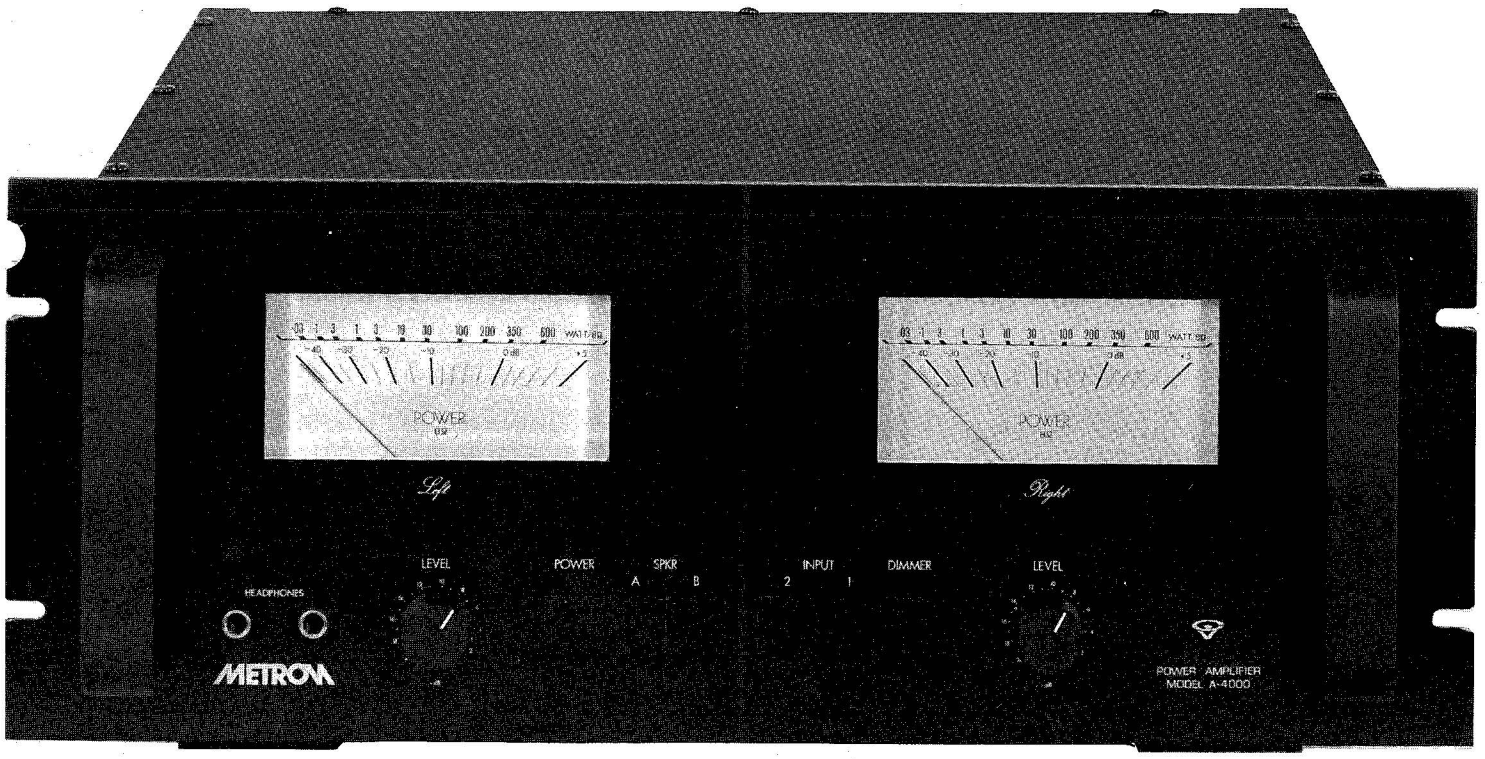
METROVA

MODEL A-4000 POWER AMPLIFIER



SERVICE MANUAL

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A-4000 Specifications

Minimum continuous power output per channel 20 Hz - 20k Hz, 8 ohms both channels driven.	350w
Minimum continuous power output per channel 20 Hz - 20k Hz at 4 ohms, both channels driven.	550w
Total harmonic distortion from 0.25w to full power, 8 ohms	.02
IM distortion, (SMPTE) from 0.25w to full power, 8 ohms	.02
Signal to noise (ref. rated output, "A" weighting).	115db
IHF noise. (ref. Odbw, "A" weighting)	-90db
Power bandwidth (IHF)	7 Hz - 100k Hz
Slew rate v/μsec	50
Damping factor ref. 50 Hz, 8 ohms	200
Input impedance	10k ohms
Input sensitivity (ref. full output)	2.0v
IHF sensitivity (ref. OdbW)	.107v
Input connection	phono (RCA)
Output connection	dual binding post (5-way)
Fan cooling	yes/2-speed
Power requirements idle/ full power	125w/1800w
Weight (net)	79 lbs. 38 kg.
Dimensions (W,H,D)	19" x 7.9" x 18 1/2" 48cm x 20cm x 47cm

DISASSEMBLY INSTRUCTIONS

1. To remove the TOP & BOTTOM plate. (Refer to Fig. A)
   Remove the twenty eight (28) screws from top and bottom.

This appliance is divided with three blocks, front chassis, center chassis and back chassis blocks.

1. To remove the Front Chassis block. (refer to Fig. B)
   Remove the ten (10) screws from the both sides of Front Panel, then remove the Front Chassis block.
2. To remove the back chassis block. (Refer to the Fig. C)
   Remove the six (6) screws from both sides of Back Panel, then remove the back chassis block.

A. To remove the POWER meters and Meter Drive & Switch Control Unit from Front Chassis block. (Refer to Fig. B)

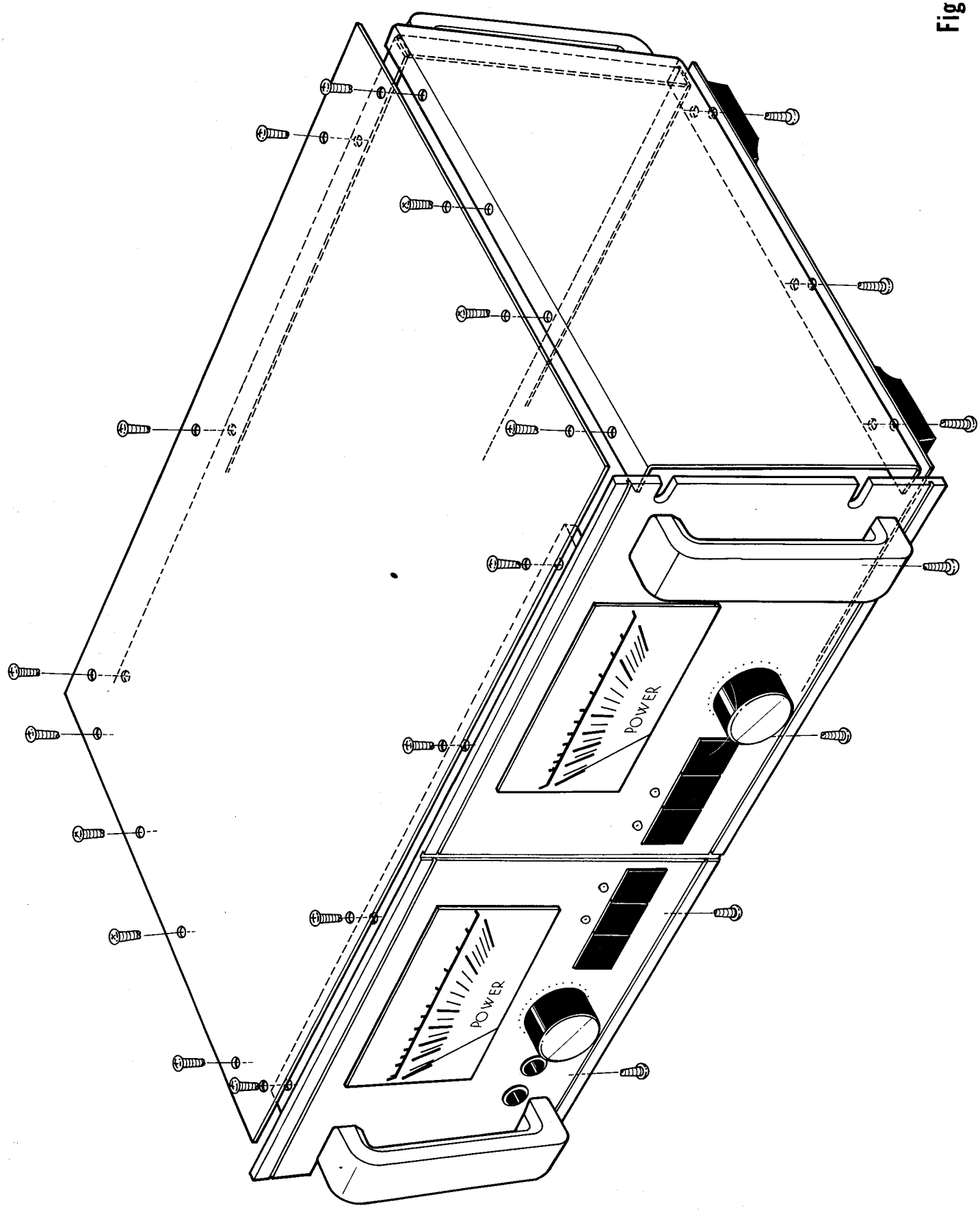
   1. Remove the LEVEL knobs.
   2. Remove the two handles from Front Panel.
   3. Remove the six (6) screws from top and bottom of Front Chassis, then remove the Front Panel.
   4. Remove the four (4) screws (#3) of meter terminals from both POWER meters.
   5. Remove the screw (#5) on 7135 Meter Drive & Switch Control Unit from mounting pillar, then remove the P. C. Board.
   6. Remove the four (4) nuts (#2) from each of POWER meters, then remove the meters.

B. To remove the heat sink and other components from back chassis block. (Refer to Fig. C)

   1. To remove the back panel from back chassis block.
      a. Remove the four (4) screws (#5) from back panel, then remove the back panel.
   2. To remove the power transistors from heat sink.
      a. Remove the cooling fan, 4016 Protection Unit and two metal covers.
      b. Then all of power transistors are exposed and remove transistor(s).

   NOTE: In the above section (2), it is not required to remove the heat sink's both end covers.

