

# DENON

Hi-Fi Component Amplifier

## SERVICE MANUAL MODEL PMA-850/II SOLID STATE STEREO INTEGRATED AMPLIFIER



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# NIPPON COLUMBIA CO., LTD.

## SPECIFICATIONS

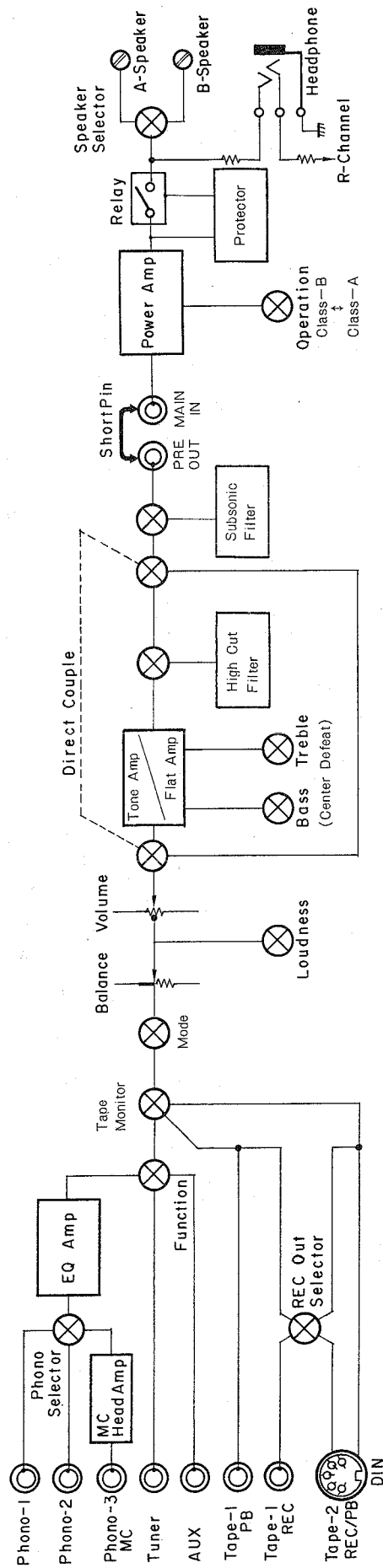
## MAIN AMPLIFIER SECTION

Type:	All stages pure complementary pushpull system DC circuit
Rated Output (both channels driven)	
20 Hz to 20 kHz:	
Class B operation:	100 W at each channel (T.H.D. 0.01% at 8 ohm)
Class A operation:	22 W at each channel (T.H.D. 0.005% at 8 ohm)
1 kHz:	100 W at each channel (T.H.D. 0.01% at 4 ohm)
Total Harmonic Distortion:	
Class B operation:	less than 0.01%
Class A operation:	less than 0.005%
Intermodulation Distortion	
60 Hz/7 kHz = 4/1:	less than 0.01% (at equivalent rated output) less than 0.01% (at 1 watt output)
Power Band Width:	
Class B operation:	5 Hz to 100 kHz (IHE. T.H.D. 0.05%)
Class A operation:	5 Hz to 100 kHz (IHE. T.H.D. 0.02%)
Transmission Characteristic:	DC to 100 kHz +0 dB, -1 dB (at 1 watt output)
Input Sensitivity:	1 volt r.m.s.
Input Impedance:	50 k ohm
Output Impedance:	less than 0.12 ohm
Signal to Noise Ratio:	122 dB
Output Terminals	
Speaker:	A & B, 4 to 16 ohm load A+B, 8 to 16 ohm load
Headphone:	for Stereo Headphone

## PRE AMPLIFIER SECTION

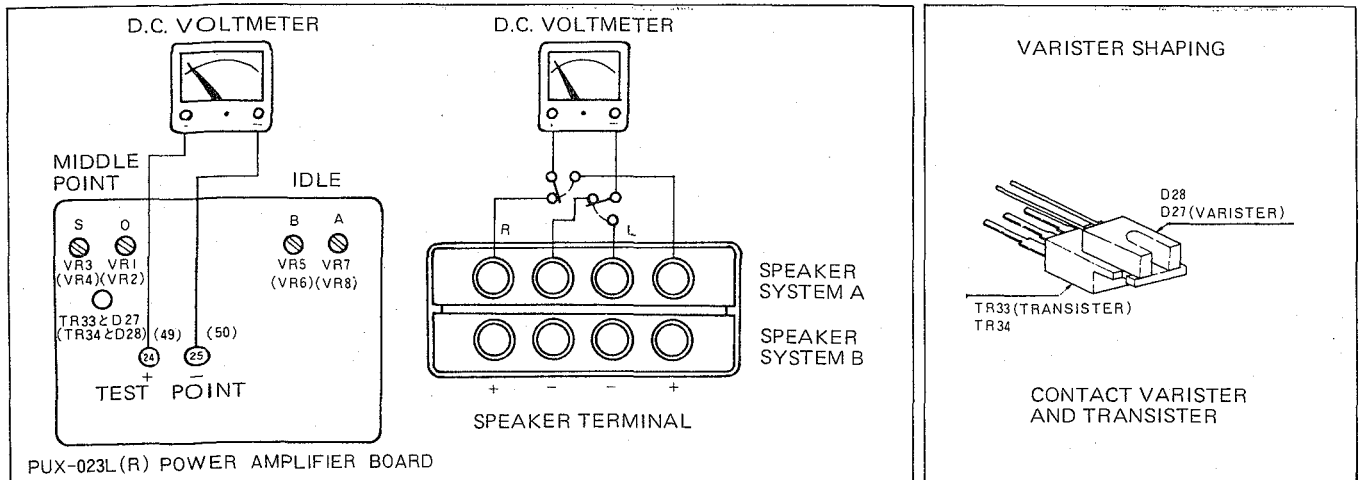
Pre Amplifier Output	
Max. Output:	25 V (at 50 k ohm)
Rated Output:	1 V
Total Harmonic	
Distortion:	0.0015% (at 10 V output) 0.005% (at 25 V output)
Equalizer Amplifier Output	
Max. Output:	25 V (T.H.D. 0.01% at 50 k ohm load)
Rated Output:	320 mV
Input Sensitivity/Input Impedance	
Phono-1, 2 (MM):	2.5 mV/50 k ohm
Phono-3 (MC):	0.42 mV (cartridge impedance 40 ohm)
Tuner:	320 mV/40 k ohm
Aux, Tape:	320 mV/40 k ohm
Maximum Allowable Input	
Phono MM:	200 mV 1 kHz
Phono MC:	300 mV (1 kHz, 40 ohm)
RIAA Deviation:	less than $\pm 0.2$ dB (20 Hz to 20 kHz)
Signal to Noise Ratio (IHF. A network)	
Phono MM:	Better than 90 dB (input terminal shorted)
Phono MC:	Better than 74 dB (input terminal 40 ohm)
Tuner, Tape, Aux:	Better than 105 dB (input terminal shorted)
Aux-Pre Out Frequency Response	
Tone Defeat:	5 Hz to 100 kHz +0 dB, -1 dB
Tone Control Section Variable Range	
Bass:	100 Hz $\pm 8$ dB
Treble:	10 kHz $\pm 8$ dB
Filter Characteristic	
Subsonic:	20 Hz, 12 dB/oct
High Cut:	9 kHz, 6 dB/oct
Loudness Control Characteristic	
Low range:	100 Hz +7 dB
High range:	10 kHz +6 dB
Power Source:	AC 220 V, 50 Hz
Power Consumption:	590 W (at max. output power)
Dimensions:	434 mm (W) x 164 mm (H) x 400 mm (D) 17-5/64" (W) x 6-29/64" (H) x 15-3/4" (D)
Weight:	17.5 kg

BLOCK DIAGRAM



## METHOD OF ADJUSTMENTS

Schematic diagram of alignment points and meter connections.



1. Put the controls into the following positions:

POWER:	OFF	DIRECT COUPLE:	ON
SPEAKERS:	A SPEAKER SYSTEM	SUBSONIC FILTER:	OFF
VOLUME:	$-\infty$ dB (⤵)	OPERATION:	CLASS-B

- Shape the varisters D27 and 28 on PUX-023 (power amplifier board) into D29 and 30 as shown in the above diagram and insert them into power radiator holes.
- Connect a DC voltmeter between the A speaker terminals and another between the power amplifier board test points. (see the above diagram)
- Put the power switch on and do the following preliminary adjustments immediately.
  - Adjust the speaker terminal voltage to  $0 \pm 10$  mV at VR3 (L-channel) and VR4 (R-channel) on PUX-023 (power amplifier board).
  - Put SUBSONIC FILTER on, and adjust the speaker terminal voltage to  $0 \pm 10$  mV at VR1 (L-channel) and VR2 (R-channel). Switch SUBSONIC FILTER off after adjustment.
  - Adjust the voltage between the test points (24) (+) and (25) (-) ((49) (50)) to  $7 \pm 1$  mV at VR5 (L-channel) and VR6 (R-channel).
- Make the following adjustments quickly three minutes after switching POWER on.
  - Do the adjustments in 4-(1) and 4-(2) above again.
  - Adjust the inter-test point voltage to  $9 \pm 0.5$  mV at VR5 and VR6.
- Switch OPERATION control to CLASS-A, and adjust preliminarily the inter-test point voltage to  $270 \pm 10$  mV at VR7 and VR8. After three minutes of aging following the turning of OPERATION switch to CLASS-A, adjust the inter-test point voltage to  $280 \pm 5$  mV.

