VH

INSTRUCTION MANUAL

RS 220

SETTON

TOWARDS PERFECTION

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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 (RMS, 2 channels driven at 20 – 20,000 Hz, at 0.1% T.H.D.)	40 watts at 8 ohms (per channel)	
TOTAL HARMONIC DISTORTION	0.1% at rated output	
INTERMODULATION DISTORTION	0.1% at rated output	
FREQUENCY RESPONSE (AUX, TAPE PLAY)	20 – 20,000 Hz ± 0.5 dB	
POWER BANDWIDTH (– 3 dB)	10 – 35,000 Hz	
HUM AND NOISE (IHF, short-circuited, A network, rated power)	AUX:	85 dB
	TAPE PLAY:	85 dB
	MAG PHONO:	65 dB (Hi)
		70 dB (Lo)
INPUT SENSITIVITY (for rated output)	MAG PHONO:	2.5 mV (Hi)
		5 mV (Lo)
	AUX:	150 mV
	TAPE PLAY A:	150 mV
	TAPE PLAY B:	150 mV
	TAPE PLAY B:	150 mV (DIN connector)
MAXIMUM INPUT VOLTAGE	MAG PHONO:	150 mV (Hi)
		300 mV (Lo)
TONE CONTROL RANGE	BASS (50 Hz):	12 dB boost or cut
	TREBLE (10 kHz):	10 dB boost or cut
	MID (1 kHz):	6 dB boost or cut
DAMPING FACTOR	30 (1 kHz, 8 ohms)	
LOUDNESS CONTROL SWITCH (Volume control set at – 30 dB position)	50 Hz:	+12 dB
	10 kHz:	+3.5 dB
HIGH FREQUENCY FILTER	10 kHz:	– 10 dB
OUTPUT LEVEL (at rated input sensitivity)	TAPE REC A:	150 mV
	TAPE REC B:	150 mV
	TAPE REC B:	30 mV (DIN connector)
	HEADPHONES:	Low impedance

FM SECTION

TUNING RANGE	88 – 108 MHz	
USABLE SENSITIVITY	MONO: 11.2 dBf, STEREO: 19.0 dBf	
IHF ('58) SENSITIVITY	MONO: 2.0 μV	
50 dB QUIETING SENSITIVITY	MONO: 18.3 dBf, STEREO: 30.0 dBf	
SELECTIVITY (antenna terminal)	70 dBf	
CAPTURE RATIO	1.25 dB	
FM DISTORTION	100 Hz:	0.15% (MONO), 0.4% (STEREO)
	1 kHz:	0.15% (MONO), 0.4% (STEREO)
	6 kHz:	0.4% (MONO), 0.6% (STEREO)

STEREO SEPARATION	100 Hz: 32 dB 1 kHz: 40 dB 10 kHz: 32 dB
FREQUENCY RESPONSE (30 Hz – 15 kHz)	+ 0.5 dB, – 2 dB
SIGNAL NOISE RATIO	70 dB (MONO), 65 dB (STEREO)
MUTING THRESHOLD	14 dBf
SPURIOUS RESPONSE REJECTION	70 dBf
IF REJECTION	80 dB
IMAGE REJECTION	55 dB
TAPE OUTPUT LEVEL	0.77 V
SUBCARRIER PRODUCT RATIO	60 dB
ANTENNA	75 ohms unbalanced and 300 ohms balanced ir external antenna

AT 98 MHz, 65 dBf input signal, 100% MOD.

AT 98 MHz

AM SECTION

TUNING RANGE	525 – 1605 kHz
SENSITIVITY (IHF)	25 μV (ANT terminal)
IMAGE REJECTION	40 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	75 ohms unbalanced and 300 ohms balanced i external antenna

AT 1 MHz, 1 mV input signal, 30% mod.

AT 1 MHz

2. CIRCUIT DESCRIPTION

1. FM FRONT END AND TUNER

The FM FRONT END and AM tuner sections of this receiver are assembled on a precision printed ci board, PSTU021COX.

FM FRONT END

The FM signals applied to the FM antenna circuit will be led to the first gate of FET (Q1, RF Ampl Dual Gate MOS) through T1 and C2.

The amplified FM signal from the drain of Q1 is led to the Mixer gate Q2. Q3 is the local oscillato oscillating signal will be applied to the source of Q2 through T3 and C9 as injection signal for signal version.

The FM and oscillator injection signals will be mixed between gate and source of the Mixer (Q2) and verted into 10.7 MHz IF signal and amplified.

The converted 10.7 MHz output is led to the ceramic band pass filter CF1 and applied to the first IF amp stage, Q4.

2. AM TUNER

The large part of AM tuner circuit are integrated into an IC (IC3) and only one transistor is used in AM t as Audio Amp.

The AM tuner consists of RF amplifier, converter, high gain 455 kHz IF amplifier with ceramic band filter, local oscillator and a tuning meter driver.

T7 is the local oscillator coil. CF4 is the 455 kHz ceramic band pass filter.

The AM tuner output is connected to the terminal 33 on P.C Board PSTU021COX and finally it is led t and right Main amplifiers (Q601, Q602 and Q1, Q2 on the P.C Board PSMA020COX) through the tone a fiers on the P.C Board PSPT004COX.

3. FM IF AMPLIFIER AND MPX DECODER

These are assembled on one printed circuit board PSTU021COX.

The IF amplifier consists of one transistor differential amplifier, one IC amplifier – a muting circuit integ in IC, and MPX decoder, phase locked loop MPX decoder and precision de-emphasis network.

The main route of 10.7 MHz IF signal is as follows:

10.7 MHz IF signal – Q4 differential amplifier – 10.7 MHz ceramic filter – IC1 – IC2 – L.P.F. – term 31, 32 on the P.C Board PSTU021COX.

The detected and impedance-transformed signal at IC1 on the P.C Board PSTU021COX will be supplie MPX decoder input terminal (2 pin of IC2) on the P.C Board.

The decoded left and right channel signals will be obtained from 6 and 7 pin of IC2.

4. SIGNAL STRENGTH METER

The 7 pin of IC1 (on PSTU021COX) provides the signal for signal strength meter.

The DC voltage is applied to the positive terminal of the meter through RV2.

5. AUDIO AMPLIFIER

The operation theory of the audio amplifier is not complicated. Generally, failures in operation ma found by tracing the audio signal injected to the input circuit carefully. A highly sensitive oscilloscope high input impedance will be required for alignment.

6. PROTECTION CIRCUIT

This circuit consists of a relay PL601, Q1, Q3, Q2, Q4, Q614, Q615, Q616 and Q617 on P.C Board 020COX. The relay is used to separate speakers and Main Amplifier circuit for the protection. DC voltage developes at the emitter of Q1 and Q3, Q2 and Q4, and if DC control voltage potential e> predetermined level, speaker circuit is cut off by the relay.

In the same way, the control signal developed at the point between base of Q601 and terminal 2A (or Q602 and terminal 2B) on P.C Board PSMA020COX operates the relay for protection.

When Speaker Mode switch (power switch) is first turned on, PL601 relay does not operate durin seconds until Main Amplifier correctly operates.

When Speaker Mode switch is turned off, the relay cuts off circuit to speakers instantly.

Also, if speaker terminals or speaker cables are a short circuited, the control voltage developes the di of electric potential between base and emitter of Q613 or Q614 and it makes Q615 on, Q616 on, S\ Tr Q617 off, the PL601 relay operates, Protection Lamp illuminates, and the Transistors within Mair fier circuit will be protected.

When temperature of the radiator has risen more than 90°C, the relay will be operated by PS1-detec Heat Lamp illuminates.

When Transistor is broken down, the abnormal voltage developes at the point between R633 and R634 and R636 and speaker circuit is cut off.

When Clipping is occured the control voltage, developed at the point R635 or R636, operates Q1 (on P.C Board PSAZ008COX), then Clipping Lamp will be activated by Q4 through Switching Tr Q3 Board PSAZ008COX).

3. ALIGNMENT PROCEDURES

3.1 TEST EQUIPMENT

The Test Equipment listed below is required to test and to align the RS-220 FM/AM HI-FI Stereo rec

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; 10 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 k ohm or higher. Input Capacitance; 25 PF or less.
5)	Clamp-on Ammeter:	Measurement range; 0.1 A to 1 a or higher.
6)	Sweep Generator:	Sweep frequency; 455 kHz ± 50 kHz, 10.7 MHz ± 1 MHz.
7)	Distortion Analyzer:	Frequency; 20 Hz to 100 kHz ± 0.5 dB.

3.2 BIAS CURRENT ADJUSTMENT

1) Unsolder the lead connected to terminal 3 which is at left side on P.C Board PSMA020COX and co a DC milliammeter between terminal 3 and the unsoldered lead.
Adjust RV601 for 30 mA reading on the meter. Then, reconnect the lead to the terminal 3.

2) Next, unsolder the lead connected to terminal 3 which is on the opposite side of P.C Board P 020COX and connect a DC milliammeter between terminal 3 and the unsoldered lead. Adjust R for a reading of 70 mA. Reconnect the lead to the terminal 3.

