

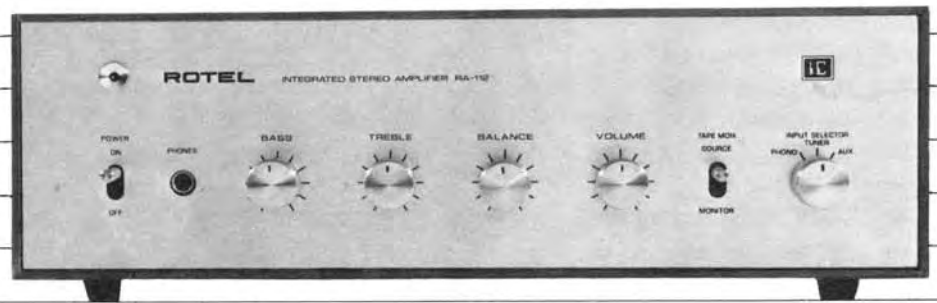
# ROTEL®

## RX-102

AM/FM STEREO RECEIVER

## RA-112

STEREO PRE/MAIN AMPLIFIER



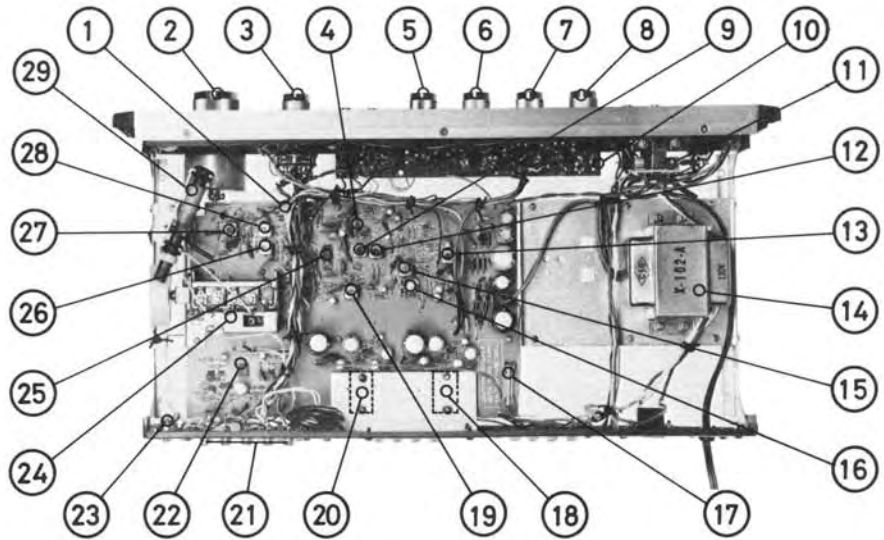
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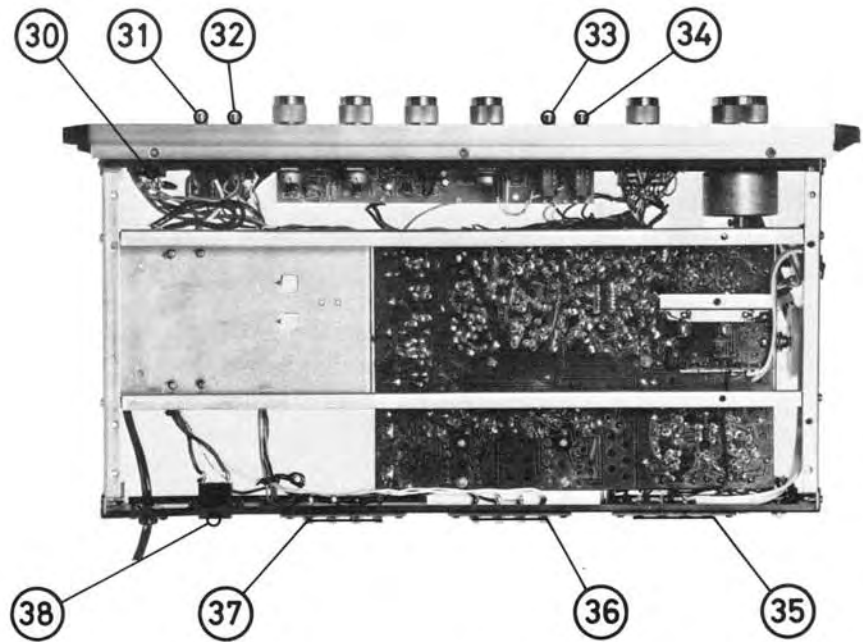
# TECHNICAL MANUAL

## MODEL RX-102 CHASSIS LAYOUT

1. VR101, AM Gain Adj.
2. Tuning Knob
3. S1, Function Selector
4. VR102, FM Meter Level Adj.
5. Volume Control
6. Balance Control
7. Treble Control
8. Bass Control
9. L105, FM IFT, Ratio (Pri.)
10. Tone Control Amp. PCB
11. Meter Light
12. L106, FM IFT, Ratio (Sec.)
13. L302, MPX Coil, 38 kHz Tune
14. T001, Power Transformer
15. L301, MPX Coil, 19 kHz Tune
16. VR301, Stereo Separation Adj.
17. F901, DC Fuse
18. IC601, Power Amp. IC, L-ch.
19. L104, AM IFT, 3rd
20. IC602, Power Amp. IC, R-ch.
21. Input and Tape Out Terminal
22. IC401, Phono Amp. IC
23. Phono Input Jack
24. AM/FM Front End
25. IC101, AM IF and FM IF Amp.
26. L102, AM IFT, 1st
27. L101, AM Osc. Coil
28. L103, AM IFT, 2nd
29. L001, AM Ant. Coil
30. Headphone Jack
31. S2, Power Switch
32. S3, Speaker Switch
33. S5, Loudness Switch
34. S4, Tape Monitor Switch
35. Antenna Terminal
36. Main Speaker Terminal
37. Remote Speaker Terminal
38. AC Outlet



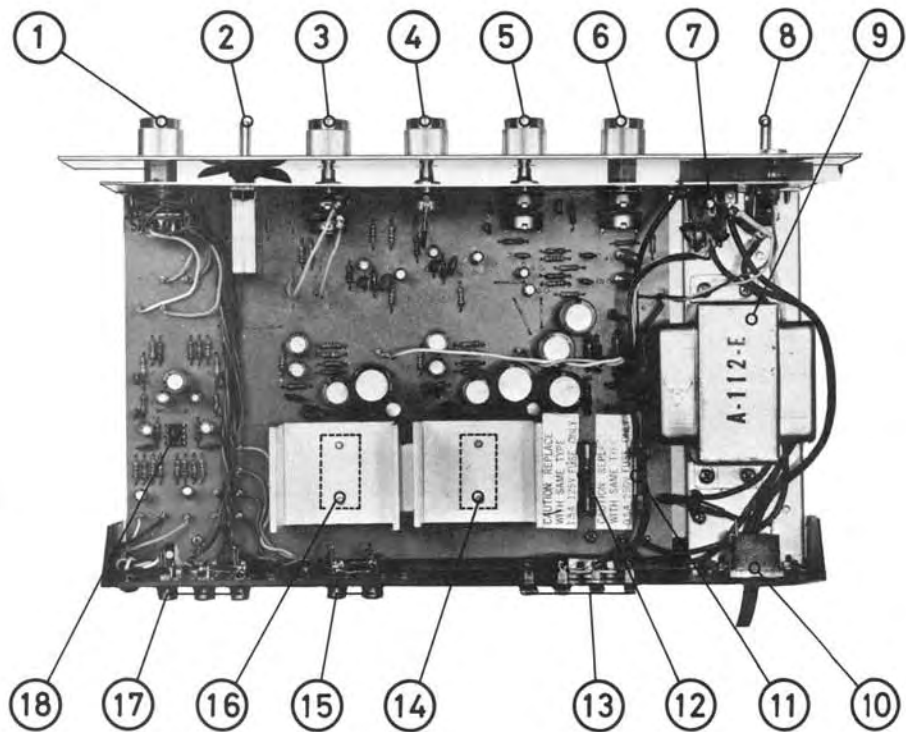
TOP VIEW



BOTTOM VIEW

## MODEL RA-112 CHASSIS LAYOUT

1. S1, Function Selector
2. S2, Tape Monitor Switch
3. Volume Control
4. Balance Control
5. Treble Control
6. Bass Control
7. Headphone Jack
8. S3, Power Switch
9. T001, Power Transformer
10. AC Outlet
11. F901, AC Fuse
12. F601, DC Fuse
13. Speaker Terminal
14. IC601, Power Amp. IC, L-ch.
15. Tape Monitor Terminal
16. IC602, Power Amp. IC, R-ch.
17. Input Terminal
18. IC401, Phono Amp. IC



## PRECAUTIONS

1. Always disconnect the chassis from the power line when soldering. Turning the power switch is not enough. Power line leakage passing through the heating element may destroy the IC's.
2. Never attempt to do any work on the IC amplifiers without first disconnecting the AC line cord and waiting until the power supply filter capacitors have discharged.

