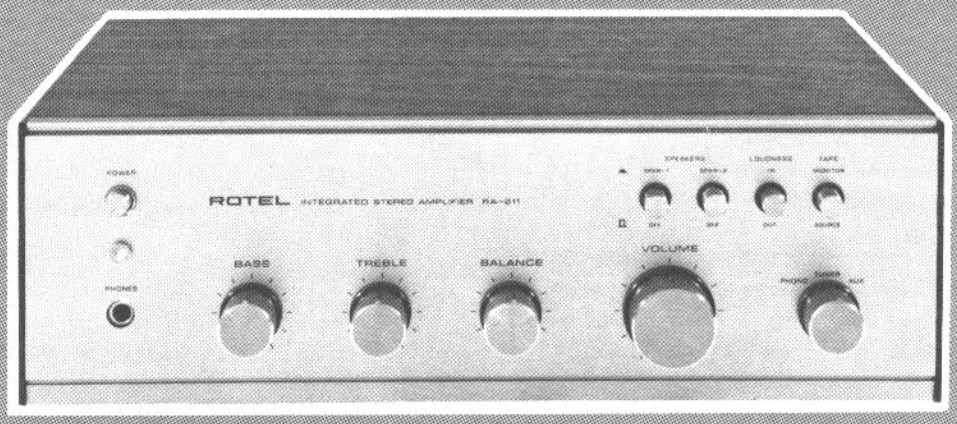
ROTEL®

RA-211

STEREO PRE-MAIN AMPLIFIER



technical manual

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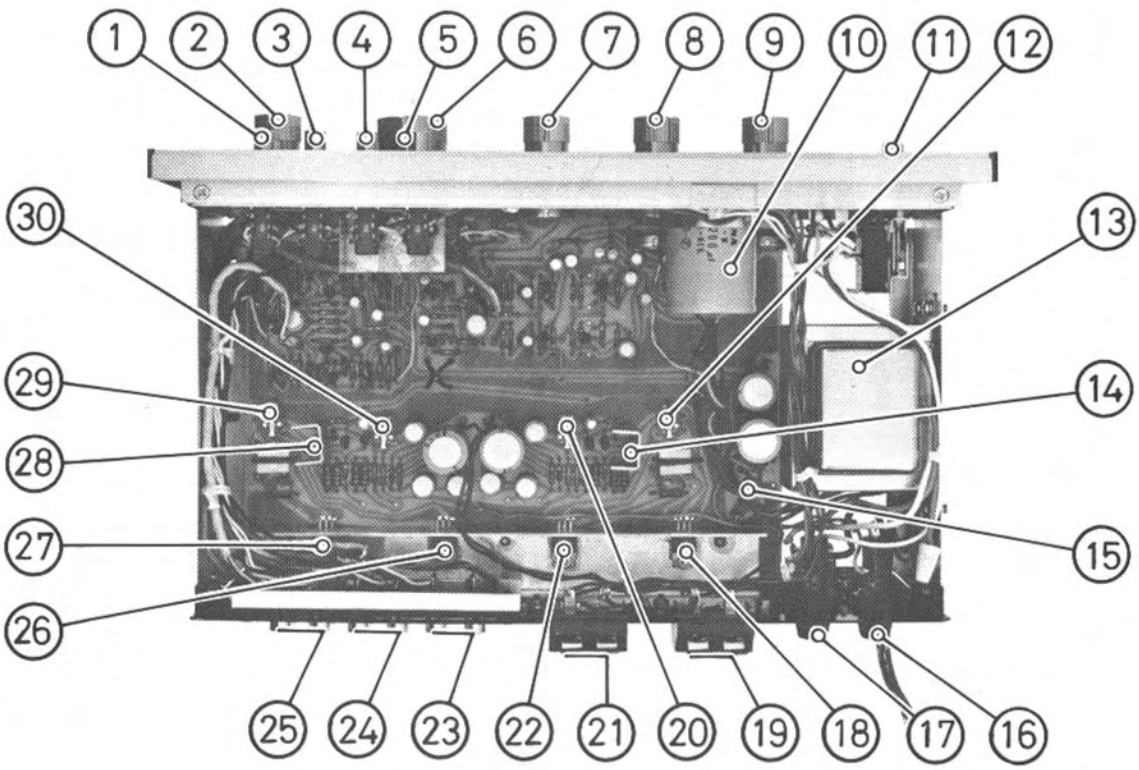
ROTEL®

CHASSIS LAYOUT

1. Tape Monitor swich
2. Selector switch
3. Loudness switch
4. SPKR-2 switch
5. SPKR-1 switch
6. Volume Control
7. Balance Control
8. Treble Control
9. Bass Control
10. C001, Ripple Filter
11. Power switch
12. VR506, Idling Current Adj.
13. T001, Power Transformer
14. Q506, Driver Transistor (L-ch.)
15. D701, Rectifier
16. F002, DC Fuse
17. F001, AC Fuse
18. Q508, Power Transistor (L-ch.)
19. SPKR-2 Terminal
20. VR505, DC Balance Adj. (L-ch.)
21. SPKR-1 Terminal
22. Q507, Power Transistor (L-ch.)
23. Tape Monitor Terminals
24. Tuner and AUX terminals
25. Phono Terminals
26. Q607, Power Transistor (R-ch.)
27. Q608, Power Transistor (R-ch.)
28. Q606, Driver Transistor (R-ch.)
29. VR508, Idling Current Adj. (R-ch.)
30. VR507, 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

A. DC Balance Adjustment
   1. Set Tape Monitor seitch to SOURCE and Selector switch to AUX position.
   2. Connect 8-ohm 50W resistor across Left Front Speaker terminals. Then in parallel with load resistor, connect an AC VTVM and the vertical input leads of an oscilloscope.
   3. Connect an audio signal generator to Left AUX input and apply 1,000Hz (sine wave) signals.
   4. Connect AC power cord and rotate Volume Control clockwise — full volume. Increase generator output until sine wave on scope just starts clipping. Adjust DC Balance Control VR505 for equal clipping on the positive and negative half cycle of the signal — see Figure 1.
   5. Repeat the steps 2 thru 4 as above for Right channel (Use VR507).

B. Idling Current Adjustment
   1. Set Volume Control to minimum position — no signal input.
   2. Connect the plus lead of a DC milli-volt meter to Pin No. 22 and the minus lead to Pin No. 24 — see Figure 2.
   3. Rotate Idling Current Control VR506 to obtain a 7.5mV reading on DC milli-volt meter.
   4. Repeat the steps 2 and 3 as above for Right channel (use Pin No. 21, 23 and VR508).

NOTE: In idling current adjustment of RA-211 "Series-2" connect a DC milli-Volt meter to the following pin numbers.
   a. Left-channel Pin 17 and pin E3
   b. Right-channel Pin 18 and pin E4

