

NIKKO AMPLIFIER

NA-2000

INTEGRATED AMPLIFIER



TYPE AND VOLTAGE

W-TYPE:	UL and CSA type	120V AC
E-TYPE:	NK-STD type	220V AC
V-TYPE:	Multi-Voltage type	110/120/220/ 240V AC

SERVICE MANUAL

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SAFETY INSTRUCTION

PRECAUTIONS DURING SERVICING

1. Parts identified by the symbol parts are critical for safety. Replace only with same parts number specified.
2. Other parts and assemblies are specified for conformance with such regulations as those applying to spurious radiation.
These must also be replaced only with replacements.
Examples: RF converters, tuner units, RF cables, noise blocking capacitors, noise blocking filters, etc.
3. Use specified internal wiring.
 - a) Primary leads.
 - b) Wires covered with PVC tubing.
 - c) Double insulated wire.
4. Use specified insulating materials for hazardous live parts.
 - a) Insulation Taps.
 - b) Insulated Barriers (Spacers)
 - c) PVC Tubing.
 - d) Plastic screws for fixing microswitch (Especially in turntable).
 - e) Terminal strips.
5. When replacing the primary components (transformer, power supply cord, switch, switch by-pass capacitor, etc.), wrap end of wires securely about the terminals before soldering.
Where hand soldering is involved a minimum spacing below between terminals of uninsulated live parts of primary or supply circuitry through air or over surface is to be maintained.
110 and 120V appliance: more than 3 mm spacing
220 and 240V appliance: more than 6 mm spacing
6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal resistors, rectifiers, etc.)
7. Check that replaced wires do not contact sharp edge or pointed parts.
8. Do not remain an electric conductive parts (screws, droplets, etc.) inside the appliance.

SAFETY RECHECK AFTER SERVICING

Confirm the specified insulation resistance between power plug prongs and externally exposed parts of the appliance is greater than 10M ohms, but for equipment with external antenna terminals (tuner, receiver, etc.) and is specified insulation resistance should be more than 2.2M ohms (ground terminals, in-output jacks, etc.)

SPECIFICATIONS

Power Amplifier Section

Continuous Power Output	100W + 100W
Min. RMS power per channel into 8 ohms from 20 to 20 KHz at rated THD both channel driven	
Both channel driven at 1000 Hz	
8 ohms	110W + 110W
8 ohms	110W + 110W
Total Harmonic Distortion at 8 ohms	
at rated power	0.01 %
Intermodulation distortion	0.01 %
Power Band Width	5 Hz — 45 KHz
Damping Factor (8 ohms)	40
(4 ohms)	20

Preamplifier Section

Input sensitivity and impedance	
Phono (MC)	0.25 mV/100 ohm
Phono (MM)	2.5 mV/47 Kohm
TUNER, AUX	150 mV/47 Kohm
TAPE 1, 2	150 mV/47 Kohm
Signal to Noise Ratio with IHF-A network	
Phono (MIC)	68 dB
Phono (MM)	86 dB
TUNER, AUX	105 dB
TAPE 1, 2	105 dB
Phono overload level (0.01 % T.H.D.)	
1 KHz	150 mV
Frequency Response	
Phono (RIAA)	± 0.3 dB
TUNER, AUX	+ 0 dB
(10 Hz — 100 KHz)	—2 dB
TAPE	+ 0 dB
(10 Hz — 100 KHz)	—2 dB
Tone Control	
Bass (70 Hz)	± 7.5 dB
Treble (10 KHz)	± 7.5 dB
Subsonic Filter	15 Hz 3 dB/oct
High Filter	7 KHz 3 dB/oct
Audio Muting	—20 dB
Output Level and Impedance	
Tape Rec. Output (PIN)	150 mV/2.8 Kohm
Speaker loaded Impedance	
A or B	4 — 16 ohm
A and B	8 — 16 ohm
Dimension	
Width	440 mm
Height	118 mm
Depth	379 mm
Weight, without package	10 kg (22 lbs)

* Specifications and design are subject to modifications without notice.

GENERAL

Power Requirement

U.S.A. & Canada Model	AC 120V, 60Hz
European Model	AC 220V, 50Hz
Multi-Voltage Model	AC 110V/120V/ 220V/240V 50Hz/60Hz
U.K. & Australia Model	AC 240V, 50Hz

Power Consumption

U.S.A. & Canada Model	400W
European Model	600W

BLOCK DIAGRAM

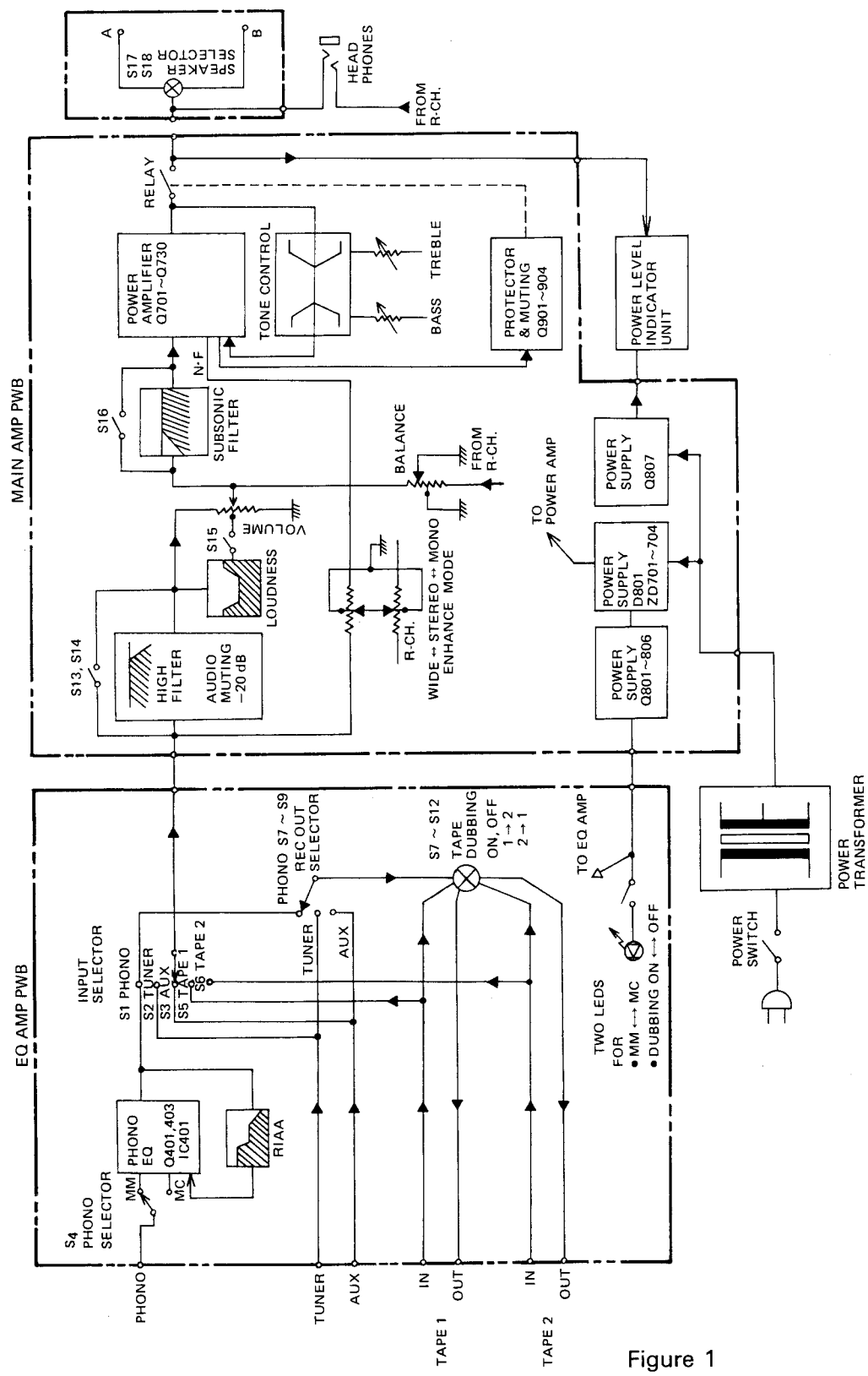


Figure 1

DISASSEMBLY

CABINET COVER REMOVAL

1. Remove two black screws (#1, #2) as shown in Photo 3.
2. Remove eight screws from sides of the top cover.
3. Lift the cover away from the unit.

