

# TC-WR99ES/WR990

## SERVICE MANUAL

US Model  
Canadian Model  
E Model  
TC-WR99ES  
AEP Model  
TC-WR990



PHOTO:TC-WR990

Dolby noise reduction and HX Pro headroom extension manufactured under license from Dolby Laboratories Licensing Corporation. HX Pro originated by Bang & Olufsen. "DOLBY", the double-D symbol  $\square\square$  and "HX PRO" are trademarks of Dolby Laboratories Licensing Corporation.

Model Name Using Similar Mechanism	TC-WR97ES/WR970
Tape Transport Mechanism Type	TCM-200R4

### SPECIFICATIONS

Recording system 4-track 2-channel stereo  
Fast winding time Approx. 90 sec. (with Sony C-60 cassette)  
Bias AC bias  
Signal-to-noise ratio (at peak level)

Cassette (Dolby NR OFF)	Type IV (Sony Metal-S/Select)	Type II (Sony UX-S)	Type I (Sony HF-S)
	59 dB	58 dB	56dB

Measured at peak level weighted without NR. The S/N is improved by about 15 dB at 500 Hz and by about 20 dB about 1 kHz with Dolby-C NR on, and by 5 dB at 1 kHz and by 10 dB about 5 kHz with Dolby-B NR on.

Harmonic distortion 0.4% (with Sony Type I, 160 nWb/m, 315 Hz, 3rd H.D.)  
1.8% (with Sony Type IV, 250 nWb/m, 315 Hz, 3rd H.D.)

Frequency response (DOLBY NR OFF)

Type IV cassette (Sony Metal-S/Select)	25 - 19,000 Hz ( $\pm 3$ dB, IEC) 30 - 15,000 Hz [ $\pm 3$ dB (-4 dB) recording]
Type II cassette (Sony UX-S)	25 - 18,000 Hz ( $\pm 3$ dB, IEC)
Type I cassette (Sony HF-S)	25 - 16,000 Hz ( $\pm 3$ dB, IEC)

Wow and flutter  $\pm 0.09\%$  W.Peak (IEC)  
0.06% W.RMS (NAB)  
 $\pm 0.16\%$  W.Peak (DIN)

Inputs

Line inputs (phono jacks)	Sensitivity	0.16 V
	Input impedance	47 kilohms

Outputs

Line outputs (phono jacks)	Rated output level	0.5 V at a load impedance of 47 kilohms
	Load impedance	Over 10 kilohms
Headphones (stereo phone jack)	Output level	0 - 3 mW at a load impedance of 32 ohms

### General

Power requirements

AEP model :  
220 - 230 V AC, 50/60 Hz  
US, Canadian model : 120V AC, 60Hz  
E model :  
120, 220, or 240 V AC adjustable,  
50/60 Hz

Power consumption 30 W  
Dimensions

TC - WR990 :  
430 x 135 x 350 mm (w/h/d)  
(17 x 5 $\frac{3}{8}$  x 13 $\frac{7}{8}$  inches) including projecting parts and controls  
TC-WR99ES:  
470 x 135 x 350 mm (w/h/d)  
(18 $\frac{5}{8}$  x 5 $\frac{3}{8}$  x 13 $\frac{7}{8}$  inches) including projecting parts and controls  
TC - WR990 :  
6.5 kg (14 lbs 6 oz)  
TC-WR99ES:  
7.5 kg (16 lbs 9 oz)

Weight

### Supplied accessories

Audio connecting cords (2)  
Wireless remote commander RM-J902 (1) (Except for US/Canadian)  
Sony size SUM-3(NS) (2) (Except for US/Canadian)  
Screws (M3) (4) (TC-WR99ES only)

Design and specifications subject to change without notice.

### Note

This appliance conforms with EEC Directive 87/308/EEC regarding interference suppression.

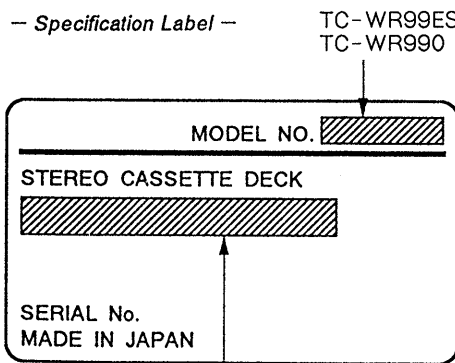
STEREO CASSETTE DECK  
**SONY**<sup>®</sup>

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MODEL IDENTIFICATION

— Specification Label —



US, Canadian Model : AC : 120V 60Hz 30W  
 AEP Model : AC : 220 - 230~50/60Hz  
 E Model : AC : 120, 220, 240V~50/60Hz30W

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK OR DOTTED LINE WITH MARK ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

SAFETY CHECK-OUT

After correcting the original service problem, perform the following safety check before releasing the set to the customer:

Check the antenna terminals, metal trim, “metallized” knobs, screws, and all other exposed metal parts for AC leakage. Check leakage as described below.

LEAKAGE TEST

The AC leakage from any exposed metal part to earth ground and from all exposed metal parts to any exposed metal part having a return to chassis, must not exceed 0.5 mA (500 microampers). Leakage current can be measured by any one of three methods.

1. A commercial leakage tester, such as the Simpson 229 or RCA WT-540A. Follow the manufacturers’ instructions to use these instruments.
2. A battery-operated AC milliammeter. The Data Precision 245 digital multimeter is suitable for this job.
3. Measuring the voltage drop across a resistor by means of a VOM or battery-operated AC voltmeter. The “limit” indication is 0.75 V, so analog meters must have an accurate low-voltage scale. The Simpson 250 and Sanwa SH-63Trd are examples of a passive VOM that is suitable. Nearly all battery operated digital multimeters that have a 2V AC range are suitable. (See Fig. A)

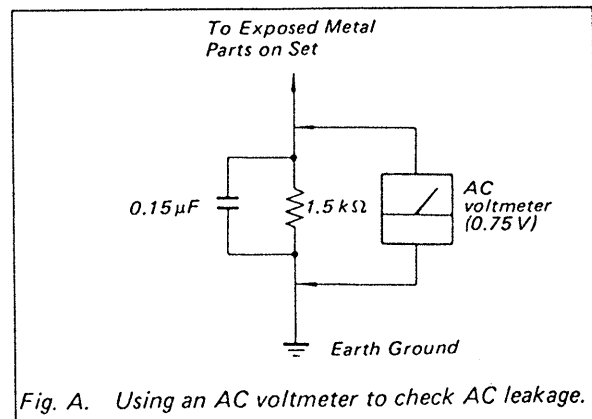


Fig. A. Using an AC voltmeter to check AC leakage.

ATTENTION AU COMPOSANT AYANT RAPPORT À LA SÉCURITÉ!

LES COMPOSANTS IDENTIFIÉS PAR UNE MARQUE SUR LES DIAGRAMMES SCHÉMATIQUES ET LA LISTE DES PIÈCES SONT CRITIQUES POUR LA SÉCURITÉ DE FONCTIONNEMENT. NE REMPLACER CES COMPOSANTS QUE PAR DES PIÈCES SONY DONT LES NUMÉROS SONT DONNÉS DANS CE MANUEL OU DANS LES SUPPLÉMENTS PUBLIÉS PAR SONY.

This section is extracted from instruction manual.

## SECTION 1 GENERAL

### Identifying the parts

#### Front Panel

For details, refer to the page number indicated in parenthesis.  
(The illustration shows the TC-WR990.)



- 9 ▲ OPEN/CLOSE button (deck B)
- 10 Front cover
- 11 ▲ OPEN/CLOSE button (deck A)
- 12 TAPE SPEED control and button (26)
- 13 BLANK SKIP button (30)
- 14 DUBBING LEVEL control (66)
- 15 AUTO PAUSE button (70)
- 16 BIAS controls (46)
- 17 A+B REC (simultaneous recording) button (52)
- 18 REC (recording) LEVEL control (38,44)
- 19 AUTO REC (automatic recording) LEVEL button and indicator (TC-WR990/WR99ES only) (38)
- 20 BALANCE control (38)
- 21 FADER button (TC-WR990/WR99ES only) (60,62)
- 22 MPX FILTER switch (46)
- 23 DOLBY NR (Dolby noise reduction) switches (22,28,38,52,56,66)
- 24 DIR (direction) MODE switch (22,28,38,52,56,66)
- 25 SYNCHRO DUBBING buttons (66)
- 26 HIGH SPEED button
- 27 NORM (normal) SPEED button
- 28 TIMER switch (72)
- 29 Headphone LEVEL control (24)
- 30 PHONES (headphones) jack
- 31 (stereo phone jack)

#### Identifying the Parts

#### Front Panel

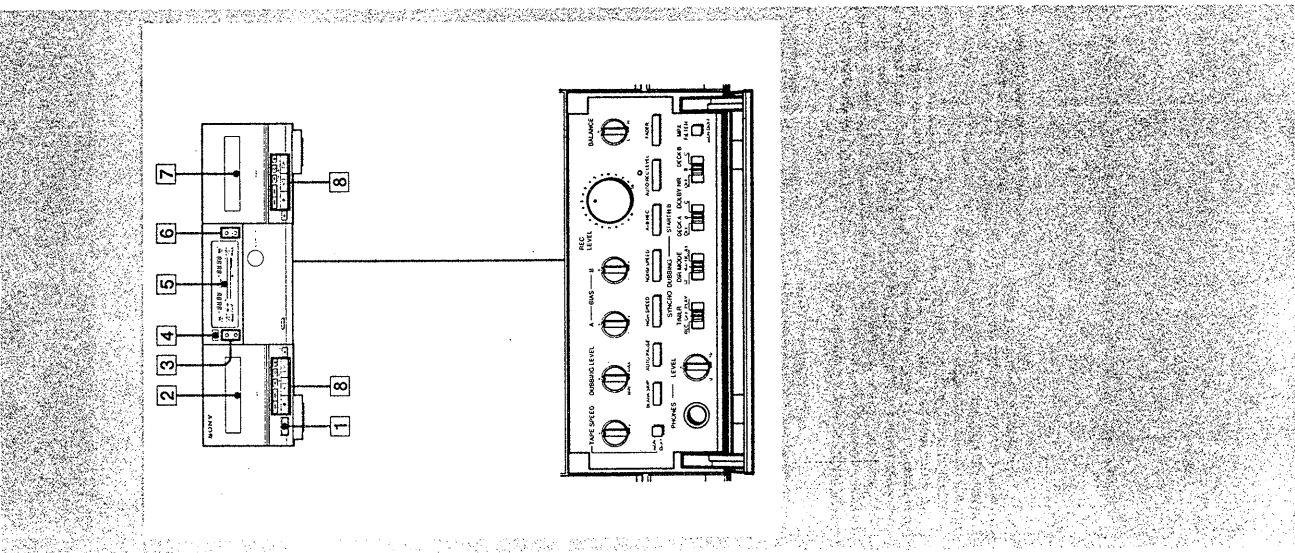
For details, refer to the page number indicated in parenthesis.

(The illustration shows the TC-WR990.)

- 1 POWER switch
- 2 Deck A
- 3 COUNTER buttons (deck A) (36)
- 4 RESET button
- 5 MEMORY button
- 6 Remote control sensor
- 7 You can remotely control this cassette deck with:
  - The supplied remote commander
  - (Except for Canada)
  - A remote commander that came with a Sony amplifier or receiver if it has the  mark and cassette deck control capability.
  - Any optional Sony remote commander with the  mark and cassette deck control capability.
- 8 Display panel
- 9 COUNTER buttons (deck B) (36)
- 10 RESET button
- 11 MEMORY button
- 12 Deck B
- 13 Tape operation buttons
  - (stop) button
  - ◀ (reverse play) button
  - ▶ (forward play) button
  - ◀▶ (leftward fast winding) button
  - ▶▶ (rightward fast winding) button
- 14 AMS\*) button
- 15 PAUSE button
- 16 REC MUTE (record muing) button (68)
- 17 REC (recording) button

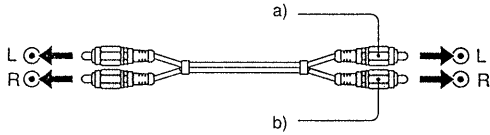
\* AMS is an abbreviation for Automatic Music Sensor.

(Continued on next page.)

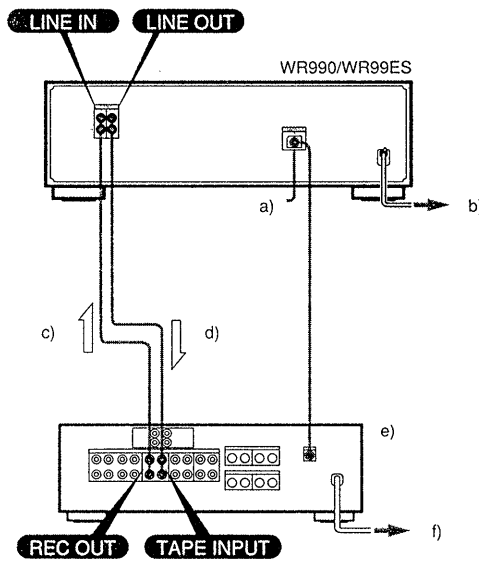


Hook-up Example

**A**



**B**



**Hooking Up the System**


**Before You Begin**

- Turn off the power to all equipment to be connected before making any connection.
- Note that the red plug of the supplied connecting cord is for right-channel (R) connection and the white plug for left-channel (L) connection. See Fig. **A**.
- a) White
- b) Red
- The connecting cords should be fully inserted into the jacks. A loose connection may cause hum pickup.

**Hook-up Example**

Fig. **B** shows how to connect the unit to an amplifier.

- a) CONTROL-S input (Canada only)
- b) to an AC outlet
- c) for recording
- d) for playback
- e) Amplifier
- f) To a wall outlet

The arrow  shows the direction of the signal flow.

**Note**

Parts on the back panel will differ depending on the model.

**Note on the CONTROL-S input**

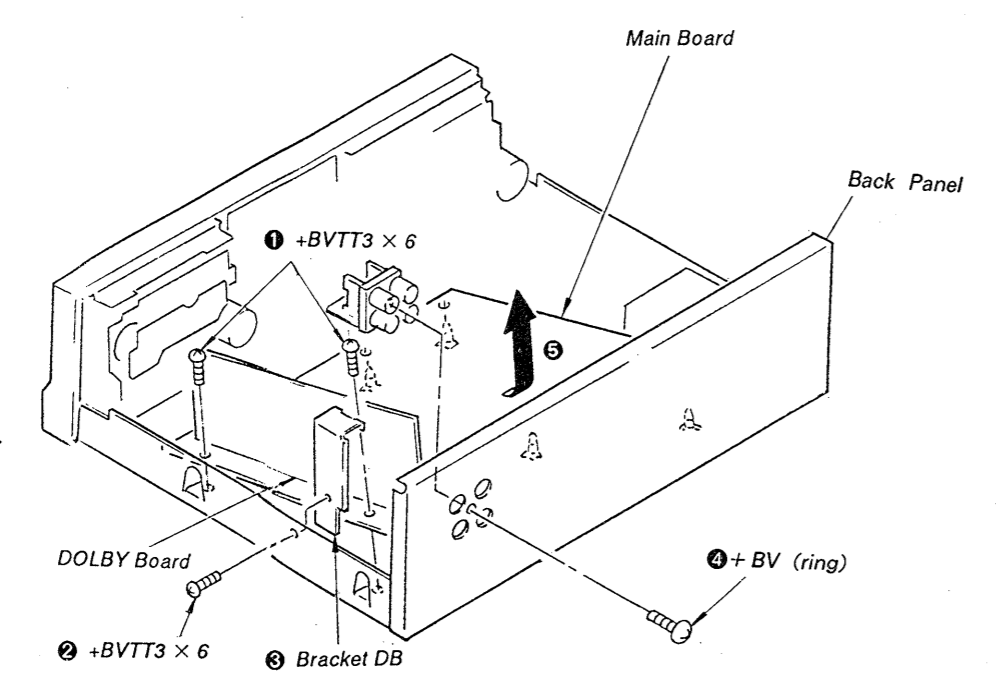
To remote control this unit through a receiver or amplifier, connect the input on this unit to the CONTROL-S output on a Sony receiver or amplifier, with a CONTROL-S cable. When this connection is used, only remote commands sent through the receiver or amplifier will be executed. The remote sensor on this unit will not function.

**SECTION 2  
DISASSEMBLY**

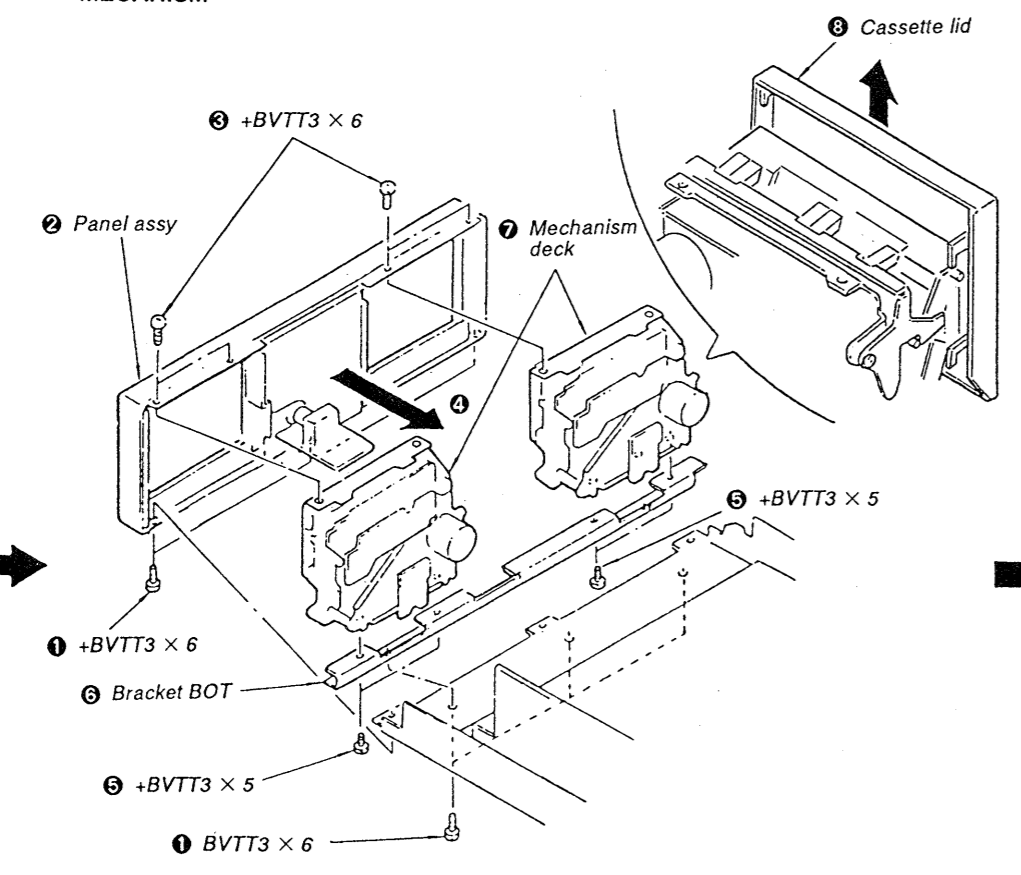
Note: Follow the disassembly procedure in the numerical order given.

Unscrew four screws (M3 × 8) and remove the upper case.

