



 **sams**

**modular  
hi-fi  
components**

**MHF-41**

**for**

*Bradford 1453C31 (WTG59022)*

*Hitachi TPG-144D — Panasonic SE-990*

*Penncrest 1703 (853-1352) — Sharp SD-101U*

*Sony ST-5100 — Sylvania ACS16, CR2741, MS2722,*

*MS3722, MST2736 — Teledyne Packard Bell RPC718,*

*RPC719, RPS103, RPTS155, RS103 — Wards Airline GEN-6022A,*

*GEN-6022B — Zenith C590W2, C590W3*



\$3.95

\$4.95 IN CANADA

Cat. No. MHF-41



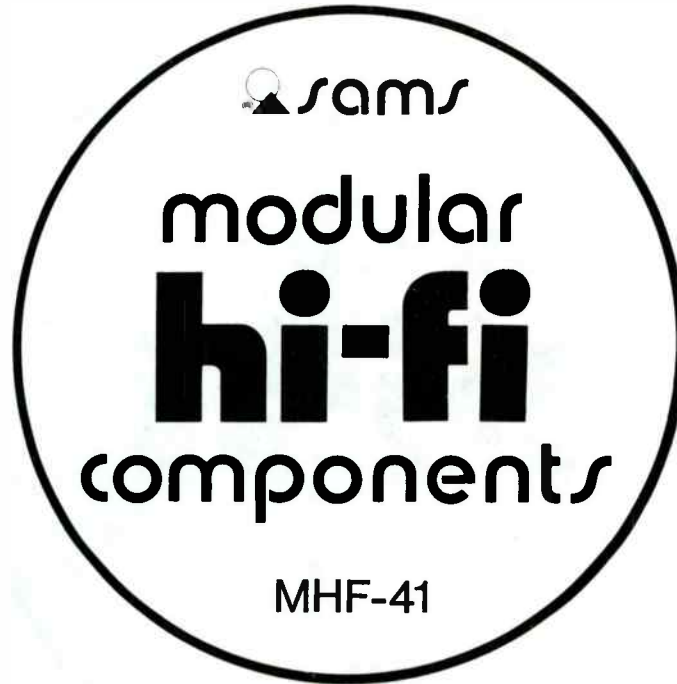
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**HOWARD W. SAMS & CO., INC.**

INDIANAPOLIS, INDIANA

*First Edition*  
*First Printing—September, 1973*



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Library of Congress Catalog Card Number 72-77606



— modular **hi-fi** components —

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## GENERAL SERVICING INFORMATION

The following information applies to all players in this volume, and should be followed before any adjustments are made or trouble diagnosis is attempted. Any exceptions or additions will be found in the detailed servicing procedures for each player.

### POWER SOURCES

Many players require full supply voltage for proper operation. Be sure the supply voltage is maintained at the rated value under load while making adjustments.

### CLEANING

Head faces should be cleaned with head cleaner to remove dust and accumulated oxide. (An applicator may be fashioned from absorbent cotton.) Do not use a screwdriver or any metallic object near the head faces.

*CAUTION: Avoid getting head cleaner on any plastic surface.*

Clean capstans, pressure rollers, and tape guides with alcohol using a soft lint-free cloth. Also use alcohol to remove oil and grease from drive belts and other driving surfaces.

### LUBRICATING

Clean all surfaces before lubricating. Apply a few drops of #20 machine oil to all bearings and rotating bushings. Apply a thin film of light, nonhardening grease to all cam surfaces and pawls, if they have been factory lubricated. Always wipe excess oil or grease from parts that have been lubricated.

*CAUTION: Oil and grease must be kept off all driving surfaces as well as any parts which may transfer oil or grease to them.*

### DEMAGNETIZING

Heads require demagnetizing at regular intervals to maintain high-frequency response, dynamic range, and low distortion. (Follow instructions included with the demagnetizing unit.) After demagnetizing the heads, keep all screwdrivers and other metallic objects away from the head faces. Tape guides may also require occasional demagnetizing.

*IMPORTANT: Be sure to demagnetize the heads after making resistance measurements in the head circuits.*

### CARTRIDGES

Many problems associated with tape players result from defective cartridges. Always try a cartridge known to be good before attempting repairs.

ALIGNMENT INSTRUCTIONS

A) EQUIPMENT NEEDED

1. AM Signal Generator
2. FM Signal Generator
3. IF Sweep Generator
4. FM Stereo Signal Generator
5. Marker Generator
6. Oscilloscope
7. Output Meter (VTVM)
8. Distortion Meter

B) IMPORTANT

1. For AM Alignment apply 400 Hz modulation on the Signal Generator and radiated signal.
2. Connect a VTVM or a circuit tester to voice coil.  
Connection may be made by means of a stiff wire in the speaker pin jack, and by using lead wire with plug. Adjust as in the tables below, for maximum meter reading.  
When necessary, reduce the oscillator output so that meter reading does not exceed 2 V.
3. Be sure to see the performance after casing the unit realigned.
4. After alignment had been completed all coil slugs and trimmers that have been moved during alignment should be rewaxed to insure stability of operation.
5. Use only nonmetallic alignment tools to insure proper alignment.

C) AM Section

Circuit Alignment	Equipment Connection	Step	Gen. Freq.	Dial Setting	Adjustments
IF	AM SIGNAL GENERATOR Radiated Signal OUTPUT METER (VTVM) Across Point B (See Figure A)	1	455 kHz (Mod.)	Tuning gang fully closed	AM IFT – T2, T3, T5, T7  Adjust for maximum
		2	---	---	Repeat until no further improvement can be made.
BAND	Same as steps 1 and 2. (See Figure B)	3	525 kHz (Mod.)	Tuning gang fully closed	16 (AM Osc. coil) Adjust for maximum output.
		4	1650 kHz (Mod.)	Tuning gang fully opened	TC5 (AM Osc. trimmer) Adjust for maximum output.
		5	---	---	Repeat steps 3 and 4.
TRACKING	Same as steps 1 and 2 (See Figure B)	6	600 kHz	Tune to signal	1604 (AM Ant. coil) Adjust coil on ferrite core for maximum output.
		7	1400 kHz	Some as step 6	TC4 (AM Ant. trimmer) Adjust for maximum output.
		8	---	Tune to	Repeat steps 6 and 7.

## D) FM Section

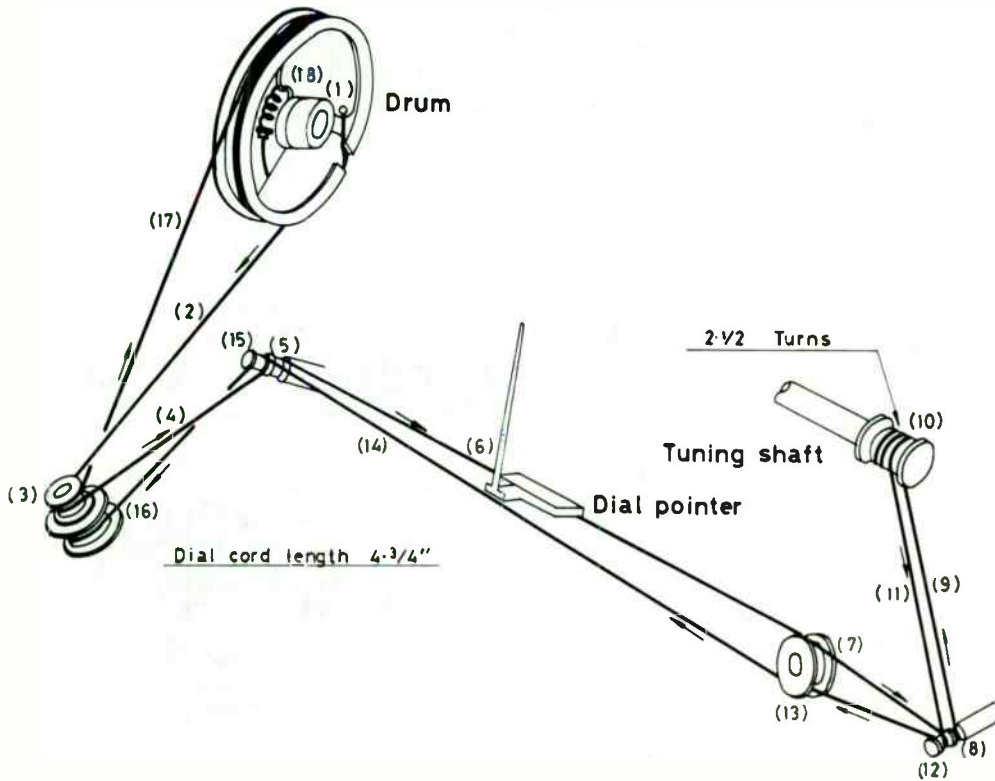
Circuit Alignment	Equipment Connection	Step	Gen. Freq.	Dial Setting	Adjustments
IF	<b>IF SWEEP GENERATOR</b> High side through 10 pF to Q1 Base, low side to ground. <b>MARKER GENERATOR</b> The same as Sweep Generator. <b>OSCILLOSCOPE</b> Across point A (47 Kohm) (see Figure C)	1	10.7 MHz	Tuning gang fully closed.	FM IFT – T, T4, T6  Adjust for maximum symmetrical response. (10.7 MHz at the center point)
		2	--	--	Repeat step 1.
RATIO DET.	Same as steps 1 and 2.	3	10.7 MHz (Mod.)	Tuning gang fully closed.	FM IFT – T8 Adjust for suitable S curve.
		4	--	--	Repeat step 3.
BAND	<b>FM SIGNAL GENERATOR</b> Radiated signals <b>OUTPUT METER (VTVM)</b> Across speaker voice coil. (See Figure D)	5	86 MHz (Mod.)	Tuning gang fully closed.	L4 FM (Osc. coil) Adjust for maximum output.
		6	110 MHz (Mod.)	Tuning gang fully opened.	TC1 (FM Osc. trimmer) Adjust for maximum output.
		7	--	--	Repeat steps 5 and 6.
RF	Same as steps 5, 6, and 7.	8			L1 (FM Ant. coil) & L2 (FM RF. coil) Adjust for maximum output.
		9			TC 2 (FM Ant. trimmer) TC3 (FM RF. trimmer) Adjust for maximum output.
		10			Repeat steps 8 and 9 to obtain suitable sensitivity at 90 MHz and 106 MHz.



**E) FM MPX.**

Circuit Alignment	Equipment Connection	Step	Gen. Freq.	Dial Setting	Alignment
	FM STEREO GEN. Composite out connect to Ext. Mod. of FM Signal Generator FM SIGNAL GEN: Connect to TM601, 602 (Ant. Terminal) OSCILLOSCOPE V. amp. to point "C" (See Schematic Diagram) (See Figure E)	1	98 MHz	98 MHz	First make sure FM Section is properly sligned; Adjust T9, T10 to obtain suitable wave on Oscilloscope (See WAVE FORM)
CHAN- NEL SEPA- RATION	FM STEREO GEN. FM SIGNAL GEN. Same as Step 1 DIST. METER (VTVM) (See Figure F)	2	98 MHz	98 MHz	Adjust VR 2 for minimum output from left (right) Channel when right (left) channel is modulated. Channel separation should be not less than 20 dB.

**DIAL CORD STRINGING DIAGRAM**



# EQUIPMENT CONNECTIONS

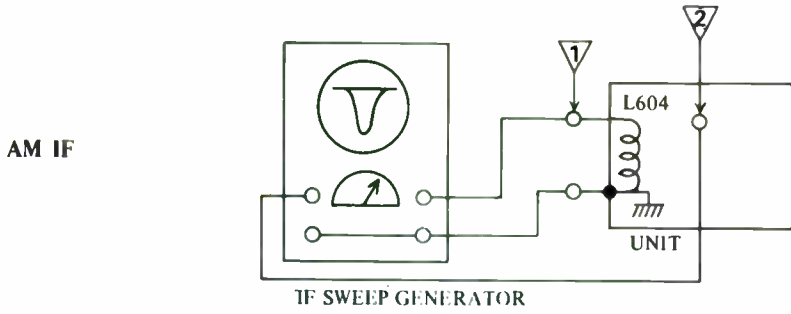


Figure A

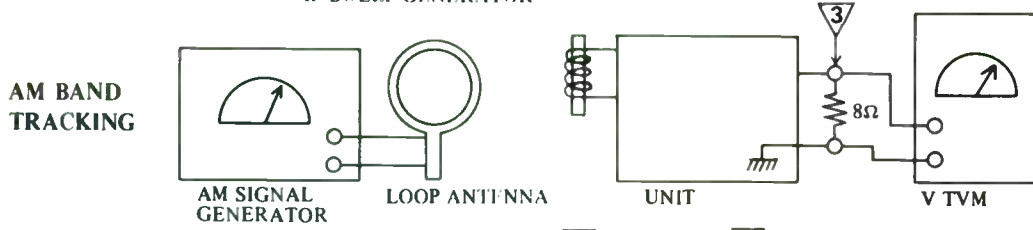


Figure B

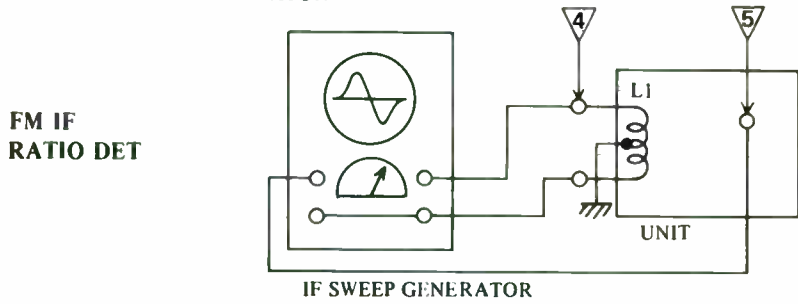


Figure C

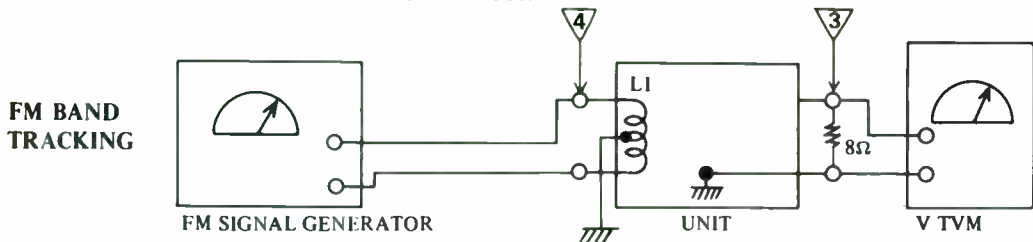


Figure D

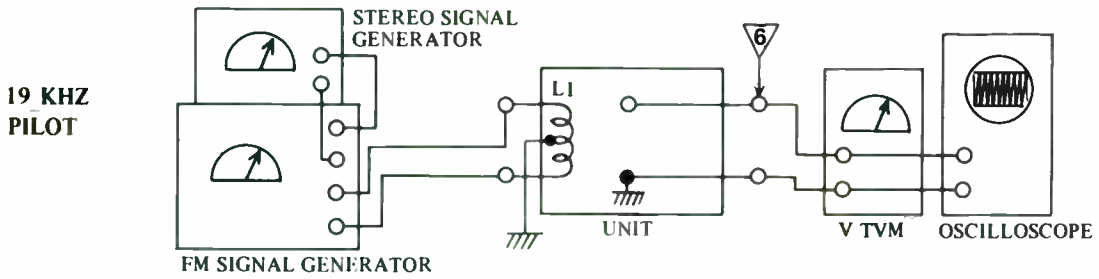


Figure E

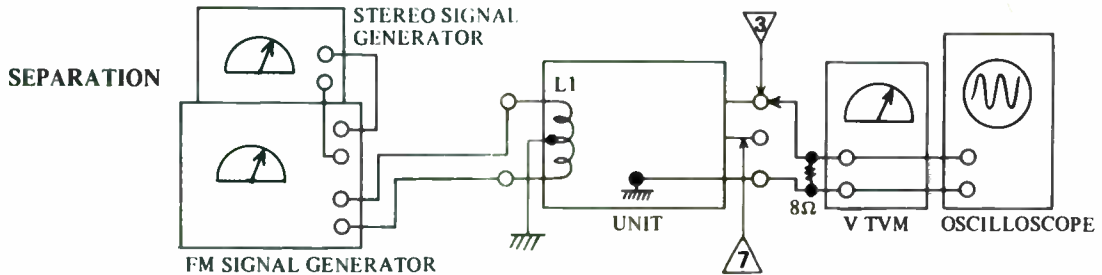


Figure F

**SEMICONDUCTORS**

ITEM	PART NO./TYPE		
D1	2S2139B	Q3	2SC461
D2	1N60	Q4	2SC460
D3	1N60	Q5	2SC460
D4	1N60	Q6	2SC460
D5	1N60	Q7	2SC460
D6	1N60(P)	Q8	2SC458
D7	1N60(P)	Q9	2SC458
D8	1N60(P)	Q10	2SC458
D9	1N60(P)	Q101	2SC458LG
D10	1N60(P)	Q102	2SA672
D11	1N60(P)	Q103	2SC1213
D12	1N60(P)	Q104	2SA715
D13	1N60(P)	Q105	2SC1162
D14	1N60	Q201	2SC458LG
D15	BZ-120(AW0112)	Q202	2SA672
D16	10D-1	Q203	2SC1213
D17	10D-1	Q204	2SA715
D101	KB-162	Q205	2SC1162
D201	KB-162	Q401	2SC644
D601	Y06	Q402	2SC644
Q1	2SC535	Q403	2SC644
Q2	2SC461	Q404	2SC644

**ELECTROLYTIC/VARIABLE CAPS**

ITEM	PART NO.	VALUE	
C34	1203476	47mfd	16V
C42	1203107	100mfd	16V
C52	1203106	10mfd	16V
C57	1203475	4.7mfd	16V
C62	1203475	4.7mfd	16V
C75	1221106	10mfd	50V
C76	1203107	100mfd	16V
C77	1203237	220mfd	16V
C78	1220040	2200mfd	35V
C83	1204227	220mfd	25V
C106	1203476	47mfd	16V
C107	1203475	4.7mfd	16V
C108	1203105	1mfd	16V
C110	1203477	470mfd	16V
C113	1203477	470mfd	16V
C114	1203477	470mfd	16V
C206	1203476	47mfd	16V
C207	1203475	4.7mfd	16V
C208	1203105	1mfd	16V
C210	1203477	470mfd	16V
C213	1203477	470mfd	16V
C214	1203477	470mfd	16V
C403	1203475	4.7mfd	16V
C404	1203475	4.7mfd	16V
C405	1211124	.12mfd	
C406	1211124	.12mfd	
C411	1203106	10mfd	16V
C412	1203106	10mfd	16V
C413	1203106	10mfd	16V
C414	1203106	10mfd	16V
C415	1203227	220mfd	16V
TC1	1280027	Trimmer	
TC2			
TC3			
TC4			
TC5			
VC1	1291122	Tuning Gang	
VC2			
VC3			
VC4			
VC5			

**CONTROLS/SPECIAL RESISTORS**

ITEM	PART NO.	DESCRIPTION
R112	1390252	3000 ohms Channel Gain
R119	1330008	.22 ohms, 1/2W WW
R120	1330008	.22 ohms, 1/2W WW
R212	1390252	3000 ohms Channel Gain
VR2	1390252	3000 ohms
VR701 & VR702	1390136	50K Treble
VR703 & VR704	1390136	50K Bass
VR705 & VR706	1390133	50K Volume
VR707	1390134	50K Balance

**COILS/TRANSFORMERS**

ITEM	PART NO.		
L1	111B416	T2	11AM085
L2	112B016	T3	11FM102
L3	111B077	T4	11LM105
L4	111B160	T5	11BM004
L6	113M146	T6	11LM105
L7	1170015	T7	11CM004
L8	1170015	T8	11DM003
L601	1170020	T9	11PN-1
L602	1170020	T10	11QN001
L604	111B461	T601	118N100
T1	11JM120		

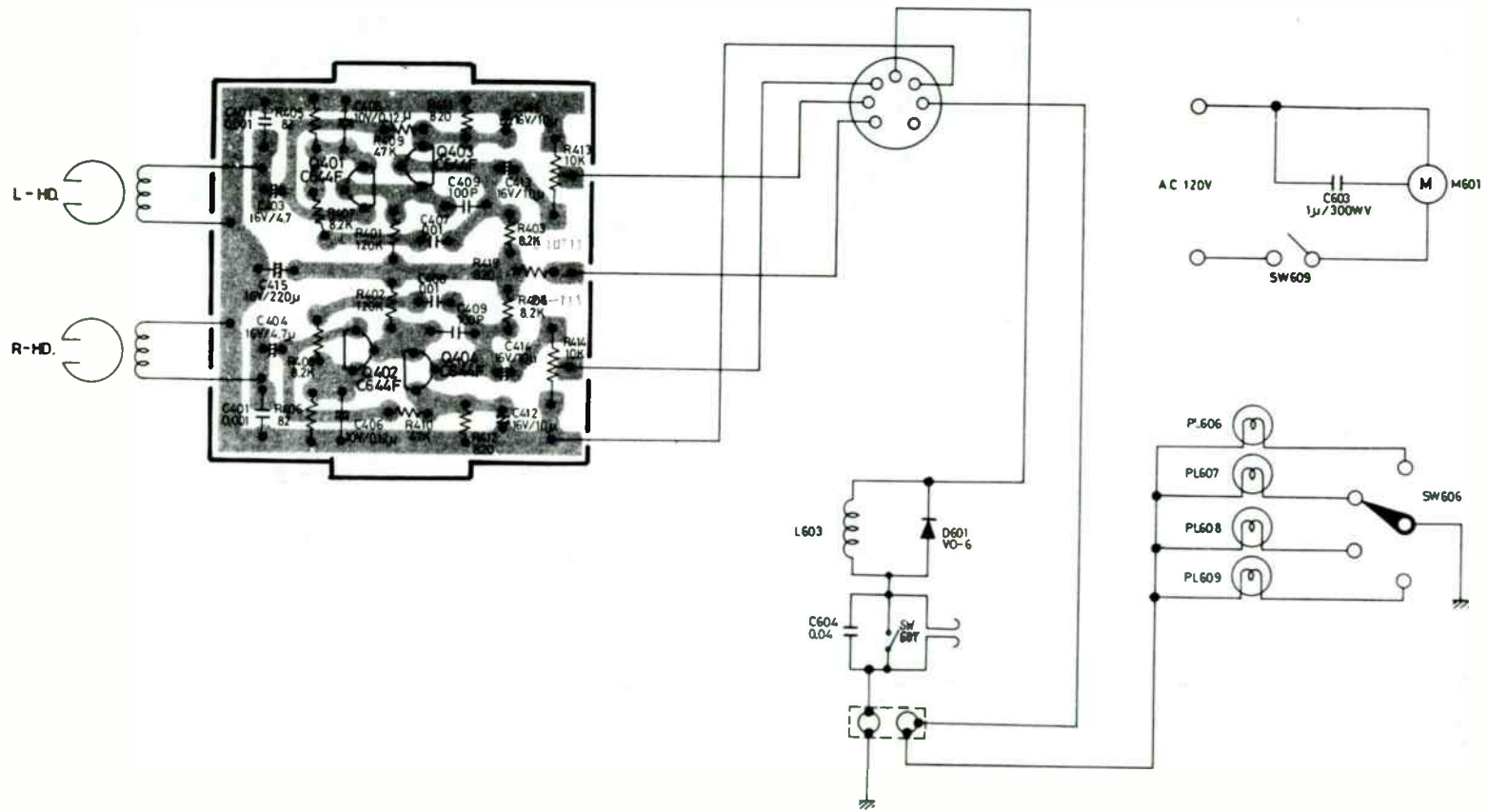
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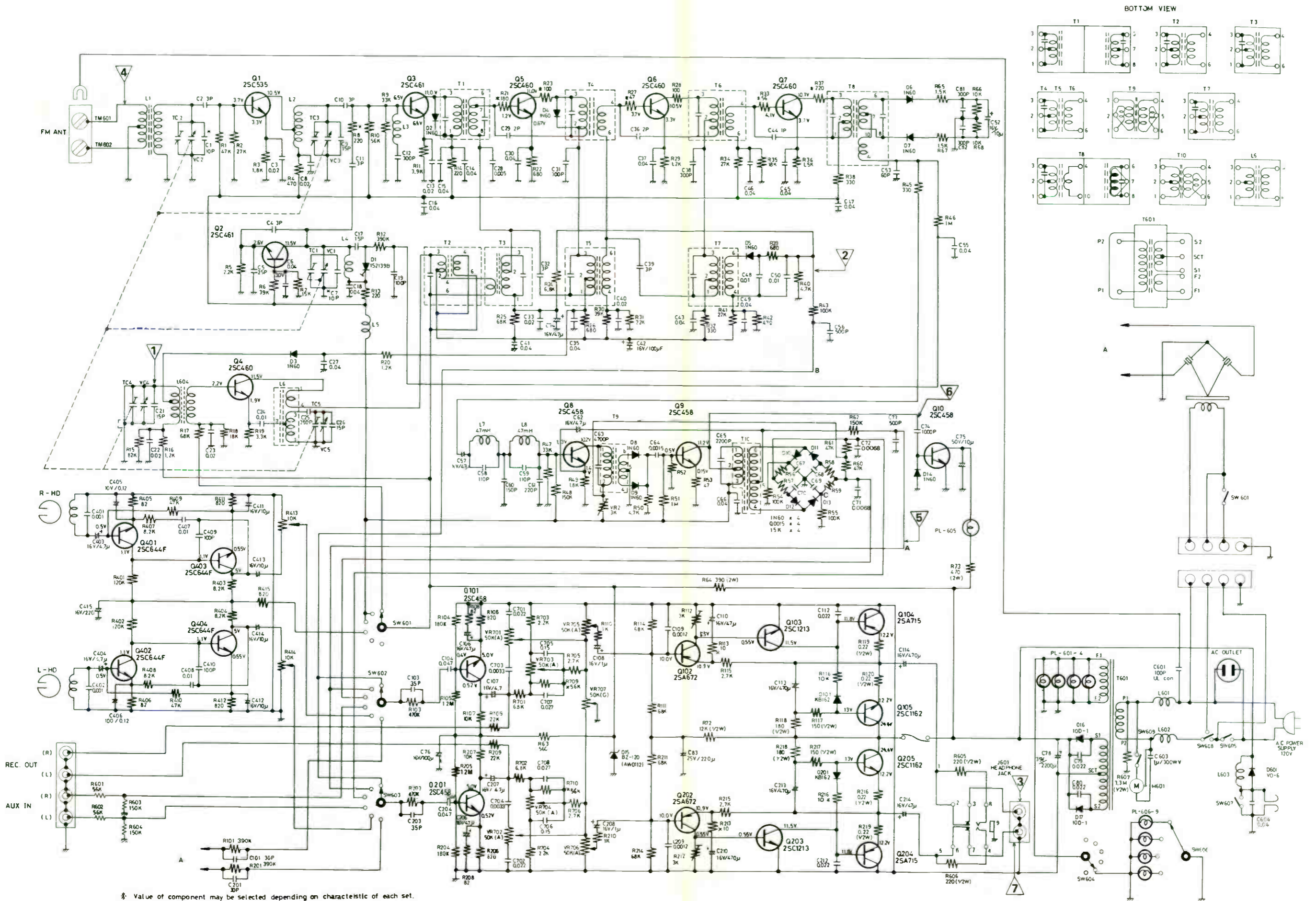
ITEM	NAME	PART NO.
L603	Solenoid, Track Change	116Y022
M601	Motor, Tape Drive	164N021
SW601	Switch, Function	1620132
SW602		
SW603		
SW604		
SW605	Switch, Power	1622037
SW608	Switch, Changer	1620132
SW609	Switch, Tape Motor	1623021
	Assembly, Record Cahger(BSR)C-124	
	Cartridge, Phono	BSR-SC7M
	Fuse	1790040
	Head, 8-Track Tape	165N006
	P.C. Board, RF/IF/Main Amp	1610471
	P.C. Board, Power Supply	1610489
	P.C. Board, Tape Preamp	1610111
	P.C. Board, Tone Control	1610566
	Stylus, Phono	BSR-SC7M-17D
	Belt, Tape Drive	21V7008

**CABINET PARTS**

NAME	PART NO.
Escutcheon, Control	21F4018
Trim, Left Front	21F4016
Trim, Right Front	21F4017
Knob, Tuning	21N4058
Knob, Volume	21N4042
Button, Power	21N4045
Cover, Tape Deck	21F4020
Panel, Cabinet Rear	24C4069
Trim, Control Escutcheon	23M4075
Door, Cartridge	23W4599
Panel, Left Side	27C4072
Panel, Right Side	27C4070
Cover, Dust	21U4051

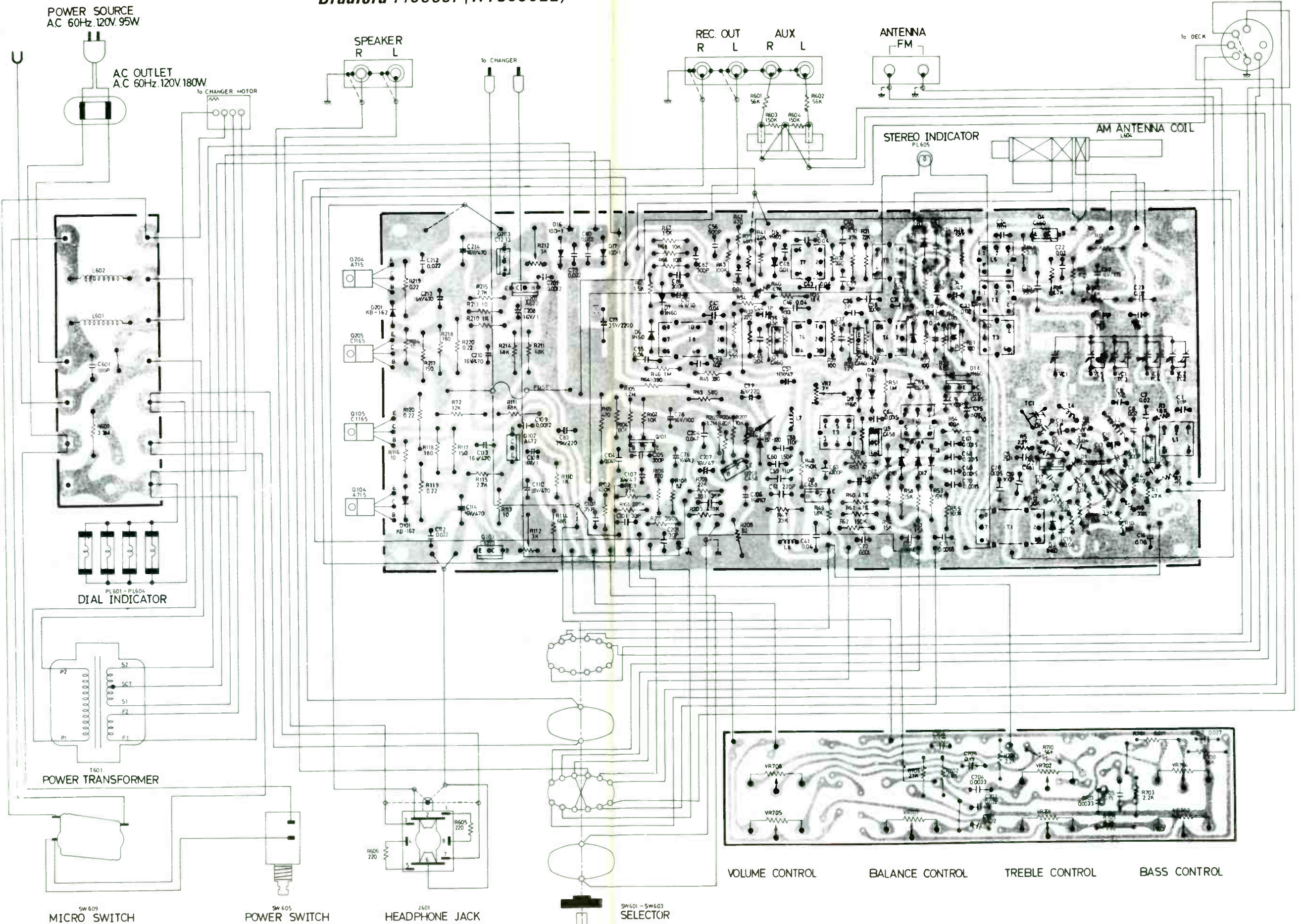
# PREAMPLIFIER CIRCUIT BOARD (BOTTOM VIEW)





‡ Value of component may be selected depending on characteristic of each set.

Bradford 1453C31 (WTG59022)



## INSPECTION AND ADJUSTMENT OF MECHANICAL UNIT

### 1. Inspection of transformer support plate and transformer

When the transformer support plate and the transformer are installed on the chassis there should be no gap between transformer support plate and chassis. The gap between transformer and chassis shall be between 0 and 0.5mm.

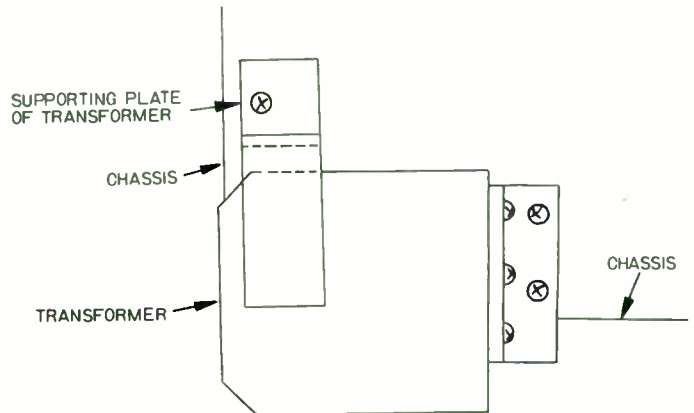


Fig. 9

### 2. Inspection of head shifting cam and cam spring

(1) Rotate the head shifting cam and assure that the tip of the cam spring is fitted in an notch of the cam without fail.

(2) Adjust the cam spring retaining screw so that the clearance between the head shifting cam and the tip of the cam spring is between 0.2mm and 0.6mm.

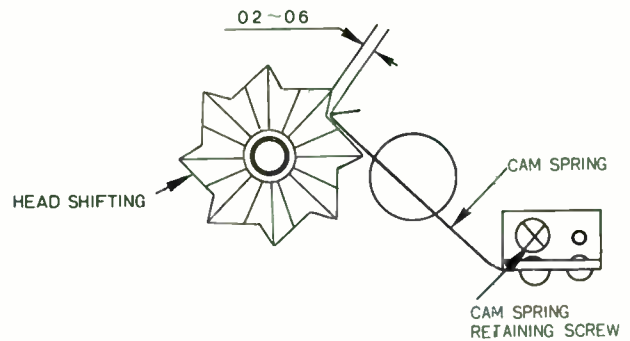


Fig. 10

### 3. Inspection of flywheel and motor pulley

Adjust the motor pulley if the centers of the flywheel and motor pulley are slip out a state where a flat belt

is fitted. The slip out of centers of flywheel and motor pulley shall be within 0.3mm.

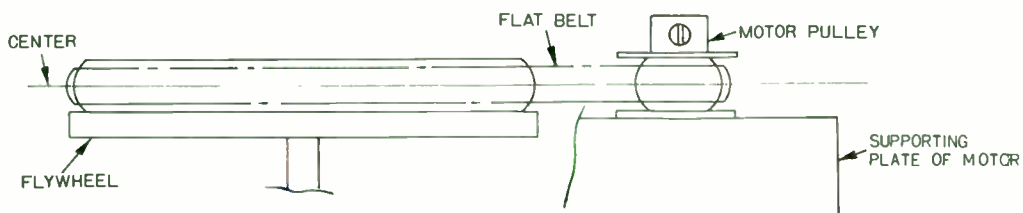


Fig. 11

### Installation and Inspection of mechanism plate

When installing the mechanism plate assembly, tighten set screw A so that the distance to the chassis is  $22.9\text{mm} \pm 0.05\text{mm}$ .

### Inspection of head adjusting holder work assembly and of head shifting cam

(1) When installing the head adjusting holder work assembly to the chassis, adjust the tapping screw A so that the tip of the adjusting screw comes to the center of the shaded area in Fig. 13.

(2) After installation assure that dimension H shown in Fig. 14 is 33.5mm. Also assure that deflection of the head shifting plate spring under this state is 2mm.

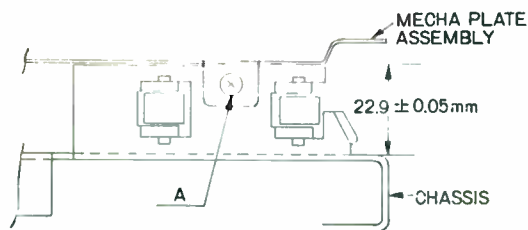


Fig. 12

### HEAD SHIFTING CAM

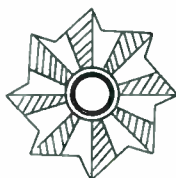


Fig. 13

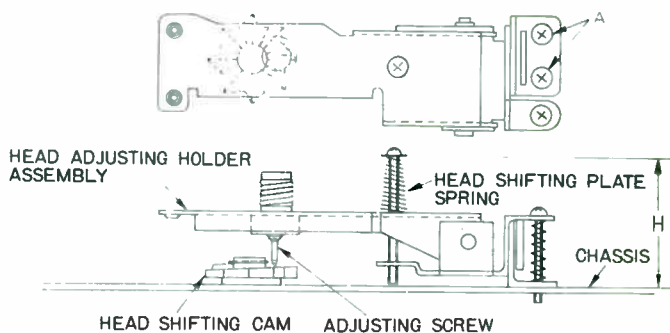


Fig. 14

### Adjustment of head angle

Playback a standard tape for correction of angle and adjust the angle adjusting screw A so that the output is maximum. Place the head in the height of the center of the tape width when adjusting.

### Adjustment of track position

Playback track No. 4 (head is located at the bottom position) of a standard tape for correction of track position by channel 1 (LH amplification) and adjust the height adjusting screw B so that the output is maximum. To perform the above job correctly, use a test cartridge No. 321 made by RCA and playback track No. 2 and track No. 6 (2 ch). Adjust the height adjusting screw B so that the output 1KHz of LH amplification playing track No. 2 is minimum. Then adjust the angle adjusting screw A so that the output 8 KHz of RH amplification playing track No. 6 is maximum. Because a slight error will occur in the height as a result of angle adjustment, readjust the height.

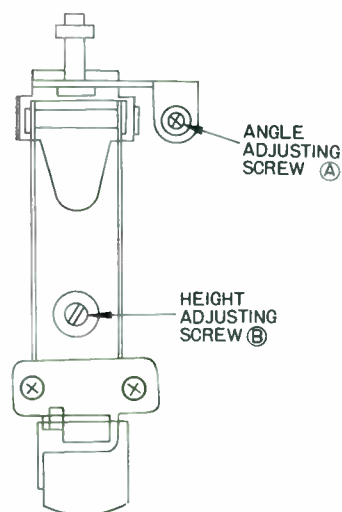


Fig. 15



**SEMICONDUCTORS**

ITEM	PART NO.	TYPE
D1	5330341	W0-6A
D2	5330341	W0-6A
D3	5330341	W0-6A
D4	5330341	W0-6A
D5	5330341	W0-6A
D6	5330341	W0-6A
D7	5330104	V0-6A
D8	5330104	V0-6A
D9	5330104	V0-6A
D10	5330104	V0-6A
D11	5330341	W0-6A
D12	5330341	W0-6A
ICA	5353081	FA6013D
ICB	5353081	FA6013D
ICC	5353081	FA6013D
ICD	5353081	FA6013D
TR1	5320064	2SC458

**ELECTROLYTIC/VARIABLE CAPS**

ITEM	PART NO.	VALUE
C2A	0252613	3.3mfd 25V
C2B	0252613	3.3mfd 25V
C2C	0252613	3.3mfd 25V
C2D	0252613	3.3mfd 25V
C5A	0252613	3.3mfd 25V
C5B	0252613	3.3mfd 25V
C5C	0252613	3.3mfd 25V
C5D	0252613	3.3mfd 25V
C6A	0252525	47mfd 16V
C6B	0252525	47mfd 16V
C6C	0252525	47mfd 16V
C6D	0252525	47mfd 16V
C7	0252531	100mfd 16V
C8	0256074	1000mfd 35V
C12	0252525	47mfd 16V
C13	0252222	22mfd 6.3V

**CONTROLS/SPECIAL RESISTORS**

ITEM	PART NO.	DESCRIPTION
RV1A	0151830	100 ohm Output Level
RV1B	0151830	100 ohm Output Level
RV1C	0151830	100 ohm Output Level
RV1D	0151830	100 ohm Output Level

**COILS/TRANSFORMERS**

ITEM	PART NO.
T	5211042

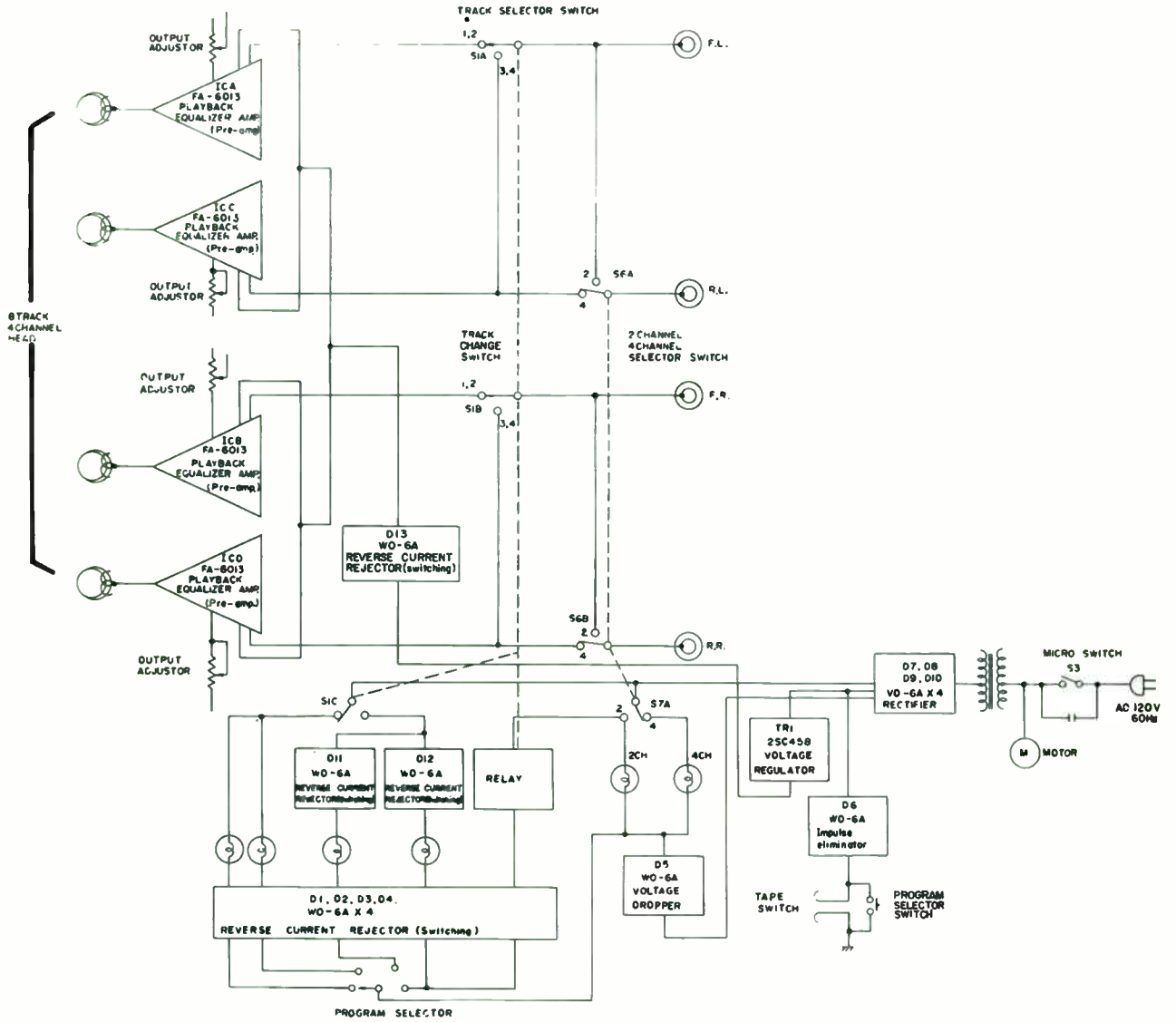
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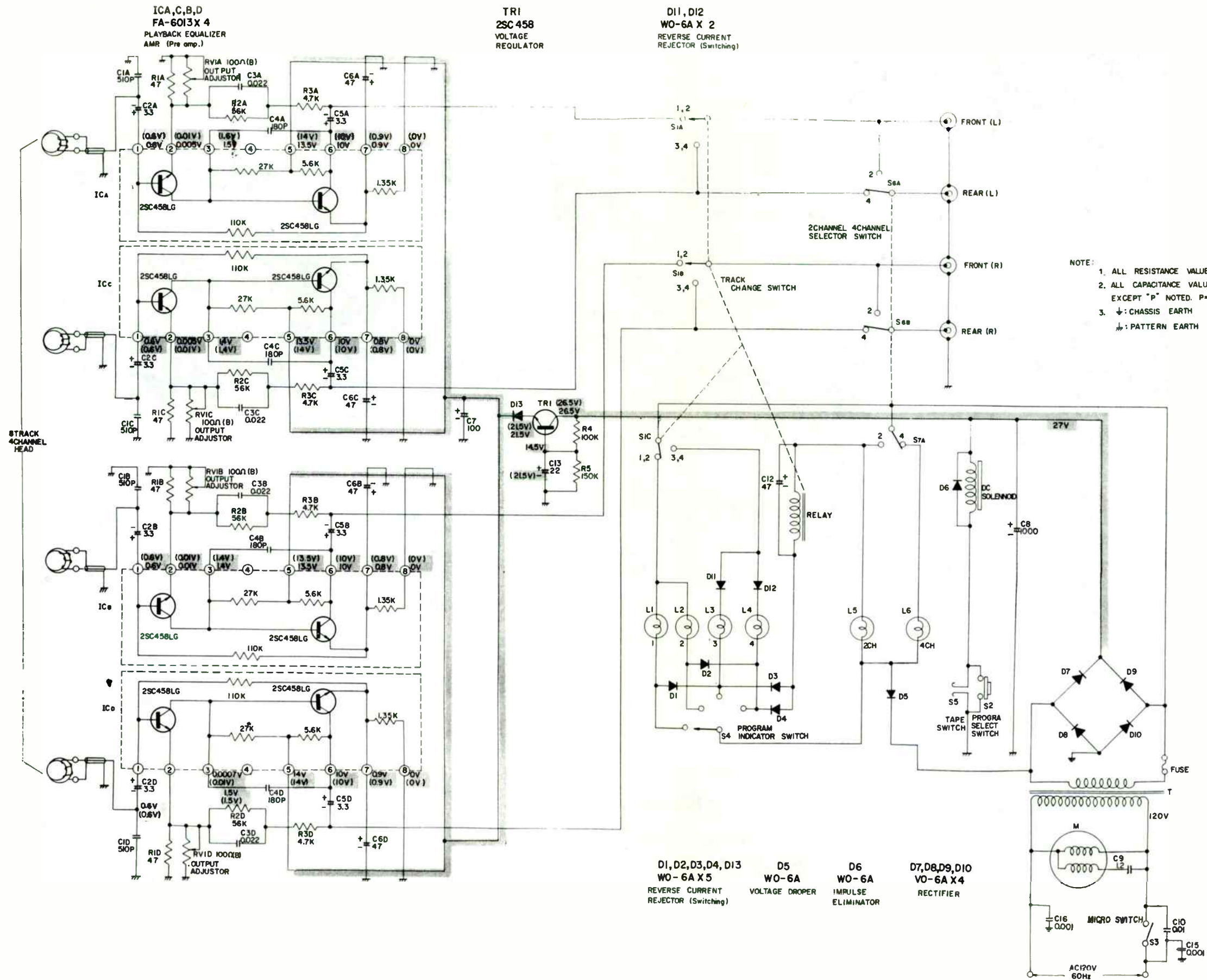
ITEM	NAME	PART NO.
Fuse	Fuse, 2A	5720242
Head	Head, Tape	5441371
RL	Relay	5640121
S3	Switch, Power	0533129
Solenoid	Solenoid, Track Change	6350591
	Belt, Tape Drive	6350591
	Motor, Tape Drive	5570922
	Pulley, Motor(120V,60Hz)	7515213
	Pulley, Motor(220V,50Hz)	7515214
	P.C. Board, Channel	6708272

**CABINET PARTS**

NAME	PART NO.
Assembly, Cabinet	6168371
Cover, Back	6190711
Assembly, Push Button	7228543

