

NIKKO POWER AMP

ALPHA 130

STEREO POWER

AMPLIFIER



TYPE AND VOLTAGE

W-TYPE:	UL and CSA type	120V AC
E -TYPE:	NK-STD type (SILVER PANEL)	220/240V
E'-TYPE:	NK-STD type	220/240V

SERVICE MANUAL

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SPECIFICATIONS

AMPLIFIER SECTION

- Continuous Power Output Channel:
- 20 ~ 20000 Hz (8 ohms) more than 100 Watts
 - 20 ~ 20000 Hz (4 ohms) more than 100 Watts
 - 1000 Hz (8 ohms) more than 120 Watts
 - 1000 Hz (4 ohms) more than 120 Watts
- T.H. Distortion, 8 ohms:
- at Continuous Power Output no more than 0.01%
 - at 1 Watt Power Output no more than 0.01%
- T.H. Distortion, 4 ohms:
- at Continuous Power Output no more than 0.03%
- I.M. Distortion, 8 ohms:
- at Continuous Power Output no more than 0.01%
 - at 1 Watt Power Output no more than 0.03%
- IHF Power Bandwidth, (THD 0.05%) 8 ohms:
- 10 ~ 50 kHz
- Damping Factor at 1000 Hz, 8 ohms. more than 50
- Frequency Response, input, 8 ohms:
- at 1 Watt Power Output 10 ~ 50 kHz ± 0.2 dB
- Input Sensitivity for 120 Watts Power Output:
- MAIN IN 1V \pm 2dB
- Signal to Noise Ratio, IHF "A" Network:
- MAIN better than 110dB

- Signal to Noise Ratio, DIN Filter:
- MAIN IN better than 90dB
- Channel Balance: no more than 1dB
- Residual Hum and Noise, 8 ohms: . . . no more than 0.5mV
- Idling Current: 20 ~ 60mA
- Midpoint Voltage: 0 \pm 20mV
- Muting Delay Time: 3 ~ 7 seconds

GENERAL

- Power Requirement:
- W-TYPE AC 120V, 60Hz
 - E-TYPE AC 220 /240V, 50Hz
 - E'-TYPE AC 220 /240V, 50Hz
- Power Consumption: 310W (420 VA)
- Ambient Temperature during Operation: -10 ~ 30°C
- Dimensions:
- Width 482 mm (19 inches)
 - Height 138 mm (5-1/3 inches)
 - Depth 344 mm (13-1/2 inches)
- Weight, without package: 12 kg (26.5 lbs)

* Specifications are subject to change without notice.

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 ends 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
- 220V 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.)

BLOCK DIAGRAM

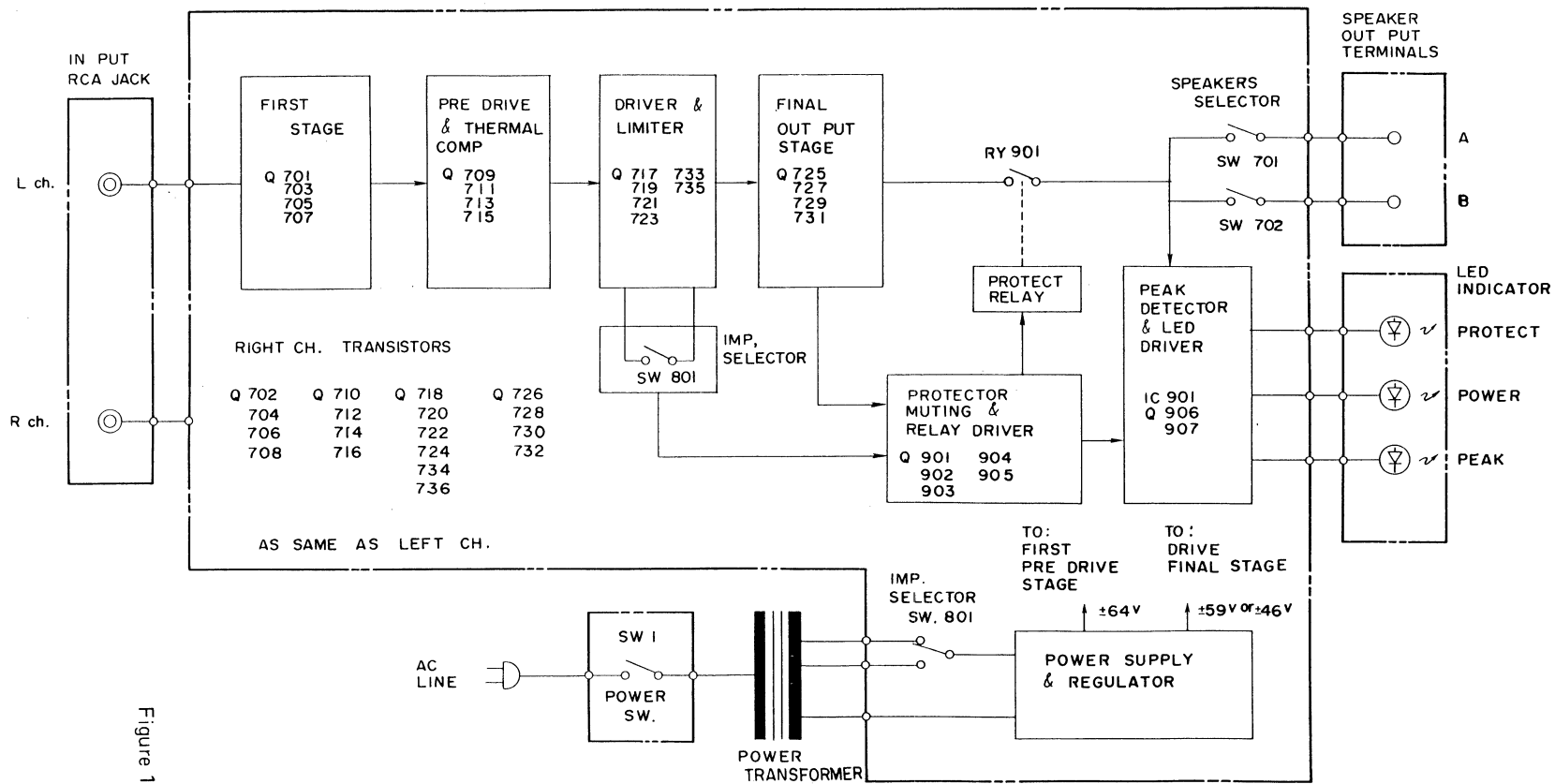


Figure 1

DISASSEMBLY

CABINET COVER REMOVAL

- Remove four tapping screws from the top of the unit.
- Remove four screws from both sides of the unit.
- Lift the cabinet cover away from the unit.

