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**ROTEL**®

# Technical Manual

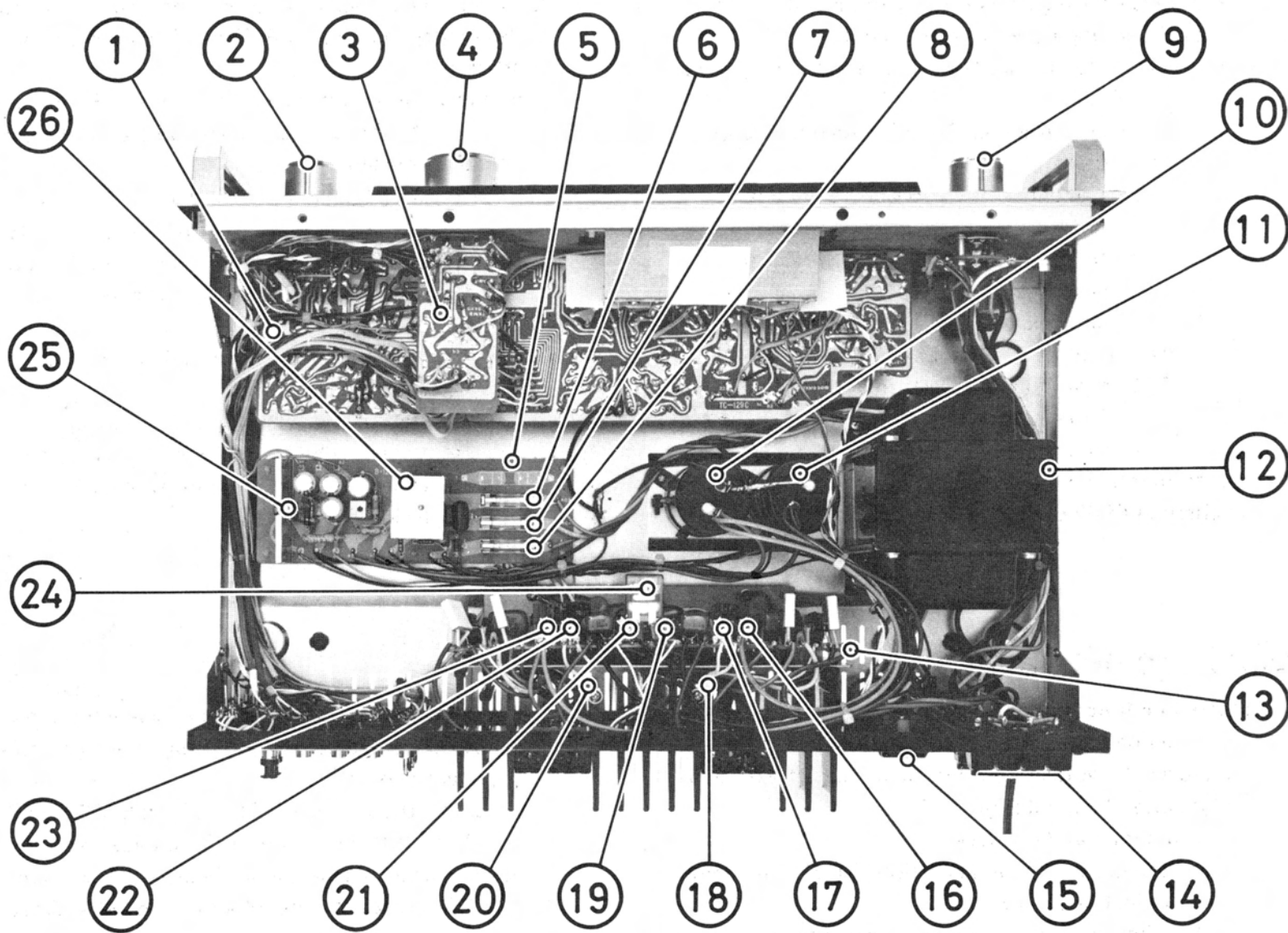
**STEREO AMPLIFIER**

# RA-913

## TABLE OF CONTENTS

CHASSIS LAYOUT (TOP VIEW) . . . . .	2
ALIGNMENT . . . . .	3
I. Overload Protection Level Adjustment . . . . .	3
II. Wattmeter Calibration . . . . .	4
III. Power Amp Bias Adjustment . . . . .	5
GAIN DIAGRAM . . . . .	6
TROUBLESHOOTING GUIDE . . . . .	6
REPAIR PARTS LIST . . . . .	8
SCHEMATIC DIAGRAM . . . . .	9
MAIN AMPLIFIER CIRCUIT BOARD DIAGRAM . . . . .	13
POWER SUPPLY CIRCUIT BOARD DIAGRAM . . . . .	13
DIN IN/OUT CIRCUIT BOARD DIAGRAM . . . . .	14
VOLUME CONTROL AMP CIRCUIT BOARD DIAGRAM . . . . .	14
PHONO AND TONE CONTROL AMP CIRCUIT BOARD DIAGRAM . . . . .	15

# Chassis Layout (Top View)



- |   |  |
|---|--|
| 1. PRE-AMPLIFIER PCB                                | 14. SPEAKER TERMINALS                  |
| 2. FUNCTION SELECTOR                                | 15. AC OUTLET                          |
| 3. VOLUME CONTROL PCB                               | 16. VR601, L-CH BIAS ADJ               |
| 4. VOLUME CONTROL                                   | 17. VR603, L-CH OVERLOAD LEVEL ADJ     |
| 5. POWER SUPPLY PCB                                 | 18. D001, L-CH TEMPERATURE COMPENSATOR |
| 6. F903, FUSE 6A-3AG (100V ~ 120V)/5A (220V ~ 240V) | 19. VR605, L-CH WATTMETER CAL          |
| 7. F902, FUSE 6A-3AG (100V ~ 120V)/5A (220V ~ 240V) | 20. D002, R-CH TEMPERATURE COMPENSATOR |
| 8. F901, FUSE 1A                                    | 21. VR606, R-CH WATTMETER CAL          |
| 9. SPEAKER SELECTOR                                 | 22. VR604, R-CH OVERLOAD LEVEL ADJ     |
| 10. C003, +B SMOOTHING CAPACITOR                    | 23. VR602, R-CH BIAS ADJ               |
| 11. C004, -B SMOOTHING CAPACITOR                    | 24. RY601, SPEAKER RELAY               |
| 12. T001, POWER TRANSFORMER                         | 25. Q901, +B STABILIZER                |
| 13. MAIN AMPLIFIER PCB                              | 26. D901, RECTIFIER                    |

# Alignment

**Instruments:** Audio Generator, HD Analyzer, AC VTVM, DC millivoltmeter, and Load Resistors ( $4\Omega$ , 200W and  $8\Omega$ , 100W).

**Note:**

Function Selector at AUX.  
Speaker Selector at A+B.  
Tone Switch at DEFEAT.  
Filter Switches at OFF.  
Mode Switches at STEREO.  
Monitor Switches at SOURCE.  
Muting and Loudness Sitches at OFF.

## I. OVERLOAD PROTECTION LEVEL ADJUSTMENT

**Note:** This adjustment should be carried out on one channel operation only.

- A. Connect load resistor  $4\Omega$ , 200W to left channel speaker terminal (A or B) and connect HD Analyzer in parallel with load resistor.
- B. Connect Audio Generator to left channel AUX input terminal. Rotate Volume Control fully clockwise, and apply 1,000Hz (sine wave) signal, and adjust input level to obtain output of 5% distortion on HD Analyzer. Keeping this state, adjust potentiometer VR603 (VR604 for R-ch) on main amp pcb so that Speaker Relay RY601 repeats action of ON-OFF at interval of 3 seconds.
- C. Carry out above steps A and B for right channel.

