

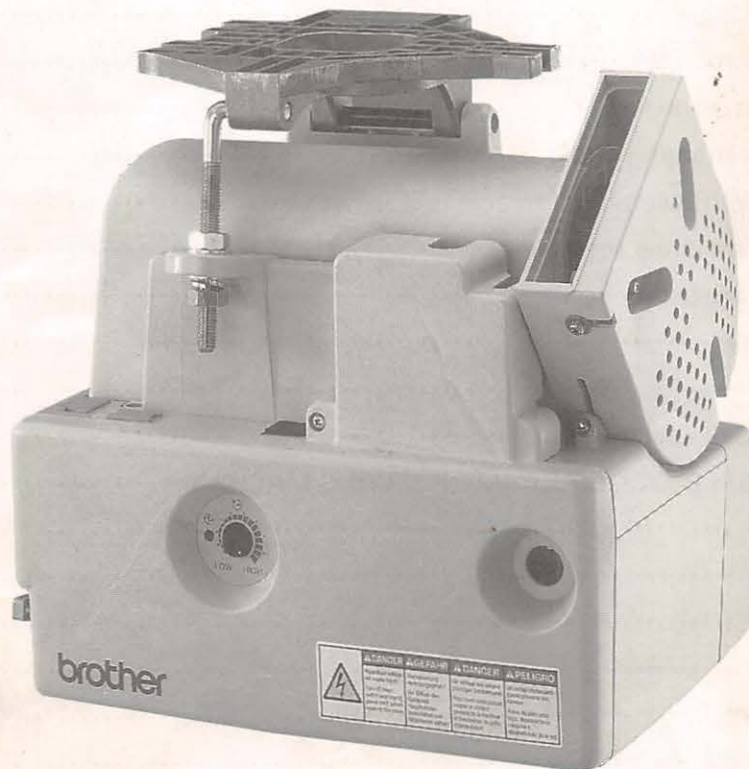
# ***MD-600 Series***

**AC Servomotor for Industrial Sewing Machines**

## **SERVICE MANUAL**

**MD-601 (Single-Phase Type)**

**MD-611 (Three-Phase Type)**



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(Note) Functions indicated with ☆ mark are activated on the new CPU version (J02954-B). They are not activated on the old CPU version (J02781-A).



## 1 Outline

The MD600 Series AC servomotor is a substitute for the MD800 Series DC servomotor, incorporating an induction motor. This motor is maintenance-free and has less noise. Improvements have been made in the vibration and heating, and the operability and reliability have been further improved with an all-digital control.

The model configuration follows the conventional MD800 Series.

## 2 Features

### ① Incorporation of induction motor

By incorporating an induction motor instead of the conventional DC motor, a stout motor without brushes, mechanical brake and magnet has been achieved.

### ② Maintenance-free

By using electric brake instead of the conventional mechanical brake, and by eliminating the brushes and mechanical brake, a completely maintenance-free motor with no wear parts has been realized.

### ③ Quiet operation

Motor noise has been eliminated with the sine wave control without strain.

By using electric brake instead of mechanical brake, the sound of the mechanical brake conventionally heard when decelerating and stopping has been reduced.

By using an integrated structure for the box and motor, the vibration conveyed to the pedal has been made creating a user-friendly quiet environment.

### ④ Lightweight

By using an induction motor, integrated box and motor structure, and resin case, the weight has been reduced to 15kg from the 21kg for the conventional DC motor. This lighter weight also makes setting up easier.

Furthermore, by using a cooling structure, the temperature rise of the motor's outer frame has been dropped by approx. 10°C according to Brother comparisons.

### ⑤ Strengthened functions

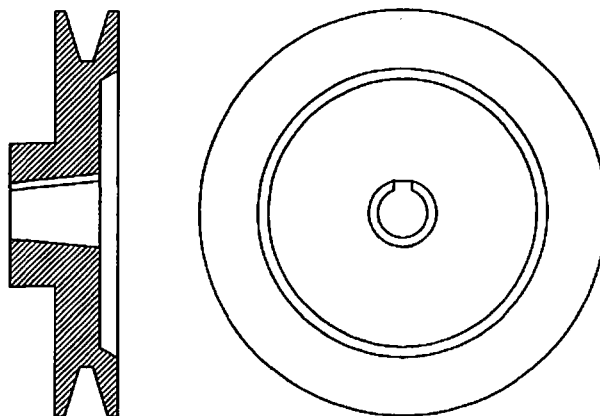
Ample memory switches and parameter settings that allow the functions and characteristics to be changed and an extensive self-diagnosis function are provided.

### ⑥ All-digital control

With the all-digital control, the stitching speed can be input with numerical inputs from the operation panel instead of the conventional volume knobs settings, allowing accurate and swift settings.

### ⑦ Others

- A commercial tapered pulley ( $\phi 90$  or  $\phi 105$ ) can be used.
- The installation pitch onto the table is the same as the conventional clutch motor, etc.



3 Model configuration

- MD-6 1
- None : Forward rotation
  - R : Reverse rotation
  - 0 : Single-phase, 50/60Hz common (Voltage 100V, 110V, 220V, 230V, 240V) 5 types ※1
  - 1 : 3-phase 50/60Hz common (Voltage 200V, 220V, 380V, 400 to 415V) 4 types ※2

※1: The 200V, 230V and 240V specifications are common by reinserting the connector internally.  
※2: The 380V and 400 to 415V specifications are common by reinserting the connector internally.

[Product Code]  
137-601-710-S1

Last digit  
Single phase

1: 110V, lamp 6V	Taiwan
2: 110V, lamp 6V, OCR	USA
3: 110V, lamp 6V, SJT	Canada
4: 230V, no lamp, no switches	Germany, UK, France
5: 220V, lamp 6V	Korea (Hong Kong)
6:	
7: 230V, lamp 6V	Singapore
8: 230V, no lamp	Spain, Portugal (New Zealand)
9:	
0: 240V, lamp 6V	Australia

Last digit  
3-phase

1: 220V, lamp 6V	Taiwan, Korea
2: 220V, lamp 6V, OCR	USA
3: 220V, lamp 6V, SJT	Canada
4: 400V, lamp, no switches	Germany, UK, France
5: 380V, lamp 6V	China
6: 380V, lamp 6V, OCR	South Africa
7: 400V, no lamp	Spain, Portugal
8:	
9:	
0: 415V, lamp 6V	Australia

Last two digits

1: Export, B798, φ90, 2000spm
2: Export, B748, φ90, 2500spm
3:
4: Export, single needle, φ90, 3500spm
5: Export, single needle, φ90, 4000spm
6: Export, single needle, φ105, 4500spm Export, covering, φ105, 4500spm
7: Export, single needle, φ105, 5000spm Export, covering, φ105, 5000spm
8: Export, overlock, φ105, 6000spm Export, covering, φ105, 6000spm
9: Export, overlock, φ105, 8000spm
T: Export, B852, φ105, 4500spm
U: Export, twin needle, φ90, 3000spm
V: Export, twin needle, φ90, 3500spm
W: Export, twin needle, φ90, 4000spm

Last two digits

01: Domestic, single needle, φ90, 4000spm
02: Domestic, single needle, φ90, 3500spm
03: Domestic, B748, φ90, 2500spm
04:
05: Domestic, B748, φ90, 2000spm
06: Domestic, B852, φ90, 4000spm
07: 01 packed in cardboard box
08: Domestic, overlock, φ105, 6000spm
09: Domestic, overlock, φ105, 8000spm
S1: Domestic, twin needle, φ90, 3000spm
S2: Domestic, twin needle, φ90, 3500spm
S3: Domestic, twin needle, φ90, 4000spm

3rd digit from last

0: Domestic specifications, domestic treadle	External panel
1: Export specifications, domestic treadle	
5: Export specifications, export treadle	
6: Export specifications, export treadle, different switches ※3	
3: Export specifications, domestic treadle	Built-in panel
8: Export specifications, export treadle	
9: Export specifications, export treadle, different switches ※3	

※3: With OCR switch Canada, Hong Kong, New Zealand, Australia (Switch for SAA)

4th and 5th digits from last

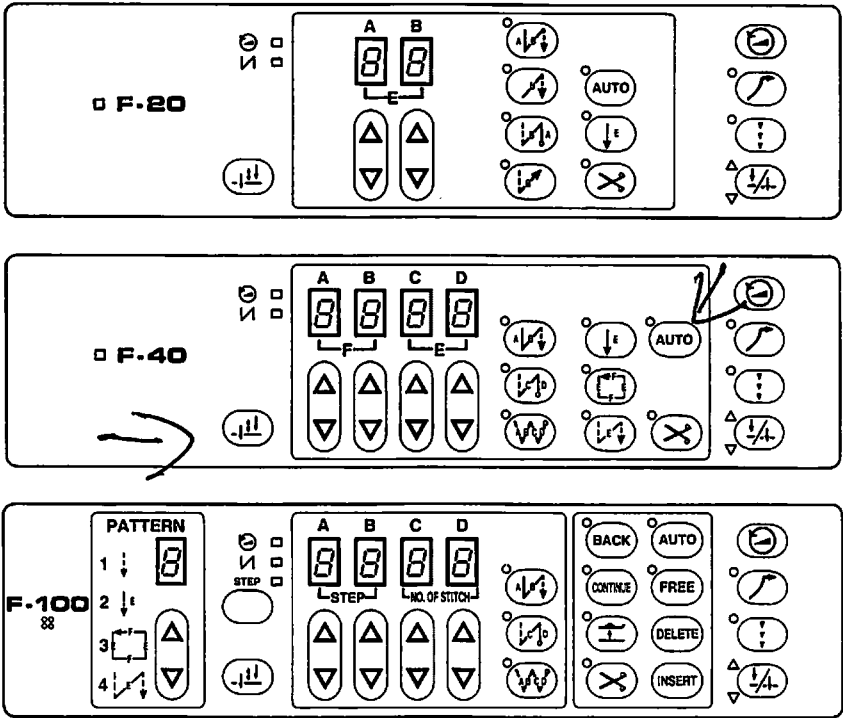
70:
71: MK2-F0, overlock
72: MK2-F20
73: MK2-F40
74: MK2-F100
79: Covering

4 Operation panel and options

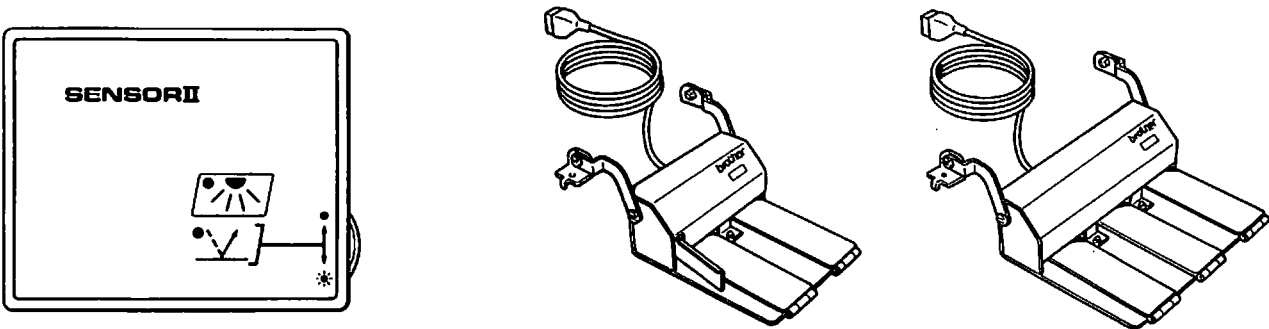
Attachable operation panel    F-20 (X-20)  
   F-40 (X-40)  
   F-100 (X-100)

Attachable options                Standing work pedal  
   Material edge sensor (Connect to S2 operation panel and use)

(Note 1) A built-in type panel for B737 and an external type (twin needle, etc.) F-panels are available.  
(Note 2) The X-panels can be used with the MD600 Series, but these panels do not have the stitching speed switch [ ⊖ ].  
(Note 3) The E-panel for the MD800 series cannot be used with the MD600 Series.



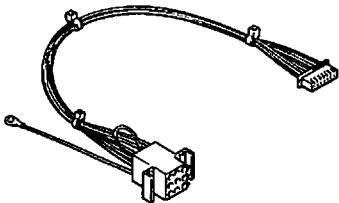
[Assembly cord for standing work]  
Standing treadle 40 variable speed # 6    J80081-040                      # 8    J80380-040



Operation panel

Sewing machine model	Installation type	Type	Code no. of operation panel
B737MK II	built-in	F-20	137-207-711-11
		F-40	137-207-712-11
		F-100	137-207-713-11
B201	built-in	BF-20	137-207-811-11
		BF-40	137-207-812-11
		BF-100	137-207-813-11
Operation panel (without install plate)	attached	F-20	137-207-711-10
		F-40	137-207-712-10
		F-100	137-207-713-10

Foot plug    J02496-001



## 5 Spare parts list (MD-601, 611)

		MK 2 B737, B842 etc.	BAST LS2 B883	PWB C51 C53	LOCK	COV FD4 group
motor assy.	1phase 100-120V	MD600#1LV J80643-001	MD600#1LV J80643-001	MD600#1LV J80643-001	MD600#1LV-R J80643-002	MD600#1-3LV-R J80644-001
	1phase 200-240V					
	3phase 200-220V					
	3phase 380-415V	MD600#2HV J80652-001	MD600#2HV J80652-001	MD600#2HV J80652-001	MD600#2HV-R J80652-002	MD600#2-3HV-R J80653-001
pulley		PULLY 090 J02278-001	PULLY 090 J02278-001	PULLY 090 J02278-001		
		PULLY 0105 J02281-001			PULLY 0105 J02281-001	PULLY 0105 J02281-001
control board		IMS-MK2-assy(B47A101) J80641-001				IMS-COV-assy(B47A101) J80674-001
sub board						COV-SUB-assy(B47A128) J80675-001
power board	1phase 100-120V	IMP-1110V-assy(B47A117) J80634-001				
	1phase 200-240V	IMP-1230V-assy(B47A118) J80635-001				IMP-1230V-COV (B47A118) J80722-001
	3phase 200-220V	IMP-3220V-assy(B47A102) J80637-001				IMP-3220V-COV (B47A102) J80723-001
	1phase 230V CE	IMP-1230VC-assy(B47A118) J80636-001				IMP-1230VC-COV(B47A118) J80724-001
	3phase 380-415V	IMP-3400V-assy(B47A119) J80690-001				
	3phase 400V CE	IMP-3400VC-assy J80691-001				
treadle unit	comp.	#E(EXPORT. spec) J80638-001				
		#D(DOMES. spec) J80639-001				
	pcb	PS-INV assy(B47A104) J80640-001				
trans former	1phase 100-120V	TRANS. INV110V J02502-001				
	1phase 220-240V	TRANS. INV220V J02503-001				
	3phase 200-220V	TRANS. INV200V J02664-001				
	3phase 380-400V	TRANS. INV400V J02504-001				
resist.	110/240V group	R-40W/100Ω J02470-001				
	400V group	R-40W/200Ω J02628-001				
synchro nizer	inner type	#13 #14	#14 291670-001			
	outer type	#12-7 291080-001		#12-8 J80351-001	#15-2 J80350-001	#15-7 J80353-001
OP panel		F-2 0		F-2 0		
		F-4 0		F-4 0		
		F-1 0 0		F-1 0 0		

#13(291079-001);B737 group #14(291670-001);B842 group

\* : About dip SW setting of the control circuit board

IMS-MK2-assy can be used for the specification of [LOCK] [BAST] and [PWB] . Please make a correct dip SW setting, depending on the type and specification of sewing head, the maximum speed of sewing head and the size of motor pulley. (Please refer to the instruction sheet included in the spare parts for correct setting.)

## 6 Explanation of the control box's name plate

name plate

<b>brother</b>		<b>THREE PHASE</b>	
<b>MD-611</b> ①		<b>WATTS</b>	<b>400</b>
<b>AC SERVO MOTOR</b>		<b>VOLTS</b>	<b>220</b>
<b>TYPE L</b> ②③④⑤⑥⑦		<b>HELTZ</b>	<b>50/60</b>
		<b>R. P. M</b>	<b>3500</b>
		<b>MADE IN JAPAN</b>	
<b>No. ①②③XXXXXX</b>		<b>BROTHER INDUSTRIES, LTD</b>	

- ① :month  
 ②② :year  
 ③ :modification No.

MD-6X1 ①	②	③	④	⑤	⑥	⑦
use	treadle unit	pully outer diameter	sewing speed	use	lamp tap voltage	
:Mark2(B737etc.)			0:1000spm		A:6V	
-2:	C:with presser foot lifter	3: φ 90	1:2000spm	1:Mark2	C:null	2:LZ2-B852etc. (zigzag)
-3:	down sw. in treadle unit	4: φ 105	2:2500spm			
-4:			3:3000spm			
-5:BAST			4:3500spm			
-6:			5:4000spm			
-7:			6:4500spm	6:BAST		3:B842 group
-8:	D:without presser foot lifter		7:5000spm			
-9:PWB	down sw. in treadle unit		8:6000spm			
MD-6X1R ①			9:8000spm	P:PWB		
:OVERLOCK						
-3:COV						

COV :Covering stitcher with thread trimmer. (FD4-B27X group & FD3-B25X group)

BAST:Single needle basting lock stitcher with thread trimmer. (LS2-b883)

## 7 Pulley selection and DIP switch settings

Always set a pulley that meets the sewing machine head type and speed and the DIP switches before turning the power switch ON.

### A. DIP switch functions

		ON	OFF	
DIP switch 1	Specifications	Export specifications	Domestic specifications	
2	Pulley size	φ90	φ105	(Note 1)
3	Automatic presser	Provided	Not provided	(Note 2)
4	Neutral stop position changeover	Needle UP position	Needle DOWN position	(Note 3)
5	Head	Twin needle	Single needle	
6	Max. speed	Separate table		
7				
8				

(Note 1) If a pulley not within the designated size is used, the specified speed and torque will not be achieved.

(Note 2) When using the head integrated electromagnetic presser (B737-9 □ □), disconnect only the capacitor on the head side. (Do not remove the flywheel resistor and diode.)

(Note 3) The operation panel settings will have the priority when the operation panel is connected.

### B. Maximum speed and pulley setting

#### B-1 Single needle and twin needle setting

DIP switch \ Speed	1000	2000	2500	3000	3500	4000	4500	(Note 3) 4700
6	OFF	ON	OFF	ON	OFF	ON	OFF	ON
7	OFF	OFF	ON	ON	OFF	OFF	ON	ON
8	OFF	OFF	OFF	OFF	ON	ON	ON	ON
Pulley size	φ90						φ105	

(Note 1) Even the if the speed reaches 4500spm with the DIP switch 6, 7 and 8 settings, the speed will not exceed 4500spm when the φ90 pulley is designated by turning DIP switch 2 ON.

(Note 2) Even the if the speed reaches 4000spm with the DIP switch 6, 7 and 8 settings, the speed will not exceed 4000spm when the twin needle is designated by turning DIP switch 5 ON.

(Note 3) If the high-speed stitching limit speed is set to 5000spm in the [8] 8-4 Stitching speed setting mode, the maximum speed can be set up to 5000spm.

