

Service Manual

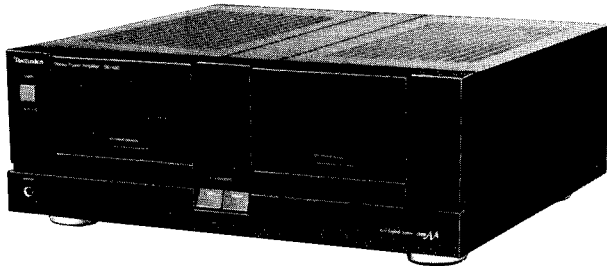
Stereo Power Amplifier

Amplifier

SE-A50

Color

(K).....Black Type



SPECIFICATIONS

(DIN 45 500)

■ AMPLIFIER SECTION

20 Hz ~ 20 kHz continuous power output
stereo operation both channels driven
For United Kingdom

2 x 115 W (8Ω)
2 x 160 W (4Ω)
2 x 125 W (8Ω)
2 x 175 W (4Ω)

For others

monaural (BTL) operation
For United Kingdom
For others

300 W (8Ω)
350 W (8Ω)

40 Hz ~ 16 kHz continuous power output (IEC)
stereo operation both channels driven
For United Kingdom

2 x 120 W (8Ω)
2 x 160 W (4Ω)
2 x 130 W (8Ω)
2 x 185 W (4Ω)

For others

monaural (BTL) operation
For United Kingdom
For others

320 W (8Ω)
370 W (8Ω)

1 kHz continuous power output (DIN)
stereo operation both channels driven
For United Kingdom

2 x 125 W (8Ω)
2 x 180 W (4Ω)
2 x 135 W (8Ω)
2 x 210 W (4Ω)

For others

monaural (BTL) operation
For United Kingdom
For others

360 W (8Ω)
420 W (8Ω)

Total harmonic distortion
rated power at 20 Hz ~ 20 kHz
stereo operation

0.002% (8Ω)
0.005% (4Ω)
0.005% (8Ω)
0.001% (8Ω)
0.0005% (8Ω)
0.001% (4Ω)
0.003% (4Ω)

monaural (BTL) operation
half power at 20 Hz ~ 20 kHz
half power at 1 kHz
-26 dB power at 1kHz
50 mW power at 1kHz

Intermodulation distortion
rated power at 250 Hz:8 kHz = 4:1, 4Ω
rated power at 60 Hz:7 kHz = 4:1, SMPTE, 8Ω

0.002%
0.002%

TIM (Transient Intermodulation Distortion) unmeasurably small
Power bandwidth both channels driven, -3dB 5 Hz ~ 80kHz (0.02%)
Residual hum and noise 0.3 mV
Damping factor 100 (8Ω), 50 (4Ω)
Input sensitivity and impedance 1 V/47 kΩ
S/N 105 dB (1/6 dB, IHF, A)

Frequency response 20 Hz ~ 20 kHz, +0 dB, -0.1 dB
0.8 Hz ~ 150 kHz, -3 dB
Channel balance, 250 Hz ~ 6,300 Hz ±1 dB
Channel separation, 1 kHz 80 dB

Headphones output level and impedance 7/0 mV/330 Ω

Load impedance
stereo operation
MAIN or REMOTE 4 Ω ~ 16 Ω
MAIN and REMOTE 8 Ω ~ 16 Ω
monaural
MAIN or REMOTE 8 Ω ~ 16 Ω
MAIN and REMOTE 16 Ω

■ GENERAL

Power consumption
For United Kingdom 900 W
For others 950 W

Power supply
For continental Europe AC 50 Hz/60 Hz, 220 V
For United Kingdom, Australia and others. AC 50 Hz/60 Hz,
110 V/127 V/220 V/240 V

Dimensions (W x H x D) 430 x 161 x 408 mm
(16-15/16" x 6-11/32" x 16-1/16")
Weight 16.6 kg (36.4 lb.)

Weight

Notes:

- Specifications are subject to change without notice. Weight and dimensions are approximate.
- Total harmonic distortion is measured by the digital spectrum analyzer (H.P. 3045 system).

Technics

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■ BEFORE REPAIR AND ADJUSTMENT

- (1) Turn off the power supply. Using a 10Ω, 10W resistor, shortcircuit both ends of power supply capacitors (C609,C610)in order to discharge the voltage.
- (2) Before turning on the power switch of the unit.
 - A. Connect the voltage controller to the primary side.
 - B. Connect the AC ampere meter to the primary side or connect the DC voltage meter to the "±B" circuit of the secondary side.
 - C. Turn the VR of ICQ(VR401,VR402,VR551 and VR552)to minimum(counterclockwise).
 - D. After setting the output to zero of the voltage contoller,turn on the power switch of the unit.
And increase the output of voltage controller gradually.
Then, check carefully whether the current value of primary side become more than following value or whether the DC voltage of secondary side is increasing slowly.
 - E. If the value of current is increasing unusually or the DC voltage is not increasing,lower the output level of voltage contoller immediately.
 - The current value of the primary side at no signal. (Confirm the power supply voltage of each area and provided voltage of the unit.)

Power supply voltage	AC110V	AC127V	AC220V	AC240V
Consumed current 50/60Hz	400 ~ 850mA	390 ~ 840mA	200 ~ 450mA	180 ~ 430mA

■ PROTECTION CIRCUITRY

The protection circuitry of the amplifier may have operated if either of the following conditions is noticed:

- No sound is heard when the power is turned on.
- Sound stops during a performance.

The function of this circuitry is to prevent circuitry damage if, for example, the positive and negative speaker connection wires are "shorted" , or if speaker systems with an impedance less than the indicated rated impedance of the amplifier are used.

If this occurs, follow the procedure outlined below:

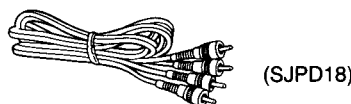
1. Turn off the power.
2. Determine the cause of the problem and correct it.
3. Turn on the power once again.

Note:

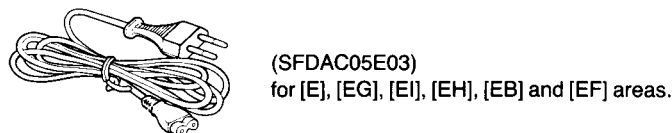
When the protection circuitry functions, the unit will not operate unless the power is first turned off and then on again.

■ ACCESSORIES

- Stereo connection cable1



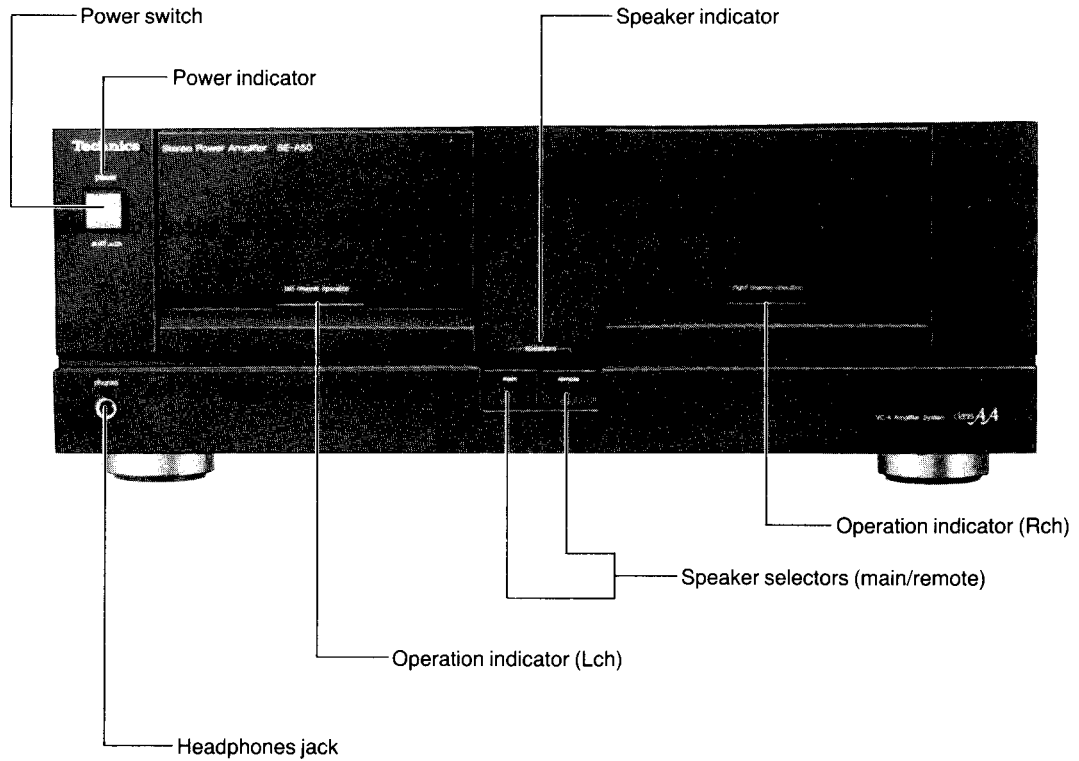
- AC power supply cord..... 1



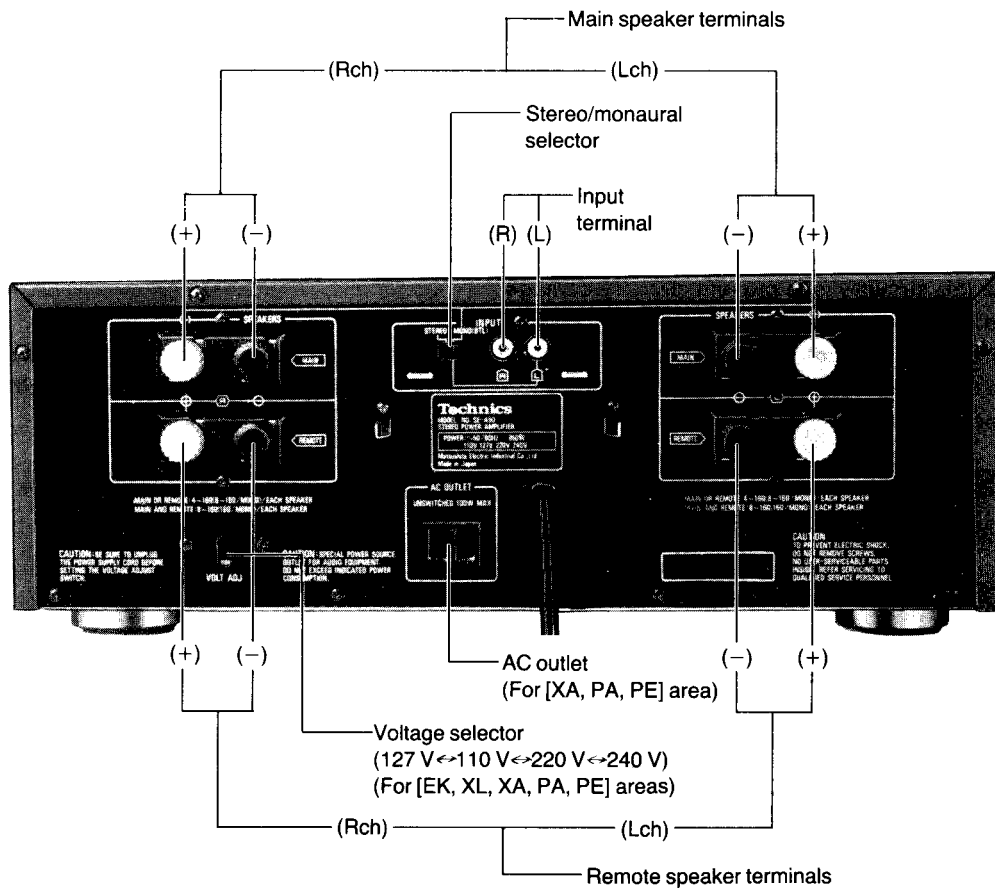
For United Kingdom and some areas,the power cord is directly attached to the unit.
Configuration of AC power supply cord differs according to area.

