

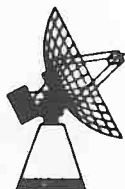
218
NEC

Authentic series

**MODEL A-11E (BU)
(BS)**

INTEGRATED AMPLIFIER SERVICE MANUAL

ORDER NO. 499-91-0255



**Better Service
Better Reputation
Better Profit**



SPECIFICATIONS

Main Amplifier Section

Circuitry configuration All stages Direct coupled.
DC servo circuit.

Actual power output Sine wave output,
both channels driven, 20Hz – 20kHz
70W + 70W (8 ohms)
140W + 140W (4 ohms)

THD Less than 0.003% (actual power output)

IM Distortion . . . Less than 0.003% (actual power output)

Frequency Response 5Hz – 300kHz

Input Sensitivity/Impedance 1.23V/20k ohms

Preamplifier Section

Circuitry Configuration All stages Direct coupled
DC servo circuit

Input (Level/Impedance)

Tuner 150mV/20k ohms
Tape (1, 2) 150mV/20k ohms
CD 150mV/20k ohms
AUX (1, 2) 150mV/20k ohms

Outputs (Level/Impedance) . Pre output 1.23V/600 ohms

S/N Ratio

PHONO 90dB (–142dBV)
TUNER 110dB (–126dBV)
TAPE (1, 2) 110dB (–126dBV)
CD 110dB (–126dBV)
AUX (1, 2) 110dB (–126dBV)

RIAA Deviation Within ± 0.2 dB (10Hz – 100kHz)

PHONO Overload More than 300mV

Subsonic Filter 15Hz (–3dB, 6dB/Oct)

Input/Output Phase Inphase

Power Supply Section and Others

Circuitry Configuration Stage independent
shunt regulator + reserve power supply

Power Requirement

BU Only AC 120V, 60Hz
BS Only AC 220V, 50Hz

Power Consumption 270W, 550 VA

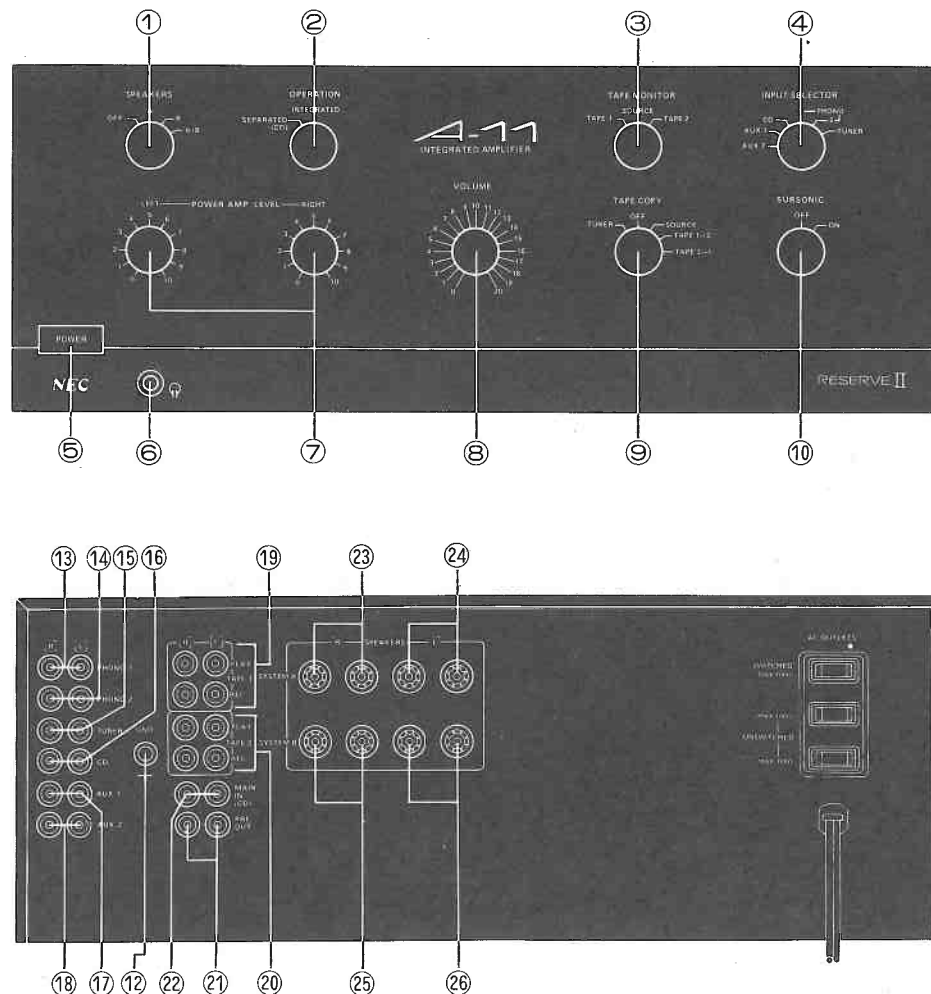
External dimensions . . . 430 (W) x 150 (H) x 430 (D) mm

Weight 22kg

NEC Corporation

TOKYO, JAPAN

Control Operation



1. SPEAKER Switch

This allows two pairs of speakers to be turned on and off. Position A will produce sound from the speakers connected to the SPEAKERS SYSTEM-A terminals (23) and (24), and position B will produce sound from the speakers connected to the SPEAKERS SYSTEM-B terminals (25) and (26).

Position A + B will produce sound from both speaker pairs A and B. When operating two pairs of speakers, using position A + B, the impedance rating of each speaker used should be in excess of 8 ohms. No sound will be heard at the OFF position setting. Set the SPEAKERS switch to the OFF position when only using a pair of headphones.

2. OPERATION Switch

Use this switch when using the A-11 as part of a multi-amplifier system, or when using the pre amplifier and power amplifier section independently, for example with an external signal processor such as a graphic equalizer connected between. Normally this switch should be set to the INTEGRATED position.

3. TAPE MONITOR Switch

This switch is used for listening to tape decks connected to the TAPE 1 terminals (19) and TAPE 2 terminals (20), or for simultaneous recording monitoring of a three-head tape deck. This switch can also be used with an external signal processor, such as a graphic equalizer. Set this switch to SOURCE when listening to program sources selected with the INPUT SELECTOR switch (4).

4. INPUT SELECTOR Switch

Set this switch to the position corresponding to the desired program source.

TUNER: This selects the tuner program source.

PHONO 1, 2: This selects the record player program source connected to the PHONO terminals (13), (14).

CD: This selects the digital compact disc player program source.

AUX 1, 2: This selects the program source connected to the AUX terminals (18), (19).

5. POWER Switch

This switch turns the power on and off. The MUTE function will prevent any sound from being heard for 8 – 9 seconds after the power is turned on.

6. HEADPHONE Jack

When listening through a pair of headphones, connect them to this jack.

7. POWER AMPLIFIER LEVEL Control

This control adjusts the sound output volume of the power amplifier section. It can be used to adjust the relative volume balance between right and left for the speakers and headphones, or for adjusting the output level when using the A-11 as a part of multi-amplifier system.

8. VOLUME Control

This control controls the sound output level from the speakers and headphones.

9. TAPE COPY Switch

This switch is used to select the recording source.

10. SUBSONIC FILTER Switch

When playing records at high listening levels, low frequency rumble caused by warped records can be irritating to you and damaging to your speaker system. Turning on the SUBSONIC FILTER switch (10) will eliminate the low frequency rumble.

Connection Cord

- Make sure that the power is turned off before attempting to make any connections.
- Be sure not to short-circuit the speaker terminals.
- Be sure to properly observe left and right when making unit connections.
- Be sure that each power and connection plug is inserted firmly.

Unit Connections

Using the Convenience AC Outlets

The amplifier is equipped with convenience AC outlets for supplying power to a tuner, record player, tape decks etc. The SWITCHED AC outlet will supply power to the unit connected only when the main power switch of the amplifier is turned on. The A-11 is also equipped with two UN-SWITCHED AC outlets that will supply power independently of the main power switch.

- The power consumption of each unit connected to the convenience AC outlets should not exceed 100W.

Connecting a Speaker System

As shown in the above diagram, connect the right hand (R channel) speaker to the right hand speaker terminals on the amplifier, and the left hand speaker (L channel) to the left hand speaker terminals. The speaker terminals have plus (+: red) and minus (-: black) polarity, corresponding to the terminals of your speakers.

Normally, connect the plus terminals of the speaker to the plus terminals of the amplifier, and the minus terminals of the speaker to the minus terminals of the amplifier. However, some speaker systems will give better results when connected using reverse polarity; that is, connecting the plus terminals of the speaker to the minus terminals of the amplifier.

Connecting a Record Player

Please connect the left (L) channel and the right (R) channels to the corresponding PHONO terminals (13) and (14). Connect the ground wire of the record player to the ground (GND) terminal (12).

● MC cartridges

MC cartridges have a wide range of output levels, ranging from low (50 μ V) to high (2.5 mV) levels. Refer to the specifications sheet of your MC cartridge and connect the cartridge to the A-11E as follows.

For MC cartridges with a normal output level range, i.e. between 50 μ V (0.05mV) and 800 μ V (0.8mV), first connect the cartridge output to a booster transformer or an MC head amplifier and then connect that output to the PHONO terminals. Connect cartridges that have an output in excess of 800 μ V (0.8mV) or that have a built in booster transformer, directly to the PHONO terminals.

Connecting a Digital Compact Disc Player

Connect the output terminals of the digital compact disc player to the CD (compact disc) terminals (16) or to the MAIN IN (CD) terminals (22) of the A-11E.

Connecting a Tuner

Connect the output terminals of the tuner to the TUNER terminals (15).

Connecting Tape Decks (Open Reel and Cassette)

Two tape decks can be connected and used. Connect the LINE INPUT terminals of the tape deck to the REC terminals of the amplifier's TAPE 1 terminals (19) or TAPE 2 terminals (20). Connect the LINE OUTPUT terminals of the tape deck to the PLAY terminals.

Connections to the AUX Terminals

These terminals are the auxiliary input terminals. When using a second tuner or digital program sources such as PCM processors, connect such components to the AUX terminals (17) and (18).

Connections to the PRE OUT and MAIN IN Terminals

Use these terminals when using an external signal processor such as a graphic equalizer or when using the A-11 as a part of a multi-amplifier system. Connect the PRE OUT terminals (21) to the input terminals of the graphic equalizer or channel divider, and connect the MAIN IN terminals (22) to the output terminals of the graphic equalizer or channel divider.

Using the OPERATION Switch

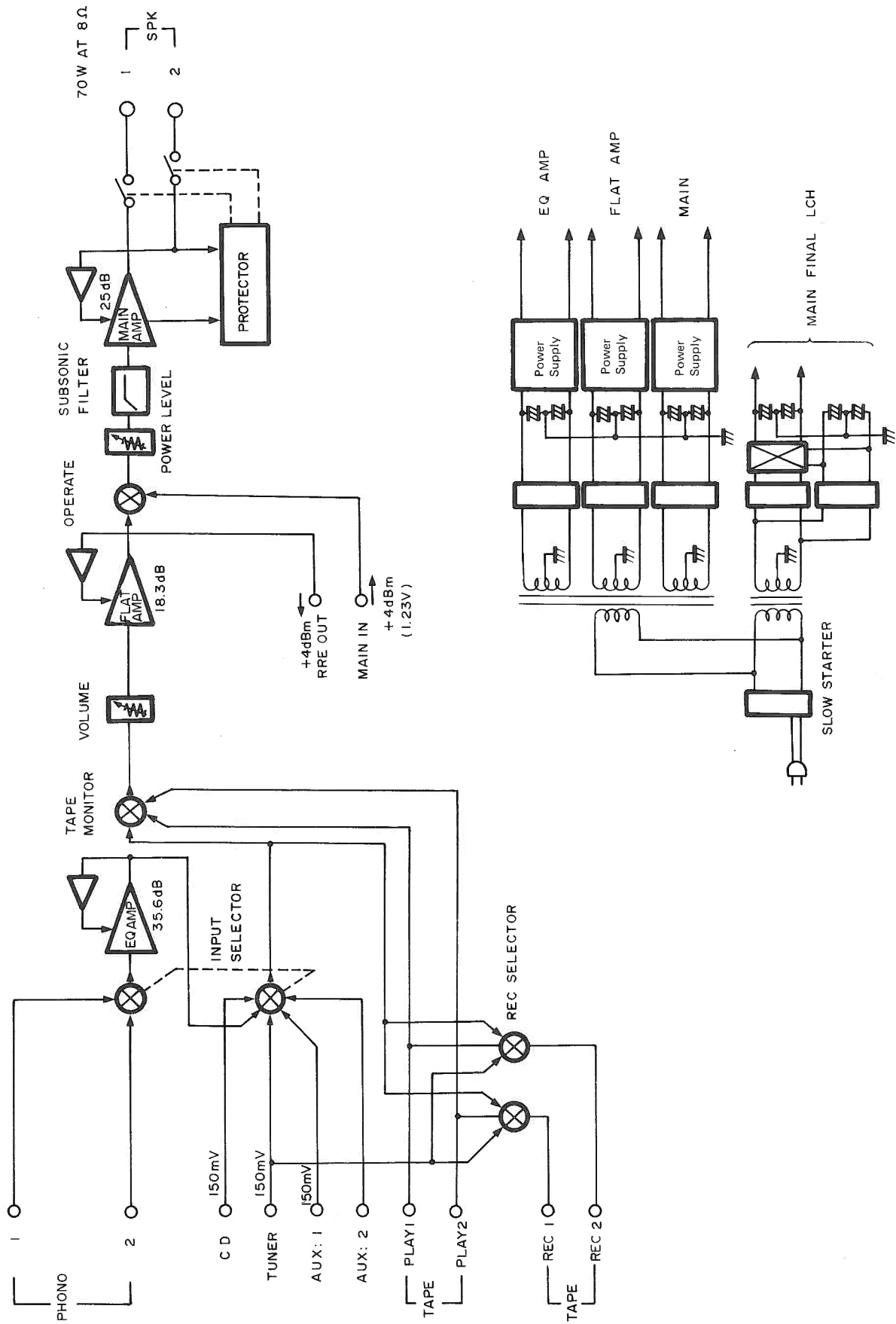
This switch selects between normal integrated operation of the pre amplifier and main amplifier stages, and separate operation of the pre amplifier and main amplifier stages. The latter position is for use with external signal processors such as graphic equalizers, or when using the A-11 as a part of a multi-amplifier system.

■ **INTEGRATED:** This position selects operation as a normal integrated amplifier. Since a pre amplifier output signal is being output from the PRE OUT terminals (21), this can be used to drive another main amplifier in parallel to the main amplifier stage of the A-11.

■ **SEPARATED:** The input of the main amplifier stage will be separated from the pre amplifier output. The signal input from the MAIN IN terminals (22) will be controlled by the POWER AMPLIFIER LEVEL controls (7) and then routed to the main amplifier stage.

Set the OPERATION switch to the SEPARATED position for use with external signal processors such as graphic equalizers, or when using the A-11 as a part of a multi-amplifier system.

Block Diagram



Disassembly Instructions

1. Removal of Top Cover

Remove screws (C1) and (C2) and pull the cover off as shown in Fig. 1.

(Note: Be careful not to disturb the wiring.)

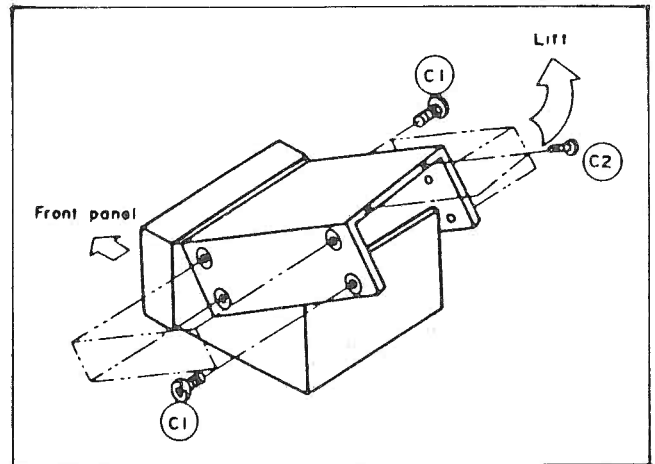


Fig. 1

2. Removal of Front Panel

Use a wrench (1.45 mm) to remove the 9 knobs on the front panel. Then remove the 5 nuts fastening the VR and front panel. After removing the power switch board (kept in place by claws), the front panel can be separated.

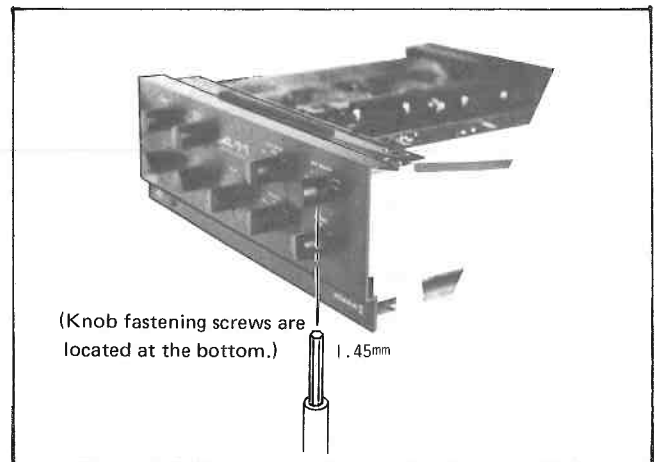


Fig. 2

3. Removal of VRs and Switches

Remove screws (F1) and remove the front top board. After removing the fastening nuts of the VRs and switches, these parts can be separated from the front panel.

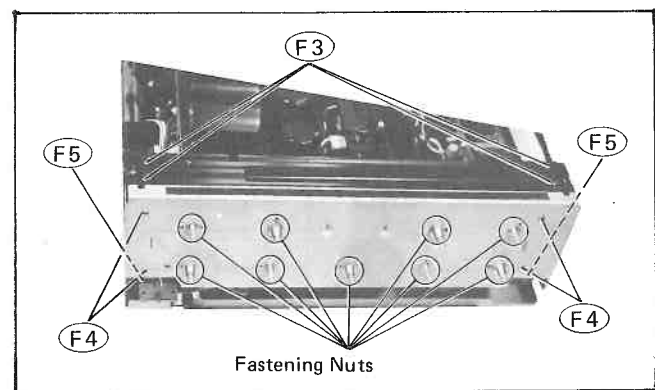


Fig. 3

4. Removal of Preamp Block

When screws (F2), (R1), and (S1) are removed, the EQ and flat amp boards can be removed. (Loosen the wiring, referring to the wiring diagram.)

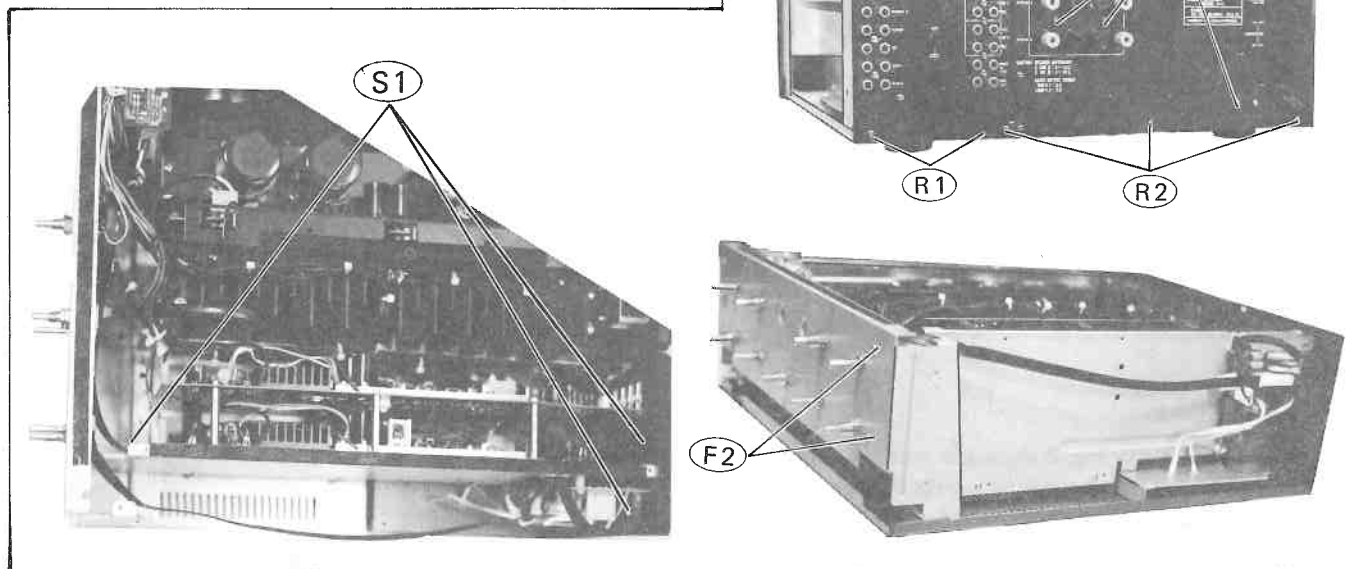


Fig. 4

5. Removal of EQ and Flat Amp PWBs

After removing screws (E1) and desoldering the solder connections the EQ and flat amp PWBs, the two boards can be removed.

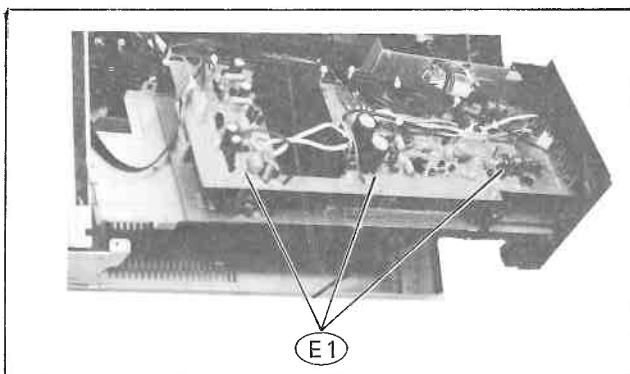


Fig. 5

6. Removal of Front Chassis

When (F4) and (F5) shown in Fig. 3 are removed, the front chassis can be removed. The PWBs fastened to the front chassis can be separated after removing the respective, VRs, switches, and screws.

7. Removal of Main Block

Remove the front chassis and screws (M1) and (R2). After detaching the headphone jack from the chassis, the main block can be removed.

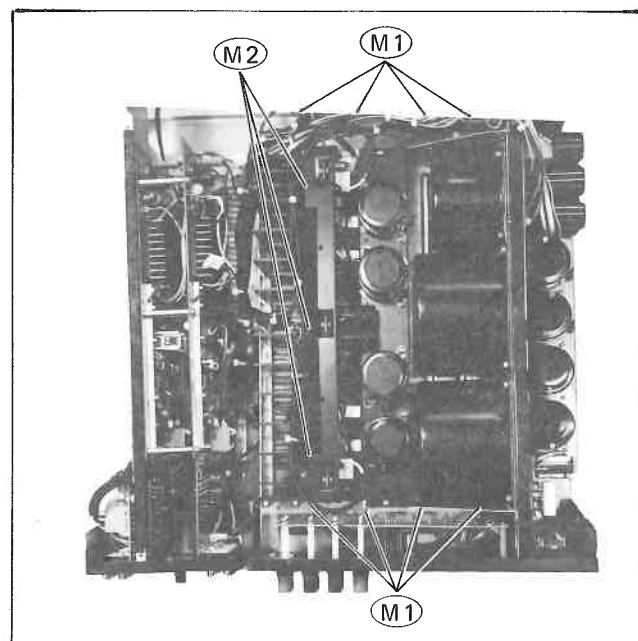


Fig. 6

8. Removal of Main (V) PWB (PWB Standing on Heatsink)

Remove screws (M2) and desolder (TR). The main (V) PWB can now be removed.

9. Removal of Protector PWB

After removing screws (R3) shown in Fig. 4, the protector PWB can be removed from the rear panel.

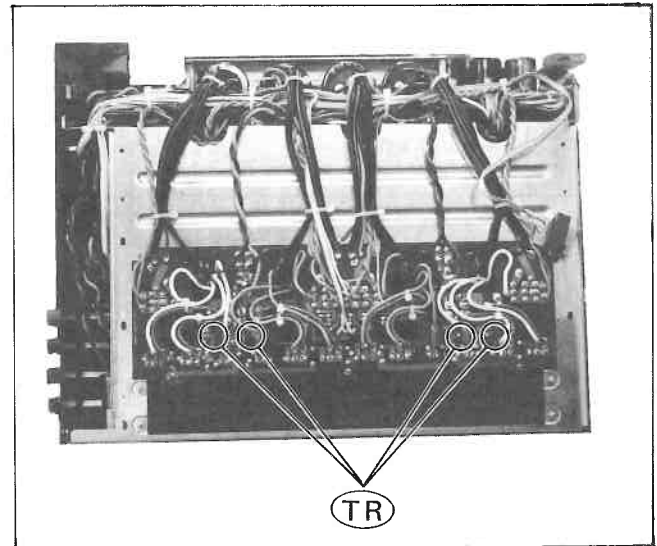


Fig. 7

10. Wiring Check

The shaded sections in Fig. 8 show the routing pattern for the internal wiring. As the wiring layout has considerable bearing on S/N ratio, restore the original conditions as closely as possible.

