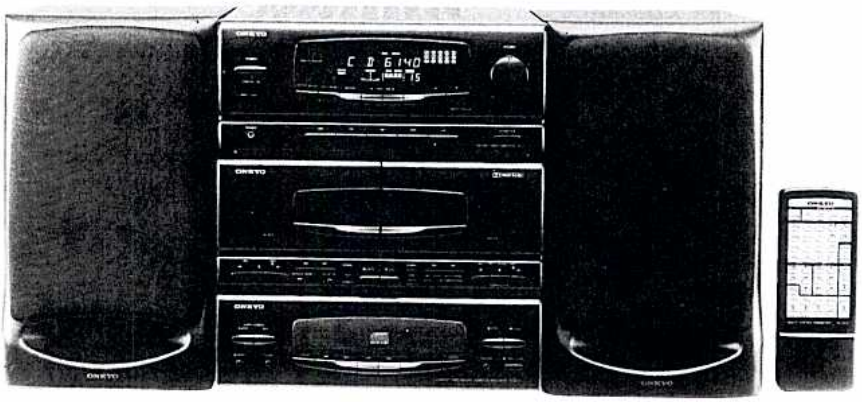
Ref. No. 3455

ONKYO SERVICE MANUAL

QUARTZ SYNTHESIZED TUNER AMPLIFIER

MODEL R-21/R-31



Black model

BHMD, BHMDN	120V AC, 60Hz
BHMP, BHMPV, BHMPF	230V AC, 50Hz
BHMW	120 or 220V AC, 50/60Hz
BHMQA	240V AC, 50Hz

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK ⚠ ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTSWHOSE 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.

ONKYO
AUDIO COMPONENTS

TABLE OF CONTENTS

SPECIFICATIONS

Tuner Amplifier R-31/21

Amplifier section

Power Output:	R-31: 30 watts per channel, min. RMS, at 6 ohms, both channels driven, from 40 Hz to 20 kHz, with no more than 0.5% THD. R-21: 25 watts per channel, min. RMS, at 6 ohms, both channels driven, from 40 Hz to 20 kHz, with no more than 0.5% THD.
Continuous Power Output:	R-31: 2×35 watts at 6 ohms, 1 kHz (DIN) R-21: 2×30 watts at 6 ohms, 1 kHz (DIN)
Total Harmonic Distortion:	0.5% at rated power
IM Distortion:	0.5% at rated power
Damping Factor:	40 at 6 ohms
Frequency Response:	40 – 20,000 Hz ±3 dB (DIRECT)
Sensitivity and Impedance:	
CD/Tape Play:	150mV/50 kohms
Tape Rec:	150 mV/3.5 kohms
Signal-to-Noise Ratio:	
CD/Tape:	100dB (IHF-A)
Tone Controls:	
Super Bass:	+15dB at 45Hz
Bass:	±10dB at 100Hz
Treble:	±10dB at 10kHz
Muting:	–45dB

Tuner section

FM:

Tuning Range:	
European models:	87.5 – 108.0MHz (50kHz steps)
U.S.A. and Canadian models:	87.9 – 107.9MHz (200kHz 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
50dB Quieting Sensitivity:	
Mono:	18.2dBf, 2.2μV, 75 ohms
Stereo:	37.2dBf, 20μV, 75 ohms
Capture Ratio:	1.5dB
Image Rejection Ratio:	85dB (European, Australian and worldwide models) 40dB (USA and Canadian models)
IF Rejection Ratio:	90dB
Signal-to-Noise Ratio:	
Mono:	73dB
Stereo:	66dB
Selectivity:	50dB DIN (±300kHz, 40kHz dev.)
AM Suppression Ratio:	50dB
Harmonic Distortion:	
Mono:	0.15%
Stereo:	0.30%
Frequency Response:	30 – 15,000Hz ±1.5dB
Stereo Separation:	40dB at 1kHz

AM:

Tuning Range:	
European and Australian models:	522 – 1611kHz (9kHz steps)
U.S.A. and Canadian models:	530 – 1710kHz (10kHz steps)
Worldwide models:	531 – 1602kHz (9kHz steps)
Usable Sensitivity:	30μV
Image Rejection Ratio:	40dB
IF Rejection Ratio:	40dB
Signal-to-Noise Ratio:	40dB
Harmonic Distortion	0.8%

General

Power Supply:	
European models:	AC 230V, 50Hz
U.S.A. and Canadian models:	AC 120V, 60Hz
Australian models:	AC 240V, 50Hz
Worldwide models:	AC 120 and 220V switchable, 50/60Hz
Dimensions:	275 (W) × 115 (H) × 321 (D) mm 10-7/8" × 4-1/2" × 12-5/8"
Weight:	5.5kg (12.3lbs.)

Remote control RC-257C

Transmitter:	Infrared
Signal range:	Approx. 5 meters (16ft. 4")
Power supply:	Two "AA"batteries (1.5V × 2)

SERVICE PROCEDURES

1. Replacing the fuses

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

CircuitNo.	PartNo.	Description	
F901	252160Y	⚠ 2.5A-UL/T-237,Primary fuse <W>	R-31
	252159Y	⚠ 2.0A-UL/T-237,Primary fuse <D/W>	R-21
F902	252071	⚠ 1.25A-SE-EAK,Primary fuse <P/W/Q>	R-31
	252070	⚠ 1.00A-SE-EAK,Primary fuse <P/W/Q>	R-21
F903	252071	⚠ 1.25A-SE-EAK,Primary fuse <P>	R-31

NOTE: 〈D〉 :Only 120V model
〈P〉 :Only 230V model
〈W〉 :Only Worldwide model
〈Q〉 :Only 240V model

2. Change of FM/AM band step

With the exception of the Worldwide model,a BAND STEP selector switch is not provided.
(FM)

BAND STEP	R799	J703
200kHz→50kHz	Add	Open
50kHz→200kHz	Open	Short

(AM)

BAND STEP	R798	J702
10kHz→ 9kHz	Add	Open
9kHz→10kHz	Open	Short

R798/R799 1kΩ carbon resistor

—Worldwide model—
Worldwide models are equipped with a step band selector switch. This switch is located on the back panel. This switch is set to 50kHz(FM)and 9kHz(AM)at the factory, but may have to be reset to 200kHz and 10kHz depending on the area where the unit is used.

	FM step	AM step
Europe:	50kHz	9kHz
U.S.A.:	200kHz	10kHz

3. Memory preservation

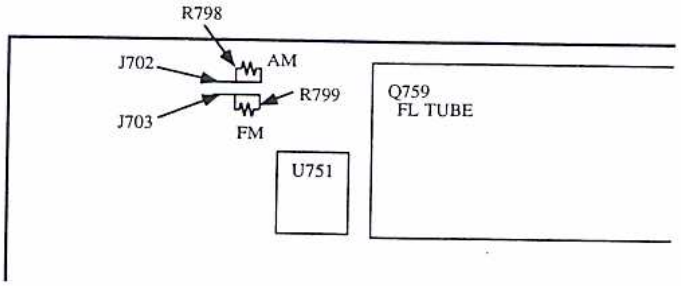
This unit does not require memory preservation batteries. A built-in memory power back-up system preserves contents of the memory during power failures and even when the unit is unplugged. The unit must be plugged in and the power switch turned on and off once in order to charge the back-up system. Note 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 operative. The period of time during which memory contents are preserved after power has last been turned off varies depending on climate 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.

4. 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 terminal GND on the back panel.
Specifications: 3.3 Mohm ±10% at 500V.