LOCATION OF CONTROLS

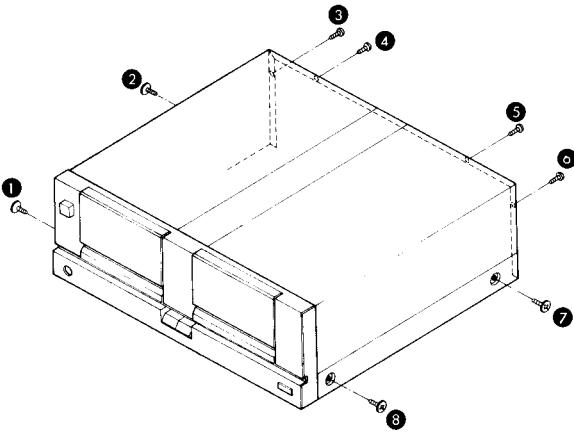
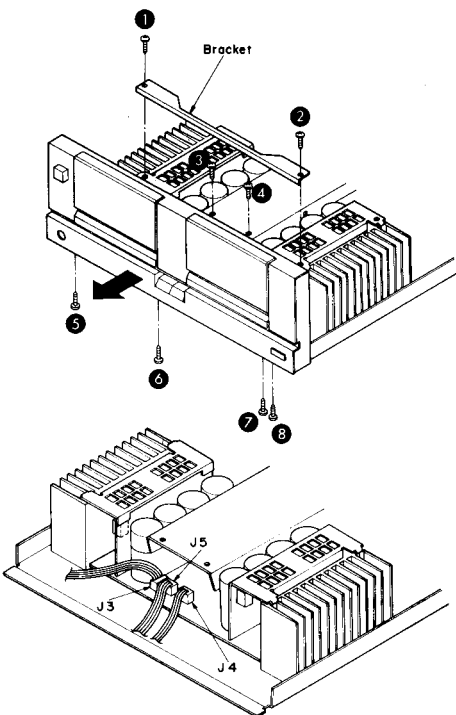
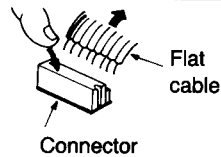
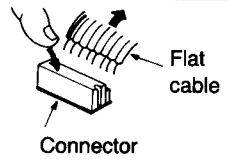
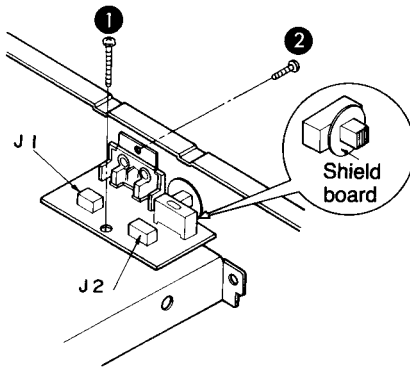
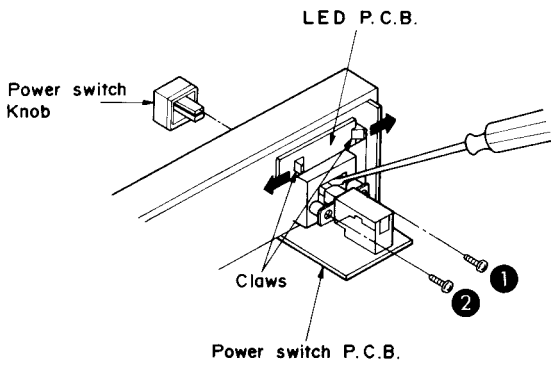
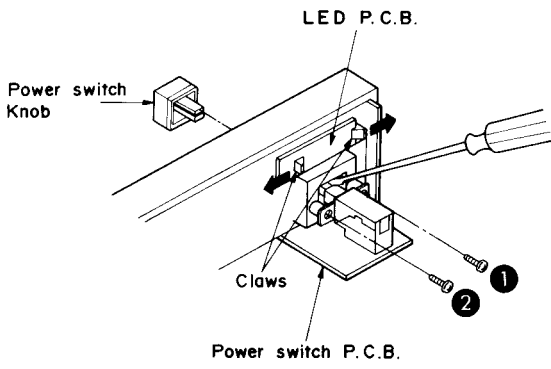
•Front

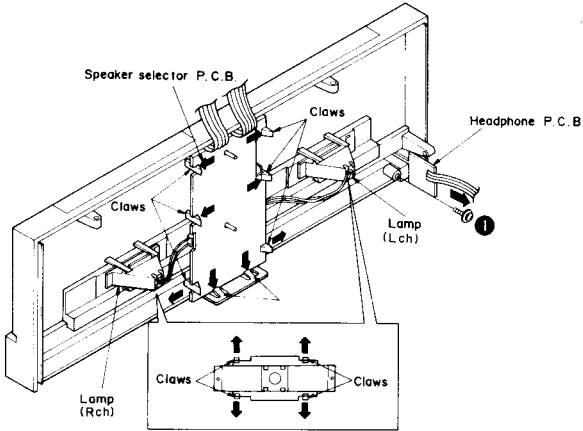
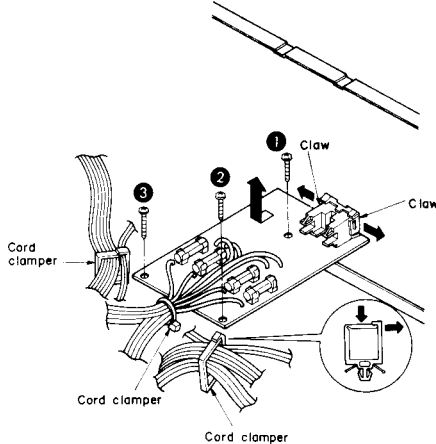
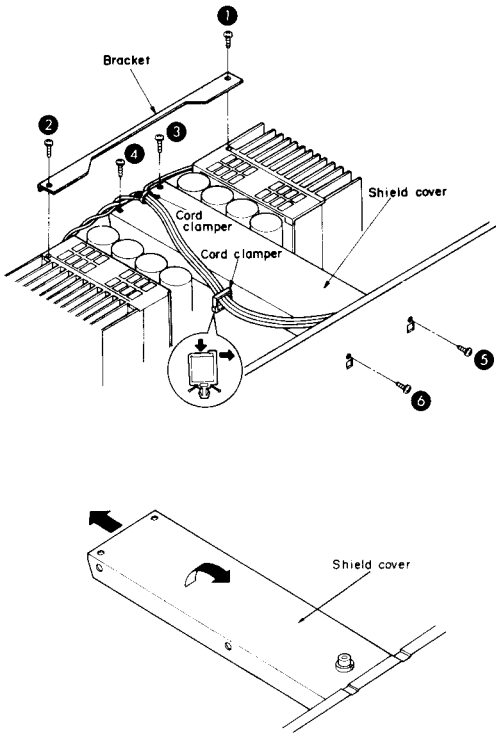
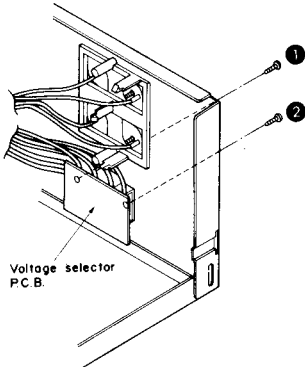
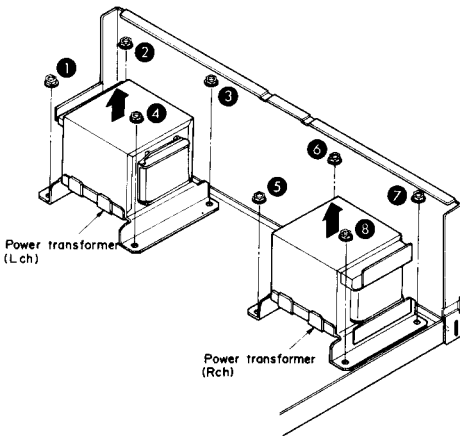


•Rear



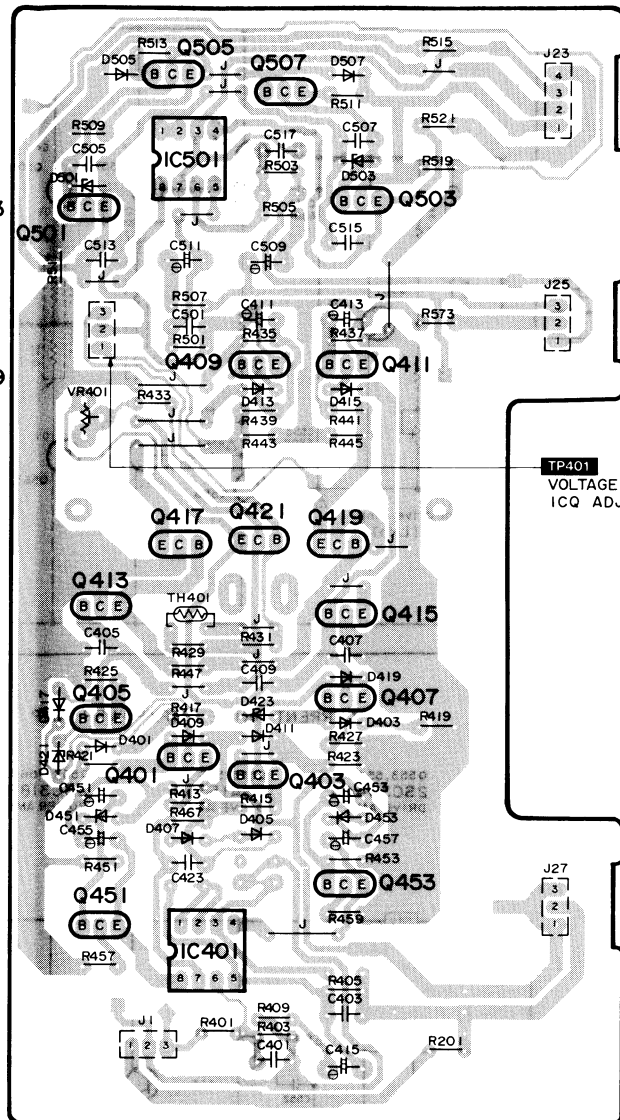
DISASSEMBLY INSTRUCTIONS

Ref. No. 1	How to remove the cabinet	Ref. No. 4	How to remove the front panel
Procedure 1	● Remove the 8 screws (①~⑧).	Procedure 1→4	<ol style="list-style-type: none"> 1. Remove the 2 screws (①, ②) and remove the bracket. 2. Remove the 6 screws (③~⑧). 3. Remove the front panel in the direction of the arrow. 4. Pull out the 1 connector (J3). 5. Pull out the 2 flat cables (J4, J5).
			
Ref. No. 2	How to remove the Input terminal P.C.B.		
Procedure 1→2	<ol style="list-style-type: none"> 1. Remove the 2 connectors (J1, J2). 2. Remove the 2 screws (①, ②). 	How to remove the flat cable Pull out the flat cable while pressing the connector 	
		Ref. No. 5	
Ref. No. 3	How to remove the power switch P.C.B and LED P.C.B.	Procedure 1→4→5	
Procedure 1→3	<ol style="list-style-type: none"> 1. Remove the power switch knob by pushing it from behind the front panel. 2. Remove the 2 screws (①, ②). 3. Remove the power switch P.C.B. 4. Release the 2 claws. 5. Remove the LED P.C.B. 	<ol style="list-style-type: none"> 1. Remove the 5 screws (①~⑤). 2. Remove the front shield case in the direction of the arrow. 	
			

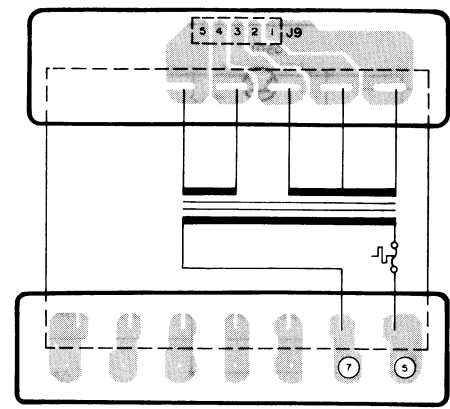
<p>Ref. No. 6</p>	<p>How to remove the headphone P.C.B., speaker selector P.C.B. and lamp</p>	<p>Ref. No. 8</p>	<p>How to remove the power source P.C.B</p>
<p>Procedure 1→4→5→6</p>	<ol style="list-style-type: none"> 1. Release the 8 claws and remove the speaker selector P.C.B. 2. Remove the 1 screw (1) and remove the headphone P.C.B. 3. Push the 8 claws and remove the 2 lamps (Lch, Rch). 	<p>Procedure 1→2→7→8</p>	<ol style="list-style-type: none"> 1. Remove the cord clammer. 2. Remove the 3 screws (1~3). 3. Release the 2 claws and remove the power source P.C.B. in the direction of the arrow. 
<p>Ref. No. 7</p>	<p>How to remove the Shield cover</p>	<p>Ref. No. 9</p>	<p>How to remove the voltage selector P.C.B.</p>
<p>Procedure 1→2→7</p>	<ol style="list-style-type: none"> 1. Remove the 2 screws (1, 2) and remove the bracket. 2. Remove the cord clammer. 3. Remove the 4 screws (3~6). 4. Remove the shield cover in the direction of the arrow. 	<p>Procedure 1→2→7→9</p>	<p>● Remove the 2 screws (1, 2)</p> 
<p>Ref. No. 10</p>	<p>How to remove the power transformer</p>	<p>Ref. No. 10</p>	<p>How to remove the power transformer</p>
<p>Procedure 1→10</p>	<ol style="list-style-type: none"> 1. Remove the 4 nuts (1~4). 2. Remove the power transformer (Lch). 3. Remove the 4 nuts (5~8). 4. Remove the power transformer (Rch). 	<p>Procedure 1→10</p>	<ol style="list-style-type: none"> 1. Remove the 4 nuts (1~4). 2. Remove the power transformer (Lch). 3. Remove the 4 nuts (5~8). 4. Remove the power transformer (Rch).