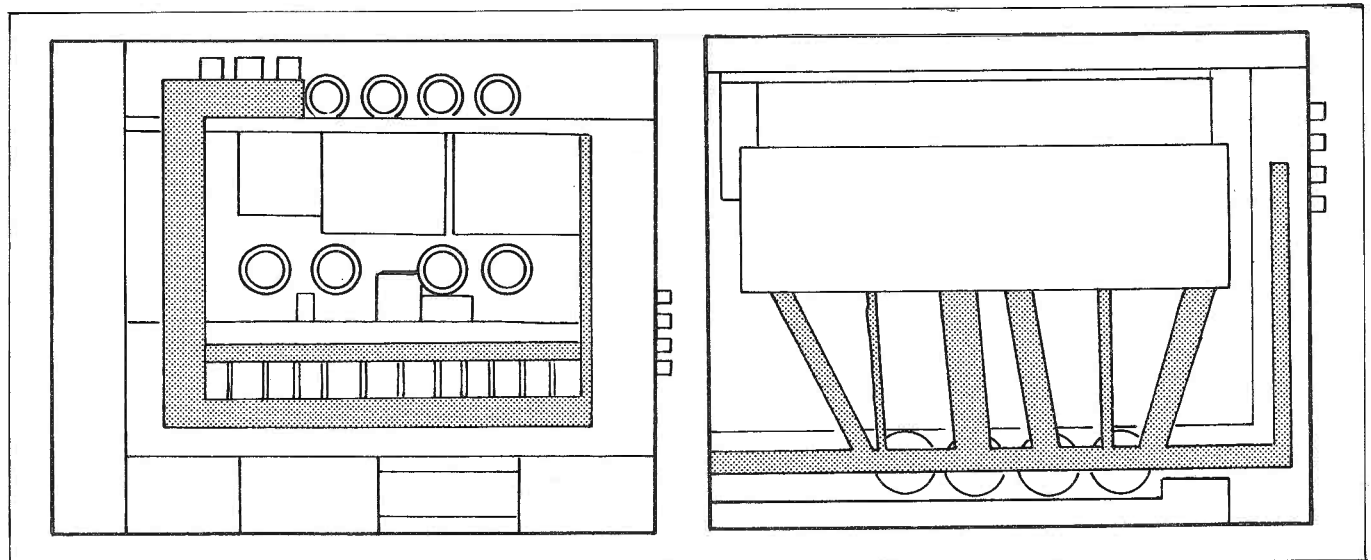
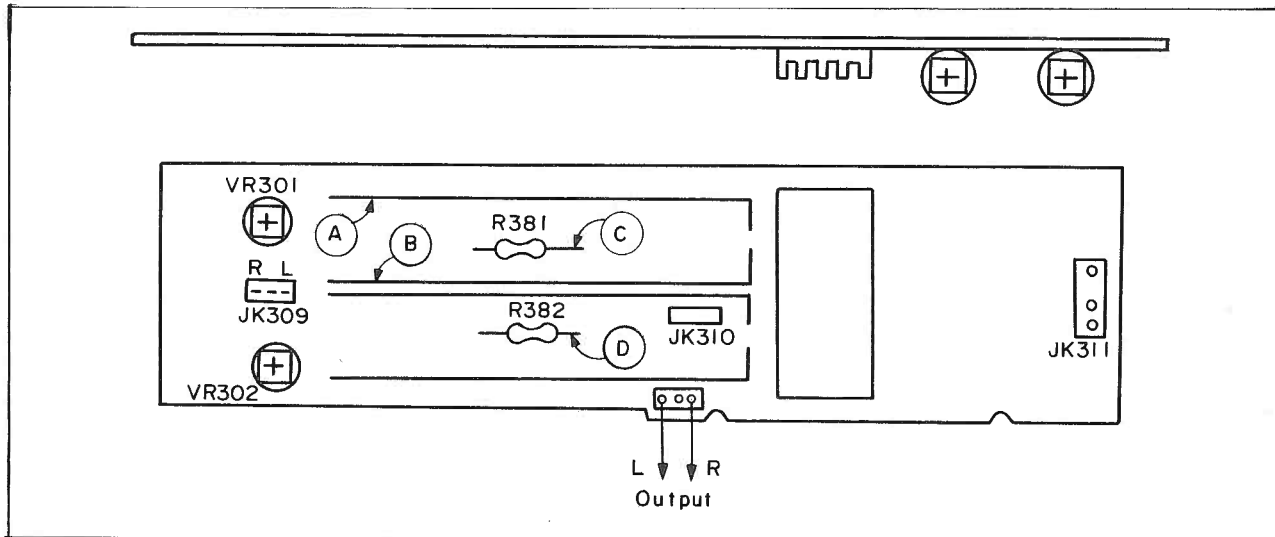


Fig. 8

Adjustments

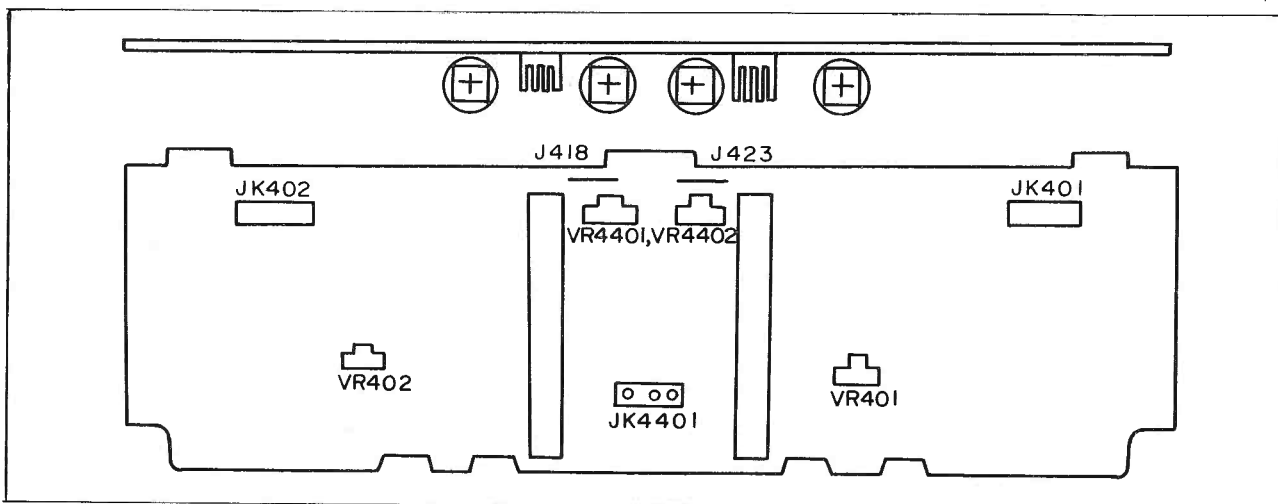
1. EQ & Flat Amp Adjustment

- (1) Adjust VR301 to obtain a voltage of less than $\pm 0.5\text{mV}$ between the (C) terminal of R381 and ground.
- (2) Adjust VR302 to obtain a voltage of less than $\pm 0.5\text{mV}$ between the (D) terminal of R382 and ground.



2. Adjustment of Main Amplifier

- (1) Adjust VR4401 to obtain a voltage of +55V between J423 and ground.
- (2) Adjust VR4402 to obtain a voltage of -55V between J418 and ground.
- (3) Provide a speaker load of 8 ohms, apply a 20kHz signal to the input to obtain maximum output. Observe the output waveform and residual distortion waveform on an oscilloscope.
- (4) After two minutes, adjust VR401 and VR402 to obtain minimum distortion and eliminate switching distortion from the residual distortion waveform.
- (5) Reduce the input signal to zero and make certain that the voltages across R519 and R520 are above 15mV and below 18mV DC. If not, adjust VR401 and VR402. (Remove the sub bottom board for R519 and R520).



Purpose of Each Circuit

1. EQ Amplifier Circuit

The amplitude vs. frequency characteristic commonly used for cutting LP records is shown in Fig. 9. When this is traced by ordinary MM or MC cartridges, low-frequency sounds gradually diminish in level, and high-frequency sounds increase in level vs. the center frequency of 1kHz. Overall output level therefore is low, and the sound balance, if reproduced in this way by the loudspeakers, would be extremely unnatural, with overbright treble and weak bass. For this reason, the amplifying characteristics of the equalizer stage are chosen to provide exactly opposite conditions from the cutting process. Around a center frequency of 1kHz, amplification of lower frequencies is emphasized and that of higher frequencies reduced (resulting in the so-called RIAA curve). In this way, a compensation of the cartridge output characteristics is achieved, as shown in Fig. 11, and the overall output characteristics of this stage are flat, equivalent to the original signal characteristics before the phono recording process. As the EQ amplifier has the highest gain of all stages in the preamplifier, high S/N ratio is also essential.

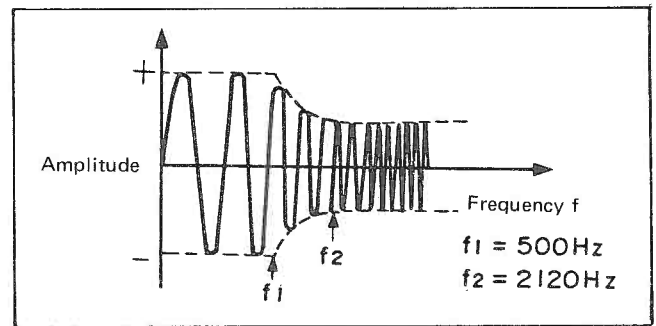


Fig. 9

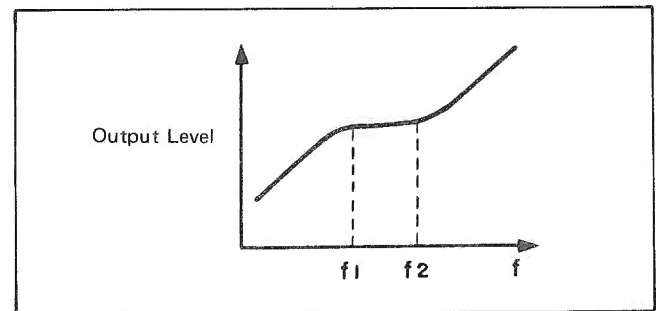


Fig. 10

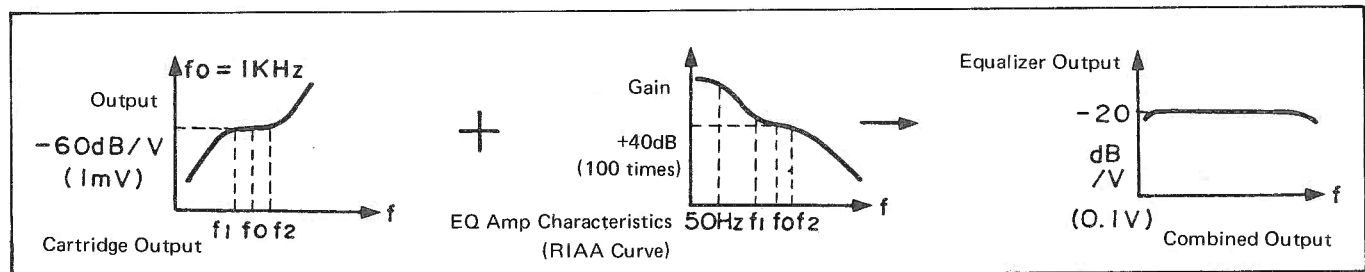


Fig. 11

2. Flat Amplifier Circuit

The output signals from the EQ amplifier stage and from the tuner and tape inputs are in turn sent to the power amp level control and subsonic filter stages. But as these stages introduce a certain gain loss, it is necessary to first pass the signals through an amplifying stage with flat frequency response characteristics, to prevent losses. This task is fulfilled by the flat amplifier stage, which is provided before the power amp control and subsonic filter.

3. Main Amplifier Circuit

Although the signal has undergone some amplification in the EQ and flat amplifier stages, it is still much too small to directly drive the loudspeakers. (Compare Fig. 12) The main amplifier provides power amplification to step up the signal to sufficiently high voltage and to a level where it can sustain the large currents required to drive the loudspeakers. The main amplifier circuit consists of 4 blocks, as shown in Fig. 13.

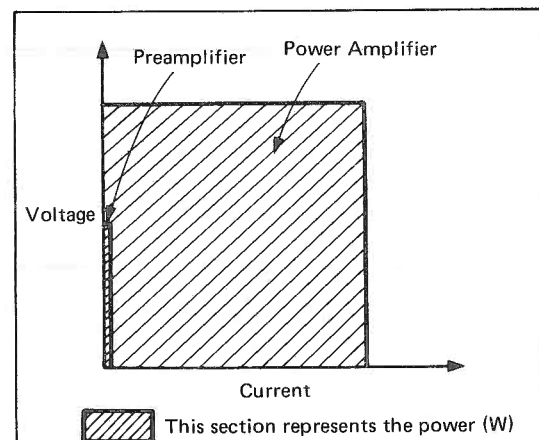


Fig. 12

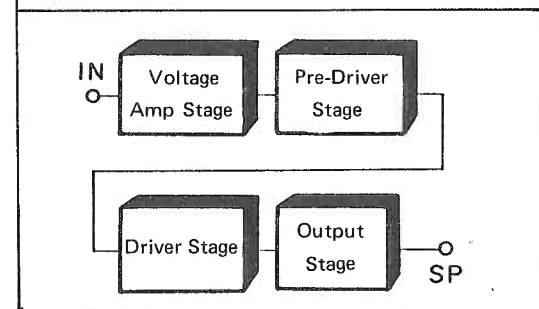


Fig. 13

■ Voltage Amplification Stage

This stage steps up the voltage of the input signal, thereby increasing the gain of the power amplifier. It also serves to combine the NFB signal and the input signal.

■ Pre-Driver Stage

Serves to supply a large signal to the driver and output stages.

■ Driver Stage, Output Stage

The purpose of the driver stage is to drive the final output stage. These two stages provide current amplification of the voltage supplied by the voltage amplification and pre-driver stages and apply this current to the loudspeakers.

4. Protector Circuit

The presence of a DC current in the output, due to a defect in the power amplifier or the like, would cause damage to the loudspeakers. On the other hand, a short-circuit in the speaker terminals would result in excessive current flows and destruction of the output stage. The protector circuit serves to prevent such occurrences by providing the following functions.

- Shut off the current to the amplifier and speakers if abnormal operating conditions are detected.
- Prevent the occurrence of shock noise when the power is switched on and off (muting function).
- Revert to normal operation when the abnormal condition has ceased.

5. Power Supply Circuit

The sound quality of an integrated amplifier depends to a great deal on its power supply. As can be seen from Fig. 14, the input level of the EQ amp is about 1/10000 (-80dB) as compared to the power amplifier's output level. If the power supply of the EQ amp, for example, introduces noise, this noise will appear in the speaker output amplified by about 100 times (40dB). To preclude this possibility, the A-11E employs one transformer (PT003) for the EQ amp, flat amp and main (V) amp, and separate transformers (PT001, PT002) for the main (P) amp.

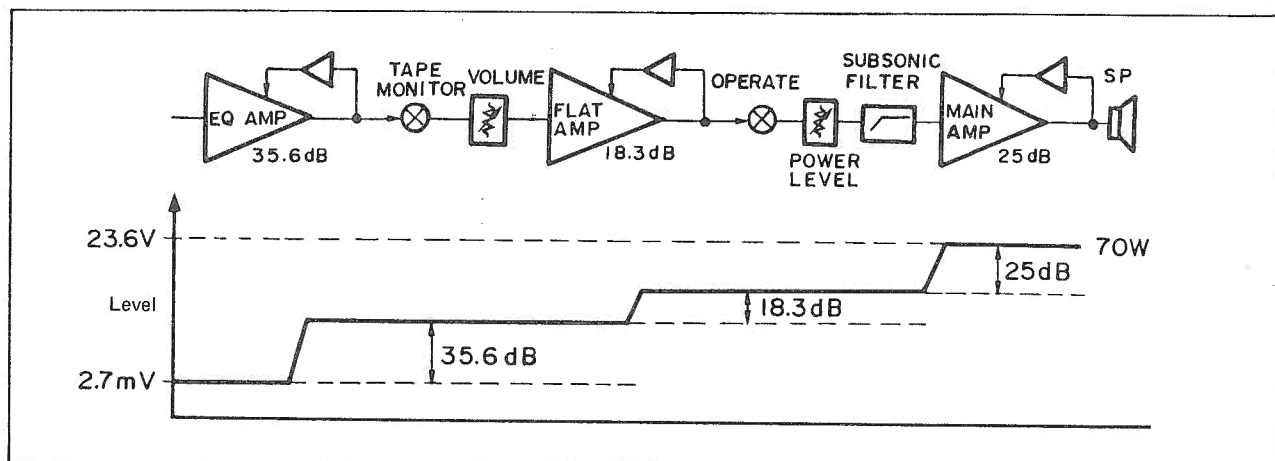


Fig. 14

Circuit Description

<EQ Amplifier Circuit>

1. Cascade Configuration (Fig. 15, 16)

In an ordinary emitter follower circuit, a feedback capacity arises between the transistor's base and collector, and a floating capacity between the collector and ground, as shown in Fig. 15. These unwanted capacities cause high-frequency distortion and impair amplifier linearity. A solution to this problem is shown in Fig. 16. Transistors TR301 and TR303 are connected in series, and the base of TR303 is grounded. This is called cascade configuration, which is largely immune to the effects of feedback or floating capacity.

When an input is applied to TR301, a current flows between the drain and source. Thereby current amplification, but not voltage amplification is achieved. TR303 on the other hand, due to its characteristics as a base follower circuit, causes almost no current amplification, but operates approximately like an emitter follower circuit, providing voltage amplification.

2. Differential Input Type Equalizer Circuit (Fig. 17)

TR305 and TR307 are transistors of identical characteristics (2SC1845), and their emitters are connected to a common constant-current supply. Therefore the sum I_0 of the collector currents I_{C1} (TR305) and I_{C2} (TR307) is always constant. If the base current of TR305 is at a positive potential vs. TR307, I_{C1} increases, and accordingly I_{C2} decreases, as I_0 is constant. This means that a current differential occurs between the collectors of TR305 and TR307, and gain is introduced. If on the other hand the base potential of TR305 and TR307 changes simultaneously by the same value, the collector currents of both transistors do not change and there is no alteration of collector voltage, as I_0 is constant. Thus a differential circuit produces no output with in-phase signals. In-phase components are therefore extracted from the input signal. When feedback voltage is high, the output decreases, and when feedback voltage is low, the output increases. The capacity to suppress in-phase components effectively protects the circuit against external influences such as power supply hum, temperature changes, etc.

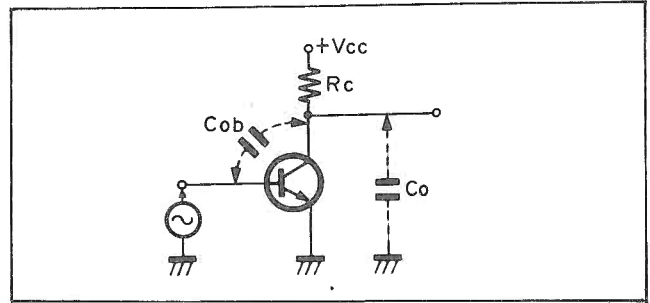


Fig. 15

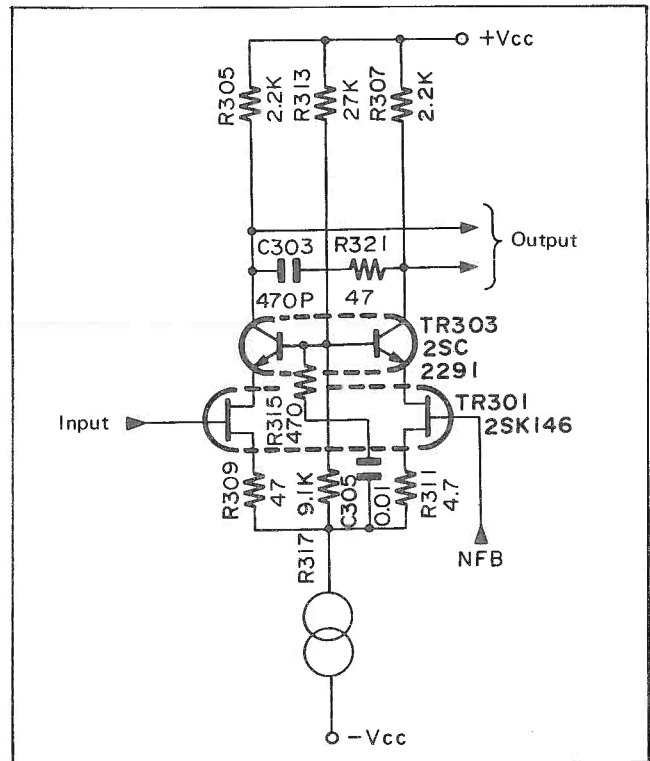


Fig. 16

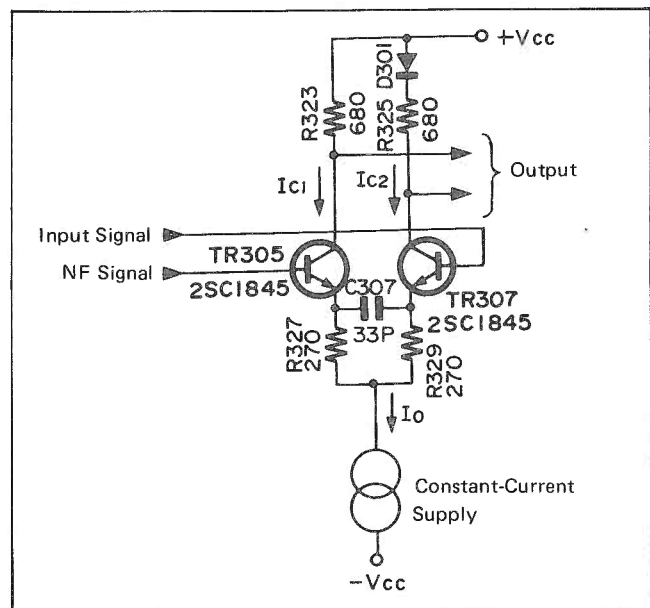


Fig. 17

3. Current Mirror Circuit

The circuit configuration shown in Fig. 18, consisting of TR309, D301, R325, R339, and R341 is called a current mirror circuit. The circuit is determined by identical conditions for the base/emitter of TR309, D301 and the values of R325, R339, and R341. Therefore, if a current flows in the collector of TR307, an exactly opposite collector

current flows in TR309 and D301. This signal is amplified by the cascade-configuration circuit consisting of TR311, TR315, R315, D305, C313, TR317, TR313, R347, D307 and C315. Then it is supplied to the SEEP circuit explained below.

