

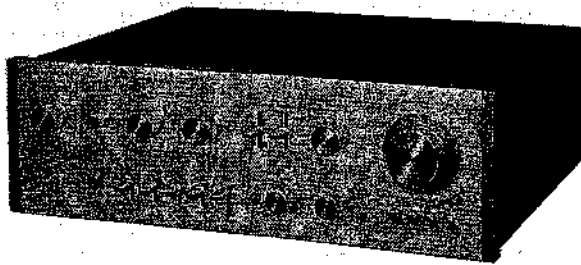


**INTEGRATED AMPLIFIER  
 INTEGRIERTER VERSTÄRKER  
 AMPLIFICATEUR INTÉGRÉ**

**MODEL  
 MODELL  
 MODÈLE**

**HA-610**

**SERVICE MANUAL  
 SERVICE ANLEITUNG  
 SERVICE MANUAL**



**HA-610**

No. 84

1975

(additional print '76)

**1. SPECIFICATIONS, TECHNISCHE DATEN, CARACTERISTIQUES TECHNIQUES**

**Main amplifier**

Circuit system . . . . . Differential 2-stage, all stage direct coupled emitter-grounded inverted Darlington pure complementary OCL Circuit

Dynamic power . . . . . 180W (IHF 8 ohms)

Output . . . 75W/75W (Single channel driven 8 ohms, 1kHz)  
 100W/100W (Single channel driven 4 ohms, 1kHz)  
 70W + 70W (Dual channels driven 8 ohms, 1kHz)  
 90W + 90W (Dual channels driven 4 ohms, 1kHz)  
 60W + 60W (Dual channels driven 8 ohms, 20Hz-20kHz)  
 70W + 70W (Dual channels driven 4 ohms, 20Hz-20kHz)

Frequency characteristics . . . . . 7Hz - 70 kHz ( $\pm 9$  dB)

Power bandwidth . . . . . 7Hz - 50 kHz (IHF)

Total harmonic distortion factor (1kHz, 8 ohms load) . . . . . 0.3% (at rated output)  
 0.006% (at 1/2 rated output)

Intermodulation distortion factor (70Hz: 7kHz = 4:1) . . . . . 0.3% (at rated output)  
 0.05% (at 1W output)

Damping factor . . . . . More than 60 (1kHz, 8-ohms)

Input sensitivity (Impedance) . . . . . 0.8V (70k ohms)

Output terminals . . . . . Speaker terminals:  
 A-B (4-16 ohms), A + B (8-16 ohms)  
 Headphone terminals: 4-16 ohms

S/N (IHF, A network) . . . . . More than 100dB

**Pre-amplifier**

Circuit system . . . . . Equalizer amplifier: Differential 1-stage, 3-stage direct coupled, with FET  
 Control amplifier: Initial stage FET, NF type

Input sensitivity (Impedance) PHONO-1: 2mV (50k ohms)  
 PHONO-2: 1.6-6mV (50 k ohms) (variable continuously)

TUNER/AUX-1, 2: 100mV (50k ohms)  
 TAPE-1/TAPE-2: 100mV (50k ohms)

PHONO max. permissible input (1kHz) . . . . . PHONO-1: 280mV/0.3%  
 PHONO-2: 200 - 750mV/0.3%

Output terminals . . . . . TAPE REC OUT (Pin jack):  
 (Level/Impedance) . . . . . 100mV/1k ohms  
 TAPE REC OUT (DIN): 30mV/80k ohms

PRE OUT: Rating 0.8V/4.7k ohms Max. 6V/4.7k ohms

Frequency characteristics . . . . . PHONO (RIAA deviation):  
 30Hz - 15kHz ( $\pm 0.3$ dB)

Tone control . . . . . BASS:  $\pm 10$ dB (50Hz, 100Hz, Turnover frequency 150Hz, 300Hz)  
 TREBLE:  $\pm 10$ dB (10kHz, 20kHz, Turnover frequency 3kHz, 6kHz)

Filter . . . . . LOW: 20Hz (12dB/oct) HIGH: 8kHz (6dB/oct)

Loudness control . . . . . +13dB (100Hz)  
 (Volume - 30dB) . . . . . +7dB (10kHz)

S/N (IHF, A network) . . . . . PHONO: 70dB  
 TUNER, AUX, TAPE: 90dB

Gain selector . . . . . -5, -10, -20dB, addition possible

Semi-conductors . . . . . FETs: 4, Transistors: 55, Diodes: 29

Power source . . . . . AC120V 60Hz or AC220V, 240V 50Hz

Power consumption . . . . . 350VA or 280W (120V),  
 400W (AC220V, 240V)

External dimensions . . . . . 435(W) x 144(H) x 388(D) mm  
 (dimensions from knobs to rear components)

Weight . . . . . 12kg

Specifications and designs may be changed without notice for improvement.

**MODEL HA-610 SERVICE MANUAL**  
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**Vollverstärker**

Schaltssystem . . . . . Rein komplementäres OCL-System mit Emitter-geerdeter Darlington-Gegentaktschaltung

Musikleistung . . . . . 180W (IHF 8 Ohm)

Sinusleistung . . . . . 75W/75W (1 Kanal an 8 Ohm, 1kHz)  
 100W/100W (1 Kanal an 4 Ohm, 1kHz)  
 70W + 70W (2 Kanäle an 8 Ohm, 1kHz)  
 90W + 90W (2 Kanäle an 4 Ohm, 1kHz)  
 60W + 60W (2 Kanäle an 8 Ohm, 20Hz-20kHz)  
 70W + 70W (2 Kanäle an 4 Ohm, 20Hz-20kHz)

Frequenzgang . . . . . 7Hz - 70kHz ( $\pm 0$  dB)

Ausgangs-Bandbreite . . . . . 7Hz - 50kHz (1kHz)

Klirrrgrad bei 1kHz und 8 Ohm . . . . . 0.3% (bei Nennleistung)  
 0.006% (bei halber Leistung)

Intermodulation . . . . . 0.3% (bei Nennleistung)  
 (70Hz: 7kHz = 4:1) . . . . . 0.05% (bei 1W)

Dämpfungszahl . . . . . mehr als 60dB (1kHz, 8 Ohm)

Eingänge (Impedanz) . . . . . 0.8V (70k Ohm)

Ausgänge . . . . . Lautsprecherklemmen: A-B (4-16 Ohm),  
 A + B (8-16 Ohm)  
 Kopfhörer: 4-16 Ohm

Fremdspannungsabstand (IHF, A) . . . . . mehr als 100dB

**Vorverstärker**

Schaltssystem . . . . . Entzerrverstärker: 1-Stufen/3-Stufen  
 Direktanschluß mit FET

Kontrollverstärker: Typ NF, FET-Eingangsstufe

Eingangsempfindlichkeit . . . . . PHONO-1: 2mV (50k Ohm)  
 (Impedanz) . . . . . PHONO-2: 1.6mV-6mV (50k Ohm)  
 (stufenlos regelbar)

TUNER/AUX-1, 2: 100mV (50k Ohm)  
 TAPE-1/TAPE-2: 100mV (50k Ohm)

Max. zulässiger PHONO . . . . . PHONO-1: 280mV/0.3%

Eingang (1kHz) . . . . . PHONO-2: 200 - 750mV/0.3%

Ausgänge . . . . . TAPE REC OUT (Stiftstecker):  
 100mV (1k Ohm)  
 TAPE REC OUT (DIN-Stecker): 30mV (80k Ohm)  
 PRE OUT: Nennleistung 0.8V/4.7k Ohm  
 Maximum 6V/4.7k Ohm

Frequenzgang . . . . . PHONO (RIAA Abweichung):  
 30Hz-15kHz ( $\pm 0.3$ dB)

Klangregler . . . . . Bässe:  $\pm 10$ dB (50Hz, 100Hz,  
 Übergangsfrequenz 150Hz, 300Hz)  
 Höhen:  $\pm 10$ dB (10kHz, 20kHz, Übergangsfrequenz  
 3kHz, 6kHz)

Filter . . . . . Bässe: 20Hz (12dB/oct) Höhen: 8kHz (6dB/oct)

Physiologische Laustärkeregelung . . . . . +13dB (100Hz)  
 (Lautstärke - 30dB) . . . . . +7dB (10kHz)

Fremdspannungsabstand (IHF, A) . . . . . PHONO: 70dB  
 TUNER, AUX, TAPE: 90dB

Verstärkungsregler . . . . . -5, -10, -20dB, Addition möglich

Bestückung . . . . . 4 FET, 55 Transistoren, 29 Dioden

Leistungsaufnahme . . . . . 350VA oder 280W (120V),  
 400W (220V, 240V)

Abmessungen . . . . . 435(B) x 144(H) x 388(T) mm  
 (Abmessungen von Reglern bis Rückseite)

Gewicht . . . . . 12kg

Änderungen der technischen Daten bleiben im Sinne der ständigen Verbesserung vorbehalten.

**Amplificateur principal**

Circuit . . . . . 2 étages différentiels, tous les étages directement couplés avec système OCL complémentaire employant un circuit Darlington à inversion de fréquence à émetteur à la masse

Puissance dynamique . . . . . 180W (IHF 80 ohms)

Puissance réelle . . . . . 75W/75W (commande indépendante de canal, 8 ohms, 1kHz)  
 100W/100W (commande indépendante de canal, 4 ohms, 1kHz)  
 70W + 70W (commande deux canaux, 8 ohms, 1kHz)  
 90W + 90W (commande deux canaux, 4 ohms, 1kHz)  
 60W + 60W (commande deux canaux, 8 ohms, 20Hz-20kHz)  
 70W + 70W (commande deux canaux, 4 ohms, 20Hz-20kHz)

Largeur de bande de fréquences . . . . . 7Hz - 70kHz ( $\pm 0$  dB)

Sortie bande passante . . . . . 7Hz - 50kHz (IHF)

Facteur de distorsion harmonique général et supérieur . . . . . 0.3% (à la puissance réelle)  
 (1kHz, 8 ohms de charge) . . . . . 0.006% (à la moitié de la puissance réelle)

Facteur de distorsion de modulation mélangée . . . . . 0.3% (à la puissance réelle)  
 (70Hz: 7kHz = 4:1) . . . . . 0.05% (sous 1W de sortie)

Facteur d'amortissement . . . . . Plus de 60 (1kHz, 8 ohms)

Sensibilité d'entrée . . . . . 0.8V (70k ohms) (impédance)

Bornes de sortie . . . . . Bornes d'enceintes: A-B (4-16 ohms),  
 A + B (8-16 ohms)  
 Bornes de casque d'écoute: 4-16 ohms

Rapport S/B (réseau IHF, A) . . . . . Plus de 100dB

**Pré-amplificateur**

Circuit . . . . . Amplificateur de correction: 1 étage différentiel, 3 étages directement couplés, FET employé

Amplificateur de commande: Etage initial avec FET type NF

Sensibilité d'entrée . . . . . PHONO-1: 2mV (50k ohms)  
 (impédance) . . . . . PHONO-2: 1.6-6mV (50k ohms)  
 (continuellement variable)

TUNER/AUX-1, 2: 100mV (50k ohms)  
 TAPE-1/TAPE-2: 100mV (50k ohms)

Entrée PHONO max admissible . . . . . PHONO-1: 280mV/0.3%  
 (1kHz) . . . . . PHONO-2: 200-750mV/0.3%

Bornes de sortie . . . . . TAPE REC OUT (jack miniature):  
 (Niveau/impédance) . . . . . 100mV/1k ohms  
 TAPE REC OUT (DIN): 30mV/80k ohms

