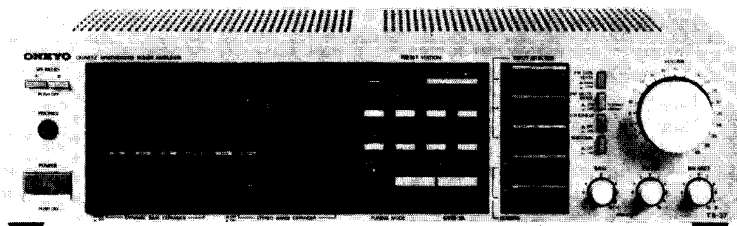


# ONKYO SERVICE MANUAL

## QUARTZ SYNTHESIZED TUNER AMPLIFIER MODEL TX-37



### Silver and black models

UD, UDN, BUD, BUDN	120V AC, 60Hz
UG, BUG	220V AC, 50Hz

### SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK  $\Delta$  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.

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**ONKYO**  
**AUDIO COMPONENTS**

# SPECIFICATIONS

## AMPLIFIER SECTION

Power Output:	55 watts per channel, min RMS, at 8 ohms, both channels driven, from 20Hz to 20kHz, with no more than 0.04% THD.
Musical Power Output:	2 × 120 watts at 4 ohms, 1kHz (DIN) 2 × 77 watts at 8 ohms, 1kHz (DIN)
Continuous Power Output:	2 × 77 watts at 4 ohms, 1kHz (DIN) 2 × 55 watts at 8 ohms, 1kHz (DIN)
Total Harmonic Distortion:	0.04% at rated power 0.04% at 1 watt output
IM Distortion:	0.04% at rated power 0.04% at 1 watt output
Damping Factor:	35 at 8 ohms
Frequency Response:	20 – 30,000 Hz ± 1 dB
RIAA Deviation:	20 – 20,000 Hz ± 0.8dB
Sensitivity and Impedance:	Phono: 2.5mV/50 kohms CD/Tape Play: 150mV/50 kohms Tape Rec: 150mV/3.5 kohms (phono)
Phono Overload:	180mV RMS at 1 kHz, 0.04% THD
Signal-to-Noise Ratio:	Phono: 85dB (at 10mV input, A weighted) 76dB (IHF A-202) CD/Tape: 95dB (A weighted) 80dB (IHF A-202)
Tone Controls:	Bass: ± 10dB at 100Hz Treble: ± 10dB at 10kHz
Loudness (–30dB):	+7 dB at 70 Hz, +5 dB at 10kHz
Subsonic:	–6 dB at 15 Hz

## TUNER SECTION

### FM:

	–G/W MODELS–	–D MODEL–
Tuning Range:	87.5 – 108.0 MHz (50kHz steps)	87.5 – 108.0 MHz (100kHz steps)
Usable Sensitivity:	Mono: 11.2dBf, 1.0μV, 75 ohms 0.9μV (S/N 26dB, 40kHz Devi.) 75 ohms DIN Stereo: 18.0dBf, 2.2μV, 75 ohms 23μV (S/N 46dB, 40kHz Devi.) 75 ohms DIN	Mono: 10.8dBf, 1.9μV Stereo: 17.2dBf, 4.0μV
50dB Quieting Sensitivity:	Mono: 18.0dBf, 2.2μV 75 ohms Stereo: 37.2dBf, 20μV, 75 ohms	Mono: 17.2dBf, 4.0μV Stereo: 37.2dBf, 40μV
Capture Ratio:	1.5dB	1.5dB
Image Rejection Ratio:	85dB	40dB
IF Rejection Ratio:	90dB	90dB
Signal-to-Noise ratio:	Mono: 72dB Stereo: 67dB	Mono: 72dB Stereo: 67dB
Selectivity:	50dB DIN (±300kHz, 40kHz dev.)	55dB
AM Suppression Ratio:	50dB	50dB
Harmonic Distortion:	Mono: 0.15% Stereo: 0.25%	Mono: 0.15% Stereo: 0.25%
Frequency Response:	30 – 15,000Hz ± 1.5dB	30 – 15,000Hz ± 1.5dB
Stereo Separation:	40dB at 1kHz 30dB at 100 – 10,000Hz	40dB at 1kHz 30dB at 100 – 10,000Hz
Tuning Level(Hi/Lo):	23.2dBf, 4μV/17.2dBf, 2μV	23.2dBf, 8μV/17.2dBf, 4μV
Muting Level:	–	–
Stereo Threshold (Hi/Lo):	23.2dBf, 4μV/17.2dBf, 2μV	23.2dBf, 8μV/17.2dBf, 4μV
<b>AM:</b>		
Tuning Range:	522 – 1611kHz (9kHz steps)	520 – 1710kHz (10kHz steps)
Usable Sensitivity:	30μV	30μV
Image Rejection Ratio:	40dB	40dB
IF Rejection Ratio:	40dB	40dB
Signal-to-Noise Ratio:	40dB	40dB
Harmonic Distortion:	0.8%	0.8%

## GENERAL

Semiconductors:	FETs: 9 TR: 36 ICs: 12 Diodes: 54 LEDs: 36	FETs: 9 TR: 32 ICs: 12 Diodes: 50 LEDs: 36
Dimensions (W×H×D):	435 × 112 × 343 mm 17-1/8" × 4-7/16" × 13-1/2"	435 × 112 × 343 mm 17-1/8" × 4-7/16" × 13-1/2"
Weight:	8.5 kg 18.8 lbs.	8.5 kg., 18.8 lbs.

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.

D(120V)model

Circuit no.	Parts no.	Description
F501, F601	252059	4A (SS-2), Speaker
F901	252049	4A (ST-6), Primary

G (220V) and Q (240V) models

Circuit no.	Parts no.	Description
F501, F601	252077	4A-SE-EAK, Speaker
F902	252074	2A-SE-EAK, Primary
F903, F904	252078	5A-SE-EAK, Secondary
F905	252070	1A-SE-EAK, Secondary

## 2. Replacing the lamp

This unit uses the lamp listed below.

Circuit no.	Parts no.	Description
PL901	210064A	PL 6.3V, 250mA, Dial plate illumination

## 3. Safety—check out

(Only U.S.A. model)

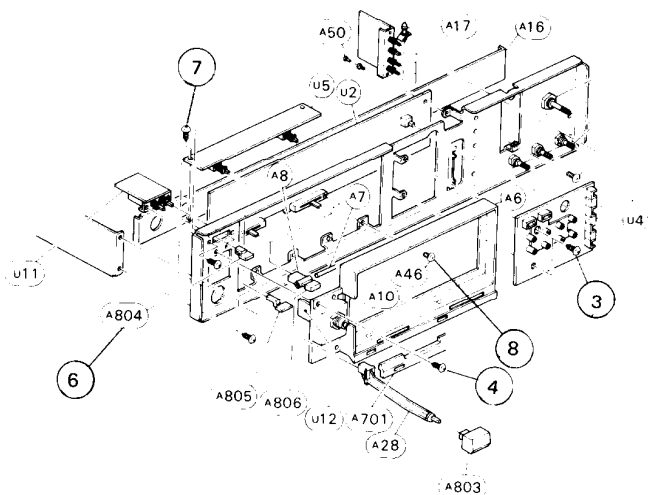
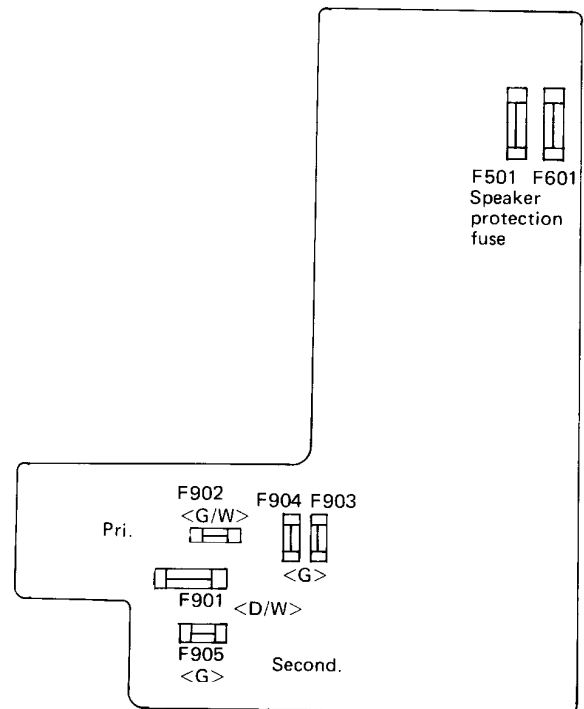
After correcting the original service problem, perform the following safety check before releasing the set to the customer.

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

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

## 4. Removement of display pc board

- ①. Remove the five screws holding the top cover and chassis (side bracket:4 back panel: 1), and remove the top cover.
- ②. Remove the five screws holding the front panel and front bracket, and remove the front panel.
- ③. Remove the two screws holding the switch pc board and front bracket, and remove the switch pc board of U4.
- ④. Remove the four screws holding the holder and front bracket.
- ⑤. Remove the display pc board ass'y from the four nails of holder, and remove the holder.
- ⑥. Remove the two knobs (A805).
- ⑦. Remove the two screws holding the NAAF-2306 pc Board ass'y and center bracket, and remove the NAAF-2306.
- ⑧. Remove the four screws holding the switch of dynamic bass expander and front bracket, and remove the display pc board.

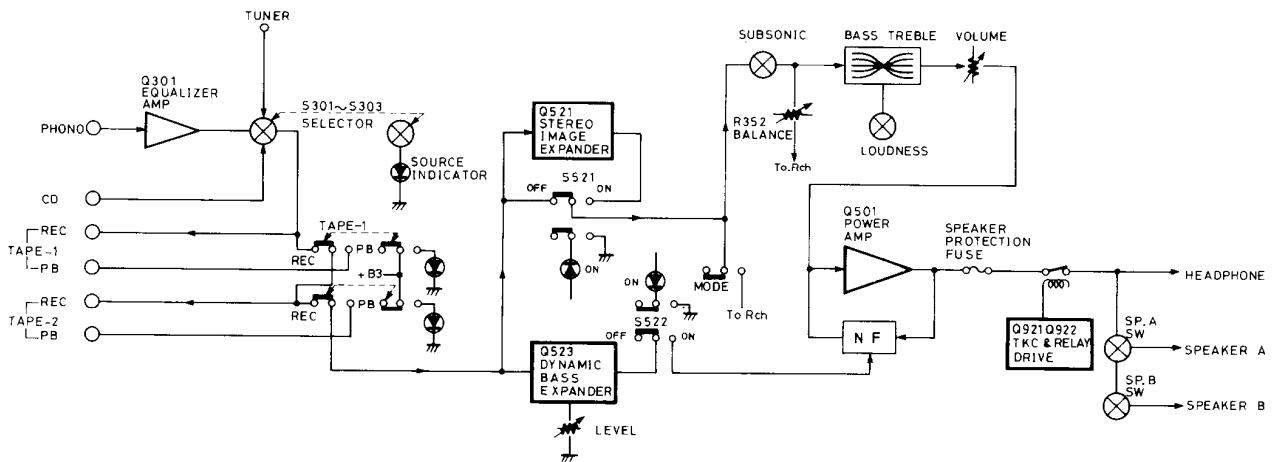


**5. Memory preservation**

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.

