

# DENON

Hi-Fi Component Amplifier

## SERVICE MANUAL MODEL **PMA-830**

SOLID STATE STEREO  
INTEGRATED AMPLIFIER



# NIPPON COLUMBIA CO., LTD.

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## SPECIFICATIONS

### MAIN AMPLIFIER SECTION

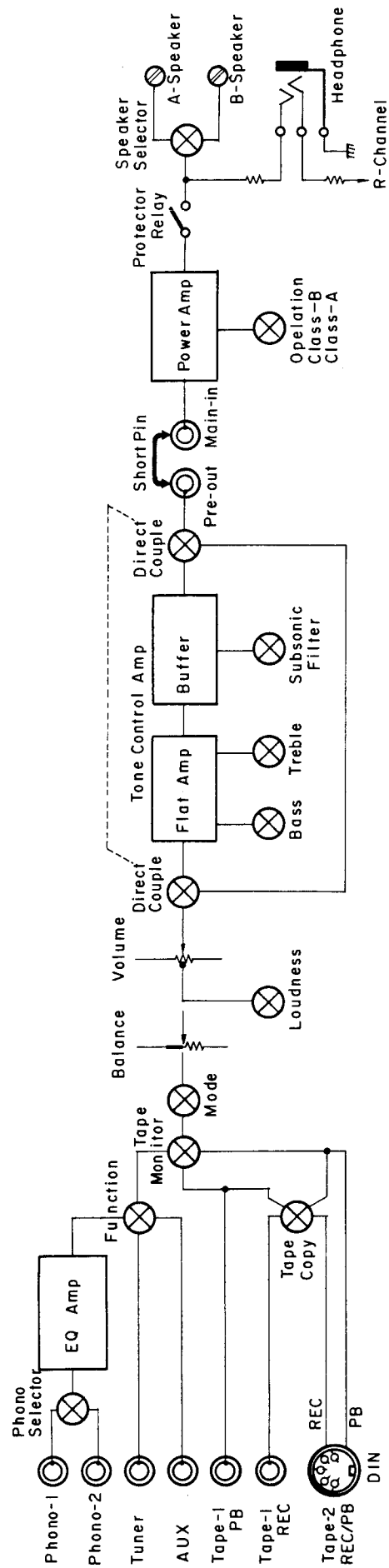
<b>Type:</b>	All stages pure complementally push-pull system DC circuit
<b>Rated Output (both channels driven)</b>	
<b>20 Hz to 20 kHz (at 8 ohm)</b>	
<b>Class B operation:</b>	65 W at each channel (T.H.D. 0.01%)
<b>Class A operation:</b>	15 W at each channel (T.H.D. 0.005%)
<b>1 kHz (at 4 ohm, T.H.D. 0.02%)</b>	
<b>Class B operation:</b>	90 W at each channel
<b>Total Harmonic Distortion</b>	
<b>Class B operation:</b>	less than 0.01%
<b>Class A operation:</b>	less than 0.005%
<b>Intermodulation Distortion</b>	
<b>60 Hz/7 kHz = 4/1:</b>	less than 0.01% (at equivalent rated output) less than 0.01% (at 1 watt output)
<b>Power Bandwidth</b>	
<b>Class B operation:</b>	5 Hz to 80 kHz (IHF, T.H.D. 0.05%)
<b>Class A operation:</b>	5 Hz to 100 kHz (IHF, T.H.D. 0.05%)
<b>Transmission Characteristic:</b>	DC to 100 kHz $\begin{matrix} +0 \\ -1 \end{matrix}$ dB (at 1 watt output)
<b>Input Sensitivity:</b>	1 volt r.m.s.
<b>Input Impedance:</b>	50 k ohm
<b>Output Impedance:</b>	less than 0.16 ohm
<b>Signal to Noise Ratio:</b>	122 dB
<b>Output Terminals</b>	
<b>Speaker:</b>	A & B, 4 to 16 ohm load A + B, 8 to 16 ohm load
<b>Headphone:</b>	for Stereo Headphone

### PRE AMPLIFIER SECTION

<b>Pre Amplifier Output</b>	
<b>Max. Output:</b>	25 V
<b>Rated Output:</b>	1 V
<b>Total Harmonic Distortion:</b>	0.003% (at 3 V output)
<b>Equalizer Amplifier Output</b>	
<b>Max. Output:</b>	25 V (T.H.D. 0.01% at 50 k ohm load)
<b>Rated Output:</b>	320 mV
<b>Input Sensitivity/Input Impedance</b>	
<b>Phono-1, 2:</b>	2.5 mV / 50 k ohm
<b>Tuner:</b>	320 mV / 40 k ohm
<b>Aux. Tape:</b>	320 mV / 40 k ohm
<b>Maximum Allowable Input</b>	
<b>Phono:</b>	200 mV 1 kHz
<b>RIAA Deviation:</b>	less than $\pm 0.2$ dB (20 Hz to 20 kHz)
<b>Signal to Noise Ratio (IHF. A network)</b>	
<b>Phono:</b>	better than 90 dB (input terminal shorted)
<b>Tuner, Tape, Aux:</b>	better than 105 dB (input terminal shorted)
<b>Aux <math>\rightarrow</math> Pre Out Frequency Response</b>	
<b>Tone Defeat:</b>	5 Hz to 100 kHz $\begin{matrix} +0 \\ -1 \end{matrix}$ dB
<b>Tone Control Section Variable Range</b>	
<b>Bass:</b>	100 Hz $\pm 8$ dB
<b>Treble:</b>	10 kHz $\pm 8$ dB
<b>Filter Characteristic</b>	
<b>Subsonic:</b>	20 Hz, $-6$ dB/oct
<b>Loudness Control Characteristic</b>	
<b>Low range:</b>	100 Hz + 7 dB
<b>High range:</b>	10 kHz + 6 dB
<b>Power Source:</b>	AC 220V, 50 Hz
<b>Power Consumption:</b>	440 W (at max. output power)
<b>Dimensions:</b>	434 (W) x 164 (H) x 400 (D) mm 17-5/64" (W) x 6-29/64" (H) x 15-3/4" (D)
<b>Weight:</b>	16 kg, 35.3 lbs

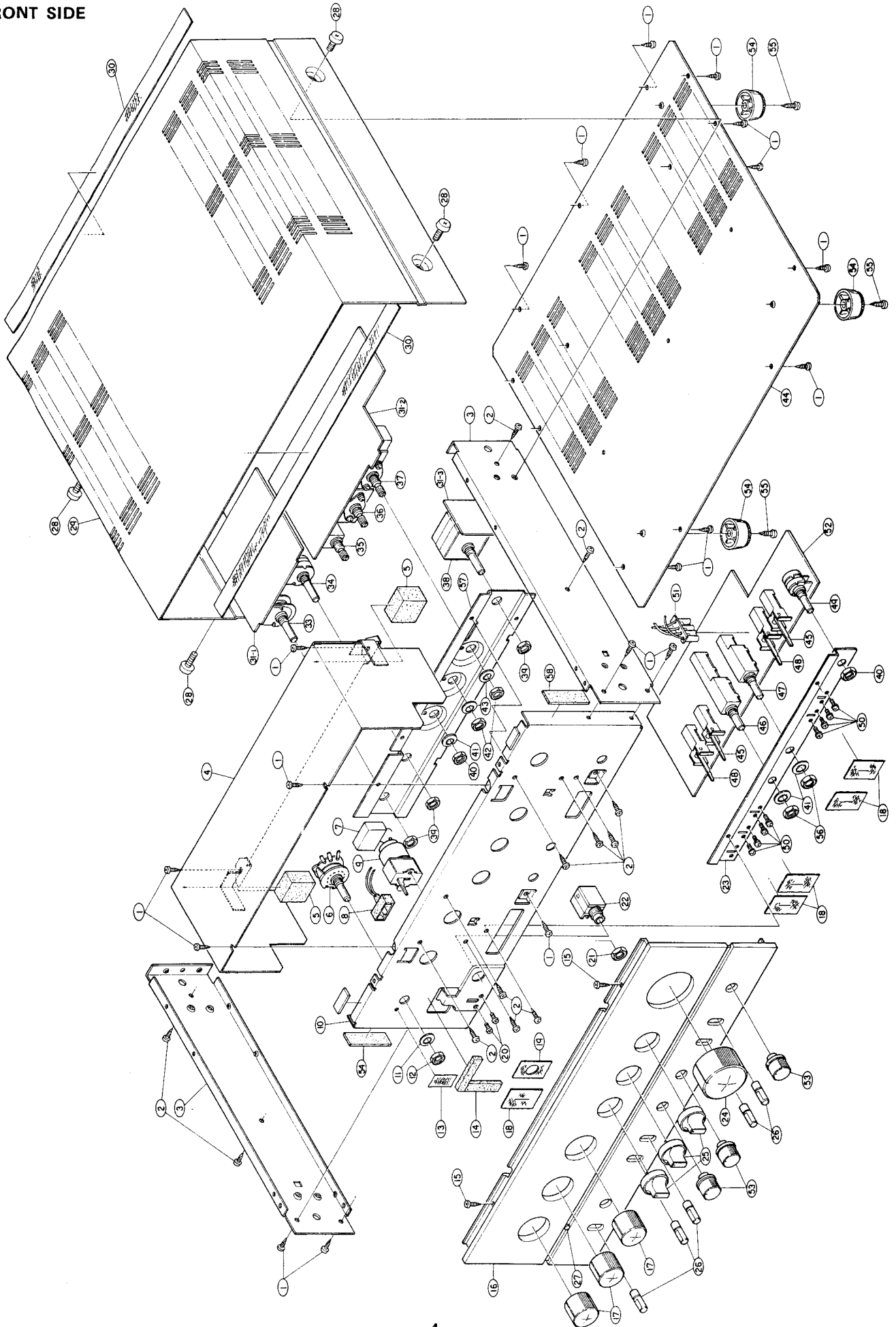
These contents are subject to alteration without prior notice.

