

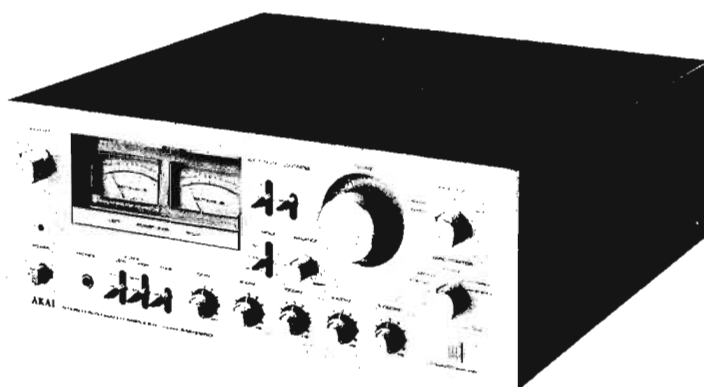
SERVICE MANUAL

PARTS LIST

MODEL AM-2950



ALSO APPLICABLE TO BLACK PANEL MODEL



STEREO INTEGRATED AMPLIFIER

MODEL **AM-2950**

ALSO APPLICABLE TO BLACK PANEL MODEL

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SECTION 1

SERVICE MANUAL

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For basic adjustments, measuring methods, and operating principles, refer to GENERAL TECHNICAL MANUAL.

I. TECHNICAL DATA

POWER AMPLIFIER SECTION

RATED OUTPUT POWER 2-CHANNELS DRIVEN		120 watts per channel, minimum RMS, at 8 ohms from 20 to 20,000 Hz with no more than 0.06% total harmonic distortion.
FREQUENCY RESPONSE		(MAIN-IN) DC to 100 kHz +0, -0.5 dB
POWER BANDWIDTH (IHF)		10 Hz to 40 kHz/8 ohms (Total Harmonic Distortion: 0.06%)
SIGNAL TO NOISE RATIO (IHF)	PHONO	Better than 80 dB
	AUX	Better than 100 dB
RESIDUAL NOISE		Less than 0.5 mV at 8 ohms
CHANNEL SEPARATION (IHF)	PHONO	Better than 50 dB at 1,000 Hz
DAMPING FACTOR		More than 50 (1 kH, 8 ohms)
OUTPUT:	SPEAKERS	A, B, C (4 to 16 ohms)/A+B, A+C, B+C (8 to 16 ohms)
	HEADPHONE	4 to 16 ohms

PRE AMPLIFIER SECTION

INPUT SENSITIVITY/IMPEDANCE	PHONO	PHONO 1:3 mV/33/47/100 kohms, PHONO 2:3 mV/47 kohms
	AUX	150 mV/100 kohms
	TUNER	150 mV/100 kohms
	TAPE MONITOR	PIN: 150 mV/100 kohms DIN: 150 mV/100 kohms
	MAIN IN	PIN: 1 V/47 kohms
OUTPUT LEVEL/IMPEDANCE	TAPE REC	PIN: 150 mV/1 kohms DIN: 30 mV/30 kohms
	PRE OUTPUT	1 V/4.7 kohms
FREQUENCY RESPONSE	PHONO (RIAA equalization)	30 Hz to 15 kHz +0.5 dB, -0.5 dB
	AUX, TAPE MONITOR	3 Hz to 60 kHz +0 dB, -1 dB
TONE CONTROL		±10 dB at 100 Hz, 1 kHz, 4 kHz, 10 kHz
LOUDNESS CONTROL		+10 dB at 100 Hz, +6 dB at 10 kHz (Volume control set at -30 dB position)
FILTER:	HIGH	-6 dB at 8.12 kHz
	LOW	-6 dB at 15.30 Hz
AUDIO MUTE		-15 dB, -30 dB

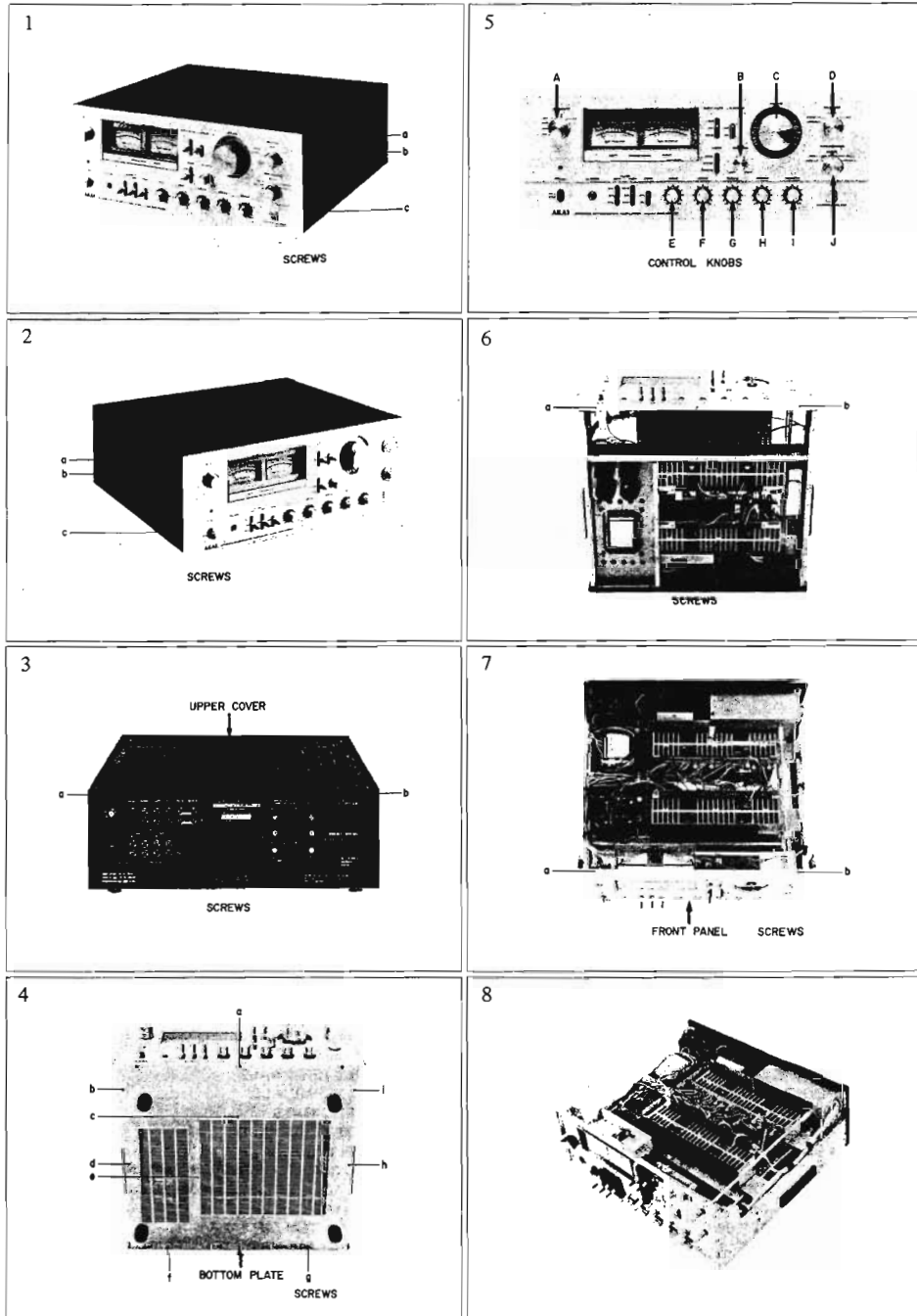
MISCELLANEOUS

SEMICONDUCTORS		Transistors: 47, Diodes: 31, IC: 2
POWER REQUIREMENTS		120 V, 60 Hz for USA and Canada 220 V, 50 Hz for Europe Except UK 240 V, 50 Hz for UK and Australia 110/220/240 V, 50/60 Hz Switchable for the other countries
DIMENSIONS		440 (W) x 170 (H) x 430 (D) mm (17.3 x 6.7 x 16.9 inches)
WEIGHT		17.8 kg (39.2 lbs)

* For improvement purposes, specifications and design are subject to change without notice.

II. DISMANTLING OF UNIT

In case of trouble, etc. necessitating dismantling, please dismantle in the order shown in the photographs. Resemble in reverse order.



III. CONTROLS

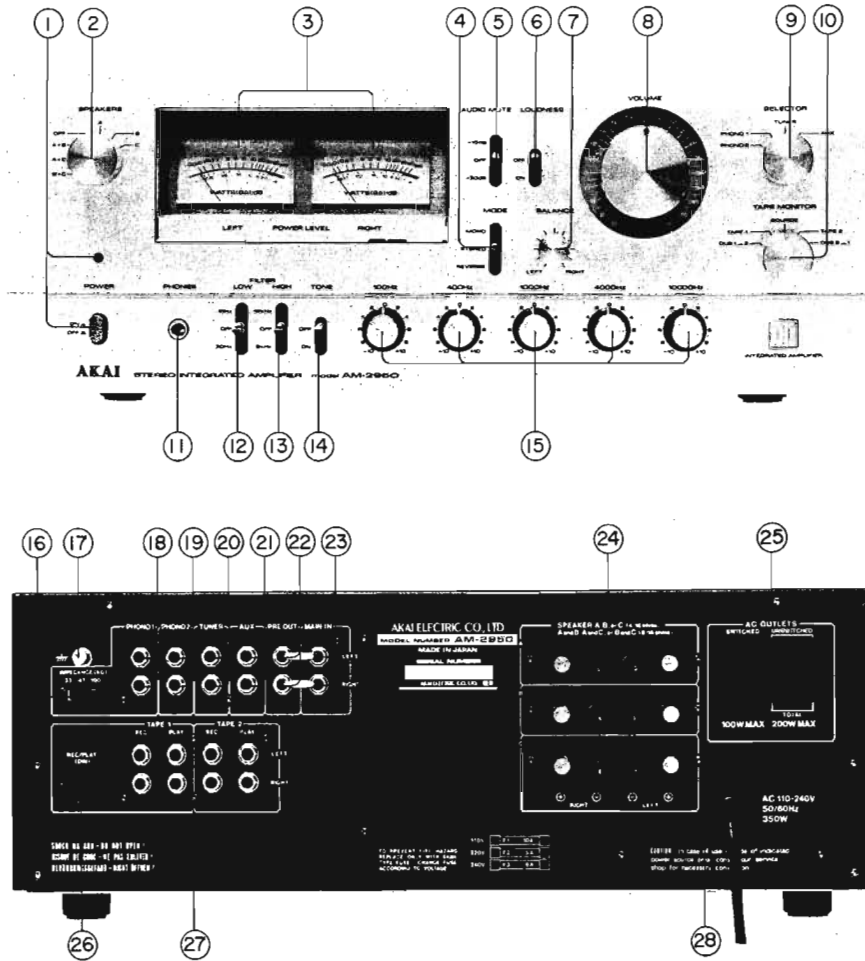


Fig. 1 Controls

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. POWER SWITCH and POWER INDICATOR LAMP 2. SPEAKER SYSTEM SELECTOR 3. OUTPUT POWER LEVEL METERS 4. MODE SWITCH 5. AUDIO MUTE SWITCH 6. LOUDNESS SWITCH 7. STEREO BALANCE CONTROL 8. VOLUME CONTROL 9. INPUT SELECTOR 10. TAPE MONITOR SWITCH 11. HEADPHONE JACK 12. LOW FILTER SWITCH 13. HIGH FILTER SWITCH 14. TONE SWITCH 15. TONE CONTROLS | <ol style="list-style-type: none"> 16. IMPEDANCE SWITCH 17. GROUND TERMINAL 18. PHONO 1 TERMINALS 19. PHONO 2 TERMINALS 20. TUNER TERMINALS 21. AUX TERMINALS 22. PRE-OUT TERMINALS 23. MAIN-IN TERMINALS 24. A, B and C SYSTEM SPEAKER TERMINALS 25. EXTRA AC OUTLETS (Some Models not equipped with this facility) 26. TAPE 1 SYSTEM DIN JACK 27. TAPE 2 and TAPE 2 SYSTEM REC/PB TERMINALS 28. AC CORD (AC Inlet for UK and some other countries) |
|---|---|

