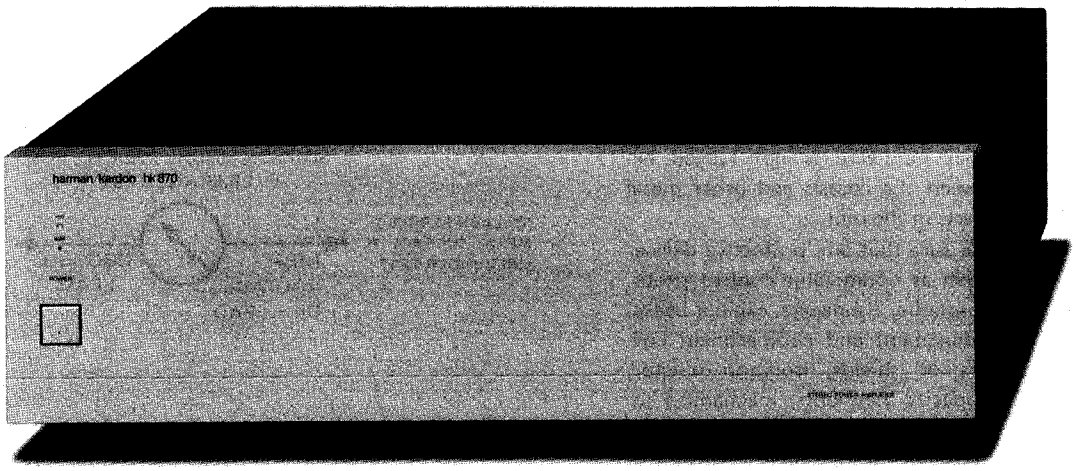
The Harman Kardon
Model hk870

Manual No.65A

STEREO POWER AMPLIFIER

Technical Manual



harman/kardon
240 CROSSWAYS PARK WEST, WOODBURY, N.Y. 11797
1112-H15265A0 P-08836 1250 PRINTED IN JAPAN

SPECIFICATIONS

	Nominal	Limit
Input Sensitivity	1.0V	± 0.2V
Input Impedance at 1kHz	22kΩ	± 2kΩ
Frequency Response	0.1Hz ~ 170kHz	≥ 150kHz
Signal to Noise Ratio	98dB	≥ 90dB
Channel Separation at 10kHz	73dB	≥ 70dB
Total Harmonic Distortion		
20Hz	0.017%	≤ 0.03%
1kHz	0.016%	≤ 0.03%
20kHz	0.021%	≤ 0.035%
RMS Output Power		
8Ω, 20Hz ~ 20kHz, THD 0.06%	110W	≥ 100W
4Ω, 1kHz, THD 0.06%	160W	≥ 150W
Power Bandwidth (1/2 rated power)	20Hz ~ 80kHz	≥ 70kHz
IM Distortion Ratio at 1W	0.05%	≤ 0.07%
Damping Factor at 1kHz	125	≥ 100

	Nominal	Limit
Slew Rate	160V /μs	≥ 130V/μs
DC Balance	0mV	± 50mV
Idle Current	75mA	± 5mA
Current Capability	60A	≥ 53A
Dimensions (W x H x D)	443 x 135 x 386 mm	
Weight	12.3 kg	
Power Supply	AC 120V, 60Hz	
Power Consumption	550W	

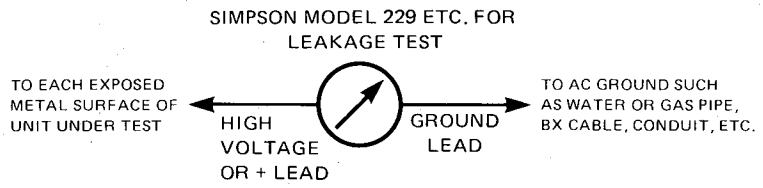
This specification is the target of servicing. But, there is a case that the specification is not applicable to the measurement condition and instrument.

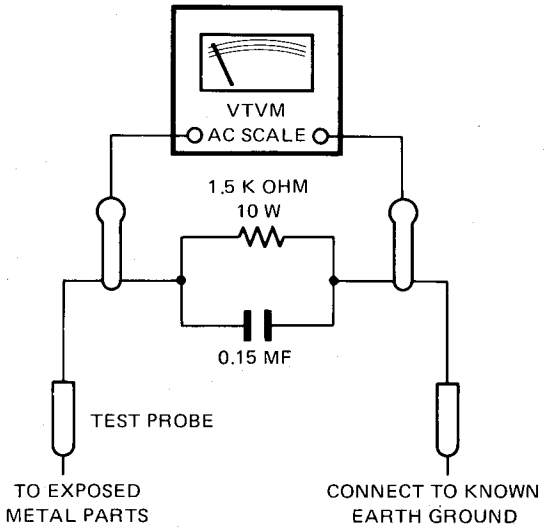
Specifications and components subject to change without notice. Overall performance will be maintained or improved.

LEAKAGE TEST

Before returning the unit to the user, perform the following safety checks:

1. Inspect all lead dress to make certain that leads are not pinched or that hardware is not lodged between the chassis and other metal parts in the unit.
2. Be sure that any protective devices such as nonmetallic control knobs, insulating fishpapers, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacity networks, mechanical insulators, etc. which were removed for servicing are properly reinstalled.
3. Be sure that no shock hazard exists; check for leakage current using Simpson Model 229 Leakage Tester, standard equipment item No. 21641, RCA Model WT540A or use alternate method as follows:
   Plug the AC line cord directly into a 120-volt AC receptacle (do not use an Isolation Transformer for this test). Using two clip leads, connect a 1500 ohm, 10-watt resistor paralleled by a 0.15mf capacitor, in series with all exposed metal cabinet parts and a known earth ground, such as a water pipe or conduit. Use a VTVM or VOM with 1000 ohms per volt, or higher, sensitivity to measure the AC voltage drop across the resistor. (See Diagram.) Move the resistor connection to each exposed metal part having a return path to the chassis (antenna, metal, cabinet, screw heads, knobs and control shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor. (This test should be performed with the power switch in both the On and Off positions.)
   A reading of 0.35 volt RMS or more is excessive and indicates a potential shock hazard which must be corrected before returning the unit to the owner.





DISASSEMBLY PROCEDURES (REFER TO PAGES 4 AND 10)

Note: When replacing parts, discharge by shorting between terminals of the capacitor (C7, 8, 9, 10, 28, 29, 30, 31) at the power source with 8Ω 100W resistor as it may have charge accumulated.

1 CABINET TOP REMOVAL

Remove 10 screws Ⓐ and remove the cabinet top.

2 FRONT PANEL ASSEMBLY (101) REMOVAL

1. Remove the cabinet top. (Refer to step 1 .)
2. Remove 6 screws Ⓑ and remove the front panel assembly.

3 POWER AMP. DRIVER P.C. BOARD (PCB-2) REMOVAL

1. Remove the cabinet top. (Refer to step 1 .)
2. Remove 2 screws Ⓒ and remove the power amp. driver P.C. board (PCB-2) with heat sink (196) upward. If necessary, unsolder the leads.

4 POWER SUPPLY P.C. BOARD (PCB-4) REMOVAL

1. Remove the power amp. driver P.C. board (PCB-2). (Refer to step 3 .)
2. Remove 3 screws Ⓓ and remove the power supply P.C. board (PCB-4). If necessary, unsolder the leads.

5 MAIN P.C. BOARD (PCB-1) REMOVAL

1. Remove the power amp. driver P.C. board (PCB-2). (Refer to step 3 .)
2. Remove 2 screws Ⓔ and remove the input jack P.C. board (PCB-7).
3. Remove 12 screws Ⓕ and remove the main P.C. board (PCB-1). If necessary, unsolder the leads.

ALIGNMENT PROCEDURES

Conditions:
- After the power switch is pushed on, wait for 20 minutes before measuring to be sure of the most stable operation.
- Make the adjustment at a room temperature of 25°C.

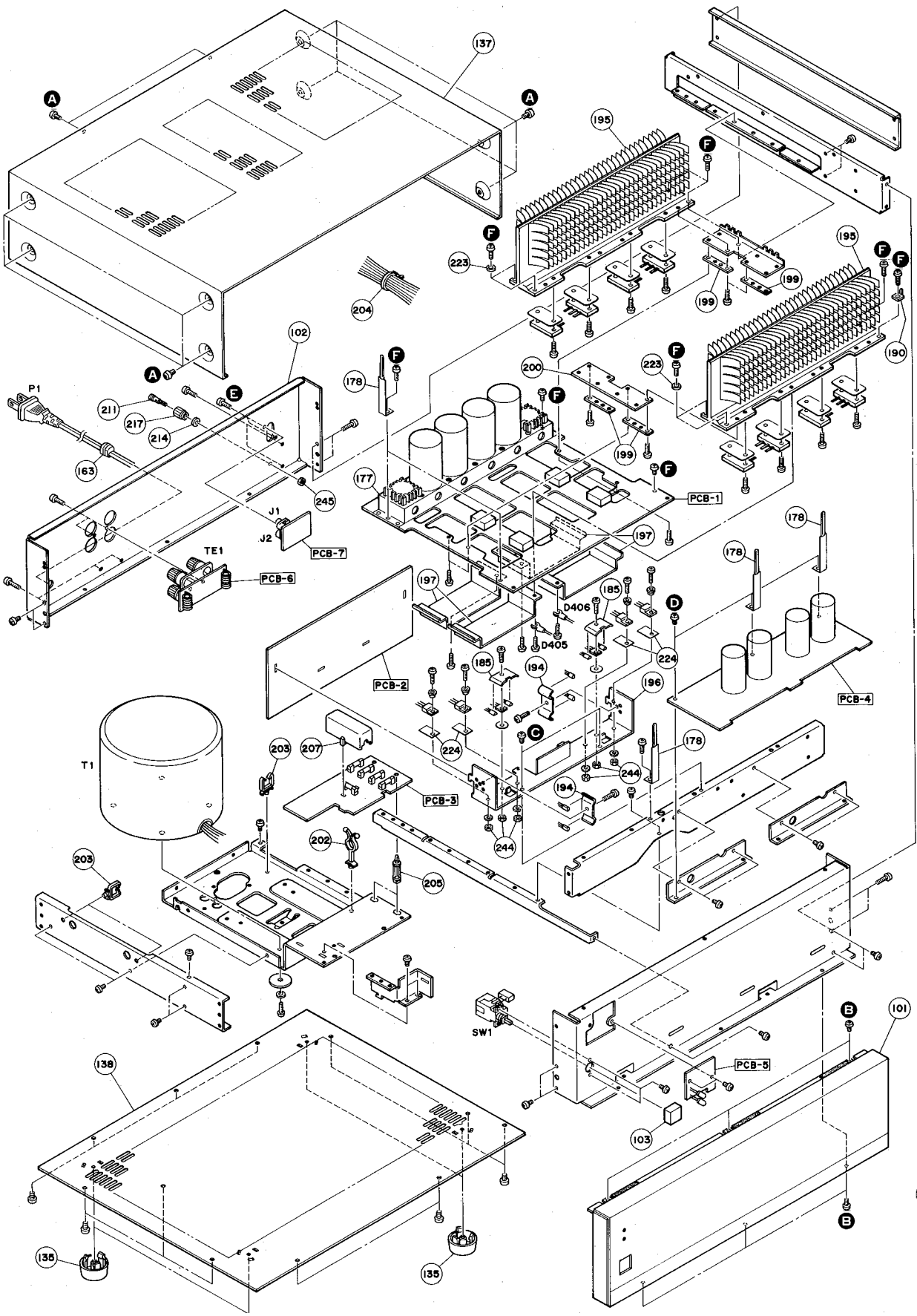
Step	Adjustment item	Connection required	Adjustment location	Adjustment value
1	DC Balance	Connect the DC voltmeter to left channel speaker terminal.	VR401	0V ± 10mV
2		Connect the DC voltmeter to right channel speaker terminal.	VR402	
3	Idling current	Connect the DC voltmeter to TP1 (+) and TP2 (−).	VR403	50mV (75mA)
4		Connect the DC voltmeter to TP4 (+) and TP3 (−).	VR404	
5	Idling current confirmation	Connect the DC voltmeter to TP5 (+) and TP6 (−).		50mV ± 5mV
6		Connect the DC voltmeter to TP8 (+) and TP7 (−).		

CIRCUIT DESCRIPTION

- **Over load protection Lch (Rch)**

As soon as the current over rated power flows, the voltage between TP1 (TP4) and TP2 (TP3) rises and Q445 (Q446), Q447 (Q448) and Q10 are turned on. So Q5 (Schmit trigger circuit) is turned off and Q7 is turned on, Q413 (Q414) is turned off and Q411 (Q412) is turned off. The operation of power amp. circuit stops and the circuit is protected.