# BLOCK DIAGRAM





# Hitachi TPQ-144D

IC A

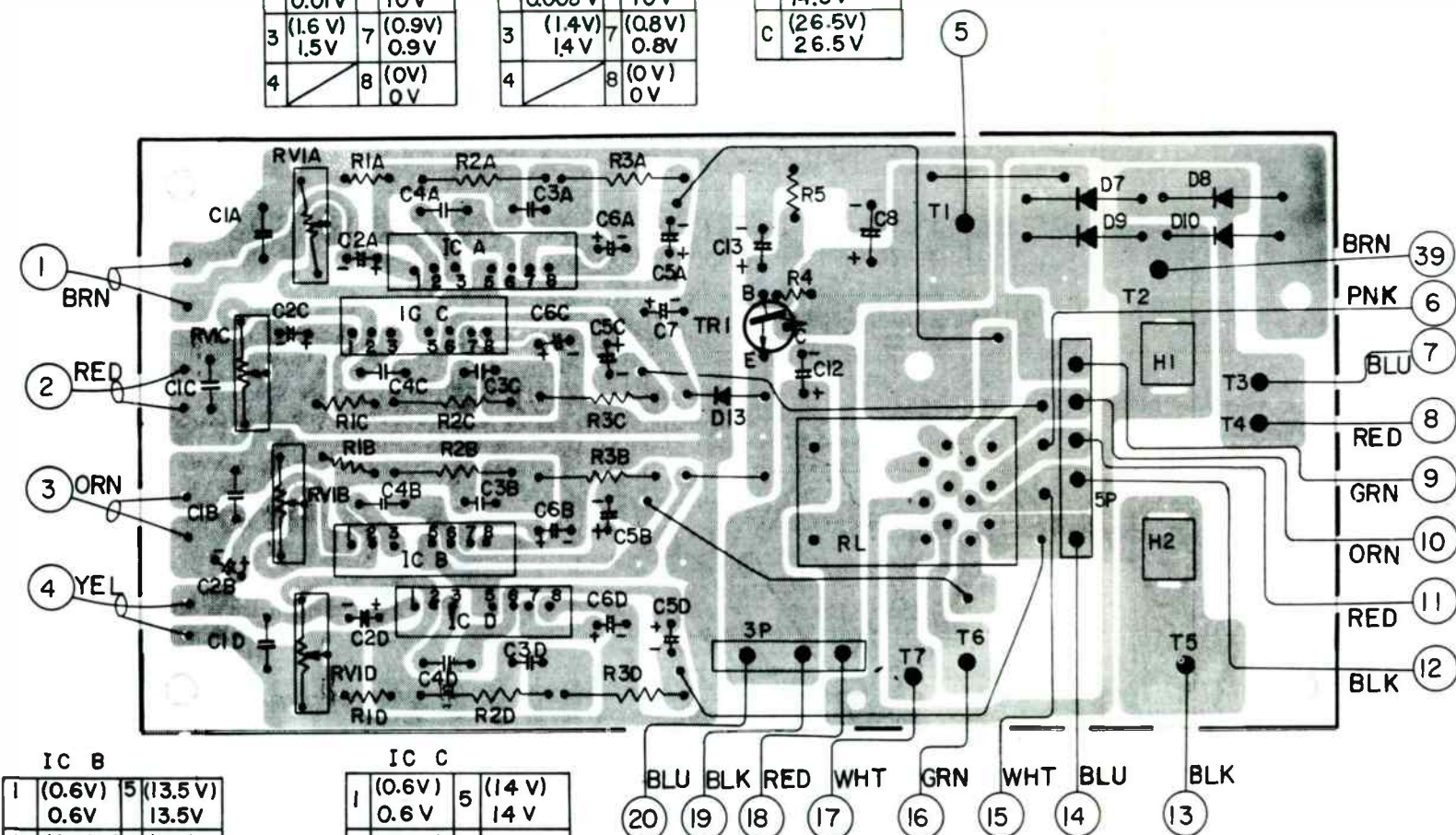
1 (0.6V)	5 (14V)
0.6V	13.5V
2 (0.01V)	6 (10V)
0.01V	10V
3 (1.6V)	7 (0.9V)
1.5V	0.9V
4	8 (0V)
	0V

IC C

1 (0.6V)	5 (14V)
0.6V	13.5V
2 (0.01V)	6 (10V)
0.005V	10V
3 (1.4V)	7 (0.8V)
1.4V	0.8V
4	8 (0V)
	0V

TR1

B (21.5V)	21.5V
E (21.5V)	14.5V
C (26.5V)	26.5V

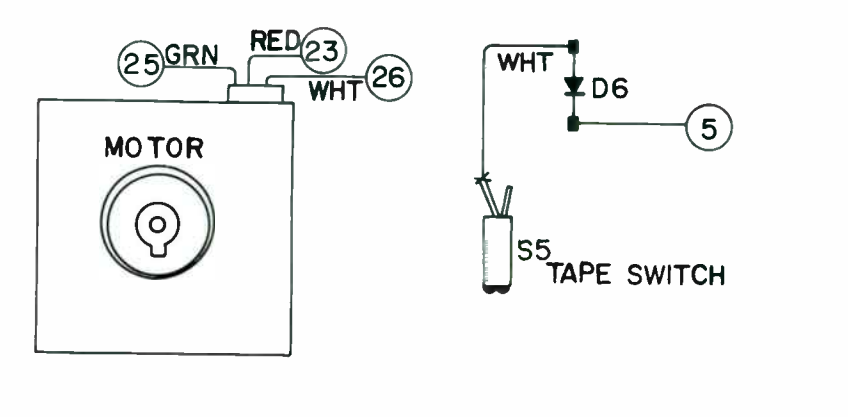
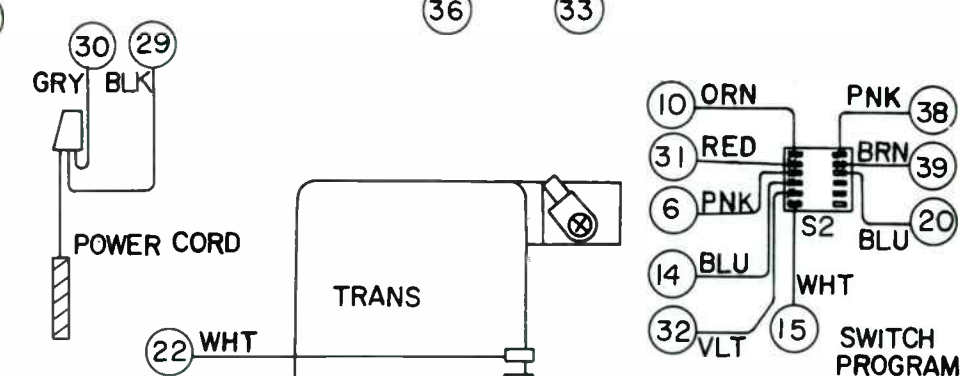
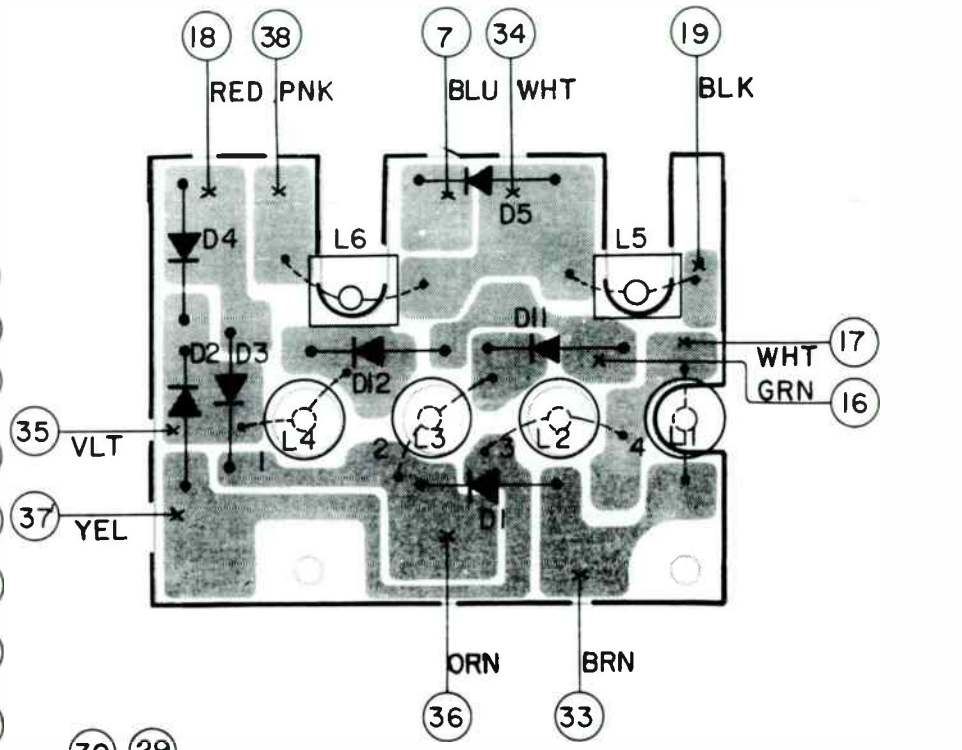
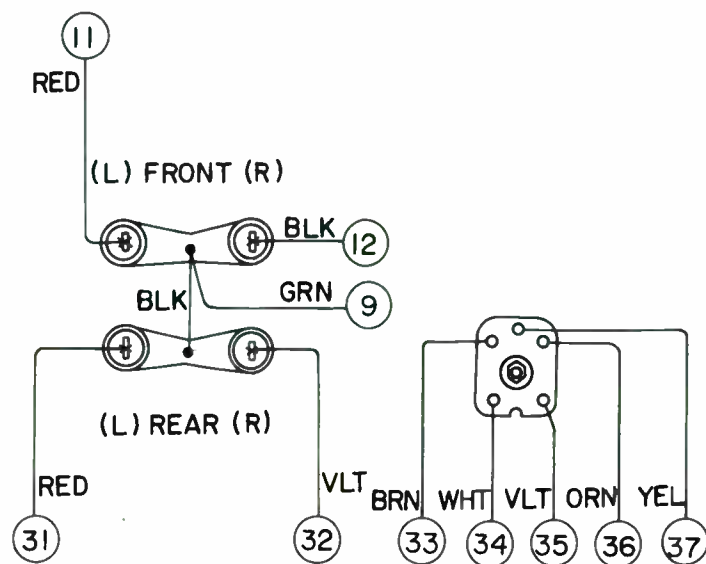
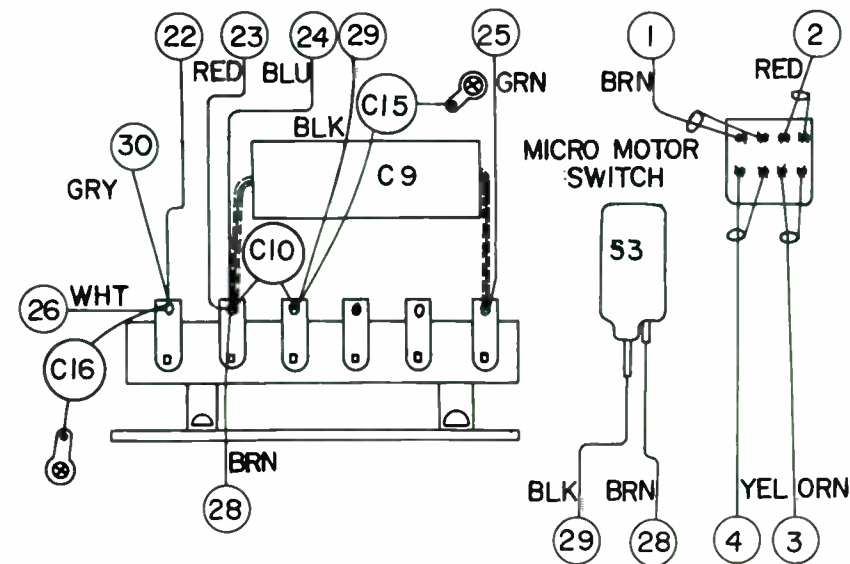
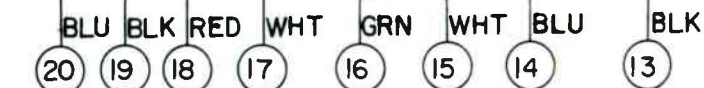


IC B

1 (0.6V)	5 (13.5V)
0.6V	13.5V
2 (0.01V)	6 (10V)
0.01V	10V
3 (1.4V)	7 (0.8V)
1.4V	0.8V
4	8 (0V)
	0V

IC D

1 (0.6V)	5 (14V)
0.6V	14V
2 (0.01V)	6 (10V)
0.007V	10V
3 (1.5V)	7 (0.9V)
1.5V	0.9V
4	8 (0V)
	0V



NOTE: FOR COMPLETE RECORD CHANGER SERVICE INFORMATION -- SEE PHOTOFAC SET 1147, FOLDER 5.

**ALIGNMENT INSTRUCTIONS (RADIO)**

**FREQUENCY & DISTANCE ON DIAL SCALE**

To accurately align to the proper frequencies on the dial scale, refer to Table at right and mark the edge of the dial scale accordingly, using the "Start Point" mark on the dial scale as reference point.

Table

Band	Frequency	Distance from "Start Point"
AM	550 kHz	13.9 mm
	1500 kHz	125.5 mm
FM	90 MHz	37.2 mm
	106 MHz	116.1 mm

**AM-IF & RF ALIGNMENT**

Output of signal generator should be no higher than necessary to obtain output reading.  
 Set band selector switch to AM.  
 Set function selector switch to RADIO.  
 Set volume control to maximum.  
 Set tone control to high.  
 Set balance control to center.  
 Maintain line voltage at 120 volts.

STEP	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1	Fashion loop of several turns of wire and radiate signal into loop receiver.	455 kHz (400 ~ Mod.)	Point of noninterference. (on/about 600 kHz)	Output meter across Speaker Jack (L) (Imp. 16Ω)	T4 (1st IFT) T6 (2nd IFT) T10 (3rd IFT)	Adjust for maximum output.
2	Fashion loop of several turns of wire and radiate signal into loop of receiver.	550 kHz (400 ~ Mod.)	550 kHz	Output meter across Speaker Jack (L) (Imp. 16Ω)	L5 (ANT Coil) L6 (OSC Coil)	Adjust for maximum output by sliding coil (L5) along ferrite core.
3	Fashion loop of several turns of wire and radiate signal into loop of receiver.	1500 kHz (400 ~ Mod.)	1550 kHz	Output meter across Speaker Jack (L) (Imp. 16Ω)	CT5 (OSC Trimmer) CT4 (ANT Trimmer)	Adjust for maximum output. Repeat steps (2) and (3).

- Notes: 1. Cement antenna bobbin with wax after completing alignment.  
 2. Make certain that speaker system is connected to the tuner when aligning.

**FM-IF AND DETECTOR ALIGNMENT WITH OSCILLOSCOPE**

**EQUIPMENT REQUIRED**

Signal generator that provides 10.7 MHz marker.  
 Sweep generator that provides 10.7 MHz center frequency and 400 kHz sweep width.

**OSCILLOSCOPE**

Set sweep selector of oscilloscope to "External Sweep". Apply 60 ~ sweep signal from sweep generator to horizontal input terminals of oscilloscope.  
 Set band selector switch to FM.  
 Set function selector switch to RADIO.  
 Set volume control to minimum.  
 Set tone control to high.  
 Set balance control to center.  
 Set AFC switch to OFF.  
 Maintain line voltage at 120 volts.

Note: When step 1 aligning, unsolder lead between TP2-a & TP2-b before alignment and resolder it after step 1 alignment.

STEP	SWEEP GENERATOR COUPLING	SIGNAL GENERATOR COUPLING	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1	High side thru. .001 mfd to point TP1 Common to chassis.	High side thru. .001 mfd to Point TP1. Common to chassis.	Point of noninterference. (on/about 98 kHz)	Connect vert. amp. of scope to point TP2. Common to chassis.	T1 (FM 1st IFT) T2 (FM 2nd IFT) T3 (FM 3rd IFT) T5 (FM 4th IFT) T7 (FM 5th IFT) T8 (FM Disc IFT)	Adjust for maximum amplitude and proper linearity between ±100 kHz markers. (Refer to Fig. 9)
2	High side thru. .001 mfd to point TP1. Common to chassis.	High side thru. .001 mfd to point TP1. Common to chassis.	Point of noninterference (on about 98 MHz)	Connect vert. amp. of scope to point TP3. Common to chassis.	T9 (FM Disc IFT)	Adjust T9 so that 10.7 MHz marker is at the center. (Refer to Fig. 10)

- Note: 1. Remove line cord antenna from FM external when aligning.  
 2. Turn the core of T9 (FM Disc IFT) fully counterclockwise before alignment.

# ALIGNMENT INSTRUCTIONS (RADIO)

## ALIGNMENT POINTS (RADIO)

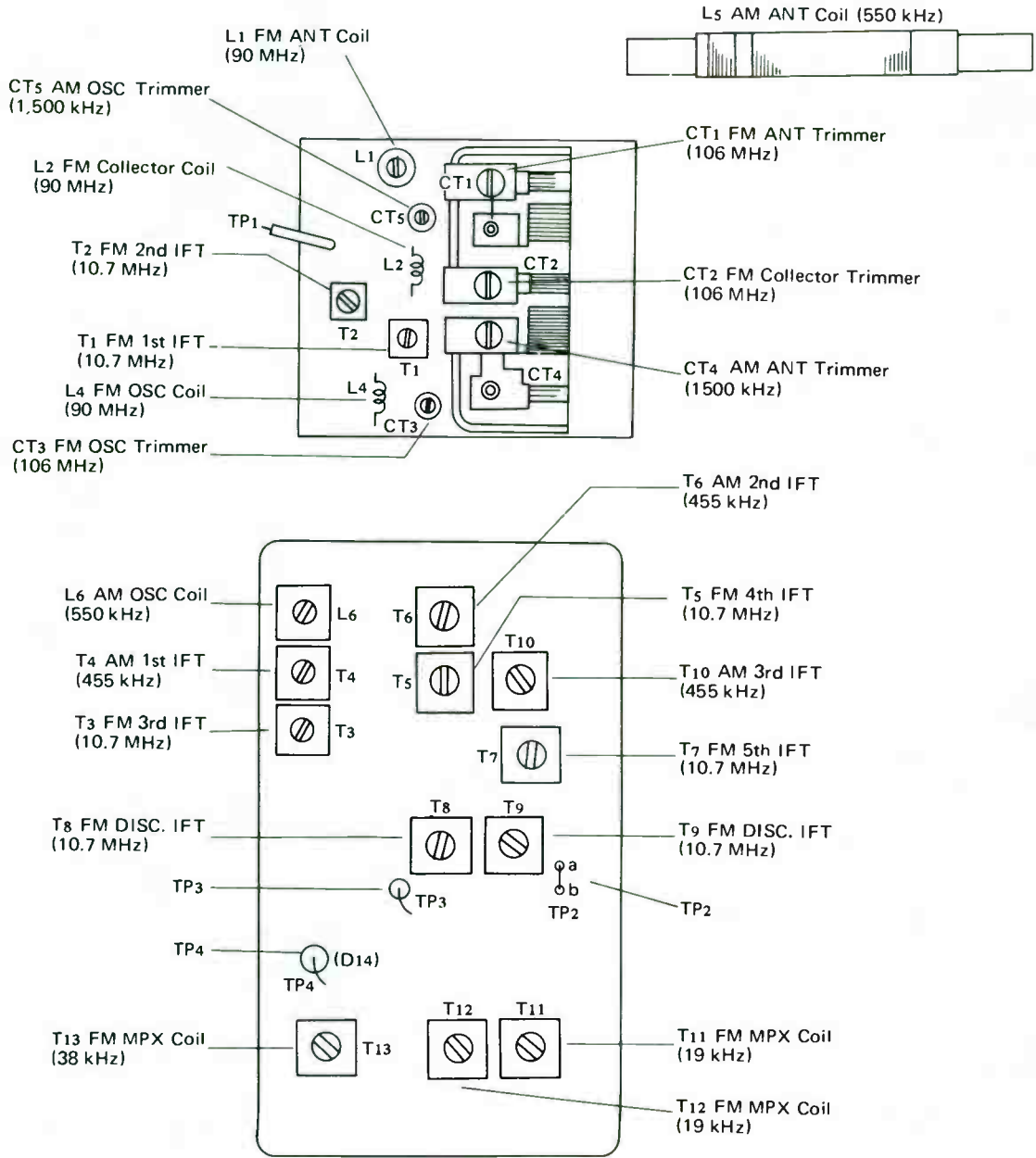


Fig. 8

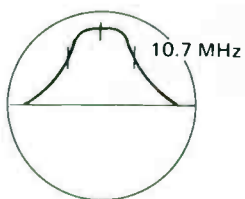


Fig. 9

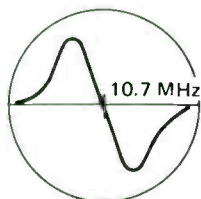


Fig. 10

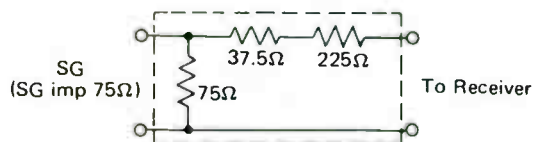


Fig. 11 FM DUMMY ANTENNA

**ALIGNMENT INSTRUCTIONS (RADIO)**

**FM-RF ALIGNMENT**

Output of signal generator should be no higher than necessary to obtain an output reading. Set volume control to maximum. Set band selector switch to FM.		Set tone control to high. Maintain line voltage at 120 volts. Set balance control to center. Set AFC switch to "OFF"				
STEP	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
1	Connect to EXT. FM Antenna terminal through FM Dummy antenna. Common to chassis (Refer to Fig. 11)	90 MHz (400 ~ Mod.)	90 MHz	Output meter across Speaker Jack (L) (Imp. 16Ω)	L4 (FM OSC Coil) L1 (FM ANT Coil) L2 (FM Collector Coil)	Adjust for maximum output.
2	Connect to EXT. FM Antenna terminal through FM Dummy antenna. Common to chassis (Refer to Fig. 11)	106 MHz (400 ~ Mod.)	106 MHz	Output meter across Speaker Jack (L) (Imp. 16Ω)	CT3 (FM OSC Trimmer) CT1 (FM ANT Trimmer) CT2 (FM Collector Trimmer)	Adjust for maximum output. Repeat steps (1) and (2).

**Note:** As three output readings will be present, adjustments must be made at center frequency.

**FM STEREO ALIGNMENT**

**19 kHz AMP. ALIGNMENT**

**Equipment Required**

- Stereo Modulator . . . . . Connect Stereo Modulator output to EXT. Mod. terminal of signal generator.
- Signal Generator . . . . . Modulation Rate of 19 kHz Pilot Signal . . . . . 10%  
Output Level . . . . . 30 dB  
Frequency . . . . . Approximately 89.5 MHz
- Oscilloscope
- Dummy Antenna . . . . . Refer to Fig. 11.

**Control Setting & Procedure**

Tuner . . . . . Band selector switch to "FM STEREO", Tone control to "HIGH", Balance control to "CENTER", AFC Switch to "OFF", Volume control to audible level of speaker sound, Dial setting to approximately 89.5 MHz.

**Notes:**

1. When aligning, remove line cord antenna from External FM Antenna terminal.
2. When aligning, set separation control (R33) as shown in Fig. 12.

EQUIPMENT CONNECTION		ADJUST	REMARKS
SIGNAL GENERATOR	OSCILLOSCOPE		
Connect to EXT. FM antenna terminal through Dummy antenna. (Refer to Fig. 11)	Connect vert. Amp. of scope to point TP4. Common to chassis.	T11 (19 kHz Coil) T12 (19 kHz Coil) T13 (38 kHz Coil)	Adjust T11 ~ T13 for maximum oscilloscope pattern of 38 kHz.

# ALIGNMENT INSTRUCTIONS (RADIO)

## SEPARATION ALIGNMENT

### Equipment Required

Stereo Modulator . . . . . Connect Stereo Modulator output to EXT. Mod. terminal of signal generator.  
 Signal Generator . . . . . Modulation Rate of 19 kHz Pilot Signal. . . . . 100%  
 . . . . . Modulation Rate of Right and Left Signal . . . . . 27%  
 . . . . . Output Level . . . . . 60 dB

Oscilloscope

Dummy Antenna . . . . . Refer to Fig. 11.

VTVM

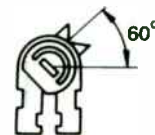


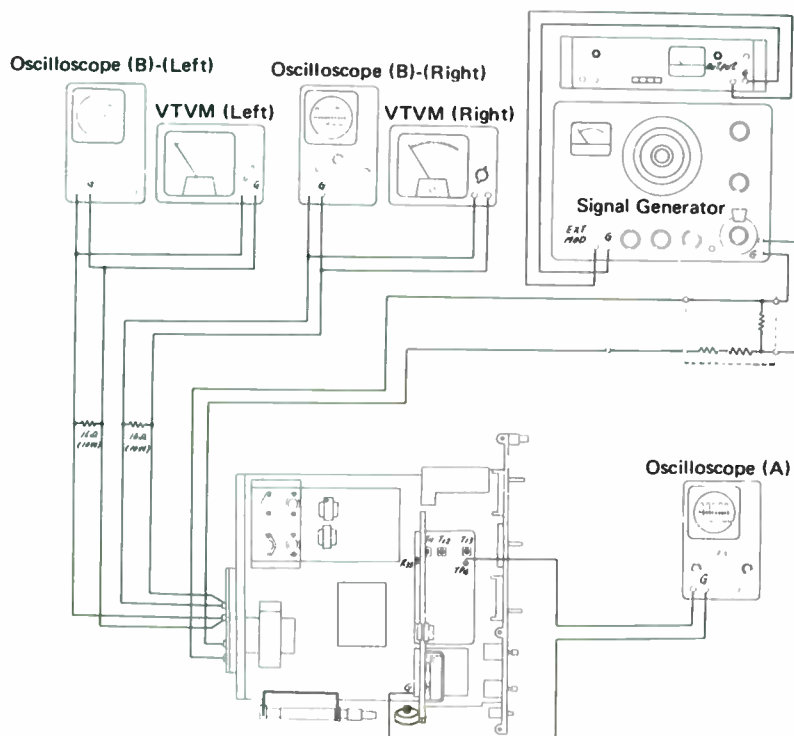
Fig. 12 R<sub>33</sub> SEPARATION CONTROL

### Control Setting & Procedure

Tuner . . . . . Band selector switch to "FM STEREO", Tone control to "CENTER", Volume control to audible level of speaker sound, AFC switch to "OFF", Dial setting to approximately 89.5 MHz. Adjust balance control so that output level from both units becomes equal.

EQUIPMENT COUPLING			ADJUSTMENT	REMARKS
SIGNAL GENERATOR	VTVM	OSCILLOSCOPE		
Connect to EXT. FM antenna terminal through Dummy antenna.	Connect across speaker jack. (Left Side) (Imp. 16Ω)	Connect to Terminals of VTVM.	T <sub>13</sub> (MPX Coil) T <sub>11</sub> (MPX Coil)	Adjust T <sub>12</sub> & T <sub>10</sub> for minimum indication on VTVM from the left side output when the right side of stereo modulator is modulated.
Connect to EXT. FM antenna terminal through Dummy antenna.	Connect across speaker jack. (Left Side) (Imp. 16Ω)	Connect to terminals of VTVM.	R <sub>33</sub> (Separation Control)	Adjust R <sub>33</sub> for minimum indication on VTVM from the left side output when the right side of stereo modulator is modulated.

Note: When separation aligning, disconnect lead between TP4 and Oscilloscope (A) before alignment.



RECOMMENDED EQUIPMENT CONNECTION FOR SEPARATION ALIGNMENT



SERVICING THE RECORD CHANGER

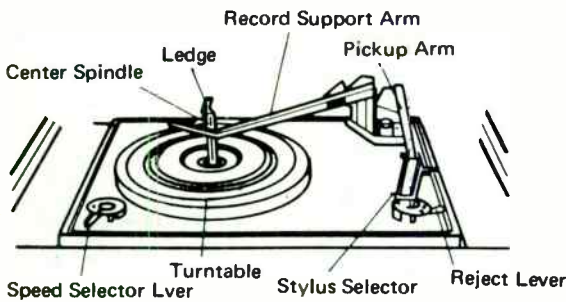


Fig. 42

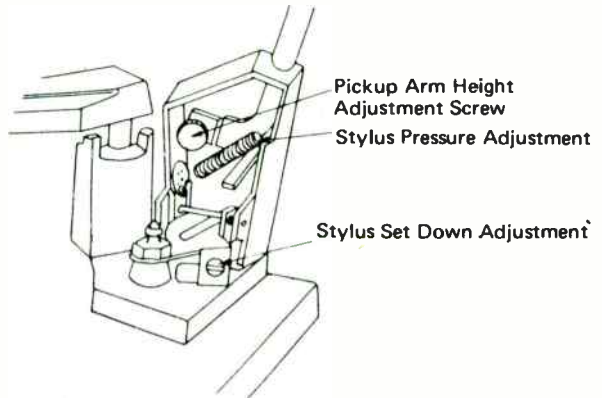


Fig. 43 PICKUP ARM ADJUSTMENT

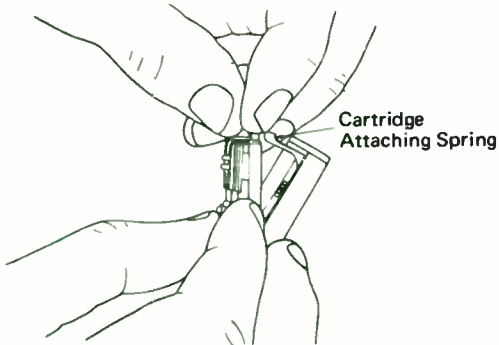


Fig. 44 REPLACING CARTRIDGE

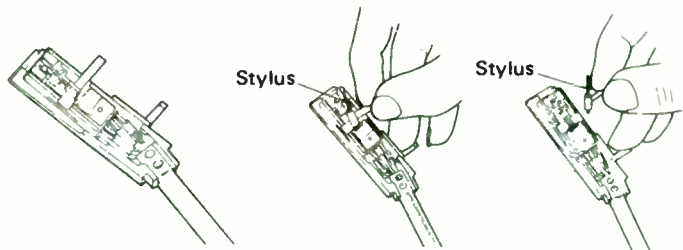


Fig. 45 REPLACING STYLUS

**ADJUSTMENT**

**Stylus Set-Down:** During automatic operation the stylus sets down 1/8 inch from edge of record, Turning the stylus set down adjustment screw counter-clockwise causes the stylus to set down further in from the edge of the record. (See Fig. 43)

**Pickup Arm Height:** To raise, turn screw head by hand counter-clockwise; to lower, turn screw head clockwise. Adjust stylus to clear a full stack of records by 1/8 inch. (See Fig. 43)

**Stylus Pressure:** The needle pressure is adjusted at the factory for the correct pressure of 6 grams. Move the spring to different holes to set different pressure. (See Fig. 43)

**REPLACING CARTRIDGE AND STYLUS**

**Stylus**

1. Lift the Pickup Arm to a position that will make the stylus accessible.
2. Gently remove Stylus and place new Stylus in to correct position as shown Fig. 45.

**Cartridge**

1. Lift the Pickup Arm to a position that will make the Cartridge accessible.
2. The leads are removed gently by pulling the connectors off the Cartridge terminals.
3. Gently remove Cartridge by spreading the Cartridge Holder spring as shown in Fig. 44.

# DIAL CORD STRINGING GUIDE

## To Reassemble Tuning Gears

1. Put tuning gears together.
2. Connect the gears with the spring as shown in Fig. 32.
3. Set tuning capacitor to fully closed position.  
Mount the tuning gear on the tuning capacitor with mounting screw and washer.
4. Rotate the two tuning gears in the opposite direction.  
Pull gear spring about 7.5 mm, as shown in Fig. 32.  
Mount dial drum with the mounting screw, as shown in Fig. 33.

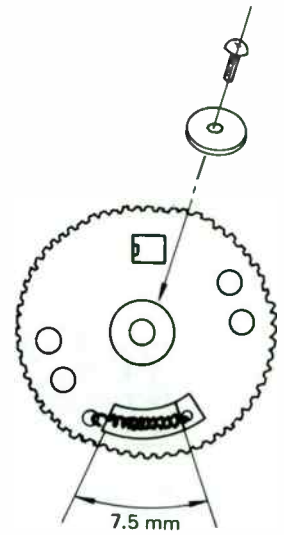


Fig. 32

### Note:

After dial drum is fixed, make sure that if there is no back lash of dial drum.

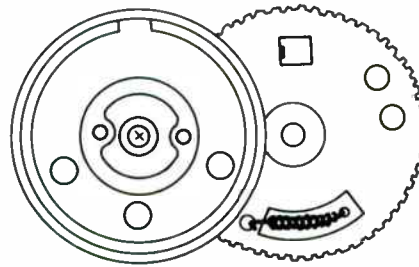


Fig. 33

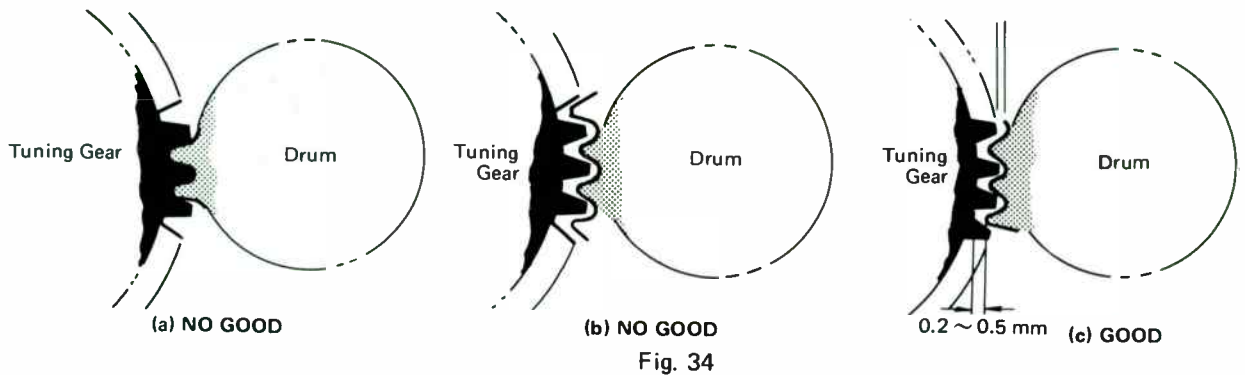
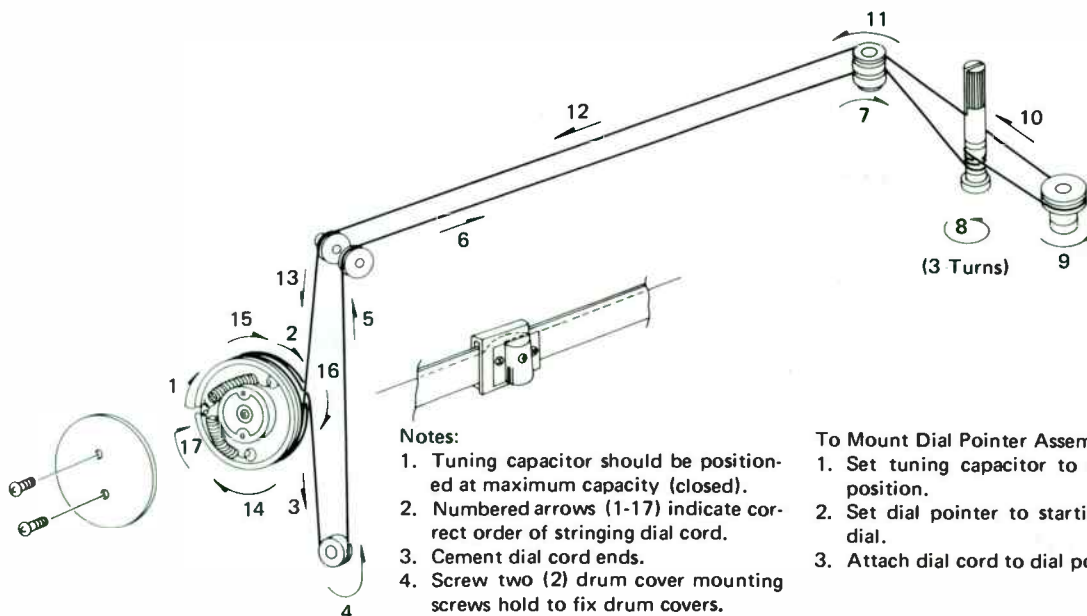


Fig. 34



### Notes:

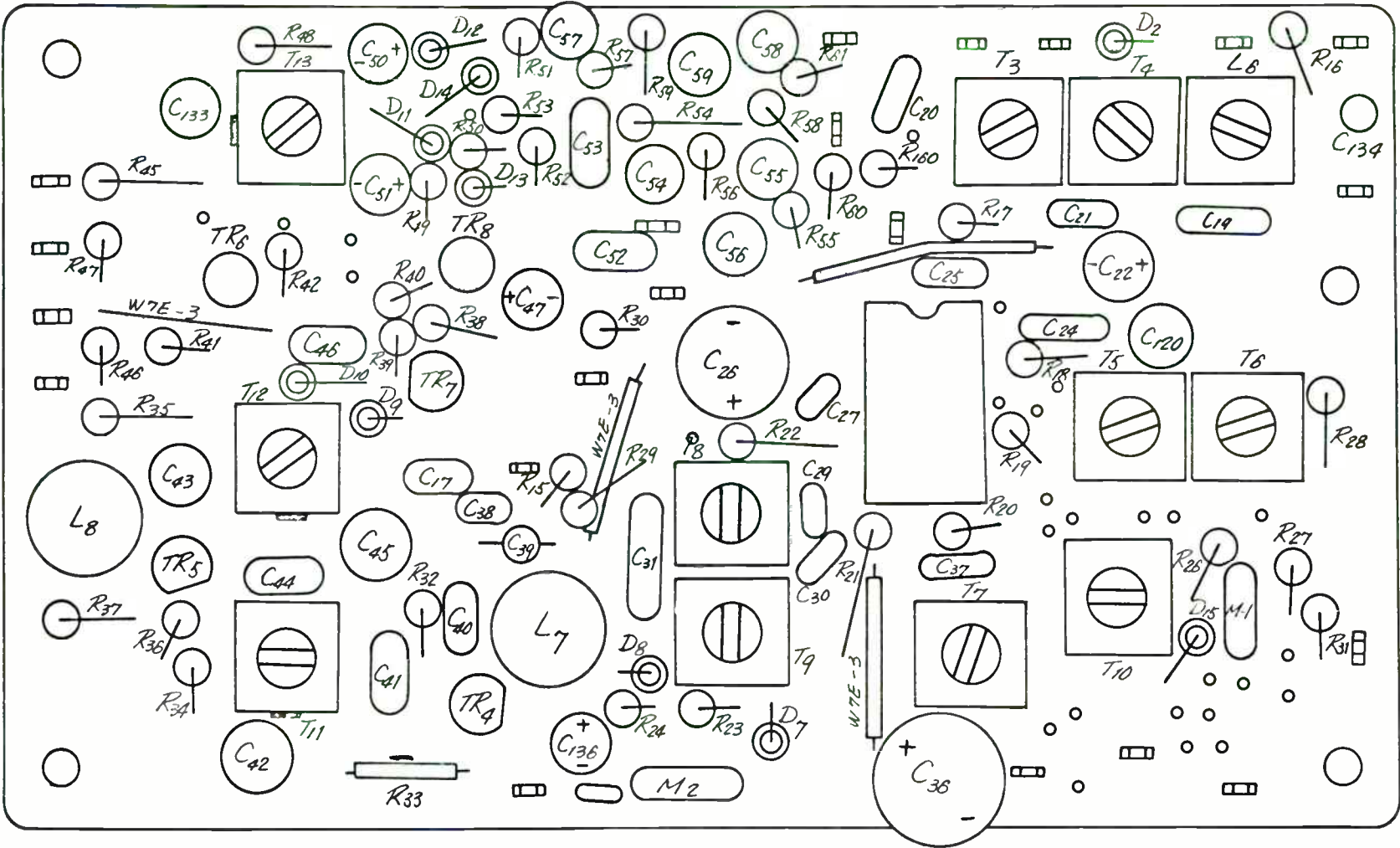
1. Tuning capacitor should be positioned at maximum capacity (closed).
2. Numbered arrows (1-17) indicate correct order of stringing dial cord.
3. Cement dial cord ends.
4. Screw two (2) drum cover mounting screws hold to fix drum covers.

### To Mount Dial Pointer Assembly

1. Set tuning capacitor to fully closed position.
2. Set dial pointer to starting point of dial.
3. Attach dial cord to dial pointer.

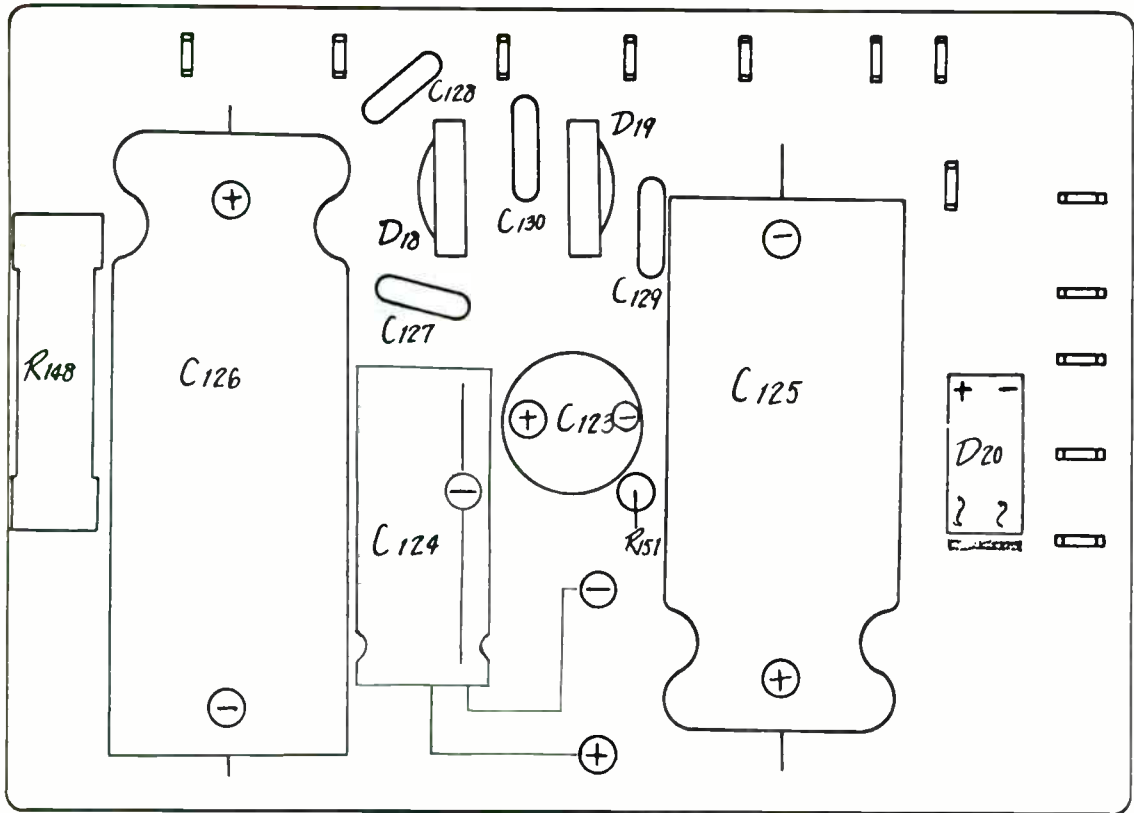
Fig. 35

PARTS IDENTIFICATION

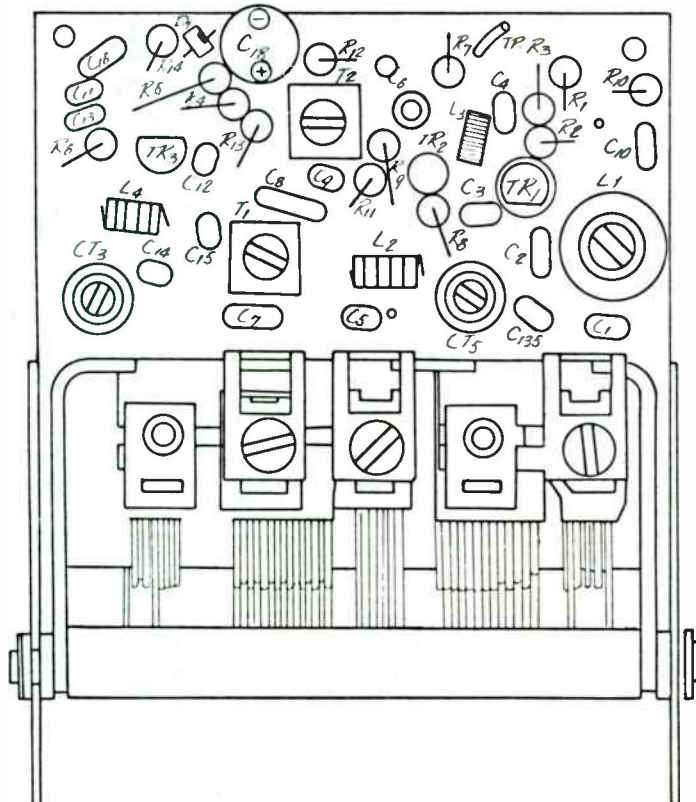


IF (FM & AM) AND MULTIPLEX SECTION

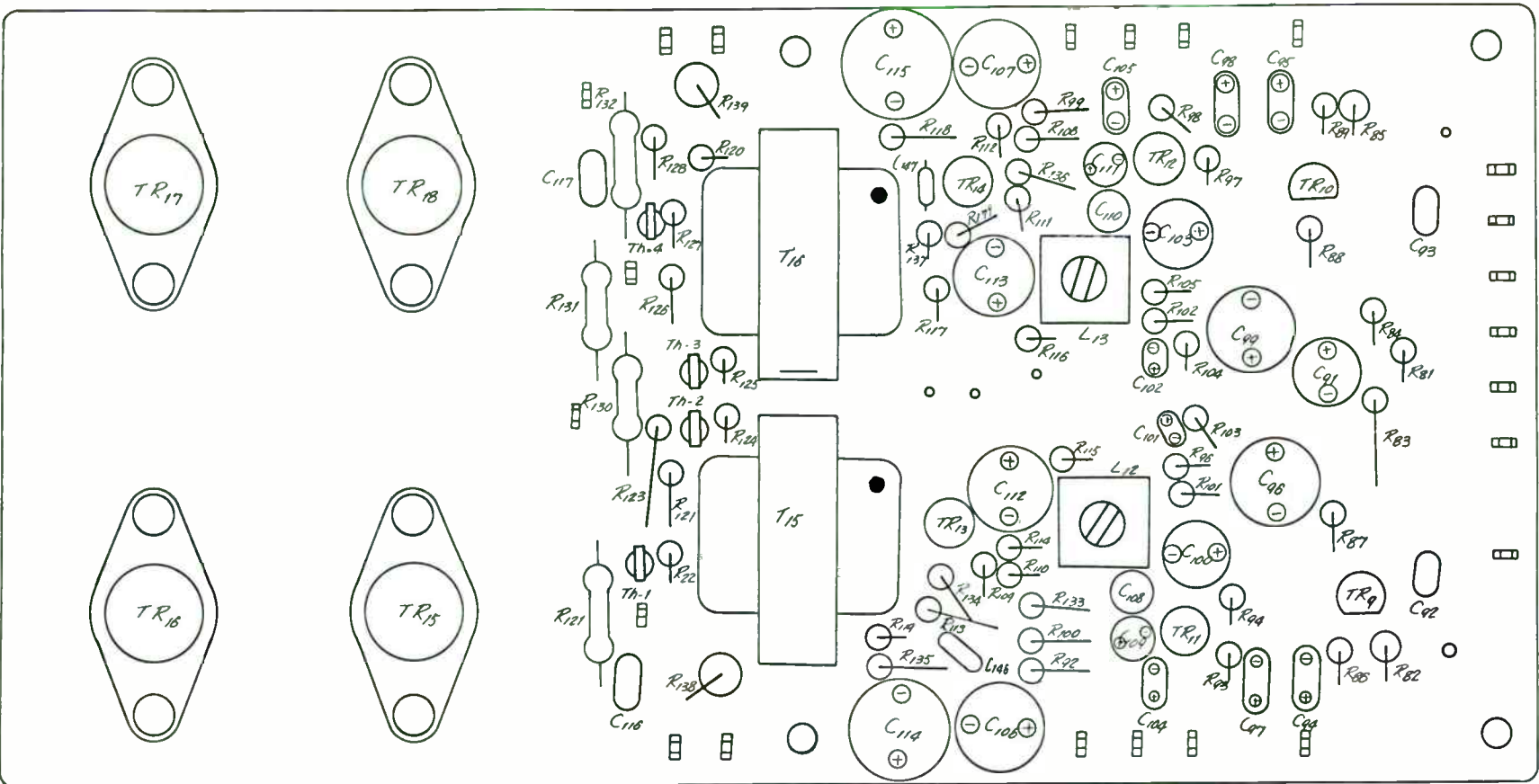
# PARTS IDENTIFICATION



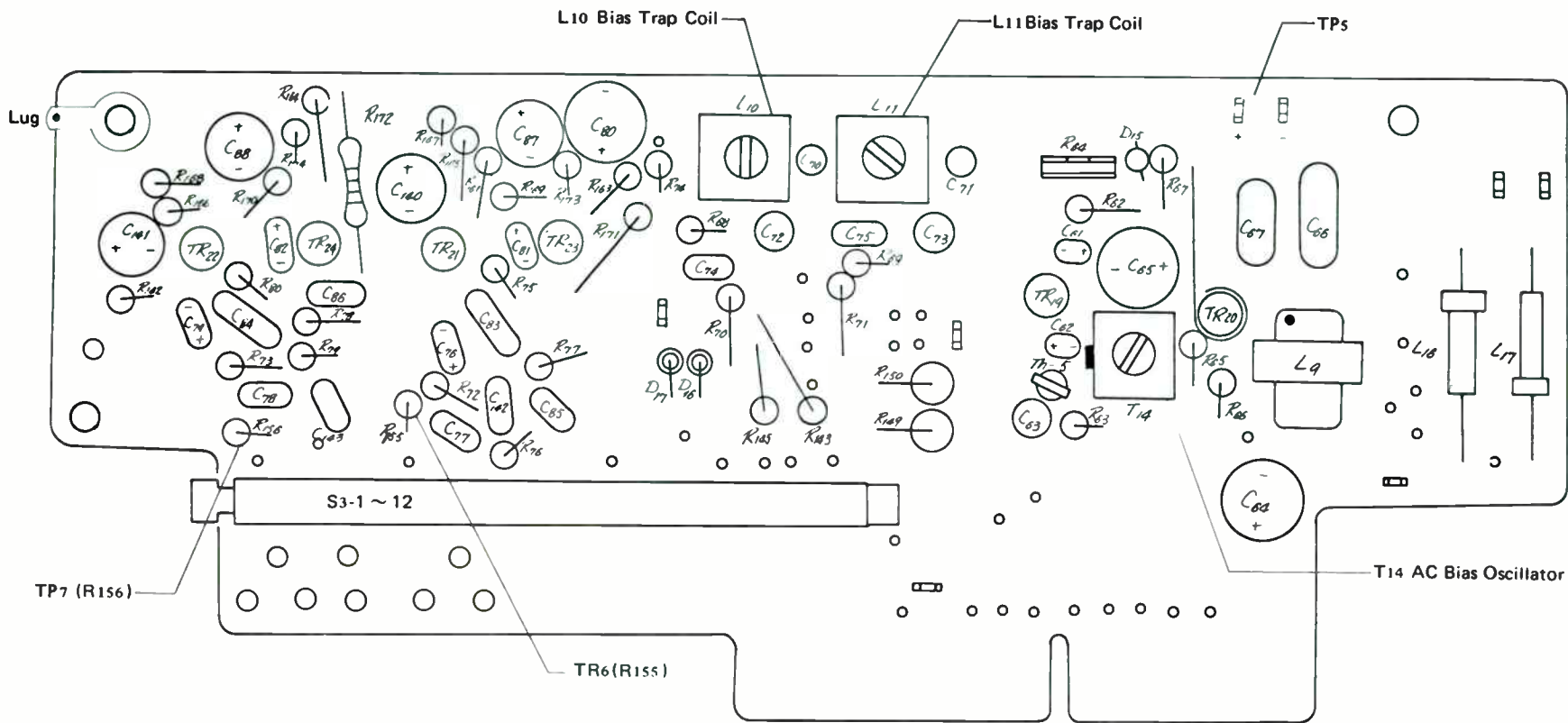
POWER SUPPLY SECTION



RF SECTION (FM & AM)

