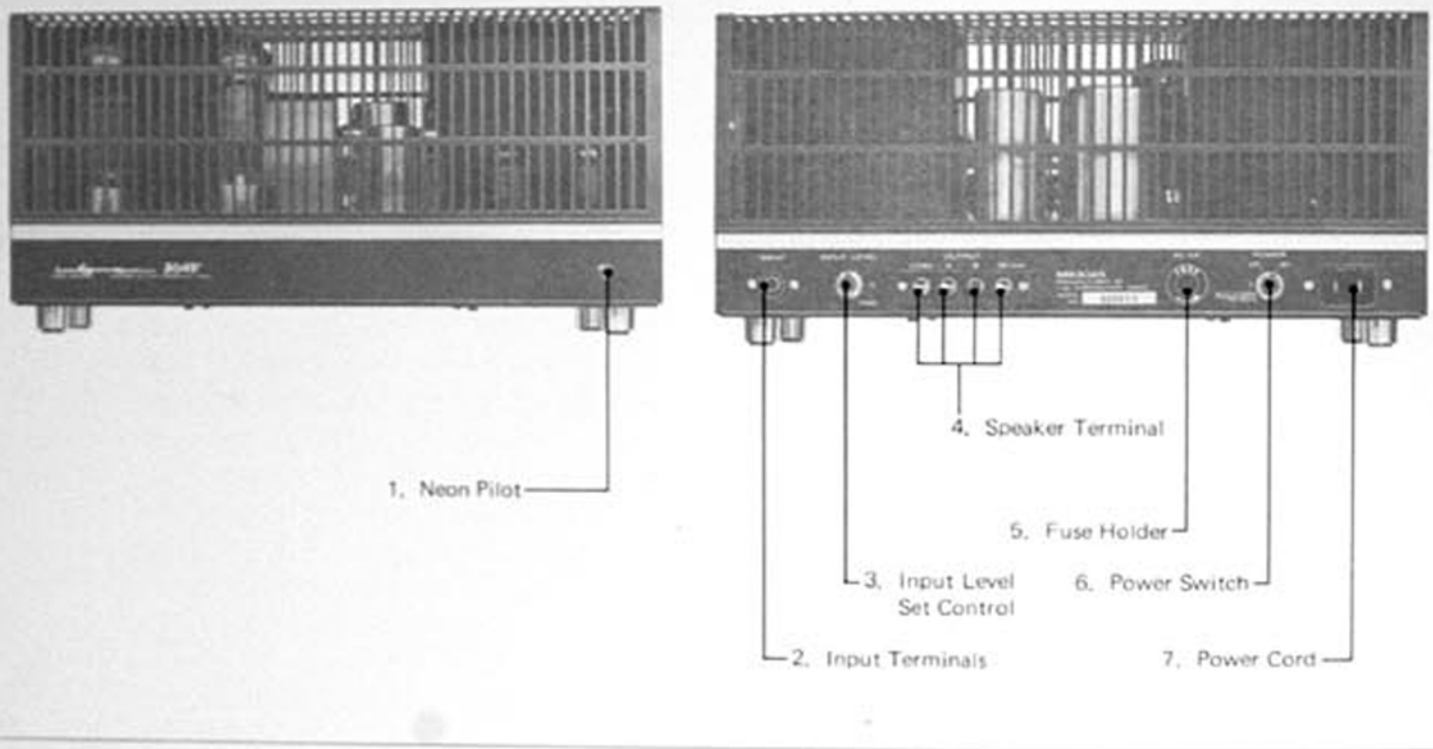
Up until lately, it had been supposed that output triode tube would have neither sufficient output power nor efficiency. Therefore, "LUX" has cultivated and completed a new output triode tube which has high efficiency and huge output power (in collaboration with NEC, Shin Nippon Denki). And consequently, the tube 8045G can easily offer huge 60W under the "Class A" push-pull configuration. The tube power amp MB3045 is a monaural Basic amplifier, adopting this 8045G at the output stage. In this amplifier, to utilize the output power of 8045G to the maximum, we designed the new output transformer GX100-3.6 of "QUADRA FILAR" winding system and the cross-shunt push-pull output circuit. To drive this output circuit, we need very powerful drive circuit. For this purpose employed are cascode-follower direct-coupled drive circuit, high voltage pre-drive circuit in combination with the newly designed high voltage driver tube 6240G. Thus, our efforts for cultivation of these new components output tube, driver tube and output transformer – and the technique to make the most of these components made it possible to attain the high output and low distortion. With natural care, it will give you many years of outstanding performance and personal delight. Please read this Owner's Manual carefully before operating the unit, which will give detailed descriptions and operating procedures for the electronic and mechanical components of the MB3045. Thank you for your selection, and may "good listening" be your daily pleasure.

MB3045 OUTLINE OF FUNCTIONS



1. Neon Pilot

This lamp lights up and shows the electric current is "on" when you put the power switch on.

2. Input Terminals

Connect the outputs of control amplifier to these input terminals. For this connection, use pin-plug cords which have pin-plug at both ends. In case the output impedance of control amplifier is too high, shorten the pin-plug cord as much as possible.

3. Input Level Set Control

Set this volume to match the output voltage of the control amplifier connected to this unit. For example, if the change, when main volume of control amplifier is turned, is felt too sharp, you can turn the level set volume to the left and adjust the gain of power amplifier. This level set volume has the A-type curve. The feature of the A-type curve is that increase of volume, when turning the volume switch, sound very natural because generally the revolution angle and the volume level audible to human ears are proportionally related.

4. Speaker Terminal

The speaker systems should be connected to these terminals. As this amp has four terminals of COMMON, 4-ohm, 8-ohm, and 16-ohm, connect carefully the (–) terminal of speaker system to "common" terminal while the (+) terminal to either of other terminals equivalent to the impedance of your loudspeakers (for example, if the speaker system has 8-ohm impedance, to the 8-ohm speaker terminal of the unit).

5. Fuse Holder

There is a 5A fuse in this fuse holder. Should the fuse blow, check the cause and then change it. To replace the fuse, turn the fuse cap to the "arrow" direction indicated on the fuse holder. Then the fuse cap can be taken off and you can replace the fuse. Be sure that the power cord is disconnected to avoid possible electric shock hazard.