GENERAL UNIT EXPLODED VIEW



GENERAL UNIT PARTS LIST

Ref. No.	Part No.	Description
101	A443-HK870A	Front Panel Assembly
102	A424-HK870A	Cabinet Back Assembly
"	A424-HK870D	Cabinet Back Assembly (for Canada model)
103	A660-HK870A	Push Button Assembly, Power
135	1319-0139	Foot
137	1414-04201	Cabinet Top
138	1423-01202	Cabinet Bottom
163	2114-415027	Bushing
177	2216-7116	Shield Plate
178	2218-7011	Holding Bracket
185	2219-7795	Bracket
190	2219-7945	Earth Bracket
194	2222-7066	Heat Sink
195	2222-7122	Heat Sink, Main
196	2222-7123	Heat Sink
197	2222-7137	Heat Sink
199	2224-7069	Insulator
200	2224-7084	Insulator
202	2240-7050	Holder
203	2240-7061	Holder
204	2240-7120	Holder
205	2240-7151	Holder
207	2240-7176	Holder
211	2310-7015	Special Screw
214	2410-7005	Special Washer
217	2440-7011	Special Nut
223	2114-71259	Bushing
224	2224-7071	Insulator
244	2446-301Z9	Hexagon Nut
245	2440-7016	Special Nut
	2211-7246	Chassis, Front
	2219-7827	Bracket, T1
	2219-7947	Bracket, Left & Right
	2219-7949	Bracket, PCB-1 Left Mounting
	2219-7948	Bracket, Center
	2219-7804	Bracket, Main Heat Sink
	2219-7938	Bracket, PCB-3 Mounting
	2219-7939	Bracket, PCB-4 Mounting
	2219-7940	Bracket, PCB-1 Right Mounting
	1111-J30139	Owner Guide
	1111-J30140	Owner Guide (for Canada model)
	1221-757143	Packing Box
	1222-7225	Packing Cushion, Right
	1222-7226	Packing Cushion, Left

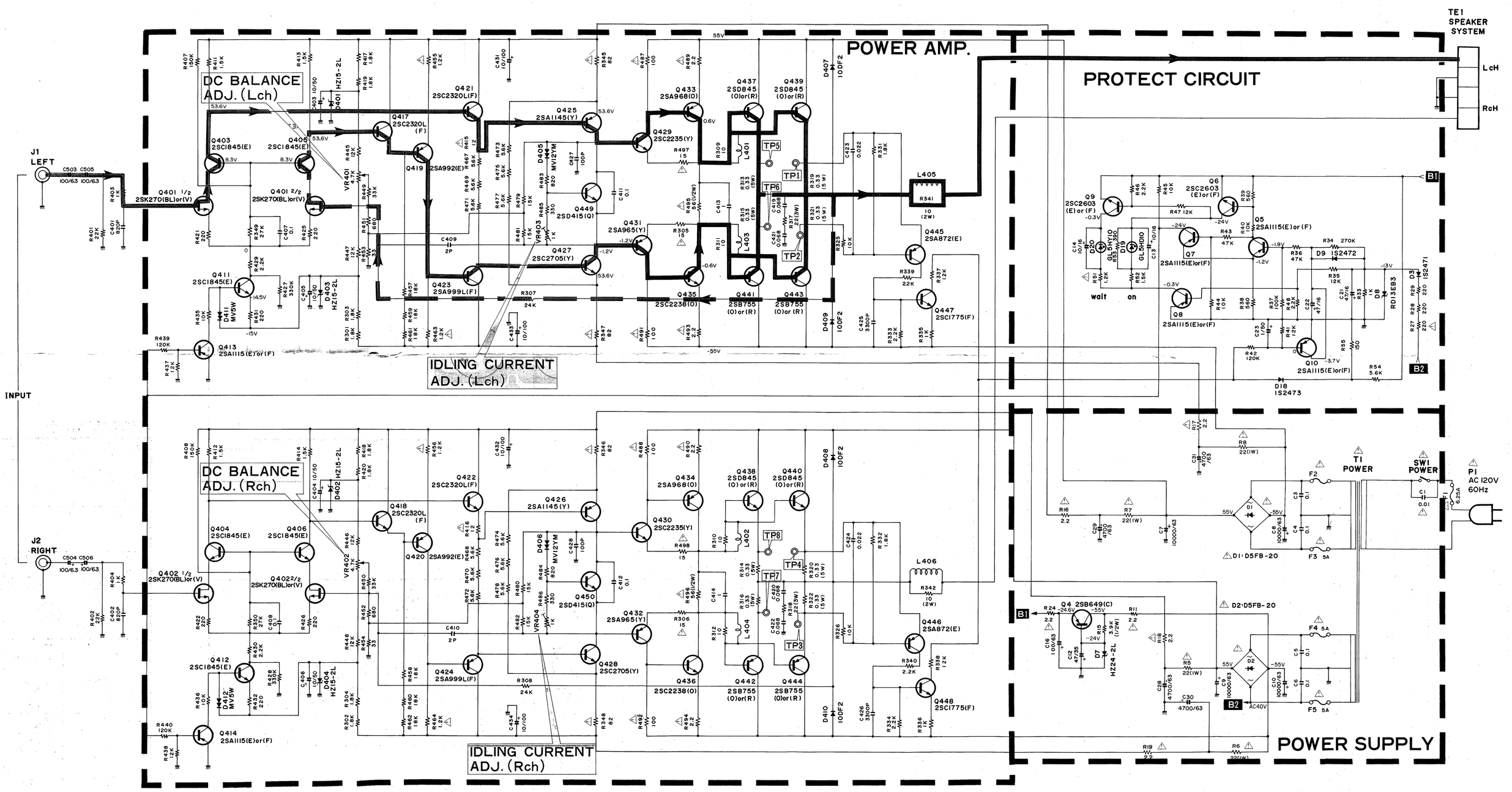
ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
	CHASSIS MISCELLANEOUS	
P1	4161-71151	Power Cord
T1	5584-701440	Power Transformer
CO1	4443-712	Connector, Power Cord
SW1	4431-01017358	Push Switch, Power
C1	5352-1030959	Capacitor, 0.01μF, ±20%, AC125V, Metalized Polyester
	PCB-1 MAIN P.C. BOARD	
	RESISTORS	
R11	5102-2R2579	2.2Ω, ±5%, 1/4W, Fuse
R27	5102-2214713	220Ω, ±2%, 1/4W, Fuse
R313/315, 314/316, 319/321, 320/322	5275-R33671	0.33Ω, ±10%, 5Wx2, Cement
R317, 318	5175-220571	22Ω, ±5%, 3W, Metal
	CAPACITORS	
C3, 4, 5, 6	5352-1041957	0.1μF, ±10%, 250V, Metalized Polyester
C7, 8, 9, 10	5341-109G0281	10000μF, ±20%, 63V, Electrolytic
C21, 22	5345-476C0951	47μF, ±20%, 16V, Electrolytic
C23	5345-105F0951	1μF, ±20%, 50V, Electrolytic
	TRANSISTORS	
Q5, 7, 8, 10, 413, 414	5611-1115(E)	2SA1115(E) or 2SA1115(F)
Q6, 9	5613-2603(E)	2SC2603(E) or 2SC2603(F)
Q437, 438, 439, 440	5614-845(O)	2SD845(O) or 2SD845(R) (w/Insulator)
Q441, 442, 443, 444	5612-755(O)	2SB755(O) or 2SB755(R) (w/Insulator)
Q445, 446	5611-872(E)	2SA872(E)
Q447, 448	5613-1775(F)	2SC1775(F)
	DIODES	
D1, 2	5685-D5FB20	Bridge Silicon, D5FB20
D3	5636-1S2471	1S2471
D8	5635-RD13EB3	Zener, RD13EB3
D9	5636-1S2472	1S2472
D405, 406	5641-MV12YM	Varister, MV12YM
D407, 408, 409, 410	5632-10DF2	10DF2
	COILS	
L401, 402, 403, 404	5597-45502	Ferrite Bead
	MISCELLANEOUS	
J401, 402	4443-107149	Connector, 10 Pos.
	2132-5049	Spacer, R313/315, 314/316, 319/321, 320/322
	2132-7049	Spacer, R317, 318
	PCB-2 POWER AMP. DRIVER P.C. BOARD	
	RESISTORS	
R301, 302, 303, 304, 417, 418, 419, 420	5174-182381	1.8kΩ, ±1%, 1/4W, Metal
R305, 306, 497, 498	5102-1504713	15Ω, ±2%, 1/4W, Fuse
R307, 308	5174-243381	24kΩ, ±1%, 1/4W, Metal
R345, 346, 347, 348	5102-8204713	82Ω, ±2%, 1/4W, Fuse
R401, 402	5174-223381	22kΩ, ±1%, 1/4W, Metal
R403, 404	5174-102381	1kΩ, ±1%, 1/4W, Metal
R415, 416	5102-1204713	12Ω, ±2%, 1/4W, Fuse
R451, 452	5174-681381	680Ω, ±1%, 1/4W, Metal
R453, 454	5174-330381	33Ω, ±1%, 1/4W, Metal
R455, 456, 463, 464	5102-1224713	1.2kΩ, ±2%, 1/4W, Fuse
R467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478	5174-562381	5.6kΩ, ±1%, 1/4W, Metal
R487, 488, 491, 492	5102-1014713	100Ω, ±2%, 1/4W, Fuse
R489, 490, 493, 494	5102-2R2579	2.2Ω, ±5%, 1/4W, Fuse
R495, 496	5102-5605114	56Ω, ±5%, 1/2W, Fuse

Ref. No.	Part No.	Description
	CONTROLS	
VR401, 402	5101-4728175	4.7kΩ, DC Balance Adjustment
VR403, 404	5101-1027875	1kΩ, Idling Current Adjustment
	CAPACITORS	
C401, 402	5359-8215851	820pF, ±5%, 100V, Polypropylene
C403, 404, 405, 406	5345-106F0951	10μF, ±20%, 50V, Electrolytic
C407, 408, 411, 412	5352-1041960	0.1μF, ±10%, 100V, Metalized Polyester
C409, 410	5353-020934	2pF, ±0.5pF, 500V, Mica
C413, 414	5352-1051960	1μF, ±10%, 100V, Metalized Polyester
C427, 428	5359-1015851	100pF, ±5%, 100V, Polypropylene
C431, 432, 433, 434	5345-106J0226	10μF, ±20%, 100V, Electrolytic
	TRANSISTORS	
Q401, 402	5616-2SK270BL	F.E.T., 2SK270(BL) or 2SK270(V)
Q403, 404, 405, 406, 411, 412	5613-1845(E)	2SC1845(E)
Q417, 418, 421, 422	5613-2320L(F)	2SC2320L(F)
Q419, 420	5611-992(E)	2SA992(E)
Q423, 424	5611-999L(F)	2SA999L(F)
Q425, 426	5611-1145(Y)	2SA1145(Y)
Q427, 428	5613-2705(Y)	2SC2705(Y)
Q429, 430	5613-2235(Y)	2SC2235(Y)
Q431, 432	5611-965(Y)	2SA965(Y)
Q433, 434	5611-968(O)	2SA968(O) (w/Bushing)
Q435, 436	5613-2238(O)	2SC2238(O) (w/Bushing)
Q449, 450	5614-415(Q)	2SD415(Q) (w/Insulator)
	DIODES	
D401, 402, 403, 404	5635-HZ15-2L	Zener, HZ15-2L
D411, 412	5641-MV5W	Varistor, MV5W
	MISCELLANEOUS	
P401, 402	4443-10418	Connector, 10 Pos.
	2132-7048	Spacer, R469, 470, 475, 476
	PCB-3 FUSE HOLDER P.C. BOARD	
F1	5732-622028	Fuse, 6.25A, 250V
F2, 3, 4, 5	5732-502028	Fuse, 5A, 125V
	4472-7113	Fuse Holder (x 10)
	PCB-4 POWER SUPPLY P.C. BOARD	
	RESISTORS	
R5, 6, 7, 8	5102-2205711	22Ω, ±5%, 1W, Fuse
R16, 17, 18, 19, 24	5102-2R2579	2.2Ω, ±5%, 1/4W, Fuse
	CAPACITORS	
C12	5345-476E0226	47μF, ±20%, 35V, Electrolytic
C16	5345-107G045	100μF, ±20%, 63V, Electrolytic
C28, 29, 30, 31	5341-478G0953	4700μF, +30% −10%, 63V, Electrolytic
	TRANSISTORS	
Q4	5612-649(C)	2SB649(C)
	DIODES	
D7	5635-HZ24-2L	Zener, HZ24-2L
D18	5631-1S2473	1S2473

Ref. No.	Part No.	Description
	PCB-5 INDICATORS P.C. BOARD	
	RESISTOR	
R51	5102-1224713	1.2kΩ, ±2%, 1/4W, Fuse
	CAPACITORS	
C13, 14	5345-106C0951	10μF, ±20%, 16V, Electrolytic
	DIODES	
D19	5637-GL5HD10	L.E.D., GL5HD10, Red, On
D20	5637-GL5HY10	L.E.D., GL5HY10, Amber, Wait
	PCB-6 SPEAKER TERMINAL P.C. BOARD	
	RESISTORS	
R341, 342	5173-100571	10Ω, ±5%, 2W, Metal
	COILS	
L405, 406	5991-7175	
	MISCELLANEOUS	
TE1	4214-140	Speaker Terminal
	PCB-7 INPUT JACK P.C. BOARD	
	CAPACITORS	
C503, 504, 505, 506	5345-227B0226	220μF, ±20%, 10V, Electrolytic
	MISCELLANEOUS	
J1/2	4482-7126	2-Pin Jack, Line Input