BOTTOM PLATE REMOVAL

- Remove nine tapping screws from the bottom of the unit as shown in Photo 1. (#1 – #12)
- Lift the bottom plate away from the unit.

FRONT PANEL REMOVAL

- Remove three tapping screws (#1 – #3) from the left side of the unit as shown in Photo 2.
- Similarly remove three tapping screws from the right side of the unit.
- Remove the front panel away from the unit by pulling it forward.

POWER TRANSFORMER REMOVAL

- Remove the cabinet cover and the bottom plate.
- Disconnect all the cables from the power transformer.
- Remove six nuts (#4–#9) as shown in photo 2.
 - Remove Power Trance Holder as shown in Figure 2, #1 Photo 3.
 - Remove four nuts (#1–#4).
- Lift the power transformer away from the unit.

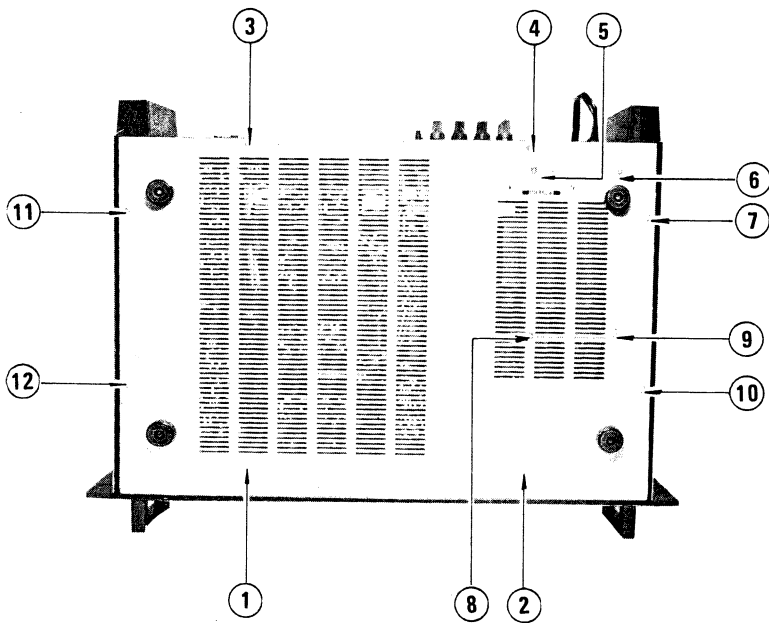


Photo 1

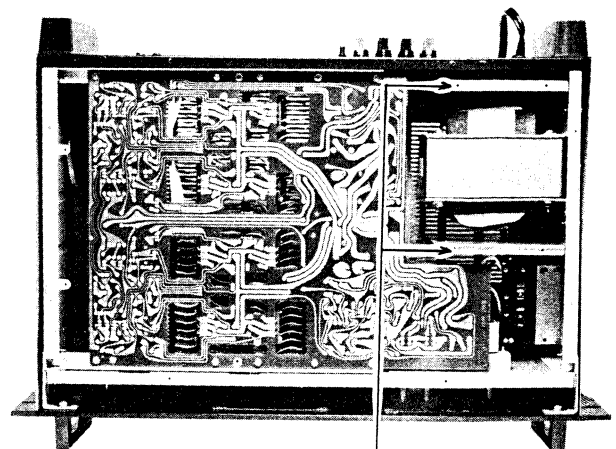


Photo 3

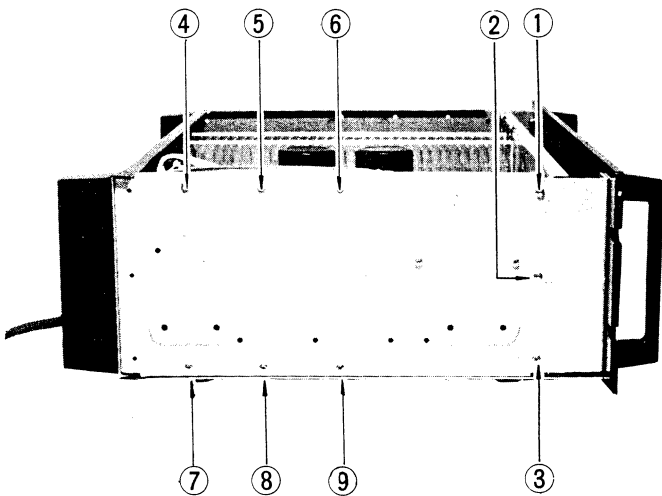


Photo 2

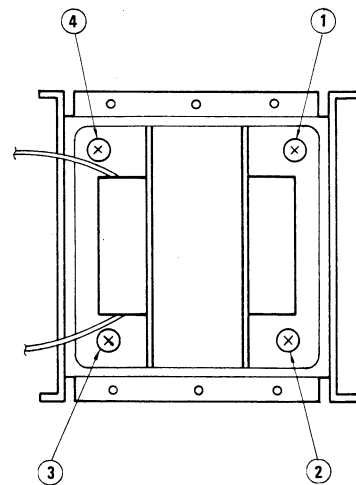


Figure 2

PARTS LOCATION

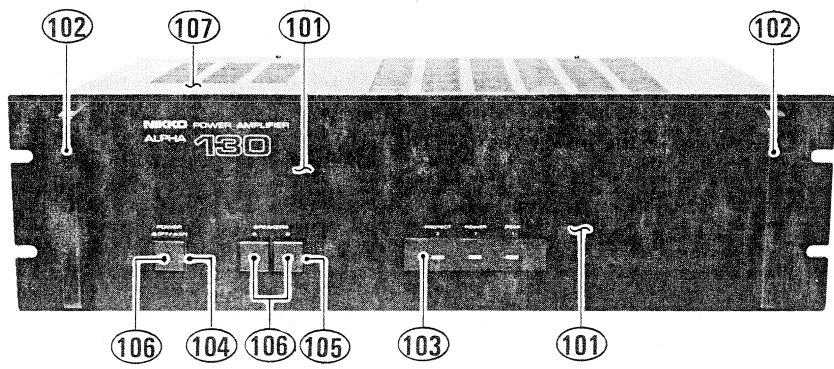


Photo 4

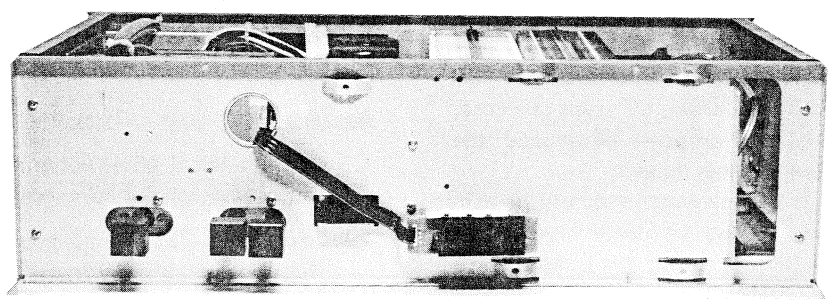


Photo 5

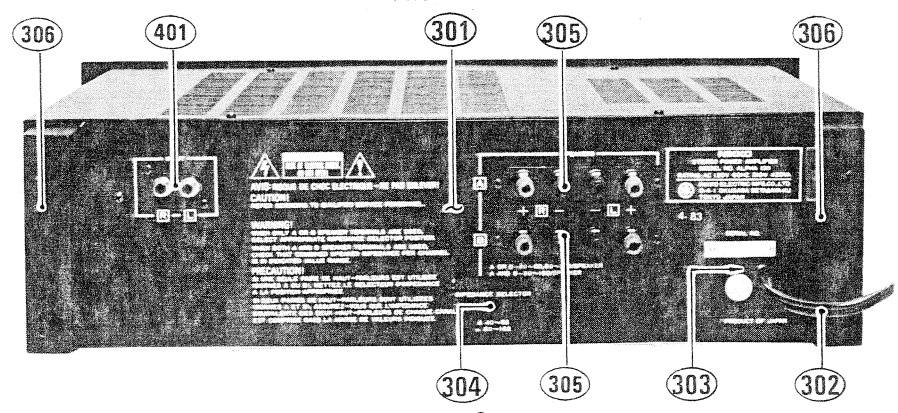


Photo 6

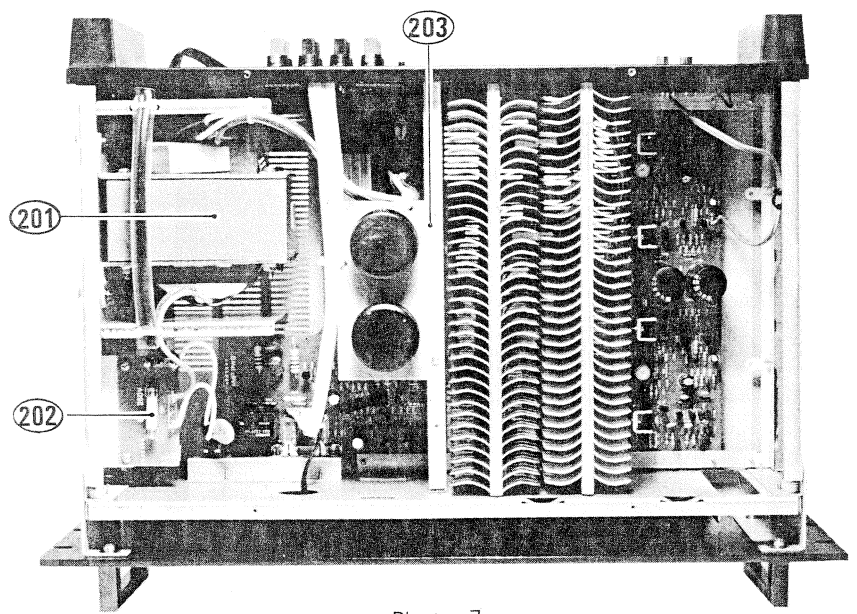


Photo 7

ALIGNMENT

ALIGNMENT PRECAUTIONS

1. As the ALPHA 130 is a power amplifier with large output power, it consumes much electrical power and a great amount of current flows in the power source line of the primary side. Therefore, in the case when it is connected to the source by an extension cord, the size of the extension cord should be equal or larger than that of the power source cord of the ALPHA 130. Otherwise, the voltage might be reduced or the extension cord might generate excessive heat because of the resistance which the cord has, then not only can proper alignment be done, but also it is very dangerous.
