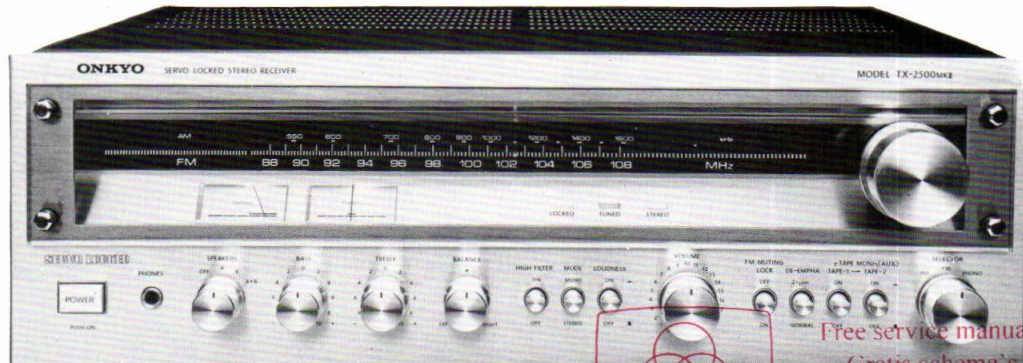


# ONKYO SERVICE MANUAL

## UNIVERSAL TYPE SERVO LOCKED FM/AM STEREO RECEIVER MODEL TX-2500MK II



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### TABLE OF CONTENTS

Item	Page
Specifications	2
Precautions	2
Service procedures	3
Component location	4
Exploded view	5
Alignment procedures	6
Stringing diagram	8
Schematic diagram	9
Printed circuit board view	11
Parts list	14
Block diagram	15
Circuit description	15
Printed circuit board view	17
Packing procedures	18

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## SPECIFICATIONS

### Amplifier section

Power Output	60 watts per channel at 4 ohms both channels driven at 1 kHz, 0.1% THD. 45 watts per channel at 8 ohms both channels driven at 1 kHz, 0.1% THD. 50 watts per channel at 4 ohms both channels driven from 20 Hz to 20 kHz, 0.1% THD.		(S/N 46 dB, 40 kHz Devi.)
	40 watts per channel at 8 ohms both channels driven from 20Hz to 20 kHz, 0.1% THD.	50 dB Quieting Sensitivity Intermediate Frequency Capture Ratio Image Rejection ratio IF Rejection ratio	AM: 25 $\mu$ V FM mono: 4.5 $\mu$ V (18.3 dBf) IHF FM stereo: 45 $\mu$ V (38.2dBf) IHF FM: 10.7 MHz AM: 455 kHz FM: 1.5 dB FM: 60 dB AM: 45 dB FM: 80 dB AM: 30 dB FM mono: 65 dB FM stereo: 60 dB AM: 40 dB FM: 60 dB IHF FM: 40 dB DIN
Total Harmonic Distortion	0.1% at rated power	Signal to Noise ratio	FM mono: 65 dB FM stereo: 60 dB
IM Distortion	0.08% at 1 watt output	ACA	AM: 40 dB
	0.3% at rated power	Selectivity	FM: 60 dB IHF FM: 40 dB DIN
Damping Factor	0.1% at 1 watt output	AM Suppression ratio	FM: 50 dB
Frequency Response	40 at 8 ohms	Harmonic Distortion	FM mono: 0.2% FM stereo: 0.4% AM: 0.8%
Sensitivity and Impedance	20 ~ 30,000 Hz ( $\pm 1$ dB)	Frequency Response	FM: 30 ~ 15,000 Hz +0.5, -2 dB
	PHONO: 2.5mV 50 kohms	Stereo Separation	FM: 37 dB at 1 kHz 30 dB at 100 ~ 10,000 Hz
	TAPE PLAY: 150 mV 50 kohms	Muting Level	FM: 3 $\mu$ V, 14.7 dBf
	DIN PLAY: 150 mV 50 kohms	Stereo Threshold	FM: 3 $\mu$ V, 14.7 dBf
	TAPE REC: 150mV 3.5 kohms (PHONO)	Locked Level	FM: 3 $\mu$ V, 14.7 dBf
	DIN REC: 30mV 50 kohms	Sub Carrier Suppression	FM: 60 dB
Phono Overload	150mV RMS at 1 kHz 0.1% THD.	Spurious Rejection	FM1/2 IF: 80 dB
Treble Control	$\pm 10$ dB at 10 kHz	Tuning Meters	Signal strength & Center Tuning
Bass Control	$\pm 12$ dB at 100 Hz		
Signal to Noise Ratio	PHONO: 85 dB (at 10 mV input IHF A network) 65 dB (IHF C network)	<b>General</b>	
	TAPE: 95 dB (IHF A network) 90 dB (IHF C network)	Power Supply	AC 110/120/220/240 volts, 50/60Hz
High Filter	6 kHz 6 dB/oct.	Dimensions	483 mm W x 160 mm H x 371 D mm
Loudness (-30 dB)	+9 dB at 40 Hz +5 dB at 20 kHz	Weight	12kg
		Semiconductors	1 FET, 32 Transistors, 8 ICs, 28 Diodes
<b>Tuner section</b>			
Tuning Range	FM: 87.5 ~ 108 MHz AM: 530 ~ 1605 kHz		
Usable Sensitivity	FM mono: 2 $\mu$ V (11.2 dBf) IHF 1.6 $\mu$ V DIN (S/N 26 dB, 40 kHz Devi.) FM stereo: 5 $\mu$ V (19.2 dBf) IHF 55 $\mu$ V DIN		

Specifications and features are subject to change without notice.

## PRECAUTIONS

1. Fuses must be replaced with size and type indicated.

Description	Parts No.	
AC fuse 3A-T	252003	(220V/240V)
5A-T	252020	(110V/120V)
Speaker fuse 4A-T	252014	

2. Replacement for power, complementary and driver transistors, if necessary, must be made from same beta group ( $h_{FE}$ ) as the original type.
3. If the TUNED lamp does not turn off when you touch the tuning knob, this may be due to strong signals generated by a nearby MW or SW broadcasting station. In this case, adjust the frequency of oscillator coil with L201 until the TUNED lamp turn off.
4. Always disconnect the chassis from power line when soldering. Turning the power switch off is not enough. Power line leakage passing through the heating element may destroy the transistors.

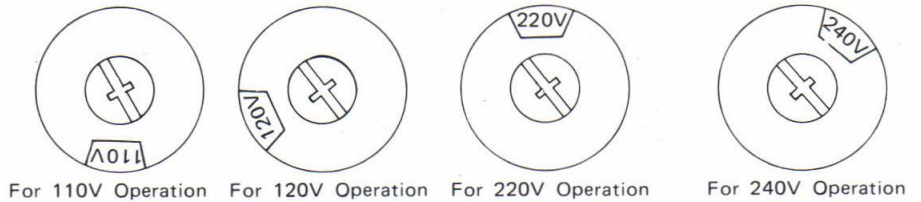
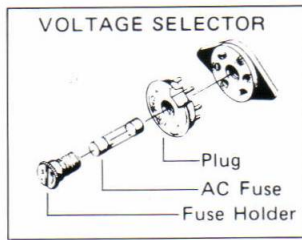
## SERVICE PROCEDURES

### 1. REPLACEMENT OF THE AC FUSE

This model is equipped with a universal power transformer to permit operation at either power source of 110, 120, 220 or 240V AC 50/60Hz.

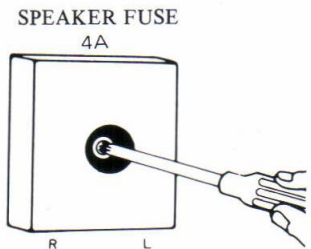
To convert the unit to a different power source voltage, change the plug as illustrated in the drawing below.

**CAUTION: DISCONNECT POWER SUPPLY CORD FROM AC OUTLET BEFORE CONVERTING VOLTAGE.**



### 2. REPLACEMENT OF THE SPEAKER PROTECTION FUSE

- 1) Remove a screw holding the cover and back panel and remove the cover.
- 2) Replace the fuse with indicial 4-ampere types.



### 3. DE-EMPHASIS SWITCH

The 25 $\mu$ sec/Normal selector switch for Dolby FM broadcasts is located on the front panel. The 50 $\mu$ sec/75 $\mu$ sec selector switch employed in the Universal Type is located on the back panel. When shipped from the factory, this back panel switch is set to the 50 $\mu$ sec position. For use in 75 $\mu$ sec regions, switch over to the 75 $\mu$ sec position.

50 $\mu$ sec

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### 4. REMOVAL OF THE FRONT PANEL

- 1) Remove four screws holding top cover and chassis.
- 2) Remove two screws holding top cover and back panel.
- 3) Remove five screws holding front panel and front bracket.
- 4) Pull out all control knobs.

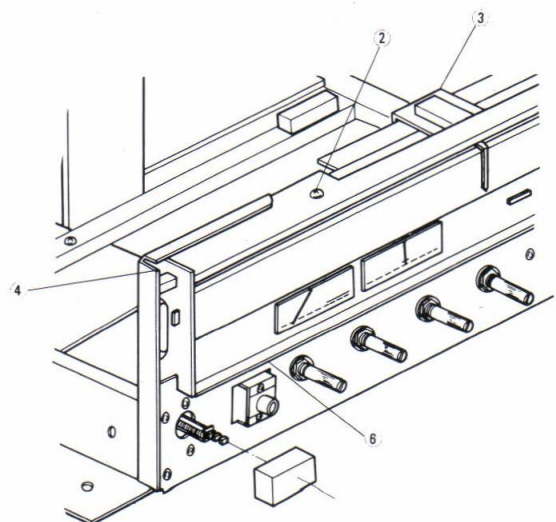
### 5. REMOVAL OF THE DIAL GLASS

- 1) Remove four screws holding dial glass and front panel.