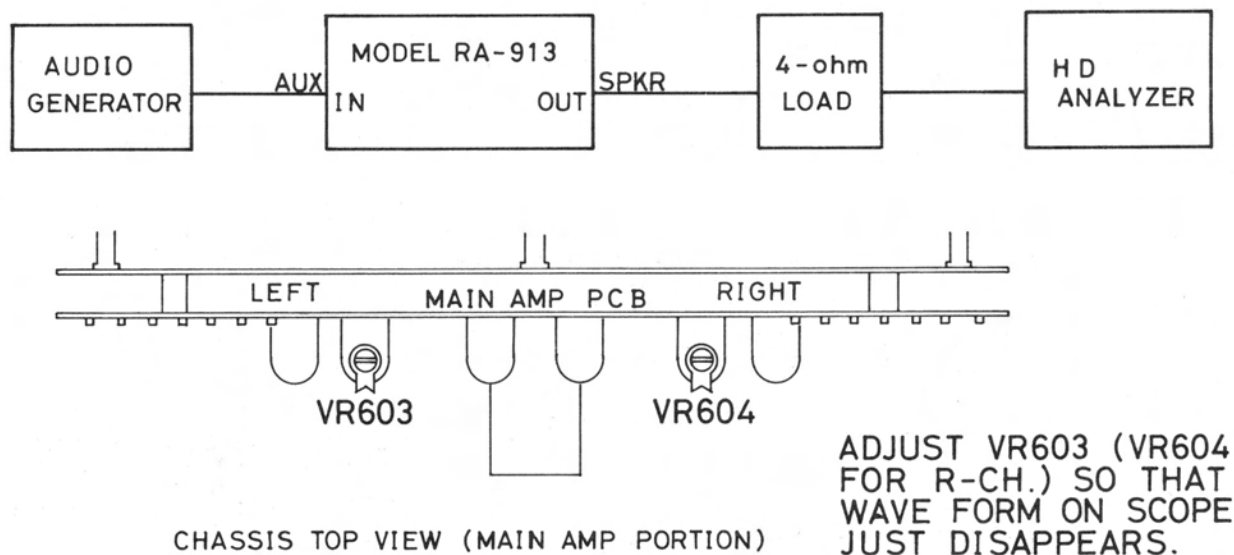


Fig. 1. Overload Protection Level Adjustment

## II. WATTMETER CALIBRATION

- A. Connect  $8\Omega$ , 100W load resistor to left channel speaker terminal (A or B) and connect AC VTVM in parallel with load resistor.
- B. Connect Audio Generator to left channel AUX input terminal and apply 1,000Hz (sine wave) signal. Adjust AUX input level to obtain 2.83V reading on AC VTVM. In this state, adjust potentiometer VR605 (VR606 for R-ch) so that Wattmeter indicates 1W.

- C. Check to see that Wattmeter indication (W) rests within the range of the actual output  $\begin{matrix} +100\% \\ -50\% \end{matrix}$  in the following cases.
  1. When output is 0.1W (0.895V on AC VTVM)/ $8\Omega$ ; Wattmeter should read  $0.1W \begin{matrix} +100\% \\ -50\% \end{matrix}$  (0.2W ~ 0.05W).
  2. When output is 25W (14.14V on AC VTVM)/ $8\Omega$ ; Wattmeter should read  $25W \begin{matrix} +100\% \\ -50\% \end{matrix}$  (50W ~ 12.5W).
- D. Carry out above steps from A to C for right channel.

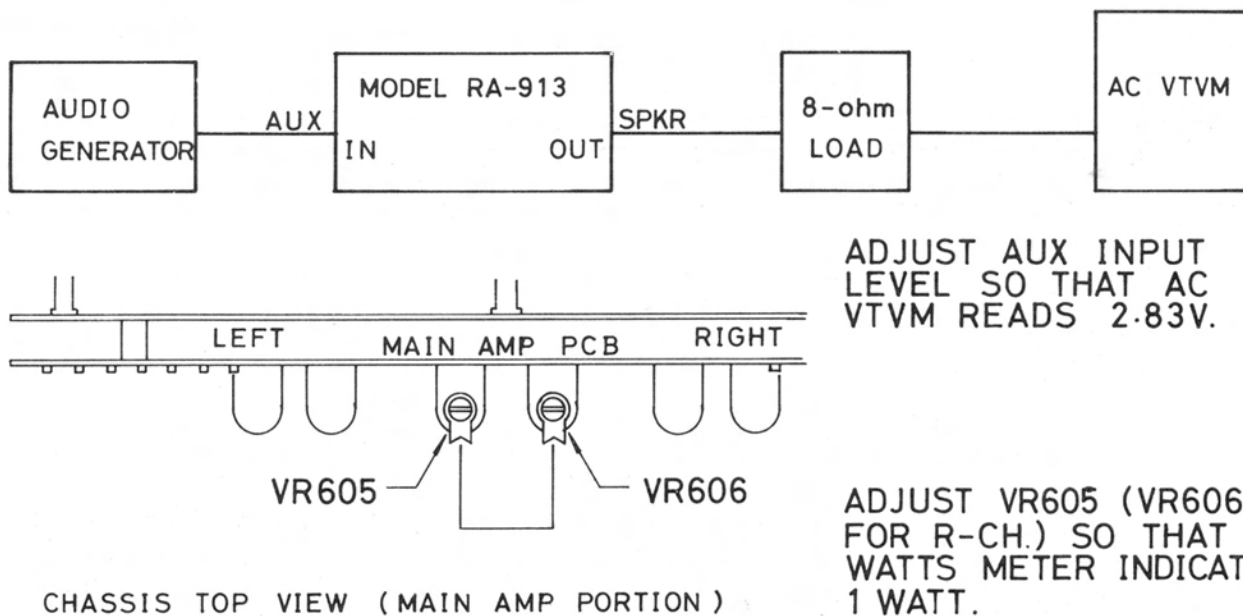


Fig. 2. Wattmeter Calibration

### III. POWER AMP BIAS ADJUSTMENT

**Note:** Prior to this bias adjustment, run about 5 minutes with rated output (at 8Ω load) and warm up power amp transistors and heat sink.

- Set potentiometers VR601 and 602 on main amp pcb to their mid-position.
- Set Volume Control to minimum (no signal output).

- Connect plus lead of DC millivoltmeter to pin No. 9 on main amp pcb, and connect minus lead to pin 7.
- Adjust potentiometer VR601 to obtain 7.5mV reading on DC millivoltmeter.
- Carry out above steps A and B for right channel (use test pin No. 10 and No. 8, and potentiometer VR602).

