



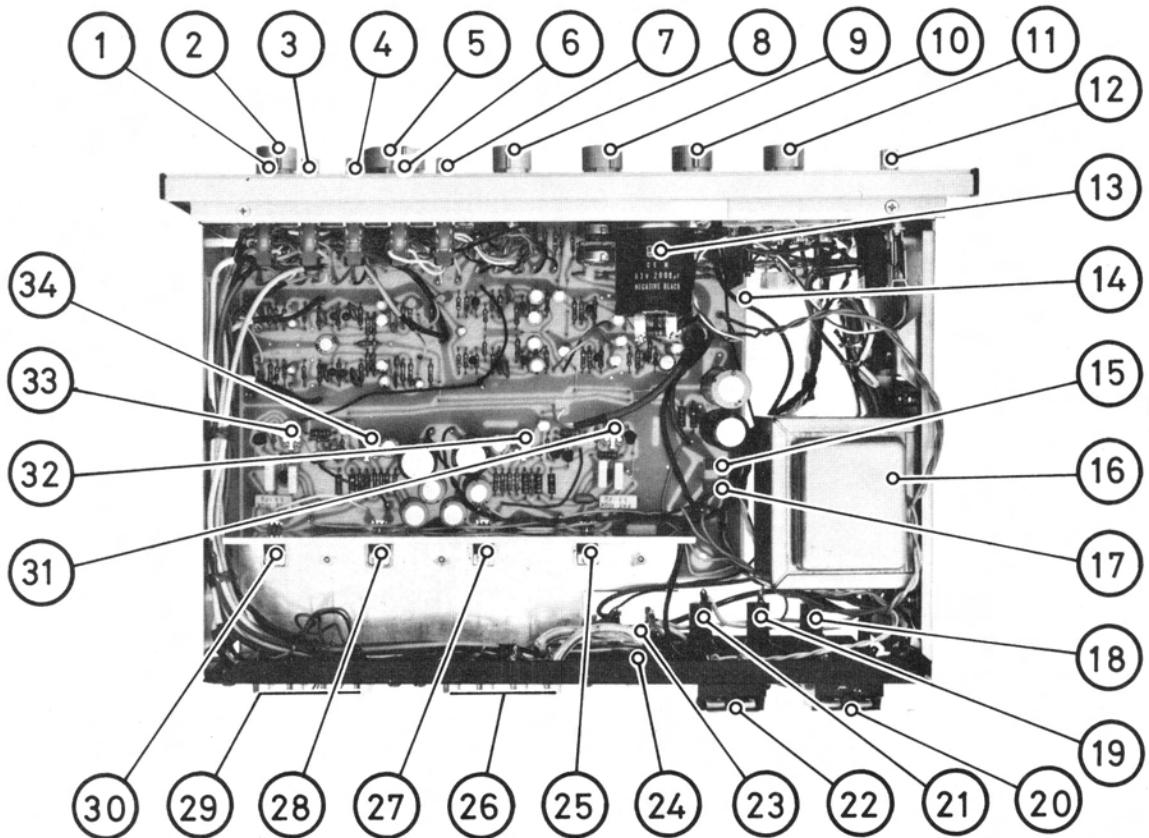
## technical manual

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# CHASSIS LAYOUT

- |                                   |                                       |
|-----------------------------------|---------------------------------------|
| 1. Tape Monitor-2 Switch          | 18. F001, DC Fuse, L-ch.              |
| 2. Selector Switch                | 19. F002, DC Fuse, R-ch.              |
| 3. Tape Monitor-1 Switch          | 20. Speaker-2 Terminal                |
| 5. Mode Switch                    | 21. F003, AC Fuse                     |
| 5. Volume Control                 | 22. Speaker-1 Terminal                |
| 6. Loudness Switch                | 23. AC Outlet                         |
| 7. Hi-Filter Switch               | 24. Din Jack                          |
| 8. Balance Control                | 25. Q509, Power Transistor, L-ch.     |
| 9. Treble Control                 | 26. Tape Monitor Jacks                |
| 10. Bass Control                  | 27. Q510, Power Transistor, L-ch.     |
| 11. Speakers Switch               | 28. Q610, Power Transistor, R-ch.     |
| 12. Power Switch                  | 29. Input Jacks                       |
| 13. C001, Ripple Filter Capacitor | 30. Q609, Power Transistor, R-ch.     |
| 14. Printed Circuit Board         | 31. VR506, Idling Current Adj., L-ch. |
| 15. D702, Rectifier               | 32. VR505, DC Balance Adj., L-ch.     |
| 16. Power Transformer             | 33. VR602, Idling Current Adj., R-ch. |
| 17. D701, Rectifier               | 34. VR601, DC Balance Adj., R-ch.     |



# PRECAUTIONS

1. Always disconnect the chassis from power line when soldering. Turning the power switch OFF is not enough. Power line leakage passing through the heating element may destroy the transistors.
2. Never attempt to do any work on the transistor amplifiers without first disconnecting the AC line cord and waiting until the power supply filter capacitors have discharged.
3. Replacement for output and driver transistors, if necessary, must be made from the same beta group as the original type.
4. If one output transistor burns out (open or short) always remove all the output transistors in that channel and check the

bias adjustment, the control and other parts in the network with an ohm-meter before inserting a new transistor. All transistors in one channel will be destroyed if the base biasing circuit is open on the emitter end.

