

VH

INSTRUCTION MANUAL

RS 440



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CAUTION

BEFORE OPERATING THIS UNIT PLEASE CHECK POWER SOURCE VOLTAGE CAREFULLY.
INCORRECT VOLTAGE SETTING MAY SERIOUSLY DAMAGE THE UNIT, WHEN CHANGING VOLTAGE SETTING, ALWAYS REMOVE THE POWER CORD PLUG FROM AC OUTLET.

1. SPECIFICATIONS

AMPLIFIER SECTION

POWER OUTPUT	55 watts at 8 ohms (per channel)	
(RMS, 2 channel driven at 20 – 20,000 Hz, 0.1% T.H.D.)		
TOTAL HARMONIC DISTORTION	0.1% at rated output	
INTERMODULATION DISTORTION	0.1% at rated output	
FREQUENCY RESPONSE	20 – 20,000 Hz ± 0.5 dB	
POWER BANDWIDTH (-3 dB)	5 – 40,000 Hz	
HUM AND NOISE	AUX:	90 dB
(IHF, short-circuited, A network rated power)	TAPE PLAY:	90 dB
	MAG PHONO:	70 dB (Low sensitivity)
	"	65 dB (High sensitivity)
INPUT SENSITIVITY (for rated output)	MAG PHONO:	2.5 mV (Low sensitivity)
	"	5 mV (High sensitivity)
	TAPE PLAY A:	150 mV
	TAPE PLAY B:	150 mV
	TAPE B:	150 mV (DIN connector)
	MIC:	6 mV/10 k ohms
DAMPING FACTOR	35 (1 kHz, 8 ohms)	
MAXIMUM INPUT VOLTAGE	MAG PHONO:	150 mV (Hi) 300 mV (Lo)
TONE CONTROL RANGE	BASS:	± 10 dB (62 Hz/125 Hz) (Turnover frequency: 250 Hz/500 Hz)
TONE CONTROL SWITCH	Switchable/flat and variable	
AUDIO MUTING	– 20 dB	
LOUDNESS SWITCH	50 Hz:	+ 12 dB, 10 kHz: + 3.5 dB (Volume control set at – 30 dB position)
HIGH FREQUENCY FILTER	10 kHz:	– 10 dB
OUTPUT LEVEL	TAPE REC A:	150 mV
	TAPE REC B:	150 mV
	TAPE REC B:	30 mV (DIN connector)
	HEAD PHONES:	Low impedance

FM SECTION

TUNING RANGE	88 – 108 MHz
USABLE SENSITIVITY	Mono: 10.3 dBf, Stereo: 18.0 dBf
IHF ('58) SENSITIVITY	Mono: 1.8 μ V
50 dB QUIETING SENSITIVITY	Mono: 16.0 dBf, Stereo: 30.0 dBf
SELECTIVITY (alternate channel)	70 dB
CAPTURE RATIO	1.25 dB
FM DISTORTION	100 Hz: 0.15% (Mono) 0.4% (Stereo) 1 kHz: 0.15% (Mono) 0.4% (Stereo) 8 kHz: 0.4% (Mono) 0.5% (Stereo)
STEREO SEPARATION	100 Hz: 32 dB 1 kHz: 40 dB 10 kHz: 32 dB
FREQUENCY RESPONSE	+ 0.5 dB, – 2.0 dB (30 Hz – 15 kHz)
SIGNAL NOISE RATIO	72 dB (Mono), 67 dB (Stereo)
MUTING THRESHOLD	14 dBf
SPURIOUS RESPONSE REJECTION	90 dB
IF REJECTION	90 dB
IMAGE REJECTION	80 dB
TAPE OUTPUT LEVEL	0.77 V
SUBCARRIER PRODUCT RATIO	60 dB
ANTENNA	75 ohms unbalanced and 300 ohms balanced input external antenna
AT 98 MHz, 65 dB INPUT SIGNAL, 100% MODULATION	
AT 98 MHz	

AM SECTION

TUNING RANGE	525 – 1605 kHz
SENSITIVITY (IHF)	25 μ V (Antenna terminal)
IMAGE REJECTION	60 dB
SELECTIVITY	45 dB
SIGNAL NOISE RATIO	45 dB
AUDIO FREQUENCY RESPONSE	Up to 2300 Hz, – 6 dB
TAPE OUTPUT LEVEL	0.3 V
ANTENNA	Built-in adjustable ferrite bar, plus provision for external antenna
AT 1 MHz, 1 mV INPUT SIGNAL 30% MOD.	
AT 1 MHz	

2. CIRCUIT DESCRIPTION

FM FRONT END AM TUNER

The FM FRONT END and AM TUNER sections of this receiver are assembled on a precision printed circuit board PSTU020COX.

1. FM FRONT END

The FM signals applied to the FM antenna circuit will be led to the double-tuned circuit (T2, T3) and the gate of FET (Q1: Dual gate MOS) RF amplifier through T1 and C2.

The amplified FM signal from the drain of Q1 is led to the Mixer Gate Q2.

Q3 is the local oscillator.

The oscillating voltage will be applied to the source of Q2 through T4 and C9 as injection signal for conversion.

Both FM and oscillator injection signals will be mixed between gate-source injection of the Mixer transistor (Q2) and converted into 10.7 MHz IF signal and, then, amplified.

The converted 10.7 MHz drain output is led to the ceramic band pass filter CF1 through T5 and its output applied to the first IF amplifier stage Q14.

2. AM TUNER

The most AM tuner circuits have been integrated in a small IC (IC3) and one transistor is used in the tuner. (audio amplifier)

The AM tuner consists of two tuned circuit, one RF amplifier, converter, high gain 455 kHz IF amplifier having ceramic band pass filter for increased selectivity, local oscillator and a tuning meter drive amp. T9 is the local oscillator coil. CF4 is the 455 kHz ceramic band pass filter.

The AM tuner output is connected to the terminal 14 on the P.C Board PSTU020COX and IC1, IC2 on the P.C Board PSPT007COX.

3. FM IF AMPLIFIER AND MPX STEREO DECODER

These are assembled on one printed circuit board PSTU020COX.

The IF amplifier consists of one transistor differential amplifier, one IC amplifier and a muting circuit consisting of IC, and MPX decoder section, phase locked loop MPX decoder IC and precision de-emphasis network. The main route of 10.7 MHz IF signal is as follows:

10.7 MHz IF signal — Q14 differential amplifier —

10.7 MHz ceramic filter — IC 1 (1 pin) — IC 1 (6 pin) —

IC 2 (2 pin) — IC 2 (6, 7 pin) — L.P.F. Filter —

active filter (consists of Q5, Q6) — terminals 18, 17 on the PC Board PSTU020COX.

The detected and impedance-transformed signal at IC 1 PC Board PSTU020COX will be supplied to the decoder input terminal 2 of IC 2 on the PC Board PSTU020COX.

The decoded left and right channel signals will be obtained from No. 6 and No. 7 terminals of IC 2 (on the same PC Board).

4. SIGNAL STRENGTH METER

The terminal 7 pin of IC 1 (PSTU020COX) will also be used for signal strength meter drive source.

The DC voltage is applied to the positive terminal of the meter through RV 2.

5. AUDIO AMPLIFIER

The operation theory of the audio amplifier is not so complicated and generally failures in operation can be located by tracing the circuit where normal signal should be expected with audio signal injected to the circuit.

A high sensitive with high input impedance oscilloscope will be required.

6. PROTECTION CIRCUIT

This circuit consists of L3 relay, Q5 or Q6, Q11, Q14, Q15, Q16 and PS1 on P.C Board PSMA026CC (electrically-controlled protection circuit).

The relay is used for controlling the protection for speakers and Main Amplifier circuit. DC control voltage developed at the terminals 3, 7 of IC1 or IC2 and if DC voltage potential exceeds a predetermined level protection of speakers and ICs and Transistors, speaker circuit is cut off by the relay.

In the similar way, the control signal developed at the terminal 4 of IC1 or IC2 operates the relay for protection.

When Speaker Mode switch (power) is turned on, L3 relay does not operate during 2 – 5 seconds until Main Amplifier correctly operates.

When Speaker Mode switch is turned off, the relay cut off circuit from the terminal 4 of IC (both left & right channels) to speakers output, instantly.

Also, if speaker terminals or speaker cables are short circuited, the control voltage develops the difference electric potential between base and emitter of Q5 or Q6, and it makes Q11 ON, Q14 ON, Switching TR C OFF, the relay operates and Protection Lamp illuminates, ICs and Transistors within Main Amplifier circuit will be protected by the relay switching circuit.

When temperature of the radiator in this circuit has reached more than 90°C, the relay will be operated PS1-detection and Heat Lamp will illuminate brightly.

When Transistor is broken down, the abnormal voltage develops at the terminal 4 of IC1 or IC2 and it makes speaker circuit cut off by the relay for speakers protection.

When Clipping is occurred for output level, the control voltage developed at the terminal 7 of IC1 or IC2 makes Q7 and Q8 operate, then Clipping Lamp will be illuminated by Q10 through Switching TR Q9. (clipping protection).

