

**Sansui®**

SANSUI ELECTRIC COMPANY LIMITED

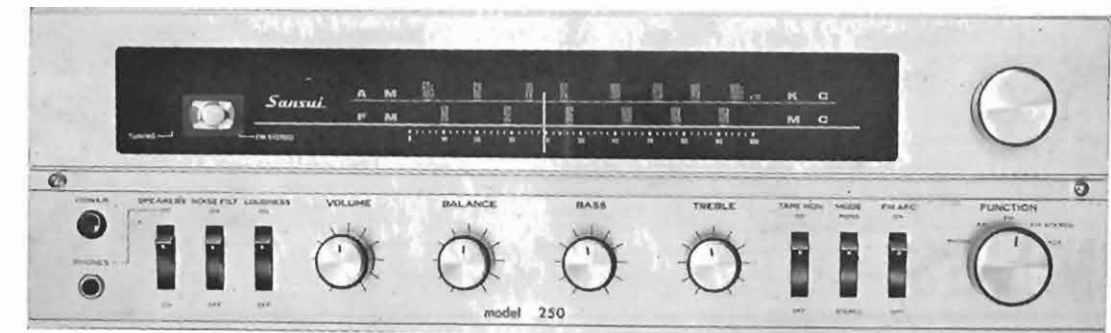
Head Office; 14-1, 2-chome, Izumi, Suginami-ku, Tokyo, Japan. TEL. 328-0111

Printed in Japan (47050M2)

# SERVICE MANUAL

AM/FM MULTIPLEX STEREO TUNER AMPLIFIER

## SANSUI MODEL 250



**Sansui®**

SANSUI ELECTRIC COMPANY LIMITED

## CONTENTS

---

TROUBLESHOOTING AUDIO SYSTEM .....	3, 4
AMPLIFIER TROUBLESHOOTING CHART..	5, 6, 7, 8, 9, 10, 11, 12
REMOVING THE FRONT PANEL, BONNET & BOTTOM PLATE .....	13
DIAL MECHANISM.....	13
PARTS LAYOUT .....	14
SCHEMATIC DIAGRAM .....	15, 16
BLOCK DIAGRAM .....	17
CHASSIS DIAGRAM .....	18
PRINTED-CIRCUIT SHEETS .....	19
SELECTOR CHART .....	20
ALIGNMENT .....	21, 22, 23, 24
PARTS LIST.....	25, 26, 27, 28
COLOR CODE.....	29

# COLOR CODE

The color code indicates 10 different colors by the help of the figures of 1 to 9. This code agrees with IEC and JIS.

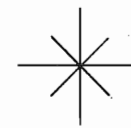
Color	Common to All Parts			Fixed Resistor Allowance (%)	Mica Capacitor				Paper Capacitor		Ceramic Capacity														
	1st Figure	2nd Figure	Multiplier		Grade	Property	Allowance (%)	Rated Voltage (V)	Allowance (%)	Rated Voltage (V)	Grade	Property	Allowance (%)	Rated Voltage (V)											
black	0	0	1	±2	X	A	±20(M)	300	±20(M)	100	X	±20	500												
brown	1	1	10 <sup>1</sup> (10)		Y	B	±5(J)		±5(J)	200	Z			250											
red	2	2	10 <sup>2</sup> (K)		Y	C	±2(G)		±2(G)	250	Z			250											
orange	3	3	10 <sup>3</sup>		Y	D	±5(J)		500	±15(L)	400			Z	±100	500									
yellow	4	4	10 <sup>4</sup>		Y	E											±5(J)	±5(J)	400	Z	±100	500			
green	5	5	10 <sup>5</sup> (M)		Y	F											±5(J)	±5(J)	400						
blue	6	6	10 <sup>6</sup>		Z	Z	±5(J)		500	±40(X)	600			(Y)	±100	500									
purple	7	7	10 <sup>7</sup>														Z	Z	±5(J)	500	±10(Y)	600	(Y)	±100	500
grey	8	8	10 <sup>8</sup>																						
white	9	9	10 <sup>9</sup>		Z	Z	±5(J)		500	±10(Y)	600			(Y)	±100	500									
golden			10 <sup>-1</sup> (0.1)	Z				Z				±5(J)	500				±10(Y)	600	(Y)	±100	500				
silver			10 <sup>-2</sup> (0.01)		Z	Z	±5(J)		500	±10(Y)	600			(Y)	±100	500									
non-colored				Z				Z				±20													

Note	<p>Carbon Resistor</p> <p>*Net Marked</p> <p>1st Figure</p> <p>2nd Figure</p> <p>Multiplier</p> <p>Allowance</p> <p>Ω</p>	<p>1st Figure</p> <p>2nd Figure</p> <p>3rd Figure</p> <p>PF</p> <p>Grade</p> <p>Property</p> <p>Allowance</p>	<p>1st Figure</p> <p>2nd Figure</p> <p>Multiplier</p> <p>Allowance</p> <p>Rated Voltage</p>	<p>Property</p> <p>1st Figure</p> <p>2nd Figure</p> <p>Multiplier</p> <p>Allowance</p> <p>Rated Voltage</p> <p>Grade</p>
	*Solid resistor is Marked from here.			

# SANSUI

## AM/FM MULTIPLEX STEREO TUNER AMPLIFIER



## MODEL 250

### HOW TO USE THIS SERVICE MANUAL

- Step 1 What type or nature of the trouble you are confronted with? Look it up in the troubleshooting charts in this service manual.
- Step 2 Isolate the trouble to a particular unit or part by referring to the charts.
- Step 3 Pinpoint the position of the part by means of the circuit diagram and the co-ordinates listed in the parts list.
- Step 4 In the same way, by referring to the chassis diagram and the co-ordinates listed in the parts list, you can easily find out in what part of chassis the part is located.

Property	Temperature Coefficient	Divergence of Capacity	Q tanδ	Insulation Resistance	Grade	Usable Temperature Range	Test Classification	Letter	Allowance
A	Not specified	Not specified	0.5 under 0.5 over	3000MΩ under 7500MΩ over but 0.1 over 3000MΩ over	X	-55~+85	I or II	G	±2
B	Not specified	Not specified			Y	-30~+85	I or II	T	±5
C	-20~+200	±(0.5%+0.5pF)			Z	-30~+85	I	K	±10
D	-100~+100	±(0.3%+0.1pF)						M	±20
E	-20~+100	±(0.1%+0.1pF)							
F	0~+70	±(0.05%±0.1pF)							

# TROUBLESHOOTING AUDIO SYSTEM

If the amplifier is operating satisfactorily, the trouble may be attributed to the following:

1. Incorrect connections or loose terminal contact. Check the speakers, record player, tape recorder antenna and line cord.
2. Incorrect or improper operation. Before operating the audio equipments, be sure to look up the

manufacturer's instructions.

3. Improper location of audio equipments. The proper positioning of the audio equipments, such as speakers and record player, is vital to stereo.
4. Defective audio equipment or equipments.
5. The next step to do is listed below:

Program	Symptom	Probable Cause	What to Do
AM, FM or MPX reception	A. Constant or intermittent noise heard at times or in a certain area	<ul style="list-style-type: none"> <li>* Discharge or oscillation caused by electrical appliances, such as fluorescent lamp, TV set, d.c. motor, rectifier and oscillator</li> <li>* Natural phenomena, such as atmospherics, statics, strays and thunderbolt</li> <li>* Insufficient antenna input due to thick reinforced concrete wall of a building or long distance from the station</li> <li>* Wave interference from other electrical appliances</li> </ul>	<ul style="list-style-type: none"> <li>* Attach a noise limiter to the electrical appliance that causes the noise, or attach it to the power source of the amplifier</li> <li>* Install an outdoor antenna and ground the amplifier to raise the signal-to-noise ratio</li> <li>* Reverse the power cord plug-receptacle connections</li> <li>* If the noise occurs at a certain frequency, attach a wave trap to the ANT. input</li> <li>* Keep the set in proper distance from other electrical appliances</li> </ul>
	B. Magic eye pattern does not close well.	Closing of magic eye pattern is one thing, the sensitivity of the amplifier is another	Tune the set for maximum signal strength
AM reception	A. Noise heard at a particular time of a day, in a certain area or over part of dial	This results from the nature of AM broadcast	<ul style="list-style-type: none"> <li>* Install the antenna for maximum antenna efficiency. See the section "ANTENNA" in the operating instructions</li> <li>* In some cases, the noise can be eliminated by grounding the amplifier or reversing the power cord plug-receptacle connections</li> </ul>
	B. High-frequency noise	<ol style="list-style-type: none"> <li>1. Adjacent-channel interference or beat interference</li> <li>2. TV set too close to the audio system</li> </ol>	<ul style="list-style-type: none"> <li>* Although such noise cannot be eliminated by the amplifier, it is advisable to turn the TREBLE control properly from midpoint to left and switch on the HIGH FILTER</li> <li>* Keep the TV set in proper distance from the audio system</li> </ul>
FM reception	A. Noisy	<ol style="list-style-type: none"> <li>1. Poor noise limiter effect or too low S/N ratio due to insufficient antenna input</li> </ol> <p>Note: FM reception is affected considerably by the conditions of transmission by stations: power and antenna efficiency. As a result, you may receive one station quite well while having difficulty in receiving another station.</p>	<ul style="list-style-type: none"> <li>* Install the antenna (attached) for maximum signal strength</li> <li>* If this does not prove effective, use an outdoor antenna designed exclusively for FM. When you use a TV antenna for both TV and FM with the help of a divider, make sure the TV reception is not affected</li> <li>* Excessive long antenna may rather cause a noise</li> </ul>

