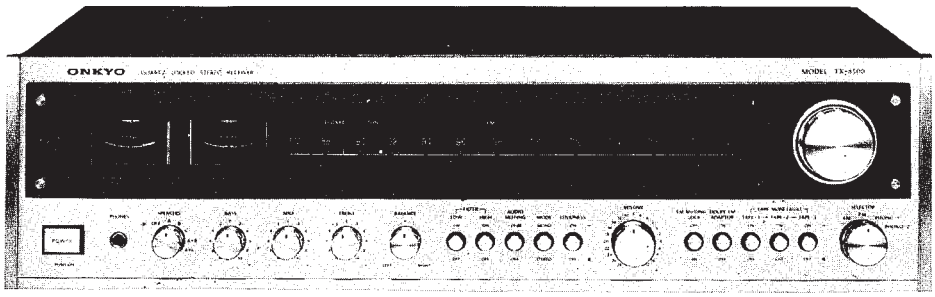
SERIAL No. 3032

ONKYO® SERVICE MANUAL

QUARTZ LOCKED STEREO RECEIVER MODEL TX-8500



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ONKYO® AUDIO COMPONENTS

SPECIFICATIONS

Power Supply Rating	ac 120 volts 60 Hz (U.S.A. model) ac 220 volts 50/60 Hz (Universal model)
Controls	POWER SPEAKERS (OFF, A, B, C, A+B, A+C) SELECTOR (AM, FM, PHONO 1, PHONO 2) TAPE MONITOR 1, 2 & 3 TUNING, VOLUME, BALANCE, TREBLE, MID, BASS, DOLBY NR SWITCH, FM MUTING/LOCK SWITCH, LOUDNESS, MODE, FILTER HIGH & LOW, AUDIO MUTING, SENSOR SWITCH (REAR PANEL)
Antennas	FM: 300 ohms balanced and 75 ohms unbalanced AM: built in ferrite core antenna and external terminal
Outputs	SPEAKER A, B & C, HEADPHONES TAPE REC OUT 1, 2 & 3, FM DOLBY OUT PRE OUT, FM 4 CH OUT AC OUTLET SWITCHED & UNSWITCHED x 2
Inputs	PHONE 1 & 2, TAPE PLAY 1, 2 & 3, FM DOLBY IN, MAIN IN,
Dimensions	570 W x 160 H x 455 D mm 22-7/16" x 6-5/16" x 17-15/16"
Weight	25 kg. 55 lbs.
Semiconductors	1 FET, 95 Transistors, 8 ICs, 58 Diodes

Amplifier section

Power Output (through TAPE)	150 watts per channel, min. RMS, at 4 ohms both channels driven, from 20 Hz to 20 kHz, with no more than 0.1% total harmonic distortion. 110 watts per channel, min. RMS, at 8 ohms both channels driven, from 20 Hz to 20 kHz, with no more than 0.1% total harmonic distortion. 160 watts per channel min. RMS, at 4 ohms both channels driven, 1 kHz, 0.1% total harmonic distortion. 115 watts per channel min. RMS, at 8 ohms both channels driven, 1 kHz, 0.1% total harmonic distortion
Total Harmonic (TAPE) Distortion	0.1% at Rated power 0.08% at 1 watt, 8 ohms
IM Distortion (TAPE) (70 Hz: 7 kHz=4:1)	0.1% at Rated power 0.08% at 1 watt, 8 ohms
Damping Factor	50 (8 ohms, 1 kHz)
Frequency Response	15 – 30,000 Hz (±1 dB) 2 – 60,000 Hz (±1 dB at power amplifier)
Power amp. Tilt	better than 5% at 50 Hz
Sensitivity and Impedance	PHONO: 2.5 mV 50 kohms TAPE PLAY: 150 mV 50 kohms TAPE REC: 150 mV DOLBY OUT: 150 mV 3 kohms DOLBY IN: 350 mV (30 %) 50 kohms PRE OUT: 1V 3 kohms MAIN IN: 1V 50 kohms
Phono Overload	250 mV RMS at 1 kHz, 0.1% THD.
Tone Controller	TREBLE: ±10 dB at 10 kHz MID RANGE: ±5 dB at 1.2 kHz BASS: ±12 dB at 100 Hz
Signal to Noise Ratio	PHONO: 65 dB (IHF C) 75 dB (IHF A) TAPE PLAY: 85 dB (IHF C) 90 dB (IHF A)
RIAA Curve Deviation	±0.2 dB, 30 Hz to 15 kHz
Filters	HIGH: 6 kHz (12 dB/oct.) LOW: 100 Hz (12 dB/oct.)
Loudness	+5 dB at 10 kHz +5 dB at 100 Hz
Audio Muting	–20 dB

Tuner section

Tuning Range	FM:	88 – 108 MHz
	AM:	530 – 1605 kHz
Usable Sensitivity	FM mono:	1.7 μV, 9.8 dBf
	FM stereo:	4 μV, 17.2 dBf
50 dB Quieting Sensitivity	FM mono:	3 μV, 14.7 dBf
	FM stereo:	35 μV, 36 dBf
Intermediate Frequency	FM:	10.7 MHz
	AM:	455 kHz
Capture Ratio	FM:	1.5 dB
Image Rejection Ratio	FM:	83 dB
	AM:	55 dB
IF Rejection Ratio	FM:	100 dB
	AM:	55 dB
Spurious Rejection	FM:	95 dB
Signal to Noise Ratio	FM mono:	70 dB
	FM stereo:	65 dB
	AM:	45 dB
Alternate Channel Attenuation	FM:	70 dB
AM Suppression Ratio	FM:	50 dB
Harmonic Distortion	FM mono:	0.15%
	FM stereo:	0.3%
	AM:	0.8%
Frequency Response	FM:	30 –15,000 Hz±1.5dB
Stereo Separation	FM:	40 dB at 1 kHz 32 dB at 70–10,000Hz
Muting Level	FM:	4 μV, 17.2 dBf
Stereo Threshold	FM:	4 μV, 17.2 dBf
Quartz Lock Level	FM:	4 μV, 17.2 dBf
Sub Carrier Suppression	FM:	60 dB

Specifications are subject to change without notice.

CIRCUIT DESCRIPTION

1. SPEAKER PROTECTION CIRCUIT

The speaker protection circuit is operated:

1) When the B circuit is unstable when the power is turned ON (approximately 5 seconds).
2) When the speaker terminals are shorted and abnormal current has flowed in the power amplifier thru this low impedance.
3) When the center voltage has increased because of trouble at the differential amplifier, etc.
4) When the temperature of the heat sink has risen.

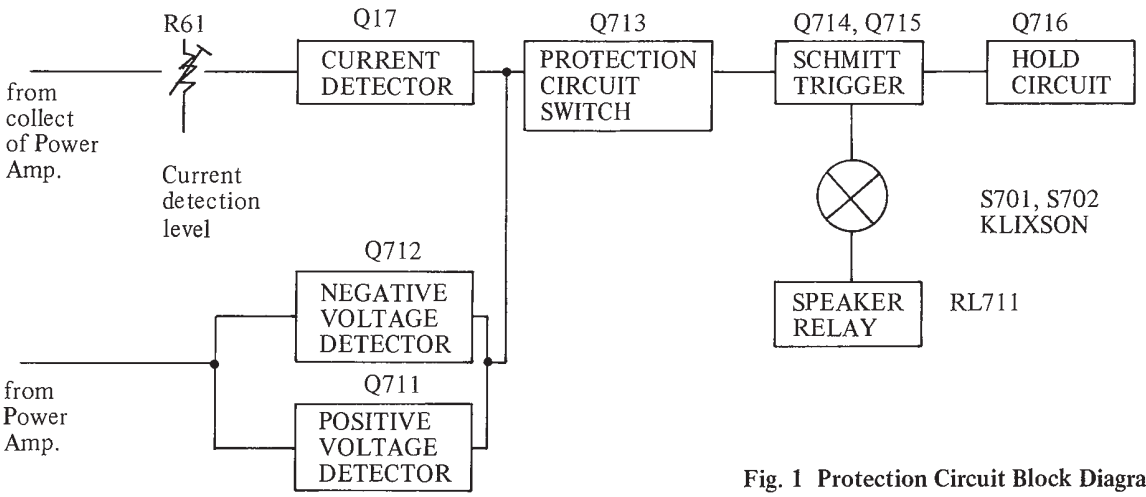


Fig. 1 Protection Circuit Block Diagram

When Q713 is turned on by voltage detection or current detection, Q714 is turned ON by the voltage drop across R719. Q714, Q715 constitute a digitalized, fast response Schmitt trigger circuit. When Q714 is turned ON, Q715 is turned OFF. Q715 is a relay drive transistor. When it is turned OFF, the relay is also turned OFF. The temperature of the heat sink is detected at the collector circuit of Q715 by the Klixson. If the temperature of the heat sink rises excessively, the klixson is turned OFF and the relay is also turned OFF.

When the power switch is turned ON, charging current flows thru the loop R721 → C714 → R718, R719 and Q714 is turned ON by the voltage drop across R719. Consequently, Q715 and the relay are turned OFF until the charging current drops below a certain value. When the power switch is turned OFF, the B voltage falls and C714 is quickly discharged thru the loop C714 → R721 → D711. During normal operation, C714 is charged to almost the B voltage. But since the saturation resistance of Q713 is sufficiently low, when Q713 is turned ON, C714 is quickly discharged thru the loop C714 → R721 → Q713 and the relay is also turned OFF. The relay is not turned ON again thereafter until C714 is charged, even if the set should return to normal and Q713 is turned OFF.

HOLD CIRCUIT

The reference voltage is produced by R726, R727, Q716 is operated as a comparator. When Q715 has been turned OFF, the collector voltage of Q715 rises and C716 is charged. Therefore, when C716 is charged to above a certain voltage relative to the reference voltage at the junction of R726 and R727, Q716 is turned ON, Q713 is turned ON thru R728 and the circuit is held.

CURRENT DETECTOR

Q17 is turned ON by the voltage detected from the collector circuit of the power amplifier. C24 prevents erroneous operation, R61 sets the current detection level and thermister R66 controls changes in the current detection level caused by tempeature rise.

When the impedance is low at a certain frequency of the speaker, the protection circuit may be unexpectedly actuated each time a large audio signal of that frequency has entered. However, when this occurs the relay is opened and the power amplifier current returns to normal. The power amplifier current is also automatically returned to normal in a like manner when the load has been inadvertently shorted momentarily.

When connected with the load shorted, the relay is repeatedly turned ON and OFF in load short → relay OFF (no load) → automatic reset (load short current detection) → relay OFF order. Since the OFF time is sufficiently longer than the relay ON time in this case, the voltage across C716 gradually increases until a voltage sufficient to turn Q716 is reached, at which time the relay is held OFF, thus protecting the power transistor against damage by a continuous overcurrent.

VOLTAGE DETECTOR

The voltage detection circuit is an OR circuit consisting of Q711, Q712. First, the Lch and Rch signals are mixed by R711, R712. When this voltage is minus, Q712 is turned ON and when this voltage is plus, Q711 is turned ON and the relay is turned OFF.
Since the center voltage is unrelated to ON-OFF of the load, when an abnormal voltage has been detected, the relay remains off and the hold circuit is operated until the voltage returns to normal. Once the hold circuit has been actuated it is not reset until the power has been turned back on after the cause of the trouble has been corrected.

2. RL701 RELAY

To prevent a rush current from flowing when the power is turned ON, when AC is applied to the transformer thru R701, R702, B voltage is applied, current flows thru the loop R706 → C703 → R707 → R708, Q702 is turned ON and Q701 is turned OFF by the voltage drop across R708 and the relay is turned OFF. When the charging current drops below a certain value, Q702 is turned OFF, the relay is turned ON and the rated voltage is applied to the power transformer.

