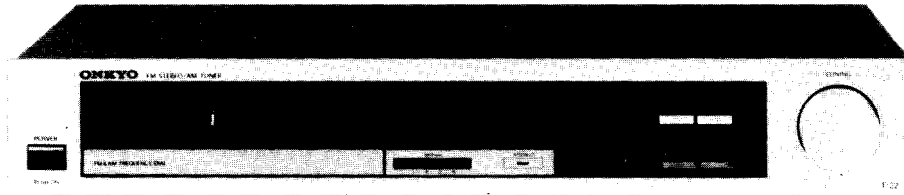


ONKYO® SERVICE MANUAL

FM STEREO/AM TUNER MODEL T-22



Silver model and black model

UD, UDN, BUD, BUDN	120V AC, 60 Hz
UG, UGV, BUG, BUGV	220V AC, 50 Hz
UW	120 or 220V AC, 50/60 Hz
UQA, UQB	240V AC, 50 Hz

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK $\triangle$ ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTS WHOSE PARTS NUMBERS APPEAR AS SHOWN IN THIS MANUAL.

MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

SPECIFICATIONS

— D model —

FM section

Tuning Range:	88 — 108 MHz
Usable Sensitivity:	Mono: 11.2 dBf, 2 μ V Stereo: 17.2 dBf, 4 μ V
50 dB Quieting Sensitivity:	Mono: 17.2 dBf, 4.0 μ V Stereo: 39.2 dBf, 50 μ V
Capture Ratio:	1.5 dB
Image Rejection Ratio:	45 dB
IF Rejection Ratio:	80 dB
Signal-to-Noise Ratio:	Mono: 70 dB Stereo: 63 dB
Alternate Channel Att.:	55 dB IHF ($\pm$ 400 kHz)
AM Suppression Ratio:	50 dB
Harmonic Distortion:	Mono: 0.15% Stereo: 0.3%
Stereo Separation:	40 dB at 1 kHz 30 dB at 100 — 10,000 Hz
Muting Level:	17.2 dBf, 4 μ V
Frequency Response:	40 — 15,000 Hz $\pm$ 1.5 dB

(Continued on next page)

ONKYO

AUDIO COMPONENTS

AM Section

Tuning Range:	530 — 1,620 kHz
Usable Sensitivity:	25 μ V
Image Rejection Ratio:	40 dB
IF Rejection Ratio:	30 dB
Signal-to-Noise Ratio:	40 dB
Harmonic Distortion:	0.8%

GENERAL

Output Voltage:	FM: 500 mV AM: 150 mV
Antennas:	FM: 300 ohms balanced and 75 ohms unbalanced AM: built-in loop antenna and external terminal
Semiconductors:	1 FET, 5 ICs, 2 transistors, 6 diodes, 7 LEDs
Dimensions:	418(W) $\times$ 73(H) $\times$ 286(D)mm 16-1/2" $\times$ 2-7/8" $\times$ 11-1/4"
Weight:	3.1 kg (6.8 lbs.)

— Other Models —**FM Section**

Tuning Range:	87.5 — 108 MHz
Usable Sensitivity:	Mono: 2 μ V, 11.2 dBf IHF 0.9 μ V (S/N 26 dB, 40 kHz, Devi.) 75 ohm DIN Stereo: 4 μ V, 17.2 dBf IHF 25 μ V (S/N 46 dB, 40 kHz Devi.) 75 ohm DIN
50 dB Quieting Sensitivity:	Mono: 4.0 μ V, 17.2 dBf Stereo: 50 μ V, 39.2 dBf
Capture Ratio:	1.5 dB

Image Rejection Ratio:	45 dB
IF Rejection Ratio:	80 dB
Signal-to-Noise Ratio:	Mono: 70 dB Stereo: 63 dB
Selectivity:	50 dB (DIN) ($\pm$ 300 kHz, 40 kHz Devi.)
AM Suppression Ratio:	50 dB
Harmonic Distortion:	Mono: 0.15% Stereo: 0.3%
Stereo Separation:	40 — 15,000 Hz $\pm$ 1.5 dB
Stereo Separation:	40 dB at 1 kHz
Frequency Response:	30 dB at 100—10,000 Hz 40—15,000 Hz $\pm$ 1.5 dB

AM Section

Tuning Range:	525 — 1620 kHz
Usable Sensitivity:	25 μ V
Image Rejection Ratio:	40 dB
IF Rejection Ratio:	30 dB
Signal-to-Noise Ratio:	40 dB
Harmonic Distortion:	0.8%

GENERAL

Output Voltage:	FM: 600 mV AM: 150 mV
Antennas:	FM: 300 ohms balanced and 75 ohms unbalanced. AM: built-in loop antenna and external terminal
Semiconductors:	3 FET, 5 ICs, 4 transistors, 6 diodes, 7 LEDs.
Dimensions:	418(W) $\times$ 73(H) $\times$ 286(D)mm 16-1/2" $\times$ 2-7/8" $\times$ 11-1/4"
Weight:	3.1 kg (6.8 lbs.)

Specifications and features are subject to change without notice.

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SERVICE PROCEDURES

1. Replacing the lamps

This unit uses the lamps listed below.

circuit no.	parts no.	description
PL901	210119	PL6.3V50mA W2.5 Pointer indicator
PL902	210064A	PL6.3V, 250mA, Dial illumination

2. Insulation resistance measurement

— D/W models —

Connect the insulating-resistance tester between the plug of power supply cable and the nickel screw of left side on the antenna terminal.