6. Power Switch

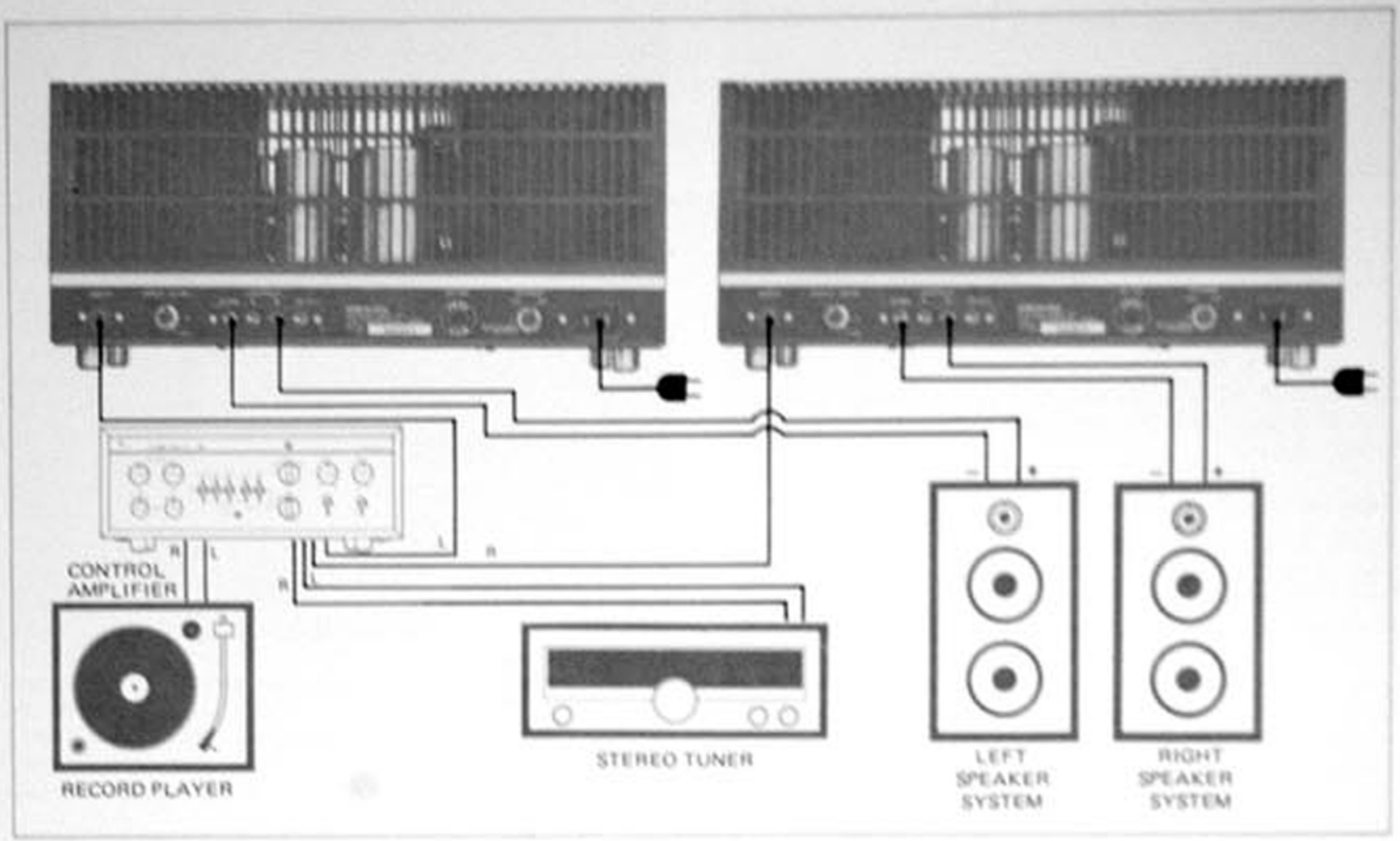
When you put this swtich on, the electricity is fed into the amplifier, and in about 20 sec. the amplifier is put into operational condition.

7. Power Cord

Insert one end of the attached AC cord into this connector, and another end to the AC power supply socket.

MB3045

CONNECTION PROCEDURE



Connection of Speakers:

Stereophonic reproduction is made with a pair of speaker systems for right and left channels. The MB3045 is a monaural amplifier, and therefore one additional power amplifier is required for the stereophonic reproduction.

When the L-ch output of a control amplifier is connected to this power amplifier, the left channel speaker system should be connected to the output terminal of this amplifier, while the R-ch output of a control amplifier is connected to this power amplifier, the right channel speaker system should be connected to the output terminals. There are four terminals for the output; COMMON, 4-ohm, 8-ohm and 16-ohm.

Connect the (−) terminal of a speaker system to the "COMMON" terminal, and the (+) terminal to either of other 3 terminals to which the impedance of your speaker corresponds. Note that perfect sound reproduction cannot be expected if the phase is not matched between both channels. If mismatched for some reason (eg., mis-connection of speakers), the low frequency range is subdued and stable playback cannot be realized.

Connection between the Input Terminals and Control Amplifier:

Connect the output terminals of a control amplifier to the input terminals of the MB3045, using pin-plug cord. Be careful of the connection of the right channel and the left channel.

When you are going to use a control amplifier of low output impedance, it is not necessary to be aware of the length of a pin-plug cord, however, it is advisable to choose a shield wire of good quality and use it as short as possible especially with the high-output impedance control amplifier in order to avoid unnecessary attenuation at the high frequency range.

Connection of the AC Power Supply Source:

One end of the attached AC cord should be connected to the AC connector on the amplifier, and the other end should be plugged into the power supply outlet. Then press the power switch. The pilot lamp lights up and the amplifier will function in about 30 seconds.

MB3045

CIRCUIT DESCRIPTION

Giant Output Triode Tube:

It is not too much to say that the performance of a power amplifier of tube type depends on the output tube itself and the circuit design to bring its power out to the utmost extent.
And this MB3405 employs the big output triode tube 8045G, which has been developed by LUX CORPORATION with the cooperation of NEC. This tube offers the plate dissipation of 45W by adopting for the plate-electrode, a special united metal of high heat-radiation characteristics with special structure of the fin for heat-radiation.
The 8045G can provide high power output of 60W without difficulty when operated in the "Class AB" push-pull configuration. With the only exception that big drive voltage is required, the characteristic is quite stable, and we are sure that this 8045G will be indispensable for the high power output amplifiers of triode tube output.

New Output Transformer: GX100-3.6

Having been specially designed for the 8045G, this is an epoch-making output transformer which adopts special winding method called "QUADRA FILAR". The primary side is divided into four windings; for the plate (1st winding), the cathode (2nd winding), the boot-strap (3rd winding) and the minor Negative Feedback (4th winding). Thus these four are wound at the same time, which helps reduce the leakage inductance and eliminate the harmful transient distortion inherent in the "Class AB" or "Class B" operation.
The excellent performance has been realized with this special transformer of large capacity and small loss by using the iron core of larger size, thus enabling to yield a high output up to 100W at 35Hz.

