

*REALISTIC*<sup>®</sup>

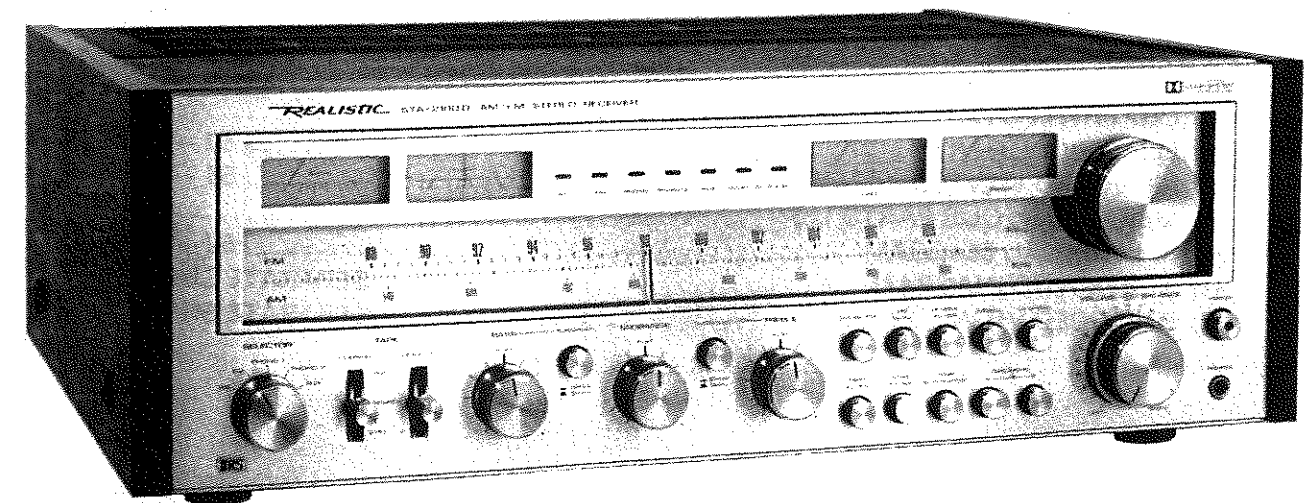
# Service Manual

31-2090

**STA-2100D**

**AM/FM STEREO RECEIVER**

**Catalog Number : 31-2090**



RADIO SHACK **T/C** A DIVISION OF TANDY CORPORATION

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CUSTOM MANUFACTURED FOR RADIO SHACK **T/C** A DIVISION OF TANDY CORPORATION

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## 1) ELECTRICAL PERFORMANCE SPECIFICATIONS

### AM SECTION

- Notes:**
1. Output readings are taken across a non-reactive 47K load termination.
  2. Output is measured at TAPE OUT terminals.
  3. The Generator output shall terminate in an IRE loop antenna.
  4. Standard modulation: 400 Hz, 30% modulation.

	UNIT	NOMINAL	LIMIT
Frequency Coverage	(kHz)	515 - 1650	520 - 1620
IF	(kHz)	455	-
Antenna Sensitivity for S/N 20 dB at 600 kHz, 1000 kHz and 1400 kHz	( $\mu$ V/m)	200	400
Terminal Sensitivity	( $\mu$ V)	10	-
S/N Ratio at 5 mV/m Input	(dB)	45	40
ACA at S/N 20 dB Input, 1000 kHz	(dB)	40	28
AGC Distortion at 100 mV/m Input, 80% modulation	(%)	1.5	4.0
IF Rejection Ratio at 600 kHz	(dB)	56	48
Image Rejection Ratio at 1400 kHz	(dB)	60	52
Bandwidth at 6 dB down, 1000 kHz	(kHz)	6.0	4.5 - 8.0
Distortion at 5 mV/m Input	(%)	1.0	3.0
Tape Out Level at 5 mV/m Input	(mV)	200	200 $\pm$ 3 dB
Audio Fidelity at 5 mV/m Input (1 kHz = 0 dB) -6 dB Point	(Hz)	50 - 3K	70 - 2.5K
Whistle Modulation of 2nd and 3rd Harmonic at 1 mV, 5 mV and 100 mV	(%)	3.0	10.0
Dial Calibration at 600 kHz	(kHz)	0	$\pm$ 25
at 1400 kHz	(kHz)	0	$\pm$ 50
Spurious Response at 1000 kHz referred to 20 dB S/N Input	(dB)	50	45
AGC Figure of Merit at 1000 kHz	(dB)	48	40

The oscillator shall not drift more than 10 kHz starting at 25°C and through a temperature range up to 50°C.

The Set shall operate in satisfactory manner through a temperature range from 0°C through plus 45°C.

### FM SECTION

- Notes:**
1. Output readings are taken across a non-reactive 47 K load termination.
  2. Output is measured at TAPE OUT terminals.
  3. The signal voltage in this specification is the voltage appearing across the tuner input terminals (IHF).
  4. Standard modulation: 1000 Hz, 75 kHz deviation.

	UNIT	NOMINAL	LIMIT
Frequency Coverage	(MHz)	86.5 - 108.5	88 - 108
IF	(MHz)	10.7	-
IHF Sensitivity at 90, 98 and 106 MHz	( $\mu$ V)	1.6	2.5
	(dBf)	9.3	13.2
S/N 50 dB Quieting Sensitivity	( $\mu$ V)	3.0	4.5
	(dBf)	14.7	18.3
-3 dB Limiting Sensitivity	( $\mu$ V)	1.5	2.0
IF Rejection Ratio at 90 MHz	(dB)	95	80
Image Rejection Ratio at 106 MHz	(dB)	80	70
Spurious Response at 98 MHz	(dB)	90	75
Capture Ratio	(dB)	1.5	2.5

	UNIT	NOMINAL	LIMIT
ACA $\pm$ 400 kHz off tuned, 50 $\mu$ V Input	(dB)	75	60
Harmonic Distortion at 1 mV Input	(%)	0.05	0.3
Dial Calibration Accuracy at 90, 98 and 106 MHz	(kHz)	—	$\pm$ 300
AFC Holding Range	(kHz)	$\pm$ 250	$\pm$ 330
AM Suppression	(dB)	55	48
Maximum Handling Capacity	(mV)	200	100
Tape Out Level	(mV)	680	680 $\pm$ 2 dB
Muting Sensitivity	( $\mu$ V)	3.0	2—6
S/N Ratio at 1 mV Input	(dB)	70	65
Frequency Response at 10 kHz at 75 $\mu$ sec	(Hz)	—	$\pm$ 1.5 dB
at 25 $\mu$ sec	(Hz)	—	$\pm$ 1.5 dB

Temperature range for satisfactory operation is 0°C to 45°C. All Sets must meet the requirements of FCC.

### FM STEREO SECTION

- Notes: 1. Output readings are taken across a non-reactive 47K load termination.  
 2. Output is measured at TAPE OUT terminals.  
 3. Signal voltage in this specification is the voltage appearing across the tuner input terminals.  
 4. Standard modulation: Main carrier (L + R) — 33.75 kHz deviation (45%)  
 Sub carrier (L — R) — 33.75 kHz deviation (45%)  
 Pilot (19 kHz) — 6 kHz deviation ( 8%)

	UNIT	NOMINAL	LIMIT
Stereo Sensitivity	( $\mu$ V)	3.0	2—6
Stereo Separation at 1 mV Input at 100 Hz	(dB)	45	33
at 1 kHz	(dB)	50	35
at 10 kHz	(dB)	40	30
Stereo Distortion at 1 kHz, 1 mV Input	(%)	0.1	0.5
Sub Carrier Rejection Ratio	(dB)	60	54
SCA Rejection Ratio	(dB)	80	—
Stereo Tape Out Level	(mV)	580	580 $\pm$ 2.5 dB

### DOLBY FM SECTION

- NOTE: 1. Output is measured at SPEAKER Terminals.  
 2. Output Level: 1 watt at 8 ohm load  
 3. Standard Modulation:

Stereo Deviation	Main Carrier	37.5 kHz (50%) dev.
	Pilot 19 kHz	6.75 kHz ( 9%) dev.
Modulation Frequency	400 Hz	
Input Level	1 mV	

4. TONE Control: Flat Position

Signal-to-Noise Ratio with CCIR Filter

Dolby FM Switch: OFF

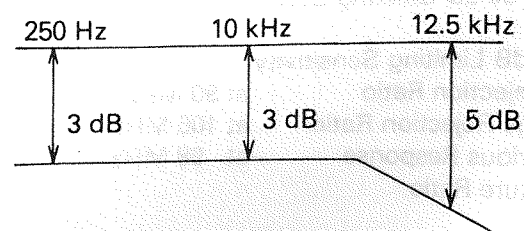
Dolby FM NR Effect, Dolby FM Switch: ON

Frequency Response with DOLBY FM Switch: ON

Dolby Level: —15 dB and —25 dB points

	UNIT	NOMINAL	LIMIT
Signal-to-Noise Ratio with CCIR Filter	(dB)	65	60
Dolby FM NR Effect, Dolby FM Switch: ON	(dB)	4.0	4.0 +0.5 —1.5

Must meet Group "B"  
(see illustration below)



### AUDIO SECTION

		UNIT	NOMINAL	LIMIT
Input Impedance	PHONO 1	(K $\Omega$ )	50	—
	PHONO 2	(K $\Omega$ )	60	—
	AUX	(K $\Omega$ )	60	—
	TAPE 1	(K $\Omega$ )	60	—
	TAPE 2	(K $\Omega$ )	60	—
Output Power, Both Channels Driven at 8 ohms from 20 to 20 kHz, THD 0.09%		(W)	125	120
THD at —3 dB Rated Power from 20 to 20 kHz		(%)	0.05	0.08
Sensitivity for Rated Power	PHONO 1 LOW/MID/HIGH Level	(mV)	2/4/8	2/4/8 $\pm$ 2 dB
	PHONO 2	(mV)	2.2	2.2 $\pm$ 2 dB
	AUX	(mV)	140	140 $\pm$ 2 dB
	TAPE 1/2	(mV)	140	140 $\pm$ 2 dB
	Frequency Response at 10 W $\pm$ 2 dB	(Hz)	15—25K	20—20K
BASS Action	at 100 Hz (Turnover switch: 300 Hz)	(dB)	$\pm$ 10	$\pm$ 10 $\pm$ 2 dB
	at 50 Hz (Turnover switch: 150 Hz)	(dB)	$\pm$ 10	$\pm$ 10 $\pm$ 2 dB
TREBLE Action	at 10 kHz (Turnover switch: 3 kHz)	(dB)	$\pm$ 10	$\pm$ 10 $\pm$ 2 dB
	at 20 kHz (Turnover switch: 6 kHz)	(dB)	$\pm$ 10	$\pm$ 10 $\pm$ 2 dB
MIDRANGE Action	at 1.5 kHz	(dB)	$\pm$ 6	$\pm$ 6 $\pm$ 2 dB
S/N Ratio (Input: Shorted) (IHF)	at PHONO 1	(dB)	70	60
	at PHONO 2	(dB)	70	60
	at AUX	(dB)	75	65
	at TAPE 1, 2	(dB)	75	65
	Hum and Noise at Minimum Volume	(mV)	0.8	1.5
Cross Talk at 1 kHz, AUX position (Input 4.7 K $\Omega$ terminated)		(dB)	60	50
	Loudness Contour at 100 Hz (—30 dB Volume position)	(dB)	+6	+6 +2 —0 dB
High Filter Effect at 10 kHz		(dB)	—6	—6 +1 dB
				—6—2 dB
Low Filter Effect at 50 Hz		(dB)	—3	—3 +1 dB
				—3—2 dB
PHONO Equalizer Response at 100 Hz		(dB)	RIAA	RIAA $\pm$ 1.5 dB
	at 10 kHz	(dB)	RIAA	RIAA $\pm$ 1.5 dB
PHONO Over Load at 1 kHz, 1W 0.8% THD		(mV)	230	200
Channel Balance at Maximum Volume		(dB)	0	$\pm$ 1.5 dB
	Tape Out level with PHONO 2.2 mV Input	(mV)	140	140 $\pm$ 2 dB
(47 K $\Omega$ terminated) with AUX 160 mV Input	(mV)	140	140 $\pm$ 2 dB	
IM Distortion at —3 dB Rated Power		(%)	0.05	0.2
DC Balance at No Signal and Output		(mV)	0	$\pm$ 30
Audio Attenuator		(dB)	10	10 $\pm$ 2 dB
Tape Out Level for DIN Jack (3.3K $\Omega$ terminated)	AM — 400 Hz, 30% modulation 5 mV Input	(mV)	3.3	3.3 $\pm$ 2.5 dB
	FM — 1000 Hz, 22.5 kHz dev. 1 mV Input	(mV)	3.3	3.3 $\pm$ 2.5 dB
	PHONO — 3.6 mV Input	(mV)	3.3	3.3 $\pm$ 2.5 dB
	AUX — 230 mV Input	(mV)	3.3	3.3 $\pm$ 2.5 dB
Hum and Noise, Volume and Tone at Maximum (Input, 4.7 K $\Omega$ terminated)		(mV)	15	—

- Notes: 1. The supply voltage is 120 volts AC from a regulated power supply.  
 2. The power source must be insulated from other equipment connected antenna or output.  
 3. The room temperature is 25 degrees C.  
 4. Nominal Specs represent the design specs; all units should be able to approximate these — some will exceed and some may drop slightly below these specs.  
 Limit Specs represent the absolute worst condition which still might be considered acceptable; in no case should a unit perform to less than within any Limit Spec.

## 2) DISASSEMBLY INSTRUCTIONS

### 1. Remove the Bottom Cover (Metal plate) as follows:

Turn the Receiver up side down and remove fifteen screws from the bottom as shown in Figure A.  
Lift the Bottom Cover off.

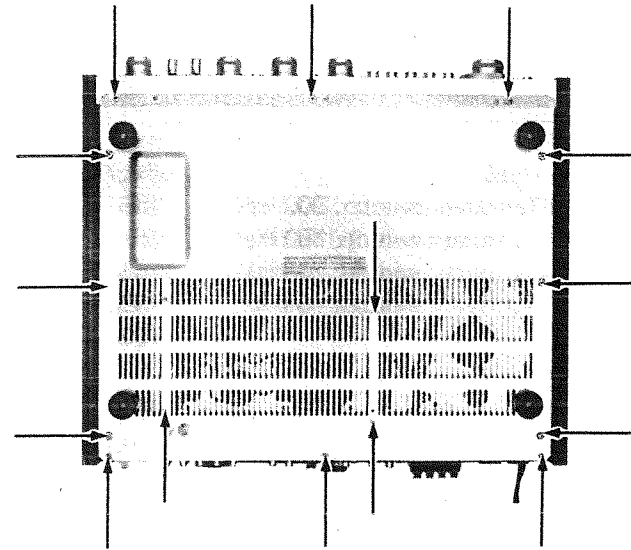


Figure A

### 2. To remove the Cabinet

- Remove two screws from the upper Back Panel as shown in Figure B1.
- Remove two screws from each side of the Cabinet (Figure B2) and pull off Cabinet toward rear of unit.  
Be careful not to lose the screw inserts when the screws are removed.

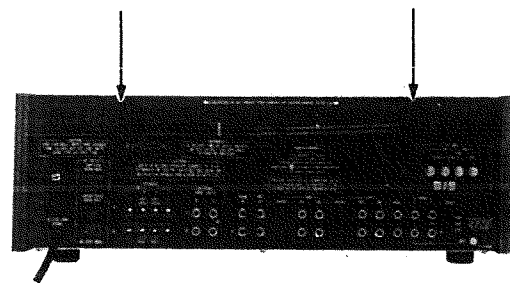


Figure B1

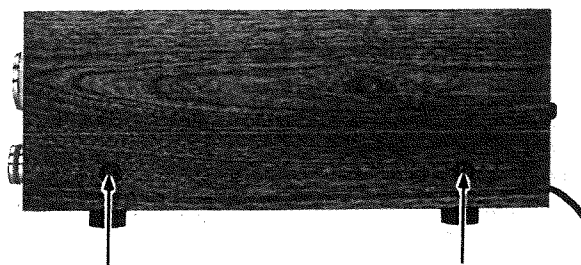


Figure B2

### 3. To remove the Front Panel (Aluminum Panel)

- Remove the Bottom Cover and Cabinet as described in 1. and 2.
- Remove four screws from the Front Panel — two screws from the left side and two screws from the right side. (Figure C1, C2)
- Remove three screws from bottom of Front Panel. (Figure C2)
- Loosen the Tuning Knob screw with an Allen wrench and remove Tuning Knob. All other knobs can simply be pulled off. (Figure C4)

Figure C1

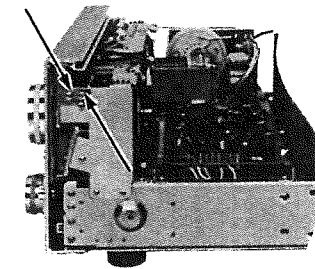


Figure C2

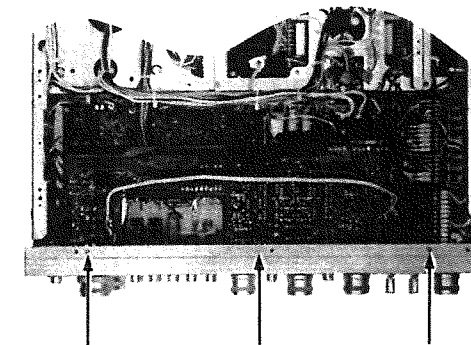
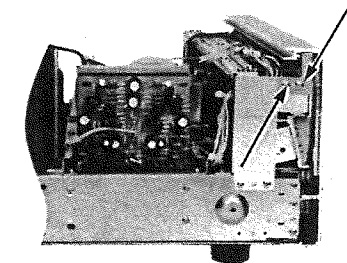


Figure C3

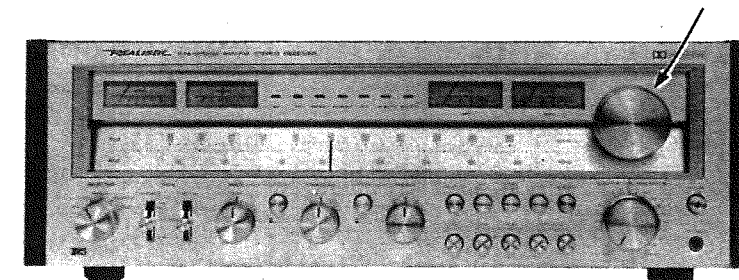


Figure C4

### 4. To remove Rear Panel from Chassis.

Remove five screws from Rear Panel. (Figure D)

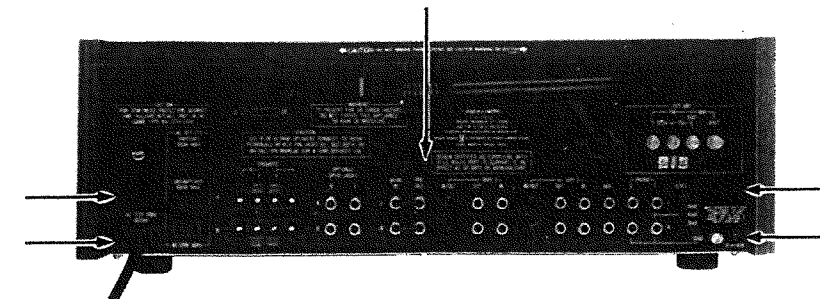
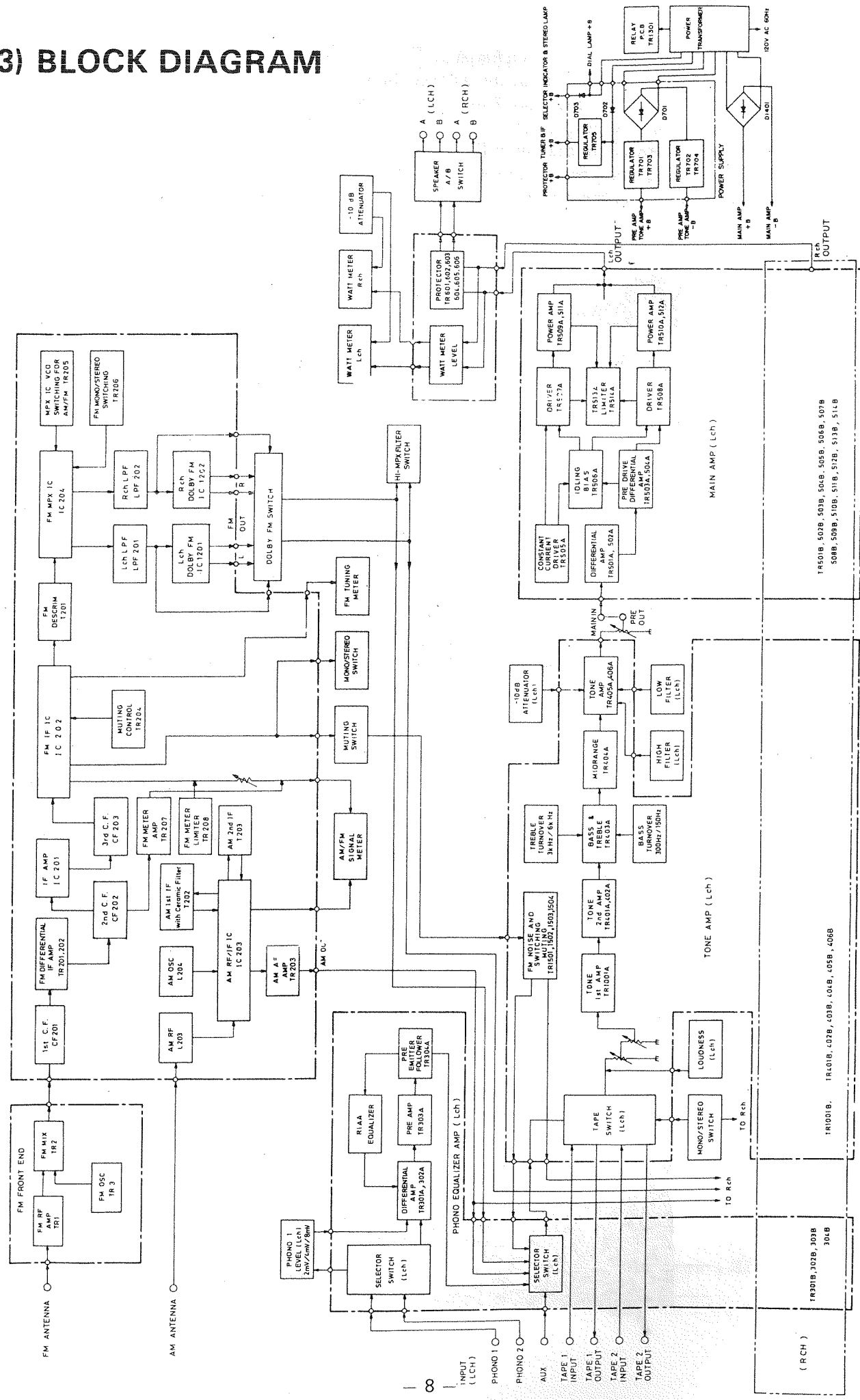


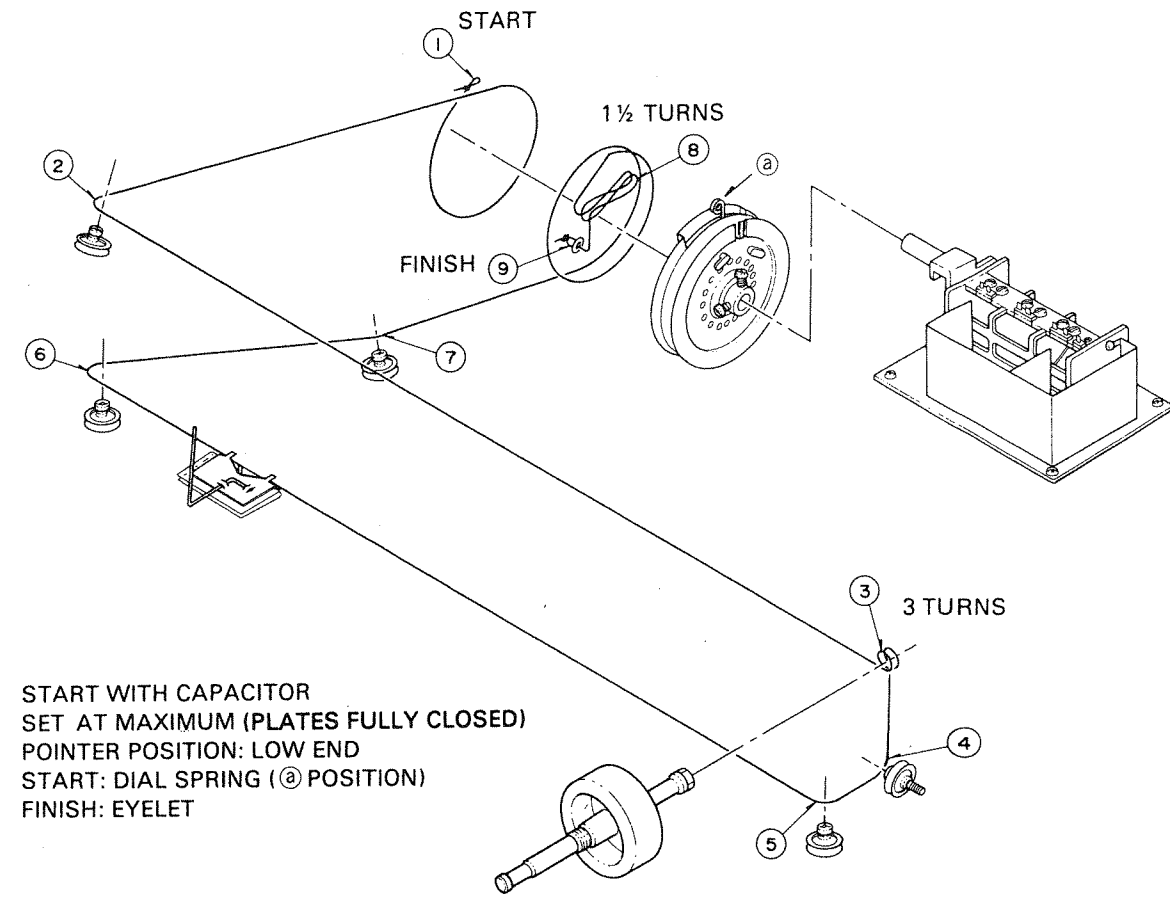
Figure D



### 3) BLOCK DIAGRAM

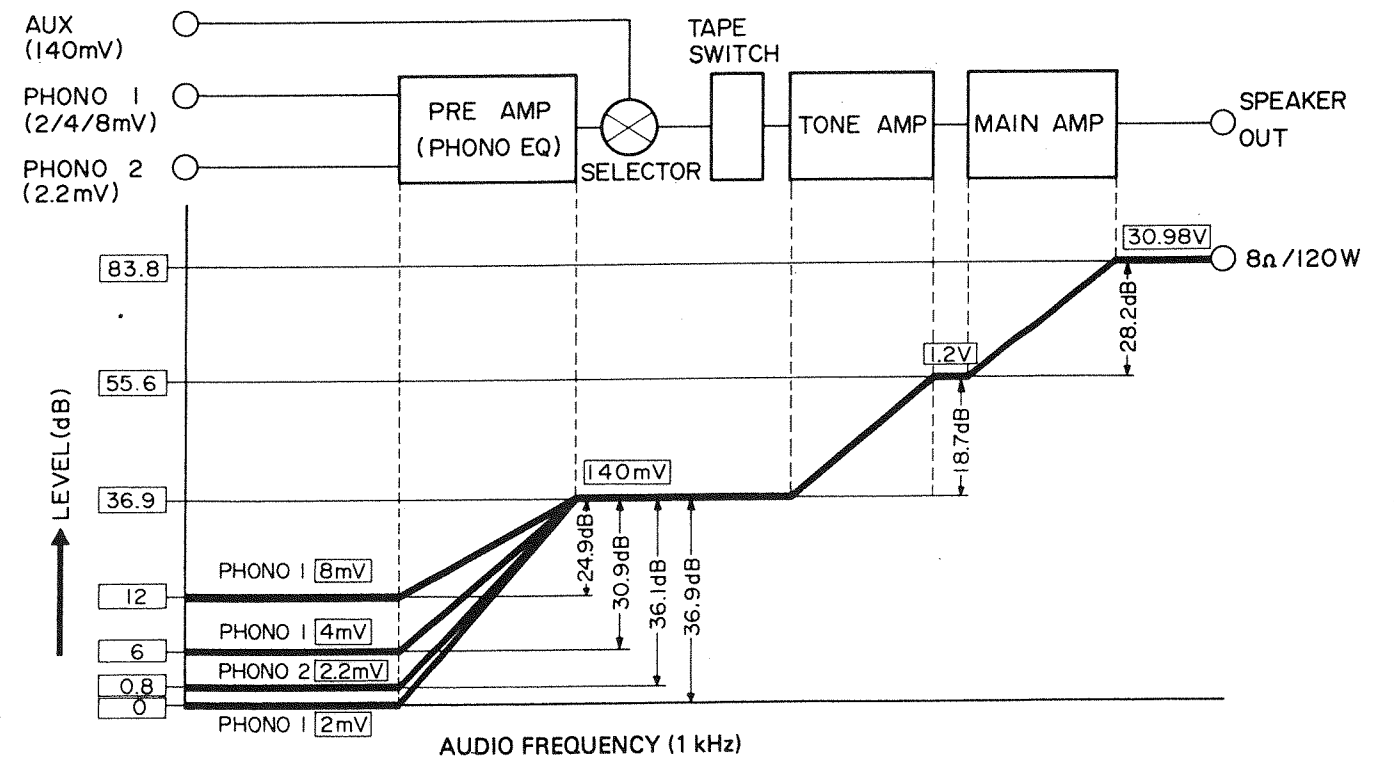


### 4) DIAL STRINGING DIAGRAM



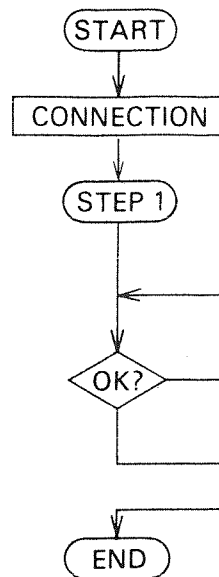
START WITH CAPACITOR SET AT MAXIMUM (PLATES FULLY CLOSED)  
 POINTER POSITION: LOW END  
 START: DIAL SPRING (@ POSITION)  
 FINISH: EYELET

### 5) LEVEL DIAGRAM



## 6) OPERATION CHECK FOR CIRCUITS

### 1) POWER SUPPLY OPERATION CHECK



Connect AC Cord to 120 V AC, 60 Hz.

Power Switch "ON" and Pilot Lamps light.  
Check the Power Supply Voltages (Figure 1).

1. Check Power Supply P.C.B., Fuse and Power Transformer.
2. See TROUBLESHOOTING on page 31.

DC Voltage is not correct.

DC Voltage is correct.

Proceed to next section.

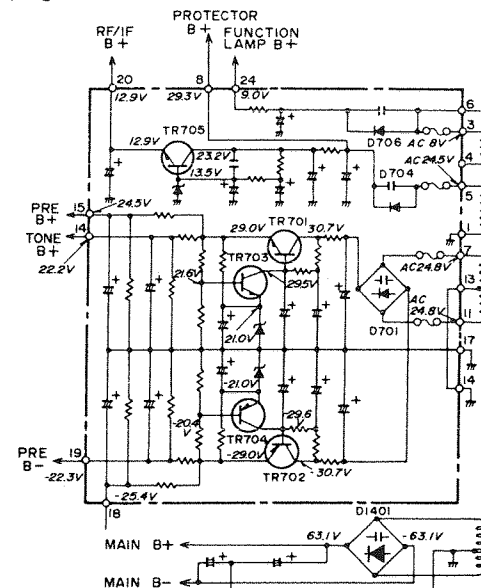
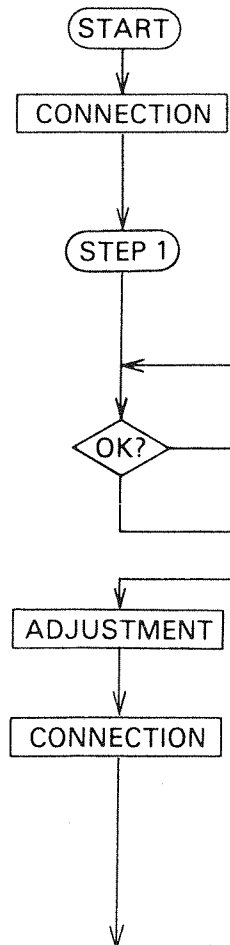


Figure 1

### 2) AUDIO SECTION OPERATION CHECK

#### (1) MAIN AMP. OPERATION CHECK



Connect 8 Ω Load to Speaker Output.

Connect DC Voltmeters to Main Amp Board, Pin No. 15 (L or R) and Ground (Plus +) and Pin No. 12 (L or R) and Ground (Minus -).  
(Both Left and Right Board - See Figure 2)

Check Power Supply voltages with no input (must be ± 64.5V)

- (1) Check D1401, C1405 or C1406.
- (2) Check for short-circuits.
- (3) See TROUBLESHOOTING.

DC Voltage is not ± 64.5V.

DC Voltage is ± 64.5V.

Adjust DC Balance and Idling Current.  
See ALIGNMENT INSTRUCTIONS on page 21.

Connect 8 Ω Load to Speaker Output.  
Connect DC Voltmeter to Main Amp. P.C.B. as shown in Figure 3.

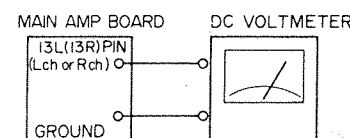


Figure 3

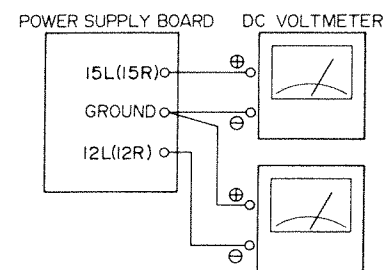
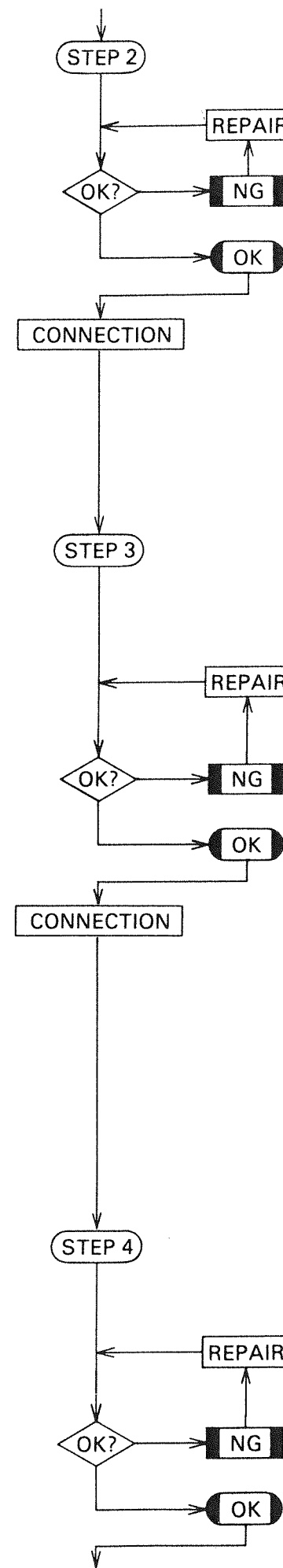


Figure 2



Check for Balance of DC Voltage at L and R channel output terminals (within ± 15 mV).

- (1) Readjust VR501A and VR501B.
- (2) See TROUBLESHOOTING.

DC Voltage over ± 15 mV.

DC Voltage within ± 15 mV.

Connect 8 Ω Load to Speaker Output.

Connect DC Voltmeter to Main Amp. P.C.B. as shown in Figure 4.