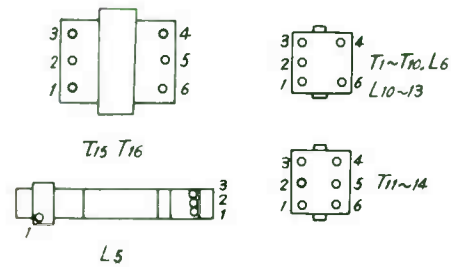
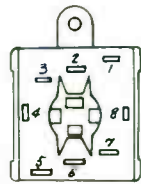


CASSETTE TAPE SECTION

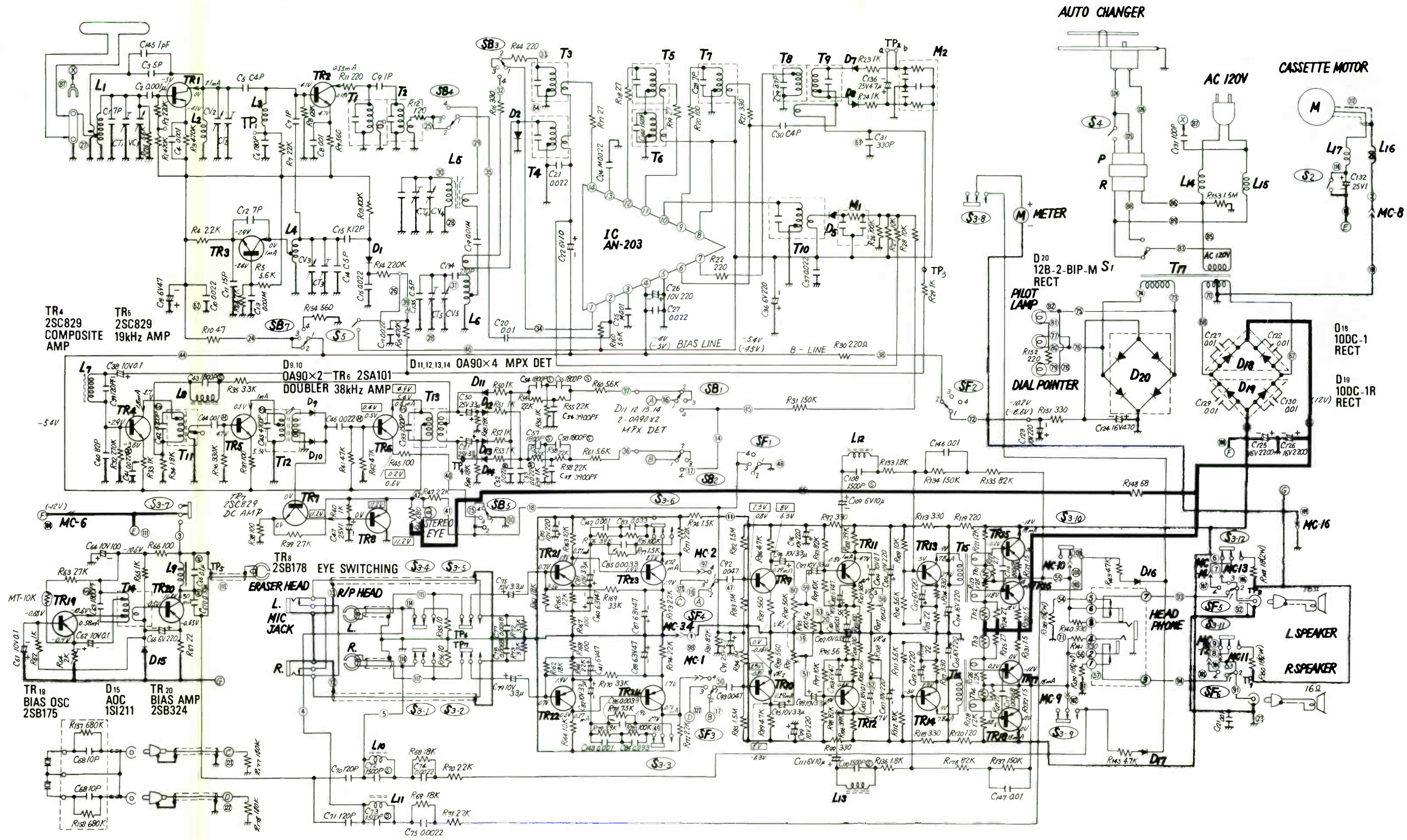
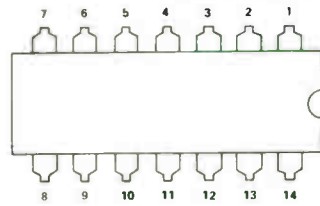


PARTS IDENTIFICATION

**HEAD PHONE JACK**



**IC BOTTOM VIEW**



- Notes: 1. SB1 - SB7 : Band Selector Switch in "FM STEREO" position.  
 1... FM 2... FM STEREO 3... AM
2. SF1 - SF6 : Function Selector Switch in "RADIO" position.  
 (TR19 & 20... TAPE)
3. S1 : Power Switch in "ON" position.
4. S2 : Cassette Motor ON-OFF Switch in "OFF" position.
5. S3-1 - S3-12 : Cassette PLAY-RECORD Switch in "PLAY" position.
6. S4 : Phono Motor ON-OFF Switch in "OFF" position.
7. S5 : AFC Switch in "OFF" position.
8. DV Voltages measured with vacuum tube voltmeter under "no" signal condition.
- DC voltages shown with respect to chassis ground.
- No Mark ..... FM position  
 ( ) ..... FM STEREO position  
 ( ) ..... AM position

ALIGNMENT INSTRUCTIONS (TAPE RECORDER)

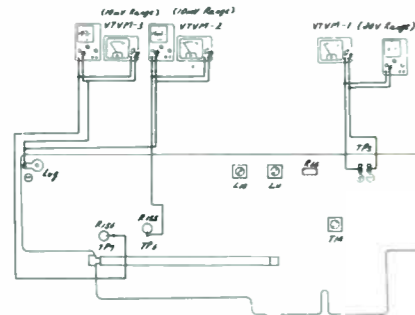
CONTROL SETTING & PROCEDURE

- Set function selector switch to TAPE.
- Depress "REC" buttons simultaneously.
- Set power source switch to ON.
- Maintain line voltage at 120 volts.

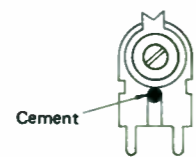
Refer to Figs. 18 & 19.

STEP	CIRCUITS	VTVM CONNECTION	VOLUME CONTROL	ADJUSTMENT	REMARKS
1	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP5 (+) and negative side to TP5 (-). (Refer to VTVM-1 in Fig. 19)	MIN	T14 (AC Bias OSC) R64 (Voltage Control)	Adjust T14 for Maximum indication of VTVM-1. Adjust R64 for 13 V reading on VTVM-1.
2	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP6 and negative side to lug. (Refer to VTVM-2 in Fig. 19)	MIN	L11 (AC Bias Trap Coil)	Adjust L11 for 5 mV reading on VTVM-2.
3	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP7 and negative side to lug. (Refer to VTVM-3 in Fig. 19)	MIN	L10 (AC Bias Trap Coil)	Adjust L10 for 5 mV reading on VTVM-3. Repeat steps (2) and (3). When adjusting steps (1) and (2), disconnect VTVM-1.
4	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP7 and negative side to lug. (Refer to VTVM-3 in Fig. 19)	MIN	T14	Adjust T14 for maximum indications on VTVM-2 and 3.
5	AC BIAS OSCILLATOR & ERASE	Connect positive side to TP5 (+) and negative side to TP5 (-). (Refer to VTVM-1 in Fig. 19)	MIN	R64 (Voltage Control)	Adjust T14 for 13V reading on VTVM-1. Repeat steps (2) and (3).

Notes: 1. Cement part of semi-fixed volume control (R64), as shown in Fig. 20.  
2. Do not touch R/P head Erase head when adjusting.



RECOMMENDED EQUIPMENT CONNECTIONS



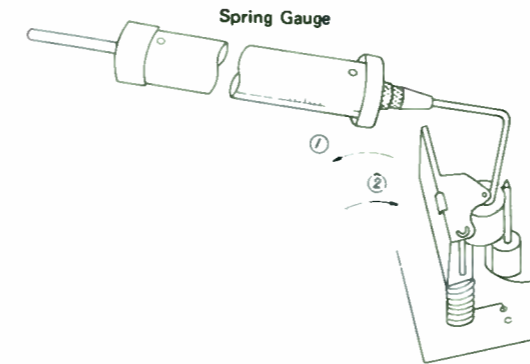
RECORD/PLAYBACK HEAD AZIMUTH ADJUSTMENT

Playback a Standard Alignment Tape and turn head adjustment screw for maximum loudness.

MECHANICAL ADJUSTMENT-TAPE RECORDER

PINCH ROLLER ADJUSTMENT

1. Switch set to PLAY.
2. Pull pinch roller in the direction of arrows with spring gauge, as shown in Fig. 22.
3. Pull the pinch roller away from the capstan, start motor, permit the pinch roller to make contact with the capstan and measure tension at time of contact.
4. The standard pressure of pinch roller should be 350 ± 50g.
5. If pressure is beyond limits, change the fixed position of pinch roller spring and repeat the above measurement or replace pinch roller assembly.



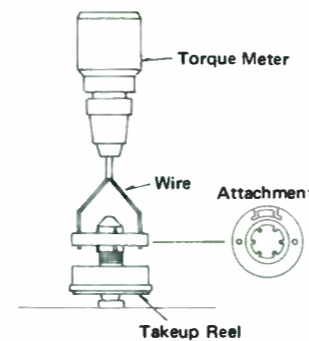
TAKE-UP TORQUE ADJUSTMENT

Take-up Torque Measurement with Torque Meter

Equipment Required:

- Torque Meter (having a range of 20 ~ 100g/cm)
- Attachment (Take reel out of cassette tape, makes 2 holes through its frame, and attach it to the torque meter with wire.)

1. Switch set to PLAY and put attachment with the torque meter onto take-up reel.
2. The standard take-up tension of the take-up reel should be 55 ± 20 g/cm.

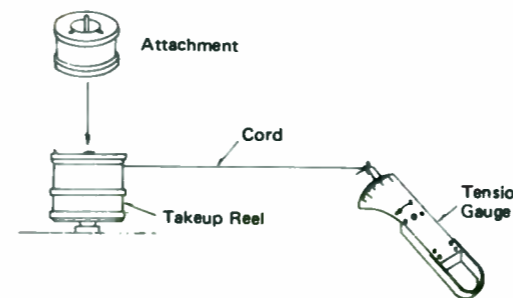


Take-up Torque Measurement with Tension Gauge

Equipment Required:

- Tension Gauge
- Attachment

1. Switch set to PLAY.
2. Put attachment which is connected to tension gauge by cord (about 30 cm) onto the take-up reel.
3. To read the number of the tension gauge, move the gauge in direction of arrow without slacking the cord.
4. The standard take-up tension of the take-up reel should be 55 ± 20g/cm.



If the take-up tension is beyond these limits-

- a) remove oil and dirt from flywheel belt (38) and/or
- b) remove oil and dirt from the rubber part of the take-up reel and/or
- c) remove rust from pinch roller or replace with new one and/or
- d) replace clutch felt (54) or take-up arm (51).

SEMICONDUCTORS

ITEM	PART NO./TYPE	VALUE
D1	SC-15	TR4 25C829
D2	0A90	TR5 25C829
D5	0A90	TR6 25A101
D7	0A90	TR7 25C829
D8	0A90	TR8 25C178
D9	0A90	TR9 25A564
D10	0A90	TR10 25A564
D11	0A90	TR11 25B346
D12	0A90	TR12 25B346
D13	0A90	TR13 25B176
D14	0A90	TR14 25B176
D15	1S1211	TR15 25B473
D16	0A90	TR16 25B473
D17	0A90	TR17 25B473
D18	10DC-1	TR18 25B473
D19	10DC-1R	TR19 25B175
D20	12B-2-B1P-M	TR20 25B324
IC	AN-203	TR21 25B346
TR1	25K19	TR22 25B346
TR2	25C920	TR23 25B175
TR3	25C829	TR24 25B175

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C18	ECE-A6V47N	47mfd 6V
C22	ECE-A6V10N	10mfd 6V
C25	ECE-A10V220N	220mfd 10V
C36	ECE-A6V220N	220mfd 6V
C38	AL-10V0.1M	.1mfd 10V
C47	ECE-A25V1N	1mfd 25V
C50	ECE-A25V3.3N	3.3mfd 25V
C51	ECE-A25V3.3N	3.3mfd 25V
C61	AL-10V0.1M	.1mfd 10V
C62	AL-10V0.1M	.1mfd 10V
C64	ECE-A10V100N	100mfd 10V
C65	ECE-A6V220N	220mfd 6V
C76	ECE-A25V3.3N	3.3mfd 25V
C79	ECE-A25V3.3N	3.3mfd 25V
C80	ECE-A10V220N	220mfd 10V
C81	ECE-A25V3.3N	3.3mfd 25V
C82	ECE-A25V3.3N	3.3mfd 25V
C87	ECE-A6V47N	47mfd 6V
C88	ECE-A6V47N	47mfd 6V
C91	ECE-A25V4R7N	4.7mfd 25V
C94	ECE-A25V3.3N	3.3mfd 25V
C95	ECE-A25V3.3N	3.3mfd 25V
C96	ECE-A10V220N	220mfd 10V
C97	ECE-A25V3.3N	3.3mfd 25V
C98	ECE-A25V3.3N	3.3mfd 25V
C99	ECE-A10V220N	220mfd 10V
C100	ECE-A6V47N	47mfd 6V
C101	AL-10V0.33M	.33mfd 10V
C102	AL-10V0.33M	.33mfd 10V
C103	ECE-A6V47N	47mfd 6V
C104	AL-10V0.1M	.1mfd 10V
C105	AL-10V0.1M	.1mfd 10V
C106	ECE-A10V220N	220mfd 10V
C107	ECE-A10V220N	220mfd 10V
C109	ECE-A6V10N	10mfd 6V
C111	ECE-A6V10N	10mfd 6V
C112	ECE-A6V220N	220mfd 6V
C113	ECE-A6V220N	220mfd 6V
C114	ECE-A16V220N	220mfd 16V
C115	ECE-A16V220N	220mfd 16V
C123	ECE-A10V220N	220mfd 10V
C124	ECE-A16V470N	470mfd 16V
C125	ECE-B16V2200	2200mfd 16V
C126	ECE-B16V2200	2200mfd 16V
C132	ECE-A25V1N	1mfd 25V
C136	ECE-A25V4R7N	4.7mfd 25V
C140	ECE-A6V47N	47mfd 6V
C141	ECE-A6V47N	47mfd 6V
CT1		
CT2	ECV-5XR27B18S	Tuning Gang
CT4		
CT3	ECV-12W101P12	Trimmer
CT5	ECV-12W101P12	Trimmer

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R129	ERN-12L1R5	1.5 ohm 10% 1/2W W
R130	ERN-12L1R5	1.5 ohm 10% 1/2W W
R131	ERN-12L1R5	1.5 ohm 10% 1/2W W
R132	ERN-12L1R5	1.5 ohm 10% 1/2W W

R138	ERX-2PSK180	18 ohm 10% 2W W
R139	ERX-2PSK180	18 ohm 10% 2W W
R149	ERX-2PSK180	18 ohm 10% 2W W
R150	ERX-2PSK180	18 ohm 10% 2W W
TH1	ERT-D2FGK750S	Thermistor
TH2	ERT-D2FGK750S	Thermistor
TH3	ERT-D2FGK750S	Thermistor
TH4	ERT-D2FGK750S	Thermistor
TH5	MT-10K	Thermistor
VR1 &	EV8-Q1AA01A54	50K Dual Volume
VR2		
VR3 &	EV8-QAA01D14	10K Dual Tone
VR4		
VR5	EVA-QAA01G15	100K Balance
VR6	EVL-S0AA00B13	1000 ohms Separation
VR7	EVL-T0AA00B23	2000 ohms AC Bias

COILS/TRANSFORMERS

ITEM	PART NO.	VALUE
L1	SLA-4P4	T1 SLI-48102
L2	SLD-4Y2	T2 SLI-48102
L3	SLQ-Y11G-2	T3 SLI-4C32M
L4	SLQ-4Y2	T4 SLI-2C22M
L5	SLF2E12	T5 SLI-4C22M
L6	SLQ-2C12H	T6 SLI-2C14M
L7	SLQ-V394-2Y	T7 SLI-4C22M
L8	SLQ-V394-2Y	T8 SLI-4C55
L9	SLT-6E2-0	T9 SLI-4C58
L10	RLQ-C542-1	T10 SLI-2C48M
L11	RLQ-C542-1	T11 SLM-2C4K
L12	RLQ-C542-1	T12 SLM-2C2K
L13	RLQ-C542-1	T13 SLM-3C2K
L14	SLQ-Y356-2D	T14 RLQ-9C2-T
L15	SLQ-Y356-2D	T15 SLI-3H4-D
L16	ELQ-250A999	T16 SLI-3H4-D
L17	ELQ-250A999	T17 SLI-5L16-D

MISCELLANEOUS

ITEM	NAME	PART NO.
M1	Component Combination	EXA-F203Z471
M2	Component Combination	EXA-5DL04C
S3	Switch, Play/Record	SSH-20
S4	Switch, Power	EST-1030DU
S5	Switch, AFC	SSH-16
SB1	Switch, Band Select	
SB2		
SB3		
SB4		ESR-E283158E
SB5		
SB6		
SB7		
SB8		
SF1	Switch, Function Select	
SF2		
SF3		
SF4		ESR-283158E
SF5		
SF6		
SF7		
SF8		
SP1	Speaker, 6-1/2", 16 ohm	EAS-16P245F
SP2	Speaker, 6-1/2", 16 ohm	EAS-16P245F
	Assembly, Cassette Push Button	FA-707A
	Belt, Tape Drive	SHQ-140
	Cartridge, Phono	EPC-34TTCD
	Head, Erase	WY-223Z
	Head, Record/Play	WY-425Z
	Meter, Level	SSM-4
	Motor, Cassette Drive	SMD-55D9S
	Motor, Phono Drive	ZE-10GPL
	Stylus, Phono	ESP-13TT5D

CABINET PARTS

NAME	PART NO.
Assembly, Main Cabinet Panel	SYP-28
Assembly, Cassette Push Button	SMD-224
Assembly, Speaker Cabinet	SYK-692
Cabinet, Main	SYK-690
Cover, Main Cabinet Bottom	SYU-158
Cover, Main Cabinet Top	SYK-668
Knob, Tuning	SBN-348
Knob, Volume	SBN-310
Knob, Selector	SBN-308



# ALIGNMENT INSTRUCTIONS

## AM-FM ALIGNMENT

READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

**Notes:**

1. Set volume control to maximum or minimum (FM-IF).
2. Set tone control to center.
3. Set loudness switch to OFF.
4. Set balance control to center.
5. Set band selector switch to AM or FM.
6. Set power source voltage to 120 volts AC.
7. Output of signal generator should be no greater than necessary to obtain an output reading.
8. When FM aligning, remove line cord antenna attached to EXT FM antenna terminal.

SIGNAL GENERATOR or SWEEP GENERATOR		RADIO DIAL SETTING	INDICATOR (VTVM or SCOPE)	ADJUSTMENT	REMARKS	
CONNECTIONS	FREQUENCY					
<b>AM ALIGNMENT</b>						
1	Fashion loop of several turns of wire and radiate signal into loop of receiver.	550 kHz	550 kHz	Output meter across voice coil. (Left side)	L <sub>6</sub> (OSC Coil)	Adjust for maximum output.
2	Same as Step 1.	600 kHz	Tune to signal	Same as Step 1.	(* 1)L <sub>5</sub> (ANT Coil)	Adjust for maximum output. Adjust L <sub>5</sub> by moving coil bobbin along ferrite core.
3	Same as Step 1.	1500 kHz	1500 kHz	Same as Step 1.	C <sub>32</sub> (OSC Trimmer) C <sub>30</sub> (ANT Trimmer)	Adjust for maximum output. Repeat steps (1), (2) and (3).
* 1 Cement antenna bobbin with wax after completing alignment.						
<b>FM-IF ALIGNMENT</b>						
4	High side thru. 0.001mfd to TP <sub>1</sub> (figure 9) and common to chassis.	10.7 MHz (400 kHz SWP.)	Point of non-interference. (on/about 90 MHz).	Connect vert. amp. of scope to TP <sub>2</sub> (figure 9) and common to chassis.	T <sub>1</sub> (1st FM IFT) T <sub>4</sub> (2nd FM IFT) (Primary)	Adjust for maximum amplitude and proper linearity between +100 kHz markers. (Refer to fig.6)
5	Same as step 4.	Same as step 4.	Same as step 4.	Connect vert. amp. of scope to TP <sub>2</sub> (figure 9) and common to chassis.	T <sub>5</sub> (2nd FM IFT) (Secondary)	Adjust T <sub>5</sub> so that 10.7 MHz marker appears at the center. (Refer to fig. 7)
<b>FM-RF ALIGNMENT</b>						
6	Connect to EXT FM antenna terminal through FM Dummy antenna. (Refer to figure 8)	90 MHz	90 MHz	Output meter across voice coil. (Left side)	L <sub>4</sub> (FM OSC Coil) L <sub>2</sub> (FM DET Coil) L <sub>1</sub> (FM ANT Coil)	(* 2)Adjust for maximum output.
7	Same as Step 6.	106 MHz	106 MHz	Same as Step 6.	C <sub>19</sub> (FM OSC Trimmer) C <sub>10</sub> (FM DET Trimmer) C <sub>2</sub> (FM ANT Trimmer)	(* 2)Adjust for maximum output. Repeat steps (6) and (7).
* 2 Three output responses will be present; tune to the center response.						

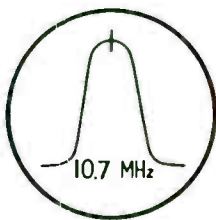


FIGURE 6. Cosine Waveform

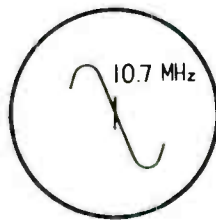


FIGURE 7. S-Curve

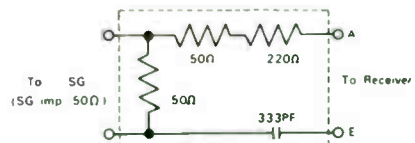
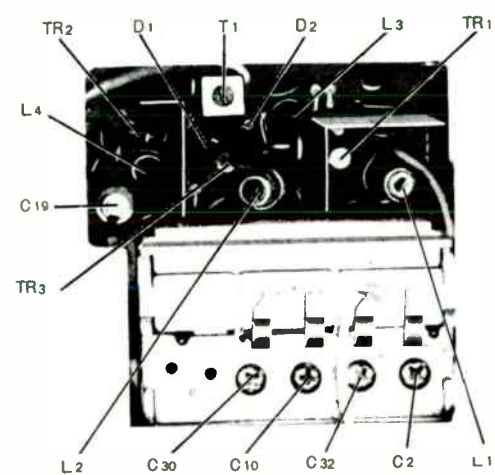
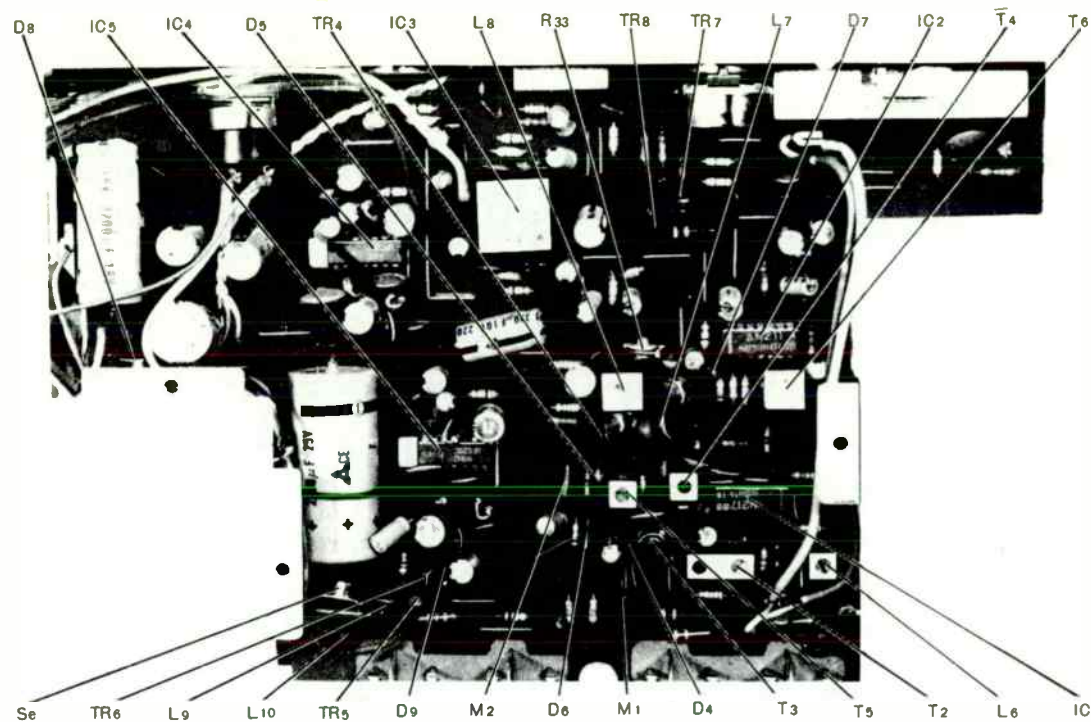


FIGURE 8. FM DUMMY ANTENNA



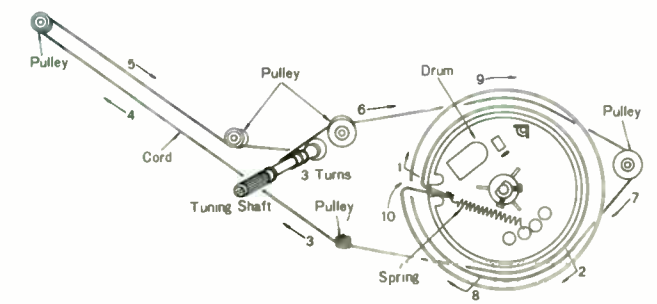


ELECTRIC PARTS IDENTIFICATION

## DIAL CORD RESTRINGING INSTRUCTIONS

**Notes:**

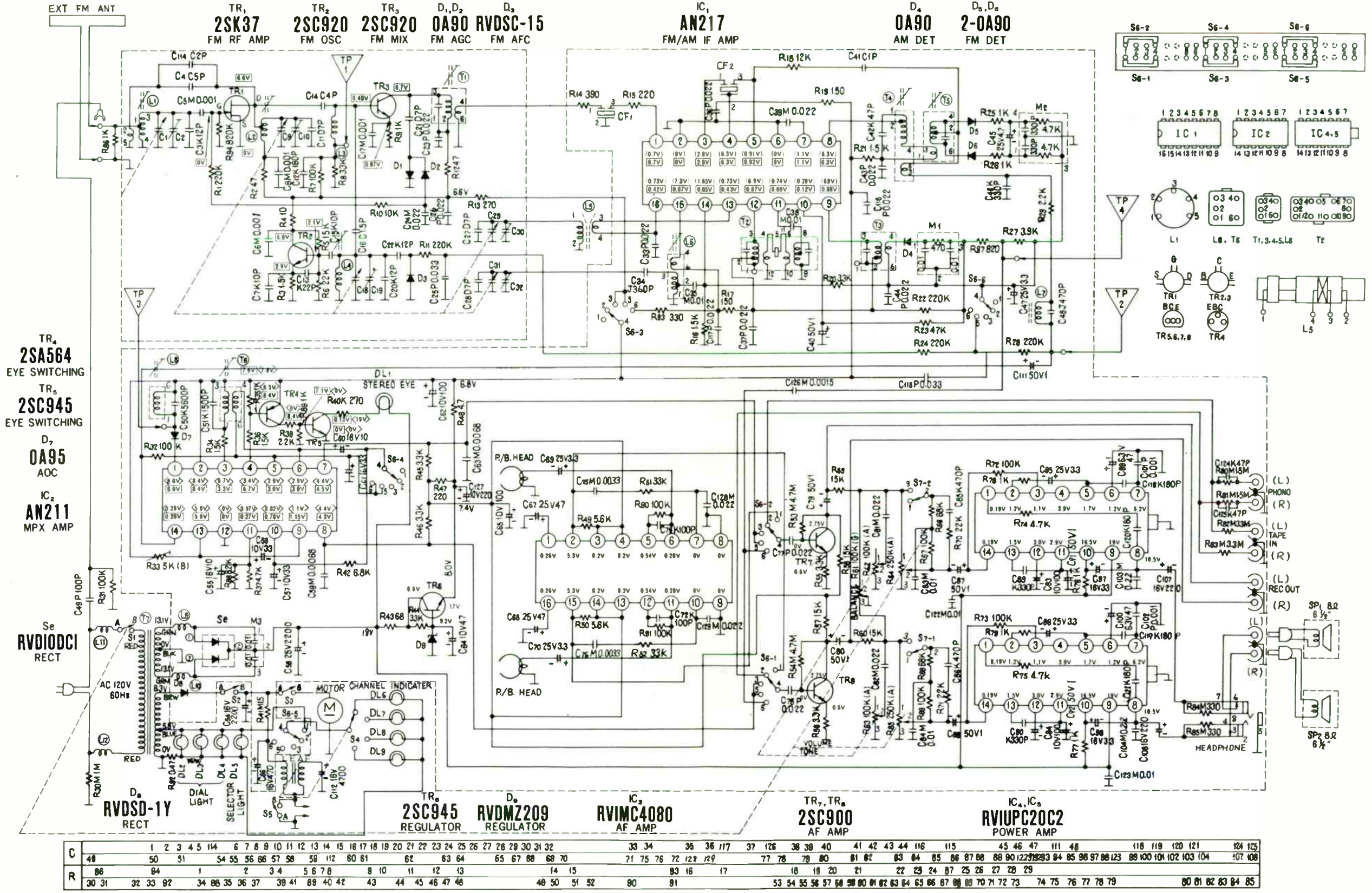
1. Dial cord 64 3/8 inches long.
2. Tuning gang is positioned at minimum capacity.
3. Arrows (1-10) indicate correct order and direction of installation dial cord.
4. Cement dial cord ends.



**To Mount Dial Pointer**

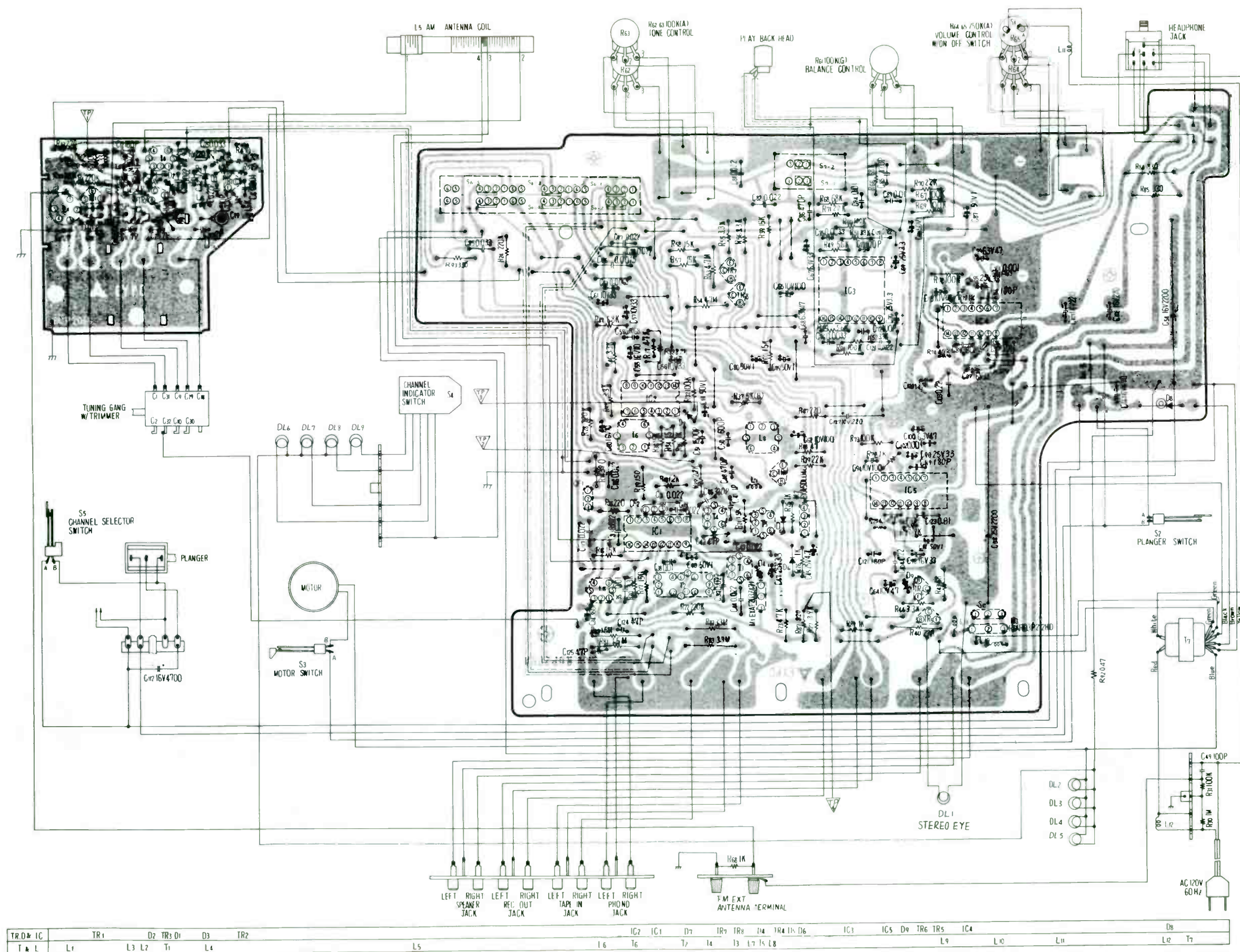
1. Set tuning gang to maximum capacity position.
2. Set dial pointer to start point of dial scale.
3. Attach dial cord to dial pointer.

RESTRINGING THE DIAL CORD



**Notes:**

1. S1: Power source switch to OFF position.
2. S2: Leaf switch to OFF position.
3. S3: Motor switch to OFF position.
4. S4: Channel indicator switch to 1 position.
5. S5: Channel selector switch to OFF position.
6. S6-1 ~ S6-6: Band selector switch to PHONO position.
7. S7-1 ~ S7-2: Loudness switch to OFF position.
8. DC voltage measurements are taken with circuit tester 10kΩ/V from chassis.



SEMICONDUCTORS

ITEM	PART NO./TYPE
D1	0A90
D2	0A90
D3	RVDS-15
D4	0A90
D5	2-0A90
D6	2-0A90
D7	0A95
D8	RVDS-1Y
D9	RVMZ-209
IC1	AN217
IC2	AN211
IC3	RVIMC4080
IC4	RVIUC20C2
IC5	RVIUC20C2
SC	RD10DC1
TR1	2SK37
TR2	2SC920
TR3	2SC920
TR4	2SA564
TR5	2SC945
TR6	2SC945
TR7	2SC900
TR8	2SC900

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE		
C1	ECV5MD34X21A	Tuning Gang		
C2				
C9				
C10				
C29				
C30				
C31				
C32				
C19			ECV1Z10P32	Trimmer
C45			ECEA25V4R7	4.7mfd 25V
C47	ECEA25V3R3	3.3mfd 25V		
C54	ECEB16V2200	2200mfd 16V		
C55	ECEA16V10	10mfd 16V		
C56	ECEA10V33	33mfd 10V		
C57	ECEA10V33	33mfd 10V		
C58	ECEB25V2200	2200mfd 25V		
C60	ECEA16V10	10mfd 16V		
C61	ECEA10V33	33mfd 10V		
C62	ECEA10V100	100mfd 10V		
C64	ECEA10V47	47mfd 10V		
C65	ECEA10V100	100mfd 10V		
C66	ECEA16V470	470mfd 16V		
C67	ECEA25V4R7	4.7mfd 25V		
C68	ECEA25V4R7	4.7mfd 25V		
C69	ECEA25V3R3	3.3mfd 25V		
C70	ECEA25V3R3	3.3mfd 25V		
C79	ECEA50V1	1mfd 50V		
C80	ECEA50V1	1mfd 50V		
C87	ECEA50V1	1mfd 50V		
C88	ECEA50V1	1mfd 50V		
C91	ECEA50V1	1mfd 50V		
C92	ECEA50V1	1mfd 50V		
C93	ECEA10V100	100mfd 10V		
C94	ECEA10V100	100mfd 10V		
C95	ECEA25V3R3	3.3mfd 25V		
C96	ECEA25V3R3	3.3mfd 25V		
C97	ECEA16V33	33mfd 16V		
C98	ECEA16V33	33mfd 16V		
C99	ECEA6V47	47mfd 6.3V		
C100	ECEA6V47	47mfd 6.3V		
C107	ECEA16V220	220mfd 16V		
C108	ECEA16V220	220mfd 16V		
C111	ECEA50V1	1mfd 50V		
C127	ECEB10V220	220mfd 10V		

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R33	EVLTOAA00B53	5000 ohms Separation
R61	EVCS2AU30G15	100K Balance
R62 &	EVFNOAU30A15	100K Dual Tone
R63		
R64 &	EVFN15U30AF5	250K Dual Volume
R65		
R92	ERM12PKR47	.47 ohms 10% WW

COILS/TRANSFORMERS

ITEM	PART NO.
L1	RLA4P7
L2	RLD4N21
L3	RLQY15G5
L4	RL04N41
L5	RLF2C44-0
L6	RL02B83-M
L7	RLM1X1-Y
L8	RLM1C16
L9	RLQY15G5
L10	RLQY15G5
T1	RLI4B152
T2	RLI7W106P-T
T3	RLI2B451P-T
T4	RLI4B551
T5	RLI4B552
T6	RLM1C17
T7	RLT5L65-W

MISCELLANEOUS

ITEM	NAME	PART NO.
CF1	Filter, Ceramic	RVFCF10S12CR
CF2	Filter, Ceramic	RVFCF10S12CR
M1	Component Combination	EXAF203Z471
M2	Component Combination	EXA5DL04C
M3	Component Combination	RXAF103P22HD
S2	Switch, Cartridge	RSH21A
S5	Switch, Channel Select	RSH3B
S6	Switch, Band Select	RSR19A
S7	Switch, Loudness	RSR29A
SP1	Speaker, 6-1/2" PM	RAS16P04
SP2	Speaker, 6-1/2" PM	RAS16P04
	Assembly, Motor	RMQ274A-A
	Assembly, Solenoid	RMQ216A-A
	Belt, Drive	RMQ195A-A
	Head, Playback	RMQ210A-A

CABINET PARTS

NAME	PART NO.
Cabinet, Main	RKM177ASP
Cover, Bottom	RKE64B
Panel, Front	RGP157A
Escutcheon	RGC32A
Panel, Cabinet Rear	RKU94C
Button, Select	RBC34A
Knob, Tuning	RBN123A
Knob, Band Select	RBN125A
Knob, Tone/Loudness/Balance/Volume	RBN124A
Cabinet, Speaker	RKM173AH
Escutcheon, Speaker Cabinet	RGC34A

**ALIGNMENT INSTRUCTIONS (Refer to Figure 4 and Schematic Diagram)**

Alignment is an exacting procedure and should be undertaken only when necessary.

If alignment of AM and FM is required, either section may be done first.

The FM stereo section, however, should be done only if the FM monaural section is properly adjusted.

Notes: Don't use a metallic screw driver.

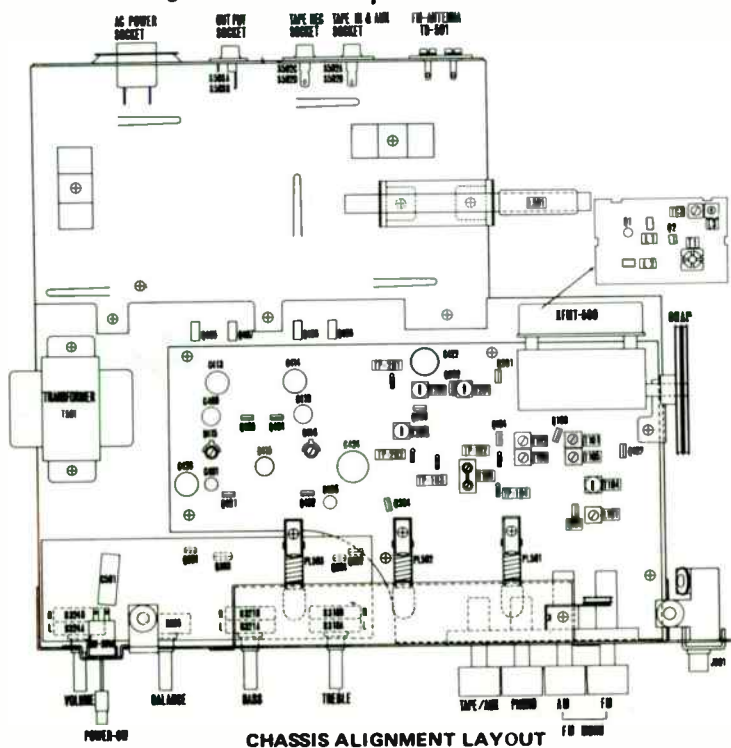
**REQUIRED EQUIPMENT:**

1. Signal generator with a frequency range of 455 kHz to 1650 kHz: AM
2. Signal generator with a frequency range of 86.5MHz to 108.5MHz: FM
3. Signal generator with a frequency output of 10.7MHz ±0.5MHz:FM
4. Vacuum tube voltmeter (AC-VTVM)
5. Sweep signal generator with a sweep range of at least 500 kHz and center frequency of 10.7MHz with at least a 10.7MHz marker. (Ext. marker may be used.)
6. Oscilloscope with a wide range amplifier of approximately 100 kHz
7. Test loops, a coil of any size wire, one turn or more.
8. FM stereo signal generator.
9. Audio signal generator with a frequency of 20Hz to 100kHz.

Notes: Allow the set at least five minutes to warm up before attempting alignment. During alignment keep the signal generator output at the lowest level that will maintain a usable output from the set, except for FM stereo signal generator. Take much care, lest the grounding of FM sweep signal generator input should make multipaths which made FM IF alignment incorrect. To avoid this the grounding lead may be connected through 0.01–0.04 MFD capacitor to the tuner chassis when sweep generator is connected to the tuner section.

Ground connection of signal generator	.....	chassis ground.
Generator modulation (AM)	.....	30%, 400 Hz
Generator modulation (FM)	.....	22.5kHz, 400 Hz
Generator modulation (FM stereo)	.....	CH.L. or CH.R. 11.25 kHz, 1000Hz Mod.

All test points are shown in Figure 4.



## ALIGNMENT PROCEDURE AM ALIGNMENT

PROCEDURE NUMBER	Signal Generator		Dial Pointer Setting	Function Setting	Meter Connection	Adjustment	Remarks
	Connection	Frequency					
1 (IF)	Thru 0.01 MFD to Q101 Base as small as possible (K106)	455kHz (SG or sweep)	High end of Dial	AM	Oscilloscope connected to TP104.	T104 T105 T106	Volume control max. Adjust for maximum output. Repeat 2 or 3 times.
2	Radiated Signal as small as possible	515kHz Modulated	Low end of Dial	AM	VTVM connected across Output Load (S503A or S503B)	Oscillator coil L101	Same as above
3	Radiated Signal as small as possible	1650kHz Modulated	High end of Dial	AM	VTVM connected across Output Load (S503A or S503B)	Oscillator Trimmer TC5	Same as above
4	Radiated Signal as small as possible	1400kHz Modulated	1400kHz	AM	VTVM connected across Output Load (S503A or S503B)	Tuning Trimmer TC4	Same as above
5	Radiated Signal as small as possible	600kHz Modulated	600kHz	AM	VTVM connected across Output Load (S503A or S503B)	Antenna coil L501	Same as above
6	If necessary, repeat step 2-step 5.						