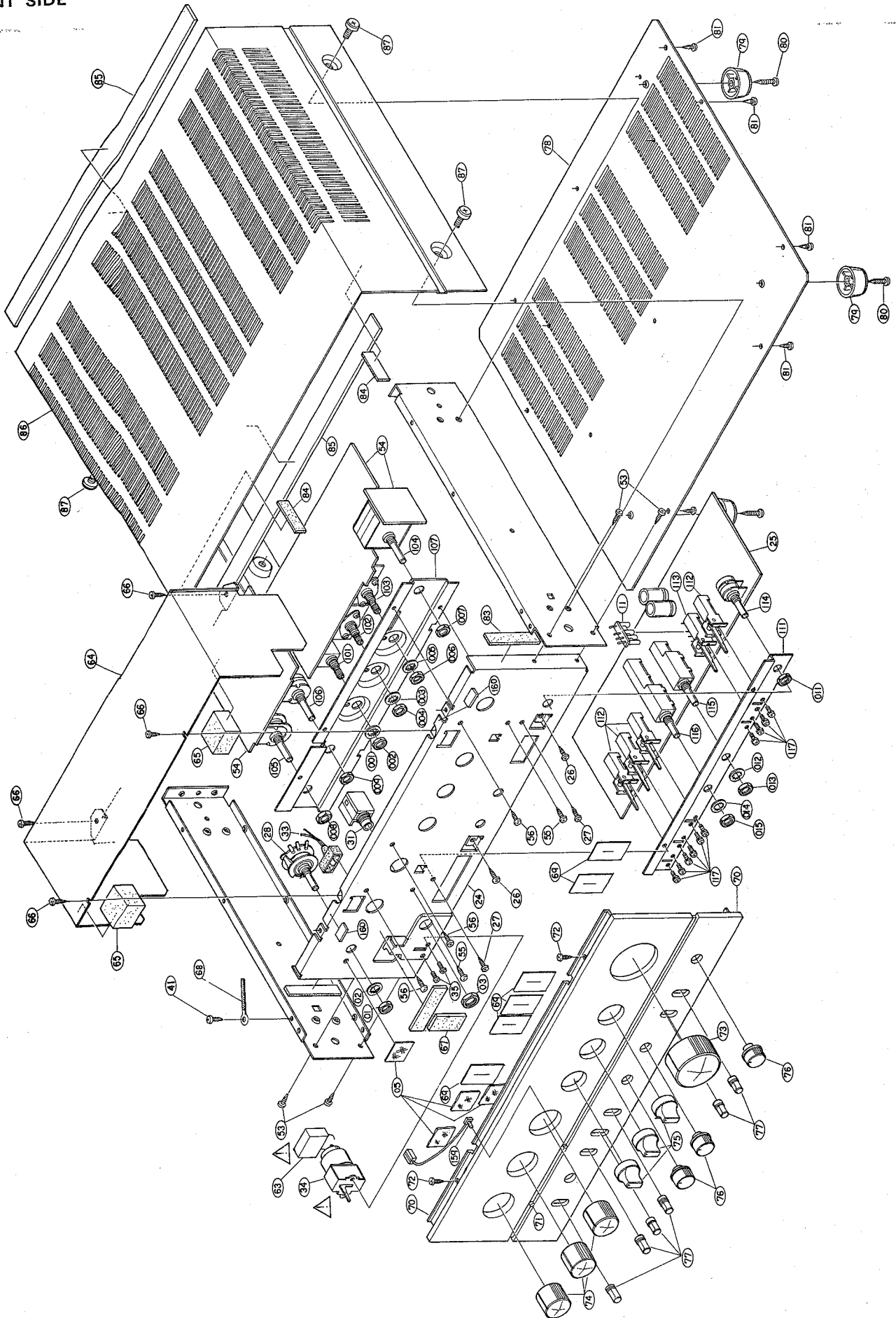
**NOTE:** Adjustments should be made while the unit is on in its normal position, and at a place not too airy.

## REPAIR SERVICE INSTRUCTIONS

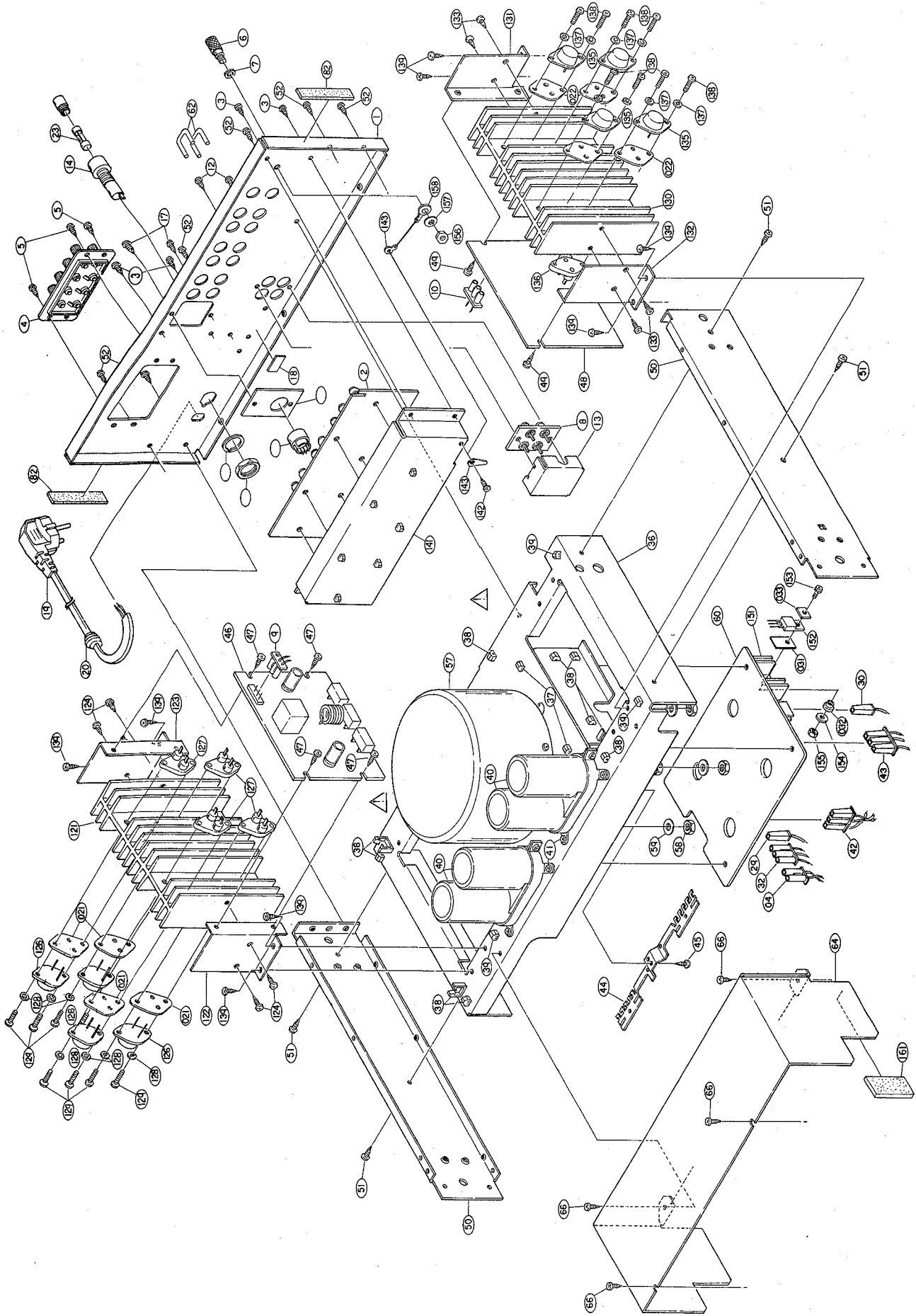
- In repairing the power source section and power amplifier section, first discharge the four C102-105 of  $10,000\mu\text{F}/63\text{V}$  on the (68) main chassis through a resistance of  $220\Omega - 1\text{K}\Omega$  (2W or more).
- The controls on the upper area of the front chassis (speaker-selector switch, treble volume, bass volume, tape monitor switch, input switch, phono input switch, volume controller) can be taken off without removing the front panel, by removing the knobs and the nuts.
- In replacing a power transistor, insert a new one while fixing by hand the transistor socket because the socket is not fixed to the power radiator. By turning the pan-head screws (129) and (138), the power transistor and the transistor socket will be fixed in a manner they hold the power radiator in between.
- In repairing the power amplifier section, make sure varisters D29 and D30 are inserted into the holes of the power radiator.
- In removing the R-channel (48) power amplifier board from the main chassis, also remove part of the back panel from the main chassis.

# EXPLODED VIEW OF CHASSIS AND CABINET

FRONT SIDE



BACK SIDE

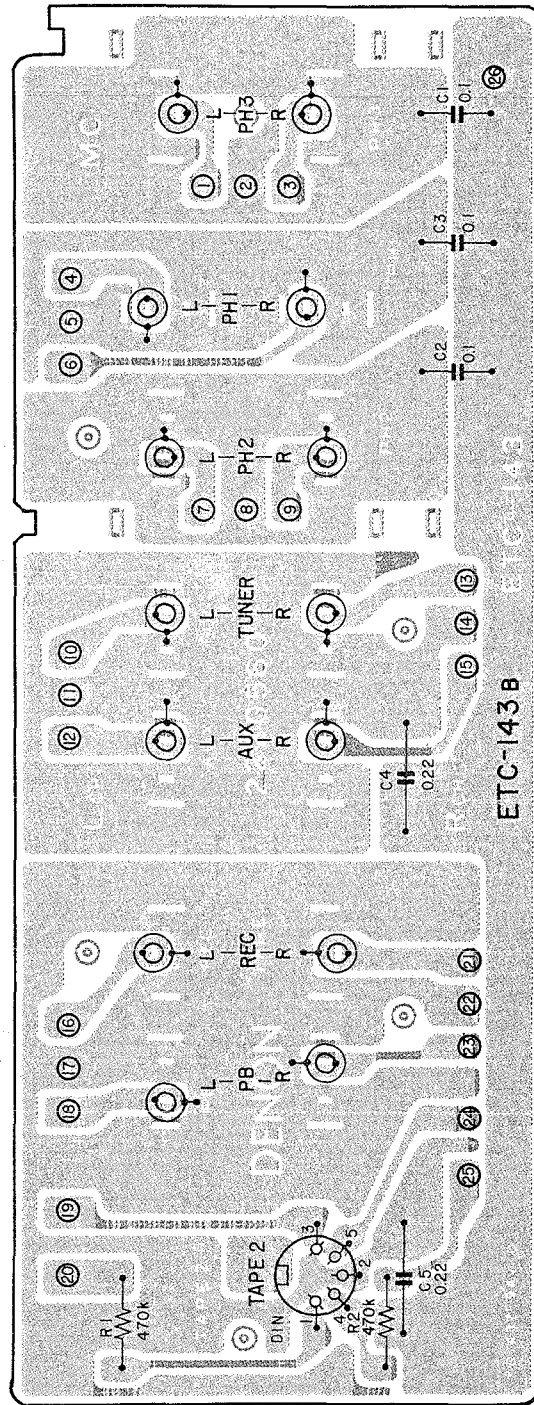
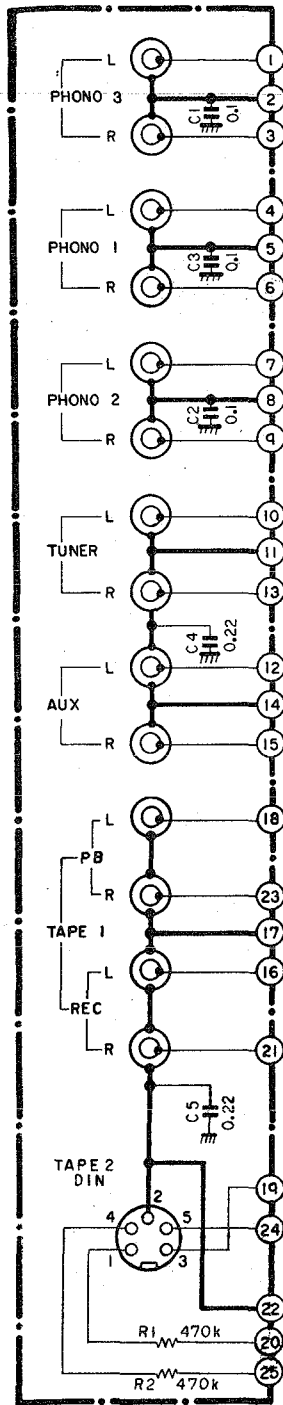


