TABLE OF CONTENTS

CHASSIS LAYOUT .................................................. 2
(TOP VIEW) ......................................................... 2
(BOTTOM VIEW) ..................................................... 3
PRECAUTION ......................................................... 4
POWER AMP. BIAS ADJUSTMENT ............................. 4
WATTS METER CALIBRATION .................................... 5
OVERLOAD PROTECTION LEVEL ADJUSTMENT .......... 5
TROUBLE SHOOTING GUIDE ................................. 6
GAIN DIAGRAM ................................................... 6
SCHEMATIC DIAGRAM (1) ..................................... 7
SCHEMATIC DIAGRAM (2) ..................................... 10

TECHNICAL MANUAL
CHASSIS LAYOUT
(TOP VIEW)

1. PHONO SWITCH
2. FUNCTION SELECTOR PCB
3. BALANCE & VOLUME CONTROL
4. VOLUME CONTROL PCB
5. WATTS METER LEVEL ADJ., R-CH.
6. WATTS METER PCB
7. WATTS METER LEVEL ADJ., L-CH.
8. WATTS METER PCB
9. POWER SWITCH
10. C002, SMOOTHING CAPACITOR
11. C001, SMOOTHING CAPACITOR
12. T001, POWER TRANSFORMER
13. VOLTAGE SELECTOR
14. POWER SUPPLY PCB
15. RY901, OVERLOAD PROTECTION RELAY
16. VR603, OVERLOAD PROTECTION LEVEL ADJ., L-CH.
17. MAIN AMP. PCB
18. VR601, POWER AMP. BIAS ADJ., L-CH.
19. PHONO EQUALIZER AMP. PCB
20. Q001, POWER AMP., L-CH.
21. Q008, POWER AMP., R-CH.
22. VR602, POWER AMP. BIAS ADJ., R-CH.
23. Q002, POWER AMP., R-CH.
24. Q005, POWER AMP., L-CH.
25. VR604, OVERLOAD PROTECTION LEVEL ADJ., R-CH.
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. Replacements for output and driver transistors, if necessary, must be made from the same hfe 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 transistors 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.

POWER AMP. BIAS ADJUSTMENT

NOTE: Prior to BIAS ADJUSTMENT, run about 5 minutes with rated output (8OΩ) and warm up Power transistor and Heat Sink.

Prior to adjustment, move VR601 and 602 potentiometers one full turn clockwise.
.... In RA-1312, Bias Current will decrease when VR601 and 602 are turned clockwise, and it will increase when turned counterclockwise.

Instruments: DC millivolt meter
a. Set volume control to minimum (i.e. no signal input).
b. Connect the plus lead of a DC millivolt meter to Test pin No.29 (on main amp. pcb) and minus lead to pin No.31.
c. Adjust potentiometer VR601 (on main amp. pcb) to obtain a 25mV reading on DC millivolt meter.
d. Repeat the above steps 1 and 2, for Right channel (use test pins No.30, 32 and potentiometer VR602).

Fig.1 BIAS ADJUSTMENT HOOK-UP
WATTS METER CALIBRATION

Instruments: Audio Generator and AC VTVM
- Set Function Selector to AUX-1 position.
- Set Bass and Treble to “O” (Center) position, or Tone Switch to defeat position and Muting, Loudness, High Filter and Low Filter Switches to “OFF” position. And Set Mode Switch to “L+R” position.

a. Connect 8-ohm (50W) resistors to right and left Speaker “A” Terminals.
b. Connect AC VTVM in parallel with this 8-ohm load of “L” or “R” channel.
c. Connect Audio Generator to input terminal of “L” or “R” channel and apply 1KHz (sine wave) signal. And adjust input level so that reading on AC VTVM is 9V (10 watts/8-ohm).
d. Turn and adjust VR701 so that watts-meter indicates 10 watts.
e. Then decrease input level by 10dB (output 1 watt=2.83 V/8-ohm) and make sure that reading on watts-meter is 1 watt.
f. Proceed the above steps from b. to e. for the other channel.

OVERLOAD PROTECTION LEVEL ADJUSTMENT

Instruments: Audio Generator and H.D. Analyzer
- Be sure to make this adjustment with one channel driven.
- Set Function Selector to AUX-1 position.
- Set potentiometers VR603 and 604 to counterclockwise position before starting this procedure.

a. Connect 4Ω 200W load resistor to output terminals (speaker A) “L” or “R”, then connect H.D. Analyzer in parallel.
b. Connect audio generator to AUX-1 input terminal “L” or “R” and apply 100Hz (sine wave) signal.
Adjust input level so that reading on H.D. Analyzer is 1% distortion.
c. Turn potentiometer VR603 or 604 so that the Protection Relay is disengaged.
d. Adjust input level to confirm that the Relay remains activated when the output distortion is 0.1%.
e. Proceed the above steps from b. to d. for the other channel.
TROUBLE SHOOTING GUIDE

I. Unit Inoperative
A. Meter lamps do not light.
   1. Power switch may be faulty, or
   2. Power Transformer may be faulty.
B. Meter lamps light, check to see if AC Fuse, F901 or 902 is blown.
   1. If AC Fuse is brown.
      a. Rectifier, D905, 906, 907, 908, 909, 910, 911 or 912 may be shorted out, or
      b. Capacitor, C427, 428, 431, 907, 908, 911, 912, 913, 001 or 002 may be faulty.
   2. If AC Fuse is OK, check to see if Overload Protection Relay, RY901, operates properly.
      a. If the Relay does not operate.
         1) Main Amp. Circuit may be shorted out, or
         2) Output Circuit (including speaker system) may be shorted, or
         3) Relay, RY901, may be faulty, or
         4) Relay switch (gang with Power Switch) may be faulty.

II. Left or Right channel inoperative, check to see if there is a signal at PRE OUT Terminal.
A. If there is a signal.
   1. Main Amp. Circuit may be Faulty, or
   2. PRE-MAIN Switch may be faulty.
   3. Contact point of Protection Relay may be faulty.
B. If there is no signal.
   1. Check each transistor of preamplifier circuits.
   2. Check each coupling capacitor of preamplifier circuits.

GAIN DIAGRAM
VOLUME CONTROL AMP. CIRCUIT BOARD DIAGRAM

BALANCE & VOLUME CONTROL

WATTS METER CIRCUIT BOARD DIAGRAM

* indicates connection with R-channel meter PCB.

---

BLK) To CHASSIS GROUND
* To L-ch METER PCB (E)

(BLU) To SPEAKER SW PCB (1)
(GRN) * To SPEAKER SW PCB (2)

To FUSE PCB (3) (GRN)
* To L-ch METER PCB

(149) To L-ch METER PCB

(BLK) To CHASSIS GROUND
* To L-ch METER PCB

(VLT) To POWER TRANSFORMER
* R-ch: NOT USED