ROTEL®

RA-210
RA-110A

STEREO PRE-MAIN AMPLIFIERS

RA-210

RA-110A

technical manual

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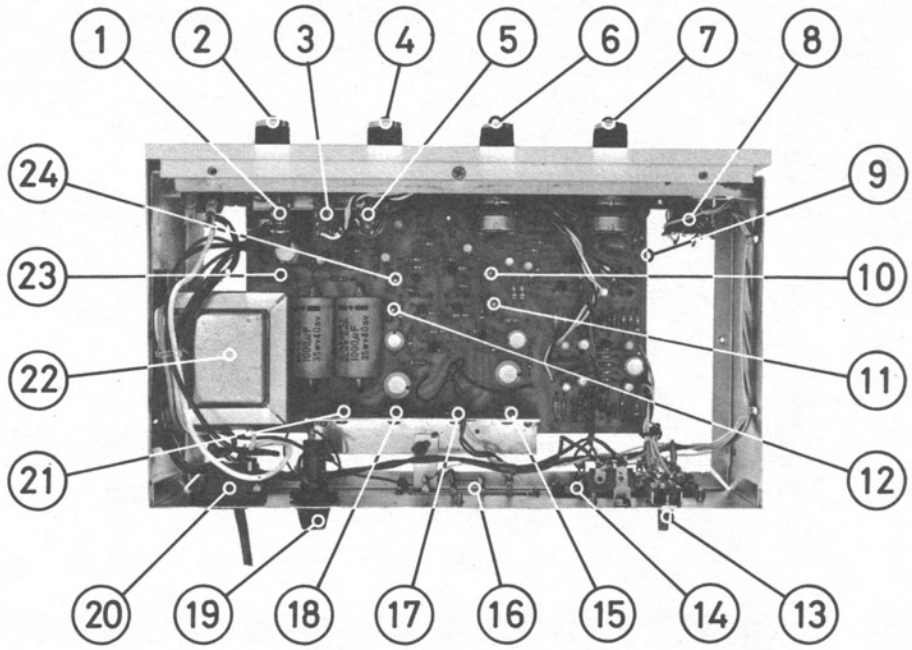
ROTEL

CHASSIS LAYOUT

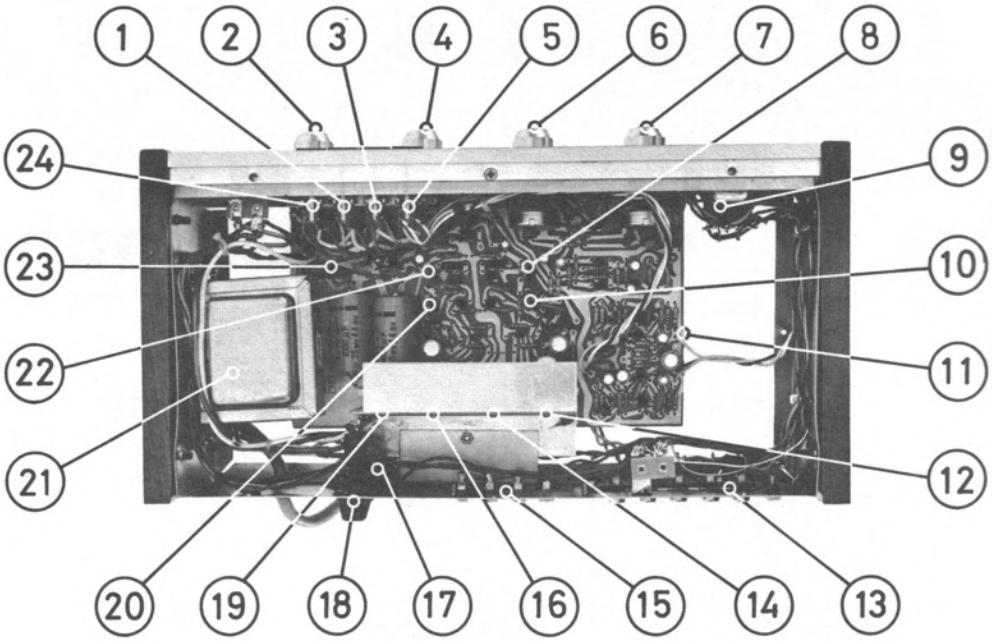
RA-110A CHASSIS LAYOUT

1. Power Switch
2. Volume Control
3. Phono Switch
4. Balance Control
5. Tuner Switch
6. Treble Control
7. Bass Control
8. Phone Jack
9. Pre. Main Amp. PCB
10. VR605, DC Balance Adj. R-ch
11. VR606, Idling Current Adj. R-ch
12. VR506, Idling Current Adj. L-ch
13. Phono Sens. Switch
14. Input Terminal
15. Tr607, Power Amp. R-ch
16. Speaker Terminal
17. Tr606, Power Amp. R-ch
18. Tr506, Power Amp. L-ch
19. DC Fuse
20. AC Outlet
21. Tr507, Power Amp. L-ch
22. Power Transformer
23. Rectifier
24. VR505, DC Balance Adj. L-ch



