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SANSUI ELECTRIC COMPANY LIMITED

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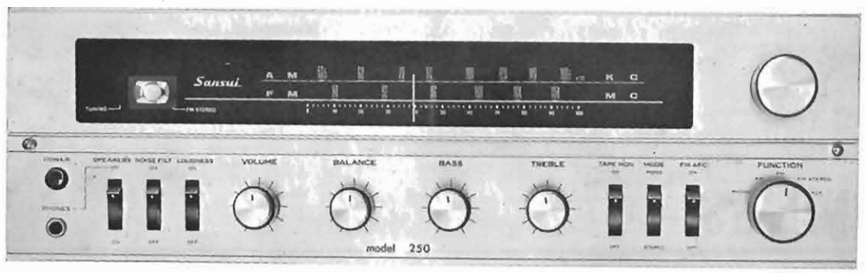
SERVICE MANUAL

AM/FM MULTIPLEX STEREO TUNER AMPLIFIER

SANSUI MODEL 250



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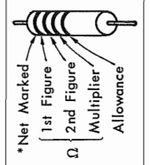
COLOR CODE

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

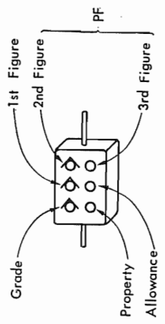
	Common to All Parts			Fixed Resistor	Mica Capacitro				Paper Capacitor		Ceramic Capacity			
Color	1st Figure	2nd Figure	Multiplier	Allowance (%)	Grade	Property	Allowance (%)	Rated Voltage (V)	Allowance (%)	Rated Voltage (V)	Grade	Property	Allowance (%)	Rated Voltage (V)
black	0	0	1		X	A	±20(M)		±20(M)	100	X		±20	
brown	1	1	10^1(10)			B			±5(J)	200				
red	2	2	10^2(K)	±2	Y	C	±2(G)		±2(G)	250	Z			250
orange	3	3	10^3			D		300						
yellow	4	4	10^4			E			±15(L)	400				
green	5	5	10^5(M)			F	±5(J)	500	$^{+20}_{-15}$(V)					500
blue	6	6	10^6						$^{+40}_{-15}$(X)	600			$^{+100}_{-1}$	
purple	7	7	10^7											
grey	8	8	10^8		Z				$^{+10}_{-15}$(Y)		(Y)			
white	9	9	10^9						±10(K)	1000				
golden			10^{-1}(0.1)	±5				1000				YY YZ		
silver			10^{-2}(0.01)	±10										
non-colored				±20										

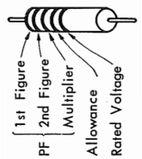
Note

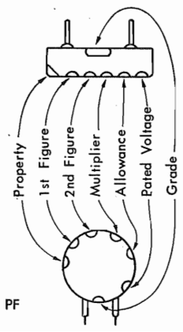
Carbon Resistor



*Solid resistor is Marked from here.







Property	Temperature Coefficient	Divergence of Capacity	Q tanδ	Insulation Resistance
A	Not specibed	Not specified	0.5 under	3000MΩ under
B	Not specified	Not specified		
C	−20∼+200	±(0.5%+0.5pF)	0.5 over	7500MΩ over but 0.1 over 3000MΩ over
D	−100∼+100	±(0.3%+0.1pF)		
E	−20∼+100	±(0.1%+0.1pF)		
F	0∼+70	±(0.05%±0.1pF)		

Grade	Usable Temperature Range	Test Classfication
X	−55∼+85	I or II
Y	−30∼+85	I or II
Z	−30∼+85	1

Letter	Allowance
G	±2
T	±5
K	±10
M	±20

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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 trouble-shooting 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.

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	* Discharge or oscillation caused by electrical appliances, such as fluorescent lamp, TV set, d.c. motor, rectifier and oscillator * Natural phenomena, such as atmospherics, statics, strays and thunderbolt * Insufficient antenna input due to thick reinforced concrete wall of a building or long distance from the station * Wave interference from other electrical appliances	* Attach a noise limiter to the electrical appliance that causes the noise, or attach it to the power source of the amplifier * Install an autdoor antenna and ground the amplifier to raise the signal-to-noise ratio * Reverse the power cord plug-receptacle connections * If the noise occurs at a certain frequency, attach a wave trap to the ANT. input * Keep the set in proper distance from other electrical appliances
	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	* Install the antenna for maximum antenna efficiency. See the section "ANTENNA" in the operating instructions * In some cases, the noise can be eliminated by grounding the amplifier or reversing the power cord plug-receptacle connections
	B. High-frequency noise	1. Adjacent-channel interference or beat interference 2. TV set too close to the audio system	* 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 * Keep the TV set in proper distance from the audio system
FM reception	A. Noisy	1. Poor noise limiter effect or too low S/N ratio due to insufficient antenna input 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.	* Install the antenna (attached) for maximum signal strength * 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 * Excessive long antenna may rather cause a noise

A	B	C	D
V_2	6BA6 (EF93) (FM, AM IF amp)	1B	2D
V_3	6BA6 (EF93) (FM IF amp)	1B	2D
V_4	6BA6 (EF93) (FM IF limiter)	1C	2C
V_5	6BE6 (EK90) (AM convertor)	2A	1E
V_6	6AQ8 (ECC85) (MPX amp & indicator amp)	3A	MPX
V_7	6BL8 (ECF80) (19KC amp & doubler)	3A	MPX
V_8	6BN8 (Dual, out & switching circuit)	3B, C	MPX
V_9	6BN8 (Dual, out & switching circuit)	3B, C	MPX
V_{10}	12AX7 (ECC83) (Pre amp)	4, 5A	1D
V_{11}	6AQ8 (ECC85) (Audio amp)	4, 5B	4D
V_{12}	6BM8 (ECL82) (Phase splitter & power amp)	4C	3D
V_{13}	6BM8 (ECL82) (Phase splitter & power amp)	4C	4D
V_{14}	6BM8 (ECL82) (Phase splitter & power amp)	5C	3E
V_{15}	6BM8 (ECL82) (Phase splitter & power amp)	5C	4E
V_{16}	6GE-12A (Magic eye. Tuning indicator & stereo indicator)	2B	(2B)
TR	Transistor 2SC-402 (650)	4, 5A	TRHP
diode	Ge, diode OA-91. V_D=50mA −55°C~75°D	1B	2D
		1C	2B
diode	Si, diode SE-0.5 AC (rms) V_D=180V I_D=500mA −65°C~75°C	2B	1B
		2C	2A
diode	Si, diode SE-05-03 AC (rms) V_D=30V I_D=500mA −65°C~75°C	2C	3A
diode	Si, diode IS-180 (SH-1) AC (rms)=50V I_D=50mA −55°C~75°C	3D	MPX
diode	Riactance diode IS-351 (FM-AFC)	1A	FAP
L_1	FM ANT coil	1A	FAP
L_2	FM RF coil	1A	FAP
L_3	FM RF coil	1A	FAP
L_4	FM oscillator coil	1A	FAP
L_5	MW loop stick antenna coil	2A	
L_6	MW oscillator coil	2A	2F
L_7	Heater choke	2C	2E
L_8	19KC trap 50mH	3A	MPX
L_9	67KC filter 50mH	3A	MPX
L_{10}	38KC trap 39mH	3C	MPX
L_{11}	38KC trap 39mH	3C	MPX
T_1	1st FM. I.F.T 10.7Mc/s	1B	FAP
T_2	2nd FM. I.F.T 10.7Mc/s	1B	2D
T_3	2nd AM. I.F.T 455Kc/s	1B	2D
T_4	1st AM. I.F.T 455Kc/s	2B	1E
T_5	3rd FM. I.F.T 10.7Mc/s	1B	2C
T_6	FM Discriminator	1C	C2
T_7	19KC coil	3A	MPX
T_8	38KC Dubler coil	3B	MPX