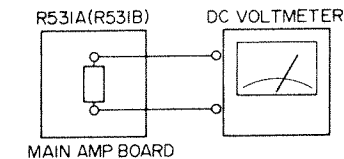


Figure 4

Check the Idling current of Main Amp:

Check the DC Voltage across Emitter Resistor R531A (L ch) and R531B (R ch); should be 9 mV ± 1 mV.

(ADJUST: VR502A (L ch) and VR502B (R ch))

- (1) Readjust VR502A and VR502B.
- (2) Check the Bias circuit of D502A, R522A (L ch) and/or D502B, R522B (R ch).
- (3) Check TR505A (L ch) and TR505B (R ch).
- (4) Check TR503A, 504A (L ch) and TR503B, 504B (R ch).
- (5) Check for short-circuits on Main P.C.B.

DC Voltage is above 10 mV or below 8 mV.

DC Voltage is 9 mV ± 1 mV.

Connect 8 Ω Load to Speaker Output.

Connect Audio Osc. to Main Amp. Input, Pin. No. 13L (Left) and/or 13R (Right). See Figure 5.

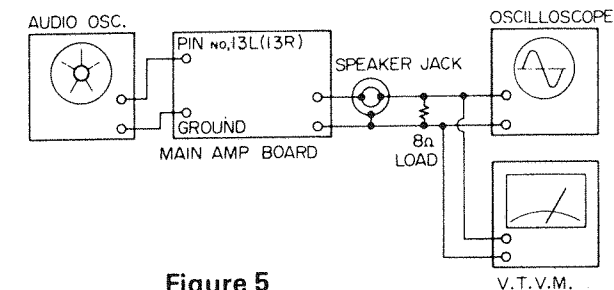


Figure 5

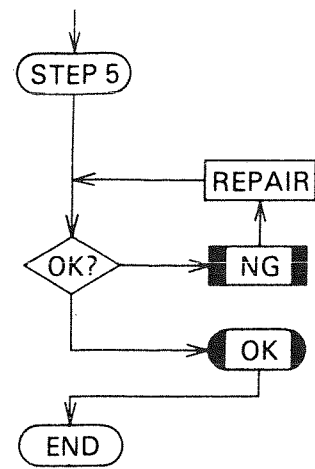
Check for symmetrical clipping of Output Signal wave shape.

Adjust output from Audio Osc. to produce clipping in the output waveform (should be about 900 mV - 1.2V).

- (1) Check TR507A, 508A, 509A, 510A, 511A, 512A (L ch) and TR507B, 508B, 509B, 510B, 511B, 512B (R ch).
- (2) Check STEP 2 and STEP 3.
- (3) Check Main Amp. circuits.

Output signal wave is not clipping symmetrically. (Figure 6)

Symmetrical clipping (Balanced) Output signal wave. (Figure 6)



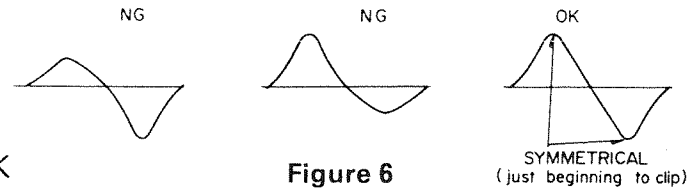
Check the Main Amp. Gain (designed level for Main Amp. is about 28 dB). Adjust output from Audio Osc. to produce 120 watts rated output power. (Both channels driven — Figure 5)

- (1) Check Main Amp. circuits.
- (2) Check STEPs 1, 2, 3 and 4.

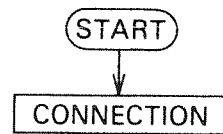
Input level is not  $1.2V \pm 2$  dB.

Input level is at least  $1.2V \pm 2$  dB for rated output power.

proceed to next section.



### (2) PREAMP. OPERATION CHECK



Set SELECTOR Switch to PHONO 2. Connect Audio Osc. to PHONO 2 Input. Connect Oscilloscope and V.T.V.M. to TAPE OUT 1 Jack. (See Figure 7)

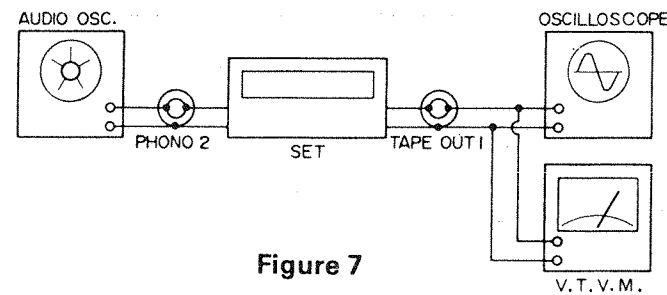


Figure 7

Check the PHONO Equalization Response. (See Figure 8, RIAA Curve.)

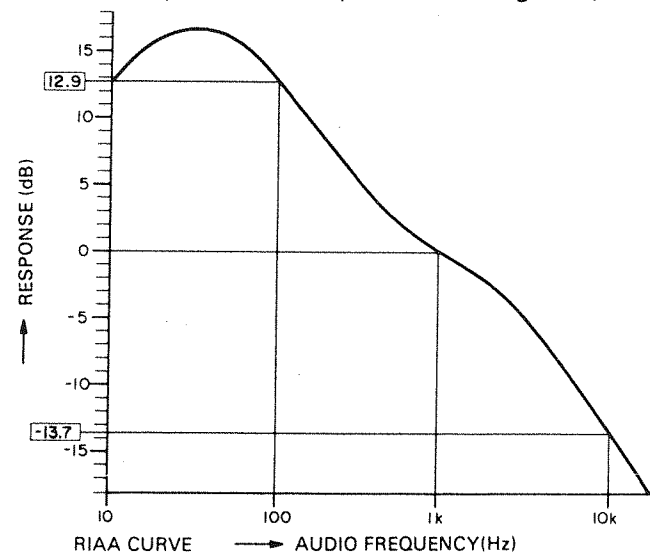


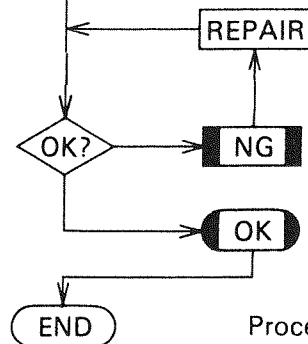
Figure 8

- (1) Check TR301A, 302A, 303A, 304A (l ch) and TR301B, 302B, 303B, 304B (R ch).
- (2) Check C306A, 307A, R308A, 309A (L ch) and C306B, 307B, R308B, 309B (R ch).
- (3) Check Preamp. circuits.

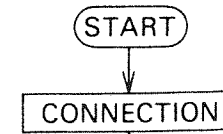
Equalization Response at 100 Hz does not fall within  $+12.9$  (RIAA)  $\pm 1.5$  dB and 10 kHz does not fall within  $-13.75$  (RIAA)  $\pm 1.5$  dB.

Equalization Response falls within  $+12.9$  (RIAA)  $\pm 1.5$  dB at 100 Hz and  $-13.75$  (RIAA)  $\pm 1.5$  dB at 10 kHz.

Proceed to next section.



### (3) TONE CONTROL OPERATION CHECK



Set SELECTOR Switch to AUX position. Connect Audio Osc. to AUX input jack. Connect Oscilloscope and V.T.V.M. to Speaker Jack on Set. Speaker Impedance = 8 ohms (OUTPUT: about 5 watts) TAPE DUBBING: SOURCE, TAPE MONITOR: SOURCE, MODE Switch: Stereo, LOUDNESS: Off. (See Figure 9)

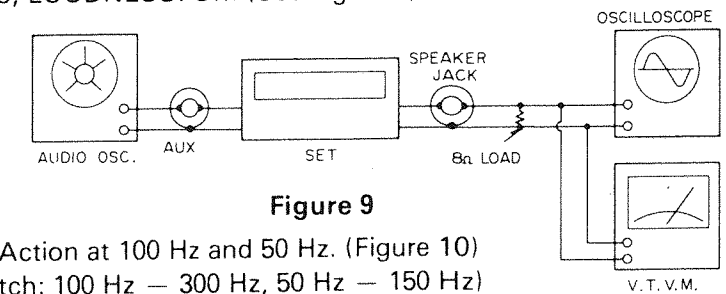


Figure 9

Check BASS Action at 100 Hz and 50 Hz. (Figure 10) (Turnover switch: 100 Hz — 300 Hz, 50 Hz — 150 Hz)

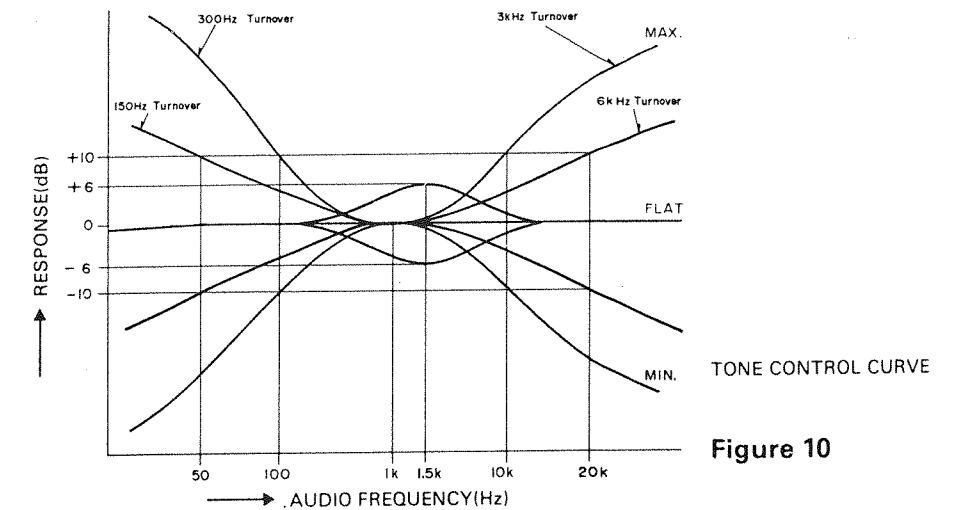
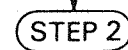


Figure 10

Check Bass Control circuit on TONE CONTROL P.C.B. and see TROUBLESHOOTING.

Frequency Response does not fall within  $\pm 10 \pm 2$  dB.

Frequency Response falls within  $\pm 10 \pm 2$  dB.

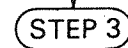


Check TREBLE Action at 10 kHz and 20 kHz. (Figure 10) (Turnover switch: 10 kHz — 3 kHz, 20 kHz — 6 kHz)

Check Treble Control circuits on TONE CONTROL P.C.B. and see TROUBLESHOOTING.

Frequency Response does not fall within  $\pm 10 \pm 2$  dB.

Frequency Response falls within  $\pm 10 \pm 2$  dB.

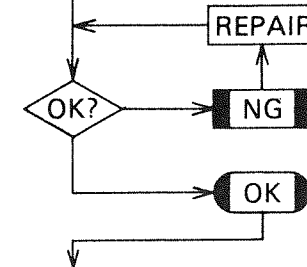


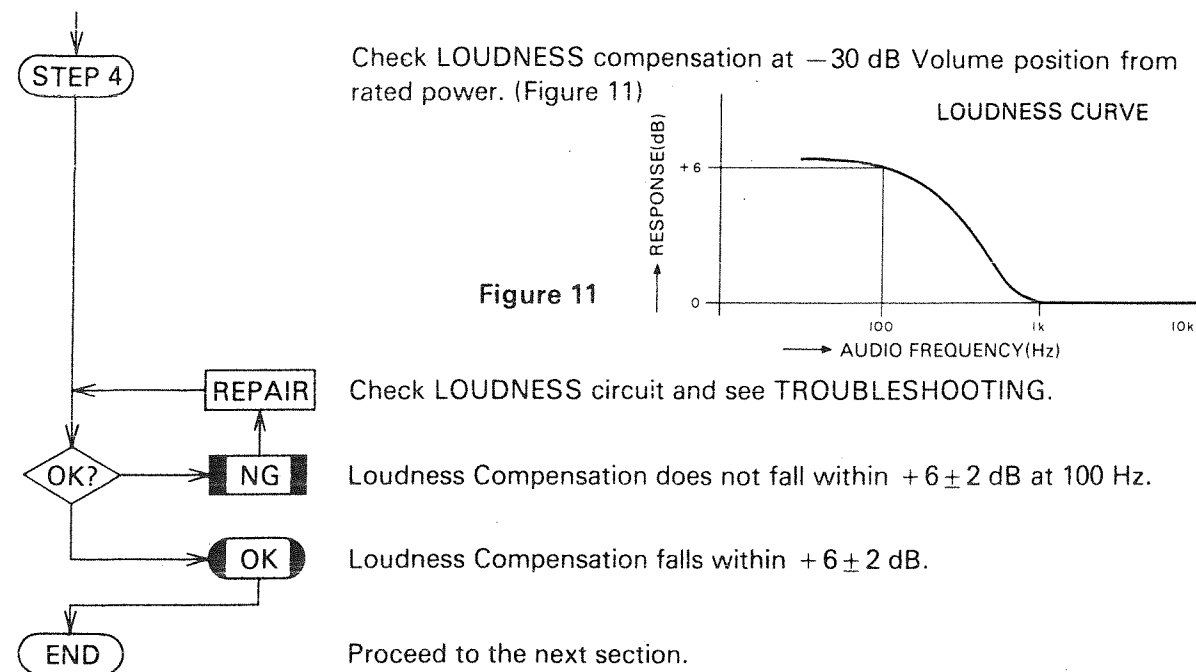
Check midrange Action at 1.5 kHz. (Figure 10)

Check midrange control circuit on TONE CONTROL P.C.B.

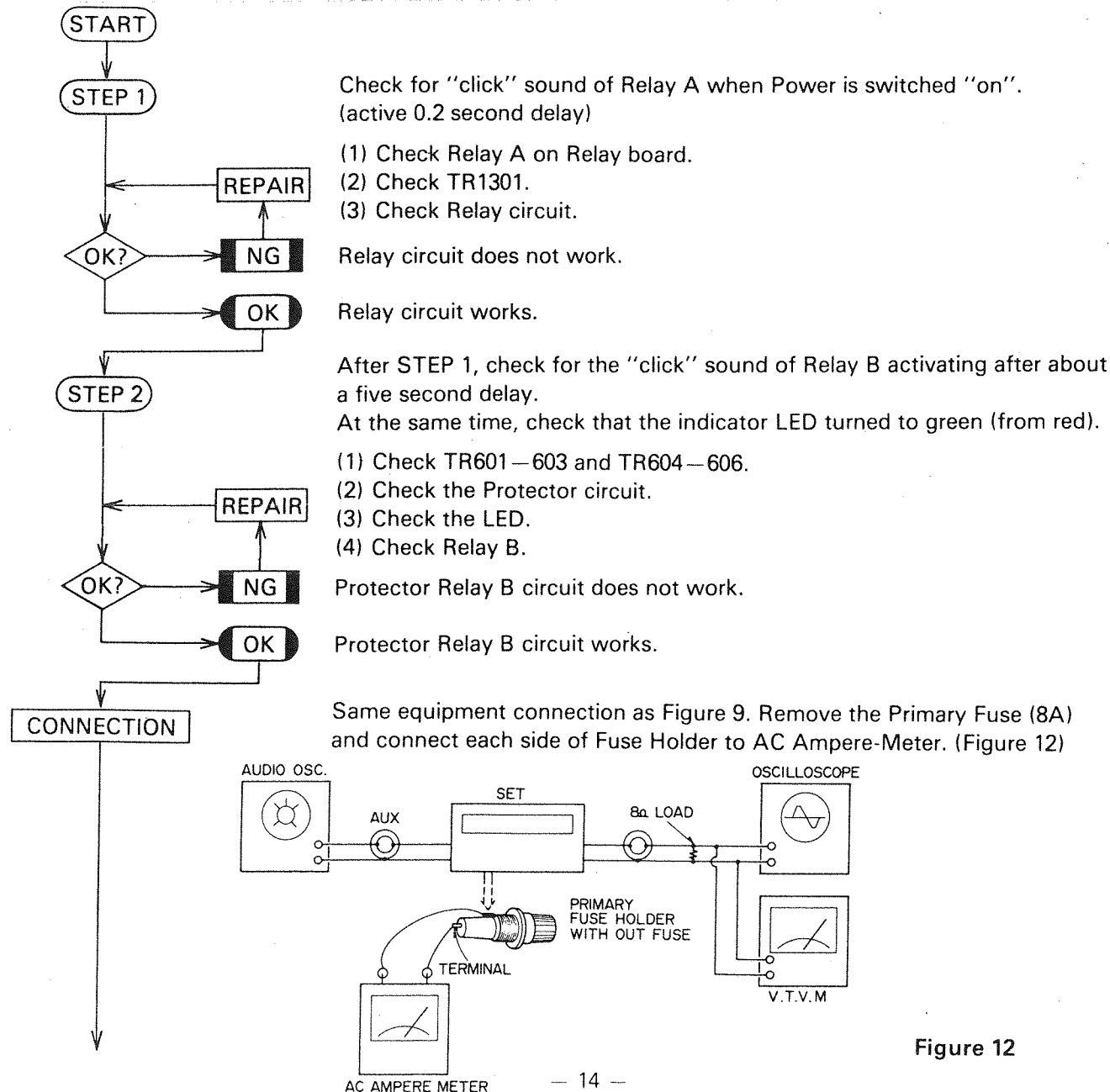
Frequency Response does not fall within  $\pm 6 \pm 2$  dB.

Frequency Response falls within  $\pm 6 \pm 2$  dB.

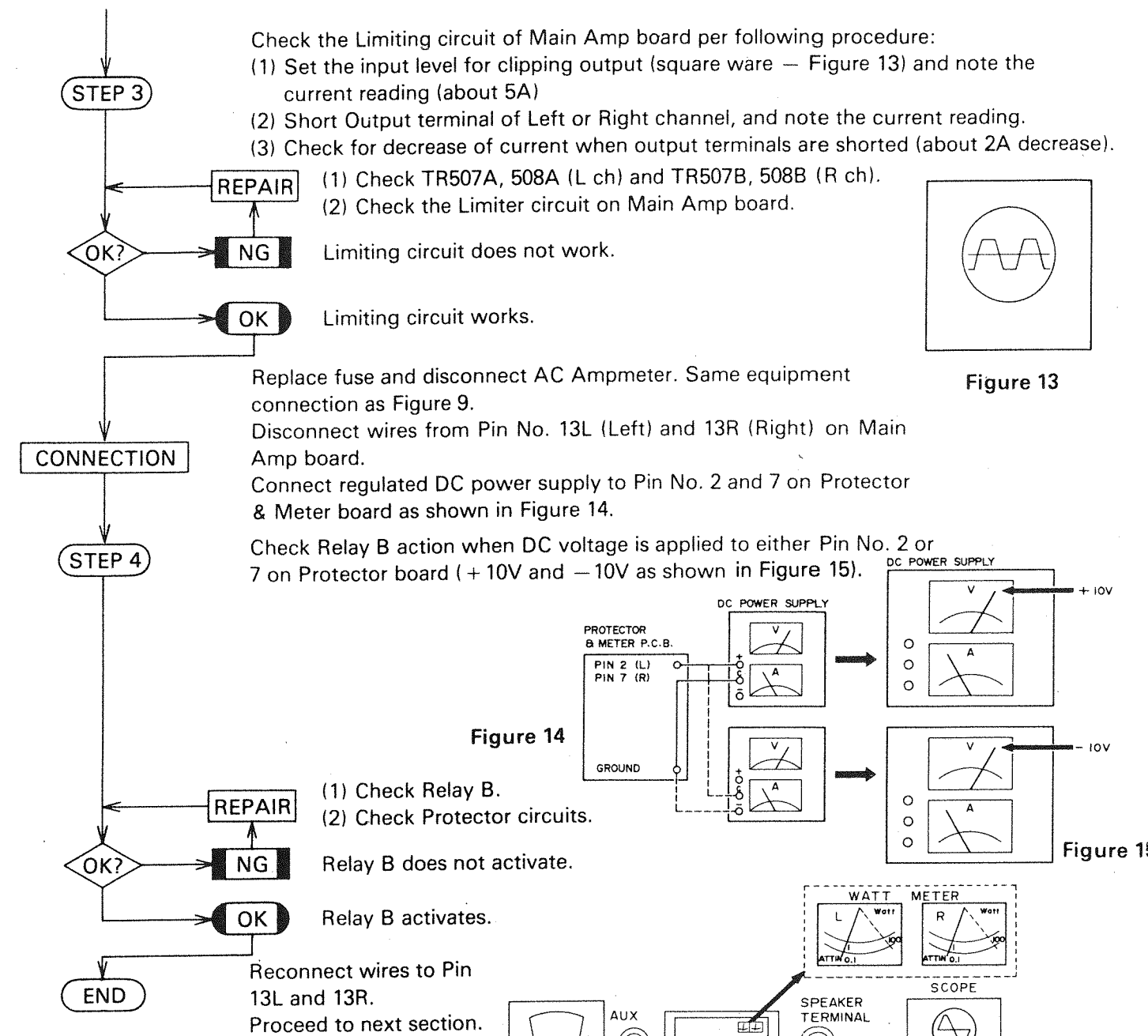




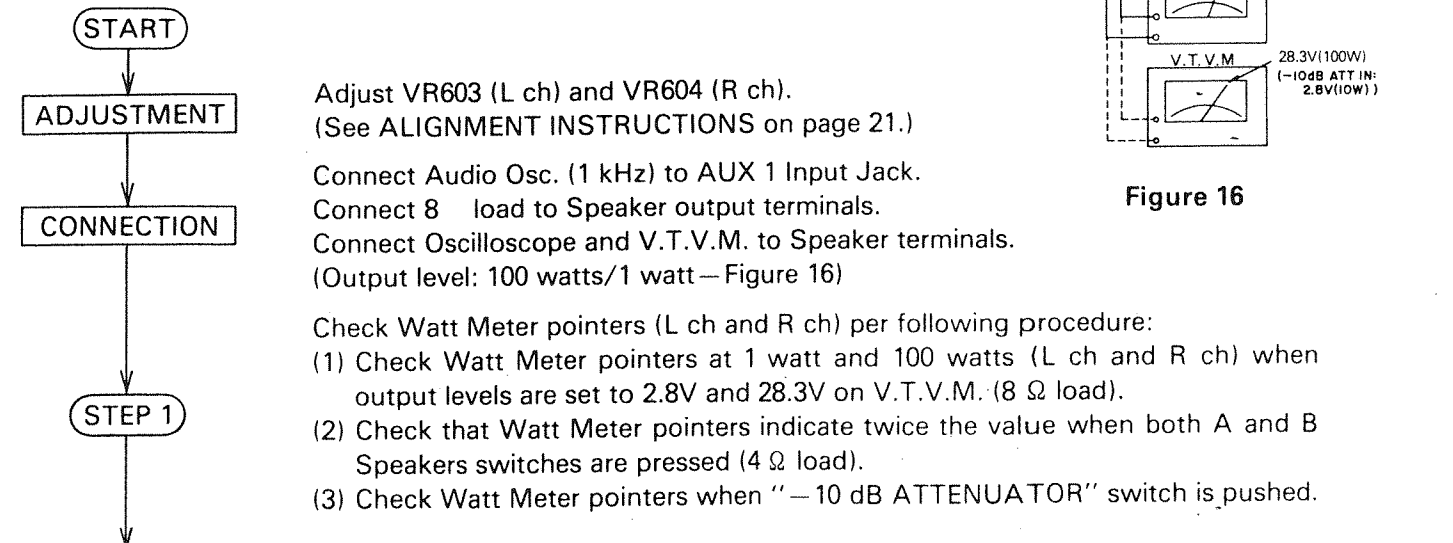
**(4) PROTECTOR CIRCUITS OPERATION CHECK**

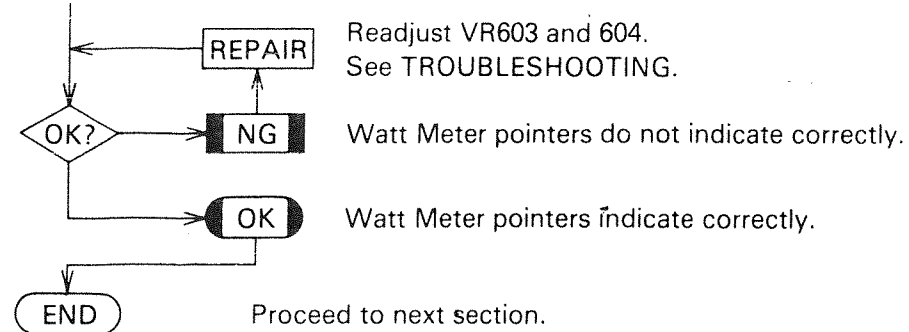


**Figure 12**



**(5) WATT METER OPERATION CHECK**





### 3) RF AND IF OPERATION CHECK

#### (1) AM OPERATION CHECK

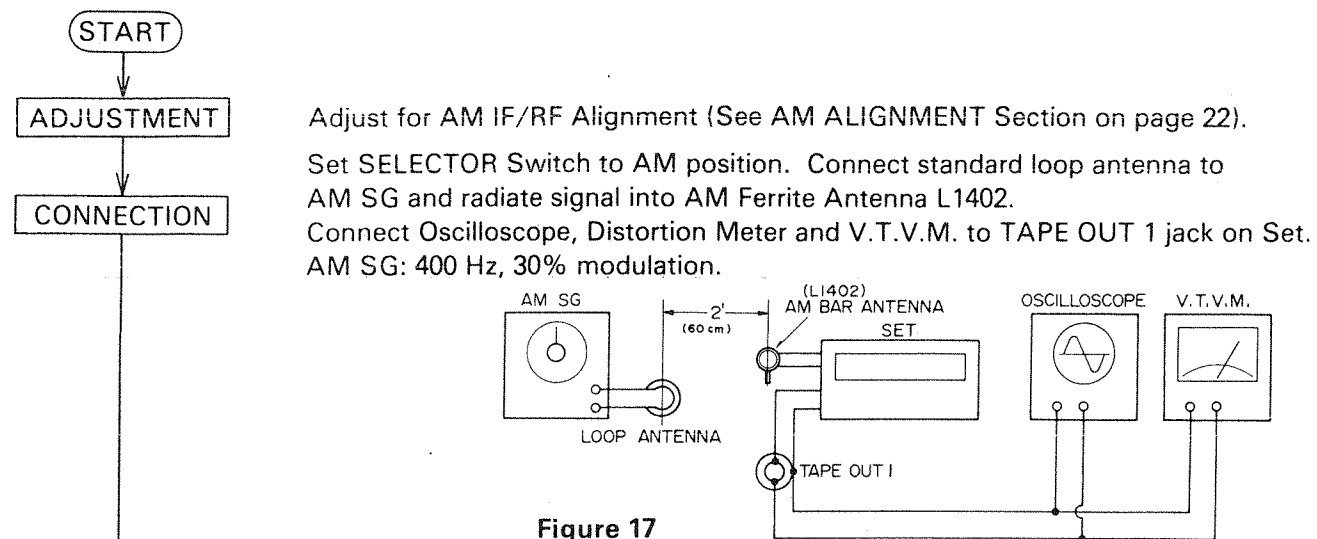


Figure 17

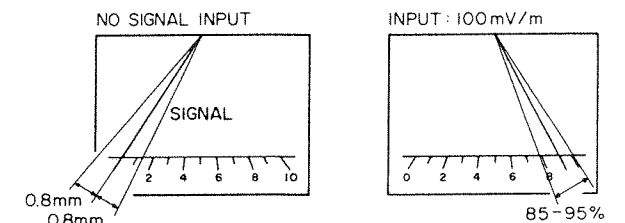
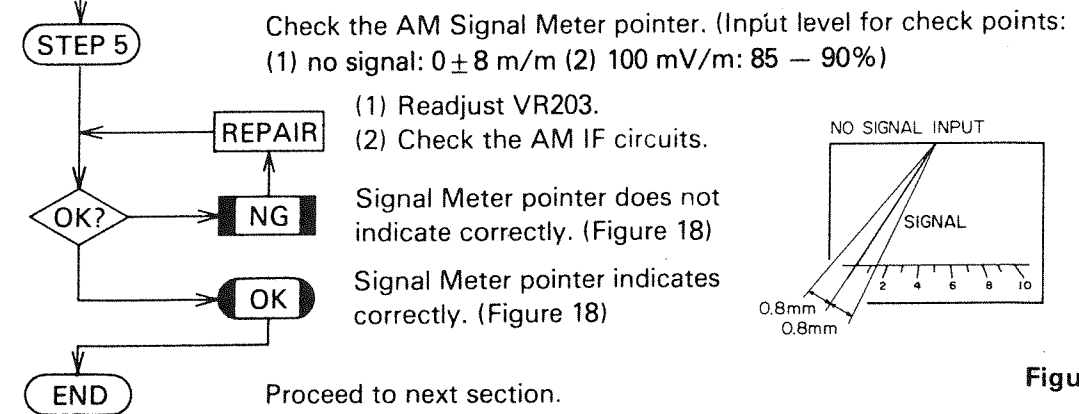
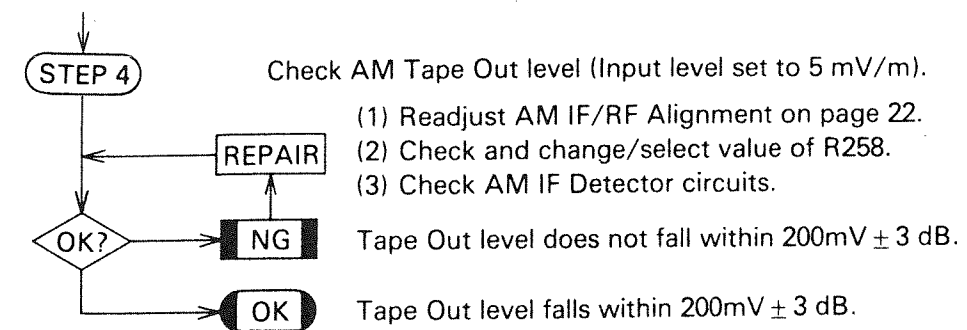
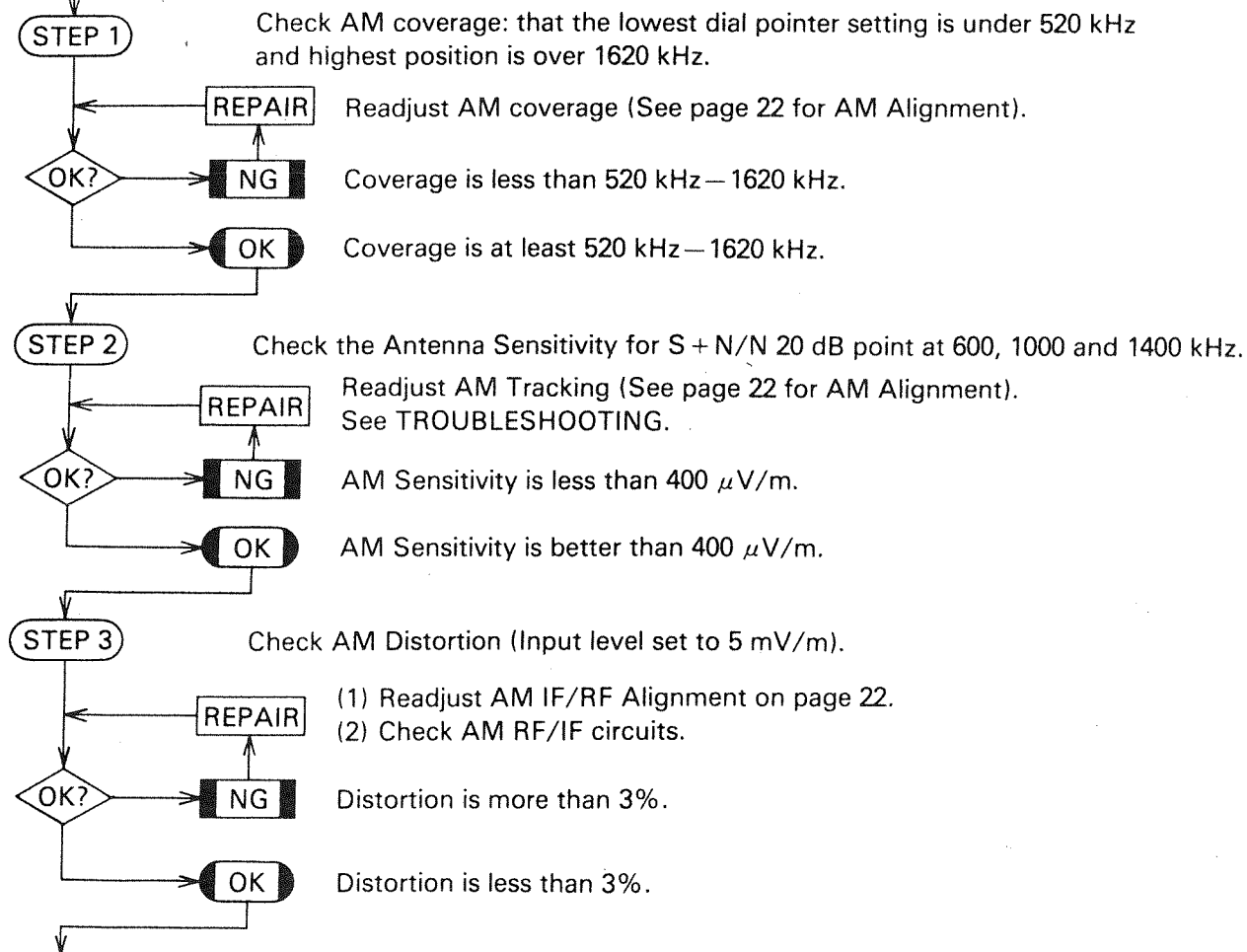


