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ROTEL®

Technical Manual

STEREO POWER AMPLIFIER

RB-2000

TABLE OF CONTENTS

Chassis Layout (Top View) 2
Adjustment 3
Specifications 7
Block Diagram. 7
Addendum. 8
Repair Parts List 12
Schematic Diagram 13
Driver Circuit Board Diagram 17
Power Meter Circuit Board Diagram 17
Protection Circuit Board Diagram. 18
Power Supply Circuit Board Diagram. 19
Inrush Absorber Circuit Board Diagram 19
Fuses Circuit Board Diagram 20
Speaker Switches Circuit Board Diagram. 20

Serial No. Beginning
NB75119

THE ROTEL CO., LTD.
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ROTEL ELECTRONICS CO., LTD.
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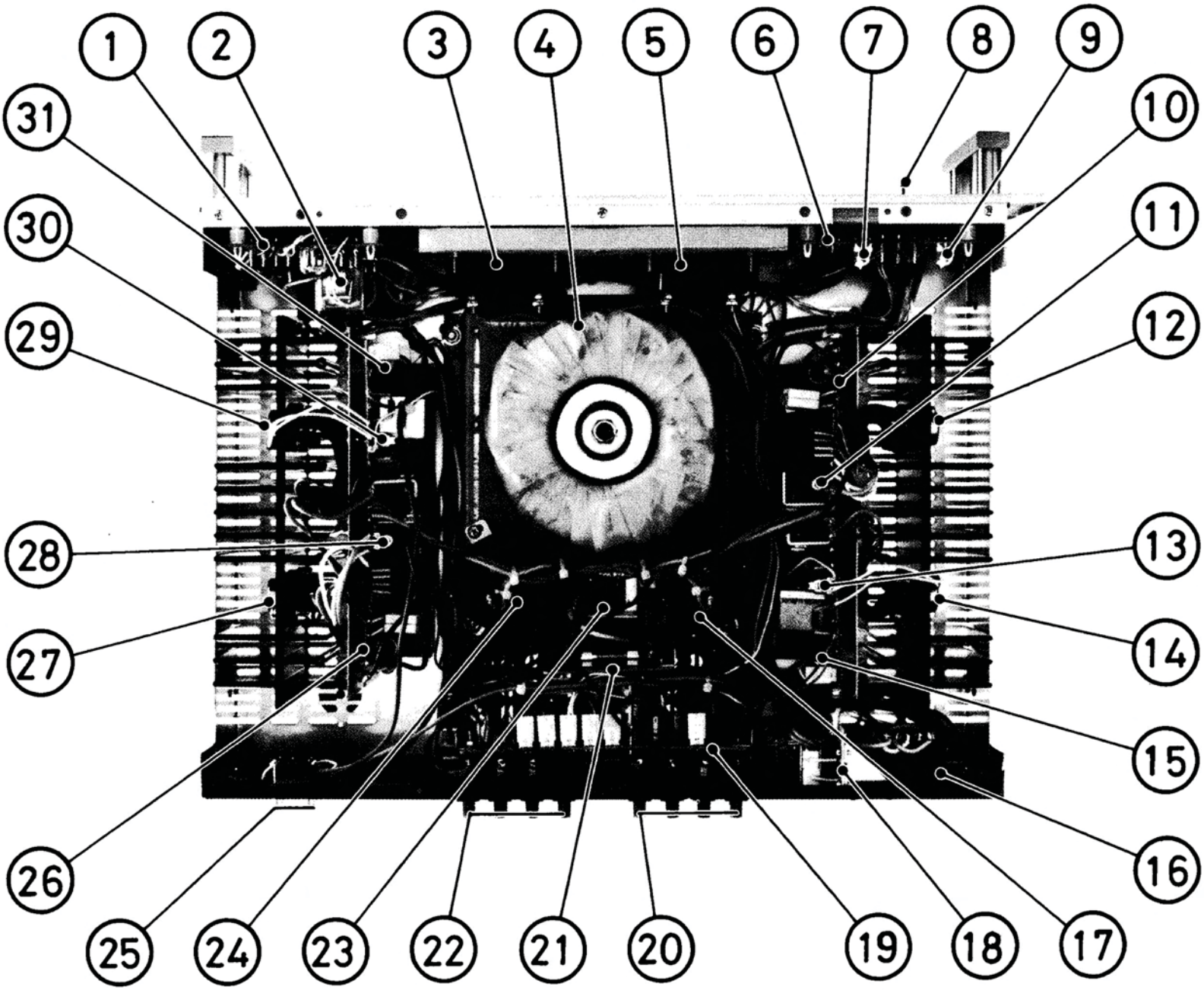
ROTEL OF AMERICA, INC.
1055 SAW MILL RIVER ROAD, ARDSLEY, N.Y. 10502, U.S.A.

Chassis Layout (Top View)



1. PROTECTION PC BOARD
2. RY201, SPEAKER RELAY
3. POWER METER, R-CH
4. T00L, POWER TRANSFORMER
5. POWER METER, L-CH
6. POWER METER AMP PC BOARD
7. VR402, METER CAL, R-CH
8. POWER SWICH
9. VR401, METER CAL, L-CH
10. DRIVER PC BOARD, L-CH
11. VR103, PROTECTION LEVEL ADJ, L-CH
12. Q003, 004, POWER AMP TRANSISTORS, L-CH
13. VR102, IDLING CURRENT ADJ, L-CH
14. Q001, 002, POWER AMP TRANSISTORS, L-CH
15. VR101, DC BALANCE ADJ, L-CH
16. VOLTAGE SELECTOR (MULTI-VOLTAGE TYPE ONLY)
17. C003, SMOOTHING CAPACITOR
18. INRUSH CURRENT ABSORBER PC BOARD
19. POWER SUPPLY PC BOARD
20. SPEAKER A TERMINALS
21. FUSES PC BOARD
22. SPEAKER B TERMINALS
23. D001, RECTIFIER FOR POWER AMP
24. C004, SMOOTHING CAPACITOR
25. INPUT JACKS
26. DRIVER PC BOARD, R-CH
27. Q007, 008, POWER AMP TRANSISTORS, R-CH
28. VR103', PROTECTION LEVEL ADJ, R-CH
29. Q005, 006, POWER AMP TRANSISTORS, R-CH
30. VR102', IDLING CURRENT ADJ, R-CH
31. VR101', DC BALANCE ADJ, R-CH

Adjustment

Instruments: Audio Generator, HD Analyzer, AC Voltmeter, DC Voltmeter, Load Resistors of 8 ohms (250 watts) and 2 ohms (250 watts).

Note: The unit goes into operation (Protection Indicator goes off) 3 ~ 10 seconds after the power is turned on.

I. DC BALANCE ADJUSTMENT

1. Short-circuit the input terminals. Connect DC Voltmeter between pins 17 and E2 on Driver PC board. If the meter needle does not deflect in normal direction, reverse the polarity.
2. Adjust potentiometer VR101 on Driver PC board so that the meter reads 0 volt.
3. Make the same adjustment for the other channel following steps 1 and 2.

