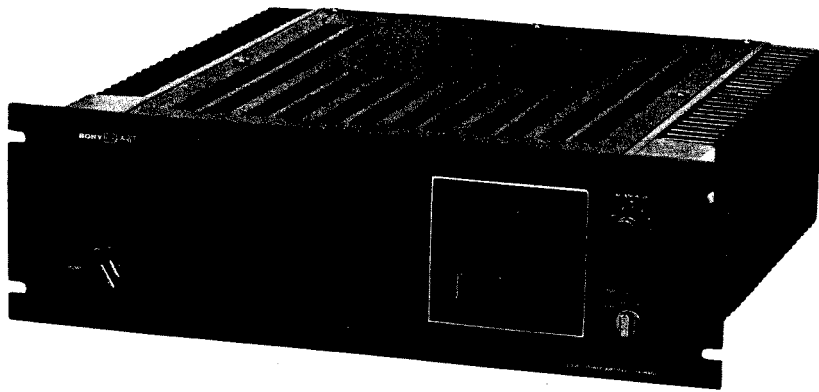


TA-N902

SERVICE MANUAL

AEP Model



SPECIFICATIONS

Continuous RMS power output

At 20 Hz - 20 kHz
130 + 130 watts (8 ohms)
200 + 200 watts (4 ohms)
According to DIN 45500
130 + 130 watts (8 ohms)
200 + 200 watts (4 ohms)
Mono 400 watts (8 ohms)

Power bandwidth (IHF)

5 Hz - 80 kHz

Slew rate

120 V/μ sec (8 ohms)

Harmonic distortion

Less than 0.1% (8 ohms)

(At rated output)

Less than 0.2% (stereo 4 ohms, mono 8 ohms)

Intermodulation (IM) distortion

(60 Hz : 7 kHz = 4 : 1, at rated output)

Less than 0.1% (8 ohms)

Less than 0.2% (stereo 4 ohms, mono 8 ohms)

Frequency response

DC - 100 kHz ± 0 dB (DIRECT INPUT)

5 Hz - 100 kHz ± 0 dB (C COUPLED INPUT)

Signal-to-noise ratio

Greater than 120 dB (short-circuited input, 8 ohms)

110 dB (8 ohms, '78 IHF)

Residual noise

Less than 30μV (8 ohms, A network)

Damping factor

50 (8 ohms, 1 kHz)

Inputs

Sensitivity 1.3 V

(For rated output)

Impedance 50 k ohms

Outputs

SPEAKER terminals

Accept speakers of 4 - 16 ohms in stereo and 8 - 16 ohms in mono

General

System

Pre-power stage

1st: Bootstrapped double cascode FET differential amp

2nd: Bootstrapped cascode differential amp with current-mirror load

3rd: Emitter follower SEPP output

Power stage

No NFB loop, pure-complementary

SEPP output in class A (non-switching type) operation

Power supply

Powerful large power transformers

installed in L and R channels

independently

Power requirements

220 V ac, 50/60 Hz

Power consumption

320 watts

Dimensions

Approx. 480 × 155 × 485 mm (w/h/d)

(19¹/₈ × 12 × 19¹/₈ inches)

including projecting parts and controls


Weight

Approx. 28 kg (12 lb 11 oz), net

31.5 kg (14 lb 5 oz), in shipping carton

-Continued on page 2-

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY SHADING AND MARK  ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

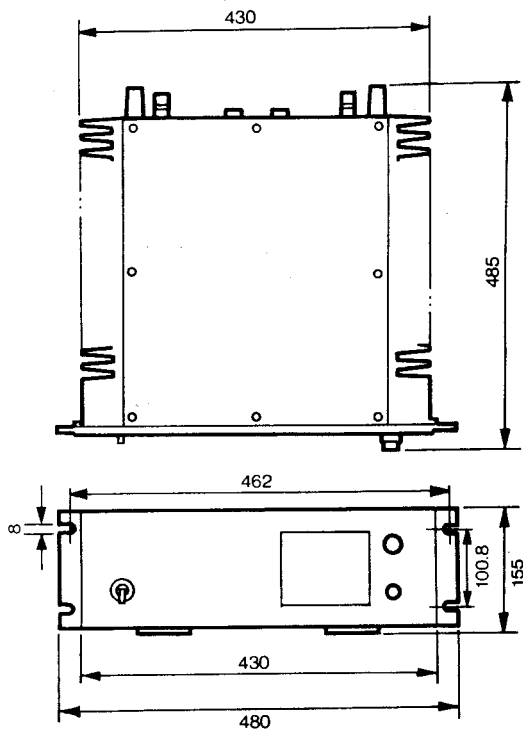
STEREO POWER AMPLIFIER SONY®



AUD

2034

Unit: mm



● FEATURES

Amplifier makes possible "Direct" sound through direct connection

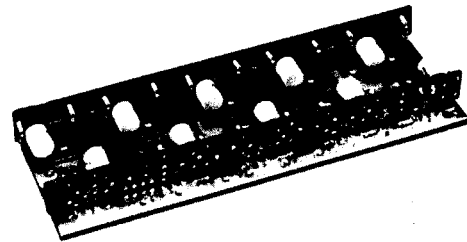
The TA-N902 permits direct connection of high quality digital sound sources such as PCM or CD eliminating the need for a preamplifier. This feature enables you to enjoy the best possible sound, with minimum impairment of tone quality.

Operation is simple. Set the INPUT SELECTOR switch to VARIABLE, connect a PCM processor or CD player directly to the VARIABLE INPUT terminals, and adjust the sound volume and balance using the ATTENUATOR controls. The tone quality is much better compared to operation with a preamplifier.

No NFB loop power stage, achieved by a combination of Hi-f_T power transistors and a distortion reduction circuit

By a combination of Hi-f_T power transistors and a distortion reduction circuit (a circuit to control the driving voltage so as to improve linearity for reducing distortion, producing class A operation without cut-off in almost all operating areas of the output transistors), the distortion factor of the power stage itself is improved by almost a full digit compared with that of the conventional power stage.

The NFB loop from the power stage to the voltage amplifying stage can be eliminated, resulting in a significant reduction in TIM (Transient Intermodulation Distortion) and freeing the voltage amplifying stage from any speaker load reaction.



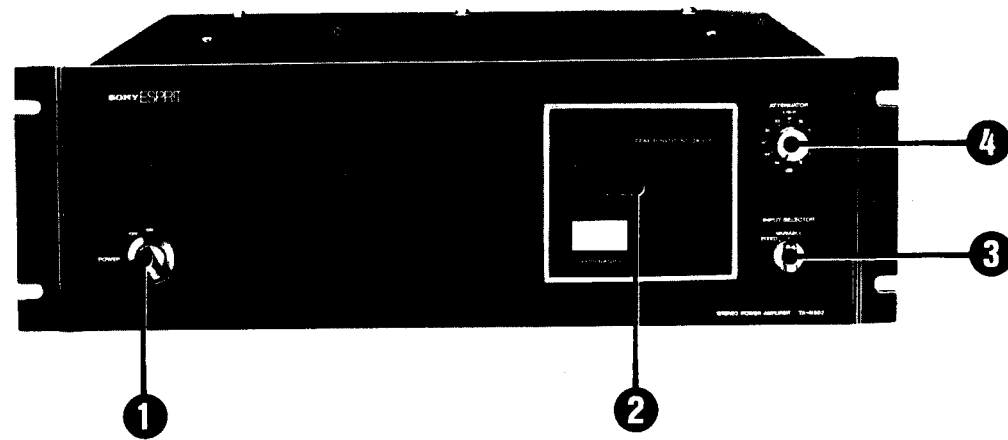
OPERATION switch to select stereo amplifier or monaural amplifier mode:

The TA-N902 is usable either as a stereo amplifier or a monaural amplifier. If the OPERATION switch is set to monaural amplifier mode, a large output power of 400 W (8 ohms) can be obtained. You can enjoy powerful dynamic sound by connecting two TA-N902s, one to the left and one to the right channel.

SECTION 1
OUTLINE

1-1. FUNCTION OF CONTROLS

Front panel



1 POWER switch and power indicator

This amplifier includes a muting circuit. A few seconds after the power switch is turned on, the amplifier is ready to produce high-quality sound. During operation, the green indicator lights up.

2 Visual communication display

This display has three indicators :

PROTECTION indicator

The word "PROTECTION" lights up when the amplifier is first turned on to indicate that the amplifier is muted.

When "PROTECTION" disappears (after a few seconds), the amplifier is ready to operate.

The PROTECTION indicator may light up when something abnormal has happened in the amplifier, showing you that the protection circuit is engaged.

When this happens, check for improper loads, an unusual temperature rise, etc.

TEMPERATURE indicator

A good amplifier is designed to avoid the internal heat build-up. This amplifier is, of course, so designed and, in addition, includes three colored lights that keep you informed of internal temperature situation so that you can drive the amplifier in ideal conditions.

Blue: When the amplifier is first turned on, the indicator lights up in blue to indicate that the amplifier is warming up. After about 15 minutes of warming up, the indicator lights up in green (at an ambient temperature of 25°C).

Green: The amplifier's internal temperature is in the range in which the amplifier operates best.

Red: The amplifier's internal temperature exceeds the optimum operational temperature range. If this happens after you have overloaded the amplifier severely for an extended period of time, move the amplifier to a well-ventilated place or turn the power off for a while. If you disregard this, the protection circuit may be engaged.

PEAK POWER indicator

This indicates the higher level channel of the speaker output peak values of the left and right channels.

When the TA-N902 is used as a stereo amplifier, this indicator indicates 0.03 - 150 W in the case of 8 ohms and 0.06 - 300 W in the case of 4 ohms (Wide-range type indicator).

When the TA-N902 is used as a monaural amplifier, the actual output value in the case of 8 ohms is obtained by doubling the indicator reading for 4 ohms.

3 INPUT SELECTOR switch

Selects the INPUT terminals on the rear panel.

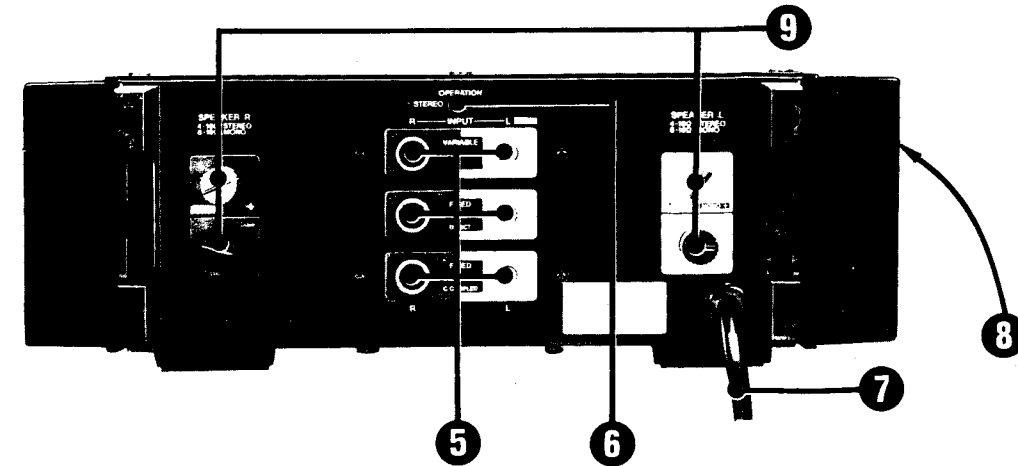
Set this switch to VARIABLE when connecting a program source to the VARIABLE INPUT terminals, and to FIXED when connecting it to the FIXED INPUT terminals. No sound will be obtained if the setting is reversed.

4 ATTENUATOR controls

Used to adjust the sound volume when the INPUT SELECTOR switch is at the VARIABLE position. The attenuation amount is continuously variable from infinity "∞" (the lowest volume) to 0 dB.

These controls can be operated separately for left and right, permitting balance adjustment of the left and right channels.

Rear panel



5 INPUT terminals

The TA-N902 provides two kinds of power amplifier inputs—VARIABLE INPUT and FIXED INPUT.

VARIABLE INPUT jacks: Use these inputs when you wish to listen to a digital audio source such as a compact disc without a preamplifier. The tone quality is free from impairment caused in the preamplifier, and you can enjoy the best possible digital source sound.

When the VARIABLE INPUT jacks are used, set the INPUT SELECTOR switch on the front panel to VARIABLE and adjust the sound volume using the ATTENUATOR controls.

FIXED INPUT jacks

DIRECT INPUT: These jacks allow the TA-N902 to perform as a dc power amplifier. For normal operation, use these jacks.

However, if subsonic noise components from the connected preamplifier or program source are present and trigger the TA-N902 protection circuits, reconnect the preamplifier to the C COUPLED INPUT.

C COUPLED INPUT: These jacks have a subsonic filter (a dc decoupling capacitor) which takes effect below 1.5 Hz with a 6 dB per octave slope to prevent the TA-N902 from being affected by an inadvertent dc signal flow and subsonic record-warp frequencies.

6 OPERATION switch

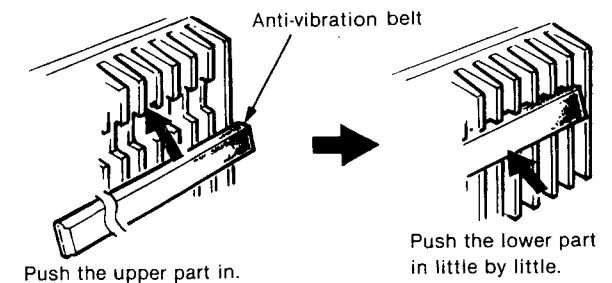
Set this switch to STEREO when using the TA-N902 as a stereo amplifier, and to MONO when using it as a monaural amplifier. Change the speaker connections accordingly in each case (see page 5). In mono mode, take care not to connect the phono plug to the R channel of the INPUT terminal. The signal will be shorted and there will be no sound output.

7 Power cord

A white mark is visible on one lead of the power cord. This will help to operate the TA-N902 and the other components of the system "in phase" by aligning the ac power cord polarities with the ac outlet polarities. In most cases, the marked plug of the TA-N902 power cord should be connected to the grounded side of the ac outlet.

8 Heat sink anti-vibration belt

Left and right heat sinks are provided with belts made of special rubber, to prevent resonance which lowers tone quality. If the belts get out of position, reinstall them as illustrated below.



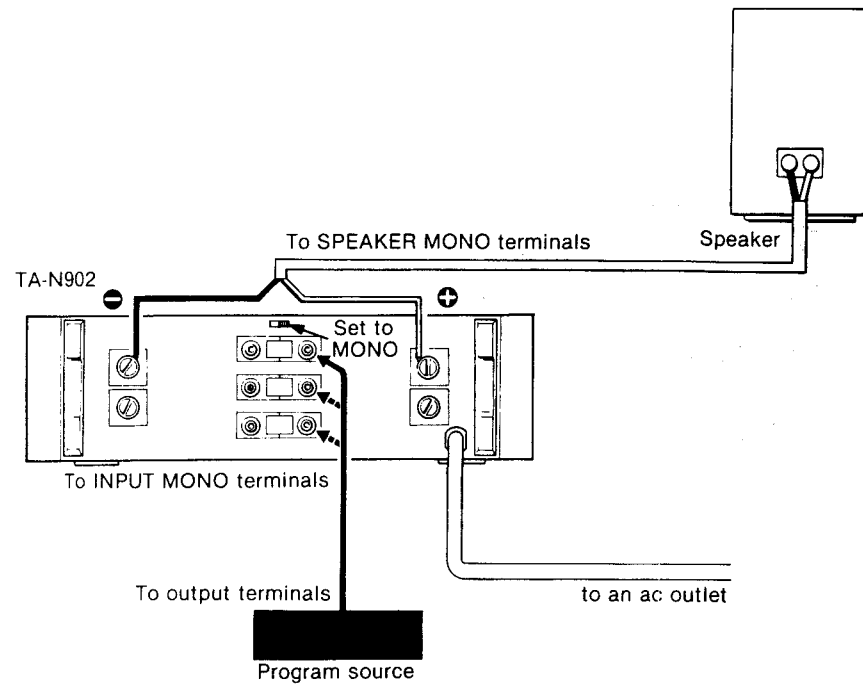
9 SPEAKER terminals

Screw-type binding terminals are used to assure positive connections.