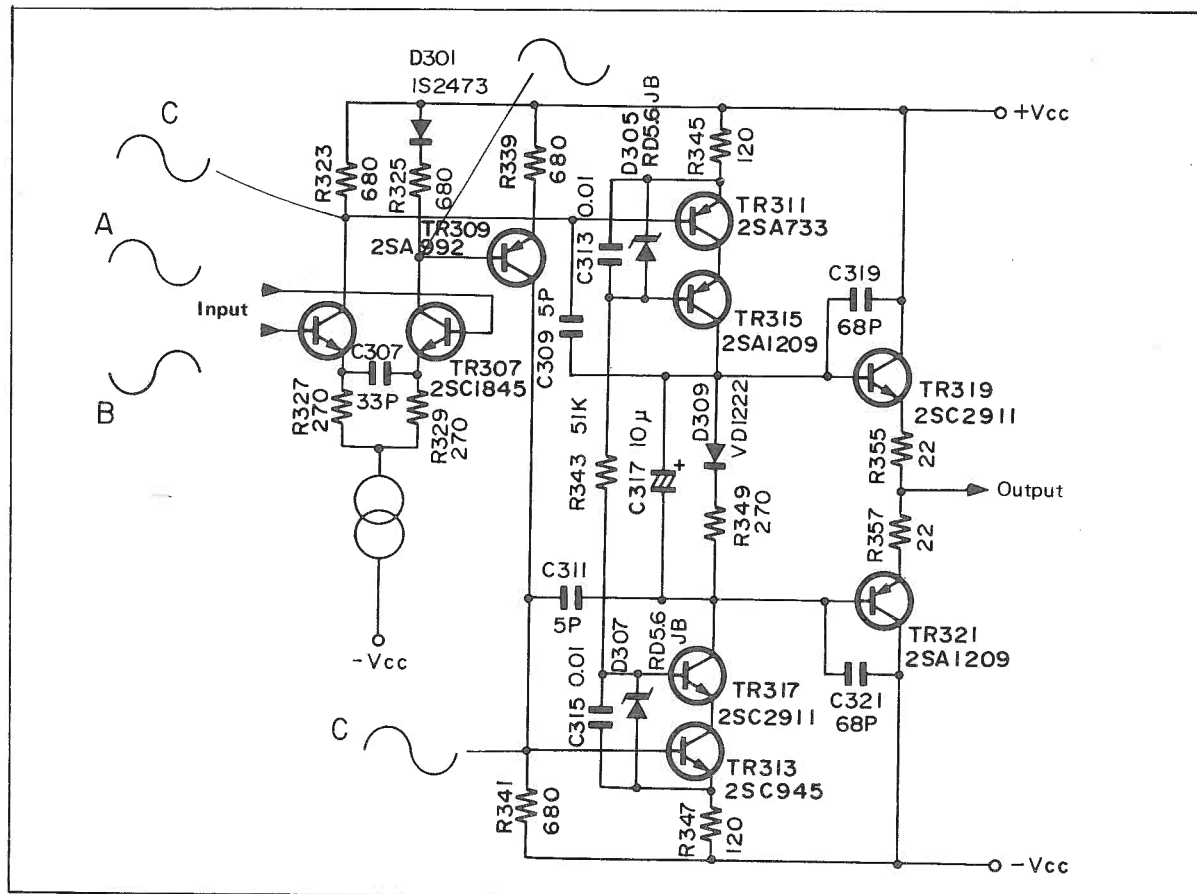


Fig. 18

4. SEEP Output Type Equalizer Circuit

When signals A and B are applied to the input of the circuit shown in Fig. 18, signal C appears at the bases of TR311 and TR313. Fig. 19 shows a simplified SEEP type equalizer amp circuit. A forward bias current is applied to the bases of TR319 and TR321, causing the transistors to be con-

stantly ON. When a signal such as C is applied to the input, TR319 produces the signal D and TR321 the signal E. The output therefore is the combined signal of D and E, which is the input signal (from the cartridge) amplified by approximately 60 times (35.5dB).

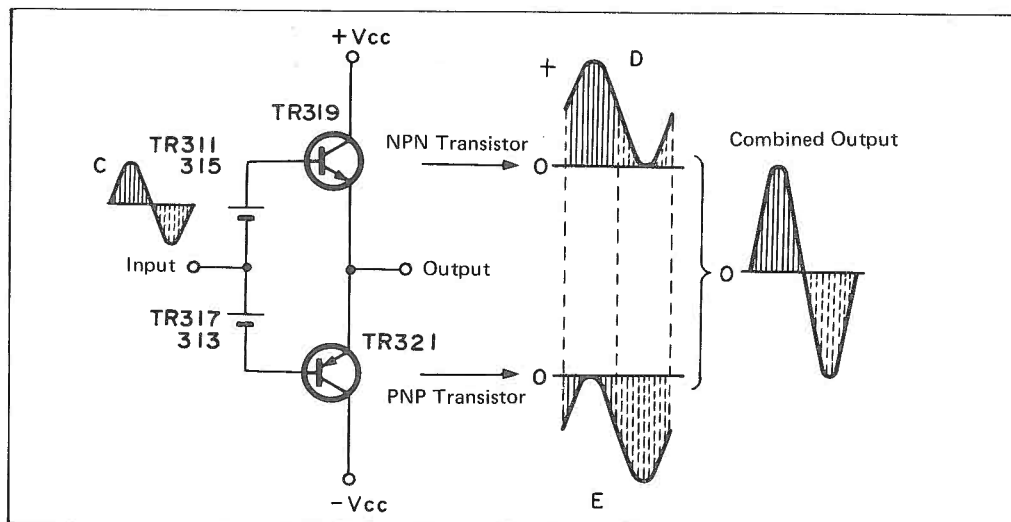


Fig. 19

5. NFB Circuit

Fig. 20 shows the negative feedback circuitry. I is the mixing (insertion) stage, II is the amplifier section, with input voltage and output voltage at opposite potential. III is the feedback loop (beta) through which the signal voltage appearing at the output of section II is feedback to the input. The characteristics of the NFB circuit are chosen in such a way that with sufficiently large feedback the overall amplification factor A becomes $1/\beta$, regardless of the amplifier section's amplification factor A_v . Therefore, determining beta also results in determining the overall amplification factor A as a constant. This NFB circuit has the following effects:

- (1) Stabilization of amplification factor
- (2) Reduction of non-linear distortion
- (3) Improvement of frequency response
- (4) Improvement of S/N ratio
- (5) Control of input and output impedance, etc.

By giving the beta circuit a certain frequency response characteristic, the amplifier can be designed for a desired frequency response, which is used in the EQ amp for RIAA equalization. The A-11E employs the circuit shown in Fig. 21.

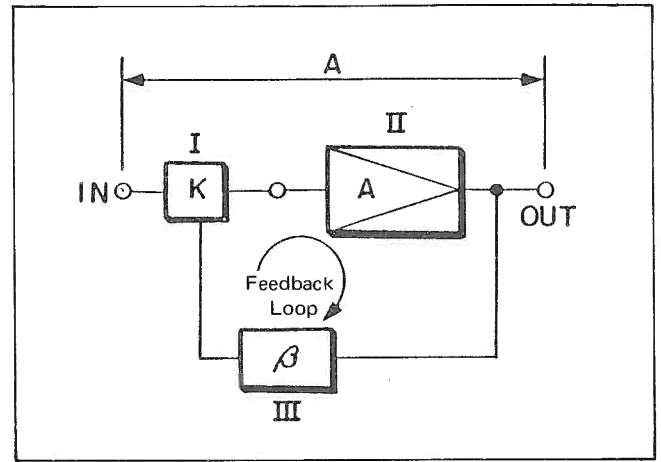


Fig. 20

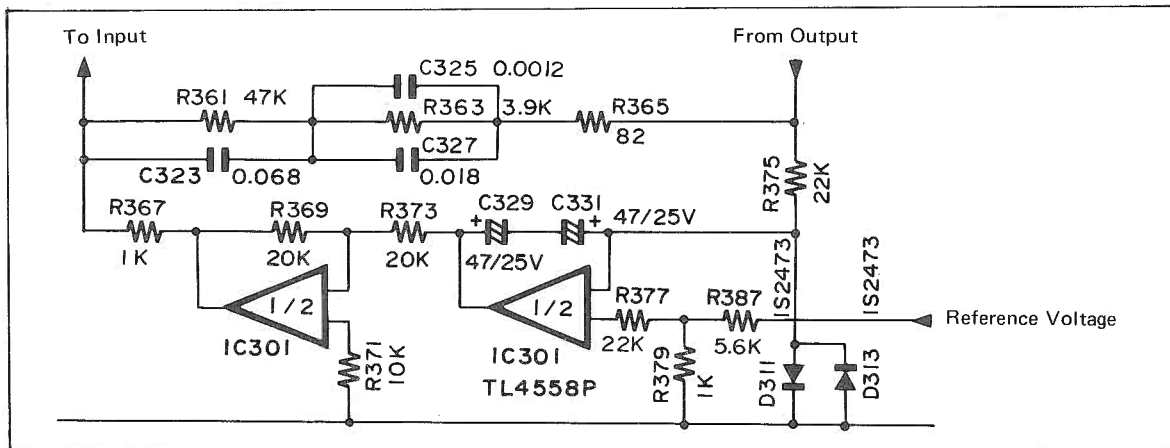


Fig. 21

5-1 RIAA Playback Equalization Circuit

The RIAA parameters require that the equalizer amplifier has a frequency response characteristic as shown in Fig. 22. When the compensation curve is converted into a straight line, as represented by the dotted line in the graph, it rises by 6dB per octave below 600Hz and falls by 6dB per octave above 2130Hz. The point where low-frequency boost sets in is called turnover frequency, and the point where high-frequency cut sets in the roll-off frequency. The RIAA compensation frequencies for the A-11E can be calculated as follow.

$$\text{therefore } f = \frac{1}{2\pi CR}$$

$$f_1 = \frac{1}{2\pi \times C323 \times R361} = 49.8 \text{ [Hz]}$$

$$f_2 = \frac{1}{2\pi \times C323 \times R363} = 600 \text{ [Hz]}$$

$$f_3 = \frac{1}{2\pi \times C327 \times R363} = 2267.2 \text{ [Hz]}$$

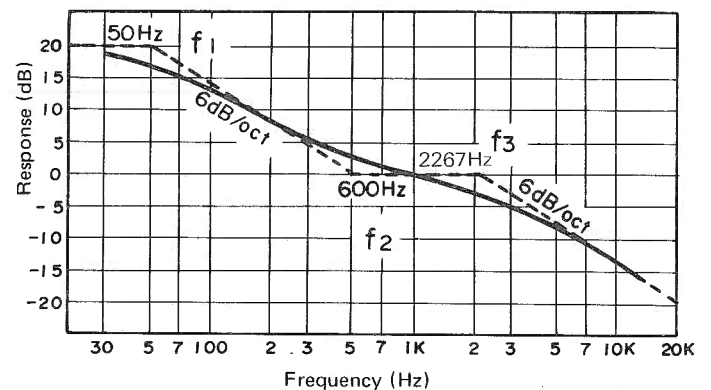


Fig. 22

This shows that at low levels feedback increases, as the impedance Z increases towards higher signal frequencies.

5-2 DC Servo Circuit

The DC servo circuit consists of the inverter amplifier IC301. The basic principle is shown in Fig. 23. the feedback amount ANF is calculated as follows.

$$\text{ANF} = \frac{XC}{R}$$

follow $XC = \frac{1}{j\omega C}$

$$\text{ANF} = \frac{1}{j\omega C R}$$

Therefore $= \frac{1}{j\omega C R}$

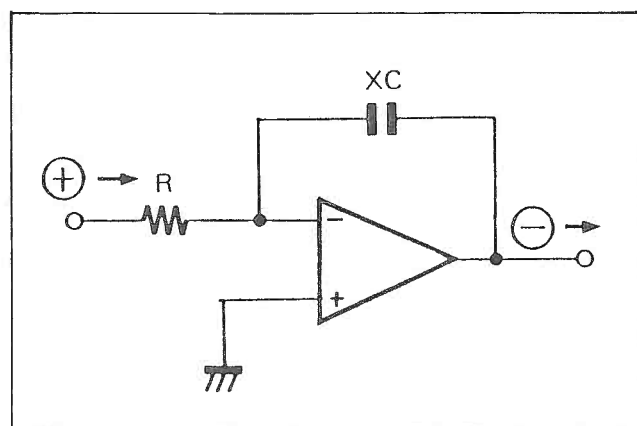


Fig. 23

This means that signals below the frequency determined by CR are cut off when applying negative feedback. Very low frequency signal can be considered equivalent to DC current. But on the other hand, the amplification factor in the low range is high, according to the RIAA characteristic

shown in Fig. 22. Therefore, given a response of 40dB, for example a signal of 0.05Hz appearing with 10mV at the input would appear at the output with 1V. For this reason, XC is employed in the feedback section to control very low frequency components (DC servo control).

<Flat Amplifier Circuit>

The flat amplifier circuit employs the same circuit configuration as the EQ amplifier, but without the RIAA compensation circuit.

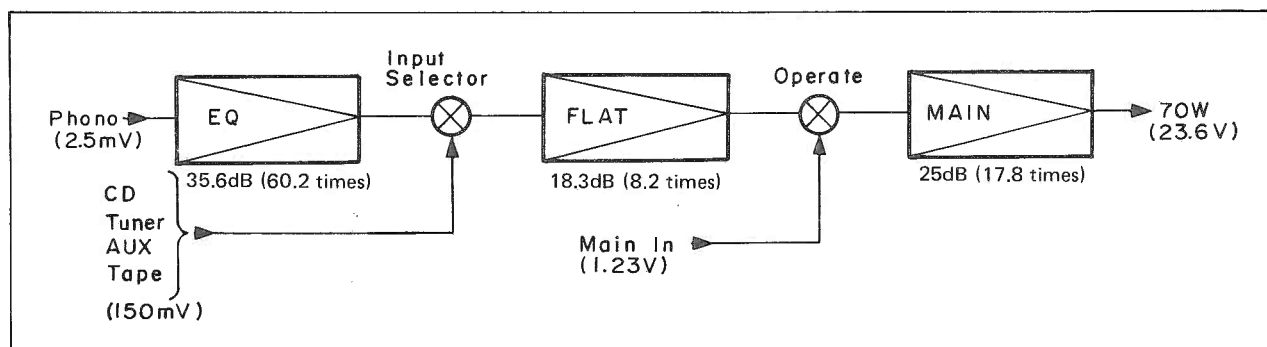


Fig. 24

Fig. 24 shows the gain for the various amplifying stages of the A-11E. The standard output level of ordinary Hi-Fi sources is 2.5mV for Phono, and 150mV for Tuner, Tape, etc. (The Phono level is increased to 150mV by the EQ amplifier.) The flat amplifier serves as a buffer stage to supply these signals to the high output impedance main amplifier without deterioration of output voltage, gain or frequency response characteristics.

<Main (V) Amplifier Circuit>

The purpose of the main (V) amplifier circuit is to provide voltage amplification. Fig. 25 shows the circuit configuration.

The operating principle at the various points is explained in the following.

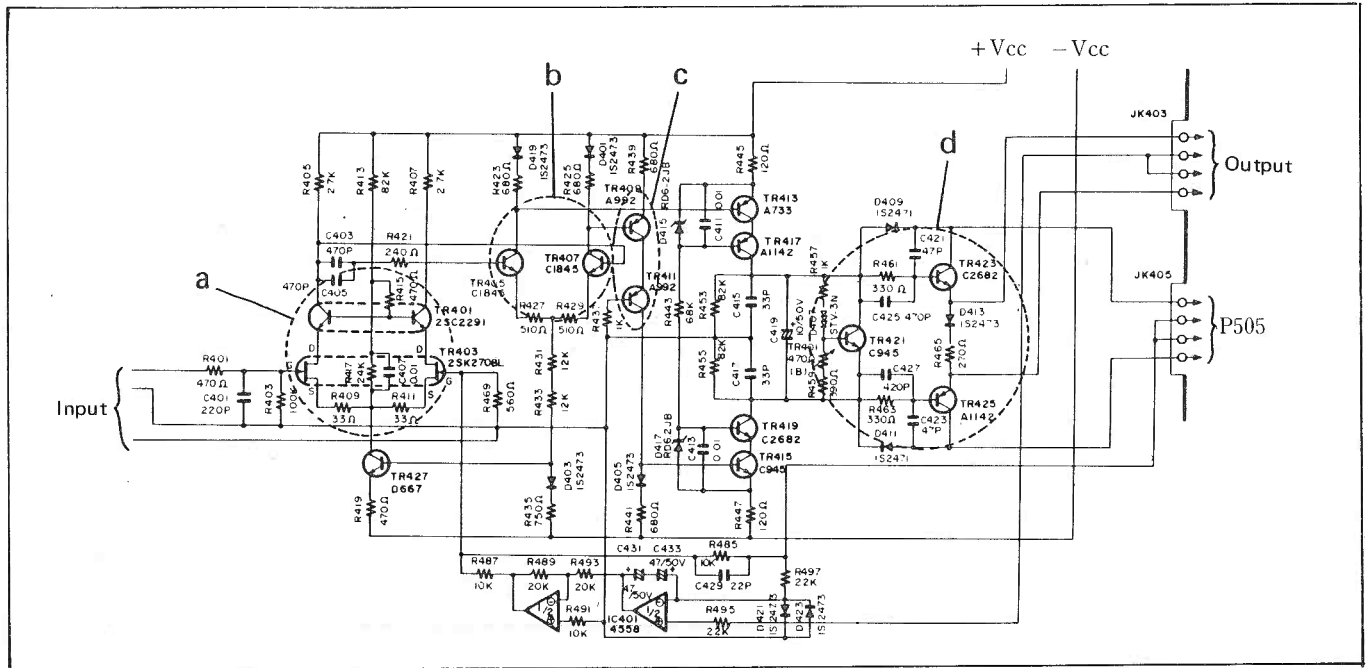
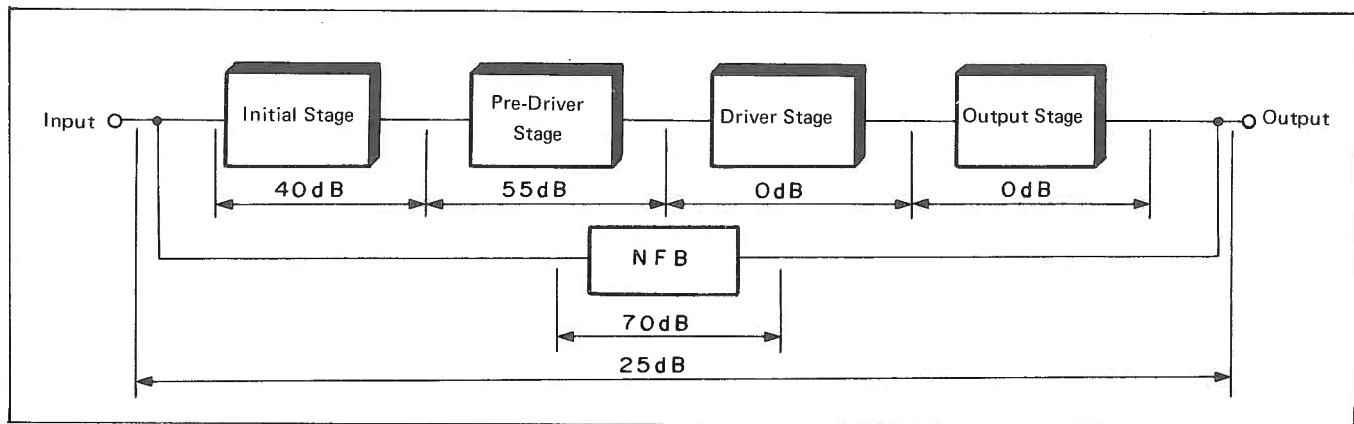


Fig. 25

1. **Point a:** Cascade connection for voltage amplification with minimum deterioration by feedback or floating capacitance.
 2. **Point b:** Differential circuit configuration for voltage amplification with minimum susceptibility to external influences such as power supply hum, temperature changes, etc.
 3. **Point c:** Current mirror circuit to induce an exactly opposite collector current from TR407 in TR411 and provide the input signal to the SEEP circuit.
 4. **Point d:** Pre-driver stage with cascade connection for voltage amplification with minimum deterioration by feedback or floating capacitance.
- As the first stage of the main (V) amplifier (points a and b) serve mainly for impedance conversion and NFB connection, low-noise performance is essential and high gain cannot be achieved. On the other hand, the driver stage and output stage described below serve only for current amplification without voltage amplification. Therefore most of the gain must be provided by the pre-driver stage. (Refer to Fig. 26) The gain for each stage can be calculated as follows.

As the first stage of the main (V) amplifier (points a and b) serve mainly for impedance conversion and NFB connection, low-noise performance is essential and high gain cannot be achieved. On the other hand, the driver stage and output stage described below serve only for current amplification without voltage amplification. Therefore most of the gain must be provided by the pre-driver stage. (Refer to Fig. 26) The gain for each stage can be calculated as follows.

Point a	$A_{va} \doteq 20 \log \frac{R_L}{R_S}$	$\doteq 20 \log \frac{R_{405}}{R_{409}}$	$\doteq 20 \log \frac{2.7 \times 10^3}{33} \doteq 38.3 \text{ dB}$
Point b	$A_{vb} \doteq 20 \log \frac{R_L}{R_E}$	$\doteq 20 \log \frac{R_{423}}{R_{427}}$	$\doteq 20 \log \frac{680}{510} \doteq 2.5 \text{ dB}$
Point c	$A_{vc} \doteq 20 \log \frac{R_L}{R_E}$	$\doteq 20 \log \frac{R_{453}}{R_{445}}$	$\doteq 20 \log \frac{82 \times 10^3}{120} \doteq 56.7 \text{ dB}$



Distribution of Voltage Amplification Within Main Amplifier **Fig. 26**

The overall gain of the main (V) amplifier is as follows.

$$A_{v\sigma} \doteq \frac{A}{1 + A\beta}$$

As is evident from the characteristics chart for TR403 (2SK270BL) (Fig. 25), A is 10n(A) (with $I_D = 3\text{mA}$ and $V_{DS} = 26\text{V}$).

Further calculation results in

$$A_{v\sigma} \doteq \frac{A}{A\beta} \doteq \frac{1}{\beta} \quad \beta = \frac{R_{469}}{R_{469} + R_{485}}$$

$$A_{v\sigma} \doteq \frac{R_{469} + R_{485}}{R_{469}} \doteq \frac{560 + 10 \times 10^3}{560} \doteq 25.5 \text{ dB}$$

Therefore the NFB amount is 70dB.

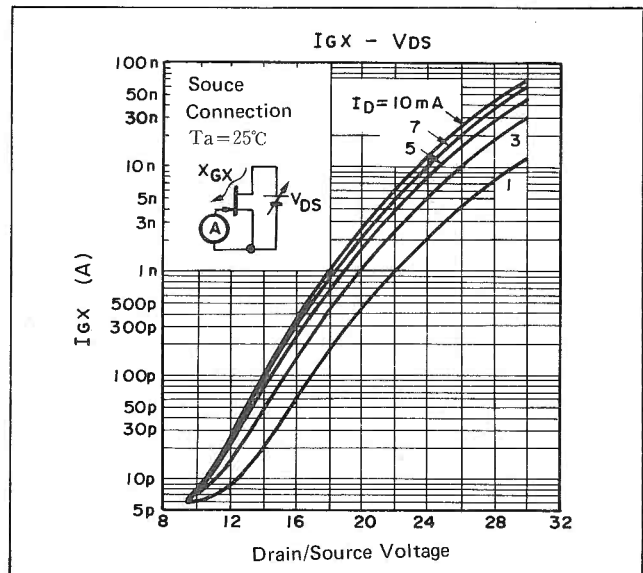


Fig. 27

5. Point e: Forms the driver stage in combination with TR423, TR425, TR501, TR503 of the main (P) amplifier circuit.

This driver stage supplies the necessary drive current to the output transistor base from the signal amplified in the initial and pre-driver stages. It is connected to the output transistors in a Darlington configuration. (Fig. 28) the circuit consisting of TR421, R457, D407, VR401, and R459 supplies an idling current to the base of the driver stage. In case of a push-pull circuit without idling current, such as shown in Fig. 29, crossover distortion arises and good sound quality cannot be obtained. Crossover distortion is a kind of switching distortion which invariably arises in a push-and-pull circuit of the type shown in Fig. 29, when the NPN and PNP transistors switch ON and OFF. However, by applying a current to the transistor base, the transistor will switch ON before the actual signal has to be processed. Thus the shift in the waveform crossover points can be prevented and a distortion-free sine wave is obtained at the output when a sine wave is applied to the input, as shown in Fig. 30. Crossover distortion is thus eliminated.

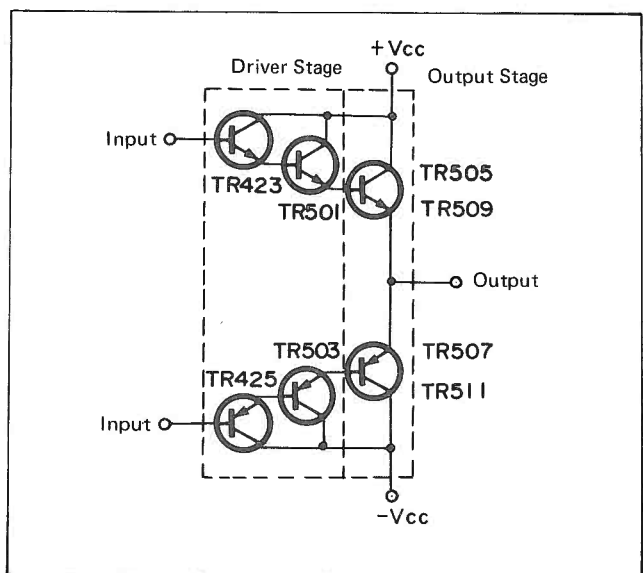


Fig. 28

The setting principle of the idling current is shown in Fig. 31. As the transistor voltage V_{BE} is 0.6V, the current flowing between A and B is $I = 0.6/R$. Therefore the voltage V_2 is I_0 is $\times 2R$ it follows

$$V_2 = 0.6/R \times 2R \\ = 1.2[V]$$

The A-11 employs the circuit shown in Fig. 32. The VR permits adjustment of idling current. D407 is attached to the heatsink of the output stage and serves to regulate the idling current depending on the temperature change V_{BE} of the output transistors. The temperature-dependant characteristics of D407 (STV-3H) are shown in Fig. 33. When the temperature rises, the voltage decreases, and vice versa.