BOTTOM PLATE REMOVAL

1. Remove eight tapping screws (#1 ~ #8) as shown in photo 1.
2. Lift the bottom plate away from the unit.

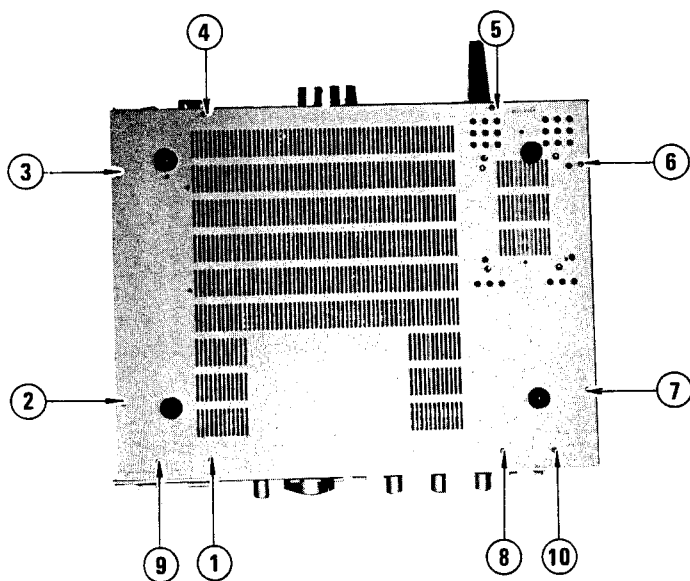


Photo 1

FRONT PANEL REMOVAL

1. Remove two tapping screws (#9, #10) as shown in photo 1.
2. Remove two tapping screws (#1, #2) as shown in photo 2.
3. Remove the front panel by pulling it forward.

POWER TRANSFORMER REMOVAL

1. Disconnect all the power transformer cables.
2. Remove four screws (#3 ~ #6) as shown in photo 2.
3. Lift the power transformer away from the unit.