3. ALIGNMENT PROCEDURES

1. Test Equipment

The Test Equipment listed below is required to test and to align the RS-440 FM/AM Hi-Fi Stereo re

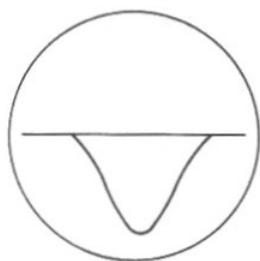
- | | |
|----------------------------|--|
| 1) Audio Signal Generator: | Frequency; 20 Hz to 200 kHz variable.
output level; 0.5 mV to 1 V variable.
Distortion; less than 1%. |
| 2) Level Meter: | Frequency response; better than 20 kHz.
Measurement range; 0.5 mV to 10 V or higher.
Input Impedance; 100 k ohm or higher. |
| 3) Oscilloscope: | Input Sensitivity; 1 mV/cm or higher.
Frequency response; 100 kHz or higher. |
| 4) VTVM: | Capability; 10 mV – 50 V, 100 kHz. Input Impedance; 500
or higher. Input Capacitance; 25 PF or less. |
| 5) Sweep Generator: | Sweep frequency; 455 kHz \pm 50 kHz, 10.7 MHz \pm 1 MHz. |
| 6) Distortion Analyzer: | Frequency; 20 Hz to 100 kHz \pm 0.5 dB. |

2. ADJUSTMENT OF MAIN AMPLIFIER

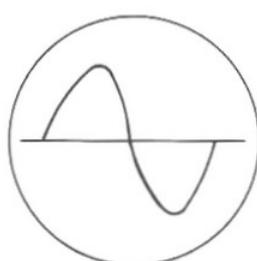
No adjustment will be necessary because of the IC circuitry employed.

3. AM IF ALIGNMENT

- 1) Place the SELECTOR SWITCH in the AM position.
- 2) Connect the 455 kHz sweep generator output to the antenna terminal and chassis ground on the panel.
- 3) Connect the oscilloscope directly to the pin 12 of IC3 and chassis ground.
- 4) Adjust CF4 for maximum and symmetrical scope display. (See Figure 1.)



a) At the pin 12 of IC3



b) At the TAPE REC

Figure 1.

4. AM TRACKING ALIGNMENT

- 1) After completion of AM IF Alignment, place the AM bar antenna in the correct position by pointing outward.
- 2) Connect the test equipment to RS-440 as shown in Figure 2.
NOTE: Do not use EXT ANT terminal for tracking.
- 3) Set the AM signal generator frequency to 600 kHz for 30% modulation at 1 kHz with tuning pointer set at the same frequency.
- 4) Increase the AM signal generator output until a sine wave appears on the oscilloscope display. Then, adjust T9 for maximum audio output (Dial frequency Alignment). Also, adjust T8 and AM bar antenna for maximum output (Tracking adjustment).
- 5) Set the AM signal generator frequency to 1400 kHz and place the dial pointer in the 1400 kHz position. Adjust CT7 for maximum audio output (Dial frequency Alignment). Also, adjust CT5, CT6 for maximum output (Tracking Adjustment).
- 6) Repeat the above steps until no further improvement is obtained.
NOTE: When adjusting the cores or trimming capacitors the audio output level will rapidly increase and the level meter pointer go off scale. In this case always decrease the signal generator output for proper audio output. Do not change the level meter range.

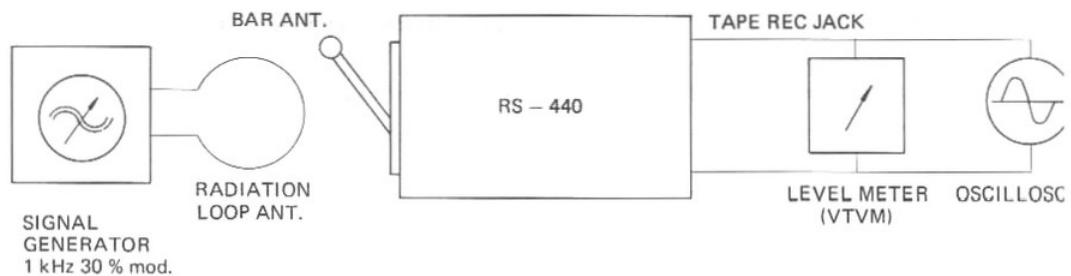


Figure 2. AM FRONT END ALIGNMENT SETUP

5. AM SIGNAL METER ALIGNMENT

The same test-setup as above.

- 1) Increase signal generator output to approximately 80 – 100 dB and adjust RV3 for reading between "0" and "5" on the scale.

6. FM IF ALIGNMENT

A. CENTER TUNING METER ALIGNMENT

- 1) Place the selector switch in the FM position.
- 2) Adjust T6 to bring the meter pointer on the exact center of meter.

B. FM IF ALIGNMENT

- 1) Couple the output of the sweep generator to T3 (RF Transformer) through a coupling coil (2 turns of vinyl wire) as shown in Figure 3 (A).

IMPORTANT: Do not ground the coaxial cable shield lead.

- 2) Connect the detector probe to the pin 13 of IC2 and "G" (ground) as shown in Figure 3 (B). probe lead should be short as possible and the ground lead should be connected to chassis ground.

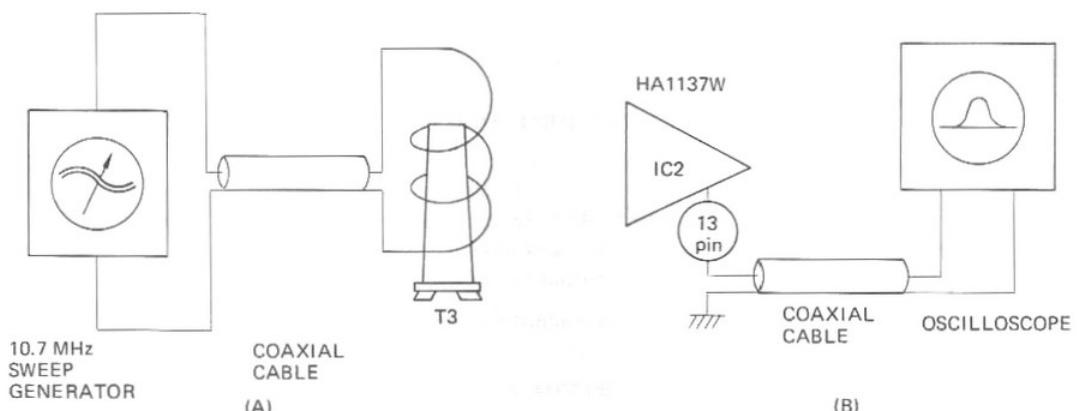


Figure 3.

- 3) Set the program SELECTOR switch to the FM position.
- 4) Increase sweep generator to provide about a half of the saturation level as indicated on the oscilloscope display.
- 5) Adjust core of T5 for highest, widest and round top display as shown in Figure 4, CORRECT (Since ceramic filters are used in the IF circuits, ignore 10.7 MHz center marker in the alignment).

NOTE: When replacing a ceramic filter always use the one having the same colour dot.

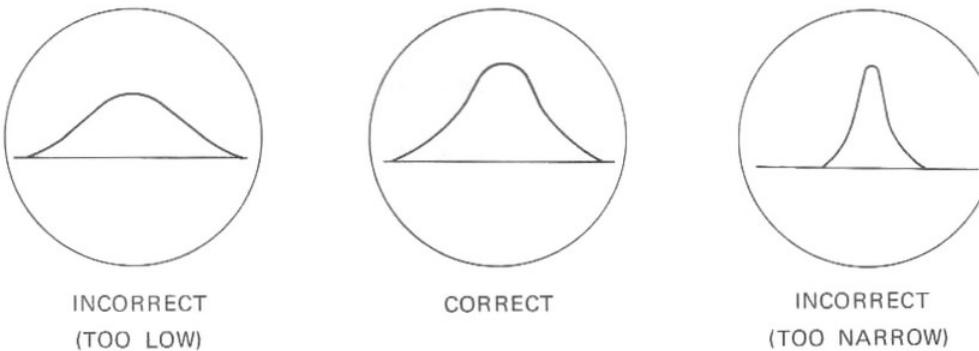


Figure 4.

7. FM FRONT END ALIGNMENT

- 1) Set the program SELECTOR SWITCH to the FM position, and FM mute switch in the OFF position.
- 2) Connect test equipment to the RS-440 as shown in Figure 5.

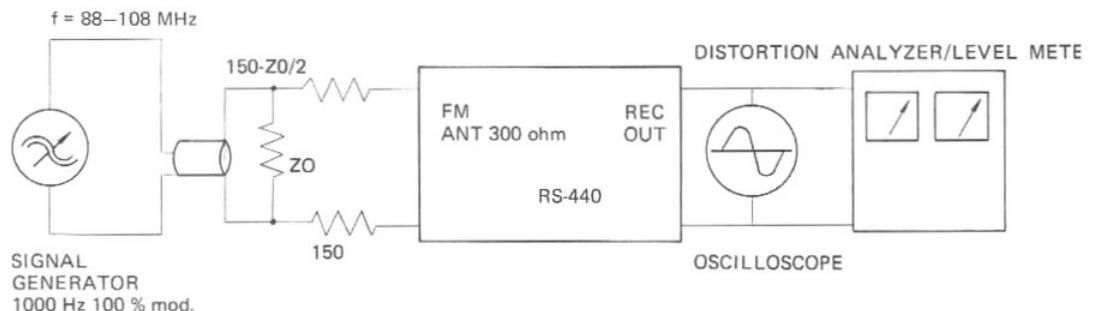


Figure 5. FM FRONT END TEST SETUP

- 3) Set the FM signal generator frequency to 90 MHz and Dial pointer to 90 MHz. Then, adjust T4 until sine wave appears on the oscilloscope display, and adjust T1 – T3 for maximum output. In this alignment, set the signal generator output for maximum output.
- 4) Set the signal generator to 106 MHz and also adjust CT4 in the same way as T4. Then adjust CT1 – CT3 for maximum output.
- 5) What is more, set the signal generator to 90 MHz, adjust T1 – T3 and CT1 – CT3 in the same manner . 3).
- 6) Repeat Step 3) and 4) until no further improvement is obtained.