2. If the power sources are supplied to the ALPHA 130 and the instruments by branching off from one cord, the voltage is sometimes dropped down and the stability of the instruments goes down. The ALPHA 130 and the instruments should be connected to the power sources by using independent cords. The ALPHA 130 must take the power source from AC outlet of the wall side.
3. As there are many parts which hold high voltages in the circuit and the parts inside of the ALPHA 130, be careful not to receive an electric shock. In the case of connecting and taking off the instruments, you must turn off the power switch of the ALPHA 130 before getting on the work.
4. When the circuit happens to be shorted by the drivers or test probes used for alignment through mistake, the circuit and the parts will be damaged. As the damage is larger than that of ordinary amplifiers and receivers, close attention is needed. It is advised that the turning driver, excluding the top part, should be wrapped with insulation tape or a driver made of plastic or some kind of insulating material should be used.
5. As the dummy load resistor generates heat while alignment, it gets very hot and you may be burnt if you touch it with bare hands. It is better if you can put the dummy load resistor in a place away from being touched, but the wire between the dummy load resistor and the amplifier should not be long. Conceive some method, like putting the dummy load resistor in a well ventilated box. Further, as more than 5 A current might flow in the wire connecting the dummy load resistor and the amplifier, at least larger than AWG #18 thick wire should be used.

TEST EQUIPMENT

Allow a minimum of 10 minutes warm-up for test equipment.

Maintain rated line voltage.

Audio Frequency Generator
Distortion Meter
Oscilloscope
AC Voltmeter
DC Voltmeter
2-Dummy Load Resistors, 8 ohms, 250 W

All the semi fixed resistors of the MAIN AMP PCB are set around the center position temporarily. (HVR R733 and HVR R734.)