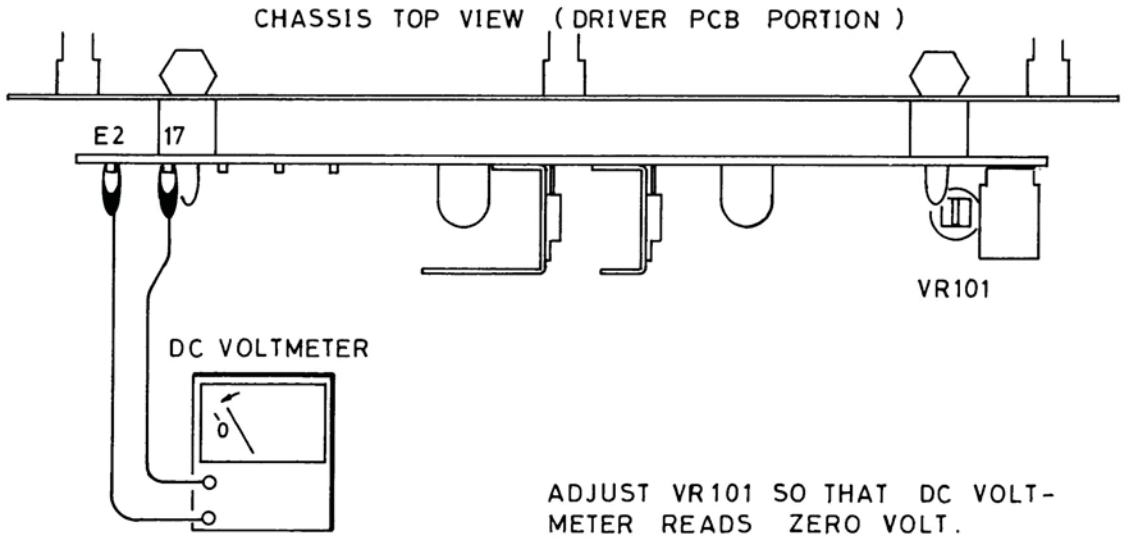


Fig.1. DC Balance Adjustment

II. IDLING CURRENT ADJUSTMENT

1. Leave the input terminals short-circuited. Connect DC Voltmeter between pins 15 and 16 on Driver PC board (minus lead to pin 15 and plus lead to pin 16).
2. Adjust potentiometer VR102 on Driver PC board to obtain 140mV reading on DC Voltmeter.
3. Make the same adjustment for the other channel following steps 1 and 2 above.

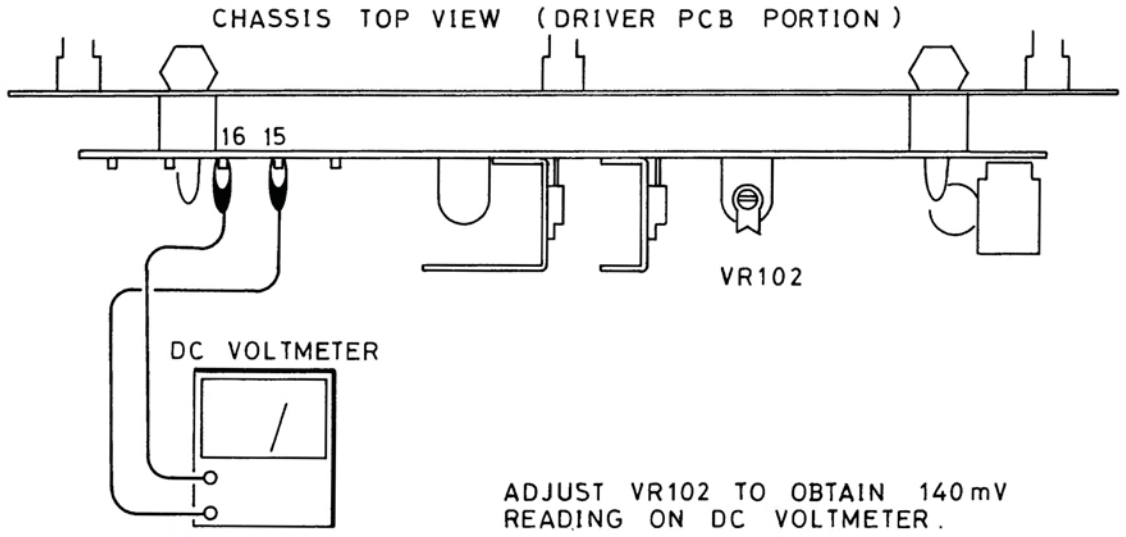


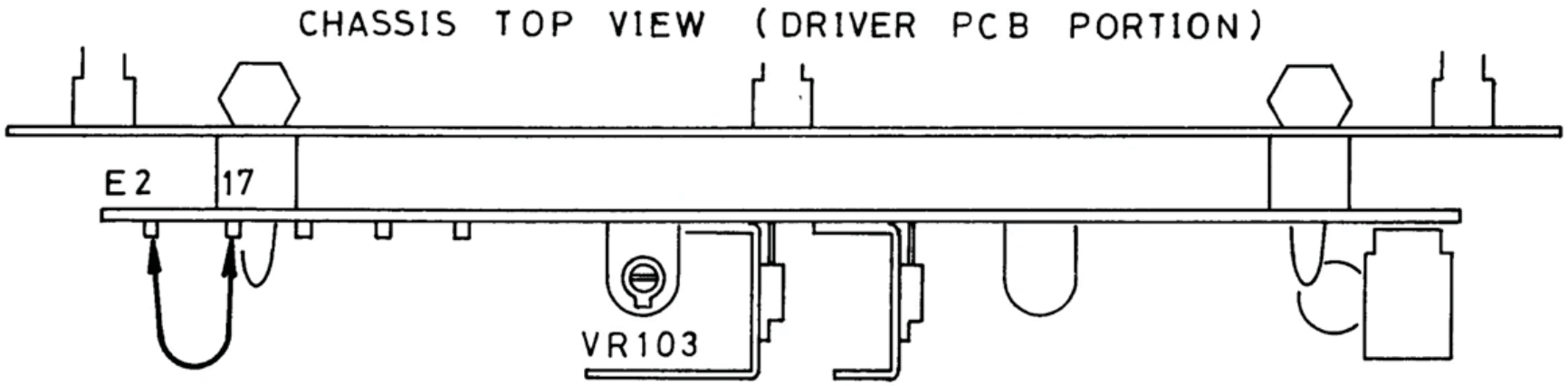
Fig.2. Idling Current Adjustment

III. OVERLOAD PROTECTION ADJUSTMENT

Make this adjustment for right and left channels separately (feed signal only to the channel to be adjusted).

1. Connect an 8-ohm load resistor to speaker terminals. Connect AC Voltmeter in parallel with the load resistor. Feed 1,000Hz (sine wave) signal to the input terminal from Audio Generator. Adjust input level (output level of Audio Generator) so that AC Voltmeter reads 0.5 volts.
2. Keeping this state, adjust potentiometer VR103 on Driver PC board so that Speaker Relay RY201 is switched to OFF the instant pins 17 and E2 on Driver PC board are short-circuited.
3. Set Power Switch to OFF to release the protection circuit, then back to ON. Adjust the output level of Audio Generator to obtain 0.45-volt reading on AC Voltmeter.
   In this state, check to see that Speaker Relay is not at OFF, even if pins 17 and E2 are shorted.

Note: Pins 17 and E2 must be short-circuited within one second, for both steps 2 and 3. If short-circuited state is maintained for a prolonged period until the relay is set to OFF, the power transistor, etc. may be damaged.



ADJUST VR103 SO THAT SPEAKER RELAY IS SET TO OFF THE INSTANT PINS 17 AND E2 ARE SHORT CIRCUITED

Fig.3. Protection Adjustment

IV. WATTMETER CALIBRATION

1. Connect an 8-ohm load resistor to speaker terminals. Connect AC Voltmeter in parallel with the load resistor. Connect Audio Generator to input terminals, and apply 1,000Hz (sine wave) signal.
2. Adjust input level so that AC Voltmeter reads 31 volts.
   Adjust potentiometer VR401 (VR402 for R-ch) on Meter Amplifier PC board to obtain 120 watts on Wattmeter.

FUNCTION OF PROTECTION IC'S

A. IC201 terminal 3 is used as a mid-point-electrostatic-potential detector circuit. When DC voltage is produced at this terminal, Speaker Relay RY201 is set to OFF, and when DC voltage disappears, the relay resets itself to the normal state. (To check this, apply about 5-volt DC.)

B. IC201 terminal 5 is used as an AC voltage detector circuit.
   Relay RY201 is set at ON with AC voltage input. (The terminal is designed to set Relay RY201 to OFF the moment Power Switch is set to OFF.)