6. Point f: DC servo circuit consisting of an inverter amplifier, to cut off low frequencies when applying negative feedback. The feedback signal is taken from the output stage.

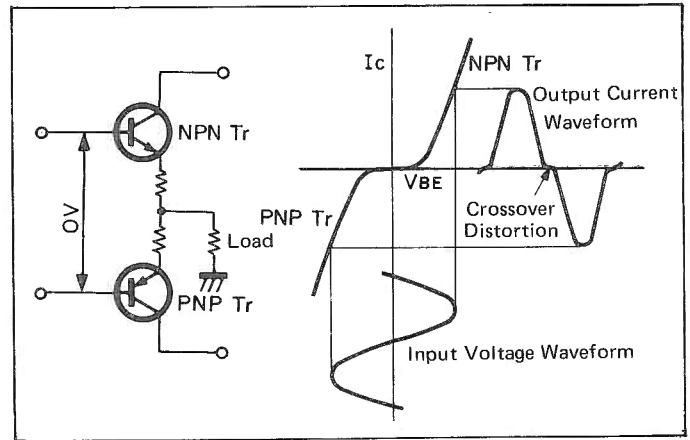


Fig. 29

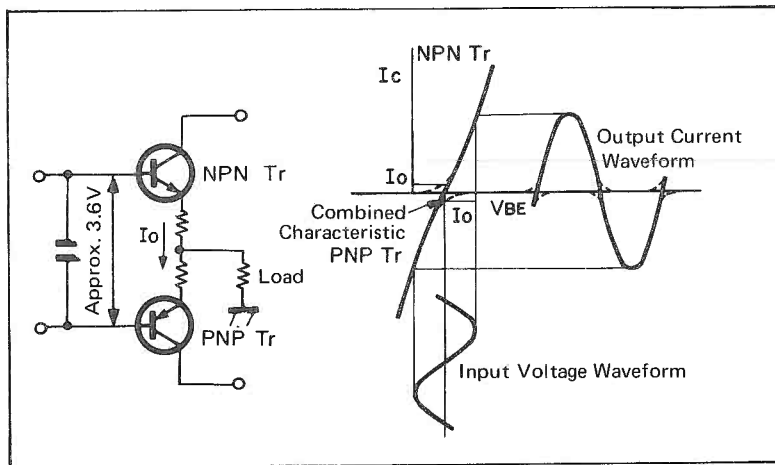


Fig. 30

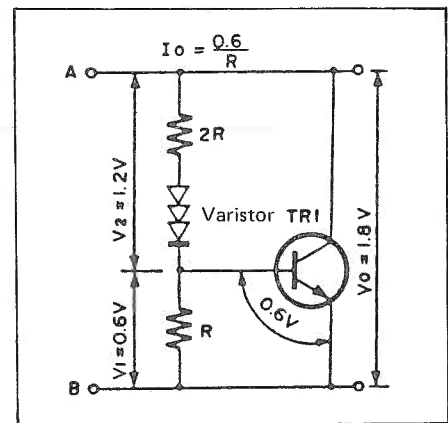


Fig. 31

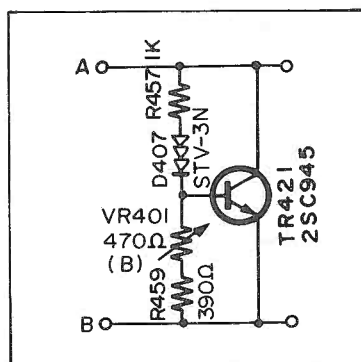


Fig. 32

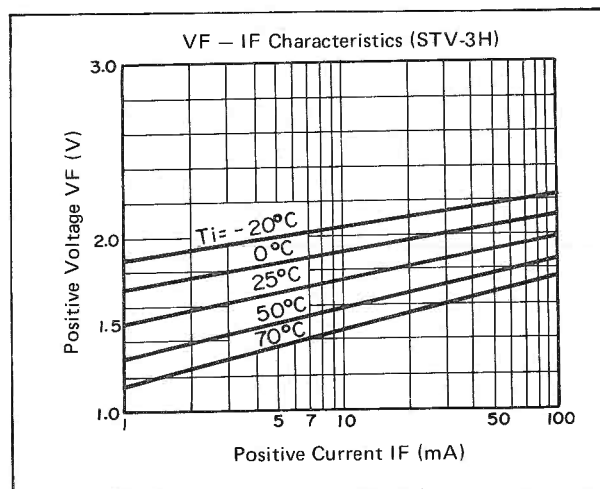


Fig. 33

<Main (P) Amplifier Circuit>

The main (P) amplifier is constructed as a complementary type SEEP circuit. Together with TR423 and TR425 of the preceding stage, TR501 and TR503 form the driver stage, and TR505, TR507, TR509, and TR511 form the output stage. The peak current flowing in the output stage with a load of 4 ohms at the 140W output of the A-11 is approxi-

mately 8.4A. In order to sustain this large current, two transistors of equal characteristics are employed in each SEEP circuit. This configuration is called para-push circuit. (Fig. 34) TR513 serves to detect any excessive current flow in the output stage and drive the protector circuit. (Fig. 34)

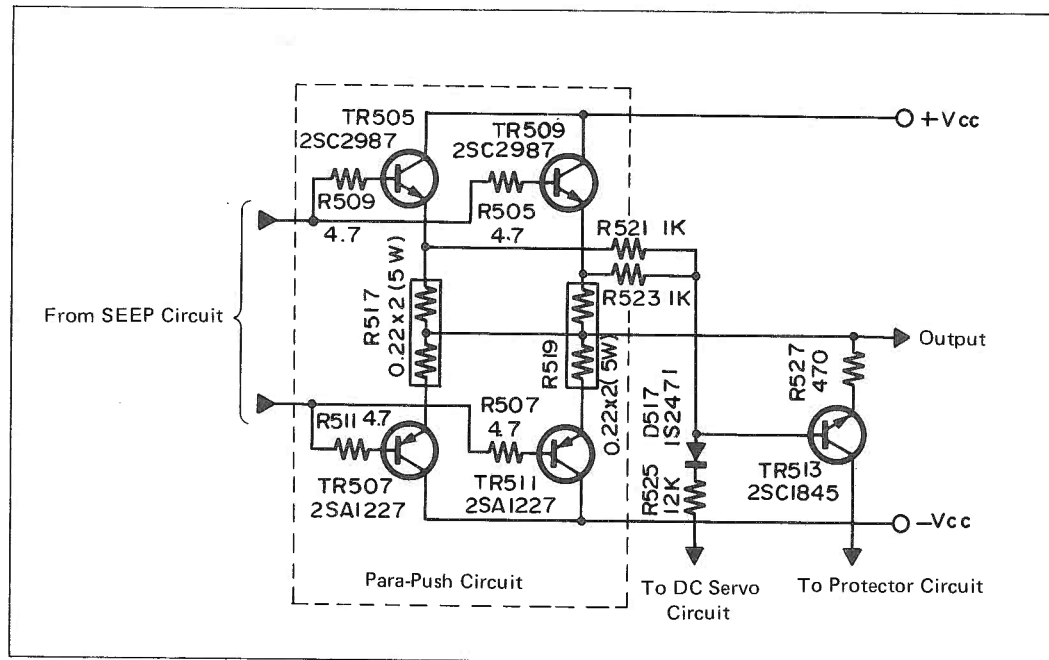


Fig. 34

<Protector Circuit>

The protector circuit consists of IC801, IC802, TR802, TR803, R101, R802, and R803. IC801 serves to prevent

excessive current from flowing to the loudspeakers, and IC802 operates the power ON/OFF muting. (Fig. 35)

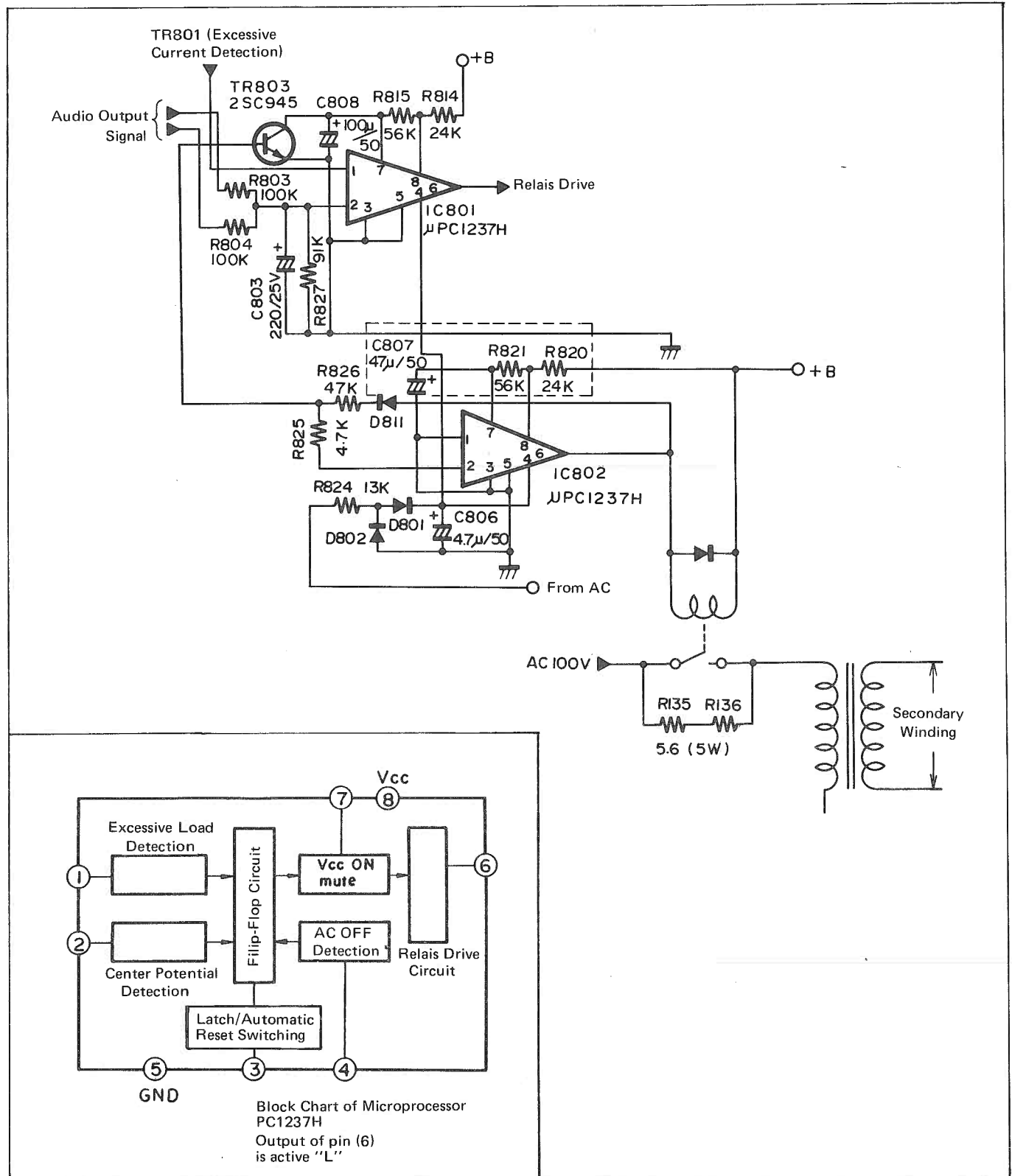


Fig. 36

Fig. 35

<Reserve II Power Supply>

The power supply rectifies the AC current and feeds it to the respective circuits. However, the waveform of the current provided by the power supply is not true DC but contains certain fluctuations, as shown in Fig. 37. The less fluctuations are present in the supply voltage, the better the sound quality of an amplifier will be. The A-11 employs the so-called Reserve II power supply principle to provide a very close equivalent of DC current. The basic principle of this circuit is shown in Fig. 38.

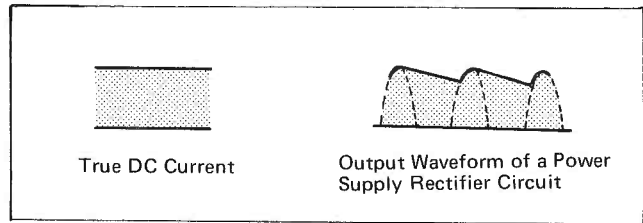


Fig. 37

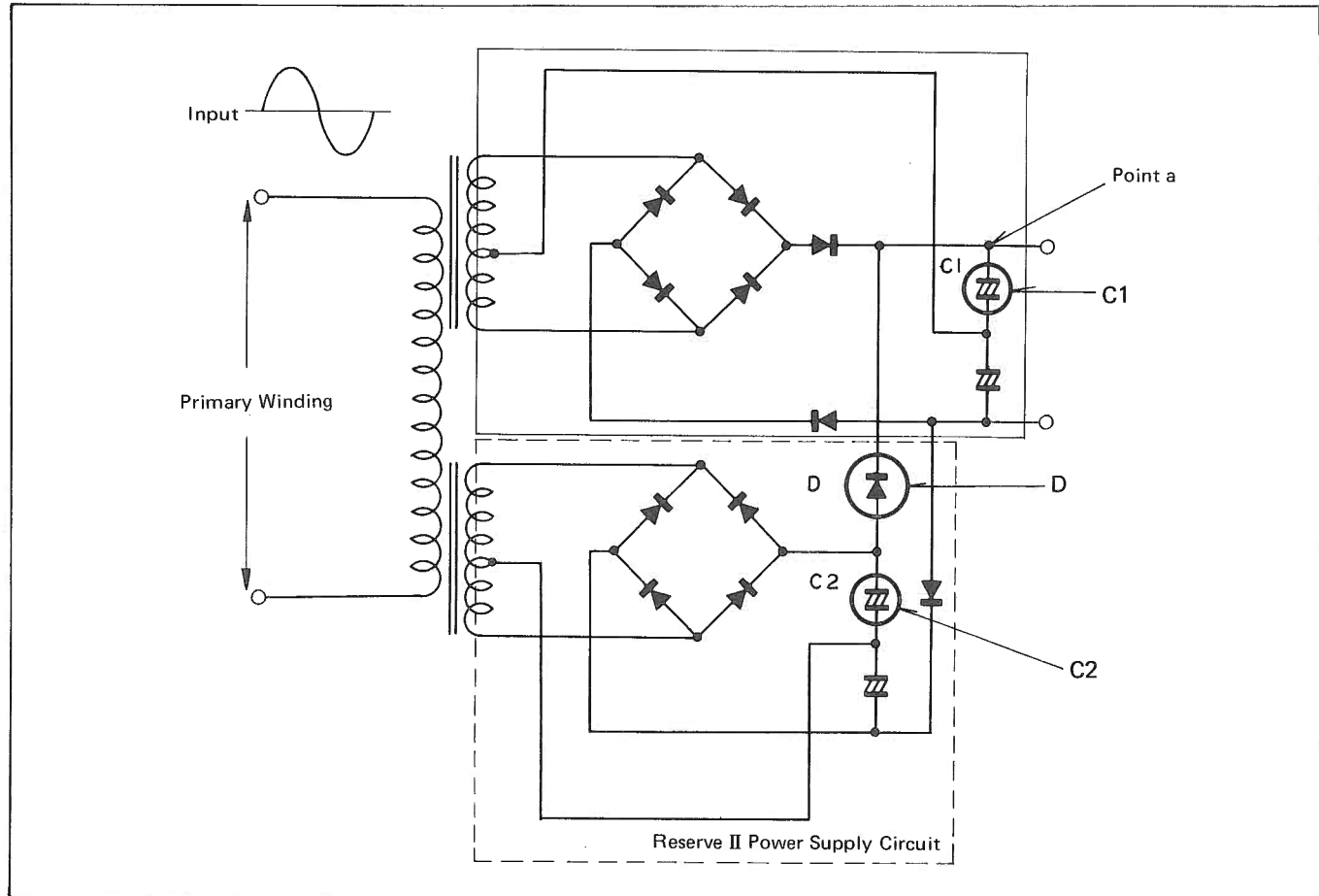


Fig. 38

With an ordinary power supply (solid line rectangle in Fig. 38), the output waveform at point (a) is as shown by the solid line in Fig. 39. By adding to this circuit another circuit with identical characteristics (dotted line rectangle in Fig. 38), the waveform at point (a) becomes as shown by the dotted line in Fig. 39.

This makes use of the characteristics of diode D, which cause C2 to discharge its electric potential when the potential of C1 becomes lower than that of C2. Thereby C1 is continuously being charged, which creates a power supply voltage close to a straight line. In this way, the A-11 achieves superior sound quality which cannot be fully expressed by more specifications.

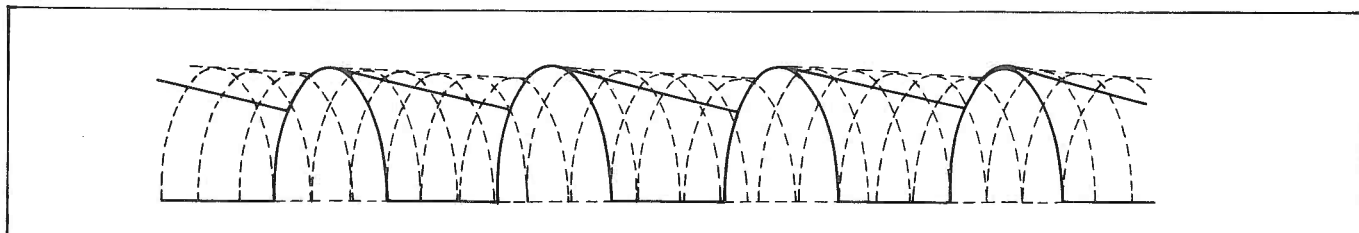
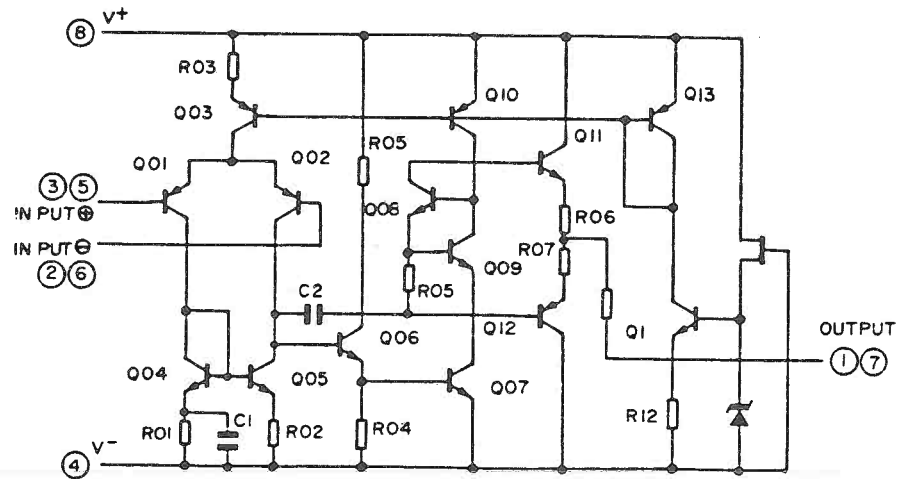


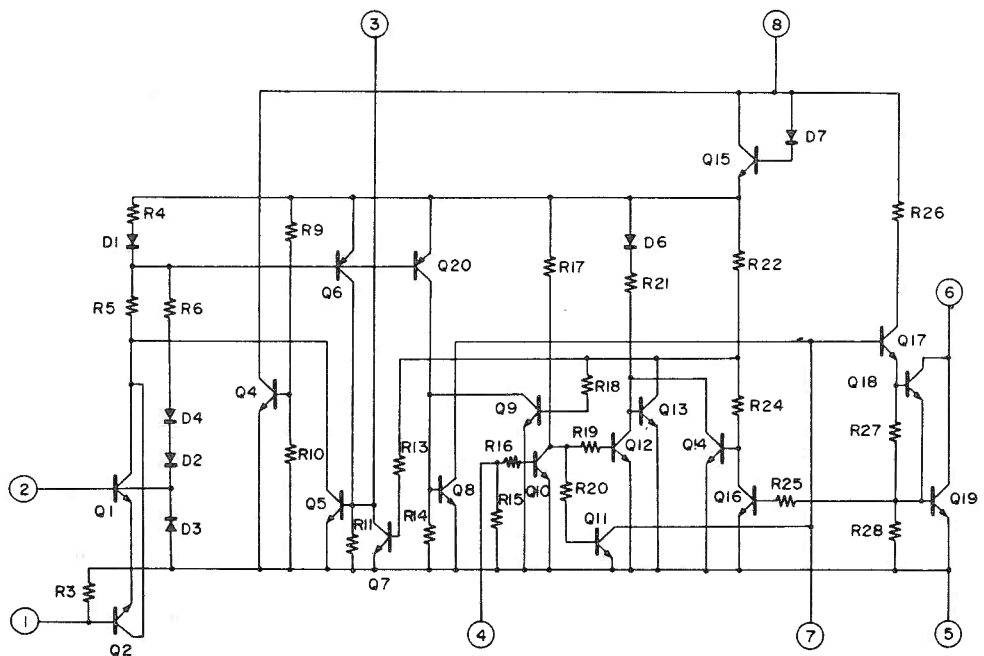
Fig. 39

IC Block Charts

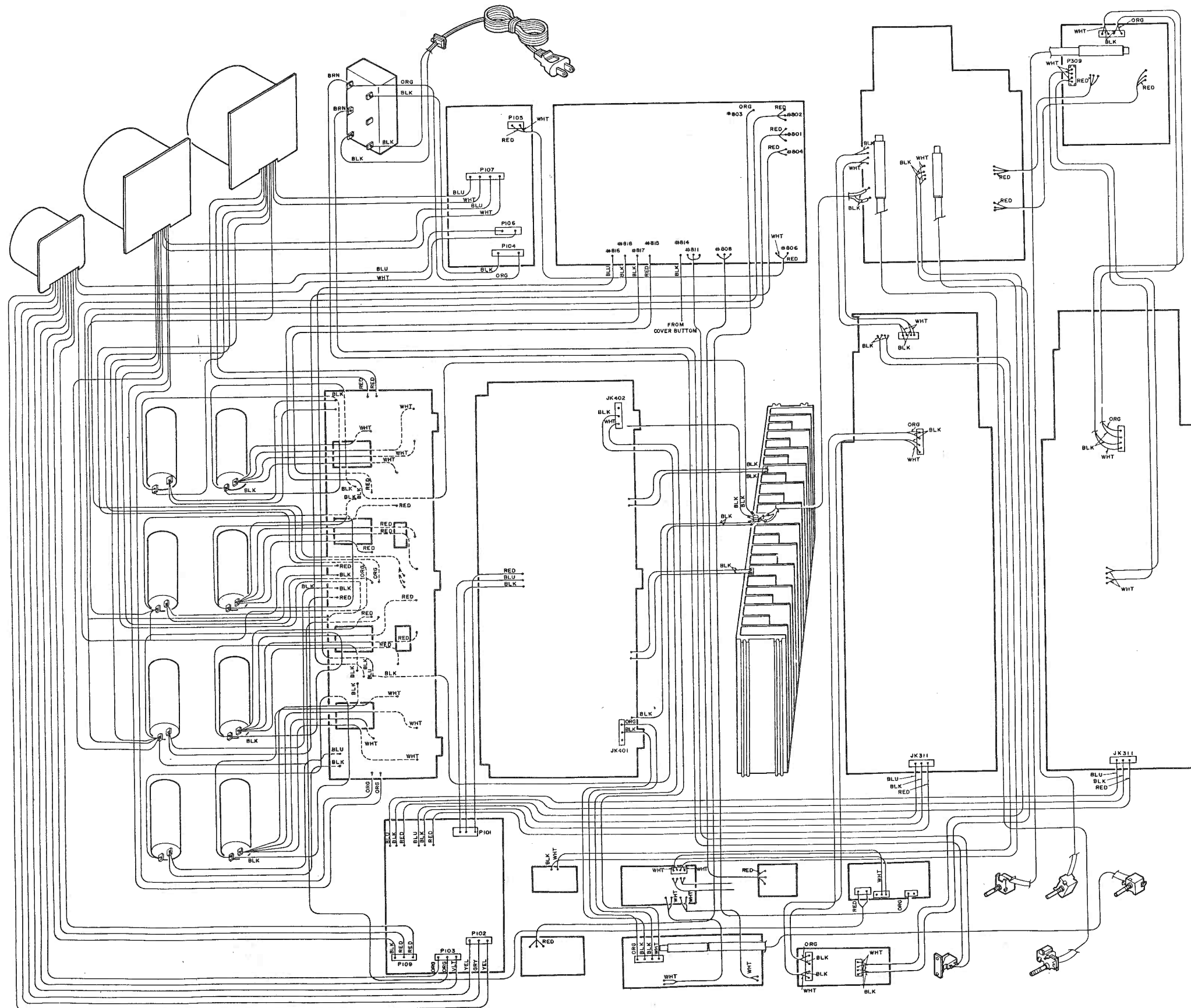
IC301, 302, 3301 (IC TL4558P)