5. When mounting a replacement power transistor, be sure that the bottom of the flange, the mica insulators and the surface of the heat sink are free of foreign matter, for they may cause transistors failure.
6. Silicon grease must be applied between the transistor and the mica insulator, and between the mica insulator and the heat conduction.

## MAIN AMPLIFIER ADJUSTMENT

### PREDRIVER/DRIVER ADJUSTMENT

1. Set Balance, Bass and Treble controls to mid-position.
2. Set Mode switch to "STEREO", loudness switch "OUT", Hi-Fil. switch "OUT", Speaker switch to "1" or "2", and Func. selector switch to "AUX" position.
3. Connect 8-ohm, 50-watt resistor across Left channel speaker terminals. In parallel with the load resistor, connect the vertical input leads of the oscilloscope.
4. Connect an audio generator, set for 1,000Hz (sine wave), to Left channel AUX input.

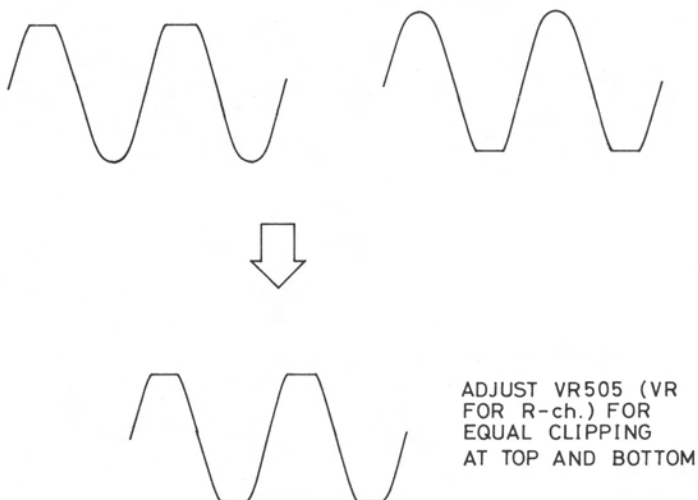


Fig. 1 DC Balance Adjustment Waveform

5. Connect AC power cord and rotate volume control to clockwise position (full volume). Increase generator output until sine wave on scope just starts clipping. Adjust DC Balance potentiometer VR505 (on Pre, Main Amp PCB) for equal clipping on the positive and negative half cycles of the signal. See Fig. 1.
6. Adjust idling current using a DC millivolt meter across R539 resistor (Test Point Pin #27 and E15), rotate VR502 (on Pre, Main Amp PCB) to obtain a 7.5mV reading on DC millivolt-meter (no signal input).
7. Repeat the steps 3 thru 6 as above for Right channel. (Use VR601, 602 and R639 [Test Point Pin #30 (J14) and E16]).

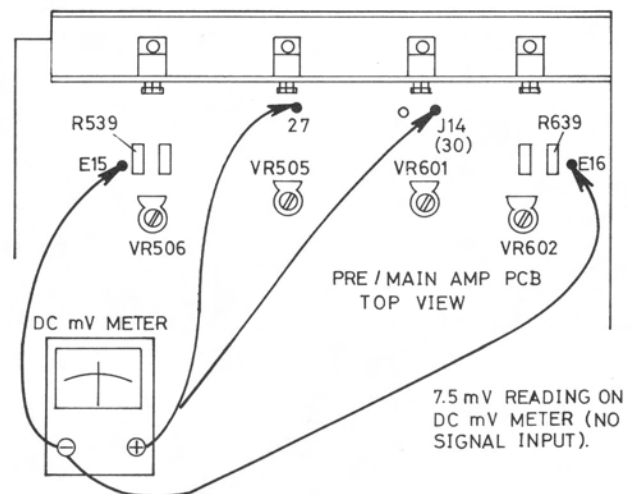


Fig. 2 Idling Current Adjustment Hook-up

# TROUBLE SHOOTING

## I. Complete inoperative.

A. If the pilot lamp does not light, check to see if the AC fuse is OK.

1. And if the AC fuse is OK,

- Power switch connection may be faulty, or
- Power Transformer may be faulty.

2. And if the AC fuse is blown,

- Rectifier D701 or 702 may be shorted out, or
- Power Transformer may be shorted out, or
- Capacitor, C001 may be faulty.

B. If the pilot lamp does light, check to see if the DC fuse is OK.

1. And if the DC fuse is OK,

- Transistor Q501, 502, 503 or 504 (Q601, 602, 603 or 604 for R-ch.) may be faulty, or
- Capacitor C503, 509, 510, 514 or 517 (C603, 609 610, 614 or 617 for R-ch.) may be faulty.

