

ONKYO SERVICE MANUAL

COMPUTER CONTROLLED

TUNER AMPLIFIER

MODEL TX-65



Silver and black models

UD, UDN, BUD, BUDN	120V AC, 60Hz
UW, BUW	120 or 220V AC, 50/60Hz

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

Amplifier Section

Power output:	60 watts per channel, min. RMS, at 8 ohms, both channels driven, from 20Hz to 20kHz, with no more than 0.025% THD.
Total Harmonic Distortion:	0.025% at rated power
IM Distortion:	0.025% at rated power
Damping Factor:	50 at 8 ohms
Frequency Response:	20 – 30,000 Hz ± 1 dB
RIAA Deviation:	20 – 20,000 Hz ± 0.5 dB
Sensitivity and Impedance:	Phono: 2.5mV/50 kohms Tape Play: 150mV/50 kohms Tape Rec: 150mV/3.3 kohms (phono)
Phono Overload:	180mV RMS at 1 kHz, 0.025% THD
Signal-to-Noise Ratio:	Phono: 93dB (at 10mV input, A weighted) 76dB (IHF A-202) Tape: 98dB (A weighted) 80dB (IHF A-202)
Tone Controls:	Bass: ± 8 dB at 70Hz Treble: ± 8 dB at 20kHz
Loudness (–30dB):	+6dB at 70Hz, +5dB at 20kHz
Subsonic:	15Hz (–6dB/oct.)

Tuner Section

FM:

Tuning Range:	87.9 – 107.9MHz (200kHz steps)
Usable Sensitivity:	Mono: 10.8dBf, 1.9 μ V Stereo: 17.2dBf, 4.0 μ V
50dB Quieting Sensitivity:	Mono: 17.2dBf, 4.0 μ V Stereo: 37.2dBf, 40 μ V
Capture Ratio:	1.5dB
Image Rejection Ratio:	70dB
IF Rejection Ratio:	90dB
Signal-to-Noise Ratio:	Mono: 73dB Stereo: 67dB
Alternate Channel Attenuation:	70dB (IF Narrow)
AM Suppression Ratio:	50dB
Harmonic Distortion:	Mono: 0.10% (IF Wide) Stereo: 0.20% (IF Wide)
Frequency Response:	30 – 15,000Hz ± 1.5 dB
Stereo Separation:	40dB at 1kHz 30dB at 100 – 10,000Hz
Tuning Level (Hi/Lo):	27.2dBf, 13 μ V/17.2dBf, 4 μ V
Stereo Threshold:	17.2dBf, 4 μ V (Lo)

AM:

Tuning Range:	530 – 1620kHz (10kHz steps)
Usable Sensitivity:	30 μ V
Image Rejection Ratio:	40dB
IF Rejection Ratio:	40dB
Signal-to-Noise Ratio:	40dB
Harmonic Distortion:	0.8%

GENERAL

Power Supply:	AC 120V, 60Hz
Semiconductors:	FETs: 14 TRs: 73 ICs: 21 Diodes: 130
Dimensions (WxHxD):	450 x 140 x 460mm (17 3/4" x 5 1/2" x 18 1/8")
Weight:	11.5kg., 25.4lbs.

Specifications and features are subject to change without notice.

SERVICE PROCEDURES

1. Replacing the fuses

For continued protection against fire hazard, replace only with same type and same rating fuse.

120 model		
Circuit No.	Part No.	Description
F921	252051	6A (ST-6), Primary fuse
Universal model		
F921	252051	6A (ST-6), Primary fuse for 120V
F922	252076	3.15A-SE-EAK, Primary fuse for 220V

2. Replacing the lamps

This unit uses the lamp listed below.

Circuit no.	Parts no.	Description
PL921	210064A	PL 6.3V, 250mA, Dial plate illumination

3. Safety-check out (D model)

After correcting the original service problem, perform the following safety check before releasing the set to the customer:

Connect the insulating-resistance tester between the plug of power supply cable and nickel screw on the back panel.

Specification: $3.3M\Omega \pm 10\%$ at 500V

4. Change of De-emphasis

W models are equipped with a $50\mu\text{sec}$ - $75\mu\text{sec}$ selector switch. This switch is located on the back panel. This switch is set to $50\mu\text{sec}$ at the factory, but may have to be reset to $75\mu\text{sec}$ depending on the area where the unit is used.

Europe: $50\mu\text{sec}$

U.S.A.: $75\mu\text{sec}$

5. 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.

6. Memory Preservation

This unit does not require memory preservation batteries. A built-in memory power back-up system preserves contents of the memory during power failures and even when the unit is unplugged. The unit must be plugged in and the power switch turned on and off once in order to charge the back-up system. Note that since this is not a permanent memory, the power switch must be turned on and off a few times each month to keep the back-up system operable. The period of time during which memory contents are preserved after power has last been turned off varies depending on climate and the location and placement of the unit. On the average, memory contents are protected over a period of 3 to 4 weeks (a minimum of 2 weeks) after the last time power has been turned off. This period is shorter when the unit is exposed to very high humidity or used in an area with an extremely humid climate.

