

# TA-E86B

*AEP Model  
UK Model  
Canadian Model*



## STEREO PREAMPLIFIER

### SPECIFICATIONS

#### SAFETY-RELATED COMPONENT WARNING !!

COMPONENTS IDENTIFIED BY SHADING AND MARK  ON THE SCHEMATIC DIAGRAMS, EXPLODED VIEWS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

ATTENTION AU COMPOSANT AYANT RAPPORT  
À LA SÉCURITÉ !

LES COMPOSANTS IDENTIFIÉS PAR UN TRAMÉ ET UNE MARQUE  SUR LES DIAGRAMMES SCHÉMATIQUES, LES VUES EXPLOSÉES ET LA LISTE DES PIÈCES SONT CRITIQUES POUR LA SÉCURITÉ DE FONCTIONNEMENT. NE REMPLACER CES COMPOSANTS QUE PAR DES PIÈCES SONY DONT LES NUMÉROS SONT DONNÉS DANS CE MANUEL OU DES SUPPLÉMENTS PUBLIÉS PAR SONY.

#### GENERAL

**Power Requirements:** 110,120, 220 or 240 V ac  
adjustable 50/60 Hz (AEP, UK Model)  
120 V 60 Hz (Canadian Model)

**Power Consumption:** 15 watts

**Dimensions:** Approx. 480 (w) x 80 (h) x 366 (d) mm  
19 (w) x 3  $\frac{1}{8}$  (h) x 14  $\frac{1}{2}$  (d) inches  
including projecting parts and controls

**Weight:** Approx. 8.2 kg (18 lb 1 oz), net  
Approx. 10 kg (22 lb 1 oz),  
in shipping carton

— Continued on page 2 —

**SONY®**  
**SERVICE MANUAL**

## AMPLIFIER SECTION

### Inputs

	Sensitivity	Impedance	Capacitance	Maximum input capability (1 kHz)	S/N (weighting network, input level)
PHONO	2.5 mV	100, 50, 25 Ω	100 pF	250 mV	87 dB (A, 2.5 mV)
PHONO (HEAD AMP)	0.125 mV	100 Ω (at the 40 Ω position) 25 Ω (at the 3 Ω position)	—	12.5 mV	78 dB (A, 0.2 mV)
TUNER					
AUX	150 mV	50 kΩ	—	—	105 dB (A, 150 mV)

### Outputs

	Voltage	Impedance
REC OUT	150 mV (max. 13 V)	10 kΩ
OUTPUT 1	1.5 V (max. 13 V)	100 Ω
OUTPUT 2	1.5 V (max. 13 V)	100 Ω

Harmonic Distortion: Less than 0.003 % at 10 V output

Intermodulation (IM) distortion: Less than 0.003 % at 10 V output  
(60 Hz : 7 kHz = 4 : 1)

Frequency Response: PHONO RIAA equalization curve ± 0.2 dB

TUNER }  
TAPE } 5 Hz–500 kHz + 0 dB  
AUX } - 1 dB

Filter: Low, 12 dB/octave attenuation  
below 15 Hz

Residual Noise: Less than 6 μV (weighting  
network A, IHF)

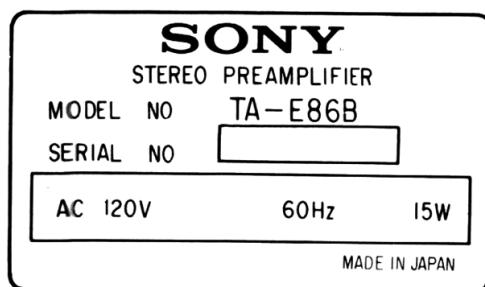
Bass Boost (output 2): + 6 dB (at 120 Hz)

**0 dB = 0.775 V**

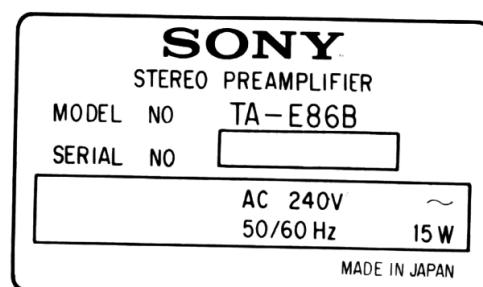
## MODEL IDENTIFICATION

### Specification Label

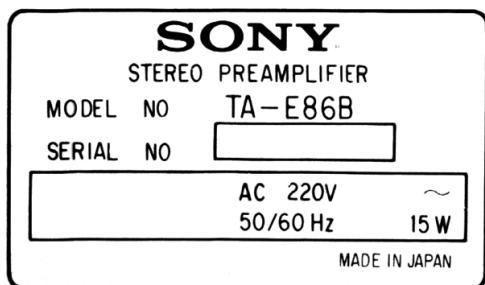
#### Canadian Model



#### UK Model



#### AEP Model



## SERVICING NOTES

### PARTS INFORMATION

#### 1-1-1 Small Resistors

The TA-E86B uses many small resistors, similar to the type shown in Fig. A. These resistors are  $\frac{1}{4}$  W metal-oxide with an accuracy of 1%.

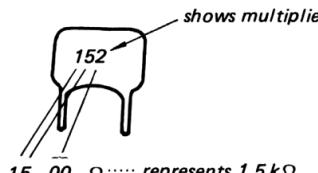
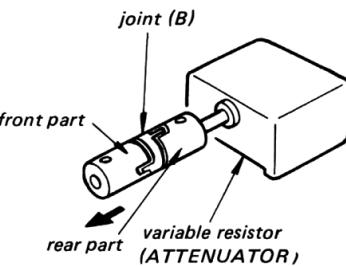


Fig. A

#### JOINT (B) REMOVAL

Do not pull the front part of the joint (B) in the direction shown by the arrow, because the front part is combined with the rear part through a spring. Be sure to loosen the set screws and remove the joint (B).



#### 1-1-2 Square Tantalum Capacitors

The capacitors employed in the TA-E86B (as shown in Fig. B) are the same square tantalum capacitors as used in pulse circuit power supplies, etc. The capacitors are especially used in the B + and B - bus where their greater bypass effect is needed.

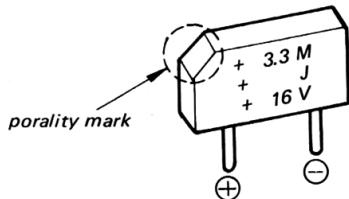


Fig. B

# SECTION 1

## OUTLINE

### 1-1. CIRCUIT DESCRIPTION

The TA-E86B has been designed without tone control circuits in the interest of maximizing such basic performance parameters as frequency response and signal-to-noise ratio, and minimizing distortion. The physical separation of each channel, plus a shield plate between the two portions contributes to an exceptionally low amount of cross-talk coupling between channels.

#### Head Amplifier (See Fig. 1-1)

1. To amplify the low output signal produced by the moving coil cartridge, low-noise LEC transistors (\*1) connected in parallel are employed in a conventional differential amplifier circuit. In addition, the TA-E86B uses a newly-developed low-noise transistor (2SC2014) (\*2) in the 1st-stage differential amplifier. This transistor is the equivalent of ten common transistors and the result is an especially high signal-to-noise ratio and superior distortion characteristics.
2. This amplifier has two input positions, one for  $40\Omega$  and the other for  $3\Omega$ . The  $40\Omega$  position is for a cartridge with an output impedance of about  $40\Omega$  (input impedance of the amplifier: about  $100\Omega$ ), and the  $3\Omega$  position is for a cartridge with an output impedance of about  $3\Omega$  (input impedance of the amplifier: about  $25\Omega$ ).
3. Q103 and Q104 serve as the load of Q101 and Q102 and form a current mirror circuit. The gain of the mirror circuit is increased by connecting the differential amplifier circuit consisting of Q101 and Q102. Furthermore, the phono signal is amplified by a SEPP (single-ended push-pull) circuit to minimize distortion.
4. Q105 and Q106 in the output stage are connected in a Darlington configuration to provide low-impedance outputs.

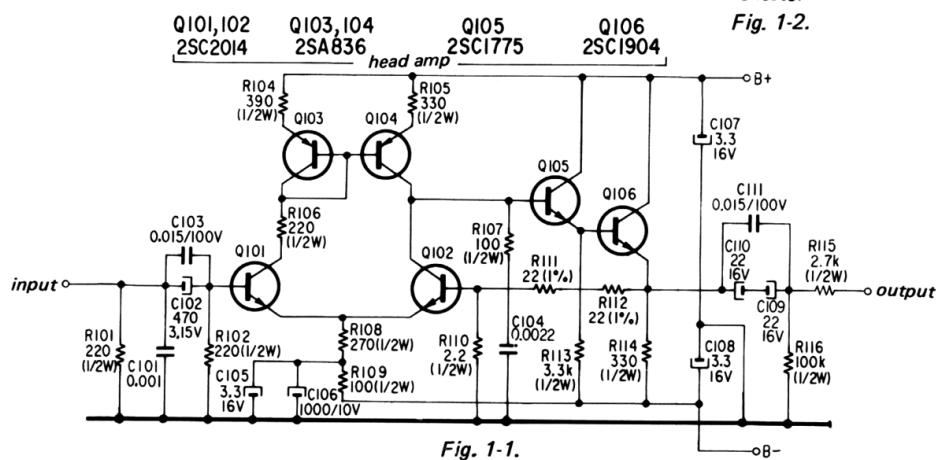


Fig. 1-1.

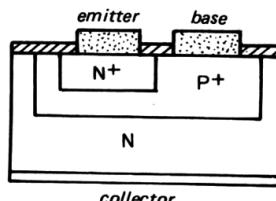
#### Note: \*1 LEC (Low-emitter Concentration) Transistors

The LEC transistors are provided with emitter impurity concentrations of less than 1/1000 that of conventional transistors with the current-amplification factor maintained at the same or greater value as compared with conventional transistors.

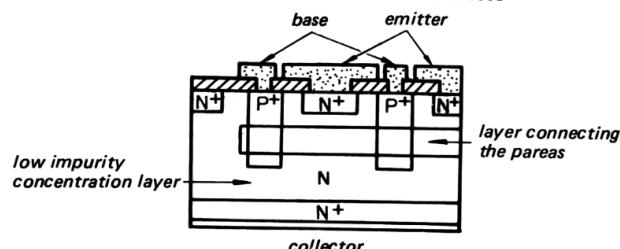
#### \*2 Low-noise Transistor for Head Amplifier (See Fig. 1-2)

This transistor (2SC2014) has been developed for head amplifier use with moving-coil cartridges. To reduce noise as much as possible, the 2SC2014 avoids the formation of regions of high concentration at the emitter-base junction, and employs the very narrow emitter region (striped formation).

