

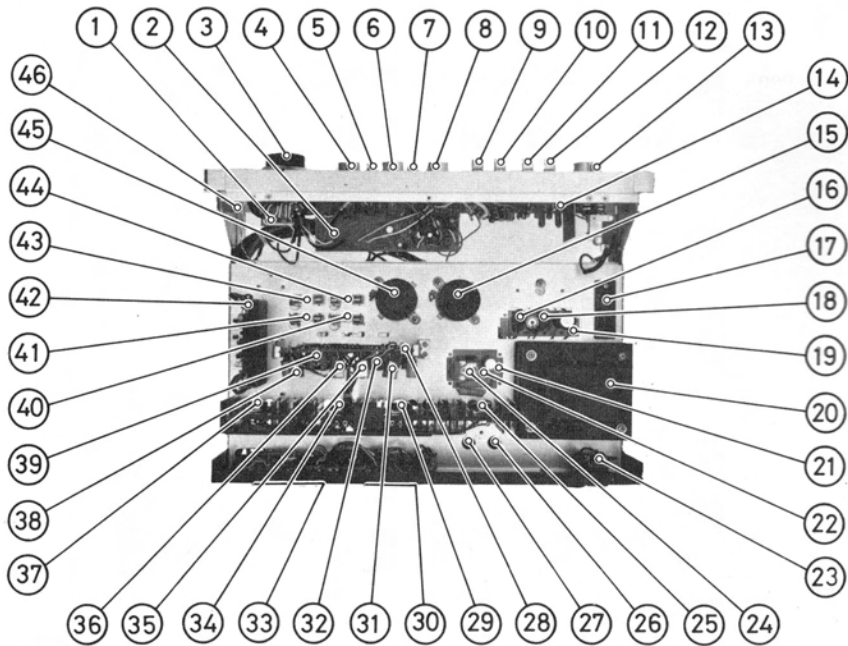
technical manual

TABLE OF CONTENTS

CHASSIS LAYOUT	2	MAIN AMPLIFIER CIRCUIT BOARD DIAGRAM	6
PRECAUTIONS	3	VOLUME CONTROL CIRCUIT BOARD DIAGRAM	6
BIAS (IDLING CURRENT) ADJUSTMENT	3	PRE-AMPLIFIER CIRCUIT BOARD DIAGRAM	7
TROUBLE SHOOTING	4	AUXILIARY INPUT CIRCUIT BOARD DIAGRAM	7
STABILIZER CIRCUIT BOARD DIAGRAM	4	TONE AMPLIFIER CIRCUIT BOARD DIAGRAM	8
PHONO INPUT CIRCUIT BOARD DIAGRAM	5	EQUALIZER AMPLIFIER CIRCUIT BOARD DIAGRAM	8
RECTIFIER CIRCUIT BOARD DIAGRAM	5	SCHEMATIC DIAGRAM	9
RELAY CIRCUIT BOARD DIAGRAM	5	PARTS LIST	12

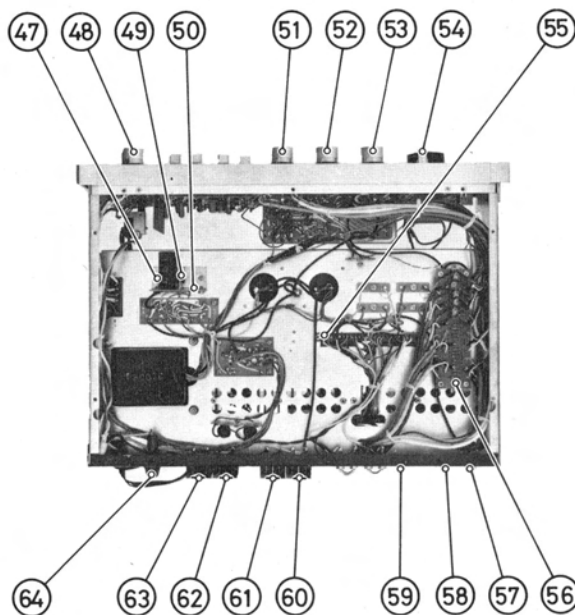
CHASSIS LAYOUT

1. Volume Control Circuit Board
2. Preamplifier Circuit Board
3. VR501, Volume Control
4. S10, Muting switch
5. S6, Loudness switch
6. S9, High Filter switch
7. S7, Low Filter switch
8. S8, Tone Defeat switch
9. VR703, Treble Control (R-ch.)
10. VR701, Treble Control (L-ch.)
11. VR704, Bass Control (R-ch.)
12. VR702, Bass Control (L-ch.)
13. S11, Power switch
14. Tone Amplifier Circuit Board
15. C004, Ripple Filter Capacitor
16. D902, Rectifier
17. Line Voltage selector
18. D901, Rectifier
19. Rectifier Circuit Board
20. T001, Power Transformer
21. Delay Circuit Board
22. Q902, Relay Control Transistor
23. AC Outlet
24. RY901, Delay Relay
25. Q002, Power Amplifier Transistor
26. BM001, Circuit Breaker (L-ch.)
27. BM002, Circuit Breaker (R-ch.)
28. Main Amplifier Circuit Board
29. Q001, Power Amplifier Transistor
30. Tape Monitor Terminals
31. Q606, Driver Transistor
32. VR601, Idling Current Adj. (L-ch.)
33. Input Terminals
34. Q003, Power Amplifier Transistor



35. Q605, Driver Transistor
36. Q611, Driver Transistor
37. Q004, Power Amp. Transistor
38. Q612, Driver Transistor
39. VR602, Idling Current Adj. (R-ch.)
40. F002, DC Fuse (L-ch.)
41. F003, DC Fuse (R-ch.)
42. Equalizer Amp. Circuit Board
43. F004, DC Fuse (R-ch.)
44. F001, DC Fuse (L-ch.)
45. C003, Ripple Filter Capacitor
46. Pilot Lamp

47. D903, Zener Diode
48. S12, Speakers switch
49. Q901, Stabilizer Transistor
50. Stabilizer Circuit Board
51. S3, Monitor switch
52. S2, Mode switch
53. S1, Selector switch
54. VR001, Balance Control
55. Bracket, Main Amp. Circuit Board
56. Aux Input Circuit Board
57. GND Terminal
58. S5, Phono Input Impedance selector
59. S4, Phono Input Sensitivity selector
60. SPKR-1, Speaker Terminals (R-ch.)
61. SPKR-2, Speaker Terminals (R-ch.)
62. SPKR-1, Speaker Terminals (L-ch.)
63. SPKR-2, Speaker Terminals (L-ch.)
64. F005, AC Fuse



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 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 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 sink for better heat conduction.

BIAS (IDLING CURRENT) ADJUSTMENT

Adjust Idling Current using a DC milli-volt meter.

1. Set Volume Control to minimum position.
2. Connect the plus lead of a DC milli-volt meter to Test Point No. 1 (on main amp. circuit board) and the minus lead to Test Point No. 2 (for Right channel, the plus lead to Test Point No. 4 and the minus lead to Test Point No.3), and rotate the potentiometer VR601 (VR602 for Right channel) to obtain a 15mV reading on DC milli-volt meter (see Fig. 1)