COMPONENT LOCATION

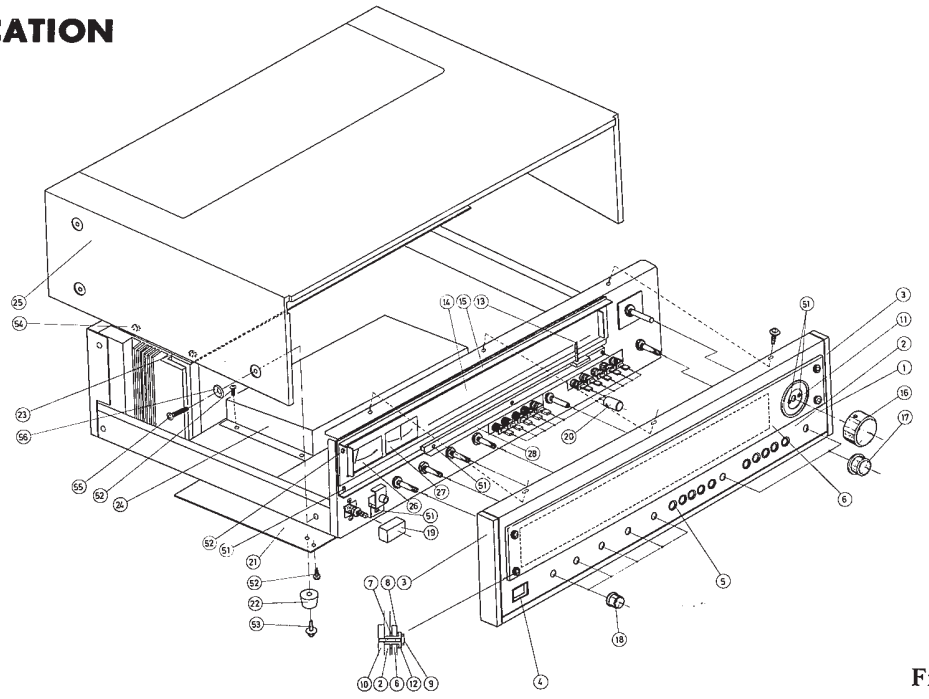
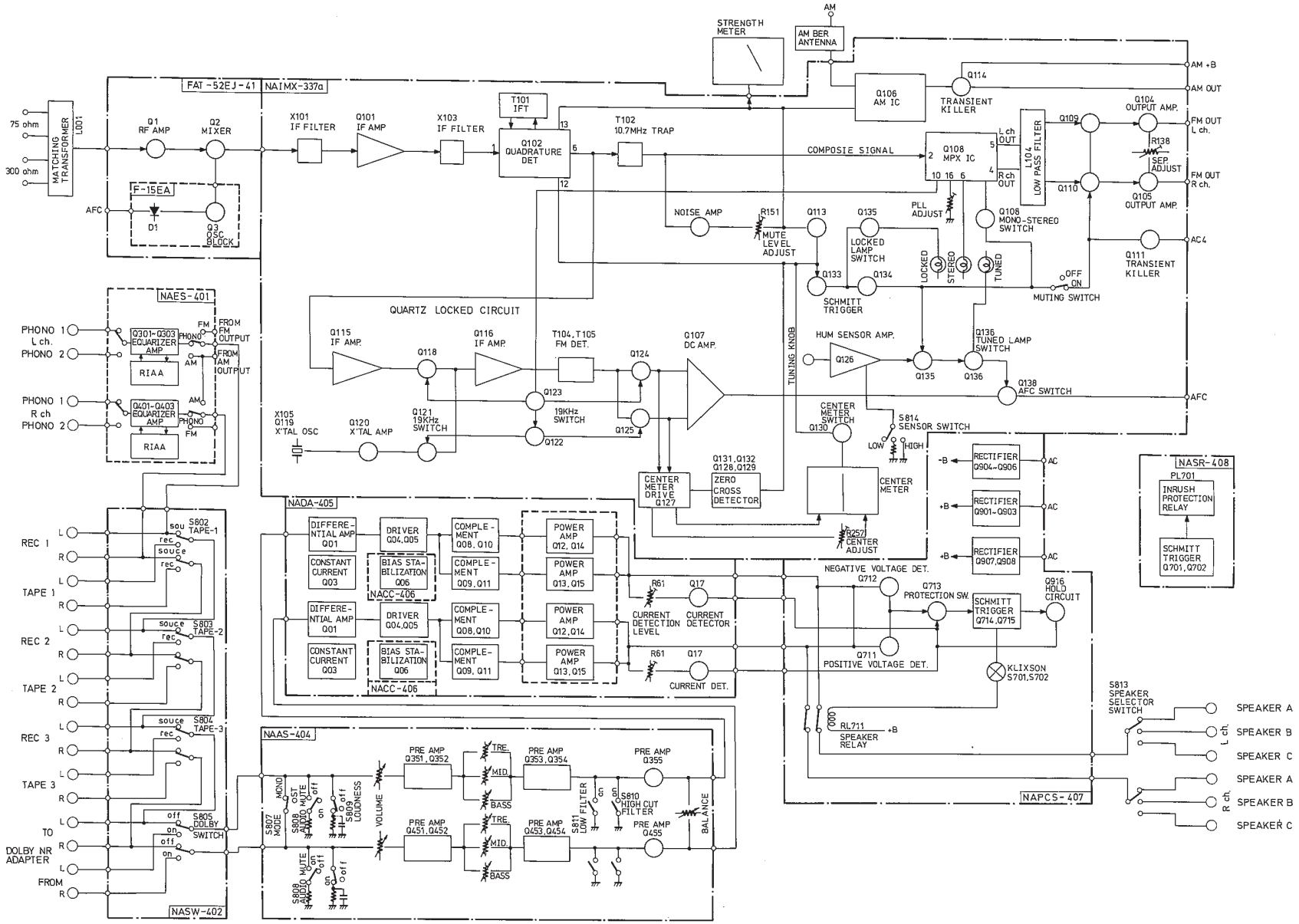


Fig. 2

PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION
1	13759121	Front Panel Ass'y
2	27210075	Front Panel
3	28125032	End Cap
4	27267011	Power Knob Guide
5	27267010	Push Knob Guide
6	28191018	Dial Glass
7	870051	Washer
8	870052	Washer
9	27300038A	Decorative Screw
10	27140092	Bracket
11	27265003A	Tuning Ring
12	27270014	Spacer
13	13829133	Pointer
	210015	Pointer Lamp 6.3V 0.05AW-3
14	28130051	Dial Plate
15	27240013	Dial Plate Bracket
16	28320136	Tuning Knob
17	28320132	Volume Knob
18	28320131	Tone Knob
19	28320130	Power Button
20	28320133	Push Button
21	27170026	Bottom Board
22	280889	Leg
23	28184027A	Cover
24	27225016	Shielded Case F
25	28110114	Top Cover (U.S.A. Model)
	28110125	Top Cover (Universal Model)
26	243054	Strength Meter
27	243055	Center Meter
28	27300035	Pointer Rail
51	834130062	3STS+6BQ Tapping Screw
52	831130082	3STW+8BQ Tapping Screw
53	831130162	3STW+16BQ Tapping Screw
54	834440102	4STS+10BQ(BC) Screw
55	82374015	4MW+15BS-Ni Screw
56	870040	4x12BS-Ni Washer

BLOCK DIAGRAM



ALIGNMENT PROCEDURES

INSTRUMENTS REQUIRED

1. DC Ammeter
2. DC Voltmeter
3. AM/FM Sweep Generator
4. AM/FM Signal Generator
5. Vacuume Tube Voltage Meter (VTVM) AC, DC
6. Oscilloscope
7. Monitorscope
8. Distortion Analyzer
9. Stereo Modulator
10. Frequency Counter

GENERAL ALIGNMENT CONDITIONS

1. Signal input should be kept as low as possible.
2. Standard modulation is 400Hz 30% (AM), 400Hz 100% (FM MONO), pilot 10% sub and main 90% (FM STEREO)
3. Standard knob position
   SPEAKERS ..... A
   TONE & BALANCE ..... Center
   MODE ..... STEREO
   FILTER, LOUD, MUTE/LOCKED, DOLBY,
   TAPE ..... OFF

ATTACHMENT OF DIAL POINTER

1. Close the variable capacitor completely.
2. Set the radio dial pointer to zero (0) on dial scale and install the dial pointer ass'y.

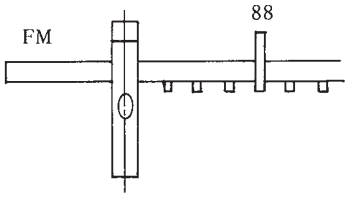
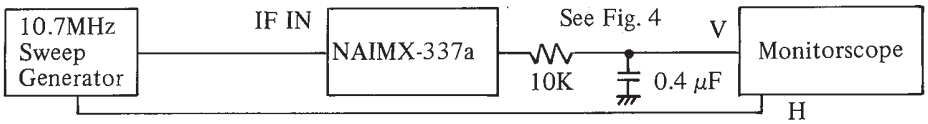


Fig. 3

QUARTZ LOCKED CIRCUIT ALIGNMENT

Set SELECTOR switch to FM.



10.7MHz Sweep	Adjustment	Adjustment for
10.7MHz	T104, 105	Maximum symmetrical response Fig. 5

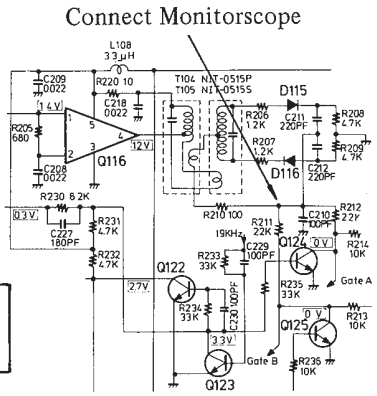


Fig. 4

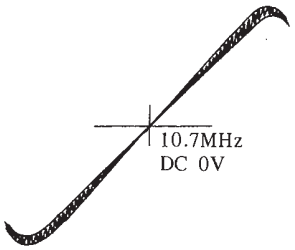
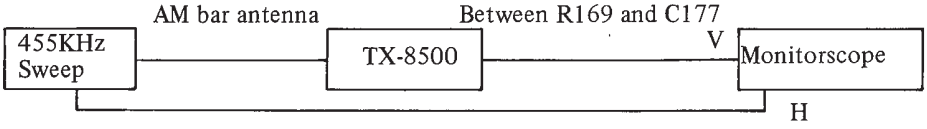


Fig. 5

AM IF ALIGNMENT



Set Radio Dial	Adjust	Adjust for	Remarks
Upper end	X104	Maximum symetrical response	Usally not necessary to adjust

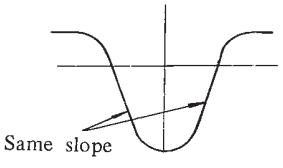
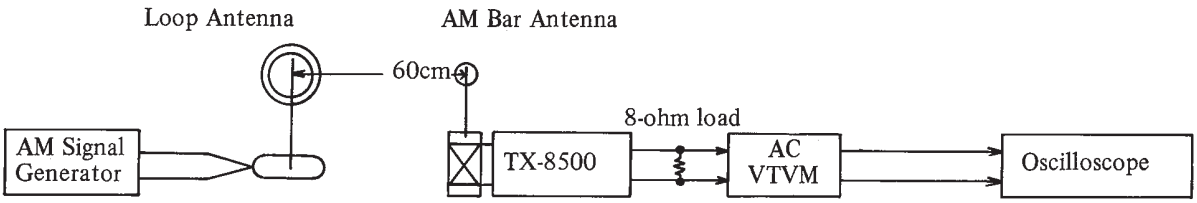


Fig. 6

AM RF ALIGNMENT

Confirm start point of dial pointer before alignment.

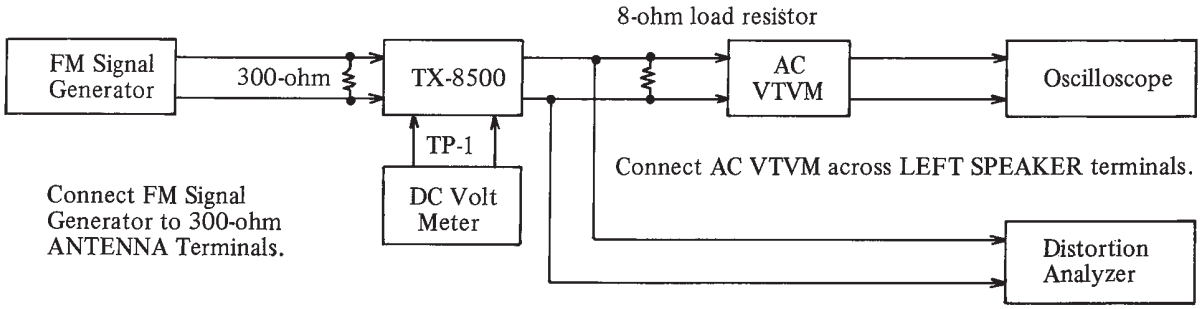


Connect AC VTVM across LEFT SPEAKER terminals.