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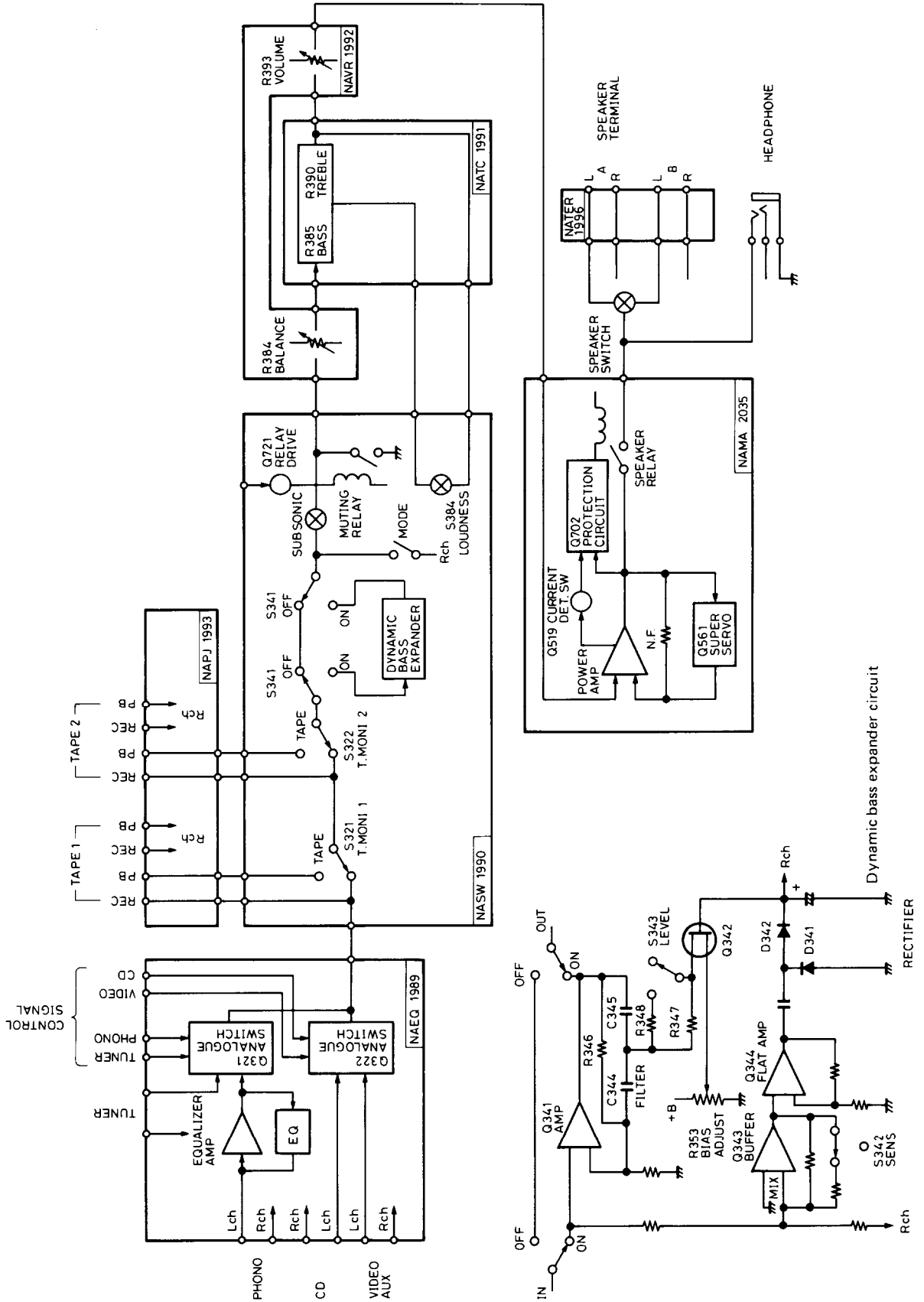
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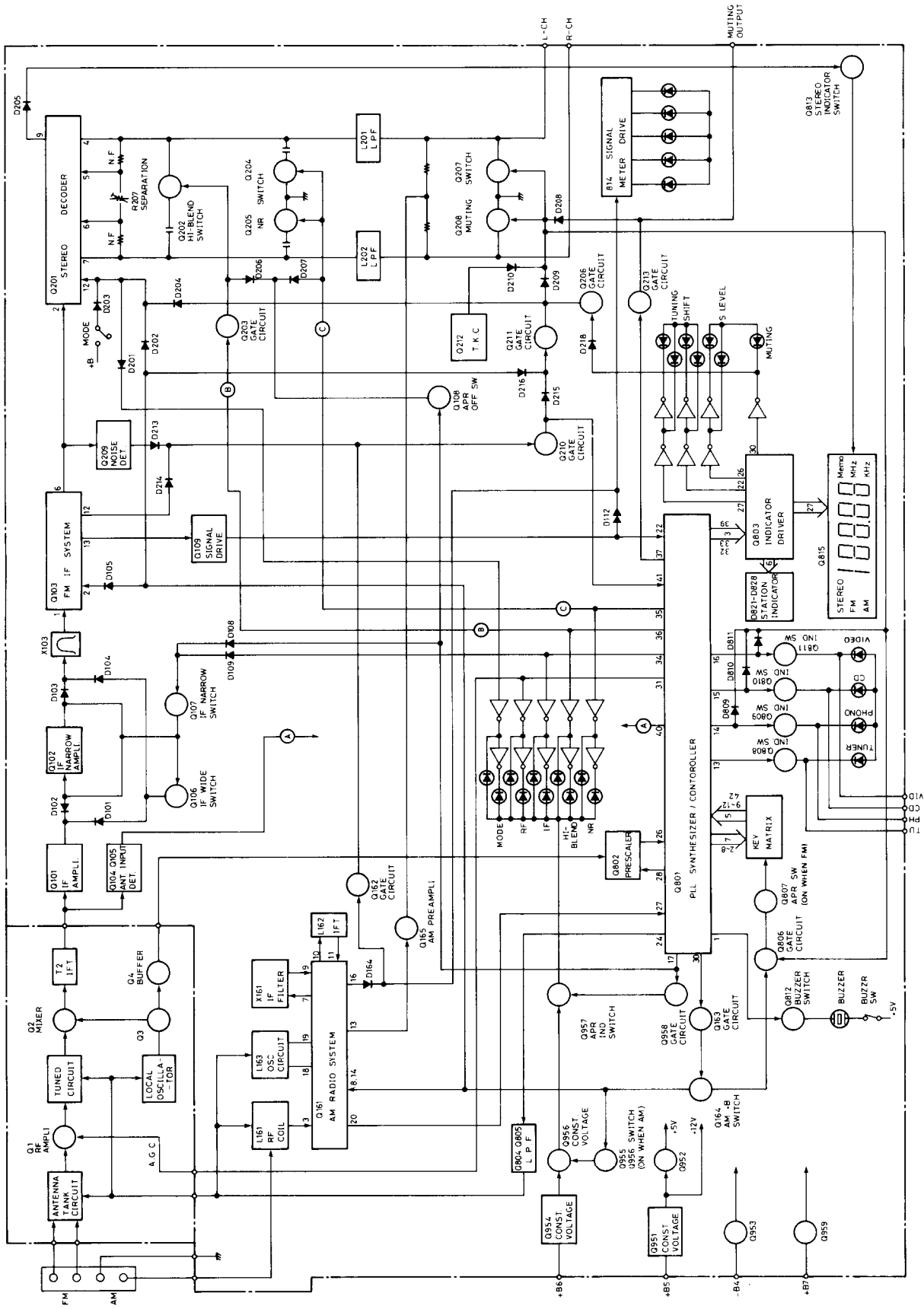
BLOCK DIAGRAM

— Amplifier section —



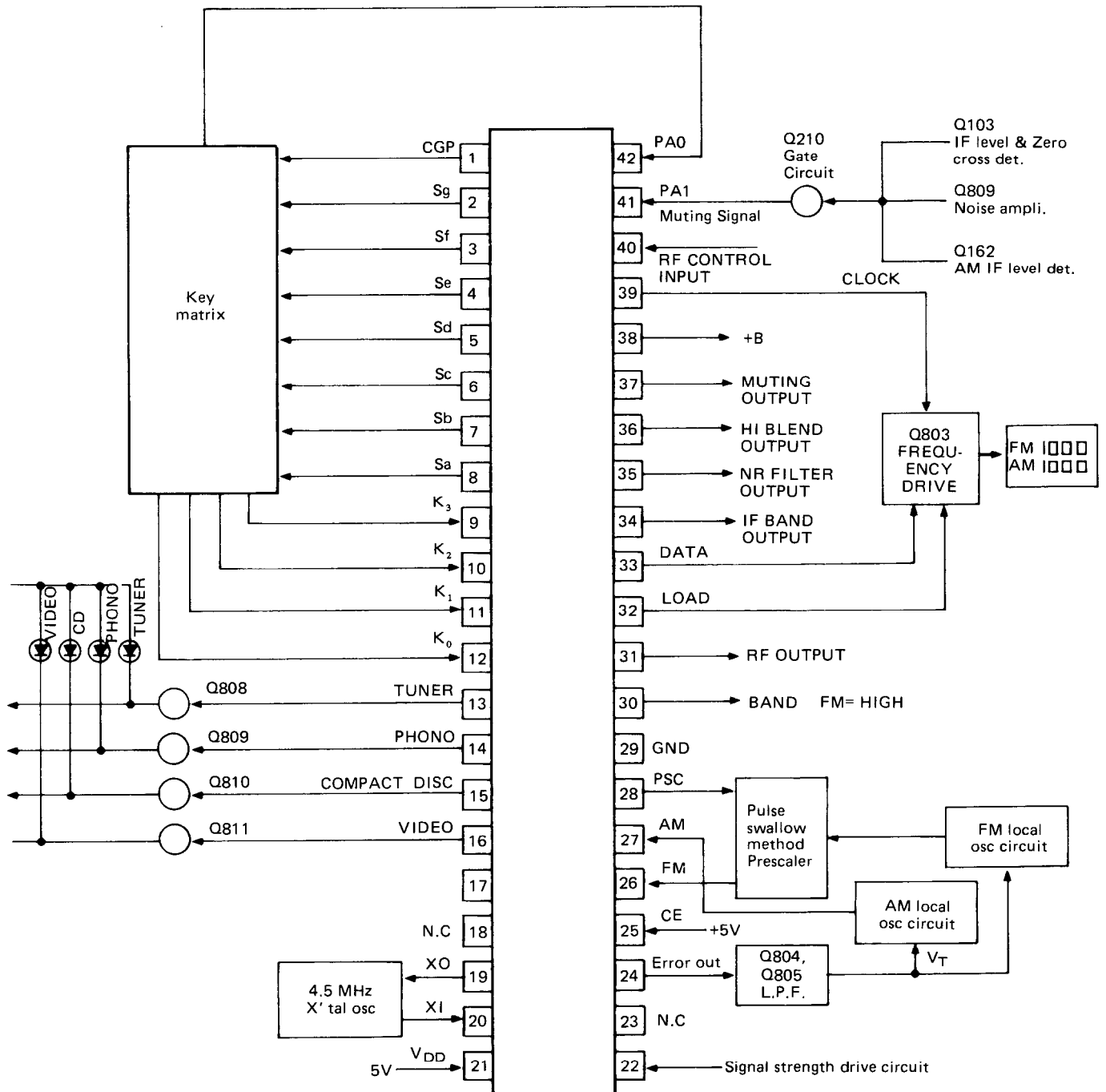
BLOCK DIAGRAM

- Tuner section -



BLOCK DIAGRAM OF IC

μ PD1712CU-712-513 (Synthesizer and controller)