## PARTS LIST

Ref. No.	Part No.	Part Name & Descriptions	Ref. No.	Part No.	Part Name & Descriptions
1	1050295000	BACK PANEL	82	4610061118	RUBBER SHEET
2	ETC-143B	INPUT TERMINAL UNIT	83	4610061121	RUBBER SHEET
3	4770064107	FIXING SCREW	84	4610066139	RUBBER SHEET
4	2050070004	8P. TERMINAL	85	1220007057	SPACER
5	4770064107	FIXING SCREW	86	1020063437	TOP COVER
6	2050043109	GND TERMINAL	87	SC-1162	SPECIAL SCREW
7	4770083002	4.1 mm WASHER	101	2120114007	ROTARY SWITCH
8	2036043000	4P. CONNECTOR BASE	001		7 mm TOOTH WASHER
9	2034106020	3P. CONNECTOR CORD	002		7 mm NUT SPARE
10	2034106017	3P. CONNECTOR CORD	102	2120115006	FUNCTION SWITCH
11	2036071001	4P. CONNECTOR CORD	003		9 mm TOOTH WASHER
12	4770064107	FIXING SCREW	004		9 mm NUT SPARE
13	4140057207	BOARD BRACKET	103	2120116005	ROTARY SWITCH
14	2020012005	FUSE HOLDER	005		9 mm TOOTH WASHER
15	—	—	006		9 mm NUT SPARE
16	—	—	104	2110160100	V3520V30RA503-50 k ohm
17	4770064107	FIXING SCREW	007		8 mm NUT SPARE
18	—	—	105	2110161002	V2420V30RE104-100 k ohm
19	2062016001	AC CORD	008		8 mm NUT SPARE
20	4450020005	CORD BUSH	106	2110162001	V2420V30RE104-100 k ohm
21	—	—	009		8 mm NUT SPARE
22	—	—	107	4110145107	CONTROL BRACKET (A)
23	2061015087	FUSE (4A) TIME LAG	111	4110146107	CONTROL BRACKET (B)
24	4110144409	FRONT CHASSIS	112	2124110007	LEVER SWITCH
25	ETC-324	CONTROL (B) UNIT	113	2124110010	LEVER SWITCH
26	4770064107	FIXING SCREW	114	2110163107	V1620V25RW104K-100 k ohm
27	4730353036	TAPPING SCREW (2) 3 x 6	011		7 mm NUT SPARE
28	2120119002	SPEAKER SWITCH	115	2120117004	ROTARY SWITCH
01	—	9 mm NUT SPARE	012		7 mm TOOTH WASHER
02	—	9 mm TOOTH WASHER	013		7 mm NUT SPARE
29	2030014035	1P. CONNECTOR (P) ASS.	116	2120118003	ROTARY SWITCH
30	2030014048	1P. CONNECTOR (P) ASS.	014		7 mm TOOTH WASHER
31	2048011101	HEAD PHONE JACK	015		7 mm NUT SPARE
03	—	11 mm NUT SPARE	117	4700009006	CROSS PAN SWITCH WITH S. WASHER 3 x 6
32	2034105005	3P. CONNECTOR CORD	121	4170099109	POWER RADIATOR
33	3930037001	PILOT LAMP 14V 75 mA	122	4120372106	RADIATOR BRACKET (A)
04	—	2P. MINI CONNECTOR	123	4120373105	RADIATOR BRACKET (B)
34	2124122008	POWER SWITCH	124	4770064107	FIXING SCREW
35	4711304033	CROSS PAN SCREW 3 x 8	125	2710096001	TRANSISTOR 2SA1007A (Q)
36	4110194103	MAIN CHASSIS ASS.	126	2730189008	TRANSISTOR 2SC2337A (Q)
05	—	ADHESION TAPE	021		INSULATION SHEET
37	MD-5271	P.C.B. SUPPORT	127	2070002007	TRANSISTOR SOCKET
38	MD-4368	WIRE CLIP	128	4753001051	3 mm TOOTH WASHER
39	MD-4232	WIRE CLIP (D)	129	4711809033	CROSS PAN SCREW 3 x 18
40	2546028007	10000µF 63V CAPACITOR	130	4170099109	POWER RADIATOR
41	4730354035	TAPPING SCREW 3 x 8	131	4120372106	RADIATOR BRACKET (A)
42	2034093010	3P. CONNECTOR CORD	132	4120373105	RADIATOR BRACKET (B)
43	2034093049	3P. CONNECTOR CORD	133	4770064107	FIXING SCREW
44	2050095102	EARTH PLATE	134	2710096001	TRANSISTOR 2SA1007A (Q)
45	4770064107	FIXING SCREW	135	2730189008	TRANSISTOR 2SC2337A (Q)
46	PUX-023	POWER AMP UNIT (L)	022		INSULATION SHEET
47	4770064107	FIXING SCREW	136	2070002007	TRANSISTOR SOCKET
48	PUX-023	POWER AMP UNIT (R)	137	4753001051	3 mm TOOTH WASHER
49	4770064107	FIXING SCREW	138	4711809033	CROSS PAN SCREW 3 x 18
50	4110148502	SIDE CHASSIS	139	4730354035	TAPPING SCREW (2) 3 x 8
51	4730353036	TAPPING SCREW (2) 3 x 6	140	—	—
52	4770064107	FIXING SCREW	141	4140113002	IN PUT BRACKET
53	4770064107	FIXING SCREW	142	4730353036	TAPPING SCREW (2) 3 x 6
54	ETC-259D	CONTROL (A) UNIT	143	2050003000	3T LUG
55	4770064107	FIXING SCREW	151	4170078201	RADIATOR
56	4730353036	TAPPING SCREW (2) 3 x 6	153	4700012006	CROSS PAN SCREW WITH S. WASHER 3 x 12
57	2335191006	POWER TRANS	154	4751003006	3 mm WASHER
58	4756012005	6 mm NUT	155	4756006008	3 mm NUT
59	4752006002	6 mm SPRING WASHER	031		INSULATION SHEET SK16B
60	ETC-323	P.S & PROT. UNIT	032		INSULATION SHEET YD2D
61	—	—	033		WASHER Y2031S
62	2050037005	SHORT PIN	156	4410316005	DIN PLATE
63	2518001007	0.01µF CAPACITOR	157	2040046006	5P. DIN SOCKET
64	4140114205	SHIELD COVER	158	2050089008	7P. WIRING TERMINAL
65	4610074176	BLIND	159	4150088004	INSULATING SHEET
66	4770064107	FIXING SCREW	160	4753100004	4 mm TOOTH WASHER
67	4610074176	BLIND	161	4770006000	4 mm NUT
68	1220050004	BLIND SHEET			
69	1190005040	BLIND SHEET			
70	1440433207	FRONT PANEL			
71	1430041007	PILOT LENS			
72	4730354035	TAPPING SCREW (2) 3 x 8			
73	1120160007	KNOB ASS.			
74	1120161006	KNOB ASS.			
75	1120224008	KNOB ASS.			
76	1120225007	KNOB ASS.			
77	1120166108	LEVER KNOB			
78	1050188405	BOTTOM COVER			
79	1040040003	FOOT			
80	4730456014	TAPPING SCREW (2) 4 x 12			
81	4770064107	FIXING SCREW			

**PRINTED CIRCUIT BOARD PATTERNS AND PARTS LIST**  
**INPUT TERMINAL UNIT ETC-143(B)**

**ETC-143B**

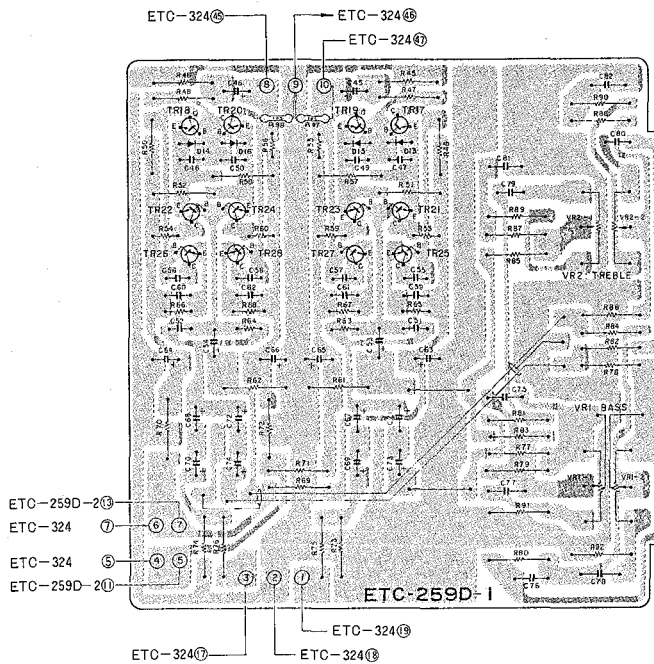
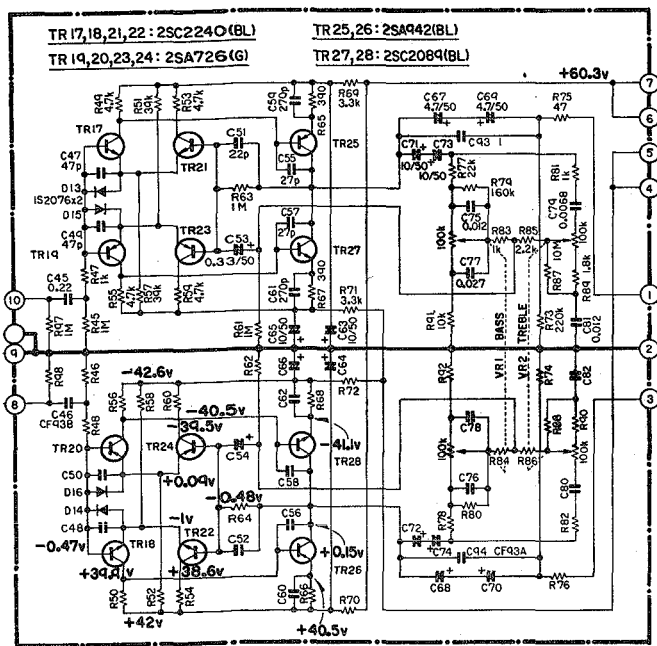