BLOCK DIAGRAM

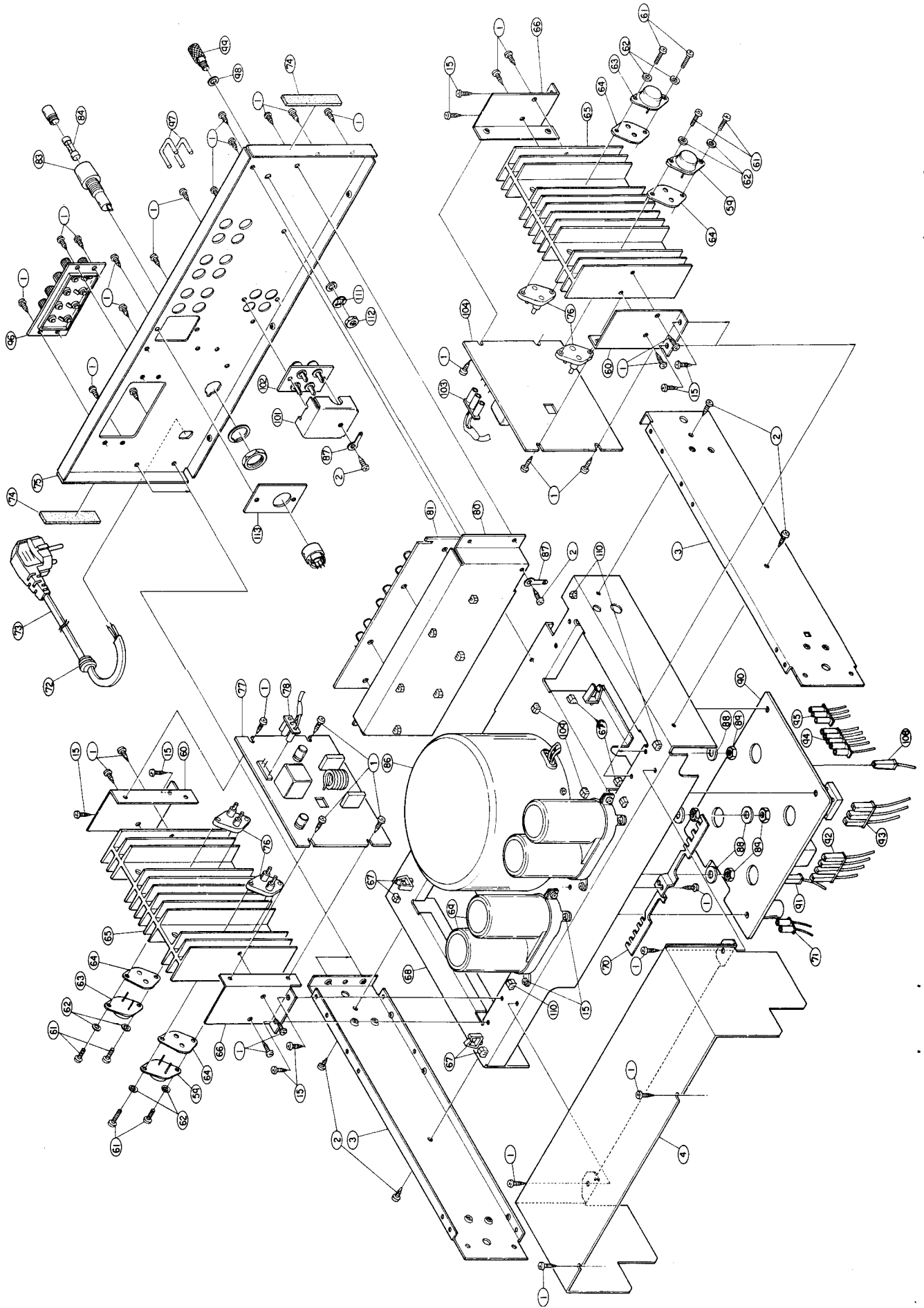


# EXPLODED VIEW OF CHASSIS AND CABINET

FRONT SIDE



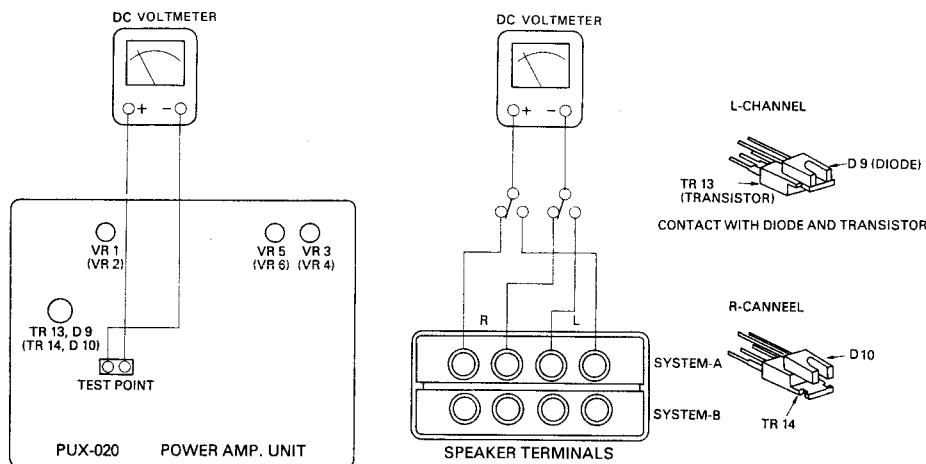
BACK SIDE



## CHASSIS AND CABINET GROUP PARTS LIST

Ref. No.	Part No.	Part Name & Descriptions	Ref. No.	Part No.	Part Name & Descriptions
1	4770064107	FIXING SCREW	57	4110145204	CONTROL BRACKET (A)
2	4730353	TAPPING SCREW 3 x 6 (2)	58	4610061121	RUBBER SHEET
3	4110148502	SIDE CHASSIS	59	2740037014	2SD427 (R) or (O) TRANSISTOR
4	4140114205	SHIELD COVER	60	4120372106	RADIATOR BRACKET (A)
5	4610074176	BLIND	61	4711809033	CROSS PEN SCREW 3 x 18
6	2120119002	SPEAKER SWITCH	62	4753001051	3 TOOTH WASHER
7	2558001007	OIL CAPACITOR 0.01 $\mu$ F	63	2720024005	2SB557 (O) TRANSISTOR
8	3930032019	PILOT LAMP 6.3V 0.15A	64	—	INSULATING SHEET
9	2124122008	POWER SWITCH	65	4170077105	POWER RADIATOR
10	4110144409	FRONT CHASSIS	66	4120373105	RADIATOR BRACKET (B)
11	—	—	67	MD-4232	WIRE CLIP
12	—	—	68	4110147309	MAIN CHASSIS
13	—	ADHESIVE TAPE	69	2546031007	6800 $\mu$ F 50 V CAPACITOR
14	—	BLIND	70	2050095102	EARTH PLATE
15	4730354035	TAPPING SCREW 3 x 8	71	—	2P CONNECTOR
16	1440375103	FRONT PANEL ASS.	72	4450020005	CORD BUSH
17	1120161006	KNOB ASS.	73	2062016001	AC CORD
18	—	BLIND SHEET	74	4610061118	RUBBER SHEET
19	—	—	75	1050294001	BACK PANEL
20	4711304033	CROSS PAN SCREW 3 x 8	76	2070002007	TRANSISTOR SOCKET
21	—	11 mm NUT	77	PUX-020L	POWER AMPLIFIER UNIT (L)
22	2048011101	HEAD PHONE JACK	78	—	3P CONNECTOR CORD
23	4110146106	CONTROL BRACKET (B)	79	—	—
24	1120160007	KNOB ASS.	80	4140113002	INPUT BRACKET
25	1120162209	KNOB ASS.	81	ETC-143	INPUT TERMINAL UNIT
26	1120166108	LEVER KNOB	82	—	—
27	1430041007	PILOT LENS	83	2020012005	FUSE HOLDER
28	SC-1162	SPECIAL SCREW	84	2061015087	FUSE 4.0A TIME LAG
29	1020063440	TOP COVER	85	—	—
30	1220007057	SPACER	86	2335127009	POWER TRANSFORMER
31	ETC-259B	CONTROL (A) UNIT	87	2050003000	3 T LUG TERMINAL
32	—	—	88	4752006002	6 mmS WASHER
33	2110161109	100 k ohm x 2 POTENTIOMETER	89	4756012005	6 mm NUT
34	2110162001	100 k ohm x 2 POTENTIOMETER	90	ETC-280	POWER SOURCE & PROTECTOR UNIT
35	2120114007	ROTARY SWITCH	91	—	1P CONNECTOR ASS.
36	2120115019	FUNCTION SWITCH	92	—	4P CONNECTOR CORD
37	2120127007	FUNCTION SWITCH	93	—	3P CONNECTOR CORD
38	2110160100	50 k ohm x 2 POTENTIOMETER	94	2038004005	5P CONNECTOR CORD
39	—	8 mm NUT	95	—	3P CONNECTOR CORD
40	—	7 mm NUT	96	2050070004	8P TERMINAL
41	—	7 mm TOOTH WASHER	97	2056037005	SHORT PIN
42	—	9 mm NUT	98	4770088002	4.1 mm WASHER
43	—	9 mm TOOTH WASHER	99	2050043109	GND TERMINAL
44	1050188405	BOTTOM COVER	100	—	—
45	2124110007	LEVER SWITCH	101	4140057207	BOARD BRACKET
46	2120118003	ROTARY SWITCH	102	2036043000	4P CONNECTOR BASE
47	2120117004	ROTARY SWITCH	103	2034093052	3P CONNECTOR CORD
48	2124110010	LEVER SWITCH	104	PUX-020R	POWER AMP UNIT (R)
49	2110163107	100 k ohm x 2 POTENTIOMETER	105	—	—
50	4700009006	CROSS PAN SCREW 3 x 6	106	—	—
51	—	4P CONNECTION CORD	107	—	—
52	ETC-277	CONTROL (B) UNIT	108	2030014048	1P CONNECTOR ASS.
53	1120163208	KNOB ASS.	109	MD-5271	P.C.B. SUPPORT
54	1040040003	FOOT	110	MD-4368	WIRE CLIP
55	4730456014	TOPPING SCREW 4 x 12 (2)	111	4753100004	4 mm TOOTH WASHER
56	—	7 mm NUT	112	4770006004	4 mm NUT
			113	4410316005	DIN PLATE