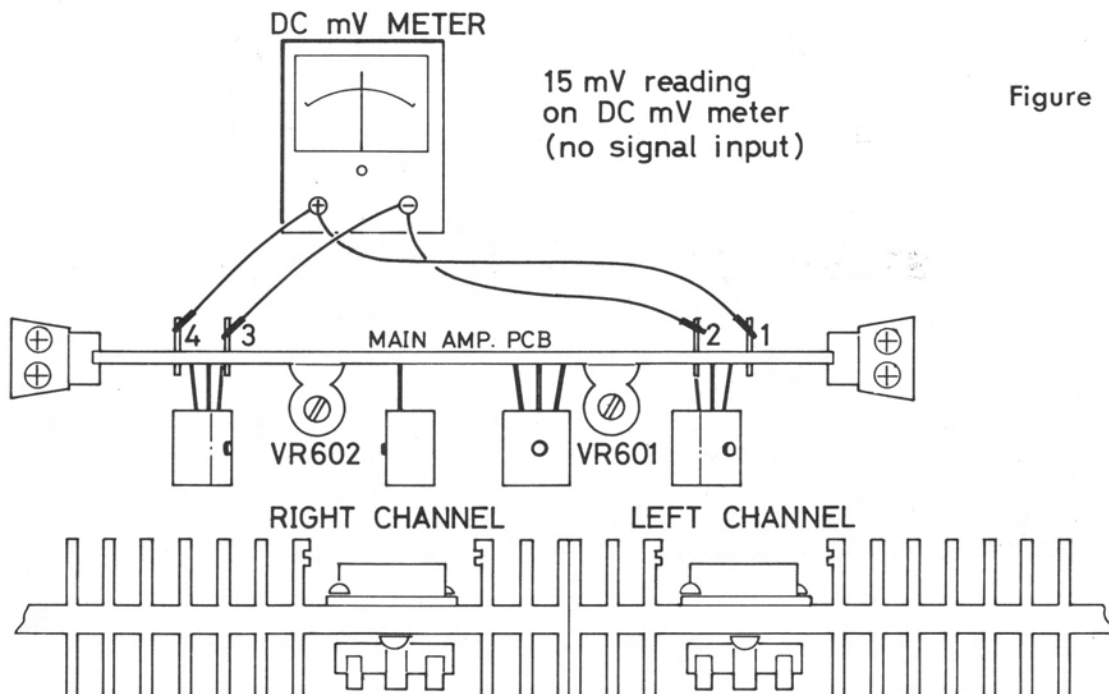
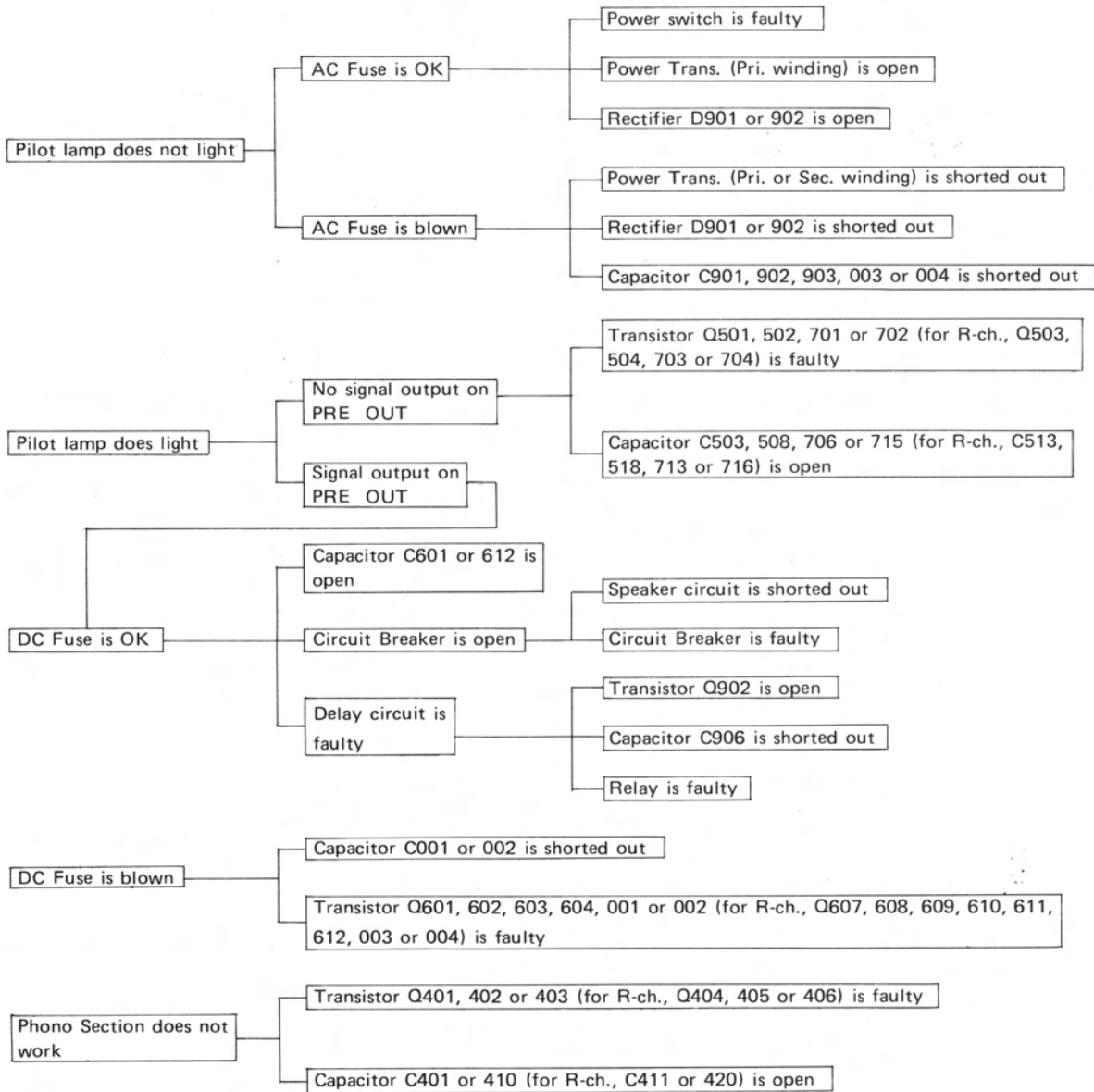
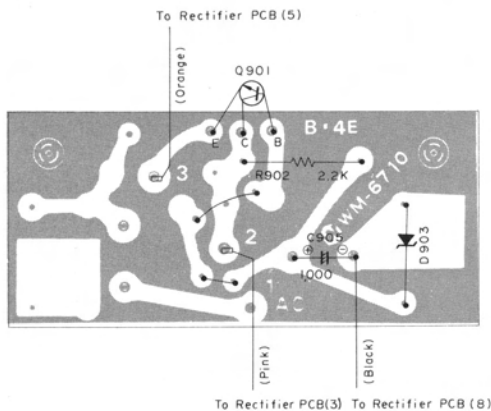