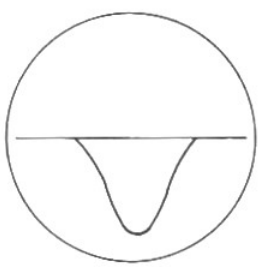
3.3 AM IF ALIGNMENT

1) Place the SELECTOR SWITCH in the AM position.

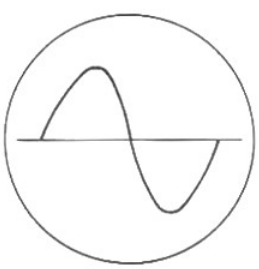
2) Connect the 455 kHz sweep generator output to the antenna terminal and chassis ground on the panel.

3) Connect the oscilloscope directly to the pin 12 of IC3 and chassis ground.

4) Adjust CF4 for maximum and symmetrical scope display.



a) At the pin 12 of IC3



b) At the TAPE REC

Figure 1.

3.4 AM TRACKING ALIGNMENT

1) Pull the AM bar antenna outwards.
   NOTE: Do not use EXT ANT terminal for Tracking.
2) Connect the test equipment to RS-220 as shown in Figure 2.
3) Set the AM signal generator frequency to 600 kHz for 30% modulation at 1 kHz and Dial pointer same frequency.
4) Increase the AM signal generator output until a sine wave appears on the oscilloscope display. Then, adjust T7 for maximum audio output (Dial frequency Alignment).
   Also, adjust screw core of AM bar antenna for maximum output. (Tracking adjustment).
5) Set the AM signal generator frequency to 1400 kHz and Dial pointer to the 1400 kHz position. Adjust CT5 for maximum audio output (Dial frequency Alignment).
   Also, adjust CT4, CT5 for maximum output (Tracking Adjustment).
6) Repeat steps 4, 5 until no further improvement is obtained.
   NOTE: When adjusting the cores or triming capacitors, the audio output level will rapidly increa the level meter pointer may go off scale. In this case always decrease the signal generat put for proper audio output. Do not change the level meter range.

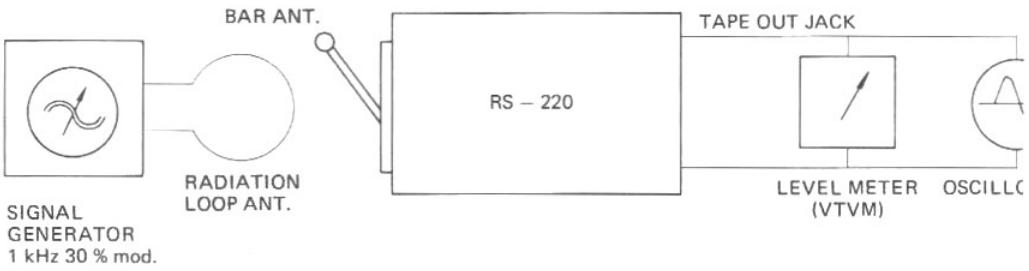


Figure 2. AM FRONT END ALIGNMENT SETUP.

3.5 AM SIGNAL METER ALIGNMENT

The same test-setup as above.

1) Increase signal generator output to 80 – 90 dB and adjust the RV3 for 90% reading of the scale.

3.6 FM IF ALIGNMENT

A. CENTER TUNING METER ALIGNMENT

1) Place the SELECTOR SWITCH in the FM position.

2) Adjust T5 to bring the meter pointer on the exact center of the scale.

B. FM IF ALIGNMENT

1) Couple the output of the sweep generator to T2 (RF Transformer) through a coupling c Figure 3 (A).
IMPORTANT: Do not ground the coaxial cable shield lead.

2) Connect the detector probe to the pin 13 of IC1 and "G" (ground) as shown in Figure 3 (B) hot lead of the probe should be made as short as possible and the ground lead should be conn to chassis ground.

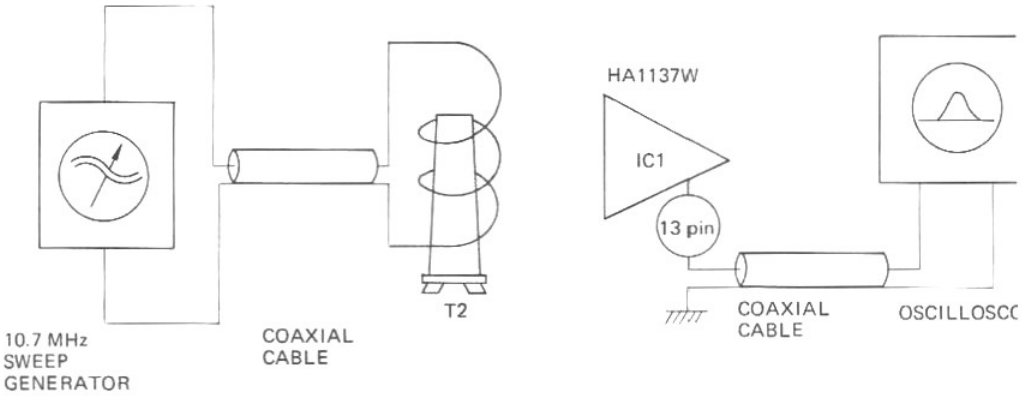


Figure 3.

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 os scope display.

5) Adjust core of T4 for highest, widest and round top display as shown in Figure 4, CORR (Since ceramic filters are used in the IF circuits, ignore 10.7 MHz center maker in the a alignment).
NOTE: When replacing a ceramic filter always use the one having the same colour dot.

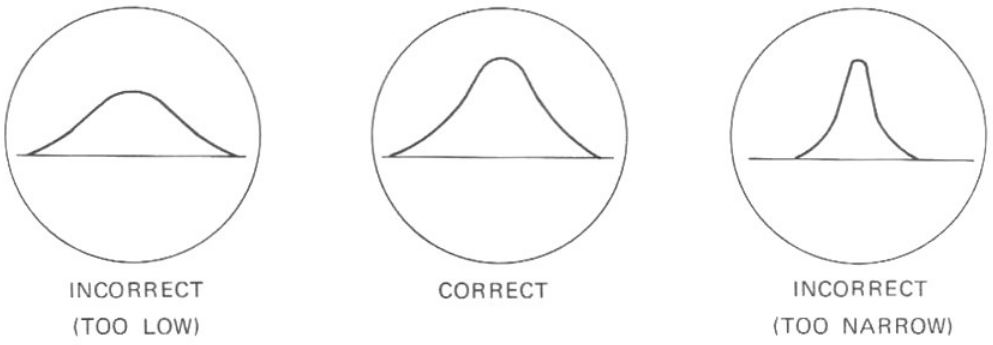


Figure 4.

3.7 FM FRONT END ALIGNMENT

1) Set the program SELECTOR SWITCH to the FM position and FM mute switch in the OFF po

2) Connect the test equipment to the RS-220 as shown in Figure 5.

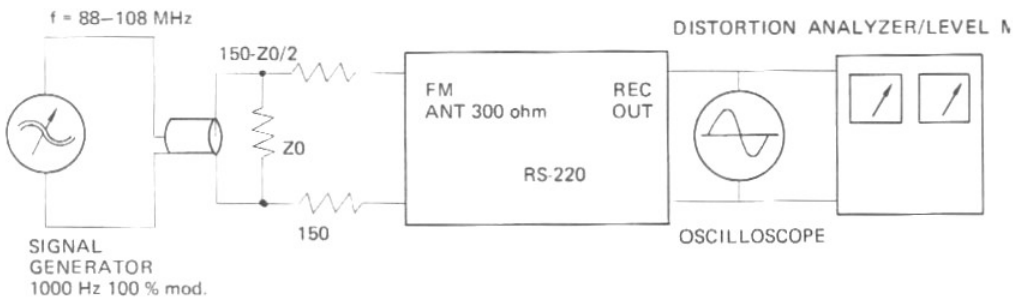


Figure 5. FM FRONT END TEST SETUP

3) Set the FM signal generator frequency to 90 MHz and Dial pointer to 90 MHz. Then, adjust T3 sine wave appears on the oscilloscope display, and adjust T1 – T2 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 CT3 in the same manner as adjustment Then adjust CT1 – CT2 for maximum output.

5) What is more, set the signal generator to 90 MHz, adjust T4 and CT1 – CT2 as in Step 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 generat put to such a level at which the sine wave on the scope includes visible noise pulses tc inaccurate alignment due to limiting action.

3.8 IF DISTORTION ALIGNMENT

1) Connect the equipment to the RS-220 same as Figure 5.

2) Make sure the FM TUNING meter, with no signal, indicates exact center reading.
If not adjust T5. 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 pc Adjust the core T6 for minimum distortion.
Adjusting T6 may upset the FM TUNING meter alignment slightly. Repeat Step 2) until no improvement is obtained.

3.9 SIGNAL METER ALIGNMENT

1) Set the signal generator to 98 MHz, 90 dB output and tune the receiver to the frequency, us TUNING meter.

2) Then make sure the meter pointer deflects approximately 90% reading. If not adjust RV2.

3.10 FM MPX STEREO CIRCUIT ALIGNMENT

Connect 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 11 and chassis ground and read the frequency should be 76 kHz ± 300 Hz.
If not, adjust RV5.