☆ (Note 4) If the DIP switch 2 or DIP switch 5 setting is changed, the head settings in section [8] 8-2 will be initialized.

#### B-2 Overlock setting

If overlock [ O U L ] is set in the [8] 8-2 head setting mode, the DIP switch settings will be as follow.

DIP switch \ Speed	5000	5500	6000	6500	7000	7500	8000	8500
6	OFF	ON	OFF	ON	OFF	ON	OFF	ON
7	OFF	OFF	ON	ON	OFF	OFF	ON	ON
8	OFF	OFF	OFF	OFF	ON	ON	ON	ON
Pulley size	φ105							






(Note 5) Use the overlock with DIP switch 5 set to OFF (single needle setting).

☆ (Note 6) If the DIP switch 2 or DIP switch 5 setting is changed, the head settings in section [8] 8-2 will be initialized. (The overlock setting will be canceled.)









## **C. Setting of maximum speed and start backtack stitching speed**

### **C-1 Setting of maximum speed**

- 1) When the stitching speed key [  ] is pressed once, the [  ] LED will light, and the maximum speed will display on the No. of stitches display section.
- 2) The No. of stitches can be set with the [  ] and [  ] keys.
- 3) When the single needle model is set, the speed can be set between 215spm and the DIP switch setting speed (max. 4700spm).
- 4) When the twin needle model is set, the speed can be set between 250spm and the DIP switch setting speed (max. 4000spm).
- 5) During stitching, the [  ] LED will go out, and the display will return to the backtacking display, etc.

### **C-2 Setting of start backtack stitching speed**

- 1) When the stitching speed key [  ] is pressed twice, [  ] and [  ] will light, and the start backtack stitching speed will display on the No. of stitches display section.
- 2) The No. of stitches can be set with the [  ] and [  ] keys.
- 3) When the single needle model is set, the speed can be set between 215spm and 1800spm.
- 4) When the twin needle model is set, the speed can be set between 250spm and 1000spm.
- 5) During stitching, the [  ] LED will go out, and the display will return to the backtacking display, etc.

## 8 Explanation of each mode

Besides the normal stitching mode, the head setting mode, initialization mode, and memory switch setting mode, etc., can be entered using the operation panel and various settings can be made. (If the power switch is turned ON while holding down the designated key, the initialization and head setting modes can be entered. If the designated key is pressed while the thread trimming needle is stopped at the UP position in the stitching mode, the memory switch setting mode, etc., can be entered.)

(Note) This function can be used only when the F-40 or F-100 operation panel is connected. **This cannot be used with the F-20 panel.** Once the settings are made with the F-40 or F-100 operation panel connected, the set details will be registered even if the panel is disconnected.

Explanation of flow chart

[□□] ... Indicates the display.

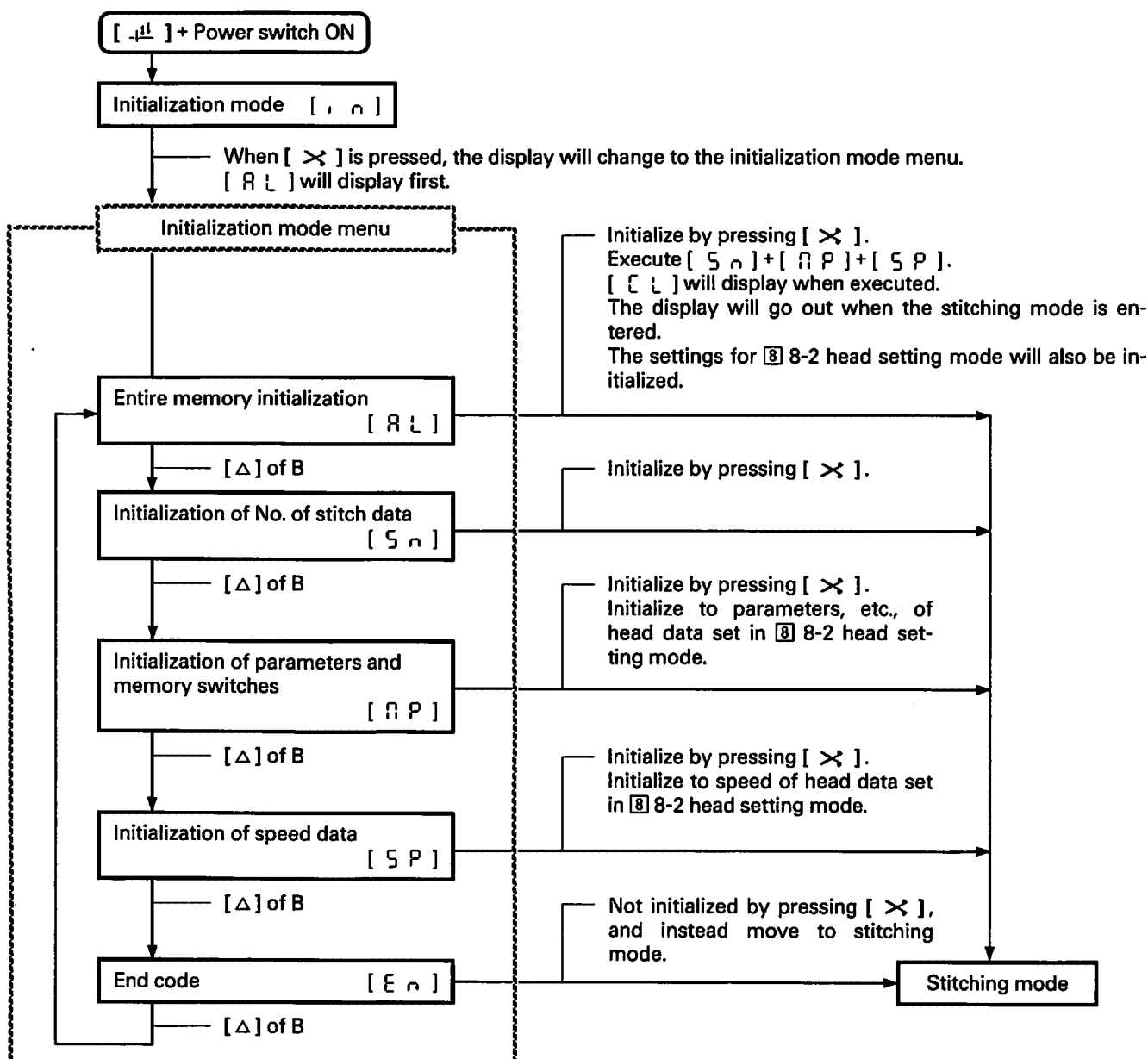
[□□] ... Indicates a key operation.

+ ... Indicates simultaneous double operation.

### 8-1 Initialization mode

Various data can be registered in the memory on the control PCB, and can be changed as required. If the data is changed by mistake, the data can be initialized with the initialization mode.

(Note) Only this function can be used with the F-20 panel.



## 8-2 Head setting mode

Before the motor is shipped from the factory, the motor product code is determined for each head and is set to match the specifications of the head. If the motor is to be used for another head, replace the pulley with an appropriate one (according to maximum speed), and select the head No. with this mode. The specifications will then match the head.

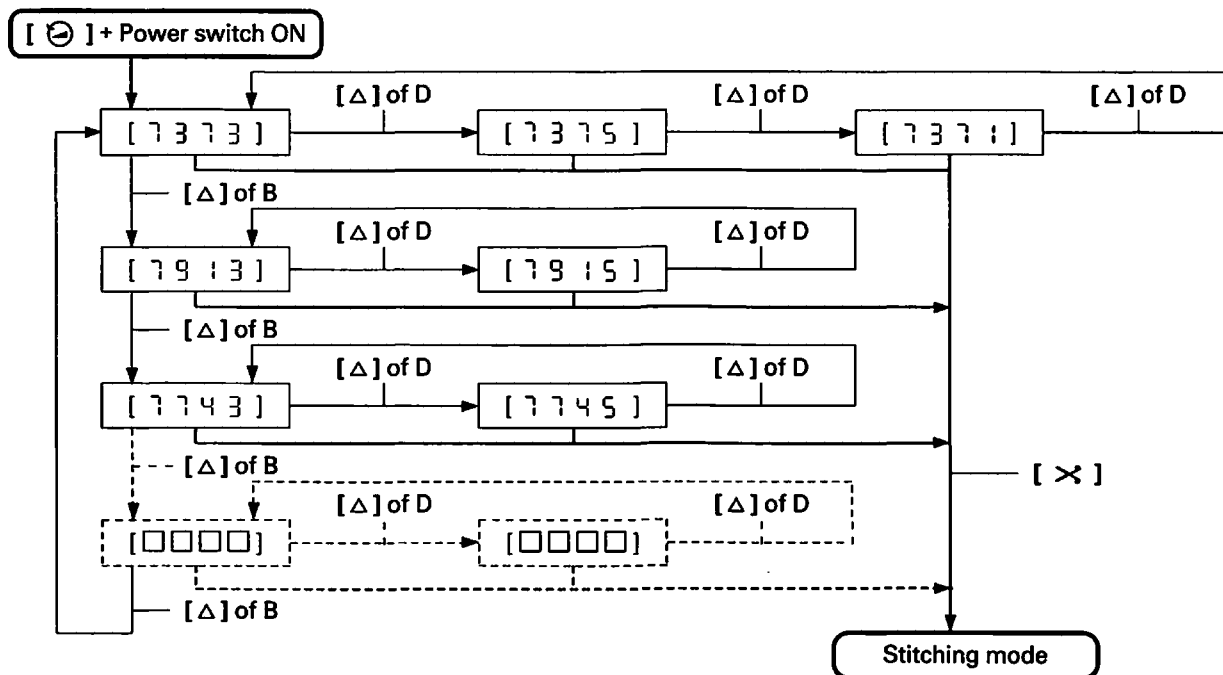
The heads that can be set are determined by the DIP switch 5 setting.

Always set the DIP switch (pulley size, single needle/twin needle, maximum speed) before making this setting.

The backtack stitching timing, etc., differs slightly according to the head. Thus, setting this mode accurately is recommended.

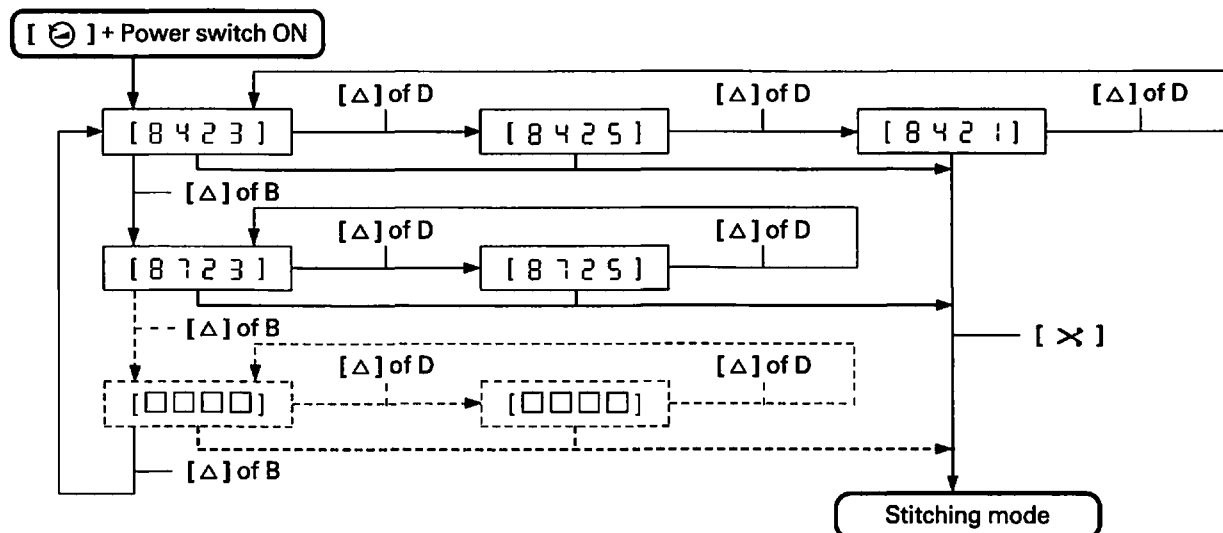
### A. Setting method

#### A-1. When DIP switch 5 is set to OFF (single needle)



Display No. [ 7 3 7 3 ] indicates DB2-B737-□□3.  
 [ 7 3 7 5 ] indicates DB2-B737-□□5.  
 [ 7 3 7 1 ] indicates DB2-B737-□□1.

#### A-2. When DIP switch 5 is set to ON (twin needle)



(Note 1) Each speed is automatically set to match the head specifications, but the maximum stitching speed is limited by the [ 7 ]-B DIP switch 6, 7 and 8 setting.

(Note 2) The settings will be registered when the [ × ] key is pressed.

If the settings are not to be changed, turn the power switch ON again without pressing the [ × ] key.

## B. List of setting heads

### B-1. When DIP switch 5 is set to OFF (single needle)

- 1) The factory setting is [ 7 3 7 3 ].
- 2) If [ R L ] is executed in the initialization menu, this setting will be initialized to [ 7 3 7 3 ].
- ☆ 3) If the DIP switch 2 or DIP switch 5 setting is changed, the head setting will be initialized.  
If DIP switch 5 is OFF, this setting will be initialized to [ 7 3 7 3 ].

Head		[ABC] display	[D] display	Maximum speed
B737	※1	7 3 7	3 ... 4700spm	5 ... 3500spm 1 ... 4000spm
B791	※1	7 9 1	3 ... 4500spm	5 ... 3500spm
B774	※1	7 7 4	3 ... 4500spm	5 ... 3500spm
B748	※2	7 4 8	5 ... 3500spm	7 ... 2500spm
B798	※3	7 9 8	None ... 2000spm	
B772	※1	7 7 2	3 ... 4500spm	
B778	※1	7 7 8	3 ... 4500spm	
B781☆	※4	7 8 1	None ... 4000spm	
B852, B853, B854	※5	8 5 2	3 ... 4500spm	
B883	※6	8 8 3	None ... 850spm	
Overlock☆	※7	o u L	None ... Set with DIP switches 6, 7 and 8	

- ※1: The inching speed is set to 215spm, the thread trimming speed to 215spm and the start and end backtack stitching speed to 1800spm.
- ※2: The inching speed is set to 215spm, the thread trimming speed to 215spm and the start and end backtack stitching speed to 1200spm.
- ※3: The inching speed is set to 215spm, the thread trimming speed to 215spm and the start and end backtack stitching speed to 1000spm.
- ☆ ※4: The inching speed is set to 215spm, the thread trimming speed to 215spm and the start and end backtack stitching speed to 1800spm.  
The option output is set to 3P output (thread release output).
- ※5: The inching speed is set to 185spm, the thread trimming speed to 185spm and the start and end backtack stitching speed to 1200spm.  
The thread trimmer is set to the timer output.
- ※6: The inching speed is set to 250spm and the thread trimming speed to 170spm.
- ☆ ※7: The inching speed is set to 215spm and the thread trimming speed to 215spm. The option output is set to the in-operation output (air output).  
(Note) When using the motor for reverse rotation, two of the three motor wires (red, white, black) must be interchanged.

### B-2. When DIP switch 5 is set to ON (twin needle)

- 1) The factory setting is [ 8 4 2 3 ].
- 2) If [ R L ] is executed in the initialization menu, this setting will be initialized to [ 8 4 2 3 ].
- ☆ 3) If the DIP switch 2 or DIP switch 5 setting is changed, the head setting will be initialized.  
If DIP switch 5 is ON, this setting will be initialized to [ 8 4 2 3 ].

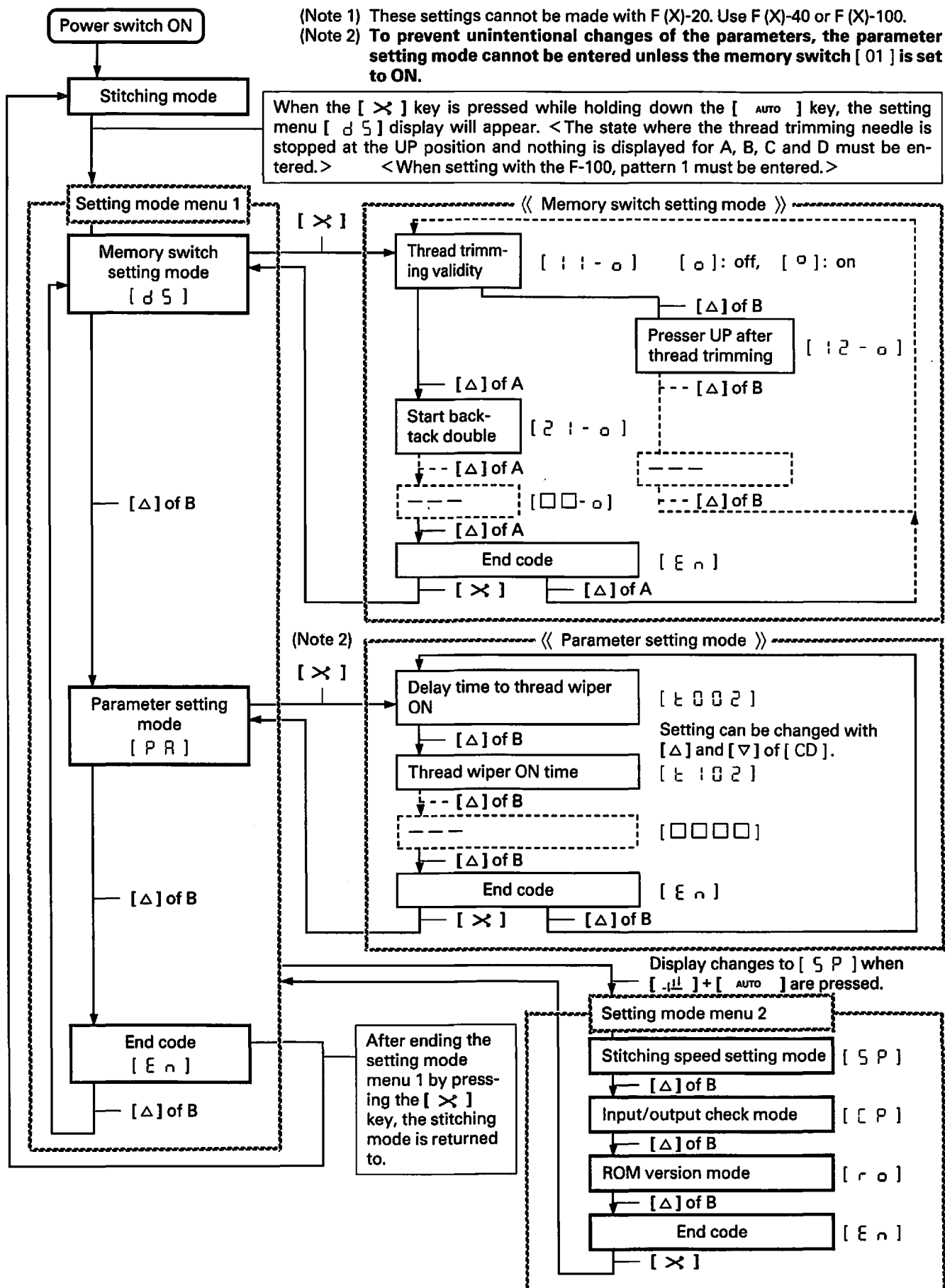
Head		[ABC] display	[D] display	Maximum speed
B842	※1	8 4 2	3 ... 4000spm	5 ... 3500spm 1 ... 4000spm
B872	※1	8 7 2	3 ... 3000spm	5 ... 3000spm
B845, B875	※1	8 4 5	3 ... 3000spm	5 ... 3000spm 7 ... 3000spm
B847	※1	8 4 7	1 ... 4000spm	
B848	※1	8 4 8	1 ... 3000spm	
B837, B838	※1	8 3 7	5 ... 3000spm	
C51, C53 (Seiko)	※2	P 8 6	2 ... 2200spm	4 ... 2400spm 6 ... 2600spm

- ※1: The inching speed is set to 185spm, the thread trimming speed to 250spm and the start and end backtack stitching speed to 1000spm.
- ※2: The inching speed is set to 185spm, the thread trimming speed to 250spm and the start and end backtack stitching speed to 1000spm.  
The correction is set to half stitch operation.