RA-210 CHASSIS LAYOUT

1. AUX Switch
2. Volume Control & Power Switch
3. Tuner Switch
4. Balance Control
5. Phono Switch
6. Treble Control
7. Bass Control
8. VR605, DC Balance Adj. R-ch
9. Phone Jack
10. VR606, Idling Current Adj. R-ch
11. Pre. Main Amp. PCB
12. Tr608, Power Amp. R-ch
13. Input Terminal
14. Tr607, Power Amp. R-ch
15. Speaker Terminal
16. Tr507, Power Amp. L-ch
17. AC Outlet
18. DC Fuse
19. Tr508, Power Amp. L-ch
20. VR506, Idling Current Adj. L-ch
21. Power Transformer
22. VR506, DC Balance Adj. L-ch
23. Rectifier
24. Tape Switch



PRECAUTIONS

1. Always disconnect the chassis from power line when soldering. Turning the power switch OFF is not enough. Power line leakage passing through the heating element may destroy the transistors.
2. Never attempt to do any work on the transistor amplifiers without first disconnecting the AC line cord and waiting until the power supply filter capacitors have discharged.
3. Replacement for output and driver transistors, if necessary, must be made from the same beta group as the original type.
4. If one output transistor burns out (open or short) always remove all output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohm-meter before inserting a new transistor. All transistors in one channel will be destroyed if the base biasing circuit is open on the emitter end.
5. When mounting a replacement power transistor, be sure the bottom of the flange, the mica insulators and the surface of the heat sink are free of foreign matter, ... for they may cause transistor failure.
6. Silicon grease must be applied between the transistor and the mica insulator, and between the mica insulator and the heat sink for better heat conduction.

PREDRIVER / DRIVER ADJUSTMENT

1. Set BALANCE, BASS and TREBLE controls to mid-position.
2. Set Func. switch to "AUX" position.
3. Connect 8-ohm, 20 watts resistor across Left speaker terminals. Then in parallel with load resistor, connect a VTVM and the vertical input leads of an oscilloscope.
4. Connect an audio signal generator to Left channel, AUX input and apply 1,000Hz (sine wave) signals.
5. Connect AC power cord and rotate Volume Control clockwise — full volume. Increase generator output until sine wave on scope just starts clipping. Adjust DC Balance Control VR505 for equal clipping on the positive and negative half cycles of the signal (see Figure 1).
6. Rotate Volume Control counterclockwise to get 0.9 volts RMS across 8 ohm (0.1 watt output) on VTVM. Adjust crossover distortion by turning Idling Adjust Control VR506 until ideal response appears on scope (see Figure 2-1). Or adjust idling current using a DC milli-volt meter across R530 resistor and rotate Idling Adjust Control VR506 to obtain a 7.5 mV reading on DC milli-volt meter (no signal input). See Figure 2.
7. Repeat the steps 3 thru 6 for Right channel.