**ETC-143B PARTS LIST**

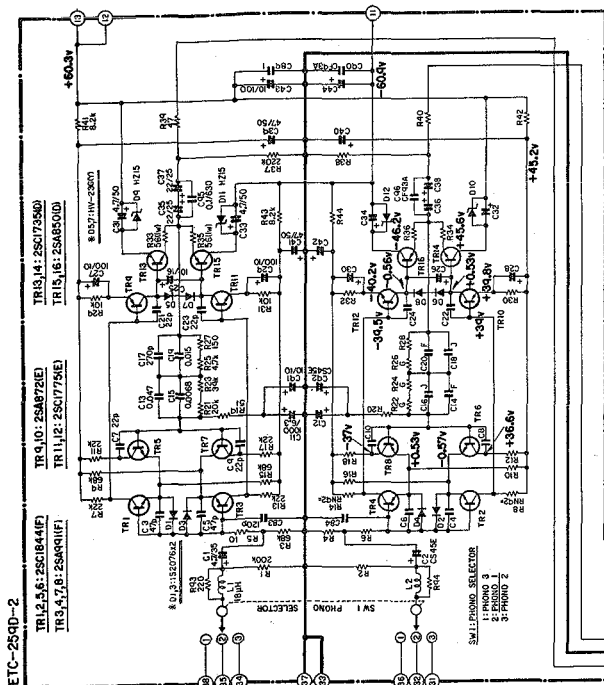
Ref. No.	Part No.	Part Name & Descriptions		
<b>PARTS</b>				
	2220360007	P.C. BOARD		
	2048007018	1P. PIN JACK		
	2048007005	1P. JACK	USED 2	FOR REC 1, 2
	2048009003	1P. JACK	USED 10	FOR TUNER, AUX, PHONE 1, 2
	2040046006	5P. DIN SOCKET		
	2034104006	3P. CONN.		
	2038059005	5P. CONN.		FOR PHONO 1, 2
	2040055000	6P. CONN.		FOR TUNER, AUX



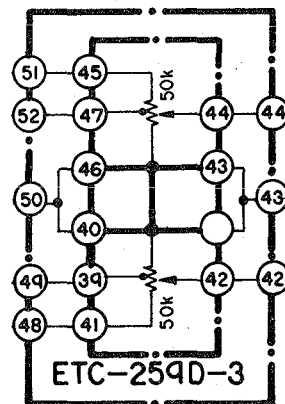
CONTROL (A) UNIT ETC-259D-1, -2, -3

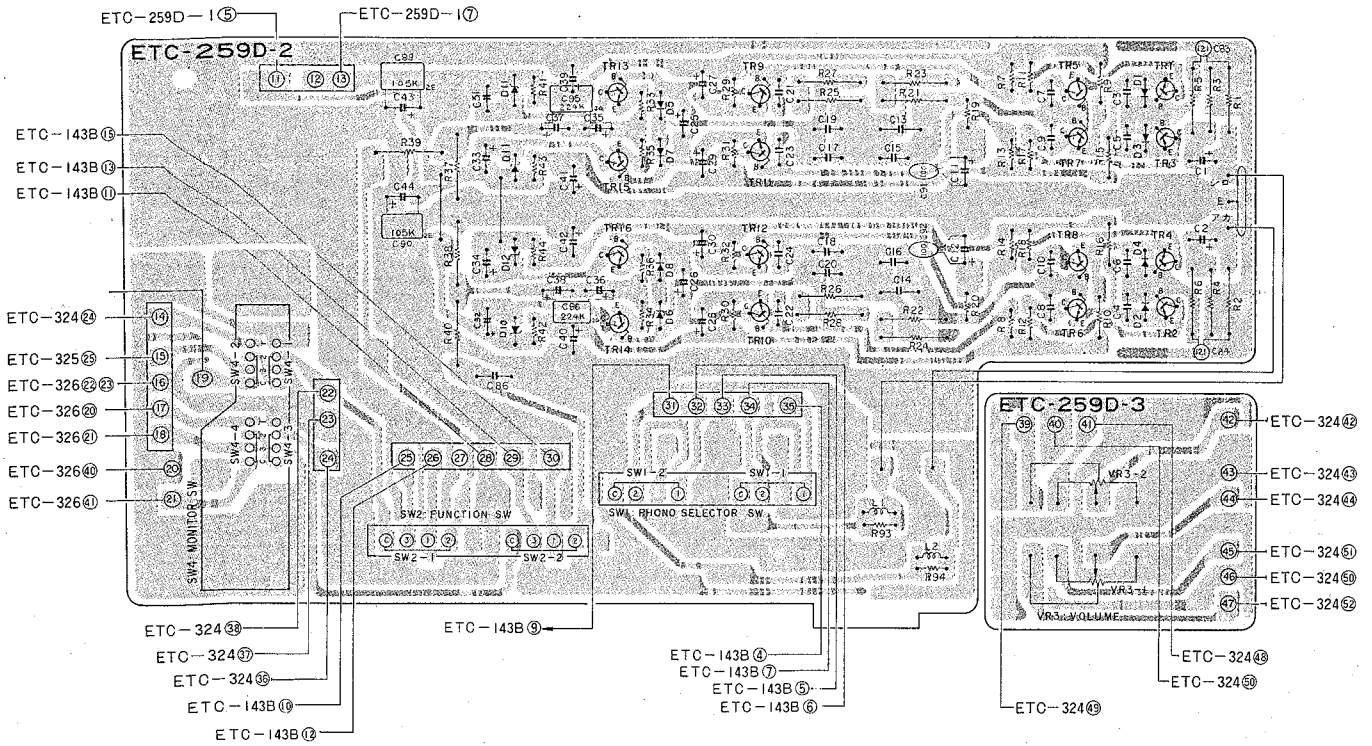


EQUALIZER AMP UNIT ETC-259D-2



VOLUME UNIT ETC-259D-3





**ETC-259D PARTS LIST**

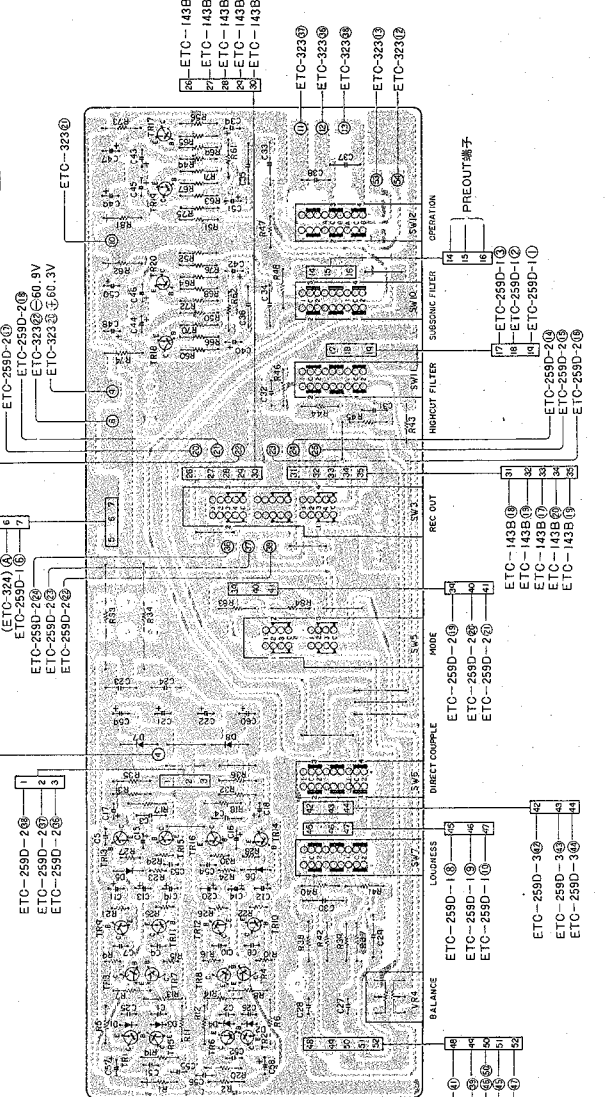
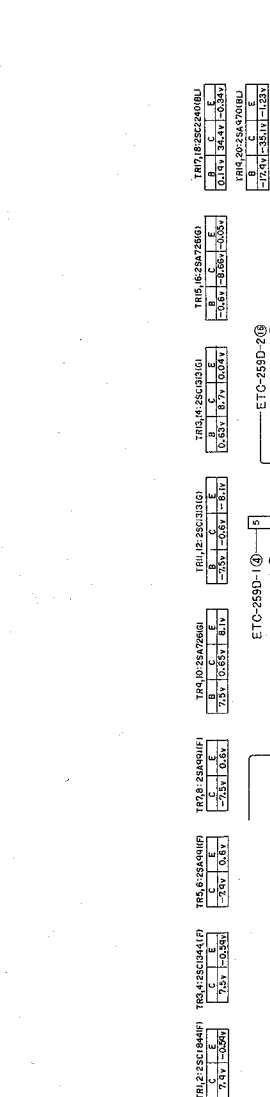
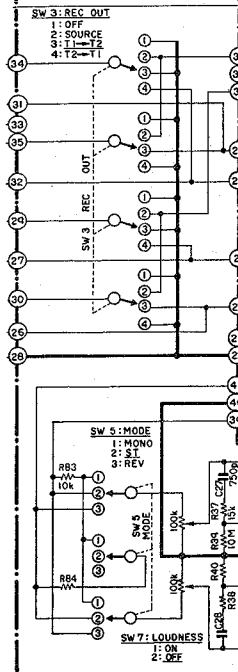
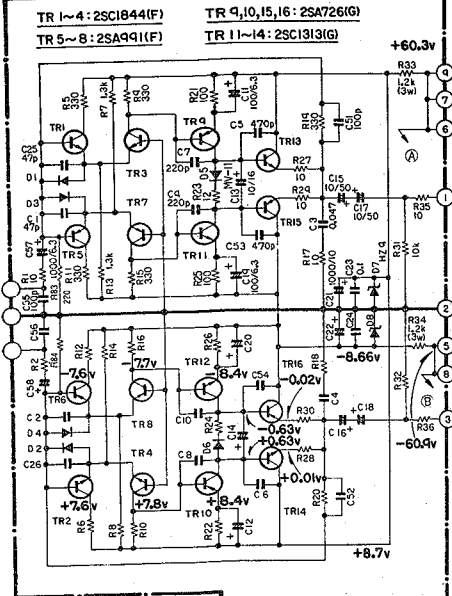
Ref. No.	Part No.	Part Name & Descriptions			
<b>SEMICONDUCTORS</b>					
TR19,20,23,24	2710087010	2SA726 (G)			TRANSISTOR
TR15,16	2710072009	2SA850 (D)			TRANSISTOR
TR9,10	2710070001	2SA872 (E)			TRANSISTOR
TR25,26	2710092005	2SA942 (BL)			TRANSISTOR
TR3,4,7,8	2710095002	2SA991 (F)			TRANSISTOR
TR17,18,21,22	2730187013	2SC2240 (BL)			TRANSISTOR
TR13,14	2730163011	2SC1735 (D)			TRANSISTOR
TR11,12	2730158026	2SC1775 (E)			TRANSISTOR
TR1,2,5,6	2730188009	2SC1844 (F)			TRANSISTOR
TR27,28	2730184003	2SC2089 (BL)			TRANSISTOR
D1,2,3,4,13,14,15,16	2760049008	1S2076			DIODE
D9,10,11,12	2760219003	HZ15			DIODE
D5,6,7,8	2760171028	HV23G(Y)			DIODE
<b>RESISTORS</b>					
R5,6	2410266005	10 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R39,40,75,76	2410282005	47 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R27,28	2410294006	150 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R47,48,81,82,83,84	2410314009	1 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R89,90	2410320006	1.8 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R85,86	2410322004	2.2 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R69,70,71,72	2410326000	3.3 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R49,50	2410330009	4.7 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R91,92	2410338001	10 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R77,78	2410346006	22 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R51,52,57,58	2410352003	29 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R3,4	2410358007	68 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R79,80	2410367001	160 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R1,2	2410369009	200 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R37,38,73,74	2410370001	220 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R45,46,61,62,97,98	2410765001	1 M ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R19,20	2412026052	51 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R93,94	2412002005	220 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R65,66,67,68	2412002034	390 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE

(Con.)