Use speaker cords whose conductor diameter is up to 4 mm.

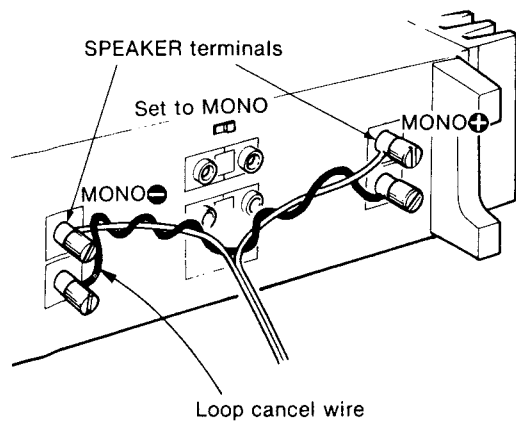
Be sure to use speakers with adequate power handling capacity. When the TA-N902 is used as a stereo amplifier, the speaker impedance should be 4 - 16 ohms. When the TA-N902 is used as a monaural amplifier, the impedance should be 8 - 16 ohms.

Using the TA-N902 as a monaural amplifier



To obtain high tone quality:

Connect a loop cancel wire as illustrated below. We recommend use of a wire with the same rating as the speaker cord.



VISUAL COMMUNICATION DISPLAY

PROTECTION indicator

Output relays react fast to break the signal path and protect the amplifier and speakers from damage when the amplifier is first turned on, or is overloaded and heated beyond its optimum operational range.

TEMPERATURE indicator

This amplifier requires a warm-up period before it can be driven at its best because the heat sinks used are large and take time to reach the temperature at which the power transistors operate best.

When the temperature of the heat sink reaches the optimum operation range, the indicator lights in green. The indicator remains lit in green with a heat sink temperature of up to 90°C. When the temperature exceeds 90°C, the indicator turns red.

If the thermal protection circuit activates due to improper loads, etc., turn the POWER switch OFF to cool the unit. Even when the temperature of the unit has dropped, if you do not turn the POWER switch to OFF, the red TEMPERATURE indicator and PROTECTION indicator remain lit and no sound can be heard from the speakers. If the protection circuit activates, be sure to turn the power off.

PEAK POWER indicator

This is a wide-range type indicator which lights in 6 steps according to the speaker output level. It indicates the peak value of the higher level of the left or right channel, whichever is the higher. As the main purpose of the indicator is to monitor the load applied to the speaker, it may work a little differently from the actual sound signal. Use the indicator as a rough output reference. How to read the scale is explained by the following example.

300	150	████████████████████	← Not lit at less than 75 W.
150	75	████████████████████	
30	15	████████████████████	← Lit at higher than 15 W.
3	1.5	████████████████████	
0.3	0.15	████████████████████	
0.06	0.03	████████████████████	
4 Ω	8 Ω		

For example, even if the load is 8 ohms and the L channel output is zero, the indicator lights as shown above if the R channel output is higher than 15 W.

The indicator lights in the same way when both channel outputs are just 7.4 W.

The indicator does not light when both channel outputs are less than 0.03 W even if channel outputs exist.

When a speaker of 16 ohms is used, divide the 8 ohm value ohms by 2. In the case of the above drawing, for example, the value is over 7.5 W and below 37.5 W.

When the TA-N902 is used as a monaural amplifier, read the 4 ohm value as it is if the load is 16 ohms, and double the value if the load is 8 ohms.

1-2. CIRCUIT DESCRIPTION

POWER SECTION

Pre-power Stage

The first stage is a differential input cascode circuit comprising a junction FET and bipolar transistors which reduces high frequency distortion caused by the FET non-linear feedback capacitance.

The next stage is a differential cascode circuit comprised of bipolar transistors. By use of current mirror load, the stability under temperature change and the power supply rejection characteristic are improved.

The final stage has a complementary emitter-follower SEPP output configuration.

The stages up to this point have a very light load, being isolated from the speaker load by the power stage. This means all problems caused by TIM or reactive loads are eliminated.

The voltage amplifying stage is a high performance preamplifier with a gain of approximately 27 dB.

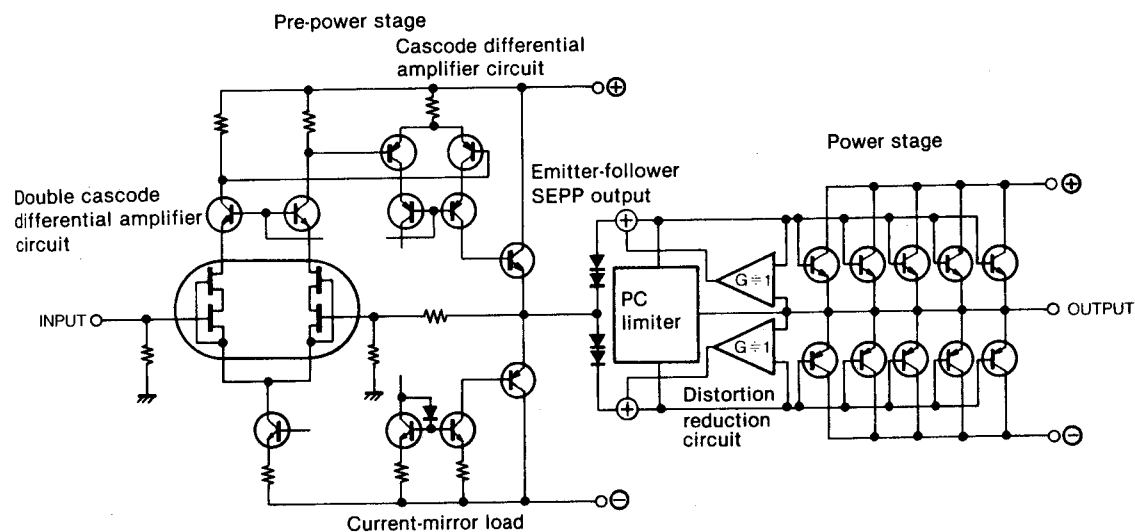
Power Stage

The power stage consists of a distortion reduction circuit and an emitter-follower SEPP output stage with five Hi- f_T bipolar power transistors each connected in parallel.

As illustrated in the drawing below, the distortion reduction circuit works to drive the power transistors by applying the voltage of the base detector to the preamplifier output.

In this way, the circuit action compensates the non-linear component of the output element and operates the output element as class A.

There is no NFB loop from the power stage to the pre-power stage.



1. Preamplifier (Refer to Figure 2)

The first stage is a differential input double cascode circuit consisting of a junction FET and bipolar transistor.

Normally, FED D-G feedback capacitance depends on voltage applied, so high range distortion is easily generated. The internal cascode connection in Q101 (2SK244) keeps the feedback capacitance between D-G uniform and reduces distortion.

Also, bipolar base-ground amplification is used at the drain to improve FET linearity.

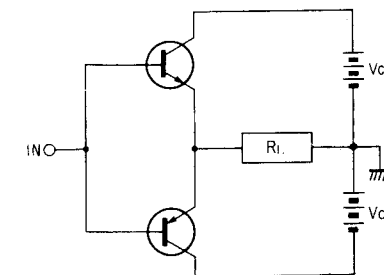
The second stage is a bipolar differential cascode circuit, and here the load is a current mirror to improve linearity, temperature response and power supply rejection.

The final stage is a complementary SEPP*1, which acts as an impedance converter. When connected to the driver stage, the effect of the impedance of the two circuits on each other may cause response to worsen, so it prevents the effect of these impedances (buffer effect) and also applies stable NFB*2 (negative feedback) to the preamp first stage.

The gain from the preamp first stage to SEPP is about 28dB.

*1 SEPP (Single ended push-pull) (Refer to Figure 1)
This refers to a push-pull circuit which is serial for DC and parallel for AC.

There is one output point, and it is the same for the waveform positive half cycle and negative half cycle. This circuit's output impedance is low, making it suitable for an OTL circuit.



SEPP Circuit
Figure 1

*2 NFB

NFB means returning part or all of amp output to the input side at a phase which decreases the input. By applying NFB to the amp stage, gain is stabilized, and interference and distortion are reduced.

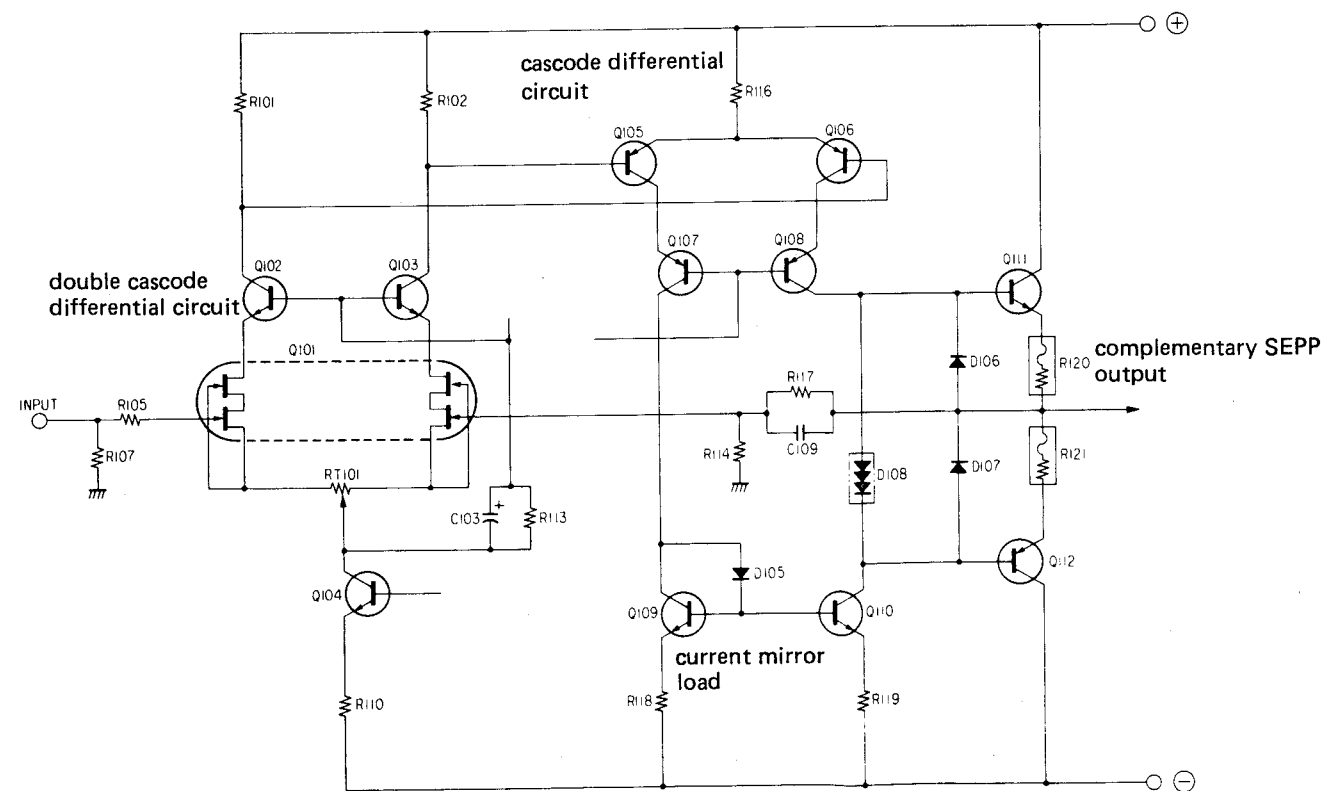


Figure 2

1. Preamplifier (Refer to Figure 2)

The first stage is a differential input double cascode circuit consisting of a junction FET and bipolar transistor.

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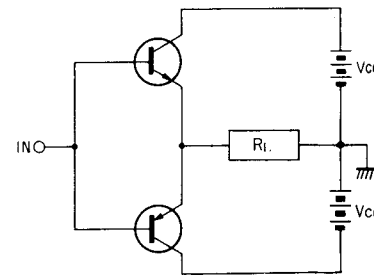
The final stage is a complementary SEPP*¹, which acts as an impedance converter. When connected to the driver stage, the effect of the impedance of the two circuits on each other may cause response to worsen, so it prevents the effect of these impedances (buffer effect) and also applies stable NFB*² (negative feedback) to the preamp first stage.

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This refers to a push-pull circuit which is serial for DC and parallel for AC.

There is one output point, and it is the same for the waveform positive half cycle and negative half cycle. This circuit's output impedance is low, making it suitable for an OTL circuit.



SEPP Circuit
Figure 1

***2 NFB**

NFB means returning part or all of amp output to the input side at a phase which decreases the input. By applying NFB to the amp stage, gain is stabilized, and interference and distortion are reduced.

2. Driver Stage (Refer to Figure 5)

This block contains an idling setting power supply section, distortion reducing circuit and PC limiter.

• Idling Setting Power Supply

The regulated voltage is made by D301 Zener diode to suppress power supply fluctuation. It is voltage divided from here and controls between Q301 and Q302 bases.

The base voltage of Q302 is semi-fixed. Q301 base is temperature-controlled by D302-304 temperature detection varistor. D302, 303 detect heat of final stage heat sink and D304 detects Q304 heat of heat sink. The varistor uses the response by which there is -2.3 mV/°C change for each element to reduce idling when the temperature rises.

- Distortion Reduction Circuit

Q311, 312 detect voltage between final stage base and emitter, Q303, 304 apply preamp output, and Q313, 314 emitter-follower SEPP drives the power stage. This operation reduces output stage crossover distortion, allowing A class operation and NO - NFB from the output stage. The gain of Q311 → Q303 → Q313 is less than 1.

• PC Limiter

This circuit is composed of a current limiter and impedance detector, and protects so that current does not go over output transistor maximum rating.

• Current Limiter (See Figure 3)

This detects the current component flowing in emitter resistor and controls Q309 → Q305 and Q310 → Q306.