Figure 1

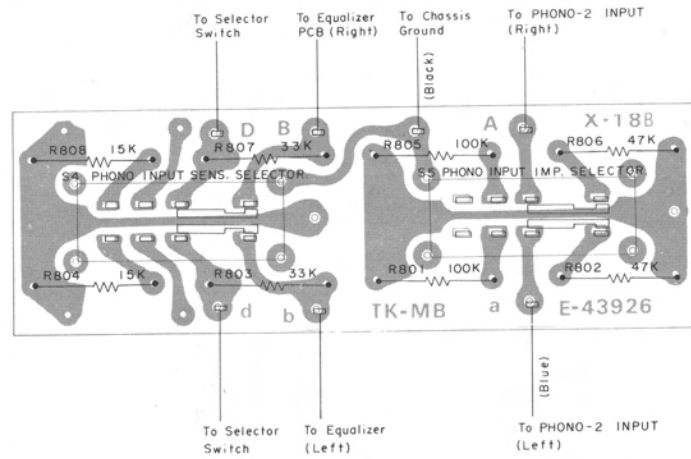
TROUBLE SHOOTING



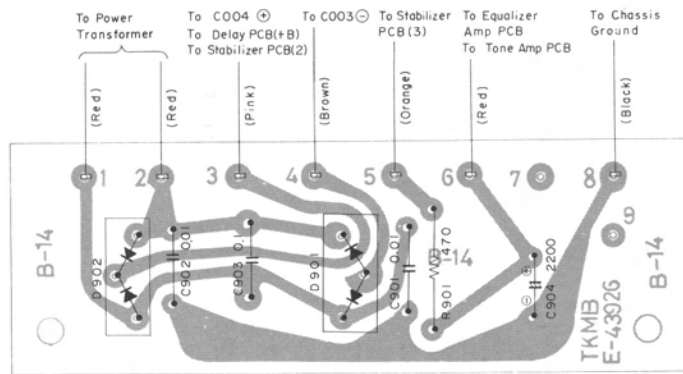
STABILIZER CIRCUIT BOARD DIAGRAM



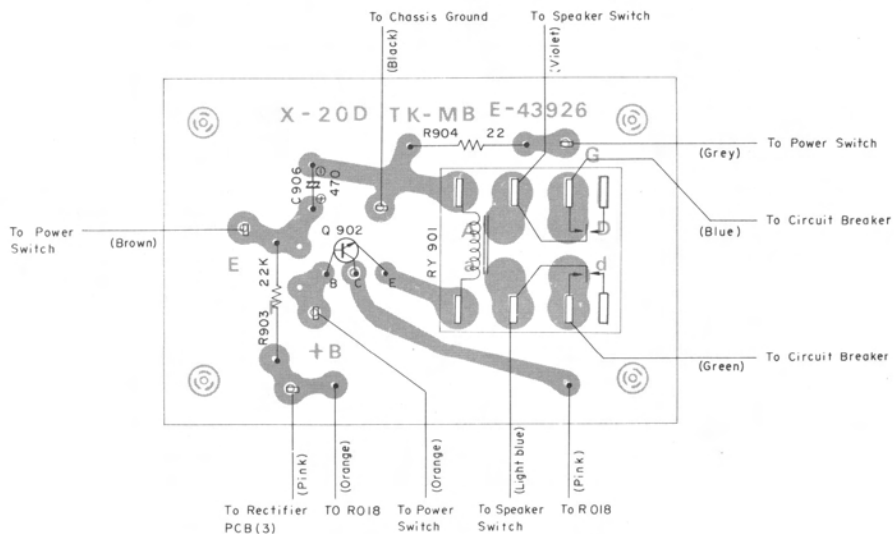
PHONO INPUT CIRCUIT BOARD DIAGRAM



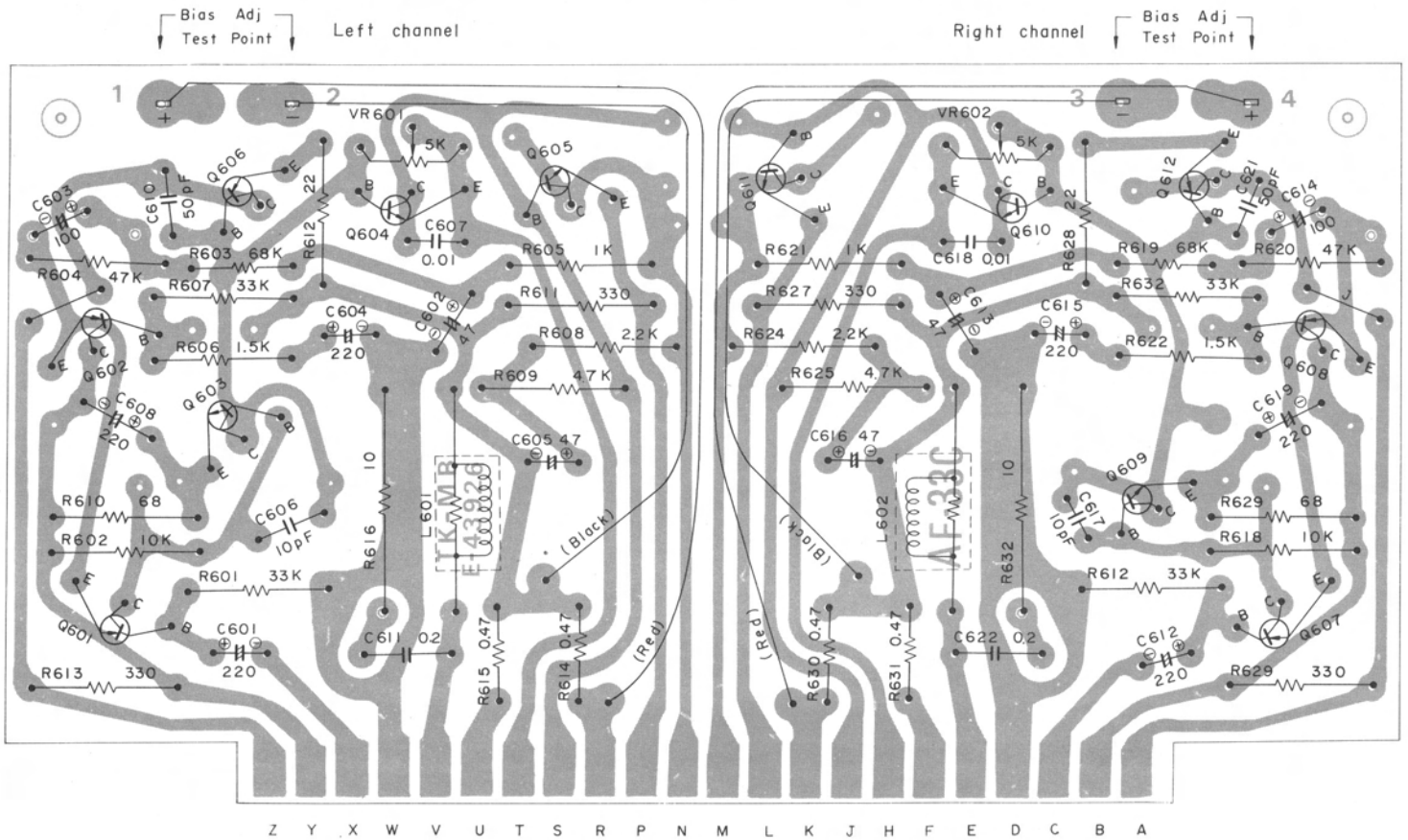
RECTIFIER CIRCUIT BOARD DIAGRAM



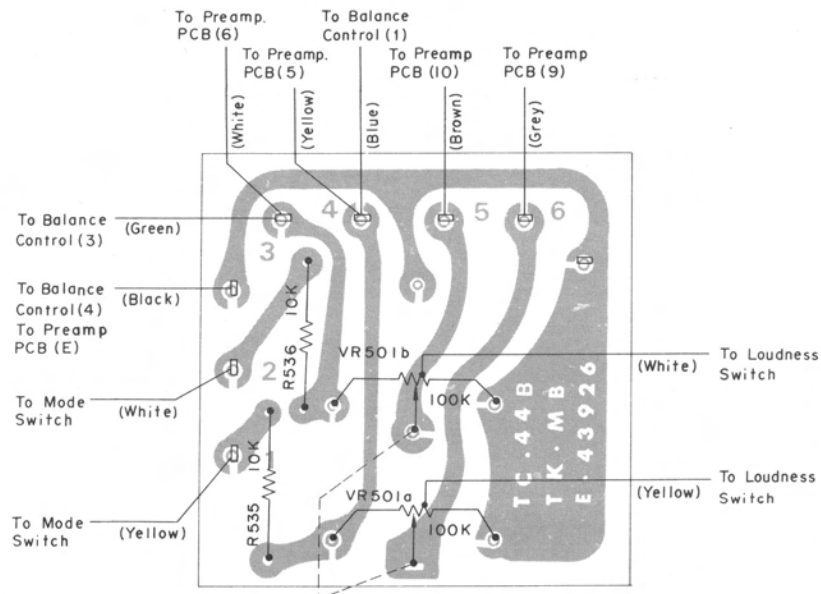
RELAY CIRCUIT BOARD DIAGRAM



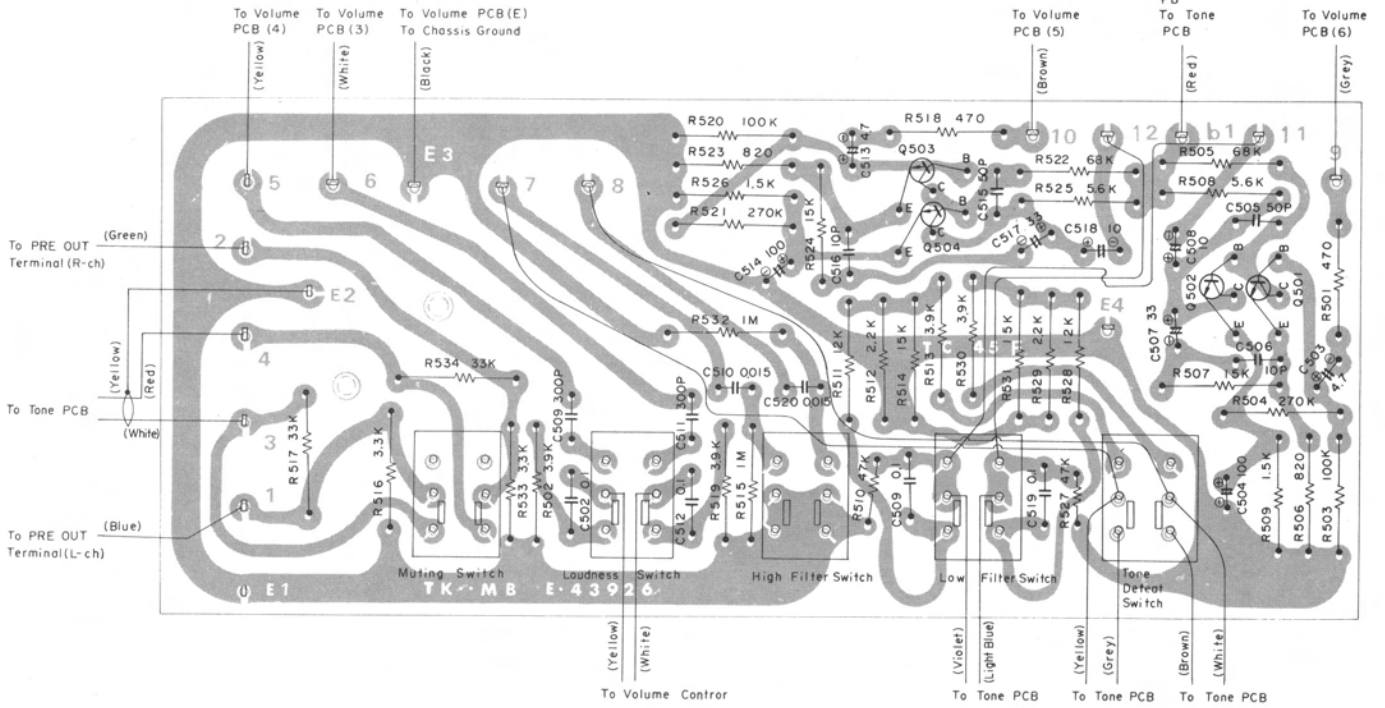
MAIN AMPLIFIER CIRCUIT BOARD DIAGRAM



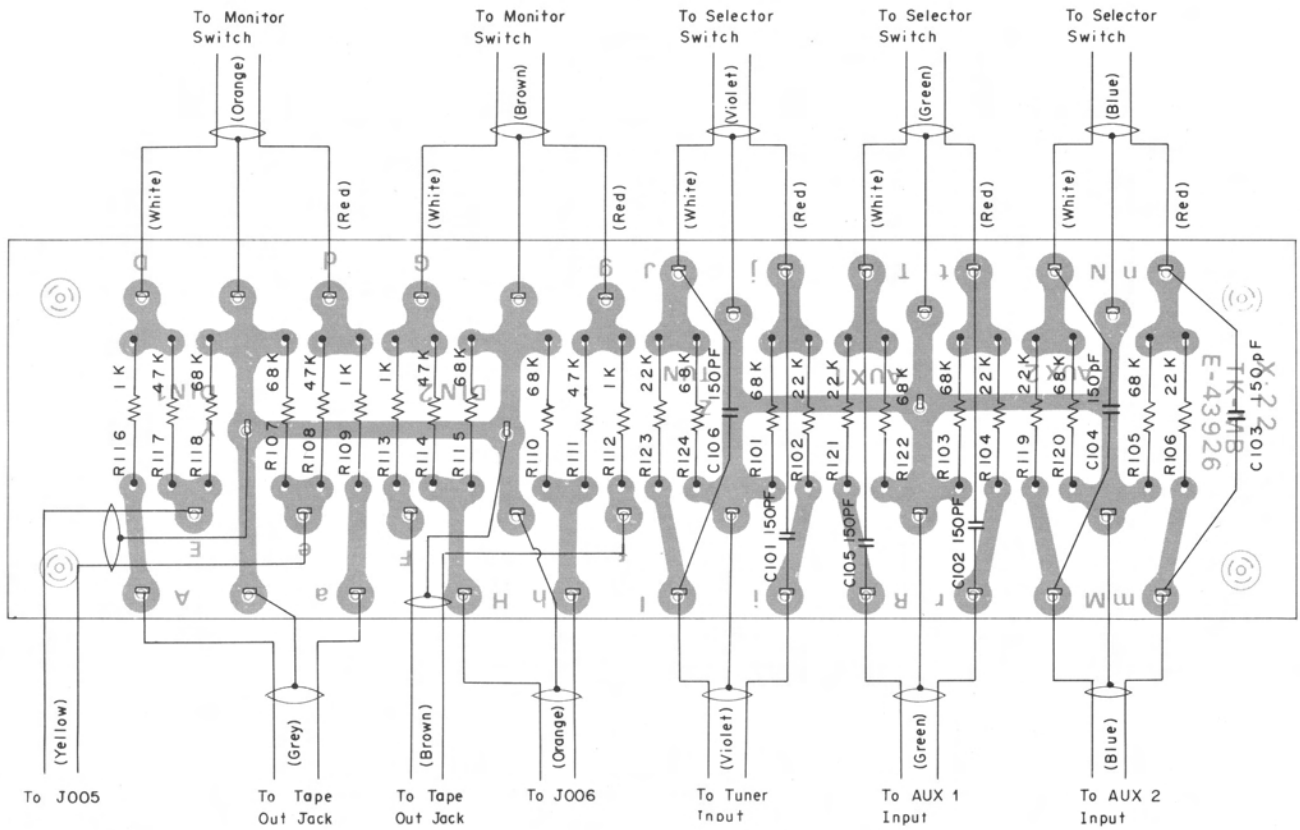