— G/Q models —

Connect the insulating-resistance tester between the plug of power supply cable and chassis.

Specifications

D model 500V, 3.3 ± 0.3 Mohm

Other models 500V, more than 10 Mohm

3. Change of De-emphasis

W models are equipped with a 50 μ sec-75 μ sec selector switch. This switch is located on the bottom board. This switch is set to 50 μ sec at the factory, but may have to be reset to 75 μ sec depending on the area where the unit is used.

Europe: 50 μ sec

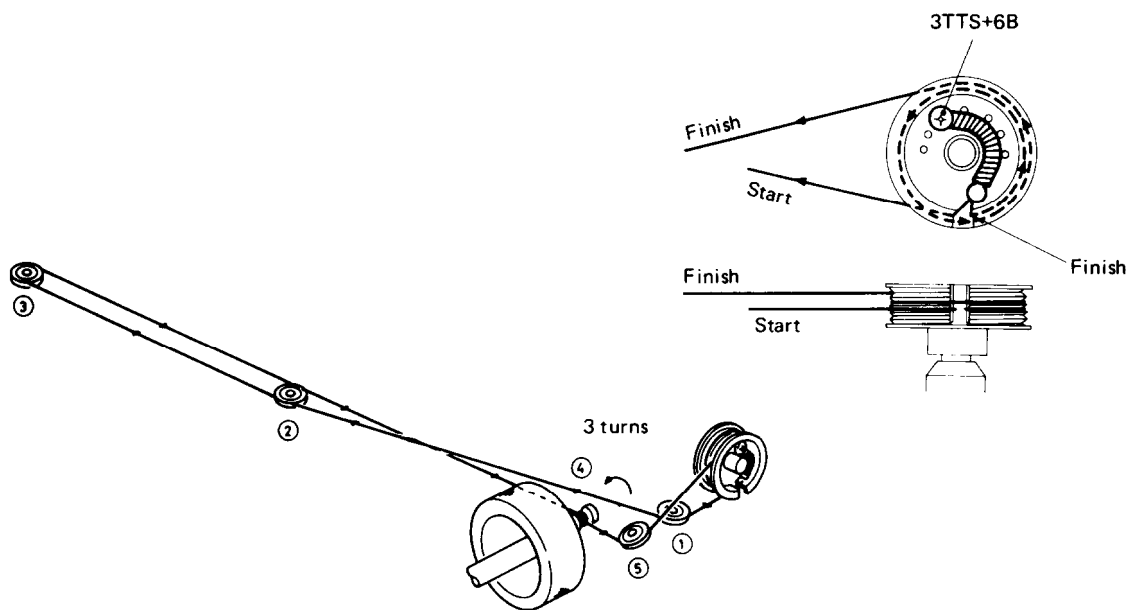
U.S.A.: 75 μ sec

4. Change of voltage

W models are equipped with a voltage selector to conform with local power supplies. This switch is located on the back panel. Be sure to set this switch to match the voltage of the power supply in your area before turning the power switch on.

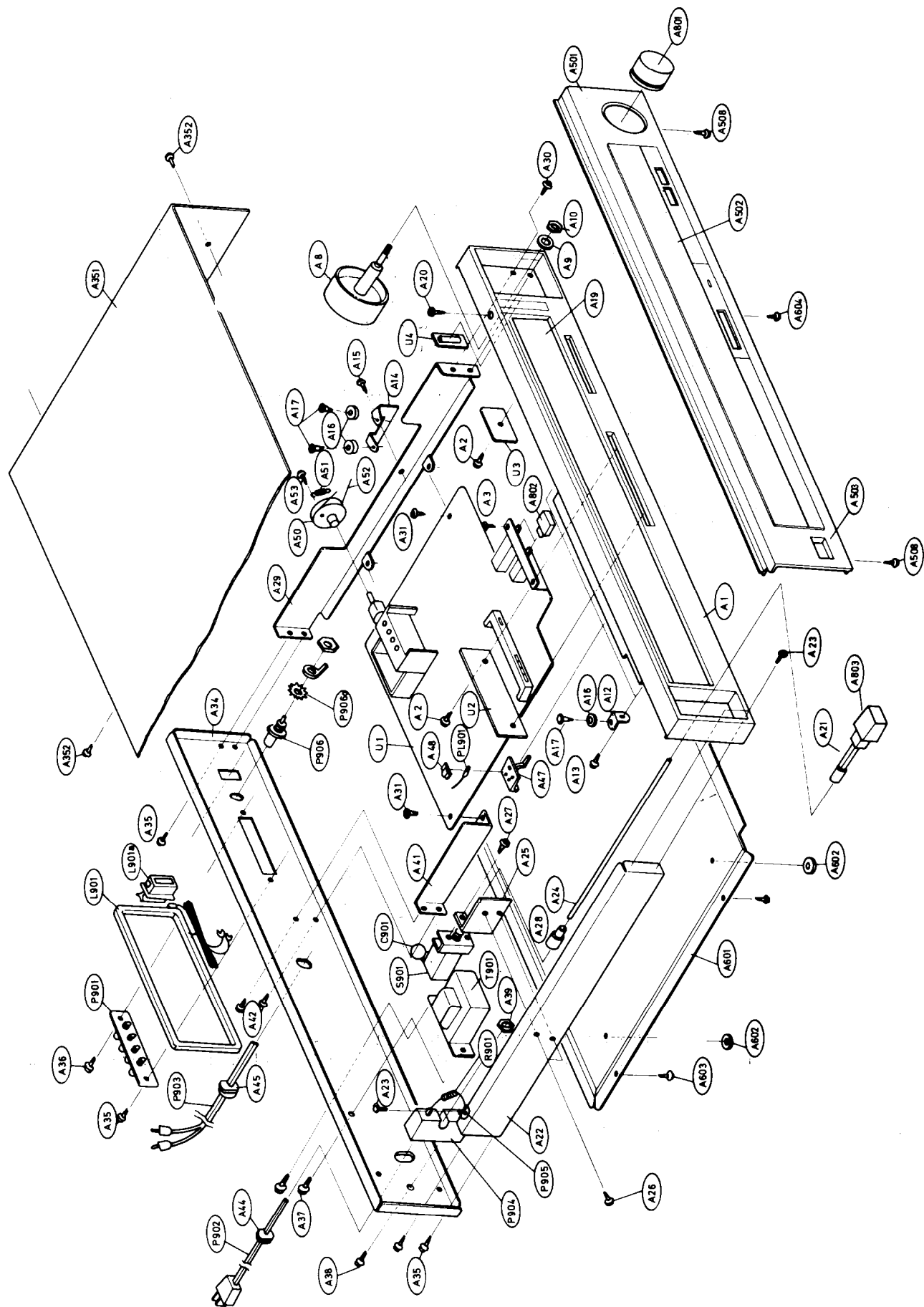
This switch is set to 220V at the factory. Voltage is changed by sliding the groove in the switch with the screwdriver to the right or left. Confirm that the switch has been moved all the way to the right or left before turning the power switch on.