NOTE: When audio output is increased during alignment, always decrease the FM signal generator output to such a level that the sine wave on the scope includes visible noise pulses to avoid inaccurate alignment due to limiting action.

8. IF DISTORTION ALIGNMENT

- 1) Connect the equipment to the RS-440 same as Figure 5.
- 2) Make sure the FM TUNING meter, with no signal, indicates exact center reading. If not, adjust T1. Then, set the signal generator frequency to 98 MHz.
- 3) Set the audio signal generator to 66 dB and set the audio distortion analyzer to distortion position. Adjust the core T7 for minimum distortion. Adjusting T7 may upset the FM TUNING meter alignment slightly. Repeat Step 2) until no further improvement is obtained.

9. SIGNAL METER ALIGNMENT

- 1) Set FM signal generator to 98 MHz, 90 dB output and tune the receiver to the frequency, using the FM TUNING meter.
- 2) Then, make sure the meter pointer reads between 4 and 5. If not, adjust RV2.

10. FM MPX STEREO CIRCUIT ALIGNMENT

Connect the test equipment to the receiver same as Figure 5.

A. 76 kHz Alignment

- 1) Place the MONITOR SWITCH in the STEREO position.
- 2) Adjust signal generator to provide 60 dBf with 1 kHz audio signal modulation.
- 3) Connect a frequency counter to the terminal 33 and chassis ground and read the frequency. It should be $76 \text{ kHz} \pm 300 \text{ Hz}$. If not, adjust RV5.

B. SEPARATION ALIGNMENT

- 1) Modulate signal generator with stereo composite signal (mod. $f = 1 \text{ kHz}/400 \text{ Hz}$). And set signal generator output to 66 dB.
Make sure the FM TUNING meter indicates exact center reading.
- 2) Modulate the signal generator with normal left channel composite signal and observe the output signal of RIGHT CHANNEL TAPE REC jack. There should be minimum leakage from the LEFT CHANNEL. Adjust RV4 for minimum leakage voltage.
- 3) Next, modulate signal generator with right channel composite signal and observe the right channel signal leakage appeared on the LEFT CHANNEL TAPE REC jack.
The leakage voltage should be the same level as of the right channel. If not, readjust RV4 for equal minimum leakage at both outputs.

4. BLOCK DIAGRAM

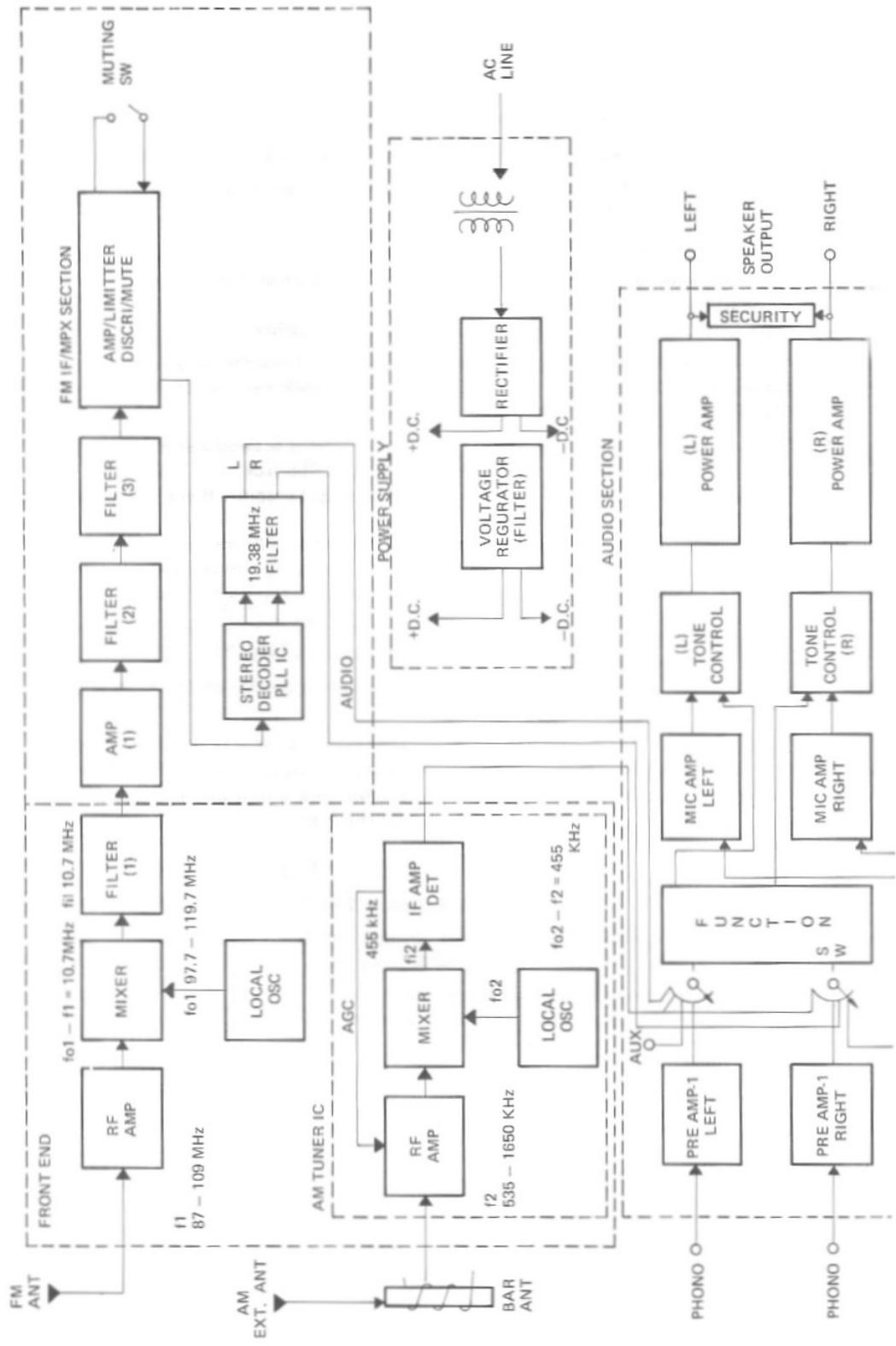
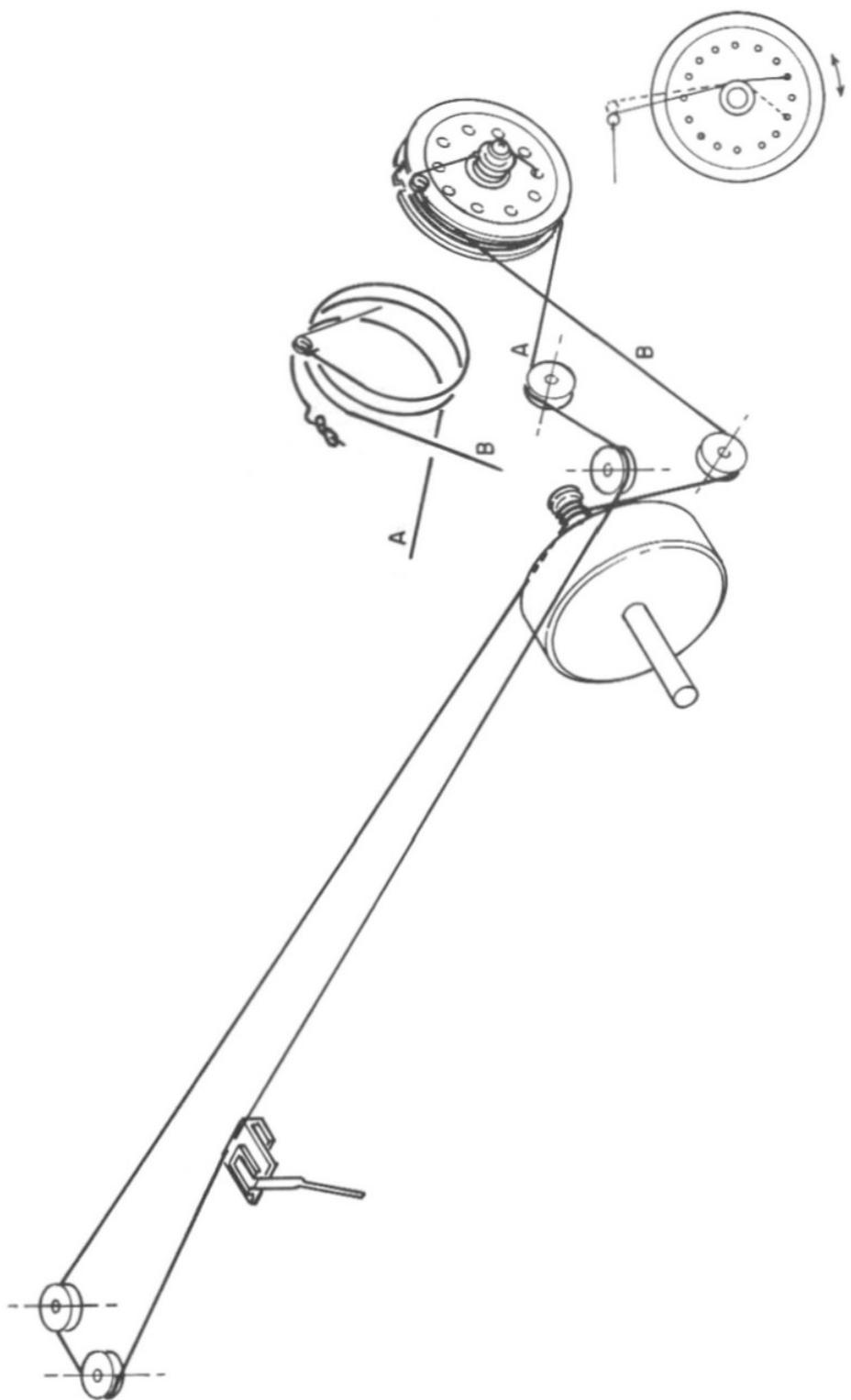


Figure 7.