A	B	C	D	A	B	C	D
V2	6BA6 (EF93) (FM, AM IF amp)	1B	2D	T9	38KC coil	3B	MPX
V3	6BA6 (EF93) (FM IF amp)	1B	2D	T10	Power transformer	2C	3A
V4	6BA6 (EF93) (FM IF limiter)	1C	2C	T11	Output transformer	4C	(3C)
V5	6BE6 (EK90) (AM convertor)	2A	1E	T12	Output transformer	5C	(3F)
V6	6AQ8 (ECC85) (MPX amp & indicator amp)	3A	MPX	JAC-1	Head phone jack	4, 5C	1A
V7	6BL8 (ECF80) (19KC amp & doubler)	3A	MPX	PV-1	Power selector for 100V/117V/220V/240V	2C	3B
V8	6BN8 (Dual, out & switching circuit)	3B, C	MPX	PL	Pilot lamp 6.3V 0.3A Fuse type	2C	
V9	6BN8 (Dual, out & switching circuit)	3B, C	MPX	F	Fuse 3A	2C	(4B)
V10	12AX7 (ECC83) (Pre amp)	4, 5A	1D	CO-1	AC, Receptacles	2C	4A
V11	6AQ8 (ECC85) (Audio amp)	4, 5B	4D	PS-1	Power switch	2C	1A
V12	6BM8 (ECL82) (Phase splitter & power amp)	4C	3D	S1(a-g)	Function selector		1F
V13	6BM8 (ECL82) (Phase splitter & power amp)	4C	4D	S2	FM. AFC switch	1A	1E
V14	6BM8 (ECL82) (Phase splitter & power amp)	5C	3E	S3	Mode switch	5A, B	1E
V15	6BM8 (ECL82) (Phase splitter & power amp)	5C	4E	S4	Tape monitor switch	4, 5B	1E
V16	6GE-12A (Magic eye. Tuning indicator & stereo indicator)	2B	(2B)	S5	Loudness switch	4, 5B	1B
TR diode	Transistor 2SC-402 (650) Ge, diode OA-91. $V_D=50mA -55^{\circ}C\sim 75^{\circ}D$	4, 5A	TRHP	S6	Noise filter switch	4, 5B	1B
diode	Si, diode SE-0.5 AC (rms) $V_D=180V$ $I_D=500mA -65^{\circ}C\sim 75^{\circ}C$	1B	2D	S7	Speaker switch	4, 5C	1A
diode	Si, diode SE-05-03 AC (rms) $V_D=30V$ $I_D=500mA -65^{\circ}C\sim 75^{\circ}C$	1C	2B				
diode	Si, diode SE-05-03 AC (rms) $V_D=30V$ $I_D=500mA -65^{\circ}C\sim 75^{\circ}C$	2B	1B				
diode	Si, diode IS-180 (SH-1) AC (rms)=50V $I_D=50mA -55^{\circ}\sim 75^{\circ}C$	2C	2A				
diode	Si, diode IS-180 (SH-1) AC (rms)=50V $I_D=50mA -55^{\circ}\sim 75^{\circ}C$	2C	3A				
diode	Riactance diode IS-351 (FM-AFC)	3D	MPX				
L1	FM ANT coil	1A	FAP				
L2	FM RF coil	1A	FAP				
L3	FM RF coil	1A	FAP				
L4	FM oscillator coil	1A	FAP				
L5	MW loop stick antenna coil	2A					
L6	MW oscillator coil	2A	2F				
L7	Heater choke	2C	2E				
L8	19KC trap 50mH	3A	MPX				
L9	67KC filter 50mH	3A	MPX				
L10	38KC trap 39mH	3C	MPX				
L11	38KC trap 39mH	3C	MPX				
T1	1st FM. I.F.T 10.7Mc/s	1B	FAP				
T2	2nd FM. I.F.T 10.7Mc/s	1B	2D				
T3	2nd AM. I.F.T 455Kc/s	1B	2D				
T4	1st AM. I.F.T 455Kc/s	2B	1E				
T5	3rd FM. I.F.T 10.7Mc/s	1B	2C				
T6	FM Discriminator	1C	C2				
T7	19KC coil	3A	MPX				
T8	38KC Dubler coil	3B	MPX				

# PARTS LIST

**A:** Part No.  
**B:** Part Name  
**C:** Co-ordinates in Schematic Diagram  
**D:** Co-ordinates in Chassis Diagram  
 MPX: MPX SECTION Stereo Indicator Sheet; TRHP: Equalizer Amp. Sheet; Parts located on the top surface are parenthesized.

A	B	C	D	A	B	C	D
C55	5000 pF 250WV 10% Mica tubular	3A	MPX	C103	0.01 μF 50WV 10% Mylar tubular	4B	1D
C56	5000 pF 250WV 10% Mica tubular	3A	MPX	C104	0.01 μF 50WV 10% Mylar tubular	5B	1D
C57	30 μF 6WV electrolytic tubular	3A	MPX	C105	0.001 μF 50WV 10% Mylar tubular	4B	1B
C58	0.01 μF 250WV $\frac{+100}{0}$ Ceramic tubular	3B	MPX	C106	0.001 μF 50WV 10% Mylar tubular	5B	1B
C59	0.001 μF 250WV 10% Ceramic tubular	3B	MPX	C107	150 pF 250WV 10% Ceramic tubular	4B	1B
C60	5000 pF 250WV 10% Mica tubular	3B	MPX	C108	150 pF 250WV 10% Ceramic tubular	5B	1B
C61	3000 pF 250WV 10% Mica tubular	3B	MPX	C109	0.005 μF 50WV 10% Mylar tubular	4B	1A
C62	0.001 μF Enclosed in CR-3	3B	MPX	C110	0.005 μF 50WV 10% Mylar tubular	5B	1A
C63	0.001 μF Enclosed in CR-3	3B	MPX	C111	30 μF 6WV electrolytic tubular	4B	3D
C64	0.001 μF Enclosed in CR-3	3B	MPX	C112	30 μF 6WV electrolytic tubular	5B	4D
C65	0.001 μF Enclosed in CR-3	3B	MPX	C113	20 μF 300WV electrolytic lug terminal	5B	2B
C66	100 pF 250WV 10% Ceramic tubular	3B	MPX	C114	250 pF 250WV 10% Mica tubular	4B	3D
C67	0.003 μF 250WV 10% Ceramic tubular	3B	MPX	C115	250 pF 250WV 10% Mica tubular	5B	4D
C68	0.003 μF 250WV 10% Ceramic tubular	3C	MPX	C116	20 μF 300WV electrolytic lug terminal	5B	2B
C69	100 pF 250WV 10% Ceramic tubular	3C	MPX	C117	0.1 μF 400WV 10% Oil tubular	4B	4D
C70	0.005 μF 250WV 10% Ceramic tubular	3C	MPX	C118	0.1 μF 400WV 10% Oil tubular	5B	4E
C71	0.005 μF 250WV 10% Ceramic tubular	3C	MPX	C119	0.3 μF 250WV 10% Oil tubular	4C	3C
C72	450 pF 250WV 10% Ceramic tubular	3C	MPX	C120	0.3 μF 250WV 10% Oil tubular	4C	4D
C73	450 pF 250WV 10% Ceramic tubular	3C	MPX	C121	0.3 μF 250WV 10% Oil tubular	5C	3E
C74	0.003 μF 250WV 10% Ceramic tubular	3C	MPX	C122	0.3 μF 250WV 10% Oil tubular	5C	4E
C75	0.003 μF 250WV 10% Ceramic tubular	3C	MPX	C123	20 μF 300WV electrolytic lug terminal	5C	5B
C76	40 μF 300WV electrolytic tubular	3B	3C	C124	20 μF 300WV electrolytic lug terminal	5C	2B
C77	40 μF 300WV electrolytic tubular	3B	3C	VR-1	20K(B) Variable resistor (FM-stereo indicator)	2B	2B
C78	5 μF 6WV electrolytic tubular	4A	TRHP	VR-2	20K(B) Variable resistor (Bias control)	2B	4F
C79	5 μF 6WV electrolytic tubular	5A	TRHP	VR-3	20K(B) Variable resistor (Bias control)	2B	4F
C80	200 pF 250WV 10% Ceramic tubular	4A	TRHP	VR-4	100 Ω Variable resistor (Hum balancer)	2C	3A
C81	200 pF 250WV 10% Ceramic tubular	5A	TRHP	VR-5	100 Ω Variable resistor (Hum balancer)	2C	4C
C82	250 pF 250WV 10% Ceramic tubular	4A	TRHP	VR-6	100K Ω(B) Variable resistor (FM-stereo separation)	3C	4C
C83	250 pF 250WV 10% Ceramic tubular	5A	TRHP	VR-7	1M Ω(N) Variable resistor (Tone control)	4, 5B	1D
C84	0.001 μF 50WV 10% Mylar tubular	4A	TRHP	VR-8	1M Ω(N) Variable resistor (Tone control)	4, 5B	1D
C85	0.001 μF 50WV 10% Mylar tubular	5A	TRHP	VR-9	500K Ω(B) Variable resistor (Volume control)	4, 5B	1B
C86	0.1 μF 50WV 10% Mylar tubular	4A	TRHP	VR-10	500K Ω(BH) Variable resistor (Balance control)	4, 5B	1C
C87	0.1 μF 50WV 10% Mylar tubular	5A	TRHP	VR-11	20K(B) Variable resistor (Bias control)	2B	2E
C88	5 μF 150WV electrolytic tubular	5A	TRHP	VR-12	20K(B) Variable resistor (Bias control)	2B	3E
C89	30 μF 6WV electrolytic tubular	4A	1D	VC-1	6~18pF Variable capacitor (FM. RF tuning)	1A	FAP
C90	30 μF 6WV electrolytic tubular	5A	2D	VC-2	6~18pF Variable capacitor (FM. oscillator)	1A	FAP
C91	0.03 μF 400WV 10% Oil tubular	4B	1D	VC-3	12~430 Variable capacitor (FM. RF tuning)	2A	FAP
C92	0.03 μF 400WV 10% Oil tubular	5B	1D	VC-4	12~430 Variable capacitor (FM. oscillator)	2A	FAP
C93	0.03 μF 400WV 10% Oil tubular	4B	1D	TC-5	15pF trimer condenser	1A	FAP
C94	0.03 μF 400WV 10% Oil tubular	5B	1D	TC-2	15pF trimer condenser	1A	FAP
C95	150 pF 250WV 10% Ceramic tubular	4B	1D	TC-3	25pF trimer condenser	2A	FAP
C96	150 pF 250WV 10% Ceramic tubular	5B	1D	TC-4	25pF trimer condenser	2A	FAP
C97	40 pF 250WV 10% Ceramic tubular	4B	1D	V1	6AQ8 (ECC85) (FM, RF, OSC & Mix)	1A	FAP
C98	40 pF 250WV 10% Ceramic tubular	5B	1D				
C99	0.001 μF 400WV 10% Oil tubular	4B	1D				
C100	0.001 μF 400WV 10% Oil tubular	5B	1D				
C101	0.0025 μF 50WV 10% Mylar tubular	4B	1D				
C102	0.0025 μF 50WV 10% Mylar tubular	5B	1D				

Program	Symptom	Probable Cause	What to Do
(continued)	B. Noise heard like "scratch noise"	1. Ignition noise caused by the starting of an automobile engine	* Install the antenna and its lead-in wire in proper distance from the road or raise the antenna input as described above
	C. Distortion or no sound during the reception	1. Drift of tuning resulted from the nature of FM	* Turn on the FM AFC switch
	D. Tuning noise between stations	This noise results from the nature of the FM reception. As the station signal becomes weak, the noise limiter effect is also decreased. The amplification of the limiter, in turn, is enlarged and thus a big noise is generated.	If the amplifier is equipped with a muting switch, turn it on. Inasmuch as it also reduces the sensitivity, it should be used sparingly.
FM-MPX reception	A. Noise heard during FM-MPX reception while not heard during FM mono reception	1. The service area of the FM-MPX broadcast is only half as much as that of the FM mono broadcast	* Install the antenna for maximum antenna input * Switch on the noise filter and/or turn the TREBLE control properly from midpoint to left
	B. Clearness of channel separation is decreased during the reception	1. Excess heat	* Circulation of air is important to the amplifier. Make sure that air can flow underneath
	C. The stereo indicator goes on and off	1. Interference	* The indicator is not at fault
	D. The stereo indicator goes on and off even though a stereo station is not received	1. Interference	* The indicator is not at fault
Record playing	A. Hum or howling	* Record player placed directly on the speaker box * Use of wire other than shielded wire * Loose terminal contact * Shielded wire too close to the line cord, fluorescent lamp or other electrical appliances * Nearby amateur radio station or TV transmission antenna	* The connecting cord should be as short as possible * Put a cushion between the player and the speaker box or place them separately from each other * Consult the nearest Radio Regulatory Bureau
	B. Distortion	* Worn or old record * Worn pick-up needle * Needle covered with dust * Improper needle pressure	* Turn the TREBLE control properly from midpoint to left * Switch on the HIGH FILTER
Over all stereo programs	The BALANCE control is not at the midpoint when equal sound comes from left and right channels	It is important to adjust the control for equal sound from both channels. It should not be always set to the midpoint	* Set the control to the position where equal sound comes from both channels