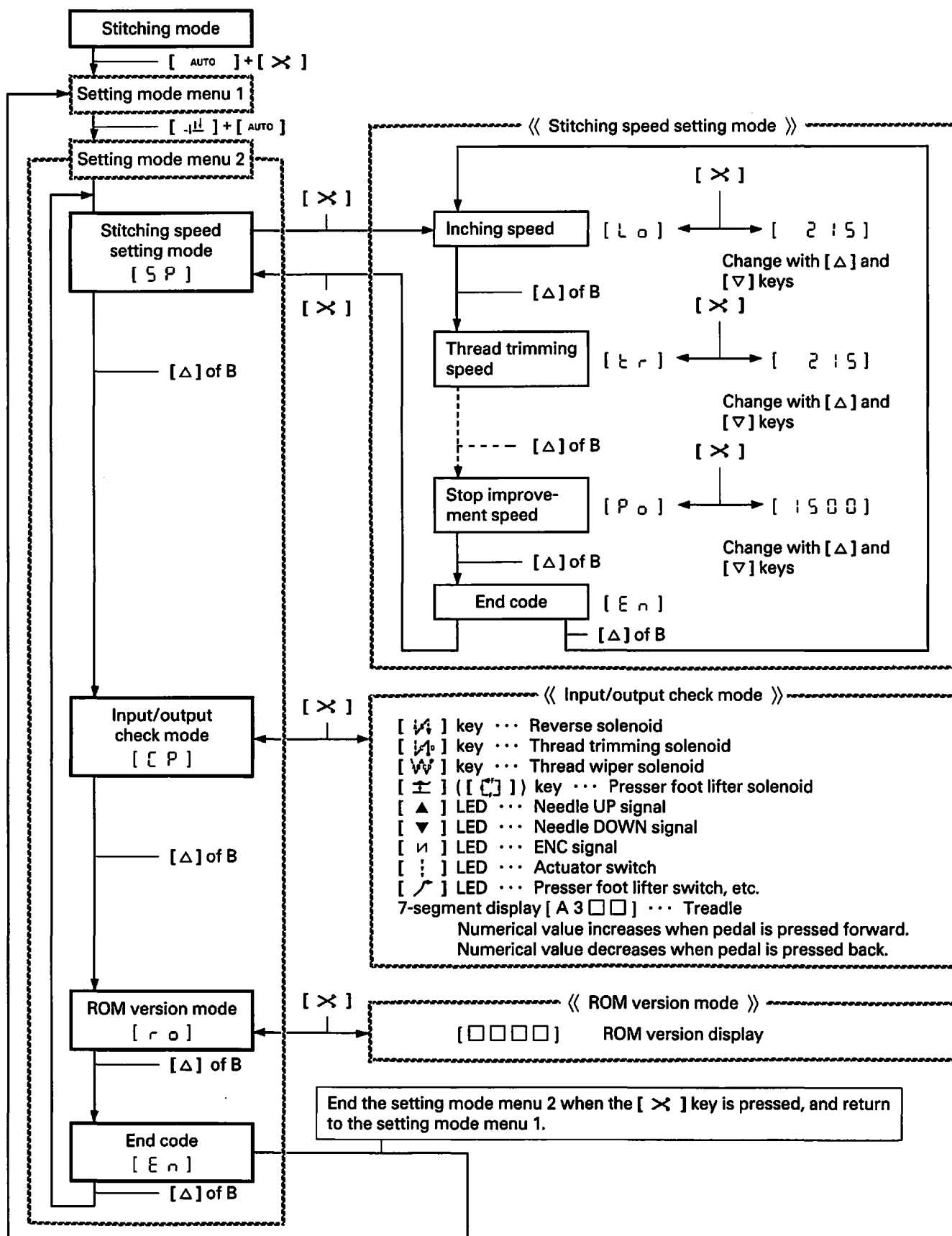


### 8-3. Memory switch setting mode and parameter setting mode, etc.

A memory switch mode for changing the functions and a parameter mode where the time and timing, etc., can be changed are provided.



(Continued from previous page)



8-4. Stitching speed setting mode

Each speed can be changed as described below by using the stitching speed setting mode.

① Setting of each stitching speed.

Normally, each speed determined by the product code corresponding to the head is set at the factory. To change the speeds, use the following procedures.

- ①-1 Press the [ > ] key while holding down the [ AUTO ] key, and enter the mode setting menu 1.
- ①-2 Press the [ . ] + [ AUTO ] keys, and enter the mode setting menu 2.
- ①-3 Press the [ > ] key, and enter the stitching speed setting mode.
- ①-4 Select the speed type to be changed with the B [ Δ ] key.
- ①-5 When the [ > ] key is pressed, the display will change to the setting speed (numerical value).  
If [ . ] is pressed at this time, the sewing machine will rotate at that speed. The display will monitor the actual speed, and display it. If [ . ] is pressed again, the sewing machine will stop.
- ①-6 Set with the [ Δ ] and [ ∇ ] keys.
- ①-7 If the [ > ] key is pressed, the display will return to the setting speed type.
- ①-8 Press the B [ Δ ] key several times, and display [ E n ].
- ①-9 When the [ > ] key is pressed, the mode setting menu 1 will be returned to.
- ①-10 Press the B [ Δ ] key several times, and display [ E n ].
- ①-11 When the [ > ] key is pressed, the stitching mode will be returned to.

The display and order of each speed type are as follows.

Speed type	Display	Setting unit	Setting range	Remarks
Inching speed	L 0	1spm unit	150-280spm	Speed for low-speed stitching and correction setting.
Thread trimming speed	t r	1spm unit	150spm-inching speed	Speed for thread trimming
Slow start speed	5 L	100spm unit	Inching speed-1000spm	Speed for slow starting
Start backtack stitching limit speed	L i	100spm unit	Inching speed-3000spm	Limit speed for start backtack stitching
End backtack stitching limit speed	E b	100spm unit	Inching speed-3000spm	Limit speed for end backtack stitching
High-speed stitching limit speed (Note 1)	H i	50spm unit	Inching speed-DIP switch setting	Limit value for maximum stitching speed
Automatic stitching speed	R U	100spm unit	Inching speed-High speed stitching limit speed	High speed for automatic stitching
Stop improvement speed	P 0	100spm unit	500-2500spm	Middle speed for stop time improvement

(Note 1) The upper limit of the maximum stitching speed limit value is limited by the DIP switches 6, 7 and 8 shown in Table 7-B.

If 5000spm is set with DIP switches 6, 7 and 8, (when ϕ105 pulley, single needle are designated), the speed can be set to a maximum of 5000spm.

(Note 2) If the DIP switch 2 or 5 setting is changed, all these speed settings will be initialized.

The 8-2 head settings will also be initialized (★).

a) When DIP switch is set to OFF (Initialized to head setting [ 7 3 7 3 ] )

- Thread trimming speed = 215spm
- Inching speed = 215spm
- Start/end backtack stitching speed = 1800spm, etc.

b) When DIP switch is set to ON (Initialized to head setting [ 8 4 2 3 ] )

- Thread trimming speed = 185spm
- Inching speed = 250spm
- Start/end backtack stitching speed = 1000spm, etc.

(Note 3) The setting range R U on the old CPU version (J02781-A) is as follows.




Inching speed-High speed stitching limit speed — 200spm

## 8-5. Memory switch and parameter lists

### A. Memory switch list


[  -  ] -- Indicates that the switch is ON.


[  -  ] -- Indicates that the switch is OFF.

Display No.	Details when set to ON	
0 1	Parameter setting change enabled	※1
0 2	No interlock during thread trimming	※2
0 3	Momentary drop or failure of power supply check valid	※3
0 4	(Reserved) ※Normally OFF.	
0 5	(Reserved) ※Normally OFF.	
0 6 ☆	No penetration force UP operation	
0 7	(Reserved) ※Normally OFF.	
0 8	(Reserved) ※Normally OFF.	
1 1 ☆	Thread trimming validity setting enabled with [  ] key	※4
1 2	Presser foot lifter rise after thread trimming	
1 3	Presser foot lifter rise after neutral stop	
1 4	Actuator switch = thread trimming switch	
1 5	No immediate stop function	
1 6 ☆	No over time [  1 ] function	
1 7	Half stitch correction with actuator switch	※5
1 8	Backward correction with actuator switch	※5
2 1	Start backtack double	
2 2	End backtack double	
2 3	No. of start backtack stitches + 10 stitches	
2 4	No. of end backtack stitches + 10 stitches	
2 5	Root stitching	
2 6	No slow down to low speed on starting of end backtack	
2 7	Continuous backtack changeover	※6
2 8	No. of continuous backtack stitches + 10 stitches	
3 1	Enable to stop during start backtack sewing, speed is variable with treadle.	
3 2	F-20, 40 No. of backtack stitches change enabled	※7
3 3	Call fixed stitches when pleats sewing will be used.	※8
3 4	No LED call when continuous backtack [  ] is canceled.	※9

※1: Set this to ON when the parameters are to be changed.

※2: When set to ON, the treadle operation pressed forward will be valid during thread trimming.

※3: When set to ON, [  ] will display if the power supply is shut off momentary during motor rotation.

☆ ※4: When set to ON, thread trimming validity can be set with [  ] key on operation panel.

※5: When one is turned ON, the other will be set to OFF.

If there is no operation panel or if [  ] (correction) is set to OFF, half stitch correction or reverse rotation correction will be applied.



※6: When set to ON, the continuous backtack will be executed for [A, B] × [D] times.

[C] display is OFF.


※7: When set to OFF:



If [  ] is validated on F-20, the No. of start/end backtack stitches will be fixed to four stitches.


If [  ] is validated on F-40, the No. of start/end backtack stitches will be fixed to four stitches.

If [  ] or [  ] is validated on F-40, the No. of end backtack stitches will be [BA].

When set to ON, the No. of start/end backtack stitches will be the No. of stitches set with [ABCD].

※8: When set to ON, the [  ] (pleat stitching) will be constant stitch (forward feed) operation.

※9: When set to ON, if [  ] is canceled, the LED setting and display from before it was turned [  ] ON will not be returned to.

When set to OFF, the [  ] original LED setting and display will be called out. (Factory setting)



(Continued from previous page)

[ ☐ ☐ - 0 ] -- Indicates that the switch is ON.  
[ ☐ ☐ - 0 ] -- Indicates that the switch is OFF.

Display No.	Details when ON	
3 5	Soft down of presser foot lifter is timer mode	※1
3 6	Presser output is not automatically OFF by timer	
3 7	Presser output chopping duty changeover	※2
3 8	Only lower part of transistor controlled during presser foot lifter rises	※2
4 1	Prohibit to rise of presser foot lifter by treadle repressed backwards after neutral stop	
4 2 ☆	Prohibit to thread trimming by treadle repressed backwards	
4 3	(Reserved) ※Normally OFF	
4 4	High-speed pedal during standing work is only high speed (no inching speed and variable speed ranges)	
4 5	No delay start during standing work	※3
4 6	Emergency stop with presser pedal disabled during standing work	
4 7	Emergency stop with high-speed pedal disabled during standing work	
4 8	Prohibit to rise of presser foot lifter with trimming pedal during standing work	
5 <input type="checkbox"/>	(Reserved) ※Normally OFF	
6 <input type="checkbox"/>	(Reserved) ※Normally OFF	
7 1	Option output 1/Output during running (needle cooler, etc.)	※5
7 2 ☆	Option output 2/Thread release output (3 position)	※6
7 3	Option output 3/Air (N stitches at start of stitching & after fabric edge sensor turns ON)	※7
7 4	Option output 4/Condense output (When B = 0 or C = 0)	※8
7 5	Option output 5/Program output 1 (ON after thread trimming, after T0, during T1)	※9
7 6	Option output 6/Program output 2 (ON during presser synchronization, after T2, during T3.	※10
7 7	Option output 7/(Spare)	※11
7 8	Option output 8/(Spare)	※11

※4

※1: When set to ON, the operation will follow the parameter [ F 3 ] and [ F 4 ] settings.

※2: The ON/OFF duty during chopping will be as follows.

		Memory switch [ 3 7 ]			
		OFF		ON	
Memory switch [ 3 8 ]	OFF	2.5ms	ON	1ms	ON
		2.5ms	OFF	1ms	OFF
	ON	1ms	ON	1ms	ON
		5ms	OFF	1ms	OFF

※3: When set to ON, the parameter [ 4 1 ] setting is invalidated.

※4: When one is turned ON, the other will be set to OFF.

If all are turned OFF, the puller output will be applied. When the output is ON, it will turn OFF after the No. of stitches set in parameter [ 2 0 ] is stitched or after 10 seconds have passed.

※5: If [ 0 0 1 ] (overlock) is set with the [ 8 ] 8-2 head setting, this will be set to ON.

※6: If [ 7 8 1 ] is set with the [ 8 ] 8-2 head setting, this will be set to ON.

※7: When set to ON, the option will be output for N stitches (set with parameter [ 2 1 ]) when stitching after thread trimming. When using sensor II, the output will turn ON when the sensor turns ON. After stopping, the output will turn OFF after the time set in parameter [ 2 5 ] has passed.

※8: When set to ON, if the No. of start backtack stitches B is set to 0, the condense will be output while stitching [A]. When set to OFF, if the No. of end backtack stitches C is set to 0, the condense will be output while stitching [D].

※9: When set to ON, the program will be output at the timing set with parameters [ 2 2 ] and [ 2 3 ].

※10: When set to ON, the program will be output at the timing set with parameters [ 2 4 ] and [ 2 5 ].

※11: Nothing will be output even when set to ON.

## B. Parameter list

Display No.	Initial data	Data setting range	Details
㊦ 0	02 (20ms)	01-07 (×10) (10-70ms)	Delay time to thread wiper is turned ON after thread trimmer is turned OFF
㊦ 1	05 (50ms)	04-10 (×10) (40-100ms)	Thread wiper ON time
㊦ 2	05 (50ms)	05-10 (×10) (50-100ms)	Delay time to presser foot lifter is turned ON after thread wiper is turned OFF
F 0	30 (300ms)	10-90 (×10) (100-900ms)	Presser foot lifter full-on time
F 1	36 (3 minutes)	00-60 (×5) (5s-5 minutes)	Time of presser foot lifter is turned OFF (When set to 00, the timer will not turn OFF automatically)
F 2	15 (150ms)	00-25 (×10) (0-250ms)	Delay time from presser foot lifter is turned OFF to motor start
F 3	00 (0ms)	00-99 (×2) (0-198ms)	Delay time of upper part transistor of presser foot lifter is turned ON (soft down of presser foot lifter)
F 4	00 (0ms)	00-30 (×10) (0-300ms)	Time of upper part transistor of presser foot lifter is turned ON (soft down of presser foot lifter)
b 0	24 (pulse)	00-47 (pulse)	Start backtack A → B reverser changeover timing (The larger the value is, the longer the timing delay)
b 1	24 (pulse)	00-47 (pulse)	Start backtack B reverser changeover timing (The larger the value is, the longer the timing delay)
b 2	24 (pulse)	00-47 (pulse)	End backtack C → D reverser changeover timing (The larger the value is, the longer the timing delay)
b 3	24 (pulse)	00-47 (pulse)	End backtack D → C or C ON reverser changeover timing (The larger the value is, the longer the timing delay) ※1
㊦ 0	40 (Stitch)	00-98 (Stitch)	No. of stitches to puller lower (Memory switches [71]-[78] all OFF, factory setting) ※2
㊦ 1	10 (Stitch)	00-99 (Stitch)	No. of option output ON stitches (N) (When memory switch [73] is set to ON)
㊦ 2	05 (50ms)	03-10 (×10) (30-100ms)	Delay time to program output 1 ON (T0) (When memory switch [75] is set to ON) ※3
㊦ 3	08 (80ms)	04-10 (×10) (40-100ms)	Program output 1 ON time (T1) (When memory switch [75] is set to ON) ※3
㊦ 4	00 (0ms)	00-05 (×10) (0-50ms)	Delay time to program output 2 ON (T2) (When memory switch [76] is set to ON) ※4
㊦ 5	20 (2s)	00-99 (×0.1) (0-9.9s)	Program output 2 ON time (T3) (When memory switch [76] is set to ON) ※4
d 0	18 (90ms)	10-30 (×5) (50-150ms)	Thread trimmer timer (ON) time (When [ 8 5 2 ] is set in head setting mode.) ※5
d 1	08 (80ms)	00-20 (×10) (0-200ms)	Standing work delay start time ※6

※1: This is valid when the C ON timing memory switch [ 2 5 ] is ON.

※2: The puller will lower even if the output ON continues for ten seconds.

※3: The ON delay time and ON time are the reference from the thread trimming needle UP stop signal.

※4: The ON delay time and ON time are the reference from the presser UP signal.

※5: This is valid only when [ 8 5 2 ] is set in the head setting mode.

※6: This is invalid when the memory switch [ 4 5 ] is set to ON.

(Continued from previous page)

Display No.	Initial data	Data setting range	Details
P 0	02	00-04	Treadle stroke, treadle pressed back (thread trimming) point (When the numerical value is large, the stroke to thread trimming is short.)
P 1	02	00-04	Treadle stroke, treadle pressed back (presser foot lifter ON) point (When the numerical value is large, the stroke to the presser foot lifter ON is short.)
P 2	02	00-04	Treadle stroke, neutral point
P 3	02	00-04	Treadle stroke, inching start point (motor start point) (When the numerical value is small, the stroke to the motor start is short.)
P 4	02	00-04	Treadle stroke, variable speed range start point (When the numerical value is small, the variable speed area will increase.) (When the numerical value is large, the inching speed area will increase.)
P 5	02	00-04	Treadle stroke, high speed reach point (When the numerical value is small, the stroke to the high speed area is short.) (When the numerical value is large, the variable speed area will decrease.)
S 0	02	00-04	Standing work pedal for variable speed, variable speed area start point (When the numerical value is small, the variable speed area will increase.) (When the numerical value is large, the inching speed area will increase.)
S 1	02	00-04	Standing work pedal for variable speed, high speed reach point (When the numerical value is small, the stroke to the high speed area is short.) (When the numerical value is large, the variable speed area will decrease.)
n 0	※1 70ms	40-99 ( ×1) (40-99ms)	Brake time during stopping
n 1	※1 11	05-15	Braking force during neutral stop (When the numerical value is small, the stopping sound will decrease.)
n 2	※1 11	05-15	Braking force during thread trimming UP position stop (When the numerical value is small, the stopping sound will decrease.)
n 3	※1 25	05-50	Return amount during neutral needle DOWN position stop (When the numerical value is large, the needle will stop at the forward position.)
n 4	※1 25	05-50	Return amount during neutral needle UP position stop (When the numerical value is large, the needle will stop at the forward position.)
n 5	※1 30	05-50	Return amount during thread trimming needle UP position stop (When the numerical value is large, the needle will stop at the forward position.)