5. DIAL CORD STRINGING

6. BOTTOM SCREWS ASSEMBLING

Note that the length of screws for the wooden cabinet are different.

SCREWS A : ROUND HEAD TYPE OF SCREW  3 x 18 mm

SCREWS B : FLAT HEAD TYPE OF SCREW  3 x 20 mm

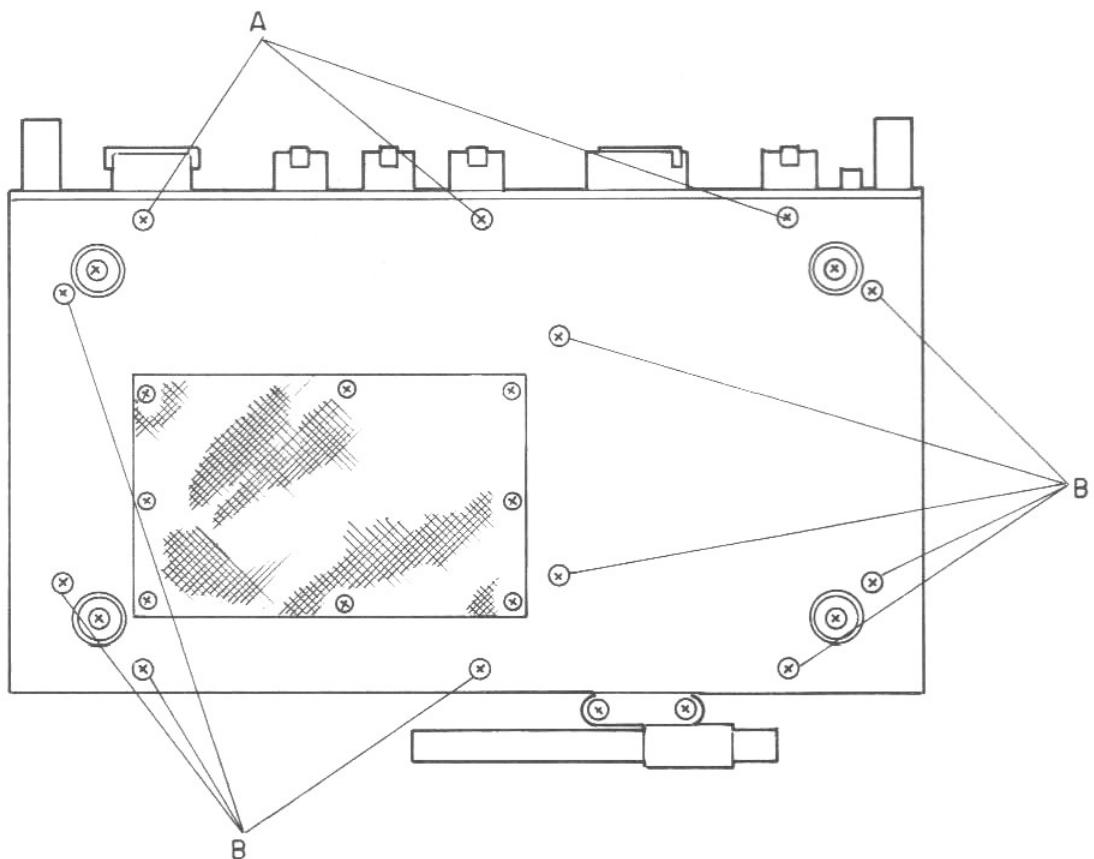


Figure 8.

7. ELECTRICAL PARTS LOCATION , PRINTED CIRCUIT BOARD

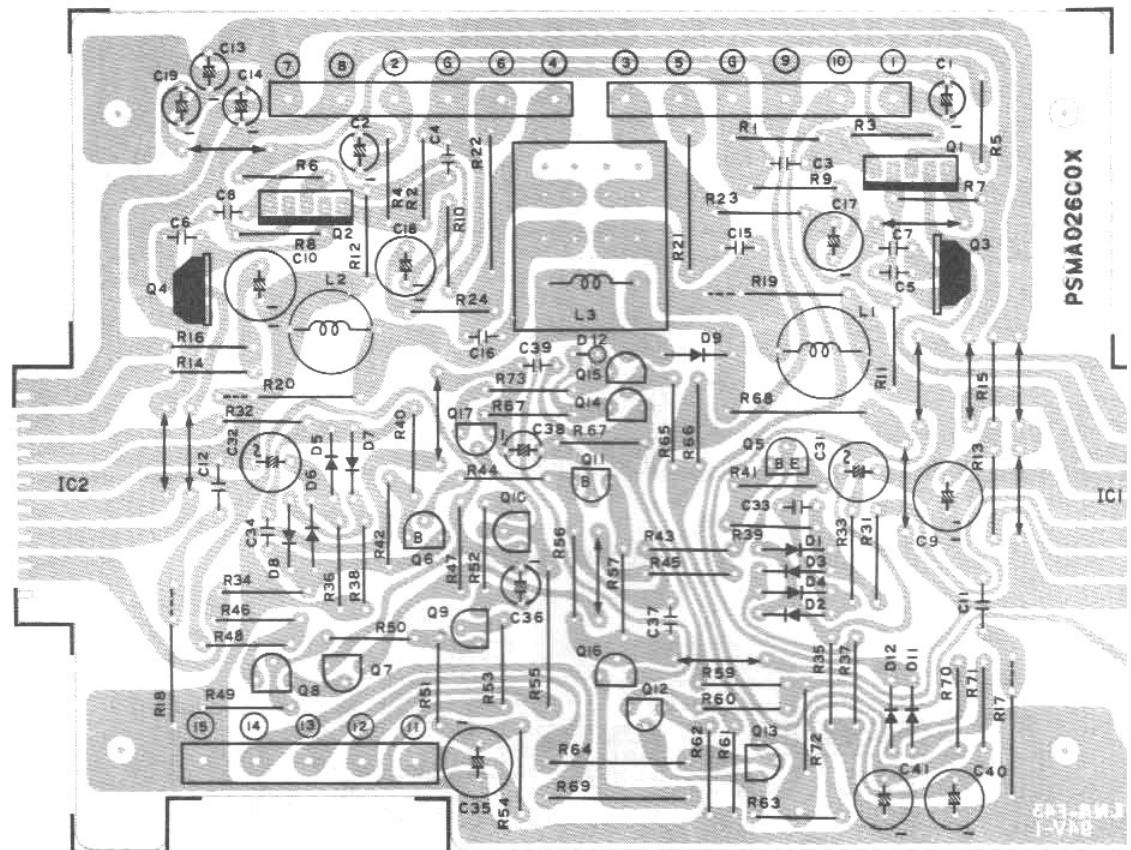


Figure 9. MAIN AMPLIFIER (PSMA026COX)

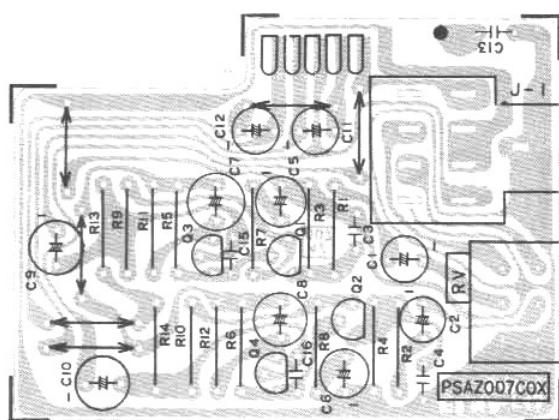


Figure 10. MIC AMPLIFIER (PSAZ007COX)

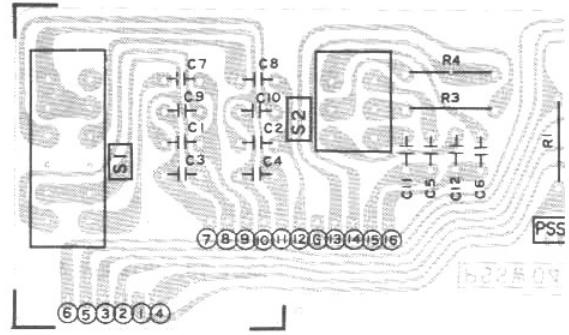


Figure 11. TURN OVER (PSSW048COX)