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 counter clockwise.
3. Thread the dial cord to ⑤.
4. Wind the dial cord 1-1/2 turns around the dial drum.

EXPLODED VIEW



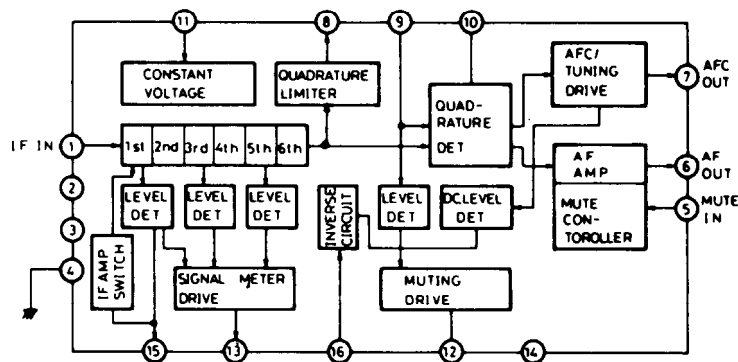
PARTS LIST

REF. NO.	PARTS NO.	DESCRIPTION	REF. NO.	PARTS NO.	DESCRIPTION	REF. NO.	PARTS NO.	DESCRIPTION
A1	27110199	Front bracket	A39	863430	N-3F-N (BC), Nut	P903	2010039	PN-B, Output cable
A2	833430080	3TTP+8P (BC), Tapping screw	A41	27140444	Bracket, pc board	△ P904	25108010	LG-2C, Terminal AC
A3	831430088	3TTW+8B (BC), Tapping screw	A42	834430068	3TTS+6B (BC), Tapping screw	△ P905	223004-1	Terminal, solid resistor (D)
A6	27262203	Plate for U4	△ A44	270025	SR-3P-4, Strainrelief (D)	P906	25045088	Connector, antenna, 75ohm (G)
A8	27205026A	Drive shaft	△	270280	SR-4K-4, Strainrelief (G/W/Q)		870057	M10B, Toothed washer (G)
A9	87619014	W9×14F, Washer	A45	270025	SR-3P-4, Strainrelief	△ R901	431523355	3.3Mohm, 1/2W, Resistor, solid (D)
A10	8631901	N-9F, Nut	A47	28165060A	Pointer ass'y	△ S901	25035135	NPS-111-L100P, Power switch (D)
A12	27140501	Bracket, dial pulley	A48	27200055	Cover, lamp	△	25035322	NPS-111-L286P, Power switch (G/W/Q)
A13	833430080	3TTP+8B (BC), Tapping screw	A50	27200029	Drum, dial	△ S902	25065123	NSS-1258P, Voltage selector switch (W)
A14	27140403	Bracket, dial pulley	A51	27180044	Spring, dial drum			
A15	838430068	3TTB+6B (BC), Tapping screw	A52	273903	Stringing			
A16	27185002B	DP-16, Dial pulley	A53	834430068	3TTS+6B (BC), Tapping screw	△ T901	230506A	NPT-723D, Power transformer (D)
A17	801147A	Special screw for dial pulley	A351	28184154A	Top cover	△	230507	NPT-723G, Power transformer (G)
A19	28130191	Clear plate		28184200	Top cover (B)	△	230508	NPT-723DG, Power transformer (W)
A20	833130100	3TTP+10P, Tapping screw	A352	834430068	3TTS+6B(BC), Tapping screw	△	230514	NPT-723Q, Power transformer (Q)
A21	27273016	Joint	A501	13038121	Front panel ass'y	△ U1	13038501	NARF-1701, FM/AM tuner pc board ass'y (D)
A22	27115090B	Side bracket L		13018121	Front panel ass'y (B)			
A23	834430068	3TTS+6B (BC), Tapping screw (D)	A502	28191192	Clear place		13044501A	NARF-1701a, FM/AM tuner pc board ass'y (G/Q)