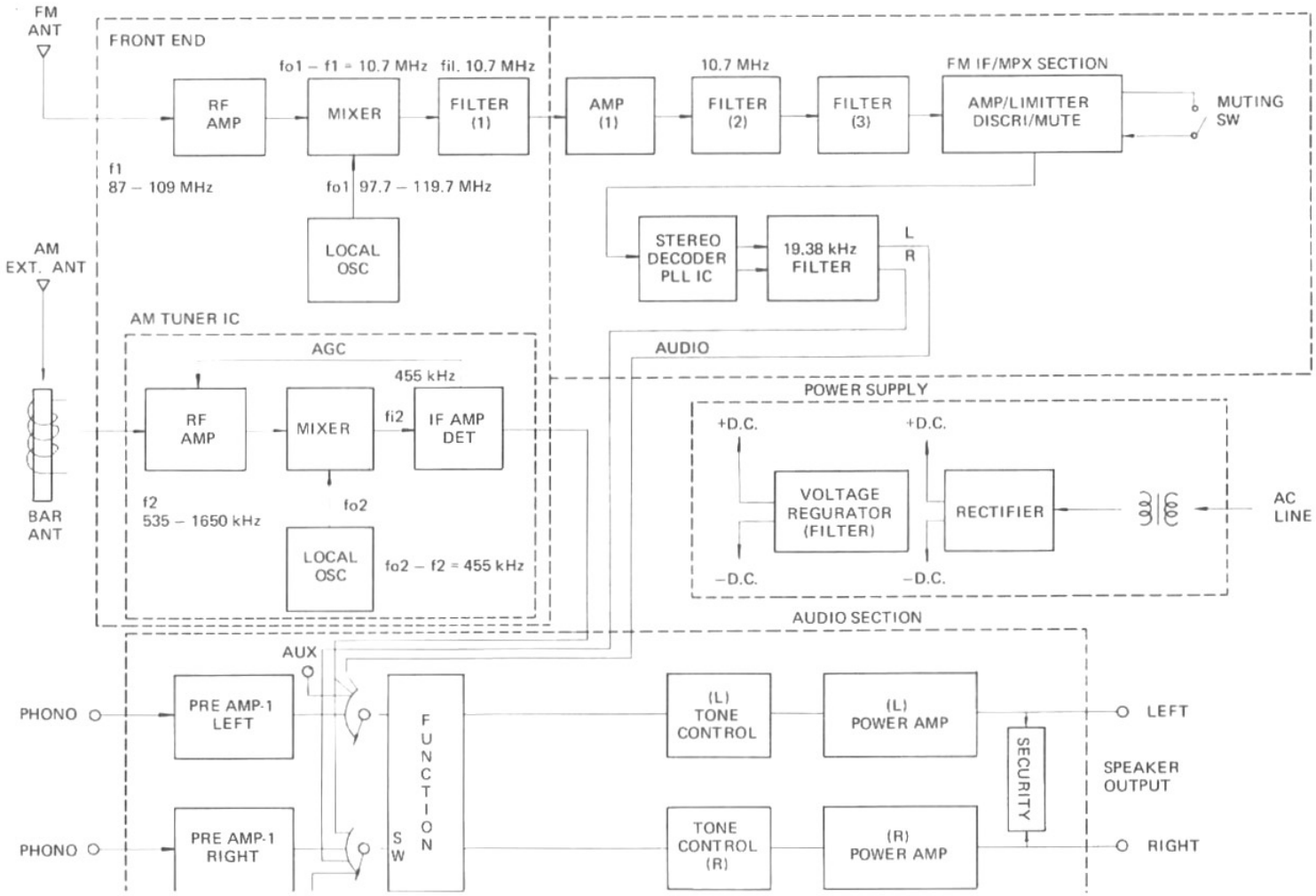
B. SEPARATION ALIGNMENT

1) Modulate signal generator with the stereo composite signal (mod. f. 1 kHz/400 Hz). And se signal generator output to 66 dB.
Make sure the FM TUNING meter indicates exact center of scale.

2) Modulate the signal generator with the normal left channel composite signal and observe the put 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 cha signal leakage appeared on the LEFT CHANNEL REC jack. The leakage voltage should be same level as that of the right channel. If not, readjust RV4 for equal and minimum leaka both outputs.
The normal leakage voltage is approximately 40 – 50 dB.

4. BLOCK DIAGRAM



5. DIAL CORD STRINGING

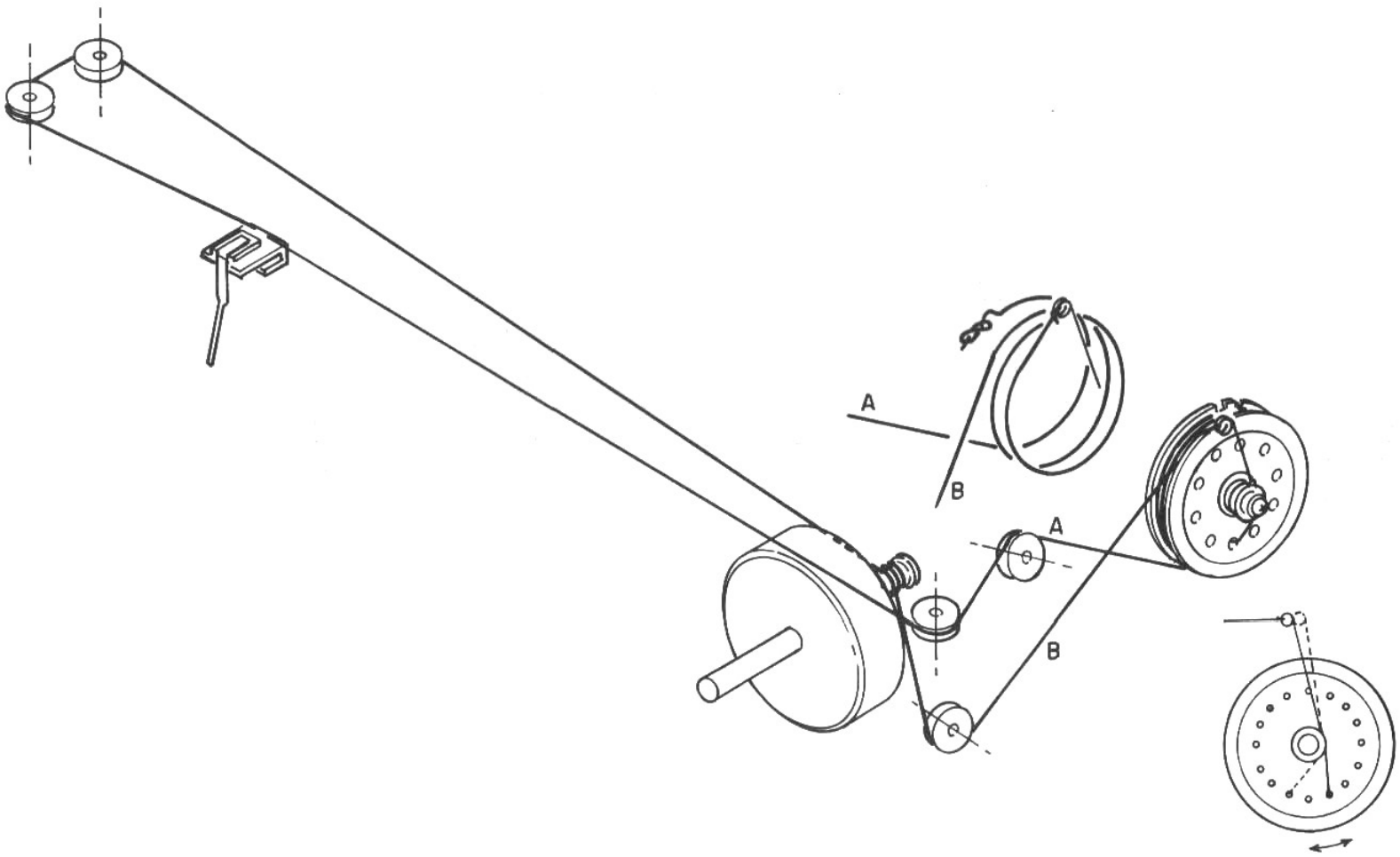


Figure 7.