Step	AM Signal Genrator	Dial to set	Adjust	AC VTVM reading	Remarks
1	515KHz 400Hz 30% mod.	515KHz Lower end	L105	Maximum	Repeat step 1 and 2 as necessary
2	1680KHz 400Hz 30% mod.	1680KHz Upper end	TC–6	Maximum	
3	600KHz 400Hz. 30% mod.	600KHz	L001 L111	Maximum	Repeat step 3 and 4 as necessary
4	1400KHz 400Hz 30% mod.	1400KHz	TC-2 TC-4	Maximum	

FM FRONT END ALIGNMENT

Set SELECTOR switch to FM.



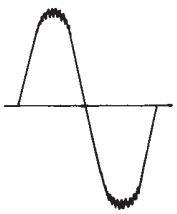
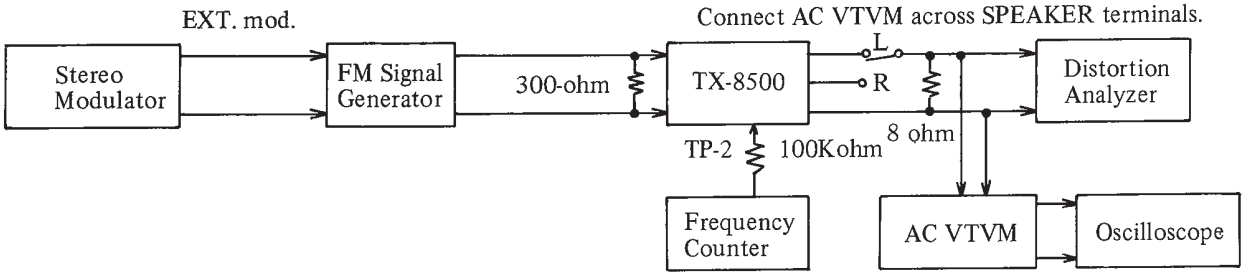


Fig. 7

Step	FM Signal Generator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
1	No Signal	Quiet Point	T101 Bottom	DC Volt Meter	0mV	
2	98MHz 400Hz 100% mod. 60dB	98MHz	T101 Top	Distortion Analyzer	Minimum Distortion	Set the output voltage to 3V with VOLUME.
3	Repeat step 1 and 2 as necessary.					
4	98MHz 400Hz 100% mod. 60dB	98MHz	R257	TUNING Meter	Center	
5	90MHz 400Hz 100% mod. 60dB	90MHz	OSC Coil L6	DC Volt Meter	0mV	
6	106MHz 400Hz 100% mod. 60dB	106MHz	OSC Trimmer TC7(TCO)	Same as above	0mV	
7	Repeat step 5 and 6 as necessary.					
8	90MHz 400Hz 100% mod.	90MHz	L1 L2 L3	AC VTVM or Oscilloscope	Maximum	
9	106MHz 400Hz 100% mod.	106MHz	TC1 TC3 TC5	Same as above	Maximum	Set FM Signal Generator level as low as possible. Fig. 7
10	Repeat step 8 and 9 as necessary					
11	98MHz 400Hz 100% mod.	98MHz	IC Core Top and Bottom L5	AC VTVM or Oscilloscope	Maximum	

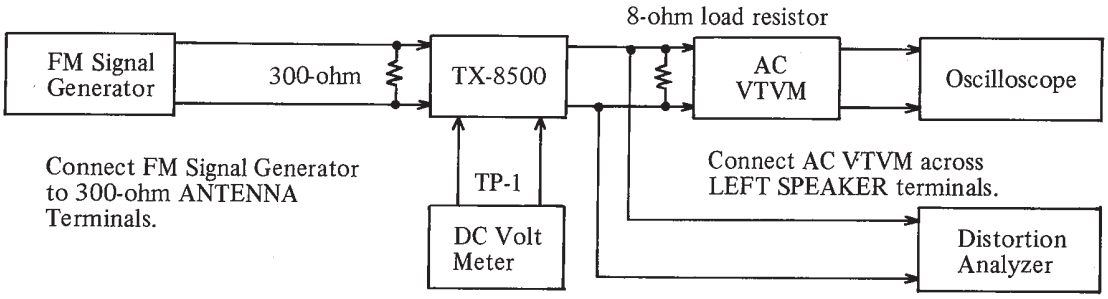
FM MONO DISTORTION AND MULTIPLEX ALIGNMENT



Alignment	Step	FM Signal Generator	Stereo Modulator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
Mono Distortion		98MHz 400Hz 100% mod. 60dB	———	98MHz	T101 Bottom	Distortion Analyzer	Minimum	
19KHz	1	98MHz 400Hz No mod. 60dB	———	98MHz	R142	Frequency Counter	19KHz	
	2	STEREO INDICATOR should light up when stereo program is being received.						
Multiplex	1	98MHz EXT. Mod.	Pilot Sig. 10% Main & Sub Sig. 1KHz Lch 90%	98MHz	R138	AC VTVM Right ch.	Minimum	Repeat step 1 & 2 as necessary
	2	Same as above	Pilot Sig. 10% Main & Sub Sig. 1KHz Rch 90%	98MHz	R138	AC VTVM Left ch.	Minimum	

CENTER METER AND MUTING LEVEL ADJUSTMENT

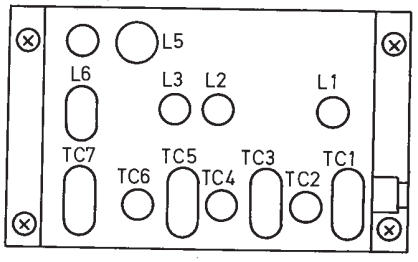
Set SELECTOR switch to FM.



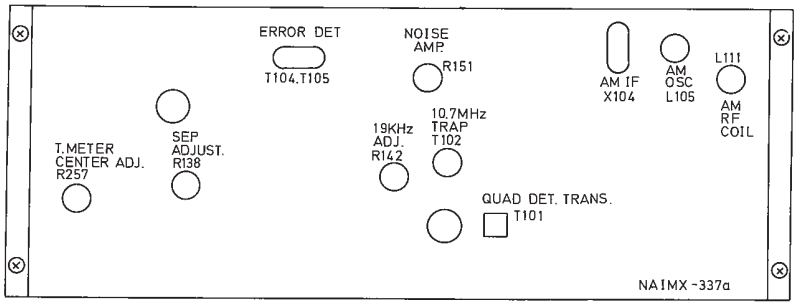
Set TUNING dial pointer and FM Signal Generator Frequency (no mod.) to 98MHz.
Confirm LOCKED LAMP should light up.

Adjustment		FM Signal Generator	Dial to set	Adjust	Output Indicator	Adjust for	Remarks
CENTER METER		98MHz 60dB no mod.	98MHz	R257	TUNING METER	Center	
MUTING	1	98MHz 400Hz 100% mod. 12dB	98MHz	R151	Oscilloscope or AC VTVM	Signal	Repeat step 1 & 2.
	2	11dB				no signal and noise	