2. And if the DC fuse is blown,

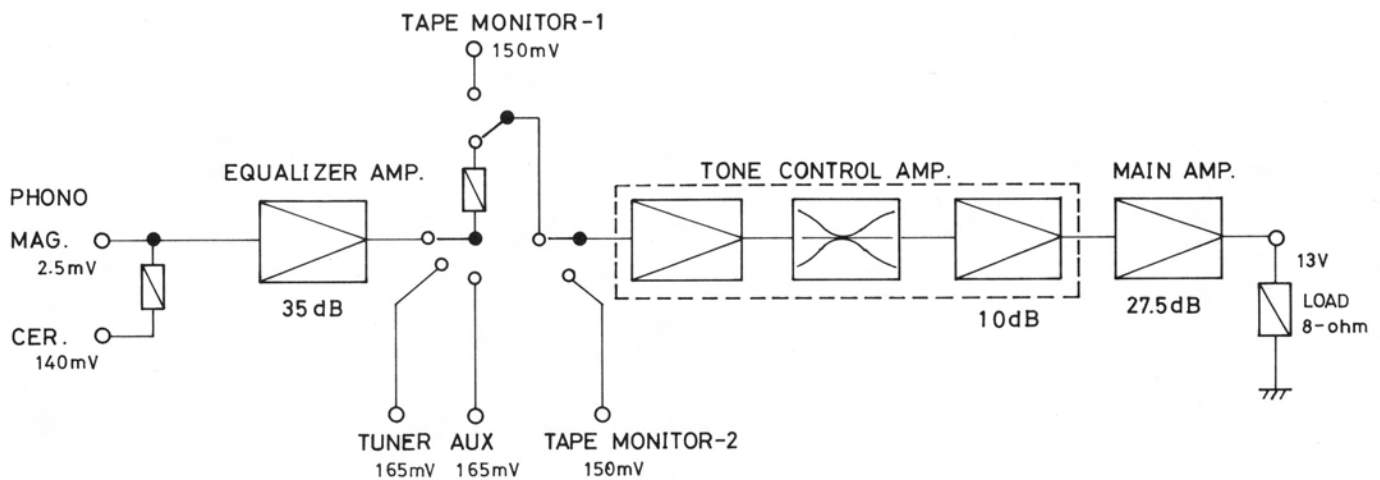
- Power Transistor Q509 or 510 (Q609 or 610 for R-ch.) may be faulty, or
- Transistor Q505, 506, 507 or 508 (Q605, 606, 607 or 608 for R-ch.) may be faulty, or
- Speaker circuits (including speaker systems) may be shorted out.

## II. Only Phono section inoperative,

A. Transistor Q401 or 402 (Q403 or 404 for R-ch.) may be faulty, or

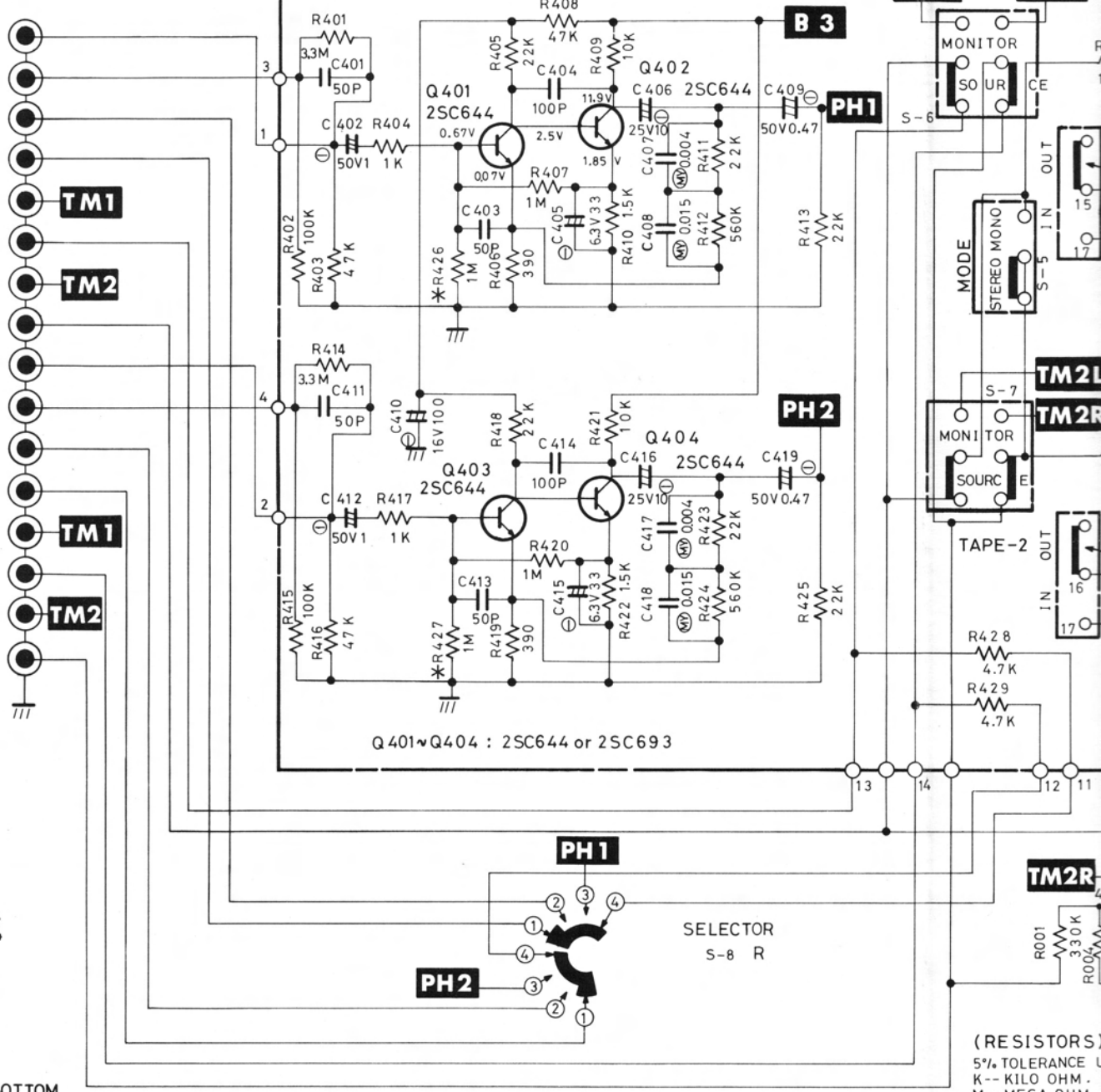
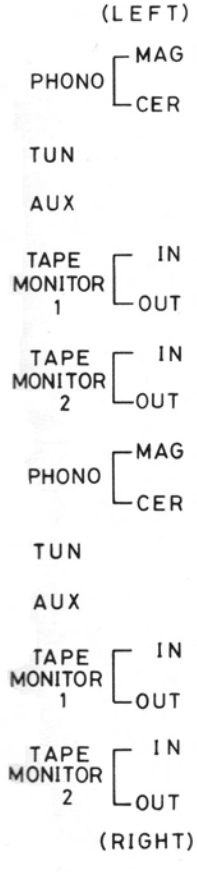
B. Capacitor C402, 406 or 409 (C412, 416 or 419 for R-ch.) may be faulty.