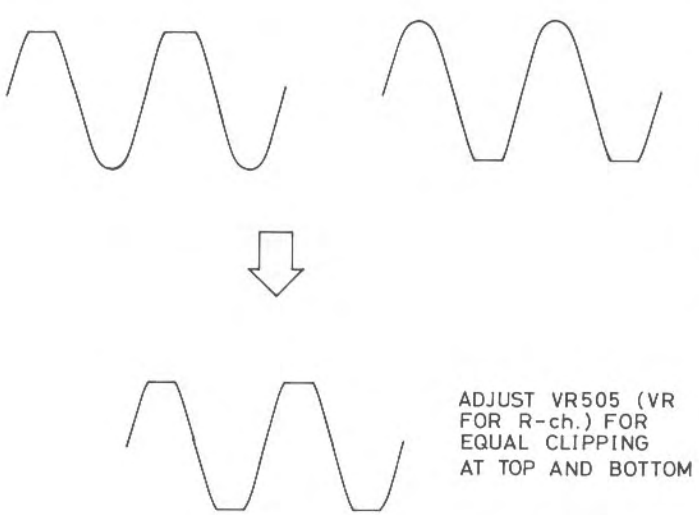


Figure 1

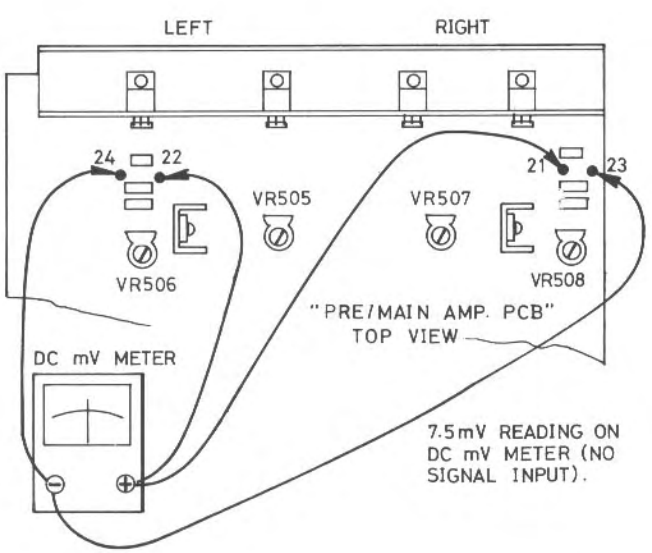


Figure 2

TROUBLE SHOOTING

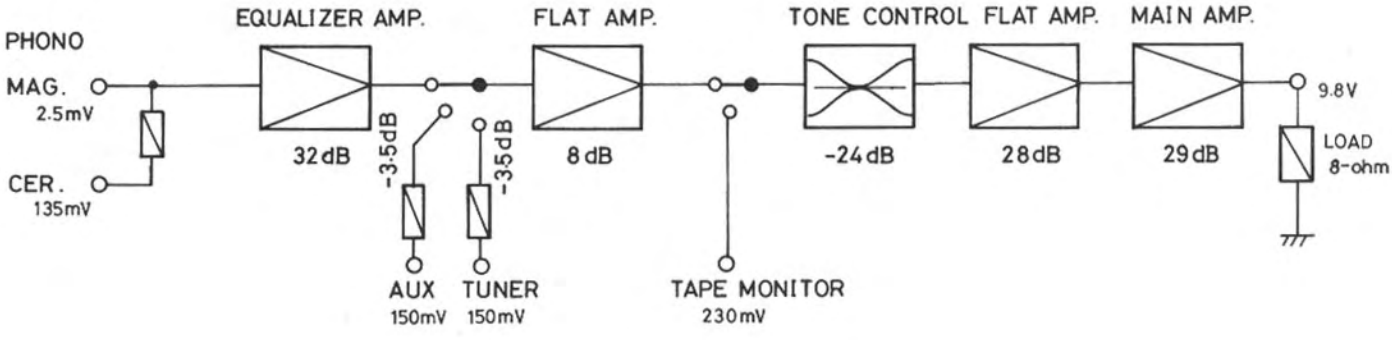
I. Complete inoperative.
   A. If the pilot lamp does not light, check to see if the AC fuse is OK.
      1. And if the AC fuse is OK,
         a. Power switch connection may be faulty, or
         b. Power Transformer may be faulty.
      2. And if the AC fuse may be blown,
         a. Rectifier, D701 may be shorted out. or
         b. Power Transformer may be shorted out, or
         c. Capacitor, C001 may be shorted out.
   B. If the pilot lamp does light, check to see if the DC fuse is OK.
      1. Anc if the DC fuse is OK,
         a. Transistor, Q501, 502 or 503 (Q601, 602 or 603 for R-ch.) may be faulty, or
         b. Capacitor, C501, 502, 512 or 513 (C601, 602, 612 or 613 for R-ch.) may be faulty.
      2. And if the DC fuse is blown,
         a. Power Transistor, Q507 or 508 (Q607 or 608 for R-ch.) may be faulty, or
         b. Driver Transistor, Q505 or 506 (Q605 or 606 for R-ch.) may be faulty, or
         c. Speaker circuit (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 or 406 (C412 or 416 for R-ch.) may be faulty.

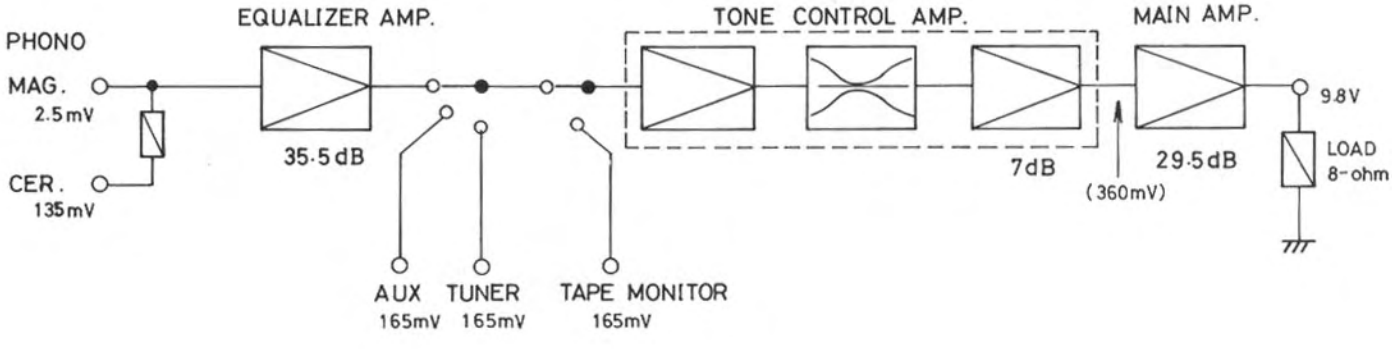
NOTE: Follow the above procedure for the trouble shooting of RA-211 "Series-2" and in doing so, make sure to refer the 'symbol numbers to the given schematic and board diagrams, for the symbol numbers provided above do not correspond to ones in the schematic and board diagrams.