## METHOD OF ADJUSTMENTS



## DATA FOR ADJUSTMENTS

- Confirm that forming has been effected as shown in the drawing for D9 and TR13, and D10 and TR14, respectively of the L- and R-channels. (PUX-020)
- The amplifier switches should be set as follows:
  - SPEAKERS switches to "A" system.
  - VOLUME to minimum position.
  - DIRECT COUPLE to OFF.
  - POWER switch to OFF.
  - OPERATION switch to "B" position.
  - Confirm that a U-shaped short pin is inserted between the PRE-OUT and MAIN-IN terminals.
- Connect a D.C. voltmeter to the SYSTEM-A terminal.
  - Connect a D.C. voltmeter to the test points of both the L- and R-channels of the PUX-020. Special attention should be paid here with regard to the polarities of the test point voltages: make sure that 16 is - and 17 + for the L-channel, and that 35 is - and 36 + for the R-channel.
- After setting the voltage regulator to 0 V, switch the amplifier's power switch on.
  - While observing the indication of the D.C. voltmeter, raise the power supply voltage from zero to the rated voltage by using the voltage regulator, and carry out the preliminary adjustments of (3) and (4) in a swift manner.
  - By adjusting VR1 (L-channel) and VR2 (R-channel) of the PUX-020, regulate the speaker terminal voltage to the range of  $0\text{ V} \pm 10\text{ mV}$ .
  - By adjusting VR5 (L-channel) and VR6 (R-channel) of the PUX-020, regulate the rest point voltages to 12 mV (10 to 14 mV) [Collector current to 26 mA (22 to 30 mA)].
- On completion of the preliminary adjustments described above, carry out the main adjustments described below.
  - By adjusting VR1 (L-channel) and VR2 (R-channel), adjust the speaker terminal voltage again so that it will be in the range of  $0\text{ V} \pm 10\text{ mV}$ .
  - Adjust VR5 (L-channel) and VR6 (R-channel) again, regulating the test point voltage to  $17\text{ mV} \pm 1\text{ mV}$  (Collector current to  $26\text{ mA} \pm 2\text{ mA}$ ).
  - With the above adjustments, the speaker terminal voltage adjustment and idling current adjustment for B-class operations have been completed.
- Change over the OPERATION switch to Class A.
  - By adjusting VR3 (L-channel) and VR4 (R-channel) of the PUX-020, carry out adjustment of the test point voltage, regulating it to  $470\text{ mV} \pm 10\text{ mV}$  (Collector current to  $1\text{ A} \pm 0.02\text{ A}$ ).
- Switch over the OPERATION switch and effect aging for 10 minutes.
  - By adjusting VR3 (L-channel) and VR4 (R-channel) of the PUX-020, regulate the test point voltage to  $500\text{ mV} \pm 5\text{ mV}$  (Collector current to  $1.06\text{ A} \pm 0.01\text{ A}$ ). With the above operations, idling current adjustment for A-class operations has been completed.

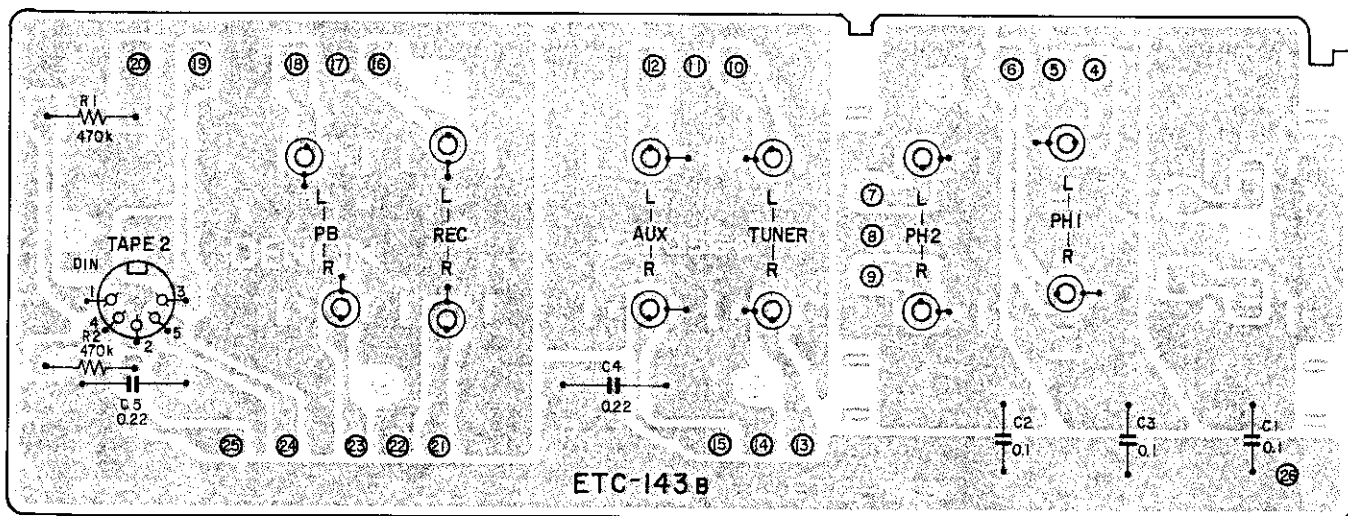
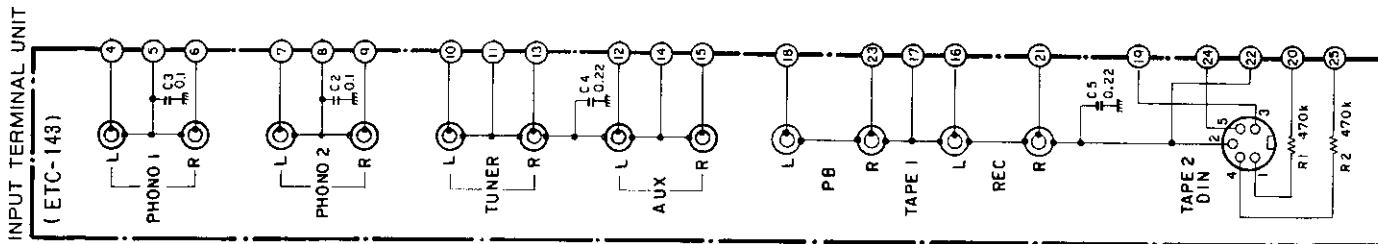
## CAUTION

- Never switch off power until the idling current adjustments for Class-A operations have been completed.
- Special attention should be paid in handling the variable resistors used for adjustments, i.e., VR3 and VR4, and VR5 and VR6, as they can be easily mistaken for one another.  
If by mistake, VR5, or VR6 has been used for the idling current adjustment for A-class operations, readjustment must be carried out (after confirming that the radiator of the power amplifier has cooled down) for B-class operations, since the mistake will cause a deviation in the adjustment for B-class operations. On completion of this, carry out adjustments for A-class operations again.
- The adjustment of "6. (2)" should be effected after about 10 seconds have passed following switch-on of the OPERATION switch.