# RX-102 AM IF & RF ALIGNMENT PROCEDURE

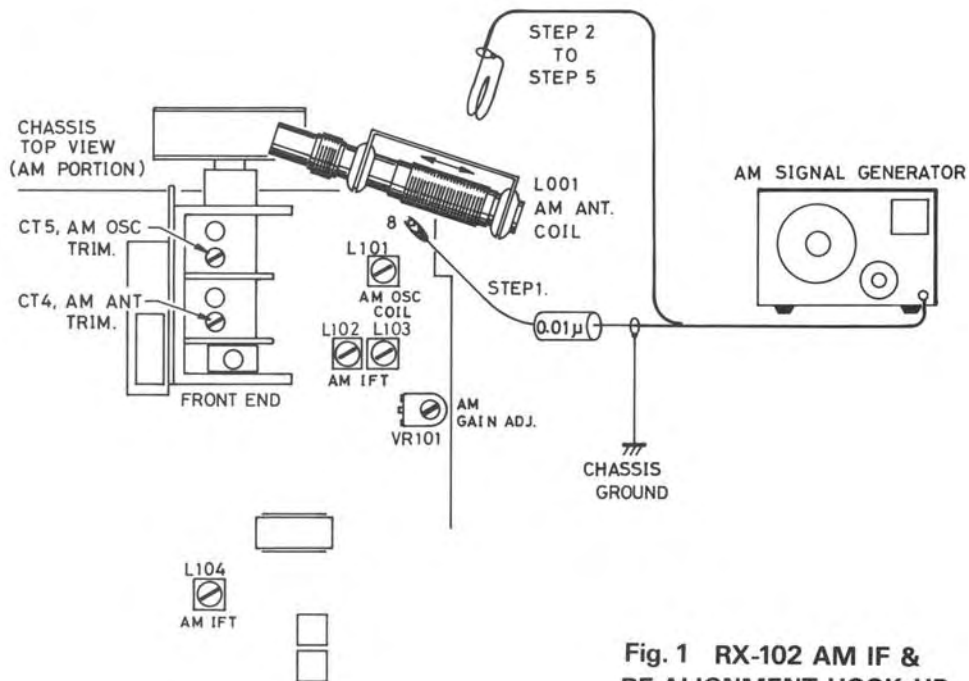
**Instruments:** AM Signal Generator, AC VTVM and Oscilloscope.

Set Function Selector Switch to AM position.

Set VR101 (on IF Board) to mid-position before starting this procedure.

**NOTE:** Input signal must be kept as low as possible to avoid AVC action.

| Step | Generator   |                          | Tuning Dial Setting                  | Output Indicator Connected to             | Adjust   | Adjust for               |
|------|---|--------------------------|--------------------------------------|---|--|--------------------------|
|      | Coupling  | Frequency                |                                      |   |  |                          |
| 1    | Q102 Base (on IF board ... Pin No. 8) Through a 0.01 mfd. capacitor.  | 455kHz (400Hz 30% Mod.)  | Non interfering at low end of scale. | AC VTVM to TAPE OUT jack (L-ch. or R-ch.) | L102, 103 and 104                              | Maximum reading on VTVM. |
| 2    | Loop Antenna  | 600kHz (400Hz 30% Mod.)  | 600kHz                               |   | L101 (OSC) and L001 (ANT) Coil                 |                          |
| 3    |   | 1400kHz (400Hz 30% Mod.) | 1400kHz                              |   | CT5 (OSC) and CT4 (ANT) (on Front end) Trimmer |                          |
| 4    | Repeat steps 2 and 3 until no further improvement is noticed.   |                          |                                      |   |  |                          |
| 5    | Same as above step 2: Adjust Signal Generator output so that input level of AM Antenna terminal comes to 100 $\mu$ V/m. | 1000kHz (400Hz 30% Mod.) | 1000kHz                              | Same as above Step 1.                     | VR101  | Same as above Step 1.    |



**Fig. 1 RX-102 AM IF & RF ALIGNMENT HOOK-UP**

# RX-102 FM IF & RF ALIGNMENT PROCEDURE

**Instruments:** FM Signal Generator and H.D. Analyzer

- Set Function Selector Switch to "FM" position.
- Connect FM Signal Generator to FM antenna terminals.
- Connect H.D. Analyzer to Tape Out jack.

## A. FM IF Alignment

1. Set Signal Generator frequency at 98 MHz (400 Hz, 100% Mod.) and tune the receiver to maximum output point. (The antenna terminal voltage should be 1 mV).
2. Adjust FM IFT L106 and T1 (on Front-end) to obtain maximum reading on Level Meter of H.D. Analyzer.
3. Adjust FM IFT, L105 to obtain minimum reading on Distortion Meter of H.D. Analyzer.

## B. FM RF Alignment

1. Set Signal Generator Frequency at 106 MHz and also the receiver at 106 MHz on the dial scale. Then adjust FM OSC trimmer CT3 (on Front-end) to obtain maximum reading on Level Meter.
2. Set the receiver at 90 MHz on the dial scale, and change the frequency of Signal Generator so that the output of the receiver becomes maximum. Then make sure Signal Generator frequency stays within 90 MHz  $\pm$  150 kHz.

3. Sensitivity on this alignment must be attempted at 106 MHz by adjusting CT1 and CT2 (on Front-end) to obtain maximum reading on Level Meter, and fine adjust to balance sensitivity at 90 MHz and 106 MHz.

**Caution:** Bandpass Filters (X101 and X102) incorporated in FM IF circuit are classified into 5 divisions according to their center frequencies. It is thus necessary to use the same frequency division in case of exchanging the Bandpass Filters. Divisions of bandpass frequencies are indicated by colored dots as shown in the following chart.

| COLOR  | CENTER FREQ. | TOLERANCE   |
|--------|--------------|-------------|
| Red    | 10.70MHz     | $\pm$ 30KHz |
| Blue   | 10.67MHz     | $\pm$ 30KHz |
| Orange | 10.73MHz     | $\pm$ 30KHz |
| Black  | 10.64MHz     | $\pm$ 30KHz |
| White  | 10.76MHz     | $\pm$ 30KHz |

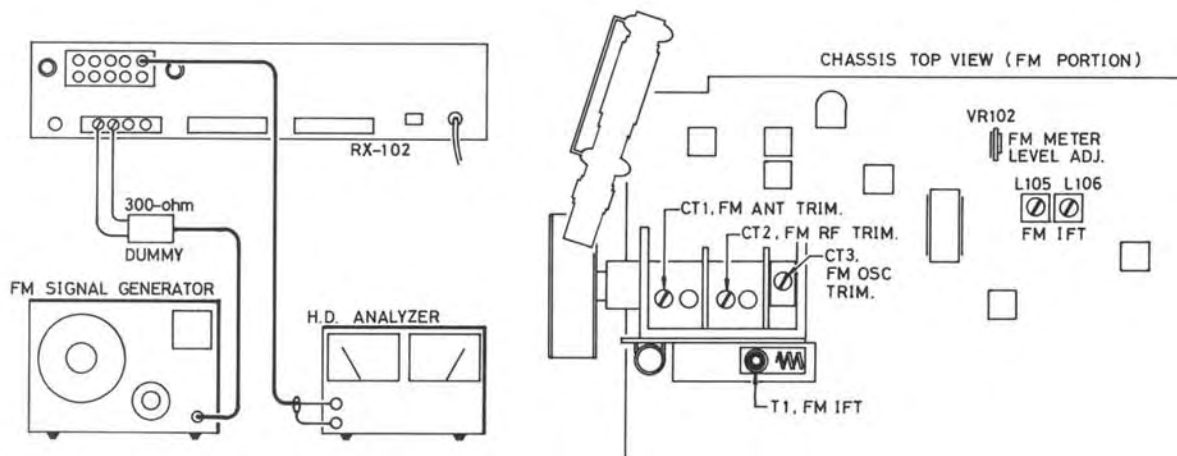


Fig. 2 RX-102 FM IF & RF ALIGNMENT HOOK-UP

# RX-102 FM MPX ALIGNMENT PROCEDURE

**NOTE:** The FM IF Alignment must be completed before attempting this FM-MPX Alignment.

Poor IF alignment will result in poor FM-MPX Alignment.

Set Function Selector Switch to FM STEREO.

Connect FM Stereo Generator to FM antenna terminals.

Set Potentiometer VR301 (on MPX board) to mid-position before starting this procedure.

| Step | Stereo Generator  |                         | Output Indicator Connected to                         | Adjust     | Adjust for  |
|------|---|-------------------------|---|------------|---|
|      | Modulation  | RF Deviation            |   |            |   |
| 1    | 19kHz<br>Pilot only   | 1 – 2%                  | VTVM &<br>Oscilloscope to<br>Test Point               | L302, L303 | Maximum reading<br>on VTVM.                       |
| 2    | Composite<br>1kHz signal<br>to Left chan-<br>nel only.        | Pilot 10%<br>Signal 70% | VTVM &<br>Oscilloscope to<br>Left channel<br>Tape Out | L302       | Maximum and<br>undistorted sine<br>wave on scope. |
| 3    | Composite<br>1kHz signal<br>to Right<br>channel only          |                         |   | VR301      | Minimum reading<br>on VTVM.                       |
| 4    | Same as in<br>Step 2  |                         | VTVM & Oscilloscope<br>to Right channel Tape<br>out   |            |   |
| 5    | Repeat steps 3 and 4 until no further improvement is noticed. |                         |   |            |   |