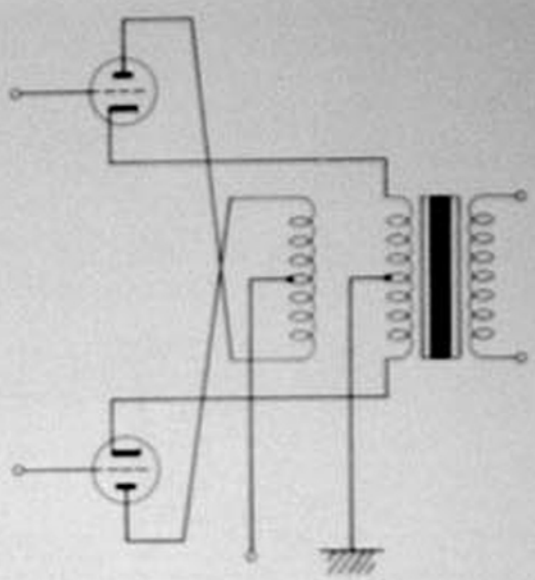
Cross-Shunt Push-Pull Circuitry :

This is a high grade circuitry to divide the loads of the output tubes into the plate and the cathode, each of which is further cross-connected each other in two lines.
Cathode-Negative-Feedback is applied on the output tube, which reduces distortion and inner resistance, thus enabling to improve the characteristic of the output tubes, in combination with the special wound output transformer.

Cathode-Follower Direct Coupled Driver Circuitry:

Adoption of the cathode-follower circuitry to the driver stage reduces the output impedance sufficiently low, and pure drive voltage free from wave-distortion is obtained. Moreover thanks to 100% negative-feedback, distortion or phase shift is quite small, which is suitable for the direct-coupling to the output tube. Since there is no time constant in the coupling section, no transient phenomenon will appear, thus stable drive is possible even at the time of over swing.
Also for the driver tube, twin triode tube 6240G of high voltage type has been newly developed, whose plate is connected to the plate winding of the output transformer to establish the boot-strap circuitry.

Cross-Shunt Push-Pull Circuit



Setting of the amplifier:

Bear it in mind to set the MB3045 at the low temperature and good ventilated place as much as possible since the inner temperature will rise up to a great extent at the time of operation. The construction of the amplifier itself is designed to have the best ventilation, and therefore never put any materials on the cover, nor house the amplifier in the cabinet etc. which may prevent ventilation.

For those who try to measure the characteristics:

The MB3045 is designed exclusively for the audio equipment. When you are to measure the MB3045 by feeding constant amplitude signal like sine-wave continuously for a long period, the resistor for the phase compensation (22-ohm, 3W on the CB-A3000C) may possibly be damaged by over-heat.
Therefore, in case the output exceeding 3W with the high frequency over 8KHz is being given to the amplifier, it is advisable to limit the operation time for measurement within 15 sec. For the operation over 15 sec, larger resistor (30W) should be placed instead of 22-ohm 3W.
The resistor should be replaced with the normal one after measurement, since there is no heat problem against the reproduction of music signals.

High Voltage Pre-Driver Circuitry:

Gain is not enough by the cathode-follower direct-coupled driver circuitry only, therefore the pre-driver circuitry, using 6240G, is arranged to compensate insufficiency. The drive voltage is 200Vr.m.s.
To the cathode of this stage, the minor loop negative feedback of approximately 5dB is applied by the balance-method from the 4th winding of the "QUADRA FILAR", which improves the overall characteristics after the pre-driver stage.

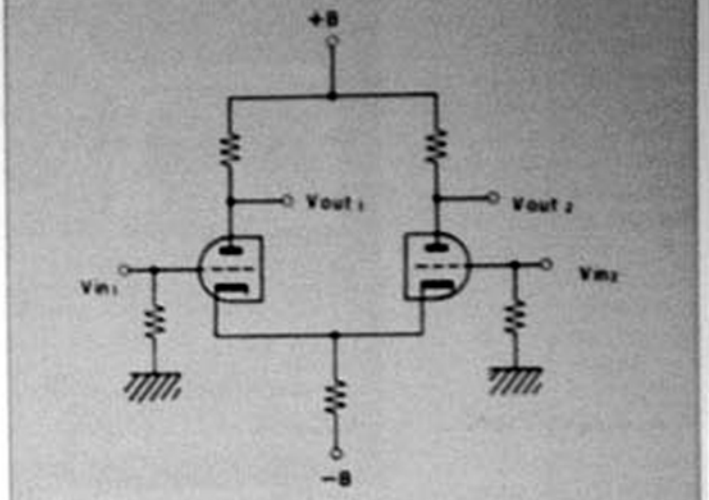
Differential Amplifier/Phase Inversion:

The "differential amplifier" has been popular in the transistor amplifier. Needless to say, however, same effect can be obtained by tube circuit design. At the first stage, the differential amplifier circuitry is adopted, using twin triode tube 12AX7 (ECC 83).
Also at the 2nd stage, which is direct-coupled to the plate of the 1st stage, the differential amplifier is arranged, where the signal inverted in phase at the 1st stage is amplified and fed to the pre-driver stage.
In summary the phase inversion circuit under differential amplification is arranged at the 1st stage, and input signal is given to one of the grids, while negative feedback input to the other.
In this construction the balance of the push-pull operation is automatically compensated, and therefore distortion characteristic should be quite excellent.
The advantage of the differential amplifier is that it is almost immune from the effects of ambient conditions such as temperature drift or the fluctuation of the mains voltage.

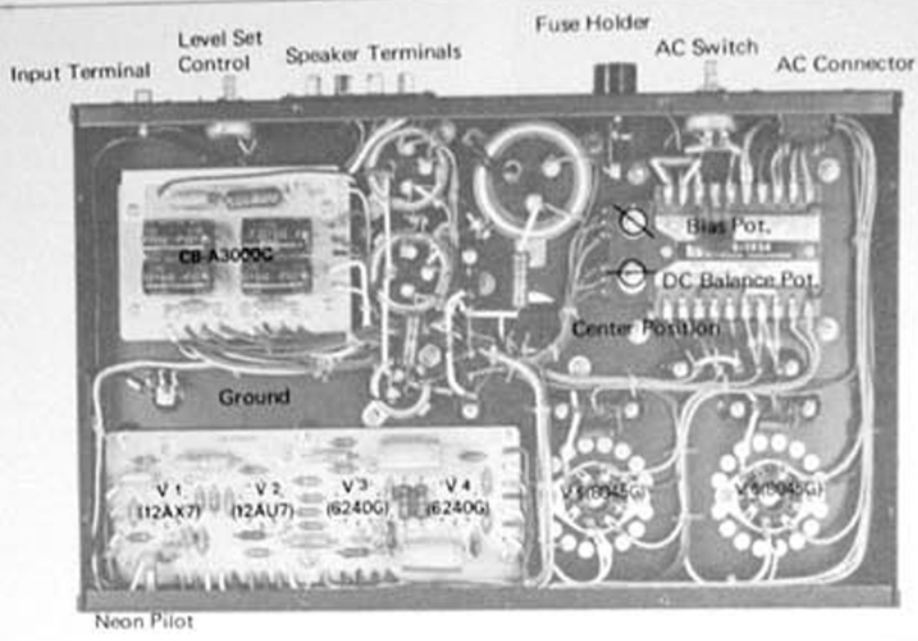
Power Supply Circuitry of Minimum Voltage Fluctuation:

The power supply circuitry is composed by the power transformer of superior regulation, the choke coil (C-1744) of less DC resistance and two large electrolytic capacitor (220μF X 2). At the output stage electric power is supplied from the bridge rectifying circuit to keep the voltage fluctuation down to the minimum.