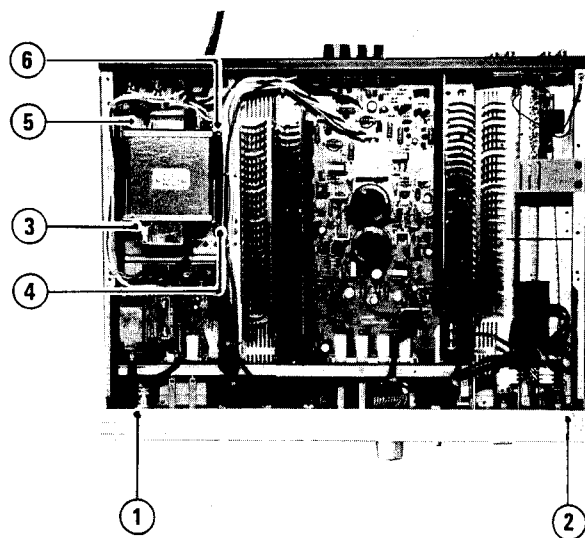


Photo 2

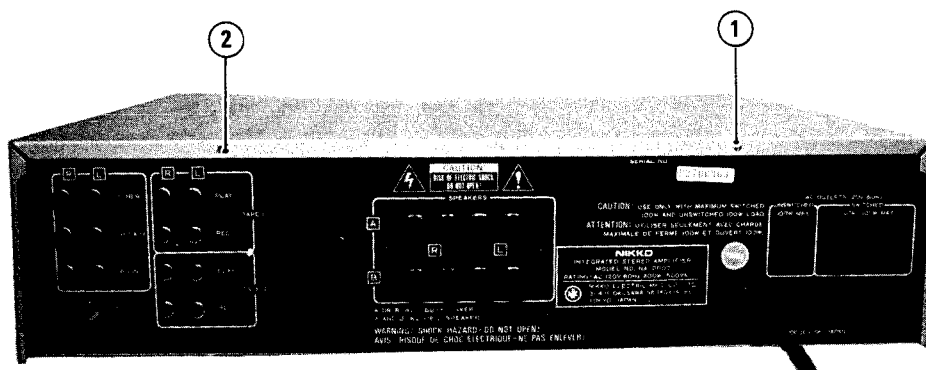


Photo 3

PARTS LOCATION

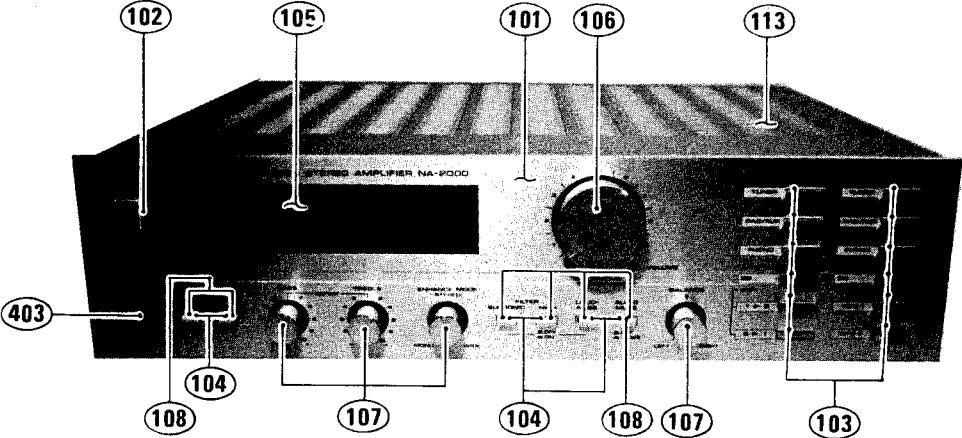


Photo 4

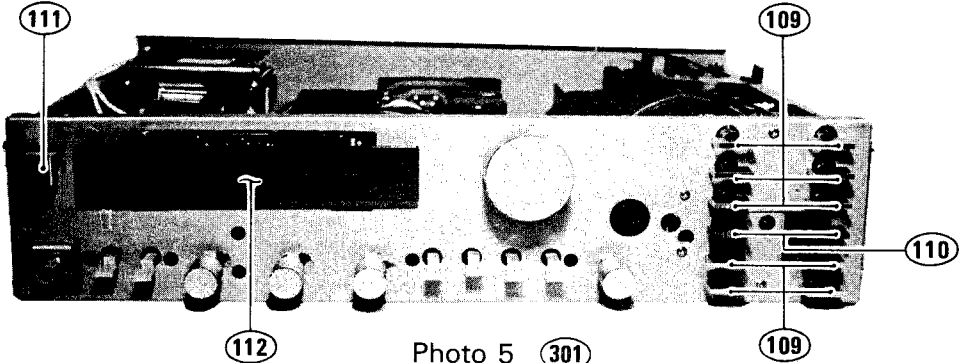


Photo 5

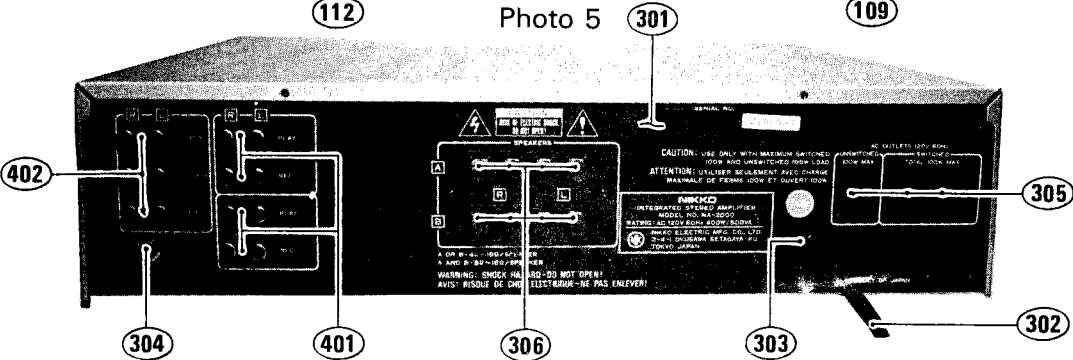


Photo 6

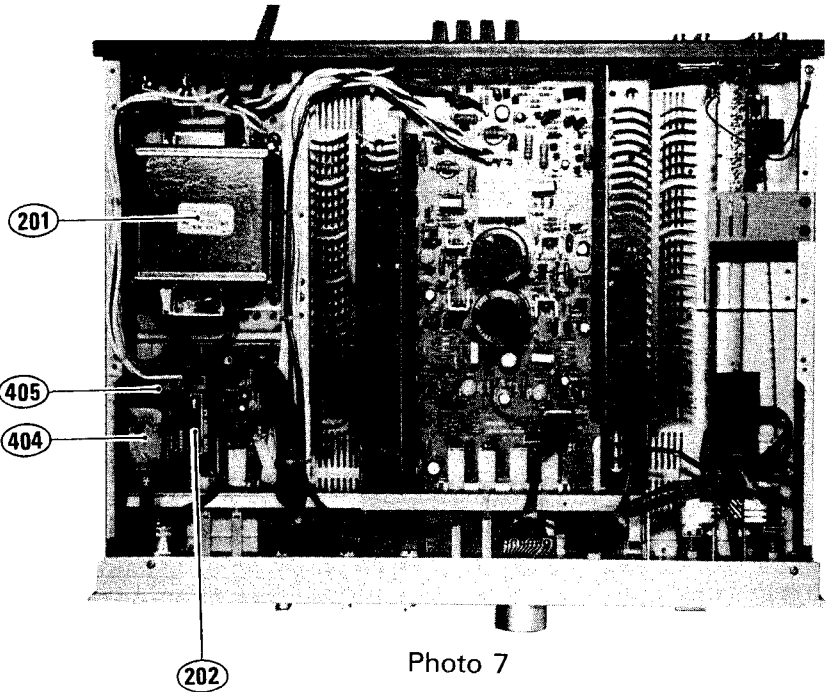


Photo 7

ALIGNMENT

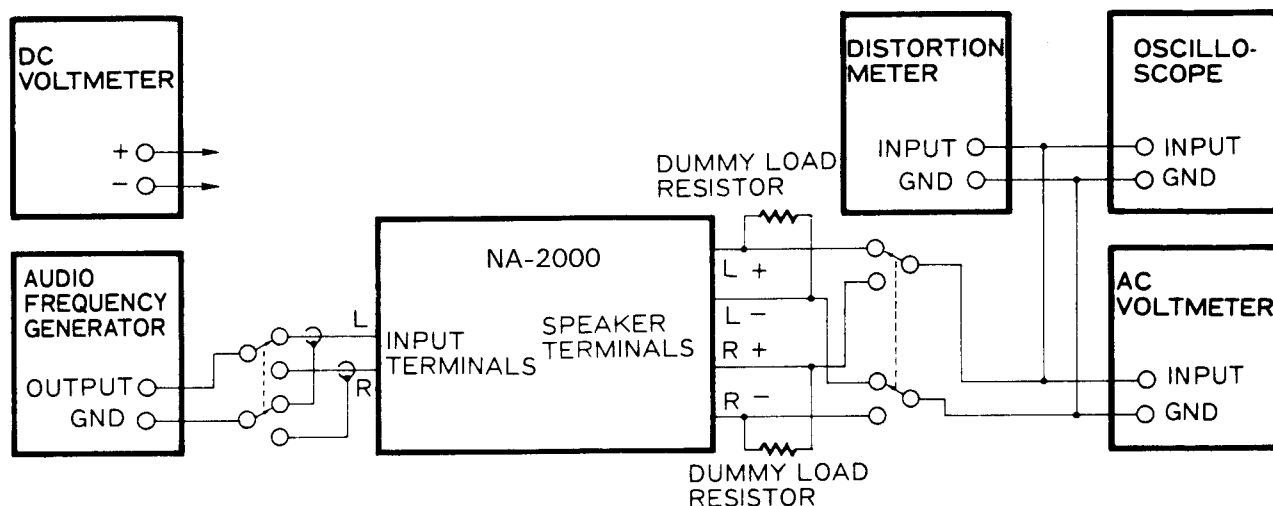


Figure 2 TEST EQUIPMENT HOOK-UP

TEST EQUIPMENTS

Audio Frequency Generator
DC Voltmeter
AC Voltmeter
Two Dummy Load Resistors, 8 ohms 250 W

- Turn the VOLUME control knob down to the fully counter clockwise (no signal applied to the MAIN AMP circuit).
- Adjust the potentiometer R707 (left channel) or R708 (right channel) on the MAIN AMP PC Board for 0 ± 250 mV DC voltmeter reading.

ALIGNMENT PRECAUTIONS

- Allow a minimum of 10 minutes warm-up for test equipment and the amplifier.
- Connect the 8 ohms dummy load resistors to the left and right speaker terminals.

DC BALANCE ADJUSTMENT

- Connect a DC voltmeter to the speaker terminals.

IDLING CURRENT ADJUSTMENT

- Connect a DC voltmeter to the test points (refer to Photo 0).
- Turn the VOLUME control knob down to the fully counter clockwise.
- Adjust the potentiometer R741 (left channel) or R742 (right channel) until the DC voltmeter shows 6 mV $\sim$ 20 mV.

