Lift and drop needle plate with one movement. 2 : Lift needle plate with one movement. Drop needle plate with two movements 3 : Slow performance when stopped (1/2 stitch speed)	
55	Selection of Button B function	0	0 : B/T delete insertion 1 : Lift and drop needle plate with one movement 2 : Slow performance when stopped (1/2 stitch speed) 3 : Only B/T operates	
56	Selection of speed during manual back tack during sewing	0	0/1	0 : current sewing speed 1: initial reverse speed
57	NOT USED			
58	Thread Trimming Sequence Selection of SunStar Chain Stitch Machine	1	0/1	1
59	Thread Trimming Sequence Selection of other Company chain Stitch Machine	0	0/1	1
60	Selection of reverse rotation after trimming	0	0/1	1:selection of reverse direction
61	Reverse rotation distance when selecting reverse rotation after thread trimming	20degree	0~250	1degree
62	When machine stops fix pulley (When machine stops fix the motor by force)	0	0/1	1: fix when machine stops
63	Power to fix the A number 62 Pulley	40	10~100	1
64	Distance recovered after fixing A number 62 Pulley and rotating it by force	20degree	10~100	1degree
65	Select the motor rotating direction ()	1	0/1	1 : clockwise 0 : counterclockwise
66	Target speed : If this speed is reached or passed, a signal saying “Target speed has been reached” will appear. (As an interior Port it is alloted and used in the ‘C’ GROUP-Default is auxiliary)	1000spm	40~9960	40spm
67	Delay start setup	0	0/1	0=normal start 1=Delay start
68	Delay start time duration setup	3	3~250	1 × 100[ms]
69	Setup of needle bar's stop at the lowest position after trimming when the pedal is pressed	0	0/1	0=disabled 1=enabled
70	Setup of the duration of needle bar's stop at the lowest position after trimming when the pedal pressed	100	100~250	1[ms]
71	Not Used	-	-	-
72	Detection time of over-voltage error	10[ms]	2~1020[ms]	2[ms]
73	Not Used	-	-	-
74	Detection time of low voltage error	10[ms]	2~1020[ms]	2[ms]
75	Not Used	-	-	-
76	Setting pattern sewing extension	0	0/1	0 : No pattern extension 1 : Pattern extension
77	Automatic changes of twin needles	0	0/1	0 : Teach stitch not used 1 : Teach stitch used
78	Start Backtack ON Duration	4[ms]	4~1020[ms]	4[ms] (Parameter run when the Backtack accuracy function is used)
79	Start Backtack OFF Duration	4[ms]	4~1020[ms]	
80	End Backtack ON Duration	4[ms]	4~1024[ms]	
81	End Backtack OFF Duration	100[ms]	4~1020[ms]	
82	Stitch width reduction during backtacking	0	0/1	0=disabled 1=enabled
83	Sewing speed screen display	0	0/1	0=disabled
84	Program unit type selection.	1	0/1	0=Simplified Manipulation 1=Full Function
85~89	Not Used	-	-	-

Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

(2) Group B Parameter : All types of output, Full-on Time/PWM Duty, checking input/output operations, sewing machine models and thread trimming sequence programming.

※ These are functions not used by general users and must be regulated by an A/S technician.

No.	Function	Initial value	Range	Step
1	Back Tack Solenoid Initial Full On Time	1020ms	4~1020	4ms
2	Presser Foot-Lift Solenoid Initial Full On Time	200ms	4~1020	4ms
3	T/T Solenoid Initial Full On Time	100ms	4~1020	4ms
4	Wiper Solenoid Initial Full On Time	100ms	4~1020	4ms
5	Tension Release Solenoid Initial Full On Time	100ms	4~1020	4ms
6	Left Solenoid Initial Full On Time (For Twin Needle)	100ms	4~1020	4ms
7	Right Solenoid Initial Full On Time (For Twin Needle)	100ms	4~1020	4ms
8	Auxiliary Solenoid Initial Full On Time	100ms	4~1020	4ms
9	Left LED Initial Full On Time (For Twin Needle)	100ms	4~1020	4ms
10	Right LED Initial Full On Time (For Twin Needle)	100ms	4~1020	4ms
11	Needle plate up-stop signal Initial Full On Time	100ms	4~1020	4ms
12	Needle plate down-stop signal Initial Full On Time	100ms	4~1020	4ms
13	Signal notifying motor running Full On Time	100ms	4~1020	4ms
14	Signal notifying target speed achieved Full On Time	100ms	4~1020	4ms
15	Back Tack Solenoid Duty Ratio	50%	0~100	10%
16	Presser Foot-Lift Solenoid Duty Ratio	20%	0~100	10
17	Thread Trimming Solenoid Duty Ratio	100	0~100	10
18	Wiper Solenoid Duty Ratio	100	0~100	10
19	Tension Release Solenoid Duty Ratio	100	0~100	10
20	Left Solenoid Duty Ratio (For Twin Needle)	50	0~100	10
21	Right Solenoid Duty Ratio (For Twin Needle)	50	0~100	10
22	Aux Solenoid Duty Ratio	100	0~100	10
23	Left LED Duty Ratio (For Twin Needle)	100	0~100	10
24	Right LED Duty Ratio (For Twin Needle)	100	0~100	10
25	Signal for up stopping needle Duty Ratio	100	0~100	10
26	Signal for low stopping needle Duty Ratio	100	0~100	10
27	Signal notifying motor running Duty Ratio	100	0~100	10
28	Signal notifying target speed reached Duty Ratio	100	0~100	10
29	NOT USED			
30	Start Back Tack A number of stitches correction value	00.30	6~6	0.05 Stitch
31	Start Back Tack B number of stitches correction value	00.30	6~6	0.05 Stitch
32	End Back Tack C stitch correction value	00.40	6~6	0.05 Stitch
33	End Back Tack D stitch correction value	00.40	6~6	0.05 Stitch
34	Selection for maintaining reverse solenoid movement when thread trimming (C Only B/T)	0	0/1	1=reverse direction maintained
35	Programming count condition (program whether or not automatic counter will be operated)	0	0/1	0=counter used 1=automatic counter after thread trimming
36	When automatically counting, select Up/Down count after thread trimming (thread trimming function must be enabled)	1	0/1	1=Up COUNT 0=DOWN COUNT
37	When count in completeded, the next operation is programmed	0	0/1/2	0=buzzer rings, sewing is allowed 1=buzzer rings, sewing is not allowed (If you press the Prog Key, set up is cancelled) 2=No buzzer ring, sewing is allowed
38	When count is completed, select the counter auto clear/preset	0	0/1	1=AUTO CLEAR/PRESET
39	NOT USED			

※ Items No. 30~33 : These are the items that make the number of stitches match when back tack number of stitches do not match.

※ Solenoid Duty Ratio : The power that holds and maintains the solenoid.

Solenoid initial full on time : The time it takes to pull the solenoid to the maximum in the outset.

Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

No.	Function	Initial value	Range	Step
40	Checks operation of B/T solenoid (OUTPUT00)	※After matching the number of the solenoid being tested, press the "+1stitch(-1+1)"key and check the condition of the movement. - Along with the output, it will say "on", or "off"		
41	Checks operation of P/F solenoid (OUTPUT01)			
42	Checks operation of T/T solenoid (OUTPUT02)			
43	Checks operation of W/P solenoid (OUTPUT03)			
44	Checks operation of T/R solenoid (OUTPUT04)			
45	Checks operation of left solenoid (OUTPUT05)			
46	Checks operation of right solenoid (OUTPUT06)			
47	Checks operation of Aux. solenoid (OUTPUT07)			
48	Checks operation of Left LED solenoid (OUTPUT10)			
49	Checks operation of Right LED solenoid (OUTPUT11)			
50	Checks operation of needle when signal notifies up stop (OUTPUT12)			
51	Checks operation of needle when signal notifies down stop (OUTPUT13)			
52	Checks operation of signal notifying motor running (OUTPUT14)			
53	Checks operation signal notifying target speed has been reached (OUTPUT15)			
54	Select [Thread trimming sequence] - The default is set to '0'. If you wish to input another sequence apart from the thread trimming sequence provided in the system input the newly composed sequence number. (Refer to the sequence composition method)	0	0~64	1
55	Thread trimming sequence data writing function			
56	Selecting sewing machine model - write the number that fits the sewing machine model provided in the full function manual.. - thread trimming sequence in the pertinent machine is copied. - if you want to correct the thread trimming sequence, change the contents of item B-55. (※However, be aware that if you initialize the parameter, the newly programmed changes will disappear and the thread trimming sequence will change to that of [SunStar 235/250]).	0	0~127	1 0~ 74 (non-order made) 75~118 (order-made) (Refer to attached material)
57	Independent operation of trimming sequence	0	0/1	0=operation after trimming 1=independent operation
58	Presser foot-lift solenoid slowing down time #1 (Applied only when it is full-on condition)	40ms	2~510ms	2ms
59	Presser foot-lift solenoid slowing down time #2 (Applied only when it is PWM)	30ms	2~510ms	2ms

※ Items No. 40~53 : functions that check if solenoid and other output signals are working properly.

※ Select Item No. 55 and press the Enter key. Along with the buzzer sound you will see the words "Seq 55" appear on the screen. Thread trimming sequence composition permitting condition is now possible. You can program a thread trimming sequence to a maximum of 64 bytes. (For thread trimming sequence program method, refer to attached material).

Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

No.	Function	Initial value	Range	Step
60	Checks the signal input INPUT00 (Button A)	Along with the input, it will say "on" or "off"		
61	Checks the signal input INPUT01 (Button B)			
62	Checks the signal input INPUT02 (1/4 stitch Switch)			
63	Checks the signal input INPUT03 (2/4 stitch Switch)			
64	Checks the signal input INPUT04 (3/4 stitch Switch)			
65	Checks the signal input INPUT05 (4/4 stitch Switch)			
66	Checks the signal input INPUT06 (Left Switch)			
67	Checks the signal input INPUT07 (Right Switch)			
68	Checks the signal input INPUT10 (Manual presser foot-lift Switch)			
69	Checks the signal input INPUT11 (Counter Switch)			
70	Checks the signal input INPUT12 (PU 1/2 stitch Button)			
71	Checks the signal input INPUT13 (Safety Switch)			
72	Checks the signal input INPUT14 (Edge Sensor)			
73	Checks the signal input INPUT15 (Thread trimming not allowed)			
74	Checks the signal input INPUT20 (First step for pedal going forward)			
75	Checks the signal input INPUT21 (First step for pedal going backwards)			
76	Checks the signal input INPUT22 (Second step for pedal going backwards)			
77	Checks the solenoid movement voltage		0~64	
78	Checks external volume value		0~64	
79	Checks the pedal analog output		0~64	
80	Checks the synchronizer signal			Increases by each rotation of the sewing machine
81	Checks the signal from encoder A/B			1) increases when sewing machine rotates clockwise 2) decreases when sewing machine rotates in counterclockwise
82	Checks the signal from encoder R/S/T			1) When sewing machine is rotating clockwise 101→100→110→010→ 011→001→101 2) When sewing machine is rotating counterclockwise 101 → 001 → 011→ 010→ 110 → 100 →101
83~	NOT USED			
89	NOT USED			

※ Items No. 60~76: functions that check individual normal movement.