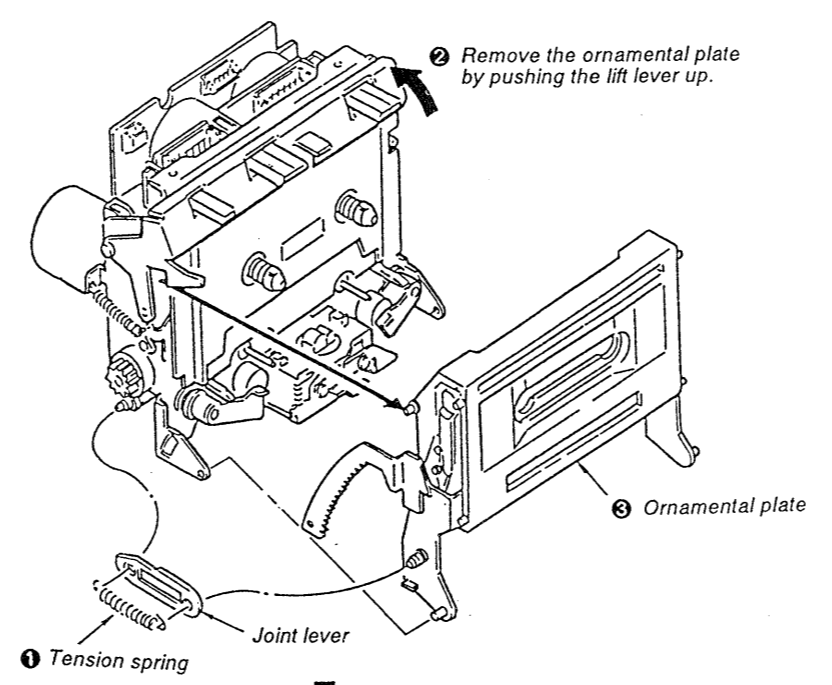
**DOLBY BOARD, MAIN BOARD**



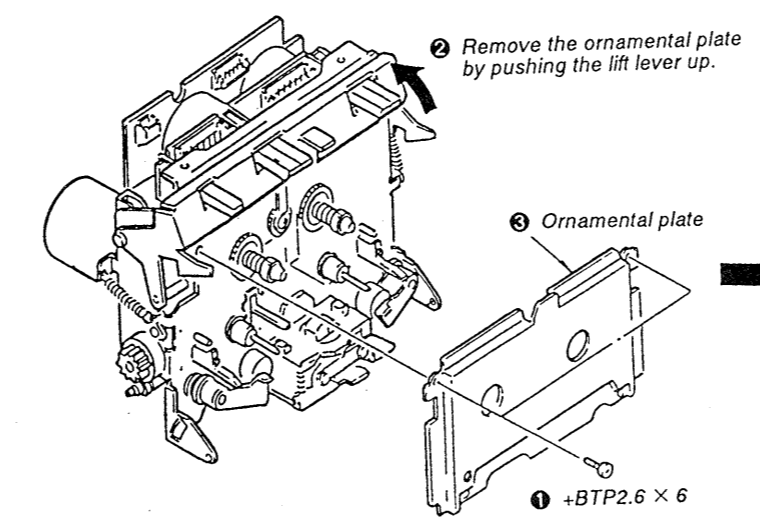
**MECANISM**



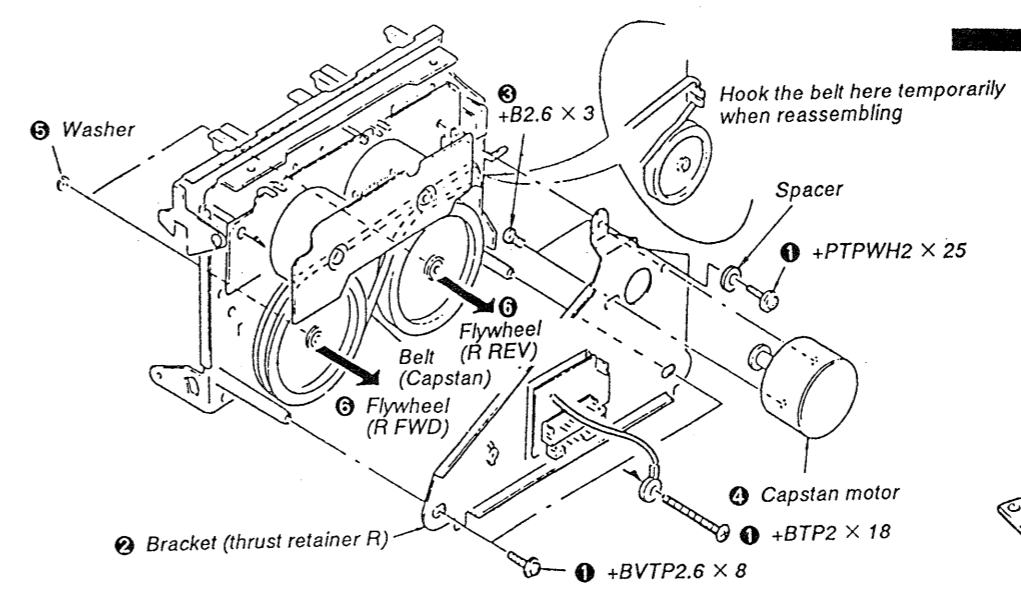
**CASSETTE HOLDER**



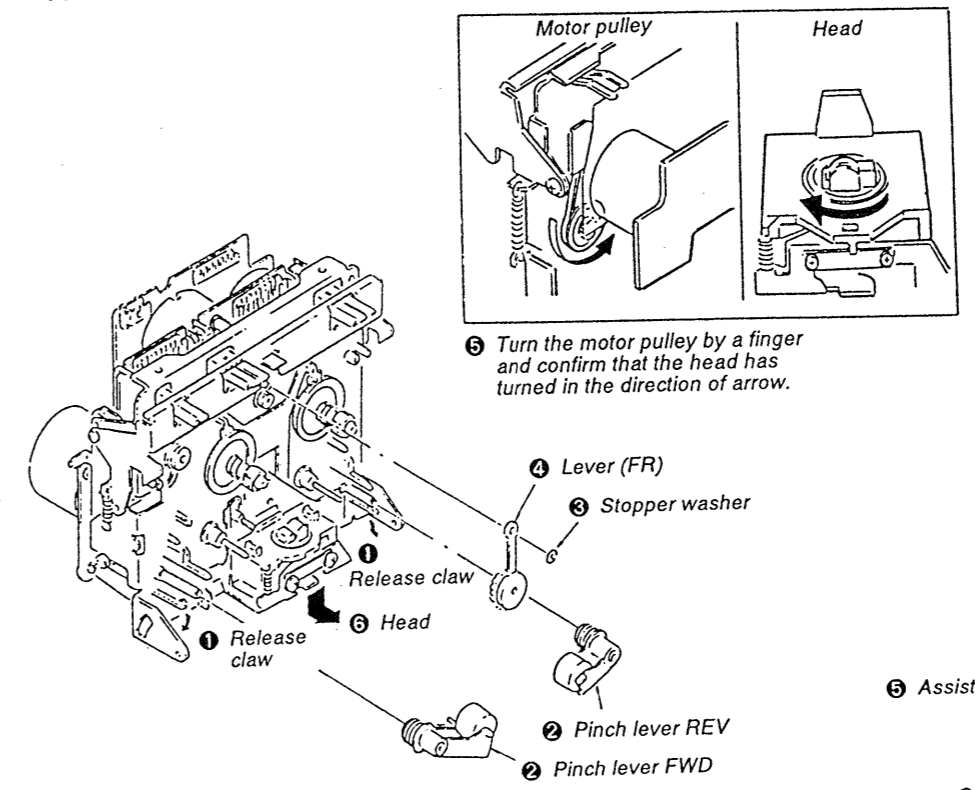
**ORNAMENTAL PLATE**



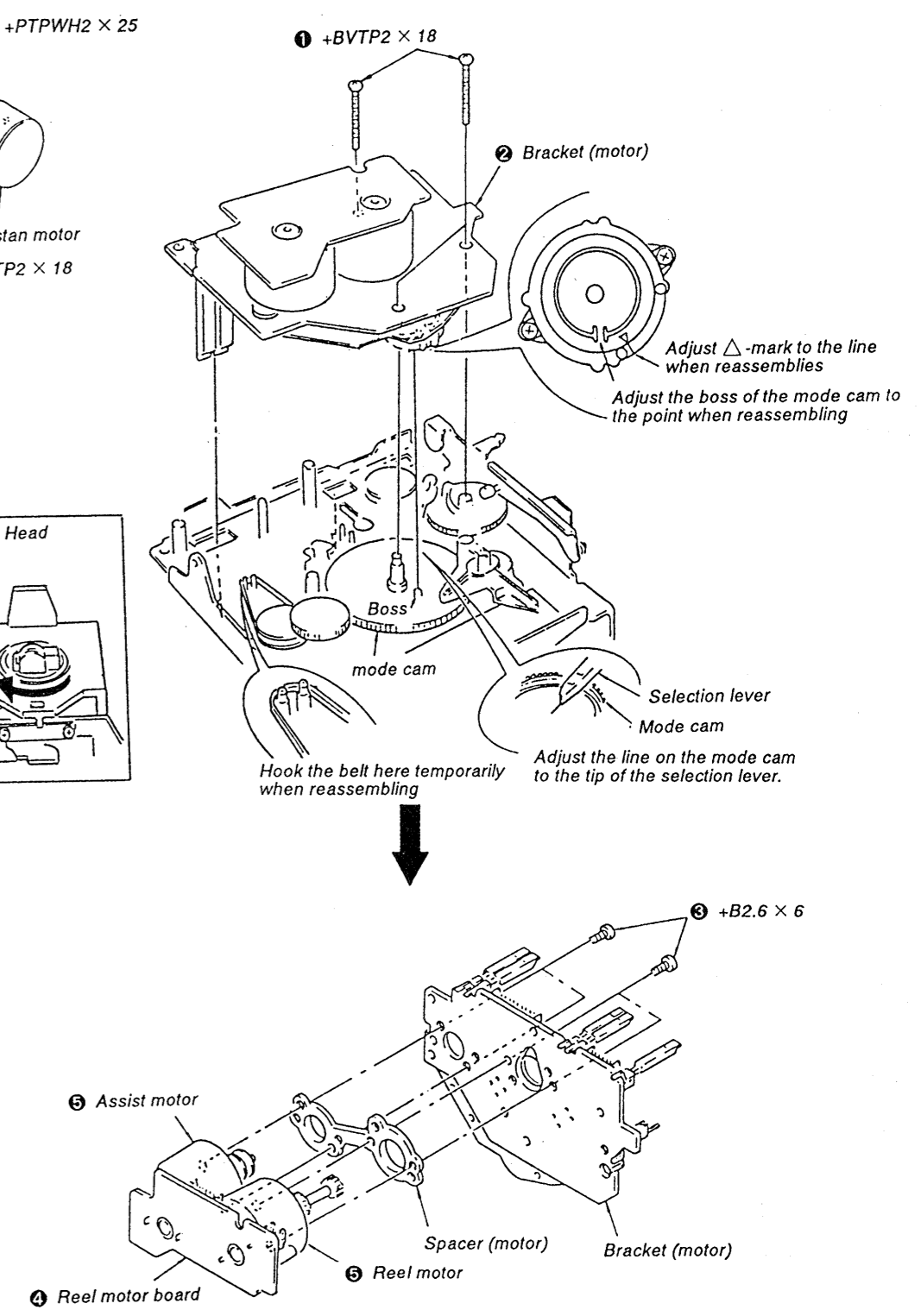
**CAPSTAN PLATE, FLYWHEEL**



**PINCH LEVER, HEAD**



**REEL AND ASSIST MOTORS**



## SECTION 3 ADJUSTMENTS

### 3-1. MECHANICAL ADJUSTMENTS

#### PRECAUTION

1. Clean the following parts with a denatured-alcohol-moistened swab :
 

record/playback head	pinch roller
erase head	rubber belts
capstan	idler
2. Demagnetize the record/playback head with a head demagnetizer.
3. Do not use a magnetized screwdriver for the adjustments.
4. After the adjustments, apply suitable locking compound to the parts adjusted.
5. The adjustments should be performed in the rated power supply voltage unless otherwise noted.

#### Torque Measurement

Torque	Torque meter	Meter reading
FWD	CQ-102C	30 - 60g·cm (0.42 - 0.83oz·inch)
FWD Back tention	CQ-102C	1 - 5g·cm (0.014 - 0.063oz·inch)
REV	CQ-102RC	30 - 60g·cm (0.42 - 0.83oz·inch)
REV Back tention	CQ-102RC	1 - 5g·cm (0.014 - 0.063oz·inch)
FF, REW	CQ-201B	65 - 90 g·cm (0.90 - 1.25 oz·inch)

### 3-2. ELECTRICAL ADJUSTMENT

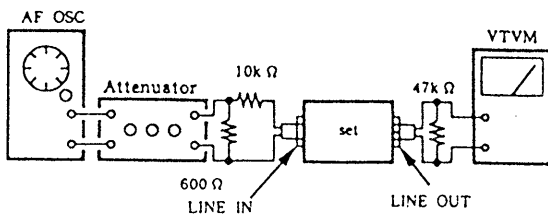
**Note:** The adjustment should be performed in the order given in the service manual. As a rule, adjustments about playback should be performed before those about recording. The adjustments should be performed for both L-CH and R-CH.

- Switches and controls should be set as follows unless otherwise specified.

DOLBY NR switch	: OFF
DIRECTION switch	: →
TIMER switch	: OFF
MPX FILTER switch	: OFF

- Standard Record :  
Deliver the standard input signal level to the input jack and set the REC LEVEL control to obtain the standard output signal level.

-Record Mode-



**0 dB = 775mV**

Standard Input Level

input terminal	LINE IN
source impedance	10k Ω
input level	0.5V (-3.8dB)

Standard Output Level

output terminal	LINE OUT
load impedance	47k Ω
output level	0.5V (-3.8dB)

Test tape

Type	Signal	Used for
P-4-A100	10kHz, -10dB	Azimuth Adjustment
P-4-L300	315Hz, 0dB	PB Level Adjustment
WS-48B	3kHz, 0dB	Tape Speed Adjustment

The set will get into TEST MODE by shorting the pins of TP801 (TEST) on Main board before turning the power on, and TEST MODE functions as follows :

1. High speed playback  
Pressing HIGH SPEED (DUBBING) button while playback changes to high speed playback and another press of the button returns the set to normal speed playback.
2. Record memory stop  
When starting recording, tape counter is reset to zero and counter memory turned on.

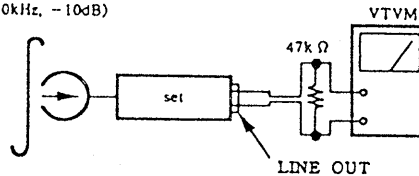
#### Record/Playback Head Azimuth Adjustment

**DECK A**   **DECK B**

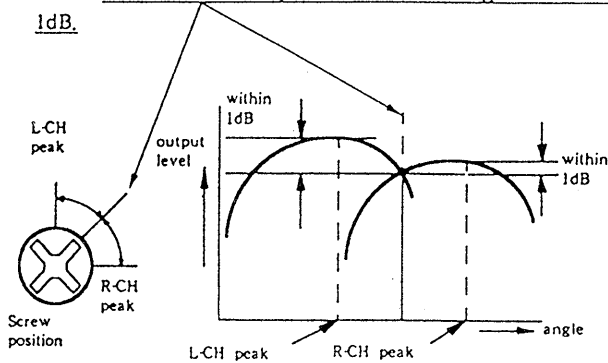
**Procedure :**

1. Mode : FWD playback

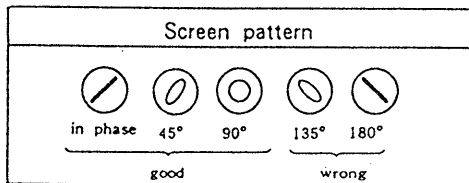
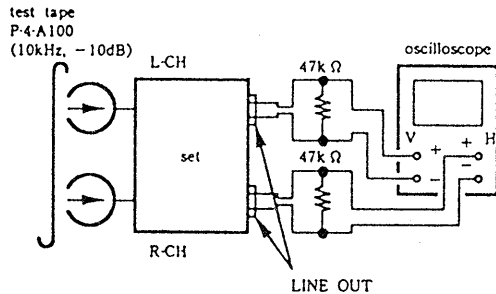
Test tape  
P-4-A100  
(10kHz, -10dB)



- Turn the adjustment screw for the maximum output levels. If these levels do not match, turn the adjustment screw until both of output levels match together within 1dB.

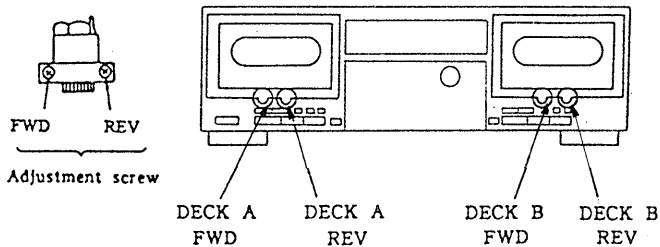


- Phase Check  
Mode : playback



- Set in the REV mode and repeat the step 1-3.
- After the adjustment, lock the screws with locking compound.

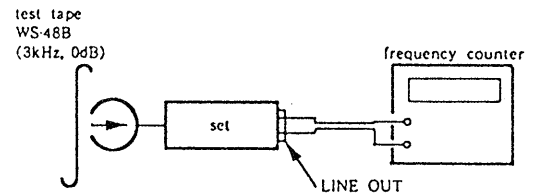
Adjustment Location : Record/Playback head



### Tape Speed Adjustment DECK A DECK B

Procedure :  
Mode : playback

Perform high speed adjustment before normal speed adjustment



(high speed adjustment)

- Short test pin TP801 (TEST) on Main board.
- Set to FWD playback mode.
- Press the HIGH SPEED DUBBING switch.
- Adjust RV871 (DECK A) and RV881 (DECK B) on Main board so that the frequency counter reading becomes  $6,000 \pm 30\text{Hz}$ .
- After adjustment, disconnect TP801 shorted in step 1.

(normal speed adjustment)

- Set to FWD playback mode.
- Adjust RV872 (DECK A) and RV882 (DECK B) on Main board so that the frequency counter reading becomes  $3,000 \pm 15\text{Hz}$ .

Frequency difference between the beginning and the end of the tape should be within 5%.

Frequency difference between deck A and deck B should be within 20 Hz (high speed) or 10 Hz (normal speed).

Adjustment Location: Main board

### Pitch Control Speed Adjustment DECK A

- Set TAPE SPEED (RV901) to the center and turn on S902.
- Play back DECK A FWD and adjust rv891.  
Adjustment value :  $3000\text{Hz} \pm 10\text{Hz}$   
A, B deviation within  $10\text{Hz}$   
Speed difference : VOL MAX  $3250\text{Hz} \pm 70\text{Hz}$   
: VOL MIN  $2710\text{Hz} \pm 70\text{Hz}$

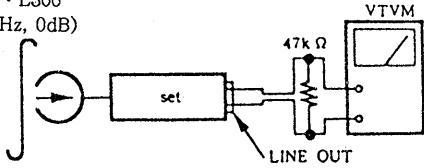
Adjustment Location : Main board

**Playback Level Adjustment** DECK A DECK B

**Procedure :**

Mode : playback

test tape  
P · 4 · L300  
(315Hz, 0dB)



Adjust RV131 (L-ch) and RV231 (R-ch) for DECK A and RV151 (L-ch) and RV251 (R-ch) for DECK B so that the reading on VTVM meter the adjustment limits below.

**Adjustment Limits :**

LINE OUT level : -8.2dB to -7.2dB (0.301 to 0.338V)

Level difference between channels : less than 0.5dB

Check that the LINE OUT level does not change even if Playback and Stop operation is repeated several times.

Adjustment Location : MAIN board

**Bias Current Adjustment**

**Procedure :**

1. Set RV121 and RV221 (DECK A), RV141 and RV241 (DECK B) to mechanical center and turn the set recording mode.
2. Connect digital voltmeter as shown by the following table.
3. Adjust the following transformers for the minimum readings on the digital voltmeter.