# AMPLIFIER TROUBLESHOOTING CHART

## OVER ALL PROGRAM SOURCES

Symptom	Probable Cause	Check Point
No sound over all program sources	A. Defective speaker	1. Broken speaker cord 2. Broken or short-circuited voice coil Check continuity of speaker and cord. Repair broken cord or replace speaker
	B. No power	1. No power comes to the power source 2. Defective on-off switch 3. Defective line cord 4. Loose plug contact 5. Blown fuse If the fuse should be burnt out as soon as it is replaced, the trouble may be attributed to: a. Shorted power transformer; b. Shorted capacitor; c. B circuit open 6. Broken primary winding of power transformer PS-1 F T <sub>10</sub> C <sub>39</sub> , C <sub>40</sub> , C <sub>49</sub> , C <sub>124</sub> Check continuity of B circuit T <sub>10</sub>
	C. Defective power circuit	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" Measure voltage in power circuit and replace defective element. Check R <sub>001</sub> , R <sub>002</sub> and R <sub>003</sub> for disconnection
	D. Defective low-frequency circuit	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Blown heater of tube 3. Capacitor, open or short-circuited Measure voltage in low-frequency circuit and replace defective element V <sub>10</sub> , V <sub>11</sub> , V <sub>12</sub> , V <sub>13</sub> or V <sub>14</sub> , V <sub>15</sub> C <sub>91</sub> , C <sub>93</sub> , C <sub>119</sub> , C <sub>120</sub> or C <sub>92</sub> , C <sub>94</sub> , C <sub>121</sub> , C <sub>122</sub>
Weak sound over all program sources	A. Defective speaker circuit	1. Shorted voice coil Check voice coil for short circuit
	B. Defective power circuit	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" Measure voltage in power circuit and replace defective element
	C. Defective low-frequency circuit	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Shorted output transformer 3. Insufficient capacity or short circuit of capacitor 4. Weak tube Measure voltage in low-frequency circuit and replace defective element T <sub>11</sub> , T <sub>12</sub> C <sub>91</sub> , C <sub>93</sub> , C <sub>119</sub> , C <sub>120</sub> or C <sub>92</sub> , C <sub>94</sub> , C <sub>120</sub> , C <sub>121</sub> V <sub>10</sub> , V <sub>11</sub> , V <sub>12</sub> , V <sub>13</sub> or V <sub>14</sub> , V <sub>15</sub>
Distortion over all program sources	A. Defective speaker	1. Defective voice coil 2. Defective cone or damper Check and replace
	B. Defective power circuit	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" Measure voltage in power circuit and replace defective element
	C. Defective low-frequency circuit	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Aging or weak tube 3. Shorted output transformer Measure voltage in low-frequency circuit and replace defective element V <sub>11</sub> T <sub>11</sub> or T <sub>12</sub>

A	B	C	D	A	B	C	D
R97	100KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1D	C7	15 pF 250WV 10% Ceramic tubular	1A	FAP
R98	82KΩ ¼Watt 10% Carbon Fixed Resistor	4B	1B	C8	100 pF 250WV 10% Ceramic tubular	1A	FAP
R99	82KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1B	C9	5 pF 250WV 10% Ceramic tubular	1A	FAP
R100	33KΩ ¼Watt 10% Carbon Fixed Resistor	4B	1C	C10	0.01 μF 250WV +100%/-0% Ceramic tubular	1B	FAP
R101	33KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1C	C11	30 pF 250WV 10% Ceramic tubular	1B	FAP
R102	2.2KΩ ¼Watt 10% Carbon Fixed Resistor	4B	3D	C12	0.01 μF Enclosed in CR-1	1B	3D
R103	2.2KΩ ¼Watt 10% Carbon Fixed Resistor	5B	4D	C13	20 μF 300WV electrolytic tubular	1B	2E
R104	100Ω ¼Watt 10% Carbon Fixed Resistor	4B	3D	C14	0.01 μF 250WV +100%/-0% Ceramic tubular	1B	2D
R105	100Ω ¼Watt 10% Carbon Fixed Resistor	5B	4D	C15	0.01 μF 250WV +100%/-0% Ceramic tubular	1B	2D
R106	220KΩ ½Watt 10% Carbon Fixed Resistor	4B	3D	C16	100 pF 250WV 10% Ceramic tubular	1B	2D
R107	220KΩ ½Watt 10% Carbon Fixed Resistor	5B	4D	C17	200 pF 250WV 10% Ceramic tubular	1B	2D
R108	15KΩ ¼Watt 10% Carbon Fixed Resistor	4B	3D	C18	0.01 μF Enclosed in CR-1	1B	2D
R109	15KΩ ¼Watt 10% Carbon Fixed Resistor	5B	4D	C19	40 μF 300WV electrolytic tubular	1B	3D
R110	22KΩ ¼Watt 10% Carbon Fixed Resistor	4C	3D	C20	0.01 μF 250WV +100%/-0% Ceramic tubular	1B	2D
R111	22KΩ ¼Watt 10% Carbon Fixed Resistor	5C	4D	C21	50 pF Enclosed in CR-2	1B	2C
R112	22KΩ ½Watt 10% Carbon Fixed Resistor	5B	2B	C22	0.01 μF 250WV +100%/-0% Ceramic tubular	1C	2C
R113	1MΩ ¼Watt 10% Carbon Fixed Resistor	4B	4D	C23	0.01 μF 250WV +100%/-0% Ceramic tubular	1C	2C
R114	1MΩ ¼Watt 10% Carbon Fixed Resistor	5B	4E	C24	200 pF 250WV 10% Ceramic tubular	1C	2B
R115	10KΩ 1Watt 10% Carbon Fixed Resistor	5C	3D	C25	200 pF 250WV 10% Ceramic tubular	1C	2B
R116	68KΩ ½Watt 10% Carbon Fixed Resistor	4C	4C	C26	0.002 μF 250WV +100%/-0% Ceramic tubular	1C	2C
R117	68KΩ ½Watt 10% Carbon Fixed Resistor	5C	3E	C27	0.001 μF 400WV 10% Oil tubular	1C	2B
R118	100KΩ ½Watt 10% Carbon Fixed Resistor	4C	3C	C28	5 μF 12WV electrolytic tubular	1C	2B
R119	100KΩ ½Watt 10% Carbon Fixed Resistor	4C	4C	C29	0.02 μF 400WV 10% Oil tubular	1C	2C
R120	100KΩ ½Watt 10% Carbon Fixed Resistor	5C	3E	C30	200 pF 250WV 10% Ceramic tubular	2A	1E
R121	100KΩ ¼Watt 10% Carbon Fixed Resistor	5C	4E	C31	50 pF 250WV 10% Ceramic tubular	2A	2F
R122	470KΩ ¼Watt 10% Carbon Fixed Resistor	4C	3C	C32	400 pF 250WV 10% Mica tubular	2A	2F
R123	470KΩ ¼Watt 10% Carbon Fixed Resistor	4C	4C	C33	0.01 μF 250WV +100%/-0% Ceramic tubular	2A	1E
R124	470KΩ ¼Watt 10% Carbon Fixed Resistor	5C	3E	C34	0.03 μF 400WV 10% Oil tubular	2A	1E
R125	470KΩ ¼Watt 10% Carbon Fixed Resistor	5C	4E	C35	0.05 μF 50WV +100%/-0% Ceramic tubular	2B	2E
R126	5KΩ 1Watt 10% Carbon Fixed Resistor	5C	3C	C36	0.002 μF 250WV +100%/-0% Ceramic tubular	2B	2D
R127	2.2KΩ ¼Watt 10% Carbon Fixed Resistor	4C	4C	C37	5 μF 12WV electrolytic tubular	2B	(2B)
R128	2.2KΩ ¼Watt 10% Carbon Fixed Resistor	5C	4C	C38	0.05 μF 50WV +100%/-0% Ceramic tubular	2B	(2B)
R129	3.3KΩ ¼Watt 10% Carbon Fixed Resistor	4C	4C	C39	100 μF 180WV electrolytic tubular	2C	2A
R130	8Ω 10Watt 10% Wire Wound Resistor	4C	2A	C40	100 μF 180WV electrolytic lug terminal	2C	2A
R131	8Ω 10Watt 10% Wire Wound Resistor	5C	2A	C41	0.01 μF 400WV Oil tubular	2C	2A
R132	220Ω 1Watt 10% Carbon Fixed Resistor	4C	2A	C42	0.01 μF 400WV Oil tubular	2C	2A
R133	220Ω 1Watt 10% Carbon Fixed Resistor	5C	2A	C43	100 μF 50WV electrolytic tubular	2C	3A
R134	300Ω 20Watt 10% Wire Wound Resistor	5C	3D	C44	50 μF 50WV electrolytic tubular	2B	4F
R135	1.7KΩ 20Watt 10% Wire Wound Resistor	5C	3D	C45	50 pF 250WV 10% Ceramic tubular	2B	4F
R136	5.6KΩ ¼Watt 10% Carbon Fixed Resistor	2B	4F	C46	0.01 μF 250WV +100%/-0% Ceramic tubular	2C	(FAP)
R137	5.6KΩ ¼Watt 10% Carbon Fixed Resistor	2B	3E	C47	0.01 μF 250WV +100%/-0% Ceramic tubular	2C	3D
				C48	0.01 μF 600WV +100%/-0% Ceramic tubular	2C	2C
C1	30 pF 250WV 10% Ceramic tubular	1A	FAP	C49	0.0047 μF 600WV 10% Oil tubular	2C	3B
C2	0.001 μF 250WV +100%/-0% Ceramic tubular	1A	FAP	C50	0.02 μF 250WV 10% Ceramic tubular	3A	MPX
C3	10 pF 250WV 10% Ceramic tubular	1A	FAP	C51	1500 pF 250WV 10% Mica tubular	3A	MPX
C4	12 pF 250WV 10% Ceramic tubular	1A	FAP	C52	120 pF 250WV 10% Mica tubular	3A	MPX
C5	100 pF 250WV 10% Ceramic tubular	1A	FAP	C53	0.02 μF 400WV 10% Oil tubular	3A	MPX
C6	18 pF 250WV 10% Ceramic tubular	1A	FAP	C54	150 pF 250WV 10% Mica tubular	3A	MPX

# PARTS LIST

**A:** Part No.  
**B:** Part Name  
**C:** Co-ordinates in Schematic Diagram  
**D:** Co-ordinates in Chassis Diagram  
 MPX: MPX SECTION Stereo Indicator Sheet; TRHP:  
 Equalizer Amp. Sheet; Parts located on the top surface  
 are parenthesized.