※ Items No. 77~79 : functions that check each analog input normal movement.

※ Item No. 80 : function that checks whether the synchronizer signal is working properly.

※ Item No. 81 : function that checks whether the encoder A/B is working properly.

※ Item No. 82 : function that checks whether the encoder R/S/T is working properly.

Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

No.	Function	Initial value	Range	Step
90	Sewing machine pulley size	?	0~9999	1pulse
91	Distance between up-stop ~ low-stop (the standard is the pulley's normal direction rotation)	?	0~9999	1pulse
92	Programming the upper stop location (the standard is the pulley's normal direction rotation) - Not valid for model S-III	?	0~359	1degree
93	Programming the low-stop location (the standard is the pulley's normal direction rotation) - Not valid for model S-III	?	0~359	1degree
94	Index pulse occurring position (the standard is the pulley's normal direction rotation) - Turn the pulley manually and stop it in the position you want.	?	0~359	1degree
95	CAM type thread release solenoid operation position - Turn the pulley manually and stop it in the position you want.	?	0~359	1degree
96	CAM type thread release solenoid release position - Turn the pulley manually and stop it in the position you want.	?	0~359	1degree
97	CAM type thread trimming solenoid operation position - Turn the pulley manually and stop it in the position you want.	?	0~359	1degree
98	CAM type thread trimming solenoid release position - Turn the pulley manually and stop it in the position the user wants	?	0~359	1degree
99	Manual and automatic set up of solenoid operation / release position in CAM type thread trimming	1	0/1	0=manual set up 1=automatic set up

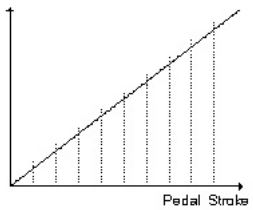
Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

(3) Group C Parameter: Pedal acceleration/deceleration curve, slow starting speed and input/output port change related parameter

※ These are functions not used by general users and must be regulated by an after-sales service engineer.

No.	Function	Initial value	Range	Step
1	1 step section where pedal moves forward	10	0~64	1
2	2 step section where pedal moves forward	15	0~64	1
3	3 step section where pedal moves forward	31	0~64	1
4	4 step section where pedal moves forward	40	0~64	1
5	5 step section where pedal moves forward	52	0~64	1
6	Sewing speed value in the 1 step where pedal moves forward	440spm	40~9960	40spm
7	Sewing speed value in the 2 step where pedal moves forward	920spm	40~9960	40spm
8	Sewing speed value in the 3 step where pedal moves forward	4000spm	40~9960	40spm
9	Sewing speed value in the 4 step where pedal moves forward	5480spm	40~9960	40spm
10	Sewing speed value in the 5 step where pedal moves forward	9960spm	40~9960	40spm
11	Select slow start after thread trimming (After performing thread trimming, start the next sewing work slowly)	0	0/1	1=selection
12	Select slow start after sewing machine stops (After performing sewing machine stops, start the next sewing work slowly)	0	0/1	1=selection
13	When starting slowly, select sewing speed change	0	0/1	1=Use C14~C18 value 0=Use default value
14	The speed of the first stitch when starting slow	400spm	40~9960	40spm
15	The speed of the second stitch when starting slow	400spm	40~9960	40spm
16	The speed of the third stitch when starting slow	640spm	40~9960	40spm
17	The speed of the fourth stitch when starting slow	1000spm	40~9960	40spm
18	The speed of the fifth stitch when starting slow	1680spm	40~9960	40spm
19	Limited maximum motor speed	3000rpm	20~3400	20rpm
20	Synchronizer sensor rotation sensing time	40×0.1sec	5~1275	0.5sec
21	Overload sensing time	30×0.1sec	5~1275	0.5sec
22	NOT USED			
23	Power - Off detection time	4ms	4~1020	4ms
24	NOT USED			
25	Bad siginal of the Encoder A and B phase detecting number of time	4	1~255	1
26	Back siginal of the Encoder R, S and T phase detecting number of time	4	1~255	1
27	Bad siginal of the Encoder R, S and T phase detecting number of time	4	1~255	1
28	NOT USED			
29	• Automatic scaling to the speed curve selected by each set mode - Mode 0 : Use a curve based on the set values from C-1 to C-10 - Mode 1 : Scaling to the speed set at A-2 - Mode 2 : Scaling to the speed set using the Speed Up/Dn key	1	1~2	1



※ Items No. 1~5 : Equal division of pedal stroke in 64 steps, The speed curve of the pedal stroke changes according to how many steps are set up for the divided pedal stroke of each forward pedal step. (Used when adjusting pedal sensor)

※ No. 20 : If a synchronizer signal comes, but the next synchronizer signal does not come within the sensing time, an error message will appear .

※ No. 21 : If a speed instruction was sent to the motor but the motor does not reach the value of the speed instruction, an error message will appear.

Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

※ This item is operated by the factory only, so general users and A/S technicians should not use it.

No.	Function		Initial value	Step
30	OUTPUT00 (B/T Solenoid)	: Low Active	0(Fixed)	※ Output port changing function - write the function number on the output PIN you want to change after referring to the table below
31	OUTPUT01 (P/F Solenoid)	: Low Active	1(Fixed)	
32	OUTPUT02 (T/T Solenoid)	: Low Active	2	
33	OUTPUT03 (W/P Solenoid)	: Low Active	3	
34	OUTPUT04 (T/R Solenoid)	: Low Active	4	
35	OUTPUT05 (Left Solenoid)	: Low Active	5	
36	OUTPUT06 (Right Solenoid)	: Low Active	6	
37	OUTPUT07 (AUX Solenoid)	: Low Active	7	
38	OUTPUT10 (Left LED)	: High Active	8	
39	OUTPUT11 (Right LED)	: High Active	9	
40	OUTPUT12 (Needle upper stop notifying signal)	: High Active	10	
41	OUTPUT13 (Needle lower stop notifying signal)	: High Active	11	
42	OUTPUT14 (Signal notifying motor is running)	: High Active	12	
43	OUTPUT15 (Signal notifying target has been reached)	: High Active	13	

★ A : Output PIN function

Function No.	H/W type actual output name		Function No.	H/W type actual output name	
0	B/T Solenoid	(with duty)	100	inv. B/T Solenoid	(with duty)
1	P/F Solenoid	(with duty)	101	inv. P/F Solenoid	(with duty)
2	T/T Solenoid	(with duty)	102	inv. T/T Solenoid	(with duty)
3	W/P Solenoid	(with duty)	103	inv. W/P Solenoid	(with duty)
4	T/R Solenoid	(with duty)	104	inv. T/R Solenoid	(with duty)
5	Left Solenoid	(with duty)	105	inv. Left Solenoid	(with duty)
6	Right Solenoid	(with duty)	106	inv. Right Solenoid	(with duty)
7	AUX Solenoid	(with duty)	107	inv. AUX Solenoid	(with duty)
8	Left LED	(with duty)	108	inv. Left LED	(with duty)
9	Right LED	(with duty)	109	inv. Right LED	(with duty)
10	"Needle Up-stop" notifying signal	(with duty)	110	inv. Needle Up-Stopped	(with duty)
11	"Needle Down-stop" notifying signal	(with duty)	111	inv. Needle Down-Stopped	(with duty)
12	"Sewing machine running" notifying signal	(with duty)	112	inv. Motor Running	(with duty)
13	"Target speed" notifying signal	(with duty)	113	inv. Target Speed	(with duty)
14	"Trimming" notifying signal	(without duty)	114	inv. Trimming	(without duty)
15	"End Back Tack" notifying signal	(without duty)	115	inv. End Back Tack	(without duty)
16	"Emergency stop" notifying signal - A signal appears when the motor stops for any error.	(without duty)	116	inv. Emergency Stopped -A signal appears when the motor stops for any error	(without duty)
17	Roller Lift Solenoid	(without duty)	117	inv. Roller Lift Solenoid	(without duty)
18	Hemming Device Output	(without duty)	118	inv. Hemming Device Output	(without duty)
19	"First step forward pedal" notifying signal	(without duty)	119	inv. Pedal Start	(without duty)
200	Low signal	(without duty)	201	High signal	(without duty)

※ If an output signal has been sent twice in the OUTPUT00~OUTPUT15 output pin, the same signal will appear in two different output pins.
Ex) if OUTPUT00 = 0 & OUTPUT03 = 0, then B/T signal is output from both OUTPUT00 & OUTPUT03 pin
※ When setting up other functions apart from the function numbers listed above, the pertinent output pin functions are disregarded.
※ Roller Lift Solenoid = Presser Foot-Lift solenoid + Back Tack solenoid + Roller Lift Switch

43~	NOT USED		
49	NOT USED		

Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

No.	Function	Initial value	Step
50	INPUT00 (Button A)	0	※ Output port changing function - Write the function number on the output PIN you want to change after referring to the table below
51	INPUT01 (Button B)	1	
52	INPUT02 (1/4 stitch Switch)	2	
53	INPUT03 (2/4 stitch Switch)	3	
54	INPUT04 (3/4 stitch Switch)	4	
55	INPUT05 (4/4 stitch Switch)	5	
56	INPUT06 (Left Sol. Switch)	6	
57	INPUT07 (Right Sol. Switch)	7	
58	INPUT10 (Presser Foot-Lift Switch)	8	
59	INPUT11 (Counter Switch)	9	
60	INPUT12 (P/U 1/2 stitch Switch Signal)	10	
61	INPUT13 (Safety Switch Signal)	11	
62	INPUT14 (Edge Sensor Signal)	12	
63	INPUT15 (Thread trimmer not allowed Signal)	13	
64	INPUT20 (Pedal Start Signal)	16	
65	INPUT21 (Pedal Presser Foot-Lift Signal)	17	
66	INPUT22 (Pedal Trim Signal)	18	