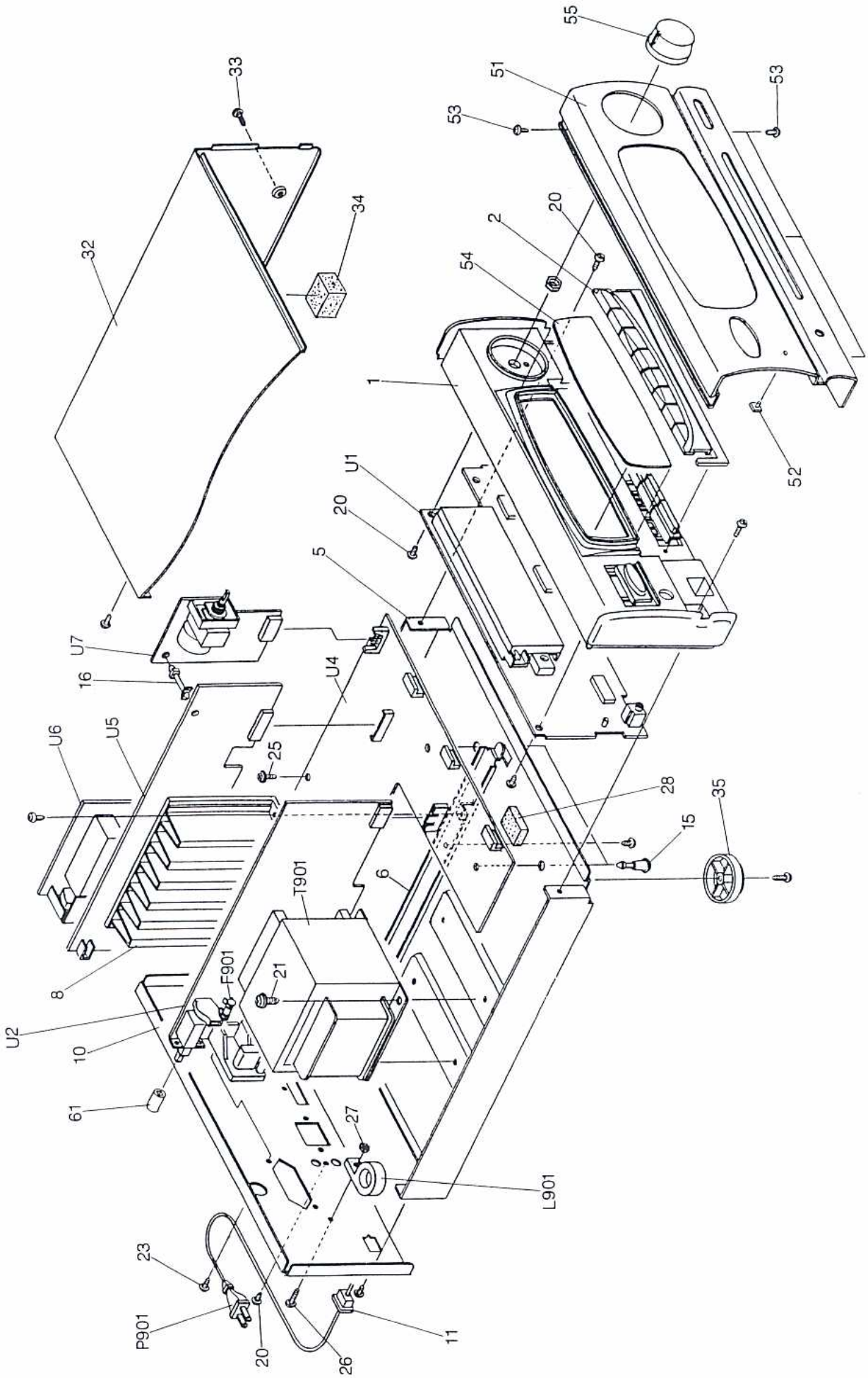
5. Change of voltage

Worldwide 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.



MICROPROCESSOR CIRCUIT PC BOARD

EXPLODED VIEW



PARTS LIST

REF.NO.	PART NO.		DESCRIPTION
1	27110770Y		Front bracket
2	28324837AY		Knob,selector
5	27100268AY		Chassis
6	27130720AY		Bracket H
8	27160326Y		Radiator
10	27121761AY	R-31	Rear panel <P>
	27121762AY	R-31	Rear panel <W>
	27121763AY	R-31	Rear panel <Q>
	27121756AY	R-21	Rear panel <D>
	27121757AY	R-21	Rear panel <P>
	27121758AY	R-21	Rear panel <W>
	27121759AY	R-21	Rear panel <Q>
11	27300750		⚠ Bushing,cord
15	27190524		KGLS-14RT,Holder
16	27190513		KGLS-18S,Holder
20	834430088		3TTS+8B(BC),Self-tapping screw
21	830440089		4TTC+8C(BC),Self-tapping screw
22	801433		3SMS8W.SW+14B(BC),Self-tapping screw
23	833430080		3TTP+8P(BC),Self-tapping screw
24	82143006		3P+6FN(BC),Pan head screw
25	831130088		3TTW+8B,Self-tapping screw
26	838440109		4TTB+10C(BC),Self-tapping screw
27	86414010		FWN4×10FN,Nut
28	28141278		15×60×40,Cushion
32	28184541Y		Top cover
33	838430088		3TTB+8B(BC),Self-tapping screw
34	28141277Y		27×40×27,Cushion
35	27175252-1AY		Leg
51	1A439701K	R-31	Front panel ass'y
	1A438701K	R-21	Front panel ass'y
52	28198794Y		Facet
53	801230		3TTS+8BQ(BC),Self-tapping screw
54	28191657AY		Clear plate
55	28324842Y		Knob,volume
61	28324843		Knob,push <P/W/Q>
F901	252160Y	R-31/⚠	2.5A-UL/T-237,Primary fuse <W>
	252159Y	R-21/⚠	2.0A-UL/T-237,Primary fuse <D/W>
F902	252071	R-31/⚠	1.25A-SE-EAK,Primary fuse <P/W/Q>
	252070	R-21/⚠	1.00A-SE-EAK,Primary fuse <P/W/Q>
F903	252071	R-31/⚠	1.25A-SE-EAK,Primary fuse <P>
L901	230910		⚠ ESD-R25DB,Core
P901	253163Y or		⚠ AS-UC-6#18,
	253174Y		⚠ Power supply cord <D>
	253164Y or		⚠ AS-CEE,
	253175Y		⚠ Power supply cord <P/W>
	253170		⚠ AS-SAA,Power supply cord <Q>
P902	25050904	R-31/⚠	NSCT-2P697,AC outlet <Q>