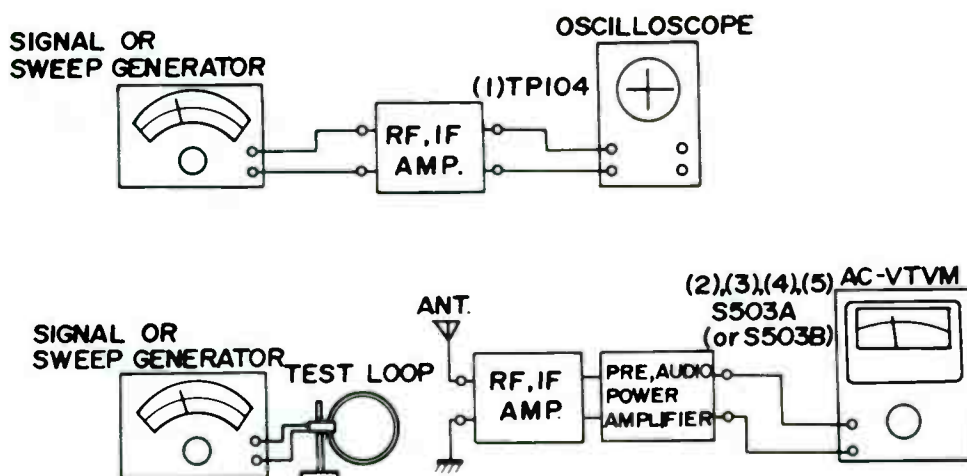


Figure 5 AM ALIGNMENT EQUIPMENT CONNECTIONS

FM IF ALIGNMENT

PROCEDURE NUMBER	Signal Generator		Dial Pointer Setting	Function Setting	Scope Connection	Adjustment	Remarks
	Connection	Frequency					
1	Detune T1, T103 completely.						
2	Thru 0.01 MFD to Q102 Base (TP101)	10.7MHz ± 300kHz	High end of Dial	FM Stereo	TP102	T101, T102	Set curve at maximum as shown in the Figure 6- (A) Repeat 2 or 3 times.
3	FM-ANT	10.7MHz ± 300kHz	High end of Dial	FM Stereo	TP102	T1	Same as above.
4	FM-ANT	10.7MHz ± 400kHz	High end of Dial	FM Stereo	TP103	T103	Adjust "S" curve at maximum. Adjust 10.7MHz at the center of "S" curve.
5	Repeat adjustments to obtain "S" curve as shown in Figure 6.						

PRECAUTIONS ON DETUNING

Turn the core of T103 two or more times.

Then pull the core out. In the case of T1 pull the core out of the spiral core.

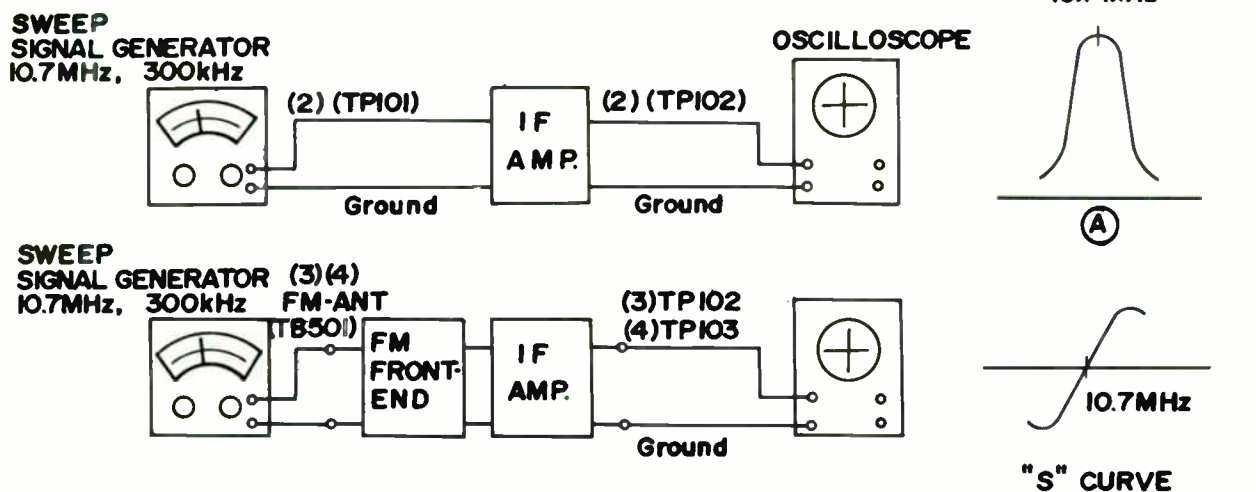


Figure 6 FM IF ALIGNMENT EQUIPMENT CONNECTIONS

## FM RF ALIGNMENT

PROCEDURE NUMBER	Signal Generator		Dial Pointer Setting	Function Setting	Meter Connection	Adjustment	Remarks
	Connection	Frequency					
1	FM-ANT Terminal (TB501) (through 300ohm matching pad)	108.5MHz Modulated	High end of Dial	FM Stereo	Across Output Load (S503A or S503B)	Oscillator Trimmer TC3	Volume Control max. Adjust for maximum output.
2	Same as above	86.5MHz Modulated	Low end of Dial	FM Stereo	Same as above	Oscillator Coil L3	Same as above
3	Same as above	106MHz Modulated	106MHz	FM Stereo	Same as above	Tuning Trimmer TC1 and then RF Trimmer TC2	Same as above
4	Same as above	90MHz Modulated	90MHz	FM Stereo	Same as above	Tuning Coil L1 (a,b,c,d) and then RF Coil L2 (a,b)	Same as above
5	If necessary, repeat step 1-step 4.						

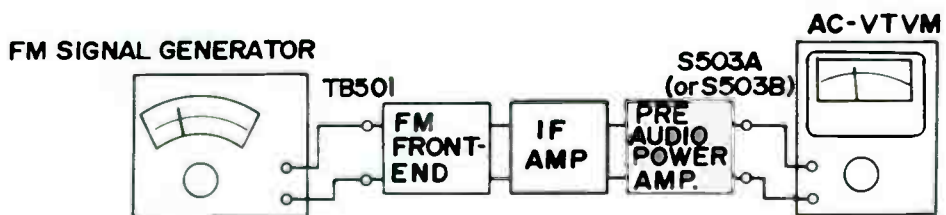


Figure 7 FM RF ALIGNMENT EQUIPMENT CONNECTIONS



FM STEREO ALIGNMENT

PROCEDURE NUMBER	Stereo Signal Generator		Tuning Frequency	Function Setting	Scope Connection	Adjustment	Remarks
	Connection	Mod. Frequency					
1	F·M-ANT	19kHz Mod. level as small as possible	98MHz	F·M stereo	TP201 (Sensitivity Max.)	T201, T202 (Respectively)	Get the maximum point. Repeat 2 or 3 times.
2	F·M-ANT	19kHz 10% Mod.	98MHz	F·M stereo	TP202	T203	Get the maximum point.
3	F·M-ANT	1000Hz Ch. L only	98MHz	F·M stereo	Across Ch. L Output Load (S503A)	T202 (Readjust)	Get the maximum output point. Counter-clockwise 1/16-1/8 turn.

Note: Output level of F·M Signal Generator which is modulated by a F·M Stereo Signal Generator shall be 1mV.(60dB)

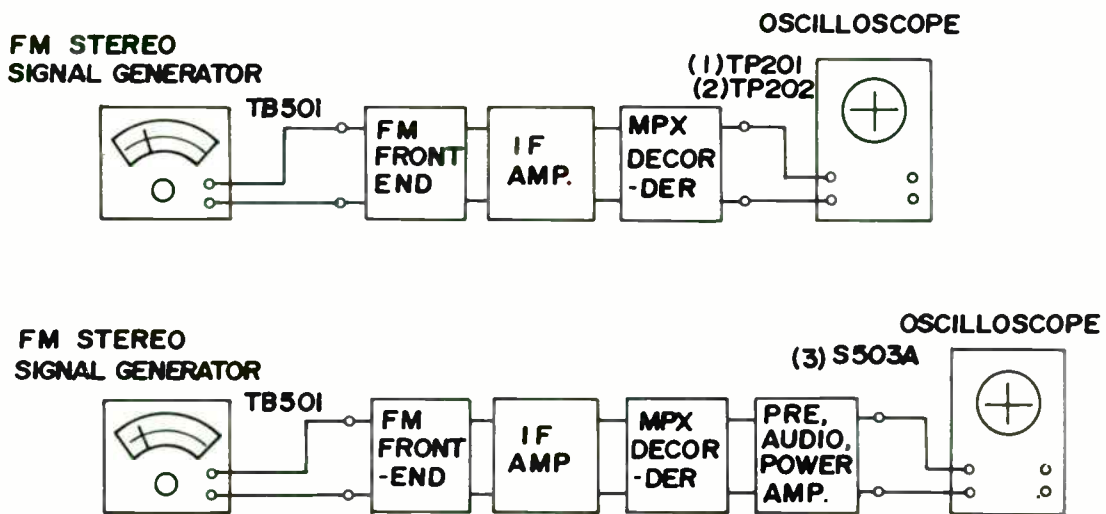
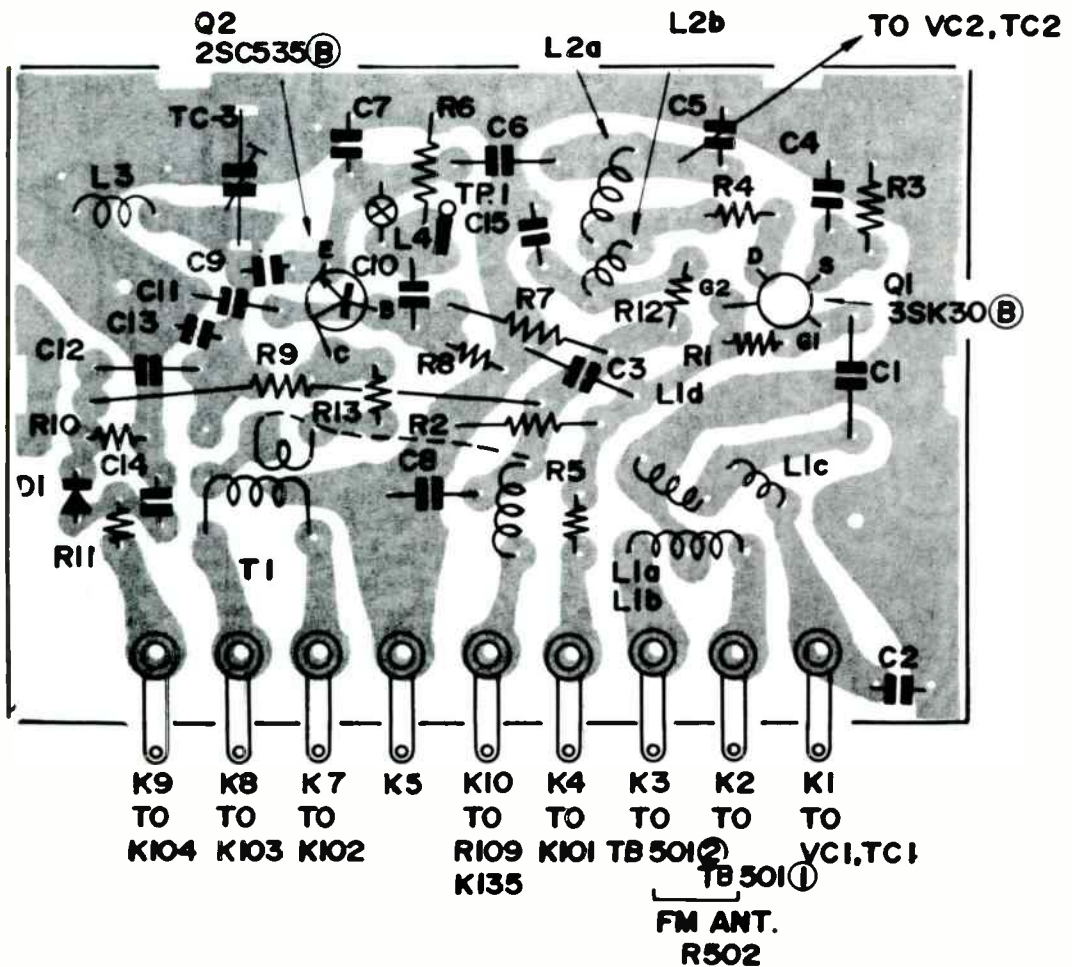
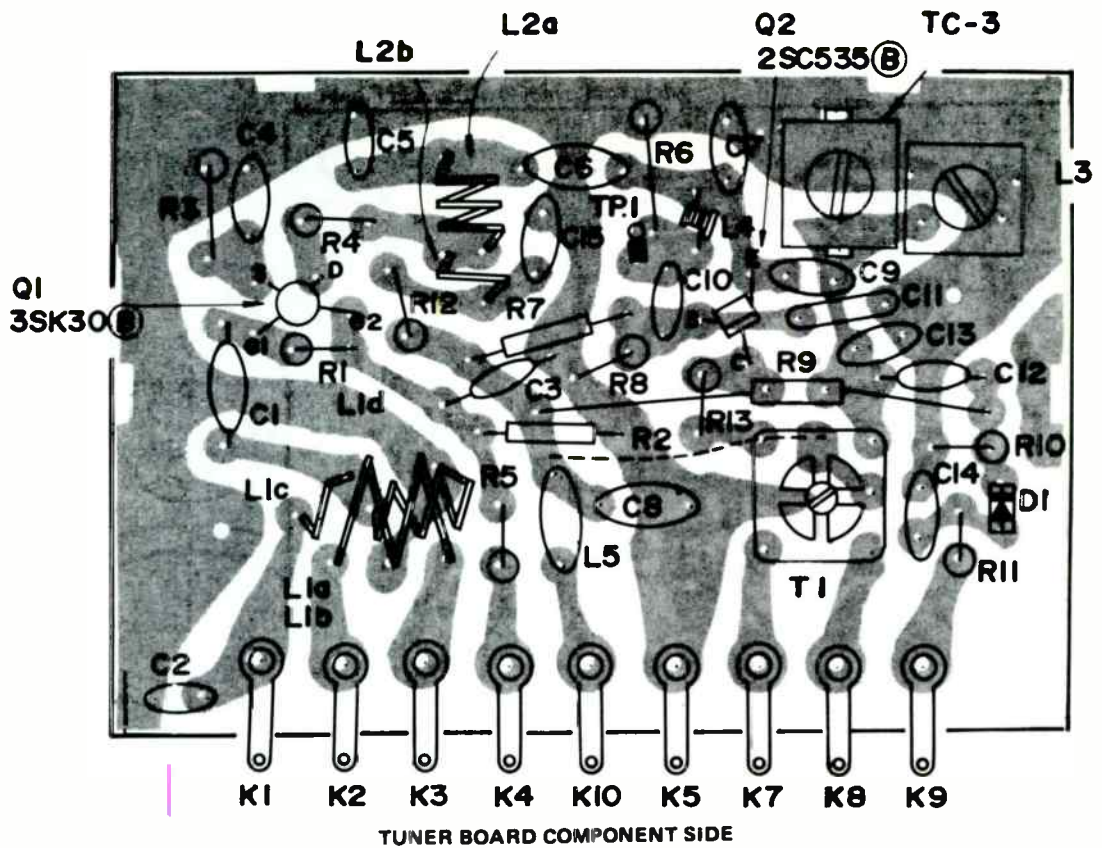
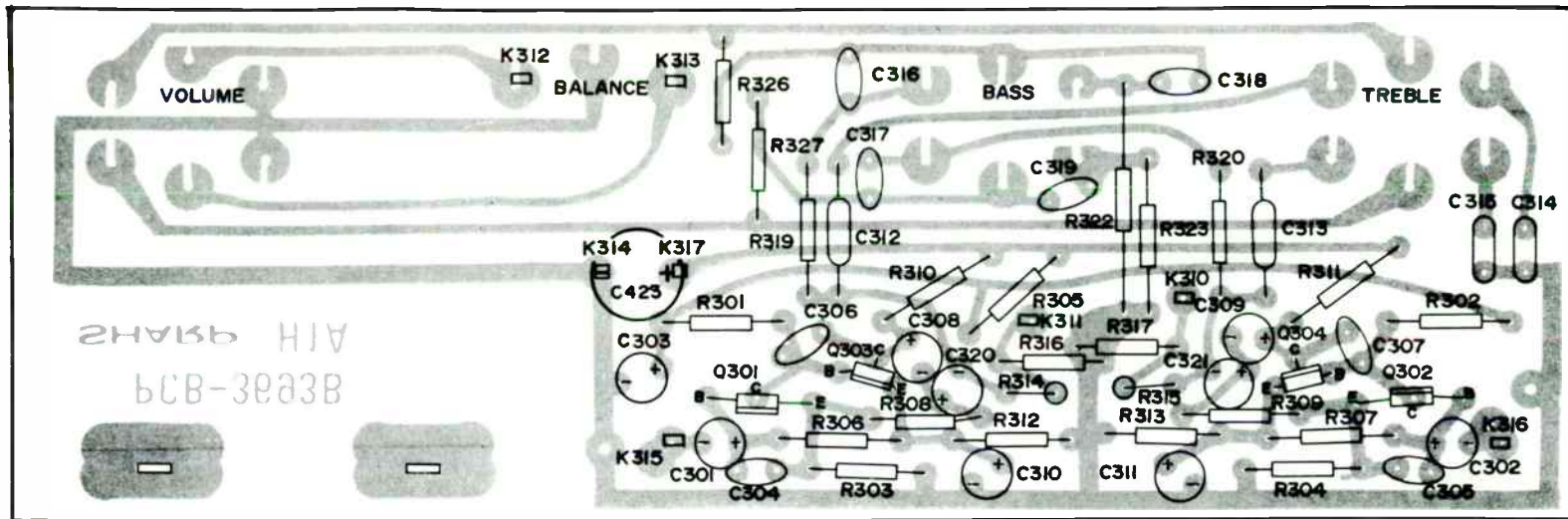
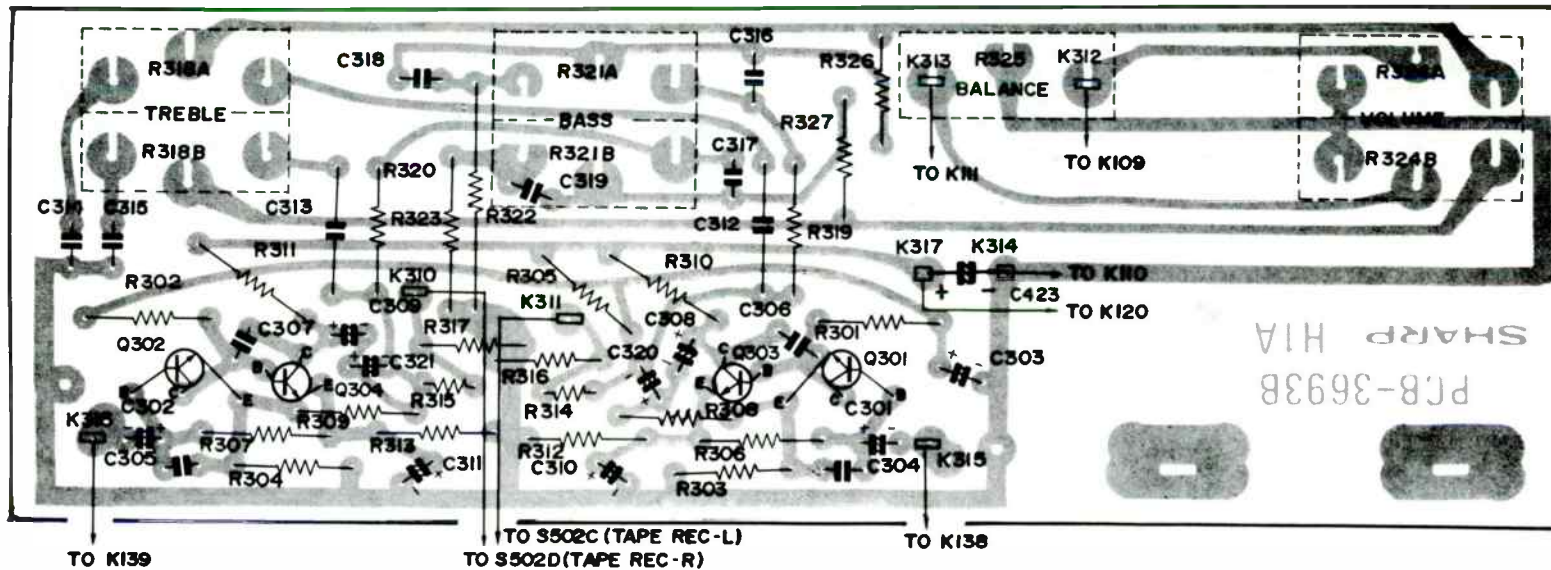


Figure 8 FM STEREO ALIGNMENT EQUIPMENT CONNECTIONS

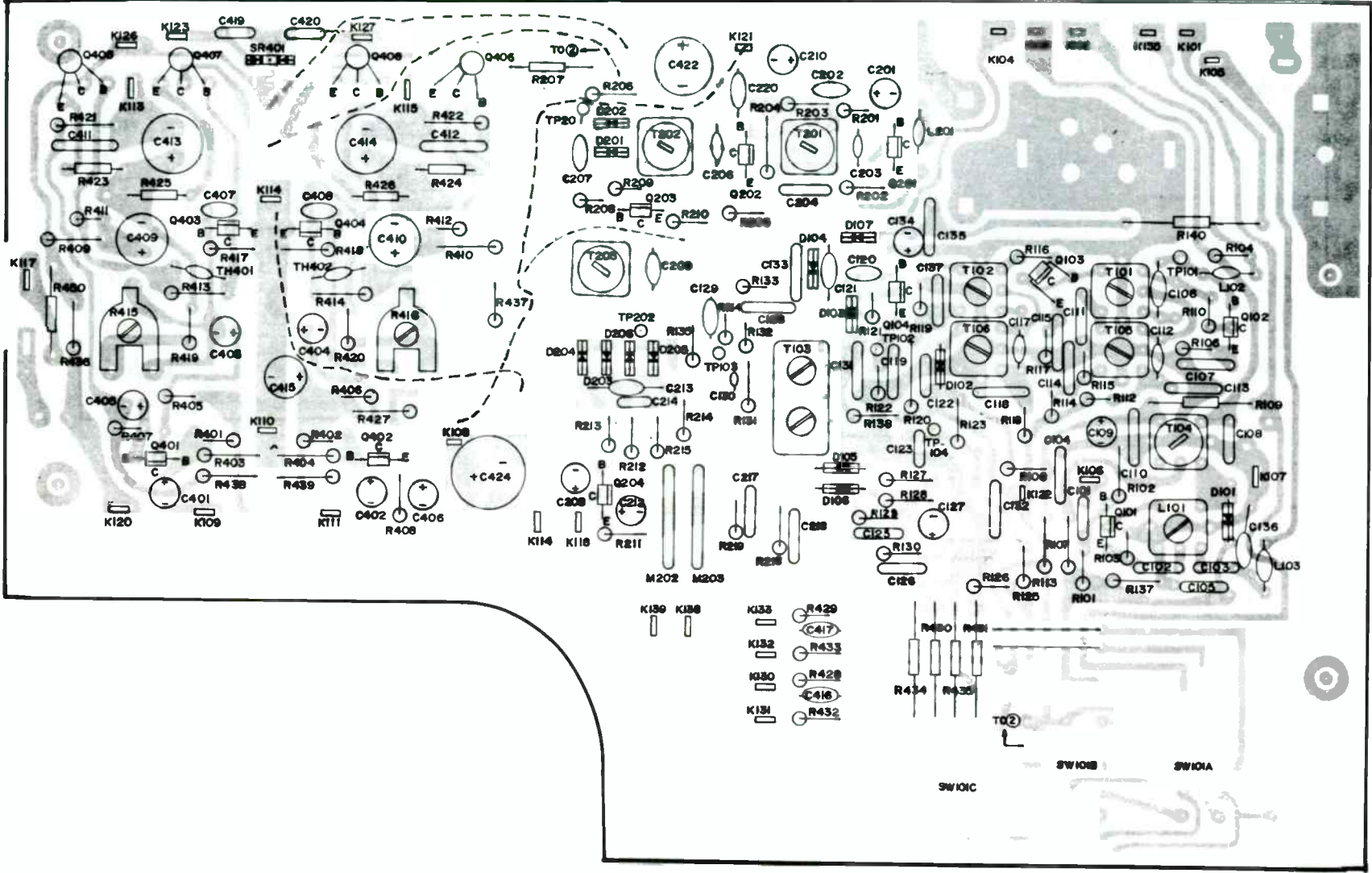




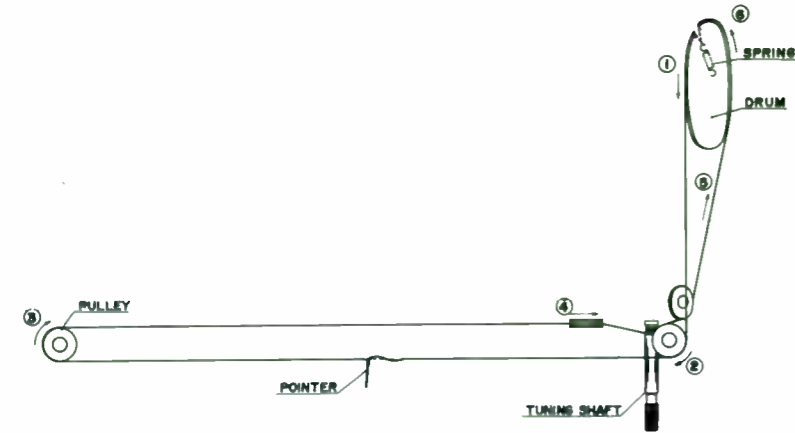
TO NE BOARD COMPONENT SIDE



Sharp SD-101U





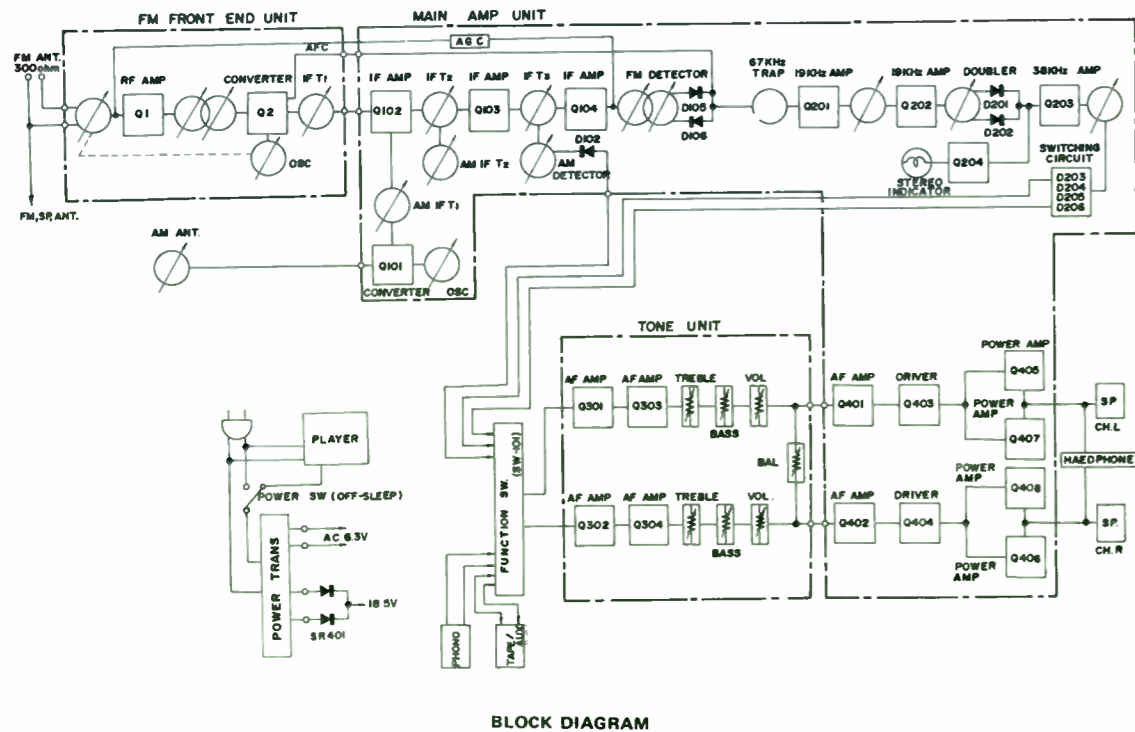


Overall length of dial cord is approximately 18-3/4 inches

DIAL CORD STRINGING

CIRCUIT DESCRIPTION

This model is an AM/FM/FM MPX tuner-amplifier with record changer and speaker systems. The circuit construction is shown in the Block Diagram



BLOCK DIAGRAM

ADJUSTMENTS

1) Idler Pulley

Disconnect changer form AC source and remove turntable (169). Set speed selector knob on 33 and reject knob to on so idler pulley (133) rests against the 33 rpm step on motor pulley (115). Using a screwdriver, turn adjustment screw (129) until idler pulley (133) is centered on the 33 rpm step of motor pulley. Check the alignment of idler pulley (133) at all speeds and readjust if necessary. Move reject knob to off and replace turntable (169) taking care not to damage idler pulley (133). (See fig. 12)

2) Tone Arm Height

To raise, hold plastic nut (174) firmly and turn screw head (173) by hand counterclockwise: to lower, turn screw head (173) clockwise. Adjust stylus to clear a full stack of records by 1/8". (See fig. 13)

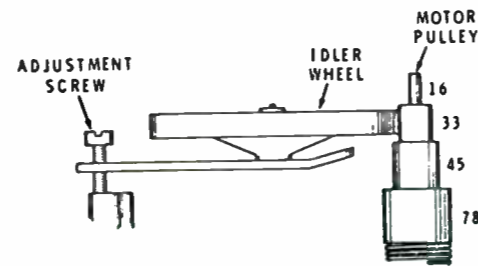


Figure 12

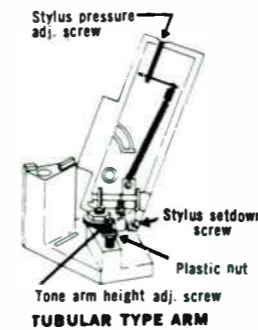


Figure 13

3) Stylus Set-Down

The set-down position of the stylus on the records is adjusted by means of the stylus adjusting screw (36). This screw is adjusted to obtain correct set-down for a 12" record. It should be adjusted so the stylus will set-down 1/8" from the outside edge of the record. This adjustment should be made with a 12" record on the turntable. When the stylus set-down is adjusted correctly for 12" record, it will automatically be correct for 7" and 10" records.

4) Stylus Pressure

Turn Stylus Pressure Adjusting screw (10) clockwise to reduce stylus pressure: counterclockwise to increase pressure.

5) Easy to Adjust (See Illustration)

This changer has been accurately pre-adjusted for correct stylus setdown, stylus pressure and tone arm height. If new adjustments should ever be needed, make them with a 12" record: then position will be correct for all sizes.

SEMICONDUCTORS

ITEM	PART NO./TYPE	ITEM	PART NO./TYPE
D1	1S-2139C	Q104	2SC450(B)
D101	1N-60	Q201	2SC458(C)
D102	1N-60	Q202	2SC458(C)
D103	1N-60	Q203	2SC458(C)
D104	1N-60	Q204	2SC458(C)
D105	1N-60(P)	Q301	2SC458LG(C)
D106	1N-60(P)	Q302	2SC458LG(C)
D107	1N-60	Q303	2SC458(D)
D201	1N-34A	Q304	2SC458(D)
D202	1N-34A	Q401	2SC458LG(C)
D203	1N-34A	Q402	2SC458LG(C)
D204	1N-34A	Q403	2SC458(D)
D205	1N-34A	Q404	2SC458(D)
D206	1N-34A	Q405	2SD170A(A)
Q1	3SK30(B)	Q406	2SD170A(A)
Q2	2SC535(B)	Q407	2SB370A(A)
Q101	2SC454(B)	Q408	2SB370A(A)
Q102	2SC460(B)	SR401	SI-RECT-59
Q103	2SC460(B)		

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C109	CU-5-103R	1mfd 50V
C127	CU-1.6-102R	10mfd 16V
C134	CU-5-103R	1mfd 50V
C201	CU-1.6-102R	10mfd 16V
C208	CU-1.6-102R	10mfd 16V
C210	CU-1.6-102R	10mfd 16V
C212	CU-5-103R	1mfd 50V
C301	CU-5-103R	1mfd 50V
C302	CU-5-103R	1mfd 50V
C303	CU-1-332R	33mfd 10V
C308	CU-2.5-473R	4.7mfd 25V
C309	CU-2.5-473R	4.7mfd 25V
C310	CU-06-472Q	47mfd 6.3V
C311	CU-06-472Q	47mfd 6.3V
C320	CU-2.5-473R	4.7mfd 25V
C321	CU-2.5-473R	4.7mfd 25V
C401	CU-5-103R	1mfd 50V
C402	CU-5-103R	1mfd 50V
C403	CU-1.6-102R	10mfd 16V
C404	CU-1.6-102R	10mfd 16V
C405	CU-06-472Q	47mfd 6.3V
C406	CU-06-472Q	47mfd 6.3V
C409	CU-1-101Q	100mfd 10V
C410	CU-1-101Q	100mfd 10V
C413	CU-1-471Q	470mfd 10V
C414	CU-1-471Q	470mfd 10V
C415	CU-2.5-472Q	47mfd 25V
C422	CU-2.5-100Q	1000mfd 25V
C423	CU-2.5-471Q	470mfd 25V
C424	CU-1.6-100Q	1000mfd 16V
C505	NP-3-153M	1.5mfd 30V
C506	NP-3-153M	1.5mfd 30V

ITEM	PART NO.	DESCRIPTION
TC1		
TC2		
TC4		
TC5		
VC1	XVC-190	Tuning Gang w/Trimers
VC2		
VC3		
VC4		
VC5		
TC3	T0-859	Trimmer

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R318	8V-3478	50K Dual Bass
R321	8V-3478	50K Dual Treble
R324	8V-3518	50K Dual Volume
R325	8V-3476	50K Balance
R415	8V-3472	50K Output Bias
R416	8V-3472	50K Output Bias
TH401	D-1A	Thermistor
TH402	D-1A	Thermistor

COILS/TRANSFORMERS

ITEM	PART NO.	ITEM	PART NO.
L1a	4L-178A	L502	4L-922
L1b	4L-178A		
L1c	4L-542C	T1	4IF-840
L1d	4L-544C	T101	4IF-780
L2a	4L-544C	T102	4IF-780
L2b	4L-542C	T103	4IF-781
L3	4L-368B	T104	4IF-829
L4	7L-947	T105	4IF-782
L5	HL-100M	T106	4IF-783
L101	7L-054B	T201	4L-992
L102	HL-108M	T202	4L-994
L103	HL-338M	T203	4L-996
L201	4L-020	T501	N5T-698UL
L501	4L-138A		

MISCELLANEOUS

ITEM	NAME	PART NO.
M202	Component Combination	PRC-413
M203	Component Combination	PRC-413
SW101	Switch, Mode Selector	6S-89
SW501	Switch, Power Supply	X13S-006UL
	Assembly, Record Changer(BSR)	C-138
	Head, Phono Pick-up	B106977
	P.C. Board, Tone Control	PCB-3693B
	P.C. Board, Main Amp	PCB-3693C
	P.C. Board, FM Tuner	PCB-3693A
	Speaker, Woofer	16P-698
	Speaker, Tweeter	4T-258

CABINET PARTS

NAME	PART NO.
Assembly, Main Cabinet	2CAB-3815A
Panel, Operation	PANEL-3761
Cover, Dust	D-COV-3815
Plate, Rear	U-BUTA3815
Knob, Tuning	8K-442
Knob, Volume/Balance/Bass/Treble	8K-444
Knob, Power	8K-446
Cabinet, Speaker	X2CAB3815B
Plate, Speaker Baffle	BAFFL-3815
Net, Speaker	N-295

## ALIGNMENT AND ADJUSTMENT PROCEDURES

### 3-1. FM I-F STRIP ALIGNMENT

#### CAUTION

The ceramic filters in the fm i-f circuit are selected according to their specified center frequencies and color coded as shown in Fig. 3-1 and listed in Table 3-1. Check the color code of the filters to identify the same center frequency when replacing any of these filters.

TABLE 3-1.

FM I-F CERAMIC FILTERS		
Part No.	Color	Specified Center Freq.
1-403-562-11	red	10.70 MHz
1-403-562-21	black	10.66 MHz
1-403-562-31	white	10.74 MHz
1-403-562-41	green	10.62 MHz
1-403-562-51	yellow	10.78 MHz



Fig. 3-1 Fm i-f ceramic filter

#### Test Equipment Required

1. Standard fm signal generator
2. Ac VTVM
3. Alignment tools

Note: Fm i-f strip alignment should be performed only after replacing IFT101 in the front end.

#### Preparation

1. Remove the top cover
2. Connect the input cable of the ac VTVM to the FIX terminal (J707).
3. Connect the signal-generator's output to the fm antenna terminal.

#### Procedure

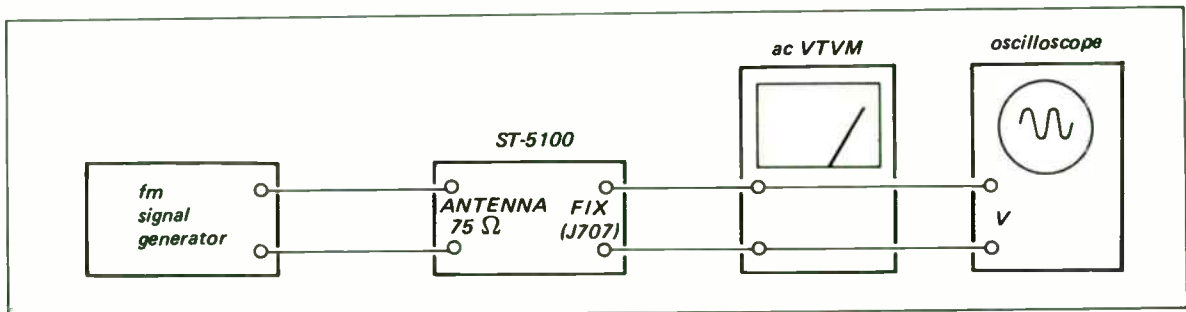
1. With the equipment connected as shown in Fig. 3-2, set the signal-generator's controls as follows:

Carrier frequency . . . . . 98 MHz  
 Modulation . . . . . Fm, 400 Hz, 100%  
 Output level . . . . . 30  $\mu$ V (30 dB)

2. Set the receiver's controls as follows:

FUNCTION switch . . . . . FM  
 MODE switch . . . . . MONO  
 AFC switch . . . . . OFF

3. Turn the core of transformer IFT101 (See Fig. 3-5) with the alignment tool to obtain maximum output.



I-f, muting and front-end alignment setup

### 3-2. FM DISCRIMINATOR ALIGNMENT

**Note:** There are two or three methods of discriminator alignment, but only the simplified method using the tuner's TUNING meter is described here.

#### Test Equipment Required

1. Oscilloscope
2. Alignment tools

#### Preparation

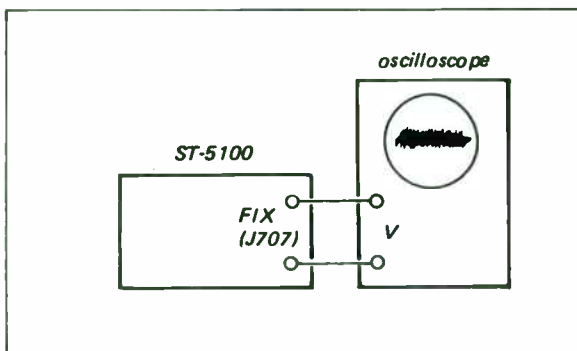
1. Remove the top cover
2. Connect the input cable of the oscilloscope to J707 (FIX jack).

#### Procedure

1. With the equipment connected as shown in Fig. 3-3, set the tuner's control as follows:

FM-AM switch . . . . . FM  
 MODE switch . . . . . MONO  
 AFC switch . . . . . OFF

No signal should be received.

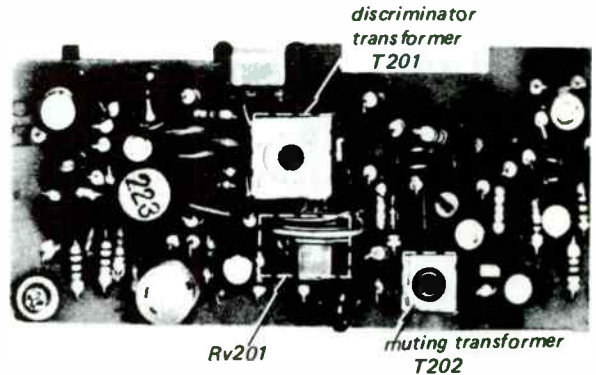


**Fig. 3-3 Discriminator alignment test setup**

2. Adjust the controls of the oscilloscope to provide a visible indication of noise. Always watch the oscilloscope to confirm that the tuner is not receiving any off-the-air signal.
3. Turn the top core (secondary side) of discriminator transformer T201 (see Fig. 3-4) with a hex-head alignment tool to obtain a null-point reading on the tuning meter.

If the discriminator transformer (T201) is not aligned correctly, some deviation on the tuning meter will be observed.

**Note:** Turn the core carefully and slowly. At both extreme positions of the top core, a null point will be observed. The real null point should be obtained in the middle of the core thread length.



**Fig. 3-4 Parts location**

### 3-3. MUTING ADJUSTMENT

**Note:** Two methods of muting alignment are available, signal generator alignment and alignment by using an off-the-air signal. You can use either of them.

#### Signal Generator Alignment

#### Test Equipment Required

1. Fm standard signal generator
2. Ac VTVM or oscilloscope
3. Alignment tool

#### Preparation

1. Remove the top cover
2. Turn the knob of Rv201 (see Fig. 3-4) fully clockwise on the fm i-f and discriminator board.

#### Procedure

1. With the equipment connected as shown in Fig. 3-2, set the tuner's controls as follows:



FM-AM switch . . . . . FM  
 MODE switch . . . . . MONO  
 AFC switch . . . . . OFF  
 MUTING switch . . . . . ON

**Note:** Before starting this alignment, the discriminator transformer alignment should be performed.

2. Follow the procedure given in Table 3-2. Note that the muting circuit should begin to operate at the symmetrical deflection point on the TUNING meter when detuning the tuner to higher or lower than the reference carrier frequency.

**Off-the-Air Signal Alignment**

Accurate muting circuit adjustment can also be performed by utilizing off-the-air local fm signals instead of the fm S. S. G.

Note that a weak signal is best for this purpose.

**3-4. FM FRONT-END ALIGNMENT (Frequency coverage)**

Never attempt alignment of the front-end section except for the frequency-coverage and dial-calibration adjustments. The front-end section of the tuner has been carefully adjusted at the factory, so very little adjustment is necessary in the field.

Alignment need not be performed when the front-end FET is replaced since changes in FET parameters have little effect upon tuning. If an rf-stage adjustment is required, ask your nearest SONY Service Station to send your unit to the Factory Service Center for a complete front-end alignment. Exercise caution when returning the faulty unit so that it is not damaged in transit. The warranty will not cover damage incurrent in transit to the Factory Service Center.

**Signal Generator Alignment**

*Test Equipment Required*

1. Standard fm signal generator
2. Ac VTVM or oscilloscope
3. Alignment tools

*Preparation*

1. Remove the top cover
2. Connect the equipment as shown in Fig. 3-2.
3. Set the tuner's controls as follows:

FM-AM switch . . . . . FM  
 MODE switch . . . . . MONO  
 AFC switch . . . . . OFF

*Procedure*

Follow the procedures given in Table 3-3 when performing this alignment with an fm signal generator.

**TABLE 3-2. MUTING ADJUSTMENT**

Coupling Between Front End and S.S.G.	SSG Frequency and Output Level	Tuner Dial Indication	Scope Connection	Adjust	Remarks
Direct	98 MHz 400 Hz. 30% Mod 30 $\mu$ V (30 dB)	98 MHz	J707	T202	Turn the core of T202 (See Fig. 3-4) to obtain proper muting operation.

**TABLE 3-3. FM FREQUENCY COVERAGE ADJUSTMENT**

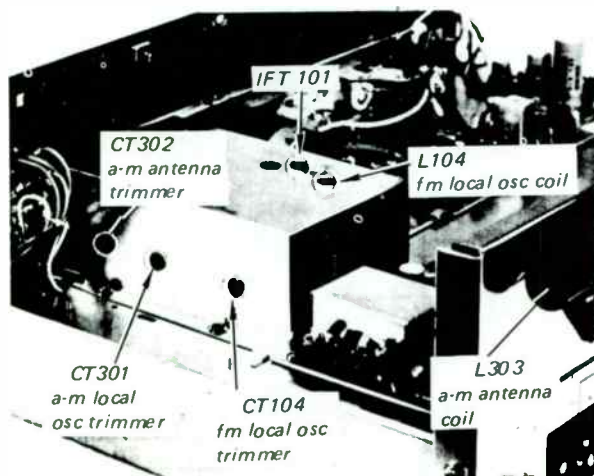
Step	Coupling Between Front End and S.S.G.	SSG Frequency and Output Level	Tuner dial	Scope Connection	Adjust	Indication
1.	Direct to 75 Ω input terminal	87 MHz 400 Hz 100 % Mod. 30 μV (30 dB)	87 MHz	FIX (J707)	OSC coil (L104) See Fig. 3-5	Maximum
2.	Same as above	108 MHz 400 Hz 100 % Mod. 30 μV (30 dB)	108 MHz	Same as above	OSC trimmer (CT104) See Fig. 3-5	Same as above

**Off-the-Air Alignment**

Accurate dial calibration and a frequency-coverage test can also be performed by utilizing off-the-air local fm signals. However, before performing the following procedure, be sure that the dial scale is correctly positioned, as described in Procedure 2-13.

*Procedure*

1. Tune the receiver to the lowest-frequency station.
2. Check the dial scale for a calibration accuracy of ±200 kHz from the carrier frequency of the station. If the dial-accuracy deviation exceeds this limit, turn local-oscillator coil L104 slightly as shown in Fig. 3-5 until optimum dial calibration is obtained.



*Fig. 3-5 Parts location*

3. Tune the receiver to the highest-frequency station in your locality. If the dial-calibration error is excessive, adjust local-oscillator trimmer CT104 to obtain maximum calibration accuracy. See Fig. 3-5.

**3-5. FM STEREO SEPARATION ADJUSTMENT**

*Test Equipment Required*

1. MPX stereo signal generator
2. Audio oscillator
3. Oscilloscope and VTVM
4. Alignment tool

*Preparation*

Before starting the stereo-separation adjustment, check and adjust the phase between the 19-kHz pilot signal and the subchannel signal in the MPX stereo generator as follows:

- (1) With the equipment connected as shown in Fig. 3-6, set the MPX and audio signal-generator's controls as follows:

MAIN CHANNEL . . . . . OFF  
 SUB CHANNEL . . . . . ON  
 PILOT (19 kHz) . . . . . OFF  
 AUDIO OSCILLATOR  
 OUTPUT . . . . . 400 Hz, 250 mV

- (2) Adjust the oscilloscope controls to obtain a visible indication. Be sure the scope's horizontal display switch is set for external input.
- (3) Turn the pilot-signal (19 kHz) phase control to obtain an in-phase and stable lissajous pattern as shown in Fig. 3-7.

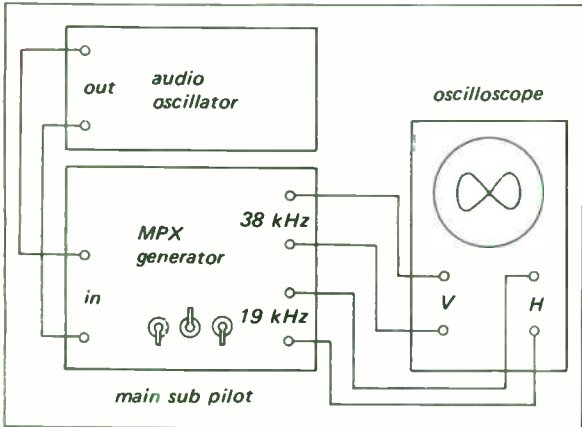


Fig. 3-6 MPX generator preadjustment setup



Fig. 3-7 Lissajous pattern

**Procedure**

1. Connect the equipment as shown in Fig. 3-8. Set the fm signal-generator's controls as follows:

Carrier frequency . . . . . 98 MHz  
 Output level . . . . . 30  $\mu$ V (30 dB)

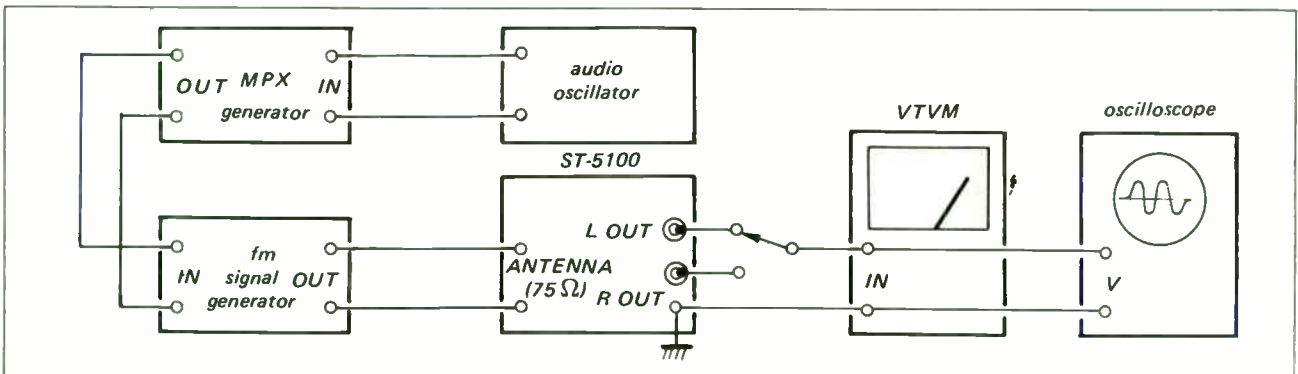


Fig. 3-8 Fm stereo separation adjustment test setup

**Modulation:**

Main channel (400 Hz) . . . . . 33.75 kHz (45 %)  
 Sub channel (38 kHz) . . . . . 33.75 kHz (45 %)  
 Pilot (19 kHz) . . . . . 7.5 kHz (10 %)

The above-mentioned modulation levels can be set as follows:

- (a) With the equipment connected as shown in Fig. 3-8, set the MPX stereo generator controls as follows:

MAIN CHANNEL . . . . . OFF  
 SUB CHANNEL . . . . . OFF  
 19 kHz (PILOT) . . . . . ON

- (b) Adjust the 19-kHz signal level to obtain a 7.5-kHz deviation on the FM SSG modulation indicator.

