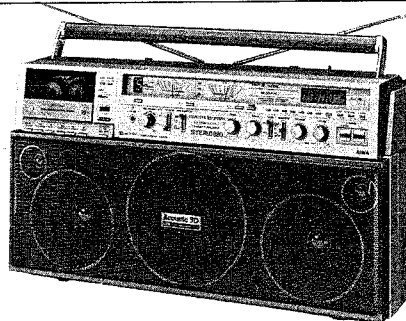


# 3-BAND STEREO RADIO CASSETTE RECORDER

## MODEL NO. CS-880E, K

# AIWA®

## [SERVICE MANUAL]



Code No. 29-880-000-18

DATE OF ISSUE 7/1981

### SPECIFICATIONS

#### GENERAL

##### Semiconductors:

17 ICs, 1 FET, 95 transistors,  
68 diodes, 7 LED's, 1 LCD

##### Power source:

E model  
Batteries DC 13.5V (UM-1 x 9)  
Back-up power supply (for tuner memory)  
DC 3V (UM-3, "AA" x 2)  
AC 110 ~ 120V/220 ~ 240V  
switchable 50/60 Hz  
K model  
Batteries, DC 13.5V (UM-1 or HP-2 x 9)  
Back-up power supply (for tuner memory)  
DC 3V (UM-3 or HP-7 x 2)  
K model  
AC 120V/240V  
switchable. 50/60 Hz  
Car battery (thru car adaptor)

##### Power consumption:

E model  
42W  
K model  
39W

##### Speakers:

140mmφ x 2 (Woofer)  
50mmφ x 2 (Tweeter)  
170mmφ x 1 (Passive Radiator)  
588(W) x 325(H) x 163(D) mm  
8.6 kg

##### Dimension:

##### Weight:

#### RADIO SECTION

##### Frequency range:

FM 87.5 ~ 108 MHz  
MW 522 ~ 1,611 kHz  
LW 146 ~ 353 kHz

##### Intermediate frequency:

FM 10.7 MHz  
MW, LW 450 kHz

##### Sensitivity:

(IHF, THD 3%)

FM  
14 ± 6 dB (at 88.0 MHz)  
12 ± 6 dB (at 98.0 MHz)  
12 ± 6 dB (at 108.0 MHz)

(S/N 10 dB)

MW  
47 ± 5 dB (at 594 kHz)  
45 ± 5 dB (at 1008 kHz)  
42 ± 5 dB (at 1404 kHz)

(S/N 10 dB)

LW  
55 ± 5 dB (at 155 kHz)  
54 ± 5 dB (at 245 kHz)  
55 ± 5 dB (at 344 kHz)

##### Image rejection:

FM 45 ± 6 dB (at 108.0 MHz)  
MW 41 ± 5 dB (at 1,404 kHz)  
LW 45 ± 10 dB (at 344 kHz)

##### IF rejection:

FM 80 ± 20 dB (at 88.0 MHz)  
MW 27 ± 5 dB (at 594 kHz)

##### Total harmonic distortion:

FM Less than 1.5% (at 98 MHz)  
MW 1.7 ± 1.0% (at 1,008 kHz)

##### FM stereo separation:

22 ± 3 dB (at 1 kHz)

##### Auto stop level:

FM 22 ± 10 dB (at 98 MHz)  
MW 60 ± 10 dB (at 1,008 kHz)  
LW 65 ± 10 dB (at 245 kHz)

#### TAPE RECORDER SECTION

##### Tape speed:

4.8 cm/s. ± 3%

##### Recording system:

AC bias

##### Erasing system:

AC erase

##### Record bias frequency:

61 ± 0.5 kHz

##### Distortion:

Less than 1.5% (PB)  
Less than 1.5% (REC/PB)

##### Frequency response:

METAL tape 35 ~ 16,000 Hz  
CrO<sub>2</sub> tape 35 ~ 13,000 Hz  
LH tape 35 ~ 12,500 Hz

##### Signal to noise ratio:

(Un-weighted)

More than 49/46 dB  
[DC/AC] (PB)  
More than 44/42 dB  
[DC/AC] (REC/PB)

##### Erasing ratio:

More than 60 dB

##### Separation:

More than 38 dB (REC/PB)

##### Output power:

More than 28W (14W + 14W)

##### FF & rewind time:

90 ± 5 s. (at C-60)

##### Automatic stop system:

Mechanical auto stop

##### Pinch roller pressure:

125 ± 15 g (1.23 ± 0.15N)

##### Wow and flutter:

Less than 0.038% (WRMS)

##### Take-up torque:

35 <sup>+15</sup>/<sub>-5</sub> g·cm (343 <sup>+147</sup>/<sub>-49</sub> mN·m)

##### FF & rewind torque:

110 ± 20 g·cm (1078 ± 196 mN·m)

##### Input terminal:


MIC 3.5φ jack x 2  
PHONO pin jack x 2  
DIN 5P

##### Input sensitivity/impedance:

MIC 0.3mV/3kΩ  
DIN 500mV/470kΩ  
PHONO 4mV/47kΩ

##### Output terminal:

DIN 5P  
EXT. SP 3.5φ jack x 2  
PHONES 6.3φ jack

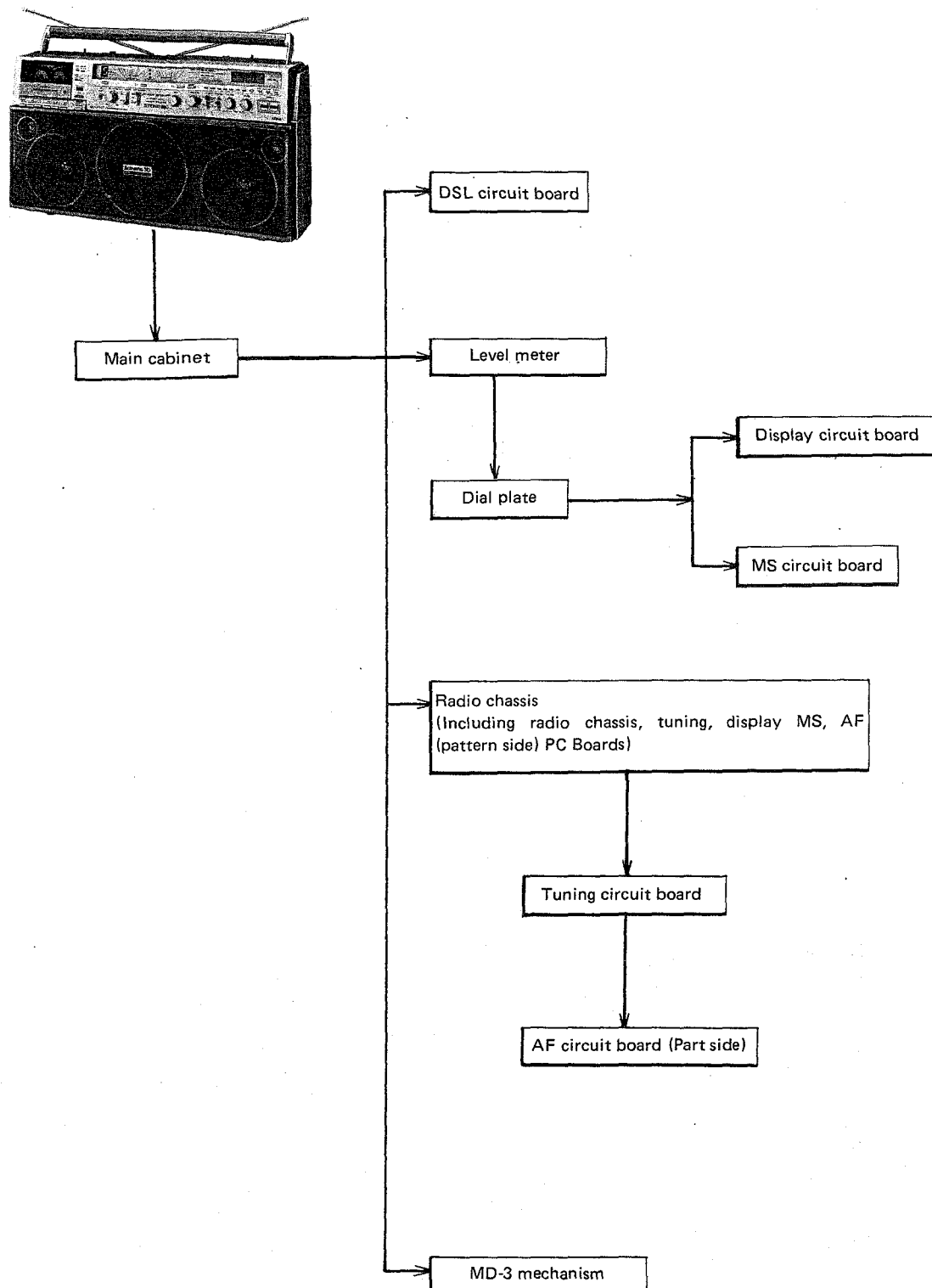
- Noise reduction system manufactured under license from Dolby Laboratories Licensing Corporation.
- Dolby and the  symbol are trademarks of Dolby Laboratories Licensing Corporation.
- Specifications and external appearance are subject to change without notice due to product improvement.

CS-880E,K

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## DISASSEMBLING CHART OF MAIN PARTS

- To avoid troubles when disassembling or replacing the main parts, follow the chart diagram as below.

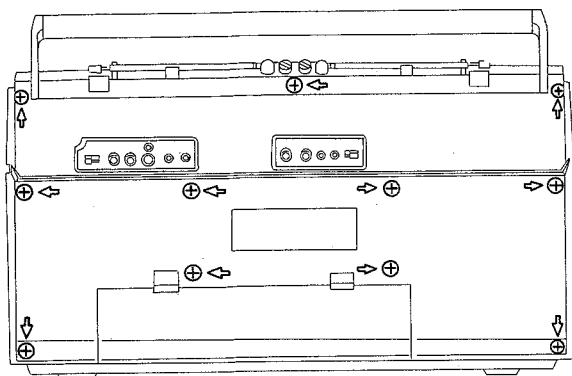


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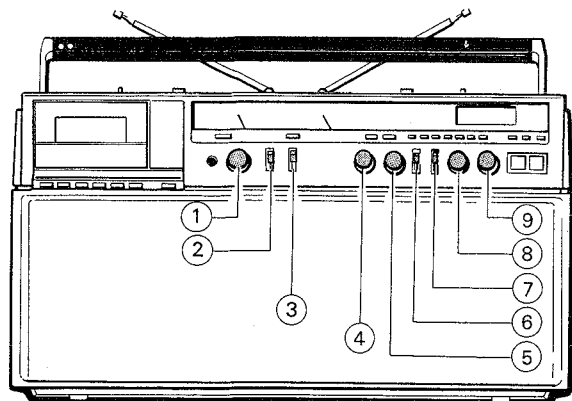
## DISASSEMBLY INSTRUCTIONS

### Removing the Main Case

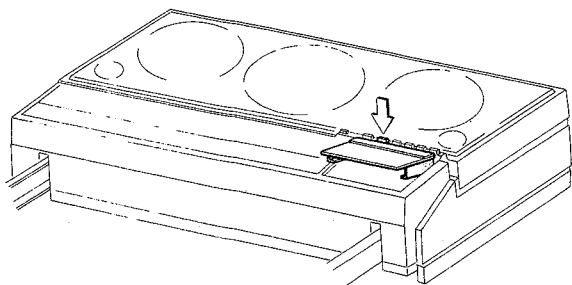
- 1) Remove 11 screws on the rear lid shown by arrows ←.



- 2) Remove 9 knobs.



- Note 3)** Open the cassette lid.  
(It is not required to remove the cassette lid)

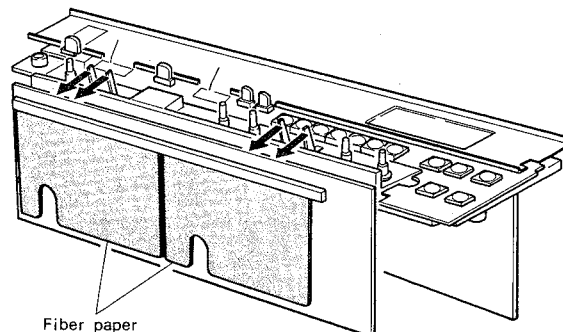


### Installing the Main Case

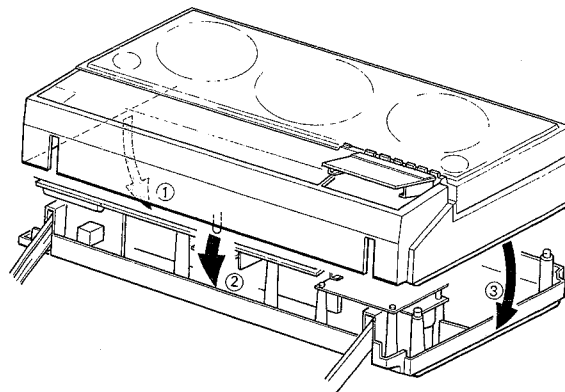
- 1) Check that the fibre apper of the REC/PB PC Board (pattern die) is fixed properly.

**Note:** Firmly fix the fibre paper using two-sided tape, etc. because it is likely to lift up when it is peeled off once.

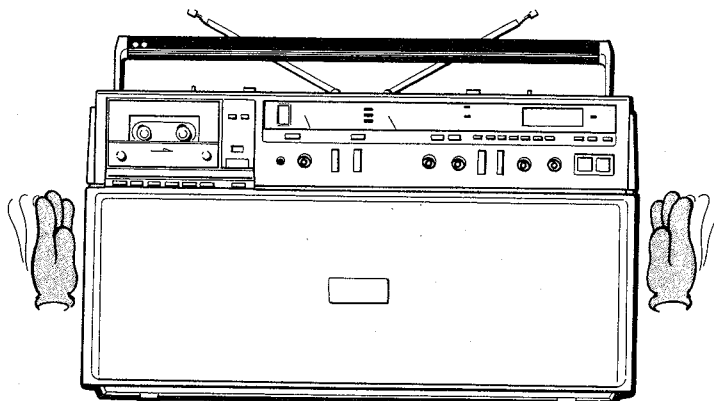
- 2) Lower all the lever switches in the direction of the arrow.



- Note 3)** Be sure to install in the order (1) – (3). Be careful: when it is mounted incorrectly, it may damage the dial plate and the display PC Boards, etc.



- 4) Match the knobs while performing item 3) and tapping the side.

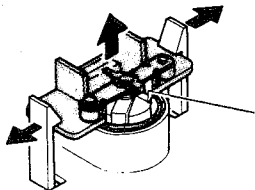


CS-880E,K

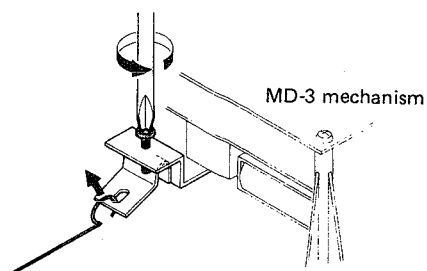
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**Note:** Removing the radio chassis

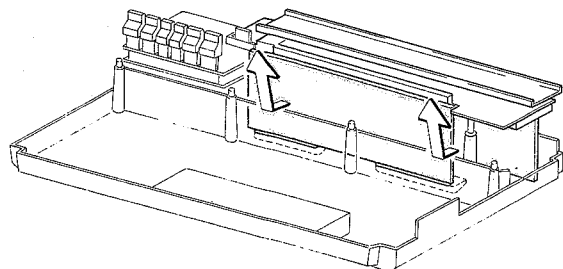
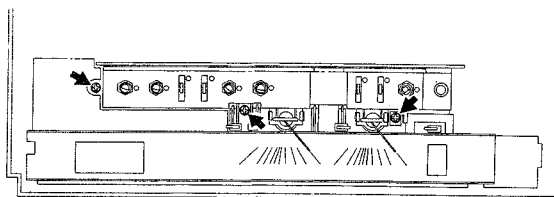
- 1) Be sure to remove the level meter before starting work to prevent the pointer of the level meter from being damaged.



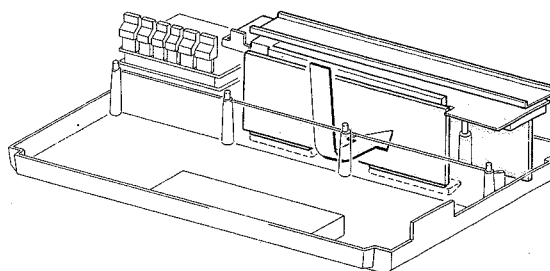
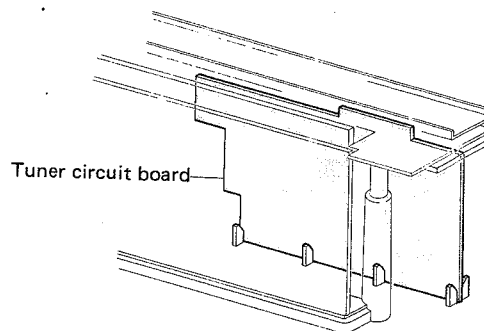
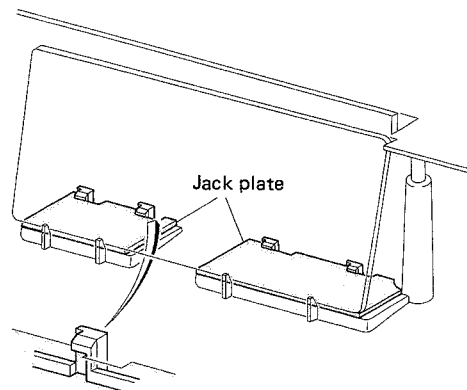
- 2) Loosen the screw and lift up the hook.



- 3) Remove 3 screws and lift up the radio chassis in the direction of the arrow. The radio chassis, REC/PB, tuner, MS and display PC Boards are removed at that time.

**Note:** Installing the radio chassis

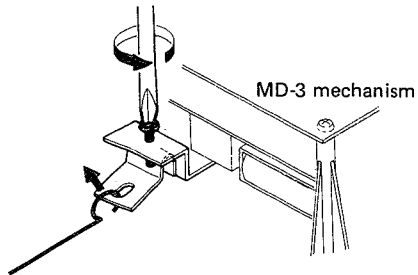
- 1) Hook the jack plate to the tab of the rear lid while paying attention not to pinch the wire. Compress the radio chassis against the direction of the arrow after checking that the tuner PC Board is inserted into the rib.



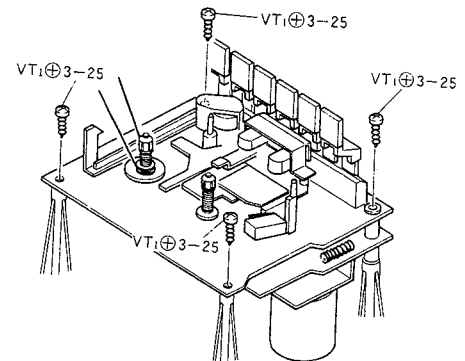


**AIWA****CS-880E,K****Removing Mechanism**

1) Loosen the screw and remove the hook of the rod.



2) Remove 4 screws.