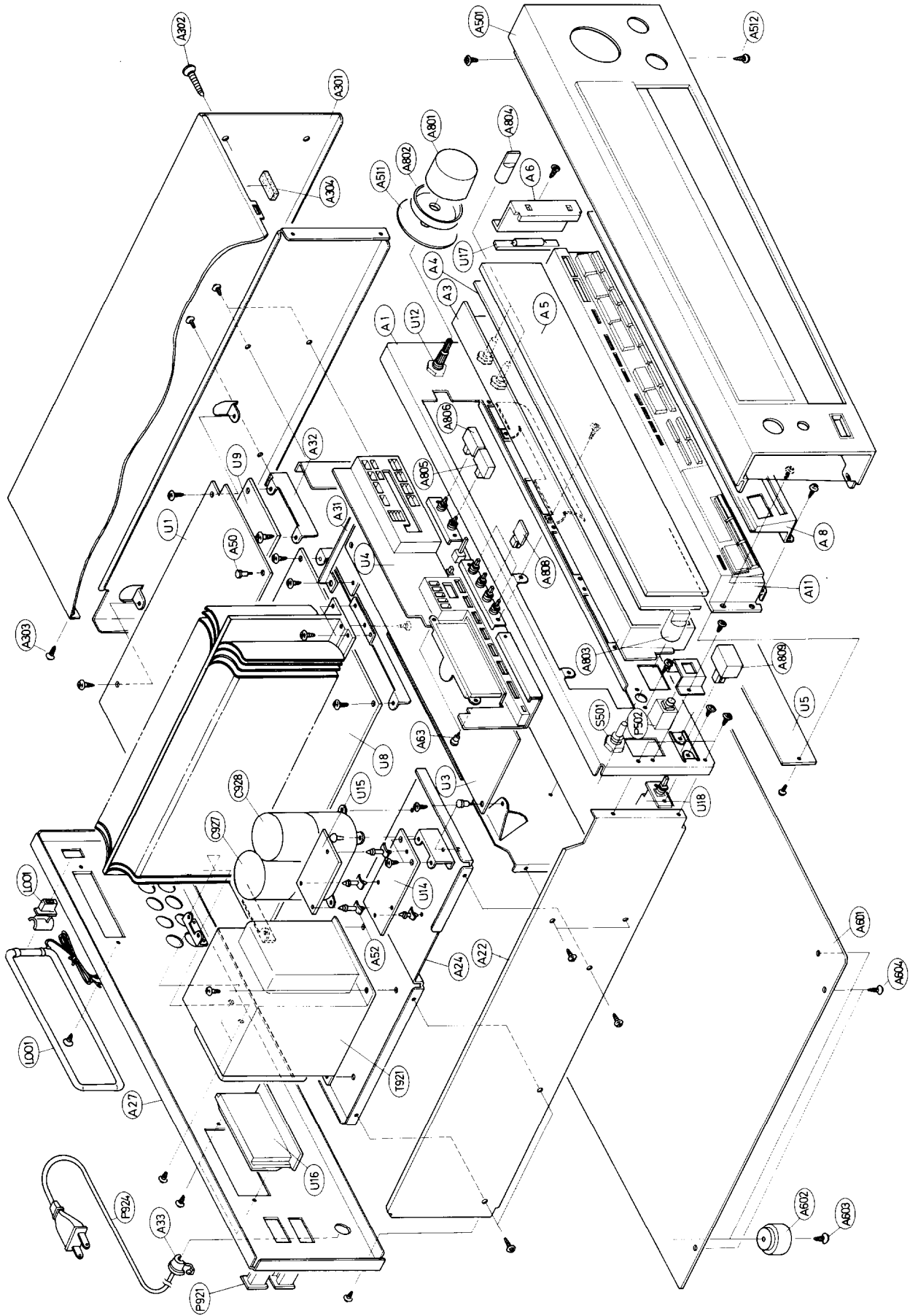


Matrix circuit

	PAD (42)	K3 (9)	K2 (10)	K1 (11)	K0 (12)
Sg (2)	MEMORY	UP	DOWN	AUTO/MANUAL	FM/AM
Sf (3)	DISPLAY	PROGRAM	AUTO MEMORY	PRESET SCAN	
Se (4)	M5/M15	M4/M14	M3/M13	M2/M12	M1/M11
Sd (5)	M10/M20	M9/M19	M8/M18	M7/M17	M6/M16
Sc (6)	DNR	HI-BLEND	IF	RF	MUTE LEVEL
Sb (7)	PHONO	TUNER	SIGNAL/FREQ	MUTING	MONO/STEREO
Sa (8)	TEST	TAPE 2	APR DEFEAT	VIDEO	COMPACT DISC
CGP (1)	BAND 2	BAND 1	BAND 0	PRESET	APR


1	CGP	Buzzer drive output and Key return signal source of diode matrix . Active high.
2	Sg	Key return signal source output terminals. Active high.
3	Sf	
4	Se	
5	Sd	
6	Sc	
7	Sb	
8	Sa	
9	K3	Terminals for input of the key return matrix and diode matrix.
10	K2	
11	K1	
12	K0	
13	D6	Tuner output. Active high.
14	D5	Phono output. Active high.
15	D4	Compact disc output. Active high.
16	D3	Video output. Active high.
17	D2	APR defeat output. Active high.
18	D1	Not used.
19	X0	Connect to the 4.5MHz crystal oscillator.
20	X1	
21	V _{DD}	Device power terminal; supplies 5V during normal operation and 3V from the super capacitor C804 for memory preservation.
22	AD	A/D converter input terminal.
23	E02	Charge pump output of the phase detector which constitutes the PLL. High level is output when the divided oscillation frequency is higher than the reference frequency. In the opposite case, Low level is output. Floating occurs when the frequencies match. The output is applied to the variable capacitor diode in the local oscillation circuit of AM/FM through low pass filter Q805 and Q806. The output from both terminals is the same, but only E01 is used.
24	E01	
25	CE	Chip enable input. Device selection signal terminal. High level . . . Normal operation Low level . . . Memory preservation.
26	FM	FM local oscillator input.
27	AM	AM local oscillator input.
28	PSC	Output to control the division ratio of the prescaler.
29	GND	Ground terminal
30	PB3	FM/AM band selector output. FM at the high level.
31	PB2	DX/LOCAL selector output. DX at the high level.
32	PB1	LOAD output.
33	PB0	DATA output
34	PC3	IF band selector output. Wide position at the high level.
35	PC2	Output to switch NR filter. Active high.
36	PC1	Output to switch the hi-blend filter. Active low.
37	PC0	Muitng output. Active high.
38	INT	Remote control input. Not used.
39	PA3	CLOCK output.
40	PA2	RF control input.
41	PA1	Sensor input.
42	PA0	Key return signal input.