★ B : Input PIN function

No.	Actual Hardware Output Name	No.	Actual Hardware Output Name
0	Button A Switch	100	inv Button A Switch
1	Button B Switch	101	inv Button B Switch
2	1/4 stitch Switch	102	inv 1/4 stitch Switch
3	2/4 stitch Switch	103	inv 2/4 stitch Switch
4	3/4 stitch Switch	104	inv 3/4 stitch Switch
5	4/4 stitch Switch	105	inv 4/4 stitch Switch
6	Left Solenoid Switch	106	inv Left Solenoid Switch
7	Right Solenoid Switch	107	inv Right Solenoid Switch
8	Presser Foot-Lift Switch	108	inv Presser Foot-Lift Switch
9	Counter Switch	109	inv Counter Switch
10	Program Unit 1/2 stitch Switch	110	inv Program Unit 1/2 stitch Switch
11	Safety Switch	111	inv Safety Switch
12	Edge Sensor Signal	112	inv Edge Sensor Signal
13	Thread Trimmer Signal	113	inv Trimming Disabled Signal
14	Roller Lift Switch	114	inv Roller Lift Switch
15	N_AUTO Switch	115	inv N_AUTO Switch
16	Pedal Start Signal	116	inv Pedal Start Signal
17	Pedal Presser Foot-Lift Signal	117	inv Pedal Presser Foot-Lift Signal
18	Pedal Thread Trimming Signal	118	inv Pedal Thread Trimming Signal
19	External Signal	119	inv External Signal

※The hardware of input switches and sensors are done with "a point of contact/Active High" input as the standard.
※When setting up other functions numbers apart from the ones listed above, the pertinent output pin functions are disregarded.

Caution

※Caution : When any inputs PIN No. INPUT00 ~ INPUT22 are overlapped, it works as the "OR" circuit.
Ex) if INPUT00 = 0 & INPUT01 = 0, then it is recognized as "button A" = INPUT00 + INPUT01.

70	Output Signal Level Collective Reverse Function	0	0/1	1=Output signa Collective Reverse, selection
71	Input Signal Level Collective Reverse Function	0	0/1	1=Input signal Collective Reverse, selection
72~	NOT USED			
99	NOT USED			

Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

(4) Group D Parameter: All types of gain parameter related motor control

※ These are functions not used by general users and must be regulated by an A/S technician.

No.	Function		Initial Value	Range	Step
1	speed P-gain	Kvp	30	0~30	1
2	speed D-gain	Kvd	0	0~3000	1
3	location P-gain	Kpp	200	0~1000	1
4	location D-gain	Kpd	1000	0~5000	1
5	acceleration A	accelA	65	1~100	1
6	acceleration B	accelB	70	1~100	1
7	acceleration C	accelC	30	1~100	1
8	acceleration D	accelD	10	1~100	1
9	sewing machine inertia value	Inertia	40	0~255	1
10	positioning speed	Wpos	220rpm	100~510	2rpm
11	stopping speed	Wstop	75rpm	0~255	2rpm
12	Stop delaying time	StopDelay	80ms	4~1020	4ms
13	Positioning distance	DIST1	110degree	24~255	1degree
14	upper speed instruction unit	spd_unit	100spm	1~100	1spm
15	Positioning P-gain	Kpp2	270	0~9999	1
16	Positioning D-gain	Kpd2	2027	0~9999	1
17	Positioning P-gain	Kpp3	200	0~9999	1
18	Positioning D-gain	Kpd3	1000	0~9999	1
19	NOT USED				
20	Overload rate limit function setting		0	0/1	
21	Pre-set overload rate		100[%]	0~255[%]	In case where the rated voltage of motor is 100[%], it can be set by 1[%].
22	Pre-set overload rate limit duration		Depending on the pre-set overload rate, limit duration is automatically calculated.	Parameter exit and re-entry should be conducted.	
23~	NOT USED				
99	NOT USED				

Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

(5) Group F Parameter : TPM(Total Production Maintenance) related Parameters

No.	Function	Initial Value	Range	Step
1	TPM 1 Enable / Disalble	0	0/1	0 : Disable 1 : Enable
2	TPM 2 Enable / Disalble	0	0/1	0 : Disable 1 : Enable
3	TPM 3 Enable / Disalble	0	0/1	0 : Disable 1 : Enable
4	TPM 4 Enable / Disalble	0	0/1	0 : Disable 1 : Enable
5	TPM 5 Enable / Disalble	0	0/1	0 : Disable 1 : Enable
6	TPM 6 Enable / Disalble	0	0/1	0 : Disable 1 : Enable
7	TPM 7 Enable / Disalble	0	0/1	0 : Disable 1 : Enable
8	TPM 8 Enable / Disalble	0	0/1	0 : Disable 1 : Enable
9	TPM 9 Enable / Disalble	0	0/1	0 : Disable 1 : Enable
10	Not Used			
11	TPM 1 time setting	750	1 ~9999	1[Hour]
12	TPM 2 time setting	1	1 ~9999	1[Hour]
13	TPM 3 time setting	1	1 ~9999	1[Hour]
14	TPM 4 time setting	1	1 ~9999	1[Hour]
15	TPM 5 time setting	1	1 ~9999	1[Hour]
16	TPM 6 time setting	1	1 ~9999	1[Hour]
17	TPM 7 time setting	1	1 ~9999	1[Hour]
18	TPM 8 time setting	1	1 ~9999	1[Hour]
19	TPM 9 time setting	1	1 ~9999	1[Hour]
20	Not Used			
21	Initialize the remain time when changing the TPM 1 set time.	1	0/1	0 : Disable 1 : Enable
22	Initialize the remain time when changing the TPM 2 set time.	1	0/1	0 : Disable 1 : Enable
23	Initialize the remain time when changing the TPM 3 set time.	1	0/1	0 : Disable 1 : Enable
24	Initialize the remain time when changing the TPM 4 set time.	1	0/1	0 : Disable 1 : Enable
25	Initialize the remain time when changing the TPM 5 set time.	1	0/1	0 : Disable 1 : Enable
26	Initialize the remain time when changing the TPM 6 set time.	1	0/1	0 : Disable 1 : Enable
27	Initialize the remain time when changing the TPM 7 set time.	1	0/1	0 : Disable 1 : Enable
28	Initialize the remain time when changing the TPM 8 set time.	1	0/1	0 : Disable 1 : Enable
29	Initialize the remain time when changing the TPM 9 set time.	1	0/1	0 : Disable 1 : Enable
30	Not Used			

Caution

Changing set values without thorough understanding of parameter details may lead to machine breakdown or physical damage. Users are recommended to have a full understanding of functions before use.

No.	Function	Initial Value	Range	Step
31	Set the TPM 1 password entry function	0	0/1	0 : Disable 1 : Enable
32	Set the TPM 2 password entry function	0	0/1	0 : Disable 1 : Enable
33	Set the TPM 3 password entry function	0	0/1	0 : Disable 1 : Enable
34	Set the TPM 4 password entry function	0	0/1	0 : Disable 1 : Enable
35	Set the TPM 5 password entry function	0	0/1	0 : Disable 1 : Enable
36	Set the TPM 6 password entry function	0	0/1	0 : Disable 1 : Enable
37	Set the TPM 7 password entry function	0	0/1	0 : Disable 1 : Enable
38	Set the TPM 8 password entry function	0	0/1	0 : Disable 1 : Enable
39	Set the TPM 9 password entry function	0	0/1	0 : Disable 1 : Enable
40	Not Used			
41	Enable the TPM function	1	0/1	0 : Disable 1 : Enable
42	Set the TPM password entry function	1	0/1	0 : Disable 1 : Enable
43	Machine rated speed	3600[spm]	40~5000[spm]	40[spm]
44	Environmental variable applied in the event of the set time reduction	20	0 ~ 20	1
45	Speed adjustment unit when adjusting time in line with current speed	400[spm]	400~2000[spm]	40[spm]
46	TPM test mode (900[Stitch]/1[Hour]	0	0/1	0 : Disable 1 : Enable
47	Not Used			
48	Not Used			
49	Not Used			
50	User password	0000	0000 ~ 9999	1

Changing set values without thorough understanding of parameter details may lead to machine breakdown or physical damage. Users are recommended to have a full understanding of functions before use.

3) Method of Use and Explanations for Specific Items of the Parameter

(1) Method of Use and Explanations for Specific Items of the Group A Parameter

(General functions of sewing machine)

A. Minimum/maximum sewing speed limit set up method and thread trimming speed set up method

Item No.	Name of function	Method of use and explanation
A-1	Minimum sewing speed limit set up	This item allows user to set up the minimum sewing speed limit or the minimum sewing speed given whenthe pedal is pressed.(20~510rpm, Initial value : 200rpm)
A-2	Maximum sewing speed limit set up	This item allows user to set up the maximum sewing speed limit or the maximum sewing speed given when the pedal is pressed.(40~9960rpm, Initial value : 4000rpm)
A-3	Thread trimming speed set up	This item allows the user to set up the thread trimming speed when the thread trimming function is operating after sewing

B. Set up method of ½stitch speed by program unit(P/U) and needle plate lift/drop by button A

Item No.	Name of function	Method of use and explanation
A-4	Set up method of stitch speed by program unit (P/U)	This item allows user to set up the stitch speed by program unit (P/U) and hence sets up the stitch operating speed. However, if set up to a rapid speed, many stitches may be sewn after pressing the button.
A-5	Set up the speed of lift/drop of needle plate with button A	This item allows user to set up the speed of lift/drop of the needle plate with button A. However, if set to a rapid speed, many stitches may be sewn after pressing the button.

C. Start B/T sewing speed and end B/T sewing speed set up method

Item No.	Name of function	Method of use and explanation
A-7	Start B/T speed set up	This item allows user to set up the start B/T speed. If the speed is changed, the stitch correction value also has to be set again.
A-8	End B/T speed set up	This item allows user to set up the end B/T speed. If the speed is changed, the stitch correction value also has to be set again.