Differential Amplifier Circuit



RE-ADJUSTMENT



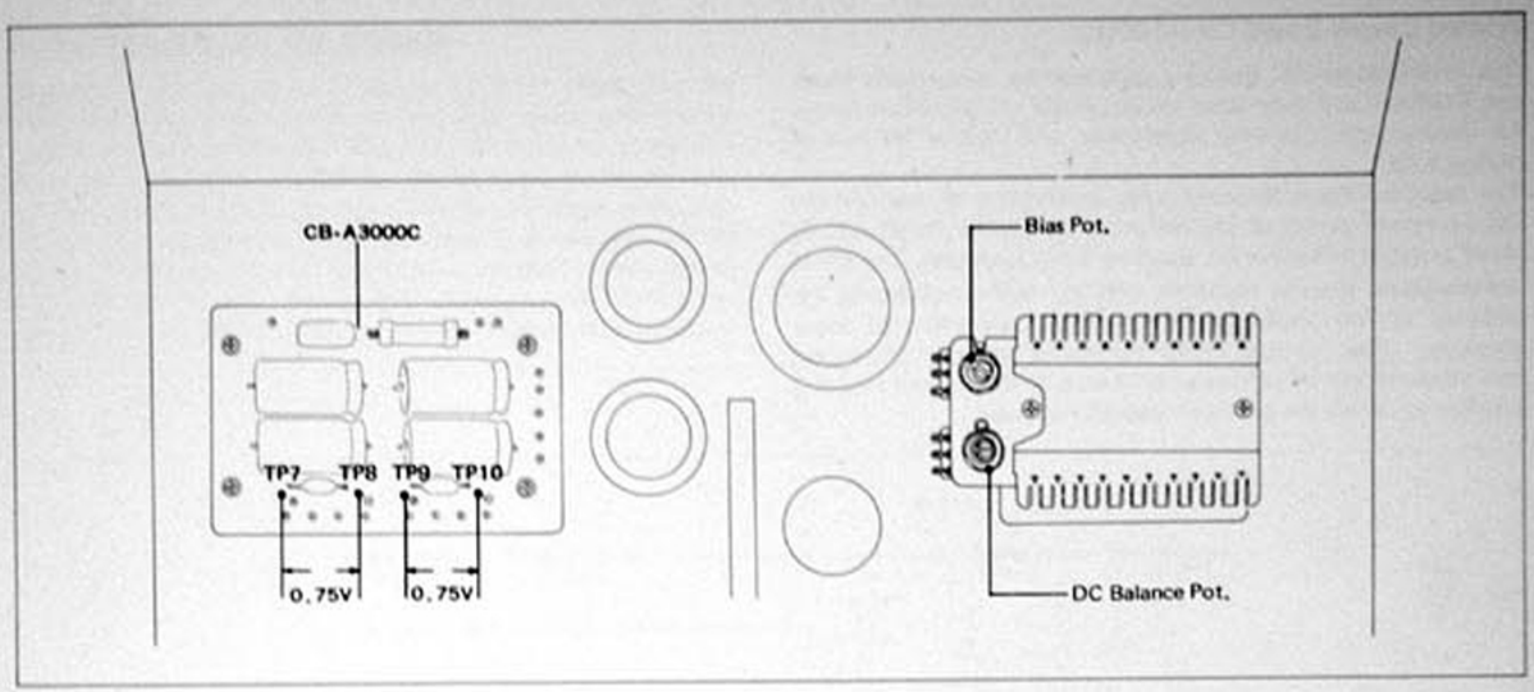
RE-ADJUSTMENT

Re-adjustment is necessary when these tubes 6240G (V4) and 8045G are replaced. It is not necessary to re-adjust when these 12AX7, 12AU7 or 6240G (V3) are replaced.

For the re-adjustment, such tools as (+) driver, (−) driver and a tester etc. are needed.

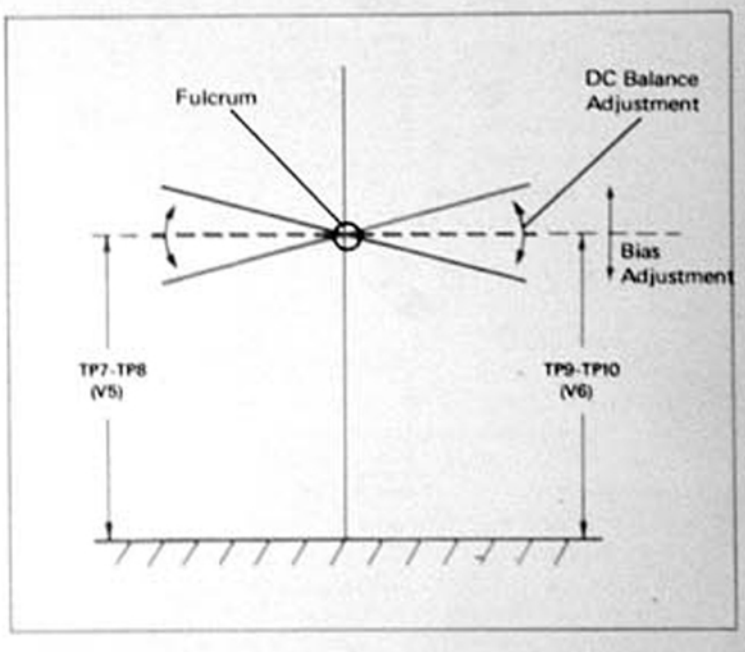
1. Power swtich to OFF. Remove the cover.
2. Set the amplifier up-side down, and remove the bottom plate.
3. Set the bias-potentiometer at the extreme counter-clockwise position.
4. Set the DC-balance potentiometer at the center of the rotation.
5. Replace the tubes.
   Then proceed the adjustment of bias and DC balance, which is of most importance to decide the operation of the power amplifier. Be sure to read the section of "about adjustment of bias and the DC balance".
6. Power switch to ON. Approximately 5 minutes later, proceed to the following adjustments.
   a) Put the (+) terminal of a tester on the TP7 on the CB-A3000C, and the (−) terminal on the TP8. Turn the bias-pot slowly to the clockwise direction in order to have 0.7V (0.68 ~ 0.72V) reading on the tester.
   CAUTION:
   The rated voltage may not be obtained for some minutes after turning on the power switch. In this case, leave it about 10 minutes, with the setting of nearly the rated voltage, then re-adjust. Right after the turn of the pot, the rated voltage value may not be obtained, and in this case measure the voltage 2 or 3 seconds later.
   b) Put the (+) terminal of the tester on TP9 and the (−) terminal on the TP10. Adjust the DC balance pot so that the voltage between TP9 and TP10 can be the same as that between TP7 and TP8.
   In case the voltage between TP9 and TP10 is lower than that between TP7 and TP8, turn the DC balance pot to the counter-clockwise direction. When it is higher than that between TP7 and TP8, turn it to the clockwise direction.
   CAUTION
   The turn of the DC balance pot varies the voltage between TP7 and TP8, and therefore make sure to obtain the same voltage between TP7 and TP8 with that between TP9 and TP10.
   c) Adjust the bias pot in order to have 0.75V (0.73 - 0.77v) reading between TP7 and TP8 (or between TP9 and TP10).
   d) Adjust DC balance pot to have the equivalent voltage between TP7 and TP8 and to that between TP9 and TP10.
   e) Check the voltage between TP7 and TP8 and that between TP9 and TP10. 0.75V is correct. In case it is not 0.75V, repeat steps (c) (d) to obtain this.
7. Keep the power switch at "ON" for approximately one hour.
8. Adjust the bias pot and the DC balance pot again so that the voltage between TP7 and TP8 and that between TP9 and TP10 can be the rated 0.75V.
9. Make running test for 8 - 16 hours, by feeding music signals, under normal operational condition.
10. Keep the power switch at "ON" for approximately one hour, with setting the level control volume at the extreme counter clockwise position.
11. Check the voltage for TP7-TP8 and TP9-TP10 to be the rated 0.75V. In case deviated, re-adjust with the bias pot and the DC balance pot again.