PRINTED CIRCUIT BOARD PATTERNS AND PARTS LIST

INPUT TERMINAL UNIT ETC-143

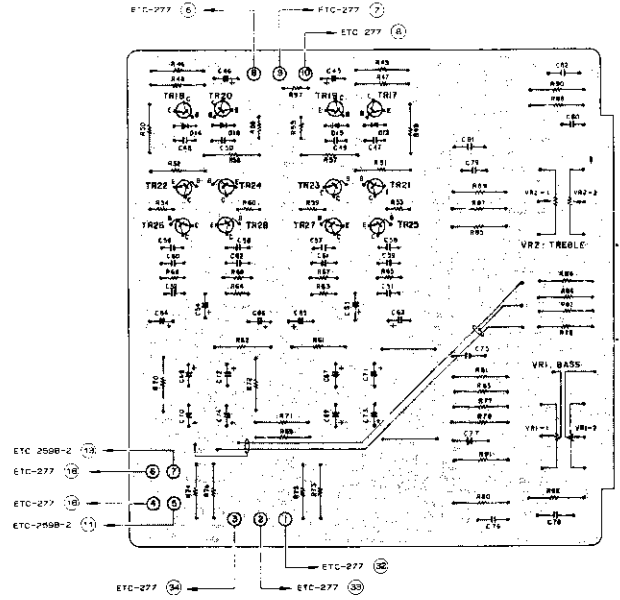
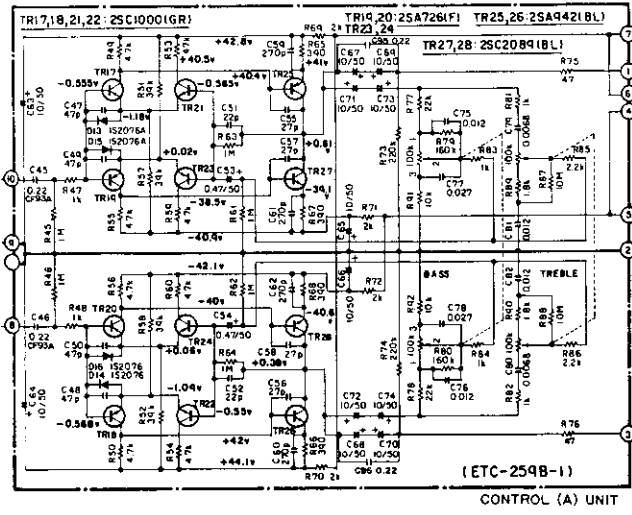


ETC-143 PARTS LIST

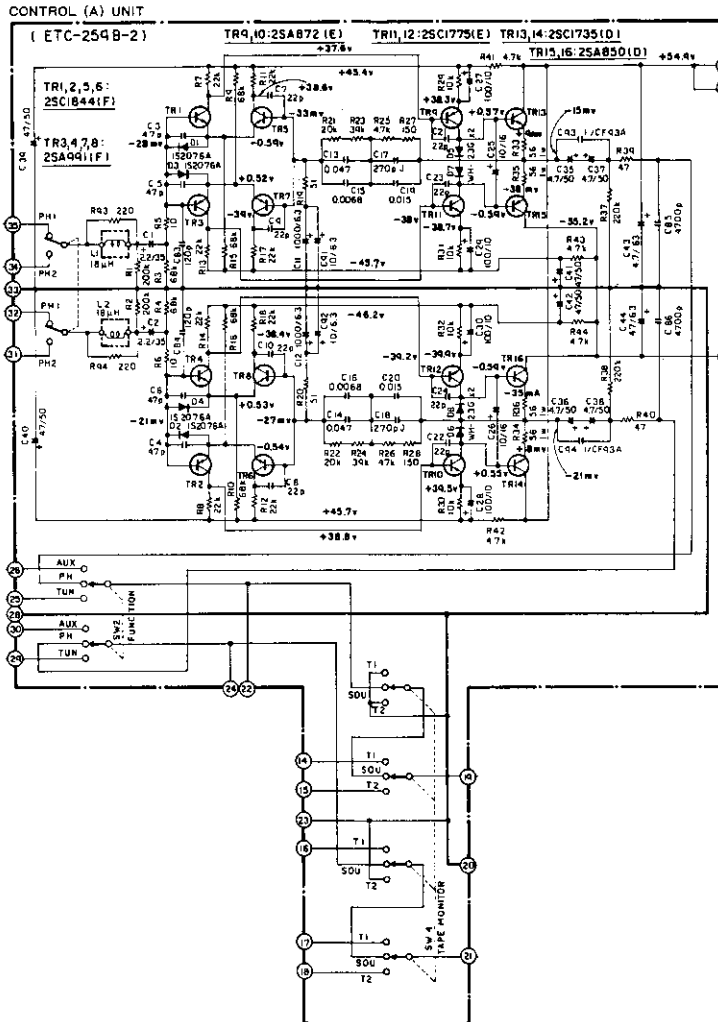
Ref. No.	Part No.	Part Name & Descriptions			
<b>RESISTORS, CAPACITORS</b>					
R1,2	2410378003	470 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
C2,3	2531027000	0.1 μF	+80,-20%	50V	FIXED CERAMIC CAPACITOR
C4,5	2551088003	0.22 μF	±10%	50V	FIXED PLASTIC FILM CAPACITOR
<b>OTHER PARTS</b>					
	2220560001	P.C. OCARD			
	2048009003	1P JACK			FOR PHONO, TUNER, AUX, P.B.
	2048007005	1P JACK			FOR REC1,2
	2040055000	6P CONNECTOR			FOR TUNER, AUX
	2038058019	5P CONNECTOR			FOR TAPE R
	2038058006	5P CONNECTOR			FOR TAPE L
	2038059005	5P CONNECTOR			FOR OHONO 1, 2
	4450033005	WIRE CLAMP BAND			USED 6
	2040046006	5P PIN SOCKET			
	4140113002	INPUT BRACKET			
	MD-5271	P.C.B. SUPOORT			USED 6

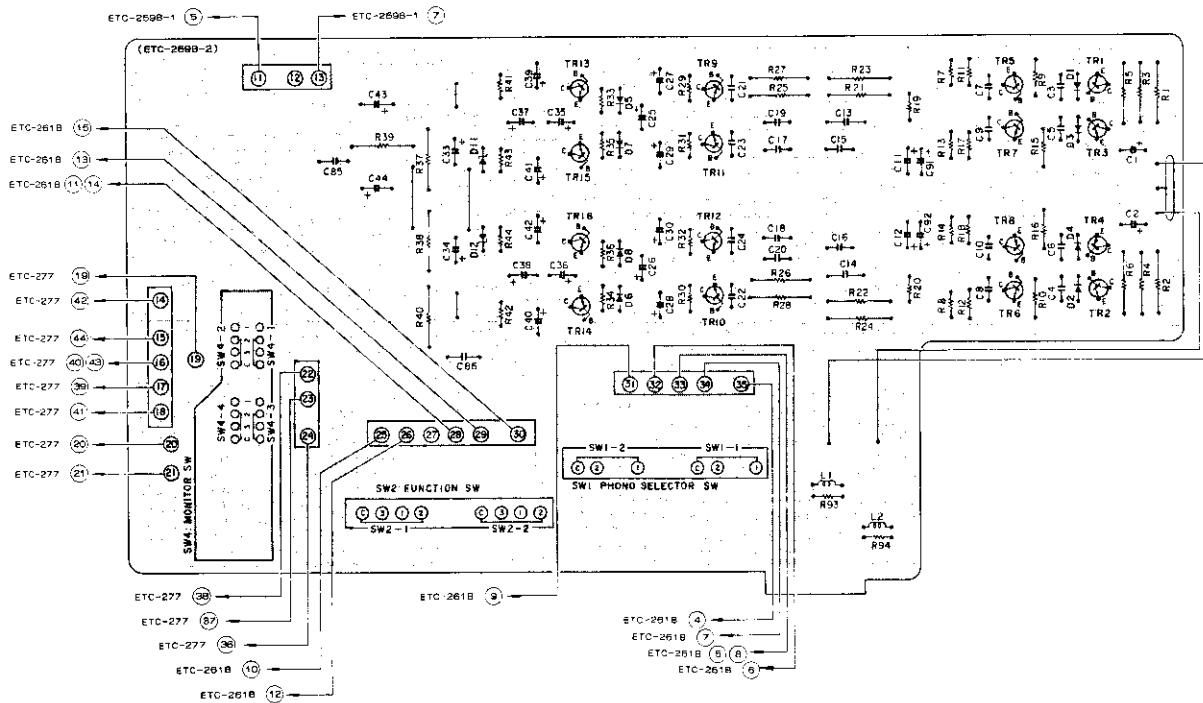
**CONTROL (A) UNIT ETC-259B-1, -2, -3**

**(1) TONE UNIT**

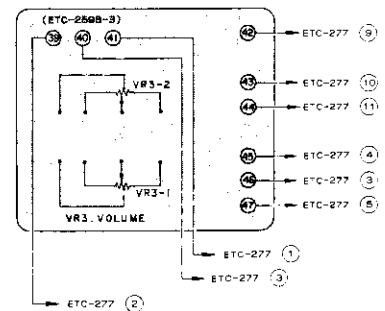
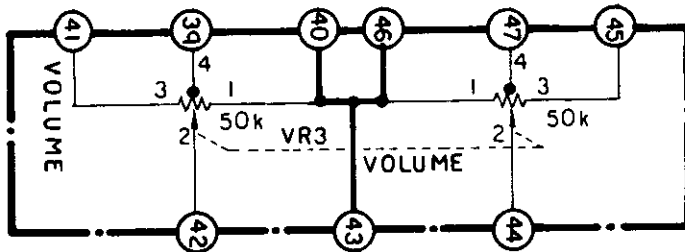