※1: The initial data will differ according to the DIP switch 2 and 5 settings.

The initial data is for when the DIP switch 2 is ON (ø90 pulley designation) and the DIP switch 5 is OFF (single needle designation). The initial data will be set again if the DIP switch 2 and 5 settings are changed.

※2: The stopping accuracy will deteriorate if the value is too small.

(Note) There are parameters other than the above, but these must not be changed. If they are changed by mistake, initialize the parameters with the [8] 8-1 initialization mode.

## 9 Error display and details

If an error occurs, an error code, etc., will display on the No. of stitch display of the operation panel (AB).

Display	Meaning	Details
P 𐀀	(Power transistor)	Driver overheat, overcurrent (IPM alarm)
𐀁 𐀂	(Overvoltage)	The power voltage is too high.
𐀃 𐀄	(Undervoltage)	The power voltage is too low.
𐀅 𐀆	(Overload)	The load is too large.
𐀇 𐀈	(Lock)	Motor lock or position detector fault.
F 𐀉	(Fuse)	8A fuse for solenoid is blown.
P 𐀊	(Power down)	Instantaneous drop of power or power failure (Only when memory switch [03] is turned ON.) The display will return to the original display when the pedal is operated again.
E 𐀋	(Error 0)	Panel switch error A switch other than [ 𐀌 ] ( [ 𐀍 ] ) is still ON.
E 𐀎	(Error 1)	It cannot be determined whether the connected panel is a 20, 40 or 100 specification panel.
P 𐀏	(Pulley)	The pulley setting (DIP switch 2) is incorrect. If the motor rotates abnormally, the sewing machine will be stopped.
☆ 𐀐 𐀑	(Over time)	If the sewing machine will move for 3 minutes continuously, the sewing machine will be stopped for the safety.
All displays flickering		Memory element fault The pedal and operation panel can be operated, but the No. of stitches, etc., cannot be memorized.
[Others]		
[ 𐀒 ]	(Clear)	Memory initialization This display when [ 𐀓 ] is executed in the initialization menu. After the display goes out, stitching can be executed. (Mode changes to the stitching mode.)

(Note) If an error display (other than P 𐀊 or all displays flickering), the control box power LED (green) and operation panel display will not go out immediately after the power switch is turned OFF.

Turn the power ON again after the control box power LED (green) and operation panel display have gone out.



## **10 Other functions**

1. The thread trimming validity can be changed over with the memory switch.
2. An emergency stop input is provided.
3. The option output is shipped as the puller output in the normal state.
4. If the synchronizer fails, the synchronizer connector can be disconnected, and the motor used at the same level as the clutch motor.
5. The production quantity counter cannot be used.
6. 3-position compatible (B781)  
If [ 7 8 1 ] is set in the head setting mode, the 12P 1-2 output is set to the 3-position output.
7. A thread trimming timer for a zigzag sewing machine (B852, B853, B854) is built in.  
If [ 8 5 2 ] is set in the head setting mode, the thread trimming will be set to the timer operation. The conventional timer circuit is not required. The timer time can be changed with the parameters.
8. C51, C53 (SEIKO) compatible  
If [ P 8 6 □ ] is set in the head setting mode, the correction operation will be set to half stitch correction.
9. Basting sewing machine (B883) compatible  
If [ 8 8 3 ] is set in the head setting mode, the maximum speed will be set to 850spm, etc.
10. If [ 0 0 L ] is set in the head setting mode, thread trimming is prohibited with pedal. The sewing machine dose not move during treadle is pressed backwards.

11 Panel display table

The following alphabetic characters and symbols are displayed on the operation panel.

	7-segment display		7-segment display		7-segment display		7-segment display
0	0	A	A	N	n	ON	o
1	1	B	b	O	o	OFF	o
2	2	C	C	P	P		
3	3	D	d	Q	q		
4	4	E	E	R	r		
5	5	F	F	S	S		
6	6	G	G	T	t		
7	7	H	H	U	U		
8	8	I	i	V	v		
9	9	J	j	W	W		
+	+	K		X			
-	-	L	L	Y	Y		
		M	M	Z			

## 12 Operational instructions

### 12.1 Operation at time of power input

- \* When the power SW is ON, LED(RED) of the power circuit board illuminates and the direct voltage is impressed between ①PV-P0V. (the voltage rectified from three phase or single phase).
- \* Then the switching power supply starts to operate, and it outputs each of the specified voltage to the secondary side of the switching transformer, ②U, ③V, ④W and ⑤X phase(+15V) as the power supply for controlling the power element(IPM). ⑥NF phase(+20V) is for monitoring of high voltage power sources. Adding ⑦P8(+8V) and ⑧N8V(-8V), the supply for the total 7 systems can become active. (note: ①-⑤ is of high voltage, therefore please be careful not to get an electric shock.)
- \* P8V outputs +5V on the control circuit board. When +5V is output, the CPU program starts to work and the LED(Green) will illuminate.
- \* The solenoid power supply rectifies the AC30V, which has been decreased in voltage by transformer, on the control circuit board and then outputs DC40V.

From all the above procedures, all the power supply can become active.

#### • About resetting

##### \*Hard reset I

When power is ON: In the hard reset, the start up voltage of 6.6V is detected by the iC(#4), and after that CPU63 pin becomes the [L] level for 30ms, and then CPU is reset.

When power is OFF: When the voltage is falling to less than 6.6V, it becomes [L] level and reset.

##### \*Hard reset II

When power is ON: By monitoring the solenoid voltage AC30V, when the [L] level does not come to the CPU90 pin within 5 seconds at time of building up of the power supply, it outputs an error message of [Fu] to the operation panel. After [L-H edge] has been detected, it becomes reset.

When power is OFF: After [L-H edge] has been detected by the CPU90 pin, if the [L] level continues for 30ms, it becomes reset.

- Next, by the programming operation, it accesses the I/O port of the operation panel, and if there is an error, it displays an error, E0 and E1. It accesses to the synchronizer(NOSYNC), Dip SW and other I/O port(except PRSW).

- RY.out becomes [L] level and the power relay becomes ON. (snapping sound)

### 12.2 Operation when the power is OFF.

- When the power SW is OFF, the hard reset II functions and the power relay is OFF and the data of panel, etc. are written on the EEROM. The LED1(Green) goes out lights instantly but the LED2 goes out lights after about 5 seconds. When pulling or inserting connector and cord, do it after the LED2 has gone out of lights.  
(note: If the LED1(Green) does not go out of lights instantly, there has occurred some error, and if the operation panel is connected, the contents of its error will be shown on the panel.)
- It takes about three minutes for the LED(Red) on the power circuit board to go out of lights due to the electric discharge of electrolytic capacitor. It is dangerous, so conduct removal of the board only after the LED(Red) light has gone out.

### 12.3 Before operation(operation of the pedal).

After the power has been input, if the pedal pressed lightly forward from the neutral position, the motor rotates at a slow speed, whereas if the pedal is pressed deeply, the motor rotates at a high speed. If the pedal is pressed backward, it works to do thread cutting and then stops at needle-up position. After the power has been input, if the neutral position is not detected once, the motor does not rotate even if the pedal is pressed forward. Also, if the VC voltage is out of the area of  $1.5V \pm 0.4V$  for the treadle unit at the pedal neutral position, it is not possible to detect the neutral position. When the voltage for the 81 pin(AN3) of the CPU(#3) is out of the specified voltage, it prevents the start up of motor.

### 12.4 While running

- After the above procedures, the motor is now awaiting start-up. By pressing the pedal forward, the PHOTO signal(2 pins of P11 on the control circuit board) becomes [L] level and it is now possible for the motor to start. The diversified signals(U, V, W,  $\bar{U}$ ,  $\bar{V}$ ,  $\bar{W}$ ) from the internal ROM table of the CPU are output to the power circuit board and after inverter control has been conducted, the motor now starts to run. If the PHOTO signal becomes [H] level, the motor decelerates and stops.
- There is one chip CPU available, which does a programming control of motor control, sewing head/panel control, etc., and except for I/O port, it is not to check the circuit hardwarewise. It is possible to check the circuit of the power circuit board and the pedal PCB. However, power circuit board is of high voltage circuit, be careful not to take an electric shock.
- OV. det terminal  
This voltage is analog voltage and it always watches the voltage fluctuation at the high voltage side(PV-P0V) through the switching transformer, (insulation). If something is wrong with this voltage, it outputs an error display of [Uv], [Ov], [OL].
  - OV. det [1.3V] → [Uv] undervoltage detection(AC130V)
  - OV. det [3.0V] → [Ov] overvoltage detection(AC300V)
  - OV. det [2.8V] → [OL] overvoltage limit detection(AC280V)



## 13 Checking the control box

### 13.1 The operation of the power circuit board and how to check it.

- \* After three phase/single phase AC power supply is rectified, DC voltage is impressed to between PV-P0V, (LED, red light illuminates) for example, in case of input of 3phase 220V, the high voltage of DC 311V is impressed.
- \* When driving a motor, this DC voltage is converted to an AC voltage, and the motor is controlled by inverter drive.
- \* When the power SW is turned OFF, an electric discharge starts, but it takes about three minutes for the LED(Red) to go out, and it is dangerous. Therefore, when you check this board, do it only after the LED(Red) has gone out.
- \* Each power supplies for the control system are sourcing from switching regulator on the power circuit board. When the VCC terminal of HiC3 has reached 16V, the switching power supply starts oscillating, and as the output voltage, the power supply of the total seven systems becomes active simultaneously, at P8(+8V), N8(-8V), U, V, W, X phase(each +15V) and NF phase(+20V).
- \* The P8V outputs +5V in the control circuit board.
- \* When +5V is impressed to the CPU(#3), the program starts and the LED(Green) will be illuminated.
- \* If the LED(Green) illuminates, Stand by is OK.
- \* If the LED(Green) illuminates, the switching power is working correctly.
- \* When the power SW is turned OFF, the LED(Green) goes out instantly, but it takes about 5 seconds for the 5V to discharge completely. Therefore, please take out or insert the connector and cord only after the LED2 has gone out. (The termination of oscillation of the switching regulator occurs when the VCC terminal of HiC becomes below 10V. )
- \* The motor repeats the operation of start up, constant running and deceleration, but while deceleration the energy of the motor is regenerated and impressed between PV-P0V and its voltage increase. This voltage is always being monitored by the OV.det terminal, and when overvoltage happens, the Q1 on the power circuit board is turned ON and avoids a rise of the voltage. This excess energy is consumed at the resistor 40W/100Ω.
- \* The VR1 on the power circuit board adjusts the voltage of the OV.det terminal, and for example, in the case of AC220V, it is adjusted to be DC2. 2V. If AC230V, it is adjusted to be DC2. 3V. (The high voltage between PV-P0V is always being monitored. Also, this terminal is of the voltage of low voltage group being separated by the insulation transformer. Therefore, depending on the variation of the OV.det voltage, it outputs an error message such as [Uv] , [0v] and [OL] .
- \* To this board, high voltage is impressed, therefore when you check and repair this board, please be careful enough not to hurt you.

### 13.2 The operation of the control circuit board and how to check it

- \* If 5V is generated correctly in the control circuit board and the hard reset I works normally, the LED(Green) is turned ON and the CPU program starts work.
- \* There is one chip CPU to control by program the operation of motor, the sequence for the sewing head, the operation of the panel, etc.. Also, most of the electronic parts in this board are well integrated, and therefore it is difficult to exchange such parts. However, as to the transistor attached to the radiator fin, BD1, Q16, etc., they are possible to replace.

- \* The speed setting for each speed is all automatically set. For example, depending on the kind and type of the sewing head, Dip SW setting has priority over others. Therefore, conduct Dip SW setting according to the conditions set(sewing head, specification).

### 13.3 The operation of the pedal and how to check it

- \* By the magnet electric conversion element, analog voltage is generated. By the pressing stroke of the pedal, the analog voltage is changed straight, and it outputs the command signals for pedal forward ON, thread trimming, presser foot UP and presser foot DOWN, and also motor speed, and then inputs the analog voltage to the CPU.
- \* Adjustment of VR1: When the treadle pedal is at the neutral position, it is set at 1.5V. If the VR1 is turned clockwise, the voltage decreases. If the VR1 is turned anti-clockwise, the voltage rises.
- \* Adjustment of VR2: When the treadle pedal is pressed forward fully, it is set at 4.5V. If the VR2 is turned clockwise, the voltage rises. If the VR2 is turned anti-clockwise, the voltage decreases.
- \* The adjustment of above 1.5V and 4.5V is done at time of delivery from the factory, and the paint lock is applied to the volume. When exchanging the printed circuit board or doing the repair on the printed circuit board, the voltage changes, therefore please make adjustment of the voltage.
- \* If the volume adjustment is not possible, replace the treadle unit.

### 13.4 The operation of the power transformer and how to check it

- \* It outputs AC30V in order to drive the solenoid. Unless this voltage is input to the control circuit board, an error message of [Fu] appears.
- \* The power supply of AC6V is output for the illumination lamp.
- \* The resistance value of the primary side of the transformer is about 15Ω. If this resistance value is extremely low, the transformer is burnt out. If the transformer is burnt out, the fuses F1 and F2 on the power circuit board are blown. At that time, check the BD(bridge diode).
- \* The resistance value of the secondary side of the transformer is extremely low and it is not possible to check.

### 13.5 How to check motor

- \* The resistance value is about 2.6Ω between each phases of U phase, V phase and W phase.
- \* Between U phase and V phase, it is 2.6Ω
- \* Between V phase and W phase, it is 2.6Ω
- \* Between W phase and U phase, it is 2.6Ω

## 14 Control box trouble shooting guide

### Power PCB

PROBLEM	CHECK	PROBABLE CAUSE	REMEDY
When power SW is ON, LED (Red) does not illuminate.	Fuse F1, F2 blown?	Short circuit of the load on the power circuit. Something wrong with BD? IPM? ZNR? C1-C6? Power transformer?	Do not switch ON unless short circuit is solved.
	Fuse F1, F2 OK?	Has the R1 broken down? Has the pattern blown?	Replace the R1 Replace power PCB
LED (Red) illuminates but LED (Green) does not	Fuse F4 (2A) blown?	Is the Q101 short-circuited? Something wrong with HiC3, ZD101?	Replace Q101, HiC3, ZD101.
	Fuse OK?	Something wrong with HiC3, ZD102?	Replace HiC3
While running the motor OV or OL error sign appears.	CN7 (40W/100ohm broken down?) F3 (2A fuse) blown?	40W/100ohm broken down? Q1 broken down?	Replace 40W/100ohm Replace fuse, Q1.
	OL error?	Pressed the pedal so hard?	Educate how to press the pedal
Motor does not run smoothly and an error sign PT appears, sometimes.  While running, PT appears.	Malfunction by noise coming from outside. Malfunction by static electricity	Is earth surely taken for the power supply? Is earth taken for the sewing head and box? Is earth good for motor and box?	Take earth  Take earth
	Operation of IPM	Something wrong with IPM, PHU-PHW	Replace the power PCB
Motor does not run smoothly.	Wirewound resistance of motor. Operation of PHU-PHZ Operation of IPM	Measure wirewound resistance. 2.6ohm between each phases?  Check IPM operation.	Replace motor  Replace power PCB
	Is power relay ON?  Heating of the R1 resistor?	Is the contact point of power relay open? When the power switch is ON, the contact point is closed. Is R1 resistor broken?	Replace relay (RY). The lead wire of relay is broken. Replace R1

### Treadle unit

Motor does not start when pressing the pedal	Is VC voltage right at pedal neutral position?	Is there about 1.5V?	Adjust by VR1
	VC voltage when pedal is pressed fully forward	Is there about 4.5V?	Adjust by VR2
	VC voltage does not change?	Something wrong with iC1? ZD1? H0?	Replace iC1, ZD1 H0.

### Synchronizer

While running an error sign LO appears.	Remove synchronizer cord and check operation. Machine and motor run	No encoder signal, needle-up signal, needle-down signal.	Replace synchronizer
	Remove synchronizer cord and check operation. No running of machine and motor	Motor is locked.	Motor
		Sewing head is locked.	Adjust sewing head
		Others	Control PCB?
Motor does not run smoothly. Motor rotate by doing inching.	Remove synchronizer cord and check It rotate smoothly	Something is wrong with the encoder signals.	Replace synchronizer
	It does not rotate smoothly.	Motor is broken down or resistance value abnormal	Motor
		Others.	Control PCB

Contorl PCB

When power is ON, an error sign FU appears.	8A fuse blown?	Check transistor for solenoid	Replace fuse
	8A fuse OK?	Check power transformer	
Something is wrong with the operation of sewing head and motor.			Replace control PCB

Power transformer

When power SW is ON, LED (Red)does not illuminate.	Fuses F1, F2 blown?	Check resistance value at the primary side of transformer.	Replace transformer
		Is there about 15ohm? Check BD.	Replace BD.

## 15 How to VR1&VR2 setting of treadle unit

PS-INV Assy (MD-601, 611)

NAME	CODE	NOTE
PS-INV Assy (B47A104)	J80640-001	

After changing this circuit board. Please adjust the volume (VR1, VR2) since we suppose that the voltage of each position may change due to the aberration of position of magnet and hole element when you set this circuit board onto the treadle base.

### Points of adjustment;

Please adjust the position of P2 with VR1 and the position of P6 with VR2.

\* Adjustment of the position of P2 means that the pedal-lever should be the neutral position.

\* Adjustment of the position of P6 means that the pedal-lever should be the position of full with forward stepping operation.

	TESTER VOLUME	HEXACODE OF OPERATION PANEL		
PEDAL-LEVER NEUTRAL(P2)	DC1. 4~1. 6V	47~51	1. 5V	4C
PEDAL-LEVER FULL(P6)	DC4. 5~4. 6V	E5~EA	4. 5V	E5

There are two adjusting ways as follows.