A	B	C	D
T_9	38KC coil	3B	MPX
T_{10}	Power transformer	2C	3A
T_{11}	Output transformer	4C	(3C)
T_{12}	Output transformer	5C	(3F)
JAC-1	Head phone jack	4, 5C	1A
PV-1	Power selector for 100V/117V/220V/240V	2C	3B
PL	Pilot lamp 6.3V 0.3A Fuse type	2C	
F	Fuse 3A	2C	(4B)
CO-1	AC, Receptacles	2C	4A
PS-1	Power switch	2C	1A
$S_{1(a-g)}$	Function selector		1F
S_2	FM. AFC switch	1A	1E
S_3	Mode switch	5A, B	1E
S_4	Tape monitor switch	4, 5B	1E
S_5	Loudness switch	4, 5B	1B
S_6	Noise filter switch	4, 5B	1B
S_7	Speaker switch	4, 5C	1A

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

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 broacast 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 Reguratory 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	PS-1
		3. Defective line cord	
		4. Loose plug contact	
		5. Blown fuse	F
		If the fuse should be burnt out as soon as it is replaced, the trouble may be attributed to:	
		a. Shorted power transformer;	T_{10}
		b. Shorted capacitor;	C_{39}, C_{40}, C_{49}, C_{124}
		c. B circuit open	Check continuity of B circuit
		6. Broken primary winding of power transformer	T_{10}
	C. Defective power circuit	1. Divergence of voltage specified in "CIRCUIT DIAGRAM"	Measure voltage in power circuit and replace defective element. Check R_{001}, R_{002} and R_{003} for disconnection
	D. Defective low-frequency circuit	1. Divergence of voltage specified in "CIRCUIT DIAGRAM"	Measure voltage in low-frequency circuit and replace defective element
		2. Blown heater of tube	V_{10}, V_{11}, V_{12}, V_{13} or V_{14}, V_{15}
		3. Capacitor, open or short-circuited	C_{91}, C_{93}, C_{119}, C_{120} or C_{92}, C_{94}, C_{121}, C_{122}
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"	Measure voltage in low-frequency circuit and replace defective element
		2. Shorted output transformer	T_{11}, T_{12}
		3. Insufficient capacity or short circuit of capacitor	C_{91}, C_{93}, C_{119}, C_{120} or C_{92}, C_{94}, C_{120}, C_{121}
		4. Weak tube	V_{10}, V_{11}, V_{12}, V_{13} or V_{14}, V_{15}
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"	Measure voltage in low-frequency circuit and replace defective element
		2. Aging or weak tube	V_{11}
		3. Shorted output transformer	T_{11} or T_{12}

A	B	C	D
R97	100KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1D
R98	82KΩ ¼Watt 10% Carbon Fixed Resistor	4B	1B
R99	82KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1B
R100	33KΩ ¼Watt 10% Carbon Fixed Resistor	4B	1C
R101	33KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1C
R102	2.2KΩ ¼Watt 10% Carbon Fixed Resistor	4B	3D
R103	2.2KΩ ¼Watt 10% Carbon Fixed Resistor	5B	4D
R104	100Ω ¼Watt 10% Carbon Fixed Resistor	4B	3D
R105	100Ω ¼Watt 10% Carbon Fixed Resistor	5B	4D
R106	220KΩ ½Watt 10% Carbon Fixed Resistor	4B	3D
R107	220KΩ ½Watt 10% Carbon Fixed Resistor	5B	4D
R108	1.5KΩ ¼Watt 10% Carbon Fixed Resistor	4B	3D
R109	1.5KΩ ¼Watt 10% Carbon Fixed Resistor	5B	4D
R110	22KΩ ¼Watt 10% Carbon Fixed Resistor	4C	3D
R111	22KΩ ¼Watt 10% Carbon Fixed Resistor	5C	4D
R112	22KΩ ½Watt 10% Carbon Fixed Resistor	5B	2B
R113	1MΩ ¼Watt 10% Carbon Fixed Resistor	4B	4D
R114	1MΩ ¼Watt 10% Carbon Fixed Resistor	5B	4E
R115	10KΩ 1Watt 10% Carbon Fixed Resistor	5C	3D
R116	68KΩ ½Watt 10% Carbon Fixed Resistor	4C	4C
R117	68KΩ ½Watt 10% Carbon Fixed Resistor	5C	3E
R118	100KΩ ½Watt 10% Carbon Fixed Resistor	4C	3C
R119	100KΩ ½Watt 10% Carbon Fixed Resistor	4C	4C
R120	100KΩ ½Watt 10% Carbon Fixed Resistor	5C	3E
R121	100KΩ ¼Watt 10% Carbon Fixed Resistor	5C	4E
R122	470KΩ ¼Watt 10% Carbon Fixed Resistor	4C	3C
R123	470KΩ ¼Watt 10% Carbon Fixed Resistor	4C	4C
R124	470KΩ ¼Watt 10% Carbon Fixed Resistor	5C	3E
R125	470KΩ ¼Watt 10% Carbon Fixed Resistor	5C	4E
R126	5KΩ 1Watt 10% Carbon Fixed Resistor	5C	3C
R127	2.2KΩ ¼Watt 10% Carbon Fixed Resistor	4C	4C
R128	2.2KΩ ¼Watt 10% Carbon Fixed Resistor	5C	4C
R129	3.3KΩ ¼Watt 10% Carbon Fixed Resistor	4C	4C
R130	8Ω 10Watt 10% Wire Wound Resistor	4C	2A
R131	8Ω 10Watt 10% Wire Wound Resistor	5C	2A
R132	220Ω 1Watt 10% Carbon Fixed Resistor	4C	2A
R133	220Ω 1Watt 10% Carbon Fixed Resistor	5C	2A
R134	300Ω 20Watt 10% Wire Wound Resistor	5C	3D
R135	1.7KΩ 20Watt 10% Wire Wound Resistor	5C	3D
R136	5.6KΩ ¼Watt 10% Carbon Fixed Resistor	2B	4F
R137	5.6KΩ ¼Watt 10% Carbon Fixed Resistor	2B	3E
C1	30pF 250WV 10% Ceramic tubular	1A	FAP
C2	0.001μF 250WV $^{+100}_{-0}$% Ceramic tubular	1A	FAP
C3	10pF 250WV 10% Ceramic tubular	1A	FAP
C4	12pF 250WV 10% Ceramic tubular	1A	FAP
C5	100pF 250WV 10% Ceramic tubular	1A	FAP
C6	18pF 250WV 10% Ceramic tubular	1A	FAP