Ref. No. 11	How to remove the voltage control amp P.C.B.		
Procedure 1→2→7→11	<ol style="list-style-type: none"> 1. Remove the 1 screw (1). 2. Remove the 2 nylon rivet (2, 3). 3. Remove the shield plate. 4. Pull out the voltage control amp P.C.B. (Lch) in the direction of the arrow. 5. Remove the 1 screw (4). 6. Remove the 2 nylon rivet (5, 6). 7. Remove the shield plate. 8. Pull out the voltage control amp, P.C.B. (Rch) in the direction of the arrow. 		
Ref. No. 12	How to remove the main P.C.B.	Ref. No. 13	How to remove the power transistor
Procedure 1→2→7 →11→12	<ol style="list-style-type: none"> 1. Remove the 10 screws (1~10). 2. Remove the 4 nuts (11~14). 3. Pull out the 1 connector (J3). 4. Remove the 2 flat cables (J4, J5). 	Procedure 12→13	<ol style="list-style-type: none"> 1. Unsolder the power transistor. 2. Remove the 4 screws (1~4).
	<p>The figure below shows the power transistor on the right side. Remove the other transistor on the left in the same way.</p> <p>●When mounting the power transistor, apply silicon thermal compound (SZZ0L15) to the rear of the power transistor.</p>		
		Ref. No. 14	How to remove the speaker terminal
	Procedure 1→10→14	<ol style="list-style-type: none"> 1. Remove the 2 screws (1, 2). 2. Remove the speaker terminal (Lch). 3. Remove the 2 screws (3, 4). 4. Remove the speaker terminal (Rch). 	

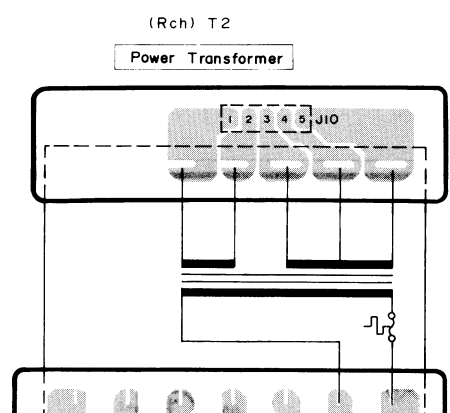
B VOLTAGE CONTROL AMP (Lch) P.C.B.



TP401
VOLTAGE CONTROL AMP
ICQ ADJ. POINT (Lch)

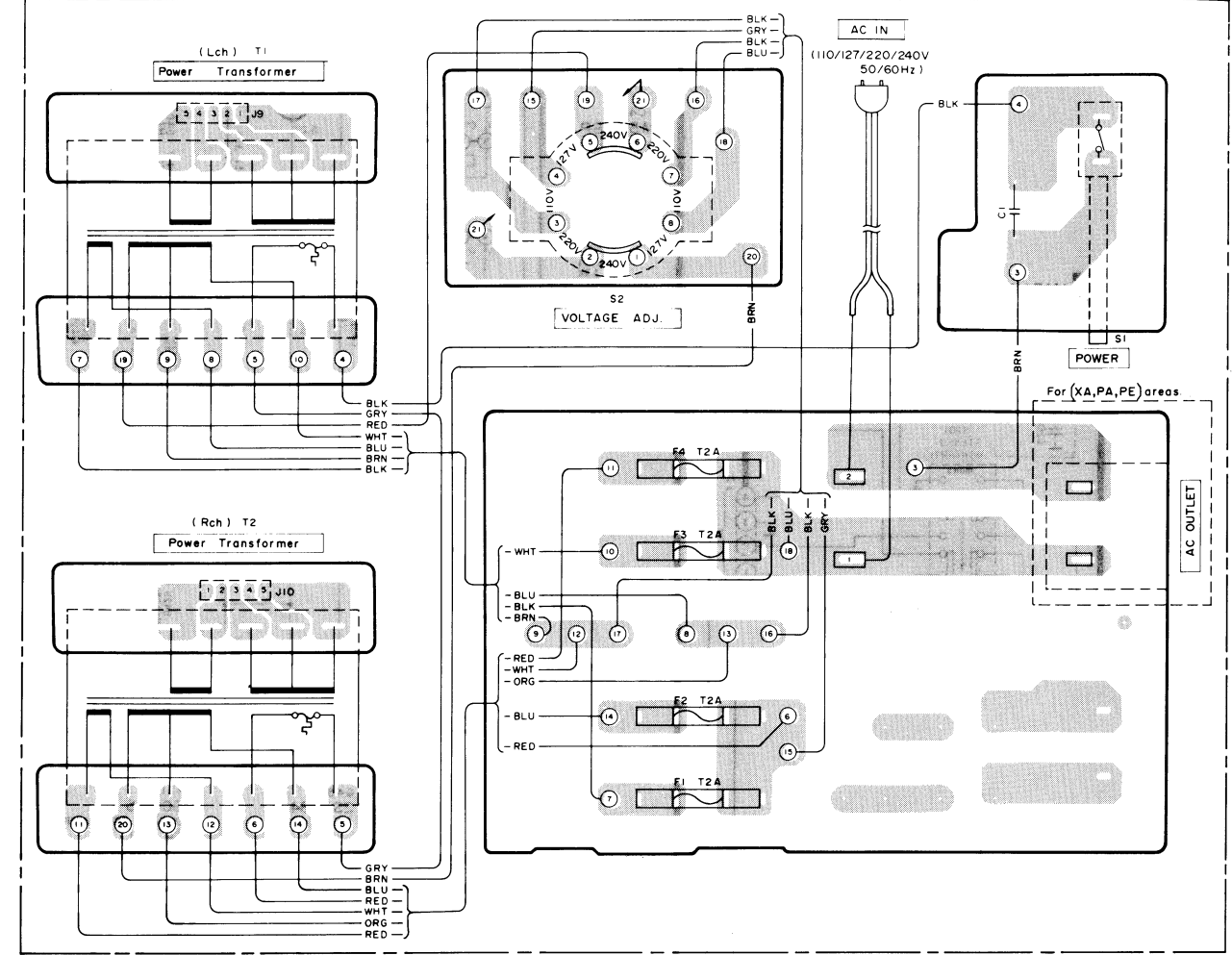


(Lch) T1
Power Transformer



(Rch) T2
Power Transformer

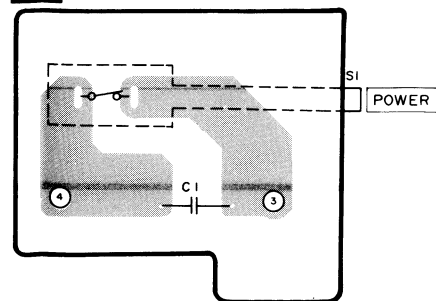
Power Source For (EK, XL, XA, PA, PE) areas



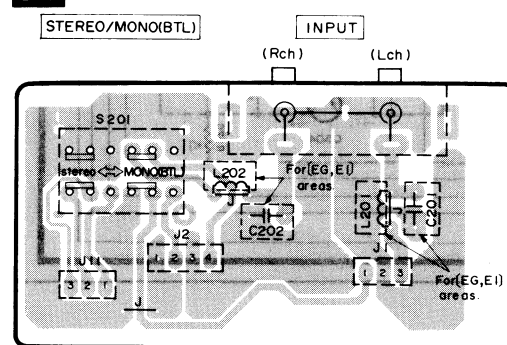
■ TERMINAL GUIDE OF TRANSISTORS, DIODES AND IC'S

<p>M5219P M5238P MN4027B</p> <p>8 pin 16 pin</p>	<p>AN78M05</p> <p>1. V in 2. GND 3. V out</p>	<p>2SA684, 2SA992 2SA1123, 2SB1036 2SC1384, 2SC1815 2SC2631, 2SD1512 2SC3112, 2SB621</p>	<p>MA29WA, MA165 MA167</p> <p>Anode Cathode Ca → A</p>	<p>LN846RP-C</p> <p>Anode Cathode Ca → A</p>
	<p>AN7073</p> <p>1 2 3 4 5 6 7 8 9</p>		<p>MA4030M, MA4051M MA4091M, MA4180M MA4240H, MA4120</p> <p>Anode Cathode Ca → A</p>	
<p>2SA1309, 2SC3311</p>	<p>2SA1265, 2SC3182</p>	<p>2SA1535, 2SC3944</p>	<p>ISR35200 SVDS3V40</p> <p>K → A</p>	

G POWER SWITCH P.C.B.



A INPUT TERMINAL P.C.B.