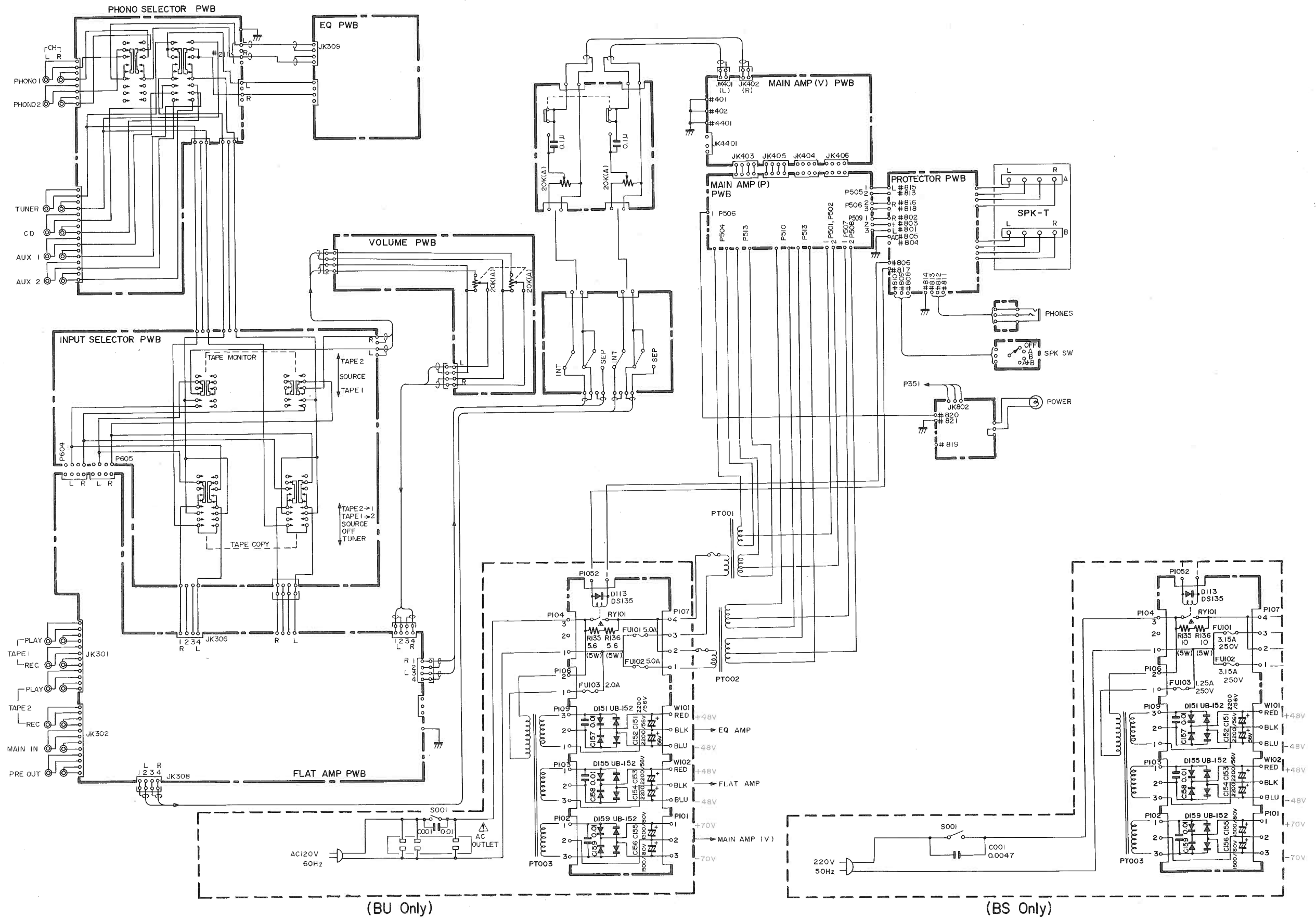
IC401, 402, 4401, 801, 802 (IC MPC1237H)



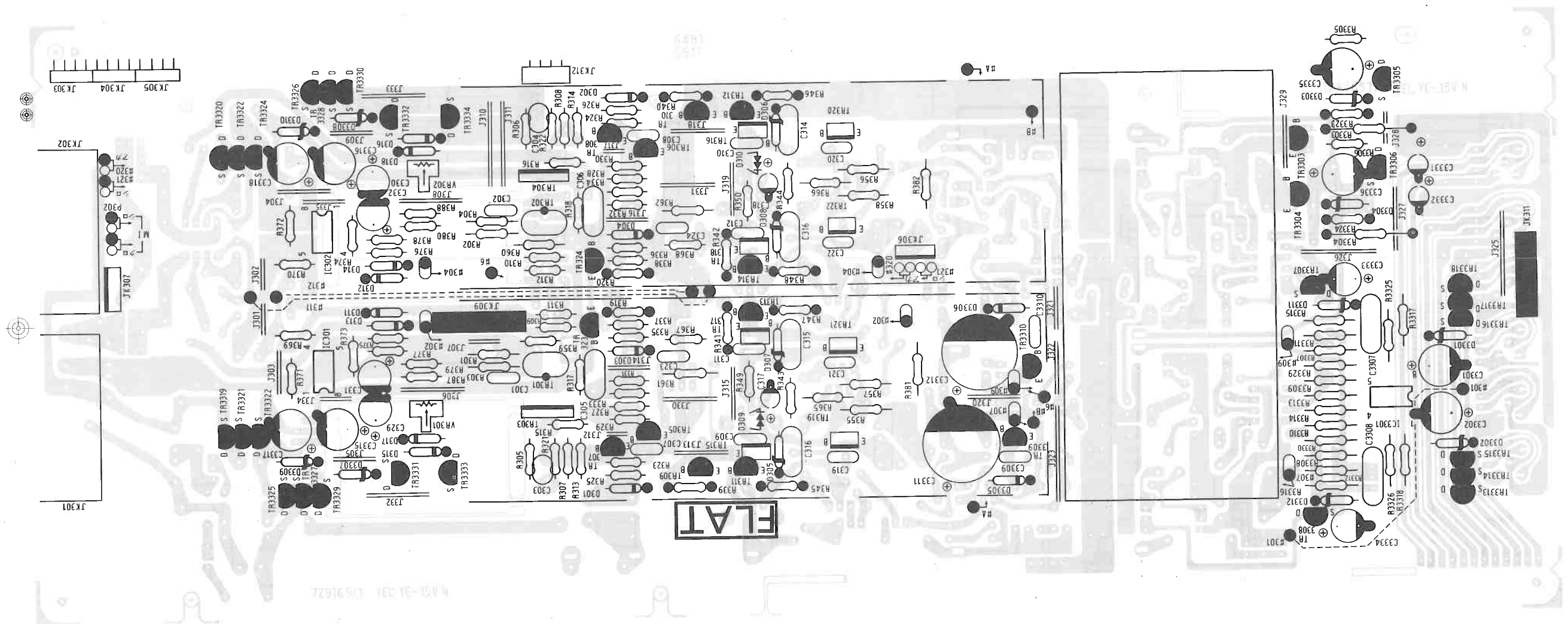
Wiring Diagram (BU Only)



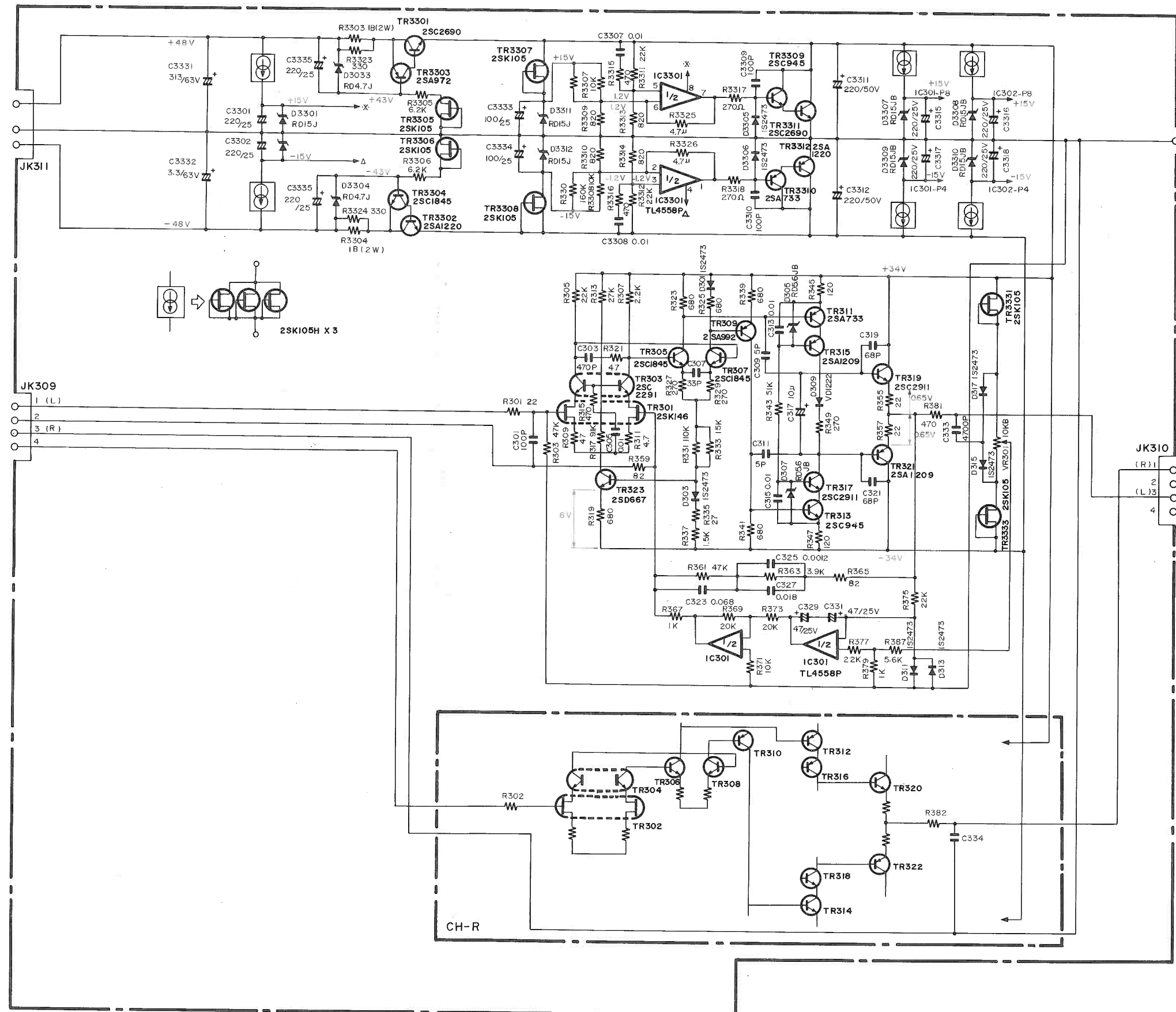
General Circuit Diagram



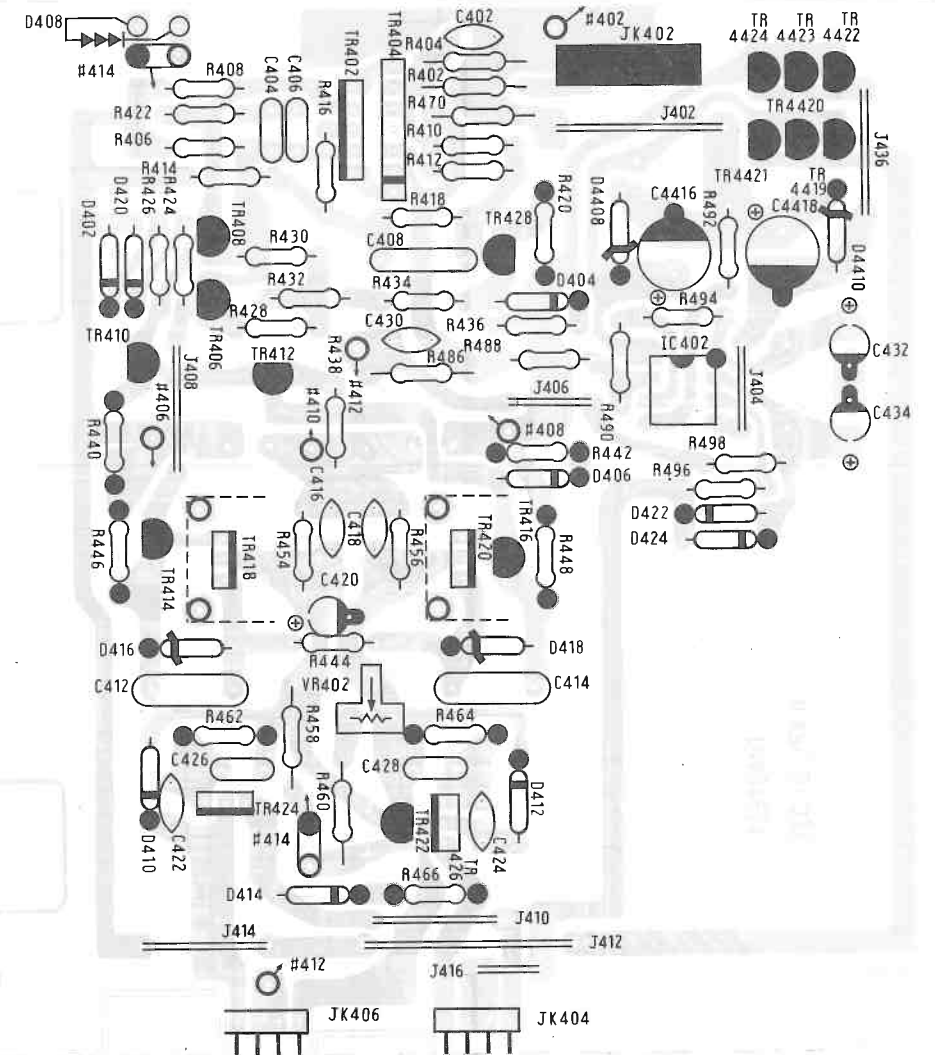
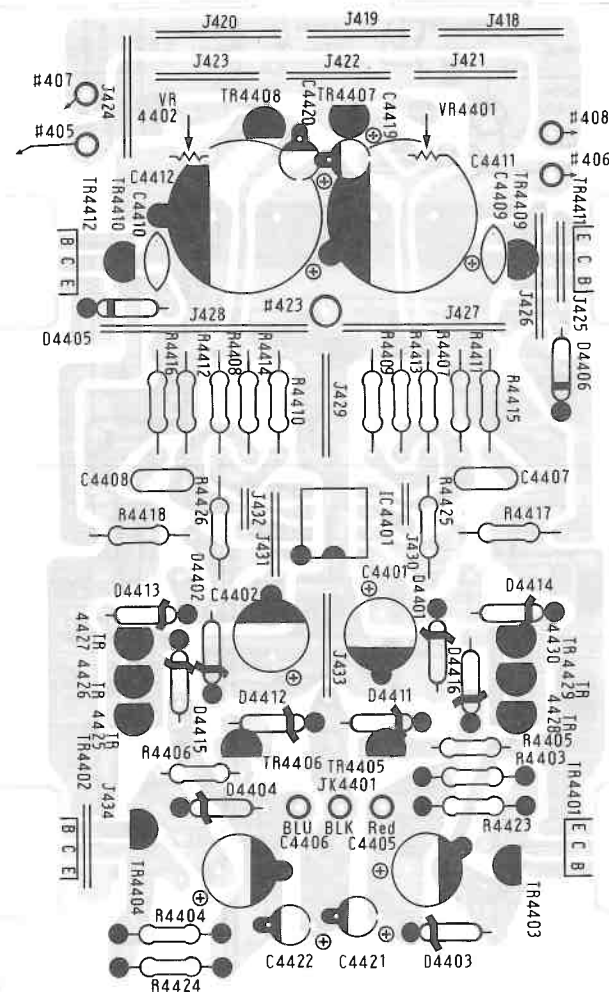
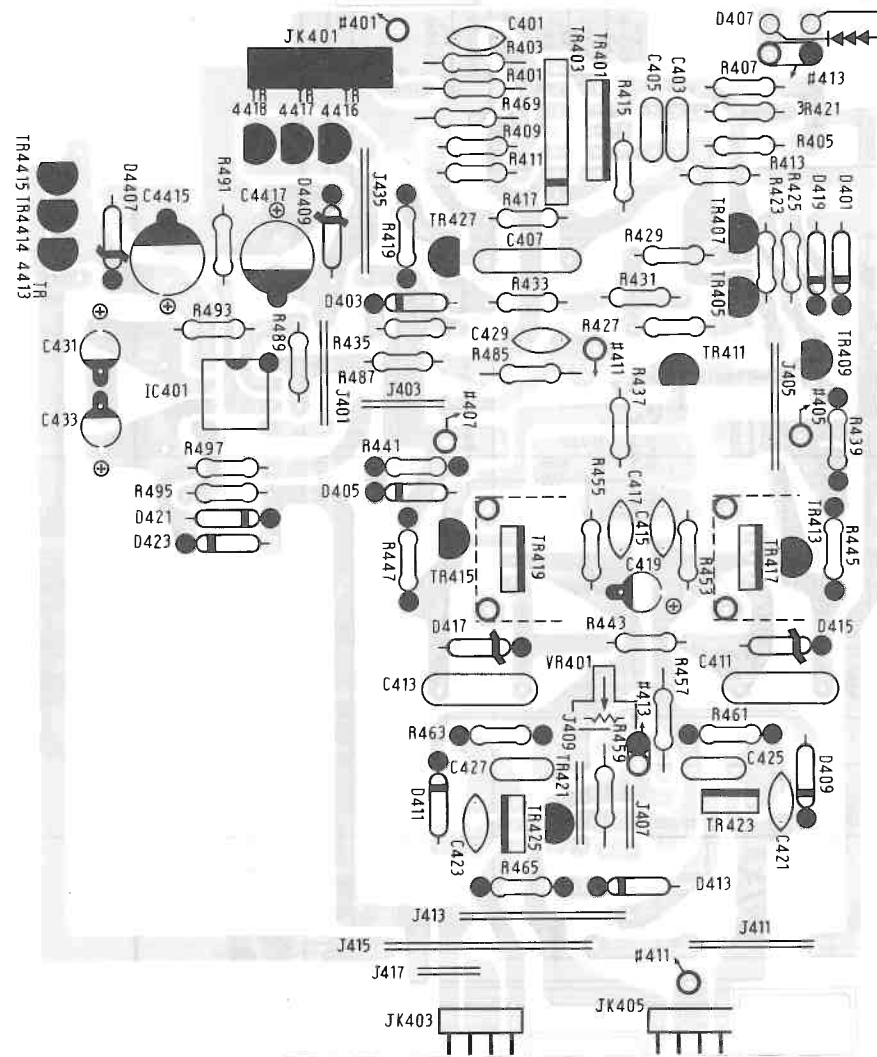
EQ Amp PWB Ass'y (Solder Side)



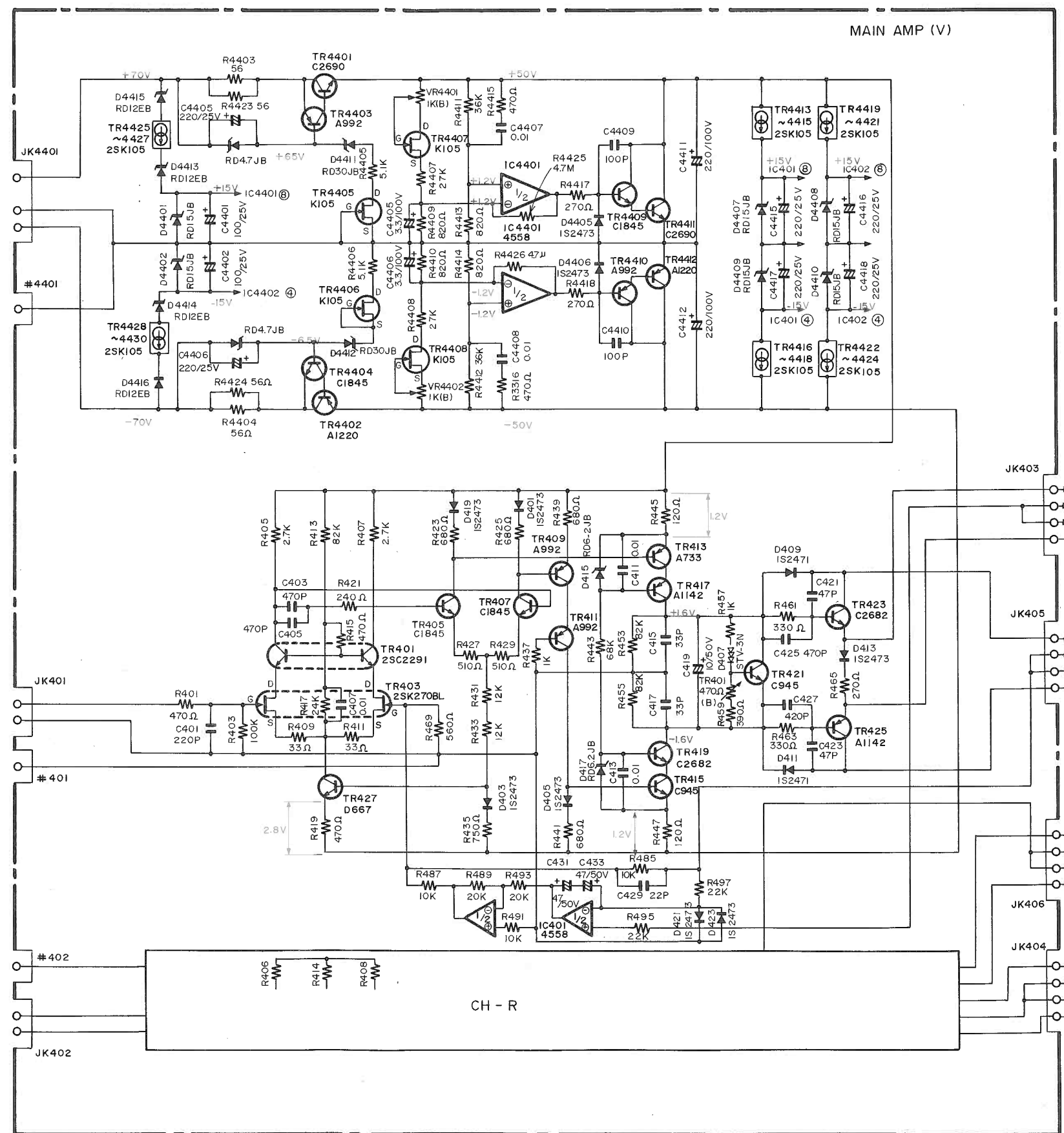
EQ Amp Circuit Diagram



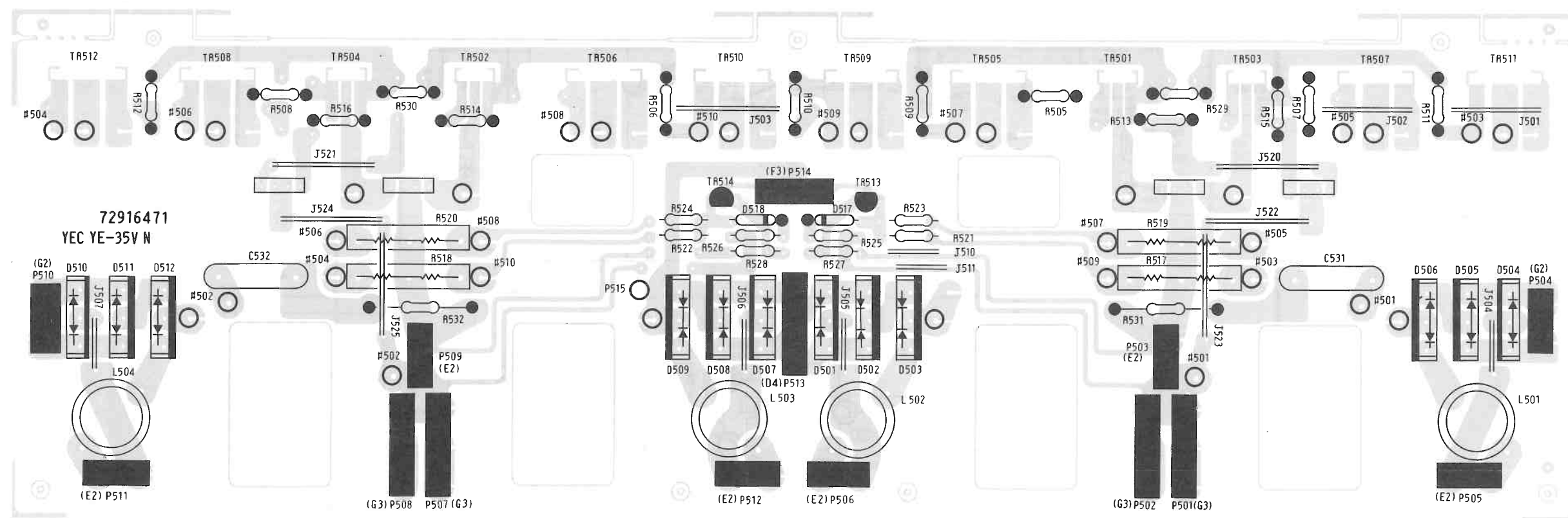
Main (V) Amp PWB Ass'y (Solder Side)