VOLUME CONTROL CIRCUIT BOARD DIAGRAM



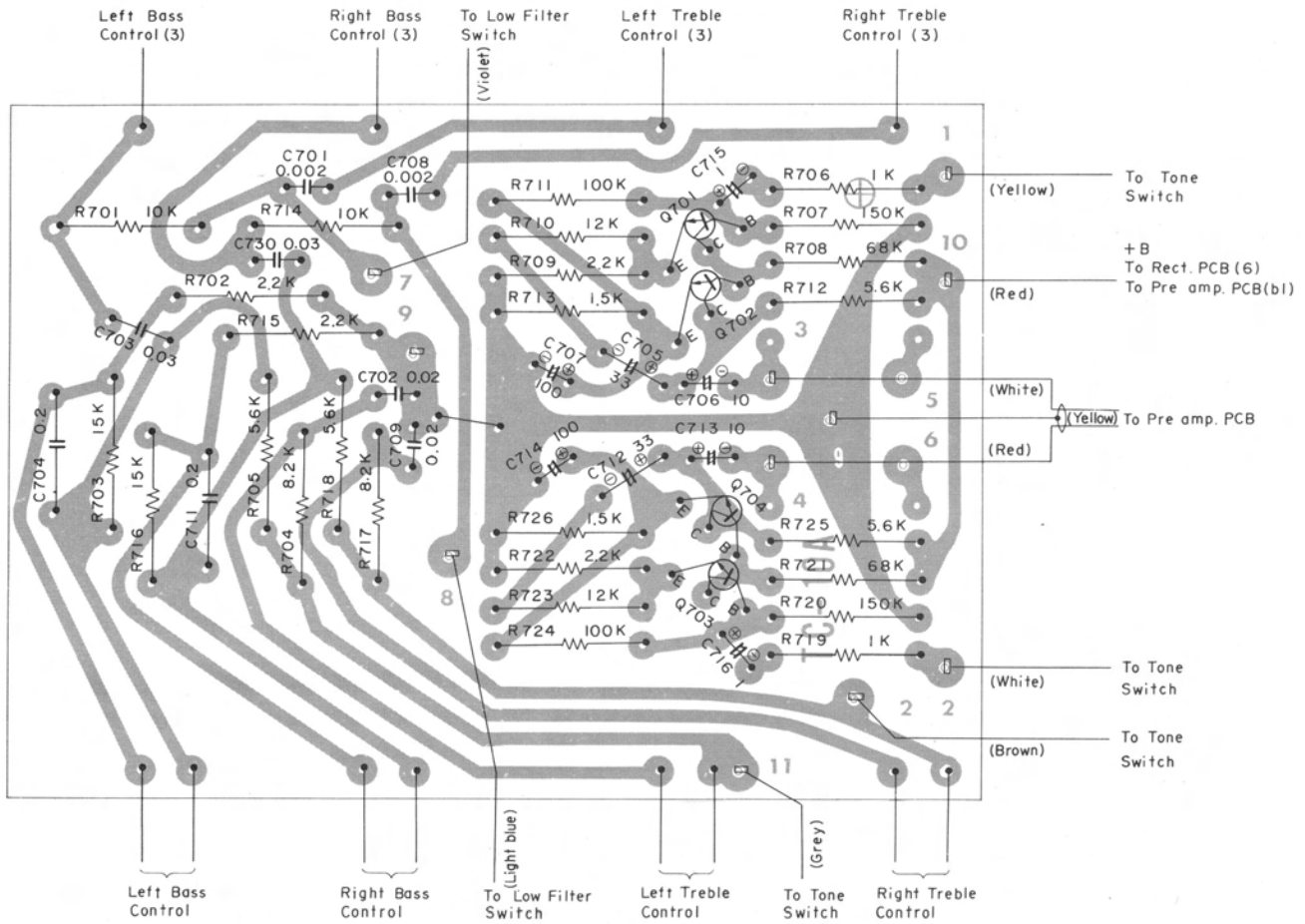
PRE-AMPLIFIER CIRCUIT BOARD DIAGRAM



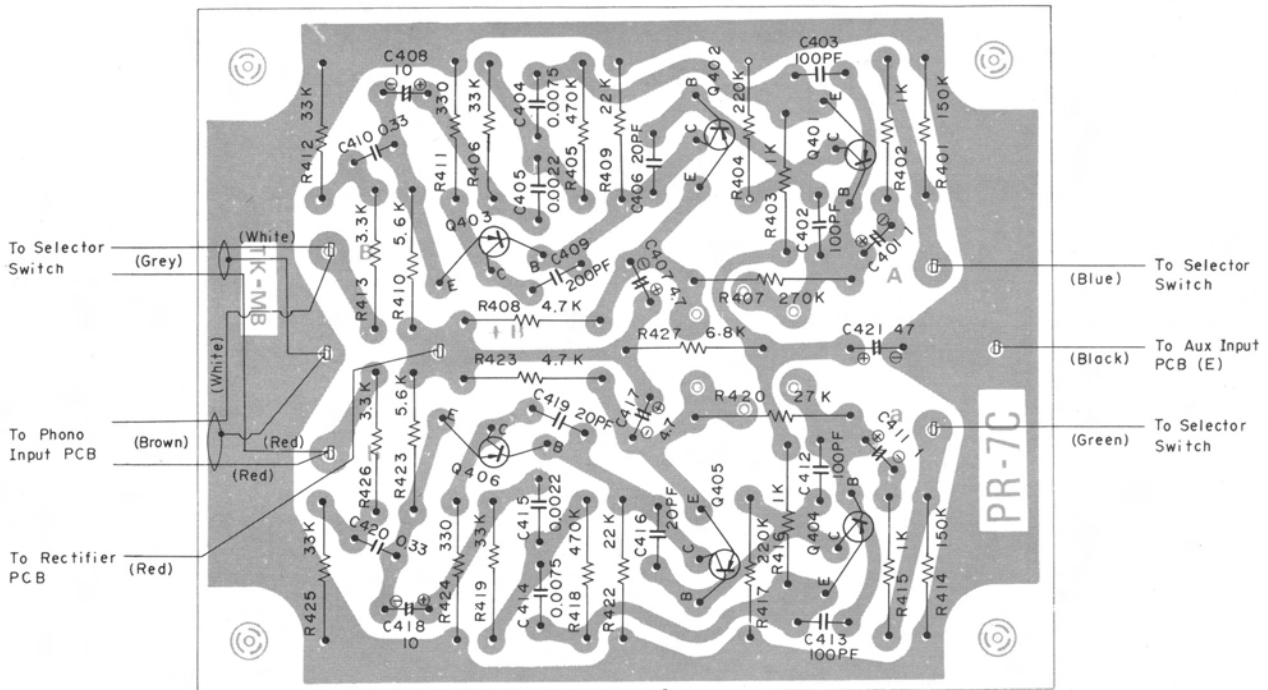
AUXILIARY INPUT CIRCUIT BOARD DIAGRAM

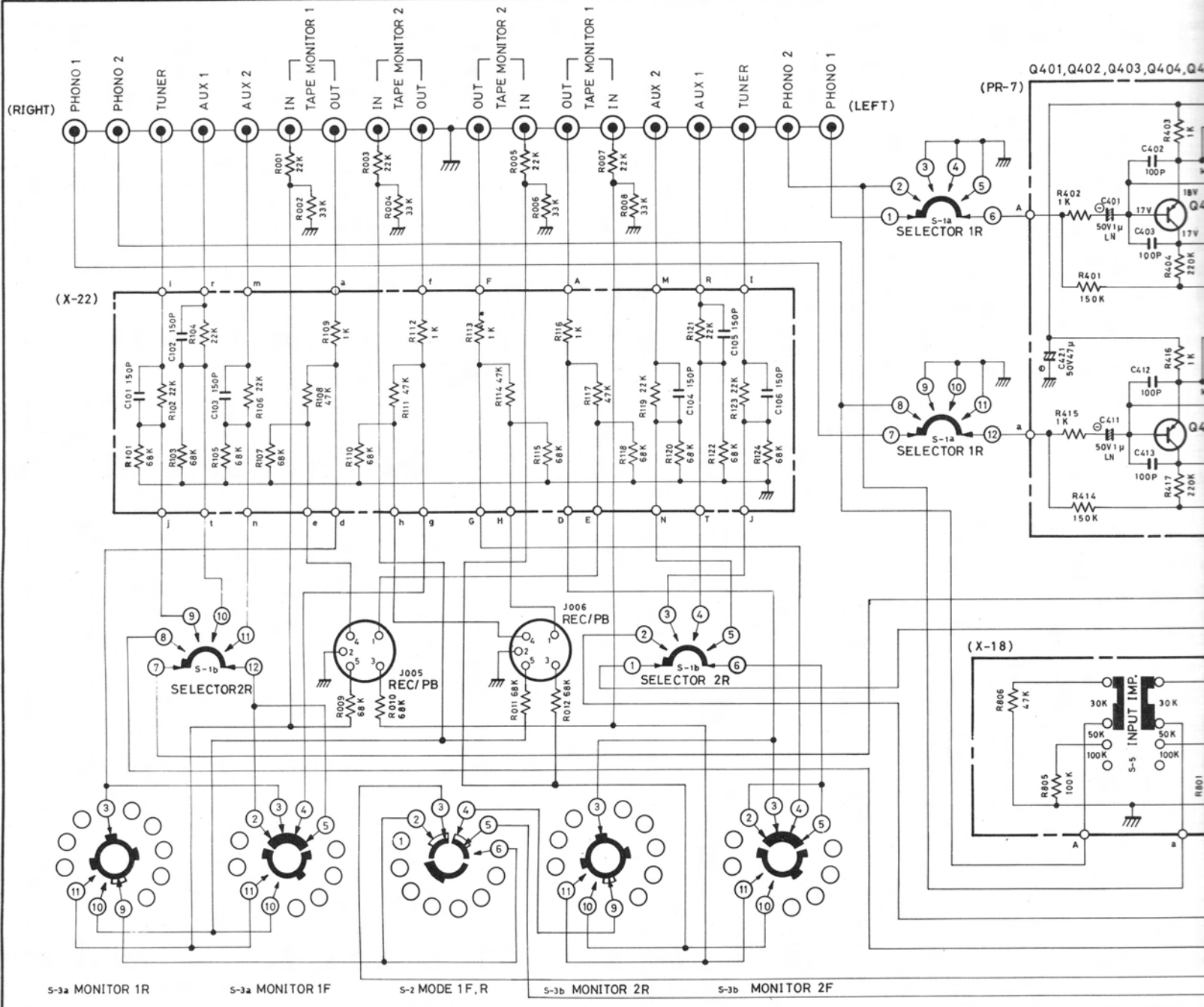


tone amplifier circuit board diagram



equalizer amplifier circuit board diagram





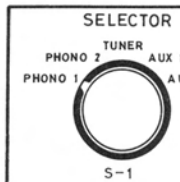
S-3a MONITOR 1R

S-3a MONITOR 1F

S-2 MODE 1F,R

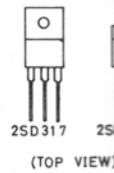