DECK		Mesurement Point	Adjustment	Value
A	L	① and ②, TP521	T121	less than 80 mV
	R	② and ③, TP521	T221	
B	L	① and ②, TP541	T141	
	R	② and ③, TP541	T241	

Adjustment Location : MAIN board

**Record Bias Adjustment** DECK A DECK B

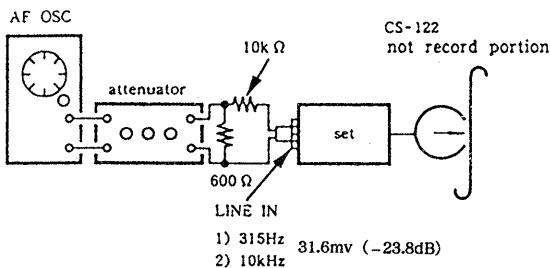
**Setting :**

REC LEVEL control : standard Record (See page 8.)

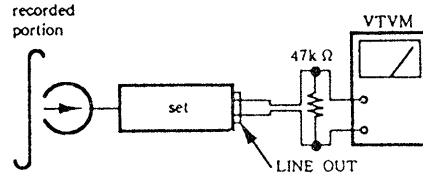
test pin TP801 : short

**Procedure :**

1. Mode : record



2. Mode : playback



Playback the signal recorded in step 1.

Confirm that the 10kHz playback output is  $0 \pm 0.5$ dB relative to the 315Hz output. If necessary, adjust RV121 (L-ch) and RV221 (R-ch) for DECK A and RV141 (L-ch) and RV241 (R-ch) for DECK B, and repeat the steps given above.

Adjustment Location : MAIN board

**Record Level Adjustment** DECK A DECK B

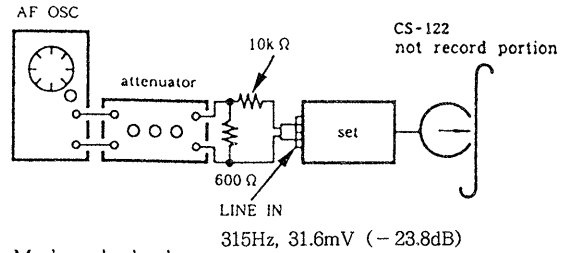
**Setting :**

REC LEVEL control : Standard Record (See page 8.)

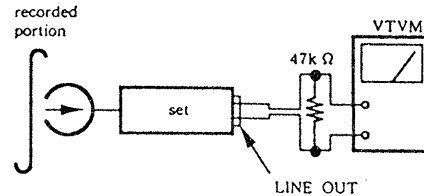
test pin TP801 : short

**Procedure :**

1. Mode : record



2. Mode : playback



3. Playback the signal recorded in step1.

Confirm that the signal level is within the adjustment limits below.

If necessary, adjust RV301 (L-ch) and RV401 (R-ch) for DECK A and RV351 (L-ch) and RV451 (R-ch) for DECK B, and repeat the step1-2.

**Adjustment Limits:** -23.8dB  $\pm$  0.5dB (29 to 33.4mV)

Adjustment Location : Main board

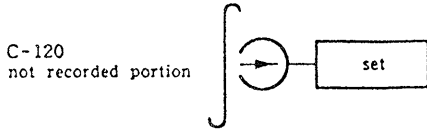


## Quick Reverse Sensitivity Adjustment DECK A DECK B

### Conditions :

DIRECTION MODE switch :  $\rightleftarrows$

### Adjustment procedure :

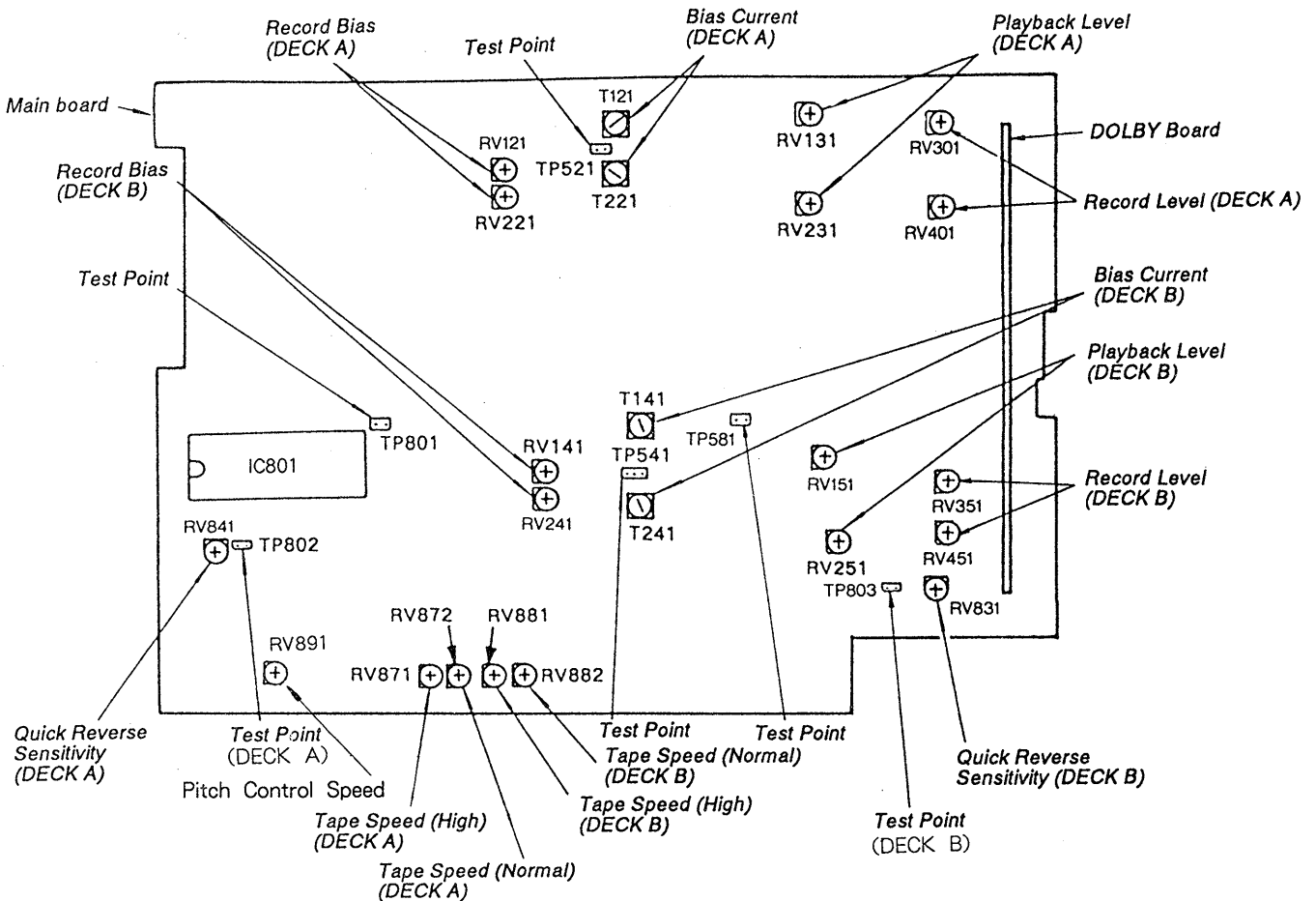


1. Connect the digital voltmeter to test point TP802 (DECK A) / TP803 (DECK B).
2. Load C-120 tape cassette and playback the leading portion in FWD mode.
3. Adjust the RV841 (DECK A), RV831 (DECK B) for  $4.5 \pm 0.5V$  reading on the digital voltmeter.

4. Playback C-120 tape cassette in FWD mode again.
5. Confirm that the reading on the digital voltmeter is "L" level at the magnetic portion of the tape.
6. Confirm that the tape stop around the tape end (border of the leading and the magnetic portions).

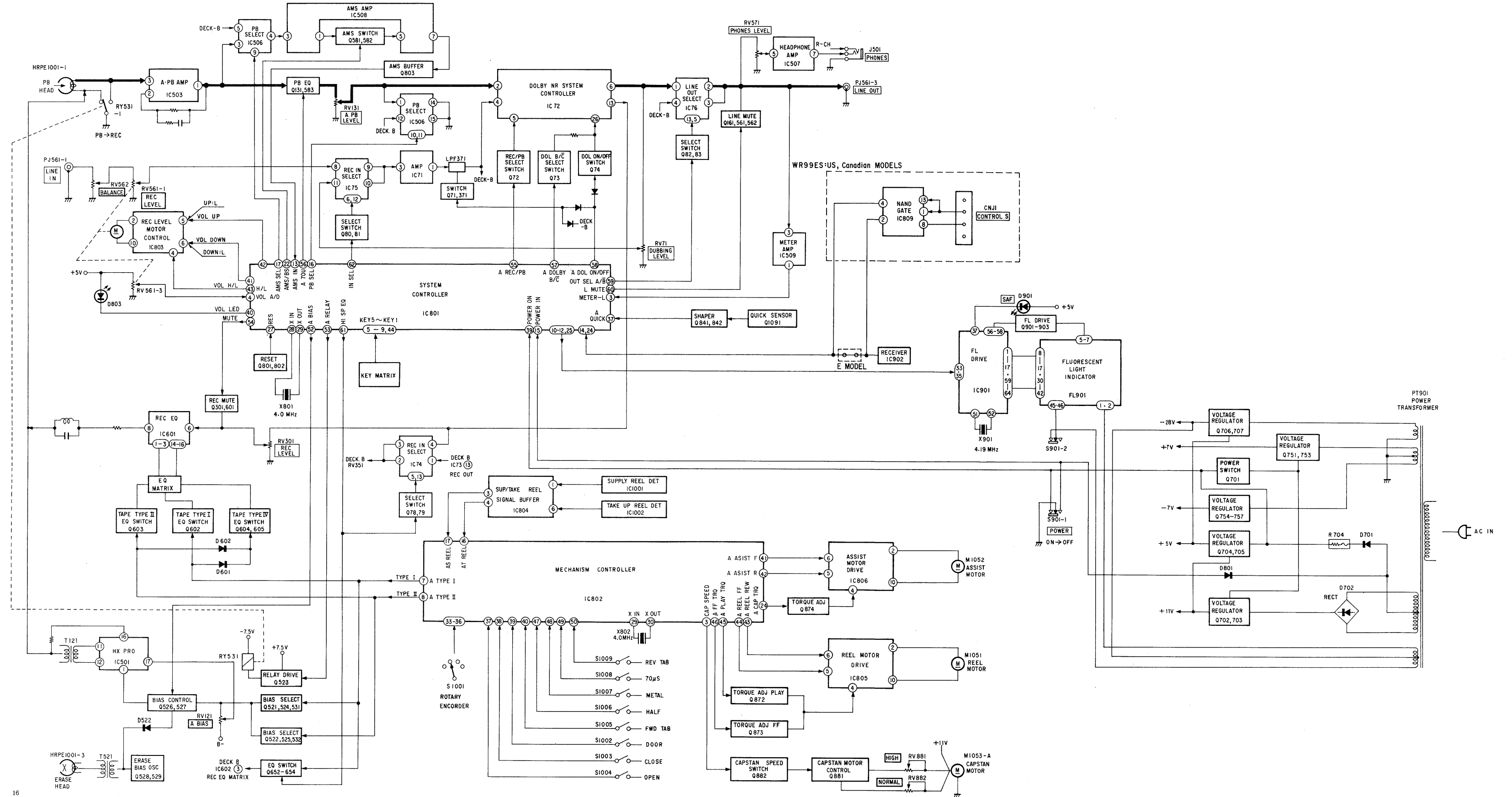
Adjustment Location : MAIN board

### Adjustment Parts Location Diagram(Component side)

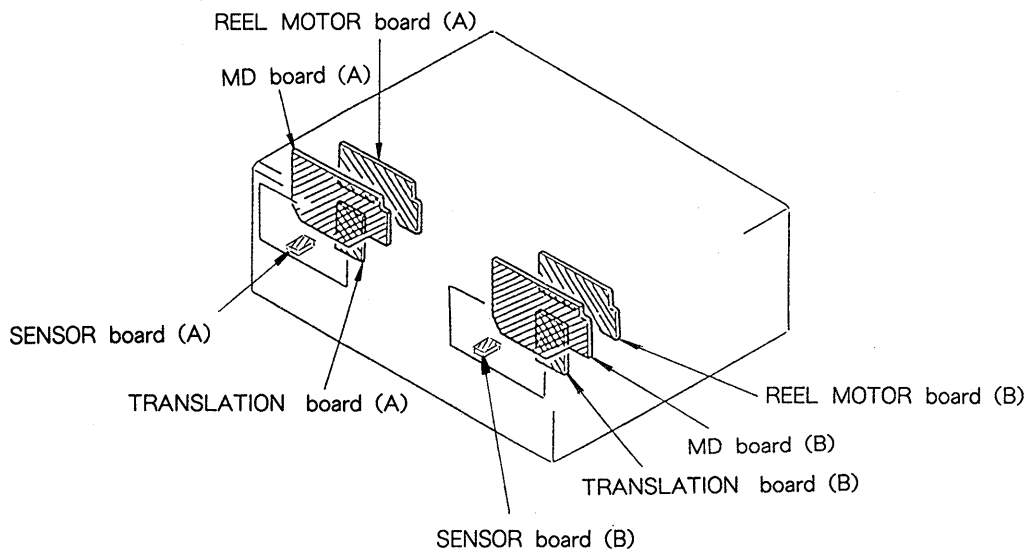
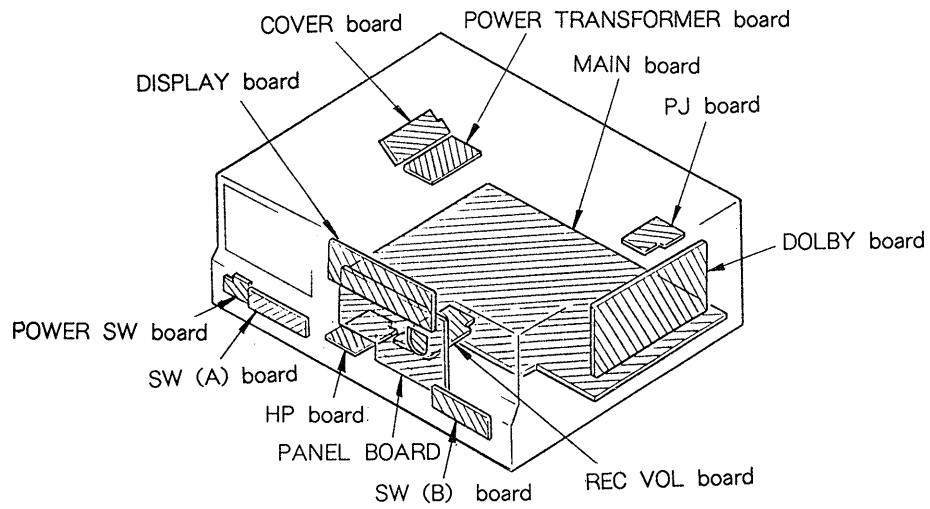


# SECTION 4 DIAGRAMS

## 4-1. BLOCK DIAGRAM

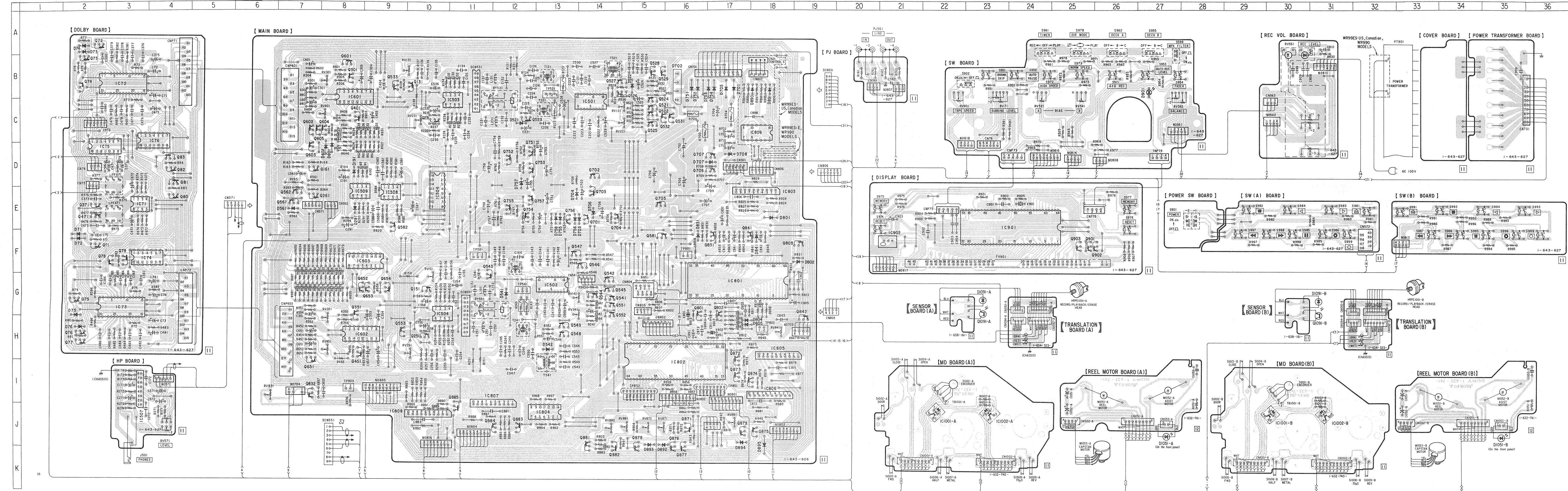


4-1-1. Circuit Boards Location





4-2. PRINTED WIRING BOARDS \*See Page 15 for Circuit Boards location, Page 24 for Semiconductor Lead Layouts.

