

# mitsubishi

## LIMI-STOP Z

### INSTRUCTION MANUAL

CA-ZK  E-AMG   
CB-ZK  E-AMG

Thank you for choosing the Mitsubishi LIMI-STOP Z motor.  
Please read this manual carefully to use your LIMI-STOP Z motor in the best condition the equipment to its optimum.

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## 1. HANDLING INSTRUCTIONS

- (1) Keep your feet away from the pedal when switching on/off the power.
- (2) Before leaving your seat, the power must be switched off to ensure safety.
- (3) The brakes may not be applied if the power is switched off or power failure occurs during operation of the sewing machine.
- (4) The control box cover must be kept closed during machine operation to prevent misoperation and/or fault caused by the entry of dirt.
- (5) The control box circuitry must not be checked with a multimeter to protect the semiconductor parts from voltage.
- (6) The power switch must be turned off before tilting the machine head or touching the needle.
- (7) The three-phase motor must be grounded with the ground wire (green). The single-phase motor must not be wired by star-burst connection.
- (8) When moving any switch in the control box, the power switch must be turned off before opening the front cover.
- (9) Use the motor away from high noise sources such as a high-frequency welder.
- (10) Securely insert the connectors after checking their shape and direction of insertion.
- (11) When the cover has been removed from the optical detector for the purpose of adjustment, etc., its detecting discs must be protected from dirt, oil, etc. If any contaminant has attached, wipe that disc with a soft cloth. Exercise care so that oil may not soak between the detecting discs.
- (12) If the position detector connector has been unplugged, the belt has been removed, or the machine has locked completely, the motor is automatically switched off in a predetermined period of time to prevent the motor from burning. (The motor may not be switched off if incomplete lock-up or overload has occurred.) The operation is restored to normal by switching the power off, then on after the fault has been remedied. The above also takes place when the detector has become faulty or any wire has been broken.

## 2. INSTALLATION

### 2.1 Installing the Motor

After placing a drilling pattern paper on the table, drill three 9mm holes in the table. Securely install the motor with the installation bolts, washers, spring washers and nuts. The pattern paper and hardware are packaged as accessories.

### 2.2 Installing the Belt

- (1) Use a V-belt for sewing machine use, type M.
- (2) Adjust the belt tension so that the belt sinks about 15mm when depressed by hand at the center of the belt span. If the tension is too low, the speed may not be constant in the low or medium range or the needle may not stop at the exact position. If the tension is too high, the motor bearings will be deteriorated earlier.

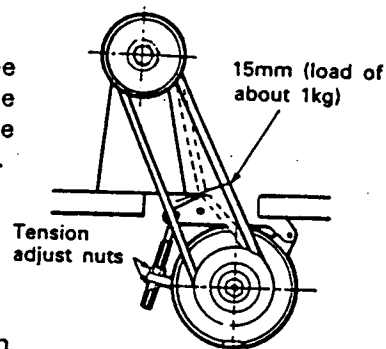


Fig. 1 Belt Installation

### 2.3 Installing the Position Detector

The way of installing the position detector depends on the type of the sewing machine used. For details, contact your sales representative. Fig. 2 shows an example of position detector installation.

### 2.4 Installing the Lever Unit

Fix the mount bracket to the motor frame with two screws A as shown in Fig. 3.

The lever unit may be installed to the most appropriate position as required, e.g. the bottom surface of the machine table.

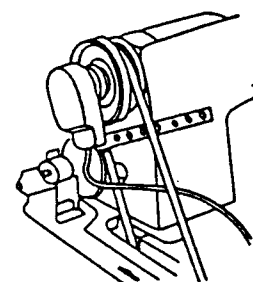


Fig. 2 Position Detector Installation

## 3. ELECTRICAL CONNECTION

### 3.1 Lamp Leads (Standard Type)

- (1) When a work lamp (6V, 15 to 20W) is used, remove the insulating tube from the leads at the front of the motor, strip the leads and connect them to the lamp as appropriate, and insulate the connections by winding insulating tape.

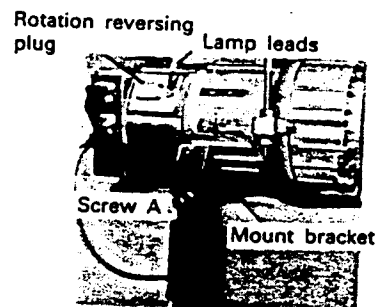


Fig. 3 Lever Unit Installation

### CAUTION

The lamp voltage is 6V but the voltage to ground is about 100V. Therefore, the power switch must be turned off before connecting the lamp.

- (2) When the lamp is not used, the lamp lead ends must be insulated as shown in Fig. 4, 1) or 2) so that the two leads may not be shorted. Otherwise, the motor windings will be burned.

**CAUTION**

The work lamp must not be connected in parallel with any heater, such as a foot warmer. Otherwise, the load capacity will be exceeded and the transformer winding burned.

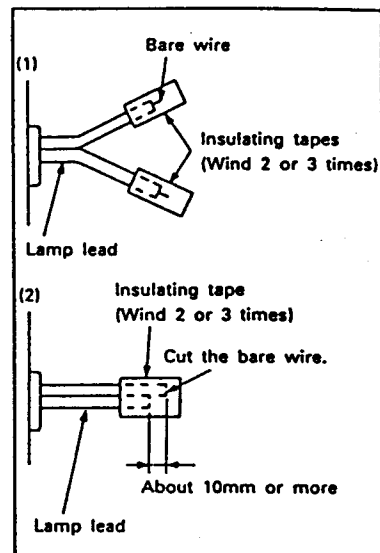
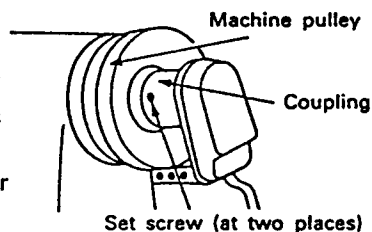


Fig. 4 Termination of the Lamp Leads

**3.2 Connection to the Power Supply**

- (1) When a three-phase motor is used, connect phase U to the red lead, V to white, and W to black. The green wire must be connected to the ground terminal to ground the motor.
- (2) For power fuse, consult with near by located electrician or our service agency.
- (3) The capacity of the fuse in the control box is 8A.



**3.3 Direction of Rotation**

To change the direction of motor rotation, remove the rotation reversing plug on the side face of the motor control box, turn it 180°, and insert it. When a single-phase motor is used, turn on the switch after the motor has stopped completely (in about two minutes). Securely insert the plug to its full depth.

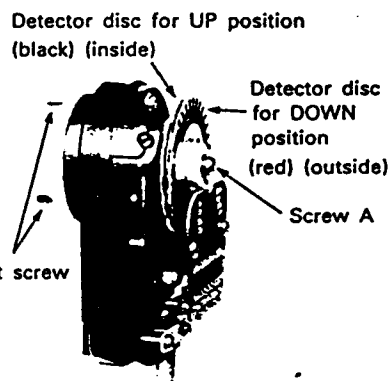


Fig. 5 Adjustment of Stop Positions

**4. ADJUSTMENTS**

**4.1 Adjusting the Stop Positions (Fig. 5)**

After installing the motor to the sewing machine, stop the sewing machine at the "UP" and "DOWN" positions and make adjustments in the following procedure. When the sewing machine is equipped with an underbed trimmer, make the adjustments after unplugging the machine connectors (e.g. thread trimmer).