# GAIN DIAGRAM



# SCHEMATIC DIAGRAM

\* R426 (R427) SHOULD BE TAKEN AWAY FROM THE CIRCUIT IN CASE OF REPLACING TRANSISTOR 2SC693 INSTEAD OF 2SC644.



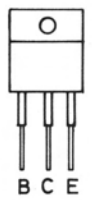
Q401~Q404 : 2SC644 or 2SC693

- 2SA684
- 2SA564A
- 2SC1384
- 2SC828
- 2SC693
- 2SC644

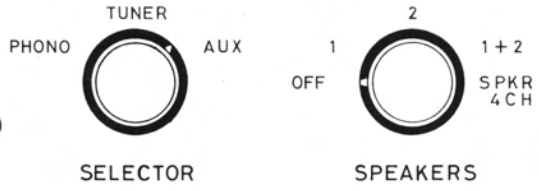


(BOTTOM VIEW)

2SC789



(TOP VIEW)



ITEM	SCHEMATIC LOCATION LAST	
	R	C
EQUALIZER	R 429	C 420
TONE CONTROL	L R 525	C 515
TONE CONTROL	R R 625	C 615
MAIN AMP	L R 541	C 523
MAIN AMP	R R 641	C 623

(RESISTORS)  
 5% TOLERANCE UN  
 K-- KILO OHM.  
 M-- MEGA OHM.  
 ▽-- COMPOSITION  
 NON MARK -- LOW  
 (CAPACITORS)  
 MY MYLAR FILM C  
 T TANTALUM CA  
 # ELECTROLYTIC  
 LN-- LOW NOISE  
 NON MARK -- CERA  
 UNLESS OTHERWIS  
 CAPACITOR VALUE

VOLTAGE READING  
 SHOWN TO THE C  
 VOLTAGE READING

ACING  
44.

B 3

PH 2

LOCATION LAST	
R	C
R 429	C 420
R 525	C 515
R 625	C 615
R 541	C 523
R 641	C 623

TAPE -1

TM1 L TM1 R

PH1

MODE  
STEREO MONO

TM2 L  
TM2 R

MONI TOR  
SOURC E

TAPE -2

REC/PB

TM2R TM2L

(RESISTORS)

5% TOLERANCE UNLESS OTHERWISE NOTED.  
K -- KILO OHM.  
M -- MEGA OHM.  
▽ -- COMPOSITION RESISTORS 1/2 WATT.  
NON MARK -- LOW NOISE TYPE CARBON RESISTORS.

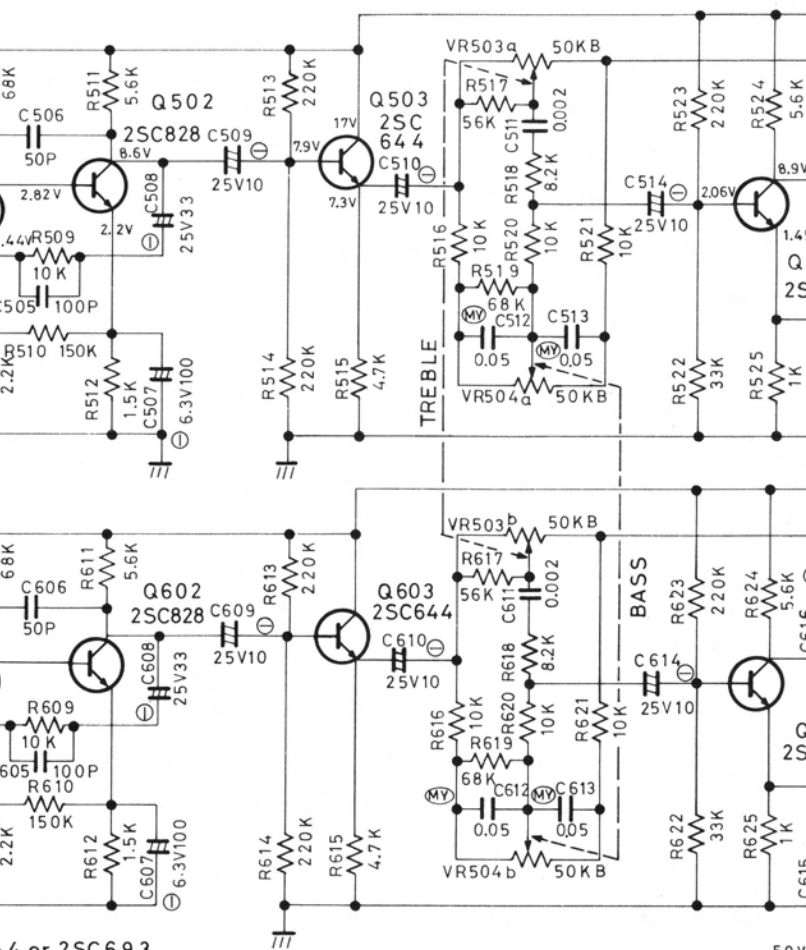
(CAPACITORS)