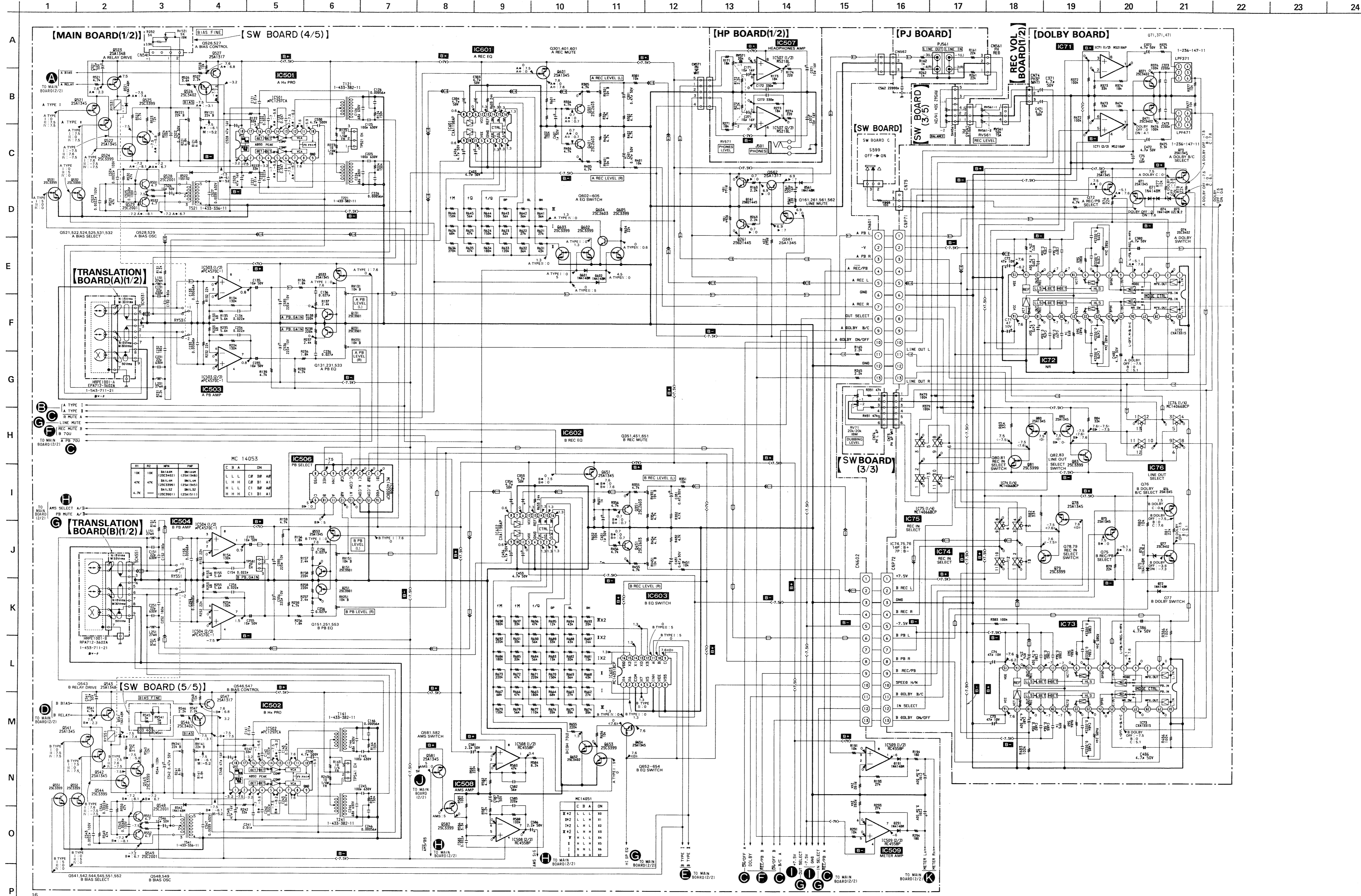


● Semiconductor Location

Ref. No.	Location	Ref. No.	Location	Ref. No.	Location
D71	F-2	IC802	H-8	Q546	F-14
D72	F-2	IC803	F-8	Q547	F-13
D73	A-2	IC801	G-17	Q548	H-13
D74	H-2	IC802	H-16	Q549	H-13
D75	H-2	IC803	F-18	Q551	G-14
D76	H-2	IC804	J-14	Q552	G-14
D191	D-8	IC805	H-18	Q553	H-9
D291	E-8	IC806	I-18	Q561	E-7
D521	C-12	IC807	I-12	Q562	E-7
D522	B-15	IC808	J-10	Q581	F-15
D541	D-12	IC809	C-16	Q582	E-9
D542	H-13	IC901	E-24	Q601	B-8
D561	E-7	IC902	F-21	Q602	C-7
D601	D-8	IC1001-A	J-22	Q603	D-7
D602	D-8	IC1001-B	J-30	Q604	C-8
D701	B-17	IC1002-A	J-23	Q605	C-7
D702	B-16	IC1002-B	J-31	Q651	I-7
D703	E-14			Q652	G-8
D704	E-13	Q71	F-2	Q653	G-9
D705	B-17	Q72	A-2	Q654	G-9
D706	E-14	Q73	B-2	Q701	E-14
D707	D-17	Q74	B-2	Q702	D-14
D708	D-17	Q75	B-2	Q703	I-14
D751	B-16	Q76	H-2	Q704	E-14
D752	B-16	Q77	H-2	Q705	E-15
D753	B-17	Q78	F-3	Q706	D-17
D754	B-17	Q79	F-3	Q707	D-17
D755	E-13	Q80	E-4	Q751	D-12
D756	E-13	Q81	D-4	Q752	D-12
D757	D-12	Q82	D-4	Q753	D-12
D758	E-13	Q83	D-4	Q754	E-12
D801	I-18	Q131	B-10	Q755	E-12
D802	F-19	Q151	G-10	Q756	E-13
D804	H-17	Q161	D-7	Q757	E-12
D805	H-17	Q231	C-10	Q801	G-16
D831	F-16	Q251	H-10	Q802	G-17
D841	F-18	Q261	E-7	Q803	F-19
D890	B-16	Q301	B-8	Q831	F-17
D891	B-17	Q351	G-8	Q832	I-7
D892	J-16	Q371	E-2	Q841	F-17
D893	J-15	Q401	C-8	Q842	G-19
D894	J-17	Q451	H-8	Q871	J-16
D895	J-18	Q471	E-2	Q872	H-17
D901	B-27	Q521	C-15	Q873	I-17
		Q522	C-15	Q874	I-18
IC71	E-3	Q523	C-12	Q875	J-18
IC72	B-3	Q524	B-15	Q876	J-16
IC73	C-3	Q525	C-15	Q877	J-16
IC74	B-3	Q526	B-14	Q878	J-15
IC75	D-2	Q527	B-14	Q879	J-17
IC76	C-4	Q528	B-15	Q881	J-14
IC501	C-14	Q529	B-15	Q882	J-14
IC502	G-16	Q531	C-16	Q883	J-12
IC503	B-11	Q532	C-16	Q884	J-12
IC504	G-10	Q533	B-9	Q885	J-11
IC506	E-10	Q541	G-14	Q901	F-25
IC507	I-3	Q542	G-14	Q902	F-26
IC508	E-9	Q543	F-11	Q903	F-25
IC509	E-8	Q544	G-14	Q1091-A	G-23
IC601	B-8	Q545	G-14	Q1091-B	G-31

Note:  
● : parts extracted from the component side.





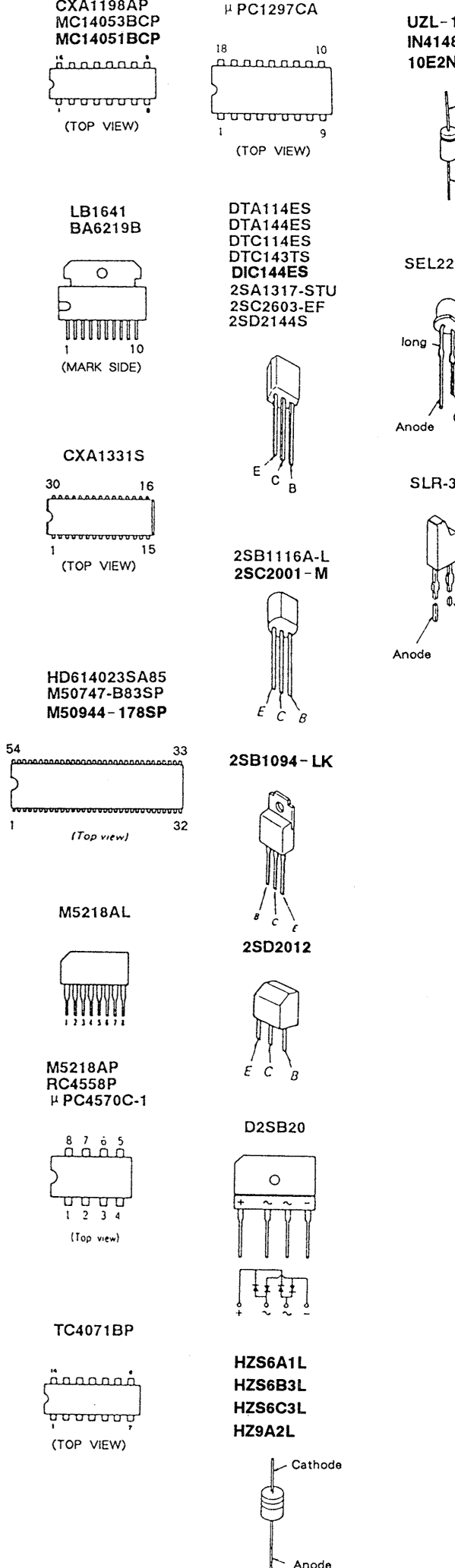
Note:  
 • All capacitors are in  $\mu F$  unless otherwise noted, pF,  $\mu F$ , 50WV or less are not indicated except for electrolytics and tantalums.  
 • All resistors are in  $\Omega$  and  $\frac{1}{2}$  W or less unless otherwise specified.  
 •  $\Delta$ : internal component.  
 •  $\text{---}/\text{---}$ : fusible resistor.

Note:  
 The components identified by mark  $\Delta$  or dotted line with mark  $\Delta$  are critical for safety. Replace only with part number specified.

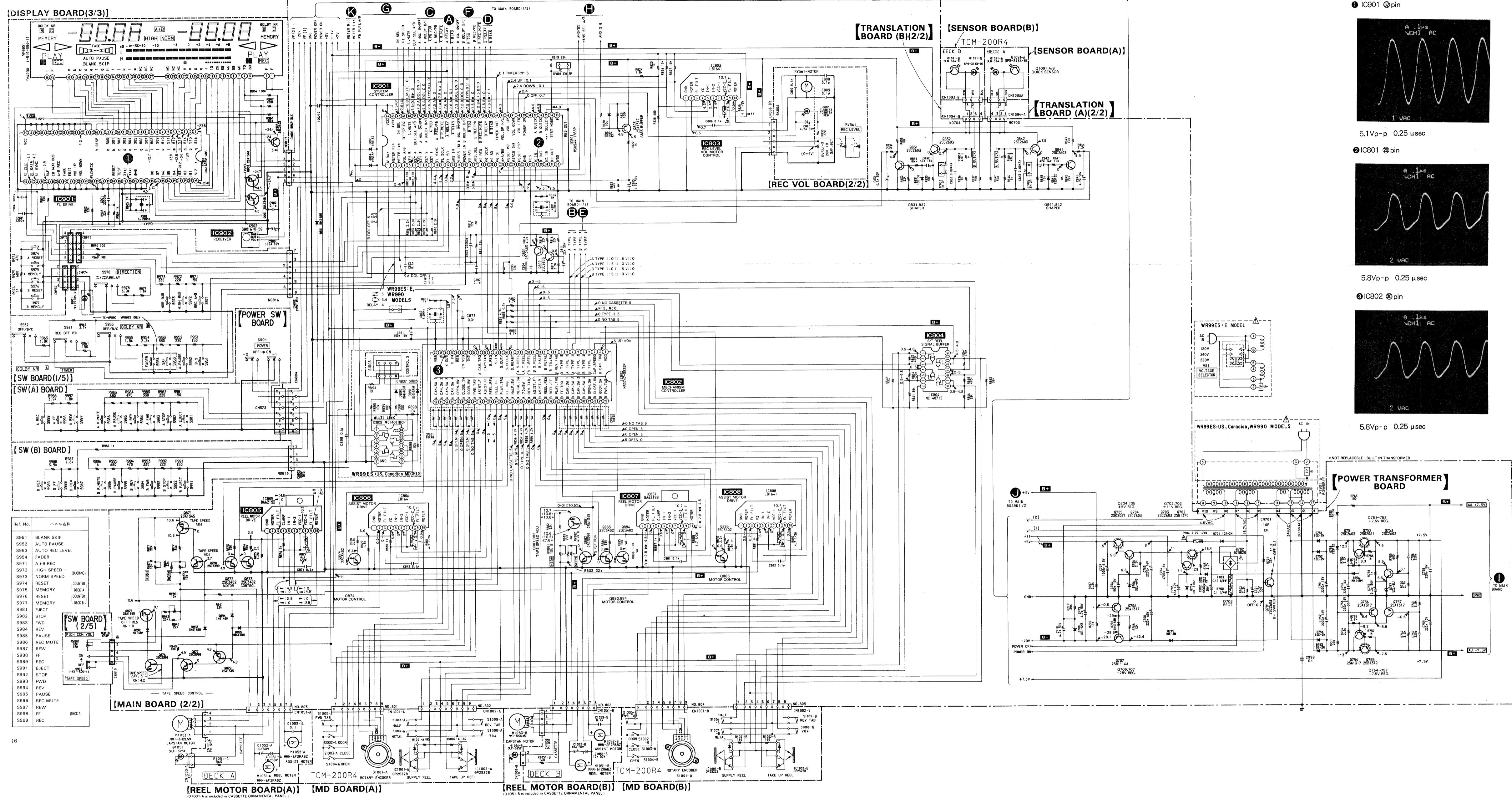
Les composants identifiés par une marque  $\Delta$  sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

- B+ : B + Line
- B- : B - Line
- I : adjustment for repair.
- Voltage and waveforms are dc with respect to ground under no-signal conditions.
- no mark : STOP
- < : NORMAL SPEED DUBBING
- << : HIGH SPEED DUBBING >>
- > : FWD < : REV
- Voltages are taken with a VOM (input impedance 10 M $\Omega$ ).
- Voltage variations may be noted due to normal production tolerances.
- Signal path.
- $\text{---}$  : PB/DECK A
- $\text{---}$  : REC/DECK A
- $\text{---}$  : PB/DECK B
- $\text{---}$  : REC/DECK B

4-4. Semiconductor Lead Layouts



A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P



[DISPLAY BOARD(3/3)]

[TRANSLATION BOARD (B)(2/2)]

[SENSOR BOARD(B)]

[SENSOR BOARD(A)]

[TRANSLATION BOARD (A)(2/2)]

[REC VOL BOARD(2/2)]

[POWER SW BOARD]

[SW BOARD (1/5)]

[SW (A) BOARD]

[SW (B) BOARD]

[SW BOARD (2/5)]

[MAIN BOARD (2/2)]

[REEL MOTOR BOARD(A)]

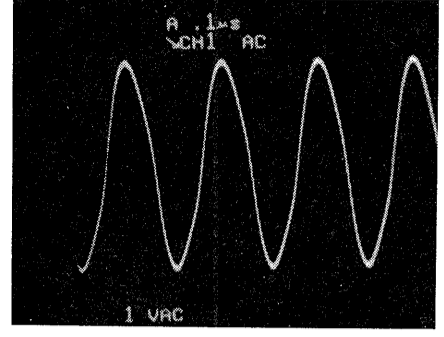
[MD BOARD(A)]

[REEL MOTOR BOARD(B)]

[MD BOARD(B)]

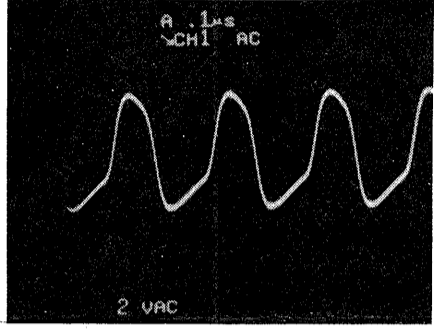
WAVEFORM

① IC901 @pin



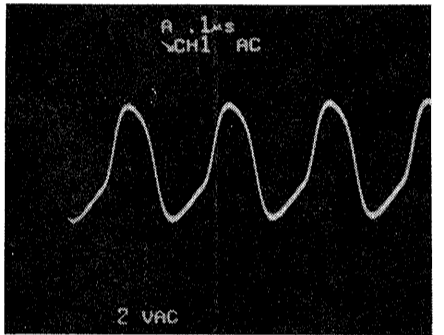
5.1Vp-p 0.25 μsec

② IC801 @pin



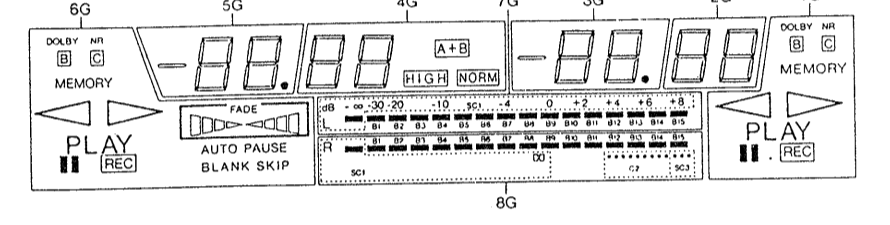
5.8Vp-p 0.25 μsec

③ IC802 @pin



5.8Vp-p 0.25 μsec

• VFD901 Internal Connection

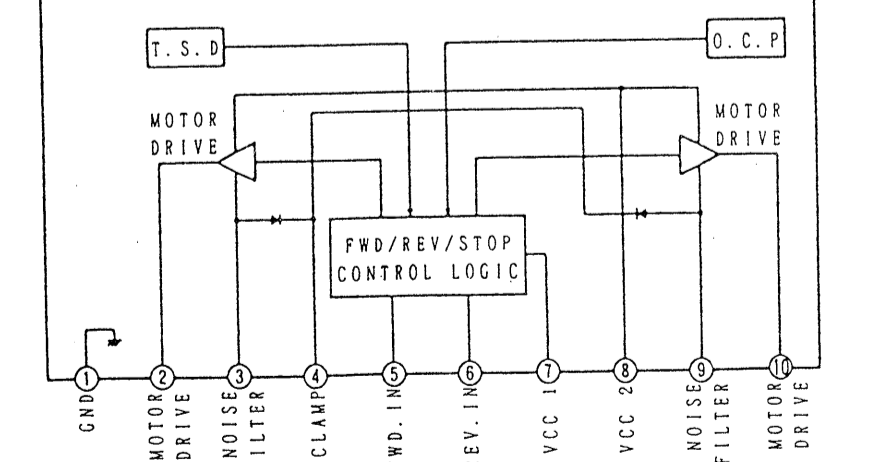


ANODE CONNECTION

	5G	7G	5G	4G	3G	2G	1G
a	SC1	SC1	DOLBY NR	a	a	a	DOLBY NR
b	(B11)	(B11)	MEMO	b	b	b	MEMO
c	(B4)	(B4)	PLAY	c	c	c	PLAY
d	(B5)	(B5)	MEMO	d	d	d	MEMO
e	(B5)	(B5)	MEMO	e	e	e	MEMO
f	(B2)	(B2)	MEMO	f	f	f	MEMO
g	(B3)	(B3)	MEMO	g	g	g	MEMO
h	(B7)	(B7)	MEMO	h	h	h	MEMO
i	(B8)	(B8)	MEMO	i	i	i	MEMO
j	(B9)	(B9)	MEMO	j	j	j	MEMO
k	(B12)	(B12)	MEMO	k	k	k	MEMO
l	(B14)	(B14)	BLANK SKIP	l	l	l	BLANK SKIP
m	(B13)	(B13)	AUTOPAUSE	m	m	m	AUTOPAUSE
n	(B10)	(B10)	MEMO	n	n	n	MEMO
o	(B15)	(B15)	MEMO	o	o	o	MEMO
p	(B15)	(B15)	MEMO	p	p	p	MEMO
q	SC3	SC3	MEMO	q	q	q	MEMO
r	SC2	SC2	MEMO	r	r	r	MEMO