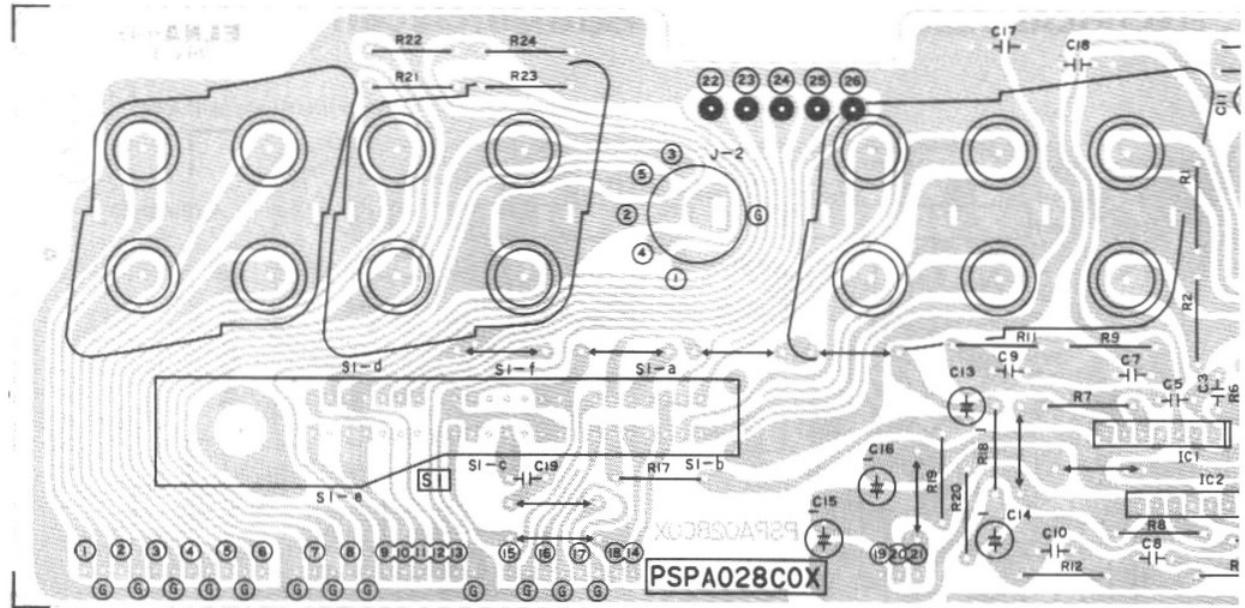


Figure 12. PRE AMPLIFIER (PSPA028COX)

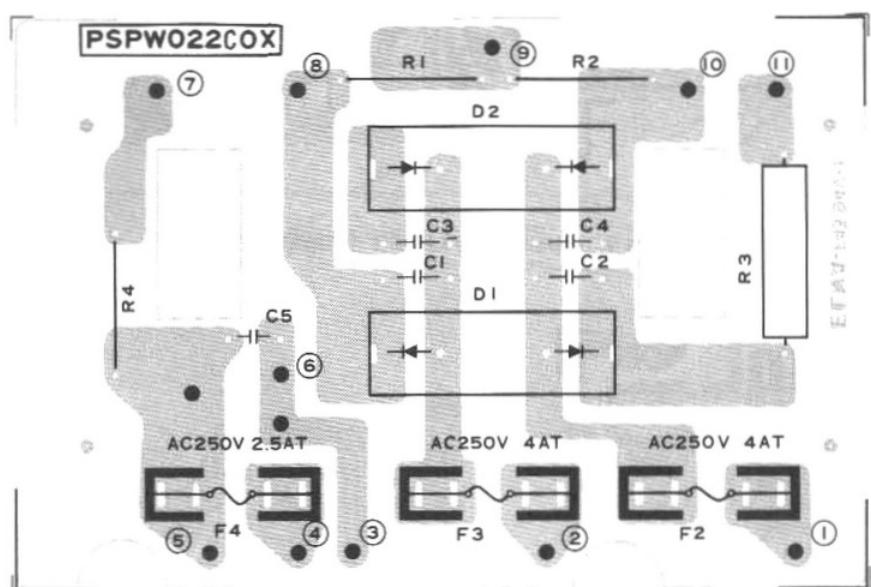
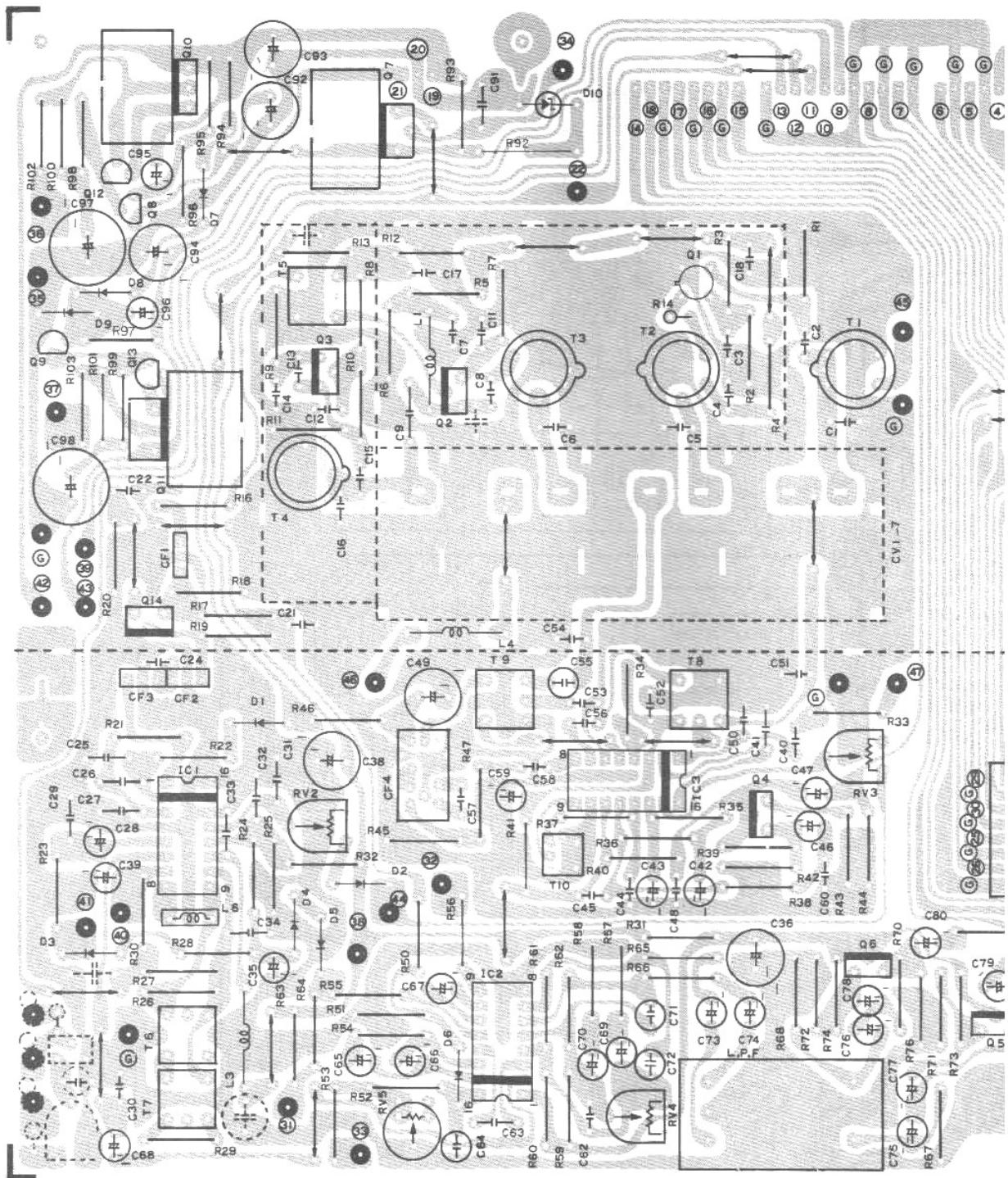


Figure 13. POWER SUPPLY (PSPW022COX)