#### ● Cross-section of double-diffusion type transistor



#### ● Cross-section of 2SC2014 transistor



#### ● Cross-section of LEC transistors

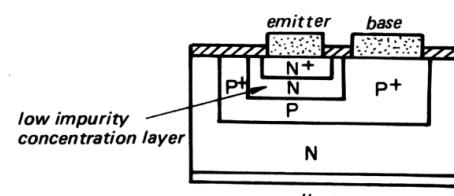


Fig. 1-2.

### Technical Features:

- LEC structure, resulting in very low current-induced noise (particularly burst noise).
- Reduced base resistance as a result of high-precision technology. The LEC structure also controls the base resistance, resulting in voltage-induced noise 50% less than that in the conventional type of transistor used in a head amplifier.

### Equalizer Amplifier (See Fig. 1-3)

The 1st-stage differential amplifier that is cascode connected consists of a dual FET (Q201) and the NPN transistors (Q202, Q203). This direct-coupled amplifier has little dc voltage drift with changes in temperature. Also, this amplifier compensates for high-frequency roll-off by reducing Miller effect due to feedback capacitance from the collector of the transistor. At the same time, this connection decreases the voltage between the source and the drain of Q201, reducing the shock noise caused by the leak current from the gate, and also reducing the distortion due to nonlinear characteristics of the circuit. The base voltage of Q202 and Q203 is maintained at about 10 V by a zener diode (D201). This results in a voltage between the drain and the source of 9 V. Q204 maintains a constant current in D201. Q205 and Q206 operate as a constant current supply circuit for Q201. The gate voltage of Q205 is kept at a

constant level by the collector voltage determined by the V<sub>BE</sub> of Q206. Therefore, this circuit always supplies constant current in spite of voltage fluctuation in the power supply circuit. D203 (EQA01-20R) which is a 20 V zener diode is turned off when the power supply voltage drops below a certain value (usually when the POWER switch is turned off). At the same time, the differential amplifier circuit is turned off, thereby preventing the presence of an unbalanced voltage in the output. A dual-FET (Q201) has been developed for the differential amplifier, which features a remarkable temperature characteristic.

The 2nd differential amplifiers (Q207 to Q212) are designed for low distortion and short rise time, minimizing the effect of the changes in temperature and noises produced in the power supply circuit.

The output stage incorporates a push-pull emitter-follower (Q213, Q214) to obtain the output signal with low impedance. The output from Q213 and Q214 is applied to the right gate of Q201 through the negative-feedback circuit consisting of R213 to R216, C204 and C206.

Q202,203,206 2SC1345	Q205 2SK23A	Q201 2SK97	Q204 2SK30A	Q207, 208 2SA836	Q209, 210 2SA872	Q211, 212 2SC1775	Q213 2SC1904
equalizer amp							

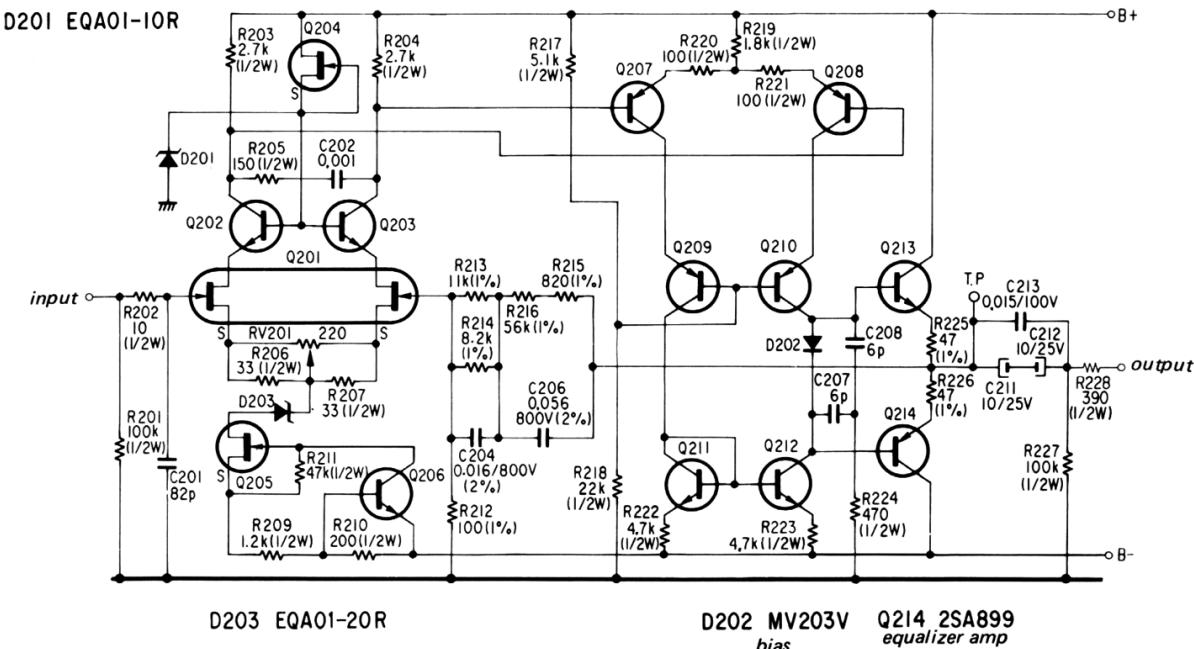


Fig. 1-3.

## Flat Amplifier

The flat amplifier (Q301 to Q314) is very similar to the equalizer amplifier, except for the feedback circuit. To avoid any degradation of the frequency response by the cable capacitance when the pre-amplifier is disconnected to the power amplifier, the output impedance of the set is relatively low. The equalizer amplifier is designed for the RIAA equalization frequency response curve. On the other hand, the flat amplifier frequency response curve is practically flat ( $\pm 0\text{dB}$ ) across the 5–500,000 Hz range.

## Low-boost Amplifier (See Fig. 1-4)

1. This amplifier is used to boost the low frequency region, compensating for insufficient bass response. To make up the direct-coupled circuit, an FET is used for the 1st-stage amplifier and a push-pull emitter-follower for the output stage (Q403, Q404).
2. The low frequencies are emphasized by the twin-T network feedback circuit (C402 to C404, R405, R406, R408, R409). Fig. 1-5 shows the resultant frequency response curve.

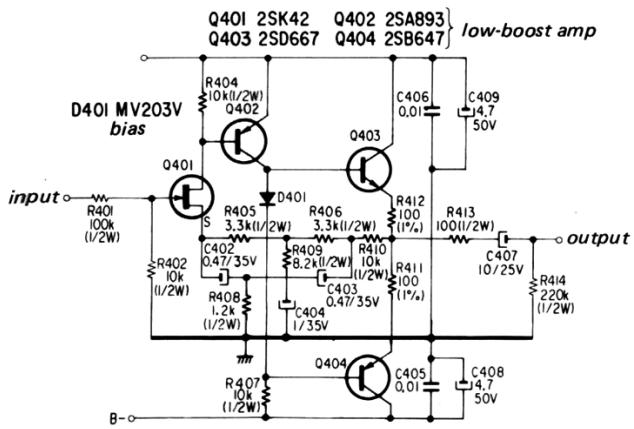


Fig. 1-4.

frequency response (BASS BOOST)

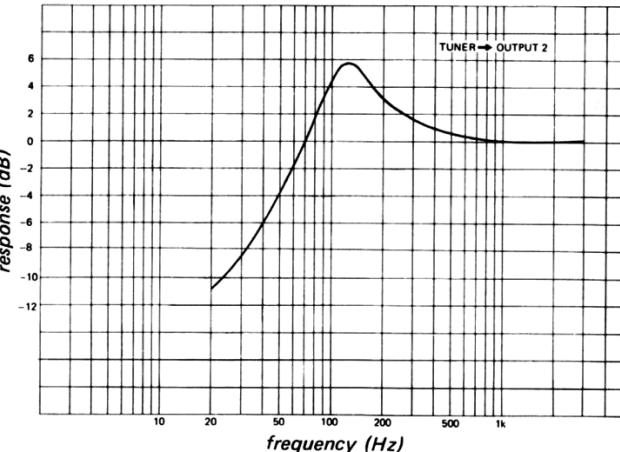


Fig. 1-5.

## Power Supply Circuit (See Fig. 1-6)

Q601 to Q618 form the power supply circuit for the head amplifier, while Q619 to Q634 form the power supply circuit for the other amplifier. The description outlined below refers to the former.

1. The base voltage of Q608 in the differential amplifier is maintained at 4.5 V by Q607. The resistive voltage divider network (R609, R611) senses any voltage change proportional to changes in the output voltage, and applies it to the base of Q609. This voltage is amplified by the differential amplifier (Q608, Q609) and the two transistors (Q604, Q605) that are connected in a Darlington configuration. The amplified voltage controls Q602 and Q603. As a result, the output voltage is essentially constant.
2. Q601 serves as a constant current load for Q604 and Q605, while Q606 supplies Q607 with constant current.

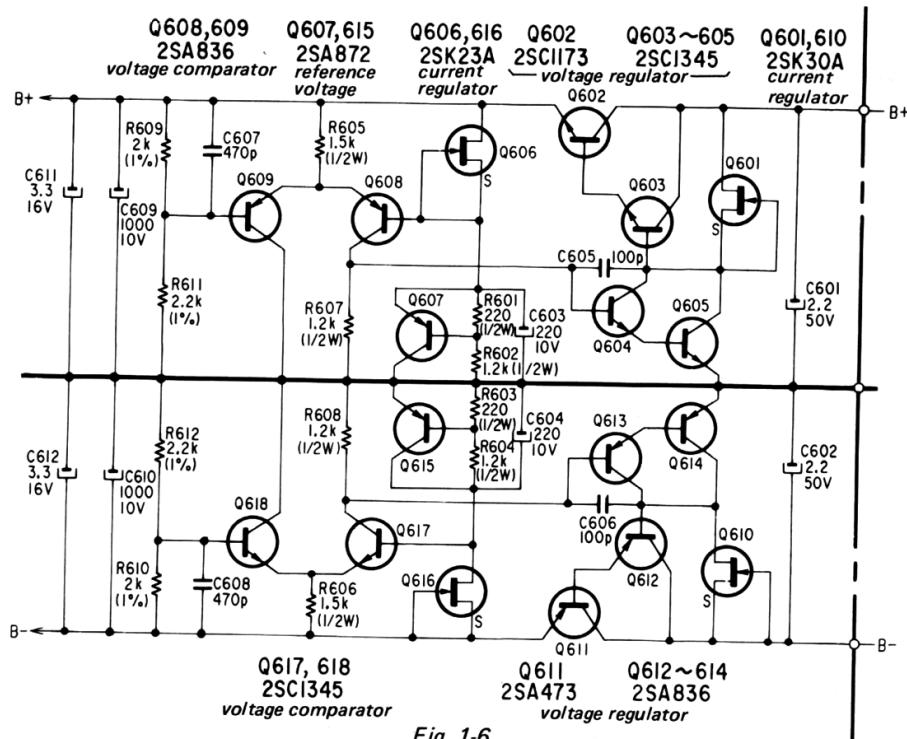


Fig. 1-6.