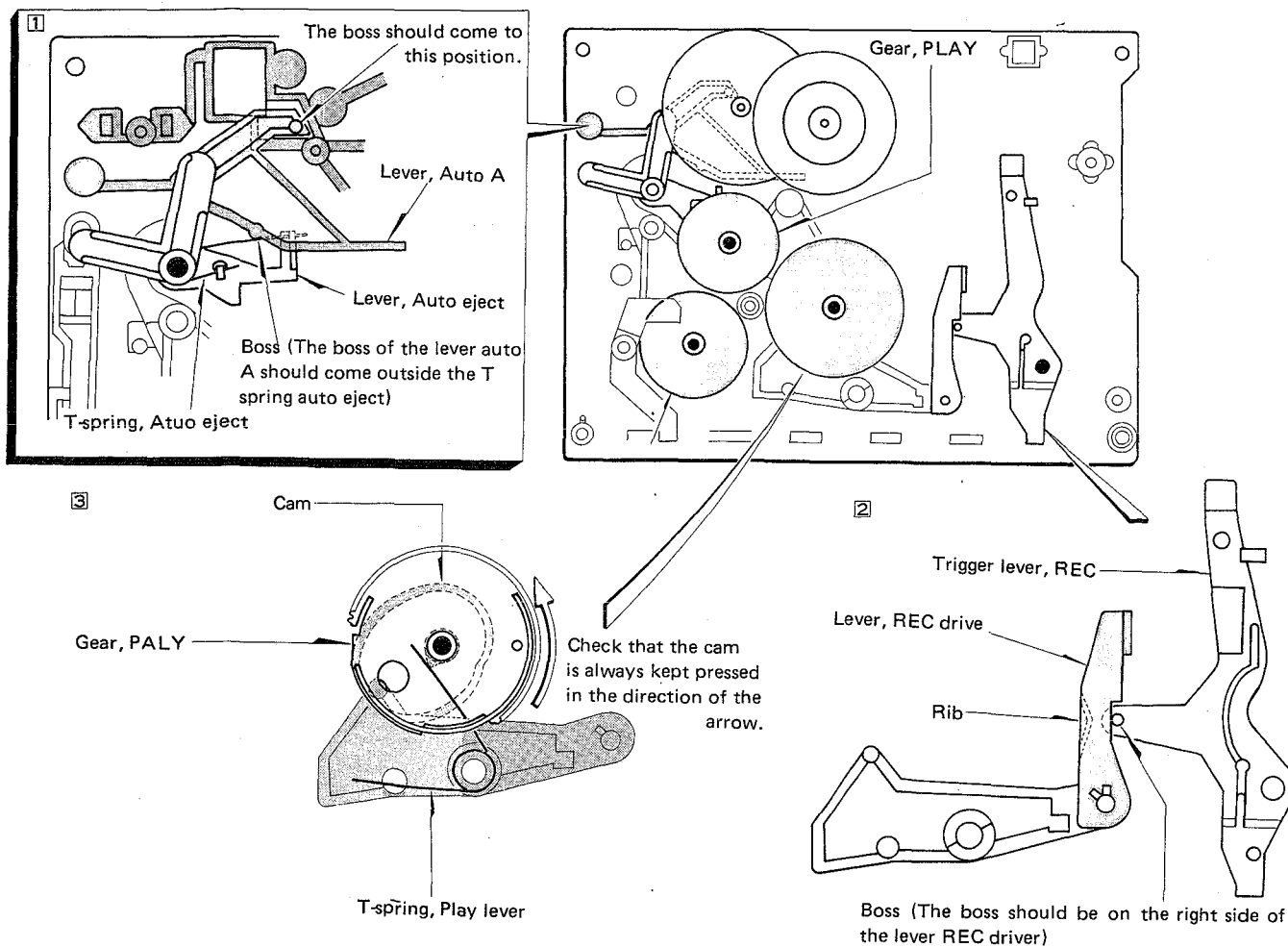


CS-880E,K

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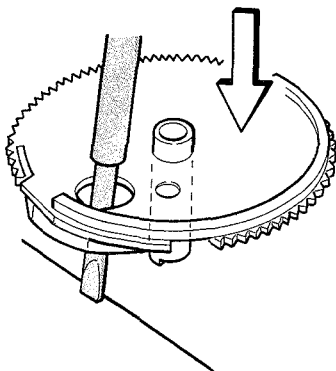
### Cautions on Disassembling MD-3 Mechanism

Disassemble or repair the MD-3 mechanism while paying attention to the springs and levers, etc. shown in the figure below.



Be sure to hook the T-spring (PLAY lever) to the cam of the gear when installing the gear PLAY.

Hook it from the inside of the gear using a clock screwdriver as shown in the figure. Perform the same for the gear FR and cam gear PAUSE.



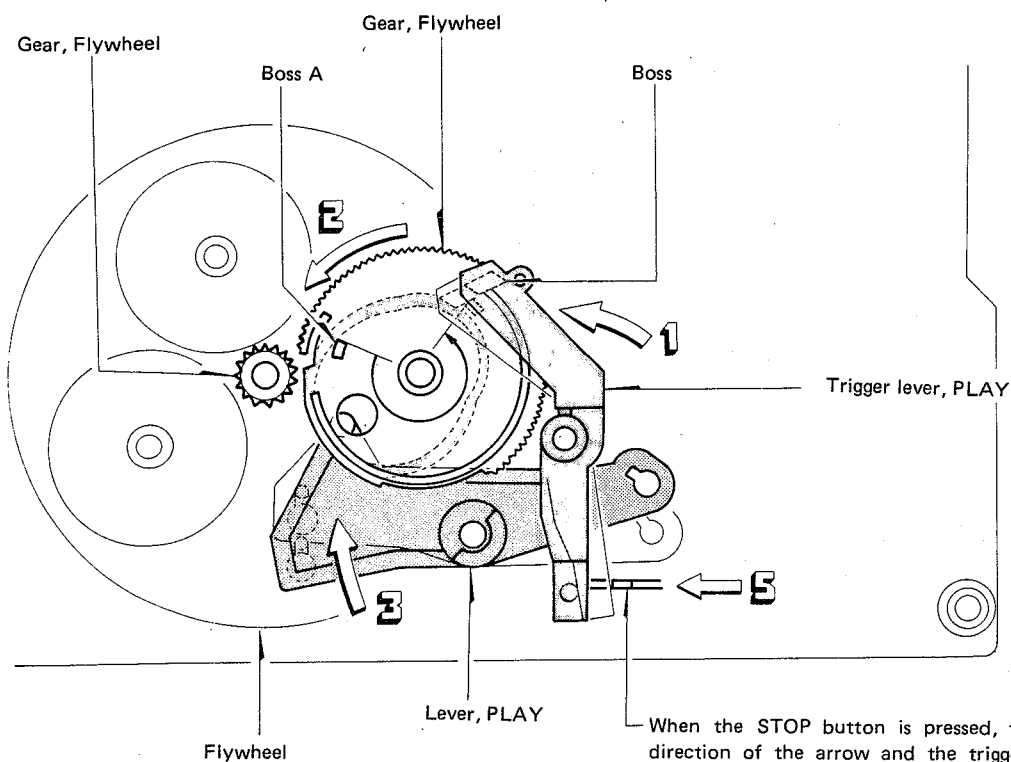
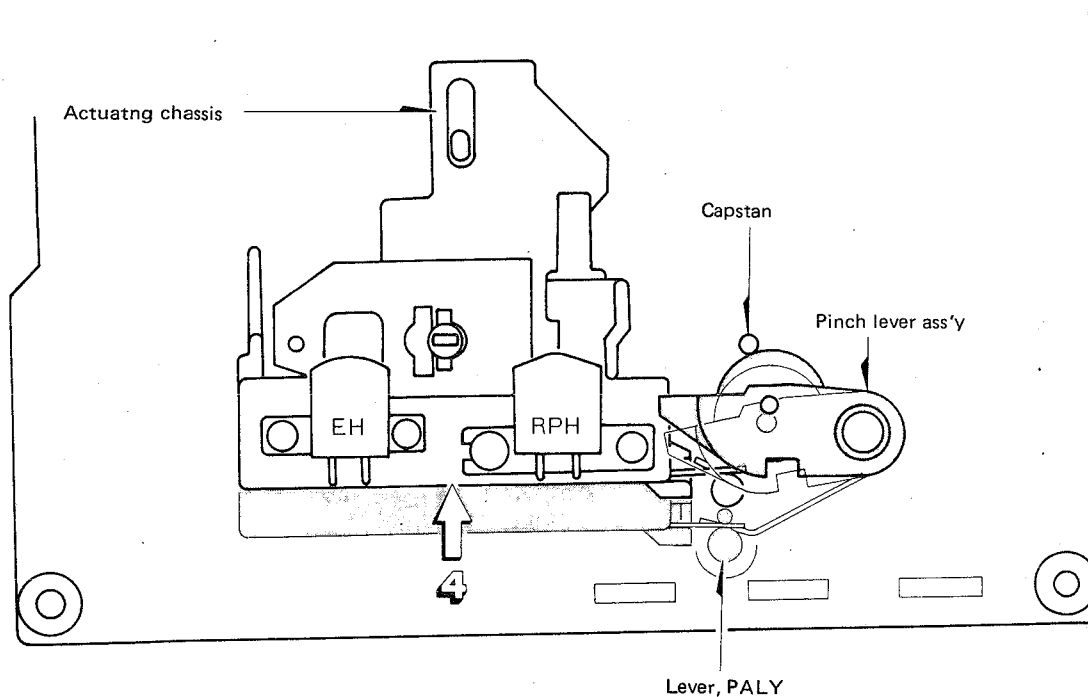
## DESCRIPTION OF THE MD-3 MECHANISM

### Description of the PLAY Operation

With the plate button pressed, the trigger lever (PLAY) moves in the direction of the arrow ← (1), the gear (PLAY) is released from the boss of the trigger lever (PLAY) engages with the gear flywheel and rotates in the direction of the arrow ← (2), the boss (A) of the gear (PLAY) touches the trigger lever (PLAY) and the gear stops rotating.

When the gear (PLAY) rotates, the lever (PLAY) moves in the direction of the arrow ← (3) along the cam groove on the rear of the gear to push up the operation chassis in the direction of the arrow ← (4).

The PLAY button which has been locked is released by pressing the STOP button, the trigger lever (PLAY) moves in the direction of the arrow ← (5), the boss (A) of the gear (PLAY) is released and the PLAY operation stops.



When the STOP button is pressed, the lever moves in the direction of the arrow and the trigger lever PLAY releases the boss (A) of the gear (PLAY).

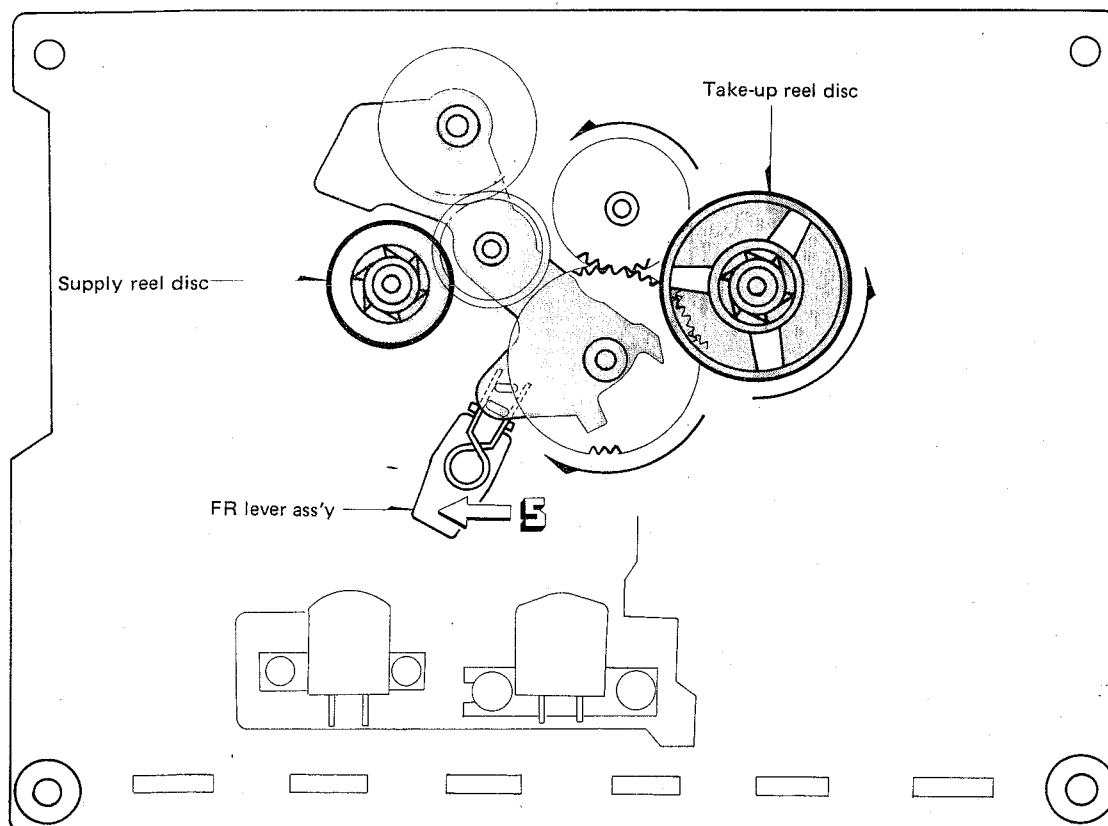
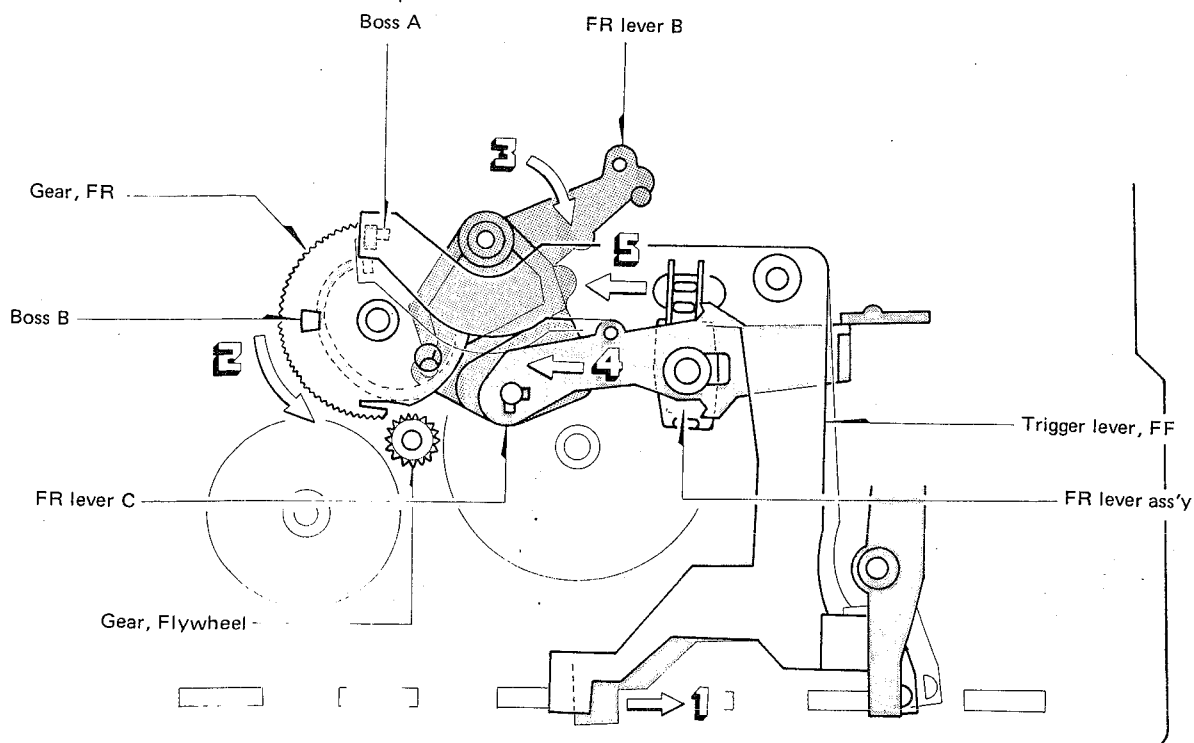
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### Description of the FF Operation

When the FF button is pressed, the trigger lever FF moves in the direction of the arrow ← (1), the boss of the gear FR cam is released and engages with the gear wheel to rotate in the direction of the arrow ← (2), the boss (A) touches the boss of the trigger lever FF

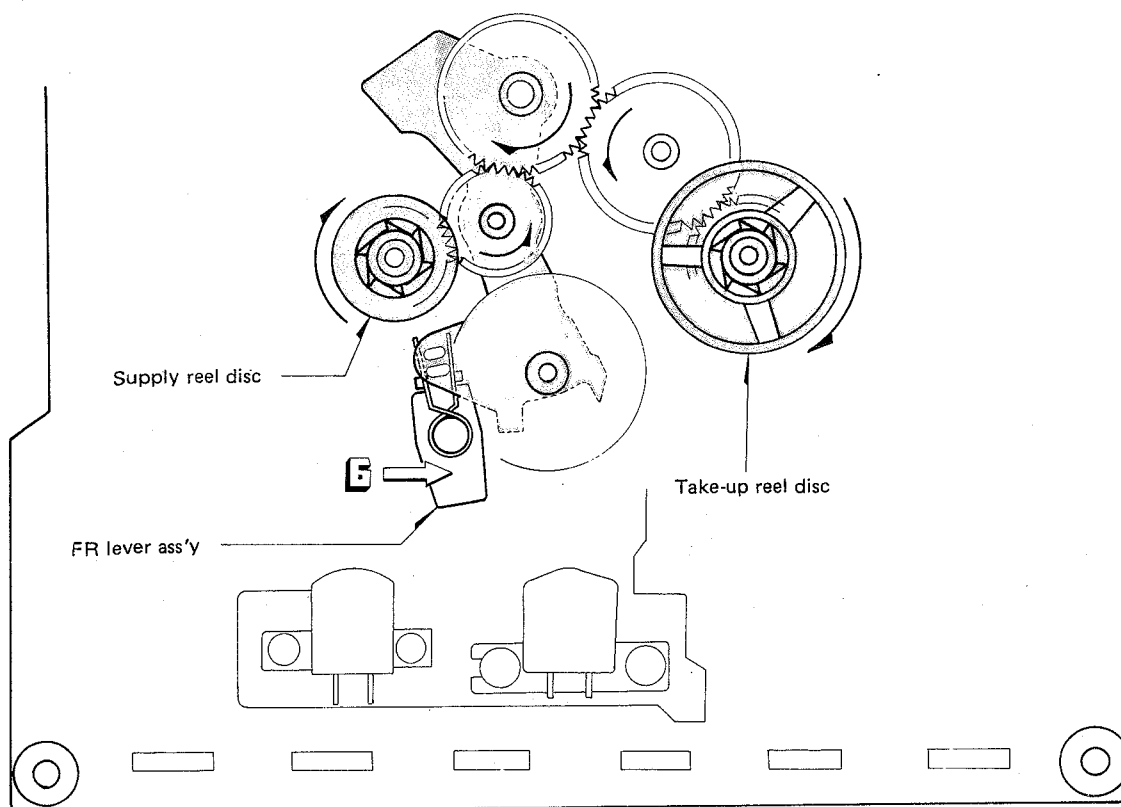
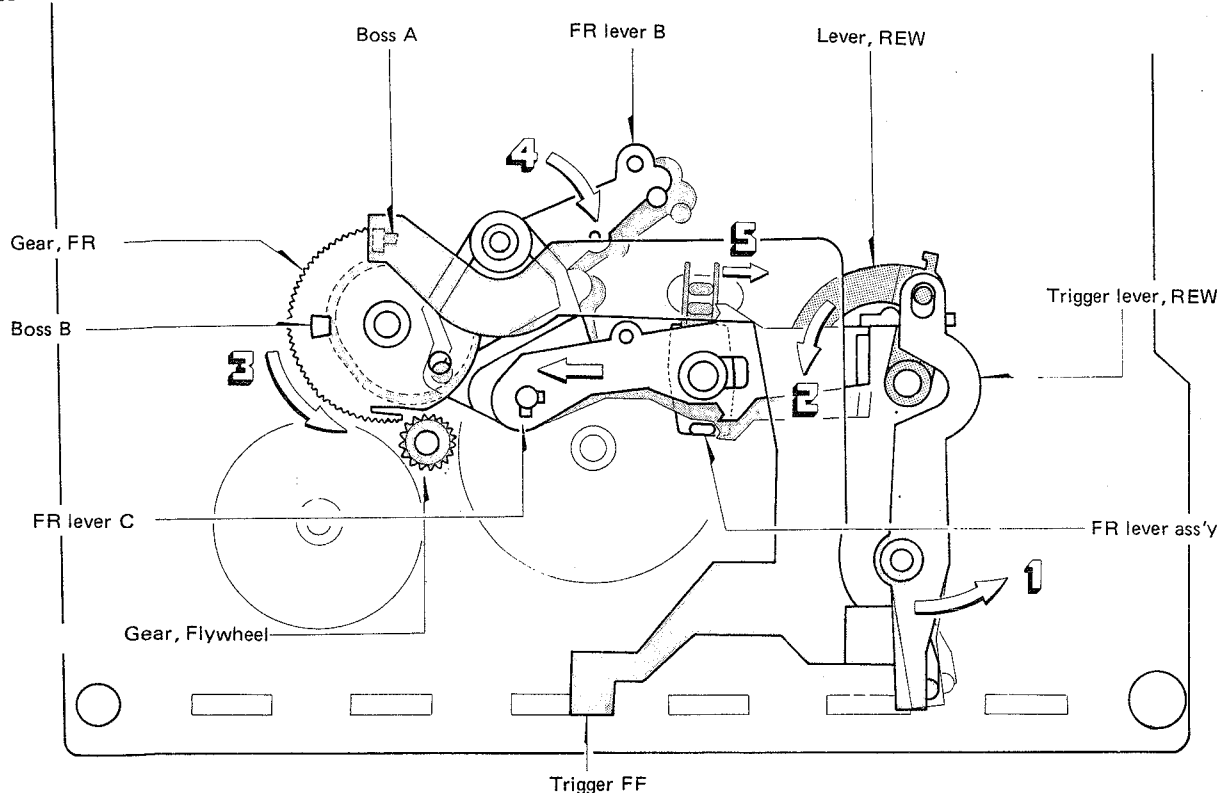
and the gear FR cam stops. The FR lever B moves in the direction of the arrow ← (3) along the groove of the gear FR cam, the FR lever B moves in the direction of the arrow ← (3), the FR lever C compresses the gear of the FR lever Ass'y against the Take-up reel disc ass'y to perform the FF operation.