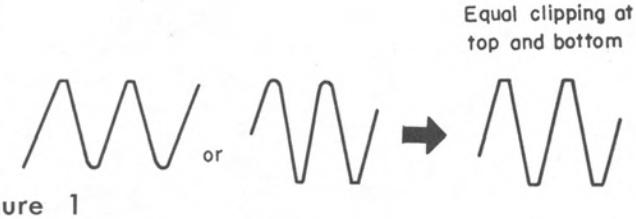


Figure 1

Figure 2–1

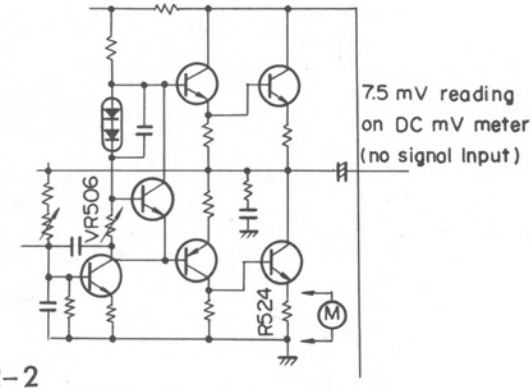
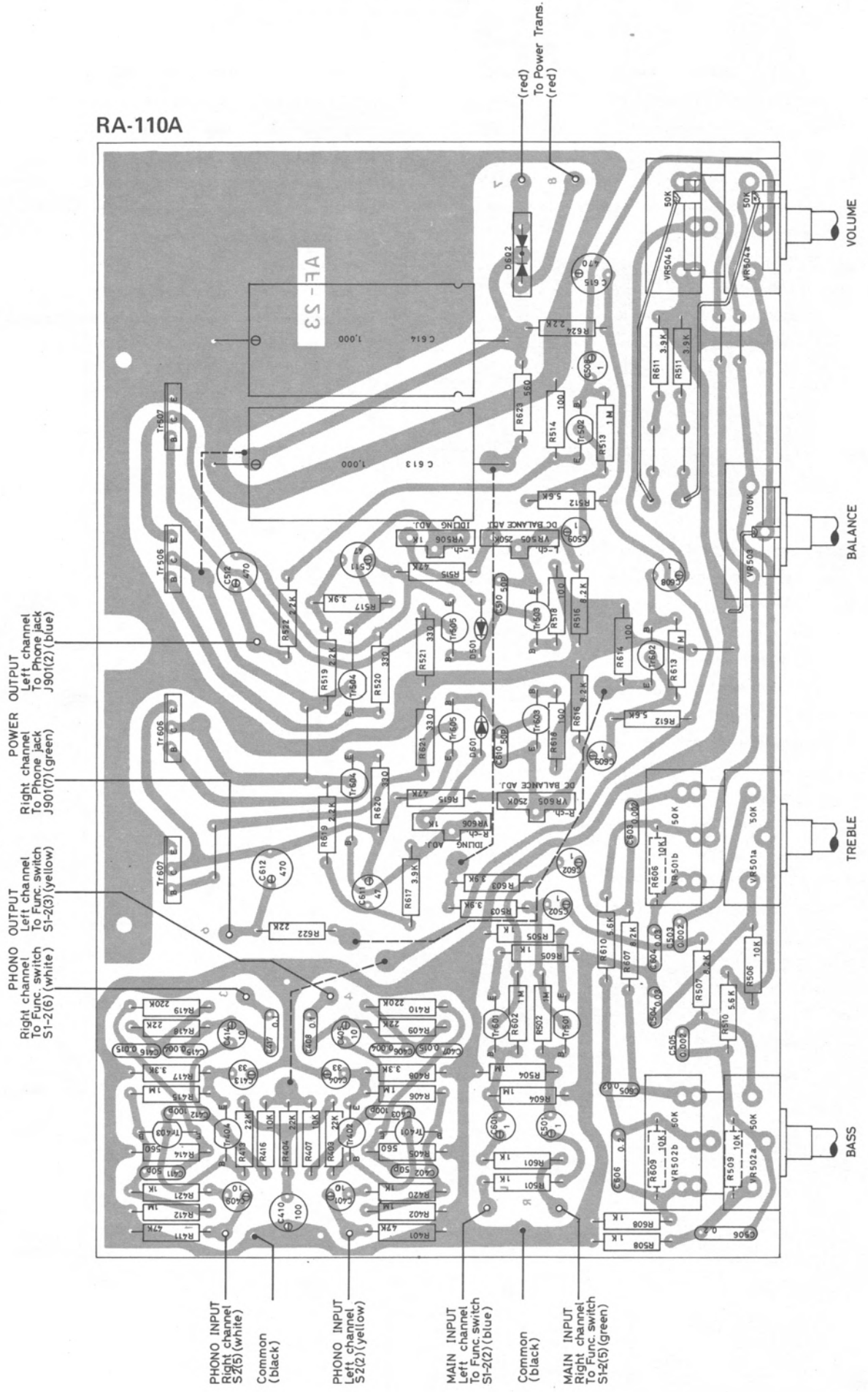
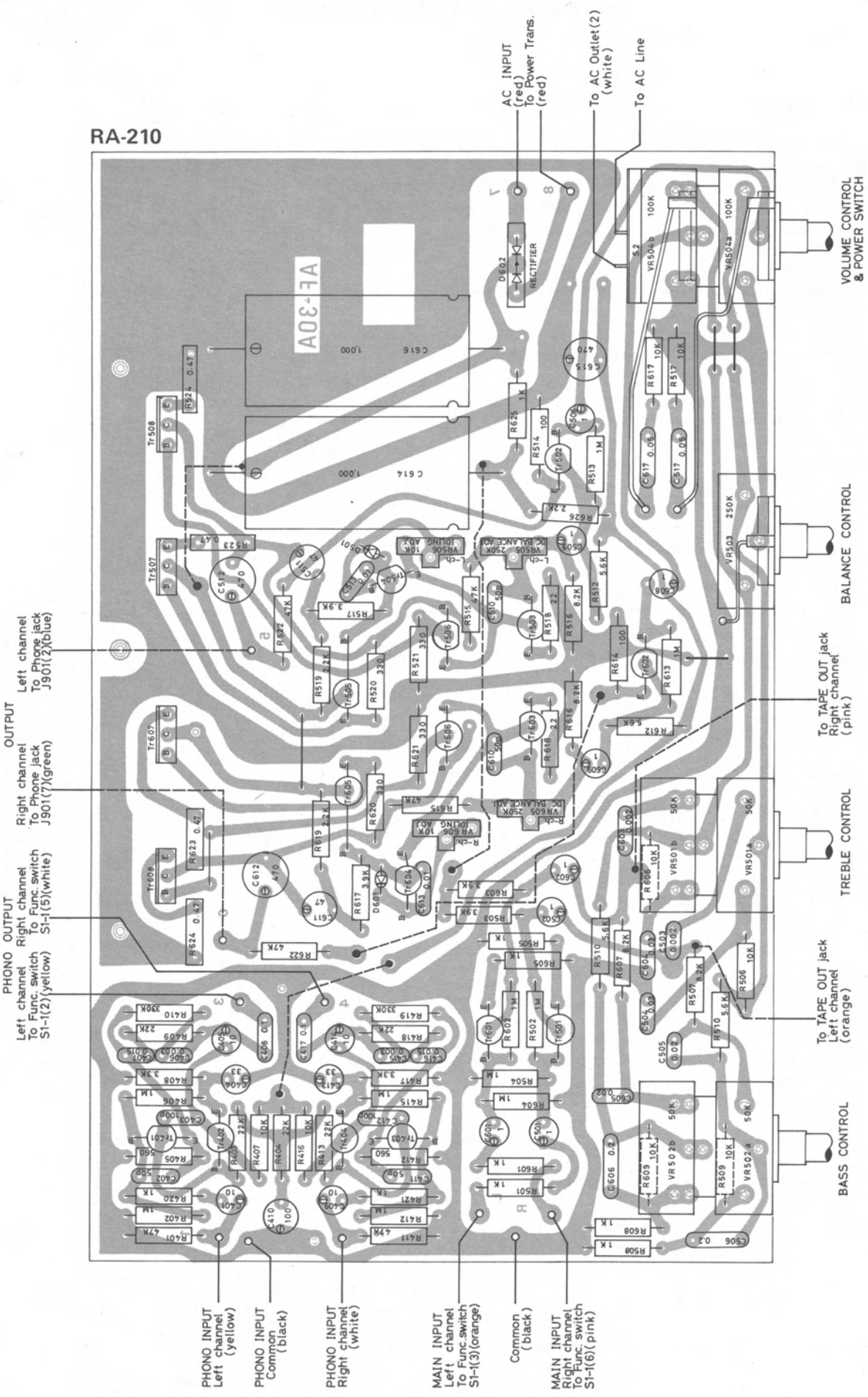