#### Muting Circuit (See Fig. 1-7)

The muting circuit eliminates the pop noises generated when the POWER switch is turned on and off. This is accomplished by releasing the relays (RY301, RY351) inserted between the amplifier circuit and the output terminal.

##### a) When the POWER switch is turned on:

1. B+ and B- voltage are applied to the relay-drive circuit, and C511 is charged according to the time constant consisting of R507 and C511.

2. Q501 and Q502 remain off until C511 is charged up (about 7 to 8 seconds later). The relays (RY301, RY351) also remain off during this period, thereby preventing any audio signals and the pop noise generated when the POWER switch is turned on from reaching the output terminals.
3. After 7 to 8 seconds, the base voltage of Q501 becomes high enough to turn Q501 and Q502 on. This activates the relays (RY301, RY351), and the audio signal is furnished to the output terminal.

##### b) When the POWER switch is turned off:

1. C511 discharges through D505, D504 and R503, and Q502 is turned off. As a result, the relays (RY301, RY351) are turned off immediately.
2. The noise generated when the POWER switch is turned off is removed from the output terminal by the opening of the relays.

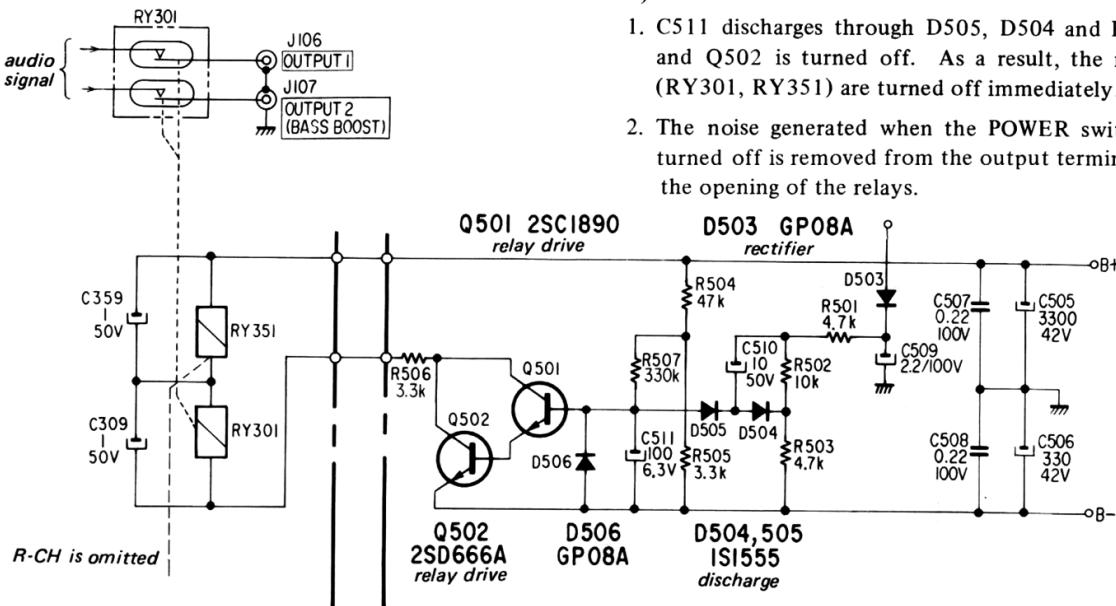
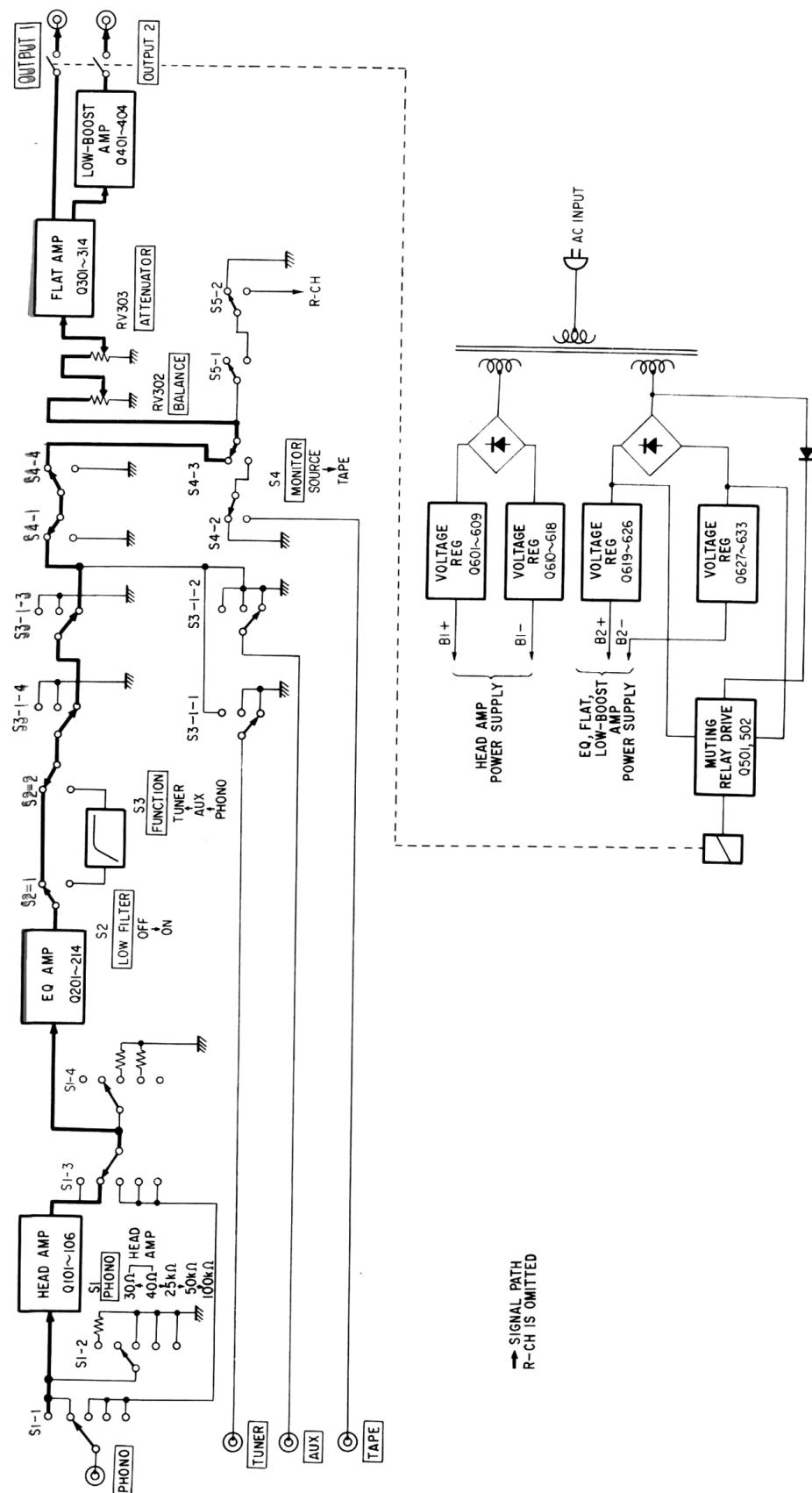


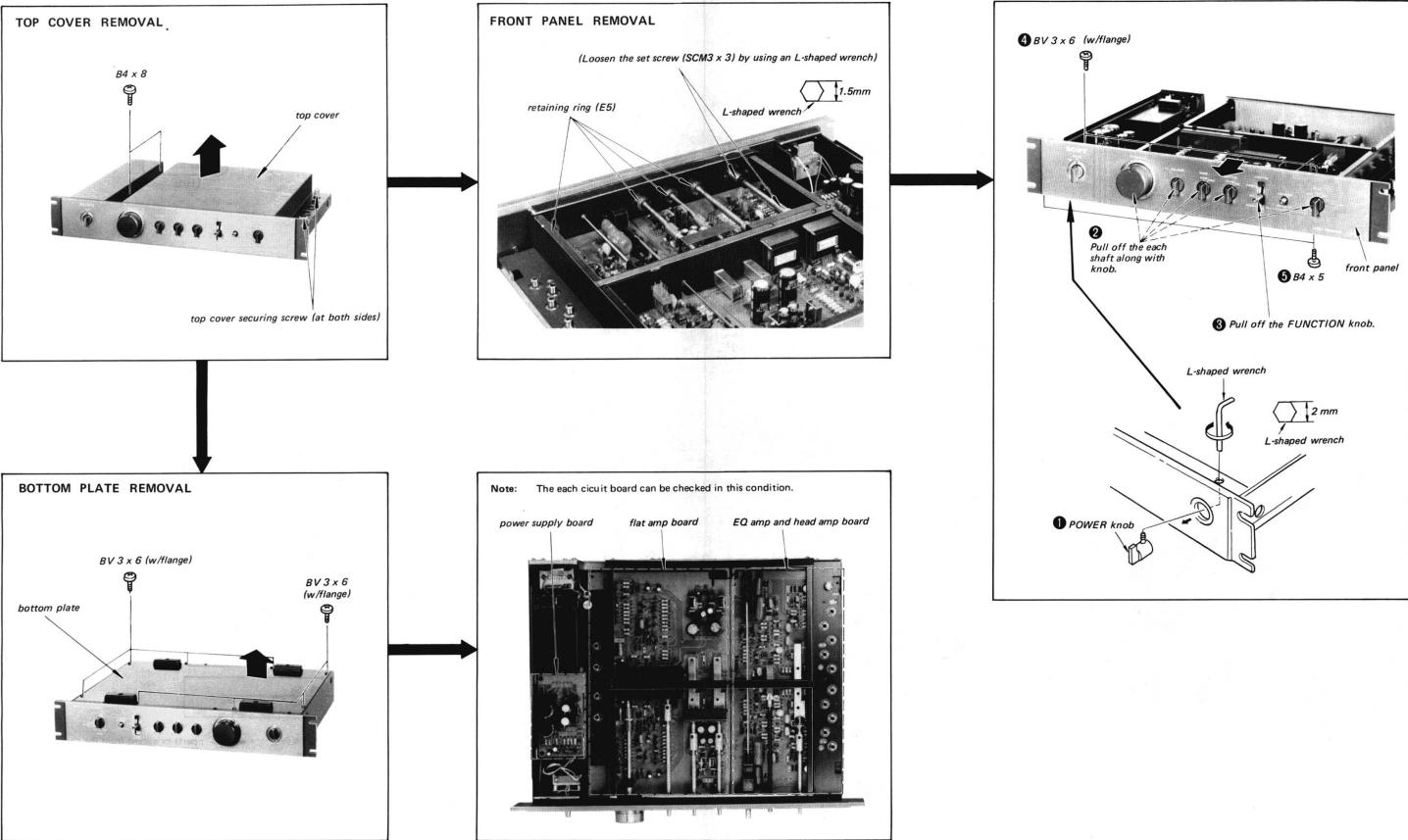
Fig. 1-7.