Now all the adjustment have been finished, and no further alignment is necessary. But be sure to re-adjust when the 6240G (V4) or the output tube 8045G is replaced.



Bias & DC Balance Adjustment:

The bias and the DC balance adjustments are compared to the principle of see-saw. (refer to the illustration.)
The bias adjustment, which is the adjustment of the height of the fulcrum of the see-saw, decides the optimum operation of the output tube (V5, V6). This can be made by measuring the plate current of the output tube. The optimum operational point of the output tube depends on the output tube and the circuit design. For the MB3045 the plate current is designed as 75mA (at no signal), and the optimum operational point is easily known by the OHM's LAW $I(A) = \frac{E(V)}{R(ohm)}$ measuring the voltage at the both ends of the resistor 10-ohm ±2% on the CB-A3000C.
The DC balance adjustment can be compared to correction of the tilt of the see-saw. When the current of one output tube increases, that of the other tube decrease. It is necessary to obtain the same current value at both of the two output tube (V5, V6). When these two values are not same, the push-pull operation will be unbalanced, which will increase distortion or deteriorate the S/N ratio.
Due to the inherent characteristic of the output tube, the DC balance tends to be unbalanced at the optimum bias point even if the balance is all right at the other bias point. Therefore these two adjustments should be repeated in such order as DC balance – Bias – DC balance .....



To prevent Electrical Shock:

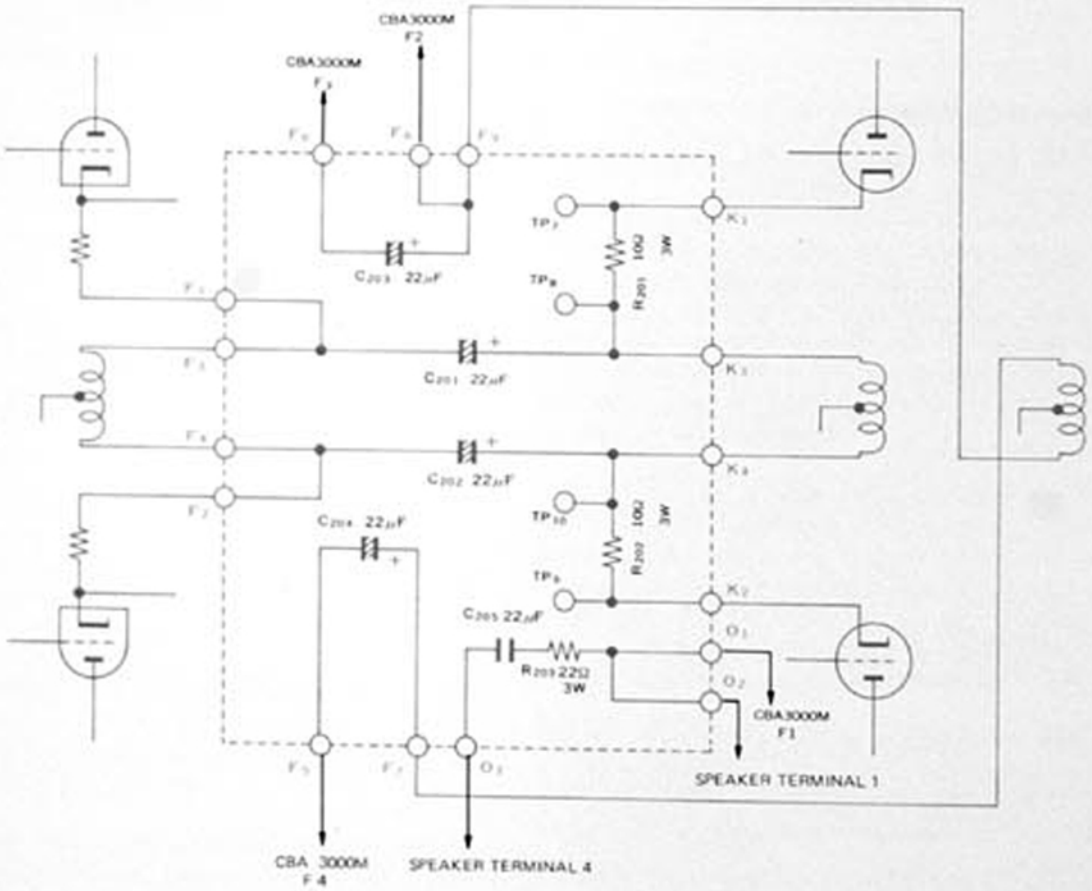
Never touch the inside part of the chassis right after the power switch is turned off or during the alignment procedure to prevent electrical shock, since the MB3045 adopts high voltage circuitry. It is advisable to wait for at least 5 minutes after switched off. Especially the best attention should be paid during the alignment, and it is advisable to use cloth-gloves, or to hold the transformer when you wish to change placement of the amplifier. Also be careful not to burn yourself by the heat of the tubes (especially the output tube).