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

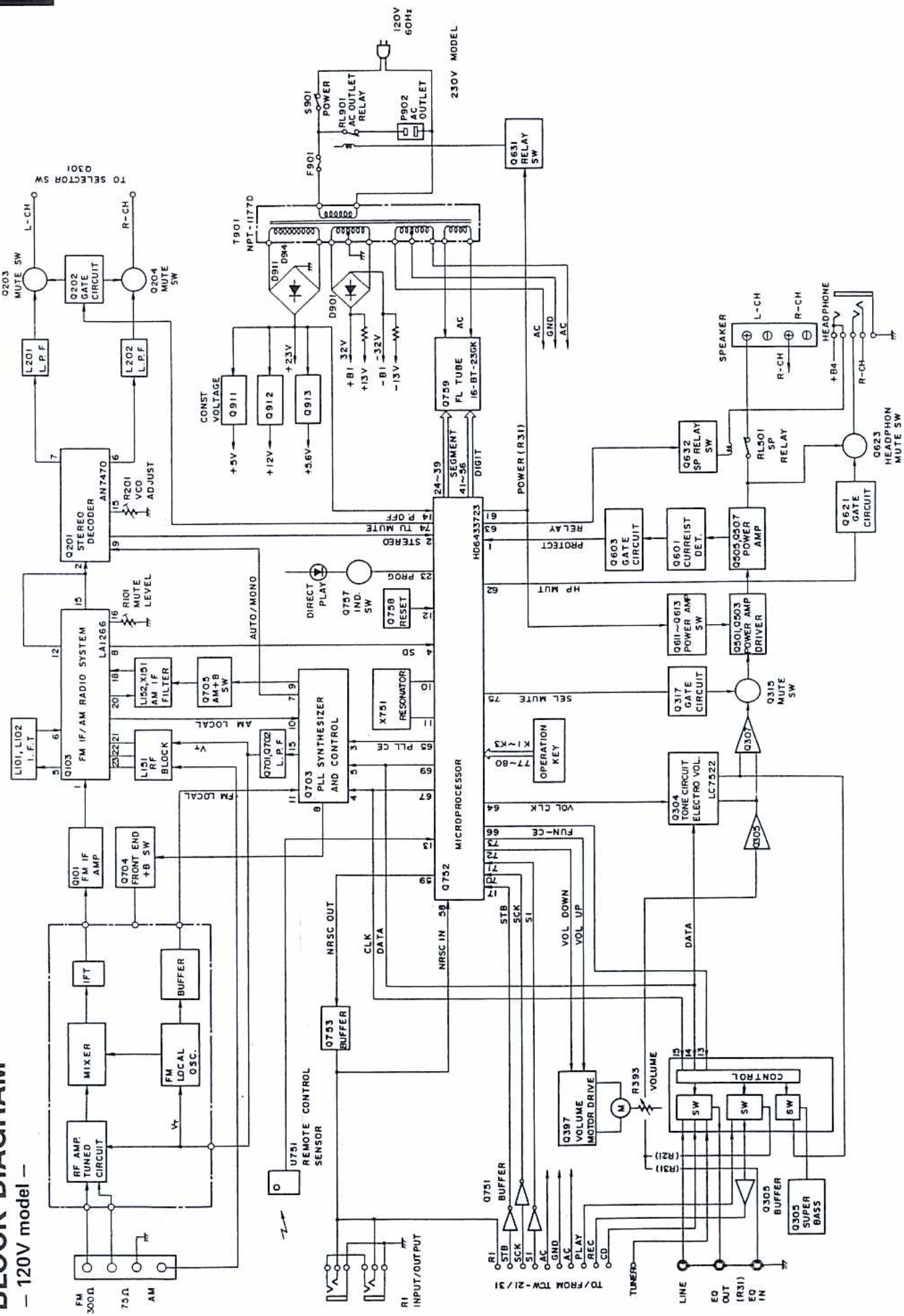
REF.NO.	PART NO.		DESCRIPTION
Q505,Q506	2202303,		☆ 2SC4512-O,
	2202304 or		☆ 2SC4512-Y or
	2202305		☆ 2SC4512-P,Power amplifier transistors
Q507,Q508	2202313,		☆ 2SA1726-O,
	2202314 or		☆ 2SA1726-Y or
	2202315		☆ 2SA1726-P,Power amplifier transistors
T901	2300928Y	R-31/⚠	NPT-1179P,Power transformer <P>
	2300929Y	R-31/⚠	NPT-1179DG,Power transformer <W>
	2300930Y	R-31/⚠	NPT-1179Q,Power transformer <Q>
	2300919Y	R-21/⚠	NPT-1177D,Power transformer <D>
	2300920Y	R-21/⚠	NPT-1177P,Power transformer <P>
	2300921Y	R-21/⚠	NPT-1177DG,Power transformer <W>
	2300922Y	R-21/⚠	NPT-1177Q,Power transformer <Q>
U1	1A439555-2A	R-31	NADG-4755-2A,Microprocessor circuit pc board ass'y <P/Q>
	1A439555-2B	R-31	NADG-4755-2B,Microprocessor circuit pc board ass'y <W>
	1A438555-1	R-21	NADG-4755-1,Microprocessor circuit pc board ass'y <D>
	1A438555-1A	R-21	NADG-4755-1A,Microprocessor circuit pc board ass'y <P/Q>
	1A438555-1B	R-21	NADG-4755-1B,Microprocessor circuit pc board ass'y <W>
U2	1A439556-2A	R-31	NAPS-4756-2A,Power supply circuit pc board ass'y <P>
	1A439556-2B	R-31	NAPS-4756-2B,Power supply circuit pc board ass'y <W>
	1A439556-2C	R-31	NAPS-4756-2C,Power supply circuit pc board ass'y <Q>
	1A438556-1	R-21	NAPS-4756-1,Power supply circuit pc board ass'y <D>
	1A438556-1A	R-21	NAPS-4756-1A,Power supply circuit pc board ass'y <P>
	1A438556-1B	R-21	NAPS-4756-1B,Power supply circuit pc board ass'y <W>
	1A438556-1C	R-21	NAPS-4756-1C,Power supply circuit pc board ass'y <Q>
U3	1A439569-2	R-31	NASW-4769-2,Voltage selector switch pc board ass'y <W>
	1A438569-1	R-21	NASW-4769-1,Voltage selector switch pc board ass'y <W>
U4	1A439557-2A	R-31	NAAR-4757-2A,Main circuit pc board ass'y <P/Q>
	1A439557-2B	R-31	NAAR-4757-2B,Main circuit pc board ass'y <W>
	1A438557-1	R-21	NAAR-4757-1,Main circuit pc board ass'y <D>
	1A438557-1A	R-21	NAAR-4757-1A,Main circuit pc board ass'y <P/Q>
	1A438557-1B	R-21	NAAR-4757-1B,Main circuit pc board ass'y <W>
U5	1A439558-2A	R-31	NAAF-4758-2A,Tone control circuit pc board ass'y
	1A438558-1	R-21	NAAF-4758-1,Tone control circuit pc board ass'y <D>
	1A438558-1A	R-21	NAAF-4758-1A,Tone control circuit pc board ass'y <P/W/Q>
U6	1A439559-2A	R-31	NARF-4759-2A,Front end pc board ass'y <P/W/Q>
	1A438559-1	R-21	NARF-4759-1,Front end pc board ass'y <D>
	1A438559-1A	R-21	NARF-4759-1A,Front end pc board ass'y <P/W/Q>
U7	1A439560-2	R-31	NAETC-4760-2,Volume circuit pc board ass'y
	1A438560-1	R-21	NAETC-4760-1,Volume circuit pc board ass'y

NOTE:
<D>:120V model only
<P>:230V model only
<W>:Worldwide model only
<Q>:240V model only

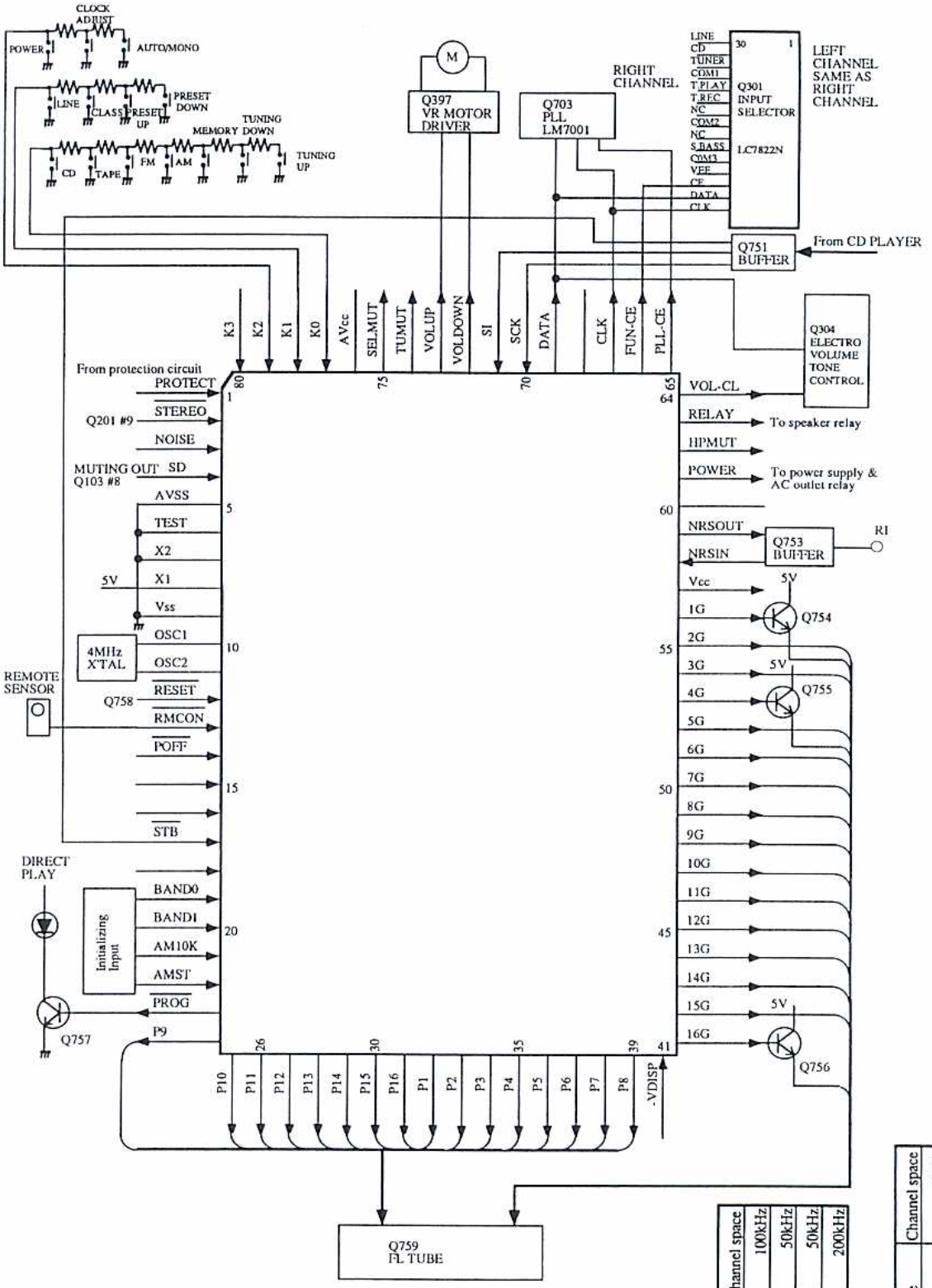
NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PARTS NUMBER SPECIFIED.