IV. PRINCIPAL PARTS LOCATION

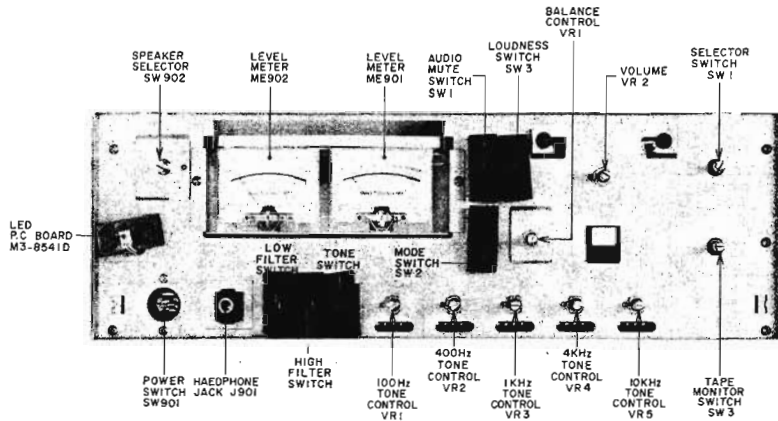


Fig. 2 Front View

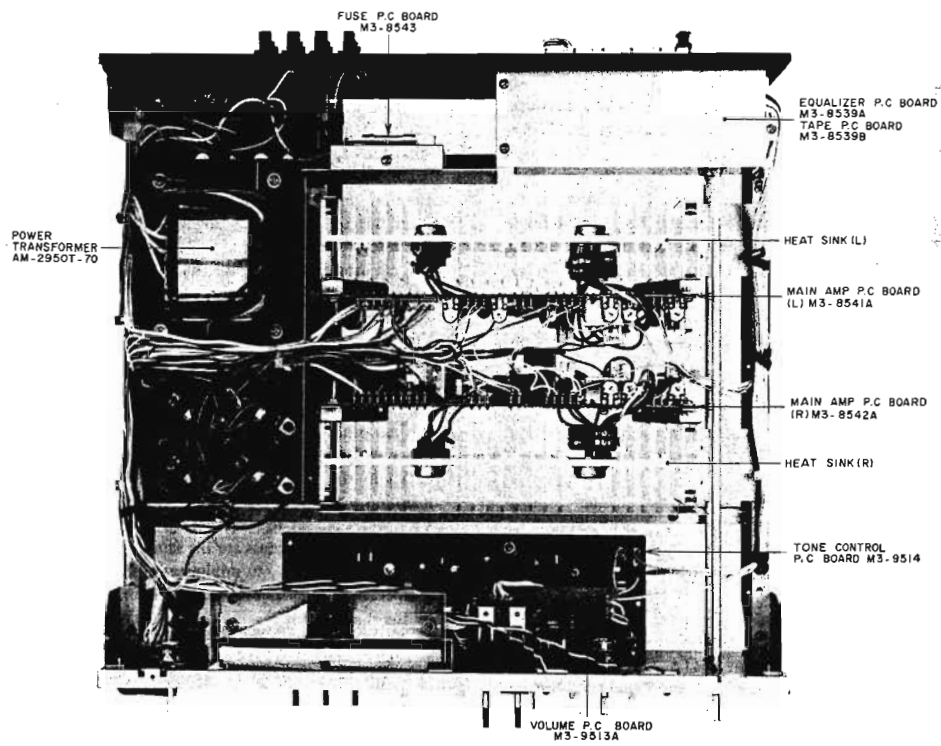


Fig. 3 Top View

V. OPERATING PRINCIPLES

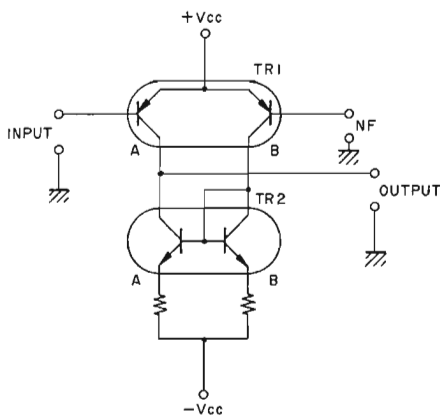


Fig. 4

1. Differential Amplifier and Current Mirror Circuit (Refer to Fig. 4)

A current mirror circuit composed of TR2A and TR2B is included as a load resistance for TR1A and TR1B which compose the Differential Amplifier. When TR1A base potential increases, the voltage between the TR1A base and the emitter decreases and TR1A collector current decreases.

Since TR1 is a dual transistor differential amplifier, TR1B collector current increases proportionately to TR1A collector current decreases. The current flowing to TR2B also increases and this increases TR2B collector potential. Since the base and the collector are connected for TR2B and TR2B collector connected to TR2A base, TR2A base potential increases by the same amount as the TR2B base potential. (V_{BE} increase) This becomes a force to increase TR2A collector current but the TR1A collector current and the TR2A collector current must be equal.

Looking at the internal resistance of TR1A and TR2A, we find that the results are:

- Decrease in voltage between base and emitter
→ increase in internal resistance
- Increase in voltage between base and emitter
→ decrease in internal resistance

Since equal amount of collector current flow to increase TR1A internal resistance and decrease TR2A internal resistance, both TR1A collector potential and TR2A collector potential rise. These two changes of potentials directly becomes the output, and TR1A and TR1B push-pull outputs combine to become the input voltage of the next stage.

The advantages of the current mirror circuit include a gain of more than two times (6 dB), low distortion at high frequencies, good rise-up characteristics, and good temperature characteristics.

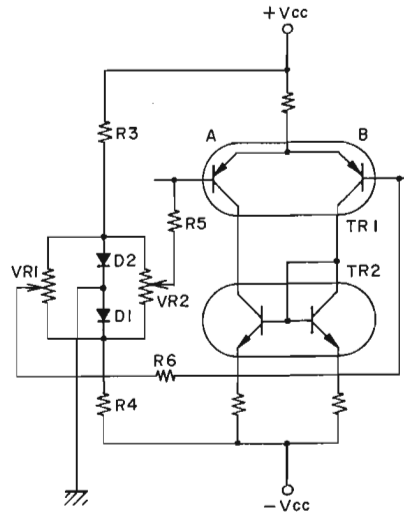


Fig. 5 D.C Balance

Fig. 5 shows the circuit for DC Balance.

With DC amplifier, voltage arising in the center point causes the direct current flow to the speakers and thus result in speaker distortion.

Balancing out is necessary even in the first stage differential amplifier where center point potential arises out of temperature change and differences in transistor performance.

The circuit composed of R3, R4, R5, R6, VR1, VR2, D1, and D2 is the DC balance circuit.

To balance, it is necessary to minimize the change of V_{BE} .

When the temperature rises, TR1 V_{BE} and the collector current increase to cause the base potential to rise.

On the other hand, the silicon diodes (D1 and D2) connected to the base show very little change (0.6 - 0.7V) in the forward voltage drop and function to maintain the TR1 base potential stabilized.

VR1 and VR2 set the base voltage so that TR1A and TR1B collector currents are the same.

Also, in this model, to minimize influence from the temperature outside, TR1 and TR2 are heat coupled by the shield box.

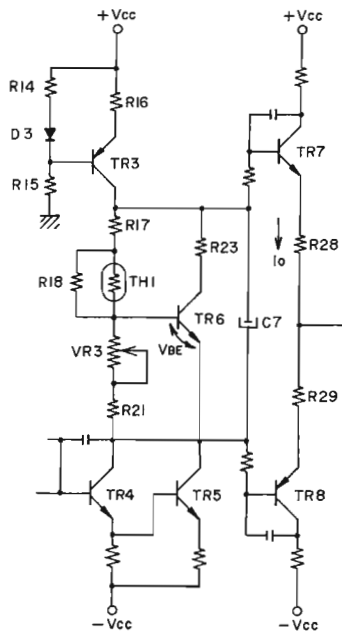


Fig. 6 Idling Current Supply Circuit & Temperature Compensation

2. Idling Current Supply Circuit and Temperature Compensation (Refer to Fig. 6)

Looking at the idling current's temperature compensation, when TR7 collector current I_0 increases due to a rise in temperature, V_{BE} of TR6 and TR6 collector current increase. This causes the V_{BE} of TR7 and TR7 collector current to decrease, thus maintaining idling current's stability. Also, because the thermister has a negative temperature characteristic I_0 increase leads to an increase of TR6's V_{BE} and TR6 collector current.

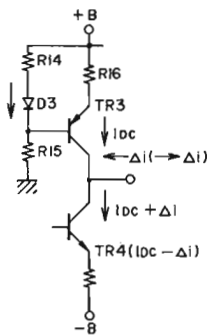


Fig. 7

Fig. 7 shows the constant-current load circuit. Its operation can be described as follows.

By making TR3 base constant voltage through D3, R14 and R15, a fixed current flows to TR3.

When there is no signal at TR3, the same I_{DC} flowing to TR3 flows to TR4. But when a positive half cycle is supplied to the TR4 base, TR4 collector current becomes more than the I_{DC} . And since TR3 is fixed by the constant current I_{DC} , Δi flows from the next stage to TR4, resulting in a flow of $I_{DC} + \Delta i$ to TR4. On the other hand, when a negative half cycle is supplied to TR4, TR4 collector current becomes less than I_{DC} . But because constant current I_{DC} flows to TR3, Δi of constant current flows to the next stage. Therefore, TR4 receives $I_{DC} - \Delta i$ current. As above, change in the TR4 current Δi flows only to the next stage.

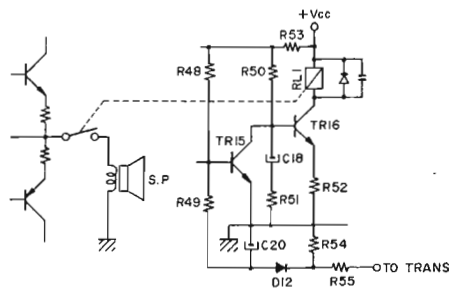


Fig. 8 Mute Circuit

3. Mute Circuit (Refer to Fig. 8)

When the amplifier power is turned OFF or ON, the popping sound and distortion occur to damage the speakers and produce unpleasant noise.

This is prevented by the circuit shown in Fig. 8. When the power is turned ON, TR15 base is reverse biased through D12, C20, R49, R54, and R55 and is put into an OFF condition.

TR16 base potential decrease with C18 charging current coming through R50 and turns on TR16 after a fixed time. The relay (RL1) is put into operation at this point, and the main amplifier and the speakers are connected.

When the power is turned OFF, the reverse bias supplied to TR15 gradually disappears to turn on TR15. Thereby, C18 discharges through TR15 and turns OFF, TR16. The relay (RL1) turns OFF and the main amplifier and the speakers are disconnected at the same time.

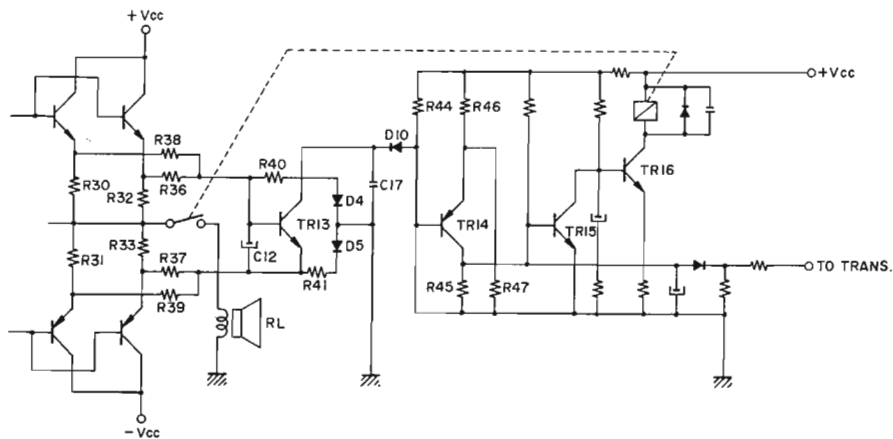


Fig. 9 Overcurrent Detection Circuit

4. Overcurrent Detection Circuit (Refer to Fig. 9)

Output stage transistor may break down because of excess current or excess power consumption by the transistor when the output terminal of the power amplifier is shortcircuited or when too many speakers are connected and the load impedances are too low equivalently.