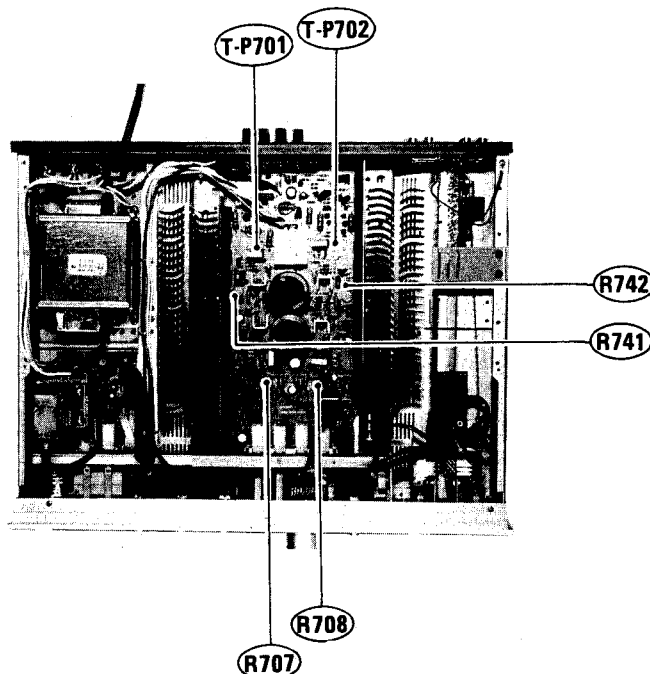


Photo 8

POWER TRANSISTORS MOUNTING ASSEMBLY

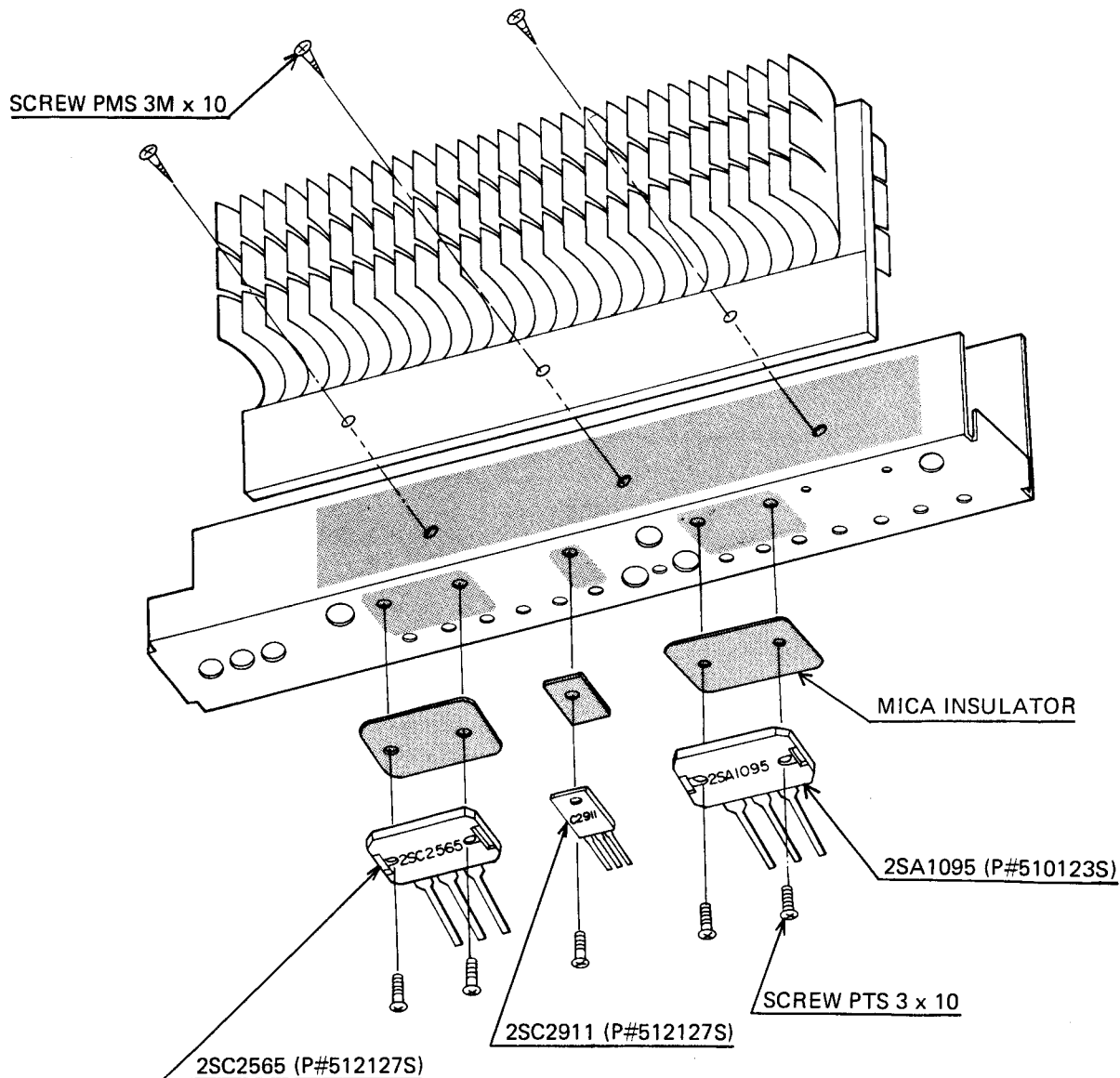


Figure 3

NOTE: For best heat conduction, use thermally conductive silicon grease between the power transistor and the mica insulator and between the insulator and the heat sink.

※ Both (L) and (R) channels are used.

PRECAUTIONS FOR REPAIR SERVICE

Many of these items are included just as a remainder — they are normal procedures for experienced technicians. Short-cuts can be taken: but, often they cause additional damage to transistors, circuit components or the printed circuit board.

1. **Do not** bridge electrolytic capacitors with AC power. The resultant surges may damage solid state devices.
2. **Do not** bias the base of any transistor while voltage is being applied to its collector.
3. Replacements for output and driver transistors, if necessary, must be made from the same **hfe** group as the original type. Be sure to include this information when ordering replacement transistors.
4. If one output transistor burns out (open or shorts), always remove all output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohmmeter before inserting a new transistor. All output transistors in one channel will be destroyed if the base biasing circuit is open in the emitter end.

PARTS LIST

1. ★ The KEY NUMBER (#) marked with a (★) on parts list relate to number of three digits with a (). (Photo 4 ~ 7)
2. + Numerals in file indicate the quantity of parts used in one type.
3. ++ TR : Transistor
FET : Field effect transistor
VR : Volume control (Variable resistor)
RES : Carbon film fixed resistor
MO-RES : Metal oxide film fixed resistor
CEM-RES : Cemented wirewound fixed resistor
FP : Flame proof
C-CAP : Ceramic capacitor
E-CAP : Aluminum electrolytic capacitor
M-CAP : Polyester film capacitor
S-CAP : Polystyrene film capacitor
T-CAP : Tantalum electrolytic capacitor
BP-CAP : Bipolar electrolytic capacitor
LC-CAP : Low current leakage electrolytic capacitor.

4. Assemblies and parts are subject to change without notice.
5. Parts ordering procedure:
 - A. DO NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only)
 - B. Include in any order
 - a. Part number.
 - b. Part description.
 - c. Model number.
 (any of the above lacking from an order may delay shipment of that order.)

CAUTION:

The  mark, the KEY NO. and the SYMBOL NO. circled with rectangle in the schematic diagram and the shaded area in the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list.

KEY NO.	SYMBOL NO.	TYPE ⁺ W E V	DESCRIPTION ⁺⁺	PART NO.
PACKING MATERIAL & ACCESSORIES				
001	1 1 1		Carton box	9826900
002	2 2 2		Pad, styrol	9841040
003	1 1 1		Sack, polyethylene cloth	9640730
004	1 1 1		Sack, polyethylene cloth #13	9640320
005a	1 - -		Manual, instruction - English and French	960441E
005b	- 1 1		Manual, instruction - in five different languages	960441K
CABINET ASSEMBLY				
★101	1 1 1		Panel, front	7886550
★102	1 1 1		Guide, button - M15SQ - Power switch	7405890
★103	1 1 1		Guide, selector buttons - P319SL - REC selector/IN PUT selector	7405900
★104	3 3 3		Guide, button P309-2 Speakers/Filter/Loudness/Audio mute	7405880
★105	1 1 1		Window, panel smoke	7803240
★106	1 1 1		Knob, 20SL-42DR - Volume	7841550
★107	4 4 4		Knob, 520SL-16DR - Bass/Treble/Enhance mode/Balance	7841600
★108	6 6 6		Button, push - P309NA - Speakers/Filter/Loudness/Audio mute	7853990
★109	10 10 10		Button, push - P319SL - Tuner/Aux/Phono/Tape 1/Tape 2	7852400
★110	2 2 2		Button, push - P319R - Tape dubbing/Cartrige	7854010
★111	1 1 1		Button, push - M15SQL - Power switch	7853930
★112	1 1 1		Scale, power level indicator	7803260
★113a	1 - -		Cover, top	7821560
★113b	- 1 -		Cover, top	7821610
114	1 1 1		Plate, bottom	7328760
115	4 4 4		Foot, polyethylene	7402640
CHASSIS ASSEMBLY				
	1 1 1		Power level indicator assembly	5060560
★201a	1 - -		Transformer, power T-1-552 AC120V	1105520
★201b	- 1 -		Transformer, power T-1-553 AC220V	1105530
★201c	- - 1		Transformer, power T-1-554 AC110V/120V/220V/240V	1105540
★202a	1 - -		Fuse, 6A 250V AC	4700730
★203a	1 - 1		Fuse, 0.5A 250V AC	4700560
★202b	- 1 -		Midget fuse, T3.15A	4720390
★203b	- 1 -		Midget fuse, T500mA	4721060
★202c	- - 1		Fuse, 3.5A 250V AC (220V/240V only)	4700640
★202d	- - 1		Fuse, 7.0A 250V AC (110V/120V only)	4700690
BACK PLATE ASSEMBLY				
★301a	1 - -		Plate, back (W)	732873A
★301b	- 1 -		Plate, back (E)	7328740
★301c	- - 1		Plate, back (V)	7328750
★302a	1 - 1		Cord, AC line - DP-70	606007A
★303a	1 - 1		Bush, power cord - SR-3P-4	7400620