## 1-2. BLOCK DIAGRAM



## SECTION 2 DISASSEMBLY

- Follow the disassembly procedure in the numerical order given.



## SECTION 3

### ADJUSTMENT

#### OFFSET ADJUSTMENT

##### Setup:

POWER switch (S6) : ON  
ATTENUATOR (RV303, 353) : minimum (fully  
BALANCE control : counterclockwise)  
MODE switch (S5) : mechanical-mid  
MONITOR switch (S4) : STEREO  
FUNCTION switch (S3) : SOURCE  
LOW FILTER switch (S2) : PHONO  
PHONO switch (S1) : OFF  
PHONO switch (S1) :  $25\text{ k}\Omega$

##### Procedure:

1. Terminate the PHONO input with a shorting plug.
2. Adjust RV 201(L-CH) and RV 251(R-CH) for 0 V dc reading on the VOM.

##### Specifications:

$0 \pm 0.5\text{ Vdc}$

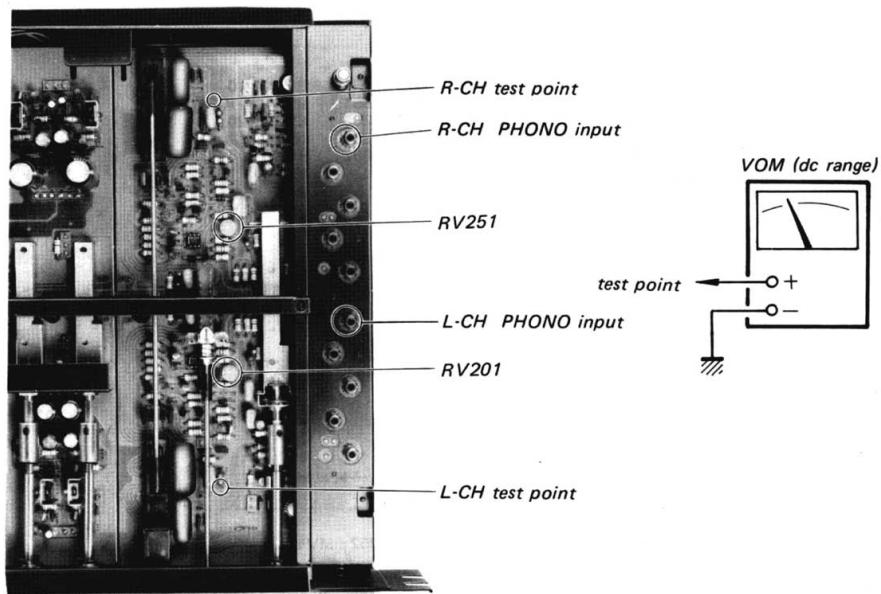
##### Adjustment Location:

—EQ amp and head amp board—

#### MUTING TIME CHECK

Confirm the operation of the relays (RY301, 351).

- RY301 and RY351 are energized about eight seconds later after the POWER switch is turned on.
- RY301 and RY351 are released as soon as the POWER switch is tuned off.



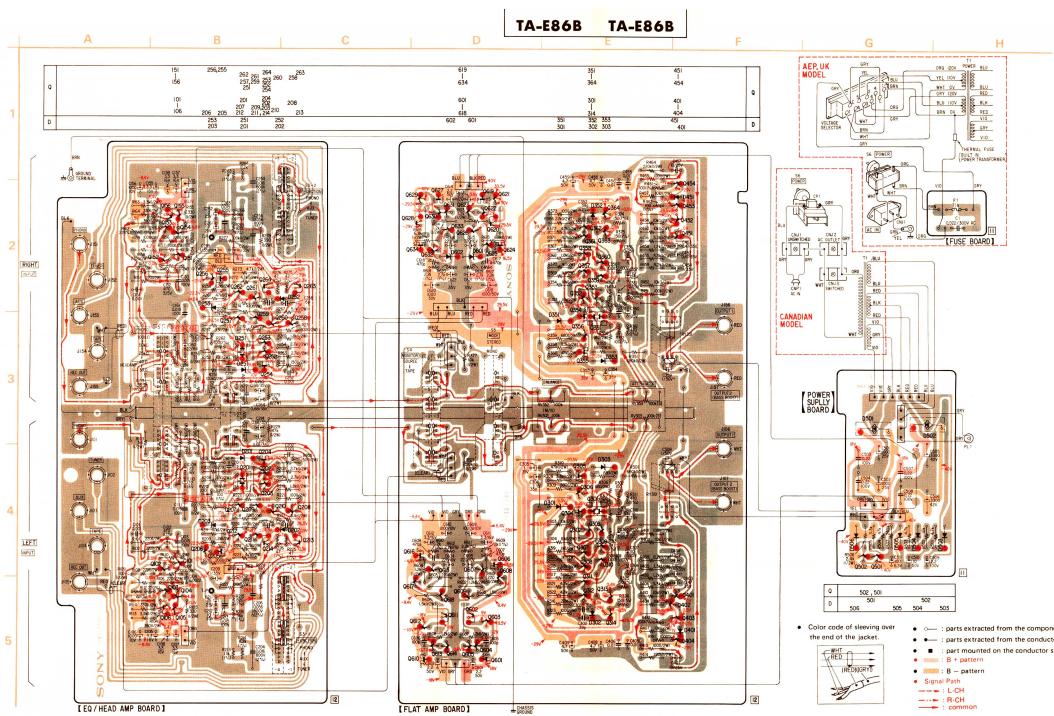
## SECTION 4 DIAGRAMS

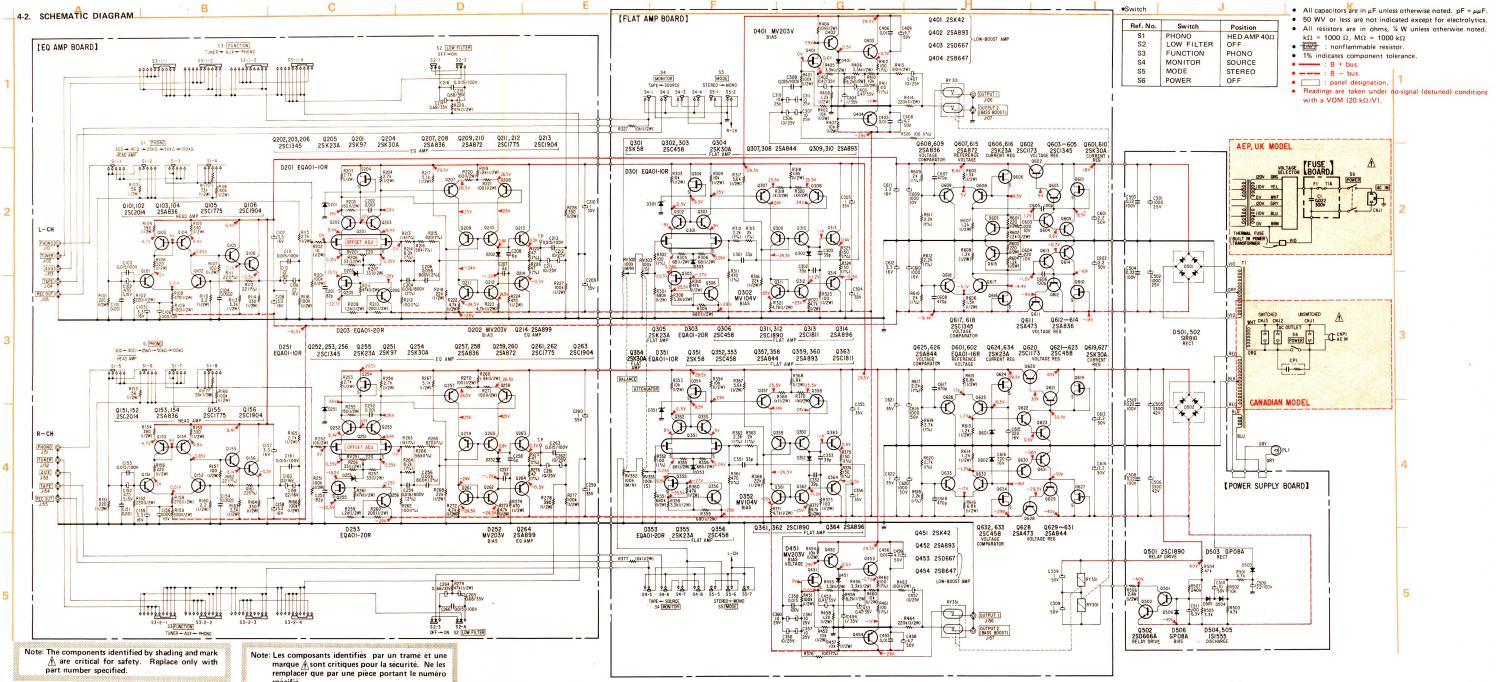
- #### **4-1. MOUNTING DIAGRAM.**

  - Replacement Semiconductors

- **Replacement Semiconductors**  
For replacement, use semiconductors.