D. Selection method of thread trimming location with pedal

Item No.	Name of function	Method of use and explanation
A-19	Start B/T speed set up	You can change the thread trimming operation through pedal position by making the following changes to the set up values. • 0 : When the pedal position is backward 2 gear, operate thread trimming(Starting set up value). • 1 : When pedal position is backward 1 gear, operate thread trimming • 2 : When pedal position is neutral, operate thread trimming.

E. Edge Sensor method of use Item No.

Item No.	Name of function	Method of use and explanation
A-40	Selection of edge sensor type	The set up method changes according to the set up parts of edge sensor • 0 : When edge is sensed and using high output sensor. • 1 : When edge is sensed and using low output sensor.
A-41	Stitches performed after edge sensor sensing	A function that programs the machine to stop after sewing a programmed amount of stitches when edge is sensed.
A-42	Sewing speed of stitches performed after edge sensor sensing	A function that programs the sewing speed after sewing a programmed amount of stitches when edge is sensed.
A-46	Selection of edge sensing sewing mode (select N-stitch mode)	A function that programs the edge sensor to operate normally, even when other sensor signals are inputted in the edge sensor port.

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

F. Pre-stitch function method of use and explanation

Item No.	Name of function	Method of use and explanation
A-47	Selection of pre-stitch function	The pre-stitch function is a function that programs the machine to sew a certain amount of stitches before commencing the actual sewing work.(0 : disable, 1 : enable)
A-48	Set pre-stitching stitch number	This item sets the number of stitches when using the pre-stitch function (0~255 stitches, Initial value : 3 stitches)
A-49	Set pre-stitching speed	This item sets the sewing speed when using the pre-stitch function. (20~2000rpm, Initial value : 2000rpm)

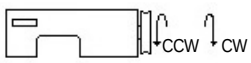
G. Method to select beginning/ending reverse sewing conditions

Item No.	Name of function	Method of use and explanation
A-50	Selection of start B/T conditions (Initial value : 1)	The start B/T function can be one of the following three operations according to their set up value • 0 : If user releases pedal during B/T operation, sewing stops. • 1 : If user releases pedal during B/T operation, sewing stops after finishing work. • 2 : The exact amount of stitches is operated, notwithstanding the number of stitch corrections. However, if this function is used, B/T will no operate naturally.
A-51	Selection of end B/T conditions (Initial value : 0)	This item selects whether or not to use the end B/T's exact number of stitches function operation • 0 : exact number of stitches function disabled • 1 : exact number of stitches function enabled (If this function is used, reverse sewing will no operate naturally)
A-52	The speed of the first stitch during B/T exact performance	This item selects the speed of the initial reverse stitch when user has selected the exact number of stitches function in the B/T operation(20~1000rpm, Initial value : 200rpm)

H. Method to select buttons A/B functions

Item No.	Name of function	Method of use and explanation
A-54	Selection of button A function (Initial value : 2)	The function of button A can be one of the following four operations according to their set up value. • 0 : If user presses A button while sewing, B/T sewing is operated while user keeps on pressing it. • 1 : If user presses the A button while sewing, B/T sewing is operated. If user stops sewing and presses A button once the needle plate is lifted. If user presses it once more, the needle plate is dropped • 2 : If user presses the A button while sewing, B/T sewing is operated while user keeps on pressing it. If user stops sewing and presses A button once, the needle plate is lifted. If user presses it twice consecutively, the needle plate is dropped. • 3 : If user presses A button while sewing, B/T sewing is operated while user keeps on pressing it. When user stops sewing and presses the A button, 1/2 stitch speed is operated.
A-55	Selection of button B function (Initial value : 0)	The function of button A can be one of the following four operations according to their set up value. • 0 : This item has the function of inserting/deleting the B/T sewing when user presses the B button. If the user presses the B button where there is no B/T sewing section, B/T sewing is inserted and when it is pressed where there is a B/T sewing section, B/T sewing is deleted. • 1 : If user presses the B button once, the needle plate is lifted and if user presses it once more, it is dropped • 2 : When user stops sewing and presses the B button, 1/2 stitch speed is operated while user presses it. • 3 : When sewing, B/T sewing is operated while user presses B button.

I. Method of use of motor rotating direction selection function

Item No.	Name of function	Method of use and explanation
A-65	Selecting the motor's rotating direction	This item sets up the set up value according to the motor's rotating direction • 0 : clockwise rotation • 1 : counterclockwise rotation(Initial value) 

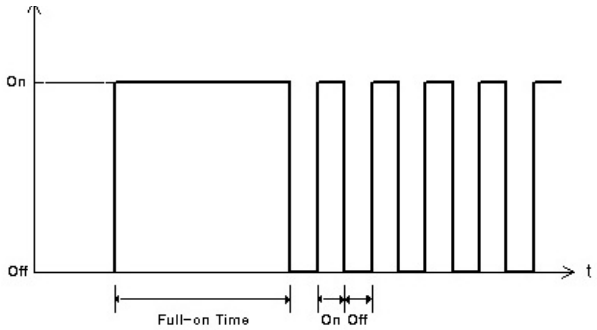
Caution

If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

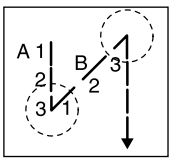
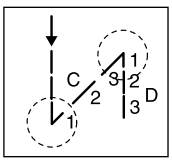
(2) Group B Parameter Specific Method of Use and Explanation (All types of output, Full-on Time/PWM Duty, checking the input/output movements, sewing machine models and thread trimming sequence programming)

※ These are functions not used by general users and should be regulated by an A/S technician.

A. All types of output, Full-on Time/PWM Duty time set up method (all types of solenoids, LED and signals)

Item No. B-1 ~ B-28
 <Type of wave that has a certain amount of Full-on Time and 50% duty>
This figure explains the Full-on Time and PWM Duty. This figure shows the wave type graph where the machine maintains the power 'ON' for a certain amount of time and when that 'Full-on Time' passes, changes itself to a PWM signal with a certain duty. In other words, the certain amount of time that each device starts operating until they become completely, the output wave type maintains itself "On", and when it maintains itself operating the output becomes the duty PWM wave type to maintain operation.

B. B/T stitch correction set up method

Item No.	Name of function	Method of use and explanation	
B-30	Start B/T A side stitch correction value	This item has the function of correcting the B/T sewing stitch that has not been shaped well, and you can change the value of sides A, B, C, D. • The programmed value in the beginning A : 3, B : 3, C : 4, D : 4 • Program range : 0 ~ 9	
B-31	Start B/T B side stitch correction value		
B-32	End B/T C side stitch correction value		
B-33	End B/T D side stitch correction value		
• If the stitch correction values is changed using the program unit, the item value will automatically change. Reversely, if you change the programmed value of the items above, the stitch correction values will also automatically change. • Detailed correction principles and methods of use are the same as the program unit's stitch correction method. Please refer to the program unit method of use of start/end B/T stitch correction method.			

C. Counter function method of use

Item No.	Name of function	Method of use and explanation
B-35	Counter condition set up	For detailed method of use and explanation of counter function, refer to the program unit's counter set up button method of use.
B-36	When using automatic counter after trimming, select increasing/decreasing counter	
B-37	After counter operation is over, set up the next operation	
B-38	After counter operation is over, select the automatic erasing operation	

Caution If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

(3) Group C Parameter Specifics Method of Use and Explanation

(Pedal acceleration/deceleration curve, slow starting speed, input/output port change related parameter)

※ These are functions not used by general users and should be regulated by an A/S technician.

A. Pedal stroke step by step section and speed set up method

Item No.	Name of function	Beginning value	Method of use and explanation
C-1	pedal forward first step section	10	After dividing the pedal stroke to 64 steps, the pedal stroke's acceleration/deceleration curve changes according to which stroke step is programmed from pedal forward steps 1 through 5.
C-2	pedal forward second step section	15	
C-3	pedal forward third step section	31	
C-4	pedal forward fourth step section	40	
C-5	pedal forward fifth step section	52	
C-6	sewing speed during pedal forward first step	440rpm	The pedal stroke's acceleration/deceleration curve changes according to how the pedal forward step by step sewing speed set up is done.
C-7	sewing speed during pedal forward second step	920rpm	
C-8	sewing speed during pedal forward third step	4000rpm	
C-9	sewing speed during pedal forward fourth step	5480rpm	
C-10	sewing speed during pedal forward fifth step	9960rpm	

B. Slow-start sewing method of use : this function allows to start the sewing slowly and the user can set up the following specific items.

Item No.	Name of function	Method of use and explanation
C-11	Slow Start after thread trimming	These items help you choose at which point you can apply slow start. If you want to apply it after thread trimming set item No. C-11 value to 1. If you want to apply it after when you start sewing after stopping set item No. C-12 to 1. If both these items are set to 0, the slow starting function will not operate.
C-12	Slow Start after sewing machine stops	
C-13	When Slow Starting, change Slow- starting speed	When using the slow start function, this item gives you the option of maintaining the same starting speed or setting up a new speed. If you want to set up a new speed, use items No. C-14~C-18 and set up a new speed.
C-14	When Slow Starting, the operation speed of beginning stitch	When the item No. C-13 set up value is "1", the slow start beginning values (the specific items that change the set up value) are • 1 : 400rpm • 2 : 400rpm • 3 : 640rpm • 4 : 1000rpm • 5 : 1680rpm
C-15	When Slow Starting, the operation speed of second stitch	
C-16	When Slow Starting, the operation speed of third stitch	
C-17	When Slow Starting, the operation speed of fourth stitch	
C-18	When Slow Starting, the operation speed of fifth stitch	

C. Motor maximum speed limit set up method

Item No.	Name of function	Method of use and explanation
C-19	Set up motor maximum speed limit	This function allows you to limit the maximum motor speed, and the starting value is set to 3000 rpm.

Caution If the specific items of the parameter are changed carelessly, they could break down or damage the machine, so the user must be well-trained before using it.