C. IC201 terminal 6 is used as an overload detector circuit. Relay RY201 is activated when the unit is overloaded. This circuit does not reset itself to the normal state; it is necessary to cut the power momentarily and then restore power.
   (In checking, produce output of about 1 watt and short-circuit speaker terminals ⊕ and ⊖)

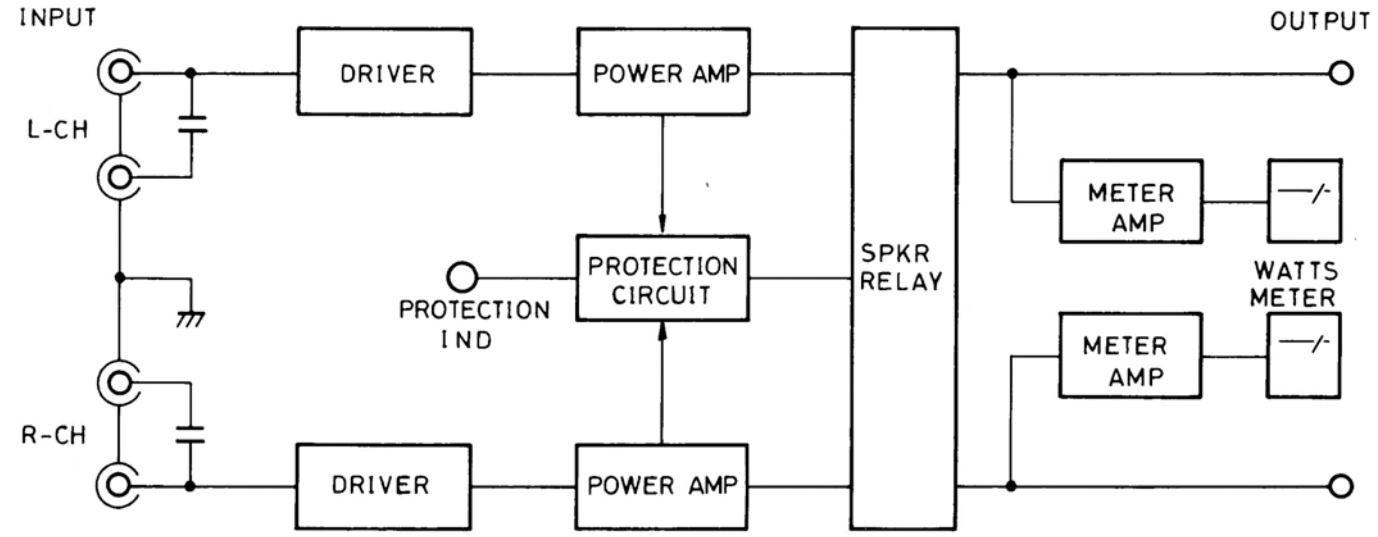
Specifications

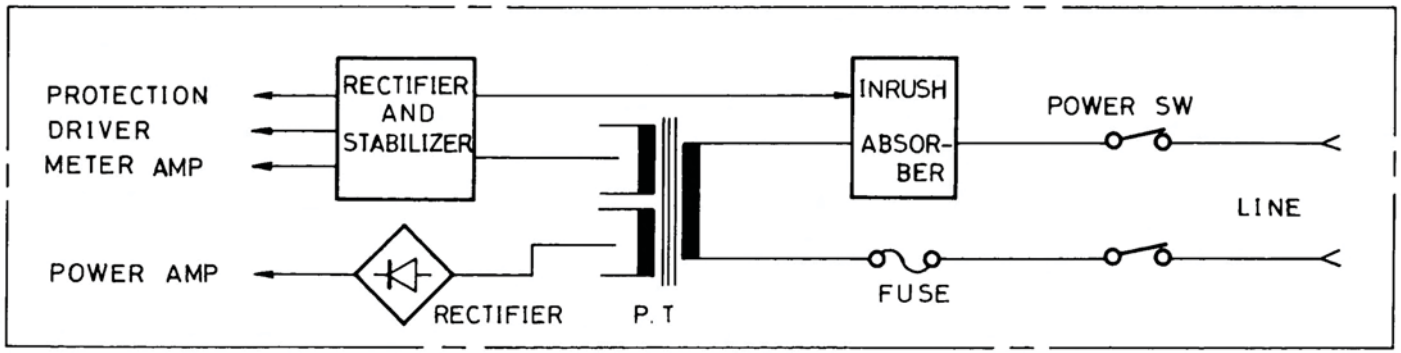
Continuous Power Output	120 watts* per channel RMS both channels driven at 8 ohms (or 4 ohms) from 20 to 20,000Hz with no more than 0.01% total harmonic distortion.
Total Harmonic Distortion	No more than 0.01% (continuous rated power output). No more than 0.006% (60 watts per channel power output at 8-ohm load). No more than 0.008% (1 watt per channel power output at 8-ohm load).
Intermodulation Distortion (60Hz: 7,000Hz = 4 : 1)	No more than 0.015% (continuous rated power output). No more than 0.015% (60 watts per channel power output at 8-ohm load). No more than 0.008% (1 watt per channel power output at 8-ohm load).
Frequency Response	DC IN 4 to 100,000Hz +0dB, −1dB AC IN 5 to 100,000Hz +0dB, −1dB (1 watt per channel power output at 8-ohm load).
Input Sensitivity/Impedance	1.5 volts/50 kilohms at 1,000-Hz, 120-watt output.
Damping Factor	60 (20Hz to 20,000Hz, 8-ohm load). 100 (1,000-Hz, 8-ohm load).
Hum and Noise	110dB (IHF, A network).
Crosstalk	65dB at 10kHz (reverse channel input shorted).
Power Requirements	120 volts/60Hz; 220 volts/50Hz; 240 volts/50Hz or 100, 120, 220, 240 volts/50-60Hz (switchable).
Power Consumption	900 watts
Dimensions (overall)	482 (W) × 143(H) × 430(D) mm
Weight (net)	18 kg

Note: Specifications and design are subject to possible modification without notice.

* Measured pursuant to the Federal Trade Commission's Trade Regulation Rule on Power Claim for Amplifiers (Applicable to the U.S. only.)

Block Diagram

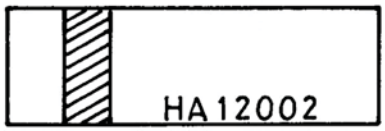




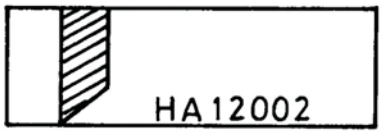
Addendum

1. IC (HA-12002) used in the protection circuit has been changed to a new IC marked HA-12002W*. HA-12002W is listed in the repair parts noted in this manual.
   (N.B. The new IC has the same number on the IC molding as on the old one. To distinguish them, note carefully the shape of the band printed on the molding. See Marking of IC in Fig. A.
   As the circuit constant of the new IC is different from conventional ones, when using the new IC, be sure to remove R201 and R202 (82kΩ) on the protection circuit, replacing them with 56kΩ resistors.

* Shape of band (portion in oblique lines) differs.



Conventional marking



"W" type marking

Fig.A. Marking on IC Molding

2. The overload detector circuit has been modified. This change is applicable to all units with serial numbers NB80100 or over.
   a) The new overload protection circuit saves adjustment of overload protection. Accordingly, registors R121, 128, 129 and VR103, and transistor Q114 are eliminated from the Driver PC Board of the new unit.
   b) Because of the modification explained in 2. a), the new Driver PC Board assembly used for repair is given a new number, to distinguish it from conventional Driver PC Board.
      - ○ Driver PC Board assembly (Part No. 141610320) is applicable to units with serial nos. NB80100 or over.
      - ○ The newly designed Overload Detector PC Board assembly: Part No. 141810850.
   c) To attach the new Overload Detector PC Board to conventional units (with serial nos. up to NB80099, it is necessary to drill a hole in the Driver PC Board fitting plate. The following parts are necessary to attach the new PC board. See Fig. B-2 for mounting position.

PARTS REQUIRED:

1) PC board fitting plate: Part No. 120012231 . . 1
2) Screw ⊕3 × 6mm: Part No. 766213006 . . 2
3) Nut, M3 Hexagonal: Part No. 770402201 . . 1

HOW TO ATTACH

1) Drill a ϕ3.5 hole in the Driver PC Board fitting plate. See Fig. B-1.
2) Attach the Overload Detector PC Board to the Driver PC Board fitting plate as shown in Fig. B-2.
3) The fitting position of the Overload Detector PC Board as seen from chassis top is illustrated in Fig. B-3.

d) See Figs. C and D for the new overload detector circuit and connection.
e) To check operation of overload protection circuit when new Overload Detector PC Board is employed:
   1) Connect an 8Ω load resistor to speaker terminals and produce 1-volt output (1,000Hz, sine wave signal) at the terminals.
   2) Maintaining this state, short-circuit pins 17 and E2 on Driver PC board and check that the speaker relay is set to OFF.