- (1) Adjusting the "UP" position  
Loosen the two set screws in the detector coupling and turn the coupling to adjust the needle "UP" position. If the adjustment cannot be made with the coupling, loosen the screw A in Fig. 5 and rotate all the detecting discs at the same time to set to the predetermined stop position.

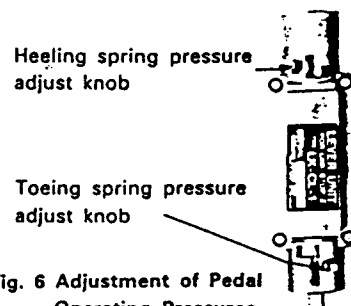


Fig. 6 Adjustment of Pedal Operating Pressures

**(2) Adjusting the "DOWN" position**

Since the relationship between the "UP" and "DOWN" positions depends on the sewing machine, adjust the "DOWN" position in accordance with the sewing machine used. (The distance between the UP and "DOWN" positions is factory-set to approx. 180°.) When changing the "DOWN" position, remove the detector cover, turn the red detecting disc only, and adjust to the predetermined stop position. (In this adjustment, the screw A need not be loosened.)

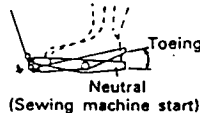
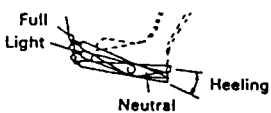
**4.2 Adjusting the Pedal Toeing and Heeling Pressures**

The pedal toeing and heeling pressures are adjustable in three steps by changing the position of the corresponding lever unit spring pressure adjust knob. (See Fig. 6.)

### 4.3 Pedal operation

The relationship between the sewing machine operation and the pedal operation depends on stitching mode selection as listed below.

(For stitching mode setting, refer to Section 4.6.)

Stitching mode	Pedal operation		Toe down → Neutral	Neutral → Light heeling	Neutral → Full heeling
	Position setting				
Thread trim-less mode	1 POSITION		Stop at needle UP position	Presser foot goes up.	Presser foot goes up.
	2 POSITION		Stop at needle DOWN position	Presser foot goes up.	Sewing machine stops with needle at UP position after half revolution and then presser foot goes up.
Chain-stitch thread trimming Mode A	1 POSITION		Stop at needle UP position	Presser foot goes up.	Presser foot goes up after thread trimming.
	2 POSITION		Stop at needle DOWN position	Presser foot goes up.	Threads are trimmed after half revolution of sewing machine and then presser foot goes up.
Chain-stitch thread trimming Mode B	1 POSITION		Stop at needle UP position	Presser foot goes up.	Threads are trimmed after one revolution of sewing machine and then presser foot goes up.
	2 POSITION		Stop at needle DOWN position	Presser foot goes up.	Threads are trimmed after half revolution of sewing machine and then presser foot goes up.
Lock-stitch thread trimming Mode M, P	1 POSITION		Stop at needle UP position	Presser foot goes up.	Threads are trimmed after one revolution of sewing machine and then presser foot goes up.
	2 POSITION		Stop at needle DOWN position	Presser foot goes up.	Threads are trimmed after half revolution of sewing machine and then presser foot goes up.
Pedal operation					

**Note:**

1. The stitching speed can be varied by changing the pedal toeing degree.
2. For automatic presser foot lifting, use the optional LE-FM-1, LE-FM-2 or LE-FA lifter. When the solenoid valve is employed, use a 24VDC, 50V or higher withstand voltage type.

#### 4.4 Selecting the Motor Pulley

$$\text{Motor pulley OD (mm)} = \frac{\text{normal sewing machine speed}}{\text{motor speed}^*} \times \text{machine pulley diameter (effective diameter)} \times 1.05 + 5\text{mm}$$

\*The motor speed is assumed to be 2750rpm (50Hz) or 3350rpm (60Hz) for a two-pole motor and 1250rpm (50Hz) or 1550rpm (60Hz) for a four-pole motor.

If the motor pulley diameter selected according to the above expression is too small, select the smallest pulley that will not cause the belt to slip. Then reduce the speed by adjusting the maximum speed in accordance with Section 4.5 (1).

Note that the motor output is as follows:

$$\text{Motor output (W)} = \frac{\text{speed after adjustment of maximum speed}}{\frac{\text{motor pulley OD-5mm}}{\text{sewing machine pulley diameter (effective diameter)}} \times \text{motor speed}^*} \times 400 \text{ (when the motor is 400W)}$$

To be replaced by 550  
when the motor is 550W)

#### 4.5 Adjusting the Operating Speeds (Fig.s 7, 8)

##### (1) Adjusting the maximum speed (speed available with the pedal fully toed)

Two variable resistors are available for adjustment of the maximum speed; one is located in the control box and the other on the external panel of the control box. The external variable resistor allows adjustment between low speed and maximum speed set by the internal variable resistor H.

The internal variable resistor H is factory-set to the following speed:

	Internal Variable Resistor H Setting	External Variable Resistor Adjustable Range
C□-ZK □□□ E - AMG60	6000 spm (Adjustable range: 1,200 ~ 8,500 spm)	6000 spm~200 spm

To set to any speed outside the above range, adjust the internal variable resistor H. When setting the speed, use a speed meter, etc.

#### **CAUTION**

If a larger motor pulley is used, the speed cannot exceed the value set by the internal variable resistor H and external variable resistor.

##### (2) Adjusting the low speed (speed available with the pedal slightly toed)

The low speed is adjustable with the internal variable resistor L. Clockwise turn increases the low speed and counterclockwise turn decreases. The speed is adjustable between 160 and 320spm (factory-set to 200spm).

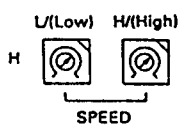
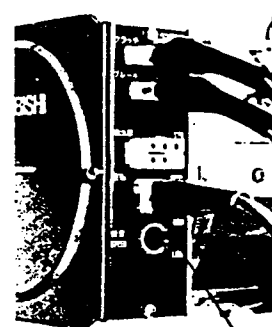


Fig.7 Internal Variable Resistors for Speed Adjustment



External variable resistor

Fig. 8 External Variable Resistor

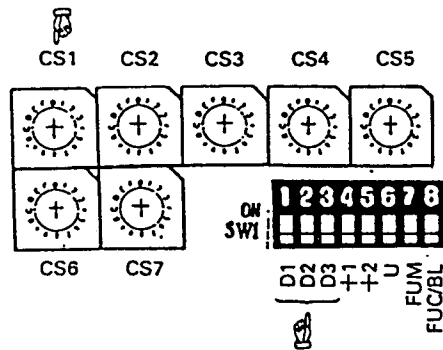


#### 4.6 Setting the stitching mode

Any one of 13 stitching modes can be selected by setting the internal DIP switches D1 to D3 and rotary switch CS1 as shown on Fig. 9.