GAIN DIAGRAM

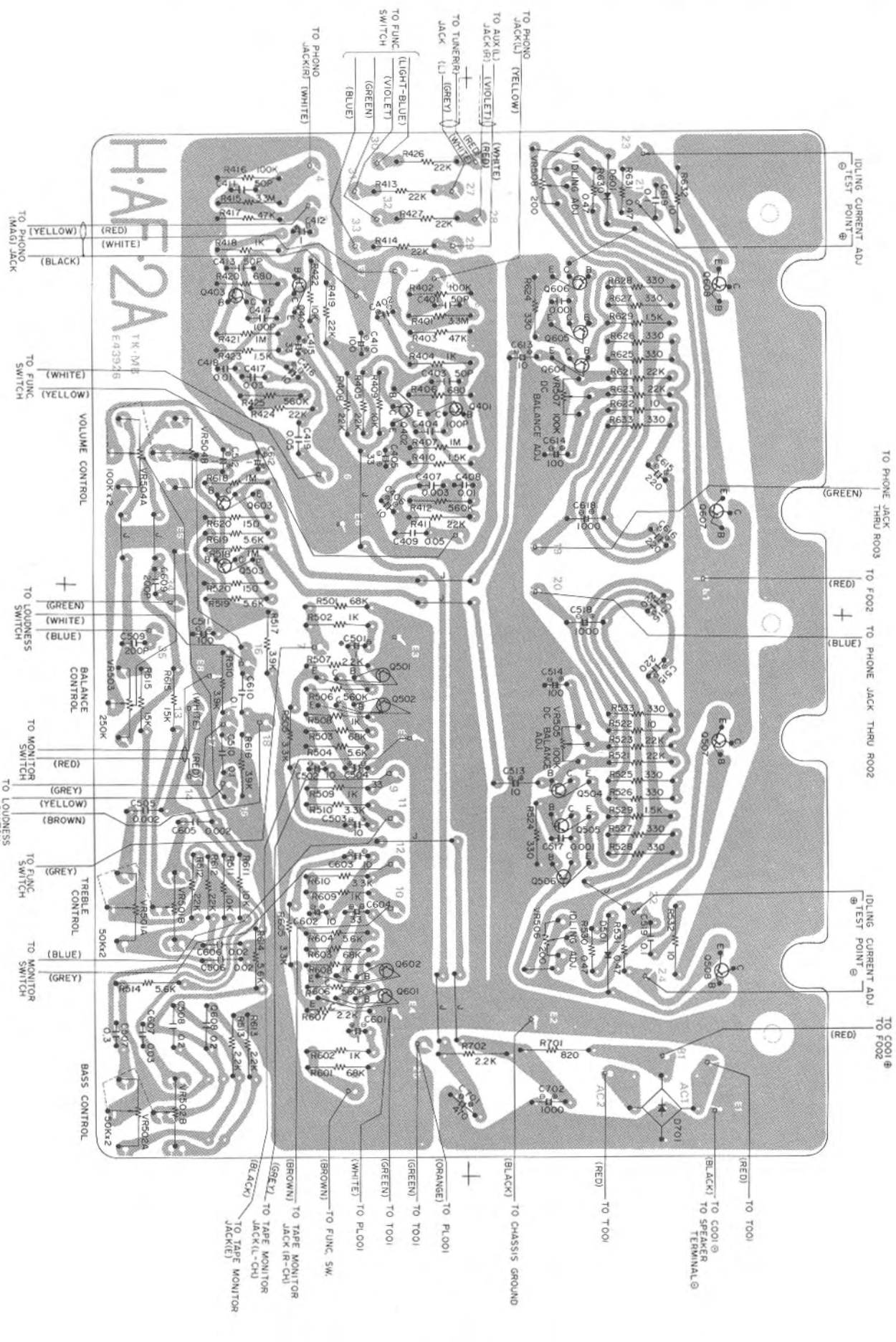
Series—1



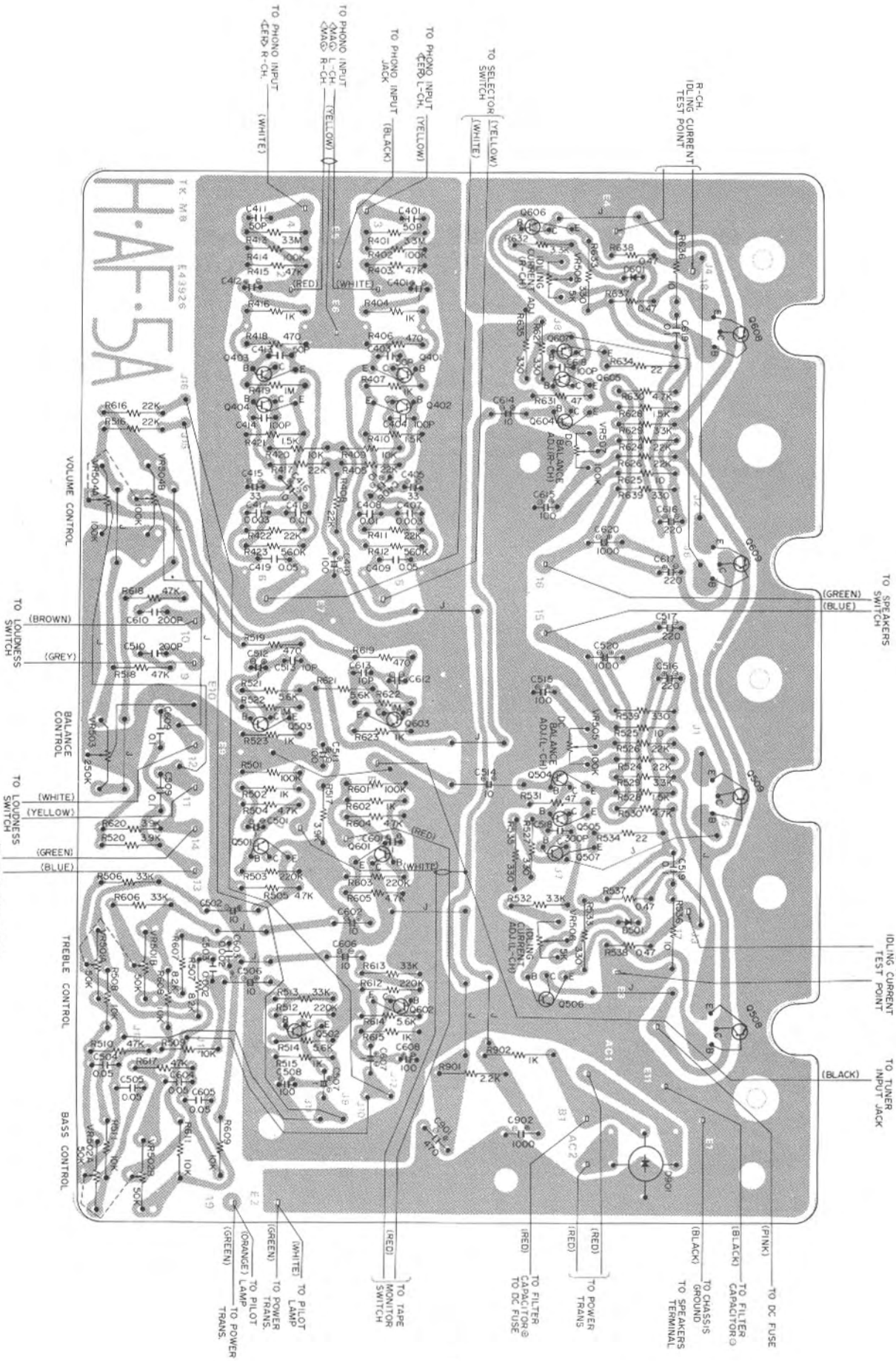
Series—2



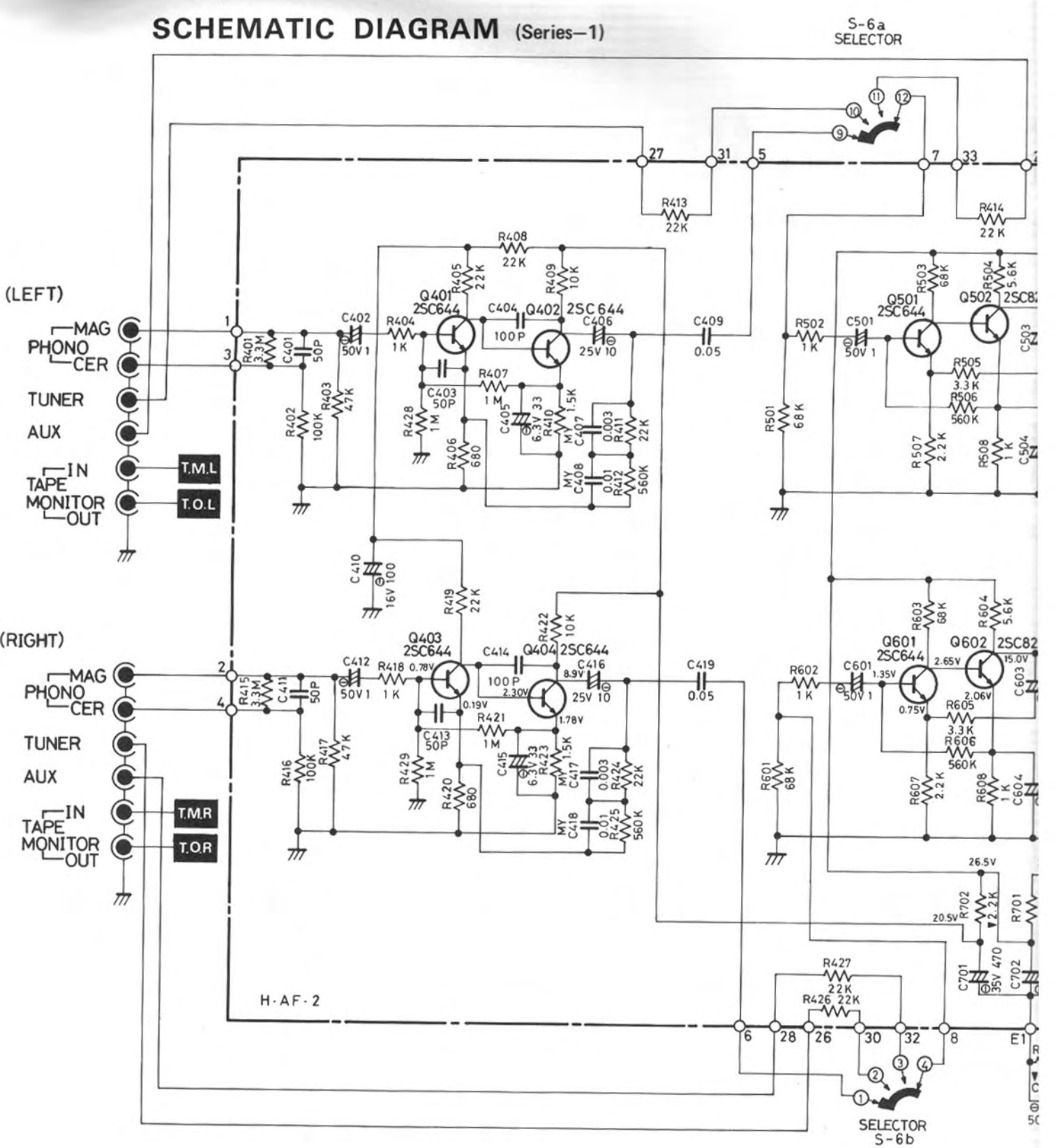
PRE/MAIN AMPLIFIER CIRCUIT BOARD (Series–1)