S-3b MONITOR 2R

S-3b MONITOR 2F



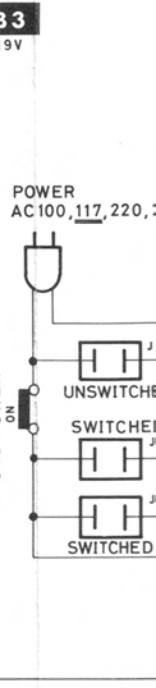
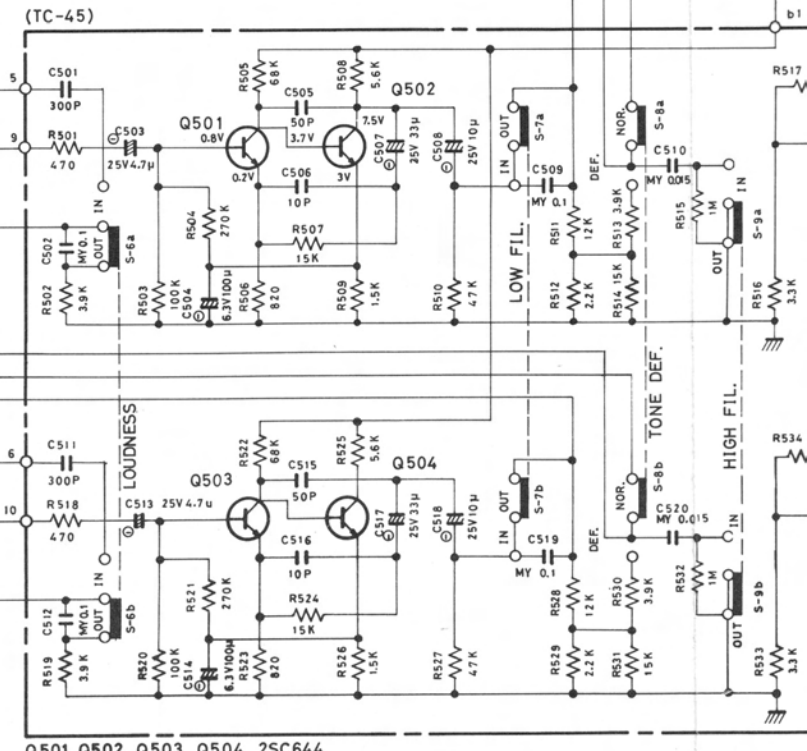
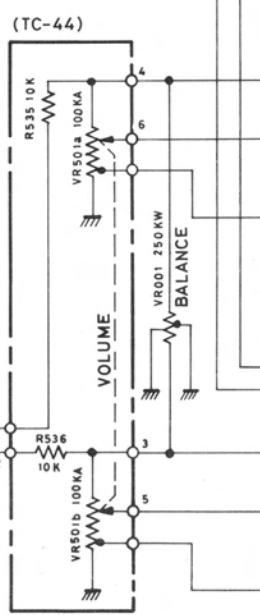
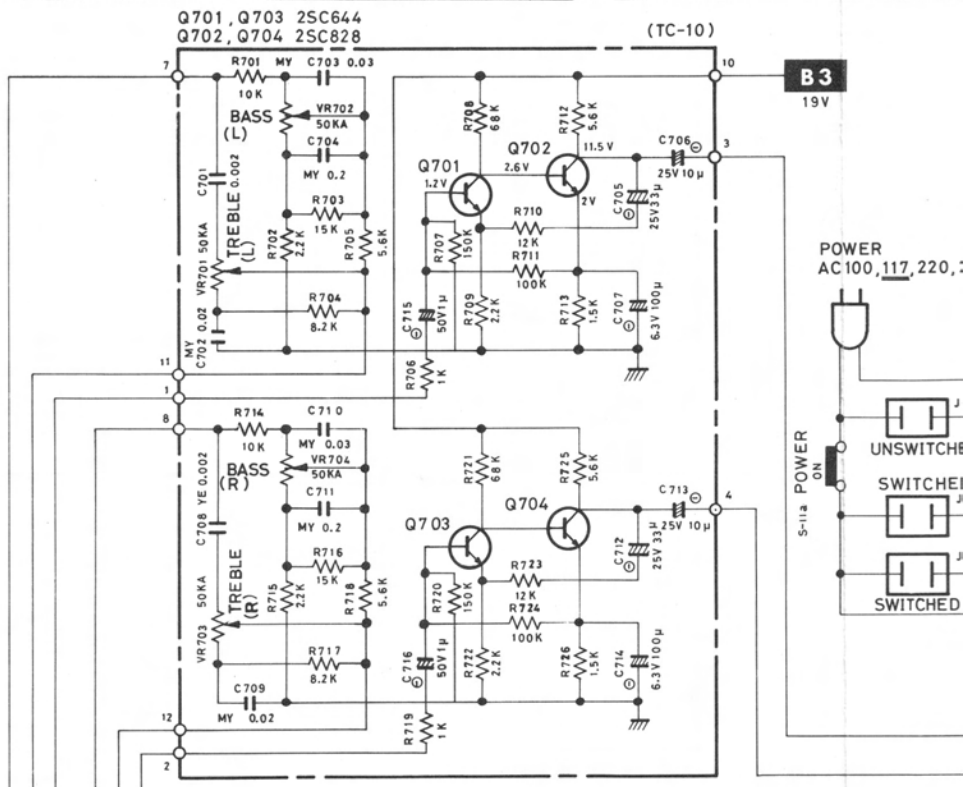
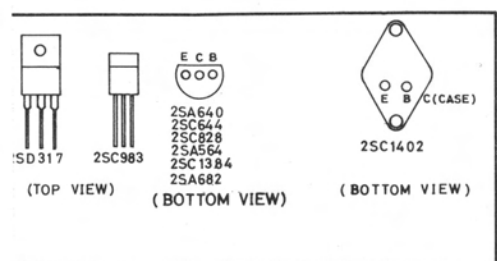
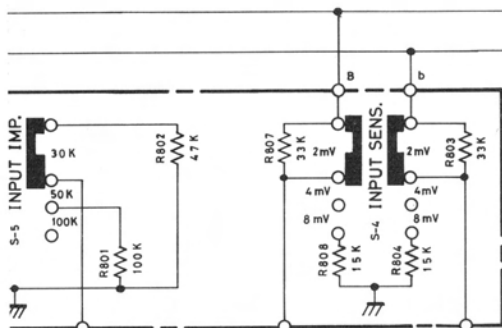
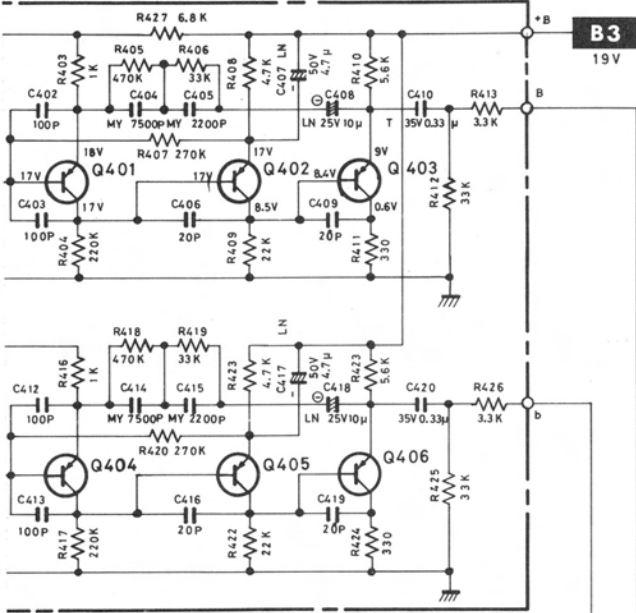
(RESISTORS)
 5% TOLERANCE UNLESS OTHERWISE NOTED
 K KILO OHM M MEGA OHM
 ▽ COMPOSITION RESISTORS 1/2 WATT
 NON MARK LOW NOISE TYPE CARBON RESISTOR 1/4 WATT