ADJUSTMENT POINT

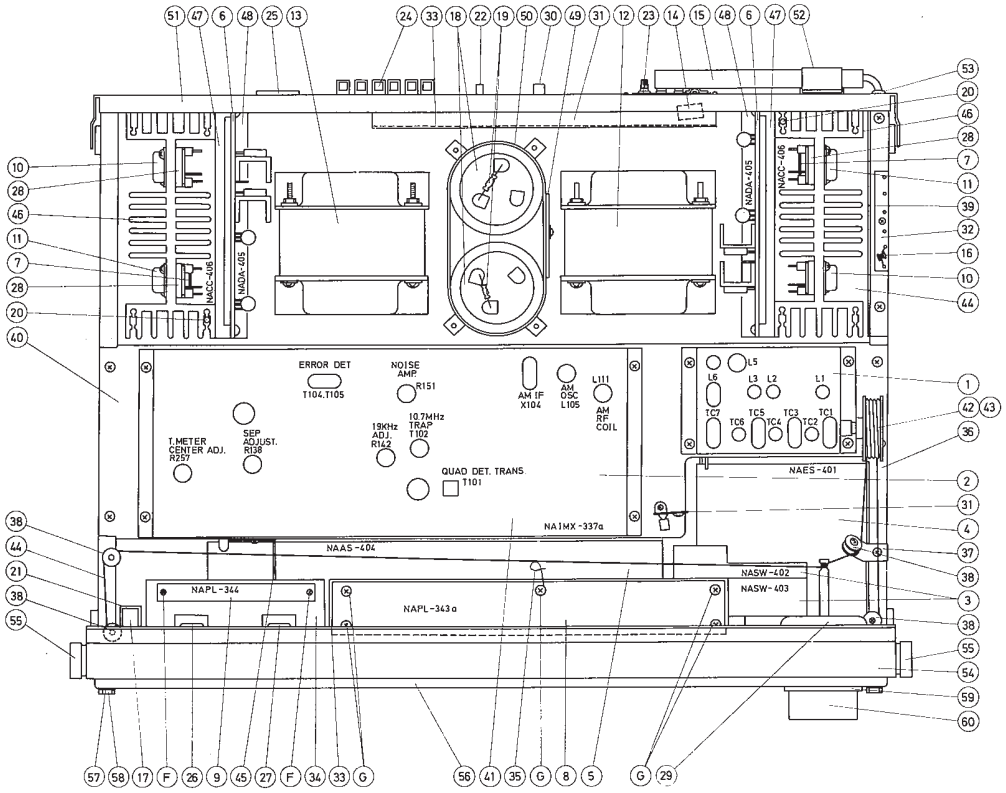


FRONT END TOP VIEW

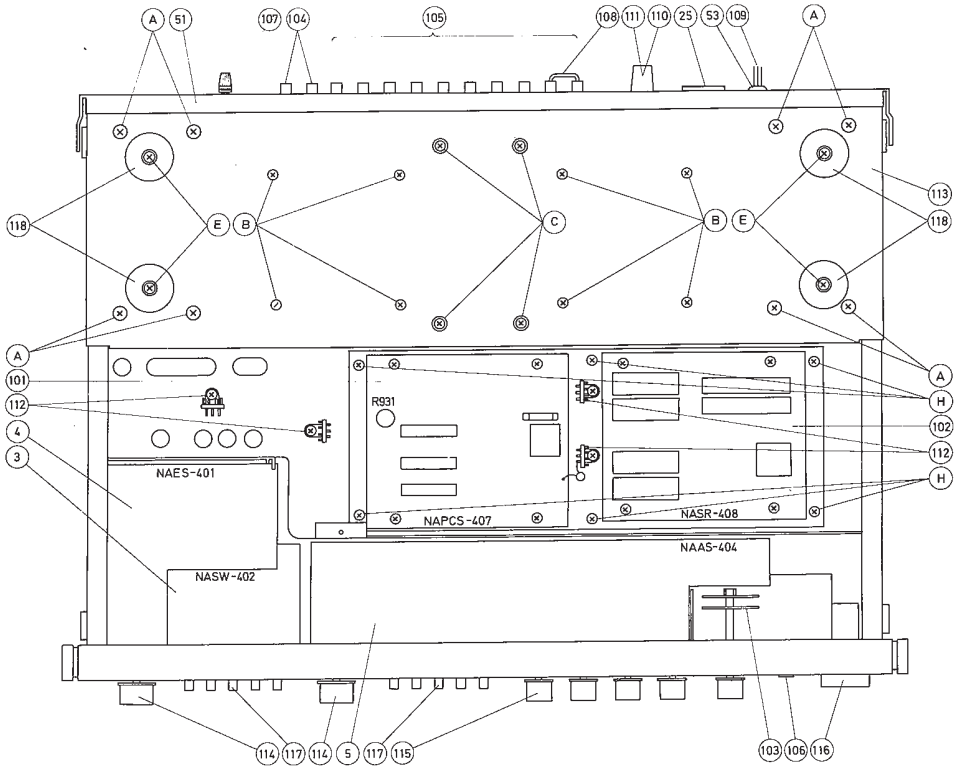


AM/FM TUNER PC BOARD TOP VIEW

CHASSIS LAYOUT



TOP VIEW



BOTTOM VIEW

PARTS LIST

U.S.A. Model

REF. NO.	PARTS NO.	DESCRIPTION
1	240037	FAT-52EJ-41 Front End
2	13759537A	NAIMX-337a AM/FM Tuner PC Board Complete
3	13759502	NASW-402 Switch PC Board Complete
4	13759501	NAES-401 Equalizer PC Board Complete
5	13759504	NAAS-404 Tone Amp. PC Board Complete
6	13759505	NADA-405 Power Amp. PC Board Complete
7	13759506	NACC-406 Bias Stabilization PC Board Complete
8	13759543A	NAPL-343a Dial Illuminator PC Board Complete
9	13829544	NAPL-344 Meter Lamp PC Board Complete
10	2200532 or 2200533	2SD424(R) or 2SD424(O) or Power Amp. Transistor
11	2200542 or 2200543	2SB554(R) or 2SB554(O) or Power Amp. Transistor
12	230190	NPT-618D Power Transformer
13	230191	NPT-619D Power Transformer
14	233026	NBLN-1 BLN Transformer
15	232061	NMA-1006 AM Bar Antenna
16	233105	NCH-1005 Choke Coil
17	3504012	0.01μF 125V UL Capacitor
18	3504092	10000μFx2 63V Elect. Capacitor
19	441723924	3.9KΩ 2W Metal Oxide Film Resistor
20	252041	9700L-36-11 Klixson
21	25035015	NPS-111LA3 Power Switch
22	25065016	NSS-2327 Hum Sensor Slide Switch
23	25060021B	NTM-3PUM1 Antenna Terminal
24	25060005	NTM-12PUR1 Speaker Terminal
25	25050008	S-16432 AC Outlet
26	243054	NIND-0500S53 Strength Meter
27	243055	NIND-0250S54 Center Meter
28	250249	M-1614 Power Transistor Socket
29	27205005	Drive Shaft
30	250256A	NTM-1WPBL-E1 4CH Det. Output Terminal
31	251065	MD-21 Lug Plate
32	251070	LG-2L Lug Plate
33	27250006A	Lamp Case
34	27300074A	Meter Cover
35	270317	Pointer Lead Clamper
36	27115019A	Side Bracket
37	27140150	Dial Pulley Bracket
38	27185003	Dial Pulley
39	27150059	Shielded Plate B
40	27100021	Front Chassis
41	27225016A	Shielded Case F
42	27200020	Dial Drum
43	273803	SP-14A Dial Drum Spring
44	273903	Dial Cord
45	27150060	Shielded Plate S
46	27160025	Heat Sink
47	27140151	Upper PC Bracket
48	27140152	Lower PC Bracket
49	27190025	Elect. Capacitor Holder
50	27300073	Elect. Capacitor Band
51	27120075A	Back Panel
52	27190021	Antenna Holder
53	270280	Strainrelief
54	13759121	Front Panel Ass'y
55	28125032	End Cap
56	28191018	Dial Glass
57	27270014	Spacer
58	27300038	Decorative Screw
59	27265003A	Tuning Ring
60	28320136	Tuning Knob
101	13759507	NAPCS-407 Rectifier PC Board Complete
102	13759508	NASR-408 Rectifier PC Board Complete
103	25030077	NRS-266-30YW Speaker Selector Switch
104	250170	NTM-2WPBL-E1 Phono Input Terminal
105	250169	NTM-4WPBL-E1 Tape, Dolby, Pre & Main Terminal
106	25045018	LJ-100H Stereo Headphone Jack
107	25060008	Ground Terminal
108	25055015	Shorted Plug
109	253091	10A Power Supply Cord
110	252053	8A(ST-6) Power Fuse
111	250080	S-N1301 Fuse Holder
112	250130	T-4461 Ground Terminal
113	27100022	Back Chassis
114	28320132	Volume Knob
115	28320131	Tone Knob
116	28320130	Power Button
117	28320133	Push Button A
118	280889	Leg

Universal Model

REF. NO.	PARTS NO.	DESCRIPTION
1	240037	FAT-52EJ-41 Front End
2	13759537A	NAIMX-337a AM/FM Tuner PC Board Complete
3	13759502	NASW-402a Switch PC Board Complete
4	13759501	NAES-401 Equalizer PC Board Complete
5	13759504	NAAS-404 Tone Amp. PC Board Complete
6	13759505	NADA-405 Power Amp. PC Board Complete
7	13759506	NACC-406 Bias Stabilization PC Board Complete
8	13759543A	NAPL-343a Dial Illuminator PC Board Complete
9	13829544	NAPL-344 Meter Lamp PC Board Complete
10	2200532 or 2200533	2SD424(R) or 2SD424(O) or Power Amp. Transistor
11	2200542 or 2200543	2SB554(R) or 2SB554(O) or Power Amp. Transistor
12	230207	NPT-618G Power Transformer
13	230208	NPT-619G Power Transformer
14	233026	NBLN-1 BLN Transformer
15	232061	NMA-1006 AM Bar Antenna
16	233105	NCH-1005 Choke Coil
17	3500052	PME271Y510CEE IS Capacitor
18	3504092	10000μFx2 63V Elect. Capacitor
19	441723924	3.9KΩ 2W Metal Oxide Film Resistor
20	252041	9700L-36-11 Klixson
21	25035015	NPS-111LA3 Power Switch
22	25065016	NSS-2327 Hum Sensor Slide Switch
23	25060021B	NTM-3PUM1 Antenna Terminal
24	25060005	NTM-12PUR1 Speaker Terminal
25	none	
26	243054	NIND-0500S53 Strength Meter
27	243055	NIND-0250S54 Center Meter
28	250249	M-1614 Power Transistor Socket
29	27205005	Drive Shaft
30	250256A	NTM-1WPBL-E1 4CH Det. Output Terminal
31	251065	MD-21 Lug Plate
32	251070	LG-2L Lug Plate
33	27250006A	Lamp Case
34	27300074A	Meter Cover
35	270317	Pointer Lead Clamper
36	27115019A	Side Bracket
37	27140150	Dial Pulley Bracket
38	27185003	Dial Pulley
39	27150059	Shielded Plate B
40	27100021	Front Chassis
41	27225016A	Shielded Case F
42	27200020	Dial Drum
43	273803	SP-14A Dial Drum Spring
44	273903	Dial Cord
45	27150060	Shielded Plate S
46	27160025	Heat Sink
47	27140151	Upper PC Bracket
48	27140152	Lower PC Bracket
49	27190025	Elect. Capacitor Holder
50	27300073	Elect. Capacitor Band
51	27120083	Back Panel
52	27190021	Antenna Holder
53	270280	Strainrelief
54	13759121	Front Panel Ass'y
55	28125032	End Cap
56	28191018	Dial Glass
57	27270014	Spacer
58	27300038	Decorative Screw
59	27265003A	Tuning Ring
60	28320136	Tuning Knob
101	13759507	NAPCS-407 Rectifier PC Board Complete
102	13759508	NASR-408 Rectifier PC Board Complete
103	25030077	NRS-266-30YW Speaker Selector Switch
104	250170	NTM-2WPBL-E1 Phono Input Terminal
105	250169	NTM-4WPBL-E1 Tape, Dolby, Pre & Main Terminal
106	25045018	LJ-100H Stereo Headphone Jack
107	20560008	Ground Terminal
108	25055015	Shorted Plug
109	253086	Power Supply Cord AS-CEE-1
109	253088	Power Supply Cord AS-VDE-1 (german model)
110	252020	5A-T Power Fuse
111	250080	S-N1301 Fuse Holder
112	250130	T-4461 Ground Terminal
113	27100022	Back Chassis
114	28320132	Volume Knob
115	28320131	Tone Knob
116	28320130	Power Button
117	28320133	Push Button A
118	280889	Leg

SERVICE PROCEDURES

1. REMOVEMENT OF THE POWER AMP. PC BOARD

Left ch.

(1) Remove six screws which hold the top cover to the chassis and lift off the top cover.
(2) Remove four screws which hold the cover to the hiat sink.
(3) Remove four screws which hold the heat sink to the back chassis.

Right ch.

(1)–(2) Same as above
(3) Remove three screws which hold the shilded plate to the side bracket.
(4) Remove five screws which hold the shielded case to the back panel.
(5) Remove four screws which hold the heat sink to the back chassis.

NOTES: When removing the power amplifier PCB at the right side, the back panel may contact the Klixson lead wire and the lead may be damaged.
Therefore, be very careful or unsolder the Klixson when removing the power amplifier.

2. CHICKING OF THE AM/FM PC BOARD.

(1) Remove seven screws which hold the bottom board to the front chassis.
(2) Remove six screws which hold the PC bracket to the front chassis.

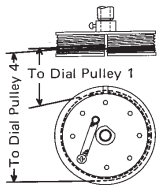
3. REPLACING OF THE DIAL LAMP

(1) Remove six screws which hold the top cover to the chassis and lift off the top cover.
(2) Remove five screws which hold the lamp PC Board to the lamp case.

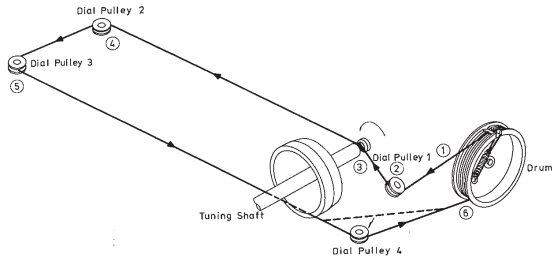
4. SCREWS

A: Heatsink fixed screw
B: Power Transformer fixed screw
C: Elect. Capacitor fixed screw
E: Leg fixed screw
F: Meter lamp PCB. fixed screw
G: Dial lamp PCB. fixed screw
H: PC bracket fixed screw

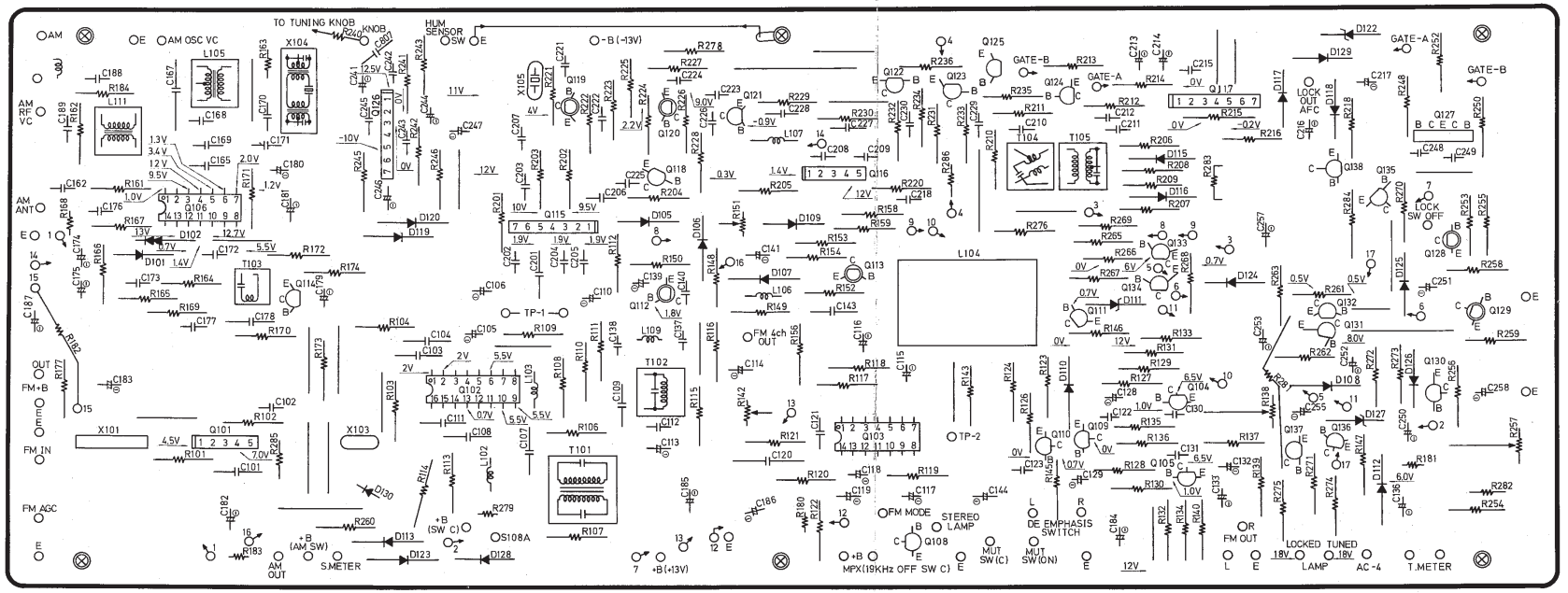
STRINGING DIAGRAM



1. Open the variable capacitor complete and tie dial cord to the spring of the drum.
2. Thread dial cord in the direction of arrow from (1) to (3) and wind dial cord three turns around the tuning shaft clockwise.
3. Thread dial cord in the direction of arrow from (4) to (6).
4. Thread dial cord to the Dial Pulley 4.