- (c) Reset the MPX stereo-generator's controls as follows:

MAIN CHANNEL . . . . . ON  
 SUB CHANNEL . . . . . OFF  
 19 kHz (PILOT) . . . . . OFF  
 INPUT SELECTOR . . . . . L-CH

- (d) Adjust the audio-generator output (400 Hz) to obtain a 33.75-kHz deviation on the FM SSG modulation indicator.

- (e) Set all controls to ON.

- Precisely tune the set to the SSG's carrier frequency, then turn the top core of switching transformer T104, to obtain maximum output at the left channel. See Fig. 3-9. Note that this adjustment has a close relationship with stereo distortion.
- Record the output level of the left channel when the MPX generator input selector is set to the left channel.
- Switch the input selector to the right channel and read the residual signal level in the left channel.
- The output-level to residual-level ratio represents the separation. Adjust separation control Rv501 (see Fig. 3-9) for minimum residual level. Check the right channel for separation. Usually, about an 8 to 9 dB difference in channel separation exists. Readjust Rv501 for minimum difference between left-and right-channel separation. While doing this, remember that the output level also changes according to the setting of Rv501.

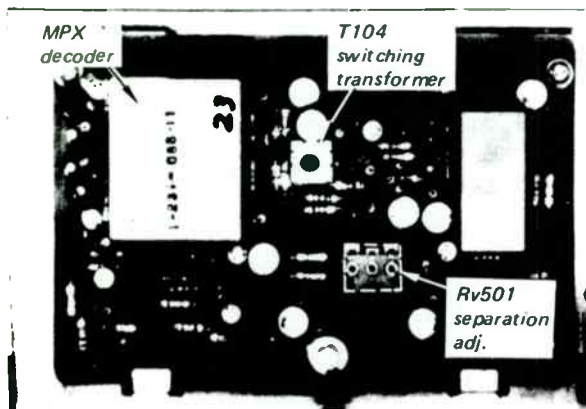


Fig. 3-9 Parts location

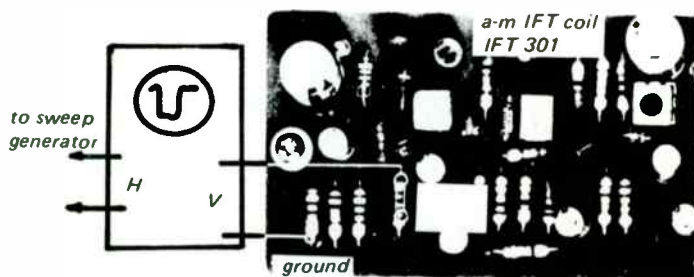


Fig. 3-11 A-m detector output connection

### 3-6. A-M I-F STRIP ALIGNMENT

#### Preparation

Remove the top cover and front-end shield cover. Then, set the receiver's FM-AM switch to AM.

#### Sweep Generator Alignment

#### Test Equipment Required

- 455-kHz sweep generator
- Oscilloscope
- Alignment tool

#### Procedure

- Connect the sweep generator's output across (variable capacitor) Cv301 as shown in Fig. 3-10.

Set the sweep generator's control as follows:

Center frequency . . . . . 455 kHz  
 Sweep width . . . . . 25 kHz  
 Output . . . . . as low as possible

- Connect the input cable of the oscilloscope to R321 and ground on the a-m tuner circuit board with alligator clips as shown in Fig. 3-11.

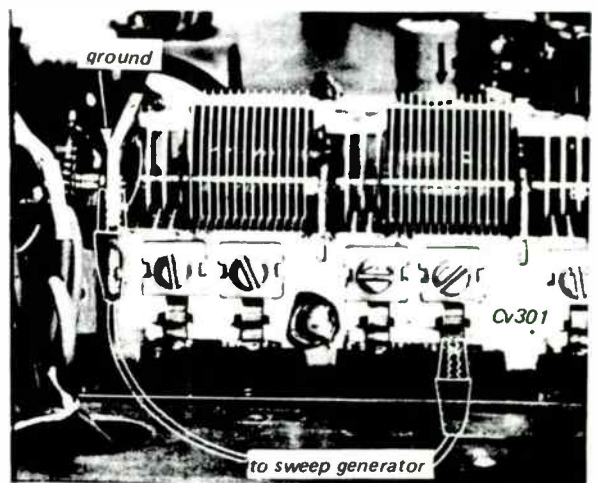


Fig. 3-10 445 kHz sweep signal injection

3. With the equipment connected as shown in Fig. 3-13, adjust the oscilloscope controls and generator output to provide a visible indication.
4. Turn the top core of (IFT301) (see Fig. 3-11) to obtain a maximum and symmetrical response as shown in Fig. 3-12.

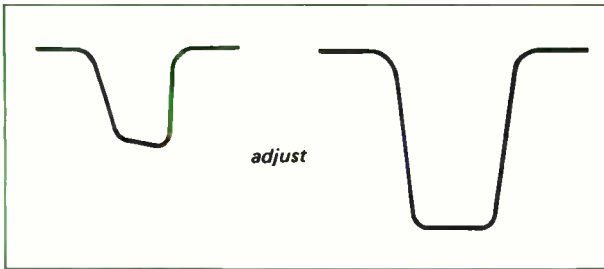


Fig. 3-12 A-m i-f response

## Rf Signal Generator Method

### Test Equipment Required

1. 455-kHz signal generator
2. Ac VTVM and oscilloscope
3. Alignment tool

### Procedure

1. Set the rf signal generator's controls as follows:  
 Modulation . . . . . Internal  
 Frequency . . . . . 455 kHz  
 OUTPUT level . . . . . 1000 $\mu$ V (60 dB)
2. Connect the rf signal-generator's output across variable capacitor, Cv301 as shown in Fig. 3-10.
3. With the scope VTVM aconnected as shown in Fig. 3-14, turn the top core of IFT301 (see Fig. 3-11) to obtain maximum output.

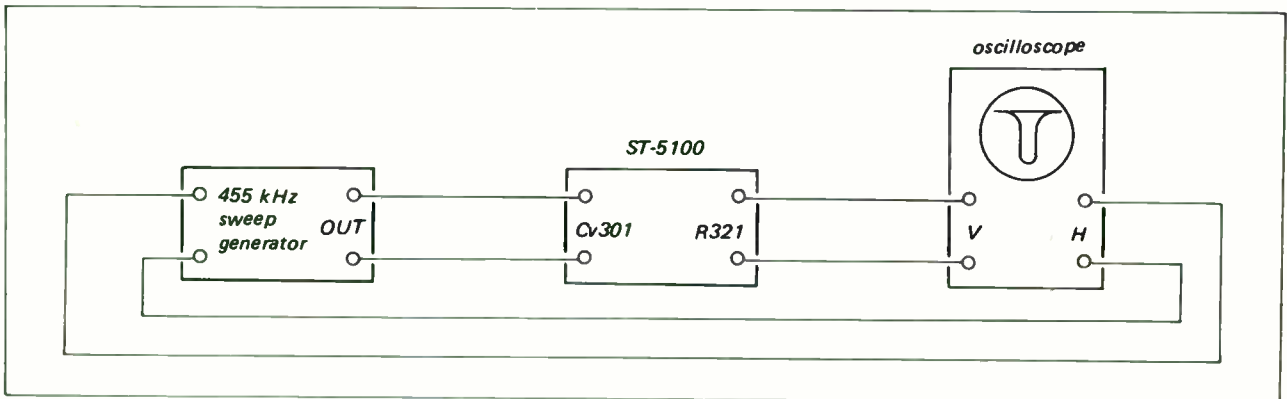


Fig. 3-13 A-m i-f strip alignment by sweep generator

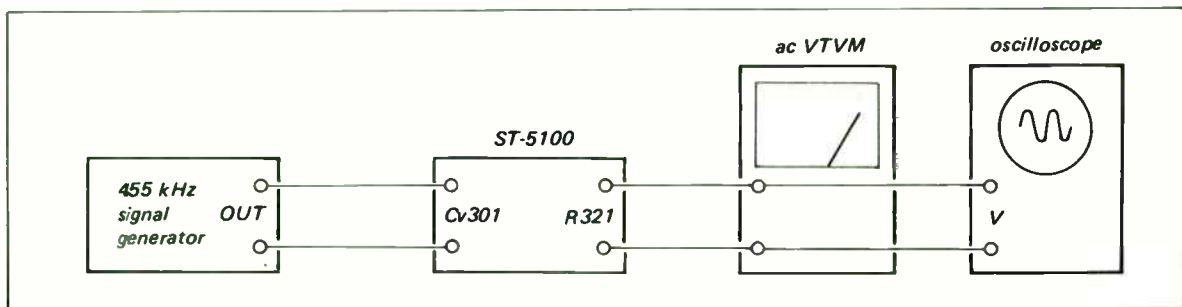


Fig. 3-14 A-m i-f strip alignment by rf generator

### 3-7. A-M FREQUENCY COVERAGE AND TRACKING ADJUSTMENT

#### Preparation

Remove the top cover  
Then, set the tuner's FM-AM switch to AM.

#### Signal Generator Method

#### Test Equipment Required

1. A-m signal generator
2. Loop antenna

3. Ac VTVM and oscilloscope

4. Alignment tool

#### Procedure

With the equipment connected as shown in Fig. 3-15, follow the procedures given in Table 3-4 and 3-5 when performing this alignment with an a-m signal generator.

**TABLE 3-4. A-M FREQUENCY COVERAGE ADJUSTMENT**

SSG Coupling	SSG Frequency and Output Level	Tuning Capacitor	Scope Connection	Adjust	Indication
Loop antenna	520 kHz 400 Hz 30 % Mod. 3000 $\mu$ V (70 dB)	Maximum capacitance position	FIX jack (J707)	OSC coil L304 See Fig. 3-16	Maximum
Loop antenna	1,680 kHz Same as above	Minimum-capacitance position	Same as above	OSC trimmer CT301 See Fig. 3-5	Same as above

**TABLE 3-5. A-M TRACKING ADJUSTMENT**

SSG Coupling	SSG Frequency and Output Level	Tuning Capacitor	Scope Connection	Adjust	Indication
Loop antenna	620 kHz 400 Hz 30% Mod. Output Level as low as possible	Tune to 620 kHz	FIX (J707)	Position of antenna coil L303 See Fig. 3-5	Maximum
Loop antenna	1,400 kHz same as above	Tune to 1,400 kHz	Same as above	Antenna trimmer CT302 See Fig. 3-5	Same as above

**Off-the-Air Signal Method**

Accurate dial calibration, and a frequency-coverage and tracking test can also be performed by utilizing off-the-air local a-m signals. However, before performing the following procedure, be sure that the dial scale is correctly positioned, as in Procedure 2-13. Note that a weak signal is best for this purpose.

**Frequency Coverage Adjustment**

1. Tune the receiver to the lowest-frequency station in your locality.  
If the dial calibration error exceeds  $\pm 15$  kHz from the station carrier frequency, turn local oscillator coil L304 (shown in Fig. 3-16) slightly until optimum dial calibration is obtained.
2. Tune the receiver to the highest-frequency station in your locality. If the dial calibration error exceeds  $\pm 30$  kHz from the station carrier frequency, adjust local-oscillator trimmer-capacitor CT301 (see Fig. 3-5) to obtain maximum calibration accuracy.

**Tracking Adjustment**

1. Tune the set to the station whose carrier frequency is closest to 620 kHz and adjust the position of antenna coil L303 as shown in Fig. 3-5 to obtain maximum output.
2. Tune the set to the station whose carrier frequency is closest to 1400 kHz and adjust antenna trimmer CT302 to obtain maximum output. See Fig. 3-5.
3. Repeat the above steps two or three times.

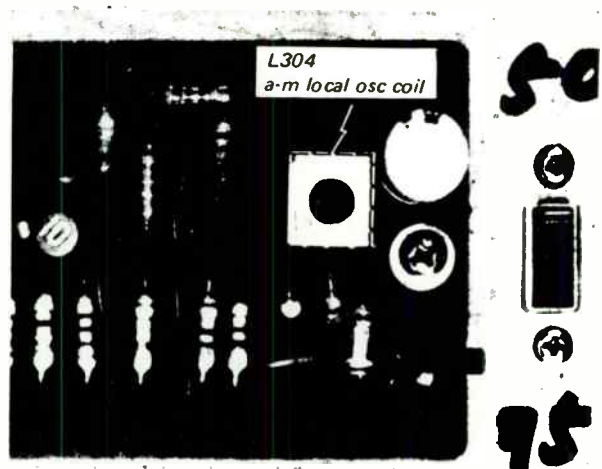


Fig. 3-16 Parts location

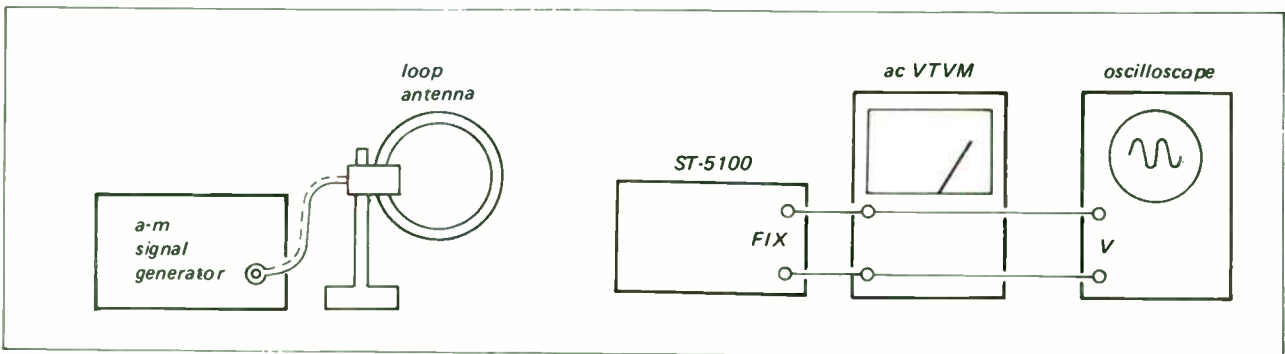
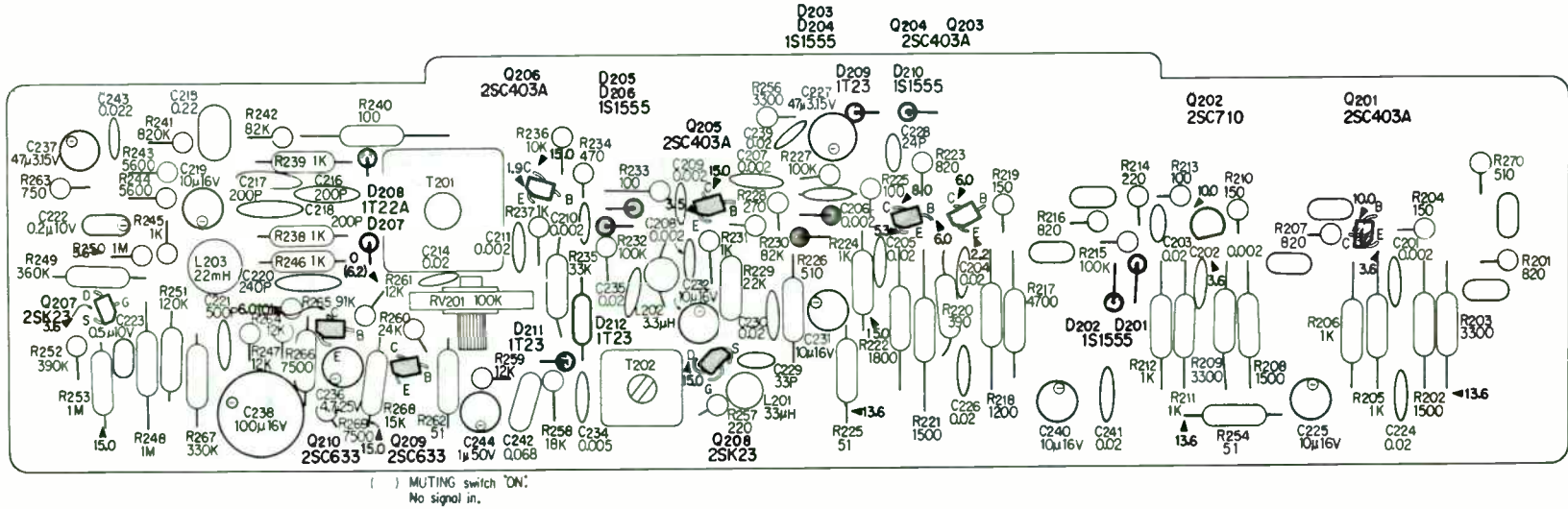


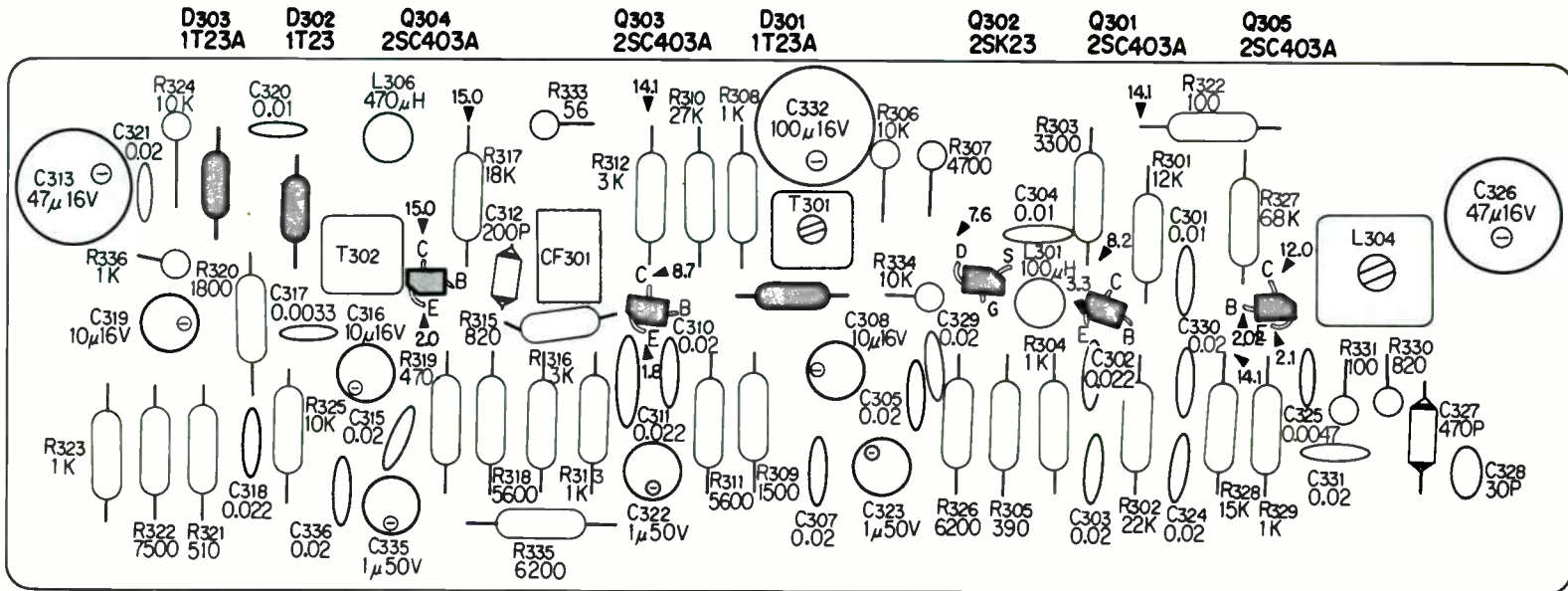
Fig. 3-15 A-m frequency coverage and tracking adjustment test setup







MOUNTING DIAGRAM - A-m I-f Amp Board





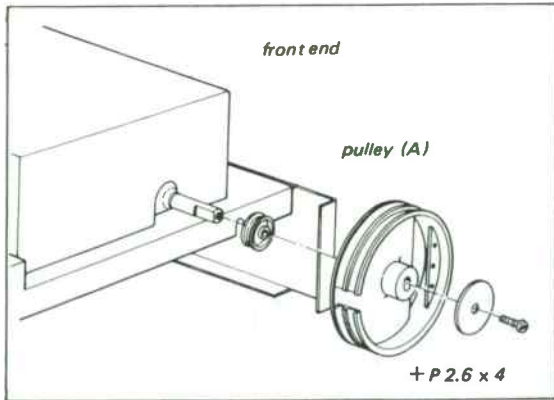


Fig. 2-14 Tuning-capacitor drive drum installation

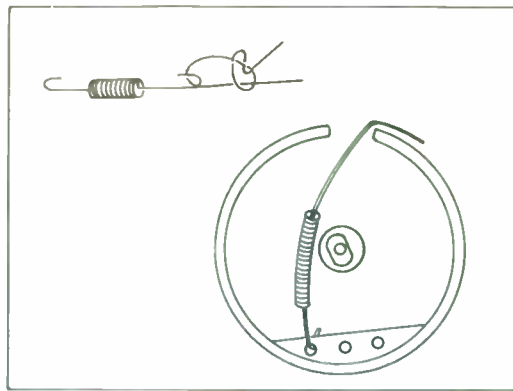


Fig. 2-15 Starting point detail

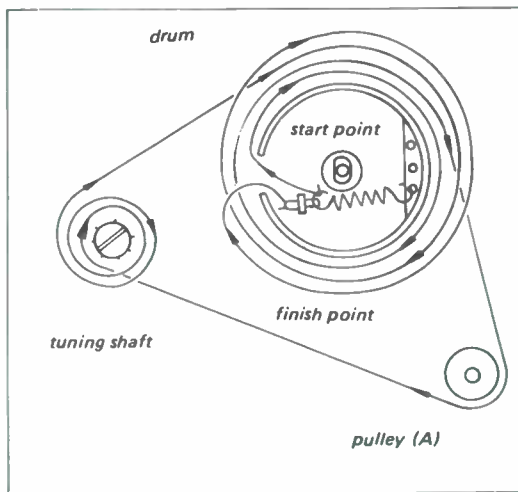


Fig. 2-16 Tuning-capacitor drive cord stringing

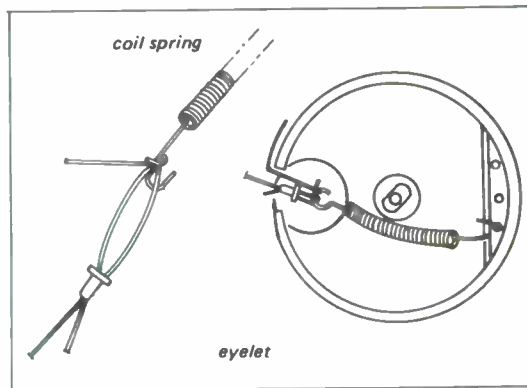


Fig. 2-17 Finish point detail

## Tuning-Capacitor Drive-Cord Stringing

### Preparation:

1. Remove the front subchassis
2. Remove the washer from the tuning capacitor shaft by loosening the screw (+P 2.6 X 4) as shown in Fig. 2-14.

### Procedure

1. Rotate the tuning-capacitor drive drum fully clockwise.

2. Tie one end of the replacement dial cord (0.5 mm or 1/32" diameter) to a coil spring, and then hook the spring to one hole of the drive drum as shown in Fig. 2-15.
3. Follow the stringing diagram as shown in Fig. 2-16. Note that the dial cord should run through the inner groove of the drive drum.
4. At the finish, tighten the cord, then squeeze the eyelet so that the spring is under tension. See Fig. 2-17. Make a knot in the cord end to keep it from slipping out of the eyelet.



Driver-Cord Stringing

Remove the front subchassis

- Remove the washer from the tuning capacitor shaft by loosening the screw (+P 2.6 X 4) as shown in Fig. 2-14.

Procedure

- Rotate the tuning-capacitor drive drum fully clockwise.
- Tie one end of the replacement dial cord (0.5 mm or 1/32" diameter) to a coil spring, and then hook the spring to one hole of the drive drum as shown in Fig. 2-19.
- Follow the stringing diagram as shown in Fig. 2-19. Note that the cord should run through the outer groove of the drive drum.
- At the finish, tighten the cord, then squeeze the eyelet so that the spring is under tension. See Fig. 2-17. Make a knot in the cord end to keep it from slipping out of the eyelet.
- Put the dial pointer on the cord as shown in Fig. 2-18.

- After completing the dial-cord stringing, make sure the tuning system works properly.
- Reassemble the front subchassis, and then follow the mechanical dial calibration.

2-13. MECHANICAL DIAL CALIBRATION

Note: This is required after replacing the dial scale, dial drum, or tuning capacitor.

- Put the dial pointer on the cord as shown in Fig. 2-18 and move it to a position indicating "0" reading on the dial scale when the tuning capacitor is set to maximum capacitance.

- Apply a drop of contact cement to the tab of the dial pointer.

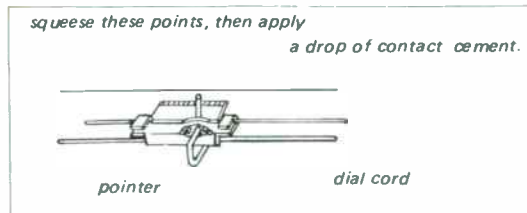


Fig. 2-18 Pointer installation



Fig. 2-19 Dial pointer driver cord stringing

SEMICONDUCTORS

ITEM	PART NO./TYPE	ITEM	PART NO./TYPE
D101	1S351M	Q101	2SK23
D102	1T243	Q102	2SC710
D201	1S1555	Q103	2SC629
D202	1S1555	Q201	2SC403A
D203	1S1555	Q202	2SC710
D204	1S1555	Q203	2SC403A
D205	1S1555	Q204	2SC403A
D206	1S1555	Q205	2SC403A
D207	1T22A	Q206	2SC403A
D208	1T22A	Q207	2SK23
D209	1T23	Q208	2SK23
D210	1T23	Q209	2SC633
D211	1T23	Q210	2SC633
D212	1T23	Q301	2SC403A
D301	1T23A	Q302	2SK23
D302	1T23	Q303	2SC403A
D303	1T23A	Q304	2SC403A
D401	1S1555	Q305	2SC403A
D402	1S1555	Q401	2SK23
D403	1S1555	Q402	2SC633
D404	1S1555	Q403	2SC634
D405	1T22A	Q404	2SK23
D406	1T22A	Q405	2SC633
D407	1T22A	Q501	2SC631
D408	1T22A	Q502	2SC633
D409	1T243	Q551	2SC631
D601	1T243	Q552	2SC633
D602	1T243	Q601	2SD28
D603	CD-2		

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C124	1-121-353	47mfd 16V
C126	1-121-343	1mfd 50V
C219	1-121-347	10mfd 16V
C222	1-127-020	.2mfd 10V
C225	1-121-347	10mfd 16V
C227	1-121-287	47mfd 3.15V
C231	1-121-347	10mfd 16V
C233	1-121-347	10mfd 16V
C236	1-121-281	4.7mfd 25V
C240	1-121-347	10mfd 16V
C244	1-121-391	1mfd 50V
C247	1-121-491	100mfd 25V
C308	1-121-347	10mfd 16V
C313	1-121-353	47mfd 16V
C316	1-121-347	10mfd 16V
C319	1-121-347	10mfd 16V
C322	1-121-391	1mfd 50V
C326	1-121-353	47mfd 16V
C332	1-121-356	100mfd 3.15V
C335	1-121-391	1mfd 50V
C402	1-121-291	100mfd 6.3V
C406	1-121-286	33mfd 16V
C408	1-121-344	3.3mfd 25V
C409	1-127-021	.3mfd 10V
C410	1-121-322	47mfd 6.3V
C411	1-121-286	33mfd 16V
C412	1-127-022	.5mfd 10V
C418	1-121-343	1mfd 50V
C422	1-121-281	4.7mfd 25V
C501	1-121-343	1mfd 50V
C503	1-121-287	47mfd 3.15V
C504	1-121-344	3.3mfd 50V
C551	1-121-343	1mfd 50V
C553	1-121-287	47mfd 3.15V
C554	1-121-344	3.3mfd 50V
C555	1-121-291	100mfd 6.3V
C601	1-121-415	100mfd 16V
C602	1-121-297	220mfd 25V
C603	1-121-361	470mfd 35V

CV101	1-551-191-13S	Tuning Gang
CV102		
CV103		
CV104		
CV301		
CV302		

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
RV202	1-221-966	10K Bias
RV202	1-221-636	10K Detector Balance
RV501	1-222-811	5000 ohms Separation
RV701	1-222-282	10K Left Level
RV702	1-222-282	10K Right Level

COILS/TRANSFORMERS

ITEM	PART NO.
B1	1-417-014-21
IFT101	1-403-295
IFT301	1-403-152
IFT302	1-403-128
L101	1-401-351
L102	1-425-446
L103	1-425-446
L104	1-405-377
L201	1-407-163
L202	1-407-184
L203	1-407-408
L301	1-407-169
L302	1-407-178
L303	1-401-370-21
L304	1-405-359
L305	1-407-182
L306	1-407-177
L701	1-470-026
T201	1-403-291
T202	1-403-299
T401	1-425-260-12
T601 (USA, Canada)	1-441-547
T601 (General Export)	1-441-566

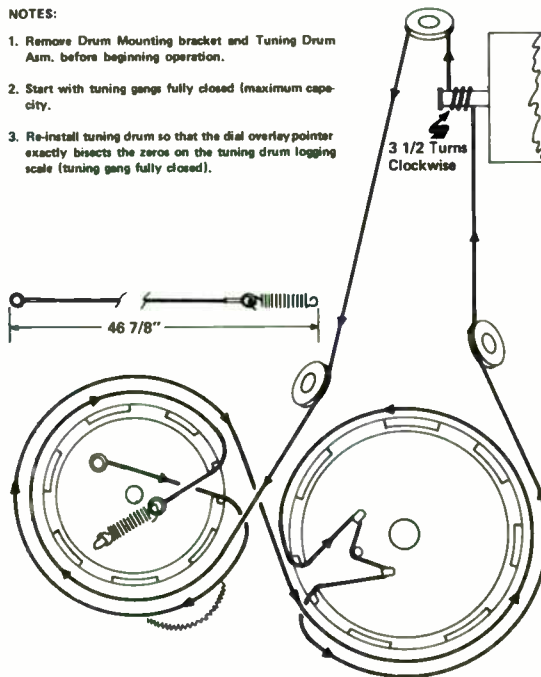
MISCELLANEOUS

ITEM	NAME	PART NO.
CF201	Filter, Ceramic	10.70MHz 1-403-562-11
CF202		10.66MHz 1-403-562-21
CF203		10.74MHz 1-403-562-31
CF204		10.62MHz 1-403-562-41
CF205		10.78MHz 1-403-562-51
CF206		
LPF	Filter, Low Pass	1-231-088
M1	Meter, Tuning	1-520-085
M2	Meter, Tuner Input	1-520-086
MU401	Unit, MPX	1-425-548
S701	Switch, FM/AM	1-514-615
S702	Switch, AFC	1-514-250
S703	Switch, Mode	1-514-250
S704	Switch, High Blend	1-514-250
S705	Switch, Muting	1-514-250
S706	Switch, Power (General Export)	1-514-599-11
S706	Switch, Power (USA)	1-514-599-21
S707	Switch, De-emphasis	1-514-520
	P.C. Board, FM IF	98-2532-25
	P.C. Board, MPX	98-2532-75
	P.C. Board, AM IF	98-2532-85
	P.C. Board, Power	98-2532-55
	P.C. Board, Front End	98-2535-15

CABINET PARTS

NAME	PART NO.
Cover, Top	2-068-015
Panel, Front	2-068-566
Glass, Dial	2-068-526
Board, Rear	2-068-523
Button, Muting/High Blend/AFC/Mode	2-068-016
Knob, Power	2-068-018
Knob, Tuning	2-068-563

———— DIAL STRINGING ————



———— ALIGNMENT PROCEDURE ————

This receiver has been factory aligned with precision laboratory equipment. The circuits are quite stable, and not normally subject to frequency drift. Therefore, check all circuits for malfunctions before attempting realignment. Realign **ONLY** when absolutely necessary.

Maintain line voltage at 120V, 60Hz during alignment.

All RF shields must be in place during alignment.

8 ohm, 15 watt non-inductive loads are required for Left and Right channel amplifier output terminals if speaker systems are disconnected during alignment.

**ALWAYS KEEP SIGNALS AT THE LOWEST USEABLE LEVEL DURING ALIGNMENT, UNLESS OTHERWISE NOTED.** Note the signal generator output attenuator setting at which further input signal does not increase output signal. Keep the input signal level below this point.

Set tuning dial indicator at zero (0) on the logging scale with tuning capacitor (C8) set at maximum capacity. Readjusting tuning dial indicator after AM or FM RF alignment will make RF realignment (AM & FM) necessary for correct station calibration.

FM RF and IF sections must be properly aligned before beginning FM Multiplex alignment.

**EQUIPMENT REQUIRED:**

**AM:**

AM signal generator capable of 400Hz, 30% modulated, accurate signals from 455kHz to 1610kHz.

General purpose scope.

**FM:**

Sweep generator, 10.7MHz center frequency, capable of 1.1MHz sweep width. FM signal generator capable of accurate modulated signals from 87.9MHz to 108.5MHz, - 300 ohm output.

General purpose scope.

**MULTIPLEX FM:**

Multiplex generator with the following capabilities:

1. Standard multiplex signal, 1kHz modulation.
2. Single channel modulation.

Oscilloscope - preferably dual trace.

— AM ALIGNMENT —

STEP	TUNING INDICATOR SETTING	TEST EQUIPMENT HOOK-UP	GENERATOR FREQUENCY	ADJUSTMENT POINT	ADJUST FOR
<p align="center"><b>IF CIRCUITS</b></p> <p>Switch receiver on, select AM function and check +15V at pin C. Tune receiver to no signal area near 600kHz, adjust R87 for 2V. on Emitter of Q8.</p>					
1	Near 600kHz, as above.	Connect signal generator to any lug of L12, rod antenna. Scope to pin K - AM Audio output.	455kHz, 30% 400Hz modulation.	T8 Top T8 Bottom T10 T12	Maximum 400Hz output
<p>Tune both cores of T8 to "outer" peaks.</p> <p>Repeat for maximum output.</p> <p align="center"><b>SENSITIVITY AND BAND SET</b></p>					
2	1400kHz	Radiate RF signal from generator. Scope to pin K - AM Audio output.	1400kHz, 30% 400Hz modulation.	C87 Trimmer C91 Trimmer	MAXIMUM 400Hz or MAX. meter deflection and correct dial calibration.
3	600kHz		600kHz, 30% 400Hz modulation.	T6 L14 Eyelet	

Reduce input signal level and repeat steps 2 and 3 until maximum sensitivity and correct dial calibration are achieved.

When correctly aligned, this receiver will tune through a signal at 540kHz and 1610kHz.

— FM ALIGNMENT —

STEP	TUNING INDICATOR SETTING	TEST EQUIPMENT HOOK-UP	GENERATOR FREQUENCY	ADJUSTMENT POINT	ADJUST FOR
<p align="center"><b>IF CIRCUITS</b></p> <p>Switch receiver on, select FM function and check +15V at pin C.</p>					
1	Near 98MHz, at off-station spot.	Sweep generator to C8E. Scope to pin V - use detector.	Swept 10.7 MHz.	T4	MAXIMUM gain and appropriate waveform symmetry.
2		Scope to pin Z - use de-emphasis probe.		L10	MAXIMUM output.
3		Adjust R158 for tuning meter center zero.			



**Sylvania ACS16, CR2741 (Ch.R53-3),  
MS2722, MS3722 (Ch. R53-4)  
MST2736 (Ch. R53-8)**

— ALIGNMENT PROCEDURE (CONTINUED) —

BAND SET					
4	90MHz	Signal generator to FM Antenna Terminals. Scope to pin Z - use de-emphasis probe.	90MHz, 100% modulation.	L8	MAXIMUM response at 90MHz.
5	106MHz		106MHz, 100% modulation.	C27 Trimmer	MAXIMUM response.
Continue to reduce signal level while repeating steps 4 and 5 until correct dial calibration is achieved.					
SENSITIVITY					
6	106MHz	Signal generator - As in step 4. Scope - As in step 4.	106MHz, modulated 400Hz to 22 1/2 kHz dev. (30%).	C8B C8F	MAXIMUM response.
7	90MHz		90MHz, modulated 400Hz to 22 1/2 kHz dev. (30%).	L4 L6	MAXIMUM response.
Continue to reduce signal level while repeating steps 6 and 7 until maximum sensitivity is achieved.					
8	90MHz	Signal generator and Scope - Same as above.	90MHz, modulated. Use signal level of 3 to 6 microvolts.	L10	MAXIMUM output.

When correctly aligned, this receiver will tune through a signal at 87.9MHz and 108.5MHz.

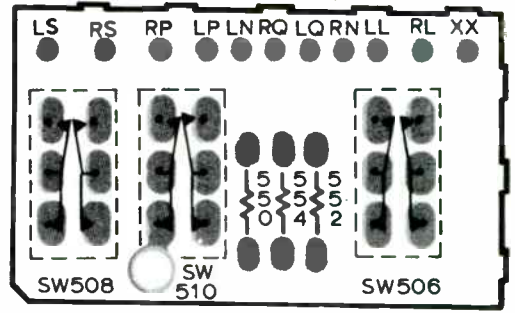
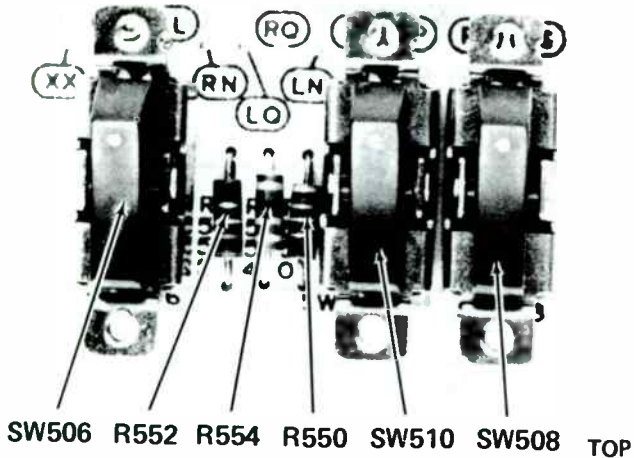
— MULTIPLEX ALIGNMENT —

STEP	TUNING INDICATOR SETTING	TEST EQUIPMENT HOOK-UP	GENERATOR FREQUENCY	ADJUSTMENT POINT	ADJUST FOR
Switch receiver on, select FM and Stereo functions. Check +15V at pin C.					
1	Tune to generator. (Zero center tuning meter indication.)	Multiplex generator to FM Antenna Terminals. Scope to pin Y.	Use stereo signal, 1kHz modulation, Left channel only.	L16 L18 R52	MAXIMUM 38kHz.
Switch generator OFF. If necessary, retune receiver to nearest off-station spot on dial. Switch multiplex generator on and tune generator to receiver for zero center tuning meter indication.					
2	As above.	Multiplex generator - as above. Scope to pin L and pin R.	As above - modulate both channels.	L16	BEST channel separation.

Channel separation between pins L and R is typically 35dB when multiplex circuit is correctly aligned.

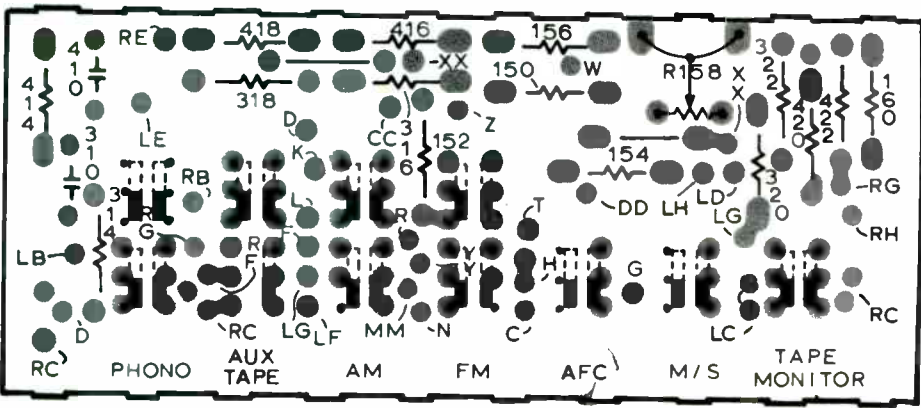
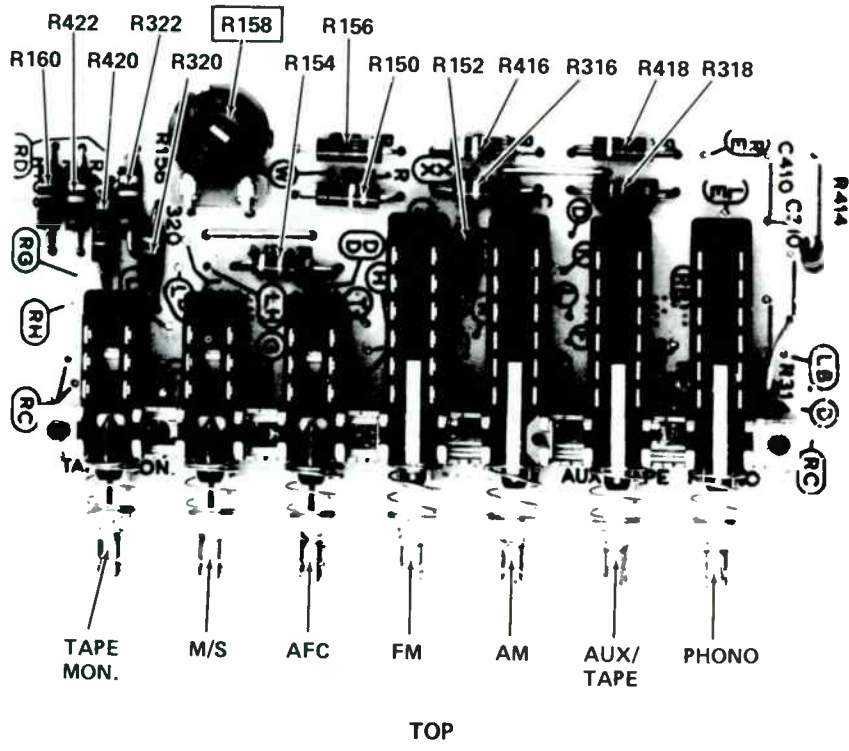
Removal of the FM carrier should cause the automatic stereo switch to function and disable the multiplex integrated circuit, IC4. Threshold of operation should occur after approximately 40dB of quieting of a stereo modulated carrier. This will occur at approximately 3 to 7mV of RF signal.

