



Technical Manual

STEREO INTEGRATED DC AMPLIFIER

RA-1000

TABLE OF CONTENTS

Chassis Layout (Top View)	2
Adjustment	3
Addenda	4
Block Diagram	5
Specifications	6
Repair Parts List	7
Schematic Diagram	9
PC Board Diagrams	13

Serial No. Beginning
NC12412

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ROTEL ELECTRONICS CO., LTD.
ROTEL OF AMERICA, INC.
ROTEL HI FI LIMITED

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2ND FLOOR, EVERGLORY BLDG., NO. 305, SECTION 3,
NANKING E. ROAD, TAIPEI, TAIWAN, REPUBLIC OF CHINA

1055 SAW MILL RIVER ROAD, ARDSLEY, N.Y. 10502, U.S.A.
2-4 ERICA ROAD, STACEY BUSHES, MILTON KEYNES,
BUCKINGHAMSHIRE, ENGLAND

TECHNICAL INFORMATION FOR MODEL RA- RB- RC-1000

This publication is a supplement to Technical Manual for the model above, and includes the following.

- Errata
- Revisions and changes made on the units produced after the publication of Technical Manual

This publication should be filed together with the Technical Manual.

A. Errata

- Page 8, Repair Parts List, left column, line 6, Part No. **141810956** of Function SW PCB Ass'y should read **141810958**.
- Page 11, Schematic Diagram for RC-1000, Phono Section, symbol Nos. of the capacitors shown in Fig. 1 are corrected as follows: C425 to C427; C426 to C428.

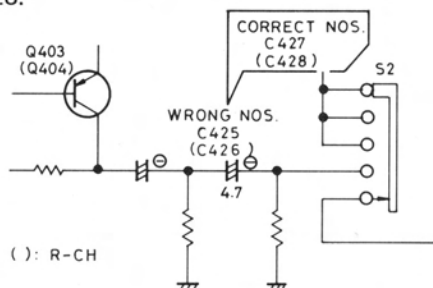


Fig. 1 Phono Amp Circuit (Portion) for RC-1000

The same correction is applied to the Phono Amp PCB in page 14. Also, C426 located at the right side of S2 in the bottom center in the figure should read C428; and C425 at bottom center inside the alternate long and short dash line in the MC amp section should read C427.

B. Changes in and Addition to Circuit Components

- Changes made to RA-1000 (applicable to the units with Serial No. beginning NC61910 or over).
 - MC Head Amp Circuit is added to the Phono Amp Circuit. The Phono Circuit with built-in MC Head Amp is the same as that of the RC-1000. Because of this modification, the capacitors C423, and 424 on the Phono Amp Circuit is changed to 100mfd. +B Circuit is partly modified. Fig. 2 shows the modified and related portion.

- Because of this modification, component parts are added as listed in Table 1 to the models equipped with built-in MC Head Amp. (Not applicable to the conventional unit without MC Head Amp.)

Schematic Location	Description	Part No.
Q401, 402	FET, 2SK155(S)	302001123
Q403, 404	Transistor, 2SA921 (S, T)	301001145
Q405	Transistor, 2SC1318 (R, S)	301201155
D401, 402	Zener Diode, RD3.6EC, 3.6V, 0.4W	300313039
D001	Zener Diode, BZ-120, 12V, 1W	300313004
	Phono Amp Circuit Board Ass'y	141510174*
	Front Panel Ass'y (Metallic Brown)	111911489
	Front Panel Ass'y (Black)	111911490
	Rear Panel	123011520
	Owner's Manual	833201364

* Common to the Phono Amp Circuit Board Ass'y for RC-1000.
 Note: Repair parts for the models without MC Head Amp are as listed in the Parts List of Technical Manual.

Table 1

- Changes for RB-1000

Some component parts of the power supply for the units destined for Canada are changed as follows (conforming to CSA standards):

 - Power Transformer "D-type" 204001475
 - Power Switch (CSA approved type) 614010139
 - Noise Canceller "NSK-132" 470101129
- Changes for RC-1000
 - The value of the capacitor C911 on the power supply circuit is changed from 1,000mfd to 2,200mfd.
 - The primary fuse for the European models is changed.
 F901: from 200mAT to 125mAT
 (Part No. 345952012)