4) Thread Trimming Sequence Function Method of Use (Items no. 54, 55, 56 of Group B)

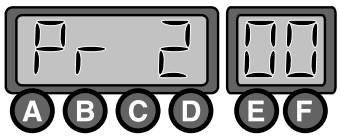
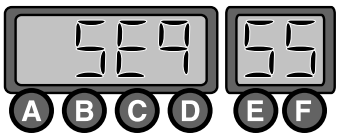
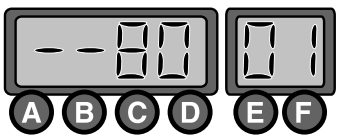
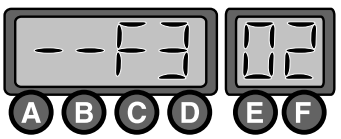
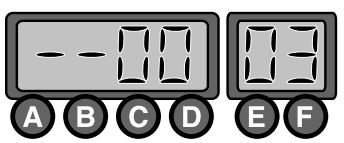
※ Thread trimming sequence function characteristics

- The thread trimming sequence is a user programming function of PLC control type used for thread trimming or when a special simple repetitive function is required .
- The user composes the thread trimming sequence he wants, and can program the machine or motor's operation during thread trimming.
- When necessary, the user can change it to exclusive mode and can program all types of special operations.
- The program size is 64 bytes, so compose the program within this size limit.
- The program code is composed of the command field and the data field.
- The thread trimming related parameters are items No. 54, 55, 56 from Group B.

Item No.	Function
B-54	This item that provides the function of thread trimming sequence selection which allows the user to select and use the sequence from item No. B-55
B-55	This item provides the function of allowing the user to compose the thread trimming sequence himself.
B-56	This item provides the function of allowing the user to select other company sewing machine models, and makes automatic changes in the thread trimming sequence that fit the selected sewing machine.

(1) Thread Trimming Sequence Function Related Parameter Method of Use and Explanations

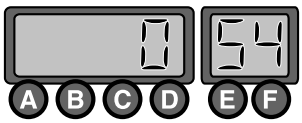
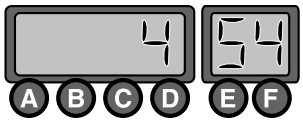
A. Thread Trimming Sequence Data Input Function (Item No. B-55)

① This function allows the user to compose the thread trimming sequence himself. In order to do this, the user must first enter parameter Group B.	
② If the screen changes, go to the specific items and choose item No. 55 from Group B. Then the user will see the letter "Seq“ blink. (Use buttons E, F)	
③ If you press the ENTER button where it says "Seq 55", you can now choose the thread trimming sequence. In the figure. you can see the command ”--80“ which indicates the sequence start. The command ”01“ is a number within the sequence (01~64) of the “--80” command.	
④ If you use buttons E, F to increase the numbers, you can see the sequence that was set up in the start. Their contents are explained below • 01 : “--08” ⇒ Sequence starting code • 02 : “--F3” ⇒ General sequence • 03 : “--00” ⇒ Sequence ending code	
⑤ Now the user can change the sequence function according to his objectives but the remember that the program size cannot exceed 64 bytes. Also you can set up several short sequences and then use the sequences you want by using item No. B-54. When you setting this up, each sequence must always have a starting and ending code. ※Refer to sequence code list	

Caution

- If you don't press the ENTER button after changing the parameter item set up value, the set up value will not be saved, so use caution when using it.
- If the specific items of the parameter are changed carelessly, they could cause breakdown or damage the machine. Therefore, the user must be well-trained before using it.

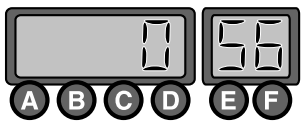
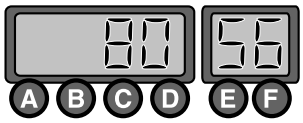
B. Thread Trimming Sequence Selection Function Method of Use (Item No. B-54)

① This function is used when the user wants to use other sequences apart from the sequences that are basically provided. If you want to use this function, first enter Item No.54 in parameter Group B. Then you will see the screen shown in the figure.	
② The starting value is set to "0". If you change this number to a value in the sequence of Item No. B-55, you can now use the extra programmed sequence. (Use the C, D buttons) (Ex : if you want to use the fourth sequence and change the sequence set up)	
③ The user can use Item No. B-55 to save and use several frequently used sequences whenever he needs them.	

Caution

- If you don't press the ENTER button after changing the parameter item set up value, the set up value will not be saved, so use caution when using it.
- If the specific items of the parameter are changed carelessly, they could cause breakdown or damage the machine. Therefore, the user must be well-trained before using it.

C. Thread Trimming Sequence Automatic Change According to Sewing Machine Model Selection

① This function allows automatic change of thread trimming sequence when user attaches the controller to a sewing machine other than the one being currently used. If you want to use this function, first enter Item No.56 in parameter Group B. You will see then the screen shown in the figure.	
② If you press the ENTER button after changing the set up value to fit the new sewing machine model number, the matching thread trimming sequence is duplicated. ※Refer to the sewing machine list (Ex : when using the SunStar KM-790BL-7 sewing machine)	
③ The duplicated thread trimming sequence can be check in the Item No. B-55 and if you want to change the contents you can do so using Item No. B-55	

Caution

- If you don't press the ENTER button after changing the parameter item set up value, the set up value will not be saved, so use caution when using it.
- If the specific items of the parameter are changed carelessly, they could cause breakdown or damage the machine. Therefore, the user must be well-trained before using it.

(2) Basic Structure of Thread Trimming Sequence Program Code

A. The thread trimming sequence program code is basically composed of the command field and data field which comes according to the command field. The size of the program cannot exceed 64 bytes.

Explanation of function		Command field	Data field		
			1st	2nd	3rd
PosStopUp	Needle plate up-stop after sewing given stitch numbers at given speed.	CE H	0~5000[rpm](20rpm)	0~255[stitch]	

B. The table above is an example of the program code structure. If you want to use the function "Needle plate up-stop after sewing given stitches at given speed" you must first select the command code "CE H" and set up the data value according to the command code. In other words, the given sewing speed is the first data and the given stitch numbers is the second data and both of these form the data field. Depending on the command code, there can exist a data field or exist three data in the data field.

(3) Thread Trimming Sequence Program Code List

Category	Explanation		Cmd Field	Data Field		
				1st	2nd	3rd
Output Port Control (Total 40)	B/T Solenoid	On	81H			
	P/F Solenoid	On	82H			
	T/T Solenoid	On	83H			
	W/P Solenoid	On	84H			
	T/R Solenoid	On	85H			
	Left Solenoid	On	86H			
	Right Solenoid	On	87H			
	AUX Solenoid	On	88H			
	Left LED	On	89H			
	Right LED	On	8AH			
	Needle Up Signal	On	8BH			
	Needle Down Signal	On	8CH			
	Motor Runing Signal	On	8DH			
	Reaching Target Speed Signal	On	8EH			
	Motor Trimming Signal	On	8FH			
	Motor End Tacking Signal	On	90H			
	Emergency Stop Signal	On	91H			
	Roller Lift Solenoid	On	92H			
	Hemming Device Output	On	93H			
	Pedal Forward Step1 Signal	On	94H			
	B/T Solenoid	Off	98H			
	P/F Solenoid	Off	99H			
	T/T Solenoid	Off	9AH			
	W/P Solenoid	Off	9BH			
	T/R Solenoid	Off	9CH			
	Left Solenoid	Off	9DH			
	Right Solenoid	Off	9EH			
	AUX Solenoid	Off	9FH			
	Left LED	Off	A0H			
	Right LED	Off	A1H			
	Needle Up Signal	Off	A2H			
	Needle Down Signal	Off	A3H			
	Motor Runing Signal	Off	A4H			
	Reaching Target Speed Signal	Off	A5H			
	Motor Trimming Signal	Off	A6H			
	Motor End Tacking Signal	Off	A7H			
	Emergency Stop Signal	Off	A8H			
	Roller Lift Solenoid	Off	A9H			
	Hemming Device Outout	Off	AAH			
	Pedal Forward Step1 Signal	Off	ABH			
Time Delay	Delay by 1[ms] unit		B0H	0~255[ms] (1ms)		
	Delay by 2[ms] unit		B1H	0~510[ms] (2ms)		
	Delay by 4[ms] unit		B2H	0~1020[ms] (4ms)		
	Delay by 0.5[s] unit		B3H	0~127.5[s] (0.5s)		

Category	Explanation		Cmd Field	Data Field		
				1st	2nd	3rd
Motor Control	On Hold	Motor–Holding Start	C0H			
	Off Hold	Motor–Holding Stop	C1H			
	Set Dir CW	Set CW direction)	C2H			
	Set Dir CCW	Set CCW direction)	C3H			
	Set Speed	Make Motor Run with given Speed	C4H	0~5000[spm] (20spm)		
	Set SpdByPed	Make Motor Run with Speed given by pedal	C5H			
	Up Stop	Make Stop in Needle Up (stop)	C6H			
	DN Stop	Make Stop in Needle Down (stop)	C7H			
	Up Stop InSpd	Make Up Stop with given Speed (stop)	C8H	0~500[spm]	(2spm)	
	Dn Stop InSpd	Make Dn Stop with given Speed (stop)	C9H	0~500[spm]	(2spm)	
	Dacc Up Edge	Decel. in Speed at Up Edge (not stop)	CAH	0~500[spm]	(2spm)	
	Dacc Dn Edge	Decel. in Speed at Dn Edge (not stop)	CBH	0~500[spm]	(2spm)	
	Move Up Edge	Move to Up Edge with given Speed (not stop)	CCH	0~500[spm]	(2spm)	
	Move DnEdge	Move to Dn Edge with given Speed (not stop)	CDH	0~500[spm]	(2spm)	
	Pos Stop Up	Up Stop after sewing given stitch with given Speed	CEH	0~5000[spm] (20spm)	0~255[stitch]	
	Pos Stop Dn	Dn Stop after sewing given stitch with given Speed	CFH	0~5000[spm] (20spm)	0~255[stitch]	
	Pos Dacc Up	Dacc Dn Edge after sewing given stitch with given Speed	D0H	0~5000[spm] (20spm)	0~500[spm] (2spm)	0~255[stitch]
	Pos Dacc Dn	Dacc Up Edge after sewing given stitch with given Speed	D1H	0~5000[spm] (20spm)	0~500[spm] (2spm)	0~255[stitch]
	L Move Stop	Move given distance with given Speed	D2H	0~ 500[spm]	(2spm)	0~357[deg]
	SpdInPos	Make motor given Speed in given Position	D3H	0~5000[spm] (20spm)	0~357[deg]	
	Random Stop	Stop randomly	D4H			
Position /Speed Check	Wait Pos1	When position aleady passed, return	E0H	0~357[deg]		
	Wait Pos2	When position aleady passed, wait next position and then return	E1H	0~357[deg]		
	Wait Up Edge	Wait until Up Edge detected.	E2H			
	Wait Dn Edge	Wait until Dn Edge detected	E3H			
	Chk Pos	Check the posiiton passed & branch to the address	E4H	0~357[deg]	0~64 (address)	
	Chk Up Edge	Check Up Edge detected & branch to the address	E5H	0~64 (address)		
	Chk Dn Edge	Check Dn Edge detected & branch to the address	E6H	0~64 (address)		
	Clr Up Edge	Clear Up Edge FG (mark UpEdge not detected)	E7H			
	Clr Dn Edge	Clear Dn Edge FG (mark DnEdge not detected)	E8H			
	Wait Speed	Wait until motor speed is target speed	E9H	0~5000[spm] (20spm)		
	Chk Speed	Check if motor speed is target speed & branch to the address	EAH	0~357[deg]	0~64 (address)	