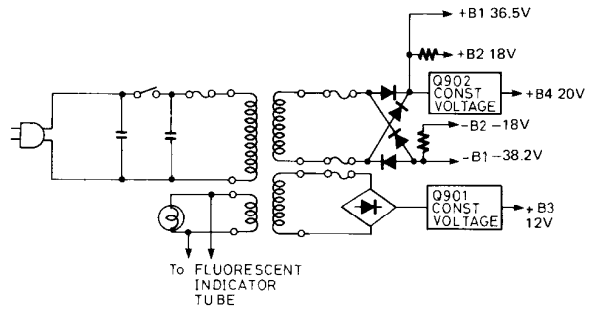
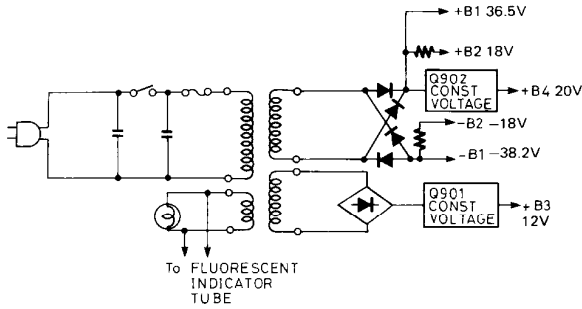
**BLOCK DIAGRAM**

**—AMPLIFIER SECTION—**

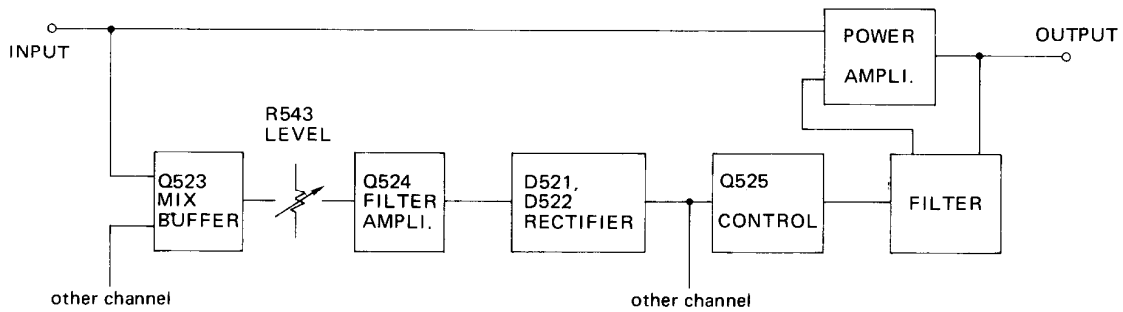


**—POWER SUPPLY SECTION—**  
**—120V MODEL—**

**—220V MODEL—**

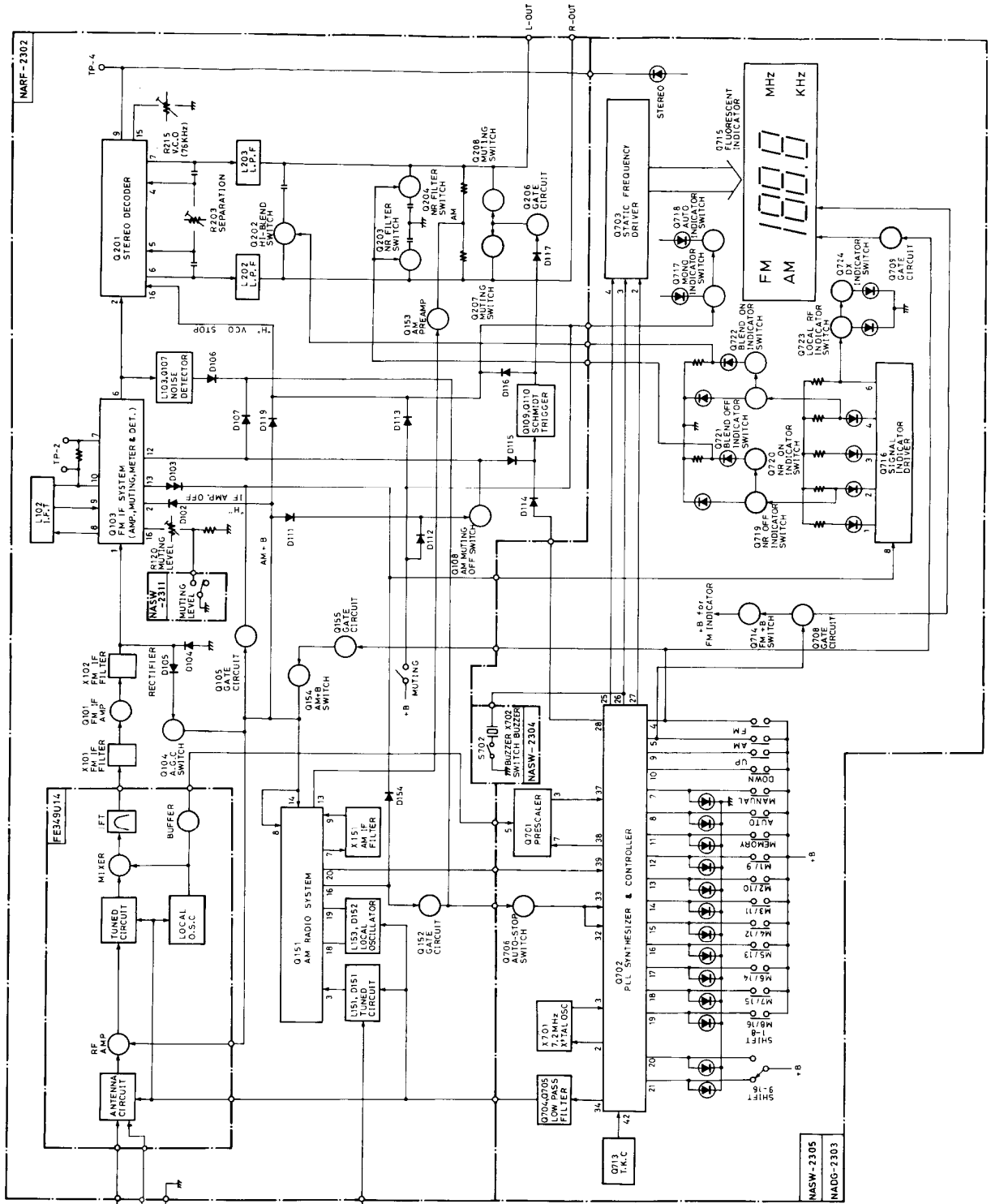


**—DYNAMIC BASS EXPANDER—**



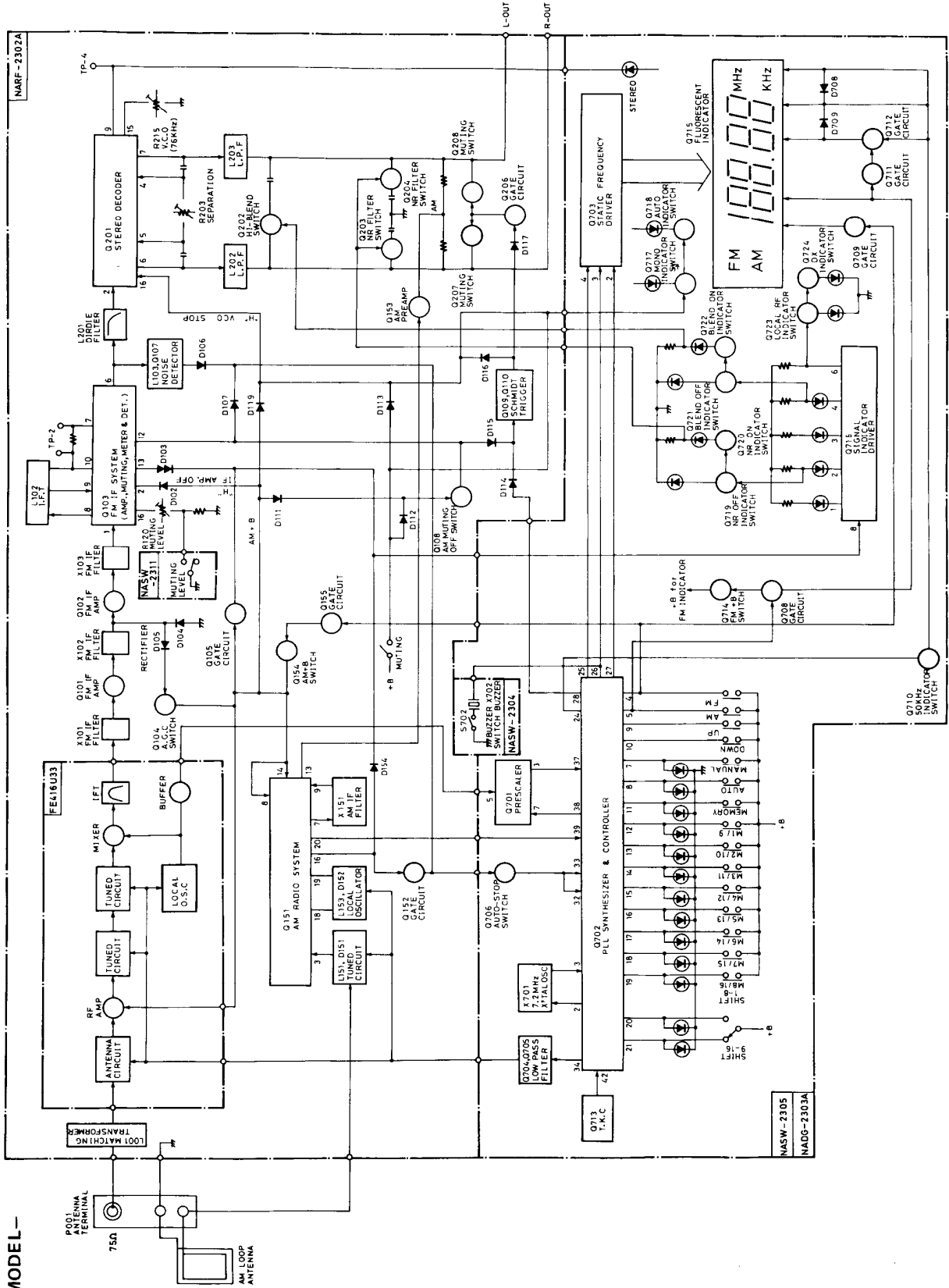
In earlier super base systems, only the frequencies about 70Hz were boosted by about 4dB to expand the playback frequency response to enable playback of the super low region. However, when there was no input signal, the above frequency response resulted in deterioration in the S/N ration in the 70Hz region. This problem has been overcome by the dynamic bass expander where the 70Hz boosted level is varied according to the input signal level. That is, the frequency response remains flat when no input signal is applied, but is boosted at the 70Hz region to the specified level when the input signal exceeds a certain level. The Left and right channel input signals from the INPUT terminals are mixed by Q523 and pass through the level volume and filter amplifier. The signal is rectified by D521 and D522, and the resultant DC component control signal is applied to the gate of Q525. When the input signal is at an adequate level, Q525 is turned on and the super base circuit of power amplifier is controlled by the input signal.