MODE SWITCH PANEL



BOTTOM

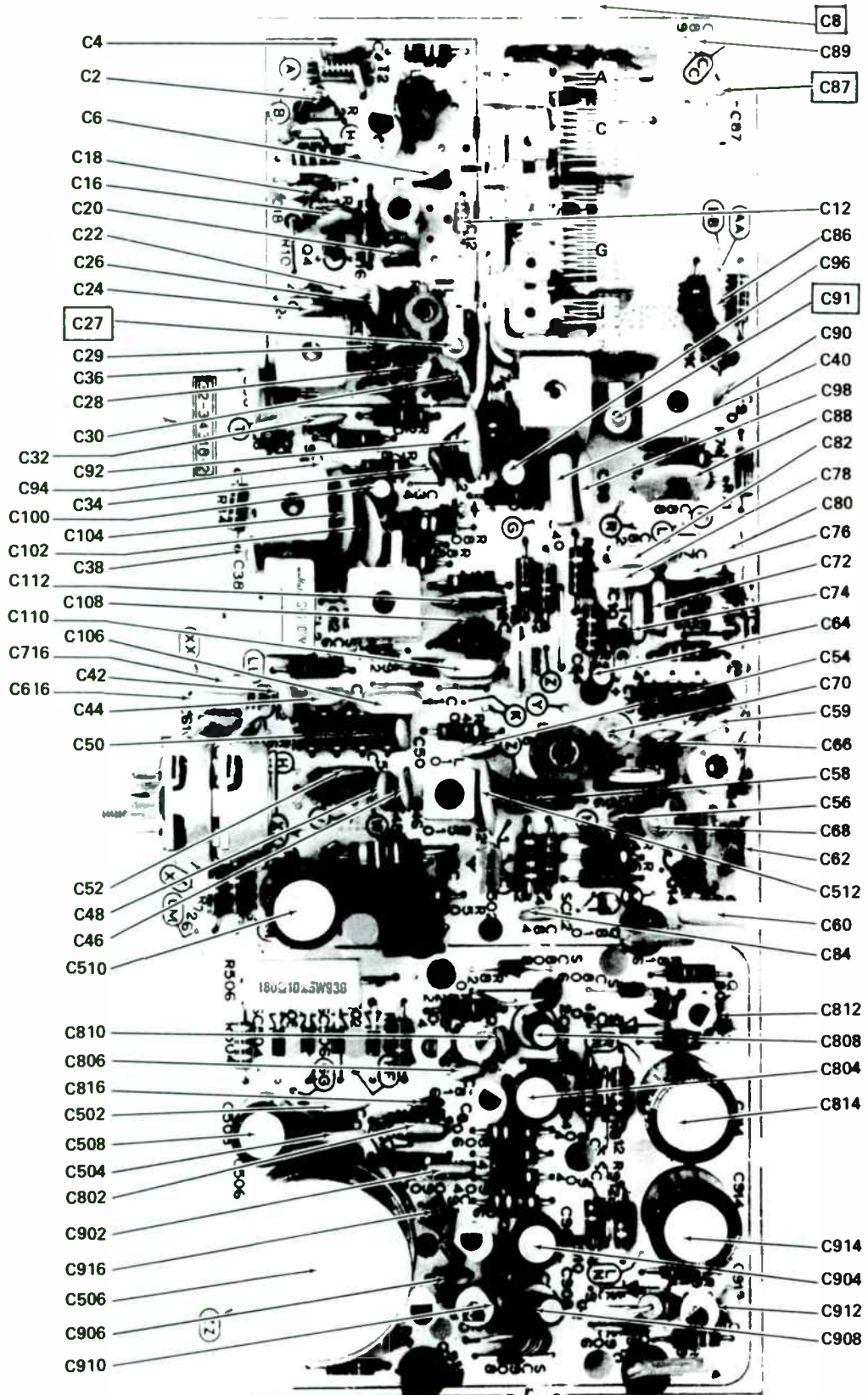
FUNCTION SWITCH PANEL



BOTTOM



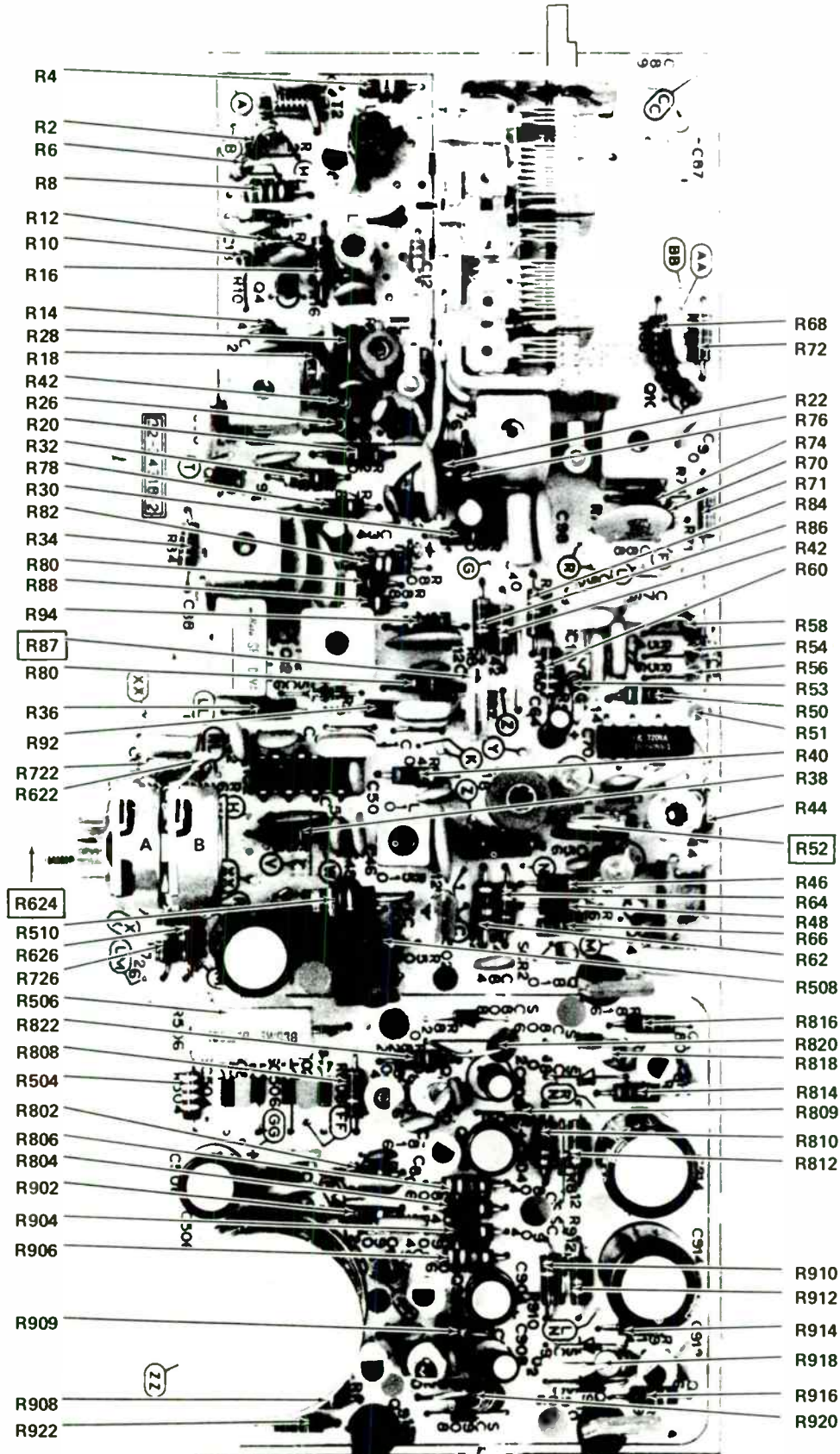
— MAIN PANEL —



CAPACITORS

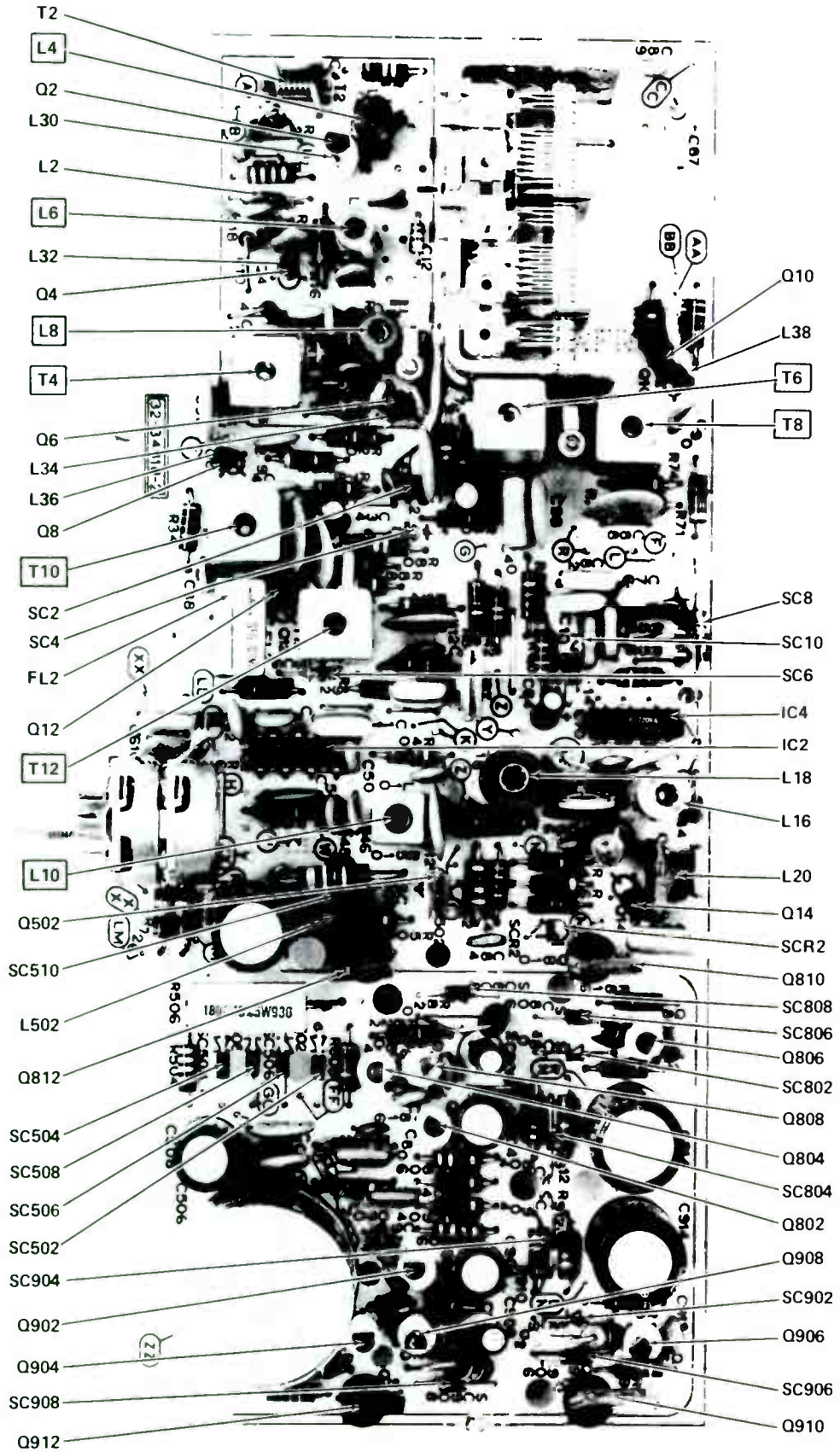
*Sylvania ACS16, CR2741 (Ch. R53-3),  
MS2722, MS3722 (Ch. R53-4)  
MST2736 (Ch. R53-8)*

— MAIN PANEL (CONTINUED) —



RESISTORS

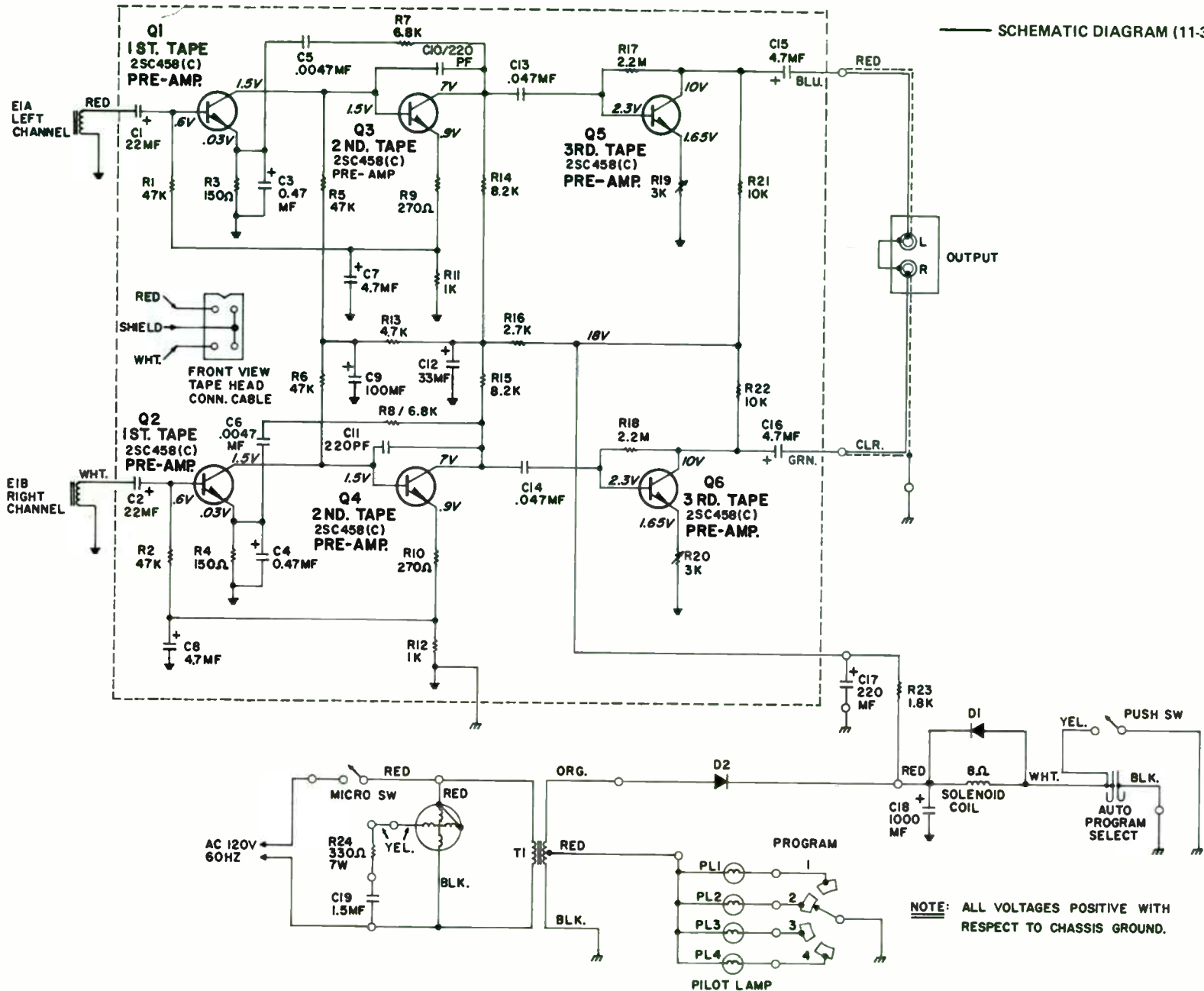
— MAIN PANEL (CONTINUED) —



MISCELLANEOUS



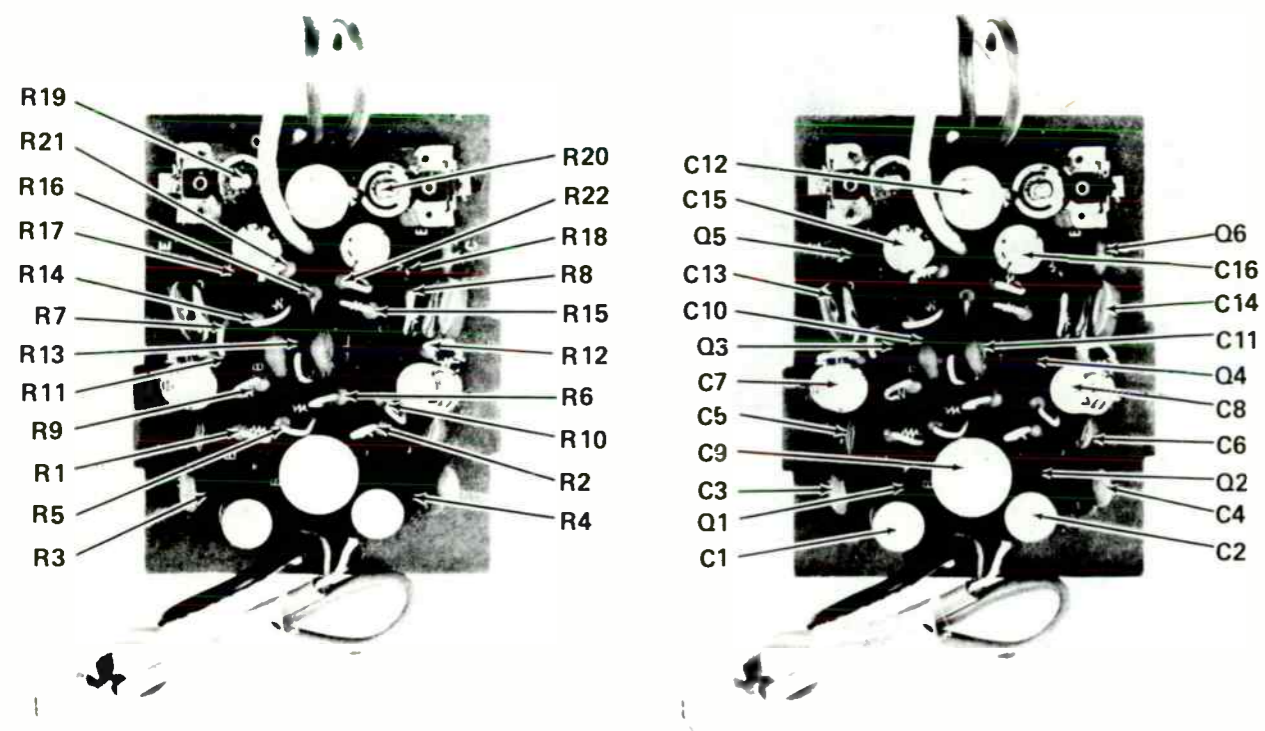
SCHEMATIC DIAGRAM (11-34422-1)



NOTE: ALL VOLTAGES POSITIVE WITH RESPECT TO CHASSIS GROUND.

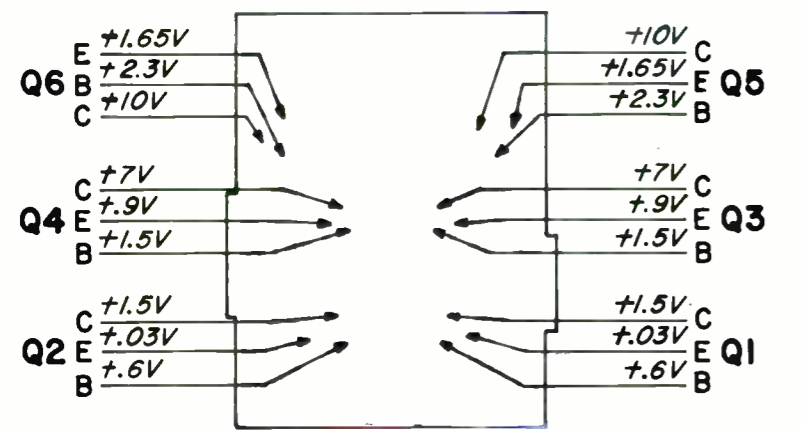


(11-34423-1)  
TAPE PLAYER MECHANISM  
PREAMP PANEL

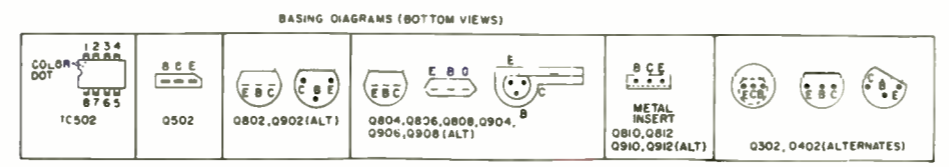
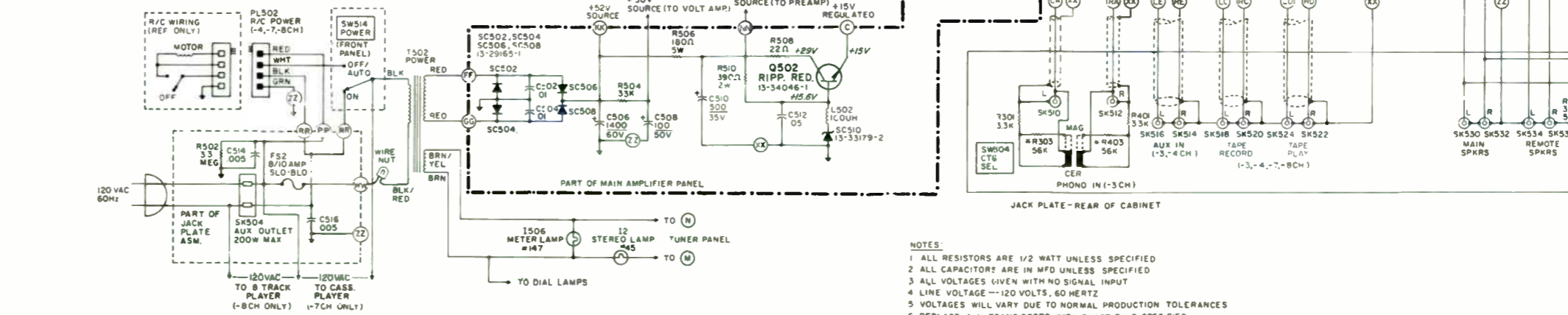
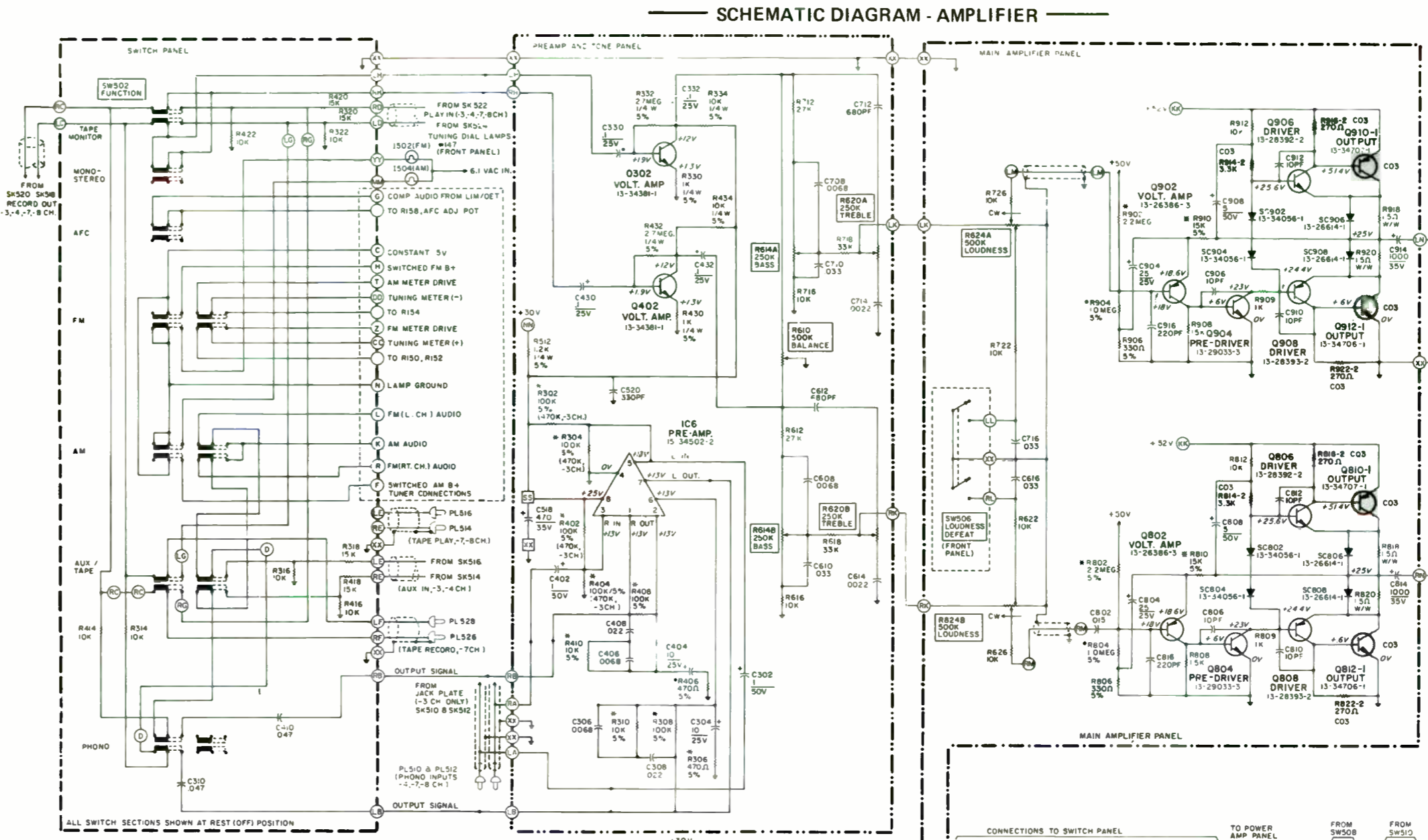


RESISTORS

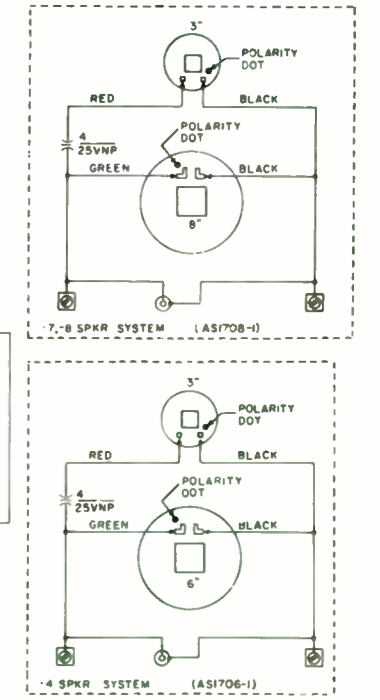
CAPACITORS, TRANSISTORS



BOTTOM VIEW

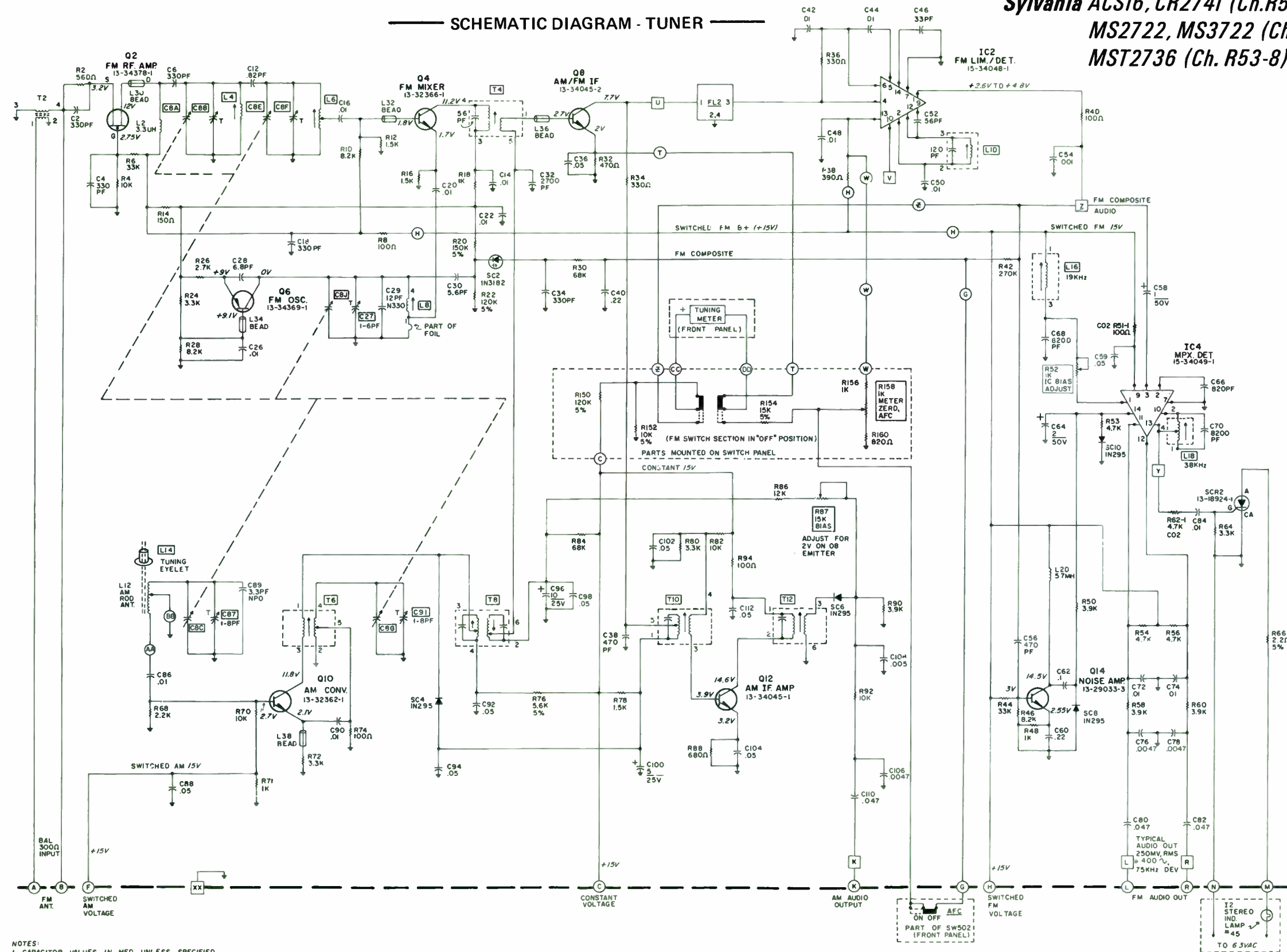


- NOTES:
- 1 ALL RESISTORS ARE 1/2 WATT UNLESS SPECIFIED
  - 2 ALL CAPACITORS ARE IN MFD UNLESS SPECIFIED
  - 3 ALL VOLTAGES GIVEN WITH NO SIGNAL INPUT
  - 4 LINE VOLTAGE - 120 VOLTS, 60 HERTZ
  - 5 VOLTAGES WILL VARY DUE TO NORMAL PRODUCTION TOLERANCES
  - 6 REPLACE ALL TRANSISTORS WITH EXACT TYPE SPECIFIED
  - 7 \* REPLACE WITH ALLEN-BRADLEY OR EQUIVALENT LOW NOISE TYPE RESISTORS
  - 8 BASING DIAGRAMS SHOW BOTTOM VIEWS.

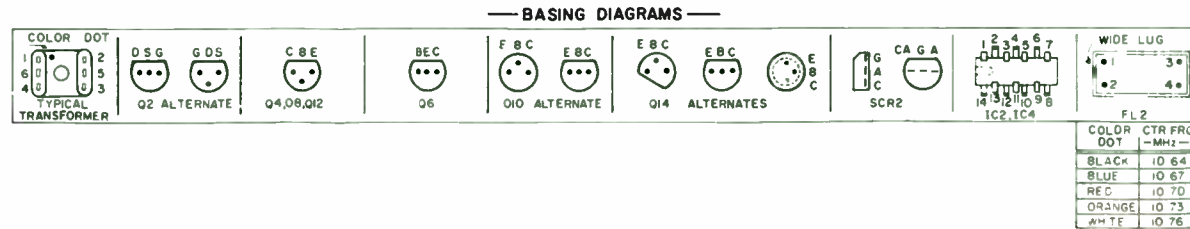


**Sylvania ACS16, CR2741 (Ch. R53-3),  
MS2722, MS3722 (Ch. R53-4)  
MST2736 (Ch. R53-8)**

**SCHEMATIC DIAGRAM - TUNER**



- NOTES:**  
 1. CAPACITOR VALUES IN MFD. UNLESS SPECIFIED.  
 2. RESISTORS ARE 1/2W. CARBON, 10% UNLESS SPECIFIED.  
 3. VOLTAGE MEASUREMENTS:  
 A. MAINTAIN 120VAC, 60Hz INPUT.  
 B. TUNE RECEIVER TO OFF-CHANNEL.  
 C. SELECT AM OR FM FUNCTION AS REQUIRED.  
 D. MEASURE TO CHASSIS GROUND.  
 E. VOLTAGES WILL VARY DUE TO NORMAL PRODUCTION TOLERANCES.  
 4. ALL BASING DIAGRAMS SHOW BOTTOM VIEWS.  
 5. SQUARE WIRE PINS [X] ARE TEST POINTS AND WIRE WRAP CONNECTIONS.  
 6. ROUND CONNECTIONS (O) ARE WIRE CONNECTIONS ONLY.



**SEMICONDUCTORS**

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
<b>(RADIO CHASSIS)</b>					
IC2	15-34048-1	FM LIM./DET.	SC4	1N295	Diode
IC5	15-34049-1	FM LIM./DET.	SC6	1N295	Diode
IC6	15-34502-1	FM LIM./DET.	SC8	1N295	Diode
IC6-1	15-34502-2	FM LIM./DET.	SC10	1N295	Diode
Q2	13-34378-1	FM RF AMP	SC502	13-17174-2	Diode
Q4	13-32366-1	FM MIXER	SC502-1	13-29165-1	Diode
Q6	13-34369-1	FM OSC.	SC504	13-17174-2	Diode
Q8	13-34045-2	AM/FM IF	SC504-1	13-29165-1	Diode
Q10	13-32362-1	AM CONV.	SC506	13-17174-2	Diode
Q12	13-34045-1	AM IF AMP	SC506-1	13-29165-1	Diode
Q14	13-2903-3	NOISE AMP	SC508	13-17174-2	Diode
Q302	13-34381-1	MPX DET.	SC508-1	13-29165-1	Diode
Q402	13-34381-1	MPX DET.	SC510	13-33179-2	Diode
Q502	13-34046-1	MPX DET.	SC802	13-34056-1	Diode
Q802	13-26386-3	MPX DET.	SC804	13-34056-1	Diode
Q804	13-28392-2	MPX DET.	SC806	13-26614-1	Diode
Q804-1	13-2903-3	NOISE AMP	SC808	13-26614-1	Diode
Q806	13-28392-2	MPX DET.	SC902	13-34056-1	Diode
Q808	13-28393-2	MPX DET.	SC904	13-34056-1	Diode
Q810	13-34617-1	MPX DET.	SC906	13-26614-1	Diode
Q810-1	13-34707-1	MPX DET.	SC908	13-26614-1	Diode
Q812	13-34616-1	MPX DET.	SCR2	13-18924-1	Diode
Q812-1	13-34706-1	MPX DET.	<b>(TAPE CHASSIS)</b>		
Q902	13-26386-3	MPX DET.	D1	13-14094-39	Diode
Q904	13-28392-2	MPX DET.	D2	13-14261-3	Diode
Q904-1	13-2903-3	NOISE AMP	Q1	13-14085-54	Diode
Q906	13-28392-2	MPX DET.	Q2	13-14085-54	Diode
Q908	13-28393-2	MPX DET.	Q3	13-14085-54	Diode
Q910	13-34617-1	MPX DET.	Q4	13-14085-54	Diode
Q910-1	13-34707-1	MPX DET.	Q5	13-14085-54	Diode
Q912	13-34616-1	MPX DET.	Q6	13-14085-54	Diode
Q912-1	13-34707-1	MPX DET.	<b>(TAPE CHASSIS)</b>		
SC2	1N3182	Diode	L38	22-28072-2	Inductor

**ELECTROLYTIC/VARIABLE CAPS**

ITEM	PART NO.	VALUE	ITEM	PART NO.	DESCRIPTION
<b>(RADIO CHASSIS)</b>					
C8	42-34273-1	Tuning Gang	FL2	Filter, Ceramic (Black Dot)	26-34156-101
C27	42-18146-1	1-pf Trimmer		Filter, Ceramic (Blue Dot)	26-34156-102
C58	41-23765-16	1mf 50V		Filter, Ceramic (Red Dot)	26-34156-103
C64	41-32477-86	2mf 50V		Filter, Ceramic (Orange Dot)	26-34156-104
C67	42-34637-1	1-8pf Trimmer		Filter, Ceramic (White Dot)	26-34156-105
C71	42-34637-1	1-8pf Trimmer	FS2	Fuse, .8A/125V S10-810	29-62496-16
C91	42-34637-1	1-8pf Trimmer	SW502	Switch, Function	33-34284-1
C96	41-32477-47	10mf 25V	SW504	Switch, Mag./Ceramic	33-16011-7
C100	41-32477-46	5mf 25V	SW506	Switch, Loud/Defeat	33-34262-2
C302	41-32477-85	1mf 50V	SW508	Switch, Main Speaker	33-34262-2
C304	41-32477-47	10mf 25V	SW510	Switch, Remote Speaker	33-34262-2
C330	41-34346-1	.1mf 25V	SW512	Switch, P4 Speaker	33-16011-7
C332	41-34346-1	.1mf 25V	SW514	Switch, AC Power	33-34262-1
C402	41-32477-85	.1mf 25V		Cartridge, Phono	11-34543-3
C404	41-32477-47	10mf 25V		Stylus, Phono	11-10329-22
C430	41-34346-1	.1mf 25V		Speaker, 3" (All Models)	12-26878-2
C432	41-34346-1	.1mf 25V		Speaker, 6" (Models MS2722 & MS3722)	12-22107-3
C506	41-34428-1	1400mf 60V		Speaker, 8" (Models ACS16 & MST2736)	12-32829-1
C508	41-32477-93	100mf 50V	<b>(TAPE CHASSIS)</b>		
C510	41-32477-67	500mf 35V		Belt, Drive	11-14207-54
C518	41-23765-13	500mf 25V (1)		Head Playback	11-14418-13
C518-1	41-96335-21	470mf 35V (2)		Motor, Tape Drive	23-14428-7
C804	41-32477-48	25mf 25V	<b>CABINET PARTS</b>		
C808	41-32477-88	5mf 50V	NAME	PART NO.	
C814	41-32477-68	1000mf 35V	<b>(COMMON)</b>		
C904	41-32477-48	25mf 25V	Button, Function Select	74-34224-1	
C908	41-32477-88	5mf 50V	Button, Slide Control (Early Prod.)	74-34224-1	
C914	41-32477-68	1000mf 35V	Button, Slide Control (Late Prod.)	74-34224-5	
<b>(TAPE CHASSIS)</b>					
C1	41-14135-73	22mf 16V	Knob, Tuning	74-34222-2	
C2	41-14135-73	22mf 16V	Knob, Volume	74-34222-1	
C7	41-14135-63	4.7mf 35V	<b>(MODEL ACS16)</b>		
C8	41-14135-63	4.7mf 35V	Cover, Bottom	74-34281-2	
C9	41-14135-50	100mf 16V	Cover, Dust	10-34474-1	
C12	41-14135-36	33mf 16V (1)	Escutcheon, Control	74-34254-1	
C15	41-14135-63	4.7mf 35V	Cabinet, Speaker	10-34492-101	
C16	41-14135-63	4.7mf 35V	<b>(MODEL CR2741)</b>		
C17	41-14135-38	220mf 25V	Cabinet, Main	10-34382-1	
C18	41-14135-10	1000mf 25V	Cover, Bottom	74-34281-2	
<b>CONTROL/SPECIAL RESISTORS</b>					
ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
<b>(RADIO CHASSIS)</b>					
R52	37-14576-5	1000 ohms IF Bias	R52	37-14576-5	1000 ohms IF Bias
R66	35-33295-4	2.2 ohms 5%	R66	35-33295-4	2.2 ohms 5%
R87	37-14576-3	15k 81as	R87	37-14576-3	15k 81as
R153	37-23063-7	1000 ohms AFC/Meter Zero	R153	37-23063-7	1000 ohms AFC/Meter Zero
R610	37-34193-1	500k Balance	R610	37-34193-1	500k Balance
R614	37-34194-1	250k Dual Bass	R614	37-34194-1	250k Dual Bass
R620	37-34194-1	250k Dual Treble	R620	37-34194-1	250k Dual Treble
R624	37-34432-1	500k Dual Loudness	R624	37-34432-1	500k Dual Loudness
R811	36-14764-59	1.5 ohm 1W (1)	R811	36-14764-59	1.5 ohm 1W (1)
R818	35-33395-4	3.9 ohm 5% (1)	R818	35-33395-4	3.9 ohm 5% (1)
R818-1	36-14764-59	1.5 ohm 1W (2)	R818-1	36-14764-59	1.5 ohm 1W (2)
R820	35-33395-4	3.9 ohm 5% (1)	R820	35-33395-4	3.9 ohm 5% (1)
R820-1	36-14764-59	1.5 ohm 1W (2)	R820-1	36-14764-59	1.5 ohm 1W (2)
R911	36-14764-59	1.5 ohm 1W (1)	R911	36-14764-59	1.5 ohm 1W (1)

**CONTROL/SPECIAL RESISTORS**

ITEM	PART NO.	DESCRIPTION	ITEM	PART NO.	DESCRIPTION
<b>(MODEL MS2722)</b>					
R52	37-14576-5	1000 ohms IF Bias	R52	37-14576-5	1000 ohms IF Bias
R66	35-33295-4	2.2 ohms 5%	R66	35-33295-4	2.2 ohms 5%
R87	37-14576-3	15k 81as	R87	37-14576-3	15k 81as
R153	37-23063-7	1000 ohms AFC/Meter Zero	R153	37-23063-7	1000 ohms AFC/Meter Zero
R610	37-34193-1	500k Balance	R610	37-34193-1	500k Balance
R614	37-34194-1	250k Dual Bass	R614	37-34194-1	250k Dual Bass
R620	37-34194-1	250k Dual Treble	R620	37-34194-1	250k Dual Treble
R624	37-34432-1	500k Dual Loudness	R624	37-34432-1	500k Dual Loudness
R811	36-14764-59	1.5 ohm 1W (1)	R811	36-14764-59	1.5 ohm 1W (1)
R818	35-33395-4	3.9 ohm 5% (1)	R818	35-33395-4	3.9 ohm 5% (1)
R818-1	36-14764-59	1.5 ohm 1W (2)	R818-1	36-14764-59	1.5 ohm 1W (2)
R820	35-33395-4	3.9 ohm 5% (1)	R820	35-33395-4	3.9 ohm 5% (1)
R820-1	36-14764-59	1.5 ohm 1W (2)	R820-1	36-14764-59	1.5 ohm 1W (2)
R911	36-14764-59	1.5 ohm 1W (1)	R911	36-14764-59	1.5 ohm 1W (1)
<b>(MODEL MS3722)</b>					
R52	37-14576-5	1000 ohms IF Bias	R52	37-14576-5	1000 ohms IF Bias
R66	35-33295-4	2.2 ohms 5%	R66	35-33295-4	2.2 ohms 5%
R87	37-14576-3	15k 81as	R87	37-14576-3	15k 81as
R153	37-23063-7	1000 ohms AFC/Meter Zero	R153	37-23063-7	1000 ohms AFC/Meter Zero
R610	37-34193-1	500k Balance	R610	37-34193-1	500k Balance
R614	37-34194-1	250k Dual Bass	R614	37-34194-1	250k Dual Bass
R620	37-34194-1	250k Dual Treble	R620	37-34194-1	250k Dual Treble
R624	37-34432-1	500k Dual Loudness	R624	37-34432-1	500k Dual Loudness
R811	36-14764-59	1.5 ohm 1W (1)	R811	36-14764-59	1.5 ohm 1W (1)
R818	35-33395-4	3.9 ohm 5% (1)	R818	35-33395-4	3.9 ohm 5% (1)
R818-1	36-14764-59	1.5 ohm 1W (2)	R818-1	36-14764-59	1.5 ohm 1W (2)
R820	35-33395-4	3.9 ohm 5% (1)	R820	35-33395-4	3.9 ohm 5% (1)
R820-1	36-14764-59	1.5 ohm 1W (2)	R820-1	36-14764-59	1.5 ohm 1W (2)
R911	36-14764-59	1.5 ohm 1W (1)	R911	36-14764-59	1.5 ohm 1W (1)

(1) Early Production  
(2) Late Production

**NOTE: FOR COMPLETE SERVICE INFORMATION,  
 CASSETTE TAPE DECK, MODEL RPTS155 --  
 SEE PHOTOFAC TAPE RECORDER MANUAL  
 TR-84.**

### ALIGNMENT

**Equipment Required:** AM signal generator, FM signal generator, FM sweep generator, Marker generator, FM-Stereo signal generator, Oscilloscope, VTVM, AM loop antenna, Balun.

**Notes:**

Letters A, B, C . . . on the schematic correspond to the letters on the equipment connection diagrams and on the waveforms.

Connect VTVM across voice coil of speaker, or across an 8  $\Omega$  dummy load replacing speaker. **Do not operate with no load across speaker terminals.**

Adjust as indicated in tables below.

Keep volume control below audio overload and I-F/RF input below AGC threshold or FM limiting.

Check performance after installing chassis in cabinet following realignment.

#### AM Section

Circuit Alignment	Equipment Connection	Step	Gen. Freq.	Dial Setting	Adjust
AM I-F	AM Sig Gen radiated sig. VTVM across voice coil See Fig. 2.	1	455 kHz, mod by 400 Hz.	Tuning gang fully closed.	AM I-F's T2, T3, T5, & T7 for maximum output.
		2	—	—	Repeat until no greater maximum can be obtained.
AM band	Ditto See Fig. 2.	3	530 kHz, mod by 400 Hz.	Tuning gang fully closed.	L6 (AM Osc. coil) for maximum output.
		4	1610 kHz, mod by 400 Hz.	Tuning gang fully opened.	TC5 (AM Osc. trimmer) for maximum output.
		5	—	—	Repeat steps 3 and 4.
AM tracking	Ditto See Fig. 2.	6	600 kHz, mod by 400 Hz.	Tune gang in to signal.	L604 (AM Ant. coil) Adjust coil on ferrite core for maximum output.
		7	1400 kHz, mod by 400 Hz.	Ditto	TC4 (AM Ant. trimmer) for maximum output.
		8	—	—	Repeat steps 6 and 7.

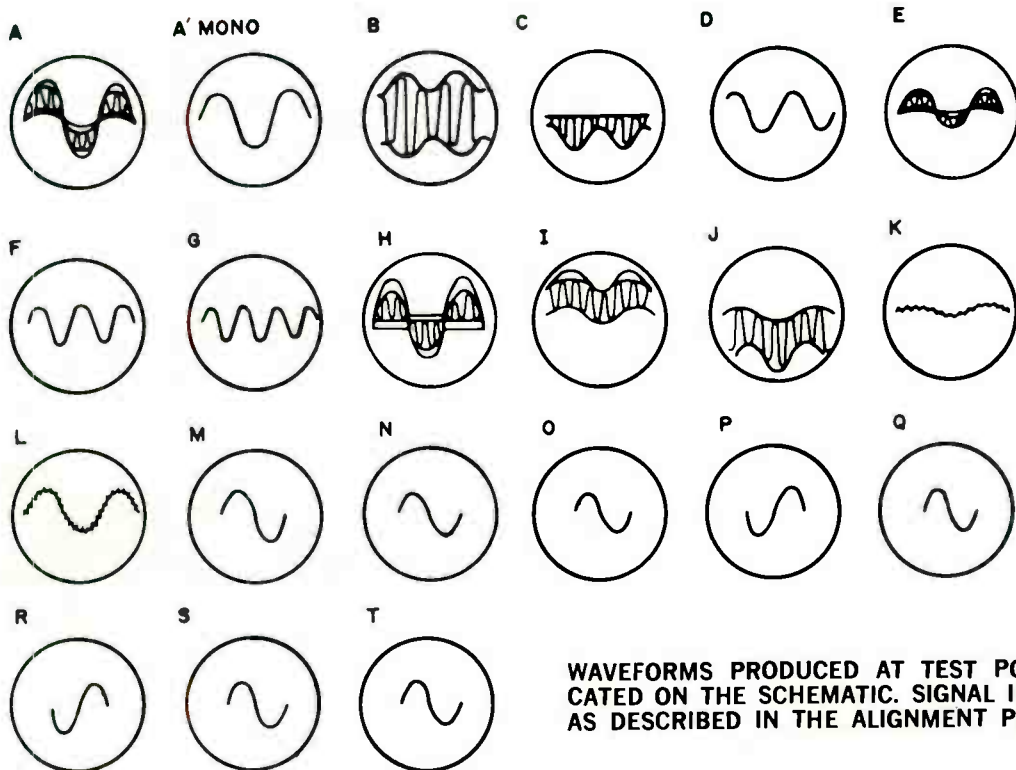
FM Section

Circuit Alignment	Equipment Connection	Step	Gen. Freq.	Dial Setting	Adjust
FM I-F	IF SWEEP GENERATOR High side through 10pF to Q-1 base, low side to ground.	1	10.7 MHz.	Tuning gang fully closed.	FM I-F's T1, T4, & T6 for maximum symmetrical response, with 10.7 MHz at the center point.
	MARKER GENERATOR The same as Sweep Generator OSCILLOSCOPE Between point "F" & ground. See Fig. 3.	2	—	—	Repeat step 1.
Ratio Detector	Ditto	3	10.7 MHz.	Tuning gang fully closed.	FM I-F T8 for suitable "S" curve.
		4	—	—	Repeat step 3.
FM band	Thru balun to FM ant. tms. VTVM across voice coil. See Fig. 4.	5	87.5 MHz mod by 400 Hz.	Tuning gang fully closed.	L4 (FM Osc. coil) for maximum output.
		6	108.5 MHz mod by 400 Hz.	Tuning gang fully opened.	TC1 (FM Osc. trimmer) for maximum output.
		7	—	—	Repeat steps 5 and 6.
FM RF	Ditto	8	90 MHz, mod by 400 Hz.	Tune to signal.	L1 (FM Ant. coil) & L2 (FM RF. coil) for maximum output.
		9	106 MHz. mod by 400 Hz.	Ditto	TC2 (FM Ant. trimmer) TC3 (FM RF. trimmer) for maximum output.
		10	—	—	Repeat steps 8 and 9 to obtain suitable sensitivity at 90 MHz and 106 MHz.

**Teledyne Packard Bell RPC718, RPC719,  
RPS103, RPTS155  
RS103 (Ch. 30HF1)**

**FM-Stereo Section**

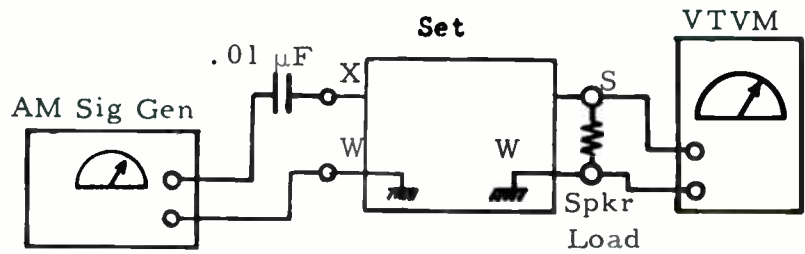
Circuit Alignment	Equipment Connection	Step	Gen. Freq.	Dial Setting	Adjust
	FM STEREO GEN. Composite output connected to Ext. Mod. of FM Signal Generator FM SIGNAL GEN. Thru balun to FM ant. tms. OSCILLOSCOPE V. amp. to point "G". See Fig. 5.	1	98 MHz.	98 MHz (Tuned in).	First make sure FM section is properly aligned. Then adjust T9 & T10 to obtain waveform on scope similar to waveform "A".
Channel Separation	FM STEREO GEN. FM SIGNAL GEN. Same as Step 1 VTVM & Scope as in Fig. 6.	2	98 MHz.	98 MHz.	Adjust VR301 for minimum output from left (right) channel when right (left) channel is modulated. Channel separation should be not less than 20 dB.



**WAVEFORMS PRODUCED AT TEST POINTS INDICATED ON THE SCHEMATIC. SIGNAL INPUTS ARE AS DESCRIBED IN THE ALIGNMENT PROCEDURE.**

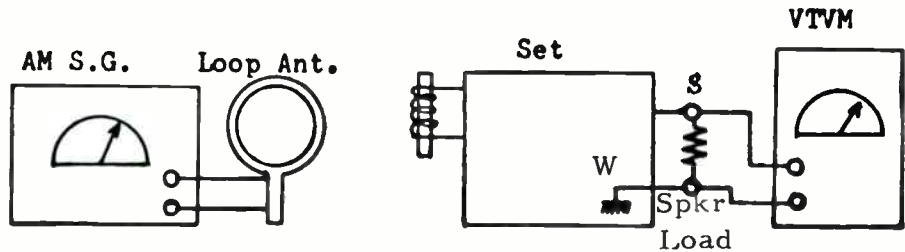
## TEST EQUIPMENT CONNECTIONS

(Fig.-1)



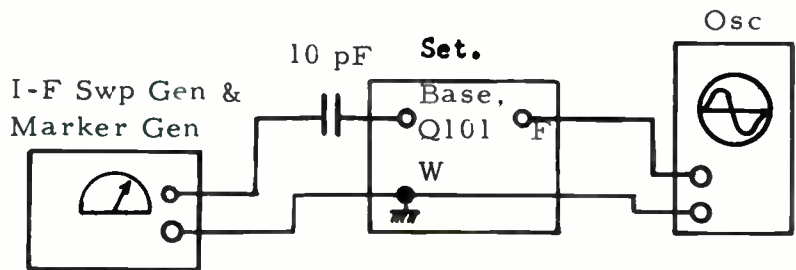
(Fig.-2)

AM



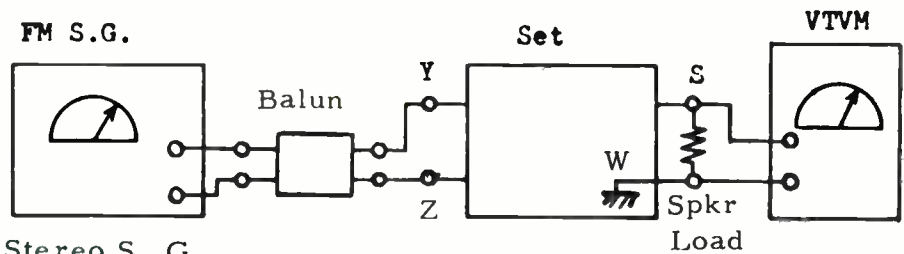
(Fig.-3)

FM IF  
RATIO DET.