Figure A



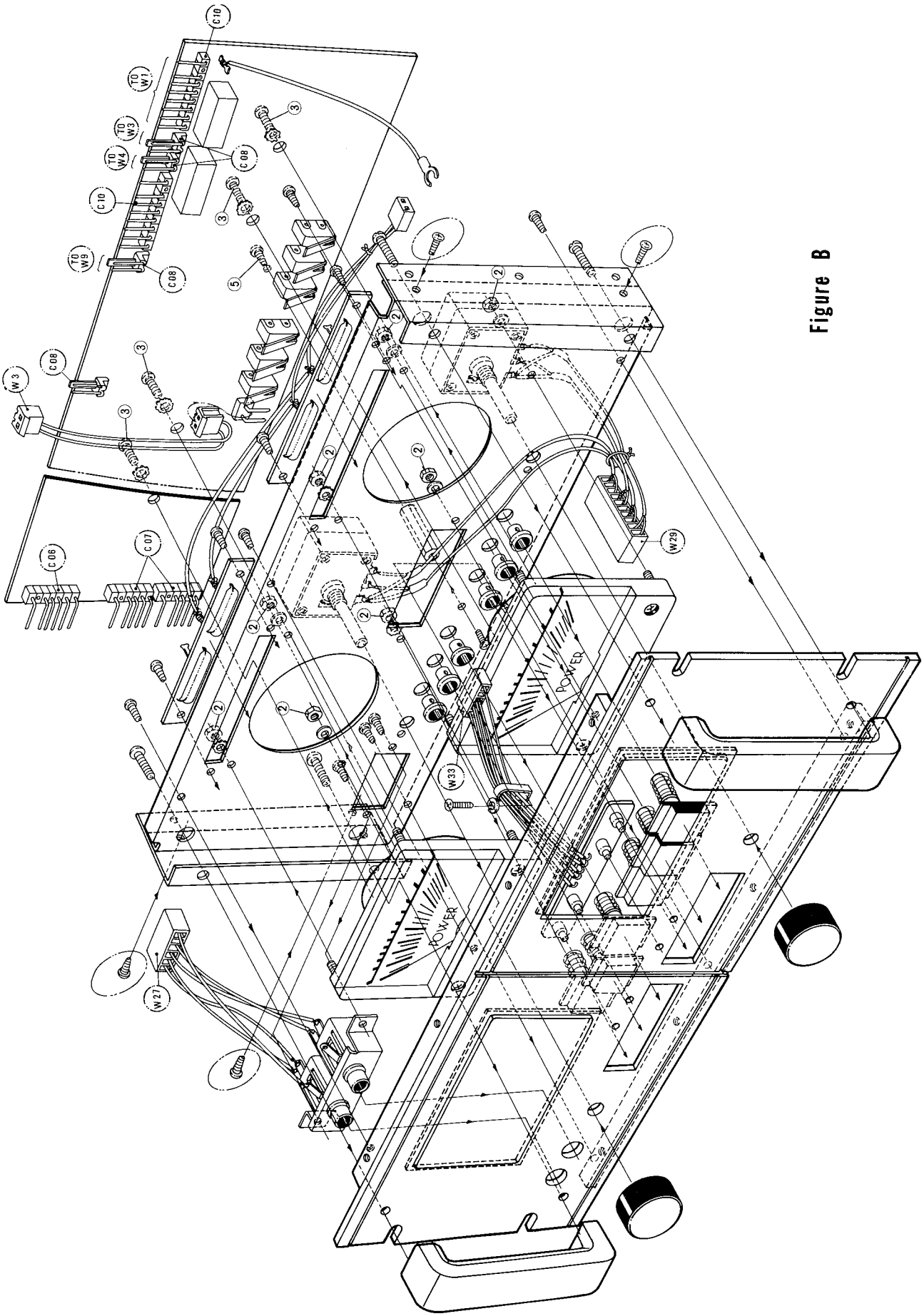

C10
TO W1
TO W3
TO W14
C08
C10
3
TO W9
C08
5
C08
W3
3
3
C06
C07
2
W29
POWER
W33
POWER
W27

Figure B

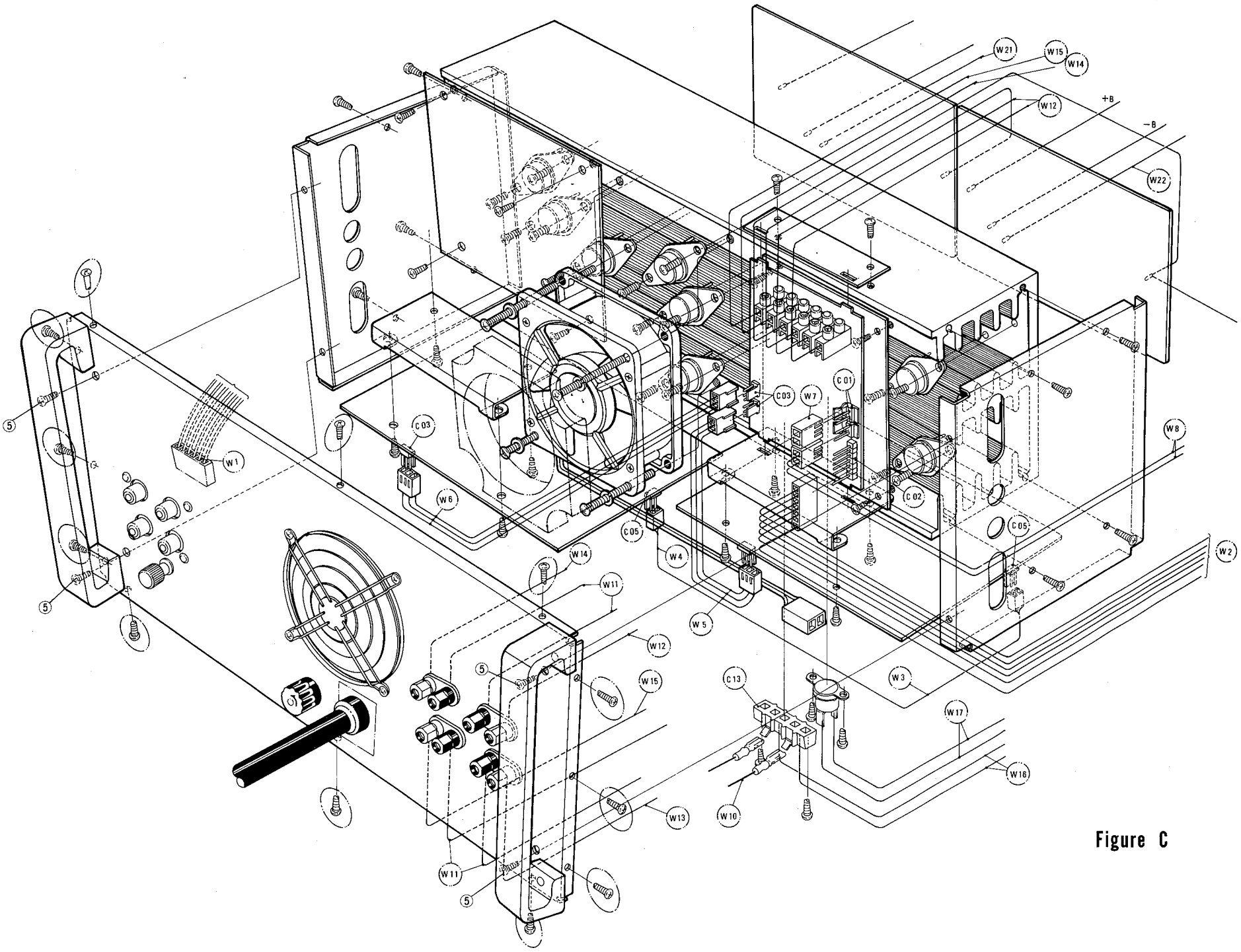

W21
W15
W14
W12
+B
-B
W22
W1
C03
W6
C03
W7
C01
W8
C02
C05
C05
W4
W2
W14
W11
W5
W12
W15
C13
W3
W17
W16
W13
W10
W11
5

Figure C

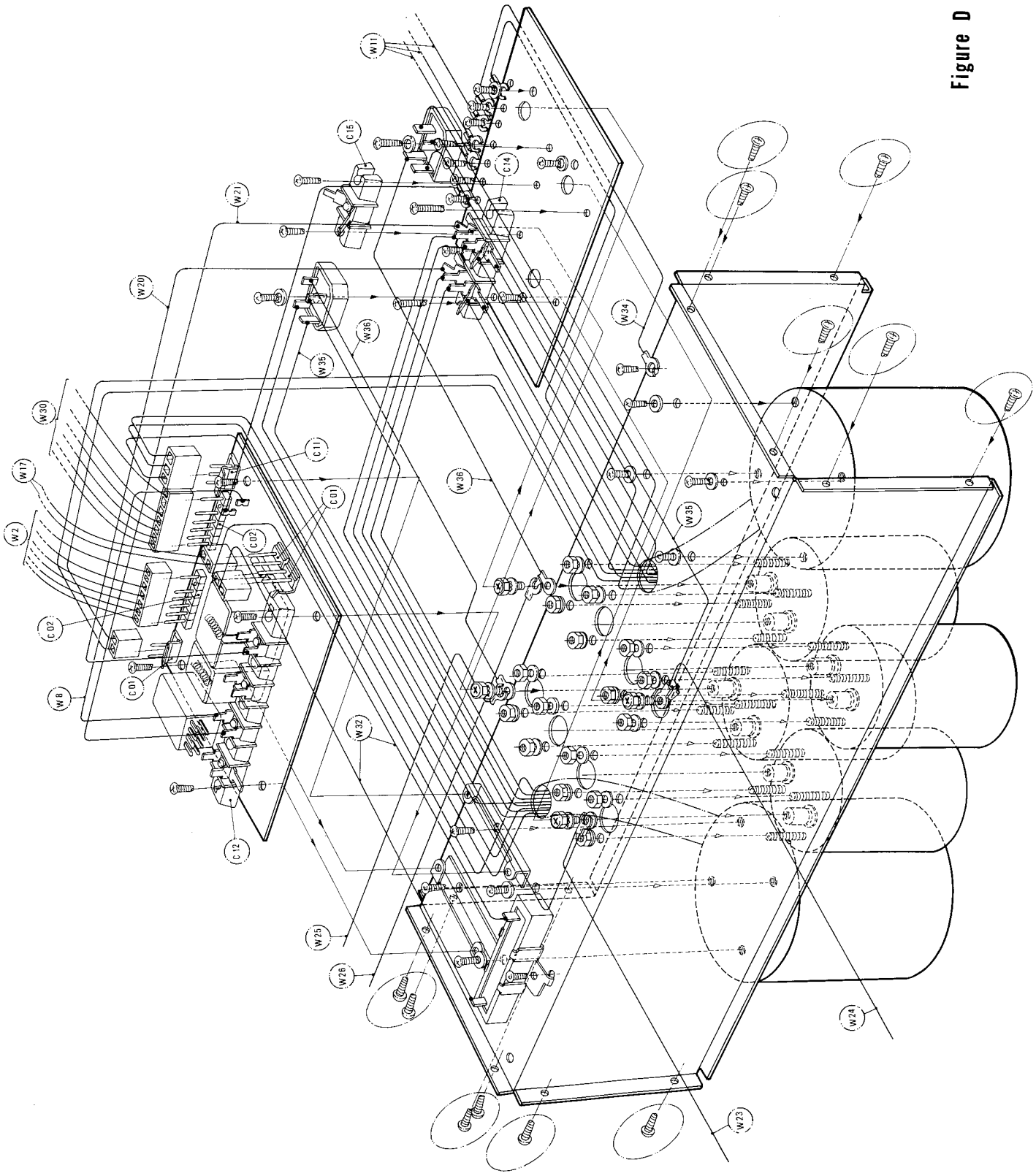

W11
C15
C14
W21
W20
W36
W35
W34
W30
C11
W17
C01
W2
C02
W36
W35
C02
C01
W8
W32
C12
W25
W26
W24
W23

Figure D

DRIVE CIRCUITRY

TR602/603 and TR604/605 make up a dual differential first stage which provides the initial voltage gain. This stage operates from a ±24v supply (zeners D603 and D604). TR601 and TR606 act as level shifters to drive the class A stage, TR809 and TR810. Drivers TR611 and TR612 provide further current gain for the output stage.

Electronic current limiting is provided by TR613 and TR614, and associated components. When the voltage across emmiter resistors in the output stage (i.e., R684 and R689) becomes excessive TR613 or TR614 turns on, clamping the base of the driver to the output rail, preventing further current drive.

OUTPUT STAGE

The output sections consist of parallelled output devices TR615 through TR624, which provide final output drive. D673, mounted behind the circuit board directly against the output sink, senses temperature and adjusts the idling current (back in the class A stage) accordingly. This provides optimum thermal stability and performance.

PROTECTION CIRCUIT

The protect circuitry is designed to protect the amplifier and speakers under potentially harmful conditions, described below:

1.) Short circuits, excessive current flow, overloads, etc., are sensed across the VI limiter transistors on the drive board (pins 11 and 12). If TR410 or TR411 switches on, level shifter TR409 will turn TR405, de-energizing the output relays K401 (via TR401) and K402 (via TR402).

2.) Sustained DC voltage @ the output - the output of CH1 and CH2 is summed and integrated by R414, R416, and C406. A positive offset will turn on TR406, a negative offset turns on the TR407/TR408 pair. Again, the result is that TR405 turns on and disconnects the relays.

3.) Loss of AC power or very low line voltages are prevented from causing dangerous or annoying transients by TR405. A loss of rectified AC (via D403) will forward bias TR405 through TR404 (+VCC). This also provides turn off muting.

As long as the fault condition remains, K401 and K402 will remain off. When the condition has claeared, they will again turn off after C401 has charged (typically three to five (3 to 5) seconds).

HIGH FREQUENCY PROTECTION UNIT

This circuit is designed to shut off the input relays at the presence of very high frequencies to prevent amplifier or speaker damage. L and R outputs are summed through R451 and R452. Each incoming cycle is squared by TR451 and fed through a two-pole hi-pass filter (R457, C452, and C453) to eliminate sensitivity to frequencies below 150kHz. If TR452 and 453 are switched on enough, the TR454/TR456 latch will fire, shunting the flip-flop in the input relays via D452/453.

POWER SUPPLY UNIT

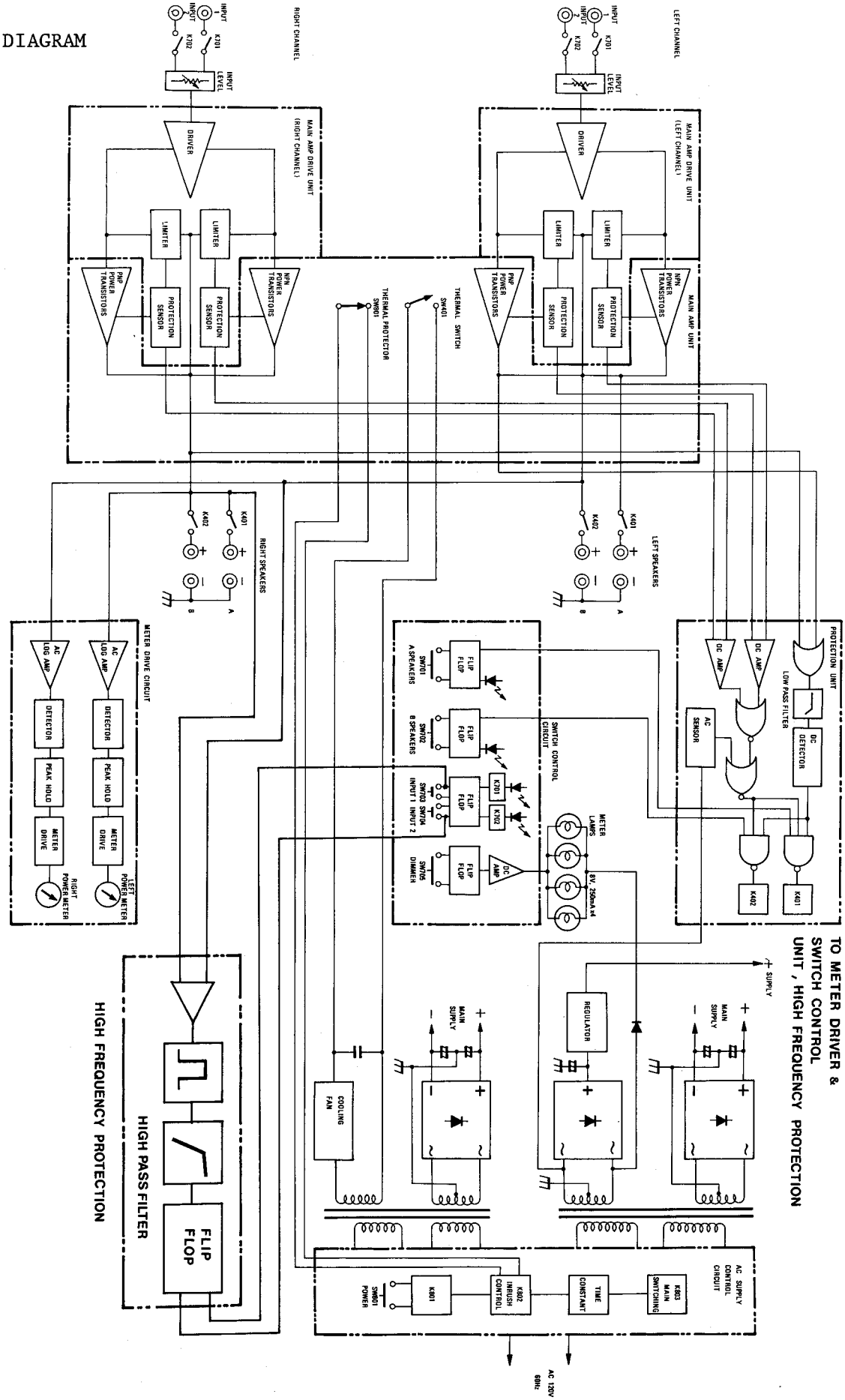
K801 is a two-position stepping relay. Its mechanical latch provides a memory as to its on-off condition in the event of external power failure. K802 pulls in when K801's contacts (and the thermal switch) are closed. Power is delivered to the transformer primaries through R851. This provides a "soft start" to eliminate the potentially fuse blowing current surge which would otherwise result. After a few (3) seconds. K803 pulls in to short R851 and apply full power.

METER DRIVE AND SWITCH CONTROL

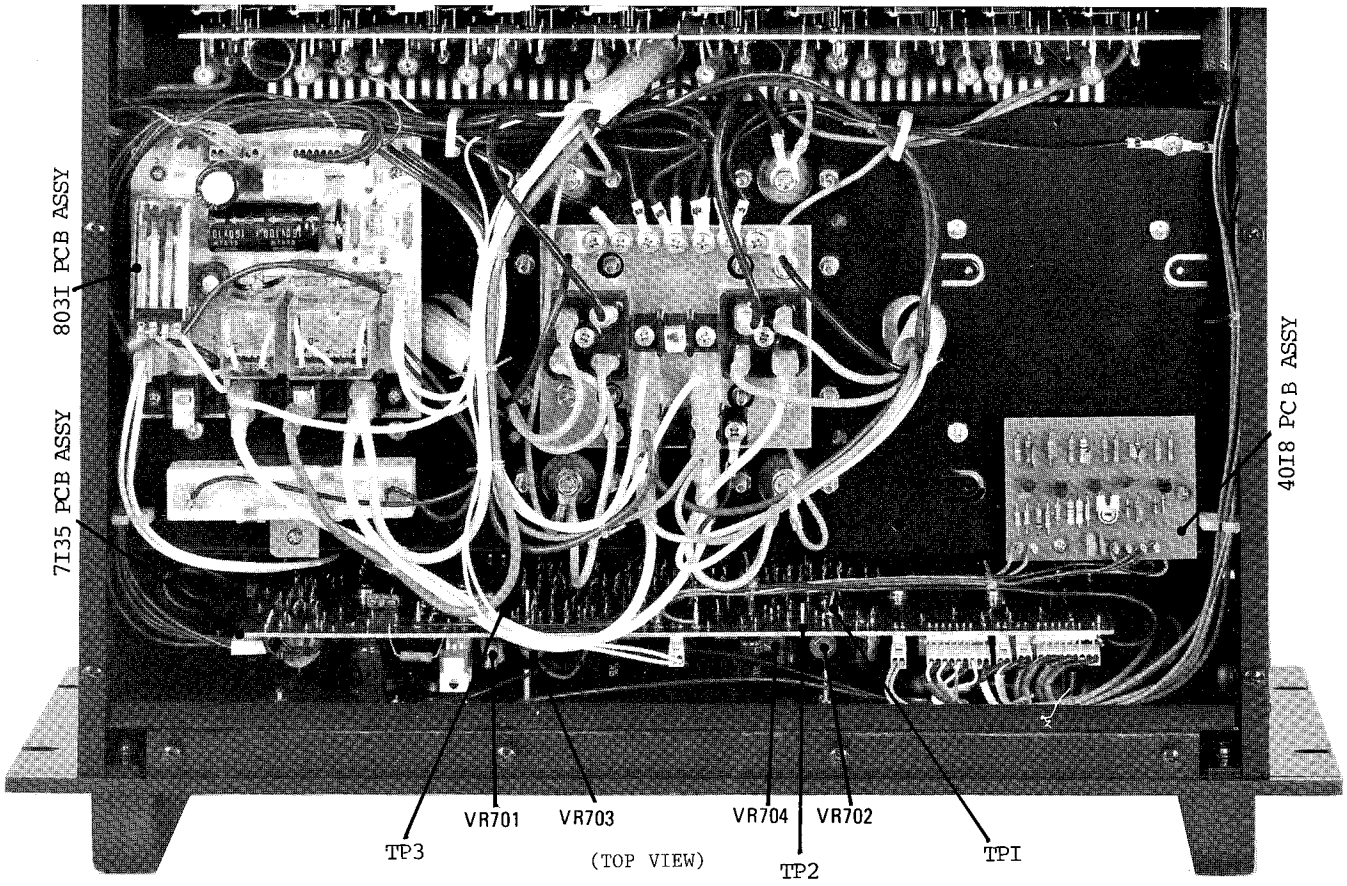
Meter Drive - TC701 is an LSI integrated circuit. It includes an AC log amp, peak detector, sample and hold circuit, and meter drive circuit. Note that the meters respond to the peak level of a sine wave. Overdriving the amp into square wave will not increase the reading.