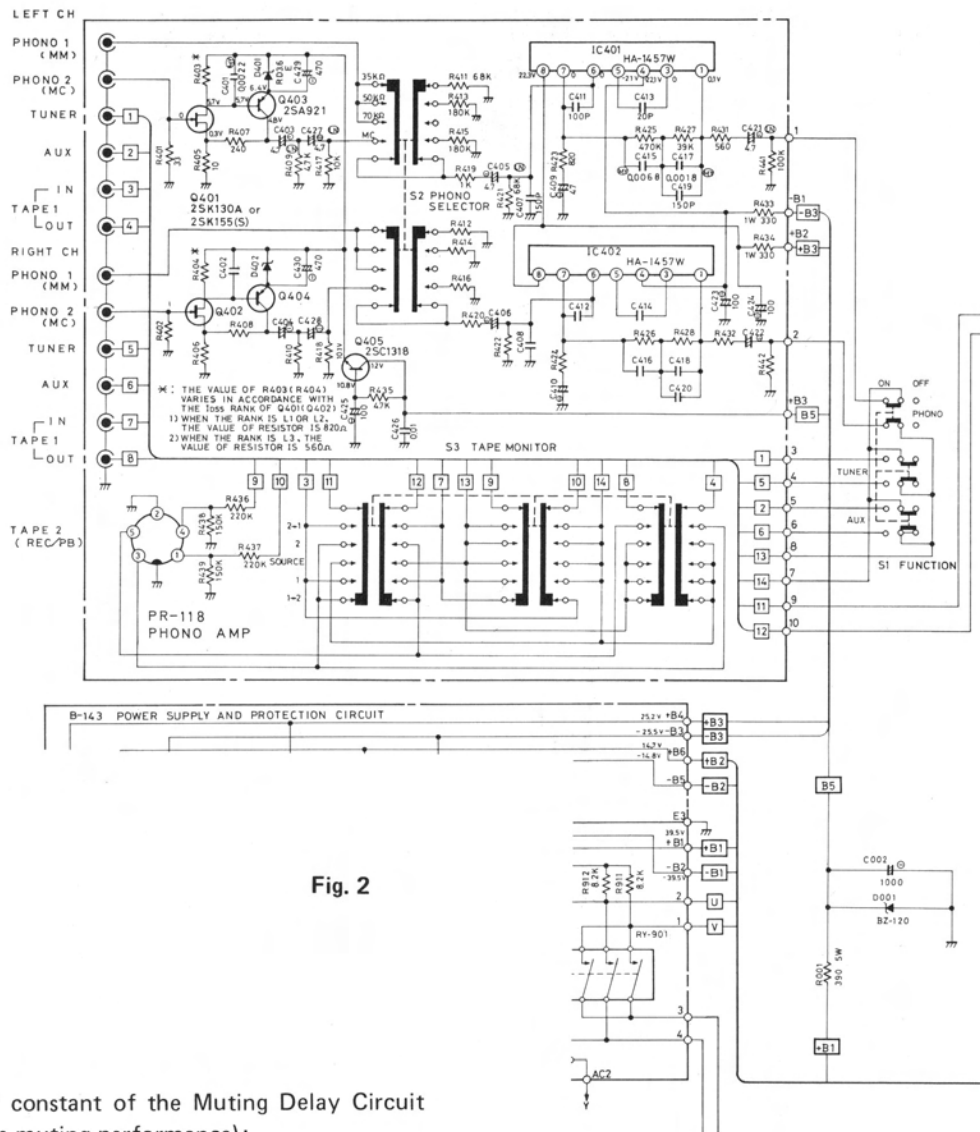


Fig. 2

c) Change of constant of the Muting Delay Circuit (to improve muting performance):

- 1) R804: from 470 kiohms to 220 kiohms
- 2) R805: from 4.7 kilohms to 1.5 kiohms

d) Changes of Headphone Amp Circuit:

- 1) R851: from 10 kilohms to 18 kilohms
- 2) Part of circuit path is cutt off and new wiring is added on the Headphone AMP PCB (X-334). See Fig. 3.

e) Change of Phono Amp Circuit:

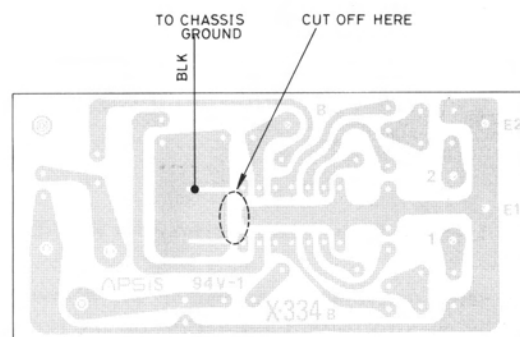
- 1) FET Q401 and 402 are changed from 2SK130 to 2SK155(S).
- 2) Because of the change in (1), R403 and 404 are specified as 820 ohms only.
- 3) Electrolytic capacitors C429 and 430, 470mfd, are added in parallel with D401 and 402. (See Fig. 2 Phono Amp Circuit for RA-1000).

f) The units for Norway and Switzerland are provided with fuse which is placed at the secondary side of the power supply circuit as shown in Fig. 4 (as required by NEMKO and SEV standards).

Fuse Circuit Board Ass'y 141810988
 Fuse, 125mA 345952012
 Fuse Clip 648211147

4. Changes common to RA-1000 and RC-1000

a) Transistors Q501 and 502 on the Tone Amp Circuit are changed from 2SC828 to 2SC1327 (R, S), Part No. 301201175 (in order to improve noise characteristics).



Note: The pattern encircled by the broken line has been cut off.

Fig. 3

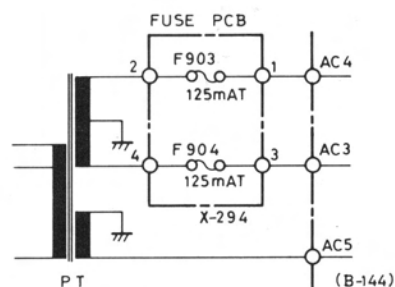
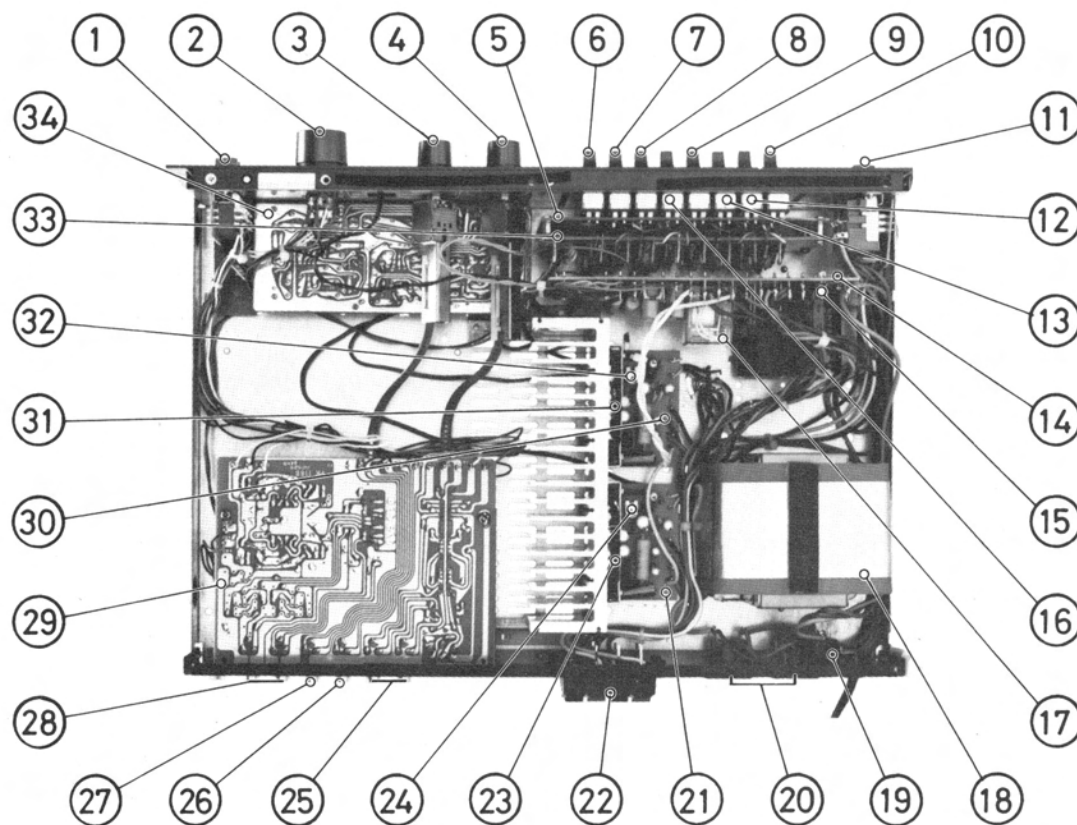


Fig. 4 Power Supply Circuit (Portion) for RC-1000 (NEMKO, SEV Approved Type Only)

Chassis Layout (Top View)