A

B

C

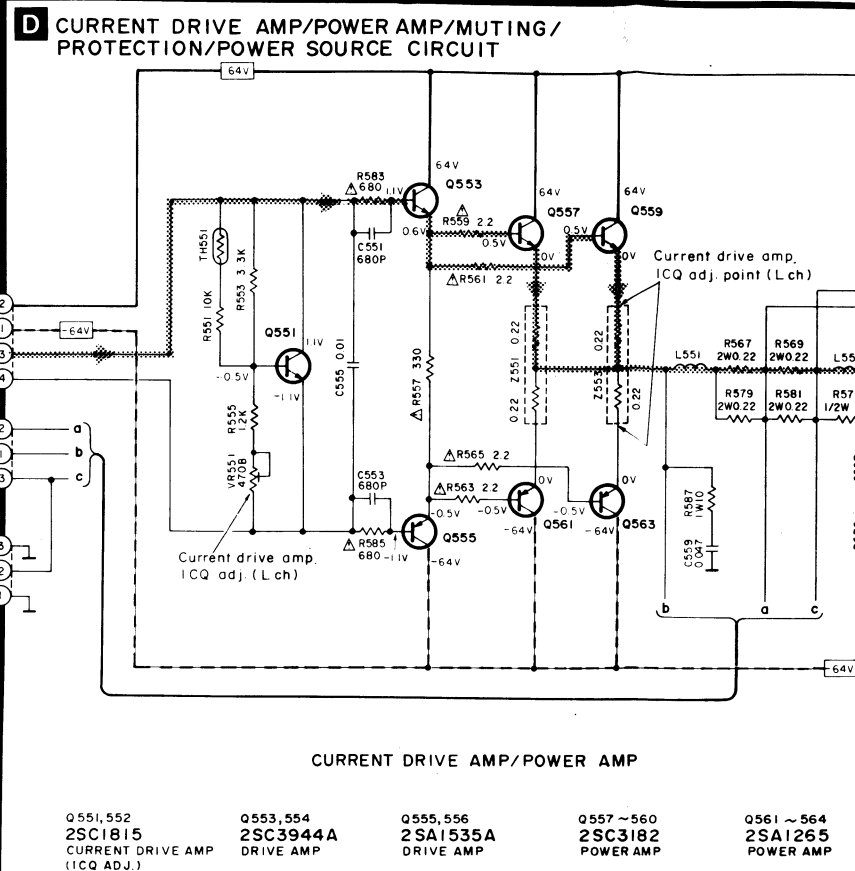
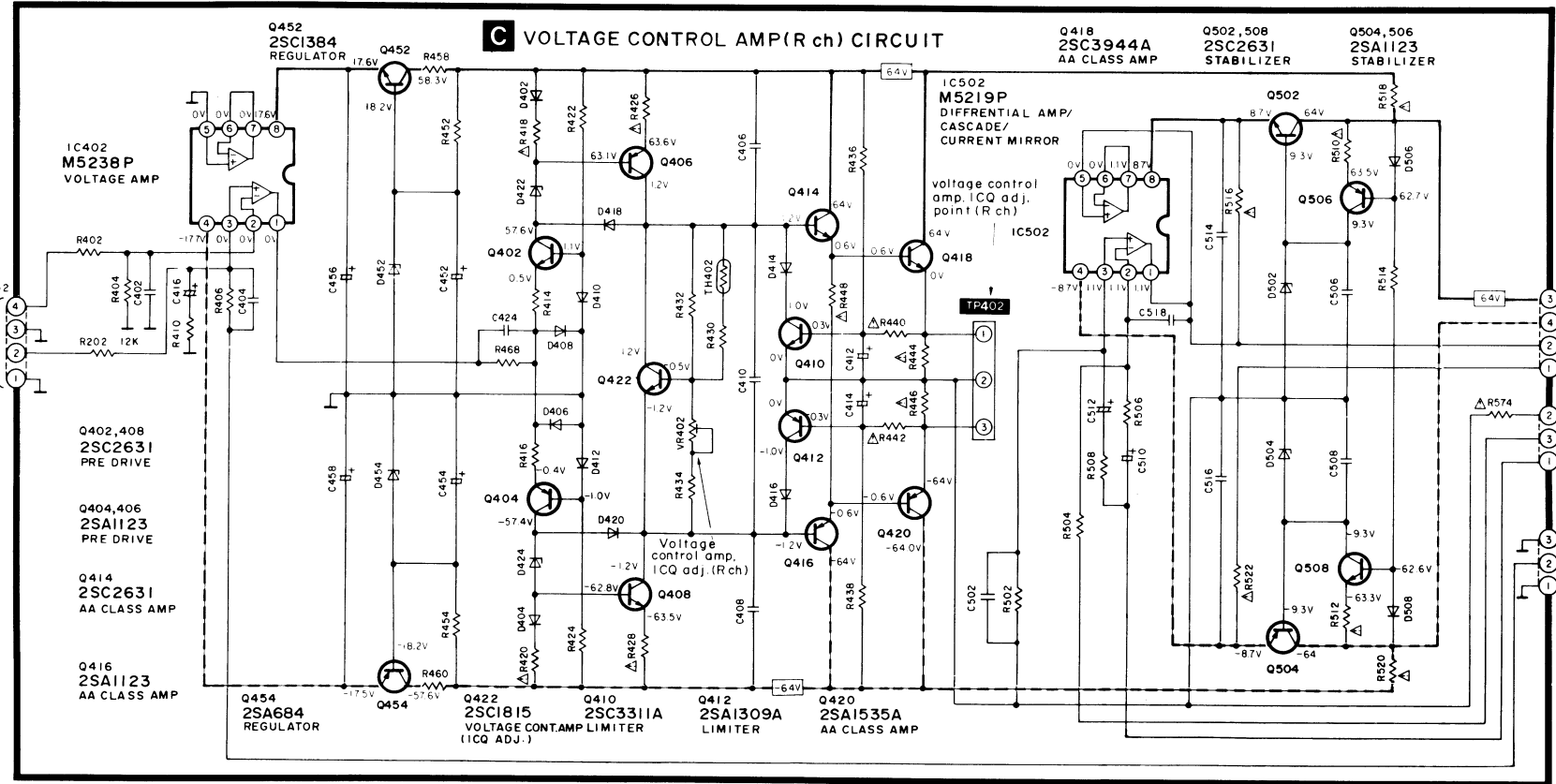
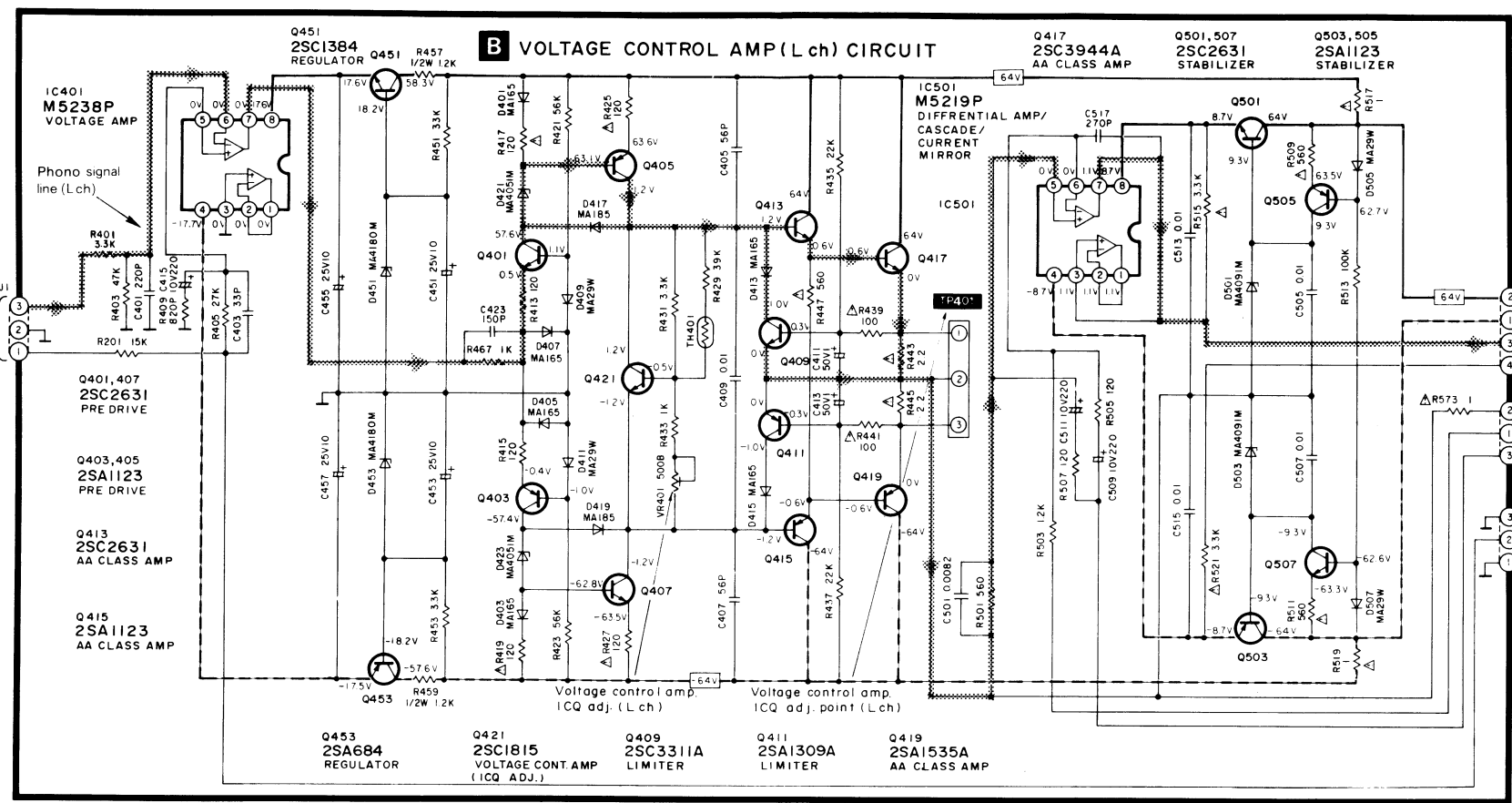
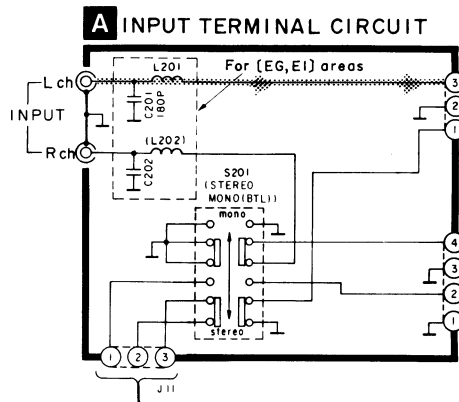
D

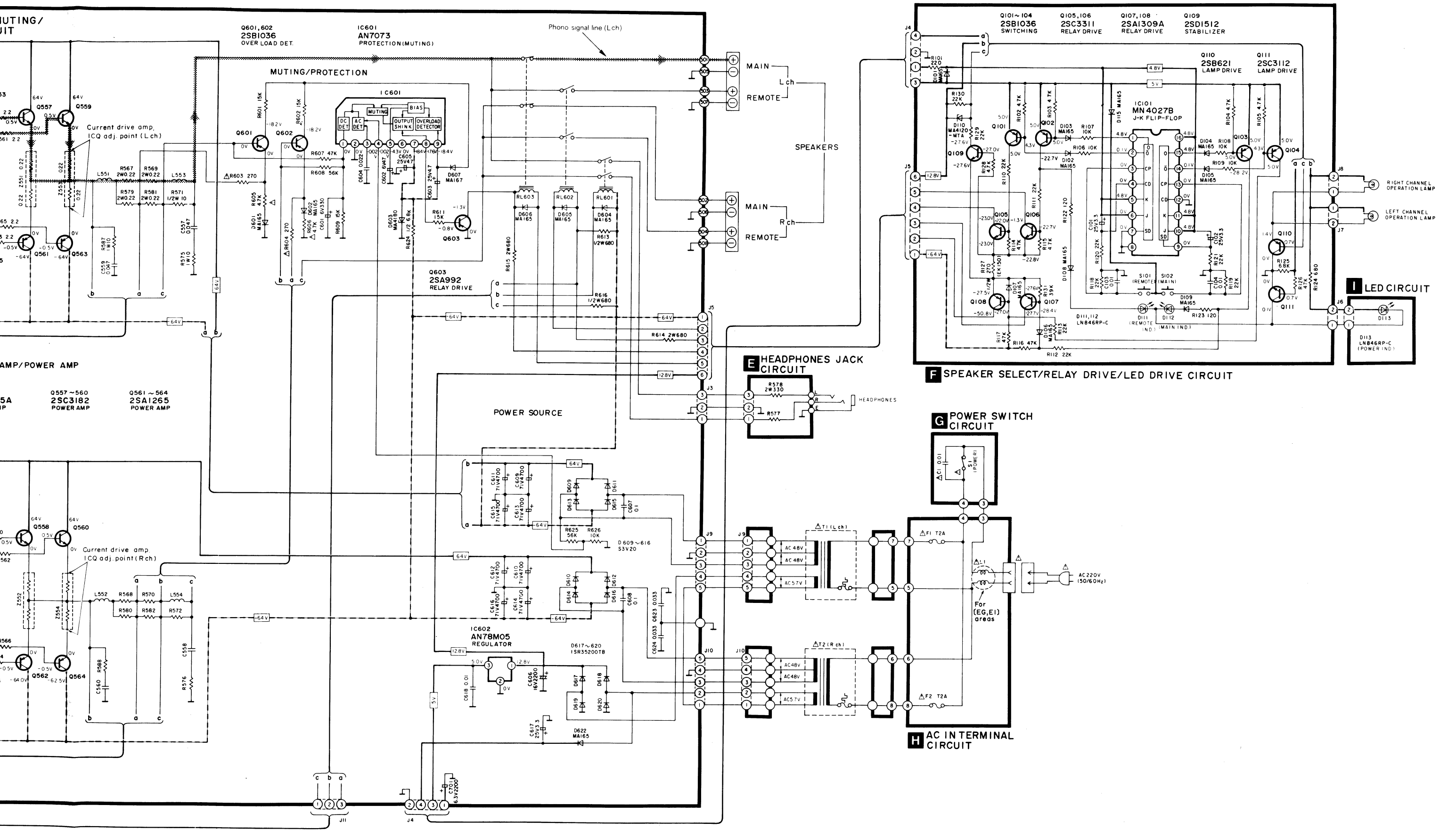
E

F

G

H








■ SCHEMATIC DIAGRAM

(This schematic diagram may be modified at any time with the development of new technology.)

Notes:

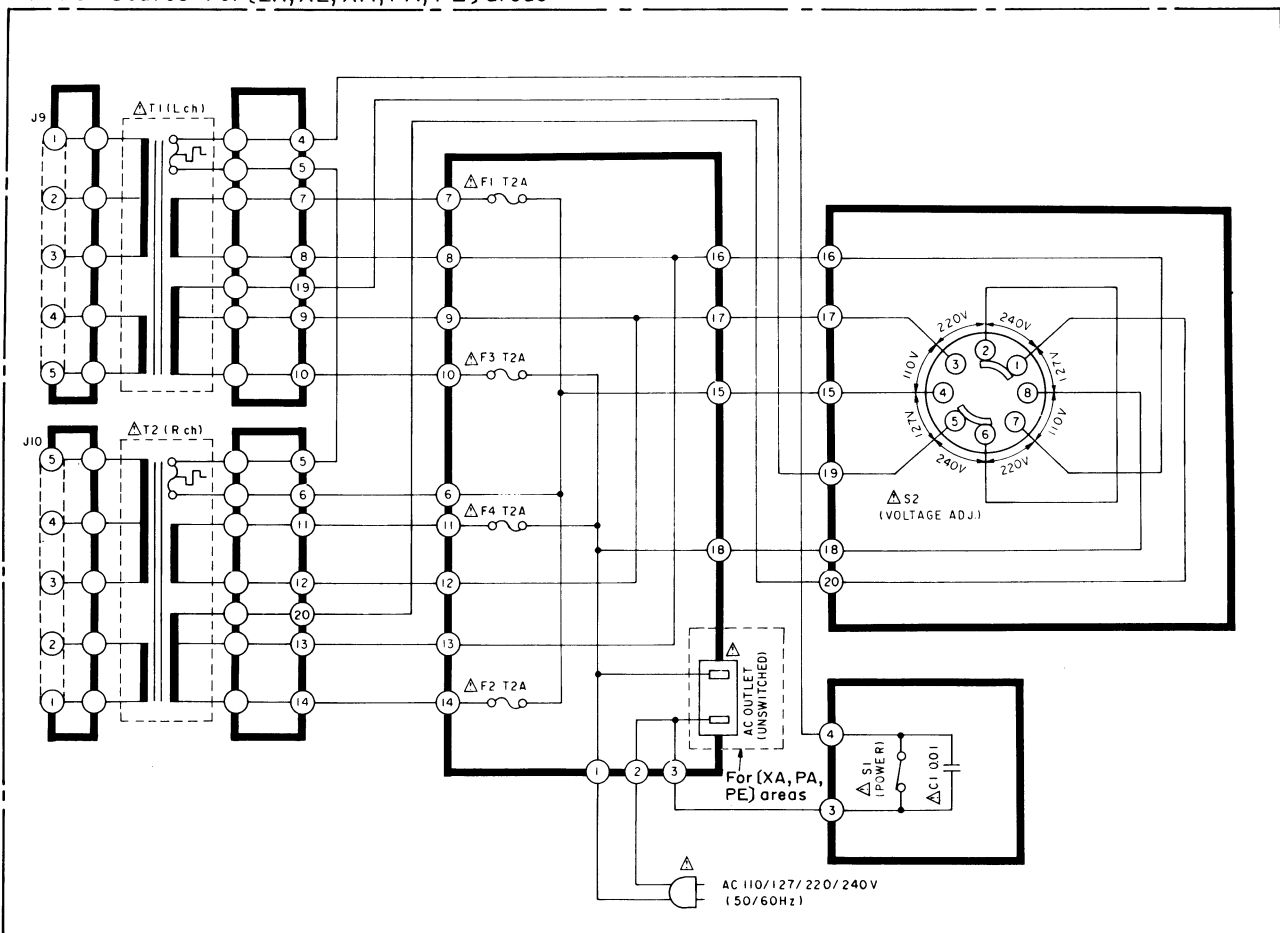
- S1 : Power switch in "on" position.
(■ off, ■ on)
- S2 : Voltage selector switch in "240 V" position.
(For [EK], [XL], [XA], [PA] and [PE] areas.)
- S101, S102: Speaker selector switch in "Main" position.
S101: Remote, S102: Main
- S201 : Stereo/monaural selector switch in "stereo" position.
- Indicated voltage values are the standard values for the unit measured by the DC electronic circuit tester (high-impedance) with the chassis taken as standard. Therefore, there may exist some errors in the voltage values, depending on the internal impedance of the DC circuit tester.

-  Phono signal line (Lch).
-  Positive voltage line.
-  Negative voltage line.

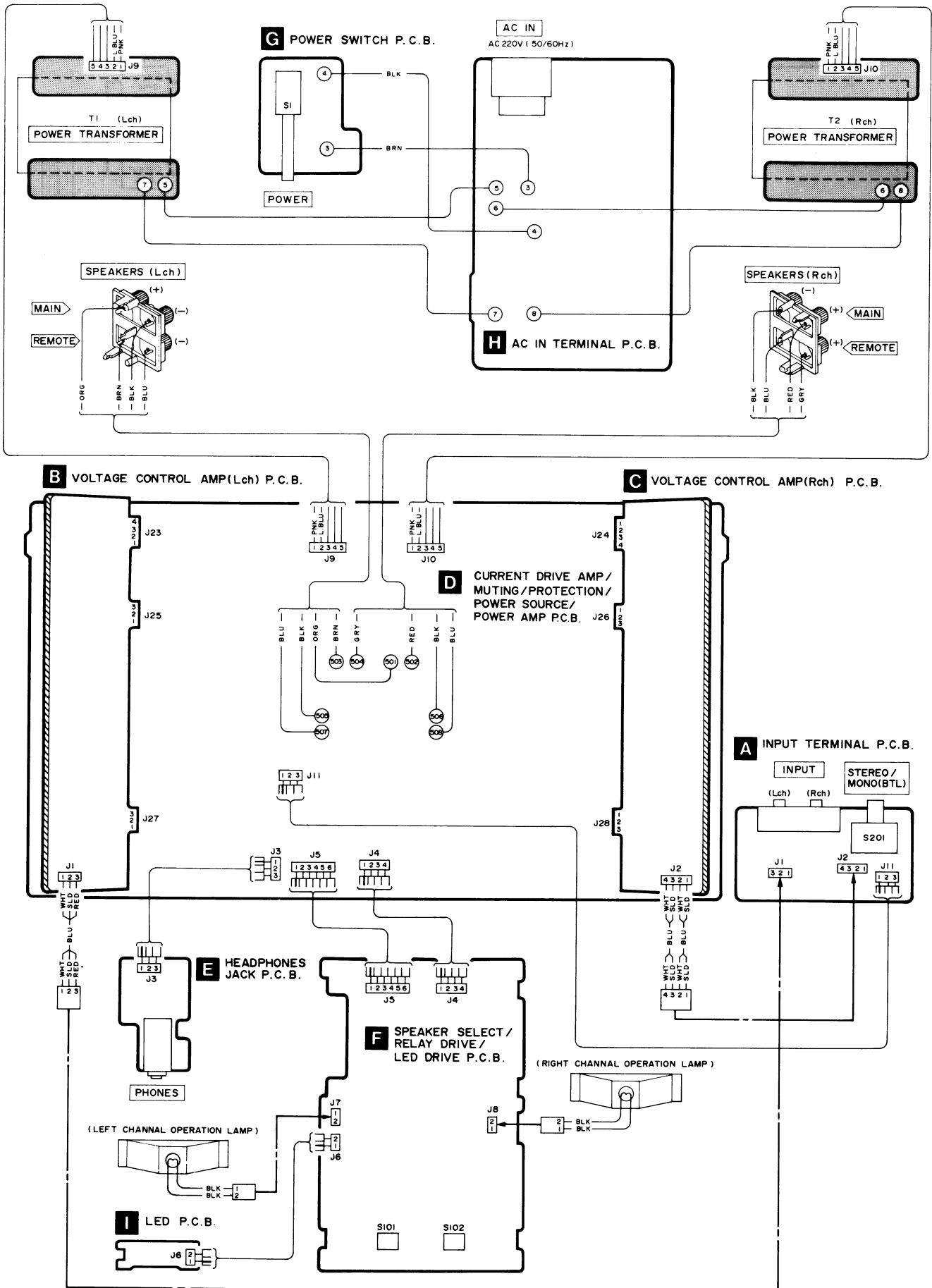
Important safety notice:

Components identified by Δ mark have special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.

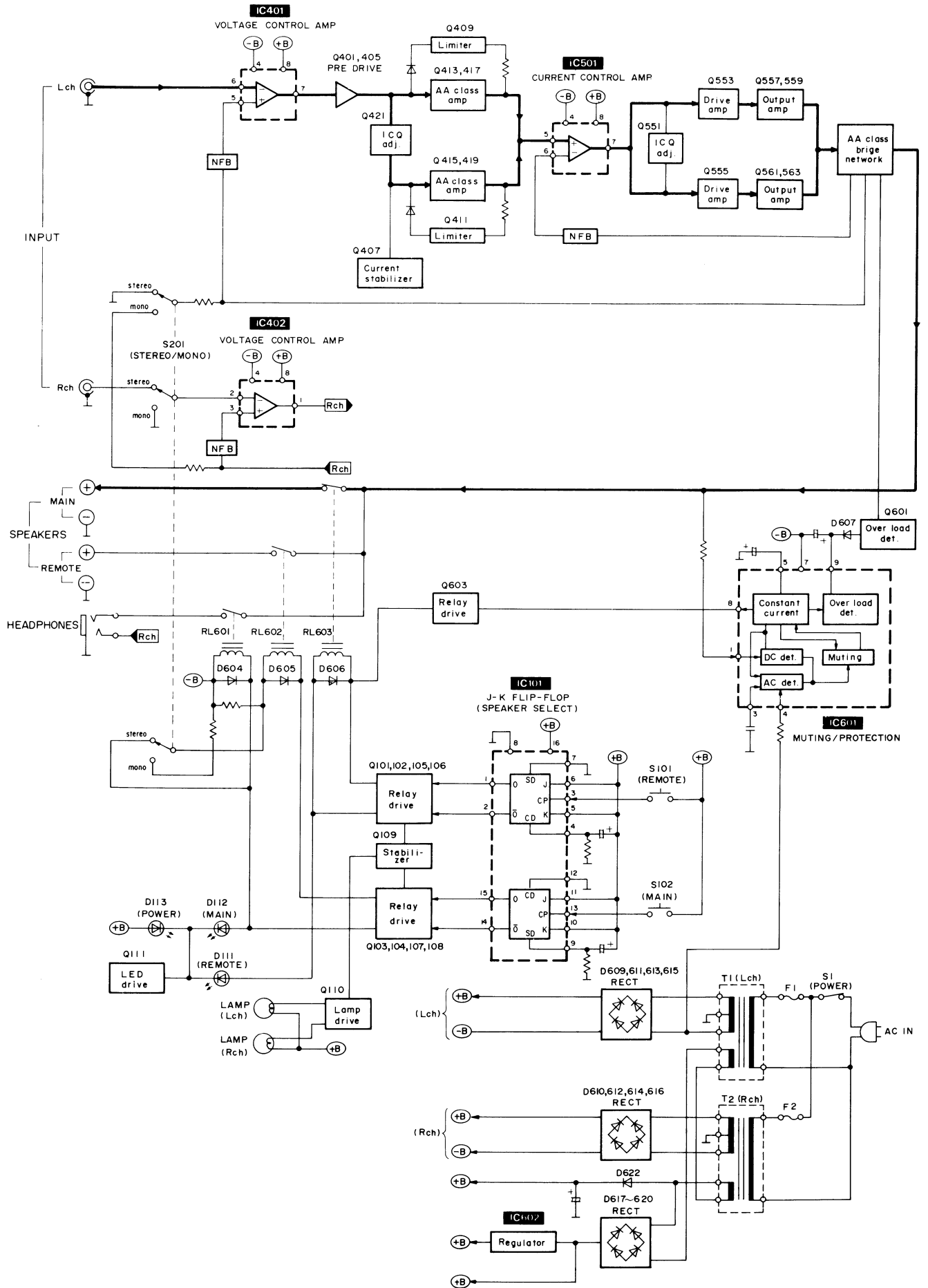
Power Source For [EK, XL, XA, PA, PE] areas



■ WIRING CONNECTION DIAGRAM



■ BLOCK DIAGRAM



MEASUREMENTS AND ADJUSTMENTS

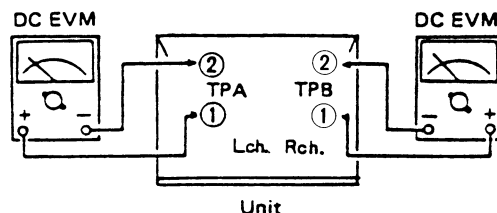
Control positions and equipment used.

- Main speaker selector.....off
- Remote speaker selector.....off

- DC electronic voltmeter(EVM)

VOLTAGE CONTROL(V)AMP.IDLING(ICQ) ADJUSTMENT

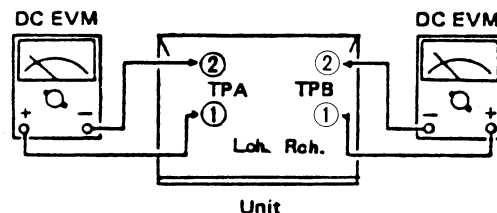
1. Test equipment connection is shown in figure. (Connect the DC EVM on both channels.)
2. Completely turn the (V) amp. adjusting volumes (VR401, VR402) counter-clockwise.
3. Turn ON the set when it is cold, and immediately adjust VR401 and VR402 so that the voltage is 25mV. Also, check that the voltage is 25 ~ 30mV (standard: 27mV) after lapse of 10 ~ 15 minutes. (Below 30mV after lapse of 20 min.)