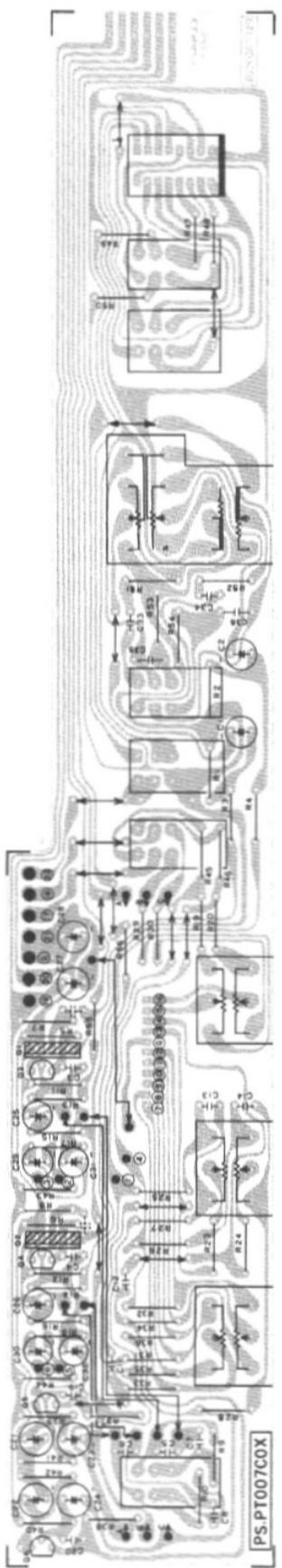
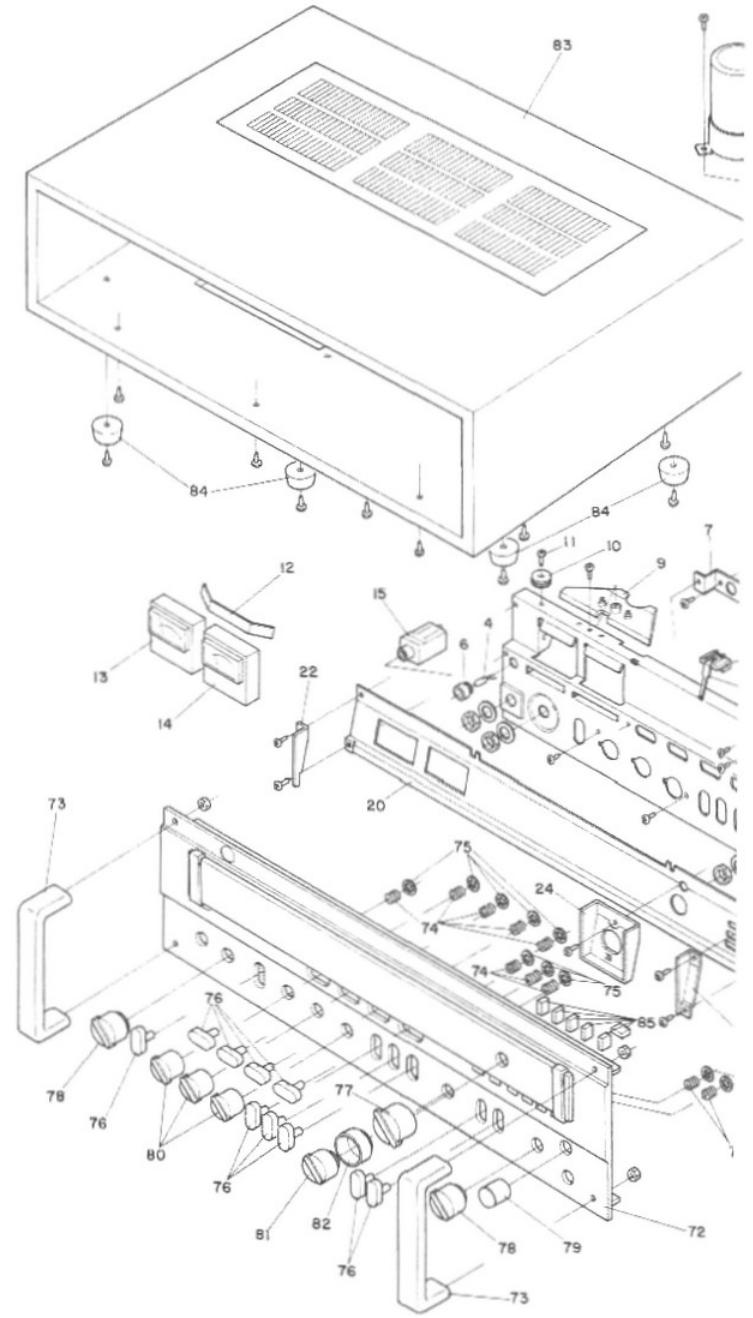
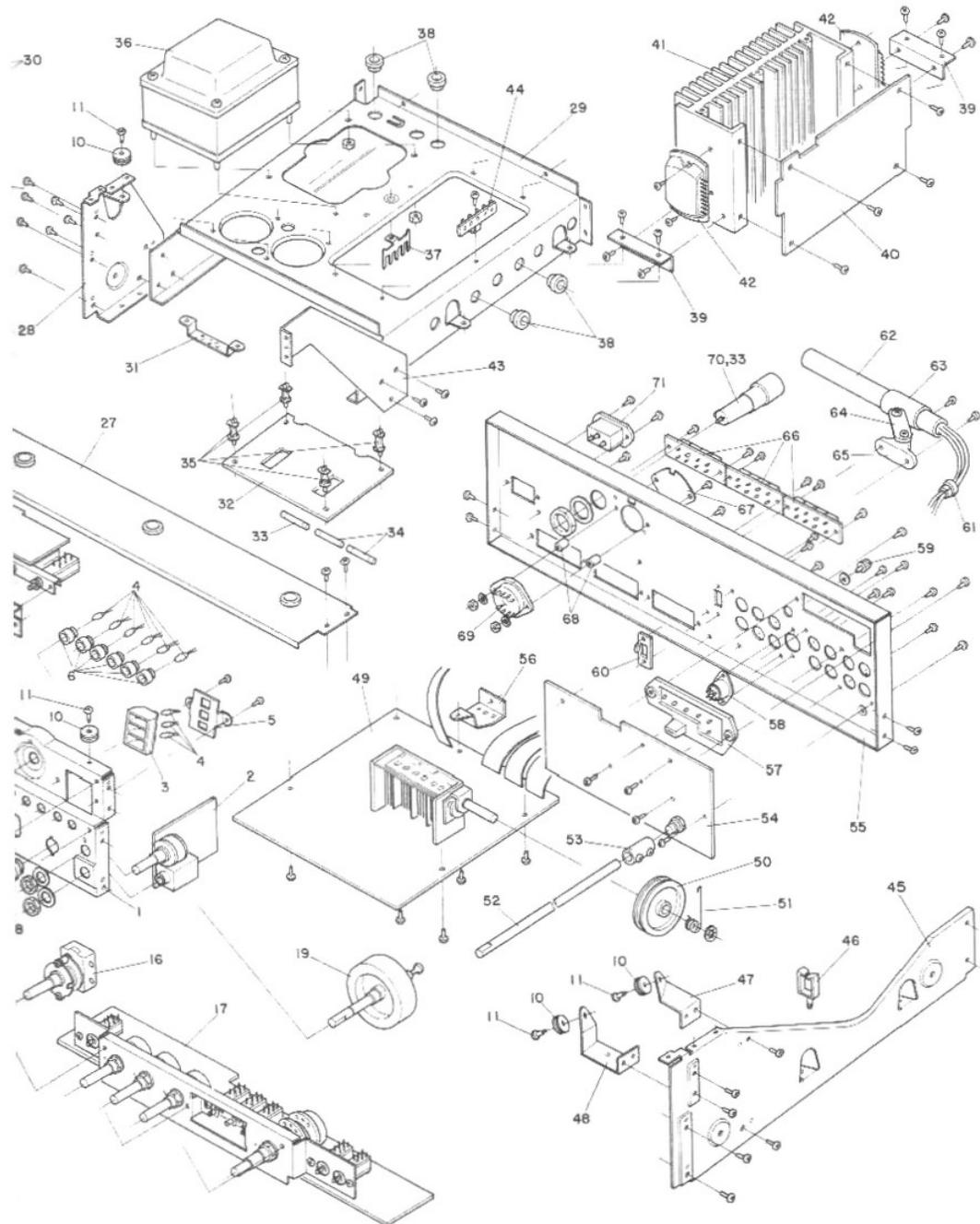