P.C.BOARDS & THEIR CIRCUITS

Printed Circuit Board CB-A3000C:

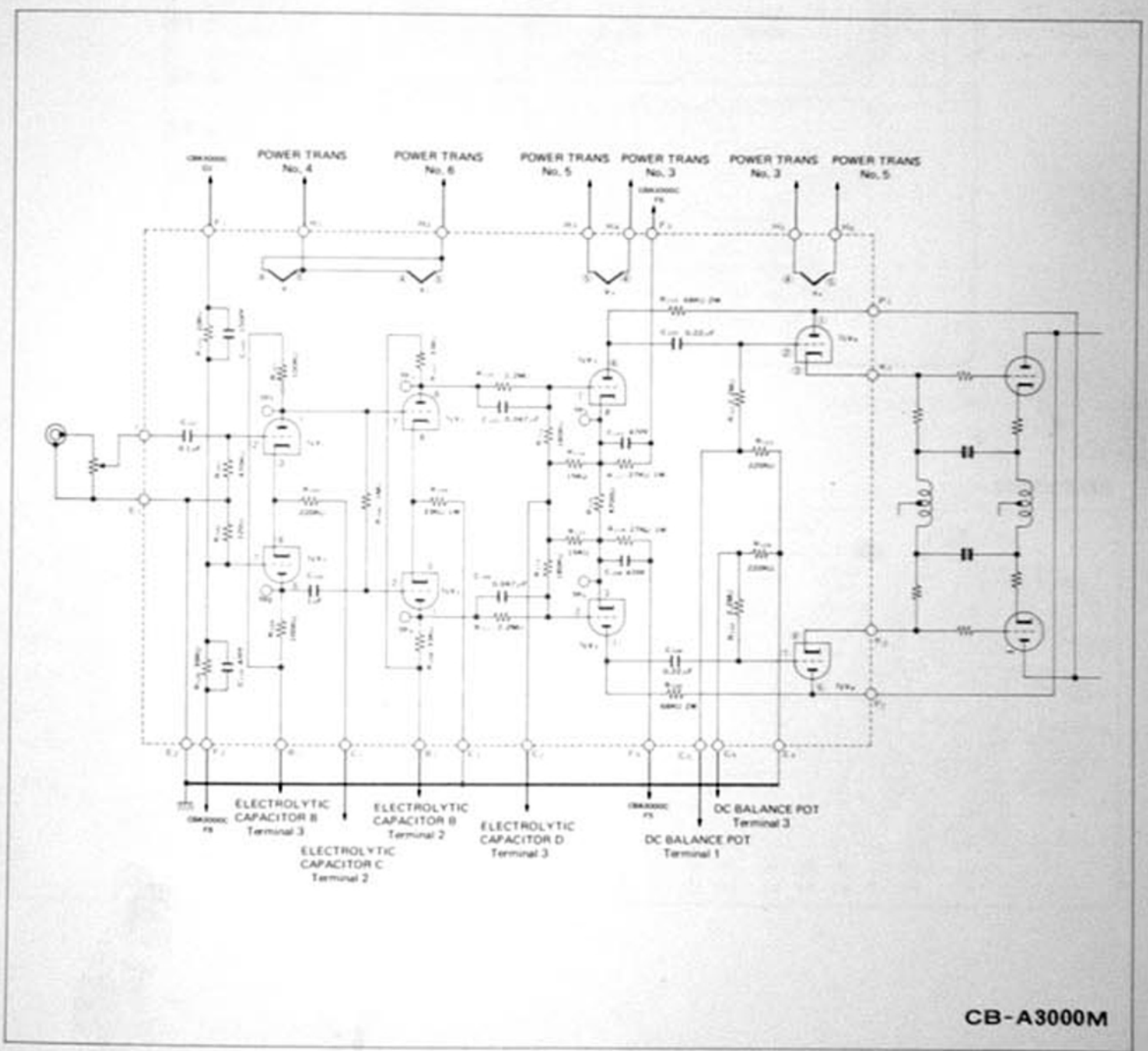
This incorporates DC blocking capacitor for minor loop Negative Feedback and boot-strap circuit, phase compensation circuit for 2ndary side of output transformer, and resistor for bias of output tube.

The capacitor has sufficiently large capacitance to maintain the DC operation points at the pre-driver and driver stages and to avoid possible influence on the Bass from loop gain. The phase compensation ensures excellent stability against increasing impedance at the treble at the time of connection of loudspeakers. The 10-ohm (±2%) resistor is for bias adjustment and measurement of voltage at both ends of this resistor makes it possible to decide the optimum operational point.



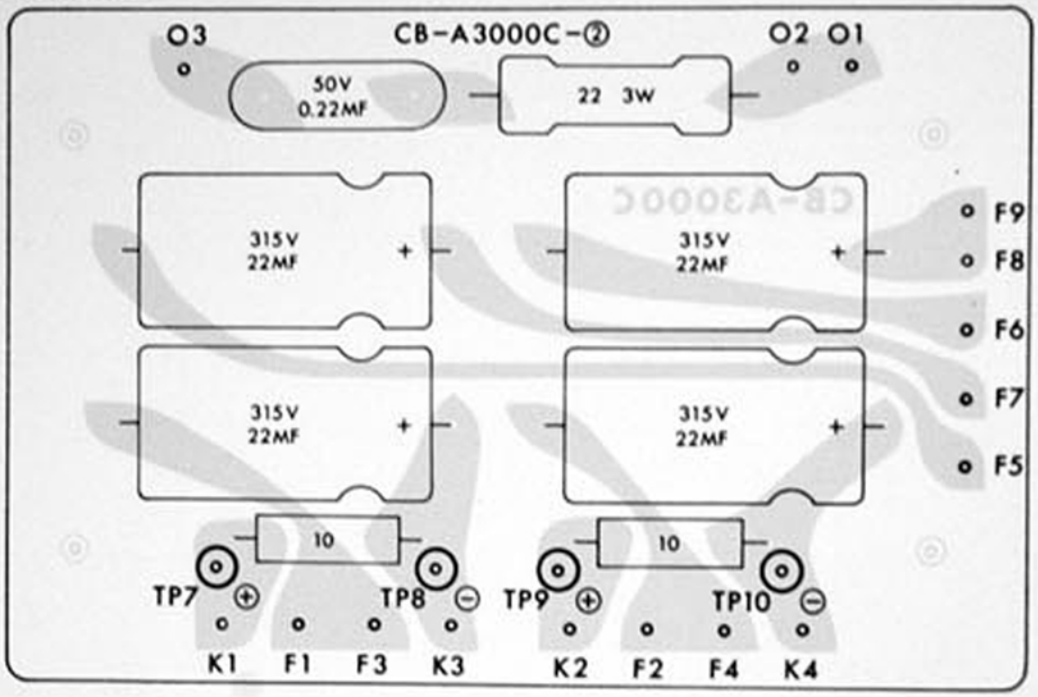
Printed Circuit Board CB-A3000M:

Here are all the circuits from the 1st to driver stages. For the differential amplifiers at the 1st and 2nd stages twin triodes 12AX7 and 12AU7 are used. They are well balanced and out of phase which makes it possible for the 1st stage to play the role of phase inversion stage. For the pre-driver and driver stages high voltage twin triodes 6240G are employed to obtain high driving voltage. The boot-strap from the output stage ensures easy driving with sufficient margin. Despite of multi-stage amplification circuitry, direct coupling causes no increase of Bass time constant.