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

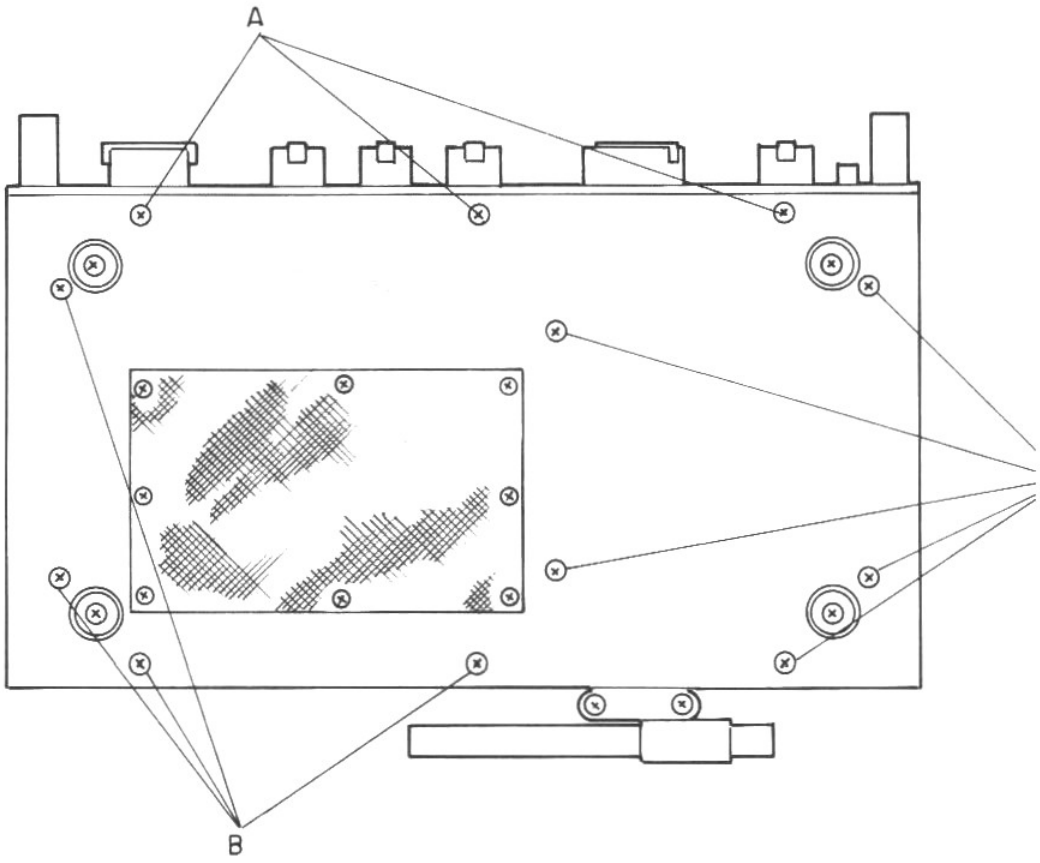


Figure 8.

7. ELECTRICAL PARTS LOCATION, PRINTED CIRCUIT BOARDS

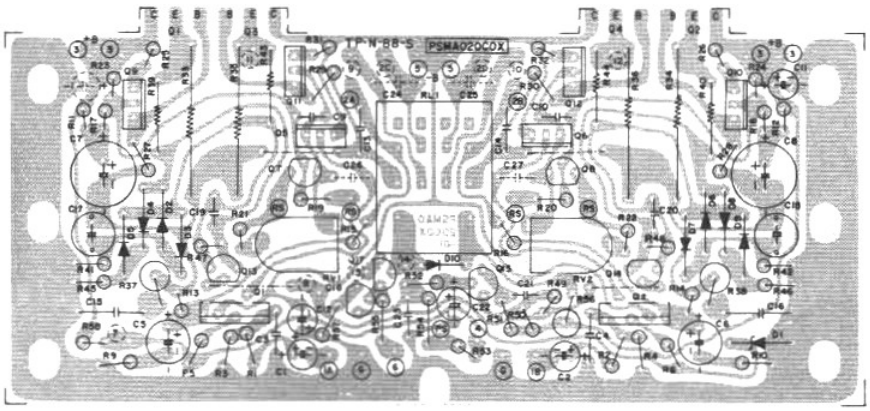


Figure 9. MAIN AMPLIFIER (PSMA020COX)

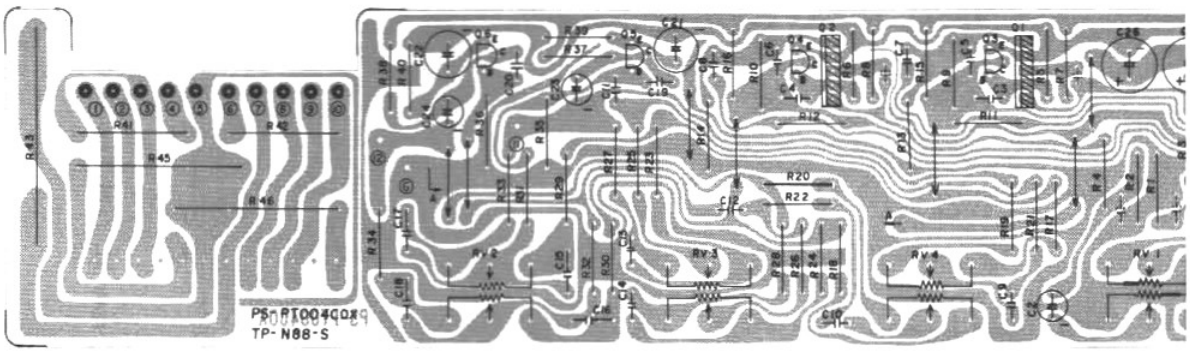


Figure 10. TONE CONTROL AMPLIFIER (PSPT004COX)

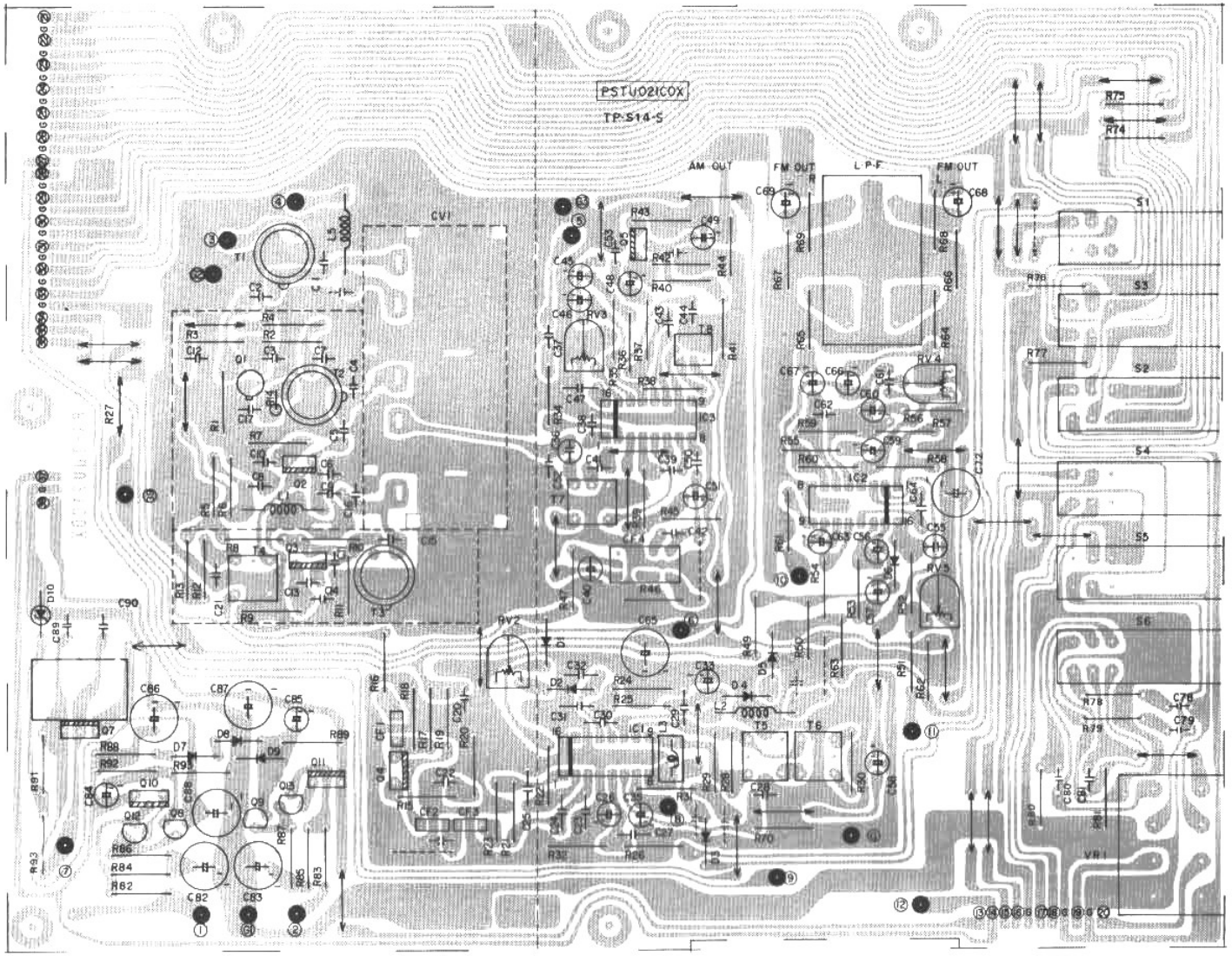


Figure 11. FM FRONT END FM IF/MPX (PSTU021COX)