<b>Q101, 151</b>	<b>25C2914</b>	<b>Q205, 255</b>	<b>25C233A-834</b>	<b>O401, 461</b>	<b>25K42-2</b>
<b>Q211, 261</b>	<b>25C1715-E</b> <b>(SC1715)</b>	<b>Q206, 256</b>	<b>25C233A-834</b>		
<b>Q103, 153</b>	<b>25A87F</b>	<b>Q208, 257</b>	<b>25A87B-E</b>	<b>O313, 363</b>	<b>25C1811</b>
<b>Q208, 258</b>	<b>25A87F/E</b>	<b>Q209, 258</b>	<b>25A87B-E</b>	<b>O402, 462</b>	<b>25C1811</b>
<b>Q512-514</b>		<b>Q210, 259</b>	<b>25A87D</b>		
<b>(2SAE3)</b>		<b>Q211, 260</b>	<b>25A87E</b>		
<b>Q105, 155</b>	<b>25C1904</b>	<b>Q214, 264</b>	<b>25A895</b>	<b>O602, 620</b>	<b>25C1173</b>
<b>Q213, 263</b>					
<b>Q201, 251</b>	<b>25K97</b>	<b>Q307, 357</b>	<b>25A896</b>	<b>O461, 428</b>	<b>25A473</b>
<b>Q301, 351</b>	<b>25K58</b>	<b>Q308, 358</b>	<b>25A897</b>		
<b>Q202, 262</b>	<b>25C1345</b>			<b>D001, 251</b>	<b>E00A1-10</b>
<b>Q203, 253</b>	<b>25C1345</b>	<b>Q209, 431</b>	<b>25A898</b>	<b>301, 351</b>	<b>E00A1-10</b>
<b>Q204, 254</b>	<b>25C1345</b>			<b>D003, 353</b>	<b>E00A1-2R</b>
<b>Q205, 255</b>	<b>25C1345</b>	<b>Q210, 431</b>	<b>25A899</b>	<b>304, 354</b>	<b>E00A1-2R</b>
<b>Q206, 256</b>	<b>25C1345</b>			<b>D005, 451</b>	<b>(E00A1-16A)</b>
<b>Q211-223</b>	<b>(25A900)</b>	<b>Q311, 361</b>	<b>25C326A</b>		
<b>(25A900)</b>		<b>Q301</b>	<b>25C326A</b>		
<b>Q304, 354</b>	<b>25K30A</b>			<b>D002, 252</b>	<b>MV203</b>
<b>Q305, 355</b>	<b>25K30A</b>	<b>Q305</b>	<b>25C326A</b>		
<b>Q306, 356</b>	<b>25C1345</b>			<b>D003, 352</b>	<b>MV104V</b>
<b>Q307, 357</b>	<b>25C1345</b>				
<b>Q308, 358</b>	<b>25C1345</b>			<b>D005, 502</b>	<b>SIR810</b>
<b>Q309, 359</b>	<b>25C1345</b>				





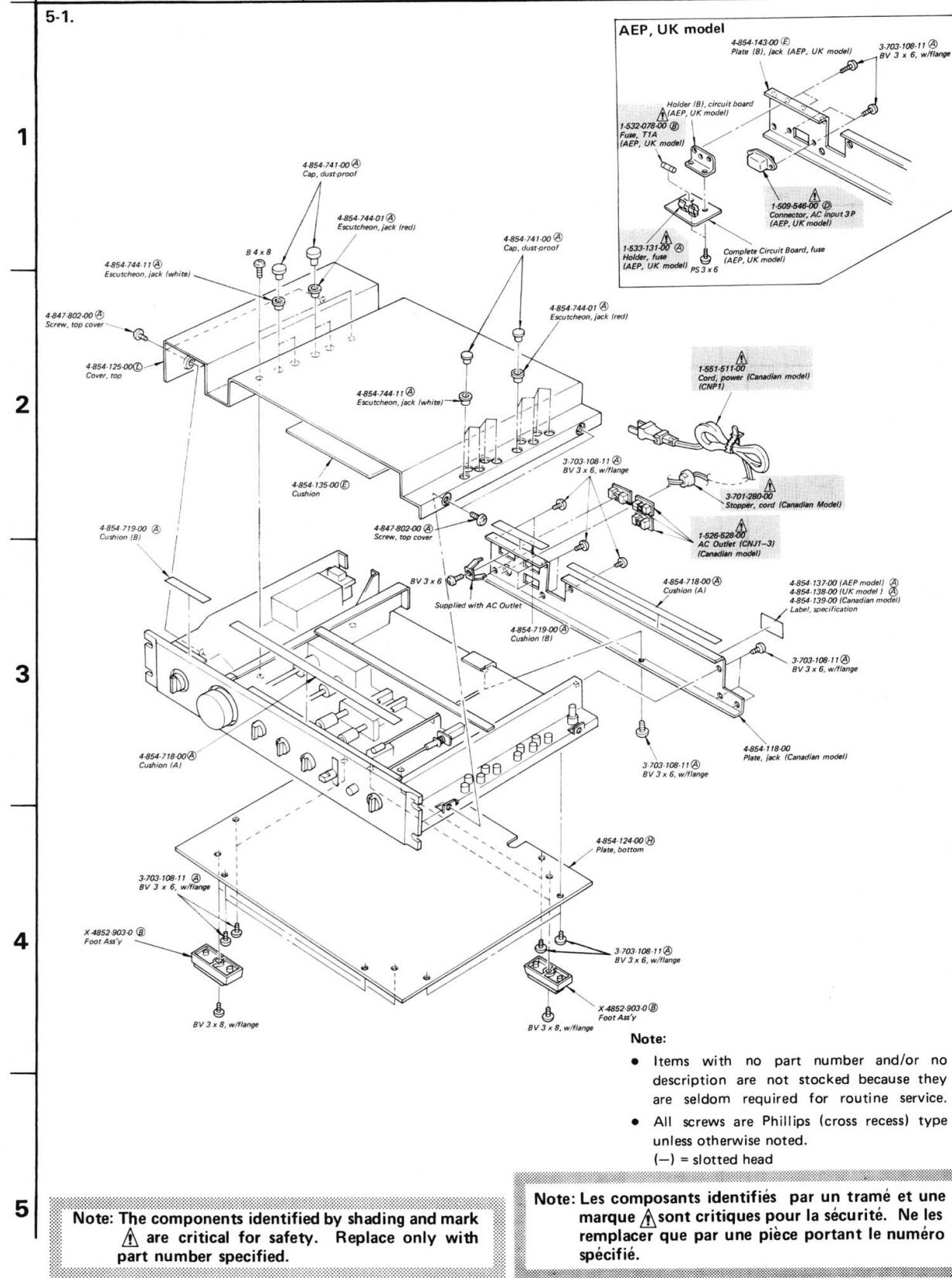
## SECTION 5 EXPLODED VIEWS

Note: Circled letters (A to Z) are applicable to European models only.