## REW Operation

When the REW button is pressed, the trigger lever REW moves in the direction of the arrow ← (1) and pushes the lever REW in the direction of the arrow ← (2). The trigger lever FF releases the boss A of the gear at that time, the gear FR engages with the gear flywheel, rotates in the direction of the arrow ← (3), boss B touches the trigger lever FF and rotation stops.

The FR gear B is moved in the direction the arrow ← (4) by means of the cam of the gear FR following the rotation of the gear FR, pulls the FR lever C in the direction of the arrow ← (5) and moves the FR lever ass'y in the direction of the arrow ← (6) to rotate the Take-up reel disc reel disc ass'y to perform the REW operation.





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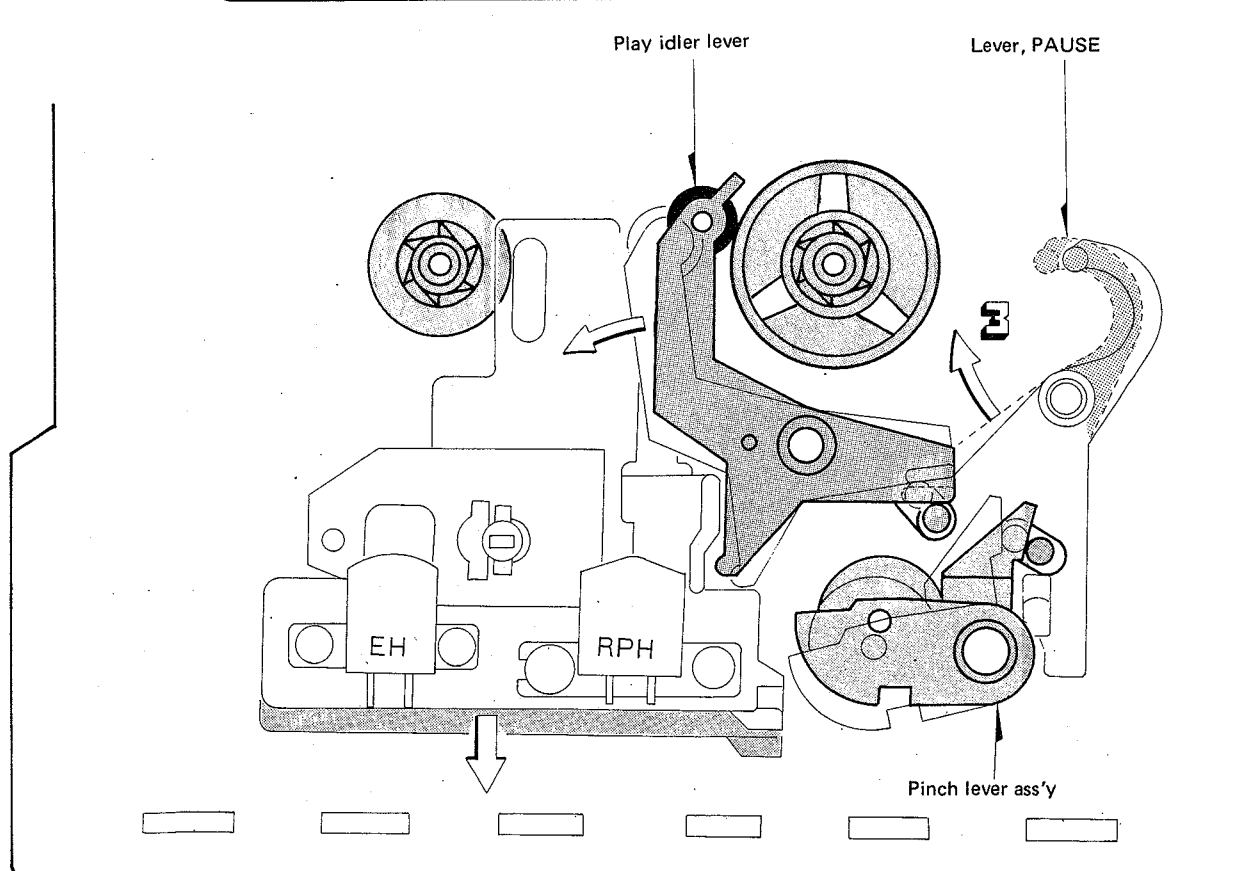
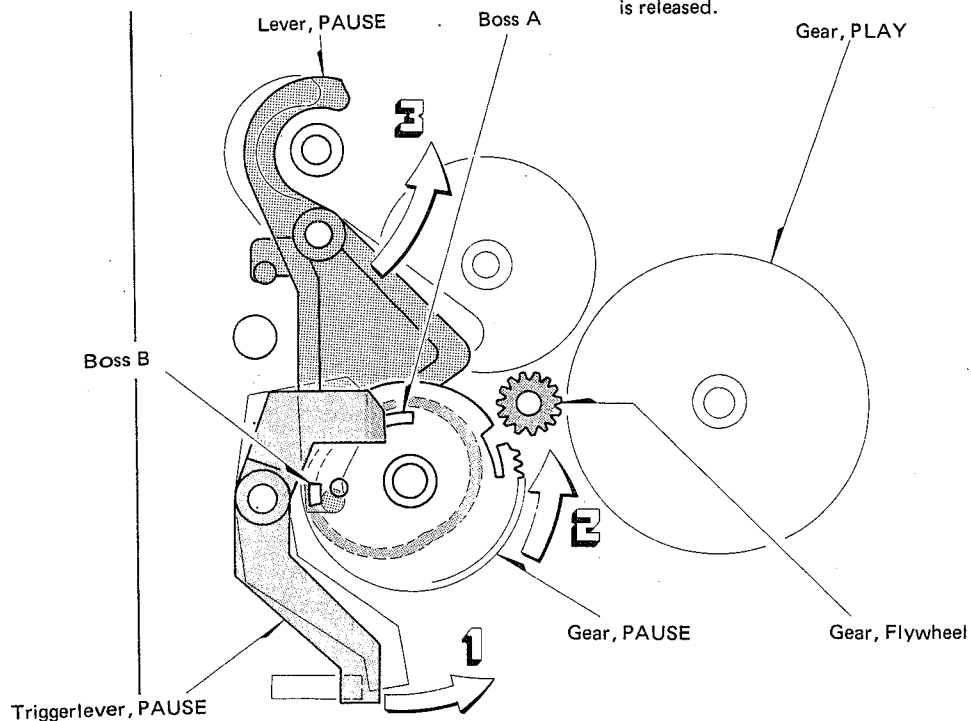
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### Description of the PAUSE Operation

When the PAUSE button is pressed, the trigger lever PAUSE moves in the direction of the arrow ← (1), the boss A of the gear PAUSE is released, engages with the gear flywheel and rotates in the direction of the arrow ← (2), the boss B touches the trigger PAUSE and rotation stops.

The PAUSE lever moves in the direction of the arrow ← (3) along the cam groove of the PAUSE gear at that time. The PLAY idler lever and the pinch lever ass'y is moved to perform the PAUSE operation at that time.

When the PAUSE button is pressed again, the button is released from locking and simultaneously the boss B of the gear PAUSE is released from the trigger lever PAUSE and the PAUSE operation is released.

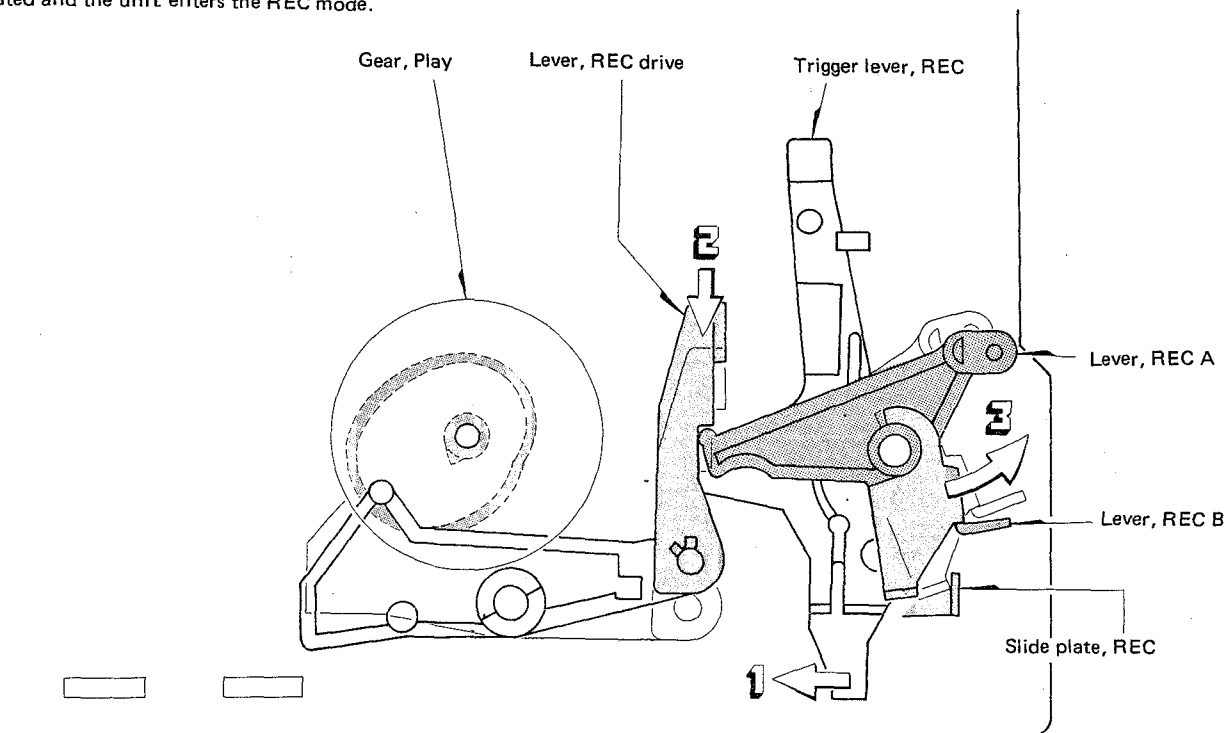


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### REC Operation

When the REC and PLAY buttons are pressed simultaneously, the trigger lever REC moves in the direction of the arrow ← (1). The PLAY operation is performed simultaneously at that time, so the REC lever driver moves in the direction of the arrow ← (2), pushes the lever REC A, B in the direction of the arrow ← (3), the interlocked slide REC plate pulls the rod, the slide switch is operated and the unit enters the REC mode.

When one of the STOP, FF and REW buttons is pressed, the REC trigger lever is released from the REC lever driver and only the REC operation is released.



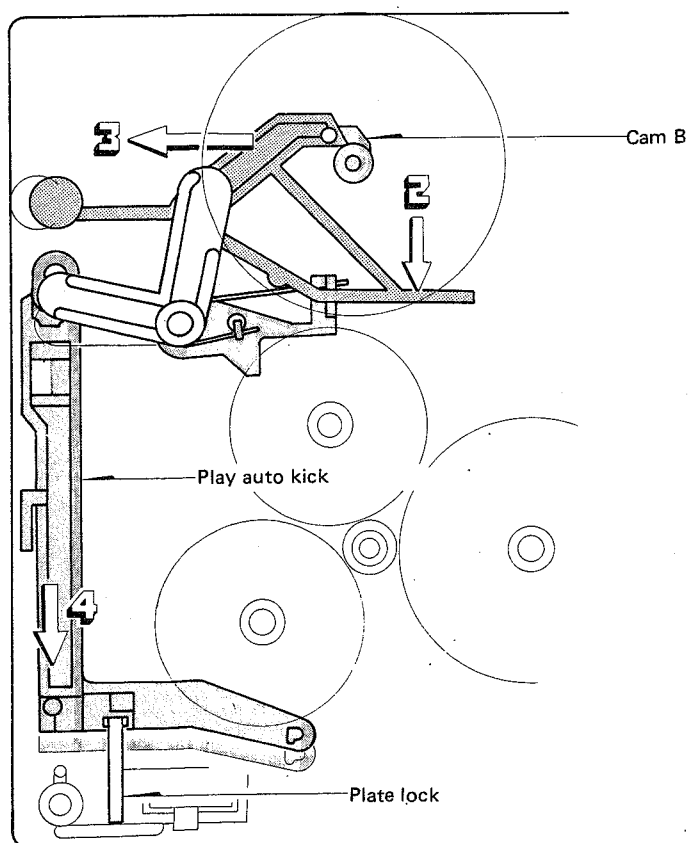
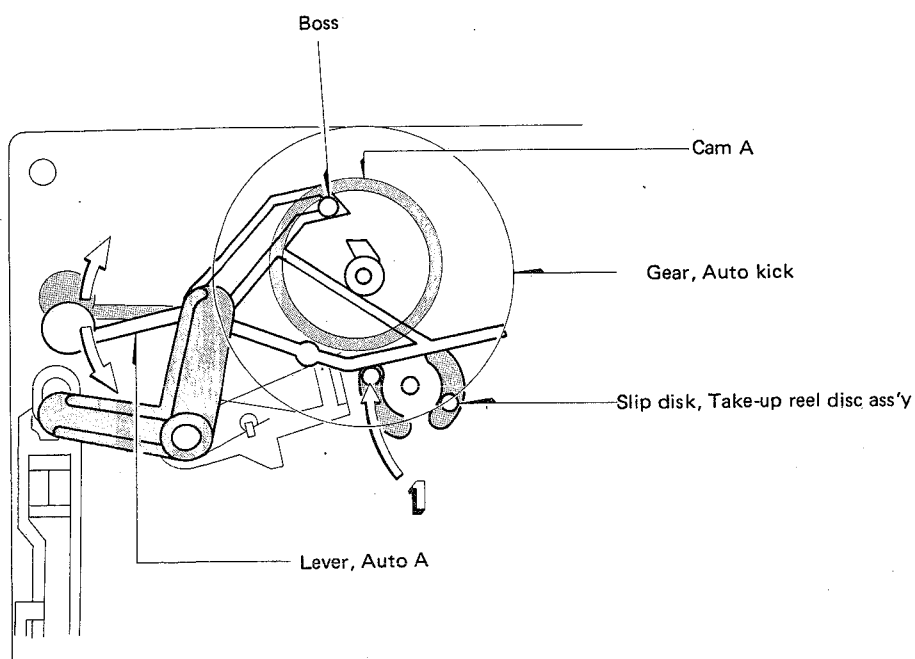
### Description of the Auto-stop Operation

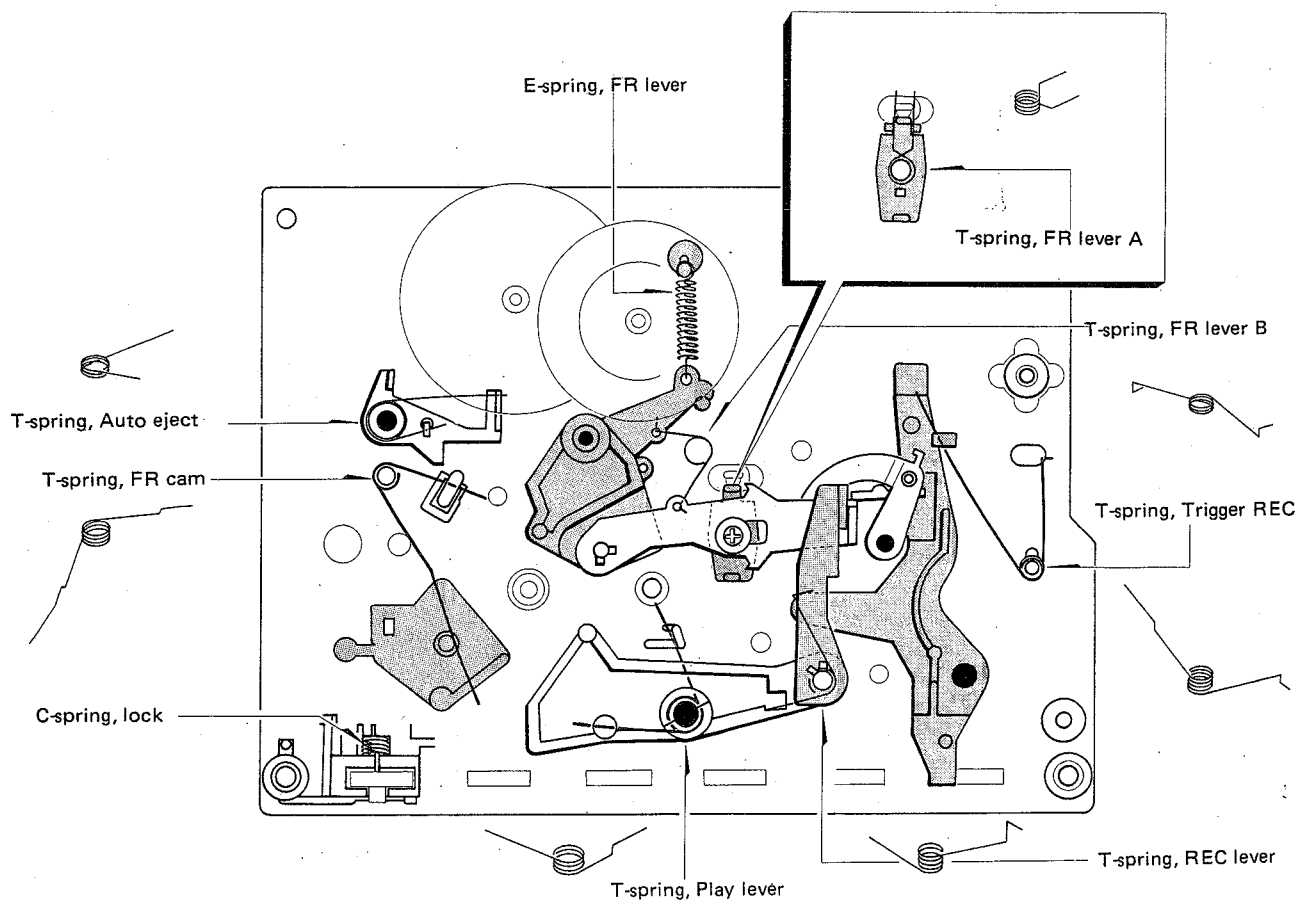
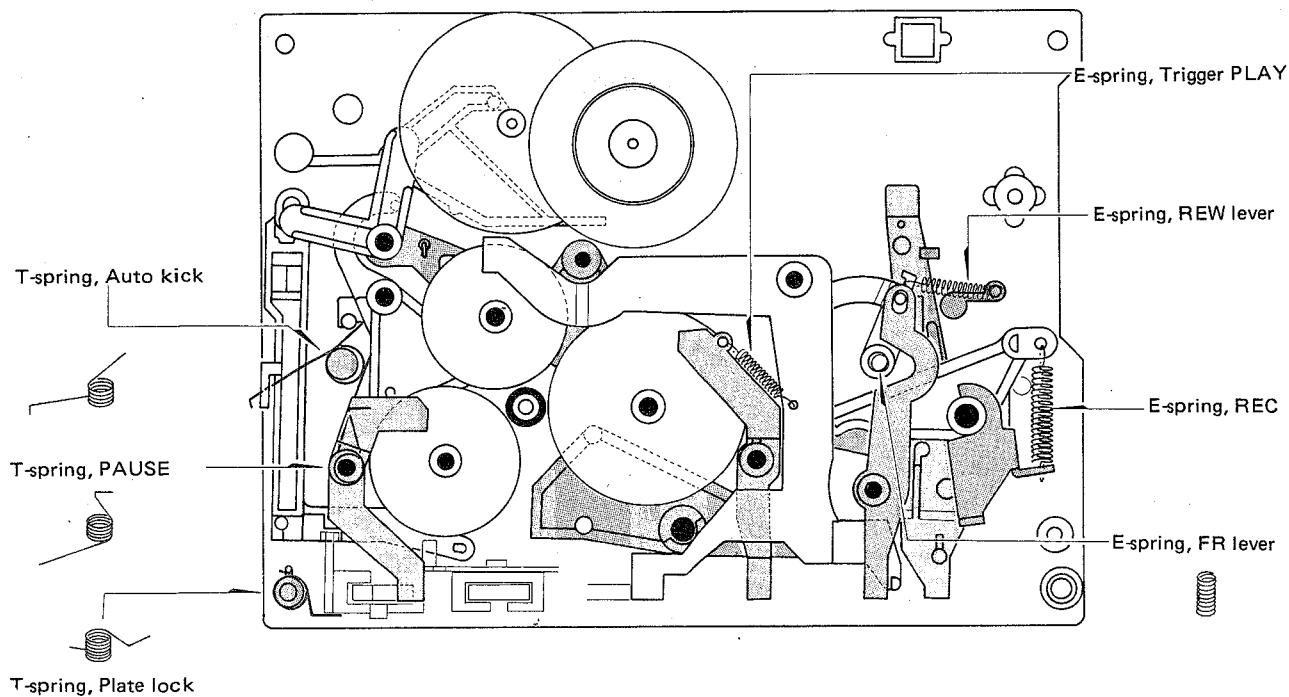
The motor rotation is transmitted to the gear auto-kick of the MD-3 mechanism via the slip pulley FR ass'y.