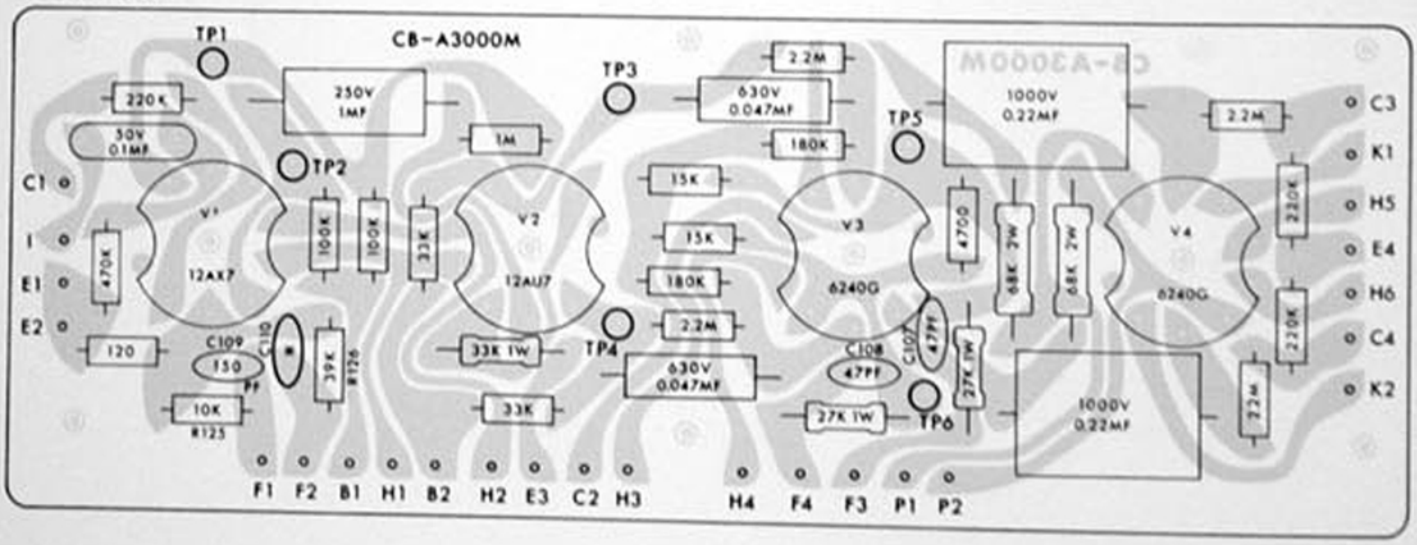


X-RAY VIEW OF P.C. BOARDS

CB-A3000C

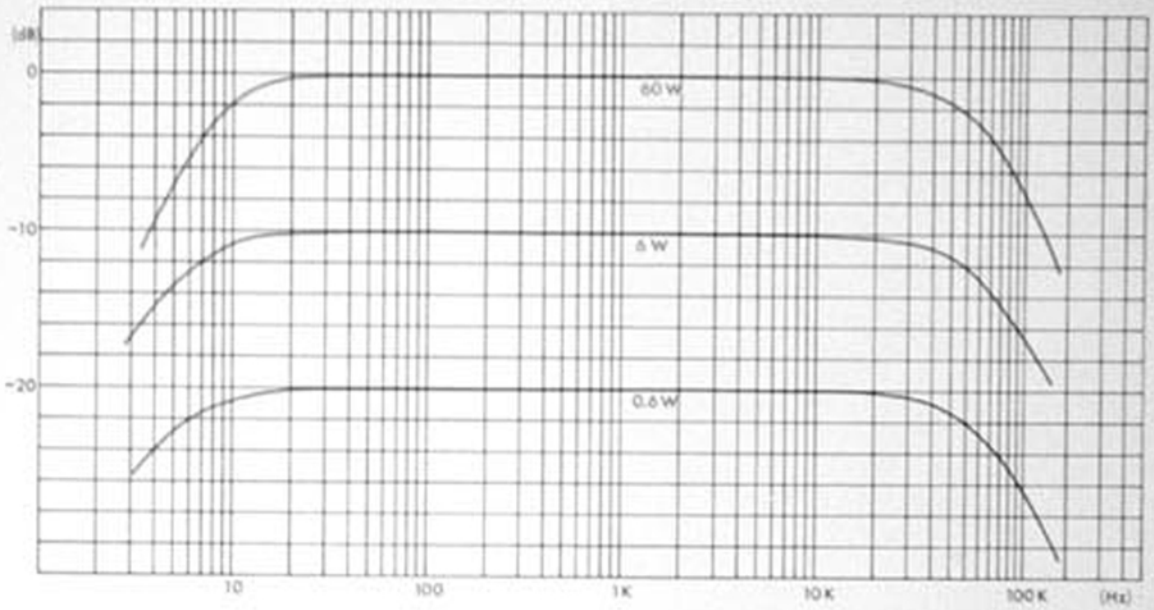


CB-A3000M

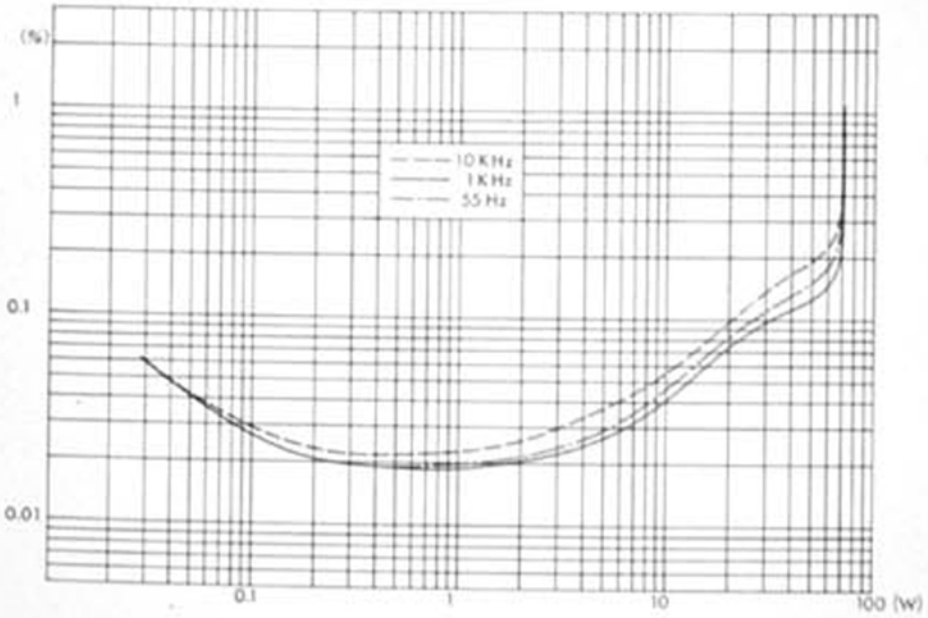


MB3045 STANDARD CURVES

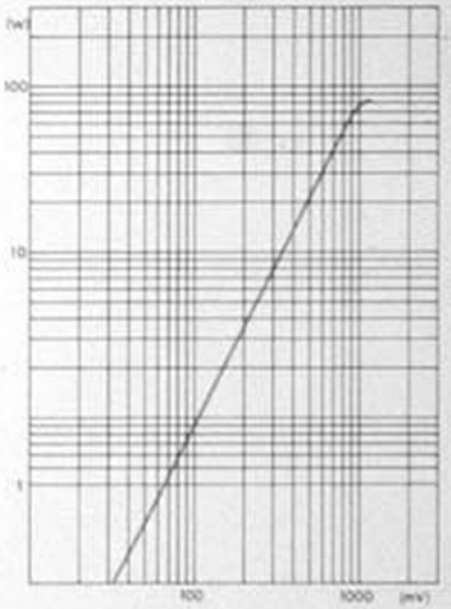
FREQUENCY RESPONSE



NOISE & TOTAL HARMONIC DISTORTION



INPUT VS. OUTPUT

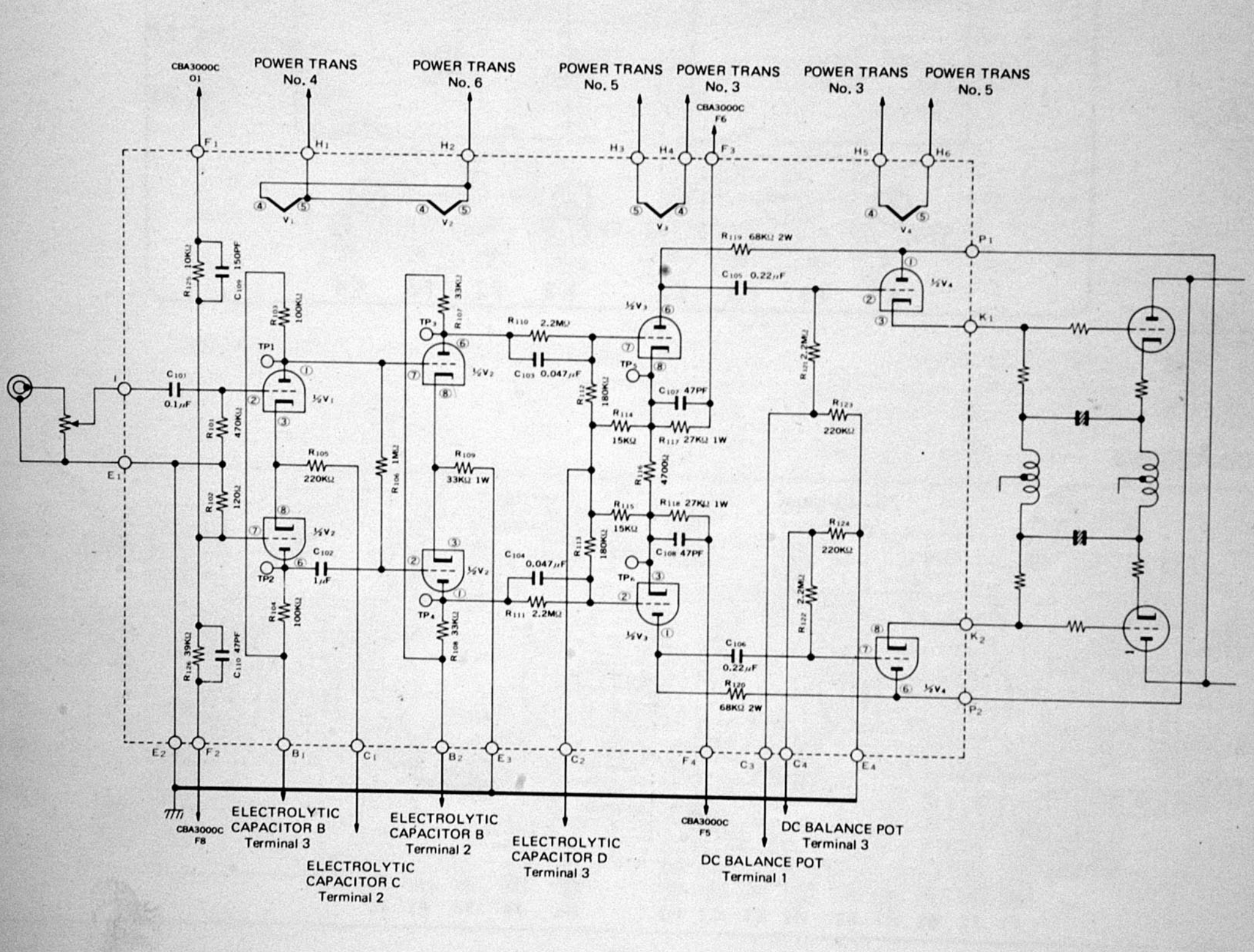


MB3045

SPECIFICATIONS

Power Output:	50 watts minimum continuous into 4-ohm, 8-ohm and 16-ohm, at any frequency from 20Hz to 20,000Hz, with no more than 0.3% total harmonic distortion
Frequency Response:	10Hz – 40,000Hz (–1dB)
Rated I.M.:	0.3% (8-ohm, 50W, 60 : 7KHz = 4 : 1)
Input Sensitivity:	700 mV
Input Impedance:	80 Kohms
Damping Factor:	16 (8-ohm, 1KHz)
Residual Hum & Noise:	no more than –95dB
Tubes:	8045G (2), 6240G (2) 12AU7 (1), 12AX7 (1)
Diodes:	U07N (4), RA1B (4)
Dimensions:	370(W) (14-9/16") x 240(D) (9-7/16") x 170(H) (6-11/16")
Weight:	Net 15.2Kgs (33.4 lbs.) Gross 17.5Kgs (38.5 lbs.)