- Chain-stitch Thread trimming Mode A1, A2, A3
- Chain-stitch Thread trimming Mode B1, B2
- Lock-stitch Thread trimming Mode H10, H11, H24, H25
- Lock-stitch Thread trimming Mode M, P
- Thread trimless Mode N1, N2

Fig. 9 Internal DIP switches and rotary switches



Select the desired mode referring to the list shown below.

	Mode	Switch setting				Thread trimmer safety S6(Note)	
		Internal DIP switch			Rotary switch		
		D1	D2	D3	CS1		
Automatic Thread Trimming	Chain-Stitch	A1	OFF	OFF	OFF	—	ON
		A2	ON	OFF	OFF	—	ON
		A3	OFF	ON	OFF	—	ON
	Lock-Stitch	B1	ON	ON	OFF	—	ON
		B2	OFF	OFF	ON	—	ON
		H10	OFF	ON	ON	0	OFF
		H11	OFF	ON	ON	1	OFF
	Thread trimless	H24	ON	ON	ON	4	OFF
		H25	ON	ON	ON	5	OFF
		M	ON	ON	ON	0	OFF
	P	ON	ON	ON	8	OFF	
	N1	ON	OFF	ON	0	OFF	
	N2	ON	OFF	ON	8	OFF	

Note : For details, refer to 4.8-(2) sewing machine connector on page 19 and 4.8-(2-a). S6 on page 20.

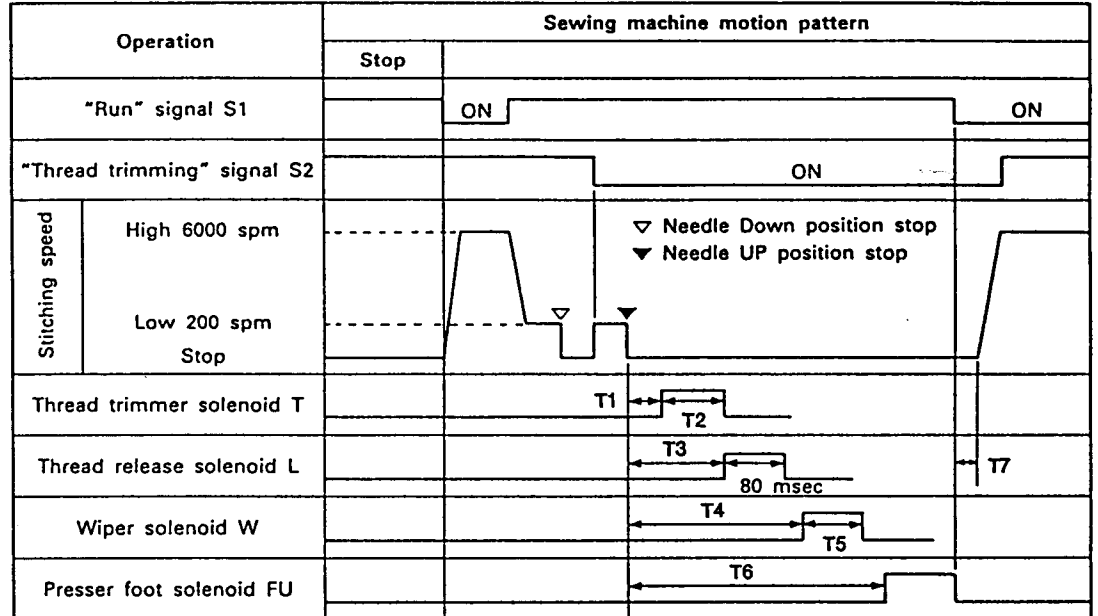
#### 4.7 Adjusting the solenoid drive

When the chain-stitch thread trimming Mode A1, A2, A3, B1, B2 or the lock-switch thread trimming Mode H10, H11, H24, H25 or the thread trimless Mode N1, N2 is selected, drive timing of each solenoid can be adjusted.

Adjust each solenoid drive timing for selected stitching mode referring to the corresponding timing chart.

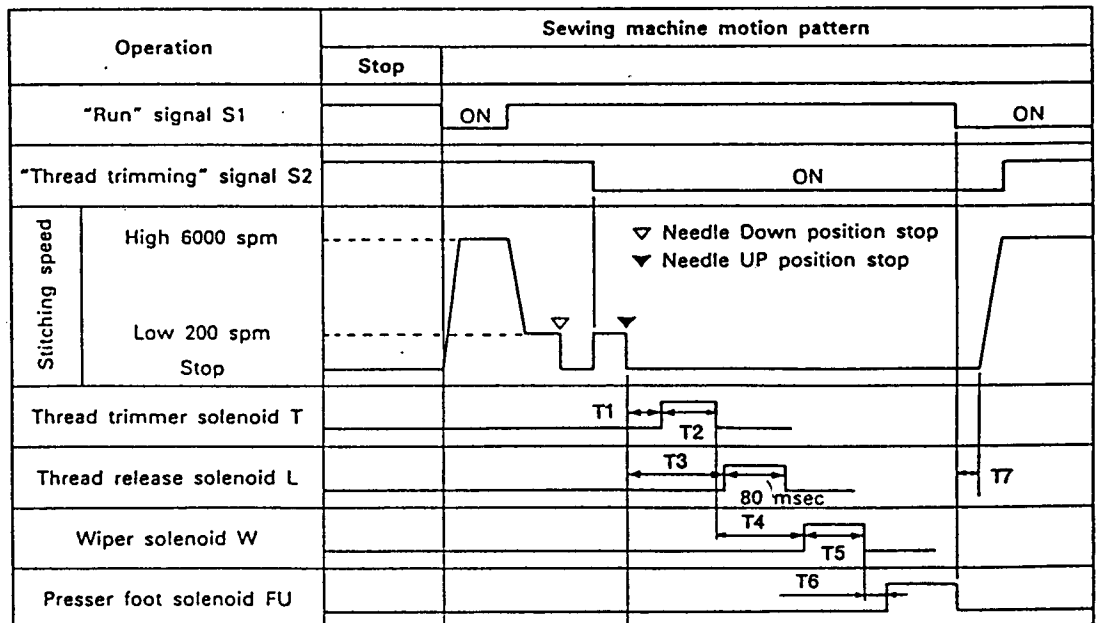
##### (1) Chain-stitch thread trimming Mode A1

(Internal DIP switch settings: D1=OFF, D2=OFF, D3=OFF)