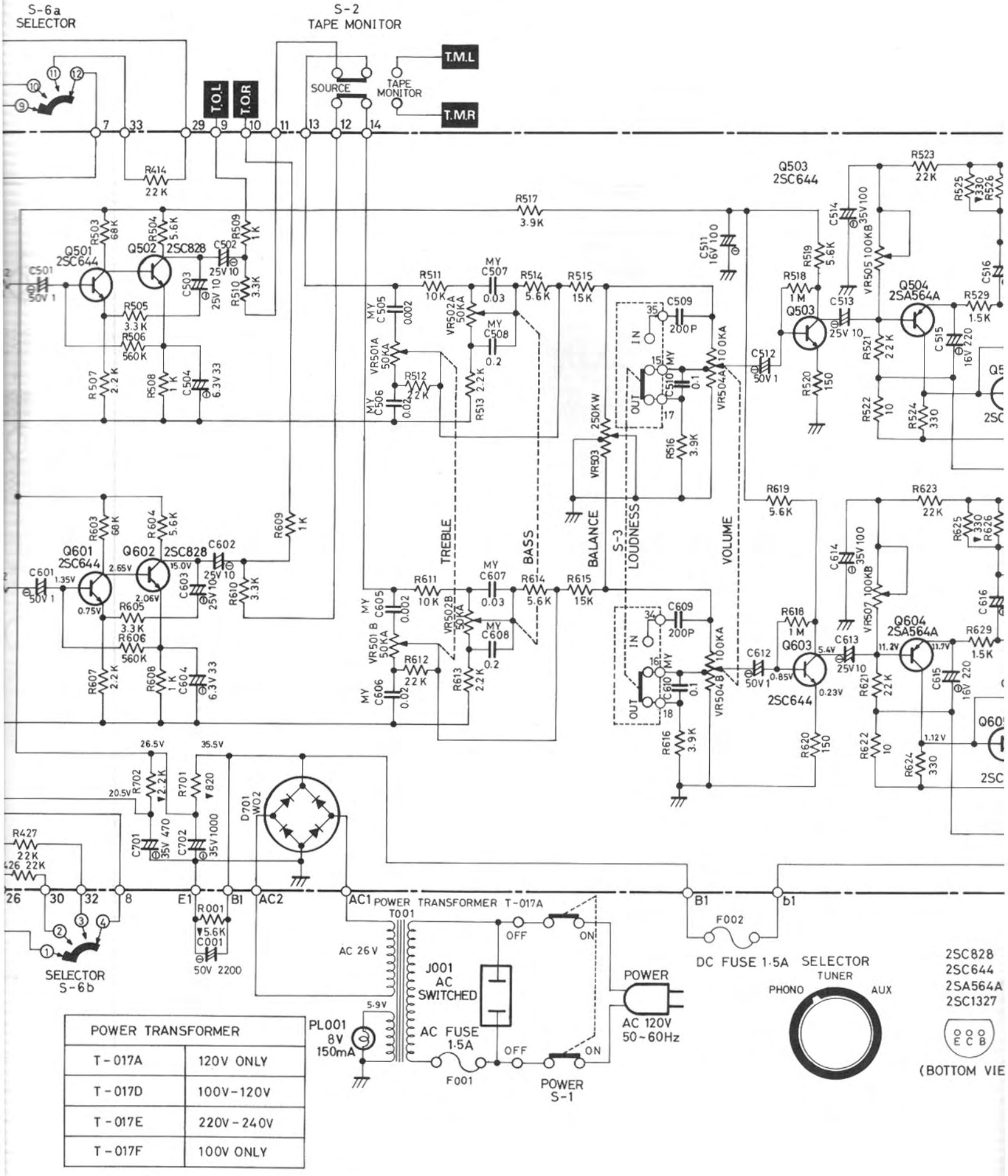
PRE/MAIN AMPLIFIER CIRCUIT BOARD (Series–2)



SCHEMATIC DIAGRAM (Series–1)