Figure 18

#### (2) FM RF/IF OPERATION CHECK

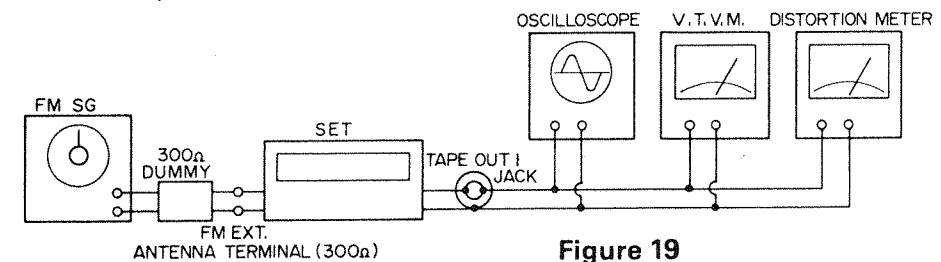
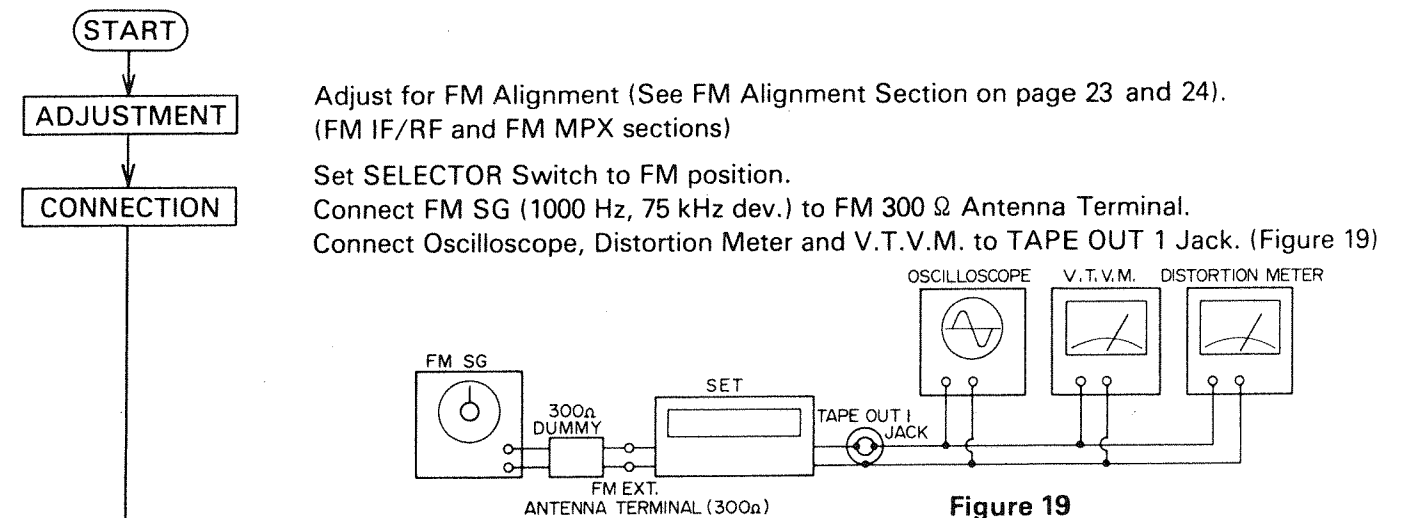
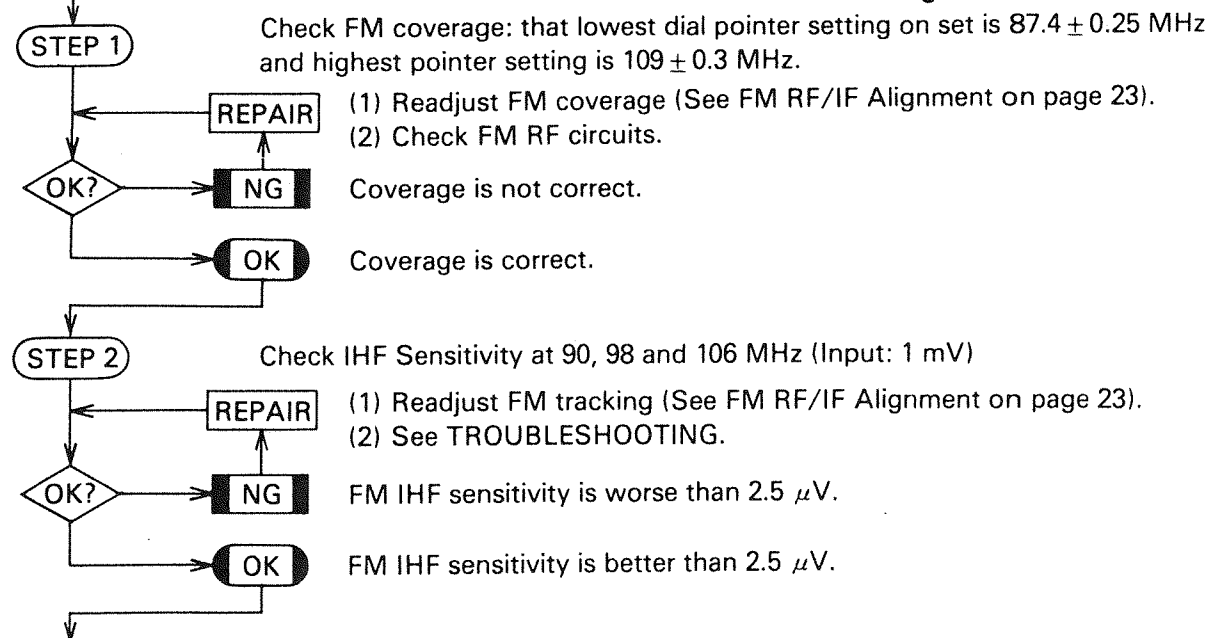
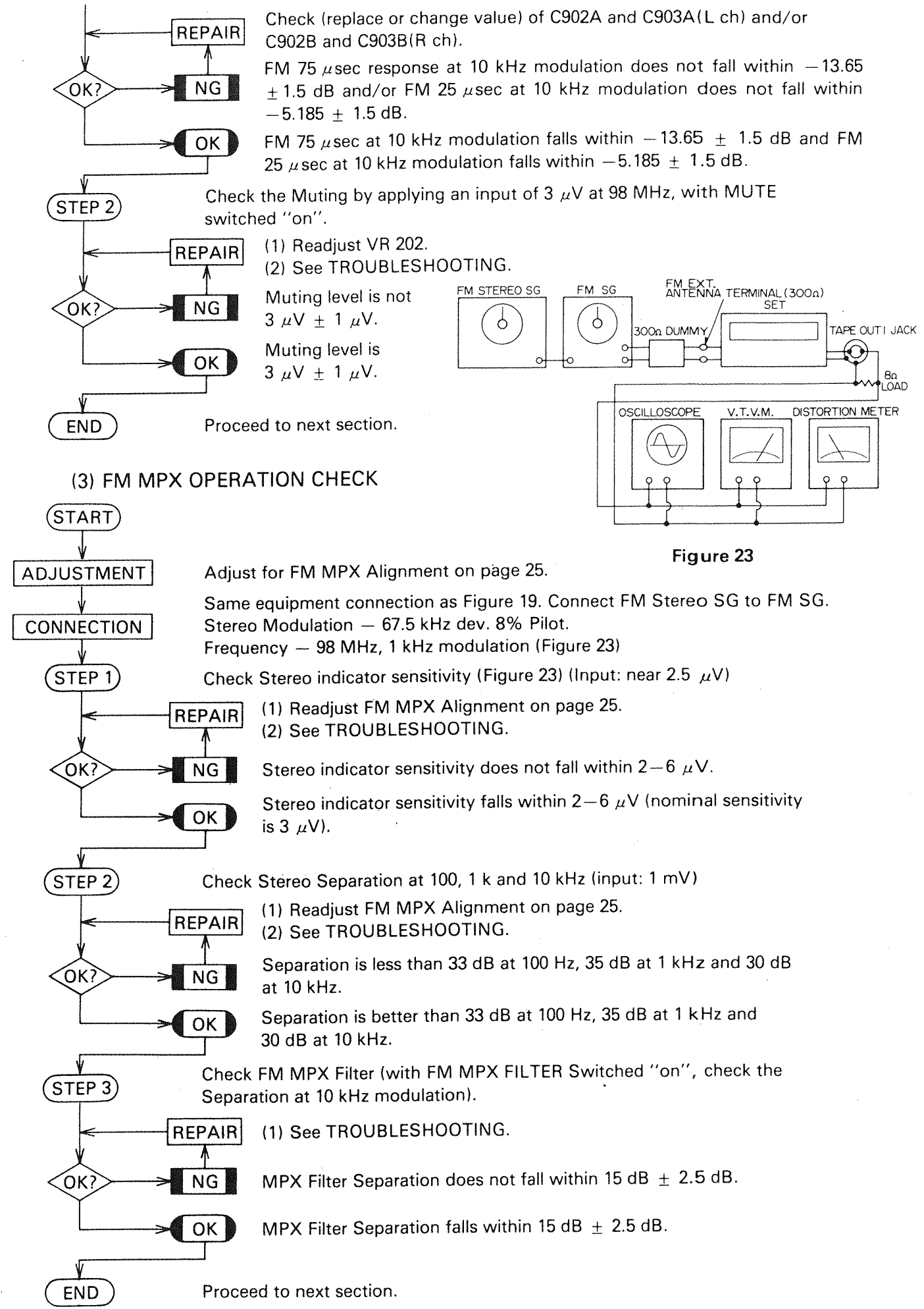
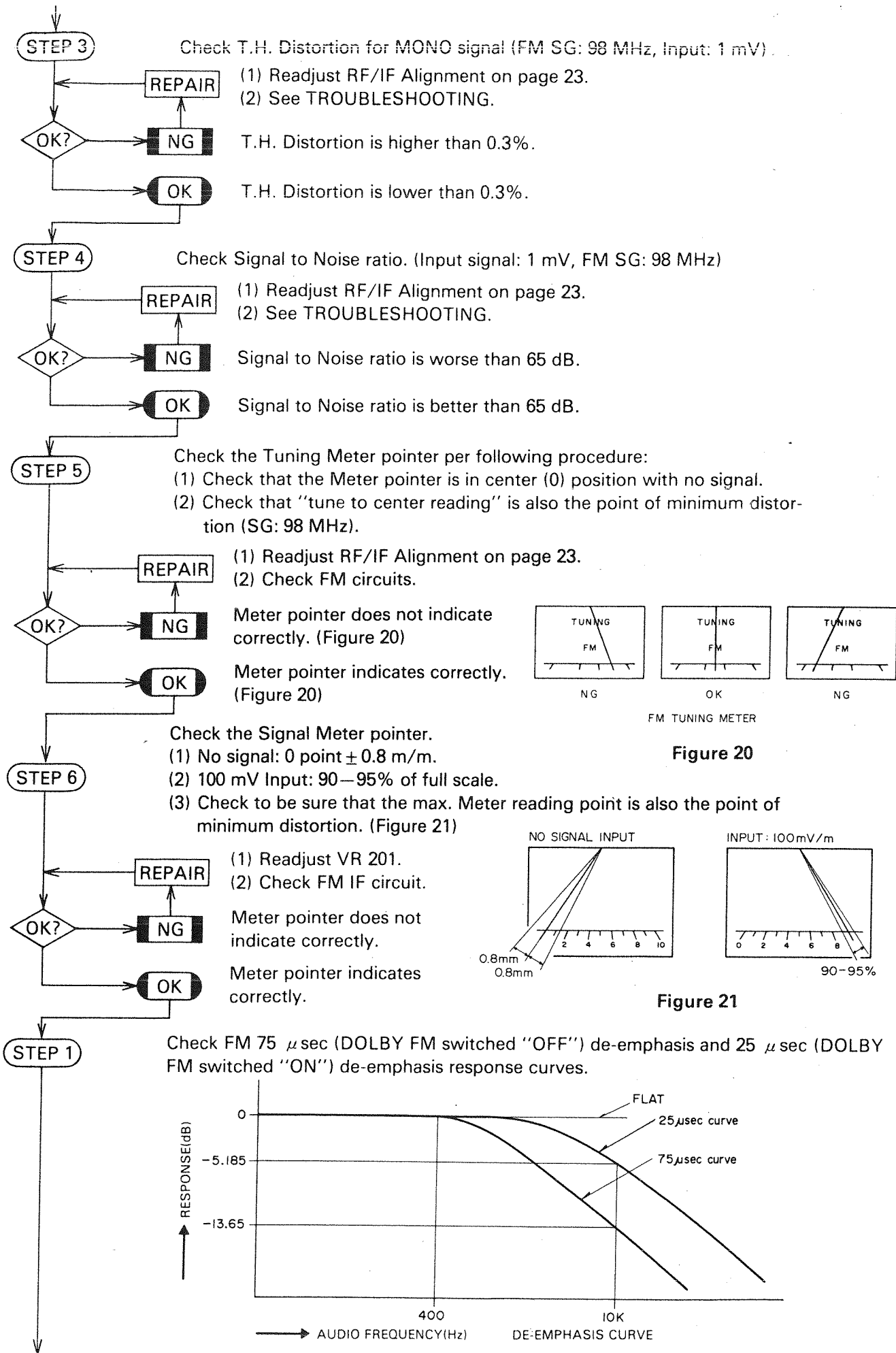


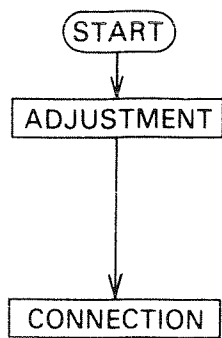
Figure 19







#### (4) DOLBY FM OPERATION CHECK



Adjust for Dolby FM Alignment (See Dolby FM Alignment section on page 26)

Same equipment connection as Figure 23.  
Connect Speaker Terminals to CCIR Filter input, and connect CCIR Filter output to Oscilloscope, V.T.V.M. and Distortion Meter.  
Tone Control: Flat position  
Output Power: 1 watt (Figure 24)  
FM Stereo Modulation: 37.5 kHz dev. pilot 9%  
Frequency: 400 Hz

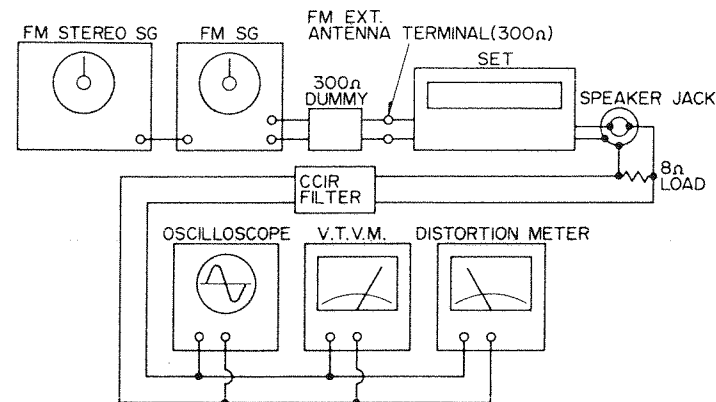


Figure 24

STEP 1

Check the Dolby FM NR effect.  
(Check the Signal to Noise ratio for Dolby FM switch ON and OFF.)

REPAIR

(1) Readjust Dolby FM Alignment.  
(2) Check Dolby FM PCB. (See TROUBLESHOOTING)

OK?

NG

Signal-to-Noise ratio does not fall within  $4 + 0.5 \text{ dB} / - 1.5 \text{ dB}$  comparing Dolby FM "on" with "off".

OK

Signal-to-Noise ratio falls within  $4 + 0.5 \text{ dB} / - 1.5 \text{ dB}$  comparing Dolby FM "on" with "off".

STEP 2

Check the Frequency Response with Dolby FM Switch "on".  
(Modulation level =  $(37.5 \text{ kHz} + 6.75 \text{ kHz}) - 25 \text{ dB}$  position)

REPAIR

(1) Readjust Dolby FM Alignment.  
(2) Check Dolby FM P.C.B. (See TROUBLESHOOTING)

OK?

NG

Frequency Response with Dolby FM "on" does not meet the Group "B" regulation. (See Figure 25)

OK

Frequency Response with Dolby FM "on" meets the Group "B" regulation. (See Figure 25)

END

Proceed to Alignment Section.

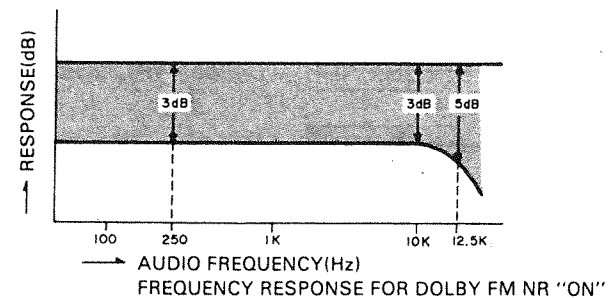


Figure 25

## 7) ALIGNMENT INSTRUCTIONS

### AUDIO CIRCUIT ADJUSTMENT/CHECK

#### EQUIPMENT REQUIRED

1. DC Voltmeter
2. Audio Oscillator
3. Oscilloscope
4. AC Voltmeter

- Notes
- Maintain voltage at 120 volts, AC 60 Hz.
  - Set SELECTORS Switch to AUX.
  - Set MODE Switch to STEREO.
  - See P.C.B. illustration for alignment points/adjustments.

For location of connection points and trimmer resistors, see P.C.B. view.

#### MAIN AMP ADJUSTMENT

STEP	ADJUSTMENT	EQUIPMENT	CONNECTION	AUDIO FRE.	LEVEL	ADJUSTMENT
1	Check Balance by measuring DC voltage across OUTPUT TERMINAL of L and R channel.	DC Volt Meter	See Fig. 26	No signal	DC voltage should be less than 15 mV.	VR501A (L ch) VR501B (R ch)
2	Idling current adjustment	DC Volt Meter	See Fig. 27.	No signal	Adjust voltage across Emitter resistors R531A (L ch) and R531B (R ch) to 9mV (8 ohm Load).	VR502A (L ch) VR502B (R ch)

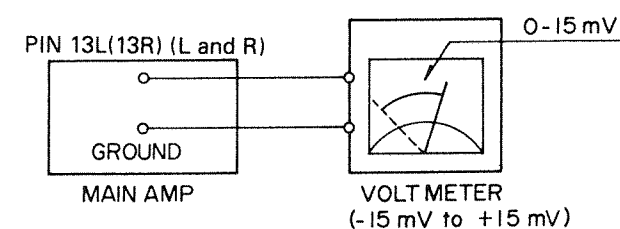


Figure 26

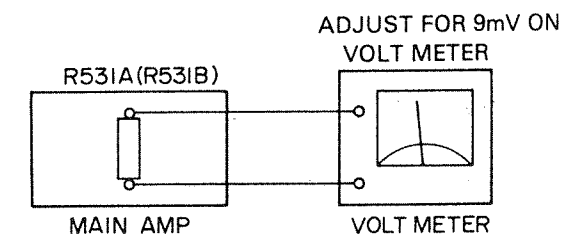


Figure 27

For location of connection points and trimmer resistors, see P.C.B. view.

#### WATT METER ADJUSTMENT

STEP	ADJUSTMENT	EQUIPMENT	CONNECTION	AUDIO FREQ.	SETTING	LEVEL	ADJUSTMENT
1	WATT Meter level adjustment	Audio Osc. V.T.V.M. Oscilloscope	See Fig. 28.	1000 Hz	VOLUME: Max. MID., TREBLE, BALANCE: center	Adjust input to AUX to get output level of 28.3V (100W) (8 ohm load).	VR603 (L ch) VR604 (R ch) so the WATT meters indicate 100 W.

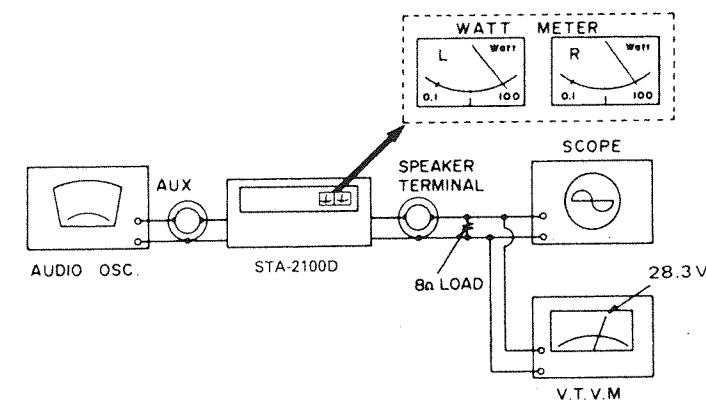


Figure 28

## AM-FM RF/IF COIL & TRIMMER LOCATIONS

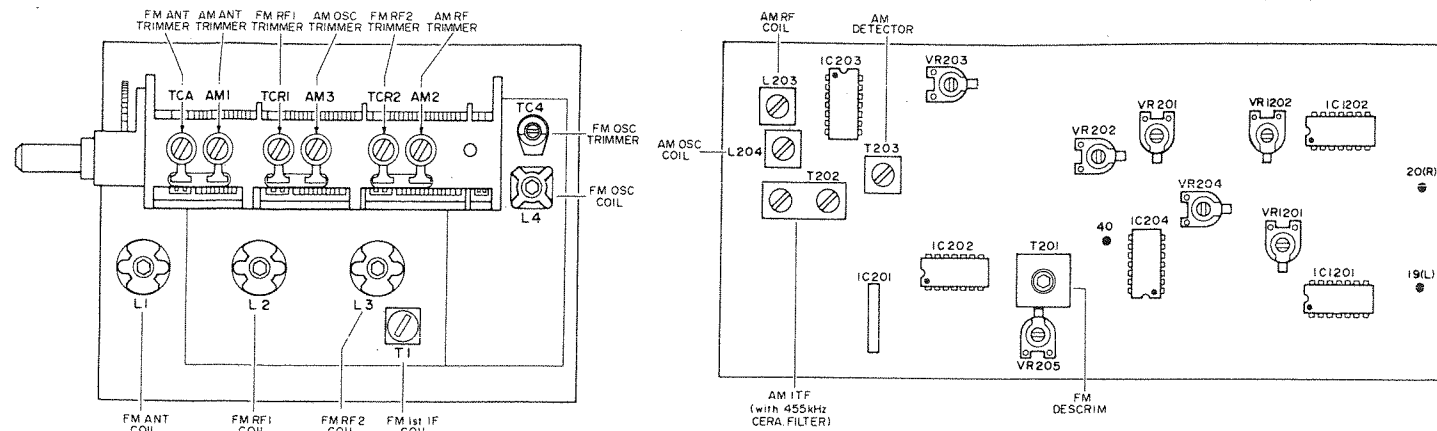


Figure 29

## AM IF & RF ALIGNMENT

### EQUIPMENT REQUIRED

1. AM Signal Generator
2. AC Voltmeter
3. Oscilloscope
4. Distortion Meter

- Notes**
- Signal generator output should be no higher than necessary to obtain an output reading.
  - Maintain line voltage at 120 volts, 60 Hz AC.
  - Set SELECTOR switch to AM.
  - See P.C.B. illustrations for alignment points/adjustments.

STEP	GENERATOR COUPLING	GENERATOR FREQUENCY	DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
1	Connect standard loop ANTENNA to Signal Generator and radiate signal into the AM Ferrite antenna. See Fig. 30.	455 kHz (400 Hz, 30% Mod.)	Point of non-interference (near 600 kHz)	AC Voltmeter to TAPE OUT 1 Jack	T202 (Both sections) T203	Adjust for maximum reading on meter.
2	Same as above	600 kHz (400 Hz, 30% Mod.)	600 kHz	Same as STEP 1	L204 (AM OSC Coil) L1401 (AM ANT Coil) L203 (AM RF Coil)	Adjust for maximum reading on meter. Refer to Fig. 29.
3	Same as above	1400 kHz (400 Hz, 30% Mod.)	1400 kHz	Same as STEP 1	AM3 (AM OSC Trimmer) AM1 (AM ANT Trimmer) AM2 (AM RF Trimmer)	Adjust for maximum reading on meter. Refer to Fig. 29 and 30.
4	Repeat STEPS 2 and 3 until no further change is noticed.					
5	Same as STEP 1	1000 kHz (400 kHz, 30% Mod.) Output level to 100 mV/m	1000 kHz	Meter on set.	VR203	Adjust so the Meter Pointer on Receiver is between 85% and 90% on the Meter.

### AM ALIGNMENT SET-UP

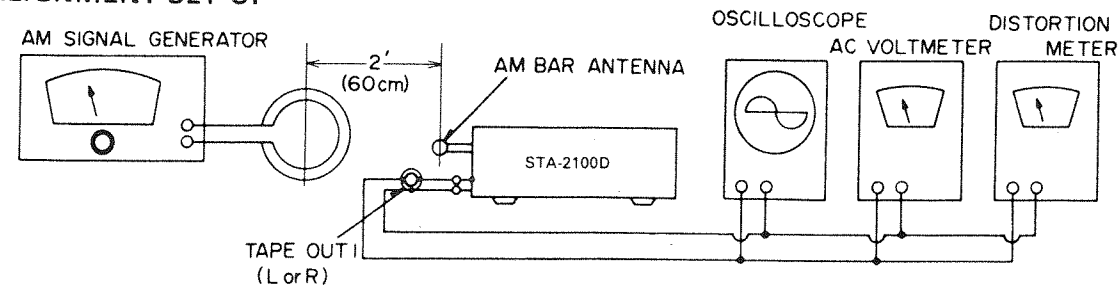


Figure 30

## FM RF & IF ALIGNMENT

### EQUIPMENT REQUIRED

1. FM Signal Generator
2. AC Voltmeter
3. Oscilloscope
4. Distortion Meter

- Notes**
- Signal Generator output should be no higher than necessary to obtain an output reading.
  - Maintain Line voltage at 120 volts 60 Hz AC.
  - Set SELECTOR Switch to FM.
  - Refer to P.C.B. illustrations for test points/adjustments.

STEP	GENERATOR COUPLING	GENERATOR FREQUENCY	DIAL SETTING	INDICATOR	ADJUSTMENT	REMARKS
1	Signal Generator to FM Antenna Terminal thru FM Dummy Antenna (300 ohm)	98 MHz (400 Hz, 75 kHz dev.) Input: no input (unit off)	Near to 98 MHz	TUNING Meter	T201 (Primary)	Adjust for Center Point on TUNING Meter. Refer to Fig. 31, 32 and 33.
2	Same as above	98 MHz (400 Hz, 75 kHz dev.) Input: 1 mV	Same as above	AC Voltmeter Scope and Distortion Meter to TAPE OUT 1 Jack (L or R)	T201 (Secondary)	Adjust for minimum Distortion (about 0.1%). Refer to Fig. 31, 32 and 33.
3	Repeat STEPS 1 and 2 until no further improvement is noticed.					
4	Same as STEP 1	90 MHz (400 Hz, 75 kHz dev.) Input: about 2-3 $\mu$ V	90 MHz	Same as STEP 2	L4 (FM OSC Coil) L2, L3 (FM 1st and 2nd RF Coil) L1 (FM Antenna Coil)	Adjust for maximum reading on meter. Refer to Fig. 29 and 33.
5	Same as STEP 1	106MHz (400 Hz, 75 kHz dev.) Input: about 2-3 $\mu$ V	106 MHz	Same as STEP 2	TC4 (FM OSC Trimmer) TCR 1, TCR 2 (FM 1st and 2nd RF Trimmer) TCA (FM Antenna Trimmer)	Adjust for maximum reading on meter. Refer to Fig. 29 and 33.
6	Repeat STEPS 4 and 5 until no further improvement is noticed.					
7	Same as STEP 1	98 MHz (400 Hz, 75 kHz dev.) Input: 10 $\mu$ V	98 MHz	Same as STEP 2	T1 (FM 1st IFT) (FM Front-end Board)	Adjust for maximum reading on meter. Refer to Fig. 29 and 33.
8	Repeat STEP 7 until no further improvement is obtained. Go back and check STEPS 1 and 2 and realign if necessary.					
9	Same as STEP 1	98 MHz (400 Hz, 75 kHz dev.) Input: 3 $\mu$ V.	98 MHz	Same as STEP 2	VR202	"MUTE" switched "ON" and adjust VR202 for no signal output.
10	Same as STEP 1	98 MHz (400 Hz, 75 kHz dev.) Input: 100 mV	98 MHz	SIGNAL Meter	VR201	Adjust so the Meter Pointer on Receiver is 90-95% of full scale.
11	Same as STEP 1	98 MHz (400 Hz, 75 kHz dev.) Input: 100 mV	98 MHz	TUNING, SIGNAL Meter.	—	With "tune to center" for TUNING and maximum on Signal Meter, Distortion Meter should indicate minimum.

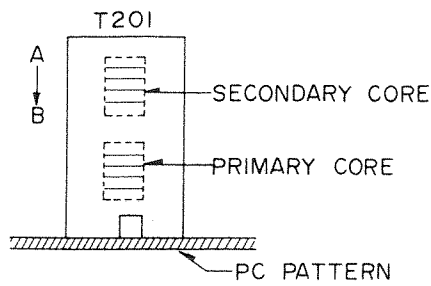


Figure 31

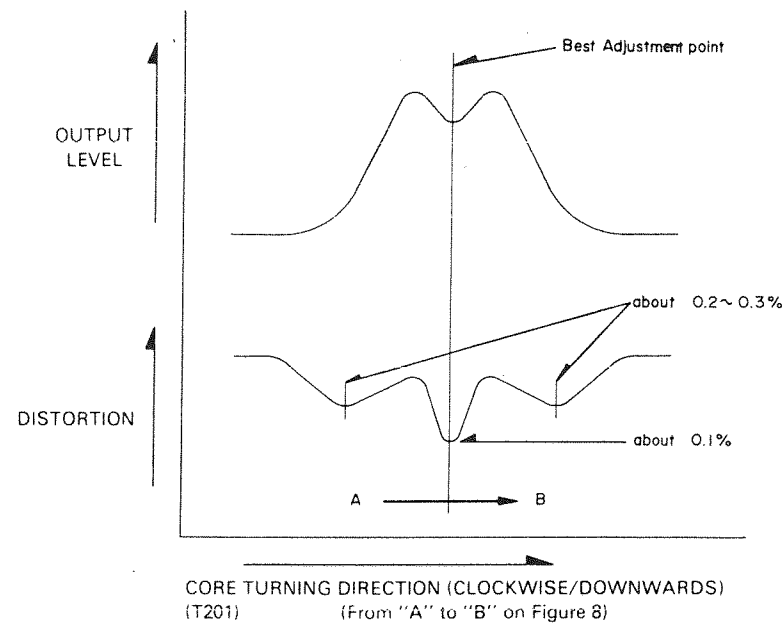


Figure 32

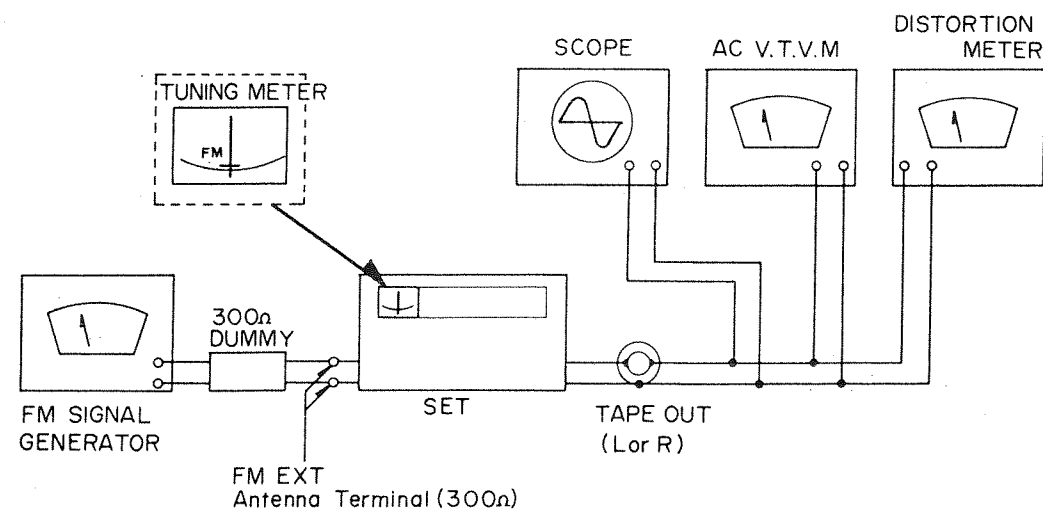


Figure 33

## FM STEREO ALIGNMENT

### EQUIPMENT REQUIRED

1. Stereo Modulation: Connect Stereo Modulator to EXT. Mod. terminal FM Signal Generator. Modulation level of 19 kHz Pilot Signal ..... 8% (6 kHz dev.)
2. FM Signal Generator: Output Level ..... 1 mV  
Frequency ..... Approximately 98 MHz  
Deviation ..... 67.5 kHz, 90% modulation composite signal

3. Audio Generator
4. AC Voltmeter
5. Oscilloscope
6. Distortion Meter
7. Frequency Counter

- Notes**
- See P.C.B. illustration for alignment/test points.
  - Set SELECTOR switch to FM, MODE switch to STEREO and MUTE switch to "off" position.

### MULTIPLEX & SEPARATION ALIGNMENT

STEP	SIGNAL GENERATOR COUPLING	STEREO MODULATION	INDICATOR	ADJUSTMENT	REMARKS
1	Connect to FM Antenna terminal thru FM dummy antenna (300 ohm)	Mono. 1 kHz (1000 Hz, No Mod.) Input: 1 mV	Counter connected to Pin No. 40 of IF & MPX Board (Pin 12 of IC204)	VR205	Adjust for 19 kHz $\pm$ 50 Hz on Counter. Refer to Fig. 34.
2	Same as above	Composite MPX Signal 1 kHz on Left channel ONLY	AC Voltmeter connector for TAPE OUT 1 Jack of Right channel	VR204 (Separation)	Adjust for minimum reading on Meter. Refer to Fig. 35.
3	Same as above	Composite MPX Signal 1 kHz on Right channel ONLY	AC Voltmeter connector for TAPE OUT 1 Jack of Left channel	Same as above	Same as above
4	Repeat STEPs 2 and 3 until AC Voltmeter reading is at least -50 dB re-same channel output. (ie. 50 dB separation)				
5	Same as STEP 1	Composite MPX Signal 1 kHz	AC Voltmeter connected to TAPE OUT 1 Jack	—	With 8 $\mu$ V antenna input signal, Stereo indicator lamp should come on.
6	Same as STEP 1	Composite MPX Signal 1 kHz	Distortion Meter Connected to TAPE OUT 1 Jack	—	With 1 mV antenna input signal, Stereo Distortion should be less than 0.1%.

### FM STEREO ALIGNMENT SET-UP

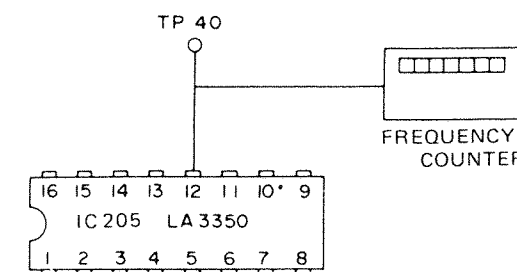


Figure 34

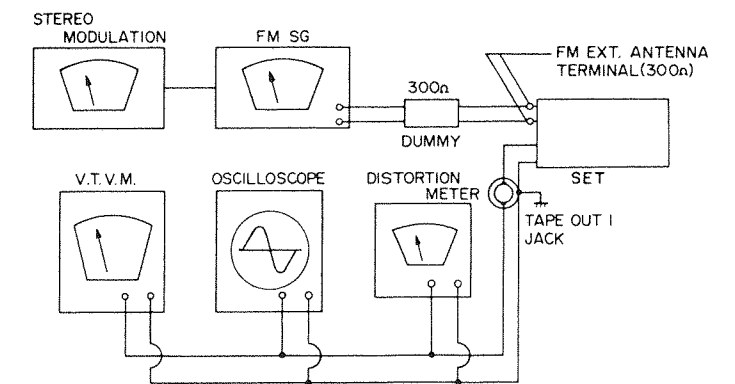


Figure 35

## DOLBY FM ALIGNMENT

### EQUIPMENT REQUIRED

1. Stereo Modulator ----- Connect STEREO MODULATOR to Ext. Mod. terminal  
FM Signal Generator  
Modulation level of 19 kHz Pilot Signal ---- 9 % (6.75 dev.)  
Main level (L + R) ---- 50% (37.5 kHz dev.)
2. FM Signal Generator -- Frequency ----- Approximately 98 MHz  
Deviation ----- 44.25 kHz, 59% modulation of composite signal  
Modulation Frequency ---- 400 Hz
3. Audio Generator
4. AC Voltmeter
5. Oscilloscope

Note: \*See P.C.B. illustrations for alignment/test points.  
\*Set SELECTOR Switch to FM, MODE Switch to STEREO and MUTE Switch to "OFF" positions.

### DOLBY LEVEL ADJUSTMENT

STEP	SIGNAL GENERATOR COUPLING	STEREO MODULATION	INDICATOR	ADJUSTMENT	REMARKS
1	Connect to FM antenna terminal thru FM dummy antenna	Composite signal 400 Hz. Input: 1 mV	AC Voltmeter connected to TP19 (L ch) or TP 20 (R ch).	VR1201 (L ch) VR1202 (R ch)	With DOLBY FM Switch in "off" position, adjust output level to 580 mV. Refer to Figures 29 and 36.

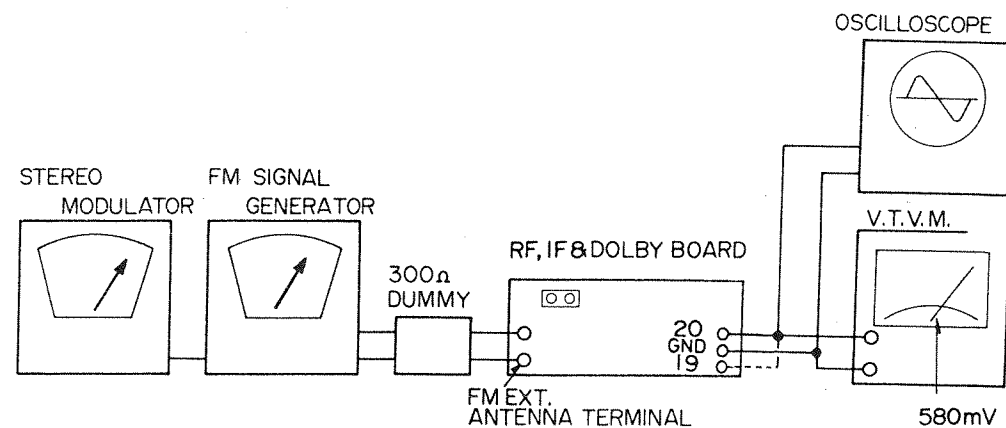


Figure 36

## 8) BRIEF DESCRIPTION OF PROTECTOR CIRCUITS

### 1. Inrush Current Protective Circuit (UL models only)

When you switch Power "ON", the indicator LED will light up red. At first, AC voltage is provided to Power Transformer through R1306, and after 0.2 second, TR1301 will be turned on, and thus AC voltage is provided through Relay A.