A	B	C	D	A	B	C	D
R1	220Ω ¼Watt 10% Carbon Fixed Resistor	1A	FAP	R49	47KΩ Enclosed in CR-3	3B	MRX
R2	33KΩ ¼Watt 10% Carbon Fixed Resistor	1A	FAP	R50	47KΩ Enclosed in CR-3	3B	MPX
R3	1MΩ ¼Watt 10% Carbon Fixed Resistor	1A	FAP	R51	47KΩ Enclosed in CR-3	3B	MPX
R4	1MΩ ¼Watt 10% Carbon Fixed Resistor	1A	FAP	R52	3.5KΩ 10Watt Wire Wound Resistor	3B	(3C)
R5	10KΩ ¼Watt 10% Carbon Fixed Resistor	1B	FAP	R53	3.5KΩ 10Watt Wire Wound Resistor	3B	(3C)
R6	1KΩ ¼Watt 10% Carbon Fixed Resistor	2A	FAP	R54	10MΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX
R7	68Ω Enclosed in CR-1	1B	3D	R55	15KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R8	2.2KΩ 1Watt 10% Carbon Fixed Resistor	1B	1E	R56	22KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R9	1KΩ ½Watt 10% Carbon Fixed Resistor	1B	2D	R57	33KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R10	50KΩ ¼Watt 10% Carbon Fixed Resistor	1B	2D	R58	22KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R11	100KΩ ¼Watt 10% Carbon Fixed Resistor	1B	2D	R59	15KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R12	68Ω Enclosed in CR-1	1B	2D	R60	10MΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R13	1KΩ ½Watt 10% Carbon Fixed Resistor	1B	2C	R61	22KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R14	50KΩ Enclosed in CR-2	1C	2C	R62	22KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R15	2.2MΩ ½Watt 10% Carbon Fixed Resistor	1B	2C	R63	100KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R16	15KΩ ½Watt 10% Carbon Fixed Resistor	1C	2C	R64	100KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R17	10KΩ ½Watt 10% Carbon Fixed Resistor	1C	2C	R65	4.7MΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R18	1KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2C	R66	4.7MΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R19	1KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2C	R67	1.5KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R20	10KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2B	R68	1.5KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R21	10KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2B	R69	470KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R22	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	1C	2C	R70	470KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R23	82KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2B	R71	270KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R24	470KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2C	R72	270KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R25	1MΩ ¼Watt 10% Carbon Fixed Resistor	2A	1E	R73	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R26	22KΩ ¼Watt 10% Carbon Fixed Resistor	2A	2E	R74	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R27	50Ω ¼Watt 10% Carbon Fixed Resistor	2A	1E	R75	1KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R28	3.3KΩ ½Watt 10% Carbon Fixed Resistor	2A	1E	R76	1KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R29	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	2B	2D	R77	1MΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R30	1MΩ ½Watt 10% Carbon Fixed Resistor	2B	(2B)	R78	1MΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R31	1MΩ ½Watt 10% Carbon Fixed Resistor	2B	(2B)	R79	1MΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R32	100KΩ ½Watt 10% Carbon Fixed Resistor	2C	2B	R80	390KΩ ¼Watt 10% Carbon Fixed Resistor	4A	1D
R33	22KΩ ½Watt 10% Carbon Fixed Resistor	2C	2B	R81	390KΩ ¼Watt 10% Carbon Fixed Resistor	5A	1D
R34	1KΩ ½Watt 10% Carbon Fixed Resistor	2B	4F	R82	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	4A	1D
R35	480KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX	R83	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	5A	1D
R36	470Ω ¼Watt 10% Carbon Fixed Resistor	3A	MPX	R84	470KΩ ¼Watt 10% Carbon Fixed Resistor	4A	1D
R37	4.7KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX	R85	470KΩ ¼Watt 10% Carbon Fixed Resistor	5A	1D
R38	1KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX	R86	3.3KΩ ¼Watt 10% Carbon Fixed Resistor	4A	1D
R39	1KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX	R87	3.3KΩ ¼Watt 10% Carbon Fixed Resistor	5A	2D
R40	1MΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX	R88	220KΩ ½Watt 10% Carbon Fixed Resistor	4A	2D
R41	10KΩ ½Watt 10% Carbon Fixed Resistor	3A	MPX	R89	220KΩ ½Watt 10% Carbon Fixed Resistor	5A	2D
R42	10KΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX	R90	100KΩ ¼Watt 10% Carbon Fixed Resistor	4B	1D
R43	1KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX	R91	100KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1D
R44	1KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX	R92	22KΩ ¼Watt 10% Carbon Fixed Resistor	4B	1D
R45	470KΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX	R93	22KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1D
R46	47KΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX	R94	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	4B	1D
R47	100KΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX	R95	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	5B	1D
R48	47KΩ Enclosed in CR-3	3B	MPX	R96	100KΩ ¼Watt 10% Carbon Fixed Resistor	4B	1D

Symptom	Probable Cause	Check Point
Hum over all program sources	A. Defective power circuit	1. Defective hum balancer 2. Insufficient capacity of capacitor VR-4, VR-5 C <sub>39</sub> , C <sub>40</sub> , C <sub>44</sub> , C <sub>45</sub> , C <sub>49</sub>
	B. Defective low-frequency circuit	1. Inner contact or poor insulation of tube 2. Insufficient capacity of capacitor 3. Fixed resistor blown V <sub>10</sub> , V <sub>11</sub> , V <sub>12</sub> , V <sub>13</sub> or V <sub>14</sub> , V <sub>15</sub> C <sub>113</sub> , C <sub>116</sub> , C <sub>123</sub> , C <sub>124</sub> R <sub>110</sub> , R <sub>111</sub>
Noisy over all program sources	A. Defective speaker	1. Defective voice coil 2. Inner contact of speaker components 3. Defective cone or damper
	B. Defective power circuit	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" Measure voltage in power circuit and replace defective element
	C. Defective low-frequency circuit	1. Fixed resistor defective 2. Capacitor, shorted or poor insulation 3. Shorted primary winding of output transformer 4. Inner contact of tube 5. Defective master volume R <sub>88</sub> , R <sub>106</sub> , R <sub>118</sub> , R <sub>119</sub> or R <sub>89</sub> , R <sub>107</sub> , R <sub>119</sub> , R <sub>120</sub> C <sub>111</sub> , C <sub>114</sub> or C <sub>112</sub> , C <sub>115</sub> T <sub>11</sub> or T <sub>12</sub> V <sub>10</sub> , V <sub>11</sub> , V <sub>12</sub> , V <sub>13</sub> or V <sub>14</sub> , V <sub>15</sub> VR-9
SPEAKER switch does not work at all	A. Defective headphone B. Defective headphone circuit	Check headphone R <sub>130</sub> , R <sub>132</sub> or R <sub>131</sub> , R <sub>133</sub>
NOISE FILTER switch does not work at all	A. Defective filter circuit	C <sub>105</sub> or C <sub>106</sub> ; S <sub>6a</sub> , S <sub>6b</sub>
LOUDNESS switch does not work at all	A. Defective filter circuit	C <sub>107</sub> , C <sub>109</sub> , R <sub>98</sub> or C <sub>108</sub> , C <sub>110</sub> R <sub>99</sub> ; VR-9, S <sub>5a</sub> , S <sub>5b</sub>
TONE CONTROL switch does not work at all	A. Defective tone control circuit	C <sub>95</sub> , C <sub>97</sub> , C <sub>99</sub> , C <sub>101</sub> , C <sub>103</sub> , R <sub>90</sub> or R <sub>92</sub> , R <sub>96</sub> or C <sub>96</sub> , C <sub>98</sub> , C <sub>100</sub> , C <sub>102</sub> , C <sub>104</sub> , R <sub>91</sub> , R <sub>98</sub> ; VR-7, VR-8

## FM RECEPTION

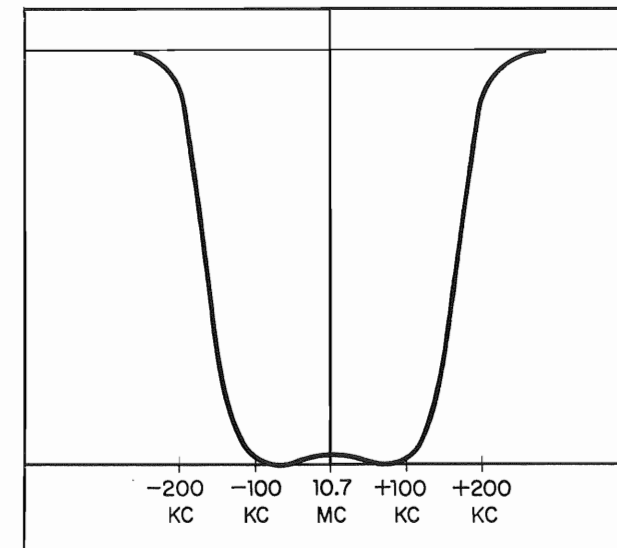
Symptom	Probable Cause	Check Point
No sound	A. Defective overall section	See "No sound over all program sources"
	B. Defective FM section	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Blown heater of tube 3. Aging capacitor 4. Aging I.F.T. 5. Defective oscillating circuit Measure voltage in FM section and replace defective element V <sub>1</sub> ~V <sub>4</sub> C <sub>29</sub> , C <sub>24</sub> , C <sub>25</sub> , C <sub>27</sub> T <sub>1</sub> , T <sub>2</sub> , T <sub>5</sub> , T <sub>6</sub> C <sub>4</sub> , C <sub>5</sub> , C <sub>6</sub> , C <sub>7</sub> , L <sub>4</sub> , V <sub>1</sub>