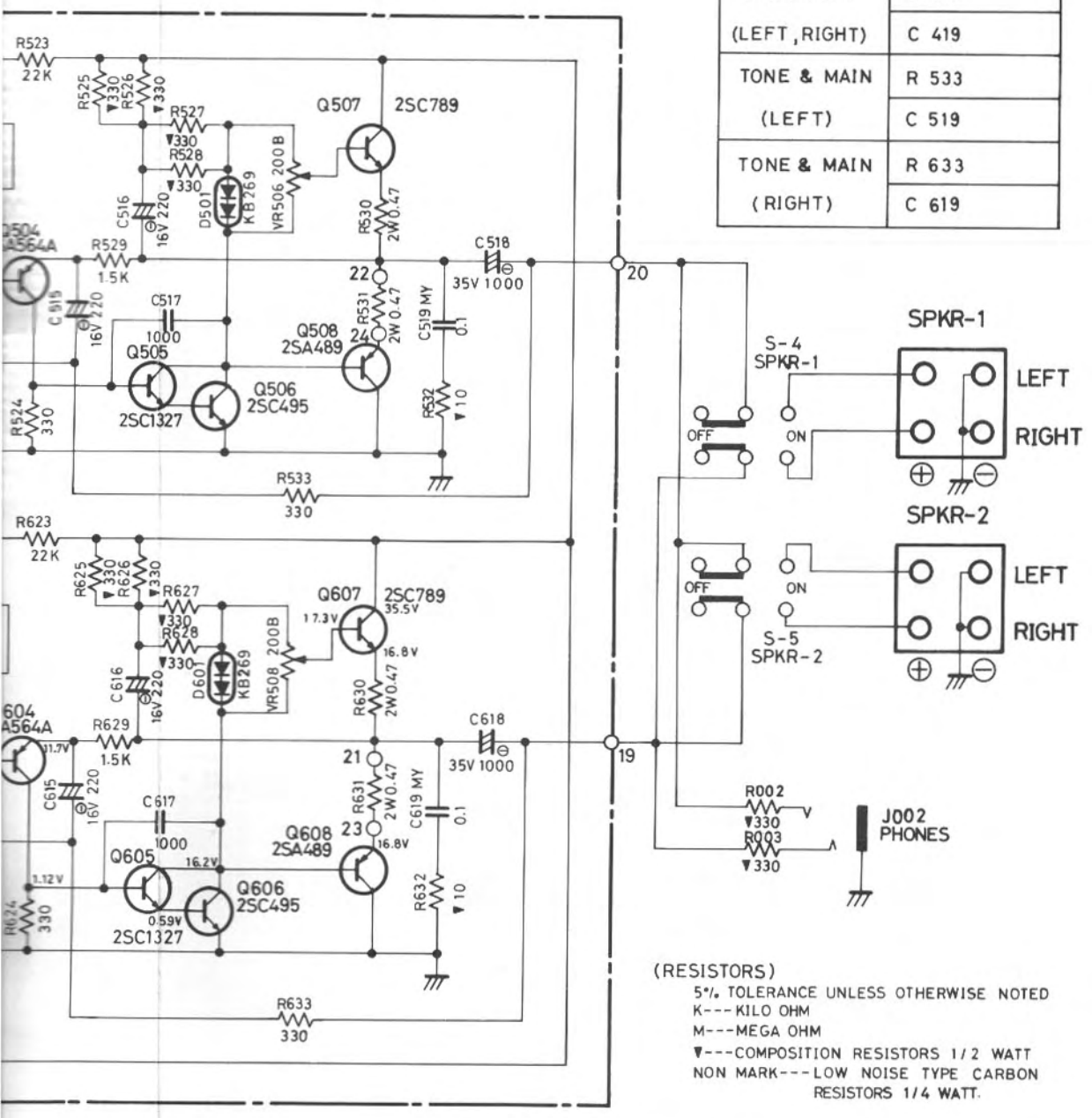


POWER TRANSFO	
T-017A	1
T-017D	1
T-017E	2
T-017F	1



POWER TRANSFORMER	
T-017A	120V ONLY
T-017D	100V-120V
T-017E	220V-240V
T-017F	100V ONLY

ITEM	SCHEMATIC LOCATION (LAST)
CHASSIS	R 704
	C 701
EQUALIZER	R 427
(LEFT, RIGHT)	C 419
TONE & MAIN	R 533
(LEFT)	C 519
TONE & MAIN	R 633
(RIGHT)	C 619



(RESISTORS)

5% TOLERANCE UNLESS OTHERWISE NOTED
K---KILO OHM
M---MEGA OHM
▼---COMPOSITION RESISTORS 1/2 WATT
NON MARK---LOW NOISE TYPE CARBON RESISTORS 1/4 WATT.

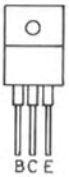
(CAPACITORS)

MY---MYLAR FILM CAPACITORS
⫫---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 120 VOLT)
VOLTAGE READING MAY VARY ±20%.

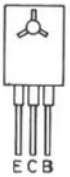
2SC828
2SC644
2SA564A
2SC1327

(BOTTOM VIEW)