Ref. No.	Part No.	Part Name & Descriptions			
R53,54,55,56, 59,60	2412020058	4.7 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R41,42,43,44	2412020087	8.2 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R29,30,31,32	2412020090	10 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R11,12,17,18	2412022043	22 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R9,10,15,16	2412003004	68 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R63,64	2410773006	1 M ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R25,26	2412032046	4.7 k ohm	±2%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R21,22	2412012053	20 k ohm	±2%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R23,24	2412032059	39 k ohm	±2%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R87,88	2420203003	10 M ohm	±10%	1/4W	FIXED CARBON COMPOSIT RESISTOR
R7,8,13,14	2452011085	22 k ohm	±1%	1/4W	FIXED CARBON COMPOSIT RESISTOR
R33,34,35,36	2440026008	56 ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR
<b>CAPACITORS</b>					
C7,8,9,10,21,22, 23,24,51,52	2533649004	22pF	±10%	50V	FIXED CERAMIC CAPACITOR
C55,56,57,58	2533650006	27pF	±10%	50V	FIXED CERAMIC CAPACITOR
C3,4,5,6,47,48, 49,50	2533653003	47pF	±10%	50V	FIXED CERAMIC CAPACITOR
C59,60,61,62	2533662007	270pF	±10%	50V	FIXED CERAMIC CAPACITOR
C17,18	2533637003	270pF	±5%	50V	FIXED CERAMIC CAPACITOR
C83,84	2533658008	120pF	±10%	50V	FIXED CERAMIC CAPACITOR
C19,20	2554073086	0.015μF	±1%	100V	FIXED PLASTIC FILM CAPACITOR
C13,14	2554075000	0.047μF	±1%	100V	FIXED PLASTIC FILM CAPACITOR
C95,96	2561016010	0.22μF	±10%	400V	FIXED METALLIZE CAPACITOR
C45,46	2561014012	0.22μF	±10%	250V	FIXED METALLIZE CAPACITOR
C89,90,93,94	2561014009	1μF	±10%	250V	FIXED METALLIZE CAPACITOR
C91,92	2541048105	10μF	±20%	10V	FIXED TANTALUM SOLID CAPACITOR
C1,2	2541050009	4.7μF	±20%	35V	FIXED TANTALUM SOLID CAPACITOR
C11,12	2544007004	1000μF		6.3V	FIXED ELECTROLYTIC CAPACITOR
C2					
C27,28,29,30	2544010004	100μF		10V	FIXED ELECTROLYTIC CAPACITOR
C53,54	2549014021	0.33μF	±20%	50V	FIXED ELECTROLYTIC CAPACITOR
C25,26	2544015009	10μF		16V	FIXED ELECTROLYTIC CAPACITOR
C31,32,33,34	2544046007	4.7μF		50V	FIXED ELECTROLYTIC CAPACITOR
C63,64,65,66, 71,72,73,74	2544047006	10μF		50V	FIXED ELECTROLYTIC CAPACITOR
C39,40,41,42	2544049004	47μF		50V	FIXED ELECTROLYTIC CAPACITOR
C43,44	2544060009	10μF		100V	FIXED ELECTROLYTIC CAPACITOR
C35,36,37,38	2544079003	22μF		25V	FIXED ELECTROLYTIC CAPACITOR
C67,68,69,70	2544077005	4.7μF		50V	FIXED ELECTROLYTIC CAPACITOR
C85,86	2554078065	0.0047μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
C15,16,79,80	2554079006	0.0068μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
C75,76,81,82	2554079064	0.012μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
C77,78	2554080040	0.027μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
<b>OTHER PARTS</b>					
	2220358307	P.C. BOARD		DIVIDED	ETC-259D-1 TONE UNIT ETC-259D-2 EQ UNIT ETC-259D-3 VOLUME UNIT
L1,2	2050112069	6P. CONNECTOR PIN ASS.			
	2050112056	5P. CONNECTOR PIN ASS.			
	2050112056	3P. CONNECTOR PIN ASS.			
	4140116106	SHIELD COVER			
	2318017000	INDUCTOR			
	4110145204	CONTROL BRACKET (A)			
SW4	2120114007	ROTARY SWITCH			FOR MONITOR SWITCH WITH 7 mm NUT & 7 mm TOOTH WASHER
SW2	2120115019	FUNCTION SWITCH			FOR FUNCTION SWITCH WITH 9 mm NUT & 9 mm TOOTH WASHER
SW1	2120116005	ROTARY SWITCH			FOR PHONO SWITCH
VR3	2110160100	V3520V30RA503-			VARIABLE RESISTOR FOR VOLUME WITH 8 mm NUT
VR1	2110161109	V2420V30RE104-			VARIABLE RESISTOR FOR BASS WITH 8 mm NUT
VR2	2110162001	V2420V30RE104-			VARIABLE RESISTOR FOR TREBLE WITH 8 mm NUT
	4550033005	WIRE CLAMP BAND			USED 2
	2038060010	5P. CONNECTOR CORD			FOR VOLUME INPUT CORD
	2034107003	3P. CONNECTOR CORD			FOR VOLUME OUTPUT CORD
	2034092079	3P. CONNECTOR CORD			FOR MODE ~ MONITOR CORD
	2034107003	3P. CONNECTOR CORD			FOR TONE INPUT CORD
	2034092082	3P. CONNECTOR CORD			FOR TONE OUTPUT CORD
	2034092095	3P. CONNECTOR CORD			FOR MIC AMP OUT PUT CORD
	2034100071	3P. CONNECTOR CORD			FOR ETC-327~ETC-324 (+B,-B) CORD
	2034100068	3P. CONNECTOR CORD			FOR ETC-327-1~ETC-327-2 (+B,-B) CORD
	2090008117	JUMPER			SHORLEAD USED 4 P=12.5 mm