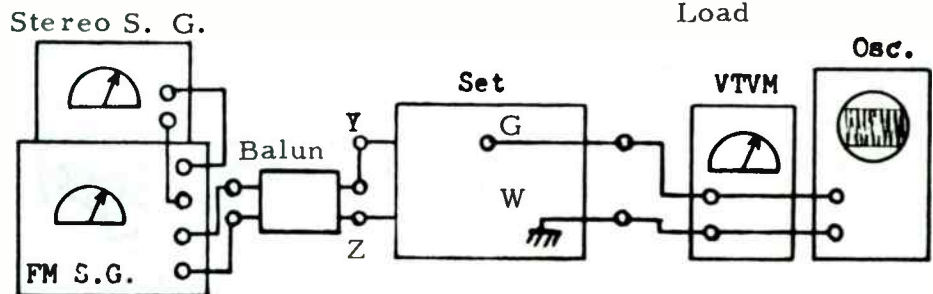
(Fig.-4)

FM BAND  
TRACKING



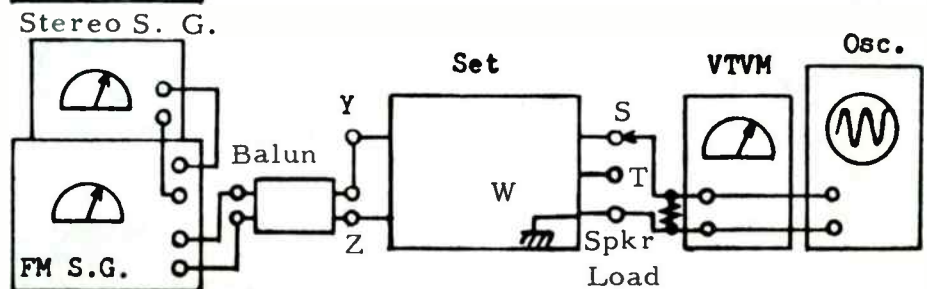
(Fig.-5)

19KHz  
PILOT

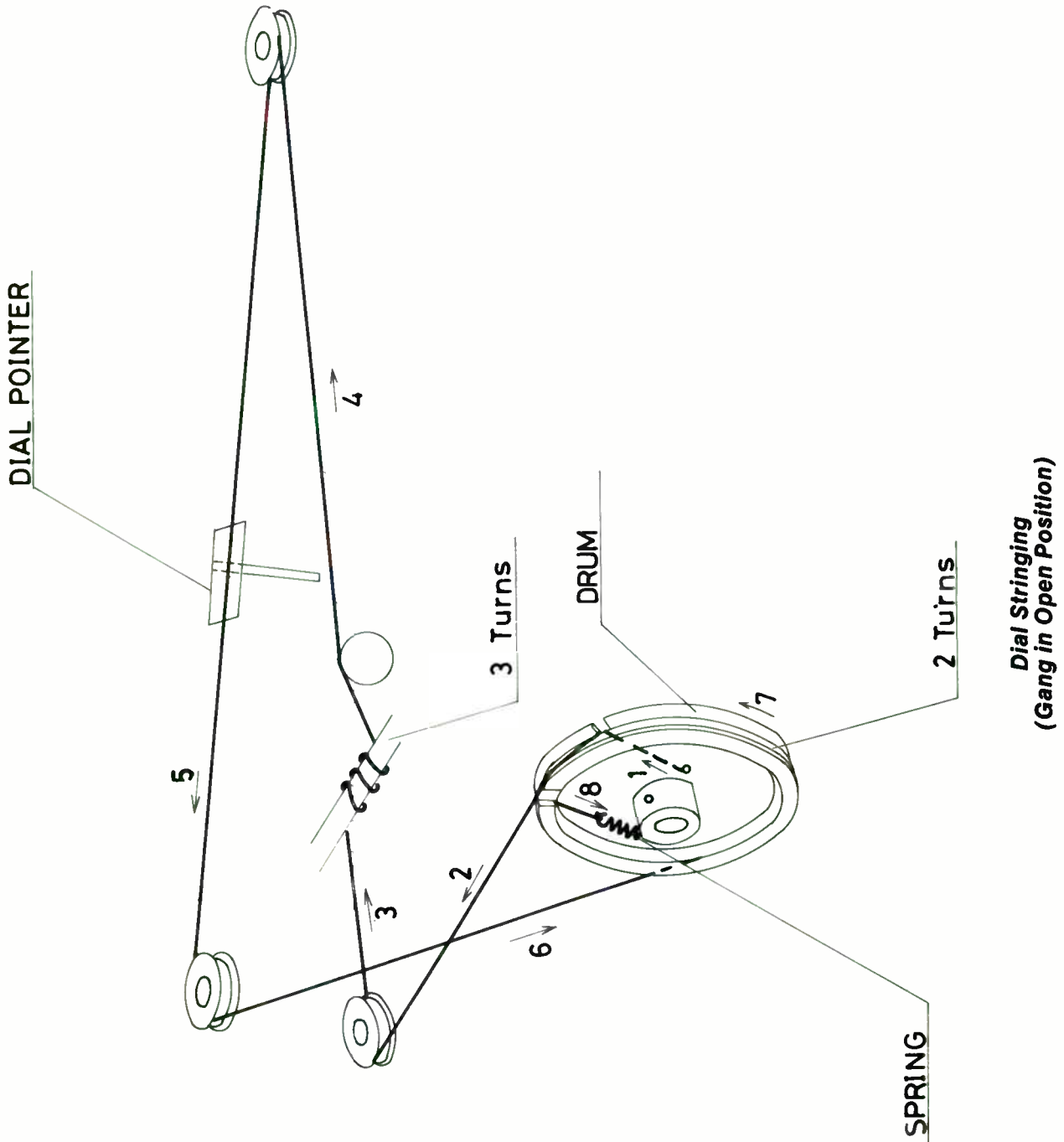


(Fig.-6)

SEPARATION



**Teledyne Packard Bell RPC718, RPC719,  
RPS103, RPTS155  
RS103 (Ch. 30HF1)**



NOTE: FOR COMPLETE SERVICE INFORMATION,  
CASSETTE TAPE DECK, MODEL RPTS155 --  
SEE PHOTOFACT TAPE RECORDER MANUAL  
TR-84.

## SEMICONDUCTORS

ITEM	PART NO./TYPE		
D1	1S2139B	Q2	2SC394
D2	1N60	Q3	2SC394
D3	1N60	Q4	2SC941
D4	1N60	Q5	2SC380
D5	1N60	Q6	2SC380
D6	1N60(P)	Q7	2SC380
D7	1N60(P)	Q8	2SC373
D8	1N60(P)	Q9	2SC373
D9	1N60(P)	Q10	2SC373
D10	1N60(P)	Q101	2SC732
D11	1N60(P)	Q102	2SA495
D12	1N60(P)	Q103	2SC735
D13	1N60(P)	Q104	2SA473
D14	1N60	Q105	2SC1173
D15	BZ-120	Q201	2SC732
D16	10D-1(SR1K-2)	Q202	2SA495
D17	10D-1(SR1K-2)	Q203	2SC735
D101	S3016R(KB162)	Q204	2SA473
D201	S3016R(KB162)	Q205	2SC1173
Q1	2SC784		

## ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C34	1203476	47mfd 16V
C42	1203107	100mfd 16V
C52	1203106	10mfd 16V
C57	1203475	4.7mfd 16V
C62	1203475	4.7mfd 16V
C75	1221106	10mfd 50V
C76	1203107	100mfd 16V
C77	1203227	220mfd 16V
C78	1220040	2200mfd 35V
C107	1203106	10mfd 16V
C108	1203105	1mfd 16V
C110	1202227	220mfd 10V
C112	1202227	220mfd 10V
C113	1203476	47mfd 16V
C114	1203477	470mfd 16V
C207	1203106	10mfd 16V
C208	1203105	1mfd 16V
C210	1202227	220mfd 10V
C212	1202227	220mfd 10V
C213	1203476	47mfd 16V
C214	1203477	470mfd 16V
TC1	1280027	Trimmer

## CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R119	1330008	.22 ohms 1/2W
R120	1330008	.22 ohms 1/2W
R219	1330008	.22 ohms 1/2W
R220	1330008	.22 ohms 1/2W
VR2	1390252	3000 ohm
VR701 & VR702	139N244	50K Dual Treble
VR703 & VR704	139N244	50K Dual Bass
VR705 & VR706	1390133	50K Dual Volume
VR707	1390134	50K Balance

## COILS/TRANSFORMERS

ITEM	PART NO.		
L1	111B416	T1	11JM120
L2	112B016	T2	11AM085
L3	111B077	T3	11AM102
L4	111B160	T4	11LM105
L6	113M146	T5	11BM004
L7	1170015	T6	11LM105
L8	1170015	T7	11CM004
L9	117B026	T8	11DM003
L601	1170020	T9	11PM001
L602	1170020	T10	11QN001
L604	111B461	T601	118N099 (118T099)

## MISCELLANEOUS

ITEM	NAME	PART NO.
(MODELS RPC718, RPC719)		

SW601	Switch, Function	1620160
SW602		
SW603		
SW605	Switch, Power Assembly, Record Changer (VM A1293-H76)	1622073
	Cartridge, Phono (Tetrad 6-21D-V141)	58154
	Needle, Phono (Tetrad 21D)	63078
	Speaker, 3-1/2" PM, 3.2 ohm	59041
	Speaker, 9" x 6", 8 ohm	83127
		83143

(MODELS RS103, RPS103)

SW601	Switch, Function	1620129
SW602		
SW603		
SW604	Switch, Phono	1622037
SW605	Switch, Power Assembly, Record Changer Cartridge, Phono (Tetrad G-21D)	1622037
	Needle, Phono (Tetrad 21D)	58155
	Speaker, 6-1/2", 8 ohm	63077
		59041
		1520169

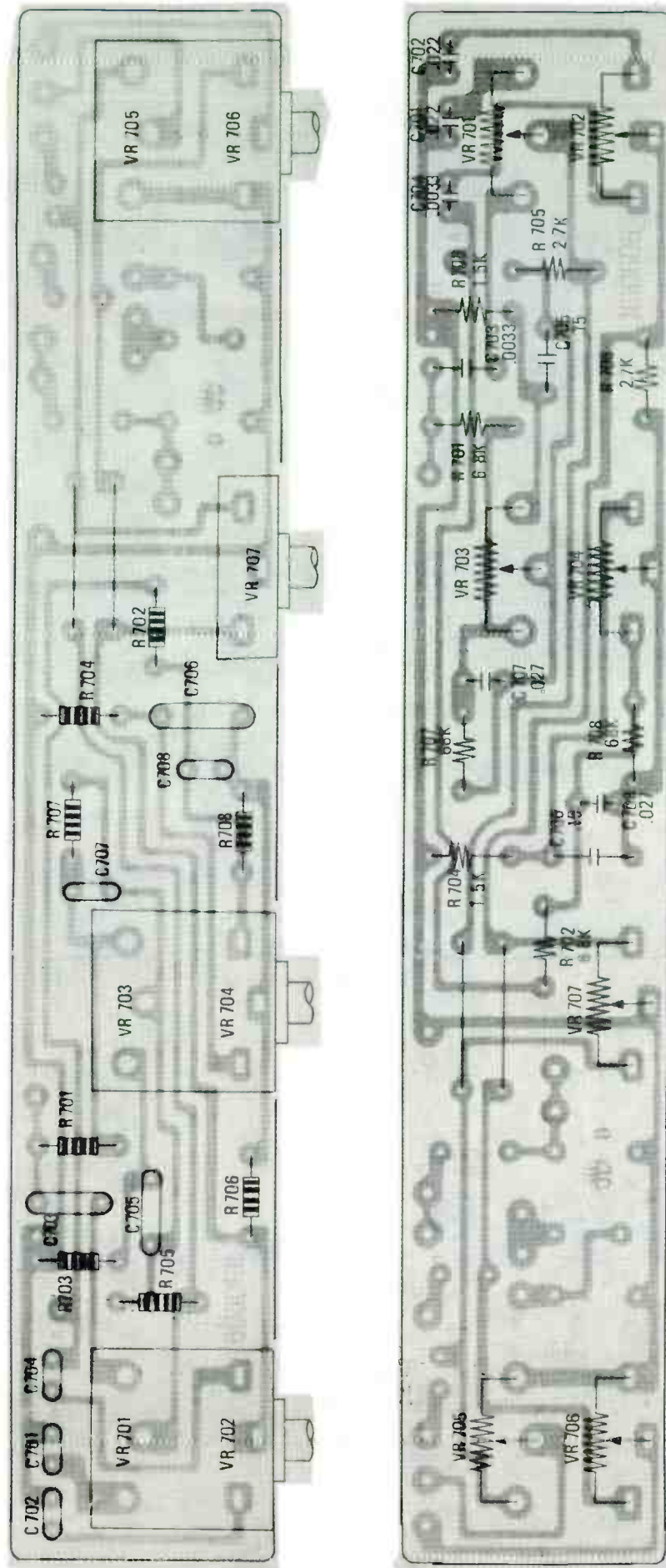
(MODEL RPTS155)

SW601	Switch, Function	1620160
SW602		
SW603		
SW604	Switch, Power Assembly, Record Changer Cartridge, Phono (Tetrad 6-21D-V183)	1622073
SW605		
	Needle, Phono (Tetrad 21D)	58158
	Speaker, 3-1/2", 8 ohm	63077
	Speaker, 6-1/2", 8 ohm	59041
	Deck, Cassette (TRAK15)	83153
		83311
		10973

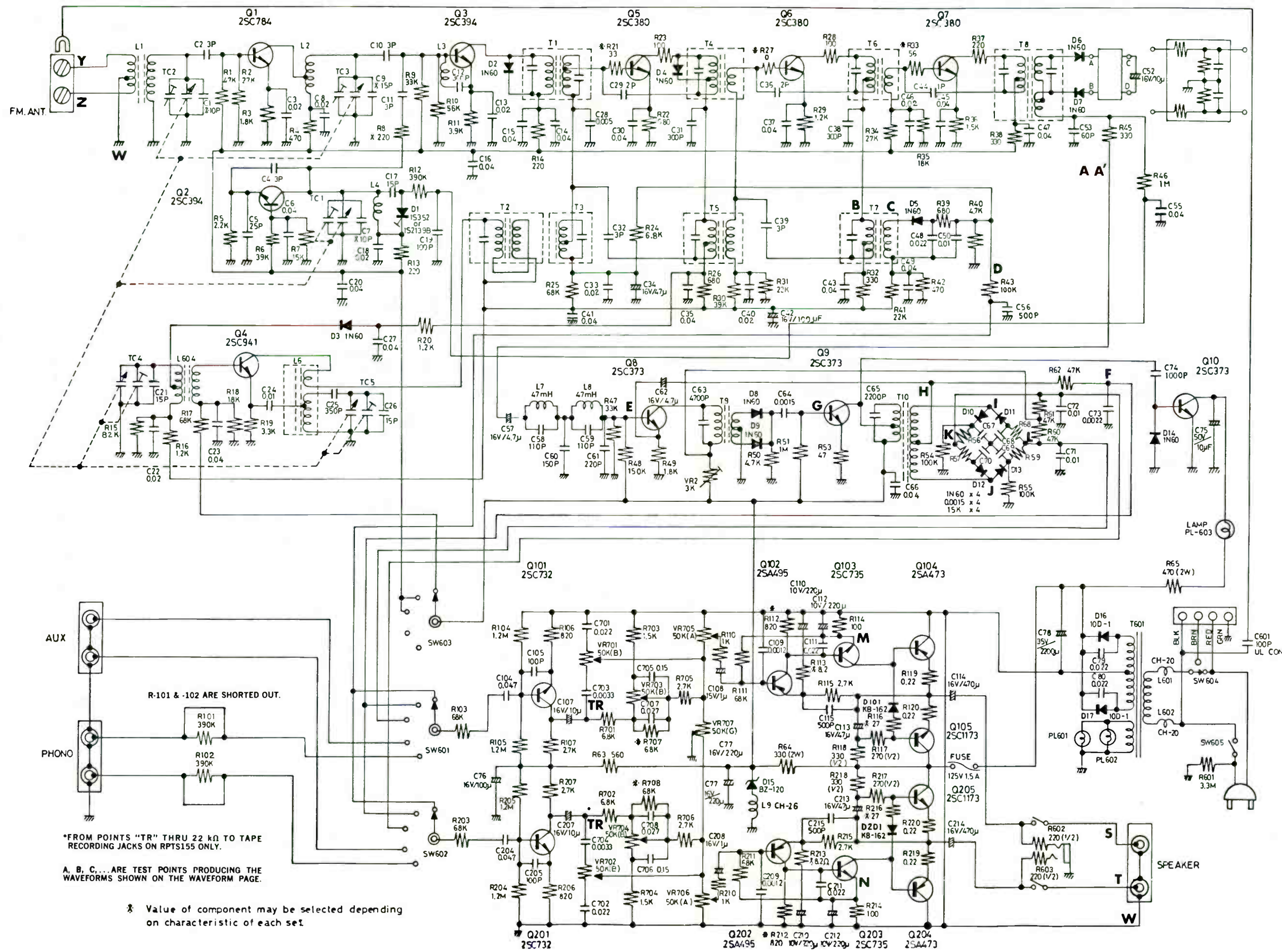
## CABINET PARTS

NAME	PART NO.
(MODELS RPC718, RPC719)	
Knob, Control	21N4023
Knob, Tuning	21N4038
Knob, Power	21N4037

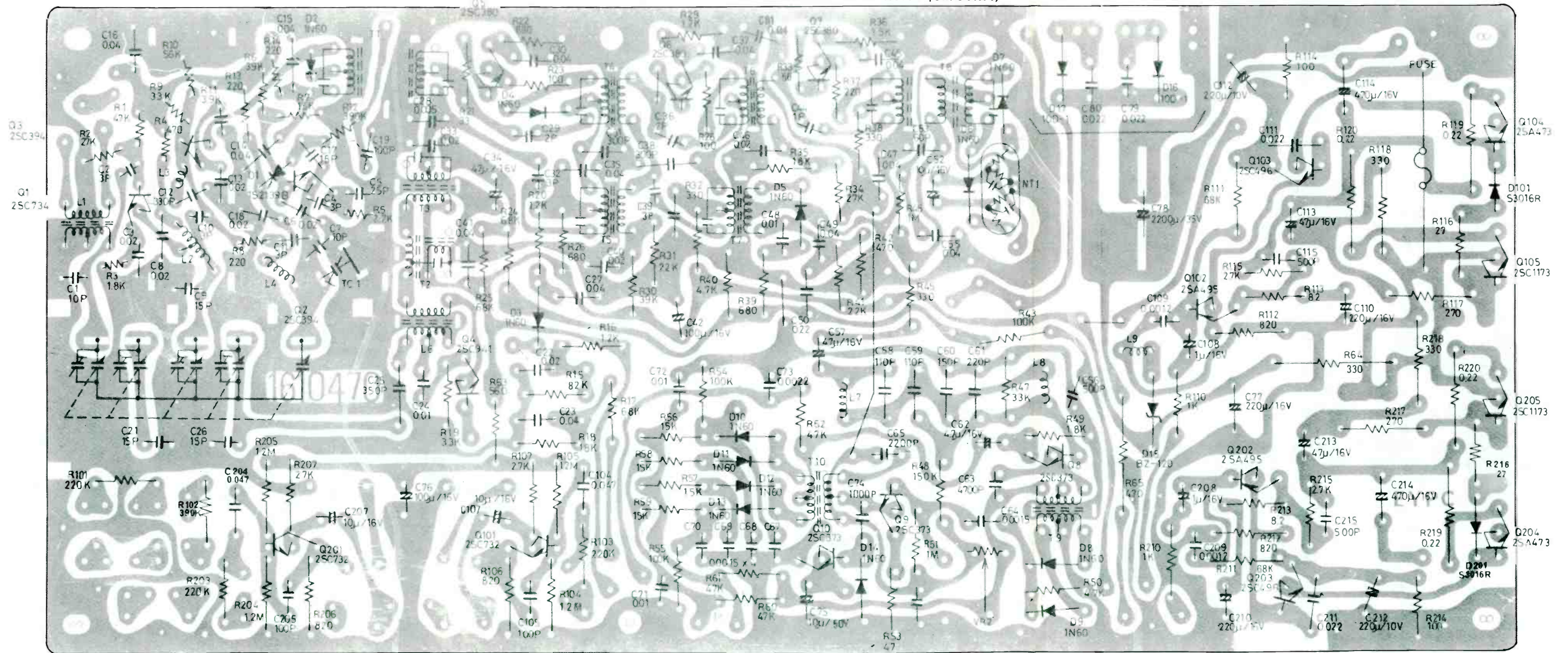




Control Panel Printed Board



Teledyne Packard Bell RPC718, RPC719,  
RPS103, RPTS155  
RS103 (Ch. 30HF1)



**SERVICE INFORMATION**

**TAPE HEAD ADJUSTMENTS**

Figure "A" shows the head adjustment screws.

Head adjustments are normally required in cases of cross-talk, loss of, or noisy high frequency response or if the head has been replaced. A suitable test tape should be used for the azimuth and height adjustments. Use standard equipment item 21617 or equivalent. Connect 8 ohm loads (either speakers or dummy resistors) across the output of each channel and set treble control to maximum position. Use an AC VTVM and a standard screwdriver for the head adjustments.

**HEIGHT**

This is the adjustment to move the tape head up or down so that it can be positioned exactly in line with the pre-recorded information on the tape. Misadjustment of this screw will cause cross-talk and/or poor separation.

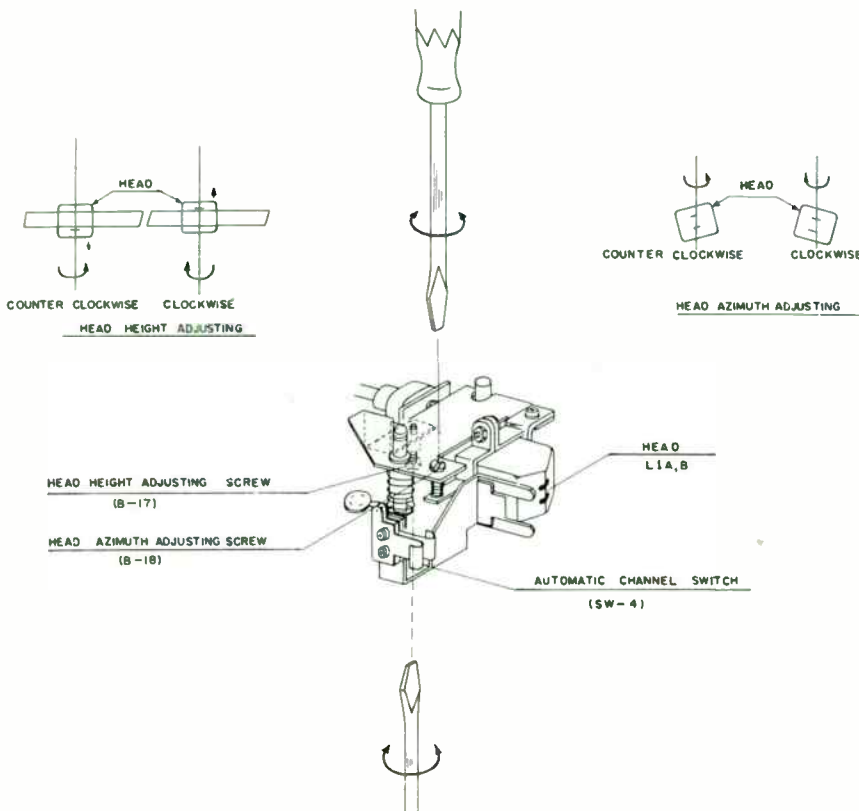
With the Test Tape, proceed as follows:

1. Insert the test tape cartridge into tape slot and position head to program 2 and advance to sequence B.
2. Set balance control for maximum output from left channel.
3. Connect VTVM across left channel output (track 2 information—approximately 125Hz will be presented). Adjust head height adjusting screw (B-17) which is accessible through opening in bottom of cabinet for a null.

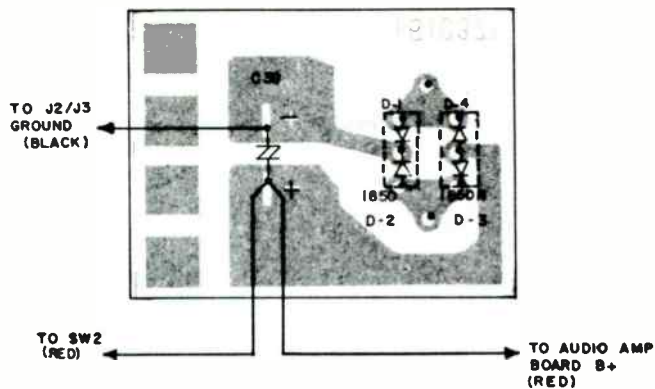
The reason for the null (minimum output) is that the 125Hz information is recorded not on track 2, but on the guard bands adjacent to track 2. This adjustment will minimize cross-talk. To be assured of proper setting, make sure there is a peak on either side of the null.

**AZIMUTH**

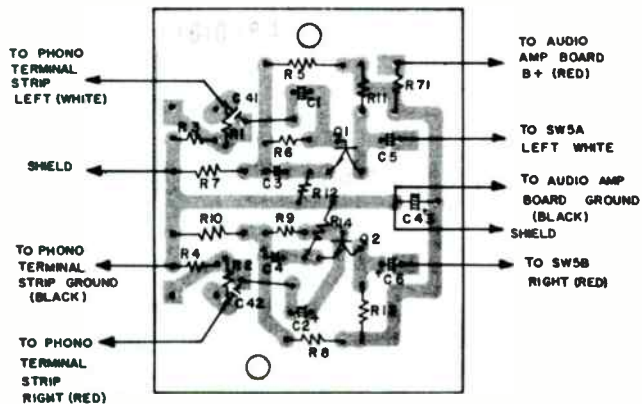
4. Refer to "Chassis Removal". Perform steps 1 and 2.
5. Connect VTVM across the right channel output and adjust balance control for maximum right channel output (track 6 information—8KHz will be presented). Adjust azimuth adjusting screw (B-18) for maximum output. Misadjustment of this screw will cause poor high frequency response.
6. Repeat steps 3 and 5 to optimize these adjustments, then fasten adjusting screws in place with glyptal or other non-hardening cement.



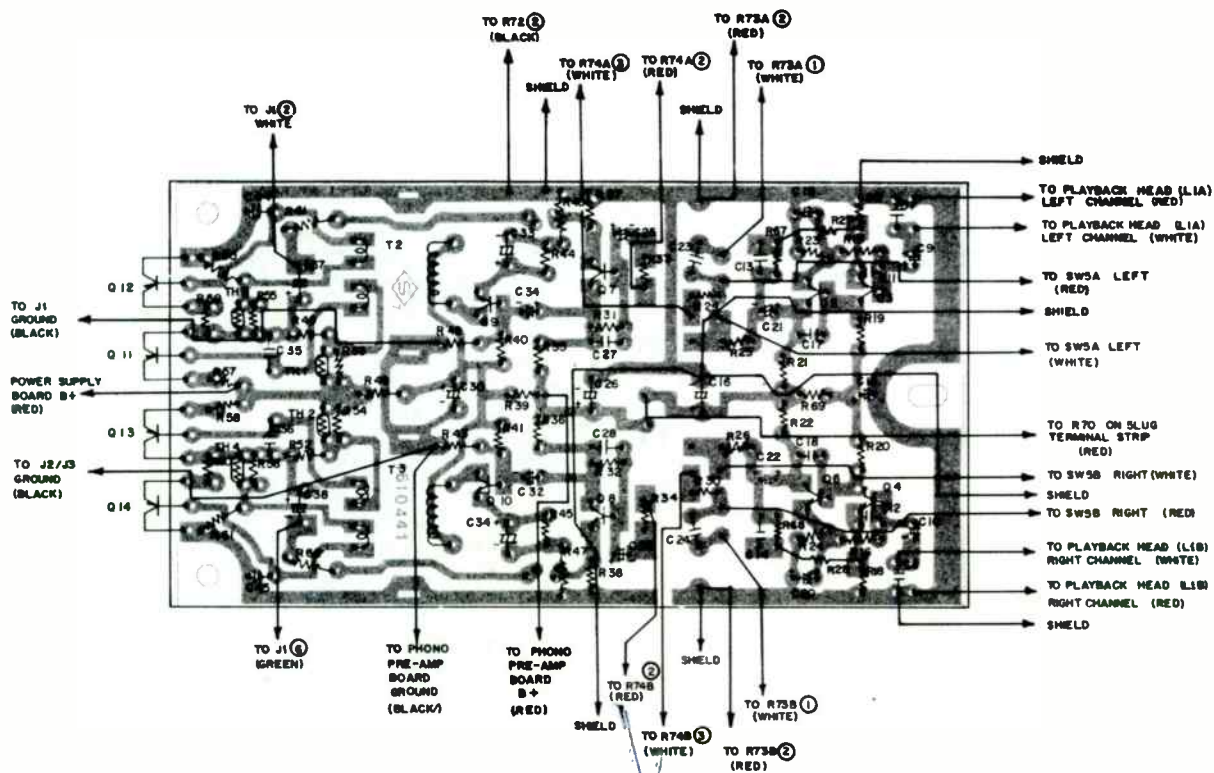
**TAPE HEAD ADJUSTMENTS (Fig. A)**



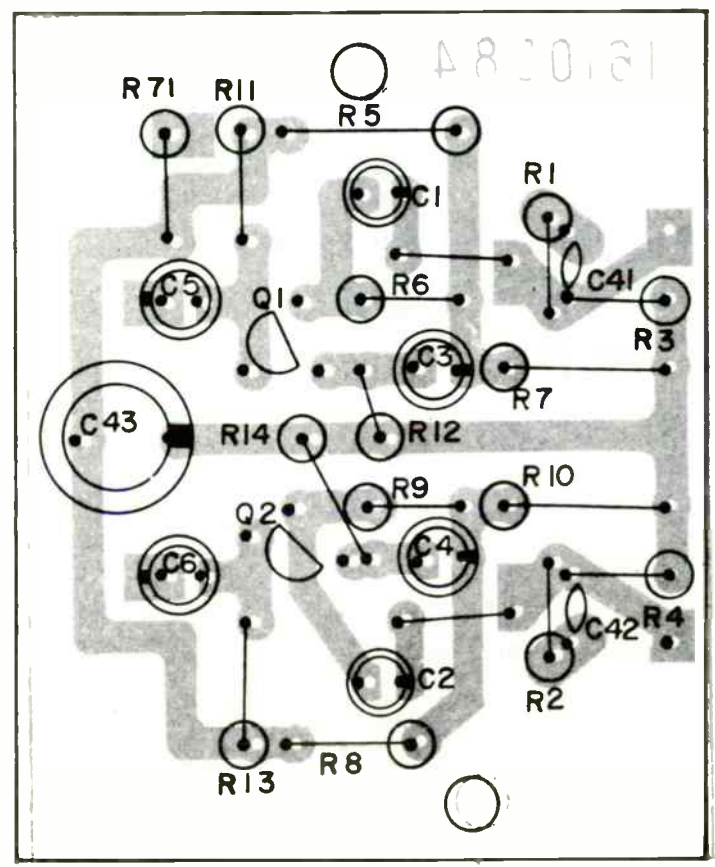
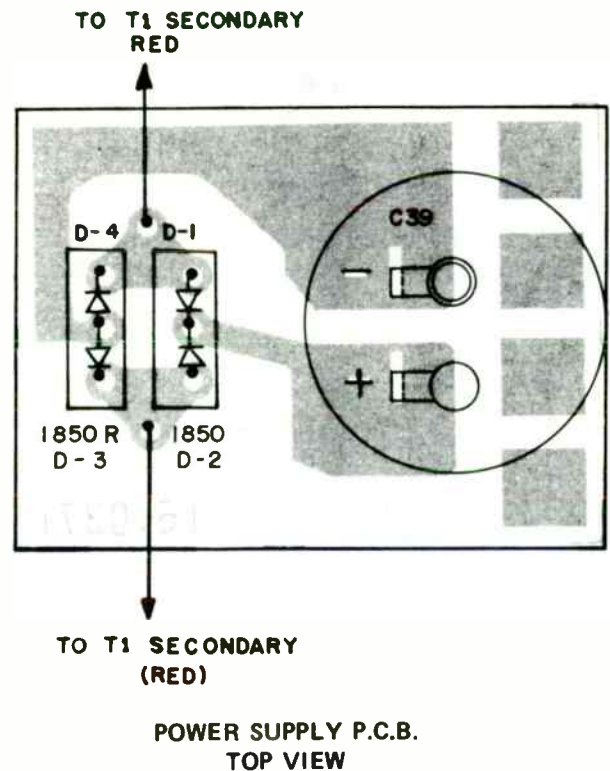
**POWER SUPPLY P.C.B.  
BOTTOM VIEW**



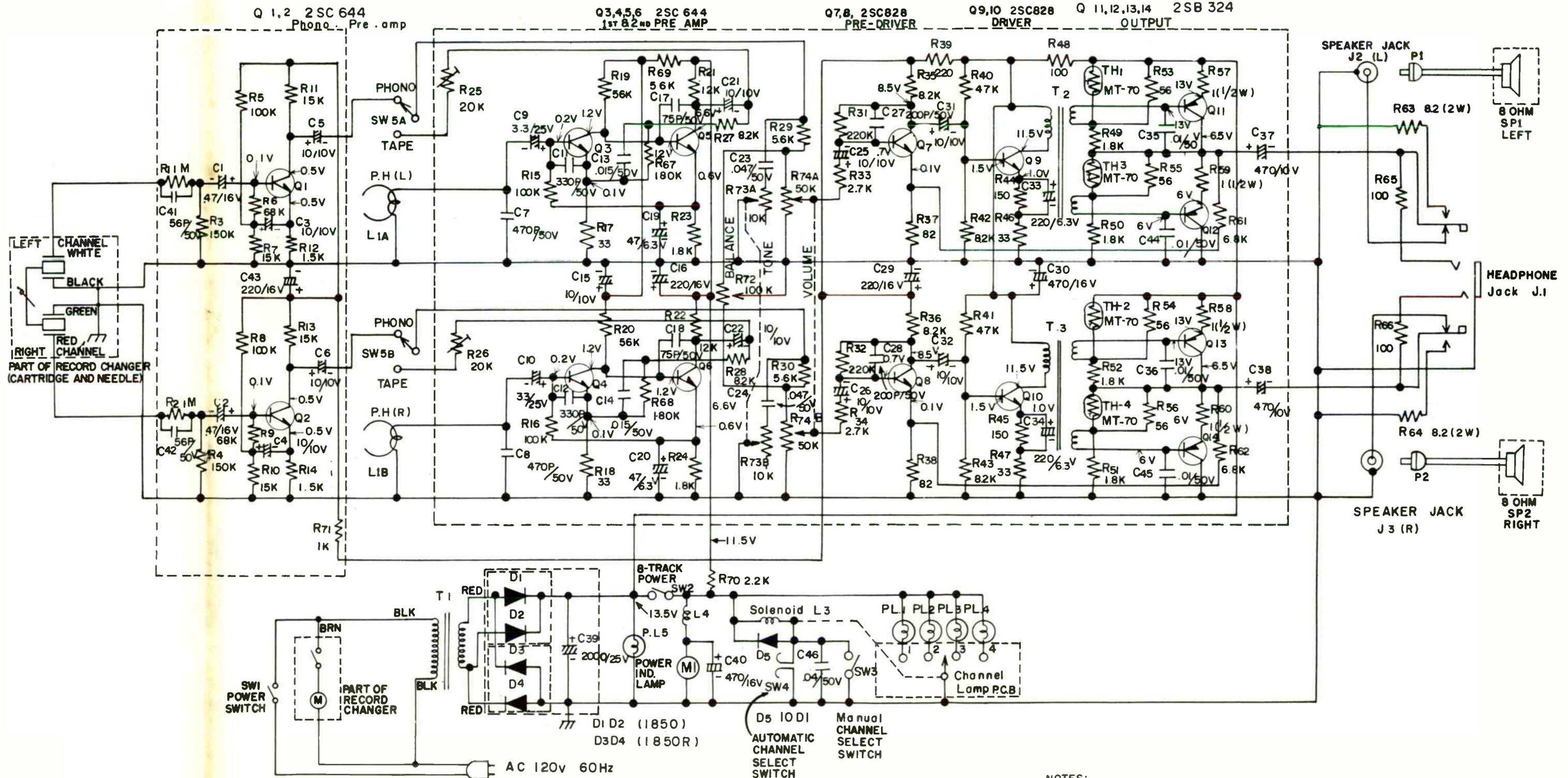
**PHONO PRE-AMP P.C.B.  
BOTTOM VIEW**



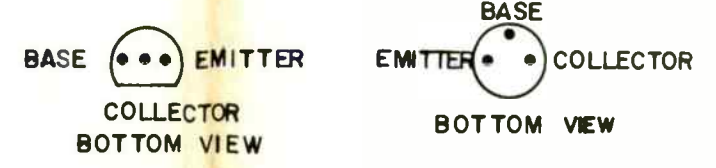
**AUDIO AMP P.C.B.—BOTTOM VIEW**



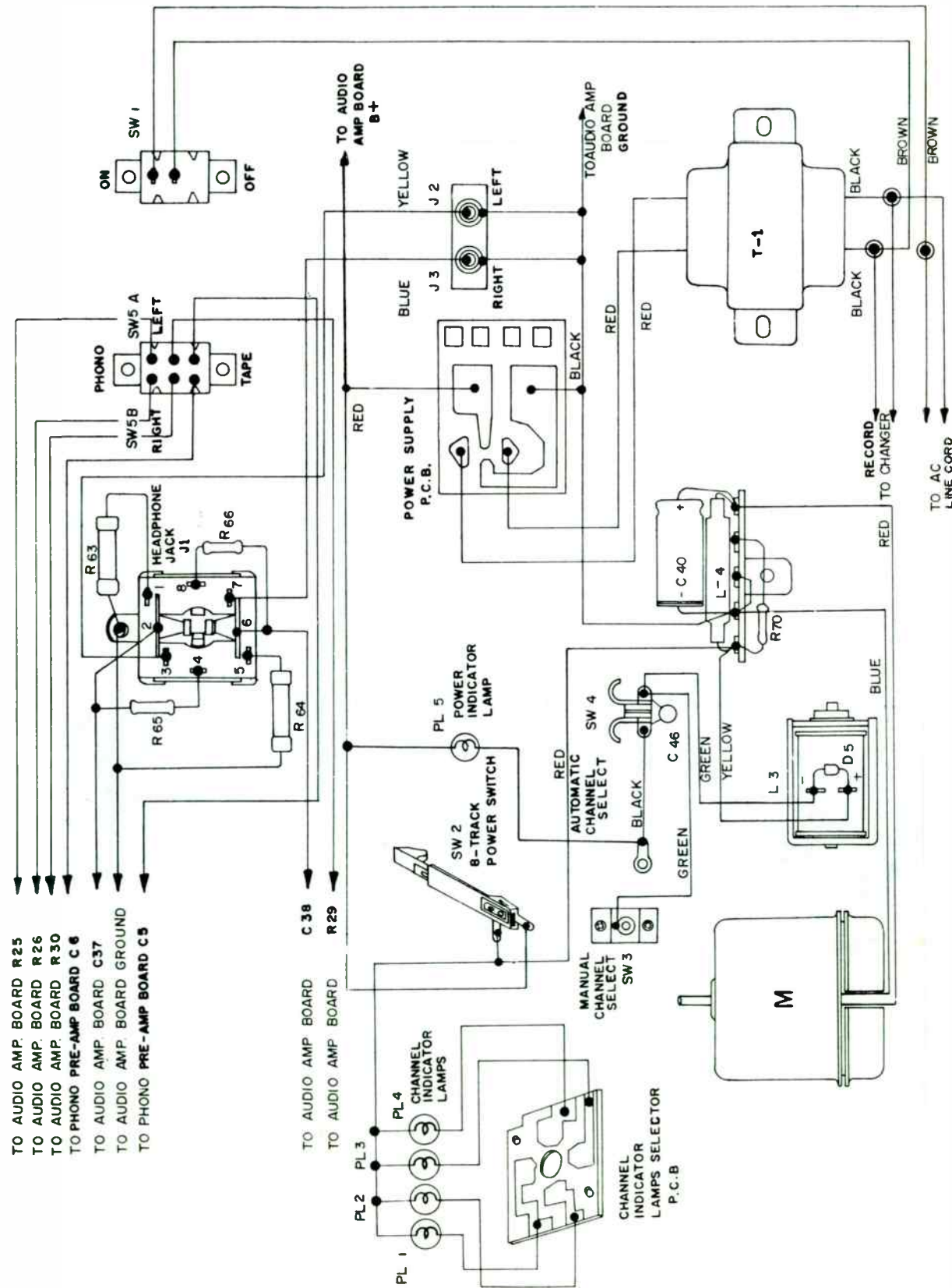
PHONO PRE-AMP P.C.B. TOP VIEW



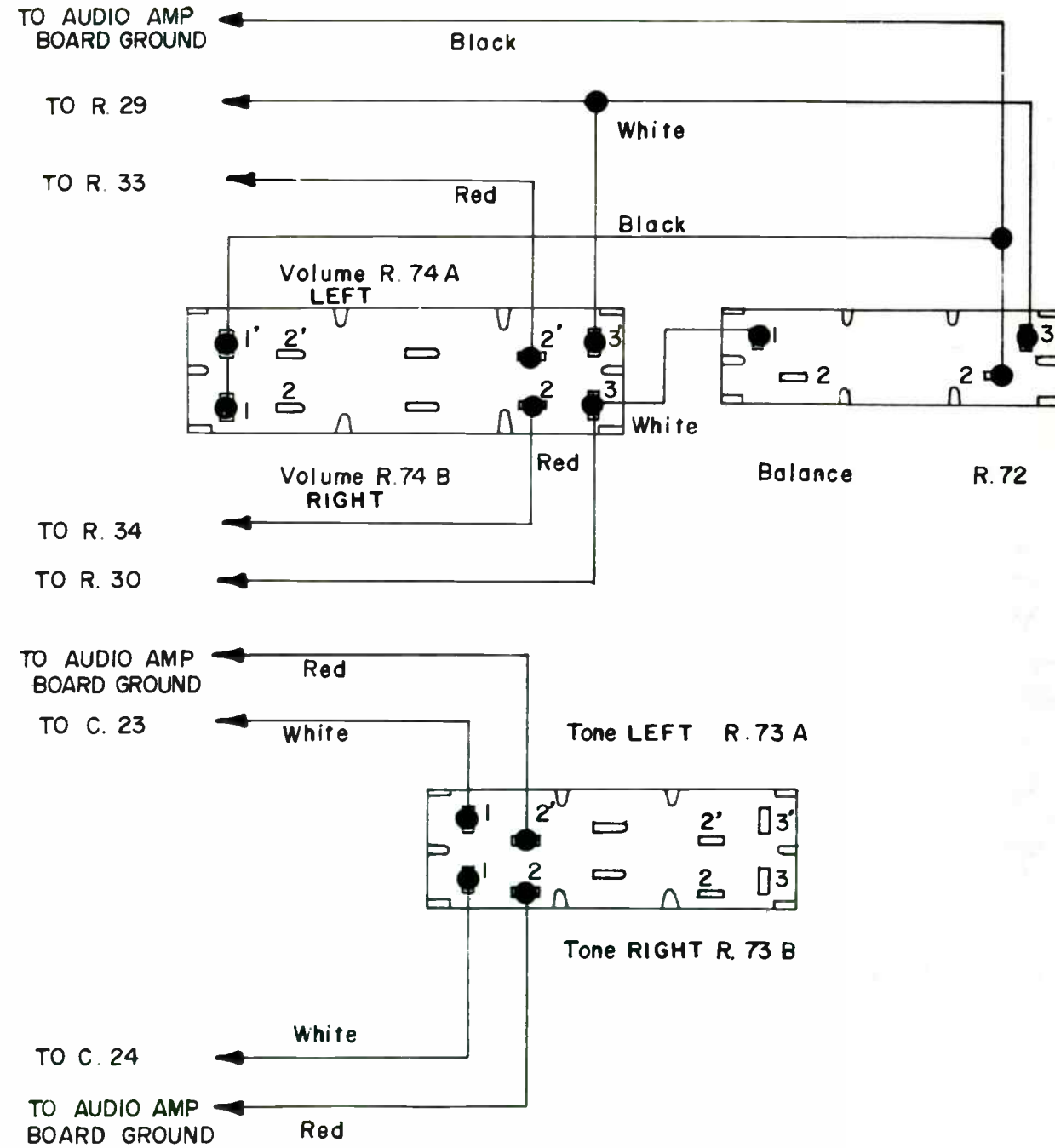
Q 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 Q 11, 12, 13, 14



- NOTES:
1. ALL RESISTORS ARE IN OHMS, 10% 1/4 WATT, UNLESS OTHERWISE INDICATED.
  2. ALL CAPACITOR VALUES ARE IN MICROFARADS, UNLESS OTHERWISE INDICATED.
  3. VOLTAGES ARE MEASURED WITH A VTVM AND REFERENCED TO GROUND.
  4. VOLUME CONTROL SET TO MINIMUM, WITH NO SIGNAL APPLIED.



CONTROL WIRING



SEMICONDUCTORS

ITEM	PART NO.	TYPE
D1	J24939	1850
D2	J24939	1850
D3	J24940	1850R
D4	J24940	1850R
D5	J24935	10D-1
Q1	J24932	2SC644
Q2	J24932	2SC644
Q3	J24932	2SC644
Q4	J24932	2SC644
Q5	J24932	2SC644
Q6	J24932	2SC644
Q7	J24933	2SC828
Q8	J24933	2SC828
Q9	J24933	2SC828
Q10	J24933	2SC828
Q11	J24934 (1)	2SB324 (1)
Q12	J24934 (1)	2SB324 (1)
Q13	J24934 (1)	2SB324 (1)
Q14	J24934 (1)	2SB324 (1)

(1) Matched Pair

R57	J23521	1 ohm 1/2W WW
R58	J23521	1 ohm 1/2W WW
R59	J23521	1 ohm 1/2W WW
R60	J23521	1 ohm 1/2W WW
R72	J25466	100K Balance
R73A,B	J25465	10K Dual Slide Tone
R74A,B	J25464	50K Dual Slide Volume
TH1	J24938	Thermistor, MT-70
TH2	J24938	Thermistor, MT-70
TH3	J24938	Thermistor, MT-70
TH4	J24938	Thermistor, MT-70

COILS/TRANSFORMERS

ITEM	PART NO.
L4	J61872
T1	J11348
T2	J11349
T3	J11349

ELECTROLYTIC CAPACITORS

ITEM	PART NO.	VALUE
C1	J32790	.47mfd 16V
C2	J32790	.47mfd 16V
C3	J32783	10mfd 10V
C4	J32783	10mfd 10V
C5	J32783	10mfd 10V
C6	J32783	10mfd 10V
C9	J32782	3.3mfd 25V
C10	J32782	3.3mfd 25V
C15	J32783	10mfd 10V
C16	J32786	220mfd 16V
C19	J32784	47mfd 6.3V
C20	J32784	47mfd 6.3V
C21	J32783	10mfd 10V
C22	J32783	10mfd 10V
C25	J32783	10mfd 10V
C26	J32783	10mfd 10V
C29	J32786	220mfd 16V
C30	J32788	470mfd 16V
C31	J32783	10mfd 10V
C32	J32783	10mfd 10V
C33	J32785	220mfd 6.3V
C34	J32785	220mfd 6.3V
C37	J32787	470mfd 10V
C38	J32787	470mfd 10V
C39	J32781	2000mfd 25V
C40	J32789	470mfd 16V
C43	J32786	220mfd 16V

MISCELLANEOUS

ITEM	NAME	PART NO.
L1	Head, Stereo Playback	J39456
L3	Solenoid	J39458
M1	Motor, Tape Transport	J39457
SP1	Speaker, 5" 8 ohm	J10131
SP2	Speaker, 5" 8 ohm	J10131
SW1	Switch, Power On/Off	J12318
SW2	Switch, 8-Track Player	J12320
SW4	Switch, Automatic Selector	J12364
SW5	Switch, Phono/Tape	J12319
	Needle Diamond/Sapphire	B-6XSD
	P.C. Board, Audio Amp	J5696
	P.C. Board, Power Supply	J5697
	P.C. Board, Phono Preamp	J56104

CABINET PARTS

NAME	PART NO.
Side, Right Cabinet	J70453
Side, Left Cabinet	J70454
Bottom, Cabinet	J70455
Cover, Cabinet Back	J70456
Cover, Speaker Box	J70459
Cover, Dust	E70907
Escutcheon	J1567
Panel, Front	J70452
Knob, Select	J50661
Knob, Volume	J50662
Knob, Balance	J50665
Knob, Tone	J50666

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R25	J25467	20K Output Level
R26	J25467	20K Output Level

**SIGNAL STRENGTH CHART**

There are certain minimum voltages necessary for proper stereo FM reception. To help determine if there is sufficient signal available, the following developed AGC voltage versus microvolt input voltage charts have been compiled. Since the desired FM Station may not always be operating in the stereo mode when an installation is made, these AGC voltage measurements have been taken with a monaural FM signal. The point "\*" of minimum AGC voltage necessary for good stereo FM reception has been indicated on these charts.