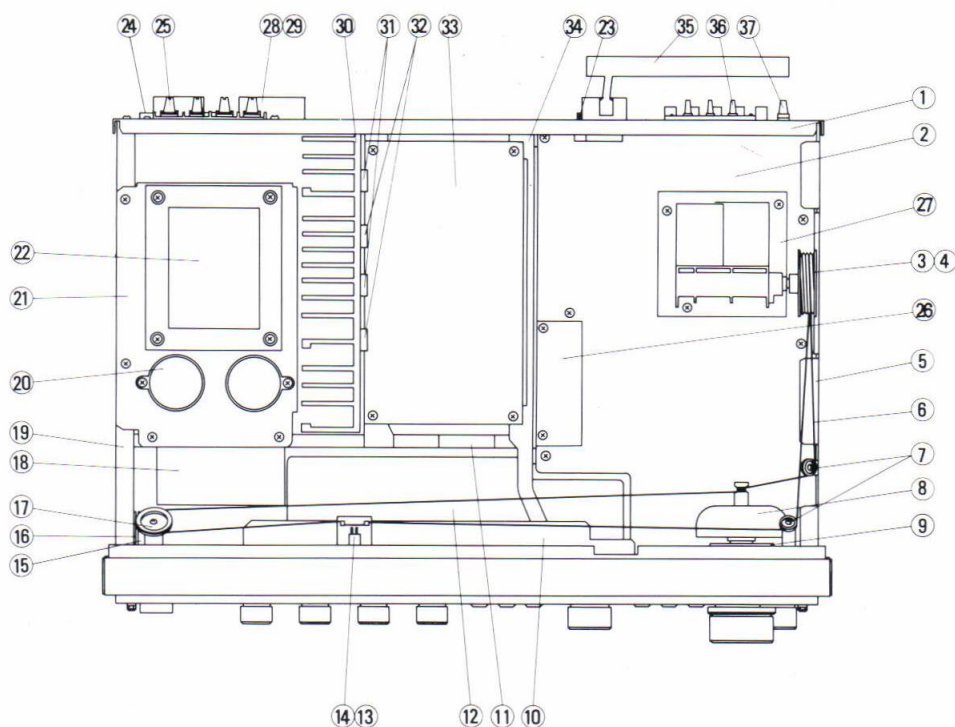
**NOTES:** The dial glass has been mounted by applying an 800gr torque to the screws. If the dial glass is removed during repairs, and a torque driver is available, apply 800gr torque to the screws when replacing. If however, a torque driver is not available, simply tighten the screws by hand. When replacing the dial glass, insert all relevant component parts in accordance with the cross-sectional diagram.

### 6. REPLACEMENT OF THE METER

- 1) Remove the top cover and the front panel.
- 2) Remove the two screws securing the illumination bracket and front bracket.
- 3) Remove the pointer ass'y from the front bracket.
- 4) Remove the 2 sets of screws securing the left and right dial plate covers to the front bracket.
- 5) Move the front panel out, keeping the dial plate cover held against the dial plate, and remove the 2 (left and right) lamp PC boards. Then remove the dial plate from the drive shaft.
- 6) Remove the 3 screws securing the front cover to the back plate.
- 7) The top sides of the meter covers are fastened to the back plate by adhesive tape. Remove this tape, taking care not to jar or knock the meters.



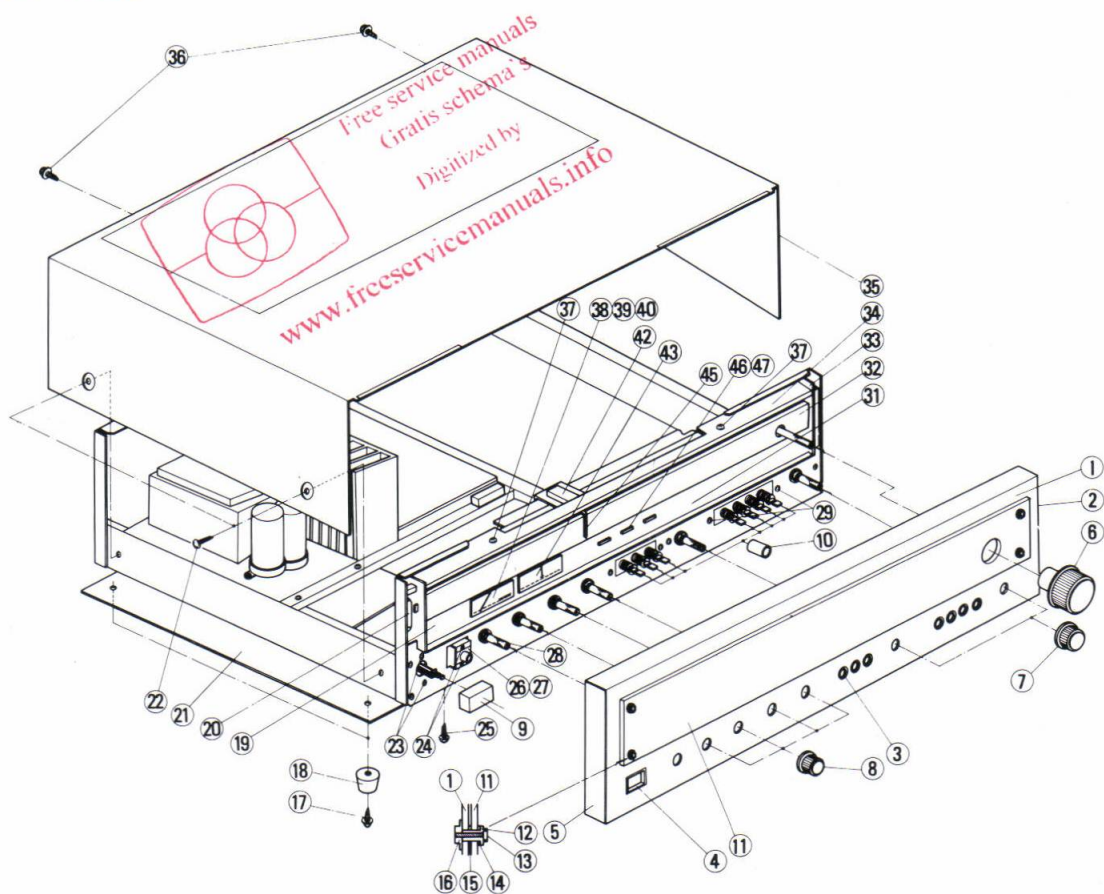
## COMPONENT LOCATION



## COMPONENT LOCATION-PARTS LIST

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION	REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
1	A081	27120115	Back panel	21	A060	27130125	Bracket, transformer
2		13720570A	NARFE-470a, AM/FM tuner and equalizer ampli. p.c.b.	22	T901	230245	NPT-639ADGQ, Power transformer
3	A075	27200019	Dial drum	23	S811	250142	NSS-2225, De-empha. switch
4	A077	273803	SP-14A, Spring for dial drum	24	P901	25050018	PA-125, 3P Inlet
5	A035	27115030	Side bracket	25	P805, P806	25060026	NTM-4PRMN03, Speaker terminal
6	A078	273903	200mm, Dial cord	26		13720504	NAIF-504, Filter p.c.b.
7	A005	27185002	DP-16N, Dial pulley	27		13720595	NARF-495, Front end p.c.b.
8	A002	27205013	Drive shaft	28	F501, F601	252014	4A-T, Speaker protector fuse
9	A003	27300071	Bearing	29	F501a, F601a	25050004	Fuseholder with cover
10	A001	27110056	Front bracket	30	A070	27160035	Radiator
11		250130	T-4461, Terminal	31	Q505, Q605	2200822	2SD718 (R) Power ampli.
12		13719571	NAAF-471, Preampli. p.c.b.			2200823	or 2SD718 (O) or transistor
13	PL808	210044	PL8V0.05AW-3, Pointer lamp	32	Q506, Q606	2200832	2SB688 (R) Power ampli.
14	A012	27230009	Pointer slider ass'y			2200833	or 2SB688 (O) or transistor
15	S901	25035034	NPS-121-L, Power switch	33		13719572	NADA-472, Power ampli. p.c.b.
16	C951, C952	3500052	PME271Y510CEE, IS capacitor	34	A046	27130126A	Bracket S
17	A004	27185001	DP-26N, Dial pulley	35		232066	NMA-3012, AM bar antenna
18		13720573A	NAPS-473a, Rectifier p.c.b.	36	P804	25060020	NTM-3WPUN1, Antenna terminal
19	A042	27115031	Side bracket	37	P803	25060008	Ground terminal
20	C908, C909	3504107	8,200 $\mu$ F, 50V, Elect. capacitor		F901	252003	3A-T, Fuse
					F901a	25050021	X-I7240, VS socket