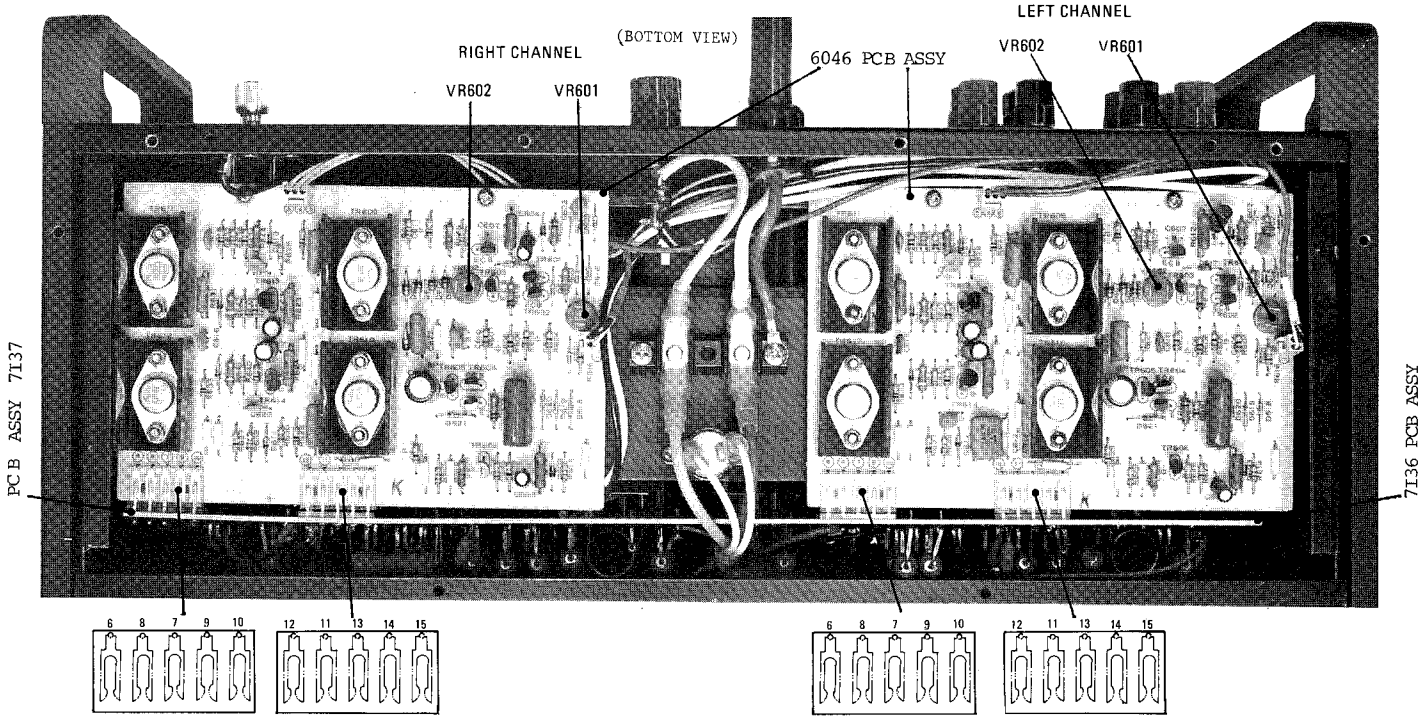
Switch control - Panel lamp dimming is provided by a discrete flip-flop circuit. Speaker A and B switching utilize two interlocked flip-flops, while the input selectors are a pair of latches. (i.e. set-reset action)

BLOCK DIAGRAM



ALIGNMENT POINTS AND PCB ASSEMBLY LOCATION



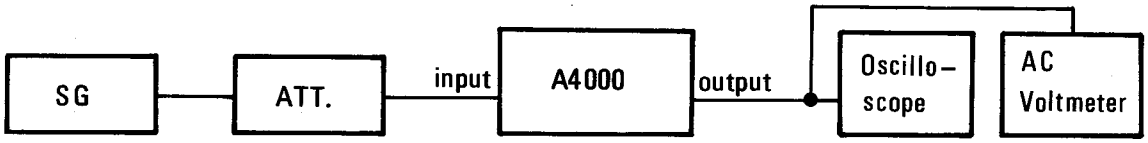


ALIGNMENT PROCEDURES

1. DC BALANCE & BIAS ADJUSTMENT

	Indicator	Adjustment	Remarks
DC Balance	DC Voltmeter connected between pins 10 and 13 on Assy's 6046	VR601 (Assy 6046)	Adjust for 0 volt ±10 mv with no signal, & no load.
Bias	DC Voltmeter connected between pins 11 and 13 on Assy's 6046	VR602 (Assy 6046)	Adjust for about 24 mV reading with no signal, & no load.

2. POWER METER ADJUSTMENT



Alignment connection of POWER meters

Input signal level: Adjust for 52.9 volts RMS (sine wave) output at 1 kHz with no load

Step	Indicator	Adjustment	Remarks
1	DC Voltmeter connected between TP3 and TP1 in case of L channel. (or TP2 and TP1 in case of R channel) on PCB #7135.	VR704 : L ch. VR703 : R ch. (Assy 7135)	Adjust for 2.7 volts reading on DC Voltmeter
2	A-4000's POWER Meter	VR702 : L ch. VR701 : R ch.	Adjust for 0 dB reading on POWER Meter
3	Same as step 2 Input signal: -30dB compared with step 2	VR704 VR702 : L ch. VR703 VR701 : R ch. (Assy 7135)	a. If the POWER Meter reading is -30 dB, everything is OK. b. If you did not obtain -30 dB reading on POWER Meter, repeat steps 2 and 3 until no further improvement is possible

240 VAC AC MAINS CONVERSION OF THE METRON A-4000

Conversion procedures:

1. Clip the two jumper wires on the power control board (upper left in photo).

2. Remove the purple and white wires (leading down into the power transformer) and connect them to the spare terminal between the bridge rectifiers.

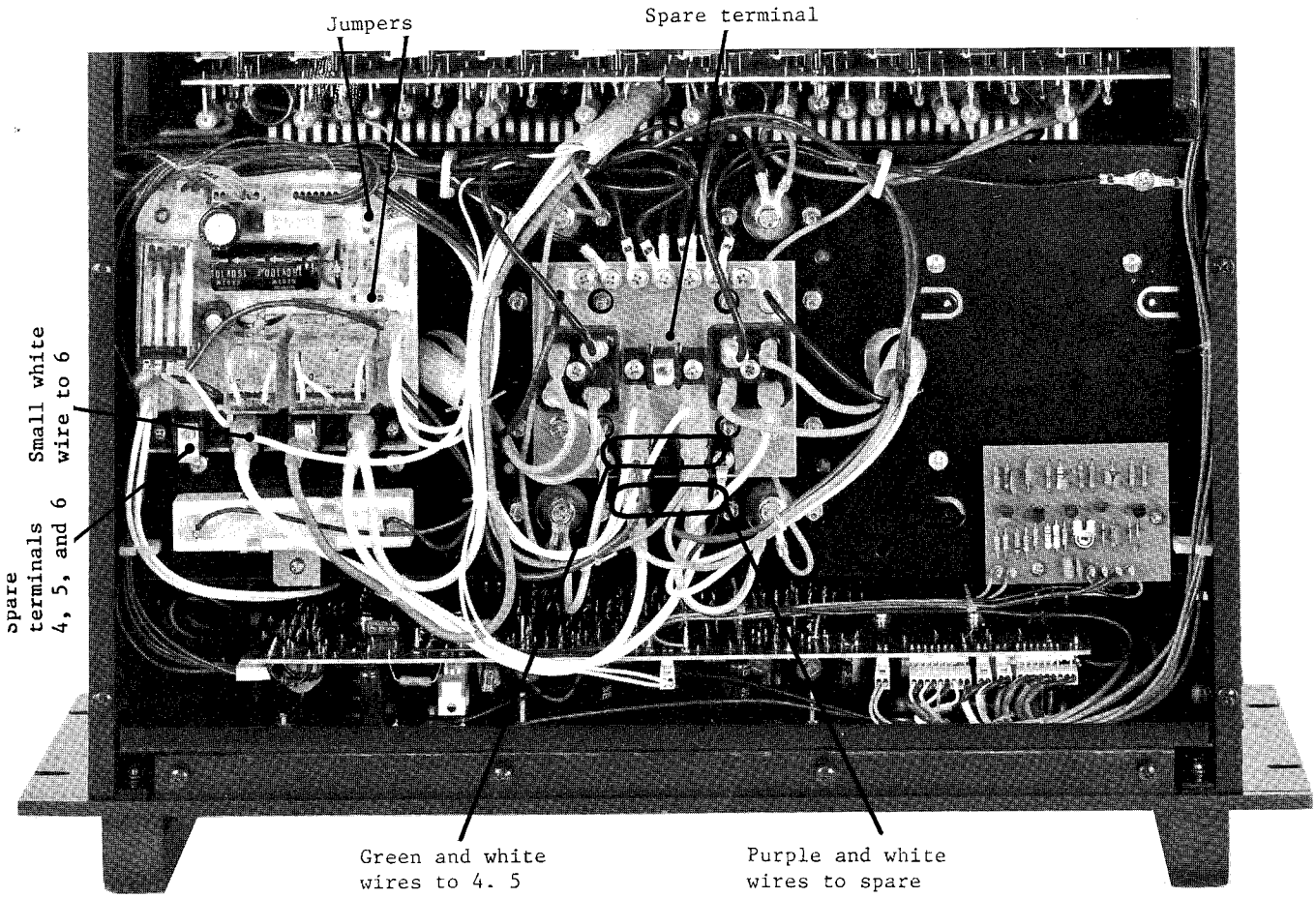
3. Remove the green and white wires (leading down into the left transformer) and connect them to spare terminals 4 and 5.

4. Also move the smaller white wire (which returns to the soldered terminal on P C board) over to the one still unused terminal (6). (Terminals 4,5, and 6 now have the green, white, and small white wires attached.)

5. Replace the 15a AC mians fuse with a 7a regular blow (3AG)

   CONVERSION IS NOW COMPLETE.

   To convert a unit to 120 VAC, reverse the above prodecure.



Power Amplifiers

1) AC Mains Power

All Cerwin-Vega amplifiers must be plugged directly into an outlet capable of supplying the maximum current demand without excessive voltage sag. (More than 10% below normal line voltage.) Insufficient in-house wiring, overloaded circuits, or lightweight extension cords will degrade performance and drastically reduce power output, possibly causing unreliable operation. If several amplifiers are installed (even when using multi-phase power systems) the line voltage for each amp should be checked with all units under full-power operation.

2) Grounding

Improper grounding is probably the most common fault in large multi-amp systems. Do not defeat the third wire AC ground under any conditions. If the electrical system does not have a solid earth ground, a cold water pipe or other suitable ground must be connected to the chassis at the ground post, using #14AWG or larger. Failure to do so can cause a lethal shock hazard, destroy the amplifier if it is connected to faulty equipment, or cause the protection circuits to activate. If the unit does not operate properly with the AC chassis ground connected, either the equipment is malfunctioning or the installation is faulty. Input and output ground wires should never be connected directly to each other or the AC ground. Each input and output connection should be wired with separate cables. This precludes common grounds for stereo inputs or outputs. Connecting grounds together may cause ground loops with attendant hum, or worse, the system may go into oscillation. Do not confuse the signal (shield) grounds with the low impedance, high current AC (chassis) grounds which require a separate wire. In systems where the units are rack mounted, do not depend upon the panel screws for a ground; the anodized face plates will not make electrical contact. Some problems with hum may require installing a #14AWG (or larger) wire between all chassis.

3) Ventilation

Amplifiers equipped with integral two-speed fans should not normally require external ventilation. When used under high power or low impedance conditions, amplifiers without fans must have (and those with fans will benefit from) external forced cooling. The best cooling method involves sealing the rack or cabinet and installing fans at the bottom (fresh air entrance) and top (hot air exhaust) of the cabinet.

4) Fuse Protection

Fast-blow fuse protection is strongly recommended to reduce driver damage from overpowering. In commercial applications where blown fuses could be a disaster, a peak limiter or compressor is recommended as an alternative.