Category	Explanation		Cmd Field	Data Field		
				1st	2nd	3rd
Input Port Check WaitPort	Wait until the port signal detected	Button A	F0H	0(Input Port No		
		Button B		1		
		Switch 1/4 stitch		2		
		Switch 2/4 stitch		3		
		Switch 3/4 stitch		4		
		Switch 4/4 stitch		5		
		Left Solenoid Switch		6		
		Right Solenoid Switch		7		
		Pressor Foot Lift Switch		8		
		Counter Switch		9		
		Button 1/2 switch on P/U Box		10		
		Safety Switch		11		
		Edge Sensor		12		
		Trimming Disable Switch		13		
		Roller lift Switch		14		
		N-AUTO Switch		15		
		Pedal Start Input		16		
		Pedal Pressor-Foot Input		17		
		Pedal Thread Trimming Input		18		
		External Input		19		
	BrChkPort (Check the port and branch the given address)	Button A	F1H	0 (Port No	0~64 (address	
		Button B		1	0~64	
		Switch 1/4 stitch		2	0~64	
		Switch 2/4 stitch		3	0~64	
		Switch 3/4 stitch		4	0~64	
		Switch 4/4 stitch		5	0~64	
		Left Solenoid Switch		6	0~64	
		Right Solenoid Switch		7	0~64	
		t Switch		8	0~64	
		Counter Switch		9	0~64	
		Button 1/2 switch on P/U Box		10	0~64	
		Safety Switch		11	0~64	
		Edge Sensor		12	0~64	
		Trimming Disable Switch		13	0~64	
		Roller lift Switch		14	0~64	
		N-AUTO Switch		15	0~64	
		Pedal Start Input		16	0~64	
		Pedal Pressor-Foot Input		17	0~64	
		Pedal Thread Trimming Input		18	0~64	
		External Input		19	0~64	
Sequence Control	Branch	Branch to given address	F2H	0~64 (Address		
	GenSeq	General Trimming Sequence	F3H			
	StartSeq	Start of the sequence	80H			
	EndSeq	End of the sequence	00H			

Caution

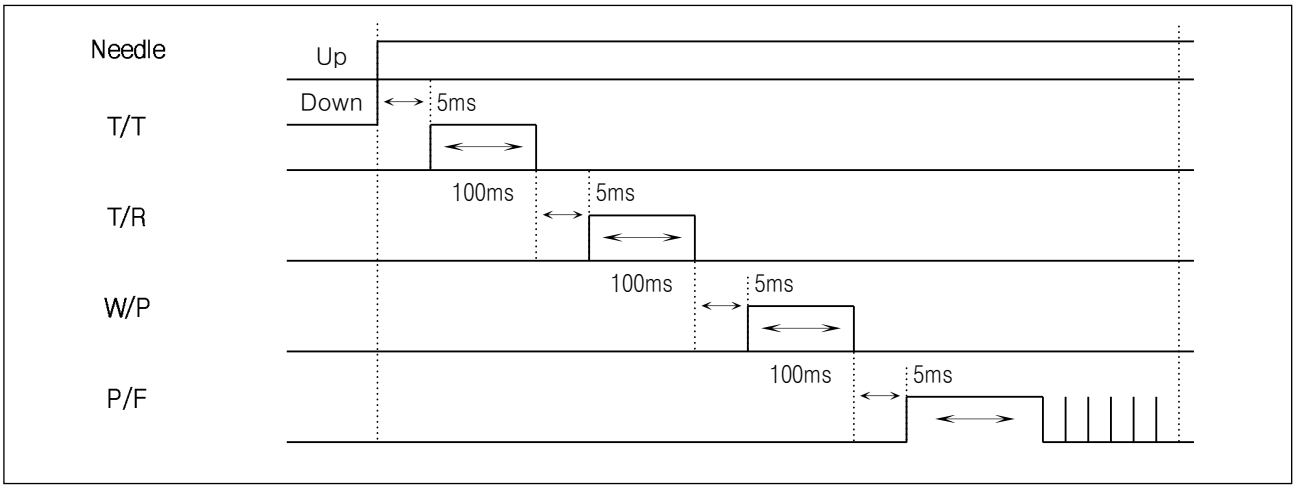
[Caution]

- Every the conditional Branch is made to the appropriate number when it is on "No(False)"
- When makingthe sequence program, please check and use its function because the wrong sequence program can cause the mechanical trouble and the physical damage.

(4) Examples of the Function of Thread Trimming Sequence

● Yamato Three-needle Trimming

① Timing of Thread Trimming Sequence



② Flow Chart of Tread Trimming Sequence & Program Code

Flow chart	Code number	Comm. field	Data field			Explanation
			1st	2nd	3rd	
START of Sequence	01	--80				Start of Sequence
↓	02	--C8				Stop after moving to needle of upstop
Needle Up Stop with 200spm	03		200			at 200spm
↓	04	--B0				Wait for 5[ms]
wait for 5ms	05		5			
↓	06	--83				Thread Trimming solenoid , On
T/T sol. on	07	--B0				Wait for 100[ms]
↓	08		100			
wait for 100ms	09	--9A				T/T sol.(off)
↓	10	--B0				Wait for 5[ms]
T/T sol. off	11		5			
↓	12	--85				T/R sol.(on)
wait for 5ms	13	--B0				Wait for 100[ms]
↓	14		100			
T/R sol. on	15	--9C				T/R sol.(off)
↓	16	--B0				Wait for 5[ms]
wait for 100ms	17		5			
↓	18	--84				W/P sol.on(on)
T/R sol. off	19	--B0				Wait for 100[ms]
↓	20		100			
wait for 5ms	21	--9B				Wiper solenoid off
↓	22	--B0				Wait for 5[ms]
W/P sol. on	23		5			
↓	24	--00				End of Sequence
wait for 100ms						
↓						
W/P sol. off						
↓						
wait for 5ms						
↓						
End of Sequence						

※ Operates Presser Foot Solenoid by "Lefting Up function of Automatic Presser Foot after Trimming" being set to A18=1

※ As every command field is displayed close to "--", it is distinguishable from Data Field

※ All Data Fields are displayed easily enough to distinguish them from others, differently from S-II and there's no necessity of transforming the number and conversing the unit

10

BREAKDOWN AND TROUBLESHOOTING

※ If the machine breaks down while using the servo motor due to an unforseen change in the machine, the error indicators mentioned below will appear in the displayer of the program unit or simple program unit according to the self-checking function of the machine. The machine will then stop along with the sound of a warning buzzer. When an error indicator appears, follow the solution steps described below and resume work. If the problem is not solved after taking these measures, contact a company branch office.

Order	Error indicator	Cause of breakdown	Troubleshooting
1	PU26 Er	Trouble with program unit connection	• Check program unit cable and connector
2	60 Er	This error sign is seen when the user connects the location sensor while the power is still on	• Turn the power off and on again before using it.
3	61 Er	This error sign is seen when the user the user removes the location sensor while the power is still on	• Turn the power off and on again before using it.
4	126 Er	This error sign is seen when the motor's rotor magnet and stator coil's electric current flow does not match	• Check the condition of the motor's
5	127 Er	This error sign appears when the direction of encoders R S T and the direction of A B do not match.	• Check the encoder cable and the connector
6	128 Er	When there is no signal from encoders R S T	• Check the encoder cable and the connector
7	129 Er	When the motor is overloaded	• Turn the machine manually and check the machine load
8	130 Er	When there is no signal from the location sensor	• Check the location sensor cable and connector
9	131 Er	When there is an electric current overflow in the motor and problems with the connector	• Check the motor cable and the connector
10	133 Er	When theelectric current overflow of the IPM stops	• Turn the power off and on again before using it.
11	132 Er	When does not presume a speed	• Turn the power off and on again before using it.
12	135 Er	At the time of the brake resistance which was caused by with overvoltage input or fuse damage	• Input voltage confirmation • Check brake resistance and fuse. Use after changing
13	136 Er	Undervoltage error	• Check supply voltage
14	137 Er	Excessirve error of current sensing	• Check motor current
15	138 Er	Disorder error of the inside fan of the control box	• Check the disorder of the inside fan of the control box
16	140 Er	Initial current sensing error	• Check initial current sensing-related voltage setting values
17	141 Er	Control power error over 20V	• Check SMPS
18	142 Er	Control power error over 12V	• Check SMPS
19	200 Er	Excessive error of a motor load factor	• Check motor load factor

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HOW TO PLACE FOR CONTROLLER

S6AC55 - □ □ □ - □ □ □

a : Sub classification according the details of the medal

A : SunStar KM-235A/B, 250A/B-7, 250BH-7, 250AU-7

1 : 1φ 220V
2 : 3φ 220V
3 : 3φ 380V

※Only control box is classified by applied voltage and motor is used in all voltages.

ORERDER Ex. S6AC55-2A refers to SERIES6, 1Phase 220V, CONTROL BOX for normal drop feed.

PARTS BOOK

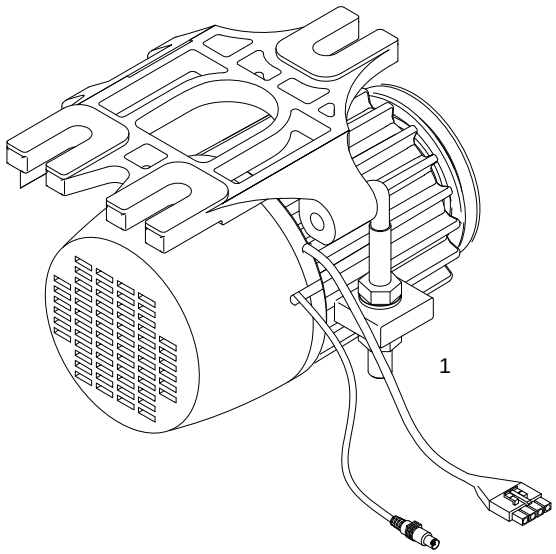
CONTENTS

• Remarks •

Please let us get the additional details according to the itemized list below for the better service when ordering spare parts for SunStar motors.