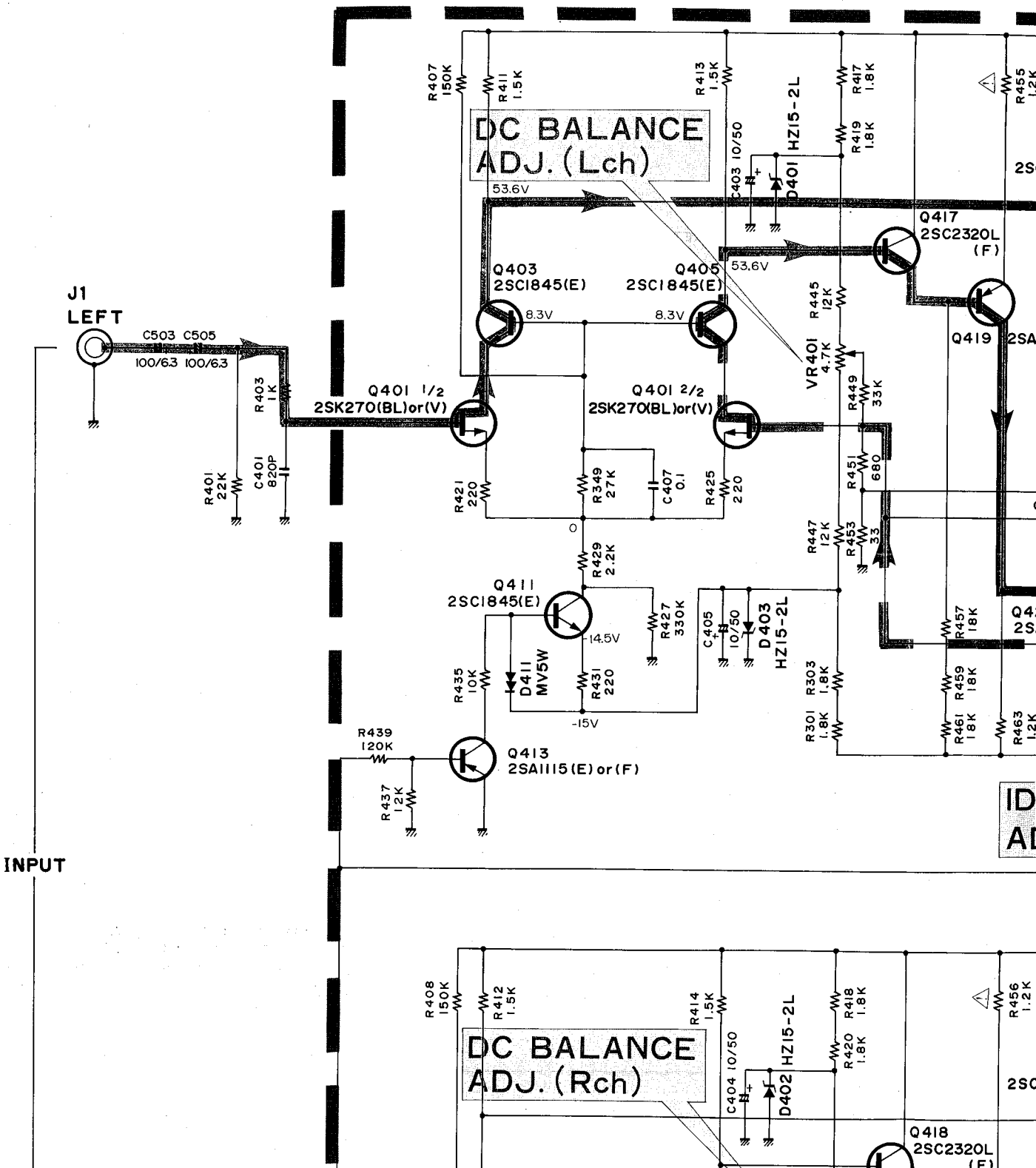
SCHEMATIC DIAGRAM

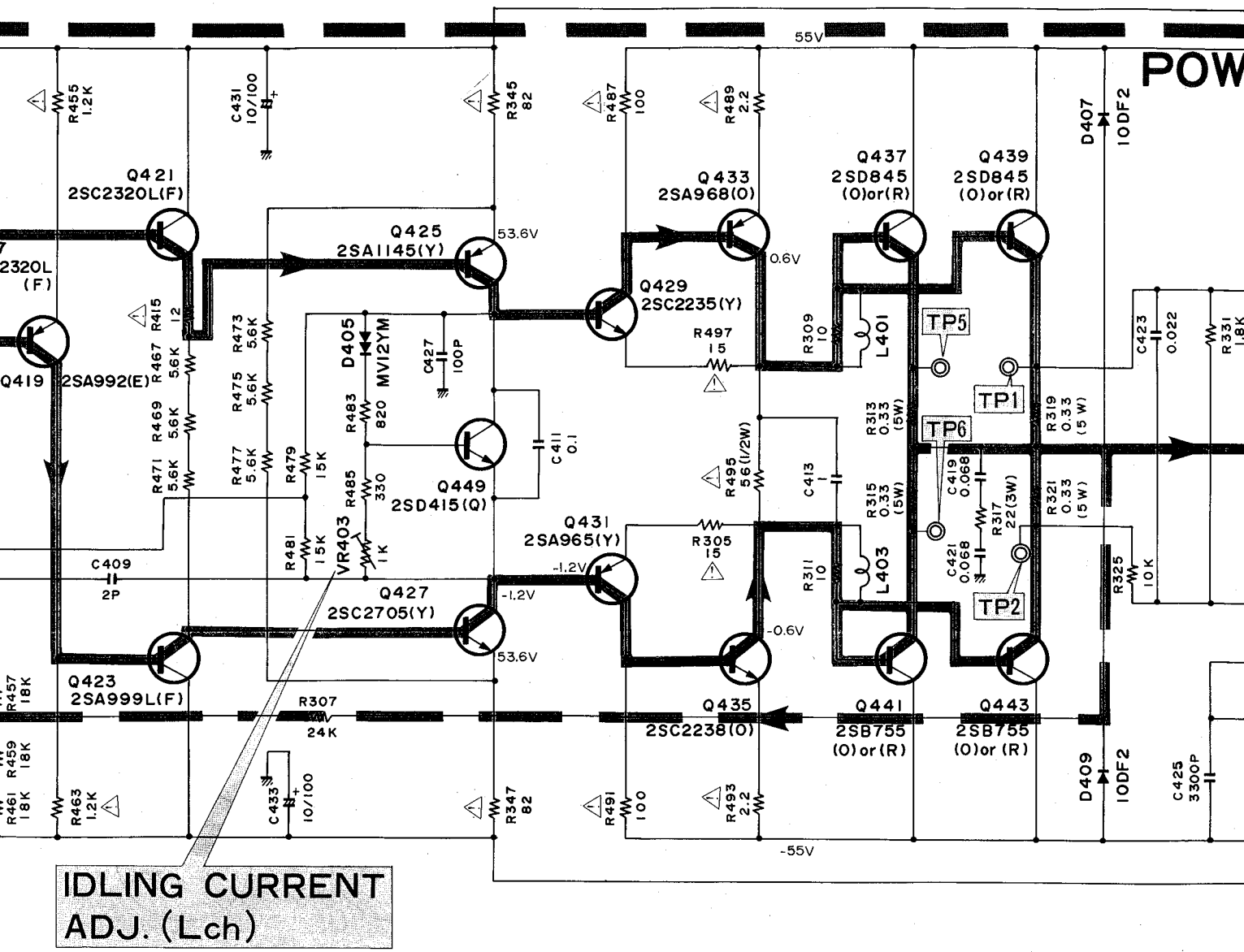


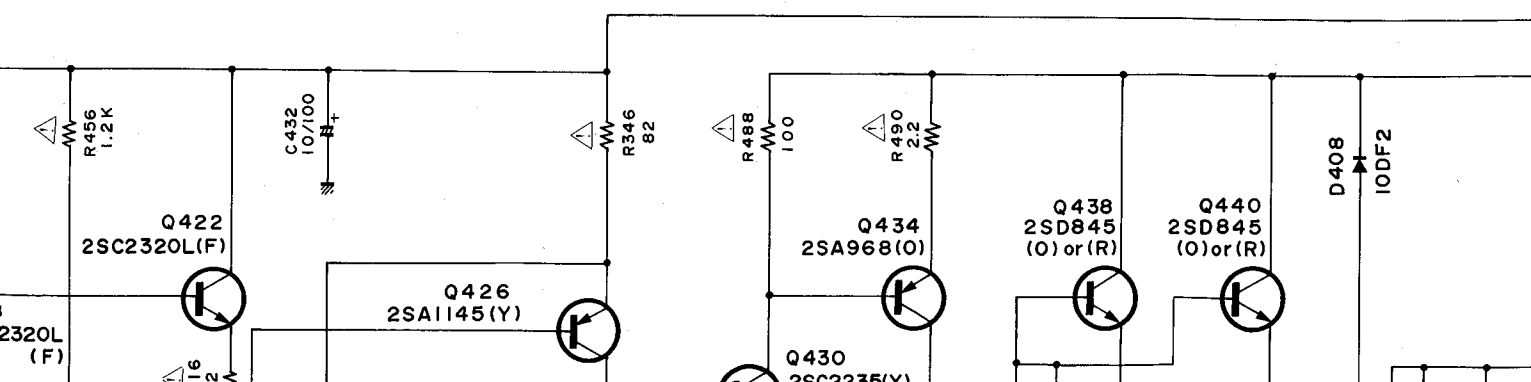
SIGNAL PATH
NFB SIGNAL

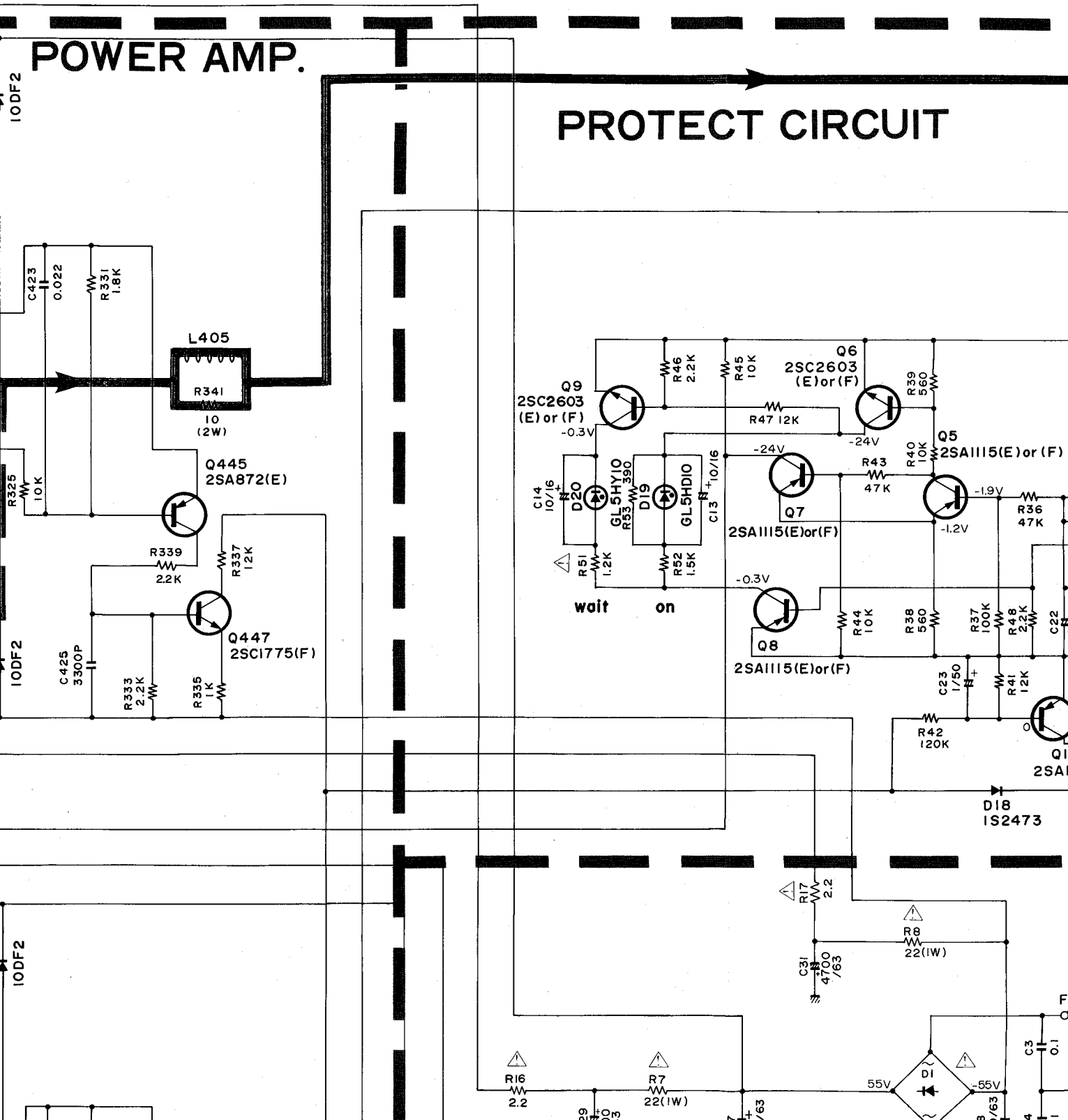
1. ALL RESISTANCES VALUES ARE IN Ω.
   kΩ = 1000Ω, MΩ = 1000kΩ
2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. P = μμF
   AND ALL ELECTRICAL CAPACITANCES VOLTAGE VALUES ARE GIVEN WITHOUT UNIT.
   THE OMITTED UNIT IS V. 47/50 → 47μF/50V
4. V: DC VOLTAGE EXCEPT (AC).
   ...V: AT NO SIGNAL
5. ⚠ SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