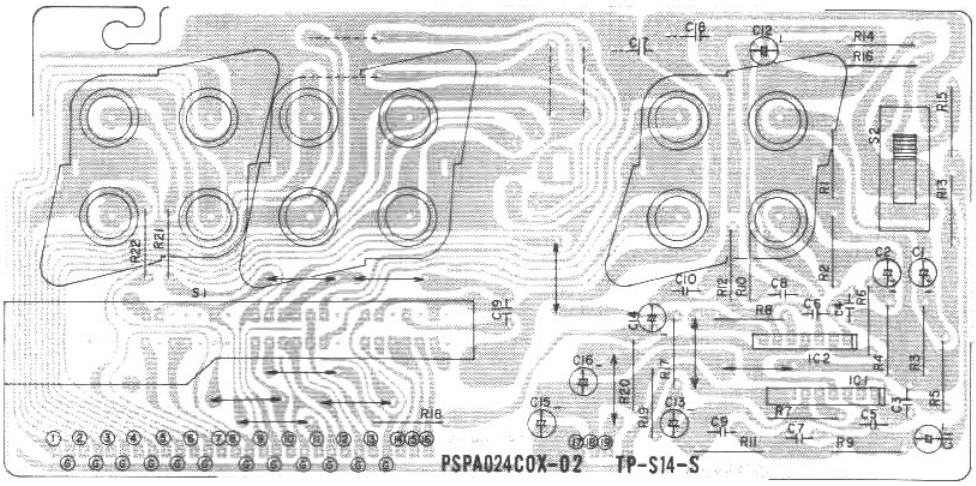


Figure 12. PRE AMPLIFIER (PSPA024COX)

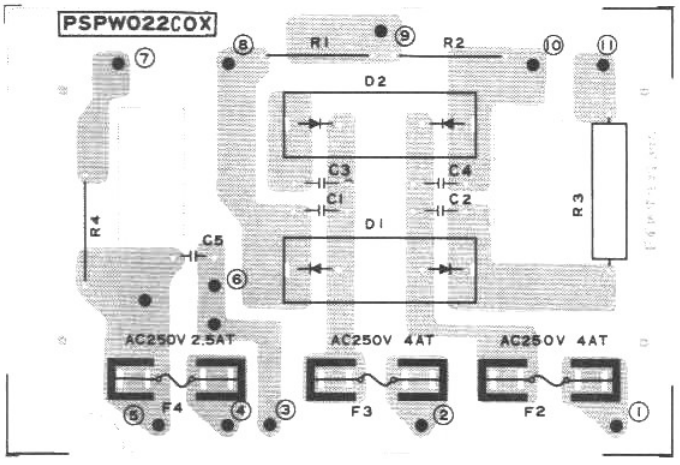


Figure 13. POWER SUPPLY (PSPW022COX)

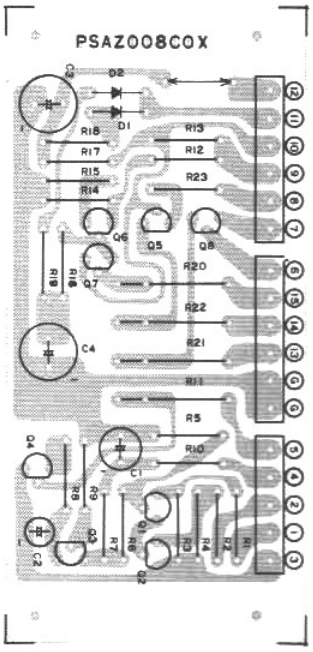


Figure 14. SECURITY (PSAZ008COX)

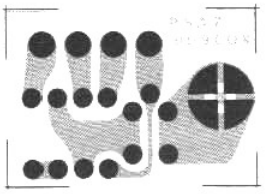
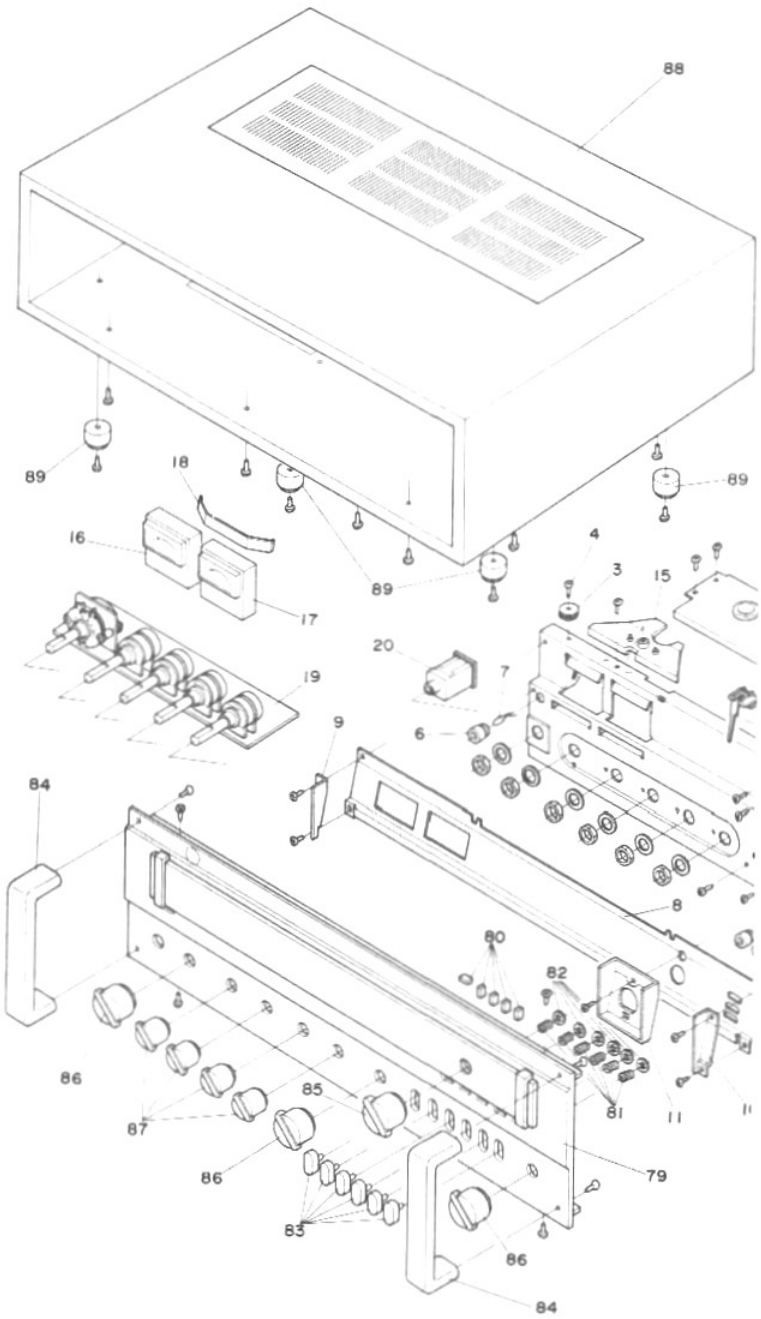
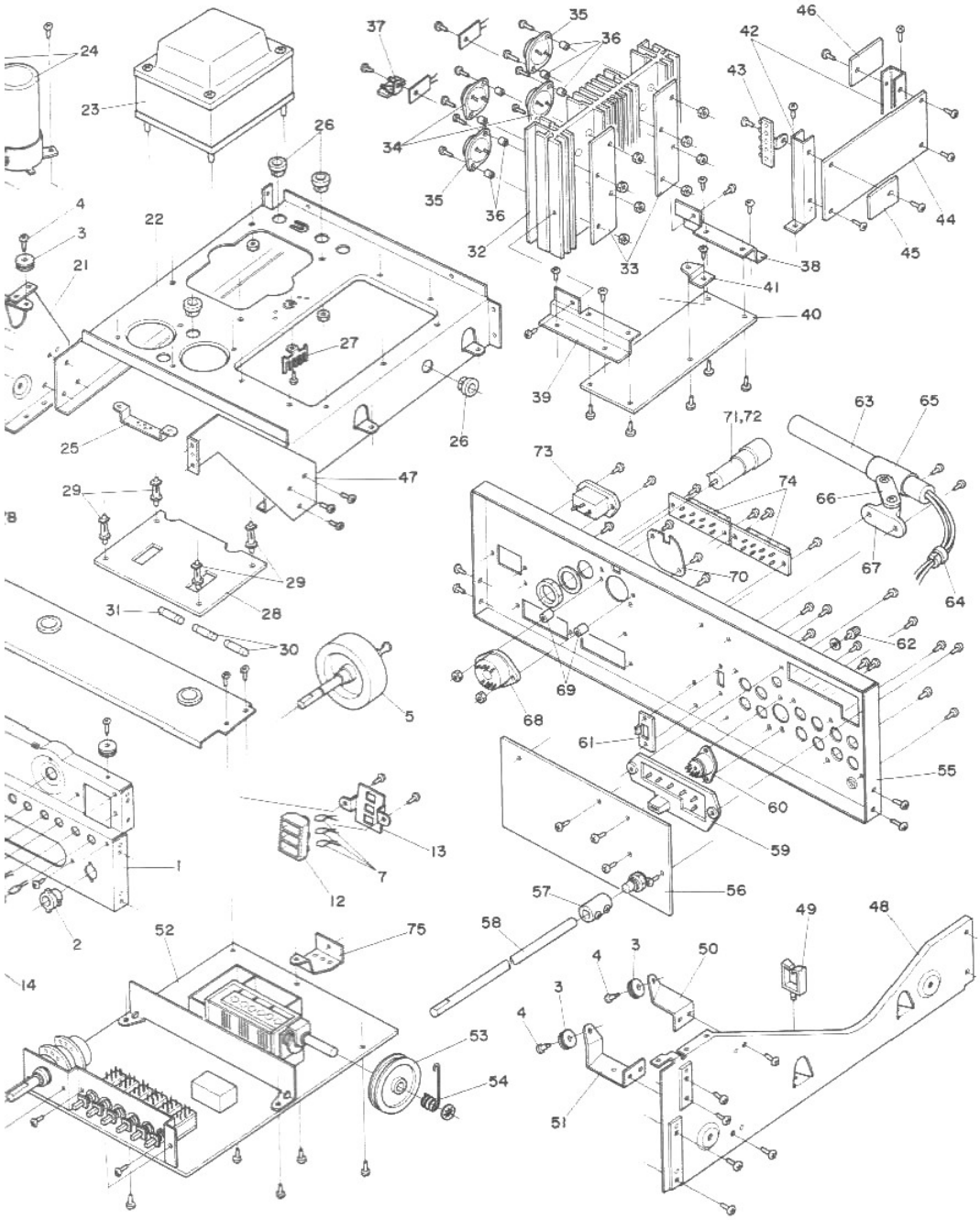