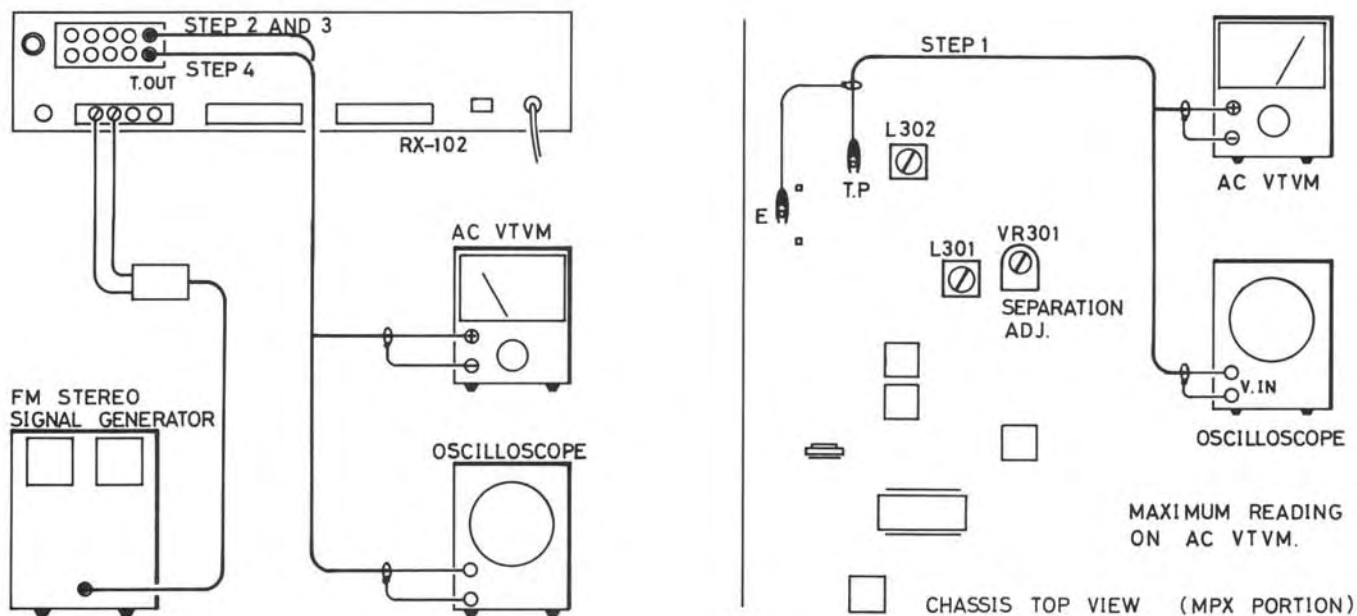


Fig. 3 RX-102 FM MPX ALIGNMENT PROCEDURE



# RX-102, RA-112 TROUBLE SHOOTING GUIDE

## I. Unit Inoperative.

### A. Pilot lamp does not illuminate. — Check AC fuse.

1. If AC fuse is blown —
  - a. Rectifier D901, 902, 903 or 904, may be shorted,
  - b. Capacitor C903 (C904 in model RX-102) may be shorted, or
  - c. Primary or secondary winding of transformer may be shorted.
2. If AC fuse is normal — Check voltage between (+) and (–) terminals on C903 (C904 in model RX-102).
  - a. If no voltage across —
    - 1) Primary or secondary winding of transformer has broken, or
    - 2) Power switch may be faulty.

### B. Pilot lamp illuminates. — Check DC fuse.

1. If DC fuse is blown —
  - a. IC601 or 602 may be faulty, or
  - b. Output circuit (including speaker system) may be shorted.

## II. Hum and/or Noise

### A. Hum and/or noise produced with VOLUME CONTROL set at Minimum.

1. Transistor Q501 or 502 may be faulty, or
2. Capacitor C501 or 505 (C502 or 513 for right channel) may be faulty.  
(C503 or 505/C511 or 513 for right channel/in model RX-102).
3. Resistor R507 or 509 (R508 or 510 for right channel) may be faulty.  
(R506 or 507/R518 or 519 for right channel/in model RX-102).

### B. Hum and/or noise produced only in PHONO —

1. IC401 may be faulty, or
2. Capacitor C401 or 411 (C402 or 412 for right channel) may be faulty.  
(C402 or 408/C401 or 415 for right channel/in model RX-102).
3. Resistor R405 or 417 (R406 or 418 for right channel) may be faulty.  
(R405 or 406/R416 or 417 for right channel/in model RX-102).

Note: When power IC has been replaced, if the maximum output is then lower than that of specification (peak or base of wave is clipped before attaining the rated output), change the bias resistance value as follows:

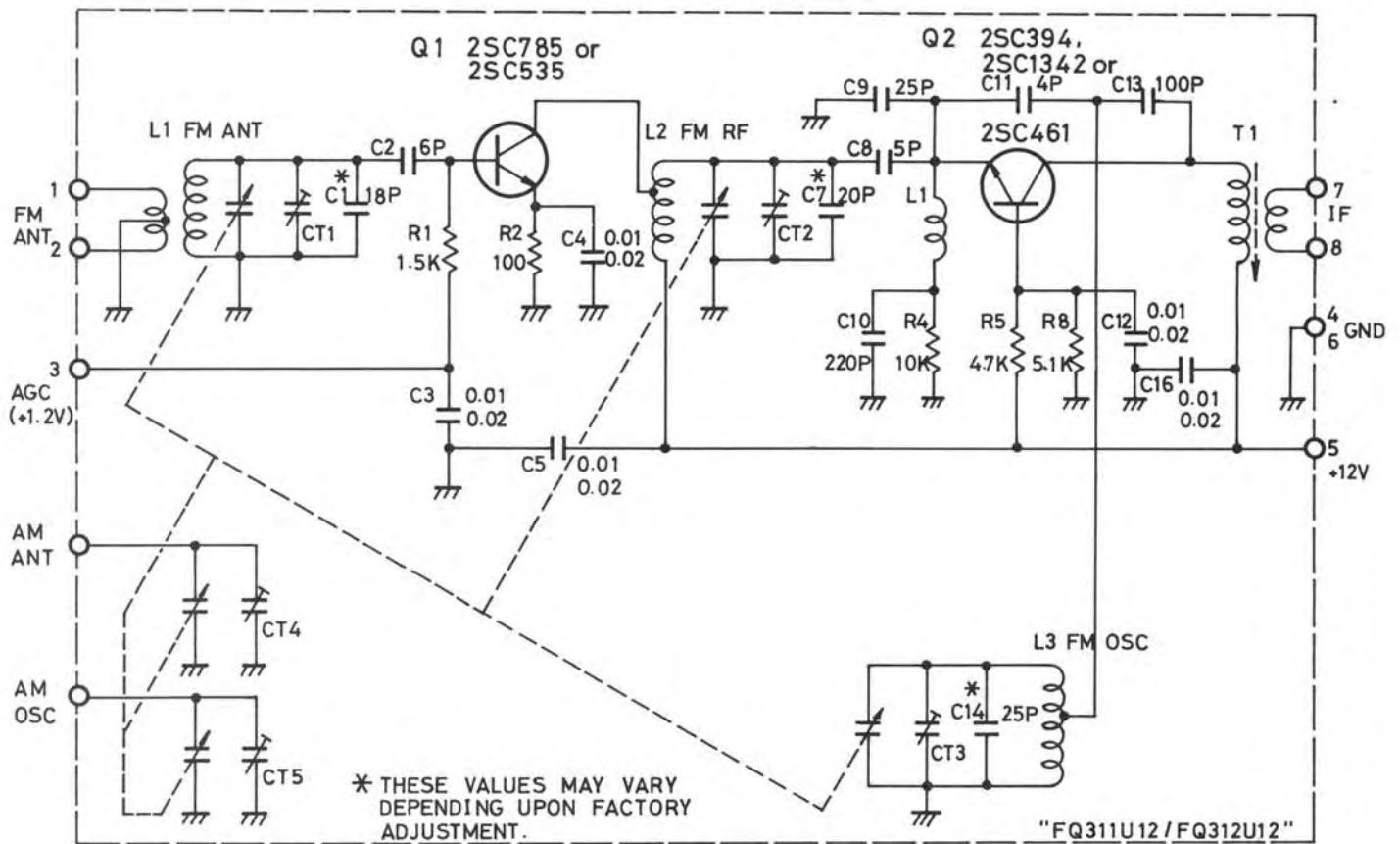
- a. If peak of wave is clipped first,  
Change bias resistor  $22\text{K}\Omega$  (R603 or 604 in model RA-112 and R602 or 609 in model RX-102) to that of  $23\text{K}–24\text{K}\Omega$ .
- b. If base of wave is clipped first,  
Use bias resistor  $18\text{K}\Omega$  instead of  $22\text{K}\Omega$ .  
If potentiometer is used as bias resistor, adjust it to meet the specification.

Note: 1. In model RA-112 with serial No. T40827 or higher, 50KB potentiometers VR601 and VR602 are employed in place of R603 and R604 respectively.

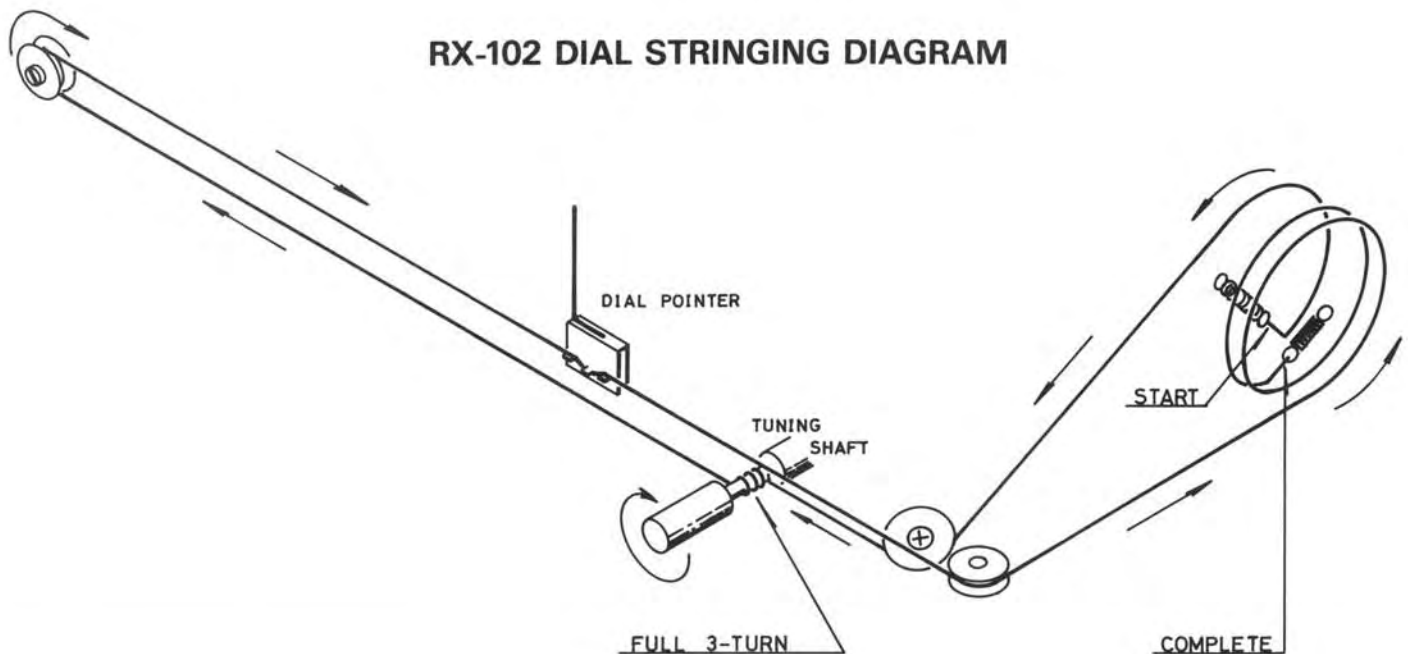
2. In model RX-102 with serial No. T38952 or higher, 50KB potentiometers VR601 and VR602 are employed in place of R602 and R609 respectively.