The slip disk presses the lever auto A in the direction of the arrow ← (1) when the Take-up reel disc ass'y is rotating, so the boss of the lever auto A moves along the cam (A) groove of the gear auto-kick.

When the reel discs (S, T sides) stop, the lever auto A stops in the condition being moves in the direction of the arrow ← (2).

The cam (B) of the gear auto-kick moves the lever auto A in the direction of the arrow ← (3), operates the plate auto-kick in the direction of the arrow ← (4) to release the plate lock and performs the AUTO STOP operation.



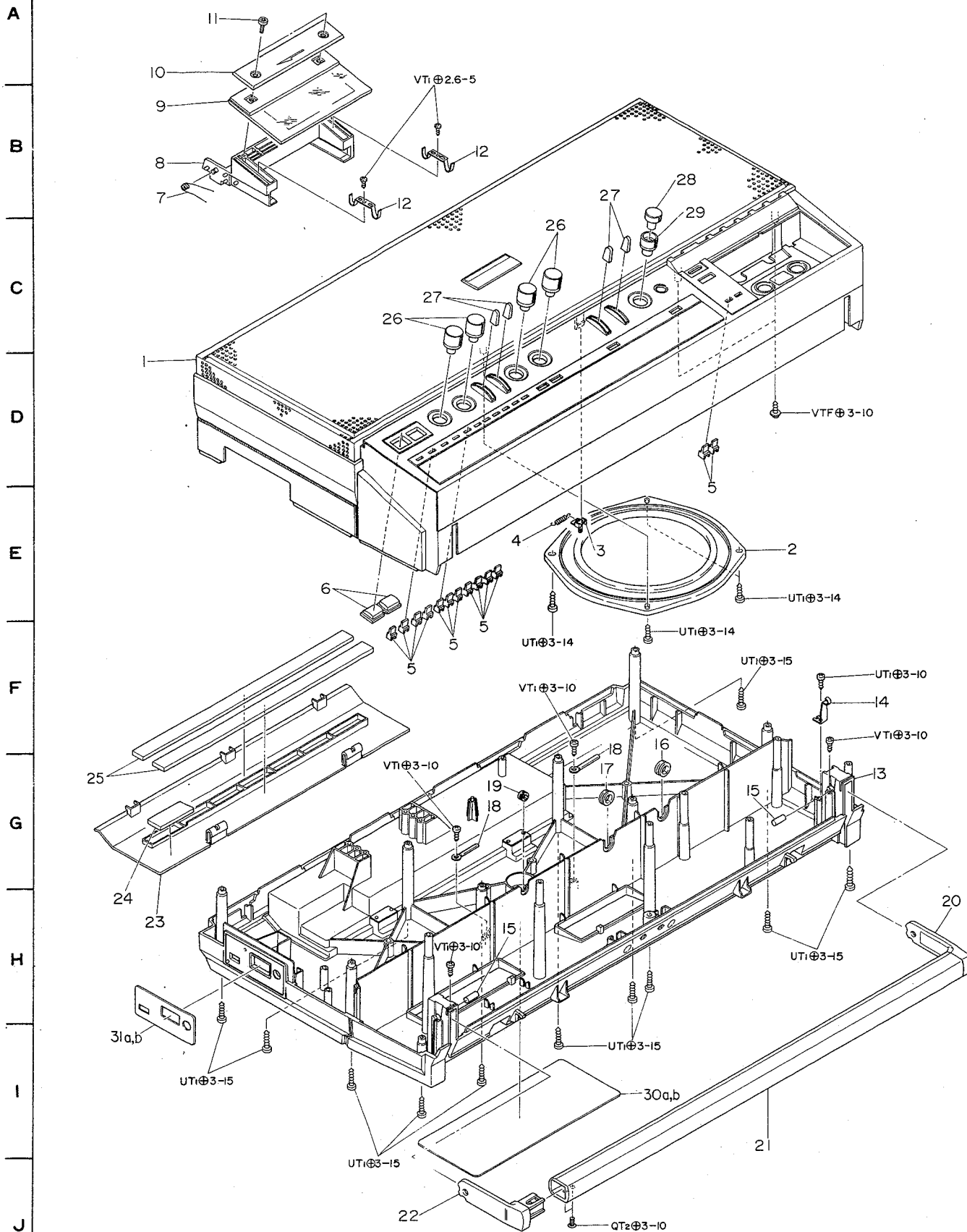
**AIWA****CS-880E,K****SPRING APPLICATION POSITION**

CS-880E,K

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## EXPLODED VIEW-1

1 2 3 4 5 6 7





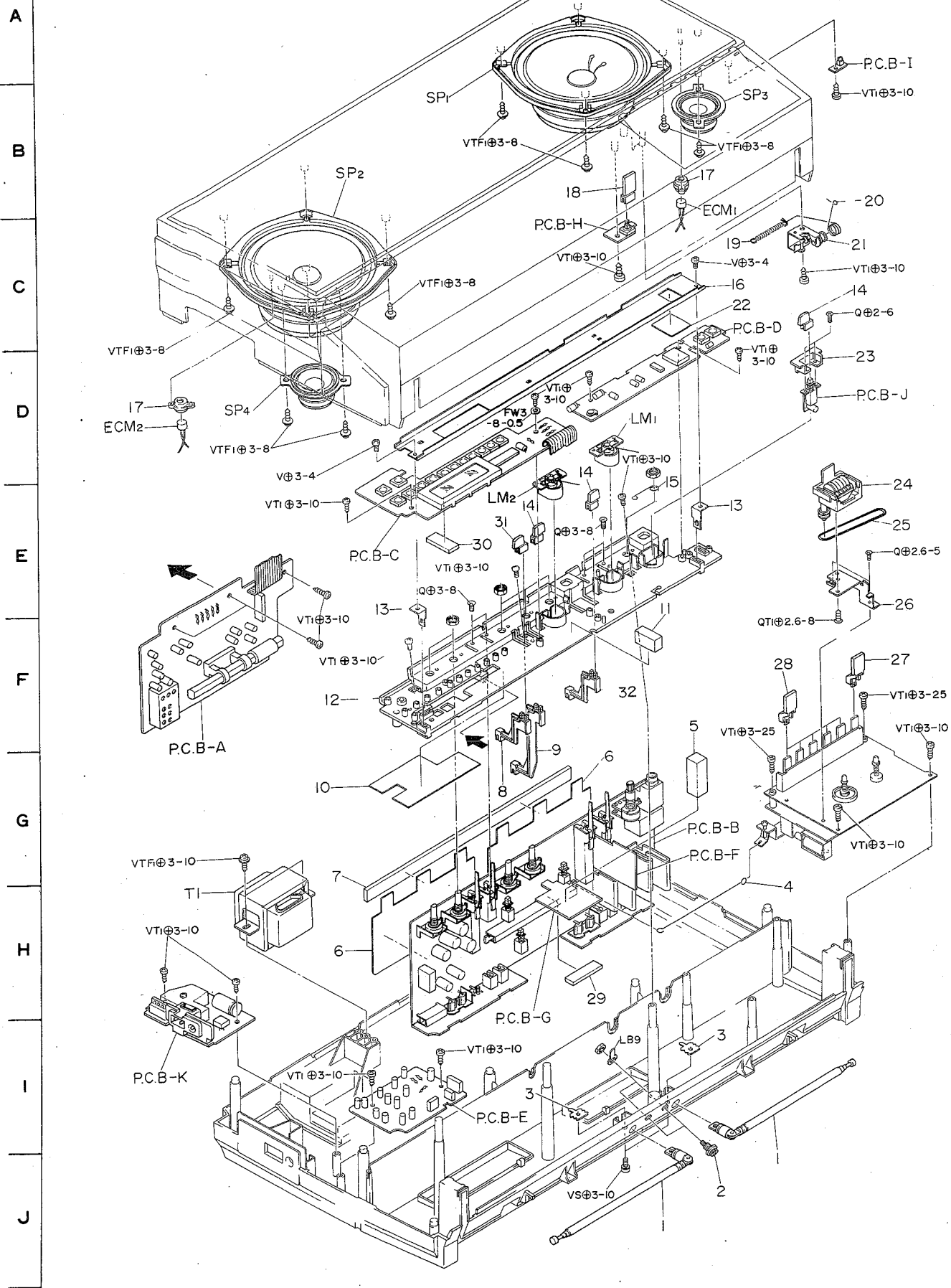
**AIWA****CS-880E,K****PARTS LIST****MECHANICAL PARTS**

■ \* mark in this part list shows exclusive part.

Ref. No.	Part No.	Part No. Changed to	Description	Common Model	Q'ty
1-1	09-017-850-01		Main case ass'y	*	1
	82-587-001-01		Cabinet, Main		1
	82-587-234-01		Damper A, Rubber	*	18
	82-587-007-01		Punching	*	1
	82-587-036-01		Badge	*	1
	82-587-009-01		Side panel R	*	1
	82-587-010-01		Side panel L	*	1
	82-587-028-01		Panel, Front	*	1
	82-563-032-01		Cassette plate	CS-990	1
	82-587-003-01		Window, Dial	*	1
	82-587-221-01		E-spring (tact)	*	1
	82-587-239-01		P-spring, Tact A	*	1
	87-321-097-21		QT <sub>1</sub> + 3 - 12	*	6
1-2	82-587-635-01		Drone cone ass'y	*	1
1-3	82-587-227-01		P-spring, Earth	*	1
1-4	82-576-241-01		E-spring, Earth	CS-350	1
1-5	82-587-020-01		Tact push-key	*	13
1-6	82-587-021-01		Push-button	*	2
1-7	82-587-218-01		T-spring, Cassette lid	*	1
1-8	82-587-202-01		Cassette box	*	1
1-9	82-587-004-01		Window, Cassette	*	1
1-10	82-587-011-01		Decorative panel, Cassette	*	1
1-11	87-081-979-01		Decorative screw 3-12		2
1-12	82-587-219-01		P-spring, Cassette holder	*	2
1-13	09-017-851-01		Back cover ass'y	*	1
	82-587-038-01		Back cover ass'y	*	1
	82-587-213-01		C-spring, Terminal A	*	1
	82-587-214-01		C-spring, Terminal B	*	1
	82-587-216-01		C-spring, Terminal C	*	1
	82-587-215-01		Terminal plate U <sub>1</sub>	*	1
	82-587-217-01		Terminal plate U <sub>3</sub>	*	1
	82-587-226-01		Sheet, Faiber	*	2
	82-277-382-01		Spring, Terminal		1
	81-235-211-01		Terminal plate D		1
	87-349-095-21		UT <sub>1</sub> + 3 - 8		1
1-14	82-534-203-01		Click plate spring R		1
1-15	82-587-212-01		Shaft, Handle	*	2
1-16	82-587-231-01		Rubber bushing 6 x 10	*	1
1-17	82-587-233-01		Rubber bushing 7 x 10	*	1
1-18	87-038-039-01		Wire binder		2
1-19	82-587-208-01		Rubber bushing 3 x 5	*	1
1-20	82-587-013-01		Handle L	*	1
1-21	82-587-014-01		Handle grip	*	1
1-22	82-587-012-01		Handle R	*	1
1-23	82-587-005-01		Battery room lid	*	1
1-24	82-587-237-01		M cushion 14 x 35 x 5	*	1
1-25	82-587-247-01		M cushion 7 x 281 x 7	*	2
1-26	82-587-017-01		Knob	*	4
1-27	82-563-014-01		Knob, TOGGLE	CS-990	4
1-28	82-587-023-01		Knob, VOLUME (UP)	*	1
1-29	82-587-024-01		Knob, VOLUME (DOWN)	*	1
1-30a	82-587-030-01		Name plate, Spec. (E model only)	*	1
1-30b	82-587-031-01		Name plate, Spec. (K model only)	*	1
1-31a	82-587-025-01		AC jack plate (E model only)	*	1
1-31b	82-587-041-01		AC jack plate (K model only)	*	1

**AIWA**

1	2	3	4	5	6	7
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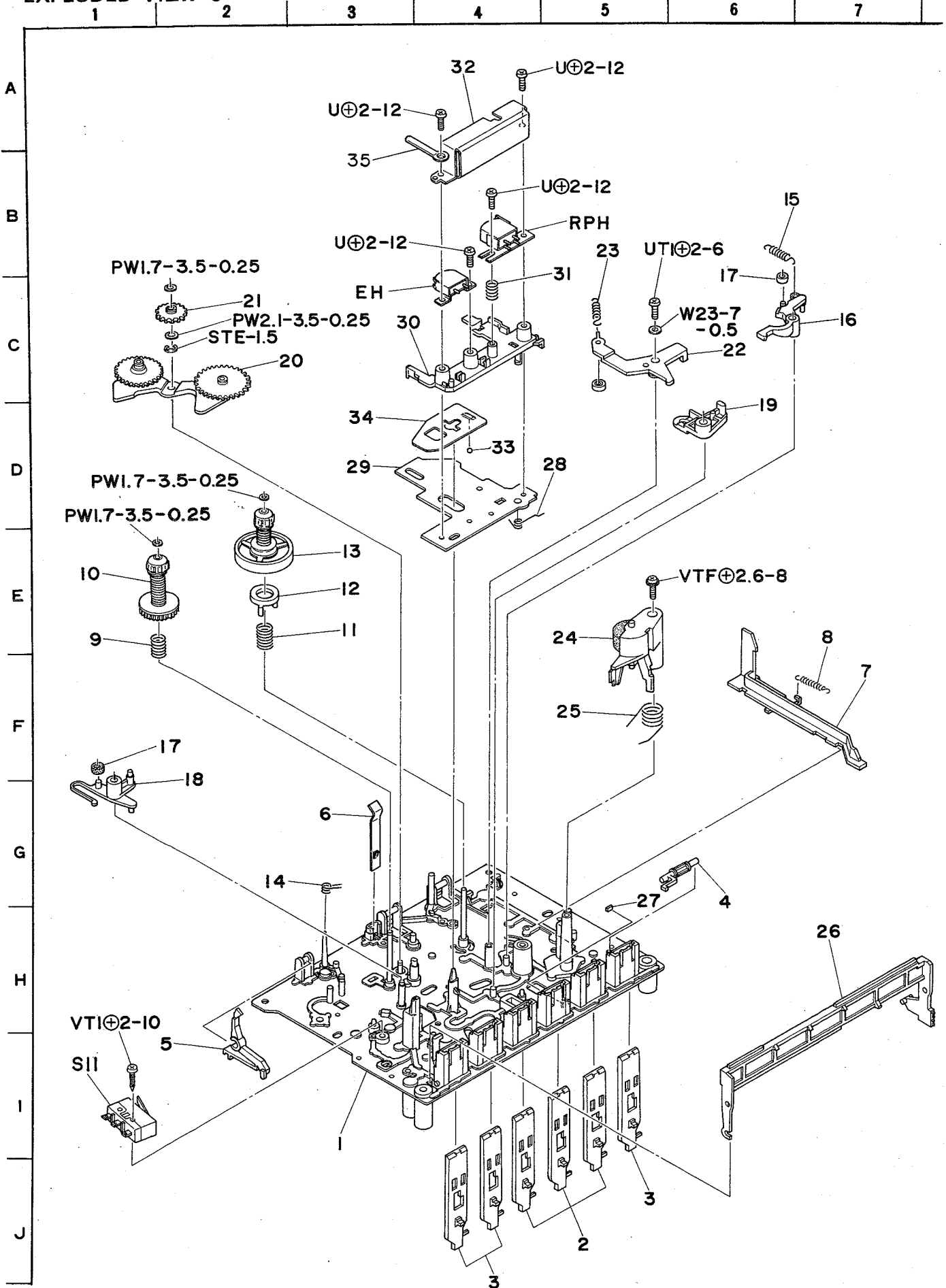
CS-880E,K

Ref. No.	Part No.	Part No. Changed to	Description	Common Model	Q'ty
2-1	87-043-058-01		Whip antenna		2
2-2	87-033-166-01		Antenna terminal		2
2-3	82-587-220-01		Terminal plate, Antenna	*	2
2-4	82-587-205-01		Rod, REC	*	1
2-5	82-588-209-01		Cushion 15 x 15 x 41	CS-770	1
2-6	82-587-242-01		Sheet, Fiber A	*	2
2-7	82-587-211-01		Cushion, Battery	*	1
2-8	82-587-225-01		Rod 37.8	*	1
2-9	82-587-206-01		Rod 87.8		1
2-10	82-587-608-01		Shield, Front		1
2-11	82-587-238-01		Rubber cushion 10 x 25 x 14		1
2-12	82-587-201-01		Chassis		1
2-13	82-587-207-01		Holder, Dial plate		2
2-14	82-162-037-01		Push-button B <sub>2</sub>	AD-R500	3
2-15	82-588-634-01		Earth, REC	CS-770	1
2-16	82-587-008-01		Dial plate (Silver)	*	1
2-17	87-064-084-01		Holder, ECM 30		2
2-18	82-587-019-01		Push-key, REC mute	*	1
2-19	82-563-247-01		E-spring, Air-damp	CS-990	1
2-20	87-096-045-01		String, Dial		1
2-21	87-078-003-01		Air-damp unit ass'y		1
2-22	82-587-240-01		LED reflector	*	1
2-23	82-587-224-01		Holder, Switch	*	1
2-24	87-040-143-01		Counter		1
2-25	82-587-209-01		Rubber belt	*	1
2-26	82-587-203-01		Holder, Counter	*	1
2-27	82-587-037-01		Push-key, REC	*	1
2-28	82-587-018-01		Push-key, Tape recorder	*	5
2-29	82-588-208-01		Rubber cushion 33-6-3	CS-770	1
2-30	87-063-113-01		Cushion WA		2
2-31	82-587-049-01		Push-button, DSL	*	1
2-32	82-587-254-01		Rod 38.3	*	1