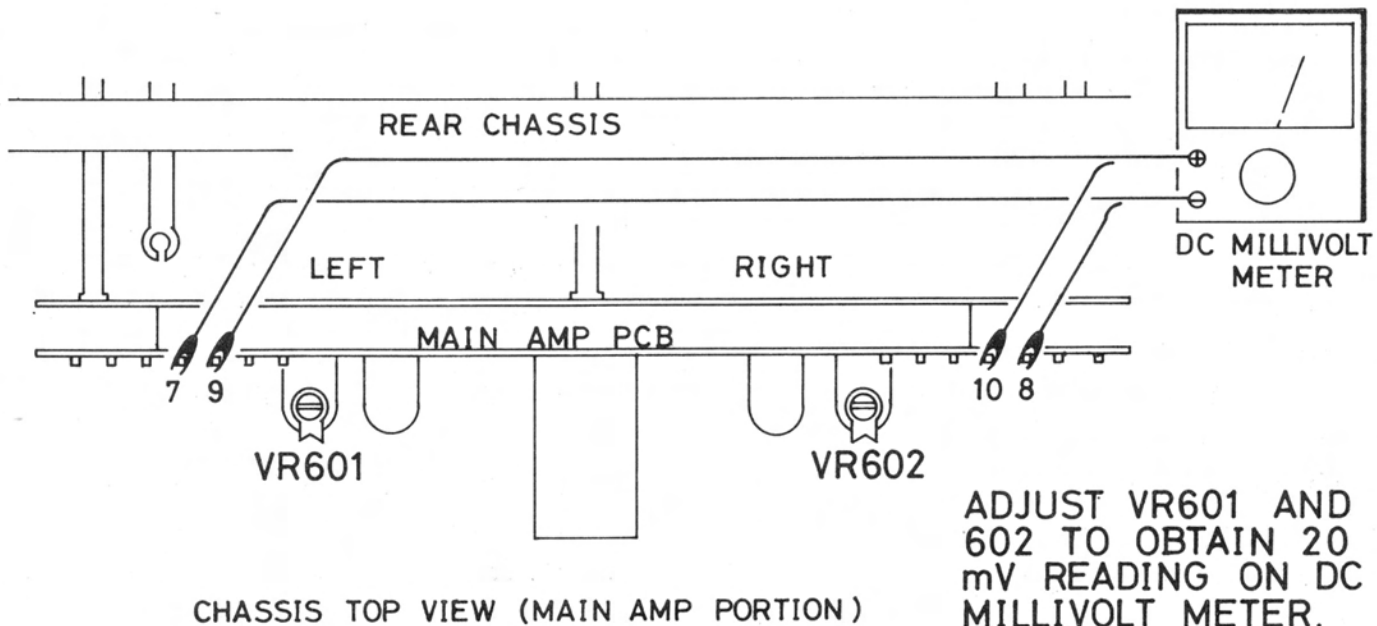
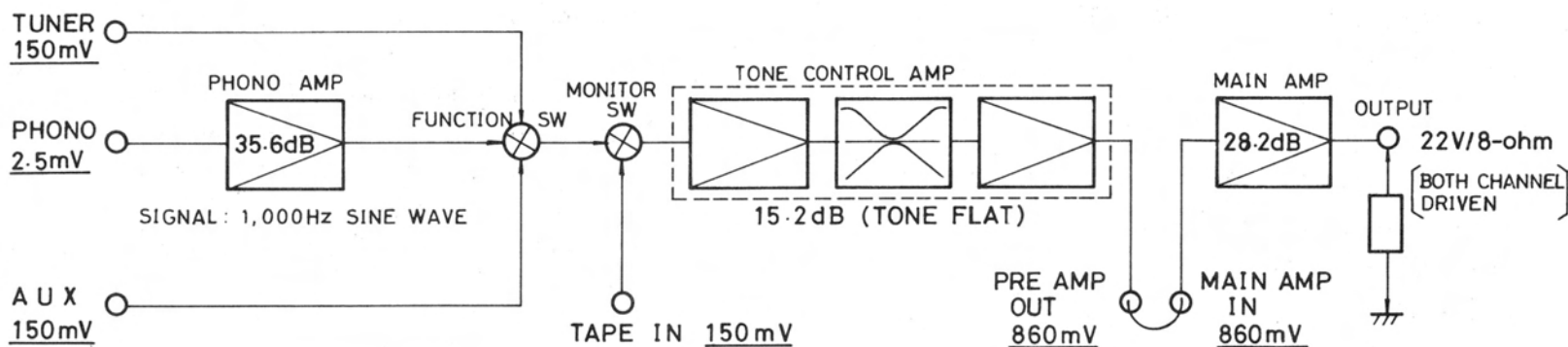


Fig. 3. Power Amp Bias Adjustment Hook-up

# Gain Diagram



# Troubleshooting Guide

## Unit inoperative.

A. Meter lamps do not light. → Measure the voltage at pin b1 and pin b2 on power supply pcb.

1. If there is no voltage,
  - a. Power Transformer T001 may be faulty, or
  - b. Power Switch S11 may be faulty.
2. If there are voltages properly, check to see if AC Fuse F904 is blown.
  - a. If F904 is blown,
    - 1) Bias Rect Circuit may be faulty.
      - a) Rectifier D904 may be shorted, or
      - b) Capacitor C905 may be shorted, or
      - c) Meter Lamps Circuit may be shorted.
    - b. If F904 is normal,
      - 1) F904 connection may be faulty, or
      - 2) Meter Lamps and Bias Rect Circuit wiring may be opened.

B. Meter Lamps light. → Check to see if AC Fuse F902 or 903 is blown.

1. If AC Fuse is blown,

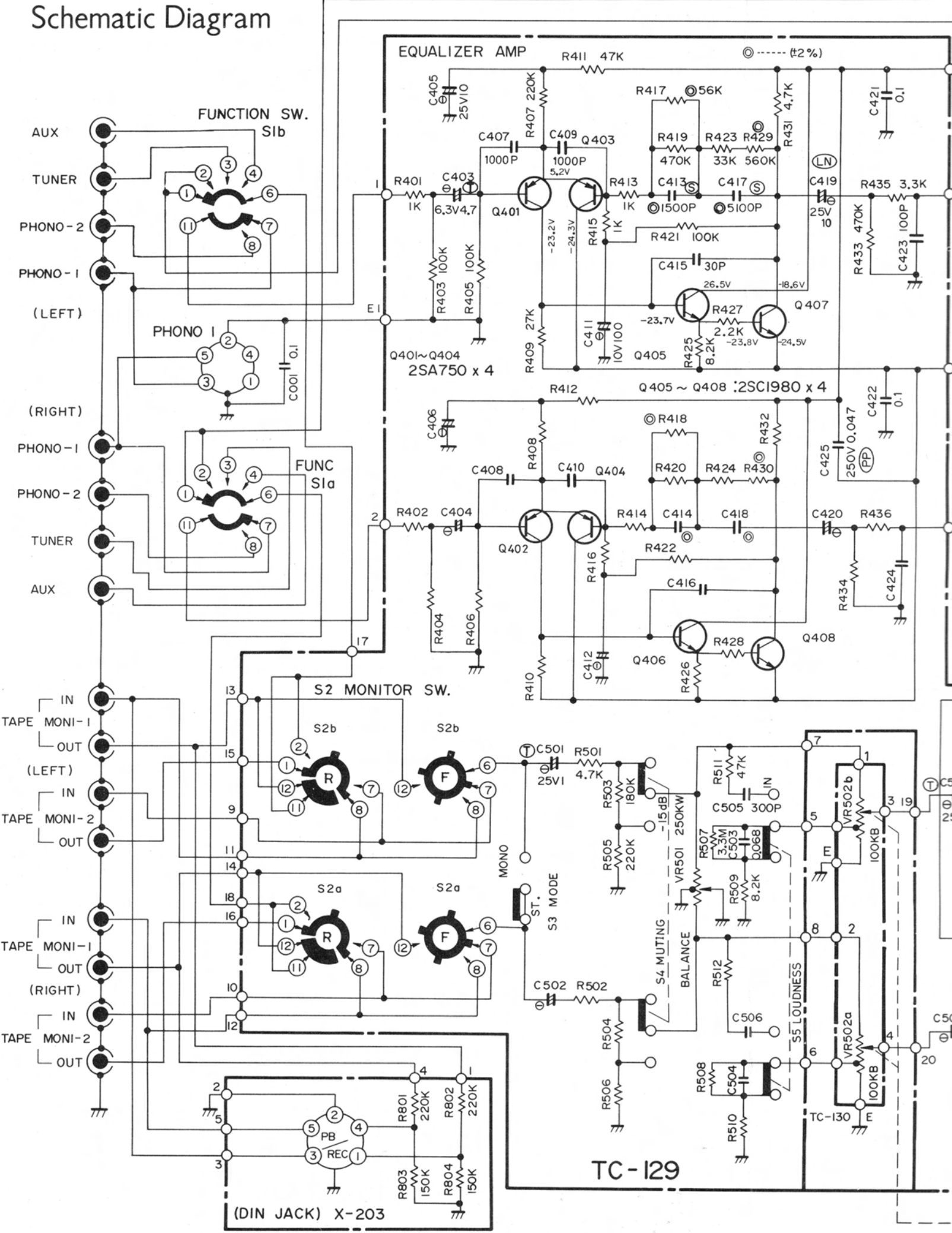
- a. Rectifier D901 may be shorted, or
- b. Stabilizer Q901 or 902 may be faulty, or
- c. Capacitor C421, 422, 555, 901, 903, 003, or 004 may be faulty, or
- d. Power Amp transistor Q001, 002, 003 or 004 may be faulty.
2. If AC Fuse is normal, check to see if speaker relay RY901 operates properly.
  - a. If the relay does not operate, measure voltage at pin 23 on main amp pcb.
    - 1) If there is plus voltage,
      - a) Main Amp transistor Q601, 603, 605, 611 or 613 (Q602, 604, 606, 612 or 614 for R-ch) may be faulty, or
      - b) Output circuit (including speaker system) may be faulty, or
    - 2) If there is no voltage or minus voltage,
      - a) Speaker Relay RY901 may be faulty, or
      - b) Overload Protection transistor Q617 or 618 may be faulty.