This change, however, is not applicable to models that carry serial No. T86171 through T87602.

## RX-102 FRONTEND SCHEMATIC DIAGRAM



## RX-102 DIAL STRINGING DIAGRAM



### DIAL STRINGING PROCEDURES

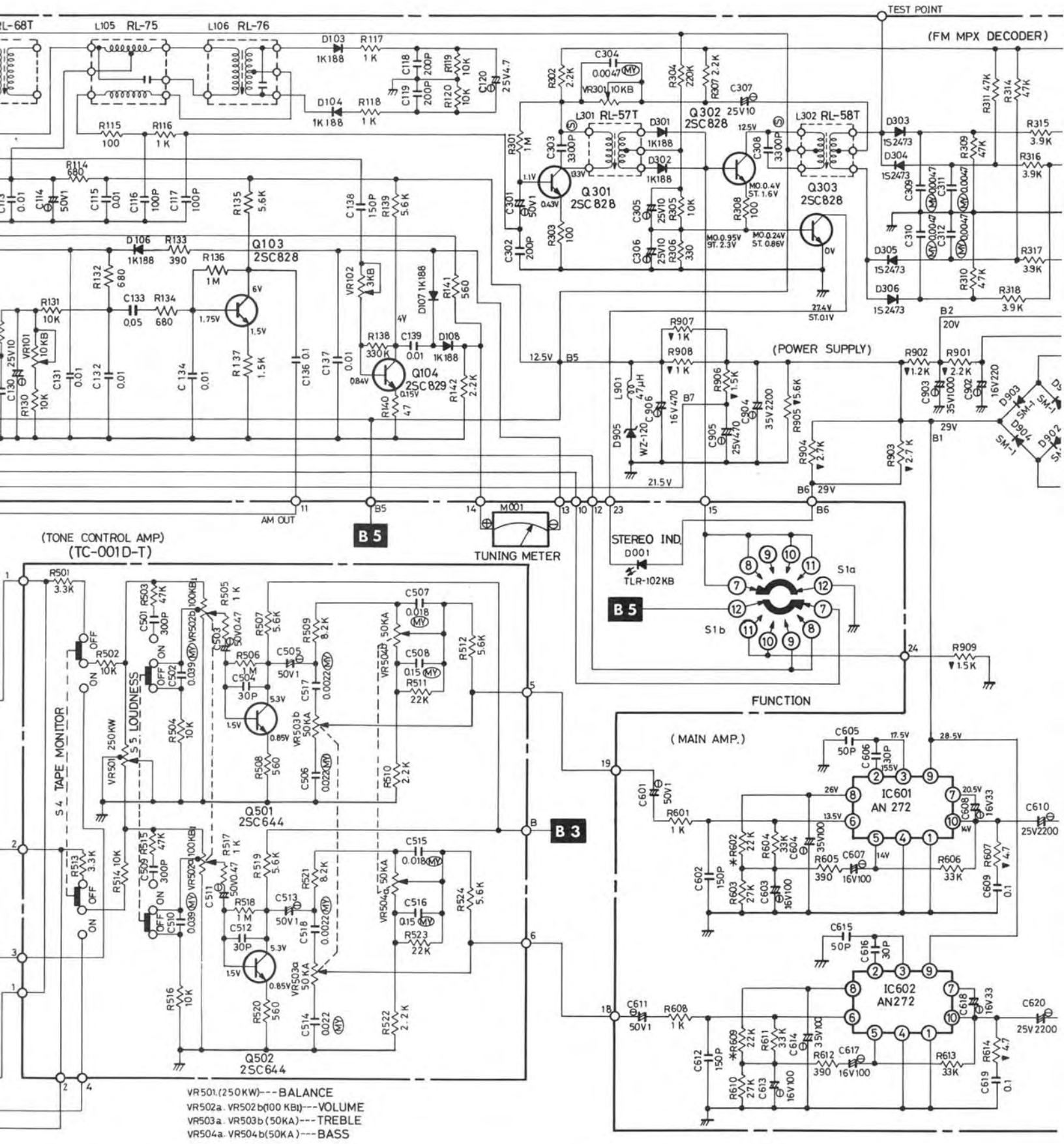
1. Remove the unit from the cabinet and remove all front panel control knobs. (Do not remove push buttons.) Then remove the front panel by loosening the 6 mounting screws: 3 on top and 3 at the bottom.
2. Carry out stringing according to the diagram with the front end set at VC minimum.
3. In the final process, the string is wound from outside

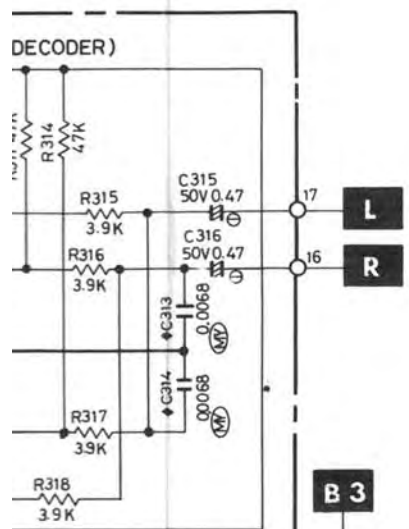
to inside (in the direction of front end) of the drum. Be careful not to press down on the wound string when inserting the string end into the drum to fix it onto the spring.

4. After completing the stringing process, attach the dial pointer. Turn the tuning shaft to VC maximum and fix the pointer mounting position so that it is aligned with the center of "0" on the 0 - 100 dial scale log.







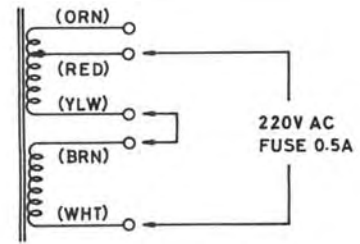
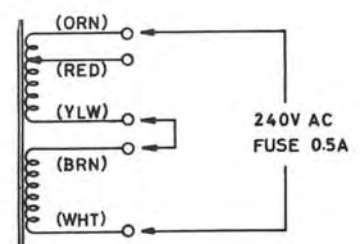


**(RESISTORS)**  
 5% TOLERANCE UNLESS OTHERWISE NOTED  
 K---KILO OHM  
 M---MEGA OHM  
 ▽---COMPOSITION RESISTORS 1/2 WATT  
 NON MARK---LOW NOISE TYPE CARBON RESISTORS 1/4 WATT

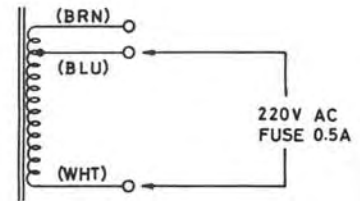
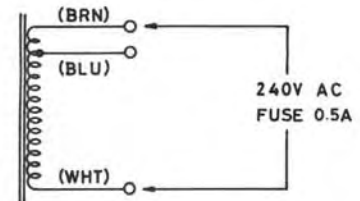
**(CAPACITORS)**  
 (MY)---MYLAR FILM CAPACITORS  
 (S)---POLYSTYRENE CAPACITORS  
 (E)---ELECTROLYTIC CAPACITORS  
 (★)---TEMPERATURE COEFFICIENT CAPACITORS  
 NON MARK---CERAMIC CAPACITORS  
 ● UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED IN MFD.  
 ● VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 120 VOLT).  
 ● VOLTAGE READING MAY VARY ±20%.  
 \*---THESE VALUES MAY VARY DEPENDING UPON FACTORY ADJUSTMENT.  
 ◆---WHEN FM DE-EMPHASIS IS AT 50μs, C313, C314 CAPACITANCE VALUES WILL BE 0.012μ.