5) Output Loads

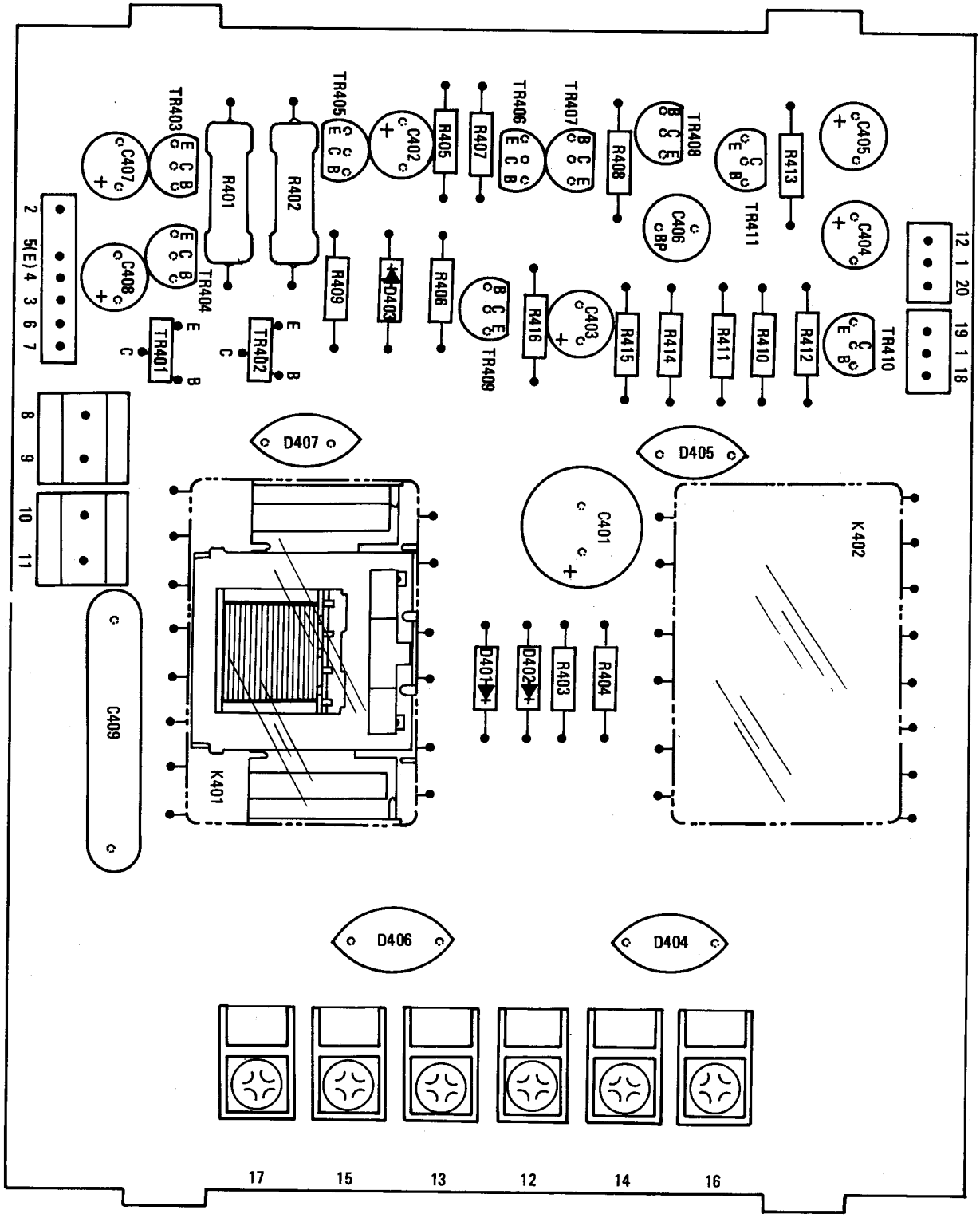
Minimum recommended load impedance for Cerwin-Vega amplifiers is 4 ohms. With lower load impedances the amplifier will protect either electronically and/or by disconnecting the outputs for several seconds. Electronic protection (VI limiting) is not indicated by the amplifier. The result is a clipped output which imparts a harshness in the sound.

Either type of protection should be avoided, either by raising the load impedance or turning down the volume.

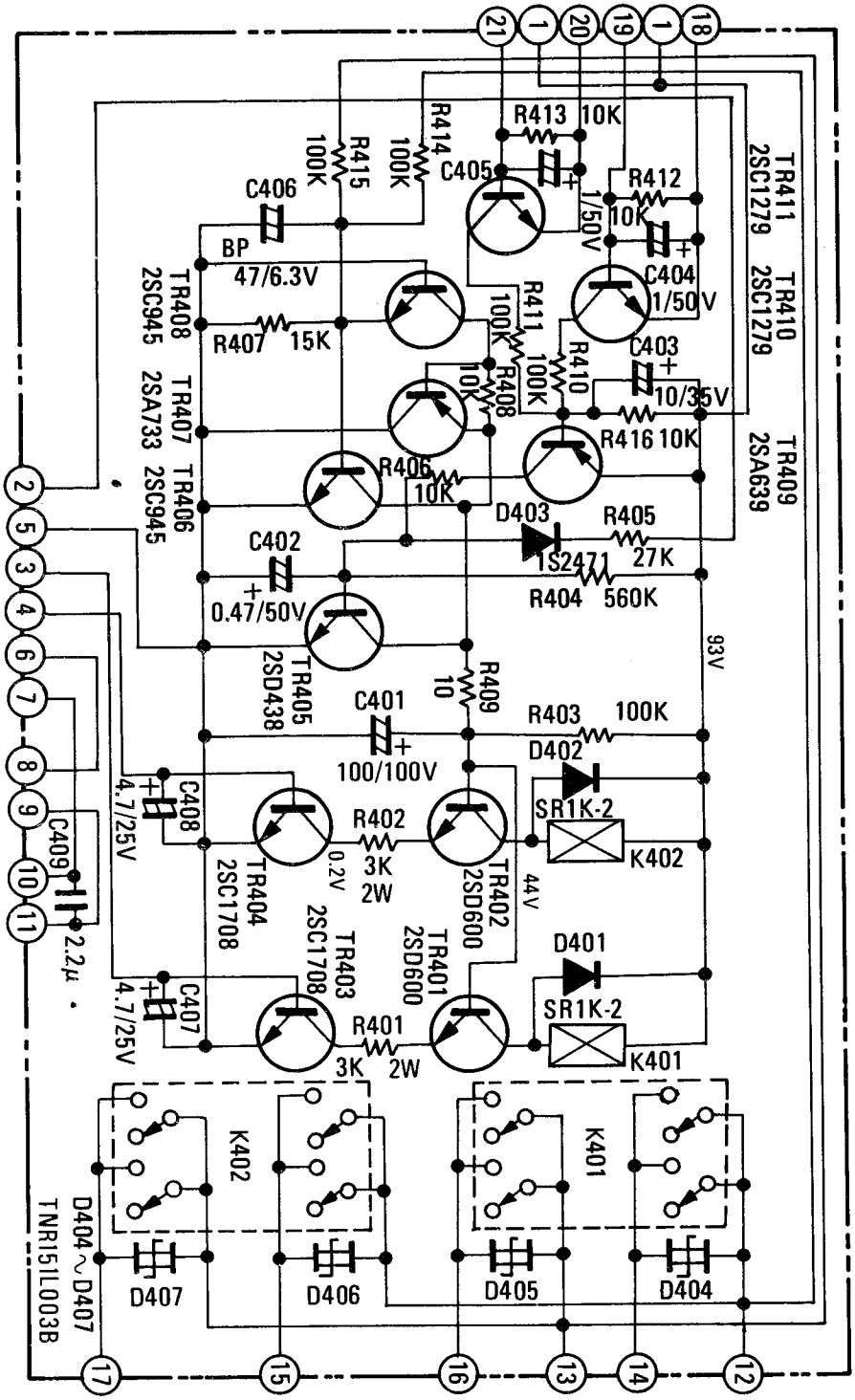
6) Inputs

Many modern preamps are capable of undistorted output at levels much higher than that required by Cerwin-Vega amps for full output. In this case the amplifier input attenuators should be reduced to take advantage of the higher drive level. This will increase the signal/noise ratio and reduce susceptability to induced hum and oscillations on the input lines. Good wiring practice should still be observed, of course, keeping input lines away from AC and speaker wires. Maximum input signal should never exceed ±15v peak (21vrms). Also remember that the input impedance is 10kΩ. Care should be taken that the driving preamp "sees" an impedance at least as high as its rated minimum.

4016 PROTECTION UNIT PARTS LOCATION



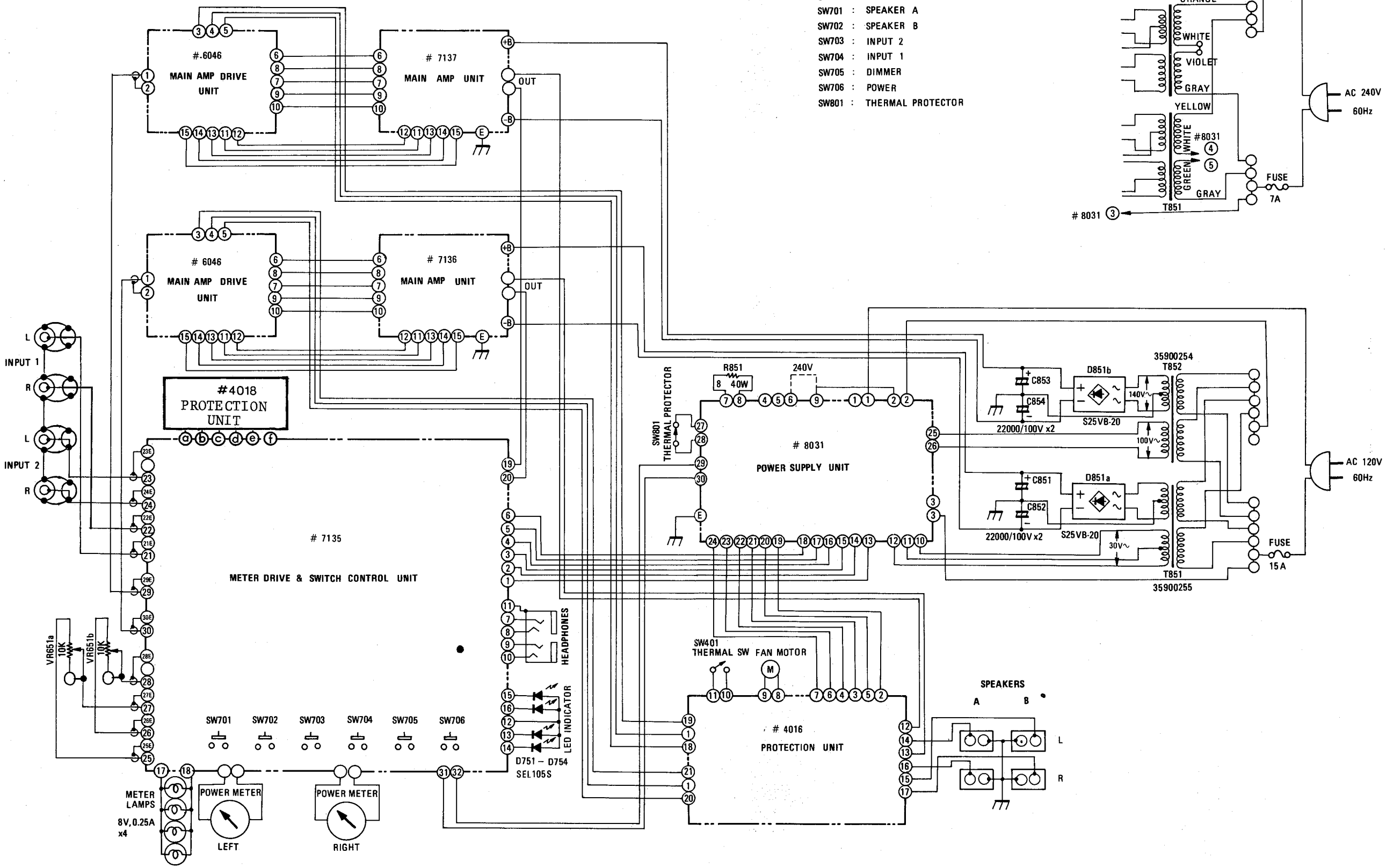
4016 PROTECTION UNIT SCHEMATIC



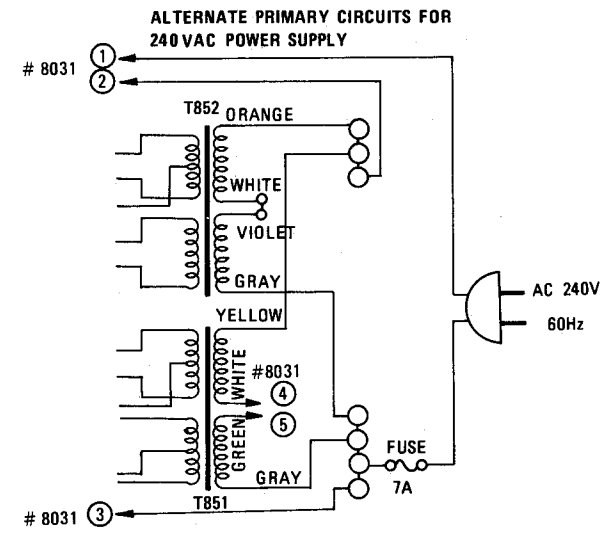
SCHEMATIC DIAGRAM

SWITCHES

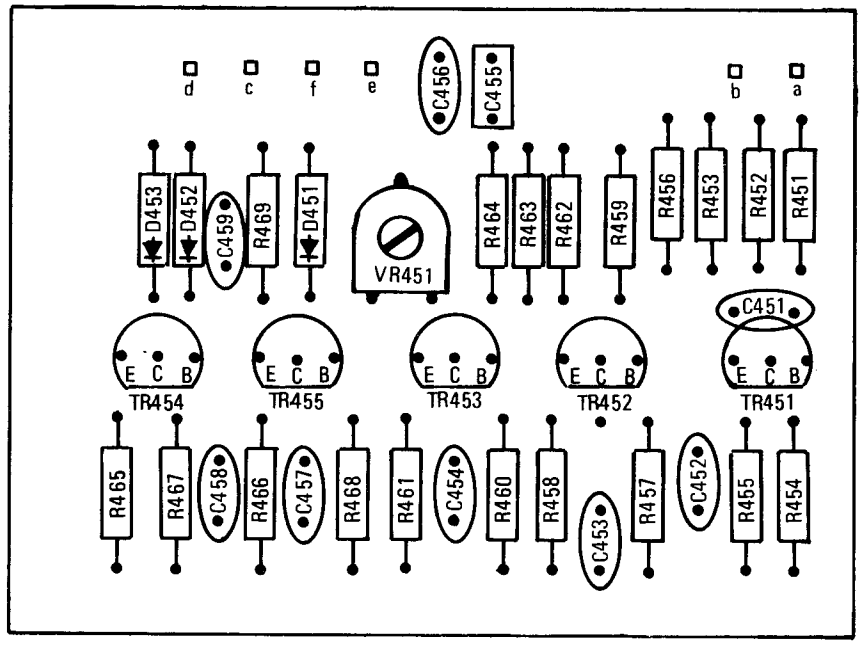
SW401 : THERMAL SW
SW701 : SPEAKER A
SW702 : SPEAKER B
SW703 : INPUT 2
SW704 : INPUT 1
SW705 : DIMMER
SW706 : POWER
SW801 : THERMAL PROTECTOR