AM/FM TUNER PC BOARD VIEW



NAIMX-337a
BOTTOM VIEW

AM/FM TUNER PC BOARD-PARTS LIST

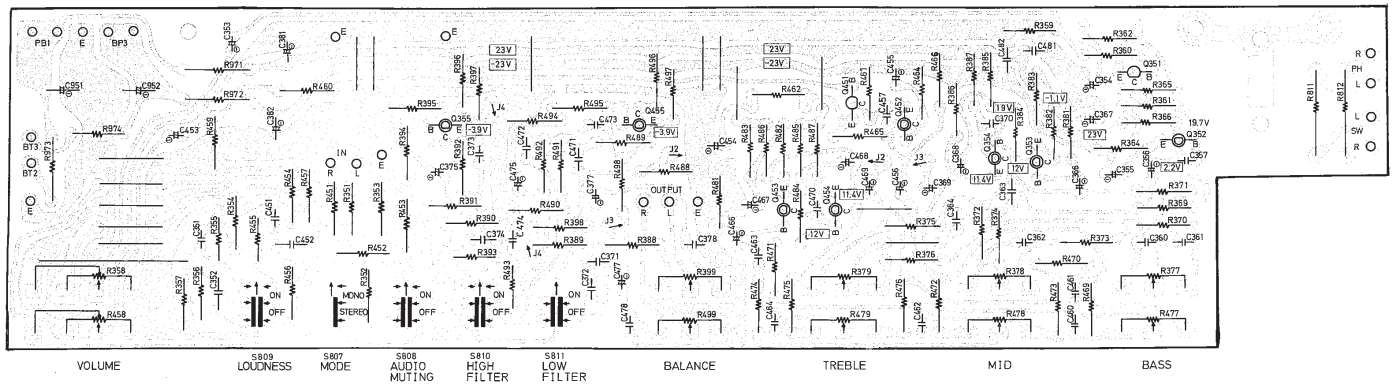
CIRCUIT NO.	PARTS NO.	DESCRIPTION
	ICS	
Q101	222407	TA-7060P FM IF Amp.
Q102	222421	HA-1137 Quadrature Det.
Q103	222419	HA-1156W MPX.
Q106	222418	HA-1151 AM
Q115	222402	TA-7061AP IF Amp.
Q116	222407	TA-7060P IF Amp.
Q117	222424	TA-7504S Differential Amp.
Q126	222423	TA-7136P Hum Sensor Amp.
	TRANSISTORS	
Q104, Q105	2210136	2SC1312(F) MPX Output Amp.
Q108	2210745	2SC945(L) Q Mono-Stereo Switch
Q109, Q110	2210943 or 2210244	2SC1317(R) or 2SC735(Y) Muting
Q111, Q114	2210745	2SC945(L) Q Transient Killer
Q112, Q113	2210086	2SC733(BL) Muting
Q118, Q121 Q122~Q125	2210943 or 2210244	2SC1317(R) or 2SC735 (Y) or 19KHz Switch
Q127	2210707	2SC1583(G) Differential Amp.
Q128, Q129	2210086	2SC733(BL) Zero Cross Det.
Q130	2210943	2SC1317(R) Center Meter Switch
Q131, Q132	2210416	2SA726(F) Zero Cross Det.
Q133, Q134	2210943 or 2210244	2SC1317(R) or 2SC735(Y) Schmitt Trigger
Q135, Q136 Q137, Q138	Same as above	Same as above Lamp Switch
Q119, Q120	2210123	2SC380(O) x 4al osc.

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	DIODES	
D101, D105 D110, D118 D124, D125 D128	223105	1S1555
D102 D106~D109 D112~D117	4000022	VD1212 Varistor
D119, D120 D123, D129 D130	2231031	1N60(N)FM
D111	223945 or 224012	RD5.1EB or WZ-052 Zener
D122	223943 or 224011	RD4.7EB or YZ-047 Zener
D127	223948 or 223928	RD5.6EC or WZ-061 Zener
	COILS	
L102	233105	NCH-1005 3.3μH Choke
L103	233074	NCCH-1506 Choke
L104	233104 or 233032	NMC-5001 or NMC-8-7 Low Pass Filter
L105	232064	NMO-2001 AM OSC
L106	233031	NMC-9-1
L107	233024	NCCH-1501 3.3μH Choke
L109	233018	NMC-4-11 MPX Coil
L111	232043	NMRF-2503 AM RF

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	TRANSFORMERS	
T101	233101 or 233083	NFIF6003 or NIT3516
T102	233084	NIT-0517
T103	232041	NIT-0509
T104	233078	NIT-0515P
T105	233079	NIT-0515S
	CERAMIC FILTERS	
X101	3010018	SFJ10.7MA(RED) FM IF
X103	3010006	SFE10.7MA(RED) FM IF
X104	3010012	CFT-455B AM IF
	X'TAL	
X105	3010015	XTL-10.7M 10.7MHz OSC
	CAPACITORS	
C105	352750471	4.7μF 25V Elect.
C106	352784791	0.47μF 50V Elect.
C110	352780101	1μF 50V Elect.
C113, C114	352741001	10μF 16V Elect.
C115, C116	352780221	2.2μF 50V Elect.
C117, C118	392884797	0.47μF±20% 50V LL
C119	392880107	1μF±20% 50V LL
C120	372325114	510pF±5% 50V ST
C121	374124737	0.047μF±20% 50V DE
C128, C129	352780101	1μF 50V Elect.
C132, C133	392882297	0.22μF±20% 50V LL
C136	392041007	10μF 16V MS
C139	352780101	1μF 50V Elect.
C141	352741001	10μF 16V Elect.
C144	352741011	100μF 16V Elect.
C167	372323615	360pF±10% 50V ST

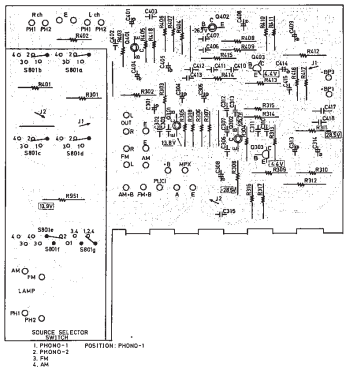
CIRCUIT NO.	PARTS NO.	DESCRIPTION
	CAPACITORS	
C174	352780101	1μF 50V Elect.
C175	352780331	3.3μF 50V Elect.
C178	374124737	0.047μF ±20% 50V DE
C179	352751001	10μF 25V Elect.
C180	352741001	10μF 16V Elect.
C181, C183 C186	352741011	100μF 16V Elect.
C182, C187	352744701	47μF 16V Elect.
C184	352742211	220μF 16V Elect.
C185	352744711	470μF 16V Elect.
C213, C214	392884797 or 392084797	0.47μF ±20% 50V LL or 0.47μF ±20% 50V MS
C216	352744701	47μF 16V Elect.
C217, C241	352780101	1μF 50V Elect.
C244	352741001	10μF 16V Elect.
C246	352784791	0.47μF 50V Elect.
C247	352741001	10μF 16V Elect.
C250	352780331	3.3μF 50V Elect.
C251~C253	352741001	10μF 16V Elect.
C255	352780101	1μF 50V Elect.
C257	352744711	470μF 16V Elect.
C258	352744701	47 μF 16V Elect.
	VARIABLE RESISTORS	
R138	5225018	R-HK1KB3P Sep. Adjust
R142	5225019	N10HR4.7KBD VCO. Adjust
R151	5225016	R-HK100KB3M Mute. Level
R257	5225055	N10HR2KBC Tuning Meter Center Adjust
	RESISTORS	
R274	441622214	220Ω 1W Metal Oxide Film
R275	441622714	270Ω 1W Metal Oxide Film

TONE AMP. PC BOARD VIEW



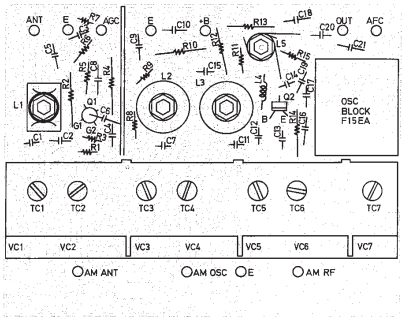
NAAS-404
BOTTOM VIEW

EQUALIZER AMP. PC BOARD VIEW



NAES-401
BOTTOM VIEW

FRONT END PC BOARD VIEW



FAT-52EJ-41
BOTTOM VIEW

FRONT END PC BOARD – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	TRANSISTORS	
Q1		3SK45(B)
Q2		2SC535(B)
	OSC BLOCK	
	222013	F-15EA

EQUALIZER AMP. PC BOARD – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	TRANSISTORS	
Q301, Q401	2210665 or 2210666	2SA841(GR) or 2SA841(BL) or Equalizer Amp.
Q302, Q402	2210670 or 2210671	2SC1681(0-1) or 2SC1681(0-2) or Equalizer Amp.
Q303, Q403	2211063 or 2211064	2SC1509(R) or 2SC1509(S) or Equalizer Amp.
	CAPACITORS	
C301, C401	392680221	2.2μF 50V LR
C304, C404	352734701	47μF 10V Elect.
C305, C405	352741001	10μF 16V Elect.
C308, C408	352721011	100μF 6.3V Elect.
C309, C409	352753301	33μF 25V Elect.
C314, C414	392684791	0.47μF 50V LR
	RESISTORS	
R312, R412	441623324	3.3KΩ 1W Metal Oxide Film
R951	441622714	270Ω 1W Metal Oxide Film
	ROTARY SWITCH	
S801	25030076	NRS-374-30A Source Selector

SWITCH PC BOARD-– PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	RESISTORS	
R961~R964	441622714	270Ω 1W Metal Oxide Film
	SWITCHES	
S802~S806	25035052	NPS-562-L17 TAPE, DOLBY, FM MUTING

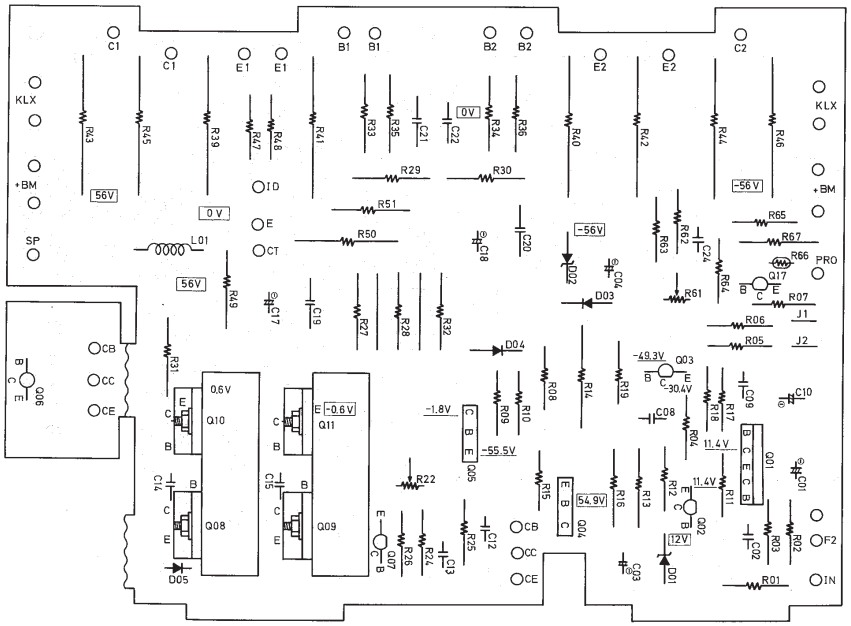
TONE AMP. PC BOARD – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	TRANSISTORS	
Q351, Q451	2210666, 2210916 or 2210417	2SA841(BL), 2SA722(T) or 2SA726(G) or Preamp.
Q352~Q355 Q452~Q455	2210670 or 2210671	2SC1681(O-1) or 2SC1681(O-2) or Preamp.
	CAPACITORS	
C353, C453	392680221	2.2μF 50V LR
C354, C355 C454, C455	352721011	100μF 6.3V Elect.
C356, C456	352780471	4.7μF 50V Elect.
C366, C466	352780221	2.2μF 50V Elect.
C367, C467	352733301	33μF 10V Elect.
C368, C468	352751001	10μF 25V Elect.
C374, C474	372328214	820pF ±5% 50V ST
C375, C475	392684791	0.47μF 50V LR
C377, C477	352780101	1μF 50V Elect.
C381, C382	352753311	330μF 25V Elect.
C951, C952	352764711	470μF 35V Elect.
	VARIABLE RESISTORS	
R358, R458	5172047	N24RGL41C100KBTP30 VOLUME
R377, R477 R378, R478 R379, R479	5172044	N24RGP100KB30-21C BASS MIDDLE TREBLE
R399, R499	5172043	N24RGP100KMN30-C BALANCE
	RESISTORS	
R811, R812	441723314	330Ω 2W Metal Oxide Film
	SWITCHES	
S807~S811	25035053	NPS-522-L18 MODE/LOUD/MUTE./FILTER

NOTES:

DE: Non-Inductive Polyester Film Capacitor.
LD, SLD: Low Leakage Current Type Electrolytic Capacitor.
ST: Polystyren Film Capacitor.