Figure 2–2

CIRCUIT BOARD DIAGRAM

RA-110A




RA-210
AC INPUT (red) To Power Trans. (red)
To AC Outlet(2) (white)
To AC Line
VOLUME CONTROL & POWER SWITCH
BALANCE CONTROL
TREBLE CONTROL
BASS CONTROL
To TAPE OUT jack Right channel (pink)
To TAPE OUT jack Left channel (orange)
Left channel To Phone jack J901(2)(blue)
Right channel To Phone jack J901(7)(green)
PHONO OUTPUT
Left channel To Func. switch S1-1(2)(yellow)
Right channel To Func. switch S1-1(5)(white)
PHONO INPUT Left channel (yellow)
PHONO INPUT Common (black)
PHONO INPUT Right channel (white)
MAIN INPUT Left channel To Func. switch S1-1(3)(orange)
Common (black)
MAIN INPUT Right channel To Func. switch S1-1(6)(pink)

TROUBLE SHOOTING

ENTIRE UNIT INOPERATIVE

I. If the pilot lamp does not light,

A. Check to see if the AC Power Supply Cord is properly connected to the power source, or

B. Check to see if there is adequate voltage from the power source (wall outlet), or

C. If A and B OK, check voltage of the AC Outlet J902 on rear panel of the unit with a VTVM, and

1. If no voltage measured on J902,
   (a). Power Switch may be faulty, or
   (b). AC Cord may be faulty, or
   (c). Faulty connection between AC Cord Plug and wall outlet.
2. If proper voltage measured on J902,
   (a). Power Transformer may be faulty, or
   (b). Primary Winding in Power Transformer may have loose connection.

II. If the pilot lamp does light, but no sound from both speakers,

A. Check to see if speakers are properly connected, or

B. If A OK, check voltage across secondary circuit B1 (see schematic) with a VTVM, and

1. If no voltage at B1,
   (a). Fuse F901 may be blown or has faulty connection, and if blown,
      (1). B1 circuit or capacitor* may be shorted out, *C614 (on RA-110A) and C616 (on RA-210), or
      (2). Faulty transistors*,
         * RA-110A: Tr506, 507, 606 or 607,
         RA-210: Tr507, 508, 607 or 608, or
      (3). Faulty transistors*.
         * RA-110A: Tr503, 504, 505 603, 604 or 605,
         RA-210: Tr504, 505, 506, 604, 605, 606, 503 or 603, or
   (b). Rectifier D602 may be faulty (opened), or
   (c). Power Transformer has its secondary winding broken off or loosely connected.

ONLY ONE CHANNEL INEFFECTIVE

I. If hum from ineffective channel persists regardless of position of volume control,

A. Transistors* may be faulty,
   * RA-110A: Tr502, 503, 504 or 505, (Tr602, 603, 604 or 605 for R-ch),
   RA-210: Tr502, 503, 505 or 506, (Tr602, 603, 605 or 606 for R-ch), or

B. Capacitor C508 or 509 (C608 or 609 for R-ch.) may be faulty.

II. If hum comes out only when volume is increased,

A. Transistor Tr501 (Tr601 for R-ch.) may be faulty, or

B. Capacitor C501 or 502 (C601 or 602 for R-ch.) may be faulty.

ONLY PHONO SECTION INOPERATIVE

I. Check to see if there is input signal to phono terminals, if not

A. Transistor Tr401 or 402 (Tr403 or 404 for R-ch.) may be faulty, or

B. Capacitor C401, 405 or 408 (C409, 414 or 417 for R-ch.) may be faulty, or

C. Selector Switch may have faulty connection.

TUNER, AUX* OR/AND TAPE IN* INPUTS INEFFECTIVE(* not on RA-110A)