1. Please indicate the voltage in hexacode after indicating (A3) in 7-segment display in (CP) check mode.

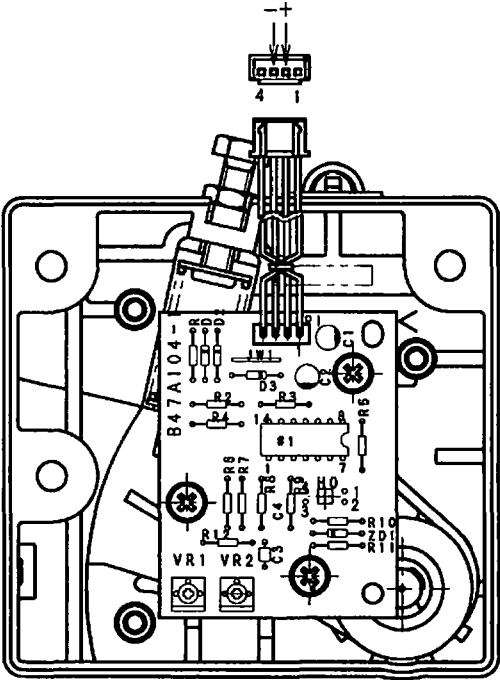
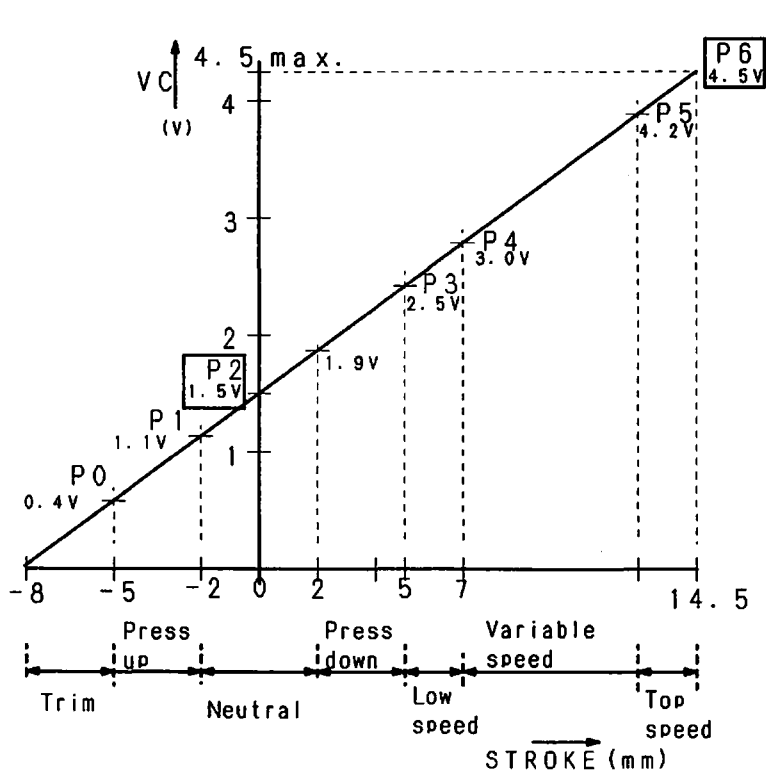
Then please adjust VR1 for hexacode to locate 47-51 in the neutral position, if you turn VR1 in clock-wise the value goes down.

Please adjust VR2 for hexacode to locate E5-EA in the full step position of pedal, if you turn VR2 in clock-wise the value goes up.

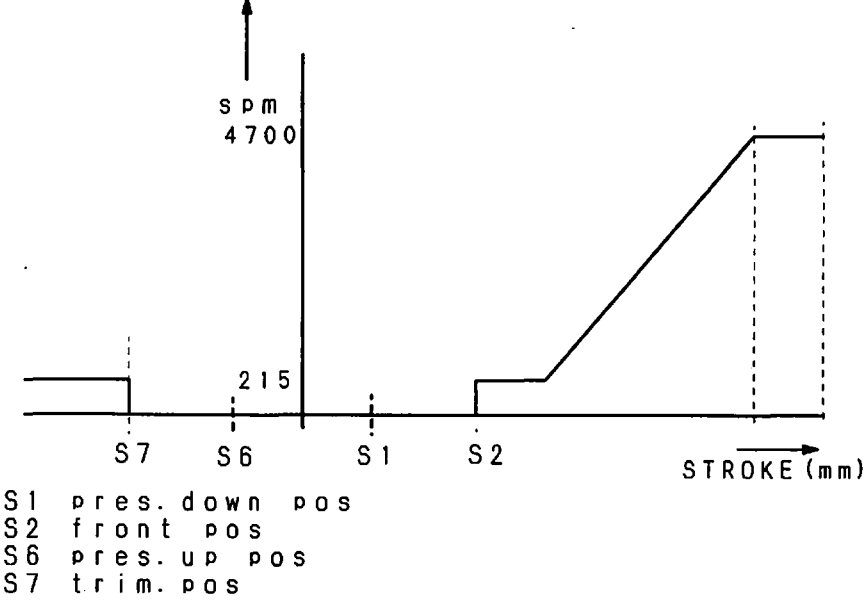
Please adjust VR1, VR2 repeatedly to locate the value within the above each limit.

2. Please measure the DC-voltage with the tester to put + pole to conecter No.2 and - pole to conecter No.3 and then adjust VR1 and VR2 to locate the volume within the above each limit.

STROKE - VC (analog voltage) CHART

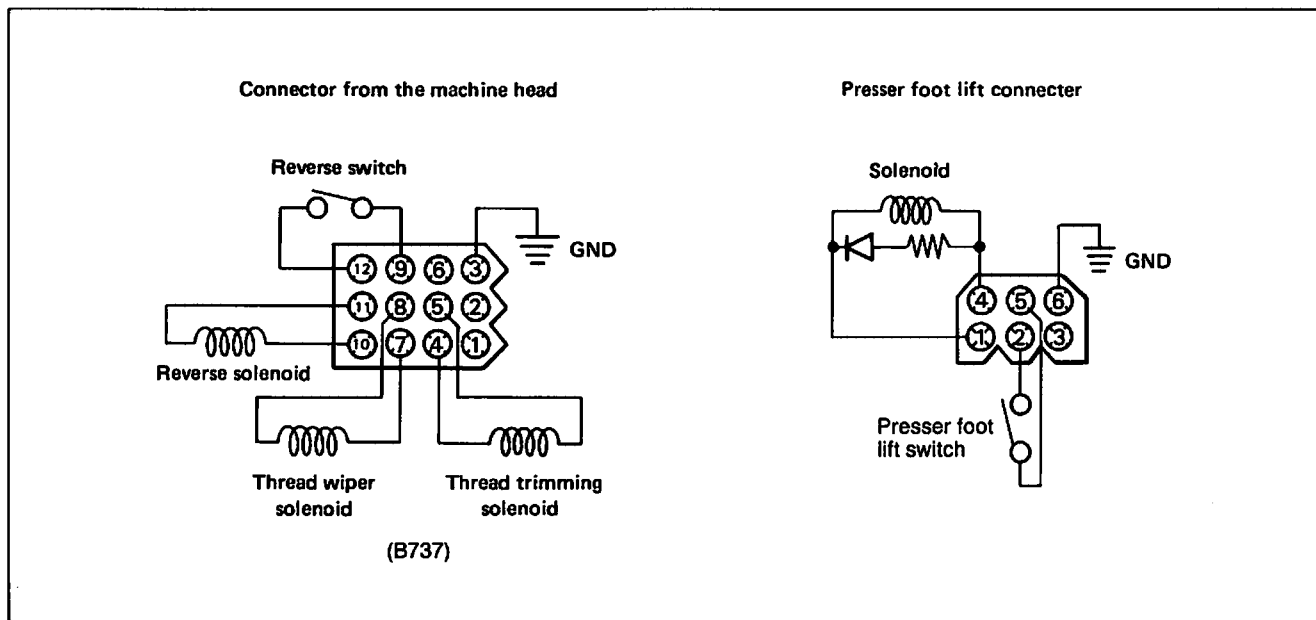


STROKE - SPM CHART



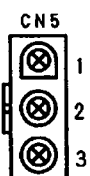
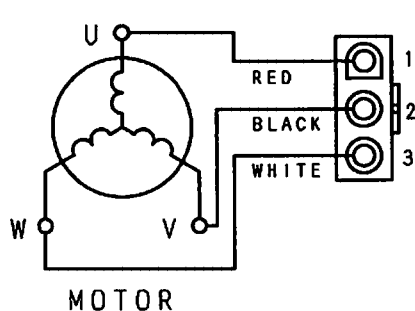


## 16 Checking the machine solenoids



1. Remove the load connector (12P connector) of the machine from the connector part of the control box.
2. Measure with the tester set in the resistance range  $\times 1$  as follows.
  - <Machine Head>
    - The thread trimming solenoid at pins 4 and 5 is normal if the tester reads approx. 7ohms.
    - The thread wiper solenoid at pins 7 and 8 is normal if the tester reads approx. 5ohms.
    - The actuator at pins 9 and 12 is normal if the tester reads 0ohms when pressed, and  $\infty$ ohms when released.
  - <Presser Lift>
    - The presser lift solenoid at pins 1 and 4 is normal if the tester reads approx. 5ohms.
    - The presser lift switch at pins 2 and 5 is normal if the tester reads 0ohms when pressed, and  $\infty$ ohms when released.

## 17 Checking the motor



1. Remove the motor cord(3P connector) from the connector part of the power board.
2. Measure with the tester set in the resistance range  $\times 1$  as follows. If the tester reads approx. 2.6 ohms in any position between 1(red) and 2(black) with the range  $\times 1$ .
  - 1 and 3 approx. 2.6 ohms.
  - 2 and 3 approx. 2.6 ohms.

## 18 Solenoids Table

(driving transistor No. &  $\Omega$ )

control PCB spec. solenoid		MK II	BAST	COV
trimmer solenoid	transistor No.	Q3		Q2(Q13)
	resistance of sol. ( $\Omega$ )	6.7		6.0
wiper solenoid	transistor No.	Q2	—	Q3
	resistance of sol. ( $\Omega$ )	5.0	—	8.0 *1
reverse solenoid (backtack)	transistor No.	Q7(Q13)	—	
	resistance of sol. ( $\Omega$ )	7.4	—	
presser foot lifter solenoid	transistor No.	Q6(Q13)	—	Q6(Q13)
	resistance of sol. ( $\Omega$ )	9.5	—	10.0
nipper solenoid	transistor No.	—	Q2(Q13)	—
	resistance of sol. ( $\Omega$ )	—	8.0	—
condence solenoid	transistor No.	—		Q7(Q13)
	resistance of sol. ( $\Omega$ )	—		200
spreader thread trimmer solenoid	transistor No.	—		Q3
	resistance of sol. ( $\Omega$ )	—		5.7 *2
folder control solenoid	transistor No.	—		Q12
	resistance of sol. ( $\Omega$ )	—		500

MK II : Straight lock stitcher with thread trimmer. (B737 etc.)

BAST : Single needle basting lock stitcher with thread trimmer. (LS2-B883)

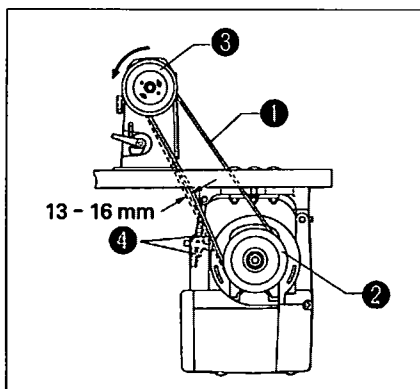
COV : Covering stitcher with thread trimmer. (FD4-B27X group and FD3-B25X group)

\*1 : FD4-B276, FD3-B256

\*2 : FD4-B277, FD3-B257

## 19 Adjustment

### AC servomotor



- ★ Tilt back the machine head and place the belt ① onto the motor pulley ② and machine pulley ③.
- ★ Press belt ① with a finger (force of 5 N), and adjust the nut ④ so that there is a deflection of 13 to 16 mm.

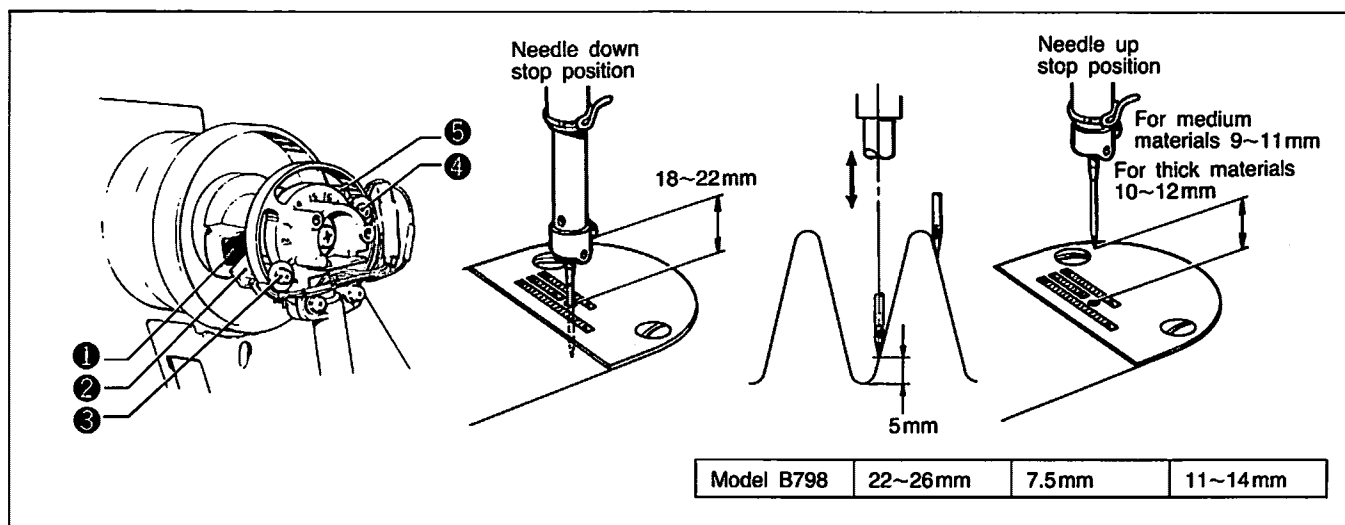
#### Note:

- ★ While using the machine, the belt will conform to the pulley and cause the belt tension to loosen. If the belt tension is too loose the following faults could occur.
  - The stopping position may shift,
  - The needle bar may drift when the machine stops,
  - An extra stitch may be sewing when the machine stops,
  - An abnormal noise may be heard due to belt slipping, and
  - The belt may become too loose and contact with the cover.

### Needle position detector (synchronizer)

#### Model DB2-B798

- ★ Take off the synchronizer cover for adjustment. The synchronizer detects the needle with two sensors and controls the needle down signal and the thread trimming signal with one sensor.



- ★ When adjusting each sensor, do not fail to turn off the power switch.

#### Position adjustment for needle down signal

- ★ Turn the machine pulley and set the needle 5mm up from the bottom to align the lower end of the magnet ① with the upper end of the thread trimming needle down sensor ②.

(As for the model B747 · B748, adjust the needle 7mm up from the bottom and as for the model B798, 7.5mm.)

When the lower end of the magnet ① does not coincide with the upper end of the thread trimming needle down sensor ②, loosen the screw ③ and move the thread trimming needle down sensor for adjustment.

When the thread trimming needle down sensor ② is moved in the rotating direction, the needle bar comes up. And when in the reverse direction, the needle bar comes down.

Turn on the power switch and stop the machine at the needle down stop position so that the distance between the top of the needle plate and the lower end of the needle clamp screw is 18 ~ 22mm. (As for the model B798, the distance is 22 ~ 26mm.)

#### Position adjustment for needle up signal

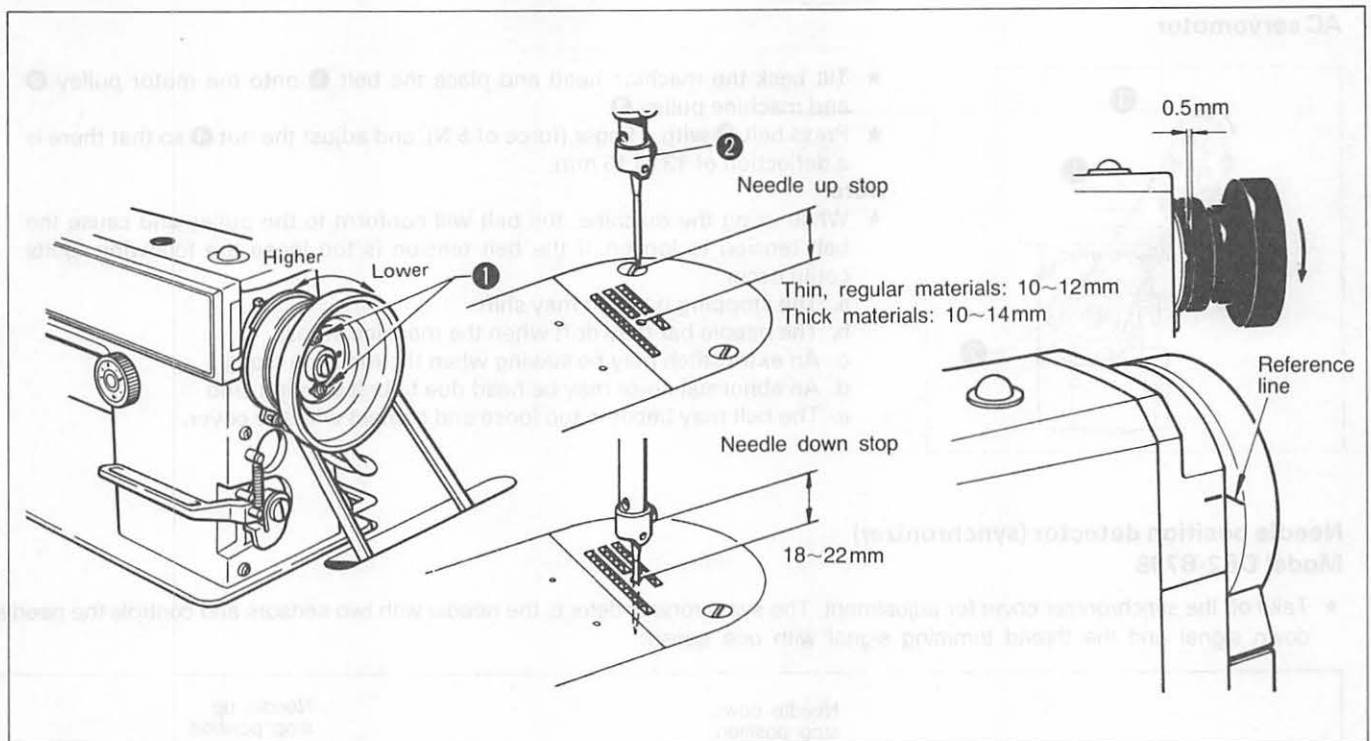
- ★ Stop the machine at the needle up stop position. The needle point stops 9 ~ 11mm away from the top of the needle plate for thin and medium materials, and 10 ~ 12mm for thick materials.

(As for the model B798, the needle point stops 11 ~ 14mm away.)

When the needle point does not stop properly, loosen the screw ④ and move the needle up stop sensor ⑤ for adjustment.

When the needle up stop sensor ⑤ is moved in the rotating direction, the needle bar comes down. And when in the reverse direction, the needle bar comes up.

- ★ Tighten the screws ③ and ④ to a torque of 6 ~ 10kg-cm.



★ The synchronizer detects the needle position with two sensors.

The thread trimming signal is timed to the needle down position signal and the treadle reverse signal.

★ When the power is turned on and the needle stopped in the down position, the distance between needle plate top and needle set screw bottom should be 18 to 22mm.