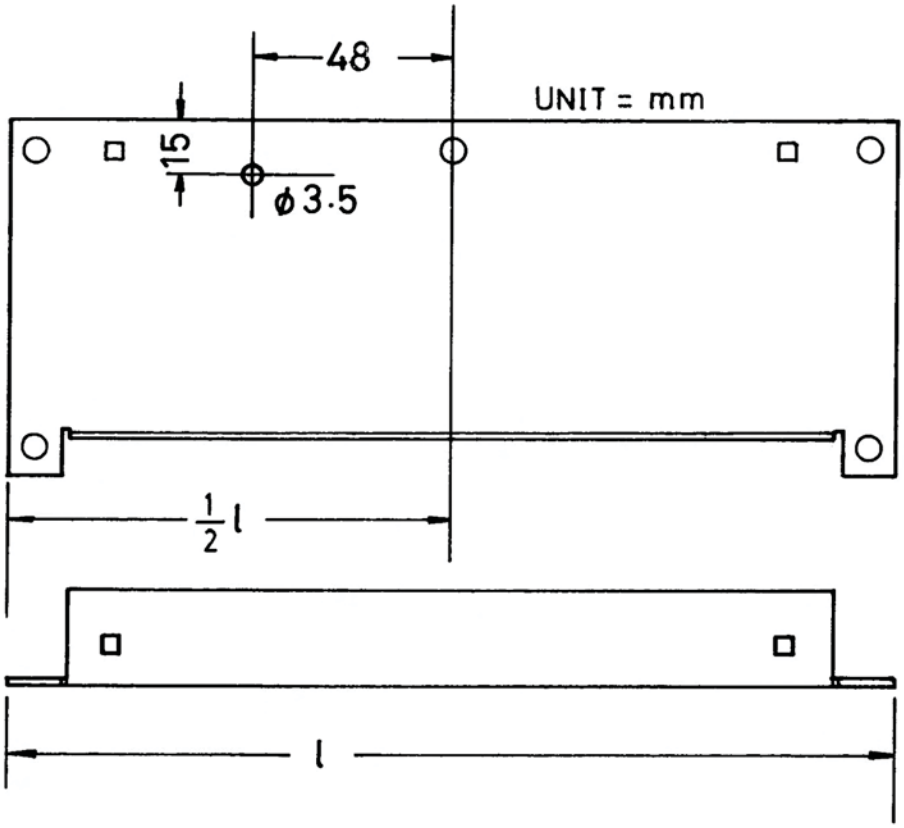


Fig.B-1

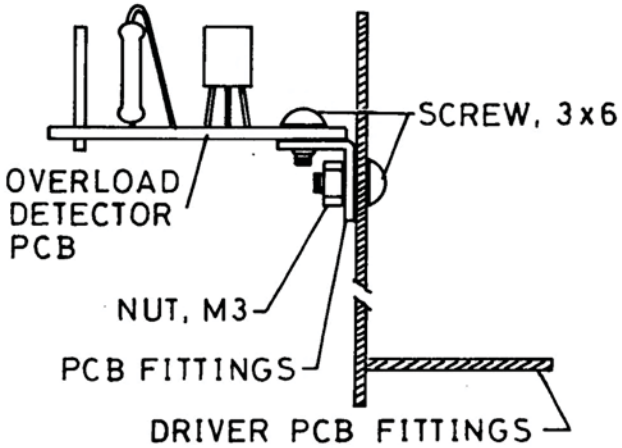


Fig.B-2

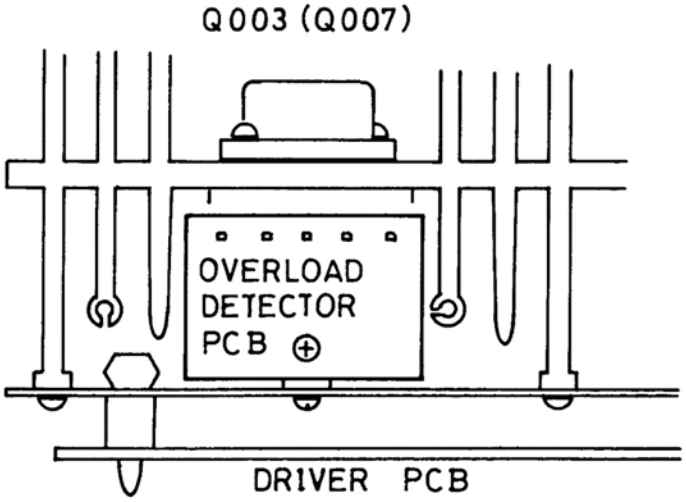


Fig.B-3

CHASSIS TOP VIEW
(POWER AMP PORTION)

- **Schematic Diagram (Overload Detector Circuit Portion): Applicable to units with serial numbers NB80100 or over.**