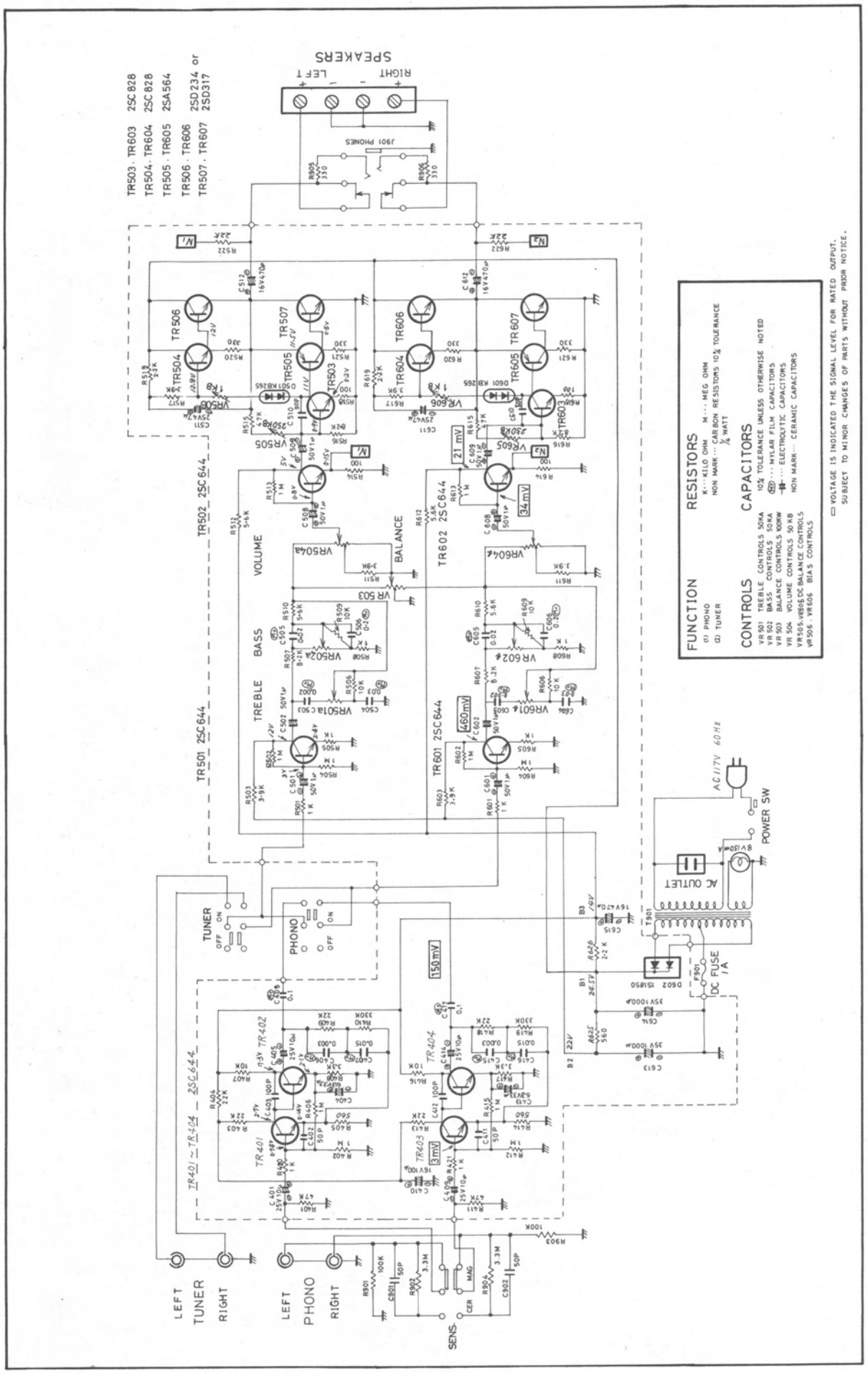
I. Selector Switch may have faulty connection.