When the needle is stopped in the up position and the pulley reference line is within the belt cover reference lines, the distance between needle plate top and needle tip should be 10 to 12mm with thin and regular materials, 10 to 14mm with thick materials. (With Model B748 the needle up stop position is 10 ~ 14mm.)

Adjust as follows when necessary.

★ Turn the power off.

#### Needle up position

1. Slightly loosen the two screws ①.

Move the set screws ① in the direction of normal pulley movement to raise the needle bar ② stop position. Turn the other way to lower the needle bar.

#### Needle down position

1. Set the treadle to reverse and then release it to neutral. (This is the needle down stop position.)

2. The distance between the needle plate top and the needle screw bottom should be 18 ~ 22mm.

3. Loosen screw ③ and move the synchronizer ④ to adjust.

\* Check the needle up stop position.

\* When the machine pulley is removed once, provide 0.5mm clearance between the pulley bottom and the synchronizer for installation.

(Improper clearance causes improper machine operation.)

#### When the synchronizer is out of order...

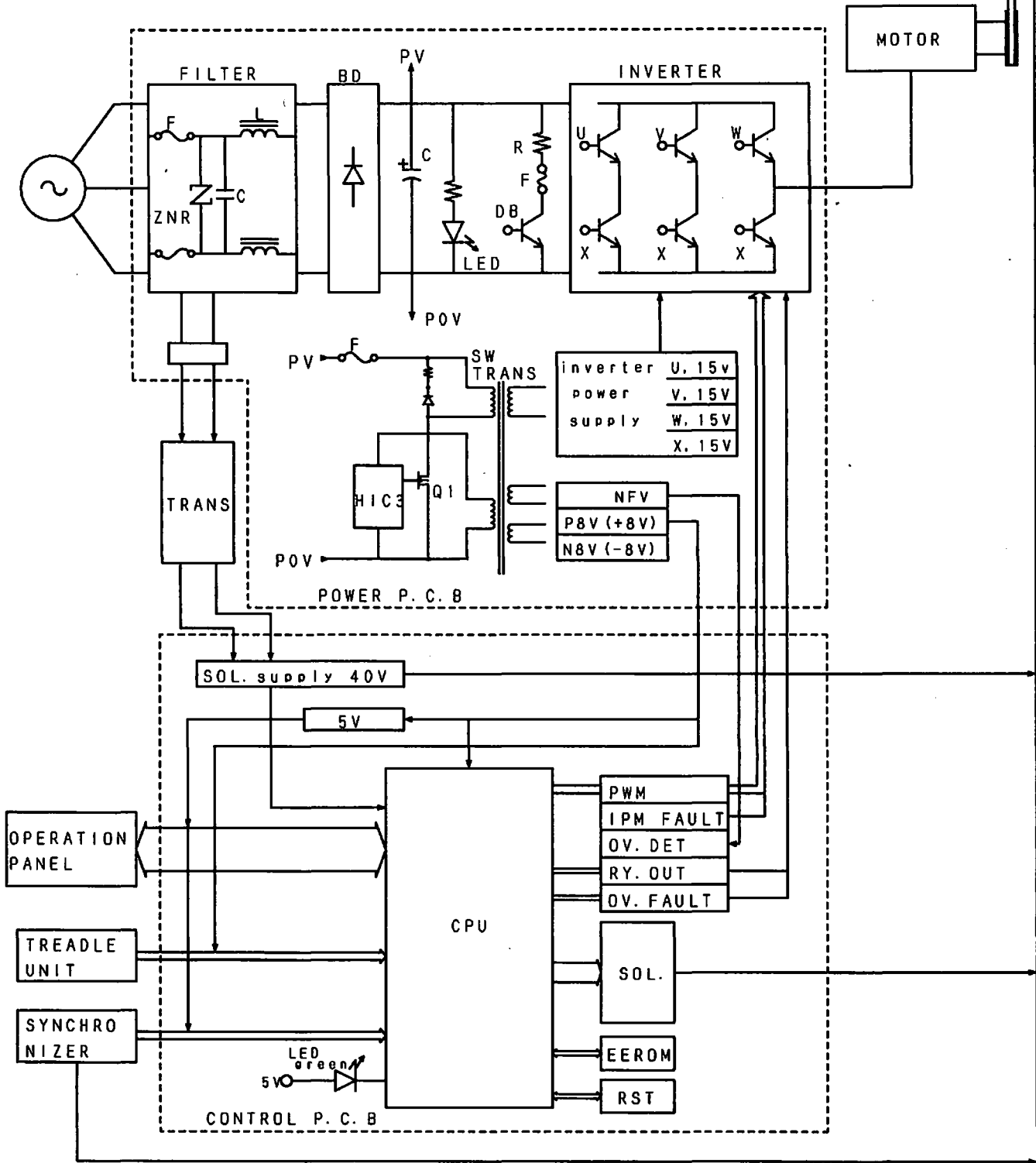
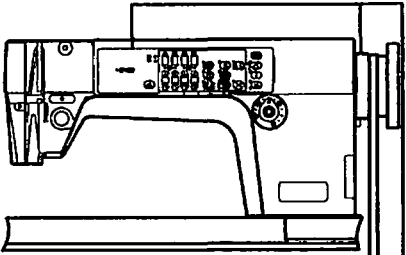
★ Turn off the power switch and disconnect the synchronizer cord.

Use the machine with standard function (without thread trimming) until the synchronizer is replaced.

## 20 Sewing speed of each machine

Model No. & Spec.	Each Sewing Speed			Motor pulley (Outer diameter)
	High Speed	Backtacking Speed	Thread trimming Speed	
B737-1	4,000	1,800	215	90
-3	5,000	1,800	215	105
-5	3,500	1,800	215	90
B747-5	3,500	1,200	215	90
B748-7	2,500	1,200	215	90
B798	2,000	1,000	215	90
B852	4,500	1,200	185	105
B853	4,500	1,200	185	105
B854	4,500	1,200	185	105
B791-3	4,500	1,800	215	105
-5	3,500	1,800	215	90
B774	4,500	1,800	215	105
B842-3	4,000	1,000	185	90
-5	3,500	1,000	185	90
B872	3,000	1,000	185	90
B845	3,000	1,000	185	90
B847	4,000	1,000	185	90
B848	3,000	1,000	185	90
LS2-B883	850	—	170	90
FD4-B27X	6,000	—	215	105
FD3-B25X	6,000	—	215	105

# CONTROL SYSTEM BLOCK DIAGRAM OF SEWING MACHINE

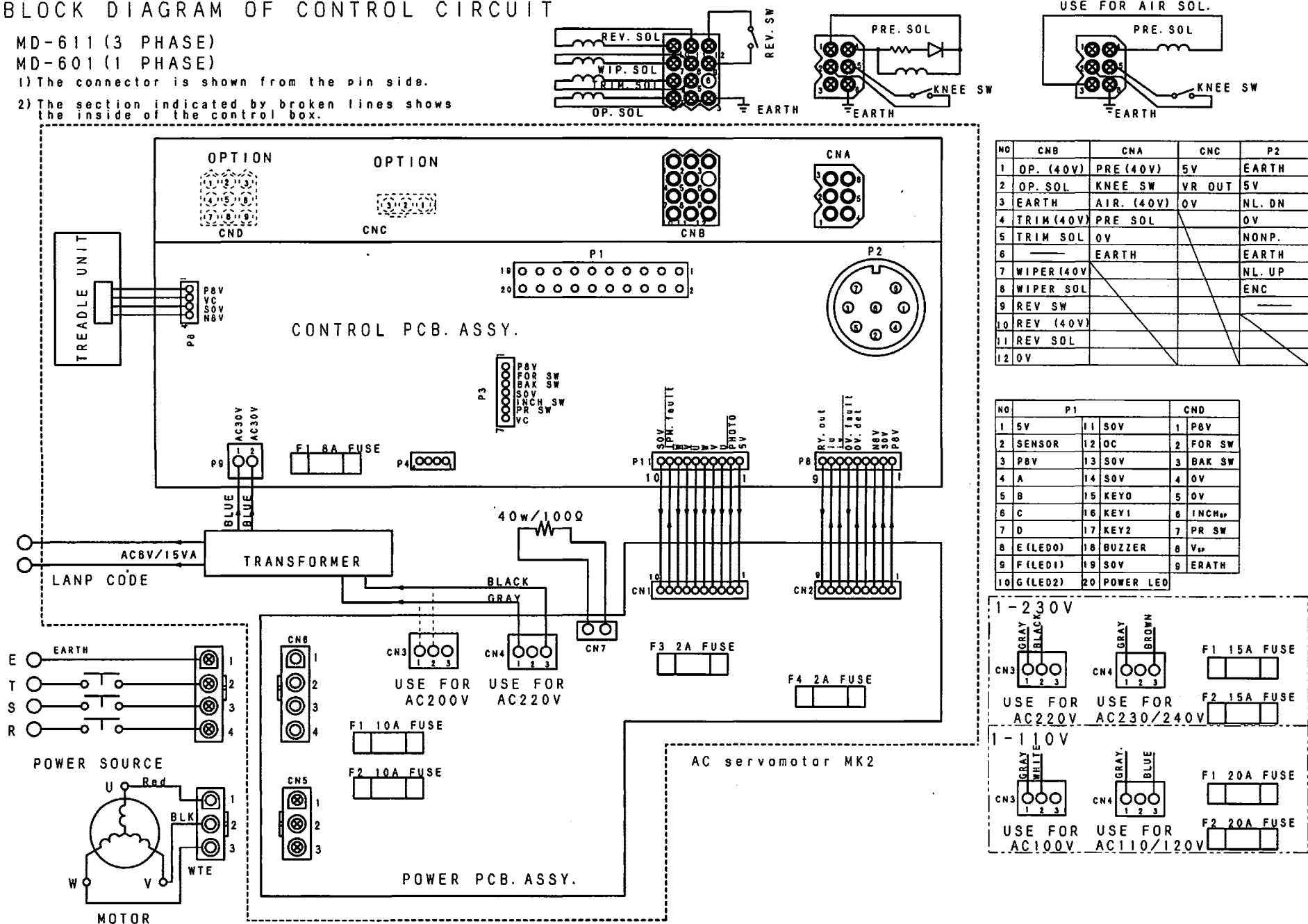




# BLOCK DIAGRAM OF CONTROL CIRCUIT

MD-611 (3 PHASE)  
MD-601 (1 PHASE)

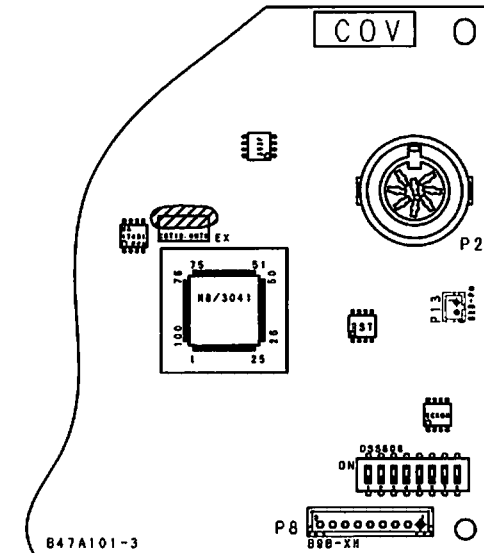
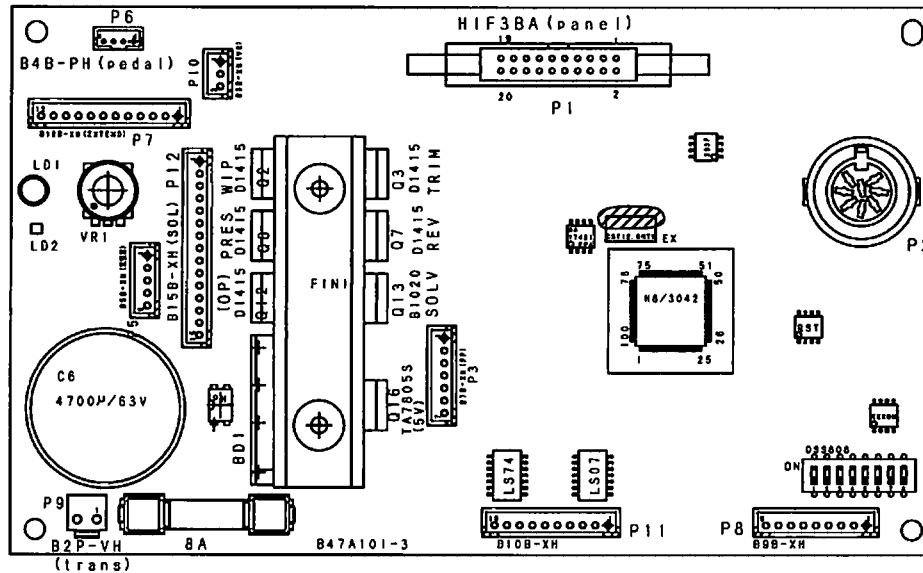
- 1) The connector is shown from the pin side.
- 2) The section indicated by broken lines shows the inside of the control box.



# IMSMK2-Assy (MD-601, 611)

NAME	CODE	NOTE
IMSMK2 Assy (B47A101)	J80641-001	MK2 spec

NAME	CODE	NOTE
IMSCOV Assy (B47A101)	J80674-001	COV spec



code numbers of common parts

SYMBOL	NANE	CODE	Q'ty	NOTE
VR nob	nob D14xD5XL12	J01776001	1	
VR1	DVR-IRLB103L30	J02042001	1	
L01	LEDLN31GPH	J00623001	1	
LED spacer	LED LN-20	J02166001	1	
#9	DIPSWDSS608	U33944001	1	
B01	BD D5S810	136348001	1	
XTAL	CST12.0MTW	U38923000	1	
F1	Fuse 8A	218225000	1	
FH1	F082	J01684001	2	
Q16	ICTA78059	130113000	1	
Q13	S1TR2381020	J02637001	1	
Q8, 3, 7, 2, 12	S1TR2301415	233276001	5	
C6	A-CAPA 63B472	J02236001	1	
P2	CDNE S-13364	233285000	1	
P6	B4B-PH	U16886000	1	
P11	B10B-XH-A	J01768001	1	
P8	B8B-XH-A	U04256000	1	
P9	B2P-VH	132575001	1	
P12	B15B-XH-A	J01811001	1	
#8	EEPROMBR9040F	J02820001	1	
#5	TLP120	J02621001	1	
#1	BIPICBA10393FT	S30183000	1	
#3	LSI6433042SF13F	J02954001	1	CPU Ver. 3.4

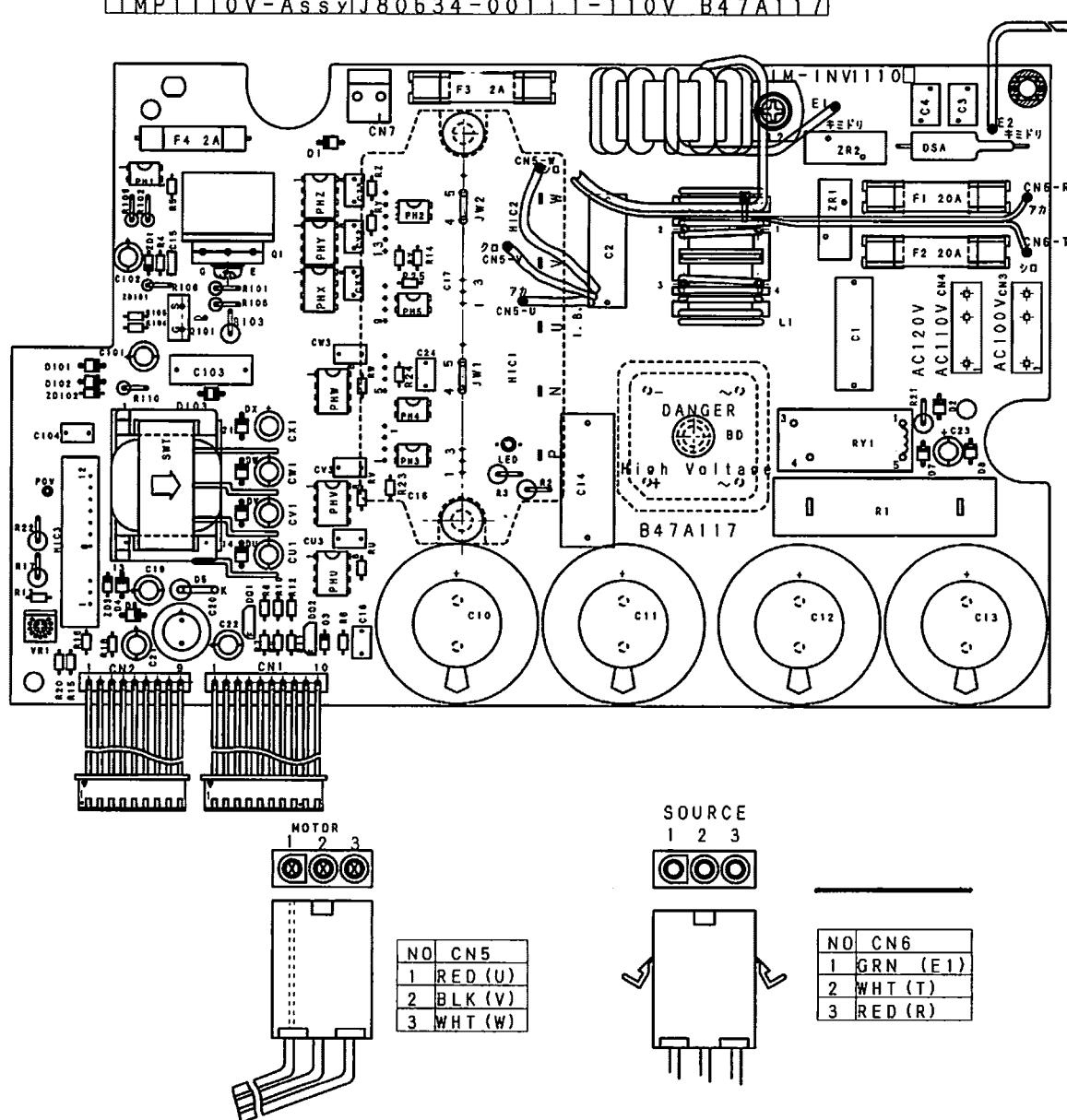
code numbers of common parts

SYMBOL	NANE	CODE	Q'ty	NOTE
#3	LSI6433042-#2	J03055001	1	CPU Ver. C1.2
P13	B2B-PH	U18686000	1	one time CPU