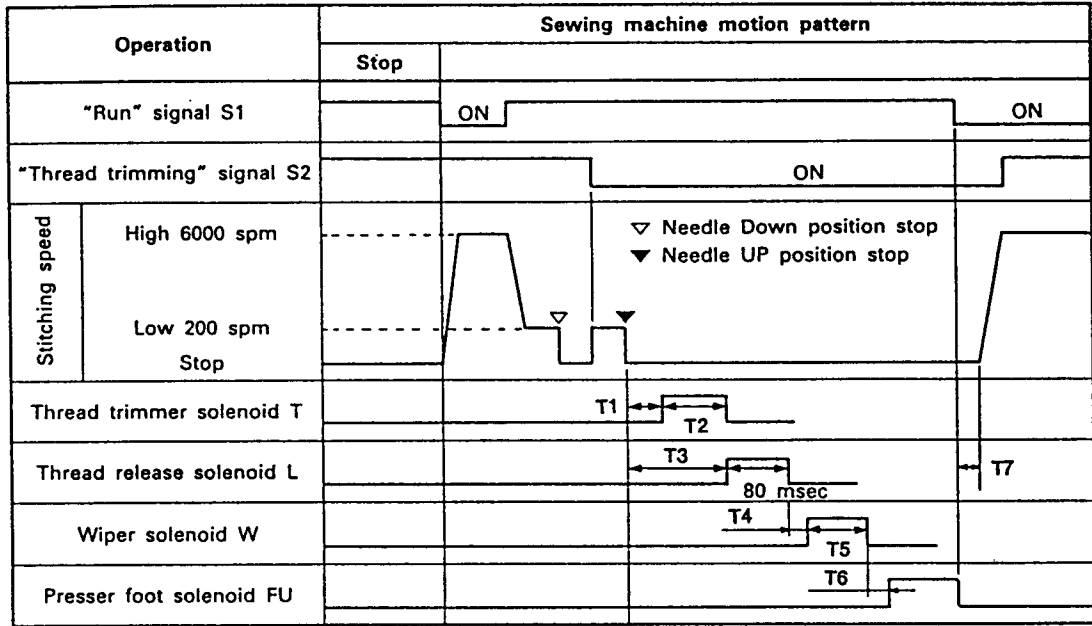
##### (2) Chain-stitch thread trimming Mode A2

(Internal DIP switch settings: D1=ON, D2=OFF, D3=OFF)



(3) Chain-stitch thread trimming Mode A3

(Internal DIP switch settings: D1=OFF, D2=ON, D3=OFF)



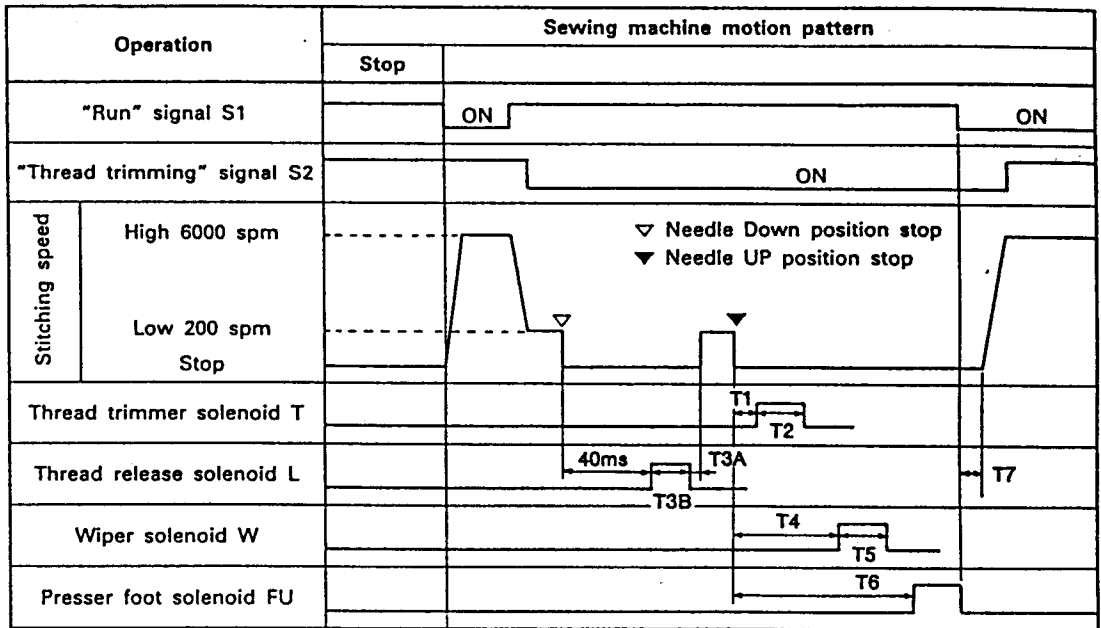
Each time CS1 to CS7 can be set within the range listed below in 15 steps by the respective rotary switch.  
Time increases with increment of rotary switch setting (0, 1, 2 ... F).

[The timing table of Mode A1, A2 and A3]

Mode	A 1							A 2							A 3							
Rotary Switch No.	CS1	CS2	CS3	CS4	CS5	CS6	CS7	CS1	CS2	CS3	CS4	CS5	CS6	CS7	CS1	CS2	CS3	CS4	CS5	CS6	CS7	
Timing	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7	T1	T2	T3	T4	T5	T6	T7	
Rotary switch setting	0	0	70	0	205	80	50	20	0	70	0	0	0	20	0	70	0	0	0	0	20	
	1	20	85	200	255	330	100	40	20	85	200	20	20	40	20	85	200	20	20	20	40	
	2	40	100	220	305	580	150	60	40	100	220	40	50	60	40	100	220	40	50	50	60	
	3	60	125	240	355	830	200	80	60	125	240	60	65	65	80	60	125	240	60	65	65	80
	4	80	150	260	375	1080	250	100	80	150	260	80	80	80	100	80	150	260	80	80	80	100
	5	100	175	280	390	1330	300	125	100	175	280	100	100	100	125	100	175	280	100	100	100	125
	6	110	200	300	405	1580	350	150	110	200	300	120	120	120	150	110	200	300	120	120	120	150
	7	120	225	320	420	1830	400	175	120	225	320	140	140	140	175	120	225	320	140	140	140	175
	8	130	250	340	435	2080	450	200	130	250	340	160	160	160	200	130	250	340	160	160	160	200
	9	140	275	360	450	2330	500	225	140	275	360	180	180	180	225	140	275	360	180	180	180	225
	A	150	300	380	465	2580	550	250	150	300	380	200	200	200	250	150	300	380	200	200	200	250
	B	160	325	400	505	2830	600	275	160	325	400	220	220	220	275	160	325	400	220	220	220	275
	C	170	350	420	555	3080	650	300	170	350	420	240	250	240	300	170	350	420	240	250	240	300
	D	180	375	440	605	3330	700	330	180	375	440	260	350	260	330	180	375	440	260	350	260	330
	E	190	400	460	655	3580	750	360	190	400	460	280	550	280	360	190	400	460	280	550	280	360
	F	200	425	480	705	3830	800	400	200	425	480	300	750	300	400	200	425	480	300	750	300	400