This is prevented by the circuit in Fig. 9.

Ordinarily, the base potential and the emitter potential of TR13 are equal and TR13 is maintained OFF. When the load RL becomes lower than the power amplifier's rated or shortcircuited, TR13 base potential becomes greater than the emitter potential (V_{BE} increase) and TR13 is turned ON. When TR13 is turned ON, TR14 base potential decrease according to the voltage drops at R44. TR14 then becomes ON, TR15 base potential decrease and TR15 becomes ON. C18 rapidly discharges and TR16 base potential increase, and TR16 turns OFF to cut off the speakers from the main amplifier. C12 is a condenser to prevent malfunction by noise.

D4 and D5 are temperature compensation diodes for TR13.

Even when there is an increase in the drift current due to a rise in temperature and there is an increase in voltage between TR13 base and emitter, TR13 base potential do not change because the silicon diode D4 forward voltage drop is fixed. The increase of TR13 collector current is thereby withheld.

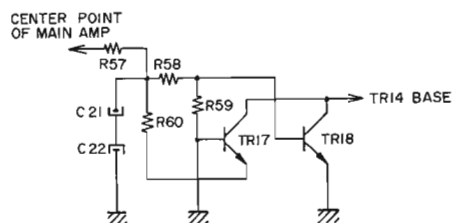


Fig. 10 Center Point DC Voltage Detection Circuit

5. Center-Point Voltage Detection Circuit (Refer to Fig. 10)

When such emergency occurs as a shortcircuit between the collector and the emitter of one of the power amplifier output transistors, direct current potential appears at the output terminal and, with the OCL circuit, the direct current flows to and damages the speakers.

This is prevented by the circuit in Fig. 10.

Ordinarily, center point potential is 0 V and therefore TR17 and TR18 are OFF. Also, since C21 and C22 are connected to the chassis, TR17 and TR18 are not affected by the AC signal.

But when the center point potential changes and a positive DC potential appears, this voltage becomes TR18 base bias and turns on TR18.

Consequently, TR14 and TR15 of the next stage turn ON and TR16 turns OFF to disconnect the main amplifier and the speakers.

Also when a negative DC potential is generated at the center point, TR17 emitter potential becomes lower than the base potential (V_{BE} increase) and TR17 is turned ON. Consequently, TR14 and TR15 are turned ON and TR16 is turned OFF to disconnect the main amplifier and the speakers.

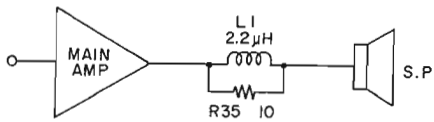


Fig. 11

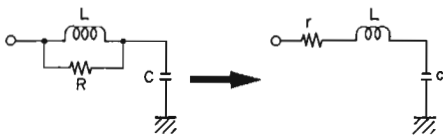


Fig. 12

6. L1 and R35 Operation (Refer to Fig. 11, 12)

Fig. 11 shows the circuit. Fig. 12 shows the equivalent circuit.

Looking at the shortcoming first, we find that when an inductance or a resistor is added between the power amplifier output and the speaker, in case of an inductance there is a disadvantage of greater and greater power amplifier output impedance in the high frequencies. But actually it is only about 0.014 ohms at 1 kHz and 1.4 ohms at 100 kHz.

Therefore it can be said that it is negligible.

Looking at the advantages, we find the following. When the load is connected to something with a capacitive component, it forms a series resonance circuit and load impedance is zero at the resonance point. But by the workings of R connected in parallel to L, the resonance circuit is damped and a pure resistance is seemingly added equivalently in series so that the load impedance does not become zero even at the resonance point.

This works as a buffer to various kinds of effect coming from the load side. For example, it can maintain the load impedance above a fixed value even if a 3-way or 4-way speaker with a built-in L-C network is connected.

VI. LEVEL DIAGRAM

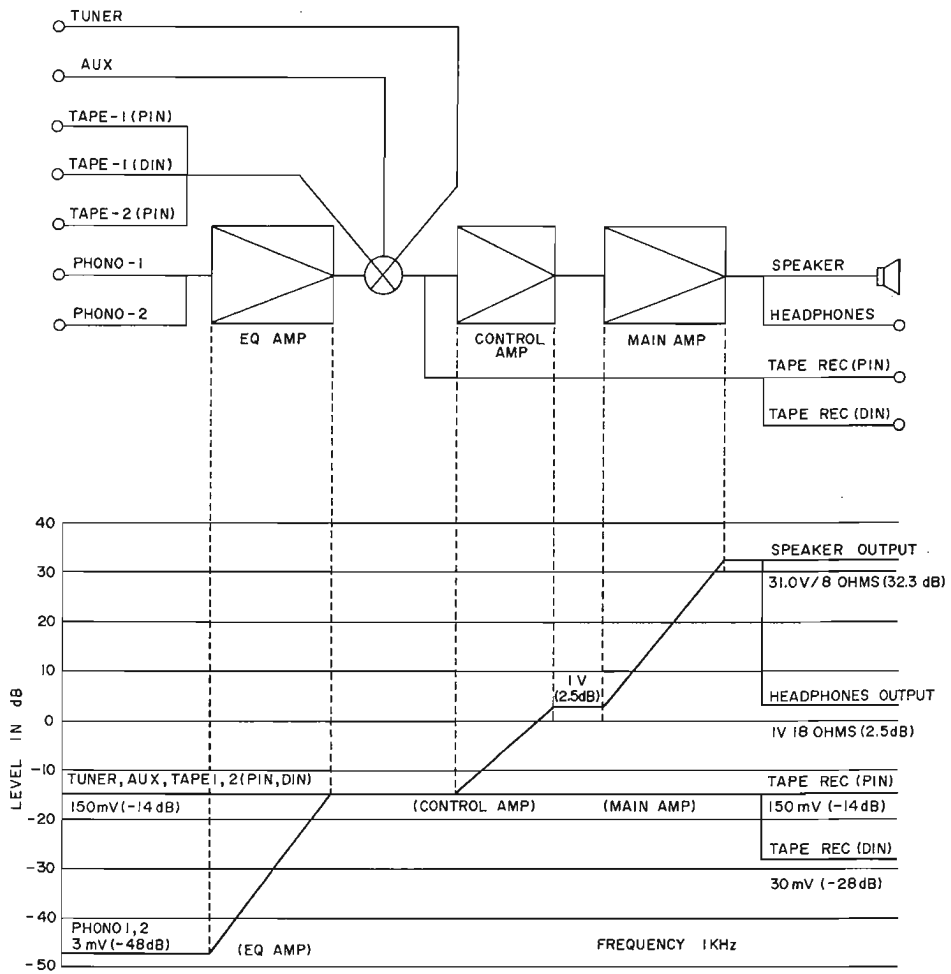


Fig. 13 Level Diagram

VII. AMPLIFIER ADJUSTMENT

NOTE: The letter "b" added to each part symbol in the following figure denotes the right channel

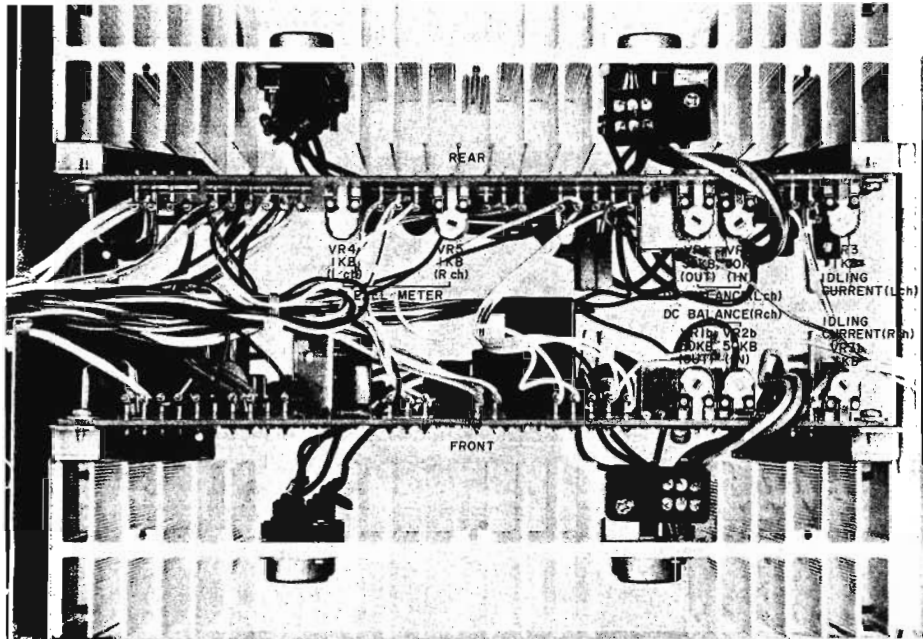


Fig. 14 Main Amp Adjust Point

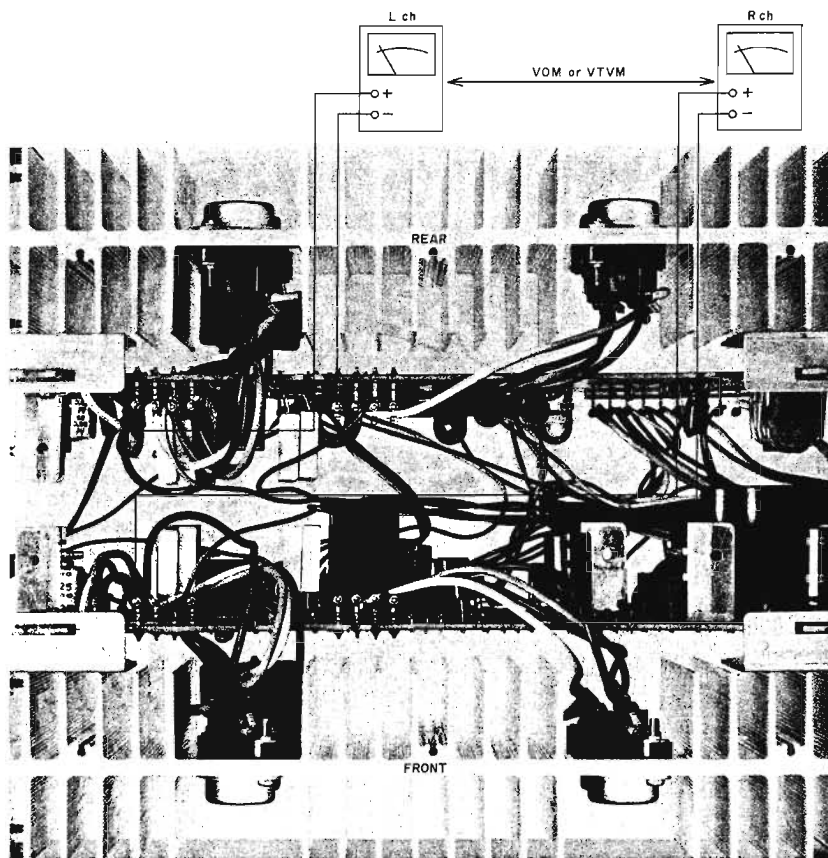


Fig. 15. Idling Current Adjustment Instrument Connection.

1. Idling Current Adjustment (Refer to Fig. 14, 15)

- 1) Disconnect the jumper plugs from the PER OUT and MAIN IN terminals on the rear panel.
- 2) Keep the SPEAKERS Switch on the front panel in the OFF position. Now, follow the directions in Table 1 below.