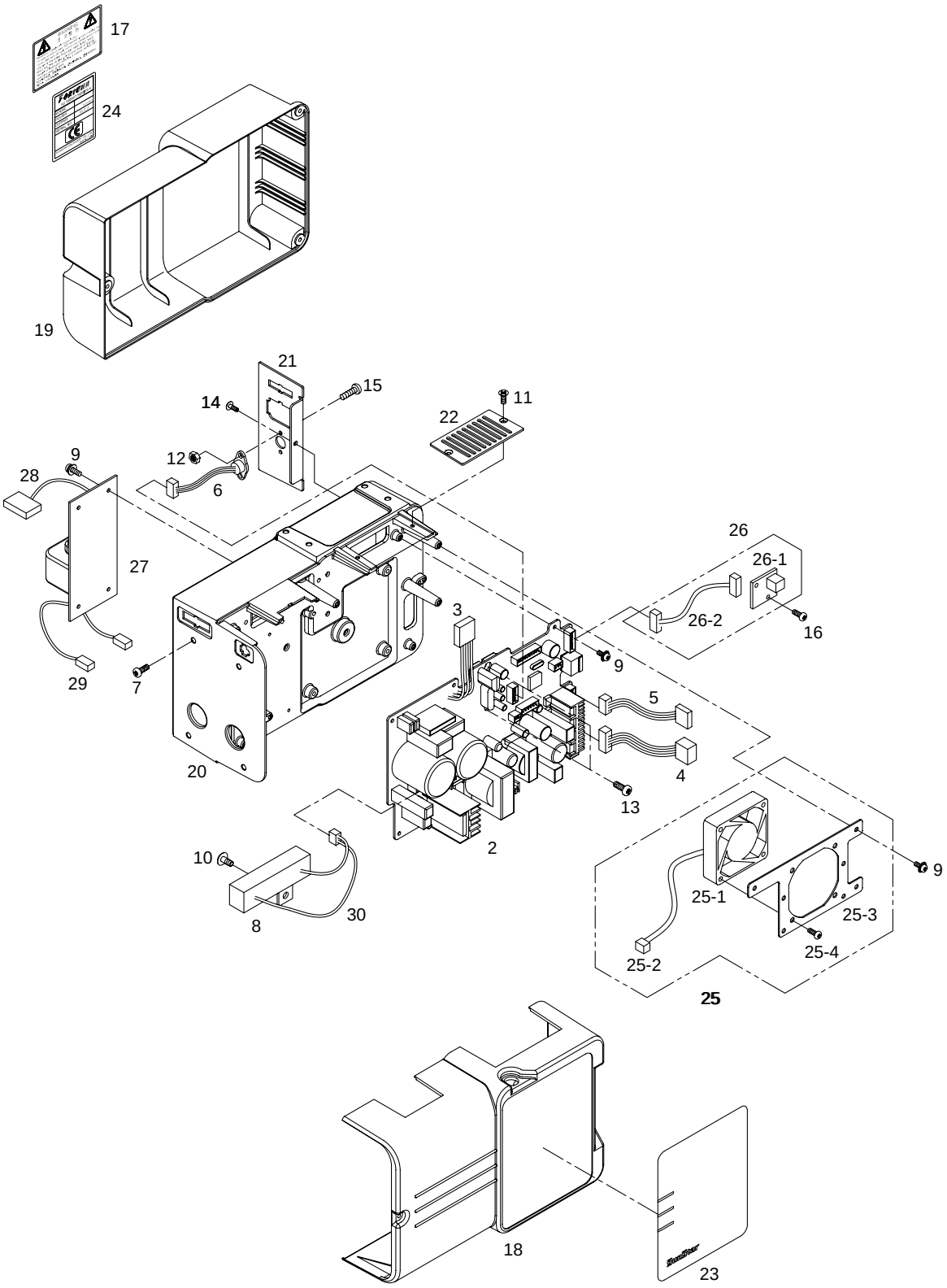
※Order for spare parts for servo motor

1) Serial number
2) Type of control box & model name
3) Electric specification (Phase, Volt, Hz)
4) Machines's model name



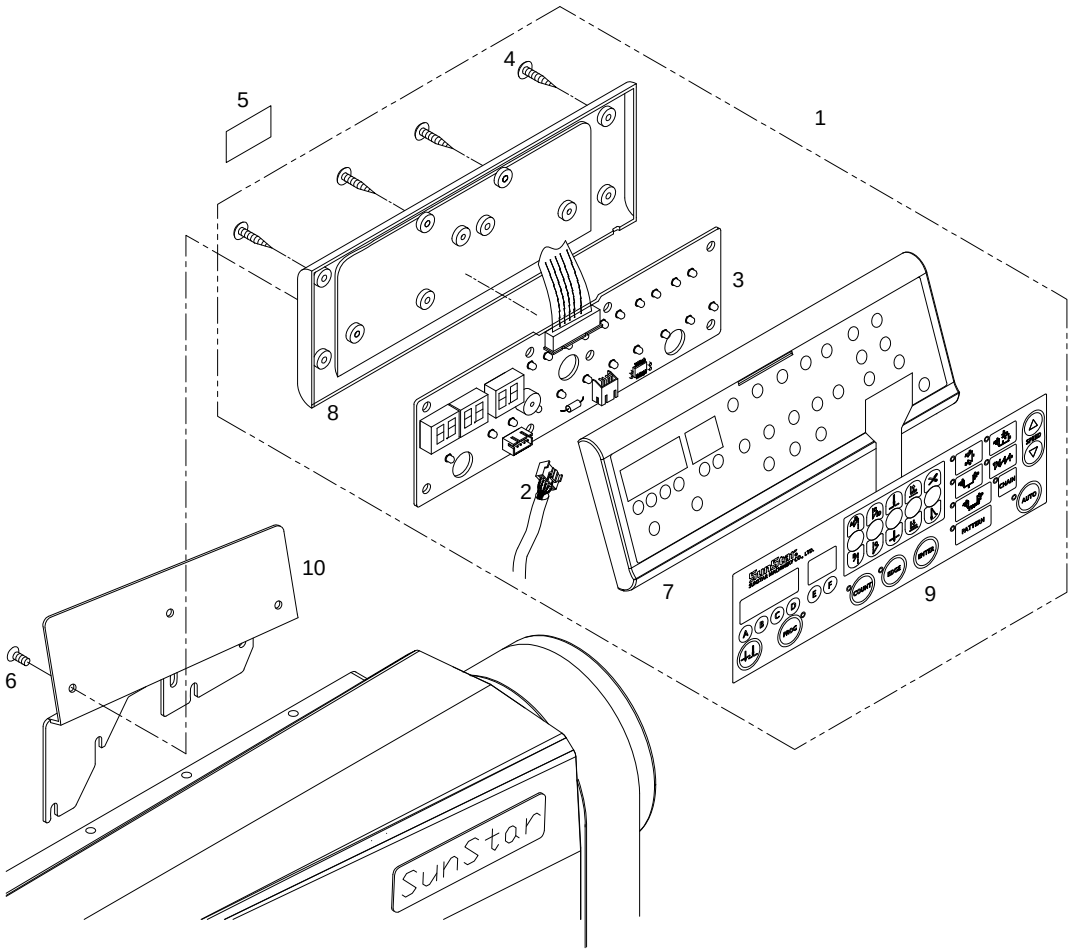
Ref. No.	Parts No.	Note	Name of Parts	품 명	Q' ty	Applied Period
A-1	MT-000643-00		OEM Motor Ass'y	OEM 모터(조)	1Set	