SCHEMATIC DIAGRAM

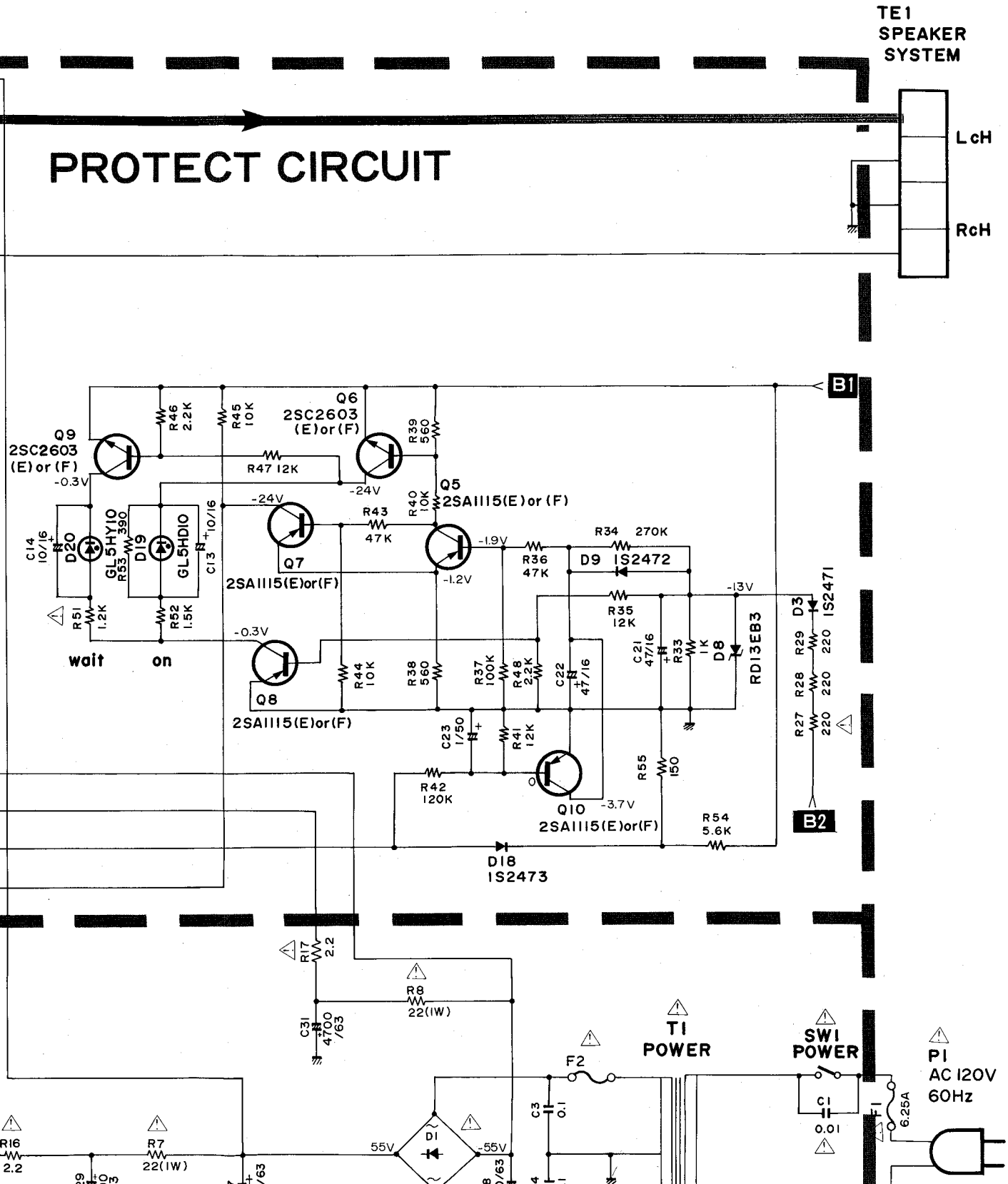


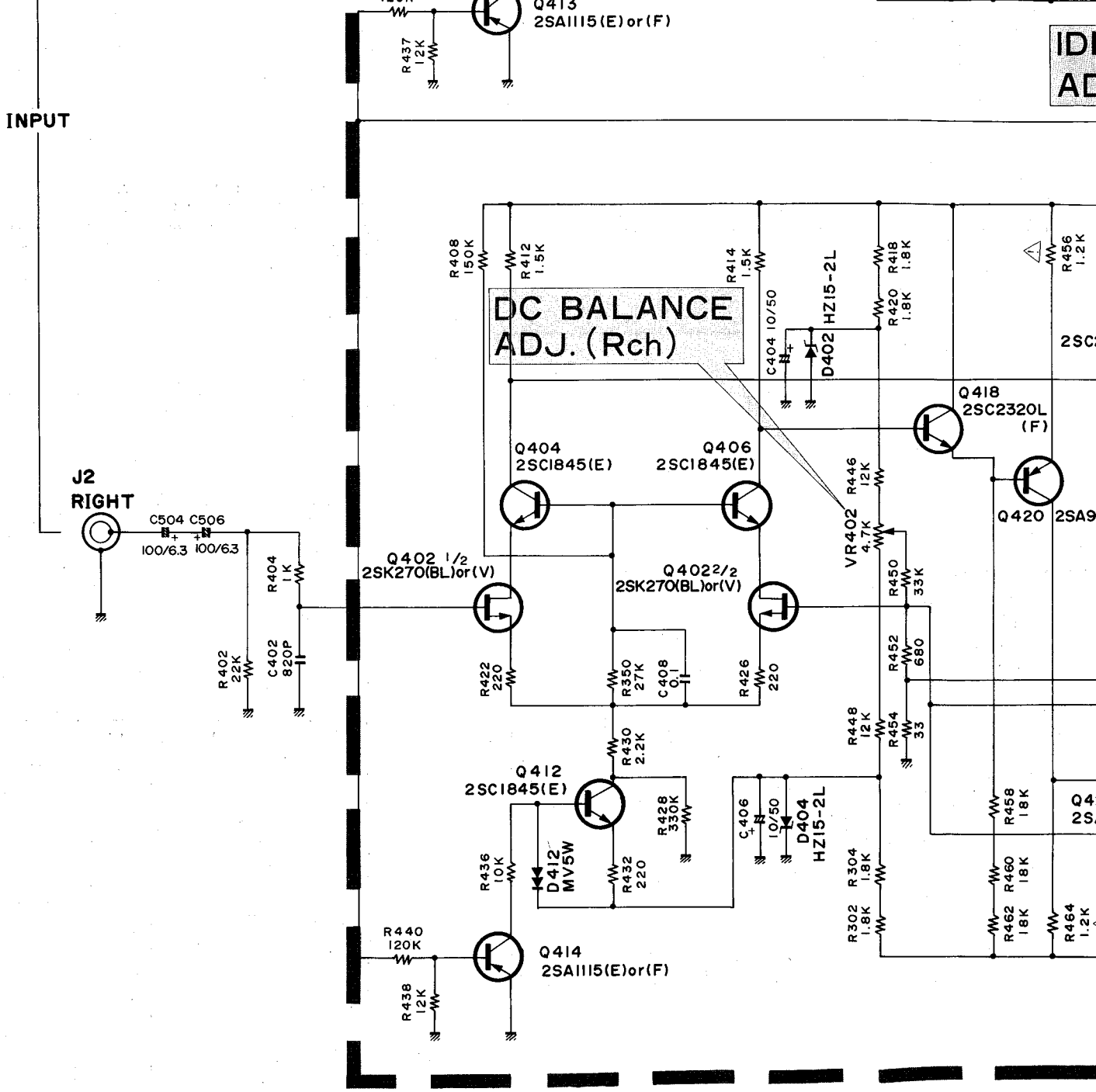

55V
POW
R455 1.2K
C431 10/100
R345 82
R487 100
R489 2.2
D407 10DF2
Q421 2SC2320L(F)
Q425 2SA1145(Y)
53.6V
Q433 2SA968(O)
Q437 2SD845 (O)or(R)
Q439 2SD845 (O)or(R)
0.6V
Q429 2SC2235(Y)
R497 15
R309 10
L401
TP5
TP1
TP6
TP2
C423 0.022
R331 1.8K
R313 0.33 (5W)
R319 0.33 (5 W)
R315 0.33 (5W)
R321 0.33 (5 W)
C419 0.068
R317 22(3W)
C421 0.068
R325 10 K
L403
R311 10
R495 56 (1/2W)
C413 1
R305 15
Q431 2SA965(Y)
-1.2V
-0.6V
R415 12
R467 5.6K
R469 5.6K
R471 5.6K
R473 5.6K
R475 5.6K
R477 5.6K
R479 15K
R481 15K
R483 820
R485 330
D405 MV12YM
C427 100P
C411 0.1
Q449 2SD415(Q)
VR403 1K
C409 2P
Q427 2SC2705(Y)
Q419 2SA992(E)
Q423 2SA999L(F)
R307 24K
Q435 2SC2238(O)
Q441 2SB755 (O)or(R)
Q443 2SB755 (O)or(R)
D409 10DF2
C425 3300P
R457 18K
R459 18K
R461 18K
R463 1.2K
C433 10/100
R347 82
R491 100
R493 2.2
-55V
IDLING CURRENT ADJ. (Lch)


R456 1.2K
C432 10/100
R346 82
R488 100
R490 2.2
D408 10DF2
Q422 2SC2320L(F)
Q426 2SA1145(Y)
Q434 2SA968(O)
Q438 2SD845 (O)or(R)
Q440 2SD845 (O)or(R)
Q430


POWER AMP.
PROTECT CIRCUIT
10DF2
C423
0.022
R331
1.8K
L405
R341
10
(2W)
Q445
2SA872(E)
R325
10K
R339
2.2K
R337
12K
Q447
2SC1775(F)
C425
3300P
R333
2.2K
R335
1K
Q9
2SC2603
(E)or(F)
-0.3V
R46
2.2K
R45
10K
Q6
2SC2603
(E)or(F)
R47 12K
-24V
R39
560
Q5
2SA1115(E)or(F)
R40
10K
R43
47K
-1.9V
-1.2V
R36
47K
-24V
Q7
2SA1115(E)or(F)
C14
10/16
D20
GL5HY10
R93
390
D19
GL5HD10
C13
10/16
R51
1.2K
R52
1.5K
wait
on
-0.3V
Q8
2SA1115(E)or(F)
R44
10K
R38
560
R37
100K
R48
2.2K
C22
C23
1/50
R41
12K
R42
120K
D18
1S2473
R17
2.2
R8
22(1W)
C31
4700
/63
R16
2.2
R7
22(1W)
55V
-55V
D1
C3
0.1

	K	L	M	N


TE1
SPEAKER
SYSTEM
LcH
RcH
PROTECT CIRCUIT
B1
B2
Q9
2SC2603
(E)or(F)
-0.3V
Q6
2SC2603
(E)or(F)
-24V
Q5
2SA1115(E)or(F)
-1.9V
-1.2V
Q7
2SA1115(E)or(F)
-24V
Q8
2SA1115(E)or(F)
-0.3V
Q10
2SA1115(E)or(F)
-3.7V
R46 2.2K
R45 10K
R47 12K
R39 560
R40 10K
R43 47K
R36 47K
R34 270K
D9 1S2472
-13V
R35 12K
D3 1S2471
D8 RD13EB3
R29 220
R28 220
R27 220
R33 1K
C21 47/16
C22 47/16
R38 560
R37 100K
R48 2.2K
R44 10K
R41 12K
C23 1/50
R42 120K
R55 150
R54 5.6K
D18 1S2473
D20 GL5HYI0
D19 GL5HDI0
R53 390
C14 10/16
C13 10/16
R51 1.2K
R52 1.5K
wait
on
R17 2.2
R8 22(1W)
C31 4700/63
F2
T1
POWER
SW1
POWER
P1
AC 120V
60Hz
C1 0.01
F1 6.25A
C3 0.1
D1
55V
-55V
R16 2.2
R7 22(1W)