IDLING CURRENT ADJUSTMENT

1. Connect the 8 ohms dummy load resistors to the left and right channel speaker terminals.
2. Connect the DC voltmeter across the wiring terminal No. 22 and 23 (left channel) or No. 24 and 25 (right channel). (see Photo 8)
3. Turning on the power switch of the ALPHA 130. Adjust the semi fixed resistor HVR R733 (left channel) or HVR R734 (right channel) so that the DC voltmeter indicates $18.2 \text{ mV} \pm 6.6 \text{ mV}$.
4. Turn off the power switch of the ALPHA 130 and remove the DC voltmeter.

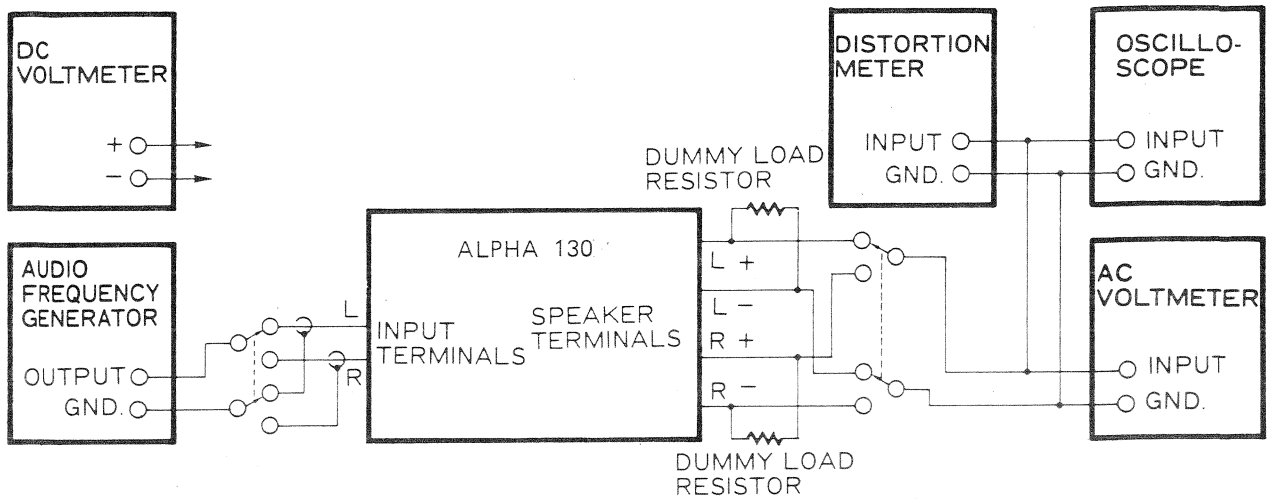


Figure 3 TEST EQUIPMENT HOOK-UP

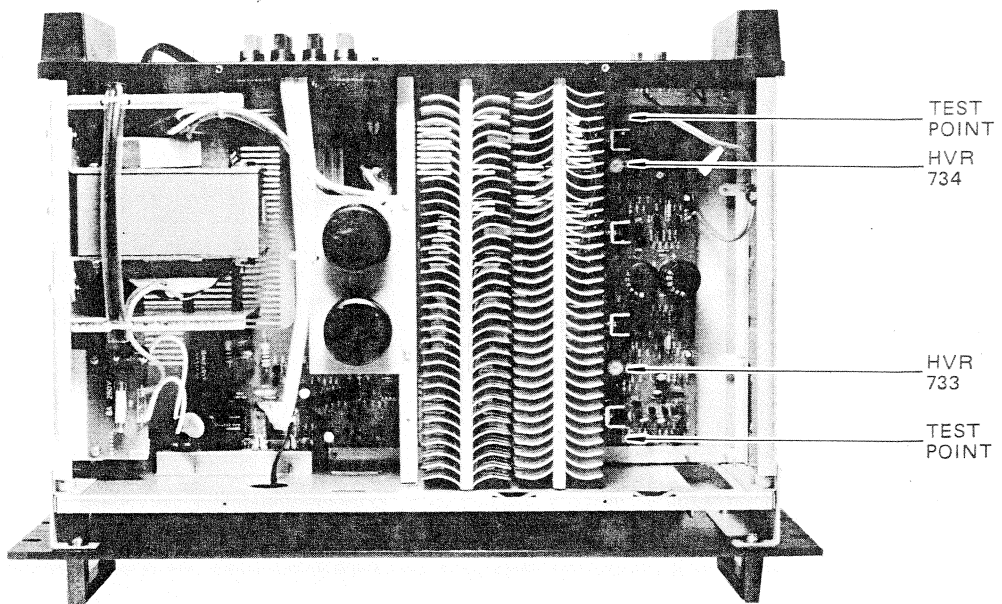


Photo 8 ADJUSTMENT POINTS

POWER TRANSISTORS MOUNTING ASSEMBLY

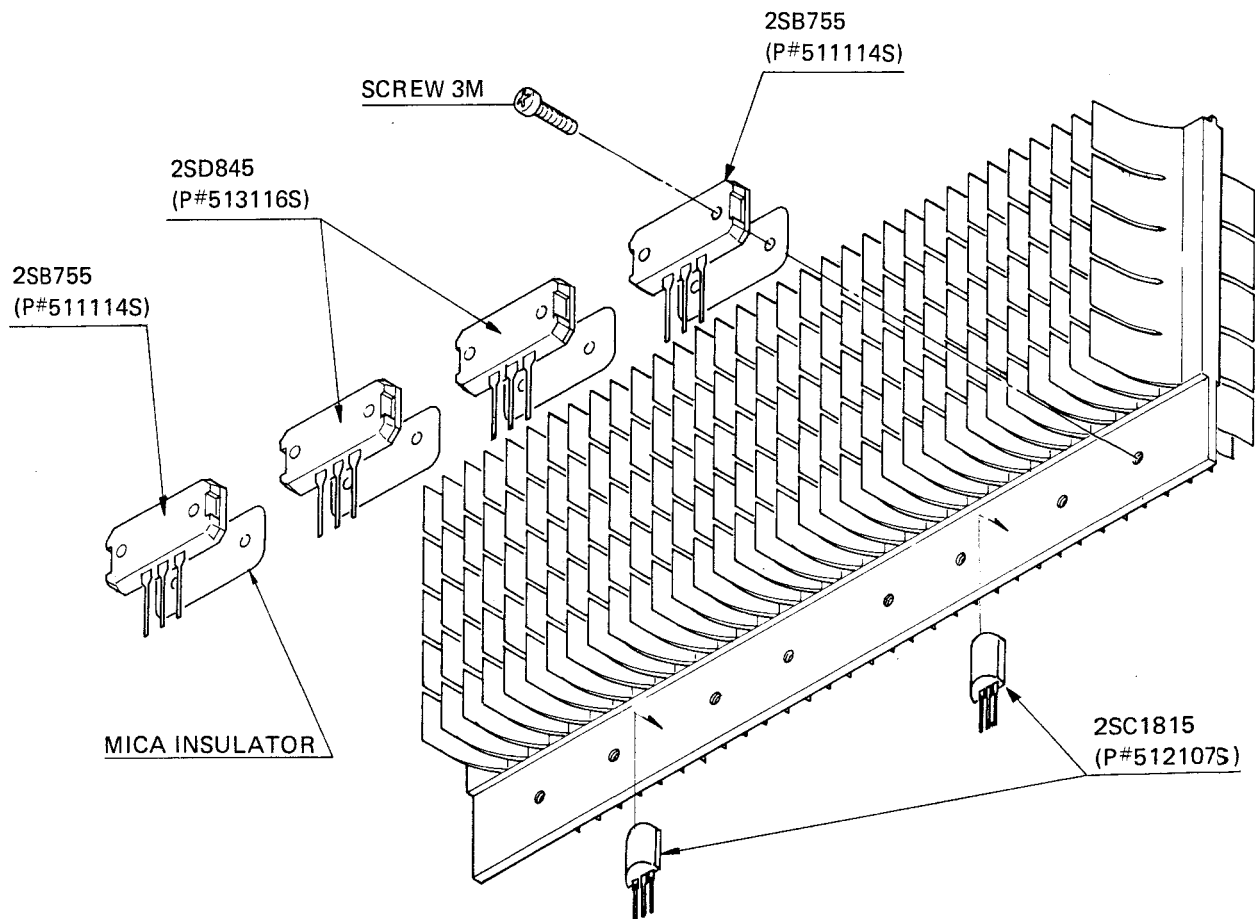


Figure 4

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.

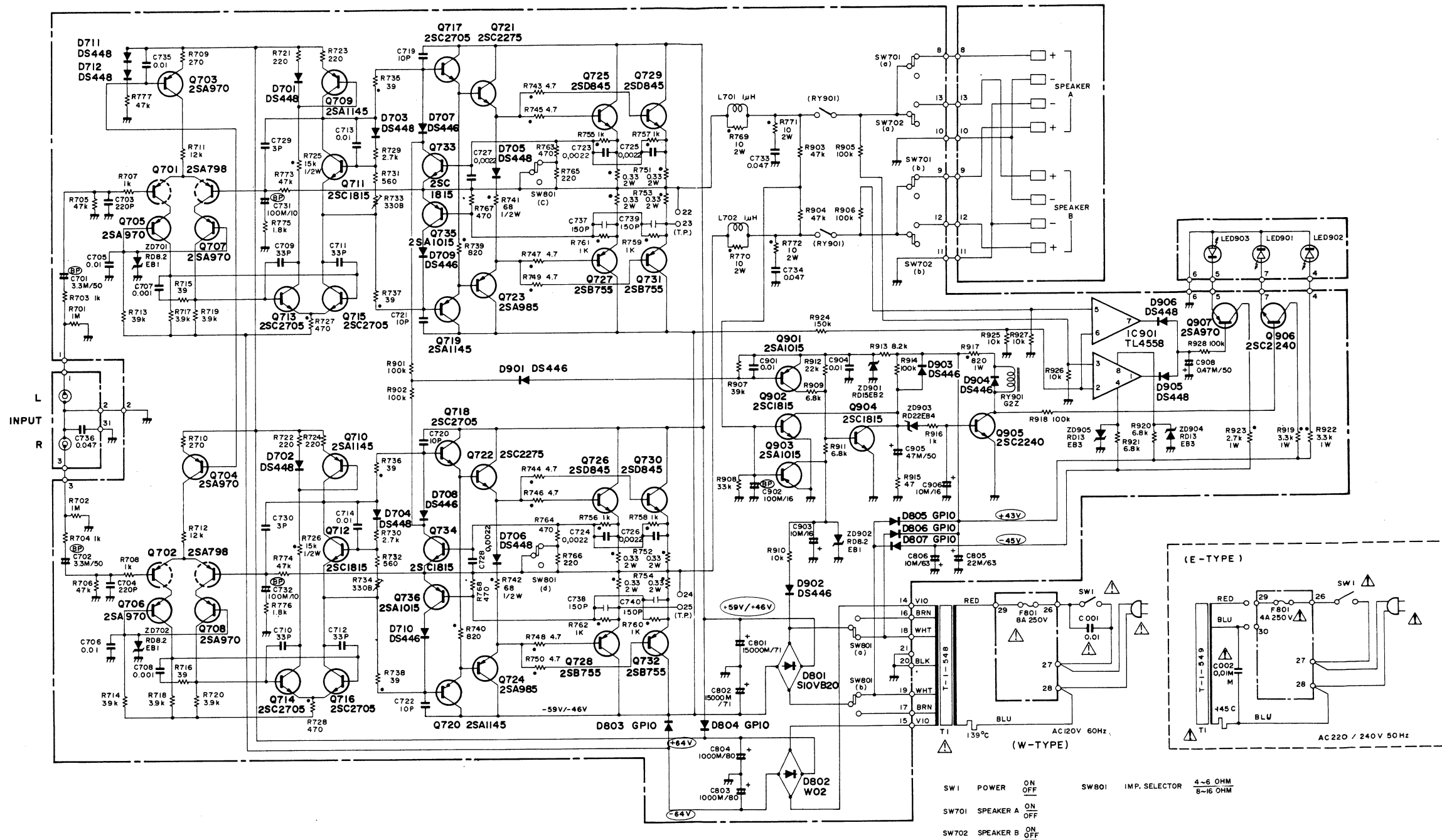
PRECAUTIONS FOR REPAIR SERVICE

Many of these items are included just as a reminder — 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 transistor, 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.