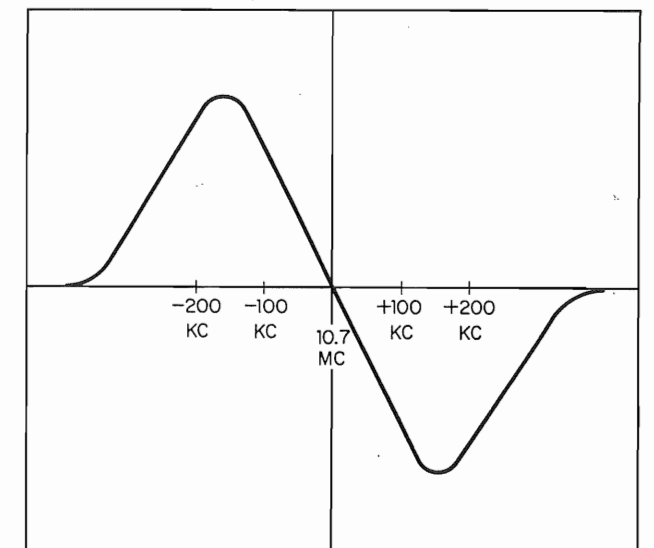
# AMPLIFIER TROUBLESHOOTING CHART

Symptom	Probable Cause	Check Point
Weak sound	A. Weak station signal	See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"
	B. Defective overall section	See "Weak sound over all program sources"
	C. Defective FM section	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Poor Q of coil 3. Insufficient capacity of capacitor 4. Improper contact of rotary switch 5. Poor emission of tube 6. Voltage drop in local oscillator 7. Divergence in adjustment of: a. Tracking b. I.F.T. Measure voltage in FM section and replace defective element T <sub>1</sub> , T <sub>2</sub> , T <sub>5</sub> , T <sub>6</sub> and L <sub>1</sub> ~L <sub>4</sub> C <sub>6</sub> , CR-1, CR-2, C <sub>29</sub> S <sub>1d</sub> , S <sub>1e</sub> V <sub>1</sub> ~V <sub>4</sub> C <sub>4</sub> , C <sub>5</sub> , C <sub>6</sub> , C <sub>7</sub> , C <sub>8</sub> , L <sub>4</sub> , V <sub>1</sub> Optimum adjustment often needs to use measuring instruments TC <sub>1</sub> , TC <sub>2</sub> , L <sub>3</sub> , L <sub>4</sub> T <sub>1</sub> , T <sub>2</sub> , T <sub>5</sub> , T <sub>6</sub> /IF curve & S curve
Distortion	A. Defective overall section	See "Distortion over all program sources"
	B. Defective FM section	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Defective diode 3. Insufficient capacity of capacitor 4. Divergence in adjustment of: a. Tracking b. I.F.T. Measure voltage in FM section and replace defective element OA-91 detector diode C <sub>14</sub> , C <sub>20</sub> , C <sub>22</sub> Optimum adjustment often needs to use measuring instrument TC <sub>1</sub> , TC <sub>2</sub> , L <sub>3</sub> , L <sub>4</sub> T <sub>1</sub> , T <sub>2</sub> , T <sub>5</sub> , T <sub>6</sub> /IF curve & S curve
Hum	A. Defective overall section	See "Hum over all program source"
	B. Defective FM section	1. Inner contact of poor insulation of tube 2. Insufficient capacity of capacitor V <sub>1</sub> ~V <sub>4</sub> C <sub>14</sub> , C <sub>20</sub> , C <sub>24</sub> , C <sub>29</sub> , C <sub>19</sub>
Noisy	A. Amplifier is O.K.	See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"
	B. Defective overall section	See "Noisy over all program sources"
	C. Defective FM section	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Aging tube 3. Resistor, rubbing or blown 4. Insufficient capacity or short circuit of capacitor Measure voltage in FM section and replace defective element V <sub>1</sub> ~V <sub>4</sub> R <sub>5</sub> , R <sub>6</sub> , R <sub>9</sub> , R <sub>13</sub> , R <sub>16</sub> , R <sub>17</sub> C <sub>10</sub> , C <sub>12</sub> , C <sub>14</sub> , C <sub>18</sub> , C <sub>20</sub> , C <sub>22</sub> , C <sub>28</sub> , C <sub>27</sub> , C <sub>29</sub>
Magic eye does not work normally	A. Defective FM tuner	
	B. Defective tuning indicator circuit	V <sub>16</sub> , R <sub>30</sub> , R <sub>15</sub> , S <sub>1b</sub>
FM-AFC switch does not work at all	A. Defective AFC circuit	IS-351, C <sub>8</sub> , C <sub>9</sub> , C <sub>26</sub> , R <sub>2</sub> , R <sub>4</sub> , R <sub>22</sub>

FM. 1F Wave form



FM Discriminator Wave form



## FM MULTIPLEX ALIGNMENT PROCEDURE

1. Do not attempt to align the Multiplex Circuit unless the following equipment is available:

- Multiplex Stereo Generator
- FM Signal Generator
- Oscilloscope
- Sweep Generator
- AC V.T. V.M.
- Audio Oscillator

STEP	ALIGN	GENERATOR	FEED SIGNAL	OUTPUT INDICATOR	ADJUST	ADJUST FOR
1.	67 KC Trap	67 KC oscillator	Connect ro TP-2	V.T. V.M. at TP-4	L <sub>9</sub>	Minimum
2.	19 KC Trap	FM Signal Gen. modulated by 19 KC pilot signal	Antenna Terminals Tune to Signal	V.T. V.M. at TP-4	L <sub>8</sub>	Minimum
3.	19 KC coil	FM Signal Gen. modulated 30% by Stereo Gen. Sub-channel	Same	V.T. V.M. & oscilloscope at output load	T <sub>7</sub>	Maximum
4.	38 KC Doubler coil	Same	Same	Same	T <sub>8</sub>	Maximum
5.	38 KC coil	Same	Same	Some	T <sub>9</sub>	Maximum
6.	Separation VR	FM Signal Gen. modulated 30% by stereo Signal Gen. Channel-L	Same	V.T. V.M. & oscilloscope at output load	Separation VR-6	Channel-L minimum



# ALIGNMENT

## FM ALIGNMENT PROCEDURE

1. AFC-OFF      2. Turn tuning gang fully, Center carrier wave.      Set pointer at reference mark.

STEP	ALIGN	GENERATOR	FEED SIGNAL	OUTPUT INDICATOR	DIAL SETTING	ADJUST	ADJUST FOR
1.	IF Transformer	10.7 MC ±400 KC	V <sub>3</sub> Pin 1 6BA6	oscilloscope at TP-1		3rd IFT (T <sub>5</sub> ) Primary & secondary	*Best IFT Wave form
		10.7 MC ±400 KC	V <sub>2</sub> Pin 1 6BA6	oscilloscope at TP-1		2nd IFT (T <sub>3</sub> ) Primary & secondary	*Best IFT Wave form
		10.7 MC ±400 KC	Couple Sweep Signal by a round tube V <sub>1</sub> 6AQ8	oscilloscope at TP-1		1st IFT (T <sub>1</sub> ) Primary & secondary	*Best IFT Wave form
2.	Discriminator	10.7 MC ±400 KC	Couple Sweep Signal by a round tube V <sub>1</sub> 6AQ8	oscilloscope at TP-2		4th IFT (T <sub>6</sub> ) Discriminator Transformer	**"S" Curve
3.	OSC.	88 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T. V.M. at oscillo load	88 MC	OSC. coil L <sub>4</sub>	Maximum
4.	OSC.	108 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T. V.M. at oscillo load	108 MC	OSC. Trimmer TC-2	Maximum
5.		Reiterate 3, 4					
6.	Antenna circuit	88 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T. V.M. at oscillo load	88 MC	Antenna coil L <sub>2</sub>	Maximum
7.	Antenna circuit	108 MC 400 c/s 100% Modulation	Antenna Terminals	oscilloscope & V.T. V.M. at oscillo load	108 MC	Antenna circuit Trimmer TC-1	Maximum
8.		Reiterate 6, 7					

## FM-MPX RECEPTION

Symptom	Probable Cause	Check Point
No sound	A. Defective FM section	See "FM RECEPTION: No sound"
	B. Defective overall section	See "No sound over all program sources"
	C. Defective MPX section	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Blown heater of tube 3. Defective resistor 4. Insufficient capacity or short circuit of capacitor 5. MPX coil aging Measure voltage in MPX section and replace defective element V <sub>6</sub> ~V <sub>9</sub> R <sub>47</sub> , R <sub>48</sub> , R <sub>49</sub> , R <sub>50</sub> , R <sub>51</sub> , R <sub>56</sub> , R <sub>58</sub> C <sub>50</sub> , C <sub>62</sub> , C <sub>63</sub> , C <sub>64</sub> , C <sub>65</sub> , C <sub>66</sub> , C <sub>67</sub> , C <sub>68</sub> , C <sub>69</sub> , C <sub>70</sub> , C <sub>71</sub> T <sub>7</sub> , T <sub>8</sub> , T <sub>9</sub>
Weak sound	A. Defective FM section	See "FM RECEPTION: Weak sound"
	B. Defective overall section	See "Weak sound over all program sources"
	C. Defective MPX section	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Insufficient capacity of capacitor 3. Aging diode 4. Divergence in adjustment of: a. MPX coil Measure voltage in MPX section and replace defective element C <sub>50</sub> , C <sub>62</sub> ~C <sub>71</sub> V <sub>8</sub> , V <sub>9</sub> Optimum adjustment often needs to use measuring instruments T <sub>7</sub> , T <sub>8</sub> , T <sub>9</sub>
Distortion	A. Defective FM section	See "FM RECEPTION: Distortion"
	B. Defective overall section	See "Distortion over all program sources"
	C. Defective MPX section	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Aging diode 3. Insufficient capacity of capacitor 4. Fixed resistor defective 5. Divergence in adjustment of MPX coil Measure voltage in MPX section and replace defective element V <sub>8</sub> , V <sub>9</sub> , C <sub>67</sub> , C <sub>68</sub> R <sub>35</sub> , R <sub>36</sub> , R <sub>37</sub> , R <sub>54</sub> , R <sub>60</sub> T <sub>7</sub> , T <sub>8</sub> , T <sub>9</sub>
Hum	A. Defective FM section	See "FM RECEPTION: Hum"
	B. Defective overall section	See "Hum over all program sources"
	C. Defective MPX section	1. Inner contact or poor insulation of tube 2. Insufficient capacity of capacitor V <sub>6</sub> ~V <sub>9</sub> C <sub>76</sub> , C <sub>77</sub>

# AMPLIFIER TROUBLESHOOTING CHART

Symptom	Probable Cause	Check Point	
Noisy	A. Defective FM section	See "FM RECEPTION: Noisy"	
	B. Defective overall section	See "Noisy over all program sources"	
	C. Defective MPX section	1. Defective MPX coil 2. Defective fixed resistor 3. Aging capacitor 4. Aging tube 5. Loose contact of rotary switch	T <sub>7</sub> , T <sub>8</sub> , T <sub>9</sub> R <sub>47</sub> , R <sub>55</sub> , R <sub>56</sub> , R <sub>58</sub> , R <sub>59</sub> C <sub>50</sub> , C <sub>67</sub> , C <sub>68</sub> , C <sub>70</sub> , C <sub>71</sub> V <sub>6</sub> ~V <sub>9</sub> S <sub>10</sub> , S <sub>10</sub>
No MPX stereo sound	A. Subcarrier amplifying circuit defective	1. Divergence of voltage specified in "CIRCUIT DIAGRAM"	Measure voltage at pins of V <sub>6</sub> and V <sub>7</sub> in subcarrier amplifying circuit and replace defective element
		2. Insufficient capacity or short circuit of capacitor	C <sub>55</sub> , C <sub>56</sub> , C <sub>57</sub> , C <sub>59</sub> , C <sub>60</sub> , C <sub>61</sub>
		3. 38-kc oscillating circuit defective	R <sub>43</sub> , R <sub>44</sub> , R <sub>45</sub> , R <sub>46</sub> , R <sub>47</sub>
		4. Aging tube (poor emission)	V <sub>6</sub> , V <sub>7</sub>
		5. Aging coil (too low Q)	T <sub>7</sub> , T <sub>8</sub> , T <sub>9</sub>
Poor separation	A. Defective MPX section	1. Same as above	Same as above
		2. Divergence of properties of circuit elements (MPX coil and diode) due to temperature change	Readjust VR-6. Taking account of the temperature change, our company has adjusted the circuit elements for the optimum conditions
Magic eye pattern does not close at all when FM MPX station is received	A. Defective MPX circuit		Same as above
	B. Defective stereo indicator circuit		
	a. Defective magic eye	PL <sub>7</sub> , V <sub>16</sub>	
	b. Aging or defective diode	OA-91 detector diode	
	c. Variable or fixed resistor defective	VR-1, R <sub>31</sub> , R <sub>39</sub> , R <sub>40</sub> , R <sub>41</sub>	
	d. Insufficient capacity or short circuit of capacitor	C <sub>37</sub> , C <sub>38</sub> , C <sub>33</sub> , C <sub>34</sub>	
Magic eye pattern closes even though a station is not received	A. Amplifier is O.K.		See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"
	B. Defective stereo indicator circuit		Check VR-1 for divergence in adjustment OA-91 detector diode
Magic eye does not work normally	A. Defective MPX section		Check the preceding items
	B. Defective tuning indicator circuit		See "FM RECEPTION: Magic eye does not work normally"