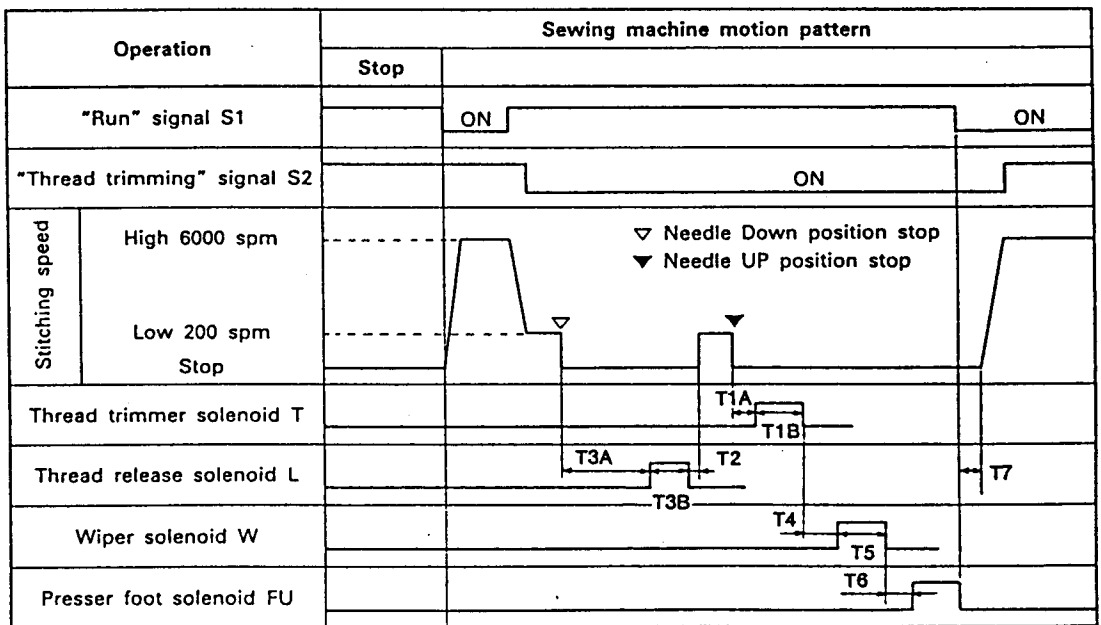
(4) Chain-stitch thread trimming Mode B1

(Internal DIP switch settings: D1=ON, D2=ON, D3=OFF)



(5) Chain-stitch thread trimming Mode B2

(Internal DIP switch settings: D1=OFF, D2=OFF, D3=ON)

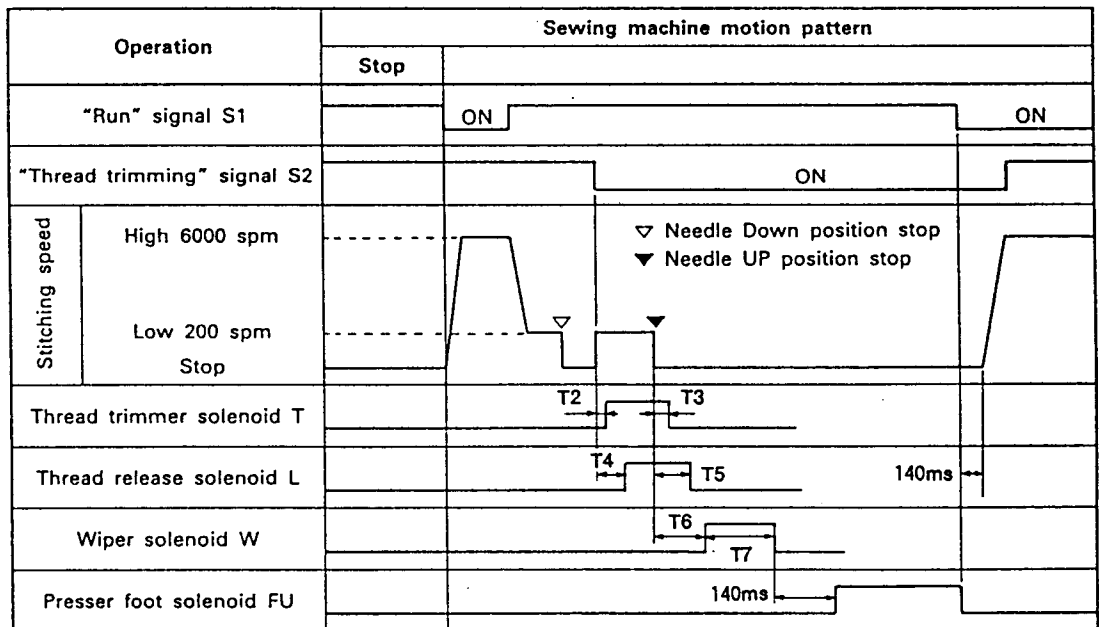


[The timing table of Mode B1 and B2]

Mode	B 1							B 2										
Rotary Switch No.	CS1	CS2	CS3	CS4	CS5	CS6	CS7	CS1	CS2	CS3	CS4	CS5	CS6	CS7				
Timing	T1	T2	T3		T4	T5	T6	T7	T1		T2	T3		T4	T5	T6	T7	
			T3A	T3B					T1A	T1B		T3A	T3B					
Rotary switch setting	0	0	70	0	50	205	80	50	20	50	70	0	40	50	0	0	0	20
	1	20	85	0	60	255	330	100	40	50	85	20	40	60	20	20	20	40
	2	40	100	0	70	305	580	150	60	50	100	40	40	70	40	50	50	60
	3	60	125	0	80	355	830	200	80	50	125	60	40	80	60	65	65	80
	4	80	150	0	90	375	1080	250	100	50	150	80	40	90	80	80	80	100
	5	100	175	0	100	390	1330	300	125	50	175	100	40	100	100	100	100	125
	6	110	200	0	110	405	1580	350	150	50	200	110	40	110	120	120	120	150
	7	120	225	0	120	420	1830	400	175	50	225	120	40	120	140	140	140	175
	8	130	250	20	50	435	2080	450	200	180	70	130	70	50	160	160	160	200
	9	140	275	20	60	450	2330	500	225	180	85	140	70	60	180	180	180	225
	A	150	300	20	70	465	2580	550	250	180	100	150	70	70	200	200	200	250
	B	160	325	20	80	505	2830	600	275	180	125	160	70	80	220	220	220	275
	C	170	350	20	90	555	3080	650	300	180	150	170	70	90	240	250	240	300
	D	180	375	20	100	605	3330	700	330	180	175	180	70	100	260	350	260	330
	E	190	400	20	110	655	3580	750	360	180	200	190	70	110	280	550	280	360
	F	200	425	20	120	705	3830	800	400	180	225	200	70	120	300	750	300	400