SCHEMATIC DIAGRAM

	2SA970 2SA1015 2SC1815 2SC2240
	2SA1145 2SC2705
	2SA798
	2SA985 2SC2275
	2SD845 2SB755
	DS448 ZD8.2EB1 ZD15EB2 ZD3EB3 ZD22EB4
	LN81RCPH
	DS10VB20
	TL4558PA



NOTES:

- SCHEMATIC ISSUBJECT TO CHANGE WITHOUT NOTICE.
- RESISTANCE VARUES 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 VOLT-METER."
V = VOLTAGES MEASURED WITH NO SIGNAL APPLIED.

SCHEMATIC SYMBOLS:

- POLYESTER FILM CAPACITOR
- BIPOLAR CAPACITOR
- NONFLAMMABLE RESISTOR

WARNING:

⚠ INDICATES SAFETY CRITICAL COMPONENTS. FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTUER'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 MANUFACTURE'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.


- SW1 POWER ON OFF
- SW701 SPEAKER A ON OFF
- SW702 SPEAKER B ON OFF
- SW801 IMP. SELECTOR 4-6 OHM 8-16 OHM











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 E'	DESCRIPTION ++	PART NO.
(PACKING MATERIALS & ACCESSORIES)				
001a		1 - 1	Carton box	9826880
001b		- 1 -	Carton box	9826890
002		1 1 1	Pad, styrol	9840970
003		1 1 1	Sack polythylene cloth	9640740
004		1 1 1	Sack polythylene cloth #13	9640320
005a		1 - -	Manual, instructions - English and French	960439E
005b		1 1	Manual, instructions - in five different languages	960439K
006		1 1 1	Cord, RCA phono pin plug 2T-75	961016A
(CABINET ASSEMBLY)				
*101a		1 - 1	Panel, front - Black	7886580
*101b		- 1 -	Panel, front - Silver	7886590
*102a		2 - 2	Handle - 100B - BLACK	7490190
*102b		- 2 -	Handle - 100S - SILVER	7490350
*103		1 1 1	Window, panel smoke	7803250
*104		1 1 1	Guide, button - 1P18	7402550
*105		1 1 1	Guide, button - 2P18	7402560
*106a		3 - 3	Button, push M18BK power/speakers	7852300
*106b		- 3 -	Button, push M18SL power/speakers	7853940
*107		1 1 1	Cover, top	7821110
108		1 1 1	Plate, bottom	7328860
109		4 4 4	Foot, polythylene - TG	7401350
(CHASSIS ASSEMBLY)				
 *202a	F801	1 - -	Fuse - 8A 250V	4700760
 *202b	F801	- 1 1	Fuse - 4A 250V	4721020
 *201a		1 - -	Transformer, power T-1-548 AC120V	1105480
 *201b		- 1 1	Transformer, power T-1-549 AC220V, 240V	1105490
*203		1 1 1	Supporter, capacitors	9003480
(BACK PLATE ASSEMBLY)				
*301a		1 - -	Plate, back - (W)	7328770
*301b		- 1 1	Plate, back - (E)	7328780
 *302a		1 - -	Cord, AC line - STP -2	606012A
 *302b		- 1 1	Cord, AC line - CEE -2T	600508A
 *303		1 1 1	Bush, power cord -SR-4N-4	7400690
*304		1 1 1	Button, push P5 (Impedance Selector)	7401550
*305		2 2 2	Terminal, speakers - screw type 4P	4450620
*306		2 2 2	Block, terminal guard	7401860
(AMP ASSEMBLY)				
		1 - -	Switch, push - SDL - 1P - power	4042520
		- 1 1	Switch, push - ESB90179S - power	4041600
		1 1 1	C-CAP 0.01μF	239103A
	Q725,726			
	Q729,730	4 4 4	TR 2SD845	513116S
	Q727,728			
	Q731,732	4 4 4	TR 2SB755	511114S

KEY NO.	SYMBOL NO.	TYPE + W E E'	DESCRIPTION ++	PART NO.
(AMP PC BOARD ASSEMBLY) (POINTER SECTION)				
*401		1 1 1	Terminal, RCA phono pin jack-2P	4442070
(AMP SECTION)				
	SW701,702	1 1 1	Switch, twin push - SUF24 - Speakerst	4041590
	Q701,702	2 2 2	TR 2SA798	514086S
	Q703			
	~ Q708	6 6 6	TR 2SA970	514086S
	Q735,736	2 2 2	TR 2SA1015	510102S
	Q709,710			
	Q719,720	4 4 4	TR 2SA1145	510137S
	Q723,724	2 2 2	TR 2SA985	510118S
	Q711,712			
	Q733,734	4 4 4	TR 2SC1815	512107S
	Q713			
	~ 718	6 6 6	TR 2SC2705	512152S
	Q721,722	2 2 2	TR 2SC2275	512152S
	D711,712			
	D701			
	~ D706	8 8 8	Diode DS448	501026S
	D707			
	~ D710	4 4 4	Diode DS446	501028S
	ZD701,702	2 2 2	Zener diode RD82EBI	502052S
	L701,702	2 2 2	Choke coil, 1uH	1210960
	R733,734	2 2 2	Semi variable volume SR 19R B330 ohm	4301450
	R751			
	~ 754	4 4 4	CEM-RES RG22 0.33 ohm 2W x 2	382339P
	R769			
	~ R772	4 4 4	FP-MO-RES 2W 10 ohm	362100L
	R741,742	2 2 2	FP-MO-RES 1/2W 68 ohm	329680L
	R725,726	2 2 2	FP-MO-RES 1/2W 15 Kohm	329153L
	R749,750			
	R743			
	~ R748	8 8 8	FP-RES 4.7Ω 1/4W	328478L
	R735			
	~ R738	4 4 4	FP-RES 39Ω 1/4W	328390L
	R727,728			
	R767,768	4 4 4	FP-RES 470Ω 1/4W	328471L
	R739,740	2 2 2	FP-RES 820Ω 1/4W	328821L
	R760,761			
	R762,765			
	R756,757			
	R758,759	8 8 8	FP-RES 1KΩ 1/4W	328102L
	R715,716	2 2 2	RES 39ohm 5% 1/4W	328390J
	R766,721			
	R722,723			
	R724,765	6 6 6	RES 220ohm 5% 1/4W	328221J
	R709,710	2 2 2	RES 270ohm 5% 1/4W	328271J