**BLOCK DIAGRAM**  
 -TUNER SECTION-  
 -120V MODEL-

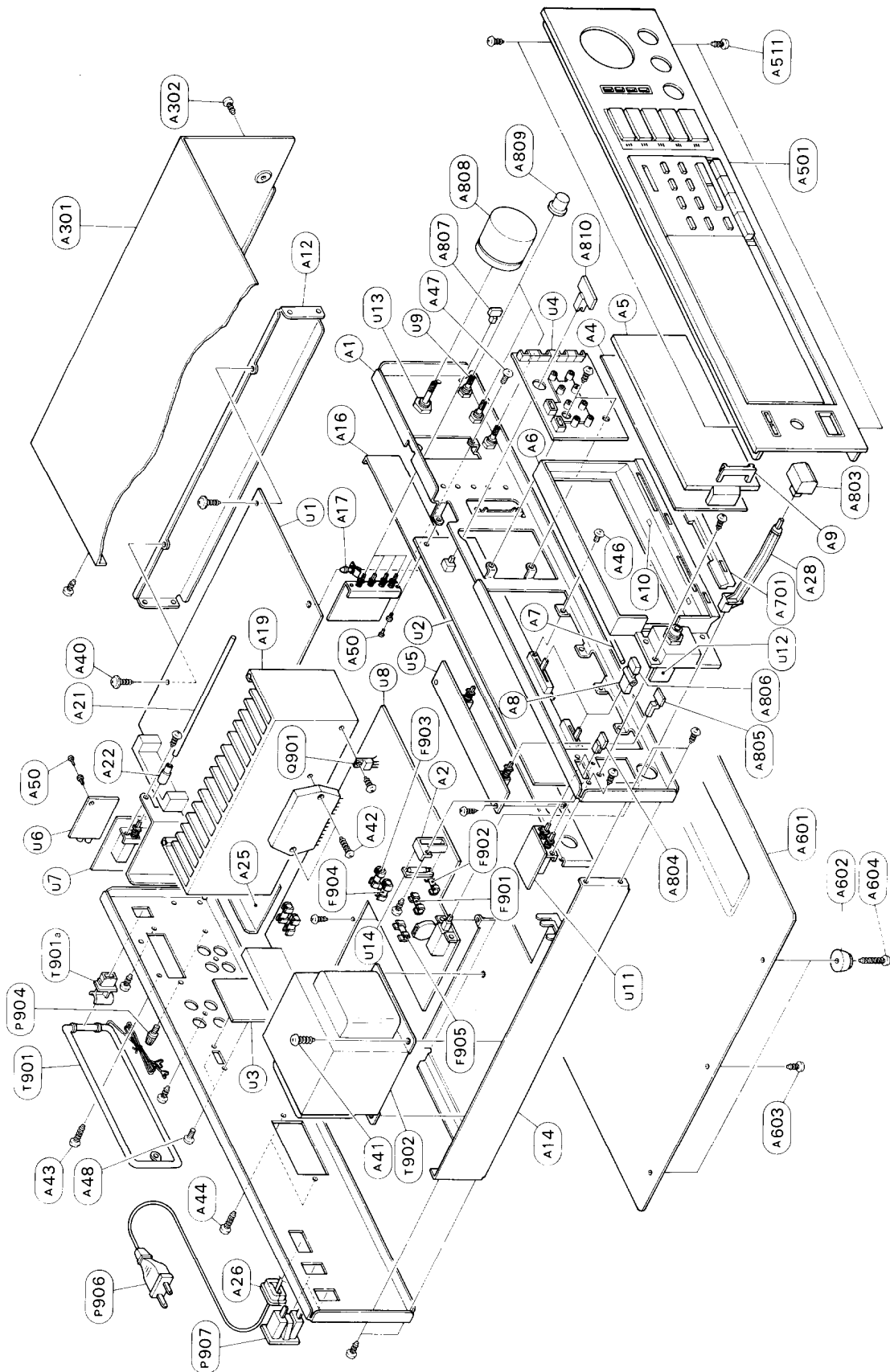


# BLOCK DIAGRAM

-TUNER SECTION-  
-220V MODEL-



EXPLODED VIEW





## PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
A1	27110243	Front bracket	A501e	28322012A	Selecter knob ass'y	U1	18408502	NARF-2302, Tuner circuit pc board ass'y (D)
A2	27190198A	Holder, lamp	A501f	28322018A	Knob ass'y			
A4	28133131	Back plate	A511	838430068	3TTB+6B(BC), Tapping screw			
A5	28130224	Dial plate	A601	27170198A	Bottom board			
A6	27190357A	Holder	A602	27175009A	Leg	U2	18408503	NARF-2302A, Tuner circuit pc board ass'y (G)
A7	27260171B	Shaft	A603	834430068	3TTS+6B(BC), Tapping screw			
A8	27220032A	Slider	A604	834430128	3TTS+12B(BC), Tapping screw			
A9	27190359A	Holder, dial	A701	27267401A	Guide, decoration			
A10	28198632	Facet	A803	28321928	Knob, power (S)	U3	18408504	NADG-2303, Digital circuit pc board ass'y (D)
A12	27115180	Side bracket R		28321905B	Knob, power (B)			
A14	27130388	Bracket, power transformer	A804	28321886	Knob, speaker (S)	U4	18408505	NASW-2305, Operation switch pc board ass'y
A16	27130390A	Bracket, center	A805	28321894	Knob, speaker (B)			
A17	27190011	Holder	A806	28322005A	Knob, expander	U5	18408506	NAAF-2306, Dynamic bass and stereo image expander circuit pc board ass'y
A19	27160162A	Radiator	A807	28322006	Knob, slide			
A21	27260172	Shaft		28322007A	Knob, loudness (S)	U6	18408507	NAEQ-2307, Equalizer amplifier pc board ass'y (D)
A22	28320135	Connector		28322020A	Knob, loudness (B)			
A24	27120685B	Back panel (D)	A808	28321887A	Knob, volume (S)			
	27120687	Back panel (G)	A809	28321895	Knob, volume (B)			
A25	27130389B	Bracket B		28322008	Knob, balance (S)			
A26	△ 27300750	Strainrelief	A810	28322009A	Knob, balance (B)	U7	18408508	NASW-2308, Source selector switch pc board ass'y (D)
A28	27273030C	Joint L		28322022A	Knob, shift (S)			
A30	27150202	Shielded plate	F501	△ 252059	4A(S)-2, Speaker protection fuse (D)	U8	18408509	NAAF-2309, Power amplifier and power supply pc board ass'y (D)
A38	834430068	3TTS+6B(BC), Tapping screw	F601	△ 252077	4A-SF-EAK, Speaker protection fuse (G)			
A40	831130088	3TTW+8B, Tapping screw	F501	△ 252049	4A(ST-6), Primary fuse (D)			
A41	838440089	4TTB+8C(BC), Tapping screw	F601	△ 252074	2A-SF-EAK, Primary fuse (G)	U9	18408510	NATC-2310, Tone control circuit pc board ass'y
A42	834430168	3TTS+16B(BC), Tapping screw	F901	△ 252078	5A-SF-EAK, Secondary fuse (G)	U10	18408511	NASW-2311, Switch pc board ass'y
A43	834230108	3TTS+10B(Ni), Nickel screw (D)	F902	△ 252070	1A-SF-EAK, Secondary fuse (G)	U11	18408512	NASW-2312, Speaker switch pc board ass'y
A44	834430108	3TTS+10B(BC), Tapping screw	F903	25060044	Terminal GND	U12	18408513	NAHP-2313, Headphone terminal pc board ass'y
A46	82142003	2P+3F(BC), Pan head screw	F904	△ 253112	AS-UC-4#18, Power supply cord (D)	U13	18408514	NAVR-2314, Volume control pc board ass'y
A47	82143006	3P+6FN(BC), Pan head screw	P904	△ 253128	AS-CEE, Power supply cord (G)			
A48	82142604	2.6P+4F(BC), Pan head screw	Q501	△ 25050046	NSCT-2P15, AC outlet (D)			
A50	880004	Rivert	Q501	222046	STK-4913, Power amplifier IC	U14	18414516	NAPL-2316, Edge light pc board ass'y
A301	28184271	Top cover (S)	Q901	222780122	78M12, Constant voltage IC			
	28184272	Top cover (B)	T901	232085	NMA-3034, AM loop antenna holder, antenna			
A302	834430068	3TTS+6B(BC), Tapping screw	T901a	27190105	Holder, antenna			
A501	18408121	Front panel ass'y (S)	T902	△ 230866	NPT-874D, Power transformer (D)			
A501a	27267387	Guide, speaker		△ 230867A	NPT-874G, Power transformer (G)			
A501b	27267386B	Guide, power						
A501c	27267398	Guide, loudness						
A501d	28191312	Clear plate						
A501e	28321992A	Selecter knob ass'y						
A501f	28321998A	Knob ass'y						
A501	18428121	Front panel ass'y (B)						
A501a	27267390	Guide, speaker						
A501b	27267389B	Guide, power						
A501c	27267399	Guide, loudness						
A501d	28191313	Clear plate						

NOTE: (D): Only 120V model  
(G): Only 220V model  
(B): Only black model  
(S): Only silver model

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

## CIRCUIT DESCRIPTION

### 1. Synthesizer and controller operation

Pin No.	Symbol	Terminal	Description
1	GND	Ground	
2	XT	X'tal	Connected to the 7.2MHz crystal oscillator for the reference frequency.
3	XT		
4	FM	FM band specification input	Mutual reset type, performs switching of each band, FM/MW/LW.
5	MW	MW band specification input	
6	LW	LW band specification input	
7	MANUAL	Manual tuning mode specification input	Mutual reset type, performs auto search and manual operation mode switching during UP/DOWN tuning.
8	AUTO	Auto search tuning mode specification input	
9	UP	UP tuning key input	Connect the push key and perform UP/DOWN tuning.
10	DOWN	DOWN tuning key input	
11	STO	Memory store command input	The preset memory is set to the write mode when the key is pressed.
12-19	M1-M8	Preset memory channel specification input	Controls the write and read out of the internal 16-station preset memory along with the MC1 and MC2 input.
20	MC-1	Memory control input	Set the 16-station preset memory to the 8 FM/8 AM station mode or the FM/MW/LW 3-band 16-station random mode. The 8 FM/8 AM mode is used in this unit.
21	MC-2		
22	OSC2	AM oscillator terminal	CR connection terminal for the oscillator that determines the scan speed during the AM search mode.
23	OSC1	FM oscillator terminal	CR connection terminal for the oscillator that determines the scan speed during the FM search mode.
24	O/5	FM 50 kHz output	Output that represents the 50kHz FM band tuning step for European models. Goes to the high level for the 50 kHz setting.
25	CK2	Tuned frequency data output	Outputs the serial data and timing clock to the tuned frequency display driver.
26	CK1		
27	DATA		
28	MUTE	Muting signal output	Goes to the high level during muting output.
29	E2	Regin specification input	See table 1.
30	E1		
31	STOP 3	AM IF signal input	During AM reception, this counts the IF signal and stops auto search.
32	STOP 2	Auto search stop signal input	When the stop 1 input (pin 33) is at the high level and this terminal goes to the high level, auto search is stopped.
33	STOP 1	Scan speed slow input	When the high level is input at this terminal, the auto search speed is cut in half.

Pin No.	Symbol	Terminal	Description
34	DO1	Error output	Charge pump output of the phase detector which constitutes the PLL. High level is output when the divided oscillation frequency is high 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 front end through low pass filter Q704 and Q705. The output from both terminals is the same, but only DO1 is used.
35	DO2		
36	TEST	Test terminal	Test mode at the high level.
37	FM IN	FM programmable counter input	Connect to the prescaler output (Pin3 of Q701)
38	PSC	Pulse swallow control output	Output to the control the division ratio of the prescaler.
39	AM IN	AM local oscillator signal input	Terminal for input of AM broadcast signal.
40	$\overline{\text{INH}}$	Inhibit input	Operates normally at the high level. Inhibit status at the low level.
41	$\overline{\text{INT}}$	Initialize input	Operates normally at the high level. At the low level, the internal status is initialized.
42	VDD	Power supply	Device power terminal; supplies 5V during the normal operation and 2.5V from the super capacitor (C712) for memory preservation.

table 1.