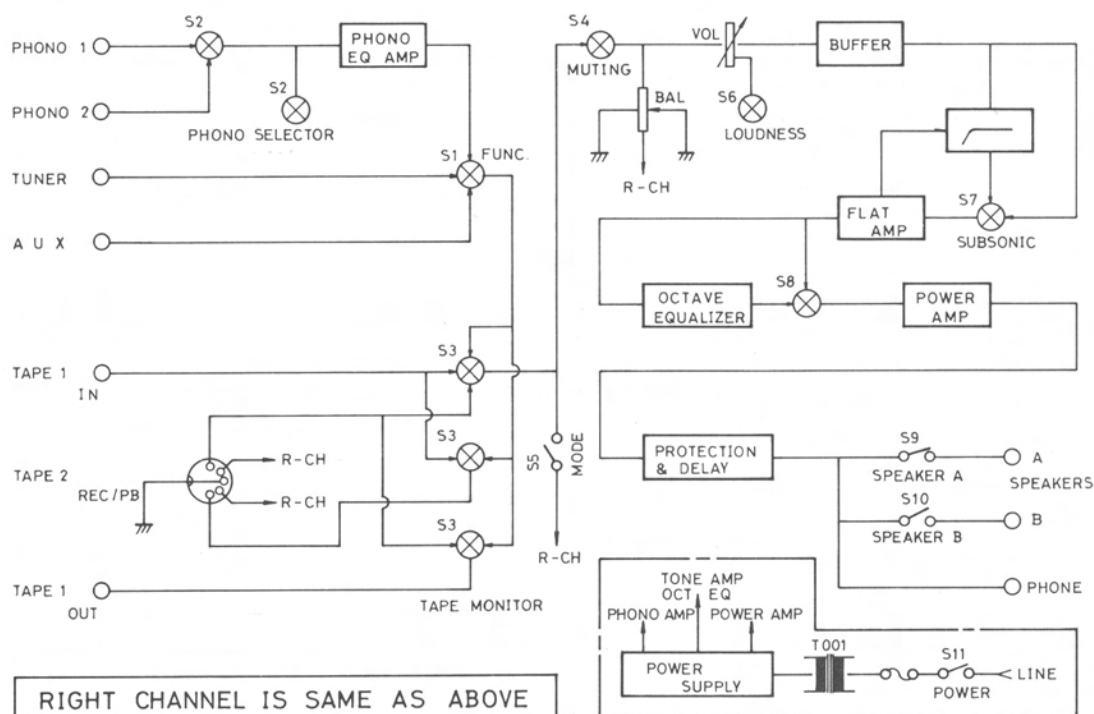
RA-1000



1. Function Selector
2. Volume Control
3. Phono Selector
4. Tape Monitor Switch
5. Acoustics Control PCB (X-332)
6. VR709, 10kHz Control
7. VR708, 5kHz Control
8. VR707, 2.5kHz Control
9. VR705, 400Hz Control
10. VR702, 40Hz Control
11. Power Switch
12. VR703, 100Hz Control
13. VR704, 200Hz Control
14. Power Supply PCB (B-143)
15. F901, AC Fuse
16. VR706, 1 kHz Control
17. RY901, Speaker Relay
18. Power Transformer
19. Voltage Selector
20. AC Outlet
21. L-ch, Main Amp PCB (AF-116)
22. Speaker Terminal
23. IC601, L-ch Power Amp IC
24. VR601, L-ch DC Balance Adj
25. Tape Monitor Jacks
26. AUX Input Jacks
27. TUNER Input Jacks
28. PHONO Input Jacks
29. Phono Amp PCB (PR-118)
30. R-ch Main Amp PCB (AF-116)
31. IC601', R-ch Power Amp IC
32. VR601', R-ch DC Balance Adj
33. Resonator PCB (X-331)
34. Tone Amp PCB (TC-152)

Block Diagram

RA-1000



Adjustment Procedures

DC BALANCE ADJUSTMENT

Instrument: Oscilloscope

- It will take 3 to 7 seconds for the unit (both models) to go into operation after power is turned on.
- RC-1000 does not require this adjustment.

1. Set vertical gain control of the oscilloscope to 0.01 V/cm, and vertical input switch to GND. Bring the trace to central position on the screen; then set the vertical input switch to DC.

2. Connect the oscilloscope to speaker terminals of amplifier. Set volume control of the amplifier to minimum position. Turn on the power.

When DC output appears on the screen (the trace will shift upwards or downwards as shown in Fig. 1), adjust potentiometer VR601 on the main-amplifier PC board so that the DC output trace falls on zero position (the position set up in step 1).

3. Repeat the adjustment in step 2 for the other channel.

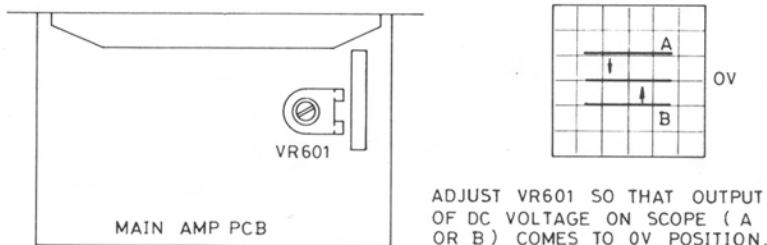


Fig. 1. DC Balance Adjustment (RA-1000, RB-1000)

Addendum

Model RA-1000

1. Values of some components used in output portion of the main amp circuit have been changed as follows:

- a) Resistor R608, changed from 10Ω to 4.7Ω (3W).
- b) Capacitor C610, changed from 0.1mfd to 0.22 mfd.

Reason: To insure stable operation when the unit operates for a long time at high output.

These modifications have been made on the units with serial numbers NC37654 and over. (With some of the units having serial numbers up to NC37654, installing position of R608 and C610 has been changed already for the same reason.)

Models RA-1000 and RC-1000

1. Value of capacitor C505 (C506) on the tone amp circuit has been changed from 1 mfd to 4.7 mfd.

Reason: To reduce residual noise.

This modification has been made on the units with serial numbers NC18450 and over.

Note: Schematic diagram and PC board diagram given in this manual are showing the new value.

2. Specification for tape-monitor switch has been changed from non-short type to non-short/short type.

Reason: To suppress pop-noise produced when the switch is operated.

- Only new type switches will be supplied for repair.

