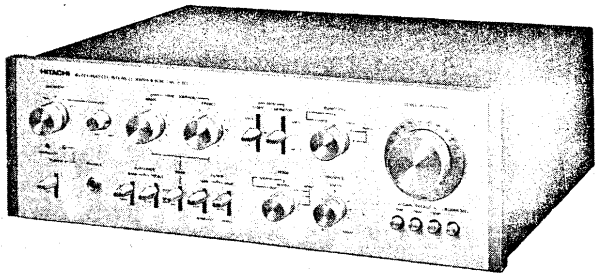
HITACHI

INTEGRATED AMPLIFIER
INTEGRIERTER VERSTÄRKER
AMPLIFICATEUR INTÉGRÉ

MODEL
MODELL
MODÈLE

HA-610



HA-610

SERVICE MANUAL
SERVICE ANLEITUNG
SERVICE MANUAL

No. 84 1975

1. SPECIFICATIONS, TECHNISCHE DATEN, CARACTÉRISTIQUES 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 ($^{+0}_{-1}$ dB)

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

Total harmonic distortion factor (1kHz, 8 ohms load) . . . . . 0.3% (at rated output)
0.006% (at ½ 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 (Level/Impedance) . . . . . TAPE REC OUT (Pin jack): 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 (±0.3dB)

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

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

Loudness control (Volume – 30dB) . . . . . +13dB (100Hz)
+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.

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.

FEATURES MERKMALE CARACTERISTIQUES

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.
Precise level control is possible by employment of a 22-contact attenuator variable resistor.
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.
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.
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, changeover 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.

. Durch den Einbau eines rein komplimentären OCL-Systems mit Emitter-geerdeter Darlington-Gegentaktschaltung konnte ein äußerst geringer Klirrfaktor bei hervorragender Stabilität erzielt werden.
. Genaueste Pegelregelung mittles Potentiometer mit 22 Schaltschritten.
. Anpassung des Laustärkepegels an die Lautsprechercharakteristik durch getrennte Verstärkerregler mit −5/−10/−20dB in Verbindung mit einem Potentiometer und einem Pegelregler für Lautsprecher B.
. Pegelregelung für Lautsprechersystem B an der Verstärker-Frontplatte, daher einfacher Vergleich und gute Anpassung an den Pegel des Lautsprechersystems A.
. 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).
. 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.

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 adjustée aux conditions de la pièce d'audition.
8. Un filtre basses fréquences est utilisé ce qui permet de nettement couper les vibrations extrêmement bases 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 facon instanée. 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 REPARATION

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-insulated wire from the wiring clamp and removing the radiation fins.

3. Adjustment of idle current

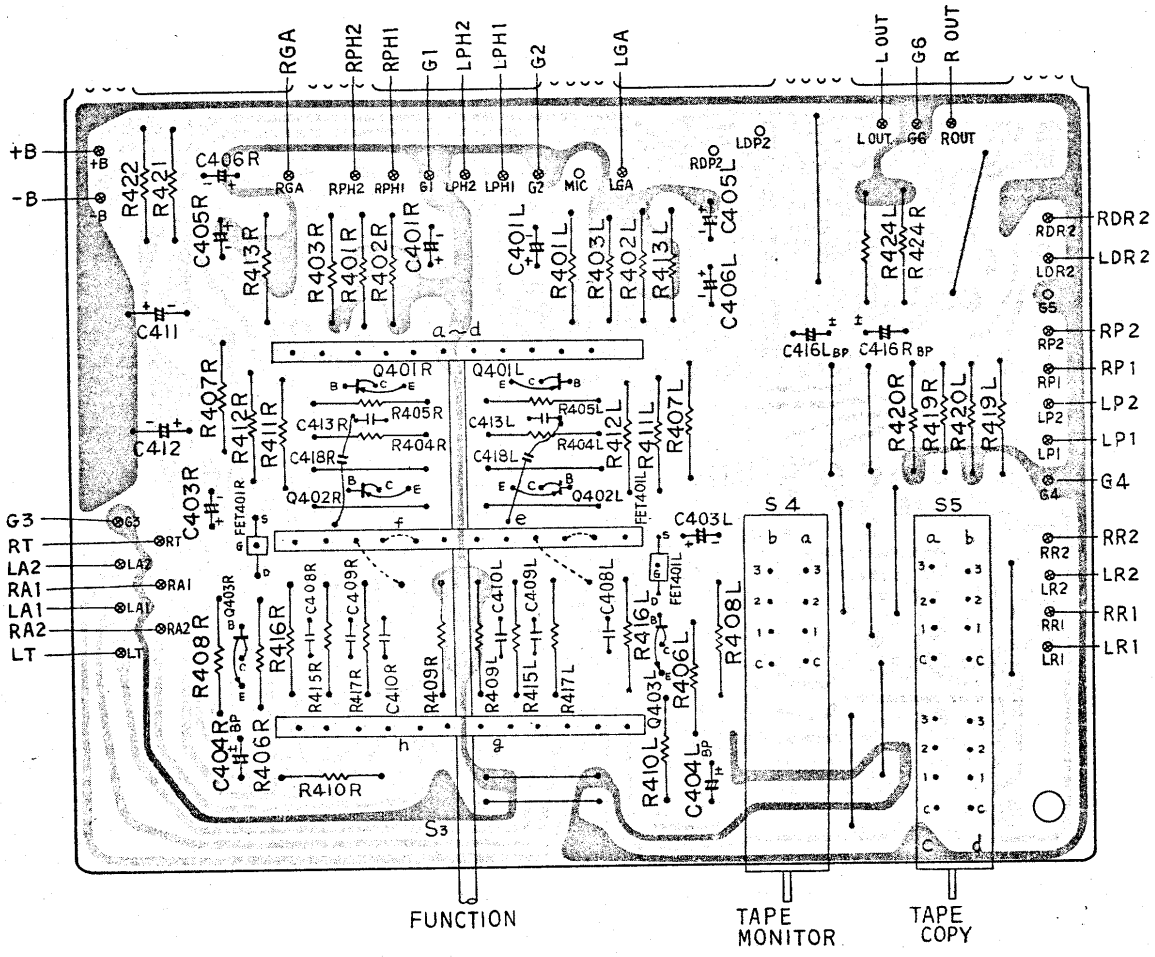
Adjust VR701 so that the voltage of both terminals of the emitter resistor R725 (0.47ohms) of the output transistor Q711 becomes 23.5mV ± 9.4mV (current value: 50mA ± 20mA). Perform this adjustment approx, 5 minutes after turning the power switch ON. Be careful, if the screw driver touches the shield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