# IMP1110V-Assy (MD-601) 1 PHASE

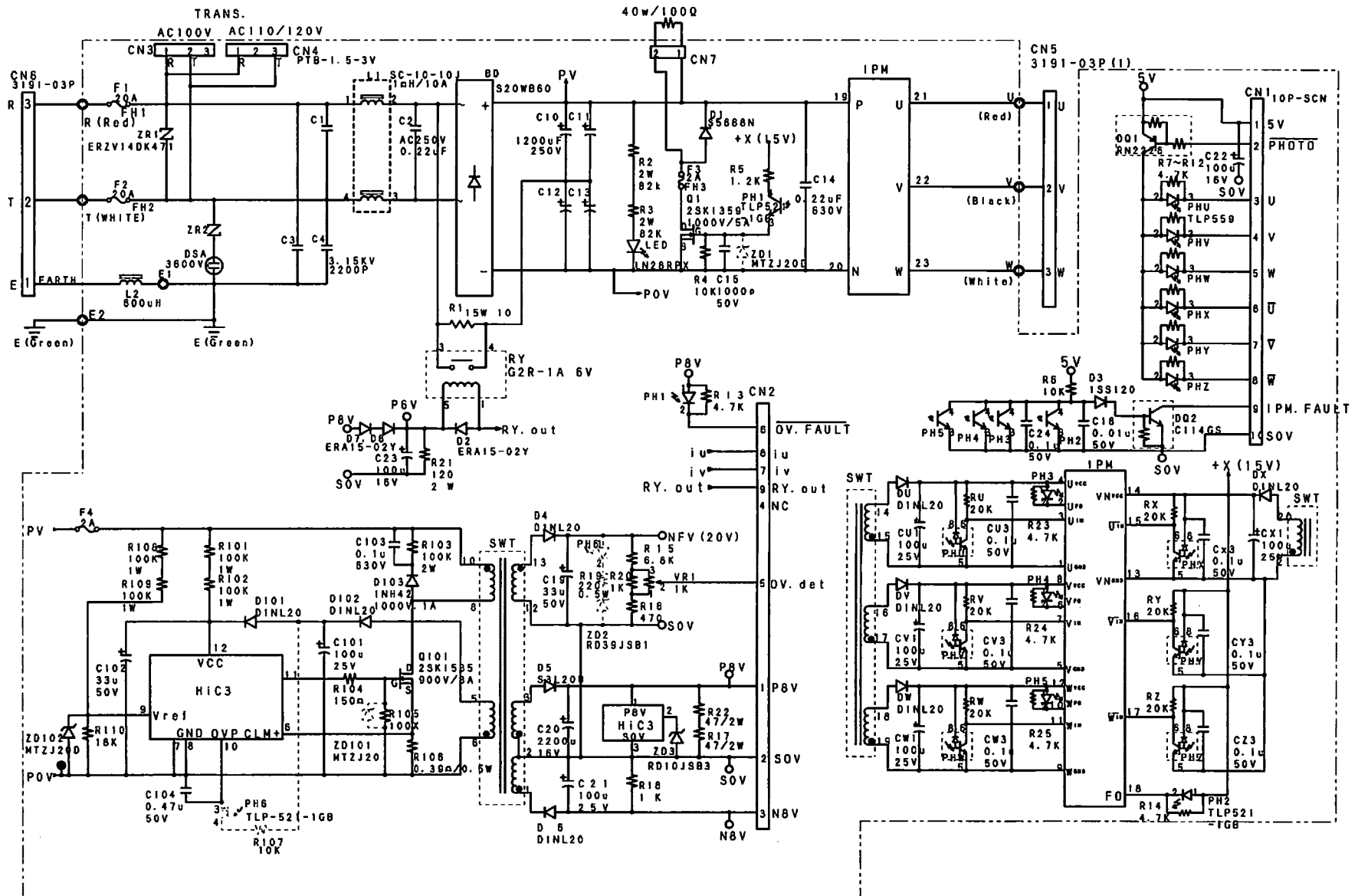
NAME	CODE	NOTE
IMP1110V-Assy	J80634-001	1-110V B47A117



## code numbers of common parts

SYMBOL	NAME	CODE	Q'ty	NOTE
C1, 2	C-C250B224	J02434001	2	AC250V, 0.22uF
C3, 4	C-C315B222	J00280001	2	AC3KV, 2200pF
ZR1, 2	FRZV14DK471	J02435001	2	470V
DSA	DSA362MA	232384001	1	
L1	SC-10-10J	643981000	1	10A, 1mH
F1, 2	FGRO 20A	J02585001	2	20A, 250V
CN6	IMCONE1110ASSY	J02585001	1	3PCONNECTOR Assy
E2	IME CODE ASSY	J02438001	1	earth code assy
L2	SNG-25R-600	J00284001	1	600uH
BD	S2QWB80	J00284001	1	20A, 800V
Q1	2SK135R	J02440001	1	5A, 1000V
RY	GR-1A 6V	J02441001	1	10A, 250V
C10, 11, 12, 13	A-CAPA 250B122	J02584001	4	250V, 1200uF
D1	S588RN	J02834001	1	1A, 100V
1PM	1PMPM20CS1060	J02443001	1	20A, 800V
C14	C-C830B224	J02444001	1	630V, 0.22uF
PH1, 2, 3, 4	PHOTOCP, TLP521-1	U87859000	6	
ZD102	MTZ120D	J00740001	1	20V, 0.5W
F3	FGRO 2A	J02471001	1	2A, 250V
R2, 3	GR-B2Y823F	Y00823618	2	2W, 82KΩ
R1	R15/20	J02446001	1	15W, 20Ω
LED	LED1N2BRPX	J00817001	1	
C103	C-C830B104	Y51045060	1	630V, 0.1uF
R103	ERG2S1104F	Y01003618	1	2W, 100KΩ
R106	ERG12S1R39F	Y00398418	1	0.5W, 0.39Ω
D4, 6, 101, 102	S1DD1N120	UL8131000	8	1A, 200V
D5	S1DS3120U02	J00785001	1	2, 1A, 200V
D103	S1D1NH42	J02454001	1	1A, 1000V
F4	FGMLB 2A	J02727001	1	2A, 250V
FH1, 2, 3	F062	J01684001	6	Fuse Holder
C101, CUI, CV1	A-CAPA 25B101	J00751001	6	25V, 100uF
CW1, C21, CX1	A-CAPA 50B330GE	J02457001	2	50V, 33uF
C18, 102	A-CAPA 18B222GE	J02458001	1	18V, 2200uF
C20	A-CAPA 18B222GE	J02458001	1	18V, 2200uF
ZD3	ZDRD10JSB3	J02460001	1	12V, 0.5W
VR1	CVR-1RLB102	J02481001	1	1KΩ
Q101	FFT2SK1535	J02482001	1	3A, 900V
HIC3	HICM8195	J02483001	1	
SWT	FTS28AC189AC	J02484001	1	
PHU~PHZ	PHOTOCP, TLP559HV	J02485001	6	
D2, 7, 8	S1DRA15-02Y	J00787001	3	1A, 200V
D3	S1DISS120	U344272000	1	0.1A, 50V
DQ1	S1TRRN2226	J01810001	1	0.6A, 50V
DQ2	S1TRDTC114GS	J00748001	1	0.1A, 50V
CN7	CONNEC5281-02A	J02449001	1	2P CONNECTOR
CN3, 4	CONNEC PTR-1.5-3V	J02587001	2	3P CONNECTOR
CN1	IM8P code ASSY	J02486001	1	8P CODE ASSY
CN2	IM10P code ASSY	J02487001	1	10P CODE ASSY
CN5	IM code 220Assy	J02448001	1	3PCONNECTOR Assy
CU3~C23	C-C50B104	Y51040045	7	50V, 0.1uF

NOTE: REV. NO. B47A117-5



IMP1110V-AsSy (MD-601)

NAME	CODE	NOTE
IMP1110V-ASSY	180634-001	1-110/120V







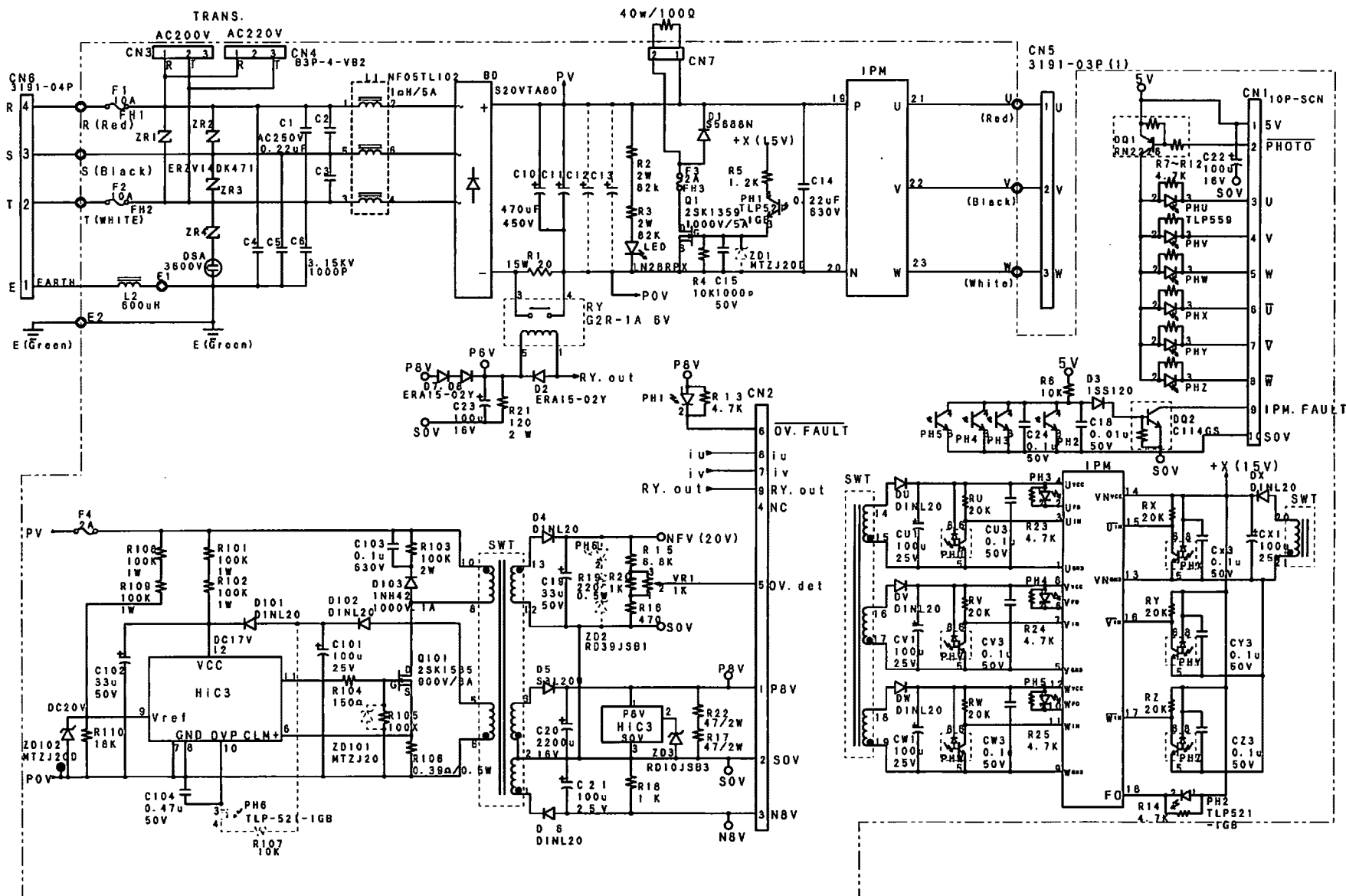
NAME	CODE	NOTE
IMP1230V-Assty	J80635-001	1-220/230-240V

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SYMBOL	NAME	CODE	Q'ty	NOTE
C1, 2, 3	C-C250B22A	J02434001	3	AC250V, 0.22uF
C4, 5, 6	C-C315R102	J01428000	3	AC3KV, 1000pF
DR1, 2, 3, 4	FRZV140K471	J02435001	4	470V
DSA	DSA382HA	J23238001	1	
L1	NF05T1102	J00770001	1	5A, 1mH
F1, 2	FG80 10A	J02468001	2	10A, 250V
CN6	1MCONE3220ASSY	J02438001	1	4PCCONNECTOR ASSY
L2	LM CODE ASSY	J02438001	1	11A CODE ASSY
F2	SN6-25B-600	J00294001	1	800uH
BD	S20VTA80	J02438001	1	20A, 800V
Q1	2SK1359	J02440001	1	5A, 1000V
RY	G2R-1A 6V	J02441001	1	10A, 250V
C10, 11	A-CAPA 450R471	J02365000	2	450V, 470uF #1
D1	S5888N	J02634001	1	1A, 1000V
1PM	1PMPH20CS1060	J02443001	1	20A, 600V
C14	C-C630B22A	J02445001	1	630V, 0.22uF
PH1, 2, 3, 4, 5	PHOTOQCP TLP521-1	J04455000	5	
R2, 102	RY1210D	J00744001	1	20V, 0.5W
F3	EG80 2A	J02471001	1	2A, 250V
R2, 3	GR-82Y823E	Y00823819	2	2W, 82KΩ
R1	R15/20	J02446001	1	15W, 20Ω
LED	LEDLN28RPX	J00817001	1	
C103	C-C630R104	Y51045060	1	630V, 0.1uF
R103	FRG2S1104E	Y01003819	1	2W, 100KΩ
R106	ERG125JR38E	Y00388419	1	0.5W, 0.38Ω
DA, 8, 101, 102	SIDDINL20	U18131000	8	1A, 200V
DV, V, W, X	S10S320U02	J00775001	1	1A, 1A, 200V
D103	S1DLN42	J02454001	1	1A, 1000V
F4	EGM18 2A	J02727001	1	2A, 250V
PH1, 2, 3	F062	J01684001	6	Fuse Holder
C101, CUI, CV1	A-CAPA 25R101	J00751001	6	25V, 100uF
CW1, C21, CX1	A-CAPA 50R330GE	J02457001	2	50V, 33uF
C19, 102	A-CAPA 18R222GE	J02458001	1	16V, 2200uF
C20	2DRD10JSB3	J02460001	1	12V, 0.5W
VR1	CVR-1R18102	J02481601	1	1KΩ
CN1	CF12SK15135	J02462001	1	3A, 900V
H1, C3	H1CM88195	J02463001	1	
SW1	ETS28AG189AC	J02464001	1	
PHU-PH2	PHOTOQCP TLP559HV	J02465001	6	
D2, 7, 8	SIDERA15-02Y	J00787001	3	1A, 200V
D3	S1D1SS120	U34427000	1	0.1A, 50V
DQ1	S1TRDTC1228	Y01810001	1	0.8A, 50V
DQ2	S1TRDTC114GS	J00748001	1	0.1A, 50V
CN7	CONNECTE5281-02A	J02448001	1	2P CONNECTOR
CN3, 4	CONNECT R3P-4-VR2	J02437001	2	3P CONNECTOR
CN1	1MSP end ASSY	J02460001	1	1P CODE ASSY
CN2	1MSP end ASSY	J02467001	1	1P CODE ASSY
CN5	1M CODE 220A ASSY	J02448001	1	3PCCONNECTOR ASSY
CN3-C23	C-C50R104	Y51040045	7	

B47A102-4				
C10, 11, 12, 13	A-CAPA 4508331	102442001	4	450V, 330uF *
COV nprc. (B47A102-5)				
C10, 11, 12	A-CAPA 4508471	102865001	3	450V, 470uF *

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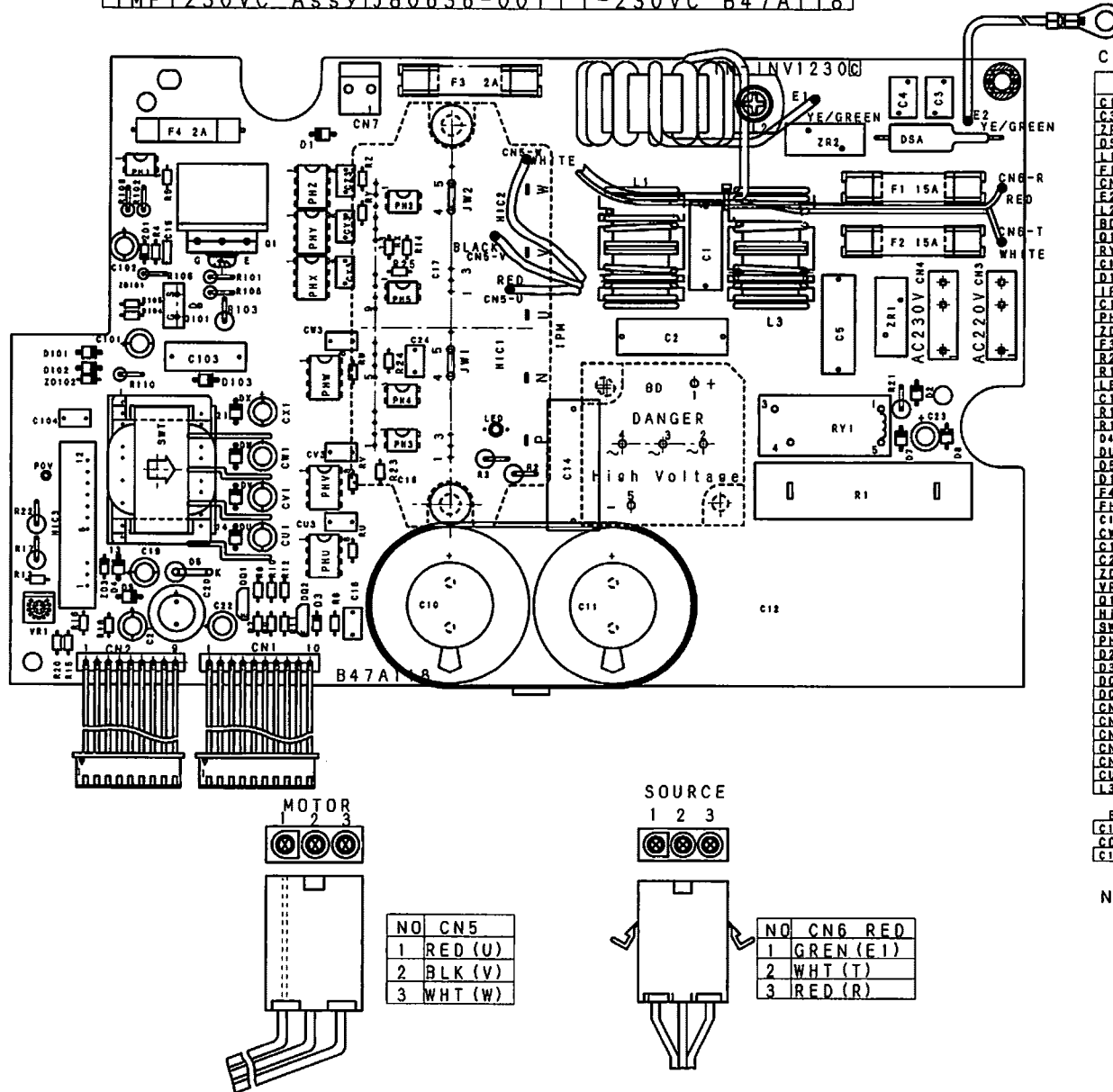


IMP3220V-Assy (MD-611)