**(2) EQUALIZER AMP UNIT**





(3) VOLUME UNIT



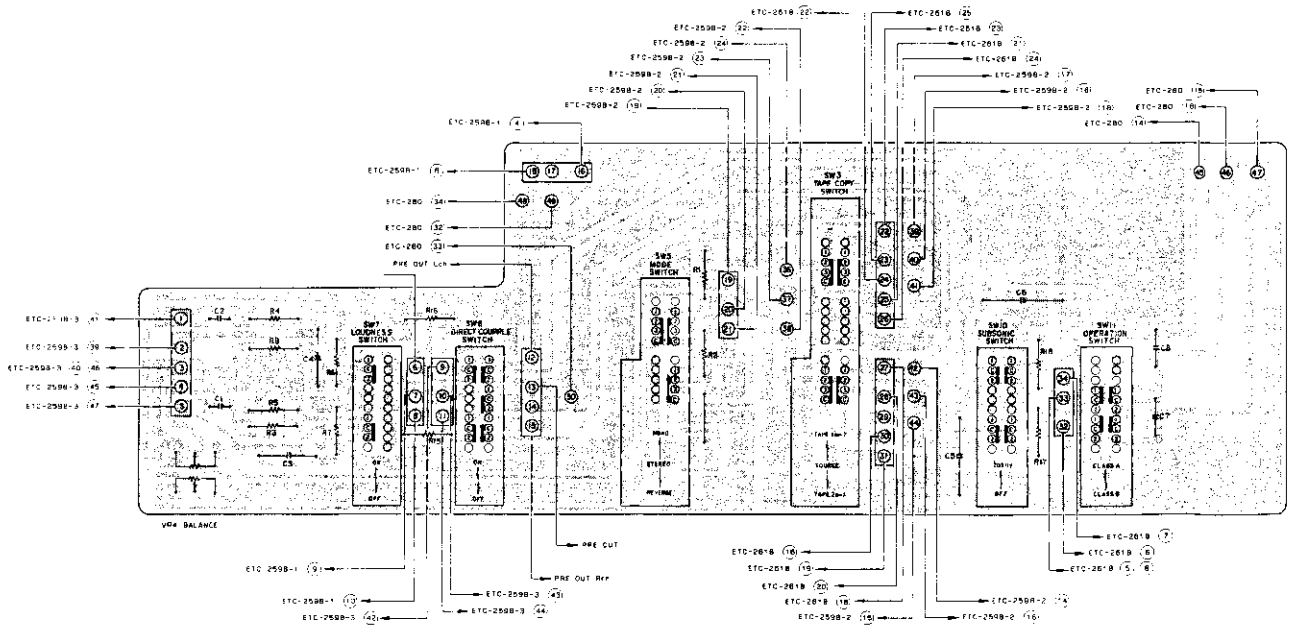
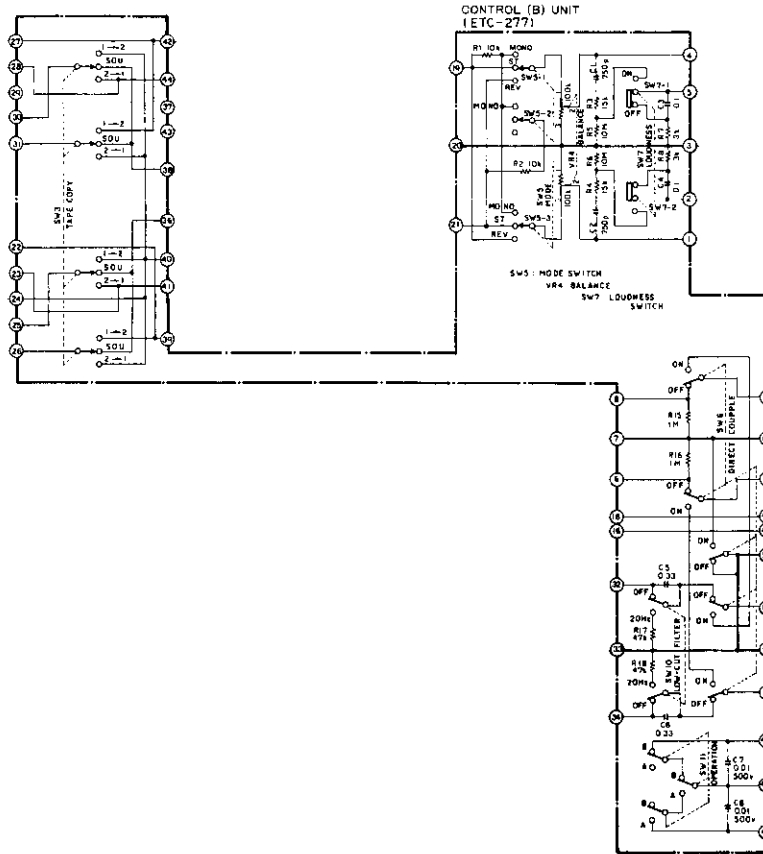
ETC-259B PARTS LIST

Ref. No.	Part No.	Part Name & Descriptions	
<b>SEMI CONDUCTORS</b>			
TR1,2,5,6	2730188009	2SC1844 (F)	TRANSISTOR
TR3,4,7,8	2710095002	2SA991 (F)	TRANSISTOR
TR9,10	2710070001	2SA872 (E)	TRANSISTOR
TR11,12	2730158026	2SC1775 (E)	TRANSISTOR
TR13,14	2730163011	2SC1735 (D)	TRANSISTOR
TR15,16	2710072009	2SA850 (D)	TRANSISTOR
TR17,18,21,22	2730098034	2SC1000 (GR)	TRANSISTOR
TR19,20,23,24	2710087007	2SA726 (F)	TRANSISTOR
TR25,26	2710092005	2SA942 (BL)	TRANSISTOR
TR27,28	2730184003	2SC2089 (BL)	TRANSISTOR
D1,2,3,4, 13,14,15,16	2760049008	1S2076	DIODE
D5,6,7,8	2760171028	HV-23G (YL)	

(Con.)

Ref. No.	Part No.	Part Name & Descriptions			
<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	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	2410321005	2 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R82,82,83,84	2410314009	1 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	39 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 STANDING TYPE
R45,46,61,62	2410765001	1 M ohm	±5%	1/4W	FIXED CARBON FILM STANDING TYPE
R41,42,43,44	2412020058	4.7 k ohm	±5%	1/4W	FIXED CARBON FILM STANDING TYPE
53,54,55,56					
R93,94	2412002005	220 ohm	±5%	1/4W	FIXED CARBON FILM STANDING TYPE
R19,20	2412026052	51 ohm	±5%	1/4W	FIXED CARBON FILM STANDING TYPE
R65,66,67,68	2412002034	390 ohm	±5%	1/4W	FIXED CARBON FILM STANDING TYPE
R59,60	2412020058	4.7 k ohm	±5%	1/4W	FIXED CARBON FILM STANDING TYPE
R29,30,31,32	2412020090	10 k ohm	±5%	1/4W	FIXED CARBON FILM STANDING TYPE
R9,10,15,16	2412003004	6.8 k ohm	±5%	1/4W	FIXED CARBON FILM STANDING TYPE
R63,64	2410773006	1 M ohm	±5%	1/4W	FIXED CARBON FILM STANDING TYPE
R25,26	2412032046	4.7 k ohm	±2%	1/4W	FIXED CARBON FILM STANDING TYPE
R21,22	2412012053	20 k ohm	±2%	1/4W	FIXED CARBON FILM STANDING TYPE
R23,24	2412032059	39 k ohm	±2%	1/4W	FIXED CARBON FILM STANDING TYPE
R87,88	2420203002	10 M ohm	±10%	1/4W	FIXED CARBON COMPOSITION RESISTOR
R7,8,13,14	2452011085	22k ohm	±1%	1/4W	FIXED METAL OXIDE FILM RESISTOR
R11,12,17,18	2412022043	22 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R33,34,35,36	2440026008	56 ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR
<b>CAPACITORS</b>					
C3,4,5,6	2333653003	47pF	±10%	50V	FIXED CERAMIC CAPACITOR
C7,8,9,10	2533649004	22pF	±10%	50V	FIXED CERAMIC CAPACITOR
C55,56,57,58	2533650006	27pF	±10%	50V	FIXED CERAMIC CAPACITOR
C47,48,49,50	2533653003	47pF	±10%	50V	FIXED CERAMIC CAPACITOR
C83,84	2533658008	120pF	±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
C21,22,23,24	2533649004	22pF	±10%	50V	FIXED CERAMIC CAPACITOR
51,52					
C15,16	2551121009	0.0068μF	±5%	50V	FIXED PLASTIC FILM CAPACITOR
C19,20	2554073086	0.015μF		100V	FIXED PLASTIC FILM CAPACITOR
C13,14	2554075000	0.047μF		100V	FIXED PLASTIC FILM CAPACITOR
C85,86	2551068007	0.0047μF	±10%	50V	FIXED PLASTIC FILM CAPACITOR
C79,80	2551121009	0.0068μF	±5%	50V	FIXED PLASTIC FILM CAPACITOR
C75,76,81,82	2551121038	0.012μF	±5%	50V	FIXED PLASTIC FILM CAPACITOR
C77,78	2551121070	0.027μF	±5%	50V	FIXED PLASTIC FILM CAPACITOR
C45,46	2561014012	0.22μF	±10%	250V	FIXED METALIZED PLASTIC FILM CAPACITOR
C93,94,95,96	2561014009	1μF	±10%	250V	FIXED METALIZED PLASTIC FILM CAPACITOR
C1,2	2541031002	22μF	±20%	35V	FIXED TANTALUM CAPACITOR
C91,92	2541003001	10μF	±20%	6.3V	FIXED TANTALUM CAPACITOR
C11,12	2344007004	1000μF		6.3V	FIXED ELECTROLYTIC CAPACITOR
C27,28,29,30	2544010004	100μF		10V	FIXED ELECTROLYTIC CAPACITOR
C25,26	2344015009	10μF		16V	FIXED ELECTROLYTIC CAPACITOR
C63,64,65,66	2544047006	10μF		50V	FIXED ELECTROLYTIC CAPACITOR
C53,54	2544043000	0.47μF		50V	FIXED ELECTROLYTIC CAPACITOR
C35,36,37,38	2544046007	4.7μF		50V	FIXED ELECTROLYTIC CAPACITOR
C67,68,69,70	2544047006	10μF		50V	FIXED ELECTROLYTIC CAPACITOR
71,72,73,74					
C39,40,41,42	2544049004	47μF		50V	FIXED ELECTROLYTIC CAPACITOR
C43,44	2544059036	4.7μF		63V	FIXED ELECTROLYTIC CAPACITOR
<b>OTHER PARTS</b>					
	2220358307	P.C. BOARD			
	2050112069	6P CONNECTOR BASE			
	2050112066	5P CONNECTOR BASE			
	2050112030	3P CONNECTOR BASE			
	4140116106	SHIELD COVER			
	4110145204	CONTROL BRACKET (A)			
SW4	2120114007	ROTARY SWITCH			
SW2	2120115019	FUNCTION SWITCH			
SW1	2120127007	FUNCTION SWITCH			
VR3	2110160100	V3520V30RA503-	50 k ohm x 2	POTENTIOMETER	
VR1	2110161109	V2420V30RE104-	100 k ohm x 2	POTENTIOMETER	
VR2	2110162001	V2420V30RE104-	100 k ohm x 2	POTENTIOMETER	
L1,2	2318017000	INDUCTOR			
	2090008146	JUMPER SHORTLEAD USED 4			
	2090008117	JUMPER SHORTLEAD USED 4			
				P = 5 mm p = 12.5 mm	