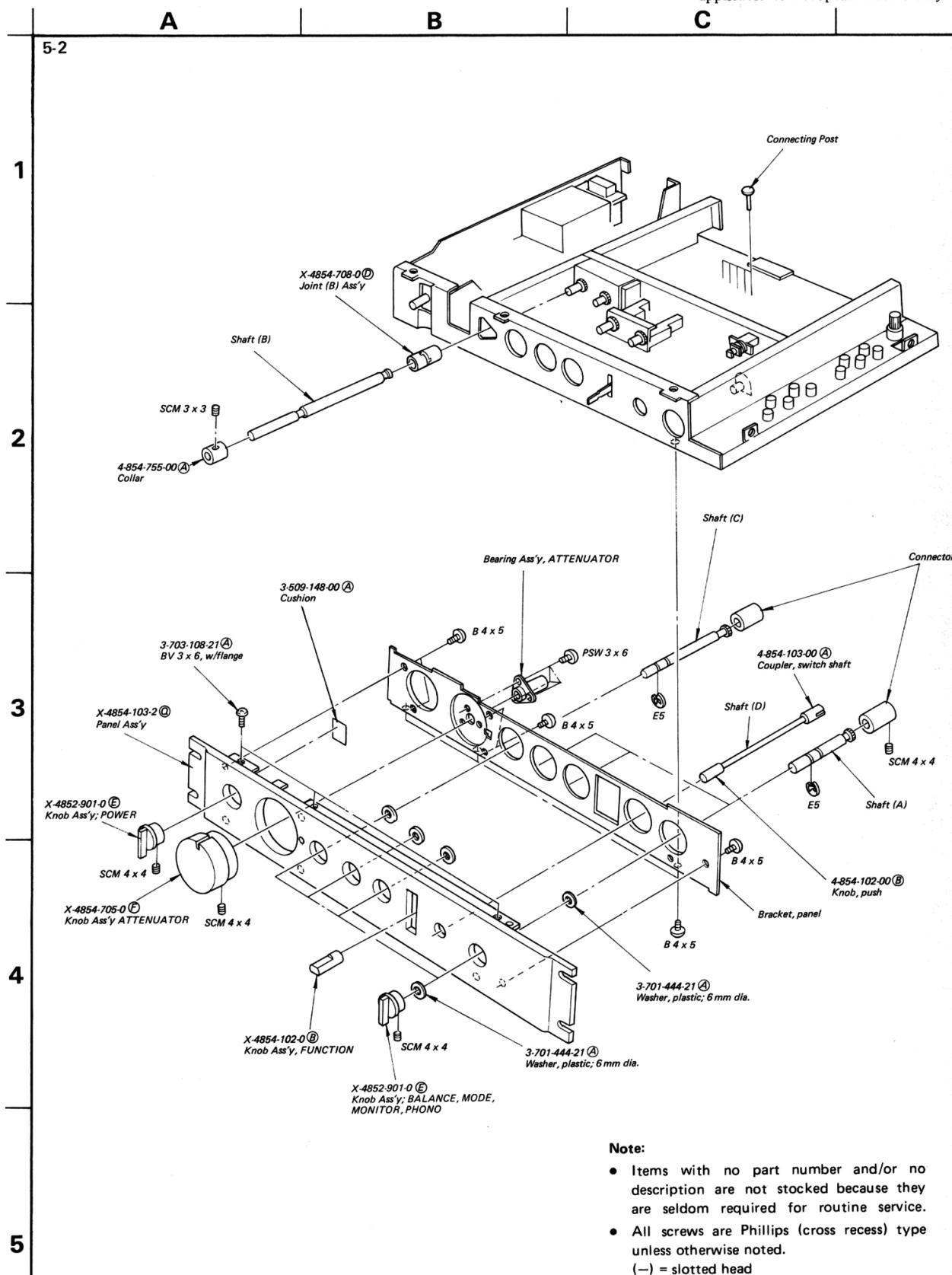
**A**

**B**

**C**



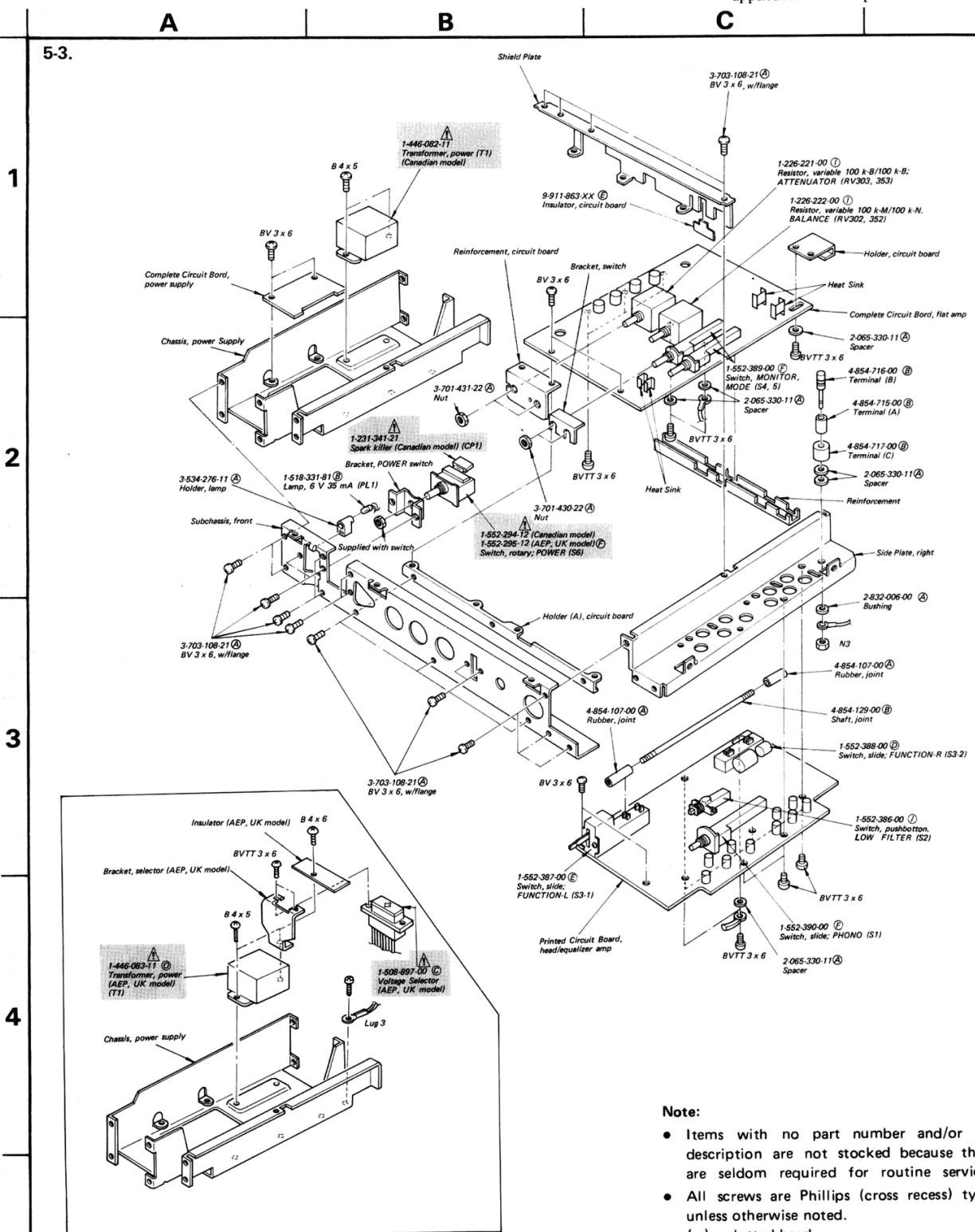
Note: Circled letters (A to Z) are applicable to European models only.



**Note:**

- Items with no part number and/or no description are not stocked because they are seldom required for routine service.
- All screws are Phillips (cross recess) type unless otherwise noted.  
(-) = slotted head

Note: Circled letters (A) to (Z) are applicable to European models only.



**5 Note:** The components identified by shading and mark are critical for safety. Replace only with part number specified.

**Note:** Les composants identifiés par un trame et une marque sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

## SECTION 6

### ELECTRICAL PARTS LIST

Note: Circled letters (Ⓐ to Ⓛ) are applicable to European models only.

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
<b>SEMICONDUCTORS</b>					
<b>Transistors</b>					
⇒ Q101, 151	8-765-493-00	Ⓐ 2SC2014	⇒ Q502	8-765-012-20	Ⓑ 2SC1811
Q102, 152			Q601	8-729-203-04	Ⓐ 2SK30A
⇒ Q103, 153	8-729-387-28	Ⓑ 2SA872-E	Q602	8-729-217-33	Ⓑ 2SC1173
Q104, 154			Q603-605	8-729-334-58	Ⓐ 2SC1345
⇒ Q105, 155	8-729-377-58	Ⓑ 2SC1775-E	⇒ Q606	8-722-383-40	Ⓑ 2SK23A-834
Q106, 156	8-729-990-43	Ⓑ 2SC1904	⇒ Q607-609	8-729-387-28	Ⓑ 2SA872-E
Q201, 251	8-765-342-31	Ⓕ 2SK97	Q610	8-729-203-04	Ⓑ 2SK30A
Q202, 252	8-729-334-58	Ⓑ 2SC1345	Q611	8-729-247-33	Ⓐ 2SA473
Q203, 253			⇒ Q612-615	8-729-387-28	Ⓐ 2SA872-E
Q204, 254	8-729-203-04	Ⓑ 2SK30A	⇒ Q616	8-722-383-40	Ⓑ 2SK23A-834
⇒ Q205, 255	8-722-383-40	Ⓑ 2SK23A-834	Q617, 618	8-729-334-58	Ⓑ 2SC1345
Q206, 256	8-729-334-58	Ⓑ 2SC1345	Q619	8-729-203-04	Ⓑ 2SK30A
⇒ Q207-210	8-729-387-28	Ⓑ 2SA872-E	Q620	8-729-217-33	Ⓐ 2SC1173
Q257-260			⇒ Q621-623	8-729-334-58	Ⓑ 2SC1345
⇒ Q211, 261	8-729-377-58	Ⓑ 2SC1775-E	⇒ 624	8-722-383-40	Ⓑ 2SK23A-834
Q212, 262			⇒ Q625, 626	8-727-788-00	Ⓑ 2SA678
Q213, 263	8-729-990-43	Ⓑ 2SC1904	Q627	8-729-203-04	Ⓑ 2SK30A
⇒ Q214, 264	8-765-082-20	Ⓐ 2SA896	Q628	8-729-247-33	Ⓐ 2SA473
Q301, 351	8-761-510-06	Ⓕ 2SK58	⇒ Q629-631	8-727-788-00	Ⓑ 2SA678
⇒ Q302, 252	8-729-334-58	Ⓑ 2SC1345	⇒ Q632, 633	8-729-334-58	Ⓑ 2SC1345
Q303, 353			⇒ Q634	8-722-383-40	Ⓑ 2SK23A-834
Q304, 354	8-729-203-04	Ⓑ 2SK30A	<b>Diodes</b>		
⇒ Q305, 355	8-722-383-40	Ⓑ 2SK23A-834	⇒ D201, 251	8-719-931-10	Ⓑ EQB01-10
⇒ Q306, 356	8-729-334-58	Ⓑ 2SC1345	D202, 252	8-719-920-30	Ⓑ MV203 V
⇒ Q307, 357	8-727-788-00	Ⓑ 2SA678	⇒ D203, 253	8-719-931-20	Ⓑ EQB01-20
Q308, 358			⇒ D301, 351	8-719-931-10	Ⓑ EQB01-10
⇒ Q309, 359	8-729-163-93	Ⓐ 2SA639S	D302, 352	8-719-910-40	Ⓑ MV104 V
Q310, 360			⇒ D303, 353	8-719-931-20	Ⓑ EQB01-20
⇒ Q311, 361	8-720-950-03	Ⓐ 2SC926A	D401, 451	8-719-920-30	Ⓑ MV203 V
Q312, 362			D501, 502	8-719-510-10	Ⓐ S1RB10
Q313, 363	8-765-012-20	Ⓐ 2SC1811	⇒ D503	8-719-911-55	Ⓑ U05G
Q314, 364	8-765-082-20	Ⓐ 2SA896	D504, 505	8-719-815-55	Ⓑ IS1555
⇒ Q401, 451	8-727-312-00	Ⓐ 2SK42-2	⇒ D506	8-719-911-55	Ⓑ U05G
⇒ Q402, 452	8-729-163-93	Ⓐ 2SA639S	⇒ D601, 602	8-719-931-16	Ⓑ EQB01-16
Q403, 453	8-729-366-71	Ⓑ 2SD667			
Q404, 454	8-729-364-71	Ⓑ 2SB647			
⇒ Q501	8-720-950-03	Ⓐ 2SC926A			

⇒: Due to standardization, interchangeable replacements may be substituted for parts specified in the diagrams.