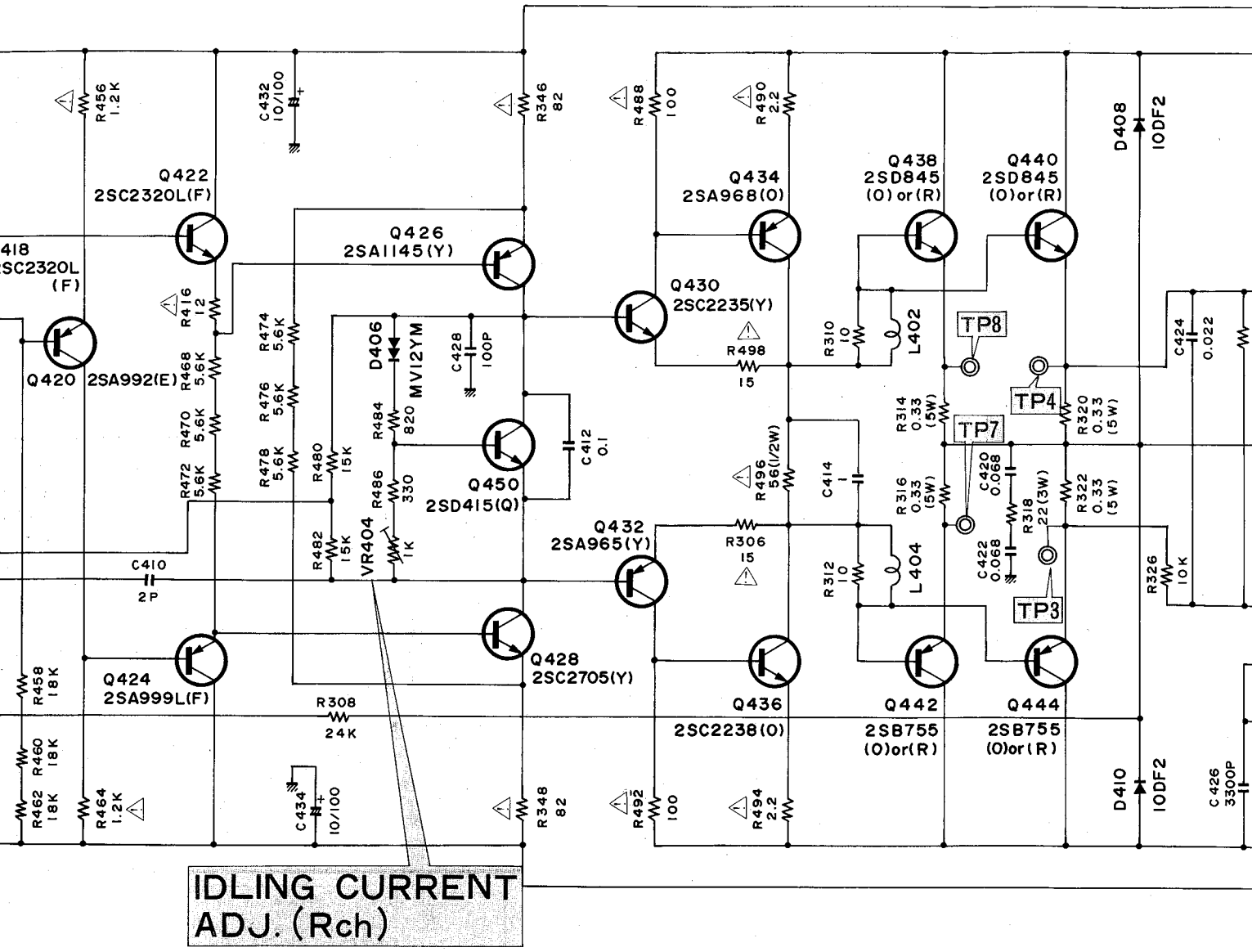
SIGNAL PATH

NFB SIGNAL

1. ALL RESISTANCES VALUES ARE IN Ω.
   kΩ = 1000Ω, MΩ = 1000kΩ
2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. P = μμF
   AND ALL ELECTRICAL CAPACITANCES VOLTAGE VALUES ARE GIVEN WITHOUT UNIT.
   THE OMITTED UNIT IS V. 47/50 → 47μF/50V
4. V: DC VOLTAGE EXCEPT (AC).
   ...V: AT NO SIGNAL
5. ⚠ SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

-55V

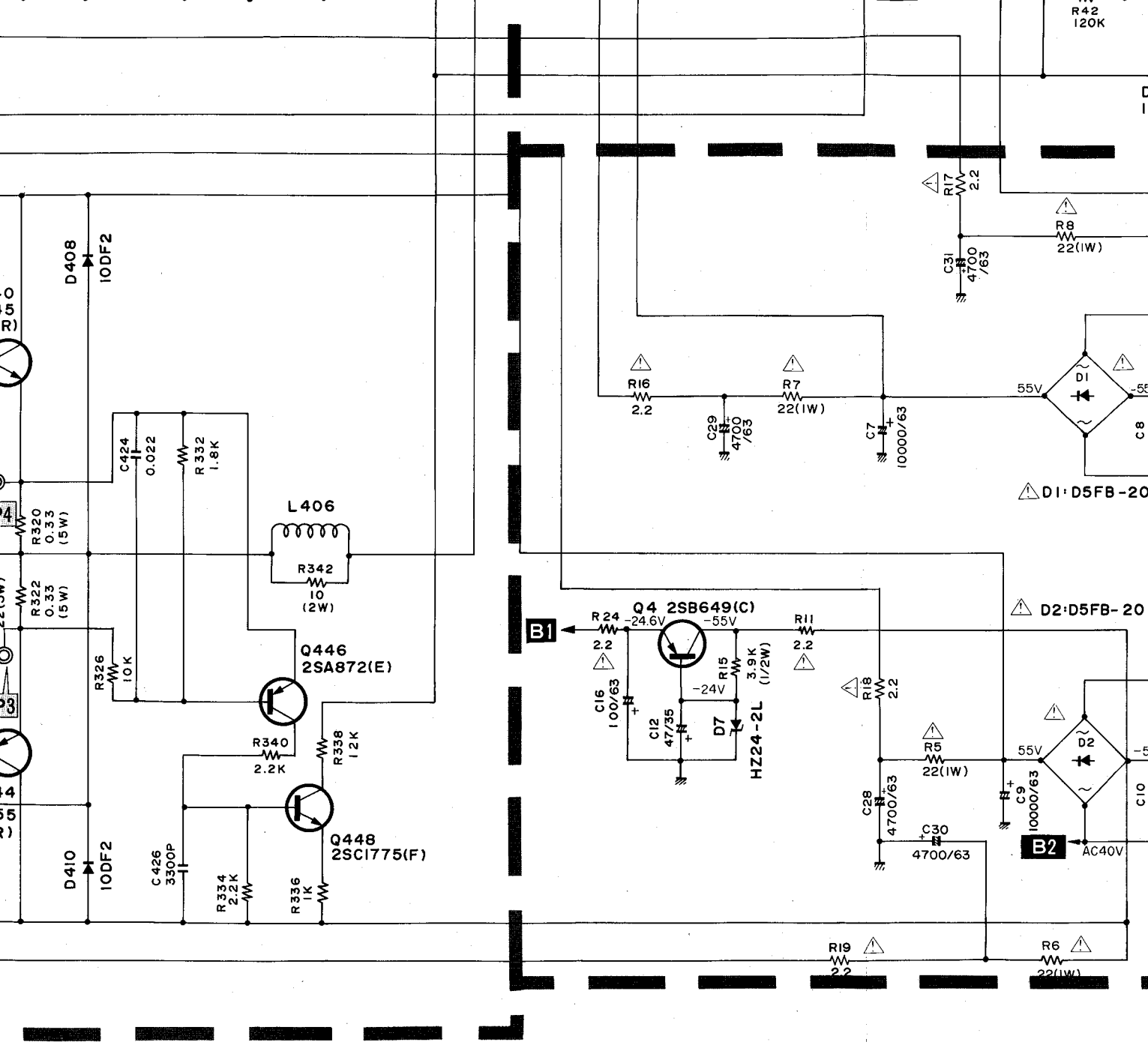
IDLING CURRENT
ADJ. (Lch)

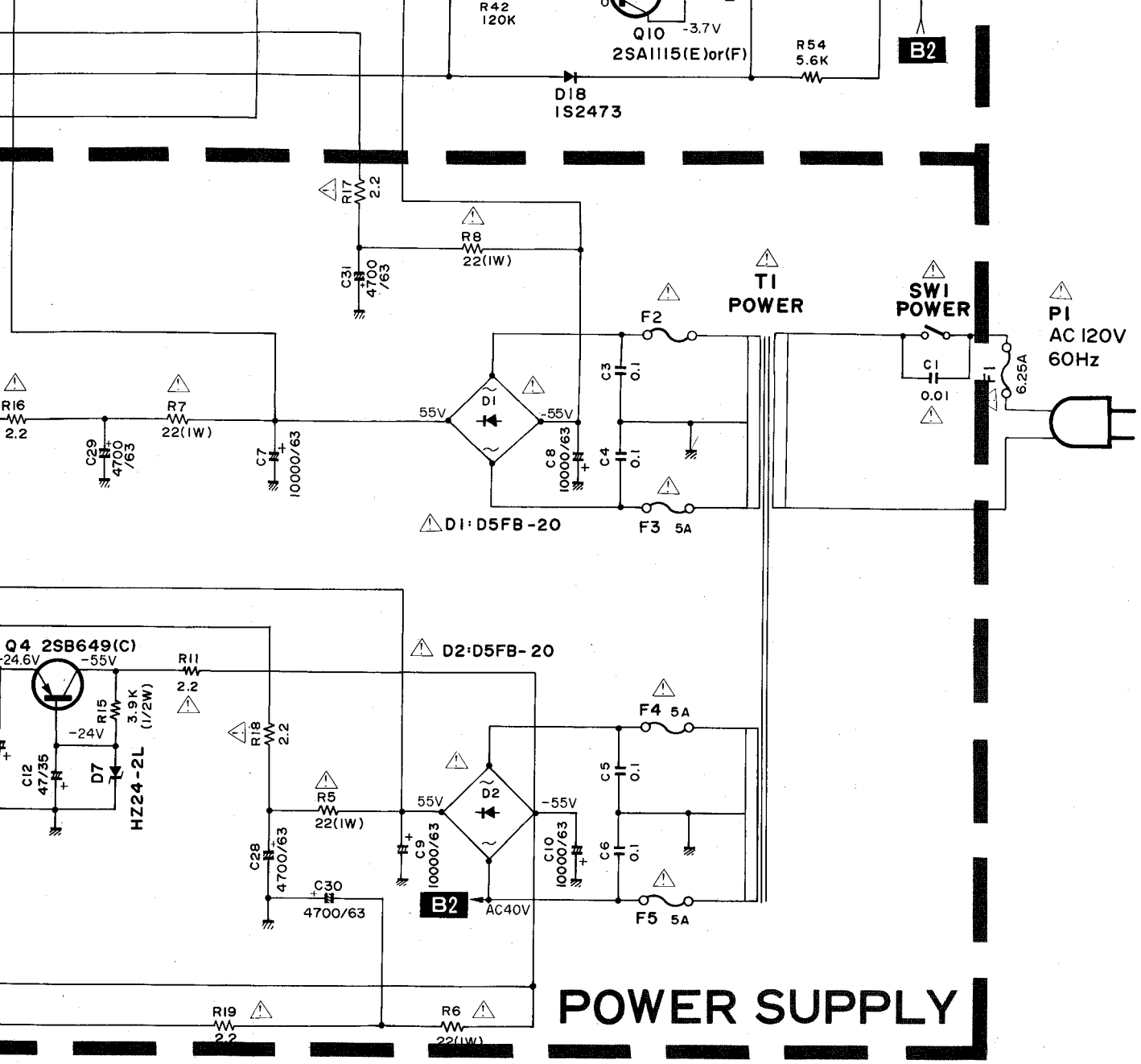


IDLING CURRENT
ADJ. (Rch)

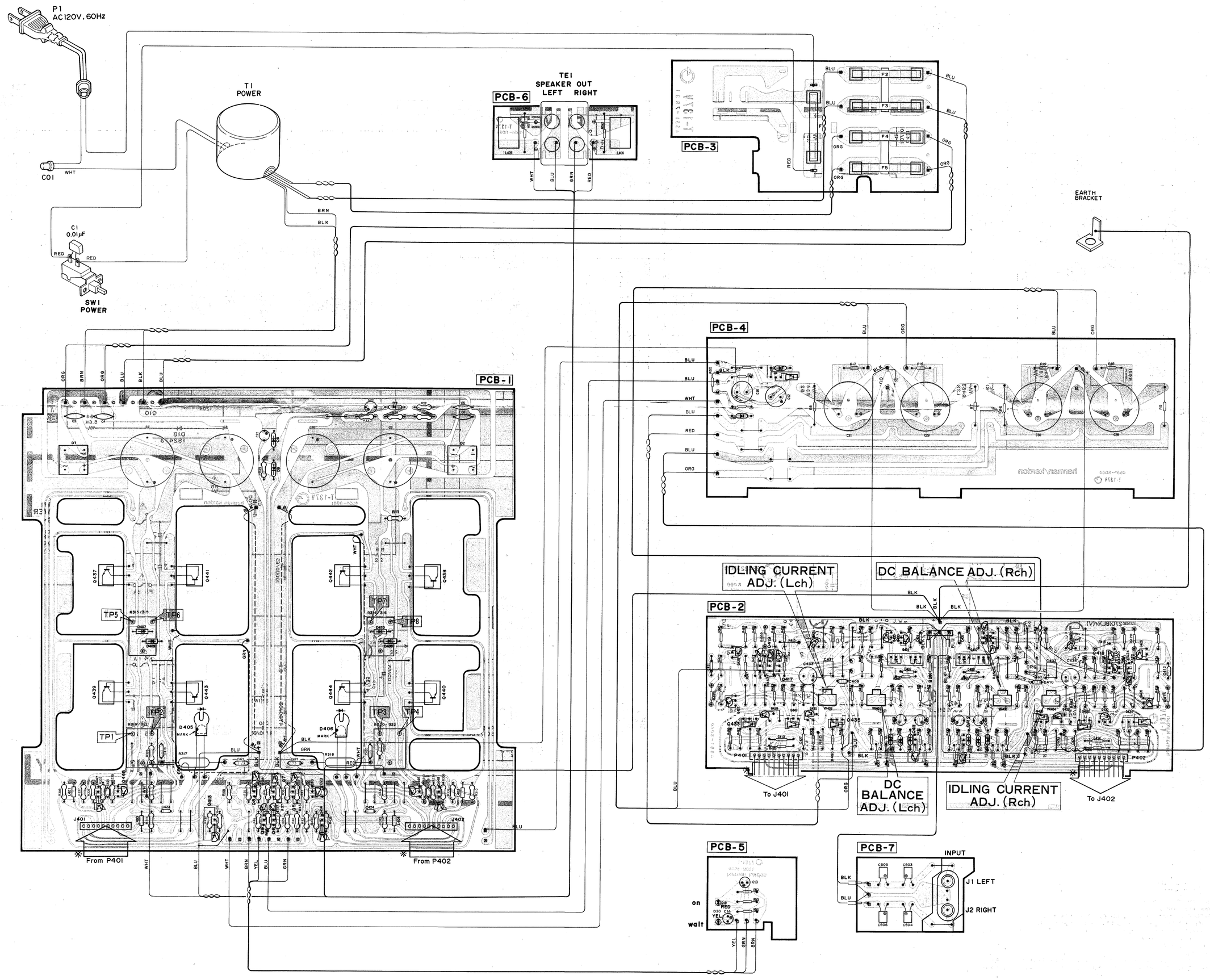
UT UNIT.