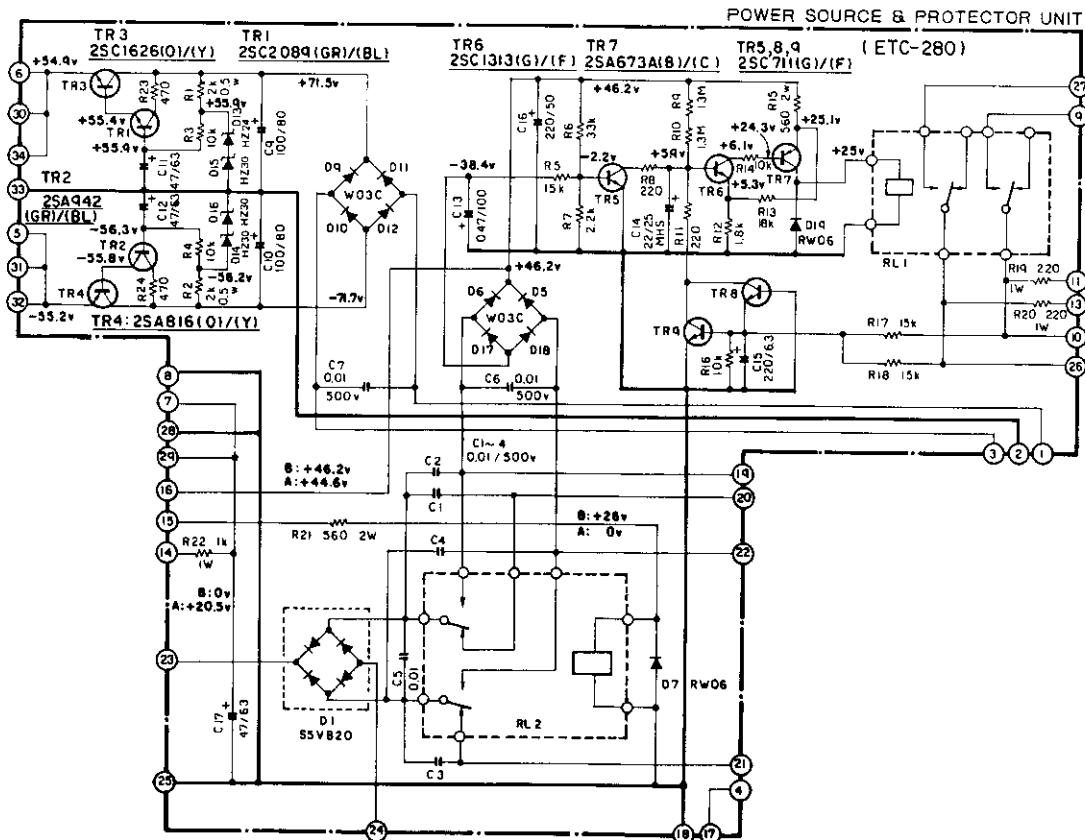
CONTROL (B) UNIT ETC-277

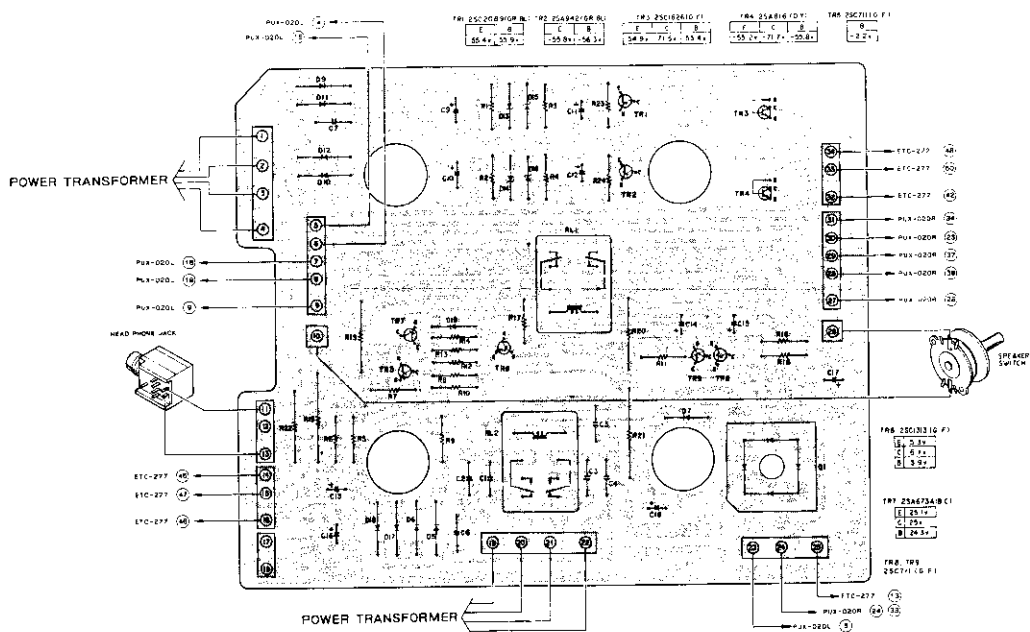


ETC-277 PARTS LIST

Ref. No.	Part No.	Part Name & Descriptions			
<b>RESISTORS</b>					
R7,8	2410325001	3 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R1,2	2410338001	10 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R3,4	2410342000	15 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R17,18	2410365003	130 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R15,16	2410765001	1 M ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R5,6	2420203003	10 M ohm	±10%	1/4W	FIXED CARBON COMPOSITION RESISTOR
<b>CAPACITORS</b>					
C3,4	2554081081	0.1μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
C5,6	2554082064	0.22μF	±5%	100V	FIXED PLASTIC FILM CAPACITOR
C1,2	2556096003	750pF	±5%	50V	FIXED PLASTIC FILM CAPACITOR
C7,8	2531053003	0.01μF	+100,-0%	500V	FIXED CERAMIC CAPACITOR
<b>OTHER PARTS</b>					
	2220421108	P.C. BOARD			
	2050112030	3P CONNECTOR BASE	USED 5		
	2050112056	5P CONNECTOR BASE	USED 3		
	2050112043	4P CONNECTOR BASE	USED 1		
	2038060007	5P CONNECTOR			
	2034089066	3P CONNECTOR			
	2034114009	3P CONNECTOR			
	2034114012	3P CONNECTOR			
	4110146106	CONTROL BRACKET (B)			
SW7	2124110007	LEVER SWITCH		FOR LOUDNESS	
SW5,11	2124110010	LEVER SWITCH		FOR OPER, DIR, COUP.	
	4700009006	CROSS PAN SCREW WITH S. WASHER 3 x 6	USED 8		
VR4	2110163107	VR1620V25RW104K	POTENTIOMETER 100 k ohm x 2 FOR BALANCE		
SW5	2120117004	ROTARY SWITCH		FOR MODE	
SW3	2120118003	ROTARY SWITCH		FOR TAPE C	
	2090008117	JUMPER SHORT LEAD	USED 1	P = 12.5 mm	
	4770064107	FIXING SCREW	USED 2		
	4730353036	TAPPING SCREW (2) 3 x 6	USED 2		