Operation is at:

$$0.33\Omega \times I_e \times \sqrt{2} \frac{75\Omega}{220\Omega + 75\Omega} \geq 0.6 (Q309 V_{BE})$$

$$I_e \approx 5A$$

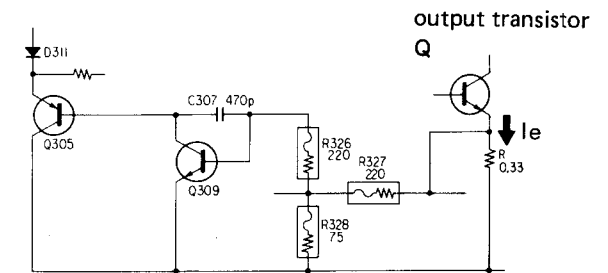


Figure 3

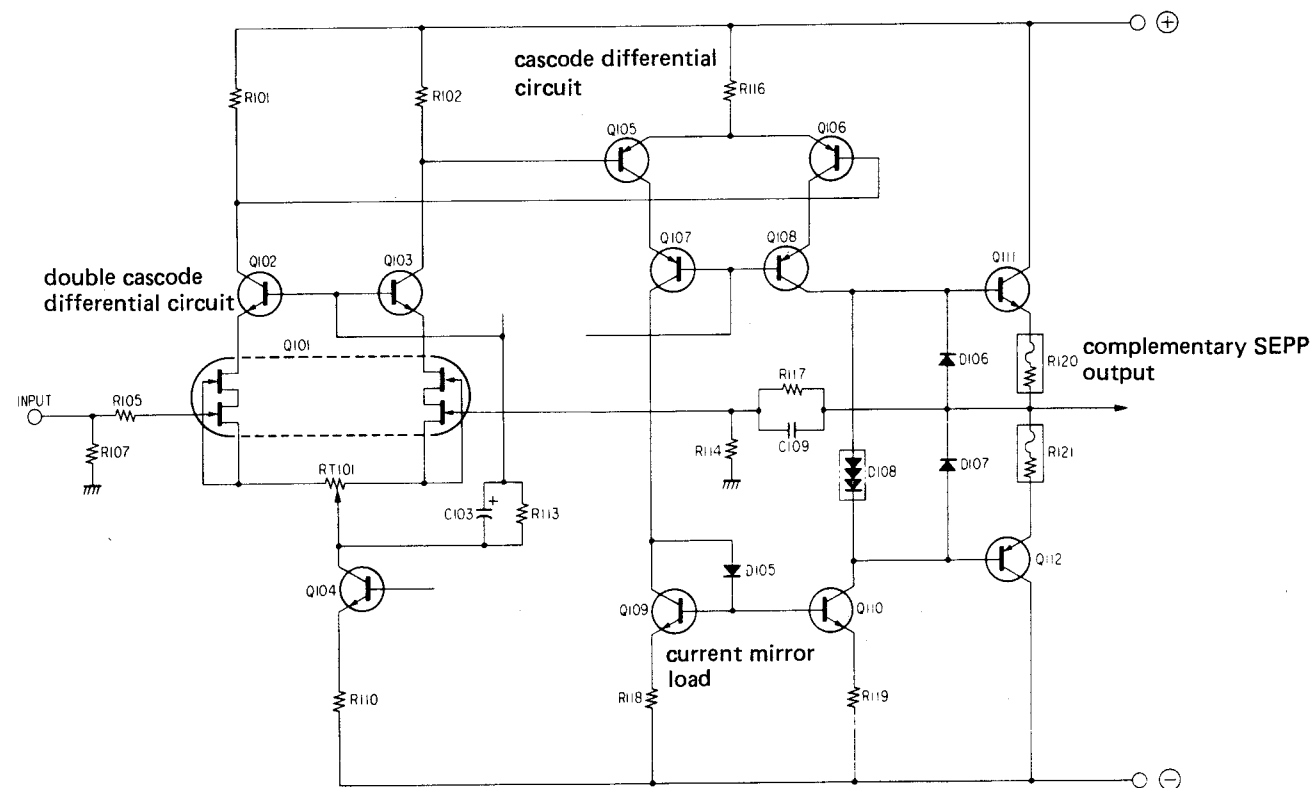


Figure 2

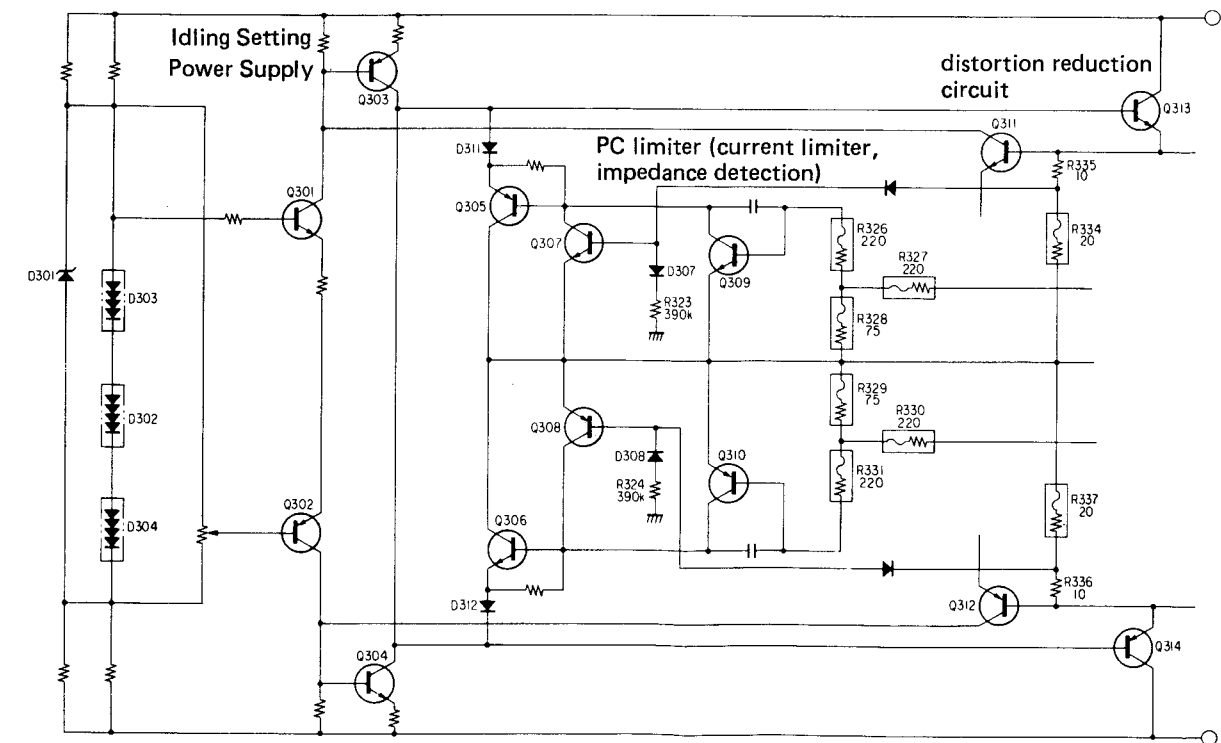


Figure 5

● **Impedance Detector** (See Figure 4)

This circuit operates when speaker impedance is very low and when speaker terminal is shorted. Normally, when P-G and Q-G potential is $R_L 1.5\Omega$, P-G potential is set high, and when less than 1.5Ω or when shorted, P-G potential drops, Q307 goes on, turns Q305 on, and controls input to the final stage.

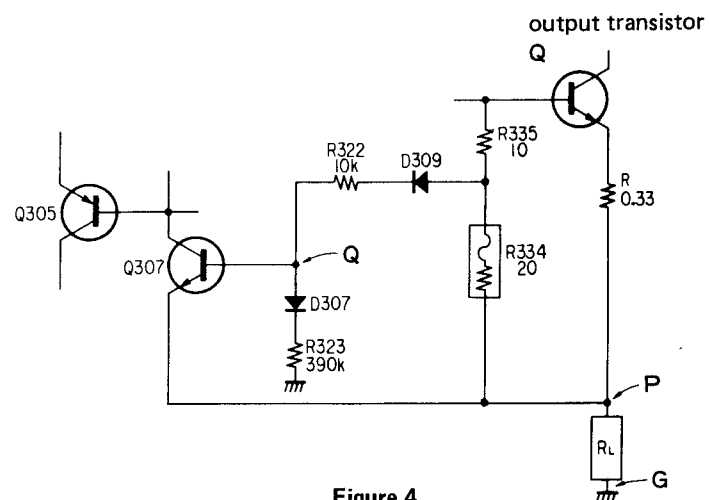


Figure 4

3. **BTL (Balanced Transformerless)** (See Figure 6)

The operation switch is set at STEREO when using as a stereo amp, and at MONO (BTL) when using as a mono amp. The effective output at this time is 400W (8Ω). The BTL circuit drives two SEPP circuits at opposite

phases, and connects the load between the respective output points. In other words, by inputting two power amp inputs at \oplus , \ominus respectively, there is double modulation between the outputs.

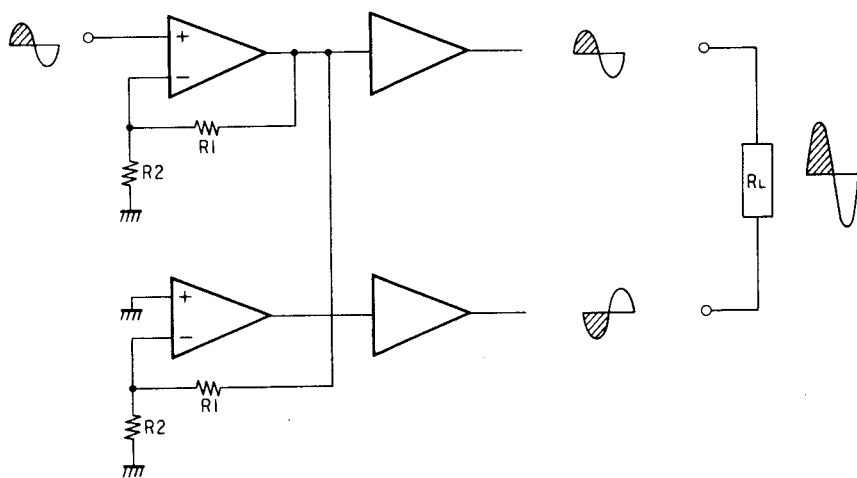


Figure 6

4. **Control Circuit**

This block is composed of a muting circuit, speaker protection circuit, peak indicator circuit and temperature display circuit.

● **Muting Circuit** (See Figures 7, 8)

When power is turned on, Q603 base potential is low and it goes on immediately, because C607 is not being charged. Therefore Q604 goes off and speaker relay goes off.

Eight seconds after being charged by R606, 607 and C607 time constant, Q603 goes off, Q604 goes on, speaker relay goes on and muting is released. D628,

629 are to prevent Q603 misoperation when power supply fluctuates, because muting circuit power supply is unstable.

Q601, 602 are used to turn off speaker relay immediately when power goes off. (See Figure 9)

When power is turned on, it is rectified by D607 and switches Q601. Therefore C606 is charged at 50Hz/60Hz cycle and Q602 is normally off.

When power is turned off, Q601 switching is stopped immediately, C606 is charged, and Q602 goes on, Q603 turns on, Q604 goes off and speaker relay goes off.

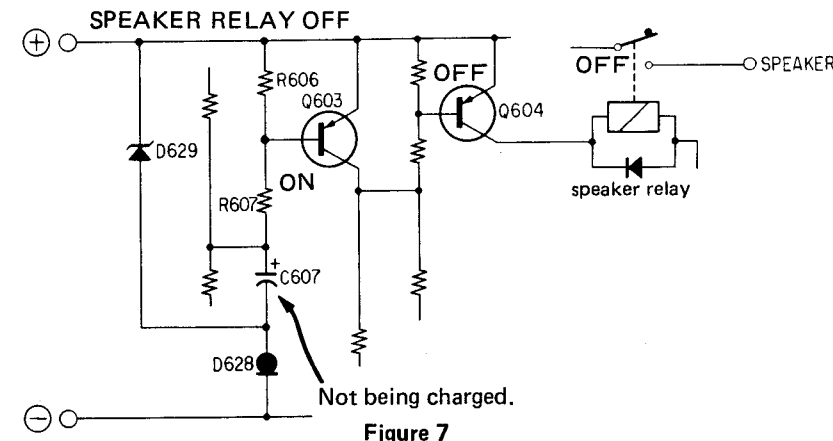


Figure 7

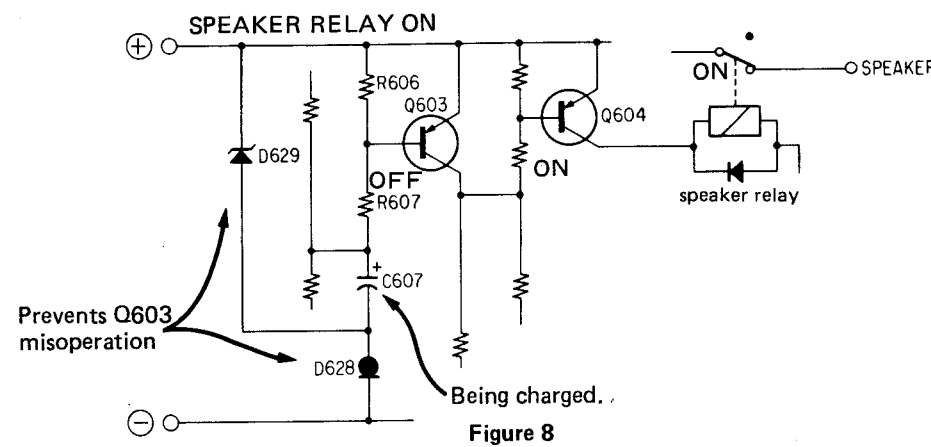


Figure 8

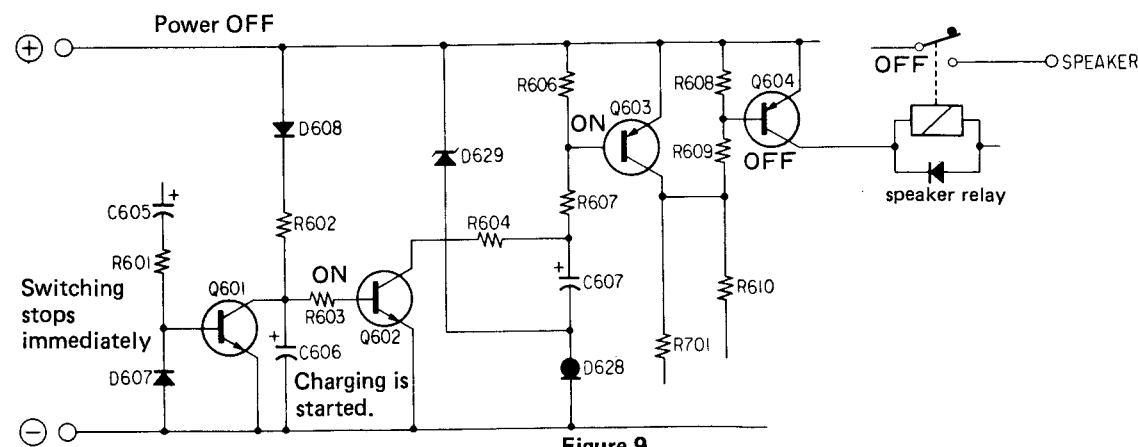


Figure 9

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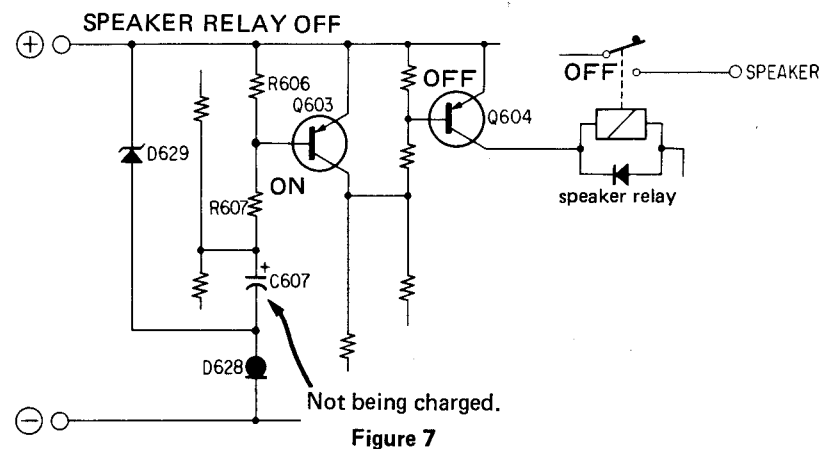