PRE OUT: Nominal 0.8V/4.7k ohms, Max. 6V/4.7k ohms

Largeur de bande de fréquences . . . . . PHONO (déviaton RIAA): 30Hz-15 kHz ( $\pm 0.3$  dB)

Commande de tonalité . . . . . GRAVE:  $\pm 10$ dB (50Hz, 100Hz, Fréquence de transition 150Hz, 300Hz)  
 AIGU:  $\pm 10$ dB (10kHz, 20kHz, Fréquence de transition 3kHz, 6kHz)

Filtre . . . . . Passe-bas: 20Hz (12dB/oct)  
 Passe-haut: 8kHz (6dB/oct)

Correction physiologique . . . . . +13dB (100Hz)  
 (Volume - 30dB) . . . . . +7dB (10kHz)

Rapport S/B (réseau IHF, A) . . . . . PHONO: 70dB  
 TUNER, AUX, TAPE: 90dB

Sélecteur d'amplification . . . . . -5, -10, -20dB, apport possible

Semiconducteurs . . . . . FET: 4, Transistors: 55, Diodes: 29

Alimentation . . . . . Secteur 120V 60Hz ou Secteur 220V, 240V 50Hz

# MODEL HA-610 SERVICE MANUAL MODELL HA-610 SERVICE ANLEITUNG MODÈLE HA-610 SERVICE MANUAL

Consommation électrique . . . . . 350VA ou 280W (120V),  
400W (Secteur 220V, 240V)  
Dimensions extérieures . . . . . 435(L) x 144(H) x 388(P) mm  
(dimensions relevées des boutons de commande aux  
éléments arrières)

Poids . . . . . 12kg  
Les caractéristiques techniques et la présentation peuvent être  
modifiées sans préavis pour des raisons d'améliorations.

## 2. FEATURES. MERKMALE. CARACTERISTIQUES

1. By employment of a differential 2-stage/all stage direct coupled pure complementary OCL system using an emitter-grounded inverted Darlington circuit, low distortion has been realized together with high stability.
2. Precise level control is possible by employment of a 22-contact attenuator variable resistor.
3. Level setting to match the efficiency of the speakers is possible by means of independent gain selectors of -5/-10/-20dB, used together with an attenuator type volume control and a speaker B level control.
4. Since level control of the B speaker system can be done from the front of the amplifier, it can easily be compared and matched with the level of the A speaker system.
5. Since low noise transistors are used in the initial stage differential section, and a high performance FET is the next stage, distortion is low and S/N is high. Max. permissible input is an impressive 280 mVrms (1kHz).
6. Since an input sensitivity control is installed at PHONO-2, it is possible to match the cartridge output. This also allows comparison between the cartridges using PHONO-1.
7. Since a 2-step turnover frequency selector switch is installed for both bass and treble, the tone quality can be adjusted to match the room conditions.
8. A low filter is employed which sharply cuts super-low band vibrations or hum without deteriorating sound quality.
9. When desiring to obtain a flat characteristic irrespective of the position of the tone control, change-over can be done instantaneously. When the defeat mechanism is working, the sound is not passed through the tone control circuit.
- 10 Hitachi's original electronic protective circuit for speakers and power transistors is built in. Since a muting circuits is provided, shock noise when switching ON and OFF is decreased.

1. Durch den Einbau eines rein komplementären OCL-Systems mit Emitter-geerdeter Darlington-Gegentakt-schaltung konnte ein äußerst geringer Klirrfaktor bei hervorragender Stabilität erzielt werden.
2. Genaueste Pegelregelung mittels Potentiometer mit 22 Schaltschritten.
3. Anpassung des Lautstärkepegels an die Lautsprecher-charakteristik durch getrennte Verstärkerregler mit -5/-10/-20dB in Verbindung mit einem Potentiometer und einem Pegelregler für Lautsprecher B.
4. Pegelregelung für Lautsprechersystem B an der Verstärker-Frontplatte, daher einfacher Vergleich und gute Anpassung an den Pegel des Lautsprechersystems A.
5. Hochleistungstransistoren in der Ausgangsstufe des Differentialteils und ein FET in der nächsten Stufe garantieren geringsten Klirrfaktor und großen Fremdspannungsabstand. Zulässige Eingangsbelastung 280 mV (bei 1 kHz).
6. Empfindlichkeitsregler am Eingang PHONO-2 ermöglicht Anpassung an die Ausgangsleistung des Tonabnehmers. Dies gewährleistet auch Vergleichsmöglichkeiten der Tonabnehmer bei gemeinsamer Verwendung mit PHONO-1.
7. Anpassung der Tonqualität an die räumlichen Verhältnisse dank eines zweistufigen Übergangsfrequenz-Wahlschalters für Tiefen und Höhen.
8. Ein Filter für niedere Frequenzen eliminiert Tonbandvibrationen und Brumm ohne Beeinträchtigung der Tonqualität.
9. Sofortumschaltung auf linearen Frequenzgang, unabhängig von der Stellung des Klangreglers, da dabei das Tonmaterial die Klangreglerschaltung umgeht.
10. Ausgerüstet mit elektronischer Schutzschaltung für Lautsprecher und Hochleistungstransistoren, ein besonderes HITACHI Merkmal. Eine Stillabstimmungsschaltung sorgt für reduzierten Stoßpegel beim Ein- und Ausschalten.

# MODEL HA-610 SERVICE MANUAL MODELL HA-610 SERVICE ANLEITUNG MODÈLE HA-610 SERVICE MANUAL

1. En utilisant un double étage différentiel/couplage direct de tous les étages avec système OCL entièrement complémentaire employant un circuit Darlington à inversion de fréquence à émetteur à la masse, on obtient un moindre taux de distorsion avec une stabilité supérieure.
2. Un contrôle de niveau de haute précision est possible grâce au régulateur de tension atténuateur à 22 contacts.
3. Réglage de niveau pour s'accorder sur la puissance des haut-parleurs grâce à des sélecteurs d'amplification indépendants de -5/-10/-20dB, utilisés en parallèle avec une commande de volume du type atténuateur et une commande de niveau de haut-parleur B.
4. Etant donné que le réglage de niveau de l'enceinte B peut être effectuée à l'avant de l'amplificateur, il est aisément comparable et équilibré avec le niveau de l'enceinte A.
5. Etant donné que des transistors faible bruit sont utilisés dans l'étage primaire différentiel et qu'un FET à haute performance est employé dans l'étage suivant, le taux de distorsion est très faible tandis que le rapport signal/bruit est élevé. La puissance maximum admissible se situe confortablement à 280mV efficace (1kHz).
6. Etant donné qu'une commande de sensibilité d'entrée est montée au niveau de PHONO-2, il est possible de s'accorder avec la sortie de cellule. Ceci permet également d'effectuer une comparaison entre les cellules utilisant en même temps PHONO-1.
7. Etant donné qu'un sélecteur de fréquence de transition à deux niveaux est fixé autant pour les graves que les aigus, la qualité sonore peut être ajustée aux conditions de la pièce d'audition.
8. Un filtre basses fréquences est utilisé ce qui permet de nettement couper les vibrations extrêmement basses de bande passante ou le ronflement pouvant altérer la qualité sonore.
9. Lorsqu'on désire obtenir des caractéristiques uniformes sans tenir compte du réglage de commande de tonalités, la commutation peut être effectuée de façon instantanée. Lorsque le mécanisme de renversement est en fonction, les signaux sonores ne passent pas par le circuit de commande de tonalité.
10. Le circuit électronique de protection propre à Hitachi prévu pour les enceintes acoustiques et les transistors de puissance sont deux éléments incorporés. D'autre part, un circuit de réglage silencieux est également prévu pour réduire les bruits de commutation lorsqu'on passe de ON à OFF ou vice et versa.

## 3. SERVICE POINT. WARTUNGSPUNKTE. PROBLEMES DE RÉPARATION

### 1. Detaching the printed wiring board

- (1) Equalizer printed wiring board  
Remove the shield plate (A) after detaching the escutcheon and screw ①. Then remove nut ② and bolt ③.
- (2) Tone printed wiring board  
Remove the escutcheon, then detach nut ④.
- (3) Audio printed wiring board  
Remove the escutcheon and detach the equalizer printed wiring board. Remove screw ⑤ and screw ⑥, which are fixed to the radiation fins (lower side of the equalizer printed wiring board), and detach shield plate (B). Then, remove the VR from the audio printed wiring board and nut ⑦ and screws ⑧, ⑨ and board fixing screw ⑩.

### 2. Detaching the output transistor

Detach the transistor after removing the cloth-insu-

lated wire from the wiring clamp and removing the radiation fins.

### 3. Adjustment of idle current

Adjust VR701 so that the voltage of both terminals of the emitter resistor R725 (0.47ohms) of the output transistor Q711 becomes 23.5mV  $\pm$  9.4mV (current value: 50mA  $\pm$  20mA). Perform this adjustment approx. 5 minutes after turning the power switch ON. Be careful, if the screw driver touches the shield plate, etc, the power circuit transistor may be damaged.

### 4. How to use a shorting pin-plug

A shorting pin plug is inserted into the input terminal of AUX-1. When unpleasant sound leakage occurs in other modes, insert this shorting pin plug into that input terminal.

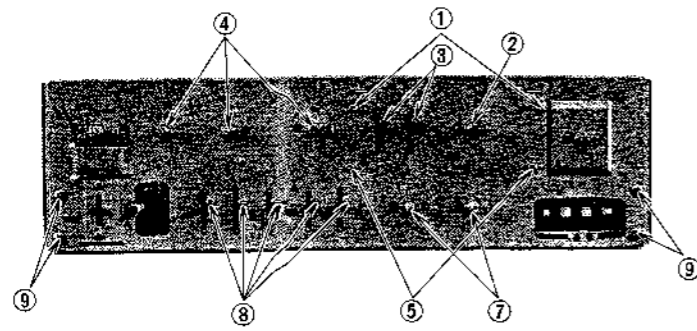


Fig. 1 Abb. 1

**1. Ausbau der gedruckten Schaltungen**

- (1) Entzerrer-Druckplatte  
 Das Schild und die Schraube ① abnehmen und die Abschirmplatte (A) entfernen. Danach die Mutter ② und die Schraube ③ lösen.
- (2) Klangregler-Druckplatte  
 Das Schild entfernen und die Mutter ④ lösen.
- (3) Audio-Druckplatte  
 Das Schild abnehmen und die Entzerrer-Druckplatte ausbauen. Anschließend die an den Kühlrippen (unterseite der Entzerrer-Druckplatte) befestigten Schrauben ⑤ und ⑥ lösen und die Abschirmplatte (B) abnehmen. Danach den Lautstärkereglern VR von der Audio-Druckplatte abnehmen, die Mutter ⑦ und die Schrauben ⑧ und ⑨ lösen und die Druckplatten-Befestigungsschraube ⑩ entfernen.

**2. Ausbau des Leistungstransistors**

Den Gewebe-isolierten Leitungsdraht von der Draht-

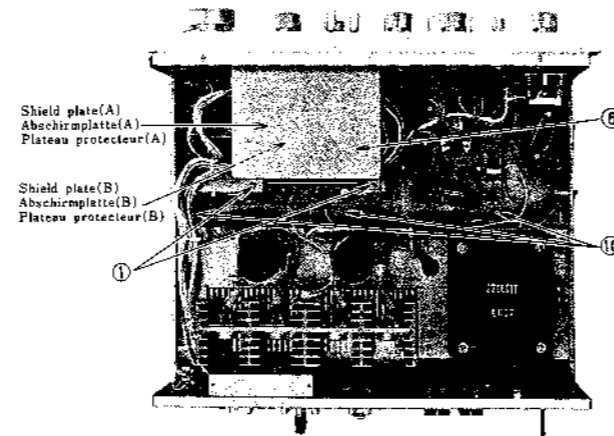


Fig. 2 Abb. 2

klemme lösen und die Kühlrippen entfernen; danach den Transistor ausbauen.