TPA=TP401, TPB=TP402

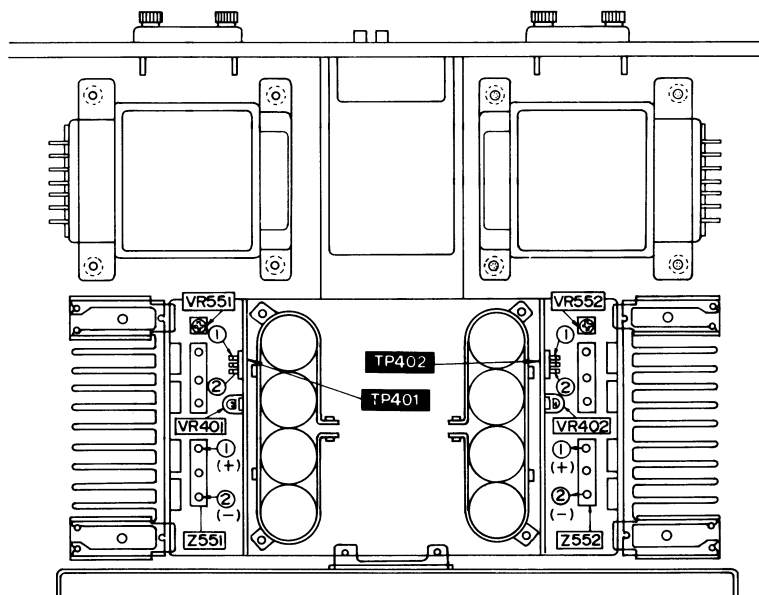
CURRENT DRIVE(C)AMP.IDLING(ICQ)ADJUSTMENT

1. Test equipment connection is shown in figure. (Connect the DC EVM on both channels.)
2. Completely turn the (C) amp. adjusting volumes (VR551, VR552) counter-clockwise.
3. Turn ON the set when it is cold, and after the adjustment of the (V) amp. ICQ, adjust VR551 and VR552 so that the voltage is 3mV. Also, check that the voltage is 4 ~ 7mV (standard: 5mV) after lapse of 10 ~ 15 minutes. (Below 10mV after lapse of 20 min.)



TPA=Z551, TPB=Z552

ADJUSTMENT POINTS



Test point

- TP401 L ch Voltage control amp
I_{ca} adj.
- TP402 R ch Voltage control amp
I_{ca} adj.
- Z551 L ch Current drive amp
I_{ca} adj.
- Z552 R ch Current drive amp
I_{ca} adj.

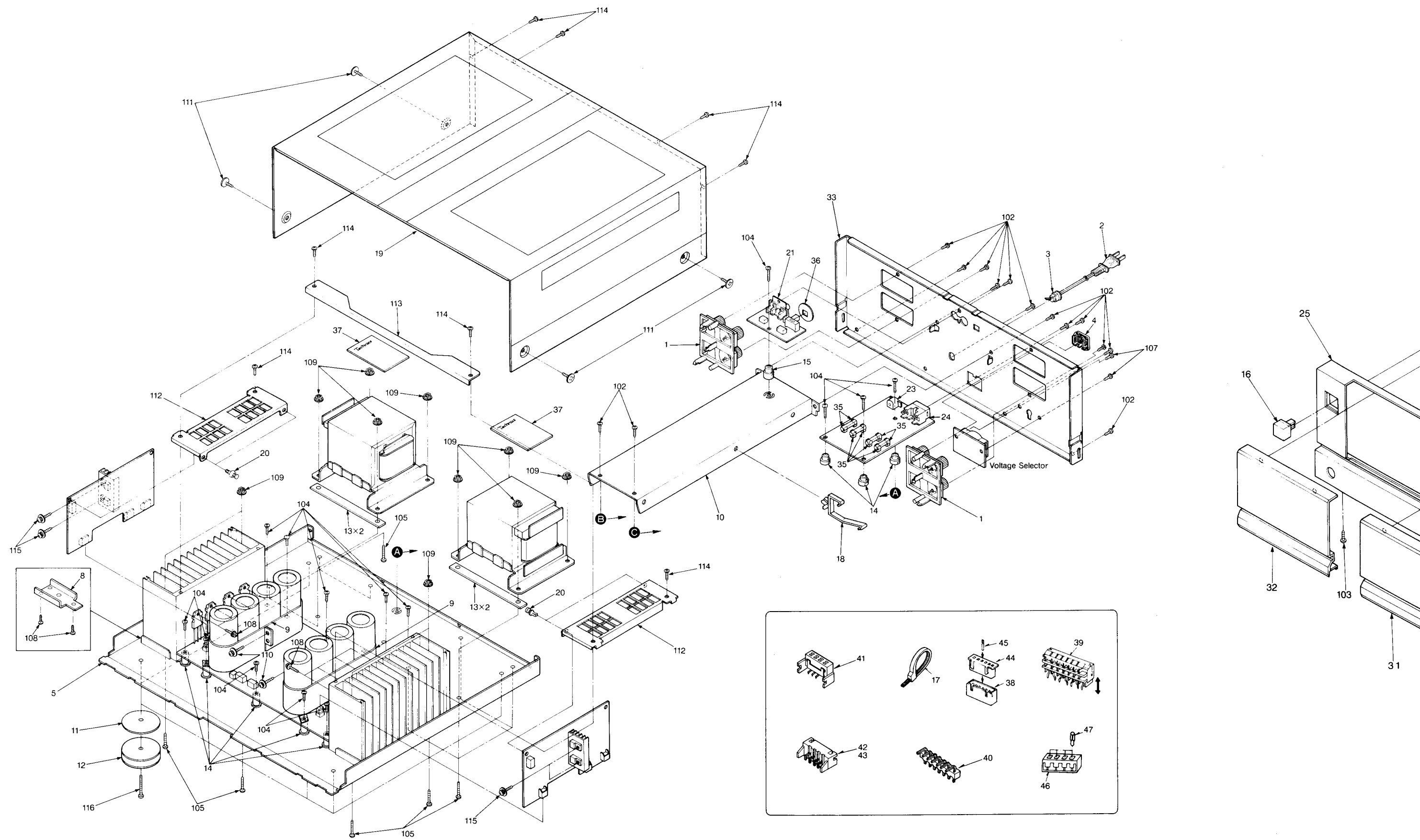
Adjustment VR

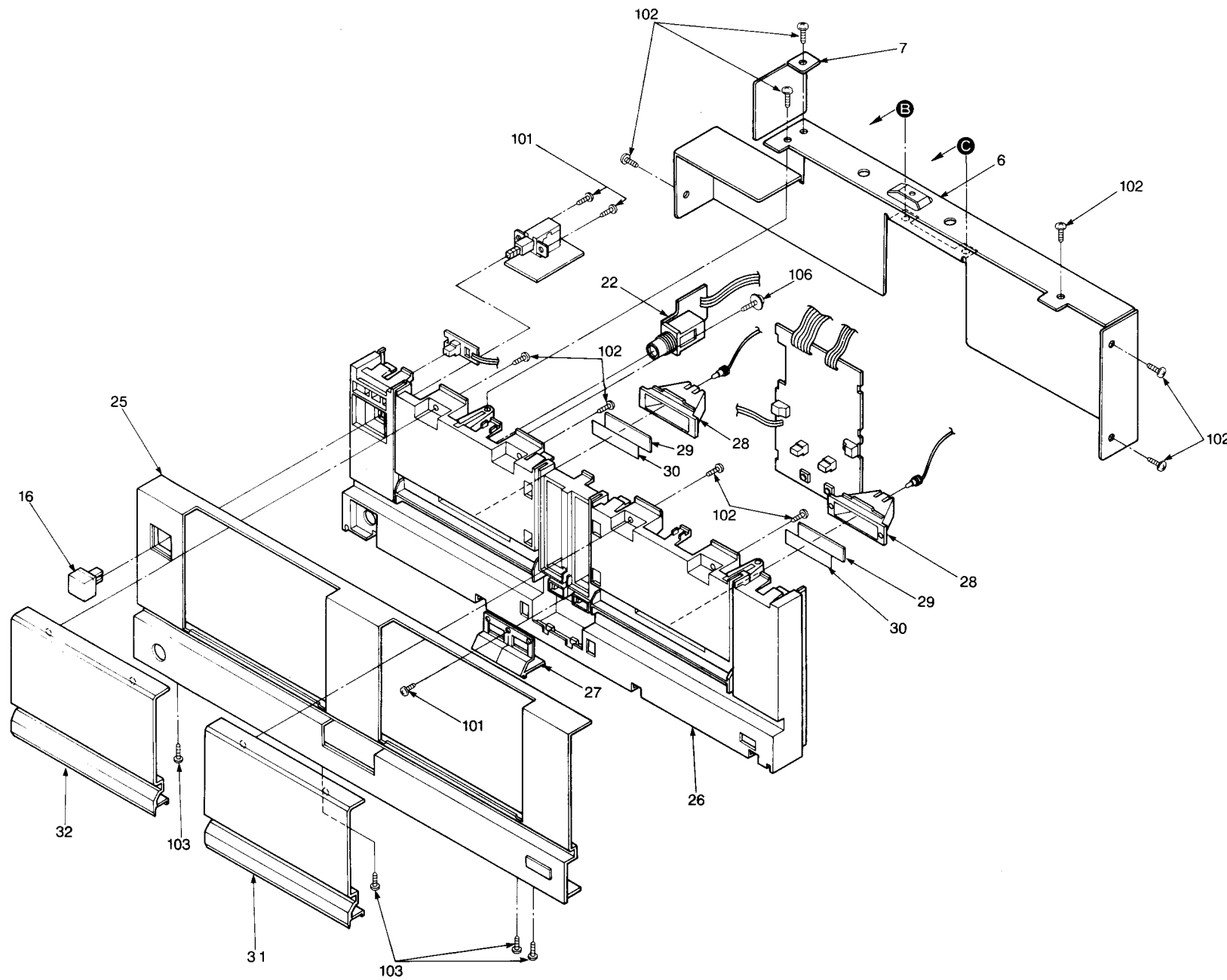
- VR401 L ch Voltage control amp
I_{ca} adj.
- VR402 R ch Voltage control amp
I_{ca} adj.
- VR551 L ch Current drive amp
I_{ca} adj.
- VR552 R ch Current drive amp
I_{ca} adj.

EXPLODED VIEW

1 2 3 4 5 6 7 8 9 10 11 12 13 14

A
B
C
D
E
F
G
H





REPLACEMENT PARTS LIST

Notes: *Important safety notice:

Components identified by Δ mark have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

*Bracketed indications in Ref. No. columns specify the area. (Refer to the first page for area.)
Parts without these indications can be used for all areas.

CABINET PARTS

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description	
CABINET AND CHASSIS						
1	SJF4443	TERMINAL PLATE	(EF)	33	SGP7380-1A	REAR PANEL
2	Δ QFC1205M	POWER CORD	(EK)	33	SGP7380-1B	REAR PANEL
2	Δ SJA121	POWER CORD	(XL)	33	SGP7380-2A	REAR PANEL
2	Δ SJA190	POWER CORD	(XA, PA, PE)	33	SGP7380A	REAR PANEL
3	SHR127	SPACER, POWER CORD	(E)	33	SGP7380B	REAR PANEL
3	SHR129	BUSHING	(EG)	35	SJT390	FUSE HOLDER
4	SJS9330A	OUTLET COVER		36	SHR6079	HOLDER
5	SKU11830-1	PLATE		37	SGK2175	INDICATION PLATE
6	SMC6451-1	SHIELD COVER		38	SJT3319	CONNECTOR(3P)
7	SMC6452	SHIELD COVER		38	SJT3415	CONNECTOR(4P)
8	SUW3059	BRACKET		39	SJT30440LX-V	CONNECTOR(4P)
9	SMN2059	ANGLE		39	SJT30640LX-V	CONNECTOR(6P)
10	SMN2085	ANGLE		40	SJT30333MB	LUG TERMINAL
11	SHG6405	SPACER		41	SJS50378JQ	CONNECTOR (3P, J25~J28)
12	SKL306	INSULATOR		41	SJS50478JQ	CONNECTOR (4P, J23, 24)
13	SHG6411	RUBBER SPACER		42	SJT30345JQ	TERMINAL (3P, J25~J28)
14	SHE181	HOLDER		42	SJT30445JQ	CONNECTOR (4P, J23, 24)
15	SHE185-1	SPACER		43	SJT3215	CONNECTOR(2P)
16	SBC666-5	BUTTON, POWER		44	SJS5215	SOCKET(2P)
17	SHR301	CLAMPER		44	SJS5331	SOCKET(3P)
18	SHR9814	PLASTIC SPACER		44	SJS5425	SOCKET(4P)
19	SKC2180K10	CABINET BODY		45	SJT783	CONTACT
20	SHR415	LOCK PIN		46	SJS5337	CONNECTOR(3P)
21	SJFD4-1	TERMINAL PLATE		46	SJS5431	SOCKET(4P)
22	SJJD17B	JACK		47	SJT785	CONTACT
23	Δ SJS9236	AC INLET		SCREWS, WASHERS AND NUTS		
24	Δ SJS9330B	AC OUTLET		101	XTB3*8G	SCREW
25	SGWEA50-KE1	FRONT PANEL	(E, EG, EI, EH)	102	XTBS3*8JFZ1	SCREW
26	SGX7980	ORNAMENT	(EB, EF)	103	XTBS3*10JFZ1	TAPPING SCREW
27	SBC1026	BUTTON	(XA, PA, PE)	104	XTB3*20J	SCREW
28	SMP388-1	ANGLE		105	XTB4*12FFZ	TAPPING SCREW
29	SOU268	GALSS, TRANSPARENT PLATE		106	XTWS3*10Q	SCREW
30	SOU358	FILTER (W)		107	XYN3*6FZ	SCREW
31	SGWEA50-KE2	SUB PANEL(R)		108	SNE2117-1	SCREW
32	SGWEA50-KE3	SUB PANEL(L)		109	SNE4065	BRACKET
33	SGPEA50-KH	REAR PANEL	(EI, EH, EB)	110	XYN3*F14	TAPPING SCREW
				111	SNE2129-3	SCREW
				112	SMN2060-1	ANGLE
				113	SMN2086	ANGLE
				114	XTBS3*8JFZ1	SCREW
				115	XYN3*F8	SCREW
				116	XTB4*12A	SCREW