A	B	C	D
C7	15pF 250WV 10% Ceramic tubular	1A	FAP
C8	100pF 250WV 10% Ceramic tubular	1A	FAP
C9	5pP 250WV 10% Ceramic tubular	1A	FAP
C10	0.01μF 250WV $^{+100}_{-0}$% Ceramic tuublar	1B	FAP
C11	30pF 250WV 10% Ceramic tubular	1B	FAP
C12	0.01μF Enclosed in CR-1	1B	3D
C13	20μF 300WV electrolytic tubular	1B	2E
C14	0.01μF 250WV $^{+100}_{-0}$% Ceramic tubular	1B	2D
C15	0.01μF 250WV $^{+100}_{-0}$% Ceramic tubular	1B	2D
C16	100pF 250WV 10% Ceramic tubular	1B	2D
C17	200pF 250WV 10% Ceramic tubular	1B	2D
C18	0.01μF Enclosed in CR-1	1B	2D
C19	40μF 300WV electrolvtic tubular	1B	3D
C20	0.01μF 250WV $^{+100}_{-0}$% Ceramic tubular	1B	2D
C21	50pF Enclosed in CR-2	1B	2C
C22	0.01μF 250WV $^{+100}_{-0}$% Ceramic tubular	1C	2C
C23	0.01μF 250WV $^{+100}_{-0}$% Ceramic tubular	1C	2C
C24	200pF 250WV 10% Ceramic tubular	1C	2B
C25	200pF 250WV 10% Ceramic tubular	1C	2B
C26	0.002μF 250WV $^{+100}_{-0}$ Ceramic tubular	1C	2C
C27	0.001μF 400WV 10% Oil tubular	1C	2B
C28	5μF 12WV electrolytic tubular	1C	2B
C29	0.02μF 400WV 10% Oil tubular	1C	2C
C30	200pF 250WV 10% Ceramic tubular	2A	1E
C31	50pF 250WV 10% CeramiF tubular	2A	2F
C32	400pF 250WV 10% Mica tubular	2A	2F
C33	0.01μF 250WV $^{+100}_{-0}$% Ceramic tubular	2A	1E
C34	0.03μF 400WV 10% Oil tubular	2A	1E
C35	0.05μF 50WV $^{+100}_{-0}$% Ceramic tubular	2B	2E
C36	0.002μF 250WV $^{+100}_{-0}$% Ceramic tubular	2B	2D
C37	5μF 12WV electrolytic tubular	2B	(2B)
C38	0.05μF 50WV $^{+100}_{-0}$% Ceramic tubular	2B	(2B)
C39	100μF 180WV electrolytic tubular	2C	2A
C40	100μF 180WV electrolytic lug terminal	2C	2A
C41	0.01μF 400WV Oil tubular	2C	2A
C42	0.01μF 400WV Oil tubular	2C	2A
C43	100μF 50WV electrolytic tubular	2C	3A
C44	50μF 50WV electrolytic tubular	2B	4F
C45	50pF 250WV 10% Ceramic tubular	2B	4F
C46	0.01μF 250WV $^{+100}_{-0}$% Ceramic tubular	2C	(FAP)
C47	0.01μF 250WV $^{+100}_{-0}$% Ceramic tubular	2C	3D
C48	0.01μF 600WV $^{+100}_{-0}$% Ceramic tubular	2C	2C
C49	0.0047μF 600WV 10% Oil tubular	2C	3B
C50	0.02μF 250WV 10% Ceramic tubular	3A	MPX
C51	1500pF 250WV 10% Mica tubular	3A	MPX
C52	120pF 250WV 10% Mica tubular	3A	MPX
C53	0.02μF 400WV 10% Oil tubular	3A	MPX
C54	150pF 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
R1	220Ω ¼Watt 10% Carbon Fixed Resistor	1A	FAP
R2	33KΩ ¼Watt 10% Carbon Fixed Resistor	1A	FAP
R3	1MΩ ¼Watt 10% Carbon Fixed Resistar	1A	FAP
R4	1MΩ ¼Watt 10% Carbon Fixed Resistor	1A	FAP
R5	10KΩ ¼Watt 10% Carbon Fixed Resistor	1B	FAP
R6	1KΩ ¼Watt 10% Carbon Fixed Resistor	2A	FAP
R7	68Ω Enclosed in CR-1	1B	3D
R8	2.2KΩ 1Watt 10% Carbon Fixed Resistor	1B	1E
R9	1KΩ ½Watt 10% Carbon Fixed Resistor	1B	2D
R10	50KΩ ¼Watt 10% Carbon Fixed Resistor	1B	2D
R11	100KΩ ¼Watt 10% Carbon Fixed Resistor	1B	2D
R12	68Ω Enclosed in CR-1	1B	2D
R13	1KΩ ½Watt 10% Carbon Fixed Resistor	1B	2C
R14	50KΩ Enclosed in CR-2	1C	2C
R15	2.2MΩ ½Watt 10% Carbon Fixed Resistor	1B	2C
R16	15KΩ ½Watt 10% Carbon Fixed Resistor	1C	2C
R17	10KΩ ½Watt 10% Carbon Fixed Resistor	1C	2C
R18	1KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2C
R19	1KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2C
R20	10KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2B
R21	10KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2B
R22	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	1C	2C
R23	82KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2B
R24	470KΩ ¼Watt 10% Carbon Fixed Resistor	1C	2C
R25	1MΩ ¼Watt 10% Carbon Fixed Resistor	2A	1E
R26	22KΩ ¼Watt 10% Carbon Fixed Resistor	2A	2E
R27	50Ω ¼Watt 10% Carbon Fixed Resistor	2A	1E
R28	3.3KΩ ½Watt 10% Carbon Fixed Resistor	2A	1E
R29	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	2B	2D
R30	1MΩ ½Watt 10% Carbon Fixed Resistor	2B	(2B)
R31	1MΩ ½Watt 10% Carbon Fixed Resistor	2B	(2B)
R32	100KΩ ½Watt 10% Carbon Fixed Resistor	2C	2B
R33	22KΩ ½Watt 10% Carbon Fixed Resistor	2C	2B
R34	1KΩ ½Watt 10% Carbon Fixed Resistor	2B	4F
R35	480KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R36	470Ω ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R37	4.7KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R38	1KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R39	1KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R40	1MΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R41	10KΩ ½Watt 10% Carbon Fixed Resistor	3A	MPX
R42	10KΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX
R43	1KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R44	1KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R45	470KΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX
R46	47KΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX
R47	100KΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX
R48	47KΩ Enclosed in CR-3	3B	MPX
R49	47KΩ Enclosed in CR-3	3B	MRX
R50	47KΩ Enclosed in CR-3	3B	MPX
R51	47KΩ Enclosed in CR-3	3B	MPX
R52	3.5KΩ 10Watt Wire Wound Resistor	3B	(3C)
R53	3.5KΩ 10Watt Wire Wound Resistor	3B	(3C)
R54	10MΩ ¼Watt 10% Carbon Fixed Resistor	3B	MPX
R55	15KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R56	22KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R57	33KΩ ¼Watt 10% Carbon Fixed Resistor	3A	MPX
R58	22KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R59	15KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R60	10MΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R61	22KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R62	22KΩ ¼Watt 10% Carbon Fixed Resistor	3C	MPX
R63	100KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R64	100KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R65	4.7MΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R66	4.7MΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R67	1.5KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R68	1.5KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R69	470KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R70	470KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R71	270KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R72	270KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R73	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R74	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R75	1KΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R76	1KΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R77	1MΩ ¼Watt 10% Carbon Fixed Resistor	4A	TRHP
R78	1MΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R79	1MΩ ¼Watt 10% Carbon Fixed Resistor	5A	TRHP
R80	390KΩ ¼Watt 10% Carbon Fixed Resistor	4A	1D
R81	390KΩ ¼Watt 10% Carbon Fixed Resistor	5A	1D
R82	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	4A	1D
R83	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	5A	1D
R84	470KΩ ¼Watt 10% Carbon Fixed Resistor	4A	1D
R85	470KΩ ¼Watt 10% Carbon Fixed Resistor	5A	1D
R86	3.3KΩ ¼Watt 10% Carbon Fixed Resistor	4A	1D
R87	3.3KΩ ¼Watt 10% Carbon Fixed Resistor	5A	2D
R88	220KΩ ½Watt 10% Carbon Fixed Resistor	4A	2D
R89	220KΩ ½Watt 10% Carbon Fixed Resistor	5A	2D
R90	100KΩ ¼Watt 10% Carbon Fixed Resistor	4B	1D
R91	100KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1D
R92	22KΩ ¼Watt 10% Carbon Fixed Resistor	4B	1D
R93	22KΩ ¼Watt 10% Carbon Fixed Resistor	5B	1D
R94	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	4B	1D
R95	2.2MΩ ¼Watt 10% Carbon Fixed Resistor	5B	1D
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_{39}, C_{40}, C_{44}, C_{45}, C_{49}
	B. Defective low-frequency circuit	1. Inner contact or poor insulation of tube 2. Insufficient capacity of capacitor 3. Fixed resistor blown	V_{10}, V_{11}, V_{12}, V_{13} or V_{14}, V_{15} C_{113}, C_{116}, C_{123}, C_{124} R_{110}, R_{111}
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_{88}, R_{106}, R_{118}, R_{119} or R_{89}, R_{107}, R_{119}, R_{120} C_{111}, C_{114} or C_{112}, C_{115} T_{11} or T_{12} V_{10}, V_{11}, V_{12}, V_{13} or V_{14}, V_{15} VR-9
SPEAKER switch does not work at all	A. Defective headphone B. Defective headphone circuit		Check headphone R_{130}, R_{132} or R_{131}, R_{133}
NOISE FILTER switch does not work at all	A. Defective filter circuit		C_{105} or C_{106}; S_{6a}, S_{6b}
LOUDNESS switch does not work at all	A. Defective filter circuit		C_{107}, C_{109}, R_{98} or C_{108}, C_{110} R_{99}; VR-9, S_{5a}, S_{5b}
TONE CONTROL switch does not work at all	A. Defective tone control circuit		C_{95}, C_{97}, C_{99}, C_{101}, C_{103}, R_{90} or R_{92}, R_{96} or C_{96}, C_{98}, C_{100}, C_{102}, C_{104}, R_{91}, R_{93}; VR-7, VR-8