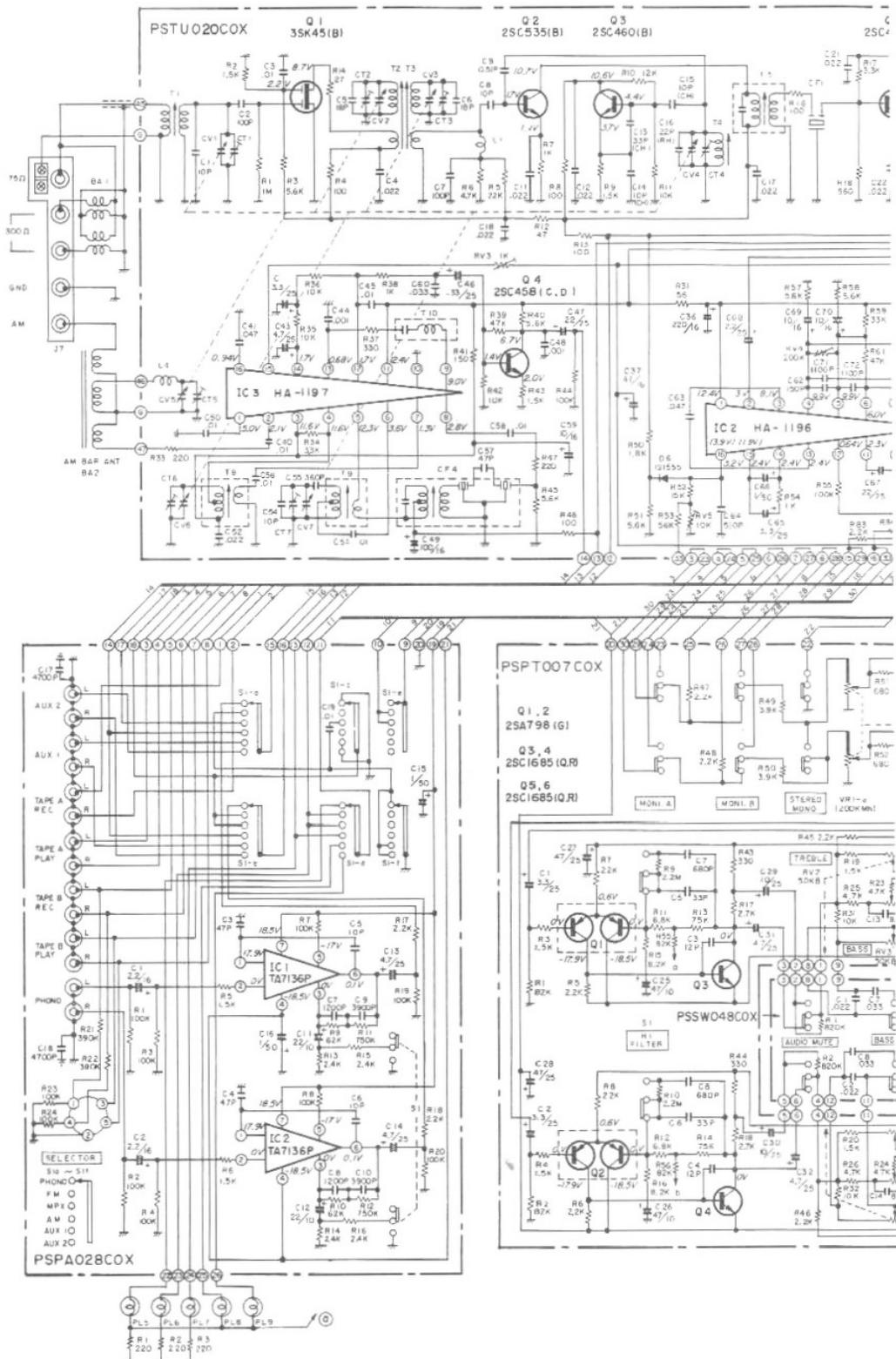
Figure 15. TONE AMPLIFIER (PSPT007COX)



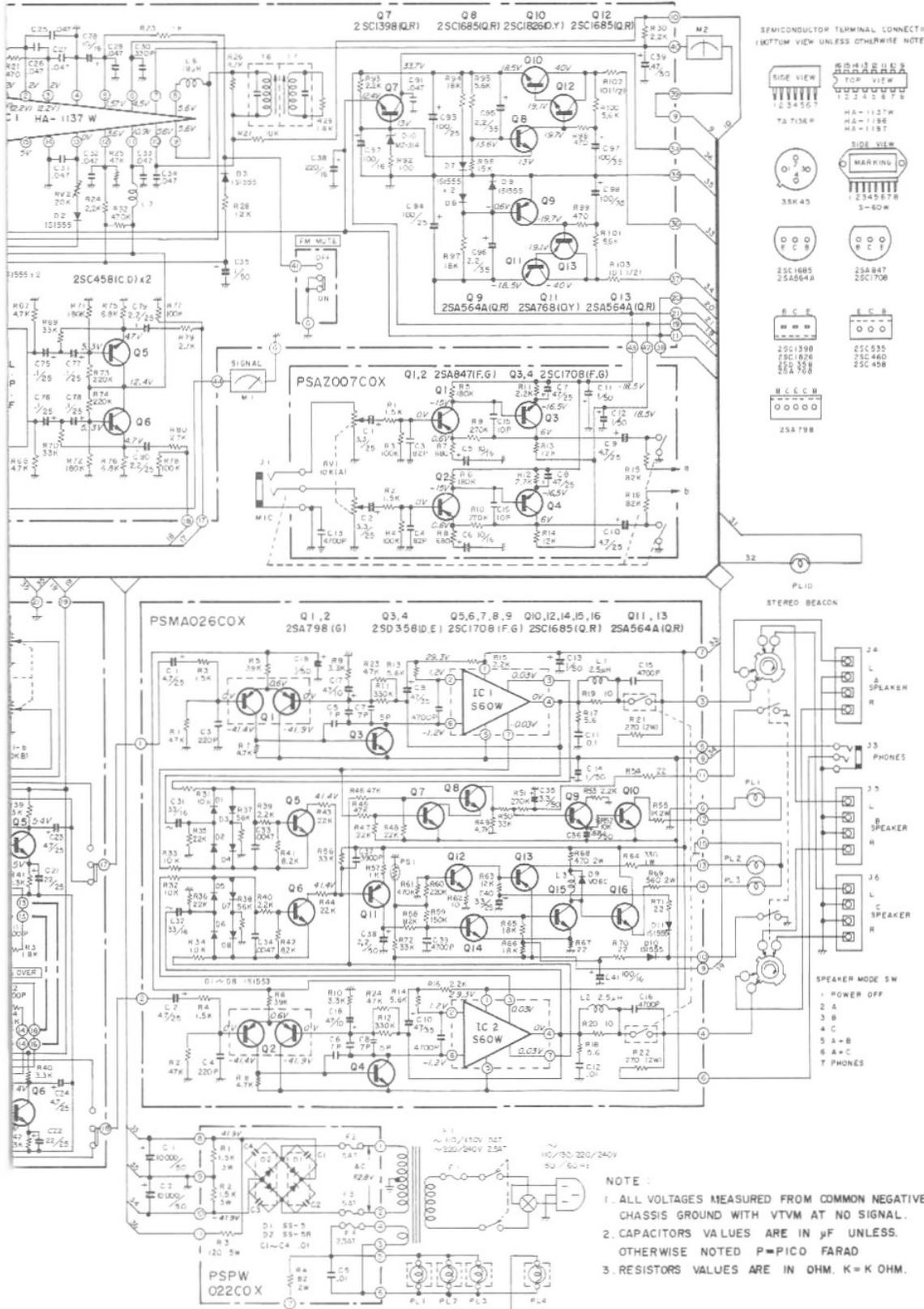
EXPLODED VIEW



9.



C DIAGRAM



10. PARTS LIST FOR RS-440

SYMBOL NO.	DESCRIPTION	SYMBOL NO.	DESCRIPTION
	Fuse 2.5AT (spare) FM Antenna-T-type Front Panel PW Board ass'y (MIC)	PT1	Support, pwr board fitting Power Transformer Terminal, GND earth, chassis Bushing, lead wire Bracket, heat sink stiffening PW Board ass'y (MAIN AMP)
PL1 – 10	Bushing, security lamp Lamp, 6.3V 35mA Bracket, security lamp Cover, lamp Bracket, push switch PW Board ass'y (TURNOVER)	IC1, 2	Heat Sink Integrated Circuit S-60W Bracket, chassis supporting, right Lug Terminal, 1L4P Side Panel, right Clamper, lead wire Bracket, dial pulley, Up " Dn PW Board ass'y (TUNER)
M1	Reflector, meter		Dial Drum
M2	Pulley, dial thread		Spring, dial drum
J3	Stud, dial pulley		Shaft, selector switch
S1	Spring board, meter		Coupler, "
	Meter, signal		PW Board ass'y (PRE AMP)
M1	" tuning		Rear Panel
J3	Jack, Headphone		Bracket, tuner board
S1	Switch, rotary, Speaker mode		Terminal, ANT
	PW Board ass'y (TONE MAP)		Jack, 5P DIN, REC/PLAY
	Bushing, selector switch		Terminal, GND earth, rear
	Flywheel ass'y		Spacer, MAG SENS sw.
	Dial Indicating Plate		Bushing, Ant. cord
	Cover, security lamp		Balance Coil
	Shade, dial plate, left		Bar Antenna
	" right		Holder, bar antenna
	" tuning shaft		"
	Holder, dial pointer		"
	Dial Pointer		Terminal, SPEAKER
	Dial Light Ass'y		Cover, voltage selector
	Bracket, chassis supporting, left		Support, "
	Chassis		Voltage Selector Socket
C1.2	Elyt. Capacitor 10000μF 50V		Fuse holder
	Connecting plate, Elyt. capacitor		
	PW Board ass'y (POWER)		
F1.4	Fuse 2.5AT		
F2.4	" 5AT		