BLOCK DIAGRAM

– 120V model –



MICROPROCESSOR CONNECTION DIAGRAM



#72	#73	VOLUME
H	H	STOP
L	H	UP
H	L	DOWN
L	L	Power Off

FM band setting

BAND1	BAND0	Region	Frequency range	Channel space
0	0	Japan	76.0~90.0MHz	100kHz
0	1	Europe	87.50~108.00MHz	50kHz
1	0	Worldwide	87.50~108.00MHz	50kHz
1	1	U.S.A.	87.9~107.9MHz	200kHz

AM band setting

BAND1	BAND0	AM10K	Region	Frequency range	Channel space
0	1	0	Europe	522~1611kHz	9kHz
1	0	0	Worldwide	531~1602Hz	9kHz
1	1	1	U.S.A.	530~1710kHz	10kHz

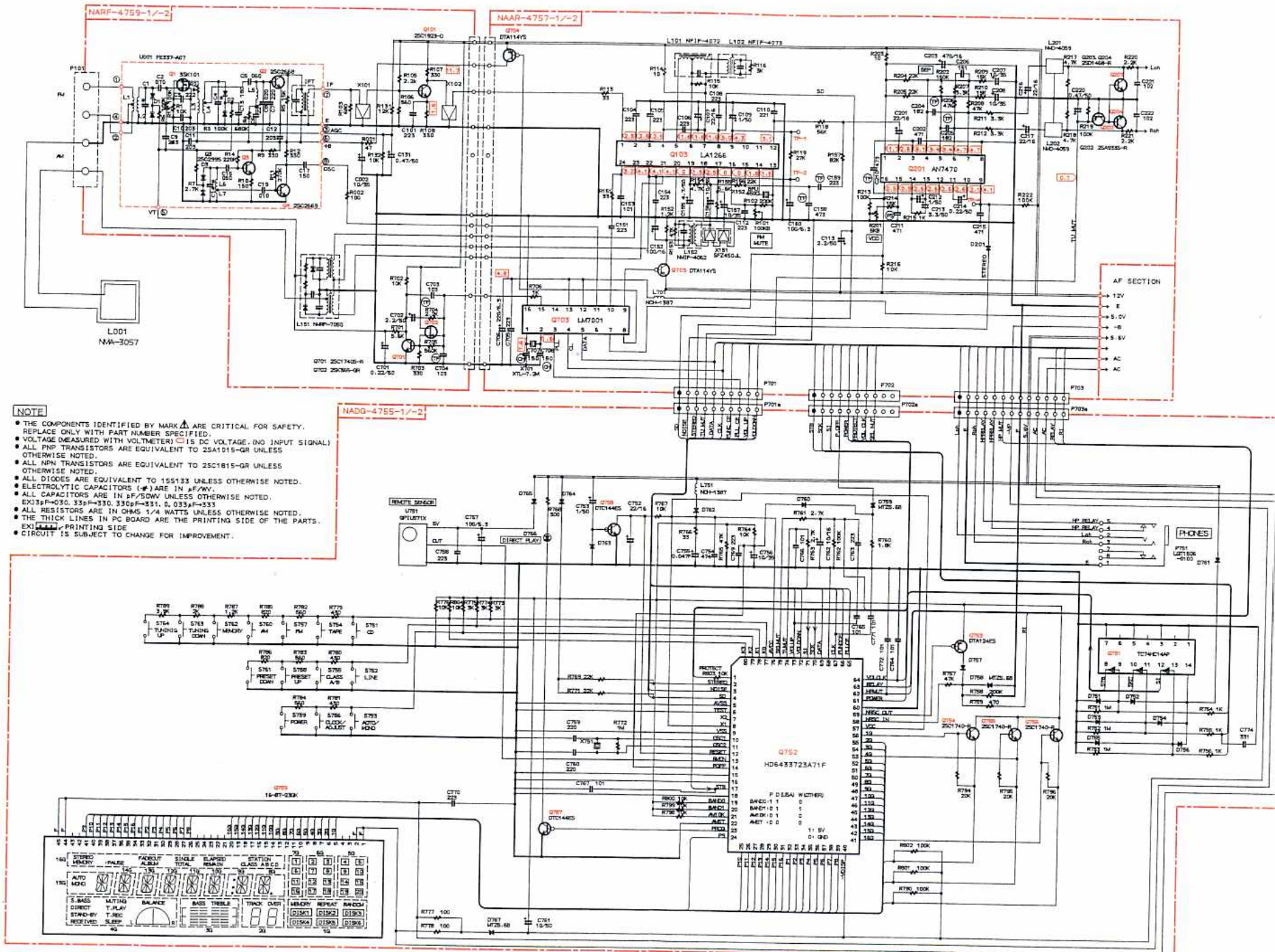
TERMINAL DESCRIPTION

Pin No.	Symbol	I/O	Description
1	PROTECT	I	Detection input terminal of protection circuit operation.
2	$\overline{\text{STEREO}}$	I	Detection input terminal of stereo broadcast.
3	NOISE	I	Noise detection input terminal of broadcast. Not used.
4	SD	I	Detection input terminal of broadcast more than muting level.
5	AVss		Reference ground terminal for AD converter.
6	TEST	I	Test terminal. Connect to the ground terminal.
7	X2	O	Resonator output terminal of sub clock.
8	X1	I	Resonator input terminal of sub clock.
9	Vss		Ground terminal
10	OSC1	I	Main clock resonator input. Connect the 4MHz crystal resonator.
11	OSC2	O	Main clock resonator output.
12	$\overline{\text{RESET}}$	I	Reset input terminal.
13	$\overline{\text{RMCN}}$	I	Remote control signal input terminal.
14	$\overline{\text{POFF}}$	I	Detection input terminal of stoppage of electric current.
15	SELC0	I	Initializing input terminal for operation mode of input selector.
16	SELC1	I	
17	$\overline{\text{STB}}$	I	Transfer strobe input terminal from CD player.
18	TIMER	I	Timer fucntion changeover input.
19	BAND0	I	FM band initializing input terminals.
20	BAND1	I	
21	AM10K	I	AM band initializing input terminal.
22	AMST	I	AM stereo operation setting initializing input.
23	$\overline{\text{PROG}}$	O	DIRECT PLAY indication output terminal.
24~31	P9~P16	O	Segment output terminals for FL tube.
32~39	P1~P8	O	Segment output terminals for FL tube.
40	-Vdisp		Negative power supply terminal for grid of FL tube.

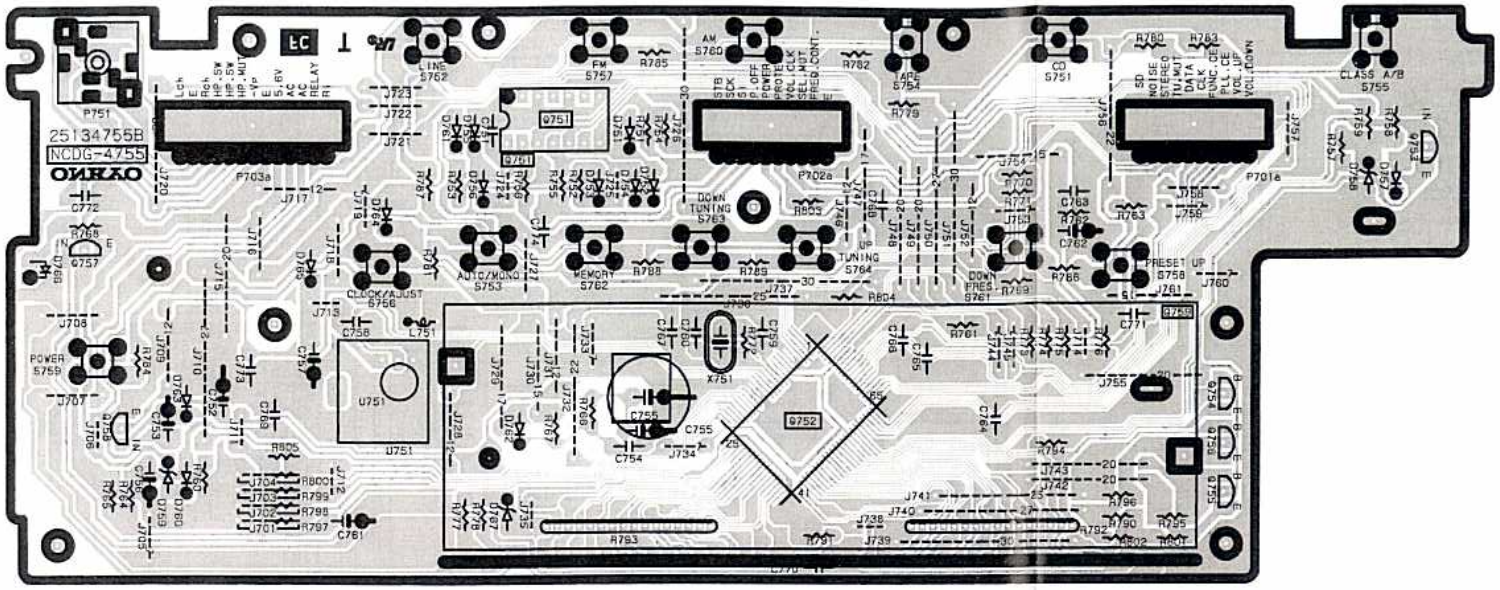
Pin No.	Symbol	I/O	Description
41~56	16G~1G	O	Grid output terminals for FL tube
57	Vcc		Power supply terminal (+5V)
58	NRSCIN	I	System code input terminal.
59	NRSCOUT	O	System code output terminal.
60			Not used.
61	POWER	O	Power source control output terminal.
62	HPMUT	O	Muting output for headphone.
63	RELAY	O	Speaker relay control output terminal.
64	VOLCLK	O	Transfer clock output terminal for electro volume LC7522.
65	PLLCE	O	Chip enable signal output terminal for PLL IC LM7001.
66	FUNCCE	O	Chip enable signal output terminal for function switch LC7822N.
67	CLK	O	Clock signal output terminal for PLL and function switch.
68			Not used.
69	DATA	O	Serial data outout terminal for LM7001,LC7822N and LC7522.
70	SCK	I	Data transfer clock input terminal of indicator from CD player.
71	SI	I	Serial data input terminal of indicator from CD player.
72	VOLDOWN	O	Volume control output terminal.
73	VOLUP	O	Volume control output terminal.
74	TUMUT	O	Muting output terminal for tuner section.
75	SELMUT	O	Muting output terminal for amplifier section.
76	AVcc		Reference voltage input terminal for A/D converter.
77~79	K0~K2	I	Operation key connection terminals.
80			Not used.