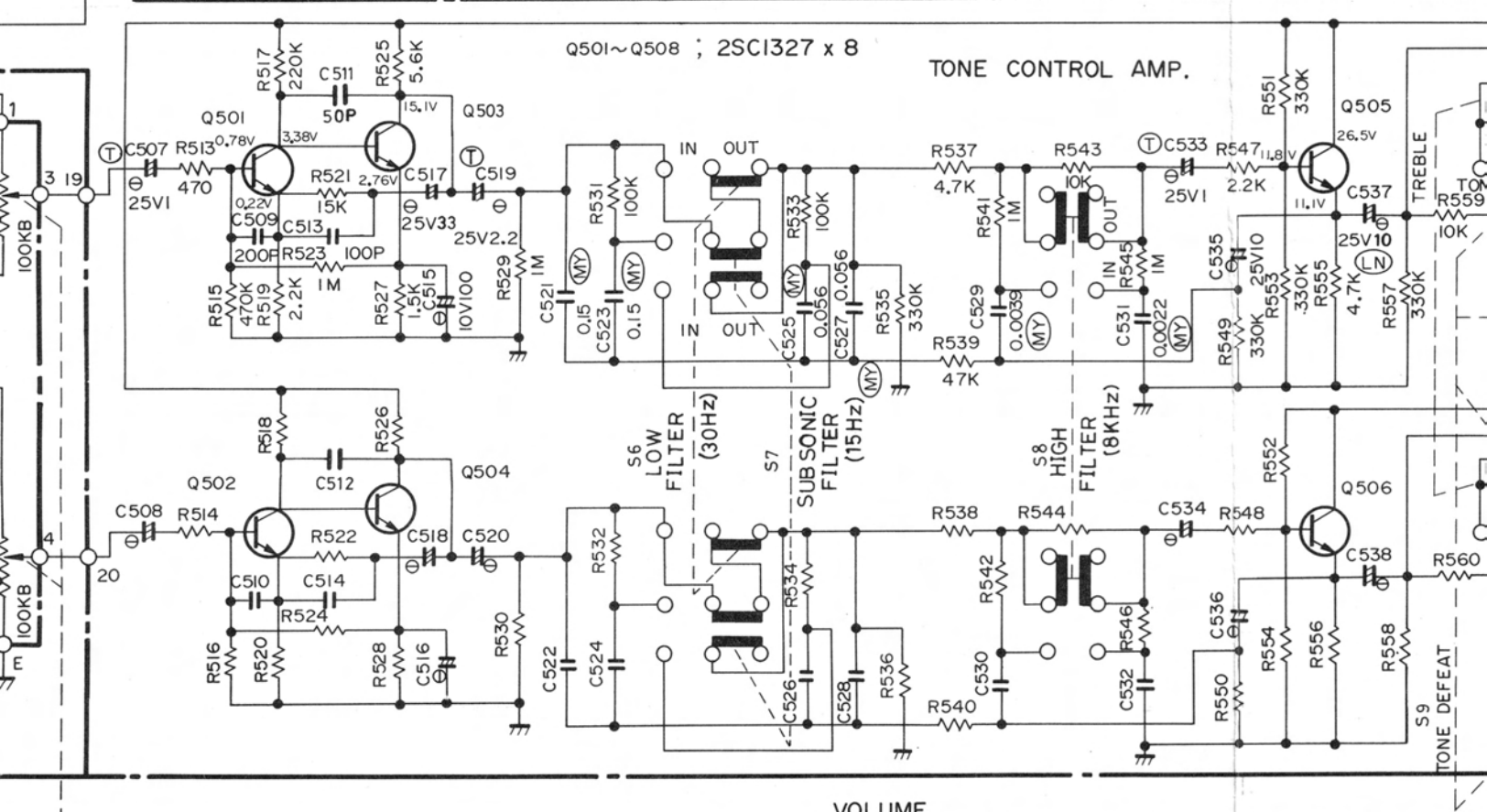
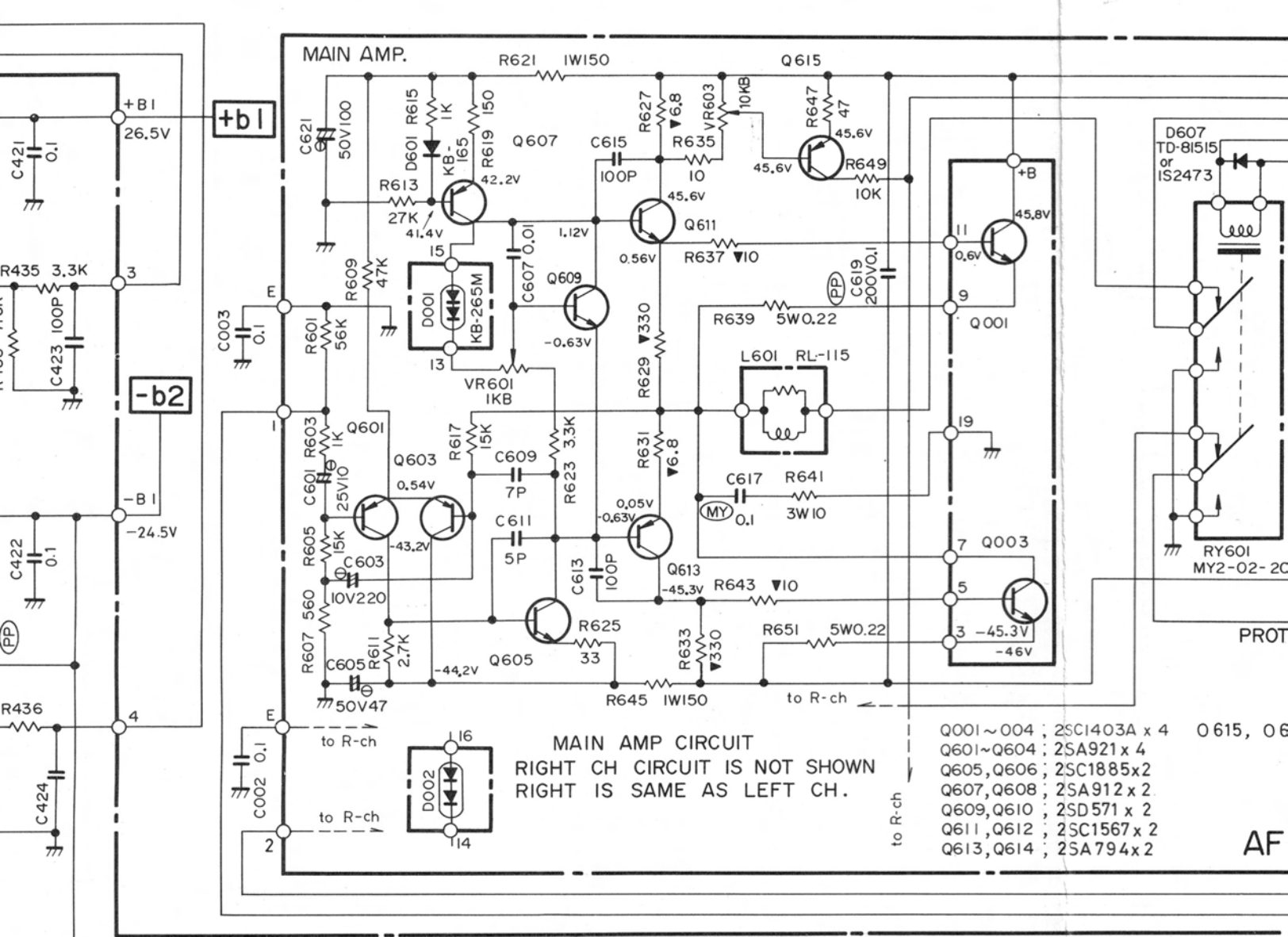
# Repair Parts List