## EXPLODED VIEW



## EXPLODED VIEW-PARTS LIST

REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION	REF. NO.	CIRCUIT NO.	PARTS NO.	DESCRIPTION
		13719121-1	Front panel ass'y (1-5)	25	A602	831130082	3STW+8BQ, Screw
1	A501	27210095	Front panel	26	P807	25045018	LJ-100H, Stereo headphone jack
2	A502	28125048	End cap R	27	R528, R628	441623314	330Ω, 1W, Metal oxide film resistor
3	A509	27267026	Guide, push switch	28	S810	25030098	NRS-144-30Y, Speaker selector switch
4	A508	27267027	Guide, power switch	29		82113006	3P+6F-N, Screw
5	A503	28125049	End cap L	31	A010	28133007	Back plate
6	A801	28320242	Tuning knob	32	A013	28130071	Dial plate
7	A802	28320238	Volume knob	33	A016	27300103	Dial plate cover
8	A803	28320237	Tone knob	34	A011	27240015	Illumination bracket
9	A804	28320235	Power knob	35	A351	28184041	Top cover
10	A805	28320239	Push knob	36	A353	834430102	3STS+10BQ(BC), Tapping screw
11	A504	28191024	Dial glass	37		834430102	3STS+6BQ Screw
12	A505	27270014	Spacer	38	M102	243085	NIND-0500S85, Strength meter
13	A506	27300038A	Screw	39	PL803, PL804	210041	PL8V0.15AW-2, Meter illumination lamp
14	A512	870052	Washer	40	A007	27300114	Cushion
15	A511	870051	Washer	42	A022	28168002	Pointer cover
16	A507	86213010	WN3x10FN, Nut	43	M101	243084	NIND-0250S84, Center meter
17	A605	831130162	3STW+16BQ, Screw	45	A009	28165042	Pointer
18	A604	280379	Leg	46	A017	28198512	Facet
19	A015	27300102	Dial plate cover	47	PL805-PL807	210040A	PL12V 30mV, Stereo/Locked/Tuned indicator lamp
20		13719574	NAPL-474, Dial illumination p.c.b.				
21	A600	27170041	Bottom board				
22	A352	838440109	4TTB+10C (BC), Screw				
23	A028	834130062	3STS+6BQ, Screw				
24	A023	801105	8W3P+6FN, Screw				

# ALIGNMENT PROCEDURES

## INSTRUMENTS REQUIRED

1. DC Voltmeter
2. AM Sweep Generator
3. AM/FM Signal Generator
4. AC VTVM
5. Oscilloscope
6. Monitorscope
7. Distortion Analyzer
8. Stereo Modulator
9. Frequency Counter

## GENERAL ALIGNMENT CONDITIONS

1. Signal input should be kept as low as possible.
2. Standard modulation is 400Hz 30% (AM), 1kHz 100% (FM MONO), pilot 9% sub and main 91% (FM STEREO).
3. Standard knob position  
 SPEAKERS . . . . . A  
 BASS, TREBLE & BALANCE . . . . . Center  
 HIGH FILTER . . . . . OFF  
 MODE . . . . . STEREO  
 DE-EMPHA . . . . . NORMAL  
 LOUDNESS . . . . . OFF  
 MUTING LOCK . . . . . OFF  
 TAPE 1, 2 . . . . . OFF (SOURCE)

### (1) IDLING CURRENT ADJUSTMENT

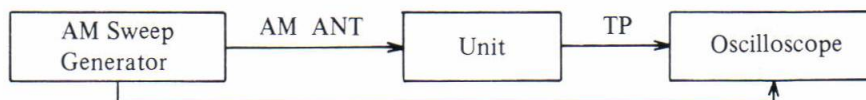
Connect the DC Voltmeter between ID and CT terminals.  
 Adjust the voltage to  $20 \pm 5\text{mV}$  with R513 (Left channel)  
 Adjust the voltage to  $20 \pm 5\text{mV}$  with R613 (Right channel)

NOTES: Adjust after switching on for 10 minutes.

Open load                      VOLUME . . . . . Minimum                      TAPE MONITOR-1 . . . . . ON

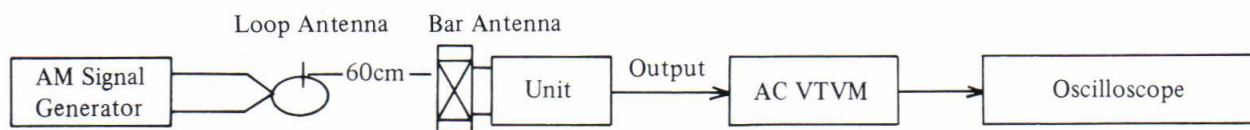
### (2) AM IF ALIGNMENT

1. Set SELECTOR switch to AM.
2. Set radio dial to quiet point.



Set signal	Adjust	Oscilloscope	Remarks
455kHz	X103	Maximum Symmetrical Response	Usually not necessary to adjust

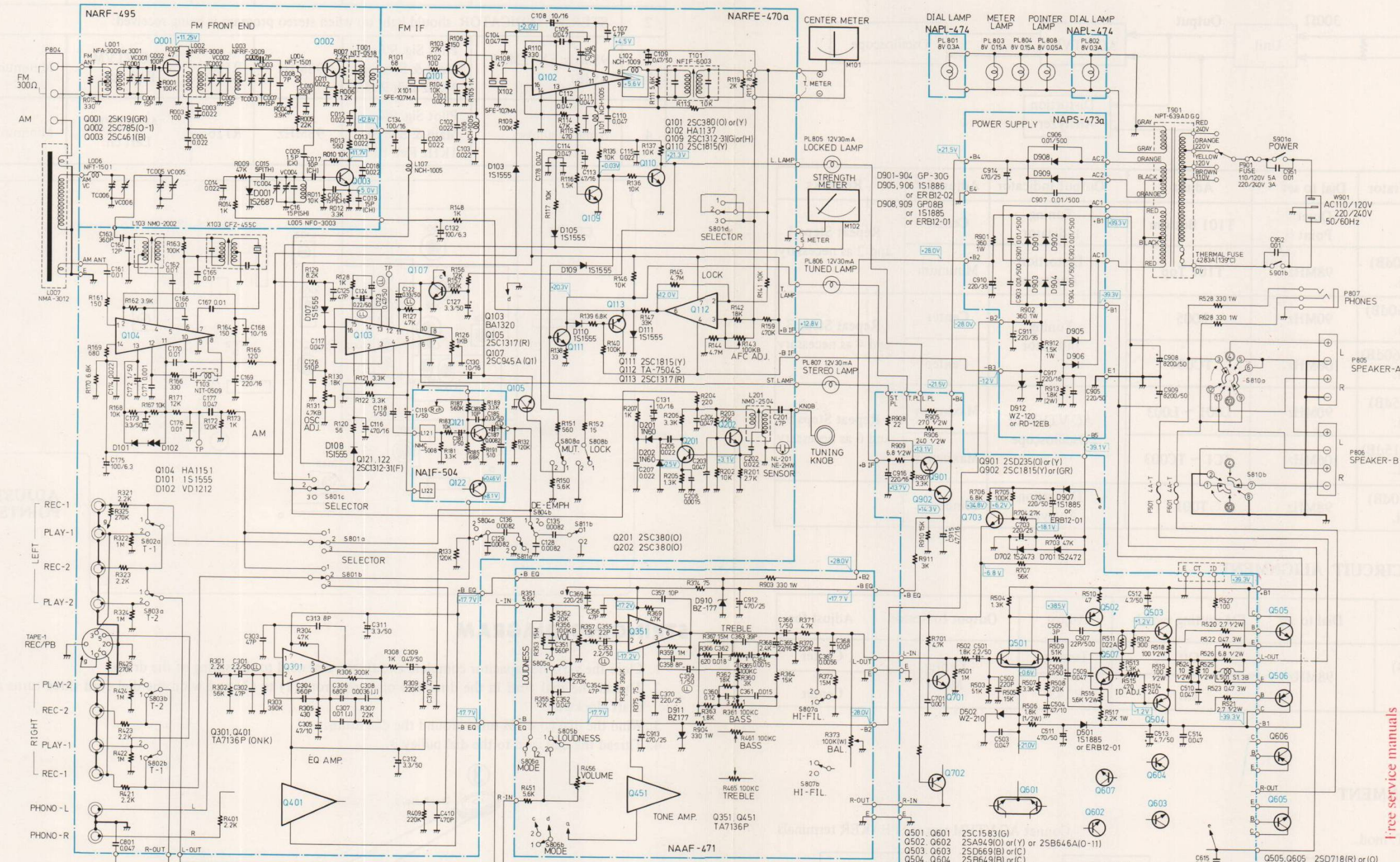
### (3) AM RF ALIGNMENT



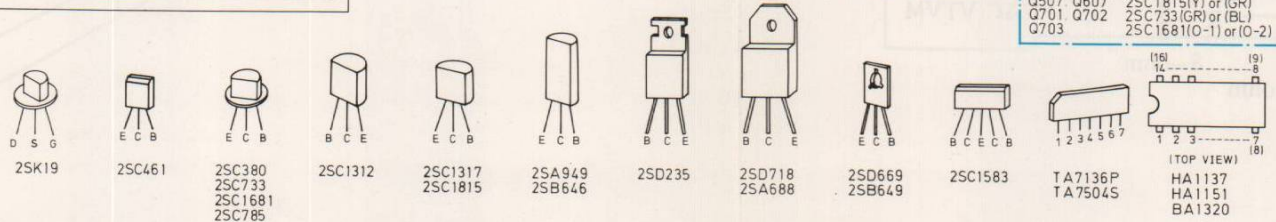
Step	Set Signal	Set Radio Dial	Adjust	VTVM reading	Remarks
1	515kHz 400Hz 30%	Lower end (515kHz)	L103	Maximum	Repeat step 1 and 2 as necessary
2	1680kHz 400Hz 30%	Upper end (1680kHz)	TC005	Maximum	
3	600kHz 400Hz 30%	600kHz	L007	Maximum	Repeat step 3 and 4 as necessary
4	1400kHz 400Hz 30%	1400kHz	TC006	Maximum	