SCHEMATIC DIAGRAM PART 1

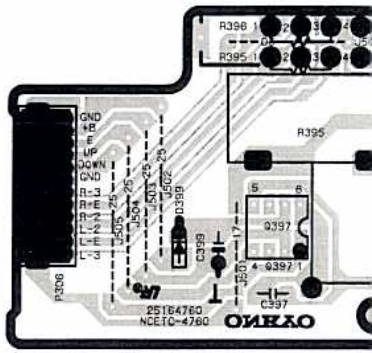
— 120V MODEL —



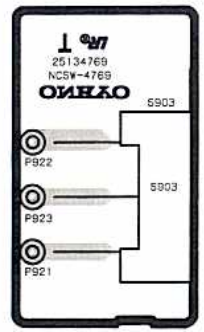
PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE



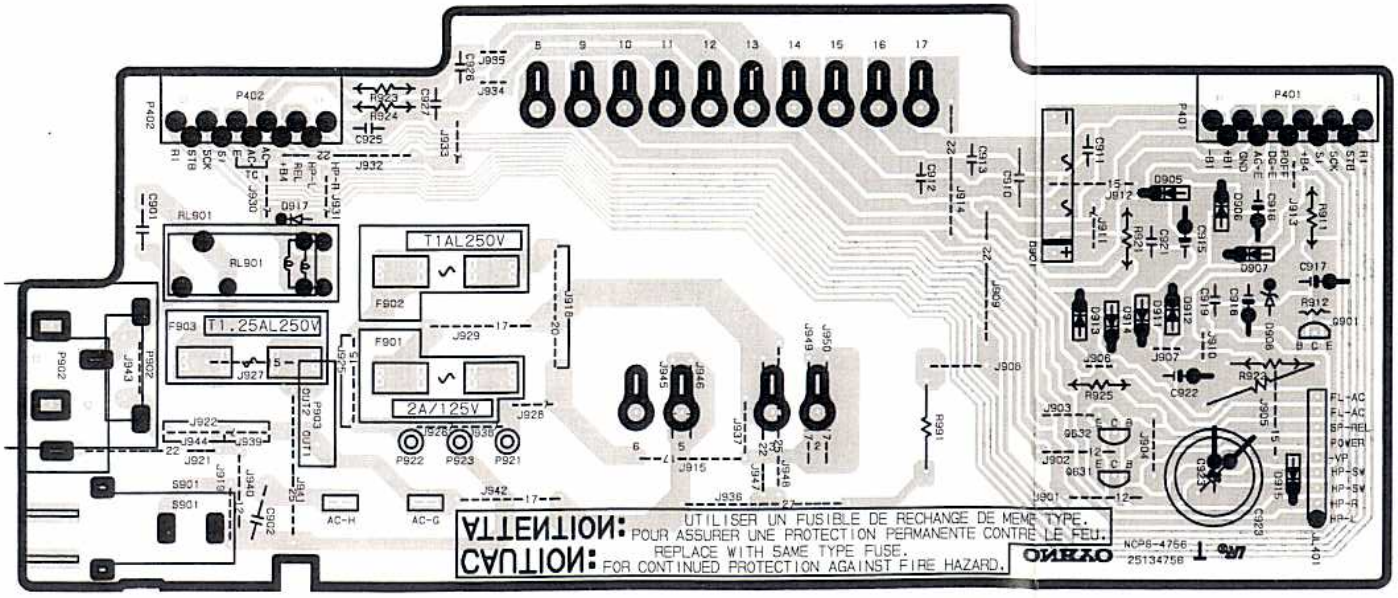
MICROPROCESSOR CIRCUIT PC BOARD



VOLUME CIRCUIT PC BO



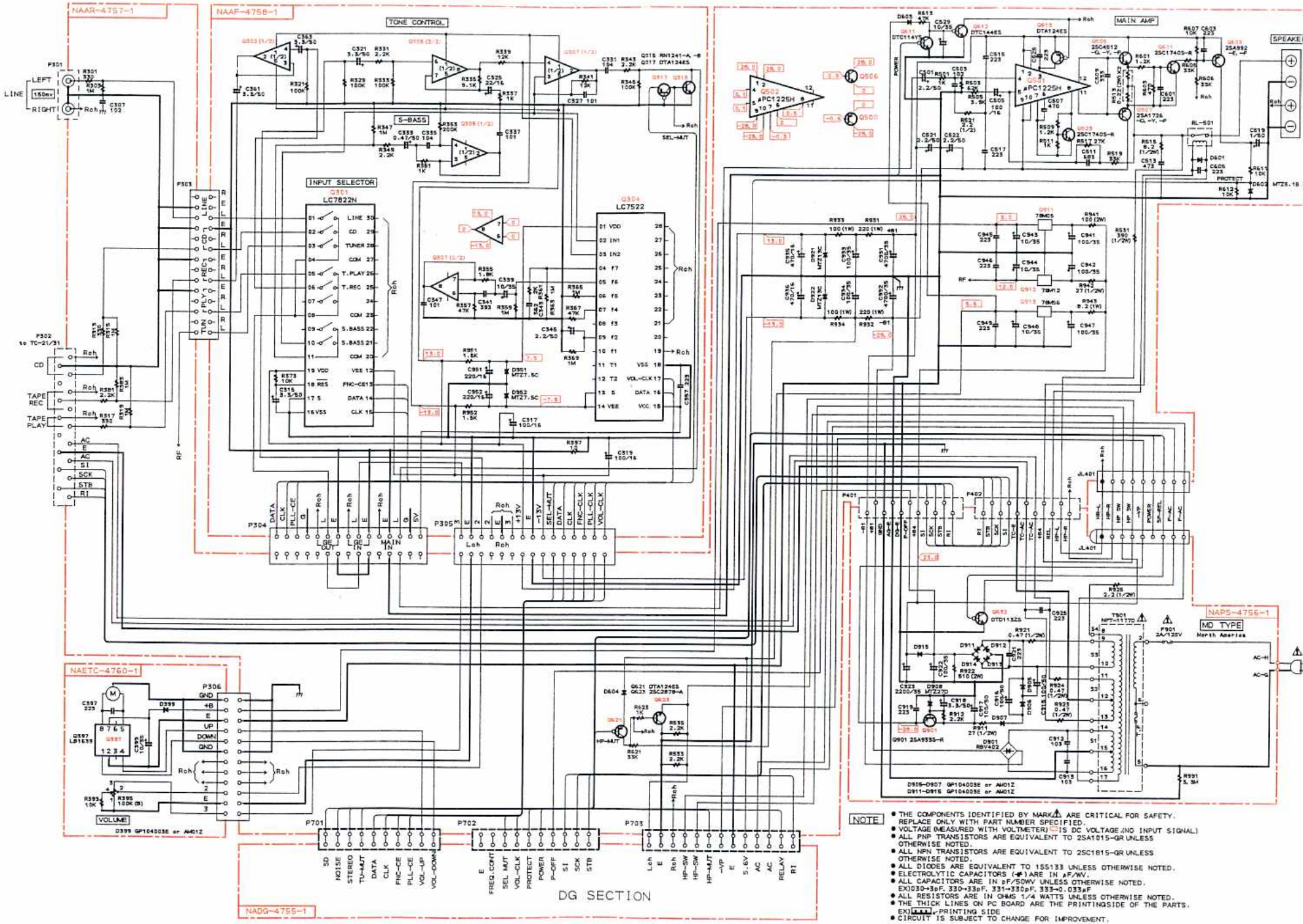
VOLTAGE SELECTO
CIRCUIT PC BOARD



POWER SUPPLY CIRCUIT PC BOARD

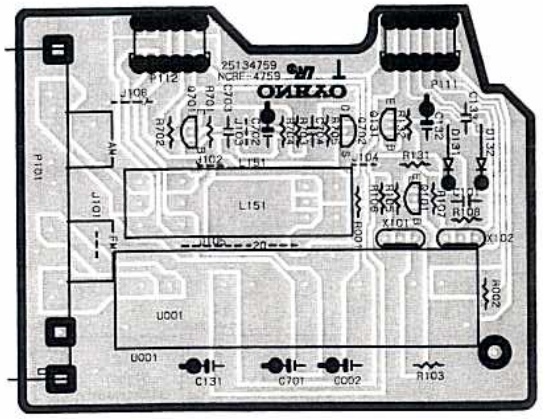
SCHEMATIC DIAGRAM PART 2

— 120V MODEL —



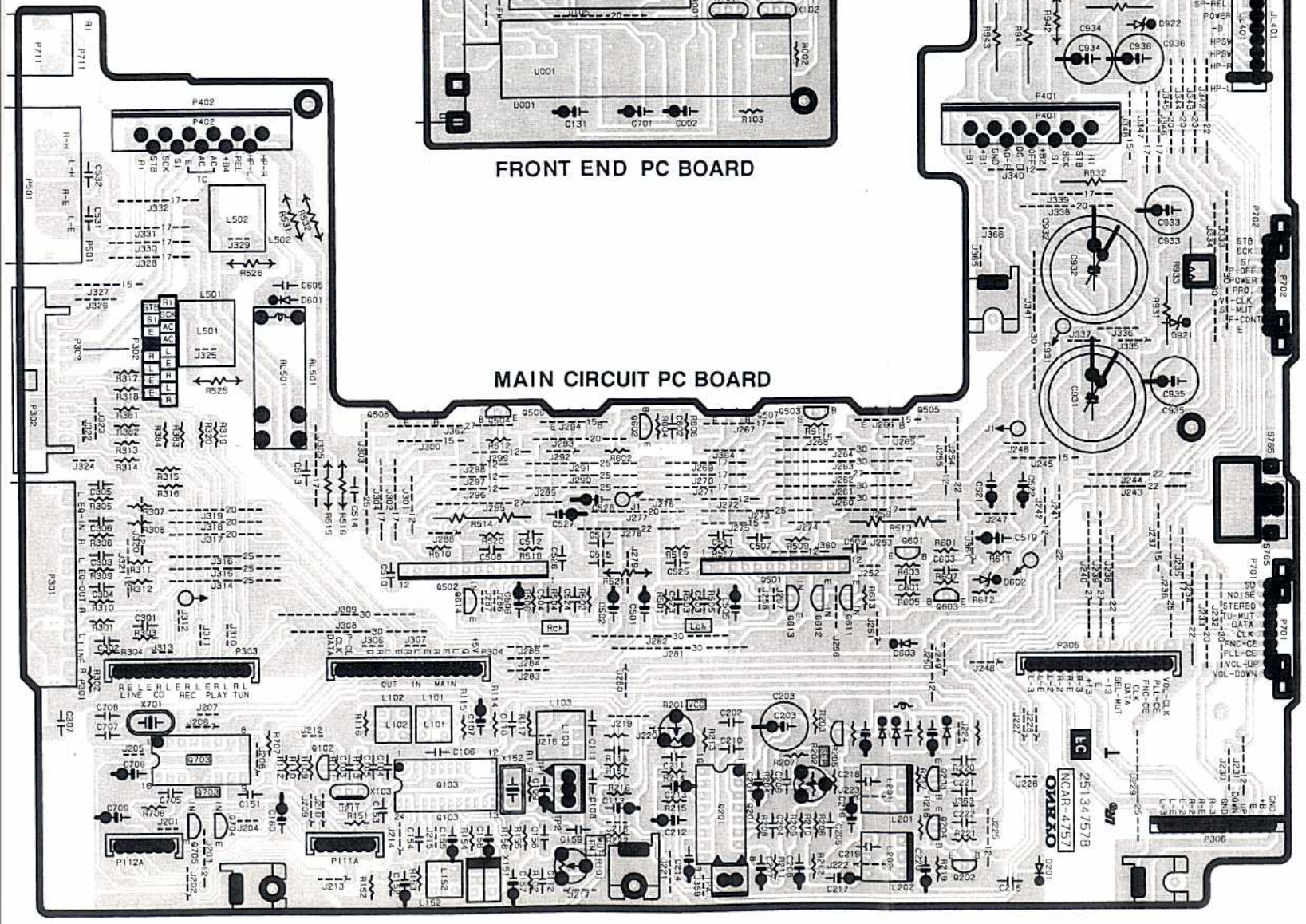
ONKYO CORPO

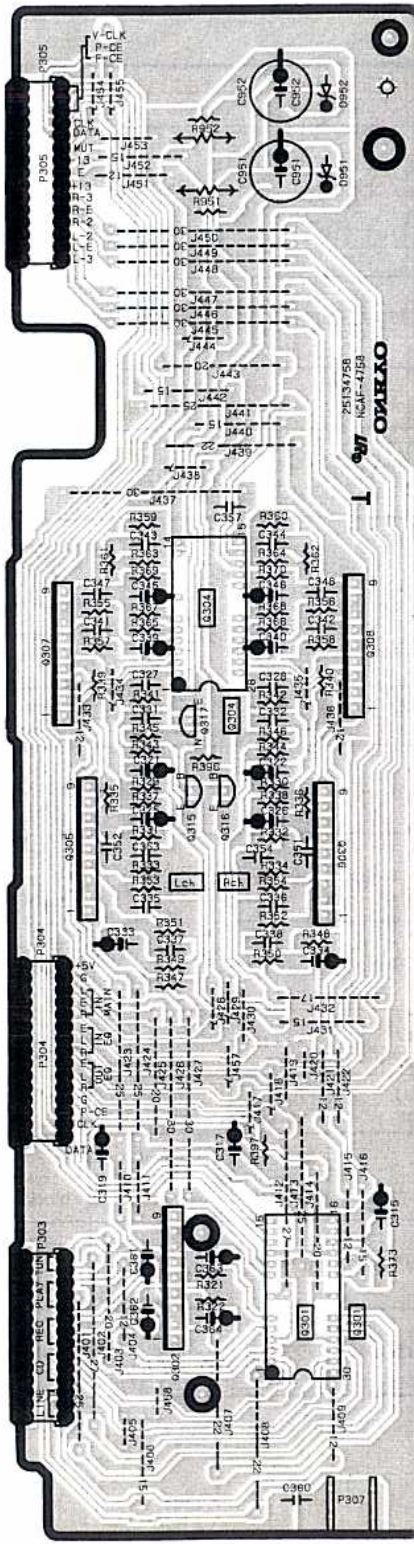
PRINTED CIRCUIT BOARD VIEW FROM BOTTOM SIDE



FRONT END PC BOARD

MAIN CIRCUIT PC BOARD





FM section

Item	Step	Connection of instrument	FM SG output	Stereo modulator output	Tuning frequency	Output indicator	Adjustment point	Adjust for	Remarks
FM IF/RF	1	Fig.1	99.1MHz 1kHz 75kHz devi. 65dBf(60dB)	——	99.1MHz	DC voltmeter	L101	0±20mV	FM MUTE/MODE switch:ON/STEREO Repeat the steps 1 and 3 until no further adjustment is necessary.
	2					AC voltmeter	IFT on the front end	Maximum	
	3					Distortion analyzer	L102	Minimum	
VCO		Fig.2	99.1MHz 1kHz 75kHz devi. 65dBf(60dB)	——	99.1MHz	Frequency counter	R201	19kHz± 10Hz	