SYMBOL NO.	DESCRIPTION	SYMBOL NO.	DESCRIPTION
R1 – 3	Jack, AC receptacle		Screw, oval flat, cabinet
	Escutcheon ass'y		Hexa. Nut, flywl ass'y
	Handle, escutcheon		" Ant. holder
	Spring, push switch		" volt selector, Ant. I
	Ring, "		Washer, cabinet
	Button, "		" flat, GND
	Knob, tuning		" inside toothed, Ant. C
	" selector sw.		selector
	" MIC VR		" inside toothed, Flywl
	" tone		Stop Ring, dial drum
	" VR		Washer, Ant. GND
	" balance		PW Board
	Cabinet ass'y	Q1, 2	Transistor 2SA847
	Foot	Q3, 4	" 2SC17C
	Shade, selector lamp	J1	Jack, MIC
	Metal Oxide Film Re. 220 ohm 1/2W	VR1	Control, 10KA
	Plate, se. no.		Short jumper 12.5mm
	Label, power board	C1, 2	Elyt. Capacitor 3.3 μ
	" FTC	C3, 4	Ceramic Capacitor 82 p
	" bottom cabinet	C5, 6	Elyt. Capacitor 10 μ
	Instruction Book, English, French	C7 – 10	" 4.7 μ
	" German, Swedish	C11, 12	" 1 μ
	Screw, tapping, dial light ass'y etc. M3x8	C13	Ceramic Capacitor 4700 p
	" rear panel etc. M3x8	C15, 16	" 10 p
	" inside toothed, tuner board etc.	R1, 2	Carbon Resistor 1.5K Ω
	M3x8	R3, 4	" 100K
	" pan head tapping, shade M3x8	R5, 6	" 180K
	" " pre amp etc.	R7, 8	" 680
	M3x8	R9, 10	" 270K
	" " escutcheon	R11, 12	" 2.2K
	M3x8	R13, 14	" 12K
	" " foot M4x18		PW Board
	" flat tapping, excutcheon M3x6		Push Switch
	" " AC jack M3x8		Connection Plug, 6P
	" " cabinet M4x20		PW board joint wire, 11P
	" pan head, Din jack M3x6	C1 – 4	Mylar Capacitor .022 μ
	" " Ant holder M3x20	C5, 6	" .0047 μ
	" " FN Ant. GND M3x10	C7 – 10	" .033 μ
	" " voltage selector M3x20	C11, 12	" .0018 μ
	" " phono sw. M2.6x8	R1, 2	Carbon Resistor 820K Ω
	" semus, pulley brkt M3x6	R3, 4	" 1.8K
	" flat head, handle M4x10		PW Board
	" bind head, pulley M2.6x6		

SYMBOL NO.	DESCRIPTION			SYMBOL NO.	DESCRIPTION		
Q1, 2	Transistor	2SA798	(G)	R13, 14	Carbon Resistor	75K	ohm
Q3 – 6	"	2SC1685	(Q.R)	R15, 16	"	8.2K	
VR1	Control, 200KMN/200KB, loud			R53, 54			
VR2 – 4	" 50KB, treble bass, mid			R17, 18	"	2.7K	
S1	Switch, push, Hi Filter			R23 – 28	"	4.7K	
S2ab	" MONI. A.B			R31 – 36	"	10K	
S3abc	" Loud. Stereo MONO. Tone Flat			R37, 38	"	47K	
	Connection Cord ass'y			R39, 40	"	3.3K	
	"			R41, 42	"	4.3K	
	Terminal, 7P			R43, 44	"	330	
	Shielded Wire			R49, 50	"	3.9K	
	Short jumper 12.5mm			R51, 52	"	680	
	Lead Wire, solid type, 70mm black				PW Board		
	" 120mm brown			D1	Diode	SS-5	
	" 120 red			D2	"	SS-5R	
	" 70mm orange				Fuse holder		
	" 70mm yellow			C1 – 5	Tie Point 16mm		
	Bracket, VR mtg.			R1, 2	Ceramic Capacitor	.01	μF
	Screw, semus		M3x6	R3	Metal Oxide Film Re.	1.5K	ohm
C1, 2	Elyt. Capacitor	3.3	μF	R4	Cement	"	120
C3, 4	Ceramic Capacitor	12	pF		Metal Oxide Film Re.	56	
C5, 6	"	33	pF		PW Board		
C7, 8	"	680	pF		Transistor	2SA79E	
C11, 12	Mylar Capacitor	.01	μF		Q1, 2	"	
C13, 14	"	8200	pF		Q3, 4	"	2SD35E
C21, 22	Elyt. Capacitor	22	μF		Q5 – 9	"	2SC170
C _{23, 24} C _{31, 32}	"	4.7	μF		Q _{10, 12} Q _{14 – 16}	"	2SC168
C25, 26	"	47	μF		Q11, 13	Diode	2SA564
C27, 28	"	47	μF		D1 – 8	"	1S1553
C29, 30	"	10	μF		D9	"	V06C
C33, 34	Ceramic Capacitor	120	pF		D10, 11	"	1S1555
C35, 36	Mylar Capacitor	.068	μF		PL1	Posistor PTH487A03BE302T	
R _{1, 2} R _{55, 56}	Carbon Resistor	82K	ohm		L1, 2	Choke Coil	2.5 μl
R _{3, 4, 19} R _{20, 29, 30}	"	1.5K	"		L1	Relay	
R _{5, 6} R _{45 – 48}	"	2.2K	"			Terminal, 6P	
R7, 8	"	22K	"			" 5P	
R9, 10	"	2.2M	"			Short jumper 12.5mm	
R11, 12	"	6.8K	"		C1, 2	Elyt. Capacitor	4.7 μl
					C3, 4	Ceramic Capacitor	220 pl
					C5, 6	"	4 pl
					C7, 8	"	7 pl
					C9, 10	Elyt. Capacitor	47 μl

SYMBOL NO.	DESCRIPTION	SYMBOL NO.	DESCRIPTION
C11, 12	Mylar Capacitor .01 μ F 50V	R64	Metal Oxide Film Re. 330 o
C13, 14, 19	Elyt. Capacitor 1 μ F 50V	R65, 66	Carbon Resistor 18K
C _{15, 16,} C _{33, 34, 39}	Ceramic Capacitor 4700 pF 50V	R67, 70, 71	" 22
C17, 18	Elyt. Capacitor 47 μ F 10V	R68	Metal Oxide Film Re. 470
C31, 32	" 33 μ F 16V	R69	" 1K
C35	" 3.3 μ F 50V	PW Board	
C36	" .68 μ F 50V	IC1	Integrated Circuit HA-11C
C37	Mylar Capacitor 3900 pF 50V	IC2	" HA-11S
C38	Elyt. Capacitor 2.2 μ F 50V	IC3	" HA-11S
C40	" 33 μ F 25V	Q1	Transistor 3SK45
C41	" 100 μ F 16V	Q2	" 2SC53E
R _{1, 2, 23,} R _{24, 45, 46}	Carbon Resistor 47K ohm 1/4W	Q3, 14	" 2SC46E
R3, 4	" 1.5K " "	Q4 - 6	" 2SC45E
R5, 6	" 39K " "	Q7	" 2SC13E
R7, 8, 49	" 4.7K " "	Q8, 12	" 2SC16E
R9, 10	" 3.3K " "	Q9, 13	" 2SA56E
R11, 12	" 330K " "	Q10	" 2SC18E
R13, 14	Metal Oxide Film Re. 5.6K " 1/2W	Q11	" 2SA76E
R15, 16	" 2.2K " "	D1 - 9	Diode 1S155E
R17, 18	" 5.6 " 1W	D10	" MZ314
R19, 20	" 10 " 1W	CV1 - 7	Variable Capacitor w/trimmer
R21, 22	" 270 " 2W	CF1 - 3	Ceramic Filter 10.7M
R _{31 - 34} R ₅₂	Carbon Resistor 10K " 1/4W	CF4	" 455KH
R _{35, 36, 43} R _{44, 47, 48}	" 22K " "	L.P.F	Low Pass Filter
R37, 38	" 56K " "		Socket, 16P
R39, 40	" 2.2K " "		Shield, front end
R41, 42	" 8.2K " "		" local/IF
R50, 56, 72	" 33K " "	RV2	Resistor semi-fixed 20K
R51	" 270K " "	RV3	" 1K
R53	" 2.2K " "	RV4	" 200K
R54	" 22 " "	RV5	" 10K
R55	Metal Oxide Film Re. 1K " 2W	L1, 3, 4	RF Coil 1.95 μ
R56	Carbon Resistor 1K " 1/4W	L6	" 18 μ
R58	" 82K " "	T1	" .055 μ
R59	" 150K " "	T2	" .055 μ
R60	" 220K " "	T3	" .055 μ
R61	" 470K " "	T4	" .034 μ
R62	" 10 " "	T5	I.F.T. 10.7 N
R63	" 12K " "	T6	" 10.7 N
		T7	" 10.7 N
		T8	RF Coil 270 μ
		T9	" 145 μ

SYMBOL NO.	DESCRIPTION			SYMBOL NO.	DESCRIPTION		
T10	I.F.T.	455	KHz	C64	Styroflex Capacitor	510	p
	Plate, pw board reinforcement			C65	Elyt. Capacitor	3.3	μ
	Heat Sink	2SC1398		C68, 73, 74	"	2.2	μ
	Screw, tapping		M3x8	C79, 80			
	Short jumper 12.5mm			C71, 72	Styroflex Capacitor	1100	p
	"			C75 – 78	Elyt. Capacitor	.1	μ
	Tie Point 16mm			C93, 94	"	100	μ
C1, 8, 54	Ceramic Capacitor	10	pF	C95, 96	"	2.2	μ
C2, 7	"	100	pF	C97, 98	"	100	μ
3, 40, 45				R1	Carbon Resistor	1M	o
C50, 53, 56	"	.01	μ F	R2, 43	"	1.5K	
58				4, 11, 12			
4, 11, 12				C17, 18, 21			
C17, 18, 21	"	.022	μ F	22, 52			
22, 52				C5, 6			
C5, 6	"	18	pF	C9			
C9	Minic Capacitor (a kind of ceramic)	.51	pF	C13			
	Ceramic Capacitor	33	pF	C14, 15			
	"	10	pF	C16			
	"	22	pF	C24			
	"	33	pF	C28, 69, 70			
				C30			
				C35, 66			
				C36			
				C38			
				C39			
				C42			
				C43			
				C44			
				C46			
				C47, 67			
				C48			
				C49, 92			
				C55			
				C57			
				C59			
				C60			
				C62			