A24	27260030	Shaft		28191193	Clear plate (B)		13040501B	NARF-1701b, FM/AM tuner pc board ass'y (W)
A25	27140789	Bracket, power	A503	27267215	Guide, power (B)	U2	13038502	NADIS-1702, Display circuit pc board ass'y
A26	838430068	3TTB+6B (BC), Tapping screw		27267272	3TTP+8P (BC), Tapping screw	U3	13038503	NALED-1703, LED pc board ass'y
A27	82143006	3P+6FN (BC), Pan head screw	A508	833430080	3TTP+8P (BC), Tapping screw	U4	13038504	NAPL-1704, Dial plate illumination lamp pc board ass'y
A28	28320135	Connector	A601	27170093B	Bottom board			
A29	27115078B	Side bracket R		27170158	Bottom board (W)			
A30	834430068	3TTS+6B (BC), Tapping screw	A602	27175011C	Leg			
A31	831430088	3TTW+8B (BC), Tapping screw	A603	834430068	3TTS+6B (BC), Tapping screw			
A34	27120506	Back panel (D)	A604	833430080	3TTP+8P (BC), Tapping screw			
	27120507	Back panel (G)	A801	28320542	Knob, tuning			
	27120508	Back panel (W)	A802	28320896	Knob, tuning (B)			
	27120538	Back panel (Q)		28320853	Knob, push			
	27120527	Back panel (Gt)		28321185A	Knob, push (B)			
A35	834430068	3TTS+6B (BC), Tapping screw	A803	28320852	Knob, power			
A36	834230108	3TTS+10B (Ni), Tapping screw (D/W/Q)		28321160	Knob, power (B)	Note:		
			△ C901	3500065A	0.01μF, AC400/125V, Capacitor IS	(D):	Only 120V model	
			△ C901a	27300601	Cover, capacitor	(G):	Only 220V model	
A37	831430088	3TTW+8B (BC), Tapping screw	L901	232085	NMA-3034, AM loop antenna	(W):	Only 120/220V model	
	834440108	4TTS+10B (BC), Tapping screw (G/W/Q)	L901a	27190105	Antenna holder	(Q):	Only 240V model	
			PL901	210119	50mA, 6.3V, Lamp, pointer	(QA):	Only Australian model	
A38	82143006	3P+6FN (BC), Tapping screw	P901	25060035	NTM-4PRMC06, Terminal, antenna	(QB):	Only British model	
			△ P902	253099A	AS-UC-3, Power supply cable (D)	(GI):	Only Italian model	
			△	253083	AS-CLE, Power supply cable (G/W)	(B):	Only black model	
			△	253077-1	Power supply cable (QA)			
			△	728320 or 728328	Power supply cable (QB)			

NOTE: THE COMPONENTS IDENTIFIED BY MARK △ ARE CRITICAL FOR LISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PARTS NUMBER SPECIFIED.

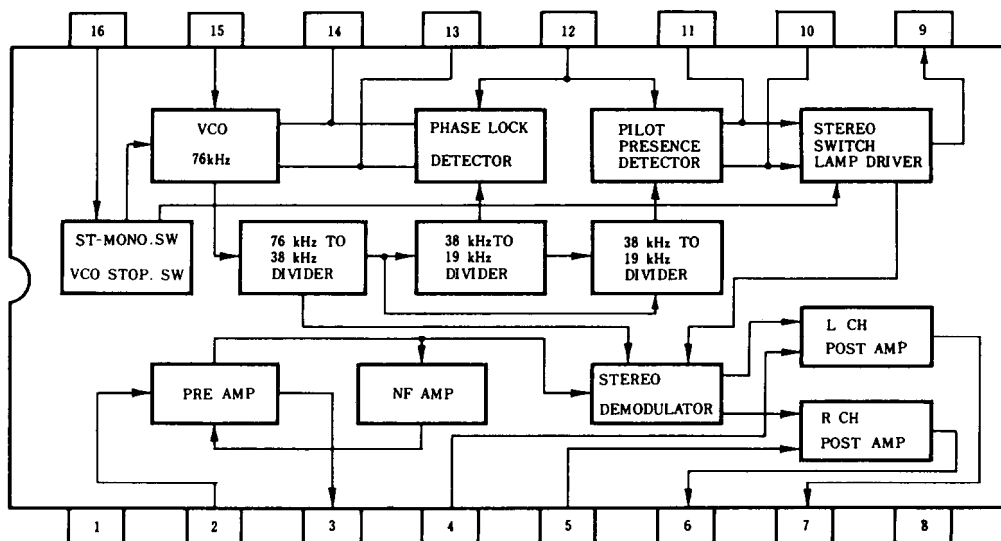
BLOCK DIAGRAM OF IC

μ PC1167C2 (FM IF System)