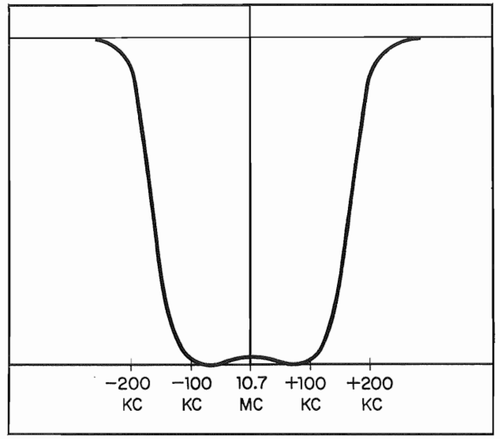
FM RECEPTION

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_1～V_4 C_{29}, C_{24}, C_{25}, C_{27} T_1, T_2, T_5, T_6 C_4, C_5, C_6, C_7, L_4, V_1

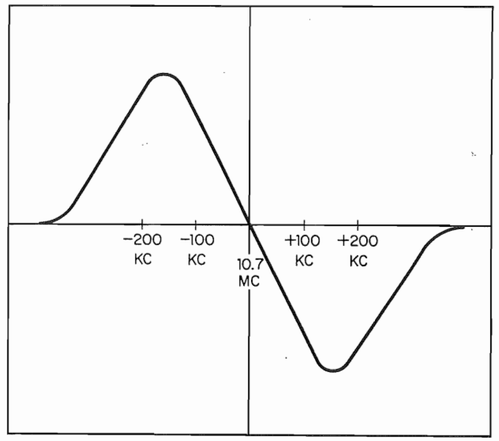
AMPLIFIER TROUBLESHOOTING CHART

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_1, T_2, T_5, T_6 and $L_1 \sim L_4$ C_6, CR-1, CR-2, C_{29} S_{1d}, S_{1e} $V_1 \sim V_4$ C_4, C_5, C_6, C_7, C_8, L_4, V_1 Optimum adjustment often needs to use measuring instruments TC_1, TC_2, L_3, L_4 T_1, T_2, T_5, T_6 /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_{14}, C_{20}, C_{22} Optimum adjustment often needs to use measuring instrument TC_1, TC_2, L_3, L_4 T_1, T_2, T_5, T_6, /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	$V_1 \sim V_4$ C_{14}, C_{20}, C_{24}, C_{29}, C_{19}
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 $V_1 \sim V_4$ R_5, R_6, R_9, R_{13}, R_{16}, R_{17} C_{10}, C_{12}, C_{14}, C_{18}, C_{20}, C_{22}, C_{28}, C_{27}, C_{29}
Magic eye does not work normally	A. Defective FM tuner		
	B. Defective tuning indicator circuit		V_{16}, R_{30}, R_{15}, S_{1b}
FM-AFC switch does not work at all	A. Defective AFC circuit		IS-351, C_8, C_9, C_{26}, R_2, R_4, R_{22}

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 :
   a. Multiplex Stereo Generator
   b. FM Signal Generator
   c. Oscilloscope
   d. Sweep Generator
   e. AC V.T. V.M.
   f. 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_9	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_8	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_7	Maximum
4.	38 KC Doubler coil	Same	Same	Same	T_8	Maximum
5.	38 KC coil	Same	Same	Some	T_9	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_3 Pin 1 6BA6	oscilloscope at TP-1		3rd IFT (T_5) Primary & secondary	*Best IFT Wave form
		10.7 MC ±400 KC	V_2 Pin 1 6BA6	oscilloscope at TP-1		2nd IFT (T_3) Primary & secondary	*Best IFT Wave form
		10.7 MC ±400 KC	Couple Sweep Signal by a round tube V_1 6AQ8	oscilloscope at TP-1		1st IFT (T_1) Primary & secondary	*Best IFT Wave form
2.	Discriminator	10.7 MC ±400 KC	Couple Sweep Signal by a round tube V_1 6AQ8	oscilloscope at TP-2		4th IFT (T_6) 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_4	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	Autenna coil L_2	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"	Measure voltage in MPX section and replace defective element
		2. Blown heater of tube	V_6～V_9
		3. Defective resistor	R_{47}, R_{48}, R_{49}, R_{50}, R_{51}, R_{56}, R_{58}
		4. Insufficient capacity or short circuit of capacitor	C_{50}, C_{62}, C_{63}, C_{64}, C_{65}, C_{66}, C_{67}, C_{68}, C_{69}, C_{70}, C_{71}
		5. MPX coil aging	T_7, T_8, T_9
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"	Measure voltage in MPX section and replace defective element
		2. Insufficient capacity of capacitor	C_{50}, C_{62}～C_{71}
		3. Aging diode	V_8, V_9
		4. Divergence in adjustment of:	Optimum adjustment often needs to use measuring instruments
		a. MPX coil	T_7, T_8, T_9
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"	Measure voltage in MPX section and replace defective element
		2. Aging diode	V_8, V_9,
		3. Insufficient capacity of capacitor	C_{67}, C_{68}
		4. Fixed resistor defective	R_{35}, R_{36}, R_{37}, R_{54}, R_{60}
		5. Divergence in adjustment of MPX coil	T_7, T_8, T_9
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	V_o～V_9
		2. Insufficient capacity of capacitor	C_{76}, C_{77}