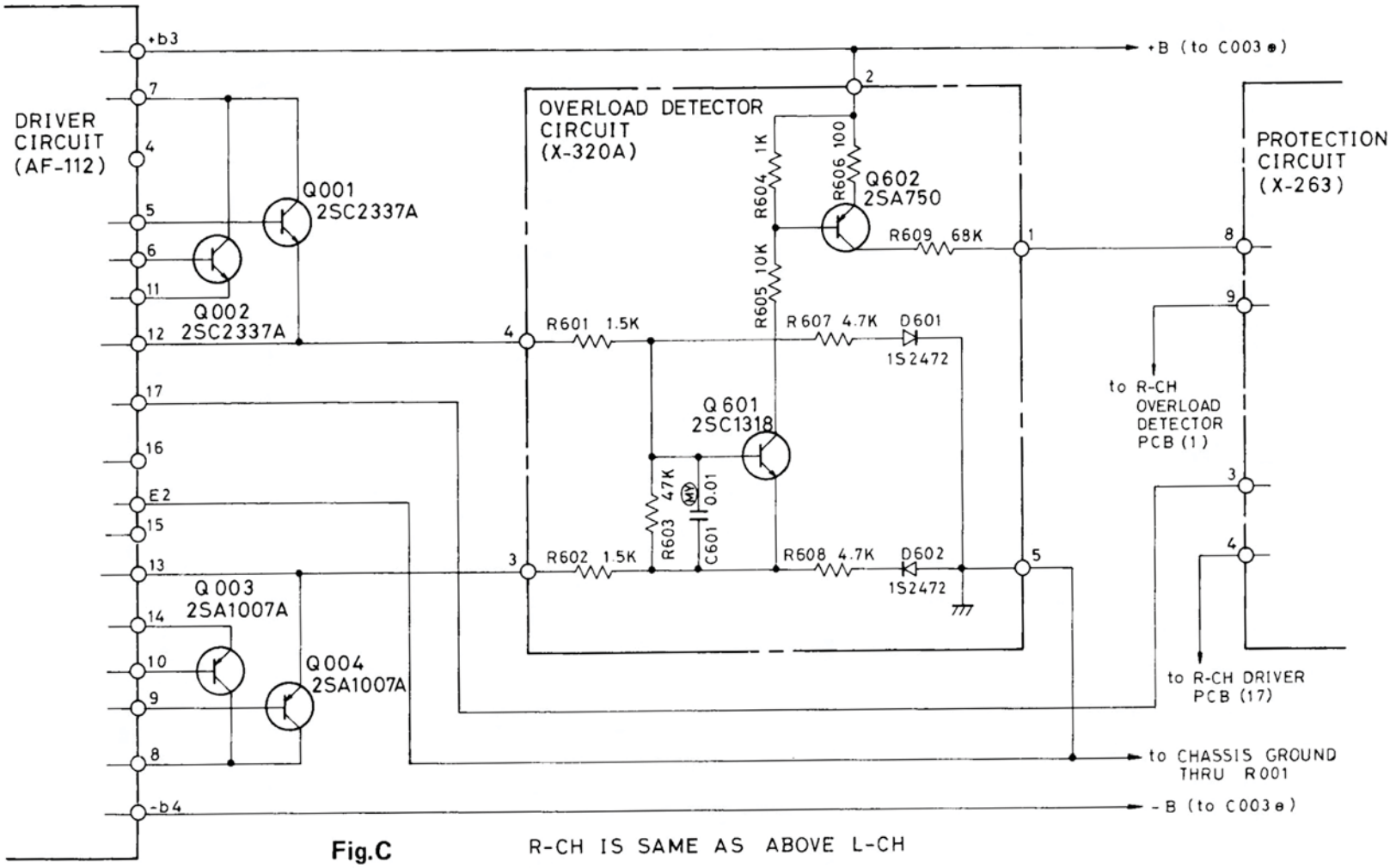


Fig.C R-CH IS SAME AS ABOVE L-CH

Overload Detector Circuit Board Diagram

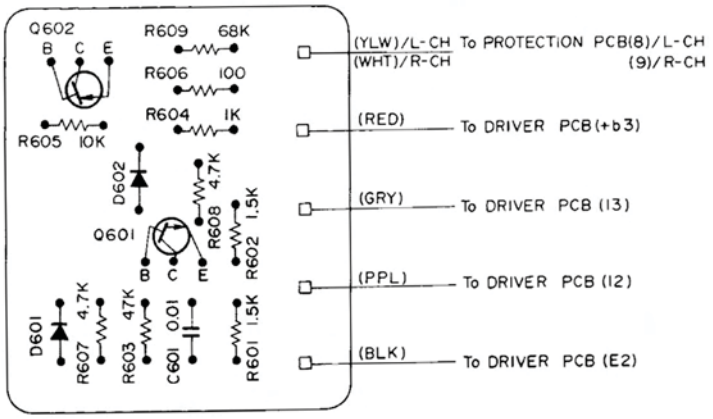


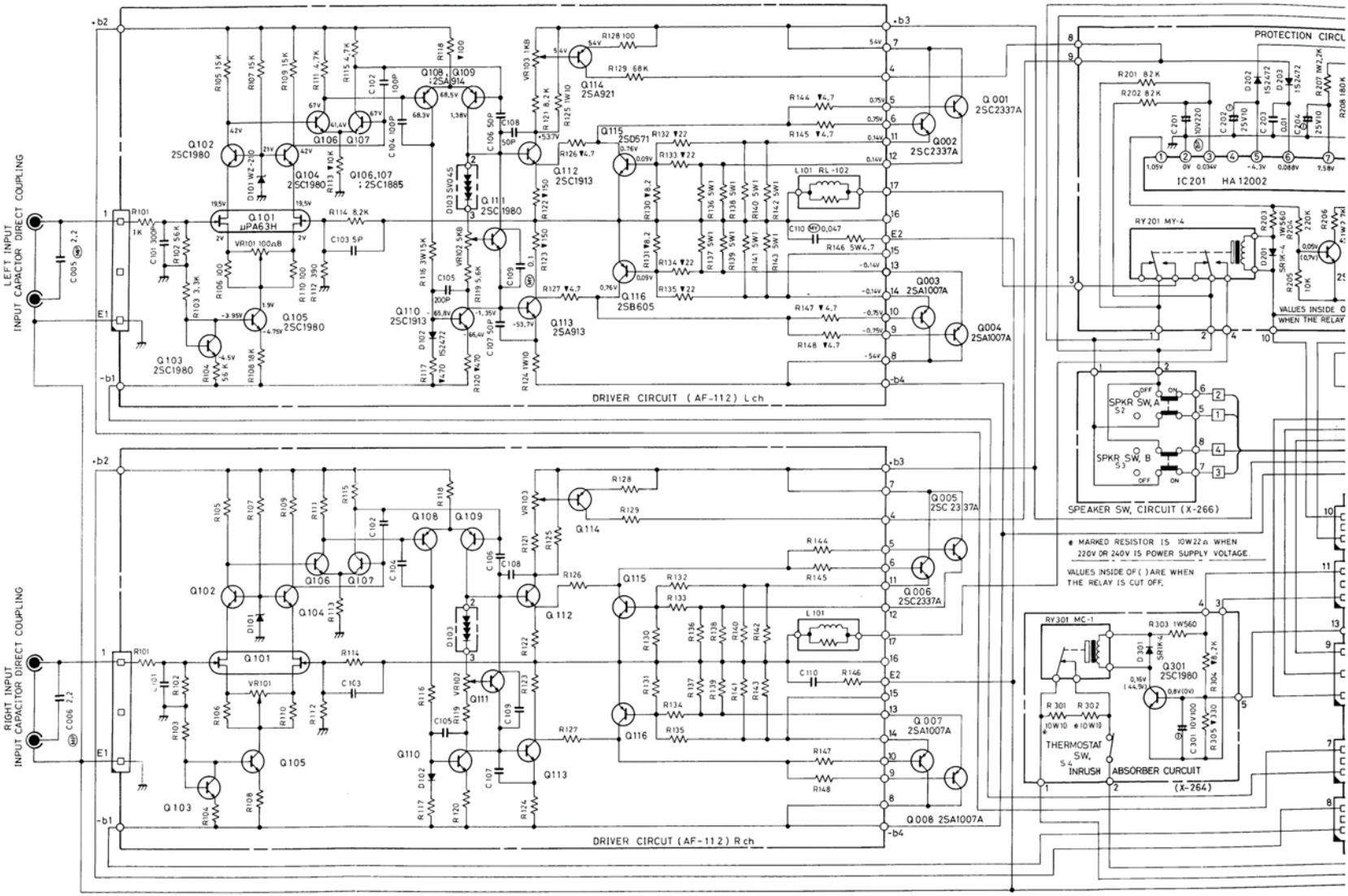
Fig.D

Repair Parts List

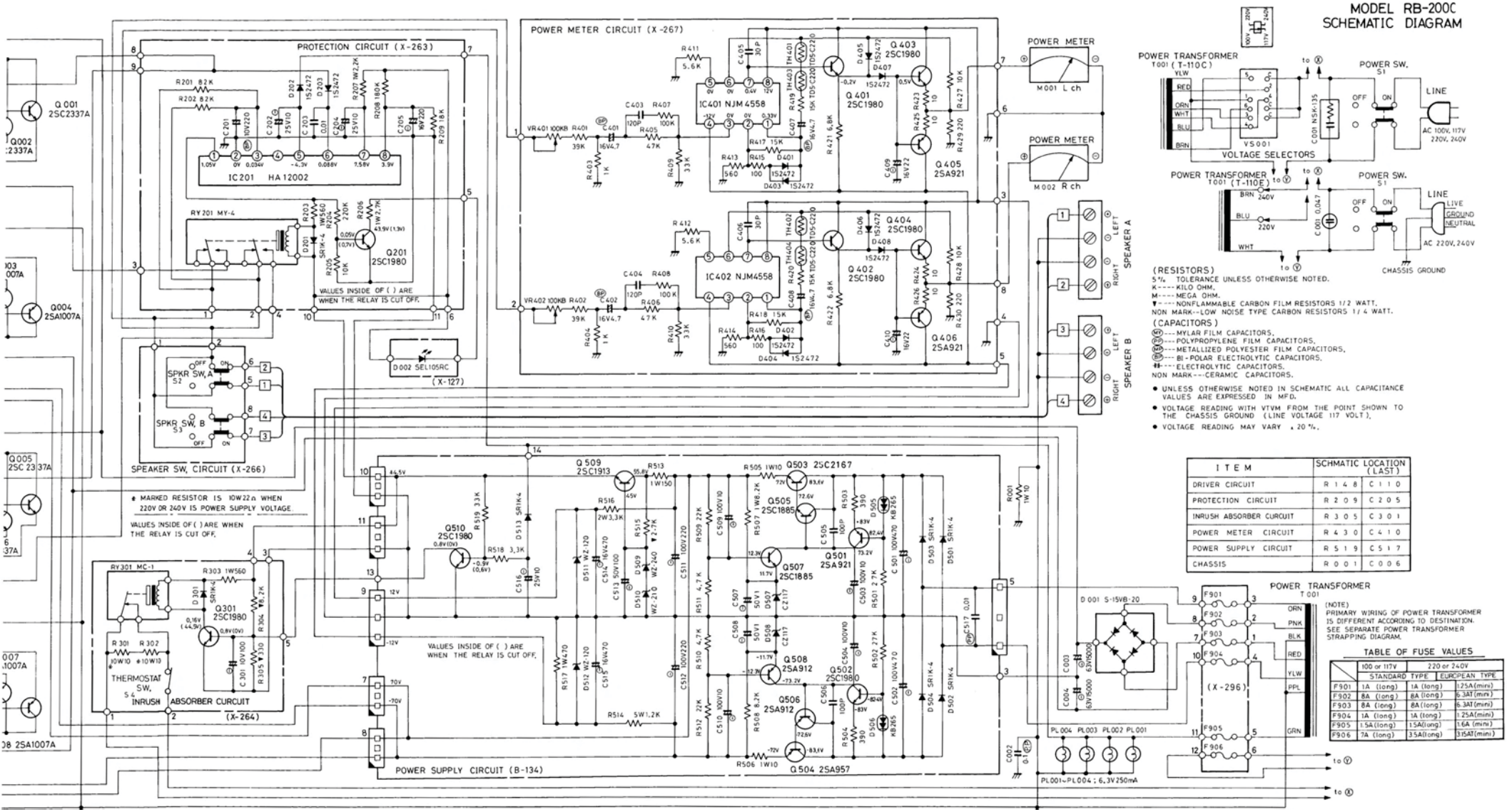
Schematic Location	Part No.	Description
TRANSISTORS, DIODES AND IC'S		
Q101	302001121	μPA63H, Dual FET
Q102, 103, 104 105, 111, 201 301, 401, 402 403, 404, 502 510	301201171	2SC1980 (S) or (T)
Q106, 107, 505 507	301201164	2SC1855 (R) or (S)
Q108, 109	301001151	2SA914 (S) or (T)
Q110, 112, 509	301201165	2SC1913 (R) or (Q)
Q113	301001143	2SA913 (R) or (Q)
Q114, 405, 406 501	301001145	2SA921 (S) or (T)
Q115	301301134	2SD571 (K) or (L)
Q116	301101124	2SB605 (K) or (L)
Q503	301201181	2SC2167 (Q) or (Y)
Q504	301001148	2SA957 (Q) or (Y)
Q506, 508	301001142	2SA912 (R) or (S)
Q001, 002, 005 006	301201187	2SC2373A (Q) or (R)
Q003, 004, 007 008	301001157	2SA1007A (Q) or (R)
D101, 510	300313016	WZ-210, 21V, 0.5W, Zener Regulator
D102, 202, 203 401, 402, 403 404, 405, 406 407, 408	300111010	1S2472
D103	300212010	SV04S, Varistor
D201, 301, 501 502, 503, 504 513	300919024	SR1K-4, Power Diode
D505, 506	300212002	KB265, Varistor
D507, 508	300313030	CZ-117, Zener Regulator
D509	300313025	WZ-240, 24V, 0.5W, Zener Regulator
D511, 512	300313013	WZ-120, 12V, 0.5W, Zener Regulator
D001	300919030	S-15VB-20, Rectifier
D002	300414014	SEL-105RC, LED
IC201	303452187	HA12002
IC401, 402	303452152	NJM4558
VARIABLE RESISTORS		
VR101	510502176	100B, DC Balance Adj
VR102	510502146	5KB, Idling Current Adj
VR103	510502145	1KB, Protection Level Adj
VR401, 402	510502149	100KB, Meter Calibration
OTHERS		
RY201	240111241	Protection Relay
RY301	240111240	Line Reley
M001, 002	231310083	Power Meter
S1	611001271	Power Switch
S2, 3 (1 set)	614020408	Speaker Switch
S4	615212260	Thermostat, 85°C
T001	205001439	Power Transformer, Multi-voltage Type (100V/120V/220V/240V)
	206001439	Power Transformer (220V/240V)
PL1001~004	359101116	Lamp, 6.3V, 0.25A, Blue
F901, 904	341221100	Fuse, 1A-3AG (Long), Standard Type
	345252125	Fuse, 1.25A (Midget), European Type
F902, 903	341221800	Fuse, 8A-3AG (Long), Standard Type
	345952630	Fuse, 6.3AT (Midget), European Type
F905	341221150	Fuse, 1.5A-3AG (Long), Standard Type
	345252160	Fuse, 1.6A (Midget), European Type
F906	341221700	Fuse, 7A-3AG (Long), Standard Type, for 100/120V Areas
	341221350	Fuse, 3.5A-3AG (Long), Standard Type, for 220V/240V Areas
	34525315	Fuse, 3.15A (Midget), European Type
TH401, 402, 403 404	511001112	Thermistor, TD5-C220
	141610315	Driver PC Board Assembly
	141810817	Overload Protection PC Board Assembly
	141810818	Inrush Absorber PC Board Assembly, for 100V/120V Areas