Stereo Distortion		Fig.3	99.1MHz Ext. mod.65dBf(60dB)	Channel L or R 1kHz	99.1MHz	Distortion analyzer	IFT on the front end	Minimum	Don't turn more than ±180°.
Muting Level		Fig.3	99.1MHz 17.2dBf(12dB) <19.2dBf(14dB)>	——	99.1MHz	Oscilloscope	R101	Signal output	

NOTE:< >:230V and Worldwide models

AM section

120V model

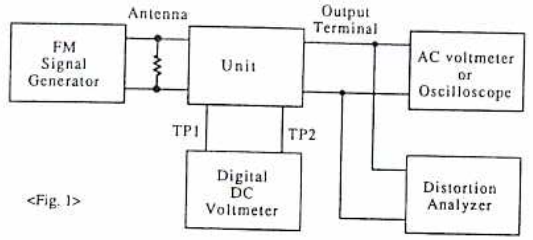
Step	AM SG output	Tuning Frequency	Output Indicator	Adjustment point	Adjust for
1		530kHz	Digital DC voltmeter	OSC coil on RF block L151	1.4±0.2V
2	600kHz 400Hz 30% mod. 60dB/m	600kHz	AC voltmeter	RF coil on RF block L151	Maximum
3	990kHz 400Hz 30% mod. 60dB/m	990kHz	AC voltmeter	L152	Maximum

Reference Specification
FM tuned voltage:87.9MHz-107.9MHz
1.6±0.5V~8.0±0.5V
AM tuned voltage:530kHz-1710kHz
1.3±0.5V~7.6±0.5V

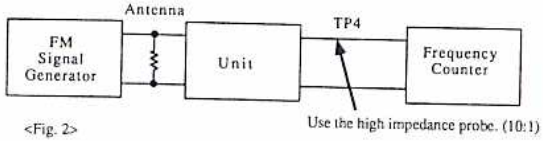
230V and Wolrdwide models

Step	AM SG output	Tuning Frequency	Output Indicator	Adjustment point	Adjust for
1		522kHz or 531kHz	Digital DC voltmeter	OSC coil on RF block L151	1.3±0.2V
2	603kHz 400Hz 30% mod. 60dB/m	603kHz	AC voltmeter	RF coil on RF block L151	Maximum
3	999kHz 400Hz 30% mod. 60dB/m	999kHz	AC voltmeter	L152	Maximum