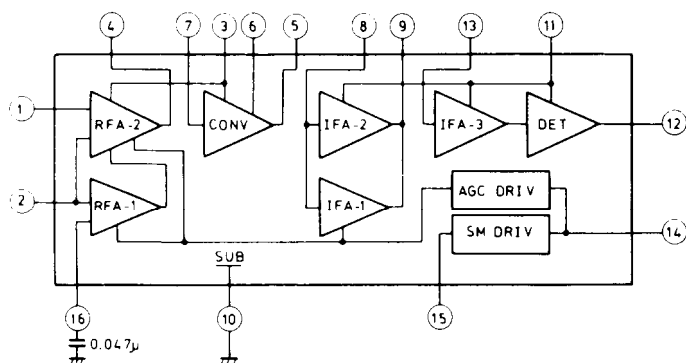


1. IF signal input
2. IF amplifier switch input
H level: Off
5. Muting switch input
6. Composite signal output
7. AFC output
8. IF amplifier output
9. 10.7MHz input
10. Reference voltage
11. Power supply
12. Muting output
Tuned: L level
13. Signal strength output
15. AGC output
16. Muting level

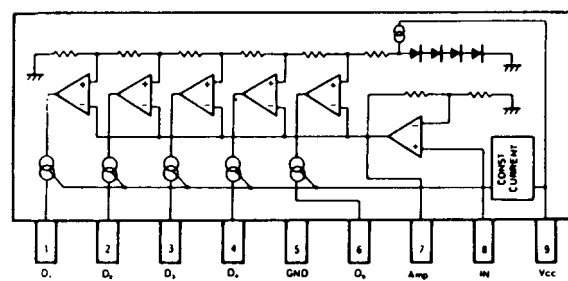
μ PC1161C3 (Stereo decoder)



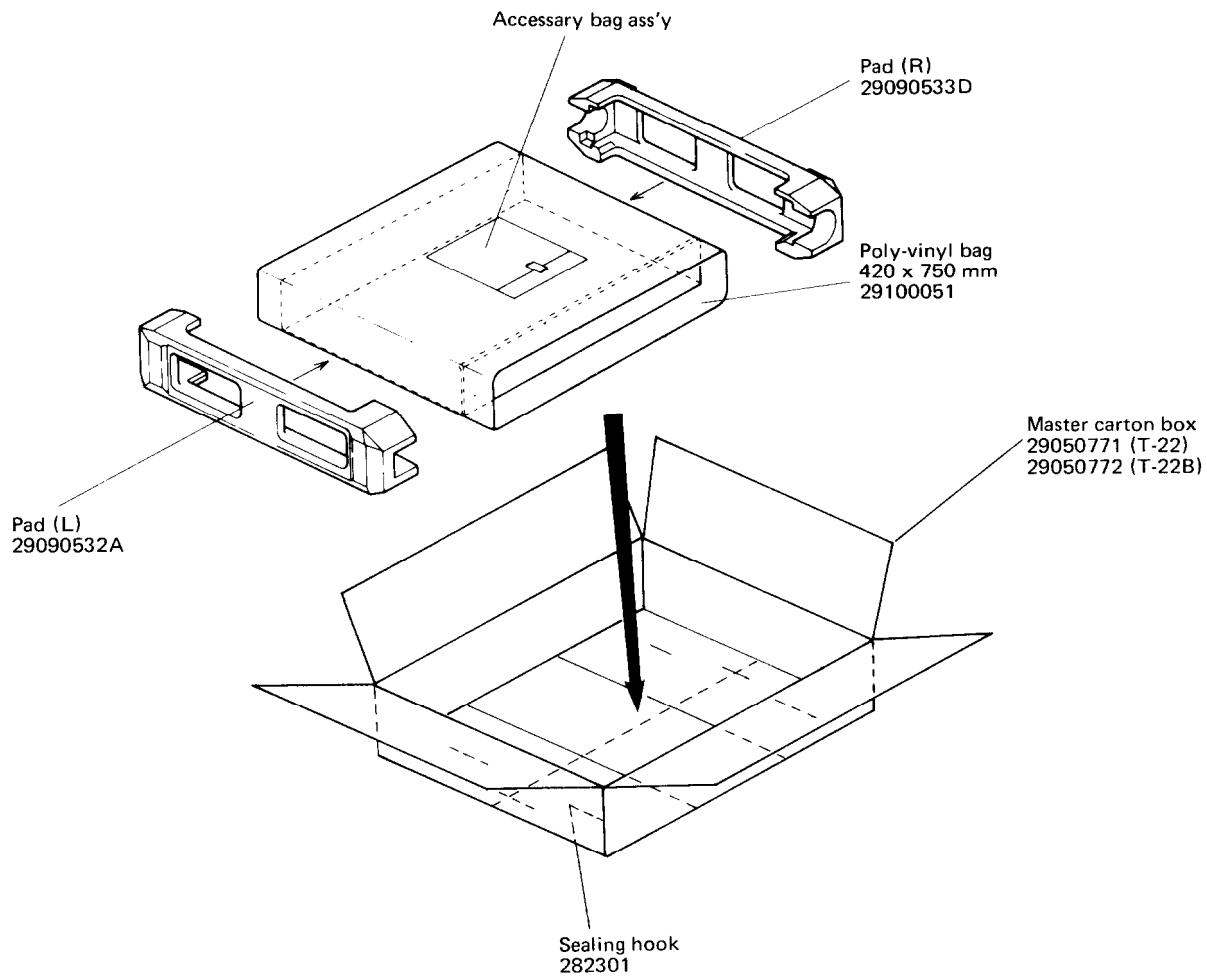
HA1197 (AM radio system)