Figure 7

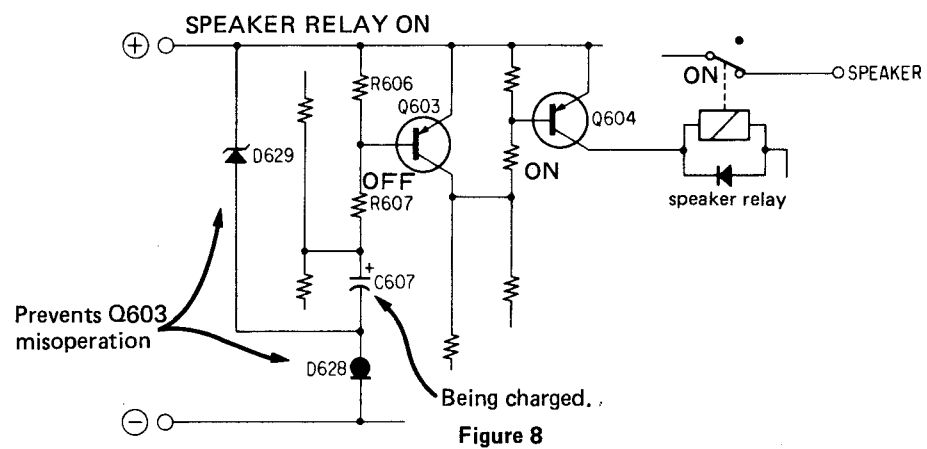


Figure 8

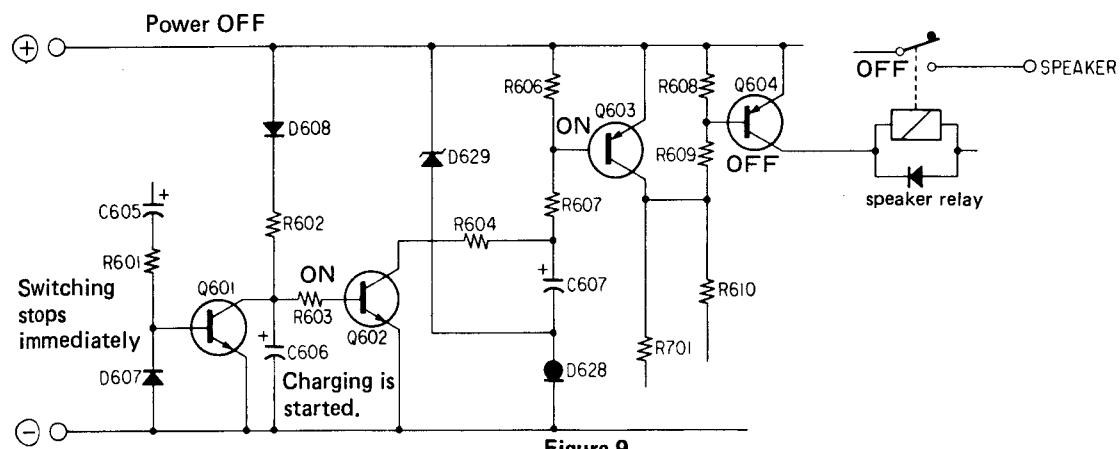


Figure 9

• Speaker Protection Circuit (See Figure 10)

Q605, 606 and 607 are used to prevent DC voltage from being applied to the speakers.

When positive: Q606 ON → Q603 ON → Q604 OFF → speaker relay OFF

When negative: Q605 ON → Q607 ON → Q603 ON → Q604 OFF → speaker relay OFF

C608 prevents misoperation resulting from music at the LPF. D609 prevents B-E from being reverse biased.

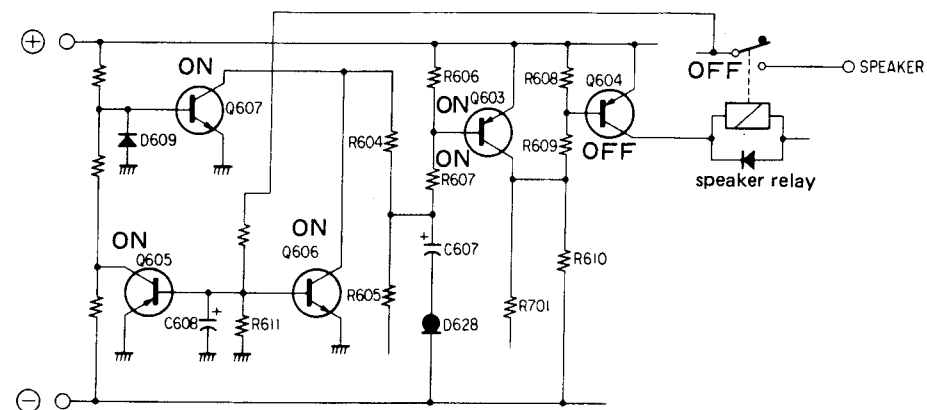


Figure 10

• Peak Indicator Circuit (See Figures 11, 12)

Speaker output is voltage divided and, due to IC602 linear wave, becomes as follows:

When negative	When positive
D ₁ ON	D ₁ OFF
D ₂ OFF	D ₂ ON

$$\text{Gain} = \frac{R}{R_T} \approx 6\text{dB} \quad \text{Output is zero.}$$

In other words the negative input voltage only is positive polarity converted.

Next, it passes R623, 624 attenuator (in order to avoid diode nonlinearity range when linear wave circuit is low level, operates at a relatively high level), and level is lowered. It is input to IC603 pin ③ and at the same time lowest level (8Ω 0.03W) offset is obtained by R_T603. At IC603, when it reaches the set output level, output changes from plus to zero. Q608 does muting to prevent the meter from lighting up mistakenly when the set is turned off.

When 0.03W level is input, output is from IC603 pin ⑬, ⑰, and Q621 goes on, Q627 goes on and the lamp lights up. Q621-626 and lamp power supplies are stabilized separately, so because of polarity, an inverter is required. R669, R675, R681, R694 (2.2kΩ) are resistors for lighting lamps below the lighting level. D622-D626 prevent the inverter from operating through the lamps.

Q633 maintains even voltage so that the indicator lamp brightness does not change due to music.

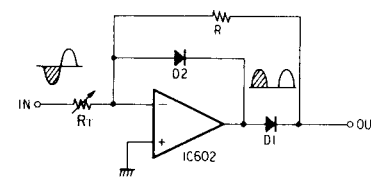


Figure 11

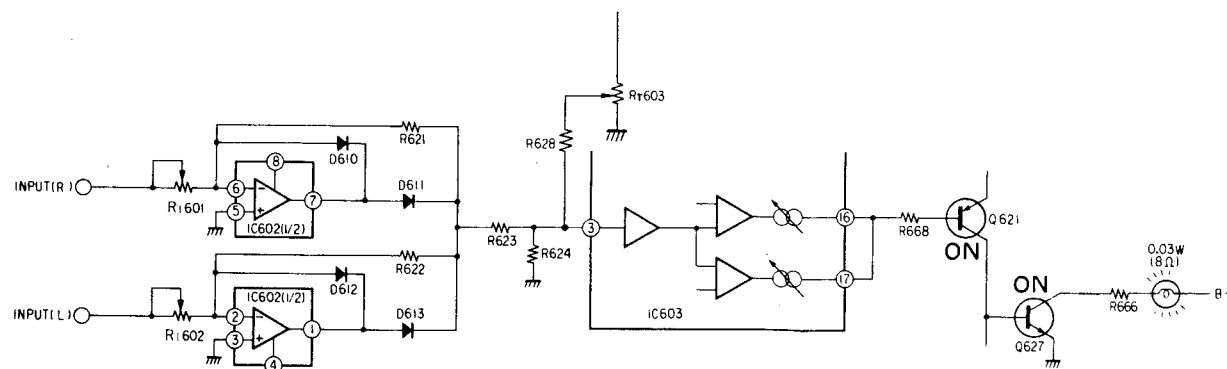


Figure 12

● Temperature Display Circuit (See Figures 13-17)
A thermistor is used as the temperature sensor.

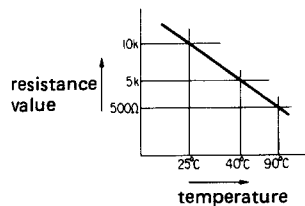


Figure 13

TH-1 is for blue -- green setting (heat sink rises 10-20°C over room temperature)
TH-2, 3 are for green -- red setting (90°C)

When the set is turned on, Q610 is turned on by R634 and D627 and blue lights up. When the heat sink rises 10-20°C over room temperature, Q609 goes on, Q610 goes off and the blue lamp goes out. The current flowing from R640 → R637 → D615 flows to Q611, because D615 goes off, and switching from the blue lamp to the green lamp is done slowly.

When temperature rises further, TH-2 (TH-3) resistance value drops, and Q614 (Q617) which was on goes off. Q613 emitter rises to positive and turns Q612 on, lights up the red lamp and turns Q611 off.

When temperature rises more, Q615 (Q618) goes off, and via D620, Q619 goes on, Q603 on, Q604 turns off and the speaker relay goes off. At this time the protection lamp lights up.

When Q619 goes on, D632 turns on, speaker relay goes off, and even if heat sink temperature drops, Q615 remains off, and unless set power is cut again, the protection and red lamps are locked. This is to prevent the relay from being turned on and off at a high temperature, possibly causing transistor damage.