4. How to use a shorting pin-plug

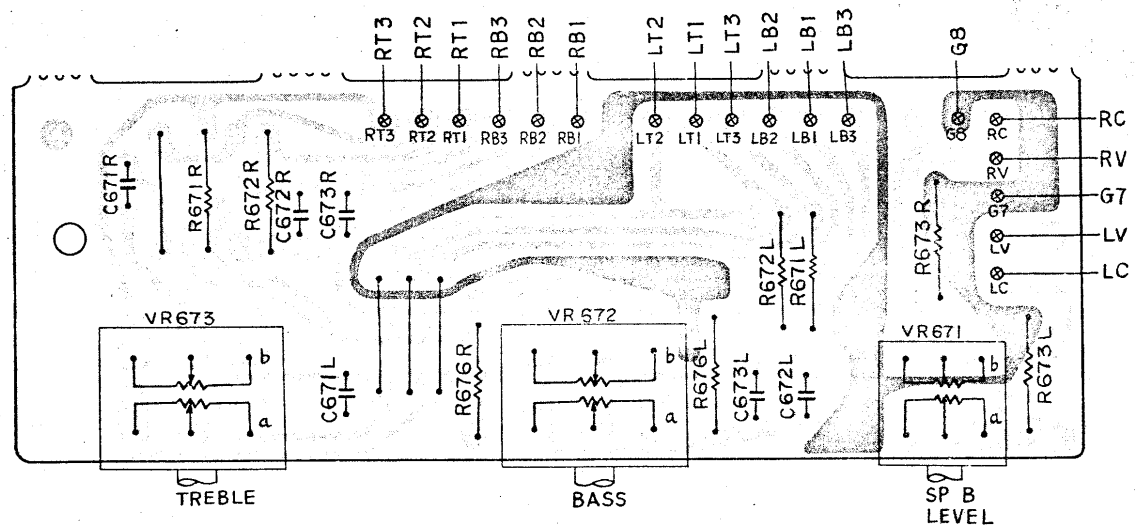
A shorting pin plug is inserted into the input terminal of AUX-1. When unpleasant sound leakage occurs in other modes, insert this shorting pin plug into that input terminal.