POWER SOURCE AND PROTECTOR UNIT ETC-280



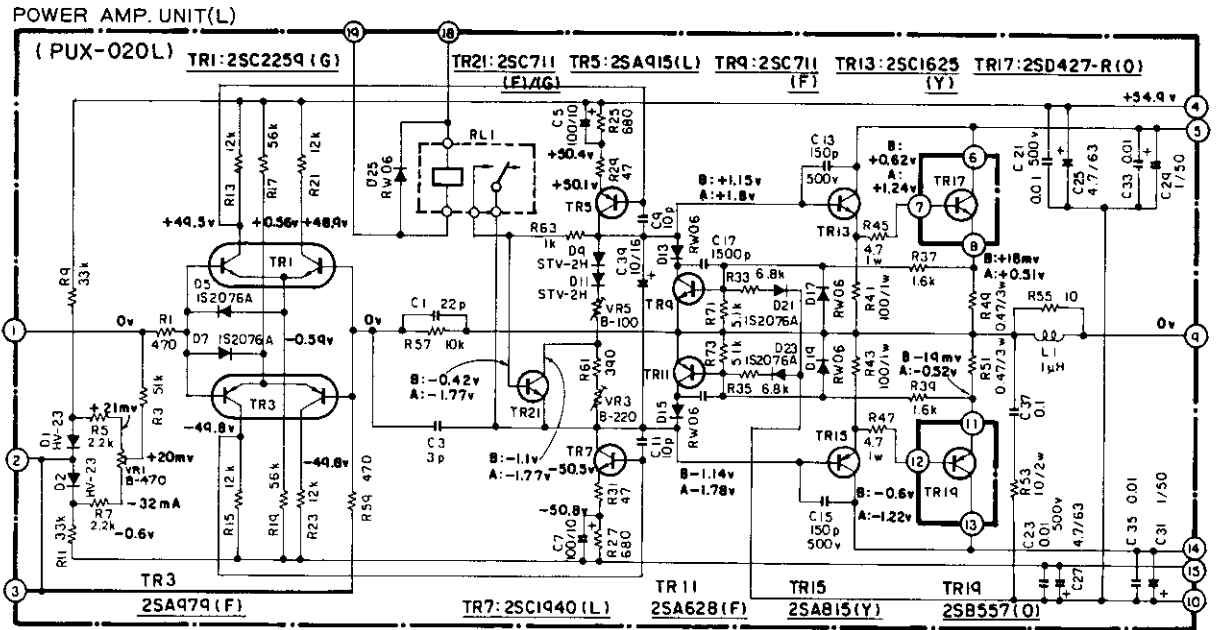


**ETC-280 PARTS LIST**

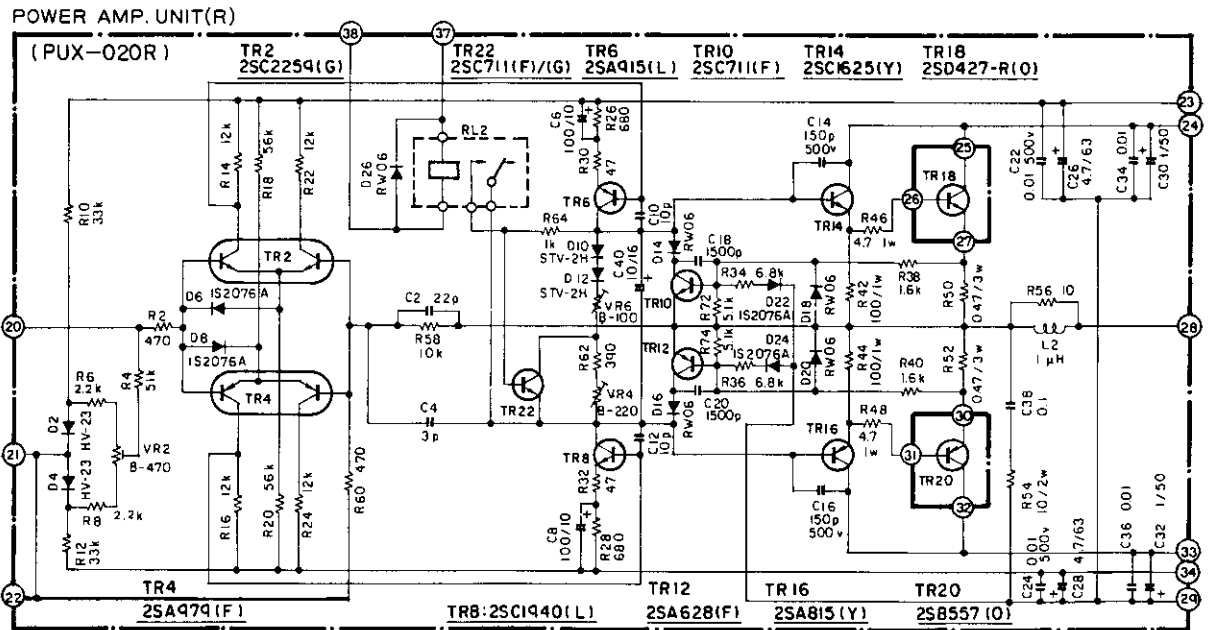
Ref. No.	Part No.	Part Name & Descriptions			
<b>SEMI CONDUCTORS</b>					
TR1	2730184016 or	2SC2089 (GR)			TRANSISTOR
TR1	2730184003	2SC2089 (BL)			TRANSISTOR
TR2	2710092018 or	2SA942 (GR)			TRANSISTOR
TR2	2710092005	2SA942 (BL)			TRANSISTOR
TR3	2730177010 or	2SC1026 (D)			TRANSISTOR
TR3	2730177007	2SC1026 (Y)			TRANSISTOR
TR4	2710088019 or	2SA816			TRANSISTOR
TR4	2710088006	2SA816 (Y)			TRANSISTOR
TR5,8,9	2730064068 or	2SC711 (G)			TRANSISTOR
TR5,8,9	2730064055	2SC711 (F)			TRANSISTOR
TR6	2730171016 or	2SC1313 (G)			TRANSISTOR
TR6	2730171003	2SC1313 (F)			TRANSISTOR
TR7	2710040004 or	2SA673A (B)			TRANSISTOR
TR7	2710040057	2SA673A (C)			TRANSISTOR
D1	2760195004	S5VB20			DIODE
D5,6,9,10, 11,12,17,18	2760191008	W03C			DIODE
D7,19	2760214008	RW06			DIODE
D13,17	2760220005	HZ-24			DIODE
D15,16	2760224001	HZ-30			DIODE
<b>RESISTORS</b>					
R23,24	2410306004	470 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R8,11	2410298002	220 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R7	2410322004	2.2 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R12	2410320006	1.8 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R3,4,14,16	2410338001	10 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R5,17,18	2410342000	15 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R6	2410350005	33 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R13	2410344008	18 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R9,10	2410768008	1.3 M ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R1,2	2410192001	2k ohm	±5%	1/2W	FIXED CARBON FILM RESISTOR
R22	2440041009	1k ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR
R19,20	2440033004	220 ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR
R15,21	2440095000	500 ohm	±5%	2W	FIXED METAL OXIDE FILM RESISTOR
<b>CAPACITORS</b>					
C15	2544004007	220µF		6.3V	FIXED ELECTROLYTIC CAPACITOR
C14	2549005027	22µF	±20%	25V	FIXED ELECTROLYTIC CAPACITOR
C16	2544051005	220µF		50V	FIXED ELECTROLYTIC CAPACITOR
C1,12,17	2544059023	47µF		63V	FIXED ELECTROLYTIC CAPACITOR
C13	2544060038	0.47µF		100V	FIXED ELECTROLYTIC CAPACITOR
C9,10	2544063006	100µF		80V	FIXED ELECTROLYTIC CAPACITOR
C1,2,3,4,5,6,7	2531053003	0.01µF	+100,-0%	500V	FIXED CERAMIC CAPACITOR
<b>OTHER PARTS</b>					
RL-1	2220419000	P.C. BOARD			
RL-2	2050112027	2P CONNECTOR BASE			
	2050112030	3P CONNECTOR BASE			
	2050112056	5P CONNECTOR BASE			
	EP-6071	BASE PIN		USED 13	
	2140016020	RELAY			
	2140031005	RELAY			

POWER AMPLIFIER UNIT PUX-020 (L) (R)

(L)



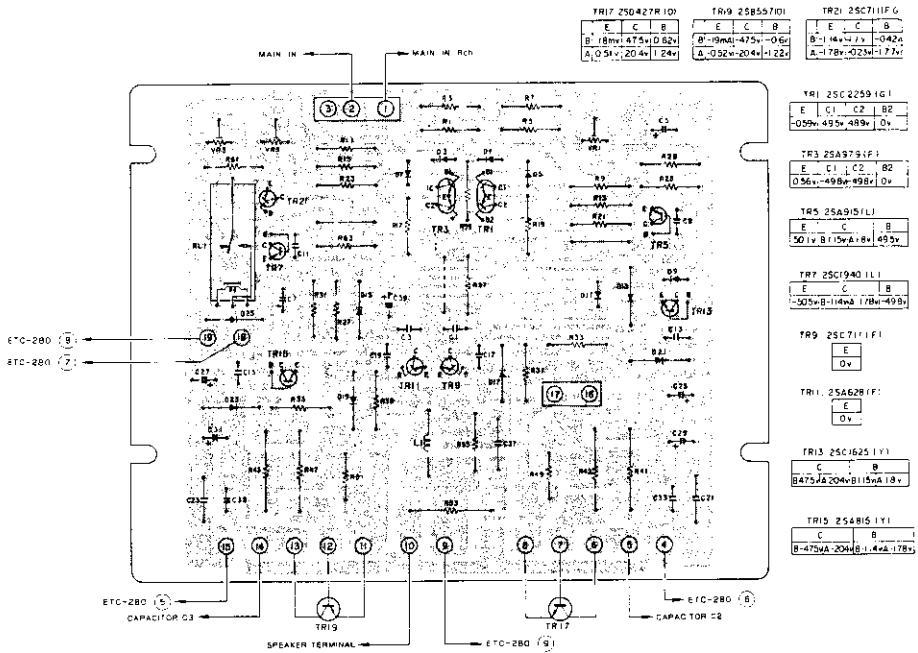
(R)