Specifications

AMPLIFIER SECTION	RA-1000	RB-1000	RC-1000
Continuous Rated Power Output RMS, both channels driven 20Hz to 20,000Hz, 0.03% THD	40W*/ch min at 8Ω	65W*/ch min at 8Ω 75W*/ch at 4Ω	Output voltage/Impedance Rated output: 1V/1kΩ Max. output: 3V, 0.1% THD
Total Harmonic Distortion 20Hz to 20,000Hz			
Rated output	Less than 0.03%	Less than 0.03%	Less than 0.03%
1/2 rated output	Less than 0.01%	Less than 0.01%	—
1W power output	Less than 0.01%	Less than 0.01%	—
Intermodulation Distortion 60Hz: 7,000Hz = 4:1	Less than 0.03%	Less than 0.01%	—
Damping Factor 20Hz to 20,000Hz, 8Ω	50	50	—
Frequency Response +0dB, -1dB	5Hz to 70,000Hz (1W power output, 8Ω)	5Hz to 100,000Hz (1W power output, 8Ω)	5Hz to 70,000Hz
Hum and Noise IHF A-network	90dB (AUX, TUNER, ... TAPE IN)	110dB	95dB (AUX, TUNER, TAPE IN)
Residual (volume control set at min.)	1.2mV	150μV	50μV
Input Sensitivity/Impedance	150mV/30kΩ (AUX, TUNER, TAPE IN)	1V/20kΩ	150mV/30kΩ (AUX, TUNER TAPE IN)
Overload at 1,000Hz	5V, 0.5% THD (AUX, TUNER, TAPE IN)	—	6V, 0.1% THD (AUX, TUNER, TAPE IN)
Crosstalk at 10,000Hz (reverse channel input short-circuited)	45dB (AUX, TUNER, TAPE IN)	55dB	45dB (AUX, TUNER, TAPE IN)

PHONO SECTION

Equalization 20Hz to 20,000Hz	RIAA STD ±0.5dB	—	RIAA STD ±0.5dB
Input Sensitivity/Impedance			
PHONO 1 (MM)	2.5mV/35k, 50k, 70kΩ	—	2.5mV/35k, 50k, 70kΩ
PHONO 2	2.5mV/50kΩ (MM)	—	120μV/30Ω (MC)
Overload at 1,000Hz, 0.5% THD			
PHONO 1 (MM)	180mV	—	180mV
PHONO 2	180mV (MM)	—	10mV (MC)
Hum and Noise (IHF A-network)			
PHONO 1	75dB	—	75dB
PHONO 2	75dB (MM)	—	65dB (MC)

CONTROL CHARACTERISTICS

Octave Equalizer (each band)			
Increase	+12dB±1dB	—	+12dB±1dB
Decrease	-12dB±1dB	—	-12dB±1dB
Loudness Contour (volume control set at -40dB position)			
At 100Hz	+10dB±1dB	—	+10dB±1dB
At 10,000Hz	+4dB±1dB	—	+4dB±1dB
Audio Muting	-15dB	—	-15dB
Subsonic Filter	—	—	.15Hz, 12dB/oct

PHONE AMPLIFIER SECTION

Harmonic Distortion at 1,000Hz	—	—	0.6%
Frequency Response, +0dB, -3dB	—	—	50Hz to 60,000Hz
Hum and Noise, IHF A-network	—	—	85dB
Residual Noise	—	—	35μV
Output Impedance	—	—	4 to 16Ω
Crosstalk at 10,000Hz			40dB

MISCELLANEOUS

Power Requirement	120V/60Hz, 220V/50Hz, 240V/50Hz or 120, 220, 240/50-60Hz (switchable)
Power Consumption	300W max 500W max 16W max

*Measured pursuant to the Federal Trading Commission's Trade Regulation Rule on Power Claims for Amplifiers (applicable to the U.S.A. only).
NOTE: Specification and design subject to possible modification without notice.

Repair Parts List

Description	Part No.	Schematic Location		
		RA-1000	RB-1000	RC-1000
TRANSISTORS				
2SK130A(L), FET	302001115	—	—	Q401, 402
2SA921 (S or T)	301001145	Q904	Q904, 906, 907	Q403, 404
2SC1318 (S)	301201155	Q902	Q902	Q405
2SC828 (R or S)	301201115	Q501, 502	—	Q501, 502, 801 to 806
μPA63H(M2) Dual FET	302001121	Q601	Q601	—
2SC1980	301201171	Q901, 903	Q901, 903	—
DIODES				
RD3.6EC, Zener 3.6V, 0.4W	300313039			D401, 402
WZ-162, Zener 16V, 0.5W	300313017	D601	D601	—
WZ-067, Zener 6.7V, 0.5W	300313036	D602	D602	—
1S2472 (Si)	300111010	D903, 904, 905	D903, 904, 905, 906	D801, 802, 908
WZ-052, Zener 5.2V, 0.5W	300313047	—	—	D803, 804
S-5VB-20, Rectifier	300919032	D901	D901	—
RB-152, Rectifier	300919038	—	—	D901
SR1K-4, Rectifier	300919024	D902	D902	D902, 909
WZ-240, Zener 24V, 0.5W	300313025	—	—	D903, 904
WZ-150, Zener 15V, 0.5W	300313027	—	—	D905, 906
BZ-240, Zener 24V, 1W	300313009	D907, 908	—	—
BZ-120, Zener 12V, 1W	300313004	—	—	D907
BZ-140, Zener 14V, 1W	300313005	D909, 910	—	—
SEL-305GC, LED (GRN)	300414015	D911	D911	D911
SEL-105RC, LED (RED)	300414014	—	D912	—
IC'S				
HA-1457W-02	303452192	IC401, 402	—	IC401, 402
NJM 4558-DD	303452152	IC501, 502	—	IC501, 502
SI-1440H	303452219	IC601	—	—
SI-1460H	303452220	—	IC601	—
NJM4558-D or -DV	303452215	IC702 to 709	—	IC701 to 710
LA4170	303452216	—	—	IC851
VARIABLE RESISTORS				
250KWT, Balance Control	515121130	VR501	—	VR501
300B, DC Balance Adj	510502187	VR601	VR601	—
100kW, Slide, Acoustic Control	581005051	VR702 to 709	—	VR701 to 710
100KBTx2, Volume Control	525321118	VR001	—	VR001
20KB, Input Level Control	515321125	—	VR001, 002	—
SWITCHES				
Push 3-key, Function	614030827	S1	—	S1
Slide, Remote, Phono	615212273	S2	—	S2
Slide, Remote, Tape Monitor	615212272	S3	—	S3
Push 1-key, Muting	614010144	S4	—	S4
Push 4-key, Loudness, Etc.	614040828	S5, 6, 7, 8 (1 set)	—	S5, 6, 7, 8 (1 set)
Push 3-key, Speaker, Power	614030829	S9, 10, 11 (1 set)	—	S9, 10, 11 (1 set)
Push 2-key, Speaker	614020433	—	S9, 10 (1 set)	—
Push 1-key, Power	614010138	—	S11	—
OTHERS				
Antiparasitic Coil	228641126	L601	L601	—
Relay, Speaker	240111241	RY901	RY901	—
Fuse, 3.5A-3AG, 120V Area	341222350	F901	—	—
Fuse, 1.6AT, φ5.2 (Europe, UK)	345952160	F901	—	—
Fuse, 5A-3AG, 120V Area	341222500	—	F901	—
Fuse, 2.5AT, φ5.2 (Europe, UK)	345952250	—	F901	—
Fuse, 0.5A-3AG, 120V Area	341222050	—	—	F901, 902
Fuse, 125mA T, φ5.2 (Europe, UK)	345952012	—	—	F901
Fuse, 100mA T, φ5.2 (Europe, UK)	345952010	—	—	F902