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

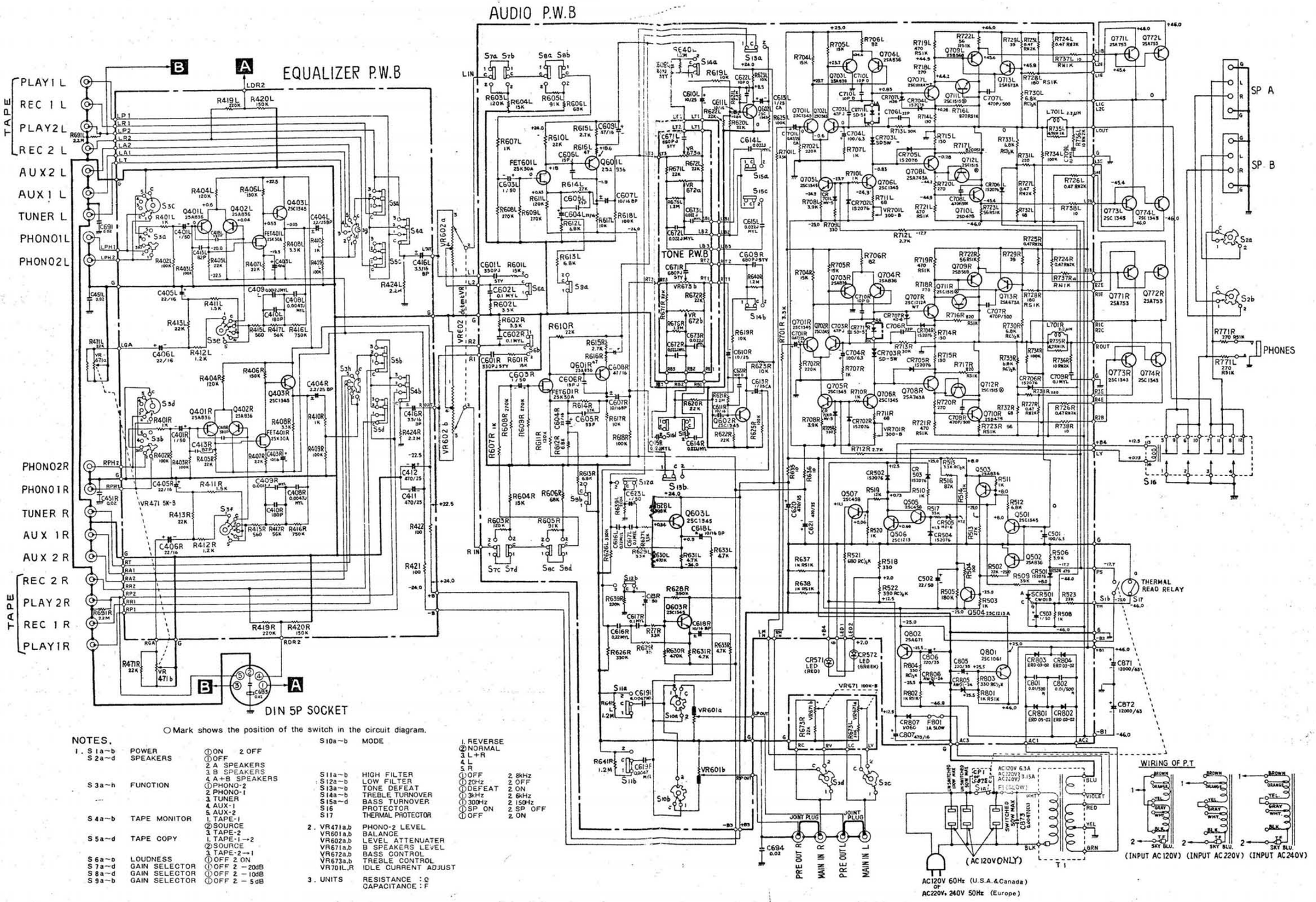
EQUALIZER PRINTED WIRING BOARD



TONE PRINTED WIRING BOARD



5. CIRCUIT DIAGRAM / SCHALTPLAN / PLAN DE CIRCUIT

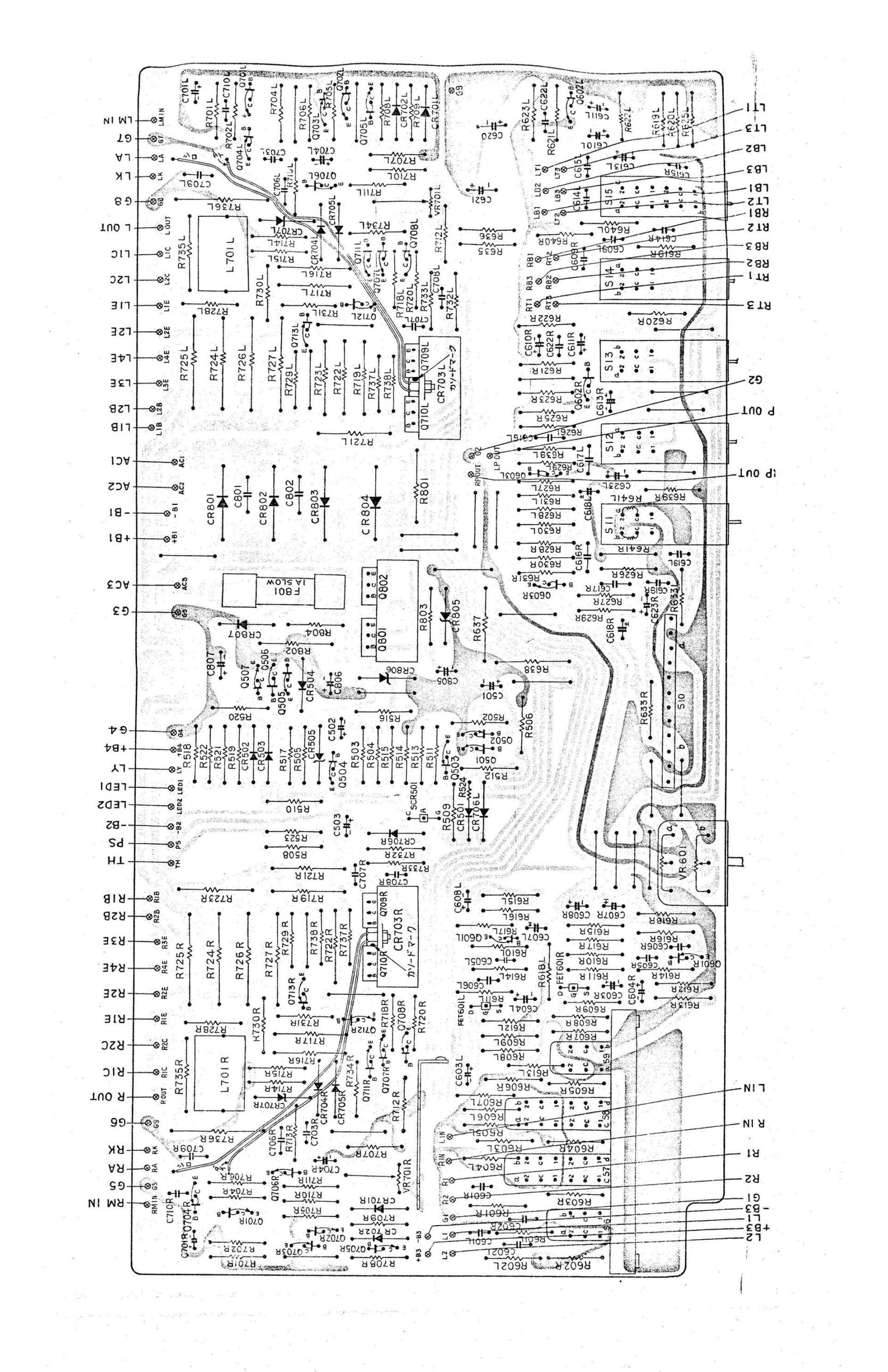


○ Mark shows the position of the switch in the circuit diagram.

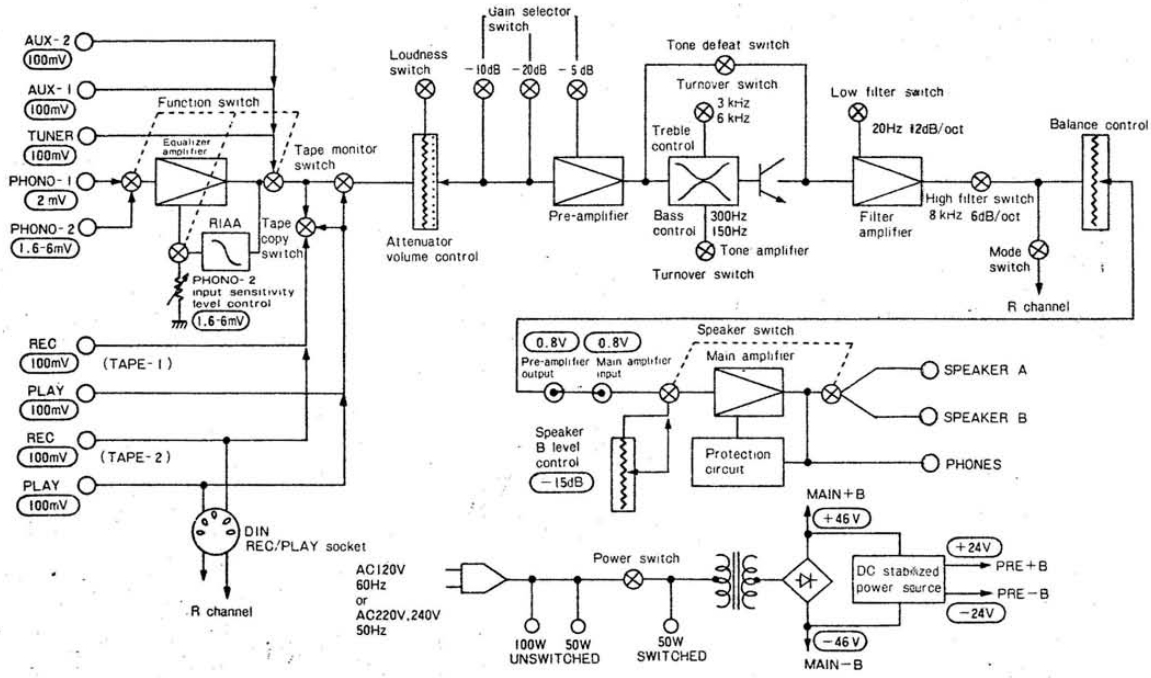
NOTES.