Schematic Location	Part No.	Description
<b>TRANSISTORS AND DIODES</b>		
Q401, 402, 403, } 404, 620	301001133	2SA750, Phono Amp, Overload Detector
Q405, 406, 407, } 408	301201171	2SC1980, Phono Amp
Q501, 502, 503, } 504, 505, 506, } 507, 508, 509, } 510	301201134	2SC1327, Pre-amp
Q601, 602, 603, } 604, 613, 614, } 615, 616	301001145	2SA921, Differential Amp, Driver, Overload Detector
Q605, 606	301201164	2SC1885, Pre-driver
Q607, 608	301001142	2SA912, Bias Compensator
Q609, 610	301301134	2SD571, Bias Compensator
Q611, 612	301201150	2SC1567, Driver
Q617	301201155	2SC1318, Protection Relay Driver
Q618, 619	301201115	2SC828, Overload Detector, etc.
Q901	301201170	2SC1984, +B Stabilizer
Q902	301001141	2SA636A, -B Stabilizer
Q001, 002, 003, } 004	301201174	2SC1403A, Power Amp
D601, 602	300212008	KB-165, Bias
D603, 604, 605, } 606	300919008	SM-1-02, (used only for CSA Approved Units)
D607, 608, 609, } 610, 905	300111010	1S2473
D611, 612, 613, } 614, 615, 616	300111013	2-1K261, Wattmeter Rect
D901	300919032	S5VB-02, Power Rectifier
D902	300313026	WZ-270, Regulator, 27V, 0.5W
D903	300313025	WZ-240, Regulator, 24V, 0.5W
D904	300919008	SM-1-02, Overload Bias Rect
D001, 002	300212013	KB-265M, Temperature Compensator

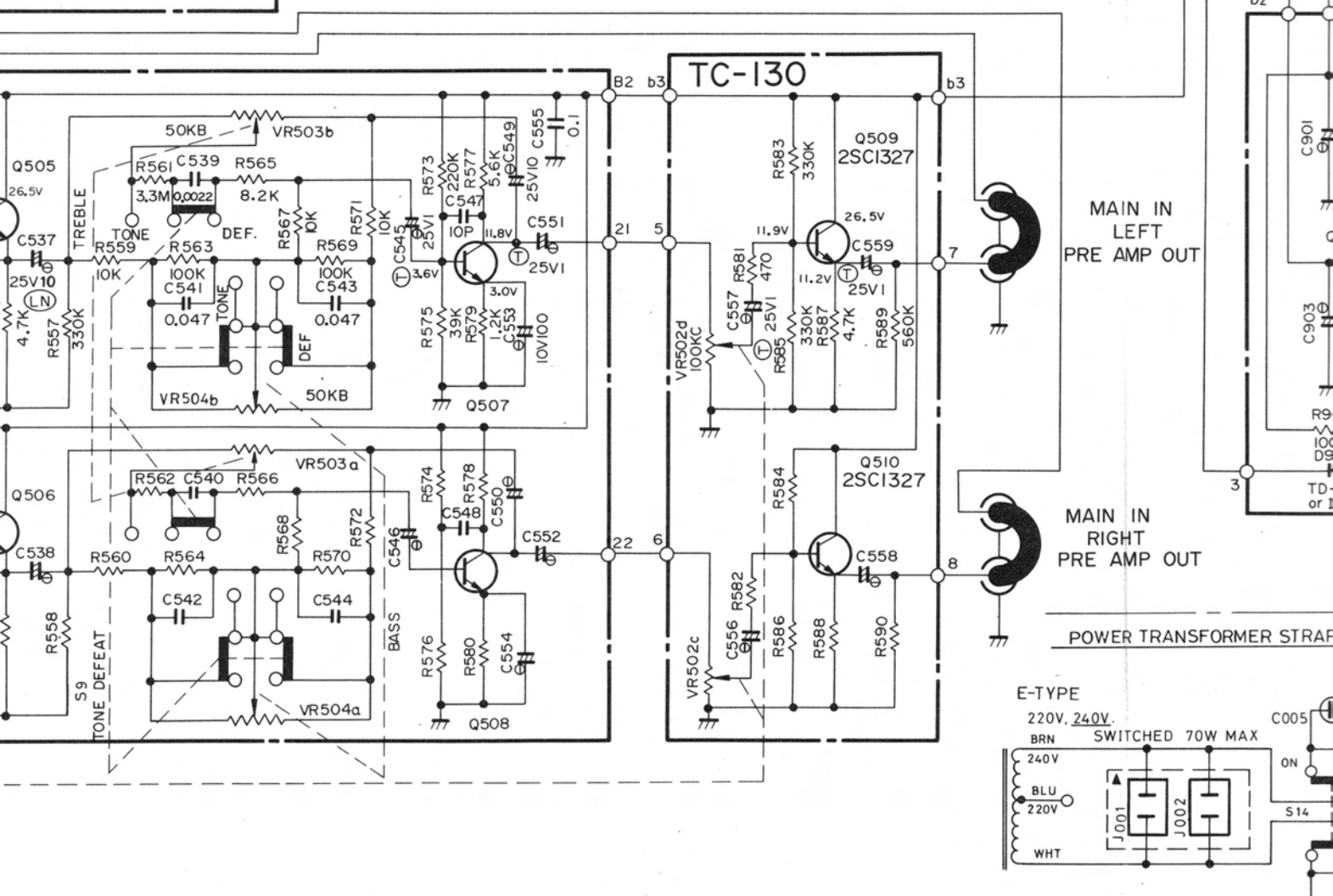
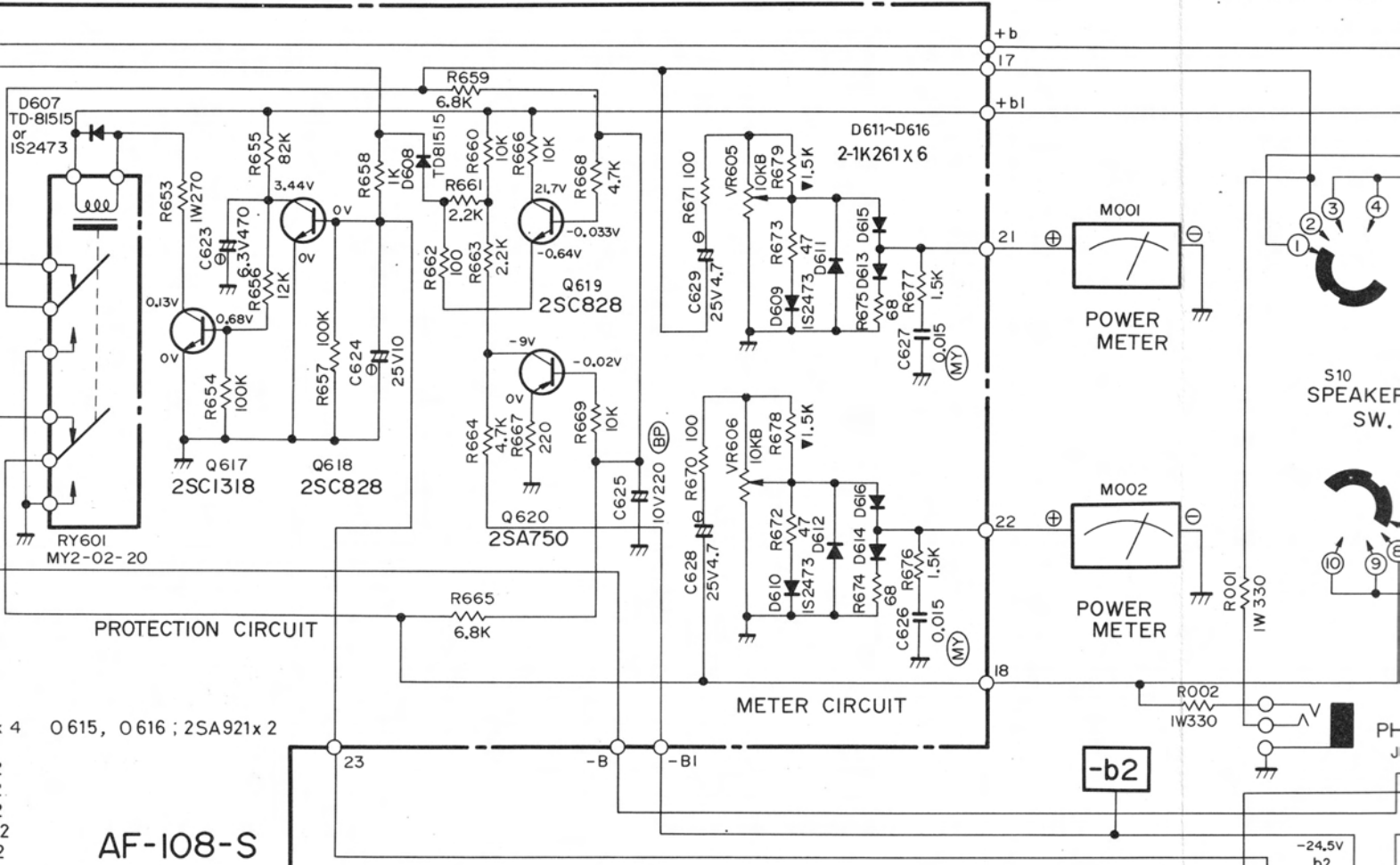
Schematic Location	Part No.	Description
<b>VARIABLE RESISTOR</b>		
VR501	515121121	250KW, Balance Control
VR502	525121136	100KBx2+100KCx2, Volume Control
VR503, 504	525101144	50KBx2, Bass, Treble Control
VR601, 602	510502145	1KB, Bias Adj
VR603, 604	510502147	10KB, Overload Level Adj
<b>SWITCHES</b>		
S1	601011283	Function Selector
S2	601011296	Monitor Selector
S3, 4, 5, 6	611001250	Mode Selector Muting Loudness Low Filter
S7, 8	611001251	Sub-sonic Filter High Filter
S9	611001252	Tone Defeat
S10	601011291	Speaker Selector
S11	614010127	Power Supply
<b>OTHERS</b>		
M001, 002	231310074	Wattmeter
RY901	240111229	Speaker Relay
T001	206001418	Power Transformer (220V/240V)
	204001418	Power Transformer (100V/120V)
T001	205001418	Power Trans. (Multivoltage)
	141710288	Pre-amp Circuit Board Ass'y
	141610287	Main Amp Circuit Board Ass'y
	141610288	Main Amp PCB Ass'y (for CSA Approved Units)
	141710289	Volume Control Amp Circuit Board Ass'y
	141810713	DIN IN/OUT Circuit Board Ass'y
	141810714	Power Supply Circuit Board Ass'y
	141810715	Power Supply PCB Ass'y (for Europe)
	141810719	Power Supply PCB Ass'y (for CSA Approved Units)