KEY NO.	SYMBOL NO.	TYPE ⁺ W E V	DESCRIPTION ⁺⁺	PART NO.
★302b	- 1 -		Cord, AC line - SEE-2T	800508A
★303b	- 1 -		Bush, power cord - SR-4N-4	7400690
★304	1 1 1		Shaft, GND terminal - 1PEV	4450660
★305	3 - 1		Socket, AC outlets	4500150
★306	1 1 1		Terminal, speakers - Screw tupe 8P	4450640
★307	- - 1		AC power selector (See volt selector manual)	4530540
EQUALIZER PC BOARD ASSEMBLY (REC SELECTOR SECTION)				
★401	2 2 2		Terminal, RCA phono pin jack 2P x 2 - Tape 1/Tape 2	4444120
	1 1 1		Switch, Hexa push SUN622 - Tuner/Aux/Phono/Tape dubbing	4042640
R507,508				
R511,512	4 4 4		RES 2.2kohm 5% 1/4W	328222J
R505,506				
R509,510	4 4 4		RES 820ohm 5% 1/4W	328824J
C-501~				
C-504	4 4 4		C-CAP 0.01uf 10% 50V	231103K
(INPUT SELECTOR SECTION)				
★402	1 1 1		Terminal, RCA phono pin jack 2P x 3 - Tuner/Aux/Phone	4446050
	1 1 1		Switch, Hexa push SUFR62 - Tuner/Aux/Phono/Tape 1/Tape 2	4042650
	1 1 1		Switch, Slide SSR24351D - MM/MC switch	4020590
IC401	1 1 1		IC μ PC4559	518110S
Q401				
~Q404	4 4 4		FET 2SK170 (GR, BL)	516039S
R403,404	2 2 2		RES 5.6ohm 5% 1/4W	328568J
R423,424	2 2 2		RES 12ohm 5% 1/4W	328120J
R401,402	2 2 2		RES 100ohm 5% 1/4W	328101J
R419~422	4 4 4		RES 120ohm 5% 1/4W	328121J
R425,426	2 2 2		RES 560ohm 5% 1/4W	328561J
R411,412	2 2 2		RES 1Kohm 5% 1/4W	328102J
R513,514	2 2 2		RES 1.2Kohm 5% 1/4W	328122J
R407~410,				
R413,414	6 6 6		RES 4.7Kohm 5% 1/4W	328472J
R415,416	2 2 2		RES 5.6Kohm 5% 1/4W	328562J
R405,406,				
R427,428	4 4 4		RES 47Kohm 5% 1/4W	328473J
R417,418	2 2 2		RES 68Kohm 5% 1/4W	328683J
R501~504	4 4 4		RES 820Kohm 5% 1/4W	328824J
C401,402			C-CAP 100pf SL 50V	232101K
C403,404			C-CAP 680pf SL 50V	232681K
C405,406			M-CAP 0.01 μ f 50V 5%	222103J
C407,408			M-CAP 0.0033 μ f 50V 5%	222332J
C409,410			M-CAP 0.047 μ f 50V 5%	222473J
C411,412			E-CAP 2200 μ f 6.3V	211042S

KEY NO.	SYMBOL NO.	TYPE ⁺ W E V	DESCRIPTION ⁺⁺	PART NO.
	C413,414	2 2 2	BP-CAP 3.3 μ f 50V	215513N
	C415,416	2 2 2	M-CAP 0.0047 μ f 50V 5%	222472J
	C417,418	2 2 2	E-CAP 100 μ f 25V	211330Q
		4 4 4	Connector 3P	4570420
MAIN AMPLIFIER PC BOARD ASSEMBLY				
	Q715,716	2 2 2	TR 2SC 2911 (R, S)	512156S
	Q729,730	2 2 2	TR 2SA 1095 (O, Y)	510123S
	Q727,728	2 2 2	TR 2SC 2565 (O, Y)	512127S
(MAIN AMPLIFIER SECTION)				
	R535,536	1 1 1	VR V12LG3N25KC 250KX2 - Enhance	4321470
	R543,544,			
	R551,552	2 2 2	VR V12LG3N25KC 100KX2 - Tone	4321460
	R537	1 1 1	VR VB12LN25KC 250K - Balance	4321480
		1 1 1	Switch, Tetra push - Filter/Loudness/ Auto mute	4042630
	Q711~714	4 4 4	TR 2SA1209(R,S)	510139S
	Q717,718	2 2 2	TR 2SC2911(R,S)	512156S
	Q725,726	2 2 2	TR 2SB649A(C)	511111S
	Q723,724	2 2 2	TR 2CD669A(C)	513112S
	Q721,722	2 2 2	TR 2SA1015(Y,GR)	510102S
	Q719,720,			
	Q703~706	6 6 6	TR 2SC1815(Y,GR)	512107S
	Q707~710	4 4 4	TR 2SC2240(GR,BL)	512102S
	Q701,702	2 2 2	FET μ PA68H	516050S
	D705~710			
	D701,702,	8 8 8	D IS2076	501019S
	ZD701			
	~ZD704	4 4 4	ZD RD18EB2	502077S
	TH701			
	~704	4 4 4	TH D2FHL103S	5400180
	R741,742	2 2 2	Semi variable resistor SR19R B330ohm	4301450
	R707,708	2 2 2	Semi variable resistor SR19R B1Kohm	4300720
	R769~772	4 4 4	CER-RES 0.22ohm 5W	384229W
	R791,792	2 2 2	FP-MO-RES 1.8Kohm 1W	361182L
	R737,738	2 2 2	FP-MO-RES 8.2Kohm 1W	361822L
	R733,734	2 2 2	FP-MO-RES 22Kohm 1W	361223L
	R757,758	2 2 2	FP-RES 150ohm 1/2W	329151L
	R723,724	2 2 2	FP-RES 10Kohm 1/2W	329103L
	R787~790	4 4 4	FP-RES 10ohm 1/4W	328100L
	R735,736	2 2 2	FP-RES 150ohm 1/4W	328151L
	R749~752	4 4 4	FP-RES 680ohm 1/4W	328681L
	R761,762,			
	R767,768	4 4 4	FP-RES 1.5Kohm 1/4W	328152L
	R715~720	6 6 6	RES 27ohm 5% 1/4W	328270J
	R729~732	4 4 4	RES 47ohm 5% 1/4W	328470J
	R705,706	2 2 2	RES 68ohm 5% 1/4W	328680J
	R745~748	4 4 4	RES 180ohm 5% 1/4W	328181J
	R701,702,			
	R785,786	4 4 4	RES 330ohm 5% 1/4W	328331J
	R533,534,	2 2 2	RES 1.2Kohm 5% 1/4W	328122J
	R545,546	2 2 2	RES 680ohm 5% 1/4W	328681J
	R531,532	2 2 2	RES 220ohm 5% 1/4W	328221J
	R547,548,			
	R743,744	4 4 4	RES 1Kohm 5% 1/4W	328102J
	R725~728	4 4 4	RES 1.5Kohm 5% 1/4W	328152J
	R555,556	2 2 2	RES 2.2Kohm 5% 1/4W	328222J
	R553,554,			
	R739,740	4 4 4	RES 1.8Kohm 5% 1/4W	328182J
	R519,520,			
	R541,542	4 4 4	RES 3.3Kohm 5% 1/4W	328332J
	R763~766	4 4 4	RES 1.2Kohm 5% 1/4W	328122J
	R783,784	2 2 2	RES 6.8Kohm 5% 1/4W	328682J
	R549,550	2 2 2	RES 10Kohm 5% 1/4W	328103J
	R711~714	4 4 4	RES 12Kohm 5% 1/4W	328123J
	R525,526	2 2 2	RES 15Kohm 5% 1/4W	328153J
	R517,518	2 2 2	RES 27Kohm 5% 1/4W	328273J
	R721,722,			
	R781,782	4 4 4	RES 47Kohm 5% 1/4W	328473J
	R529,530	2 2 2	RES 68Kohm 5% 1/4W	328683J
	R753,754	2 2 2	RES 100Kohm 5% 1/4W	328104J