Table 1 Idling Current Adjustment

Step	Item	Adjust:	Result	Method
3	Idling current (Left channel)	VR3 1 k Ω (Main Amp P.C Board)	20 mV	Use a VOM or VTVM with it in 100 mV DC range. The idling current should be 20 mA
4	Idling current (Right channel)	VR3b 1 k Ω (Main Amp P.C Board)	20 mV	

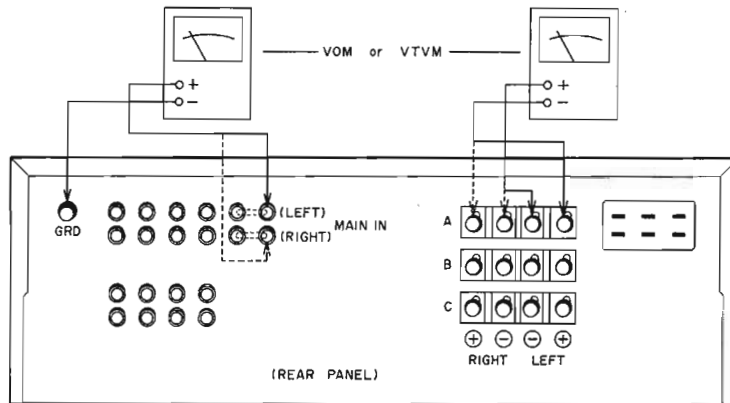


Fig. 16 DC Balance Adjustment Instrument Connection

2. DC Balance Adjustment (Refer to Fig. 14, 16)

- 1) Disconnect the jumper plugs from the PRE OUT and MAIN IN terminals on the rear panel.
- 2) Keep the SPEAKERS switch on the front panel in the A position.
- 3) For the left-channel DC balance, turn VR2 (50 k Ω) until the input voltage at the MAIN IN (LEFT) terminal is around 0 V.
- 4) Turn VR1 (50 k Ω) until the output voltage at the SPEAKER A (LEFT) terminal is around 0 V.
- 5) Repeat Steps 3) and 4) until the input and output voltages are within ± 1 and ± 20 mV, respectively.
- 6) Similarly, adjust VR2b (50 k Ω) and VR1b (50 k Ω) for the right-channel DC balance until the input and output voltage at the SPEAKER A (RIGHT) terminal is within ± 1 and ± 20 mV, respectively.

3. Level Meter Indication Adjustment (Refer to Fig. 14, 17, 18)

Set-up

- 1) Connect an AF oscillator to the AUX jacks on the rear panel as illustrated in Fig. 17.
- 2) Connect an 8-ohms load across each SPEAKER A terminal as illustrated.
- 3) Connect an AC voltmeter across the load.
- 4) Set the SPEAKERS selector to the A position.
- 5) Set the TONE controls and BALANCE control to their mechanical centers ("0").
- 6) Throw the MODE switch into the MONO position.
- 7) Keep the LOUDNESS switch in the OFF position.
- 8) Set the SELECTOR switch to the AUX position.
- 9) Set the AUDIO MUTE, FILTER LOW and HIGH, and TONE switches to the OFF position.

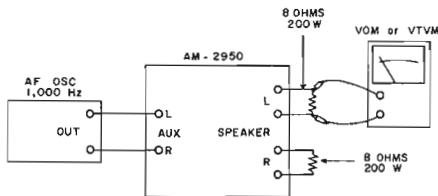


Fig. 17 Level Meter Indication Adjustment Instrument Connection

Procedures

- 1) Turn on the AF oscillator and under adjustment.
- 2) Set the AF oscillator output frequency to 1,000 Hz and the level to 150 mV.
- 3) Adjust the VOLUME control on the front panel until the VTVM reads 31.0 V.
- 4) Now, adjust VR4 (Right) on the Main Amp P.C board (see Fig. 14) until each POWER LEVEL meter deflects to the mark "120". (see Fig. 18)

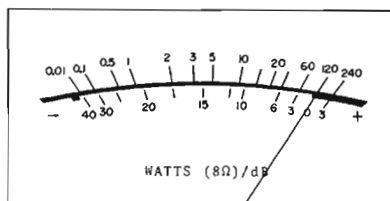


Fig. 18 Level Meter

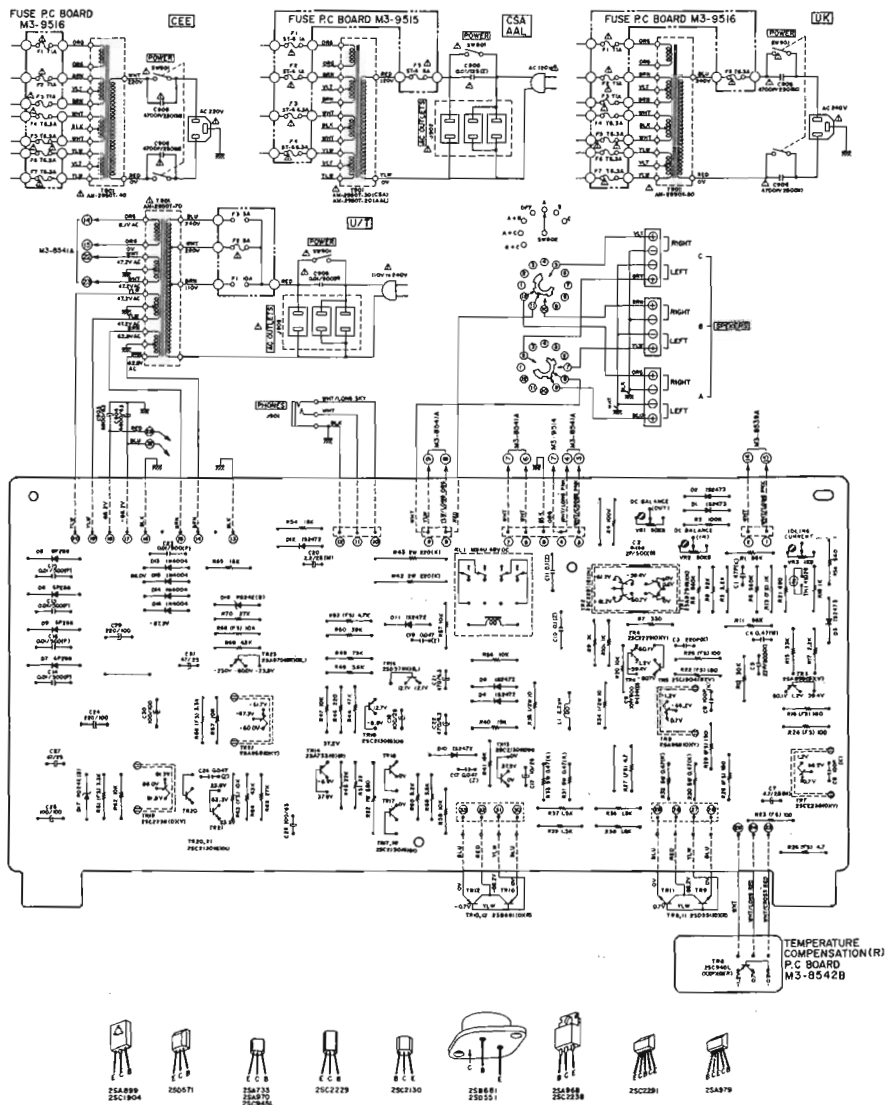
VIII. CLASSIFICATION OF VARIOUS P.C BOARDS

1. P.C BOARD TITLES AND IDENTIFICATION NUMBERS

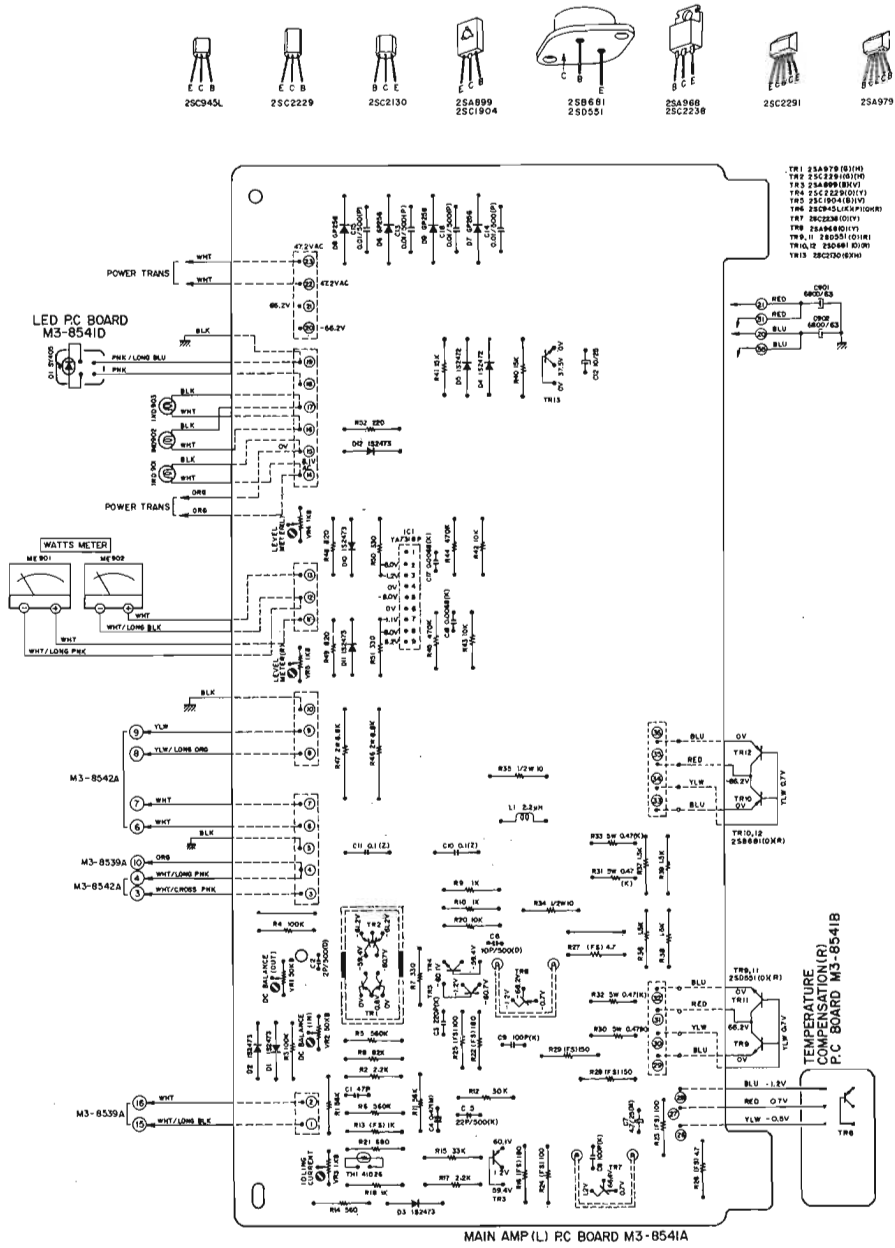
P.C Board Title	P.C Board Number
Main Amp (L) P.C Board	M3-8541A
Main Amp (R) P.C Board	M3-8542A
Tone Control P.C Board	M3-9514
Equalizer P.C Board	M3-8539A
Tape P.C Board	M3-8539B
Volume P.C Board	M3-9513A
Balance P.C Board	M3-9513B
Temperature Compensation (L) P.C Board	M3-8541B
Temperature Compensation (R) P.C Board	M3-8542B
LED P.C Board	M3-8541D
Fuse P.C Board (U/T)	M3-8543
Fuse P.C Board (CSA, AAL)	M3-9515
Fuse P.C Board (CEE, UK)	M3-9516