COMMON TO ALL MODELS

Description	Part No.
Remote Control Unit,* ¹ Phono Sw	654101151
Remote Control Unit,* ¹ Tape Monitor	654101150
Wire Ass'y,* ¹ Phono Sw	647110010
Wire Ass'y,* ¹ Tape Monitor	647110008
Pilot Indicator PCB Ass'y	141810806
Function Sw PCB Ass'y* ¹	141810956
Headphone Jack* ¹	626110033
Pin Jack, 4P w/DIN Socket* ¹	649201120
Pin Jack, 4P* ¹	624300204
Pin Jack, 2P* ²	624200202
Speaker Terminal, 4P* ³	642400111
AC Outlet (Not used for UK)	648211141
Voltage Selector (Not used for Canada)	648211247
Fuse Clip (STD)	648211146
Fuse Clip (Europe, UK)	648211147
Closed End Terminal	643110012
Noise Canceller, NSK-135 (120V)	470101118
" , X-type 0.047 (220/240V)	470101122
Line Cord (STD)	796301115
" (Europe)	796301139
" (Australia, etc)	796301140
" (UK, etc)	796301138
Cord Stopper (STD)	675201111
" (Europe)	675201114
" (UK, etc)	675201116
" (Canada)	675201117
Knob,* ¹ Volume Control (Metallic Brown)	116310289
" (Black)	116310290
Knob,* ¹ Phono, Tape Selector	
" (Metallic Brown)	116310285
" (Black)	116310286
Knob,* ¹ Acoustics Control (Metallic Brown)	116310291
" (Black)	116310233
Knob, Balance or Input Level Control	
" (Metallic Brown)	116310287
" (Black)	116310288
Button,* ¹ Muting, Loudness, etc	
" (Metallic Brown)	116210056
" (Black)	116210057
Button, Power, Speaker, etc (Metallic Brown)	116210058
" (Black)	116210059
Foot	673402021
Top Cover* ³	138011304
Screws	
⌀3x6mm, Oval Countersunk (Ni)	702213006
⌀3x10mm, Tapping (BLZ)	726223010
⌀3x8mm, Tapping (Ni)	726213008
⌀3x8mm, Binding Head (BLZ)	705223008
3x5.6mm, Flat Head (BLZ)	770911166
⌀3x15mm, Binding Head (Ni)	705213015
⌀3x10mm, Brinding Head (Ni)	705213010
⌀3x6mm, Binding Head (Ni)	705213006
⌀3x12mm, Tapping (Ni)	726213012
⌀4x10mm, Binding Head (Ni)	705214010
⌀3x6mm, Oval Countersunk (Ni)	702213006
⌀3x6mm, Tapping, Oval Countersunk (Ni)	722213006
⌀3x6mm, Countersunk (Ni)	701213006
⌀4x8mm, w/FW, Binding Head (BLZ)	755224008
⌀3x9mm	770911130
Ground Terminal	770911119
Insert Screw, ℓ=8.5mm	770911132
Washers	
⌀3, Flat	770500003
⌀7, Flat	770500006
⌀3, Teethed	770500014
⌀4, Spring	770500011
⌀4, Flat	770500004

*1: Not used on RB-1000
 *2: Not used on RA-1000
 *3: Not used on RC-1000

Spacers	
⌀2.7x⌀10x3t	990201231
⌀6x⌀20x1t	990201306
Nuts	
M3	770402201
M4	770402202
M7	770402205
M12	770402209

FOR RA-1000 ONLY

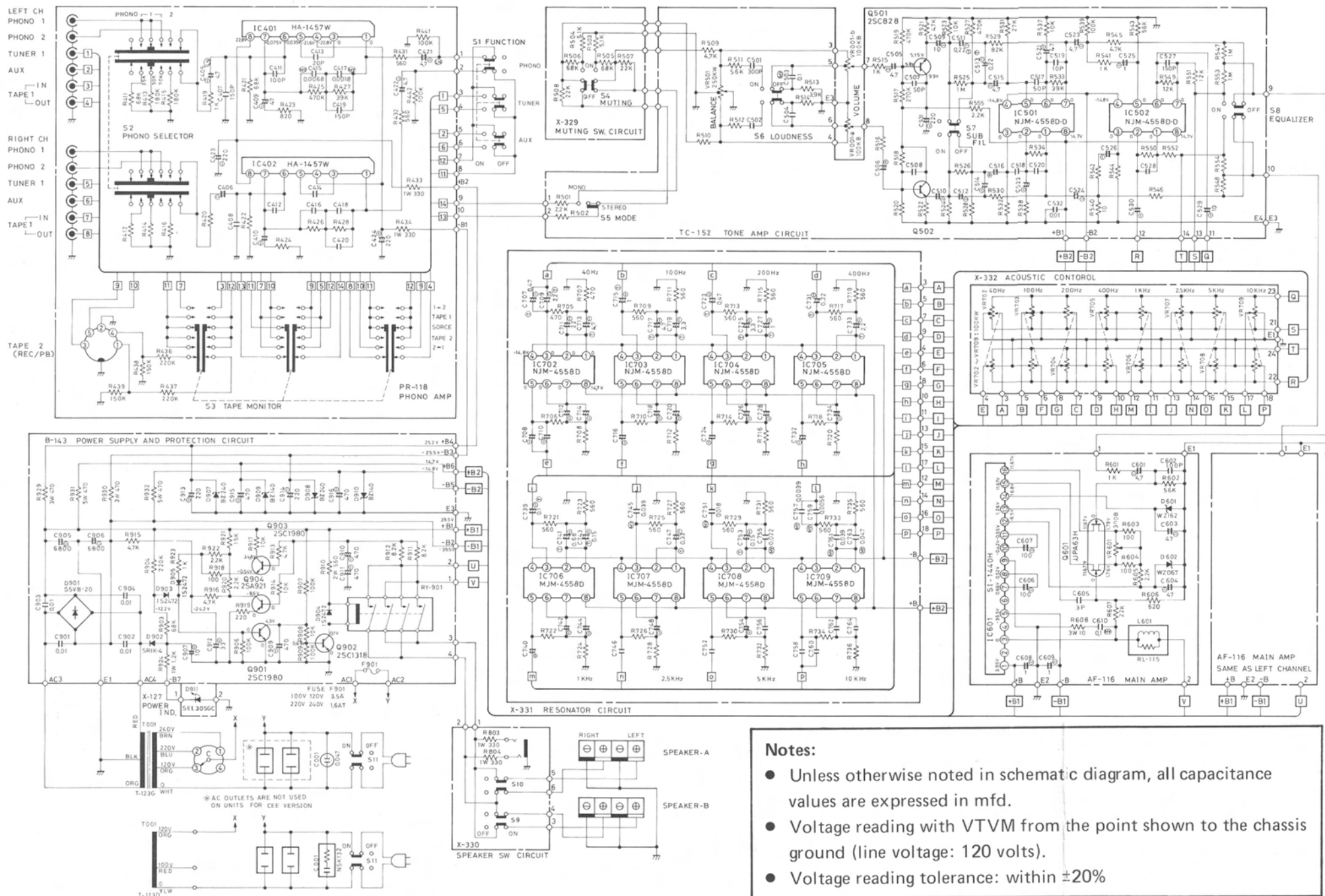
Description	Part No.
Power Transformer (120/220/240V)	207001482
Phone Amp PCB Ass'y	141510173
Tone Amp PCB Ass'y	141710326
Main Amp PCB Ass'y without Power IC and Heatsink	141610331
Muting Switch PCB Ass'y	141810949
Power Supply PCB Ass'y (120V)	141810961
Power Supply PCB Ass'y (Europe, UK)	141810965
Speaker Switch PCB Ass'y	141810951
Resonator PCB Ass'y	141810954
Acoustics Control PCB Ass'y	141810956
Front Panel Ass'y (Metallic Brown)	111911465
" (Black)	111911466