FETY
PARTS.


R42
120K
R17
2.2
R8
22(1W)
C31
4700
/63
R16
2.2
R7
22(1W)
C29
4700
/63
C7
10000/63
D1
55V
D1:D5FB-20
D408
10DF2
C424
0.022
R332
1.8K
R320
0.33
(5W)
R322
0.33
(5W)
L406
R342
10
(2W)
Q446
2SA872(E)
R326
10K
R340
2.2K
R338
1.2K
Q448
2SCI775(F)
C426
3300P
R334
2.2K
R336
1K
D410
10DF2
B1
Q4 2SB649(C)
-24.6V
-55V
R24
2.2
C16
100/63
C12
47/35
-24V
R15
3.9K
(1/2W)
D7
HZ24-2L
R11
2.2
D2:D5FB-20
R18
2.2
R5
22(1W)
C28
4700/63
C30
4700/63
D2
55V
C9
10000/63
B2
AC40V
R19
2.2
R6
22(1W)


R42
120K
Q10
2SA1115(E)or(F)
-3.7V
R54
5.6K
B2
D18
1S2473
R17
2.2
R8
22(1W)
C31
4700
/63
T1
POWER
SW1
POWER
P1
AC 120V
60Hz
F2
C1
0.01
F1
6.25A
R16
2.2
R7
22(1W)
C29
4700
/63
C7
10000/63
55V
D1
-55V
C8
10000/63
C3
0.1
C4
0.1
D1:D5FB-20
F3 5A
Q4 2SB649(C)
-24.6V
-55V
R11
2.2
D2:D5FB-20
R15
3.9K
(1/2W)
-24V
C12
47/35
D7
HZ24-2L
R18
2.2
F4 5A
R5
22(1W)
55V
D2
-55V
C28
4700/63
C9
10000/63
C10
10000/63
C5
0.1
C6
0.1
C30
4700/63
B2
AC40V
F5 5A
R19
2.2
R6
22(1W)
POWER SUPPLY

WIRING DIAGRAM



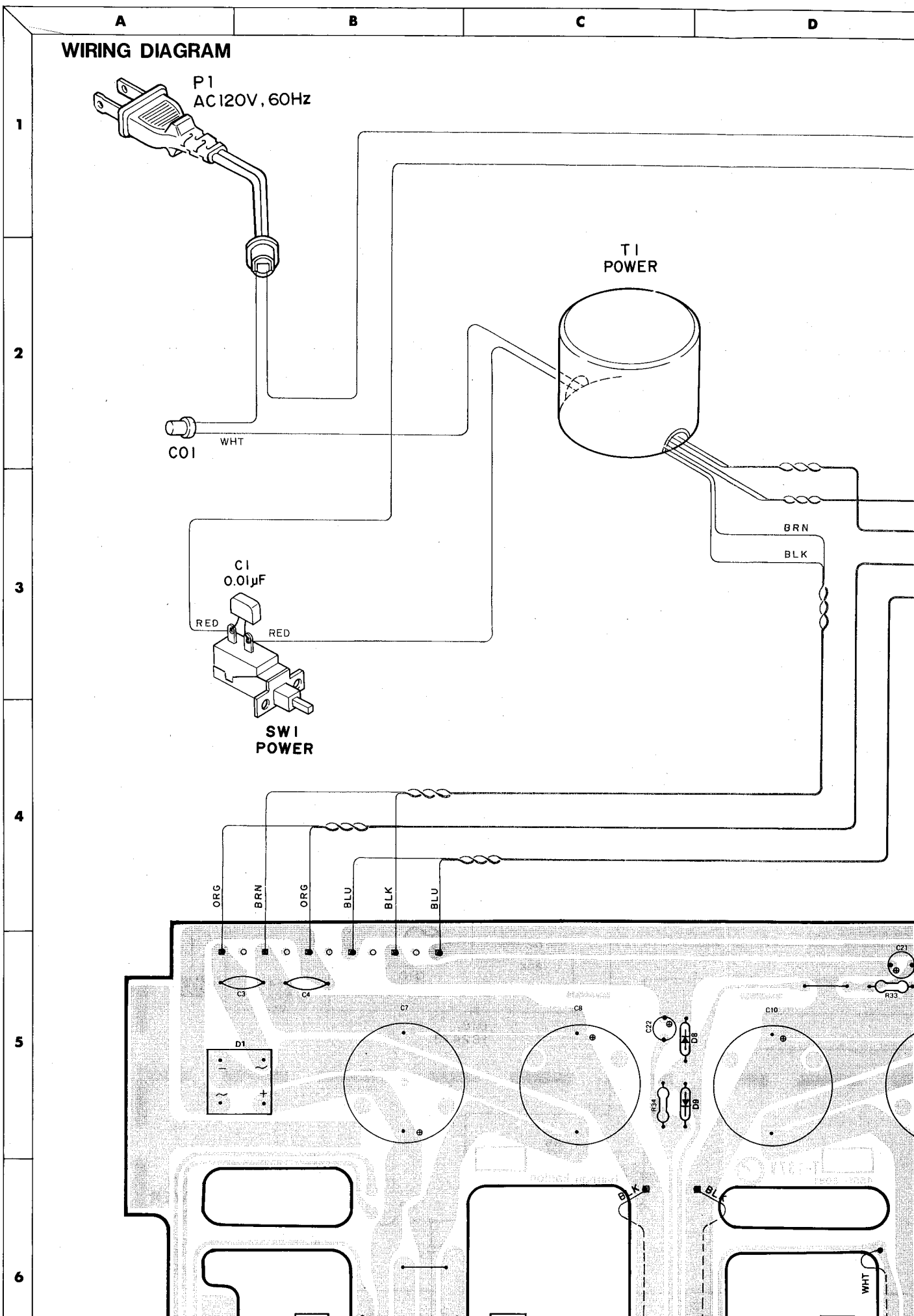
PIN CONNECTION DIAGRAM OF TRANSISTORS AND DIODES.

2SB649(C) : Q4 2SD415(Q) : Q449, 450	2SA1115(E)or(F) : Q5, 7, 8, 10, 413, 414 2SC2603(E)or(F) : Q6, 9
2SK270(BL)or(V) : Q401, 402	
2SC1845(E) : Q403～406, 411, 412 2SC2320L(F) : Q417, 418, 421, 422 2SA922(E) : Q419, 420 2SA999L(F) : Q423, 424	2SA1145(Y) : Q425, 426 2SC2705(Y) : Q427, 428 2SC2235(Y) : Q429, 430 2SA965(Y) : Q431, 432 2SA872(E) : Q445, 446 2SC1775(F) : Q447, 448
2SA968(O) : Q433, 434 2SC2238(O) : Q435, 436	2SD845(O)or(R) : Q437～440 2SB755(O)or(R) : Q441～444
D5FB20 : D1, 2	1S2471 : D3 HZ24-2L : D7 RD13EB3 : D8 IS2472 : D9 IS2473 : D18 HZ15-2L : D401～404
10DF2 : D407～410	GL5HD10 : D19 GL5HY10 : D20
MV12YM : D405, 406 MV5W : D411, 412	

WIRE COLOR ABBREVIATIONS

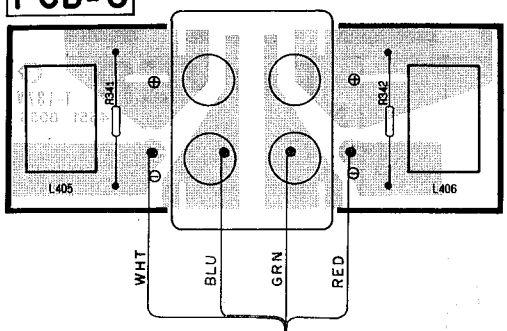
RED	: Red	GRN	: Green
WHT	: White	ORG	: Orange
BLK	: Black	YEL	: Yellow
BLU	: Blue	BRN	: Brown