# CONTROL (B) UNIT ETC-324

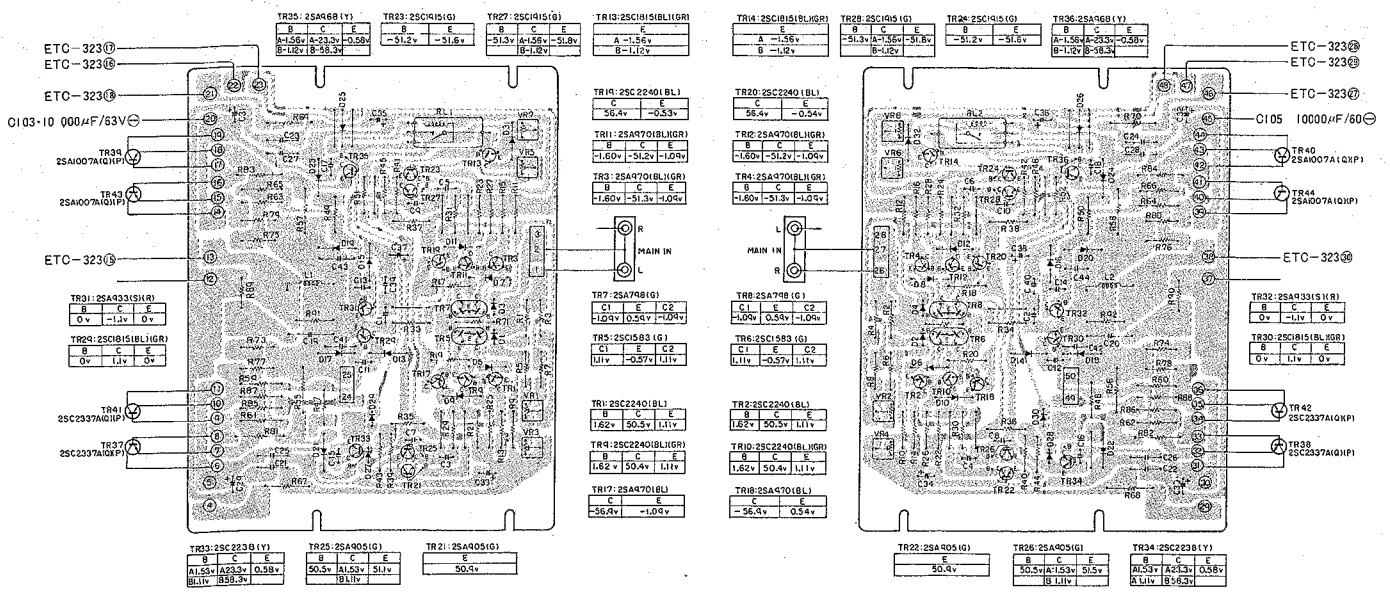
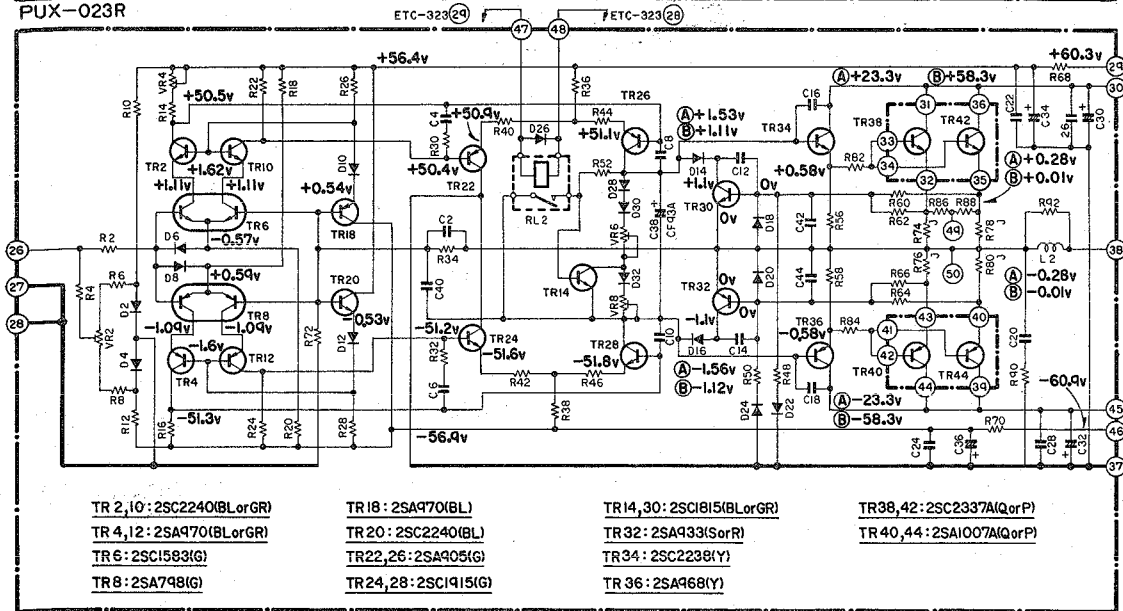
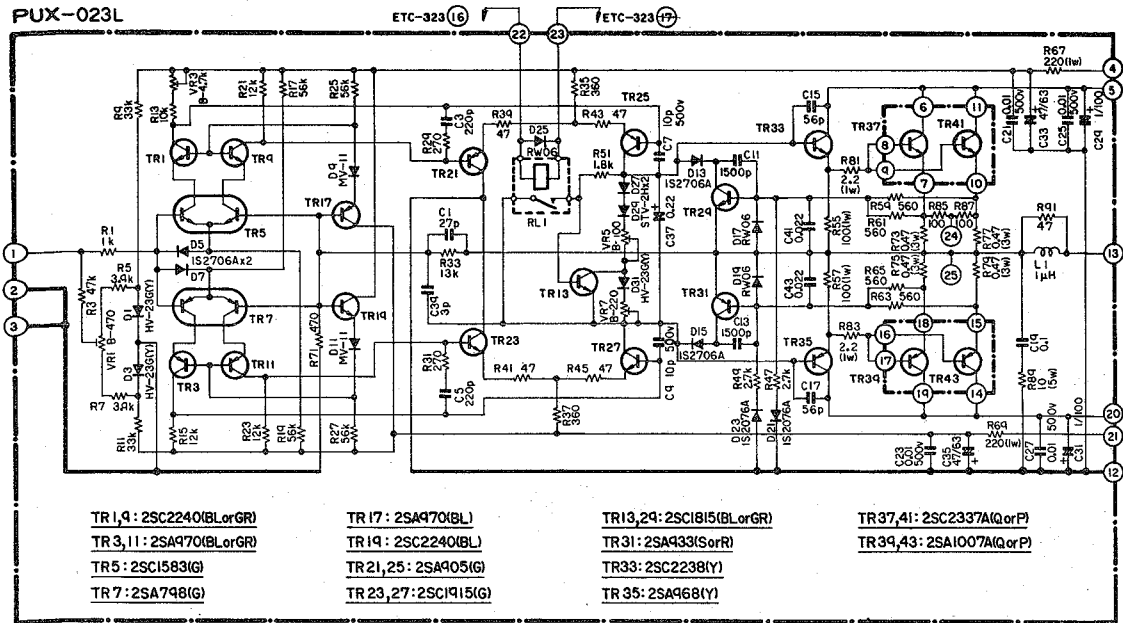
ETC-324 (B)



## ETC-324 PARTS LIST

Ref. No.	Part No.	Part Name & Descriptions			
<b>SEMICONDUCTORS</b>					
TR9,10,15,16	2710087010	2SA726 (G)			TRANSISTOR
TR19,20	2710094016	2SA970 (BL)			TRANSISTOR
TR5,6,7,8	2710095002	2SA991 (F)			TRANSISTOR
TR11,12,13,14	2730171016	2SC1313 (G)			TRANSISTOR
TR1,2,3,4	2730188009	2SC1844 (F)			TRANSISTOR
TR17,18	2730187013	2SC2240 (BL)			TRANSISTOR
D7,8	2760218004	HZ9			DIODE
D5,6	2760200009	MV-11			DIODE
D1,2,3,4	2760049008	1S2076			DIODE
<b>RESISTORS</b>					
R1,2,17,18, 35,36	2410266005	10 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R69,70,71,72, 75,76	2410290000	100 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R19,20	2410301009	300 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R5,6,11,12	2410302008	330 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R65,66,67,68		1 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R7,8,13,14	2410317006	1.3 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R43,44	2410320006	1.8 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R41,42	2410325001	3 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R73,74,81,82	2410332007	5.6 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R83,84	2410298002	220 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R31,32,83,84	2410338001	10 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R61,62,37,38	2410342000	15 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R49,50	2410356009	56 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R47,48	2410362006	100 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R59,60,63,64, 51,52	2410371000	240 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R45,46	2410765001	1 M ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R27,28,29,30	2412000049	10 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R23,24	2412000052	12 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R21,22,25,26	2412001064	100 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R9,10,15,16	2412002021	330 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR STANDING TYPE
R39,40	2420203003	10 M ohm	±10%	1/4W	FIXED CARBON COMPOSIT RESISTOR
R33,34	2440154006	1.2 k ohm	±5%	3.15W	FIXED METAL OXIDE FILM RESISTOR
<b>CAPACITORS</b>					
C1,2,25,26	2533653003	47pF	±10%	50V	FIXED CERAMIC CAPACITOR
C51,52,55,56	2533657009	100pF	±10%	50V	FIXED CERAMIC CAPACITOR
C7,8,9,10	2533661008	220pF	±10%	50V	FIXED CERAMIC CAPACITOR
C5,6,53,54	2531002009	470pF	±10%	50V	FIXED CERAMIC CAPACITOR
C23,24	2531027000	0.1μF	+80,-20%	50V	FIXED CERAMIC CAPACITOR
C37,38	2531053003	0.01μF	+100,-0%	50V	FIXED CERAMIC CAPACITOR
C3,4	2554081007	0.047μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
C31,32	2554079048	0.01μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
C29,30,33,34, 35,36	2554081081	0.1μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
C11,12,19,20	2544003008	100μF		63V	FIXED ELECTROLYTIC CAPACITOR
C57,58	2544078004	100μF		63V	FIXED ELECTROLYTIC CAPACITOR
C21,22	2544014000	1000μF		10V	FIXED ELECTROLYTIC CAPACITOR
C13,14	2544015009	10μF		16V	FIXED ELECTROLYTIC CAPACITOR
C47,48,49,50	2544047006	10μF		50V	FIXED ELECTROLYTIC CAPACITOR
C39,40,41,42	2549011008	1μF		50V	FIXED ELECTROLYTIC LOW REAK
C15,16,17,18, 43,44,45,46,	2544077018	10μF		50V	FIXED ELECTROLYTIC LOW REAK
C27,28	2556096003	750pF	±5%	50V	FIXED PLASTIC FILM CAPACITOR
<b>OTHER PARTS</b>					
	2220489001	P.W. BOARD			
	2050112030	3P. CONNECTOR PIN ASS.			USED 7
	2050112056	5P. CONNECTOR PIN ASS.			USED 3
	2034123003	3P. CONNECTOR CORD			FOR (+B, -B, EARTH)
	2034118034	3P. CONNECTOR CORD			FOR OPERATION
	2034089066	3P. CONNECTOR CORD			FOR COPY ~ FUNCTION
	2038060007	5P. CONNECTOR CORD			FOR COPY ~ MONITOR
	2032036053	2P. CONNECTOR ASS.			FOR MUTING
	2090008117	JUMPER SHORTLEAD			USED 8 P=12.5 mm
	2090008159	JUMPER SHORTLEAD			USED 4 P=17.5 mm
	4110146106	CONTROL BRACKET (B)			
SW11, SW7	2124110007	LEVER SWITCH			FOR HIGH CUT (SW11), LOUDNESS (SW7)
SW10, SW6	2124110010	LEVER SWITCH			FOR SUBSONIC (SW10), DIRECT COUPLLE (SW6)
	4700009006	CROSS PAN SCREW 3 x 6			WITH SPRING WASHER
VR4	2110163107	V1620V25RW104K			VARIABLE RESISTOR FOR BALANCE WITH 7 mm NUT
SW5	2120143007	ROTARY SWITCH			FOR MODE WITH 7 mm TOOTH WASHER, 7 mm NUT
SW3	2120144006	ROTARY SWITCH			FOR RECOOT WITH 7 mm TOOTH WASHER, 7 mm NUT
SW12	2124142004	LEVER SWITCH			FOR OPERATION