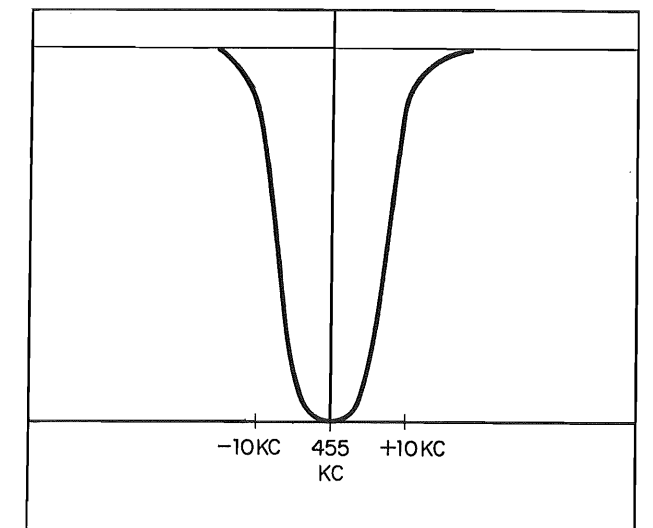
## AM ALIGNMENT PROCEDURE

Turn tuning gang fully, Center carrier wave.

Set pointer at reference mark.

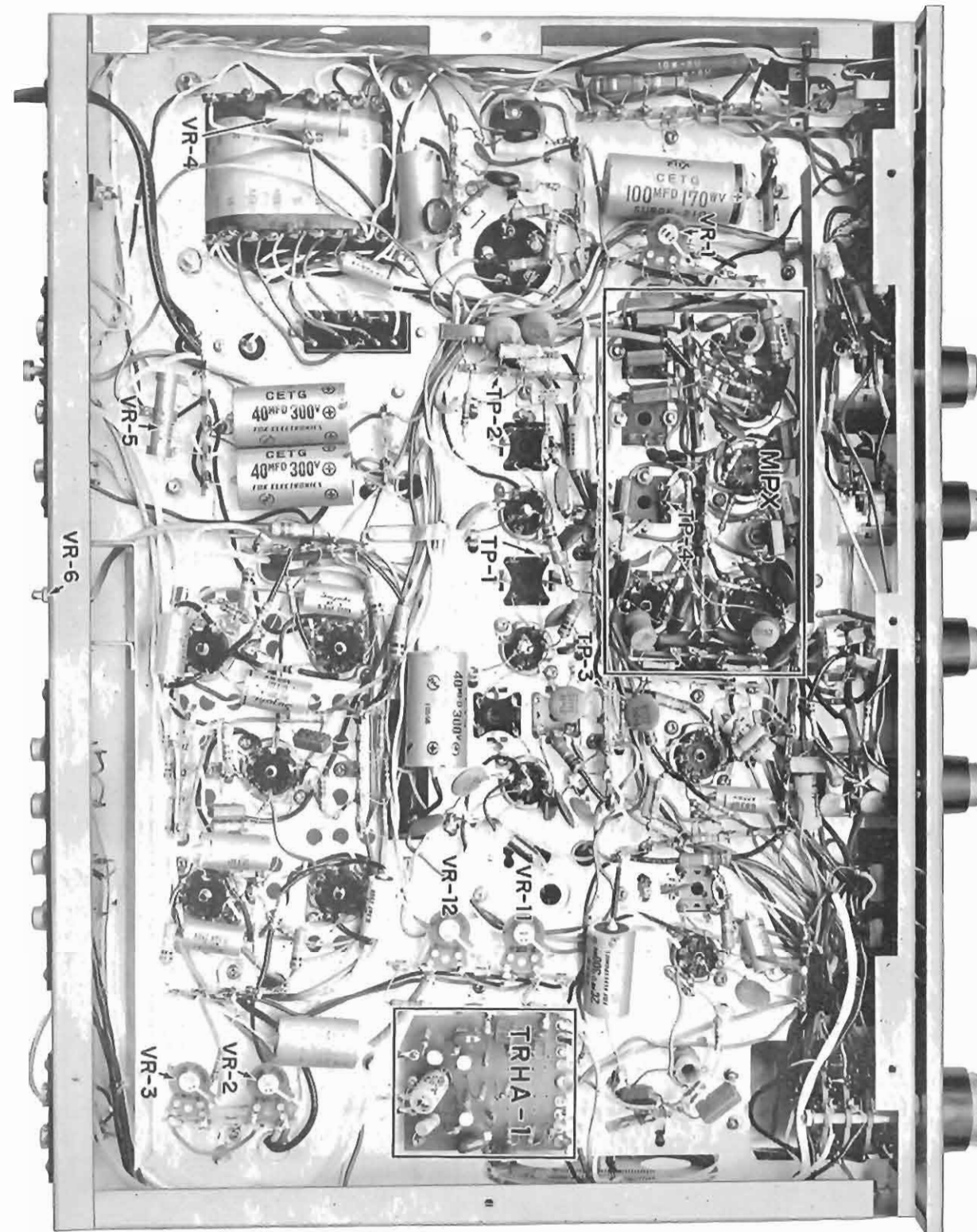
STEP	ALIGN	GENERATOR	FEED SIGNAL	OUTPUT INDICATOR	DIAL SETTING	ADJUST	ADJUST FOR
1.	IF Transformer	455 KC ±30 KC sweep-generator	Pin 7 6BE6	Sweep input at TP-3		1st I.F.T--(T <sub>3</sub> ) Primary & secondary 2nd I.F.T--(T <sub>4</sub> ) Primary & secondary	*Best I.F.T Wave form
2.	OSC.	AM-OSCILLATOR 600 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T. V.M. at output load	600 KC	OSC. coil L <sub>6</sub>	Maximum
3.	OSC.	1400 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T. V.M. at output load	1400 KC	OSC. Trimmer TC-4	Maximum
4.		Reiterate 2, 3					
5.	Antenna	600 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T. V.M. at output load	600 KC	Ferrite Loop Antenna at coil L <sub>5</sub>	Maximum
6.	Antenna	1400 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T. V.M. at output load	1400 KC	Antenna circuit at Trimmer TC-3	Maximum
7.		Reiterate 5, 6					

AM. IF Wave form



# ALIGNMENT

## CO-ORDINATES OF TEST POINTS



## AM RECEPTION

Symptom	Probable Cause	Check Point
No sound	A. Defective overall section	See "No sound over all program sources".
	B. Defective AM section	<ol style="list-style-type: none"> <li>1. Divergence of voltage specified in "CIRCUIT DIAGRAM"</li> <li>2. Aging or defective tube</li> <li>3. Aging or defective I.F.T.</li> <li>4. Detector diode defective</li> <li>5. Aging or defective capacitor</li> </ol> Measure voltage in AM section and replace defective element. V <sub>2</sub> , V <sub>5</sub> T <sub>4</sub> , T <sub>3</sub> D <sub>301</sub> Check C <sub>16</sub> and C <sub>17</sub> for short circuit and C <sub>309</sub> for insufficient capacity.
Weak sound	A. Weak station signal	See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD".
	B. Defective overall section	<ol style="list-style-type: none"> <li>1. Divergence of voltage specified in "CIRCUIT DIAGRAM"</li> <li>2. Voltage drop in local oscillator</li> <li>3. Detector diode, aging or weak</li> <li>4. Too low Q of coil</li> <li>5. Insufficient capacity of capacitor</li> <li>6. Aging or weak tube (poor emission)</li> <li>7. Divergence in adjustment of:               <ol style="list-style-type: none"> <li>a. Tracking</li> <li>b. I.F.T.</li> </ol> </li> </ol> Measure voltage in AM section and replace defective element. V <sub>5</sub> , C <sub>31</sub> , C <sub>32</sub> , R <sub>26</sub> , R <sub>27</sub> , L <sub>6</sub> OA-91 L <sub>6</sub> , T <sub>3</sub> , T <sub>4</sub> C <sub>31</sub> , CR-1, C <sub>15</sub> V <sub>2</sub> , V <sub>5</sub> Optimum adjustment often needs to use measuring instruments. TC <sub>3</sub> , TC <sub>4</sub> T <sub>3</sub> , T <sub>4</sub>
Distortion	A. Defective overall section	See "Distortion over all program sources".
	B. Defective AM section	<ol style="list-style-type: none"> <li>1. Divergence of voltage specified in "CIRCUIT DIAGRAM"</li> <li>2. Detector diode, aging or weak</li> <li>3. Insufficient capacity of capacitor</li> <li>4. Divergence in adjustment</li> </ol> Measure voltage in AM section and replace defective element. OA-91 C <sub>33</sub> , C <sub>34</sub> , C <sub>35</sub> See "weak sound".
Hum	A. Defective overall section	See "Hum over all program sources".
	B. Defective AM section	<ol style="list-style-type: none"> <li>1. Inner contact or poor insulation of tube</li> <li>2. Insufficient capacity of capacitor</li> </ol> V <sub>2</sub> , V <sub>5</sub> C <sub>33</sub> , C <sub>19</sub>
Noisy	A. Amplifier is O.K.	See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD".
	B. Defective overall section	See "Noisy over all program sources".
	C. Defective AM section	<ol style="list-style-type: none"> <li>1. Aging or defective tube</li> <li>2. Loose contact of rotary switch</li> </ol> V <sub>5</sub> S <sub>1d</sub> , S <sub>1e</sub>
Magic eye does not work normally.	A. Defective AM tuner	Check as described above.
	B. Defective tuning indicator circuit	See "FM RECEPTION; Magic eye does not work normally".

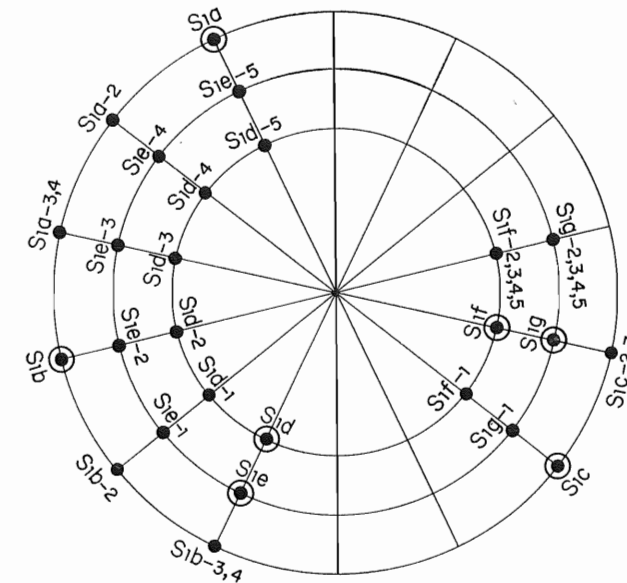
# AMPLIFIER TROUBLESHOOTING CHART

# SELECTOR CHART

## RECORD PLAYER\*

\*Equipped with a magnetic cartridge, but not a crystal one.