	141810849	Inrush Absorber PC Board Assembly, for 220V/240V Areas
	141810820	Power Meter PC Board Assembly
	141810824	Power Supply PC Board Assembly
	141810819	Speaker Switches PC Board Assembly
	141810821	Fuses PC Board Assembly, Standard Type for 100V/120V Areas
	141810822	Fuses PC Board Assembly, Standard Type for 220V/240V Areas
	141810823	Fuses PC Board Assembly, for European Type
	648211135	Meter Lamp Holder
	648211121	Voltage Selector
	649201118	Speaker Terminal, 4P
	624200204	Input Pin Jack Board, 4P
	648211147	Fuse Clip, for Midget Fuse
	648211163	Socket, Power Amp Transistor
	111911405	Front Panel Assembly w/o Handle
	670101118	Handle
	770911216	Collar, Handle Mtg
	138011295	Bonnet
	116210047	Button, Push Switch
	116310242	Knob, Lever Switch
	673402018	Foot
	770911212	Washer, Power Trans Mtg
	990201273	Rubber Pad, ϕ60, Power Trans Mtg
	990201274	Rubber Pad, ϕ130, Power Trans Mtg
	990201272	Rubber Sheet, t5, PT Mtg, for STD Type
	990201271	Rubber Sheet, t3, PT Mtg, for European Type

Schematic Location	Part No.	Description
	770911210	Screw, 8 x 70mm, PT Mtg
	770402211	Nut, M8, Hex, PT Mtg
	770500031	Flat Washer, ϕ9 x ϕ18 x t1.6, PT Mtg
	770500030	Spring Washer, ϕ8.2 x ϕ15.4 x t2, PT Mtg
	770402210	Nut, M5, Hex, Power Supply Chassis Mtg
	770500029	Spring Washer, ϕ5, Power Supply Chassis Mtg
	770500033	Flat Washer, ϕ5, Power Supply Chassis Mtg
	770911209	Screw, 6 x 40mm, Handle Mtg
	770402204	Nut, M6, Hex, Handle Mtg
	770500012	Spring, ϕ6, Handle Mtg
	762213006	Screw, 3 x 6mm, Oval Countersunk, Tap-tight
	705213004	Screw, 3 x 4mm, Binding Head
	766213006	Screw, 3 x 6mm, Tap-tight
	766223008	Screw, 3 x 8mm, Tap-tight (BLZ)
	725223008	Screw, 3 x 8mm, Tapping II (BLZ), Speaker Terminal Mtg
	770911166	Screw, 3 x 8mm, Flat Head (BLZ)
	766213012	Screw, 3 x 12mm, Tap-tight
	766213010	Screw, 3 x 10mm, Tap-tight
	766213020	Screw, 3 x 20mm, Tap-tight
	766223012	Screw, 3 x 12mm, Tap-tight (BLZ)
	765214008	Screw, 3 x 8mm, Tap-tight
	765214020	Screw, 4 x 20mm, Tap-tight
	765214012	Screw, 4 x 12mm, Tap-tight (BLZ)
	762213008	Screw, 3 x 8mm, Tap-tight, Oval Countersunk Head
	770500003	Flat Washer, ϕ3
	770500010	Spring Washer, ϕ3
	770500014	Teethed Washer, ϕ3
	770500002	Flat Washer, ϕ4 (BLZ)
	770402201	Nut, M3, Hex
	770911144	Nut, M3, Square, Transistor Mtg
	992001111	Collar, ϕ3, Transistor Mtg

Schematic Diagram



MODEL RB-200C
SCHEMATIC DIAGRAM



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

(CAPACITORS)
(MY)---- MYLAR FILM CAPACITORS.
(PP)---- POLYPROPYLENE FILM CAPACITORS.
(MM)---- METALLIZED POLYESTER FILM CAPACITORS.
(BP)---- BI-POLAR ELECTROLYTIC CAPACITORS.
⧺---- ELECTROLYTIC CAPACITORS.
NON MARK---CERAMIC CAPACITORS.