This is to protect the Power Transformer T1401 from inrush current. This circuit is made up of Time Constant circuit R1302 and C1302. (Figure 37)

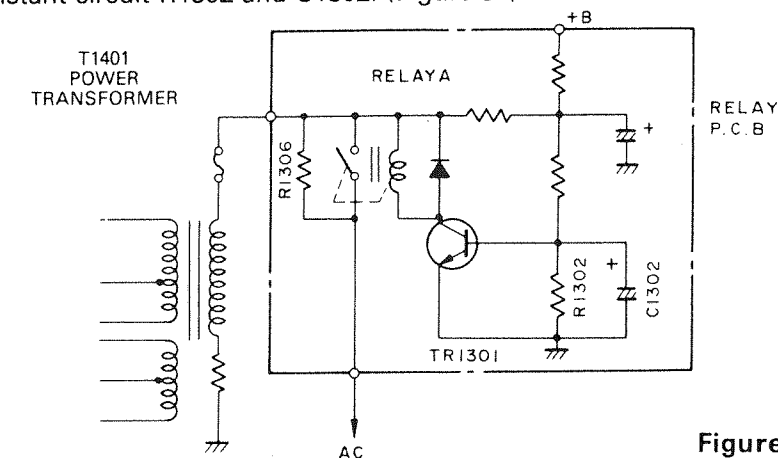


Figure 37

### 2. Speaker Protective Circuit

With Power Switch "ON", a five second signal delay is provided to the Speaker Output terminals by Relay B.

This is to protect Speakers from switching transients.

With Power Switch "ON", TR601, 602 and 603 will be turned on through Time Constant circuit R601 and C601. And indicator LED will change to green.

### 3. Main Amp Protective Circuit

If center voltage of Main Amp goes to  $\pm 5V$  (Natural Condition: within  $\pm 15 mV$ ) TR604, 605 and 606 will be turned on, and thus TR601, 602 and 603 will be turned off. If this should occur, Relay B will shut off output to the Speaker terminals and output will drop to zero and thus protect Main Amp and Speakers. In this case, indicator LED will turn to red. (Figure 38)

**Note:** To prevent AC voltages from upsetting these circuits, capacitors C602 and 603 have been incorporated. If AC voltage is applied to the base of TR604 and 605, it will be grounded through C602 and 603: thus TR604 and 605 are immune to AC voltages.

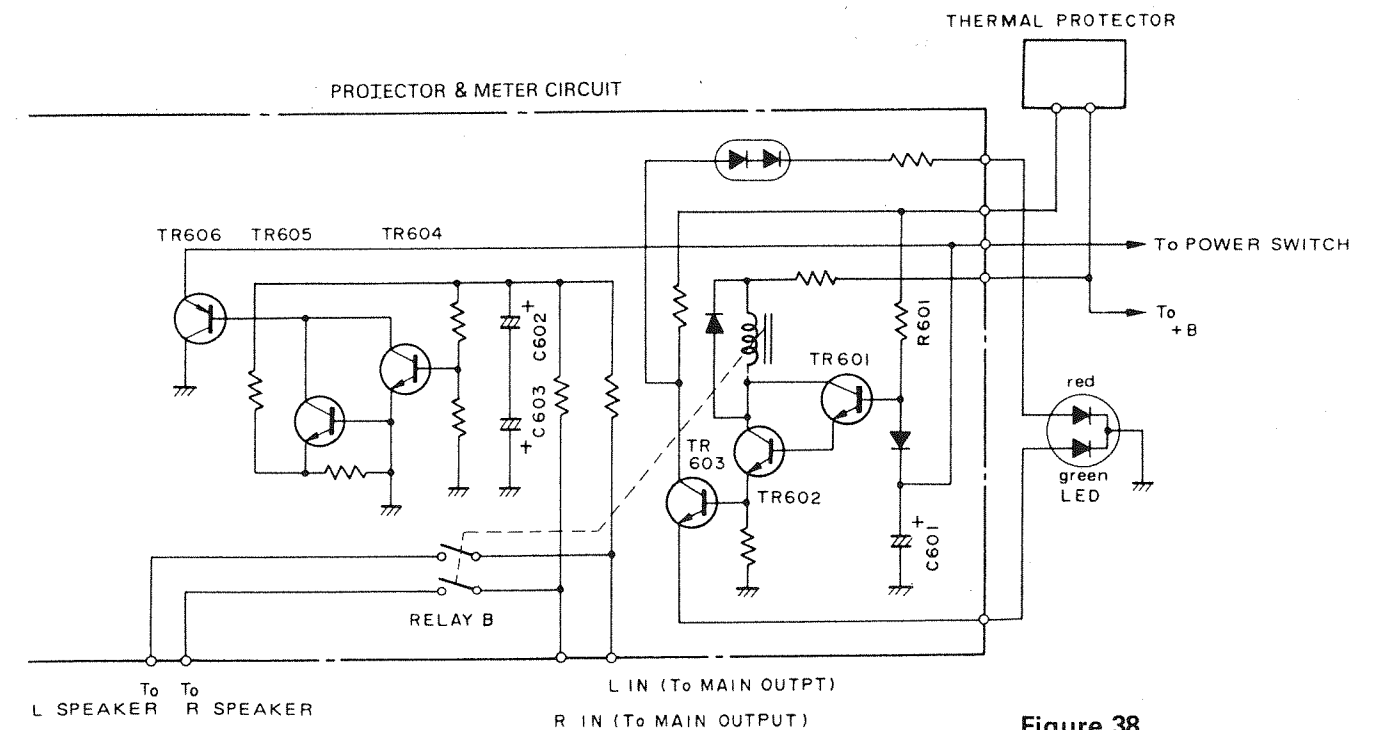


Figure 38



#### 4. Main Amp Limiting Circuit

If Speaker terminals are shorted, the output line (C) line of Figure 39) is grounded and excessively high current flows from collector to emitter of TR509A (TR509B) and TR510A (TR510B), and a high voltage will appear across R529A (R529B) and 530A (R530B). This high voltage goes to base of TR513A (TR513B) and TR514A (TR514B).

When the voltage between base and emitter increases to about 0.6V, TR513A (TR513B) and TR514A (TR514B) will be turned on.

High current [(input signal of TR507A (TR507B) and TR508A (TR508B)] flows from collector to emitter of TR513A (TR513B) and TR514A (TR514B) through D505A (D505B) and D506A (D506B), and collector-to-emitter current of TR509A (TR509B) and TR510A (TR510B) will drop as Figure 40 (from a to a', from b to b') because of the output current limiting, and thus protect Power Transistors TR509A (TR509B), TR510A (TR510B) and TR511A (TR511B), TR512A (TR512B).

If this should occur, turn off the Receiver.

When the problem is corrected, turn the Receiver on again.

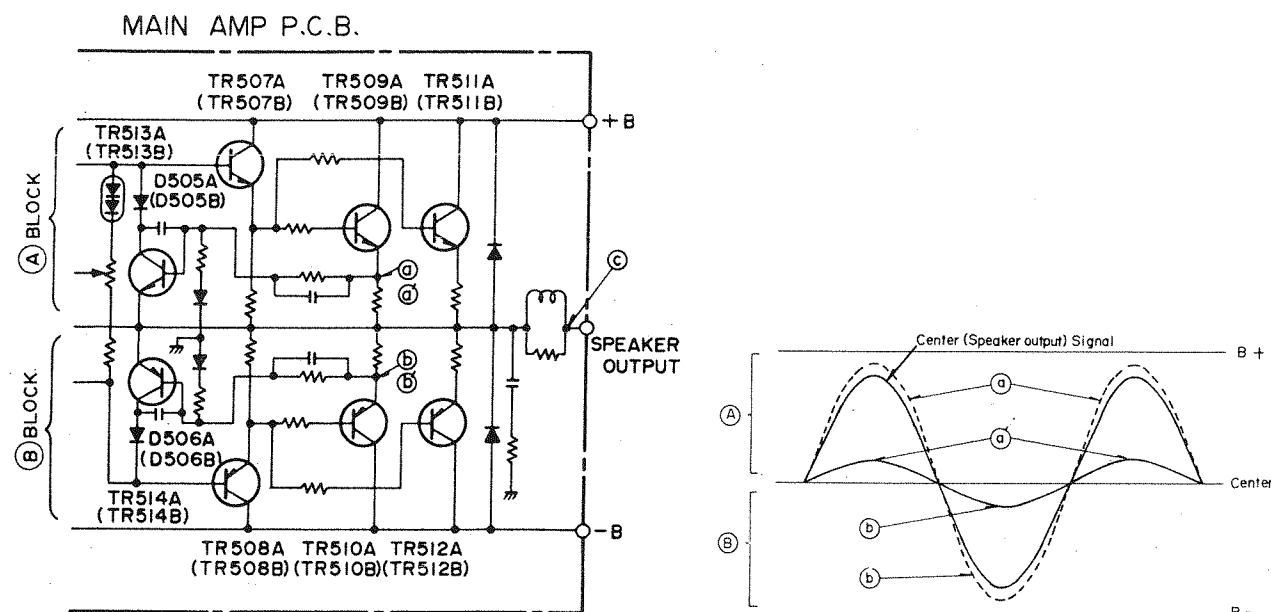


Figure 39

Figure 40

#### 5. Abnormal Temperature Rise Protection

The STA-2100D has two thermal protectors.

If the temperature of Main Amp Heat Sink rises to 100°C or Power Transformer rises to 95°C, the thermal protector switch is shut off and TR601, 602 and 603 will be turned off, and Relay B will shut off.

In this case, Amplifier will automatically shut down and output will drop to zero. Indicator LED will turn to red.

If this should occur, turn the Receiver "OFF". When the temperature of the Main Amp Heat Sink falls to within the operating limits of the Receiver, the Thermal Protector switch will reset itself. When the problem is corrected, turn the Receiver on again. (Figure 38)

#### 6. FM Noise and Switching/Muting Circuit

This circuit performs two functions.

- a) To eliminate the interstation hiss-noise sometimes noted just on either side of a station you are tuning in, with FM muting "ON".

With no signal received, the voltage applied to the base of TR1503 is 3V and both TR1503 and TR1504 are kept on, which activates the relay (REED Relay) and output is cut off. When a weak noise signal is received, the voltage drops to around 1.2V and both TR1503 and TR1504 remain on, keeping the relay activated and output cut off. When tuned to a station, the voltage drops further (to less than 1V) and TR1503/4 are turned off and the REED Relay is deactivated.

- b) To eliminate the clicking noise when function switch is turned from AM to FM (or FM to PHONO 1, PHONO 1 to PHONO 2, etc.).

The switch Ss-8 is a shorting type, goes through a short-circuit condition when turning from 1 (AM) to 2 (FM), etc. (it is momentarily grounded). This turns TR1501 off and TR1502 on. Thus, REED Relay is activated and output is cut off. The time constant of R1504 and C1502 allows the cut off condition to last for about one second (before C1502 charges up to a point where TR1501 turns on again, etc.). (Figure 41)

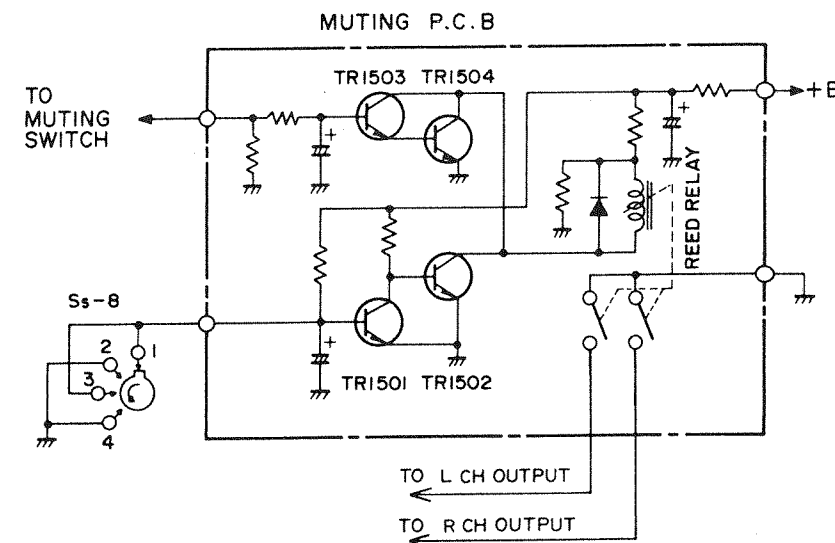


Figure 41

## 9) DOLBY FM

In conventional FM broadcasting, a signal having the characteristics shown in Figure 42 is transmitted to reduce noise during broadcasting.

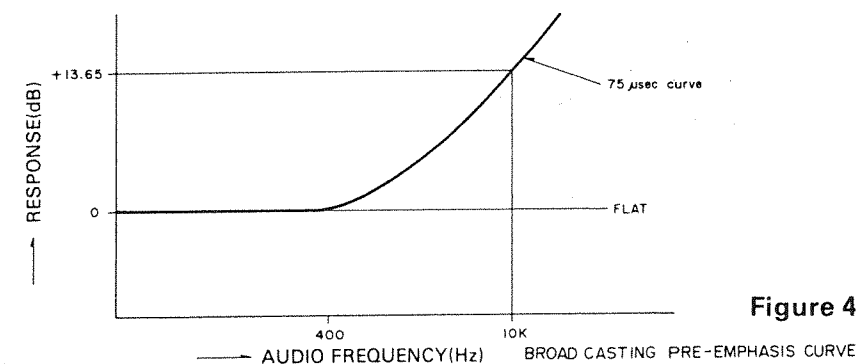


Figure 42

Such signals have characteristics of high emphasis by the respective time constants. This signal is then flattened when recovered by a Receiver having the inverse characteristics shown in Figure 43.

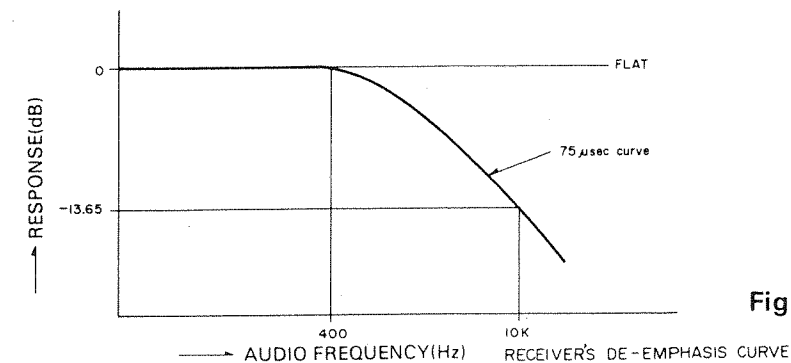


Figure 43

Since such a "noise reduction" system becomes easily saturated, etc. The DOLBY FM NOISE REDUCTION System eliminates some of the inherent difficulties of the standard pre-emphasis/de-emphasis approach.

DOLBY FM does not emphasize at 75  $\mu$ S but emphasizes at only 25  $\mu$ S, and transmits it with the DOLBY ENCODE superimposed.

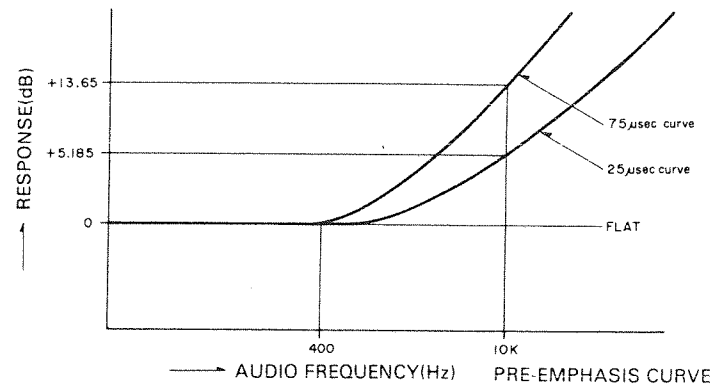


Figure 44

A signal transmitted with 25  $\mu$ S pre-emphasis must be recovered through 25  $\mu$ S de-emphasis circuit.

However, standard Receiver de-emphasis is still 75  $\mu$ S; so when the 25  $\mu$ S broadcast is received, the characteristics shown in Figure 45 are obtained.

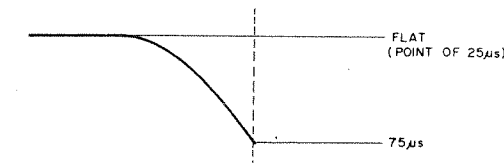


Figure 45

To make the characteristics flat, the signal must be passed through a circuit providing the characteristics shown in Figure 46.

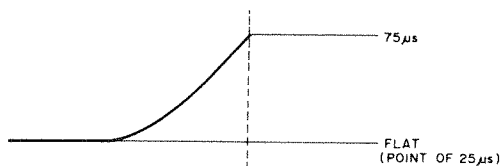


Figure 46

The STA-2100D incorporates a circuit shown in Figure 47.

This Time Constant conversion circuit converts 75  $\mu$ S  $\rightarrow$  25  $\mu$ S.

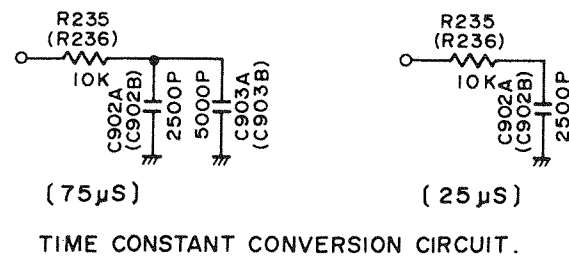


Figure 47

In DOLBY NR, the audio transmission level must be precisely matched in the receiver circuit.

When DOLBY FM Switch is "ON", the STA-2100D has a built-in level control adjustable by the VR1201 and 1202 on DOLBY FM Board, and these used to match the level of the transmitted signal from a DOLBY FM broadcast station.

The STA-2100D has both 75  $\mu$ S and 25  $\mu$ S de-emphasis; with DOLBY FM Switch ("ON" = 25  $\mu$ S, "OFF" = 75  $\mu$ S).

When DOLBY FM broadcast signals are received, a flat output is obtained with DOLBY FM switched "ON".

## 10) TROUBLESHOOTING

SYMPTOM	CAUSE/REMEDY
1) No output	<ol style="list-style-type: none"> <li>Faulty AC power cord *Replace the cord.</li> <li>Defective POWER switch *Replace the switch.</li> <li>Broken wire in the Power Transformer *Replace the Transformer.</li> <li>Blown Primary Fuse *Replace the Fuse.</li> <li>Defective D1401 or diodes, transistors on Power Supply board *Replace the defective part(s).</li> <li>Defective Relay A on RELAY Board (UL models only) *Replace the Relay.</li> </ol>
2) Pilot Lamp does not light for SELECTOR. (AM, FM, PHONO 1, PHONO 2 or AUX)	<ol style="list-style-type: none"> <li>Broken Lamp *Replace the Lamp.</li> <li>Open in the Power Transformer tertiary winding *Replace the Transformer.</li> <li>Defective diode D706 *Replace the diode.</li> </ol>
3) Pilot Lamp lights but no Speaker output.	<ol style="list-style-type: none"> <li>Defective capacitor C1405 or C1406 *Replace the defective capacitor(s).</li> <li>Defective Rectifier D1401 *Replace the defective Rectifier.</li> <li>Defect in the Power Transformer secondary winding *Replace the Power Transformer.</li> <li>Defective Relay B on Protector Board *Replace the Relay.</li> </ol>
4) Blows Fuse.	<ol style="list-style-type: none"> <li>Defective Rectifier D1401 *Replace the Rectifier.</li> <li>Short circuit in the rectifier circuit *Remove the short.</li> <li>Short circuit in Power Transistor Circuitry TR507A-512A or TR507B-TR512B *Repair circuit and/or replace the defective Transistor.</li> <li>Defective Relay B or Transistors on Protector board *Replace the part(s).</li> </ol>
5) "A" Speakers do not work.	<ol style="list-style-type: none"> <li>Speaker switch A defective *Replace the switch.</li> </ol>
6) "B" Speakers do not work.	<ol style="list-style-type: none"> <li>Speaker switch B defective *Replace the switch.</li> </ol>
7) No output one channel with VOLUME at maximum and BALANCE at center, when a test signal is applied to the terminal of non-operating channel of the BALANCE control VR1001a/1001b.	<ol style="list-style-type: none"> <li>Defective Transistor TR401A-406A, 501A-512A or TR-401B-405B, 501B-512B or TR601-606 *Replace the defective Transistor(s).</li> <li>Defective resistor or capacitor or TONE, MAIN AMP or PROTECTOR circuit *Replace the defective part(s).</li> </ol>
8) No output when a test signal is applied to the input terminals except PHONO 1 or 2.	<ol style="list-style-type: none"> <li>Defective MONO-Stereo or TAPE switch *Replace or repair the switch.</li> <li>Defective Selector switch *Replace the switch.</li> </ol>

SYMPTOM	CAUSE/REMEDY
9) No output when a test signal is applied to the PHONO 1 input terminals.	<ol style="list-style-type: none"> <li>1. Defective transistor, resistor or capacitor of PRE AMP circuit *Replace the part(s).</li> <li>2. Defective MONO-Stereo or TAPE switch *Replace or repair the switch.</li> <li>3. Defective Selector switch *Replace the Selector switch.</li> <li>4. Defective R1201A, 1202A, or 1201B, 1202B *Replace the defective part(s).</li> </ol>
10) No output when a test signal is applied to the PHONO 2 input terminals.	<ol style="list-style-type: none"> <li>1. Defective transistor, resistor or capacitor of PRE AMP circuit *Replace the part(s).</li> <li>2. Defective MONO-Stereo or TAPE switch *Replace or repair the switch.</li> <li>3. Defective Selector switch *Replace the Selector switch.</li> </ol>
11) No output when a test signal is applied to the desired input.	<ol style="list-style-type: none"> <li>1. Defective transistors or diodes on Power Supply board *Replace the defective part(s).</li> <li>2. Defective transistor, resistor or capacitor on Tone Control board *Replace the defective part(s).</li> <li>3. Defective transistor, capacitor or resistor on Main Amp board *Replace the defective part(s).</li> </ol>
12) DC not balanced within $\pm 20$ mV at output of L/R channel.	<ol style="list-style-type: none"> <li>1. Defective TR501A, 502A or TR501B, 502B *Replace the defective transistor(s).</li> <li>2. Improper value for VR501A or 501B *Replace or readjust the VR501A or 501B.</li> <li>3. Defective zener diode D509A or 509B *Replace the defective diode(s).</li> </ol>
13) Speaker works normally but Headphone does not work.	<ol style="list-style-type: none"> <li>1. Defective R611 (Left) or R612 (Right) *Change it.</li> <li>2. Headphone plug does not mate with jack *Replace the plug.</li> </ol>
14) All the inputs work normally except "AUX" input.	<ol style="list-style-type: none"> <li>1. Poor contact in "AUX" input jack *Repair or replace it.</li> <li>2. Poor contact in Selector switch *Repair or replace the switch.</li> </ol>
15) "PHONO 1" input not operative.	<ol style="list-style-type: none"> <li>1. Poor contact in "PHONO 1" input jack *Repair or replace it.</li> <li>2. Faulty Selector switch *Repair or replace it.</li> <li>3. Faulty PHONO Level switch *Replace the switch.</li> </ol>
16) "PHONO 2" input not operative.	<ol style="list-style-type: none"> <li>1. Poor contact in "PHONO 2" input jack *Repair or replace it.</li> <li>2. Faulty Selector switch *Repair or replace it.</li> </ol>
17) "TAPE OUT 1" inoperative.	<ol style="list-style-type: none"> <li>1. Poor contact in "TAPE OUT 1" output jack *Repair or replace the jack.</li> </ol>
18) "TAPE IN 1" inoperative.	<ol style="list-style-type: none"> <li>1. Poor contact in "TAPE IN 1" input jack *Repair or replace the jack.</li> </ol>

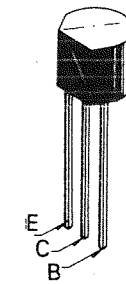
SYMPTOM	CAUSE/REMEDY
19) "TAPE OUT 2" inoperative.	<ol style="list-style-type: none"> <li>1. Poor contact in "TAPE OUT 2" output jack *Repair or replace the jack.</li> </ol>
20) "TAPE IN 2" inoperative.	<ol style="list-style-type: none"> <li>1. Poor contact in "TAPE IN 2" input jack *Repair or replace the jack.</li> </ol>
21) No AM or FM (Tuner + B voltage is not 11-12V.)	<ol style="list-style-type: none"> <li>1. Broken tertiary winding in the Power Transformer *Replace the Transformer.</li> <li>2. Defective Diode D704 *Change the defective Diode(s).</li> <li>3. Faulty capacitor C716-C720 or 727 *Change the defective capacitor(s).</li> <li>4. Defective resistor R721, 722 or 723 *Replace the resistor(s).</li> <li>5. Zener Diode D705 defective *Replace the Diode.</li> <li>6. Short-circuit in Tuner + B circuit *Repair the short.</li> <li>7. Poor contact in Selector switch *Repair or replace it.</li> <li>8. Defective Transistor TR705 *Replace the Transistor.</li> </ol>
22) No FM	<ol style="list-style-type: none"> <li>1. Poor contact in Selector switch *Repair or replace it.</li> <li>2. IC, Transistor, Diode, resistor, capacitor, Inductor or IFT of FM IF board or FM Front End defective *Replace the defective part(s).</li> <li>3. Faulty FM Antenna lead-in/circuitry *Replace or repair the Antenna lead-in/circuitry.</li> </ol>
23) No AM	<ol style="list-style-type: none"> <li>1. Poor contact in Selector switch *Repair or replace switch.</li> <li>2. IC, Transistor, Diode, IFT, resistor or capacitor of AM IF defective *Replace the defective part(s).</li> <li>3. Bar-Antenna coil defective *Repair or replace it.</li> </ol>
24) Poor FM sensitivity.	<ol style="list-style-type: none"> <li>1. Defective TR1-3 or TR201, 202 *Replace the defective Transistor(s).</li> <li>2. Defective IC201, 202 or 204 *Replace the defective IC(s).</li> <li>3. Defective ceramic filter CF201, 202 or 203 *Replace the defective ceramic filter(s).</li> <li>4. Defective L1-4, T1 or T201 *Replace the defective coil(s).</li> </ol>
25) Poor FM distortion.	<ol style="list-style-type: none"> <li>1. Defective T201 *Replace the defective detector coil.</li> <li>2. Defective ceramic filter CF201, 202 or 203 *Replace the defective filter(s).</li> <li>3. Defective IC IC201, 202 or 204 *Replace the defective IC(s).</li> <li>4. Defective L201 or L202 *Change the defective part(s).</li> </ol>

SYMPTOM	CAUSE/REMEDY
26) Poor AM sensitivity.	1. Defective L1401, L203, 204 or T202, 203 *Replace the defective part(s). 2. Defective IC203 *Replace the defective IC.
27) No FM MPX Separation	1. Improper adjustment *Readjust VR204 and VR205. 2. IC205 of MPX board defective *Replace the IC. 3. VR204, 205 (Trimmer resistor) defective *Replace the Trimmer resistor(s). 4. Defective Transistor TR205 or 206 *Replace the defective Transistor(s).
28) No STEREO light or FM Stereo does not work.	1. Broken STEREO indicator lamp *Replace the lamp. 2. Defective IC204 of MPX board *Change the defective IC. 3. Defective Transistor TR205 or 206 *Replace the defective Transistor(s). 4. VR204, 205 defective *Replace the defective Trimmer resistor(s).
29) "LOUDNESS" has no effect.	1. Defective "LOUDNESS" switch *Replace the switch. 2. Defective C901A, R901A, R902A or C901B, R901B, 902B *Replace the defective part(s).
30) "Stereo-MONO" not effective.	1. Defective Stereo-MON "MODE" switch *Repair or replace the switch.
31) "MUTING" not effective.	1. Defective MUTE switch *Repair or replace the switch. 2. Defective Transistor TR204 or TR1501-1504 *Replace the defective Transistor(s). 3. Defective Trimmer resistor VR202 *Replace the Trimmer resistor. 4. Defective the part(s) or MUTING board *Replace the part(s).
32) "HI MPX FILTER" not effective.	1. Defective HI MPX FILTER switch *Repair or replace the switch. 2. Defective C904 or R903 *Replace the defective part(s).
33) "- 10 dB ATTENUATOR" not effective.	1. Defective - 10 dB ATTENUATOR switch *Repair or replace the switch. 2. Defective R1103A, 1104A, 1105 or R1103B, 1104B, 1106 *Replace the resistor(s).
34) "TAPE DUBBING 1→2" does not operate.	1. Defective TAPE DUBBING switch *Replace it.
35) "TAPE DUBBING 2→1" does not operate.	1. Defective TAPE DUBBING switch *Replace it.
36) "TAPE MONITOR 1" does not operate.	1. Defective TAPE MONITOR switch *Replace it.

SYMPTOM	CAUSE/REMEDY
37) "TAPE MONITOR 2" does not operate.	1. Defective TAPE MONITOR switch *Replace it.
38) "BASS" has no effect. (TURNOVER Switch to 300 Hz)	1. VR403(100K ohm control) defective *Replace it. 2. Defective R409A, 412A, 413A, 417A, C409A or R409B, 412B, 413B, 417B, C409B *Replace the defective part(s).
39) "BASS" has no effect. (TURNOVER Switch to 150 Hz)	1. VR403 (100K ohm control) defective *Replace it. 2. Defective R409A, 412A, 413A, 417A, C408A or R409B, 412B, 413B, 417B, C408B *Replace the defective part(s).
40) "TREBLE" has no effect. (TURNOVER Switch to 3 kHz)	1. Faulty VR401 (100K ohm control) *Replace it. 2. Defective R408A, 410A, 411A, C404A, 405A or R408B, 410B, 411B, C404B, 405B *Replace the defective part(s).
41) "TREBLE" has no effect. (TURNOVER Switch to 6 kHz)	1. Faulty VR401 (100K ohm control) *Replace it. 2. Defective R408A, 410A, 411A, C403A 405A or R408B, 410B, 411B, C403B, 405B *Replace the defective part(s).
42) WATTs Meter does not work.	1. Defective WATT Meter L or/and R *Repair or replace the Meter. 2. Defective Diode, capacitor or resistor of Meter circuit *Replace the defective part(s). 3. Defective Trimmer resistor VR603 or 604 *Replace the defective Trimmer resistor.
43) PROTECTOR circuit does not work.	1. Defective resistor or capacitor of PROTECTOR circuit *Replace the defective part(s). 2. Defective Diode D601, 602 or 603 *Replace the defective Diode(s). 3. Defective Transistor TR601-606 *Replace the defective Transistor(s). 4. Defective Relay B *Replace it.
44) "SIGNAL" Meter not functioning.	1. Defective SIGNAL Meter *Replace it. 2. In case of FM reception, D201, 202, TR208 or VR201 defective *Replace the defective part(s). 3. In case of AM reception, VR203 or R267 defective *Replace the defective part(s).
45) "TUNING" Meter not functioning.	1. Defective TUNING Meter *Replace it. 2. Defective R220 or C217 *Replace the defective part(s).