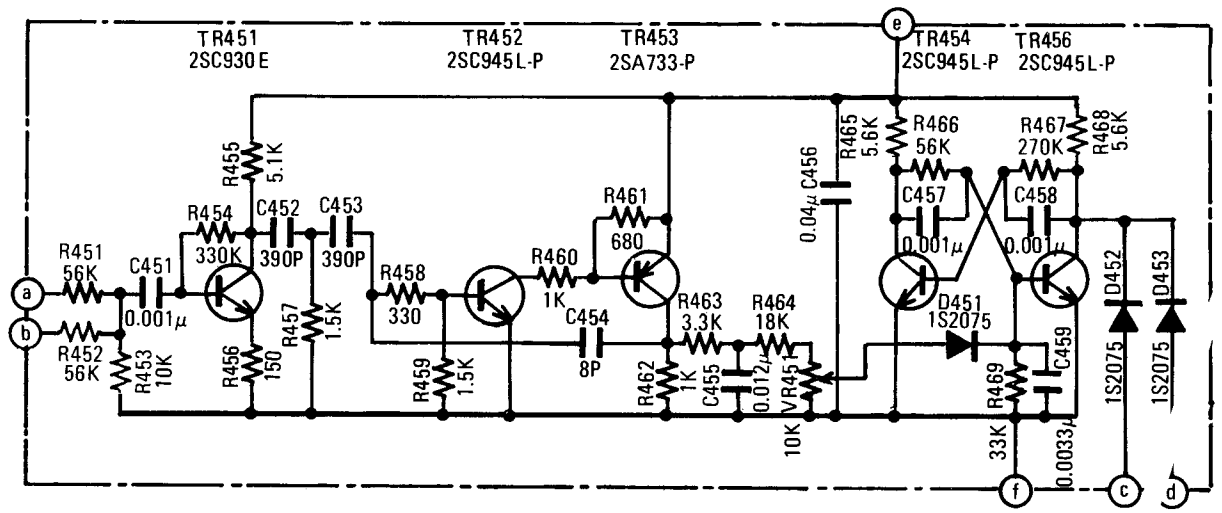


ALTERNATE PRIMARY CIRCUITS FOR 240VAC POWER SUPPLY



4018 HIGH FREQUENCY PROTECTION UNIT PARTS LOCATION AND SCHEMATIC

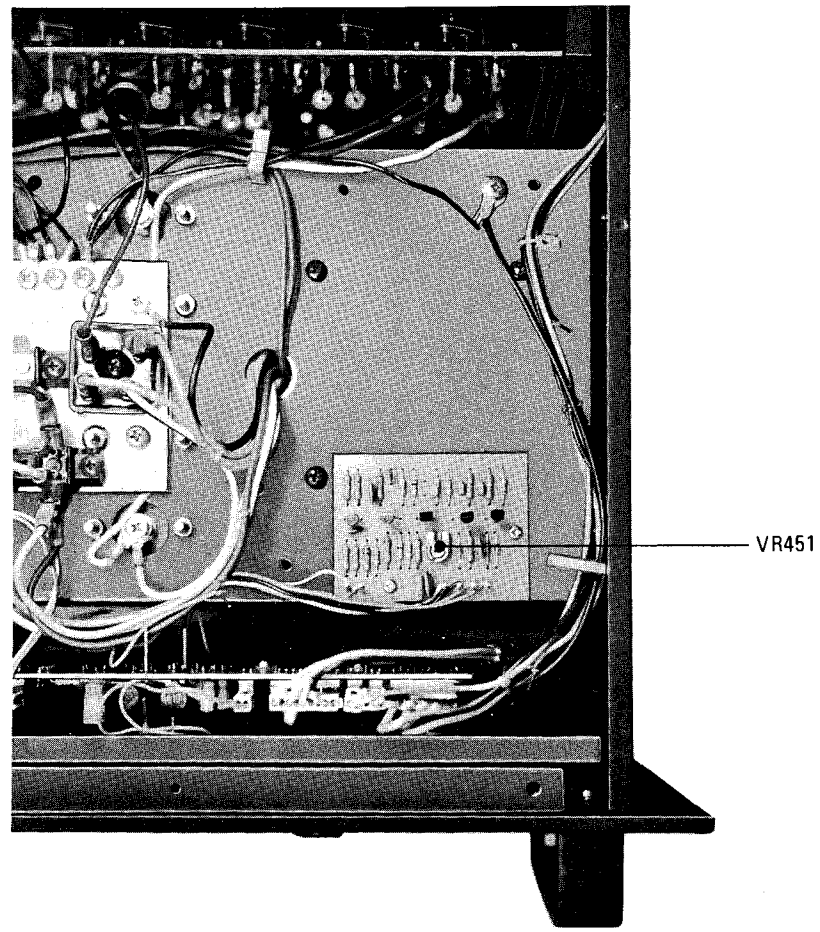




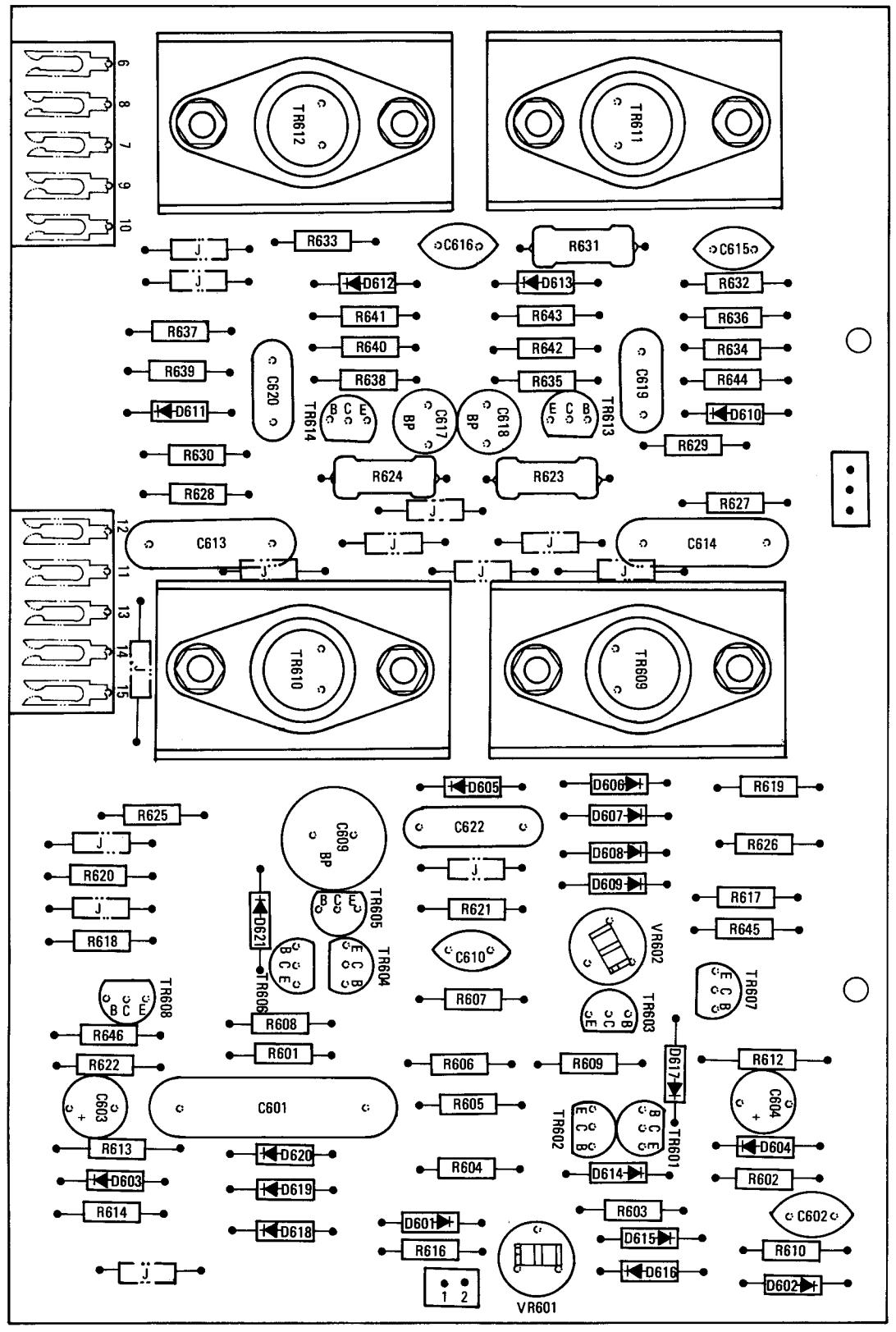
SENSITIVITY ADJUSTMENT FOR HIGH FREQUENCY PROTECTION UNIT

Indicator	Adjustment	Remarks
AC Voltmeter connected to L or R channel SPEAKER terminals	VR451 (Assy 4018 High Frequency Protection Unit)	Adjust to cut off the inputs when the output reaches 2 volts at 200k Hz. Be sure meter is accurate at 200k Hz.