AMPLIFIER TROUBLESHOOTING CHART

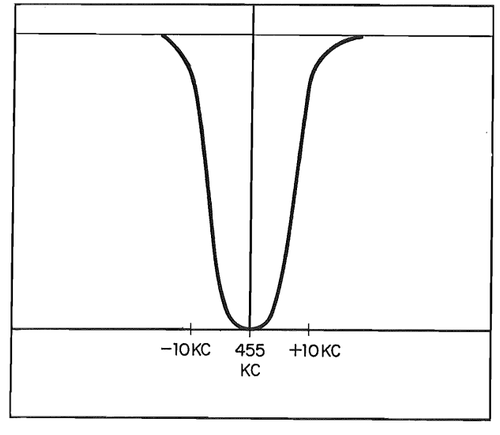
Symptom	Probable Cause		Check Point
Noisy	A. Defective FM section		See "FM RECEPTION : Noisy"
	B. Defective overall section		See "Noisy over all program sources"
	C. Defective MPX section	1. Defective MPX coil	T_7, T_8, T_9
		2. Defective fixed resistor	R_{47}, R_{55}, R_{56}, R_{58}, R_{59}
		3. Aging capacitor	C_{50}, C_{67}, C_{68}, C_{70}, C_{71}
		4. Aging tube	$V_6 \sim V_9$
		5. Loose contact of rotary switch	S_{1d}, S_{1e}
No MPX stereo sound	A. Subcarrier amplifying circuit defective	1. Divergence of volatge specified in "CIRCUIT DIAGRAM"	Measure voltage at pins of V_6 and V_7 in subcarrier amplifying circuit and replace defective element
		2. Insufficient capacity or short circuit of capacitor	C_{55}, C_{56}, C_{57}, C_{59}, C_{60}, C_{61}
		3. 38-kc oscillating circuit defective	R_{43}, R_{44}, R_{45}, R_{46}, R_{47}
		4. Aging tube (poor emission)	V_6, V_7
		5. Aging coil (too low Q)	T_7, T_8, T_9
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_7, V_{16}
	b. Aging or defective diode		OA-91 detector diode
	c. Variable or fixed resistor defective		VR-1, R_{31}, R_{39}, R_{40}, R_{41}
	d. Insufficient capacity or short circuit of capacitor		C_{37}, C_{38}, C_{53}, C_{54}
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 ALGNMENT PROCEDURE

Turn tuning gang fully, Center carrier wave. Set pointer at reference mark.

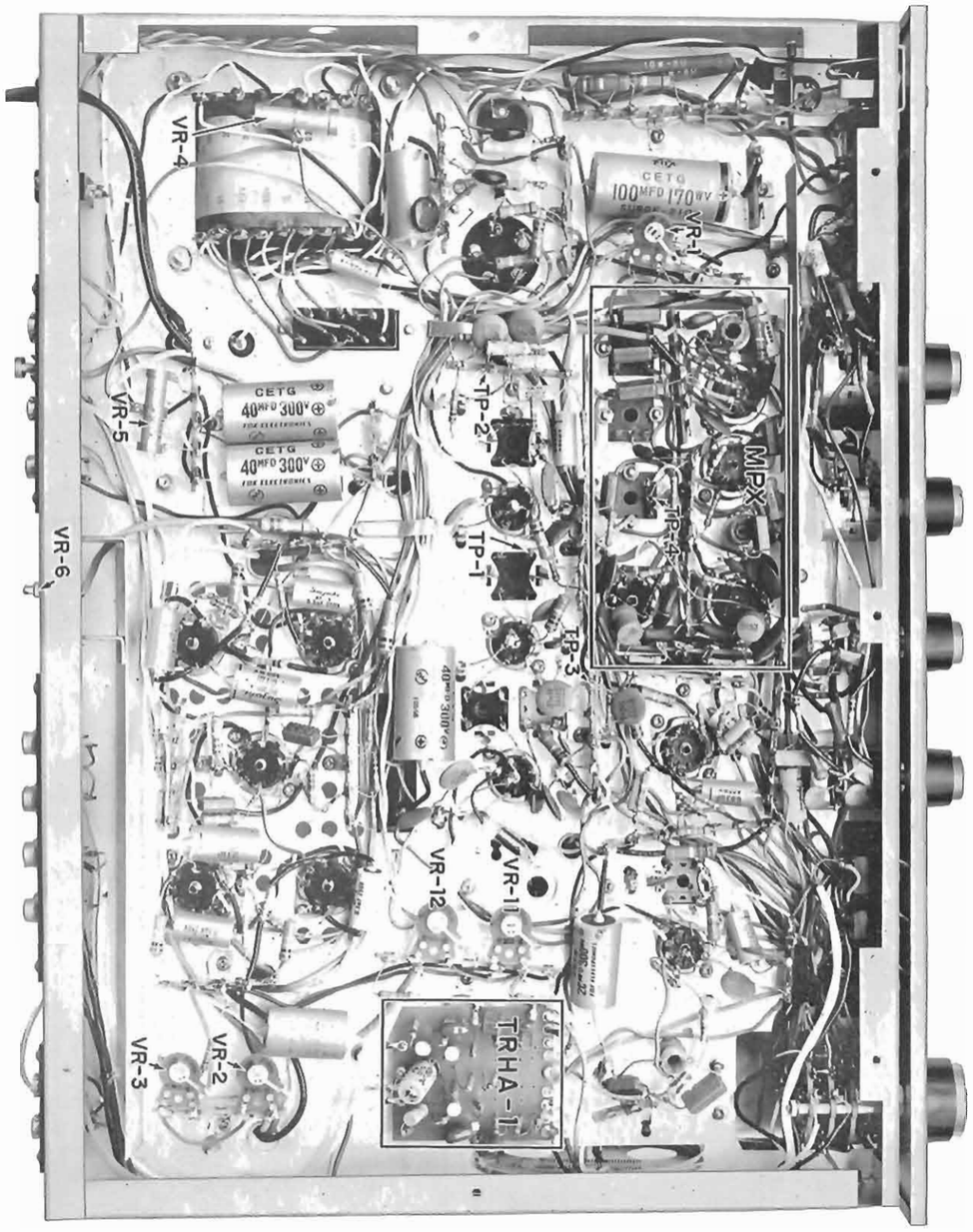
STEP	ALIGN	GENERATOR	FEED SIGNAL	OUTPUT INDICATOR	DIAL SETTING	ADJUST	ADJUST FOR
1.	IF Transformer	455 KC ±30 KC sweep-generator	Pin 7 6BE6	Sweep input at TP-3		1st I.F.T--(T_3) Primary & seconbary 2nd I.F.T--(T_4) Primary & secondary	*Best I.F.T Wave form
2.	OSC.	AM-OSCILLATOR 600 KC 400 c/s 30% Modulation	Antenna Terminals	oscilloscope & V.T. V.M. at output load	600 KC	OSC. coil L_6	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_5	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	1. Divergence of voltage specified in "CIRCUIT DIAGRAM"	Measure voltage in AM section and replace defective element.
		2. Aging or defective tube	V_2, V_5
		3. Aging or defective I.F.T.	T_4, T_3
		4. Detector diode defective	D_{301}
		5. Aging or defective capacitor	Check C_{16} and C_{17} for short circuit and C_{309} for insufficient capacity.
Weak sound	A. Weak station signal		See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD".
	B. Defective overall section	1. Divergence of voltage specified in "CIRCUIT DIAGRAM"	Measure voltage in AM section and replace defective element.
		2. Voltage drop in local oscillator	V_5, C_{31}, C_{32}, R_{26}, R_{27}, L_6
		3. Detector diode, aging or week	OA-91
		4. Too low Q of coil	L_6, T_3, T_4
		5. Insufficient capacity of capacitor	C_{31}, CR_{-1}, C_{15}
		6. Aging or weak tube (poor emission)	V_2, V_5
		7. Divergence in adjustment of: a. Tracking b. I.F.T.	Optimum adjustment often needs to use measuring instruments. TC_3, TC_4 T_3, T_4
Distortion	A. Defective overall section		See "Distortion over all program sources".
	B. Defective AM section	1. Divergence of voltage specified in "CIRCUIT DIAGRAM"	Measure voltage in AM section and replace defective element.
		2. Detector diode, aging or weak	OA-91
		3. Insufficient capacity of capacitor	C_{33}, C_{34}, C_{35}
		4. Divergence in adjustment	See "weak sound".
Hum	A. Defective overall section		See "Hum over all program sources".
	B. Defective AM section	1. Inner contact or poor insulation of tube	V_2, V_5
		2. Insufficient capacity of capacitor	C_{33}, C_{19}
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	1. Aging or defective tube	V_5
		2. Loose contact of rotary switch	S_{1d}, S_{1e}
Magic eye does not work normally.	A. Defective AM tuner		Check as desribed above.
	B. Defective tuning indicator circuit		See "FM RECEPTION: Magic eye does not work normally".