POWER AMP. PC BOARD VIEW



NADA-405
BOTTOM VIEW

POWER AMP. PC BOARD – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION	
	TRANSISTORS		
Q01	2210700	2SC1583(O-001)	Differential Amp.
Q02	2210755	2SC1775A(E)	Driver
Q03	2210795	2SC1890A(E)	Regulator Current
Q04	2210774	2SA818(Y)	Driver
Q05	2210784	2SC1628(Y)	Driver
Q07	2211183 or 2211184	2SC1740(R) or 2SC1740(S)	Complement
Q08	2210782 or 2210784	2SC1628(O) or 2SC1628(Y)	Complement
Q09	2210772 or 2210774	2SA818(O) or 2SA818(Y)	Complement
Q10	2200552 or 2200553	2SC1669(O) or 2SC1669(Y)	Complement
Q11	2200562 or 2200563	2SA839(O) or 2SA839(Y)	Complement
Q12, Q14	2200532 or 2200533	2SD424(R) or 2SD424(O)	Power Amp.
Q13, Q15	2200542 or 2200543	2SB554(R) or 2SB554(O)	Power Amp.
Q17	2210795	2SC1890A(E)	Current Detector Amp.
	DIODES		
D01	223910	WZ-120 Zener	
D02	223928	WZ-061 Zener	
D03, D04	4000031	M8513A(O) Varistor	
D05	223105	1S1555	

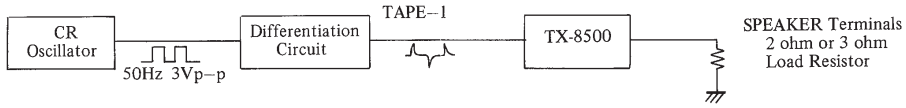
CIRCUIT NO.	PARTS NO.	DESCRIPTION
	COIL	
L01	231001	S-1.3B
	CAPACITORS	
C01	392651001	10μF 25V LR
C03, C10	352744701	47μF 16V Elect.
	352743311	330μF 16V Elect.
C17, C18	352771001	10μF 63V Elect.
C22	374131045	0.1μF ±10% 100V DE
	RESISTORS	
R13	441628224	8.2KΩ 1W Metal Oxide Film
R14	441721534	15KΩ 2W Metal Oxide Film
R29, R30	441624704	47Ω 1W Metal Oxide Film
R31, R32	451631004	10Ω 1W Metal
R33~R36	451630274	2.7Ω 1W Metal
R39~R42	48114795	0.47Ω 5W Cement
R43~R46	48193395	0.33Ω 3W Cement
R49	451630684	6.8Ω 1W Metal
R50	451731004	10Ω 2W
R66	4000003	D22A Termistor
	VARIABLE RESISTORS	
R22	5221017	R-HK1KB3S
R61	5221007	R-HK2.2KB3S
	HEAT SINK	
	27160011	RAD-05

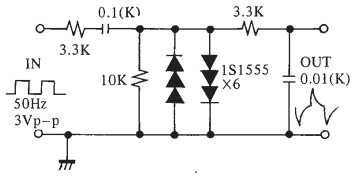
POWER AMP. ALIGNMENT PROCEDURES

IDLING CURRENT ADJUSTMENT

Connect the DC voltmeter between ID-CT terminals.
Adjust the voltage to 40 + 10mV with R22.
NOTES: Adjust after switching on for 10 minutes.
Open Load Volume ... Minimum

CURRENT DETECTOR LEVEL ADJUSTMENT





Differentiation Circuit

Apply a tone burst signal to the TAPE-1 terminal, connect a 2 ohm hollow resistor to the speaker terminals and adjust variable resistor R61 so that the relay is operated at maximum volume. Confirm that the relay is not operated when the 3 ohm hollow resistor is connected.

NOTES: Adjust after switching on for 10 minutes.
VOLUME – Maximum

CENTER VOLTAGE CHECK

When the transistor of the differential amp (Q1) of the power amplifier (NADA-405) or the constant current circuit (Q3) has been replaced, check the center voltage.

(Check method)
Connect a DC VTVM between the CT-E terminals and check if the reading of the DC VTVM is within 30mV of the rated voltage.
When outside the rated voltage, cut or connect the jumper wires (J1, J2) by referring to the below table. Perform this check 10 minutes after the power switch has been set to ON.

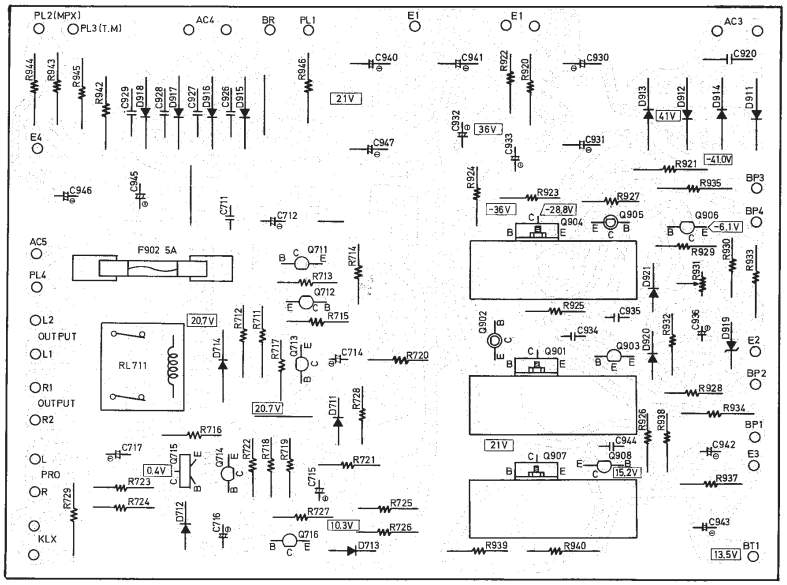
J1	J2	Center Voltage
Connect	Connect	0mV
Connect	Cut	–9 ~ –13mV
Cut	Connect	–18 ~–22mV
Cut	Cut	–34 ~–38mV

The center voltage when jumpers J1, J2 are connected was assumed to be 0mV.

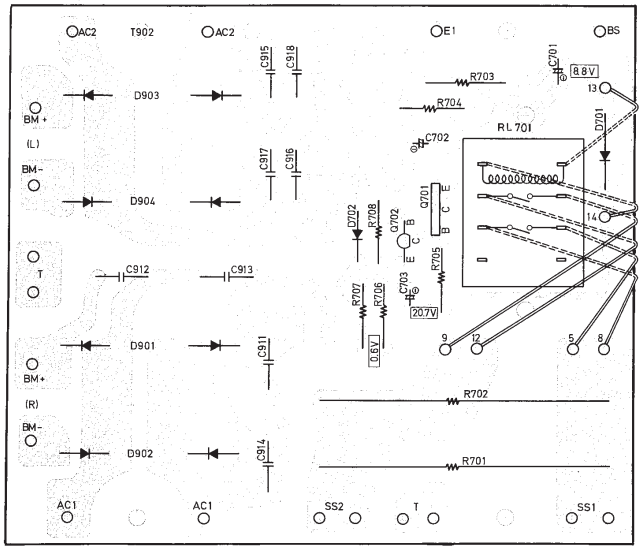
28.5 VOLT LINE ADJUSTMENT

Connect the DC Voltmeter between PL1 and E terminals.
Adjust the voltage to 28.5 Volt with R931.

RECTIFIER PC BOARD VIEW



NAPCS-407
BOTTOM VIEW



NASR-408
BOTTOM VIEW

RECTIFIER P.C.B. – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	TRANSISTORS	
Q711, Q712	2211183 or 2211184	2SC1740(R) or 2SC1740(S) or Voltage det.
Q713	2210416 or 2210417	2SA726(F) or 2SA726(G) or Protection Switch
Q714	2211183 or 2211184	2SC1740(R) or 2SC1740(S) or Schmitt Trigger
Q715	2210863 or 2210864	2SC1212AWT(C) or 2SC1212AWT(D) Schmitt Trigger
Q716	2211183 or 2211184	2SC1740(R) or 2SC1740(S) or Hold Circuit
Q901, Q904	2200113 or 2200020	2SD234(O) or 2SD234(Y) or Rectifier
Q902	2210670 or 2210671	2SC1681(0-1) or 2SC1681(0-2) or Rectifier
Q903, Q908	2211183 or 2211184	2SC1740(R) or 2SC1740(S) or Rectifier
Q905	2210665 or 2210666	2SA841(GR) or 2SA841 (BL) or Rectifier
Q906	2210416 or 2210417	2SA726(F) or 2SA726(G) or Rectifier
Q907	2200013 or 2200014	2SD235(O) or 2SD235(Y) or Rectifier
	DIODES	
D711~D713	223105	1S1555
D714	223802	1S1885
D911~D914	223806	1S1886
D915~D918	223802	1S1885
D919	223928	WZ-061 Zener
D920, D921	223105	1S1555
	CAPACITORS	
C712	352724711	470μF 6.3V Elect.
C714	352753301	33μF 25V Elect.
C715	352780331	3.3μF 50V Elect.
C716	352741011	100μF 16V Elect.
C717	352753301	330μF 25V Elect.
C930, C931	352783311	330μF 50V Elect.
C932, C933	352783301	33μF 50V Elect.
C936	352734701	47μF 10V Elect.
C940, C941	352754711	470μF 25V Elect.
C942	352744701	47μF 16V Elect.
C943	352743311	330μF 16V Elect.
C945	352752211	220μF 25V Elect.
C946	352753311	330μF 25V Elect.
C947	352754711	470μF 25V Elect.
	RESISTORS	
R720	441623314	330Ω 1W Metal Oxide Film
R729	441621214	120Ω 1W Metal Oxide Film
R942	441621014	100Ω 1W Metal Oxide Film
R943	441621514	150Ω 1W Metal Oxide Film
R944	441626814	680Ω 1W Metal Oxide Film
	VARIABLE RESISTOR	
R931	5225005	R-HK2.2KB Voltage Adjustment
	FUSE	
F902	252020	5A-T
	FUSE HOLDER	
F902a	250113	SN5051
	RELAY	
RL711	250166	NRS2P5A-DC12 Speaker
	RADIATOR	
	27160011	

RECTIFIER P.C.B. – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	TRANSISTORS	
Q701	2210863 or 2210864	2SC1212AWT(C) or 2SC1212AWT(D) Schmitt Trigger
Q702	2211183 or 2211184	2SC1740(R) or 2SC1740(S) or Schmitt Trigger
	DIODES	
D701	223802	1S1885
D702	223105	1S1555
D901, D903	223819	S5151
D902, D904	223820	S5151R
	CAPACITORS	
C701	352733311	330μF 10V Elect.
C702	352780331	3.3μF 50V Elect.
C703	352780101	1μF 50V Elect.
	RESISTORS	
R701, R702	4000033	3.9Ω 10W Fuse
R703	441621214	120Ω 1W Metal Oxide Film
	RELAY	
RL701	25065030	NRL-2P5ADC12-01

DIAL LAMP P.C.B. – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
PL801~PL804	210026	250mA 6.3V Dial Lamp
PL808~PL814	210027	50mA 6.3V Indicator Lamp
PL816~PL819	210027	50mA 6.3V Indicator Lamp
	250113	SN5051 Fuse Holder
	27140082	Lamp Bracket
	27190014	Lamp Holder
	27140104	Bracket