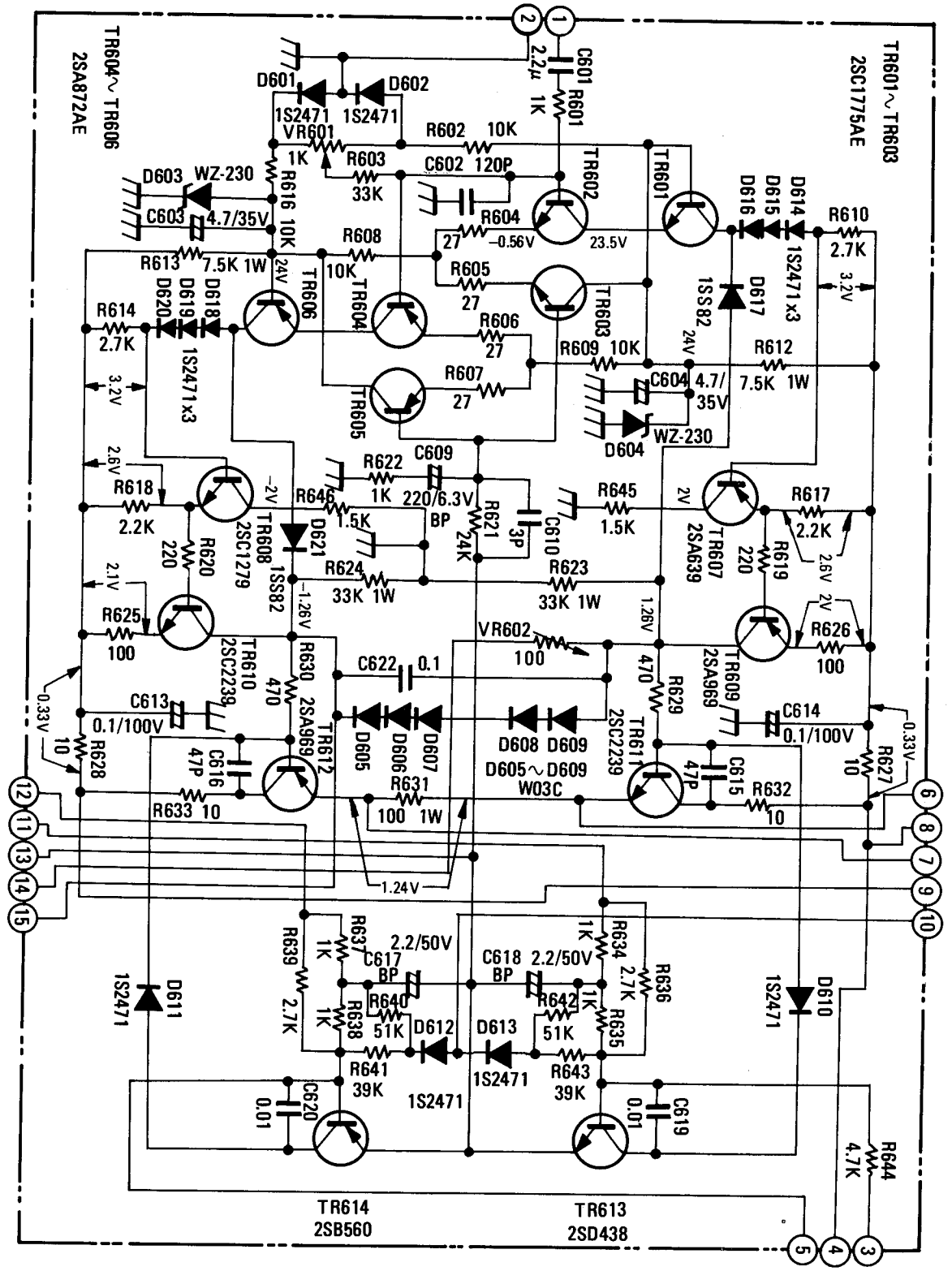
ALIGNMENT POINT



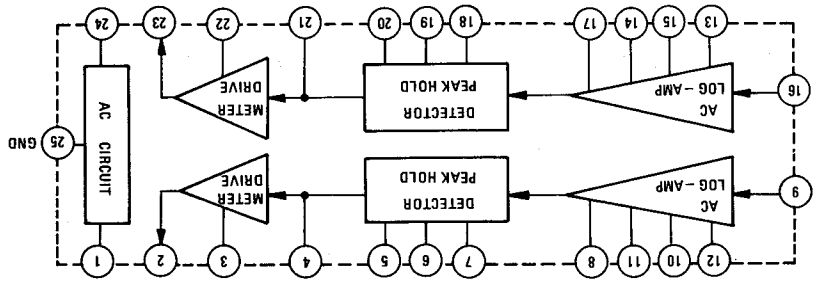
6046 MAIN AMP DRIVE UNIT PARTS LOCATION



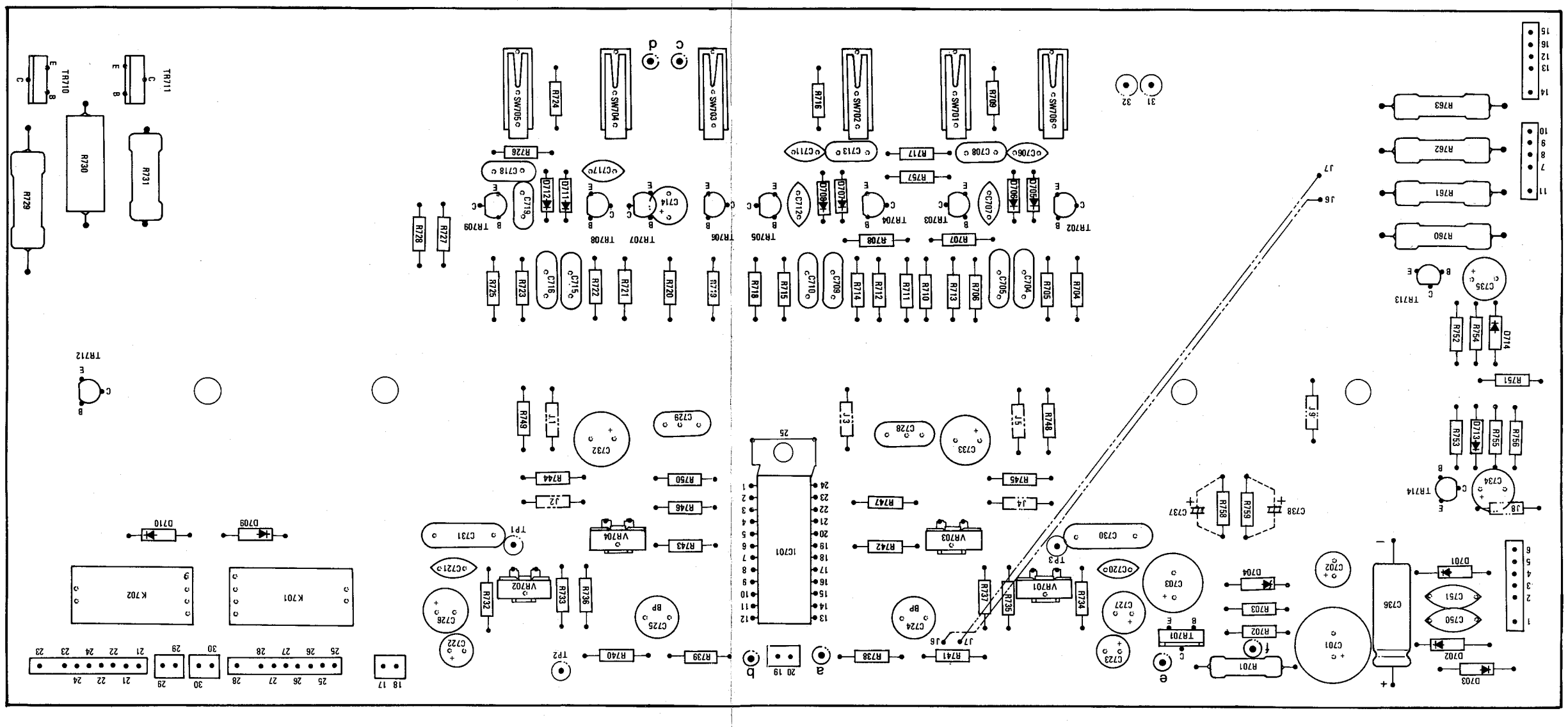
6046 MAIN AMP DRIVE UNIT SCHEMATIC



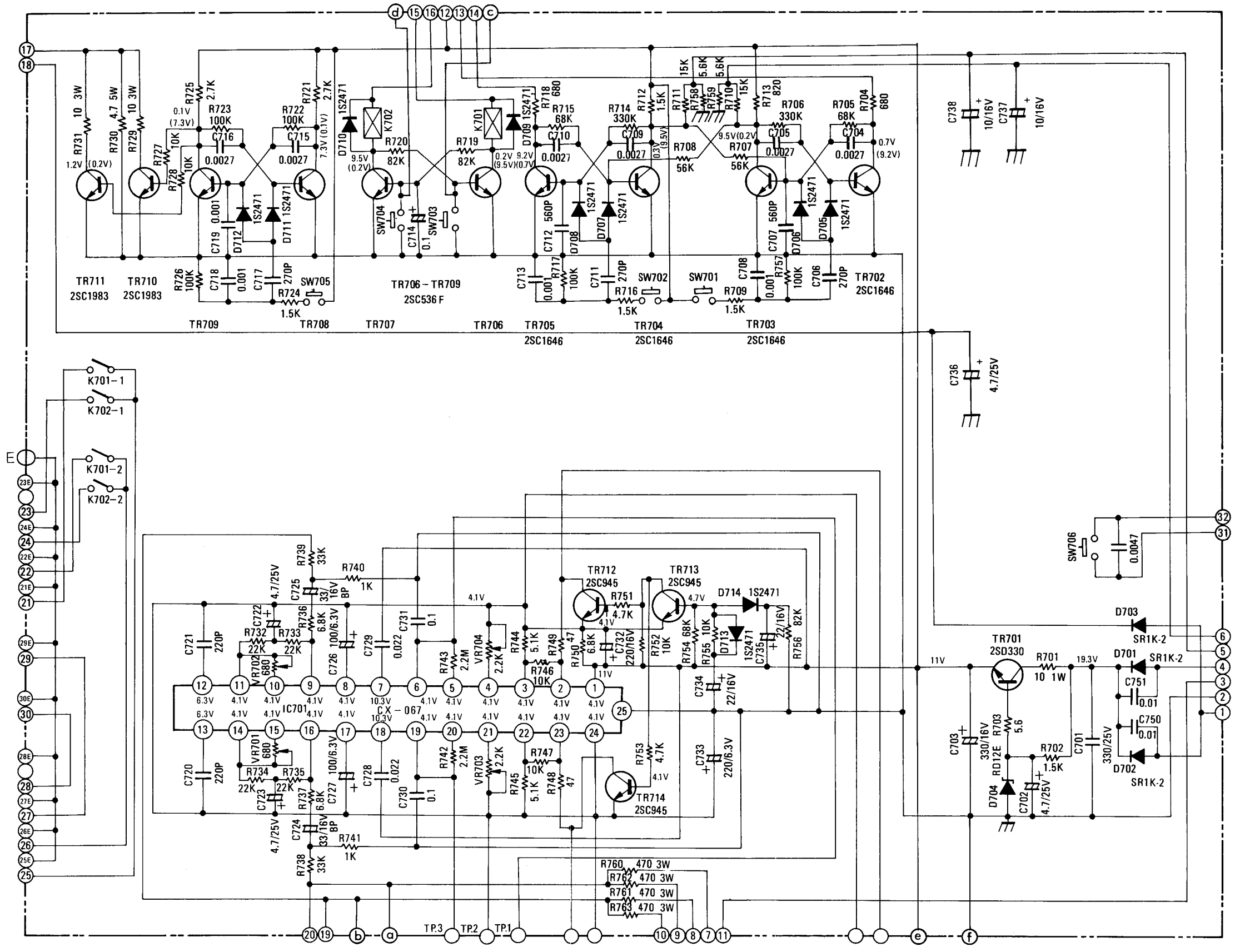
Internal view of IC CX-067



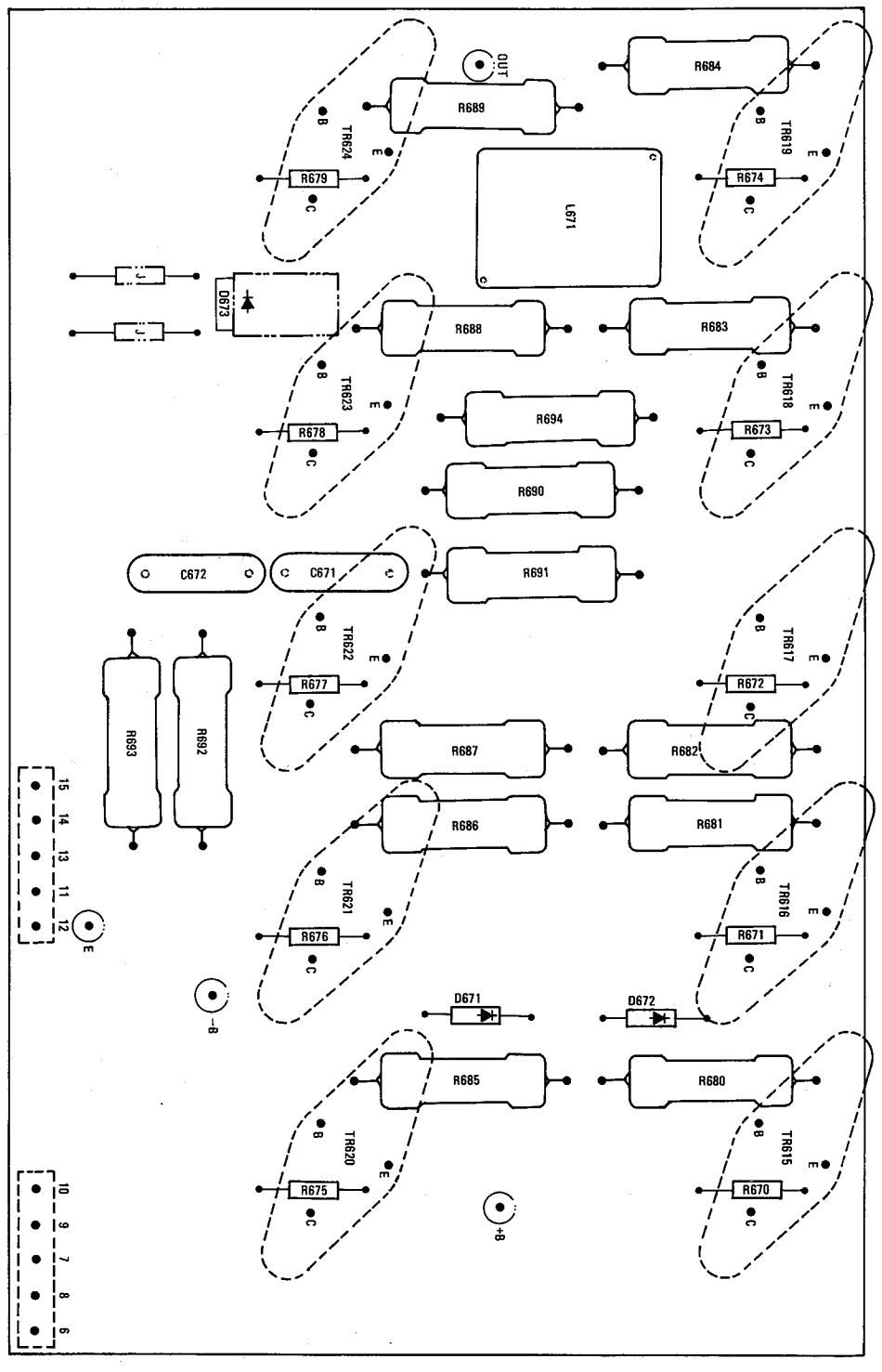
7135 METER DRIVE & SWITCH CONTROL UNIT PARTS LOCATION



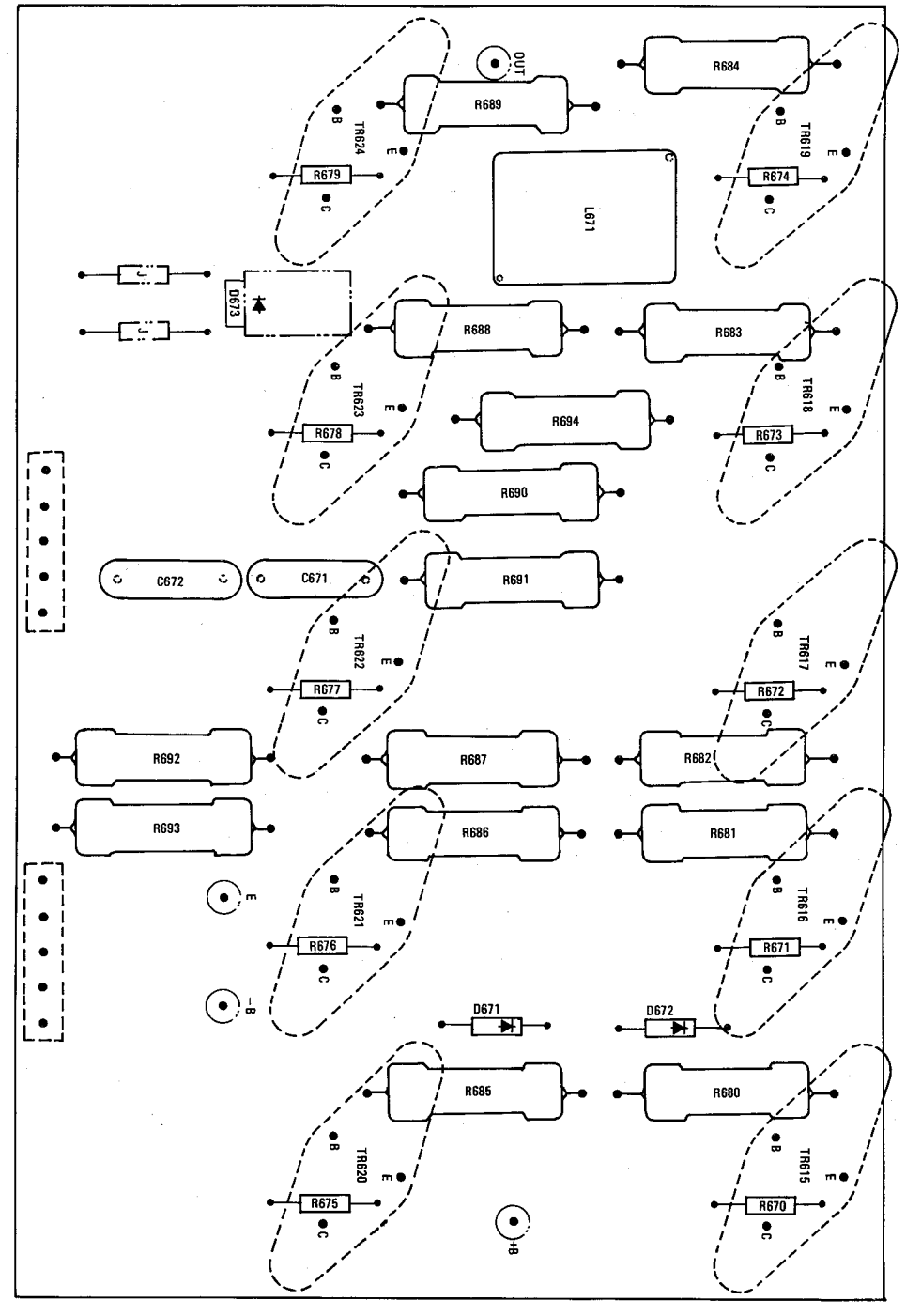
7135 METER DRIVE & SWITCH CONTROL UNIT SCHEMATIC



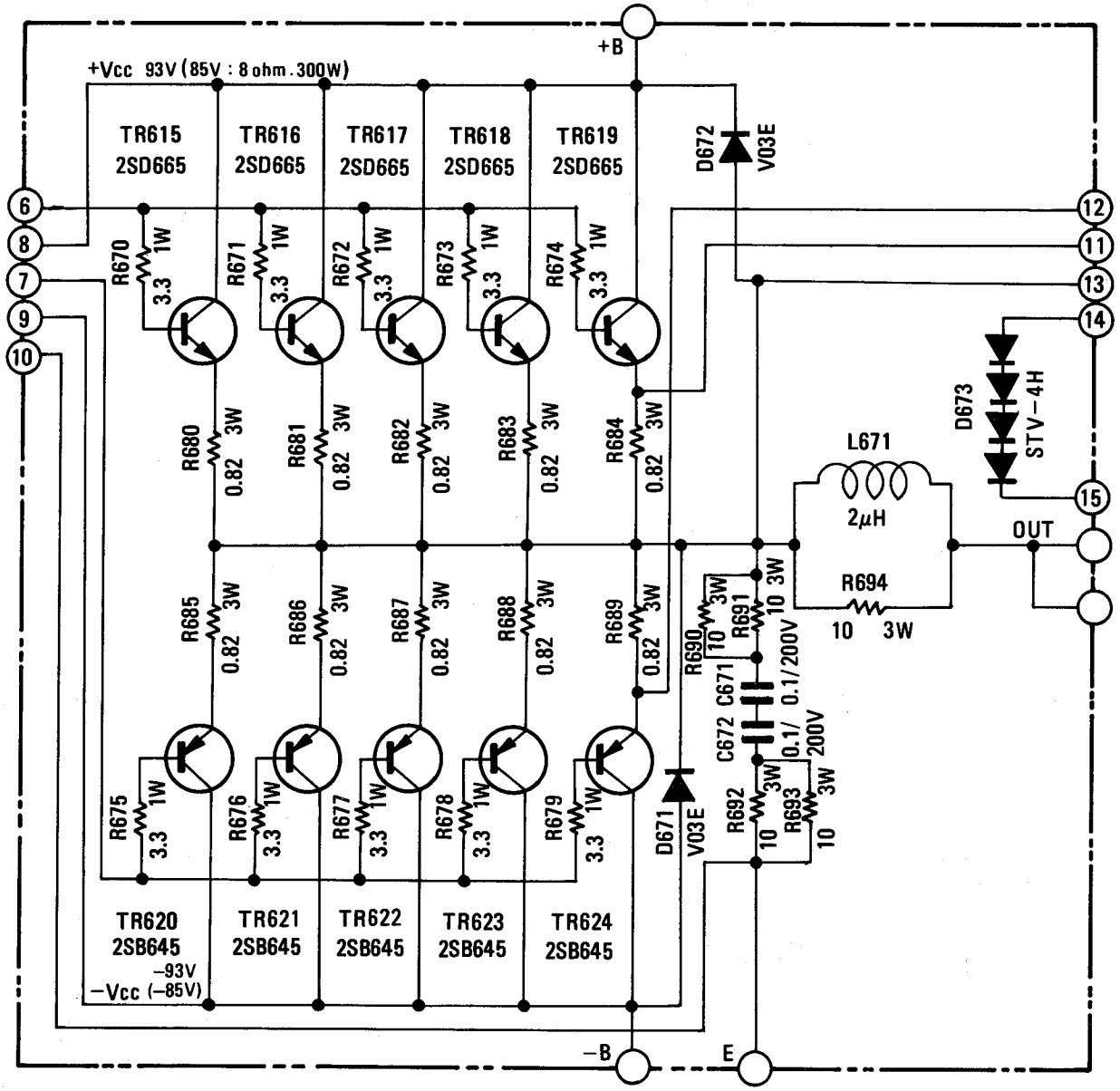
7136 MAIN AMP UNIT PARTS LOCATION (Left Channel)