# SCHEMATIC DIAGRAM

## MODEL TX-2500MKII



- S901a,b POWER 1-ON [2-OFF]
- S801a-d SELECTOR 1-AM [2-FM] 3-PH
- S802a,b T. MONI-1 [1-OFF] 2-ON
- S803a,b T. MONI-2 [1-OFF] 2-ON
- S804a,b DE-EMPH [1-NORM] 2-25µS
- S805a,b LOUDNESS [1-OFF] 2-ON
- S806a,b MODE [1-STEREO] 2-MONO
- S807a,b HI-FILTER [1-OFF] 2-ON
- S808a,b MUTING [1-ON] 2-OFF
- S808b LOCK [1-ON] 2-OFF
- S810a,b SPEAKER 2-A 3-B 4-A+B
- S811a,b DE-EMPH [1-50µS] 2-75µS



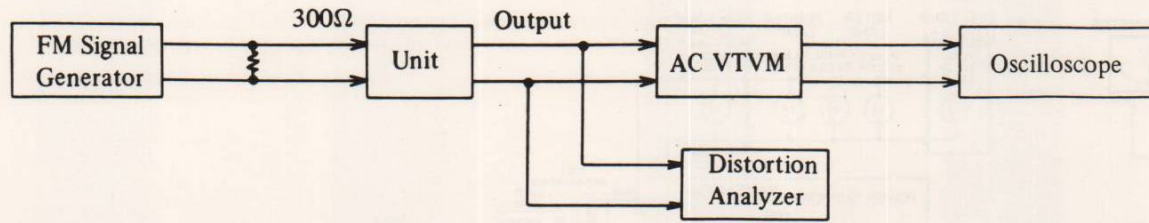
NOTES

- ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN µF, 50V UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS (⊖) ARE IN µF/WV.
- VOLTAGE (MEASURED WITH V.T.V.M.) (NO INPUT SIGNAL).
- CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT.

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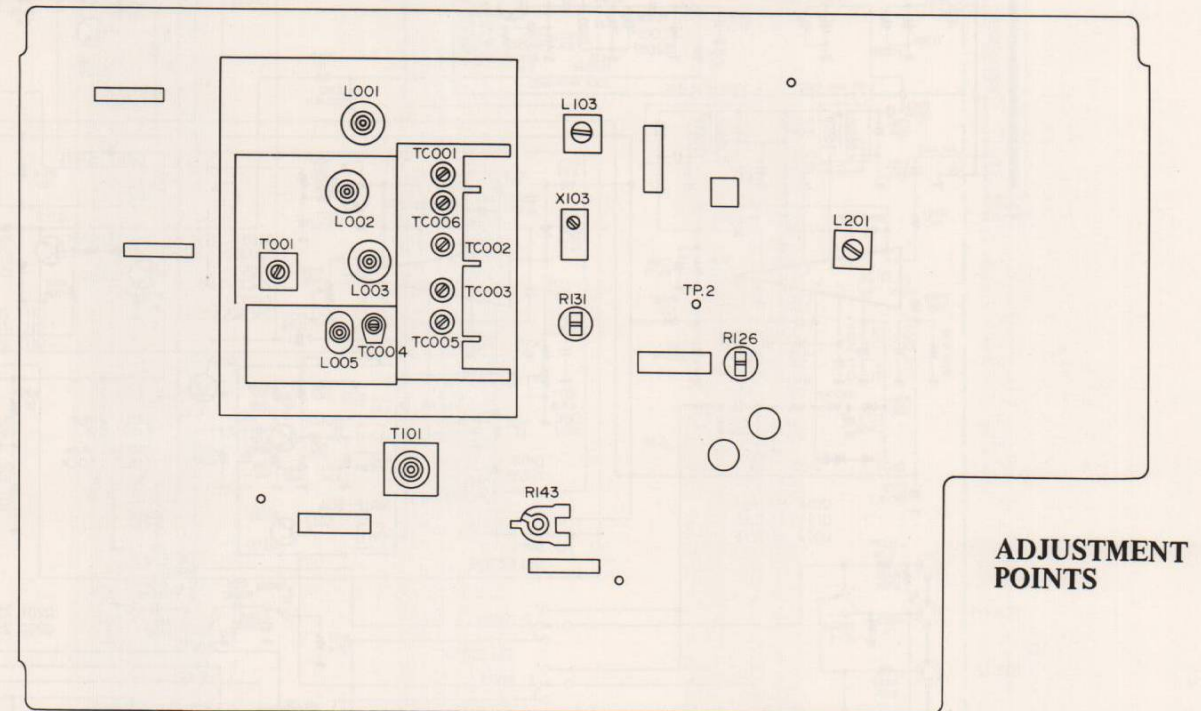
**(4) FM FRONT END ALIGNMENT**

1. Set SELECTOR switch to FM.
2. Connect FM Signal Generator to 300-ohm antenna terminals.



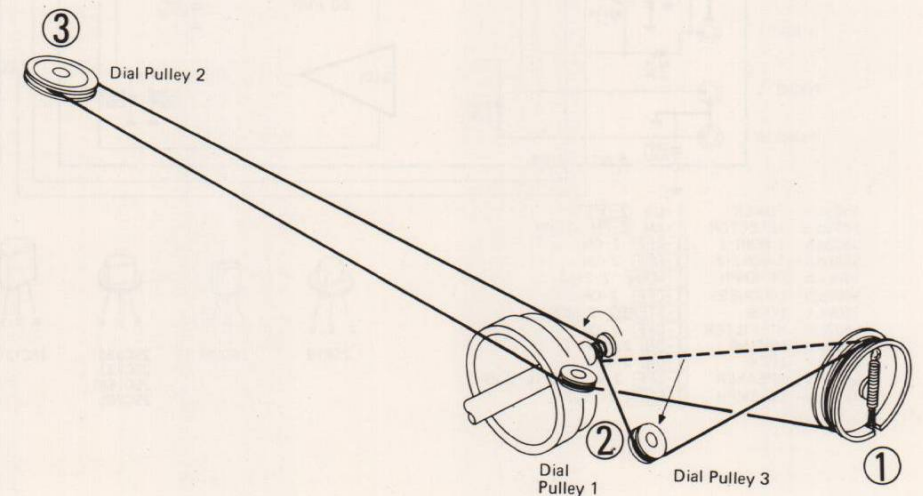
Step	FM Signal Generator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	No signal	Quiet Point	T101 Bottom	Tuning Indicator	Center	Repeat Steps 1 and 2 as necessary
2	98MAz 65dBf (60dB) 1kHz 75kHz devi.	98MHz	T101 Top	Distortion Analyzer	Minimum	
3	90MHz 65 dBf (60dB) 1kHz 75kHz devi.	90MHz	L005	Tuning Indicator	Center	Repeat Steps 3 and 4 as necessary
4	106MHz 65dBf (60dB) 1kHz 75kHz devi.	106MHz	TC004		Center	
5	90MHz 20dBf (15dB) 1kHz 75kHz devi.	90MHz	L001 ~ L003	AC VTVM or Oscilloscope	Maximum	Repeat Steps 5 and 6 as necessary
6	106MHz 20dBf (15dB) 1kHz 75kHz devi.	106MHz	TC1 ~ TC003		Maximum	
7	98MHz 65dBf (60dB) 1kHz 75kHz devi.	98MHz	T001	Distortion Analyzer	Minimum	

Step	FM Signal Generator	Stereo Modulator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	98MHz no mod. 65dBf	-	98MHz	R131	Frequency Counter	19000±19Hz	
2	STEREO INDICATOR should light up when stereo program is being received.						
3	98MHz EXT. Mod. 65dBf	Pilot Sig. 9% Main & Sub Sig. 1KHz Lch 91%	98MHz	R126	AC VTVM Right ch.	Minimum	Repeat Steps 3 & 4 as necessary
4	Same as above	Pilot Sig. 9% Main & Sub Sig. 1KHz Rch 91%	98MHz	R126	AC VTVM Left ch.	Minimum	



**STRINGING DIAGRAM**

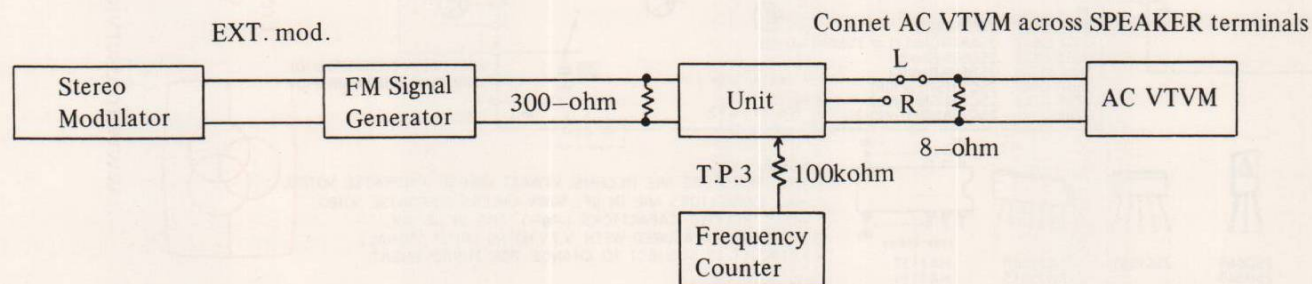
1. Close the variable capacitor complete and tie the dial cord to the spring of the drum.
2. Thread the dial cord in the direction of arrow from (1) to (3) and wind the dial cord three turns around the tuning shaft clockwise.
3. Wind the dial cord 1½ turns around the dial drum.
4. Thread the dial cord to the dial pulley 3.