1. S 1a~b POWER ①ON 2 OFF
   S 2a~d SPEAKERS ①OFF 2 A SPEAKERS 3 B SPEAKERS 4 A+B SPEAKERS
   S 3a~h FUNCTION ①PHONO-2 2 PHONO-1 3 TUNER 4 AUX-1 5 AUX-2
   S 4a~b TAPE MONITOR 1 TAPE-1 ②SOURCE 3 TAPE-2
   S 5a~d TAPE COPY 1 TAPE-1→2 ②SOURCE 3 TAPE-2→1
   S 6a~b LOUDNESS ①OFF 2 ON
   S 7a~d GAIN SELECTOR ①OFF 2 −20dB
   S 8a~d GAIN SELECTOR ①OFF 2 −10dB
   S 9a~b GAIN SELECTOR ①OFF 2 −5dB
   S10a~b MODE 1 REVERSE ②NORMAL 3 L+R 4 L 5 R
   S11a~b HIGH FILTER ①OFF 2 8kHz
   S12a~b LOW FILTER ①OFF 2 20Hz
   S13a~b TONE DEFEAT ①DEFEAT 2 ON
   S14a~b TREBLE TURNOVER ①3kHz 2 6kHz
   S15a~d BASS TURNOVER ①300Hz 2 150Hz
   S16 PROTECTOR ①SP ON 2 SP OFF
   S17 THERMAL PROTECTOR ①OFF 2 ON
2. VR471a,b PHONO-2 LEVEL
   VR601a,b BALANCE
   VR602a,b LEVEL ATTENUATER
   VR671a,b B SPEAKERS LEVEL
   VR672a,b BASS CONTROL
   VR673a,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 PIECE

SYMBOL NO.	STOCK NO.	DESCRIPTION			
CAPACITORS					
for EQUALIZER PRINTED WIRING BOARD					
C401(L,R)	0252811	Electrolytic	1μF		50V
C403(L,R)	0252521	Electrolytic	10μF		16V
C404(L,R)	0257162	Electrolytic	2.2μF		25V
C405(L,R)	0252522	Electrolytic	22μF		16V
C406(L,R)	0252522	Electrolytic	22μF		16V
C408(L,R)	0274415	Mylar, film	4700pF	±5%	50V
C409(L,R)	0274231	Mylar, film	1200pF	±5%	50V
C410(L,R)	0248730	Ceramic, discal	180pF	±10%	50V
C411	0252635	Electrolytic	470μF		25V
C412	0252635	Electrolytic	470μF		25V
C413(L,R)	0248722	Ceramic, discal	82pF	±10%	50V
C416(L,R)	0257143	Electrolytic	3.3μF		16V
C418(L,R)	0248736	Ceramic, discal	330pF	±10%	50V
for TONE PRINTED WIRING BOARD					
C671(L,R)	0228331	Styrol	680pF	±5%	50V
C672(L,R)	0275213	Mylar, film	0.022μF	±5%	50V
C673(L,R)	0275213	Mylar, film	0.022μF	±5%	50V
for AUDIO PRINTED WIRING BOARD					
C501	0252231	Electrolytic	100μF		6.3V
C502	0252822	Electrolytic	22μF		50V
C503	0252811	Electrolytic	1μF		50V
C601(L,R)	0228323	Styrol	330pF	±5%	50V
C602(L,R)	0276011	Mylar, film	0.1μF	±10%	50V
C603(L,R)	0252811	Electrolytic	1μF		50V
C604(L,R)	0252522	Electrolytic	22μF		16V
C605(L,R)	0248712	Styrol	33pF	±10%	50V
C606(L,R)	0248664	Styrol	15pF	±5%	50V
C607(L,R)	0257145	Electrolytic	10μF		16V
C608(L,R)	0252525	Electrolytic	47μF		16V
C609(L,R)	0228331	Styrol	680pF	±5%	50V
C610(L,R)	0252621	Electrolytic	10μF		25V
C611(L,R)	0252521	Electrolytic	10μF		16V
C613(L,R)	0251927	Aluminum Solid	1μF		25V
C614(L,R)	0275213	Mylar, film	0.022μF	±5%	50V
C615(L,R)	0275213	Mylar, film	0.022μF	±5%	50V
C616(L,R)	0276013	Mylar, film	0.22μF	±10%	50V
C617(L,R)	0276011	Mylar, film	0.1μF	±10%	50V
C618(L,R)	0257145	Electrolytic	10μF		16V
C619(L,R)	0274315	Mylar, film	4700pF	±10%	50V

SYMBOL NO.	STOCK NO.	DESCRIPTION			
C620	0252735	Electrolytic	470μF		35V
C621	0252735	Electrolytic	470μF		35V
C622(L,R)	0248650	Ceramic, discal	10pF	±0.5pF	50V
C623(L,R)	0252811	Electrolytic	1μF		50V
C701(L,R)	0251925	Aluminum Solid	0.47μF		25V
C703(L,R)	0248676	Ceramic, discal	47pF	±5%	50V
C704(L,R)	0252231	Electrolytic	100μF		6.3V
C706(L,R)	0248708	Ceramic, discal	22pF	±10%	50V
C707(L,R)	0243449	Ceramic, discal	470pF	±10%	500V
C708(L,R)	0243449	Ceramic, discal	470pF	±10%	500V
C709(L,R)	0276011	Mylar, film	0.1μF	±10%	50V
C710(L,R)	0248650	Ceramic, discal	10pF	±0.5pF	50V
C801	0245408	Ceramic, discal	0.01μF	±20%	500V
C802	0245408	Ceramic, discal	0.01μF	±20%	500V
C805	0252732	Electrolytic	220μF		35V
C806	0252732	Electrolytic	220μF		35V
C807	0252535	Electrolytic	470μF		16V

for CHASSIS ASSEMBLY

C451(L,R)	0245018	Ceramic, discal	0.02μF	+80% −20%	25V
C691	0245018	Ceramic, discal	0.02μF	+80% −20%	25V
C693	0245018	Ceramic, discal	0.02μF	+80% −20%	25V
C694	0245018	Ceramic, discal	0.02μF	+80% −20%	25V
C871	0250633	Electrolytic	12000μF		63V
C872	0250633	Electrolytic	12000μF		63V
C873	0243875	Ceramic, discal	4700pF	±20%	250V (for U.K. Europe)
C873	0243873	Ceramic, discal	4700pF	+80% −20%	150V (for Canada)
C875	0243876	Ceramic, discal	0.01μF	±10%	250V (for Canada)