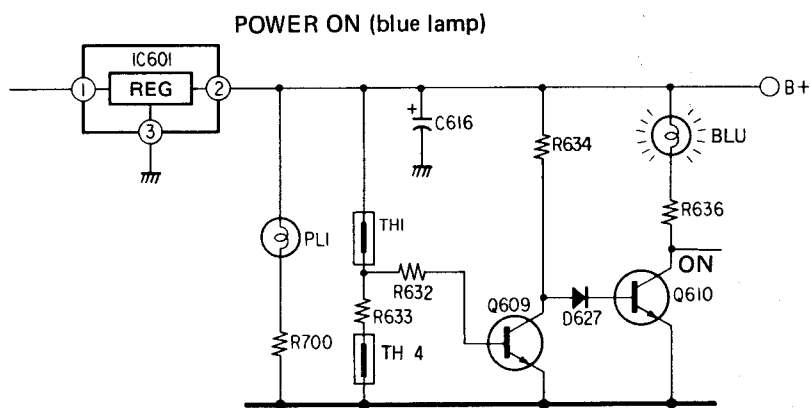


Figure 14

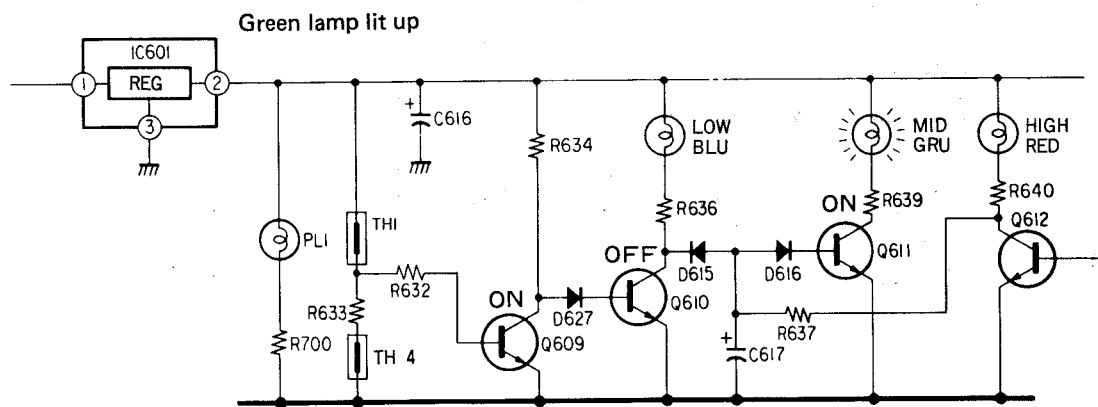


Figure 15

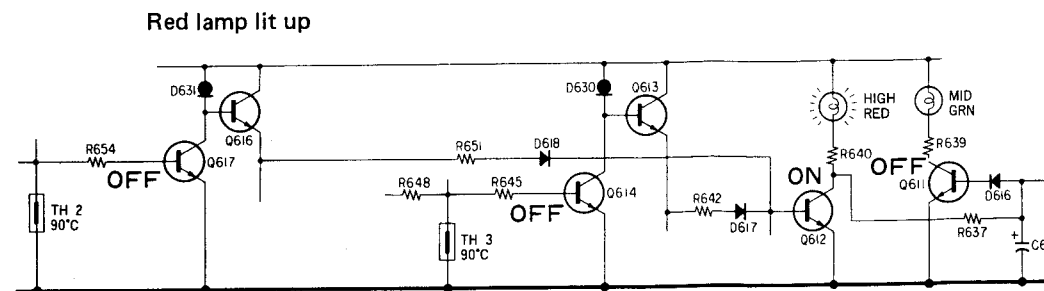


Figure 16

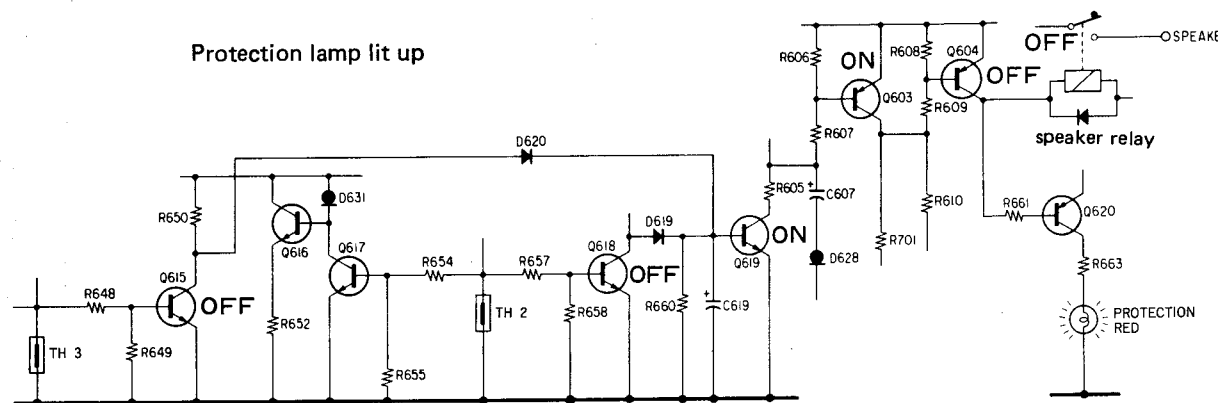
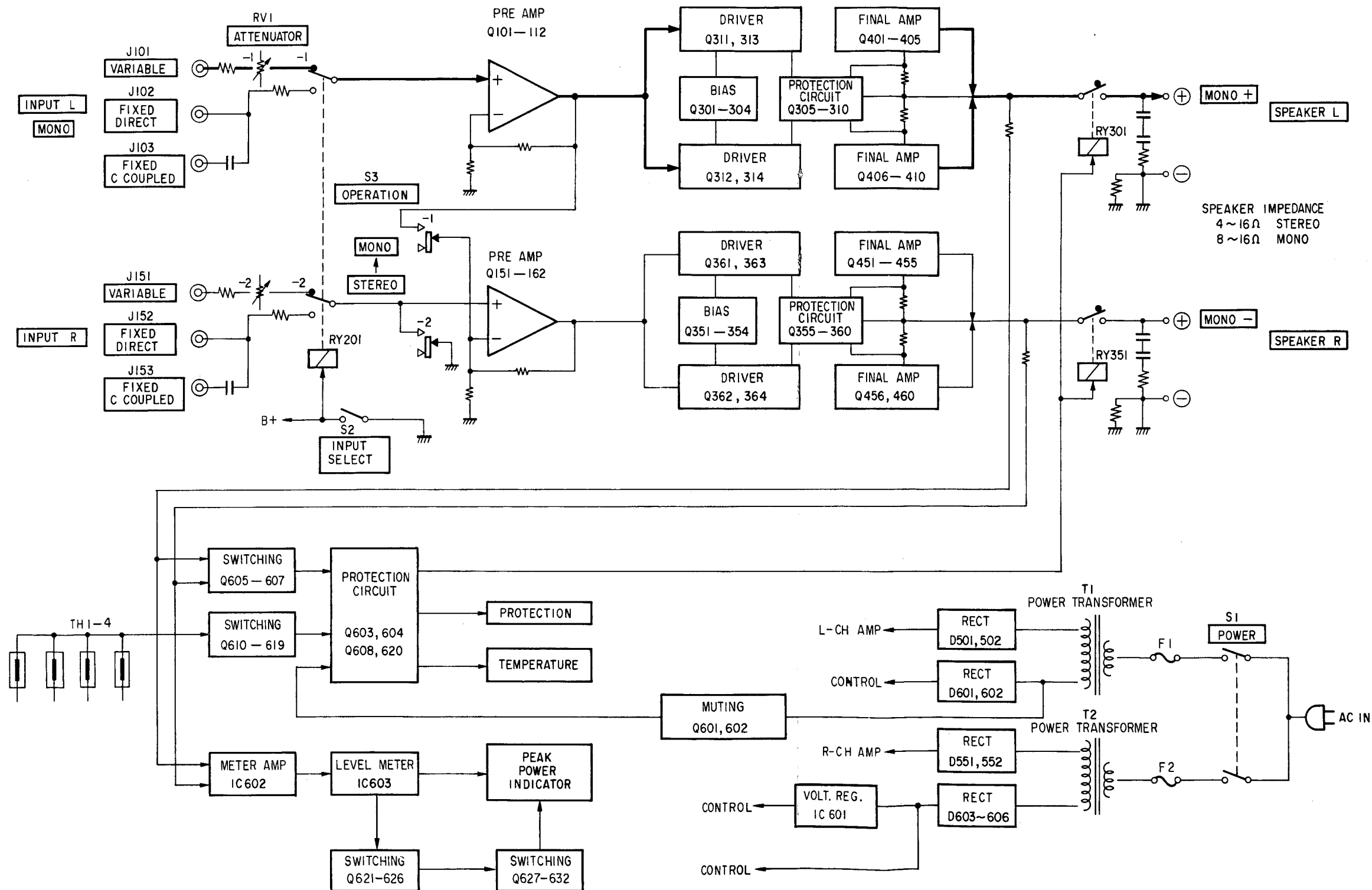


Figure 17

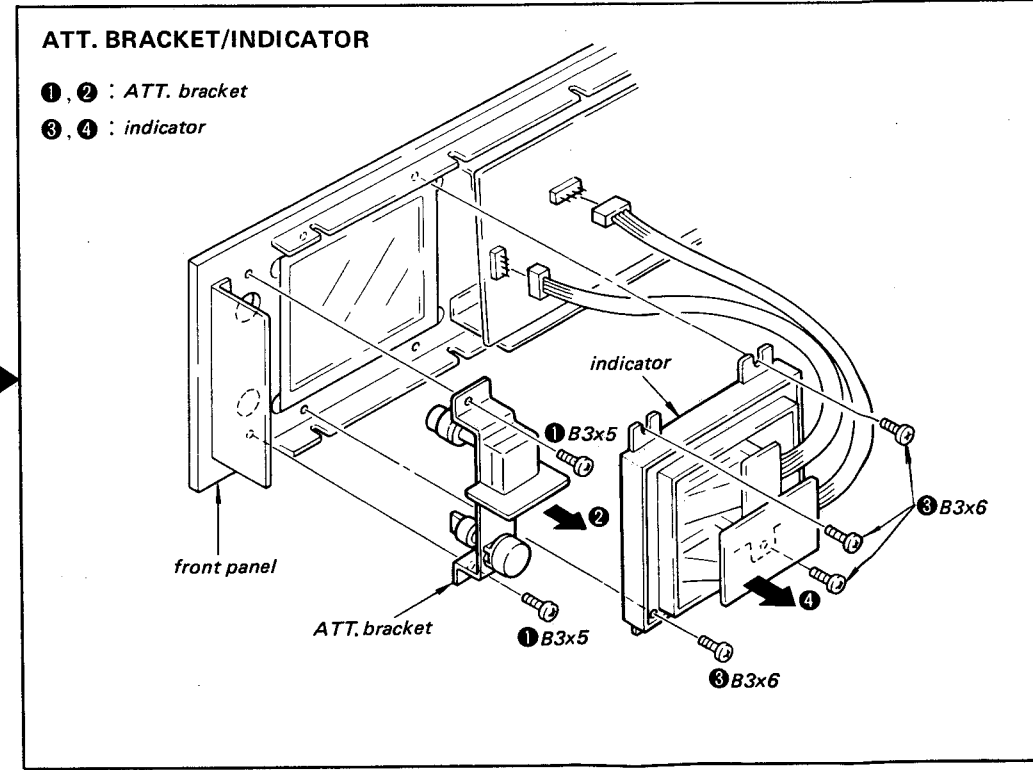
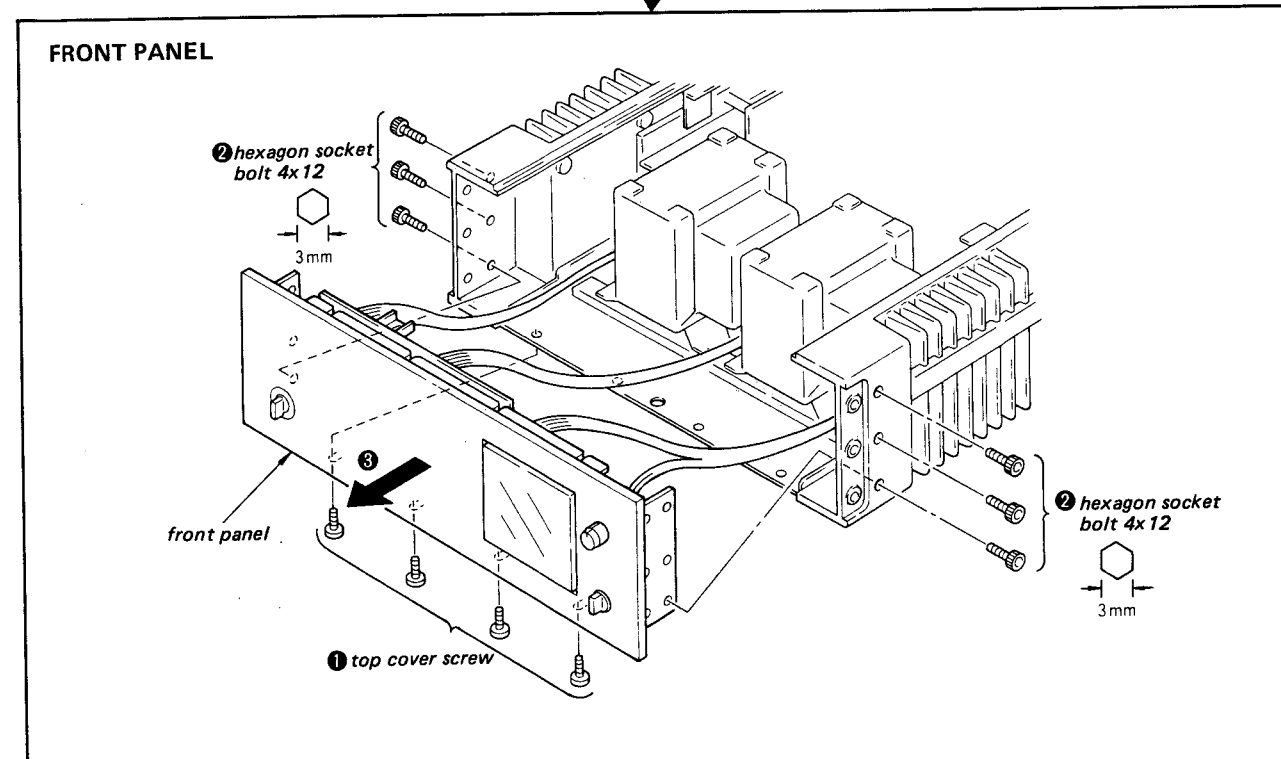
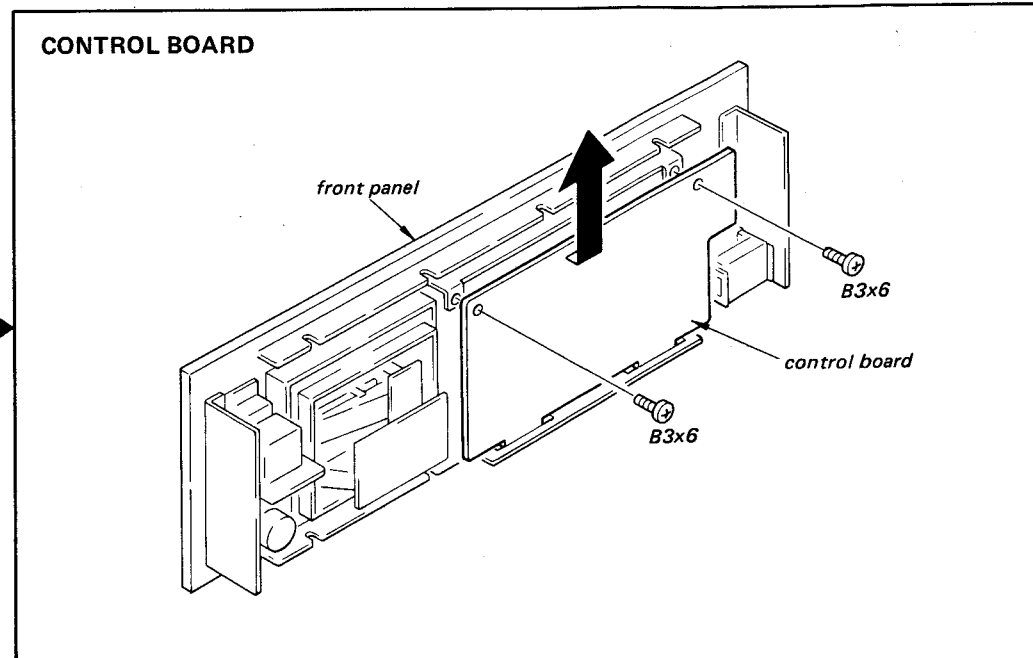
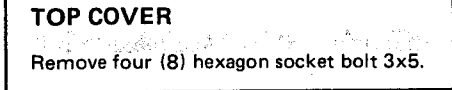
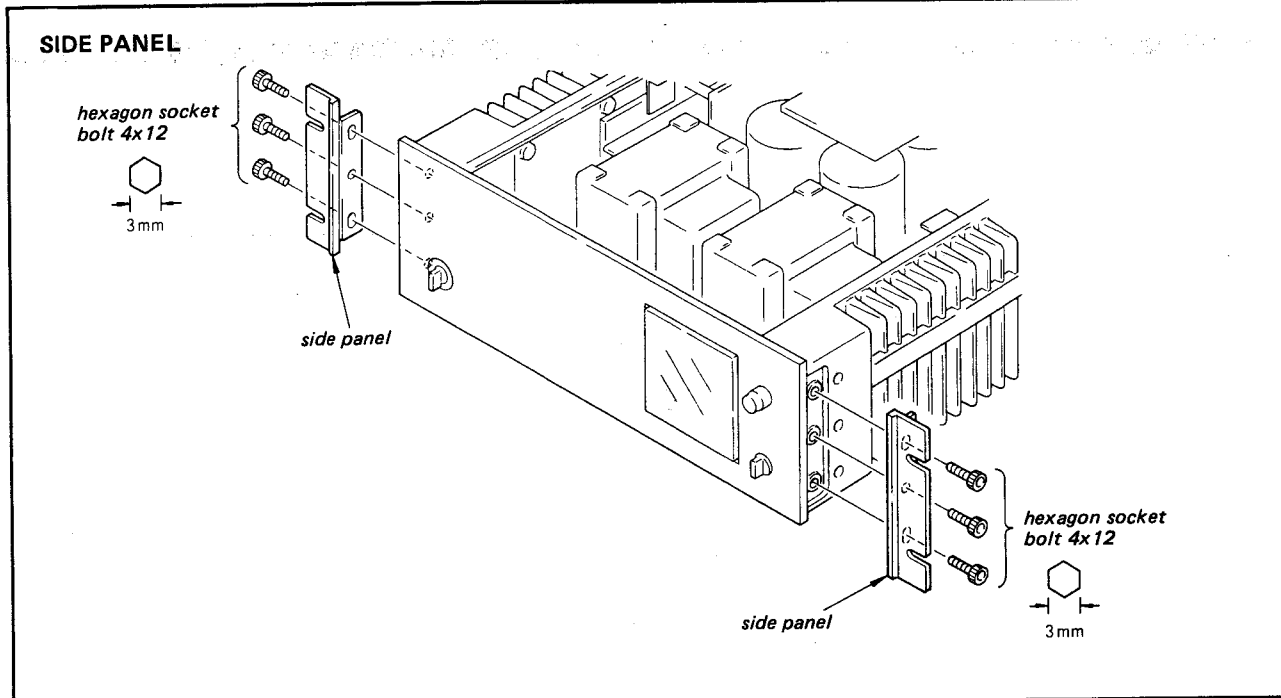
1-3. BLOCK DIAGRAM