2. COMPOSITION OF VARIOUS P.C BOARDS

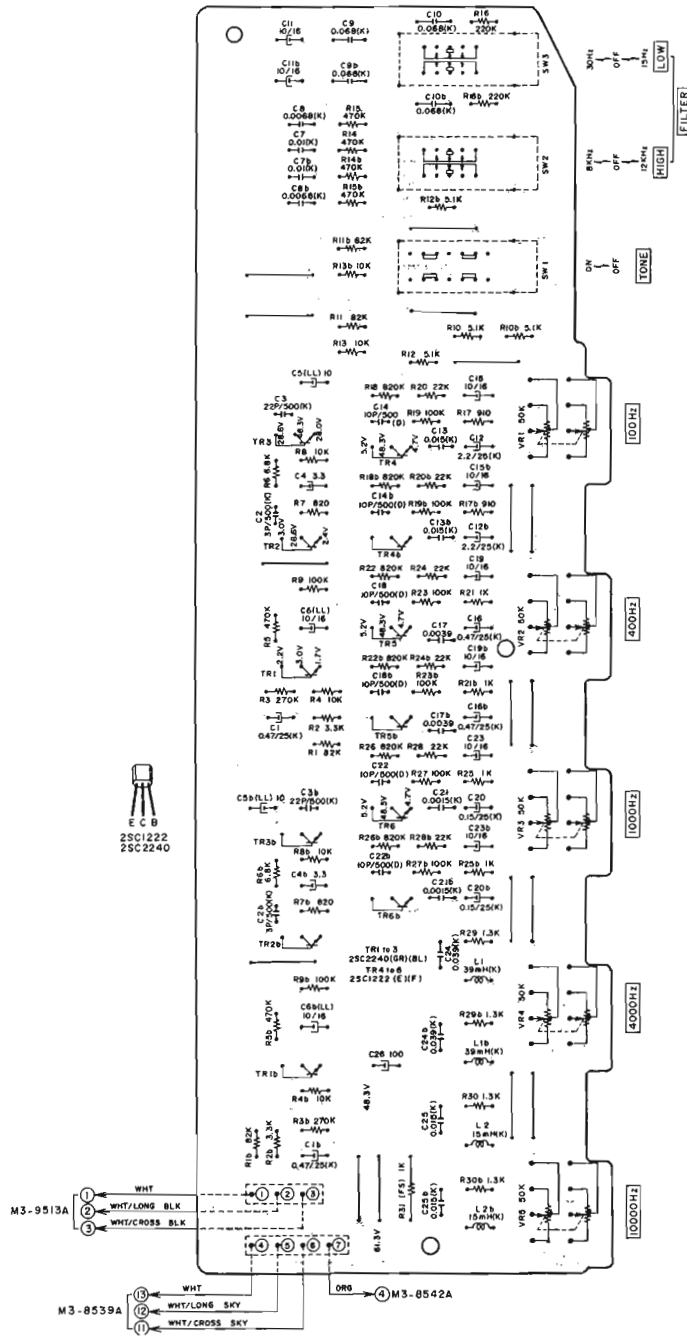
1) MAIN AMP (R) P.C BOARD M3-8542A(2ED) & TEMPERATURE COMPENSATION (R) P.C BOARD M3-8542B



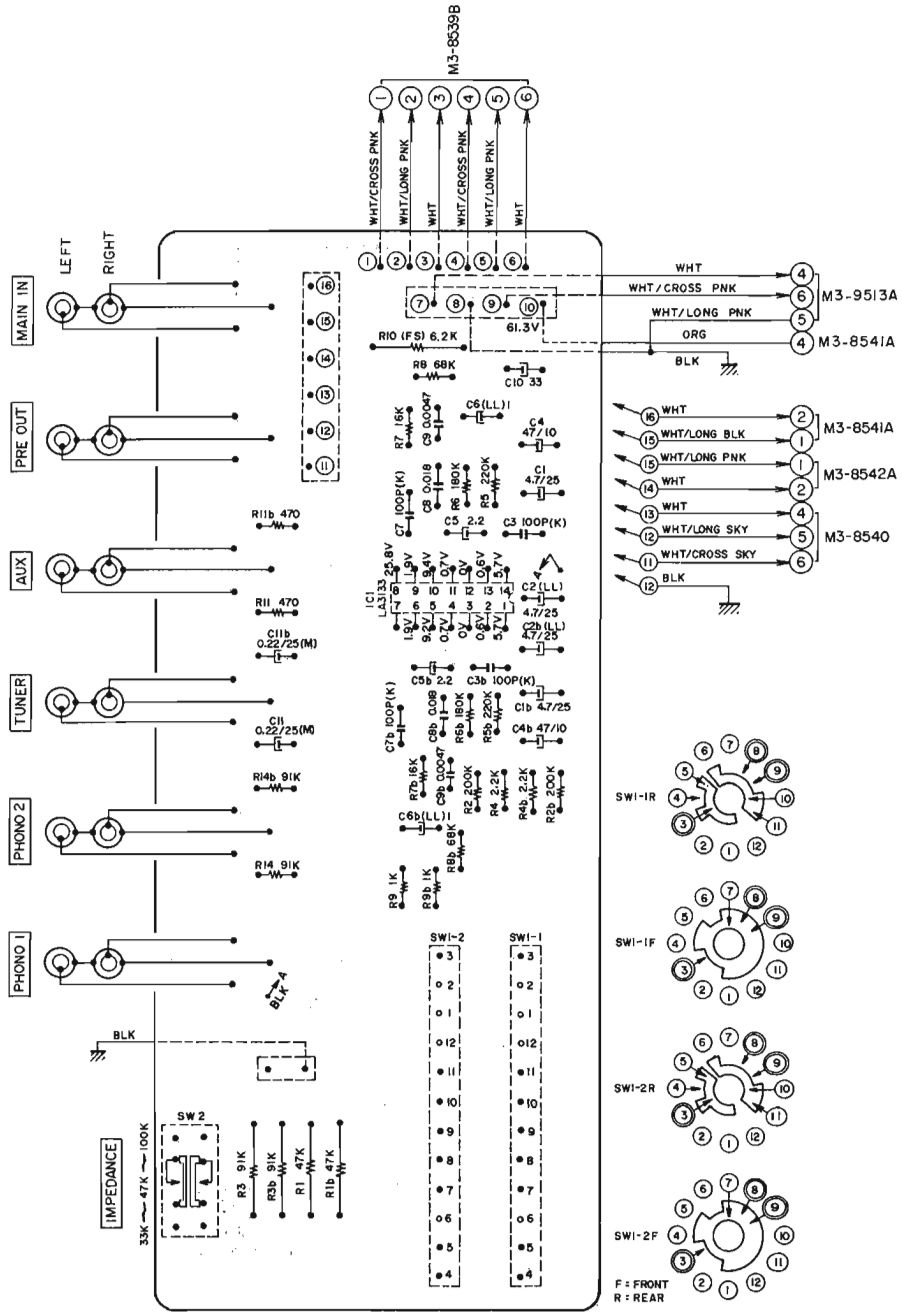
2) MAIN AMP (L) P.C BOARD M3-8541A, TEMPERATURE COMPENSATION (L) P.C BOARD M3-8541B & LED P.C BOARD M3-8541D



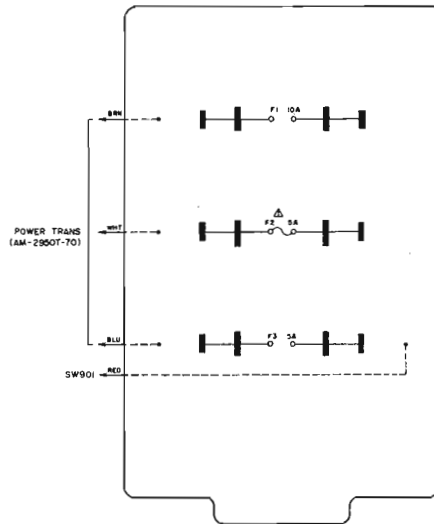
3) TONE CONTROL P.C BOARD M3-9514



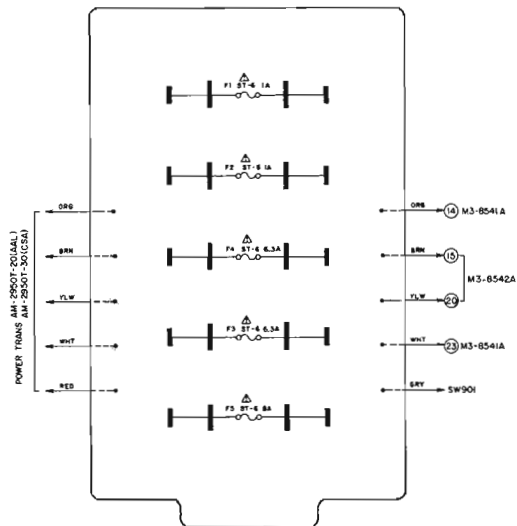
4) EQUALIZER P.C BOARD M3-8539A



7) FUSE P.C BOARD (U/T) M3-8543

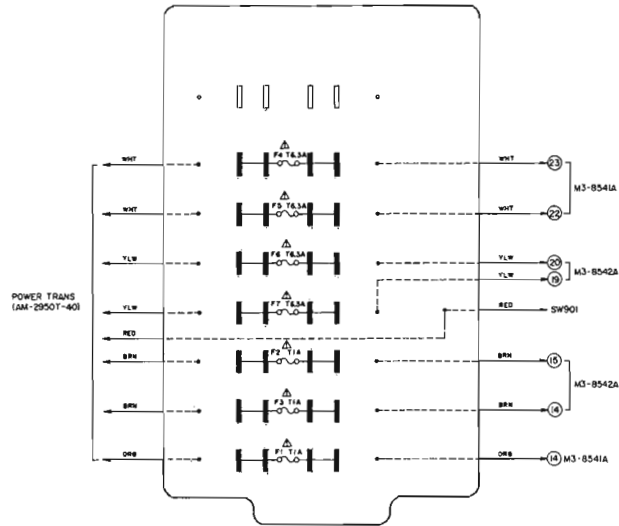


8) FUSE P.C BOARD (CSA, AAL) M3-9515

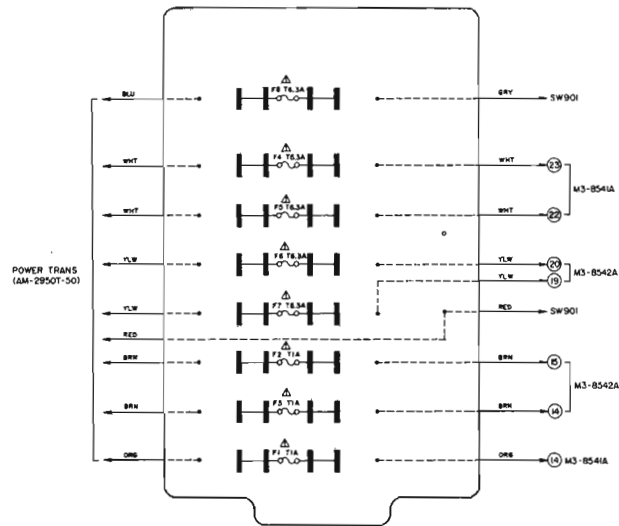


WARNING: Δ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.
 AVERTISSEMENT: Δ IL INDIQUE LES COMPOSANTS CRITIQUES DE SÛRETÉ. POUR MAINTENIR LE DEGRÉ DE SÛRETÉ DE L'APPAREIL, NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SÛRETÉ QUE PAR DES PIÈCES RECOMMANDÉES PAR LE FABRICANT.

9) FUSE P.C BOARD (CEE) M3-9516



10) FUSE P.C BOARD (UK) M3-9516



WARNING: Δ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.
 AVERTISSEMENT: Δ ILLIQUOVI LES COMPOSANTS CRITIQUES DE SÛRETÉ. POUR MAINTENIR LE DEGRÉ DE SÛRETÉ DE L'APPAREIL, NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SÛRETÉ QUE PAR DES PIÈCES RECOMMANDÉES PAR LE FABRICANT.

-MEMO-

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SECTION 2

PARTS LIST

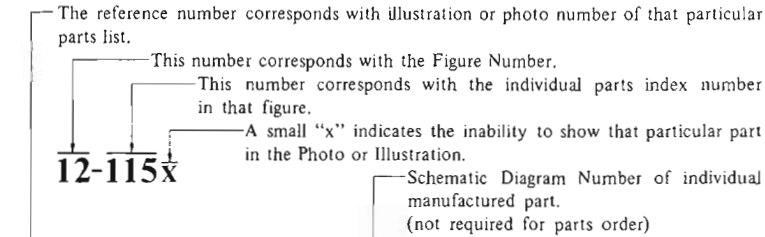
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Resistor and Capacitor which is not listed in this parts list, please refer to COMMON LIST FOR SERVICE PARTS.

HOW TO USE THIS PARTS LIST

1. This parts list is compiled by various individual blocks based on assembly process.
2. When ordering parts, please describe parts number, serial number, and model number in detail.
3. How to read list.