KEY NO.	SYMBOL NO.	TYPE ⁺ W E V	DESCRIPTION ⁺⁺	PART NO.
	R523,524,			
	R709,710	4 4 4	RES 120Kohm 5% 1/4W	328124J
	R703,704	2 2 2	RES 150Kohm 5% 1/4W	328154J
	R515,516	2 2 2	RES 560Kohm 5% 1/4W	328564J
	R521,522	2 2 2	RES 820Kohm 5% 1/4W	328824J
	C731	1 1 1	E-CAP 47 μ f 50V	211525S
	C732	1 1 1	E-CAP 220 μ f 50V	211532S
	C733~736	4 4 4	E-CAP 10 μ f 100V	211820S
	C527,528	2 2 2	BP-CAP 3.3 μ f 50V	215513N
	C525,526	2 2 2	BP-CAP 22 μ f 50V	215522N
	C715~720	6 6 6	M-CAP 0.001 μ f 10% 50V	222102K
	C517,518	2 2 2	M-CAP 0.0039 μ f 10% 50V	222392K
	C505,506			
	C711~714,	6 6 6	M-CAP 0.01 μ f 10% 50V	222103K
	C529,530	2 2 2	M-CAP 0.012 μ f 10% 50V	222123K
	C523,524	2 2 2	M-CAP 0.022 μ f 10% 50V	222223K
	C531,532	2 2 2	M-CAP 0.039 μ f 10% 50V	222393K
	C511,512	2 2 2	M-CAP 0.047 μ f 10% 50V	222473K
	C513~516,			
	C535,709,			
	C710	7 7 7	M-CAP 0.1 μ f 10% 50V	222104K
	C533,534	2 2 2	M-CAP 0.27 μ f 10% 100V	281274K
	C705,706	2 2 2	C-CAP 10pf 10% 500V SL	234100K
	C727,728	2 2 2	C-CAP 15pf 10% 500V SL	234150K
	C707,708	2 2 2	C-CAP 47pf 10% 500V SL	234470K
	C729,730	2 2 2	C-CAP 18pf 10% 50V SL	232180K
	C519,520	2 2 2	C-CAP 82pf 10% 50V SL	232820K
	C509,510,			
	C701,702	4 4 4	C-CAP 150pf 10% 50V SL	232151K
	C507,508,			
	C703,704	4 4 4	C-CAP 330pf 10% 50V SL	232331K
	C521,522	2 2 2	C-CAP 560pf 10% 50V SL	232561K
	RY901	1 1 1	Relay, FBR 323-DC 24V	1700370
	Q905	1 1 1	TR 2SD 666 (B, C)	511019S
	Q805,902,			
	Q904	3 3 3	TR 2SC 1815 (Y,GR)	512107S
	Q806,901,			
	Q903	3 3 3	TR 2SA 1015 (Y,GR)	510102S
	Q801	1 1 1	TR 2SC 2240 (GR,BL)	512102S
	Q802	1 1 1	TR 2SA 970 (GR,BL)	510103S
	Q803,804	2 2 2	FET 2SK 105 (F)	516041S
	D801	1 1 1	D S5VB20	560042S
	D901,902	2 2 2	D S5277D	560047S
	ZD802,803	2 2 2	ZD RD 12EB3	502058S
	ZD901	1 1 1	ZD RD 8.2EB1	502052S
	ZD801	1 1 1	ZD RD 6.2EB2	502048S
	R773~778	6 6 6	FP-MO-RES 10ohm 2W	362100L
	R913	1 1 1	FP-MO-RES 1.5Kohm 2W	362152L
	R801,802	2 2 2	FP-MO-RES 1.8Kohm 2W	362182L
	R803	1 1 1	RES 2.2Kohm 5% 1/4W	328222J
	R809,908,			
	R909	3 3 3	RES 6.8Kohm 5% 1/4W	328682J
	R911	1 1 1	RES 8.2Kohm 5% 1/4W	328822J
	R804			
	905,910	3 3 3	RES 10Kohm 5% 1/4W	328103J
	R805,807	2 2 2	RES 12Kohm 5% 1/4W	328123J
	R907	1 1 1	RES 27Kohm 5% 1/4W	328273J
	R806,808,			
	R903,904	4 4 4	RES 47Kohm 5% 1/4W	328473J
	R901,902,			
	R906	3 3 3	RES 100Kohm 5% 1/4W	328104J
	R912	1 1 1	RES 180Kohm 5% 1/4W	328184J
	C805, 807,			
	C901	3 3 3	E-CAP 10 μ f 10V	211220S
	C904	1 1 1	E-CAP 100 μ f 16V	211230S
	C806,808,			
	C809,903	4 4 4	E-CAP 10 μ f 25V	211320S
	C801,802	2 2 2	E-CAP 10000 μ f 71V	2100200
	C902	1 1 1	BP-CAP 100 μ f 16V	215230N
	C804	1 1 1	C-CAP 0.001 μ f 10% 50V	231102K
	C803	1 1 1	C-CAP 0.01 μ f 10% 50V	231103K
	C725,726	2 2 2	M-CAP 0.022 μ f 10% 50V	222223K
	C723,724	2 2 2	M-CAP 0.047 μ f 50V	222473K

KEY	SYMBOL	TYPE ⁺	DESCRIPTION ⁺⁺	PART
NO.	NO.	W E V		NO.
L701,702	2 2 2		Choke Coil 1μH	1210960
(SPEAKER SWITCH SECTION)				
	1 1 1		Switch, Twin push — Speaker A/ Speaker B switch	4042190
Q807	1 1 1	TR	2SC 1627 (O, Y)	511017S
D802	1 1 1	D	S5277D	560047S
D903~906	4 4 4	D	IS2076	501019S
ZD804	1 1 1	ZD	RD 11E82	502089S
R919,920	2 2 2	RES	330ohm 5% 1/4W	328331J
R914,915	2 2 2	RES	680ohm 5% 1/4W	328681J
R810	1 1 1	RES	1.5Kohm 5% 1/4W	328152J
R925,926	2 2 2	RES	15Kohm 5% 1/4W	328153J
R923,924	2 2 2	RES	18Kohm 5% 1/4W	328183J
R917,918	2 2 2	RES	33Kohm 5% 1/4W	328333J
R927,928	2 2 2	RES	100Kohm 5% 1/4W	328104J
R921,922	2 2 2	RES	330Kohm 5% 1/4W	328334J
R779,980	2 2 2	FP-MO-RES	330ohm 1W	361331L
C905,906	2 2 2	BP-CAP	3.3μf 50V	215513N
C811	1 1 1	E-CAP	10μf 16V	211220S

KEY	SYMBOL	TYPE ⁺	DESCRIPTION ⁺⁺	PART
NO.	NO.	W E V		NO.
C812	1 1 1	E-CAP	100μf 16V	211230S
C810	1 1 1	E-CAP	470μf 25V	213335S
C907,908	2 2 2	E-CAP	3.3μf 50V	211513S
(GAIN VR SECTION)				
R527,528	1 1 1	VR	GM80F 250KBX 2 — Volume	4321160
(EAR JACK SECTION)				
* 403	1 1 1		Jack, headphones	4550390
(POWER SWITCH SECTION)				
△ * 404a	SW 1	1 — —	Switch, push ESB99354T — Power	4041830
△ * 404b	SW 1	— 1 1	Switch, push ESB90179S — Power	4041600
△ * 405a	Coo1	1 — —	M-CAP 0.01μf 125VAC	284103M
△ * 405b	Coo1	— 1 1	M-CAP 0.01μf 250VAC	283103M
(LED SECTION)				
LD901,902	2 2 2		LED GL9PR12	5060810