**3. Einstellung des Blindstromes**

VR701 so einstellen, daß die Spannung an beiden Klemmen des Emitterwiderstandes R725 (0.47 Ohm) des Leistungstransistors Q711  $23.5mV \pm 9.4mV$  (Stromstärke  $50mA \pm 20mA$ ) beträgt. Diese Einstellung ungefähr 5 Minuten nach dem Einschalten der Stromversorgung (Netzschalter auf Position ON) vornehmen. Dabei mit dem Schraubenzieher nicht die Abschirmplatte, usw. berühren, da ansonsten der Leistungstransistor beschädigt werden könnte.

**4. Verwendung des Kurzschlußsteckers**

Ein Kurzschlußstecker ist an die Eingangsbuchse AUX-1 angeschlossen. Falls bei anderen Betriebsarten unangenehme Störgeräusche auftreten, diesen Kurzschlußstecker an die genannte Eingangsbuchse anschließen.

**1. Pour détacher le panneau de montage des fils**

- (1) Panneau de montage des fils de l'égalisateur  
 Enlevez le plateau protecteur (A) après avoir détaché l'écusson et la vis ①. Puis enlevez l'écrou ② et la cheville ③.
- (2) Panneau de montage des fils du ton  
 Enlevez l'écusson, puis détachez l'écrou ④.
- (3) Panneau de montage des fils d'audition (audio)  
 Enlevez l'écusson et le panneau de montage des fils de l'égalisateur. Enlevez les vis ⑤ et ⑥, qui sont fixées aux ailettes de ventilation (partie inférieure du panneau de montage des fils de l'égalisateur), et détachez le plateau protecteur (B). Puis, enlevez le régulateur de volume du panneau de montage des fils d'audition et l'écrou ⑦ et les vis ⑧, ⑨ et la vis de fixation à la planche ⑩.

**2. Pour détacher le transistor de sortie**

Détachez le transistor après avoir enlevé le fil isolé de

tissus de sa fixation et après avoir enlevé les ailettes de ventilation.

**3. Ajustement du courant dé watté**

Ajustez VR701 de sorte que le voltage des deux bornes de la résistance de l'émetteur R725 (0.47 ohms) et du transistor de sortie Q711 deviennent  $23.5mV \pm 9.4mV$  (valeur du courant  $50mA \pm 20mA$ ). Faites ce réglage approximativement 5mm après avoir mis le commutateur d'alimentation sur ON. Attention: si le tournevis touche le plateau de protection, etc. le circuit transistor d'alimentation peut être endommagé.

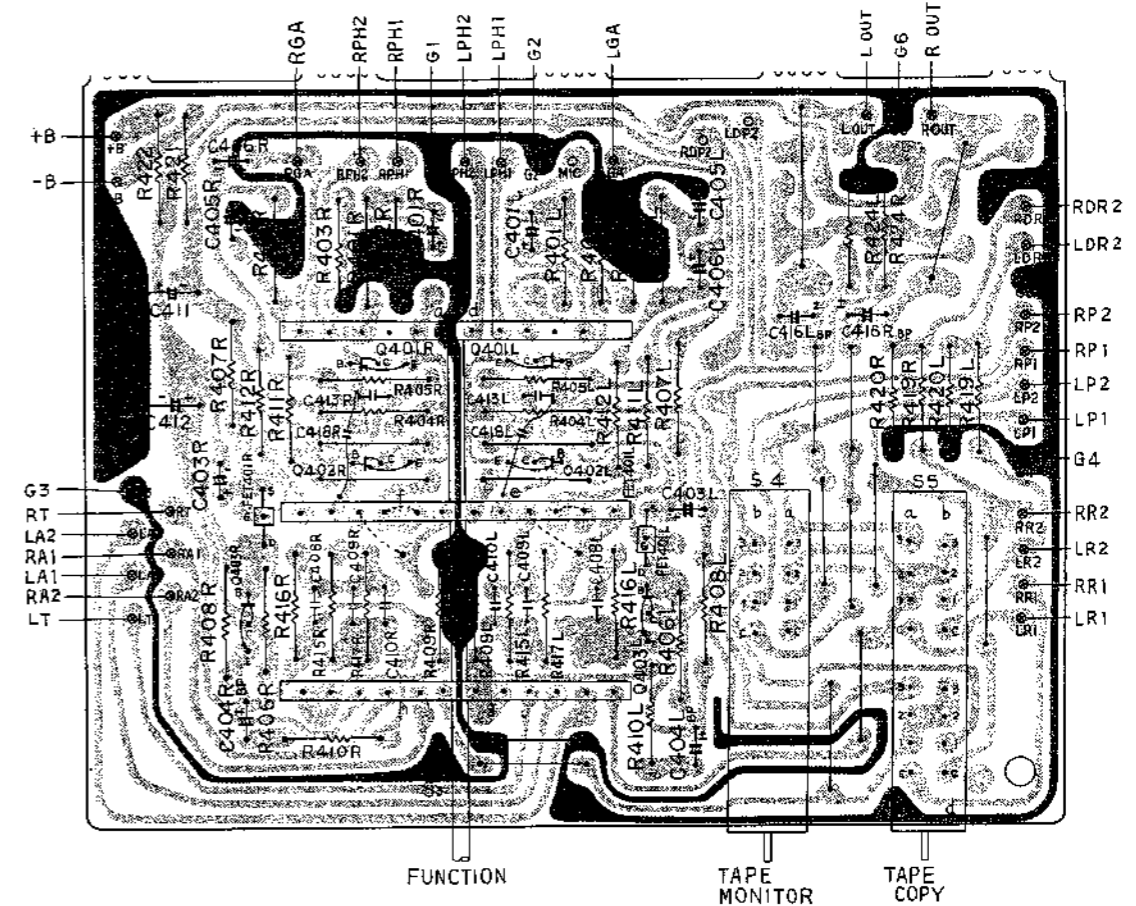
**4. Utilisation des fiches "shorting"**

Une fiche "shorting" est introduite dans la borne d'entrée AUX-1. Quand des bruits de fuite désagréables se font entendre aux autres modes, introduisez cette fiche "shorting" dans cette borne d'entrée.

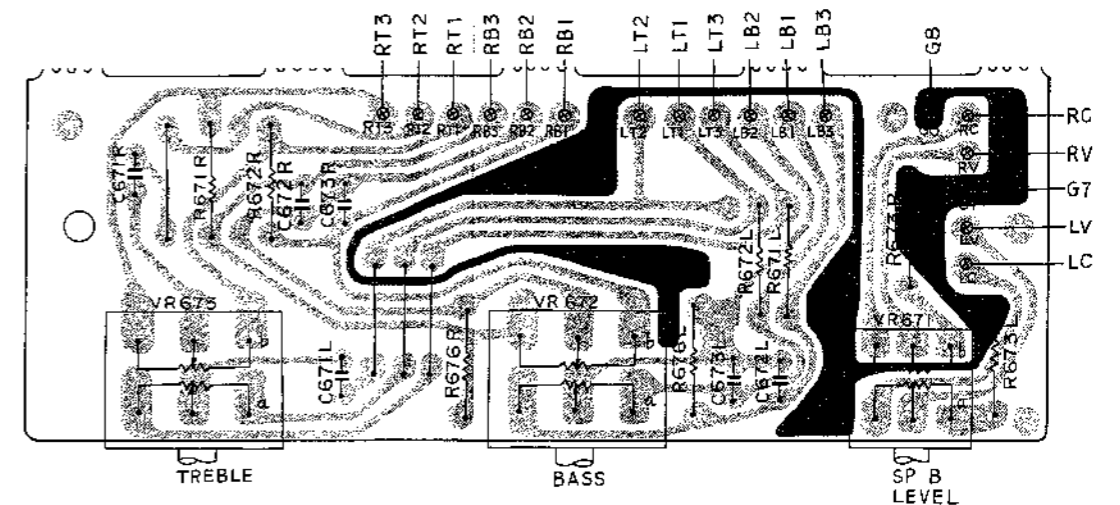
**4. PRINTED WIRING BOARD, PRINTPLATTEN, PLAN DE BASE**

**EQUALIZER PRINTED WIRING BOARD**

The terminal mark shows the stamp on the printed wiring board. This mark matches the mark in the circuit diagram.



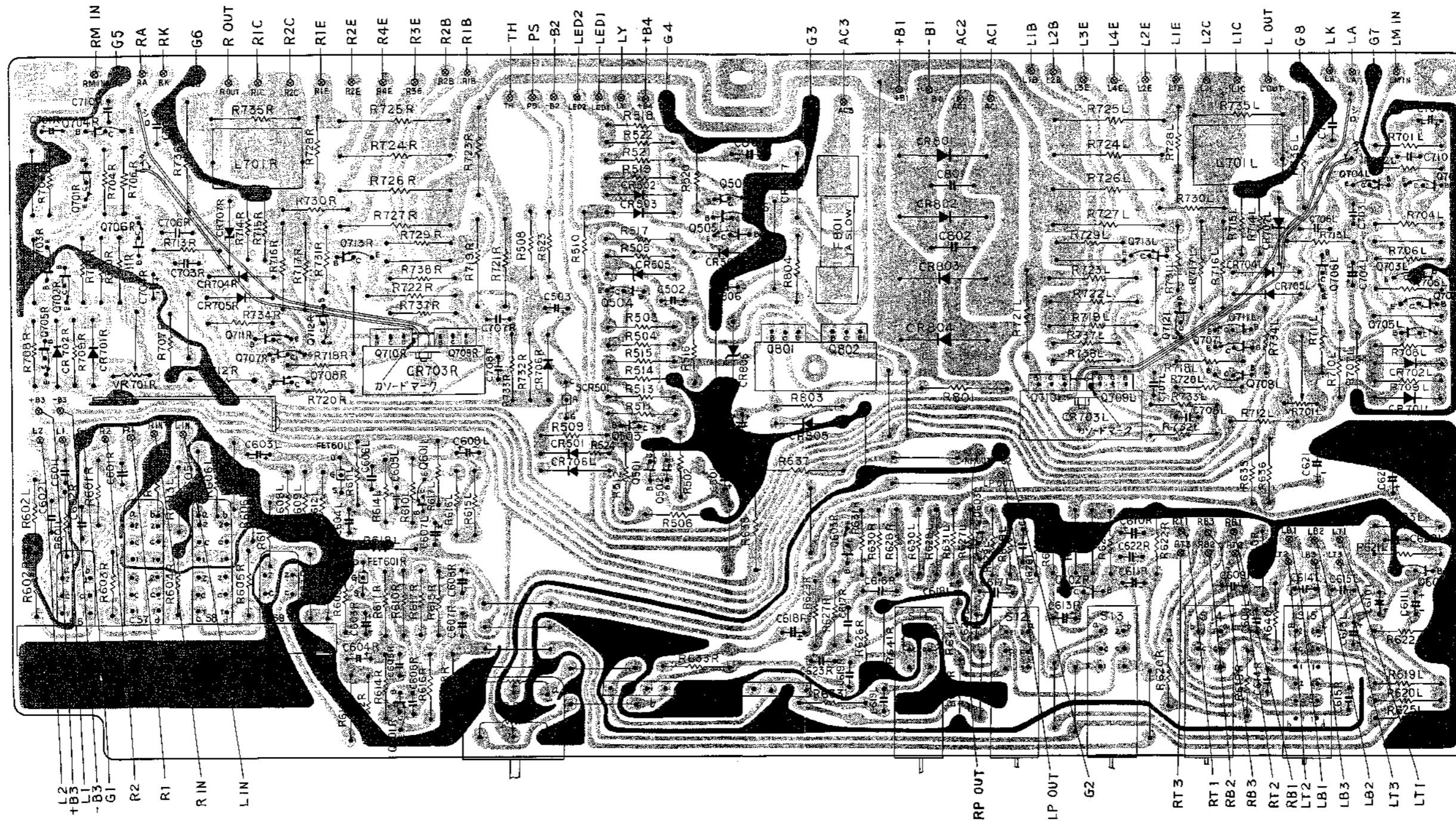
**TONE PRINTED WIRING BOARD**



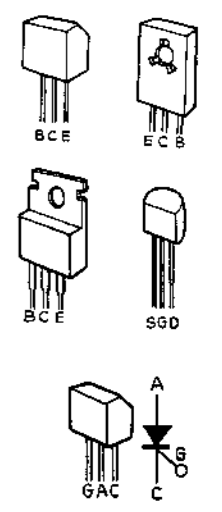
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**AUDIO PRINTED WIRING BOARD**