LB1403 (Signal indicator drive)



PACKING VIEW



Accessory bag ass'y					
Model	U.S.A.	120V	West Germany	220V/240V	120/220V
Instruction manual	29340699	29340699	29340700	29340700	29340700
FM antenna	292064A	292064A	292064A	292064A	292064A
Warranty card	29365006-5	—	29365005-3A	—	—
Service station list	29358002	—	29358004	—	—
Conversion plug	—	—	—	—	25055040
Poly-vinyl bag	29100006A	29100006A	29100006A	29100006A	29100006A

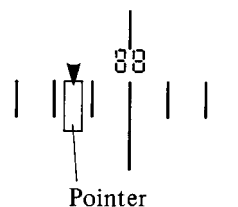
ADJUSTMENT PROCEDURES

INSTRUMENTS REQUIRED

1. AM sweep generator
2. AM/FM signal generator
3. AC VTVM
4. Oscilloscope
5. Monitor scope
6. Distortion analyzer
7. Frequency counter

GENERAL ALIGNMENT CONDITIONS

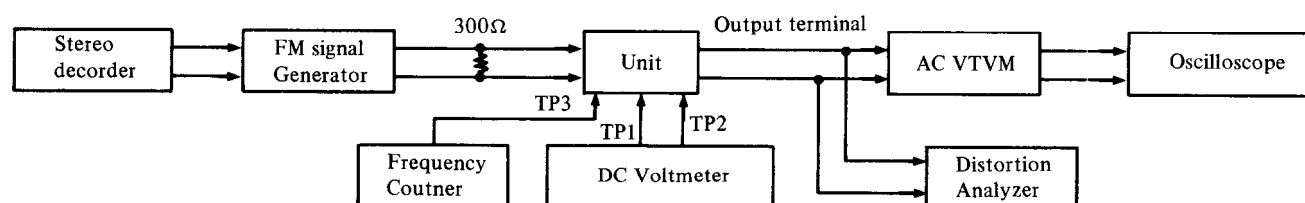
1. Signal input should be kept as low as possible.
2. Standard modulation is 400Hz 30%, (AM), 1kHz 75kHz devi. (FM MONO), pilot 6.75kHz devi. sub and main 68.25kHz devi. (FM STEREO)



(1) Attachment of dial pointer

1. Close the variable capacitor completely.
2. Set the radio dial pointer to zero point on dial scale and secure the stringing and pointer with the bond.

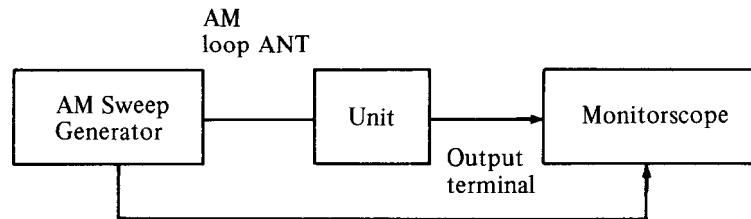
(2) FM ALIGNMENT



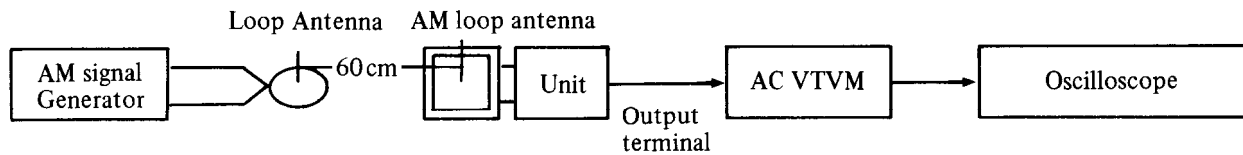
Item	Step	SG output	Stereo decoder	Dial position	Adjustment point	Output indicator	Adjust for	Remarks
IF	1	No signal			L101 primary	DC voltmeter	0V	Repeat the steps 1 and 2 until no further adjustment is necessary.
	2	98MHz, 65dBf 1kHz, 100% mod.		98MHz	L101 secondary	Distortion analyzer	Minimum	
RF		106MHz 1kHz 100% mod.		106MHz	TC1 TC3 TC5	AC voltmeter	Maximum	
VC0		98MHz, 65dBf 1kHz 100% mod.		98MHz	R217	Frequency counter	19kHz±19Hz	
MPX	1	98MHz, 65dBf Ext. mod.	L	98MHz	R208	AC voltmeter	Minimum (R ch.)	Maximum and same separation at the channels left and right.
	2	98MHz, 65dBf Ext. mod.	R	98MHz	R208	AC voltmeter	Minimum (L ch.)	
Distortion		98MHz, 65 dBf Ext. mod.	L + R	98MHz	T	Distortion analyzer	Minimum	
Muting level	1	98MHz, 18dBf		98MHz	R117	Oscilloscope	Signal	
	2	98MHz, 17dBf		98MHz	R117	Oscilloscope	No signal	