POWER AMP UNIT PUX-023 -L, -R



## PUX-023-L,R PARTS LIST

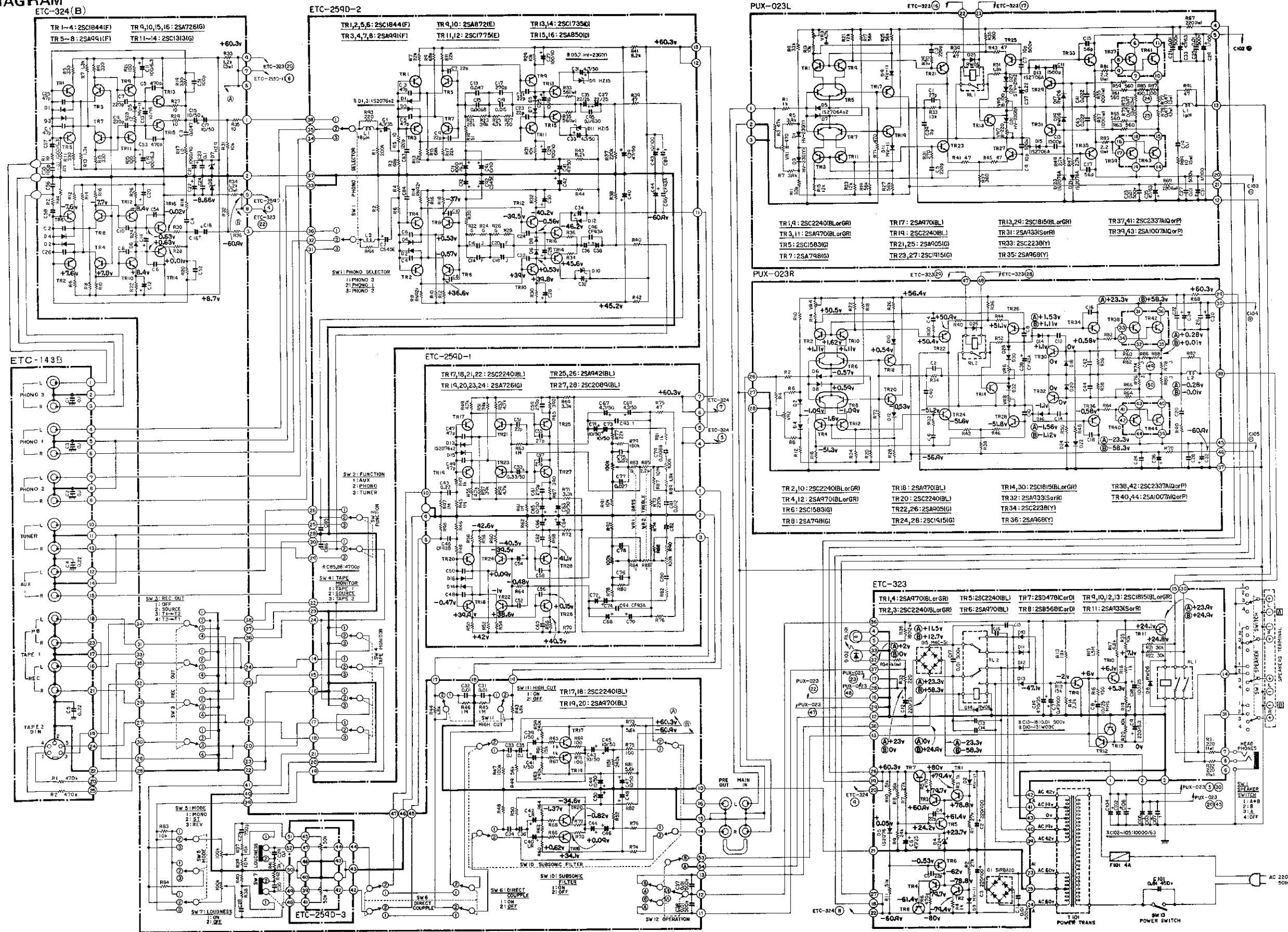
Ref. No.	Part No.	Part Name & Descriptions			
<b>SEMICONDUCTORS</b>					
TR7,8	2710073008	2SA798 (G)			TRANSISTOR
TR17,18	2710094016	2SA970 (B)			TRANSISTOR
TR3,4,11,12	2710094016 or	2SA970 (BL)			TRANSISTOR
TR3,4,11,12	2710094003	2SA970 (GR)			TRANSISTOR
TR31,32	2710101019 or	2SA933 (S)			TRANSISTOR
TR31,32	2710101006	2SA933 (R)			TRANSISTOR
TR35,36	2710104003	2SA968 (Y)			TRANSISTOR
TR21,22,25,26	2710108009	2SA905 (G)			TRANSISTOR
TR5,6	2730181006	2SC1583 (G)			TRANSISTOR
TR19,20	2730187013	2SC2240 (BL)			TRANSISTOR
TR1,2,9,10	2730187013 or	2SC2240 (BL)			TRANSISTOR
TR1,2,9,10	2730187000	2SC2240 (GR)			TRANSISTOR
TR13,14,29,30	2730198015	2SC1815 (BL)			TRANSISTOR
TR13,14,29,30	2730198028	2SC1815 (GR)			TRANSISTOR
TR33,34	2730199001	2SC2238 (Y)			TRANSISTOR
TR23,24,27,28	2730203007	2SC1915 (G)			TRANSISTOR
TR39,43,40,44	2710096001 or	2SA1007A (Q)			TRANSISTOR
TR39,43,40,44	2710096014	2SA1007A (P)			TRANSISTOR
TR38,41,38,42	2730189008 or	2SC2337A (Q)			TRANSISTOR
	2730189001	2SC2337A (P)			TRANSISTOR
D5,6,7,8,21,22 13,14,15,16, 23,24	2760049011	1S2076A			DIODE
D19,20,25,26 17,18	2760214008	RW06			DIODE
D9,10,11,12	2760200009	MV-11			DIODE
D1,2,3,4	2760171028	HV23G (Y)			DIODE
D31,32	2760171028	HV23G (Y)			DIODE
D27,28,29,30	2760217005	STV-2H			DIODE
<b>RESISTORS</b>					
R39,40,41,42 43,44,45,46, 91,92	2410282005	47 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R85,86,87,88	2410290000	100 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R29,30,31,32	2410300000	270 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R35,36,37,38	2410303007	360 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R71,72	2410306004	470 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R59,60,61,62, 63,64,65,66	2410308002	560 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R51,52	2410320006	1.8 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R1,2	2410314009	1 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R47,48,49,50	241324002	2.7 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R5,6,7,8	2410328008	3.9 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R33,34	2410341001	13 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R13,14	2410338001	10 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R15,16,21,22, 23,24	2410340002	12 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R9,10,11,12	2410350005	33 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R3,4	2410350005	47 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R19,20,25,26 27,28,17,18	2410356009	56 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R81,82,83,84	2440009025	2.2 ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR FORMING TYPE
R55,56,57,58	2440029021	100 ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR FORMING TYPE
R67,68,69,70	2440033020	220 ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR FORMING TYPE
R73,74,75,76, 77,78,79,80	2430023008	0.47 ohm	±5%	3.15W	FIXED WIRE WOUND RESISTOR
R89,90	2430045002	10 ohm	±10%	5W	FIXED WIRE WOUND RESISTOR FORMING TYPE
<b>CAPACITORS</b>					
C39,40	2533596005	3pF	±0.25pF	50V	FIXED CERAMIC CAPACITOR
C7,8,9,10	2534269001	10pF	±0.5pF	100V	FIXED CERAMIC CAPACITOR
C1,2	2533650006	27pF	±10%	50V	FIXED CERAMIC CAPACITOR
C15,16,17,18	2534322003	56pF	±10%	100V	FIXED CERAMIC CAPACITOR
C3,4,5,6	2533661008	220pF	±10%	50V	FIXED CERAMIC CAPACITOR
C11,12,13,14	2531005006	0.0015μF	±10%	50V	FIXED CERAMIC CAPACITOR
C21,22,23,24 25,26,27,28	2531053003	0.01μF	+100,-0%	50V	FIXED CERAMIC CAPACITOR
C41,42,43,44	2531025002	0.022μF	+80,-20%	50V	FIXED CERAMIC CAPACITOR
C37,38	2561014012	0.22μF	±10%	250V	FIXED METALLIZE CAPACITOR
C19,20	2554081081	0.1μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
C33,34,35,36	2544059023	47μF		63V	FIXED ELECTROLYTIC CAPACITOR
C29,30,31,32	2544060025	1μF		100V	FIXED ELECTROLYTIC CAPACITOR

(Con.)

Ref. No.	Part No.	Part Name / Descriptions
<b>OTHER PARTS</b>		
L1,2 RL1,2	2220488002	P.W. BOARD
	2220488015	P.W. BOARD
VR5,6 VR7,8 VR1,2 VR3,4	2050075025	2P. WRAPPING TERMINAL USED 2
	2050112030	3P. CONNECTOR PIN ASS. USED 2
	2090008117	JUMPER SHORTLEAD USED 17 P=12.5 mm
	2320017001	INDUCTOR (1μH)
	2140029004	REED RELAY FOR DC 24V
	4450033005	WIRE CLAMP BAND USED 6
	2116003009	V10QB101 VARIABLE RESISTOR B 100 ohm FOR B CLASS
	2116003025	V10QB221 VARIABLE RESISTOR B 220 ohm FOR A CLASS
	2116003041	V10QB471 VARIABLE RESISTOR B 470 ohm
	2116001001	V10QB472 VARIABLE RESISTOR B 4.7 k ohm
	4170099002	POWER RADIATOR FOR L
	4120372009	RADIATOR BRACKET (A)
	4120373008	RADIATOR BRACKET (B) FOR L
	4770064107	FIXING SCREW USED 4 FOR L
	2070002007	TR SOCKET USED 4 FOR L
	4753001051	3 TOOTH WASHER USED 8 FOR L
	4711809033	CROSS PAN SCREW 3 x 18 USED 8 FOR L
	4730354035	TAPPING SCREW 3 x 8 FOR POWER (L) AMP FIXED. FOR L
	EP-4772	CORD HOLDER
	4170099109	POWER RADIATOR FOR R
	4120372009	RADIATOR BRACKET (A) FOR R
	4120373008	RADIATOR BRACKET (B) FOR R
	4770064107	FIXING SCREW USED 4 FOR R
	2070002007	TR SOCKET USED 4 FOR R
	4753001051	3 TOOTH WASHER USED 8 FOR R
	4711809033	CROSS PAN SCREW 3 x 18 FOR R
	4730354035	TAPPING SCREW 3 x 8 FOR POWER (R) AMP FIXED
	EP-4772	CORD HOLDER