AGC voltages are to be measured with a V.T.V.M. connected to the following Test Points.

Chassis 29AT24, (Z1), (Z2) — Test Point "C" RF Amplifier AGC Feed Thru on FM Tuner.

Micro Volts Input	Reverse AGC Voltage At Gate 2 of FM RF	Micro Volts Input	AGC Voltage At 1st.I.F. (See Note)
0	5.7	0	1.50
25	4.5	25	1.40
100	2.8	100	1.10
200	2.2	200	.95
500	1.5	500	.80
1K	*-0.96	1K	*.75
5K	-0.22	5K	.65
50K	-1.10	50K	.52
100K	-1.20	100K	.40

**FM ALIGNMENT**

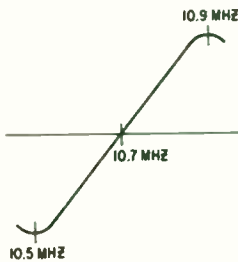
Alignment of these chassis will, in most cases, not be necessary unless an RF or IF transformer is replaced or if someone has tampered with the adjustment.

Because of the wide band pass required in the multiplex FM tuner, it is desirable to use an FM signal generator having a deviation of 400 KHz with a sweep rate of 60 Hertz as well as an oscilloscope when aligning both the IF and RF FM portions of this receiver. It is not only necessary to obtain maximum amplitude in the IF amplifier stages, but also necessary to maintain symmetry. It is desirable to use 10.6, 10.7 and 10.8 Megahertz markers in obtaining IF curve symmetry.

Capacitors mentioned in the alignment procedure should be as small as possible and the ground lead of the generator must be connected to ground as close as possible to the point of injection.

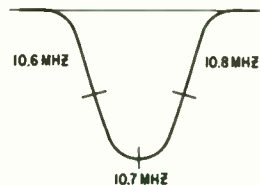
**AM ALIGNMENT**

A V.T.V.M. on low AC scale connected across the speaker voice coil output terminals (either left or right channels), will be satisfactory for all AM, IF and RF adjustments.



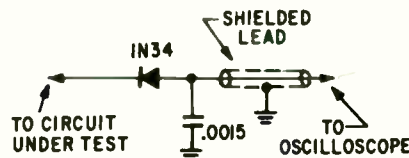
**Scope Pattern - A**

Adjust for maximum amplitude while maintaining linearity and symmetry. 10.7 MHz marker must be on the curve at base line.



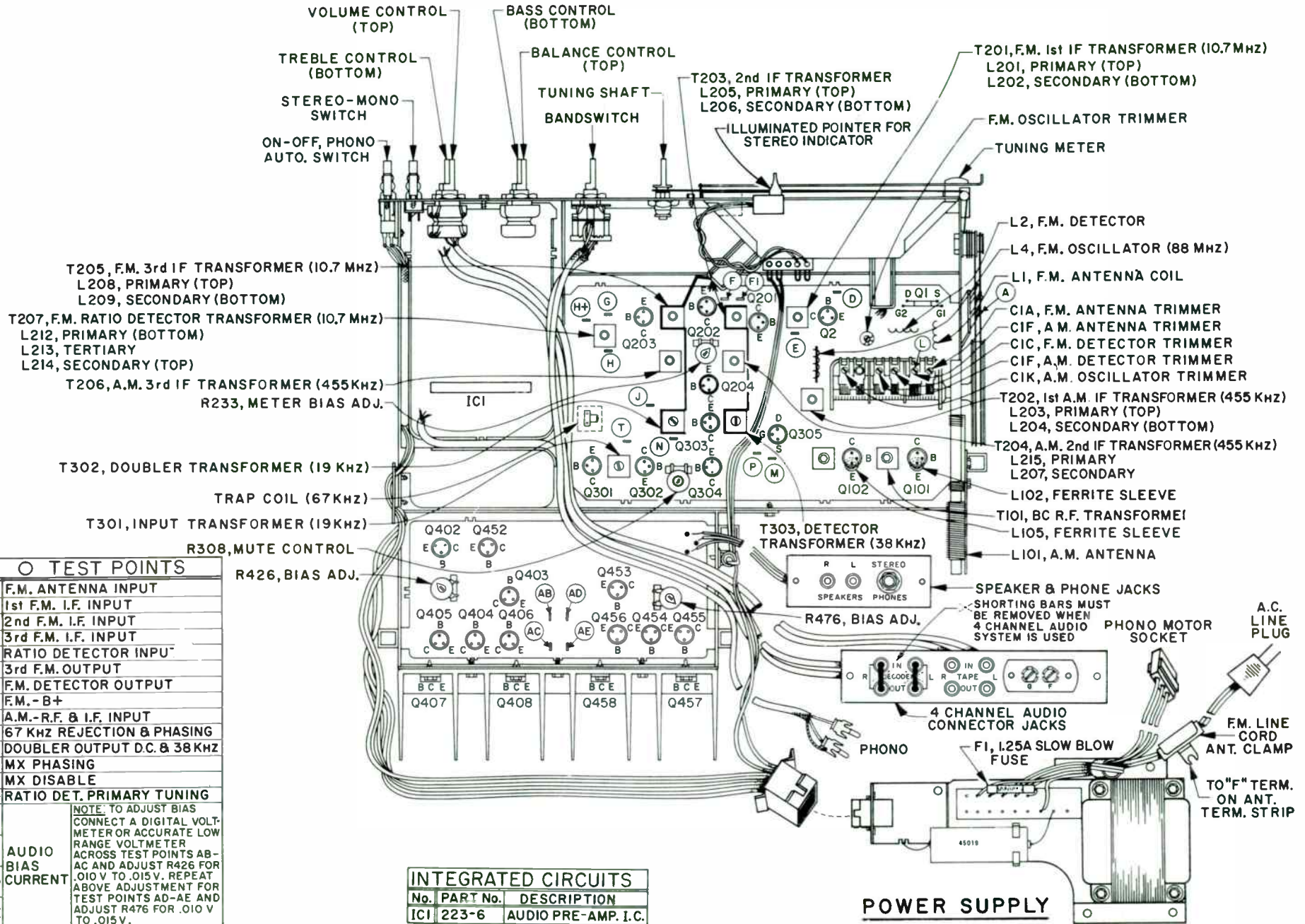
**Scope Pattern - B**

10.6 and 10.8 MHz markers must be symmetrically positioned with 10.7 MHz at center of curve. This point must be adjusted for maximum.



**Detector Probe -**

If your oscilloscope is not equipped with a detector probe, one can easily be constructed. For best results the probe should be shielded.



O TEST POINTS		
A	F.M. ANTENNA INPUT	
D	1st F.M. I.F. INPUT	
E	2nd F.M. I.F. INPUT	
F	3rd F.M. I.F. INPUT	
FI	RATIO DETECTOR INPUT	
G	3rd F.M. OUTPUT	
H	F.M. DETECTOR OUTPUT	
J	F.M. - B+	
L	A.M.-R.F. & I.F. INPUT	
M	67 KHZ REJECTION & PHASING	
N	DOUBLER OUTPUT D.C. & 38 KHZ	
P	MX PHASING	
T	MX DISABLE	
H+	RATIO DET. PRIMARY TUNING	
AB	NOTE: TO ADJUST BIAS CONNECT A DIGITAL VOLT-METER OR ACCURATE LOW RANGE VOLTMETER ACROSS TEST POINTS AB-AC AND ADJUST R426 FOR .010 V TO .015 V. REPEAT ABOVE ADJUSTMENT FOR TEST POINTS AD-AE AND ADJUST R476 FOR .010 V TO .015 V.	
AC		AUDIO BIAS
AD		BIAS CURRENT
AE		

INTEGRATED CIRCUITS		
No.	PART No.	DESCRIPTION
IC1	223-6	AUDIO PRE-AMP. I.C.



RF AND IF ALIGNMENT PROCEDURE

STEP	CONNECT VTVM / SCOPE TO	CONNECT GENERATOR TO	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	SET DIAL TO	ADJUST	PURPOSE	
NOTE: For AM Alignment Use A Signal With 400 Hertz Modulation, Bandswitch in AM.								
1	VTVM Speaker Voice Coil	One turn loosely coupled to wavemagnet		455 KHz	600 KHz	L203, L204, L207, L210, L215	Align IF channel for maximum output	
2				1600 KHz	1600 KHz	C1K	Set oscillator to dial scale	
3				600 KHz	600 KHz	L103		
4				Repeat Steps No. 2 & 3				
5				1400 KHz	1400 KHz	C1H	Align RF stage	
6				600 KHz	600 KHz	T101		
7				Repeat Steps No. 5 & 6				
8				1400 KHz	1400 KHz	C1F		Align antenna stage.
NOTE: For FM Alignment Use A Signal With 400 KHz Deviation, Bandswitch in FM, AFC "OFF".								
9	Scope Ratio Detector Test Point "H"	Term. No. 5 of T205 3rd IF Trans. Test Point "G"		10.7 MHz	Gang Closed	L212	Adjust Primary and Secondary of ratio detector for maximum amplitude and symmetry, as shown in Scope Pattern "A"	
10						L214		
11	Scope Last FM IF Test Point "G"	Term. No. 3 of T203 2nd IF Trans. Test Point "F"	47 ohm in shunt with gen. output. Then from hot lead a 27 ohm in series with a .001 MFD capacitor.			L208 & L209		Align I.F. transformer for maximum output and symmetry. This pattern is not necessarily identical to the overall Scope Pattern "B"
12		Term. No. 4 of T201 1st IF Trans. Test Point "E"				L205 & L206		
13		Connect to Test Point "D"				L201 & L202		
14						Readjust L201, L202, L205, L206, L208 & L209	Align I.F. transformer for maximum output and symmetry as indicated in Scope Pattern "B"	
NOTE: In Steps 13B and 14B Generator ground Must be Connected On Braid As Close To Gang As Possible								
15	Scope Last FM IF Test Point "G"	FM Antenna Post (Remove Antenna) Test Point "A"	300 ohm	106 MHz	106 MHz	C13	Set oscillator to dial scale	
16				90 MHz	90 MHz	L4		
17				Repeat Steps 15 & 16				
18				106 MHz	106 MHz	C1C	Align FM Detector stage for maximum	
19				90 MHz	90 MHz	L2 if necessary		
20				106 MHz	106 MHz	C1A	Align FM Antenna stage for maximum	
21				90 MHz	90 MHz	L1 if necessary		
22				Repeat Steps 15 thru 21				

Zenith C590W2, C590W3 (Ch. 29CT21Z2)

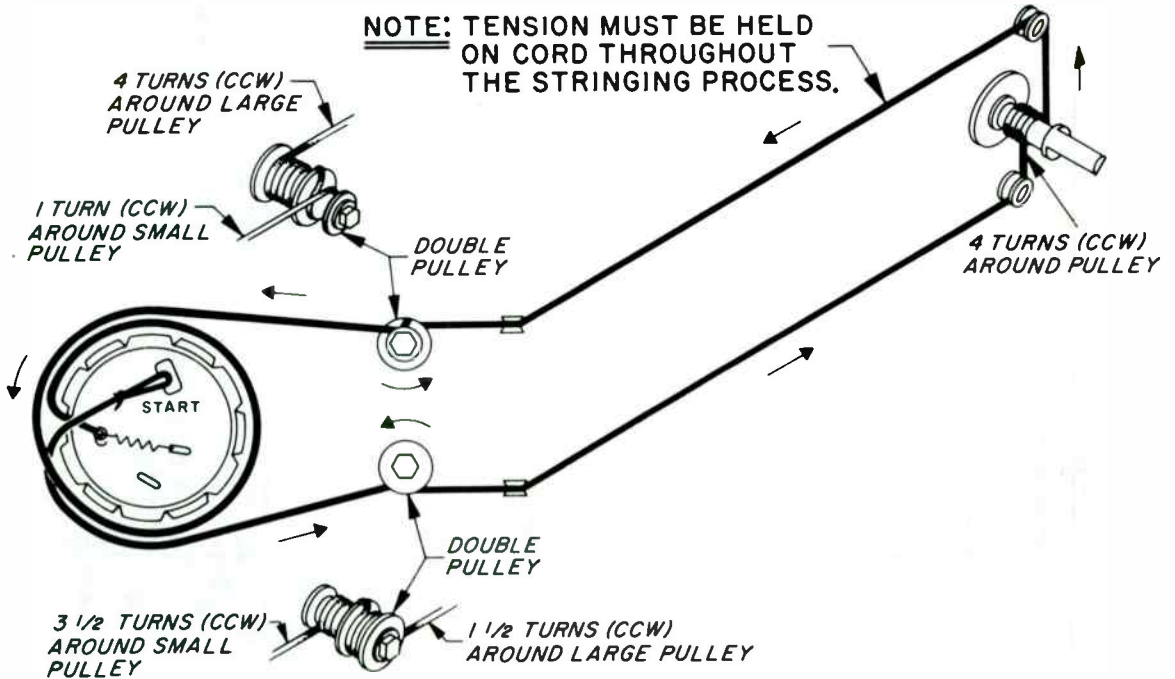
## FM – MULTIPLEX ALIGNMENT PROCEDURE

Before aligning or servicing Multiplex Circuits be certain that RF, IF, and Ratio Detector are correctly aligned and that operation is normal on monaural FM signals.

STEP	CONNECT SCOPE AND/OR VTVM	CONNECT GENERATOR	DUMMY ANTENNA	INPUT SIGNAL FREQUENCY	BAND	SET DIAL TO	ADJUST	PURPOSE
<b>NOTE: PLACE BANDSWITCH IN FM POSITION AND STEREO/MONO SWITCH IN STEREO. USE RF FREQUENCY NEAR CENTER SCALE</b>								
1**	Test Point "M" Composite Amp VTVM(AC)	Test Point "A" FM ANT.	300 Ohm	98MHz, 67kHz SCA	FM	98MHz	(T301**)	Adjust 67kHz Trap for minimum.
2	Test Point "N" Doubler VTVM(DC)			98MHz, 10% Pilot			T301, T302, R308 (T302, T303, R309**)	Adjust 19kHz Amp and Doubler for maximum.
3				98MHz, 5% Pilot			R308(R309**)	Adjust mute control to point where stereo lamp lights up.
4	"L" Audio Output (After 38kHz filter) VTVM(AC)			98MHz, 10% Pilot L+R, L-R, (Mod. L Only)			T303(T304**)	Adjust 38kHz Detector for maximum at "L" Output. NOTE— "L" Output should be approximately 10 (or greater) times "R" Output.
5	"R" Audio Output (After 38kHz filter) VTVM(AC)			Check "R" channel output				

## DIAL CORD DRIVE

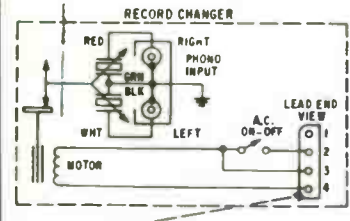
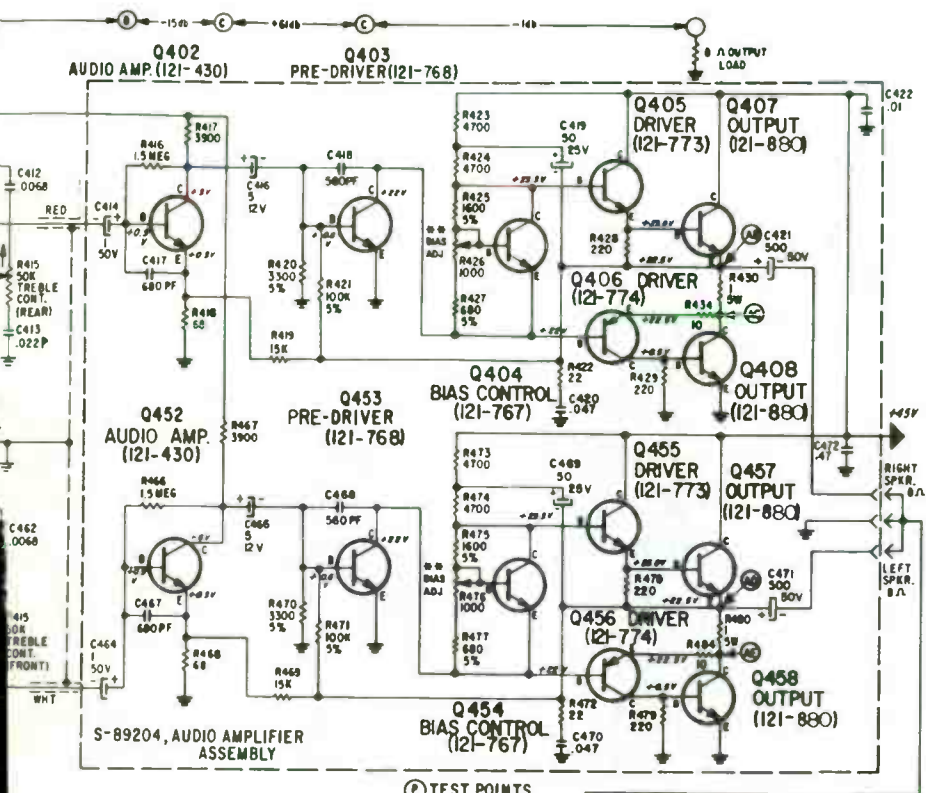
SHOWN IN FULL COUNTERCLOCKWISE POSITION





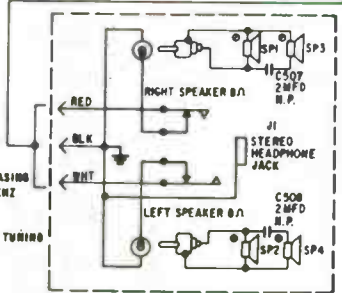


-13dB  
GAINS AT MAX. CONTROL SETTINGS

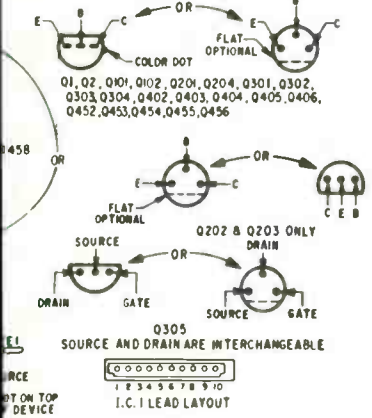


**TEST POINTS**

- A F.M. ANT. INPUT
- D 1ST F.M. IF INPUT
- E 2ND F.M. IF INPUT
- F 3RD F.M. IF INPUT
- F1 BATH DETECTOR INPUT
- B 3RD F.M. OUTPUT
- H F.M. DETECTOR OUTPUT
- J F.M. B+
- L A.M. R.F. & IF INPUT
- M 675KZ REJECTION & MIX PHASING
- N DOUBLER OUTPUT DC @ 36KHZ
- P MIX PHASING
- T MIX DISABLE
- M+ RADIO DETECTOR PRIMARY TUNING



**TRANSISTOR LEAD LAYOUTS**  
LEAD END VIEWS



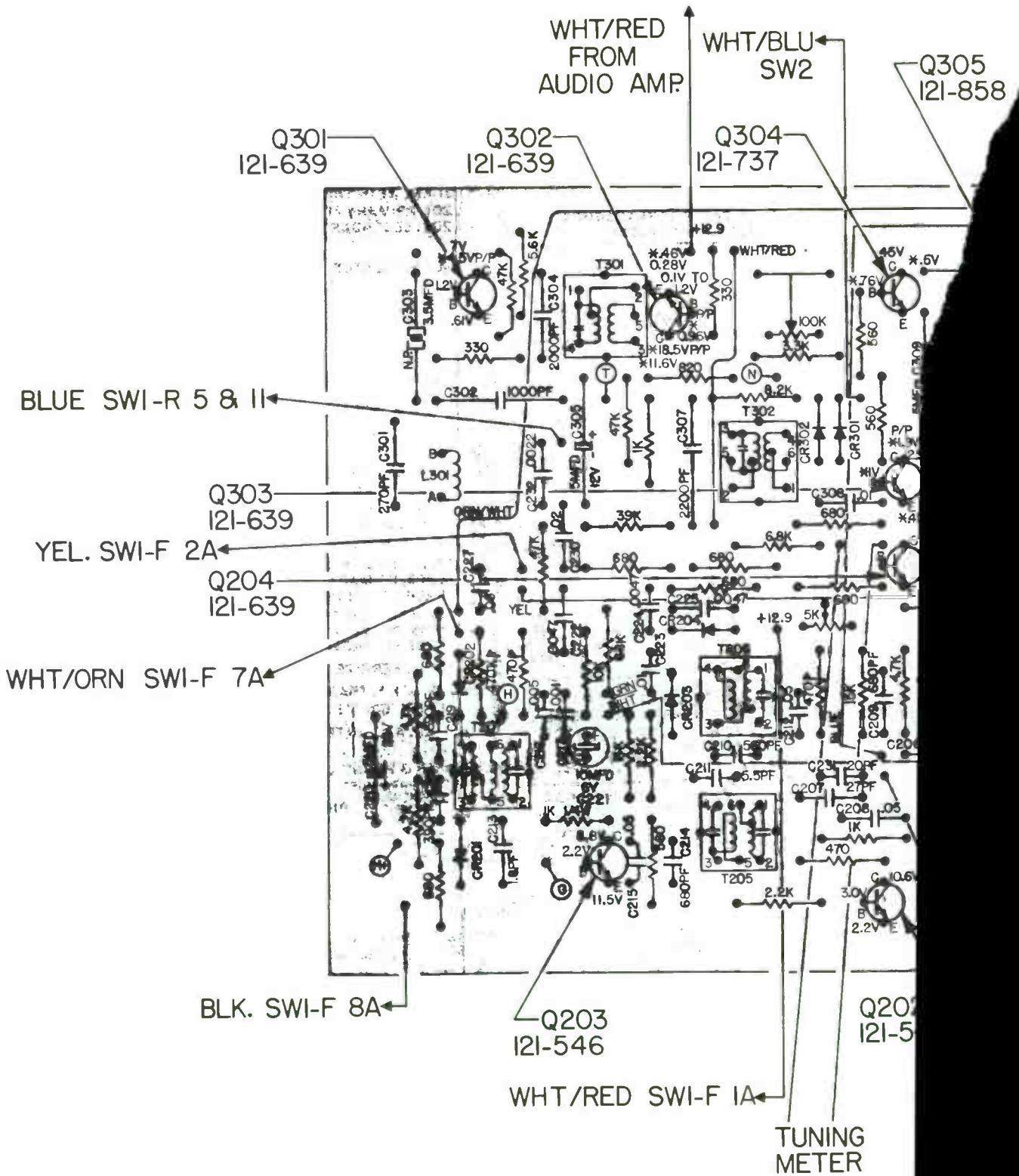
**NOTES:**

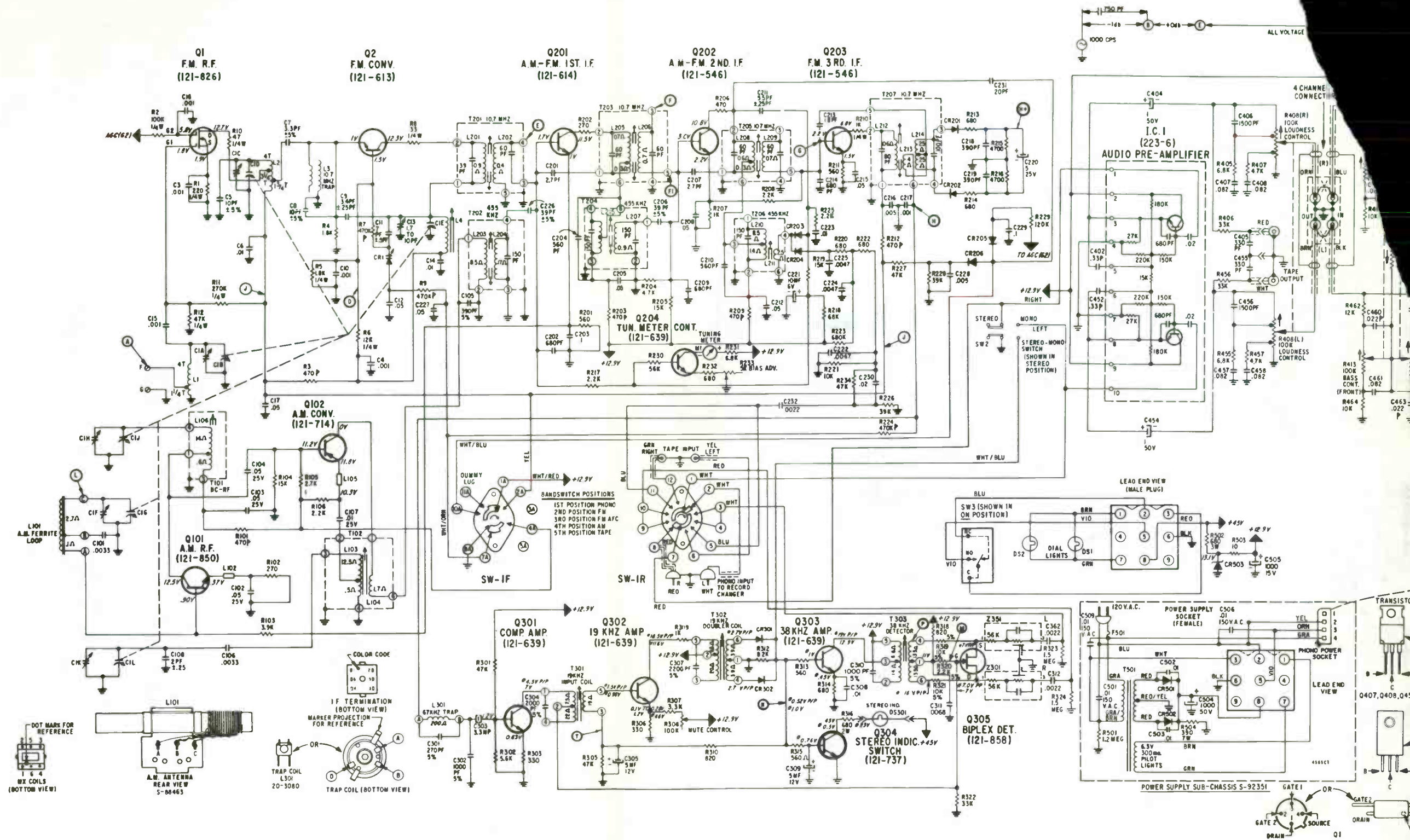
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED  
D.C. VOLTAGES SHOWN ARE MEASURED FROM CHASSIS, WITH NO SIGNAL INPUT, LOUDNESS CONTROL AT MINIMUM, LINE VOLTAGE 120 V.A.C. USING A HIGH IMPEDANCE V.T.V.M.  
ALL RESISTORS IN OHMS, 1/2 WATT CARBON, ± 10% UNLESS OTHERWISE SPECIFIED  
ALL CAPACITORS ARE IN MICROFARADS ± 10% UNLESS OTHERWISE SPECIFIED  
I.F. FREQUENCY: A.M. 456 KHz  
F.M. 10.7 MHz  
TUNING RANGE: A.M. 540-1800 KHz  
F.M. 88-108 MHz

- ⊥ INDICATES CHASSIS GROUND
- ⊕ INDICATES ± 20% TOLERANCE
- ⊖ INDICATES VOLTAGE SOURCE
- ⊙ TEST POINTS

**BIAS TEST POINTS**

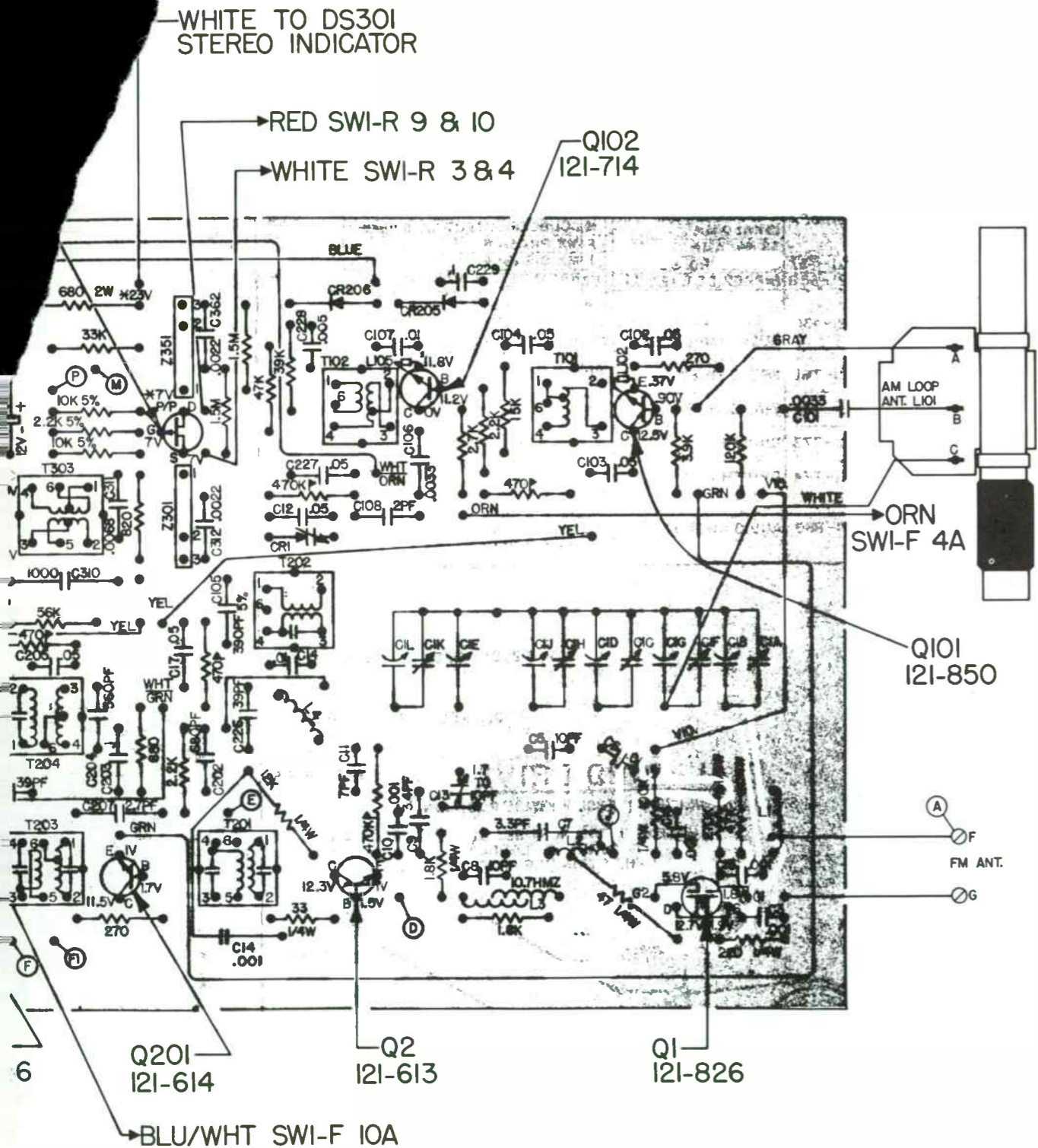
\* VOLTAGES MEASURED IN THE F.M. STEREO POSITION.  
\* TO ADJUST BIAS, CONNECT A DIGITAL VOLTMETER OR ACCURATE LOW RANGE VOLTMETER ACROSS TEST POINTS AB-AC AND ADJUST R426 FOR .010V TO .015V. REPEAT ABOVE ADJUSTMENT FOR TEST POINTS AD-AE AND ADJUST R478 FOR .010V TO .015V.  
OUTPUT DEVICES MUST BE USED AS PAIRS FROM THE SAME MANUFACTURER IN EACH CHANNEL.  
**X** SHORTING BAR MUST BE REMOVED WHEN 4 CHANNEL AUDIO SYSTEM IS USED





CHASSIS 29CT21Z2 - SCHEMATIC

Zenith C590W2, C590W3 (Ch. 29CT21Z2)



—WIRING AND COMPONENTS VIEWED FROM FOIL SIDE

SEMICONDUCTORS

ITEM	PART NO.
CR1	103-47 (103-189)
CR201	103-90
CR202	103-90
CR203	103-23
CR204	103-23
CR205	103-23
CR206	103-23
CR301	103-23
CR302	103-23
CR501	212-76
CR502	212-76
CR503	103-96
IC1	223-6
Q1	121-826
Q2	121-613
Q101	121-850
Q102	121-714
Q201	121-614
Q202	121-546
Q203	121-546
Q204	121-639
Q301	121-639
Q302	121-639
Q303	121-639
Q304	121-737
Q305	121-858
Q402	121-430
Q403	121-768
Q404	121-767
Q405	121-773
Q406	121-774
Q407	121-880 (121-853)
Q408	121-880 (121-853)
Q452	121-430
Q453	121-768
Q454	121-767
Q455	121-773
Q456	121-774
Q457	121-880 (121-853)
Q458	121-880 (121-853)

ELECTROLYTIC/VARIABLE CAPS

ITEM	PART NO.	VALUE
C1	22-6245	Tuning Gang
C13	22-4855	1.7-10pf Trimmer
C220	22-3896	5mfd 25V
C221	22-5486	10mfd 6V
C303	22-6246	3.3mfd 15VNP
C305	22-2884	5mfd 12V
C309	22-2884	5mfd 12V
C404	22-3687	1mfd 50V
C414	22-3687	1mfd 50V
C416	22-2884	5mfd 12V
C419	22-5986	50mfd 25V
C421	22-5316	500mfd 50V
C454	22-3687	1mfd 50V
C464	22-3687	1mfd 50V
C466	22-2884	5mfd 12V
C469	22-5986	50mfd 25V
C471	22-5316	500mfd 50V
C504	22-5362	1000mfd 50V
C505	22-4573	1000mfd 15V
C507	22-4588	2mfd 30VNP
C508	22-4588	2mfd 30VNP

CONTROLS/SPECIAL RESISTORS

ITEM	PART NO.	DESCRIPTION
R233	63-8708	5000 ohms Bias

R308	63-6495	100K Muting
R408	63-8999	100K Dual Volume
R413	63-8997	100K Dual Bass
R415	63-8998	50K Dual Treble
R426	63-8977	1000 ohms Bias
R430	63-6424	1 ohm 5W
R432	63-8996	250K Balance
R476	63-8977	1000 ohms Bias
R480	63-6424	1 ohm 5W

COILS/TRANSFORMERS

ITEM	PART NO.
L1	20-3076
L2	20-3077
L3	20-1256
L4	20-1649
L101	S-88463
L102	149-311
L103	INT102
L104	INT102
L105	149-311
L106	INT101
L201	INT201
L202	INT201
L203	INT202
L204	INT202
L205	INT203
L206	INT203
L207	INT204
L208	INT205
L209	INT205
L210	INT206
L211	INT206
L212	INT207
L213	INT207
L214	INT207
L215	INT209
L301	20-3080 (S-79435)
T101	95-2750
T102	95-2544
T201	95-2753
T202	95-2751
T203	95-2754
T204	95-2752
T205	95-2755
T206	95-2543
T207	95-2756
T301	95-2858
T302	95-2856
T303	95-2857
T501	95-2940

MISCELLANEOUS

ITEM	NAME	Part No.
F501	Fuse, 1.25 Amp S10-B10	136-79
M1	Meter, Tuning	122-66
S1	Switch, Band	85-1210
S2	Switch, Stereo/Mono	85-1212
S3	Switch, AFC	85-1349
SP1	Speaker, 6" PM	49-1214
SP2	Speaker, 6" PM	49-1214
SP3	Speaker, Horn	49-1168
SP4	Speaker, Horn	49-1168
	Assembly, Record Changer	169-436
	Cartridge, Phono	142-162
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50X92-18 .....	33	711 .....	32	LSC-25 (24-03236WX) ..	9	T-11 .....	19	SD-203 .....	28
80L33-18 .....	27	Chassis		LSC50 .....	3	T-100A .....	37	SE-840 .....	34
80L77-18 .....	29	H18-201 .....	37	LSC100 (24-02907WX) ..	11	T-107 .....	22	SE-850 .....	33
80P25-19 .....	26	H18-202 .....	37	LSC-888 (24-03228WX) ..	17	T-108 .....	23	SE-970 .....	18
80P37-19 .....	31	H19-201 .....	36	24-0316WX .....	3	T-109 .....	23	SE-990 .....	41
80X76-18 .....	34	H19-202 .....	36	655 .....	3	T-113 .....	20	SE-1519 .....	6
Chassis		ELECTROPHONIC		Chassis		T-400 .....	40	SE-2030 .....	28
1.00231 .....	33	(See Morse/ElectroPhonic)		99-01893WX .....	7	T-500A .....	26	SE-2070 .....	26
1.00991 .....	27	ELGIN		LEAR JET		T-600 .....	17	SE-2075 .....	40
1.01001 .....	29	RM-4100, RM-4200,		H-410, H-460 .....	5	T-600A .....	37	SG-999 .....	2
1.01041 .....	26	RM-4210, RM-4300,		LLOYD'S		T-600B .....	39	PENNEY'S - PENNCREST	
1.01051 .....	31	RM-4340 .....	29	1M10-94A .....	18	T-700 .....	26	853-1352 .....	41
1.01141 .....	34	EMERSON		1M53-07A .....	27	T-800 .....	28	1100 .....	10
1.01161 .....	34	31M15 .....	26	1V56W-34A .....	10	T-4100 .....	21	1310 .....	26
1.01171 .....	34	31M16, 31M16A .....	30	9F13-08 .....	13	T-4200 .....	27	1312 .....	28
AUTOMATIC		31M17, 31M17A .....	24	9F15-08 .....	15	T-4600 .....	34	1330A .....	31
HDX-4000 .....	27	31M25, 31M25B .....	36	9F85 .....	6	TG-440 .....	40	1701 .....	29
BELL & HOWELL		31M30 .....	39	9M19 .....	12	4DT411 .....	35	1702 .....	34
3600 .....	36	FISHER		9M20-07A .....	15	102R, 105 .....	15	1703 (853-1352) .....	41
3650 .....	37	125B (Serial Number		9M39-94A .....	13	124870 .....	1	1760 .....	36
BRADFORD		50001 and Up) .....	38	9M73 .....	12	125265 .....	1	1900 .....	40
WTG30-96438A .....	5	210-T .....	40	MAGNAVOX		Chassis		5910 .....	35
WTG-5330 .....	29	250-T .....	24	1K8891, 1K8892 .....	20	12M .....	1	5925 .....	30
WTG51839 .....	33	400-T .....	24	1K8895 .....	40	22 .....	16	6015B .....	1
WTG53553 .....	36	GENERAL ELECTRIC		1P9281 .....	16	MOTOROLA		6422, 6422A .....	9
WTG59022 .....	41	A505g/h .....	37	1P9282 .....	21	SK102GW .....	24	6651 .....	12
WTG-59048 .....	39	C172g .....	37	1R1710 .....	1	SK104GW .....	22	6681 .....	24
1404840 (WTG-53553) ..	36	C460g .....	37	1R1811, 1R9270,		SK106GW .....	26	6825, 6825A .....	21
1404E42 .....	33	C467g/h .....	37	1V9053, 1V9054 .....	27	SK107GW .....	24	6900A .....	6
1405C30 .....	5	G270g .....	37	2K8886 .....	24	TT39FW .....	20	6912A .....	33
1405M31 .....	26	G504g/h .....	37	2P9281 .....	16	NIVICO		8511 .....	1
1427A31 .....	29	G507g .....	37	701454-1 .....	27	4210 .....	3	8551 .....	1
1453C31 (WTG59022) ..	41	M8635A .....	38	Chassis		4320 .....	3	8571A .....	1
1453D41 (WTG-59048) ..	39	M8650A (Similar		AS11-01-AA .....	16	8920 .....	6	Chassis	
2104E31 (WTG-61028) ..	28	to page 37) .....	32	A512-01-AA .....	21	9810 .....	9	R681 .....	31
53322 .....	32	P365g, P365h .....	35	R233-01-AA/-02-AA,		OLYMPIC		PHILCO-FORD	
53702 .....	25	P462g .....	20	R234-01-AA/-02-AA ..	20	CS821 .....	25	M3720U .....	30
59089 .....	34	P572g, P572h .....	35	R235-01-AA,		CS843 .....	36	M3760U .....	35
CAPEHART		P774g .....	37	R235-02-AA .....	13	CS844 .....	36	M4720U .....	30
P880 .....	10	P775g .....	37	R240-01-AA .....	24	CS845 .....	36	M4760U .....	35
8770 .....	10	SKT300 (Similar		R244-01-AA .....	40	CST850 .....	36	35-1613-1, 35-1613-2 ..	30
770 .....	10	to page 37) .....	32	R264-03-CB .....	1	CT822 .....	25	Chassis	
2001 .....	13	T2010, T2010A-1 .....	31	R265-06-AA .....	10	Chassis		T20TS, T20TSR .....	30
CLARICON		T2020, T2020A .....	30	R271-01-AA/-02-AA,		330-1 .....	36	T70TS, T70TSR .....	35
35-130 .....	2	T2040, T2040A .....	28	R271-71-AA/-72-AA ..	14	PACKARD BELL		PILOT	
35-140 .....	14	T2050A .....	32	R278-01-AA,		RPC718 .....	41	MC-20 .....	7
35-160, 35-180 .....	5	8630A .....	25	R278-02-AA .....	27	RPC719 .....	41	MC-30 .....	10
6720 .....	2	Chassis		MARANTZ		RPS103 .....	41	Chassis	
67230 .....	14	PK6 .....	35	22 .....	29	RPTS155 .....	41	PIONEER	
67350 .....	5	PK16 .....	35	28 .....	31	RS103 .....	41	SX-440 .....	22
CONCERTONE		PK170 .....	37	MASTERWORK		RTS-22 .....	1	SX-525/FW .....	39
SAT-1010X .....	16	T7NK .....	20	M500 .....	25	RTS-24 .....	25	SX-525/FVZW .....	39
CONCORD		HITACHI		M502 .....	31	RTS123 (Similar to		SX-525/KCW .....	39
CE-15 .....	2	DPK-321(U) .....	26	M503 .....	33	RTS24) Page 78 .....	25	SX-525/NJW .....	39
F-600 .....	7	DPK-340 .....	37	M504 .....	28	RTS123A .....	27	SX-525/NBW .....	39
HES-20 .....	4	DPK-345 .....	33	M506 .....	32	Chassis		SX-770 (FVW, KCW) ..	24
		KS-2200H .....	2	M2415 .....	10	30HF1 .....	41	SX-990 .....	21
		KS-2210 .....	24	M4002 .....	1	PANASONIC		REA	
		KS-2300 .....	25	M4700 .....	3	RE-7080, RE-7080C ..	17	RK-325A .....	3
		KS-2400H .....	13	M4710 .....	10	RE-7412 .....	29	RK-329B .....	3
		KSP-2850 .....	39	M4720 .....	34	RE-7430, RE-7430C ..	24	RK329C .....	33
		SDP-2820 .....	38	M5130 .....	1	RE-7670, RE-7670C ..	12	RK329E .....	27
				M5132 .....	1				

RCA (CONT.)	VOL.	SEARS-SILVERTONE (CONT.)VOL.	SONY (CONT.)	VOL.	SYMPHONIC (CONT.)	VOL.	WESTINGHOUSE (CONT.) VOL.		
RK335A	34	528.32861100	31	TA-1144	36	1253T	37	PAS7150A	25
RZC288	29	528.32870000/1/2	19	TC-119A	38	1323CR,1323T	33	RCF9100A	26
RZC291W	20	528.32880100	25	8FS-50W	13	1324,1324CR,1324T	33	RCF9120A	24
RZC292	31	548.74210000	37			1433	32	RCF9130A	38
RZC295W	18	570.74050100	40	SOUNDESIGN		2123	34	RCF9150A	29
RZC792	38	700.91310200	39			2223	34	RCF9160A	38
RZC936WK	20	2050	2	4370	10	4202TK	8	RCF9600A	39
RZC941WK	24	2056	9	4488	9	5001WA	8	RCF9620A,RCF9620B	38
SPK250W	3	7403	4			5202WA	16	RCF9624A	30
SS3000W	18	7413	6	SUPERSCOPE		5204-WA	38		
SS4000	3	7415	7					Chassis	
TCT800	30	7423	11	R-230	40			V2541-1	32
TCT801	34	7433	14			Chassis		V2544-2	32
VMP68W,VMP69W,		7473	7	SYLVANIA		A-881-1	8	V2693-1	32
VMP99WK	5	74033	4	ACS14	27	A-881-9	8	V2694-1	32
VPP64W	8			ACS16	41	R-835	23	V3012C01	26
VS1250W	38	Chassis		CR280	25	R-840	34	V-3014-C01	24
VS1300W	28	132.51701	9	CR2740	27	R-845	34	V-3014-C02	29
VS1400Y	29	132.52601/602	2	CR2741	41			V3023C01	38
VS1420Y	31	540.10030	4	CR2742	31	TELEDYNE PACKARD BELL		V3023C02	38
VS3000	33	540.10050	6	CR2742A (Similar		(See Packard Bell)		V-4003-C03	25
VS3001W	27	540.10070	11	to page 115)	31	TELEFUNKEN		V-4007-C01	12
VS4000	26	540.10090	14	CRT2730W	29	T201	35	ZENITH	
VS6025	34	540.10100	7	CS20W	4	TOSHIBA		A564W	2
YZD572W	36			CS35P	4	SM-350	33	A589W	3
YZD596W	37	SHARP		Exponent 4/45W	4	550C	26	C587W	24
YZD597W	40	SA-104U	32	MM12WX	38	TOYO		C590w2	41
YZD599W	30	SA-301U	28	MM12WX-1	38	CRH-661	34	C590W3	41
		SD-101U	41	MS150W	4	TRUETONE		Z590P/W	1
Chassis				MS2712W	38	DC1055	35	Chassis	
RC-1227L	5	SHERWOOD		MS2720	27	MAE610SA-17(4DC6105)	12	10AT37	2
RC-1240A/B,RK-327,		SEL-200 (Serial Number		MS2722	41	M1C1055A07 (DC1055)	35	10ZT30	1
RK-327B	16	291001 and later)	39	MS2728 (Similar		SYR6096A-07/96B-07		11ZT27	1
RS-255A	2			to page 115)	31	(4DC6069/69B)	15	20AT31Z	3
RS-255B	8	SILVERTONE		MS3712W (Similar				29CT20	24
		(See Sears-Silvertone)		to page 99)	38	WARDS AIRLINE		29CT21Z2	41
REALISTIC		SINGER		MS3722	41	GEN-1745A	25		
SC-70 (13-1045)	11	HE-925	1	MST2736	41	GEN-2930A	8		
12-694	20	HE-4020	33	MST2738(Radio Ch.		GEN-6011A	23		
12-1470 (Modulaire)	17			Only)	41	GEN-6022A	41		
12-1487	19	SONY		Chassis		GEN-6022B	41		
22W (13-1138)	12	CF-500	32	P55-1	4	GEN-6031A	24		
REALTONE		CF-610	40	P55-2	4	GEN-6111A	25		
4356	7	CF-620	40	P63-2	38	JWR-2812A/B	10		
ROSS		HP-150(CSA),(E),(UL)	28	P63-3	38	JWR-2814A, JWR-2814B	21		
RE-3430	15	HP-155	7	Q28-3	4				
SANYO		HP-180W	27	R33-3/-4	27	WEBCOR			
DCX2500K	35	HP-188	3	R49-3	25	ST180	29		
DXL5480	32	HP-215	39	R53-3	41	WFX158	32		
DXRS110	38	HP-450A(CSA),(UL)	33	R53-4	41	WFX257	39		
SEARS-SILVERTONE		HP-465	4	R53-8	41	350	35		
171.32752200	38	HP-465A	31	R63-3	31	WESTINGHOUSE			
499.74060000/60001	23	HP-480,A	8	R63-13 (Similar		H394C	32		
499.74180000	30	HP-510	37	to page 115)	31	PAS7118A	12		
528.32860000/1/2/3/4/		HP-580	11	R63-55 (Similar					
5/6	19	HST-110	30	to page 115)	31				
		HST-119	38	S38-3	4				
		HST-230A	34	SYMPHONIC					
		HST-330	35	1123B,1123G	34				
		ST-5100	41	1143	23				
				1253	37				



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