EXPLODED VIEW



PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
A1	27110218A	Front bracket	A501	28125143	End cap	S501	25030238	NRSM-144+25 Y, Sepaker selector switch
A2	27140894	Bracket, headphone		28191246A	Clear plate	S922	25065123	NSS-1258P, Voltage selector switch (W)
A3	27190272	Holder		27267332	Guide, power	T921	230801	NPT-840D, Power transformer (D)
A4	28133097A	Back plate		18138121	Front panel ass'y (B)		230802	NPT-840DG, Power transformer (W)
A5	28130213A	Dial plate		27262271	Plate, bass			NARF-1982, FM/AM tuner pc board ass'y (D)
A6	29105132	Lamp case		27262272	Plate, speaker			NARF-1982b, FM/AM tuner pc board ass'y (W)
A7	27262274	Plate, decoration		28125144	End cap			NASW-1983, De-emphasis switch pc board ass'y (W)
A8	27210454	Panel S ass'y (S)		28191246A	Clear plate			NADG-1984, Digital circuit pc board ass'y (D)
	28125145	End cap S, right		27267331	Guide, power			NADG-1984b, Digital circuit pc board (W)
	28125146	End cap S, left		28140206A	φ60mm, Cushion (B)			NADIS-1985, Display pc board ass'y
	27210455	Panel S ass'y (B)		834430068	3TTS+6B (BC), Tapping screw			NASW-1986, Control switch circuit pc board ass'y
	28125147	End cap S, right		27170177	Bottom board			NASW-1987, Switch pc board ass'y
	28125148	End cap S, left		280889B	Leg			NASW-1984, Band selector switch pc board ass'y (W)
A11	28321520A	Holder ass'y, knob (S)	A511	28140206A	φ60mm, Cushion (B)	U1	18128582	NATC-1991, Tone control circuit pc board ass'y
A12	28321521A	Holder ass'y, knob (B)	A512	834430068	3TTS+6B (BC), Tapping screw			NAV-1992, Volume/Balance control pc board ass'y
A13	833420068	2TTP+6B (BC), Tapping screw	A601	27170177	Bottom board			NAP-1993, Tape input/output terminal pc board ass'y
A14	27160144	Radiator	A602	280889B	Leg			NAPS-1994, Power supply circuit pc board ass'y
A15	260204	Clamp	A603	831430168	3TTW+16B (BC), Tapping screw			NATRM-1996, Speaker terminal pc board ass'y
A16	271150183	Shielded plate	A604	834430068	3TTS+6B (BC), Tapping screw			NAPL-1997, Dial illumination lamp pc board ass'y
A21	27115160A	Side bracket R	A801	28321486	Knob, volume (B)			NASW-1998, Power switch pc board ass'y (D)
A22	27115161	Side bracket L	A802	28321483	Knob, balance (S)			NASW-1998a, Power switch pc board ass'y (W)
A23	27130353	Bracket C	A803	28321516	Knob, speaker (S)			
A24	27130320G	Bracket, power transformer	A804	28321517	Knob, balance (B)			
A25	27140778	Bracket P	A805	28321514	Knob, volume (S)			
A26	27130189	Bracket KE	A806	28321484-1	Knob, balance (S)			
A27	27120576A	Back panel (D)	A808	28321487	Knob, speaker (S)			
A28	27140693	Bracket, back	A809	28321489	Knob, push (S)			
A31	27130354	Bracket, pc board		28321527	Knob, power (S)			
A32	27130355	Bracket, pc board		28321528	Knob, power (B)			
A33	270280	SR-4K-4, strain relief	C328, C329	330924730	capacitor			
A51	880004	Rivert	C927, C928	3504172	15,000μF, 59V, Elect. capacitor			
A52	27190164	Holder	D505, D605	4000068	VD1222, Diode			
A53	834430068	3TTS+6B (BC), Tapping screw	F921	252051	6A (ST-6), Primary fuse			
A54	831430088	3TTW+8B (BC), Tapping screw	F922	252076	3.15A-SE-EAK, Primary fuse (W)			
A55	834230108	3TTS+10B (NI), Nickel screw	L001	232085	NMA-3034, AM loop antenna			
A56	833426060	2.6TTP+6P (BC), Tapping screw	L001a	27190105	Holder, antenna			
A57	833425059	2.5TTP+5C (BC), Tapping screw	P502	25045067	HLJ-0279-01-070, Headphone terminal			
A58	834430108	3TTS+10B (BC), Tapping screw	P921	25050046	NSCT-2P15, AC outlet (D)			
A59	833430080	3TTP+8P (BC), Tapping screw	P924	253112	AS-UC-4#18, Power supply cord (D)			
A60	82143006	3P+6FN (BC), Pan head screw		253092-1	AS-CEE-2, Power supply cord (W)			
A61	834430108	3TTS+10B (BC), Tapping screw	P925	25060044	Ground terminal			
A62	830440089	4TTC+8C (BC), Tapping screw	P926	25108010	LG-2C, Terminal, primary (W)			
A63	880009	Rivert	P930	223004-1	B-5, Terminal			
A64	834430128	3TTS+12B (BC), Tapping screw	Q617	2201164 or 2201163	2SC2581 (Y) or 2SC2581 (O), Transistor			
A65	82142604	2.6P+4F (BC), Pan head screw (W)	Q618	2201154 or 2201153	2SA1106 (Y) or 2SA1106 (O), Transistor			
A66	863430	N-3F-N (BC), Nut (W)	R571, R671	441623914	3900Ω, 1W, Metal oxide film resistor			
A301	28184230	Top cover (S)						
A302	838440089	4TTB+8C (BC), Tapping screw						
A303	834430068	3TTS+6B (BC), Tapping screw						
A304	28140020	4x10x4mm, Cushion						
A501	18128121	Front panel ass'y (S)						
	27262270	Plate, bass						
	27262269	Plate, speaker						

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

ADJUSTMENT PROCEDURES

Preparation

• Input

FM mono: 1kHz, 75kHz devi., 60dB/ μ V

FM stereo: 1kHz, L+R 67.5kHz devi.: Pilot signal 19kHz
7.5kHz devi.

AM: 400Hz, 30% mod., 74dB/m

• Output

Connect the non-inductive type resistor of 8 ohms to the speaker terminal A of left and right channels unless otherwise noted.

• Standard knob position

BASS, TREBLE, BALANCE	Center
TAPE-1, TAPE-2	Off
TUNING LEVEL	Low
FM MUTING	On
APR	On
DYNAMIC BASS EXPANDER	Off
TOUCH TONE	On
SUBSNIC, LOUDNESS	Off
Mode	Stereo
SPEAKER	A

Amplifier section

1. Idling current adjustment

Connect the DC voltmeter to the terminals Iid and Vct on the power amplifier pc board.

Adjust the semi-fixed resistors R538 and R638 so that the indication of voltmeter is $10 \pm 2\text{mV}$.

Notes: VOLUME Maximum, Open load,
Adjust after switching on for 5 minutes.

2. Dynamic bass expander level adjustment

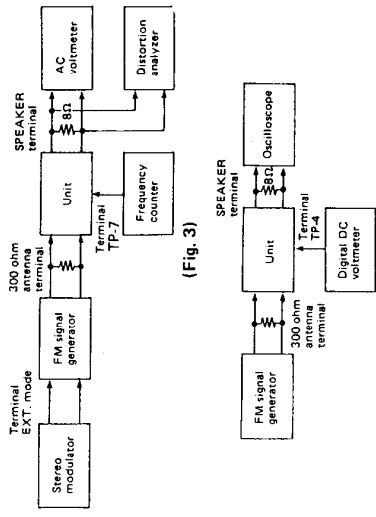
1. Connect the AF oscillator to the input terminal CD on the back panel.
2. Connect the AC voltmeter to the speaker terminal A.
3. Set the AF oscillator output to 70Hz and -31dBV (28mV).
4. Set the Sens switch to -10dB and Level switch to $+6\text{dB}$.
5. Press the Dynamic bass expander switch to on.
6. Set the Volume to -30dB .
7. Turn fully the semi-fixed resistors R353 and R453 counter-clockwise (minimum position).
8. Adjust R353 and R453 so that the output voltage rises up $+3\text{dB}$ than minimum position.

AM Section

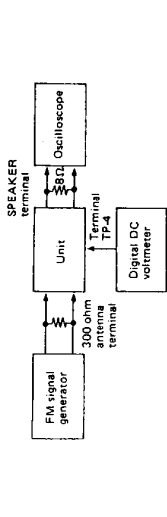
Step	AM SG output	Tuned frequency	Output indicator	Adjust. point	Adjust for	Remarks
1	600 kHz, 400 Hz 30% mod. 74 dB/m	530 kHz	Digital DC voltmeter	L163	1.0±0.1V	Repeat the steps 1 and 2 until no further adjustment is necessary.
2	1400 kHz, 400Hz 30% mod. 74 dB/m	1620 kHz	AC voltmeter	C183	20.0±0.2V	
3	990 kHz, 74 Hz 30% mod. 74 dB/m	600 kHz	AC voltmeter	L161	Maximum	Repeat the steps 3 and 4 until no further adjustment is necessary.
4		1400 kHz	AC voltmeter	C162	Maximum	
5		990 kHz	AC voltmeter	X161 L162	Maximum	