Ref. No.	Parts No.	Description	Schematic No.
FLYWHEEL BLOCK #13			
12-115x	800425	Flywheel Block Assy. Comp.	800 113
12-116	244506	Flywheel Only	80 222
12-117x	244754	Felt, Flywheel	80 275
12-118	251324	Main Metal Case	80 256
12-119	253080	Main Metal	80 257

4. The symbol numbers shown on the P.C. Board list can be matched with the Composite Views of components of the Schematic Diagram or Service Manual.
5. The indications of Resistors and Capacitors in the photos of P.C. Board are being eliminated.
6. The shape of the parts and parts name, etc. can be confirmed by comparing them with the parts shown on the Electrical Parts Table of P.C. Board.
7. Both the kind of part and installation position can be determined by the Parts Number. To determine where a parts number is listed, utilize Parts Index at end of Parts List.
It is necessary first of all to find the Parts Number. This can be accomplished by using the Reference Number listed at right of parts number in the Parts Index. (meaning of ref. no. outlined in Item 3 above).
8. Utilize separate "Price List for Parts" to determine unit price. The most simple method of finding parts Price is to utilize the reference number.

CAUTION:

1. When placing an order for parts, be sure to list the parts no., model no., and description. There are instances in which if any of this information is omitted, parts cannot be shipped or the wrong parts will be delivered.
2. Please be careful not to make a mistake in the parts no. If the parts no. is in error, a part different from the one ordered may be delivered.
3. Because parts number and parts unit supply in the Preliminary Service Manual (Basic Parts List) may be partially changed, please use this parts list for all future reference.

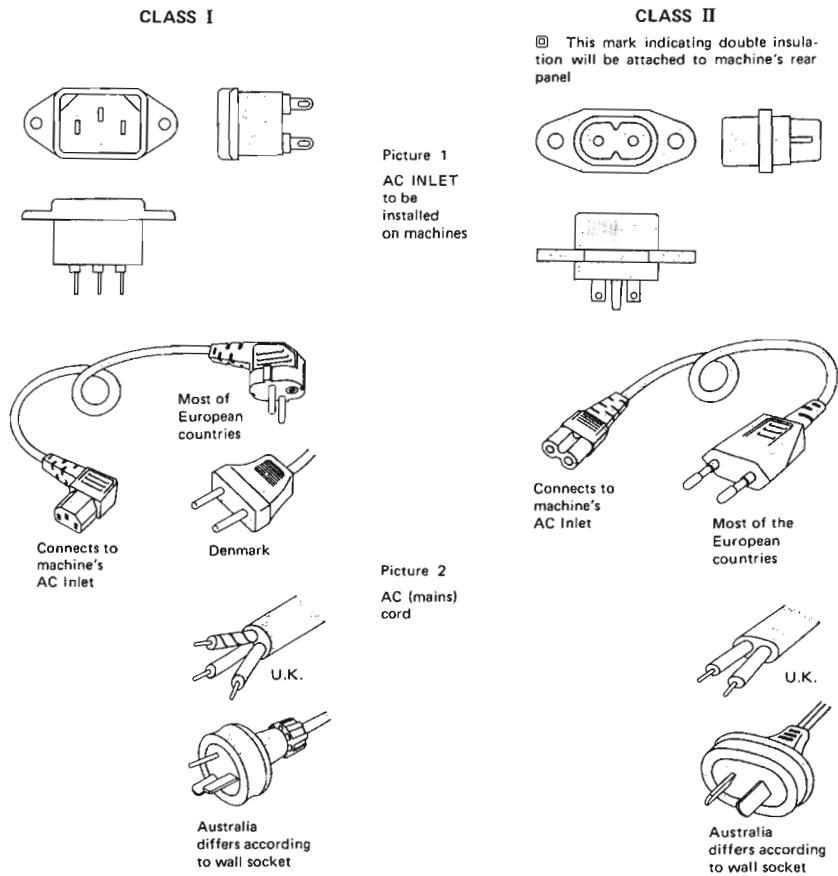
WARNING: Δ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.

AVERTISSEMENT: Δ IL INDIQUE LES COMPOSANTS CRITIQUES DE SURETE. POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.

AC INLET SYSTEM

This model is equipped with an AC INLET SYSTEM. Please refer to the AC INLET SYSTEM CHART below for the specific type. By the AC INLET SYSTEM, AC (mains) cord can be connected to and disconnected from the model because the model is provided with socket exclusively for AC (mains) cord on its main body. Please note, however, that certain models are not equipped with this system and has a built-in AC (mains) cord as before.

AC INLET SYSTEM CHART



Parts List for AC (mains) Cord Set

	Standard	Description	Type of AC Inlet	Parts No.
Class I	CEE	Cord Set CEE (3 cores)	3P	EW302993
	BEAB	Cord Set BEAB (3 cores)	3P	EW302994
	SAA	Cord Set SAA (3 cores)	3P	EW302996
	U/T	Cord Set U/T (3 cores)	3P	EW302646
Class II	CEE	Cord Set CEE (2 cores)	2P	EW638144
	BEAB	Cord Set BEAB (2 cores)	2P	EW302995
	SAA	Cord Set SAA (2 cores)	2P	EW302991
	U/T	Cord Set U/T (2 cores)	2P	EW302899

1. RECOMMENDED SPAIR PARTS LIST

Because, if the parts listed below are on hand, almost any repair can be accomplished, we suggest that you stock these Recommended Spare Parts Items.

Parts No.	Description	Note
BA311573	Main Amp P.C Board (L) Comp. AM-2950	
BA311577	Main Amp P.C Board (R) Comp. AM-2950	
BA311565	Tone Control P.C Board Comp. AM-2950	
BT313273	△ Power Trans. AM-2950T -20	AAL
BT313274	△ Power Trans. AM-2950T -30	CSA
BT313275	△ Power Trans. AM-2950T -40	CEE
BT313276	△ Power Trans. AM-2950T -50	UK
BT313278	△ Power Trans. AM-2950T -70	U/T
EC313279	Elect./C. 6800µF 63WV	
ED308592	LED SY-405D	
ED313566	Silicon Diode GP-25G	
ED570273	Silicon Diode 1N4004	
ED214457	Silicon Diode 1S2472	
ED624903	Silicon Diode 1S2473	
ED624903	Silicon Diode 1S2473	
ED321390	Thermister 41D26	
ED244732	Zener Diode RD24E (B)	
EF277402	△ Fuse ST-6 1A	CSA, AAL
EF303348	△ Fuse ST-6 6.3A	CSA, AAL
EF303349	△ Fuse ST-6 8A	CSA, AAL
EF313584	△ Fuse 10A 250V	U/T
EF623103	△ Fuse (SEMKO T Type) 1AT	CEE, UK
EF242605	△ Fuse (SEMKO T Type) 6.3AT	CEE, UK
EI305696	IC LA3133	
EI308865	IC TA7318P	
EL308840	Lamp (Cord Type) 8V 300mA (600mm x 2)	
EL313557	Lamp (Cord Type) 8V 50mA (750mm x 2)	
EM313280	Watt Meter S11ADR80A	
EM313281	Watt Meter S11ADR80B	BL
EP313565	Relay MS4U 48V DC	
ES224436	△ Push SW.	U/T
ES315801	△ Push SW. ESB-9933A Z-33 TV 10	CSA
ES280258	△ Push SW. SDV1P TV-5 (w/label)	AAL
ES296796	△ Push SW. SDV3P 5A/80A	CEE, UK
ES313282	Lever SW. SLR-523	
ES313563	Lever SW. SLR-542	
ES313283	Lever SW. SLR-543	
ES313709	Lever SW. SLR-822	
ES313297	Lever SW. SLR-823	
ES313708	Rotary SW. SR26 (PH-2) N2-4-5 20kC	

Parts No.	Description	Note
ES313707	Rotary SW. SR26 (PH-2) N2-6-4 20kC	
ES313738	Rotary SW. SR321N 1-2-7 30kC	
ES310170	Slide SW. 23460	
ET557965	Transistor 2SA733 (Q) (R)	
ET311845	Transistor 2SA899 (B) (V)	
ET311791	Transistor 2SA968 (O) (Y)	
ET305463	Transistor 2SA970 (GR) (BL)	
ET308866	Transistor 2SA979 (G) (H)	
ET311847	Transistor 2SB681 (O) (R) AKAI	
ET459810	Transistor 2SC1222 (E) (F)	
ET311865	Transistor 2SC1904 (B) (V)	
ET308937	Transistor 2SC2130 (G) (H)	
ET312485	Transistor 2SC2229 (O) (Y) AKAI	
ET311790	Transistor 2SC2238 (O) (Y)	
ET307195	Transistor 2SC2240 (GR) (BL)	
ET313560	Transistor 2SC2291 (G) (H)	
ET635218	Transistor 2SC945L (K) (P) (Q) (R)	
ET311846	Transistor 2SD551 (O) (R) AKAI	
ET666404	Transistor 2SD571 (K) (L)	
EV306737	Semi-fixed/Vol. V10K8-1-2 B50k	
EV300921	Semi-fixed/Vol. V10K8-1-2 1k (B)	
EV313562	Single-Axial 2-Throw/Vol. GM70E 50k (Special w) x 2	
EV307188	Single-Axial 2-Throw/Vol. GM80E-250kB x 2	
EV307189	Single-Axial 2-Throw/Vol. GM80E-250kMN	

2. MAIN AMP P.C BOARD (L) (M3-8541A)

BLOCK

Symbol No.	Parts No.	Description	Schematic No.
2-1	BA311573	Main Amp P.C Board (L) Comp. AM-2950	M3-8541A
2-IC1	EI308865	IC TA7318P	45-8-306
2-TR1	ET308866	Transistor 2SA979(G)(H)	45-1-324
2-TR2	ET313560	Transistor 2SC2291(G)(H)	45-1-337
2-TR3	ET311845	Transistor 2SA899(B)(V)	45-1-341
2-TR4	ET312485	Transistor 2SC2229(O)(Y)	45-1-349
		AKAI	
2-TR5	ET311865	Transistor 2SC1904(B)(V)	45-1-342
2-TR7	ET311790	Transistor 2SC2238(O)(Y)	45-1-339
2-TR8	ET311791	Transistor 2SA968(O)(Y)	45-1-338
2-TR13	ET308937	Transistor 2SC2130(G)(H)	45-1-317
2-D1to3	ED624903	Silicon Diode 1S2473	45-3-28
2-D4,5	ED214457	Silicon Diode 1S2472	45-3-41
2-D6to9	ED313566	Silicon Diode GP-25G	45-2-91
2-D10to12	ED624903	Silicon Diode 1S2473	45-3-28
2-L1	EO551711	Phase Compensation Coil 2.2μH (+30%)	23-1-188
2-TH1	ED321390	Thermister 41D26	45-5-5
2-VR1,2	EV306737	Semi-fixed/Vol. V10K8-1-2 50 kΩ	36-10-255
2-VR3to5	EV300921	Semi-fixed/Vol. V10K8-1-2 1 kΩ	36-10-255
2-C4	EC308940	NP/C. 0.47μF(M) 50WV	24-17-31
2-C7	EC313570	Aluminum Elect./C. (Vert.) 4.7μF(M) 25WV	24-19-2
2-R13	ER311667	Carbon/R. F 1/4W 1k(J)	35-11-25
2-R16	ER313292	Carbon/R. F 1/4 WS 180 ohms(J)	35-11-25
2-R22	ER313292	Carbon/R. F 1/4 WS 180 ohms(J)	35-11-25
2-R23to25	ER307196	Carbon/R. F 1/4W 100 ohms(J)	35-11-25
2-R26,27	ER308872	Carbon/R. F 1/4W 4.7 ohms(J)	35-11-25
2-R28,29	ER308873	Carbon/R. F 1/4W 150 ohms(J)	35-11-25
2-R30to33	ER622978	Metal Plate/R. MPC71F1 5W 0.47 ohm (K)	35-16-48
2-R46,47	ER313751	Metaloxide Film/R. 2W 6.8k(J)	35-15-18
2-2	ZS325495	Tapping Screw, #2 3x6(BR)	