FOR RB-1000 ONLY

Description	Part No.
Power Transformer (120/220/240V)	207001475
Main Amp PCB Ass'y without Power IC and Heatsink	141610332
Speaker Switch PCB Ass'y	141810952
Protection Ind PCB Ass'y	141810703
Power Supply PCB Ass'y (120V)	141810962
Power Supply PCB Ass'y (Europe, UK)	141810966
Front Panel Ass'y (Metallic Brown)	111911471
" (Black)	111911472

FOR RC-1000 ONLY

Description	Part No.
Power Transformer	207001483
Phono Amp PCB Ass'y	141510174
Tone Amp PCB Ass'y	141710327
Muting Switch PCB Ass'y	141810950
Power Supply PCB Ass'y (120V)	141810963
" (Europe, UK)	141810967
Resonator PCB Ass'y	141810955
Acoustics Control PCB Ass'y	141810957
Headphone Amp PCB Ass'y	141810959
Muting Delay PCB Ass'y	141810960
Front Panel Ass'y (Metallic Brown)	111911469
" (Black)	111911470
Top Cover	138011305
Signal Cord Ass'y	791001112

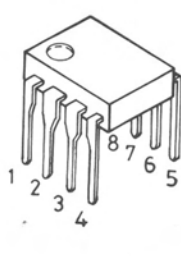


Notes:

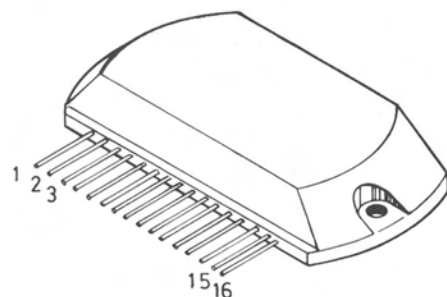
- Unless otherwise noted in schematic diagram, all capacitance values are expressed in mfd.
- Voltage reading with VTVM from the point shown to the chassis ground (line voltage: 120 volts).
- Voltage reading tolerance: within $\pm 20\%$



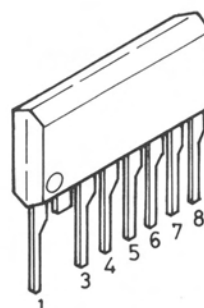
2SC1318
2SC828
2SC1980
2SA921



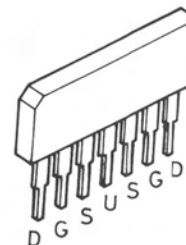
NJM4558D
NJM4558DD



SI-1440H



HA1457W



µPA63H

RESISTORS

5% tolerance unless otherwise noted.