# 11) IC & TRANSISTOR LEAD IDENTIFICATION

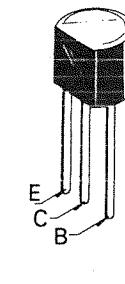
SYMPTOM	CAUSE/REMEDY
46) "LOW FILTER" has no effect.	<ol style="list-style-type: none"> <li>1. Defective "LOW FILTER" switch *Replace the switch.</li> <li>2. Defective R1101A, 1102A or R1101B, 1102B *Replace the defective part(s).</li> </ol>
47) "HIGH FILTER" has no effect.	<ol style="list-style-type: none"> <li>1. Defective "HIGH FILTER" switch *Replace the switch.</li> <li>2. Defective C1101A or C1101B *Replace the defective part(s).</li> </ol>
48) Dolby FM NR has no effect.	<ol style="list-style-type: none"> <li>1. Defective IC1201 or 1202 *Replace the defective IC.</li> <li>2. Defective diode, resistor or capacitor on Dolby FM board *Replace the defective part(s).</li> <li>3. Defective Dolby FM switch *Replace the switch.</li> </ol>
49) With Dolby FM "in", frequency response is not correct.	<ol style="list-style-type: none"> <li>1. Defective C902A, 903A or C902B, 903B *Replace the defective capacitor(s).</li> <li>2. Defective IC1201 or 1202 *Replace the defective IC.</li> <li>3. Defective diode, resistor or capacitor on Dolby FM board *Replace the defective part(s).</li> </ol>



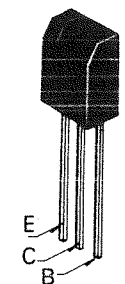
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2SC1175  
2SA 659



2SA 872  
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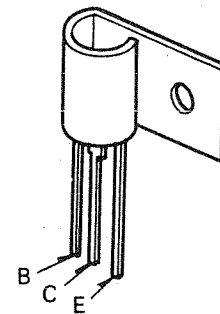
2SC 945  
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2SC1222  
2SA 750



2SD 571  
2SB 605



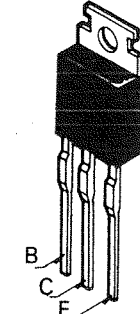
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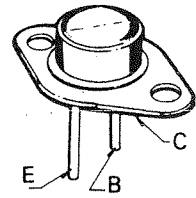
2SD 400P



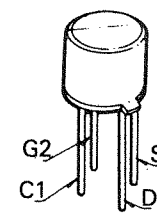
2SB 649A  
2SD 668  
2SD 669A



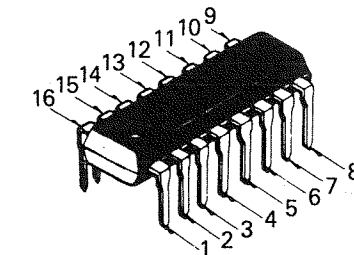
2SD 325



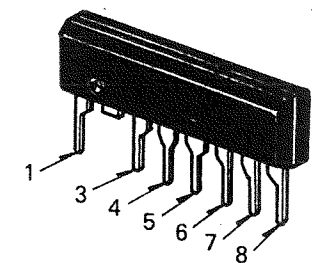
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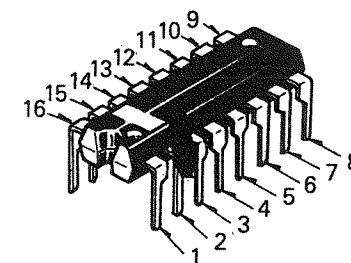
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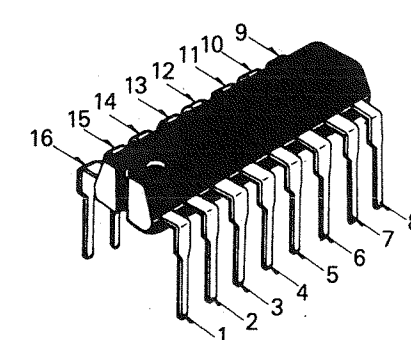
LM 1011AN



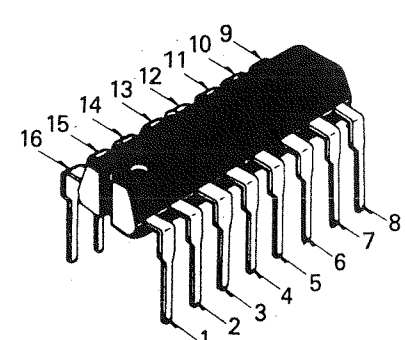
HA 1211



HA 1197



LA-1230



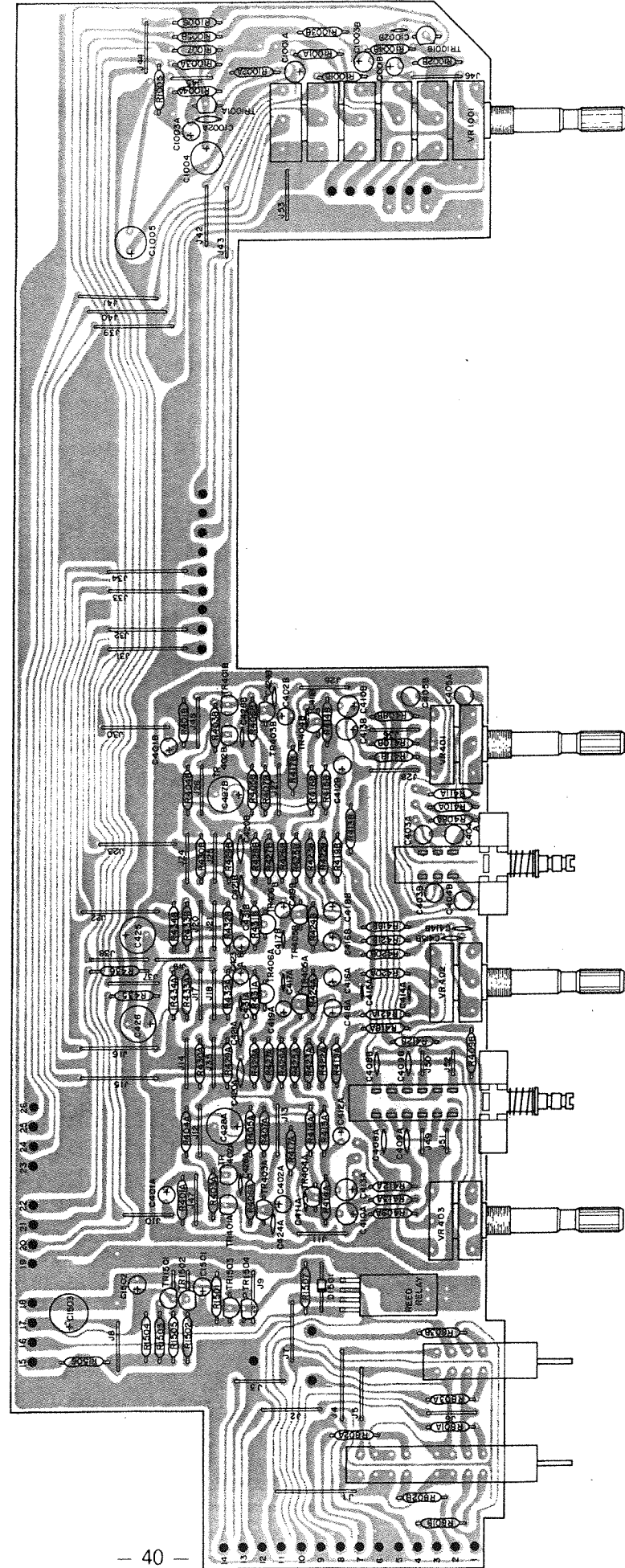
LA-3350



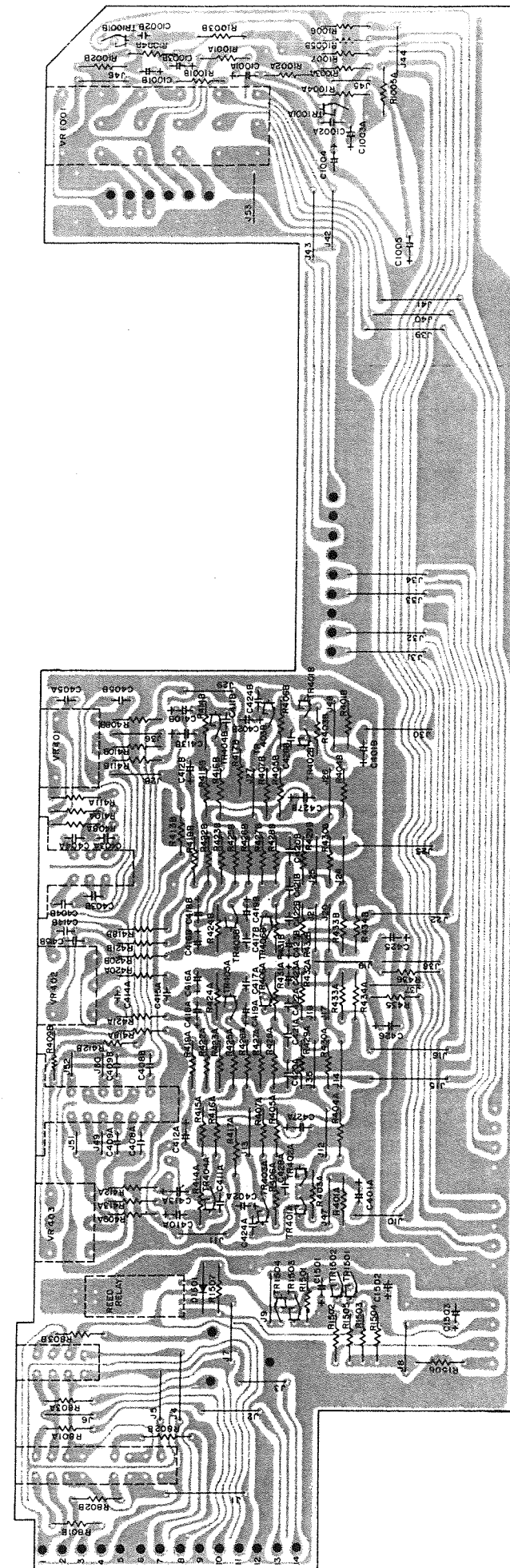


14) TONE AMP, MUTING, TAPE SWITCH P.C.B.  
(TOP & BOTTOM VIEWS)

TOP VIEW



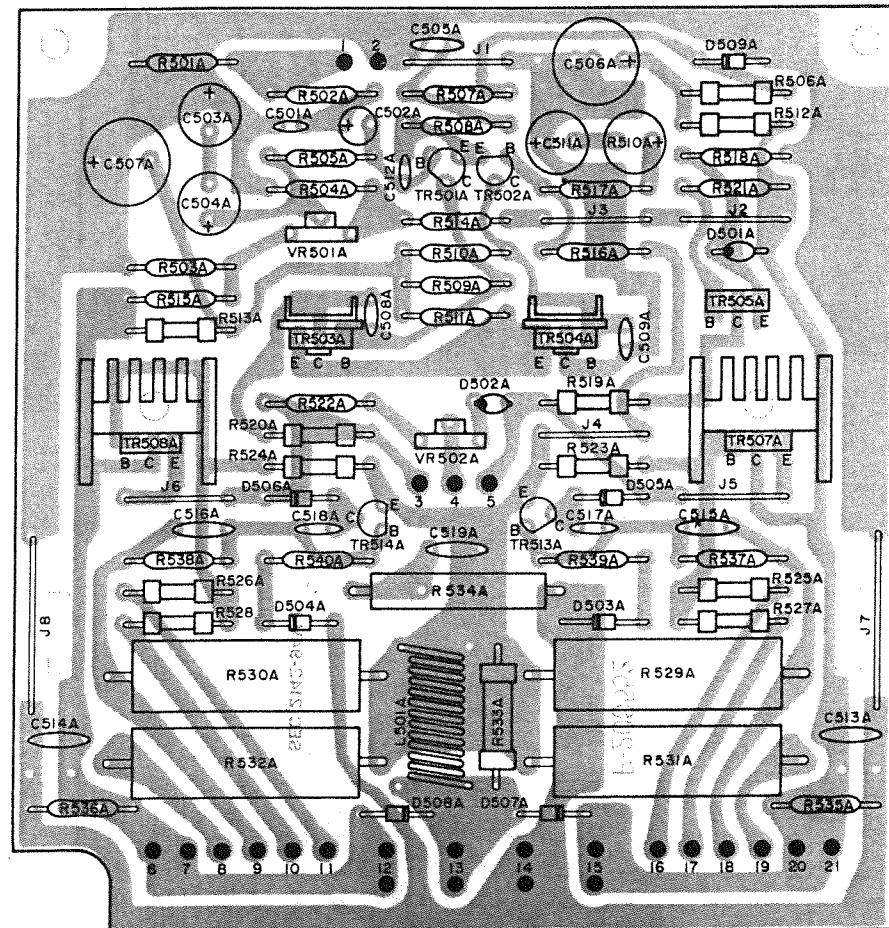
BOTTOM VIEW



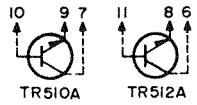
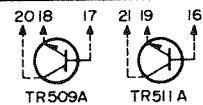
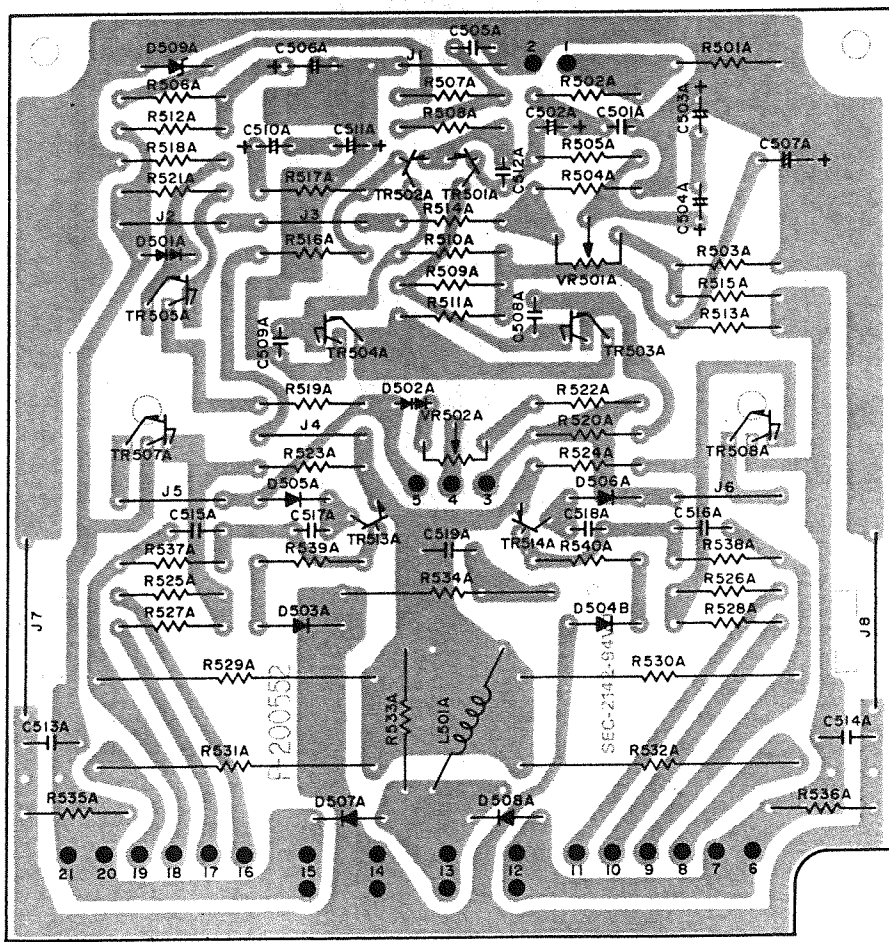


15) MAIN AMP P.C.B. (LEFT) (TOP & BOTTOM VIEWS)

TOP VIEW

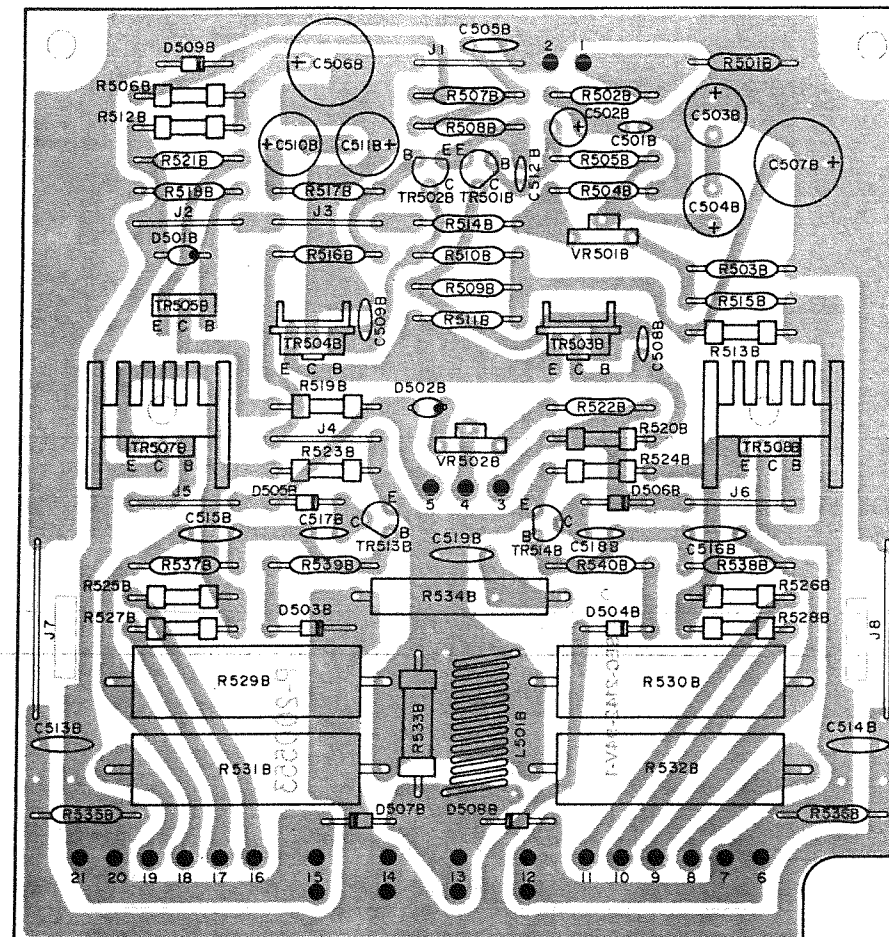


BOTTOM VIEW

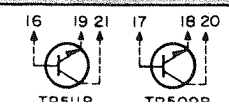
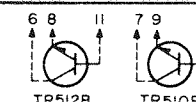
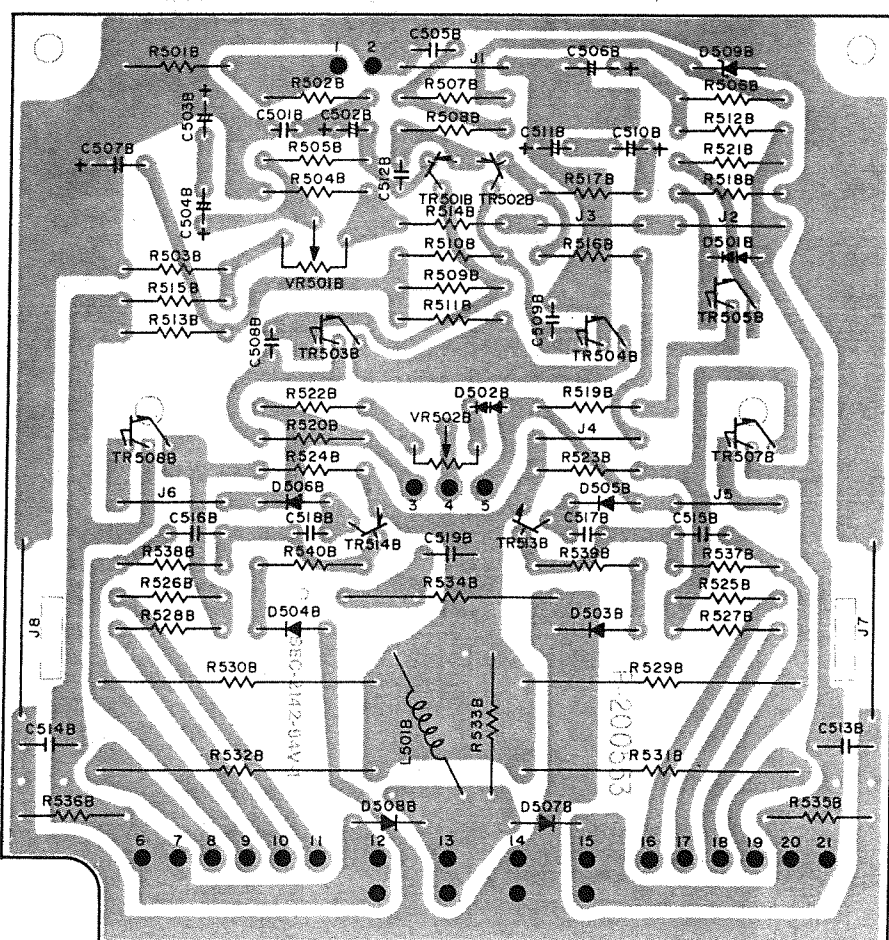


16) MAIN AMP P.C.B. (RIGHT) (TOP & BOTTOM VIEWS)

TOP VIEW



BOTTOM VIEW

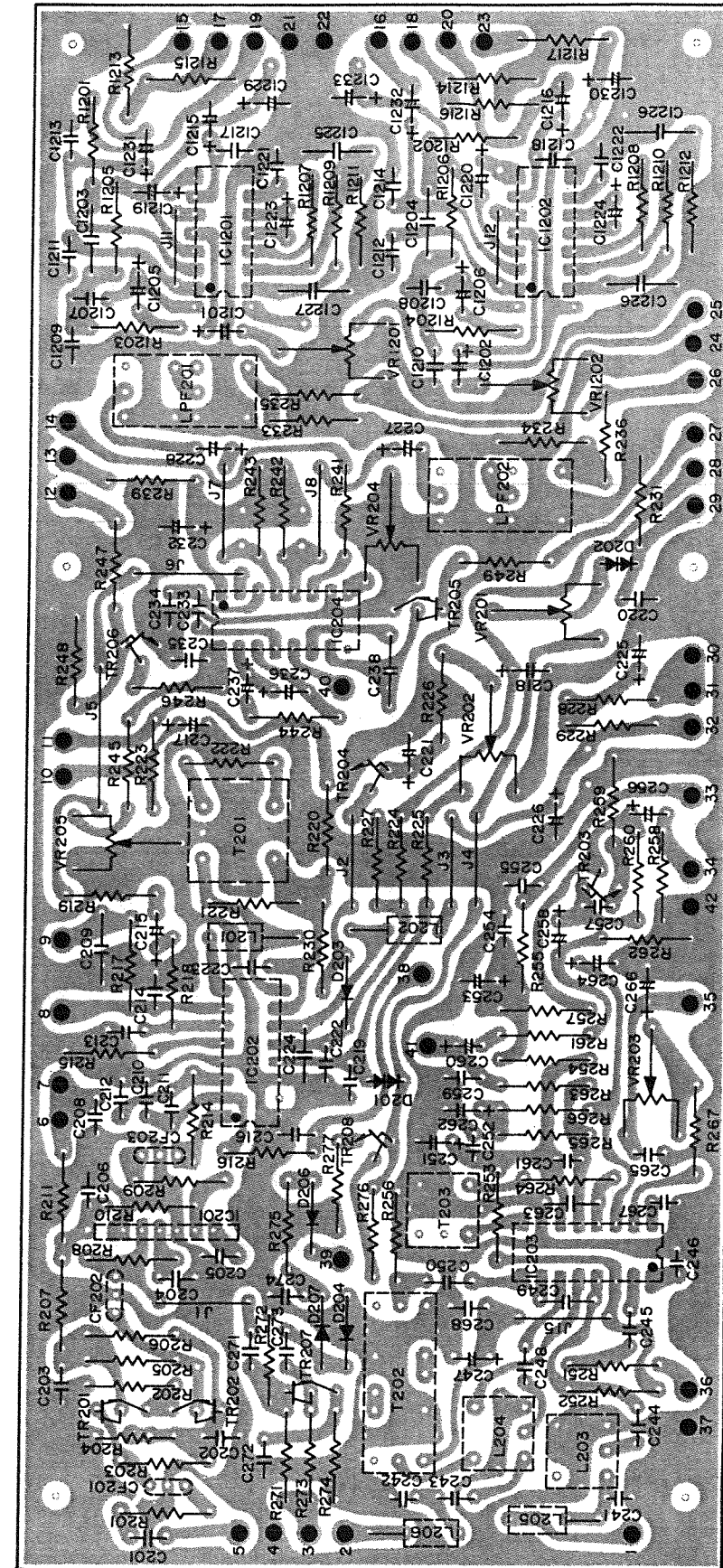
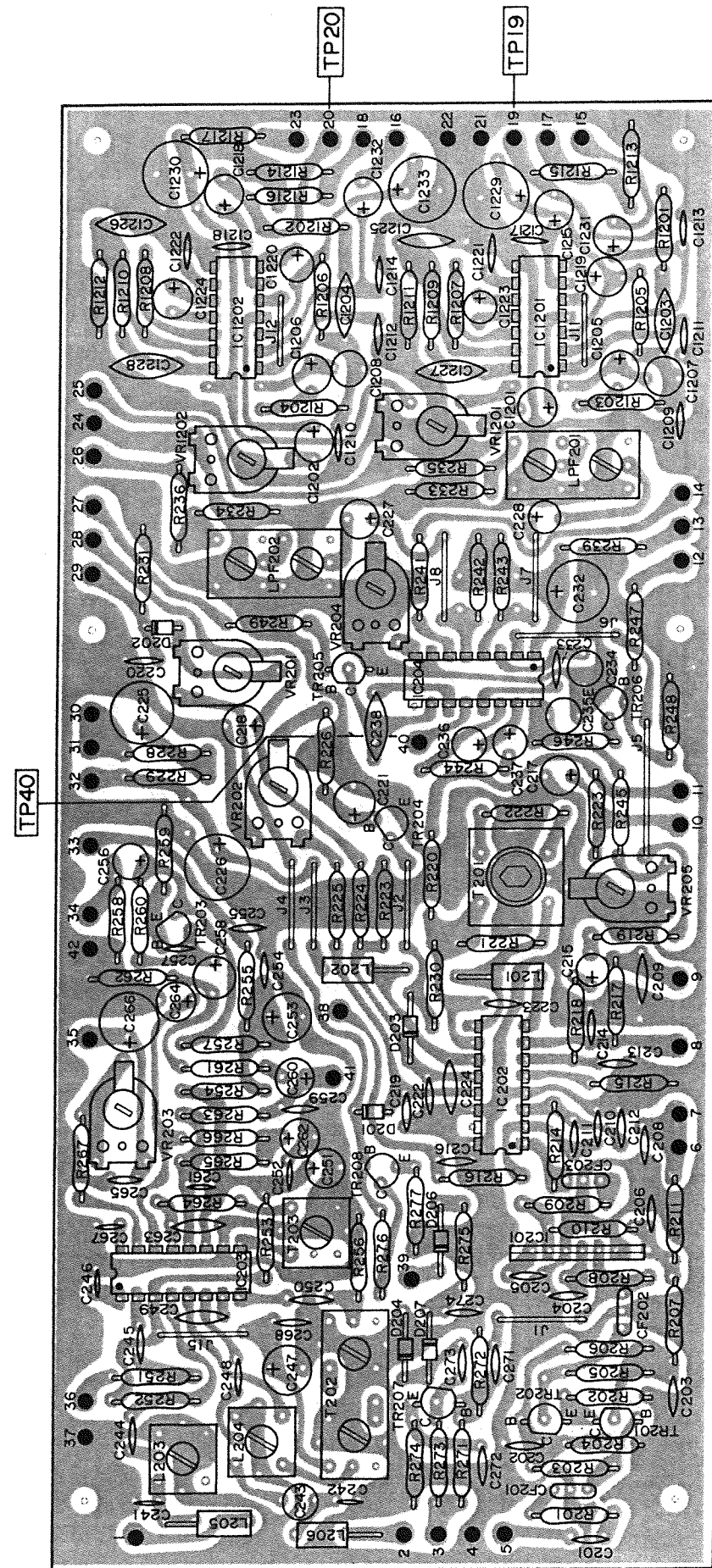