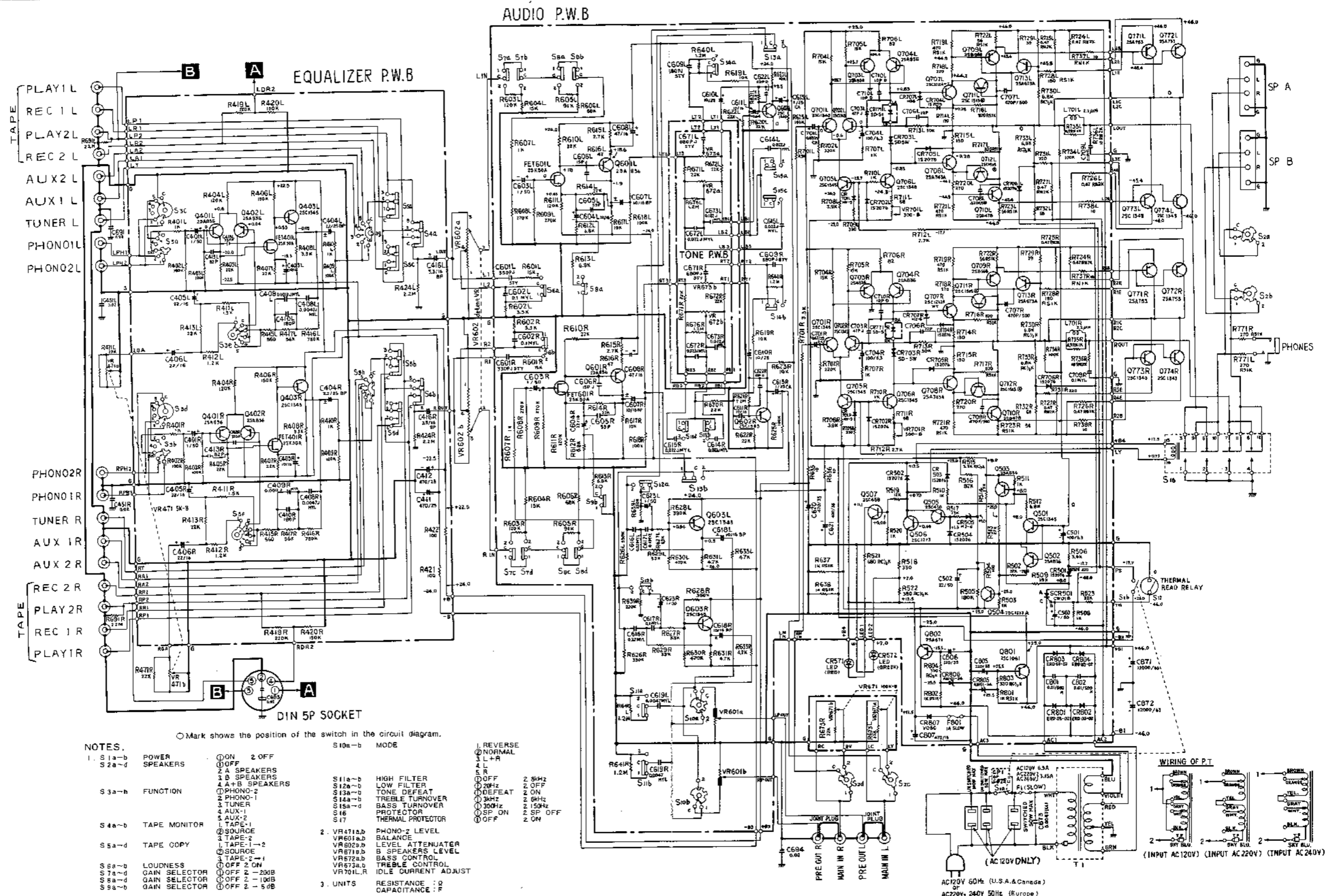
The terminal mark shows the stamp on the printed wiring board.  
 This mark matches the mark in the circuit diagram.



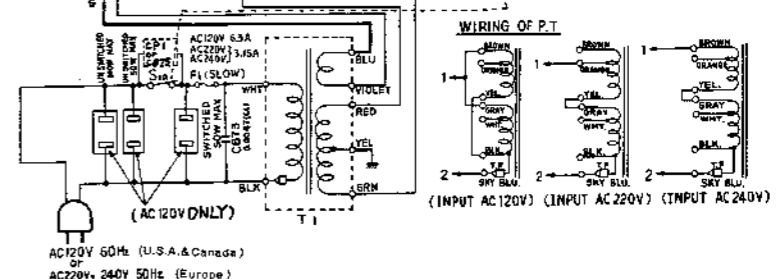
**TERMINAL GUIDE OF TRANSISTORS**



CIRCUIT DIAGRAM SCHALTPLAN PLAN DE CIRCUIT

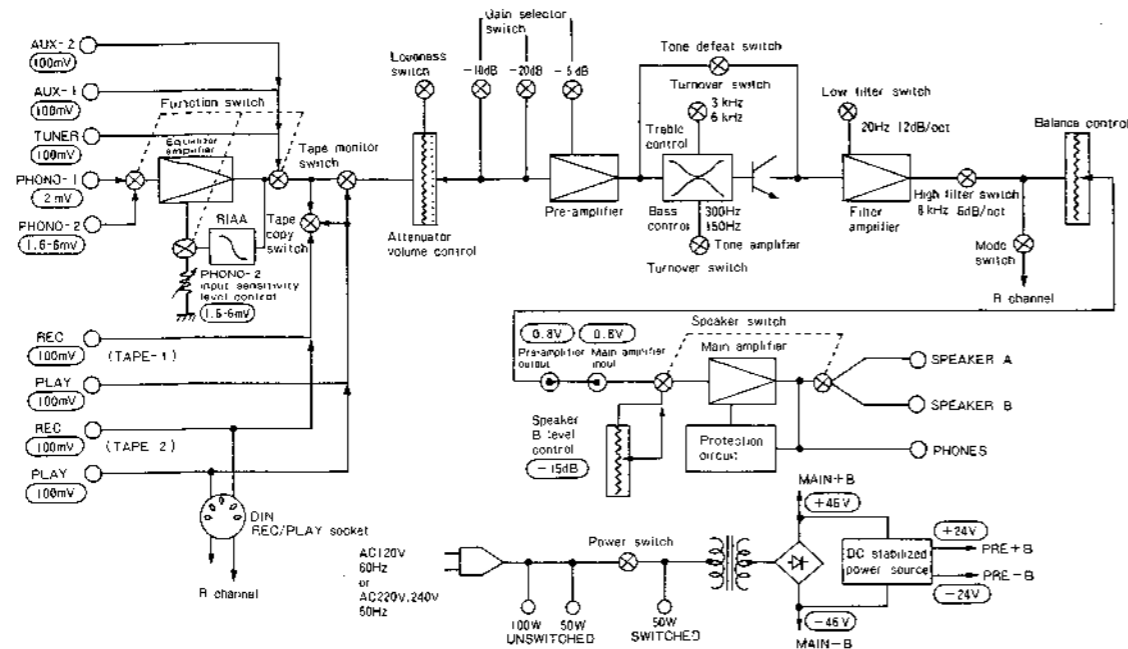


- NOTES.
- |           |               |                  |                |             |                     |
|-----------|---------------|------------------|----------------|-------------|---------------------|
| 1. S 1a-b | POWER         | ⊙ ON             | 2 OFF          | S 10a-b     | MODE                |
| S 2a-d    | SPEAKERS      | ⊙ OFF            | 2 & 3 SPEAKERS |             |                     |
|           |               | ⊙ 2 & 3 SPEAKERS | 2 & 3 SPEAKERS |             |                     |
| S 3a-b    | FUNCTION      | ⊙ A+B SPEAKERS   | 2 PHONO-2      | S 11a-b     | HIGH FILTER         |
|           |               | ⊙ PHONO-1        | 3 TUNER        | S 12a-b     | LOW FILTER          |
| S 4a-b    | TAPE MONITOR  | ⊙ AUX-1          | 4 AUX-2        | S 13a-b     | TONE DEFEAT         |
|           |               | ⊙ TAPE-1         | 1 TAPE-2       | S 14a-b     | TREBLE TURNOVER     |
| S 5a-d    | TAPE COPY     | ⊙ SOURCE         | 2 TAPE-1-2     | S 15a-d     | BASS TURNOVER       |
|           |               | ⊙ TAPE-2         | 3 TAPE-2-1     | S 16        | PROTECTOR           |
| S 6a-b    | LOUDNESS      | ⊙ OFF            | 2 ON           | S 17        | THERMAL PROTECTOR   |
| S 7a-d    | GAIN SELECTOR | ⊙ OFF            | 2 -200B        | 2. VR471a,b | PHONO-2 LEVEL       |
| S 8a-d    | GAIN SELECTOR | ⊙ OFF            | 2 -100B        | VR601a,b    | BALANCE             |
| S 9a-b    | GAIN SELECTOR | ⊙ OFF            | 2 -50B         | VR602a,b    | LEVEL ATTENUATOR    |
|           |               |                  |                | VR603a,b    | B SPEAKERS LEVEL    |
|           |               |                  |                | VR604a,b    | BASS CONTROL        |
|           |               |                  |                | VR605a,b    | TREBLE CONTROL      |
|           |               |                  |                | VR701L,R    | IDLE CURRENT ADJUST |
|           |               |                  |                |             | 3. UNITS            |
|           |               |                  |                |             | RESISTANCE : Ω      |
|           |               |                  |                |             | CAPACITANCE : F     |



The circuit diagram is subject to change for improvement without notice.

6. BLOCK DIAGRAM, BLOCKSCHEMA, SCHEMA



This block diagram indicates only R or L channel.