E1 (Pin 20)	E2 (Pin 29)	Region	Band	Frequency range	Intermediate frequency	Scan step	Reference frequency
0	1	U.S.A	FM	87.5 ~ 108.0 MHz	+10.7 MHz	100 kHz	25 kHz
1	1		AM1	520 ~ 1710 kHz	+450 kHz	10kHz	10 kHz
1	1		AM2	522 ~ 1710 kHz	+450 kHz	9kHz	9kHz
1	0	Europe	FM	87.50 ~ 108.00 MHz	+10.7 MHz	50 kHz	25 kHz
1	0		MW	522 ~ 1611 kHz	+450 kHz	9 kHz	9 kHz
0	0	Japan	LM	153 ~ 360 kHz	+450 kHz	1 kHz	1 kHz
			FM	76.0 ~ 90.0 MHz	-10.7 MHz	100 kHz	25 kHz
0	0	Japan	AM	522 ~ 1611 kHz	+450 kHz	9 kHz	9 kHz

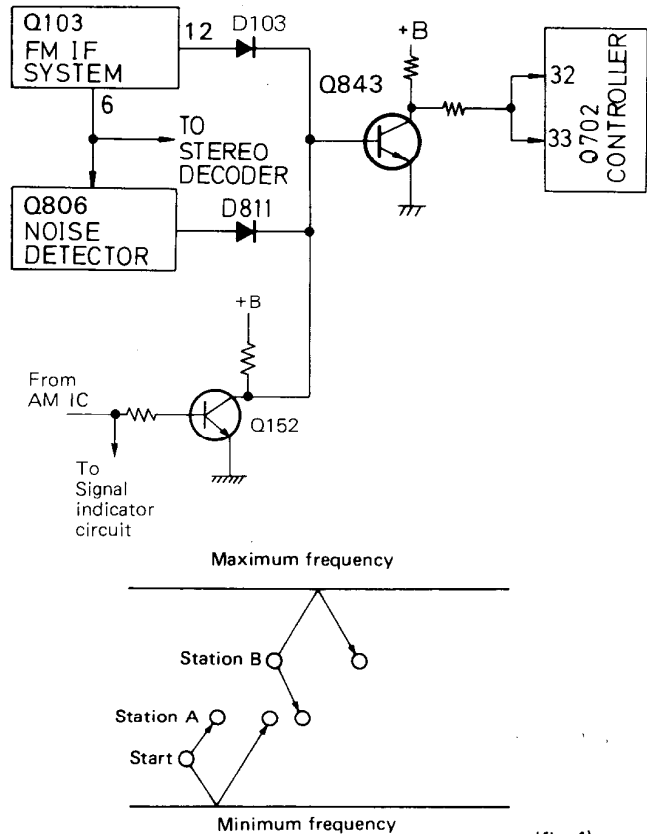
## 2. Auto Hi-blend and NR switch circuit

The Q103 FM IF system incorporates IC's with a built-in IF level detector with a 13 pin output.

If an input above 38dB enters the antenna, the 4 pin of Q716 signal driver becomes low level, the Q721 is turned on, the Q722 and Q202 are turned off and the high blend function is turned off.

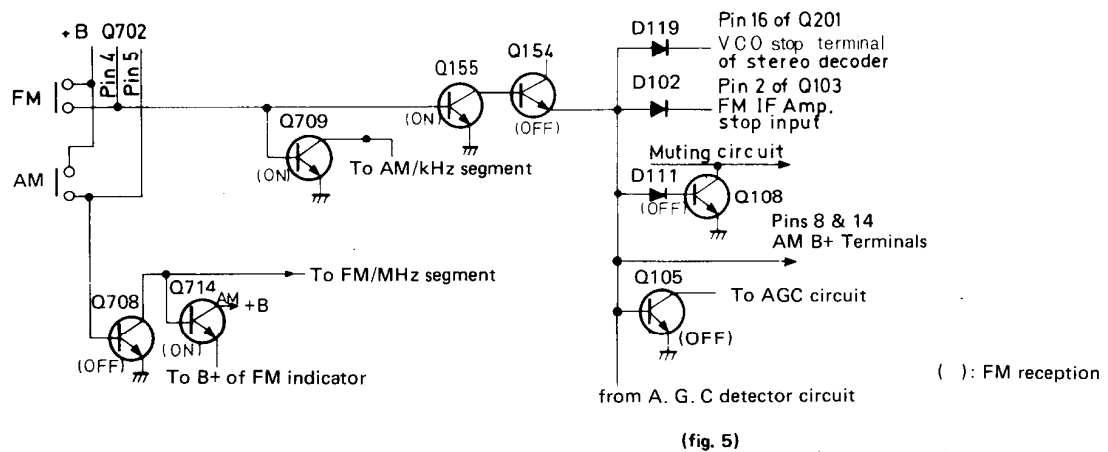
If an input above 17dB enters the antenna, the 2 pin of Q716 signal driver becomes low level, the Q719 is turned on, the Q720, Q203 and Q204 are turned off and the NR function is turned off.

### 3. Auto search tuning circuit



(fig. 4)

### 4. FM/AM switch circuit



(fig. 5)

The FM/AM selector circuit is shown in the diagram. fig.5. Pins 4 and 5 of Q702 are of the mutual reset type. For FM, pin 4 is high and pin 5 is low; for AM, pin 4 is low and pin 5 is high. Because pin 5 is high and pin 4 is low during AM reception, Q709 is off, the AM, kHz segments of the fluorescent display are turned on. Also, since Q708 goes to on and Q714 is turned off, and the FM indicators are turned off. At the same time, Q155 is turned off and Q154 turned on, so +B is supplied to the power source terminal of the radio

During FM reception, this is operated by the IF level detection and zero point detection circuits included in the FM IF system IC of Q103 and by the noise component detection circuit of Q806. When a station is tuned, the output of all outputs go to the low level so Q843 goes from on to off, causing pins 32 and 33 of the controller IC to go to the high level to complete auto search tuning.

During AM reception, this is operated by the IF level detection included in the AM radio system IC of Q151. When a station is turned, Q152 goes from off to on and Q706 goes to off, causing pins 32 and 33 of the controller IC to go to the high level to complete auto search tuning.

#### • Manual Tuning

When the UP or DOWN key is pressed, the frequency goes up or down by one step. When either key is held down, the frequency rapidly increases or decreases (scans) and stops when the key is released. When either end of the turning range is reached, key input will no longer be received and the frequency will stop at the highest or lowest frequency.

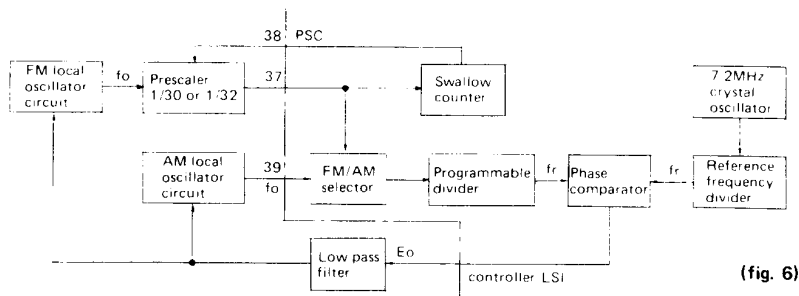
#### • Auto Tuning

When the UP or DOWN key is pressed, scanning begins in the up or down direction, stopping where there is a radio station. Since auto scan is operated by a triangular wave, scanning is begun in the opposite direction the instant either end of the tuning range is reached. Also, if the UP or DOWN key is pressed when the tuned frequency is not at either end of the range, up or down scanning will begin.

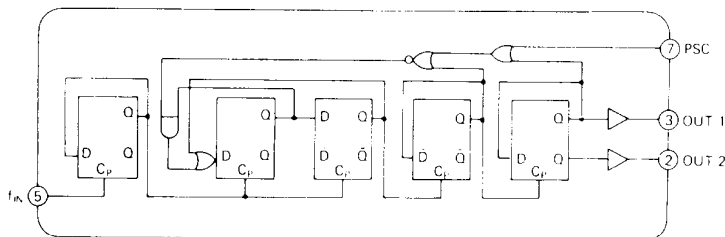
system pins 8 & 14 of Q151.

Pin 16 of Q201 goes to the high level, the VCO oscillator stops, and pin 2 of Q103 goes to the high level so the FM IF amp is also switched off. Also, during AM reception, Q108 is turned on so the muting circuit is off. During FM reception, all of the switching transistors mentioned above perform the opposite operations to switch to the FM mode. Figures in parentheses indicate transistor operation during FM reception.

5. PLL tuned circuit



(fig. 6)



(fig 7) TD6104P (Prescaler)

A block diagram of the tuned circuit of the PLL is shown in figer 6.

Operation during AM reception

The reception frequency is applied to the programmable divider where it is divided to 1/N and output as  $f_v$ . This is applied to the phase comparator where it is compared with frequency reference  $f_r$  (9kHz for G/W model and 10kHz for D model). If  $f_r$  and  $f_v$  differ,  $E_o$  equal to the difference in frequency is output. Since error output  $E_o$  is a pulse waveform, it is passed through the low pass filter to change it into DC voltage  $V_D$ , which is applied to the variable capacitor diode in the front end to change the reception frequency. This continues until  $f_v$  and  $f_r$  are the same and  $E_o = 0$ .

Operation during FM reception

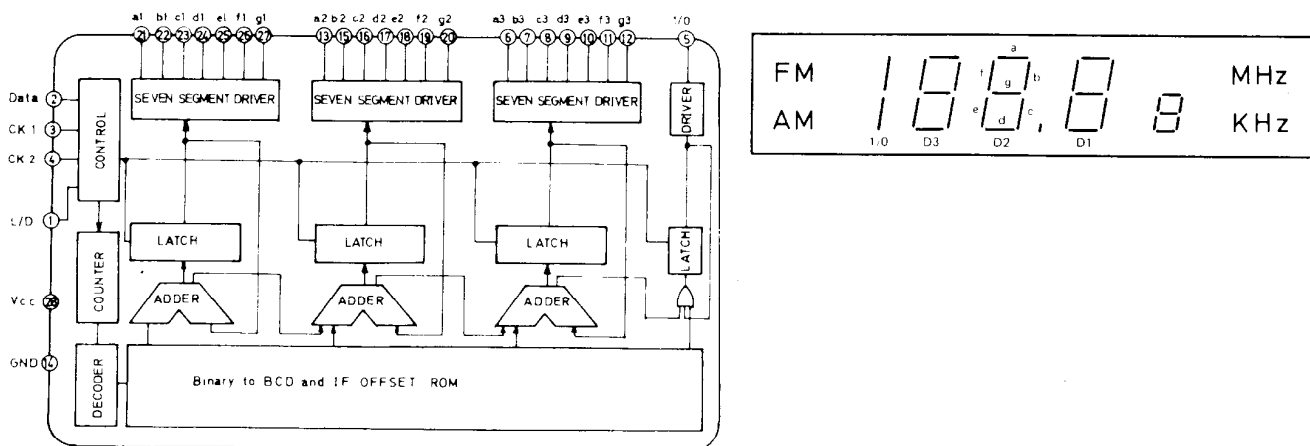
The pulse swallow method is used in the prescaler of this unit. In this type of prescaler, a supplementary number

(changed according to the program code input) and the divided reception frequency from the prescaler are combined in the control counter and the prescaler's division factor is switched 1/30 or 1/32 according to external control (1/32 when the PSC terminal is "H" and 1/30 when it is "L").

The station oscillator frequency is applied at the programmable divider, but the programmable divider has an upper frequency limit of only 30MHz, so the pulse swallow-type prescaler, which can be used up to 150 MHz, is inserted for division to 1/Np;

The signal is applied to the programmable divider and divided to 1/N. The result is compared with a 25kHz frequency reference in the phase detector and the error is output as  $E_o$  until a match is obtained as in AM operation.