2SC789
2SA489

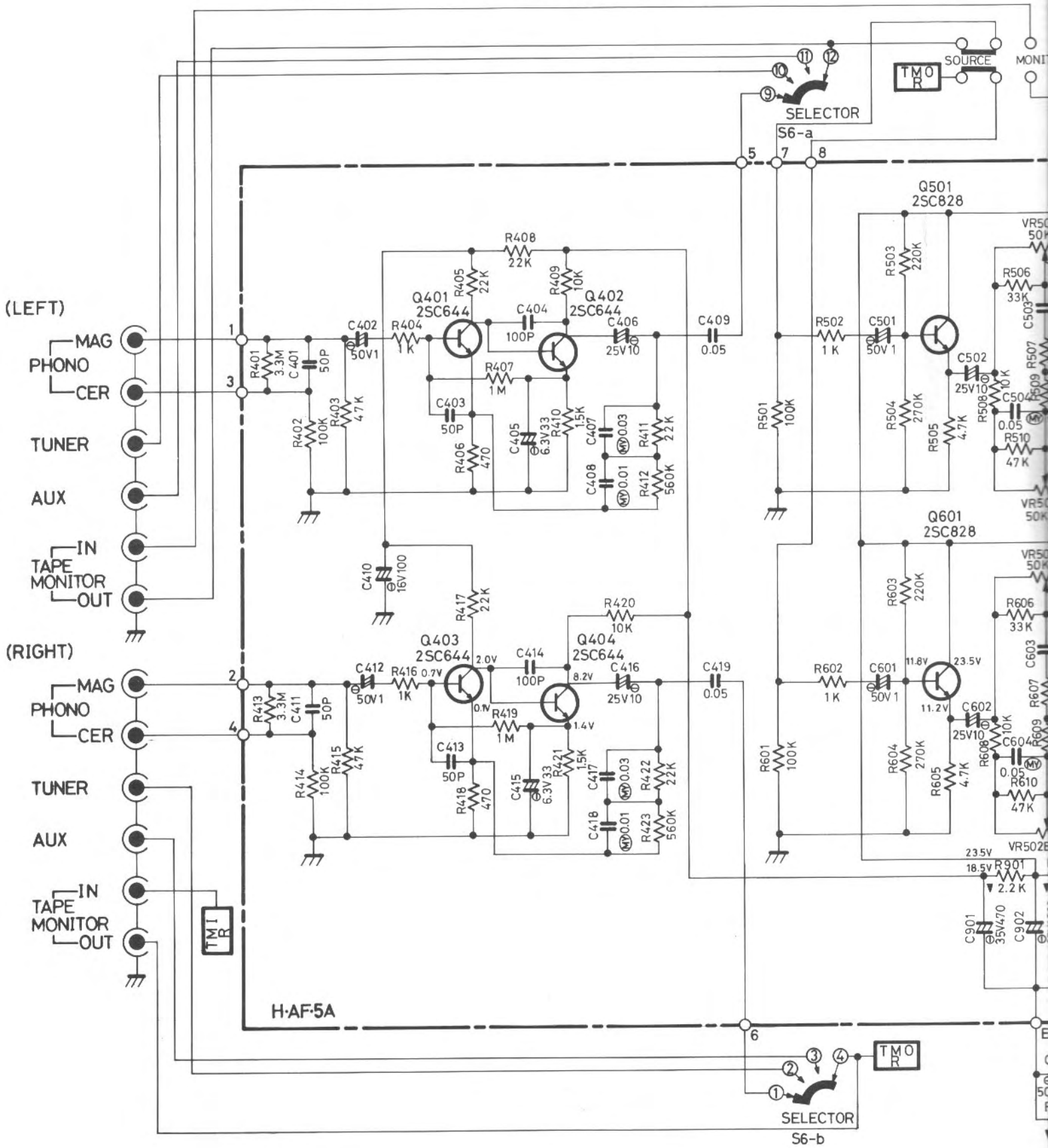


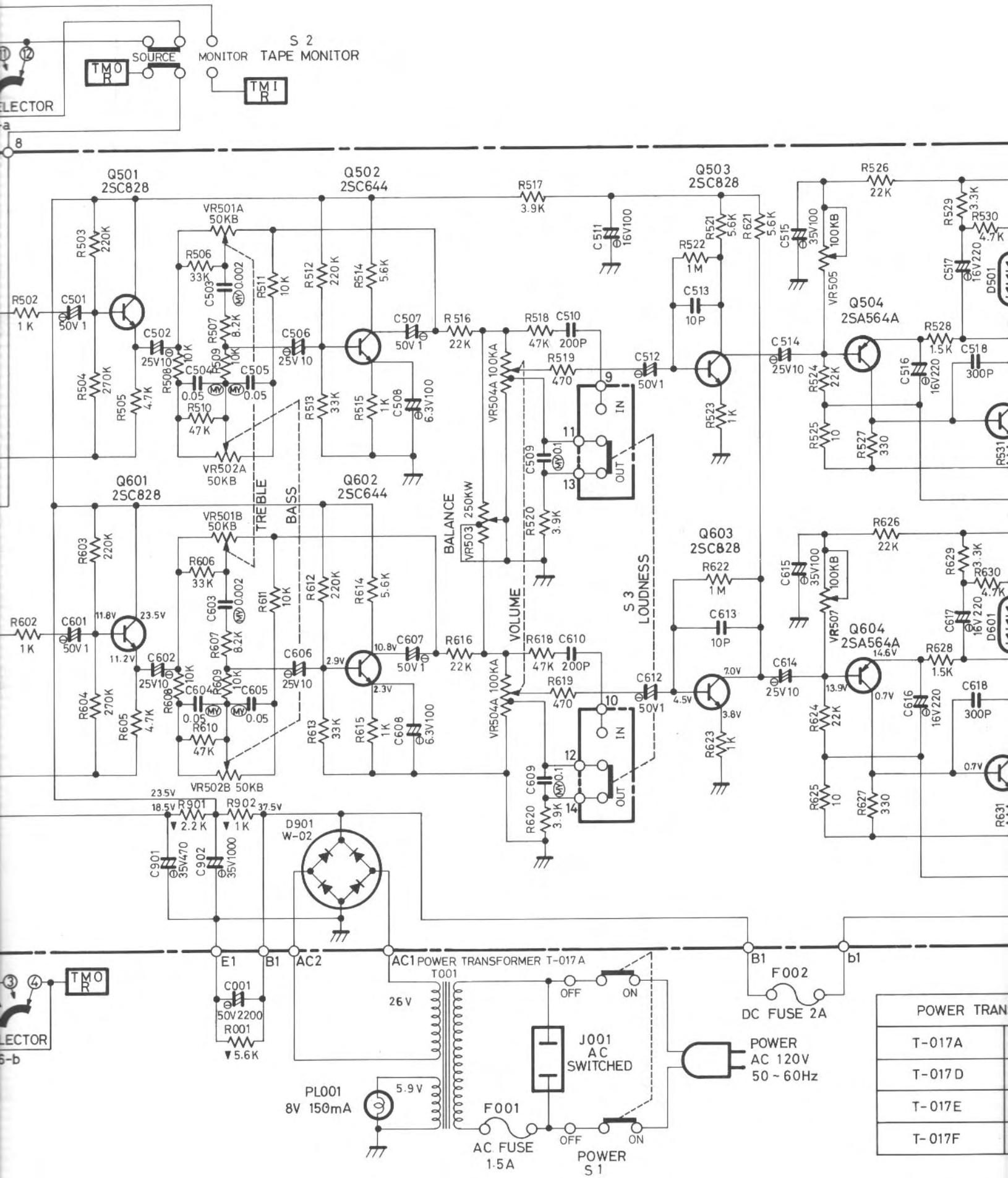
2SC495

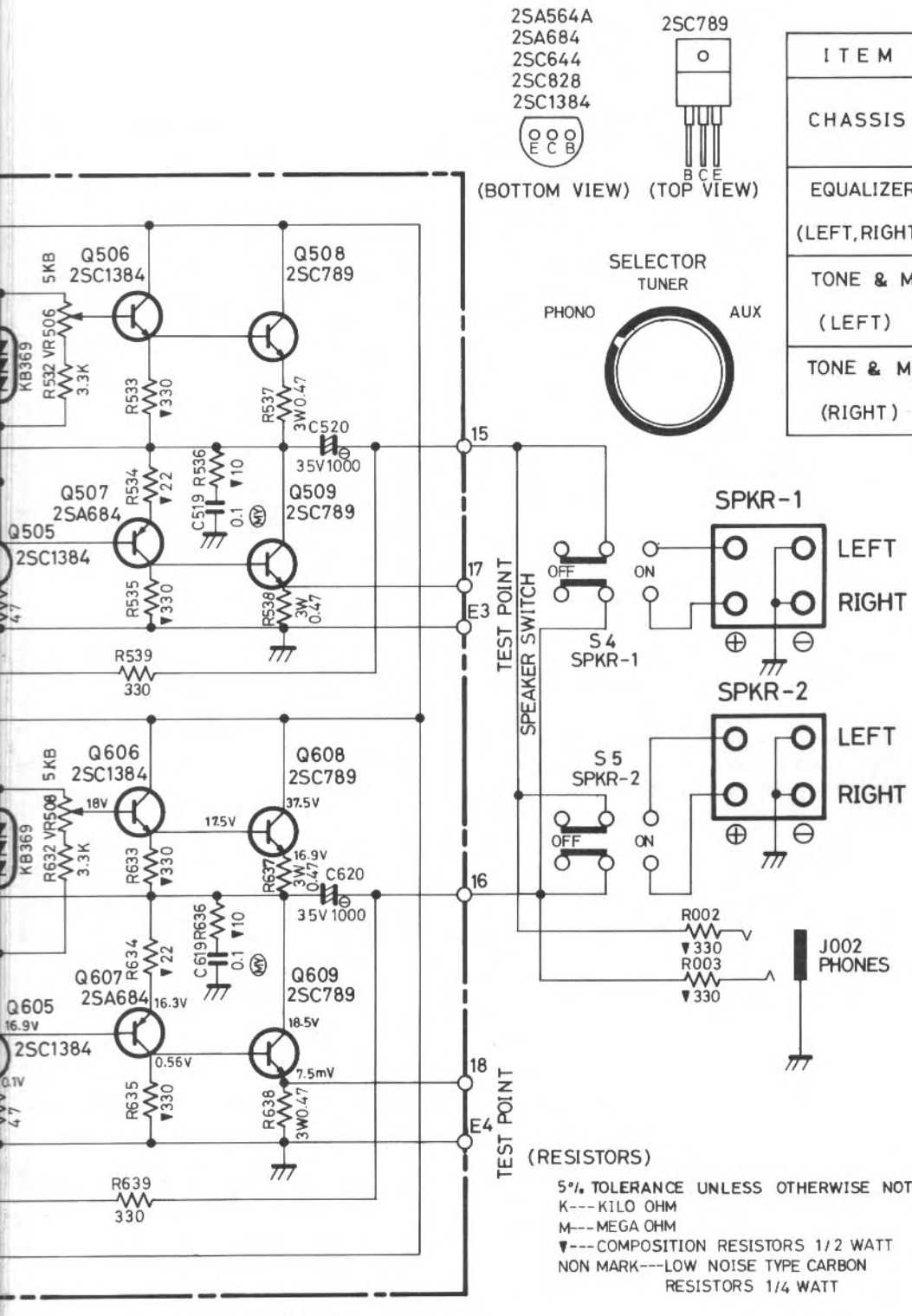


(TOP VIEW)

SCHEMATIC DIAGRAM (Series–2)