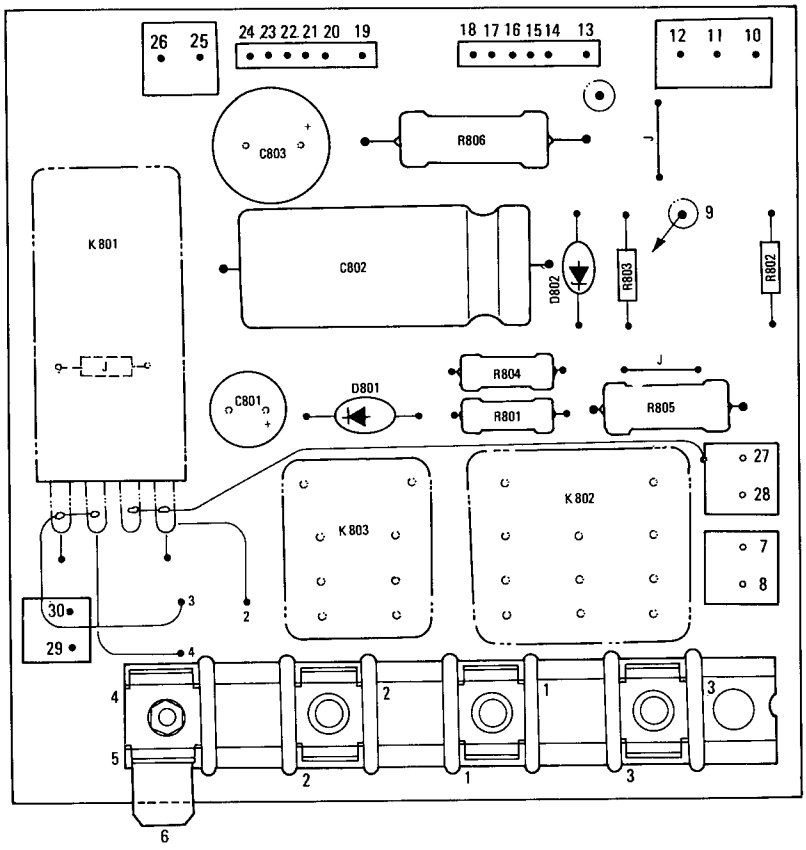
7137 MAIN AMP UNIT PARTS LOCATION (Right Channel)

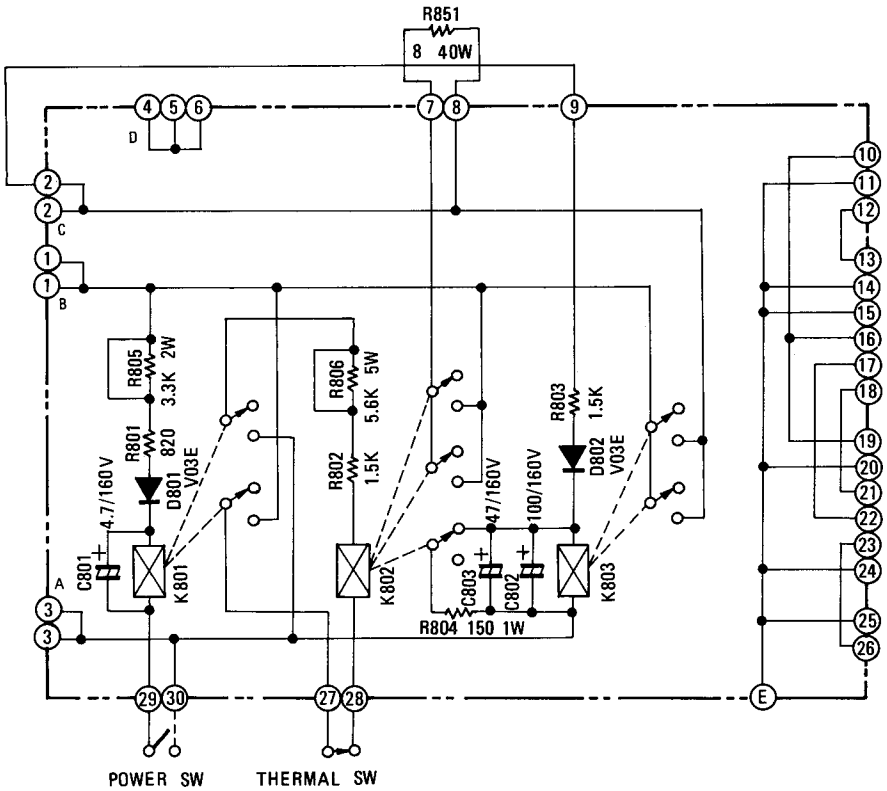


7136 & 7137 MAIN AMP UNIT SCHEMATIC

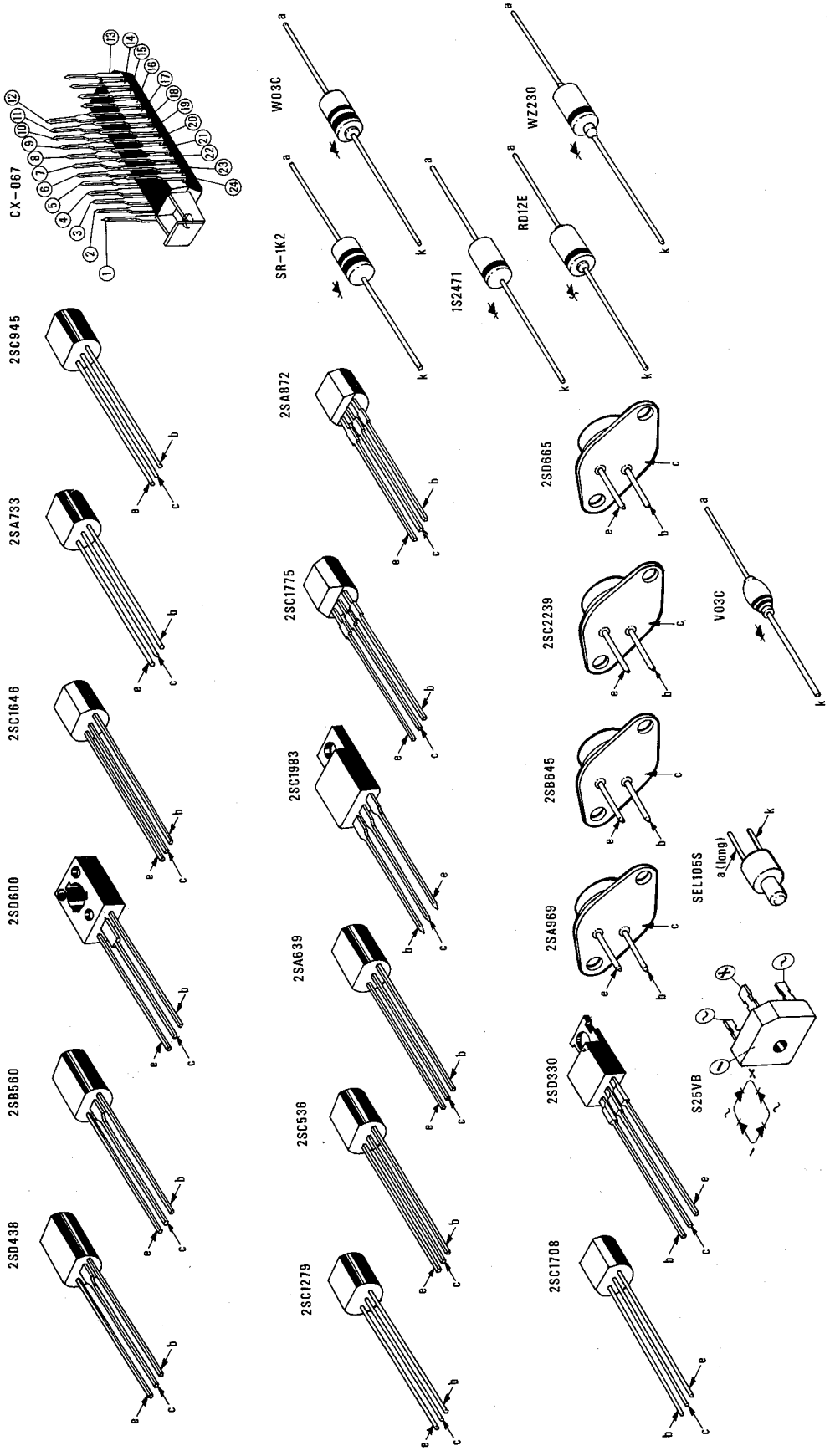


8031 POWER SUPPLY UNIT PARTS LOCATION and SCHEMATIC





SEMICONDUCTOR LEAD IDENTIFICATIONS



MODEL A-4000 POWER AMPLIFIER

ELECTRICAL PARTS LIST

ELECTRICAL PARTS LIST

CAPACITORS				
Ref. No.	Value (F)	Voltage (V)	Tolerance (%)	Material
C401	100u	100	+50/-10	Electrolytic
C402	0.47u	50	+75/-10	"
C403	10u	16	+50/-10	"
C404	1u	50	+75/-10	"
C405	"	"	"	"
C406	47u	6.3	+50/-10	"
C407	4.7u	25	+75/-10	"
C408	"	"	"	"
C409	2.2u	200	±10	Polyester
C451	0.001u	50	+80/-20	Ceramic
C452	390p	50	±10	"
C453	390p	50	±10	"
C454	8p	50	±10	"
C455	1.012u	50	±10	Polyster
C456	0.04u	25	+80/-20	Ceramic
C457	0.001u	50	+80/-10	"
C458	0.001u	50	+80/-20	"
C459	1.0033u	50	±10	"
C601	2.2u	100	±5	Metalized Polyester
C602	120P	50	±10	Ceramic
C603	4.7u	35	+75/-10	Eletrolytic
C604	"	"	"	"
C605	Not Used			
C606	"			
C607	"			

CAPACITORS				
Ref. No.	Value (F)	Voltage (V)	Tolerance (%)	Material
C608	"			
C609	220u	6.3	+50/-10	Electrolytic
C610	3P	500	±10	Ceramic
C611	Not Used			
C612	"			
C613	0.1u	100	±20	Polyester
C614	"	"	"	"
C615	47P	500	±10	Ceramic
C616	"	"	"	"
C617	2.2u	50	+75/-10	Electrolytic
C618	2.2u	50	+75/-10	Electrolytic
C619	0.01u	25	+80/-10	Ceramic
C620	"	"	"	"
C621	Not Used			
C622	0.1u	50	±10	Polyester
C671	0.1u	200	±10	Polyester
C672	"	"	"	"
C701	330u	25	+50/-10	Electrolytic
C702	4.7u	"	+75/-10	"
C703	330u	16	+50/-10	"
C704	2700P	50	±10	Ceramic
C705	"	"	"	"
C706	270P	"	"	"
C707	560P	"	"	"
C708	1000P	"	"	"
C709	2700P	"	"	"

CAPACITORS				
Ref. No.	Value (F)	Voltage (V)	Tolerance (%)	Material
C710	"	"	"	"
C711	270P	"	"	"
C712	560P	"	"	"
C713	1000P	"	"	"
C714	0.1u	"	+75/-10	Electrolytic
C715	2700P	"	±10	Ceramic
C716	"	"	"	"
C717	"	"	"	"
C718	1000P	50	±10	Ceramic
C719	"	"	"	"
C720	220P	"	"	"
C721	"	"	"	"
C722	4.7u	25	+75/-10	Electrolytic
C723	"	"	"	"
C724	33u	16	+50/-10	"
C725	"	"	"	"
C726	100u	6.3	"	"
C727	"	"	"	"
C728	0.022u	50	±10	Polyester
C729	"	"	"	"
C730	0.1u	"	"	"
C731	"	"	"	"
C732	220u	16	+50/-10	Electrolytic
C733	"	6.3	"	"
C734	22u	16	"	"
C735	"	"	"	"

CAPACITORS				
Ref. No.	Value (F)	Voltage (V)	Tolerance (%)	Material
C736	4.7u	25	+75/-10	"
C737	10u	16	+50/-10	"
C738	"	"	"	"
C750	0.01u	500	±10	Ceramic
C751	"	"	"	"
C801	4.7u	160		Electrolytic
C802	100u	"		"
C803	47u	"		"
C851	22000u	100		Electrolytic
C852	"	"		"
C853	"	"		"
C854	"	"		"

DIODES			
Ref. No.	Type No.	Manufacturer	Mfr's Part No.
D401	SR1K-2	UNISON	30600540
D402	"	"	"
D403	1S2471	Toyo	30600412
D404	TNR151L003B	Toshiba	30601211
D405	"	"	"
D406	TNR151L003B	Toshiba	30601211
D407	"	"	"
D601	1S2471	Toyo	30600412
D602	"	"	"
D603	WZ230	JRC	30600600
D604	"	"	"
D605	W03C	Hitachi	30600871
D606	"	"	"
D607	"	"	"
D608	"	"	"
D609	"	"	"
D610	1S2471	Toyo	30600412
D611	"	"	"
D612	"	"	"
D613	"	"	"
D614	"	"	"
D615	"	"	"
D616	"	"	"
D617	1SS82	Hitachi	30601201
D618	1S2471	Toyo	30600412
D619	"	"	"
D620	"	"	"
D621	1SS82	Hitachi	30601201
D451	1S2075	Hitachi	30601001
D452	"	"	"
D453	"	"	"

DIODES			
Ref. No.	Type No.	Manufacturer	Mfr's Part No.
D671	Hitachi	V03E	30601091
D672	"	"	"
D673	Sanken	STV-4H	30601111
D701	UNISON	SR1K-2	30600540
D702	"	"	"
D703	"	"	"
D704	NEC	RD12EB	30600650
D705	Toyo	1S2471	30600412
D706	"	"	"
D707	1S2471	Toyo	30600412
D708	"	"	"
D709	"	"	"
D710	"	"	"
D711	"	"	"
D712	"	"	"
D713	"	"	"
D714	"	"	"
D751	SEL105S(LED)	Sanken	30601171
D752	"	"	"
D753	"	"	"
D754	"	"	"
D801	V03E	Hitachi	30601091
D802	"	"	"
D851a, b	S25VB-20	Shindengen	30601101

LEAD WIRES (with Connectors)		
Ref. No.	Description	Mfr's Part No.
W1	5047-08 (input)	62900001
W2	5047-06 (protection)	62900002
W3	5051-02 (power L)	62900003
W4	5051-02 (power R)	62900004
W5	5051-03 (power L)	62900005
W6	5051-03 (power R)	62900006
W7	5011-02 (fan)	62900007
W8	5011-02 (Thermal Protect.)	62900008
W9	5051-02 (Meter Drive)	62900009
W10	lead (Fuseholder)	62900017
W11	" (Speaker earth)	62900018
W12	" (for Speaker)	62900019
W13	" (")	62900020
W14	" (")	62900021
W15	" (")	62900022
W16	" (Power Supply)	62900023
W17	5011-02 (Thermal Protector)	62900010
W18	lead	62900027
W19	"	62900052
W20	"	62900053
W21	" (PCB-ground)	62900028
W22	" (")	62900029
W23	" (PCB-Elect. L +)	62900030
W24	" (PCB-Elect. R +)	62900031
W25	" (PCB-Elect. L -)	62900032
W26	" (PCB-Elect. R -)	62900033
W27	5047-05 (Headphone)	62900011
W28	5051-02 (Lamp)	62900012
W29	lead (LEVEL Control)	62900054
W30	5047-06 (Meter)	62900013
W31	5011-02 (Push Switch)	62900014
W32	5011-02	62900015
W33	5047-05 (LED)	62900016
W34	lead (Ground)	62900025
W35	" (Rectifier-Elect. +)	62900055
W36	" (Rectifier-Elect. -)	62900056