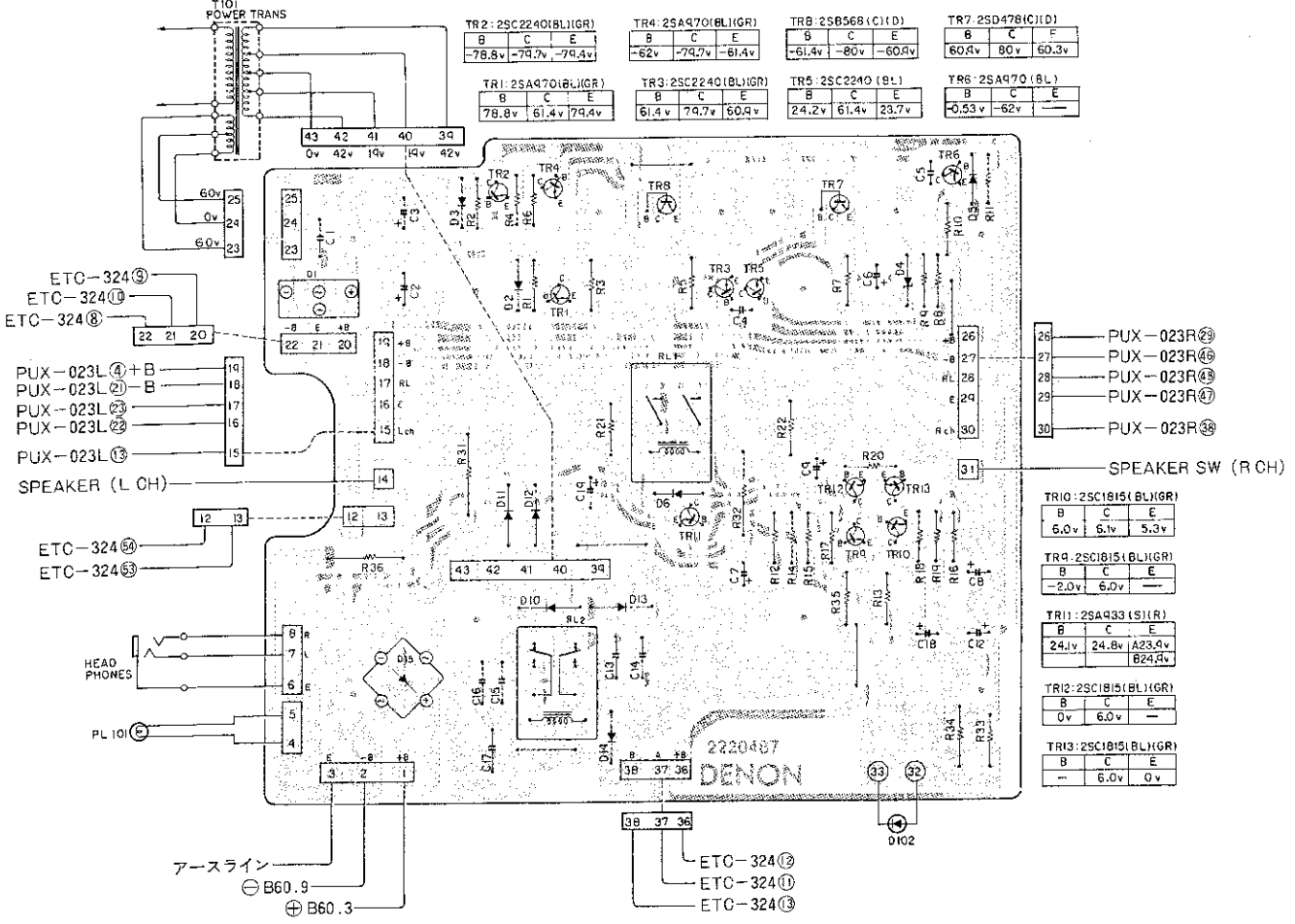
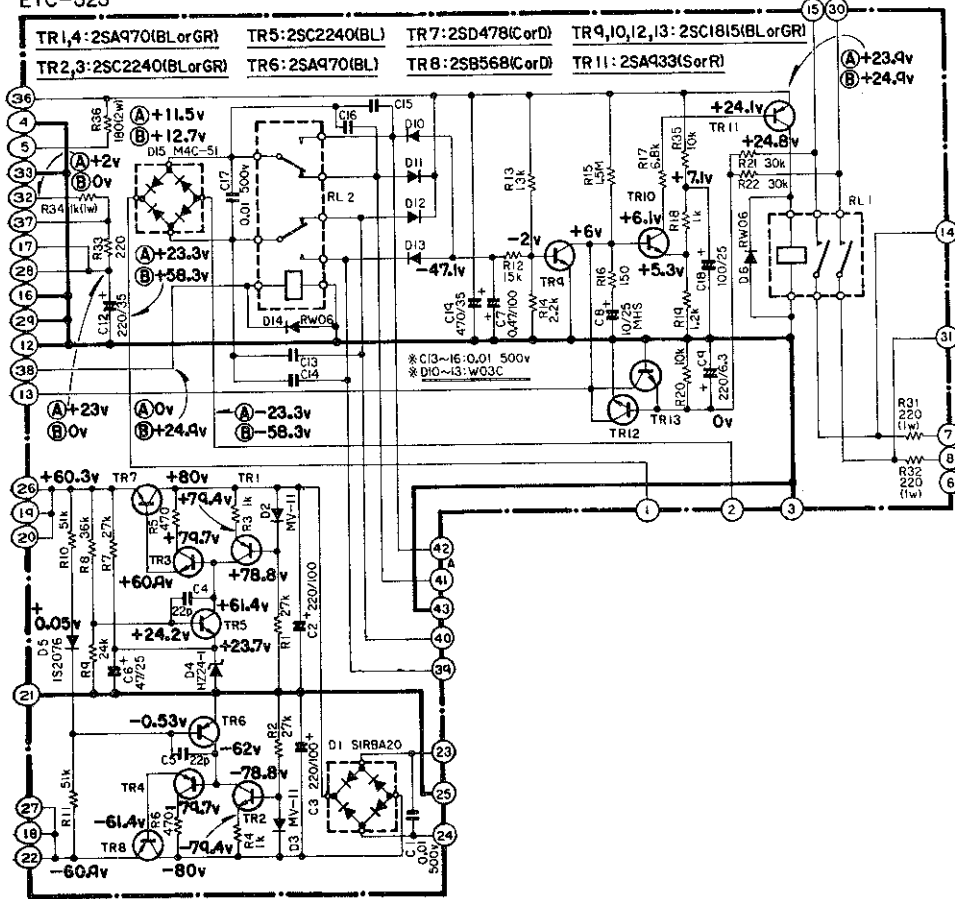


# WIRING DIAGRAM



**NOTES**  
 ALL RESISTANCE VALUES IN OHM K = 1,000 OHM M = 1,000,000 OHM  
 ALL CAPACITANCE VALUES IN MICRO FARAD P = MICRO-MICRO FARAD  
 CIRCUIT AND PARTS ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.

POWER SWITCH & PROTECTOR UNIT ETC-323  
ETC-323



TR 2: 2SC2240(BL)(GR)	TR 4: 2SA970(BL)(GR)	TR 6: 2SB56B(C)(D)	TR 7: 2SD478(C)(D)
B C E	B C E	B C E	B C E
-78.8v -79.7v -79.4v	-62v -79.7v -61.4v	-61.4v -80v -60.4v	60.4v 80v 60.3v

TR 1: 2SA970(BL)(GR)	TR 3: 2SC2240 (BL)(GR)	TR 5: 2SC2240 (BL)	TR 6: 2SA970 (BL)
B C E	B C E	B C E	B C E
78.8v 61.4v 79.4v	61.4v 79.7v 60.4v	24.2v 61.4v 23.7v	-0.53v -62v -

TR 10: 2SC1815 (BL)(GR)
B C E
6.0v 6.1v 5.3v

TR 9: 2SC1815 (BL)(GR)
B C E
-2.0v 6.0v -

TR 11: 2SA933 (S)(R)
B C E
24.1v 24.8v A23.4v B24.4v

TR 12: 2SC1815 (BL)(GR)
B C E
0v 6.0v -

TR 13: 2SC1815 (BL)(GR)
B C E
- 6.0v 0v

## ETC-323 PARTS LIST

Ref. No.	Part No.	Part Name & Descriptions			
<b>SEMICONDUCTORS</b>					
TR7	2740044010 or	2SD478 (C)			TRANSISTOR
TR7	2740044007	2SD478 (D)			TRANSISTOR
TR8	2720031014 or	2SB568 (C)			TRANSISTOR
TR8	2720031001	2SB568 (D)			TRANSISTOR
TR6	2710094016	2SA970 (BL)			TRANSISTOR
TR1,4	2710094016 or	2SA970 (BL)			TRANSISTOR
TR1,4	2710094003	2SA970 (GR)			TRANSISTOR
TR11	2710101019 or	2SA933 (S)			TRANSISTOR
TR11	2710101006	2SA933 (R)			TRANSISTOR
TR5	2730187013	2SC2240 (BL)			TRANSISTOR
TR2,3	2730187013 or	2SC2240 (BL)			TRANSISTOR
TR2,3	2730187000	2SC2240 (GR)			TRANSISTOR
TR9,10,12,13	2730198015 or	2SC1815 (BL)			TRANSISTOR
TR9,10,12,13	2730198028	2SC1815 (GR)			TRANSISTOR
D15	2760233005	M4C-51			DIODE
D1	2760239009	SIRBA20			DIODE
D5	2760049008	1S2076			DIODE
D6,14	2760214008	RW06			DIODE
D10,11,12,13	2760191008	W03C			DIODE
D2,3	2760200009	MV-11			DIODE
D4	2760220018	HZ24-1			DIODE
<b>RESISTORS</b>					
R16,	2410294006	150 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R33	2410298002	220 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R5,6	2410306004	470 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R3,4,18	2410314009	1 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R14	2410322004	2.2 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R19	2410316007	1.2 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R17	2410334005	6.8 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R13	2410341001	13 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R20,35	2410338001	10 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R12	2410342000	15 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R9	2410347005	24 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R1,2,7	2410348004	27 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R21,22	2410349003	30 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R8	2410351004	36 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R10,11	2410355000	51 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R15	2410769007	1.5 M ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R34	2440041025	1 k ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR FORMING TYPE
R31,32	2440033020	220 ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR FORMING TYPE
R36	2440089029	180 ohm	±5%	2W	FIXED METAL OXIDE FILM RESISTOR FORMING TYPE
<b>CAPACITORS</b>					
C4,5	2533649004	22pF	±10%	50V	FIXED CERAMIC CAPACITOR
C1,13,14,15,16,17	2531053003	0.01μF	+100,-0%	50V	FIXED CERAMIC CAPACITOR
C18	2544028009	100μF		25V	FIXED ELECTROLYTIC CAPACITOR
C9	2544004007	220μF		6.3V	FIXED ELECTROLYTIC CAPACITOR
C6	2544027000	47μF		25V	FIXED ELECTROLYTIC CAPACITOR
C12	2544039001	220μF		35V	FIXED ELECTROLYTIC CAPACITOR
C7	2544060038	0.47μF		100V	FIXED ELECTROLYTIC CAPACITOR
C2,3	2544060041	220μF		100V	FIXED ELECTROLYTIC CAPACITOR
C19	2544041002	470μF		35V	FIXED ELECTROLYTIC CAPACITOR
C8	2549005038	10μF	±20%	25V	FIXED ELECTROLYTIC CAPACITOR
<b>OTHER PARTS</b>					
RL1	2220487003	P.W. BOARD			
RL2	EP-6071	BASE PIN	USED 10		
	2050112030	3P. CONNECTOR PIN ASS.		USED 4	
	2050112056	5P. CONNECTOR PIN ASS.		USED 2	
	2050112027	2P. CONNECTOR PIN ASS.		USED 2	
	2090008104	JUMPER SHORTLEAD		USED 5 P=15 mm	
	2032072004	2P. CONNECTOR ASS.			
	2140016020	RELAY			SPEAKER PROTECT FOR DC24V
	2140031005	RELAY			A.B CLASS CHANGED FOR DC24V
	4170078201	RADIATOR			
	4700012006	CROSS PAN SCREW 3 x 12			WITH SPRING WASHER
	4751003006	3 WASHER			
	4756006008	3 NUT			
	4730454016	TAPPING SCREW 4 x 8			FOR RADIATOR (A) FIXED
	4170078201	RADIATOR			
	47000120016	CROSS PAN SCREW 3 x 12			WITH SPRING WASHER
	4751003006	3 WASHER			
	4756006008	3 NUT			
	4730454016	TAPPING SCREW 4 x 8			FOR RADIATOR (B) FIXED