Figure 15. SECURITY SWITCH (PSAZ009C(

8. EXPLODED VIEW

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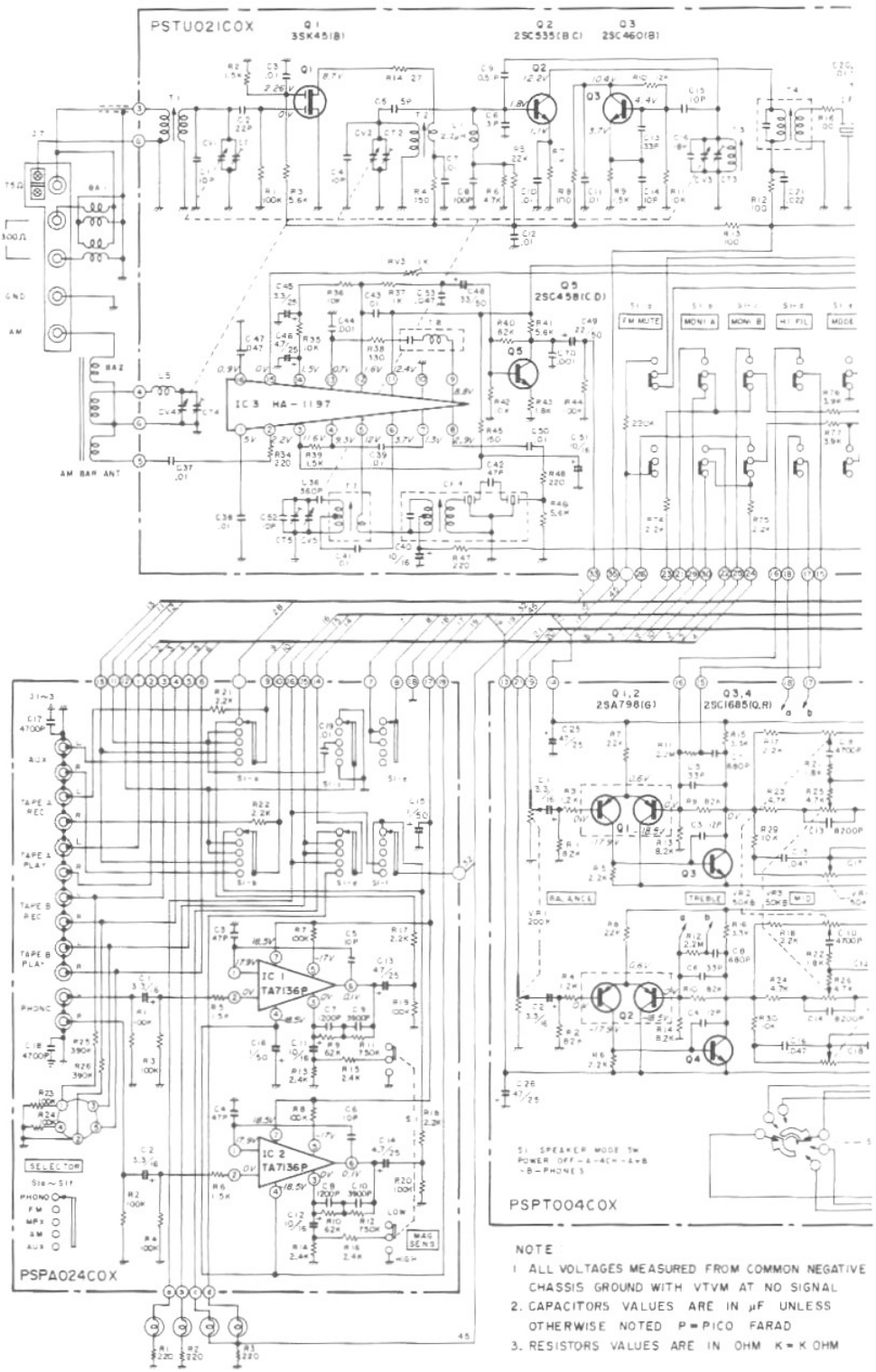
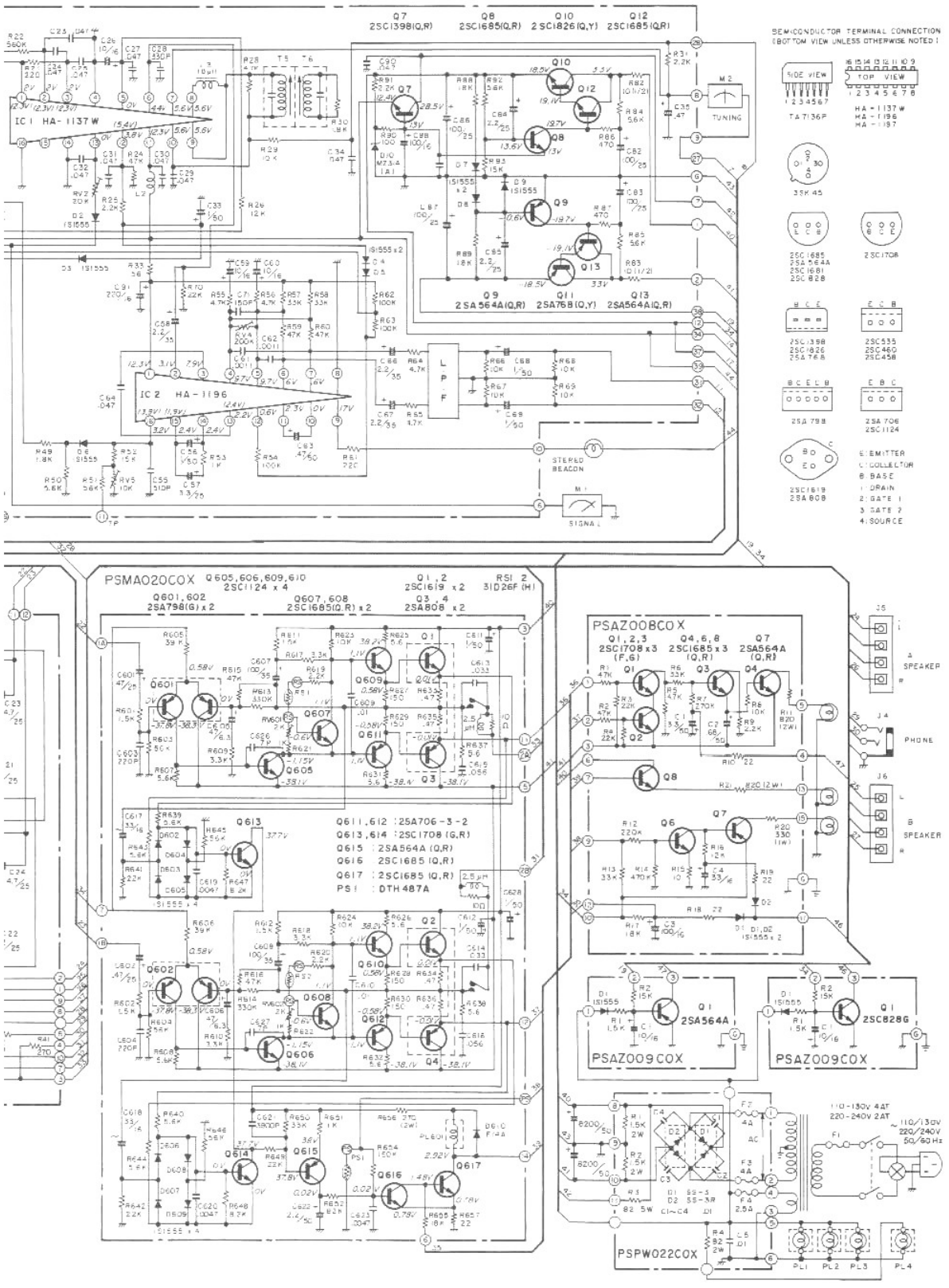
9. SCHEMATIC DIAGRAM