• IC Block Diagram

IC805, 807 BA6219B  
IC803, 806, 808 LB1641

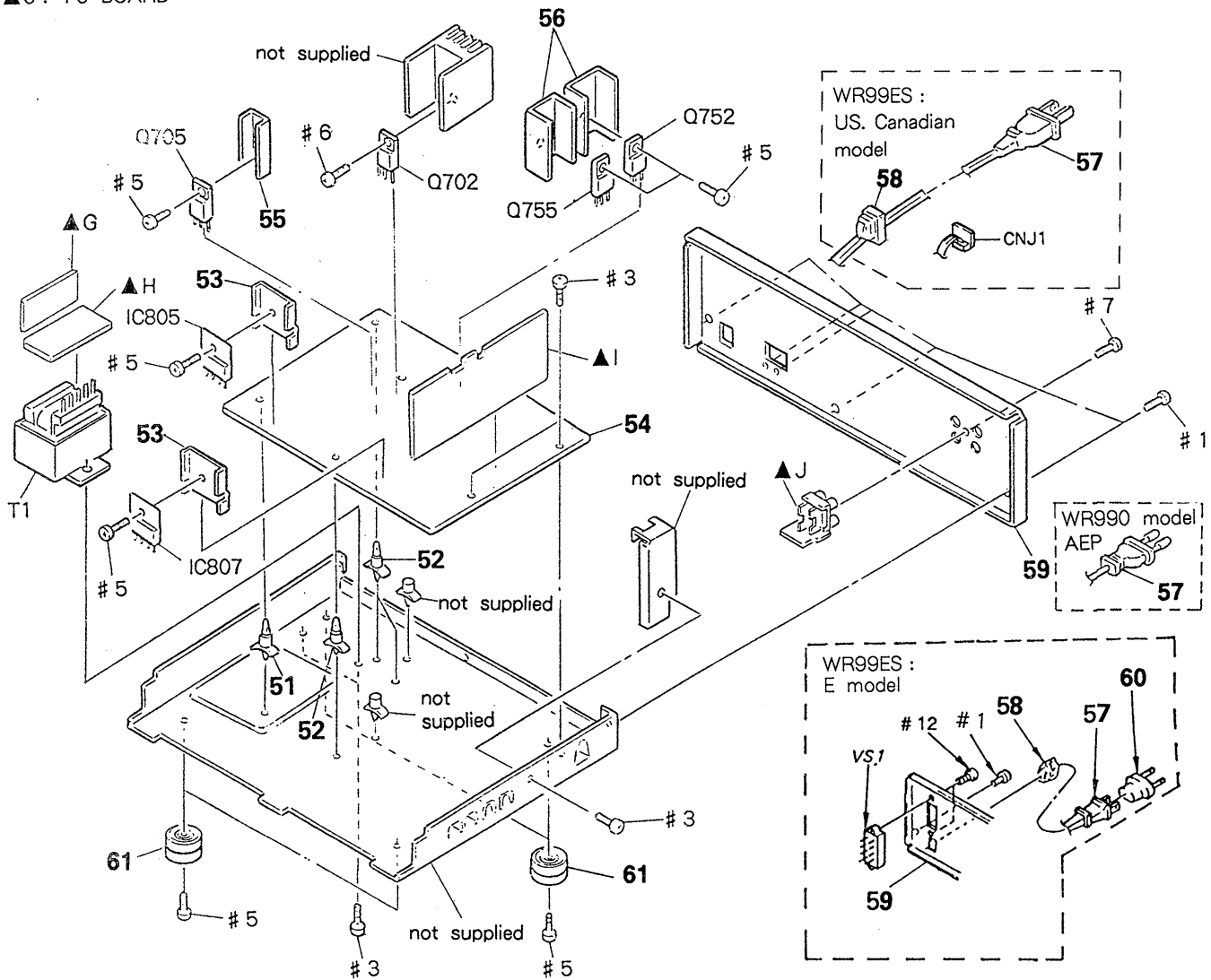






(2) CHASSIS SECTION

- ▲ G : COVER BOARD
- ▲ H : POWER TRANSFORMER BOARD
- ▲ I : DOLBY BOARD
- ▲ J : PJ BOARD



Ref. No.	Part No.	Description	Remarks
51	* 4-924-098-11	HOLDER, PC BOARD	
52	* 3-346-265-11	HOLDER, PC BOARD	
53	* 3-356-925-01	HEAT SINK	
54	* A-2006-725-A	MAIN BOARD, COMPLETE	(WR99ES:E, WR990)
54	* A-2006-727-A	MAIN BOARD, COMPLETE	(WR99ES:US, Canadian)
55	* 3-309-144-21	HEAT SINK	
56	* 4-880-403-11	HEAT SINK	
57	▲ 1-551-188-XX	CORD, POWER	(WR99ES:E)
57	▲ 1-555-795-00	CORD, POWER EULO PLUG	(WR990)
57	▲ 1-590-836-31	CORD, POWER	(WR99ES US, Canadian)
58	* 3-703-244-00	BUSHING (2104), CORD	(WR99ES US, Canadian, WR990)

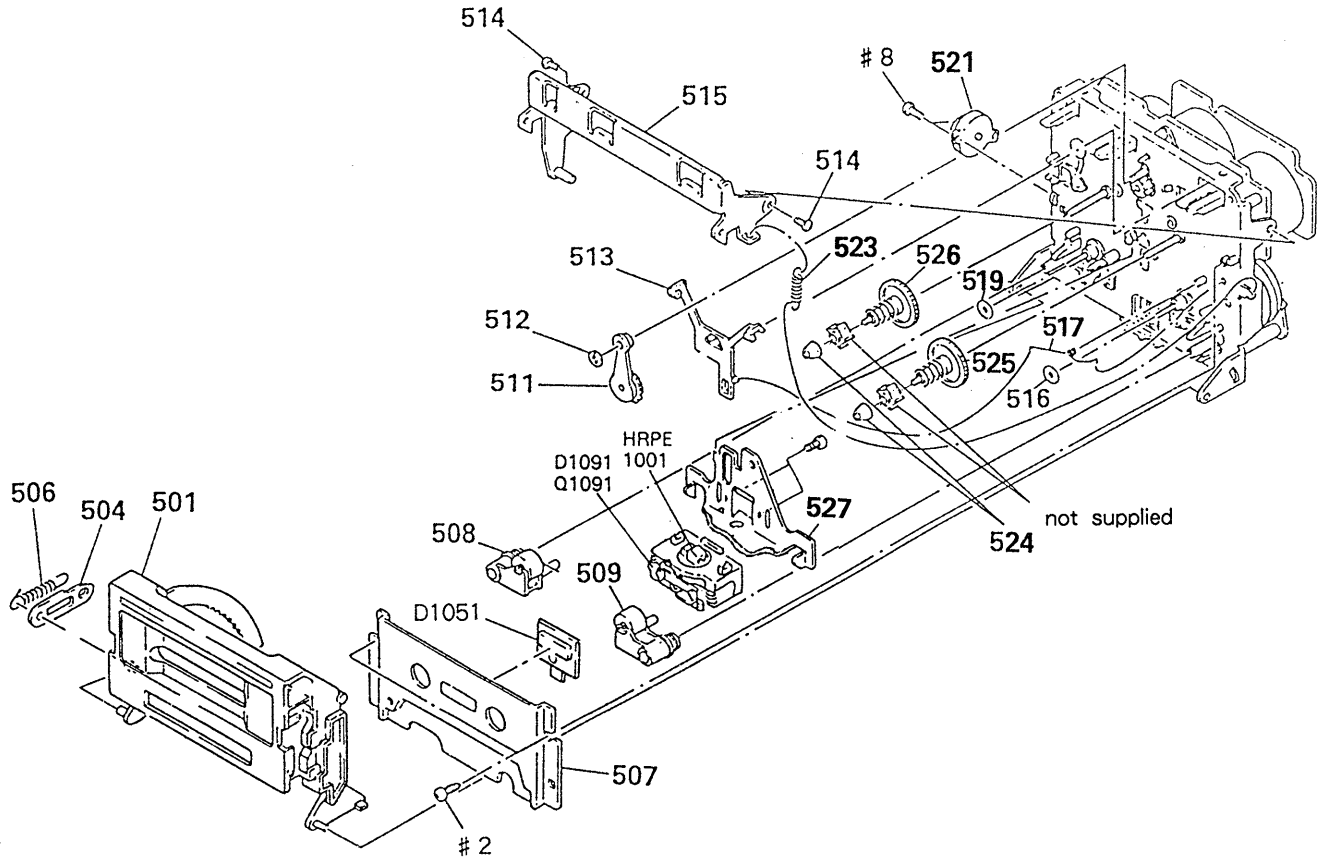
Ref. No.	Part No.	Description	Remarks
58	* 3-703-571-11	BUSHING (S) (4516), CORD	(WR99ES:E)
59	* 3-375-668-11	PANEL, BACK	(WR99ES:US, Canadian)
59	* 3-375-668-41	PANEL, BACK	(WR99ES:E)
59	* 3-375-668-21	PANEL, BACK	(WR990)
60	▲ 1-569-007-11	ADAPTER, CONVERSION 2P	(WR99ES:E)
61	4-943-148-42	FOOT	
T1	▲ 1-450-446-11	TRANSFORMER, POWER	(WR990)
T1	▲ 1-450-444-11	TRANSFORMER, POWER	(WR99ES:US, Canadian)
T1	▲ 1-450-445-11	TRANSFORMER, POWER	(WR99ES:E)
VS1	▲ 1-692-155-11	SELECTOR, POWER VOLTAGE	(WR99ES:E)
CNJ1	1-558-350-21	CORD (WITH CONNECTOR)	(WR99ES:US, Canadian)

**Note:**  
The components identified by mark ▲ or dotted line with mark ▲ are critical for safety. Replace only with part number specified.

**Note:**  
Les composants identifiés par une marque ▲ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

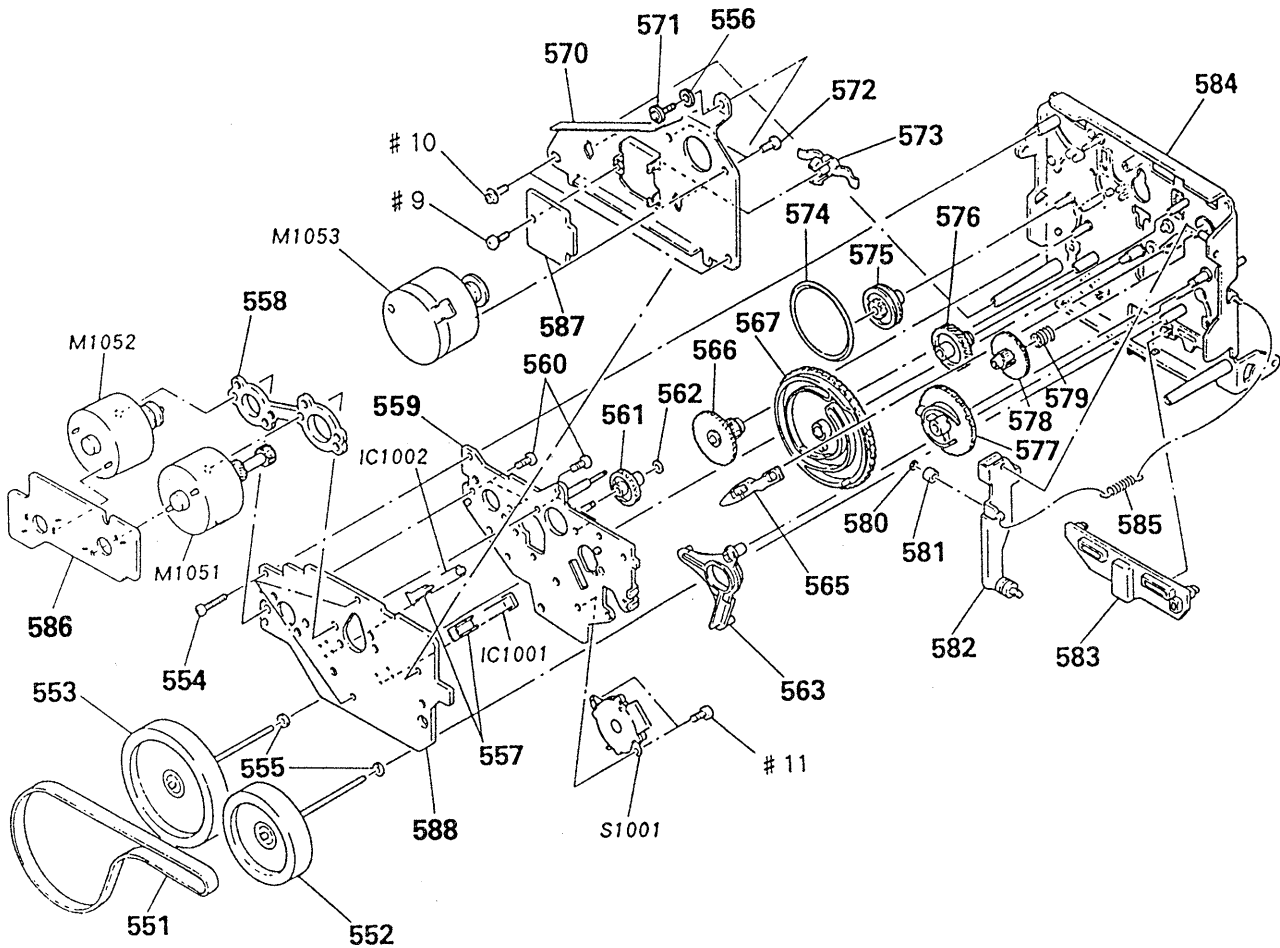


(3) MECHANISM DECK SECTION 1 (TCM-200R4)



Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
501	X-3364-566-1	HOLDER (CD-W) ASSY, CASSETTE		519	3-356-714-01	WASHER	
504	* 3-356-717-01	LEVER (JOINT)		521	3-712-786-01	DAMPER, OIL	
506	3-356-626-01	SPRING, TENSION		523	3-356-625-01	SPRING, TENSION	
507	X-3356-613-1	PLATE ASSY, ORNAMENTAL		524	3-362-308-01	CAP (REEL)	
508	X-3343-456-1	LEVER (PINCH R) ASSY		525	X-3356-627-1	GEAR (T) ASSY	
509	X-3343-455-1	LEVER (PINCH F) ASSY		526	X-3356-628-1	GEAR (S) ASSY	
511	X-3356-641-1	LEVER (FR2) ASSY		527	X-3362-819-2	SLIDER (HEAD CHASSIS R) ASSY	
512	3-669-465-11	WASHER (1.5), STOPPER		D1051	8-719-980-85	DIODE SLF325C	
513	3-356-614-01	SLIDER (BRAKE)		D1091	8-719-950-74	LED SLR314D	
514	3-356-601-11	SCREW, STEP		HRPE1001	A-2003-722-A	DECK ASSY, HEAD	
515	* X-3356-608-1	LEVER (LIFTER) ASSY		Q1091	8-729-809-43	TRANSISTOR SPS-314B	
516	3-356-713-01	WASHER					
517	3-356-619-01	SPRING (B), TORSION					

(4) MECHANISM DECK SECTION 2 (TCM-200R4)



Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
551	3-356-604-01	BELT (CAPSTAN)		574	3-356-603-01	BELT (MODE)	
552	X-3356-642-1	FLYWHEEL (R FWD) ASSY		575	3-356-607-01	PULLEY (MODE)	
553	X-3356-643-1	FLYWHEEL (R REV) ASSY		576	3-356-703-01	GEAR (COMMUNICATION C)	
554	3-355-801-01	SCREW (BTP 2X18)		577	3-356-616-01	GEAR (LOADING CAM)	
555	3-356-705-01	WASHER (CAPSTAN)		578	3-356-609-01	GEAR (LOADING)	
556	* 3-356-718-01	SPACER (THRUST RETAINER R)		579	3-356-605-01	SPRING, COMPRESSION	
557	3-356-631-01	HOLDER (SENSOR)		580	3-558-708-11	WASHER, STOPPER	
558	* 3-356-628-01	SPACER (MOTOR)		581	3-356-630-01	ROLLER (LOADING)	
559	* X-3356-602-1	BRACKET (MOTOR R) ASSY		582	* X-3356-606-1	LEVER (LOADING) ASSY	
560	3-363-804-01	SCREW (+P 2.6X6.5)		583	3-356-612-01	SLIDER (REVERSE)	
561	3-356-702-01	GEAR (COMMUNICATION B)		584	X-3356-634-1	CHASSIS (R2) COMPLETE ASSY, MECH	
562	3-669-465-00	WASHER (1.5), STOPPER		585	3-356-624-01	SPRING, TENSION	
563	3-356-613-01	LEVER (MODE)		586	* 1-632-741-11	REAL MOTOR BOARD	
565	3-356-617-01	LEVER (SELECTION)		587	* 1-634-323-11	TRANSLATION BOARD	
566	3-356-606-01	GEAR (MODE)		588	* 1-632-740-11	MD BOARD	
567	3-356-615-01	GEAR (MODE CAM RR)		M1051	X-3356-638-1	MOTOR (REEL R) ASSY	
570	* 3-356-629-01	BRACKET (THRUST RETAINER R)		M1052	X-3356-604-1	MOTOR (ASSIST) ASSY	
571	3-356-707-01	SCREW (+PTPWH 2X25)		M1053	X-3356-605-1	MOTOR (CAPSTAN R) ASSY	
572	4-885-599-00	SCREW, FITTING, REINFORCEMENT		S1001	1-466-525-11	ENCORDER, ROTARY	
573	3-575-321-00	RETAINER, THRUST, CAPSTAN		IC1001	8-749-920-97	DIODE GP2S22B	
				IC1002	8-749-920-97	DIODE GP2S22B	

## SECTION 6 ELECTRICAL PARTS LIST

TRANSLATION    MAIN

**NOTE:**

The components identified by mark  $\Delta$  or dotted line with mark  $\Delta$  are critical for safety. Replace only with part number specified.

Les composants identifiés par une marque  $\Delta$  sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spéci-fie.

When indicating parts by reference number, please include the board name.

- Due to standardization, replacements in the parts list may be different from the parts specified in the diagrams or the components used on the set.
- - XX, - X mean standardized parts, so they may have some difference from the original one.
- RESISTORS  
All resistors are in ohms.  
METAL : metal-film resistor  
METAL OXIDE : Metal Oxide-film resistor  
F : nonflammable
- Items marked "\*" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- SEMICONDUCTORS  
In each case, u :  $\mu$ , for example :  
uA... :  $\mu$ A... , uPA... ,  $\mu$ PA... ,  
uPB... ,  $\mu$ PB... , uPC... ,  $\mu$ PC... ,  
uPD... ,  $\mu$ PD...
- CAPACITORS :  
uF :  $\mu$ F
- COILS  
uH :  $\mu$ H

Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
	* 1-634-323-11	TRANSLATION BOARD *****		C153	1-130-469-00	MYLAR 680PF 5% 50V	
		< CONNECTOR >		C154	1-136-157-00	FILM 0.022uF 5% 50V	
CN1091 *	1-564-709-11	PIN, CONNECTOR (SMALL TYPE) 7P		C155	1-124-657-00	ELECT 10uF 20% 50V	
CN1092 *	1-564-509-11	PLUG, CONNECTOR 6P		C156	1-136-158-00	FILM 0.027uF 5% 50V	
CN1093 *	1-564-705-11	PIN, CONNECTOR (SMALL TYPE) 3P		C191	1-123-382-00	ELECT 3.3uF 20% 100V	
CN1094 *	1-564-506-11	PLUG, CONNECTOR 3P		C192	1-164-159-11	CERAMIC 0.1uF 50V	
*****				C221	1-136-153-00	FILM 0.01uF 5% 50V	
	* A-2006-727-A	MAIN BOARD, COMPLETE (WR99ES:US, Canadian) *****		C222	1-136-157-00	FILM 0.022uF 5% 50V	
	* A-2006-725-A	MAIN BOARD, COMPLETE (WR99ES:E, WR990) *****		C223	1-136-161-00	FILM 0.047uF 5% 50V	
	7-685-646-79	SCREW +BVTP 3X8 TYPE2 IT-3		C224	1-136-272-00	FILM 68PF 5% 630V	
	7-682-548-04	SCREW +BVTT 3X8 (S)		C225	1-136-433-11	FILM 100PF 5% 630V	
		< CAPACITOR >		C226	1-130-468-00	MYLAR 560PF 5% 50V	
C121	1-136-153-00	FILM 0.01uF 5% 50V		C231	1-136-935-11	FILM 22PF 5% 630V	
C122	1-136-157-00	FILM 0.022uF 5% 50V		C232	1-162-285-31	CERAMIC 180PF 10% 50V	
C123	1-136-161-00	FILM 0.047uF 5% 50V		C233	1-130-469-00	MYLAR 680PF 5% 50V	
C124	1-136-272-00	FILM 68PF 5% 630V		C234	1-136-157-00	FILM 0.022uF 5% 50V	
C125	1-136-433-11	FILM 100PF 5% 630V		C235	1-124-657-00	ELECT 10uF 20% 50V	
C126	1-130-468-00	MYLAR 560PF 5% 50V		C236	1-136-158-00	FILM 0.027uF 5% 50V	
C131	1-136-935-11	FILM 22PF 5% 630V		C241	1-136-153-00	FILM 0.01uF 5% 50V	
C132	1-162-285-31	CERAMIC 180PF 10% 50V		C242	1-136-157-00	FILM 0.022uF 5% 50V	
C133	1-130-469-00	MYLAR 680PF 5% 50V		C243	1-136-161-00	FILM 0.047uF 5% 50V	
C134	1-136-157-00	FILM 0.022uF 5% 50V		C244	1-136-272-00	FILM 68PF 5% 630V	
C135	1-124-657-00	ELECT 10uF 20% 50V		C245	1-136-433-11	FILM 100PF 5% 630V	
C136	1-136-158-00	FILM 0.027uF 5% 50V		C246	1-130-468-00	MYLAR 560PF 5% 50V	
C141	1-136-153-00	FILM 0.01uF 5% 50V		C251	1-136-935-11	FILM 22PF 5% 630V	
C142	1-136-157-00	FILM 0.022uF 5% 50V		C252	1-162-285-31	CERAMIC 180PF 10% 50V	
C143	1-136-161-00	FILM 0.047uF 5% 50V		C253	1-130-469-00	MYLAR 680PF 5% 50V	
C144	1-136-272-00	FILM 68PF 5% 630V		C254	1-136-157-00	FILM 0.022uF 5% 50V	
C145	1-136-433-11	FILM 100PF 5% 630V		C255	1-124-657-00	ELECT 10uF 20% 50V	
C146	1-130-468-00	MYLAR 560PF 5% 50V		C256	1-136-158-00	FILM 0.027uF 5% 50V	
C151	1-136-935-11	FILM 22PF 5% 630V		C291	1-123-382-00	ELECT 3.3uF 20% 100V	
C152	1-162-285-31	CERAMIC 180PF 10% 50V		C292	1-164-159-11	CERAMIC 0.1uF 50V	
				C301	1-124-902-00	ELECT 0.47uF 20% 50V	
				C303	1-124-927-11	ELECT 4.7uF 20% 100V	
				C304	1-124-927-11	ELECT 4.7uF 20% 100V	
				C351	1-124-902-00	ELECT 0.47uF 20% 50V	
				C353	1-124-927-11	ELECT 4.7uF 20% 100V	
				C354	1-124-927-11	ELECT 4.7uF 20% 100V	
				C401	1-124-902-00	ELECT 0.47uF 20% 50V	
				C403	1-124-927-11	ELECT 4.7uF 20% 100V	