# 17) IF & DOLBY P.C.B. (TOP & BOTTOM VIEWS)

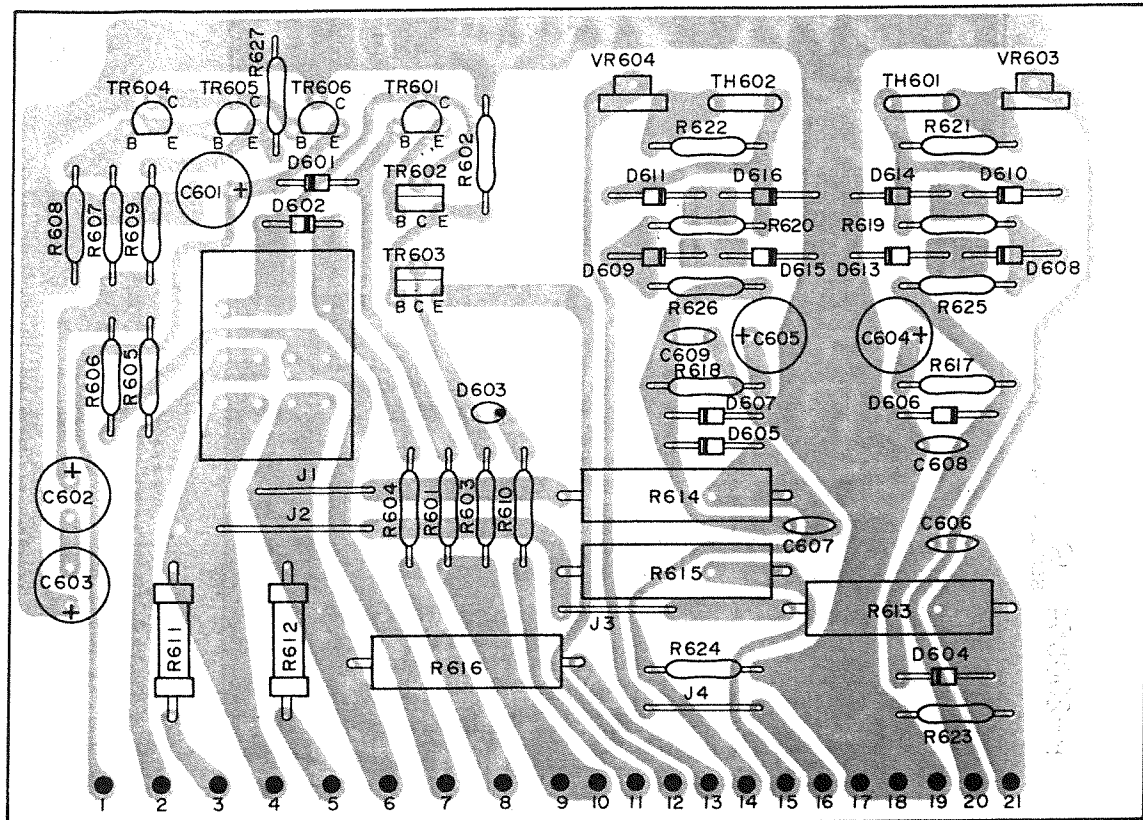
BOTTOM VIEW

TOP VIEW

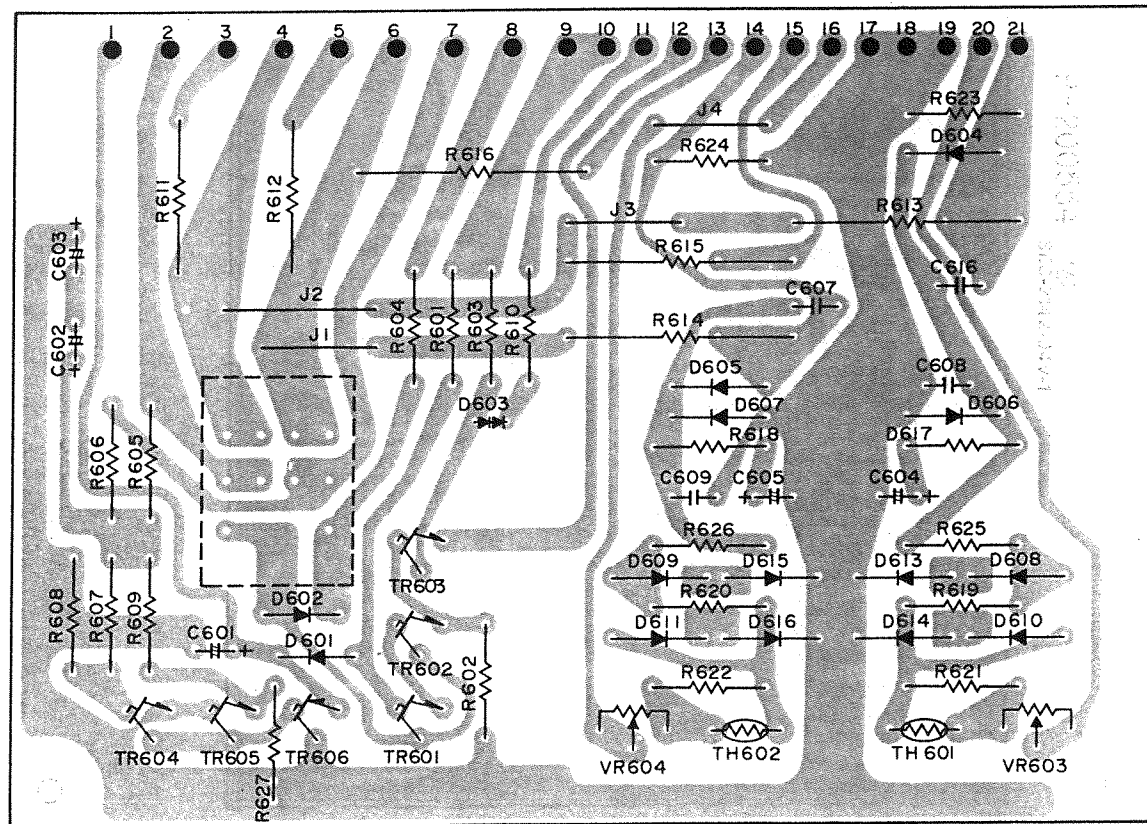


# 18) PROTECTOR & METER P.C.B. (TOP & BOTTOM VIEWS)

TOP VIEW

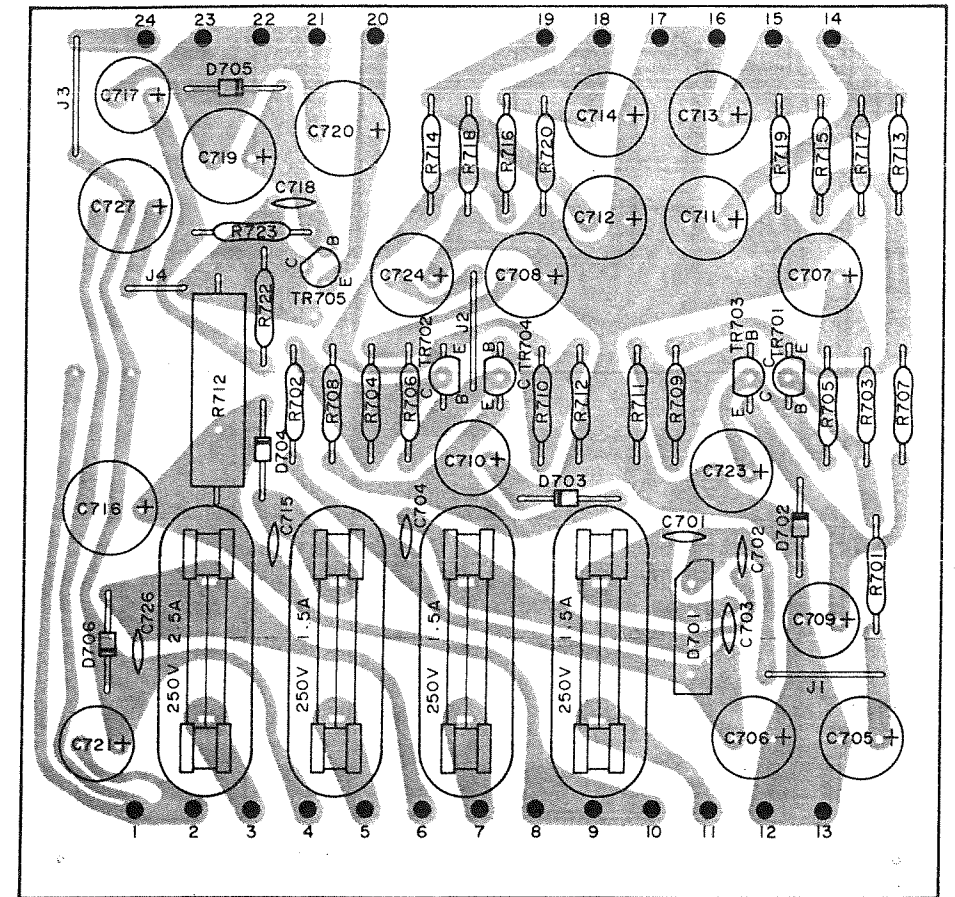


BOTTOM VIEW

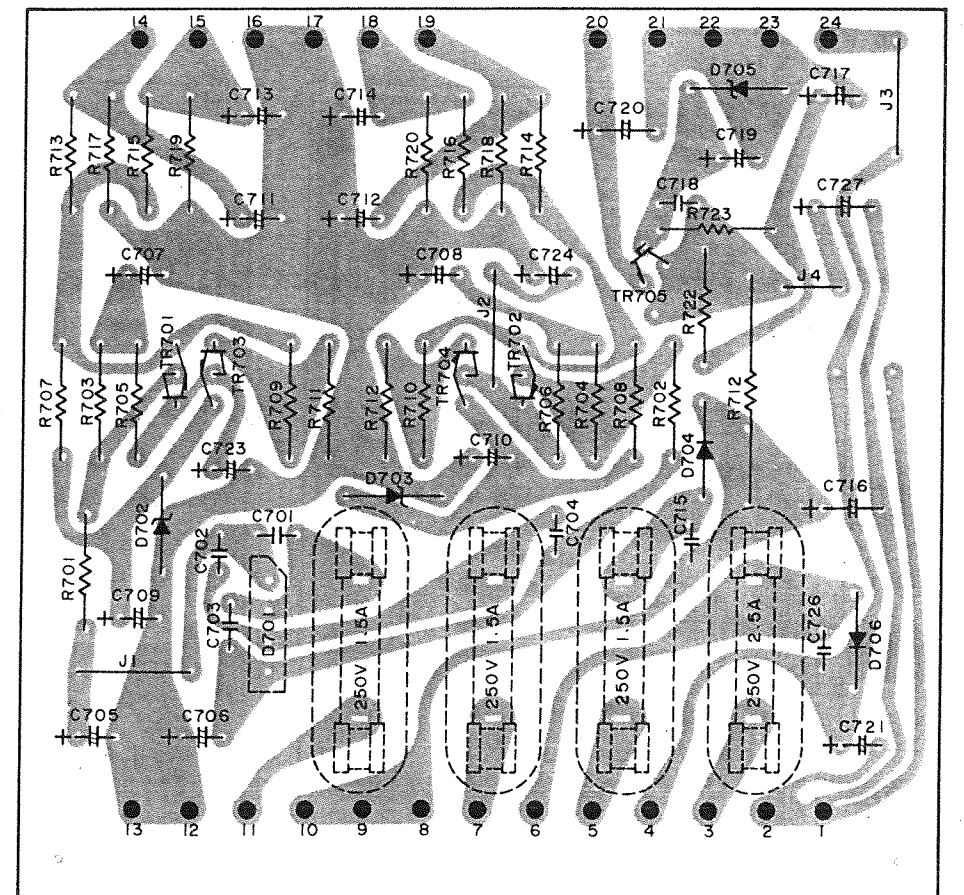


# 19) POWER SUPPLY P.C.B. (TOP & BOTTOM VIEWS)

TOP VIEW



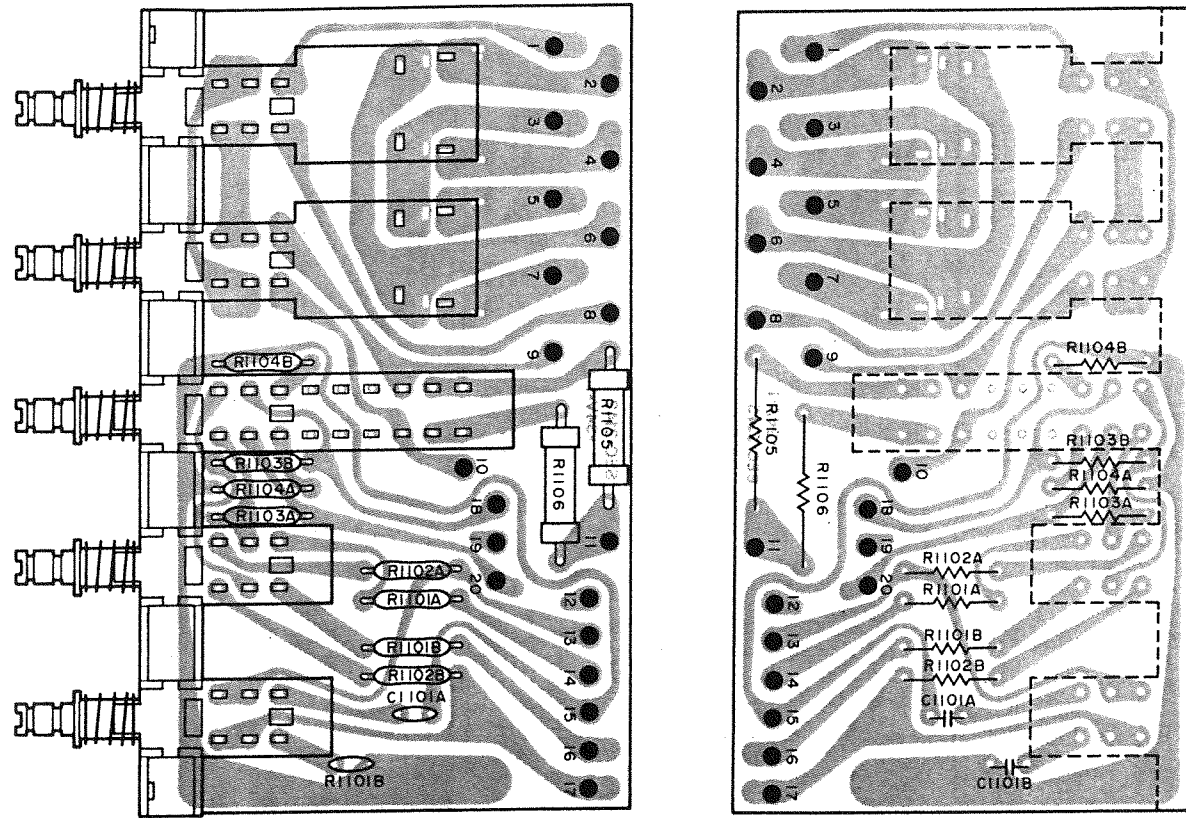
BOTTOM VIEW





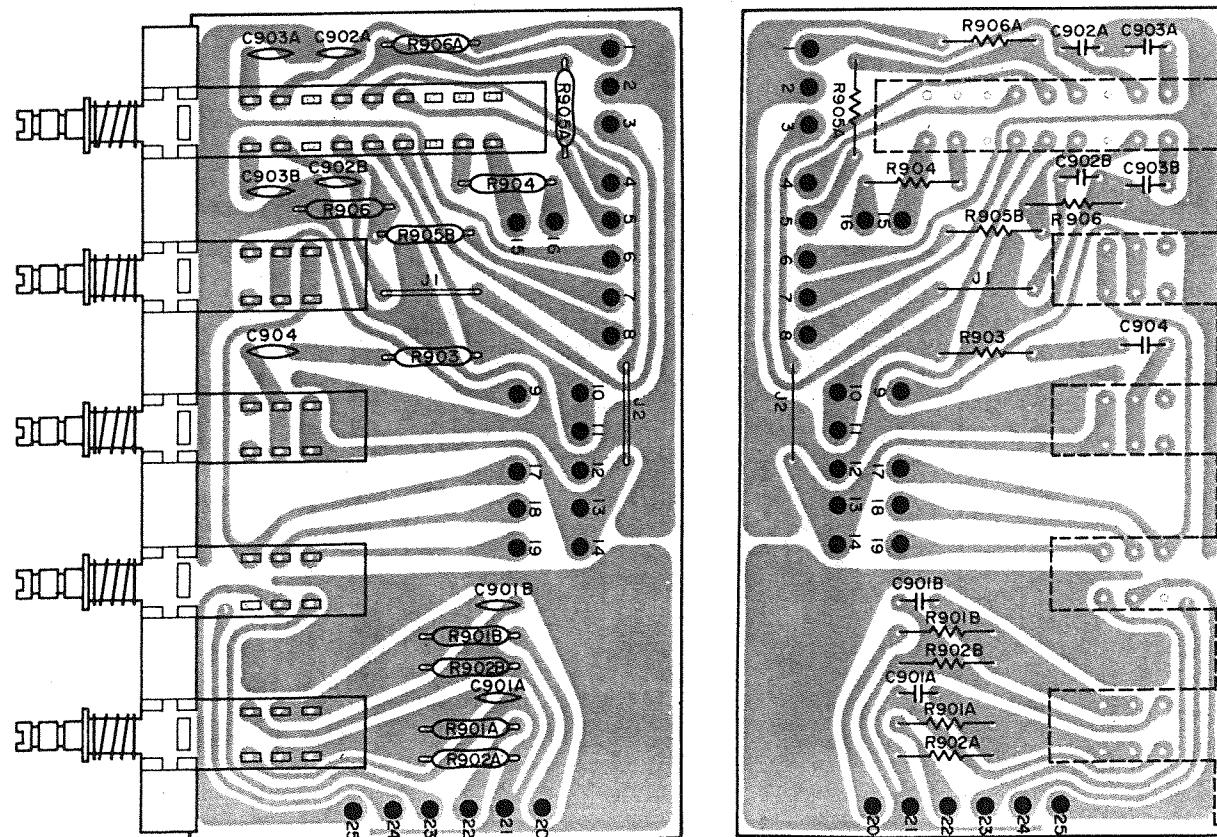
**20) SPEAKER SWITCH P.C.B. (TOP & BOTTOM VIEWS)**

TOP VIEW



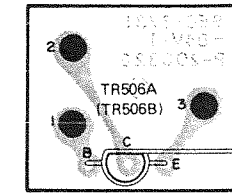
**21) MODE SWITCH P.C.B. (TOP & BOTTOM VIEWS)**

BOTTOM VIEW

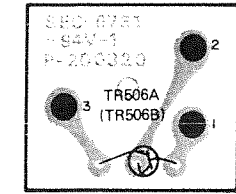


**22) MAIN SUB P.C.B. (LEFT & RIGHT) (TOP & BOTTOM VIEWS)**

TOP VIEW

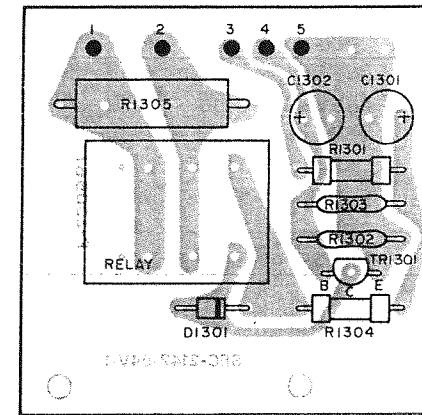


BOTTOM VIEW

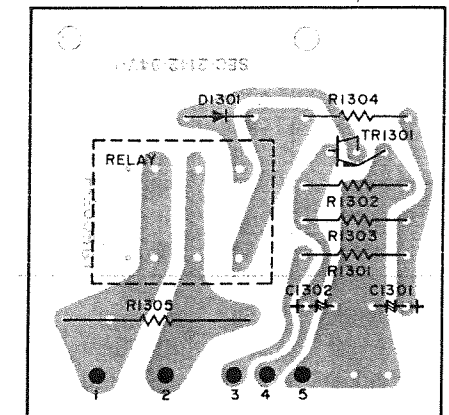


**23) RELAY P.C.B. (TOP & BOTTOM VIEWS) (use for UL models only)**

TOP VIEW

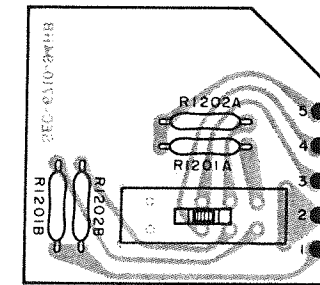


BOTTOM VIEW

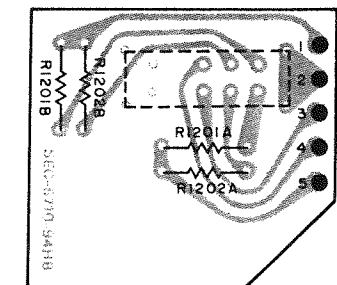


**24) PHONO LEVEL P.C.B. (TOP & BOTTOM VIEWS)**

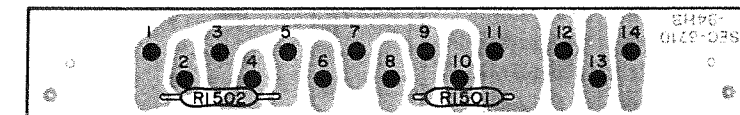
TOP VIEW



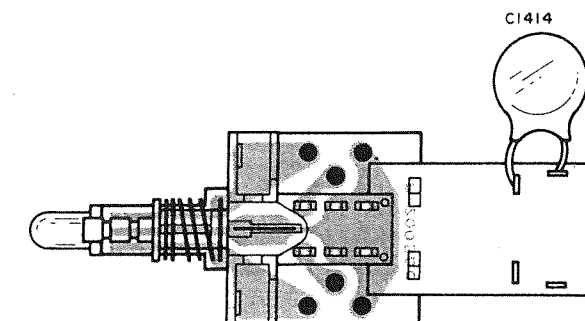
BOTTOM VIEW



**25) SELECTOR INDICATOR P.C.B. (TOP VIEW)**



**26) LED WITH POWER SWITCH P.C.B. (TOP VIEW)**



## 27) ELECTRICAL PARTS LIST

CAPACITORS					Ref. No.	Value (F)	Voltage (V)	Tolerance (%)	Material
Ref. No.	Value (F)	Voltage (V)	Tolerance (%)	Material					
C1	7p(NPO)	50	±0.5pF	Ceramic	C236	0.22μ	25	±20	Tantalum
C2	47p	50	±5	Ceramic	C237	0.47μ	25	±20	Tantalum
C3	0.0047μ(YP)	50	+80	Ceramic	C238	0.1μ	50	±10	Mylar or Semi-Con Ceramic
C4	15p(NPO)	50	±5	Ceramic		0.1μ	25	±10	
C5	0.0047μ(YP)	50	+80/-20	Ceramic	C242	12p(NPO)	50	±5	Ceramic
C6	15p(NPO)	50	±5	Ceramic	C243	340p	50	±5	Polystyrene
C7	7p(NPO)	50	±0.5pF	Ceramic	C244	0.01μ	50	+80/-20	Ceramic
C8	7p(NPO)	50	±0.5pF	Ceramic	C245	0.01μ	50	+80/-20	Ceramic
C9	100p	50	±5	Ceramic	C246	0.001μ	50	±10	Mylar
C10	0.47p	500	±10	G-Capacitor	C247	100μ	16	+50/-10	Electrolytic
C11	0.0047μ(YP)	50	+80/-20	Ceramic	C248	0.01μ	50	+80/-20	Ceramic
C12	0.022μ	50	+80/-20	Ceramic	C249	0.01μ	50	+80/-20	Ceramic
C13	0.022μ	50	+80/-20	Ceramic	C250	0.01μ	50	+80/-20	Ceramic
C14	0.022μ	50	+80/-20	Ceramic	C251	47μ	50	+50/-10	Electrolytic
C15	10p(NPO)	50	±0.5pF	Ceramic	C252	0.022μ	50	+80/-20	Ceramic
C16	33p(NPO)	50	±5	Ceramic	C253	100μ	16	+50/-10	Electrolytic
C17	10p(NPO)	50	±0.5pF	Ceramic	C254	0.022μ	50	+80/-20	Ceramic
C18	15p(N330)	50	±5	Ceramic	C255	0.022μ	50	+80/-20	Ceramic
C19	5p(NPO)	50	±0.25p	Ceramic	C256	0.47μ	50	+75/-10	Electrolytic
C20	0.022μ	50	+80/-20	Ceramic	C257	220p	50	±5	Ceramic
C201	0.01μ	50	+80/-20	Ceramic	C258	0.47μ	50	+75/-10	Electrolytic
C202	0.01μ	50	+80/-20	Ceramic	C259	0.033μ	50	±10	Mylar
C203	0.022μ	50	+80/-20	Ceramic	C260	0.1μ	25	±20	Tantalum
C204	0.022μ	50	+80/-20	Ceramic	C261	0.01μ	50	+80/-20	Ceramic
C205	0.022μ	50	+80/-20	Ceramic	C262	3.3μ	25	+75/-10	Electrolytic
C206	0.022μ	50	+80/-20	Ceramic	C263	0.001μ	50	+80/-20	Ceramic
C207	(Not used)				C264	4.7μ	25	+50/-10	Electrolytic
C208	0.022μ	50	+80/-20	Ceramic	C265	0.022μ	50	+80/-20	Ceramic
C209	0.1μ	50	±10	Mylar or Semi-Con Ceramic	C266	220μ	16	+50/-10	Electrolytic
	0.1μ	25	±10		C267	0.047μ	50	+80/-20	Ceramic
C210	0.047μ	50	+80/-20	Ceramic	C268	0.022μ	50	+80/-20	Ceramic
C211	0.047μ	50	+80/-20	Ceramic	C271	15p	50	±5	Ceramic
C212	0.047μ	50	+80/-20	Ceramic	C272	0.022μ	50	+80/-20	Ceramic
C213	220p	50	±5	Ceramic	C273	0.001μ	50	+80/-20	Ceramic
C214	0.022μ	50	+80/-20	Ceramic	C274	0.01μ	50	+80/-20	Ceramic
C215	10μ	16	+50/-10	Electrolytic					
C216	0.022μ	50	+80/-20	Ceramic	C301AB	2.2μ	25	±20	Tantalum
C217	0.47μ	50	+75/-10	Electrolytic	C302AB	100p	50	±10	Ceramic
C218	1μ	50	+75/-10	Electrolytic	C303AB	47μ	25	+50/-10	Electrolytic
C219	0.022μ	50	+80/-20	Ceramic	C304AB	22μ	16	+50/-10	Electrolytic
C220	0.022μ	50	+80/-20	Ceramic	C305AB	56p	50	±10	Ceramic
C221	1μ	50	+75/-10	Electrolytic	C306AB	1800p	50	±5	Polystyrene
C222	0.047μ	50	+80/-20	Ceramic	C307AB	6800p	50	±5	Polystyrene
C223	0.047μ	50	+80/-20	Ceramic	C308AB	100μ	25	+50/-10	Electrolytic
C224	0.047μ	50	+80/-20	Ceramic	C309AB	(Not used)			
C225	100μ	16	+50/-10	Electrolytic	C310AB	0.15μ	50	±10	Mylar
C226	47μ	16	+50/-10	Electrolytic	C311AB	0.082μ	50	±10	Mylar
C227	10μ	16	+50/-10	Electrolytic	C312AB	1μ	25	+75/-10	Electrolytic
C228	10μ	16	+50/-10	Electrolytic					
C232	100μ	16	+50/-10	Electrolytic	C313	0.04μ	50	+80/-20	Ceramic
C233	0.047μ	50	±10	Mylar	C314	0.04μ	50	+80/-20	Ceramic
C234	680p	50	±5	Polystyrene	C315	220μ	25	+50/-10	Electrolytic
C235	1500p	50	±10	Polystyrene	C316	220μ	25	+50/-10	Electrolytic

Ref. No.	Value (F)	Voltage (V)	Tolerance (%)	Material	Ref. No.	Value (F)	Voltage (V)	Tolerance (%)	Material
C401AB	4.7μ	50	+50/-10	Electrolytic	C703	0.047μ	50	+80/-10	Ceramic
C402AB	4.7μ	50	+50/-10	Electrolytic	C704	0.047μ	50	+80/-10	Ceramic
C403AB	440p	50	±5	Polystyrene	C705	220μ	35	+50/-10	Electrolytic
C404AB	900p	50	±5	Polystyrene	C706	220μ	35	+50/-10	Electrolytic
C405AB	100p	50	±5	Polystyrene	C707	220μ	35	+50/-10	Electrolytic
C408AB	0.056μ	50	±10	Mylar	C708	220μ	35	+50/-10	Electrolytic
C409AB	0.027μ	50	±10	Mylar	C709	47μ	35	+50/-10	Electrolytic
C410AB	4.7μ	50	+50/-10	Electrolytic	C710	47μ	35	+50/-10	Electrolytic
C411AB	10p	50	±5	Ceramic	C711	220μ	35	+50/-10	Electrolytic
C412AB	4.7μ	50	+50/-10	Electrolytic	C712	220μ	35	+50/-10	Electrolytic
C413AB	1μ	50	+75/-10	Electrolytic	C713	220μ	35	+50/-10	Electrolytic
C414AB	0.0068μ	50	±10	Mylar	C714	220μ	35	+50/-10	Electrolytic
C415AB	0.0039μ	50	±10	Mylar	C715	0.047μ	50	+80/-20	Ceramic
C416AB	4.7μ	50	+50/-10	Electrolytic	C716	470μ	35	+50/-10	Electrolytic
C417AB	10p	50	±5	Ceramic	C717	100μ	25	+50/-10	Electrolytic
C418AB	4.7μ	50	+50/-10	Electrolytic	C718	100p	50	±5	Ceramic
C419AB	1μ	50	+75/-10	Electrolytic	C719	330μ	16	+50/-10	Electrolytic
C420AB	0.056μ	50	±10	Mylar	C720	470μ	16	+50/-10	Electrolytic
C421AB	0.039μ	50	±10	Mylar	C721	1000μ	16	+50/-10	Electrolytic
C422AB	33p	50	±5	Ceramic	C724	220μ	35	+50/-10	Electrolytic
C423AB	4.7μ	25	+50/-10	Electrolytic	C725	220μ	35	+50/-10	Electrolytic
	(non-polar)				C726	0.047μ	50	+80/-20	Ceramic
C424AB	22p	50	±5	Ceramic	C727	470μ	25	+50/-10	Electrolytic
C425	330μ	25	+50/-10	Electrolytic					
C426	330μ	25	+50/-10	Electrolytic	C901AB	0.033μ	50	±10	Mylar
C427AB	100μ	25	+50/-10	Electrolytic	C902AB	0.0025μ	50	±5	Mylar
					C903AB	0.005μ	50	±5	Mylar
C501AB	56p	50	±5	Ceramic	C904	0.0082μ	50	±10	Mylar
C502AB	4.7μ	50	+50/-10	Electrolytic					
C503AB	220μ	16	+50/-10	Electrolytic	C1001AB	0.47μ	50	+75/-10	Electrolytic
C504AB	220μ	16	+50/-10	Electrolytic	C1002AB	10p	50	±5	Ceramic
C505AB	(Not used)				C1003AB	4.7μ	50	+50/-10	Electrolytic
C506AB	100μ	80	+50/-10	Electrolytic	C1004	100μ	25	+50/-10	Electrolytic
C507AB	100μ	80	+50/-10	Electrolytic	C1005	100μ	25	+50/-10	Electrolytic
C508AB	47p	50	±5	Ceramic	C1006AB	56p	50	±5	Ceramic
C509AB	330p	50	±5	Ceramic	C1101AB	0.027μ	50	±10	Mylar
C510AB	100μ	16	+50/-10	Electrolytic					
C511AB	100μ	16	+50/-10	Electrolytic	C1201	1μ	50	+75/-10	Electrolytic
C512AB	47p	50	±5	Ceramic	C1202	1μ	50	+75/-10	Electrolytic
C513AB	0.1μ	100	±10	Mylar	C1203	5600p	50	±2	Polystyrene
C514AB	0.1μ	100	±10	Mylar	C1204	5600p	50	±2	Polystyrene
C515AB	0.022μ	50	±10	Mylar	C1205	10μ	16	+50/-10	Electrolytic
C516AB	0.022μ	50	±10	Mylar	C1206	10μ	16	+50/-10	Electrolytic
C517AB	0.001μ	50	±10	Mylar	C1207	4700p	50	±2	Polystyrene
C518AB	0.001μ	50	±10	Mylar	C1208	4700p	50	±2	Polystyrene
C519AB	0.082μ	50	±10	Mylar	C1209	0.027μ	50	±2	Polystyrene
					C1210	0.027μ	50	±2	Polystyrene
C601	220μ	16	+50/-10	Electrolytic	C1211	0.0022μ	50	±10	Mylar
C602	330μ	16	+50/-10	Electrolytic	C1212	0.0022μ	50	±10	Mylar
C603	330μ	16	+50/-10	Electrolytic	C1213	0.001μ	50	±10	Mylar
C604	47μ	50	+50/-10	Electrolytic	C1214	0.001μ	50	±10	Mylar
C605	47μ	50	+50/-10	Electrolytic	C1215	10μ	16	+50/-10	Electrolytic
C606	0.047μ	50	+80/-20	Ceramic	C1216	10μ	16	+50/-10	Electrolytic
C607	0.047μ	50	+80/-20	Ceramic	C1217	0.001μ	50	±10	Polystyrene
C608	0.047μ	50	+80/-20	Ceramic	C1218	0.001μ	50	±10	Polystyrene
C609	0.047μ	50	+80/-20	Ceramic	C1219	10μ	16	+50/-10	Electrolytic
C701	0.047μ	50	+80/-10	Ceramic	C1220	10μ	16	+50/-10	Electrolytic
C702	0.047μ	50	+80/-10	Ceramic	C1221	0.047μ	50	±5	Mylar

Ref. No.	Value (F)	Voltage (V)	Tolerance (%)	Material
C1222	0.047 $\mu$	50	$\pm 5$	Mylar
C1223	10 $\mu$	16	+50/-10	Electrolytic
C1224	10 $\mu$	16	+50/-10	Electrolytic
C1225	0.1 $\mu$	50	$\pm 10$	Mylar
C1226	0.1 $\mu$	50	$\pm 10$	Mylar
C1227	0.33 $\mu$	50	$\pm 10$	Mylar
C1228	0.33 $\mu$	50	$\pm 10$	Mylar
C1229	220 $\mu$	16	+50/-10	Electrolytic
C1230	220 $\mu$	16	+50/-10	Electrolytic
C1231	10 $\mu$	16	+50/-10	Electrolytic
C1232	10 $\mu$	16	+50/-10	Electrolytic
C1233	220 $\mu$	16	+50/-10	Electrolytic
C1401	0.047 $\mu$	100	$\pm 20$	Ceramic
C1402	0.047 $\mu$	100	$\pm 20$	Ceramic
C1403	0.047 $\mu$	100	$\pm 20$	Ceramic
C1404	0.047 $\mu$	100	$\pm 20$	Ceramic
C1405	15000 $\mu$	71	+50/-10	Electrolytic
C1406	15000 $\mu$	71	+50/-10	Electrolytic
C1407	0.022 $\mu$	50	+80/-20	Ceramic
C1408	0.022 $\mu$	50	+80/-20	Ceramic
C1409	0.022 $\mu$	50	+80/-20	Ceramic
C1410	(Not used)			
C1411	0.022 $\mu$	50	+80/-20	Ceramic
C1412	0.022 $\mu$	50	+80/-20	Ceramic
C1413	0.022 $\mu$	50	+80/-20	Ceramic
C1414	0.01 $\mu$	125	+80/-20	Ceramic
C1414	(UK535 or LB type) (UL) (MY Type) (C. S. A.)	125	+80/-20	Ceramic
C1501	0.1 $\mu$	25	$\pm 20$	Tantalum or Aluminum
C1502	47 $\mu$	10	+50/-10	Electrolytic
C1503	100 $\mu$	35	+50/-10	Electrolytic
C1301	100 $\mu$ (UL)	35	+50/-10	Electrolytic
C1302	100 $\mu$ (UL)	16	+50/-10	Electrolytic

CERAMIC FILTERS			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
CF201	Ceramic Filter	CA-7536	P-140030
CF202	Ceramic Filter	CA-7536	P-140030
CF203	Ceramic Filter	CA-7536	P-140030

COILS & TRANSFORMERS			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
L1	FM Antenna Coil	CA-0680	P-110109
L2	FM RF Coil	CA-5103	P-110110
L3	FM RF Coil	CA-5104	P-110111
L4	FM OSC Coil	CA-5028	P-120086
L5	Micro Inductor 2.2 $\mu$ H $\pm 10\%$	CA-5072	P-360034
L201	Micro Inductor 18 $\mu$ H $\pm 10\%$	C-0709	P-360022 or P-360041

Ref. No.	Description	R/S Part No.	Mfr's Part No.
L202	Micro Inductor 2.2 $\mu$ H $\pm 10\%$	CA-7873	P-360021 or P-360034
L203	AM FR Coil	CA-5101	P-340092
L204	AM OSC Coil	CA-5106	P-120091
L205	Micro Inductor 2.2 $\mu$ H $\pm 10\%$	CA-7873	P-360021 or P-360034
L206	Micro Inductor 2.2 $\mu$ H $\pm 10\%$	CA-7873	P-360021 or P-360034
L6	Micro Inductor 2.2 $\mu$ H $\pm 10\%$	CA-7873	P-360021 or P-360034
L501A	Choke Coil 2 $\mu$ H	CB-2298	P-370009
L501B	Choke Coil 2 $\mu$ H	CA-7987	P-370032
L1402	Balun Coil	CA-5107	P-110107
L1401	AM Antenna Coil (260 $\mu$ H)	CA-5108	P-110108
T1	FM IFT (7F-007)	CA-7970	P-140007
T201	FM IFT (3F-033)	CA-7606	P-140033
T202	AM IFT with Ceramic Filter (0A-023)	C-0575	P-130023
T203	AM IFT (0A-048)	CA-7882	P-130048
T1401	Power Transformer	TA-0746	P-100635

DIODES			
Ref. No.	Description	R/S Part No.	Manufacturer
D1	ITT-410	DX-0307	ITT
D201	VD-1221	DX-0517	NEC
D202	VD-1221	DX-0517	NEC
D203	1N-60P	DX-0162	UNIZON
D204	or 1S-188FM1 1N-60P	DX-0241 DX-0162	HITACHI SANYO
D204	or 1S-188FM1 (Not used)	DX-0241	SANYO
D205	(Not used)		
D206	ITT-73N	DX-1008	ITT
D207	1N-60P	DX-0162	UNIZON
D501AB	or 1S-188FM1 VD-1221	DX-0241 DX-0517	SANYO NEC
D502AB	VD-1221	DX-0517	NEC
D503AB	ITT-73N	DX-1008	ITT
D504AB	ITT-73N	DX-1008	ITT
D505AB	ITT-73N	DX-1008	ITT
D506AB	ITT-73N	DX-1008	ITT
D507AB	SR-1K-8	DX-1052	UNIZON
D508AB	SR-1K-8	DX-1052	UNIZON
D509AB	RD-13E	DX-0405	NEC
D601	or WZ-130 10E-1	DX-0537 DX-1039	JRC INTER-RECTIFIER
D602	or SR-1K-2 10E-1	DX-0475 DX-1039	UNIZON INTER-RECTIFIER
D603	VD-1221	DX-0517	NEC
D604	1K-100-350	DX-0033	UNIZON
D605	1K-100-350	DX-0033	UNIZON

Ref. No.	Description	R/S Part No.	Mfr's Part No.
D606	1K-100-350	DX-0033	UNIZON
D607	1K-100-350	DX-0033	UNIZON
D608	2-1K261	DX-1107	UNIZON
D609	2-1K261	DX-1107	UNIZON
D610	2-1K261	DX-1107	UNIZON
D611	2-1K261	DX-1107	UNIZON
D612	(Not used)		
D613	2-1K261	DX-1107	UNIZON
D614	2-1K261	DX-1107	UNIZON
D615	2-1K261	DX-1107	UNIZON
D616	2-1K261	DX-1107	UNIZON
D701	SVB10-200	DX-1115	UNIZON
D702	WZ-210	DX-1282	JRC
D703	or RD-21E WZ-210		NEC
D704	SR-1K-2 or 10E-1	DX-0475 DX-1039	UNIZON INTER-RECTIFIER
D705	WZ-130 or RD-13E	DX-0537 DX-0405	JRC NEC
D706	SR-1K-2 or 10E-1	DX-0475 DX-1039	UNIZON INTER-RECTIFIER
D1301	SR-1K-2 or 10E-1 (UL only)	DX-0475 DX-1039	UNIZON INTER-RECTIFIER
D1401	S15VB-20	DX-1117	SHIN-DENGEN
D1501	SR-1K-2 or 10E-1	DX-0475 DX-1039	UNIZON INTER-RECTIFIER

FILTERS			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
LPF201	Low Pass Filter (19kHz/38kHz)	C-0997	P-510014
LPF202	Low Pass Filter (19kHz/38kHz)	C-0997	P-510014

FUSES			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
F1	Fuse 1.5A/250V	HF-0004	P-250007
F2	Fuse 2.5A/250V	HF-0021	P-250008
F3	Fuse 1.5A/250V	HF-0004	P-250007
F4	Fuse 1.5A/250V	HF-0004	P-250007
F5	Fuse 8A /125V		P-250102

INTEGRATED CIRCUITS			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
IC201	HA-1211	MX-3617	HITACHI
IC202	LA-1230	MX-3210	SANYO
IC203	HA-1197	MX-3467	HITACHI
IC204	LA-3350SS	MX-3768	SANYO
IC1201	LM-1011AN	MX-4190	N.S.
IC1202	LM-1011AN	MX-4190	N.S.

LAMPS			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
PL1401 /1402	Dial Lamp 8V, 0.3A (L= 320m/m)	L-0915	P-240108
PL1403 /1404	Dial Lamp 8V, 0.3A (L= 160m/m)	L-0916	P-240109
PL1405 -1408	Meter Lamp 8V, 0.3A	L-0864	P-240091
PL1409 -1415	Function Indicator Lamp 6V, 60mA	L-0917	P-240107

LIGHT EMITTING DIODE			
Ref. No.	Description	R/S Part No.	Manufacturer
	LED (red & green) GL-52RG		SHARP

METERS			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
M1	SIGNAL Meter	M-0391	P-230073
M2	TUNING Meter	M-0391	P-230074
M3	WATTS (L)	M-0424	P-230083
M4	WATTS (R)	M-0424	P-230083

RESISTORS					
Ref. No.	Value ( $\Omega$ )	Wattage (W)	Tolerance (%)	Material	R/S Part No.
R1	100K	1/4	$\pm 5$	Carbon	NEE-0371
R2	100K	1/4	$\pm 5$	Carbon	NEE-0371
R3	82K	1/4	$\pm 5$	Carbon	NEE-0360
R4	(Not used)				
R5	22	1/4	$\pm 5$	Carbon	NEE-0078
R6	47	1/4	$\pm 5$	Carbon	NEE-0099
R7	22K	1/4	$\pm 5$	Carbon	NEE-0311
R8	4.7K	1/4	$\pm 5$	Carbon	NEE-0247
R9	1K	1/4	$\pm 5$	Carbon	NEE-0196
R10	100	1/4	$\pm 5$	Carbon	NEE-0132
R11	(Not used)				
R12	100	1/4	$\pm 5$	Carbon	NEE-0132
R13	12K	1/4	$\pm 5$	Carbon	NEE-0288
R14	2.2K	1/4	$\pm 5$	Carbon	NEE-0216
R15	10K	1/4	$\pm 5$	Carbon	NEE-0281
R16	1.5M	1/4	$\pm 5$	Carbon	NEE-0450
R17	150K	1/4	$\pm 5$	Carbon	NEE-0384
R18	(Not used)				
R19	22	1/4	$\pm 5$	Carbon	NEE-0078
R201	100	1/4	$\pm 5$	Carbon	NEE-0132
R202	330	1/4	$\pm 5$	Carbon	NEE-0159
R203	470	1/4	$\pm 5$	Carbon	NEE-0169
R204	2.2K	1/4	$\pm 5$	Carbon	NEE-0216
R205	330	1/4	$\pm 5$	Carbon	NEE-0159
R206	12K	1/4	$\pm 5$	Carbon	NEE-0288
R207	100	1/4	$\pm 5$	Carbon	NEE-0132
R208	330	1/4	$\pm 5$	Carbon	NEE-0159