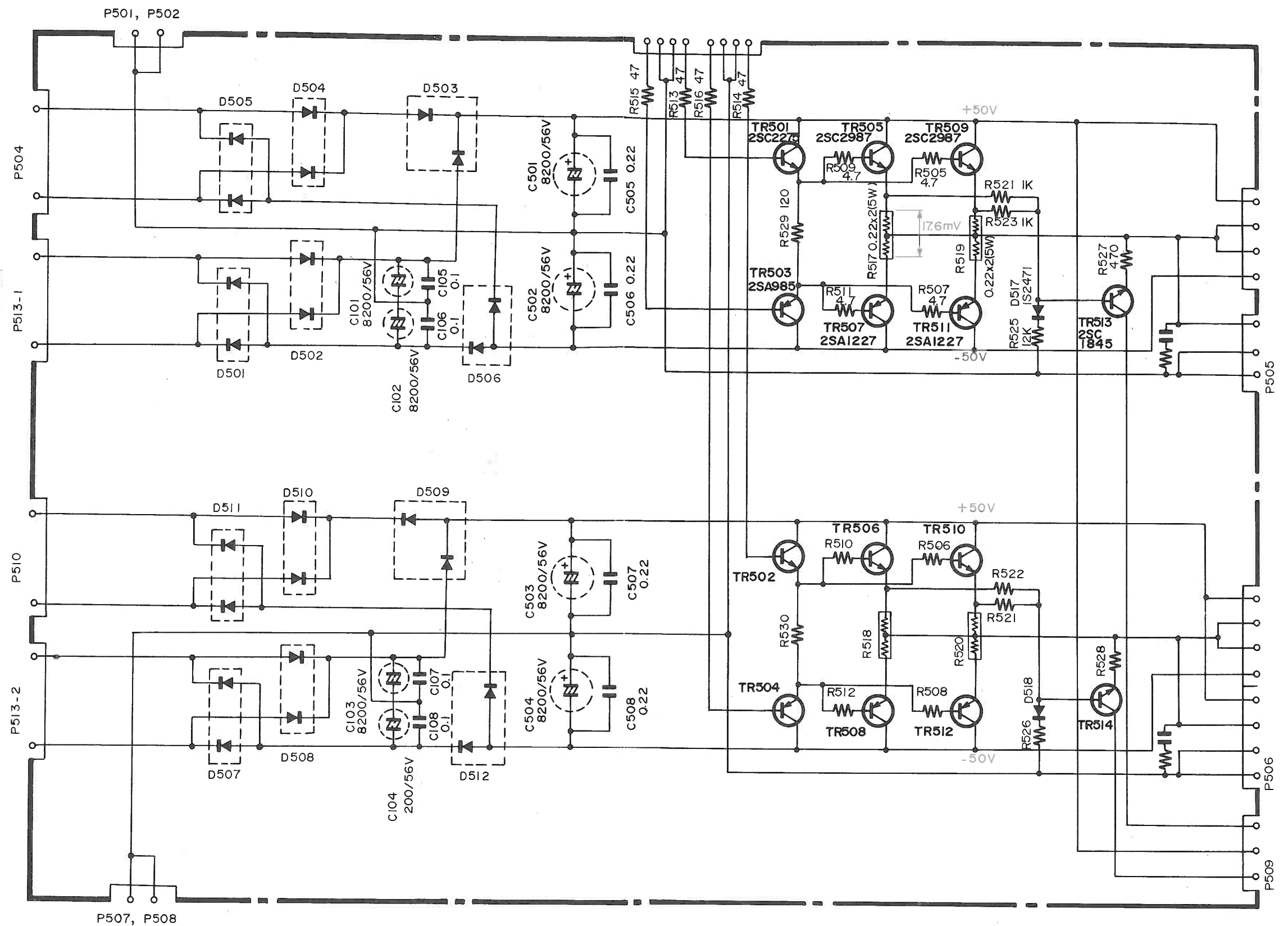
Main (V) Amp Circuit Diagram



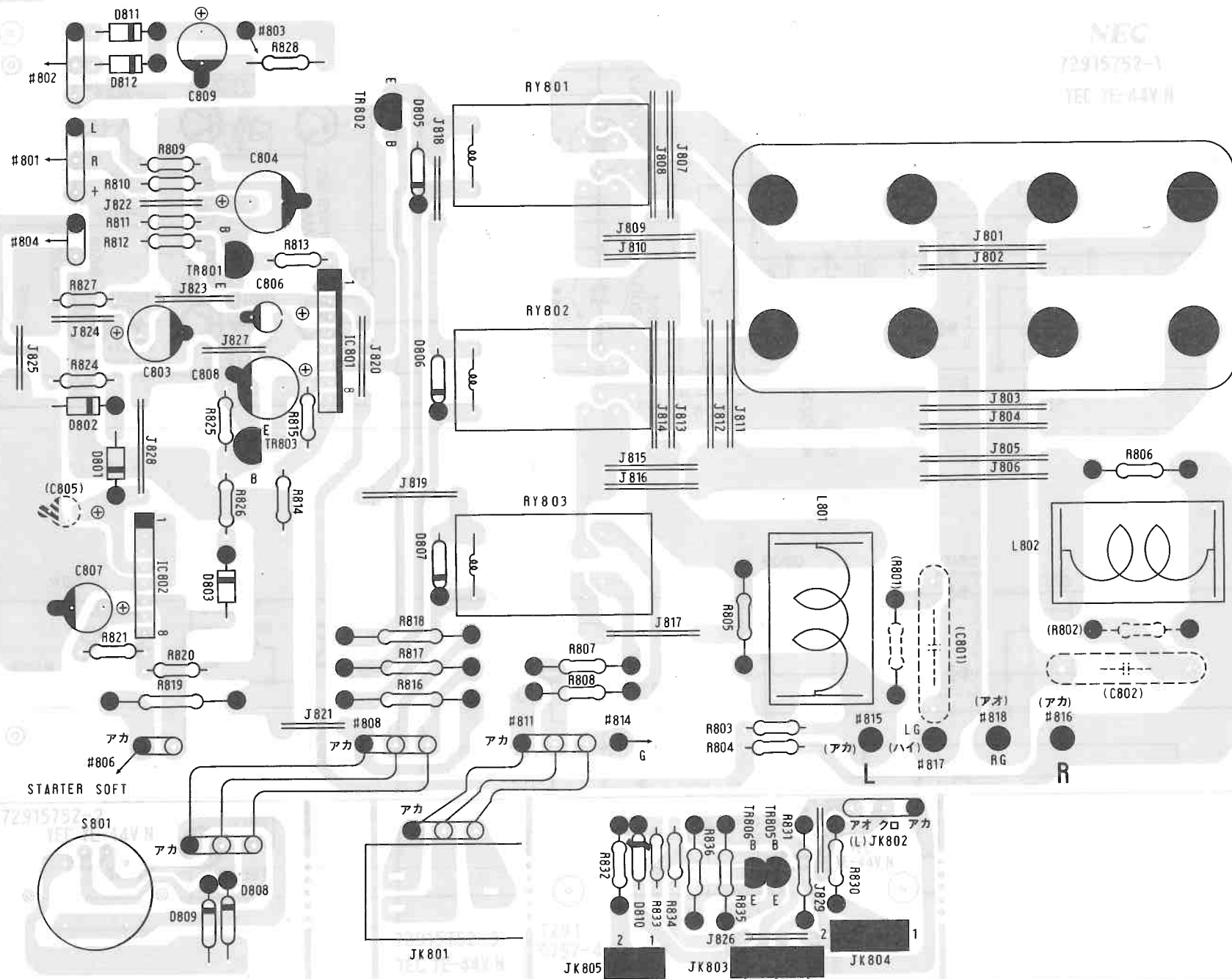
Main (P) Amp PWB Ass'y (Solder Side)



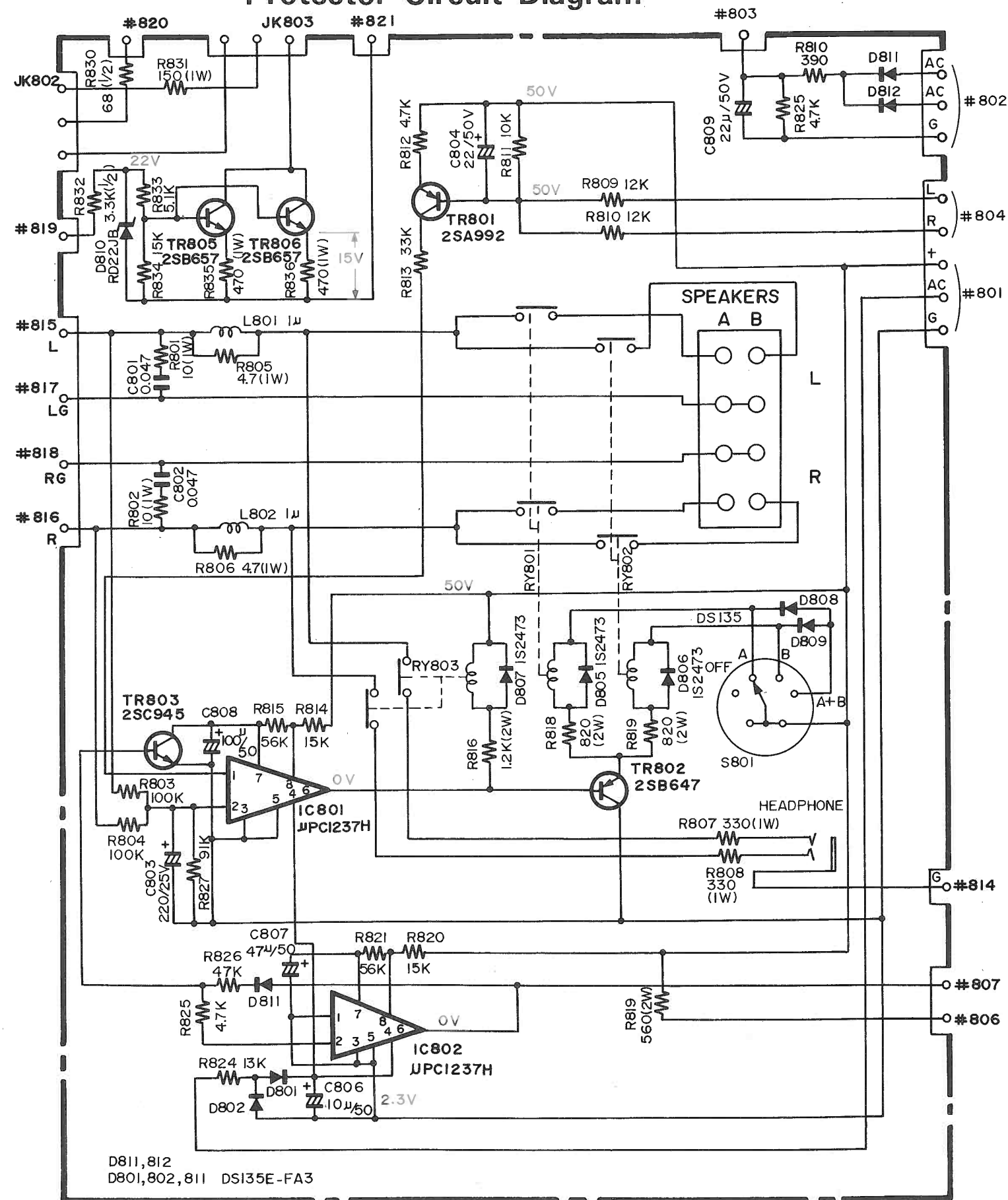
Main (P) Amp Circuit Diagram



Protector PWB Ass'y (Solder Side)



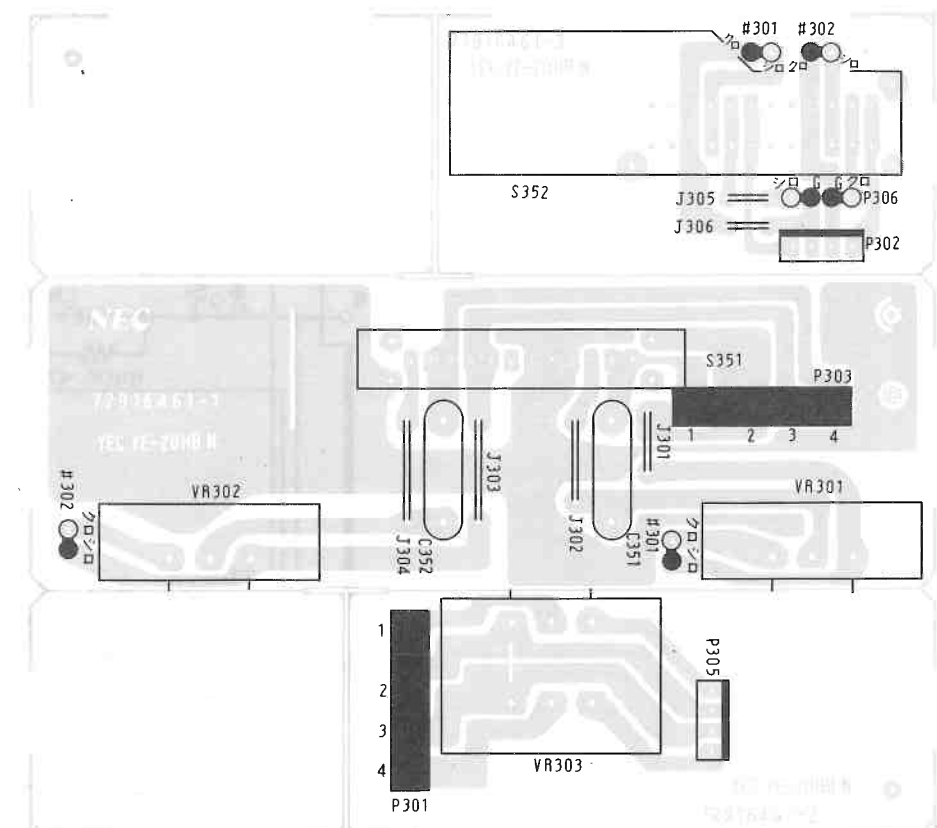
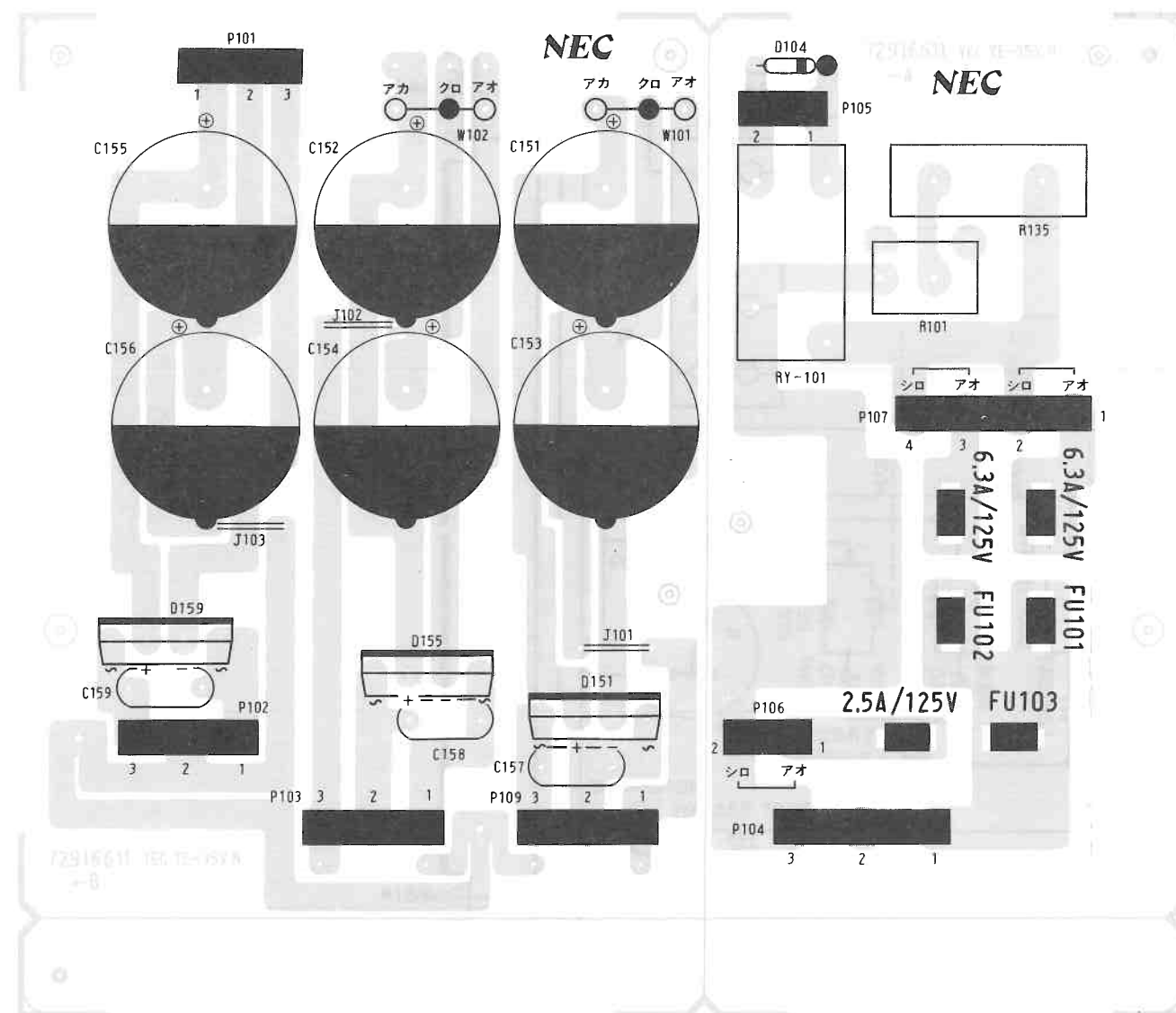
Protector Circuit Diagram



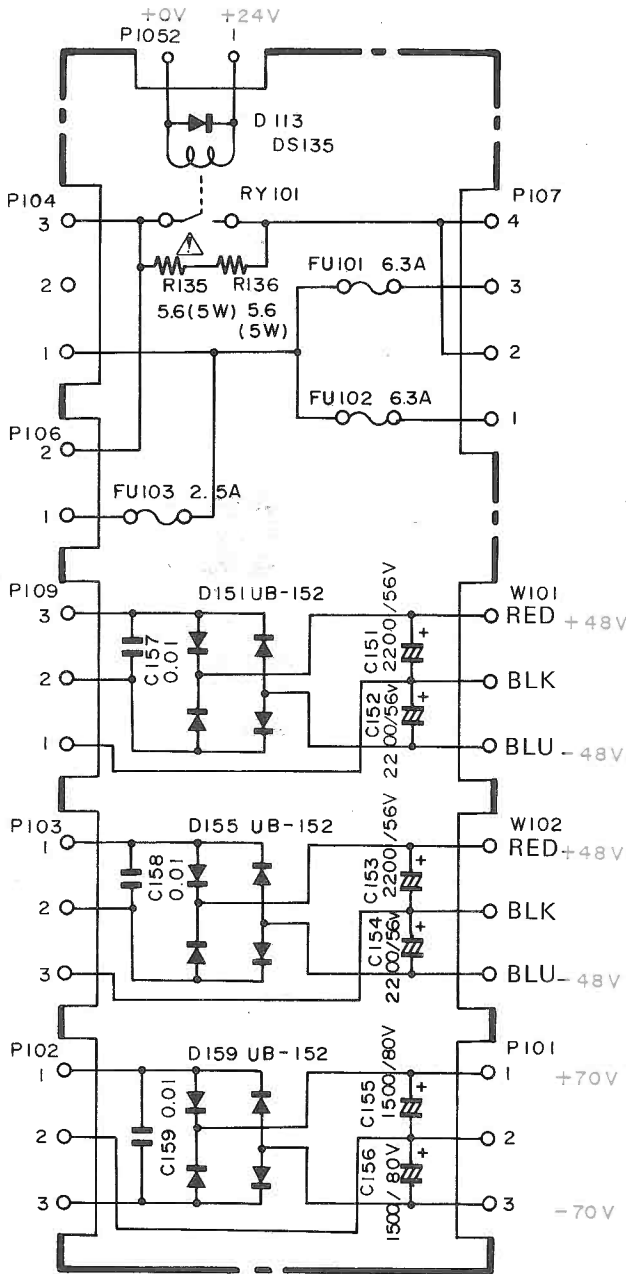
D811, 812
D801, 802, 811 DS135E-FA3

Reserve Power Supply PWB Ass'y (Solder Side)

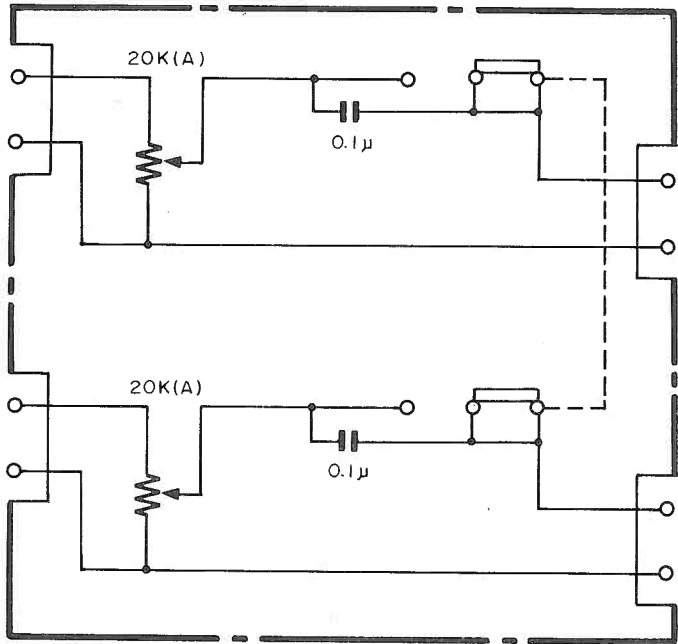
Gain Control PWB Ass'y (Solder Side)



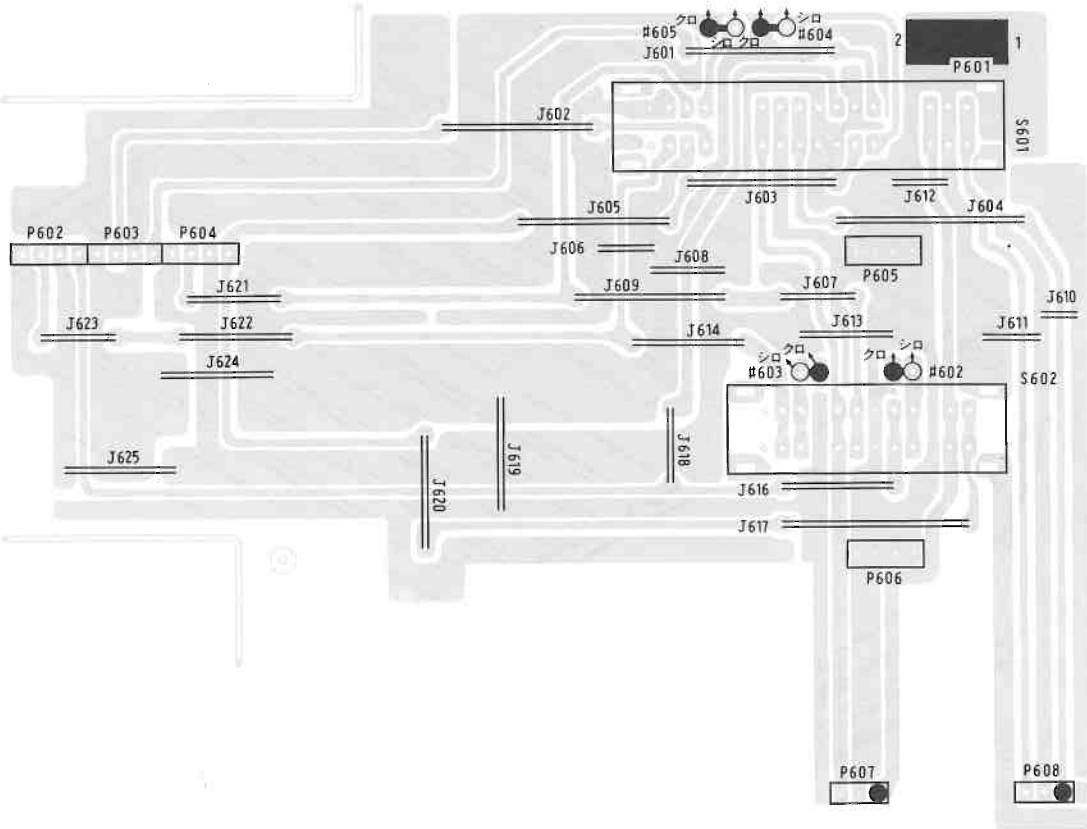
**Reserve Power Supply
Circuit Diagram**