CS-880E,K

AIWA

## EXPLODED VIEW-3



**AIWA****CS-880E,K**

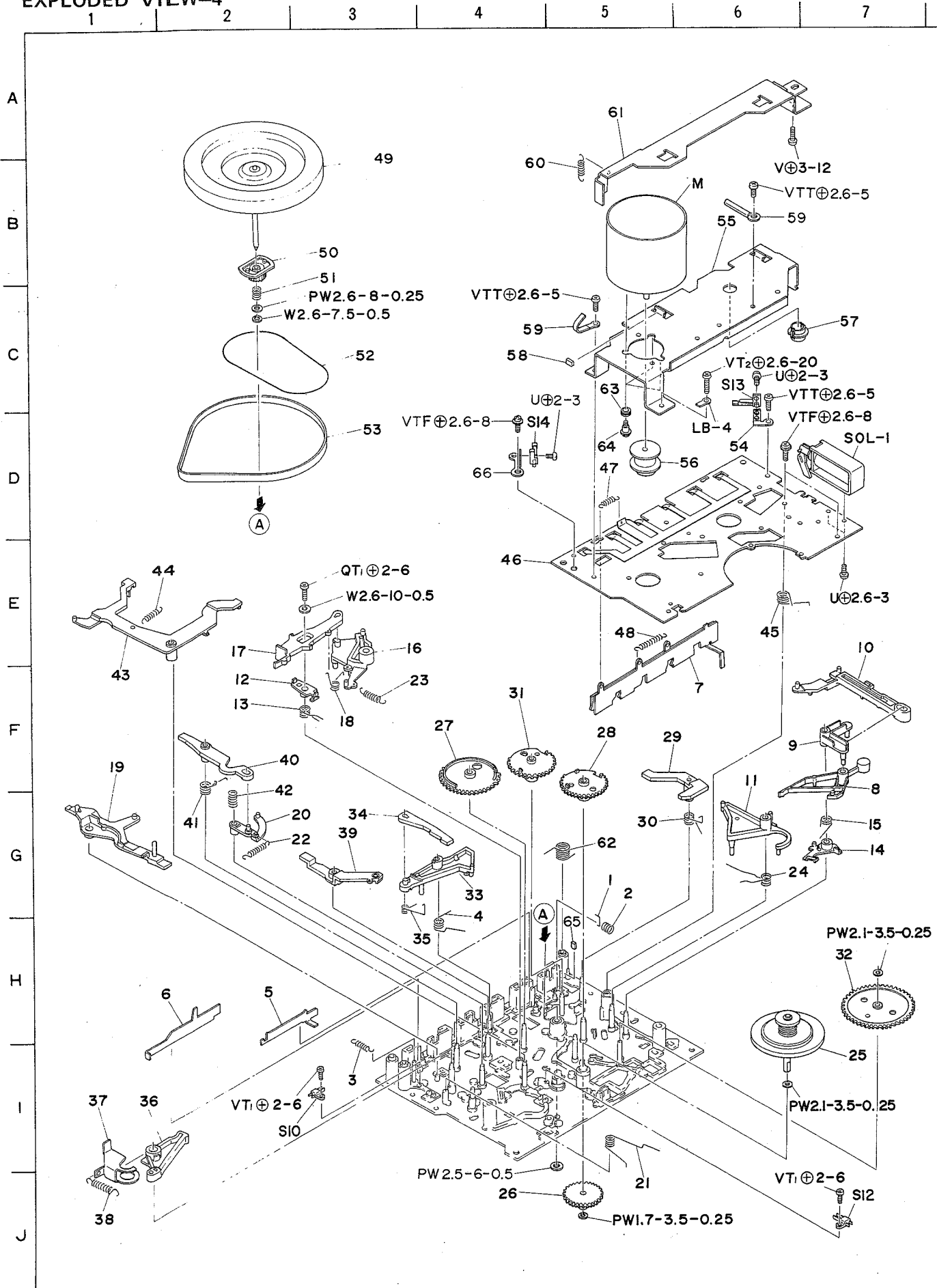
Ref. No.	Part No.	Part No. Changed to	Description	Common Model	Q'ty	
3-1	82-585-325-01		Outsert chassis		1	
3-2	82-585-277-01		Plate button, FR		3	
3-3	82-585-337-01		Plate button, REC		3	
3-4	82-585-279-01		Lever A, Eject		1	
3-5	82-585-255-01		REC blocking lever		1	
3-6	82-585-319-01		P-spring, Cassette pressure		1	
3-7	82-585-254-01		Slide plate, Eject		1	
3-8	82-585-311-01		E-spring, Lid lock		1	
3-9	82-585-290-01		C-spring, Back tension		1	
3-10	82-585-215-01		Supply reel platform ass'y		1	
3-11	82-585-292-01		C-spring, Slip disk		1	
3-12	82-585-272-01		Slip disk T		1	
3-13	82-585-210-01		Take-up reel platform ass'y		1	
3-14	82-585-294-01		T-spring, Center shift		1	
3-15	82-585-312-01		E-spring, Brake R		1	
3-16	82-585-253-01		Lever, Brake R		1	
3-17	82-585-286-01		Rubber cushion, Brake		2	
3-18	82-585-252-01		Lever, Brake L		1	
3-19	82-585-265-01		REV lever		1	
3-20	82-585-231-01		FR lever ass'y		1	
3-21	82-585-235-01		Gear A, REW		1	
3-22	82-585-223-01		Play idler lever ass'y		1	
3-23	82-585-313-01		F-spring, Play idler		1	
3-24	82-585-364-01		Pinch lever B ass'y		1	
3-25	82-585-296-01		T-spring, Pinch lever		1	
3-26	82-585-340-01		Plate lock ass'y		1	
3-27	82-585-338-01		Rubber cushion, Play lever		1	
3-28	82-585-295-01		T-spring, Actuating		1	
3-29	82-585-208-01		Actuating chassis		1	
3-30	82-585-209-01		Head base		1	
3-31	82-585-291-01		C-spring, RPH		1	
3-32	82-588-628-01		Shield plate	CS-770	1	
3-33	87-073-005-01		Steel ball 2φ		1	
3-34	82-585-284-01		P-spring, Actuating		1	
3-35	87-038-056-01		Wire binder		1	



**CS-880E,K**

**AIWA**

EXPLODED VIEW-4



AIWA

CS-880E,K

Ref. No.	Part No.	Part No. Changed to	Description	Common Model	Q'ty
4-1	82-585-289-01		Shaft lock		1
4-2	82-585-285-01		C-spring lock		1
4-3	82-585-317-01		E-spring, Button lock		1
4-4	82-585-306-01		T-spring, Play lever		1
4-5	82-585-283-01		Slide plate, FR auto		1
4-6	82-585-282-01		Slide plate, Motor switch		1
4-7	82-585-327-01		Slide plate key ass'y		1
4-8	82-585-268-01		Auto A lever		1
4-9	82-585-269-01		Auto B lever		1
4-10	82-585-270-01		Plate auto kick		1
4-11	82-585-248-01		Lever, PAUSE		1
4-12	82-585-264-01		FR lever D		1
4-13	82-585-297-01		T-spring, FR lever A		1
4-14	82-585-271-01		Auto eject lever		1
4-15	82-585-299-01		T-spring, Auto eject		1
4-16	82-585-262-01		FR lever B		1
4-17	82-585-263-01		FR lever C		1
4-18	82-585-298-01		T-spring, FR lever B		1
4-19	82-585-261-01		Trigger lever, REC		1
4-20	82-585-260-01		Lever, REW		1
4-21	82-585-303-01		T-spring, Trigger (REC)		1
4-22	82-585-308-01		E-spring, REW lever		1
4-23	82-585-341-01		E-spring, FR lever		1
4-24	82-585-300-01		T-spring, FR cam		1
4-25	82-585-217-01		Slip pulley FR ass'y		1
4-26	82-585-216-01		Drive gear		1
4-27	82-585-244-01		Play cam gear		1
4-28	82-585-245-01		FR cam gear		1
4-29	82-585-256-01		Trigger lever, PAUSE		1
4-30	82-585-304-01		T-spring, Trigger (PAUSE)		1
4-31	82-585-246-01		Gear, PAUSE		1
4-32	82-585-247-01		Gear, Auto kick		1
4-33	82-585-249-01		PLAY lever		1
4-34	82-585-250-01		Lever, REC drive		1
4-35	82-585-307-01		T-spring, REC lever		1
4-36	82-585-266-01		REC A lever		1
4-37	82-585-267-01		REC B lever		1
4-38	82-585-314-01		E-spring, REC		1
4-39	82-585-258-01		Trigger lever, PLAY		1
4-40	82-585-259-01		Trigger lever, REW		1
4-41	82-585-308-01		T-spring, REW lever		1
4-42	82-585-331-01		C-spring, REW lever		1
4-43	82-585-257-01		FF trigger lever		1
4-44	82-585-301-01		E-spring, Trigger PLAY		1
4-45	82-585-321-01		T-spring, Auto kick		1
4-46	82-585-203-01		Mechanism chassis B ass'y		1
4-47	82-585-315-01		E-spring, Slide plate		1
4-48	82-585-332-01		E-spring, REC lock		1
4-49	82-585-229-01		Flywheel ass'y		1
4-50	82-585-243-01		Gear, Flywheel		1
4-51	82-585-324-01		C-spring, Flywheel		1
4-52	82-585-336-01		Rubber belt FR B		1
4-53	82-585-287-01		Rubber belt, Flywheel		1
4-54	82-585-323-01		Holder, Pause switch		1
4-55	82-585-281-01		Holder, Motor		1
4-56	82-585-242-01		Motor pulley		1
4-57	82-585-326-01		Thrust bearing B		1
4-58	82-588-206-01		Rubber cushion, REC lever	CS-770	1
4-59	87-038-039-01		Wire binder		1
4-60	82-587-241-01		E-spring, Slide plate	*	1
4-61	82-587-228-01		Slide plate REC ass'y	*	1
4-62	82-585-335-01		T-spring, Plate lock		1
4-63	87-087-029-01		Rubber cushion		3
4-64	87-081-483-01		Motor screw, M2.6		3
4-65	82-585-342-01		Rubber cushion, PAUSE lock		1
4-66	82-587-232-01		Holder, REC switch	*	1

## Description of Circuitry

### 1. Block Diagram of Synthesizer Tuner

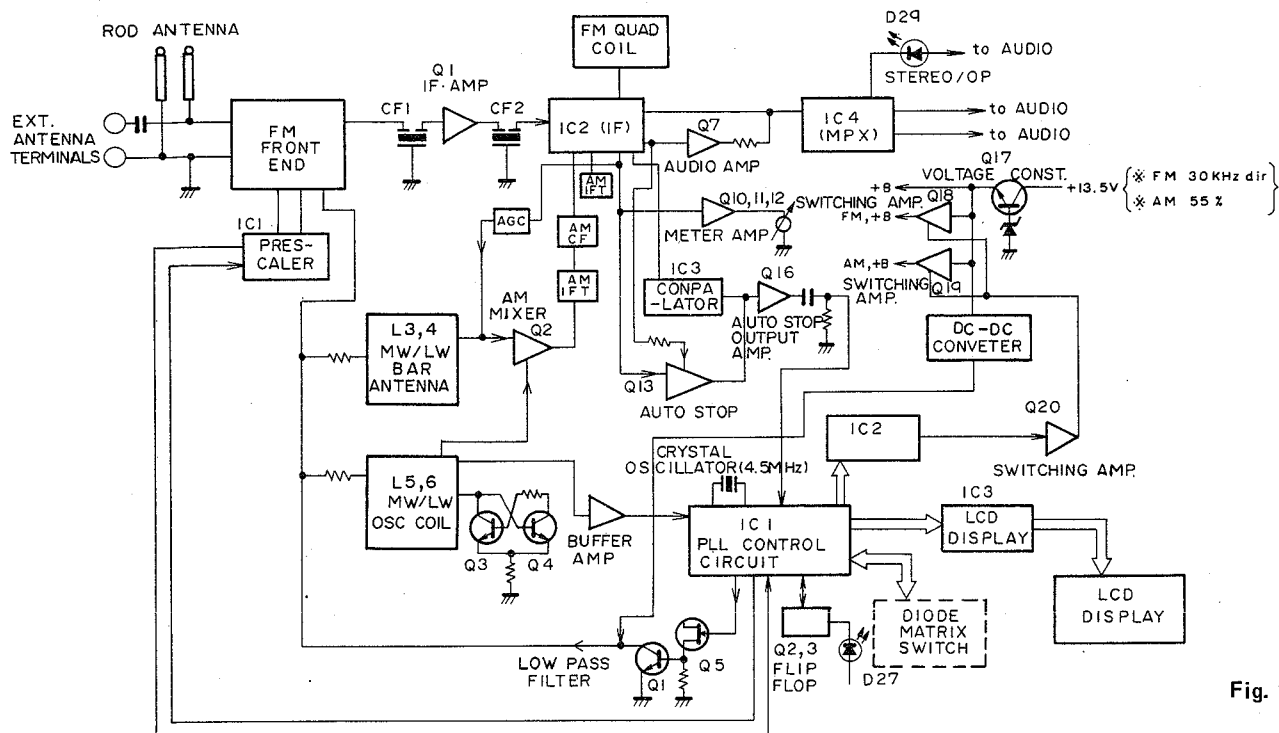


Fig. 1

### 2. Outline of PLL Frequency Synthesizer

The PLL (phase-locked loop) frequency synthesizer is a circuit which uses the extremely stable frequency of a crystal oscillator as the reference signal to produce the frequencies desired. For instance, to pick up a station broadcasting on a frequency of 100 MHz, a local oscillator frequency ( $f_o$ : output frequency of voltage-controlled oscillator) supplied to the mixer of 110.7 MHz ( $100 + 10.7$ ) is required. This particular unit adopts a prescaler which employs a pulse swallow system to divide the frequency, and send it to the programmable counter inside the controller IC. The output frequency  $f_n$  then enters the phase comparator. The frequency of the extremely stable 4.5 MHz crystal oscillator is counted down (1/180) at the same time and the reference frequency  $f_{ref}$  of 25 kHz is sent to the phase comparator. The phases of  $f_n$  and  $f_{ref}$  are compared and the difference between the two is detected. If there is no difference, the loop is locked; if there is a difference, the control voltage passes through the low-pass filter, it is fed out to the VCO and the VCO is controlled until  $f_n$  is made equivalent to 25 kHz. The reference frequency  $f_{ref}$  for AM reception is 9 kHz (or 10 kHz). The VCO frequency signal is sent directly to the programmable counter.

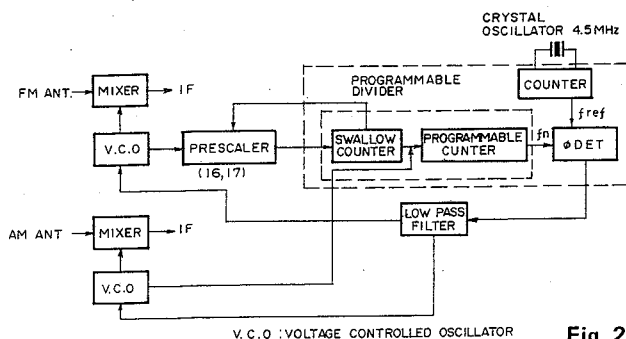


Fig. 2

#### 2-1. Operation During FM Reception

The pulse swallow system is first outlined.

The relationship between  $f_{osc}$  and  $f_{ref}$  is expressed as:

$$f_{osc} = N \times f_{ref} \quad (1)$$

If  $N$  is assumed to be  $P$  notation:

$$f_{osc} = (n_1 + pn_2 + P^2 n_3 + \dots + pn^{n-1} n_n) f_{ref}$$

$$= P (n_1/P + n_2 + Pn_3 + \dots + pn^{n-2} n_n) f_{ref}$$

If, now, the part including the second digit and above is made  $N_p$ :

$$f_{osc} = P (n_1/P + N_p) f_{ref}$$

This is modulated to become:

$$f_{osc} = (n_1 + PN_p + Pn_1 - Pn_1) f_{ref}$$

$$= [(N_p - n_1) P + n_1 (P + 1)] f_{ref} \quad (2)$$

The above represents the principle of the pulse swallow system.

In order to achieve the relationship expressed in formula (2) by physical means, this unit has a prescaler with two frequency division ratios, 1/16 and 1/17. In formula (1), this corresponds to  $P = 16$ . Actual operation is as follows: when the signal produced by dividing  $f_{osc}$  by  $(P + 1)$  is counted down  $n_1$  times at the first programmable divider digit and  $n_1$  becomes 0, the  $P$ -divided signal is counted down  $(N_p - n_1)$  times equivalent to the number of the first digit subtracted from the number of the second and higher digits of the programmable divider, and the cycle ends. This cycle is performed with  $f_{ref}$  equal to 25 kHz.

When  $f_s = 100$  MHz is received:

$$f_{IF} \text{ is } 10.7 \text{ MHz and so therefore } f_{osc} = 100 + 10.7 = 110.7 \text{ MHz}$$

$$\text{From formula (1): } N = \frac{110.7 \text{ MHz}}{25 \text{ KHz}} = 4428$$

If this figure is re-expressed in the sexadecimal notation, and made to correspond with 114C formula (2):

$$N_p = 114, n_1 = C$$

$$\text{Therefore, } f_{ref} \times [(114 - C) \times 10 + C \times 11] = f_{osc}$$

If this is re-expressed in the decimal notation:

$$25 \text{ kHz} \times [(16^2 + 16^1 + 4 - 12) \times 16 + 12 \times 17] = 110.7 \text{ MHz}$$

What happens is that the prescaler divides the frequency by 1/17 for the first 12 counts and then by 1/16 until 264 counts, and this switching operation is repeated. The swallow counter is locked at 12 and the programmable counter is locked at 264.

### 2-2. Operation During AM Reception

When  $f_s = 594$  kHz is received:

$$f_s = 594 \text{ kHz and } f_{IF} = 450 \text{ kHz}$$

Therefore:  $f_{osc} = 594 + 450 = 1044$  kHz

Since  $f_{ref} = 9$  kHz (or 10 kHz), (at LW  $f_{ref} = 1$  kHz)

$$4.5 \text{ MHz} \div 9 \text{ kHz} = 500$$

$$f_{osc} (1044 \text{ kHz}) \div 9 \text{ kHz} = 116$$

Therefore, the crystal oscillator frequency division is locked at 500 and that of the programmable counter at 116.

### 3. Description of ICs Used

Fig. 3 is a block diagram of the ICs in the PLL frequency synthesizer section and LCD indicator section.

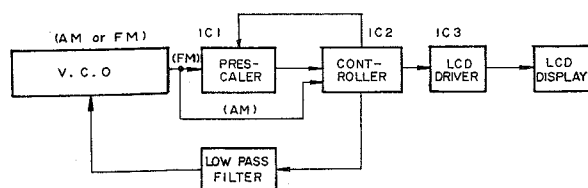


Fig. 3

#### 3-1. Prescaler $\mu$ PB553AC

This IC is energized during FM reception, it selects either the 1/16 or 1/17 frequency division ratio in accordance with the command from the swallow counter inside the controller, and it sends the signal to the controller's programmable divider.

##### 3-1-1. Pin Configuration

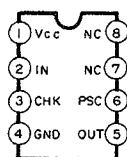


Fig. 4

Pin no.	Name	Function
1	V <sub>cc</sub>	Power supply
2	IN	VCO input pin
3	CHK	Check pin, connected to GND at all times
4	GND	Ground
5	OUT	Output pin
6	PSC	Frequency division ratio setting pin (frequency division setting input from controller)
7	NC	Not used
8	NC	Not used

#### 3-2. Controller $\mu$ PD1703C-515

Contained in this IC are the conventional programmable divider section and control section.

##### 3-2-1. Pin Configuration

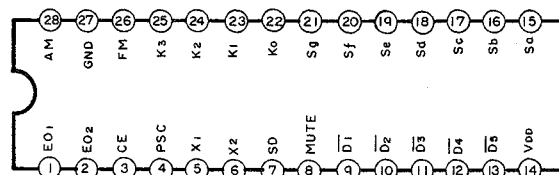


Fig. 5

Pin no.	Name	Function
1, 2	EO1, EO2	Charge pump output pins of phase detector; since signals are fed out during AM/FM reception, one or other is connected to LPF.
3	CE	High: Normal operation Low: Memory held, operation stops
4	PSC	Feeds out frequency division ratio switching signal to prescaler.
5, 6	X1, X2	Crystal oscillator pins
7	SD	High: Auto tuning stop mode Low: Auto tuning enable mode
8	MUTE	Feeds out high level signal during key operation. (Used for muting of signal system)
9~13	D1~D5	Display digit signal output pins Only D1 and D2 are used with this unit and are connected to LCD driver.
14	VDD	Power supply pin
15~21	Sa~Sg	Key matrix key return signal source pins
22~25	K0~K3	Key matrix key return signal input pins
26	FM	Input pin for FM prescaler output
27	GND	Ground
28	AM	AM $f_{osc}$ input pin

##### 3-2-2. Key Matrix Functions

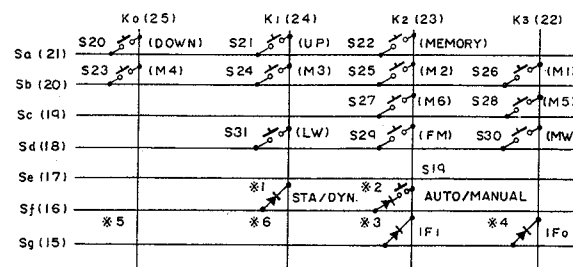


Fig. 6

- The function in parentheses is displayed by key operation based on a momentary switch (marked  $\odot$ ).
- Manual/auto selection (\*1)**  
Manual/auto selection is performed by a fixed switch but in this unit the key operations are carried out with momentary switches which, thanks to the flip-flop circuit, have the same functions as fixed switches.  
When connected: Auto tuning  
When disconnected: Manual tuning
- LCD static/dynamic selection (\*2)**  
This determines whether the LCD display system should be static or dynamic. In this unit, static specifications apply and so the diode is shorted.
- IF frequency selection (\*3, \*4)**  
Alignment is made with the FM IF frequency by IF<sub>1</sub> and IF<sub>0</sub> shorting and open combinations. The IF frequencies used by this unit are 10.675 MHz, 10.700 MHz and 10.725 MHz and so the combinations appear as follows:

IF offset frequency	IF <sub>1</sub>	IF <sub>0</sub>
10.675 MHz (blue)	Open	Shorted
10.700 MHz (red)	Open	Open
10.725 MHz (orange)	Shorted	Shorted

Color of ceramic filter indicated in parentheses.