**(5) SERVO LOCKED CIRCUIT ALIGNMENT**

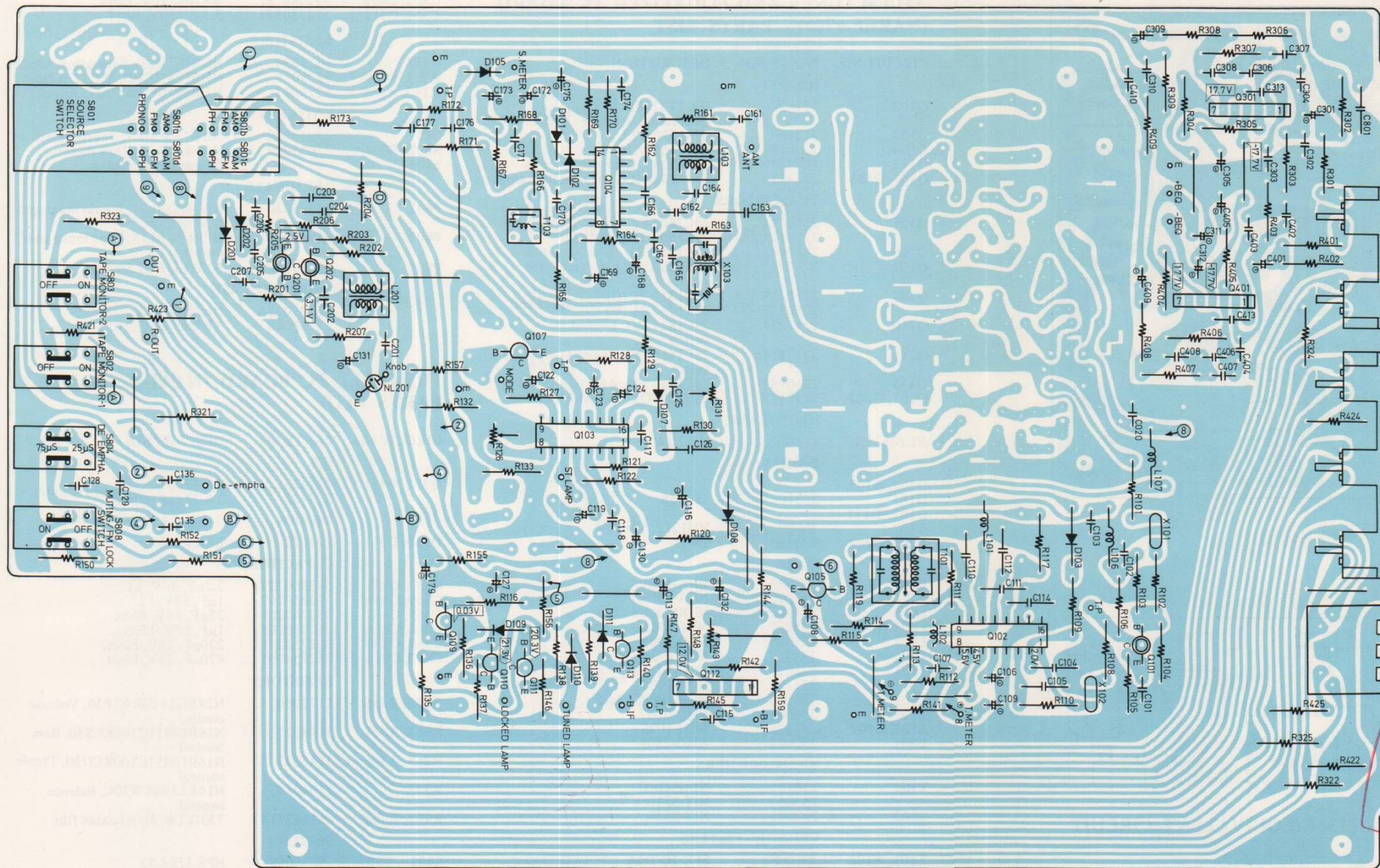
FM signal generator	Dial to set	FM muting switch	Adjust	Output Indicator	Adjust for
98MHz 65dBf (60dB) 1kHz 75kHz devi.	98MHz	Off	Tuning	Center Meter	Center
		On	R143		Center