7. REPLACEMENT PARTS LIST, ERSATZTEILLISTE, TABLEAU DES PIÈCE

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
<b>CAPACITORS</b>					
<b>for EQUALIZER PRINTED WIRING BOARD</b>					
C401(L,R)	0252811	Electrolytic 1μF 50V	C672(L,R)	0275213	Mylar, film 0.022μF ±5% 50V
C403(L,R)	0252521	Electrolytic 10μF 16V	C673(L,R)	0275213	Mylar, film 0.022μF ±5% 50V
C404(L,R)	0257162	Electrolytic 2.2μF 25V	C501	0252231	Electrolytic 100μF 6.3V
C405(L,R)	0252522	Electrolytic 22μF 16V	C502	0252822	Electrolytic 22μF 50V
C406(L,R)	0252522	Electrolytic 22μF 16V	C503	0252811	Electrolytic 1μF 50V
C408(L,R)	0274415	Mylar, film 4700pF ±5% 50V	C601(L,R)	0228323	Styrol 330pF ±5% 50V
C409(L,R)	0274231	Mylar, film 1200pF ±5% 50V	C602(L,R)	0276011	Mylar, film 0.1μF ±10% 50V
C410(L,R)	0248730	Ceramic, discal 180pF ±10% 50V	C603(L,R)	0252811	Electrolytic 1μF 50V
C411	0252635	Electrolytic 470μF 25V	C604(L,R)	0252522	Electrolytic 22μF 16V
C412	0252635	Electrolytic 470μF 25V	C605(L,R)	0248712	Styrol 33pF ±10% 50V
C413(L,R)	0248722	Ceramic, discal 82pF ±10% 50V	C606(L,R)	0248664	Styrol 15pF ±5% 50V
C416(L,R)	0257143	Electrolytic 3.3μF 16V	C607(L,R)	0257145	Electrolytic 10μF 16V
C418(L,R)	0248736	Ceramic, discal 330pF ±10% 50V	C608(L,R)	0252525	Electrolytic 47μF 16V
C617(L,R)	0276011	Mylar, film 0.1μF ±10% 50V	C609(L,R)	0228331	Styrol 680pF ±5% 50V
C618(L,R)	0257145	Electrolytic 10μF 16V	C610(L,R)	0252621	Electrolytic 10μF 25V
C619(L,R)	0274315	Mylar, film 4700pF ±10% 50V	C611(L,R)	0252521	Electrolytic 10μF 16V
C614(L,R)	0275213	Mylar, film 0.022μF ±5% 50V	C613(L,R)	0251927	Aluminum Solid 1μF 25V
C615(L,R)	0275213	Mylar, film 0.022μF ±5% 50V	C614(L,R)	0275213	Mylar, film 0.022μF ±5% 50V
C616(L,R)	0276013	Mylar, film 0.22μF ±10% 50V	C615(L,R)	0275213	Mylar, film 0.022μF ±5% 50V
C617(L,R)	0276011	Mylar, film 0.1μF ±10% 50V	C616(L,R)	0276013	Mylar, film 0.22μF ±10% 50V
C618(L,R)	0257145	Electrolytic 10μF 16V	C617(L,R)	0276011	Mylar, film 0.1μF ±10% 50V
C619(L,R)	0274315	Mylar, film 4700pF ±10% 50V	C618(L,R)	0257145	Electrolytic 10μF 16V

for AUDIO PRINTED WIRING BOARD

for TONE PRINTED WIRING BOARD

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION			
C620	0252735	Electrolytic 470μF 35V	R412(L,R)	0114163	Carbon film 1.2kΩ ±5% SRD¼P			
C621	0252735	Electrolytic 470μF 35V	R413(L,R)	0114209	Carbon film 22kΩ ±5% SRD¼P			
C622(L,R)	0248650	Ceramic, discal 10pF ±0.5pF 50V	R415(L,R)	0114149	Carbon film 560Ω ±5% SRD¼P			
C623(L,R)	0252811	Electrolytic 1μF 50V	R416(L,R)	0114302	Carbon film 750kΩ ±5% SRD¼P			
C701(L,R)	0251925	Aluminum Solid 0.47μF 25V	R417(L,R)	0114219	Carbon film 56kΩ ±5% SRD¼P			
C703(L,R)	0248676	Ceramic, discal 47pF ±5% 50V	R419(L,R)	0114289	Carbon film 220kΩ ±5% SRD¼P			
C704(L,R)	0252231	Electrolytic 100μF 6.3V	R420(L,R)	0114285	Carbon film 150kΩ ±5% SRD¼P			
C706(L,R)	0248708	Ceramic, discal 22pF ±10% 50V	R421	0134361	Composition 100Ω ±10% RC¼GF			
C707(L,R)	0243449	Ceramic, discal 470pF ±10% 500V	R422	0134361	Composition 100Ω ±10% RC¼GF			
C708(L,R)	0243449	Ceramic, discal 470pF ±10% 500V	R424(L,R)	0114319	Carbon film 2.2MΩ ±5% SRD¼P			
C709(L,R)	0276011	Mylar, film 0.1μF ±10% 50V	<b>for TONE PRINTED WIRING BOARD</b>					
C710(L,R)	0248650	Ceramic, discal 10pF ±0.5pF 50V	R671(L,R)	0114209	Carbon film 22kΩ ±5% SRD¼P			
C801	0245408	Ceramic, discal 0.01μF ±20% 500V	R672(L,R)	0114209	Carbon film 22kΩ ±5% SRD¼P			
C802	0245408	Ceramic, discal 0.01μF ±20% 500V	R673(L,R)	0114209	Carbon film 22kΩ ±5% SRD¼P			
C805	0252732	Electrolytic 220μF 35V	R676(L,R)	0114313	Carbon film 1.2MΩ ±5% SRD¼P			
C806	0252732	Electrolytic 220μF 35V	<b>for AUDIO PRINTED WIRING BOARD</b>					
C807	0252535	Electrolytic 470μF 16V	R502	0114209	Carbon film 22kΩ ±5% SRD¼P			
<b>for CHASSIS ASSEMBLY</b>								
C451(L,R)	0245018	Ceramic, discal 0.02μF ±80%/-20% 25V	R503	0114161	Carbon film 1kΩ ±5% SRD¼P			
C691	0245018	Ceramic, discal 0.02μF ±80%/-20% 25V	R504	0114131	Carbon film 100Ω ±5% SRD¼P			
C693	0245018	Ceramic, discal 0.02μF ±80%/-20% 25V	R505	0114287	Carbon film 180kΩ ±5% SRD¼P			
C694	0245018	Ceramic, discal 0.02μF ±80%/-20% 25V	R506	0114175	Carbon film 3.9kΩ ±5% SRD¼P			
C871	0250633	Electrolytic 12000μF 63V	R508	0114161	Carbon film 1kΩ ±5% SRD¼P			
C872	0250633	Electrolytic 12000μF 63V	R509	0114215	Carbon film 39kΩ ±5% SRD¼P			
C873	0243875	Ceramic, discal 4700pF ±20% 250V (for U.K. Europe)	R510	0114161	Carbon film 1kΩ ±5% SRD¼P			
C873	0243873	Ceramic, discal 4700pF ±80%/-20% 150V (for Canada)	R511	0114161	Carbon film 1kΩ ±5% SRD¼P			
C875	0243876	Ceramic, discal 0.01μF ±10% 250V (for Canada)	R512	0114181	Carbon film 6.8kΩ ±5% SRD¼P			
<b>RESISTORS</b>								
<b>for EQUALIZER PRINTED WIRING BOARD</b>								
R401(L,R)	0114161	Carbon film 1kΩ ±5% SRD¼P	R601(L,R)	0114205	Carbon film 15kΩ ±5% SRD¼P			
R402(L,R)	0114281	Carbon film 100kΩ ±5% SRD¼P	R602(L,R)	0114173	Carbon film 3.3kΩ ±5% SRD¼P			
R403(L,R)	0114281	Carbon film 100kΩ ±5% SRD¼P	R603(L,R)	0114283	Carbon film 120kΩ ±5% SRD¼P			
R404(L,R)	0114283	Carbon film 120kΩ ±5% SRD¼P	R604(L,R)	0114205	Carbon film 15kΩ ±5% SRD¼P			
R405(L,R)	0114209	Carbon film 22kΩ ±5% SRD¼P	R605(L,R)	0114224	Carbon film 91kΩ ±5% SRD¼P			
R406(L,R)	0114285	Carbon film 150kΩ ±5% SRD¼P	R606(L,R)	0114221	Carbon film 68kΩ ±5% SRD¼P			
R407(L,R)	0114209	Carbon film 22kΩ ±5% SRD¼P	R607(L,R)	0114161	Carbon film 1kΩ ±5% SRD¼P			
R408(L,R)	0114173	Carbon film 3.3kΩ ±5% SRD¼P	R608(L,R)	0114291	Carbon film 270kΩ ±5% SRD¼P			
R409(L,R)	0114281	Carbon film 100kΩ ±5% SRD¼P	R609(L,R)	0114291	Carbon film 270kΩ ±5% SRD¼P			
R410(L,R)	0114161	Carbon film 1kΩ ±5% SRD¼P	R610(L,R)	0114209	Carbon film 22kΩ ±5% SRD¼P			
R411(L,R)	0114165	Carbon film 1.5kΩ ±5% SRD¼P	R611(L,R)	0114283	Carbon film 120kΩ ±5% SRD¼P			
			R612(L,R)	0114181	Carbon film 6.8kΩ ±5% SRD¼P			
			R613(L,R)	0114181	Carbon film 6.8kΩ ±5% SRD¼P			
			R614(L,R)	0114211	Carbon film 27kΩ ±5% SRD¼P			
			R615(L,R)	0114171	Carbon film 2.7kΩ ±5% SRD¼P			
			R616(L,R)	0114057	Carbon film 47Ω ±5% SRD¼P			
			R617(L,R)	0114201	Carbon film 10kΩ ±5% SRD¼P			
			R618(L,R)	0114281	Carbon film 100kΩ ±5% SRD¼P			
			R619(L,R)	0114201	Carbon film 10kΩ ±5% SRD¼P			
			R620(L,R)	0114209	Carbon film 22kΩ ±5% SRD¼P			
			R621(L,R)	0114319	Carbon film 2.2MΩ ±5% SRD¼P			
			R622(L,R)	0114209	Carbon film 22kΩ ±5% SRD¼P			