- Japan/US use selection (\*5)**  
When connected: US specifications  
When disconnected: Japan specifications
- AM frequency interval selection (\*6)**  
The AM channel frequency intervals are selected to 10 kHz or 9 kHz.  
When connected: 10 kHz  
When disconnected: 9 kHz

### 3-3. LCD driver (MSM5829GS)

Indication is provided on the LCD by connecting the three serial output data from the controller ( $\mu$ PD1703C-515)

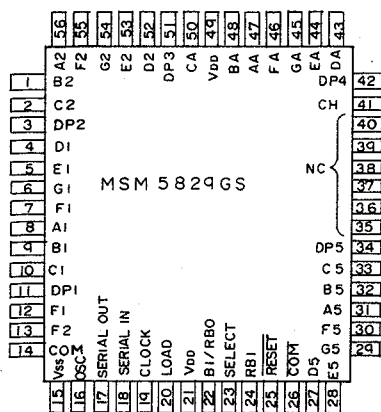


Fig. 7

Pin no.	Name	Function
8, 9, 10, 4 5, 7, 6, 56, 1, 2, 52 53, 55, 54 31, 32, 33, 27 28, 30, 29 47, 48, 50, 43 44, 46, 45 12, 13 11, 3, 51, 42, 34, 41	SEGMENT OUT A1, B1, C1, D1 E1, F1, G1 A2, B2, C2, D2 E2, F2, G2 A5, B5, C5, D5 E5, F5, G5 AA, BA, CA, DA EA, FA, GA F1, F2 DP1, DP2, DP3, DP4, DP5 CH	LCD segment output pins (see Fig. 8*)
15	VSS	Ground Pin
16	OSC	LCD AC drive frequency pin; with this unit, the circuit is configured as below.
17	SERIAL OUT	Not used
18	SERIAL IN	Data indicated with shift register data input pins are fed into this pin in synchronization with clock pulses. (Connected to pin 19 of controller IC)
19	CLOCK	Sync. input pin when data is fed into, or fed out of shift register. (Connected to pin 9 of controller IC)
20	LOAD	Input pin for latching shift register contents. High: Shift register contents are transmitted to decoder. Low: Final contents at high level are held (Connected to pin 10 of controller IC)
21, 49	VDD	Power supply pin
22	BI/RBO	Not used
23	SELECT	This function is not used and so pin is always at high level or, in other words, it is connected to VDD.
24	RBI	Pin for determining whether or not leftmost display digit is to indicate a numeral or not. In this unit, it displays only significant figures and so it is used at the low level, or in other words, it is connected to VSS (ground).
25	RESET	Pin for switching display to segment or dot; since segment is used in this unit, it is set to high level or, in other words, it is connected to VDD.
26	COM	This pin feeds out an output with the reverse phase to that of COM. In this unit, it is not used for direct display but for AM and FM +B selection as mentioned later.
14	COM	This pin feeds out a signal with the reverse phase to that of output and 7 segments for AC drive of the LCD; it drives the LCD common pin.
35, 36, 37 38, 39, 40		Not used

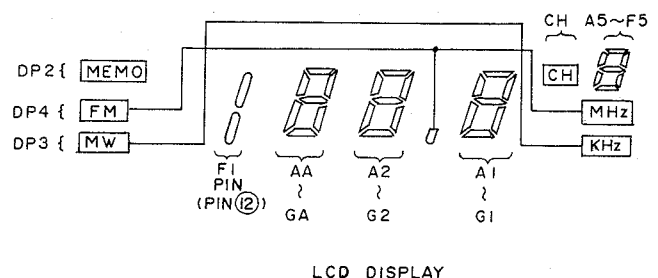


Fig. 8



#### 4. Other Circuits

##### 4-1. FM/AM +B Power Selector Circuit

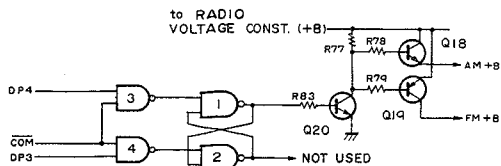
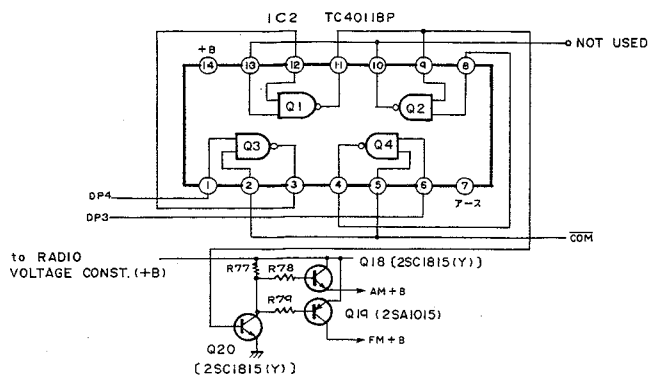


Fig. 9

Switching is performed with a 4-NAND gate IC (IC2).

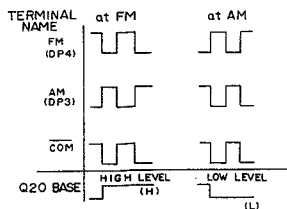
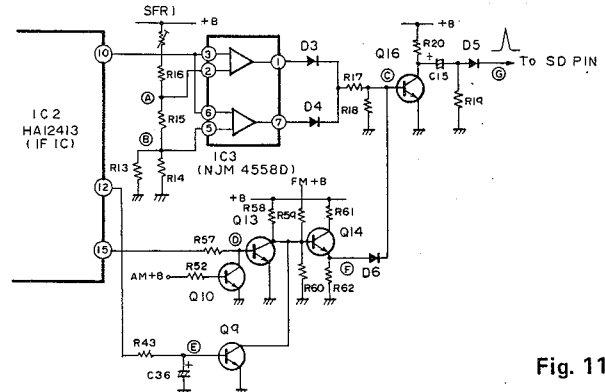


Fig. 10

When the FM band selector key is depressed, pulses with the same phase are fed out to IC3 (MSG5829G) DP4 and COM. As this output passes through the NAND gate IC (TC4011BP), a high level output is produced at NAND gate 1 output and this causes Q20 to turn ON. As a result, Q19 turns ON and the FM +B is obtained. With AM reception, no output appears at DP4, the NAND gate 1 output is set to the low level and with Q20 OFF, Q18 turns ON and the AM +B is obtained.

##### 4-2. Scan Auto Stop Circuit



However, the DSL system judges the strength of the sound level by electrical means and features a configuration which produces dynamic super loudness characteristics.

The DSL circuit comprises the equalizer circuit which produces the DSL characteristics, the detector circuit which judges the strength of the sound level and the control circuit which suppresses the DSL characteristics when the sound is high.



An ordinary direct-coupled amplifier feedback circuit (T-type bridge circuit) is provided with time constants, and its characteristics generated.

The figure consists of three parts. On the left is a circuit diagram of a parallel RLC network. It has an 'INPUT' on the left and an 'OUTPUT' on the right. A resistor labeled 'R1' is in the top series path. In parallel with this resistor are three components: a capacitor 'C1', an inductor 'L' (represented by a coil symbol), and another capacitor 'C2'. The output is taken across the parallel combination. In the middle is a graph of 'OUTPUT' versus 'FREQUENCY'. The curve shows a constant high output level that drops to a minimum at a frequency labeled 'f1' on the x-axis, then rises back to the original level. On the right is the formula for the resonance frequency: 
$$f = \frac{1}{2 \pi \sqrt{C_1 C_2 R_1 R_2}}$$

The diagram illustrates an active filter circuit and its frequency response. The block diagram shows an input signal  $f$  entering an amplifier (AMP) and a feedback loop containing a filter (FILTER). The output is labeled OUTPUT. Below the block diagram is a graph of Gain versus Frequency. The graph shows a peak at 80Hz and a flat region starting at 10kHz. A small waveform is shown below the graph.

Because of the boosted level, the output must be not distorted. When a signal exceeding a certain fixed level is fed out, it is taken out by the Q49 emitter, the IC7 ALC circuit functions and the input of pin 2 is controlled.



The resistor inserted across the ground and OFF side pin of the DSL ON/OFF switch functions to compensate for the difference in the volume when the switch is selected.

**AIWA****CS-880E,K****ACCESSORIES/PACKAGE**

Ref. No.	Part No.	Part No. Changed to	Description	Common Model	Q'ty	
1	82-587-855-01		Printed indiv., Packing	*	1	
2	82-587-852-21		Cushion L, Printed indiv.	*	1	
3	82-587-853-21		Cushion R, Printed indiv.	*	1	
4	87-051-137-11		Poly-vinyl sack		1	
5	87-056-626-01		Poly-vinyl sack		1	
6a	82-587-908-01		Instructions booklet (E model only)	*	1	
6b	82-587-909-01		Instructions booklet (K model only)	*	1	
7	82-587-907-01		Sticker, POP	*	1	
8	87-051-171-11		Poly-vinyl sack (for instruction)		1	
9	87-056-009-41		Distributors list		1	
10	87-056-008-11		Label, AC power cord (K model only)		1	
11	87-056-016-01		Tag, Main voltage (K model only)		1	
12	82-916-740-01		Tape cassette, DMC-164		1	
13a	87-034-883-01		AC power cord (E model only)		1	
13b	87-034-871-01		AC power cord (K model only)		1	

810725(1)-Z

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**AIWACO.,LTD.**

Printed in Japan

Published in Heiloo, Holland.

ELECTRICAL MAIN PARTS LIST

Symbol No.	Part No.	Description
« TUNER CIRCUIT BOARD SECTION »		
PCB-A	82-587-611-21	Tuner circuit board
CP1	82-587-626-11	FM front end
⊕IC1	87-027-752-01	IC, 553AC
IC2	87-027-734-01	IC, HA12413
IC3	87-027-235-01	IC, NJM4558D
IC4	87-027-430-11	IC, LA3361
Q1	89-319-233-01	Transisotr, 2SC1923 (O)
Q2	89-303-803-01	Transistor, 2SC380 (O)
Q3,4,5,7, 8,9,10,11, 13,14,15,16, 18,20,21,22 25,26,27	89-318-154-01	Transistor, 2SC1815 (Y)
Q6,23,24	89-318-156-01	Transistor, 2SC1815 (BL)
Q12,19	89-110-154-01	Transistor, 2SA1015 (Y)
Q17	89-403-135-01	Transistor, 2SD313 (E)
D1,2	87-027-753-01	Diode, KV1236Z
D3,4,5,6, 7,8,9,11	87-027-097-01	Diode, 1S1555
D10	87-027-431-01	Zener diode, RD6.2EB2
L1,10,11,13	87-003-051-01	Choke coil, 470μH
L2	87-005-121-01	FM coil
L3,4	82-587-680-01	MW/LW bar antenna coil
L5	82-755-607-01	MW OSC coil
L6	82-587-681-01	LW OSC coil
L7,8	87-005-126-01	Coil, 1mH
L9	87-008-227-01	FM coil
L12	87-003-045-01	Choke coil, 22μH
TC1	87-011-108-01	Trimmer, 8pF
TC2	87-011-109-01	Trimmer, 15pF
CF1,2	87-008-245-01	Ceramic filter kid
CF3	87-008-225-01	AM ceramic filter
IFT1	87-008-226-01	AM IFT
IFT2	87-008-223-01	AM IFT
SFR1	87-021-566-01	Semi-fixed resistor, 5kΩ-B
SFR2	87-021-567-01	Semi-fixed resistor, 10kΩ-B
PIN-1	87-049-045-01	Pin, 12P
< Resistor >		
R50	87-025-317-01	47Ω ½w Nonflammable resistor
< Capacitors >		
C108	87-014-040-41	200pF PP
C19	87-014-048-41	430pF PP
C48	87-014-057-41	1000pF PP
C105	87-014-065-01	2200pF PP
« REC/PB CIRCUIT BOARD SECTION »		
PCB-B	82-587-658-01	REC/PB circuit board
IC1,2	87-027-540-01	IC, AN7146
IC3,4	87-027-754-01	IC, LM1111C
IC5,9	87-027-539-01	IC, LA3161
IC10	87-027-656-01	IC, TC4066BP
Q1,2	89-322-405-01	Transistor, 2SC2240 GR)
Q3,4,5,6, 7,8,17, 18,19,20, 21,22,27, 28,29,30, 31,32,33, 34,35,36, 37,38,42, 44	89-318-154-01	Transistor, 2SC1815 (Y)

Symbol No.	Part No.	Description
Q39,40	89-318-155-01	Transistor, 2SC1815 (GR)
Q41	89-318-464-01	Transistor, 2SC1846 (R)
Q43	89-322-364-01	Transistor, 2SC2236 (Y)
Q45,46	89-320-011-21	Transistor, 2SC2001 (K,L)
D1,2,7,8, 9,10,11,12, 13,17,18,19, 352	87-027-097-01	Diode, 1S1555
D3,4,5,6	88-052-188-11	Diode, 1S188 (FM)
D14	87-027-346-01	Zener diode, HZ11A2L
D16	87-027-199-01	Zener diode, 05Z-15U
L1,2	87-008-173-01	Trap coil, 10mH
L3,4	82-487-654-01	Coil, 10mH
L7,9,13,14,17	87-003-039-01	Choke coil, 36μH
L8	82-491-661-01	Choke coil, 600μH
L11,12	87-003-051-01	Choke coil, 470μH
L15,16	87-005-088-01	Coil, 5.6mH
CP1	82-587-641-11	Bias OSC unit
LPF1	87-030-070-01	Low-pass filter
J1,2,3,4,6	82-587-633-01	Jack plate ass'y (PHONO, MIC-L,R, PLAYER SYNC)
J5, S34	87-049-059-01	DIN jack w/switch (DIN)
J7,8	82-587-632-01	Jack plate ass'y (EXT SP-L,R)
J9	87-049-043-01	Jack, 6.3φ (PHONES)
VR1	87-021-671-01	Volume, 50kΩ-A (REC VOLUME)
VR2,3	87-021-668-01	Volume, 50kΩ-A (BASS, TREBLE)
VR4	87-021-669-01	Volume, 100kΩ-W (BALANCE)
VR5	87-021-667-01	Volume, 20kΩ-A (VOLUME)
S1	87-031-655-01	Lever switch (FUNCTION)
S2	82-588-622-21	Slide switch (REC/PB)
S3	87-031-631-01	Lever switch (TAPE SELECTOR)
S4	87-031-620-01	Lever switch (RECORD)
S5	82-563-609-01	Slide switch (PHONO/AUX)
S6	87-031-622-01	Lever switch (MODE)
S7,8,15	87-031-619-01	Push-switich (DOLBY-NR, POWER, DSL)
S32	82-431-604-01	Slide switch (QSC)
SFR1,2	87-021-564-01	Semi-fixed resistor, 1kΩ-B
SFR3,7,8	87-021-624-01	Semi-fixed resistor, 50kΩ-B
SFR4	87-021-514-01	Semi-fixed resistor, 200kΩ-B
SFR5,6	82-587-634-01	Semi-fixed resistor, 100Ω-B
	82-588-634-01	Earth terminal
< Resistors >		
R83,84	87-025-209-01	3.3kΩ Metal film resistor
R245	87-025-313-01	4.7Ω Nonflammable resistor
R164	87-025-320-01	100Ω 2w Nonflammable resistor
△R202	87-029-108-01	1Ω ½w Fuse resistor
△R153,154, 220,246	87-029-089-01	4.7Ω Fuse resistor
△R162,163	87-029-090-01	22Ω ¼w Fuse resistor
△R172	87-029-365-01	22Ω ¼w Fuse resistor
< Capacitors >		
C49,50,89, 90	87-014-053-01	680pF PP
C17,18	87-014-055-01	820pF PP
C13,14,75, 76	87-015-311-01	0.1μF 10V Aluminum solid
C115,116	87-015-367-01	0.15μF 10V Aluminum solid
C107,108, 117,118	87-015-312-01	0.22μF 10V Aluminum solid

Symbol No.	Part No.	Description
C77,78	87-015-313-01	0.33μF 10V Aluminum solid
« CONTROL CIRCUIT BOARD SECTION »		
PCB-C	82-587-604-11	Control circuit board
⊕IC1	87-027-750-01	IC, μPD1703C514
⊕IC2,4	87-027-564-01	IC, TC4011BP
⊕IC3	87-027-751-01	IC, MSM5829GS
Q1,2,3,4	89-318-154-01	Transistor, 2SC1815 (Y)
Q5	89-500-303-01	FET, 2SK30 (O)
D1,2,3,4, 5,6,7,11, 12,13,14,15, 16,17,18,19, 20,21,22,23, 24,25,26	87-027-097-01	Diode, 1S1555
D27,29	87-027-716-01	LED, GL-PPR22 (AUTO OPERATE/FM STEREO)
D28	87-027-758-01	LED, GL-9PG22 (DOLBY-NR)
D30	82-587-603-01	LCD (FREQUENCY INDICATOR)
X1	87-030-083-01	Crystal resonator
S19,20,21, 22,23,24, 25,26,27, 28,29,30, 31	87-031-498-01	Push-switch (TUNING, DOWN, UP, MEMORY, 1,2,3,4,5,6, FM, MW, LW)
PL1,2	82-587-605-01	Pilot lamp
	82-587-606-01	Electric conduction rubber
« MS CIRCUIT BOARD SECTION »		
PCB-D	82-587-615-21	MS circuit board
⊕IC6	87-027-713-01	IC, TC9138P
Q401,402,403, 404,405,411, 412,413,414, 415,416	89-327-854-01	Transistor, 2SC2785 (E)
Q406	89-111-154-51	Transistor, 2SA1115 (E,F)
Q407,409	89-313-834-01	Transistor, 2SC1383 (S)
Q408	89-106-834-51	Transistor, 2SA683 (RS)
D401	87-027-756-01	LED, SL-1160L (MS PROGRAM)
D402	87-027-365-01	Diode, S5277B
D403	87-027-332-01	Zener diode, HZ6B1L
D404,405, 406,407, 408,409, 410,411, 415	87-027-097-01	Diode, 1S1555
D412,413, 414	87-027-716-01	LED, GL-9PR22 (PEAK 0, +3, +7)
D416	87-027-228-01	Zener diode, 05Z-7.5U
S17,18	87-031-496-01	Tact switch (PROGRAM, RESET)
SFR401,402	87-021-624-01	Semi-fixed resistor, 50kΩ-B
C412	87-015-318-01	< Capacitors > 0.1μF 10V Aluminum solid
C407	87-015-425-01	1μF 25V Aluminum solid
« DSL CIRCUIT BOARD SECTION »		
PCB-E	82-587-617-21	DSL circuit board
IC7,8	87-027-176-01	IC, TA-7137P Stereo type
Q47,48,49, 50,51,52, 73,74	89-318-154-01	Transistor, 2SC1815 (Y)
D351	87-027-097-01	Diode, 1S1555
L10	82-587-610-01	Coil, DC-DC
PIN-4	87-049-038-01	Pin, 3P
PIN-2	82-481-647-01	Pin, 4P

Symbol No.	Part No.	Description
PIN-3	87-049-034-01	Pin, 4P
< Capacitors >		
C361,362	87-015-311-01	0.1μF 10V Aluminum solid
C359,360	87-015-313-01	0.33μF 10V Aluminum solid
« REC AMP CIRCUIT BOARD SECTION »		
PCB-F	82-588-617-11	REC amp circuit board
Q23,24,25, 26	89-318-154-01	Transistor, 2SC1815 (Y)
L5,6	87-005-088-01	Micro inductor, 5.6mH
SFR9,10	87-021-672-01	Semi-fixed resistor, 50kΩ-B
< Capacitor >		
C81,82	87-015-311-01	0.1μF 10V Aluminum solid
« MONITOR CIRUCIT BOARD SECTION »		
PCB-G	82-588-633-21	Monitor circuit board
Q9,10	89-322-405-01	Transistor, 2SC2240 (GR)
Q11,12,13, 14,15,16	89-318-154-01	Transistor, 2SC1815 (Y)
PIN	87-032-634-01	Pin, 4P
« REC MUTE CIRCUIT BOARD SECTION »		
PCB-H	82-587-618-21	REC mute circuit board
Q72	89-110-154-01	Transistor, 2SA1015 (Y)
D1	87-027-097-01	Diode, 1S1555
S9	82-587-642-01	Push-switch (REC MUTE)
« LED CIRCUIT BOARD SECTION »		
PCB-I	82-587-619-21	LED circuit board
D1	87-027-731-01	LED, SR-535D (RECORD)
« LIGHT SWITCH CIRCUIT BOARD SECTION »		
PCB-J	82-587-648-21	Light switch circuit board
S33	86-992-604-01	Push-switch (LIGHT)
« POWER CIRCUIT BOARD SECTION »		
△PCB-K	82-551-672-21	Power circuit board
D501	87-027-609-01	Encapsulated diode
J10,11	87-032-958-01	AC-DC jack
△S16	87-031-466-01	Slide switch (VOLTAGE SELECTOR)
△F1	87-035-192-01	Fuse, "T" 4A
△F2	87-098-022-01	Fuse lable, "T" 4A
△	87-035-219-01	Fuse, "T" 500mA
△	87-098-013-01	Fuse label, "T" 500mA
△	87-033-147-01	Fuse clamp
< Resistor >		
R501	87-025-194-01	220Ω 2w Metal film resistor
« MISCELLANEOUS »		
△T1	82-587-651-01	Power transformer (E model only)
△T1	82-587-652-01	Power transformer (K model only)
RPH	87-046-159-01	REC/PB head
EH	87-046-189-01	Erase head
SOL1	82-585-601-21	Solenoid
SP1,2	82-587-644-11	Speaker (Woofer)
SP3,4	82-563-602-01	Speaker (Tweeter)
SP5	82-587-635-11	Passive radiator ass'y
LM1,2	82-588-642-01	Level meter
ECM1,2	87-041-015-01	ECM, ESM-10PB
M1	87-045-135-01	Motor DC EG
S10,14	87-031-548-01	Leaf switch (MOTOR, SYNCRATE)
S11	87-031-537-01	Micro switch (PLAY)