WIRING DIAGRAM

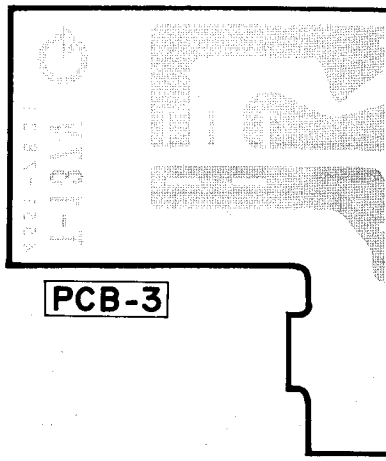


TE1
SPEAKER OUT
LEFT RIGHT

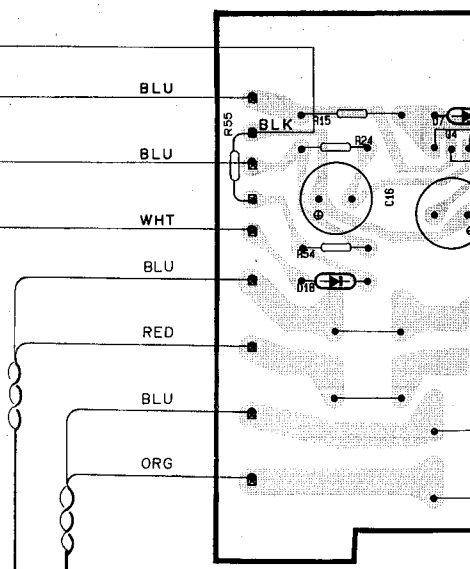
PCB-6



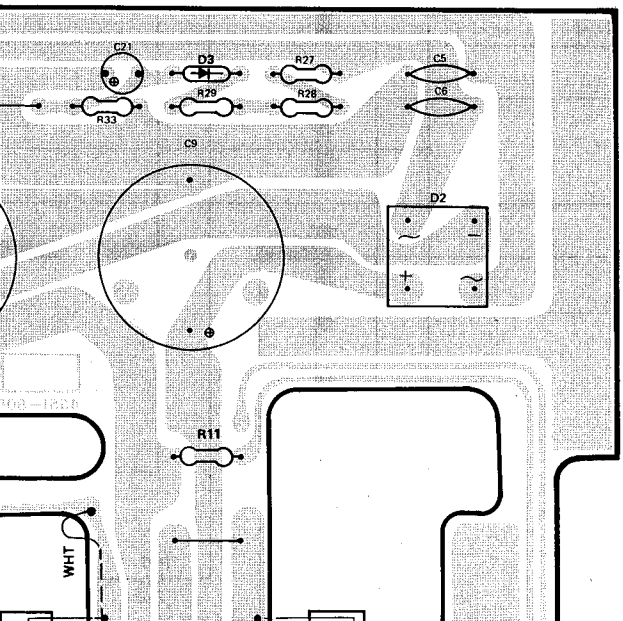
PCB-3

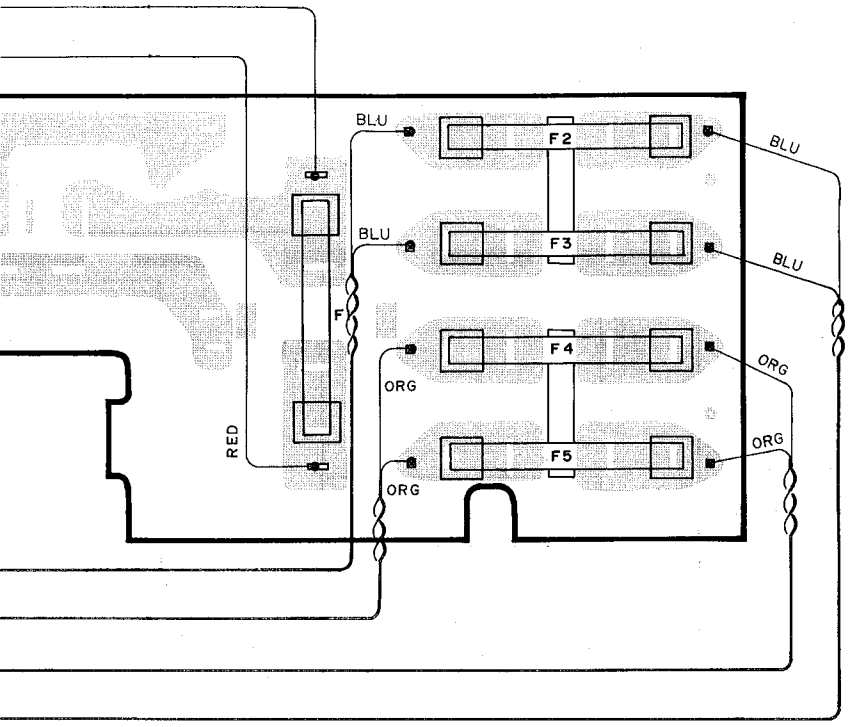


PCB-4

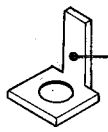


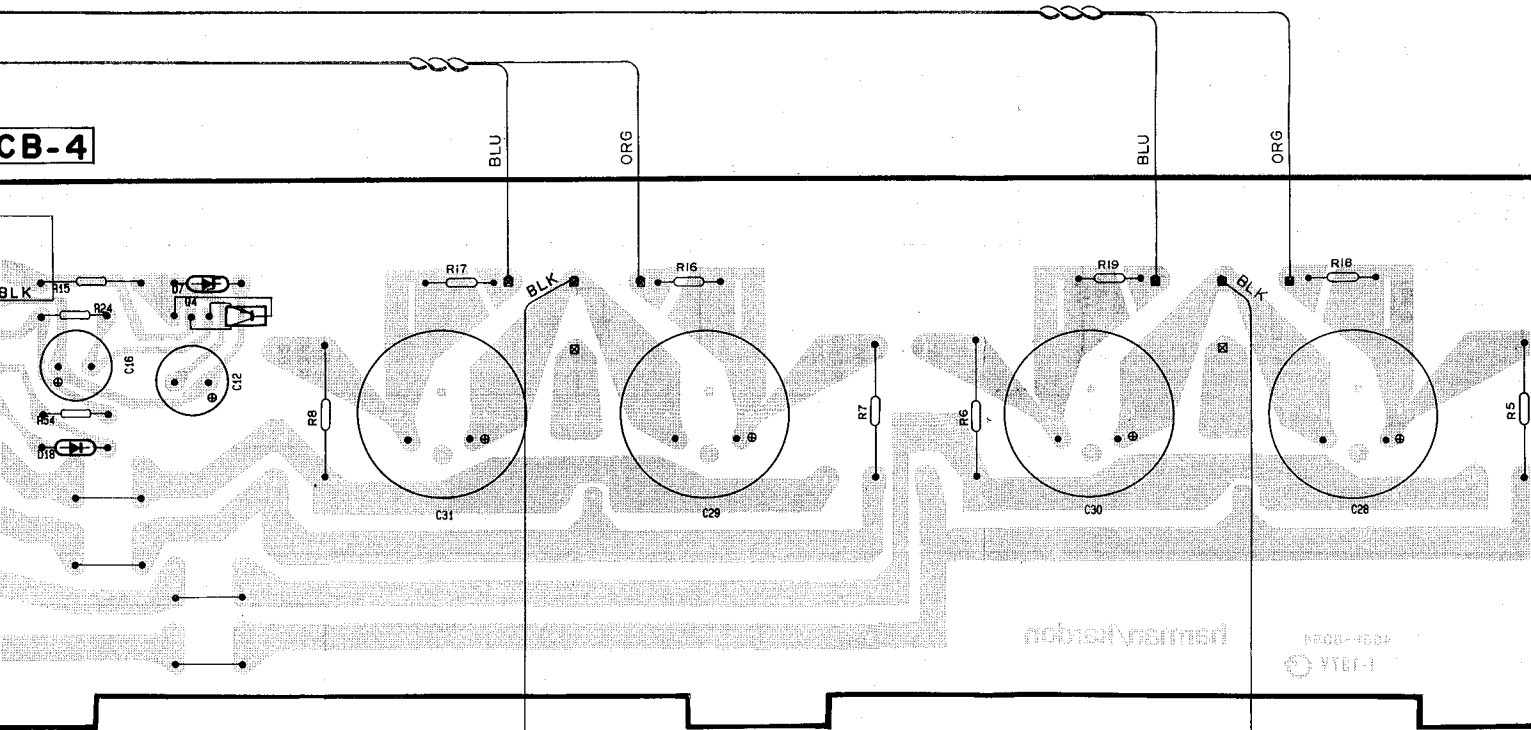
PCB-1



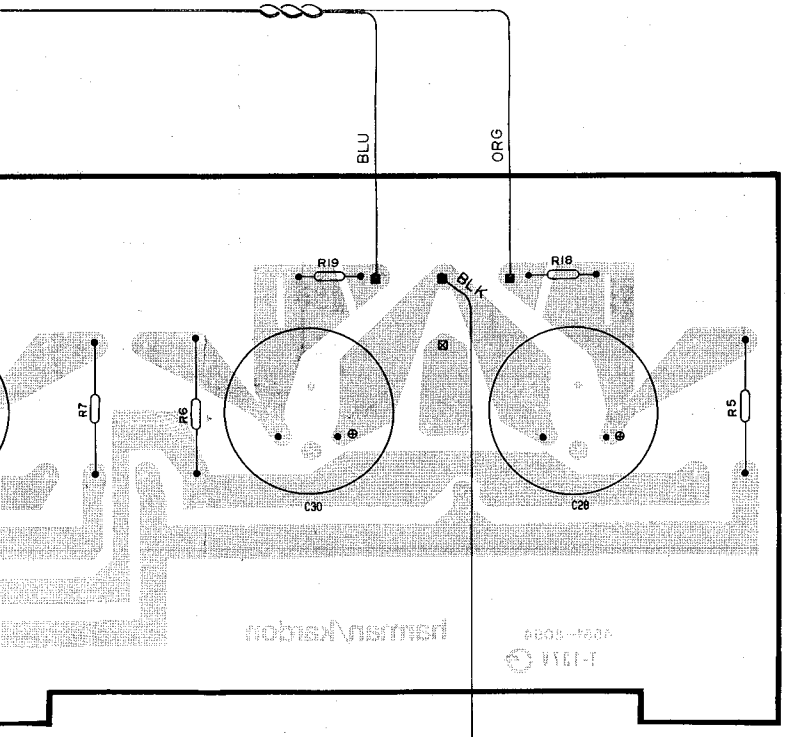


EARTH
BRACKET

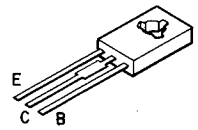
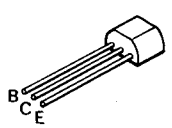