METER LAMP P.C.B. – PARTS LIST

CIRCUIT NO.	PARTS NO.	DESCRIPTION
PL805, PL806	210026	250mA 6.3V Meter Lamp
	250113	SN5051 Fuse Holder

BIAS STABILIZATION PC BOARD – PARTS LIST

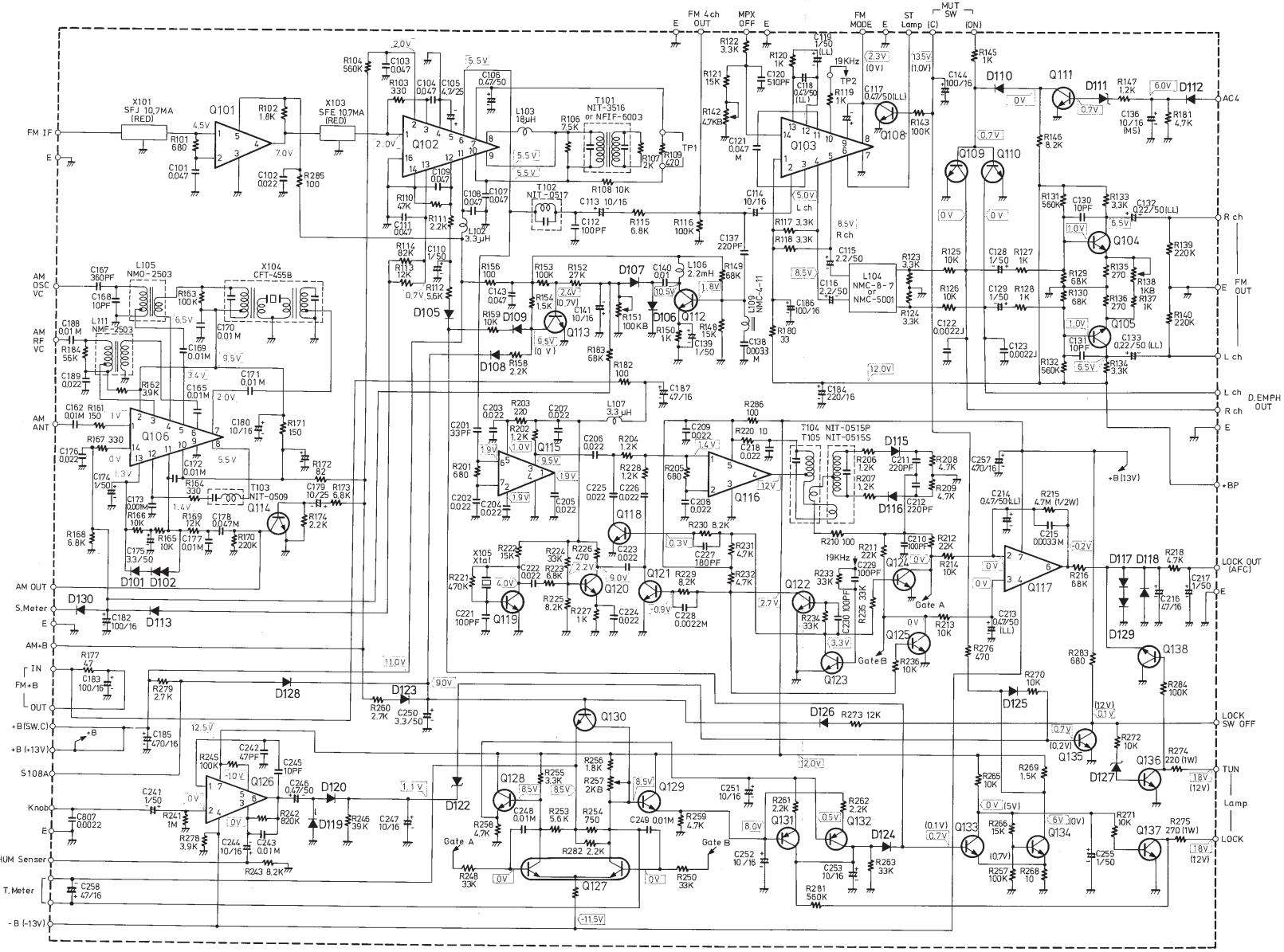
CIRCUIT NO.	PARTS NO.	DESCRIPTION
	TRANSISTOR	
Q06	2211183 or 2211184	2SC1740(R) or 2SC1740(S) or Bias Stabilization

NOTES:

DE: Non-Inductive Polyester Film Capacitor
LD: Low Leakage Current Type Electrolytic Capacitor
SLD: Low Leakage Current Type Electrolytic Capacitor
ST: Polystyren Film Capacitor
NP: Non-polar Electrolytic capacitor
When replacing differential amplifier or push-pull amplifier transistors, be sure that transistors of one channel have the same h_{FE} ratings.

AM/FM TUNER SCHEMATIC DIAGRAM

UNIVERSAL MODEL



Q101, Q116 ---------- TA7060P
Q102 ---------- HA1137
Q103 ---------- HA1156W
Q104, Q105 ---------- 2SC1312(F)
Q106 ---------- HA1151
Q108, Q111, Q114 ---------- 2SC945①Q or 2SC732(B) or(GR)
Q109, Q110, Q118, Q130 ---------- 2SC1317(R) or 2SC735(Y)
Q121-Q125, Q133-Q138 ---------- 2SC1317(R) or 2SC735(Y)
Q112, Q113, Q128, Q129 ---------- 2SC733(BL)
Q115 ---------- TA7061AP
Q117 ---------- TA7504S
Q119, Q120 ---------- 2SC380(O)
Q126 ---------- TA7136P
Q127 ---------- 2SC1583G
Q131, Q132 ---------- 2SA726(F)

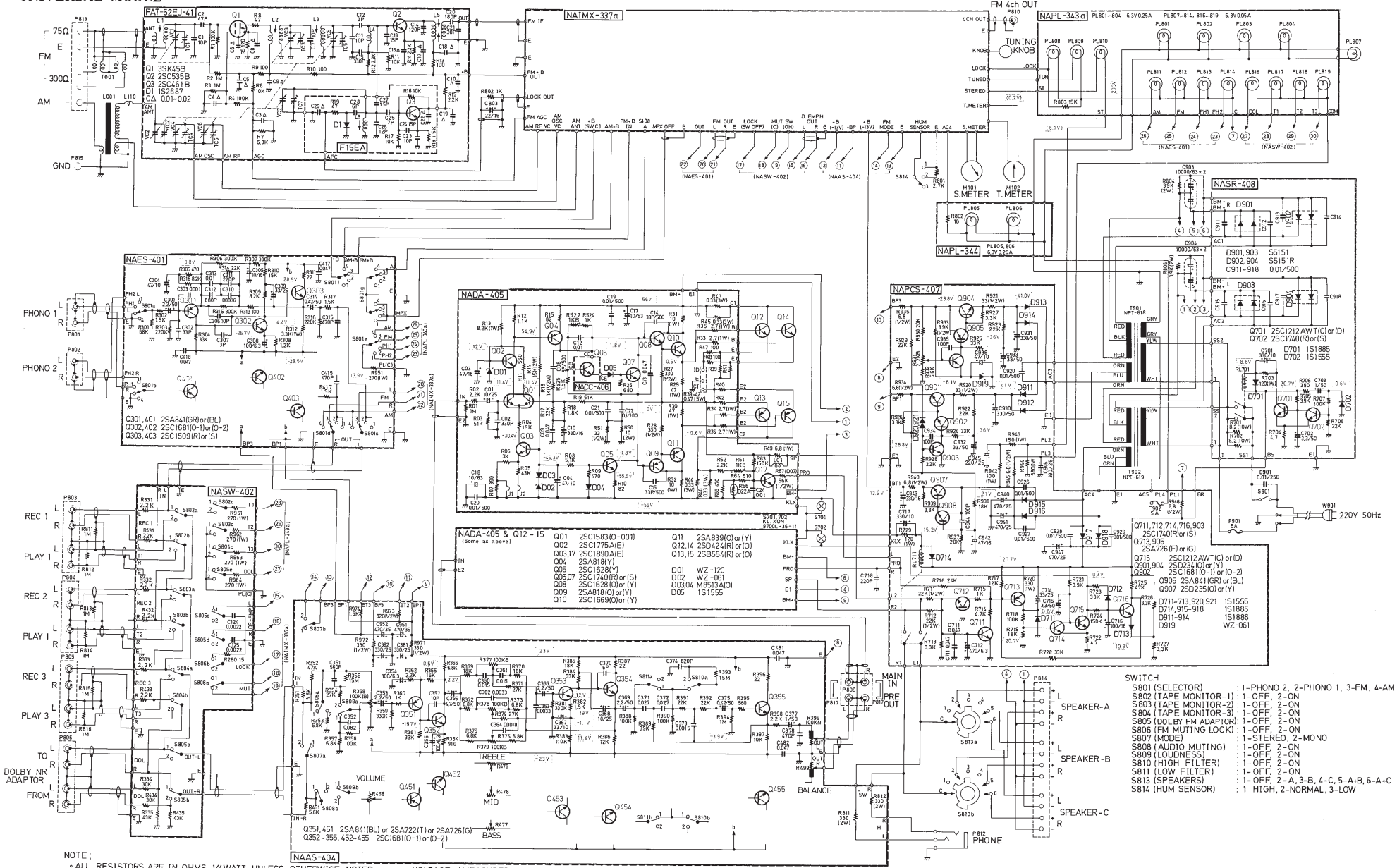
D101, D105, D110, D118 ---------- 1S1555
D124, D125, D128 ---------- 1S1555
D102 ---------- VD1212
D106-D109, D112-D117 ---------- 1N60
D119, D120, D123, D126 ---------- 1N60
D129, D130 ---------- 1N60
D111 ---------- WZ051 or RD5.1EB
D122 ---------- YZ047 or RD4.7EB
D127 ---------- WZ061 or RD5.6EC

NOTES

- ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF, 500WV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS (+B−) ARE IN μF/WV.
- VOLTAGE (MEASURED WITH V.T.V.M.).
  (V) DC VOLTAGE (NO INPUT SIGNAL).
  (v) DC VOLTAGE (FM STEREO).