Symbol No

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CON-4  
CON-3  
CON-2  
CON-1

C1,2

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Symbol No.	Part No.	Description
Q39,40	89-318-155-01	Transistor, 2SC1815 (GR)
Q41	89-318-464-01	Transistor, 2SC1846 (R)
Q43	89-322-364-01	Transistor, 2SC2236 (Y)
Q45,46	89-320-011-21	Transistor, 2SC2001 (K,L)
D1,2,7,8, 9,10,11,12, 13,17,18,19, 352	87-027-097-01	Diode, 1S1555
D3,4,5,6	88-052-188-11	Diode, 1S188 (FM)
D14	87-027-346-01	Zener diode, HZ11A2L
D16	87-027-199-01	Zener diode, 05Z-15U
L1,2	87-008-173-01	Trap coil, 10mH
L3,4	82-487-654-01	Coil, 10mH
L7,9,13,14,17	87-003-039-01	Choke coil, 36μH
L8	82-491-661-01	Choke coil, 600μH
L11,12	87-003-051-01	Choke coil, 470μH
L15,16	87-005-088-01	Coil, 5.6mH
CP1	82-587-641-11	Bias OSC unit
LPF1	87-030-070-01	Low-pass filter
J1,2,3,4,6	82-587-633-01	Jack plate ass'y (PHONO, MIC-L,R, PLAYER SYNC)
J5, S34	87-049-059-01	DIN jack w/switch (DIN)
J7,8	82-587-632-01	Jack plate ass'y (EXT SP-L,R)
J9	87-049-043-01	Jack, 6.3φ (PHONES)
VR1	87-021-671-01	Volume, 50kΩ-A (REC VOLUME)
VR2,3	87-021-668-01	Volume, 50kΩ-A (BASS, TREBLE)
VR4	87-021-669-01	Volume, 100kΩ-W (BALANCE)
VR5	87-021-667-01	Volume, 20kΩ-A (VOLUME)
S1	87-031-655-01	Lever switch (FUNCTION)
S2	82-588-622-21	Slide switch (REC/PB)
S3	87-031-631-01	Lever switch (TAPE SELECTOR)
S4	87-031-620-01	Lever switch (RECORD)
S5	82-563-609-01	Slide switch (PHONO/AUX)
S6	87-031-622-01	Lever switch (MODE)
S7,8,15	87-031-619-01	Push-switck (DOLBY-NR, POWER, DSL)
S32	82-431-604-01	Slide switch (OSC)
SFR1,2	87-021-564-01	Semi-fixed resistor, 1kΩ-B
SFR3,7,8	87-021-624-01	Semi-fixed resistor, 50kΩ-B
SFR4	87-021-514-01	Semi-fixed resistor, 200kΩ-B
SFR5,6	82-587-634-01	Semi-fixed resistor, 100Ω-B
	82-588-634-01	Earth terminal
		< Resistors >
R83,84	87-025-209-01	3.3kΩ Metal film resistor
R245	87-025-313-01	4.7Ω Nonflammable resistor
R164	87-025-320-01	100Ω 2w Nonflammable resistor
R202	87-029-108-01	1Ω ½w Fuse resistor
R153,154, 220,246	87-029-089-01	4.7Ω Fuse resistor
R162,163	87-029-090-01	22Ω ¼w Fuse resistor
R172	87-029-365-01	22Ω ¼w Fuse resistor
		< Capacitors >
C49,50,89, 90	87-014-053-01	680pF PP
C17,18	87-014-055-01	820pF PP
C13,14,75, 76	87-015-311-01	0.1μF 10V Aluminum solid
C115,116	87-015-367-01	0.15μF 10V Aluminum solid
C107,108, 117,118	87-015-312-01	0.22μF 10V Aluminum solid

Symbol No.	Part No.	Description
C77,78	87-015-313-01	0.33μF 10V Aluminum solid
		≪ CONTROL CIRCUIT BOARD SECTION ≫
PCB-C	82-587-604-11	Control circuit board
⚡IC1	87-027-750-01	IC, μPD1703C514
⚡IC2,4	87-027-564-01	IC, TC4011BP
⚡IC3	87-027-751-01	IC, MSM5829GS
Q1,2,3,4	89-318-154-01	Transistor, 2SC1815 (Y)
Q5	89-500-303-01	FET, 2SK30 (O)
D1,2,3,4, 5,6,7,11, 12,13,14,15, 16,17,18,19, 20,21,22,23, 24,25,26	87-027-097-01	Diode, 1S1555
D27,29	87-027-716-01	LED, GL-PPR22 (AUTO OPERATE/FM STEREO)
D28	87-027-758-01	LED, GL-9PG22 (DOLBY-NR)
D30	82-587-603-01	LCD (FREQUENCY INDICATOR)
X1	87-030-083-01	Crystal resonator
S19,20,21, 22,23,24, 25,26,27, 28,29,30, 31	87-031-498-01	Push-switch (TUNING, DOWN, UP, MEMORY, 1,2,3,4,5,6, FM, MW, LW)
PL1,2	82-587-605-01	Pilot lamp
	82-587-606-01	Electric conduction rubber
		≪ MS CIRCUIT BOARD SECTION ≫
PCB-D	82-587-615-21	MS circuit board
⚡IC6	87-027-713-01	IC, TC9138P
Q401,402,403, 404,405,411, 412,413,414, 415,416	89-327-854-01	Transistor, 2SC2785 (E)
Q406	89-111-154-51	Transistor, 2SA1115 (E,F)
Q407,409	89-313-834-01	Transistor, 2SC1383 (S)
Q408	89-106-834-51	Transistor, 2SA683 (RS)
D401	87-027-756-01	LED, SL-1160L (MS PROGRAM)
D402	87-027-365-01	Diode, S5277B
D403	87-027-332-01	Zener diode, HZ6B1L
D404,405, 406,407, 408,409, 410,411, 415	87-027-097-01	Diode, 1S1555
D412,413, 414	87-027-716-01	LED, GL-9PR22 (PEAK 0, +3, +7)
D416	87-027-228-01	Zener diode, 05Z-7.5U
S17,18	87-031-496-01	Tact switch (PROGRAM, RESET)
SFR401,402	87-021-624-01	Semi-fixed resistor, 50kΩ-B
		< Capacitors >
C412	87-015-318-01	0.1μF 10V Aluminum solid
C407	87-015-425-01	1μF 25V Aluminum solid
		≪ DSL CIRCUIT BOARD SECTION ≫
PCB-E	82-587-617-21	DSL circuit board
IC7,8	87-027-176-01	IC, TA-7137P Stereo type
Q47,48,49, 50,51,52, 73,74	89-318-154-01	Transistor, 2SC1815 (Y)
D351	87-027-097-01	Diode, 1S1555
L10	82-587-610-01	Coil, DC-DC
PIN-4	87-049-038-01	Pin, 3P
PIN-2	82-481-647-01	Pin, 4P

Symbol No.	Part No.	Description
PIN-3	87-049-034-01	Pin, 4P
		< Capacitors >
C361,362	87-015-311-01	0.1μF 10V Aluminum solid
C359,360	87-015-313-01	0.33μF 10V Aluminum solid
		≪ REC AMP CIRCUIT BOARD SECTION ≫
PCB-F	82-588-617-11	REC amp circuit board
Q23,24,25, 26	89-318-154-01	Transistor, 2SC1815 (Y)
L5,6	87-005-088-01	Micro inductor, 5.6mH
SFR9,10	87-021-672-01	Semi-fixed resistor, 50kΩ-B
		< Capacitor >
C81,82	87-015-311-01	0.1μF 10V Aluminum solid
		≪ MONITOR CIRUCIT BOARD SECTION ≫
PCB-G	82-588-633-21	Monitor circuit board
Q9,10	89-322-405-01	Transistor, 2SC2240 (GR)
Q11,12,13, 14,15,16	89-318-154-01	Transistor, 2SC1815 (Y)
PIN	87-032-634-01	Pin, 4P
		≪ REC MUTE CIRCUIT BOARD SECTION ≫
PCB-H	82-587-618-21	REC mute circuit board
Q72	89-110-154-01	Transistor, 2SA1015 (Y)
D1	87-027-097-01	Diode, 1S1555
S9	82-587-642-01	Push-switch (REC MUTE)
		≪ LED CIRCUIT BOARD SECTION ≫
PCB-I	82-587-619-21	LED circuit board
D1	87-027-731-01	LED, SR-535D (RECORD)
		≪ LIGHT SWITCH CIRCUIT BOARD SECTION ≫
PCB-J	82-587-648-21	Light switch circuit board
S33	86-992-604-01	Push-switch (LIGHT)
		≪ POWER CIRCUIT BOARD SECTION ≫
⚡PCB-K	82-551-672-21	Power circuit board
D501	87-027-609-01	Encapsulated diode
J10,11	87-032-958-01	AC-DC jack
⚡S16	87-031-466-01	Slide switch (VOLTAGE SELECTOR)
⚡F1	87-035-192-01	Fuse, "T" 4A
⚡F2	87-098-022-01	Fuse lable, "T" 4A
⚡	87-035-219-01	Fuse, "T" 500mA
⚡	87-098-013-01	Fuse label, "T" 500mA
⚡	87-033-147-01	Fuse clamp
		< Resistor >
R501	87-025-194-01	220Ω 2w Metal film resistor
		≪ MISCELLANEOUS ≫
⚡T1	82-587-651-01	Power transformer (E model only)
⚡T1	82-587-652-01	Power transformer (K model only)
RPH	87-046-159-01	REC/PB head
EH	87-046-189-01	Erase head
SOL1	82-585-601-21	Solenoid
SP1,2	82-587-644-11	Speaker (Woofer)
SP3,4	82-563-602-01	Speaker (Tweeter)
SP5	82-587-635-11	Passive radiator ass'y
LM1,2	82-588-642-01	Level meter
ECM1,2	87-041-015-01	ECM, ESM-10PB
M1	87-045-135-01	Motor DC EG
S10,14	87-031-548-01	Leaf switch (MOTOR, SYNCRATE)
S11	87-031-537-01	Micro switch (PLAY)

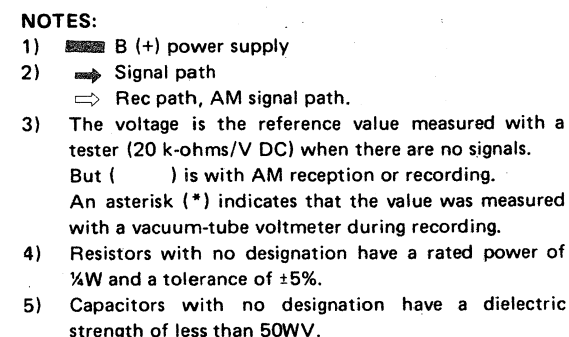
Symbol No.	Part No.	Description
S12	87-031-615-01	Leaf switch (MUSIC SENSOR)
S13	87-031-361-01	Leaf switch (PAUSE)
CON-4	82-587-623-11	Connector ass'y, 3P
CON-3	82-587-622-11	Connector ass'y, 4P
CON-2	82-587-646-01	Connector ass'y, 4P
CON-1	82-587-613-11	Connector ass'y, 12P
	87-033-166-01	Antenna terminal (EXT-ANT)
		< Capacitor >
C1,2	82-918-610-01	3.3μF 50V Electrolytic BP




 Safety component symbol  
This symbol is given to important parts which serve to maintain the safety of the product, and which are made to conform to special safety specifications. Therefore, when replacing a component with this symbol, make absolutely sure that you use a designated part.





- C-MOS IC handling precaution**  
The C-MOS IC's construction makes this part susceptible to damage by static electricity and so take sufficient care in regard to following articles.
1. Need to be put on conductive sheet, to be put in a metallic box and to be wrapped by aluminium foil for transportation and deposit.
  2. To use solder iron less than 40W (less than 260°C) of power consumption for soldering. But do not overheat more than 10 second.
  3. Do not perform a conductivity test with a tester, etc. Refer to the circuit voltages of each part.
  4. The ICs on the electrical parts which are indicated by an C-MOS IC symbol mark ( ⚡ ).



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- 6) The only capacitor tolerances indicated are  $\pm 5\%$  (J) and  $\pm 10\%$  (K).
- 7) Ceramic capacitor symbols:
  -  For temperature compensation (SL)
  -  High dielectric constant system (YY)
  -  High dielectric constant system (YW, YP, YZ)
- 8) Explanation of symbols
  - (M) Mylar capacitor
  - (A) Aluminum solid capacitor
  - (PP) Polypropylene film capacitor
  - (BP) Bi-polarized capacitor
  - (LL) Low-leakage capacitor
  - (T) Tantalum capacitor

-  Fuse resistor
-  Nonflammable resistor
-  Low noise resistor
-  Safety component symbol

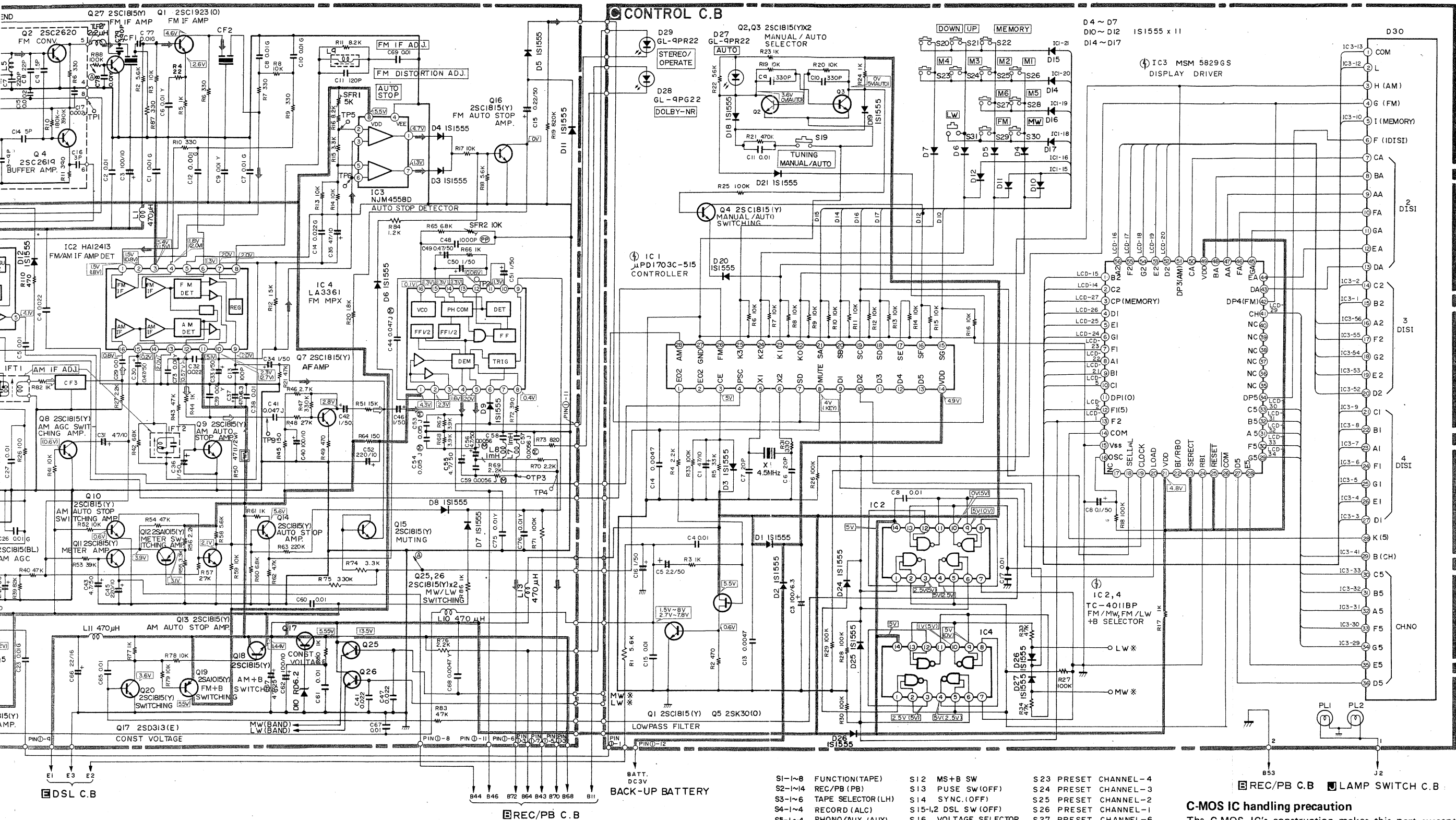
This symbol is given to important parts which serve to maintain the safety of the product, and which are made to conform to special safety specifications. Therefore, when replacing a component with this symbol, make **absolutely** sure that you use a designated part.

This schematic diagram is subject to change without notice in the interests of improved performance.

S1-1~8	FUNCTION(TAPE)	S12	MS+B SW	S23	PRESET CHANNEL-4
S2-1~4	REC/PB (PB)	S13	PUSE SW(OFF)	S24	PRESET CHANNEL-3
S3-1~6	TAP SELECTOR(LH)	S14	SYNC.(OFF)	S25	PRESET CHANNEL-2
S4-1~4	RECORD (ALC)	S15-1,2	DSL SW(OFF)	S26	PRESET CHANNEL-1
S5-1~4	PHONO/AUX (AUX)	S16	VOLTAGE SELECTOR	S27	PRESET CHANNEL-6
S6-1,2	MODE (STEREO)	S17	PROGRAM SW(OFF)	S28	PRESET CHANNEL-5
S7	DOLBY-NR	S18	RESET SW(OFF)	S29	FM
S8	SLEEP(OFF)	S19	TUNING	S30	MW
S9	REC MUT (OFF)	S20	DOWN	S31	LW
S10	MOTOR SW(OFF)	S21	UP	S32	OSC
S11	PLAY SW(OFF)	S22	MEMORY	S33	LIGHT
				S34	Q1W



5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
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The only capacitor tolerances indicated are  $\pm 5\%$  (J) and  $\pm 10\%$  (K).

Ceramic capacitor symbols:  
— For temperature compensation (SL)  
— High dielectric constant system (YY)  
— High dielectric constant system (YW, YP, YZ)

Explanation of symbols  
(M) Mylar capacitor  
(A) Aluminum solid capacitor  
(PP) Polypropylene film capacitor  
(BP) Bi-polarized capacitor  
(LL) Low-leakage capacitor  
(T) Tantalum capacitor

— Fuse resistor  
— Nonflammable resistor  
(LN) Low noise resistor  
— Safety component symbol

This symbol is given to important parts which serve to maintain the safety of the product, and which are made to conform to special safety specifications. Therefore, when replacing a component with this symbol, make absolutely sure that you use a designated part.  
This schematic diagram is subject to change without notice in the interests of improved performance.

S1-1~8	FUNCTION(TAPE)	S12	MS+B SW	S23	PRESET CHANNEL-4
S2-1~4	REC/PB (PB)	S13	PULSE SW(OFF)	S24	PRESET CHANNEL-3
S3-1~6	TAPE SELECTOR (LH)	S14	SYNC. (OFF)	S25	PRESET CHANNEL-2
S4-1~4	RECORD (ALC)	S15-1,2	DSL SW (OFF)	S26	PRESET CHANNEL-1
S5-1~4	PHONO/AUX (AUX)	S16	VOLUME SELECTOR	S27	PRESET CHANNEL-6
S6-1,2	MODE (STEREO)	S17	PROGRAM SW(OFF)	S28	PRESET CHANNEL-5
S7	DOLBY-NR	S18	RESET SW(OFF)	S29	FM
S8	SLEEP(OFF)	S19	TUNING	S30	MW
S9	REC MUT (OFF)	S20	DOWN	S31	LW
S10	MOTOR SW(OFF)	S21	UP	S32	OSC
S11	PLAY SW (OFF)	S22	MEMORY	S33	LIGHT
				S34	DIN

□ REC/PB C.B. ■ LAMP SWITCH C.B.