Ref. No.	Value (Ω)	Wattage (W)	Tolerance (%)	Material	R/S Part No.	Ref. No.	Value (Ω)	Wattage (W)	Tolerance (%)	Material	R/S Part No.
R209	100	¼	± 5	Carbon	NEE-0132	R266	10K	¼	± 5	Carbon	NEE-0281
R210	330	¼	± 5	Carbon	NEE-0159	R267	100	¼	± 5	Carbon	NEE-0132
R211	100	¼	± 5	Carbon	NEE-0132	R268	(Not used)				
R212	(Not used)					R269	(Not used)				
R213	(Not used)					R270	(Not used)				
R214	330	¼	± 5	Carbon	NEE-0159	R271	15K	¼	± 5	Carbon	NEE-0297
R215	56K	¼	± 5	Carbon	NEE-0345	R272	2.2K	¼	± 5	Carbon	NEE-0216
R216	100K	¼	± 5	Carbon	NEE-0371	R273	2.7K	¼	± 5	Carbon	NEE-0224
R217	470K	¼	± 5	Carbon	NEE-0423	R274	820	¼	± 5	Carbon	NEE-0187
R218	1K	¼	± 5	Carbon	NEE-0196	R275	10K	¼	± 5	Carbon	NEE-0281
R219	100	¼	± 5	Carbon	NEE-0132	R276	15K	¼	± 5	Carbon	NEE-0297
R220	8.2K	¼	± 5	Carbon	NEE-0271	R277	180	¼	± 5	Carbon	NEE-0144
R221	3.9K	¼	± 5	Carbon	NEE-0237						
R222	3.3K	¼	± 5	Carbon	NEE-0230	R301AB	56K	¼	± 5	Carbon	NEE-0345
R223	1.5K	¼	± 5	Carbon	NEE-0206	R302AB	4.7K	¼	± 5	Carbon	NEE-0240
R224	2.2K	¼	± 5	Carbon	NEE-0216	R303AB	390K	¼	± 5	Carbon	NEE-0414
R225	4.7K	¼	± 5	Carbon	NEE-0240	R304AB	100K	¼	± 5	Carbon	NEE-0371
R226	10K	¼	± 5	Carbon	NEE-0281	R305AB	180K	¼	± 5	Carbon	NEE-0387
R227	47K	¼	± 5	Carbon	NEE-0340	R306AB	3.3K	¼	± 5	Carbon	NEE-0230
R228	22	¼	± 5	Carbon	NEE-0078	R307AB	270	¼	± 5	Carbon	NEE-0155
R229	22	¼	± 5	Carbon	NEE-0078	R308AB	39K	¼	± 5	Carbon	NEE-0330
R230	10K	¼	± 5	Carbon	NEE-0281	R309AB	680K	¼	± 5	Carbon	NEE-0433
R231	2.2K	¼	± 5	Carbon	NEE-0216	R310AB	15K	¼	± 5	Carbon	NEE-0297
R232	(Not used)					R311AB	560	¼	± 5	Carbon	NEE-0176
R233	4.7K	¼	± 5	Carbon	NEE-0240	R312AB	4.7K	¼	± 5	Carbon	NEE-0247
R234	4.7K	¼	± 5	Carbon	NEE-0240	R313AB	1K	¼	± 5	Carbon	NEE-0196
R235	10K	¼	± 5	Carbon	NEE-0281	R314AB	220K	¼	± 5	Carbon	NEE-0396
R236	10K	¼	± 5	Carbon	NEE-0281	R315AB	270K	¼	± 5	Carbon	NEE-0402
R237	(Not used)					R316AB	56K	¼	± 5	Carbon	NEE-0345
R238	(Not used)					R317AB	4.7K	¼	± 5	Carbon	NEE-0247
R239	33	¼	± 5	Carbon	NEE-0087	R318AB	100	¼	± 5	Carbon	NEE-0132
R240	(Not used)					R319AB	(Not used)				
R241	100	¼	± 5	Carbon	NEE-0132	R320AB	1K	¼	± 5	Carbon	NEE-0196
R242	4.7K	¼	± 5	Carbon	NEE-0240						
R243	4.7K	¼	± 5	Carbon	NEE-0240	R401AB	47K	¼	± 5	Carbon	NEE-0340
R244	1K	¼	± 5	Carbon	NEE-0196	R402AB	(Not used)				
R245	8.2K	¼	± 5	Carbon	NEE-0271	R403AB	4.7K	¼	± 5	Carbon	NEE-0247
R246	100	¼	± 5	Carbon	NEE-0132	R404AB	47K	¼	± 5	Carbon	NEE-0340
R247	10K	¼	± 5	Carbon	NEE-0281	R405AB	1K	¼	± 5	Carbon	NEE-196
R248	1K	¼	± 5	Carbon	NEE-0196	R406AB	12K	¼	± 5	Carbon	NEE-0288
R249	47K	¼	± 5	Carbon	NEE-0340	R407AB	4.7K	¼	± 5	Carbon	NEE-0240
R250	(Not used)					R408AB	3.3K	¼	± 5	Carbon	NEE-0230
R251	220	¼	± 5	Carbon	NEE-0149	R409AB	18K	¼	± 5	Carbon	NEE-0303
R252	1.8K	¼	± 5	Carbon	NEE-0210	R410AB	1K	¼	± 5	Carbon	NEE-0196
R253	150	¼	± 5	Carbon	NEE-0142	R411AB	3.3K	¼	± 5	Carbon	NEE-0230
R254	100	¼	± 5	Carbon	NEE-0132	R412AB	18K	¼	± 5	Carbon	NEE-0303
R255	22	¼	± 5	Carbon	NEE-0078	R413AB	18K	¼	± 5	Carbon	NEE-0303
R256	5.6K	¼	± 5	Carbon	NEE-0257	R414AB	2.7M	¼	± 5	Carbon	NEE-0456
R257	5.6K	¼	± 5	Carbon	NEE-0257	R415AB	4.7K	¼	± 5	Carbon	NEE-0247
R258	39K	¼	± 5	Carbon	NEE-0330	R416AB	47	¼	± 5	Carbon	NEE-0099
R259	820	¼	± 5	Carbon	NEE-0187	R417AB	220K	¼	± 5	Carbon	NEE-0396
R260	1.5M	¼	± 5	Carbon	NEE-0450	R418AB	6.8K	¼	± 5	Carbon	NEE-0262
R261	10K	¼	± 5	Carbon	NEE-0281	R419AB	47K	¼	± 5	Carbon	NEE-0340
R262	4.7K	¼	± 5	Carbon	NEE-0240	R420AB	10K	¼	± 5	Carbon	NEE-0281
R263	1K	¼	± 5	Carbon	NEE-0196	R421AB	6.8K	¼	± 5	Carbon	NEE-0262
R264	330	¼	± 5	Carbon	NEE-0159	R422AB	6.8K	¼	± 5	Carbon	NEE-0340
R265	10K	¼	± 5	Carbon	NEE-0281	R423AB	220K	¼	± 5	Carbon	NEE-0396

Ref. No.	Value (Ω)	Wattage (W)	Tolerance (%)	Material	R/S Part No.	Ref. No.	Value (Ω)	Wattage (W)	Tolerance (%)	Material	R/S Part No.
R424AB	2.7M	¼	± 5	Carbon	NEE-0456	R603	1K	1	± 5	Metal Oxide	NEG-0196
R425AB	4.7K	¼	± 5	Carbon	NEE-0247	R604	82	1	± 5	Metal Oxide	NEG-0122
R426AB	47	¼	± 5	Carbon	NEE-0099	R605	18K	½	± 5	Carbon	NEF-0303
R427AB	220K	¼	± 5	Carbon	NEE-0396	R606	18K	½	± 5	Carbon	NEF-0303
R428AB	1K	¼	± 5	Carbon	NEE-0196	R607	8.2K	½	± 5	Carbon	NEF-0271
R429AB	220K	¼	± 5	Carbon	NEE-0396	R608	3.9K	½	± 5	Carbon	NEF-0237
R430AB	220K	¼	± 5	Carbon	NEE-0396	R609	10K	½	± 5	Carbon	NEF-0281
R431AB	47K	¼	± 5	Carbon	NEE-0340	R610	470	½	± 5	Carbon	NEF-0169
R432AB	4.7K	¼	± 5	Carbon	NEE-0247	R611	470	2	± 5	Metal Oxide	NEH-0169
R433AB	1K	¼	± 5	Carbon	NEE-0196	R612	470	2	± 5	Metal Oxide	NEH-0169
R434AB	220K	¼	± 5	Carbon	NEE-0396	R613	470	3	± 5	Metal Oxide	NEJ-0169
R435	100	¼	± 5	Carbon	NEE-0132	R614	470	3	± 5	Metal Oxide	NEJ-0169
R436	100	¼	± 5	Carbon	NEE-0132	R615	820	3	± 5	Metal Oxide	NEJ-0187
						R616	820	3	± 5	Metal Oxide	NEJ-0187
R501AB	1M	½	± 5	Carbon	NEF-0445	R617	22	½	± 5	Carbon	NEF-0078
R502AB	4.7K	½	± 5	Carbon	NEF-0247	R618	22	½	± 5	Carbon	NEF-0078
R503AB	47	½	± 5	Carbon	NEF-0099	R619	68	½	± 5	Carbon	NEF-0111
R504AB	47	½	± 5	Carbon	NEF-0099	R620	68	½	± 5	Carbon	NEF-0111
R505AB	47K	½	± 5	Carbon	NEF-0340	R621	1.5K	½	± 5	Carbon	NEF-0206
R506AB	4.7K	1	± 5	Metal Oxide	NEG-0247	R622	1.5K	½	± 5	Carbon	NEF-0206
R507AB	1K	½	± 5	Carbon	NEF-0196	R623	1.5K	½	± 5	Carbon	NEF-0206
R508AB	8.2K	½	± 5	Carbon	NEF-0271	R624	1.5K	½	± 5	Carbon	NEF-0206
R509AB	2.2K	½	± 5	Carbon	NEF-0216	R625	1.2K	½	± 5	Carbon	NEF-0199
R510AB	2.2K	½	± 5	Carbon	NEF-0216	R626	1.2K	½	± 5	Carbon	NEF-0199
R511AB	39	½	± 5	Carbon	NEF-0042	R627	6.8K	½	± 5	Carbon	NEF-0262
R512AB	68	1	± 5	Metal Oxide	NEG-0111						
R513AB	68	1	± 5	Metal Oxide	NEG-0111	R701	22	1	± 5	Metal Oxide	NEG-0078
R514AB	12K	½	± 5	Carbon	NEF-0288	R702	22	1	± 5	Metal Oxide	NEG-0078
R515AB	12K	½	± 5	Carbon	NEF-0288	R703	1.5K	½	± 5	Carbon	NEF-0206
R516AB	47K	½	± 5	Carbon	NEF-0340	R704	1.5K	½	± 5	Carbon	NEF-0206
R517AB	1.8K	½	± 5	Carbon	NEF-0210	R705	1.5K	½	± 5	Carbon	NEF-0206
R518AB	18K	½	± 5	Carbon	NEE-0303	R706	1.5K	½	± 5	Carbon	NEF-0206
R519AB	22	1	± 5	Metal Oxide	NEG-0078	R707	1K	½	± 5	Carbon	NEF-0196
R520AB	22	1	± 5	Metal Oxide	NEG-0078	R708	1K	½	± 5	Carbon	NEF-0196
R521AB	68	½	± 5	Carbon	NEF-0111	R709	22K	½	± 5	Carbon	NEF-0311
R522AB	3.3K	½	± 5	Carbon	NEF-0230	R710	22K	½	± 5	Carbon	NEF-0311
R523AB	150	1	± 5	Metal Oxide	NEG-0142	R711	56K	½	± 5	Carbon	NEF-0345
R524AB	150	1	± 5	Metal Oxide	NEG-0142	R712	56K	½	± 5	Carbon	NEF-0345
R525AB	4.7	1	± 5	Metal Oxide	NEG-0047	R713	390	1	± 5	Metal Oxide	NEG-0162
R526AB	4.7	1	± 5	Metal Oxide	NEG-0047	R714	390	1	± 5	Metal Oxide	NEG-0162
R527AB	4.7	1	± 5	Metal Oxide	NEG-0047	R715	100	1	± 5	Metal Oxide	NEG-0132
R528AB	4.7	1	± 5	Metal Oxide	NEG-0047	R716	100	1	± 5	Metal Oxide	NEG-0132
R529AB	0.5	7	± 5	Cement	NEN-0010	R717	33K	½	± 5	Carbon	NEF-0324
R530AB	0.5	7	± 5	Cement	NEN-0010	R718	33K	½	± 5	Carbon	NEF-0324
R531AB	0.5	7	± 5	Cement	NEN-0010	R719	18K	½	± 5	Carbon	NEF-0303
R532AB	0.5	7	± 5	Cement	NEL-0010	R720	18K	½	± 5	Carbon	NEF-0303
R533AB	22	2	± 5	Metal Oxide	NEH-0078	R721	68	3	± 5	Metal Oxide	NEJ-0111
R534AB	10	3	± 5	Metal Oxide	NEJ-0063	R722	330	½	± 5	Carbon	NEF-0159
R535AB	15K	½	± 5	Carbon	NEF-0297	R723	330	½	± 5	Carbon	NEF-0159
R536AB	15K	½	± 5	Carbon	NEF-0297						
R537AB	120	½	± 5	Carbon	NEF-0136	R801AB	4.7K	¼	± 5	Carbon	NEE-0247
R538AB	120	½	± 5	Carbon	NEF-0136	R802AB	4.7K	¼	± 5	Carbon	NEE-0247
R539AB	2.2K	½	± 5	Carbon	NEF-0216	R803AB	2.2K	¼	± 5	Carbon	NEE-0216
R540AB	2.2K	½	± 5	Carbon	NEF-0216						
						R901AB	6.8K	¼	± 5	Carbon	NEE-0262
R601	150K	½	± 5	Carbon	NEF-0284	R902AB	2.2M	¼	± 5	Carbon	NEE-0454
R602	220	½	± 5	Carbon	NEF-0149	R903	100	¼	± 5	Carbon	NEE-0132

Ref. No.	Value (Ω)	Wattage (W)	Tolerance (%)	Material	R/S Part No.
R 904	68	¼	± 5	Carbon	NEE-0111
R 905AB	1K	¼	± 5	Carbon	NEE-0196
R 906AB	2.7K	¼	± 5	Carbon	NEE-0224
R 1001AB	1K	¼	± 5	Carbon	NEE-0196
R 1002AB	560K	¼	± 5	Carbon	NEE-0429
R 1003AB	10K	¼	± 5	Carbon	NEE-0281
R 1004AB	220K	¼	± 5	Carbon	NEE-0396
R 1005AB	1K	¼	± 5	Carbon	NEE-0196
R 1006	1K	¼	± 5	Carbon	NEE-0196
R 1007	1K	¼	± 5	Carbon	NEE-0196
R 1101AB	1K	¼	± 5	Carbon	NEE-0196
R 1102AB	1K	¼	± 5	Carbon	NEE-0196
R 1103AB	33K	¼	± 5	Carbon	NEE-0324
R 1104AB	22K	¼	± 5	Carbon	NEE-0311
R 1105	120	2	± 5	Metal Oxide	NEH-0136
R 1106	120	2	± 5	Metal Oxide	NEH-0136
R 1201AB	1K	¼	± 5	Carbon	NEE-0196
R 1202AB	2.7K	¼	± 5	Carbon	NEE-0224
R 1201	180	¼	± 5	Carbon	NEE-0144
R 1202	180	¼	± 5	Carbon	NEE-0144
R 1203	47K	¼	± 5	Carbon	NEE-0340
R 1204	47K	¼	± 5	Carbon	NEE-0340
R 1205	3.3K	¼	± 2	Carbon	
R 1206	3.3K	¼	± 2	Carbon	
R 1207	270K	¼	± 5	Carbon	NEE-0402
E 1208	270K	¼	± 5	Carbon	NEE-0402
R 1209	270K	¼	± 5	Carbon	NEE-0402
R 1210	270K	¼	± 5	Carbon	NEE-0402
R 1211	560K	¼	± 5	Carbon	NEE-0429
R 1212	560K	¼	± 5	Carbon	NEE-0429
R 1213	2.2K	¼	± 5	Carbon	NEE-0216
R 1214	2.2K	¼	± 5	Carbon	NEE-0216
R 1215	1K	¼	± 5	Carbon	NEE-0196
R 1216	1K	¼	± 5	Carbon	NEE-0196
R 1217	100	¼	± 5	Carbon	NEE-0132
R 1301	56 (UL only)	1	± 5	Metal Oxide	NEG-0142
R 1302	10K (UL only)	½	± 5	Carbon	NEF-0281
R 1303	150K (UL only)	½	± 5	Carbon	NEF-0384
R 1304	150 (UL only)	1	± 5	Metal Oxide	NEG-0384
R 1305	0.47 (UL only)	5	± 5	Cement	NEL-0008
R 1401	220K	¼	± 5	Carbon	NEE-0396
R 1402	220K	¼	± 5	Carbon	NEE-0396
R 1403	220K	¼	± 5	Carbon	NEE-0396
R 1404	220K	¼	± 5	Carbon	NEE-0396
R 1405	2.2M	½	± 5	Carbon	NEF-0454
R 1501	100K	¼	± 5	Carbon	
R 1502	39K	¼	± 5	Carbon	

Ref. No.	Value (Ω)	Wattage (W)	Tolerance (%)	Material	R/S Part No.
R 1503	330	½	± 5	Carbon	
R 1504	390K	¼	± 5	Carbon	
R 1505	39K	¼	± 5	Carbon	
R 1506	100	¼	± 5	Carbon	
R 1507	3.3K	¼	± 5	Carbon	
R 1601	68	¼	± 5	Carbon	
R 1602	68	¼	± 5	Carbon	

RELAYS				
Ref. No.	Description	R/S Part No.	Mfr's Part No.	
REED RELAY A	Reed Relay L-24 Relay for Power MS24D2-D (UL models only)	R-8110	P-290007	
		R-8100	P-290016	
RELAY B	Relay for Protector MY4-02-VS-4DL or MS24D4-0(Z)	R-8081	P-290012	or P-290013

SWITCHES				
Ref. No.	Description	R/S Part No.	Mfr's Part No.	
Ss1-Ss12	SELECTOR Switch	S-1314	P-180305	
SP1-2/SP3-4/SA1-2/HF1/LF1	Push Switch 5 gangs (SPEAKER A-B/-10dB ATT/LOW FIL/HIGH FIL)	S-7380	P-180300	or P-180318
DF1-3/FM1/HM1	Push Switch 5 gangs (DOLBY FM/FM MUTE/HIGH-MPX FIL/MONO/LOUDNESS)	S-7425	P-180372	
MS1-2/LS1-2	TURNOVER 300Hz/150Hz	S-7377	P-180313	
	TURNOVER 3kHz/6kHz	S-7378	P-180314	
PS1-3	POWER Switch TV-5 (UL)	S-0856	P-180239	
PS1-3	POWER Switch TV-10 (C.S.A.)		P-180430	
SL1-2	PHONO LEVEL	S-7381	P-180301	
SM1-2	TAPE MONITOR	S-5038	P-180209	
SD1-4	TAPE DUBBING	S-5039	P-180210	

THERMISTORS				
Ref. No.	Description	R/S Part No.	Manufacturer	
TH601	Thermistor (SDT-500)	T-1214	SANYO	
TH602	Thermistor (SDT-500)	T-1214	SANYO	

THERMAL PROTECTORS			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
PR1401	Thermal Protector (100°C)	HH-0329	P-290025
		HB-8443	or P-290028
PR1402	Thermal Protector (100°C)	HH-0329	P-290025
		HB-8443	or P-290028
PR1403	Thermal Protector (95°C) for Power Transformer	HB-6880	P-290018
			or P-290033

TRANSISTORS		
Ref. No.	Description	Manufacturer
TR 1	MOS FET 3SK 45 (B)	HITACHI
TR 2	2SC535 (B, C)	HITACHI
TR 3	2SC461 (B, C)	HITACHI
TR201	2SC1674 (L, K)	NEC
TR202	2SC1674 (L, K)	NEC
TR203	2SC945 (P, K)	NEC
	or 2SC536 (G, H)	SANYO
TR204	2SC945 (K)	NEC
	or 2SC536 (H)	SANYO
TR205	2SC945 (K)	NEC
	or 2SC536 (H)	SANYO
TR206	2SC945 (K)	NEC
	or 2SC536 (H)	SANYO
TR207	2SC1674 (L, K)	NEC
TR208	2SC945 (K)	NEC
	or 2SC536 (H)	SANYO
TR301AB	2SC1222(2) (E, U)	NEC
TR302AB	2SC1222(2) (E, U)	NEC
TR303AB	2SA750 (E)	NEC
TR304AB	2SC1222(2) (E, U)	NEC
TR401AB	2SA750 (E)	NEC
TR402AB	2SA750 (E)	NEC
TR403AB	2SC1222 (U)	NEC
TR404AB	2SC1222 (U)	NEC
TR405AB	2SC1222 (U)	NEC
TR406AB	2SC1222 (U)	NEC
TR501AB	2SA872 (E)	HITACHI
TR502AB	2SA872 (E)	HITACHI
TR503AB	2SD668 (D, C)	HITACHI
TR504AB	2SD668 (D, C)	HITACHI
TR505AB	2SB649A (B)	HITACHI
TR506AB	2SD400P-I (E)	SANYO
TR507AB	2SD669A (B)	HITACHI
TR508AB	2SB649A (B)	HITACHI
TR509AB	2SD675A (B)	HITACHI
TR510AB	2SB655A (B)	HITACHI
TR511AB	2SD675A (B)	HITACHI
TR512AB	2SB655A (B)	HITACHI
TR513AB	2SC1175 (E)	SANYO
TR514AB	2SA659 (E)	SANYO
TR601	2SC536 (G, H)	SANYO
TR602	2SD571 (L, K)	NEC

VARIABLE CAPACITORS			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
VC1-7	Tuning Gang (includes TCA, TCR1, TCR2, AM1, AM2, AM3)	C-4684	P-150039
TC4	Trimmer	C-0943	P-160016

VARIABLE RESISTORS			
Ref. No.	Description	R/S Part No.	Mfr's Part No.
VR201	Trimmer 10KΩ B	P-6571	P-170371
			or P-170439
VR202	Trimmer 47KΩ/50KΩ B	P-6572	P-170373
			or P-170442
VR203	Trimmer 1KΩ B	P-6569	P-170367
			or P-170433
VR204	Trimmer 1KΩ B	P-6569	P-170367
			or P-170433
VR205	Trimmer 4.7KΩ/5KΩ B	P-6570	P-170370
			or P-170438
VR401AB	Potentiometer TREBLE 100KΩ 1B x 2	P-1889	P-170188
VR402AB	Potentiometer MIDRANGE 100KΩ 1B x 2	P-1889	P-170188
VR403AB	Potentiometer BASS 100KΩ 1B x 2	P-1889	P-170188
VR501AB	Trimmer 500Ω B	P-6353	P-170197
VR502AB	Trimmer 5KΩ B	P-6505	P-170201
VR603	Trimmer 1KΩ B	P-6352	P-170198
VR604	Trimmer 1KΩ B	P-6352	P-170198
VR1001a	Potentiometer VOLUME & BALANCE 250K1Z + 250K3B x 2 + 100K15CX 2		P-170458
VR1001f			
VR1201	Trimmer 47KΩ/50KΩ D	P-6572	P-170373
			or P-170442
VR1202	Trimmer 47KΩ/50KΩ D	P-6572	P-170373
			or P-170442

## 28) EXPLODED VIEW PARTS LIST

Ref. No.	Description	R/S Part No.	Mfr's Part No.
1	Front Chassis Ass'y		P-400202
2	Mode Switch Assembled P.C.B.	X-8192	U-23125
3	Tone Amp Assembled P.C.B.	X-8186	U-14113
4	Headphone Jack	J-0919	P-190125
5	Speaker Switch Assembled P.C.B.	X-8193	U-23126
6	Cushion for P.C.B.		P-680187
7	Dial Scale Plate	D-5273	P-411084
8	Side Bracket for Panel (R)	HB-7802	P-411503
9	Side Bracket for Panel (L)	HB-7803	P-411504
10	Lamp Holder (Fuse type)	F-1013	P-260012
11	Panel for Selector	Z-4885	P-700439
12	Function Indicator Lens	HB-8781	P-610666
13	Lens for STEREO	HB-8782	P-610667
14	Lens for DOLBY FM	HB-8783	P-610668
15	Signal Meter	M-0391	P-230073
16	Tuning Meter	M-0392	P-230074
17	Watt Meter	M-0424	P-230083
18	Reflector Tape for Meter	HB-7804	P-690239
19	Reflector Holder Ass'y	Z-4114	P-411505
20	Dial Reflector	Z-4115	P-610575
21	Lamp Case	HB-8780	P-610665
22	Meter Lamp (Fuse type)	L-0864	P-240091
23	Fiber Sheet for Lens		P-480261
24	Meter Holder	HB-7807	P-411507
25	Dial Lamp with Lead (L = 320m/m)	L-0915	P-240108
26	Indicator Lamp with Lead	L-0917	P-240107
27	Dial Lamp with Lead (L = 160m/m)	L-0916	P-240109
28	Tuning Shaft Holder	HB-7808	P-411509
29	Tuning Shaft Ass'y	D-3273	P-470026
30	Pointer Ass'y	D-1243	P-450062
	Consists of Pointer		P-450063
	Pointer Base		P-450064
	Mylor Sheet		P-480205
31	Sub-Pulley Bracket (C)	HB-5084	P-410946
32	Sub-Pulley Bracket (D)	HB-5085	P-410947
33	Sub-Pulley Bracket (E)	HB-8785	P-411794
34	Sub-Pulley Bracket (B)	HB-7811	P-411511
35	Supporter Bracket (C)	RT-2214	P-411852
36	Sub-Pulley (middle)	D-0385	P-610471
37	Sub-Pulley (small)	D-0280	P-610049
38	Dial Pulley	D-0411	P-610623
39	Dial Spring	RB-6486	P-440156
40	Eyelet		
41	Dial String		
42	Dial Scale	D-5362	P-700440
43	Dial Side Bracket (R)	D-5363	P-610644
44	Dial Side Bracket (L)	D-5364	P-610645
45	Cushion for Light Intercept		P-660178
46	IF Bracket (A)	HB-8786	P-411795
47	IF Bracket (B)	HB-8787	P-411796
48	Shield Plate	HB-7826	P-411539
49	Front End Bracket	HB-8788	P-411881
50	Power Supply Assembled P.C.B.	X-8189	U-17070
51	P.C.B. Holder for Power Supply (A)	HB-7816	P-41162Y
52	P.C.B. Holder for Power Supply (B)	HB-7817	P-41163Y
53	Front End Assembled P.C.B.	X-8184	U-11028

Ref. No.	Description	R/S Part No.	Mfr's Part No.
54	IF & DOLBY Assembled P.C.B.	X-8185	U-12046
55	Pre Amp Assembled P.C.B.	X-8187	U-14114
56	Holder for Pre Amp P.C.B.	HB-7820	P-620070
57	Shaft Holder Bracket for Selector	HB-7819	P-411169Y
58	Switch Shaft for Selector		P-610094
59	P.C.B. Holder for Pre Amp	HB-7818	P-411514
60	Shield Case for Pre Amp	HB-7821	P-411515
61	PHONO Level Switch Assembled P.C.B.	X-8194	U-23127
62	Power Switch Assembled P.C.B.	X-8195	U-23128
63	Supporter Bracket (B)	HB-8784	P-411591
64	Main Chassis		P-400244
65	Label for Power Transformer		P-810854
66	Power Transformer	TA-0746	P-100635
67	Lug Type Electrolytic Capacitor	C-4685	P-220037
68	Main Amp Assembled P.C.B.	X-8188	U-16090
69	Supporter Bracket	HB-8840	P-411261Y
70	Protector & Meter Assembled P.C.B.	X-8190	U-23123
71	Bracket for Protector & Meter P.C.B.	RT-2216	P-411171Y
72	Bracket for Bridge Diode	HB-7825	P-411167
73	Bridge Diode (S15VB-20)		
74	Relay Assembled P.C.B. (UL models only)	X-8191	U-23124
75	Bracket for Relay P.C.B. (UL models only)	HB-8791	P-410609Y
76	Thermal Protector Bracket	HB-7836	P-411265
77	Thermal Protector (100°C)	HH-0329 or HB-8443	P-290025 or P-290028
78	Side Chassis (R)		P-400204
79	Side Chassis (L)		P-400205
80	Insulator Fiber Washer		P-480039
81	Back Panel (UL)	Z-4886	P-411876
81	Back Panel (C.S.A.)		P-411877
82	Bracket for Back Panel	HB-7827	P-410821Y
83	Number Plate	HB-6879	P-730184
84	AC Cord		P-310092
85	AC Cord Strain Relief	HB-6881	P-480080
86	AC Outlet	J-6434 or J-6	P-190098 or P-190157
87	Fuse Holder (UL)	F-1013	P-260011 or P-260020
87	Fuse Holder (C.S.A.)		P-260013
88	Speaker Terminal (Use for Serial No. 1-10770)		P-320215
	Speaker Terminal (Use after Serial No. 10771)	J-4604	P-320257
89	Antenna Terminal	J-4563	P-320218
90	Ground (GND) Screw	HD-1305	P-420284
91	Joint Pin for PRE OUT/MAIN IN	HB-7828	P-190120
92	4P Pin Jack	J-0969	P-320137
93	6P Pin Jack	J-0970	P-320151
94	Balun Coil	CA-5107	P-110107
95	Balun Coil P.C.B.		P-200244
96	AM Bar Antenna Coil	CA-5108	P-110108
97	Cushion for AM Antenna		P-680207
98	CS type Stop Ring		
99	Thermal Protector (95°C)	HB-6880	P-290018 or P-290033



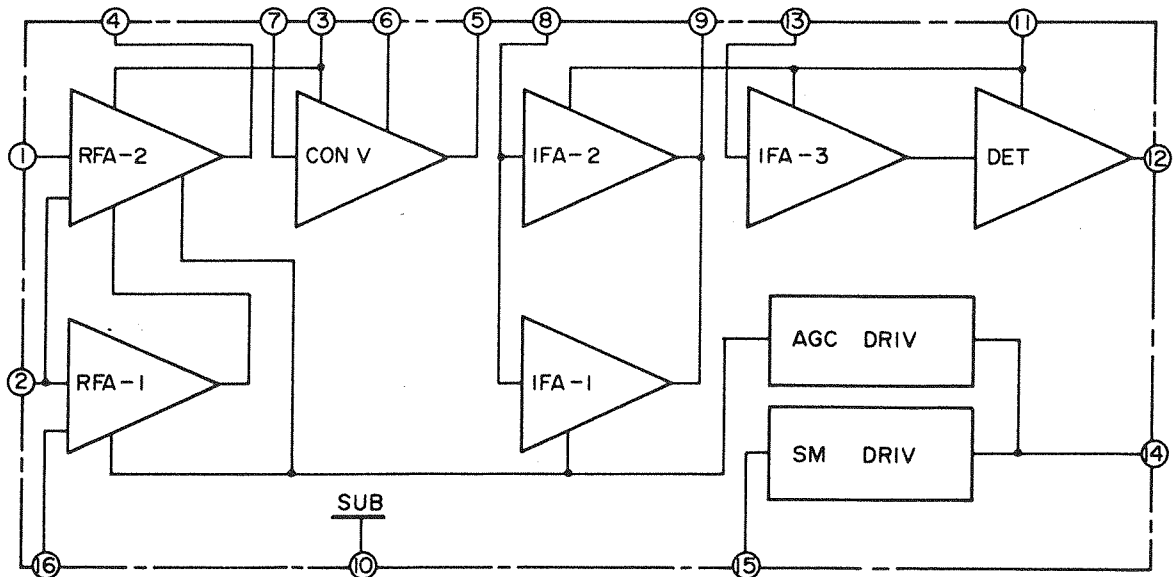
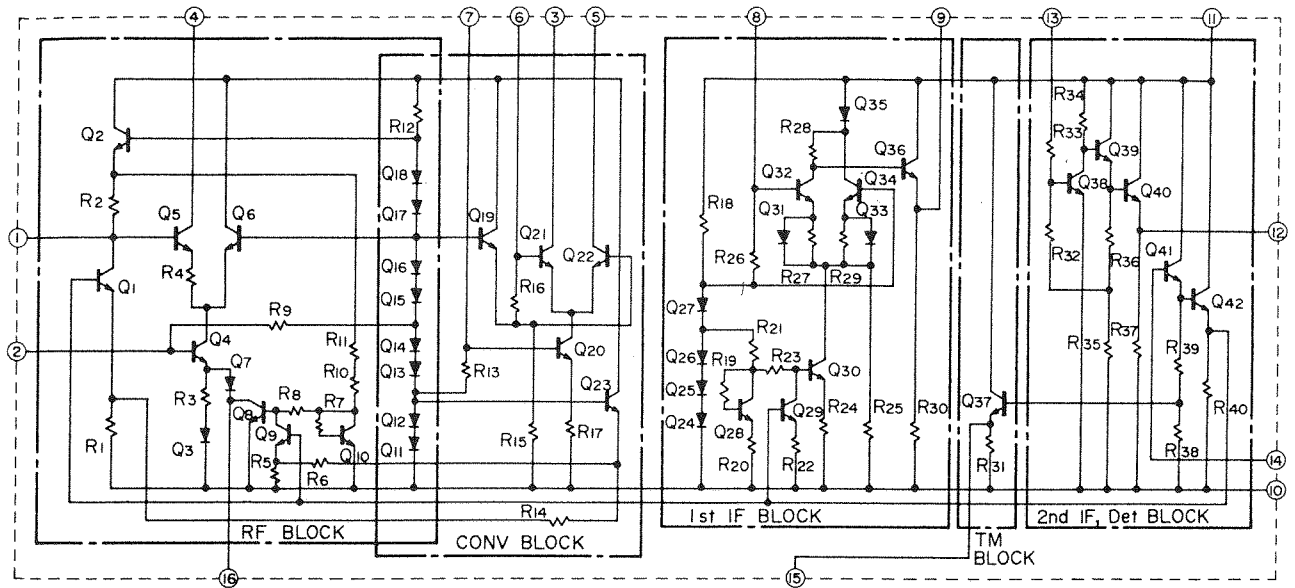
Ref. No.	Description	R/S Part No.	Mfr's Part No.	HARDWARE	
Ref. No.	Description			Ref. No.	Description
100	DIN Jack	J-0747	P-190036	S 1	Frang Lock Screw 3 X 6P
101	Wire Stay		P-450073	S 2	Bind Tapping Screw 3 X 8BT-2
102	Lug Terminal (2PL)	HB-6878	P-320152	S 3	Bind Tapping Screw 3 X 6BT-3
103	Indicator Lamp P.C.B.		P-200719	S 4	Screw with Spring Washer 3 X 6P
104	Shield Plate (B)	HB-8789	P-411605	S 5	Bind Tapping Screw 3 X 5BT-2
105	Fiber Sheet (B)		P-480213	S 6	Bind Tapping Screw 3 X 10BT-2
106	Shield Plate (D)	RT-2215	P-411724	S 7	Screw with Stopper 3 X 9 X 3
107	Fiber Sheet (D)		P-480232	S 8	Bind Tapping Screw 4 X 8BT-3
108	Front Panel Ass'y	Z-4887	P-700441	S 9	Bind Tapping Screw 3 X 12BT-2
	Consists of Front Panel		P-700442	S10	Frang Lock Screw 2.6 X 6P
	Knob Guide		P-610603	S11	Bind Tapping Screw 5 X 12BT-C TITE
	Window Frame		P-610578	S12	Bind Tapping Screw 4 X 18BT-2
	Dial Window		P-610579	S13	Toothed Tapping Screw 3 X 8BT-2 (Black)
	Switch Cover		P-610416	S14	Bind Tapping Screw 3 X 8BT-2 (Black)
	Blind Sheet		P-660125	S15	Bind Tapping Screw 4 X 18BT-2
	Knob Guide		P-610586	S16	Bind Tapping Screw 3 X 10BT-2 (Black)
109	TURNOVER Push Knob	K-3016	P-650299	S17	Wood Screw 3.1 X 13P
110	Tuning Knob	K-2301	P-650199	S18	Wood Screw 3.1 X 10P
111	Selector and Control Knob	K-2297	P-650196	S19	Bind Tapping Screw 3 X 8BT-3
112	Push Knob Spring	RB-6204	P-440140	S20	Screw with Washer 4 X 20P (Black)
113	Balance Knob (Outer of Double)	K-3014	P-650289	W1	Toothed Washer of Outer Side 3W
114	Volume Knob (Inner of Double)	K-3015	P-650288	W2	Washer 3W
115	Fiber Sheet for Selector		P-690018	W3	Washer 5W (Black)
116	Power Push Knob	K-3532	P-650361	N 1	Frang Nut 5N
117	Lever Switch Knob	K-2300	P-650201	R 1	Rivet YB-420
118	Front Panel Bracket (R)	HB-7831	P-411518	R 2	Rivet YB-320 (Black)
119	Front Panel Bracket (L)	HB-7832	P-411519	R 3	Rivet YB-429 (Black)
120	Cabinet	Z-4120	P-600129	R 4	Rivet YB-420 (Black)
121	Ventilation Plate (Top)	Z-4121	P-411520		
122	Name Plate	HB-7834	P-730229		
123	Screw Cover	HB-5105	P-610397		
124	Foot	F-0240	P-610485		
125	Bottom Plate	Z-4122	P-411521		
126	Collar for Tuning Shaft	HB-7809	P-610577		
127	Power Switch (UL)	S-0856	P-180239		
128	Power Switch (C.S.A.)		P-180430		
129	Power Switch Cover	HB-6875	P-480145		
130	Power Indicator LED (gree & red)	L-0914			
131	Heat Sink	HH-0284	P-411143		
132	Main Amp Bracket (R)	HB-5061	P-410957		
133	Main Amp Bracket (L)	HB-5059	P-410953		
134	Spacer for Speaker P.C.B.		P-660173		
135	Net for Cabinet		P-660166		
136	Protector Holder		P-411932		
137	Fiber Washer		P-480266		