(CAPACITORS)
 MY --- MYLAR FILM CAPACITORS
 O --- OIL CAPACITORS
 T --- TANTAL 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



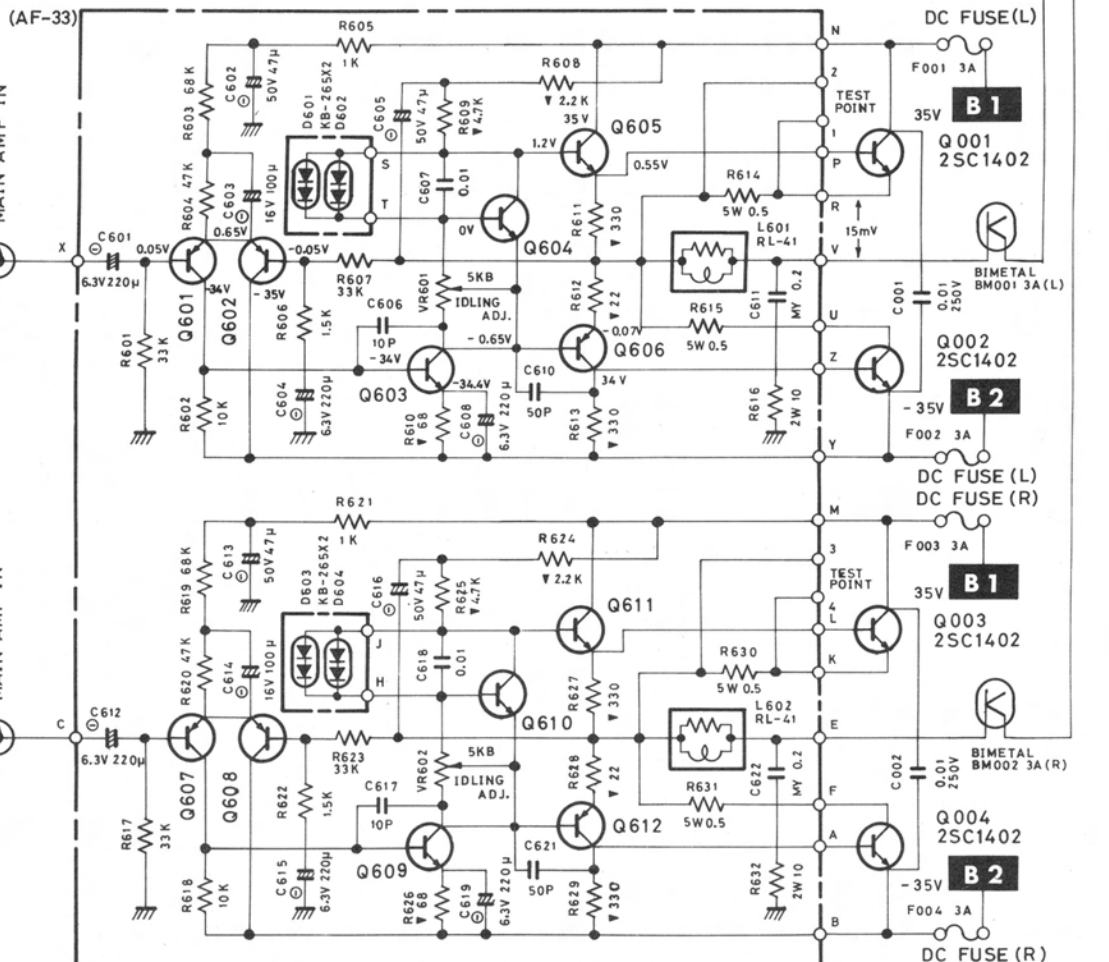
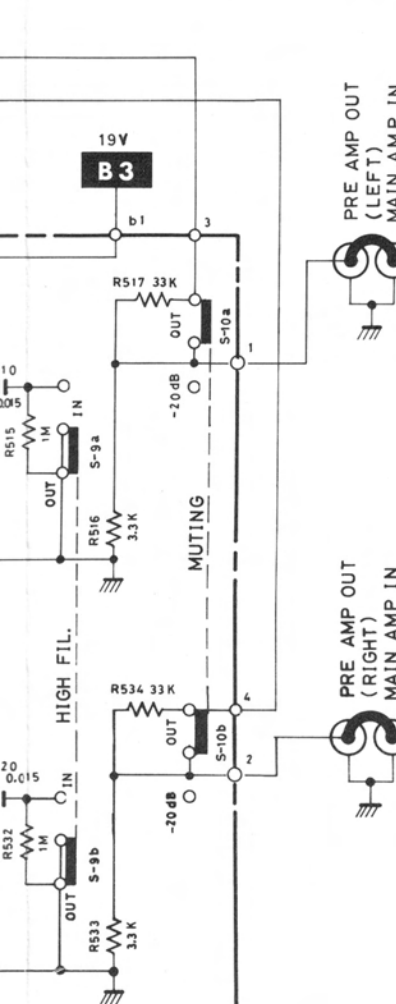
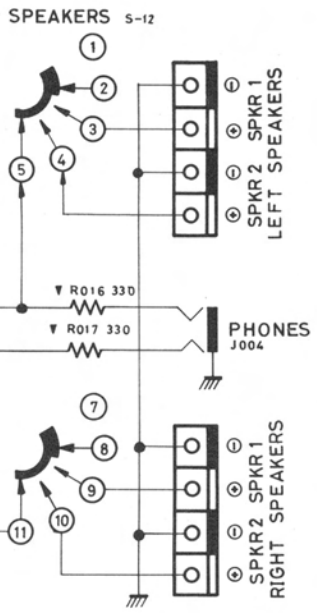
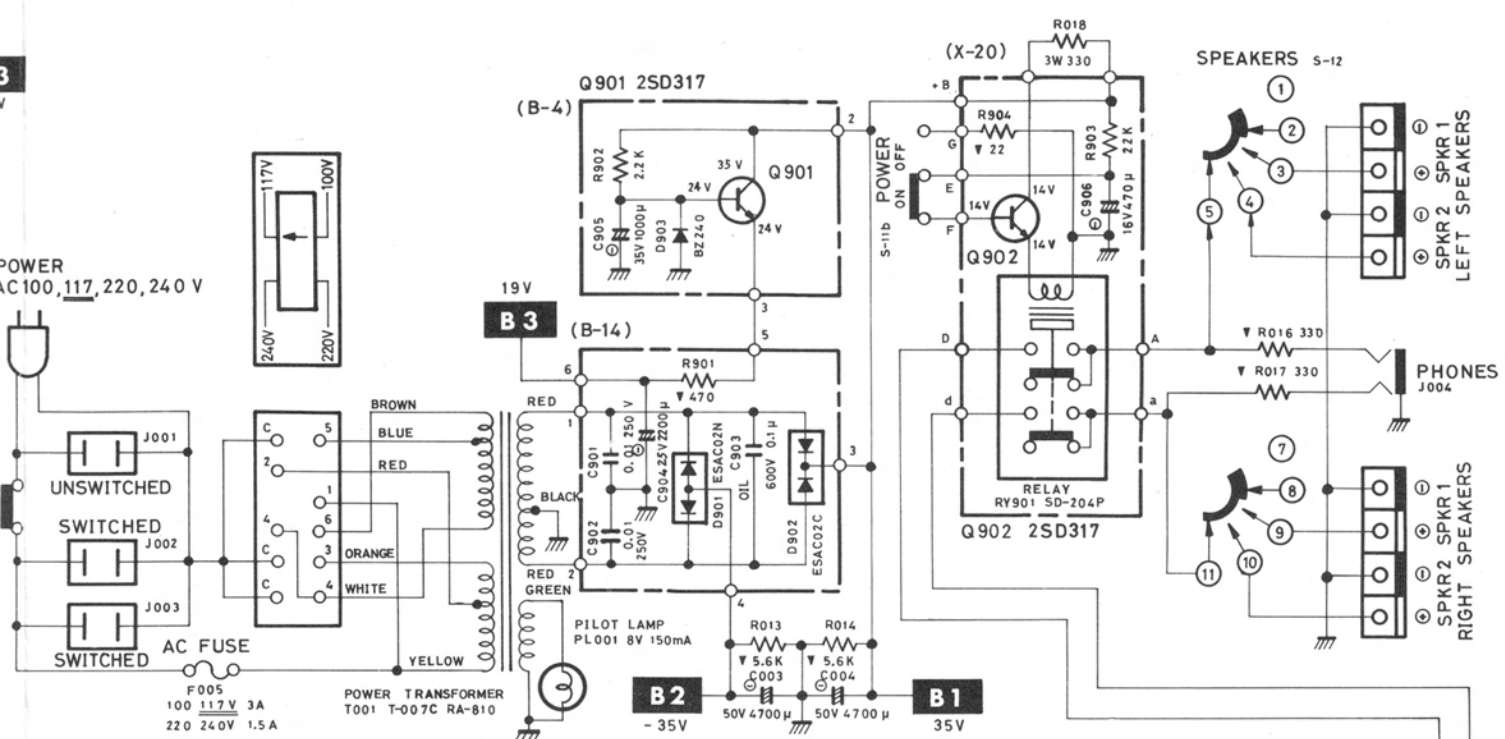
SCHEMATIC DIAGRAM