(3) AM IF ALIGNMENT

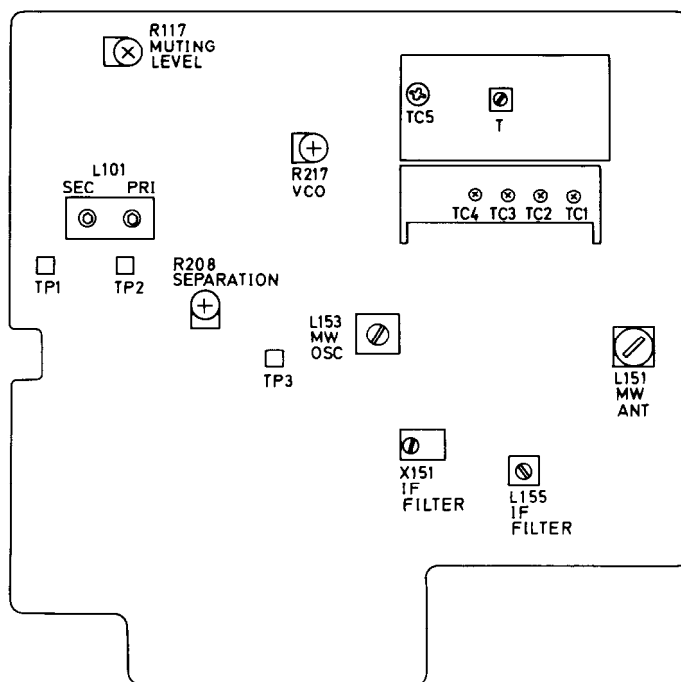
1. Set selector switch to AM.
2. Set radio dial to quiet point.



Set signal	Adjust	Monitor scope	Remarks
455kHz	X151, L155	Maximum Symmetrical Response	Usually not necessary to adjust

(4) AM RF ALIGNMENT

Step	Set Signal	Set Radio Dial	Adjust	VTVM reading	Remarks
1	515kHz 400Hz 30%	Lower end (515kHz)	L153	Maximum	Repeat steps 1 and 2 until no further adjustment is necessary
2	1680kHz 400Hz 30%	Upper end (1680kHz)	TC4	Maximum	
3	600kHz 400Hz 30%	600kHz	L151	Maximum	Repeat steps 3 and 4 until no further adjustment is necessary
4	1400kHz 400Hz 30%	1400kHz	TC2	Maximum	



PRINTED CIRCUIT BOARD-PARTS LIST

FM/AM TUNER PC BOARD (NARF-1701/a/b)

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	Front end	
	240049	FF711U (D)
	240050	FF711E (G/W/Q)
	ICs	
Q103	222608	μ PC1167C2, FM IF system
Q151	222626	HA-1197, AM radio system
Q201	222678	μ PC1161C3, Stereo decoder
	Transistors	
Q101	2210823	2SC1675 (L-1)
Q102	2210823	2SC1675 (L-1) (G/W/Q)
Q202	2212304	2SK381 (D) (G/W/Q)
Q301	2211225	2SC1815 (GR) (G/W/Q)
Q901	2201034 or 2201035	2SD325 (D) or 2SD325 (E)
	Diodes	
D101, D151	223105,	1S1555,
D201	223145 or 223133	1S2076TD or DS442X
D152	4000068	VD1222
D901	223862	WL-01
D902	224113	GZA12-Z
	Transformers	
L101	233290	NFIF-6044
L155	232095	NMIF-6025
	Coils	
L102	233105 or 233024	NCH-1005 or NCCH-1501
L151	232086	NMA3035
L153	232073	NMO-2008
L201	233236	NMC-6027 (G/W/Q)
L202, L203	233294	NMC-5040 (G/W/Q)
	Ceramic filters	
X101, X103	3010057 or 3010003	SFE-10.7MA5-Z or SFE-10.7MA (D)
X101-X103	3010071	SFE-10.7MA5 (RED) (G/W/Q)
X151	3010075	SFL450B3
	Notch filters	
Z201, Z202	3020016	B3xN4123-32N (D)
	Capacitors	
C106, C109	352780339	3.3 μ F, 50V, Elect.
C111	352780109	1 μ F, 50V, Elect.
C113	352741009	10 μ F, 16V, Elect.
C153	370133614	360pF $\pm$ 5%, 100V, APS
C163	352750479	4.7 μ F, 25V, Elect.
C164	352780339	3.3 μ F, 50V, Elect.
C166	352744709	47 μ F, 16V, Elect.
C167	352784799	0.47 μ F, 50V, Elect.
C170, C171	352741009	10 μ F, 16V, Elect.
C201	352750479	4.7 μ F, 25V, Elect.
C202, C203	352741009	10 μ F, 16V, Elect.
C208, C209	352780109	1 μ F, 50V, Elect. (G/W/Q)
C208, C209	352782299	0.22 μ F, 50V, Elect. (D)
C212	352744719	470 μ F, 16V, Elect.
C215	370134714	470pF $\pm$ 5%, 100V, APS
C216	352780109	1 μ F, 50V, Elect.
C217	352780339	3.3 μ F, 50V, Elect.
C218	352782299	0.22 μ F, 50V, Elect.
C223	352784799	0.47 μ F, 50V, Elect.