S 2
TAPE MONITOR
SOURCE
MONITOR
TMO R
TMI R
ELECTOR
Q501 2SC828
Q502 2SC644
Q503 2SC828
Q504 2SA564A
Q601 2SC828
Q602 2SC644
Q603 2SC828
Q604 2SA564A
VR501A 50KB
VR502A 50KB
VR501B 50KB
VR502B 50KB
VR503 250KW
VR504A 100KA
VR504B 100KA
VR505 100KB
VR506 100KB
VR507 100KB
TREBLE
BASS
BALANCE
VOLUME
S 3
LOUDNESS
R501 220K
R502 1K
R503 220K
R504 270K
R505 4.7K
R506 33K
R507 8.2K
R508 10K
R509 10K
R510 47K
R511 10K
R512 220K
R513 33K
R514 5.6K
R515 1K
R516 22K
R517 3.9K
R518 47K
R519 470
R520 3.9K
R521 5.6K
R522 1M
R523 1K
R524 22K
R525 10
R526 22K
R527 330
R528 1.5K
R529 3.3K
R530 4.7K
R601 220K
R602 1K
R603 220K
R604 270K
R605 4.7K
R606 33K
R607 8.2K
R608 10K
R609 10K
R610 47K
R611 10K
R612 220K
R613 33K
R614 5.6K
R615 1K
R616 22K
R618 47K
R619 470
R620 3.9K
R621 5.6K
R622 1M
R623 1K
R624 22K
R625 10
R626 22K
R627 330
R628 1.5K
R629 3.3K
R630 4.7K
C501 50V1
C502 25V10
C503 0.002
C504 0.05
C505 0.05
C506 25V10
C507 50V1
C508 6.3V100
C509 0.1
C510 200P
C511 16V100
C512 50V1
C513 10P
C514 25V10
C515 35V100
C516 16V220
C517 16V220
C518 300P
C601 50V1
C602 25V10
C603 0.002
C604 0.05
C605 0.05
C606 25V10
C607 50V1
C608 6.3V100
C609 0.1
C610 200P
C612 50V1
C613 10P
C614 25V10
C615 35V100
C616 16V220
C617 16V220
C618 300P
C901 35V470
C902 35V1000
C001 50V2200
R001 5.6K
R901 2.2K
R902 1K
D901 W-02
D501
D601
R531
R631
11.8V
23.5V
11.2V
10.8V
2.9V
2.3V
14.6V
13.9V
7.0V
4.5V
3.8V
0.7V
23.5V
18.5V
37.5V
E1
B1
AC2
AC1
POWER TRANSFORMER T-017A
T001
26V
PL001
8V 150mA
5.9V
F001
AC FUSE
1.5A
J001
AC
SWITCHED
OFF
ON
POWER
S1
POWER
AC 120V
50 ~ 60Hz
F002
DC FUSE 2A
B1
b1
POWER TRAN
T-017A
T-017D
T-017E
T-017F



ITEM	SCHEMATIC LOCATION (LAST)
CHASSIS	R 002
	C 001
EQUALIZER (LEFT, RIGHT)	R 423
	C 419
TONE & MAIN (LEFT)	R 539
	C 520
TONE & MAIN (RIGHT)	R 639
	C 620

(RESISTORS)

5% TOLERANCE UNLESS OTHERWISE NOTED.
K---KILO OHM
M---MEGA OHM
▼---COMPOSITION RESISTORS 1/2 WATT
NON MARK---LOW NOISE TYPE CARBON RESISTORS 1/4 WATT

(CAPACITORS)

(MY)---MYLAR FILM CAPACITORS
⫫---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 120 VOLT).
VOLTAGE READING MAY VARY ± 20%.

FORMER
120V ONLY
100V-120V
220V-240V
100V ONLY

PARTS LIST

PRE/MAIN AMPLIFIER CIRCUIT BAORD

Schematic Location	Part No.	Description
	RESISTORS	
R401, 415	552033522	Carbon Film, 3.3M ±5%, 1/4W
R402, 416	552010422	Carbon Film, 100K ±5%, 1/4W
R403, 417	552047322	Carbon Film, 47K ±5%, 1/4W
R404, 418, R502, 508, R509, 602, R608, 609	552010222	Carbon Film, 1K ±5%, 1/4W
R405, 408, R411, 413, R414, 419, R424, 426, R427, 512, R521, 523, R612, 621, R623	552022322	Carbon Film, 22K ±5%, 1/4W
R406, 420	552068122	Carbon Film, 680 ±5%, 1/4W
R407, 421, R518, 618	552010522	Carbon Film, 1M ±5%, 1/4W
R409, 422, R511, 611	552010322	Carbon Film, 10K ±5%, 1/4W
R410, 423, R529, 629	552015222	Carbon Film, 1.5K ±5%, 1/4W
R412, 425, R506, 606	552056422	Carbon Film, 560K ±5%, 1/4W
R501, 503, R601, 603	552068322	Carbon Film, 68K ±5%, 1/4W
R504, 514, R519, 604, R614, 619	552056222	Carbon Film, 5.6K ±5%, 1/4W
R505, 510, R605, 610	552033222	Carbon Film, 3.3K ±5%, 1/4W
R507, 513, R607, 613	552022222	Carbon Film, 2.2K ±5%, 1/4W
R515, 615	552015322	Carbon Film, 15K ±5%, 1/4W
R516, 517, R616	552039222	Carbon Film, 3.9K ±5%, 1/4W
R520, 620	552015122	Carbon Film, 150 ±5%, 1/4W
R522, 622	552010022	Carbon Film, 10 ±5%, 1/4W
R524, 533, R624, 633	552033122	Carbon Film, 330 ±5%, 1/4W
R525, 526, R527, 528, R625, 626, R627, 628	551033133	Composition, 330 ±10%, 1/2W
R530, 531, R630, 631,	554147953	MPC, 0.47 ±10%, 2W
R532, 632	551010033	Composition, 10 ±10%, 1/2W
R701	551082133	Composition, 820 ±10%, 1/2W
R702	551022233	Composition, 2.2K ±10%, 1/2W
VR501, 502	525101119	Variable, 50KA x2, Bass & Treble Cont.
VR503	515121115	Variable, 250KW, Balance Cont.
VR504	525121113	Variable, 100KA x2, Volume Cont.
VR505, 507	510502130	Potentiometer, 100KB, DC Balance Adj.
VR506, 508	510502129	Potentiometer, 200 B, Bias Adj.

Schematic Location	Part No.	Description
	CAPACITORS	
C401, 403, C411, 413	440501283	Ceramic, 50pF ±10%, 250V
C402, 412, C501, 512, C601, 612	402100749	Electrolytic, 1mfd, 50V
C404, 414	440101183	Ceramic, 100pF ±10%, 250V
C405, 415, C504, 604	402331619	Electrolytic, 33mfd, 6.3V
C406, 416, C502, 503, C513 602, C603, 613	402100629	Electrolytic, 10mfd, 25V
C407, 417	450301033	Mylar Film, 0.003mfd ±10%, 50V
C408, 418	450100933	Mylar Film, 0.01mfd ±10%, 50V
C409, 419	440500935	Ceramic, 0.05mfd, 50V
C410, 511	402100519	Electrolytic, 100mfd, 16V
C505, 605,	450201033	Mylar Film, 0.002mfd ±10%, 50V
C506, 606	450200933	Mylar Film, 0.02mfd ±10%, 50V
C507, 607	450300933	Mylar Film, 0.03mfd ±10%, 50V
C508, 608	450200833	Mylar Film, 0.2mfd ±10%, 50V
C509, 609	440201183	Ceramic, 200pF ±10%, 250V
C510, 519, C610, 619	450100833	Mylar Film, 0.1mfd ±10%, 50V
C514, 614	402100539	Electrolytic, 100mfd, 35V
C515, 516, C615, 616	402220519	Electrolytic, 220mfd, 16V
C517, 617	440101085	Ceramic, 0.001mfd, 250V
C518, 618, C702	402100439	Electrolytic, 1000mfd, 35V
C701	40240539	Electrolytic, 470mfd, 35V
	TRANSISTORS AND DIODES	
Q401, 402, Q403, 404, Q501, 503, Q601, 603	301201114	2SC644, Phono Amp., Pre 1st & 3rd Amp.
Q502, 602	301201115	2SC828, Pre 2nd Amp.
Q504, 604	301001117	2SA564A, Predriver
Q505, 605	301201143	2SC1327, Driver
Q506, 606	301201129	2SC495 (Y), Driver
Q507, 607	301201112	2SC789 (Y), Power Amp.
Q508, 608	301001127	2SA489 (Y), Power Amp.
D501, 601	300212004	KB-269, Varistor
D701	300919011	W-02, Rectifier
	127012118	Heat sink for Q506 & Q606
	127012117	Heat sink for Q507, 508, 607 & 608
	770101224	Pin, Terminal
	705213010	Screw, + 3x10mm, Power Transistor Mtg.
	714203006	Screw w/washer, + 3x6mm, Heat sink Mtg.
	740011130	Nut, 3mm, Power Transistor Mtg.
	756001030	Washer, Spring, 3mm dia, Power Transistor Mtg.
	140600658	Printed Circuit Board "H-AF-2"
	141610242	Pre/Main Amp. Circuit Assembly