Symptom	Probable Cause		Check Point
No sound	A. Program defective	source	Check and repair or replace
	B. Defective section	overall	See "No sound over all program sources".
	C. Defective amplifier	head	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Defective capacitor or resistor 3. Loose contact of rotary switch 4. Loose contact of input terminal or pin jack Measure voltage in head amplifier section and replace defective element. C <sub>67</sub> , C <sub>68</sub> , R <sub>69</sub> , R <sub>70</sub> , R <sub>79</sub> , C <sub>86</sub> , C <sub>87</sub> S <sub>1d</sub> , S <sub>1e</sub> , S <sub>1f</sub> , S <sub>1g</sub>
Weak sound	A. Program defective	source	Check and repair or replace
	B. Defective section	overall	See "Weak sound over all program sources"
	C. Defective amplifier	head	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Insufficient capacity of capacitor 3. Divergence of capacity of capacitor 4. Loose contact of rotary switch 5. Loose contact of input terminal or pin jack Measure voltage in head amplifier section and replace defective element. C <sub>78</sub> , C <sub>86</sub> , C <sub>91</sub> or C <sub>79</sub> , C <sub>87</sub> , C <sub>92</sub> C <sub>89</sub> , C <sub>90</sub> S <sub>1d</sub> , S <sub>1e</sub> , S <sub>1f</sub> , S <sub>1g</sub>
Distortion	A. Program defective	source	Check and repair or replace
	B. Defective section	overall	See "Distortion over all program sources"
	C. Defective amplifier	head	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Capacitor, shorted or blown Measure voltage in head amplifier section and replace defective element. C <sub>78</sub> , C <sub>79</sub> , C <sub>86</sub> , C <sub>87</sub> , C <sub>91</sub> , C <sub>92</sub>
Hum	A. Program defective	source	Check and repair or replace
	B. Amplifier is O.K.		1. Improper connections See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"
	C. Defective section	overall	See "Hum over all program sources".
	D. Defective amplifier	head	1. Insufficient capacity of capacitor C <sub>88</sub>
Noisy	A. Program defective	source	Check and repair or replace
	B. Amplifier is O.K.		See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"
	C. Defective section	overall	See "Noisy over all program sources"
	D. Defective amplifier	head	1. Fixed resistor defective 2. Defective capacitor R <sub>83</sub> ~R <sub>89</sub> C <sub>78</sub> ~C <sub>94</sub>



Remove the bonnet and look at the switches from the back side of the amplifier. This chart tells you the location of their contact and supporting points. The smaller the circle, the nearer the points locate to the back of the amplifier.

- : contact point
- ⊙: supporting point

### FUNCTION

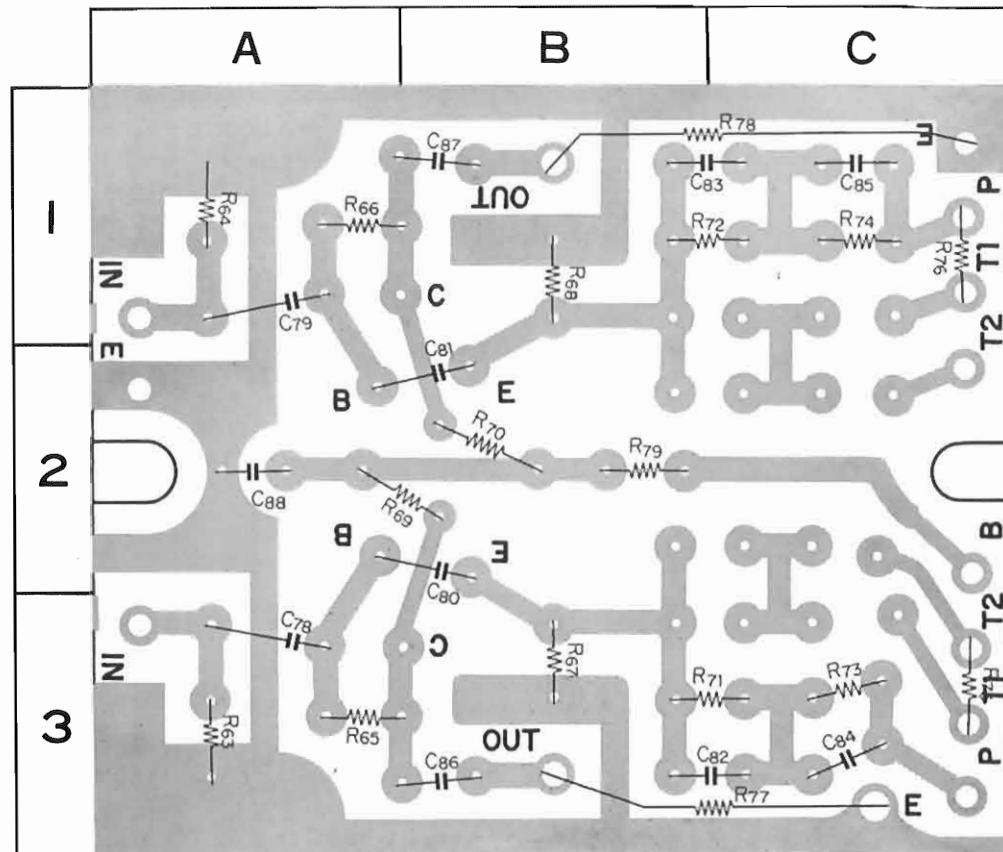
- S<sub>1</sub> (a-g)
- 1 PHONO
- 2 AM
- 3 FM
- 4 FM-STEREO
- 5 AUX

### Co-ordinates in Circuit Diagram

S <sub>1a</sub> ...2B	S <sub>1e</sub> ...5A
S <sub>1b</sub> ...2B	S <sub>1f</sub> ...4A
S <sub>1c</sub> ...2B	S <sub>1g</sub> ...5A
S <sub>1d</sub> ...4A	

# PRINTED-CIRCUIT SHEETS

## EQUALIZER AMP. SHEET



### Co-ordinates of Parts Used

R63...3A	R71...3B	R79...2B	C84...3C
R64...1A	R72...1B		C85...1C
R65...3A	R73...3C	C78...3A	C86...3B
R66...1A	R74...1C	C79...1A	C87...1B
R67...3B	R75...3C	C80...2B	C88...2B
R68...1B	R76...1C	C81...2B	
R69...2A	R77...3C	C82...3B	
R70...2B	R78...1C	C83...1B	

## OTHER PROGRAM SOURCES

Symptom	Probable Cause	Check Point
Record player with crystal cartridge does not operate properly	<ol style="list-style-type: none"> <li>1. Program source defective</li> <li>2. Improper or incorrect connections</li> <li>3. Defective overall section</li> </ol>	<p>Check and repair or replace</p> <p>See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"</p> <p>See "OVER ALL PROGRAM SOURCES"</p>
Sound input from TV, additional tuner or others is not reproduced properly	<ol style="list-style-type: none"> <li>1. Program source defective</li> <li>2. Improper or incorrect connections</li> <li>3. Defective overall section</li> </ol>	<p>Check and repair or replace</p> <p>See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"</p> <p>See "OVER ALL PROGRAM SOURCES"</p>
Pin-jack tape recorder does not operate properly	<ol style="list-style-type: none"> <li>1. Program source defective</li> <li>2. Improper or incorrect connections</li> <li>3. Defective overall section</li> </ol>	<p>Check and repair or replace</p> <p>See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"</p> <p>See "OVER ALL PROGRAM SOURCES"</p>

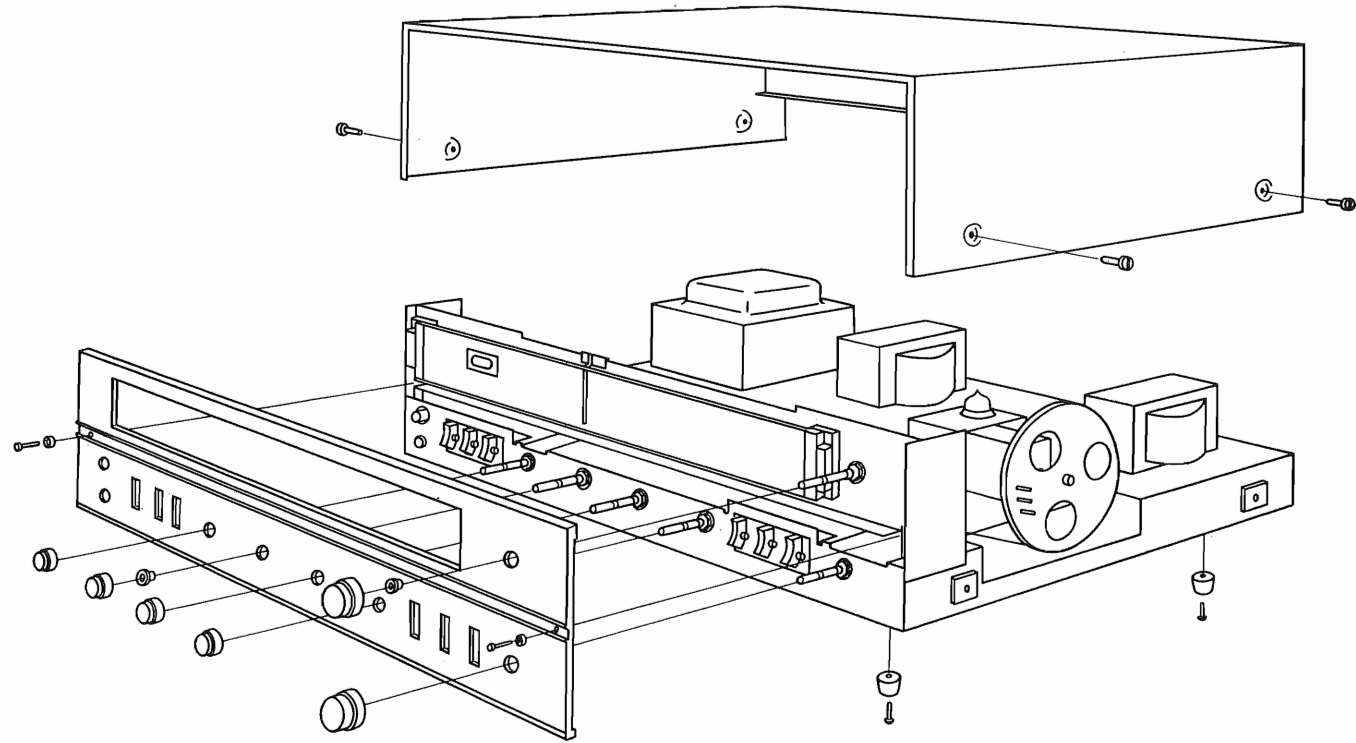
## RECORDING ON TAPE

Symptom	Probable Cause	Check Point
Broadcast is not recorded well	<ol style="list-style-type: none"> <li>1. Defective tape or tape recoder</li> <li>2. Improper or incorrect connections</li> <li>3. FM, FM-MPX or AM section defective</li> </ol>	<p>Check and repair or replace</p> <p>See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"</p> <p>See "AM", "FM" or "FM-MPX RECEPTION"</p>
Record is not recorded well	<ol style="list-style-type: none"> <li>1. Defective tape or tape recorder</li> <li>2. Improper or incorrect connections</li> <li>3. Record, record player defective</li> </ol>	<p>Check and repair or replace</p> <p>See "TROUBLESHOOTING AUDIO IS GOOD"</p> <p>See "RECORD PLAYER: Defective head amplifier"</p>