**MODEL HA-610 SERVICE MANUAL  
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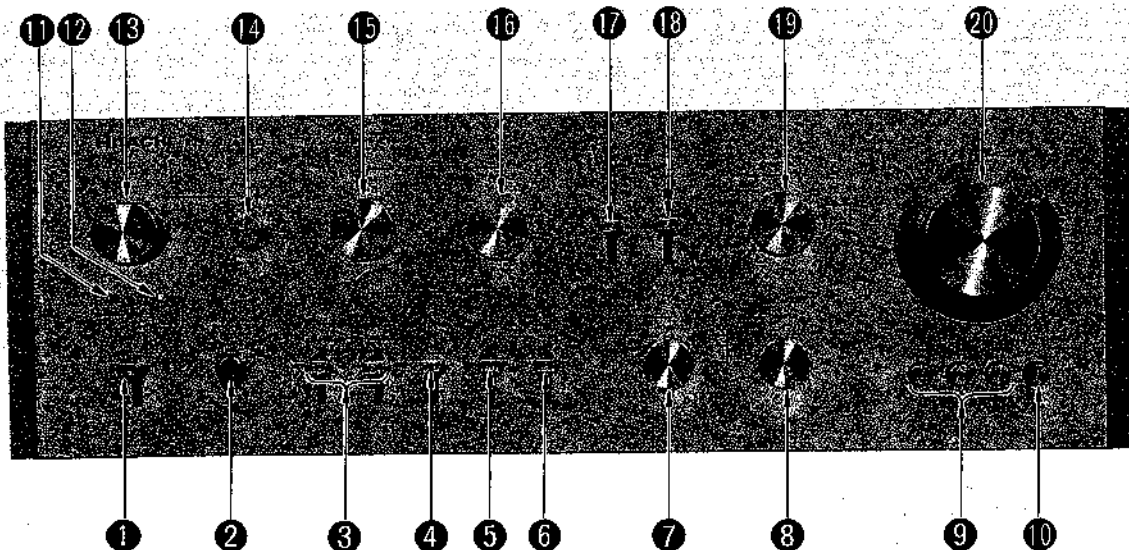
SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
R623(L,R)	0114201	Carbon film 10kΩ ±5%	<b>TRANSISTORS</b>		
R625(L,R)	0114281	Carbon film 100kΩ ±5%	<b>for EQUALIZER PRINTED WIRING BOARD</b>		
R626(L,R)	0114293	Carbon film 330kΩ ±5%	FET401(L,R)	2327833	2SK30A (Y)
R627(L,R)	0114173	Carbon film 3.3kΩ ±5%	Q401(L,R)	2327743	2SA836 (E)
R628(L,R)	0114295	Carbon film 390kΩ ±5%	Q402(L,R)	2327743	2SA836 (E)
R629(L,R)	0114213	Carbon film 33kΩ ±5%	Q403(L,R)	2327364	2SC1345 (F)
R630(L,R)	0114297	Carbon film 470kΩ ±5%	<b>for AUDIO PRINTED WIRING BOARD</b>		
R631(L,R)	0114177	Carbon film 4.7kΩ ±5%	FET601(L,R)	2327833	2SK30A (Y)
R633(L,R)	0114177	Carbon film 4.7kΩ ±5%	Q501	2327363	2SC1345 (E)
R635	0114041	Carbon film 10Ω ±5%	Q502	2327742	2SA836 (D)
R636	0114041	Carbon film 10Ω ±5%	Q503	2327742	2SA836 (D)
R637	0119441	Metal, oxide 1kΩ ±10%	Q504	2327293	2SC1213A (C)
R638	0119441	Metal, oxide 1kΩ ±10%	Q505	2320063	2SC458 (C)
R639(L,R)	0114289	Carbon film 220kΩ ±5%	Q506	2327333	2SC1213 (C)
R640(L,R)	0114313	Carbon film 1.2MΩ ±5%	Q507	2320063	2SC458 (C)
R641(L,R)	0114313	Carbon film 1.2MΩ ±5%	Q601(L,R)	2327743	2SA836 (E)
R701(L,R)	0114173	Carbon film 3.3kΩ ±5%	Q602(L,R)	2327363	2SC1345 (E)
R702(L,R)	0114289	Carbon film 220kΩ ±5%	Q603(L,R)	2327363	2SC1345 (E)
R704(L,R)	0114205	Carbon film 15kΩ ±5%	Q701(L,R)	2327364	2SC1345 (F)
R705(L,R)	0114205	Carbon film 15kΩ ±5%	Q702(L,R)	2327364	2SC1345 (F)
R706(L,R)	0114063	Carbon film 82Ω ±5%	Q703(L,R)	2327742	2SA836 (D)
R707(L,R)	0114161	Carbon film 1kΩ ±5%	Q704(L,R)	2327742	2SA836 (D)
R708(L,R)	0114175	Carbon film 3.9kΩ ±5%	Q705(L,R)	2327363	2SC1345 (E)
R709(L,R)	0114143	Carbon film 330Ω ±5%	Q706(L,R)	2327363	2SC1345 (E)
R710(L,R)	0114161	Carbon film 1kΩ ±5%	Q707(L,R)	2327607	2SC1212AWT (C)
R711(L,R)	0114061	Carbon film 68Ω ±5%	Q708(L,R)	2327393	2SA743A (C)
R712(L,R)	0114171	Carbon film 2.7kΩ ±5%	Q709(L,R)	2327792	2SB568 (C)
R713(L,R)	0114212	Carbon film 30kΩ ±5%	Q710(L,R)	2327802	2SD478 (C)
R714(L,R)	0114134	Carbon film 130Ω ±5%	Q711(L,R)	2327751	2SC1515 (K)
R715(L,R)	0114134	Carbon film 130Ω ±5%	Q712(L,R)	2327751	2SC1515 (K)
R716(L,R)	0119432	Metal, oxide 820Ω ±10%	Q713(L,R)	2327283	2SA673A (C)
R717(L,R)	0119432	Metal, oxide 820Ω ±10%	Q801	2327153	2SC1061 (C)
R718(L,R)	0114141	Carbon film 270Ω ±5%	Q802	2327676	2SA671 (C)
R719(L,R)	0119429	Metal, oxide 470Ω ±10%	<b>for CHASSIS ASSEMBLY</b>		
R720(L,R)	0114141	Carbon film 270Ω ±5%	Q771(L,R)	2327622	2SA753 (B)
R721(L,R)	0119429	Metal, oxide 470Ω ±10%	Q772(L,R)	2327622	2SA753 (B)
R722(L,R)	0119410	Metal, oxide 56Ω ±10%	Q773(L,R)	2327612	2SC1343 (B)
R723(L,R)	0119410	Metal, oxide 56Ω ±10%	Q774(L,R)	2327612	2SC1343 (B)
R724(L,R)	0119127	Metal 0.47Ω ±10%	<b>DIODES</b>		
R725(L,R)	0119127	Metal 0.47Ω ±10%	<b>for AUDIO PRINTED WIRING BOARD</b>		
R726(L,R)	0119127	Metal 0.47Ω ±10%	CR501	2337011	1S2076
R727(L,R)	0119127	Metal 0.47Ω ±10%	CR502	2337011	1S2076
R728(L,R)	0119424	Metal, oxide 180Ω ±10%	CR503	2337011	1S2076
R729(L,R)	0114055	Carbon film 39Ω ±5%	CR504	2337011	1S2076
R730(L,R)	0134383	Composition 6.8kΩ ±10%	CR505	2337123	HZ-6 (C)
R731(L,R)	0114139	Carbon film 220Ω ±5%	CR701(L,R)	2347041	MV-5
R732(L,R)	0114061	Carbon film 68Ω ±5%	CR702(L,R)	2337011	1S2076
R733(L,R)	0134383	Composition 6.8kΩ ±10%	CR703(L,R)	2337301	SD-5W
R734(L,R)	0114281	Carbon film 100kΩ ±5%	CR704(L,R)	2337011	1S2076
R735(L,R)	0119029	Metal 4.7Ω ±10%	CR705(L,R)	2337011	1S2076
R736(L,R)	0119151	Metal 10Ω ±10%	CR706(L,R)	2337011	1S2076
R737(L,R)	0119041	Metal 10Ω ±10%	CR707(L,R)	2337123	HZ-6 (C)
R738(L,R)	0114041	Carbon film 10Ω ±5%			
R801	0119441	Metal, oxide 1kΩ ±10%			
R802	0119441	Metal, oxide 1kΩ ±10%			
R803	0134367	Composition 330Ω ±10%			
R804	0134367	Composition 330Ω ±10%			
<b>for CHASSIS ASSEMBLY</b>					
R471(L,R)	0114209	Carbon film 22kΩ ±5%			
R691(L,R)	0114319	Carbon film 2.2MΩ ±5%			
R771(L,R)	0119426	Metal, oxide 270Ω ±10%			

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SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
CR801	2337251	ERD 03-02	F801	2727083	Fuse-Wired in fuse (1A, 125V SLOW) (UL) (for Canada)
CR802	2337251	ERD 03-02	F801	0591169	Fuse-fuse (1A, 125V SLOW) (for Europe & U.K.)
CR803	2337251	ERD 03-02		4368861	Washer -13.2φ washer
CR804	2337251	ERD 03-02		3914611	Washer -13.5φ washer
CR805	2327073	AW 01-24		2677234	Jack-headphone jack
CR806	2327073	AW 01-24		4090092	Screw-earth screw
CR807	2327041	VO6C		4387281	AC bush plate (for Canada)
SCR501	2337091	CW01B		4387283	AC bush plate (for U.K. & Europe)
<b>for CHASSIS ASSEMBLY</b>				0043793	Bushing (for AC power cord) (for Canada)
CR571	2337233	LED (RED)		3913001	Bushing (for AC power cord) (for Europe)
CR572	2337232	LED (GREEN)		3913005	Bushing (for AC power cord) (for U.K.)
CR771(L,R)	2347062	SD-5		3920381	Cover-AC socket cover (for U.K. & Europe)
<b>VARIABLE RESISTORS</b>				2657281	Socket-AC socket (for Canada)
<b>for TONE PRINTED WIRING BOARD</b>				2748441	AC power cord (for Canada)
VR671	0151861	100kΩ-(B) B SPEAKER LEVEL adj.		2748511	AC power cord (for Europe)
VR672	0156152	200kΩ-(B) BASS		2747732	AC power cord (for U.K.)
VR673	0156152	200kΩ-(B) TREBLE		2687622	4P US pin jack
<b>for AUDIO PRINTED WIRING BOARD</b>				2687632	6P US pin jack
VR601	0156142	100kΩ-(MN) BALANCE		2687642	8P US pin jack
VR701(L,R)	0151256	300Ω-(B) Idle current adj.		0541358	Socket-DIN 5P socket
<b>for CHASSIS ASSEMBLY</b>				2667201	Joint plug
VR471	0151871	5kΩ-(B) PHONO 2 LEVEL CONTROL		2687701	Terminal-4P speaker terminal
VR602	0159091	Attenuator volume		4567411	Screw-3φ×6 CT bind screw
<b>COILS</b>				4567414	Screw-3φ×12 CT bind screw
L701(L,R)	2227142	Audio trap coil (2.2μH)		4567453	Screw-3φ×10 CT bind screw
<b>MISCELLANEOUS</b>				4567433	Screw-3φ×10 CT bind screw
	2505254	Equalizer printed wiring board assembly	<b>for FINAL ASSEMBLY</b>		
	2505255	Tone printed wiring board assembly		3243662	Escutcheon
	2505261	Audio printed wiring board assembly (for Europe & U.K.)		3282801	Knob-Gain selector & Loudness knob
	2505262	Audio printed wiring board assembly (for Canada)		3283021	Knob plate
S1	2637693	Switch-power switch		3283162	Knob-Level attenuator knob
S2	2617541	Switch-rotary switch		3283041	Knob-Speaker/Bass/Treble/Function knob
S3	2617551	Switch-rotary switch (for function sw.)		3283031	Knob-Mode/Balance knob
S4	2627111	Switch-lever switch (for tape monitor sw.)		3282661	Knob-B speaker level knob
S5	2627121	Switch-lever switch (for tape copy sw.)		3282981	Knob-Lever knob
S6-9	2637671	Switch-push switch (for loudness & gain selector sw.)		3916411	Leg
S10	2617561	Switch-rotary switch (for mode sw.)		4353141	Washer-4.5φ washer
S11-14	2627131	Switch-lever switch (for turnover & filter sw.)		4374051	Washer-4.3φ washer
S15	2627141	Switch-lever switch (for tone defeat sw.)		4388742	Cover assembly
S16	2647071	Relay		2667161	Short pin plug
S17	2647052	Thermal lead switch		4567421	Screw-4φ×6 CT bind screw
CP1,CP2	0269015	Spark killer (for U.K. & Europe)		4567412	Screw-3φ×8 CT bind screw
				4567413	Screw-3φ×10 CT bind screw
				4567411	Screw-3φ×6 CT bind screw
<b>for DIAL MECHANISM ASSEMBLY</b>				3920731	Bushing (for power transistor)
				2657181	Transistor socket
				2687691	2P terminal board
				4770255	4φ washer with nut
				4790096	Washer-3.2φ washer
T1	2218061	Power transformer		2218061	Fuse holder
F1	2727181	Fuse holder		2727196	Fuse-fuse (3.15A 250V) (for U.K. & Europe)
F1	2727392	Fuse-wired in fuse (6.3A 125V) (for Canada)		2687311	6P terminal board
				4567411	Screw-3φ×6 CT bind screw
				4567441	Screw-4φ×6 CT bind screw
				4567421	Screw-4φ×6 CT bind screw
				4567423	Screw-4φ×10 CT bind screw