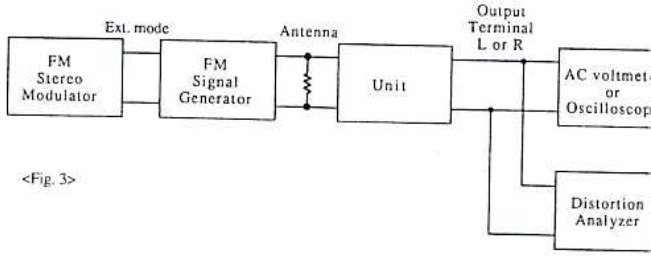
Reference Specification
FM tuned voltage:87.5MHz-108MHz
1.6±0.5V~8.0±0.5V
AM tuned voltage:522kHz-1611kHz
1.3±0.5V~7.2±0.5V
(230V model)
AM tuned voltage:531kHz-1602kHz
1.3±0.5V~7.2±0.5V
(Worldwide model)



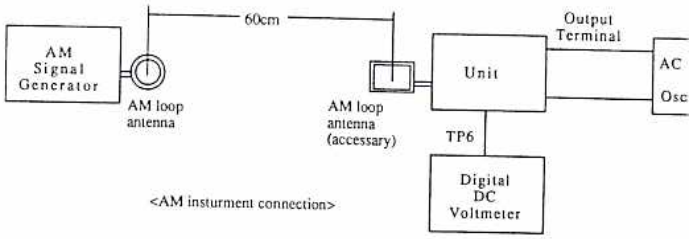
<Fig. 1>



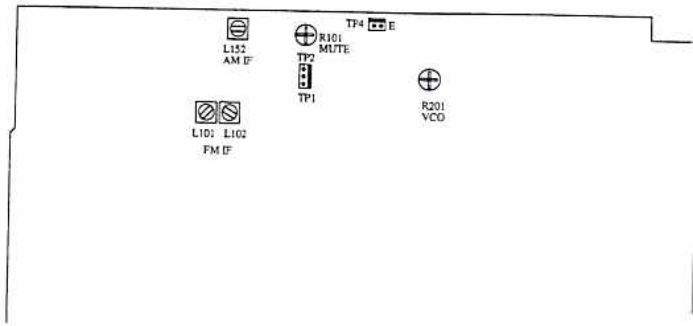
<Fig. 2>

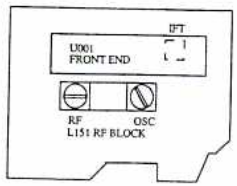


<Fig. 3>



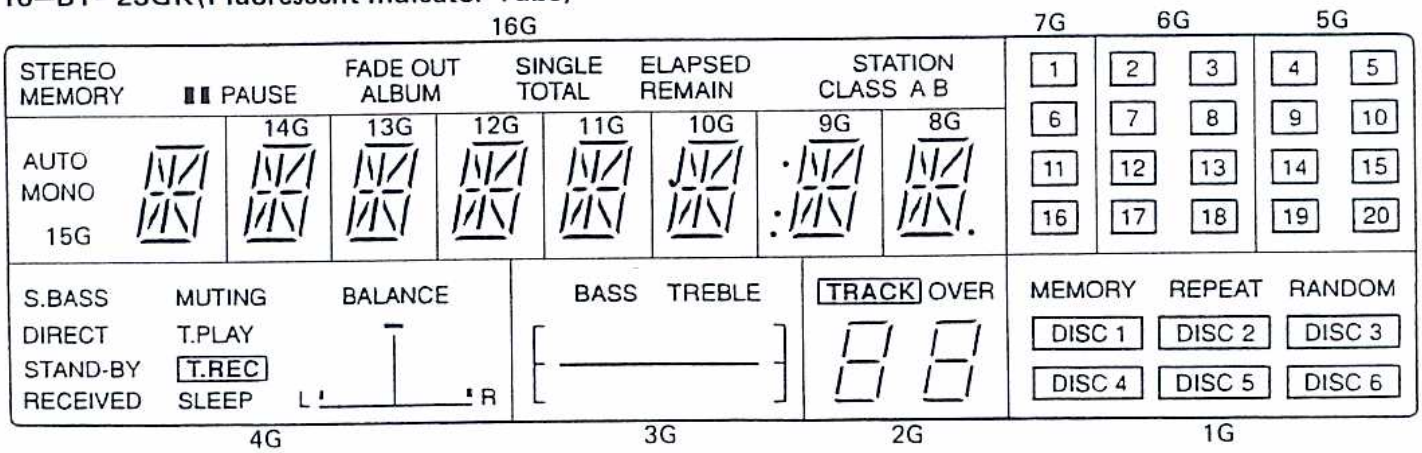
<AM insturment connection>





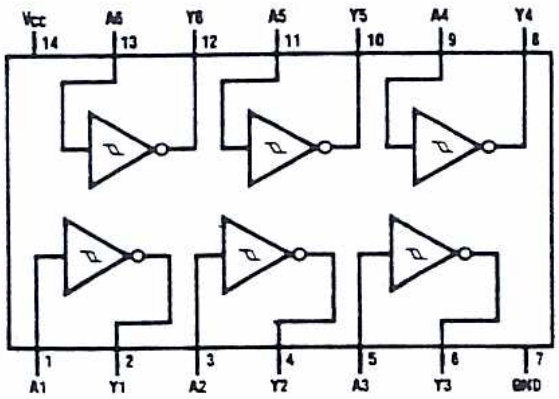
IC BLOCK DIAGRAMS AND DESCRIPTION

16–BT–23GK (Fluorescent Indicator Tube)



	16G	15G	14G	13G	12G	11G	10G	9G	8G	7G	6G	5G	4G	3G	2G	1G
P1	STEREO	AUTO	–	–	–	–	–		–	<1>	<2>	<4>	S.BASS	S2	TRACK	MEMORY
P2	MEMORY	MONO	–	–	–	–	–			<6>	<7>	<9>	DIRECT	B1	2a	REPEAT
P3	PAUSE	h	h	h	h	h	h	h	h	<11>	<12>	<14>	STAND-BY	B2	2b	RANDOM
P4	FADE OUT	b	b	b	b	b	b	b	b	<16>	<17>	<19>	RECEIVED	B3	2f	<DISC1>
P5	ALBUM	m	m	m	m	m	m	m	m	–	<3>	<5>	MUTING	B4	2g	<DISC2>
P6	SINGLE	c	c	c	c	c	c	c	c	–	<8>	<10>	T.PLAY	B5	2c	<DISC3>
7P	TOTAL	r	r	r	r	r	r	r	r	–	<13>	<15>	T.REC	B6	2e	<DISC4>
P8	ELAPSED	p	p	p	p	p	p	p	p	–	<18>	<20>	SLEEP	–	2d	<DISC5>
P9	REMAIN	a	a	a	a	a	a	a	a	1	2	4	S1	–	OVER	<DISC6>
P10	STATION	j	j	j	j	j	j	j	j	6	7	9	L3	B7	1a	DISC1
P11	CLASS	k	k	k	k	k	k	k	k	11	12	14	L2	B8	1b	DISC2
P12	A	f	f	f	f	f	f	f	f	16	17	19	L1	B9	1f	DISC3
P13	B	g	g	g	g	g	g	g	g	–	3	5	R1	B10	1g	DISC4
P14	C	e	e	e	e	e	e	e	e	–	8	10	R2	B11	1c	DISC5
P15	D	n	n	n	n	n	n	n	n	–	13	15	R3	B12	1e	DISC6
P16	–	d	d	d	d	d	d	d	d	–	18	20	–	–	1d	–

TC74HC14AP (Hex Invering Schmitt Trigger)



PRINTED CIRCUIT BOARD – PARTS LIST

MICROPROCESSOR CIRCUIT PC BOARD

(NADG-4755-1/1A/1B/2A/2B)