Specifications and appearance design subject to possible change without notice


CBA3000C 01
POWER TRANS No. 4
POWER TRANS No. 6
POWER TRANS No. 5
POWER TRANS No. 3
CBA3000C F6
POWER TRANS No. 3
POWER TRANS No. 5
F1
H1
H2
H3
H4
F3
H5
H6
V1
V2
V3
V4
R125 10KΩ
C109 150PF
R103 100KΩ
TP1
C101 0.1μF
R101 470KΩ
R102 120KΩ
E1
R105 220KΩ
R106 1MΩ
R104 100KΩ
R126 39KΩ
C110 47PF
TP2
C102 1μF
TP3
R107 33KΩ
R110 2.2MΩ
C103 0.047μF
R109 33KΩ 1W
TP4
R108 33KΩ
C104 0.047μF
R111 2.2MΩ
R112 180KΩ
R113 180KΩ
TP5
C107 47PF
R114 15KΩ
R117 27KΩ 1W
R116 470Ω
R115 15KΩ
R118 27KΩ 1W
C108 47PF
TP6
R119 68KΩ 2W
C105 0.22μF
R121 2.2MΩ
R123 220KΩ
R124 220KΩ
R122 2.2MΩ
C106 0.22μF
R120 68KΩ 2W
P1
K1
K2
P2
E2
F2
B1
C1
B2
E3
C2
F4
C3
C4
E4
CBA3000C F8
ELECTROLYTIC CAPACITOR B Terminal 3
ELECTROLYTIC CAPACITOR C Terminal 2
ELECTROLYTIC CAPACITOR B Terminal 2
ELECTROLYTIC CAPACITOR D Terminal 3
CBA3000C F5
DC BALANCE POT Terminal 1
DC BALANCE POT Terminal 3