MY -- MYLAR FILM CAPACITORS.  
T -- TANTALUM CAPACITORS.  
\* -- ELECTROLYTIC CAPACITORS.  
LN -- LOW NOISE TYPE ELECTROLYTIC CAPACITORS.  
NON MARK -- CERAMIC CAPACITORS.

UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITOR VALUES ARE EXPRESSED IN MFD

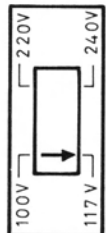
VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 117 V)  
VOLTAGE READING MAY VARY ± 20%.

100V, 117V 2 A  
AC FUSE 220V, 240V 1 A



Q 501, Q 503, Q 601, Q 603 : 2SC644 or 2SC693

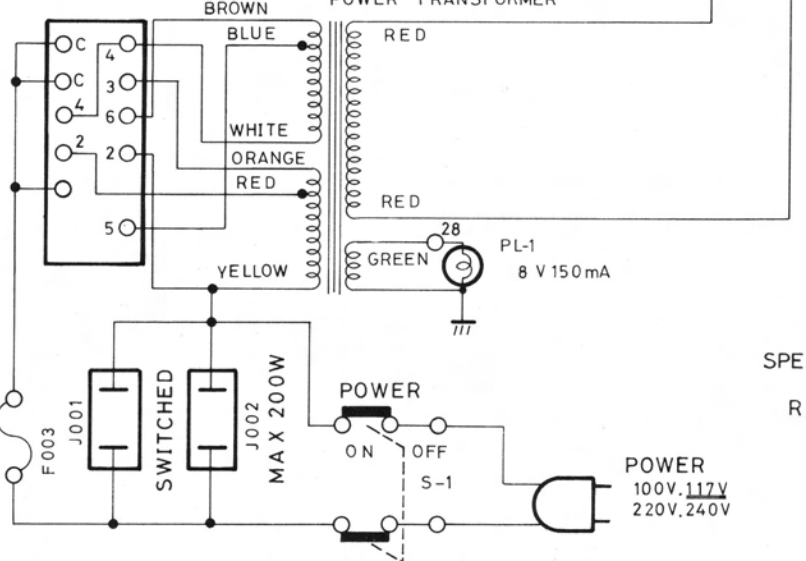
50V



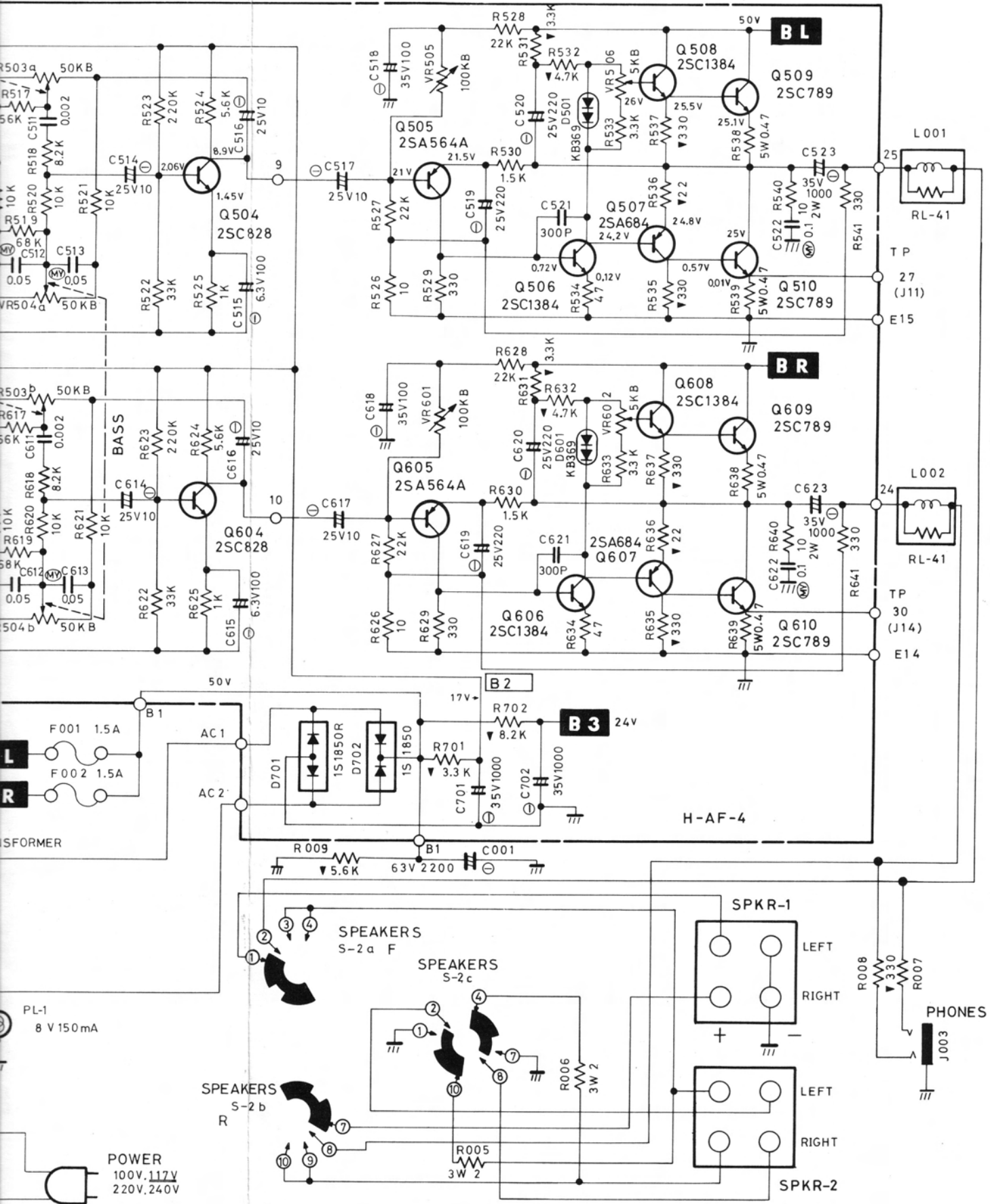
LEFT DC FUSE B L  
RIGHT DC FUSE B R

F001 1.5A  
F002 1.5A

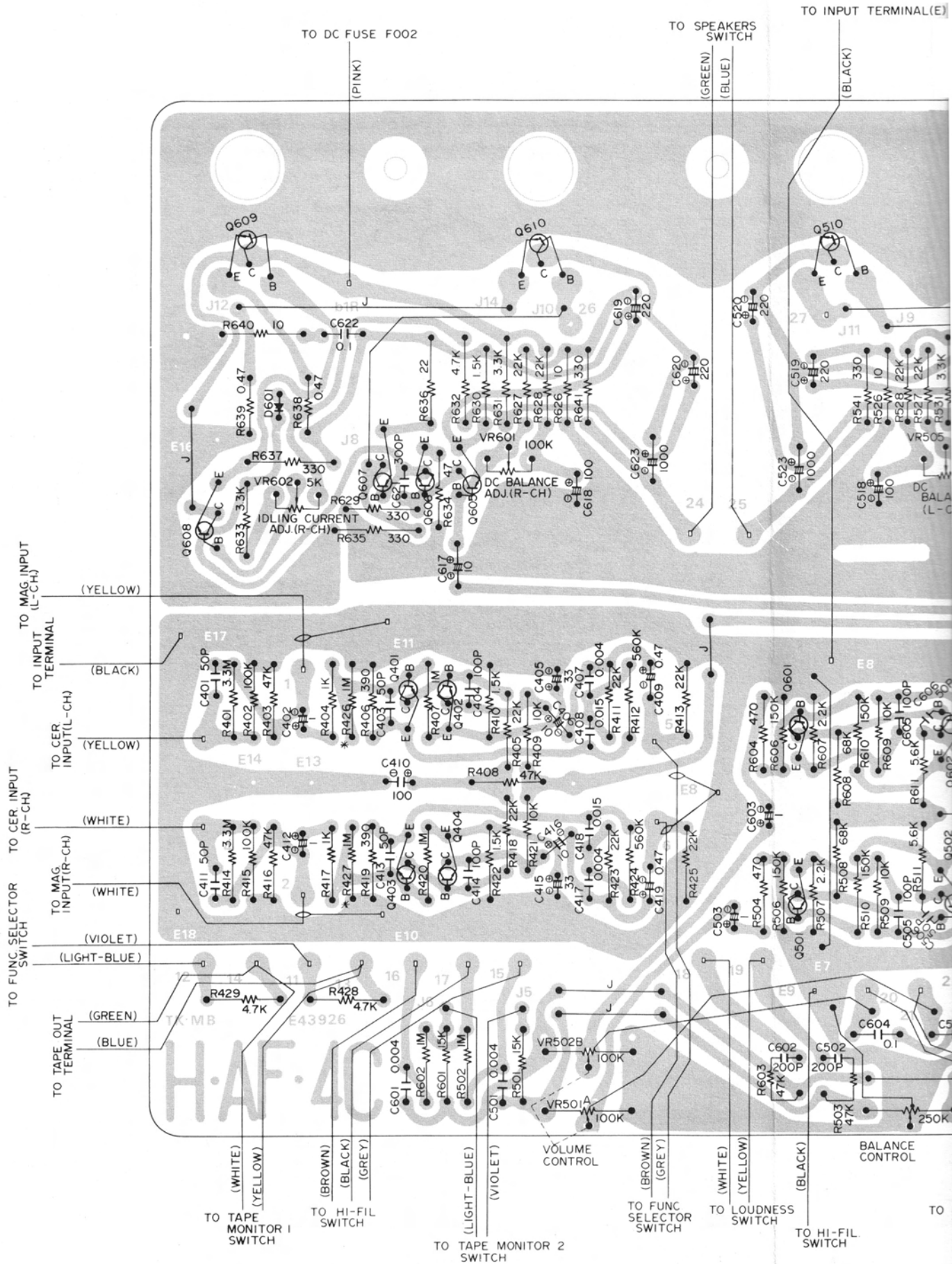
T001 T014C POWER TRANSFORMER



POWER 100V, 117V 220V, 240V



# PRE / MAIN AMPLIFIER CIRCUIT BOARD







# PARTS LIST

## PRE/MAIN AMPLIFIER CIRCUIT BAORD

Schematic Location	Part No.	Description
<b>RESISTORS</b>		
R401, 414	552033522	Carbon Film, 3.3M $\pm$ 5%, 1/4W