KEY NO.	SYMBOL NO.	TYPE W E E'	DESCRIPTION	PART NO.
	R763,764	2 2 2	RES 470ohm 5% 1/4W	328471J
	R731,732	2 2 2	RES 560ohm 5% 1/4W	328561J
	R703,704			
	R707,708	4 4 4	RES 1Kohm 5% 1/4W	328102J
	R775,776	2 2 2	RES 1.8Kohm 5% 1/4W	328182J
	R729,730	2 2 2	RES 2.7Kohm 5% 1/4W	328272J
	R717			
	~ R720	4 4 4	RES 3.9Kohm 5% 1/4W	328392J
	R711,712	2 2 2	RES 12Kohm 5% 1/4W	328123J
	R713,714	2 2 2	RES 39Kohm 5% 1/4W	328393J
	R705,706			
	R773,774			
	R707	5 5 5	RES 47Kohm 5% 1/4W	328473J
	R701,702	2 2 2	RES 1Mohm 5% 1/4W	328105J
	C731,732	2 2 2	BP-CAP 100uf 10V	215130N
	C701,702	2 2 2	BP-CAP 3.3uf 50V	215513N
	C729,730	2 2 2	C-CAP 3pF 500V	234309D
	C719			
	~ C722	4 4 4	C-CAP 10pF 500V	234100K
	C709			
	~ C712	4 4 4	C-CAP 33pF 500V	234330K
	C737			
	~ C740	4 4 4	C-CAP 150pF 50V	232151K
	C703,704	2 2 2	C-CAP 220pF 50V	232221K
	C723			
	~ C728	4 4 4	C-CAP 0.0022MF 50V	231222K
	C733,734	2 2 2	M-CAP 0.047MF 250V	274473K
	C707,708	2 2 2	M-CAP 0.001MF 50V	222102K
	C705,706			
	C713,714	5 5 5	M-CAP 0.01MF 50V	222103K
			HC (PROTECTOR SECTION)	
	RY901	1 1 1	RELAY G2Z-222P DC24V	1700300
	Q907	1 1 1	TR 2SA970	510103S
	Q901,903	2 2 2	TR 2SA1015	510102S
	Q902,904	2 2 2	TR 2SC1815	512107S
	Q905,906	2 2 2	TR 2SC2240	512102S
	IC901	1 1 1	IC TL4558P	518129S
	D905,906	2 2 2	D DS448	501026S
	D901			
	~ D904	4 4 4	D DS446	501028S
	ZD902	1 1 1	Zener diode RD8 2EB1	502052S
	ZD904,905	2 2 2	Zener diode RD13EB3	502063S
	ZD901	1 1 1	Zener diode RD15EB2	502050S
	ZD903	1 1 1	Zener diode RD22EB4	502059S

KEY NO.	SYMBOL NO.	TYPE W E E'	DESCRIPTION	PART NO.
	R917	1 1 1	FP-MO-RES 1W 820Kohm	361821L
	R919,922	2 2 2	FP-MO-RES 1W 3.3Kohm	361332L
	R923	1 1 1	FP-MO-RES 1W 2.7Kohm	361272L
	R915	1 1 1	RES 47ohm 5% 1/4W	328470J
	R916	1 1 1	RES 1Kohm 5% 1/4W	328102J
	R909,911			
	R920,921	4 4 4	RES 6.8Kohm 5% 1/4W	328682J
	R913	1 1 1	RES 8.2Kohm 5% 1/4W	328822J
	R910,925			
	R926,927	4 4 4	RES 10Kohm 5% 1/4W	328103J
	R912	1 1 1	RES 22Kohm 5% 1/4W	328223J
	R908	1 1 1	RES 33Kohm 5% 1/4W	328333J
	R907	1 1 1	RES 39Kohm 5% 1/4W	328393J
	R903,904	2 2 2	RES 47Kohm 5% 1/4W	328473J
	R928,905			
	R906,901			
	R902,914			
	R918	7 7 7	RES 100Kohm 5% 1/4W	328104J
	R924	1 1 1	RES 150Kohm 5% 1/4W	328154J
	C903,906	2 2 2	E-CAP 10uF 16V	211220S
	C908	1 1 1	E-CAP 0.47uF 50V	211505S
	C905	1 1 1	E-CAP 47uF 50V	211525S
	C902	1 1 1	BP-CAP 16R100	215230N
	C901,904	2 2 2	C-CAP 0.01MF 50V	231103K
			(LEAD SECTION)	
	LED901			
	~ LED903	3 3 3	LED LN81RCPH	5060750
	SW801	1 1 1	Switch push SDU-4P-Impedance selector	4042620
	D801	1 1 1	Diode S10VB20	560058S
	D802	1 1 1	Diode W02	560061S
	D803			
	~ D807	5 5 5	Diode GP10-4002	560066S
	C806	1 1 1	10u 63V	211020S
	C805	1 1 1	22u 63V	211022S
	C801,802	2 2 2	15000u 71V	2100120
	C803,804	2 2 2	1000u 80V	2100130