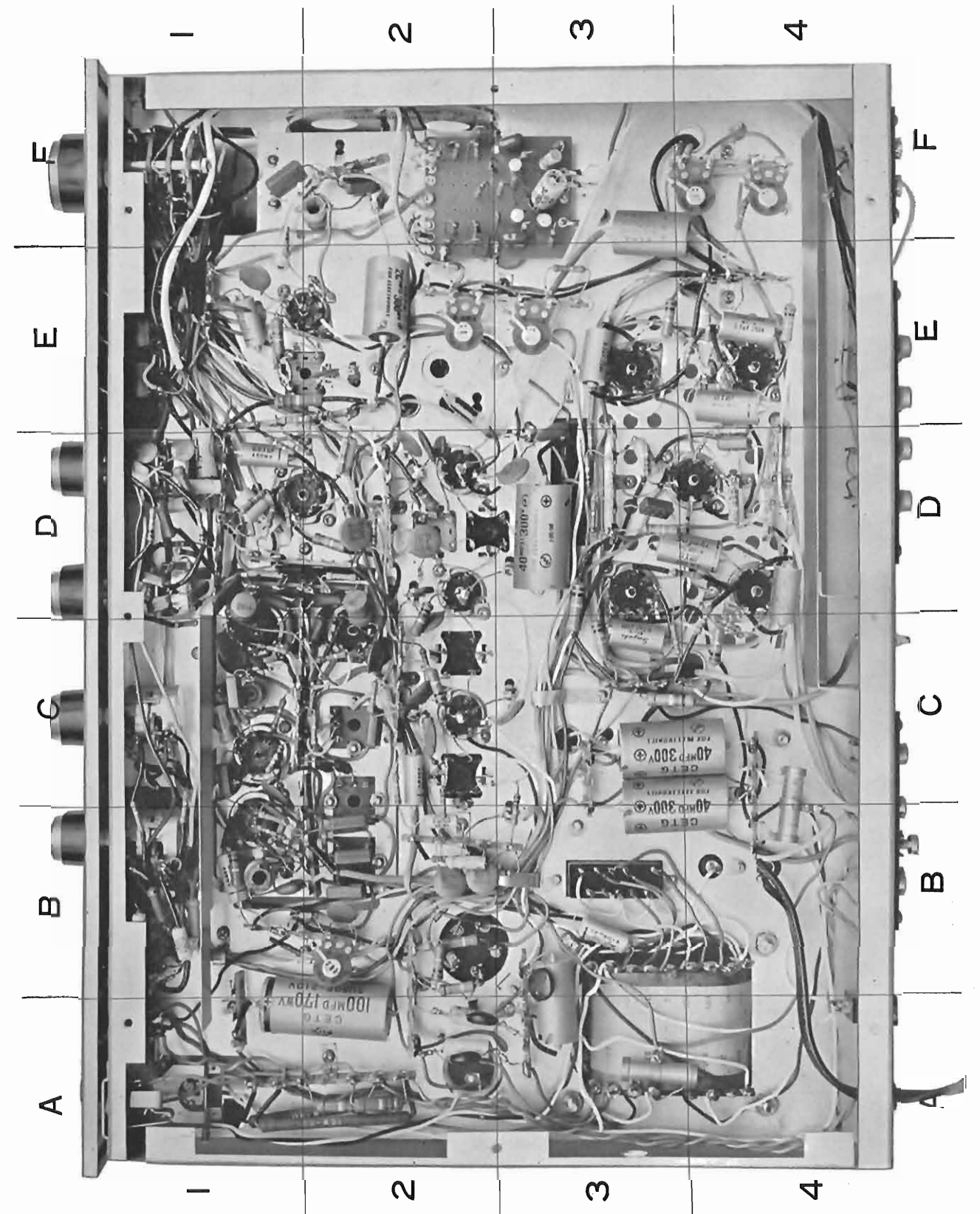
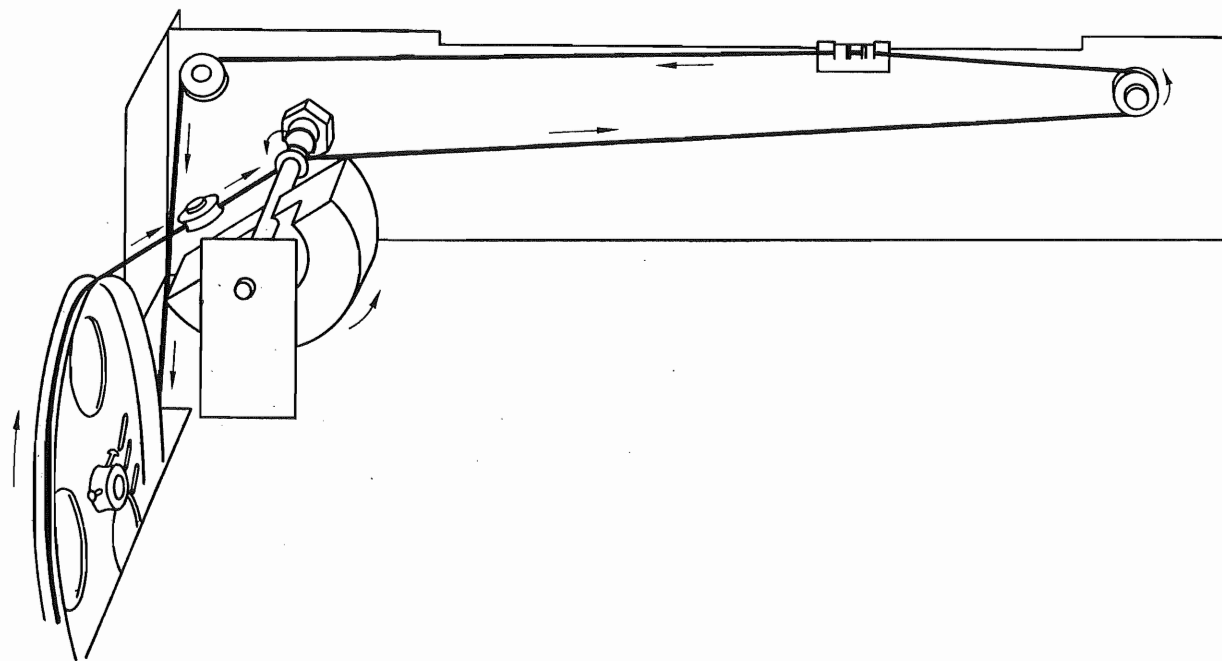


# REMOVING THE FRONT PANEL, BONNET & BOTTOM PLATE/DIAL MECHANISM

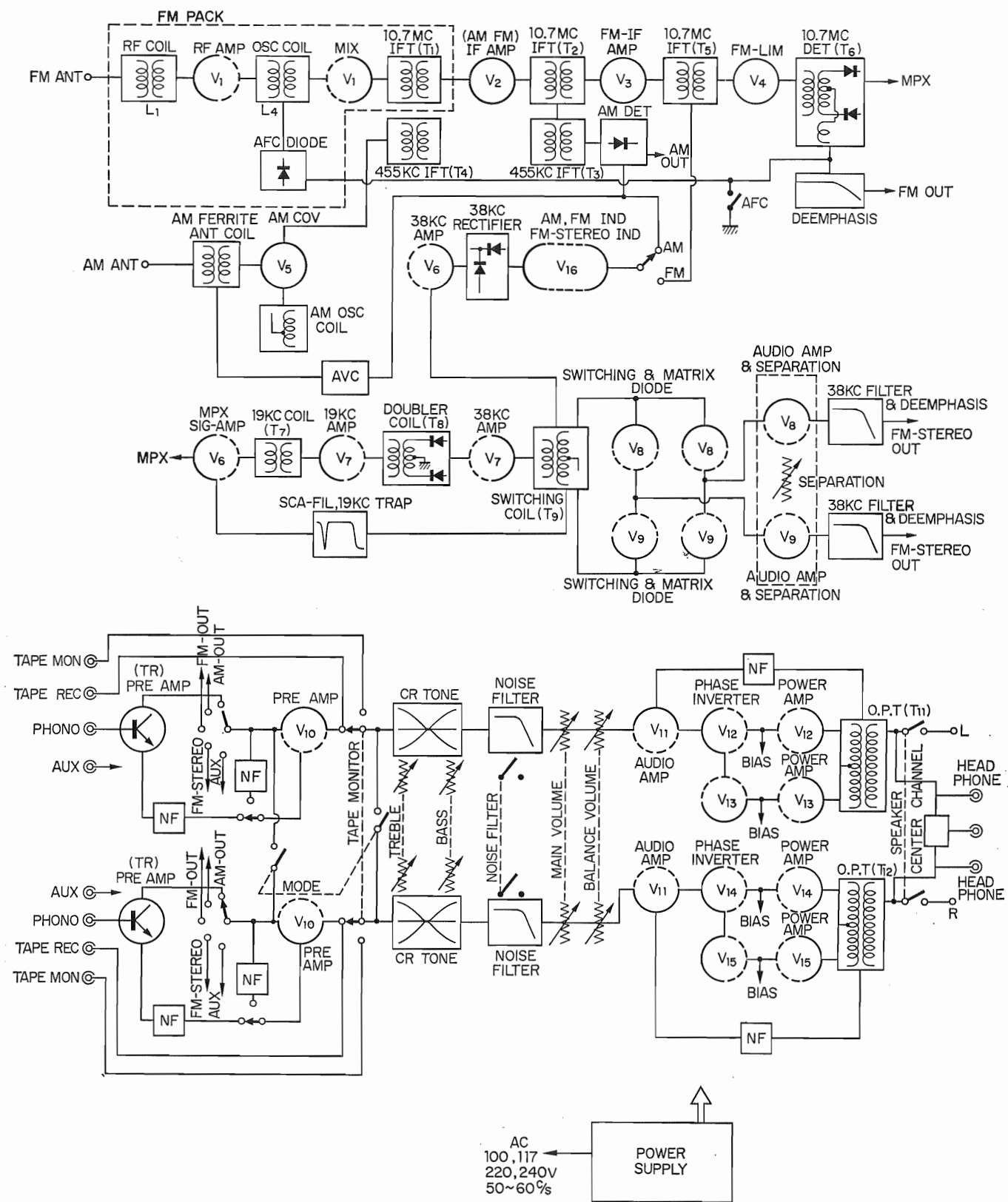
## REMOVING THE FRONT PANEL, BONNET & BOTTOM PLATE



## DIAL MECHANISM



# BLOCK DIAGRAM



# PARTS LAYOUT