# Schematic Diagram









▲---AC OUTLET IS NOT USED FOR BS VERSION

# RA-913 SCHEMATIC DIAGRAM

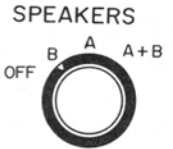
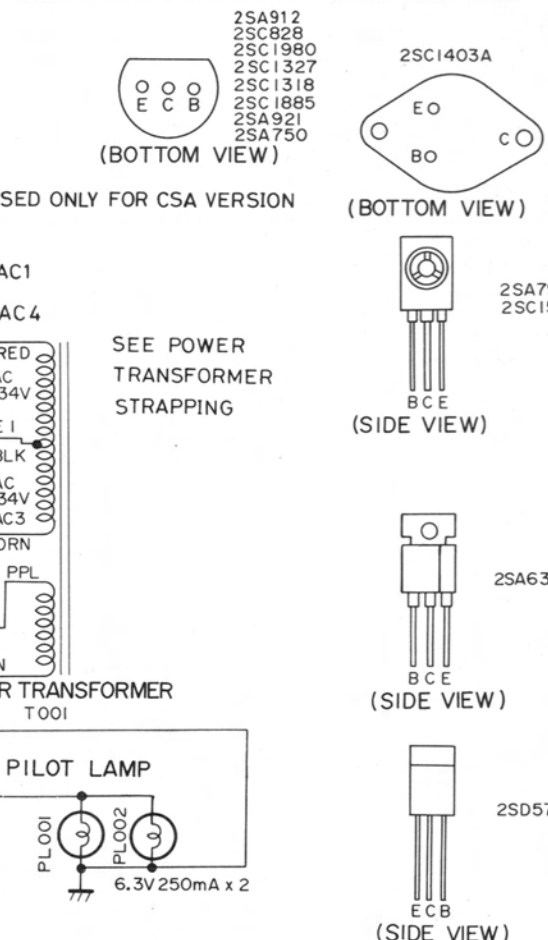
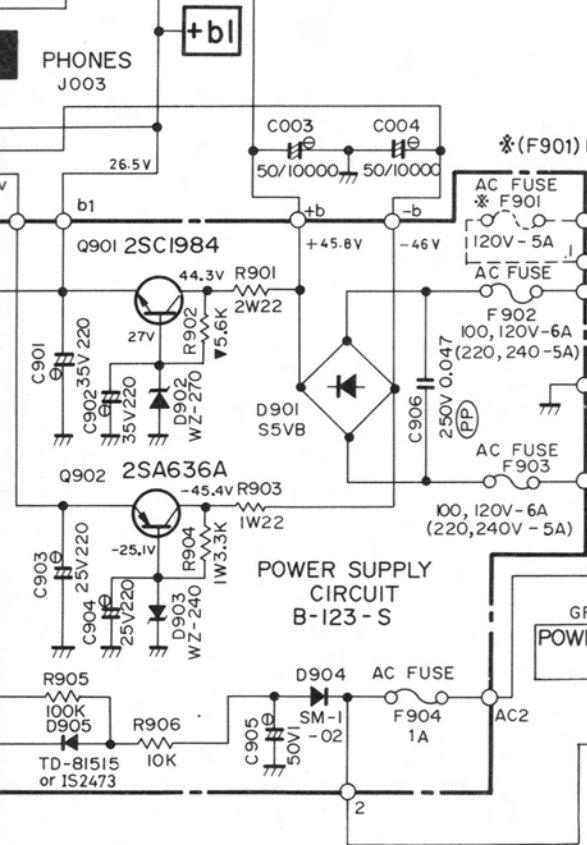
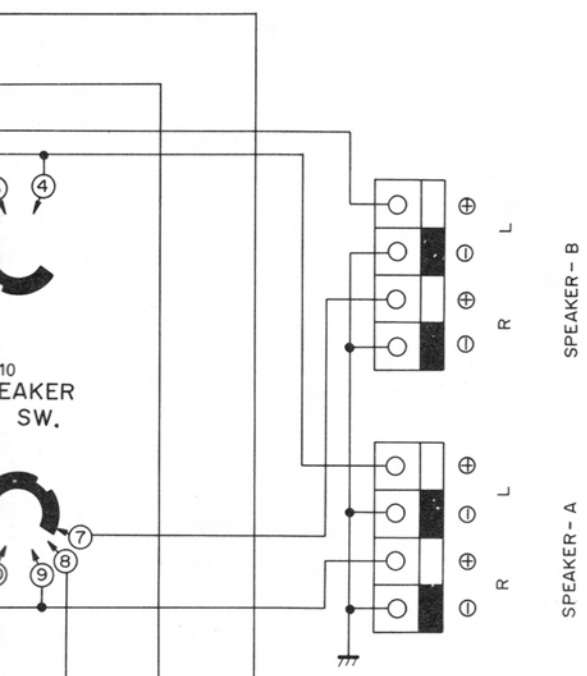
## RESISTORS

- 5% TOLERANCE UNLESS OTHERWISE NOTED.
- K ---- KILO OHM.
- M ---- MEGA OHM.
- ▽ ---- COMPOSITION RESISTORS 1/2 WATT.
- NONMARK ---- LOW NOISE TYPE CARBON RESISTORS 1/4 WATT.