CIRCUIT NO.	PARTS NO.	DESCRIPTION
C301	352750479	4.7 μ F, 25V, Elect. (G/W/Q)
C903	352751029	1,000 μ F, 25V, Elect.
C904	352754709	47 μ F, 25V, Elect.
C905, C906	352742219	200 μ F, 16V, Elect.
	Resistors	
R117	5215046	NO8HR50KBC, Semi-fixed
R208	5215048	NO8HR200KBC, Semi-fixed
R217	5215044	NO8HR5KBC, Semi-fixed
R904	441526804	68ohm, 1/2W, Metal oxide film
	Switches	
S1, S2	25035350	NPS-122-142-L313, Selector/Mode
S5	250142	NSS-2225, De-emphasis (W)
	Bracket	
	27140703	Switch
	Screws	
	82143006	3P+6FN (BC), Pan head

DISPLAY CIRCUIT PC BOARD (NADIS-1702)

CIRCUIT NO.	PARTS NO.	DESCRIPTION
	IC	
Q501	222666 or 222670	LB1403 or BA6124, Signal strength indicator drive
	LEDs	
D501-D504	225048	SLP-252B-04
D505	225046	SLP-151B
	Capacitor	
C501	352741009	10 μ F, 16V, Elect.
	Holder	
	27190218	LED

LED PC BOARD (NALED-1703)

CIRCUIT NO.	PARTS NO.	DESCRIPTION
D506, D507	225047	SLP-251B, LEDs

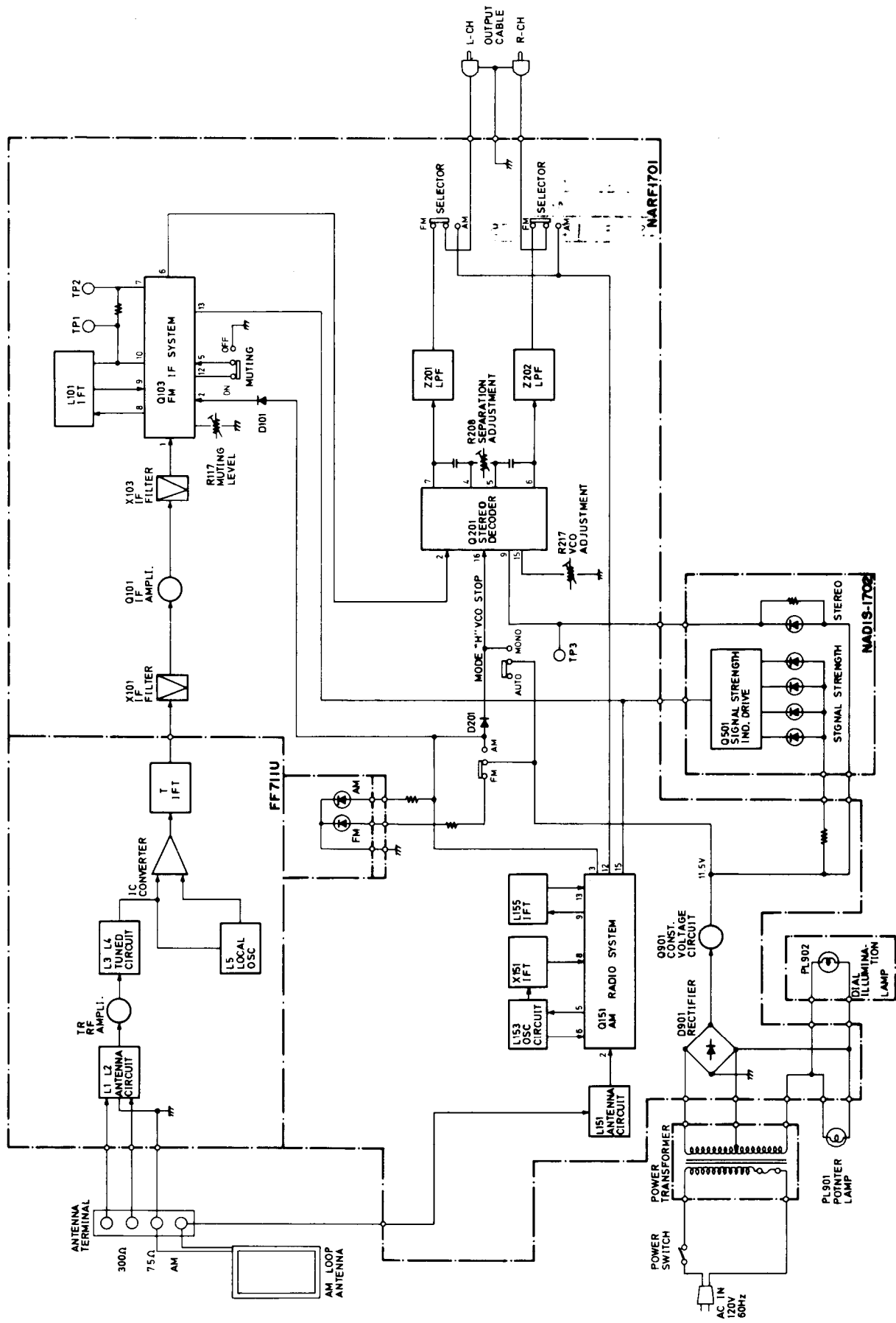
DIAL PLATE ILLUMINATION LAMP PC BOARD (NAPL-1704)

CIRCUIT NO.	PARTS NO.	DESCRIPTION
PL902	210064A	250mA, 6.3V, Lamp

Note: (D): Only 120V model
(G): Only 220V model
(W): Only 120/220V model
(Q): Only 240V model

BLOCK DIAGRAM

— 120V MODEL —



BLOCK DIAGRAM

— OTHER MODELS —