K Kilohm

M Megohm

Unmarked . . Low noise type carbon resistor, 1/4 watts

CAPACITORS

T Tantalum capacitor

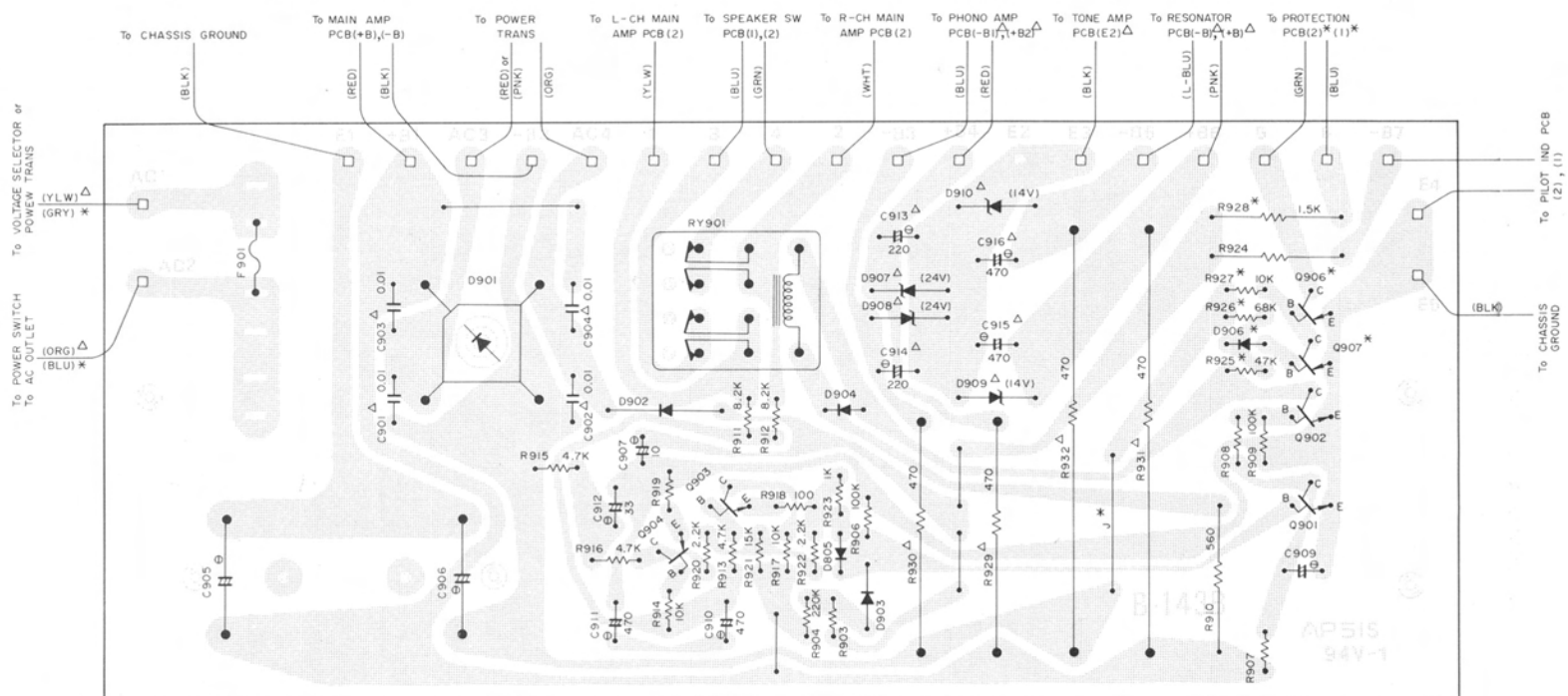
MY . . . Mylar film capacitor

LN . . . Low noise type capacitor

—E— . . . Electrolytic capacitor

Unmarked . . Ceramic capacitor

Power Supply Circuit (RA-1000/RB-1000)

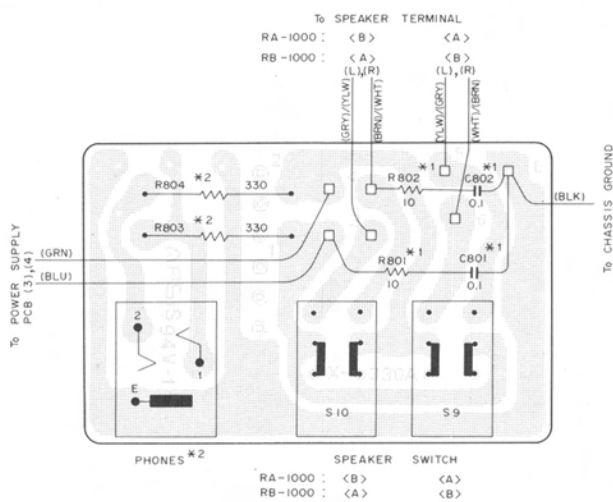


NOTES:

- Components and wirings marked with "△" are not used on RB-1000 (used on RA-1000 only).
- Components and wirings with asterisk are not used on RA-1000 (used on RB-1000 only).
- Values of capacitors and resistors whose values are not given depend on models (see the separate table).

Schematic Location	RA-1000	RB-1000
F901	3.5A (120V) 1.6AT-φ5.2 (Europe)	5A (120V) 2.5AT-φ5.2 (Europe)
C905, 906	6,800 mfd	10,000 mfd
C909	470 mfd	1,000 mfd
R903	68kΩ	56kΩ
R907	100kΩ	91kΩ
R908	10kΩ	1.2kΩ
R919	220Ω	1kΩ
R924	1.2kΩ	1.5kΩ

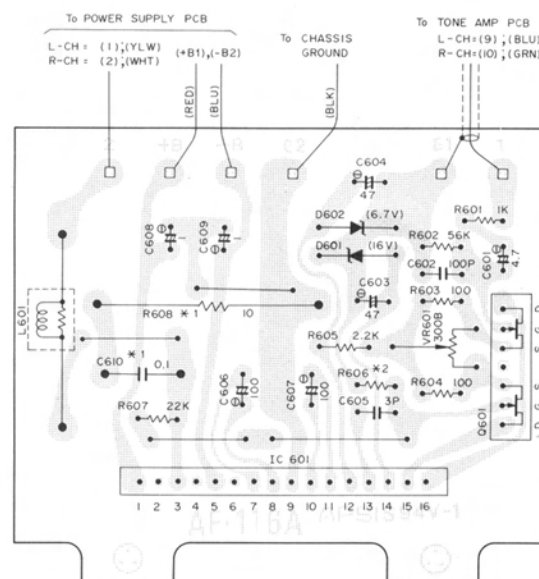
Speaker Switch Circuit (RA-1000/RB-1000)



*1: Not used on RA-1000.

*2: Not used on RB-1000.

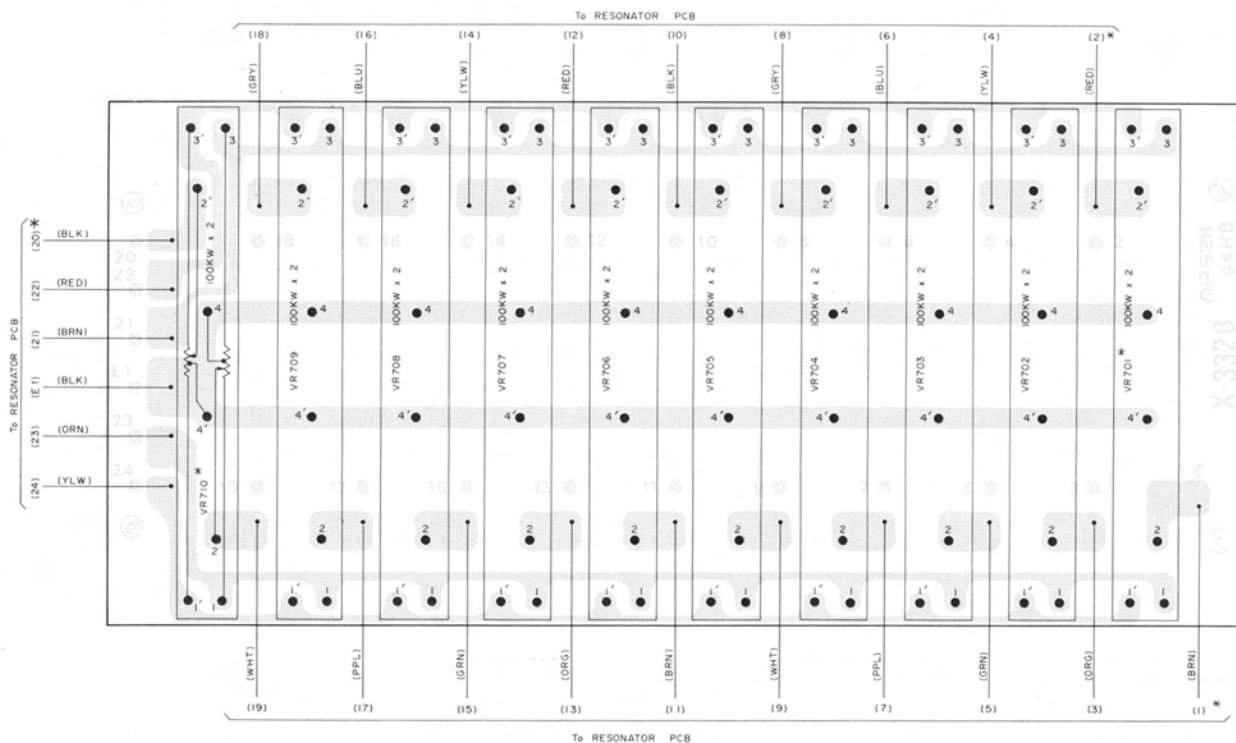
Main Amp Circuit (RA-1000/RB-1000)



*1. Not used on RB-1000.