NOTE

1. ALL VOLTAGES MEASURED FROM COMMON NEGATIVE CHASSIS GROUND WITH VTVM AT NO SIGNAL
2. CAPACITORS VALUES ARE IN μF UNLESS OTHERWISE NOTED P=PICO FARAD
3. RESISTORS VALUES ARE IN OHM K=K OHM


Q7 2SC1398(Q,R)
Q8 2SC1685(Q,R)
Q10 2SC1826(Q,Y)
Q12 2SC1685(Q,R)
IC1 HA-1137W
IC2 HA-1196
Q9 2SA564A(Q,R)
Q11 2SA768(Q,Y)
Q13 2SA564A(Q,R)
L P F
TUNING
M2
STEREO BEACON
M1
SIGNAL
SEMICONDUCTOR TERMINAL CONNECTION (BOTTOM VIEW UNLESS OTHERWISE NOTED)
SIDE VIEW
TOP VIEW
TA7136P
HA-1137W
HA-1196
HA-1197
35K45
2SC1685 2SA564A 2SC1681 2SC828
2SC1708
2SC1398 2SC1826 2SA768
2SC535 2SC460 2SC458
2SA798
2SA706 2SC1124
2SC1619 2SA808
E: EMITTER
C: COLLECTOR
B: BASE
1: DRAIN
2: GATE 1
3: GATE 2
4: SOURCE
PSMA020COX Q605,606,609,610 2SC1124 x 4
Q601,602 2SA798(G) x 2
Q607,608 2SC1685(Q,R) x 2
Q1,2 2SC1619 x 2
Q3,4 2SA808 x 2
RS1 2 31D26F(H)
Q611,612 : 2SA706-3-2
Q613,614 : 2SC1708(G,R)
Q615 : 2SA564A(Q,R)
Q616 2SC1685(Q,R)
Q617 : 2SC1685(Q,R)
PS1 : DTH487A
PSAZ008COX
Q1,2,3 2SC1708 x 3 (F,G)
Q4,6,8 2SC1685 x 3 (Q,R)
Q7 2SA564A (Q,R)
PSAZ009COX
2SA564A
2SC828G
PSPW022COX
110-130V 4AT
220-240V 2AT
110/130V 220/240V 50/60Hz
A SPEAKER
PHONE
B SPEAKER
PL1 PL2 PL3 PL4

10. PARTS LIST FOR RS-220

SYMBOL NO.	DESCRIPTION
	Fuse 2AT (spare)
	Antenna, T-type
	Front Panel
	Bushing, function sw.
	Pulley, dial thread
	Shaft, dial pulley
	Flywheel ass'y
	Cover, lamp
PL1 – 9	Lamp 6.3V 35mA
	Dial Indicating Plate
	Shade, dial plate, left
	" right
	Shade, turning
	Bushing, security lamp
	Bracket, "
	Cover, "
	Reflector, meter
M2	Meter, tuning
M1	" signal
	Spring plate, meter
	PW Board ass'y (TONE AMP)
J4	Jack, Headphone
	Bracket, chassis supporting, left
	Chassis
PT1	Power Transformer
C1, 2	Elyt. Capacitor 8200 μF 50V
	Terminal, Elyt. Capacitor earth
	Bushing, lead wire
	Terminal, GND earth, chassis
	PW Board ass'y (POWER)
	Support, PWR board
F1, 2	Fuse 4AT
F3	" 2.5AT
	Heat Sink
	PW Board ass'y (Power Transistor)
Q1, 2	Transistor 2SC1619] pair
Q3, 4	" 2SA808

SYMBOL NO.	DESCRIPTION
	Bushing, power transistor fixin
	Lug Terminal, posistor
	Bracket, heat sink fixing, right
	" left
	PW Board ass'y (MAIN AMP)
	Bracket, main amp board
	Lug Terminal, 1L4P
	PW Board ass'y (SECURITY)
	PW Board ass'y (SECURITY S\
	PW Board ass'y (SECURITY S\
	Bracket, chassis supporting, rig
	Side Plate, right
	Clamper, lead wire
	Bracket, dial pulley, Up
	" Dn
	PW Board ass'y (TUNER)
	Dial Drum
	Spring, dial drum
	Rear Panel
	PW Board ass'y (PRE AMP)
	Coupler, function sw.
	Shaft, "
	Terminal, ANT
	Jack, 5P DIN, REC. PLAY
	Spacer. MAG SENS SW
	Terminal, GND earth, rear
BA1	Balance Coil
BA2	Bar Antenna
	Bushing, ANT. wire
	Holder, ANT
	"
	"
S2	Socket, Voltage Select
	Support, voltage selector

SYMBOL NO.	DESCRIPTION
	Cover, voltage selector
	Fuse holder
F4	Fuse 2AT
	Jack, AC
	Terminal, Speaker
	Bracket, main pw board supporting, rear
	Dial Pointer
	Bracket, dial pointer
	Dial Light Ass'y
	Escutcheon ass'y
	Shade, knobs
	Spring, push button
	Ring, "
	Button, push sw.
	Handle, escutcheon
	Knob, tuning
	" rotary sw.
	" tone
	Cabinet ass'y
	Foot
PS1	Posistor DTH-487A
RS1, 2	Thermistor 31D26F (H)
R1 – 3	Metal Oxide Film Re. 220 ohm 1/2W
	Plate, se. no.
	Label, caution
	" FTC
	" warning
	Instruction Book (English, French)
	" (Germany, Swedish)
	Screw, tapping, dial light etc. M3x8
	" rear panel etc. M3x8
	" inside toothed, tuner board etc. M3x8
	" pan tapping, shade M3x8
	" " ant. terminal M3x8
	" " escutcheon, tuner M3x8
	" " foot M4x18
	" flat tapping, escutcheon M3x6
	" " AC jack M3x8
	" " Cabinet M4x20
	" pan head, Din jack etc. M3x6

SYMBOL NO.	DESCRIPTIOI
	Screw, pan head, Ant. hol
	" pan head, GND ear
	" " PHONO
	" semus, pulley brkt
	" " PWr. transis
	" flat head, handle
	" bind head, pulley
	" oval flat cabinet
	Hexa. Nut flywheel
	" Nut Ant. holder
	" volt selector, FM GI
	Washer, cabinet
	" flat, GND
	" inside toothed loc etc.
	" inside toothed loc
	Stop Ring, dial drum
	Washer, GND FM Ant.
	PW Board
Q1, 2	Transistor 2SA
Q3 – 6	" 2SC
VR1	Control, 200KM.N Balanc
VR2 – 4	" 50KB Treble, Mic
S1	Rotary Switch, speaker mc
	Terminal, 5P
	Tie Point, 16mm
	PW board joint wire, 11P
C1, 2	Tantalum Capacitor 3.3
C3, 4	Ceramic Capacitor 12
C5, 6	" 33
C7, 8	" 680
C9, 10	Mylar Capacitor 470
C11, 12	" .01
C13, 14	" 820
C15 – 18	" .047
C19, 20	" 12
C21, 22	Elyt. Capacitor 22
C23, 24	" 4.7
C25, 26	" 4.7
R1, 2	Carbon Resistor 82K
R3, 4	" 1.2k
R5, 6	" 2.2k

SYMBOL NO.	DESCRIPTION			
R7, 8	Carbon Resistor	22K	ohm	1/4W
R9, 10	"	82K	"	"
R11, 12	"	2.2M	"	"
R13, 14	"	8.2K	"	"
R15, 16	"	3.3K	"	"
R17 – 20	"	2.2K	"	"
R21, 22	"	1.8K	"	"
R23 – 28	"	4.7K	"	"
R29 – 34	"	10K	"	"
R35, 36	"	47K	"	"
R37, 38	"	3.3K	"	"
R39, 40	"	4.3K	"	"
R41, 42	Metal Oxide Film Re.	270	"	2W
	Short jumper 12.5mm			
	Lead wire, solid type 140mm			
	PW Board			
D1	Diode SS-3			
D2	" SS-3R			
	Fuse holder			
	Tie point 16mm			
C1 – 5	Ceramic Capacitor	.01	μF	500V
R1, 2	Metal Oxide Film Re.	1.5K		2W
R3	Cement Resistor	56		5W
R4	Metal Oxide Film Re.	56		2W
	PW Board			
Q601, 602	Transistor	2SA798 (F)		
$Q_{609, 610}^{605, 606}$	"	2SC1124-2		
$C_{616, 617}^{607, 608}$	"	2SC1685 (Q.R)		
Q611, 612	"	2SA706-3-2		
Q613, 614	"	2AC1708 (F.G)		
Q615	"	2SA564A (Q.R)		
D602 – 609	Diode	1S1555		
D610	"	F14A		
RL601	Relay, UL			
RV601, 602	Resistor, semi-fixed 2K			
	Tie Point			
C601, 602	Elyt. Capacitor	.47	μF	50V
C603, 604	Ceramic Capacitor	220	pF	50V
C605, 606	Elyt. Capacitor	47	μF	6.3V
C607, 608	"	100	μF	35V
C609, 610	Ceramic Capacitor	.01	μF	50V