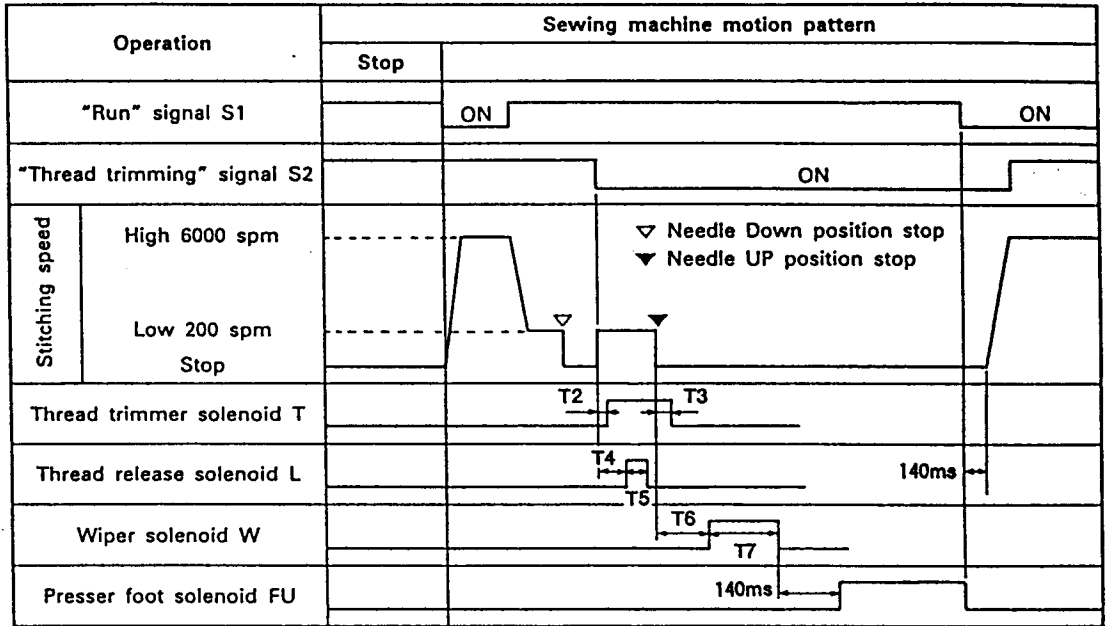
(6) Lock-stitch thread trimming Mode H10

(Internal DIP switch settings: D1=OFF, D2=ON, D3=ON, Rotary switch setting CS1=0)



(7) Lock-stitch thread trimming Mode H11

(Internal DIP switch settings: D1=OFF, D2=ON, D3=ON, Rotary switch setting CS1=1)

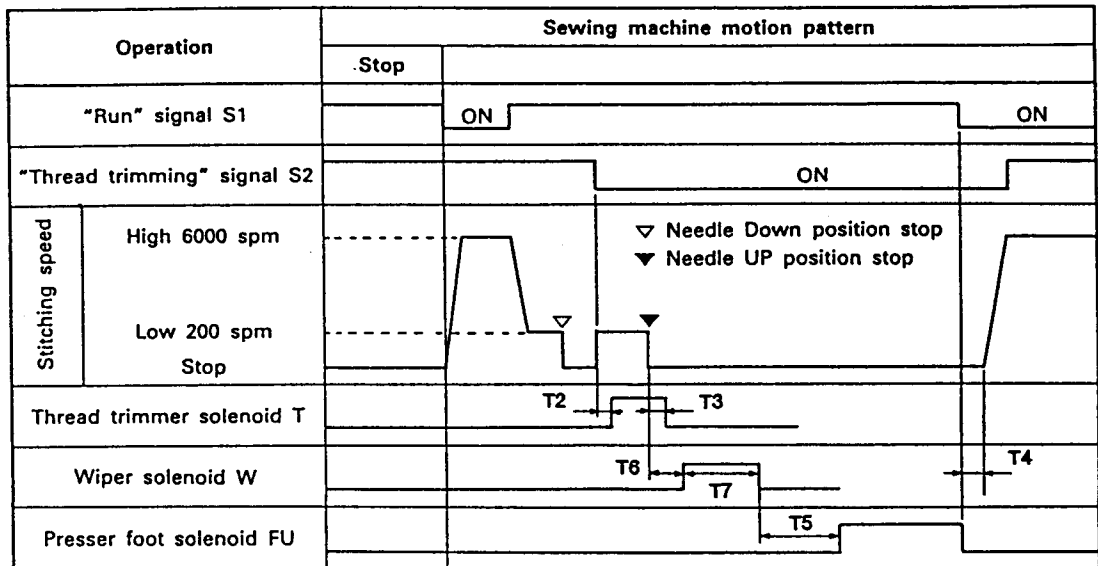


[The timing table of Mode H10 and H11]

Mode	H10							H11						
Rotary Switch No.	CS2	CS3	CS4	CS5	CS6	CS7	CS2	CS3	CS4	CS5	CS6	CS7		
Timing	T2	T3	T4	T5	T6	T7	T2	T3	T4	T5	T6	T7		
Rotary switch setting	0	2	2	2	2	0	40	2	2	2	20	0	40	
	1	4	6	4	6	8	50	4	6	4	30	8	50	
	2	6	9	6	9	12	60	6	9	6	40	12	60	
	3	8	12	8	12	16	70	8	12	8	50	16	70	
	4	9	16	9	16	20	80	9	16	9	60	20	80	
	5	11	19	11	19	40	90	11	19	11	70	40	90	
	6	13	23	13	23	60	100	13	23	13	80	60	100	
	7	15	26	15	26	80	110	15	26	15	90	80	110	
	8	17	29	17	29	100	120	17	29	17	100	100	120	
	9	18	33	18	33	120	140	18	33	18	110	120	140	
	A	20	36	20	36	140	160	20	36	20	120	140	160	
	B	22	40	22	40	160	180	22	40	22	130	160	180	
	C	24	43	24	43	180	200	24	43	24	140	180	200	
	D	26	46	26	46	200	250	26	46	26	150	200	250	
	E	27	50	27	50	250	300	27	50	27	160	250	300	
	F	29	53	29	53	300	350	29	53	29	170	300	350	

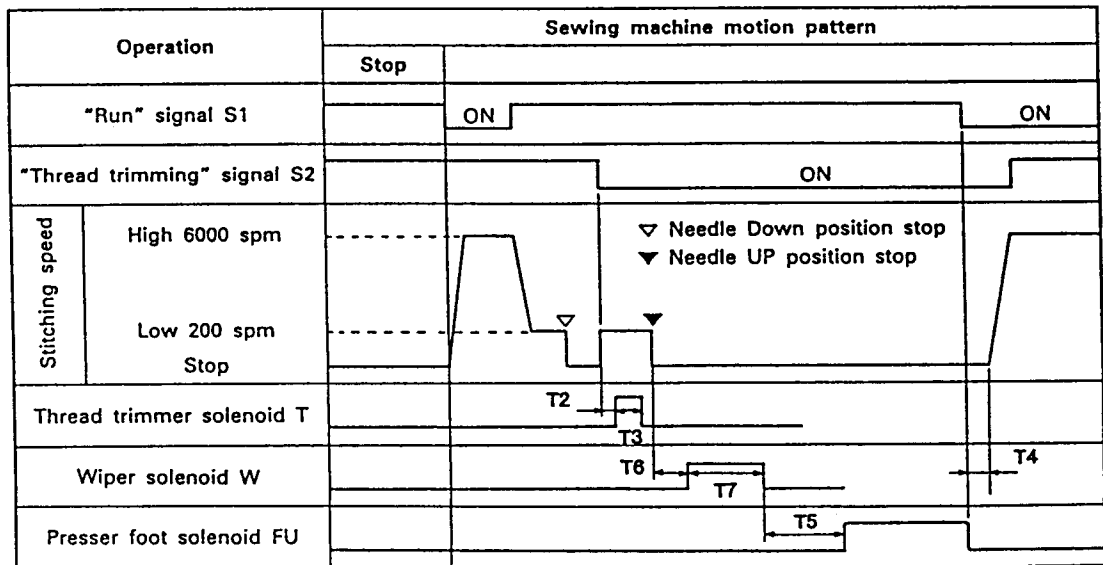
(8) Lock-stitch thread trimming Mode H24

(Internal DIP switch settings: D1=ON, D2=ON, D3=ON, Rotary switch setting CS1=4)



(9) Lock-stitch thread trimming Mode H25

(Internal DIP switch settings: D1=ON, D2=ON, D3=ON, Rotary switch setting CS1=5)



Note : When the lock-stitch thread trimming Mode H24 or H25 is selected, the back-tack signal B out put function is available.