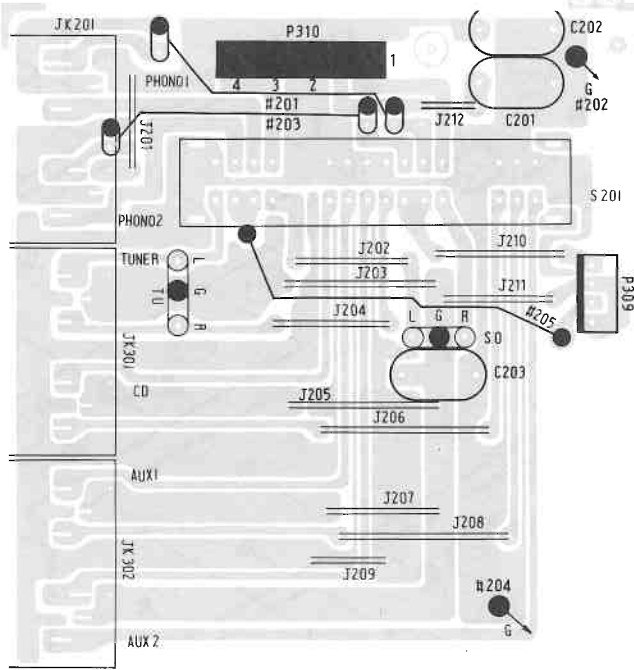
Gain Control Circuit Diagram



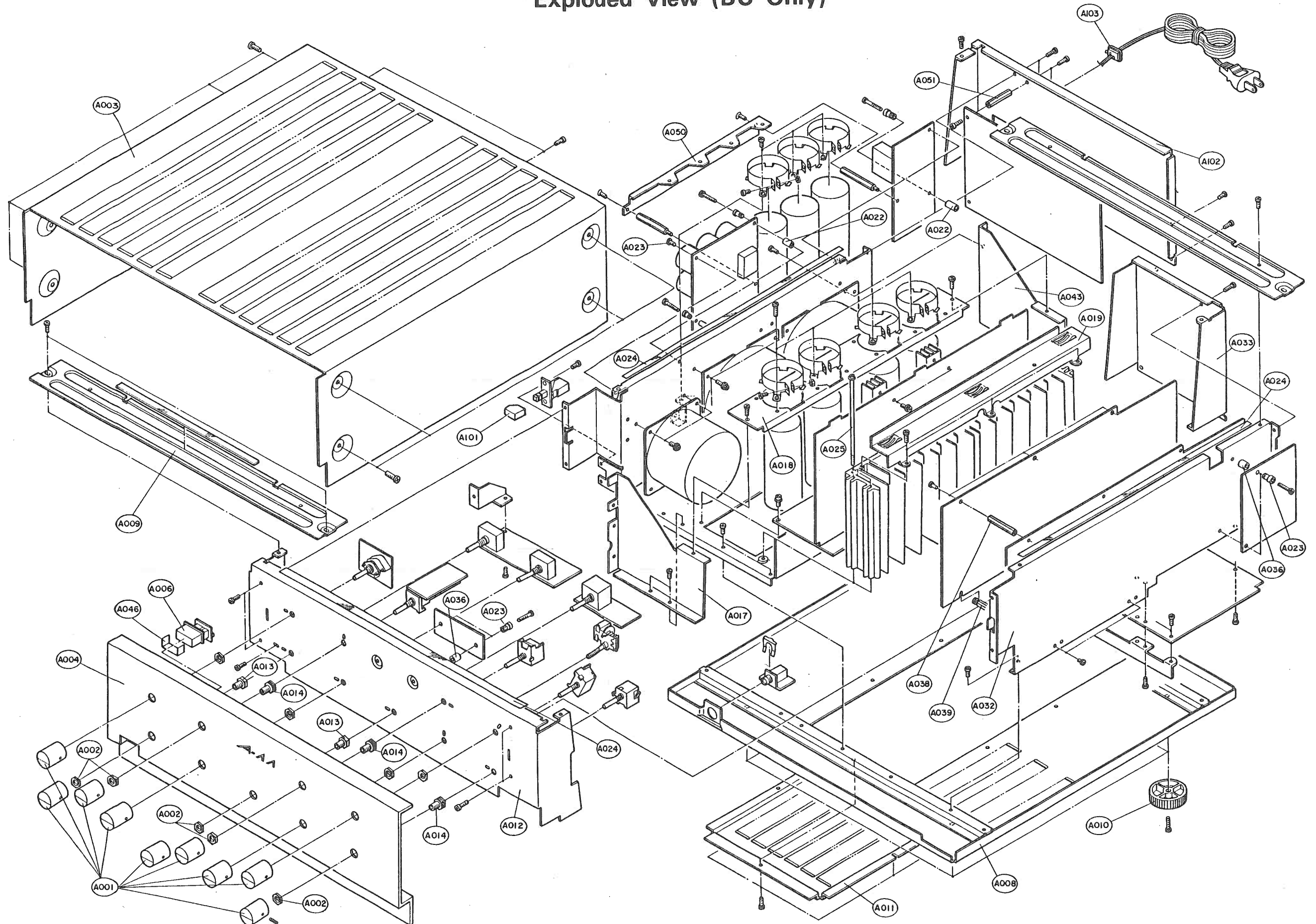
Selector & Wiring PWB Ass'y (Solder Side)



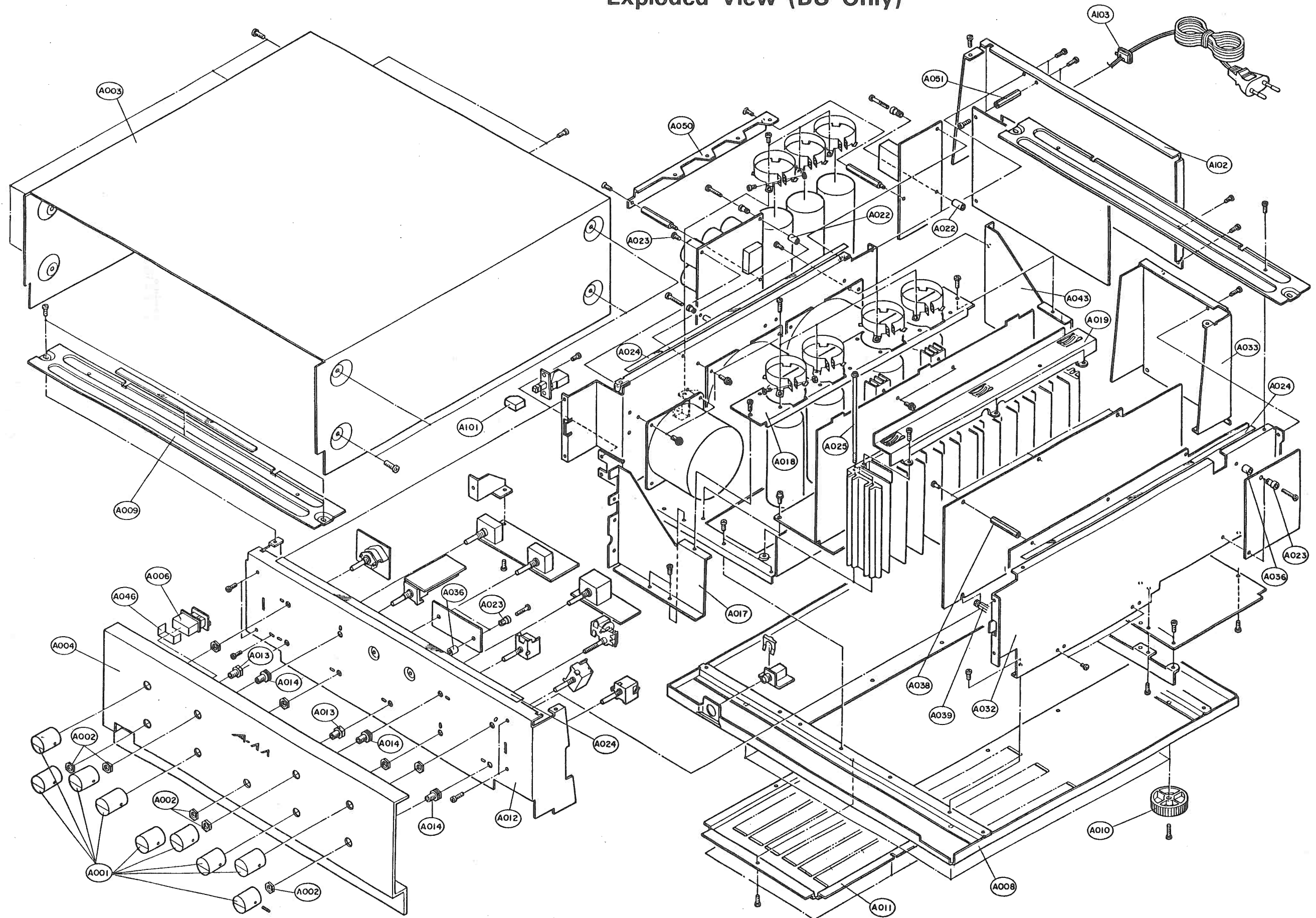
Phono Selector PWB Ass'y (Solder Side)



Exploded View (BU Only)



Exploded View (BS Only)



Replecement Parts List (BU Only)

Note: The components identified by  mark are critical for safety. Replace only with part number specified.

SYMBOL			PARTS NO	DESCRIPTION	QTY	REMARKS
*** ICS ***						
IC301	IC302	IC3301	37901079	IC TL4558P	6	
IC401	IC402	IC4401				
IC801	IC802		37903117	IC,UPC1237H	2	
*** TRANSISTORS ***						
TR311	TR312	TR3310	35003517	TR,2SA733/733A Q	5	
TR413	TR414					
TR313	TR314	TR3309	35047217	TR,2SC945Q	8	
TR415	TR416	TR421				
TR422	TR803					
TR309	TR310	TR3303	35901805	TR,2SA992E	10	
TR409	TR410	TR411				
TR412	TR4403	TR4410				
TR801						
TR503	TR504		35901917	TR,2SA985Q	2	
TR417	TR418	TR425	35904617	TR,2SA1142 Q	4	
TR426						
TR3302	TR3312	TR4402	35904717	TR,2SA1220 Q	4	
TR4412						
TR315	TR316	TR321	35905819	TR 2SA1209 S	4	
TR322						
TR507	TR508	TR511	35905917	TR 2SA1227 Q SUTORETO S34	4	
TR512						
TR802			35921903	TR,2SB647 C	1	
TR427	TR428		35944012	TR,2SC-1940 L	2	
TR305	TR306	TR307	35947405	TR 2SC1845E	11	
TR308	TR3304	TR405				
TR406	TR407	TR408				
TR4404	TR4409					
TR513	TR514		35947406	TR,2SC1845F	2	
TR419	TR420	TR423	35951917	TR,2SC2682 Q	4	
TR424						
TR3301	TR3311	TR4401	35952017	TR,2SC2690 Q	4	
TR4411						
TR501	TR502		35952317	TR,2SC2275 Q	2	
TR303	TR304	TR401	35952507	TR,2SC2291 G	4	
TR402						
TR317	TR318	TR319	35954019	TR 2SC2911 S	4	
TR320						
TR505	TR506	TR509	35954217	TR 2SC2987 Q SUTORETO S34	4	
TR510						
TR323	TR324	TR805	35962203	TR,2SD667C	4	
TR806						
TR3331	TR3332	TR3333	35991205	FET	4	
TR3334						
TR3305	TR3306	TR3307	35991208	FET,2SK105H	44	

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** TRANSISTORS ***

TR3308 TR3313 TR3314	35991208	FET, 2SK105H	44	
TR3315 TR3316 TR3317				
TR3318 TR3319 TR3320				
TR3321 TR3322 TR3323				
TR3324 TR3325 TR3326				
TR3327 TR3328 TR3329				
TR3330 TR4405 TR4406				
TR4407 TR4408 TR4413				
TR4414 TR4415 TR4416				
TR4417 TR4418 TR4419				
TR4420 TR4421 TR4422				
TR4423 TR4424 TR4425				
TR4426 TR4427 TR4428				
TR4429 TR4430				
TR403 TR404	35991931	TR 2SK 270 BL	2	
TR301 TR302	35992128	TR 2SK146 BL	2	

*** DIODES ***

D301 D302 D303	360K1009	DIODE, SI. 1S2473	42	
D304 D311 D312				
D313 D314 D315				
D316 D317 D318				
D3305 D3306 D3313				
D3314 D3315 D3316				
D401 D402 D403				
D404 D405 D406				
D413 D414 D419				
D420 D421 D422				
D423 D424 D4405				
D4406 D4417 D4418				
D4419 D4420 D805				
D806 D807				
D409 D410 D411	369K1031	DIODE 1S2471, AT	4	
D412				
D305 D306 D307	369K5153	DIODE, ZENER RD3.9EB2(A)	4	
D308				
D3303 D3304 D4403	369K5415	DIODE, ZENER RD4.7JB2, AT	4	
D4404				
D305 D306 D307	369K5421	DIODE, ZENER RD5.6JB2, AT	4	
D308				
D415 D416 D417	369K5424	DIODE, ZENER RD6.2JB2, AT	4	
D418				
D3307 D3308 D3309	369K5439	DIODE, ZENER RD10JB2, AT	6	
D3310 D3311 D3312				
D3301 D3302 D3307	369K5451	DIODE, ZENER RD15JB2, AT	14	
D3308 D3309 D3310				
D3311 D3312 D4401				
D4402 D4407 D4408				

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** DIODES ***

⚠	D4409	D4410	369K5451	DIODE,ZENER RD15JB2,AT	14	
	D810		369K5463	DIODE ZENER RD22JB2,AT	1	
	D407	D408	36901012	VARISTOR STV-3H (Y)	2	
	D517	D518	36901031	DIODO	2	
	D113	D801 D802	36902072	DIODE DS135E-FA3	8	
	D803	D808 D809				
	D811	D812				
	D151	D155 D159	36902102	RECTIFIER BLOCK UB-152	3	
	D502	D503 D504	36902103	DIODE CTU-32S	6	
	D508	D509 D510				
	D501	D505 D506	36902104	DIODE CTU-32R	6	
	D507	D511 D512				
	D4411	D4412	36905137	ZENER DIODE RD30JB	2	
	D4413	D4414 D4415	36905189	ZENER DIODE RD12E B2(A)	4	
	D4416					
	D3303	D3304	36905415	DIODE,ZENER RD4.7J B2	2	
	D309	D310 D425	38005013	VARISTER,VD1222	6	
	D426	D427 D428				

*** TRANSFORMERS ***

⚠	PT001	PT002	45006166	TRANS,POWER A-11 UL 1	2	
	PT003		45006167	TRANS,POWER A-11 UL 2	1	

*** VARIABLE RESISTORS ***

VR4401	VR4402	41950231	R,VARIABLE 1.0K	2	
VR301	VR302	41950235	R,VARIABLE 10K	2	
VR301	VR302	41950502	VOLUME 20KA	2	
VR303		41950503	VOLUME 2KEY 20KX2	1	
VR401	VR402	41952137	R,VARIABLE 470H	2	

*** SWITCHES ***

⚠	S801	65901066	SWITCH ROTARY ESRE114R25E	1	
	S001	65904464	SWITCH,PUSH,POWER	1	
	RY803	65910049	RELEY AP-2 DC24V	1	
	RY801	65910056	RELAY	2	
	RY101	65910057	RELAY	1	
	S352	65912042	SLIDE,ROTALY SWITCT ESR-M	1	
	S602	65913020	SWITCH REMOCON ESA26132	1	
	S351	65913021	SWITCH REMOCON ESD801003	1	
	S201	65913028	REMOCON SW	1	
	S601	65913030	SWITCH,REMO-CON,ZSA26131	1	
		65913529	SWITCH REMOCON ESA331300B	1	

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** SWITCHES ***

	65913537	REMOTE CONTROL SWITCH	1	
	65913539	REMOTE CONTROL SWITCH	1	
	65913543	REMOCON SW	1	

*** COILS & FILTERS ***

L801 L802	61911181	COIL 1UH	2	
-----------	----------	----------	---	--

*** PWB ASSYS ***

	87F55101	PHONO SEL PWB FULL ASSY	1	
	87F55201	EQ AMP PWB FULL ASSY	1	
	87F55501	MAIN AMP PWB(P) FULL ASSY	1	
	87F55601	SELECTOR PWB FULL ASSY	1	
	87F55701	GC PWB FULL ASSY	1	
	87F55901	PROTECTOR PWB FULL ASSY	1	
	87F83A01	RESERVE PWB FULL ASSY	1	
	87F83B01	FLAT AMP PWB FULL ASSY	1	
	87F83401	MAIN AMP PWB(V) FULL ASSY	1	

*** MISCELLANEOUS PARTS ***

△	FU103	66901090	FUSE 2A T 125V UL 20MM	1	
△	FU101 FU102	66901096	FUSE 5.0AT UL 20MM	2	
	JK303 JK304 JK305	70905313	TERMINAL, 4P L-TYPE	8	
	JK312 JK403 JK404				
	JK405 JK406				
	JK801	70905355	RECEPTACLE, TRIPLE	1	
		70905537	JACK HEADPHONE B11-5010	1	
	A035	71905077	2P TERMINAL	1	
	JK301 JK302	71905137	TERMINAL, GND	1	
	JK201	71905229	RCA JACK 6P	2	
		71905230	RCA JACK 4P GOLD	1	
		71905231	TERMINAL, SPEAKER 8P	1	
△	JK301 JK302	71905253	PCA TERMINAL BOARD L 4P	2	
		75516004	LINE CORD SPT-2 BLACK	1	

*** APPEARANCE PARTS ***

A010	18292611	CLAMPER, WIRE	1	
A003	18293671	FOOT UL	4	
	18358281	CABINET	1	
	18408212	SW ADAPTER	1	
A009	18528043	COVER	2	

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** APPEARANCE PARTS ***

A033	18530791	PANEL REAR S	1	
	18531771	PANEL REAR L	1	
A024	18609412	CUSHION SHEET	3	
	88F55631	FRONT PANEL S, ASSY	1	

*** KNOBS & PUSH BUTTONS ***

A001	18470211	KNOB ROTARY	9	
------	----------	-------------	---	--

*** PACKING MATERIALS ***

	18801032	BAG, POLYETHYLENE (1/12)	1	
	18811524	FILLER CARTON R	1	
	18811571	BAG, PROTECTION	1	
	18811653	FILLER CARTON L	1	
	18813011	CARTON BOX A-11E	1	
	19800672	BAG-B, POLYETHYLENE	1	
	78916261	INSTRUCTION BOOKLET	1	

*** RESISTORS ***

R805	R806	40351117	R, METAL 4.7H 5% 1W	2	
R831		40351153	R, METAL 150H 5% 1W	1	
R807	R808	40351161	R, METAL 330H 5% 1W	2	
R835	R836	40351165	R, METAL 470H 5% 1W	2	
R531	R532	40352125	R, METAL 10H 5% 2W	2	
R3303	R3304	40352131	R, METAL 18H 5% 2W	2	
R3303	R3304	40352133	R, METAL 22H 5% 2W	2	
R819		40352167	R, METAL 560H 5% 2W	1	
R817	R818	40352171	R, METAL 820H 5% 2W	2	
R816		40352175	R, METAL 1.2K 2% 2W	1	
R301	R302	R355	409A4633	R, CARBON 22H 5% 1/3W	6
R356	R357	R358			
R365	R366		409A4647	R, CARBON 82H 5% 1/3W	2
R301	R302		409A4649	R, CARBON 100H 5% 1/3W	2
R459	R460		409A4663	R, CARBON 390H 5% 1/3W	2
R3315	R3316	R381	409A4665	R, CARBON 470H 5% 1/3W	8
R382	R401	R402			
R4415	R4416				
R3309	R3310	R3313	409A4671	R, CARBON 820H 5% 1/3W	4
R3314					
R3307	R3308		409A4691	R, CARBON 5.6K 5% 1/3W	2
R3307	R3308		409A4697	R, CARBON 10K 5% 1/3W	2
R3311	R3312		409A4699	R, CARBON 12K 5% 1/3W	2

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** RESISTORS ***

R3311	R3312	409A4705	R CARBON 22K 5% 1/3W	2	
R4407	R4408	409A4707	R CARBON 27K 5% 1/3W	2	
R4411	R4412	409A4710	R CARBON 36K 5% 1/3W	2	
R303	R304	409A4713	R CARBON 47K 5% 1/3W	2	
R403	R404	409A4721	R CARBON 100K 5% 1/3W	2	
R3329	R3330	409A4723	R CARBON 120K 5% 1/3W	2	
R303	R304	409A4725	R CARBON 150K 5% 1/3W	2	
R3325	R3326	409A4741	R CARBON 680K 5% 1/3W	2	
R309	R310	409H2617	R CARBON 4.7H 5% 1/4W	4	
R312	R311				
R335	R336	409H2635	R CARBON 27H 5% 1/4W	2	
R409	R410	409H2637	R CARBON 33H 5% 1/4W	4	
R412	R411	409H2641	R CARBON 47H 5% 1/4W	6	
R309	R310	409H2658	R CARBON 240H 5% 1/4W	2	
R312	R321	409H2659	R CARBON 270H 5% 1/4W	6	
R421	R422	409H2663	R CARBON 390H 5% 1/4W	4	
R327	R328				
R330	R349	409H2665	R CARBON 470H 5% 1/4W	4	
R327	R329	409H2666	R CARBON 510H 5% 1/4W	4	
R330	R329	409H2669	R CARBON 680H 5% 1/4W	8	
R315	R316	409H2670	R CARBON 750H 5% 1/4W	2	
R416	R415	409H2673	R CARBON 1.0K 5% 1/4W	4	
R427	R428	409H2677	R CARBON 1.5K 5% 1/4W	2	
R430	R429	409H2681	R CARBON 2.2K 5% 1/4W	6	
R323	R324	409H2683	R CARBON 2.7K 5% 1/4W	4	
R326	R325	409H2689	R CARBON 4.7K 5% 1/4W	4	
R425	R423	409H2690	R CARBON 5.1K 5% 1/4W	3	
R425	R426	409H2691	R CARBON 5.6K 5% 1/4W	6	
R435	R436	409H2692	R CARBON 6.2K 5% 1/4W	2	
R379	R380	409H2696	R CARBON 9.1K 5% 1/4W	2	
R438	R437	409H2697	R CARBON 10K 5% 1/4W	7	
R337	R338	409H2698	R CARBON 11K 5% 1/4W	2	
R305	R306				
R308	R305				
R405	R406				
R408	R407				
R317	R318				
R825	R812				
R4405	R4406				
R333	R334				
R344	R387				
R3305	R3306				
R317	R318				
R371	R372				
R488	R491				
R811	R492				
R367	R368				