**(6) MULTIPLEX ALIGNMENT**

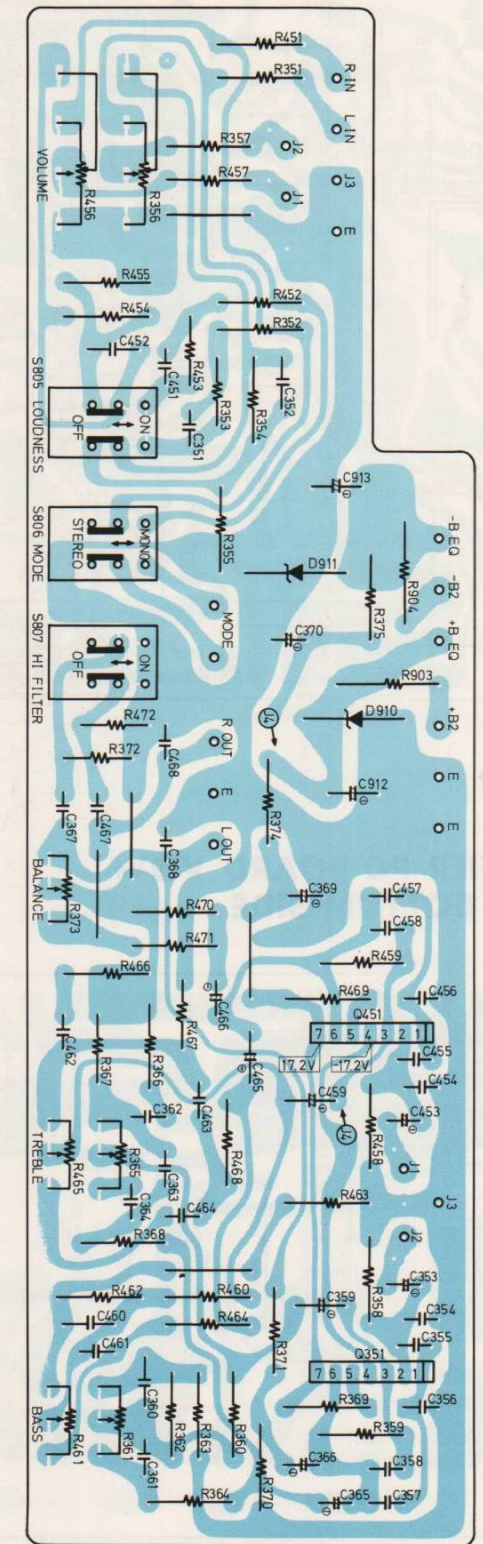




### AM/FM TUNER AND EQUALIZER AMP. PC BOARD VIEW FROM BOTTOM SIDE

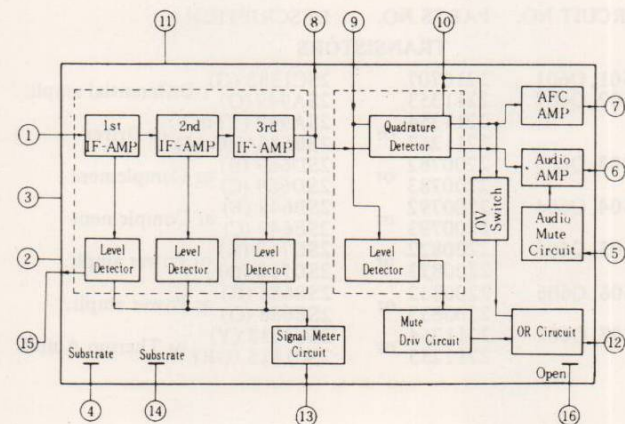


### PREAMP. PC BOARD VIEW FROM BOTTOM SIDE

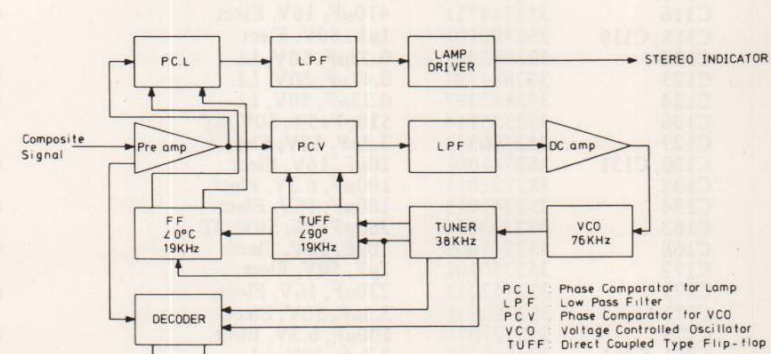


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HA-1137 BLOCK DIAGRAM

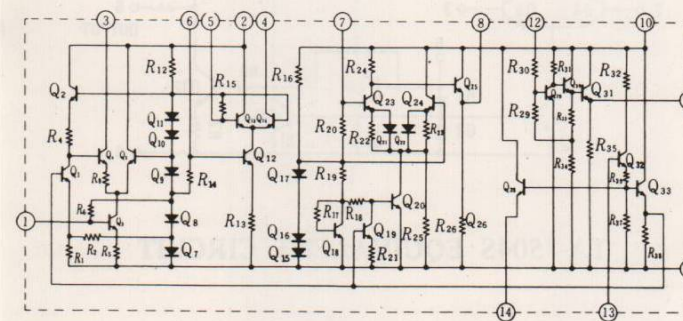


BA-1320 BLOCK DIAGRAM



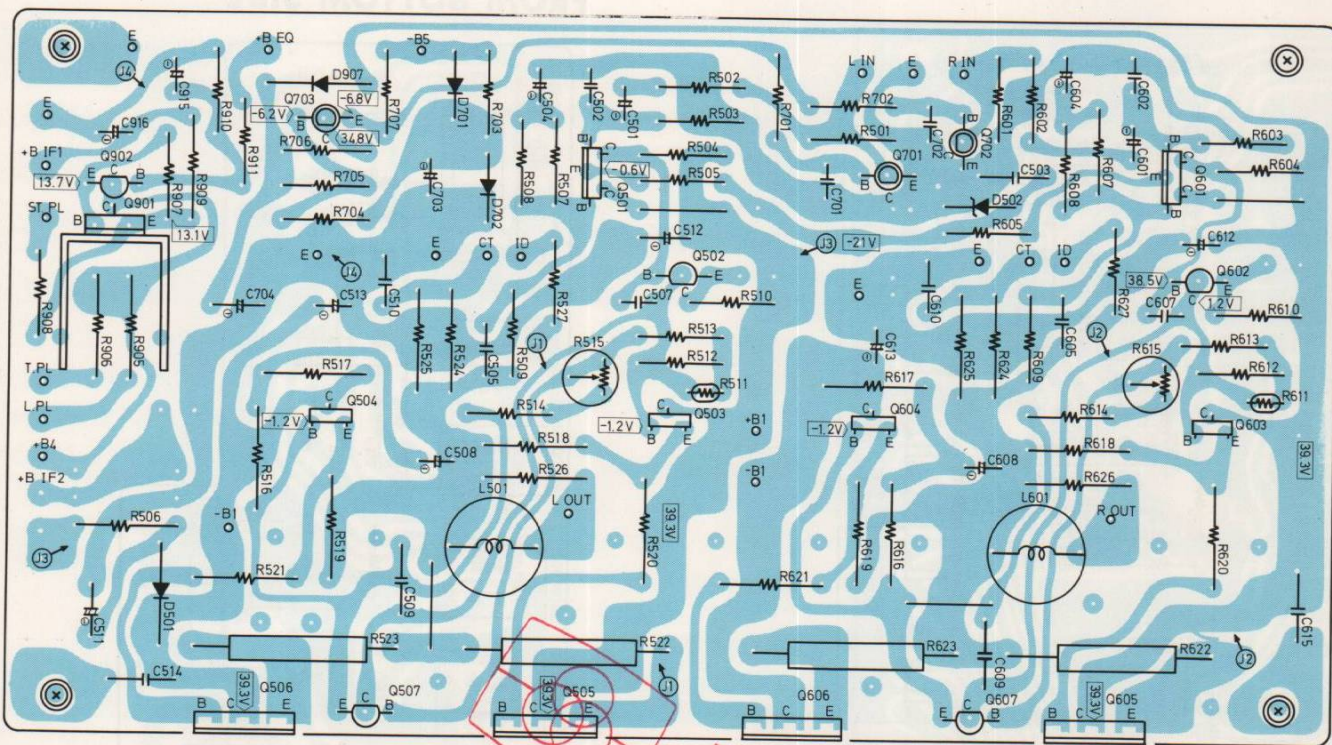
PCL : Phase Comparator for Lamp  
 LPF : Low Pass Filter  
 PCV : Phase Comparator for VCO  
 VCO : Voltage Controlled Oscillator  
 TUFF : Direct Coupled Type Flip-Flop

HA-1151 EQUIVALENT CIRCUIT



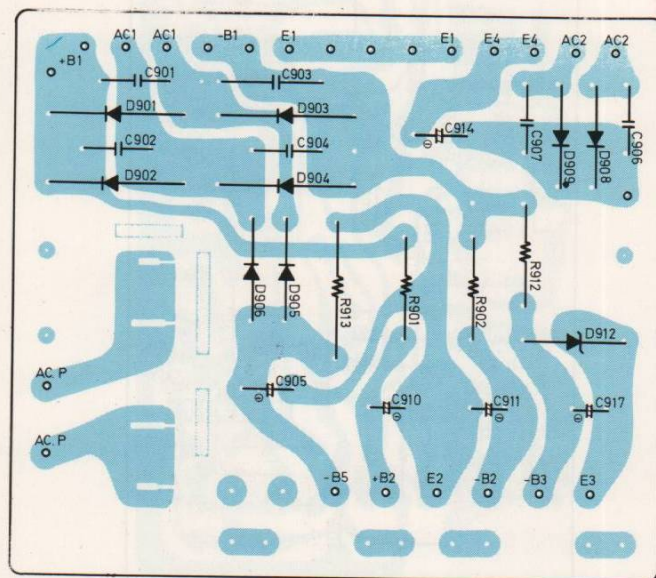
VOLTAGE MEASURED WITH V.T.V.M (NO INPUT SIGNAL)

**POWER AMP. PC BOARD VIEW FROM BOTTOM SIDE**

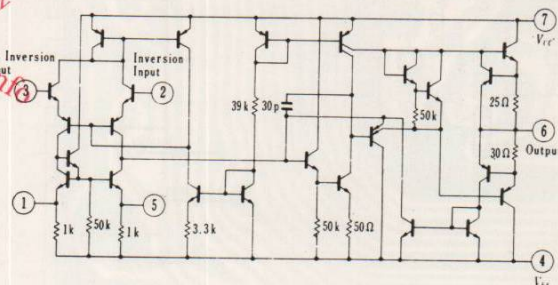


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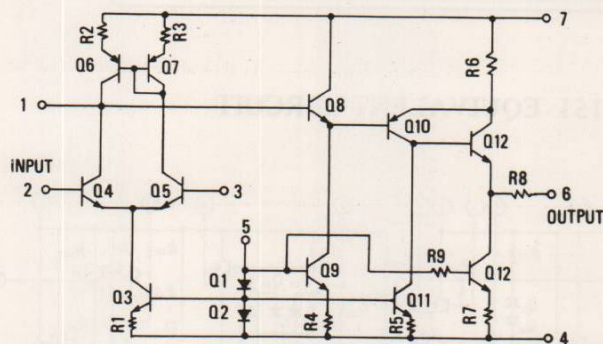
**RECTIFIER PC BOARD VIEW FROM BOTTOM SIDE**



VOLTAGE: MEASURED WITH V.T.V.M  
(NO INPUT SIGNAL)



TA-7136P EQUIVALENT CIRCUIT



TA-7504S EQUIVALENT CIRCUIT

**PARTS LIST**

**AM/FM TUNER AND EQUALIZER PC BOARD (NAREF-470a) - PARTS LIST**

CIRCUIT NO.	PARTS NO.	DESCRIPTION
		<b>ICS</b>
Q102	222421	HA-1137, FM IF amp. and Quadrature detector
Q103	222464	BA-1320, PLL
Q104	222418	HA-1151, AM
Q112	222424	TA-7504S, OP amp.
Q301, Q401	222422	TA-7136P (ONK), Equalizer amp.
		<b>TRANSISTORS</b>
Q101	2210124 or 2210123	2SC380 (Y) or 2SC380 (O) or FM IF amp.
Q105	2210943	2SC1317(R), Muting switch
Q107	2210747	2SC945A (Q1), Mono/Stereo switch
Q109	2210138 or 2210137	2SC1312-31 (G) or 2SC1312-31 (H) or Gate circuit
Q110	2211254	2SC1815 (Y), Locked lamp switch
Q111	2211254	2SC1815 (Y), Tuned Lamp switch
Q113	2210943	2SC1317 (R), AFC switch
Q201, Q202	2210123	2SC380 (O), Oscillator
		<b>NEON LAMP</b>
NL201	211002	NE-2HW
		<b>DIODES</b>
D101, D103, D105	223105	1S1555
D107~D111	4000022	VD1212, Varistor
D102	223103	1N60
D201, D202	223103	1N60
		<b>COILS</b>
L001	233088-1 or 233106	NFA-3001 or NFA-3009 or
L002	233112	NFRF-3008
L004	233037	NFT-1501
L005	233090	NFO-3003
L006	233037	NFT-1501
L101	233024 or 233105	NCCH-1501 or 3.3μH
L102	233114	NCH-1005
L103	232065	NCH-1009, 18μH
L106, L107	233105	NMO-2002
L201	232042	NCH-1005 or NMO-2504
		<b>TRANSFORMERS</b>
T101	233101 or 233083	NFIF-6003 or NIT-3516 or
T103	232041	NIT-0509
		<b>CERAMIC FILTERS</b>
X101, X102	3010003	SFE-10.7MA
X103	3010004	CFZ-455C
		<b>CAPACITORS</b>
C106	352750471	4.7μF, 25V, Elect.
C108	352741001	10μF, 16V, Elect.
C109	352784791	0.47μF, 50V, Elect.
C113	352744701	47μF, 16V, Elect.
C116	352744711	470μF, 16V, Elect.
C118, C119	352780101	1μF, 50V, Elect.
C122	392883397	0.33μF, 50V, LL
C123	392884797	0.47μF, 50V, LL
C124	392882297	0.22μF, 50V, LL
C126	372325114	510pF±5%, 50V, ST
C127	352780331	3.3μF, 50V, Elect.
C130, C131	352741001	10μF, 16V, Elect.
C132	352721011	100μF, 6.3V, Elect.
C134	352741011	100μF, 16V, Elect.
C163	372323614	360pF±5%, 50V, ST
C168	352741001	10μF, 16V, Elect.
C172	352780101	1μF, 50V, Elect.
C179	352742211	220μF, 16V, Elect.
C173	352780331	3.3μF, 50V, Elect.
C175	352721011	100μF, 6.3V, Elect.
C301, C401	392880227	2.2μF, 50V, LL
C305, C405	352734701	47μF, 10V, Elect.

C309, C409	352784791	0.47μF, 50V, Elect.
C311, C312	352780331	3.3μF, 50V, Elect.