FM section

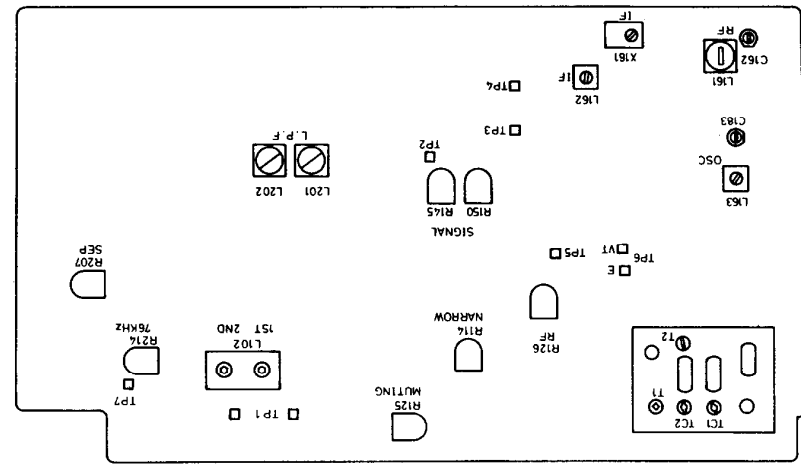
Item	Step	Connection of instrument	FM SG output	Stereo modulator output	Tuned frequency	Output indicator	Adjustment	Adjust for	Remarks
FM IF	1	Fig. 2	99.1 MHz 1 kHz, 75 kHz devi. 65 dBf (60 dB)	-	99.1 MHz	DC voltmeter	L102 1st coil	OV	Muting: off Repeat the steps 1 and 2 until no further adjustment is necessary
	Distortion analyzer					L102 2nd coil	Minimum	Remove the frequency counter after adjustment	
VCO		Fig. 3	99.1 MHz 1 kHz, 75 kHz devi. 65 dBf (60 dB)	-	99.1 MHz	Frequency counter	R214	76 kHz±76 Hz	
Distortion		Fig. 3	99.1 MHz 65 dBf (60 dB) Ext. modulation	L+R 1 kHz	99.1 MHz	Distortion analyzer	IF coil on the front end (T2)	Minimum	
	1	Fig. 3	99.1 MHz 65 dBf (60 dB) Ext. modulation	L ch. 1 kHz	99.1 MHz	R ch. AC voltmeter	R207	Minimum	Maximum and same separation
Separation	2	Fig. 3	99.1 MHz no modulation 25.2 dBf (20 dB)	R ch. 1 kHz	99.1 MHz	L ch. AC voltmeter		Minimum	
		Fig. 3	99.1 MHz no modulation 25.2 dBf (20 dB)	-	99.1 MHz	NARROW indicator	R145	Light on	APR switch to on
Narrow IF level	1	Fig. 4	99.1 MHz No modulation 25.2 dBf (20 dB)	-	99.1 MHz	DC voltmeter	R114	Same value as above (step 1)	APR switch to off
	2	Fig. 4	99.1 MHz 17.2 dBf (12 dB) 99.1 MHz 45.2 dBf (40 dB)	-	99.1 MHz	DC voltmeter	R150 R145	1.2±0.05V 3.2±0.1V	APR: on Repeat the steps 1 and until no further adjustment is necessary
Muting	1	Fig. 4	99.1 MHz 18.2 dBf (13dB)	-	99.1 MHz	Oscilloscope	R125	Signal	TUNING Level : Low
	2		99.1 MHz 17.2 dBf (12 dB)	-	99.1 MHz	Oscilloscope		No signal	



(Fig. 1)



(Fig. 2)



(Fig. 3)

(Fig. 4)

PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE

DIGITAL CIRCUIT PC BOARD

DIGITAL CIRCUIT PC BOARD (NADG-1984/b)

CIRCUIT NO.	PART NO.	DESCRIPTION	CIRCUIT NO.	PART NO.	DESCRIPTION
	ICs			X'tal	
Q801	222768	μ PD1712CU-712-513	X801	3010052	XTL-4.5M
Q802	222619	μ PB553AC		Buzzer	
Q803	222770	μ PD6320G	X802	241048	PKM24-4A0
Q954	222780062	78M06		Capacitors	
	Transistors		C804	3020018	0.047F, 5V, Super
Q804	2112294 or	2SK108 (D) or	C805	352784799	0.47 μ F, 50V, Elect.
	2211293	2SK68 (M)	C807	352723319	330 μ F, 6.3V, Elect.
Q805	2211255	2SC1815 (GR)	C810	395160227	2.2 μ F, 35V, Tantalum
Q806	2211255,	2SC1815 (GR),	C812	352723319	330 μ F, 6.3V, Elect.
Q808-Q813	2210746 or	2SC945A (P) or	C816	352780109	1 μ F, 50V, Elect.
Q955, Q958	2212485	JC501 (Q)	C958	352764709	47 μ F, 35V, Elect.
Q956, Q957	2211705 or	2SD655 (E) or	C959, C960	352780339	3.3 μ F, 50V, Elect.
	2211706	2SD655 (F)	C963	352753319	330 μ F, 25V, Elect.
Q959	2211654 or	2SC2235 (Y) or	C965	352741009	10 μ F, 16V, Elect.
	2211653	2SC2235 (O)	C966	352780109	1 μ F, 50V, Elect.
	Fluorescent tube		C967	352723319	330 μ F, 6.3V, Elect.
Q815	212023	FIP7F8S		Resistors	
	Diodes		R811-R817	49121562408	5.6k Ω ×8, 1/8W, Network
D801-D806	223133,	DS442X,	R825-R828	49121104504	100k Ω ×4, 1/8W, Network
D809-D811	223145 or	1S2076TD or	R958	441523314	330 Ω , 1/2W, Metal oxide film
D956	223124	1S2473	R961	441721804	18 Ω , 2W, Metal oxide film
D807, D808	223133,	DS442X,		Radiator	
	223145 or	1S2076TD or	27160021	RAD-06B	
	223124	1S2473 (W)			
D952	2239792	RD27EB2			
D954	2239672 or	RD3. 3EB1 or			
	2243252	MTZ15B			
D955	2241291	RD3. 3EB1			

Note: (W): Only Universal model

CIRCUIT NO.	PART NO.	DESCRIPTION
	Sockets	
	25050140	NJPS-3P-S
	25050143	NJPS-6P-S
	25050145	NJPS-8P-S
	Screws	
	82143010	3P+10F (BC), Pan head
	834430068	3TTS+6B (BC), Tapping
	Bracket	
	27130352	Fluorescent indicator tube

SWITCH PC BOARD (NASW-1987)

CIRCUIT NO.	PART NO.	DESCRIPTION
S801	25035372	NPS-122-L336, Push

DE-EMPHASIS/BAND SELECTOR SWITCH PC BOARD (NASW-1983/1988) (Only model W)

CIRCUIT NO.	PART NO.	DESCRIPTION
	250142	NSS-2225, Push switch

PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE

DISPLAY CIRCUIT PC BOARD

CONTROL SWITCH CIRCUIT PC BOARD

DISPLAY CIRCUIT PC BOARD (NADIS-1985)

CIRCUIT NO.	PART NO.	DESCRIPTION
ICs		
Q814	222666	LB1403
Q816, Q817	222771	BA614
Q818	222772	BA612
L.E.Ds		
D821-D832	225137	SEL2413E
D834, D836	225137	SEL2413E
D838, D840	225137	SEL2413E
D842, D844	225137	SEL2413E
D848-D856	222137	SEL2413E
D833, D835	225142	SEL2913K
D837, D839	225142	SEL2913K
D841, D843	225142	SEL2913K
D845	225142	SEL2913K
D857-D863	225142	SEL2913K
Capacitors		
C817, C818	352741009	10 μ F, 16V, Elect.
Resistors		
R850-R854	49241221505	220 Ω x5, 1/8W, Network
R855-R859	49241181505	180 Ω x5, 1/8W, Network
R860-R866	49241181507	180 Ω x7, 1/8W, Network
R874-R877	49121221504	220 Ω x4, 1/8W, Network
R878-R881	49121103504	10k Ω x4, 1/8W, Network
Holders		
	27190270B	LED, left
	27190271A	LED, right
Screws		
	833430080	3TTP+8P (BC), Tapping

CONTROL SWITCH CIRCUIT PC BOARD (NASW-1986)

CIRCUIT NO.	PART NO.	DESCRIPTION
Transistor		
Q807	2212304, 2211945 or 2211293	2SK381D, 2SK246 (GR) or 2SK68 (M)
Switches		
S801-S822	25035389	NPS-111-S353

VOLUME/BALANCE CONTROL PC BOARD (NAVR-1992)

CIRCUIT NO.	PART NO.	DESCRIPTION
R384, R484	5104145	N16RDQMC250KMN100 KBTP40, Volume/Balance control variable resistor

TAPE INPUT/OUTPUT TERMINAL PC BOARD (NAPJ-1993)

CIRCUIT NO.	PART NO.	DESCRIPTION
P321, P322	25045142	NPJ-4PDBL55, Tape input/ output terminal

SPEAKER TERMINAL PC BOARD (NATRM-1996)

CIRCUIT NO.	PART NO.	DESCRIPTION
P501	25060058	NTM-8PDML25, Speaker terminal

FM/AM TUNER PC BOARD (NARF-1982/b)