3. MAIN AMP P.C BOARD (R) (M3-8542A)

BLOCK

Symbol No.	Parts No.	Description	Schematic No.
3-1	BA311577	Main Amp P.C Board (R) Comp. AM-2950	M3-8542A
3-TR1	ET308866	Transistor 2SA979(G)(H)	45-1-324
3-TR2	ET313560	Transistor 2SC2291(G)(H)	45-1-337
3-TR3	ET311845	Transistor 2SA899(B)(V)	45-1-341
3-TR4	ET312485	Transistor 2SC2229(O)(Y)	45-1-349
		AKAI	
3-TR5	ET311865	Transistor 2SC1904(B)(V)	45-1-342
3-TR7	ET311790	Transistor 2SC2238(O)(Y)	45-1-339
3-TR8	ET311791	Transistor 2SA968(O)(Y)	45-1-338
3-TR13	ET308937	Transistor 2SC2130(G)(H)	45-1-317
3-TR14	ET557965	Transistor 2SA733(Q)(R)	45-1-124
3-TR15	ET308937	Transistor 2SC2130(G)(H)	45-1-317
3-TR16	ET666404	Transistor 2SD571(K)(L)	45-1-218
3-TR17,18	ET308937	Transistor 2SC2130(G)(H)	45-1-317
3-TR20,21	ET308937	Transistor 2SC2130(G)(H)	45-1-317
3-TR23	ET305463	Transistor 2SA970 (GR)(BL)	45-1-303
3-D1to3	ED624903	Silicon Diode 1S2473	45-3-28
3-D4,5	ED214457	Silicon Diode 1S2472	45-3-41
3-D6to9	ED313566	Silicon Diode GP-25G	45-2-91
3-D10to12	ED214457	Silicon Diode 1S2472	45-3-41
3-D13to16	ED570273	Silicon Diode 1N4004	45-2-59
3-D17,18	ED244732	Zener Diode RD24E(B)	45-6-72
3-L1	ED551711	Phase Compensation Coil 2.2μH(±30%)	23-1-188
3-TH1	ED321390	Thermister 41D26	45-5-5
3-VR1,2	EV306737	Semi-fixed/Vol. V10K8-1-2 50 kΩ	36-10-255
3-VR3	EV300921	Semi-fixed/Vol. V10K8-1-2 1 kΩ	36-10-255
3-RL1	EP313565	Relay MS4U 48V DC	47-1-39
3-C4	EC308940	NP/C. 0.47μF(M) 50WV	24-17-31
3-C7	EC313570	Aluminum Elect./C. (Vert.) 4.7μF(M) 25WV	24-19-2
3-C20	EC662128	Solid Aluminum/C. (Vert.) 2.2μF(M) 25WV	24-19-2
3-R13	ER311667	Carbon/R. F 1/4W 1k(J)	35-11-25
3-R16	ER313292	Carbon/R. F 1/4 WS 180 ohms(J)	35-11-25
3-R22	ER313292	Carbon/R. F 1/4 WS 180 ohms(J)	35-11-25
3-R23to25	ER307196	Carbon/R. F 1/4W 100 ohms(J)	35-11-25
3-R26,27	ER308872	Carbon/R. F 1/4W 4.7 ohms(J)	35-11-25
3-R28,29	ER308873	Carbon/R. F 1/4W 150 ohms(J)	35-11-25
3-R30to33	ER622978	Metal Plate/R. MPC71F1 5W 0.47 ohms(K)	35-16-48
3-R42,43	ER658034	Metal Oxide Film/R. 2W 220 ohms(J)	35-15-18
3-R52	ER313791	Metal Oxide Film/R. 1W 680 ohms(J)	35-15-17
3-R53	ER313575	Carbon/R. F 1/4W 4.7k(J)	35-11-25
3-R61	ER311669	Carbon/R. F 1/4W 3.3k(J)	35-11-25
3-R63	ER313296	Carbon/R. F 1/4W 10k(J)	35-11-25
3-R66	ER311669	Carbon/R. F 1/4W 3.3k(J)	35-11-25
3-R68	ER313296	Carbon/R. F 1/4W 10k(J)	35-11-25
3-2	ZS325495	Tapping Screw, #2 3x6(BR)	

When ordering parts, please describe Parts Number, Description, and Model Number in detail.

4. TONE CONTROL P.C BOARD (M3-9514)

BLOCK

Symbol No.	Parts No.	Description	Schematic No.
4-1	BA311565	Tone Control P.C Board Comp. AM-2950	M3-9514
4-TR1to3	ET307195	Transistor 2SC2240 (GR)(BL)	45-1-302
4-TR4to6	ET459810	Transistor 2SC1222(E)(F)	45-1-110
4-L1	EO313582	Inductor RX-9P 39MH(K)	23-1-275
4-L2	EO313583	Inductor RX-9P 15MH(K)	23-1-275
4-VR1to5	EV313562	Single-Axial 2-Throw/Vol. GM70E 50k (Special w)×2	36-22-42
4-SW1	ES313563	Lever SW. SLR-542	25-12-57
4-SW2,3	ES313282	Lever SW. SLR-523	25-12-56
4-C1	EC675178	Solid Aluminum/C. (Vert.) 0.47μF(K) 25WV	24-19-2
4-C12	EC313744	Solid Aluminum/C. (Vert.) 2.2μF(K) 25WV	24-19-2
4-C16	EC675178	Solid Aluminum/C. (Vert.) 0.47μF(K) 25WV	24-19-2
4-C20	EC662308	Solid Aluminum/C. (Vert.) 0.15μF(K) 25WV	24-19-2
4-R31	ER663625	Carbon/R. F 1/4W 1k(J)	35-11-12

5. EQ P.C BOARD (M3-8539A) BLOCK

Symbol No.	Parts No.	Description	Schematic No.
5-IC1	E1305696	IC LA3133	45-8-270
5-SW1	ES313707	Rotary SW. SR26 (PH-2) N2-6-4 20kC	25-6-169
5-SW2	ES310170	Slide SW. 23460	25-3-158
5-J1,2	EJ293376	6P PIN Jack	31-1-198
5-C11	EC522167	Solid Aluminum/C. (Vert.) 0.22μF(M) 25WV	24-19-2
5-R10	ER313571	Carbon/R. F 1/4W 6.2k(J)	35-11-25

6. TAPE P.C BOARD (M3-8539B) BLOCK

Symbol No.	Parts No.	Description	Schematic No.
6-SW3	ES313708	Rotary SW. SR26 (PH-2) N2-4-5 20kC	25-6-168
6-J3,4	EJ293365	4P PIN Jack	31-1-197
6-J5	EJ698051	DIN Jack	31-1-158

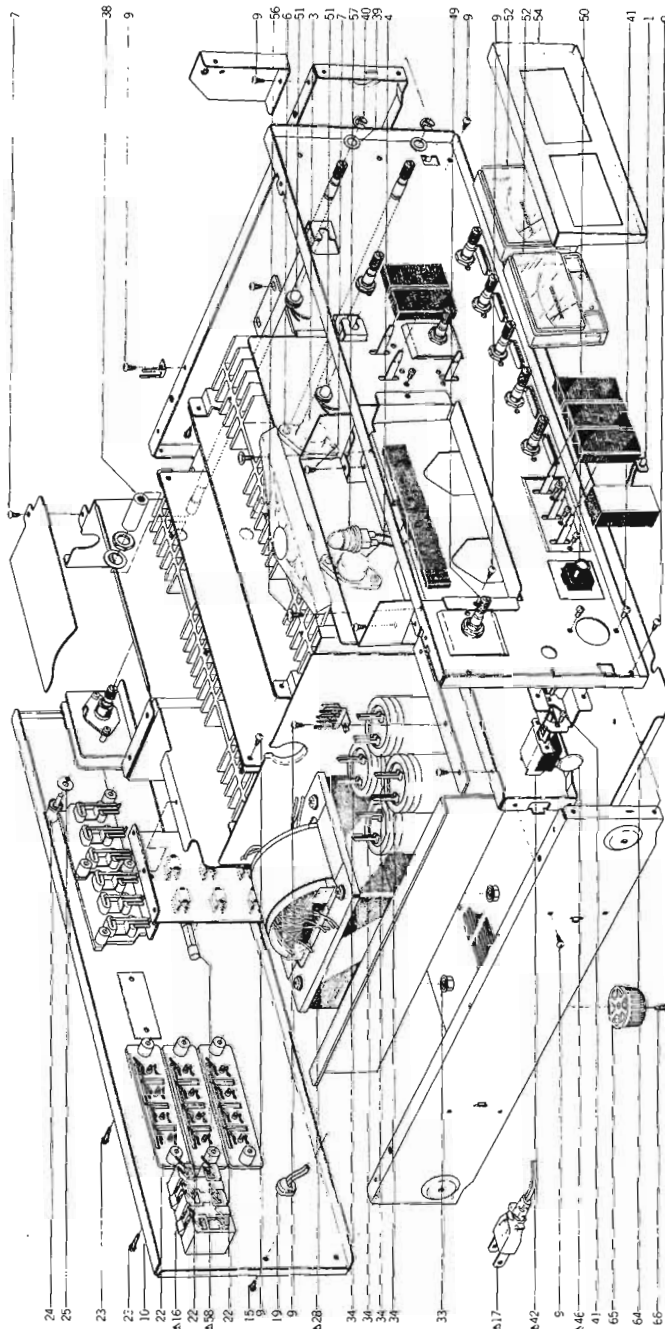
7. VOL. P.C BOARD (M3-9513A) BLOCK

Symbol No.	Parts No.	Description	Schematic No.
7-VR2	EV307188	Single-Axial 2-Throw/Vol. GM80E -250k B×2	36-22-35
7-SW1	ES313297	Lever SW. SLR-823	25-12-55
7-SW3	ES313709	Lever SW. SLR-822	25-12-54

8. BALANCE P.C BOARD (M3-9513B) BLOCK

Symbol No.	Parts No.	Description	Schematic No.
8-VR1	EV307189	Single-Axial 2-Throw/Vol. GM70E -250k MN	36-22-36
8-SW2	ES313283	Lever SW. SLR-543	25-12-58