(The timing table of Mode H24 and H25)

Mode	H24						H25						
Rotary Switch No.	CS2	CS3	CS4	CS5	CS6	CS7	CS2	CS3	CS4	CS5	CS6	CS7	
Timing	T2	T3	T4	T5	T6	T7	T2	T3	T4	T5	T6	T7	
Rotary switch setting	0	2	2	20	0	0	40	2	20	20	0	0	40
	1	4	5	40	20	8	50	4	30	40	20	8	50
	2	6	8	60	40	12	60	6	40	60	40	12	60
	3	8	11	80	60	16	70	8	50	80	60	16	70
	4	9	14	100	80	20	80	9	60	100	80	20	80
	5	11	17	125	100	40	90	11	70	125	100	40	90
	6	13	20	150	120	60	100	13	80	150	120	60	100
	7	15	23	175	140	80	110	15	90	175	140	80	110
	8	17	26	200	160	100	120	17	100	200	160	100	120
	9	18	29	225	180	120	140	18	110	225	180	120	140
	A	20	32	250	200	140	160	20	120	250	200	140	160
	B	22	35	275	220	160	180	22	130	275	220	160	180
	C	24	38	300	240	180	200	24	140	300	240	180	200
	D	26	41	330	260	200	250	26	150	330	260	200	250
	E	27	44	360	280	250	300	27	160	360	280	250	300
F	29	47	400	300	300	350	29	170	400	300	300	350	

(10) Lock-stitch thread trimming Mode M and P

( Internal DIP switch settings: Mode M, D1=ON, D2=ON, D3=ON, Rotary switch CS1=0 )  
 Mode P, D1=ON, D2=ON, D3=ON, Rotary switch CS1=8 )

Each solenoid drive timing in the lock-stitch thread trimming Mode M and P is fixed. Settings of rotary switches CS2 to CS7 are ignored.

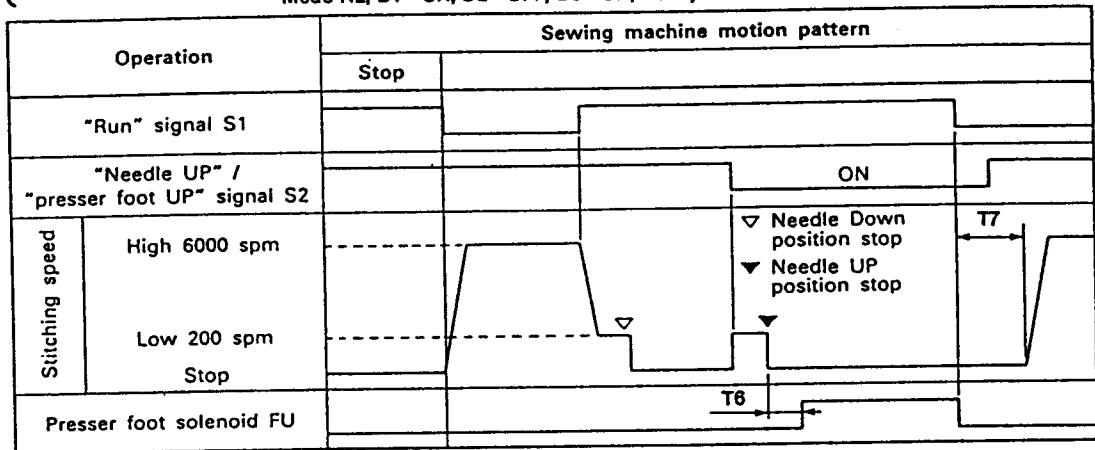
Mode M is selected for Mitsubishi, Juki, Seiko, Toyota and Yakumo sewing machines equipped with thread trimmer.

Mode P is selected for Pfaff sewing machine (Model 463) equipped with thread trimmer.



(1) Thread trimless Mode N1, N2

( Internal DIP switch settings: Mode N1 D1=ON, D2=OFF, D3=ON, Rotary switch CS1=0 )  
 Mode N2, D1=ON, D2=OFF, D3=ON, Rotary switch CS1=8 )



Times CS6 and CS7 can be set within the ranges listed below. Settings CS2 to CS5 are ignored.

Note : When Mode N2 is selected, the back-tack signal B output function is available.

[The timing table of Mode N1 or N2]

Mode	N1 or N2					
Rotary Switch No.	CS2	CS3	CS4	CS5	CS6	CS7
Timing	T2	T3	T4	T5	T6	T7
Rotary switch setting	0	-	-	-	0	20
	1	-	-	-	20	40
	2	-	-	-	50	60
	3	-	-	-	65	8
	4	-	-	-	80	100
	5	-	-	-	100	125
	6	-	-	-	120	150
	7	-	-	-	140	175
	8	-	-	-	160	200
	9	-	-	-	180	225
	A	-	-	-	200	250
	B	-	-	-	220	275
	C	-	-	-	240	300
	D	-	-	-	260	330
	E	-	-	-	280	360
	F	-	-	-	300	400

## 4.8 Optional functions

### (1) Internal DIP switches

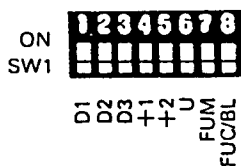


Fig. 10 Internal DIP switches

Set these DIP switches referring to the following instruction and Fig. 10.

D1, D2, D3: Stitching mode select switch  
For details, refer to Section 4.6.

+1, +2: Slow start switch  
At the first toeing after the power-on or thread trimming, the sewing machine runs slow for the range from 0 stitch to the stitches listed in the following table:

Stitches / Switch setting	0	1	2	3
+1	OFF	ON	OFF	ON
+2	OFF	OFF	ON	ON

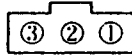
U: Selection of 1-POSITION or 2-POSITION  
When this switch is set to "ON", 1-POSITION is selected. For details, refer to Section 4.3.

FUM: Momentary presser foot up switch  
When this switch is set "ON", the automatic presser foot lifting operation starts and continues after the thread trimming by full heeling or external thread trimming signal S2.  
The presser foot can be lowered by repeating full heeling, or by turning on and then off external thread trimming signal S2, light heeling S3 or external presser foot lifting signal F.

FUC/BL: Timer-triggered presser foot lifting switch/braking control during sewing machine stop  
The function of this switch depends on stitching mode selection.  
When the chain-stitch trimming Mode A1, A2, A3, B1 or B2 is selected, the switch function is FUC (timer-triggered presser foot up).  
When the lock-stitch trimming Mode H10, H11, H24, H25, M, P or thread trimless Mode N1, N2 is selected, the switch function is BL (braking control during sewing machine stop).  
With the FUC switch set at "ON", the automatic presser foot lifting operation continues for about 12 sec. after the thread trimming by heeling signal S2 and then changes to the normal presser foot lifting operation.  
The presser foot can be lowered by giving heeling signal S2 or external presser foot up signal F again during the automatic presser foot lifting operation.  
With the BL switch set at "ON", the soft brake acts during machine stop to lock the pulley lightly.