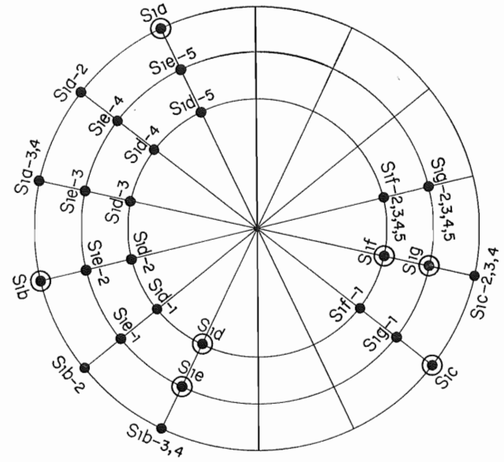
AMPLIFIER TROUBLESHOOTING CHART

RECORD PLAYER*

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

Symptom	Probable Cause		Check Point
No sound	A. Program source defective		Check and repair or replace
	B. Defective overall section		See "No sound over all program sources".
	C. Defective head amplifier	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_{67}, C_{68}, R_{69}, R_{70}, R_{79}, C_{86}, C_{87} S_{1d}, S_{1e}, S_{1f}, S_{1g}
Weak sound	A. Program source defective		Check and repair or replace
	B. Defective overall section		See "Weak sound over all program sources"
	C. Defective head amplifier	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_{78}, C_{86}, C_{91} or C_{79}, C_{87}, C_{92} C_{89}, C_{90} S_{1d}, S_{1e}, S_{1f}, S_{1g}
Distortion	A. Program source defective		Check and repair or replace
	B. Defective overall section		See "Distortion over all program sources"
	C. Defective head amplifier	1. Divergence of voltage specified in "CIRCUIT DIAGRAM" 2. Capacitor, shorted or blown	Measure voltage in head amplifier section and replace defective element. C_{78}, C_{79}, C_{86}, C_{87}, C_{91}, C_{92}
Hum	A. Program source defective		Check and repair or replace
	B. Amplifier is O.K.	1. Improper connections	See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"
	C. Defective overall section		See "Hum over all program sources".
	D. Defective head amplifier	1. Insufficient capacity of capacitor	C_{88}
Noisy	A. Program source defective		Check and repair or replace
	B. Amplifier is O.K.		See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD"
	C. Defective overall section		See "Noisy over all program sources"
	D. Defective head amplifier	1. Fixed resistor defective 2. Defective capacitor	R_{63}~R_{89} C_{78}~C_{94}

SELECTOR CHART



FUNCTION
S_1 (a–g)
1 PHONO
2 AM
3 FM
4 FM-STEREO
5 AUX

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.

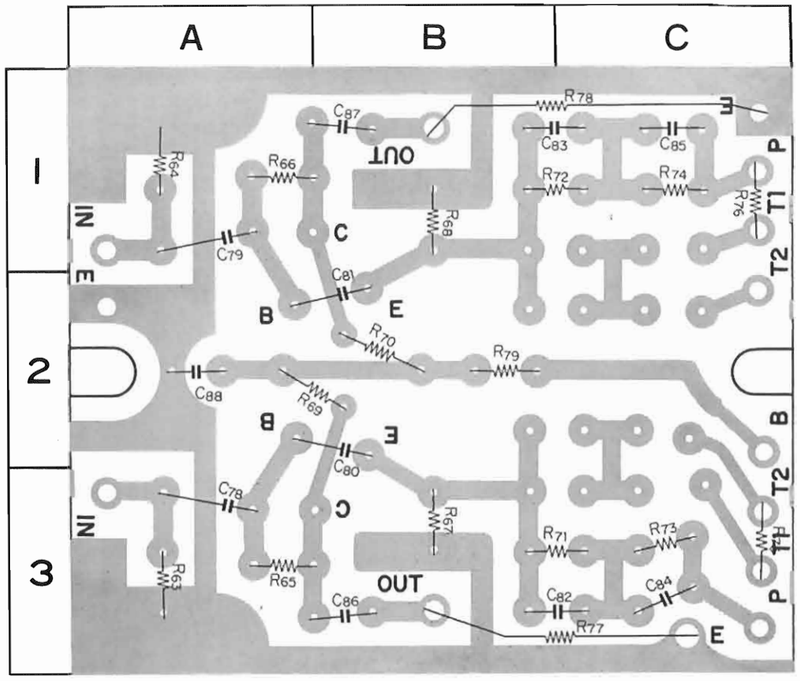
●: contact point
◎: supporting point

Co-ordinates in Circuit Diagram

S_{1a}....2B	S_{1e}....5A
S_{1b}....2B	S_{1f}....4A
S_{1c}....2B	S_{1g}....5A
S_{1d}....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

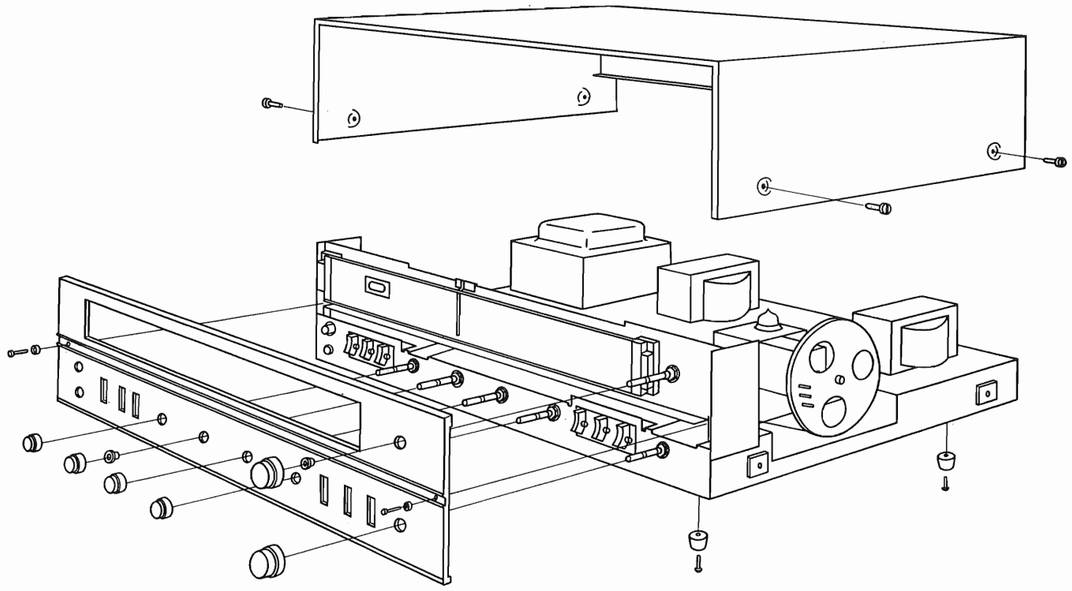
Symptom	Probable Cause	Check Point
Record player with crystal cartridge does not operate properly	1. Program source defective 2. Improper or incorrect connections 3. Defective overall section	Check and repair or replace See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD" See "OVER ALL PROGRAM SOURCES"
Sound input from TV, additional tuner or others is not reproduced properly	1. Program source defective 2. Improper or incorrect connections 3. Defective overall section	Check and repair or replace See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD" See "OVER ALL PROGRAM SOURCES"
Pin-jack tape recorder does not operate properly	1. Program source defective 2. Improper or incorrect connections 3. Defective overall section	Check and repair or replace See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD" See "OVER ALL PROGRAM SOURCES"