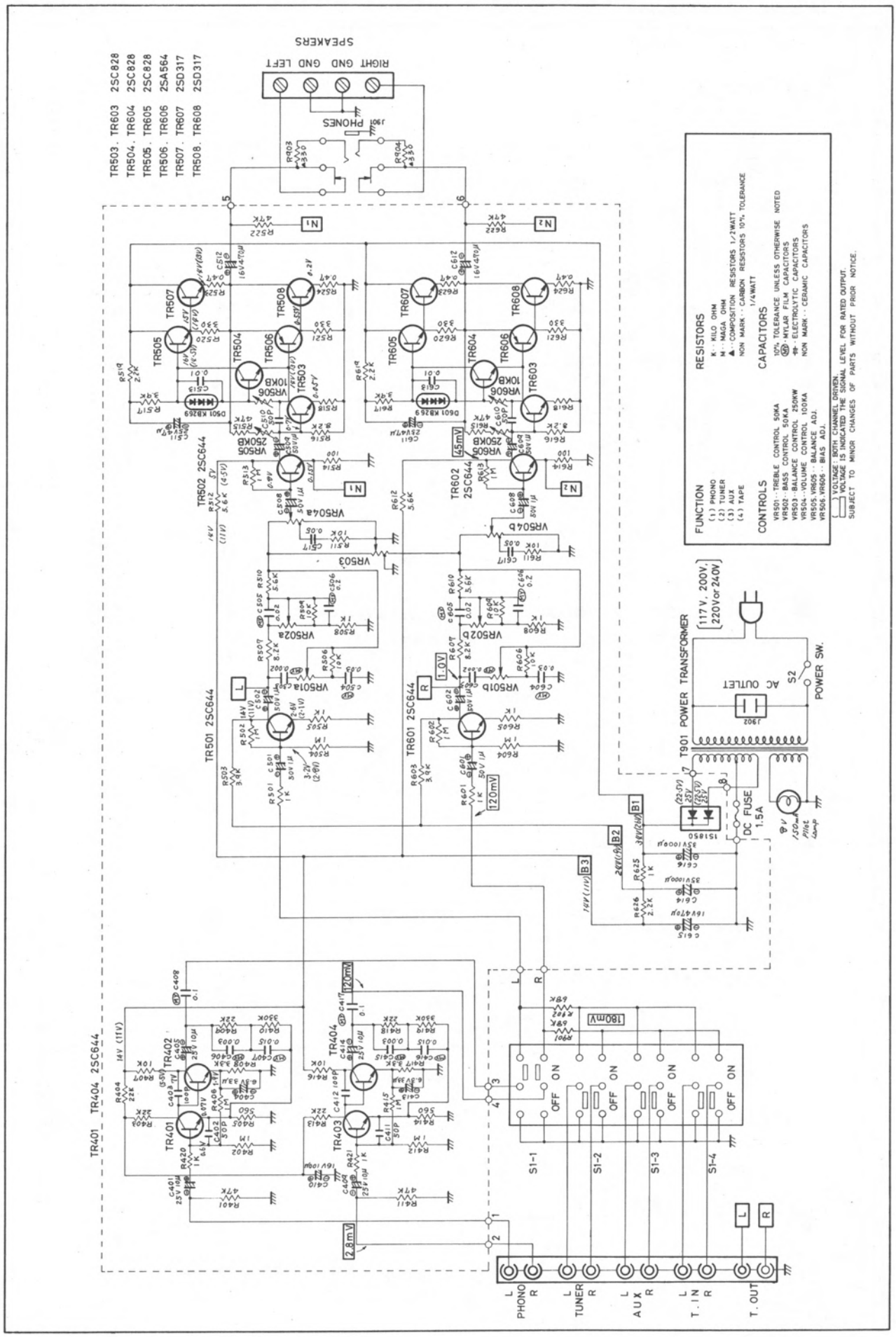
TONE CONTROLS INEFFECTIVE

I. Capacitor C503, 504, 505 or 506 (C603, 604, 605 or 606 for R-ch.) may be faulty.

SCHEMATIC DIAGRAM

RA-110A




SPEAKERS
RIGHT GND GND LEFT
PHONES
TR503 . TR603 2SC828
TR504 . TR604 2SC828
TR505 . TR605 2SC828
TR506 . TR606 2SA564
TR507 . TR607 2SD317
TR508 . TR608 2SD317
FUNCTION
(1) PHONO
(2) TUNER
(3) AUX
(4) TAPE
RESISTORS
K : KILO OHM
M : MAGA OHM
▲ : COMPOSITION RESISTORS 1/2WATT
NON MARK : CARBON RESISTORS 10% TOLERANCE 1/4WATT
CAPACITORS
10% TOLERANCE UNLESS OTHERWISE NOTED
MYLAR FILM CAPACITORS
ELECTROLYTIC CAPACITORS
NON MARK : CERAMIC CAPACITORS
CONTROLS
VR501 : TREBLE CONTROL 50KA
VR502 : BASS CONTROL 50KA
VR503 : BALANCE CONTROL 250KW
VR504 : VOLUME CONTROL 100KA
VR505 VR605 : BALANCE ADJ.
VR506 VR606 : BIAS ADJ.
( ) VOLTAGE : BOTH CHANNEL DRIVEN.
[ ] VOLTAGE IS INDICATED THE SIGNAL LEVEL FOR RATED OUTPUT.
SUBJECT TO MINOR CHANGES OF PARTS WITHOUT PRIOR NOTICE.
T901 POWER TRANSFORMER
(117 V. 200V. 220V or 240V)
AC OUTLET
POWER SW.
DC FUSE 1.5A
TR501 2SC644
TR601 2SC644
TR401 TR404 2SC644
TR402 2SC644
TR403 2SC644
TR502 2SC644
TR602 2SC644
S1-1
S1-2
S1-3
S1-4
OFF ON
L PHONO R
L TUNER R
L AUX R
L T. IN R
T. OUT

PARTS LIST

REPLACEMENT PARTS FOR MODEL RA-110A

Schematic Location	Part No.	Description
	PHONO SECTION	
R401, 411	552047323	Resistor, Carbon Film, 47K ±10%, 1/4W
R402, 406, R412, 415	552010523	Resistor, Carbon Film, 1M ±10%, 1/4W
R403, 404, R409, 413 R418	552022323	Resistor, Carbon Film, 22K ±10%, 1/4W
R405, 414	552056123	Resistor, Carbon Film, 560 ±10%, 1/4W
R407, 416	552010323	Resistor, Carbon Film, 10K ±10%, 1/4W
R408, 417	552033223	Resistor, Carbon Film, 3.3K ±10%, 1/4W
R410, 419	552033423	Resistor, Carbon Film, 330K ±10%, 1/4W
R420, 421	552010223	Resistor, Carbon Film, 1K ±10%, 1/4W
C401, 405, C409, 414	402100749	Capacitor, Electrolytic, 1mfd, 50V
C402, 411	440501283	Capacitor, Ceramic, 50pF ±10%, 250V
C403, 412	440101183	Capacitor, Ceramic, 100pF ±10%, 250V
C404, 413	402330609	Capacitor, Electrolytic, 33mfd, 6.3V
C406, 415	450301033	Capacitor, Mylar Film, 0.003mfd ±10%, 50V
C407, 416	450150933	Capacitor, Mylar Film, 0.015mfd ±10%, 50V
C408, 417	450100833	Capacitor, Mylar Film, 0.1mfd ±10%, 50V
C410	402100519	Capacitor, Electrolytic, 100mfd, 16V
Tr401, 402, Tr403, 404	301201114	Transistor, 2SC644
	MAIN AMP & POWER SUPPLY SECTION	
R501, 505, R508, 601, R605, 608	552010223	Resistor, Carbon Film, 1K ±10%, 1/4W
R502, 504, R513, 602, R604, 613	552010523	Resistor, Carbon Film, 1M ±10%, 1/4W
R503, 517, R511, 603, R617, 611	552039223	Resistor, Carbon Film, 3.9K ±10%, 1/4W
R506, 509, R606, 609	552010323	Resistor, Carbon Film, 10K ±10%, 1/4W
R507, 516, R607, 616	552082223	Resistor, Carbon Film, 8.2K ±10%, 1/4W
R510, 512, R610, 612	552056223	Resistor, Carbon Film, 5.6K ±10%, 1/4W