RESISTORS

Ref. No.	Value (ohm)	Wattage (W)	Tolerance (%)	Material
R401	3K	2	5	Metal Oxide
R402	"	"	"	"
R403	100K	1/4	"	Carbon
R404	560K	"	"	"
R405	27K	"	"	"
R406	10K	"	"	"
R407	15K	"	"	"
R408	10K	"	"	"
R409	10	"	"	"
R410	100K	"	"	"
R411	"	"	"	"
R412	10K	"	"	"
R413	"	"	"	"
R414	100K	"	"	"
R415	"	"	"	"
R416	10K	"	"	"
R451	56K	1/4	±5	Carbon
R452	"	"	"	"
R453	10K	"	"	"
R454	330K	"	"	"
R455	5.1K	"	"	"
R456	150	"	"	"
R457	1.5K	"	"	"
R458	330	"	"	"
R459	1.5K	"	"	"
R460	1K	"	"	"
R461	680	"	"	"
R462	1K	"	"	"
R463	3.3K	"	"	"
R464	18K	"	"	"
R465	5.6K	"	"	"
R466	56K	"	"	"
R467	270K	"	"	"
R468	5.6K	"	"	"
R469	33K	"	"	"
R601	1K	1/4	±5	Carbon
R602	10K	"	"	"
R603	33K	"	"	"
R604	27	"	"	"

RESISTORS				
Ref. No.	Value (ohm)	Wattage (W)	Tolerance (%)	Material
R605	27	1/4	±5	Carbon
R606	"	"	"	"
R607	"	"	"	"
R608	10K	"	"	"
R609	"	"	"	"
R610	2.7K	"	"	"
R611	Not Used			
R612	7.5K	1	±5	Metal Oxide
R613	"	"	"	"
R614	2.7K	1/4	"	Carbon
R615	Not Used			
R616	10K	1/4	±5	Carbon
R617	2.2K	"	"	"
R618	"	"	"	"
R619	220	"	"	"
R620	"	"	"	"
R621	24K	"	"	"
R622	1K	"	"	"
R623	33K	1	"	Metal Oxide
R624	"	"	"	"
R625	100	1/4	"	Carbon
R626	"	"	"	"
R627	10	"	"	"
R628	"	"	"	"
R629	470	"	"	"
R630	"	"	"	"
R631	100	1	"	Metal Oxide
R632	10	1/4	"	Carbon
R633	"	"	"	"
R634	1K	"	"	"
R635	"	"	"	"
R636	2.7K	"	"	"
R637	1K	"	"	"

RESISTORS				
Ref. No.	Value (ohm)	Wattage (W)	Tolerance (%)	Material
R638	1K	1/4	±5	Carbon
R639	2.7K	"	"	"
R640	51K	"	"	"
R641	39K	"	"	"
R642	51K	"	"	"
R643	39K	"	"	"
R644	4.7K	"	"	"
R645	1.5K	"	"	"
R646	"	"	"	"
R670	3.3	1	±5	Metal
R671	"	"	"	"
R672	"	"	"	"
R673	"	"	"	"
R674	"	"	"	"
R675	"	"	"	"
R676	"	"	"	"
R677	"	"	"	"
R678	"	"	"	"
R679	"	"	"	"
R680	0.82	3	"	"
R681	"	"	"	"
R682	"	"	"	"
R683	"	"	"	"
R684	"	"	"	"
R685	"	"	"	"
R686	"	"	"	"
R687	"	"	"	"
R688	"	"	"	"
R689	"	"	"	"
R690	10	"	"	"
R691	"	"	"	"
R692	"	"	"	"
R693	"	"	"	"

RESISTORS				
Ref. No.	Value (ohm)	Wattage (W)	Tolerance (%)	Material
R694	10	3	±5	Metal
R701	"	1	"	"
R702	1.5K	1/4	"	Carbon
R703	5.6	"	"	"
R704	680	"	"	"
R705	68K	"	"	"
R706	330K	"	"	"
R707	56K	"	"	"
R708	"	"	"	"
R709	1.5K	"	"	"
R710	15K	"	"	"
R711	"	"	"	"
R712	1.5K	"	"	"
R713	820	"	"	"
R714	330K	"	"	"
R715	68K	"	"	"
R716	1.5K	"	"	"
R717	100K	"	"	"
R718	680	"	"	"
R719	82K	"	"	"
R720	"	"	"	"
R721	2.7K	"	"	"
R722	100K	"	"	"
R723	"	"	"	"
R724	1.5K	"	"	"
R725	2.7K	"	"	"
R726	100K	"	"	"
R727	10K	"	"	"
R728	"	"	"	"
R729	10	3	"	Metal
R730	4.7	5	±10	"
R731	10	3	±5	"

RESISTORS				
Ref. No.	Value (ohm)	Wattage (W)	Tolerance (%)	Material
R732	22K	1/4	±5	Carbon
R733	"	"	"	"
R734	"	"	"	"
R735	"	"	"	"
R736	6.8K	"	"	"
R737	"	"	"	"
R738	33K	"	"	"
R739	"	"	"	"
R740	1K	"	"	"
R741	"	"	"	"
R742	2.2M	"	"	"
R743	"	"	"	"
R744	5.1K	"	"	"
R745	"	"	"	"
R746	10K	"	"	"
R747	"	"	"	"
R748	47	"	"	"
R749	"	"	"	"
R750	6.8K	"	"	"
R751	4.7K	"	"	"
R752	10K	"	"	"
R753	4.7K	"	"	"
R754	68K	"	"	"
R755	10K	"	"	"
R756	82K	"	"	"
R757	100K	"	"	"
R758	5.6K	"	"	"
R759	"	"	"	"
R760	470	3	"	Metal Oxide
R761	"	"	"	"
R762	"	"	"	"
R763	"	"	"	"

RESISTORS

Ref. No.	Value (ohm)	Wattage (W)	Tolerance (%)	Material
R801	820	1	±5	Metal Oxide
R802	1.5K	"	"	"
R803	"	"	"	"
R804	150	"	"	"
R805	3.3K	2	"	"
R806	5.6K	5	±10	Wire Wound
R851	8	40	±10	Wire Wound

SWITCHES

Ref. No.	Description	Mfr's Part No.
SW701	Micro Switch AH2524	27800001
SW702	"	"
SW703	"	"
SW704	"	"
SW705	"	"
SW706	"	"

TRANSISTORS

Ref. No.	Type No.	Manufacturer	Mfr's Part No.	Substitute	
				Type No.	Manufacturer
TR401	2SD600(K,E,F)	Sanyo	30300311	2SC1567	Matsushita
TR402	"	"	"	"	"
TR403	2SC1708(F,G)	Mitsubishi	30201231	2SC1400	NEC
TR404	"	"	"	"	"
TR405	2SD438(E,F)	Sanyo	30300250	2SC1509	Matsushita
TR406	2SC945(L-P)	NEC	30201031	2SC536	Sanyo
TR407	2SA733(P,Q)	"	30000425	2SA844	Hitachi
TR408	2SC945(L-P)	"	30201031	2SC536	Sanyo
TR409	2SA639(P,Q)	"	30000603		
TR410	2SC1279(P,Q)	"	30201363		
TR411	"	"	"		
TR451	2SC930NP-E	Sanyo	30200272	2SC1047	Matsushita
TR452	2SC945L-P	NEC	30201031	2SC536	Sanyo
TR453	2SA733-P,C	NEC	30000425	2SA844	Hitachi
TR454	2SC945L-P	NEC	30201031	2SC536	Sanyo
TR455	"	"	"	"	"

TRANSISTORS

Ref. No.	Type No.	Manufacturer	Mfr's Part No.	Substitute	
				Type No.	Manufacturer
TR601	2SC1775(A,E)	Hitachi	30201342	2SC1708	Mitsubishi
TR602	"	"	"	"	"
TR603	"	"	"	"	"
TR604	2SA872(A,E)	Hitachi	30000571	2SA841	Mitsubishi
TR605	"	"	"	"	"
TR606	"	"	"	"	"
TR607	2SA639(P,Q)	NEC	30000603		
TR608	2SC1279(P,Q)	"	30201363		
TR609	2SA969	Toshiba	30000611		
TR610	2SC2239		30201371		
TR611	"	"	"		
TR612	2SA969	Toshiba	30000611		
TR613	2SD438(E,F)	Sanyo	30300250	2SC1509	Matsushita
TR614	2SB560(E,F)	Sanyo	30100041	2SA777	"
TR615	2SD665	Toshiba	30300321	2SC1586	Sanken
TR616	"	"	"	"	"
TR617	"	"	"	"	"
TR618	"	"	"	"	"
TR619	"	"	"	"	"
TR620	2SB645	"	30100101	2SA909	"
TR621	"	"	"	"	"
TR622	"	"	"	"	"
TR623	"	"	"	"	"
TR624	"	"	"	"	"
TR701	2SD330(E)	Sanyo	30300192	2SC1419	Hitachi
TR702	2SC1646	Toyo	30201311	2SC982	Toshiba
TR703	"	"	"	"	"
TR704	"	"	"	"	"
TR705	"	"	"	"	"
TR706	2SC536(F)	"	30200131	2SC945	NEC
TR707	"	"	"	"	"
TR708	"	"	"	"	"
TR709	"	"	"	"	"

TRANSISTORS

Ref. No.	Type No.	Manufacturer	Mfr's Part No.	Substitute	
				Type No.	Manufacturer
TR710	2SC1983	Sanken	30201211		
TR711	"	"	"		
TR712	2SC945(L-P)	NEC	30201031	2SC536	Sanyo
TR713	"	"	"	"	"
TR714	"	"	"	"	"

VARIABLE RESISTORS

Ref. No.	Description	Mfr's Part No.
VR451	Semi Variable 10k/B	28101103
VR601	Semi Variable 1K/B	28100100
VR602	" 100/B	28100099
VR651a,b	LEVEL control 10K	28000144
VR701	Semi Variable 680/B	28100101
VR702	" "	"
VR703	" 2.2K/B	28100102
VR704	"	"

CONNECTORS

Ref. No.	Description	Mfr's Part No.
C01	Socket 5011-02A	87302001
C02	" 5048-06A	87006002
C03	" 5045-03A	87003003
C04	Connector DTC-105F	36010001
C05	Socket 5045-02A	87002003
C06	" 5049-06A	87006004
C07	" 5049-05A	87005004
C08	" 5046-02A	87002005
C09	" 5014-02A	87302006
C10	" 5049-08A	87008004
C11	" 5011-03A	87303001
C12	6P Connector Terminal	53044010
C13	2P Connector Terminal	53022810
C14	2P Connector Terminal	53022910
C15	1P Connector Terminal	53012810
C16	5P Connector Pin	19074001

COILS & TRANSFORMERS		
Ref. No.	Description	Mfr's Part No.
L671	Choke Coil 2uH	35199006
T852	Right Ch. Power Transformer	35900254
T851	Left Ch. Power Transformer	35900255

RELAYS		
Ref. No.	Description	Mfr's Part No.
K401	NC4-JP-DC48V	82000130
K402	"	"
K701	Lead Relay HA-212S	82000160
K702	"	"
K801	HCSB-DC100V	82000140
K802	LY3-O-AC100V	82000170
K803	LY2-O-DC100V	82000120

IC			
Ref. No.	Type No.	Manufacturer	Mfr's Part No.
IC701	CX-067	Sony	30900470

LAMPS		
Ref. No.	Description	Mfr's Part No.
	Meter Lamp 8V, 0.25A	37008019

MISCELLANEOUS PARTS LIST

Ref. No.	Description	Mfr's Part No.
	Heat Sink for TR609-TR612	15072001
	Pan Head Screw M3x12	40330123
	Spring Washer M3	42250341
	Nut M3	41113070
	Jumper Wire	92000001
	Tubing D1x10mm	31501062
	Wire Wrap Pin	19044001
	F3 Pin	19004001
	Tubing D1.6x15	31501182
	Relay Mounting Bracket	63381001
	Screw B 3x6	40230061
	Nut M2.6	41112670
	Back Panel	11300A01
	4P RCA Jack	33041040
	Fan Guard	19083001
	Fuseholder 342015L	34073001
	P.C.Board for RCA Jack	96716410
	Cord Strain Relief SR-8P2	74147001
	AC Cord with Plug	62110036
	Fuse TLC 15A	38234615
	Rear Handle	19085001
	2P SPEAKER Terminals	53022710
	Bind Head Screw M4x20	40440205
	Spring Washer 4S	42250441
	Toothed Washer 4	42380431
	Nut M4	41114010
	Bind Head Screw 4x8B	40640085
	Ground Terminal	53012500
	Bind Head Screw 4x15B	40640151
	Plastic Rivet	84246001
	6P Block Terminal	53060210
	Tubing D3.3x15	31501362
	Pan Head Screw M4x45	40340451
	Tubing D4.1x35	31501426

Ref. No.	Description	Mfr's Part No.
	Bind Head Screw M3x15	40430151
	Spring Washer 3.5S	42253543
	Screw B 3x10	40230101
	Flat Washer 3S	42120321
	Screw B 3x8	40230081
	Wire Clamper	63075001
	Heat Sink	15093002
	Bracket for Heat Sink	63378001
	Cover for Heat Sink	63393001
	Inlet Plate for AC Cord	63397001
	PCB Mounting Bracket	63380001
	PCB Mounting Plate	63395001
	Cooling Fan 4506	82000150
SW801	Thermal Protector YO-85	30700230
SW401	" " UK-3-115	30700170
	Ground Lug M4	51030001
	Cushion Sponge for fan	74141001
	Cushion Rubber	74148001
	Metal Bracket for Thermal Protector	63359002
	Front Chassis	03076001
	POWER Meter	60161001
	Push Knob Escutcheon	84243002
	Metal Spacer	55074001
	Bind Head Screw M3x8	40430081
	Headphone Jack	33031900
	Cushion Sponge	74149001
	Center Chassis	01097001
	Side Chassis (R)	04022001
	Side Chassis (L)	04023001
	Wire Clip 14	84225001
	Wire Clip 18	84224001
	Wire Bundler D5	84248001
	" D11	84250001

Ref. No.	Description	Mfr's Part No.
	Aluminum Ground Plate	63382001
	Front Panel	10300A02
	Front Handle	19081001
	Push Button	29276001
	Spring Coil for Push Button	19082001
	Pan Head Screw M5x25	40350251
	Spring Washer 5S	42250451
	Cushion Sponge	74150001
	Irrux Tube DO.7x15mm	31140003
	LEVEL Knob	29258001
	Top Plate	70024002
	Bottom Plate	05053001
	Plastic Foot	84233001
	Shorted Pin Plug	36007001
	Transistor Socket	34061002
	Nylon Washer	42400017
	Flat Washer M5	42120521
	1P Angle Terminal	19091001

METRONA
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