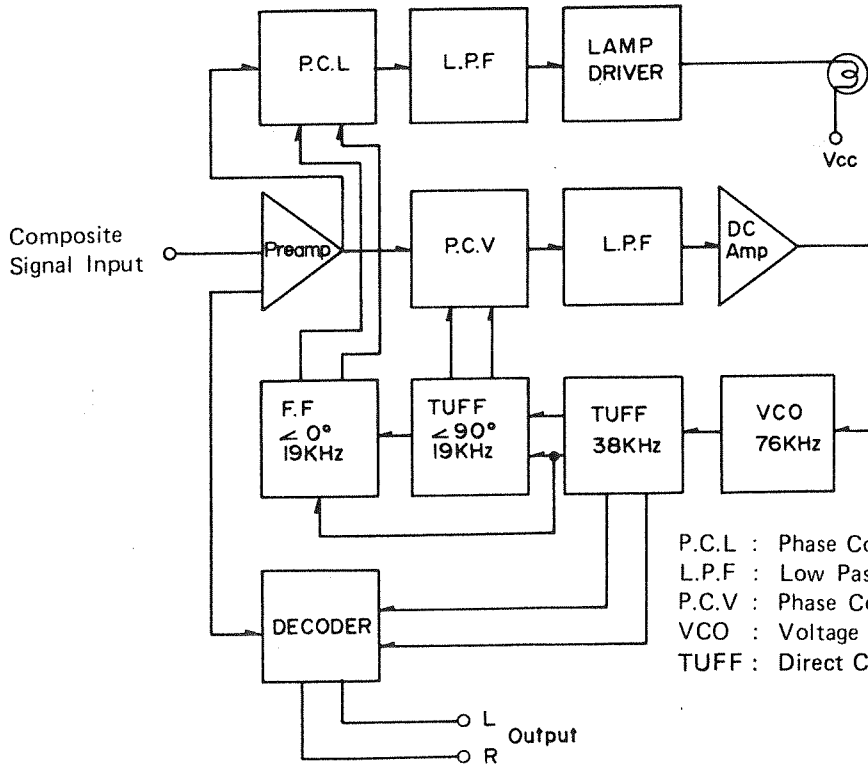
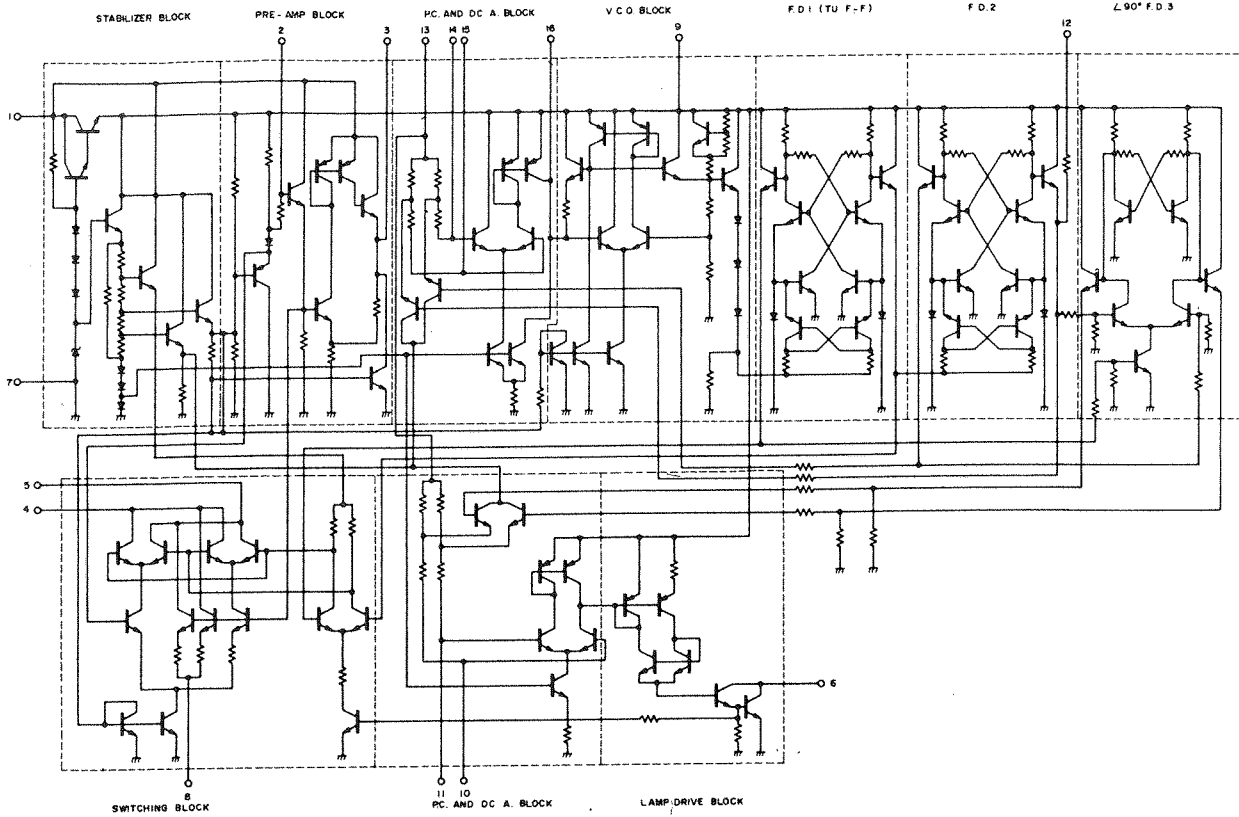
## 29) MISCELLANEOUS PARTS LIST

Description	R/S Part No.	Mfr's Part No.	Description	R/S Part No.	Mfr's Part No.
Shield Case A (one of Front End Assembled P.C.B.)	HB-8841	P-411912	5P(L) Mold Wire Connection Terminal		P-320177
Shield Case B (one of Front End Assembled P.C.B.)	HB-8842	P-411913	Jumper Wire (L= 7.5m/m)		P-320126
Shield Case C (one of Front End Assembled P.C.B.)	HB-8843	P-411914	Jumper Wire (L=15 m/m) (Protector & Meter Amp P.C.B.)		P-320129
Insulation Collar for Transistor (one of Main Amp Assembled P.C.B.)		P-420247	3P(L) Mold Wire Connection Terminal		P-320105
Transistor Socket	J-6433	P-190099	4P(L) Mold Wire Connection Terminal		or P-320162
(one of Main Amp Assembled P.C.B.)			6P(L) Mold Wire Connection Terminal		P-320106
Heat Sink(A) for Pre Drive Transistor (one of Main Amp Assembled P.C.B.)	HB-0285	P-411144	4P(L) Mold Wire Connection Terminal		or P-320080
Heat Sink(B) for Drive Transistor (one of Main Amp Assembled P.C.B.)	HH-0286	P-411173	Jumper Wire (L=15 m/m)		P-320107
Line Capacitor Cover (UL) (one of Power Switch Assembled P.C.B.)	HB-6379	P-610466	Jumper Wire (L=20 m/m)		or P-320163
Line Capacitor Cover (C.S.A.) (one of Power Switch Assembled P.C.B.)		P-610670	Jumper Wire (L=7.5m/m)		or P-320118
LED Base Holder (C.S.A.)		P-412063	Jumper Wire (L=12.5m/m)		or P-320176
Earth Bar for Lug type Capacitor		P-411433	Jumper Wire (L=10 m/m)		P-320129
Solderless Terminal		P-320006	Jumper Wire (L=15 m/m)		P-320127
Shield Plate (E) for Protector (C.S.A.)		P-412064	Jumper Wire (L=20 m/m)		P-320129
Fiber Sheet (E) for Protector (C.S.A.)		P-480290	Jumper Wire (L=20 m/m) (Relay P.C.B. (UL only))		P-320213
Knob Guide for Power Switch (Pre Amp P.C.B.)		P-610640	3P Mold Wire Connection Terminal (Front End P.C.B.)		P-320105
4P(V) Mold Wire Connection Terminal		P-320158	Jumper Wire (L=12.5m/m)		or P-320162
6P(V) Mold Wire Connection Terminal		P-320160	Jumper Wire (L=10 m/m)		P-320128
2P(V) Mold Wire Connection Terminal		P-320100	Jumper Wire (L=10 m/m) (Mode Switch P.C.B.)		P-320127
2P(V) Mold Wire Connection Terminal		P-320156	Jumper Wire (L=12.5m/m)		P-320128
3P(V) Mold Wire Connection Terminal		P-320101	Pin Terminal for P.C.B. (245)		P-320245
Jumper Wire (L=12.5m/m)		P-320128	Pin Terminal for P.C.B. (046)		P-320046
Jumper Wire (L= 5 m/m)		P-320125	Pin Terminal for P.C.B. (225) (Main Amp)		P-320225
Jumper Wire (L=15 m/m)		P-320129	Pin Terminal for P.C.B. (135) (Main Amp) (Relay)		P-320135
(Tone Amp P.C.B.)			2P(I) Mold Wire Connector Plug (Pre Amp) (Main Amp)		P-190216
4P(V) Mold Wire Connection Terminal		P-320110	3P(I) Mold Wire Connector Plug (Pre Amp)		P-190196
4P(L) Mold Wire Connection Terminal		or P-320166	4P(I) Mold Wire Connector Plug (Pre Amp)		P-190197
2P(L) Mold Wire Connection Terminal		P-320080	2P(L) Mold Wire Connector Plug (Pre Amp) (Tone Amp)		P-190215
3P(U) Mold Wire Connection Terminal		or P-320106	3P(L) Mold Wire Connector Plug (Pre Amp)		P-190187
Jumper Wire (L=12.5m/m)		P-320104	2P(L) Mold Wire Connector Plug (Tone Amp)		P-190188
Jumper Wire (L=10 m/m)		or P-320161			
Jumper Wire (L=15 m/m)		P-320109			
Jumper Wire (L=17.5m/m)		or P-320165			
Jumper Wire (L=20 m/m)		P-320128			
(Main Amp P.C.B.)		P-320127			
2P(V) Mold Wire Connection Terminal		P-320129			
Jumper Wire (L=15 m/m)		P-320130			
(Power Supply P.C.B.)		P-320213			
3P(L) Mold Wire Connection Terminal		P-320100			
4P(L) Mold Wire Connection Terminal		or P-320175			
		P-320117			
		or P-320176			
		P-320118			
		or P-320176			

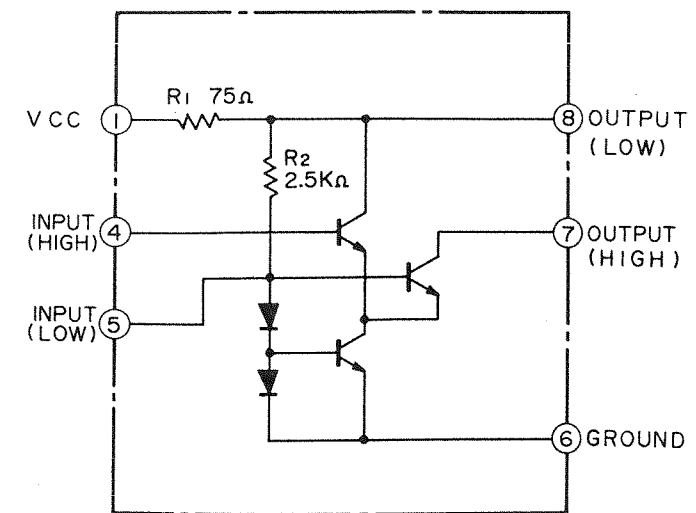
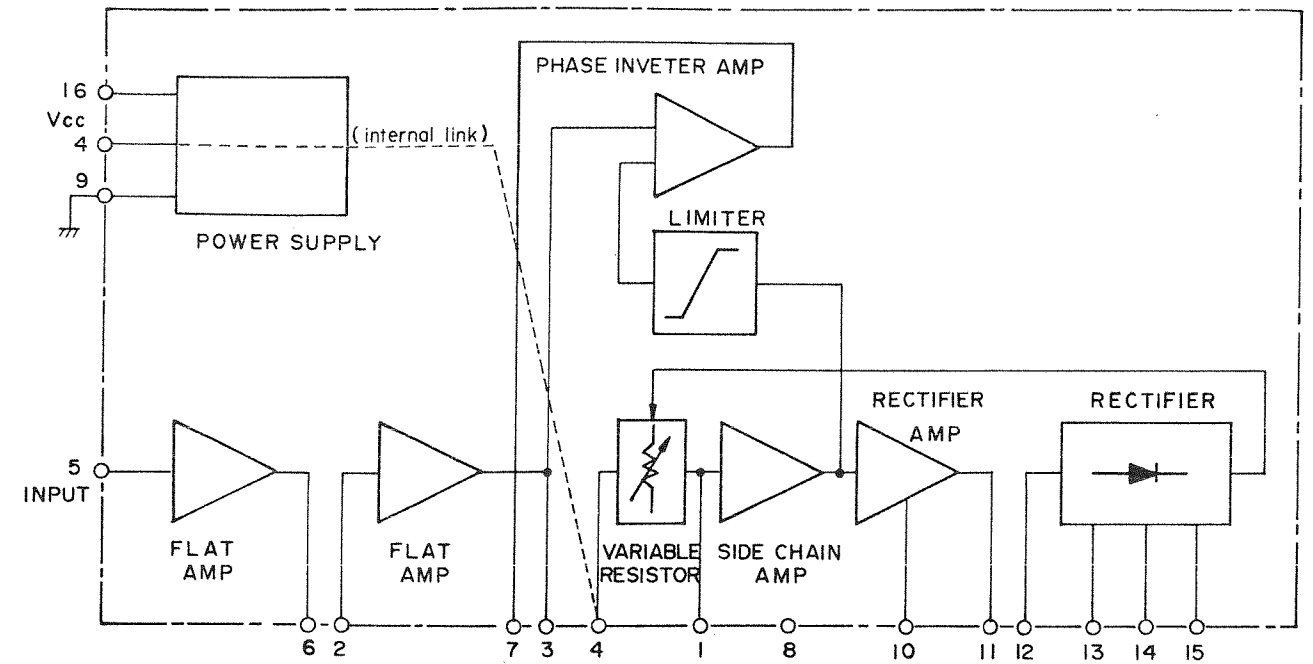
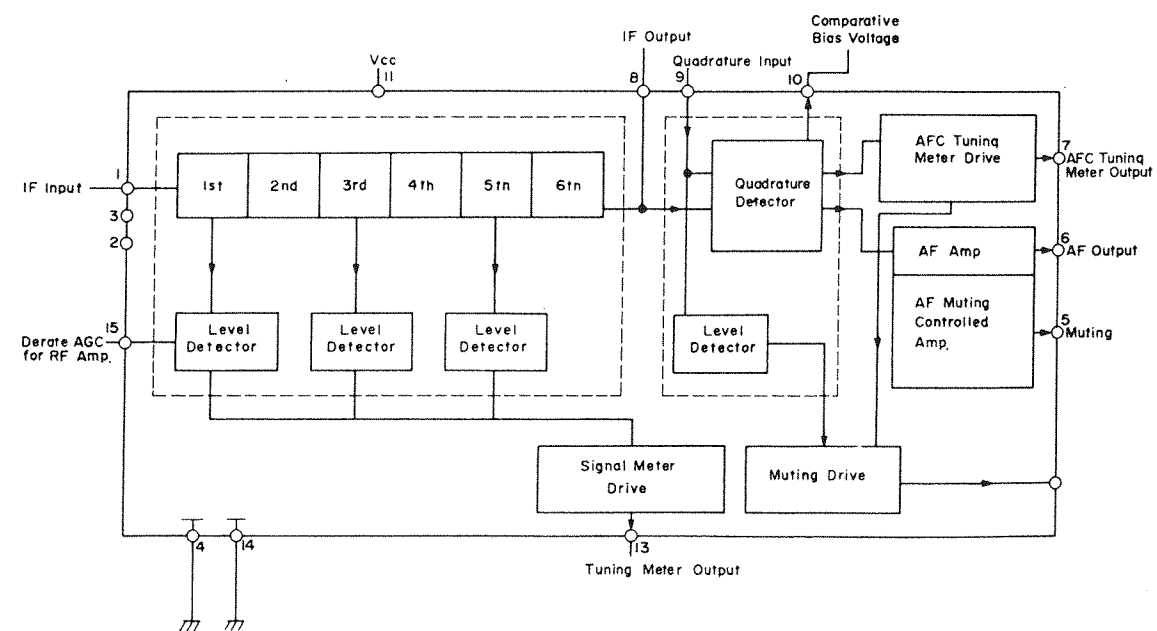
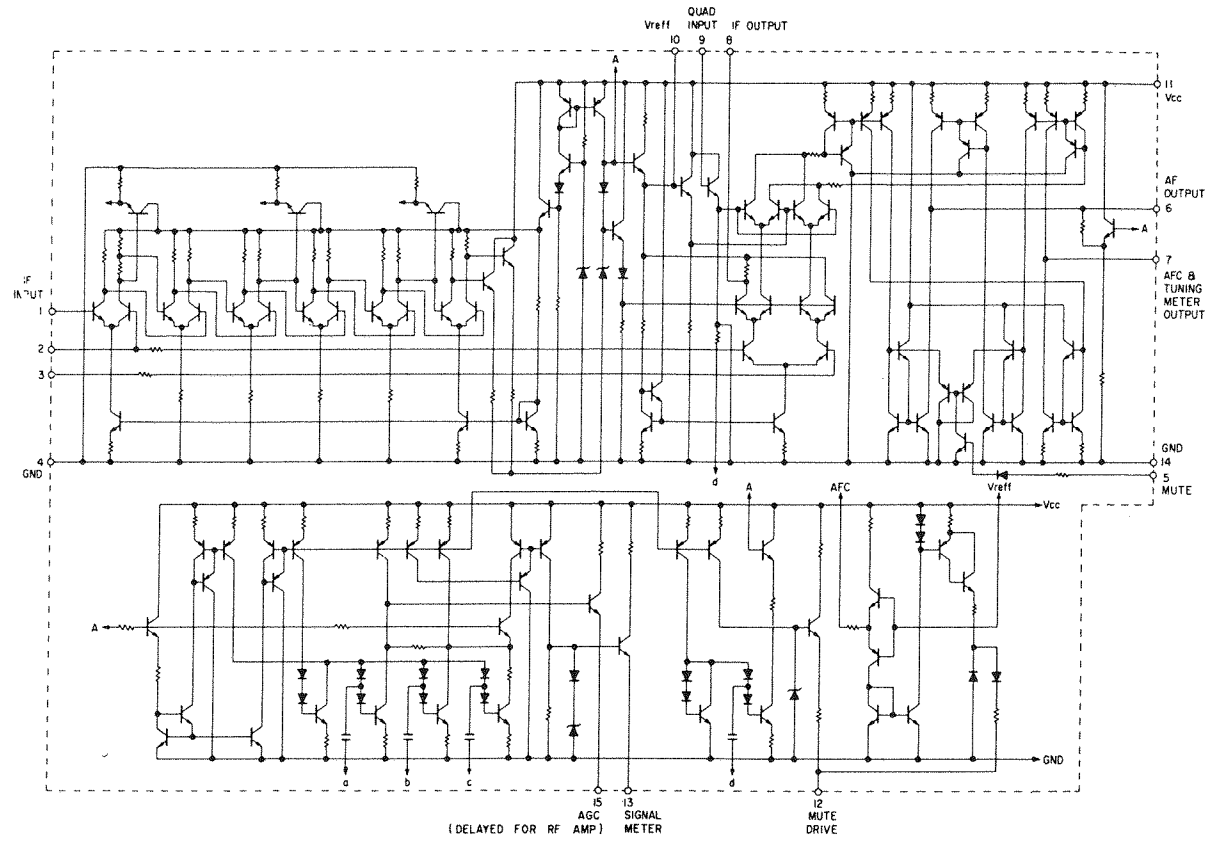
# 30) IC INTERNAL DIAGRAM

HA-1197



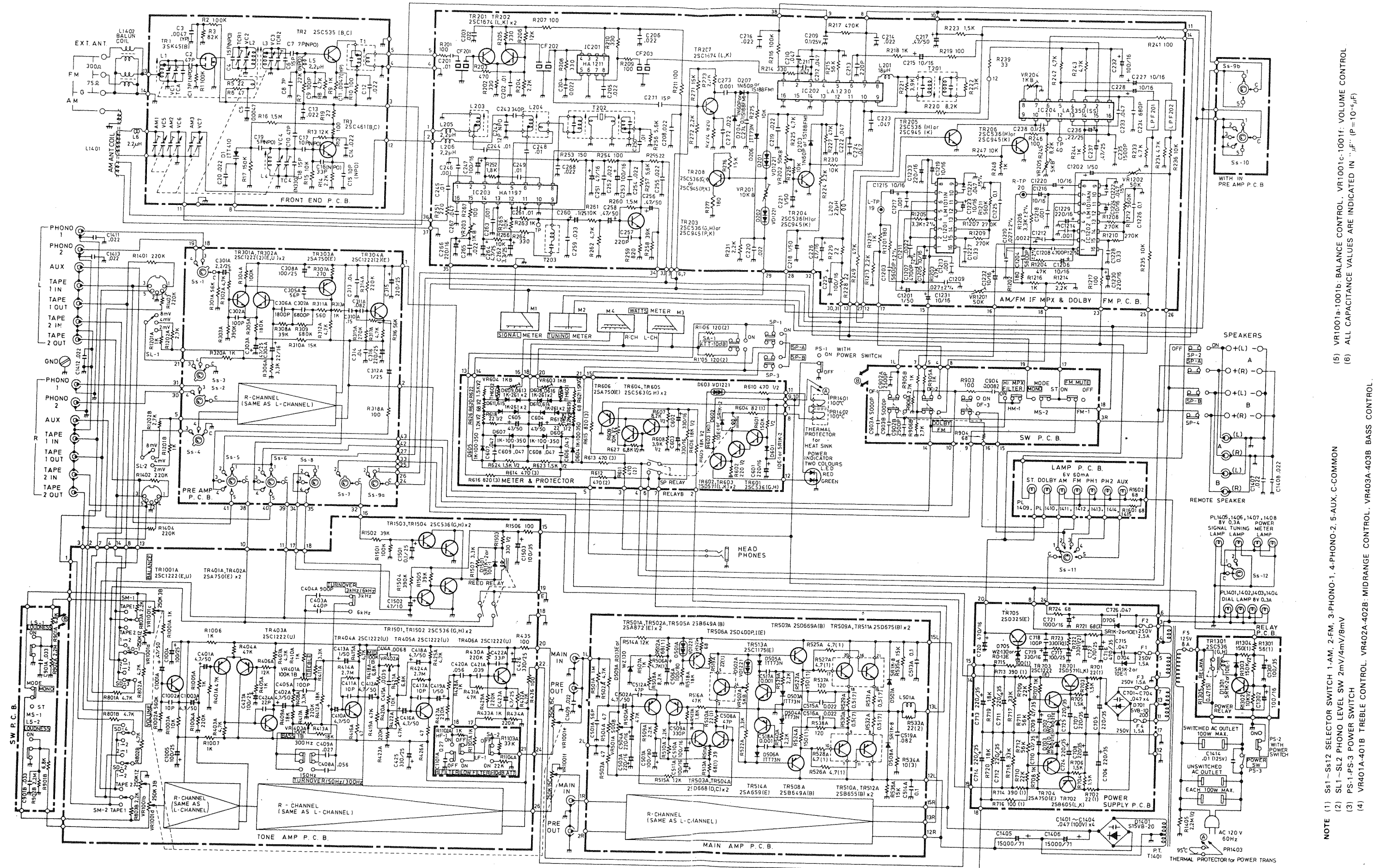


P.C.L : Phase Comparator for Lamp  
 L.P.F : Low Pass Filter  
 P.C.V : Phase Comparator for VCO  
 VCO : Voltage Controlled Oscillator  
 TUFF : Direct Coupled Type Flip-flop,



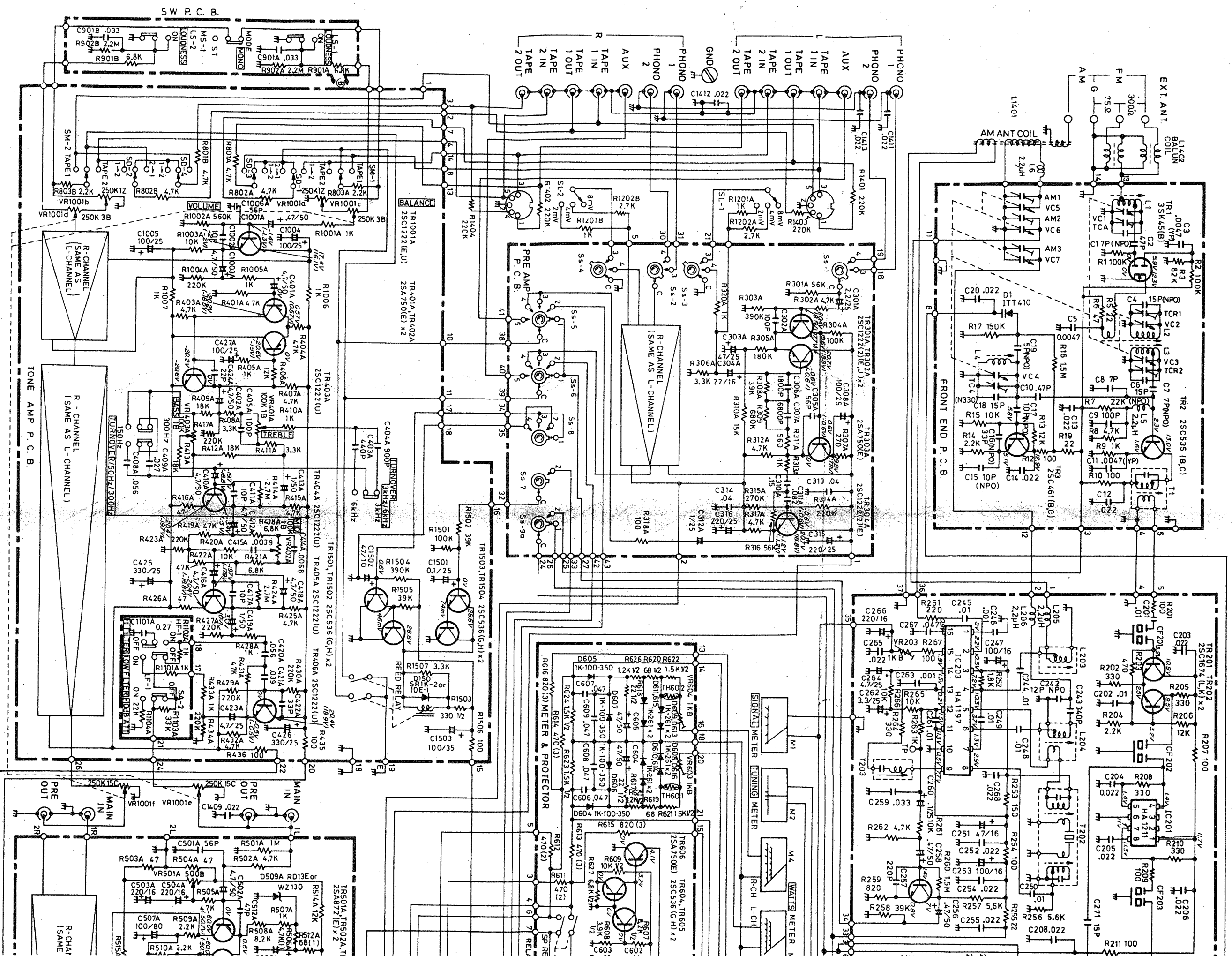
# SCHEMATIC DIAGRAM

STA-2100D Cat. No. 31-2090



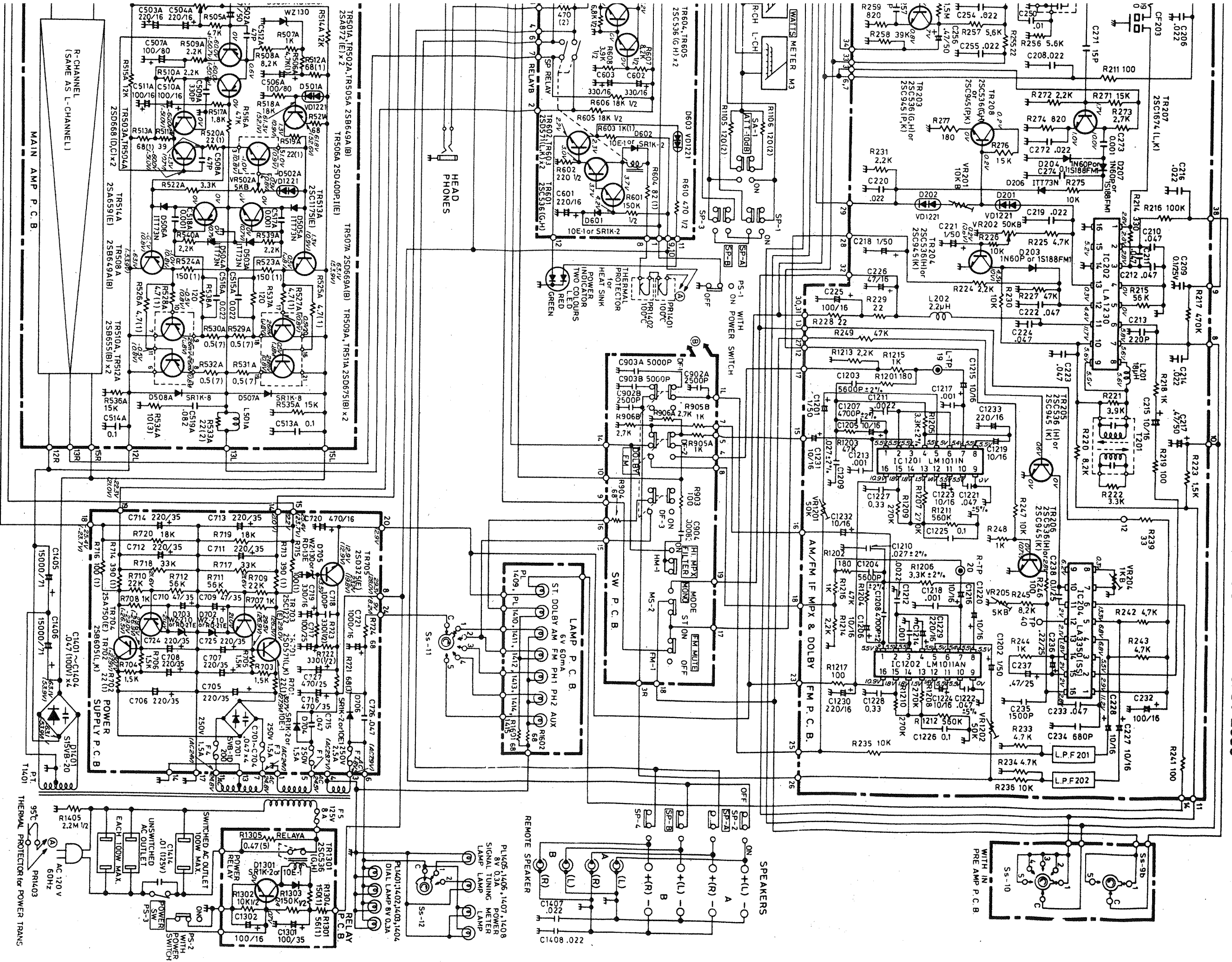
- NOTE (1) S5-1-S5-12 SELECTOR SWITCH 1-AM, 2-FM, 3-PHONO-1, 4-PHONO-2, 5-AUX, C-COMMON  
 (2) SL1-SL2 PHONO LEVEL SW 2mV/4mV/8mV  
 (3) PS-1-PS-3 POWER SWITCH  
 (4) VR401A-401B TREBLE CONTROL, VR402A-402B MIDRANGE CONTROL, VR403A-403B BASS CONTROL  
 (5) VR1001a-1001b: BALANCE CONTROL, VR1001c-1001f: VOLUME CONTROL  
 (6) ALL CAPACITANCE VALUES ARE INDICATED IN "µF" (P=10<sup>-9</sup>µF)





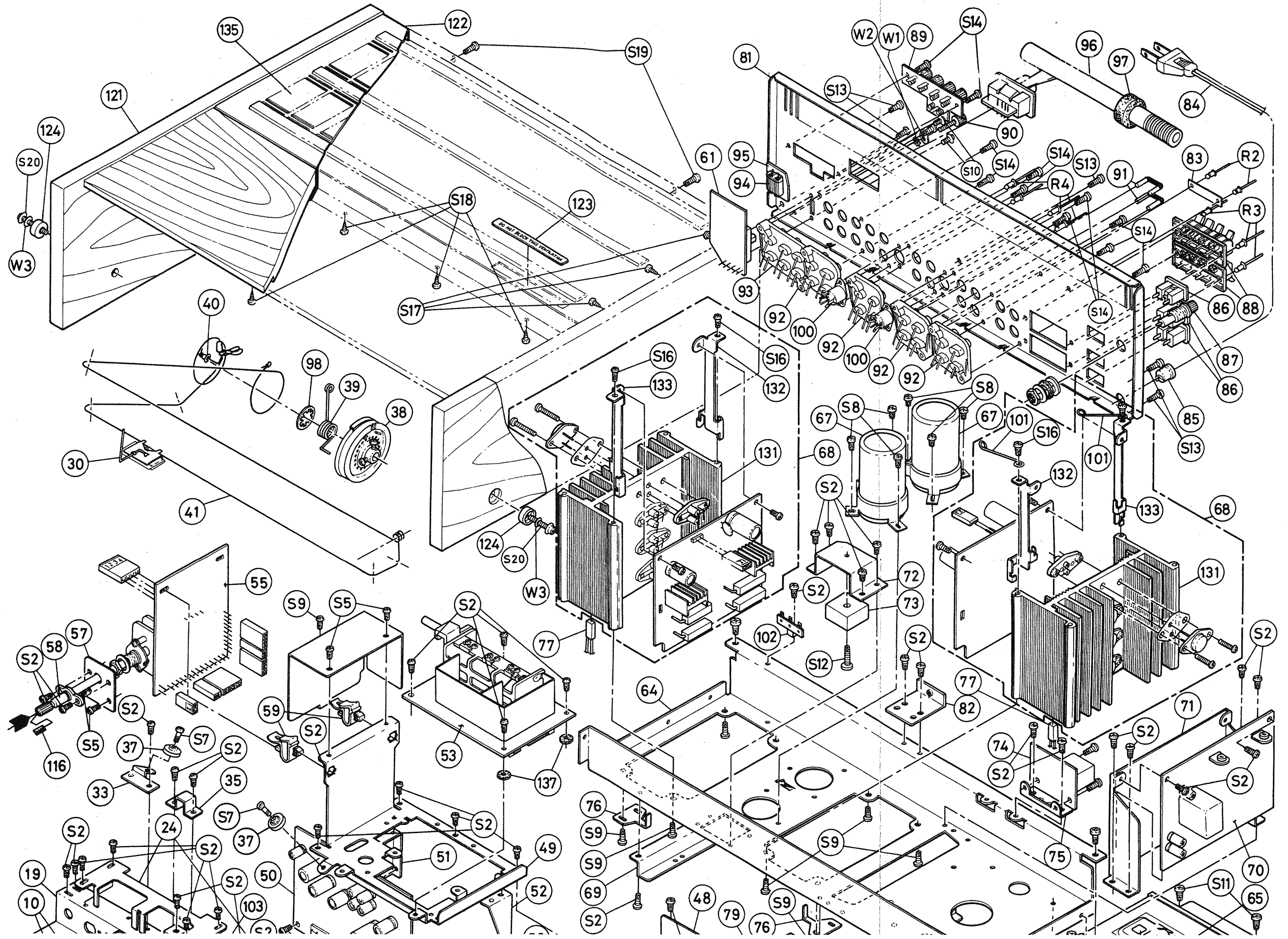
- NOTE**
- (1) Ss1 - Ss2 SELECTOR SWITCH 1-AM, 2-FM, 3-PHONO-1, 4-PHONO-2, 5-AUX, C-COMMON
  - (2) SL1 - SL2 PHONO LEVEL SW 2mV/4mV/8mV
  - (3) PS-1 - PS-3 POWER SWITCH
  - (4) VR401A-401B TREBLE CONTROL, VR402A-402B: MDRANGE CONTROL, VR403A-403B: BASS CONTROL.
  - (5) VR1001a-1001b: BALANCE CONTROL, VR1001c-1001f: VOLUME CONTROL.
  - (6) ALL CAPACITANCE VALUES ARE INDICATED IN "µF" (P = 10<sup>-6</sup> µF)
  - (7) ALL RESIST
  - (8) VOLTAGES
  - (9) VOLTAGES
  - (10) VOLTAGES
  - (INSIDE PAREN





- (7) ALL RESISTANCE VALUES ARE INDICATED IN "Ω" (K = 10<sup>3</sup> Ω, M = 10<sup>6</sup> Ω)
- (8) VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A VOLTMETER (DIGITAL VOLTMETER, OVER 10K Ω /V) WITH RECEIVER DETUNED.
- (9) VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH A VOLTMETER (DIGITAL VOLTMETER, OVER 10K Ω /V) WITH MAIN AMP P. C. B.
- (10) VOLTAGES ARE MEASURED UNDER TWO CONDITIONS: WITH NO INPUT AND 120 WATTS (1 KHz) OUTPUT POWER (INSIDE PARENTHESIS).





32" EXPLoded