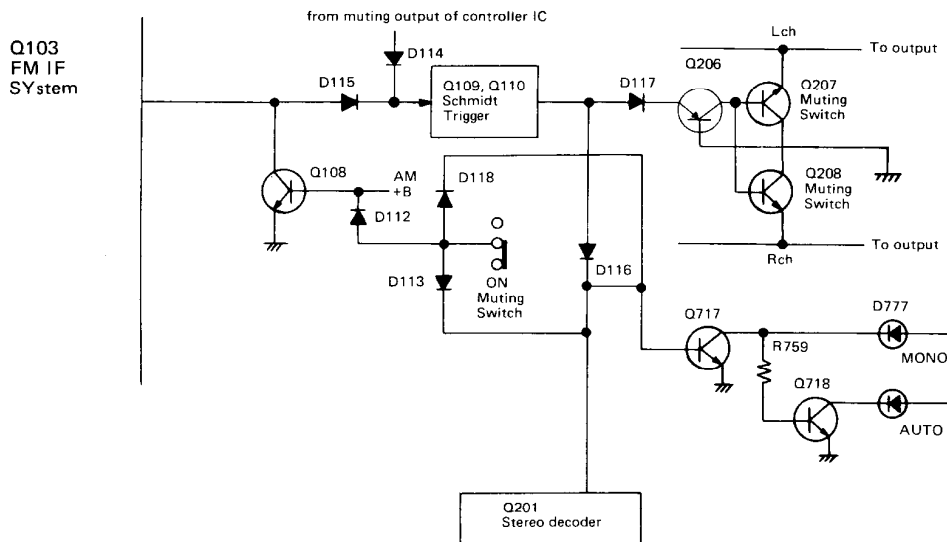
6. Frequency indicator circuit



(fig. 8) TD6301AP block diagram

Pin No.	Terminal	Description
1	L/D	Output indication switching input terminal: Fluorescent display at the low level, and LED display at the high level.
2	Data	Tuned frequency data input terminal: Input from the system controller LSI to the serial.
3,4	CK1, CK2	Tuned frequency data input control timing input terminal: Transferred simultaneously with data from the system controller LSI.
5	1/0	Segment drive output terminal: Sets the number of display digit for FM (100MHz) and AM (1,000kHz) reception.
6-12	a3-g3	Seven segment drive output terminals: Sets the number of display digit for FM(10MHz) and AM (100kHz) reception.
13, 15-20	a2-g2	Seven segment drive output terminals: Sets the number of display digit for FM (1MHz) and AM (10kHz) reception
21-27	a1-g1	Seven segment drive output terminals; set the number of display digit for FM (100kHz) and AM (1kHz) reception
14	Vcc	Power source terminal
28	Gnd	Ground

## 7. Muting circuit



The muting circuit operates in the following cases.

- While pin 28 of the controller IC outputs the high level, Q207 and Q208 are turned on and muting is closed in the following cases: (1) While the the manual UP/DOWN switch is being held down, (2) When a station in the memory is recalled, and (3) While a radio station is being received using auto search tuning.
- When an FM station is not being received (and the muting switch is on).

The IF level in the FM IF system (set at R120 so muting is opened at 17 dBf (low position)) and zero point detection circuit (tuning point 55kHz (100kHz step): 30kHz

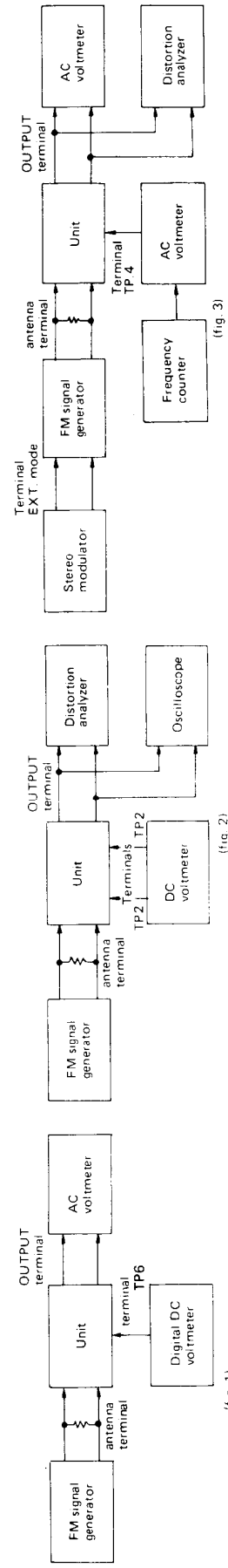
(50kHz step)— are output at pin 12 through the AND circuit. When a station is tuned, the output goes to the low level.

When output goes to the low level, Q109 is turned off, Q110 is turned on and Q207 and Q208 are turned off, so muting is opened. At the same, pin 16 of stereo decoder Q201 goes to the low level, so the VCO oscillator starts.

# ADJUSTMENT PROCEDURES

## FM section

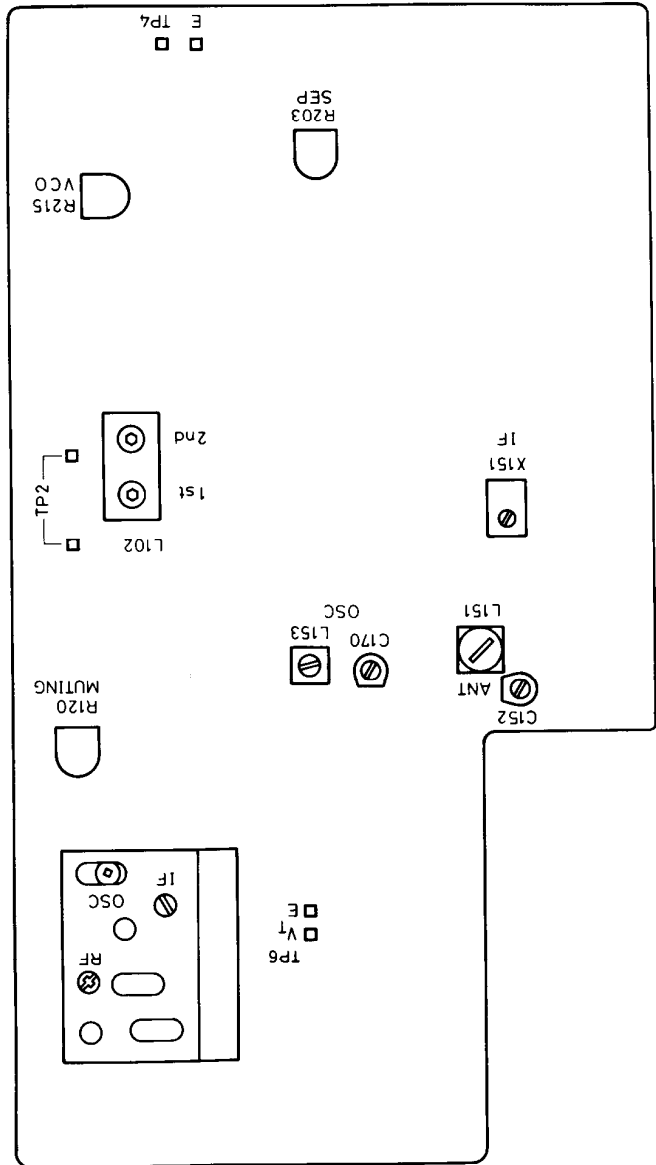
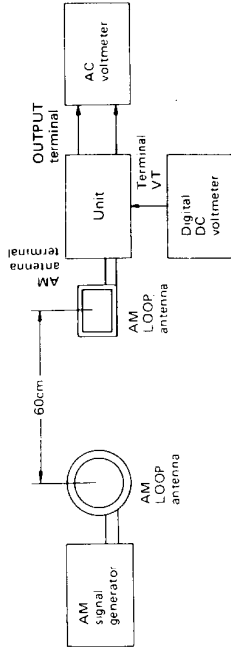
Item	Step	Connection of instrument	FM SG output	Stereo modulator output	Turning dial setting	Output indicator	Adjustment	Adjust for	Remarks
FM RF	1	Fig. 1	—	—	88.0 MHz	Digital DC voltmeter	OSC	1.4V	Usually not necessary to adjust.
	2	Fig. 1	107.9 MHz 1 kHz, 75 kHz devi.	—	107.9 MHz	AC voltmeter	RF	Maximum output	
FM IF	1	Fig. 2	99.0 MHz 1 kHz, 75 kHz devi. 65 dBf (60 dB)	—	99.0 MHz	DC voltmeter	L102 Primary coil	0V	Muting switch : off Repeat the steps 1 and 2 until no further adjustment is necessary
	2	Fig. 2	—	—	99.0 MHz	Distortion analyzer	L102 Secondary coil	Minimum	
VCO		Fig. 3	99.0 MHz 1 kHz, 75 kHz devi. 65 dBf (60 dB)	—	99.0 MHz	Frequency counter	R215	19 kHz $\pm$ 10 Hz	Muting switch : on
Distortion		Fig. 3	99.0 MHz 65 dBf (60 dB) Ext. modulation	L+R 1 kHz	99.0 MHz	Distortion analyzer	IF	Minimum	
		Fig. 3	99.0 MHz 65 dBf (60 dB) Ext. modulation	L ch. 1 kHz R ch. 1 kHz	99.0 MHz	R ch. AC voltmeter L ch. AC voltmeter	R203	Minimum Minimum	Maximum and same separation
Muting level	1	Fig. 2	99.0 MHz 17.2 dBf (12 dB) 1 kHz, 75 kHz devi.	—	99.0 MHz	Oscilloscope	R120	Signal output	Muting level: high
	2	Fig. 2	99.0 MHz 16.2 dBf (11 dB) 1 kHz, 75 kHz devi.	—	99.0 MHz	—	—	No output	Muting switch: on



AM section

Step	AM SG output	Tuned frequency	Output indicator	Adjustment point	Adjust for	Remarks
1		522kHz (520kHz)	Digital DC voltmeter	L153	1.2V	Repeat the steps 1 and 2 until no further adjustment is necessary.
2		1611kHz (1710kHz)	Digital DC voltmeter	C170	9.0V (10.5V)	
3	603kHz (600kHz) 400Hz 30% mod.	603kHz (600kHz)	AC voltmeter	L151	Maximum	Repeat the steps 3 and 4 until no further adjustment is necessary.
4	1404kHz (1400kHz) 400Hz 30% mod.	1404kHz (1400kHz)	AC voltmeter	C152	Maximum	
5	999kHz (1000kHz) 400Hz 30% mod.	999kHz (1000kHz)	AC voltmeter	X151	Maximum	

( ): 120V model <10kHz step>





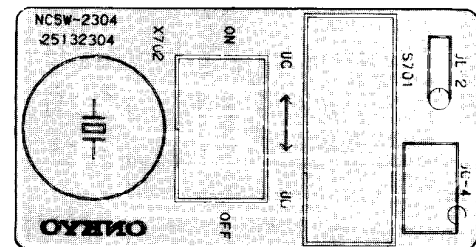


CIRCUIT NO.	PART NO.	DESCRIPTION
	<b>Capacitors</b>	
C152	3060010	NTC-20P09, Trimmer
C158	352741009	10 $\mu$ F, 16V, Elect.
C161	352744709	47 $\mu$ F, 16V, Elect.
C162	352780109	1 $\mu$ F, 50V, Elect..
C165,C166	352750479	4.7 $\mu$ F, 25V, Elect.
C168	370135114	510pF $\pm$ 5%, 100V, APS
C170	3060010	NTC-20P09, Trimmer
C174	352782299	0.22 $\mu$ F, 50V, Elect.
C175	352721019	100 $\mu$ F, 6.3V, Elect.
C176	352780339	3.3 $\mu$ F, 50V, Elect.
C201	352744719	470 $\mu$ F, 16V, Elect.
C203	352750479	4.7 $\mu$ F, 25V, Elect.
C209,C210	352741009	10 $\mu$ F, 16V, Elect.
C212	352782299	0.22 $\mu$ F, 50V, Elect.
C213	352780109	1 $\mu$ F, 50V, Elect.
C214	352780339	3.3 $\mu$ F, 50V, Elect.
C215	370134714	470pF $\pm$ 5%, 100V, APS
C220,C221	352780229	2.2 $\mu$ F, 50V, Elect.
	<b>Resistors</b>	
R120	5215045	N08HR10KBC, Semi-fixed
R203	5215048	N08HR200KBC, Semi-fixed
R215	5215044	N08HR5KBC, Semi-fixed
	<b>Terminal</b>	
P001	25060087	NTM-2PDMN31, Antenna
	25060085	NTM-4PDMB29, Antenna
	<b>Sockets</b>	
	25050141	NJPS-4P-S

(D): Only 120V model  
(G): Only 220V model

CIRCUIT NO.	PART NO.	DESCRIPTION
	<b>Coils</b>	
L153	232110	NMO-4027
L201	233236	NMC-6027 (G)
L202,L203	233291	NMC-5039
	<b>Transformer</b>	
L102	233274	NFIF-6041
	<b>Ceramic filters</b>	
X101-X103	3010043	SEE10.7MM (G)
X101,X102	3010071	SFE10.7MA5 (D)
X151	3010075	SFL450B3
X152	3010076	BFU450C
	<b>Capacitors</b>	
C101	352780339	3.3 $\mu$ F, 50V, Elect.
C107,C110	352780109	1 $\mu$ F, 50V, Elect.
C111	352741009	10 $\mu$ F, 16V, Elect.
C117	352784799	0.47 $\mu$ F, 50V, Elect.
C118	352742209	22 $\mu$ F, 16V, Elect.
C120	352741009	10 $\mu$ F, 16V, Elect.
C123	352784799	0.47 $\mu$ F, 50V, Elect.
C125	352780229	2.2 $\mu$ F, 50V, Elect.
C126	352780109	1 $\mu$ F, 50V, Elect.
C128	352741009	10 $\mu$ F, 16V, Elect.