**POWER TRANSFORMER STRAPPING**

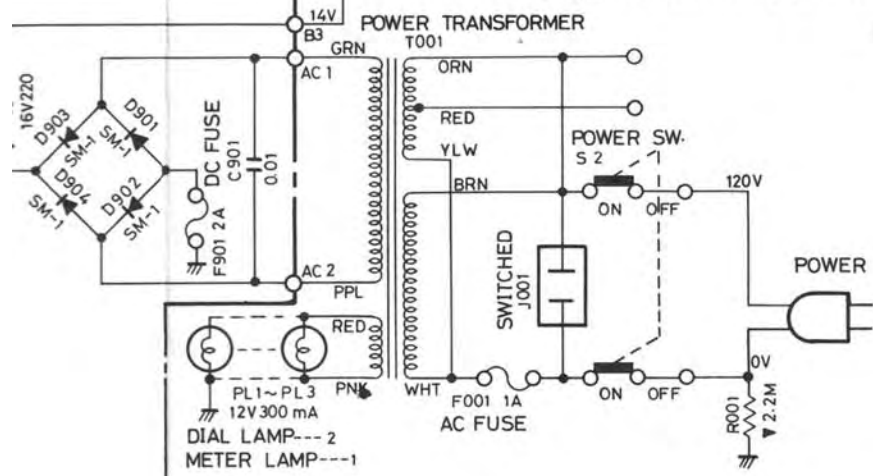
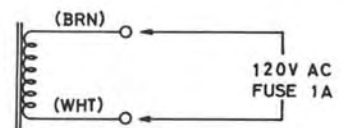
**X-102-CT**



**X-102-E**



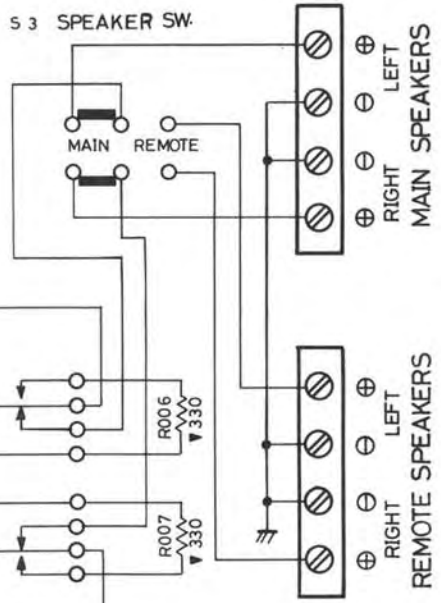
**X-102-A**



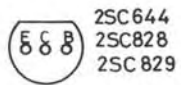
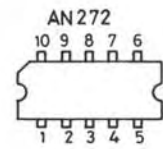
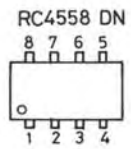
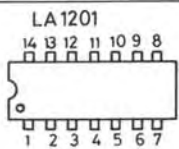
**(IC101) VOLTAGE**

|    | NO SIGNAL |
|----|-----------|
| 1  | 2.25V     |
| 2  | 3.2V      |
| 3  | 0.63V     |
| 4  | 1.08V     |
| 5  | 1.35V     |
| 6  | 0.63V     |
| 7  | 0V        |
| 8  | 2.8V      |
| 9  | 0.7V      |
| 10 | 2.15V     |
| 11 | 0V        |
| 12 | 2.15V     |
| 13 | 6.4V      |
| 14 | 6.4V      |

| ITEM              | SCHEMATIC LOCATION (LAST) |
|-------------------|---------------------------|
| AM/FM IF AMP.     | R143                      |
| FM MPX DEC.       | R318                      |
| EQUALIZER AMP.    | R421                      |
| TONE CONTROL AMP. | R524                      |
| MAIN AMP.         | R614                      |
| POWER SUPPLY      | R909                      |
| CHASSIS           | C906                      |
|                   | R007                      |
|                   | C003                      |



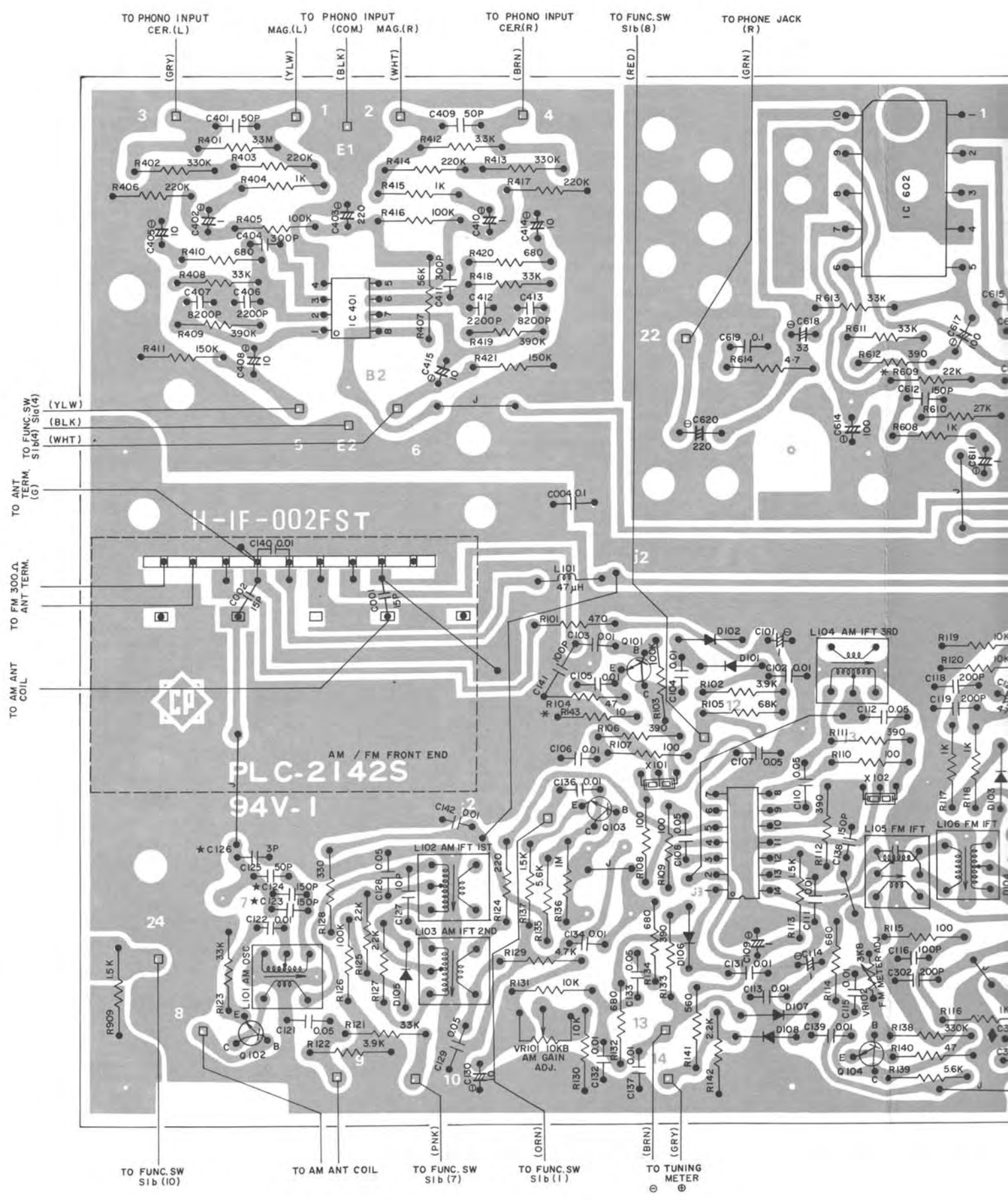
**(FUNCTION)**



(TOP VIEW)

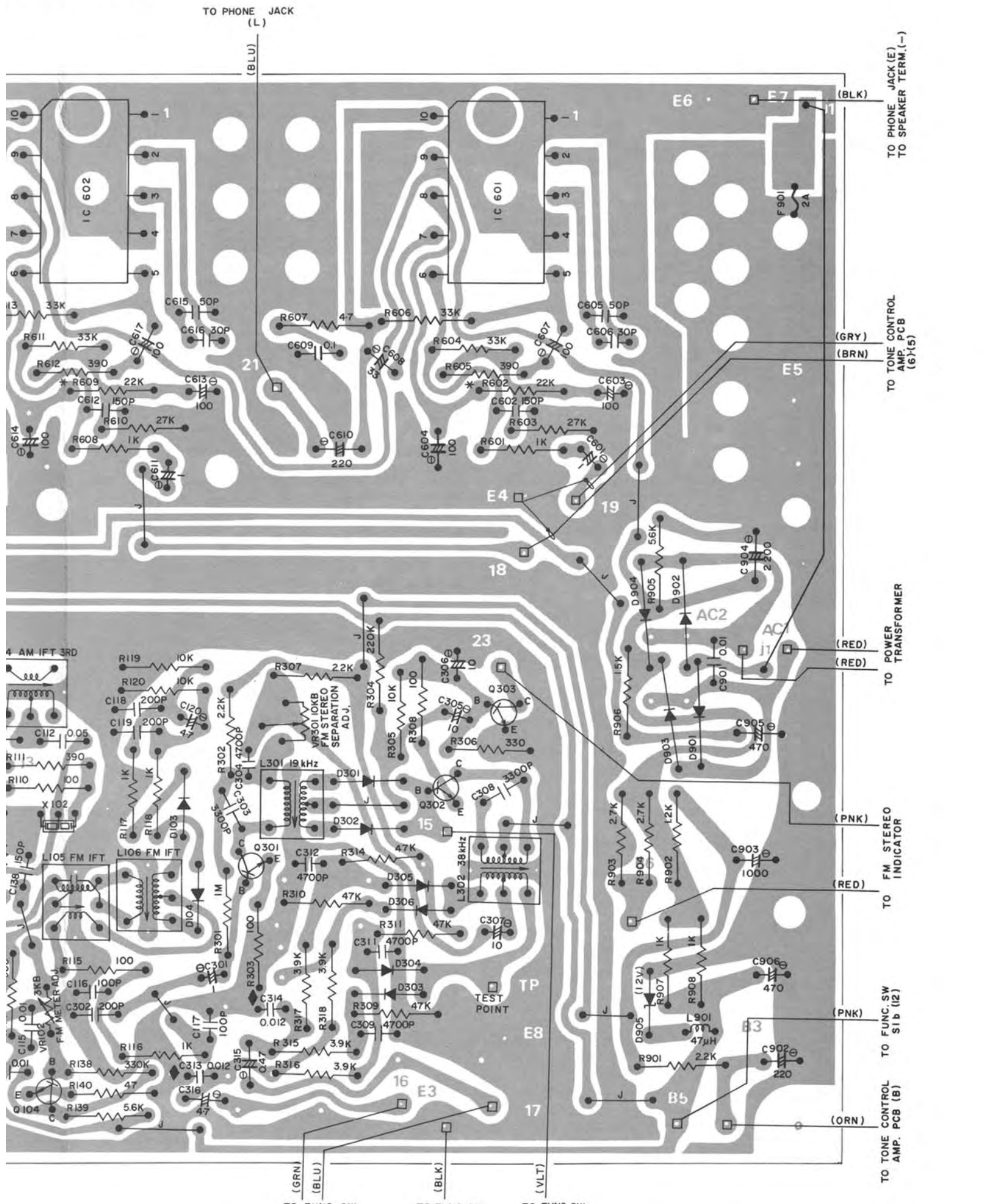
(BOTTOM VIEW)