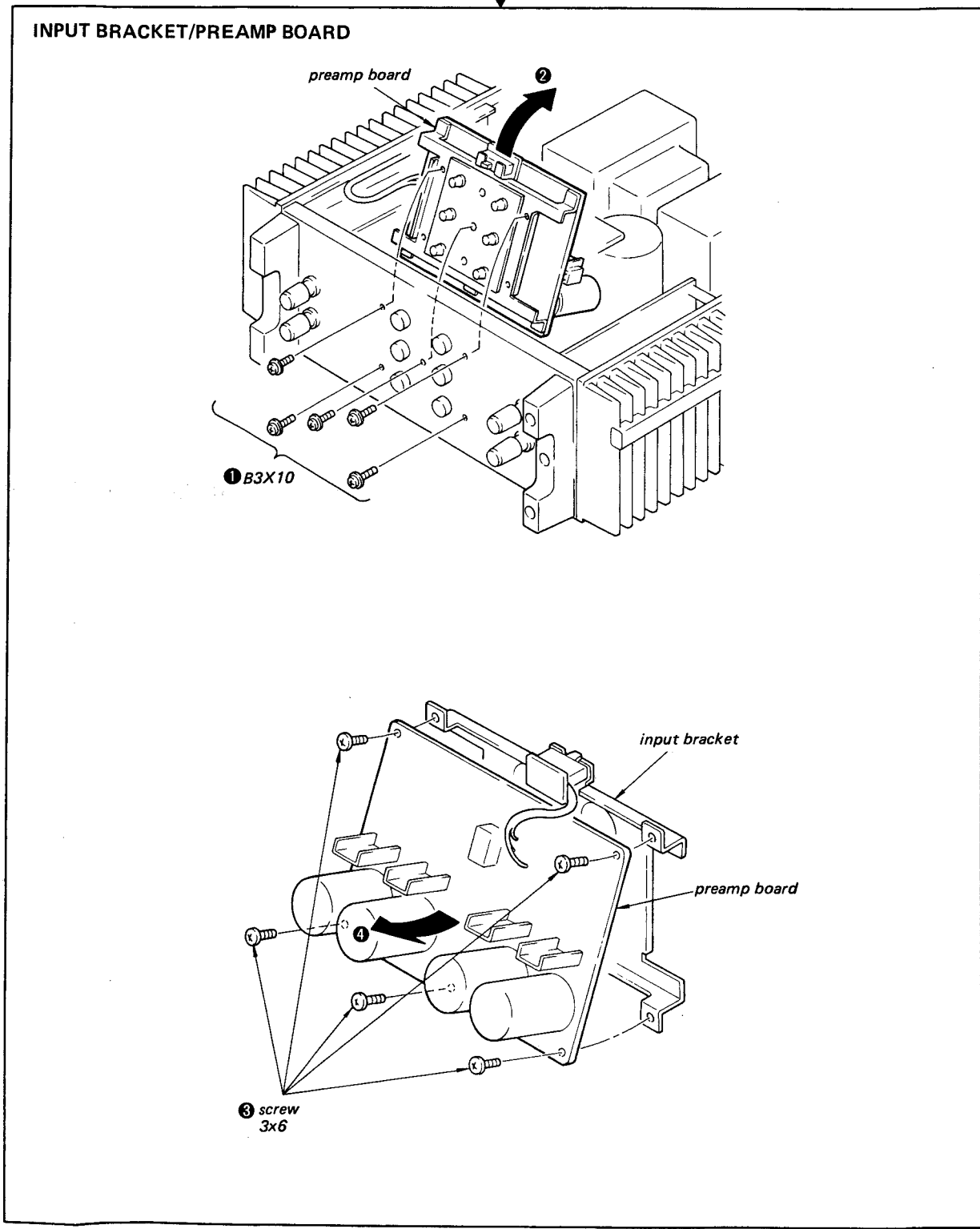
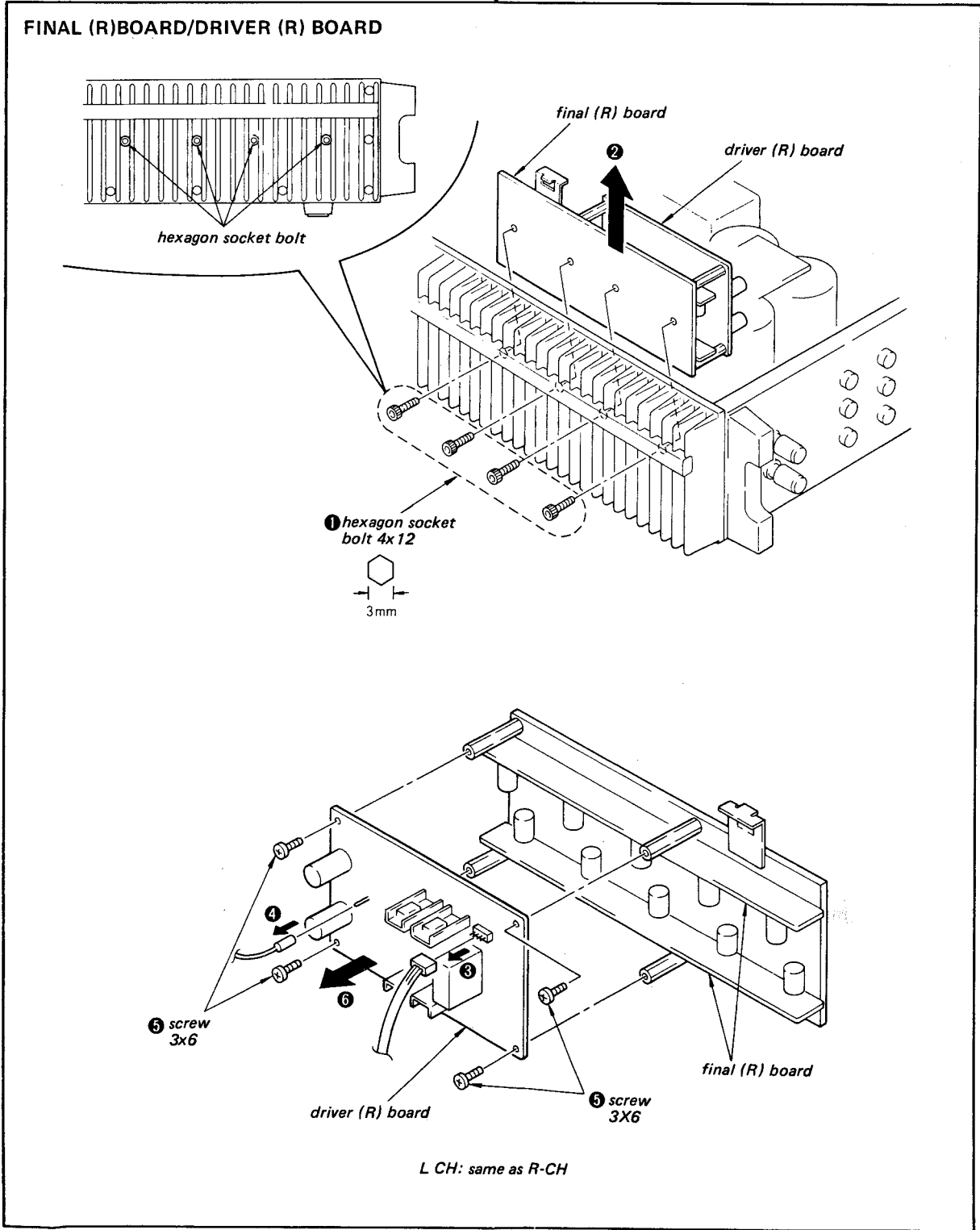


SECTION 2
DISASSEMBLY

REMOVAL

Note: Follow the disassembly procedure in the numerical order given.





SECTION 3
ADJUSTMENTS

Setting

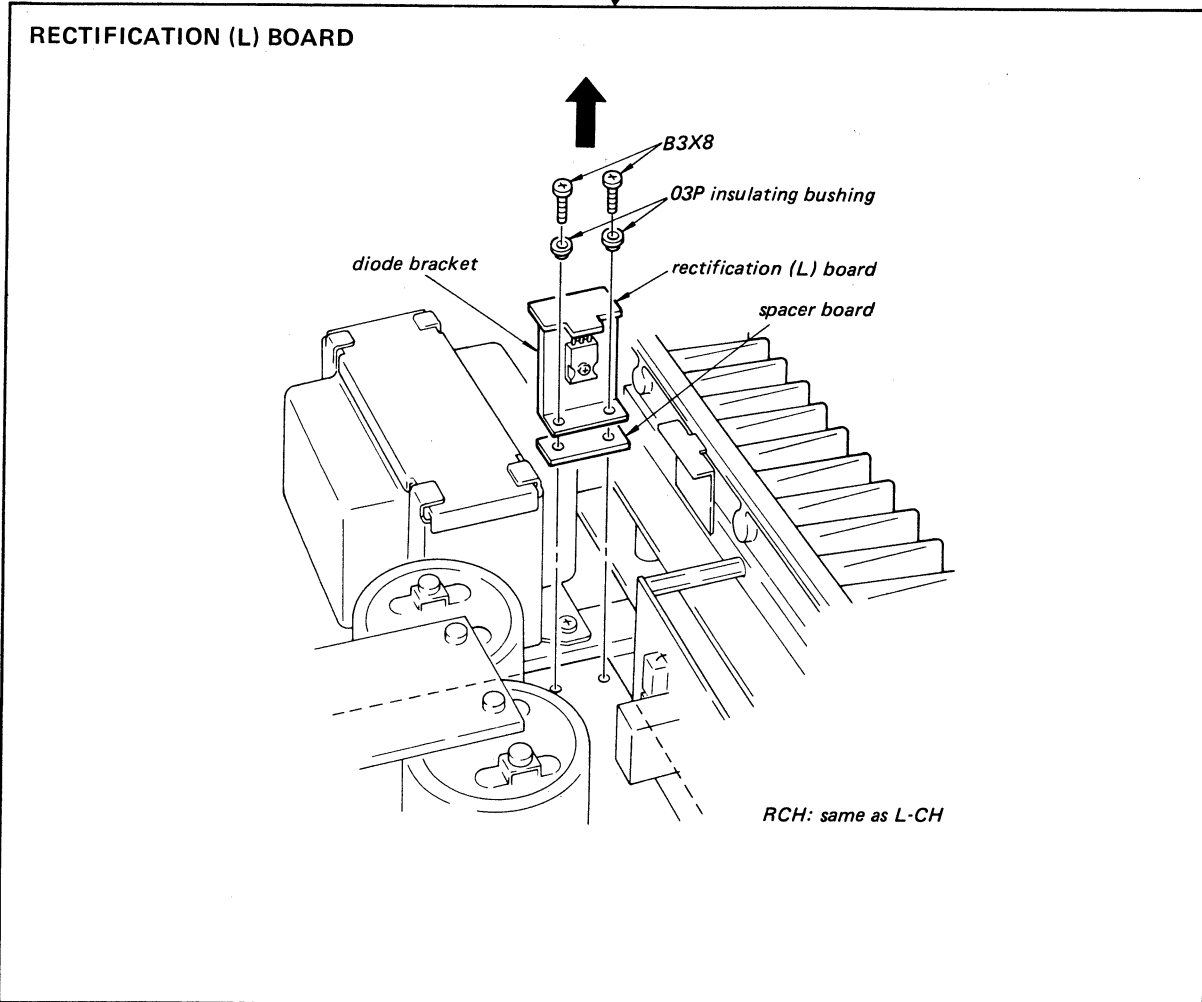
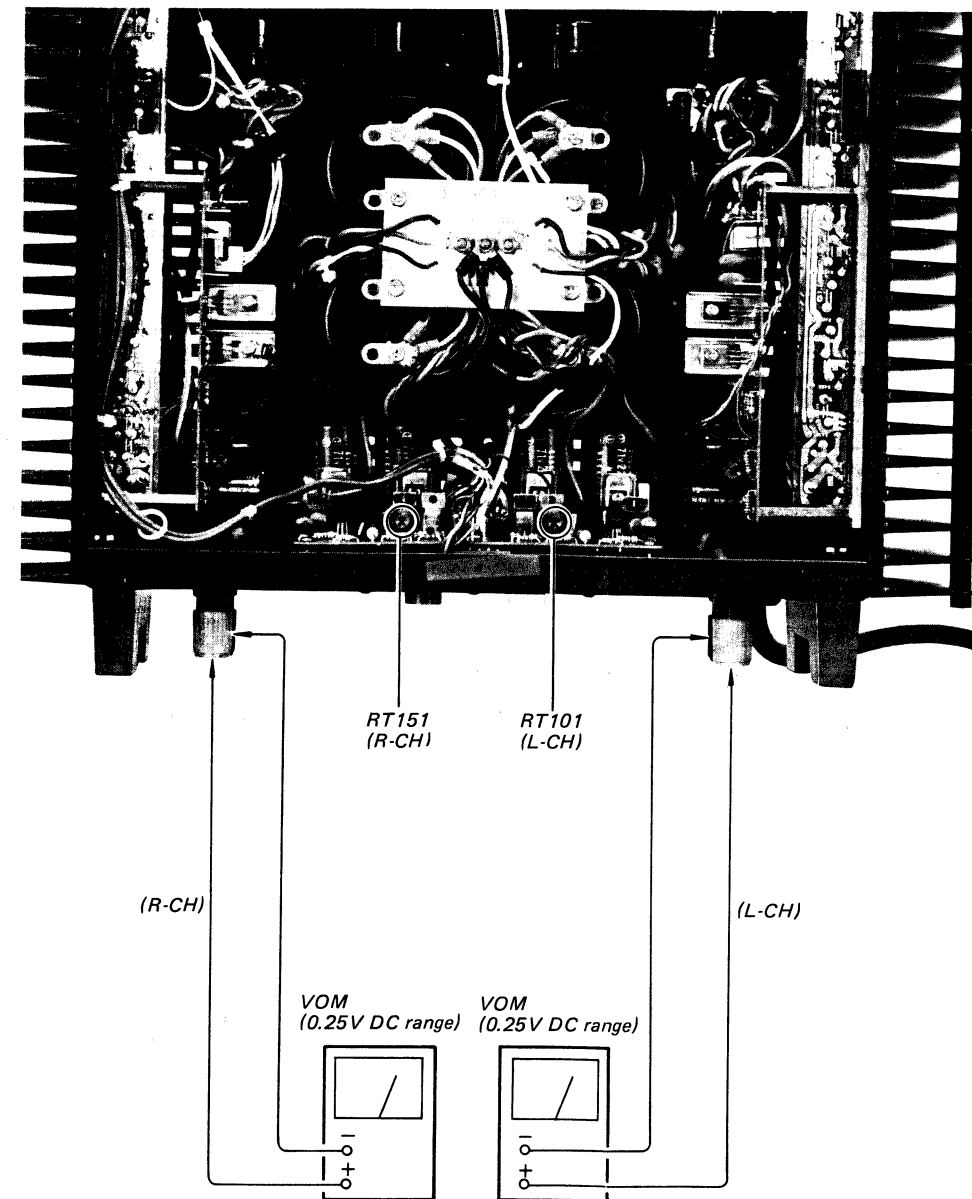
Be sure to start the adjustments with the lamp (heat sink temperature: 40°C) turned to blue.

Offset Adjustment

Procedure:

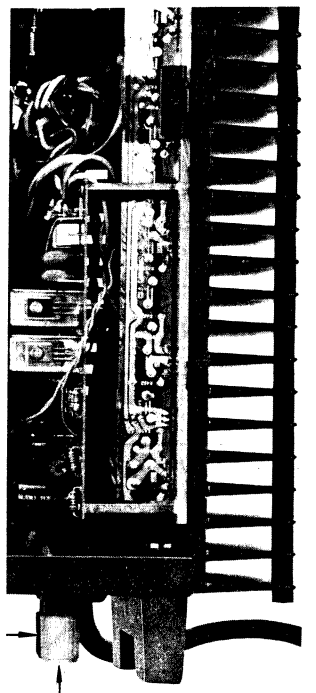
Adjust RT101 (L-CH), RT151 (R-CH) for 0V reading on VOM with no signal input.

Adjustment Location: *Preamp board*



S

C) turned to blue.