RECORDING ON TAPE

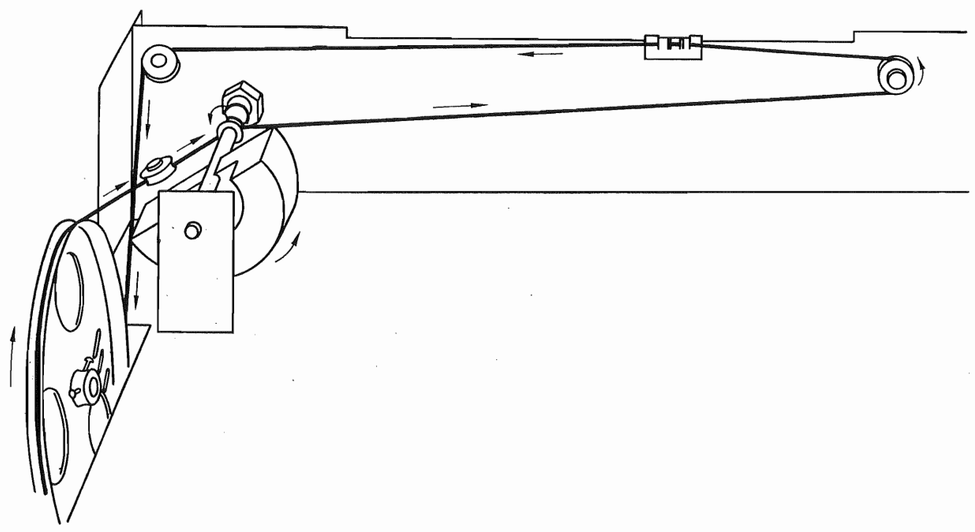
Symptom	Probable Cause	Check Point
Broadcast is not recorded well	1. Defective tape or tape recoder 2. Improper or incorrect connections 3. FM, FM-MPX or AM section defective	Check and repair or replace See "TROUBLESHOOTING AUDIO SYSTEM WHEN THE AMPLIFIER IS GOOD" See "AM", "FM" or "FM-MPX RECEPTION"
Record is not recorded well	1. Defective tape or tape recorder 2. Improper or incorrect connections 3. Record, record player defective	Check and repair or replace See "TROUBLESHOOTING AUDIO IS GOOD" See "RECORD PLAYER: Defective head amplifier"