**Note:** Circled letters ( A ) to ( Z ) are applicable to European models only.

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
<b>CAPACITORS</b>		
All capacitors are in $\mu\text{F}$ and ceramic unless otherwise noted. 50 WV or less are not indicated except for electrolytics and tantalum. pF = $\mu\mu\text{F}$ , elect = electrolytic		
<b>C1</b>	<b>Δ1-108-777-12</b>	<b>© 0.022 300 V mylar (AEP. UK model)</b>
C101, 151	1-102-074-11	(A) 0.001
C102, 151	1-131-429-11	(F) 470 3.15 V tantalum
C103, 153	1-130-127-11	(B) 0.015 100 V polyethylene
C104, 154	1-102-121-11	(A) 0.0022
C105, 155	1-131-449-11	(C) 3.3 16 V tantalum
C106, 156	1-121-943-11	(B) 1000 10 V elect
C107, 157	1-131-449-11	(C) 3.3 16 V tantalum
C108, 158	1-131-449-11	(C) 3.3 16 V tantalum
C109, 159	1-131-201-11	(B) 22 16 V tantalum
C110, 160	1-130-127-11	(B) 0.015 100 V polyethylene
C201, 251	1-102-971-11	(A) 82 p
C202, 252	1-102-074-11	(A) 0.001
C204, 254	1-130-145-11	(B) 0.016 800 V polyethylene
C206, 256	1-130-146-11	(C) 0.056 800 V polyethylene
C207, 257	1-102-943-11	(A) 6 p
C208, 258	1-131-450-11	(C) 1 35 V tantalum
C210, 260	1-131-238-11	(B) 10 25 V tantalum
C211, 261	1-130-127-11	(B) 0.015 100 V polyethylene
C212, 262	1-131-214-11	(B) 0.68 35 V tantalum
C213, 263	1-130-127-11	(B) 0.015 100 V polyethylene
C214, 264	1-131-450-11	(C) 1 35 V tantalum
C215, 265	1-102-963-11	(A) 33 p
C216, 266	1-102-965-11	(A) 39 p
C301, 351	1-102-963-11	(A) 33 p
C302, 352	1-102-965-11	(A) 39 p
C303, 353	1-131-450-11	(C) 1 35 V tantalum
C304, 354	1-131-450-11	(C) 1 35 V tantalum
C305, 355	1-131-450-11	(C) 1 35 V tantalum

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
C306, 356	1-131-238-11	(B) 10 25 V tantalum
C307, 357	1-130-127-11	(B) 0.015 100 V polyethylene
C308, 358	1-121-391-11	(A) 1 50 V elect
C309, 359	1-131-238-11	(B) 10 25 V tantalum
C310, 360	1-131-213-11	(B) 0.47 35 V tantalum
C311, 361	1-131-215-11	(B) 1 35 V tantalum
C402, 452	1-102-129-11	(A) 0.01
C403, 453	1-121-396-11	(A) 4.7 50 V elect
C404, 454	1-123-066-11	(B) 1000 25 V elect
C405, 455	1-130-085-11	(B) 0.22 100 V polyethylene
C406, 456	1-123-393-11	(B) 3300 42 V elect
C407, 457	1-130-085-11	(B) 0.22 100 V polyethylene
C408, 458	1-123-250-11	(A) 2.2 100 V elect
C409, 459	1-123-183-11	(A) 10 50 V elect
C501, 502	1-123-068-11	(B) 220 6.3 V tantalum
C503, 504	1-121-986-11	(A) 2.2 10 V elect
C505, 506	1-102-973-11	(A) 100 p
C507, 508	1-102-114-11	(A) 470 p
C509	1-121-943-11	(B) 1000 10 V elect
C510	1-123-061-11	(C) 1000 50 V elect
C511	1-121-295-11	(C) 100 6.3 V tantalum
C601, 602	1-121-986-11	(A) 2.2 50 V elect
C603, 604	1-123-072-11	(A) 220 10 V elect
C605, 606	1-102-973-11	(A) 100 p
C607, 608	1-102-114-11	(A) 470 p
C609, 610	1-121-943-11	(B) 1000 10 V elect
C611, 612	1-131-449-11	(C) 3.3 16 V tantalum
C613, 614	1-121-986-11	(A) 2.2 50 V elect
C615, 616	1-123-068-11	(B) 220 16 V elect
C617, 618	1-102-114-11	(A) 470 p
C619, 620	1-123-061-11	(C) 1000 50 V elect
C621, 622	1-131-450-11	(C) 1 35 V tantalum

**Note:** The components identified by shading and mark  are critical for safety. Replace only with part number specified.

**Note:** Les composants identifiés par un trame et une marque  sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

**Note:** Circled letters ( **A** ) to ( **Z** ) are applicable to European models only.

Ref. No.    Part No.    Description

**RESISTOR**

All resistors are in ohms. Common  $\frac{1}{4}$ W carbon resistors are omitted. Refer to the list on page 26 for their resistance values. ( $k\Omega = 1000 \Omega$ ,  $M\Omega = 1000 k\Omega$ )

R101, 151	1-244-857-11	(A) 220	$\frac{1}{2}$ W	carbon
R102, 152	1-244-857-11	(A) 220	$\frac{1}{2}$ W	carbon
R103, 153	1-244-843-11	(A) 56	$\frac{1}{2}$ W	carbon
R104, 154	1-244-863-11	(A) 390	$\frac{1}{2}$ W	carbon
R105, 155	1-244-861-11	(A) 330	$\frac{1}{2}$ W	carbon
R106, 156	1-244-857-11	(A) 220	$\frac{1}{2}$ W	carbon
R107, 157	1-244-849-11	(A) 100	$\frac{1}{2}$ W	carbon
R108, 158	1-244-859-11	(A) 270	$\frac{1}{2}$ W	carbon
R109, 159	1-244-849-11	(A) 100	$\frac{1}{2}$ W	carbon
R110, 160	1-212-364-11	(A) 2.2	$\frac{1}{2}$ W	carbon
R111, 161	1-214-092-11	(A) 22	$\frac{1}{4}$ W	metal oxide
R112, 162	1-244-885-11	(A) 3.3 k	$\frac{1}{2}$ W	carbon
R113, 163	1-244-861-11	(A) 330	$\frac{1}{2}$ W	carbon
R114, 164	1-244-883-11	(A) 2.7 k	$\frac{1}{2}$ W	carbon
R115, 165	1-244-921-11	(A) 100 k	$\frac{1}{2}$ W	carbon
R116, 166	1-244-909-11	(A) 33 k	$\frac{1}{2}$ W	carbon
R117, 167	1-244-921-11	(A) 100 k	$\frac{1}{2}$ W	carbon
R201, 252	1-244-921-11	(A) 100 k	$\frac{1}{2}$ W	carbon
R202, 252	1-244-825-11	(A) 10	$\frac{1}{2}$ W	carbon
R203, 253	1-244-883-11	(A) 2.7 k	$\frac{1}{2}$ W	carbon
R204, 254	1-244-853-11	(A) 150	$\frac{1}{2}$ W	carbon
R205, 255	1-244-837-11	(A) 33	$\frac{1}{2}$ W	carbon
R206, 256	1-244-875-11	(A) 1.2 k	$\frac{1}{2}$ W	carbon
R207, 257	1-244-856-11	(A) 200	$\frac{1}{2}$ W	carbon
R208, 258	1-244-913-11	(A) 47 k	$\frac{1}{2}$ W	carbon
R209, 259	1-244-912-11	(A) 100	$\frac{1}{2}$ W	metal oxide
R210, 260	1-214-108-11	(A) 100	$\frac{1}{4}$ W	metal oxide
R211, 261	1-214-157-11	(A) 11 k	$\frac{1}{4}$ W	metal oxide
R212, 262	1-214-154-11	(A) 8.2 k	$\frac{1}{4}$ W	metal oxide
R213, 263	1-214-130-11	(A) 820	$\frac{1}{4}$ W	metal oxide
R214, 264	1-214-174-11	(A) 56 k	$\frac{1}{4}$ W	metal oxide

Ref. No.    Part No.    Description

R217, 267	1-244-890-11	(A) 5.1 k	$\frac{1}{2}$ W	carbon
R218, 268	1-244-905-11	(A) 22 k	$\frac{1}{2}$ W	carbon
R219, 269	1-244-879-11	(A) 1.8 k	$\frac{1}{2}$ W	carbon
R220, 270	1-244-849-11	(A) 100	$\frac{1}{2}$ W	carbon
R221, 271	1-244-889-11	(A) 4.7 k	$\frac{1}{2}$ W	carbon
R222, 272	1-244-913-11	(A) 47 k	$\frac{1}{2}$ W	carbon
R223, 273	1-244-865-11	(A) 470	$\frac{1}{2}$ W	carbon
R224, 274	1-214-100-11	(A) 47	$\frac{1}{4}$ W	metal oxide
R225, 275	1-244-921-11	(A) 100 k	$\frac{1}{2}$ W	carbon
R226, 276	1-244-863-11	(A) 390	$\frac{1}{2}$ W	carbon
R227, 277	1-244-913-11	(A) 47 k	$\frac{1}{2}$ W	carbon
R301, 351	1-244-941-11	(A) 680 k	$\frac{1}{2}$ W	carbon
R302, 352	1-214-108-11	(A) 100	$\frac{1}{4}$ W	metal oxide
R303, 353	1-244-897-11	(A) 10 k	$\frac{1}{2}$ W	carbon
R304, 354	1-244-845-11	(A) 68	$\frac{1}{2}$ W	carbon
R305, 355	1-244-885-11	(A) 3.3 k	$\frac{1}{2}$ W	carbon
R306, 356	1-244-869-11	(A) 680	$\frac{1}{2}$ W	carbon
R307, 357	1-214-124-11	(A) 470	$\frac{1}{4}$ W	metal oxide
R308, 358	1-214-140-11	(A) 2.2 k	$\frac{1}{4}$ W	metal oxide
R309, 359	1-214-139-11	(A) 2 k	$\frac{1}{4}$ W	metal oxide
R310, 360	1-244-905-11	(A) 22 k	$\frac{1}{2}$ W	carbon
R311, 361	1-244-891-11	(A) 5.6 k	$\frac{1}{2}$ W	carbon
R312, 362	1-244-873-11	(A) 1 k	$\frac{1}{2}$ W	carbon
R313, 363	1-244-889-11	(A) 4.7 k	$\frac{1}{2}$ W	carbon
R314, 364	1-214-112-11	(A) 150	$\frac{1}{4}$ W	metal oxide
R315, 365	1-214-108-11	(A) 100	$\frac{1}{4}$ W	metal oxide
R316, 366	1-244-897-11	(A) 10 k	$\frac{1}{2}$ W	carbon
R317, 367	1-244-863-11	(A) 390	$\frac{1}{2}$ W	carbon
R318, 368	1-244-921-11	(A) 100 k	$\frac{1}{2}$ W	carbon
R319, 369	1-244-879-11	(A) 1.8 k	$\frac{1}{2}$ W	carbon
R320, 370	1-244-849-11	(A) 100	$\frac{1}{2}$ W	carbon
R321, 371	1-244-889-11	(A) 4.7 k	$\frac{1}{2}$ W	carbon
R322, 372	1-244-913-11	(A) 47 k	$\frac{1}{2}$ W	carbon
R323, 373	1-244-865-11	(A) 470	$\frac{1}{2}$ W	carbon
R324, 374	1-214-157-11	(A) 11 k	$\frac{1}{4}$ W	metal oxide
R325, 375	1-244-913-11	(A) 100	$\frac{1}{2}$ W	carbon
R326, 376	1-214-154-11	(A) 8.2 k	$\frac{1}{4}$ W	metal oxide
R327, 377	1-244-897-11	(A) 10 k	$\frac{1}{2}$ W	carbon
R401, 451	1-244-921-11	(A) 100 k	$\frac{1}{2}$ W	carbon
R402, 452	1-244-897-11	(A) 10 k	$\frac{1}{2}$ W	carbon