**MAIN**

Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
C404	1-124-927-11	ELECT	4. 7uF 20% 100V	C758	1-126-176-11	ELECT	220uF 20% 10V
C451	1-124-902-00	ELECT	0. 47uF 20% 50V	C759	1-126-176-11	ELECT	220uF 20% 10V
C453	1-124-927-11	ELECT	4. 7uF 20% 100V	C802	1-164-159-11	CERAMIC	0. 1uF 50V
C454	1-124-927-11	ELECT	4. 7uF 20% 100V	C803	1-161-494-00	CERAMIC	0. 022uF 25V
C521	1-124-925-11	ELECT	2. 2uF 20% 100V	C804	1-162-306-11	CERAMIC	0. 01uF 20% 16V
C522	1-124-902-00	ELECT	0. 47uF 20% 50V	C805	1-124-925-11	ELECT	2. 2uF 20% 100V
C523	1-136-230-00	FILM	0. 0022uF 5% 100V	C806	1-164-159-11	CERAMIC	0. 1uF 50V
C524	1-136-230-00	FILM	0. 0022uF 5% 100V	C807	1-164-159-11	CERAMIC	0. 1uF 50V
C525	1-130-856-00	FILM	0. 0068uF 5% 100V	C811	1-126-233-11	ELECT	22uF 20% 50V
C526	1-124-907-11	ELECT	10uF 20% 50V	C831	1-124-927-11	ELECT	4. 7uF 20% 100V
C527	1-136-558-11	FILM	0. 0039uF 5% 630V	C832	1-124-477-11	ELECT	47uF 20% 25V
C528	1-124-477-11	ELECT	47uF 20% 25V	C833	1-130-479-00	MYLAR	0. 0047uF 5% 50V
C529	1-124-477-11	ELECT	47uF 20% 25V	C834	1-124-443-00	ELECT	100uF 20% 10V
C530	1-107-046-00	MICA	4. 7PF 500V	C841	1-124-927-11	ELECT	4. 7uF 20% 100V
C535	1-126-176-11	ELECT	220uF 20% 10V	C842	1-124-477-11	ELECT	47uF 20% 25V
C536	1-126-176-11	ELECT	220uF 20% 10V	C843	1-130-479-00	MYLAR	0. 0047uF 5% 50V
C541	1-124-925-11	ELECT	2. 2uF 20% 100V	C851	1-124-443-00	ELECT	100uF 20% 10V
C542	1-124-902-00	ELECT	0. 47uF 20% 50V	C871	1-164-159-11	CERAMIC	0. 1uF 50V
C543	1-136-230-00	FILM	0. 0022uF 5% 100V	C872	1-164-159-11	CERAMIC	0. 1uF 50V
C544	1-136-230-00	FILM	0. 0022uF 5% 100V	C873	1-162-306-11	CERAMIC	0. 01uF 20% 16V
C545	1-130-856-00	FILM	0. 0068uF 5% 100V	C881	1-164-159-11	CERAMIC	0. 1uF 50V
C546	1-124-907-11	ELECT	10uF 20% 50V	C882	1-164-159-11	CERAMIC	0. 1uF 50V
C547	1-136-558-11	FILM	0. 0039uF 5% 630V	C898	1-164-159-11	CERAMIC	0. 1uF 50V
C548	1-124-477-11	ELECT	47uF 20% 25V			(WR99ES:US, Canadian)	
C549	1-124-477-11	ELECT	47uF 20% 25V	C899	1-161-375-00	CERAMIC	0. 0022uF 20% 50V
C550	1-107-046-00	MICA	4. 7PF 500V			< CONNECTOR >	
C555	1-126-176-11	ELECT	220uF 20% 10V	CN541	1-506-469-11	CONNECTOR	4P, MALE
C556	1-126-176-11	ELECT	220uF 20% 10V	CN561	* 1-564-705-11	PIN, CONNECTOR (SMALL TYPE)	3P
C561	1-124-120-11	ELECT	220uF 20% 25V	CN562	* 1-564-337-00	PIN, CONNECTOR	3P
C562	1-161-494-00	CERAMIC	0. 022uF 25V	CN571	* 1-564-707-11	PIN, CONNECTOR (SMALL TYPE)	5P
C581	1-124-925-11	ELECT	2. 2uF 20% 100V	CN701	* 1-564-513-11	PLUG, CONNECTOR	10P
C582	1-162-217-31	CERAMIC	56PF 5% 50V	CN801	* 1-564-340-61	PIN, CONNECTOR	6P
C583	1-136-157-00	FILM	0. 022uF 5% 50V	CN802	* 1-568-935-11	PIN, CONNECTOR	8P
C585	1-162-286-31	CERAMIC	220PF 10% 50V	CN804	* 1-691-908-11	SOCKET, CONNECTOR	
C586	1-124-925-11	ELECT	2. 2uF 20% 100V	CN805	* 1-564-338-71	PIN, CONNECTOR	4P
C587	1-124-925-11	ELECT	2. 2uF 20% 100V	CN806	* 1-564-340-00	PIN, CONNECTOR	6P
C601	1-124-903-11	ELECT	1uF 20% 50V	CN807	1-565-951-11	SOCKET, CONNECTOR (PC BOARD)	4P
C651	1-124-903-11	ELECT	1uF 20% 50V			(WR99ES:US, Canadian)	
C701	1-124-927-11	ELECT	4. 7uF 20% 100V	CN810	1-506-469-11	CONNECTOR	4P, MALE
C702	1-124-772-11	ELECT	10000uF 20% 25V	CNP601	* 1-691-915-11	CONNECTOR, BOARD TO BOARD	15P
C703	1-124-126-00	ELECT	47uF 20% 10V	CNP602	* 1-691-915-11	CONNECTOR, BOARD TO BOARD	15P
C704	1-124-898-11	ELECT	4700uF 20% 16V			< COMPOSITION CIRCUIT BLOCK >	
C705	1-124-556-11	ELECT	2200uF 20% 16V	CP851	1-233-199-11	COMPOSITION CIRCUIT BLOCK	
C706	1-124-443-00	ELECT	100uF 20% 10V	CP852	1-233-199-11	COMPOSITION CIRCUIT BLOCK	
C707	1-124-471-00	ELECT	1000uF 20% 6. 3V			< DIODE >	
C708	1-124-919-11	ELECT	220uF 20% 63V	D191	8-719-987-63	DIODE	1N4148M
C709	1-124-927-11	ELECT	4. 7uF 20% 100V	D291	8-719-987-63	DIODE	1N4148M
C710	1-124-927-11	ELECT	4. 7uF 20% 100V	D521	8-719-987-63	DIODE	1N4148M
C751	1-124-556-11	ELECT	2200uF 20% 16V	D522	8-719-987-63	DIODE	1N4148M
C752	1-124-556-11	ELECT	2200uF 20% 16V	D541	8-719-987-63	DIODE	1N4148M
C753	1-124-120-11	ELECT	220uF 20% 25V				
C754	1-124-120-11	ELECT	220uF 20% 25V				
C755	1-124-925-11	ELECT	2. 2uF 20% 100V				
C756	1-162-286-31	CERAMIC	220PF 10% 50V				
C757	1-162-286-31	CERAMIC	220PF 10% 50V				

MAIN

Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
D542	8-719-987-63	DIODE 1N4148M				< COIL >	
D561	8-719-987-63	DIODE 1N4148M					
D601	8-719-987-63	DIODE 1N4148M		L131	1-410-780-11	INDUCTOR 27mH	
D602	8-719-987-63	DIODE 1N4148M		L151	1-410-780-11	INDUCTOR 27mH	
D701	8-719-200-77	DIODE 10E2N		L231	1-410-780-11	INDUCTOR 27mH	
				L251	1-410-780-11	INDUCTOR 27mH	
D702	8-719-500-36	DIODE D2SB20				< JACK >	
D703	8-719-987-63	DIODE 1N4148M					
D704	8-719-001-54	DIODE UZL-11HZ					
D705	8-719-200-77	DIODE 10E2N		PJ561	1-573-070-11	JACK, PIN 4P (LINE IN/OUT)	
D706	8-719-933-41	DIODE HZS6C3L				< TRANSISTOR >	
D707	8-719-987-63	DIODE 1N4148M					
D708	8-719-933-38	DIODE HZS6B3L		Q131	8-729-900-74	TRANSISTOR DTC143TS	
D751	8-719-200-77	DIODE 10E2N		Q151	8-729-900-74	TRANSISTOR DTC143TS	
D752	8-719-200-77	DIODE 10E2N		Q161	8-729-922-37	TRANSISTOR 2SD2144S	
D753	8-719-200-77	DIODE 10E2N		Q231	8-729-900-74	TRANSISTOR DTC143TS	
				Q251	8-729-900-74	TRANSISTOR DTC143TS	
D754	8-719-200-77	DIODE 10E2N					
D755	8-719-987-63	DIODE 1N4148M		Q261	8-729-922-37	TRANSISTOR 2SD2144S	
D756	8-719-987-63	DIODE 1N4148M		Q301	8-729-620-05	TRANSISTOR 2SC2603-EF	
D757	8-719-933-33	DIODE HZS6A1L		Q351	8-729-620-05	TRANSISTOR 2SC2603-EF	
D758	8-719-987-63	DIODE 1N4148M		Q401	8-729-620-05	TRANSISTOR 2SC2603-EF	
				Q451	8-729-620-05	TRANSISTOR 2SC2603-EF	
D801	8-719-987-63	DIODE 1N4148M					
D802	8-719-987-63	DIODE 1N4148M	(WR99ES:US, Canadian)	Q521	8-729-900-65	TRANSISTOR DTA144ES	
D804	8-719-987-63	DIODE 1N4148M	(WR99ES:US, Canadian)	Q522	8-729-900-65	TRANSISTOR DTA144ES	
D805	8-719-987-63	DIODE 1N4148M		Q523	8-729-900-61	TRANSISTOR DTA114ES	
D831	8-719-987-63	DIODE 1N4148M		Q524	8-729-900-89	TRANSISTOR DTC144ES	
				Q525	8-729-900-89	TRANSISTOR DTC144ES	
D841	8-719-987-63	DIODE 1N4148M		Q526	8-729-900-80	TRANSISTOR DTC114ES	
D890	8-719-987-63	DIODE 1N4148M		Q527	8-729-821-04	TRANSISTOR 2SA1317-STU	
D891	8-719-987-63	DIODE 1N4148M		Q528	8-729-142-46	TRANSISTOR 2SC2001-M	
D892	8-719-987-63	DIODE 1N4148M		Q529	8-729-142-46	TRANSISTOR 2SC2001-M	
D893	8-719-987-63	DIODE 1N4148M		Q531	8-729-900-89	TRANSISTOR DTC144ES	
D894	8-719-987-63	DIODE 1N4148M		Q532	8-729-900-89	TRANSISTOR DTC144ES	
D895	8-719-987-63	DIODE 1N4148M		Q533	8-729-900-65	TRANSISTOR DTA144ES	
		< IC >		Q541	8-729-900-65	TRANSISTOR DTA144ES	
IC501	8-759-106-56	IC uPC1297CA		Q542	8-729-900-65	TRANSISTOR DTA144ES	
IC502	8-759-106-56	IC uPC1297CA		Q543	8-729-900-61	TRANSISTOR DTA114ES	
IC503	8-759-111-44	IC uPC4570C-1					
IC504	8-759-111-44	IC uPC4570C-1		Q544	8-729-900-89	TRANSISTOR DTC144ES	
IC506	8-759-140-53	IC MC14053BCP		Q545	8-729-900-89	TRANSISTOR DTC144ES	
				Q546	8-729-900-80	TRANSISTOR DTC114ES	
IC508	8-759-945-58	IC RC4558P		Q547	8-729-821-04	TRANSISTOR 2SA1317-STU	
IC509	8-759-945-58	IC RC4558P		Q548	8-729-142-46	TRANSISTOR 2SC2001-M	
IC601	8-752-060-64	IC CXA1198AP					
IC602	8-752-060-64	IC CXA1198AP		Q549	8-729-142-46	TRANSISTOR 2SC2001-M	
IC603	8-759-000-47	IC MC14051BCP		Q551	8-729-900-89	TRANSISTOR DTC144ES	
				Q552	8-729-900-89	TRANSISTOR DTC144ES	
IC801	8-759-059-44	IC M50944-178SP		Q553	8-729-900-65	TRANSISTOR DTA144ES	
IC802	8-759-633-86	IC M50747-B83SP		Q561	8-729-900-65	TRANSISTOR DTA144ES	
IC803	8-759-822-09	IC LB1641					
IC804	8-759-240-71	IC TC4071BP		Q562	8-729-821-04	TRANSISTOR 2SA1317-STU	
IC805	8-759-973-95	IC BA6219B		Q581	8-729-900-65	TRANSISTOR DTA144ES	
				Q582	8-729-900-89	TRANSISTOR DTC144ES	
IC806	8-759-822-09	IC LB1641		Q601	8-729-900-65	TRANSISTOR DTA144ES	
IC807	8-759-973-95	IC BA6219B		Q602	8-729-900-89	TRANSISTOR DTC144ES	
IC808	8-759-822-09	IC LB1641					
IC809	8-759-140-11	IC uPD4011BC (WR99ES:US, Canadian)					

**MAIN**

Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
Q603	8-729-900-89	TRANSISTOR DTC144ES		R137	1-247-840-00	CARBON 2.4K 5%	1/4W
Q604	8-729-620-05	TRANSISTOR 2SC2603-EF		R138	1-247-887-00	CARBON 220K 5%	1/4W
Q605	8-729-900-89	TRANSISTOR DTC144ES		R139	1-249-425-11	CARBON 4.7K 5%	1/4W
Q651	8-729-900-65	TRANSISTOR DTA144ES		R141	1-249-427-11	CARBON 6.8K 5%	1/4W
Q652	8-729-900-80	TRANSISTOR DTC114ES		R142	1-249-435-11	CARBON 33K 5%	1/4W
Q653	8-729-900-89	TRANSISTOR DTC144ES		R143	△1-219-153-11	FUSIBLE 10 5%	1/4W F
Q654	8-729-900-65	TRANSISTOR DTA144ES		R144	1-247-883-00	CARBON 150K 5%	1/4W
Q701	8-729-620-05	TRANSISTOR 2SC2603-EF		R151	1-249-428-11	CARBON 8.2K 5%	1/4W
Q702	8-729-141-83	TRANSISTOR 2SB1094-LK		R152	1-249-433-11	CARBON 22K 5%	1/4W
Q703	8-729-620-05	TRANSISTOR 2SC2603-EF		R153	1-249-403-11	CARBON 68 5%	1/4W
Q704	8-729-620-05	TRANSISTOR 2SC2603-EF		R154	1-247-882-11	CARBON 130K 5%	1/4W
Q705	8-729-209-15	TRANSISTOR 2SD2012		R155	1-249-426-11	CARBON 5.6K 5%	1/4W
Q706	8-729-821-04	TRANSISTOR 2SA1317-STU		R156	1-249-420-11	CARBON 1.8K 5%	1/4W
Q707	8-729-140-04	TRANSISTOR 2SB1116A-L		R157	1-247-840-00	CARBON 2.4K 5%	1/4W
Q751	8-729-620-05	TRANSISTOR 2SC2603-EF		R158	1-247-887-00	CARBON 220K 5%	1/4W
Q752	8-729-209-15	TRANSISTOR 2SD2012		R159	1-249-425-11	CARBON 4.7K 5%	1/4W
Q753	8-729-620-05	TRANSISTOR 2SC2603-EF		R161	1-249-433-11	CARBON 22K 5%	1/4W
Q754	8-729-821-04	TRANSISTOR 2SA1317-STU		R162	1-249-417-11	CARBON 1K 5%	1/4W
Q755	8-729-141-83	TRANSISTOR 2SB1094-LK		R163	1-249-421-11	CARBON 2.2K 5%	1/4W
Q756	8-729-821-04	TRANSISTOR 2SA1317-STU		R164	1-249-432-11	CARBON 18K 5%	1/4W
Q757	8-729-821-04	TRANSISTOR 2SA1317-STU		R165	1-249-421-11	CARBON 2.2K 5%	1/4W
Q801	8-729-620-05	TRANSISTOR 2SC2603-EF		R191	1-249-429-11	CARBON 10K 5%	1/4W
Q802	8-729-620-05	TRANSISTOR 2SC2603-EF		R192	1-247-864-11	CARBON 24K 5%	1/4W
Q803	8-729-821-04	TRANSISTOR 2SA1317-STU		R193	1-249-434-11	CARBON 27K 5%	1/4W
Q831	8-729-620-05	TRANSISTOR 2SC2603-EF		R194	1-249-408-11	CARBON 180 5%	1/4W
Q832	8-729-620-05	TRANSISTOR 2SC2603-EF		R221	1-249-427-11	CARBON 6.8K 5%	1/4W
Q841	8-729-620-05	TRANSISTOR 2SC2603-EF		R222	1-249-435-11	CARBON 33K 5%	1/4W
Q842	8-729-620-05	TRANSISTOR 2SC2603-EF		R223	△1-219-153-11	FUSIBLE 10 5%	1/4W F
Q871	8-729-900-65	TRANSISTOR DTA144ES		R224	1-247-883-00	CARBON 150K 5%	1/4W
Q872	8-729-900-80	TRANSISTOR DTC114ES		R231	1-249-428-11	CARBON 8.2K 5%	1/4W
Q873	8-729-900-80	TRANSISTOR DTC114ES		R232	1-249-433-11	CARBON 22K 5%	1/4W
Q874	8-729-900-80	TRANSISTOR DTC114ES		R233	1-249-403-11	CARBON 68 5%	1/4W
Q875	8-729-900-65	TRANSISTOR DTA144ES		R234	1-247-882-11	CARBON 130K 5%	1/4W
Q876	8-729-900-89	TRANSISTOR DTC144ES		R235	1-249-426-11	CARBON 5.6K 5%	1/4W
Q877	8-729-900-89	TRANSISTOR DTC144ES		R236	1-249-420-11	CARBON 1.8K 5%	1/4W
Q878	8-729-900-89	TRANSISTOR DTC144ES		R237	1-247-840-00	CARBON 2.4K 5%	1/4W
Q879	8-729-900-65	TRANSISTOR DTA144ES		R238	1-247-887-00	CARBON 220K 5%	1/4W
Q881	8-729-900-65	TRANSISTOR DTA144ES		R239	1-249-425-11	CARBON 4.7K 5%	1/4W
Q882	8-729-900-89	TRANSISTOR DTC144ES		R241	1-249-427-11	CARBON 6.8K 5%	1/4W
Q883	8-729-900-80	TRANSISTOR DTC114ES		R242	1-249-435-11	CARBON 33K 5%	1/4W
Q884	8-729-900-80	TRANSISTOR DTC114ES		R243	△1-219-153-11	FUSIBLE 10 5%	1/4W F
Q885	8-729-900-80	TRANSISTOR DTC114ES		R244	1-247-883-00	CARBON 150K 5%	1/4W
		< RESISTOR >		R251	1-249-428-11	CARBON 8.2K 5%	1/4W
R121	1-249-427-11	CARBON 6.8K 5%	1/4W	R252	1-249-433-11	CARBON 22K 5%	1/4W
R122	1-249-435-11	CARBON 33K 5%	1/4W	R253	1-249-403-11	CARBON 68 5%	1/4W
R123	△1-219-153-11	FUSIBLE 10 5%	1/4W F	R254	1-247-882-11	CARBON 130K 5%	1/4W
R124	1-247-883-00	CARBON 150K 5%	1/4W	R255	1-249-426-11	CARBON 5.6K 5%	1/4W
R131	1-249-428-11	CARBON 8.2K 5%	1/4W	R256	1-249-420-11	CARBON 1.8K 5%	1/4W
R132	1-249-433-11	CARBON 22K 5%	1/4W	R257	1-247-840-00	CARBON 2.4K 5%	1/4W
R133	1-249-403-11	CARBON 68 5%	1/4W	R258	1-247-887-00	CARBON 220K 5%	1/4W
R134	1-247-882-11	CARBON 130K 5%	1/4W	R259	1-249-425-11	CARBON 4.7K 5%	1/4W
R135	1-249-426-11	CARBON 5.6K 5%	1/4W	R261	1-249-433-11	CARBON 22K 5%	1/4W
R136	1-249-420-11	CARBON 1.8K 5%	1/4W	R262	1-249-417-11	CARBON 1K 5%	1/4W
				R263	1-249-421-11	CARBON 2.2K 5%	1/4W
				R264	1-249-432-11	CARBON 18K 5%	1/4W