R402, 415	552010422	Carbon Film, 100K $\pm$ 5%, 1/4W
R403, 408, R416	552047322	Carbon Film, 47K $\pm$ 5%, 1/4W
R404, 417	552010222	Carbon Film, 1K $\pm$ 5%, 1/4W
R405, 411, R413, 418, R423, 425	552022322	Carbon Film, 22K $\pm$ 5%, 1/4W
R406, 419	552039122	Carbon Film, 390 $\pm$ 5%, 1/4W
R407, 420, R426*, 427*	552010522	Carbon Film, 1M $\pm$ 5%, 1/4W
R409, 421	552010322	Carbon Film, 10K $\pm$ 5%, 1/4W
R410, 422	552015222	Carbon Film, 1.5K $\pm$ 5%, 1/4W
R412, 424	552056422	Carbon Film, 560K $\pm$ 5%, 1/4W
R428, 429	552047222	Carbon Film, 4.7K $\pm$ 5%, 1/4W
R501, 601	552015322	Carbon Film, 15K $\pm$ 5%, 1/4W
R502, 602	552010522	Carbon Film, 1M $\pm$ 5%, 1/4W
R503, 603	552047322	Carbon Film, 47K $\pm$ 5%, 1/4W
R504, 604	552047122	Carbon Film, 470 $\pm$ 5%, 1/4W
R505, 605	552039222	Carbon Film, 3.9K $\pm$ 5%, 1/4W
R506, 510, R606, 610	552015422	Carbon Film, 150K $\pm$ 5%, 1/4W
R507, 607	552022222	Carbon Film, 2.2K $\pm$ 5%, 1/4W