CIRCUIT NO.	PART NO.	DESCRIPTION	CIRCUIT NO.	PART NO.	DESCRIPTION
	Front end			Capacitors	
TU001	240063	BFE496U11	C111	352780109	1 μ F, 50V, Elect.
	ICs		C112	352741009	10 μ F, 16V, Elect.
Q103	222680	LA1235	C118	352784799	0.47 μ F, 50V, Elect.
Q109	222465	NJM4558D	C121	352780229	2.2 μ F, 50V, Elect.
Q161	222701	LA1245	C126	352721019	100 μ F, 6.3V, Elect.
Q201	222593	HA12016	C127	352780109	1 μ F, 50V, Elect.
Q951	222780122	78M12	C162	3060010	NTC-20P-09, Trimmer
	Transistors		C164	392884797	0.47 μ F, 50V, LL
Q101, Q102	2211723	2SC1923 (O)	C169	352741009	10 μ F, 16V, Elect.
Q104-Q108	2211255,	2SC1815 (GR),	C170	352744709	47 μ F, 16V, Elect.
Q162, Q163	2210746 or	2SC945A (P) or	C171	352782299	0.22 μ F, 50V, Elect.
Q203, Q206	2212485	JC501 (Q)	C175	352780109	1 μ F, 50V, Elect.
Q164, Q207	2211705 or	2SD655 (E) or	C177	352750479	4.7 μ F, 25V, Elect.
Q208	2211706	2SD655 (F)	C178	352741009	10 μ F, 16V, Elect.
Q165	2211256	2SC1815 (BL)	C180	370135114	510pF \pm 5%, 100V, APS
Q202	2212304 or	2SK381 (D) or	C183	3060010	NTC-20P-09, Trimmer
	2211945	2SK246 (GR)	C184	352721019	100 μ F, 6.3V, Elect.
Q204, Q205	2211945 or	2SK246 (GR) or	C185	352780339	3.3 μ F, 50V, Elect.
	2211293	2SK68 (M)	C201	352780109	1 μ F, 50V, Elect.
Q209-Q213	2211255,	2SC1815 (GR),	C202	352744719	470 μ F, 16V, Elect.
	2210746 or	2SC945A (P) or	C203, C204	352721019	100 μ F, 6.3V, Elect.
	2212485	JC501 (Q)	C207, C208	370138214	820pF \pm 5%, 100V, APS (W)
Q952	2211255	2SC1815 (GR)	C209	352780339	3.3 μ F, 50V, Elect.
Q953	2211454	2SA1015 (Y)	C210	352750479	4.7 μ F, 25V, Elect.
	Diodes		C211	352780109	1 μ F, 50V, Elect.
D101-D105	223145,	1S2076TD,	C212	352780339	3.3 μ F, 50V, Elect.
D108-D110	223133 or	DS442X or	C213	370131024	1.000pF \pm 5%, 100V, APS
D164	223124	1S2473	C218, C219	352780229	2.2 μ F, 50V, Elect.
D106, D107	223132	1K60	C222	352783399	0.33 μ F, 50V, Elect.
D111	2239433 or	RD4. 7EB3 or	C223	352780109	1 μ F, 50V, Elect.
	2243133	MTZ4. 7C	C225	352784799	0.47 μ F, 50V, Elect.
D112, D163	4000068	VD1222	C226	352744719	470 μ F, 16V, Elect.
D161, D162	223136	KV1226, Variable capacitor	C227	352750479	4.7 μ F, 25V, Elect.
D202-D218	223145,	1S2076TD,	C228	352742209	22 μ F, 16V, Elect.
	223133 or	DS442X or	C951	352753319	330 μ F, 25V, Elect.
	223124	1S2473	C953	352744709	47 μ F, 16V, Elect.
D219	2239471	RD5. 6EB1 or	C954, C955	352741009	10 μ F, 16V, Elect.
	2243151	MTZ5. 6A	C956	352741019	100 μ F, 16V, Elect.
D951	2239493 or	RD6. 2EB3 or	C957	352741009	10 μ F, 16V, Elect.
	2243163	MTZ6. 2C		Resistors	
D953	2239652 or	RD13EB2 or	R114	5215041	N08HR500BC, Semi-fixed
	2243242	MTZ13B	R125	5215003	N08HR20KBC, Semi-fixed
	Coils		R145	5215062	N08HR30KBC, Semi-fixed
L101	233105 or	NCCH-1005 or	R150	5215047	N08HR100KBC, Semi-fixed
	233024	NCCH-1501	R207	5215046	N08HR50KBC, Semi-fixed
L161	232089 or	NMA-3037 or	R214	5215061	N08HR3KBC, Semi-fixed
	232107	NMA-3045	R951	441721004	10 Ω , 2W, Metal oxide film
L163	232110	NMO-4027	R952	441525604	56 Ω , 1/2W, Metal oxide film
L201, L202	233291	NMC-5039		Radiator	
L203	231042	NCH-2082		27160011A	RAD-05
L204	233031	NMC-9-1		Sockets	
	Transformers			25050140	NJPS-3P-S
L102	233274	NFIF-6041		25050141	NJPS-4P-S
L162	232095	NFIF-6025		25050143	NJPS-6P-S
	Ceramic filters			Terminal	
X101, X103	3010024	SFE10. 7ML-A	P001	25060085	NTM-4PDMN29, Antenna
X102	3010070	SFE10. 7MS3GY-A		Screws	
X161	3010075	SFL450B3		82143010	3P+10F (BC), Pan head screw
X162	3010076	BFU450C		834430068	3TTS+6B (BC), Tapping
				Nut	
				863430	N-3F-N (BC)

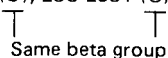
Note: (W): Only Universal model

POWER AMPLIFIER PC BOARD (NAMA-2035)

CIRCUIT NO.	PART NO.	DESCRIPTION	CIRCUIT NO.	PART NO.	DESCRIPTION
ICs			Capacitors		
Q561, Q661 Q702	222502 222584	NJM4558DX TA7317P	C515, C615 C516, C616 C561, C661 C562, C662 C703 C704 C705 C707	352743309 352752209 352752209 352722219 352732209 352784799 352742219 352752219 352754709 352782219	33 μ F, 16V, Elect. 22 μ F, 25V, Elect. 22 μ F, 25V, Elect. 220 μ F, 6.3V, Elect. 22 μ F, 10V, Elect. 0.47 μ F, 50V, Elect. 220 μ F, 16V, Elect. 220 μ F, 25V, Elect. 47 μ F, 25V, Elect. 220 μ F, 50V, Elect.
Transistors			Resistors		
Q501, Q601	2211915 or 2211916	2SK240 (GR) or 2SK240 (BL)	R526, R626 R529, R529 R527, R528 R627, R628	442524314 441526204	430 Ω , 1/2W, Metal oxide film 62 Ω , 1/2W, Metal oxide film
Q502, Q602	2211255	2SC1815 (GR)	R536, R537 R636, R637 R538, R638	442521814	180 Ω , 1/2W, Metal oxide film
Q503, Q603	2211255	2SC1815 (GR)	R540, R640 R541, R542 R641, R642	5225015 442521014 442520274	N08HR10KBD, Semi-fixed 100 Ω , 1/2W, Metal oxide film 2.7 Ω , 1/2W, Metal oxide film
Q504, Q604	2211455	2SA1015 (GR)	R543, R544 R643, R644	4000063	0.47 Ω , 2W, Metal plate
Q506, Q606	2211455	2SA1015 (GR)	R545, R645 R546, R547 R646, R647	441620104 4000063	1 Ω , 1W, Metal oxide film 0.47 Ω , 2W, Metal plate
Q507, Q607	2211255	2SC1815 (GR)	R549, R649 R550, R650 R901, R902	441620564 441721004 441521614	5.6 Ω , 1W, Metal oxide film 10 Ω , 2W, Metal oxide film 160 Ω , 1/2W, Metal oxide film
Q508, Q608	2211732 or 2211733	2SC1845 (F) or 2SC1845 (E)			
Q509, Q609	2211792 2211793	2SA992 (F) or 2SA992 (E)	RL701	25065237	Relay NRL-4P3A-DC24-26
Q512, Q612	2211743 or 2211742	2SA915 (M) or 2SA915 (L) *			Radiators 27160029 RAD-07
Q513, Q613	2211763 or 2211762	2SC1940 (M) or 2SC1940 (L) *			Brackets 27140695A 27140694 Back Front
Q514, Q614	2211255	2SC1815 (GR)			Screws 82143010 831430088 3P+10FN (BC), Pan head screw 3TTW+8B (BC), Tapping
Q515, Q615	2211923 or 2211924	2SC2824 (O) or 2SC2824 (Y) *			
Q516, Q616	2211933 or 2211934	2SA1184 (O) or 2SA1184 (Y) *			
Q517, Q617	2201164 or 2201163	2SC2581 (Y) or 2SC2581 (O) *			
Q518, Q618	2201154 or 2201153	2SA1106 (Y) or 2SA1106 (O) *			
Q519, Q619	2211395 or 2211396	2SA970 (GR) or 2SA970 (BL)			
Q901	2201073 or 2201074	2SD880 (O) or 2SD880 (Y) *			
Q902	2201243 or 2201244	2SB834 (O) or 2SB834 (Y) *			
Q903, Q904	2211945 or 2211315	2SK246 (GR) or 2SK117 (GR)			
Diodes					
D501, D601	223145, 223133 or 223105	1S2076TD, DS442X or 1S1555 (TX-65)			
D502-D504 D561, D562 D602-D604 D661, D662 D703, D705	223145, 223133 or 223105 223145, 223133 or 223105	1S2076TD, DS442X or 1S1555 1S2076TD, DS442X or 1S1555			
D704	2241072 or 2241073	GZA-10Y or GZA-10Z			
D901, D902	2241192 or 2241193	GZA-18Y or GZA-18Z			
Coils					
L501, L601	231015	S-0. 8C			

CAUTION: Replacement for transistor of mark *, if necessary, must be made from the same beta group (H_{EF}) as the original type.