## BUZZER SWITCH PC BOARD

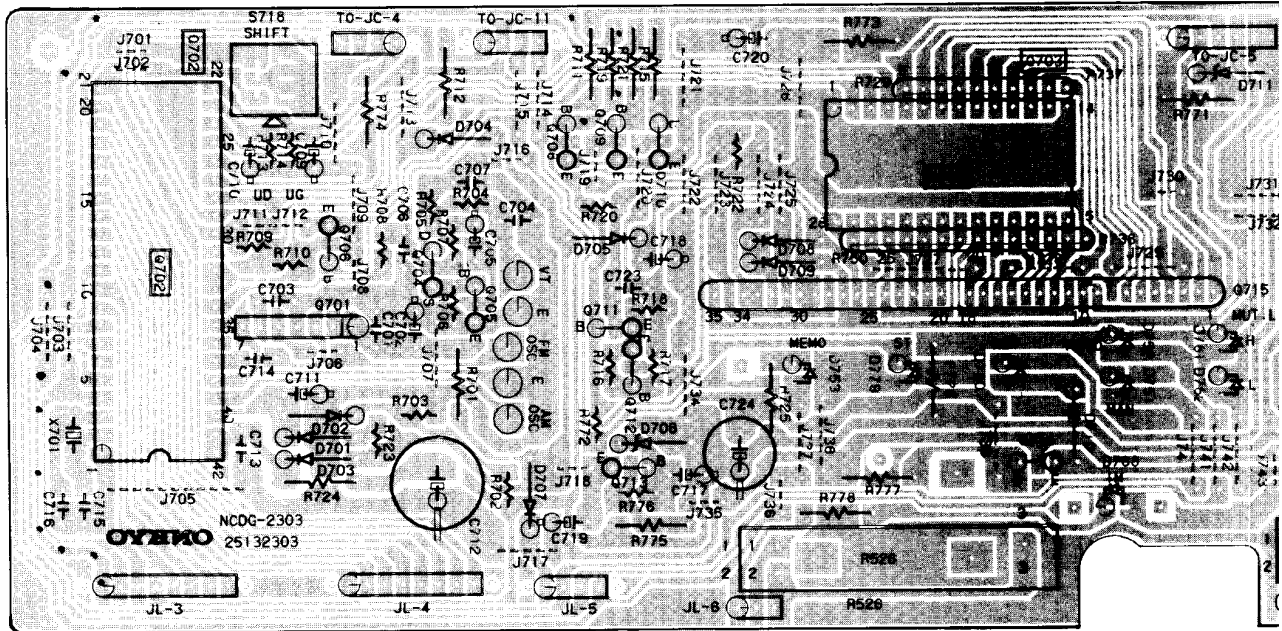


## BUZZER SWITCH PC BOARD(NASW-2304)

CIRCUIT NO.	PART NO.	DESCRIPTION
X702	241048	PKM24-4A0, Buzzer
S702	250142	NSS-2225, Slide switch
	25050141	NJPS-4P-S, Socket, jumper

# PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE

## DIGITAL CIRCUIT PC BOARD

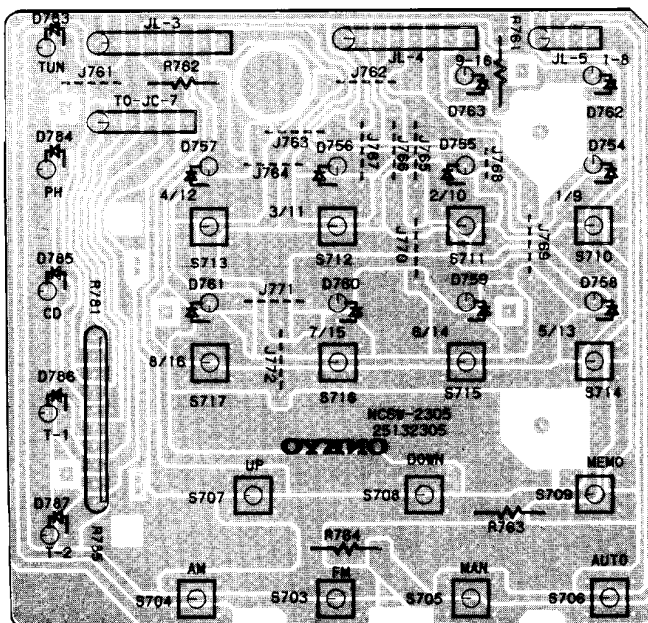


## PRINTED CIRCUIT BOARD-PARTS LIST

### DIGITAL CIRCUIT PC BOARD(NADG-2303/A)

CIRCUIT NO.	PART NO.	DESCRIPTION	CIRCUIT NO.	PART NO.	DESCRIPTION
				<b>Transistors</b>	
Q701	222675	TD6104P	Q704	2212294 or	2SK108(D) or
Q702	222674	TC9147BP		2211293	2SK68(M)
Q703	222673	TD6301AP	Q705,Q713	2211255	2SC1815(GR)
Q716	222670 or	BA6124 or	Q706	2211255,	2SC1815(GR),
	222666	LB1403	Q708,Q709	2210746 or	2SC945A(P) or
			Q717,Q718	2212485	JC501(Q)

### OPERATION SWITCH PC BOARD



### OPERATION SWITCH PC BOARD(NASW-2305)

CIRCUIT NO.	PART NO.	DESCRIPTION
		<b>L.E.D.s</b>
D754-D761	225137CG,	SEL2413E
D783-D785	225137DG or	
	225137DY	
D762,D763	225142	SEL2913K
D786,D787	225142	SEL2913K
		<b>Resistors</b>
R781-R785	49241681505	680Ω×5, 1/4W, Network
		<b>Switches</b>
S703-S717	25035389	NPS-111-S353, Push
		<b>Holders</b>
	27190361A	STL
	27190362	SELL

CIRCUIT NO.	PART NO.	DESCRIPTION
Q710,Q711	2211255, 2210746 or 2212485	2SC1815(GR), 2SC945A(P) or JC501(Q) (G)
Q712	2211454 or 2212494	2SA1015(Y) or JA101(P) (G)
Q714	2211705 or 2211706	2SD655(E) or 2SD655(F)
Q719-Q724	2212600 or 221243	DTA124ES or 2SA1346

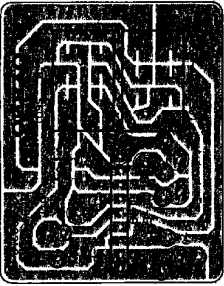
CIRCUIT NO.	PART NO.	DESCRIPTION
<b>Diodes</b>		
D701-D705 D707,D710	223150, 223145 or 223124	US1040, 1S2076TD or 1S2473
D708,D709	223150, 223145 or 223124	US1040, 1S2076TD or 1S2473 (G)
D706	2243163 or 2239493	MTZ6.2C or RD6.2EB3
D711	2241291	RD3.3EB1
<b>L.E.Ds</b>		
D751,D772 D752,D771 D766-D769 D773	225142 225137CG, 225137DG or 225137DY	SEL2913K SEL2413E
D753,D779 D774 D775,D778 D780,D781	225141 225142 225137CG, 225137DG or 225137DY	SEL2213C SEL2913K SEL2413E
D776,D777 D782,D788 D789	225142 225142 225142	SEL2913K SEL2913K SEL2913K
<b>Fluorescent tube</b>		
Q715	212016	FIP-7B8CS
<b>X'tal</b>		
X701	3010073	XTL-7.2M
<b>Capacitors</b>		
C702	352744709	47 $\mu$ F, 16V, Elect.
C705	395160107	1 $\mu$ F, 35V, Tantalum
C709	352780109	1 $\mu$ F, 50V, Elect.
C710	352780229	2.2 $\mu$ F, 50V, Elect.
C711	352784799	0.47 $\mu$ F, 50V, Elect.
C712	3020018	0.047F, 5V, Super
C717-C719	352741009	10 $\mu$ F, 16V, Elect.
C720	352751009	10 $\mu$ F, 25V, Elect.
C722	352741009	10 $\mu$ F, 16V, Elect.
C724	352742209	22 $\mu$ F, 16V, Elect.
<b>Resistors</b>		
R729-R737	49121333509	33k $\Omega$ ×9, 1/8W, Network
R738-R750	49121333513	33k $\Omega$ ×13, 1/8W, Network
R526	6142043	N30LL10KA15Z, Slide variable
R534	6142044	N30LL100KA15Z, Slide variable
<b>Switch</b>		
S718	25035399	NPS-122-L364, Shift
<b>Holder</b>		
	27190363A	L.E.D
	27190360	EXL
<b>Cushion</b>		
	28140593	40×10×3.5

(D): Only 120V model  
(G): Only 220V model





**PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE**  
**AMPLIFIER AND POWER SUPPLY CIRCUIT PC BOARD**



**SPEAKER SWITCH PC BOARD**



**HEADPHONE TERMINAL PC BOARD**

**PRINTED CIRCUIT BOARD-PARTS LIST**

**POWER AMPLIFIER AND POWER SUPPLY PC BOARD**  
**(NAAF-2309/A)**

CIRCUIT NO.	PART NO.	DESCRIPTION	CIRCUIT NO.	PART NO.	DESCRIPTION
Q501, Q601	222046	STK-4913	D921-D923	Diodes	
Q901	227801/22	78M12		US1040,	
				1S2076TD or	
				1S2473	
Q902, Q921	2211225	2SC1815(GR)		Coils	
Q922	2211254	2SC1815(G)		231001	S-1, 3B (G)
D901-D906	Diodes			Capacitors	
D907, D908	2242273,	GP-30DL	C501, C601	352780479	4.7µF, 50V, Elect.
	2241191,	MTZ18C,	C504, C604	352731019	100µF, 10V, Elect. (G)
	223862	GZA18X,		35200080	100µF, 10V, Elect. (D)
D909	2239713	RD18EB3	C507, C607	352984799	0.47µF, 50V, Non-polar elect.
D910	223880	GP101N4003	C510, C610	352984799	0.47µF, 50V, Non-polar elect.
D911	2241291	RD33EB1	C511, C611	352784709	47µF, 50V, Elect. (G)
D912	2239733 or	RD20EB3 or	C513, C514	352781019	47µF, 63V, Elect. (D)
	2243283	MTZ20C	C515, C517	352781009	10µF, 50V, Elect.
			C901	35200655A	0.01µF, AC400V/125V, JS
			C905, C906	352761019	10,000µF, 50V, Elect.
			C907, C908	352761019	100µF, 35V, Elect.
			C909, C910	352752219	220µF, 25V, Elect.