SEMICONDUCTOR DATA

TRANSISTORS

DEVICE TYPE	APPLICATIONS	STRUCTURE [†]	MAXIMUM RATINGS Absolute-Maximum Values: (TA = 25°C unless otherwise specified)						ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25°C unless otherwise specified)												MANUFACTURER
			Collector-to-Base Voltage V _{CE0} (V)	Emitter-to-Base Voltage V _{EB0} (V)	Collector Current I _C (mA)	Collector Dissipation P _C (mW)	Junction Temperature T _J (°C)	Collector Cutoff Current I _{CBO} (μA)	V _{CE} (V)	h _{FE}	Static Forward Current Transfer Ratio V _{CE} (V)	I _C (mA)	Collector-Emitter Saturation Voltage V _{CE(sat)} (V)	I _C (mA)	I _B (mA)	f _T f _{0B} * (MHz)	V _{CE} V _{CE*} (V)	I _E I _C * (mA)	Output Capacitance C _{ob} (pF)	others	
2SA970 (GR, BL)	AF, Low noise	PNP Si-E	-120	-5	-100	300	125	-0.1 max.	-120	200 ~ 700	-6	-2	-0.3 max.	-10	-1					Complementary to 2SC2240	TOSHIBA
2SA1209 (R, S)	AF, SW	PNP Si-Tp	-180	-5	-140	10W (Tc=25°C)	150	-0.1 max.	-80	140 ~ 280	-5	-10	-0.4 max.	-50	-5	150	-10	-10	4	Complementary to 2SC2911	SANYO
2SA1015 (Y, GR)	AF, General	PNP Si-E	-50	-5	-150	400	125	-0.1 max.	-50	120 ~ 400	-6	-2	-0.3 max.	-100	-10	80 min.	-10*	-1*	7 max.	Complementary to 2SC1815	TOSHIBA
2SA1095 (O, R)	AF, Power amp.	PNP Si-E	-160	-5	-15A	150W (Tc=25°C)	150	-50 max.	-160	55 ~ 160	-5	-1A	-2 max.	-5A	-500	60	-10	-1A*	350	Complementary to 2SC2565	TOSHIBA
2SB649A (B, C)	AF, Driver	PNP Si-E	-180	-5	-1.5A	20W (Tc=25°C)	150	-10 max.	-160	60 ~ 200	-5	-150	-1 max.	-500	-50	140	-5	-500*	27	Complementary to 2SD669A	HITACHI
2SC1627 (O, Y)	AF, Driver	NPN Si-EP	80	5	300	600	150	0.1 max.	50	70 ~ 240	2	50	0.5 max.	200	10	100	10	10*	10		TOSHIBA
2SC1815 (Y, GR)	AF, General	NPN Si-E	60	5	150	400	125	0.1 max.	60	120 ~ 400	6	2	0.25 max.	100	10	80 min.	10	1*	3 max.	Complementary to 2SA1015	TOSHIBA
2SC2240 (GR, BL)	AF, Low Noise	NPN Si-E	120	5	100	300	125	0.1 max.	120	200 ~ 700	6	2	0.3 max.	10	1	100	6	1*	3		TOSHIBA
2SC2565 (O, R)	AF, Power amp.	NPN Si-E	160	5	15A	150W (Tc=25°C)	150	50 max.	160	55 ~ 160	5	1A	2 max.	5A	500	80	10	1A*	200	Complementary to 2SA1095	TOSHIBA
2SC2911 (R, S)	AF, SW	Si-EP	180	5	140	10W (Tc=25°C)	150	0.1 max.	80	140 ~ 280	5	10	0.3 max.	50	5	150	10	10	3	Complementary to 2SA1209	SANYO
2SD669A (B, C)	AF, Driver	NPN Si-E	180	5	1.5A	20W (Tc=25°C)	150	10 max.	160	60 ~ 200	5	150	1 max.	500	50	140	5	500*	14	Complementary to 2SB649A	HITACHI
2SD666 (B, C)	AF, Voltage amp.	NPN Si-E	120	5	50	900	150	10 max.	100	60 ~ 200	5	10	2 max.	30	3	140	5	10*	3		HITACHI

FIELD EFFECT TRANSISTORS

DEVICE TYPE	APPLICA TIONS	STRUC [†] TURE	MAXIMUM RATINGS Absolute-Maximum Values: (TA = 25°C unless otherwise specified)						ELECTRICAL CHARACTERISTICS Typical values: (TA = 25°C unless otherwise specified)														Noise Figure		MANU- FACTURE			
			Gate-to-Drain Voltage	Gate-to-Source Voltage	Gate Current	Drain Current	Total Dissipa- tion	Channel Tempera- ture	Gate Leak Current		Gate-to Drain Breakdown Voltage		Drain Current		Gate-to Source Cutoff Voltage		Forward Transfer Admittance		Feed Back Capacitance		Power Gain (Common Source)							
			V _{GD0} (V)	V _{GS0} (V)	I _G (mA)	I _D (mA)	P _D (mW)	T _{ch} (°C)	Test Conditions	I _{GSS} (nA)	Test Conditions	V(BR) V _{GD0} (V)	Test Conditions	I _{DSS} (mA)	Test Conditions	V _{GS} (off) (V)	Conditions	Y _f (mS)	Test Conditions	C _{iss} (pF)	Test Conditions	G _{PS} (dB)	Test Conditions	NF (dB)				
2SK105 (F)	AF, General	Si N-channel junction	-50	-50	10	20	250	125	V _{GS} = -30V V _{DS} = 0	-1 max.			V _{DS} = 5V V _{GS} = 0	1.0 ~3.0	V _{DS} = 5V I _D = 10μA	-1.1	V _{DS} = 5V V _{GS} = 0 f = 1kHz	4.1	V _{DS} = 10V V _{GS} = 0 f = 1MHz	0.9								NEC
2SK170 (GR, BL)	AF, Low noise	Si N-channel Junction	-40		10		400	125	V _{GS} = -30V V _{DS} = 0	-1 max.	V _{DS} = 0 I _G = -100μA	-40 min.	V _{DS} = 10V V _{GS} = 0	2.6 ~12			V _{DS} = 10V V _{GS} = 0 f = 1kHz	22	V _{DS} = 10V I _D = 0 f = 1MHz	6					V _{DS} = 10V R _g = 1kΩ I _D = 1mA f = 1kHz	0.5	TOSHIBA	
μPA68H (L)	AF, Low noise Differential amp.	Si N-channel junction (Dual)	-50	-50	10		200/ unit	125	V _{GS} = -30V V _{DS} = 0	-1 max.			V _{DS} = 10V V _{GS} = 0	2.6 ~6.5			V _{DS} = 10V V _{GS} = 0 f = 1kHz I _{DSS} = 3mA	12	V _{DS} = 10V I _D = 0 f = 1MHz	3					V _{DS} = 10V R _g = 1kΩ I _D = 1mA f = 1kHz	2 max.	NEC	

ZENER DIODES

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (TA=25°C unless otherwise specified)			ELECTRICAL CHARACTERISTICS Typical Values: (TA=25°C unless otherwise specified)														MANU- FACTURER
			Total Power Dissipation	Zener Current	Junction Temperature	Zener Voltage Vz			Differential Resistance rz			Temperature Coefficient TZ		Reverse Current Iz		Others				
						MIN (V)	TYP (V)	MAX (V)	IZ (mA)	TYP (Ω)	MAX (Ω)	IZ (mA)	TYP (%/°C)	MAX (%/°C)	IZ (mA)		MAX (μA)	VR (V)		
																			Test conditions	
RD6.2-EB2	Regulator	Si-J	400		175	5.96		6.27	20		20	20				5	3.0		NEC	
RD8.2-EB1	Regulator	Si-J	400		175	7.53		7.92	20		10	20				2	5.0		NEC	
RD11EB2	Regulator	Si-J	400		175	10.50		11.05	10		15	10				2	8.0		NEC	
RD12-EB3	Regulator	Si-J	400		175	11.74		12.35	10		20	10				2	9.0		NEC	
RD18-EB2	Regulator	Si-J	400		175	16.82		17.70	10		45	10				2	13		NEC	