Q03, Q04, Q05, Q06 2SA640 LOW NOISE TYPE



Q501, Q502, Q503, Q504 2SC644

POWER
AC 100, 117, 220, 240 V



- Q601, Q602, Q608, Q607 2SA564A
- Q603, Q604, Q609, Q610 2SC983
- Q605, Q611 2SC1384
- Q606, Q612 2SA682

PARTS LIST

Schematic Location	Part No.	Description
RESISTORS		
R001, 003, R005, 007	552022322	Carbon Film, 22K ±5%, 1/4W
R002, 004, R006, 008	552033322	Carbon Film, 33K ±5%, 1/4W
R009, 010, R011, 012	552068322	Carbon Film, 68K ±5%, 1/4W
R013, 014	551056233	Composition, 5.6K ±10%, 1/2W
R016, 017	551033133	Composition, 330 ±10%, 1/2W
R018	553133163	Metal Oxide, 330 ±10%, 3W
VR001	581005033	Variable, 250KW, Balance Control
VR701, 702, VR703, 704	581005031	Variable, 50KA, Bass & Treble Control
CAPACITORS		
C001, 002	440100985	Ceramic, 0.01mfd, 250V
C003, 004	400470449	Electrolytic, 4700mfd, 50V
TRANSISTORS & DIODES		
Q001, 002, Q003, 004	301201139	2SC1402, Power Amp.
D601, 602, D603, 604	300212002	Varistor, KB-265
SWITCHES		
S1	601011239	Selector
S2	601011240	Mode
S3	601011227	Monitor
S11	614010103	Power

Schematic Location	Part No.	Description
S12	601011225	Speakers
MISCELLANEOUS		
	111911244	Front Panel Assembly
	116310066	Knob, Selector
	116310062	Knob, Mode, Monitor etc.
	116310065	Knob, Bass, Treble, Balance
	116210009	Button, Push switch
T001	205001330	Power Transformer
BM001, BM002	330111012	Circuit Breaker
PL001	351080015	Pilot Lamp, 8V, 0.15A
F001, 002, F003, 004	341220030	Fuse, 3A-3AG
F005	341220030	Fuse, 3A-3AG (line voltage, 100 – 120V)
	341220015	Fuse, 1.5A (line voltage, 220 – 240V)
J001, 002, J003	648211116	AC Outlet
J004	626110023	Headphones Jack
J005, 006	625001112	Din Jack, 5P
	624100210	Pin Jack, 10P, RCA type
	624100208	Pin Jack, 8P, RCA type
	641400104	Speakers Terminal, 4P
	648211119	Bracket, DC fuse
	648211114	Bracket, AC fuse
	648211121	Voltage Selector
	648211118	Bracket, Power Transistor
	648211120	Bracket, Main Amp. PCB

AUX INPUT CIRCUIT BOARD

Schematic Location	Part No.	Description
RESISTORS		
R101, 103, R105, 107, R110, 115, R118, 120, R122, 124	552068322	Carbon Film, 68K ±5%, 1/4W
R102, 104, R106, 119, R121, 123	552022322	Carbon Film, 22K ±5%, 1/4W
R108, 111, R114, 117	552047322	Carbon Film, 47K ±5%, 1/4W
R109, 112, R113, 116	552010222	Carbon Film, 1K ±5%, 1/4W

Schematic Location	Part No.	Description
CAPACITORS		
C101, 102, C103, 104, C105, 106	440100985	Ceramic, 0.01mfd, 250V
	770101223	Pin, Terminal
	140800147	Printed Circuit Board "X-22"
	141810151	AUX Input Circuit Board Assembly

EQUALIZER AMPLIFIER CIRCUIT BOARD

Schematic Location	Part No.	Description
RESISTORS		
R401, 414	552015422	Carbon Film, 150K ±5%, 1/4W
R402, 403, R415, 416 }	552010222	Carbon Film, 1K ±5%, 1/4W
R404, 417	552022422	Carbon Film, 220K ±5%, 1/4W
R405, 418	552047422	Carbon Film, 470K ±5%, 1/4W
R406, 412, R419, 425 }	552033322	Carbon Film, 33K ±5%, 1/4W
R407, 420	552027422	Carbon Film, 270K ±5%, 1/4W
R408, 423	552047222	Carbon Film, 4.7K ±5%, 1/4W
R409, 422	552022322	Carbon Film, 22K ±5%, 1/4W
R410, 423	552056222	Carbon Film, 5.6K ±5%, 1/4W
R411, 424	552033122	Carbon Film, 330 ±5%, 1/4W
R413, 426	552033222	Carbon Film, 3.3K ±5%, 1/4W
CAPACITORS		
C401, 411	412100749	Electrolytic, 1 mfd, 50V (low noise)
C402, 403, C412, 413 }	440101183	Ceramic, 100pF ±10%, 250V

Schematic Location	Part No.	Description
C404, 414	452751032	Mylar Film, 0.0075mfd ±5%, 50V
C405, 415	452221032	Mylar Film, 0.0022 mfd ±5%, 50V
C406, 409, C416, 419 }	440201283	Ceramic, 20pF ±10%, 250V
C407, 417	412470749	Electrolytic, 4.7mfd, 50V (low noise)
C408, 418	412100629	Electrolytic, 10mfd, 25V (low noise)
C410, 420	444330843	Tantalum, 0.33mfd, 35V
C421	402470649	Electrolytic, 47mfd, 50V
TRANSISTORS		
Q401, 402, Q403, 404 }	301001120	2SA640
	770101223	Pin, Terminal
	140500525	Printed Circuit Board "PR-7"
	141510131	Equalizer Amp. Circuit Board Assembly

PHONO SWITCH CIRCUIT BOARD

Schematic Location	Part No.	Description
RESISTORS		
R801, 805	552010422	Carbon Film, 100K ±5%, 1/4W
R802, 806	552047322	Carbon Film, 47K ±5%, 1/4W
R803, 807	552033322	Carbon Film, 33K ±5%, 1/4W
R804, 805	552015322	Carbon Film, 15K ±5%, 1/4W

Schematic Location	Part No.	Description
S4, 5	613000023	Switch, Input Sens. and Impedance selector
	770101223	Pin, Terminal
	140800148	Printed Circuit Board "X-18"
	141810153	Phono Switch Circuit Board Assembly