**Note:** Circled letters ( A ) to ( Z ) are applicable to European models only.

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>			
R404, 454	1-244-897-11	(A) 10 k	½ W	carbon	
R405, 455	1-244-885-11	(A) 3.3 k	½ W	carbon	
R406, 456					
R407, 457	1-244-897-11	(A) 10 k	½ W	carbon	
R408, 458	1-244-875-11	(A) 1.2 k	½ W	carbon	
R409, 459	1-244-895-11	(A) 8.2 k	½ W	carbon	
R410, 460	1-244-897-11	(A) 10 k	½ W	carbon	
R411, 451	1-214-108-11	(A) 100	¼ W	metal oxide	
R412, 462					
R413, 463	1-244-849-11	(A) 100	½ W	carbon	
R414, 464	1-244-929-11	(A) 220 k	½ W	carbon	
R506	1-244-882-11	(A) 2.4 k	½ W	carbon	
R507	1-246-530-11	(A) 240 k			
R601	1-244-857-11	(A) 220	½ W	carbon	
R602	1-244-875-11	(A) 1.2 k	½ W	carbon	
R603	1-244-857-11	(A) 220	½ W	carbon	
R604	1-244-875-11	(A) 1.2 k	½ W	carbon	
R605, 606	1-244-877-11	(A) 1.5 k	½ W	carbon	
R607, 608	1-244-875-11	(A) 1.2 k	½ W	carbon	
R609, 610	1-214-139-11	(A) 2.0 k	¼ W	metal oxide	
R611, 612	1-214-140-11	(A) 2.2 k	¼ W	metal oxide	
R613, 614	1-244-875-11	(A) 1.2 k	½ W	carbon	
R615, 616	1-244-893-11	(A) 6.8 k	½ W	carbon	
R617, 618	1-214-140-11	(A) 2.2 k	¼ W	metal oxide	
R619, 620	1-214-142-11	(A) 2.7 k	¼ W	metal oxide	
RV201, 251	1-224-550-21	(B) 220 k-B, adjustable; OFFSET			
RV302, 352	1-225-222-00	(I) 100 k-M/100 k-N, variable BALANCE			
RV303, 353	1-226-221-00	(I) 100 k-B/100 k-B, variable; ATTENUATOR			

#### SWITCHES

S1	1-552-390-00	(F) Slide, PHONO
S2	1-552-386-00	(I) Pushbutton, LOW FILTER
S3-1	1-552-387-00	(E) Lever-Slide, FUNCTION (L)

**Note:** The components identified by shading and mark are critical for safety. Replace only with part number specified.

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	
S3-2	1-552-388-00	(D) Slide, FUNCTION (R)	
S4, 5	1-552-389-00	(F) Rotary, MONITOR, MODE	
S6	1-552-294-12	Rotary, POWER (Canadian model)	
S6	1-552-295-00	(G) Rotary, POWER (AEP, UK model)	

#### MISCELLANEOUS

CNJ1-3	1-526-528-00	AC Outlet (Canadian model)	
CNJ1	1-509-546-00	(C) AC Input Connector 3 p, (AEP, UK model)	
CNP1	1-551-511-00	Cord, power (Canadian model)	
CP1	1-231-341-00	Spark killer (Canadian model)	
J101-105	1-507-567-00	(B) Jack, phono 1 P; PHONO	
J151-155		TUNER, AUX, TAPE, REC OUT	
J106, 156	1-507-567-12	(B) Jack, 1 P; OUTPUT 1, 2	
J107, 157			
PL1	1-518-331-81	(B) Lamp, 6 V 35 mA	
RY301, 351	1-515-294-21	(F) Relay	
F1	1-532-078-00	(B) Fuse, T1A (AEP, UK model)	
T1	1-446-082-11	Transformer, power (Canadian model)	
T1	1-446-083-11	(C) Transformer, power (AEP, UK model)	
	1-508-897-00	Voltage Selector (AEP, UK model)	
	1-533-131-00	(A) Holder, fuse (AEP, UK model)	

**Note:** Les composants identifiés par un trame et une marque sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

**Note:** Circled letters ( **A** to **Z** ) are applicable to European models only.

ACCESSORIES AND PACKING MATERIALS	
<u>Part No.</u>	<u>Description</u>
▲1-534-819-00 <b>(G)</b>	Cord, power (UK model)
1-551-315-00 <b>(H)</b>	Cord, connection; RK-112
3-701-020-00 <b>(A)</b>	Bag, check sheet
3-701-622-01 <b>(A)</b>	Bag, polyethylene (Canadian, UK model)
3-770-362-11	Manual, instruction (AEP, UK model)
3-770-362-21	Manual, instruction (Canadian model)
3-794-302-31	Leaflet, instruction (Canadian model)
4-809-251-00 <b>(A)</b>	Bag, protection
4-852-949-00 <b>(C)</b>	Cushion
4-854-140-00 <b>(E)</b>	Carton

**Note:** The components identified by shading and mark **▲** are critical for safety. Replace only with part number specified.

**Note:** Les composants identifiés par un trame et une marque **▲** sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

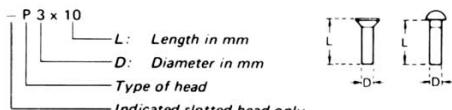
**1/4 WATT CARBON RESISTORS A**

**Note:** Circled letter A is applicable to European models only.

$\Omega$	Part No.										
1.0	1-244-601-11	10	1-244-625-11	100	1-244-649-11	1.0k	1-244-673-11	10k	1-244-697-11	100k	1-244-721-11
1.1	1-244-602-11	11	1-244-626-11	110	1-244-650-11	1.1k	1-244-674-11	11k	1-244-698-11	110k	1-244-722-11
1.2	1-244-603-11	12	1-244-627-11	120	1-244-651-11	1.2k	1-244-675-11	12k	1-244-699-11	120k	1-244-723-11
1.3	1-244-604-11	13	1-244-628-11	130	1-244-652-11	1.3k	1-244-676-11	13k	1-244-700-11	130k	1-244-724-11
1.5	1-244-605-11	15	1-244-629-11	150	1-244-653-11	1.5k	1-244-677-11	15k	1-244-701-11	150k	1-244-725-11
1.6	1-244-606-11	16	1-244-630-11	160	1-244-654-11	1.6k	1-244-678-11	16k	1-244-702-11	160k	1-244-726-11
1.8	1-244-607-11	18	1-244-631-11	180	1-244-655-11	1.8k	1-244-679-11	18k	1-244-703-11	180k	1-244-737-11
2.0	1-244-608-11	20	1-244-632-11	200	1-244-656-11	2.0k	1-244-680-11	20k	1-244-704-11	200k	1-244-728-11
2.2	1-244-609-11	22	1-244-633-11	220	1-244-657-11	2.2k	1-244-681-11	22k	1-244-705-11	220k	1-244-729-11
2.4	1-244-610-11	24	1-244-634-11	240	1-244-658-11	2.4k	1-244-682-11	24k	1-244-706-11	240k	1-244-730-11
2.7	1-244-611-11	27	1-244-635-11	270	1-244-659-11	2.7k	1-244-683-11	27k	1-244-707-11	270k	1-244-731-11
3.0	1-244-612-11	30	1-244-636-11	300	1-244-660-11	3.0k	1-244-684-11	30k	1-244-708-11	300k	1-244-732-11
3.3	1-244-613-11	33	1-244-637-11	330	1-244-661-11	3.3k	1-244-685-11	33k	1-244-709-11	330k	1-244-733-11
3.6	1-244-614-11	36	1-244-638-11	360	1-244-662-11	3.6k	1-244-686-11	36k	1-244-710-11	360k	1-244-734-11
3.9	1-244-615-11	39	1-244-639-11	390	1-244-663-11	3.9k	1-244-687-11	39k	1-244-711-11	390k	1-244-735-11
4.3	1-244-616-11	43	1-244-640-11	430	1-244-664-11	4.3k	1-244-688-11	43k	1-244-712-11	430k	1-244-736-11
4.7	1-244-617-11	47	1-244-641-11	470	1-244-665-11	4.7k	1-244-689-11	47k	1-244-713-11	470k	1-244-737-11
5.1	1-244-618-11	51	1-244-642-11	510	1-244-666-11	5.1k	1-244-690-11	51k	1-244-714-11	510k	1-244-738-11
5.6	1-244-619-11	56	1-244-643-11	560	1-244-667-11	5.6k	1-244-691-11	56k	1-244-715-11	560k	1-244-739-11
6.2	1-244-620-11	62	1-244-644-11	620	1-244-668-11	6.2k	1-244-692-11	62k	1-244-716-11	620k	1-244-740-11
6.8	1-244-621-11	68	1-244-645-11	680	1-244-669-11	6.8k	1-244-693-11	68k	1-244-717-11	680k	1-244-741-11
7.5	1-244-622-11	75	1-244-646-11	750	1-244-670-11	7.5k	1-244-694-11	75k	1-244-718-11	750k	1-244-742-11
8.2	1-244-623-11	82	1-244-647-11	820	1-244-671-11	8.2k	1-244-695-11	82k	1-244-719-11	820k	1-244-743-11
9.1	1-244-624-11	91	1-244-648-11	910	1-244-672-11	9.1k	1-244-696-11	91k	1-244-720-11	910k	1-244-744-11

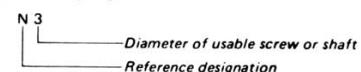
### HARDWARE NOMENCLATURE

Screw:



Unless otherwise indicated, it means cross-recessed head (Phillips type).

Nut, Washer, Retaining ring:



Reference Designation	Shape	Description	Remarks
<b>SELF-TAPPING SCREWS</b>			
TA		self-tapping screw	ex: TA, P 3 x 10
PTP		pan-head self-tapping screw	binding-head self-tapping (TA, BI) screw for replacement
PTPWH		pan-head self-tapping screw with washer face	binding head self-tapping (TA, BI) screw and flat washer for replacement
PTTWH		pan-head thread-rolling screw with washer face	binding-head (BI) screw and flat washer for replacement
<b>SET SCREWS</b>			
SC		set screw	
SC		hexagon-socket set screw	ex: SC 2.6 x 4, hexagon socket
<b>NUT</b>			
N		nut	
<b>WASHERS</b>			
W		flat washer	
SW		spring washer	
LW		internal-tooth lock washer	ex: LW3, internal
LW		external-tooth lock washer	ex: LW3, external
<b>RETAINING RINGS</b>			
E		retaining ring	
G		grip-type retaining ring	

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