●ELECTRICAL PARTS

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
INTEGRATED CIRCUITS			DIODES		
IC101	MN4027B	I.C. SP/SELECT	D101	MA165	DIODE
IC401	M5238P	I.C. CONTROL AMP	D102	MA165	DIODE
IC402	M5238P	I.C. CONTROL AMP	D103	MA165	DIODE
IC501	M5219P	I.C. CASCADE AMP	D104	MA165	DIODE
IC502	M5219P	I.C. CASCADE AMP	D105	MA165	DIODE
IC601	AN7073	I.C. PROTECTION	D106	MA165	DIODE
IC602	AN78M05	I.C. REGULATOR	D107	MA165	DIODE
TRANSISTORS			D108	MA165	DIODE
Q101	2SB1036R	TRANSISTOR	D109	MA165	DIODE
Q102	2SB1036R	TRANSISTOR	D110	MA4120	DIODE
Q103	2SB1036R	TRANSISTOR	D111	LN846RP-C	L.E.D
Q104	2SB1036R	TRANSISTOR	D112	LN846RP-C	L.E.D
Q105	2SC3311A-Q	TRANSISTOR	D113	LN846RP-C	L.E.D
Q106	2SC3311A-Q	TRANSISTOR	D115	MA165	DIODE
Q107	2SA1309AQS	TRANSISTOR	D401	MA165	DIODE
Q108	2SA1309AQS	TRANSISTOR	D402	MA165	DIODE
Q109	2SD1512R	TRANSISTOR	D403	MA165	DIODE
Q110	2SB621A-R	TRANSISTOR	D404	MA165	DIODE
Q111	2SC3112	TRANSISTOR	D405	MA165	DIODE
Q401	2SC2631-Q	TRANSISTOR	D406	MA165	DIODE
Q402	2SC2631-Q	TRANSISTOR	D407	MA165	DIODE
Q403	2SA1123R	TRANSISTOR	D408	MA165	DIODE
Q404	2SA1123R	TRANSISTOR	D409	MA29WA	DIODE
Q405	2SA1123R	TRANSISTOR	D410	MA29WA	DIODE
Q406	2SA1123R	TRANSISTOR	D411	MA29WA	DIODE
Q407	2SC2631-Q	TRANSISTOR	D412	MA29WA	DIODE
Q408	2SC2631-Q	TRANSISTOR	D413	MA165	DIODE
Q409	2SC3311A-Q	TRANSISTOR	D414	MA165	DIODE
Q410	2SC3311A-Q	TRANSISTOR	D415	MA165	DIODE
Q411	2SA1309AQS	TRANSISTOR	D416	MA165	DIODE
Q412	2SA1309AQS	TRANSISTOR	D417	MA185	DIODE, SI
Q413	2SC2631-Q	TRANSISTOR	D418	MA185	DIODE, SI
Q414	2SC2631-Q	TRANSISTOR	D419	MA185	DIODE, SI
Q415	2SA1123R	TRANSISTOR	D420	MA185	DIODE, SI
Q416	2SA1123R	TRANSISTOR	D421	MA4051-M	DIODE
Q417	2SC3944AQRS	TRANSISTOR	D422	MA4051-M	DIODE
Q418	2SC3944AQRS	TRANSISTOR	D423	MA4051-M	DIODE
Q419	2SA1535AQRS	TRANSISTOR	D424	MA4051-M	DIODE
Q420	2SA1535AQRS	TRANSISTOR	D451	MA4180-M	DIODE
Q421	2SC1815BG	TRANSISTOR, SI	D452	MA4180-M	DIODE
Q422	2SC1815BG	TRANSISTOR, SI	D453	MA4180-M	DIODE
Q451	2SC1384A-R	TRANSISTOR	D454	MA4180-M	DIODE
Q452	2SC1384A-R	TRANSISTOR	D501	MA4091-M	DIODE
Q453	2SA684-RNC	TRANSISTOR	D502	MA4091-M	DIODE
Q454	2SA684-RNC	TRANSISTOR	D503	MA4091-M	DIODE
Q501	2SC2631-Q	TRANSISTOR	D504	MA4091-M	DIODE
Q502	2SC2631-Q	TRANSISTOR	D505	MA29WA	DIODE
Q503	2SA1123R	TRANSISTOR	D506	MA29WA	DIODE
Q504	2SA1123R	TRANSISTOR	D507	MA29WA	DIODE
Q505	2SA1123R	TRANSISTOR	D508	MA29WA	DIODE
Q506	2SA1123R	TRANSISTOR	D601	MA165	DIODE
Q507	2SC2631-Q	TRANSISTOR	D602	MA165	DIODE
Q508	2SC2631-Q	TRANSISTOR	D603	MA4180-M	DIODE
Q551	2SC1815BG	TRANSISTOR, SI	D604	MA165	DIODE
Q552	2SC1815BG	TRANSISTOR, SI	D605	MA165	DIODE
Q553	2SC3944AQRS	TRANSISTOR	D606	MA165	DIODE
Q554	2SC3944AQRS	TRANSISTOR	D607	MA167	DIODE
Q555	2SA1535AQRS	TRANSISTOR	D609	△ SVDS3V40	RECTIFIER
Q556	2SA1535AQRS	TRANSISTOR	D610	△ SVDS3V40	RECTIFIER
Q557	△ 2SC3182R	TRANSISTOR, SI	D611	△ SVDS3V40	RECTIFIER
Q558	△ 2SC3182R	TRANSISTOR, SI	D612	△ SVDS3V40	RECTIFIER
Q559	△ 2SC3182R	TRANSISTOR, SI	D613	△ SVDS3V40	RECTIFIER
Q560	△ 2SC3182R	TRANSISTOR, SI	D614	△ SVDS3V40	RECTIFIER
Q561	△ 2SA1265R	TRANSISTOR, SI	D615	△ SVDS3V40	RECTIFIER
Q562	△ 2SA1265R	TRANSISTOR, SI	D616	△ SVDS3V40	RECTIFIER
Q563	△ 2SA1265R	TRANSISTOR, SI	D617	△ SVD1SR35200A	RECTIFIER
Q564	△ 2SA1265R	TRANSISTOR, SI	D618	△ SVD1SR35200A	RECTIFIER
Q601	2SB1036R	TRANSISTOR	D619	△ SVD1SR35200A	RECTIFIER
Q602	2SB1036R	TRANSISTOR	D620	△ SVD1SR35200A	RECTIFIER
Q603	2SA992E	TRANSISTOR	D622	MA165	DIODE

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
VARIABLE RESISTORS			(E, EG, E1, EH) (EB, EF)		
VR401	EVNK0AA00B52	SEMI FIXED RESISTOR, V CONTROL	T2	SLT5N477	POWER TRANSFORMER
VR402	EVNK0AA00B52	SEMI FIXED RESISTOR, V CONTROL	COMPONENT COMBINATIONS		
VR551	QVNB3A00B471	SEMI FIXED RESISTOR, C CONTROL	Z551	ERF3GBKR22N	WIRE WOUND RESISTOR
VR552	QVNB3A00B471	SEMI FIXED RESISTOR, C CONTROL	Z552	ERF3GBKR22N	WIRE WOUND RESISTOR
THERMISTORS AND VARIATORS			Z553	ERF3GBKR22N	WIRE WOUND RESISTOR
TH401	ERTD2WHL104S	THERMISTOR	Z554	ERF3GBKR22N	WIRE WOUND RESISTOR
TH402	ERTD2WHL104S	THERMISTOR	LAMPS		
TH551	ERTD2WHL104S	THERMISTOR	PL1	XAMS12S500	PILOT LAMP
TH552	ERTD2WHL104S	THERMISTOR	FUSES		
COILS AND TRANSFORMERS			F1	XBA2C20TB0	FUSE 250V, T2A
L1	SLQZ650MH49	CHOKE COIL	F2	XBA2C20TB0	FUSE 250V, T2A
(EG, E1)			F3	XBA2C20TB0	FUSE 250V, T2A
L201	ELEPH4R7KA	COIL	(XL, XA, PA) (PE, EK)		
(EG, E1)			F4	XBA2C20TB0	FUSE 250V, T2A
L202	ELEPH4R7KA	COIL	SWITCHES		
(EG, E1)			S1	SSH1201	SW, POWER
L551	SLQY07G-50	COIL	S2	ESE37263	SW, V.SELECT
L552	SLQY07G-50	COIL	(EK, XL, XA) (PA, PE)		
L553	SLQY18G-20	COIL	S101	SSG13	SW
L554	SLQY18G-20	COIL	S102	SSG13	SW
T1	SLT5N477	POWER TRANSFORMER	S201	RSS42A	SWITCH
(E, EG, E1, EH) (EB, EF)			RELAYS		
T1	SLT5N478	POWER TRANSFORMER	RL601	SFDYG5A237P	RELAY
(XL, XA, PA) (PE)			RL602	SSY126	RELAY
T1	SLT5N479	POWER TRANSFORMER	RL603	SSY126	RELAY
(EK)					
T2	SLT5N478	POWER TRANSFORMER			
(XL, XA, PA) (PE)					
T2	SLT5N479	POWER TRANSFORMER			

● PACKING PARTS

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
PACKING MATERIAL			A1	RJP120ZBS-H	AC PLUG ADAPTOR
P1	SPG6235	CARTON BOX	(XA, PA, PE)		
(E, EG, EK, XL)			A2	SJPD18	OUTPUT CORD
(XA, PA, PE)			A3	SPB1035	ACCESSORY BAG
(E1, EH, EB)			A4	SFDAC05E03	POWER CORD
P1	SPG6240	PACKING CASE	(E, EG, E1, EH) (EB, EF)		
(EF)			A5	SQF13206	INSTRUCTION BOOK
P2	SPS5133	PAD	(XA)		
P3	SPS5134	PAD	A5	SQF13207	INSTRUCTION BOOK
P4	SPS5135	PAD	(E, E1, EH, EB) (EF)		
P5	SPS5136	PAD	A5	SQF13208	INSTRUCTION BOOK
P6	SPS5051	PAD	(EG)		
P7	SPH6438	PACKING SHEET	A5	SQF13209	INSTRUCTION BOOK
P8	SPB1073	POLYETHYLENE BAG	(XL)		
(XL, XA, PA) (PE)			A5	SQF13210	INSTRUCTION BOOK
ACCESSORIES			(PA, PE)		
			A5	SQF13324	INSTRUCTION BOOK
			(EK)		

RESISTORS & CAPACITORS

Notes : * Important safety notice :

Components identified by Δ mark have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

* Bracketed indications in Ref. No. columns specify the area. (Refer to the first page for area.)
Parts without these indications can be used for all areas.

Numbering System of Resistor

Example:

ERD	25	F	J	102
Type	Wattage (1/4W)	Shape	Tolerance	Value (1K Ω)
ERX	2	AN	J	471
Type	Wattage (2W)	Shape	Tolerance	Value (470 Ω)

Numbering System of Capacitor

Example:

ECKD	1H	102	Z	F
Type	Voltage (50V)	Value (0.001 μ F)	Tolerance	Peculiarity
ECEA	50	M	330	
Type	Voltage (50V)	Peculiarity	Value (33 μ F)	

● Capacity are in microfarads (μ F) unless specified otherwise, P = Pico-farads (pF) F = Farads (F).