RESISTORS

for EQUALIZER PRINTED WIRING BOARD

R401(L,R)	0114161	Carbon film	1kΩ	±5%	SRD¼P
R402(L,R)	0114281	Carbon film	100kΩ	±5%	SRD¼P
R403(L,R)	0114281	Carbon film	100kΩ	±5%	SRD¼P
R404(L,R)	0114283	Carbon film	120kΩ	±5%	SRD¼P
R405(L,R)	0114209	Carbon film	22kΩ	±5%	SRD¼P
R406(L,R)	0114285	Carbon film	150kΩ	±5%	SRD¼P
R407(L,R)	0114209	Carbon film	22kΩ	±5%	SRD¼P
R408(L,R)	0114173	Carbon film	3.3kΩ	±5%	SRD¼P
R409(L,R)	0114281	Carbon film	100kΩ	±5%	SRD¼P
R410(L,R)	0114161	Carbon film	1kΩ	±5%	SRD¼P
R411(L,R)	0114165	Carbon film	1.5kΩ	±5%	SRD¼P
R412(L,R)	0114163	Carbon film	1.2kΩ	±5%	SRD¼P
R413(L,R)	0114209	Carbon film	22kΩ	±5%	SRD¼P
R415(L,R)	0114149	Carbon film	560Ω	±5%	SRD¼P
R416(L,R)	0114302	Carbon film	750kΩ	±5%	SRD¼P
R417(L,R)	0114219	Carbon film	56kΩ	±5%	SRD¼P
R419(L,R)	0114289	Carbon film	220kΩ	±5%	SRD¼P
R420(L,R)	0114285	Carbon film	150kΩ	±5%	SRD¼P
R421	0134361	Composition	100Ω	±10%	RC½GF
R422	0134361	Composition	100Ω	±10%	RC½GF
R424(L,R)	0114319	Carbon film	2.2MΩ	±5%	SRD¼P

for TONE PRINTED WIRING BOARD

R671(L,R)	0114209	Carbon film	22kΩ	±5%	SRD¼P
R672(L,R)	0114209	Carbon film	22kΩ	±5%	SRD¼P
R673(L,R)	0114209	Carbon film	22kΩ	±5%	SRD¼P
R676(L,R)	0114313	Carbon film	1.2MΩ	±5%	SRD¼P

for AUDIO PRINTED WIRING BOARD

R502	0114209	Carbon film	22kΩ	±5%	SRD¼P
R503	0114161	Carbon film	1kΩ	±5%	SRD¼P
R504	0114131	Carbon film	100Ω	±5%	SRD¼P
R505	0114287	Carbon film	180kΩ	±5%	SRD¼P
R506	0114175	Carbon film	3.9kΩ	±5%	SRD¼P
R508	0114161	Carbon film	1kΩ	±5%	SRD¼P
R509	0114215	Carbon film	39kΩ	±5%	SRD¼P
R510	0114161	Carbon film	1kΩ	±5%	SRD¼P
R511	0114161	Carbon film	1kΩ	±5%	SRD¼P
R512	0114181	Carbon film	6.8kΩ	±5%	SRD¼P
R513	0114211	Carbon film	27kΩ	±5%	SRD¼P
R514	0114165	Carbon film	1.5kΩ	±5%	SRD¼P
R515	0134379	Composition	3.3kΩ	±10%	RC½GF
R516	0114223	Carbon film	82kΩ	±5%	SRD¼P
R517	0114213	Carbon film	33kΩ	±5%	SRD¼P
R518	0114143	Carbon film	330Ω	±5%	SRD¼P
R519	0114203	Carbon film	12kΩ	±5%	SRD¼P
R520	0114161	Carbon film	1kΩ	±5%	SRD¼P
R521	0134371	Composition	680Ω	±10%	RC½GF
R522	0134368	Composition	390Ω	±10%	RC½GF
R523	0114209	Carbon film	22kΩ	±5%	SRD¼P
R524	0134369	Composition	470Ω	±10%	RC½GF
R601(L,R)	0114205	Carbon film	15kΩ	±5%	SRD¼P
R602(L,R)	0114173	Carbon film	3.3kΩ	±5%	SRD¼P
R603(L,R)	0114283	Carbon film	120kΩ	±5%	SRD¼P
R604(L,R)	0114205	Carbon film	15kΩ	±5%	SRD¼P
R605(L,R)	0114224	Carbon film	91kΩ	±5%	SRD¼P
R606(L,R)	0114221	Carbon film	68kΩ	±5%	SRD¼P
R607(L,R)	0114161	Carbon film	1kΩ	±5%	SRD¼P
R608(L,R)	0114291	Carbon film	270kΩ	±5%	SRD¼P
R609(L,R)	0114291	Carbon film	270kΩ	±5%	SRD¼P
R610(L,R)	0114209	Carbon film	22kΩ	±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