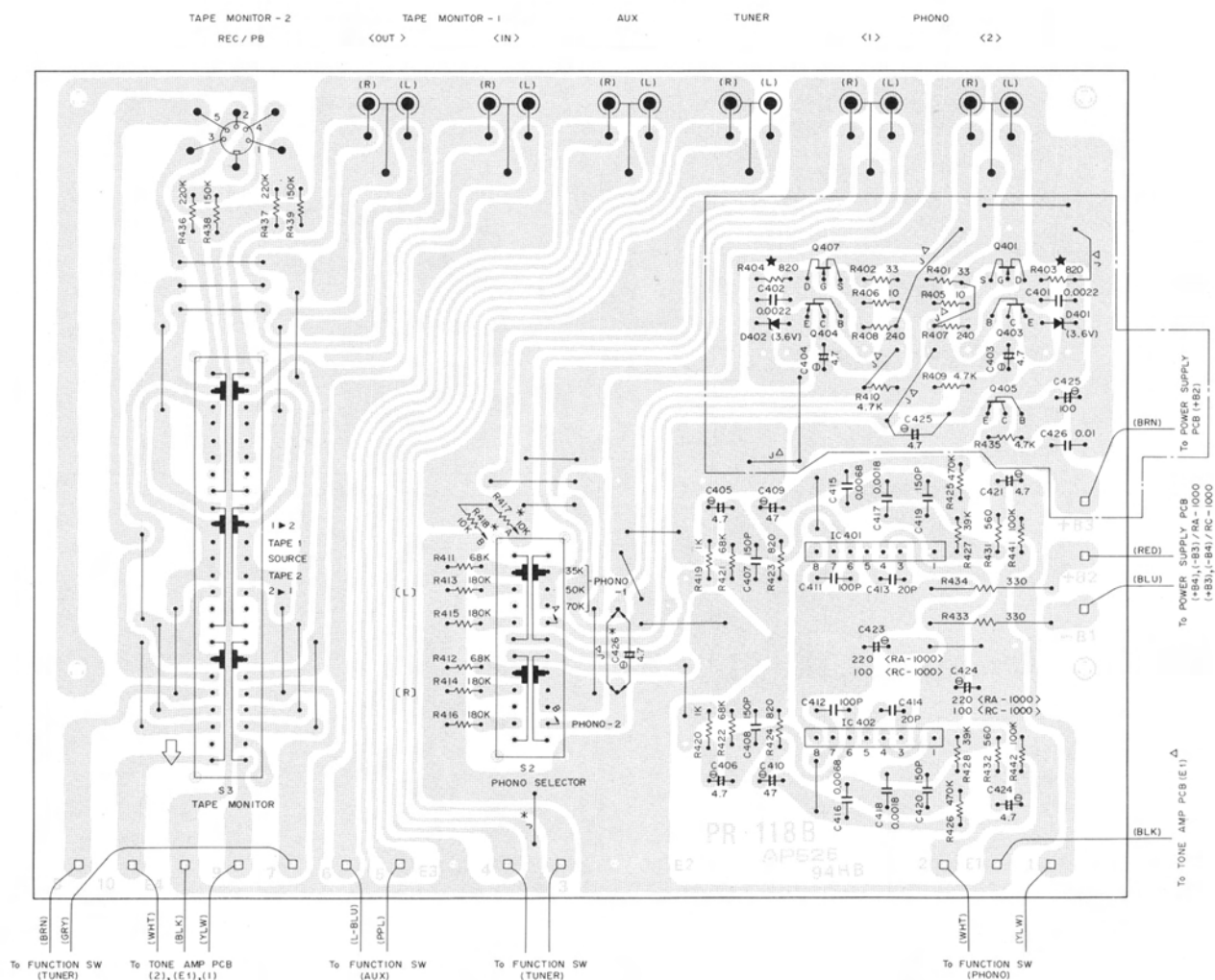
*2. Value of R606. . . . 620Ω for RA-1000;
910Ω for RB-1000

Acoustic Control Circuit (RA-1000/RC-1000)



NOTE: Components and wirings with asterisk are not used on RA-1000 (used on RC-1000 only).

Phono Amp Circuit (RA-1000/RC-1000)



NOTES:

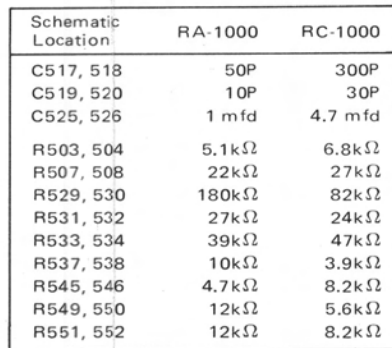
* : Value of R403 (R404) on MC head amp circuit for model RC-1000 depends on IDSS rating of Q401 (Q402).

* : Not used on RA-1000.

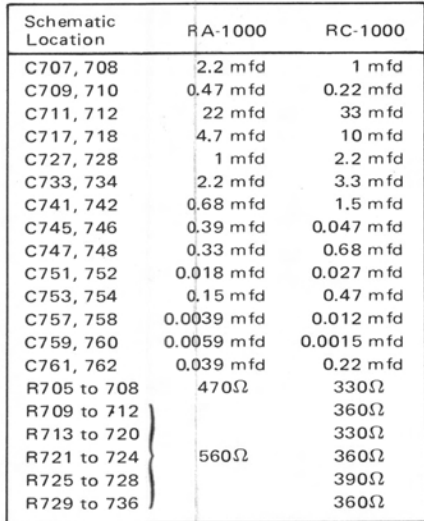
△ : Not used on RC-1000.

● Components, other than those marked with "△," inside the area formed by broken line are not used on RA-1000 (used on RC-1000 only).

To MAIN AMP PCB (1) / RA-1000



- ### Resonator Circuit (RA-1000/RC-1000)



- Values of capacitors and resistors whose values are not given depend on models (see the attached table).

Diagram of the PHONO AMP PCB showing terminal connections for (1) through (6). The connections are: (1) YLW to PHONO; (2) WHT to PHONO; (7) GRAY to PHONO; (3) BLU to TUNER; (4) GRN to TUNER; (6) BRN to TUNER; (5) PPL to AUX; (6) L-BLU to AUX. The PCB is labeled "PHONO AMP PCB" and "S1 FUNCTION SELECTOR".