CIRCUIT NO.	PART NO.	DESCRIPTION	CIRCUIT NO.	PART NO.	DESCRIPTION
C912	352761019	100µF, 35V, Elect.	R507, R607	441521024	1KΩ, 1/2W, Metal oxide film
C913	352752229	2,200µF, 25V, Elect.	R508, R608	441523324	3.3KΩ, 1/2W, Metal oxide film
C914	352751019	100µF, 25V, Elect.	R510, R610	441522424	2.4KΩ, 1/2W, Metal oxide film
C916	352741009	10µF, 16V, Elect.	R511, R611	441520824	8.2Ω, 1/2W, Metal oxide film
C917	352780109	14F, 50V, Elect.	R512, R612	441520474	4.7Ω, 1/2W, Metal oxide film (G)
C921	352753309	33µF, 25V, Elect.	R513	441525614	560Ω, 1/2W, Metal oxide film
C923	352780339	3.3µF, 50V, Elect.	R514	4415222014	200Ω, 1/2W, Metal oxide film
			R901	441523355	3.3MΩ, 1/2W, Solid (D)
			R902	441523904	39Ω, 1/2W, Metal oxide film
			R904-R907	441526214	620Ω, 1/2W, Metal oxide film
			R908	44172024	1KΩ, 1W, Metal oxide film
			R909	441720474	4.7Ω, 2W, Metal oxide film
			R910	441627514	750Ω, 1/2W, Metal oxide film
			R924	441522704	27Ω, 1/2W, Metal oxide film
			P501	Terminal	
				25060058	
				25060092	
				NTM-8PDM125	Speaker
				NTM-1S33 (G)	
			S901	Switch	
				25035398	
				NPS-111-L-362P	Power Relay
				25065134	
				NRL-2P9A-DCC4V-07	
				2520777	
				44(SS-2)	Speaker protection (D)
				44(GT-6)	Primary (D)
				2A-SE-EAK	Primary (G)
				5A-SE-EAK	Secondary (G)
				1A-SE-EAK	Secondary (G)
				YSH403T (G)	
				29360374	
				29360626-1	
				T4A/250V	Fuse, rating (G)
				SB-1925	Capacitor for C901
				NJPS-3P-S	Sockets
				25050140	
				25050143	
				NJPS-6P-S	Label

**SPEAKER SWITCH PC BOARD (NASW-2312)**

CIRCUIT NO.	PART NO.	DESCRIPTION
S501, S601	25035467	NPS-212-L-429, Speaker switch

**HEADPHONE TERMINAL PC BOARD (NAHP-2313)**

CIRCUIT NO.	PART NO.	DESCRIPTION
P502	25045138	HLJ0520-01-010, Headphone terminal
R561, R661	441522914	390Ω, 1/2W, Metal oxide film resistor

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

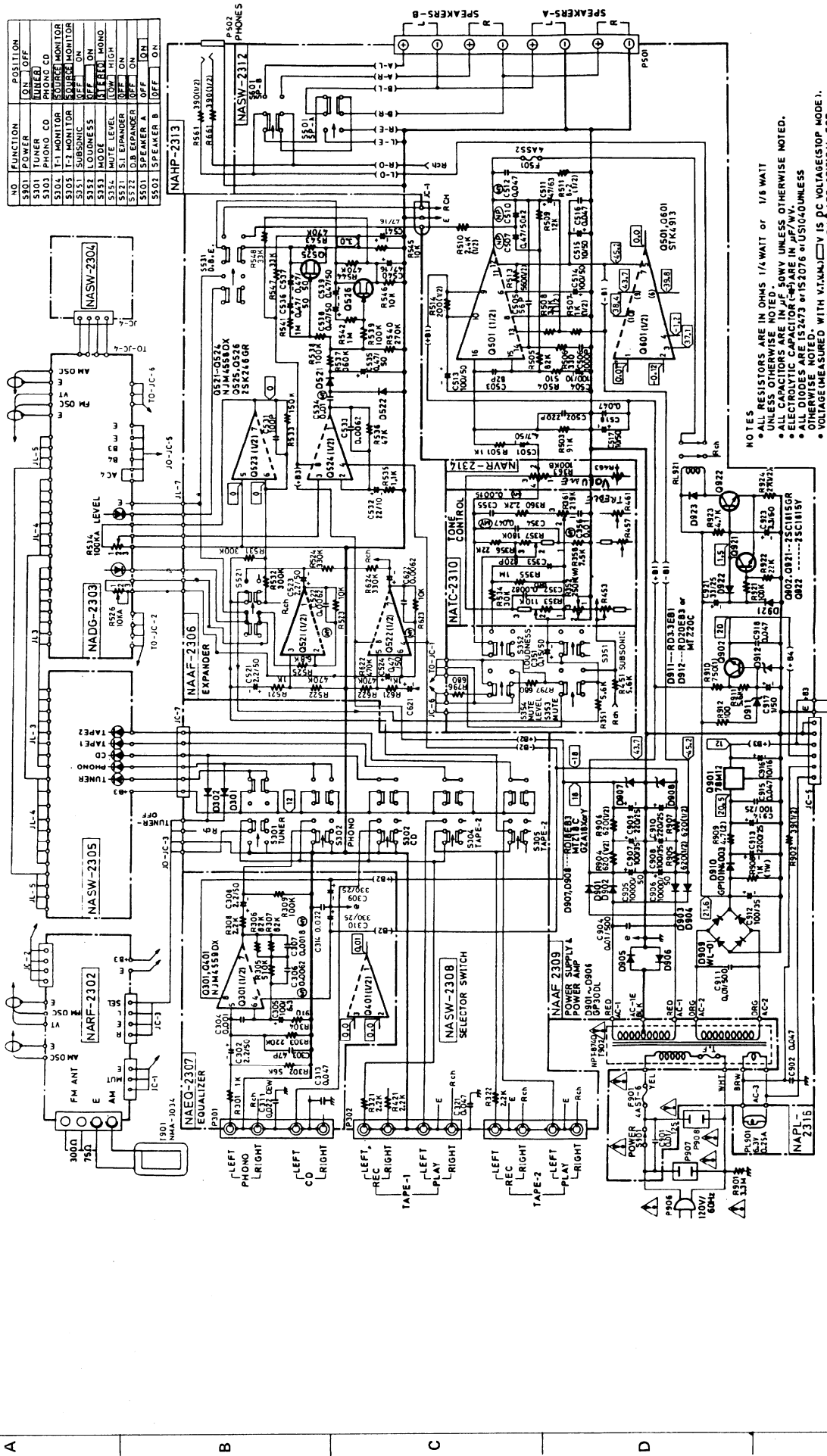
Only 120V model  
 Only 220V model





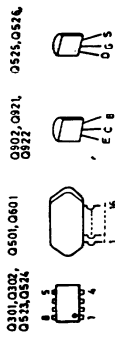
# SCHEMATIC DIAGRAM

-AMPLIFIER SECTION-  
-120V MODEL-



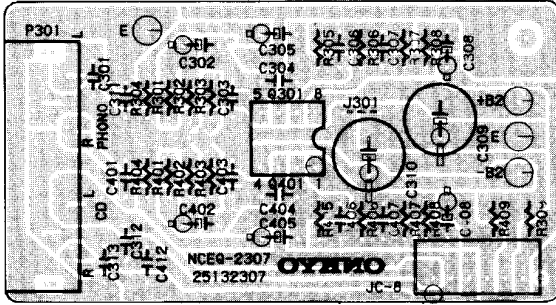
NO.	FUNCTION	POSITION
S301	PULLER	ON/OFF
S101	TUNER	PHONO CD
S103	PHONO CD	SOURCE MONITOR
S104	T-1 MONITOR	OFF ON
S105	T-2 MONITOR	OFF ON
S331	SUBSONIC	OFF ON
S332	MODE	OFF ON
S333	EQUAL.	OFF ON
S334	SPEAKER	OFF ON
S335	EXPANDER	OFF ON
S501	SPEAKER A	OFF ON
S502	SPEAKER B	OFF ON

NOTES  
 • ALL RESISTORS ARE IN OHMS 1/4 WATT or 1/8 WATT UNLESS OTHERWISE NOTED.  
 • ALL CAPACITORS ARE IN  $\mu$ F 50V UNLESS OTHERWISE NOTED.  
 • ELECTROLYTIC CAPACITOR (E) ARE IN  $\mu$ F/50V.  
 • OTHERWISE NOTED.  
 • VOLTAGE (MEASURED WITH VTX/M/J) IS DC VOLTAGE (STOP MODE).  
 • THE COMPONENTS IDENTIFIED BY MARK ARE CRITICAL FOR SAFETY. REPLACE ONLY WITH PART NUMBER SPECIFIED.

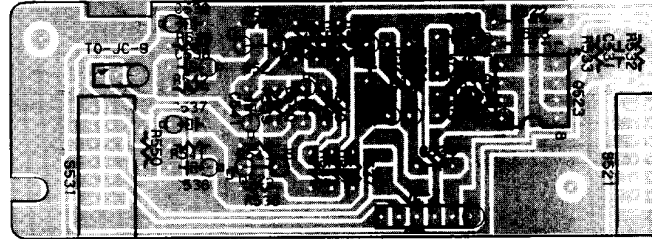


# PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE

EQUALIZER AMPLIFIER PC BOARD



DYNAMIC BASS AND STEREO IMAGE CIRCUIT PC BOARD



## PRINTED CIRCUIT BOARD-PARTS LIST

EQUALIZER AMPLIFIER PC BOARD (NAEQ-2307/A)

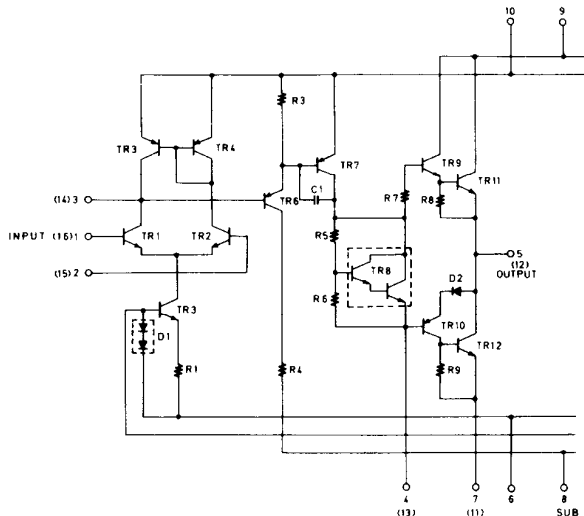
CIRCUIT NO.	PART NO.	DESCRIPTION
Q301, Q302	222534	NJM-4559DX <b>IC</b>
C302, C402	352780229	2.2μF, 50V, Elect.
C305, C405	352721019	100μF, 6.3V, Elect.
C308, C408	352780229	2.2μF, 50V, Elect.
C309, C310	352753319	330μF, 25V, Elect.
P301	25045142	NPJ-4PDBL55 <b>Terminal</b>

DYNAMIC BASS AND STEREO IMAGE CIRCUIT PC BOARD (NAAF-2306)

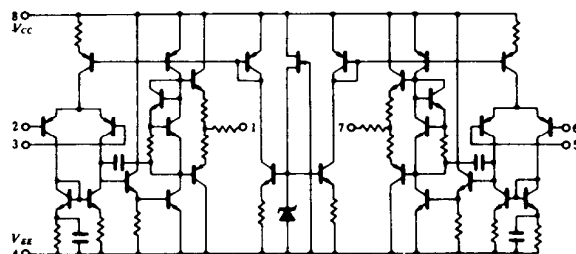
CIRCUIT NO.	PART NO.	DESCRIPTION
Q521-Q524	222502	NJM4558DX <b>ICs</b>
Q525, Q526	2211945	2SK246(GR) <b>Transistors</b>
D521, D522	223124, 223145 or 223150	1S2473, 1S2076TD or US1040 <b>Diodes</b>
C521, C621	352780229	2.2μF, 50V, Elect.
C523, C623	352780229	2.2μF, 50V, Elect.
C524	352784799	0.47μF, 50V, Elect.
C532	352732209	22μF, 10V, Elect.
C535-C539	352784799	0.47μF, 50V, Elect.
C540, C541	352744709	47μF, 16V, Elect.
S521, S531	25035480	NPS-142-L442, Push <b>Switches</b>

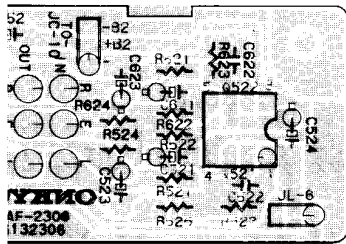
## BLOCK DIAGRAM

STK-4913(Power amplifier)