● Resistance are in ohms (Ω), unless specified otherwise, 1K = 1,000 Ω , 1M = 1,000k Ω

Resistor Type	Wattage		Tolerance
ERD : Carbon	10 : 1/8W	12 : 1/2W	J : \pm 5%
ERG : Metal Oxide	14 : 1/4W	25 : 1/4W	F : \pm 1%
ERQ : Fuse Type Metal	1A : 1W	18 : 1/8W	G : \pm 2%
ERX : Metal Film	S2 : 1/4W	S1 : 1/2W	J : \pm 5%
ERD L : Carbon (chip)	2F : 1/4W	50 : 1/2W	K : \pm 10%
ERO K : Metal Film (chip)	2A : 2W	3A : 3W	M : \pm 20%
ERC : Solid	6G : 1/10W	8G : 1/8W	
ERF : Incombustible Box-Shaped			
ERM : Wire-Wound			
RRJ : Chip Resistor			
ERJ : Chip Resistor			

Capacitor Type	Voltage		Tolerance
ECE : Electrolytic	0J : 6.3V	1A : 10V	K : \pm 10%
ECCD : Ceramic	1C : 16V	1E : 25V	M : \pm 20%
ECKD : Ceramic Capacitor	1H : 50V	1V : 35V	Z : -80 % -20
ECQM : Polyester	50 : 50V	05 : 50V	J : \pm 5%
ECQP : Polypropylene	2H : 500V	2A : 100V	G : \pm 2%
ECG : Ceramic	1 : 100V	1J : 63V	F : \pm 1%
ECEA N : Non Polar Electrolytic	KC : 400V AC		C : \pm 0.25pF
QCU : Ceramic (Chip Type)	KC : 125V AC		D : \pm 0.5pF
ECUX : Ceramic (Chip Type)	(UL)		
ECF : Semiconductor			
EECW : Liquid electrolyte double layer capacitor			

Ref. No.	Part No.	Value.	Ref. No.	Part No.	Value.	Ref. No.	Part No.	Value.
RESISTORS(VALUE,WATTAGE)								
R101	ERDS2T J221	220 1/4	R403	ERD25T J473	47K 1/4	R451	ERDS2T J333	33K 1/4
R102	ERDS2T J472	4.7K 1/4	R404	ERD25T J473	47K 1/4	R452	ERDS2T J333	33K 1/4
R103	ERDS2T J472	4.7K 1/4	R405	ERD25T J273	27K 1/4	R453	ERDS2T J333	33K 1/4
R104	ERDS2T J472	4.7K 1/4	R406	ERD25T J273	27K 1/4	R454	ERDS2T J333	33K 1/4
R105	ERDS2T J472	4.7K 1/4	R409	ERD25F J821	820 1/4	R457	ERDS1F J122	1.2K 1/2
R106	ERDS2T J103	10K 1/4	R410	ERD25F J821	820 1/4	R458	ERDS1F J122	1.2K 1/2
R107	ERDS2T J103	10K 1/4	R413	ERDS2T J121	120 1/4	R459	ERDS1F J122	1.2K 1/2
R108	ERDS2T J103	10K 1/4	R414	ERDS2T J121	120 1/4	R460	ERDS1F J122	1.2K 1/2
R109	ERDS2T J103	10K 1/4	R415	ERDS2T J121	120 1/4	R467	ERDS2T J1102	1K 1/4
R110	ERDS2T J223	22K 1/4	R416	ERDS2T J121	120 1/4	R468	ERDS2T J1102	1K 1/4
R111	ERDS2T J223	22K 1/4	R417	ERD25F J121	120 1/4	R501	ERD25F J561	560 1/4
R112	ERDS2T J223	22K 1/4	R418	ERD25F J121	120 1/4	R502	ERD25F J561	560 1/4
R113	ERDS2T J223	22K 1/4	R419	ERD25F J121	120 1/4	R503	ERDS2T J122	1.2K 1/4
R114	ERDS2T J472	4.7K 1/4	R420	ERD25F J121	120 1/4	R504	ERDS2T J122	1.2K 1/4
R115	ERDS2T J472	4.7K 1/4	R421	ERDS2T J563	56K 1/4	R505	ERDS2T J121	120 1/4
R116	ERDS2T J473	47K 1/4	R422	ERDS2T J563	56K 1/4	R506	ERDS2T J121	120 1/4
R117	ERDS2T J473	47K 1/4	R423	ERDS2T J563	56K 1/4	R507	ERDS2T J121	120 1/4
R118	ERDS2T J223	22K 1/4	R424	ERDS2T J563	56K 1/4	R508	ERDS2T J121	120 1/4
R119	ERDS2T J223	22K 1/4	R425	ERD25F J121	120 1/4	R509	ERD25F J561	560 1/4
R120	ERDS2T J223	22K 1/4	R426	ERD25F J121	120 1/4	R510	ERD25F J561	560 1/4
R121	ERDS2T J223	22K 1/4	R427	ERD25F J121	120 1/4	R511	ERD25F J561	560 1/4
R122	ERDS2T J121	120 1/4	R428	ERD25F J121	120 1/4	R512	ERD25F J561	560 1/4
R123	ERDS2T J121	120 1/4	R429	ERDS2T J393	39K 1/4	R513	ERDS2T J104	100K 1/4
R124	ERDS2T J681	680 1/4	R430	ERDS2T J393	39K 1/4	R514	ERDS2T J104	100K 1/4
R125	ERDS2T J682	6.8K 1/4	R431	ERDS2T J332	3.3K 1/4	R515	ERD25F J332	3.3K 1/4
R126	ERDS2T J473	47K 1/4	R432	ERDS2T J332	3.3K 1/4	R516	ERD25F J332	3.3K 1/4
R127	ERDS1F J271	270 1/2	R433	ERDS2T J102	1K 1/4	R517	ERD25F J1R0	1 1/4
(E, EG, XL, XA)			R434	ERDS2T J102	1K 1/4	R518	ERD25F J1R0	1 1/4
(PA, PE, E1)			R435	ERDS2T J223	22K 1/4	R519	ERD25F J1R0	1 1/4
(EH, EB, EF)			R436	ERDS2T J223	22K 1/4	R520	ERD25F J1R0	1 1/4
R127	ERD25F J151	150 1/4	R437	ERDS2T J223	22K 1/4	R521	ERD25F J332	3.3K 1/4
(EK)			R438	ERDS2T J223	22K 1/4	R522	ERD25F J332	3.3K 1/4
R128	ERDS2T J472	4.7K 1/4	R439	ERD25F J101	100 1/4	R551	ERDS2T J103	10K 1/4
R129	ERDS2T J223	22K 1/4	R440	ERD25F J101	100 1/4	R552	ERDS2T J103	10K 1/4
R130	ERDS2T J223	22K 1/4	R441	ERD25F J101	100 1/4	R553	ERDS2T J332	3.3K 1/4
R131	ERDS2T J393	39K 1/4	R442	ERD25F J101	100 1/4	R554	ERDS2T J332	3.3K 1/4
R201	FSR25T J153T2	15K 1/4	R443	ERD25F J2R2	2.2 1/4	R555	ERDS2T J122	1.2K 1/4
R202	FSR25T J123T2	15K 1/4	R444	ERD25F J2R2	2.2 1/4	R556	ERDS2T J122	1.2K 1/4
R401	ERD25F J332	3.3K 1/4	R445	ERD25F J2R2	2.2 1/4	R557	ERD25F J331	330 1/4
R402	ERD25F J332	3.3K 1/4	R446	ERD25F J2R2	2.2 1/4	R558	ERD25F J331	330 1/4
R403	ERD25F J332	3.3K 1/4	R447	ERD25F J561	560 1/4	R559	ERD25F J2R2	2.2 1/4
			R448	ERD25F J561	560 1/4	R560	ERD25F J2R2	2.2 1/4

Ref. No.	Part No.	Value.	Ref. No.	Part No.	Value.	Ref. No.	Part No.	Value.
R561	ERD25FJ2R2	2.2 1/4	R624	ERDS1FJ682	6.8K 1/2	C506	ECKD1H103PF	0.01 50
R562	ERD25FJ2R2	2.2 1/4	R625	ERDS2TJ563	56K 1/4	C507	ECKD1H103PF	0.01 50
R563	ERD25FJ2R2	2.2 1/4	R626	ERDS2TJ103	10K 1/4	C508	ECKD1H103PF	0.01 50
R564	ERD25FJ2R2	2.2 1/4	CAPACITORS(VALUE,VOLTAGE)			C509	ECEA1APH221E	220 10
R565	ERD25FJ2R2	2.2 1/4	C1	ECKWNS103ZVS	0.01	C510	ECEA1APH221E	220 10
R566	ERD25FJ2R2	2.2 1/4	C101	ECEA1EK3R3B	3.3 25	C511	ECEA1APH221E	220 10
R567	ERF2AKR22P	0.22 2	C102	ECEA1EK3R3B	3.3 25	C512	ECEA1APH221E	220 10
R568	ERF2AKR22P	0.22 2	C103	ECKD1H103PF	0.01 50	C513	ECKD1H103PF	0.01 50
R569	ERF2AKR22P	0.22 2	C104	ECKD1H103PF	0.01 50	C514	ECKD1H103PF	0.01 50
R570	ERF2AKR22P	0.22 2	C201	ECCD1H181K	180P 50	C515	ECKD1H103PF	0.01 50
R571	ERDS1FJ100	10 1/2	(EG. E1)			C516	ECKD1H103PF	0.01 50
R572	ERDS1FJ100	10 1/2	C202	ECCD1H181K	180P 50	C517	ECKD1H271KB	270P 50
R573	ERD25FJ1R0	1 1/4	(EG. E1)			C518	ECKD1H271KB	270P 50
R574	ERD25FJ1R0	1 1/4	C401	ECCC1H221K	220P 50	C551	ECKD1H681K	680P 50
R575	ERX1ANJ100	10 1	C402	ECCC1H221K	220P 50	C552	ECKD1H681K	680P 50
R576	ERX1ANJ100	10 1	C403	ECCD2H330K	33P 500	C553	ECKD1H681K	680P 50
R577	ERG2SJ331H	330 2	C404	ECCD2H330K	33P 500	C554	ECKD1H681K	680P 50
R578	ERG2SJ331H	330 2	C405	ECCD2H560K	56P 500	C555	ECKD1H103PF	0.01 50
R579	ERF2AKR22P	0.22 2	C406	ECCD2H560K	56P 500	C556	ECKD1H103PF	0.01 50
R580	ERF2AKR22P	0.22 2	C407	ECCD2H560K	56P 500	C557	ECQM1H473JZ	0.047 50
R581	ERF2AKR22P	0.22 2	C408	ECCD2H560K	56P 500	C558	ECQM1H473JZ	0.047 50
R582	ERF2AKR22P	0.22 2	C409	ECKD1H103PF	0.01 50	C559	ECQM1H473JZ	0.047 50
R583	ERD25FJ681	680 1/4	C410	ECKD1H103PF	0.01 50	C560	ECQM1H473JZ	0.047 50
R584	ERD25FJ681	680 1/4	C411	ECEA1HK010	1 50	C601	ECEA0JS331	330 6.3
R585	ERD25FJ681	680 1/4	C412	ECEA1HK010	1 50	C602	ECEA0JK470	47 6.3
R586	ERD25FJ681	680 1/4	C413	ECEA1HK010	1 50	C603	ECEA1EK4R7	4.7 25
R587	ERX1ANJ100	10 1	C414	ECEA1HK010	1 50	C604	ECKD1H223PF	0.022 50
R588	ERX1ANJ100	10 1	C415	ECEA1APH221E	220 10	C605	ECEA1EK4R7	4.7 25
R601	ERDS2TJ153	15K 1/4	C416	ECEA1APH221E	220 10	C606	ECEA1CU222	2200 16
R602	ERDS2TJ153	15K 1/4	C423	ECCD1H151K	150P 50	C607	ECQE2104KS	0.1 250
R603	ERD25FJ271	270 1/4	C424	ECCD1H151K	150P 50	C608	ECQE2104KS	0.1 250
R604	ERD25FJ271	270 1/4	C451	ECEA1EK100	10 25	C609	ECET71V472LM	4700 71
R605	ERD25FJ472	4.7K 1/4	C452	ECEA1EK100	10 25	C610	ECET71V472LM	4700 71
R606	ERD25FJ472	4.7K 1/4	C453	ECEA1EK100	10 25	C611	ECET71V472LM	4700 71
R607	ERDS2TJ473	47K 1/4	C454	ECEA1EK100	10 25	C612	ECET71V472LM	4700 71
R608	ERDS2TJ563	56K 1/4	C455	ECEA1EK100	10 25	C613	ECET71V472LM	4700 71
R609	ERDS2TJ153	15K 1/4	C456	ECEA1EK100	10 25	C614	ECET71V472LM	4700 71
R611	ERDS2TJ153	15K 1/4	C457	ECEA1EK100	10 25	C615	ECET71V472LM	4700 71
R613	ERDS1FJ681	680 1/2	C458	ECEA1EK100	10 25	C616	ECET71V472LM	4700 71
R614	ERG2ANJ681	680 2	C501	ECQM1H822JZ	0.0082 50	C617	ECEA1EK3R3	3.3 25
R615	ERG2ANJ681	680 2	C502	ECQM1H822JZ	0.0082 50	C618	ECKD1H103PF	0.01 50
R616	ERDS1FJ681	680 1/2	C505	ECKD1H103PF	0.01 50	C623	ECKD1H333PF	0.033 50
						C624	ECKD1H333PF	0.033 50
						C701	ECEA0JU222	2200 6.3