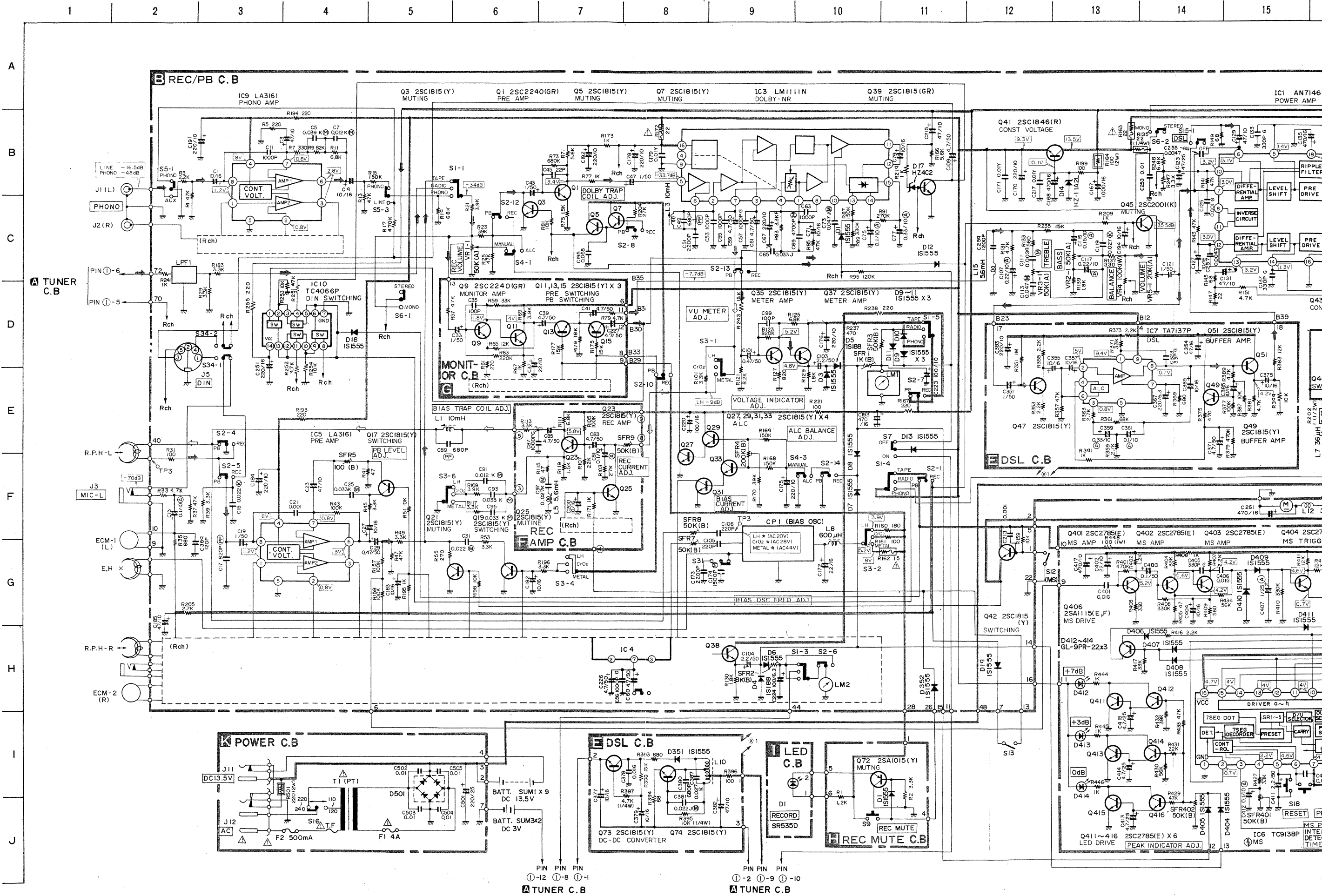
C-MOS IC handling precaution

The C-MOS IC's construction makes this part susceptible to damage by static electricity and so take sufficient care in regard to following articles.

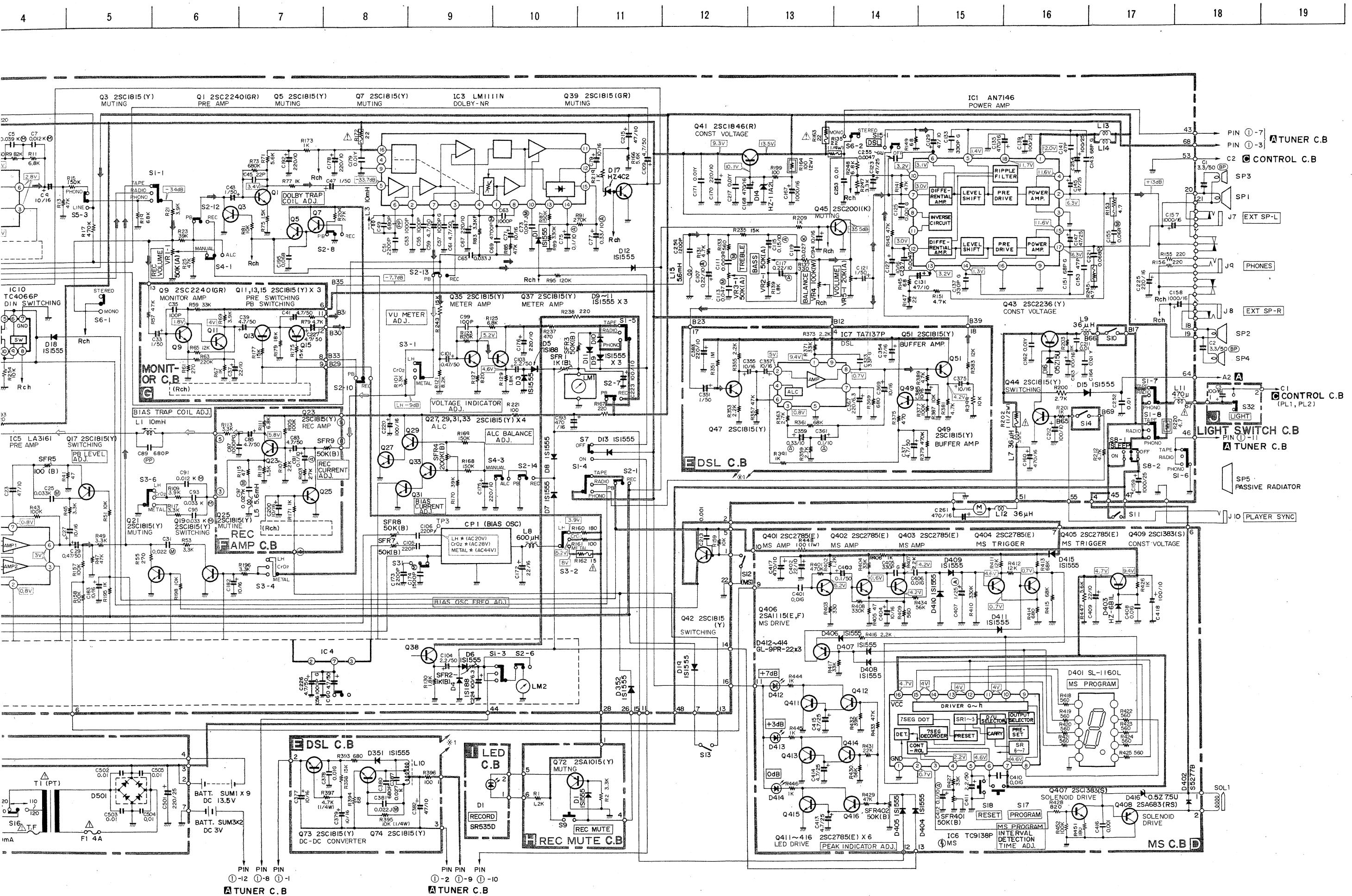
1. Need to be put on conductive sheet, to be put in a metallic box and to be wrapped by aluminium foil for transportation and deposit.
2. To use solder iron less than 40W (less than 260°C) of power consumption for soldering. But do not overheat more than 10 second.
3. Do not perform a conductivity test with a tester, etc. Refer to the circuit voltages of each part.
4. The ICs on the electrical parts which are indicated by an C-MOS IC symbol mark ( ).



SCHEMATIC DIAGRAM -2

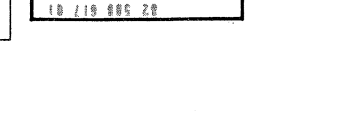






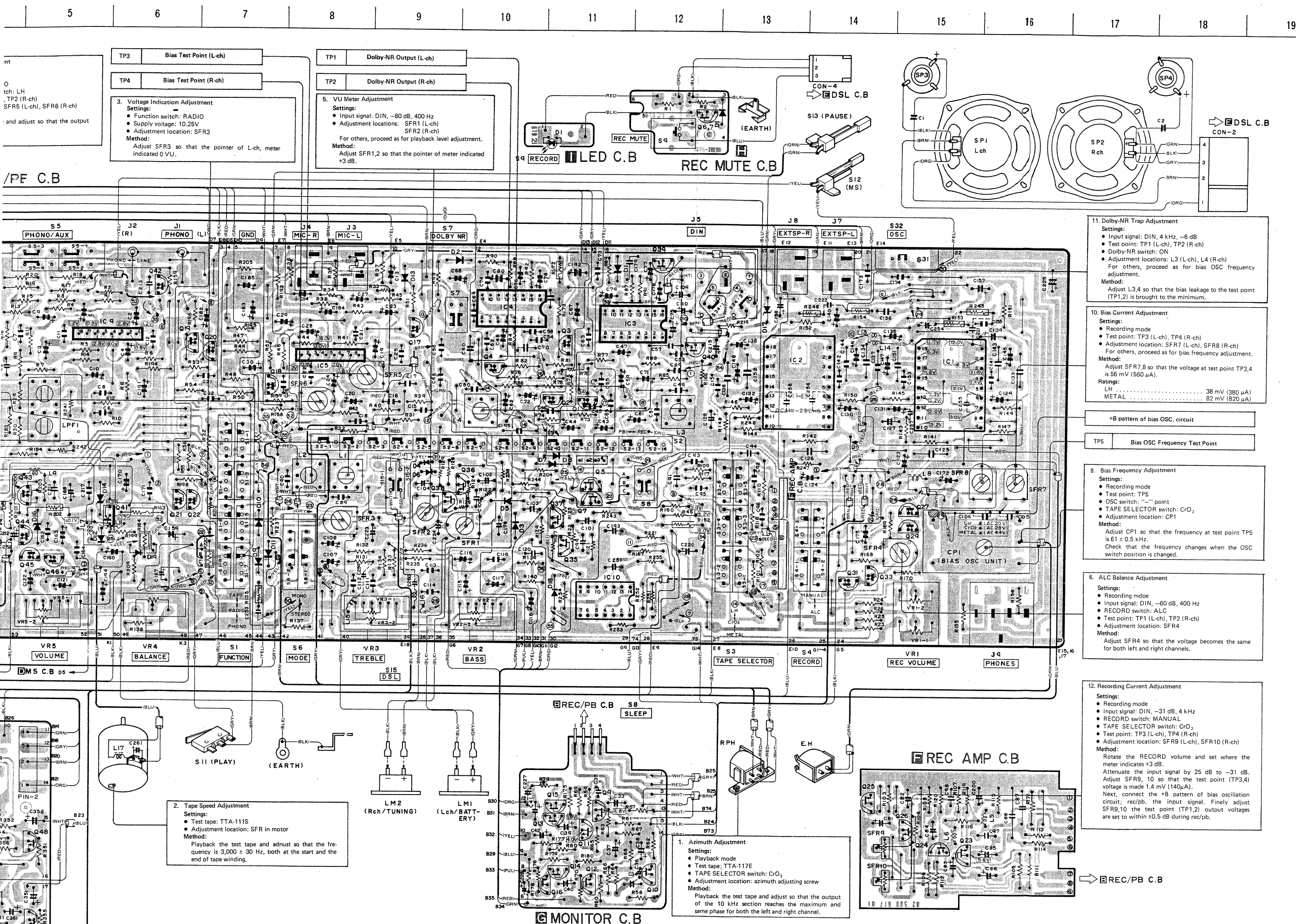


1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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The voltage is the reference value measured with a tester (20 K ohms/V DC) when there are no signals.  
An asterisk (\*) indicates that the value was measured with a vacuum-tube voltmeter during recording.



**11. Dolby-NR Trap Adjustment**  
Settings:  
• Input signal: DIN, 4 kHz, -6 dB  
• Test point: TP1 (L-ch), TP2 (R-ch)  
• Dolby-NR switch: ON  
• Adjustment locations: L3 (L-ch), L4 (R-ch)  
For others, proceed as for bias OSC frequency adjustment.  
Method:  
Adjust L3,4 so that the bias leakage to the test point (TP1,2) is brought to the minimum.

**10. Bias Current Adjustment**  
Settings:  
• Recording mode  
• Test point: TP3 (L-ch), TP4 (R-ch)  
• Adjustment location: SFR7 (L-ch), SFR8 (R-ch)  
For others, proceed as for bias frequency adjustment.  
Method:  
Adjust SFR7,8 so that the voltage at test point TP3,4 is 56 mV (560  $\mu$ A).  
Ratings:  
LH ..... 38 mV (380  $\mu$ A)  
METAL ..... 82 mV (820  $\mu$ A)

+B pattern of bias OSC. circuit  
TP5 Bias OSC Frequency Test Point

**8. Bias Frequency Adjustment**  
Settings:  
• Recording mode  
• Test point: TP5  
• OSC switch: "—" point  
• TAPE SELECTOR switch: CrO<sub>2</sub>  
• Adjustment location: CP1  
Method:  
Adjust CP1 so that the frequency at test point TP5 is 61  $\pm$  0.5 kHz.  
Check that the frequency changes when the OSC switch position is changed.

**6. ALC Balance Adjustment**  
Settings:  
• Recording mode  
• Input signal: DIN, -60 dB, 400 Hz  
• RECORD switch: ALC  
• Test point: TP1 (L-ch), TP2 (R-ch)  
• Adjustment location: SFR4  
Method:  
Adjust SFR4 so that the voltage becomes the same for both left and right channels.

**12. Recording Current Adjustment**  
Settings:  
• Recording mode  
• Input signal: DIN, -31 dB, 4 kHz  
• RECORD switch: MANUAL  
• TAPE SELECTOR switch: CrO<sub>2</sub>  
• Test point: TP3 (L-ch), TP4 (R-ch)  
• Adjustment location: SFR9 (L-ch), SFR10 (R-ch)  
Method:  
Rotate the RECORD volume and set where the meter indicates +3 dB.  
Attenuate the input signal by 25 dB to -31 dB.  
Adjust SFR9, 10 so that the test point (TP3,4) voltage is made 1.4 mV (140  $\mu$ A).  
Next, connect the +B pattern of bias oscillation circuit; rec/pb. the input signal. Finely adjust SFR9,10 the test point (TP1,2) output voltages are set to within  $\pm$ 0.5 dB during rec/pb.

**1. Azimuth Adjustment**  
Settings:  
• Playback mode  
• Test tape: TTA-117E  
• TAPE SELECTOR switch: CrO<sub>2</sub>  
• Adjustment location: azimuth adjusting screw  
Method:  
Playback the test tape and adjust so that the output of the 10 kHz section reaches the maximum and same phase for both the left and right channel.

**2. Tape Speed Adjustment**  
Settings:  
• Test tape: TTA-111S  
• Adjustment location: SFR in motor  
Method:  
Playback the test tape and adjust so that the frequency is 3,000  $\pm$  30 Hz, both at the start and the end of tape winding.

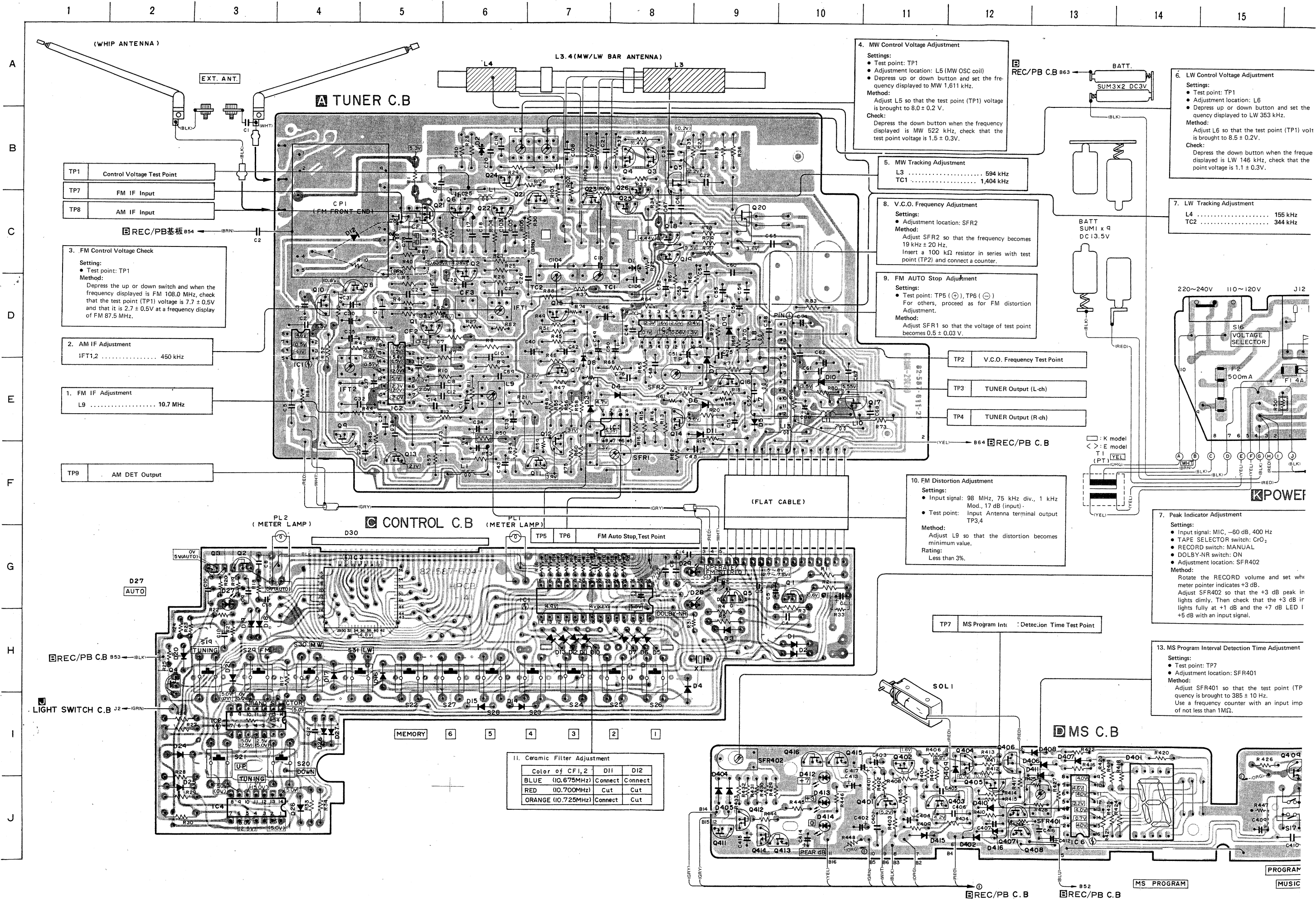
**3. Voltage Indication Adjustment**  
Settings:  
• Function switch: RADIO  
• Supply voltage: 10.25V  
• Adjustment location: SFR3  
Method:  
Adjust SFR3 so that the pointer of L-ch, meter indicated 0 VU.

**5. VU Meter Adjustment**  
Settings:  
• Input signal: DIN, -80 dB, 400 Hz  
• Adjustment locations: SFR1 (L-ch), SFR2 (R-ch)  
For others, proceed as for playback level adjustment.  
Method:  
Adjust SFR1,2 so that the pointer of meter indicated +3 dB.



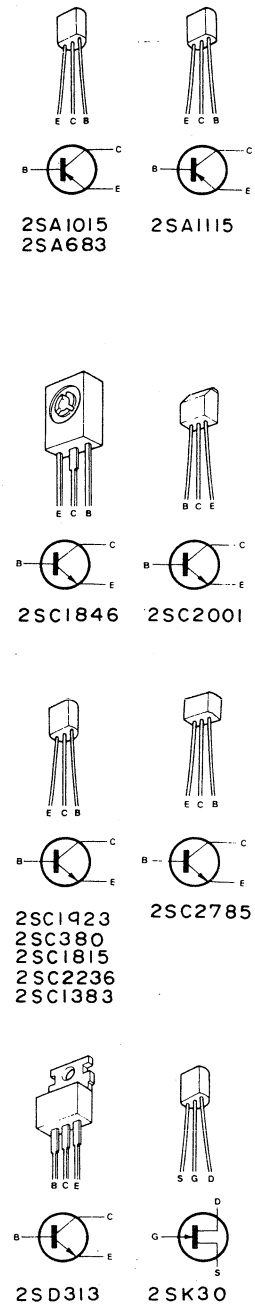
- NOTES (1) B(+) Pattern Component side pattern Others pattern  
 (2) The voltage is the reference value measured with a tester (20 K ohms/V DC) when there are no signals.  
 But ( ) is with AM reception.

## WIRING-2





4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
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1. Need to be put on conductive sheet, to be put in a metallic box and to be wrapped by aluminium foil for transportation and deposit.
2. To use solder iron less than 40W (less than 260°C) of power consumption for soldering. But do not overheat more than 10 second.
3. Do not perform a conductivity test with a tester, etc. Refer to the circuit voltages of each part.
4. The ICs on the electrical parts which are indicated by an C-MOS IC symbol mark ( )