# RX-102 AM/FM/MPX/PHONO/MAX AMP. & POWER SUPPLY CIRCUIT BOARD DIAGRAM

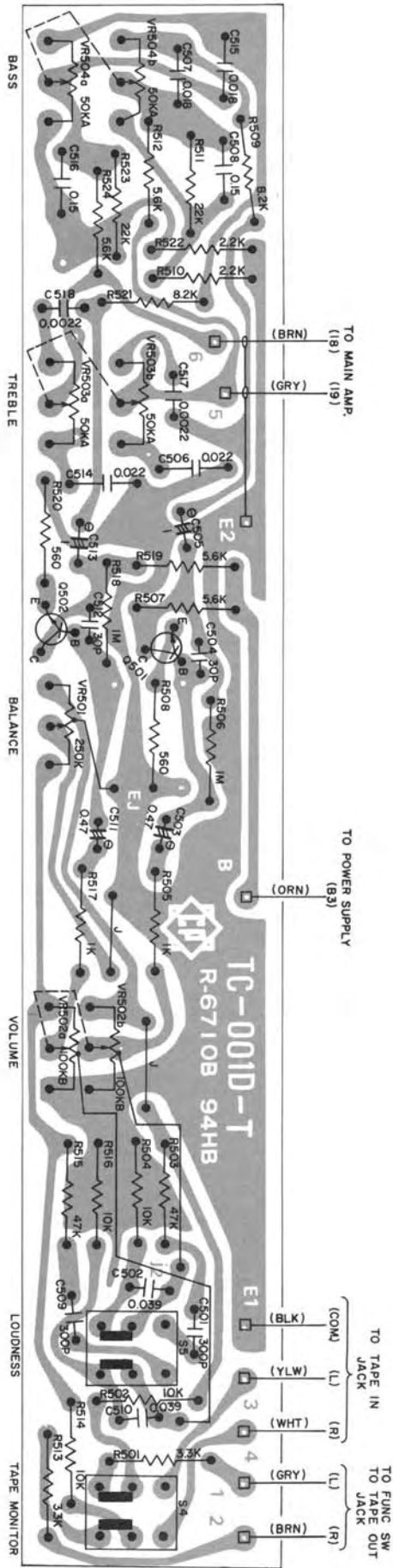




# D DIAGRAM

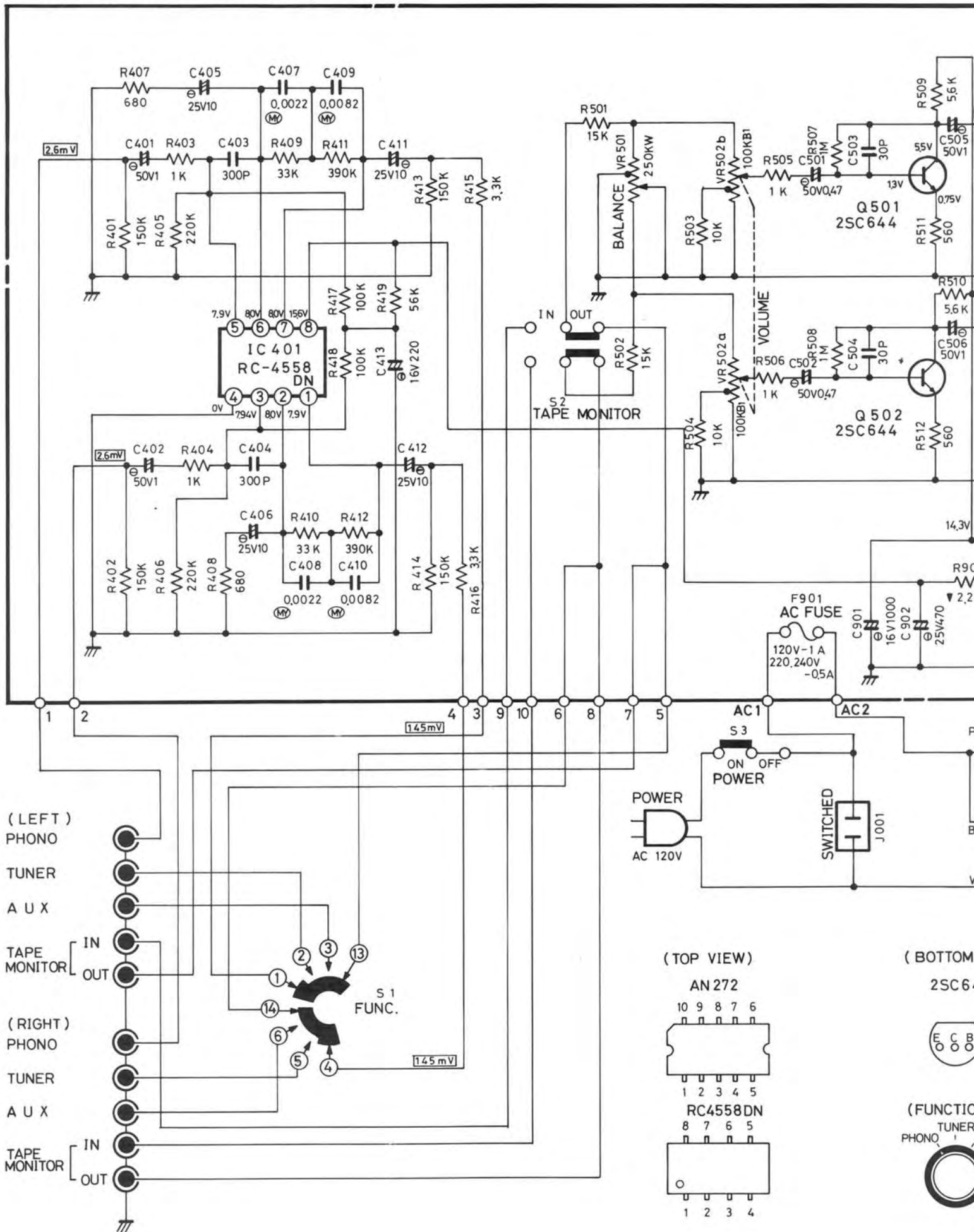


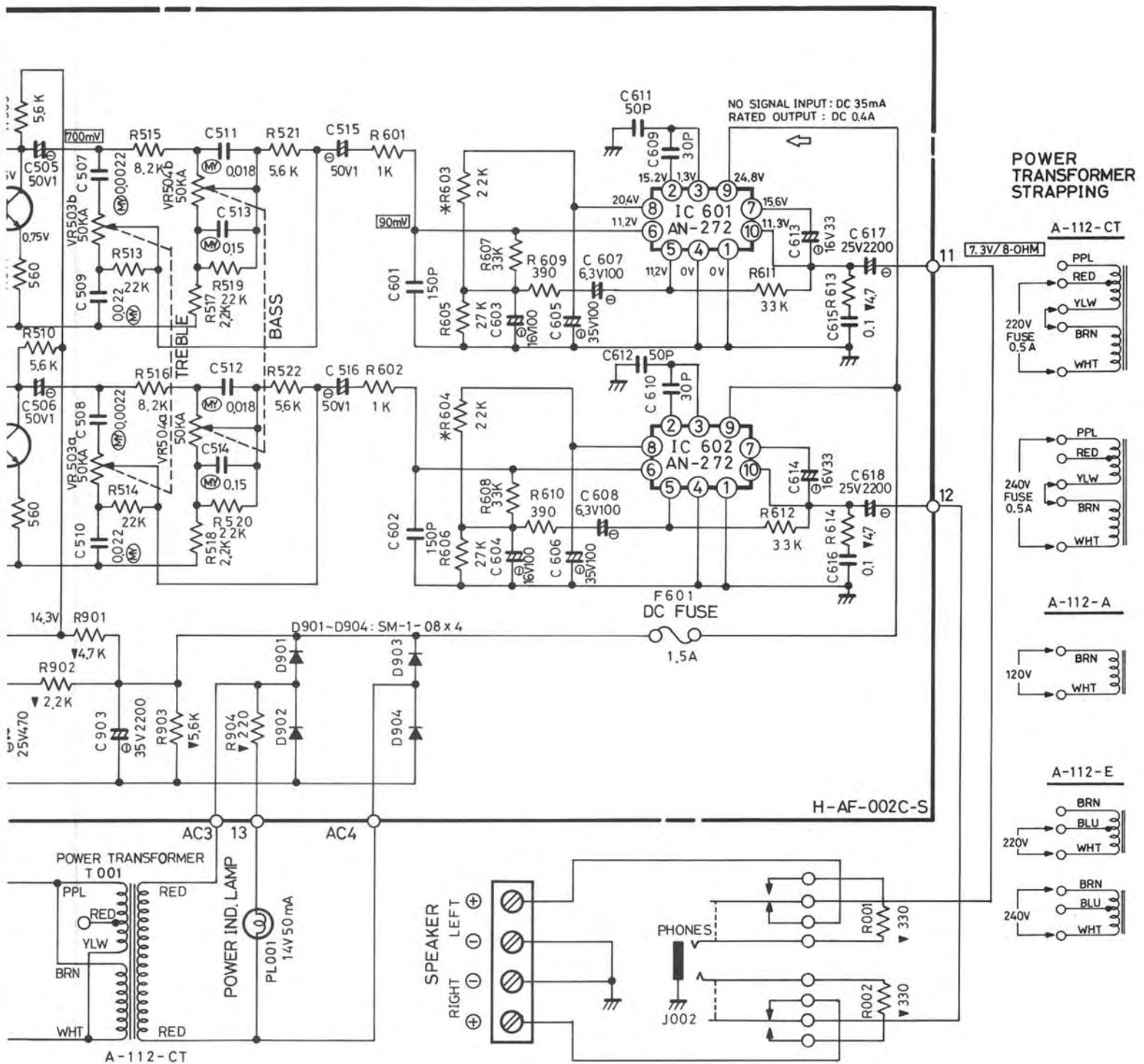
# RX-102 TONE CONTROL AMP. CIRCUIT BOARD DIAGRAM