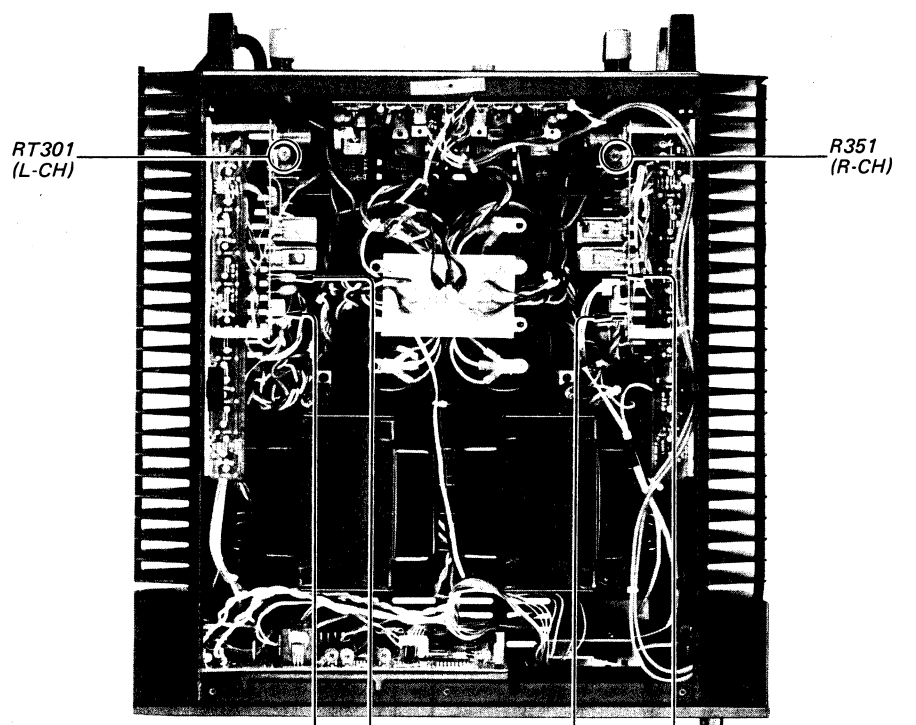
(L-CH)

Idling Adjustment

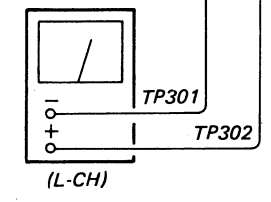
Procedure:

Adjust RT301 (L-CH), RT351 (R-CH) so that VOM reading between TP301 and TP302 (L-CH), between TP351 and TP352 (R-CH) become 60 mV.

Adjustment Location: *Driver board*

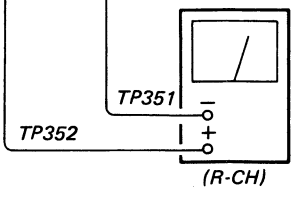


VOM
(0.25V DC range)



(L-CH)

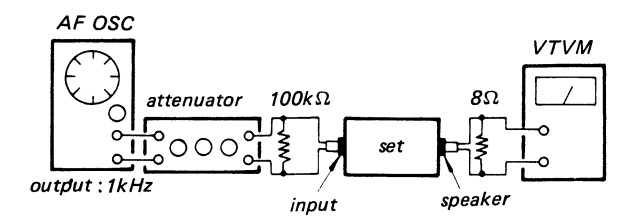
VOM
(0.25V DC range)



(R-CH)

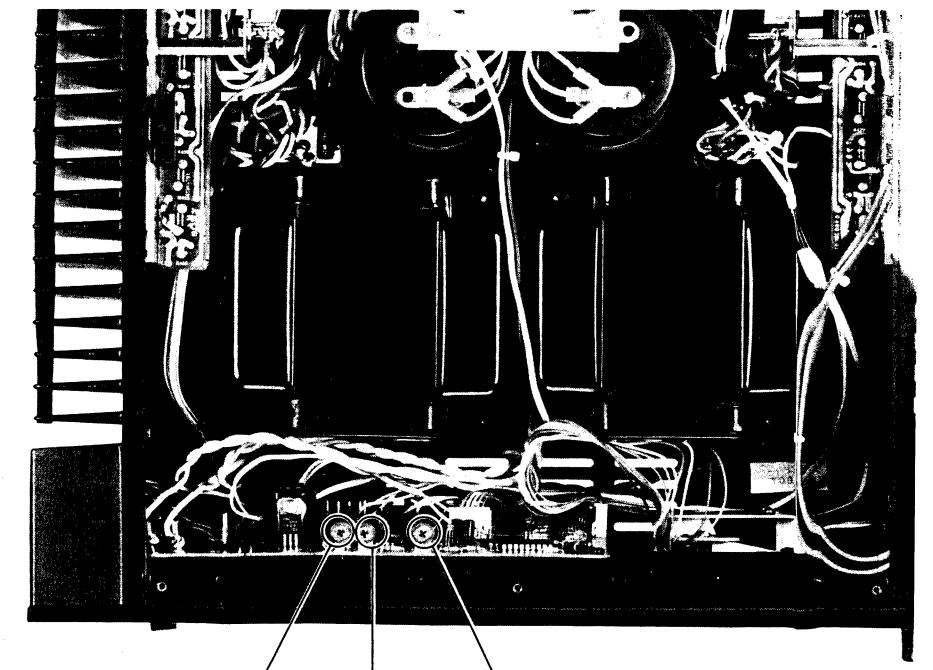
Level Meter Adjustment

Procedure:



1. Turn the ATTENUATOR knob fully clockwise. Adjust the input level for 75W (24.5V) across the SPEAKER terminal.
2. Adjust RT602 (L-CH), RT601 (R-CH) to the position where the 75W indication bar on PEAK POWER INDICATOR begins to go on.
3. Adjust the attenuator so that the VTVM reads 0.03W (0.49V).
4. Adjust RT603 to the position indication bar on PEAK POW begins to go on.

Adjustment Location: *Control board*

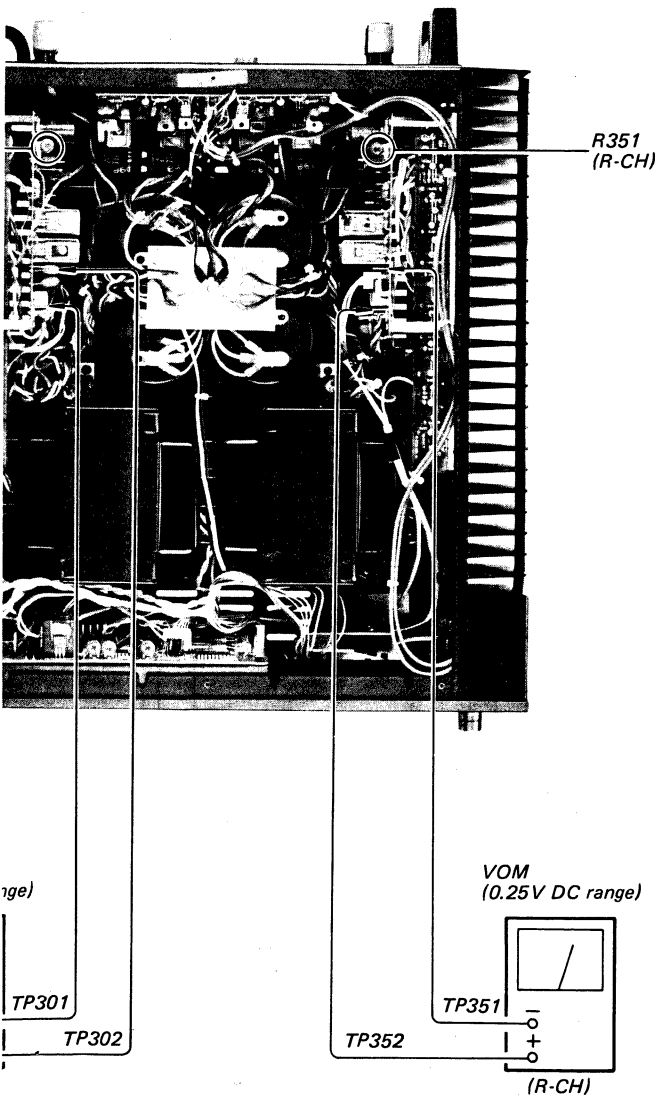


RT602
(L-CH)

RT601
(R-CH)

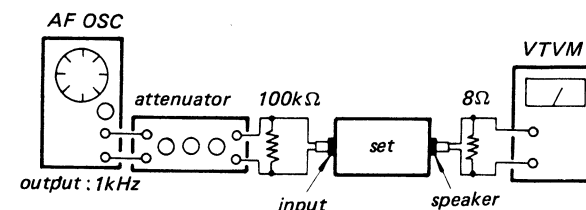
RT603

H) so that VOM
(L-CH), between
1 mV.



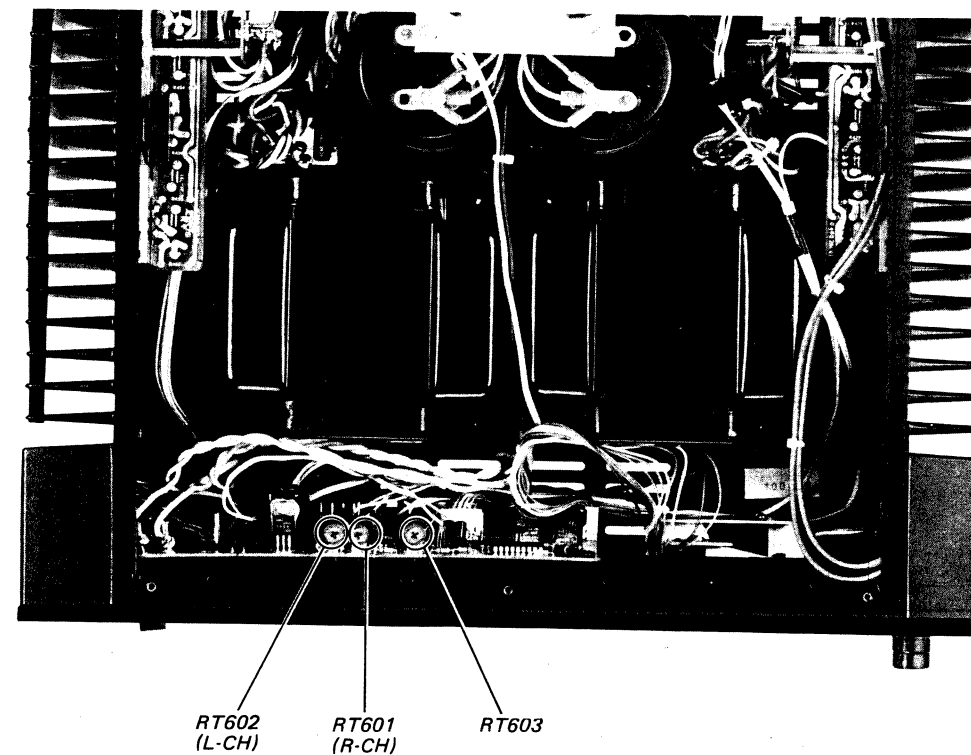
Level Meter Adjustment

Procedure:



1. Turn the ATTENUATOR knob fully clockwise. Adjust the input level for 75W (24.5V) across the SPEAKER terminal.
2. Adjust RT602 (L-CH), RT601 (R-CH) to the position where the 75W indication bar on PEAK POWER INDICATOR begins to go on.
3. Adjust the attenuator so that the VTVM reads 0.03W (0.49V).
4. Adjust RT603 to the position where the 0.03W indication bar on PEAK POWER INDICATOR begins to go on.

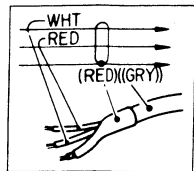
Adjustment Location: Control board



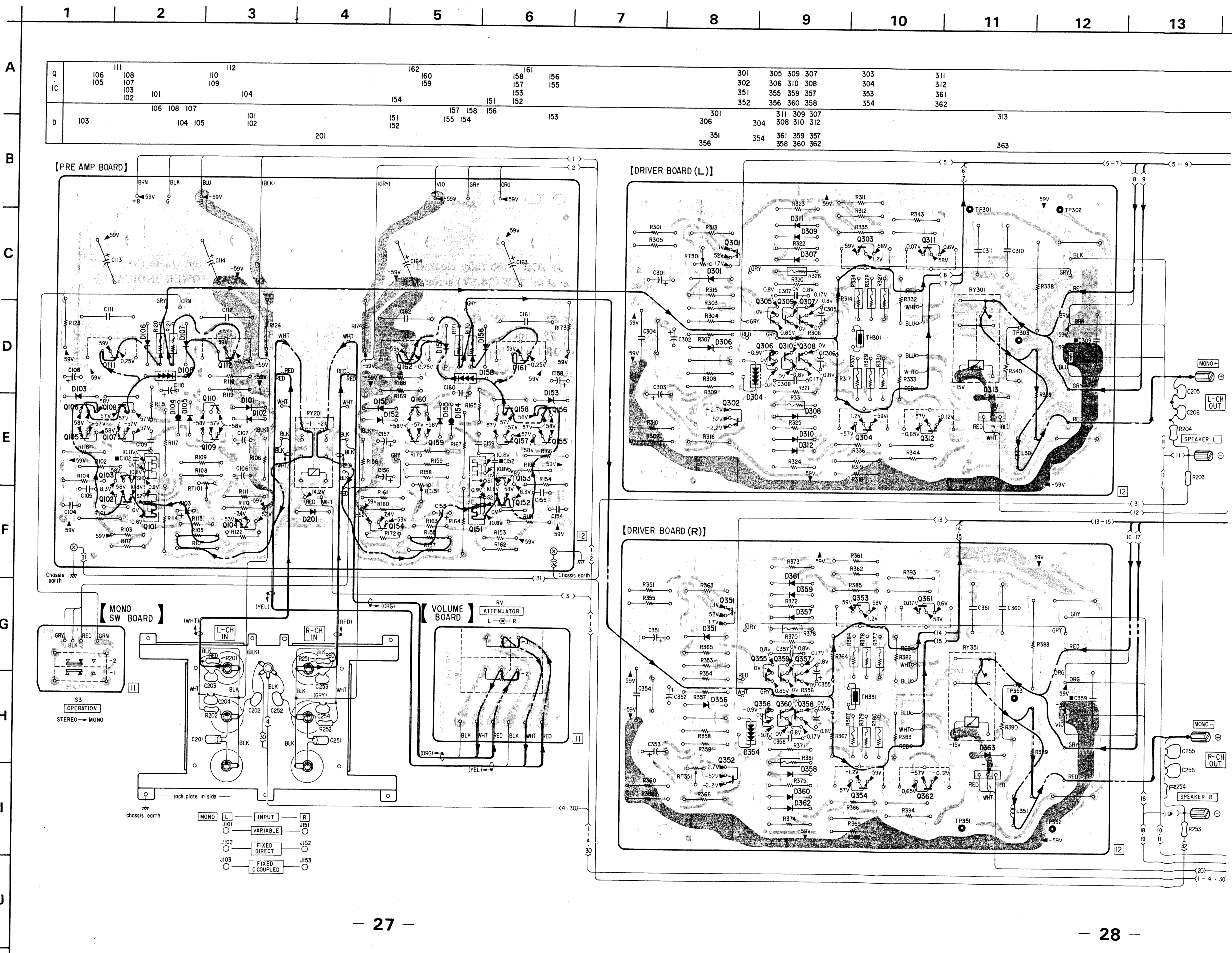
SECTION 4
DIAGRAMS

4-1. MOUNTING DIAGRAM

Color code of sleeving over the end of the jacket.