SYMBOL NO.	STOCK NO.	DESCRIPTION			
R623(L,R)	0114201	Carbon film	10kΩ	±5%	SRD¼P
R625(L,R)	0114281	Carbon film	100kΩ	±5%	SRD¼P
R626(L,R)	0114293	Carbon film	330kΩ	±5%	SRD¼P
R627(L,R)	0114173	Carbon film	3.3kΩ	±5%	SRD¼P
R628(L,R)	0114295	Carbon film	390kΩ	±5%	SRD¼P
R629(L,R)	0114213	Carbon film	33kΩ	±5%	SRD¼P
R630(L,R)	0114297	Carbon film	470kΩ	±5%	SRD¼P
R631(L,R)	0114177	Carbon film	4.7kΩ	±5%	SRD¼P
R633(L,R)	0114177	Carbon film	4.7kΩ	±5%	SRD¼P
R635	0114041	Carbon film	10Ω	±5%	SRD¼P
R636	0114041	Carbon film	10Ω	±5%	SRD¼P
R637	0119441	Metal, oxide	1kΩ	±10%	RS1B
R638	0119441	Metal, oxide	1kΩ	±10%	RS1B
R639(L,R)	0114289	Carbon film	220kΩ	±5%	SRD¼P
R640(L,R)	0114313	Carbon film	1.2MΩ	±5%	SRD¼P
R641(L,R)	0114313	Carbon film	1.2MΩ	±5%	SRD¼P
R701(L,R)	0114173	Carbon film	3.3kΩ	±5%	SRD¼P
R702(L,R)	0114289	Carbon film	220kΩ	±5%	SRD¼P
R704(L,R)	0114205	Carbon film	15kΩ	±5%	SRD¼P
R705(L,R)	0114205	Carbon film	15kΩ	±5%	SRD¼P
R706(L,R)	0114063	Carbon film	82Ω	±5%	SRD¼P
R707(L,R)	0114161	Carbon film	1kΩ	±5%	SRD¼P
R708(L,R)	0114175	Carbon film	3.9kΩ	±5%	SRD¼P
R709(L,R)	0114143	Carbon film	330Ω	±5%	SRD¼P
R710(L,R)	0114161	Carbon film	1kΩ	±5%	SRD¼P
R711(L,R)	0114061	Carbon film	68Ω	±5%	SRD¼P
R712(L,R)	0114171	Carbon film	2.7kΩ	±5%	SRD¼P
R713(L,R)	0114212	Carbon film	30kΩ	±5%	SRD¼P
R714(L,R)	0114134	Carbon film	130Ω	±5%	SRD¼P
R715(L,R)	0114134	Carbon film	130Ω	±5%	SRD¼P
R716(L,R)	0119432	Metal, oxide	820Ω	±10%	RS1B
R717(L,R)	0119432	Metal, oxide	820Ω	±10%	RS1B
R718(L,R)	0114141	Carbon film	270Ω	±5%	SRD¼P
R719(L,R)	0119429	Metal, oxide	470Ω	±10%	RS1B
R720(L,R)	0114141	Carbon film	270Ω	±5%	SRD¼P
R721(L,R)	0119429	Metal, oxide	470Ω	±10%	RS1B
R722(L,R)	0119410	Metal, oxide	56Ω	±10%	RS1B
R723(L,R)	0119410	Metal, oxide	56Ω	±10%	RS1B
R724(L,R)	0119127	Metal	0.47Ω	±10%	RN2B
R725(L,R)	0119127	Metal	0.47Ω	±10%	RN2B
R726(L,R)	0119127	Metal	0.47Ω	±10%	RN2B
R727(L,R)	0119127	Metal	0.47Ω	±10%	RN2B
R728(L,R)	0119424	Metal, oxide	180Ω	±10%	RS1B
R729(L,R)	0114055	Carbon film	39Ω	±5%	SRD¼P
R730(L,R)	0134383	Composition	6.8kΩ	±10%	RC½GF
R731(L,R)	0114139	Carbon film	220Ω	±5%	SRD¼P
R732(L,R)	0114061	Carbon film	68Ω	±5%	SRD¼P
R733(L,R)	0134383	Composition	6.8kΩ	±10%	RC½GF
R734(L,R)	0114281	Carbon film	100kΩ	±5%	SRD¼P
R735(L,R)	0119029	Metal	4.7Ω	±10%	RN1B
R736(L,R)	0119151	Metal	10Ω	±10%	RN2B
R737(L,R)	0119041	Metal	10Ω	±10%	RN1B
R738(L,R)	0114041	Carbon film	10Ω	±5%	SRD¼P
R801	0119441	Metal, oxide	1kΩ	±10%	RS1B
R802	0119441	Metal, oxide	1kΩ	±10%	RS1B
R803	0134367	Composition	330Ω	±10%	RC½GF
R804	0134367	Composition	330Ω	±10%	RC½GF

for CHASSIS ASSEMBLY

R471(L,R)	0114209	Carbon film	22kΩ	±5%	SRD¼P
R691(L,R)	0114319	Carbon film	2.2MΩ	±5%	SRD¼P
R771(L,R)	0119426	Metal, oxide	270Ω	±10%	RD1PA

SYMBOL NO.	STOCK NO.	DESCRIPTION

TRANSISTORS

for EQUALIZER PRINTED WIRING BOARD

FET401(L,R)	2327833	2SK30A (Y)
Q401(L,R)	2327743	2SA836 (E)
Q402(L,R)	2327743	2SA836 (E)
Q403(L,R)	2327364	2SC1345 (F)

for AUDIO PRINTED WIRING BOARD

FET601(L,R)	2327833	2SK30A (Y)
Q501	2327363	2SC1345 (E)
Q502	2327742	2SA836 (D)
Q503	2327742	2SA836 (D)
Q504	2327293	2SC1213A (C)
Q505	2320063	2SC458 (C)
Q506	2327333	2SC1213 (C)
Q507	2320063	2SC458 (C)
Q601(L,R)	2327743	2SA836 (E)
Q602(L,R)	2327363	2SC1345 (E)
Q603(L,R)	2327363	2SC1345 (E)
Q701(L,R)	2327364	2SC1345 (F)
Q702(L,R)	2327364	2SC1345 (F)
Q703(L,R)	2327742	2SA836 (D)
Q704(L,R)	2327742	2SA836 (D)
Q705(L,R)	2327363	2SC1345 (E)
Q706(L,R)	2327363	2SC1345 (E)
Q707(L,R)	2327607	2SC1212AWT (C)
Q708(L,R)	2327393	2SA743A (C)
Q709(L,R)	2327792	2SB568 (C)
Q710(L,R)	2327802	2SD478 (C)
Q711(L,R)	2327751	2SC1515 (K)
Q712(L,R)	2327751	2SC1515 (K)
Q713(L,R)	2327283	2SA673A (C)
Q801	2327153	2SC1061 (C)
Q802	2327676	2SA671 (C)

for CHASSIS ASSEMBLY

Q771(L,R)	2327622	2SA753 (B)
Q772(L,R)	2327622	2SA753 (B)
Q773(L,R)	2327612	2SC1343 (B)
Q774(L,R)	2327612	2SC1343 (B)

DIODES

for AUDIO PRINTED WIRING BOARD

CR501	2337011	1S2076
CR502	2337011	1S2076
CR503	2337011	1S2076
CR504	2337011	1S2076
CR505	2337123	HZ-6 (C)
CR701(L,R)	2347041	MV-5
CR702(L,R)	2337011	1S2076
CR703(L,R)	2337301	SD-5W
CR704(L,R)	2337011	1S2076
CR705(L,R)	2337011	1S2076
CR706(L,R)	2337011	1S2076
CR707(L,R)	2337123	HZ-6 (C)