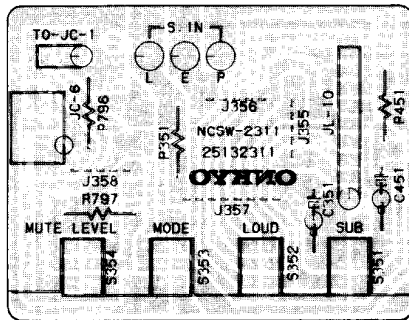


NJM4558/4559(Operation amplifier)





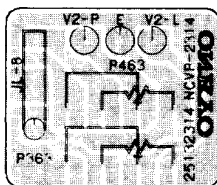
**SWITCH PC BOARD**



**SWITCH PC BOARD(NASW-2311)**

CIRCUIT NO.	PART NO.	DESCRIPTION
C351,C451	352781599	0.15µF, 50V, Elect. capacitor
S351-S354	25035470	NPS-422-L432, Selector switch
	25050140	NJPS-3P-S, Socket

**VOLUME CONTROL PC BOARD**



**VOLUME CONTROL PC BOARD(NAVR-2314)**

CIRCUIT NO.	PART NO.	DESCRIPTION
R363,R463	5148101	N16RGM100KBTP30, Variable resistor

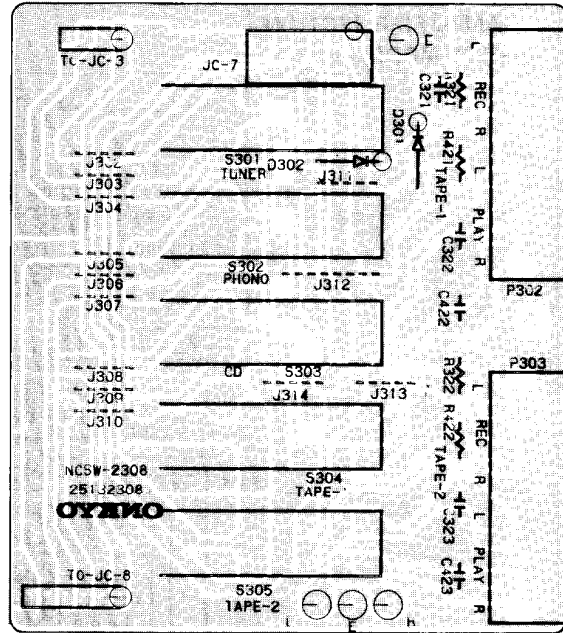
**EDGE LIGHT PC-BOARD**



**EDGE LIGHT PC BOARD(NAPL-2316)**

CIRCUIT NO.	PART NO.	DESCRIPTION
PL901	210064A	PL6.3V, 0.25A, Lamp

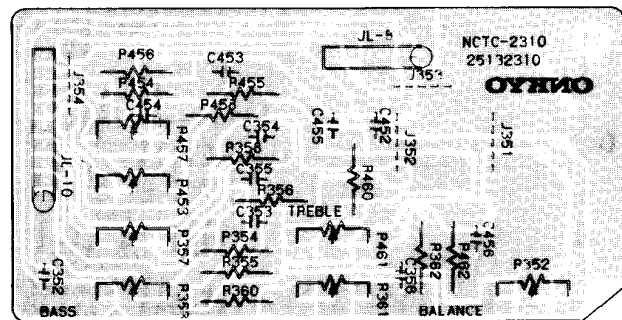
**SOURCE SELECTOR SWITCH PC BOARD**



**SOURCE SELECTOR SWITCH PC BOARD(NASW-2308/A)**

CIRCUIT NO.	PART NO.	DESCRIPTION
D301,D302	223124	1S2473,
	223145 or	1S2076TD or
	223150	US1040, Diode
S301-S305	25035468	NPS-542-L430, Push switch
P302,P303	25045142	NPJ-4PDBL55, Tape input/output
	25050143	NJPS-6P-S, Socket, jumper

**TONE CONTROL PC BOARD**

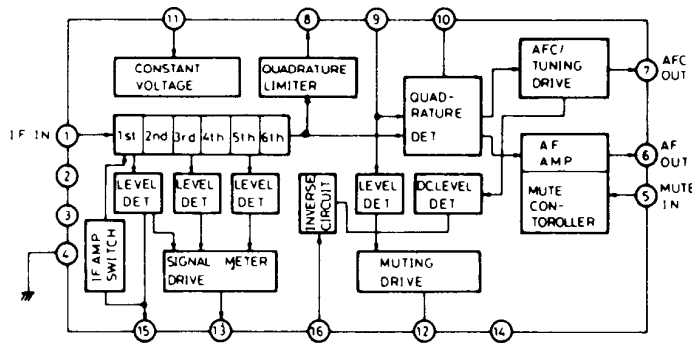


**TONE CONTROL CIRCUIT PC BOARD(NATC-2310)**

CIRCUIT NO.	PART NO.	DESCRIPTION
R352,R452	5146049	N16RLC250KWT30, Balance control variable resistor
R353,R453	5148073	N16RQMC110K180K30, Bass control variable resistor
R361,R461	5148102	N16RGMC219K30, Treble control variable resistor

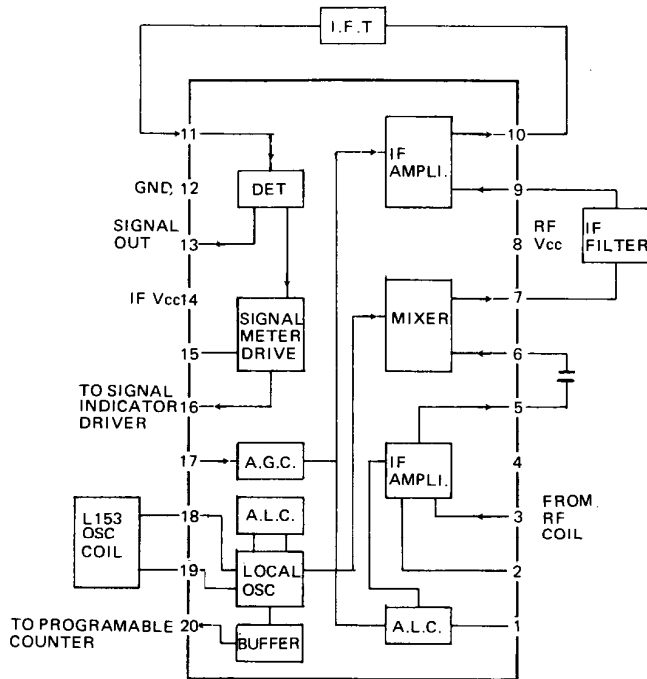
# BLOCK DIAGRAM OF IC

HA-11225(FM IF system)

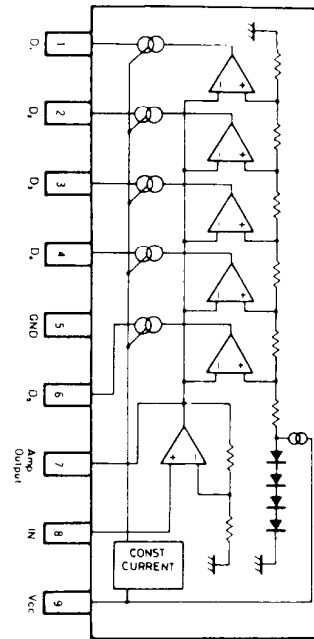


1. IF signal input
2. IF amplifier switch input  
H level: Off
5. Muting switch input
6. Composite signal output
7. AFC output
8. IF amplifier output
9. 10.7MHz input
10. Reference voltage
11. Power supply
12. Muting output  
Tuned: L level
13. Signal strength output
15. AGC output
16. Muting level

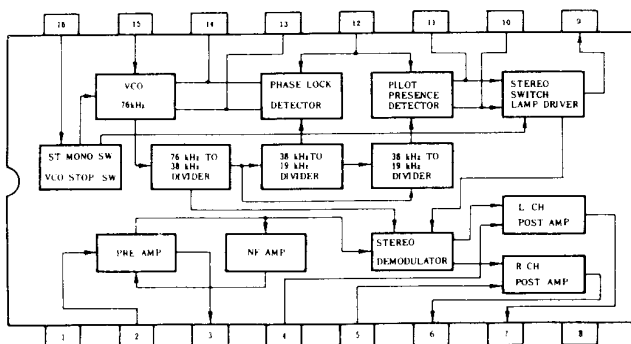
## LA-1245(AM radio system)



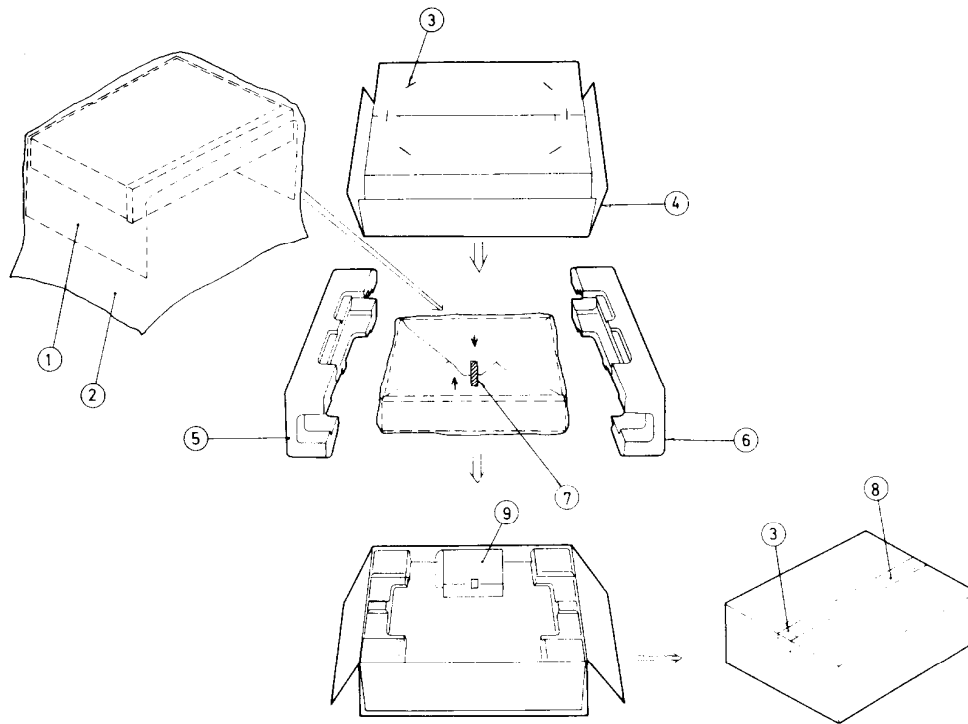
## LB-1403(Signal indicator driver)



## μPC1161C3(Stereo decoder)



## PACKING VIEW



REF. NO.	PART NO.	DESCRIPTION
1	29095012-1	500×800mm, Protection sheet (B)
2	29100034	650×850mm, Poly-vinyl bag
3	282301	Sealing hook
4	29051088	Master carton box (S)
	29051089	Master carton box (B)
5	29090817A	Pad R
6	29090816B	Pad L
7	29110032	W=15mm, Adhesive tape
8	260012	50(W)×600mm, Damplon tape
9		Accessory bag complete
	<b>U.S.A. model</b>	
	292064A	FM antenna
	29100006A	350×250mm, Poly-vinyl bag
	29340860	Instruction manual
	29365006-6	Warranty card
	29358002C	Service station list

REF. NO.	PART NO.	DESCRIPTION
	<b>120V model</b>	
	292064A	FM antenna
	29100006A	350×250mm, Poly-vinyl bag
	29340860	Instruction manual
	<b>220V model</b>	
	292092	FM antenna
	29100006A	350×250mm, Poly-vinyl bag
	29340863	Instruction manual

Note: (B): Only black model  
(S): Only silver model

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