B Control Box Mechanism



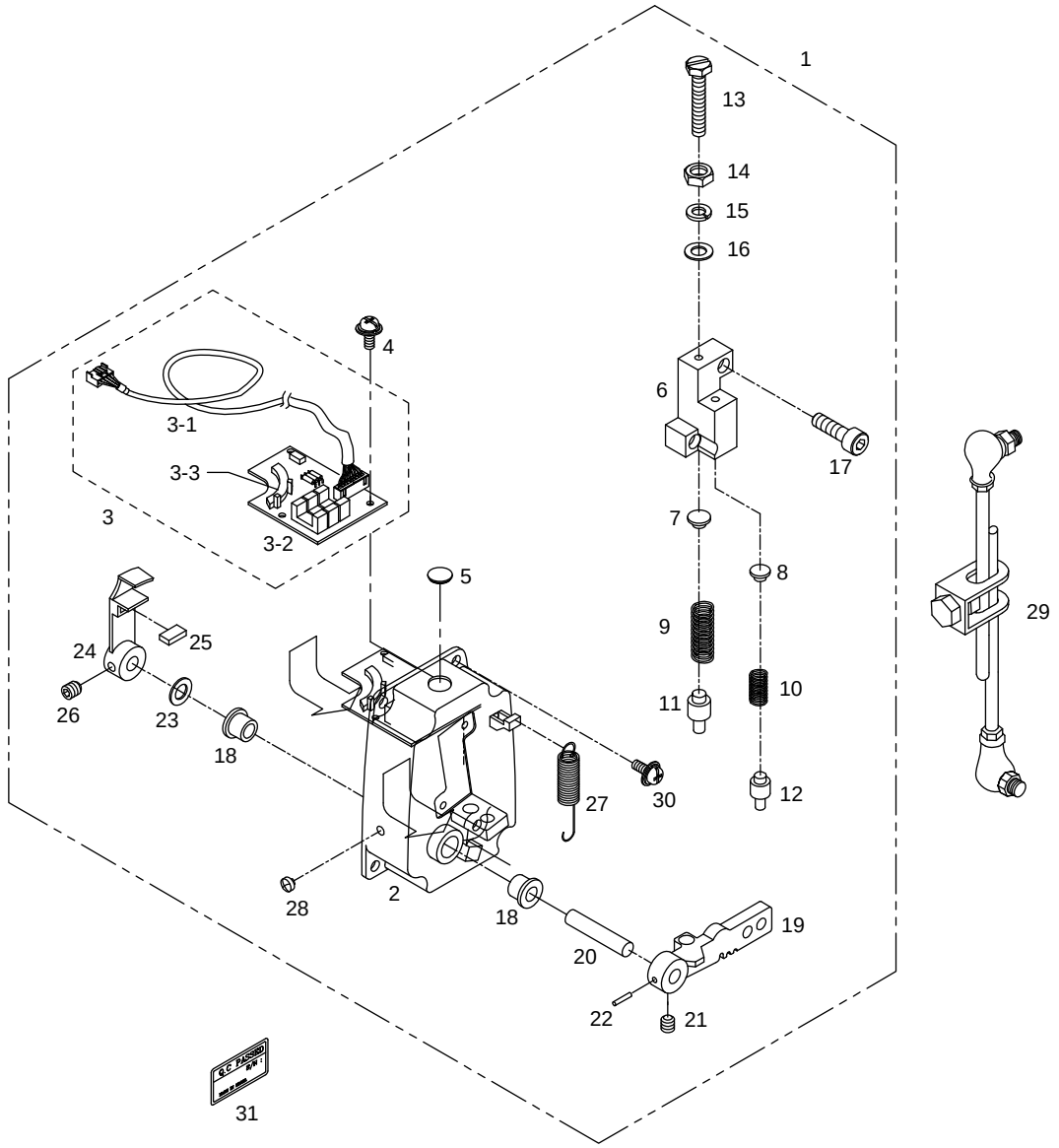
Ref. No.	Parts No.	Note	Name of Parts	품 명	Q' ty	Applied Period.
B-1	EA-000459-00		Control Box	콘트롤 박스 (조)	1	
B-2	BD-000836-00		Digital B/D	디지털 보드	1	
B-3	CA-004864-00		Motor Power Cable	모터 출력 케이블	1	
B-4	CA-004865-00		Solenoid Cable	솔레노이드 케이블	1	
B-5	CA-004869-00		PF Solenoid Cable	무릎 솔레노이드 케이블	1	
B-6	CA-004870-00		Synchro Cable	싱크로 케이블	1	
B-7	07-027S-SW66		Screw for Pedal (M5 * L10)	페달 죔나사 (M5 * L10)	4	
B-8	09-007A-HB10		Ceramic Resistor 160Ω 40W	석면저항 160Ω 40W	1	
B-9	10-002S-SW66		Screw for Board (M3 * L8 set)	보드 죔나사 (M3 * L8 set)	12	
B-10	01-004S-2070		Screw for Resistor (M4 * L8)	저항 죔나사 (M4 * L8 set)	2	
B-11	10-004M-SW68		Screw for Plate (B) (M3 * L5)	Plate (B) 죔나사 (M3 * L5)	2	
B-12	10-074S-3701		Nut for Plate(A) Synchro M3	Plate(A) 싱크로 고정 너트 M3	2	
B-13	SC-000395-00		Screw for SPM (M3 * L10 set)	SPM 죔나사 (M3 * L10 set)	7	
B-14	10-002S-SW66		Screw for Plate(A) (M3 * L8 set)	Plate (A) 죔나사 (M3 * L8 set)	1	
B-15	SC-001099-00		Screw for Plate(A) Synchro (M3 * L7 set)	Plate(A) 싱크로 고정 죔나사(M3 * L7 set)	2	
B-16	SC-000459-00		Screw for Encoder BD (ST3 * L8)	엔코더 젠더 보드 죔나사 (ST3 * L8 탭핑)	2	
B-17	GP-011049-01		Principle Sticker	주의 스티커	1	
B-18	GP-044647-00		Front Cover for Control Box	전면 커버	1	
B-19	GP-044618-00		Rear Cover for Control Box	후면 커버	1	
B-20	GP-044619-02		Base for Control Box	베이스	1	
B-21	GP-044748-01		Plate Port (A)	플레이트 포트 (A)	1	
B-22	GP-044749-01		Plate Port (B)	플레이트 포트 (B)	1	
B-23	GP-045251-00		Front Cover Sticker	전면 커버 스티커	1	
B-24	GP-045255-00		Model Sticker	모델 스티커	1	
B-25	EA-000477-00		F-6 Cooling Fan Assemble	F-6 냉각팬 (조)	1	
B-25-1	EP-000465-00		Cooling Fan (DFB601512M)	냉각팬 (DFB601512M)	1	
B-25-2	CA-004913-00		Cooling Fan Cable	냉각팬 케이블	1	
B-25-3	GP-046264-00		Plate Port (C)	Plate Port (C) 브라켓	1	
B-25-4	04-001C-SE50		Screw for Cooling Fan (M5 * L16)	냉각팬 고정 죔나사 (M5 * L16 탭핑)	1	
B-26	EA-000543-00		Encoder Jender Assemble	엔코더 젠더 (조)	1	
B-26-1	BD-000838-00		Encoder Jender BD	엔코더 젠더 보드	1	
B-26-2	CA-004866-00		Encoder Jender Cable	엔코더 젠더 케이블	1	
B-27	BD-000837-00		Noise Filter BD	노이즈 필터 보드	1	
B-28	CA-004871-00		Power Input Cable	전원 입력 케이블	1	
B-29	CA-004867-00		Power Ouput Cable	전원 출력 케이블	1	
B-30	11-015B-SE55		Ceramic Resistor Cable	석면저항 케이블	1	

C Program Unit Mechanism



Ref. No.	Parts No.	Note	Name of Parts	품 명	Q' ty	Applied Period.
C-1	EA-000467-00		F-6 P/U(Program Unit) Assembly	F-6 P/U(프로그램 유닛) (조)		
C-2	CA-004891-00		Cable for P/U Box	P/U 케이블	1	
C-3	BD-000255-02		P/U BD	P/U 케이블 보드	1	
C-4	01-036S-1701		Screw for P/U (M3 * L12)	P/U 죔나사 (M3 * L12 플랜지)	5	
C-5	09-023C-SC53		QC Passed Sticker	QC 스티커	1	
C-6	91-001C-SE50		Screw for P/U Bracket (M4 * L6)	P/U 브라켓 죔나사 (M4 * L6)	3	
C-7	GP-024743-00		Front Cover for P/U	P/U 전면 커버	1	
C-8	GP-024744-00		Rear Cover for P/U	P/U 후면 커버	1	
C-9	GP-024745-00		Membrane	멤브레인	1	
C-10	91-200A-SE55		KM-250 P/U Bracket	KM-250 P/U 브라켓	1	

D Pedal Mechanism



Ref. No.	Parts No.	Note	Name of Parts	품 명	Q' ty	Applied Period.
D-1	EA-000460-00		F-6 Pedal Unit Assembly	F-6 페달 유닛 (조)	1	
D-2	GP-014593-01		Pedal Base	페달 베이스	1	
D-3	EE-002736-00		Pedal BD Assembly	페달 보드 (조)	1Set	
D-3-1	CA-004873-00		Cable for Pedal Unit	페달 입력 케이블	1	
D-3-2	BD-000252-01		Pedal Board	페달 보드	1	
D-3-3	10-014B-SC53		Hall Sensor Housing	홀센서 하우징	1	
D-4	10-028S-SC53		Screw for Pedal Unit (M3×L7)	페달 보드 죔나사 (조) (M3×L7)	3	
D-5	06-001C-SE55		Rubber Cap for Up Pedal Base	페달 베이스 위쪽 마개	1	
D-6	10-016A-SC53		Spring Housing	스프링 하우징	1	
D-7	10-024P-SC53		Spring Guide (A)	스프링 가이드 A	1	
D-8	10-025P-SC53		Spring Guide (B)	스프링 가이드 B	1	
D-9	10-019G-SC53		Pressure Spring for Pressure Foot	노루발 압력 스프링	1	
D-10	10-020G-SC53		Pressure Spring for Thread Trimming	사절 압력 스프링	1	
D-11	10-029P-SC53		Stopper for Pressure Spring (A)	압력 스프링 스토퍼 A	1	
D-12	10-030P-SC53		Stopper for Pressure Spring (B)	압력 스프링 스토퍼 B	1	
D-13	10-021S-SC53		Pressure Control Screw (M4×L10)	압력 조절 나사 (M4×L10)	2	
D-14			Pressure Control Nut (M4)	압력 조절 너트(M4)	2	
D-15			Spring Washer for Pressure Control (ø4)	압력 조절 스프링 와셔 (ø4)	2	
D-16	10-031W-SC53		Washer for Pressure Control (ø4)	압력 조절 평 와셔 (ø4)	2	
D-17	10-031S-SC53		Screw for Spring Housing (M4×L6)	스프링 하우징 죔나사 (M4×L6)	2	
D-18	11-012C-3701		Bushing for Pedal Control Lever	페달 콘트롤 레버 부싱	2	
D-19	10-017A-SC53		Pedal Control Lever	페달 콘트롤 레버	1	
D-20	10-025A-SC53		Shaft for Pedal Control Lever	페달 콘트롤 레버 축	1	
D-21	03-004S-SM5S		Screw for Pedal Control Lever (M5×L6)	페달 콘트롤 레버 죔나사 (M5×L6)	1	
D-22	10-024P-3701		Fixing Pin for Pedal Control Lever(ø4×L10)	페달 콘트롤 레버 고정 핀 (ø4×L10)	1	
D-23	10-024W-SC53		Flat Washer for Pedal Shaft (ø8)	페달 축 평와셔 (ø8)	1	
D-24	10-026A-SC53		Base for Pedal Magnet & Film	페달 마그네트 & 필름 베이스	1	
D-25	10-027C-SC53		Pedal Magnet	페달 마그네트	1	
D-26	03-004S-SM5S		Base Screw for Pedal Magnet&Film (M5×L6)	페달 마그네트&필름 베이스 죔나사 (M5×L6)	2	
D-27	10-018G-SC53		Tension Spring for Pedal	페달 인장 스프링	1	
D-28	10-033C-SF55		Rubber Cap for Pedal Base	페달 베이스 고무마게	2	
D-29	91-007A-3701		Pedal Control Rod Assembly	페달 연결 롯드 (조)	1	
D-30	07-027S-SE55		Pedal Screw(M5×L10)	페달 죔나사 (조) (M5×L10)	4	
D-31	09-023C-SC53		QC Passed Sticker	QC 스티커	1	