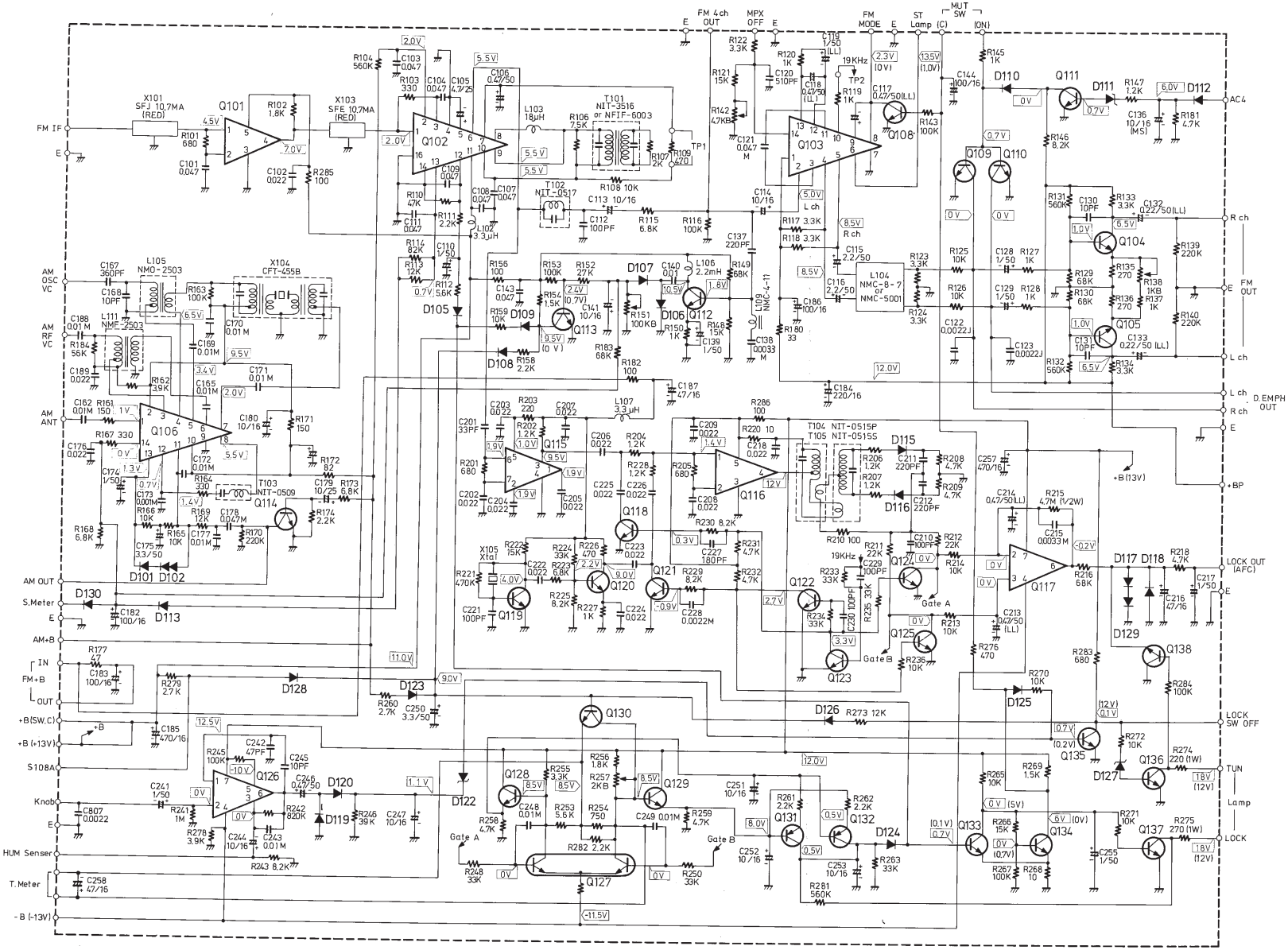
SCHEMATIC DIAGRAM

UNIVERSAL MODEL



AM/FM TUNER SCHEMATIC DIAGRAM

U.S.A. MODEL



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Q102 ---------- HA1137
Q103 ---------- HA1156W
Q104, Q105 ---------- 2SC1312(F)
Q106 ---------- HA1151
Q108, Q111, Q114 ---------- 2SC945①Q or 2SC732(B) or(GR)
Q109, Q110, Q118, Q130 ---------- 2SC1317(R) or 2SC735(Y)
Q121 - Q125, Q133 - Q138 ---------- 2SC1317(R) or 2SC735(Y)
Q112, Q113, Q128, Q129 ---------- 2SC733(BL)
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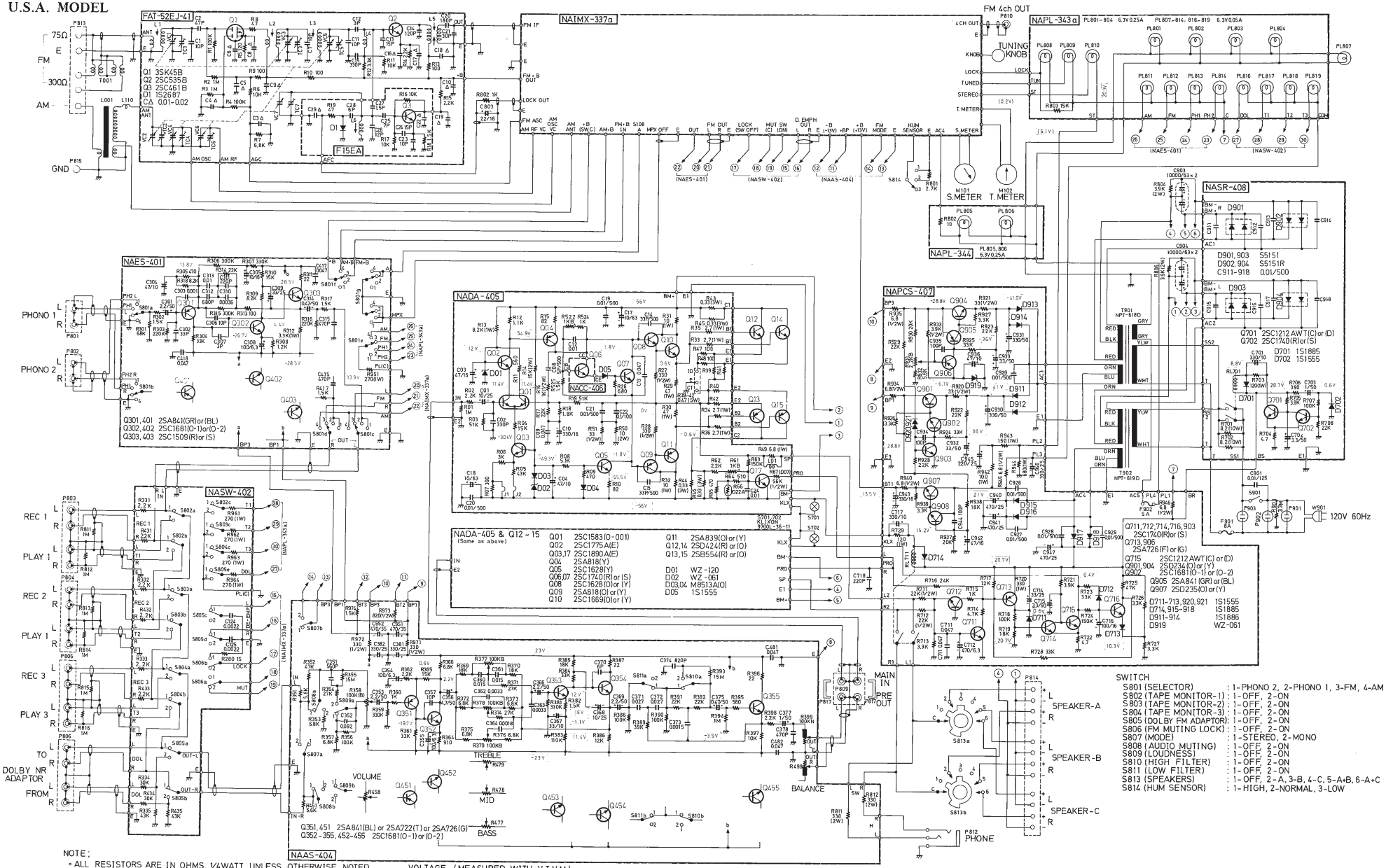
Q119, Q120 ---------- 2SC380(O)
Q126 ---------- TA7136P
Q127 ---------- 2SC1583G
Q131, Q132 ---------- 2SA726(F)

D101, D105, D110, D118, D124, D125, D128 ---------- 1S1555
D102 ---------- VD1212
D106 - D109, D112 - D117, D119, D120, D123, D126, D129, D130 ---------- 1N60
D111 ---------- WZ051 or RD5.1EB
D122 ---------- YZ047 or RD4.7EB
D127 ---------- WZ061 or RD5.6EC

NOTES
- ALL RESISTORS ARE IN OHMS, 1/4 WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF, 500WV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS (-⊞-) ARE IN μF/WV.
- VOLTAGE (MEASURED WITH V.T.V.M.).
  [V] DC VOLTAGE (NO INPUT SIGNAL).
  (V) DC VOLTAGE (FM STEREO).

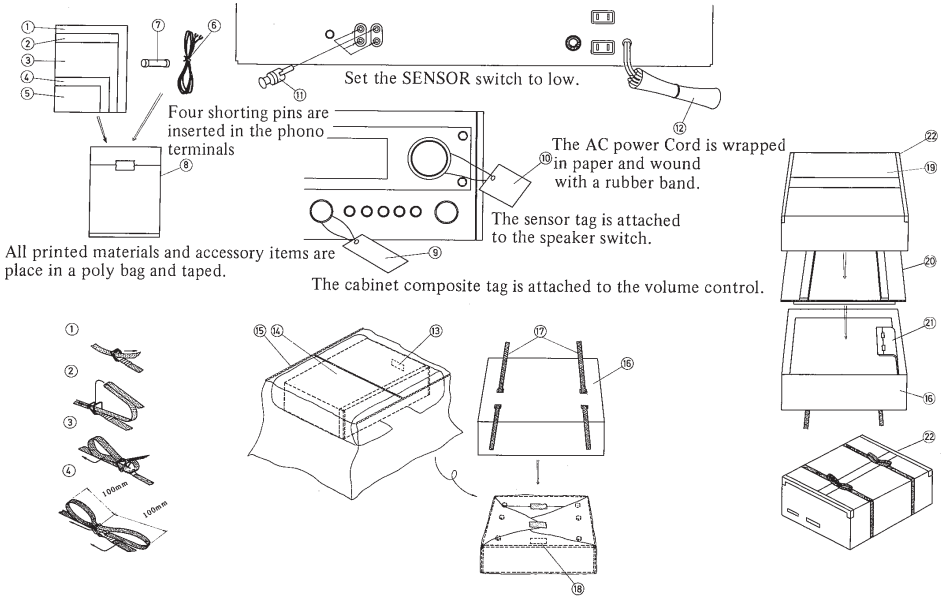
SCHEMATIC DIAGRAM

U.S.A. MODEL



PACKING PROCEDURES

U.S.A. MODEL



PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION
1	29340205	Instruction Manual
2	29358001	Service Station List
3	29355046	Caution Card for Warranty Card
4	29365003	Warranty Card
5	292017-2	Silicon Cloth
6	292064	5059-01 FM Antenna
7	252053	8A(ST-6) Fuse
8	29100006A	Poly Bag
9	29380004	Cabinet Composite Tag
10	29355045	Sensor Tag
11	250153	PO-107 Shorting Pin
12	290076	AC Cord Wrapper
13	282969	Caution Card A
14	29095003	670x1600mm Sheet
15	29100029	Poly Bag
16	29090223	Pad, Bottom
17	29112001	Band
18	293041	Caution Card
19	29050138	Carton Box
20	29090224	Pad, Top
21	13759119	Accessory Bag Complete
22	260012	Adhesive Tape

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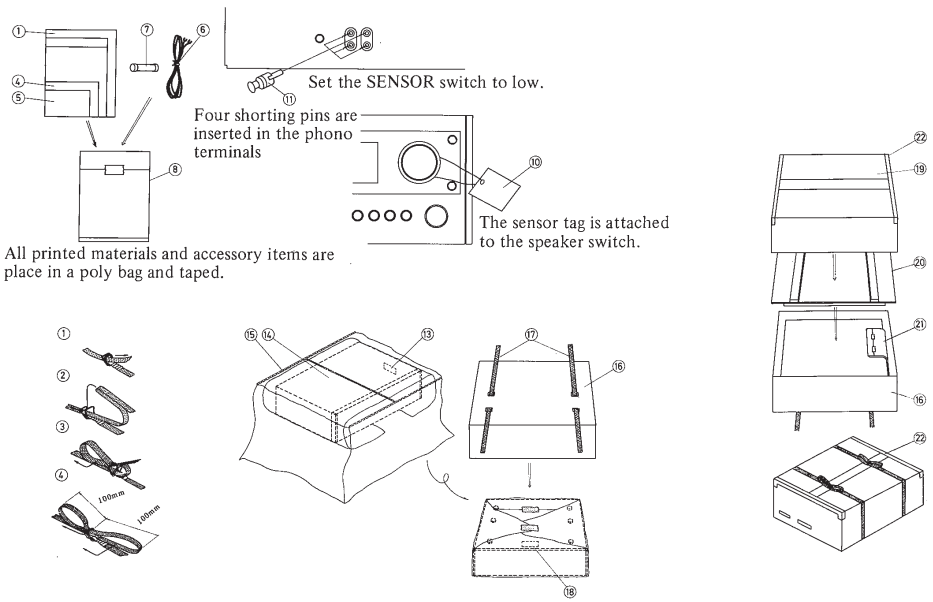
UNIVERSAL MODEL



PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION
1	29340207	Instruction Manaul
4	29365001-1	Warranty Card (Only German Model)
5	292017-2	Silicon Cloth
6	29064	5059-01 FM Antenna
7	252020	5A-T Fuse
8	29100006A	Poly Bag
10	29355045	Sensor Tag
11	250153	PO-107 Shorting Pin
12	290076	AC Cord Wrapper
13	282969	Caution Card A
14	29095003	670x1600mm Sheet
15	29100029	Poly Bag
16	29090223	Pad, Bottom
17	29112001	Band
18	293041	Caution Card
19	29050138	Carton Box
20	29090224	Pad, Top
21		Accessory Bag Complete
22	260012	Adhesive Tape
23	253088	AS-VDE-1 (German Model)
	253086	AS-CEE-1 (Universal Model)

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