SYMBOL NO.	STOCK NO.	DESCRIPTION
CR801	2337251	ERD 03-02
CR802	2337251	ERD 03-02
CR803	2337251	ERD 03-02
CR804	2337251	ERD 03-02
CR805	2327073	AW 01-24
CR806	2327073	AW 01-24
CR807	2327041	VO6C
SCR501	2337091	CW01B
for CHASSIS ASSEMBLY		
CR571	2337233	LED (RED)
CR572	2337232	LED (GREEN)
CR771(L,R)	2347062	SD-5
VARIABLE RESISTORS		
for TONE PRINTED WIRING BOARD		
VR671	0151861	100kΩ-(B) B SPEAKER LEVEL adj.
VR672	0156152	200kΩ-(B) BASS
VR673	0156152	200kΩ-(B) TREBLE
for AUDIO PRINTED WIRING BOARD		
VR601	0156142	100kΩ-(MN) BALANCE
VR701(L,R)	0151256	300Ω-(B) Idle current adj.
for CHASSIS ASSEMBLY		
VR471	0151871	5kΩ-(B) PHONO 2 LEVEL CONTROL
VR602	0159091	Attenuator volume
COILS		
L701(L,R)	2227142	Audio trap coil (2.2μH)
MISCELLANEOUS		
	2505254	Equalizer printed wiring board assembly
	2505255	Tone printed wiring board assembly
	2505261	Audio printed wiring board assembly (for Europe & U.K.)
	2505262	Audio printed wiring board assembly (for Canada)
S1	2637693	Switch-power switch
S2	2617541	Switch-rotary switch
S3	2617551	Switch-rotary switch (for function sw.)
S4	2627111	Switch-lever switch (for tape monitor sw.)
S5	2627121	Switch-lever switch (for tape copy sw.)
S6-9	2637671	Switch-push switch (for loudness & gain selector sw.)
S10	2617561	Switch-rotary switch (for mode sw.)
S11-14	2627131	Switch-lever switch (for turnover & filter sw.)
S15	2627141	Switch-lever switch (for tone defeat sw.)
S16	2647071	Relay
S17	2647052	Thermal lead switch
CP1	0269015	Spark killer (for U.K.& Europe)

SYMBOL NO.	STOCK NO.	DESCRIPTION
F801	2727083	Fuse-wired in fuse (1A, 125V SLOW)(UL)
	4368861	Washer -13.2φ washer
	3914611	Washer-13.5φ washer
	2677234	Jack-headphone jack
	4090092	Screw-earth screw
	4387281	AC bush plate (for Canada)
	4387283	AC bush plate (for U.K. & Europe)
	0043793	Bushing (for AC power cord) (for Canada)
	3913001	Bushing (for AC power cord) (for Europe)
	3913005	Bushing (for AC power cord) (for U.K.)
	3920381	Cover-AC socket cover (for U.K. & Europe)
	2657281	Socket-AC socket (for Canada)
	2748441	AC power cord (for Canada)
	2748511	AC power cord (for Europe)
	2747732	AC power cord (for U.K.)
	2687622	4P US pin jack
	2687632	6P US pin jack
	2687642	8P US pin jack
	0541358	Socket-DIN 5P socket
	2667201	Joint plug
	2687701	Terminal-4P speaker terminal
	4567411	Screw-3φx6 CT bind screw
	4567414	Screw-3φx12 CT bind screw
	4567453	Screw-3φx10 CT bind screw
	4567433	Screw-3φx10 CT bind screw
for FINAL ASSEMBLY		
	3243662	Escutcheon
	3282801	Knob-Gain selector & Loudness knob
	3283021	Knob plate
	3283162	Knob-Level attenuator knob
	3283041	Knob-Speaker/Bass/Treble/Function knob
	3283031	Knob-Mode/Balance knob
	3282661	Knob-B speaker level knob
	3282981	Knob-Lever knob
	3916411	Leg
	4353141	Washer-4.5φ washer
	4374051	Washer-4.3φ washer
	4388742	Cover assembly
	2667161	Short pin plug
	4567421	Screw-4φx6 CT bind screw
	4567412	Screw-3φx8 CT bind screw
	4567413	Screw-3φx10 CT bind screw
	4567411	Screw-3φx6 CT bind screw
for DIAL MECHANISM ASSEMBLY		
	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
	2727181	Fuse holder
F1	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-3φx6 CT bind screw
	4567441	Screw-4φx6 CT bind screw
	4567421	Screw-4φx6 CT bind screw
	4567423	Screw-4φx10 CT bind screw

HITACHI

INTEGRATED AMPLIFIER

MODEL HA-610

SERVICE MANUAL

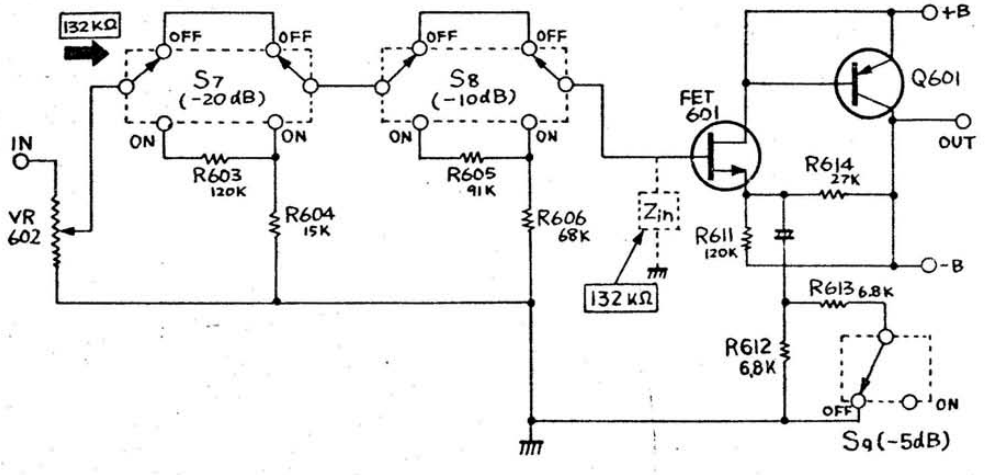
SUPPLEMENT

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.