**8. FRONT AND REAR PANEL, VORDERE UND HINTERE BEDIENUNGSTAFEL**  
**PANNEAUX AVANT ET ARRIERE**

**FRONT PANEL**



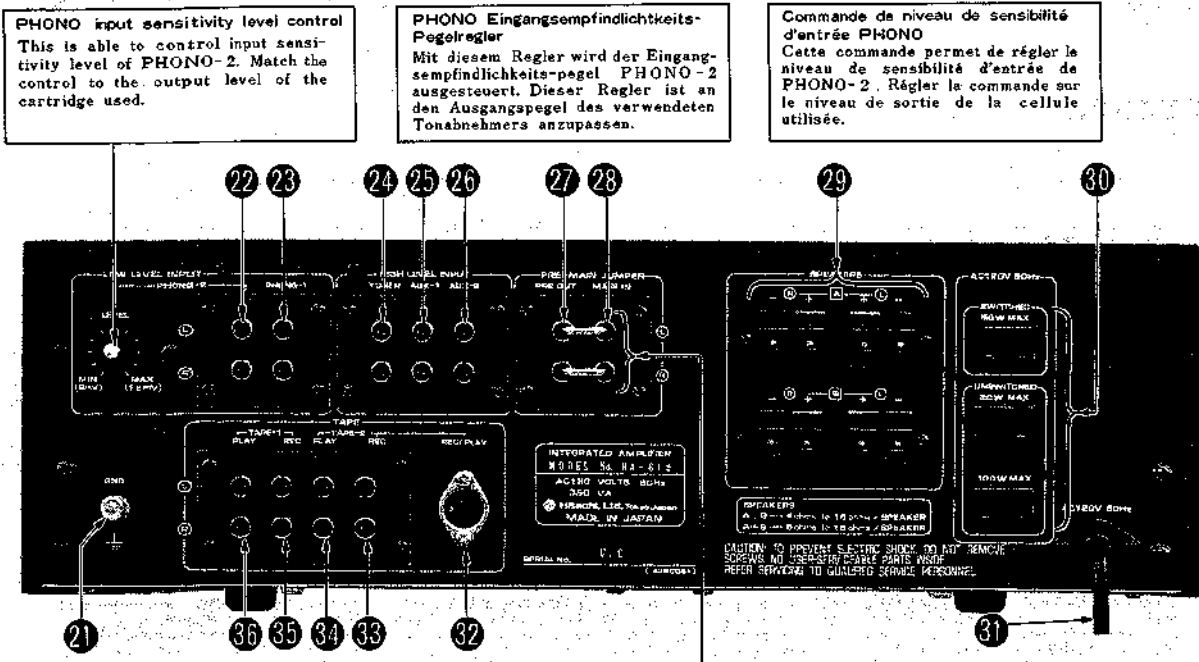
- ① Power switch
- ② Phone jack
- ③ Turnover switch (Bass, Treble)
- ④ Tone switch
- ⑤ Low filter switch
- ⑥ High filter switch
- ⑦ Mode switch
- ⑧ Balance control
- ⑨ Gain selector swlch
- ⑩ Loudness switch
- ⑪ Protector lamp (red)
- ⑫ Pilot lamp (green)
- ⑬ Speaker switch
- ⑭ Speaker B level control
- ⑮ Bass control
- ⑯ Treble control
- ⑰ Tape copy switch
- ⑱ Tape monitor switch
- ⑲ Function switch
- ⑳ Attenuator volume control

- ① Netzschalter
- ② Kopfhörer-Buchse
- ③ Tiefen- und Höhen-Umschalter
- ④ Tonschalter
- ⑤ Tiefenfilter
- ⑥ Höhenfilter
- ⑦ Funktionswähler
- ⑧ Balance-Regler
- ⑨ Verstärkungsregler
- ⑩ Physiologischer Lautstärkereglr
- ⑪ Schutzleuchte (rot)
- ⑫ Kontrollampe (grün)
- ⑬ Lautsprecherwähler
- ⑭ Pegelregler für Lautsprecher B
- ⑮ Tiefenregler
- ⑯ Höhenregler
- ⑰ Tonband-Kopierschalter
- ⑱ Schalter für Hinterbandkontrolle
- ⑲ Betriebsartenwähler
- ⑳ Potentiometer- Lautstärkereglr

- ① Interrupteur d'alimentation
- ② Sortie casque d'ecoute
- ③ Commutation de renversement (grave, aigu)
- ④ Commutateur de tonalité
- ⑤ Commutateur de filtre passe-bas
- ⑥ Commutateur de filtre passe-haut
- ⑦ Commutateur de mode
- ⑧ Balance
- ⑨ Commutateur d'amplification
- ⑩ Correcteur physiologique
- ⑪ Lampe de protection (rouge)
- ⑫ Voyant lumineux (vert)
- ⑬ Commutateur Haut-parleur
- ⑭ Commande de niveau d'enceinte B
- ⑮ Commande de grave
- ⑯ Commande d'aigu
- ⑰ Commutateur de copie de bande
- ⑱ Commutateur moniteur
- ⑲ Fonctions
- ⑳ Commande de volume type atténuateur

**MODEL HA-610 SERVICE MANUAL**  
**MODELL HA-610 SERVICE ANLEITUNG**  
**MODÈLE HA-610 SERVICE MANUAL**

**REAR PANEL**



**PHONO input sensitivity level control**  
 This is able to control input sensitivity level of PHONO-2. Match the control to the output level of the cartridge used.

**PHONO Eingangsempfindlichkeits-Pegelregler**  
 Mit diesem Regler wird der Eingangsempfindlichkeitspegel PHONO-2 angesteuert. Dieser Regler ist an den Ausgangspegel des verwendeten Tonabnehmers anzupassen.

**Commande de niveau de sensibilité d'entrée PHONO**  
 Cette commande permet de régler le niveau de sensibilité d'entrée de PHONO-2. Régler la commande sur le niveau de sortie de la cellule utilisée.

**Intermediate plug**  
 Pull out this plug when using only the pre-amplifier section or main amplifier section.

**Zwischenstecker**  
 Falls jedoch nur der Vorverstärker-Teil oder nur der Vollverstärker-Teil verwendet werden sollen, ist dieser Stecker abzuziehen.

**Prise intermédiaire**  
 Extraire cette prise intermédiaire lorsqu'une utilise uniquement la section d'amplification principale.

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>① GROUND TERMINAL</li> <li>② PHONO INPUT TERMINALS-2</li> <li>③ PHONO INPUT TERMINALS-1</li> <li>④ TUNER INPUT TERMINALS</li> <li>⑤ AUX INPUT TERMINALS-1</li> <li>⑥ AUX INPUT TERMINALS-2</li> <li>⑦ PRE OUTPUT TERMINALS</li> <li>⑧ MAIN INPUT TERMINALS</li> <li>⑨ SPEAKER TERMINALS</li> <li>⑩ AC OUTLET (for Canada set only)</li> <li>⑪ AC POWER CORD</li> <li>⑫ DIN REC/PLAY SOCKET</li> <li>⑬ TAPE-2 REC OUT TERMINALS</li> <li>⑭ TAPE-2 PLAYBACK TERMINALS</li> <li>⑮ TAPE-1 REC OUT TERMINALS</li> <li>⑯ TAPE-1 PLAYBACK TERMINALS</li> </ul> | <ul style="list-style-type: none"> <li>① Erdung</li> <li>② Plattenspieler-Eingangsklemmen-2</li> <li>③ Plattenspieler-Eingangsklemmen-1</li> <li>④ Tuner-Eingangsklemmen</li> <li>⑤ Eingangsklemmen f. ext. Schallquellen-1</li> <li>⑥ Eingangsklemmen f. ext. Schallquellen-2</li> <li>⑦ Vorverstärker-Ausgangsklemmen</li> <li>⑧ Hauptverstärker-Eingangsklemmen</li> <li>⑨ Lautsprecher-Klemmen</li> <li>⑩ Wechselstromausgang (nur 120V)</li> <li>⑪ Netzkabel</li> <li>⑫ Normbuchse f. Aufn./Wiederg. (DIN)</li> <li>⑬ Ausgang für Tonbandgerät-2</li> <li>⑭ Eingang für Tonbandgerät-2</li> <li>⑮ Ausgang für Tonbandgerät-1</li> <li>⑯ Eingang für Tonbandgerät-1</li> </ul> | <ul style="list-style-type: none"> <li>① Prise de terre</li> <li>② Borne d'entrée PHONO-2</li> <li>③ Borne d'entrée PHONO-1</li> <li>④ Bornes d'entrée du tuner</li> <li>⑤ Borne d'entrée auxiliaires-1</li> <li>⑥ Borne d'entrée auxiliaires-2</li> <li>⑦ Bornes de Sortie PRE OUT</li> <li>⑧ Bornes d'entrée Principales</li> <li>⑨ Bornes de haut-parleur</li> <li>⑩ Sortie C.A. (uniquement 120V)</li> <li>⑪ Cordon d'alimentation C.A.</li> <li>⑫ Connecteur d'enregistrement/reproduction DIN</li> <li>⑬ Borne REC OUT TAPE-2</li> <li>⑭ Borne PLAYBACK TAPE-2</li> <li>⑮ Borne REC OUT TAPE-1</li> <li>⑯ Borne PLAYBACK TAPE-1</li> </ul> |
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Printed in Japan (H)  
 Gedruckt in Japan (H)  
 Imprimé au Japon (H)



# INTEGRATED AMPLIFIER

MODEL **HA-610**

# SERVICE MANUAL

## SUPPLEMENT

No. 84-1

1976

EXPLANATION OF THE  
NEW CIRCUITS INCLUDING  
THE PROTECTION CIRCUITS.

### GAIN SELECTOR SWITCH

This switch is for the purpose of pre-setting the volume of sound and making full use of the loudness characteristics. Set the unit using the gain selector switch so that the max. Sound level, ordinarily listened to, is obtained when the volume control is turned fully to the right. The volume of sound can be varied while keeping the optimum sensitivity

correction. Since VR602 shows the precise attenuation with a load 132 k ohms, the load 132 k ohms is not varied no matter which switch is pressed. S7, S8, and S9 are of an addition system in which they can be used independently or in combination.