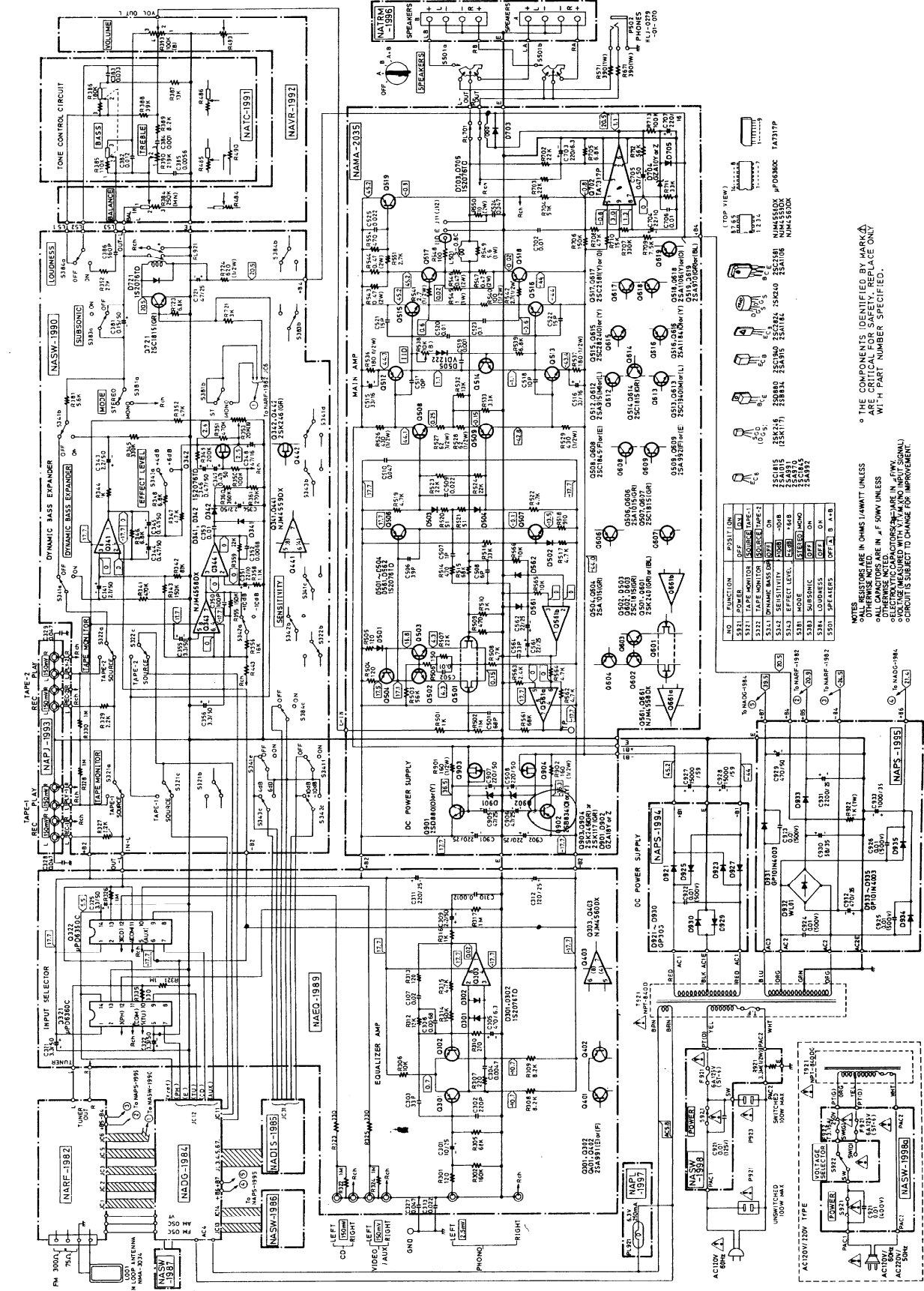
EX. 2SA 1184 (O), 2SC 2581 (O)



Same beta group

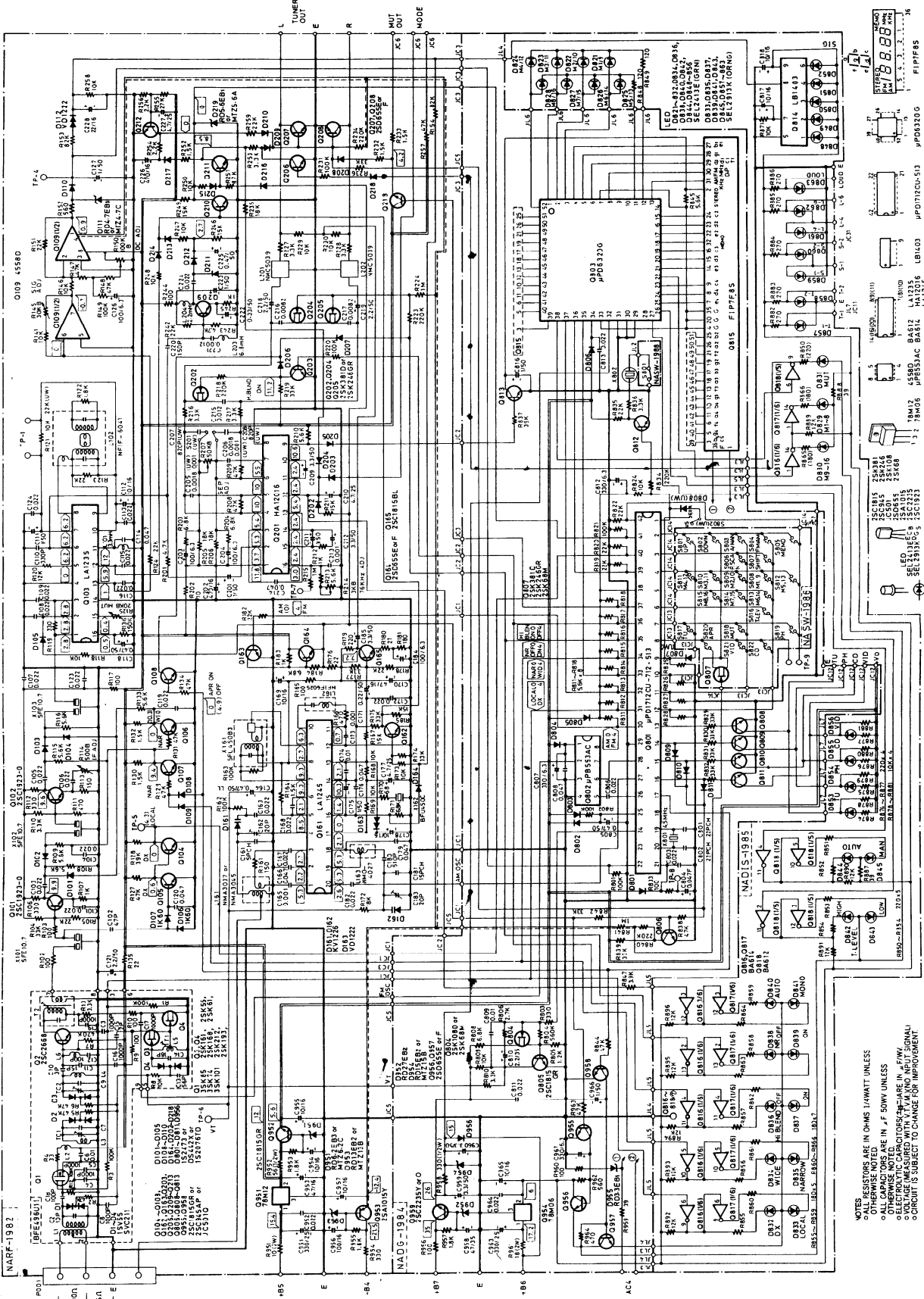
SCHEMATIC DIAGRAM

A B C D E F G



SCHEMATIC DIAGRAM

TUNER SECTION



NOTES:
 *RESISTORS ARE IN OHMS UNLESS OTHERWISE NOTED
 *ALL CAPACITORS ARE IN P.F. UNLESS OTHERWISE NOTED
 *ELECTRONIC CAPACITORS ARE IN P.F.W.
 *VOLTAGE MEASURED WITH V.T.M. IN NO INPUT SIGNAL
 *CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT

EQUALIZER AMPLIFIER PC BOARD (NAEQ-1989)

CIRCUIT NO.	PART NO.	DESCRIPTION
ICs		
Q303, Q403	222570	NJM-4560DX
Q321, Q322	222768	μ PD-6360C
Transistors		
Q301, Q302	2211783 or	2SA991 (E) or
Q401, Q402	2211782	2SA991 (F) *
Diodes		
D301, D302	223145	1S2076TD
D401, D402	223145	1S2076TD
Capacitors		
C301, C401	352751009	10 μ F, 25V, Elect.
C305, C405	352724719	470 μ F, 6.3V, Elect.
C309, C409	352780228	2.2 μ F, 50V, Elect.
C311, C312	352752219	220 μ F, 25V, Elect.
C321, C322	352780339	3.3 μ F, 50V, Elect.
C325	352780339	3.3 μ F, 50V, Elect.
Terminal		
P301	25045143	NPJ-6PDBL56, Input

CAUTION: Replacement for transistor of mark *, if necessary, must be made from the same beta group (H_{FE}) as the original type.