R508, 519, R608, 619	552068322	Carbon Film, 68K $\pm$ 5%, 1/4W
R509, 516, R520, 521, R609, 619, R620, 621	552010322	Carbon Film, 10K $\pm$ 5%, 1/4W
R511, 524, R611, 624	552056222	Carbon Film, 5.6K $\pm$ 5%, 1/4W
R512, 530, R612, 630	552015222	Carbon Film, 1.5K $\pm$ 5%, 1/4W
R513, 514, R523, 613, R614, 623	552022422	Carbon Film, 220K $\pm$ 5%, 1/4W
R515, 615	552047222	Carbon Film, 4.7K $\pm$ 5%, 1/4W
R517, 617	552056322	Carbon Film, 56K $\pm$ 5%, 1/4W
R518, 618	552082222	Carbon Film, 8.2K $\pm$ 5%, 1/4W
R522, 622	552033322	Carbon Film, 33K $\pm$ 5%, 1/4W
R525, 625	552010222	Carbon Film, 1K $\pm$ 5%, 1/4W
R526, 626	552010022	Carbon Film, 10 $\pm$ 5%, 1/4W
R527, 528, R627, 628	552022322	Carbon Film, 22K $\pm$ 5%, 1/4W
R529, 541, R629, 641	552033122	Carbon Film, 330 $\pm$ 5%, 1/4W
R531, 631	551033233	Composition, 3.3K $\pm$ 10%, 1/2W
R532, 632	551047233	Composition, 4.7K $\pm$ 10%, 1/2W
R533, 633	552033222	Carbon Film, 3.3K $\pm$ 5%, 1/4W