TONE AMPLIFIER CIRCUIT BOARD

Schematic Location	Part No.	Description
RESISTORS		
R701, 714	552010322	Carbon Film, 10K ±5%, 1/4W
R702, 709, R715, 722 }	552022222	Carbon Film, 2.2K ±5%, 1/4W
R703, 716	552015322	Carbon Film, 15K ±5%, 1/4W
R704, 717	552082222	Carbon Film, 8.2K ±5%, 1/4W
R705, 712, R718, 725 }	552056222	Carbon Film, 5.6K ±5%, 1/4W

Schematic Location	Part No.	Description
R706, 719	552010222	Carbon Film, 1K ±5%, 1/4W
R707, 720	552015422	Carbon Film, 150K ±5%, 1/4W
R708, 721	552068322	Carbon Film, 68K ±5%, 1/4W
R710, 723	552012322	Carbon Film, 12K ±5%, 1/4W
R711, 724	552010422	Carbon Film, 100K ±5%, 1/4W
R713, 726	552015222	Carbon Film, 1.5K ±5%, 1/4W

Schematic Location	Part No.	Description
CAPACITORS		
C701, 708	442201083	Ceramic, 0.002mfd $\pm 10\%$, 250V
C702, 709	450200933	Mylar Film, 0.02mfd $\pm 10\%$, 50V
C703, 710	450300933	Mylar Film, 0.03mfd $\pm 10\%$, 50V
C704, 711	450200833	Mylar Film, 0.2mfd $\pm 10\%$, 50V
C705, 712	402330629	Electrolytic, 33mfd, 25V
C706, 713	402100629	Electrolytic, 10mfd, 25V
C707, 714	402100509	Electrolytic, 100mfd, 6.3V
C715, 716	402100749	Electrolytic, 1mfd, 50V

Schematic Location	Part No.	Description
TRANSISTORS		
Q701, 703	301201114	2SC644
Q702, 704	301201115	2SC828
	770101223	Pin, Terminal
	140700722	Printed Circuit Board "TC-10"
	141710231	Tone Amp. Circuit Board Assembly

PREAMPLIFIER CIRCUIT BOARD

Schematic Location	Part No.	Description
RESISTORS		
R501, 518	552047122	Carbon Film, 470 $\pm 5\%$, 1/4W
R502, 513, } R519, 530 }	552039222	Carbon Film, 3.9K $\pm 5\%$, 1/4W
R503, 520	552010422	Carbon Film, 100K $\pm 5\%$, 1/4W
R504, 521	552027422	Carbon Film, 270K $\pm 5\%$, 1/4W
R505, 522	552068322	Carbon Film, 68K $\pm 5\%$, 1/4W
R506, 523	552082122	Carbon Film, 820 $\pm 5\%$, 1/4W
R507, 514, } R524, 531 }	552015322	Carbon Film, 15K $\pm 5\%$, 1/4W
R508, 525	552056222	Carbon Film, 5.6K $\pm 5\%$, 1/4W
R509, 526	552015222	Carbon Film, 1.5K $\pm 5\%$, 1/4W
R510, 527	552047322	Carbon Film, 47K $\pm 5\%$, 1/4W
R511, 528	552012322	Carbon Film, 12K $\pm 5\%$, 1/4W
R512, 529	552022222	Carbon Film, 2.2K $\pm 5\%$, 1/4W
R515, 532	552010522	Carbon Film, 1M $\pm 5\%$, 1/4W
R516, 533	552033222	Carbon Film, 3.3K $\pm 5\%$, 1/4W
R517, 534	552033322	Carbon Film, 33K $\pm 5\%$, 1/4W

Schematic Location	Part No.	Description
CAPACITORS		
C501, 511	440301183	Ceramic, 300pF $\pm 10\%$, 250V
C502, 509, } C512, 519 }	450100833	Mylar Film, 0.1mfd $\pm 10\%$, 50V
C503, 513	402470729	Electrolytic, 4.7mfd, 25V
C504, 514	402100509	Electrolytic, 100mfd, 6.3V
C505, 515	440501283	Ceramic, 50pF $\pm 10\%$, 250V
C506, 516	440101283	Ceramic, 10pF $\pm 10\%$, 250V
C507, 517	402330629	Electrolytic, 33mfd, 25V
C508, 518	402100629	Electrolytic, 10mfd, 25V
C510, 520	450150933	Mylar Film, 0.015mfd $\pm 10\%$, 50V
Q501, 502, } Q503, 504 }	301201114	Transistor, 2SC644
S6, 7, 8, 9, } S10. (1 set) }	614051007	Push switch, 5 keys
	770101223	Pin, Terminal
	140700738	Printed Circuit Board "TC-45"
	141710230	Preamplifier Circuit Board Assembly

VOLUME CONTROL CIRCUIT BOARD

Schematic Location	Part No.	Description
RESISTORS		
R535, 536	552010322	Carbon Film, 10K $\pm 5\%$, 1/4W
VR501	525121113	Variable, 100 KAT

Schematic Location	Part No.	Description
	770101223	Pin, Terminal
	140700739	Printed Circuit Board "TC-44"
	1410710232	Volume Control Circuit Board Assembly

MAIN AMPLIFIER CIRCUIT BOARD

Schematic Location	Part No.	Description
RESISTORS		
R601, 607, R617, 623 }	552033322	Carbon Film, 33K $\pm 5\%$, 1/4W
R602, 618	552010322	Carbon Film, 10K $\pm 5\%$, 1/4W
R603, 619	552068322	Carbon Film, 68K $\pm 5\%$, 1/4W
R604, 620	552047322	Carbon Film, 47K $\pm 5\%$, 1/4W
R605, 621	552010222	Carbon Film, 1K $\pm 5\%$, 1/4W
R606, 622	552015222	Carbon Film, 1.5K $\pm 5\%$, 1/4W
R608, 624	551022033	Composition, 22 $\pm 10\%$, 1/2W
R609, 625	551047233	Composition, 4.7K $\pm 10\%$, 1/2W
R610, 626	551068033	Composition, 68 $\pm 10\%$, 1/2W
R611, 613, R627, 629 }	551033133	Composition, 330 $\pm 10\%$, 1/2W
R612, 628	551022033	Composition, 22 $\pm 10\%$, 1/2W
R614, 615, R630, 631 }	554147973	Mold, 0.47 $\pm 10\%$, 5W
R616, 632	554010053	Bath tub, 10 $\pm 10\%$, 2W
VR601, VR602	510502121	Potentiometer, 5KB Idling Current Adj.
CAPACITORS		
C601, 604, C608, 612, }	402220509	Electrolytic, 220mfd, 6.3V

Schematic Location	Part No.	Description
C615, 619)		
C602, 605, C613, 616 }	402470649	Electrolytic, 47mfd, 50V
C603, 614	402100519	Electrolytic, 100mfd, 16V
C606, 617	440101283	Ceramic, 10pF $\pm 10\%$, 250V
C607, 618	440100985	Ceramic, 0.01mfd, 250V
C610, 621	440501283	Ceramic, 50pF $\pm 10\%$, 250V
C611, 622	450200833	Mylar Film, 0.2mfd $\pm 10\%$, 50V
TRANSISTORS		
Q601, 602, Q607, 608 }	301001117	2SA564A
Q603, 604, Q609, 610 }	301201137	2SC983
Q605, 611	301201132	2SC1384
Q606, 612	301001125	2SA682
L601, 602	220401120	Coil, Anti-parasitic
	127012096	Heat sink for Q605, 606, 611 & 612
	770100223	Pin, Terminal
	140600655	Printed Circuit Board "AF-33D"
	141610232	Main Amp. Circuit Board Assembly

RECTIFIER CIRCUIT BOARD

Schematic Location	Part No.	Description
R901	551047133	Resistor, Composition, 470 $\pm 10\%$, 1/2W
CAPACITORS		
C901, 902	440100985	Ceramic, 0.01mfd, 250V
C903	431100894	Oil, 0.1mfd $\pm 20\%$, 400V
C904	402220429	Electrolytic, 2200mfd, 25V

Schematic Location	Part No.	Description
DIODES		
D901	300919010	ESAC02-N, Rectifier
D902	300919009	ESAC02-C, Rectifier
	770101223	Pin, Terminal
	140800144	Printed Circuit Board "B-14"
	141810571	Rectifier Circuit Board Assembly

STABILIZER CIRCUIT BOARD

Schematic Location	Part No.	Description
R902	552022222	Resistor, Carbon Film, 2.2K $\pm 5\%$, 1/4W
C905	402100439	Electrolytic, 1000mfd, 35V
Q901	301301122	Transistor, 2SD317, Stabilizer
D903	300313009	Diode, BZ-240

Schematic Location	Part No.	Description
	120012233	Heat sink for Q901
	770101223	Pin, Terminal
	140800146	Printed Circuit Board "B-4"
	141810152	Stabilizer Circuit Board Assembly

RELAY CIRCUIT BOARD

Schematic Location	Part No.	Description
RESISTORS		
R903	552022322	Carbon Film, 22K \pm 5%, 1/4W
R904	551022033	Composition, 22 \pm 10%, 1/2W
C906	402470519	Capacitor, Electrolytic, 470mfd, 16V

Schematic Location	Part No.	Description
Q902	301301122	Transistor, 2SD317
RY901	240111221	Relay
	770101223	Pin, Terminal
	140800142	Printed Circuit Board "X-20"
	141810146	Delay Relay Circuit Board Assembly