<p><b>Note:</b> The components identified by mark △ or dotted line with mark △ are critical for safety. Replace only with part number specified.</p>	<p><b>Note:</b> Les composants identifiés par une marque △ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.</p>
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MAIN

Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
R265	1-249-421-11	CARBON	2. 2K 5% 1/4W	R587	1-249-421-11	CARBON	2. 2K 5% 1/4W
R291	1-249-429-11	CARBON	10K 5% 1/4W	R588	1-249-441-11	CARBON	100K 5% 1/4W
R292	1-247-864-11	CARBON	24K 5% 1/4W	R601	1-249-417-11	CARBON	1K 5% 1/4W
R293	1-249-434-11	CARBON	27K 5% 1/4W	R602	1-249-441-11	CARBON	100K 5% 1/4W
R294	1-249-408-11	CARBON	180 5% 1/4W	R603	1-247-864-11	CARBON	24K 5% 1/4W
R301	1-249-429-11	CARBON	10K 5% 1/4W	R604	1-249-433-11	CARBON	22K 5% 1/4W
R302	1-249-425-11	CARBON	4. 7K 5% 1/4W	R621	1-249-434-11	CARBON	27K 5% 1/4W
R304	1-249-425-11	CARBON	4. 7K 5% 1/4W	R622	1-249-434-11	CARBON	27K 5% 1/4W
R305	1-249-425-11	CARBON	4. 7K 5% 1/4W	R623	1-247-874-11	CARBON	62K 5% 1/4W
R306	1-249-425-11	CARBON	4. 7K 5% 1/4W	R624	1-247-883-00	CARBON	150K 5% 1/4W
R351	1-249-429-11	CARBON	10K 5% 1/4W	R625	1-249-437-11	CARBON	47K 5% 1/4W
R352	1-249-425-11	CARBON	4. 7K 5% 1/4W	R626	1-249-439-11	CARBON	68K 5% 1/4W
R354	1-249-425-11	CARBON	4. 7K 5% 1/4W	R631	1-249-436-11	CARBON	39K 5% 1/4W
R355	1-249-425-11	CARBON	4. 7K 5% 1/4W	R632	1-247-868-11	CARBON	36K 5% 1/4W
R356	1-249-425-11	CARBON	4. 7K 5% 1/4W	R633	1-247-880-11	CARBON	110K 5% 1/4W
R401	1-249-429-11	CARBON	10K 5% 1/4W	R634	1-247-885-00	CARBON	180K 5% 1/4W
R402	1-249-425-11	CARBON	4. 7K 5% 1/4W	R635	1-249-437-11	CARBON	47K 5% 1/4W
R404	1-249-425-11	CARBON	4. 7K 5% 1/4W	R636	1-247-889-00	CARBON	270K 5% 1/4W
R405	1-249-425-11	CARBON	4. 7K 5% 1/4W	R641	1-249-436-11	CARBON	39K 5% 1/4W
R406	1-249-425-11	CARBON	4. 7K 5% 1/4W	R642	1-249-436-11	CARBON	39K 5% 1/4W
R451	1-249-429-11	CARBON	10K 5% 1/4W	R643	1-249-439-11	CARBON	68K 5% 1/4W
R452	1-249-425-11	CARBON	4. 7K 5% 1/4W	R644	1-247-883-00	CARBON	150K 5% 1/4W
R454	1-249-425-11	CARBON	4. 7K 5% 1/4W	R645	1-247-868-11	CARBON	36K 5% 1/4W
R455	1-249-425-11	CARBON	4. 7K 5% 1/4W	R646	1-249-441-11	CARBON	100K 5% 1/4W
R456	1-249-425-11	CARBON	4. 7K 5% 1/4W	R651	1-249-417-11	CARBON	1K 5% 1/4W
R521	1-249-425-11	CARBON	4. 7K 5% 1/4W	R652	1-249-441-11	CARBON	100K 5% 1/4W
R522	1-249-422-11	CARBON	2. 7K 5% 1/4W	R653	1-247-864-11	CARBON	24K 5% 1/4W
R523	1-249-430-11	CARBON	12K 5% 1/4W	R655	1-247-887-00	CARBON	220K 5% 1/4W
R524	1-249-441-11	CARBON	100K 5% 1/4W	R656	1-249-429-11	CARBON	10K 5% 1/4W
R526	1-249-421-11	CARBON	2. 2K 5% 1/4W	R662	1-249-434-11	CARBON	27K 5% 1/4W
R527	1-249-421-11	CARBON	2. 2K 5% 1/4W	R663	1-249-434-11	CARBON	27K 5% 1/4W
R528	1-249-429-11	CARBON	10K 5% 1/4W	R664	1-249-439-11	CARBON	68K 5% 1/4W
R529	1-249-437-11	CARBON	47K 5% 1/4W	R665	1-247-885-00	CARBON	180K 5% 1/4W
R530	1-249-437-11	CARBON	47K 5% 1/4W	R666	1-249-437-11	CARBON	47K 5% 1/4W
R531	1-249-389-11	CARBON	4. 7 5% 1/4W	R667	1-249-439-11	CARBON	68K 5% 1/4W
R532	1-249-389-11	CARBON	4. 7 5% 1/4W	R668	1-249-436-11	CARBON	39K 5% 1/4W
R541	1-249-425-11	CARBON	4. 7K 5% 1/4W	R669	1-247-868-11	CARBON	36K 5% 1/4W
R542	1-249-422-11	CARBON	2. 7K 5% 1/4W	R670	1-247-883-00	CARBON	150K 5% 1/4W
R543	1-249-430-11	CARBON	12K 5% 1/4W	R671	1-247-887-00	CARBON	220K 5% 1/4W
R544	1-249-441-11	CARBON	100K 5% 1/4W	R672	1-247-870-11	CARBON	43K 5% 1/4W
R546	1-249-421-11	CARBON	2. 2K 5% 1/4W	R673	1-247-889-00	CARBON	270K 5% 1/4W
R547	1-249-421-11	CARBON	2. 2K 5% 1/4W	R674	1-249-436-11	CARBON	39K 5% 1/4W
R548	1-249-429-11	CARBON	10K 5% 1/4W	R675	1-249-436-11	CARBON	39K 5% 1/4W
R549	1-249-437-11	CARBON	47K 5% 1/4W	R676	1-249-440-11	CARBON	82K 5% 1/4W
R550	1-249-437-11	CARBON	47K 5% 1/4W	R677	1-247-885-00	CARBON	180K 5% 1/4W
R551	1-249-389-11	CARBON	4. 7 5% 1/4W	R678	1-247-868-11	CARBON	36K 5% 1/4W
R552	1-249-389-11	CARBON	4. 7 5% 1/4W	R679	1-249-441-11	CARBON	100K 5% 1/4W
R561	1-249-409-11	CARBON	220 5% 1/4W	R681	1-247-858-11	CARBON	13K 5% 1/4W
R562	1-249-433-11	CARBON	22K 5% 1/4W	R682	1-247-866-11	CARBON	30K 5% 1/4W
R581	1-247-887-00	CARBON	220K 5% 1/4W	R683	1-247-858-11	CARBON	13K 5% 1/4W
R582	1-249-425-11	CARBON	4. 7K 5% 1/4W	R684	1-249-438-11	CARBON	56K 5% 1/4W
R583	1-249-437-11	CARBON	47K 5% 1/4W	R685	1-249-435-11	CARBON	33K 5% 1/4W
R584	1-249-428-11	CARBON	8. 2K 5% 1/4W	R686	1-247-885-00	CARBON	180K 5% 1/4W
R585	1-249-441-11	CARBON	100K 5% 1/4W	R687	1-247-864-11	CARBON	24K 5% 1/4W
R586	1-249-423-11	CARBON	3. 3K 5% 1/4W	R688	1-247-870-11	CARBON	43K 5% 1/4W

**MAIN**

Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
R689	1-249-435-11	CARBON	33K 5% 1/4W	R824	1-249-420-11	CARBON	1.8K 5% 1/4W
R690	1-249-438-11	CARBON	56K 5% 1/4W	R825	1-249-417-11	CARBON	1K 5% 1/4W
R691	1-247-866-11	CARBON	30K 5% 1/4W	R826	1-249-429-11	CARBON	10K 5% 1/4W
R692	1-247-887-00	CARBON	220K 5% 1/4W	R827	1-249-429-11	CARBON	10K 5% 1/4W
R693	1-247-862-11	CARBON	20K 5% 1/4W	R828	1-249-415-11	CARBON	680 5% 1/4W
R694	1-247-870-11	CARBON	43K 5% 1/4W	R829	△1-212-950-00	FUSIBLE	4.7 5% 1/2W F
R695	1-249-429-11	CARBON	10K 5% 1/4W	R831	1-249-429-11	CARBON	10K 5% 1/4W
R696	1-249-437-11	CARBON	47K 5% 1/4W	R832	1-249-433-11	CARBON	22K 5% 1/4W
R697	1-249-435-11	CARBON	33K 5% 1/4W	R833	1-249-429-11	CARBON	10K 5% 1/4W
R698	1-247-885-00	CARBON	180K 5% 1/4W	R834	1-249-421-11	CARBON	2.2K 5% 1/4W
R700	△1-219-134-11	FUSIBLE	0.1 5% 1/4W F	R835	1-249-429-11	CARBON	10K 5% 1/4W
R701	1-249-433-11	CARBON	22K 5% 1/4W	R836	1-249-417-11	CARBON	1K 5% 1/4W
R702	1-249-421-11	CARBON	2.2K 5% 1/4W	R837	1-249-412-11	CARBON	390 5% 1/4W
R703	△1-219-154-11	FUSIBLE	0.12 10% 1/4W	R841	1-249-429-11	CARBON	10K 5% 1/4W
R704	△1-219-136-11	FUSIBLE	0.22 10% 1/4W	R842	1-249-433-11	CARBON	22K 5% 1/4W
R705	1-249-422-11	CARBON	2.7K 5% 1/4W	R843	1-249-429-11	CARBON	10K 5% 1/4W
R706	1-249-421-11	CARBON	2.2K 5% 1/4W	R844	1-249-421-11	CARBON	2.2K 5% 1/4W
R707	1-249-421-11	CARBON	2.2K 5% 1/4W	R845	1-249-429-11	CARBON	10K 5% 1/4W
R708	1-249-430-11	CARBON	12K 5% 1/4W	R846	1-249-417-11	CARBON	1K 5% 1/4W
R709	1-249-429-11	CARBON	10K 5% 1/4W	R847	1-249-412-11	CARBON	390 5% 1/4W
R710	1-249-436-11	CARBON	39K 5% 1/4W	R851	1-247-903-00	CARBON	1M 5% 1/4W
R751	1-249-433-11	CARBON	22K 5% 1/4W	R852	1-249-425-11	CARBON	4.7K 5% 1/4W
R752	1-249-421-11	CARBON	2.2K 5% 1/4W	R853	1-249-425-11	CARBON	4.7K 5% 1/4W
R753	1-249-421-11	CARBON	2.2K 5% 1/4W	R854	1-249-425-11	CARBON	4.7K 5% 1/4W
R754	1-249-421-11	CARBON	2.2K 5% 1/4W	R855	1-249-425-11	CARBON	4.7K 5% 1/4W
R755	1-249-421-11	CARBON	2.2K 5% 1/4W	R856	1-249-425-11	CARBON	4.7K 5% 1/4W
R756	1-249-417-11	CARBON	1K 5% 1/4W	R857	1-249-425-11	CARBON	4.7K 5% 1/4W
R757	1-249-417-11	CARBON	1K 5% 1/4W	R858	1-249-425-11	CARBON	4.7K 5% 1/4W
R758	1-249-417-11	CARBON	1K 5% 1/4W	R859	1-249-425-11	CARBON	4.7K 5% 1/4W
R759	1-249-415-11	CARBON	680 5% 1/4W	R861	1-249-436-11	CARBON	39K 5% 1/4W
R760	1-249-422-11	CARBON	2.7K 5% 1/4W	R862	1-249-436-11	CARBON	39K 5% 1/4W
R761	1-249-424-11	CARBON	3.9K 5% 1/4W	R863	1-247-895-00	CARBON	470K 5% 1/4W
R762	1-249-423-11	CARBON	3.3K 5% 1/4W	R864	1-247-895-00	CARBON	470K 5% 1/4W
R763	1-249-405-11	CARBON	100 5% 1/4W	R865	1-249-436-11	CARBON	39K 5% 1/4W
R801	1-249-405-11	CARBON	100 5% 1/4W	R866	1-249-436-11	CARBON	39K 5% 1/4W
R802	1-249-405-11	CARBON	100 5% 1/4W	R867	1-247-895-00	CARBON	470K 5% 1/4W
R803	1-249-433-11	CARBON	22K 5% 1/4W	R868	1-247-895-00	CARBON	470K 5% 1/4W
R804	1-249-433-11	CARBON	22K 5% 1/4W	R871	1-249-433-11	CARBON	22K 5% 1/4W
R806	1-249-421-11	CARBON	2.2K 5% 1/4W	R872	1-247-864-11	CARBON	24K 5% 1/4W
R807	1-249-421-11	CARBON	2.2K 5% 1/4W	R873	1-249-411-11	CARBON	330 5% 1/4W
R808	1-249-421-11	CARBON	2.2K 5% 1/4W	R874	1-247-830-11	CARBON	910 5% 1/4W
R809	1-249-421-11	CARBON	2.2K 5% 1/4W	R875	1-249-418-11	CARBON	1.2K 5% 1/4W
R810	1-249-421-11	CARBON	2.2K 5% 1/4W	R876	1-249-417-11	CARBON	1K 5% 1/4W
R811	1-249-433-11	CARBON	22K 5% 1/4W	R877	△1-212-950-00	FUSIBLE	4.7 5% 1/2W F
R812	1-249-433-11	CARBON	22K 5% 1/4W	R878	1-249-416-11	CARBON	820 5% 1/4W
R813	1-247-903-00	CARBON	1M 5% 1/4W	R879	1-249-419-11	CARBON	1.5K 5% 1/4W
R814	1-249-425-11	CARBON	4.7K 5% 1/4W	R880	1-249-417-11	CARBON	1K 5% 1/4W
R815	1-249-433-11	CARBON	22K 5% 1/4W	R881	△1-212-950-00	FUSIBLE	4.7 5% 1/2W F
R816	1-249-433-11	CARBON	22K 5% 1/4W	R882	1-249-433-11	CARBON	22K 5% 1/4W
R817	1-249-424-11	CARBON	3.9K 5% 1/4W	R883	1-247-864-11	CARBON	24K 5% 1/4W
R819	1-249-433-11	CARBON	22K 5% 1/4W	R884	1-249-411-11	CARBON	330 5% 1/4W
R820	1-249-429-11	CARBON	10K 5% 1/4W	R885	1-247-830-11	CARBON	910 5% 1/4W
R821	1-249-441-11	CARBON	100K 5% 1/4W	R886	1-249-418-11	CARBON	1.2K 5% 1/4W
R822	1-249-417-11	CARBON	1K 5% 1/4W	R887	1-249-417-11	CARBON	1K 5% 1/4W
R823	1-249-437-11	CARBON	47K 5% 1/4W	R888	△1-212-950-00	FUSIBLE	4.7 5% 1/2W F

<p><b>Note:</b> The components identified by mark △ or dotted line with mark △ are critical for safety. Replace only with part number specified.</p>	<p><b>Note:</b> Les composants identifiés par une marque △ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.</p>
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**PANEL** (including SW (A) / (B) / POWER SW/FL/HP/REC VOL/COVER/POWER TRANSFORMER/DOLBY/PJ)

Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
< CAPACITOR >				< CONNECTOR >			
C71	1-124-126-00	ELECT	47uF 20% 10V	CN73	* 1-564-708-11	PIN, CONNECTOR (SMALL TYPE) 6P	
C72	1-124-126-00	ELECT	47uF 20% 10V	CN74	* 1-564-705-11	PIN, CONNECTOR (SMALL TYPE) 3P	
C73	1-124-126-00	ELECT	47uF 20% 10V	CN75	1-506-468-11	CONNECTOR 3P, MALE	
C74	1-124-126-00	ELECT	47uF 20% 10V	CN76	1-564-722-11	PIN, CONNECTOR (SMALL TYPE) 6P	
C75	1-124-903-11	ELECT	1uF 20% 50V	CN563	* 1-564-705-11	PIN, CONNECTOR (SMALL TYPE) 3P	
C171	1-126-157-11	ELECT	10uF 20% 16V	CN572	1-691-909-11	SOCKET, CONNECTOR 8P	
C172	1-162-288-31	CERAMIC	330PF 10% 50V	CNP71	* 1-691-914-11	CONNECTOR, BOARD TO BOARD 15P	
C271	1-126-157-11	ELECT	10uF 20% 16V	CNP72	* 1-691-914-11	CONNECTOR, BOARD TO BOARD 15P	
C272	1-162-288-31	CERAMIC	330PF 10% 50V	CNP73	* 1-691-469-11	CONNECTOR (PC BOARD) (PLUG) 5P	
C371	1-124-927-11	ELECT	4.7uF 20% 100V	CNP74	* 1-691-007-11	CONNECTOR (PC BOARD) (PLUG) 4P	
C372	1-124-927-11	ELECT	4.7uF 20% 100V	CNP76	1-573-105-11	CONNECTOR, PC BOARD (RECEPTACLE)	
C373	1-161-375-00	CERAMIC	0.0022uF 20% 50V	< DIODE >			
C375	1-124-927-11	ELECT	4.7uF 20% 100V	D71	8-719-987-63	DIODE 1N4148M	
C376	1-136-171-00	FILM	0.33uF 5% 50V	D72	8-719-987-63	DIODE 1N4148M	
C377	1-136-174-00	FILM	0.56uF 5% 50V	D73	8-719-933-54	DIODE HZS9A2L	
C378	1-130-475-00	MYLAR	0.0022uF 5% 50V	D74	8-719-987-63	DIODE 1N4148M	
C379	1-130-475-00	MYLAR	0.0022uF 5% 50V	D75	8-719-987-63	DIODE 1N4148M	
C380	1-124-768-11	ELECT	4.7uF 20% 50V	D76	8-719-933-54	DIODE HZS9A2L	
C381	1-124-927-11	ELECT	4.7uF 20% 100V	D901	8-719-301-39	DIODE SEL2210S	
C382	1-136-171-00	FILM	0.33uF 5% 50V	< IC >			
C383	1-136-174-00	FILM	0.56uF 5% 50V	IC71	8-759-634-51	IC M5218AP	
C384	1-130-475-00	MYLAR	0.0022uF 5% 50V	IC72	8-752-059-55	IC CXA1331S	
C385	1-130-475-00	MYLAR	0.0022uF 5% 50V	IC73	8-752-059-55	IC CXA1331S	
C386	1-124-768-11	ELECT	4.7uF 20% 50V	IC74	8-759-000-49	IC uPD4066BC	
C471	1-124-927-11	ELECT	4.7uF 20% 100V	IC75	8-759-000-49	IC uPD4066BC	
C472	1-124-927-11	ELECT	4.7uF 20% 100V	IC76	8-759-000-49	IC uPD4066BC	
C473	1-161-375-00	CERAMIC	0.0022uF 20% 50V	IC507	8-759-634-50	IC M5218AL	
C475	1-124-927-11	ELECT	4.7uF 20% 100V	IC901	8-759-323-40	IC HD614023SA85	
C476	1-136-171-00	FILM	0.33uF 5% 50V	IC902	8-741-100-48	IC SBX1610-59	
C477	1-136-174-00	FILM	0.56uF 5% 50V	< JACK >			
C478	1-130-475-00	MYLAR	0.0022uF 5% 50V	J501	1-507-796-71	JACK (PHONES)	
C479	1-130-475-00	MYLAR	0.0022uF 5% 50V	< FILTER >			
C480	1-124-768-11	ELECT	4.7uF 20% 50V	LPF371	1-236-147-11	FILTER, LOW PASS	
C481	1-124-927-11	ELECT	4.7uF 20% 100V	LPF471	1-236-147-11	FILTER, LOW PASS	
C482	1-136-171-00	FILM	0.33uF 5% 50V	< TRANSISTOR >			
C483	1-136-174-00	FILM	0.56uF 5% 50V	Q71	8-729-900-65	TRANSISTOR DTA144ES	
C484	1-130-475-00	MYLAR	0.0022uF 5% 50V	Q72	8-729-900-65	TRANSISTOR DTA144ES	
C485	1-130-475-00	MYLAR	0.0022uF 5% 50V	Q73	8-729-900-65	TRANSISTOR DTA144ES	
C486	1-124-768-11	ELECT	4.7uF 20% 50V	Q74	8-729-900-80	TRANSISTOR DTC114ES	
C571	1-126-157-11	ELECT	10uF 20% 16V	Q75	8-729-900-65	TRANSISTOR DTA144ES	
C572	1-126-157-11	ELECT	10uF 20% 16V	Q76	8-729-900-65	TRANSISTOR DTA144ES	
C808	1-164-159-11	CERAMIC	0.1uF 50V	Q77	8-729-900-80	TRANSISTOR DTC114ES	
C809	1-164-159-11	CERAMIC	0.1uF 50V	Q78	8-729-900-65	TRANSISTOR DTA144ES	
C810	1-124-927-11	ELECT	4.7uF 20% 100V	Q79	8-729-900-89	TRANSISTOR DTC144ES	
C899	1-164-159-11	CERAMIC	0.1uF 50V	Q80	8-729-900-65	TRANSISTOR DTA144ES	
C901	1-161-494-00	CERAMIC	0.022uF 25V	Q81	8-729-900-89	TRANSISTOR DTC144ES	
C902	1-164-159-11	CERAMIC	0.1uF 50V	Q82	8-729-900-65	TRANSISTOR DTA144ES	
C903	1-124-443-00	ELECT	100uF 20% 10V				
C904	1-161-375-00	CERAMIC	0.0022uF 20% 50V				
C905	1-161-375-00	CERAMIC	0.0022uF 20% 50V				
C999	1-164-159-11	CERAMIC	0.1uF 50V				

**PANEL** (including SW (A) / (B) /POWER SW/FL/HP/REC VOL/COVER/POWER TRANSFORMER/DOLBY/PJ )

Ref. No.	Part No.	Description	Remarks	Ref. No.	Part No.	Description	Remarks
Q83	8-729-900-89	TRANSISTOR DTC144ES		R482	1-247-864-11	CARBON 24K 5% 1/4W	
Q371	8-729-900-80	TRANSISTOR DTC114ES		R483	1-249-441-11	CARBON 100K 5% 1/4W	
Q471	8-729-900-80	TRANSISTOR DTC114ES		R484	1-249-414-11	CARBON 560 5% 1/4W	
				R485	1-247-864-11	CARBON 24K 5% 1/4W	
Q901	8-729-900-61	TRANSISTOR DTA114ES					
Q902	8-729-900-61	TRANSISTOR DTA114ES		R486	1-249-441-11	CARBON 100K 5% 1/4W	
Q903	8-729-620-05	TRANSISTOR 2SC2603-EF		R491	1-249-437-11	CARBON 47K 5% 1/4W	
		< RESISTOR >		R525	1-247-842-11	CARBON 3K 5% 1/4W	
				R545	1-247-842-11	CARBON 3K 5% 1/4W	
R71	1-249-425-11	CARBON 4.7K 5% 1/4W		R830	1-249-410-11	CARBON 270 5% 1/4W	
R72	1-215-455-00	METAL 27K 1% 1/6W					
R73	1-249-417-11	CARBON 1K 5% 1/4W		R901	1-249-411-11	CARBON 330 5% 1/4W	
R74	1-215-455-00	METAL 27K 1% 1/6W		R902	1-249-433-11	CARBON 22K 5% 1/4W	
R75	1-249-417-11	CARBON 1K 5% 1/4W		R903	1-249-433-11	CARBON 22K 5% 1/4W	
				R904	1-249-417-11	CARBON 1K 5% 1/4W	
R76	1-249-433-11	CARBON 22K 5% 1/4W		R905	1-247-903-00	CARBON 1M 5% 1/4W	
R77	1-249-429-11	CARBON 10K 5% 1/4W					
R78	1-249-433-11	CARBON 22K 5% 1/4W		R906	1-249-441-11	CARBON 100K 5% 1/4W	
R79	1-249-433-11	CARBON 22K 5% 1/4W		R907	1-249-441-11	CARBON 100K 5% 1/4W	
R80	1-249-429-11	CARBON 10K 5% 1/4W		R908	1-249-441-11	CARBON 100K 5% 1/4W	
				R951	1-249-407-11	CARBON 150 5% 1/4W	
R81	1-249-433-11	CARBON 22K 5% 1/4W		R952	1-249-409-11	CARBON 220 5% 1/4W	
R82	1-249-435-11	CARBON 33K 5% 1/4W					
R83	1-249-435-11	CARBON 33K 5% 1/4W		R953	1-249-411-11	CARBON 330 5% 1/4W	
R84	1-249-435-11	CARBON 33K 5% 1/4W		R954	1-249-421-11	CARBON 2.2K 5% 1/4W	
R001	1-249-673-11	CARBON 1K 5% 1/2W		R955	1-249-420-11	CARBON 1.8K 5% 1/4W	
				R961	1-249-407-11	CARBON 150 5% 1/4W	
R002	1-249-417-11	CARBON 1K 5% 1/4W		R962	1-249-422-11	CARBON 2.7K 5% 1/4W	
R171	1-249-432-11	CARBON 18K 5% 1/4W					
R172	1-249-421-11	CARBON 2.2K 5% 1/4W		R963	1-249-420-11	CARBON 1.8K 5% 1/4W	
R173	1-249-432-11	CARBON 18K 5% 1/4W		R968	1-249-405-11	CARBON 100 5% 1/4W	
R174	1-249-409-11	CARBON 220 5% 1/4W		R969	1-249-405-11	CARBON 100 5% 1/4W	
				R970	1-249-405-11	CARBON 100 5% 1/4W	
R271	1-249-432-11	CARBON 18K 5% 1/4W		R971	1-249-407-11	CARBON 150 5% 1/4W	
R272	1-249-421-11	CARBON 2.2K 5% 1/4W					
R273	1-249-432-11	CARBON 18K 5% 1/4W		R972	1-249-409-11	CARBON 220 5% 1/4W	
R274	1-249-409-11	CARBON 220 5% 1/4W		R973	1-249-411-11	CARBON 330 5% 1/4W	
R372	1-249-441-11	CARBON 100K 5% 1/4W		R974	1-249-413-11	CARBON 470 5% 1/4W	
				R975	1-249-415-11	CARBON 680 5% 1/4W	
R373	1-249-435-11	CARBON 33K 5% 1/4W		R976	1-249-417-11	CARBON 1K 5% 1/4W	
R374	1-249-432-11	CARBON 18K 5% 1/4W					
R375	1-249-423-11	CARBON 3.3K 5% 1/4W		R977	1-249-420-11	CARBON 1.8K 5% 1/4W	
R376	1-249-441-11	CARBON 100K 5% 1/4W		R978	1-249-424-11	CARBON 3.9K 5% 1/4W	
R377	1-249-428-11	CARBON 8.2K 5% 1/4W		R981	1-249-407-11	CARBON 150 5% 1/4W	
				R982	1-249-409-11	CARBON 220 5% 1/4W	
R379	1-249-441-11	CARBON 100K 5% 1/4W		R983	1-249-411-11	CARBON 330 5% 1/4W	
R381	1-249-414-11	CARBON 560 5% 1/4W					
R382	1-247-864-11	CARBON 24K 5% 1/4W		R984	1-249-413-11	CARBON 470 5% 1/4W	
R383	1-249-441-11	CARBON 100K 5% 1/4W		R985	1-249-415-11	CARBON 680 5% 1/4W	
R384	1-249-414-11	CARBON 560 5% 1/4W		R986	1-249-417-11	CARBON 1K 5% 1/4W	
				R987	1-249-420-11	CARBON 1.8K 5% 1/4W	
R385	1-247-864-11	CARBON 24K 5% 1/4W		R988	1-249-424-11	CARBON 3.9K 5% 1/4W	
R386	1-249-441-11	CARBON 100K 5% 1/4W					
R391	1-249-437-11	CARBON 47K 5% 1/4W		R991	1-249-407-11	CARBON 150 5% 1/4W	
R472	1-249-441-11	CARBON 100K 5% 1/4W		R992	1-249-409-11	CARBON 220 5% 1/4W	
R473	1-249-435-11	CARBON 33K 5% 1/4W		R993	1-249-411-11	CARBON 330 5% 1/4W	
				R994	1-249-413-11	CARBON 470 5% 1/4W	
R474	1-249-432-11	CARBON 18K 5% 1/4W		R995	1-249-415-11	CARBON 680 5% 1/4W	
R475	1-249-423-11	CARBON 3.3K 5% 1/4W					
R476	1-249-441-11	CARBON 100K 5% 1/4W		R996	1-249-417-11	CARBON 1K 5% 1/4W	
R477	1-249-428-11	CARBON 8.2K 5% 1/4W		R997	1-249-420-11	CARBON 1.8K 5% 1/4W	
R479	1-249-441-11	CARBON 100K 5% 1/4W		R998	1-249-424-11	CARBON 3.9K 5% 1/4W	
R481	1-249-414-11	CARBON 560 5% 1/4W					

PANEL (including SW (A) / (B) / POWER SW/FL/HP/REC VOL/COVER/POWER TRANSFORMER/DOLBY/PJ )

Ref. No.	Part No.	Description	Remarks
< VARIABLE RESISTOR >			
RV71	1-241-898-11	RES, VAR, CARBON 10K/10K (DUBBING LEVEL)	
RV521	1-241-895-11	RES, VAR, CARBON 5K (BIAS A)	
RV541	1-241-895-11	RES, VAR, CARBON 5K (BIAS B)	
RV561	1-238-908-11	RES, VAR, CARBON 20K/50K/50K (REC LEVEL)	
RV562	1-241-897-11	RES, VAR, CARBON 50K/50K (BALANCE)	
RV571	1-238-085-11	REA, VAR, CARBON 20K/20K (LEVEL PHONES)	
< SWITCH >			
S599	1-554-118-00	SWITCH, PUSH (1 KEY) (MPX FILTER)	
S901	1-554-118-00	SWITCH, PUSH (1 KEY) (POWER)	
S902	1-554-118-00	SWITCH, PUSH (1 KEY) (TAPE SPEED)	
S951	1-554-303-21	SWITCH, TACTILE (BLANK SKIP)	
S952	1-554-303-21	SWITCH, TACTILE (AUTO PAUSE)	
S953	1-554-303-21	SWITCH, TACTILE (AUTO REC LEVEL)	
S954	1-554-303-21	SWITCH, TACTILE (FADER)	
S955	1-571-452-11	SWITCH, SLIDE (DECK B)	
S961	1-571-452-11	SWITCH, SLIDE (TIMER)	
S962	1-571-452-11	SWITCH, SLIDE (DECK A)	
S971	1-554-303-21	SWITCH, TACTILE (A+B REC)	
S972	1-554-303-21	SWITCH, TACTILE (HIGH SPEED)	
S973	1-554-303-21	SWITCH, TACTILE (NORM SPEED)	
S974	1-554-303-21	SWITCH, TACTILE (RESET A)	
S975	1-554-303-21	SWITCH, TACTILE (MEMORY A)	
S976	1-554-303-21	SWITCH, TACTILE (RESET B)	
S977	1-554-303-21	SWITCH, TACTILE (MEMORY B)	
S978	1-571-452-11	SWITCH, SLIDE (DIR MODE)	
S981	1-554-303-21	SWITCH, TACTILE (▲) A DECK	
S982	1-554-303-21	SWITCH, TACTILE (■) A DECK	
S983	1-554-303-21	SWITCH, TACTILE (▷) A DECK	
S984	1-554-303-21	SWITCH, TACTILE (◁) A DECK	
S985	1-554-303-21	SWITCH, TACTILE (▨) A DECK	
S986	1-554-303-21	SWITCH, TACTILE (○) A DECK	
S987	1-554-303-21	SWITCH, TACTILE (◀) B DECK	
S988	1-554-303-21	SWITCH, TACTILE (▶) B DECK	
S989	1-554-303-21	SWITCH, TACTILE (•) B DECK	
S991	1-554-303-21	SWITCH, TACTILE (▲) B DECK	
S992	1-554-303-21	SWITCH, TACTILE (■) B DECK	
S993	1-554-303-21	SWITCH, TACTILE (▷) B DECK	
S994	1-554-303-21	SWITCH, TACTILE (◁) B DECK	
S995	1-554-303-21	SWITCH, TACTILE (▨) B DECK	
S996	1-554-303-21	SWITCH, TACTILE (○) B DECK	
S997	1-554-303-21	SWITCH, TACTILE (◀) A DECK	
S998	1-554-303-21	SWITCH, TACTILE (▶) A DECK	
S999	1-554-303-21	SWITCH, TACTILE (•) A DECK	
< FLUORESCENT INDICATOR >			
VFD901	1-519-594-11	INDICATOR TUBE, FLUORESCENT	
< VIBRATOR >			
X901	1-577-359-21	VIBRATOR, CERAMIC 4.19MHZ	

Ref. No.	Part No.	Description	Remarks
* 1-632-741-11		REEL MOTOR BOARD *****	
< CAPACITOR >			
C1051	1-124-907-11	ELECT 10uF 20% 50V	
C1052	1-124-907-11	ELECT 10uF 20% 50V	
C1053	1-164-159-11	CERAMIC 0.1uF 50V	
< CONNECTOR >			
CN1051	1-564-501-11	PIN, CONNECTOR 8P	
CN1052 *	1-564-720-11	PIN, CONNECTOR (SMALL TYPE) 4P	
CN1053 *	1-564-718-11	PIN, CONNECTOR (SMALL TYPE) 2P	
< RESISTOR >			
R1051	1-249-414-11	CARBON 560 5% 1/4W	
*****			
MISCELLANEOUS *****			
T1	△1-450-446-11	TRANSFORMER, POWER (WR990)	
CNJ1	1-558-350-21	CORD (WITH CONNECTOR) (WR99ES:US, Canadian)	
T1	△1-450-444-11	TRANSFORMER, POWER (WR99ES:US, Canadian)	
T1	△1-450-445-11	TRANSFORMER, POWER (WR99ES:E)	
VS1	△1-692-155-11	SELECTOR, POWER VOLTAGE (WR99ES:E)	
D1051	8-719-980-85	DIODE SLF325C	
D1091	8-719-950-74	LED SLR314D	
Q1091	8-729-809-43	TRANSISTOR SPS-314B	
S1001	1-466-525-11	ENCORDER, ROTARY	
57	△1-551-188-XX	CORD, POWER (WR99ES:E)	
57	△1-590-836-31	CORD, POWER (WR99ES:US, Canadian)	
57	△1-555-795-00	CORD, POWER EULOPLUG (WR990)	
60	△1-569-007-11	ADAPTER, CONVERSION 2P (WR99ES:E)	
*****			

<p><b>Note:</b> The components identified by mark △ or dot-ted line with mark ▲ are critical for safety. Replace only with part number specified.</p>	<p><b>Note:</b> Les composants identifiés par une marque △ sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.</p>
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Ref. No.	Part No.	Description	Remarks
ACCESSORIES & PACKING MATERIALS			
*****			
1-465-369-11		COMMANDER, REMOTE (RM-J902) (WR99ES:E, WR990)	
1-558-271-11		CORD, CONNECTION	
1-558-271-11		CORD, CONNECTION	
2-181-754-01		COVER, BATTERY (FOR RM-J902) (WR99ES:E WR990)	
* 3-354-915-01		CUSHION (WR99ES)	
* 3-354-913-01		CUSHION (WR990)	
* 3-354-919-41		INDIVIDUAL CARTON (WR99ES)	
* 3-366-699-61		INDIVIDUAL CARTON (WR990)	
3-677-503-00		SHEET (LARGE), PROTECTION (WR99ES:US, Canadian)	
3-704-366-01		SCREW (CASE) (M3X8)	
3-754-915-11		MANUAL, INSTRUCTION (ENGLISH, FRENCH, SPANISH, PORTUGUESE) (WR99ES:Canadian, E, WR990)	
3-754-915-21		MANUAL, INSTRUCTION (ENGLISH) (WR99ES:US)	
3-754-915-41		MANUAL, INSTRUCTION (GERMAN, DUTCH, SWEDISH ITALIAN) (WR990)	
9-910-999-33		INSTRUCTION (WR99ES:US)	

Ref. No.	Part No.	Description	Remarks
<b>HARDWARE LIST</b>			
*****			
#1	7-682-548-09	SCREW +BVTT 3X8 (S)	
#2	7-685-133-19	SCREW +BTP 2.6X6 TYPE2 N-S	
#3	7-682-547-04	SCREW +BVTT 3X6 (S)	
#4	7-685-870-01	SCREW +BVTT 3X5 (S)	
#5	7-682-548-04	SCREW +BVTT 3X8 (S)	
#6	7-685-646-79	SCREW +BVTP 3X8 TYPE2 IT-3	
#7	7-621-849-00	SCREW (BV/RING)	
#8	7-621-255-20	SCREW +BVTT 2X4 (S)	
#9	7-621-770-67	SCREW +BVTT 2.6X6 (S)	
#10	7-685-131-19	SCREW +BTP 2.6X4 TYPE2 N-S	
#11	7-621-255-35	SCREW +BVTT 2X5 (S)	
#12	7-685-534-19	SCREW +BTP 2.6X8 (E)	

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