(2) External functions

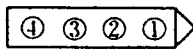
Clutch



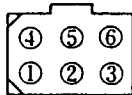
Brake



Presser foot



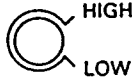
Detector



Operation



Speed

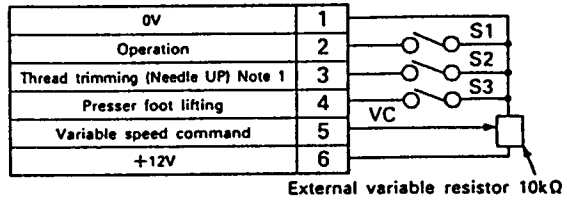


Sewing machine

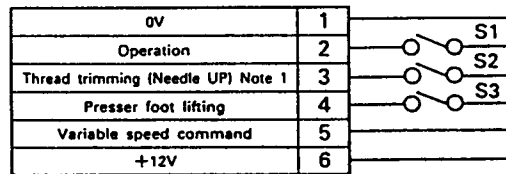


Operation connector

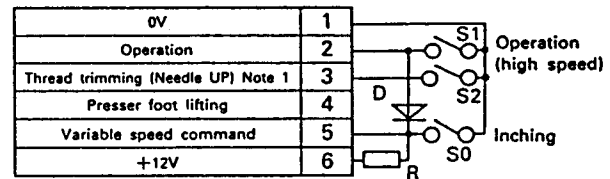
• Operation using external variable resistor



• High-speed operation for stand working



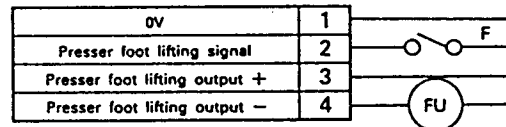
• High-speed and inching operations for stand working



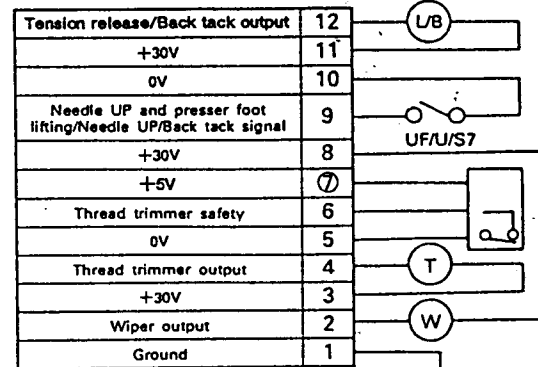
D: 1S953 (NEC) or equivalent (VR ≥ 30V, IF ≥ 30mA)  
R: 1kΩ, 1/2W or more

Note 1: To be replaced by the needle UP signal when thread trimless Mode.

Presser foot lifting connector



Sewing machine connector



Note : ⑦ pin indicates the male pin.  
The other pins indicate the female pin.

**(2-a) Sewing machine connector input signals**

**S6: Thread trimmer safety**

The function of this input depends on stitching mode selection.

When the chain-stitch trimming Mode A1, A2, A3, B1 or B2 is selected and thread trimmer safety signal S6 is turned off, pedal toeing and heeling operation is ignored and the sewing machine does not run.

When the lock-stitch trimming Mode H10, H11, H24, H25, M, P or thread trimless Mode N1, N2 is selected and thread trimmer safety signal S6 is turned on, pedal toeing and heeling operation is ignored.

When the signal is turned on, the sewing machine stops.

Mode Input		Chain-Stitch trimming Mode A1, A2, A3, B1, B2	Lock-Stitch trimming Mode H10, H11, H24, H25, M, P	Thread trimless mode N1, N2
S6	ON	Operative	Inoperative (thread trimmer protection)	S6 should be held "OFF".
	OFF	Inoperative (thread trimmer protection)	Operative	

**UF/U/S7: Needle UP and pressor foot lifting/Needle UP/Back-tack signal**

The signal function is UF when the chain-stitch Mode A1, A2, A3, B1 or B2 is selected, and S7 when the lock-stitch trimming Mode M, P, H24, H25 or the thread trimless Mode N2 is selected, and U when the lock-stitch trimming Mode H10, H11 or the thread trimless Mode N1 is selected.

**UF: Needle UP and pressor foot lifting signal**

When this signal is turned on while the sewing machine remains stopped with the needle at position other than UP position, the sewing machine runs until the needle reaches UP position and then the presser foot starts lifting.

When the UF signal is turned on while the sewing machine remains stopped with the needle at UP position, the sewing machine does not run and the presser foot goes up.

**S7: Back-tack signal**

When this signal is turned on, the stitching motion is reversed (while the sewing machine is running).

The signal is ignored if it is given while the sewing machine remains stopped.

**U: Needle UP signal**

When this signal is turned on while the sewing machine remains stopped with the needle at DOWN position, the sewing machine stops with the needle UP position after half revolution of the sewing machine.

The signal is ignored if it is given while the internal DIP switch "U" is at "ON" position.

(2-b) Sewing machine connector output signals

- T: Thread trimmer output, W: Wiper output  
These two output signals is used in mode other than the thread trimless Mode.  
For signal timing, refer to Section 4.7.
- L/B: Tension release output/back-tack output signal  
The function of this signal depends on stitching mode selection.  
When the chain-stitch trimming Mode A1, A2, A3, B1, B2 or the lock-stitch trimming Mode H10, H11 is selected, the tension release signal L is output.  
When the lock-stitch trimming Mode M, P, H24, H25 or the thread trimless Mode N2 is selected, the back-tack signal B is output.  
When the thread trimless Mode N1 is selected, no signal is output.  
For signal timing, refer to Section 4.7.

## 5. MAINTENANCE

Clean the dust filters every two to three months. IF operated with the filters clogged with yarn waste and lint, the motor will overheat and its service life will be adversely affected.

## 6. FACTORY SETTING OF CONTROL BOX

Mode setting	DIP Switch			Rotary Switch						
	D1	D2	D3	CS1	CS2	CS3	CS4	CS5	CS6	CS7
Chain-Stitch Mode A	OFF	OFF	OFF	5	1	1	4	0	C	B

## 7. SPECIFICATIONS

Motor Type	Number of Phases	Number of Poles	Output (W)	Voltage (V)		Output Shaft Speed (spm)		Speed Control Range (spm)	Lever Unit Type
				Signal phase	Three phases	50Hz	60Hz		
CA-ZK402E-AMG60	1	2	400	100, 110	200, 220	2750	3350	200 to 6000*	LK-CL-2 With variable-speed operation, needle DOWN stop, thread trimmer, automatic presser foot lifting functions
CB-ZK402E-AMG60	3			110/220					
CA-ZK552E-AMG60	1	2	550	100, 110	200, 220	2750	3350	200 to 6000*	
CB-ZK552E-AMG60	3			110/220					
				200, 220				200 to 6000*	
				230, 240					

\* May be changed to 160 to 8500 spm by internal variable resistor in the control box.