DIODES, LEDS

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATING Absolute-Maximum Values: (TA=25° C unless otherwise specified)										ELECTRICAL CHARACTERISTICS Typical Values: (TA=25° C unless otherwise specified)										MANU- FACTURER
			Reverse Surge Voltage VRSurge (V)	Peak Reverse Voltage VRM (V)	Reverse Voltage VR (V)	Peak Forward Voltage VFM (V)	Peak Forward Current IFM (mA)	Average Rectified Current IO (mA)	Forward Surge Current IF surge (A)	Junction Temperature TJ (°C)	Total Power Dissipation PD (mW)	Forward Current IFmin (mA)	Test Condition VF (V)	Forward Voltage		Reverse Current		Others					
														VFmax (V)	Test Condition IF (mA)	IRmax (μA)	Test Condition VR (V)						
S5VB20	Rectifier	Si-D (Bridge)		200				3.5A	200					1.05	2.5A	10	200		SHINDENGEN				
SS277D	Rectifier	Si-DJ		200				2.0A	1.0A	50	150				1.2	1A	10	200		TOSHIBA			
IS2076	Medium speed switching	Si-EP		35	30			450	150	1	175	250			0.8	1.0	0.1	30		HITACHI			
GL9PR12	Lamp (red)	Gap			5		50	IF=10			23				2.3	5	10	5	0.6 mcd (IF=5mA)	SHARP			

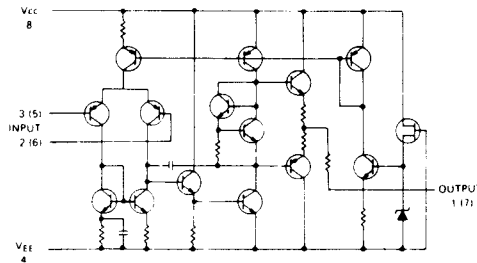
INTEGRATED CIRCUIT μ PC4559C

FUNCTION/MANUFACTURER

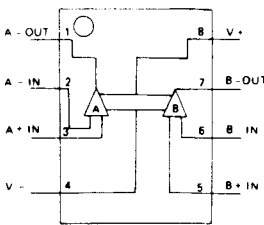
- Dual Operational Amplifier/NEC

EQUIVALENT CIRCUIT AND CONNECTION INFORMATION

EQUIVALENT CIRCUIT

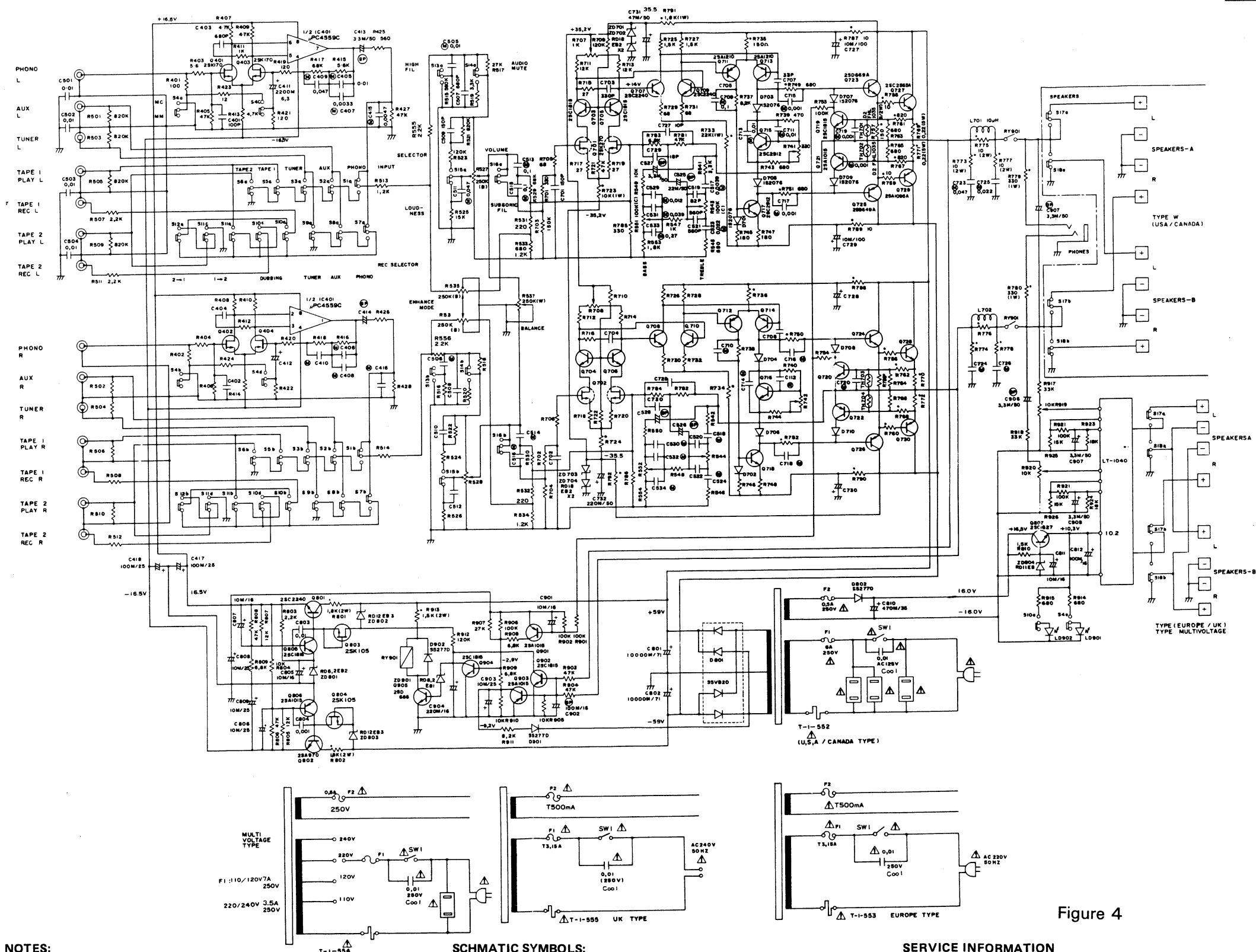


TERMINAL GUIDE (TOP VIEW)



SCHEMATIC DIAGRAM

	2SA970 2SA1015 2SC1627 2SC1815 2SC2240 2SD666
	2SA1209 2SB649A 2SC2911 2SD669A
	2SK170 2SK105
	2SA1095 2SC2565
	μPA68H
	1S2076 RD6.2EB2 RD8.2EB1 RD11EB2 RD12EB3 RD18EB2 S5277D
	GL9PR12
	S5VB20
	μPC4559C



NOTES:

1. SCHEMATIC IS SUBJECT TO CHANGE WITHOUT NOTICE.

UNLESS OTHERWISE SPECIFIED:

- RESISTANCE VALUES ARE IN OHMS.
K = 1,000; M = 1,000,000
- CAPACITANCE VALUES 1.0 AND ABOVE ARE IN pF OR μF
(P = pF, M = μF), LESS THAN 1.0 ARE IN μF. (ELECTROLYTIC CAPACITANCE VALUES ARE IN μF/MV.)
- VOLTAGES ARE MEASURED TO CHASSIS, GROUND WITH A "DC VOLTMETER."
V = VOLTAGES MEASURED WITH NO SIGNAL APPLIED.

SCHEMATIC SYMBOLS:

-  POLYESTER FILM CAPACITOR (NO MARK) CERAMIC CAPACITOR
-  BIPOLAR CAPACITOR
-  NON FLAMMABLE RESISTOR

WARNING:

⚠ INDICATES SAFETY CRITICAL COMPONENTS.
FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.

SERVICE INFORMATION

CAUTION: REFER SERVICING TO QUALIFIED SERVICE PERSONAL.

- EACH PRECAUTION TO BE FOLLOWED DURING SERVICING.
- INDICATES SAFETY CRITICAL COMPONENTS FOR CONTINUED SAFETY. REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.
- BEFORE RETURNING THIS APPLIANCE TO THE CUSTOMER, YOU MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT.

Figure 4

P.C. BOARD (BOTTOM VIEW)