**RESISTORS**

R126	5225024	N10HR1KBD, Separation Adjust.
R131	5225019	N10HR4.7KBD, V.C.O. Adjust.
R143	5225013	N10HR100KBC, AFC Adjust.

**SWITCHES**

S801	25030100	NRS-143-30ZV, Source selector
S802~S804	25035069	NPS-422-L34, Tape monitor, De-emphasis, Muting
S808		

**TERMINALS**

P801	25045020	NPJ-4PDBL11, Phono input and tape output
P802	25045041	NPJ-6PDBL18, Tape input and output
P808	250199	S-13316, DIN Socket

**SHIELDED CASE**

27225022A	Oscillator
27150080	RF amp and mixer

**PREAMPLI. PC BOARD (NAAF-471) - PARTS LIST**

CIRCUIT NO.	PARTS NO.	DESCRIPTION
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		<b>ICS</b>
Q351, Q451	222423 or 222422	TA-7136P or TA-7136P (ONK) or Preampli.
		<b>DIODES</b>
D910, D911	224072	BZ-177, Zener
		<b>CAPACITORS</b>
C353, C453	392880227	2.2μF, 50V, LL
C359, C459	392880107	1μF, 50V, LL
C365, C465	352742201	22μF, 16V, Elect.
C366, C466	352780101	1μF, 50V, Elect.
C369, C370	352752211	220μF, 25V, Elect.
C912, C913	352754711	470μF, 25V, Elect.
		<b>RESISTORS</b>
R356, R456	5172050	N24RGL100KBTP30, Volume control
R361, R461	5148023	N16RGM11C100KCS30, Bass control
R365, R465	5148022	N16RGM11C100KCO30, Treble control
R373	5104035	N16RL100KW30C, Balance control
R903, R904	441623314	330Ω 1W, Metal oxide film
		<b>SWITCH</b>
S805 ~ S807	25035068	NPS-322-L33

**POWER AMPLI. PC BOARD (NADA-472) - PARTS LIST**

CIRCUIT NO.	PARTS NO.	DESCRIPTION
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		<b>TRANSISTORS</b>
Q501, Q601	2210707	2SC1583 (G), Differential ampli.
Q502, Q602	2211353, 2211354, 2211267 or 2211267	2SA949 (O), 2SA949 (Y) or 2SB646A (O-11) or Driver
Q503, Q603	2200782 or 2200783	2SD669 (B) or 2SD669 (C) or Complement
Q504, Q604	2200792 or 2200793	2SB649 (B) or 2SB649 (C) or Complement
Q505, Q605	2200822 or 2200823	2SD718 (R) or 2SD718 (O) or Power ampli.
Q506, Q606	2200832 or 2200833	2SB688 (R) or 2SB688 (O) or Power ampli.
Q507, Q607	2211254 or 2211255	2SC1815 (Y) or 2SC1815 (GR) or Thermo Ampli.

Q701, Q702	2210085 or 2210086	2SC733 (GR) or T.K.C
Q703	2210670 or 2210671	2SC1681 (O-1) or T.K.C
Q901	2200013 or 2200014	2SD235 (O) or Rectifier
Q902	2211254 or 2211255	2SC1815 (Y) or Rectifier

**DIODES**

D501, D907	223802 or 223849	1S1885 or ERB12-01
D502	223921	WZ-210, Zener
D701	223123	1S2472
D702	223124	1S2473

**CAPACITORS**

C501, C601	352780221	2.2μF, 50V, Elect.
C504, C604	352734701	47μF, 50V, Elect.
C508, C608	352784701	47μF, 50V, Elect.
C511, C611	352784711	470μF, 50V, Elect.
C512, C513	352780471	4.7μF, 50V, Elect.
C612, C613		
C703	352752211	220μF, 25V, Elect.
C704	352782211	220μF, 50V, Elect.
C915	352744701	47μF, 16V, Elect.
C916	352742211	220μF, 16V, Elect.

**RESISTORS**

R511, R611	4000003	D22A, Thermistor
R515, R615	5225026	N10HR470BD, Idling current adjustment
R517, R617	441622224	2.2kΩ, 1W, Metal oxide film
R522, R523	48394794	0.47Ω, 3W, Cement
R622, R623		

**RADIATOR**

27160029	RAD-07, Radiator
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**COILS**

L501, L601	231001	S-1.3B
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**RECTIFIER PC BOARD (NAPS-473a) – PARTS LIST**

CIRCUIT NO.	PARTS NO.	DESCRIPTION
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**DIODES**

D901~D904	223841	GP-30G
D905, D906	223806	1S1886
	223850	ERB12-02 or GP08P,
D908, D909	223848, 223802	1S1885
	223849	ERB12-01 or
D912	223910 or 223963	WZ-120 or RD-12EB

**CAPACITORS**

C905	352782211	220μF, 50V, Elect.
C910, C911	352762211	220μF, 35V, Elect.
C914	352754711	470μF, 25V, Elect.
C917	352742211	220μF, 16V, Elect.

**METAL OXIDE FILM RESISTORS**

R901, R902	441623614	360Ω, 1W
R912	441621524	1.5KΩ, 1W
R913	441721824	1.8KΩ, 2W

**DIAL ILLUMINATION PC BOARD (NAPL-474) – PARTS LIST**

P801	210039A	300mA, 8V, Dial illumination lamp
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**NOTES:**

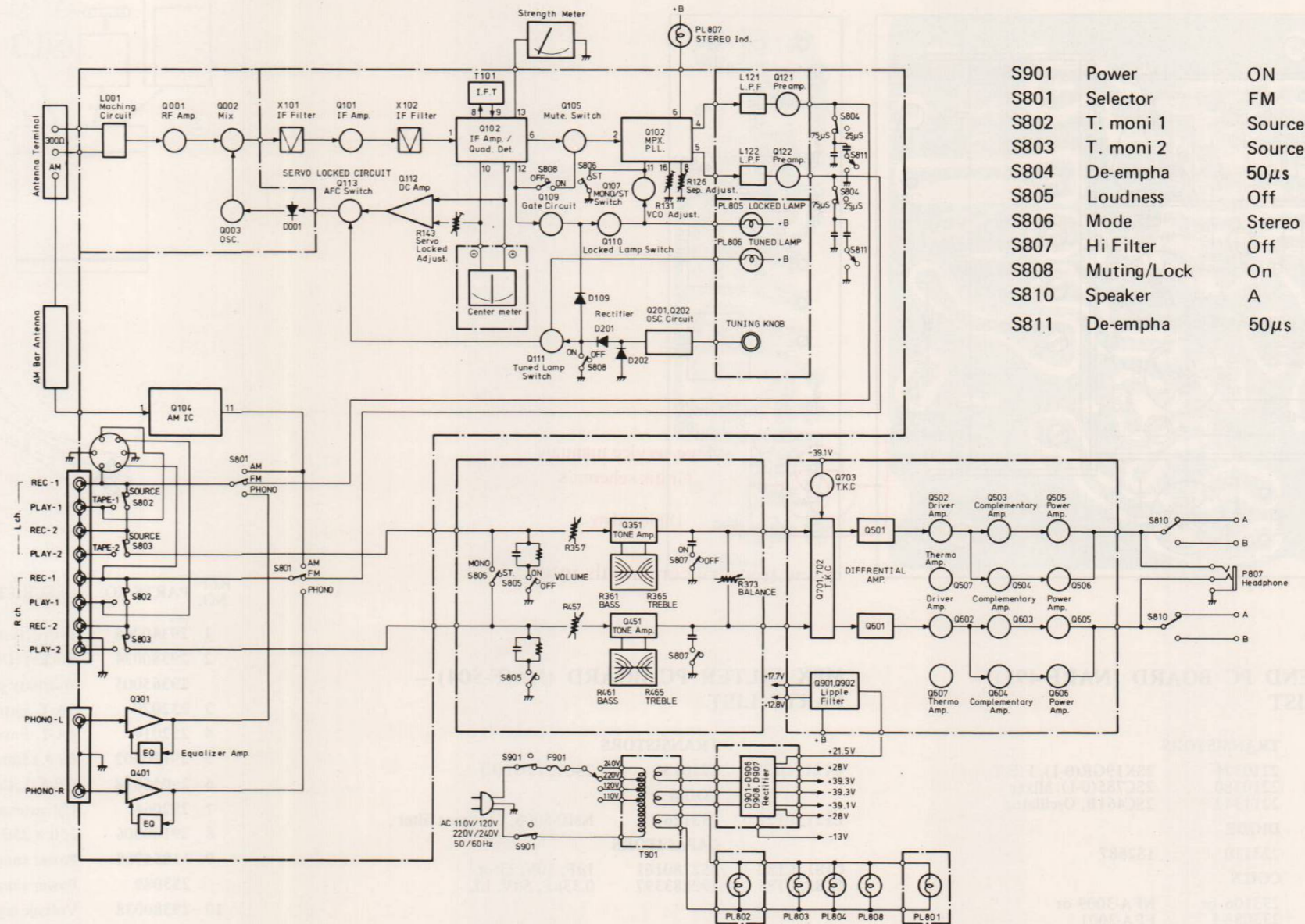
**CAPACITOR**

LL: Low leakage current type electrolytic capacitor

ST: Polystyrene film capacitor

When replacing differential amplifier or push-pull amplifier transistors, be sure that transistors of one channel have same h<sub>FE</sub> ratings.