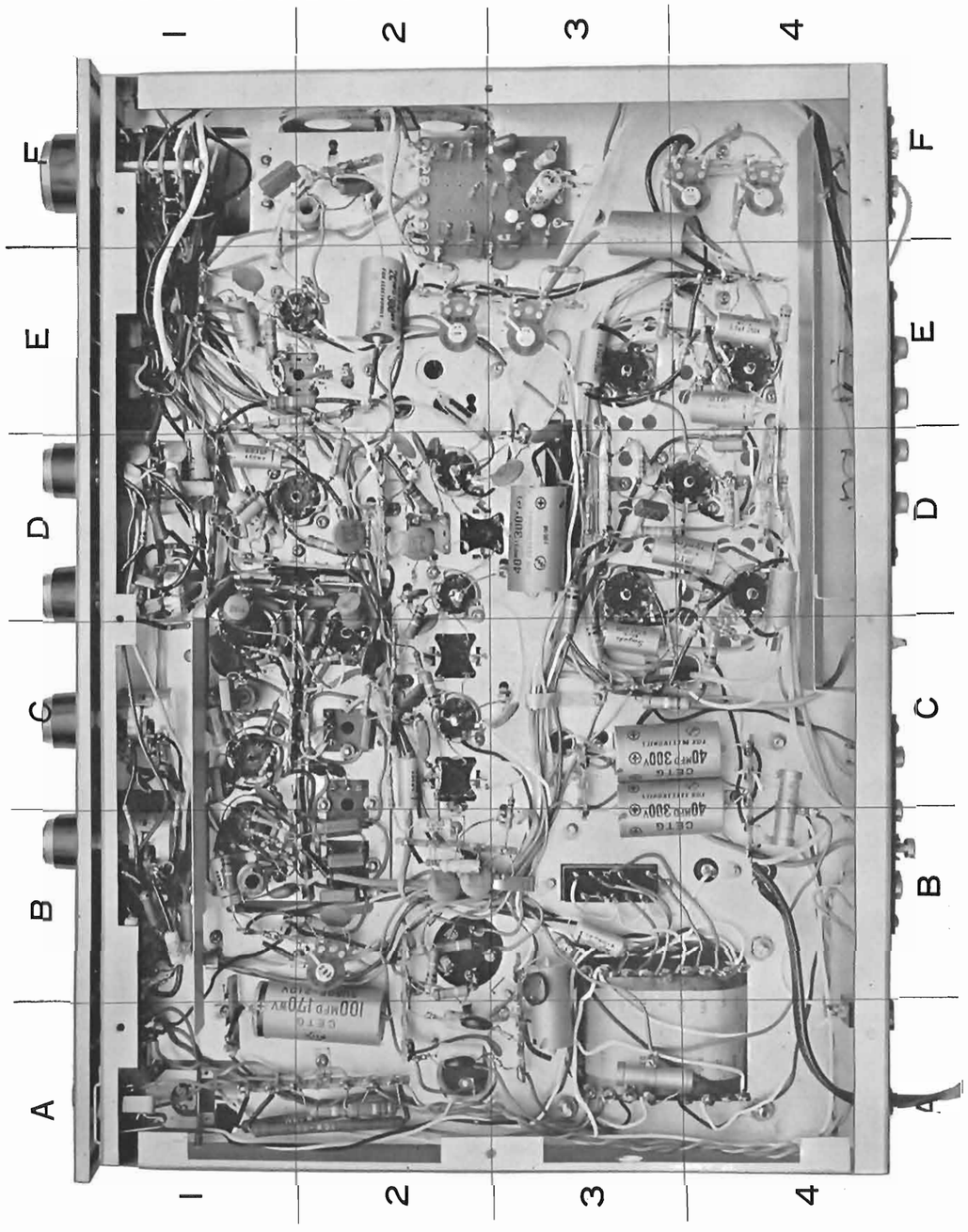
REMOVING THE FRONT PANEL, BONNET & BOTTOM PLATE/DIAL MECHANISM

REMOVING THE FRONT PANEL, BONNET & BOTTOM PLATE

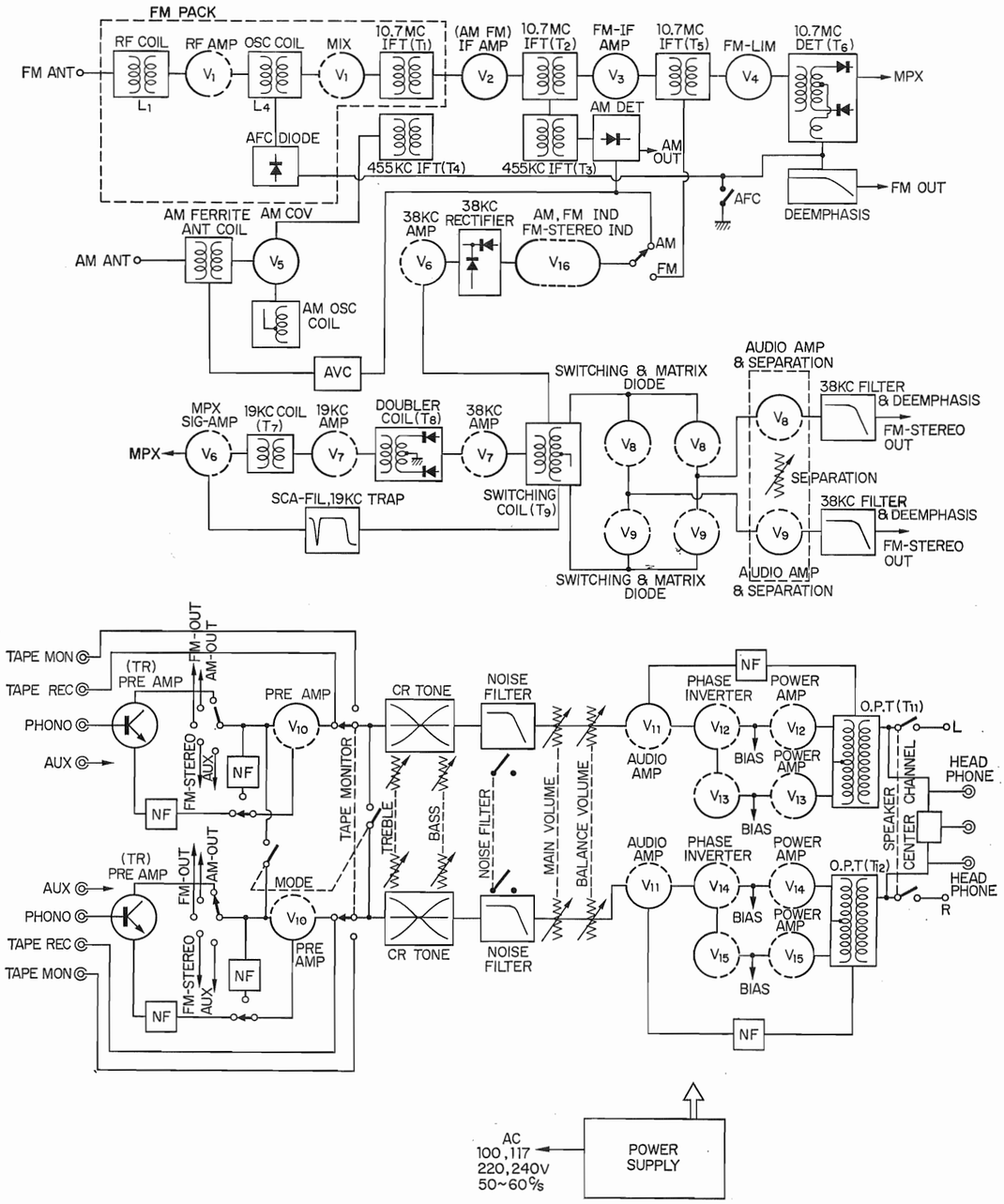


DIAL MECHANISM

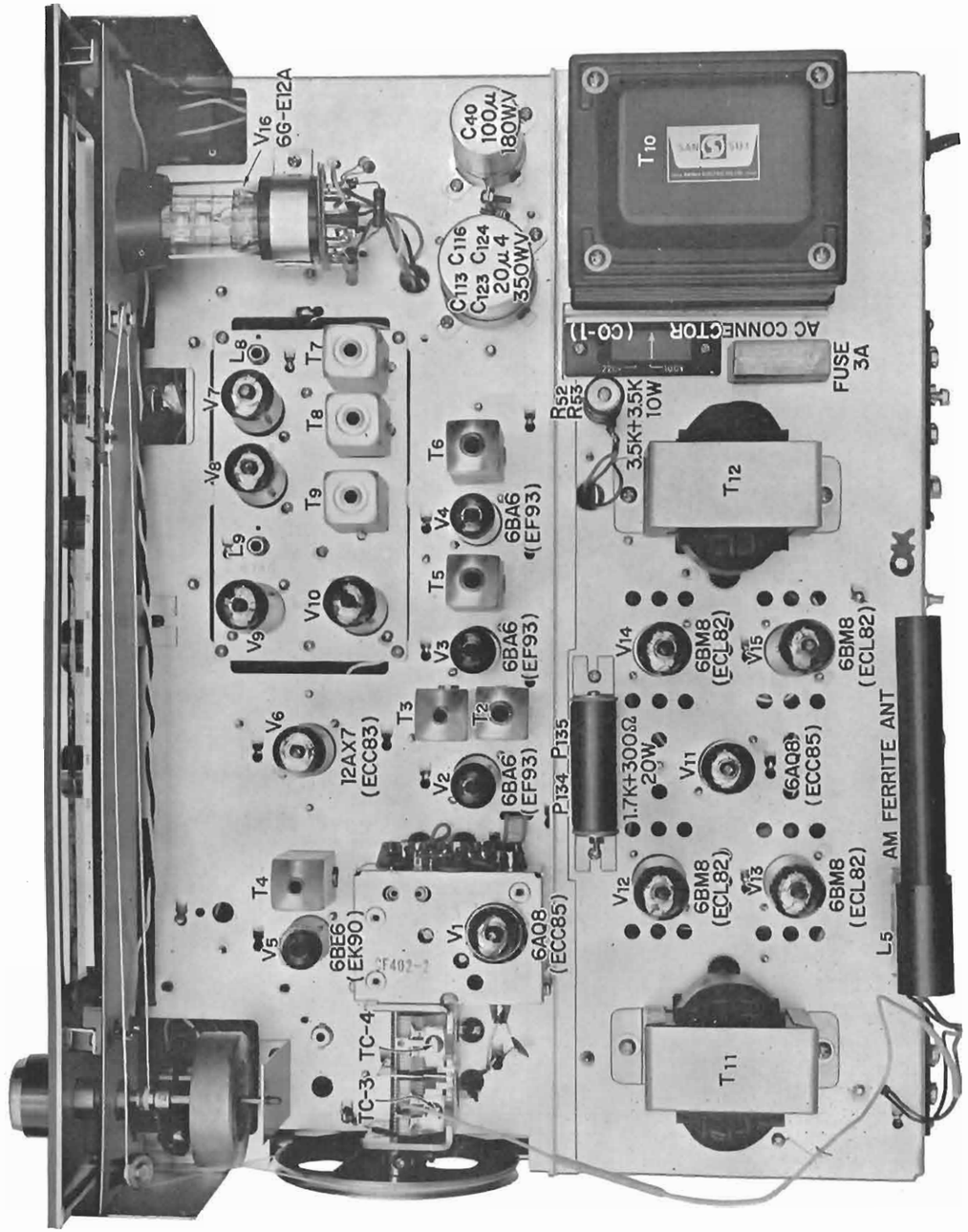




BLOCK DIAGRAM



PARTS LAYOUT



SCHEMATIC DIAGRAM