NAME	CODE	NOTE
IMP3220V-Assy	J80637-001	3-220V

# IMP1230VC-Assy (MD-601) 1 PHASE

NAME	CODE	NOTE
IMP1230VC-Assy	J80636-001	1-230VC B47A118



## code numbers of common parts

SYMBOL	NAME	CODE	Q'ty	NOTE
C1, 2, 5	C-C250B224	J02434001	3	AC250V, 0.22uF
C3, 4	C-C315B222	J02430001	2	AC3KV, 2200pF
RL, 2	FRY140K471	J02435001	2	470V
DSA	DSA362MA	232334001	1	
L1	SC-08-30J	J02800001	1	8A, 3mH
E1, 2	EGR0 15A	216469001	2	15A, 250V
CN6	IMCONE1230ASSY	J02832001	1	3PCONNECTOR Assy
E2	IME CODE ASSY	J02438001	1	earih code assy
L2	SNG-25B-600	J00284001	1	600uH
BD	S20VTA80	J02439001	1	20A, 800V
Q1	2SK1359	J02440001	1	5A, 1000V
RY	G2R-1A 8V	J02441001	1	10A, 250V
C10, 11	A-CAPA 450B471	J02985001	2	450V, 470uF
D1	S5688N	J02834001	1	1A, 1000V
1PM	1PMPM20CSJ080	J02443001	1	20A, 800V
C14	C-C630B224	J02444001	1	630V, 0.22uF
PH1, 2, 3, 4	PHOTOCP, T1P521-1	U2885000	5	
ZD102	MTZ120J	J02749001	1	20V, 0.5W
F3	EGR0 2A	J02471001	1	2A, 250V
R2, 3	GR-B2Y623F	Y00823819	2	2W, 82KΩ
R1	R15/20	J02446001	1	15W, 20Ω
LED	LEDLN28PX	J00817001	1	
C103	C-C630B104	Y51045000	1	630V, 0.1uF
R103	ERG2S1104F	Y01003819	1	2W, 100KΩ
R108	ERG12S1R38F	Y00388419	1	0.5W, 0.38Ω
D4, 6, 101, 102	S1DD1NL20	U18131000	8	1A, 200V
DV, V, W, X	S1DS3120U02	J00785001	1	2, 1A, 200V
D5	S1D1NH42	J02454001	1	1A, 1000V
D103	FGH1B 2A	J02727001	1	2A, 250V
F4	F062	J01684001	8	Fuse Holder
PH1, 2, 3	F062	J01684001	8	Fuse Holder
C101, C01, CV1	A-CAPA 25B101	J00751001	6	25V, 100uF
C19, 102	A-CAPA 50B330GE	J02457001	2	50V, 33uF
C20	A-CAPA 16B222GE	J02458001	1	16V, 2200uF
ZD3	ZDRD10JSB3	J02460001	1	12V, 0.5W
VR1	CVR-1RLB102	J02461001	1	1KΩ
Q101	FET2SK1535	J02482001	1	3A, 900V
HIC3	HICM68195	J02483001	1	
SWT	ETS28AG189AC	J02484001	1	
PHV~PH7	PHOTOCP T1P558HV	J02485001	8	
D2, 7, 8	S1DERA15-02Y	J00787001	3	1A, 200V
D3	S1D1SS120	U34427000	1	0.1A, 50V
D01	S1TRRN2226	J01810001	1	0.8A, 50V
D02	S1TRDTC114GS	J00746001	1	0.1A, 50V
CN7	CONNEC5281-02A	J02449001	1	2P CONNECTOR
CN3, 4	CONNEC 83P-4-VR2	J02437001	2	3P CONNECTOR
CN1	IMRP code ASSY	J02466001	1	9P CODE ASSY
CN2	IM10P code ASSY	J02487001	1	10P CODE ASSY
CN5	IM code 220Assy	J02446001	1	3PCONNECTOR ASSY
CN3~CN7	C-C50B104	Y51040045	7	
L3	SC-10-10J	643981000	1	10A, 1mH

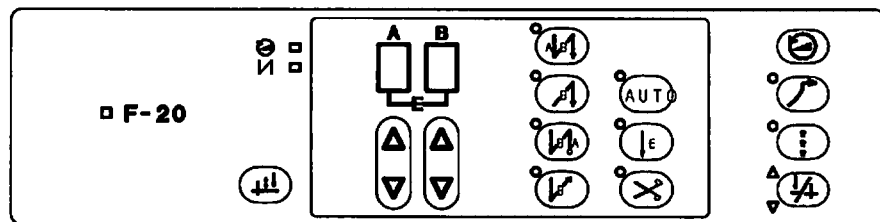
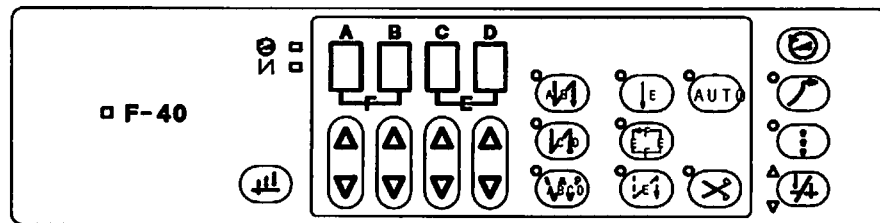
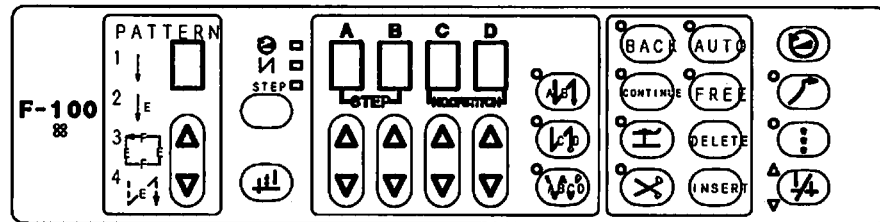
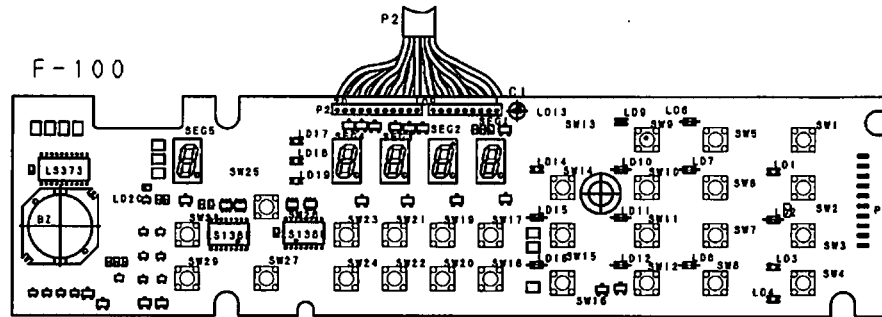
B47A118-4		
C10, 11, 12, 13	A-CAPA 450B331	J02442001 4 450V, 330uF #1
CONV spec. (B47A102-5)		
C10, 11, 12	A-CAPA 450B471	J02985001 3 450V, 470uF #1

NOTE: REV. NO. B47A118-5

NAME	CODE	NOTE
IMP1230VC-AsSy	J80636-001	1-230VC (CF)

# Operation Panel (MD-601, 611)

F-100, F-40, F-20

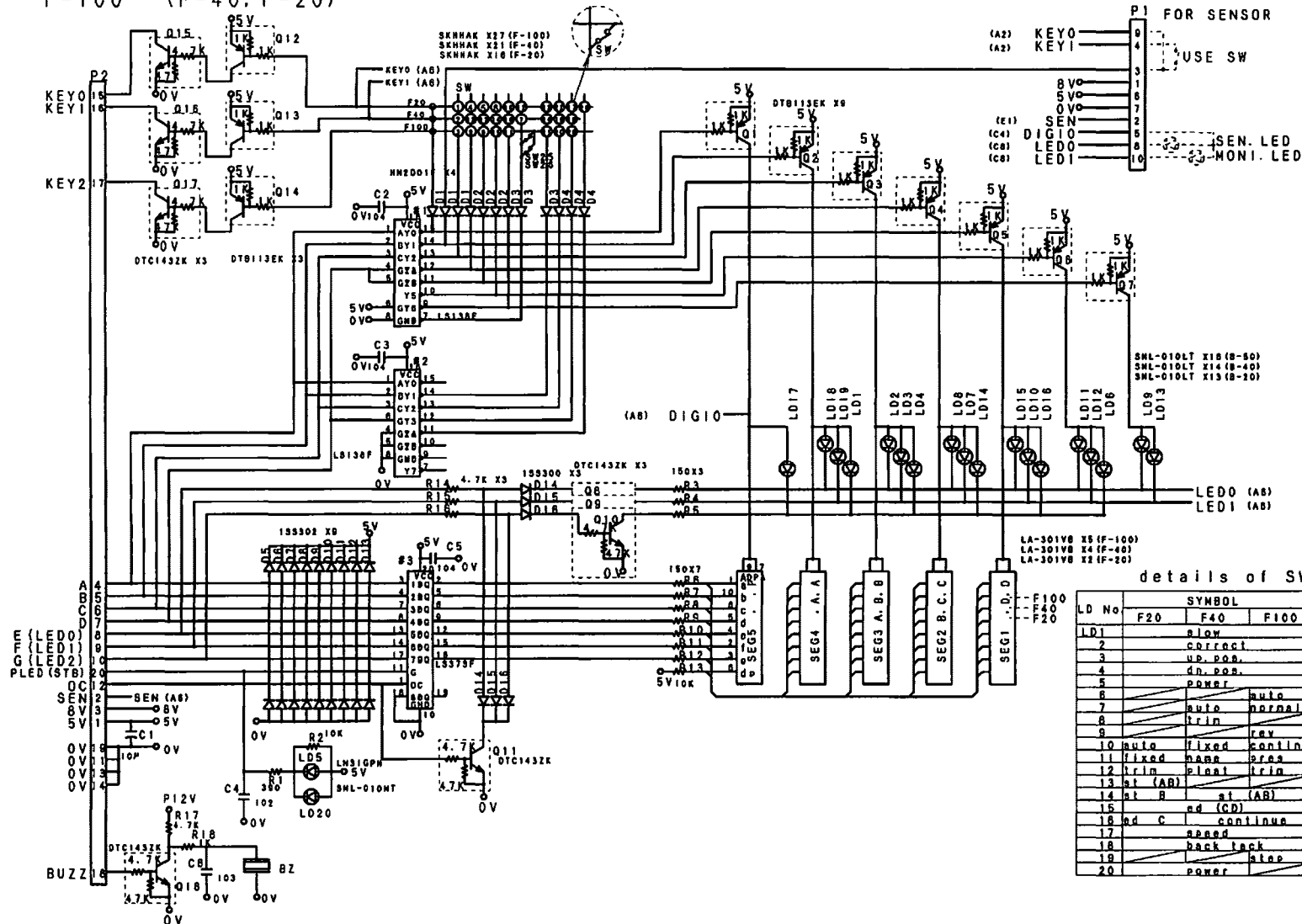


## code numbers of common parts

SYMBOL	CODE	NANE	QTY	NOTE
#1, 2	091120138	BIPIC74LS138	2	
#3	091120373	BIPIC74LS373F	1	
Q1~7, 12, 13, 14	J00625001	TRDTB113EK	10	
Q8~11, 15~18	U38326000	TRDTC143ZK	8	
D1, 2, 3, 4	UG2520085	SIDHN2D01F	4	
D5~13	J02613001	SID1SS302	9	
D14, 15, 16	J02614001	SID1SS300	3	
SW1, 2, 3, 4, 5, 6, 7 8, 9, 10, 11, 12, 14, 15, 16, 17, 18 19, 20, 21, 22, 23 24, 26, 27, 28 29	236387001	SWSKHVBD	27	
LD1, 2, 3, 4, 6, 7, 8 9, 10, 11, 12, 14 15, 16, 17, 18, 19	J02485001	LEDSML-010LT	17	
SEG1, 2, 3, 4, 5	J00621001	LEDLA-301VB L	5	
R3~12	094151320	GR-C14J151	10	
R2, 13	094103120	GR-C110J103	2	
R1	094391120	GR-C110J391	1	
R14~17	094472120	GR-C110J472	4	
R18	094102120	GR-C110J102	1	
C2, 3, 5	Y81042415	C-C50C104F-T	3	
C4	Y81020015	C-C50C102B-T	1	
C6	Y81030015	C-C50B103B	1	
C1	Y41002301	A-CAPA16B100	1	
P1	U73353000	S10B-XH-A	1	
BZ1	J00626001	EFBAL300402	1	
P2	J02487001	PLUG COAD F	1	



# OPERATION PANEL CIRCUIT DIAGRAM (MD-601, 611) F-100 (F-40, F-20)

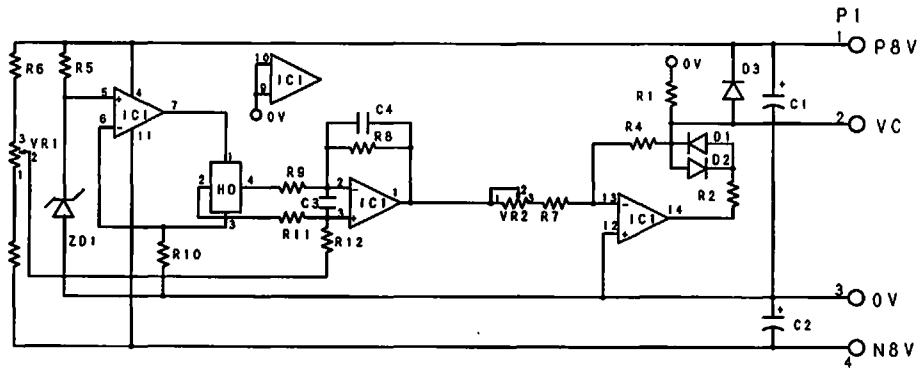


details of SW&LED layout

LD No	SYMBOL			SW NO.	SYMBOL		
	F20	F40	F100		F20	F40	F100
LD1	slow	slow	slow	SW1	slow	slow	slow
2	correct	correct	correct	2	correct	correct	correct
3	up. pos.	up. pos.	up. pos.	3	up. pos.	up. pos.	up. pos.
4	dn. pos.	dn. pos.	dn. pos.	4	dn. pos.	dn. pos.	dn. pos.
5	power	power	power	5	power	power	power
6	auto	auto	auto	6	auto	auto	auto
7	auto normal	auto normal	auto normal	7	auto normal	auto normal	auto normal
8	trim	trim	trim	8	trim	trim	trim
9	ray	ray	ray	9	ray	ray	ray
10	auto fixed continue	auto fixed continue	auto fixed continue	10	auto fixed continue	auto fixed continue	auto fixed continue
11	fixed nana	fixed nana	fixed nana	11	fixed nana	fixed nana	fixed nana
12	trim	trim	trim	12	trim	trim	trim
13	st (AB)	st (AB)	st (AB)	13	st (AB)	st (AB)	st (AB)
14	st B	st B	st B	14	st B	st B	st B
15	ed (CD)	ed (CD)	ed (CD)	15	ed (CD)	ed (CD)	ed (CD)
16	ed C	ed C	ed C	16	ed C	ed C	ed C
17	speed	speed	speed	17	speed	speed	speed
18	back lock	back lock	back lock	18	back lock	back lock	back lock
19	stop	stop	stop	19	stop	stop	stop
20	power	power	power	20	power	power	power
				21	A +	B +	C +
				22	A -	B -	C -
				23	A +	B +	C +
				24	A -	B -	C -
				25	A +	B +	C +
				26	A -	B -	C -
				27	half stitch	half stitch	half stitch
				28	P +	P +	P +
				29	P -	P -	P -

# TREADLE UNIT (MD-601, 611)

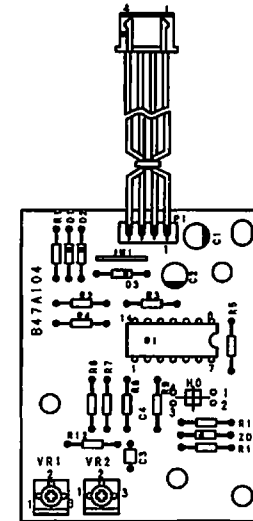
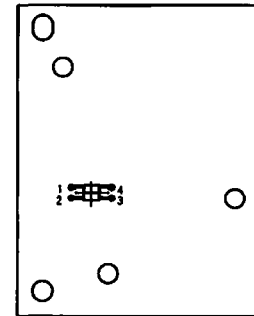
NAME	CODE	NOTE
Treadle Unit#E	J80638-001	EXPORT spec.
Treadle Unit#D	J80639-001	DOMES spec.
PS-INV Assy	J80640-001	B47A104



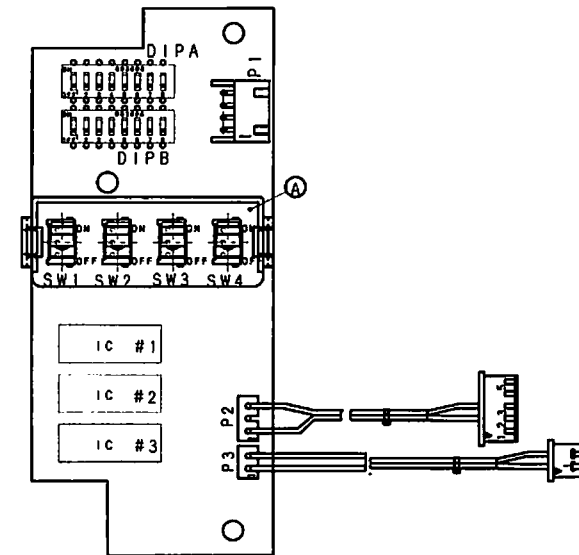
## code numbers of common parts

SYMBOL	NAME	CODE	Q'ty	NOTE
IC1	BIPICuPC324C	411111001	1	
Ho	THS102A	231897001	1	
ZD1	ZDRD4.7JSB1	233132001	1	0.5W. 4.7V
VR1	RG06P0502	J02476001	1	5kΩ
VR2	RG06P0103	J02477001	1	10kΩ
C1, 2	A-CAPA 50B470	Y44702301	2	47μF
C3	C-C 50B102	Y51020010	1	1000pF
R6	ERD-S2TJ822	090622620	1	8.2kΩ
R3	432	090432620	1	4.3kΩ
R5, 10	102	090102620	2	1kΩ
R1, 8, 11	222	090222620	3	2.2kΩ
R8, 12	224	090224620	2	220kΩ
R7	432	090432620	1	4.3kΩ
R4	103	090103620	1	10kΩ
R2	101	090101620	1	100Ω
D1, 2, 3	SIDISS120	U34427000	3	
P1	PSI CONE Assy	J02478001	1	

B47A104-2			
Ho	THS117	J03010001	1



PHR-4	4P-SCN
1	8 P8V
2	8 VC
3	8 0V
4	8 N8V



SYMBOL	NANE	Q' ty	CODE	NOTE
#1, #2, #3	TC74HC138AP	3	093100138	
D1PA, DIPB	DipswDSS808	2	U33944001	
Q2, Q3, Q4	DTC114ES	3	J00326001	
Q1	DTA114ES	1	J00335001	
D1~D32	ISS120	32	U34427000	
R1~R30	ERD-S2TJ103	30	090103620	
C1	ECEAICKA100	1	Y41002301	
SW1~4	A-12KP	4	J03052001	
P1	S4B-XH-A	1	T02547000	
P2	COV3P code	1	J03048001	
P3	COV2P code	1	J03049001	
A	SW PLATE	1	J03046001	

# MD600 Power board for repair flow-chart

IMP1110V-assy.  
IMP1230V-assy.  
IMP1230VC-assy.  
IMP3220V-assy.