Schematic Location	Part No.	Description
R514, 614	52010123	Resistor, Carbon Film, 100 ±10%, 1/4W
R515, 615	552047323	Resistor, Carbon Film, 47K ±10%, 1/4W
R519, 619	552022223	Resistor, Carbon Film, 2.2K ±10%, 1/4W
R518, 618	551010133	Resistor, Composition, 100 ±10%, 1/2W
R520, 521, R620, 621	552033123	Resistor, Carbon Film, 330 ±10%, 1/4W
R522, 622	552022323	Resistor, Carbon Film, 22K ±10%, 1/4W
R625	552056123	Resistor, Carbon Film, 560 ±10%, 1/4W
R901, 902	552068323	Resistor, Carbon Film, 100K ±10%, 1/4W
R903, 904	551033533	Resistor, Composition, 3.3M ±10%, 1/2W
R905, 906	551033133	Resistor, Composition, 330 ±10%, 1/2W
VR501, 502	525101111	Resistor, Variable, 50K, Bass & Treble
VR503	515121112	Resistor, Variable, 100K, Balance
VR504	525121112	Resistor, Variable, 50K, Volume
VR505, 605	510502124	Potentiometer, 250K, DC Balance Adj.
VR506, 606	510502119	Potentiometer, 1K, Idling Current Adj.
C501, 502, C508, 509, C601, 602, C608, 609	402100749	Capacitor, Electrolytic, 1mfd, 50V
C503, 603	450201033	Capacitor, Mylar Film, 0.002mfd ±10%, 50V
C504, 604	450300933	Capacitor, Mylar Film, 0.03mfd ±10%, 50V
C505, 605	450200933	Capacitor, Mylar Film, 0.02mfd ±10%, 50V
C506, 606	450200833	Capacitor, Mylar Film, 0.2mfd ±10%, 50V
C507, 607	450509033	Capacitor, Mylar Film, 0.05mfd ±10%, 50V
C510, 610, C901, 902	440501283	Capacitor, Ceramic, 50pF ±10%, 250V
C511, 611	402470629	Capacitor, Electrolytic, 47mfd, 25V
C512, 612, C615	402470519	Capacitor, Electrolytic, 470mfd, 16V
C513, 613	440100985	Capacitor, Ceramic, 0.01mfd, 250V
C614, 616	401100439	Capacitor, Electrolytic, 1,000mfd, 35V
Tr501, 502 Tr601, 602	301201114	Transistor, 2SC644
Tr503, 504 Tr603, 604	301201115	Transistor, 2SC828
Tr505, 605	301001117	Transistor, 2SA564A

Schematic Location	Part No.	Description
Tr506, 507, Tr606, 607	301301121	Transistor, 2SD234 or 2SD317 (301301122) Power Amp.
D501, 601	300212002	Diode, Varistor, KB-265
D602	300919005	Rectifier, 1S1850
	127012106	Heat Sink for Power Amp.
	140600641	Printed Circuit Board
	141610226	Circuit Board Assembly
	MISCELLANEOUS	
	138011260	Top Cover
	124011262	Bottom Cover
	111911237	Front Panel Assembly
	116310028	Knob, Vol., Bal., Bass and Treble
	614030804	Switch, Func. Selector, 3 keys w/Button
	648211116	AC Outlet
	626117814	Jack, Headphones

Schematic Location	Part No.	Description
	648211114	Bracket, Fuse
	624100204	Jack, RCA type 4P
	641201104	Output Terminal, 4P
	761911126	GND Screw
T901	201001326	Power Transformer, (120V only)
	206001326	Power Transformer, (220V/240V)
	351080015	Lamp, 8V 0.15A
	341220015	Fuse, 1.5A, 3AG

REPLACEMENT PARTS FOR MODEL RA210

Schematic Location	Part No.	Description
	PHONO SECTION	
R401, 411	552047323	Resistor, Carbon Film, 47K ±10%, 1/4W
R402, 406, R412, 415	552010523	Resistor, Carbon Film, 1M ±10%, 1/4W
R403, 404 R409, 413, R418	552022323	Resistor, Carbon Film, 22K ±10%, 1/4W
R405, 414	552056123	Resistor, Carbon Film, 560 ±10%, 1/4W
R407, 416	552010323	Resistor, Carbon Film, 10K ±10%, 1/4W
R408, 417	552033223	Resistor, Carbon Film, 3.3K ±10%, 1/4W
R410, 419	552033423	Resistor, Carbon Film, 330K ±10%, 1/4W
R420, 421	552010223	Resistor, Carbon Film, 1K ±10%, 1/4W
C401, 405, C409, 414	402100749	Capacitor, Electrolytic, 1mfd, 50V
C402, 411	440501283	Capacitor, Ceramic, 50pF ±10%, 250V
C403, 412	440101183	Capacitor, Ceramic, 100pF ±10%, 250V
C404, 413	402330609	Capacitor, Electrolytic, 33mfd, 6.3V
C406, 415	450301033	Capacitor, Mylar Film, 0.003mfd ±10%, 50V