# RA-112 SCHEMATIC DIAGRAM





OTTOM VIEW )  
2SC644



| ITEM              | SCHMATIC LOCATION (LAST) |
|-------------------|--------------------------|
| EQUALIZER AMP.    | R 419<br>C 413           |
| TONE CONTROL AMP. | R 516<br>C 522           |
| MAIN AMP.         | R 614<br>C 618           |
| POWER SUPPLY      | R 904<br>C 903           |
| CHASSIS           | R 002                    |

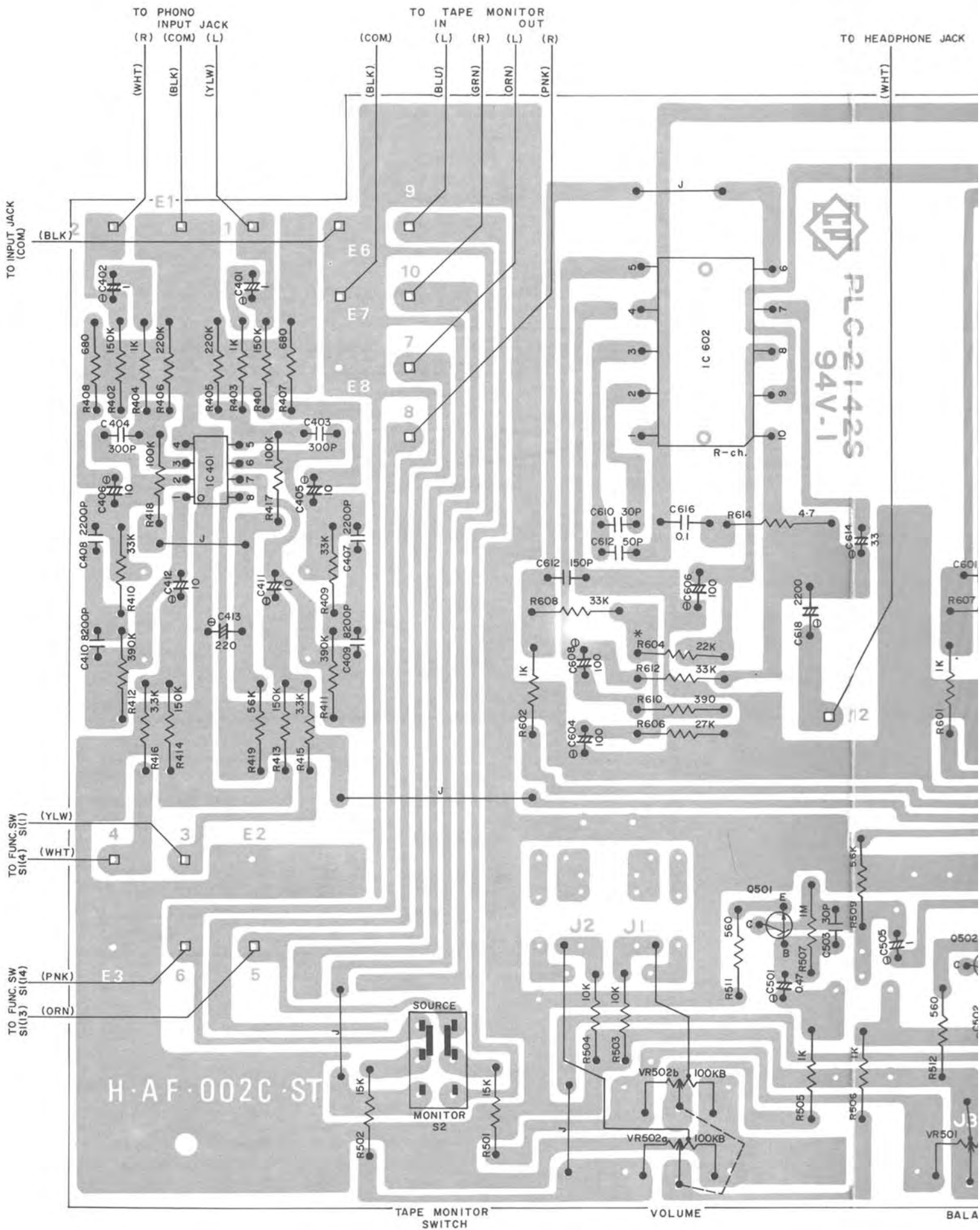
(RESISTORS)

- 5% TOLERANCE UNLESS OTHERWISE NOTED
- K--- KILO OHM
- M--- MEGA OHM
- ▼--- COMPOSITION RESISTORS 1/2 WATT
- NON MARK--- LOW NOISE TYPE CARBON RESISTORS 1/4 WATT

(CAPACITORS)

- Ⓜ---MYLAR FILM CAPACITORS
- ⚡---ELECTROLYTIC CAPACITORS
- NON MARK----CERAMIC CAPACITORS
- UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED IN MFD.
- VOLTAGE READING MAY VARY ± 20 %.
- [ ] INDICATES 1kHz SIGNAL LEVELS FROM PHONO INPUT : [ 2.6mV ] TO PA OUTPUT : [ 7.3V ACROSS 8-OHM LOAD ]
- \* THESE VALUES MAY VARY DEPENDING UPON FACTORY ADJUSTMENT.

# RA-112 PRE/MAIN AMP. & POWER SUPPLY CIRCUIT BOARD DIAGRAM



HEADPHONE JACK

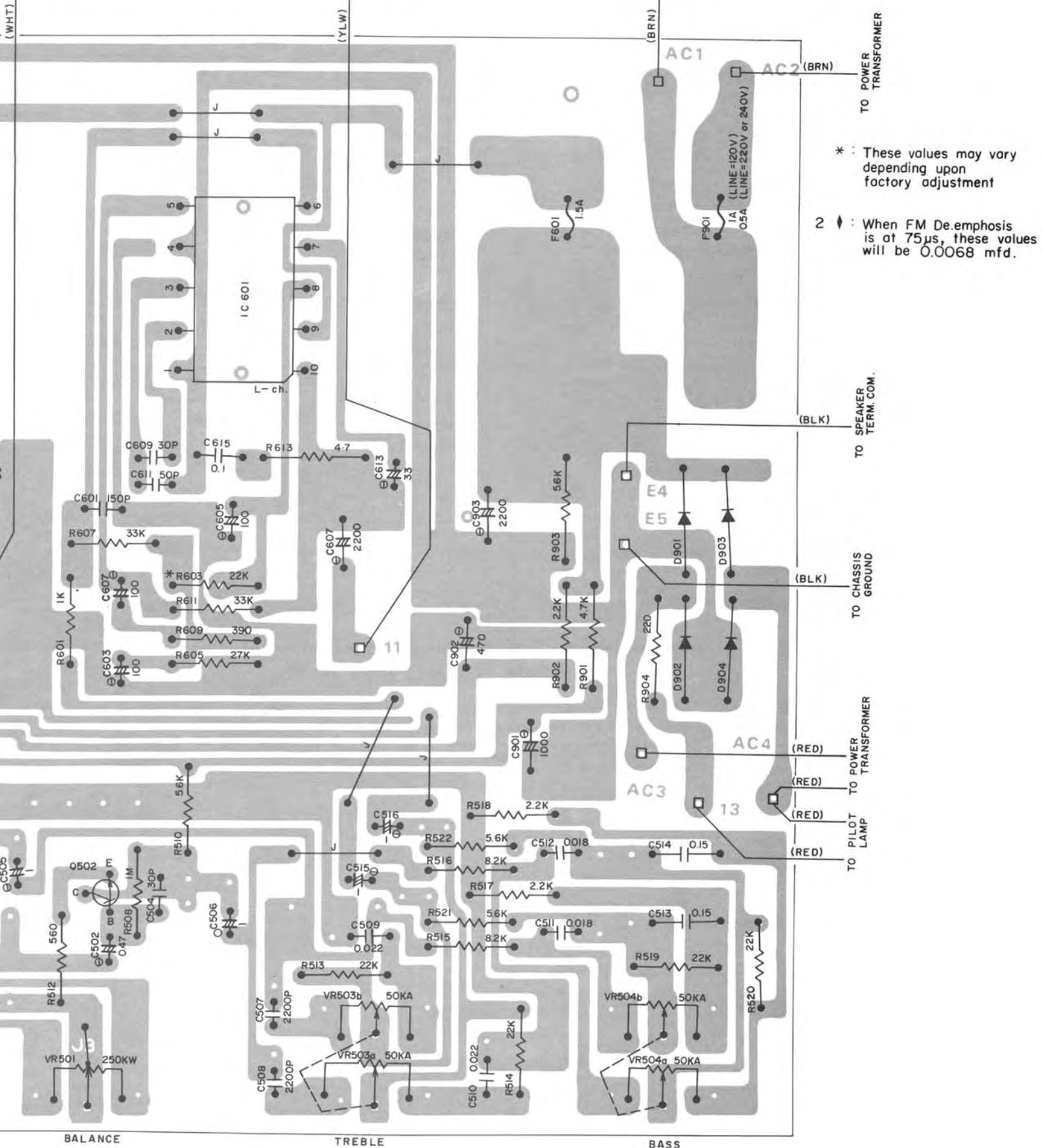
TO HEADPHONE JACK

TO POWER SWITCH

TO POWER TRANSFORMER

\* : These values may vary depending upon factory adjustment

2 † : When FM De.emphasis is at 75µs, these values will be 0.0068 mfd.