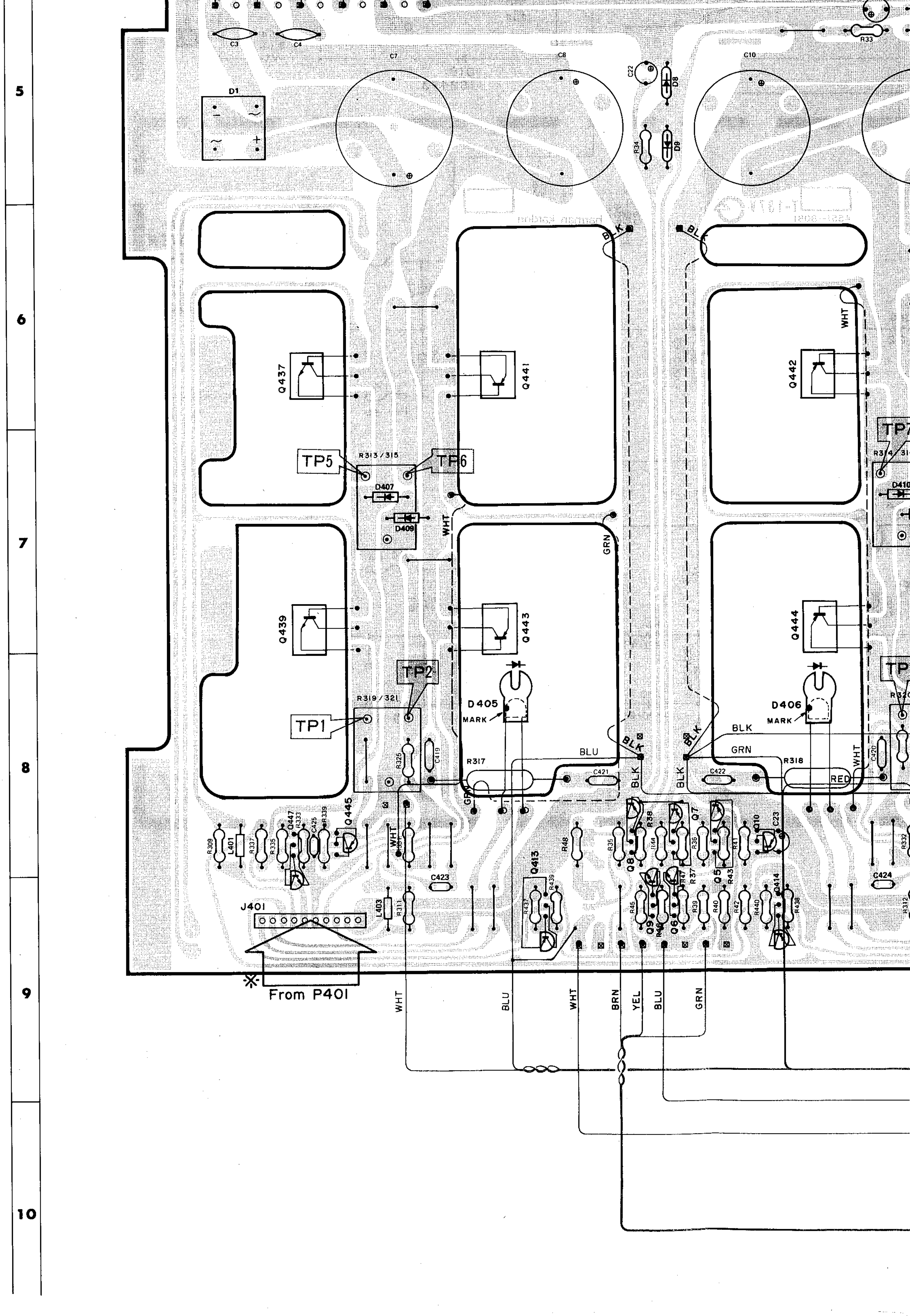


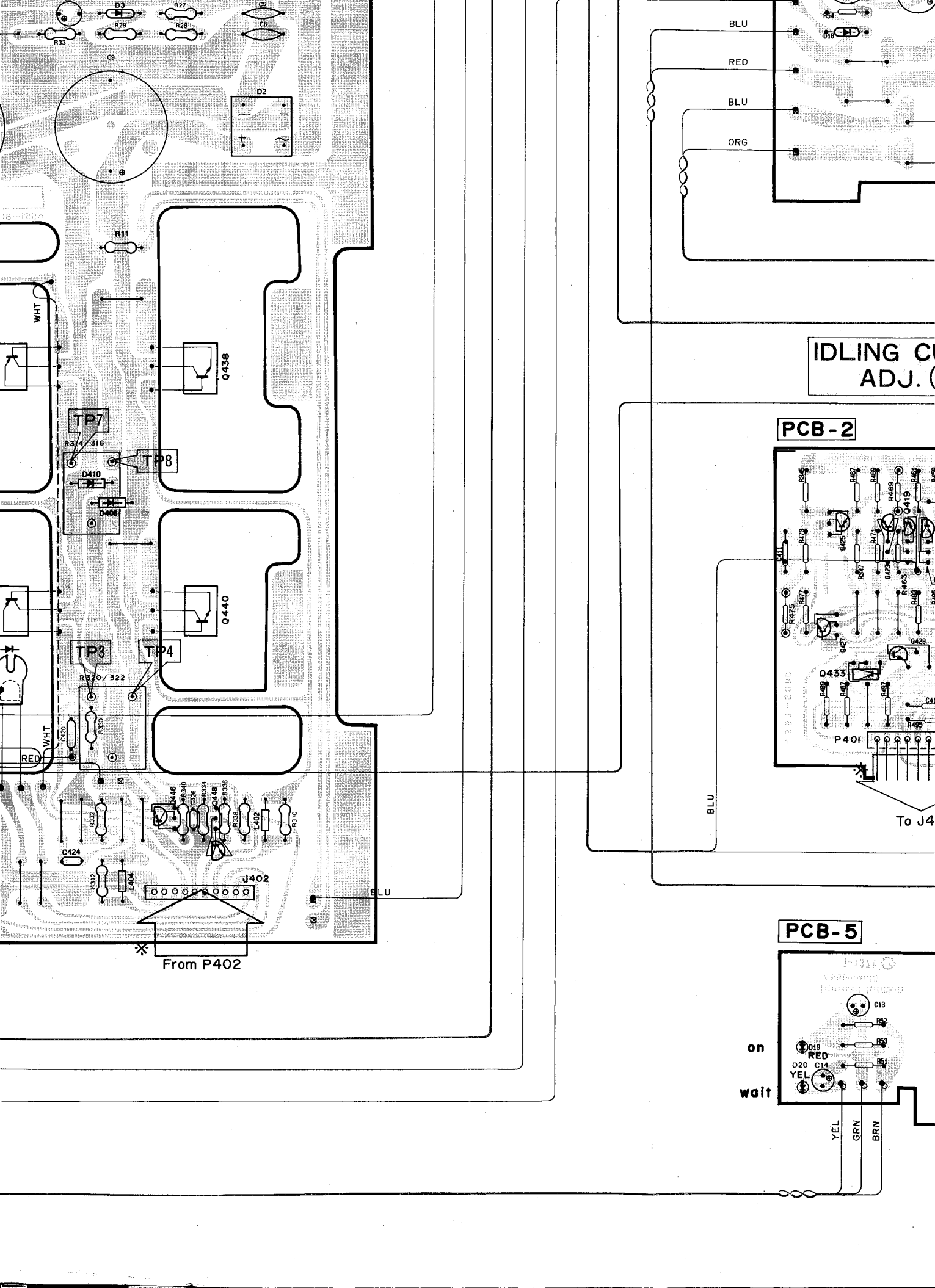
EARTH
BRACKET

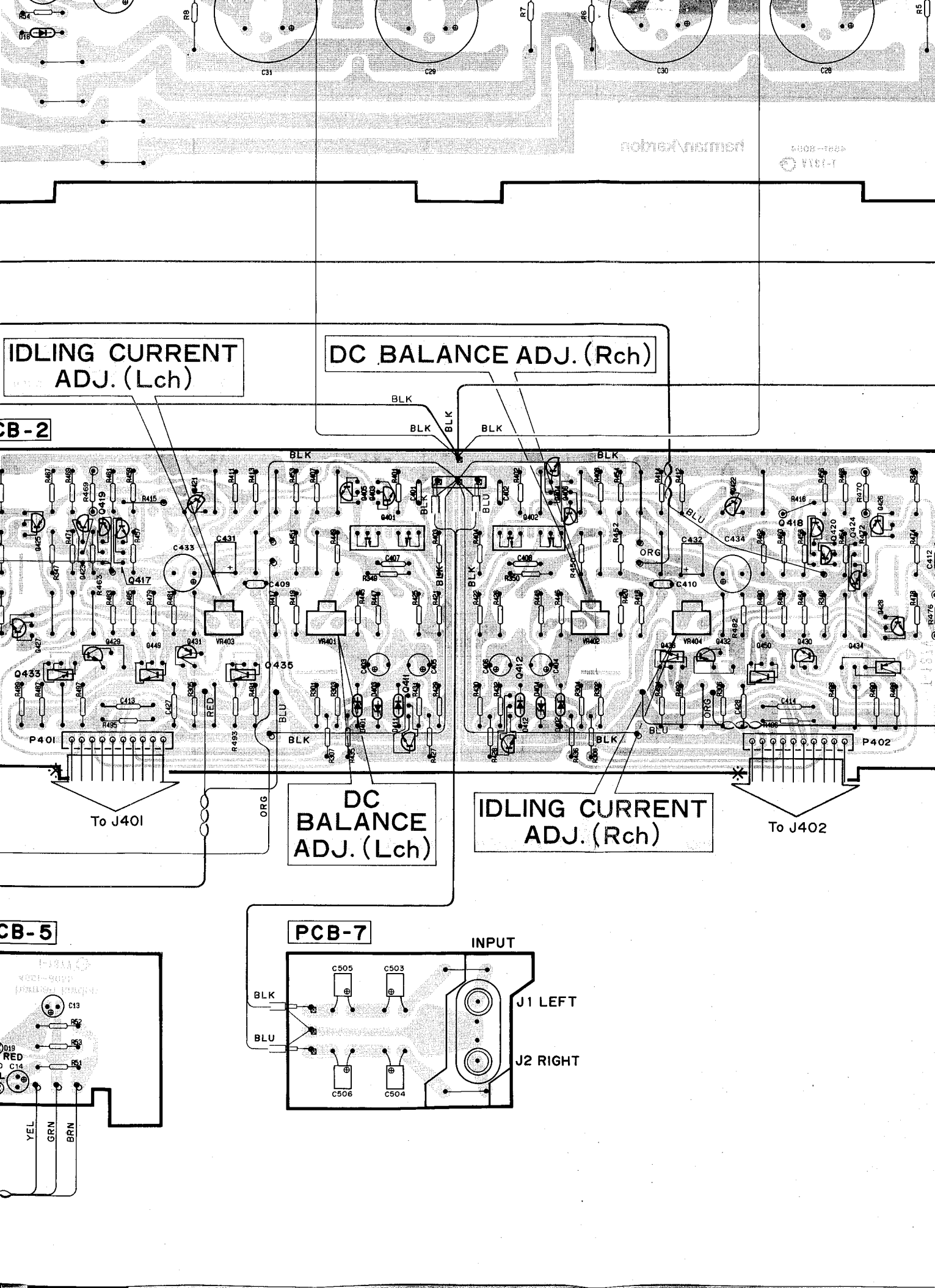


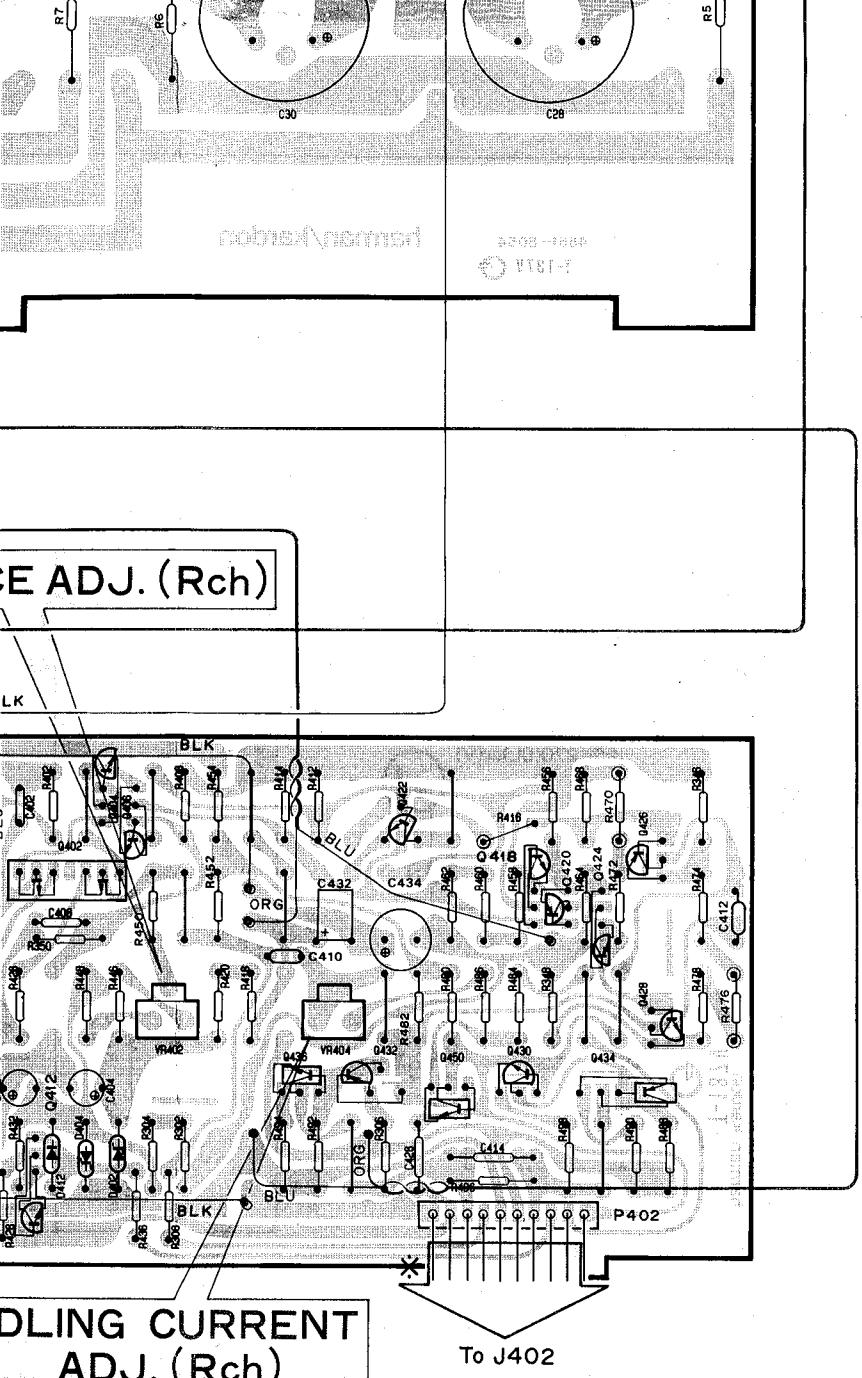
PIN CONNECTION DIAGRAM OF TRANSISTORS AND DIODES.

2SB649(C) : Q4 2SD415(Q) : Q449, 450 	2SA1115(E)or(F) : Q5, 7, 8, 10, 413, 414 2SC2603(E)or(F) : Q6, 9 
2SK270(BL)or(V) : Q401, 402 	


5
6
7
8
9
10
C3
C4
C7
C8
C22
D8
D9
R34
C10
R33
D1
BLK
WHT
GRN
BLU
RED
BRN
YEL
Q437
Q441
Q442
Q439
Q443
Q444
TP5
TP6
TP1
TP2
R313/315
R319/321
D407
D409
D405
D406
MARK
R317
R318
R325
C419
C420
C421
C422
C423
C424
Q445
Q447
Q413
Q414
Q5
Q6
Q7
Q8
Q9
Q10
C23
R309
L401
R337
R335
R333
C425
R339
R48
R35
R36
R37
R38
R39
R40
R41
R42
R43
R44
R45
R46
R47
R437
R439
R440
R438
L403
R311
R312
R332
J401
From P401


BLU
RED
BLU
ORG
IDLING CU
ADJ. (
PCB-2
P401
To J4
BLU
PCB-5
on
wait
YEL
GRN
BRN
D3
R27
C5
R33
R28
R28
C6
C9
D2
R11
WHT
Q438
TP7
R314 / 316
TP8
D410
D408
Q440
TP3
TP4
R320 / 322
C420
R330
WHT
RED
C424
R312
L404
J402
BLU
From P402


IDLING CURRENT ADJ. (Lch)
DC BALANCE ADJ. (Rch)
PCB-2
BLK
BLU
ORG
RED
P401
P402
To J401
To J402
DC BALANCE ADJ. (Lch)
IDLING CURRENT ADJ. (Rch)
PCB-5
YEL
GRN
BRN
PCB-7
INPUT
J1 LEFT
J2 RIGHT



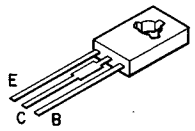
PUT

J1 LEFT

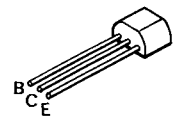
J2 RIGHT

PIN CONNECTION DIAGRAM OF TRANSISTORS AND DIODES.

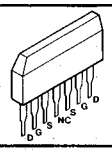
2SB649(C) : Q4
2SD415(Q) : Q449, 450



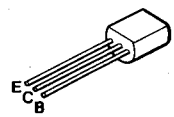
2SA1115(E)or(F) : Q5, 7, 8, 10, 413, 414
2SC2603(E)or(F) : Q6, 9



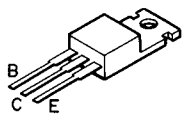
2SK270(BL)or(V) : Q401, 402



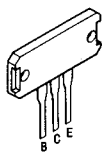
2SC1845(E) : Q403 ~ 406, 411, 412
2SC2320L(F) : Q417, 418, 421, 422
2SA922(E) : Q419, 420
2SA999L(F) : Q423, 424
2SA1145(Y) : Q425, 426
2SC2705(Y) : Q427, 428
2SC2235(Y) : Q429, 430
2SA965(Y) : Q431, 432
2SA872(E) : Q445, 446
2SC1775(F) : Q447, 448



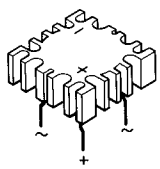
2SA968(O) : Q433, 434
2SC2238(O) : Q435, 436



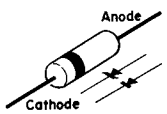
2SD845(O)or(R) : Q437 ~ 440
2SB755(O)or(R) : Q441 ~ 444



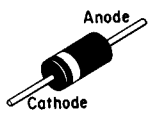
D5FB20 : D1, 2



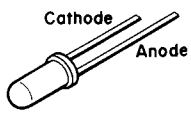
1S2471 : D3
HZ24-2L : D7
RD13EB3 : D8
IS2472 : D9
IS2473 : D18
HZ15-2L : D401 ~ 404



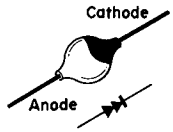
10DF2 : D407 ~ 410



GL5HD10 : D19
GL5HY10 : D20



MV12YM : D405, 406
MV5W : D411, 412



WIRE COLOR ABBREVIATIONS

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BLU	: Blue	BRN	: Brown