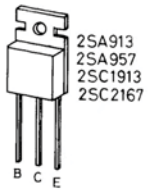
- UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED IN MFD.
- VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 117 VOLT).
- VOLTAGE READING MAY VARY ± 20 %.

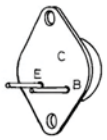
ITEM	SCHMATIC LOCATION (LAST)	
DRIVER CIRCUIT	R 1 4 8	C 1 1 0
PROTECTION CIRCUIT	R 2 0 9	C 2 0 5
INRUSH ABSORBER CURCUIT	R 3 0 5	C 3 0 1
POWER METER CIRCUIT	R 4 3 0	C 4 1 0
POWER SUPPLY CIRCUIT	R 5 1 9	C 5 1 7
CHASSIS	R 0 0 1	C 0 0 6

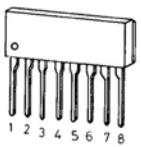
(NOTE)
PRIMARY WIRING OF POWER TRANSFORMER IS DIFFERENT ACCORDING TO DESTINATION. SEE SEPARATE POWER TRANSFORMER STRAPPING DIAGRAM.

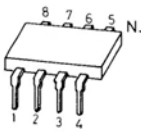
TABLE OF FUSE VALUES

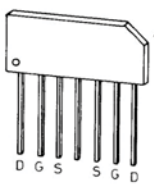
	100 or 117V	220 or 240V	
	STANDARD TYPE		EUROPEAN TYPE
F901	1A (long)	1A (long)	125A(mini)
F902	8A (long)	8A (long)	6.3AT(mini)
F903	8A (long)	8A (long)	6.3AT(mini)
F904	1A (long)	1A (long)	1.25A(mini)
F905	1.5A(long)	1.5A(long)	1.6A (mini)
F906	7A (long)	3.5A(long)	3.15AT(mini)