CIRCUIT NO.	PART NO.	DESCRIPTION
	Opto. sensor	
U751	24130007	GP1U571X
	ICs	
Q751	222740145TOS	TC74HC14AP
Q752	22240709R3HI	HD6433723A-71F
	FL tube	
Q759	212114	16-BT-23GK
	Transistors	
Q753	2212600	DTA124ES
Q754-Q756	2213284	2SC1740S-R
Q757,Q758	221282	DTC144ES
	Diodes	
D751-D757	223163 or	1SS133 or
D760-D765	223205	1SS270A
D758,D759	224450562	MTZ5.6B
D766	225255B,	SEL3110S-B,
	225255C or	SEL3110S-C or
	225255D	SEL3110S-D,L.E.D.
D767	224450562	MTZ5.6B
	Crystal	
X751	3010192	AT-49
	Coil	
L751	233411K220	NCH-1387
	Capacitors	
C752	354742209	22 μ F,16V,Elect.
C753	354780109	1 μ F,50V,Elect.
C754	375524744	0.47 μ F±5%,50V,Plastic
C755	3000060 or	0.047F,5.5V,Super
	3020027	0.047F,5.5V,Super
C756	354761009	10 μ F,35V,Elect.
C757	354721019	100 μ F,6.3V,Elect.
C761	354781009	10 μ F,50V,Elect.
C762	353741009	10 μ F,16V,Elect.
	Switches	
S751-S764	25035548	NPS-111-S510
	Jack	
P751	25045396	LGT1516-0101
	Plugs	
P701a,P702a	25055659	NPLG-10P615
P703a	25055660Y	NPLG-13P616
	Holder	
	27190893Y	FL

POWER SUPPLY CIRCUIT PC BOARD

(NAPS-4756-1/1A/1B/1C/2A/2B/2C)

CIRCUIT NO.	PART NO.	DESCRIPTION
	Transistors	
Q631	2213650	DTD113ZS <R-31>
Q632	2213650	DTD113ZS
Q901	2213354	2SA933S-R

CIRCUIT NO.	PART NO.	DESCRIPTION
	Diodes	
D901	22380022F	RBV402
D905-D907	22380035 or	GP104003E or
D911-D915	22380046	AM01Z
D908	224452704	MTD27D
D917	223163 or	1SS133 or
	223205	1SS270A <R-31>
	Capacitors	
C901	3500065A	⚠ DE7150FZ103PAC400V/125V, IS <R-31>
C902	3500065A	⚠ DE7150FZ103PAC400V/125V, IS <P/W/Q>
C912,C913	374721034	0.01 μ F±5%,50V,Plastic
C915-C917	354781019	100 μ F,50V,Elect.
C918	354780339	3.3 μ F,50V,Elect.
C922	354761019	100 μ F,35V,Elect.
C923	354762229	2200 μ F,35V,Elect.
	Covers	
C901a	27301216	⚠ Cover for C901 <P/W/Q> <R-31>
C902a	27301216	⚠ Cover for C902 <P/W/Q>
	Resistors	
R911	442522704	27Ω ±5%,1/2W,Metal oxide
R921	452534794	0.47Ω ±5%,1/2W,Metal
R922	441725114	510Ω ±5%,2W,Metal oxide
R923,R924	452534794	0.47Ω ±5%,1/2W,Metal
R925	452530224	2.2Ω ±5%,1/2W,Metal
R991	431523355	⚠ 3.3MΩ,1/2W,Solid <D>
	Relay	
RL901	25065341	⚠ NRL-1P15A-DC24-047 <P/W/Q> <R-31>
	Sockets	
P401,P402	25051051Y	NSCT-11P838
	Fuseholders	
F901a	25050065	⚠ YSH-403T <D/W>
F902a	25050065	⚠ YSH-403T <P/W/Q>
F903a	25050065	⚠ YSH-403T <P> <R-31>
	Fuses	
F901	252160Y	⚠ 2.5A-UL/T-237,Primary <D/W> <R-31>
	252159Y	⚠ 2.0A-UL/T-237,Primary <D/W> <R-21>
F902	252071	⚠ 1.25A-SE-EAK,Primary <P/W/Q> <R-31>
	252070	⚠ 1.0A-SE-EAK,Primary <P/W/Q> <R-21>
F903	252071	⚠ 1.25A-SE-EAK,AC outlet <P> <R-31>
	Terminals	
P902	25050410	⚠ NSCT-2P235,AC outlet <P/W/Q> <R-31>
	Switches	
S901	25035550	⚠ NPS-111-L512P <P/W/Q>

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

MAIN CIRCUIT PC BOARD

(NAAR-4757-1/1A/1B/2A/2B)

CIRCUIT NO.	PART NO.	DESCRIPTION
	ICs	
Q103	22240039	LA1266
Q201	22240242	AN7470
Q501,Q502	22240108	μPC1225H
Q703	22240090	LM7001
Q911	222780055	78M05HF
Q912	222780125	78M12HF
Q913	222780565JRC	78M56
	Transistors	
Q102	2210746	2SC945A-P <P/W/Q>
Q202	2213354	2SA933S-R
Q203,Q204	2212794	2SD1468-R
Q503,Q504	2213284	2SC1740S-R
Q505,Q506	2202303,	☆ 2SC4512-O,
	2202304 or	☆ 2SC4512-Y or
	2202305	☆ 2SC4512-P
Q507,Q508	2202313,	☆ 2SA1726-O,
	2202314 or	☆ 2SA1726-Y or
	2202315	☆ 2SA1726-P
Q601,Q602	2213284	2SC1740S-R
Q603	2211792 or	2SA992-F or
	2211793	2SA992-E
Q611	221281	DTC114YS
Q612	221282	DTC144ES
Q613,Q614	2212600	DTA124ES
Q621	2212600	DTA124ES
Q623,Q624	2212285	2SC2878-A
Q704,Q705	2213090	DTA114YS
	Diodes	
D201,D601	223163 or	1SS133 or
D603,D604	223205	1SS270A
D602	224450512	MTZ5.1B
D921,D922	224451303	MTZ13C
	Coils and Transformers	
L101	233401	NFIF-4072
L102	233402	NFIF-4073
L103	233383	NMC-6070 <P/W/Q>
L152	232139	NMIF-4062
L201,L202	233355A	NMC-4059
L701	233411K220	NCH-1387
	Ceramic filters	
X103	3010137	SFE10.7MMK <P/W/Q>
X151	3010123	SFZ450JL
X152	3010076	BFU450C
	X'tal	
X701	3010141 or	XTL7.2M
	3010158	
	Capacitors	
C107,C201	354742209	22μF,16V,Elect.
C109,C212	354780109	1μF,50V,Elect.
C113	354780229	2.2μF,50V,Elect.
C152	354741019	100μF,16V,Elect.

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

CIRCUIT NO.	PART NO.	DESCRIPTION
	Capacitors	
C155	354780479	4.7μF,50V,Elect.
C156,C157	354761009	10μF,35V,Elect.
C158,C210	374724734	0.047μF±5%,50V,Plastic
C159	374722234	0.022μF±5%,50V,Plastic
C160	354721019	100μF,6.3V,Elect.
C203	354744719	470μF,16V,Elect.
C204,C205	374721824	1800pF±5%,50V,Plastic <D>
	374721224	1200pF±5%,50V,Plastic <P/Q>
	374721524	1500pF±5%,50V,Plastic <W>
C207,C208	354761009	10μF,35V,Elect.
C211	370134714	470pF±5%,100V,Plastic
C213	354780339	3.3μF,50V,Elect.
C214	354782299	0.22μF,50V,Elect.
C216,C217	354742209	22μF,16V,Elect.
C220	354784799	0.47μF,50V,Elect.
C501,C502	354780229	2.2μF,50V,Elect.
C503,C504	374721024	1000pF±5%,50V,Plastic
C505,C506	354741019	100μF,16V,Elect.
C509,C510	374723334	0.033μF±5%,50V,Plastic
C511,C512	374726834	0.068μF±5%,50V,Plastic
C513,C514	374724734	0.047μF±5%,50V,Plastic
C519	354780109	1μF,50V,Elect.
C521,C522	354780229	2.2μF,50V,Elect.
C527	354761009	10μF,35V,Elect.
C605	374722234	0.022μF±5%,50V,Plastic
C706	354722219	220μF,6.3V,Elect.
C931,C932	3504260	4700μF,40V,Elect. <R-31>
	3504213	4700μF,35V,Elect. <R-21>
C933,C934	354761019	100μF,35V,Elect.
C935,C936	354743319	330μF,16V,Elect. <R-31>
	354744719	470μF,16V,Elect. <R-21>
C941,C942	354761019	100μF,35V,Elect.
C943,C944	354761009	10μF,35V,Elect.
C947,C948	354761019	100μF,35V,Elect.
	Resistors	
R101	5210070 or	N06HR100KBD,
	5210221	Trim
R201	5210062 or	N06HR4.7KBD or
	5210216	N06HR5KBD,Trim
R513,R514	4000131	0.22Ω×2,2W+2W,Metal plate
R515,R516	442530824	8.2Ω±5%,1/2W,Metal
R521	442530224	2.2Ω±5%,1/2W,Metal
R531,R532	442523914	390Ω±5%,1/2W,Metal oxide
R931-R934	441622414	240Ω±5%,1W,Metal oxide <R-31>
R931,R932	441622214	220Ω±5%,1W,Metal oxide <R-21>
R933,R934	441621014	100Ω±5%,1W,Metal oxide <R-21>
R941	441721014	100Ω±5%,2W,Metal oxide
R942	442522704	27Ω±5%,1/2W,Metal oxide
R943	451630824	8.2Ω±5%,1W,Metal
	Relay	
RL501	25065339	NRL-2P5A-DC24-046