DYNAMIC BASS EXPANDER CIRCUIT PC BOARD (NASW-1990)

CIRCUIT NO.	PART NO.	DESCRIPTION
ICs		
Q341, Q441	222534	NJM-4559DX
Q343, Q344	222502	NJM-4558DX
Transistors		
Q342, Q442	2211945	2SK246 (GR)
Q721	2211255	2SC1815 (GR)
Diodes		
D341, D342	223145,	1S2076TD,
D721	223133 or	DS442X or
	223105	1S1555
Capacitors		
C341, C441	352780229	2.2 μ F, 50V, Elect.
C343, C443	352780229	2.2 μ F, 50V, Elect.
C344-C347	352784799	0.47 μ F, 50V, Elect.
C348, C448	352734709	47 μ F, 16V, Elect.
C351	352732209	22 μ F, 10V, Elect.
C354	352780229	2.2 μ F, 50V, Elect.
C355, C356	352780339	3.3 μ F, 50V, Elect.
C381, C481	352781599	0.15 μ F, 50V, Elect.
C444-C447	352784799	0.47 μ F, 50V, Elect.
C721	352754709	47 μ F, 25V, Elect.
Resistors		
R353, R453	5215022	N08HR20KBC, Semi-fixed
R724	441526214	620 Ω , 1/2W, Metal oxide film
Switches		
S321, S322	25035423	NPS-242-L387, Tape 1/2
S341-S343	25035425	NPS-242-122-162-L
S384		389, Expander/Loudness
S381, S383	25035424	NPS-222-L388, Mode/Subsonic
Relay		
RL721	25065048	FRL-644D12/2AS
Socket		
	25050143	NJPS-6P-S

TONE CONTROL CIRCUIT PC BOARD (NATC-1991)

CIRCUIT NO.	PART NO.	DESCRIPTION
Resistors		
R385, R485	5148092	N16RQM11C110K180K 25M Bass
R390, R490	5148091	N16RGM11C219K25M, Treble

PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE

POWER SUPPLY CIRCUIT
PC BOARD

POWER SUPPLY CIRCUIT
PC BOARD

POWER SWITCH
PC BOARD

POWER SUPPLY CIRCUIT PC BOARD (NAPS-1994)

CIRCUIT NO.	PART NO.	DESCRIPTION
D921, D923 D925, D927 D929, D930	223841	GP-30G, Diode

POWER SUPPLY CIRCUIT PC BOARD (NAPS-1995)

CIRCUIT NO.	PART NO.	DESCRIPTION
Diodes		
D931, D933	223880	GP101N4003
D934, D935	223880	GP101N4003
D932	223862	WL01
Capacitors		
C929	352784719	470 μ F, 50V, Elect.
C930	352766809	68 μ F, 35V, Elect.
C931	352752229	2,200 μ F, 25V, Elect.
C932	352764719	470 μ F, 35V, Elect.
C933	352761029	1,000 μ F, 35V, Elect.
Resistor		
R922	441621024	1k Ω , 1W, Metal oxide film

DIAL ILLUMINATION LAMP PC BOARD (NAPL-1997)

CIRCUIT NO.	PART NO.	DESCRIPTION
PL921	210064A	250mA, 6.3V, Lamp

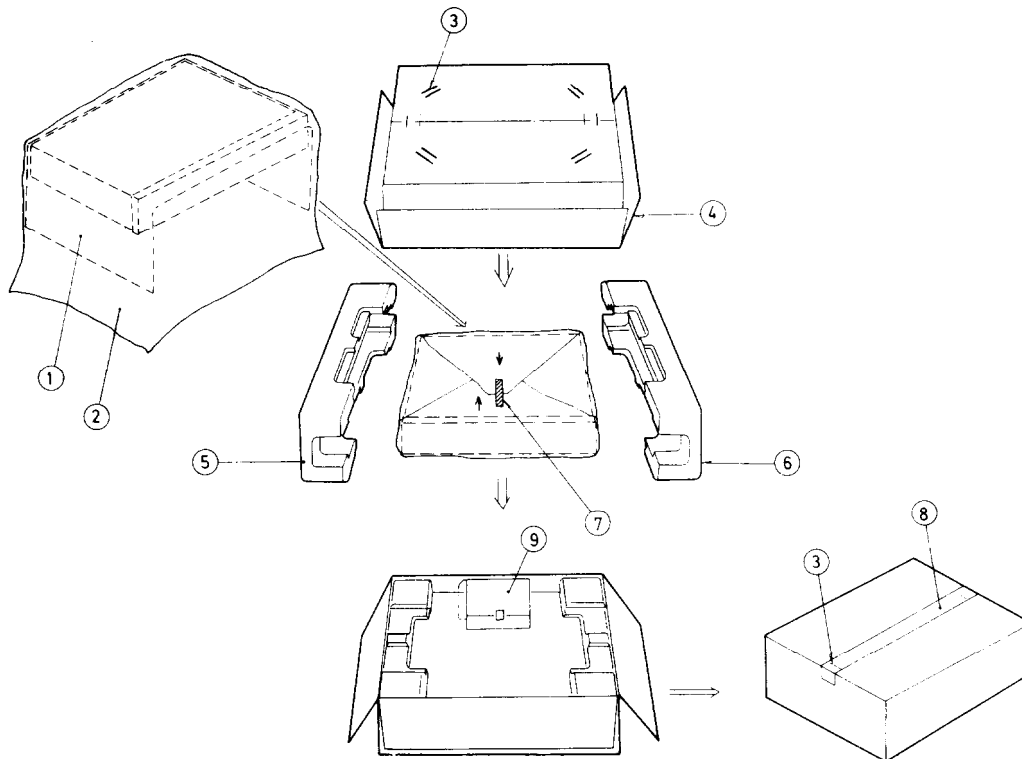
POWER SWITCH PC BOARD (NASW-1998/a)

CIRCUIT NO.	PART NO.	DESCRIPTION
\triangle C921	3500065A	0.01 μ F, AC400V/125V, Capacitor IS
\triangle R921	431523355	3.3M Ω , 1/2W, Solid resistor (D)
\triangle S921	25035015A	NPS-111-LA3, Power switch
\triangle F921	252051	6A (ST-6), Primary fuse
\triangle F921a	250113	SN5051
\triangle F922	252076	3.15A-SE-EA, Primary fuse (W)
\triangle F922a	25050065	YSH403T, Fuseholder (W)
\triangle C921a	27300601	Cover, capacitor

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

Note (D): Only 120V model
(W): Only Universal model

PACKING VIEW



REF. NO.	PARTS NO.	DESCRIPTION			
1	29095108-1	600×1000mm, Protection sheet		29340773	Instruction manual
2	29100035A	1020×720mm, Poly-vinyl bag		29365006-5	Warranty card
3	282301	Sealing hook		29358002A	Service station list
4	29050943	Master carton box		120V model	
	29050944	Master carton box (B)		292064A	FM antenna
5	29090910A	Pad R		29100006	350×250mm, Poly-vinyl bag
6	29090911B	Pad L		29340773	Instruction manual
7	29110032	W=15mm, Adhesive tape		120/220V model	
8	260012	50(W)×600mm, Damplon tape		292064A	FM antenna
9	Accessory bag complete			29100006	350×250mm, Poly-vinyl bag
	U.S.A. model			29340773	Instruction manual
	292064A	FM antenna		25055040	CV-K-2, Conversion plug
	29100006	350×250mm, Poly-vinyl bag			

Note: (B): Only black model

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