CABINET AND CHASSIS

Schematic Location	Part No.	Description
	131011239	Cabinet
	111911269	Front Panel Assembly
	116310067	Knob, Volume Control
	116310055	Knob, Selector, Bass, Treble and Balance
	116210008	Button, Push switch
	116210012	Button, Power switch
R001	551056233	Resistor, Composition, 5.6K ±10%, 1/2W
R002, 003	551033133	Resistor, Composition, 330 ±10%, 1/2W
C001	400220449	Capacitor, Electrolytic, 2200mfd, 50V
S1	614010106	Switch, Power
S2, 3, 4, S5, (1set)	614040810	Switch, Push 4-keys

Schematic Location	Part No.	Description
S6	601011247	Switch, Selector
T001	201001340	Power Transformer, (Pri. voltage 120v)
	206001340	Power Transformer, (Pri. voltage 220V/24V)
PL001	315080015	Lamp, Pilot, 8V, 0.15A
F001	341220015	Fuse, 1.5A–3AG (line voltage at 120V)
	341220010	Fuse, 1A–3AG (line voltage at 220V – 240V)
F002	341220015	Fuse, 1.5A–3AG, Power Amp. Protector
J001	648211126	AC Outlet
J002	626110023	Headphone Jack

PRE/MAIN AMPLIFIER CIRCUIT BOARD (Series–2)

Schematic Location	Part No.	Description
	RESISTORS	
R401, 413	552033522	Carbon Film, 3.3M ±5%, 1/4W
R402, 414	552010422	Carbon Film, 100K ±5%, 1/4W
R403, 415	552047322	Carbon Film, 47K ±5%, 1/4W
R404, 416	552010222	Carbon Film, 1K ±5%, 1/4W
R405, 408, R411, 417, R422	552022322	Carbon Film, 22K ±5%, 1/4W
R407, 419	552010522	Carbon Film, 1M ±5%, 1/4W
R409, 420	552010322	Carbon Film, 10K ±5%, 1/4W
R410, 421	552015222	Carbon Film, 1.5K ±5%, 1/4W
R412, 423	552056422	Carbon Film, 560K ±5%, 1/4W
R501, 601	552010422	Carbon Film, 100K ±5%, 1/4W
R502, 515, R523, 602, R615, 623	552010222	Carbon Film, 1K ±5%, 1/4W
R503, 512, R603, 612	552022422	Carbon Film, 220K ±5%, 1/4W
R504, 604	552027422	Carbon Film, 270K ±5%, 1/4W
R505, 530, R605, 630	552047222	Carbon Film, 4.7K ±5%, 1/4W
R506, 513, R606, 613	552033322	Carbon Film, 33K ±5%, 1/4W
R507, 607	552082222	Carbon Film, 8.2K ±5%, 1/4W
R508, 509, R511, 608, R609 611	552010322	Carbon Film, 10K ±5%, 1/4W
R510, 518, R610, 618	552047322	Carbon Film, 47K ±5%, 1/4W
R514, 521, R614, 621	552056222	Carbon Film, 5.6K ±5%, 1/4W
R516, 524, R526, 616, R624, 626	552022322	Carbon Film, 22K ±5%, 1/4W

Schematic Location	Part No.	Description
R517, 520, R620	552039222	Carbon Film, 3.9K ±5%, 1/4W
R519, 619	552047122	Carbon Film, 470 ±5%, 1/4W
R522, 622	552010522	Carbon Film, 1M ±5%, 1/4W
R525, 625	552010022	Carbon Film, 10 ±5%, 1/4W
R527, 539, R627, 639	552033122	Carbon Film, 330 ±5%, 1/4W
R528, 628	552015222	Carbon Film, 1.5K ±5%, 1/4W
R529, 532, R629, 632	552033222	Carbon Film, 3.3K ±5%, 1/4W
R531, 631	552047022	Carbon Film, 47 ±5%, 1/4W
R533, 535, R633, 635	551033133	Composition, 330 ±10%, 1/2W
R534, 634	551022033	Composition, 22 ±10%, 1/2W
R536, 636	551010033	Composition, 10 ±10%, 1/2W
R537, 538, R637, 638	554147963	MPC, 0.47 ±10%, 3W
VR501, 502	525101121	Variable, 50KB x2, Bass, Treble Cont.
VR503	515121115	Variable, 250KWT, Balance Cont.
VR504	525121113	Variable, 100KAT x2, Volume Cont.
VR505, 507	510502130	Potentiometer, 100K, DC Balance Adj.
VR506, 508	510502128	Potentiometer, 5K, Idling Current Adj.
R901	551022233	Composition, 2.2K ±10%, 1/2W
R902	551010233	Composition, 1K ±10%, 1/2W
	CAPACITORS	
C401, 403, C411, 413	440501283	Ceramic, 50pF ±10%, 250V
C402, 412	402100749	Electrolytic, 1mfd, 50V
C404, 414	440101183	Ceramic, 100pF ±10%, 250V
C405, 415	402330609	Electrolytic, 33mfd, 6.3V
C406, 416	402100629	Electrolytic, 10mfd, 25V
C407, 417	450300933	Mylar Film, 0.03mfd ±10%, 50V
C408, 418	450100933	Mylar Film, 0.01mfd ±10%, 50V

Schematic Location	Part No.	Description
C409, 419	440500935	Ceramic, 0.05mfd, 50V
C501, 507, C512, 601, C607, 612	402100749	Electrolytic, 1mfd, 50V
C502, 506, C514, 602, C606, 614	402100629	Electrolytic, 10mfd, 25V
C503, 603	450201033	Mylar Film, 0.002mfd ±10%, 50V
C504, 505, C604, 605	450500933	Mylar Film, 0.05mfd ±10%, 50V
C508, 608	402100509	Electrolytic, 100mfd, 6.3V
C509, 519, C609, 619	450100833	Mylar Film, 0.1mfd ±10%, 50V
C510, 610	440201183	Ceramic, 200pF ±10%, 250V
C511	402100519	Electrolytic, 100mfd, 16V
C513, 613	440101283	Ceramic, 10pF ±10%, 250V
C515, 615	402100539	Electrolytic, 100mfd, 35V
C516, 517, C616, 617	402220519	Electrolytic, 220mfd, 16V
C518, 618	440301183	Ceramic, 300pF ±10%, 250V
C520, 620	402100439	Electrolytic, 100mfd, 35V
C901	402471539	Electrolytic, 470mfd, 35V
C902	402100439	Electrolytic, 1000mfd, 35V

Schematic Location	Part No.	Description
	TRANSISTORS AND DIODES	
Q401, 402, Q403, 404	301201114	2SC644, Equalizer Amp.
Q501, 503, Q601, 603	301201115	2SC828, Flat Amp.
Q502, 602	301201114	2SC644, Flat Amp.
Q504, 604	301001117	2SA564, Flat Amp.
Q505, 506, Q605, 606	301201132	2SC1384, Predriver, Driver
Q507, 607	301001123	2SA684, Driver
Q508, 509, Q608, 609	301201142	2SC789, Power Amp.
D501, 601	300212006	KB-369, Varistor
D901	300919011	W-02, Rectifier
	127012117	Heat sink, Power Transistor Mtg.
	770101225	Pin, Terminal
	992001111	Grommet, Power Transistor Mtg.
	705213012	Screw, + 3x12mm, Power Transistor Mtg.
	756001030	Spring washer, 3mm, Power Transistor Mtg.
	751901403	Washer, 3mm, Power Transistor Mtg.
	761911144	Nut, 3mm, Power Transistor Mtg.
	714203006	Screw w/washer, + 3x6mm, Heat sink Mtg.
	140600659	Printed Circuit Board "H-AF-5"
	141610224	Pre/Main Amplifier Circuit Assembly

NOTE: Only the board parts which are different from those of "Series-1" are provided in this RA-211 "Series-2" parts list. Cabinet and chassis parts are exactly the same as "Series-1".