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** RESISTORS ***

R431	R432	R433	409H2699	R, CARBON 12K 5% 1/4W	6	
R434	R809	R810	409H2700	R, CARBON 13K 5% 1/4W	1	
R824			409H2701	R, CARBON 15K 5% 1/4W	7	
R313	R314	R333				
R334	R814	R820				
R834			409H2702	R, CARBON 16K 5% 1/4W	2	
R367	R368		409H2704	R, CARBON 20K 5% 1/4W	8	
R369	R370	R373				
R374	R489	R490				
R493	R494					
			409H2705	R, CARBON 22K 5% 1/4W	8	
R375	R376	R377				
R378	R495	R496				
R497	R498		409H2706	R, CARBON 24K 5% 1/4W	2	
R417	R418		409H2707	R, CARBON 27K 5% 1/4W	3	
R313	R314	R828	409H2709	R, CARBON 33K 5% 1/4W	1	
R813			409H2713	R, CARBON 47K 5% 1/4W	1	
R826						
			409H2714	R, CARBON 51K 5%	2	
R343	R344		409H2715	R, CARBON 56K 5% 1/4W	2	
R815	R821		409H2717	R, CARBON 68K 5% 1/4W	2	
R443	R444		409H2719	R, CARBON 82K 5% 1/4W	6	
R413	R414	R453				
R454	R455	R456	409H2720	R, CARBON 91K 5% 1/4W	1	
R827						
			409H2721	R, CARBON 100K 5% 1/4W	2	
R803	R804		409H2722	R, CARBON 110K 5% 1/4W	2	
R331	R332		409H2749	R, CARBON 1.5M 5% 1/4W	2	
R3325	R3326		409H2761	R, CARBON 4.7M 5% 1/4W	2	
R4425	R4426		409J9667	R, CARBON 560H 2% 1/3W	2	
R469	R470					
			409J9668	R, CARBON 620H 2% 1/3W	4	
R359	R360	R361				
R362			409J9687	R, CARBON 3.9K 2% 1/3W	2	
R363	R364		409J9698	R, CARBON 11K 2% 1/3W	2	
R485	R486		40912143	R, CARBON 56H 5% 1/2W	4	
R4403	R4404	R4423				
R4424			40912145	R, CARBON 68H 5% 1/2W	1	
R830						
			40912159	R, CARBON 270H 5% 1/2W	2	
R4417	R4418		40912163	R, CARBON 390H 5% 1/2W	1	
			40912171	R, CARBON 820H 5% 1/2W	4	
R4409	R4410	R4413				
R4414			40912185	R, CARBON 3.3K 5% 1/2W	1	
R832			40913117	R, CARBON 4.7H 5% 1/4W	8	
R505	R506	R507				
R508	R509	R510				
R511	R512					
			40913141	R, CARBON 47H 5% 1/4W	4	
R513	R514	R515				
R516						

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** RESISTORS ***

R345	R346	R347	40913151	R CARBON 120H 5% 1/4W	10	
R348	R445	R446				
R447	R448	R529				
R530						
R3323	R3324		40913153	R CARBON 150H 5% 1/4W	2	
R465	R466		40913159	R CARBON 270H 5% 1/4W	2	
R3323	R3324	R461	40913161	R CARBON 330H 5% 1/4W	6	
R462	R463	R464				
R419	R420		40913165	R CARBON 470H 5% 1/4W	2	
R319	R320	R339	40913169	R CARBON 680H 5% 1/4W	10	
R340	R341	R342				
R439	R440	R441				
R442						
R3317	R3318		40914659	3 CARBON 270H 5% 1/3W	2	
R457	R458		40914673	R CARBON 1.0K 5% 1/3W	2	
R135			40920063	ERF5ZX K5R6H	1	
R136			40920064	ERUSR K5R6H	1	
R517	R518	R519	40970010	R 0.22+0.22H 5W/K	4	
R520						
R321	R322		40982150	R CARBON 110H 5% 1/4W	2	
R349	R350		40982151	R CARBON 120H 5% 1/4W	2	
R527	R528		40982165	R CARBON 470H 5% 1/4W	2	
R521	R522	R523	40982173	R CARBON 1.0K 5% 1/4W	4	
R524						
R525	R526		40982199	R CARBON 12K5% 1/4W	2	
R359	R360		40999647	R CARBON 82H 2% 1/3W	2	
R361	R362		40999713	R CARBON 47K 2% 1/3W	2	

*** CAPACITORS ***

C001			42910007	C CERAMIC 125V 0.01UF	1	
C309	C310	C311	42940022	C MICA 100V 5PF 0.5%	4	
C312						
C429	C430		42940035	C MICA 100V 22PF 5%	2	
C307	C308	C415	42940039	C MICA 100V 33PF 5%	6	
C416	C417	C418				
C323	C324		42940042	C MICA 100V 43PF 5%	2	
C421	C422	C423	42940043	C MICA 100V 47PF 5%	4	
C424						
C319	C320	C321	42940047	C MICA 100V 68PF 5%	4	
C322						
C301	C302	C3309	42940051	C MICA 100V 100PF 5%	6	
C3310	C4409	C4410				
C401	C402		42940059	C MICA 100V 220PF 5%	2	
C325	C326		42976220	C FILM 100V 1200PF	2	
C327	C328		42976248	C FILM 100V 0.018UF	2	

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** CAPACITORS ***

C323	C324		4297G262	C,FILM 100V 0.068UF	2	
C4413	C4414		42975046	C,FILM 100V 1UF	2	
C531	C532		42975047	C,FILM 250V 0.047UF	2	
C157	C158	C159	42975048	C,FILM 250V 0.01UF	7	
C509	C510	C511				
C512						
C201	C202	C203	42975049	C,FILM 160V 0.01UF	17	
C305	C306	C313				
C314	C315	C316				
C407	C408	C411				
C412	C413	C414				
C450	C451					
C351	C352		42975056	C,FILM 100V 0.1UF	2	
C105	C106	C107	42975063	C,FILM 100V 0.1UF	6	
C108	C3313	C3314				
C505	C506	C507	42975064	C,FILM 100V 0.22UF	4	
C508						
C3307	C3308		42977153	C,FILM 100V 2200PF 5%	2	
C3307	C3308		42977167	C,FILM 100V 8200PF 5%	2	
C4407	C4408		42977169	C,FILM 100V 0.01UF	2	
C333	C334		42977404	C,FILM 10V 4700PF	2	
C303	C304	C403	42978111	C,FILM 125V 470PF (C-NL)	10	
C404	C405	C406				
C425	C426	C427				
C428						
C303	C304		42978121	C,FILM 125V 1200PF (C-NL)	2	
C3311	C3312		439A0008	C,ELEC 50V 220UF (AUDIO)	2	
C317	C318	C3319	439A0010	C,ELEC 50V 10UF (AUDIO)	6	
C3320	C419	C420				
C3301	C3302	C3315	439A0011	C,ELEC 25V 220UF AUDIO	16	
C3316	C3317	C3318				
C3335	C3336	C4401				
C4402	C4405	C4406				
C4415	C4416	C4417				
C4418						
C3333	C3334		439A0013	C,ELEC 25V 100UF (AUDIO)	2	
C329	C330	C331	439A0014	C,ELEC 25V 47UF (AUDIO)	8	
C332	C431	C432				
C433	C434					
C4419	C4420		439A0015	C,ELEC 100V 3.3UF (AUDIO)	2	
C4411	C4412		439A0016	C,ELEC 50V 100UF (AUDIO)	2	
C4421	C4422		43910046	C,ELEC 160V 1UF	2	
C155	C156		43910117	C,ELEC 80V 1500UF	2	
C501	C502	C503	43910139	C,ELEC 50V 2200UF (A)	4	
C504						
C151	C152	C153	43910141	C,ELEC 56V 2200UF	4	
C154						

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** CAPACITORS ***

C101	C102	C103	43910144	C,ELEC	4	
C104						
C3315	C3316	C3317	43993029	C,ELEC 16V 220UF	4	
C3318						
C329	C330	C331	43993038	C,ELEC 25V 22UF	4	
C332						
C807			43993040	C,ELEC 25V 47UF	1	
C808			43993041	C,ELEC 25V 100UF	1	
C803			43993042	C,ELEC 25V 220UF	1	
C806			43993064	C,ELEC 50V 10UF	1	
C804			43993065	C,ELEC 50V 22UF	1	
C3331	C3332		43993076	C,ELEC 63V 3.3UF	2	
C809			43993079	C,ELEC 63V 22UF	1	

Replecement Parts List (BS Only)

Note: The components identified by  mark are critical for safety. Replace only with part number specified.

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** ICS ***

IC301	IC302	IC3301	37901079	IC TL4558P	6	
IC401	IC402	IC4401				
IC801	IC802		37903117	IC,UPC1237H	2	

*** TRANSISTORS ***

TR311	TR312	TR3310	35003517	TR,2SA733/733A Q	5	
TR413	TR414					
TR313	TR314	TR3309	35047217	TR,2SC945Q	8	
TR415	TR416	TR421				
TR422	TR803					
TR309	TR310	TR3303	35901805	TR,2SA992E	10	
TR409	TR410	TR411				
TR412	TR4403	TR4410				
TR801						
TR503	TR504		35901917	TR,2SA985Q	2	
TR417	TR418	TR425	35904617	TR,2SA1142 Q	4	
TR426						
TR3302	TR3312	TR4402	35904717	TR,2SA1220 Q	4	
TR4412						
TR315	TR316	TR321	35905819	TR 2SA1209 S	4	
TR322						
TR507	TR508	TR511	35905917	TR 2SA1227 Q SUTORETO S34	4	
TR512						
TR802			35921903	TR,2SB647 C	1	
TR427	TR428		35944012	TR,2SC-1940 L	2	
TR305	TR306	TR307	35947405	TR 2SC1845E	11	
TR308	TR3304	TR405				
TR406	TR407	TR408				
TR4404	TR4409					
TR513	TR514		35947406	TR,2SC1845F	2	
TR419	TR420	TR423	35951917	TR,2SC2682 Q	4	
TR424						
TR3301	TR3311	TR4401	35952017	TR,2SC2690 Q	4	
TR4411						
TR501	TR502		35952317	TR,2SC2275 Q	2	
TR303	TR304	TR401	35952507	TR,2SC2291 G	4	
TR402						
TR317	TR318	TR319	35954019	TR 2SC2911 S	4	
TR320						
TR505	TR506	TR509	35954217	TR 2SC2987 Q SUTORETO S34	4	
TR510						
TR323	TR324	TR805	35962203	TR,2SD667C	4	
TR806						
TR3331	TR3332	TR3333	35991205	FET	4	
TR3334						
TR3305	TR3306	TR3307	35991208	FET,2SK105H	44	

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** APPEARANCE PARTS ***

A024	18531851	PANEL, REAR L (BS)	1	
	18609411	CUSHION SHEET	3	
	88F55631	FRONT PANEL S, ASSY	1	

*** KNOBS & PUSH BUTTONS ***

A001	18470211	KNOB ROTARY	9	
------	----------	-------------	---	--

*** PACKING MATERIALS ***

	18801032	BAG, POLYETHYLENE (1/12)	1	
	18811524	FILLER CARTON R	1	
	18811571	BAG, PROTECTION	1	
	18811653	FILLER CARTON L	1	
	18813011	CARTON BOX A-11E	1	
	19800672	BAG-B, POLYETHYLENE	1	
	78916341	INSTRUCTION BOOKLET	1	

*** RESISTORS ***

R805	R806	40351117	R, METAL 4.7H 5% 1W	2	
R831		40351153	R, METAL 150H 5% 1W	1	
R807	R808	40351161	R, METAL 330H 5% 1W	2	
R835	R836	40351165	R, METAL 470H 5% 1W	2	
R531	R532	40352125	R, METAL 10H 5% 2W	2	
R3303	R3304	40352131	R, METAL 18H 5% 2W	2	
R3303	R3304	40352133	R, METAL 22H 5% 2W	2	
R819		40352167	R, METAL 560H 5% 2W	1	
R817	R818	40352171	R, METAL 820H 5% 2W	2	
R816		40352175	R, METAL 1.2K 2% 2W	1	
R301	R302	R355	409A4633	R, CARBON 22H 5% 1/3W	6
R356	R357	R358			
R365	R366	409A4647	R, CARBON 82H 5% 1/3W	2	
R301	R302	409A4649	R, CARBON 100H 5% 1/3W	2	
R459	R460	409A4663	R, CARBON 390H 5% 1/3W	2	
R3315	R3316	R381	409A4665	R, CARBON 470H 5% 1/3W	8
R382	R401	R402			
R4415	R4416				
R3309	R3310	R3313	409A4671	R, CARBON 820H 5% 1/3W	4
R3314					
R3307	R3308	409A4691	R, CARBON 5.6K 5% 1/3W	2	
R3307	R3308	409A4697	R, CARBON 10K 5% 1/3W	2	
R3311	R3312	409A4699	R, CARBON 12K 5% 1/3W	2	
R3311	R3312	409A4705	R, CARBON 22K 5% 1/3W	2	

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** SWITCHES ***

	65913537	REMOTE CONTROL SWITCH	1	
	65913539	REMOTE CONTROL SWITCH	1	
	65913543	REMOCON SW	1	

*** COILS & FILTERS ***

L801	L802	61911181	COIL 1UH	2	
------	------	----------	----------	---	--

*** PWB ASSYS ***

	87F55101	PHONO SEL PWB FULL ASSY	1	
	87F55201	EQ AMP PWB FULL ASSY	1	
	87F55501	MAIN AMP PWB(P) FULL ASSY	1	
	87F55601	SELECTOR PWB FULL ASSY	1	
	87F55701	GC PWB FULL ASSY	1	
	87F55901	PROTECTOR PWB FULL ASSY	1	
	87F83B01	FLAT AMP PWB FULL ASSY	1	
	87F83401	MAIN AMP PWB(V) FULL ASSY	1	
	87F87A01	RESERVE PWB FULL ASSY	1	

*** MISCELLANEOUS PARTS ***

FU103		66901054	FUSE 1.25A T	1	
FU101	FU102	66901059	FUSE 3.15AT	2	
JK303	JK304	JK305	70905313	TERMINAL, 4P L-TYPE	8
JK312	JK403	JK404			
JK405	JK406				
JK801		70905537	JACK HEADPHONE B11-5010	1	
		71905077	2P TERMINAL	1	
A035		71905137	TERMINAL, GND	1	
JK301	JK302	71905229	RCA JACK 6P	2	
JK201		71905230	RCA JACK 4P GOLD	1	
		71905231	TERMINAL, SPEAKER 8P	1	
JK301	JK302	71905253	PCA TERMINAL BOARD L 4P	2	
		79759093	LINE CORD SEMKO	1	

*** APPEARANCE PARTS ***

A010		18292501	CLAMPER WIRE	1	
A003		18293671	FOOT UL	4	
		18358281	CABINET	1	
A009		18408212	SW ADAPTER	1	
		18528043	COVER	2	
A033		18530791	PANEL REAR S	1	

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** RESISTORS ***

R4407	R4408		409A4707	R, CARBON 27K 5% 1/3W	2
R4411	R4412		409A4710	R, CARBON 36K 5% 1/3W	2
R303	R304		409A4713	R, CARBON 47K 5% 1/3W	2
R403	R404		409A4721	R, CARBON 100K 5% 1/3W	2
R3329	R3330		409A4723	R, CARBON 120K 5% 1/3W	2
R303	R304		409A4725	R, CARBON 150K 5% 1/3W	2
R3325	R3326		409A4741	R, CARBON 680K 5% 1/3W	2
R309	R310	R311	409H2617	R, CARBON 4.7H 5% 1/4W	4
R312					
R335	R336		409H2635	R, CARBON 27H 5% 1/4W	2
R409	R410	R411	409H2637	R, CARBON 33H 5% 1/4W	4
R412					
R309	R310	R311	409H2641	R, CARBON 47H 5% 1/4W	6
R312	R321	R322			
R421	R422		409H2658	R, CARBON 240H 5% 1/4W	2
R327	R328	R329	409H2659	R, CARBON 270H 5% 1/4W	6
R330	R349	R350			
R327	R328	R329	409H2663	R, CARBON 390H 5% 1/4W	4
R330					
R315	R316	R415	409H2665	R, CARBON 470H 5% 1/4W	4
R416					
R427	R428	R429	409H2666	R, CARBON 510H 5% 1/4W	4
R430					
R323	R324	R325	409H2669	R, CARBON 680H 5% 1/4W	8
R326	R423	R424			
R425	R426				
R435	R436		409H2670	R, CARBON 750H 5% 1/4W	2
R379	R380	R437	409H2673	R, CARBON 1.0K 5% 1/4W	4
R438					
R337	R338		409H2677	R, CARBON 1.5K 5% 1/4W	2
R305	R306	R307	409H2681	R, CARBON 2.2K 5% 1/4W	6
R308	R3305	R3306			
R405	R406	R407	409H2683	R, CARBON 2.7K 5% 1/4W	4
R408					
R317	R318	R812	409H2689	R, CARBON 4.7K 5% 1/4W	4
R825					
R4405	R4406	R833	409H2690	R, CARBON 5.1K 5% 1/4W	3
R333	R334	R343	409H2691	R, CARBON 5.6K 5% 1/4W	6
R344	R387	R388			
R3305	R3306		409H2692	R, CARBON 6.2K 5% 1/4W	2
R317	R318		409H2696	R, CARBON 9.1K 5% 1/4W	2
R371	R372	R487	409H2697	R, CARBON 10K 5% 1/4W	7
R488	R491	R492			
R811					
R367	R368		409H2698	R, CARBON 11K 5% 1/4W	2
R431	R432	R433	409H2699	R, CARBON 12K 5% 1/4W	6

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** RESISTORS ***

R434	R809	R810	409H2699	R CARBON 12K 5% 1/4W	6	
R824			409H2700	R CARBON 13K 5% 1/4W	1	
R313	R314	R333	409H2701	R CARBON 15K 5% 1/4W	7	
R334	R814	R820				
R834						
R367	R368		409H2702	R CARBON 16K 5% 1/4W	2	
R369	R370	R373	409H2704	R CARBON 20K 5% 1/4W	8	
R374	R489	R490				
R493	R494					
R375	R376	R377	409H2705	R CARBON 22K 5% 1/4W	8	
R378	R495	R496				
R497	R498					
R417	R418		409H2706	R CARBON 24K 5% 1/4W	2	
R313	R314	R828	409H2707	R CARBON 27K 5% 1/4W	3	
R813			409H2709	R CARBON 33K 5% 1/4W	1	
R826			409H2713	R CARBON 47K 5% 1/4W	1	
R343	R344		409H2714	R CARBON 51K 5%	2	
R815	R821		409H2715	R CARBON 56K 5% 1/4W	2	
R443	R444		409H2717	R CARBON 68K 5% 1/4W	2	
R413	R414	R453	409H2719	R CARBON 82K 5% 1/4W	6	
R454	R455	R456				
R827			409H2720	R CARBON 91K 5% 1/4W	1	
R803	R804		409H2721	R CARBON 100K 5% 1/4W	2	
R331	R332		409H2722	R CARBON 110K 5% 1/4W	2	
R3325	R3326		409H2749	R CARBON 1.5M 5% 1/4W	2	
R4425	R4426		409H2761	R CARBON 4.7M 5% 1/4W	2	
R469	R470		409J9667	R CARBON 560H 2% 1/3W	2	
R359	R360	R361	409J9668	R CARBON 620H 2% 1/3W	4	
R362						
R363	R364		409J9687	R CARBON 3.9K 2% 1/3W	2	
R485	R486		409J9698	R CARBON 11K 2% 1/3W	2	
R4403	R4404	R4423	40912143	R CARBON 56H 5% 1/2W	4	
R4424						
R830			40912145	R CARBON 68H 5% 1/2W	1	
R4417	R4418		40912159	R CARBON 270H 5% 1/2W	2	
			40912163	R CARBON 390H 5% 1/2W	1	
R4409	R4410	R4413	40912171	R CARBON 820H 5% 1/2W	4	
R4414						
R832			40912185	R CARBON 3.3K 5% 1/2W	1	
R505	R506	R507	40913117	R CARBON 4.7H 5% 1/4W	8	
R508	R509	R510				
R511	R512					
R513	R514	R515	40913141	R CARBON 47H 5% 1/4W	4	
R516						
R345	R346	R347	40913151	R CARBON 120H 5% 1/4W	10	

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** RESISTORS ***

R348	R445	R446	40913151	R CARBON 120H 5% 1/4W	10	
R447	R448	R529				
R530						
R3323	R3324		40913153	R CARBON 150H 5% 1/4W	2	
R465	R466		40913159	R CARBON 270H 5% 1/4W	2	
R3323	R3324	R461	40913161	R CARBON 330H 5% 1/4W	6	
R462	R463	R464				
R419	R420		40913165	R CARBON 470H 5% 1/4W	2	
R319	R320	R339	40913169	R CARBON 680H 5% 1/4W	10	
R340	R341	R342				
R439	R440	R441				
R442						
R3317	R3318		40914659	3 CARBON 270H 5% 1/3W	2	
R457	R458		40914673	R CARBON 1.0K 5% 1/3W	2	
R135			40920065	ERF5ZX K10H	1	
R136			40920066	ERU5R K10H	1	
R517	R518	R519	40970010	R 0.22+0.22H 5W K	4	
R520						
R321	R322		40982150	R CARBON 110H 5% 1/4W	2	
R349	R350		40982151	R CARBON 120H 5% 1/4W	2	
R527	R528		40982165	R CARBON 470H 5% 1/4W	2	
R521	R522	R523	40982173	R CARBON 1.0K 5% 1/4W	4	
R524						
R525	R526		40982199	R CARBON 12K5% 1/4W	2	
R359	R360		40999647	R CARBON 82H 2% 1/3W	2	
R361	R362		40999713	R CARBON 47K 2% 1/3W	2	

*** CAPACITORS ***

C001			42910036	C CERAMIC 400V 4700	1	
C309	C310	C311	42940022	C MICA 100V 5PF 0.5%	4	
C312						
C429	C430		42940035	C MICA 100V 22PF 5%	2	
C307	C308	C415	42940039	C MICA 100V 33PF 5%	6	
C416	C417	C418				
C323	C324		42940042	C MICA 100V 43PF 5%	2	
C421	C422	C423	42940043	C MICA 100V 47PF 5%	4	
C424						
C319	C320	C321	42940047	C MICA 100V 68PF 5%	4	
C322						
C301	C302	C3309	42940051	C MICA 100V 100PF 5%	6	
C3310	C4409	C4410				
C401	C402		42940059	C MICA 100V 220PF 5%	2	
C325	C326		42976220	C FILM 100V 1200PF	2	
C327	C328		42976248	C FILM 100V 0.018UF	2	

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** CAPACITORS ***

C323	C324		4297G262	C,FILM 100V 0.068UF	2
C4413	C4414		42975046	C,FILM 100V 1UF	2
C531	C532		42975047	C,FILM 250V 0.047UF	2
C157	C158	C159	42975048	C,FILM 250V 0.01UF	7
C509	C510	C511			
C512					
C201	C202	C203	42975049	C,FILM 160V 0.01UF	17
C305	C306	C313			
C314	C315	C316			
C407	C408	C411			
C412	C413	C414			
C450	C451				
C351	C352		42975056	C,FILM 100V 0.1UF	2
C105	C106	C107	42975063	C,FILM 100V 0.1UF	6
C108	C3313	C3314			
C505	C506	C507	42975064	C,FILM 100V 0.22UF	4
C508					
C3307	C3308		42977153	C,FILM 100V 2200PF 5%	2
C3307	C3308		42977167	C,FILM 100V 8200PF 5%	2
C4407	C4408		42977169	C,FILM 100V 0.01UF	2
C333	C334		42977404	C,FILM 10V 4700PF	2
C303	C304	C403	42978111	C,FILM 125V 470PF (C-NL)	10
C404	C405	C406			
C425	C426	C427			
C428					
C303	C304		42978121	C,FILM 125V 1200PF (C-NL)	2
C3311	C3312		439A0008	C,ELEC 50V 220UF (AUDIO)	2
C317	C318	C3319	439A0010	C,ELEC 50V 10UF (AUDIO)	6
C3320	C419	C420			
C3301	C3302	C3315	439A0011	C,ELEC 25V 220UF AUDIO	16
C3316	C3317	C3318			
C3335	C3336	C4401			
C4402	C4405	C4406			
C4415	C4416	C4417			
C4418					
C3333	C3334		439A0013	C,ELEC 25V 100UF (AUDIO)	2
C329	C330	C331	439A0014	C,ELEC 25V 47UF (AUDIO)	8
C332	C431	C432			
C433	C434				
C4419	C4420		439A0015	C,ELEC 100V 3.3UF (AUDIO)	2
C4411	C4412		439A0016	C,ELEC 50V 100UF (AUDIO)	2
C4421	C4422		43910046	C,ELEC 160V 1UF	2
C155	C156		43910117	C,ELEC 80V 1500UF	2
C501	C502	C503	43910139	C,ELEC 50V 2200UF (A)	4
C504					
C151	C152	C153	43910141	C,ELEC 56V 2200UF	4
C154					

SYMBOL	PARTS NO	DESCRIPTION	QTY	REMARKS
--------	----------	-------------	-----	---------

*** CAPACITORS ***

C101	C102	C103	43910144	C,ELEC	4	
C104						
C3315	C3316	C3317	43993029	C,ELEC 16V 220UF	4	
C3318						
C329	C330	C331	43993038	C,ELEC 25V 22UF	4	
C332						
C807			43993040	C,ELEC 25V 47UF	1	
C808			43993041	C,ELEC 25V 100UF	1	
C803			43993042	C,ELEC 25V 220UF	1	
C806			43993064	C,ELEC 50V 10UF	1	
C804			43993065	C,ELEC 50V 22UF	1	
C3331	C3332		43993076	C,ELEC 63V 3.3UF	2	
C809			43993079	C,ELEC 63V 22UF	1	

Memo