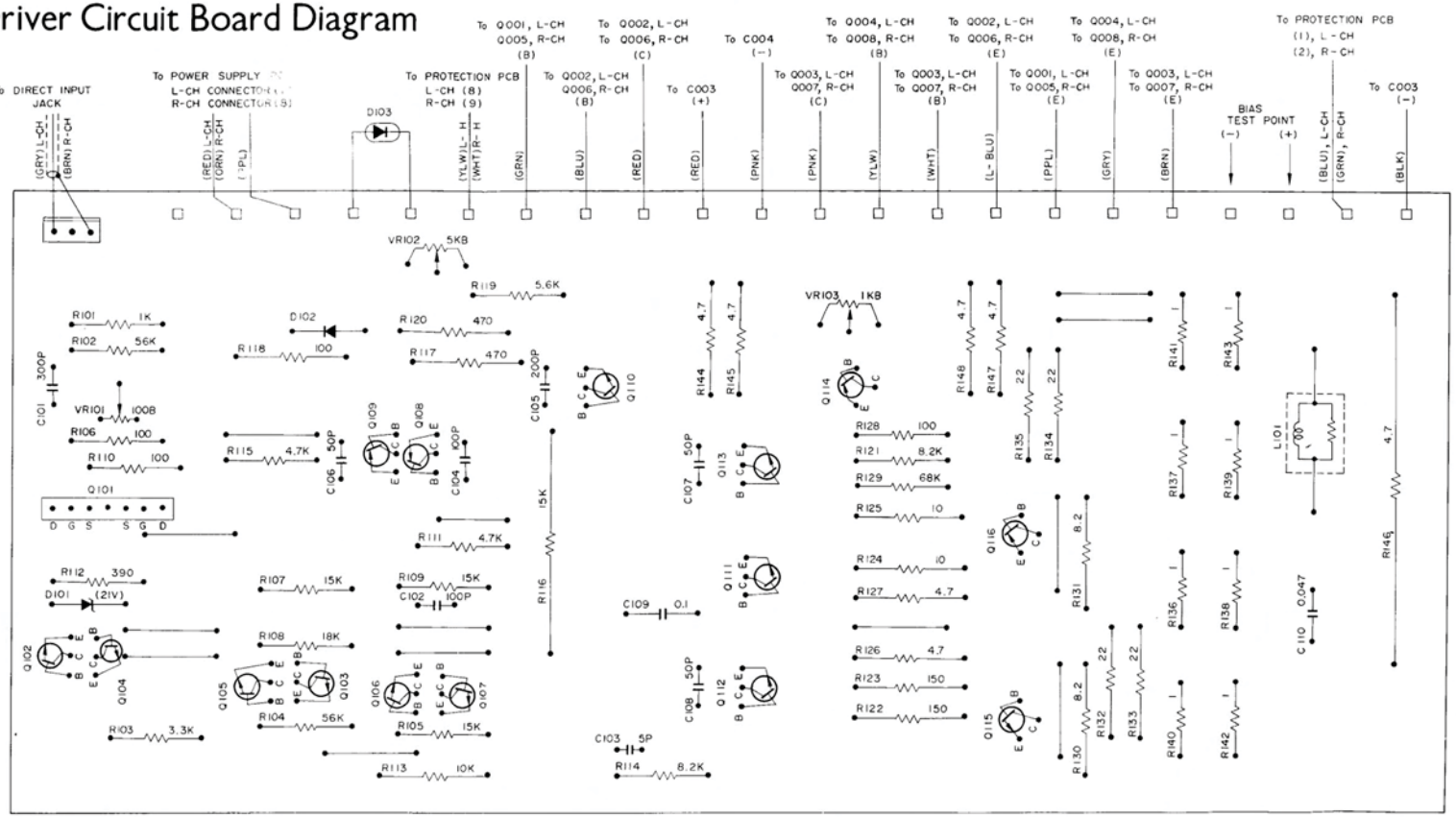




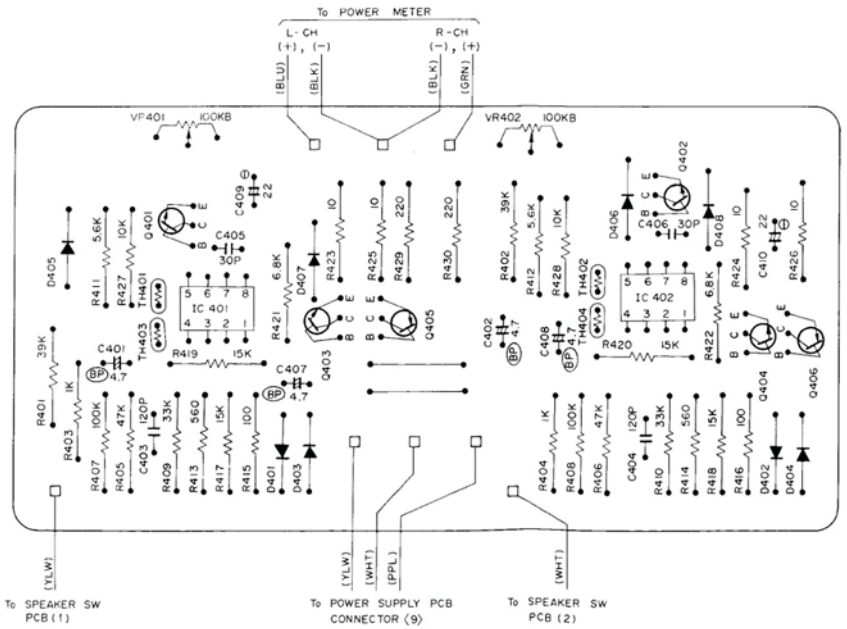




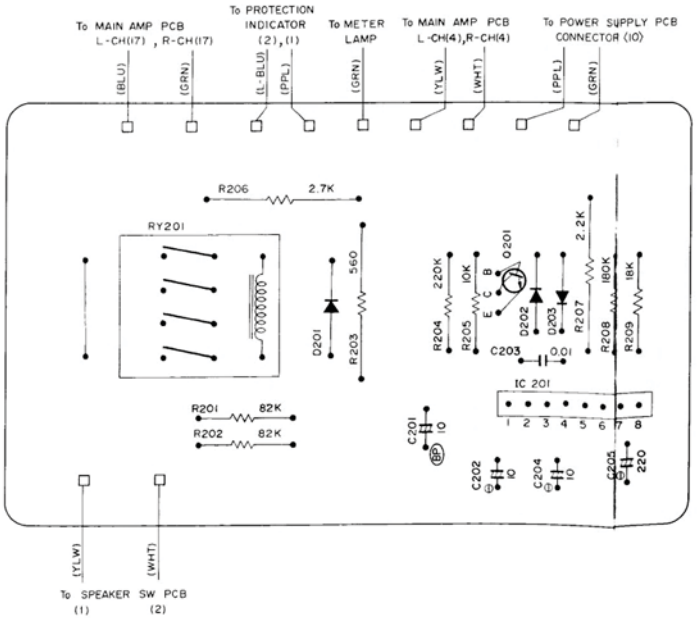
Driver Circuit Board Diagram



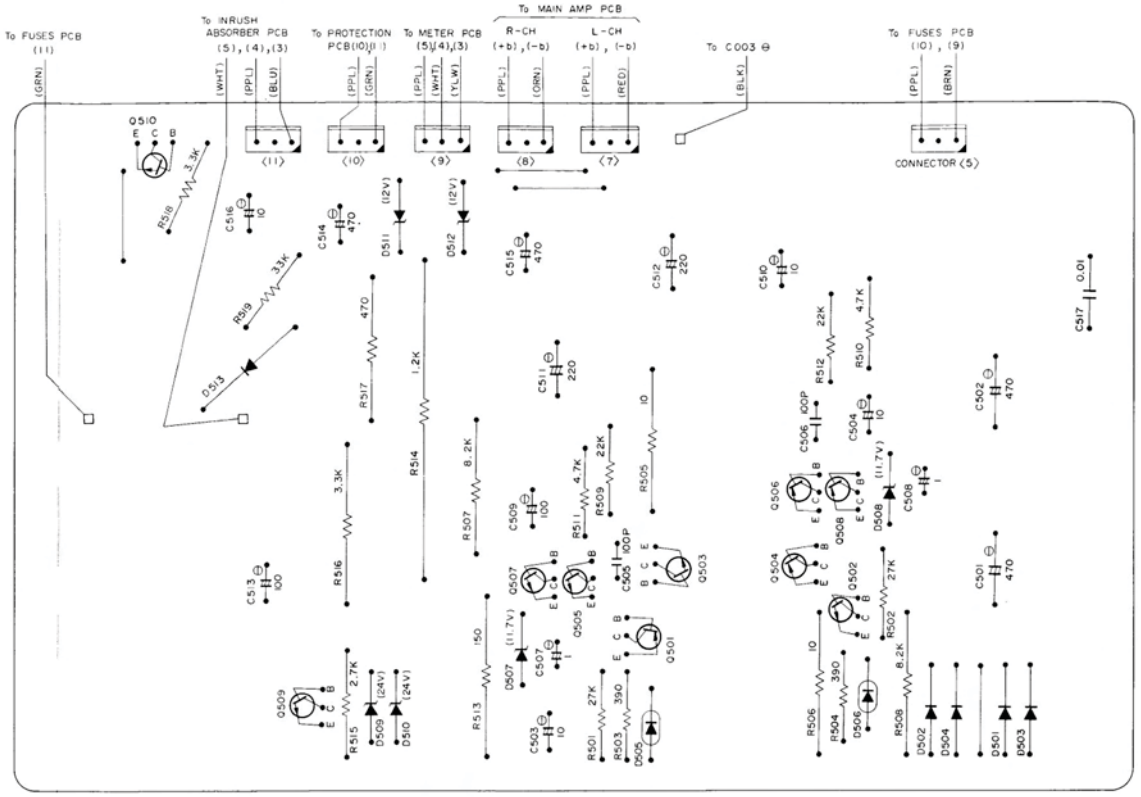
Power Meter Circuit Board Diagram



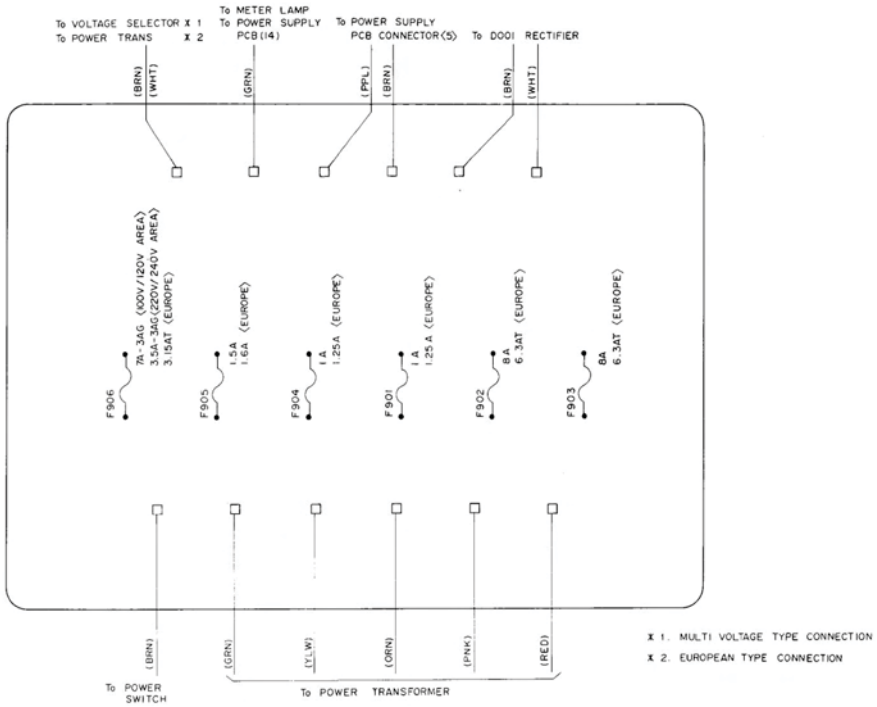
Protection Circuit Board Diagram



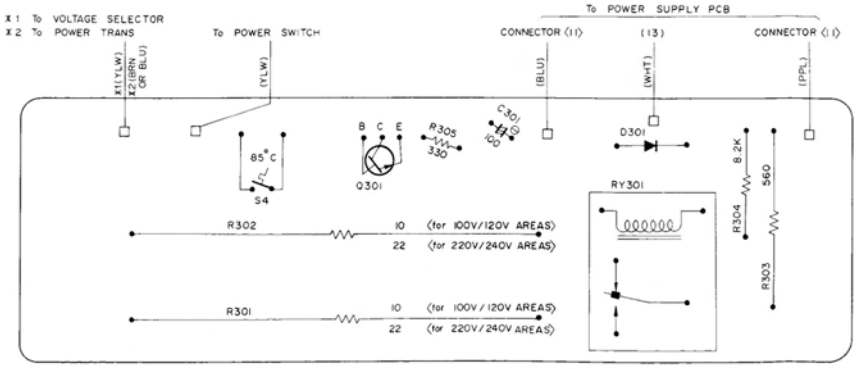
Power Supply Circuit Board Diagram



Fuses Circuit Board Diagram



Inrush Absorber Circuit Board Diagram



Speaker Switches Circuit Board Diagram