SYMBOL NO.	DESCRIPTION		
$C_{628}^{611, 612}$	Elyt. Capacitor	1	μ
C613, 614	Mylar Capacitor	.033	μ
C615, 616	"	.056	μ
C617, 618	Elyt. Capacitor	33	μ
$C_{623}^{619, 620}$	Mylar Capacitor	.0047	μ
C621	"	3900	p
C622	Elyt. Capacitor	2.2	μ
C626, 627	Ceramic Capacitor	7	p
R601, 602	Carbon Resistor	1.5K	o
R603, 604	"	56K	
R605, 606	"	39K	
R607, 608	"	5.6K	
R609, 610	"	3.3K	
R611, 612	Solid Resistor	1.5K	
R613, 614	Carbon Resistor	330K	
R615, 616	"	47K	
R617, 618	Solid Resistor	3.3K	
R619, 620	Carbon Resistor	2.2K	
R621, 622	"	1K	
R623, 624	Solid Resistor	10K	
$R_{631, 632}^{625, 626}$	"	5.6	
R627 – 630	"	150	
R633 – 636	Cement Resistor	.47	
R637, 638	Metal Oxide Film Re.	5.6	
$R_{643, 644}^{639, 640}$	Carbon Resistor	5.6K	
$R_{649}^{641, 642}$	"	22K	
R645, 646	"	56K	
R647, 648	"	8.2K	
R650	"	33K	
R651	"	1K	
R652	"	82K	
R654	"	150K	
R655	"	18K	
R656	Metal Oxide Film Re.	270	
R657	Carbon Resistor	22	
	PW Board		
Q1 – 3	Transistor	2SC170	
Q4, 6, 8	"	2SC168	

SYMBOL NO.	DESCRIPTION
Q7	Transistor 2SA564A (Q.R)
D1, 2	Diode 1S1555
	Terminal, 5P
	" 6P
	Short jumper 12.5mm
C1	Elyt. Capacitor 3.3 μF 50V
C2	" .68 μF 50V
C3	" 100 μF 25V
C4	" 33 μF 25V
R1, 2	Carbon Resistor 47K ohm 1/4W
R3, 4	" 22K " "
R5	" 4.7K " "
R6, 13	" 33K " "
R7	" 270K " "
R8	" 10K " "
R9	" 2.2K " "
R10, 18, 19	" 22 " "
R11, 21	Metal Oxide Film Re. 820 " 2W
R12	Carbon Resistor 220K " 1/4W
R14	" 470K " "
R15	" 10 " "
R16	" 12K " "
R17	" 18K " "
R20	Metal Oxide Film Re. 330 " 1W
	PW Board
Q1	Transistor 2SC828 (P.Q.R)
Q1	" 2SA564A (Q.R)
D1	Diode 1S1555
	Terminal, 4P
C1	Elyt. Capacitor 10 μF 16V
R1	Carbon Resistor 1.5K ohm 1/4W
R2	" 15K " "
	PW Board
IC1	Integrated Circuit HA-1137W
IC2	" HA-1196
IC3	" HA-1197
Q1	Transistor 3SK45 (B)
Q2	" 2SC535 (B or C)
Q3, 4	" 2SC460 (B)
Q5	" 2SC458 (C or D)
Q7	" 2SC1398 (Q.R)
Q8, 12	" 2SC1685 (Q.R)

SYMBOL NO.	DESCRIPTION
Q9, 13	Transistor 2SA
Q10	" 2SC
Q11	" 2SA
D1 – 9	Diode 1S1
D10	" MZ3
RV1	Control, 200K VOLUME
S1	Switch, push, FM MUTE e
CV1 – 5	Variable Capacitor 326p w
CF1 – 3	Ceramic Filter 10.7
CF4	" 455
L.P.F	Low Pass Filter
	Short jumper 12.5mm
RV2	Resistor semi-fixed 20K
RV3	" 1K
RV4	" 200
RV5	" 10K
L1, 2, 5	RF Coil 1.95
L3	" 18
T1	" 10.7
T2	" .055
T3	" .055
T4	I.F.T. 10.7
T5	" 10.7
T6	" 10.7
T7	RF Coil 145
T8	I.F.T. 455
	Shield, RF Circuit
	" Local Oscillator
	Plate, PW board reinforcin
	Bracket, push switch mtg.
	Heat Sink 2SC
	Screw, semus sw brkt
	" tapping 2SC
	Tie Point 16mm
C1	Ceramic Capacitor 10
C2	" 22
3,7,10–12 C20,37–39 41,43,50	" .01
C4, 52	" 10
C5	" 5
C6	" 3

SYMBOL NO.	DESCRIPTION			
C8	Ceramic Capacitor	100	pF	50V
C9	Minic Capacitor (a kind of ceramic)	.5	pF	500V
C13	Ceramic Capacitor	33	pF	50V
C14, 15	"	10	pF	50V
C16	"	18	pF	50V
C17	"	33	pF	50V
C21, 22	"	.022	μF	50V
C23–25, 27 C29–32, 34 47,64,89,90	"	.047	μF	50V
C26, 56 C59, 60	Elyt. Capacitor	10	μF	16V
C28	Ceramic Capacitor	330	pF	50V
C33	Elyt. Capacitor	1	μF	50V
C35	"	.47	μF	50V
C36	Styroflex Capacitor	360	pF	100V/ 125V
C40, 51, 88	Elyt. Capacitor	10	μF	16V
C42	Ceramic Capacitor	47	pF	50V
C44, 57, 70	Mylar Capacitor	1000	pF	50V
C45	Elyt. Capacitor	3.3	μF	25V
C46	"	4.7	μF	25V
C48	"	.33	μF	25V
C49	"	.22	μF	50V
C53	Mylar Capacitor	.047	μF	50V
C55	Styroflex Capacitor	510	pF	100V/ 125V
C56, 68, 69	Elyt. Capacitor	1	μF	50V
C58, 66, 67	"	2.2	μF	35V
C61, 62	Styroflex Capacitor	11pp	pF	100V/ 125V
C63	Elyt. Capacitor	.47	μF	50V
C65	"	100	μF	16V
C71	Ceramic Capacitor	150	pF	50V
C78, 79	"	220	pF	50V
C80, 81	Mylar Capacitor	.056	μF	50V
C82, 83 C86, 87	Elyt. Capacitor	100	μF	25V
C84, 85	"	2.2	μF	25V
C88	"	100	μF	16V
C91	Elyt. Capacitor	220	μF	16V
R1, 44, 54 R62, 63	Carbon Resistor	100K	ohm	1/4W

SYMBOL NO.	DESCRIPTION	
R2, 9, 39	Carbon Resistor	1.5K ol
R3, 41, 46 R50, 84, 85 92	"	5.6K
R4, 45, 70	"	150
R5	"	22K
R6, 28, 55 R56, 64, 65	"	4.7K
R7, 37, 53	"	1K
R8, 12, 13 R16, 27, 90	"	100
R10, 26	"	12K
R11, 29, 35 R36, 42 66 – 69	"	10K
R14	"	27
R15	"	68
R17	"	3.3K
R18, 19	"	560
R20, 38	"	330
R21, 34 R47, 48	"	220
R22	"	560K
R23	"	120
R24	"	47K
R25, 31, 74 R75, 91	"	2.2K
R30	"	1.8K
R33	"	56
R40, 43, 49	"	82K
R51	"	56K
R52, 93	"	15K
R57, 58	"	33K
R59, 60	"	47K
R61	Metal Oxide Film Re.	220
R76, 77	Carbon Resistor	3.9K
R78, 79	"	680
R80, 81	"	6.8K
R82, 83	Metal Oxide Film Re.	10
R86, 87	Carbon Resistor	470
R88, 89	"	18K
	PW Board	
IC1, 2	Integrated Circuit	TA713
S1	Switch, slide rotary,	SELECT

SYMBOL NO.	DESCRIPTION		
S2	Switch, slide, MAG SENS		
J1 – 3	Jack, 4P		
	PW board joint wire, 3P		
	" 7P		
	Short jumper, 12.5mm		
	Washer		
C1, 2	Tantalum Capacitor	3.3 μF	16V
C3, 4	Ceramic Capacitor	47 pF	50V
C5, 6	"	10 pF	50V
C7, 8	Mylar Capacitor	1200 pF	50V
C9, 10	"	3900 pF	50V
C11, 12	Elyt. Capacitor	10 μF	16V
C13, 14	"	4.7 μF	25V
C15, 16	"	1 μF	50V
C17, 18	Ceramic Capacitor	4700 pF	50V
C19	Mylar Capacitor	.01 μF	50V
R 1, 2, 3 4, 7, 8 19, 20	Carbon Resistor	100 k ohm	1/4W
R5, 6	"	1.5K "	"
R9, 10	"	62K "	"
R11, 12	"	750K "	"
R13 – 16	"	2.4K "	"
R 17, 18 21, 22	"	2.2K "	"