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 ½ 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 (½).

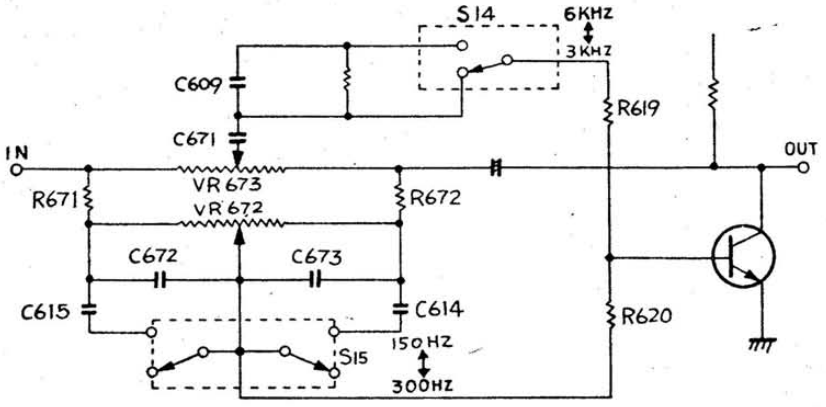


Fig. 2

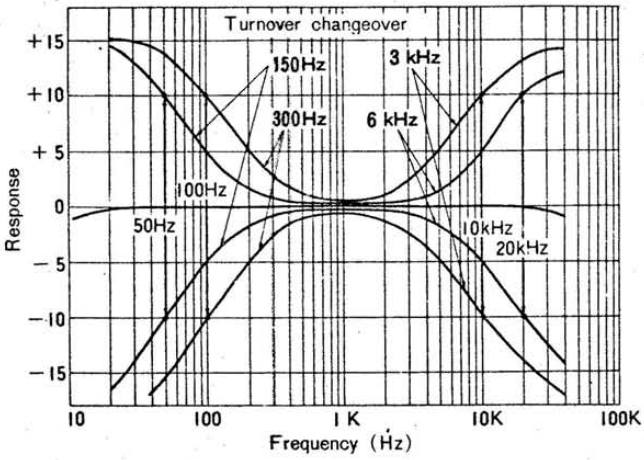


Fig. 3

PROTECTION CIRCUIT

(1) MUTING CIRCUIT

To remove click noise caused by the start of circuit operation when the power switch is turend 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, Slb 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 (Ic) 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 Ic and V_{CE} exceeds the specified value.

For ptotection of Q771, Q772, Ic 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, Ic of Q773 is detected

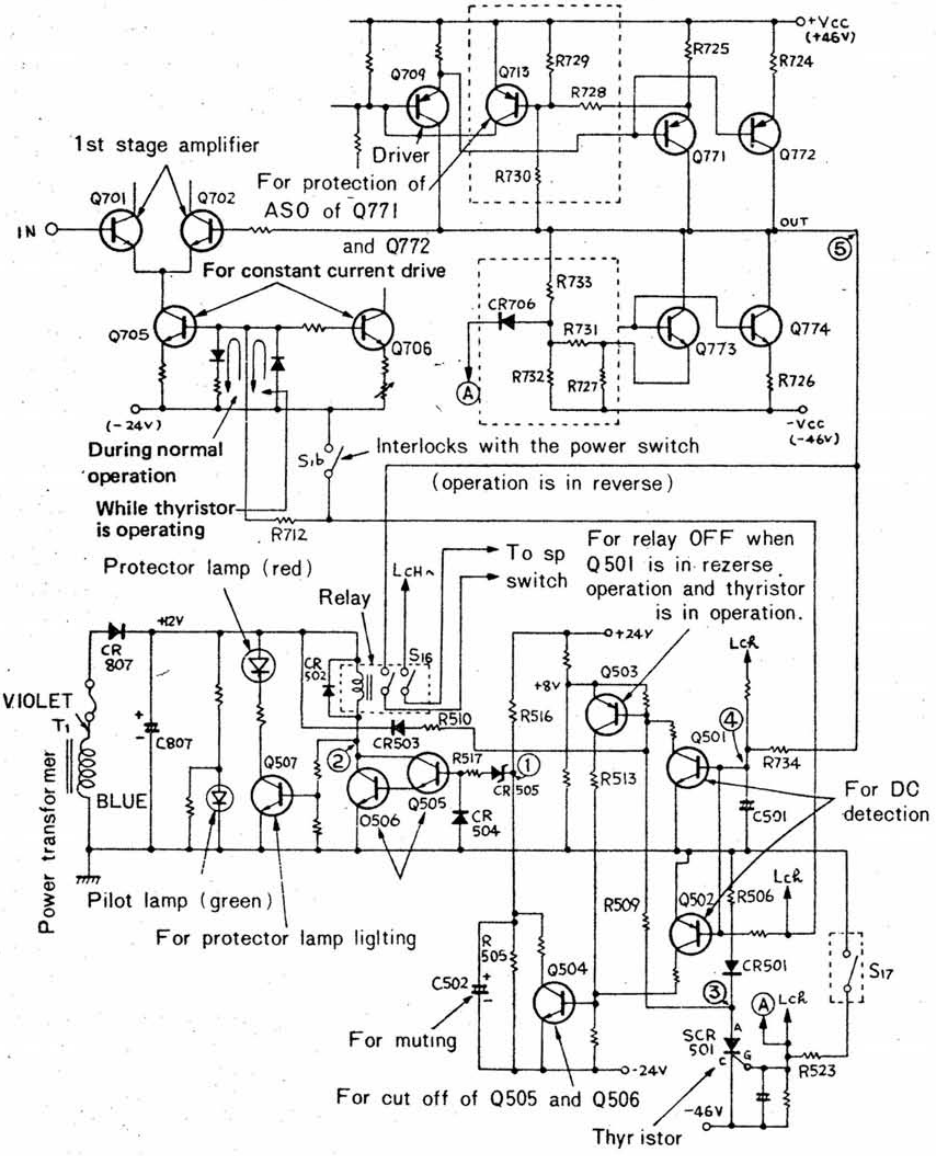


Fig. 4

by R727 and divided by R731 and R732; V_{CE} 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 temeprature 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.

(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 raturally 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 ± 1.6V	Trouble in the main amplifier, etc.	Repair the fault. (Be sure to check that neutral point voltage is within ±150mV)

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