## CAPACITORS

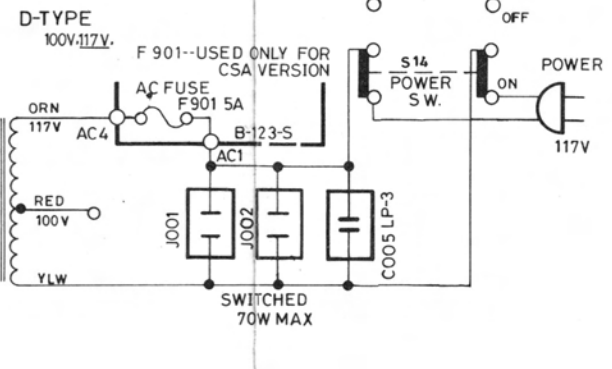
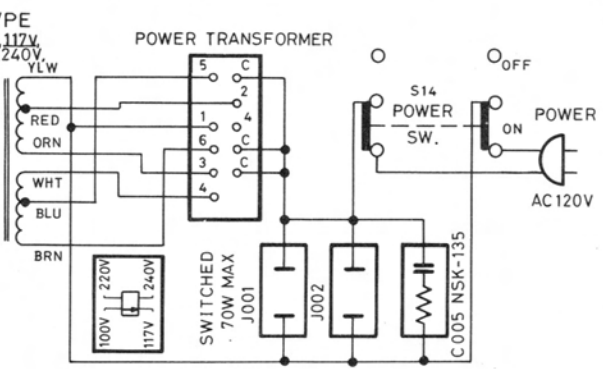
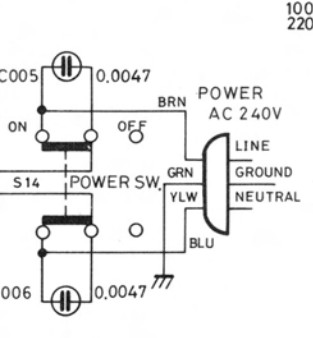
- (MY) ---- MYLAR FILM CAPACITORS.
- (AL) ---- SINTERED ALUMINUM SOLID ELECTROLYTIC CAPACITORS (ALSICON).
- (S) ---- POLYSTYRENE FILM CAPACITORS.
- (T) ---- TANTALUM CAPACITORS.
- (LN) ---- LOW NOISE TYPE CAPACITORS.
- (E) ---- ELECTROLYTIC CAPACITORS.
- (\*) ---- TEMPERATURE COEFFICIENT CAPACITORS.
- NONMARK ---- CERAMIC CAPACITORS.
- UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED IN MFD.
- VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 240VOLT).
- VOLTAGE READING MAY VARY ±20%
- (PP) ---- POLYPROPYLENE FILM CAPACITORS.
- (BP) ---- BI-POLAR ELECTROLYTIC CAPACITOR

ITEM	SCHMATIC LOCATION (LAST)
EQUALIZER AMP.	R436 C425
TONE CONTROL AMP.	R590 C559
MAIN AMP & PROTECTION & METER CIRCUIT	R679 C629
POWER SUPPLY CIRCUIT	R906 C906
CHASSIS	ROO2 COO6