**BLOCK DIAGRAM**



S901	Power	ON
S801	Selector	FM
S802	T. moni 1	Source
S803	T. moni 2	Source
S804	De-empha	50μs
S805	Loudness	Off
S806	Mode	Stereo
S807	Hi Filter	Off
S808	Muting/Lock	On
S810	Speaker	A
S811	De-empha	50μs

**CIRCUIT DESCRIPTION**

**1. Muting Circuit**

The Quadrature detector IC incorporates an IF level detector circuit (output at pin 12). If the IF signal level drops below the muting level, pin 12 will be switched to high level, turning Q105 on. Consequently, the detector output signal will be cut off before it can be applied to the multiplex IC. When, on the other hand, the IF signal level is higher than the muting level, the Q102 pin 12 will be switched to low level, turning Q105, and Q109 off. Q110 will therefore turn on, followed by the LOCKED lamp turning on.

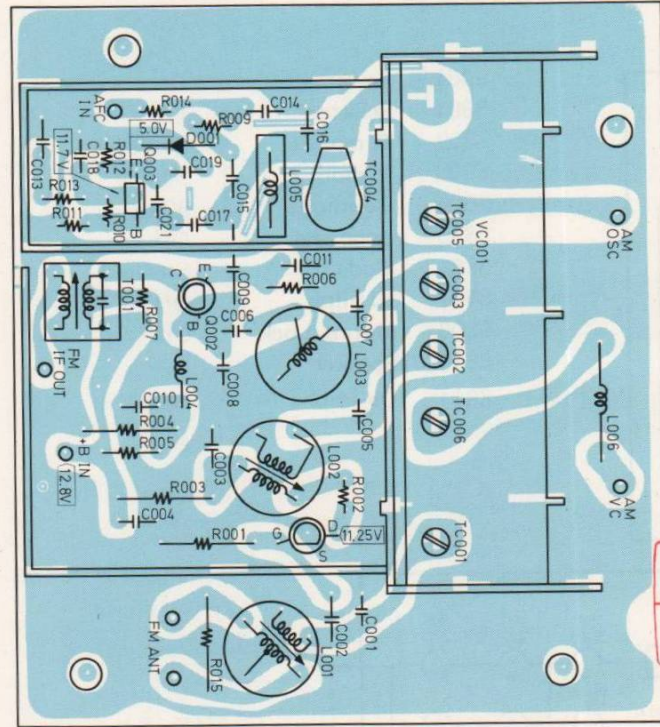
**2. Servo Locked Circuit**

The DC potential difference across both ends of the tuning meter (corresponding to the DC portion of the ratio detector output) is amplified by about 30dB by the Q112 operational amplifier in order to increase the AFC control capacity.

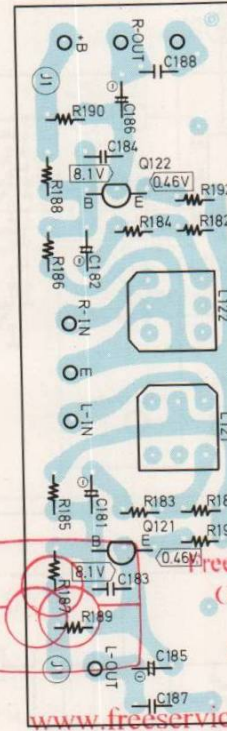
**3. AFC Switching Circuit**

In order to ensure accurate tuning, the AFC circuit is automatically disconnected as soon as the tuning knob is touched. The Q202 oscillator circuit generates a signal of approximately 6MHz which is amplified by Q201, and full-wave rectified by D201/D202. The DC portion of this signal is then employed in switching Q113 on and off. When tuned away from broadcasting stations, the Q109 collector will be at low level, thereby switching the Q111 base voltage to low level also. Q113 will consequently turn on, and the AFC circuit turn off. When tuned into a station, however, the Q111 base voltage will be switched to high level, thereby turning Q111, and the Tuned Lamp on. Q113 will turn off, and the AFC circuit turn on. If the tuning knob is then touched, the oscillator circuit will cease to generate signals, and the AFC circuit will turn off. Furthermore, the NL-201 neon lamp serves to prevent the destruction of transistors due to the presence of static electricity.

**FRONT END PC BOARD VIEW FROM BOTTOM SIDE**



**MPX. FILTER PC BOARD VIEW FROM BOTTOM SIDE**



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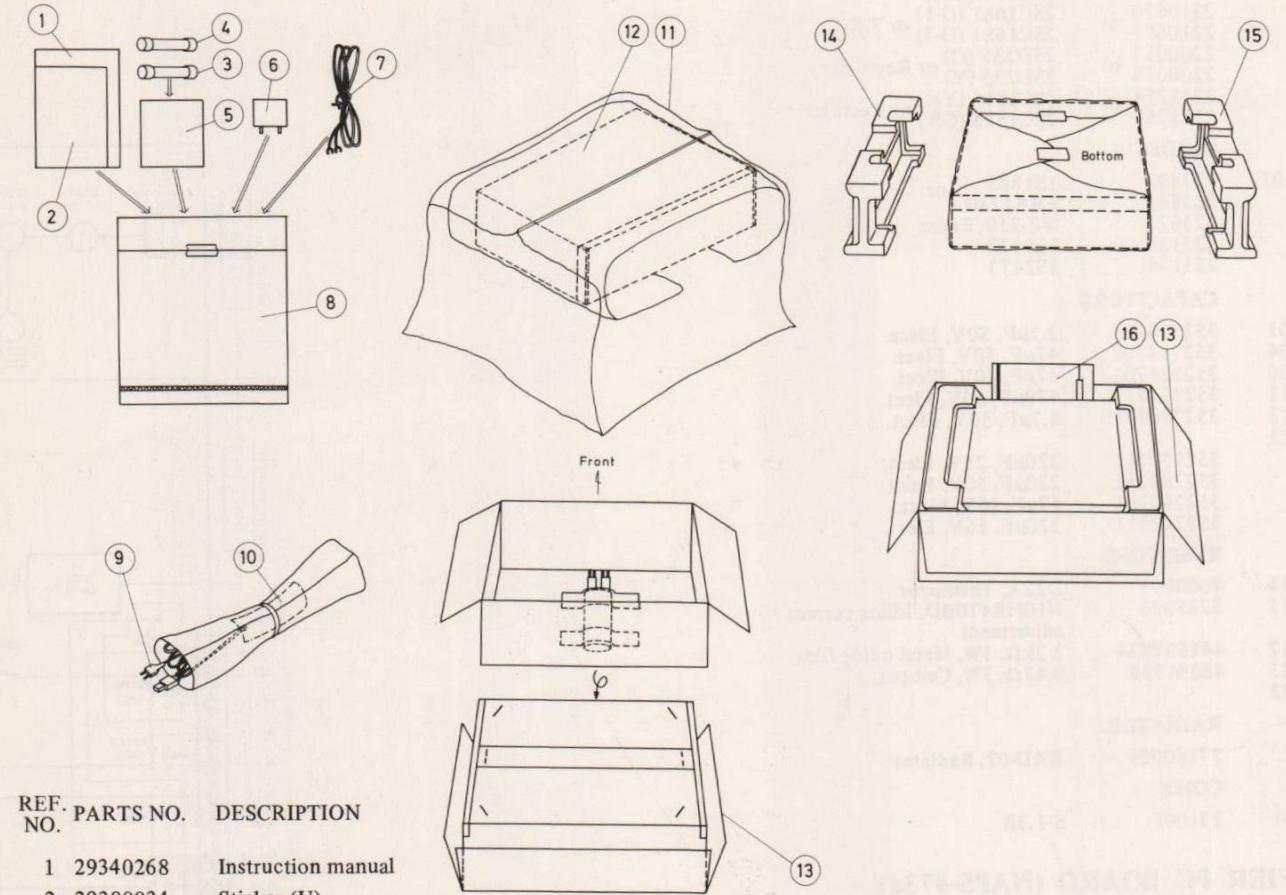
**FRONT END PC BOARD (NARF-495) - PARTS LIST**

TRANSISTORS		
Q001	2210374	2SK19GR(0-1), F.E.T.
Q002	2210380	2SC785(0-1), Mixer
Q003	2211342	2SC461B, Oscillator
DIODE		
D001	223110	1S2687
COILS		
L001	233106 or 233088-1	NFA-3009 or FFA-3001
L002	233112	NFRF-3008
L003	233113	NFRF-3009
L004	233037	NFT-1501
L005	233090	NFO-3003
L006	233037	NFT-1501
TRANSFORMER		
T001	233085	NIT-0518
CAPACITORS		
TC004	3060003	NTC-10P02, Trimmer
VC001	3050006	NVC-20FQ327WD02, Variable
SHIELDED PLATE		
	27225029	
	27150085	

**MPX. FILTER PC BOARD (NAIF-504) - PARTS LIST**

TRANSISTORS			
Q121, Q122	2210136	2SC1312-31(F)	
COILS			
L121, L122	233126	NMC-5008, Low pass filter	
CAPACITORS			
C181, C182	352780101	1μF, 50V, Elect.	
C185, C186	392883397	0.33μF, 50V, LL	

**PACKING PROCEDURES**



REF. NO.	PARTS NO.	DESCRIPTION
1	29340268	Instruction manual
2	29380034	Sticker (U)
	29365005	Warmaty card (G)
3	252020	5A-T, Fuse (U)
4	252014	4A-T, Fuse
5	29100002	80 × 150mm, Poly bag
6	25055018	CV-K-1, Conversion plug
7	292064	FM antenna
8	29100006	350 × 250 mm, Poly bag
9	11855709	Power supply cord (U)
	253089	Power supply cord (G)
10	29380038	Voltage tag
11	29100027A	850 × 650mm, Poly bag
12	290093	500 × 1, 200mm, Protection sheet
13	29050185	Carton box
14	29090279	Pad (R)
15	29090278	Pad (L)
16	13720119	Accessory bag (U)
	13722119	Accessory bag (G)

U: Only Universal model  
G: Only German model

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