Schematic Location	Part No.	Description
R534, 634	552047022	Carbon Film, 47 $\pm$ 5%, 1/4W
R535, 537, R635, 637	551033133	Composition, 330 $\pm$ 10%, 1/2W
R536, 636	551022033	Composition, 22 $\pm$ 10%, 1/2W
R538, 539, R639, 639	554147973	MPC, 0.47 $\pm$ 10%, 5W
R540, 640	554010053	Bathtub, 10 $\pm$ 10%, 2W
VR501	515121115	Variable, 250KW, Balance Control
VR502	525121113	Variable, 100KAT x2, Volume Control
VR503, 504	525101121	Variable, 50KB x2, Bass, Treble Control
VR505, 601	510502130	Potentiometer, 100K, DC Balance Adj.
VR506, 602	510502128	Potentiometer, 5K, Idling Current Adj.
R701	551033233	Composition, 3.3K $\pm$ 10%, 1/2W
R702	551082233	Composition, 8.2K $\pm$ 10%, 1/2W
<b>CAPACITORS</b>		
C401, 403, C411, 413	440501283	Ceramic, 50pF $\pm$ 10%, 250V
C402, 412	402100749	Electrolytic, 1mfd, 50V
C404, 414	440101183	Ceramic, 100pF $\pm$ 10%, 250V
C405, 415	402330609	Electrolytic, 33mfd, 6.3V
C406, 416	402100629	Electrolytic, 10mfd, 25V
C407, 417	450401033	Mylar Film, 0.004mfd $\pm$ 10%, 50V
C408, 418	450150933	Mylar Film, 0.015mfd $\pm$ 10%, 50V
C409, 419	402470949	Electrolytic, 0.47mfd, 50V
C410	402100519	Electrolytic, 100mfd, 16V
C501, 601	450401233	Mylar Film, 0.004mfd $\pm$ 10%, 50V
C502, 602	440201183	Ceramic, 200pF $\pm$ 10%, 250V
C503, 603	402100749	Electrolytic, 1mfd, 50V
C504, 522, C604, 622	450100833	Mylar Film, 0.1mfd $\pm$ 10%, 50V
C505, 605	440101183	Ceramic, 100pF $\pm$ 10%, 250V
C506, 606	440501283	Ceramic, 50pF $\pm$ 10%, 250V
C507, 515, C607, 615	402100509	Electrolytic, 100mfd, 16V
C508, 608	402330629	Electrolytic, 33mfd, 25V
C509, 510, C514, 516, C517, 609, C610, 614, C616, 617	402100629	Electrolytic, 10mfd, 25V
C511, 611	450201033	Mylar Film, 0.002mfd $\pm$ 10%, 50V
C512, 513, C612, 613	450500933	Mylar Film, 0.05mfd $\pm$ 10%, 50V
C518, 618	402100539	Electrolytic, 100mfd, 35V
C519, 520, C619, 620	402220529	Electrolytic, 220mfd, 25V
C521, 621	440301183	Ceramic, 300pF $\pm$ 10%, 250V
C523, 623	402100439	Electrolytic, 1000mfd, 35V
C701, 702	402100439	Electrolytic, 100mfd, 35V

Schematic		
Location	Part No.	Description
<b>TRANSISTORS AND DIODES</b>		
Q401, 402, } Q403, 404 }	301201114	2SC644, Equalizer Amp. (301201148 2SC693)
Q501, 503, } Q601, 603 }	301201114	2SC644, Flat Amp. (301201148 2SC693)
Q502, 504, } Q602, 604 }	301201115	2SC828, Flat Amp.
Q505, 605	301001117	2SA564A, Flat Amp.
Q506, 508, } Q606, 608 }	301201132	2SC1384, Predriver, Driver
Q507, 607	301001123	2SA684, Driver

\* The resistor R426 (R427) can only be used when the transistor 2SC644 is applied with the circuit at position Q401 (Q403).

Schematic		
Location	Part No.	Description
Q509, 510, } Q609, 610 }	301201146	2SC789 (0), Power Amp.
D501, 601	300212006	KB-369, Varistor
D701	300919006	1S1850R, Rectifier
D702	300919005	1S1850, Rectifier
	127012129	Heat Sink, Power Transistors Mtg.
	992001111	Grommet, Power Transistor Mtg.
	761911145	Supporting Washer, Power Transistor Mtg.
	751901403	Washer, 3mm dia, Power Transistor Mtg.
	756001030	Nut, 3mm, Power Transistor Mtg.
	705213012	Screw, + 3x12mm, Power Transistor Mtg.
	715203006	Screw w/Washer, + 3x6mm, Heat Sink Mtg.
	770101225	Pin, Terminal
	140600660	Printed Circuit Board "H-AF-4"
	141610245	Pre/Main Amp. Circuit Assembly

## CABINET AND CHASSIS PARTS

Schematic		
Location	Part No.	Description
	131011243	Cabinet
	111911277	Front Panel
	116310067	Knob, Volume Control
	116310055	Knob, Func, Bass, Treble and Balance
	116210008	Button, Loudness, Tape, etc.
	116210012	Button, Power Switch
	601011247	Switch, Function
	601011226	Switch, Speakers
	614010106	Switch, Power
	614051007	Switch, Push 7-key (Loudness, etc.)
	626110023	Headphones Jack
	624100208	Pin Jack, 8P, RCA type
	625001112	Din Jack, 5P,
	642400204	Speakers Terminal, 4P

Schematic		
Location	Part No.	Description
	648211126	AC Outlet
	648211127	Bracket, Fuse
L001, 002	220401120	Coil, Anti-parasitic
T001	205001343	Transformer, Power Supply
R001, 002	552033422	Resistor, Carbon Film, 330K ±5%, 1/4W
R003, 004	552022422	Resistor, Carbon Film, 220K ±5%, 1/4W
R005, 006	554020863	Resistor, Bathtub, 2 ±10%, 2W
R007, 008	551033133	Resistor, Composition, 330 ±10%, 1/2W
R009	551056233	Resistor, Composition, 5.6K ±10%, 1/2W
C001	410220459	Capacitor, Electrolytic, 2200mfd, 63V
PL1	351080015	Lamp, 8V, 0.15A, Pilot
F001, 002	341220015	Fuse, 1.5A-3AG, DC circuit protector
F003	341220020	Fuse, 2A-3AG, (AC 100 – 120V only)
	341220010	Fuse, 1A-3AG, (AC 220V – 240V only)