Schematic Location	Part No.	Description
C407, 416	450150933	Capacitor, Mylar Film, 0.015mfd ±10%, 50V
C408, 417	450100833	Capacitor, Mylar Film, 0.1mfd ±10%, 50V
C410	402100519	Capacitor, Electrolytic, 100mfd, 16V
Tr401, 402 Tr403, 404	301201114	Transistor, 2SC644
	MAIN AMP & POWER SUPPLY SECTION	
R501, 505 R508, 601, R605, 608, R625	552010223	Resistor, Carbon Film, 1K ±10%, 1/4W
R502, 504, R513, 602, R604, 613	552010523	Resistor, Carbon Film, 1M ±10%, 1/4W
R503, 517, R603, 617	552039223	Resistor, Carbon Film, 3.9K ±10%, 1/4W
R506, 509, R511, 606, R609, 611	552010323	Resistor, Carbon Film, 10K ±10%, 1/4W
R507, 516, R607, 616	552082223	Resistor, Carbon Film, 8.2K ±10%, 1/4W
R510, 512, R610, 612	552056223	Resistor, Carbon Film, 5.6K ±10%, 1/4W

Schematic Location	Part No.	Description
R514, 614	552010123	Resistor, Carbon Film, 100 ±10%, 1/4W
R515, 522, R615, 622	552047323	Resistor, Carbon Film, 47K ±10%, 1/4W
R519, 619, R626	552022223	Resistor, Carbon Film, 2.2K ±10%, 1/4W
R518, 618	551022033	Resistor, Composition, 22 ±10%, 1/2W
R520, 521, R620, 621	552033123	Resistor, Carbon Film, 330 ±10%, 1/4W
R523, 524 R623, 624	554147953	Resistor, Bath-tub, 0.47 ±10%, 2W
R901, 902	552010423	Resistor, Carbon Film, 68K ±10%, 1/4W
R903, 904	551033133	Resistor, Composition, 330 ±10%, 1/2W
VR501, 502	525101111	Resistor, Variable, 50K, Bass & Treble
VR503	515121114	Resistor, Variable, 250K, Balance
VR504	525121120	Resistor, Variable, 100K, Volume
VR505, 605	510502124	Potentiometer, 250K, DC Balance Adj.
VR506, 606	510502125	Potentiometer, 10K, Idling Current Adj.
C501, 502, C508, 509, R601, 602, R608, 609	402100749	Capacitor, Electrolytic, 1mfd, 50V
C503, 603	450201033	Capacitor, Mylar Film, 0.002mfd ±10%, 50V
C504, 604	450300933	Capacitor, Mylar Film, 0.03mfd ±10%, 50V
C505, 605	450200933	Capacitor, Mylar Film, 0.02mfd ±10%, 50V
C506, 606	450200833	Capacitor, Mylar Film, 0.2mfd ±10%, 50V
C507, 607	450500933	Capacitor, Mylar Film, 0.05mfd ±10%, 50V
C510, 610	440501283	Capacitor, Ceramic, 50pF ±10%, 250V
C511, 611	402470629	Capacitor, Electrolytic, 47mfd, 25V
C512, 612, C615	402470519	Capacitor, Electrolytic, 470mfd, 16V
C513, 613	440100985	Capacitor, Ceramic, 0.01mfd, 250V
C614, 616	401100439	Capacitor, Electrolytic 1,000mfd, 35V
Tr501, 502, Tr601, 602	301201114	Transistor, 2SC644
Tr503, 504, Tr505, 603, Tr604, 605	301201115	Transistor, 2SC828
Tr506, 606	301001117	Transistor, 2SA564A
Tr507, 508, Tr607, 608	301301122	Transistor, 2SD317, Power Amp.
D501, 601	300212004	Diode, Varistor, KB-269

Schematic Location	Part No.	Description
D602	300919005	Rectifier, 1S1850
	127012106	Heat Sink for Power Amp.
	140600642	Printed Circuit Board
	141610223	Circuit Board Assembly

MISCELLANEOUS

	138011259	Top Cover
	124011260	Bottom Cover
	111911234	Front Panel Assembly
	116310017	Knob, Vol., Bal., Bass and Treble
	116210004	Knob, Func. Switch
	614040804	Switch, Func. Selector, 4 keys
	648211116	AC Outlet
	626117814	Jack, Headphones
	648211114	Bracket, Fuse
	624100210	Jack, RCA type 10P
	641201104	Output, Terminal, 4P
	761911126	GND Screw
T901	201001323	Power Transformer, (120V only)
	206001323	Power Transformer, (220V/240V)
	351080015	Lamp, 8V 0.15A
	341220015	Fuse, 1.5A, 3AG