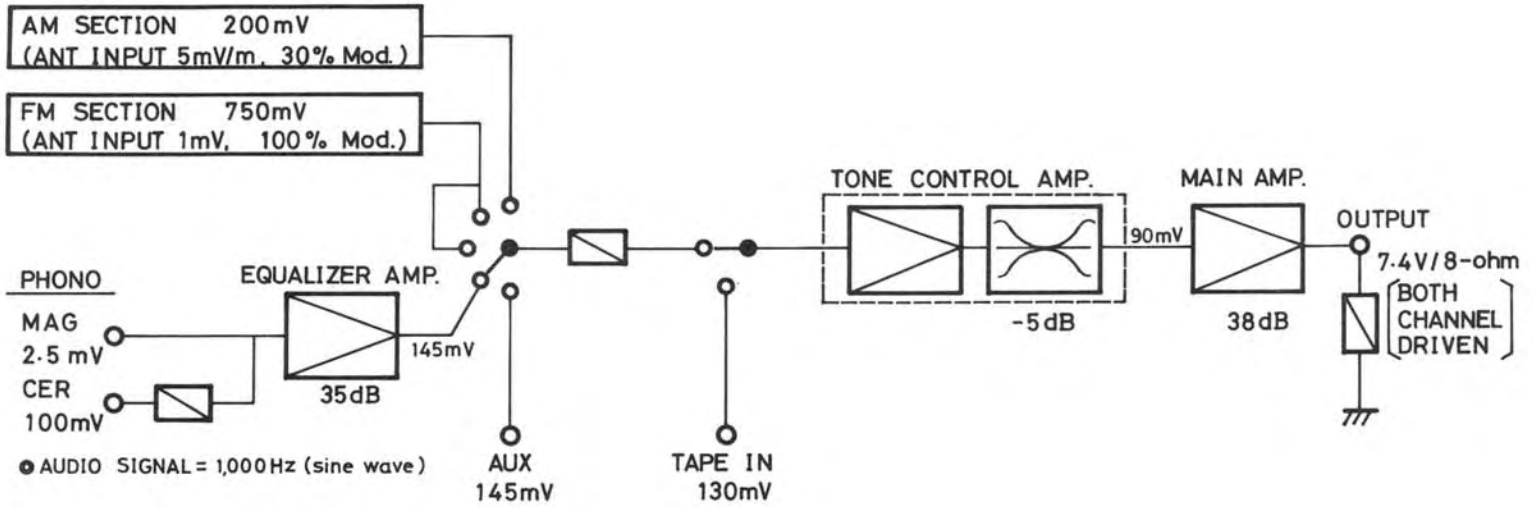


BALANCE

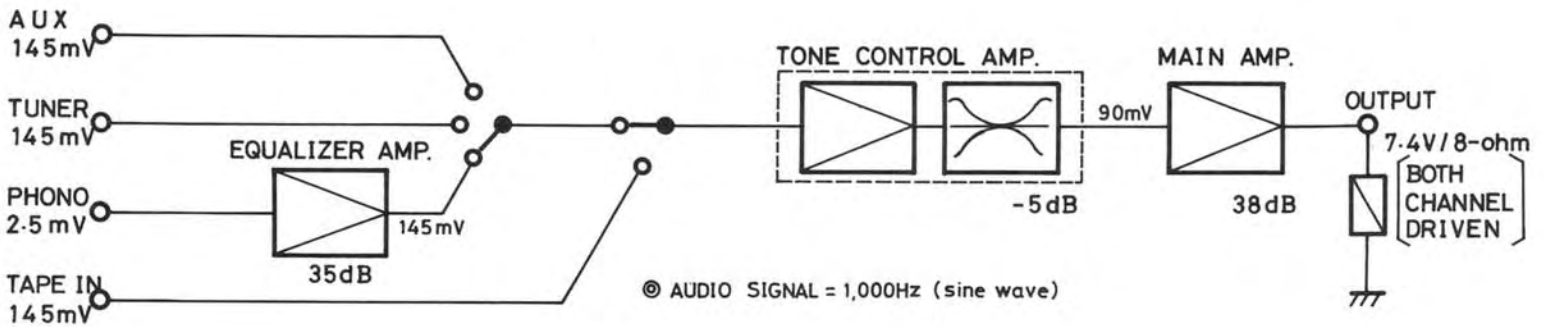
TREBLE

BASS

## RX-102 GAIN DIAGRAM



## RA-112 GAIN DIAGRAM





# REPAIR PARTS LIST

## RX-102

| Symbol No.  | Part No.  | Description   |
|---|-----------|---|
| <b>TRANSISTORS, IC'S AND DIODES</b>               |           |   |
| Q101, 102, 104                                    | 301201117 | 2SC829 (C), FM IF Amp., AM Conv., etc.  |
| Q103, 301, 302, 303                               |           |   |
| Q501, 502   | 301201114 | 2SC644 (S), Pre-amp.  |
| IC101   | 303452148 | LA1201, AM IF and FM IF Amp.  |
| IC401   | 303452152 | RC-4558 (DN or NB), Phono Amp.  |
| IC601, 602  | 303452153 | AN272, Power Amp.   |
| D101, 102, 103, 104, 105, 106, 107, 108, 301, 302 | 300111008 | 1K188, FM AGC, FM Det., MPX Doubler, etc.   |
| D303, 304, 305, 306                               |           |   |
| D901, 902, 903, 904                               | 300919016 | SM-1-08, Rectifier  |
| D905  | 300313013 | WZ-120, Zener Regulator, 12V  |
| D001  | 300414004 | TLR-102KB, FM Stereo Indicator  |
| <b>COILS AND TRANSFORMERS</b>                     |           |   |
| L101  | 223301127 | Coil, AM Local Oscillation  |
| L102, 103   | 225301131 | IFT, AM, 455 kHz, 1st, 2nd  |
| L104  | 225301133 | IFT, AM, 455 kHz, 3rd   |
| L105  | 225501125 | IFT, FM, Ratio (PRI.)   |
| L106  | 225501126 | IFT, FM, Ratio (SEC.)   |
| L107  |           | Not used  |
| L108, 901   | 226501123 | Coil, 47 micro-Henry, RF Choke  |
| L301  | 225601133 | Coil, MPX, 19 kHz Tune  |
| L302  | 225601134 | Coil, MPX, 38 kHz Tune  |
| L001  | 222301204 | Coil, AM Antenna  |
| T001  | 207001383 | Transformer, Power Supply (120V, 220V, 240V)  |
| <b>VARIABLE RESISTORS</b>                         |           |   |
| VR101, 301  | 510502126 | 10KB, AM Gain Adj.  |
| VR102   | 510502134 | 3KB, FM Meter Level Adj.  |
| VR501   | 515121120 | 250KW, Balance Control  |
| VR502   | 525121129 | 100KB x 2, Volume Control   |
| VR503, 504  | 525101127 | 50KA x 2, Bass, Treble Control  |
| <b>OTHERS</b>                                     |           |   |
| S1  | 601011255 | Switch, Function Selector   |
| S2, 3   | 614020406 | Switch, Power Supply, Speaker Selector  |
| S4, 5   | 614020407 | Switch, Push 2-key, Loudness, Tape Monitor  |
|   | 321304374 | Front end, AM/FM  |
| PL1, 2, 3   | 352126030 | Lamp, 12.6V, 300mA, Dial Light  |
| F001  | 341240010 | Fuse, 1A-250V, AC Circuit Protector   |
| F901  | 341220015 | Fuse, 1.5A-125V, DC Circuit Protector   |
| M001  | 231310046 | Meter, AM/FM Tuning Ind.  |
| X101, 102   | 229101134 | Bandpass Filter, 10.7 MHz,  |
|   | 141710261 | Tone Control Amp. Circuit Assembly  |
|   | 141010107 | AM/FM/MPX/PHONO/MAIN & Power Supply Circuit Assembly (without Front end and heat sink. for Power Amp. IC's) |

## RA-112

| Symbol No.                          | Part No.  | Description  |
|-------------------------------------|-----------|--|
| <b>TRANSISTORS, IC'S AND DIODES</b> |           |  |
| Q501, 502                           | 301201114 | 2SC644 (S), Pre Amp.   |
| IC401                               | 303452152 | RC-4558 (DN or NB), Phono Amp.   |
| IC601, 602                          | 303452153 | AN-272, Power Amp.   |
| D901, 902, 903, 904                 | 30919016  | SM-1-08, Rectifier   |
|                                     |           |  |
| <b>VARIABLE RESISTORS</b>           |           |  |
| VR501                               | 515121122 | 250KW, Balance Control   |
| VR502                               | 525121130 | 100KB x 2, Volume Control  |
| VR503, 504                          | 525101131 | 50KA x 2, Bass, Treble Control   |
| <b>OTHERS</b>                       |           |  |
| S1                                  | 601011247 | Switch, Function Selector  |
| S2                                  | 611001629 | Switch, Tape Monitor   |
| S3                                  | 611001631 | Switch, Power Supply   |
| F601                                | 341220015 | Fuse, 1.5A-3AG, DC Circuit Protector                                   |
| F901                                | 341220010 | Fuse, 1A-3AG, (line 120V)  |
|                                     | 341220005 | Fuse, 0.5A-3AG (line 220V or 240V)                                     |
| PL001                               | 351140005 | Lamp, 14V, 50mA, Pilot   |
| T001                                | 207001384 | Transformer, Power Supply (Multi-voltage Type)                         |
|                                     | 201001384 | Transformer, Power Supply (120V only)                                  |
|                                     | 206001384 | Transformer, Power Supply (220V or 240V)                               |
|                                     | 141010108 | Pre/Main Amp. Circuit Assembly (without heat sink for Power Amp. IC's) |

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