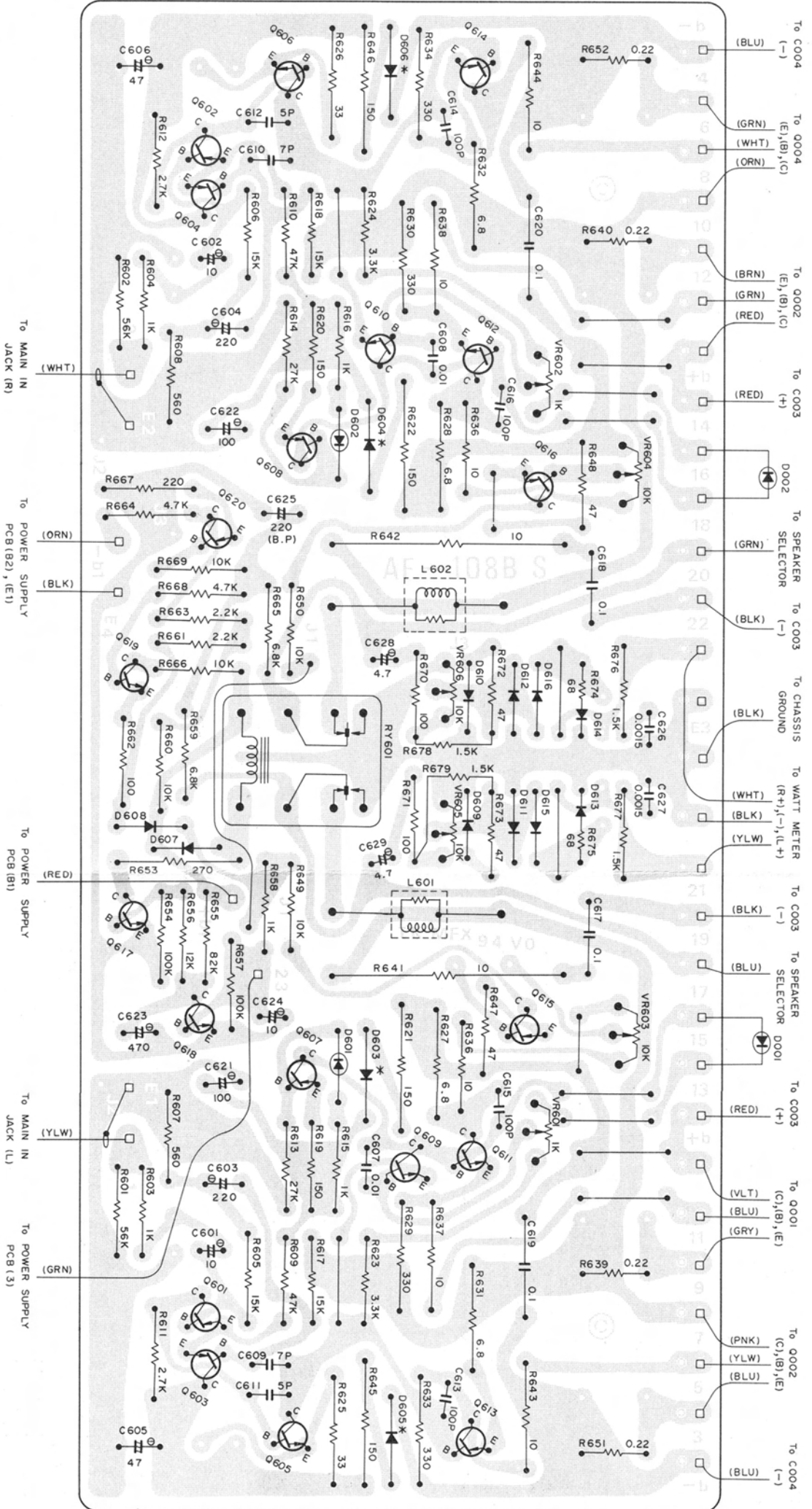


SEE POWER TRANSFORMER STRAPPING

## STRAPPING



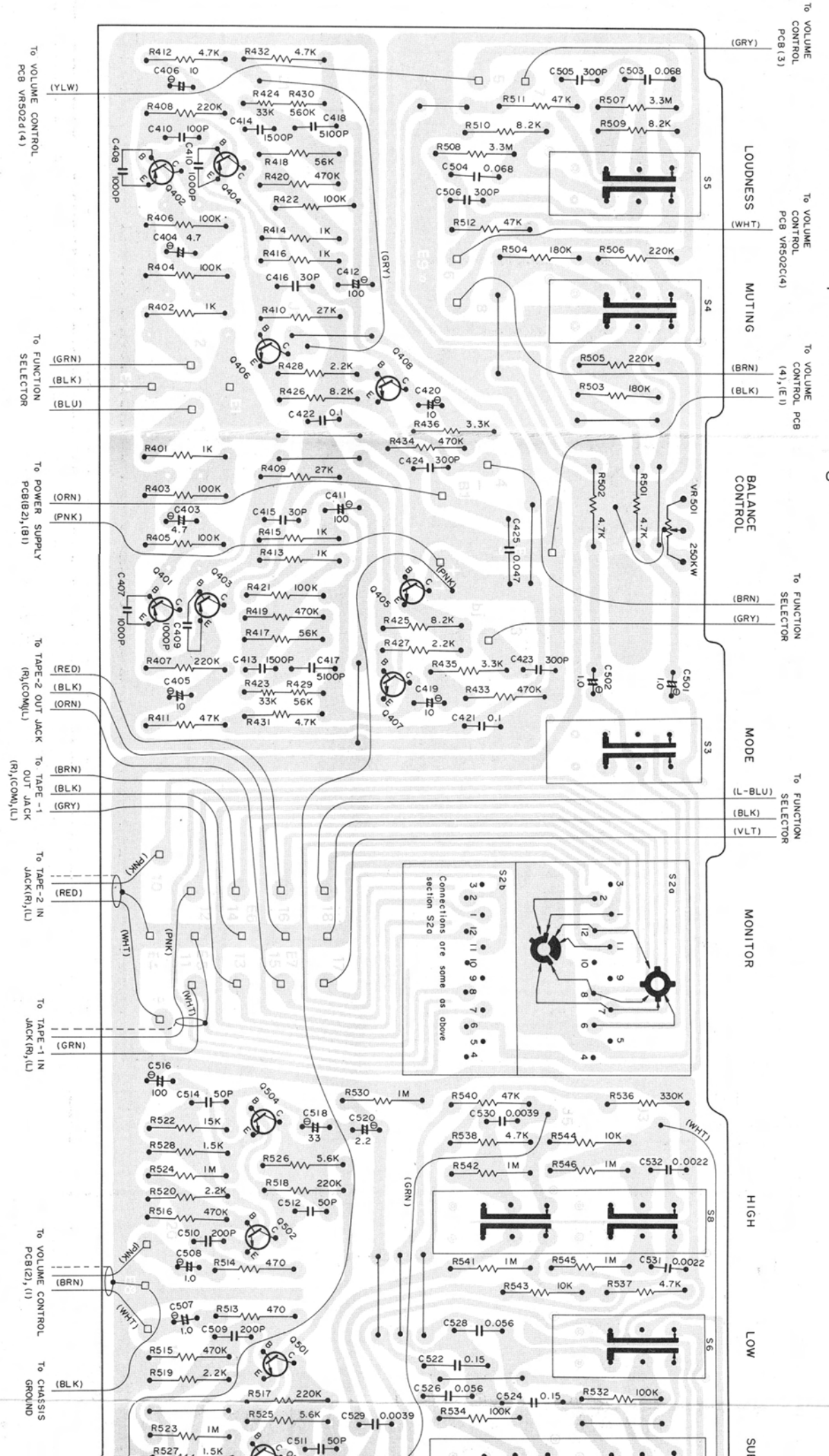
# Main Amplifier Circuit Board Diagram



Note: D603, 604, 605 and 606 are used in CSA approved units only. For other specifications, they are not employed. (shorted with jumper wire.)



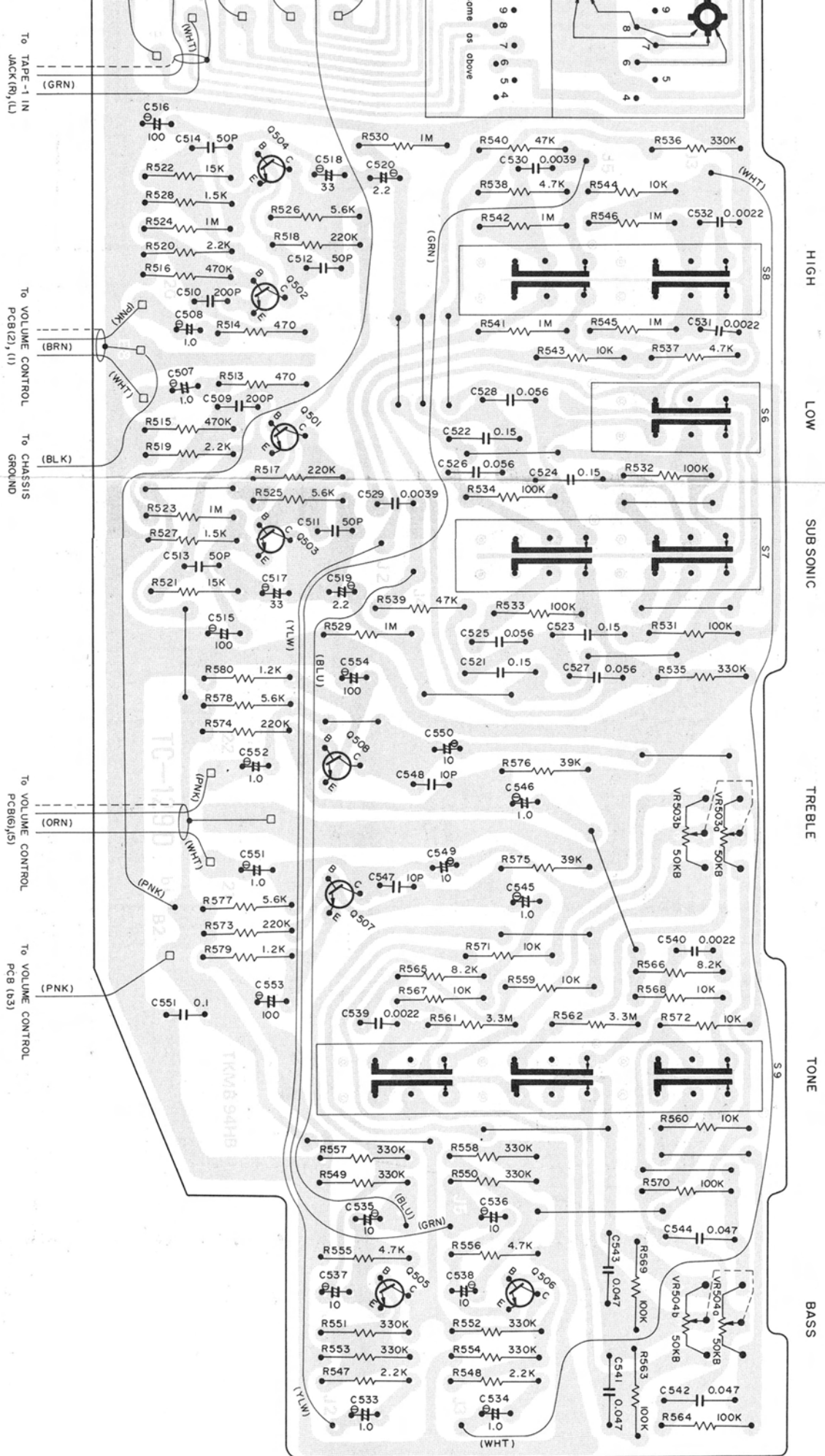
# Phono and Tone Control Amp Circuit Board Diagram



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1-368 OHOKAYAMA, MEGURO-KU, TOKYO 152, JAPAN  
 310 SEC. 5, NANKING E. ROAD, TAIPEI, TAIWAN  
 1055 SAW MILL RIVER ROAD, ARDSLEY, N.Y. 10502, U.S.A.



HIGH

LOW

SUBSONIC

TREBLE

TONE

BASS