SEMICONDUCTOR DATA

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-Base Voltage VCB0 (V)	Emitter-Base Voltage VEBO (V)	Collector Current IC (mA)	Collector Dissipation PC (mW)	Junction Temperature TJ (°C)	Collector Cutoff Current ICBO (uA)	VCE (V)	hFF	VCE (V)	IC (mA)	VCE(sat) (V)	IC (mA)	IB (mA)	fT (MHz)	VCE VCB* (V)	IE IC* (mA)		Output Capacitance Cob (pF)	Others
2SA798 (F, G)	AF, Low noise diff. amp.	PNP Si-EP	-70	-5	-100	200/unit	125	-0.1 max.	-50	250 ~ 800	-6	-1	-0.6 max.	-10	-1	100	-6	-1*	3	Dual transistor	mitsubishi
2SA970 (GR, BL)	AF, Low noise	PNP Si-E	-120	-5	-100	300	125	-0.1 max.	-120	200 ~ 400	-6	-2	-0.3 max.	-10	-1	100	-6	-1*	4		TOSHIBA
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 max.	-10	-10*	7		TOSHIBA
2SA1145	AF	PNP Si-E	-150	-5	-50	800	150	-0.1	-150	80 ~ 240	-5	10	-1.0	-10	1	200	-5	-10	25	Complementary to 2SC2705	TOSHIBA
2SA985 (P, Q)	AF, Power amp.	PNP Si-E	-120	-5	-1.5A	25W (Tc=25°C)	150	-1 max.	-120	100 ~ 320	-5	-300	-2 max.	-1A	-100	180	-5	-200*	29	Complementary to 2SC2275	NEC
2SB755 (R, O)	AF, Power amp.	PNP Si-Td	-150	-5	-12A	120W (Tc=25°C)	-150	-50 max.	-150	50 ~ 160	-5	-1A	-2 max.	-5A	-500	20	-10	-1A*	450	Complementary to 2SD845	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 max.	10	1*	3 max.		TOSHIBA
2SC2705	AF	NPN Si-E	150	5	50	800	150	0.1 max.	150	80 ~ 240	5	10	1.0 max.	10	1	200	5	10	1.8	Complementary to 2SA1145	TOSHIBA
2SC2275 (P, Q)	AF, Power amp.	NPN Si-E	120	5	1.5A	25W (Tc=25°C)	150	1 max.	120	100 ~ 320	5	300	2 max.	1A	100	200	5	200*	19	Complementary to 2SA985	NEC
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
2SD845 (R, O)	AF, Power amp.	NPN Si-Td	150	5	12A	120W (Tc=25°C)	150	50 max.	150	55 ~ 160	5	1A	2 max.	5A	500	20	10	1A*	200	Complementary to 2SB755	TOSHIBA

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)						MANUFACTURER	
			Reverse Surge Voltage VR(surge) (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 VFmax (V)	Test Condition IF (mA)	Reverse Current IRmax (uA)	Test Condition VR (V)	Others		
DS448	Switching	Si-P		35	30		360	120	0.5	175	300				1	50	1	30		SANYO
DS446	Switching	Si-P		105	100		500	200	0.7	175	200				0.65	15	0.1	100		SANYO
LNB1R-CPH	Lamp (orange)	GaAsP			3		40	IF=30			90				2.8	20	10	3	IV=20 mcd (IF=20mA)	MATSUSHITA
S10VB-20	Rectifier	Si-DJ (Bridge)		200			10A	200		150					1.05		10			SHINDENGEN
W02	Rectifier	Si-DJ (Bridge)			200	200		1.5A	50	125					1.0	1.0A	10		Rth=50°C/W	GENERAL INSTRUMENT
GP-10	Rectifier	Si-DJ		100				1A	30	175					1.1	1A	5			GENERAL INSTRUMENT

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)											MANUFACTURER			
			Total Power Dissipation PD (mW)	Zener Current IZ (A)	Junction Temperature TJ (°C)	Zener Voltage Vz			Differential Resistance Rz		Temperature Coefficient Z		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)			
RDB.2-EB1	Regulator	Si-J	400		175	7.53		7.92	20		10	20			2	5				NEC
RD13-EB3	Regulator	Si-J	400		175	12.99		13.66	10		25	10			2	10				NEC
RD15-EB2	Regulator	Si-J	400		175	13.89		14.62	10		30	10			2	11				NEC
RD22-EB4	Regulator	Si-J	400		175	21.52		22.63	5		60	5			2	17				NEC

INTEGRATED CIRCUITS NJM4558D/TL4558P

■ APPLICATION: DUAL OPERATIONAL AMPLIFIER

■ MANUFACTURER: JRC (NJM4558D)/Texas Instruments (TL4558P)

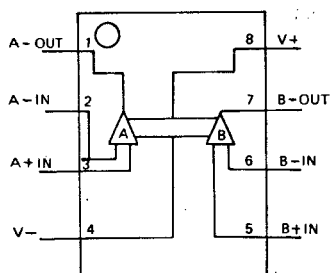
ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	NJM4558D	TL4558P	UNITS
Supply Voltage	Vs	±18	±18	V
Total Power Dissipation	PT	500	680	mW
Differential Input Voltage	VID	±30	±30	V
Input Voltage	VICM	±15	±15	V
Storage Temperature	Tsrg	-40 ~ +125	-65 ~ +150	°C
Operating Temperature	Topt	-20 ~ +75	-20 ~ +70	°C

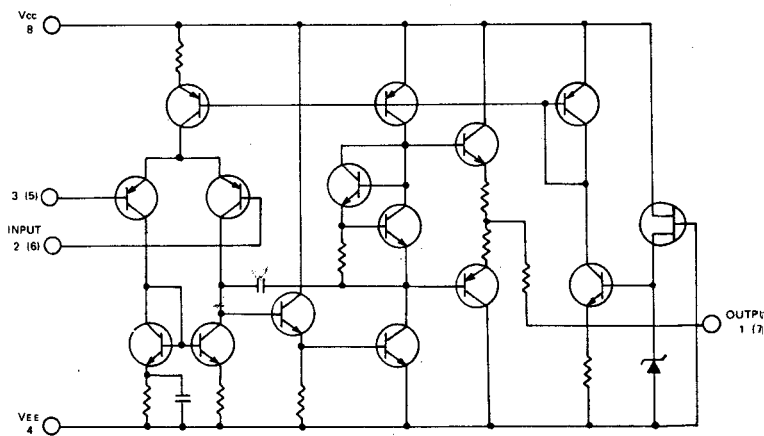
ELECTRICAL CHARACTERISTICS (Ta = 25°C, Vs = ±15V)

ITEM	SYMBOL	CONDITIONS	NJM4558D			TL4558P			UNITS
			MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
Input Offset Voltage	VIO	Rs ≤ 10kΩ			6.0		0.5	6.0	mV
Input Offset Current	IIO				200		5	200	nA
Input Bias Current	IB				500		40	500	nA
Large-Signal Voltage Gain	AV	RL ≥ 2kΩ, Vo = ±10V	86			86	110		dB
Output Voltage Swing	Vom	RL ≥ 10kΩ	±12			±12	±14		V
Common Mode Rejection Ratio	CMR	Rs ≤ 10kΩ	70			70	90		dB
Supply Voltage Rejection Ratio	SVR	Rs ≤ 10kΩ			150		30	150	μV/V
Power Consumption	Pd	both channel			170		75	170	mW

TERMINAL GUIDE (TOP VIEW)



EQUIVALENT CIRCUIT (1/2 CIRCUIT)



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