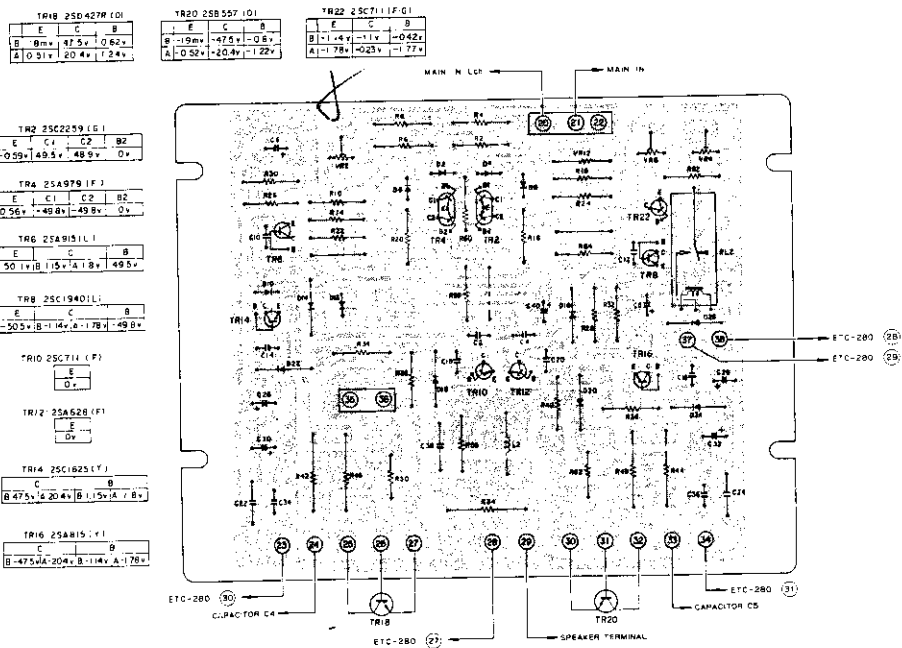


PUX-020 (L) (R)

(L)



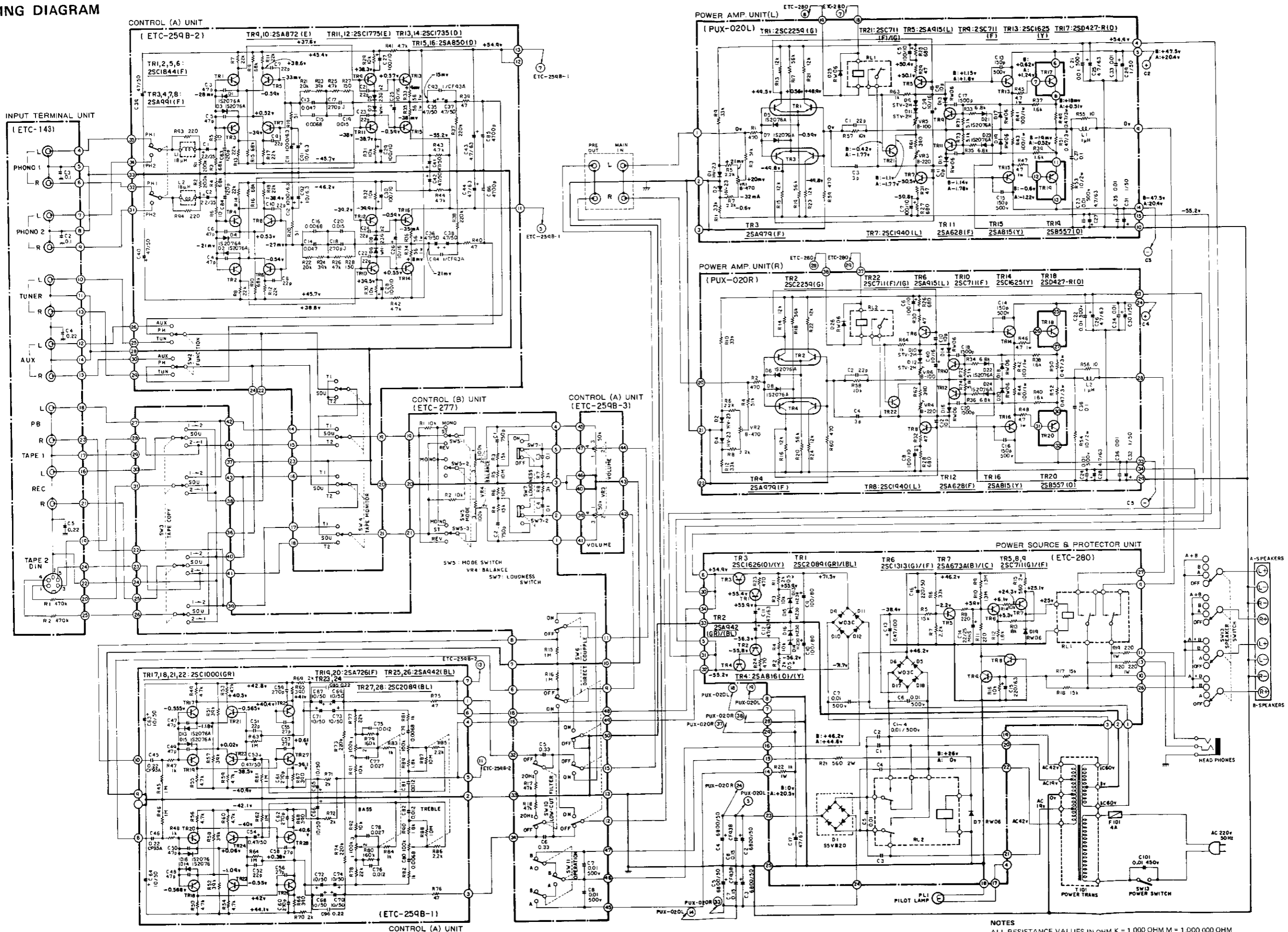
(R)



## PUX-020 PARTS LIST

Ref. No.	Part No.	Part Name & Descriptions			
<b>SEMI CONDUCTORS</b>					
TR1,2	2730191009	2SC2259 (G)			TRANSISTOR
TR3,4	2710098012	2SA979 (F)			TRANSISTOR
TR1,6	2710093004	2SA915 (L)			TRANSISTOR
TR7,8	2730186001	2SC1940 (L)			TRANSISTOR
TR9,10	2730064055	2SC711 (F)			TRANSISTOR
TR11,12	2710033022	2SA628 (F)			TRANSISTOR
TR13,14	2730159012	2SC1625 (Y)			TRANSISTOR
TR15,16	2710068000	2SA815 (Y)			TRANSISTOR
TR21,22	2730064055 or	2SC711 (F)			TRANSISTOR
TR21,22	2730064068	2SC711 (G)			TRANSISTOR
D1,2,3,4	2760171028	HV-23G (YL)			DIODE
D5,6,7,8	2760049011	1S2076A			DIODE
D9,10,11,12	2760217005	STV-2H			DIODE
D13,14,15,16	2760214008	RW06			DIODE
17,18,19,20					
D21,22,23,24	2760049011	1S2076A			DIODE
D25,26	2760214008	RW06			DIODE
<b>RESISTORS</b>					
R55,56	2410266005	10 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R29,30,31,32	2410282005	47 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R61,62	2410304006	390 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R1,2,59,60	2410306004	470 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R25,26,27,28	2410310003	680 ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R63,64	2410314009	1 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R37,38,39,40	2410319004	1.6 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R5,6,7,8	2410322004	2.2 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R71,72,73,74	2410331008	5.1 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R33,34,35,36	2410334005	6.8 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R57,58	2410338001	10 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R13,14,15,16	2410340002	12 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R9,10,11,12	2410350000	33 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R3,4	2410355000	51 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R17,18,19	2410356009	56 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R21,22,23,24	2410340002	12 k ohm	±5%	1/4W	FIXED CARBON FILM RESISTOR
R45,46,47,48	2440013008	4.7 ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR
R41,42,43,44	2440029005	100 ohm	±5%	1W	FIXED METAL OXIDE FILM RESISTOR
R53,54	2432020009	10 ohm	±10%	2W	FIXED WIRE WOUND RESISTOR
R49,50,51,52	2430023008	0.47 ohm	±5%	3.15W	FIXED WIRE WOUND RESISTOR
<b>CAPACITORS</b>					
C3,4	2533596005	3pF	±0.25pF	50V	FIXED CERAMIC CAPACITOR
C1,2	2533611003	22pF	±5%	50V	FIXED CERAMIC CAPACITOR
C9,10,11,12	2534269001	10pF	±0.5pF	500V	FIXED CERAMIC CAPACITOR
C13,14,15,16	2534327008	150pF	±10%	500V	FIXED CERAMIC CAPACITOR
C17,18,19,20	2531005006	0.0015μF	±10%	50V	FIXED CERAMIC CAPACITOR
C33,34,35,36	2531024003	0.01μF	+80,-20%	50V	FIXED CERAMIC CAPACITOR
C21,22,23,24	2531053003	0.01μF	+100,-0%	500V	FIXED CERAMIC CAPACITOR
C37,38	2551084007	0.1μF	±10%	50V	FIXED PLASTIC FILM CAPACITOR
C5,6,7,8	2544010004	100μF		10V	FIXED ELECTROLYTIC CAPACITOR
C39,40	2344015009	10μF		16V	FIXED ELECTROLYTIC CAPACITOR
C29,30,31,32	2544044009	1μF		50V	FIXED ELECTROLYTIC CAPACITOR
C25,26,27,28	2544059036	4.7μF		63V	FIXED ELECTROLYTIC CAPACITOR
<b>OTHER PARTS</b>					
	2220420002	P.C. BOARD			
	2220420015	P.C. BOARD			
	2050087026	2P TERMINAL		USED 2	
	2050112030	3P CONNECTOR BASE		USED 2	
VR3,4	2116003025	V10QB221			VARIABLE RESISTOR 220 ohm
VR5,6	2116003009	V10QB101			VARIABLE RESISTOR 100 ohm
VR1,2	2116003041	V10QB471			VARIABLE RESISTOR 470 ohm
	4140116105	SHIELD COVER			
	2090008117	JUMPER SHORT LEAD	P = 12.5 mm	USED 6	

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.