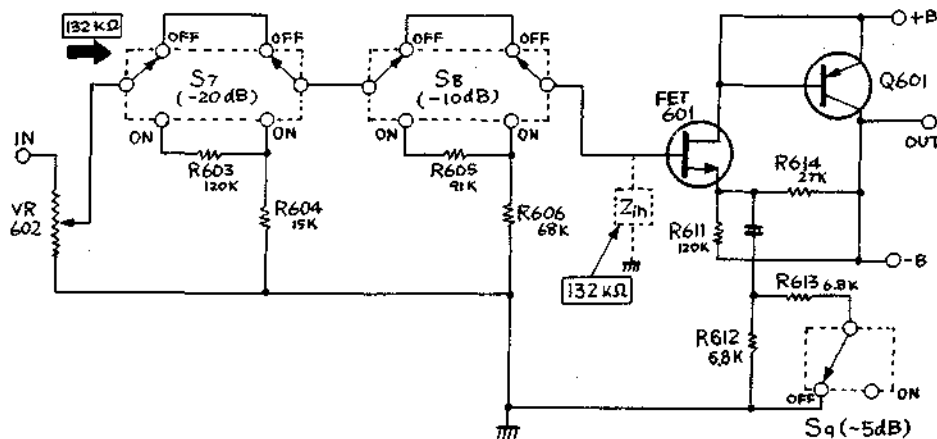


Fig. 1

72(A)

**TURNOVER SWITCH**

This switch changes the frequency in high and low bands so that effective tone control can be performed in accordance with the audio characteristics and cartridge characteristics of the room.

The rise frequency of the treble control is determined by C671 (3kHz), but when C609, with the same capacity, is

arranged in series, the capacity decreases to  $\frac{1}{2}$  and the rise frequency increases to 6kHz (2 times). The rise frequency of the bass control is determined by C672, 673 (300Hz) ; when C614, 615, (with same capacity) are arranged in series, the capacity doubles and the rise frequency decrease to 150Hz ( $\frac{1}{2}$ ).

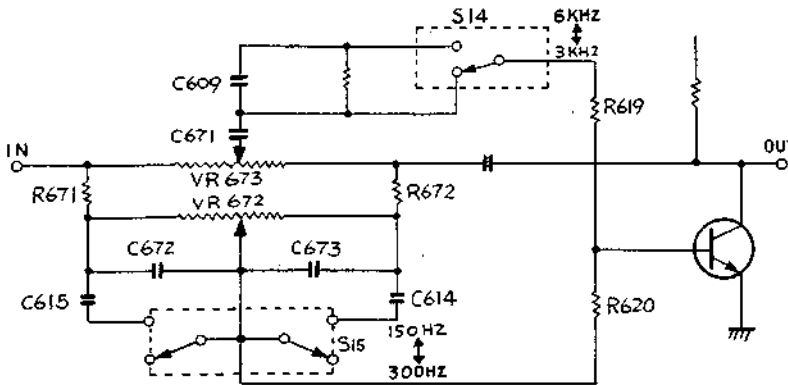


Fig. 2

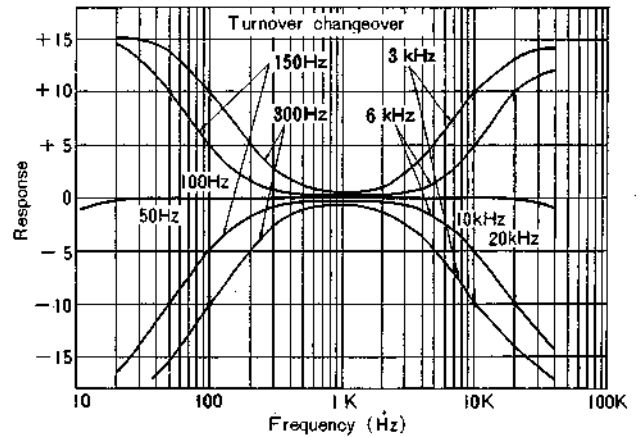


Fig. 3

**PROTECTION CIRCUIT**

**(1) MUTING CIRCUIT**

To remove click noise caused by the start of circuit operation when the power switch is turned ON, a muting circuit which turns the relay (S16) to OFF for 3 sec. after the power switch is turned ON, is employed. While the power switch is ON, C502 is charged by R505, 516 and 517 and +7V is applied to point ① and Q505, 506 turn ON, the relay turns ON and the speaker terminal then turns ON. When current flows in the relay, the voltage at point ② lowers, Q507 is cut off, and the protector lamp (red) indicates off.

When current flows to the relay, to avoid the abrasion of contact point in the relay, S1b is interlocked when the power switch is off, and turns ON, cutting off the main amplifier, and the relay is cut off while the current to the relay is cut.

**(2) AREA OF SAFETY OPERATION DETECTION CIRCUIT (PROTECTION OF POWER TRANSISTOR)**

This protects the output transistors Q771-Q774 from damage, especially when excess collector current ( $I_c$ ) flows while the C-E voltage ( $V_{CE}$ ) of the output transistor is large, the transistors are liable to be damaged so the protection circuit of this unit is so designed that it operates when the sum  $I_c$  and  $V_{CE}$  exceeds the specified value.

For protection of Q771, Q772,  $I_c$  of Q771 is detected by R725 and divided by R728 and R729;  $V_{CE}$  is divided by R729 and R730. Both are added between Base/Emitter of Q715. When this voltage exceeds 0.65V, Q713 operates to control the voltage between Base/Emitter of Q709 and controls the collector current of Q771 and Q772.

For protection of Q773 and Q774,  $I_c$  of Q773 is detected

# MODEL HA-610 SERVICE MANUAL (SUPPLEMENT)

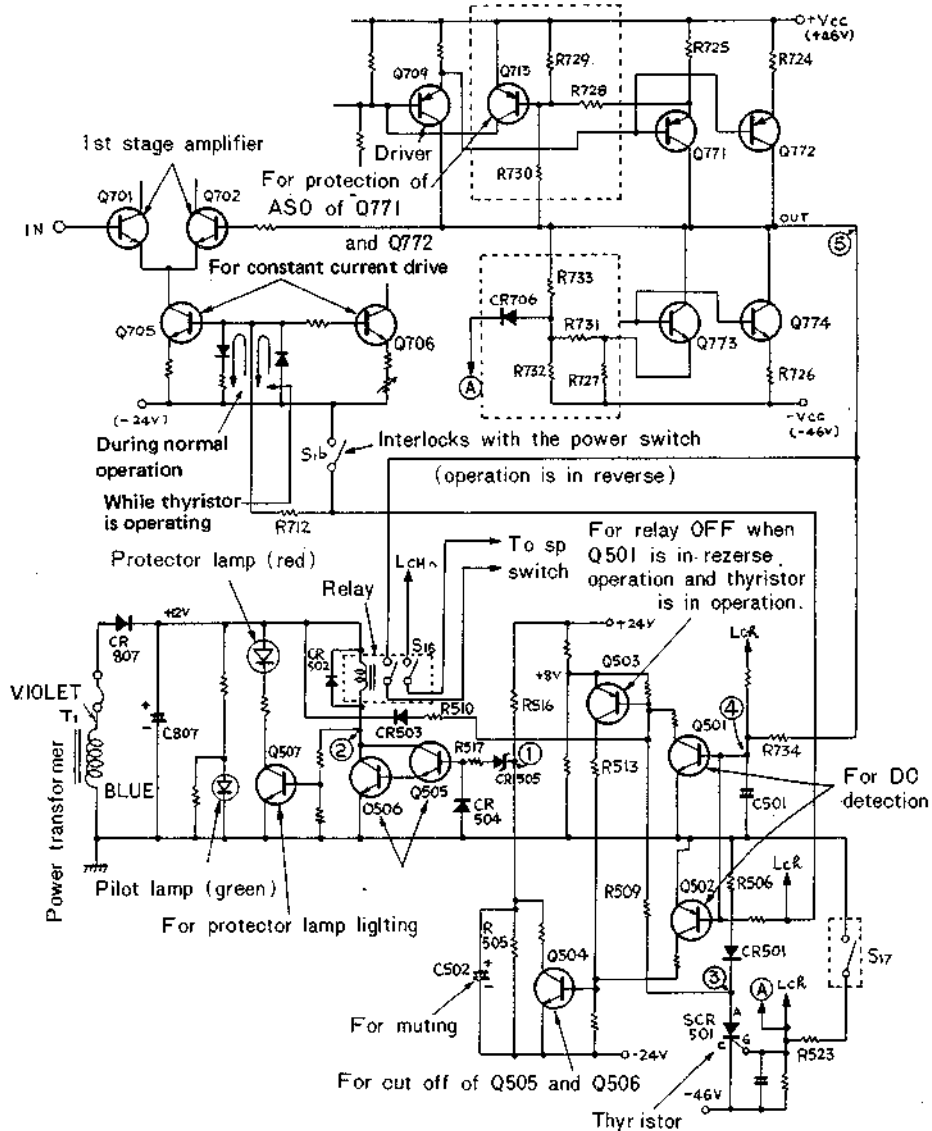


Fig. 4

by R727 and divided by R731 and R732; V<sub>CE</sub> is divided by R733 and R732; and applies voltage between Gate/Cathode of SCR501 through CR706. When it exceeds 0.8V, SCR501 turns ON, cuts off Q705, 706 for constant current drive use, to cut the whole off. Further, the relay turns off through "Q503 ON-Q504 ON-Q505, 506 OFF" and the protector lamp (red) lights.

### (3) ABNORMAL HEAT GENERATION DETECTION CIRCUIT (PROTECTION OF POWER TRANSISTOR)

Since the output transistor consumes a large amount of power, it is installed on the heat sink. When the junction temperature of the transistors exceeds a certain value, the

transistor may deteriorate.

To prevent this, a thermal lead switch S17 is installed on the heat sink to detect whether the temperature of the transistors used is correct or not, and when the temperature of the heat sink exceeds 120°C, S17 turns on and applies voltage between Gate/Cathode of SCR501 through R523 to turn SCR501 ON. What follows is the same as for (2) and the protection circuit operates.

## MODEL HA-610 SERVICE MANUAL (SUPPLEMENT)

### 4) DC VOLTAGE DETECTION CIRCUIT (PROTECTION OF SPEAKER)

In the OCL amplifier, when any trouble occurs, DC voltage appears at the speaker terminal and may damage the speakers. To prevent this, any DC voltage is detected by the filter circuit of R734 and C501. When it is (+) voltage, the relay turns off through Q501 ON—Q503 ON—Q504 ON—Q505, 506 OFF, and the protector lamp (red) lights. When the voltage is (—), the relay turns off (same as for (+)) the voltage through Q502 ON—Q504 ON—Q505, 506 OFF. This circuit naturally assumes its normal condition when

DC voltage is no longer detected. Also, when the input terminal is touched or any ultra low frequency noise enters, the speaker input is cut for a short time but is restored automatically.

#### Phenomena and remedy when the protection circuit operates

Type of protection circuit	Phenomenon when the protection circuit operates	Cause	Remedy
1. Muting circuit	The protection lamp lights for about 3 sec. after the power switch is turned on.		Normal
2. Protection circuit (1) of the power transistor (ASO Protection circuit)	1. Protection lamp (red) lights. 2. No sound comes out. 3. Anode voltage of SCR501 is - 45V (+8V in normal condition)	Short circuit of speaker output terminal	Cut the power switch, check whether the speaker terminal is short circuited or not, and turn on again after approximately 10 sec.
3. Protection circuit (2) of the transistor circuit (Abnormal heat generation detection circuit)	same as above	which used for a long time with a large output while the impedance of the speaker is 4ohms, temperature of the heat sink rises abnormally and the thermal switch operates.	Turn off the power switch and leave until the temperature of the heat sink lowers. Then turn on the power again.
4. Speaker protection circuit	1. Protector lamp (red) turns on 2. Sound do not come out 3. Neutral point voltage (5) is more than $\pm 1.6V$	Trouble in the main amplifier, etc.	Repair the fault. (Be sure to check that neutral point voltage is within $\pm 150mV$ )



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