9. ASSEMBLY BLOCK

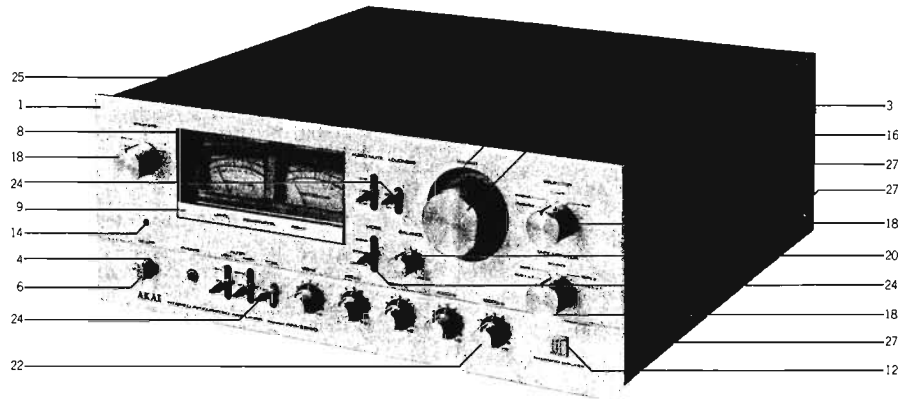


9. ASSEMBLY BLOCK

Ref. No.	Parts No.	Description	Schematic No.	Ref. No.	Parts No.	Description	Schematic No.
		LED P.C BOARD BLOCK		9-48x	EC301320	△ MP/C. 4700PF(M) 250WV (CEE,UK)	24-9-122
9-1	ED308592	LED SY-405D	45-15-20	9-49	ES313738	Rotary SW. SR321N 1-2-7 30 kC	25-7-52
		TEMP. COMPENSATION BLOCK		9-50	EJ301199	Headphone jack 3P64M	31-2-83
9-2x	ET635218	Transistor 2SC945L (K)(P)(Q)(R)	45-1-85	9-51	EL313557	Lamp (Cord Type) 8V 50mA (750mm×2)	28-2-74
		HEAT SINK BLOCK		9-52	EM313280	Watt Meter S11ADR80A	46-1-224
9-3	ET311846	Transistor 2SD551(O)(R) AKAI	45-1-343	9-53x	EM313281	Watt Meter S11ADR80B(BL)	46-1-225
9-4	ET311847	Transistor 2SB681(O)(R) AKAI	45-1-344	9-54	ML313665	Meter Plate	M3-8530
9-5x	EJ624486	Power Transistor Socket	31-1-97	9-55x	ML313666	Meter Plate (BL)	M3-8530
9-6	ZS593201	Screw, pan head 3x16		9-56	ZS462194	Tapping Screw, #2 pan 3x8 (W=8)	
9-7	ZS447840	Tapping Screw #2 3x8 (BR)		9-57	EL308840	Lamp (Cord Type) 8V 300mA (600mm×2)	28-2-71
9-8x	ZS302024	Tapping Screw #2, 3x8 (Pan) W=10		9-58	EF313584	△ Fuse 10A 250V (U/T)	39-1-50
9-9	ZS325495	Tapping Screw, #2, 3x6 (BR)		9-59x	EF277402	△ Fuse ST-6 1A (CSA,AAL)	39-1-63
		ASSEMBLY BLOCK		9-60x	EF303348	△ Fuse ST-6 6.3A (CSA,AAL)	39-1-63
9-10	SP313764	Rear Panel (U-2)(U/T)	M3-9510	9-61x	EF303349	△ Fuse ST-6 8A (CSA,AAL)	39-1-63
9-11x	SP313766	Rear Panel (C-2)(CSA)	M3-9511	9-62x	EF623103	△ Fuse (SEMKO T Type) 1AT (CEE,UK)	39-1-53
9-12x	SP313765	Rear Panel (A-2)(AAL)	M3-9511	9-63x	EF242605	△ Fuse (SEMKO T Type) 6.3AT (CEE,UK)	39-1-53
9-13x	SP313767	Rear Panel (E-2)(CEE)	M3-9512			FINAL ASSEMBLY BLOCK	
9-14x	SP313768	Rear Panel (B-2)(UK)	M3-9512	9-64	SP313668	Bottom Plate	M3-8532
9-15	ZS447761	Tapping Screw, #2, 3x6 (BR) (Black)		9-65	SA312465	Circular Foot (A) Part CA	CA-6014
9-16	EJ240535	△ 3-Throw AC Outlet (U/T,CSA,AAL)	31-1-173	9-66	ZS565942	Tapping Screw #2 4x8 (Pan)	
9-17	EW306428	△ AC Cord (U/T)	26-3-64				
9-18x	EW305691	△ AC Cord CUL (CSA,AAL)	26-3-65				
9-19	EZ631945	Strain Relief SR-4N-4 (U/T,CSA,AAL)	2-7-49				
9-20x	EJ296853	△ 3P In-let CM-3 (CEE,UK)	31-1-199				
9-21x	ZS463353	Tapping Screw #2, 3x8 (BR) (Black)					
9-22	EJ313559	Speaker Terminal	32-1-103				
9-23	ZS522865	Tapping Screw #2, 3x12(BR) (Black)					
9-24	EJ306940	Earth Terminal	32-1-87				
9-25	ZW651082	Washer (SPC) D3.2x10x1t					
9-26x	ZS201767	Screw, pan 4x6, w/washer					
9-27x	ZW413188	Nut M4, #1					
9-28	BT313278	△ Power Trans. AM-2950T-70 (U/T)	38-4-704				
9-29x	BT313274	△ Power Trans. AM-2950T-30 (CSA)	38-4-701				
9-30x	BT313273	△ Power Trans. AM-2950T-20 (AAL)	38-4-700				
9-31x	BT313275	△ Power Trans. AM-2950T-40 (CEE)	38-4-702				
9-32x	BT313276	△ Power Trans. AM-2950T-50 (UK)	38-4-703				
9-33	ZW413267	Flange Nut M4					
9-34	EC313279	Elect./C. 6800µF 63WV	24-10-133				
9-35x	ZS608185	Screw, pan 2.6x4					
9-36x	ZW698308	Nylon Rivet (FNRP) 3x5.5 (Black)	2-7-54				
9-37x	EJ554578	Short Plug	42-1-66				
9-38	TA646773	Joint	AA-5240				
9-39	ZW322110	Washer (Nylon) D6.1x10x1t					
9-40	ZW270123	'E' Ring 4M	6-1-9				
9-41	ZS379350	Screw, pan 3x6					
9-42	ES224436	△ Push SW. (U/T)	25-5-221				
9-43x	ES280258	△ Push SW. SDV1P TV-5 (w/label) (AAL)	25-5-243				
9-44x	ES315801	△ Push SW. ESB-9933A Z-33 TV-10 (CSA)	25-5-345				
9-45x	ES296796	△ Push SW. SDV3P 5A/80A (CEE,UK)	25-5-255				
9-46	EC204671	△ Ceramic/C. DD31-6E 0.01µF(P) 500WV (U/T)	24-5-66				
9-47x	EC286198	△ Ceramic/C. AL-10 0.01µF (Z) 125WV (AAL, CSA)	24-5-69				

When ordering parts, please describe Parts Number, Description, and Model Number in detail.

10. FINAL ASSEMBLY BLOCK



10. FINAL ASSEMBLY BLOCK

Ref. No.	Parts No.	Description	Schematic No.
FRONT PANEL BLOCK			
10-1	BD311585	Front Panel Block Comp. AM-2950	M3-9517
10-2x	BD311586	Front Panel Block Comp. AM-2950-BL	M3-9517
10-3	TA313632	Vol. Illumination Plate	M3-8503, 85
10-4	SE306863	Button Escutcheon	M3-2522
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10-6	SK306864	Push Button	M3-2523
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10-8	ZS313633	Meter Plate	M3-8505
10-9	SM313634	Meter Name Plate	M3-8506
10-10x	SM313635	Meter Name Plate (BL)	M3-8506
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10-15x	ZS447840	Tapping Screw #2, 3x8 (BR)	
10-16	SK308562	Vol. Knob	M3-4530
10-17x	SK308563	Vol. Knob (BL)	M3-4530
10-18	SK308567	Knob (B)	M3-4532
10-19x	SK308568	Knob (B-BL)	M3-4532
10-20	SK313758	Knob (A)	M3-9508
10-21x	SK313759	Knob (A-BL)	M3-9508
10-22	SK313760	Knob (B)	M3-9509
10-23x	SK313761	Knob (B-BL)	M3-9509
10-24	SK310130	Lever Knob	M3-6515
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10-26x	BC313670	Upper Plate (AAL)	M3-8533
10-27	ZS537006	Screw, bind 4x8 (Black)	
10-28x	ZS447761	Tapping Screw, #2, 3x6 (BR) (Black)	
10-29x	ZW305013	Pop Rivet D3.2	7-6-9

When ordering parts, please describe Parts Number, Description, and Model Number in detail.

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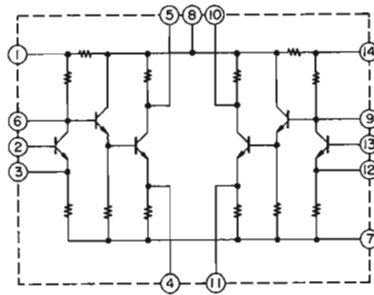
Parts No.	Ref. No. & Symbol No.	Parts No.	Ref. No. & Symbol No.	Parts No.	Ref. No. & Symbol No.	Parts No.	Ref. No. & Symbol No.	Parts No.	Ref. No. & Symbol No.
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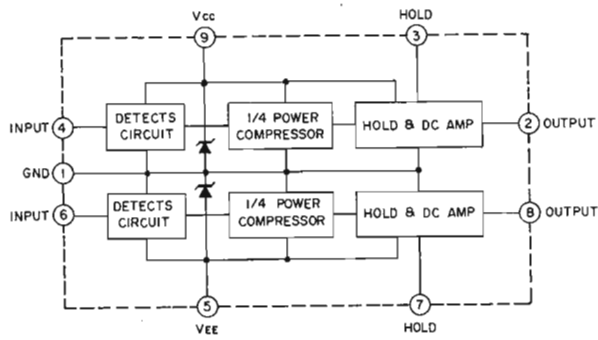
SCHEMATIC DIAGRAM

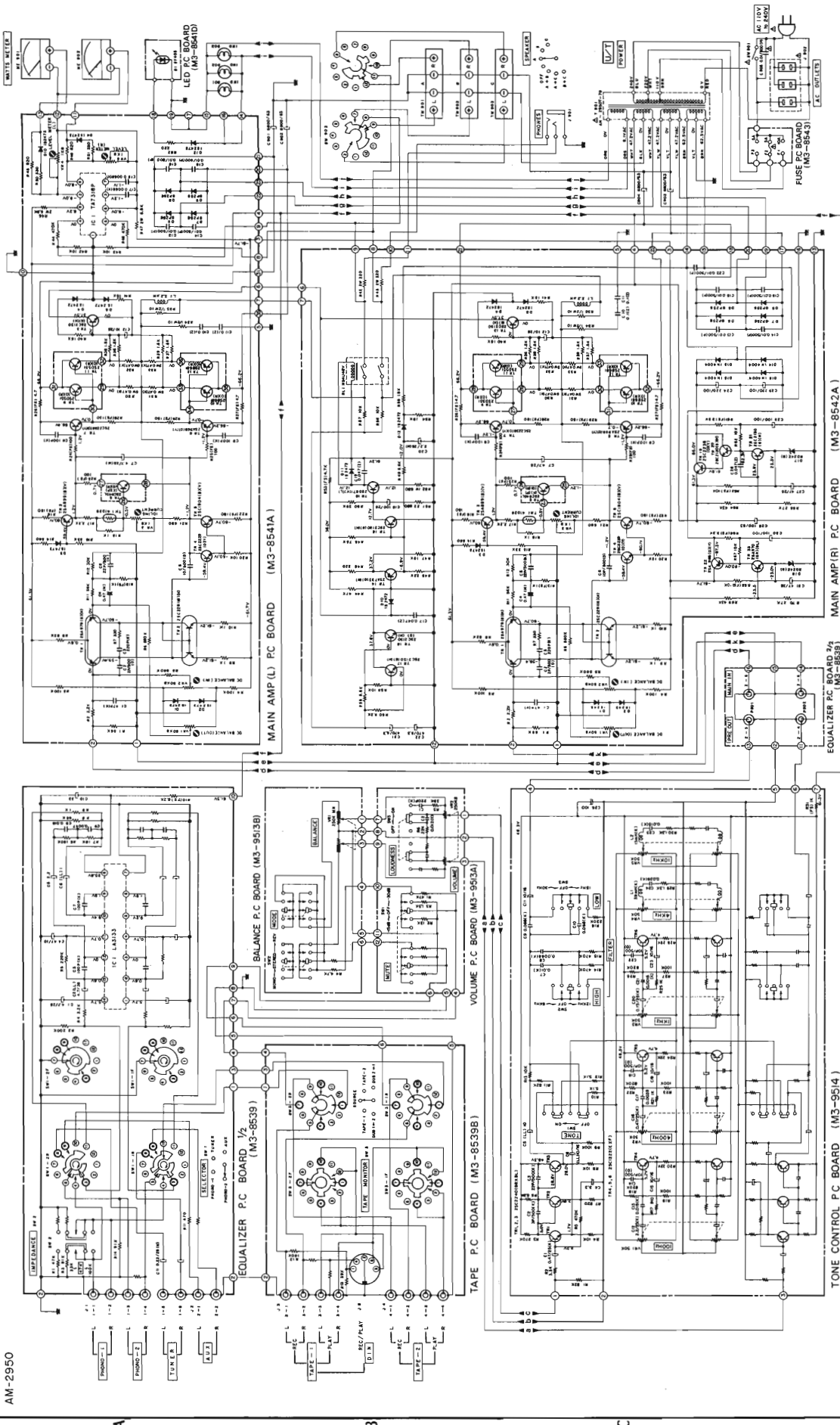
AM-2950 NO. 1580862A SCHEMATIC DIAGRAM

LA-3133



TA-7318P





WARNING: INDICATES SAFETY-CRITICAL COMPONENTS FOR OBTAINED SAFETY. REPAIRS MUST BE MADE BY QUALIFIED PERSONNEL ONLY WITH MANUFACTURER'S APPROVED PARTS. ALL UNLabeled COMPONENTS OBTAINED BY OTHER SOURCES ARE NOT WARRANTED BY THE MANUFACTURER. FOR FULL SAFETY INFORMATION, SEE THE USER MANUAL.

NOTE

1. UNLabeled COMPONENTS SPECIFIED
2. ALL CAPACITORS IN OHM (Ω) (M) (U)
3. ALL CAPACITORS IN μF (50V) (J)
4. * MARK INDICATES NON-POLAR CAPACITORS
5. POWER TRANSFORMER IS DIFFERENT ACCORDING TO AREA

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