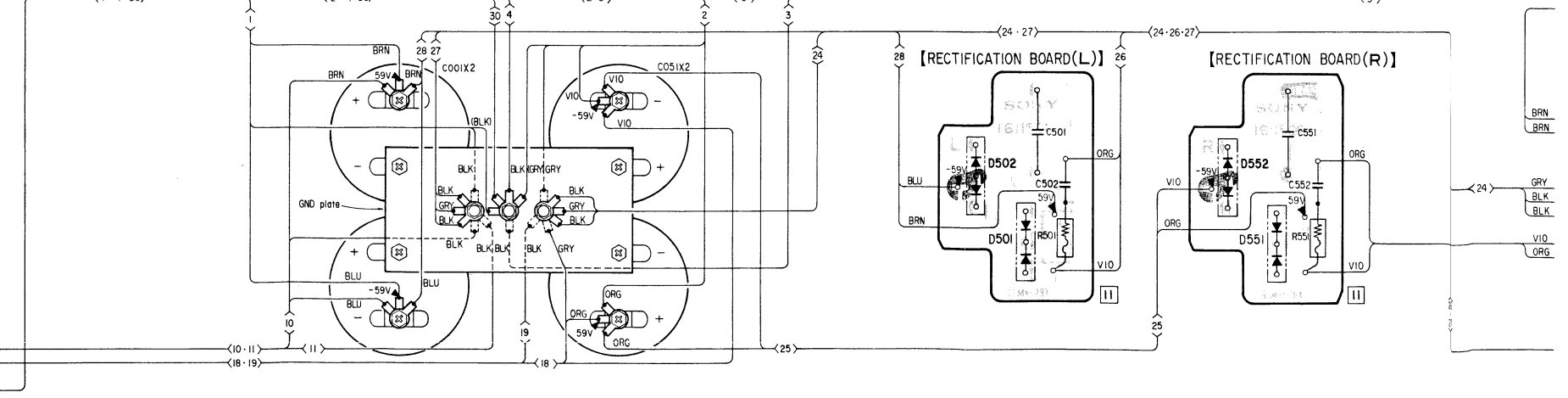
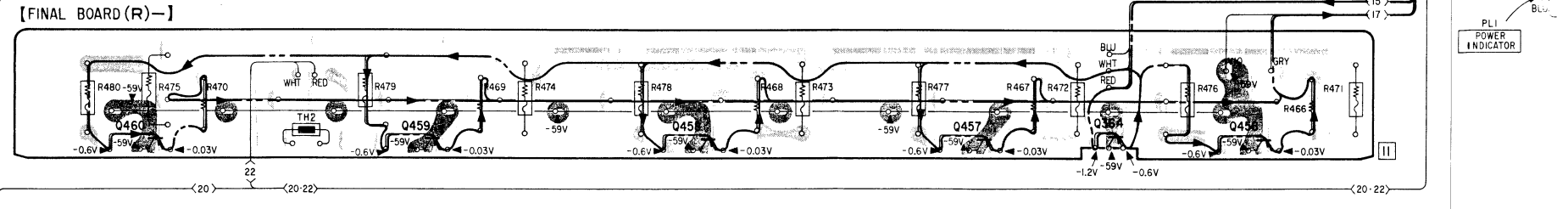
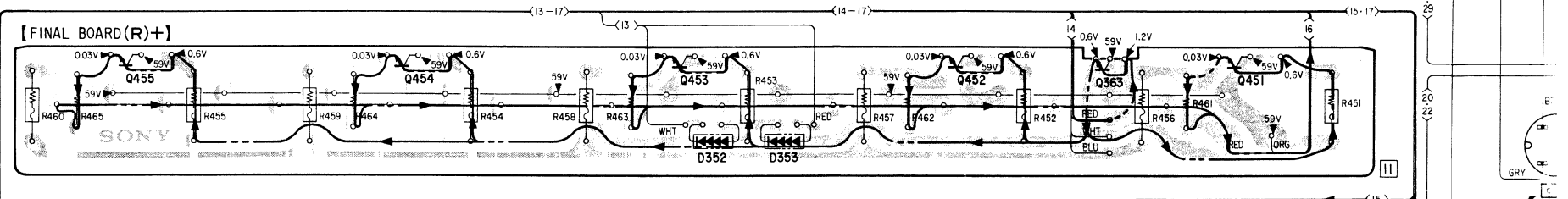
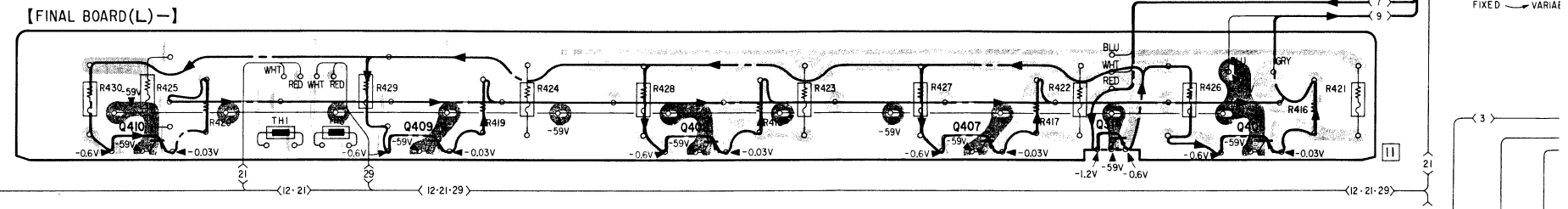
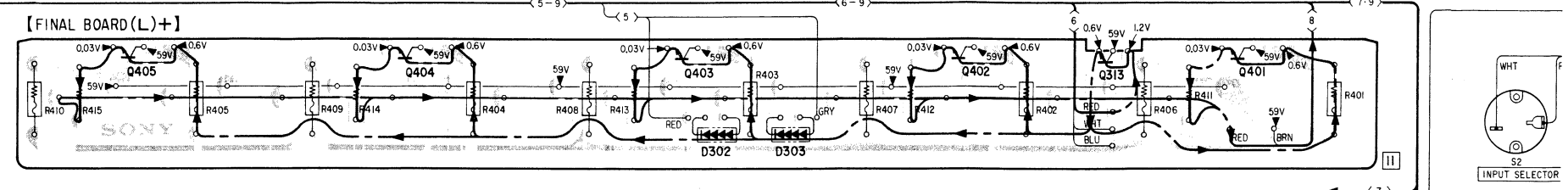
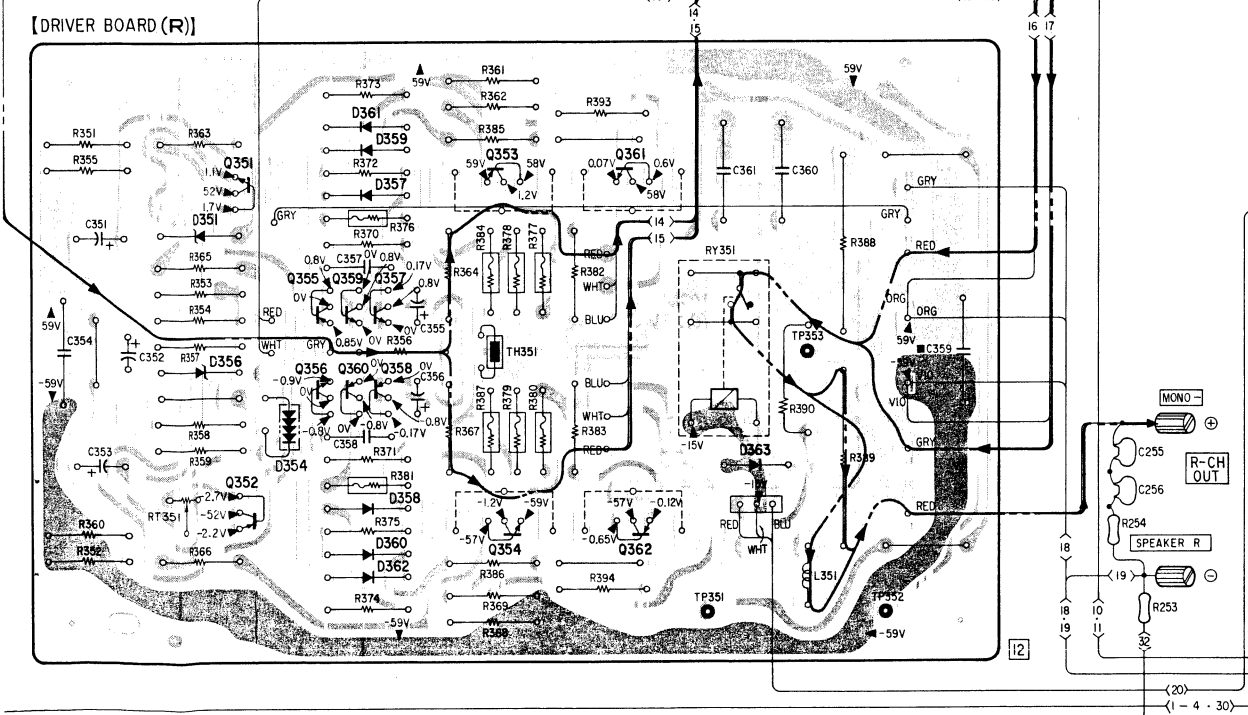
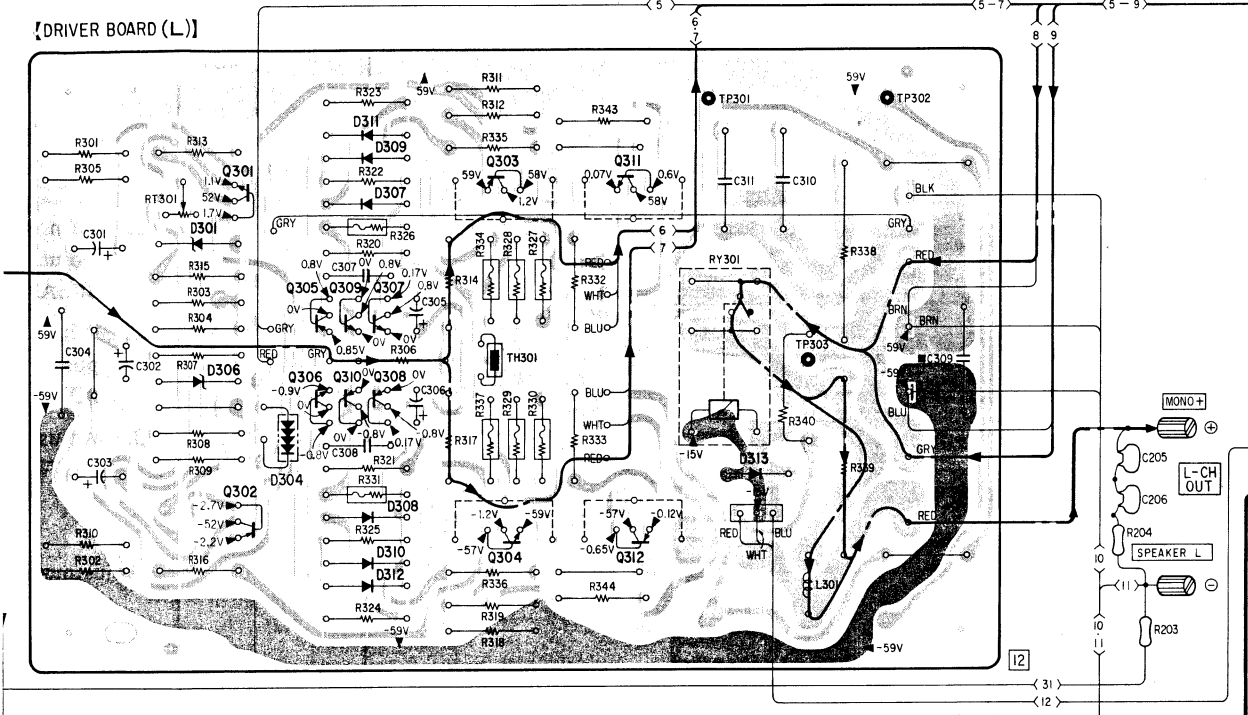


- : parts extracted from the component side.
- : parts extracted from the conductor side.
- : part mounted on the conductor side.
- ▨ : B + pattern
- ▩ : B - pattern
- : signal path
- (dashed) : L-CH signal path
- (dotted) : R-CH signal path

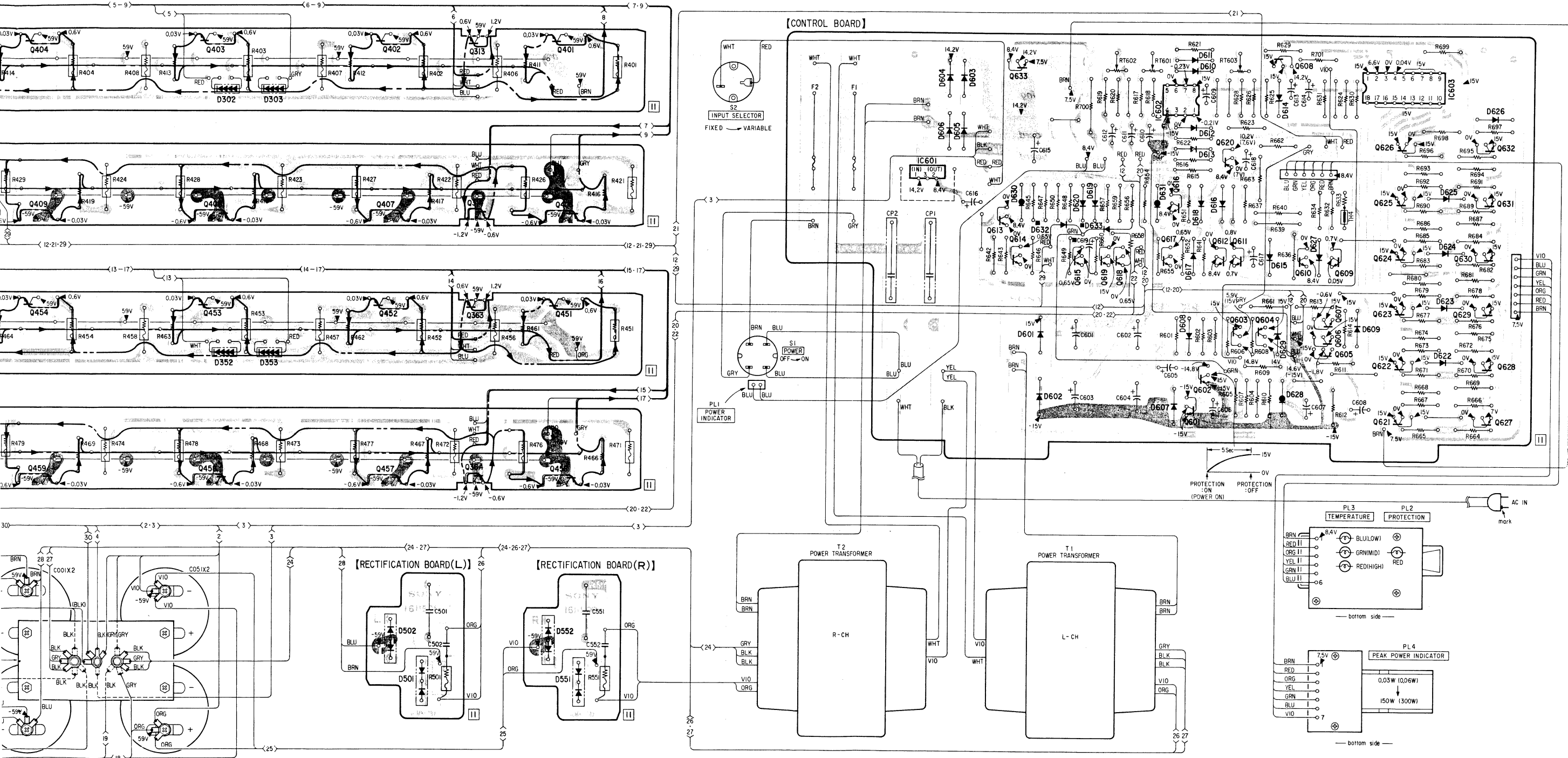


7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----

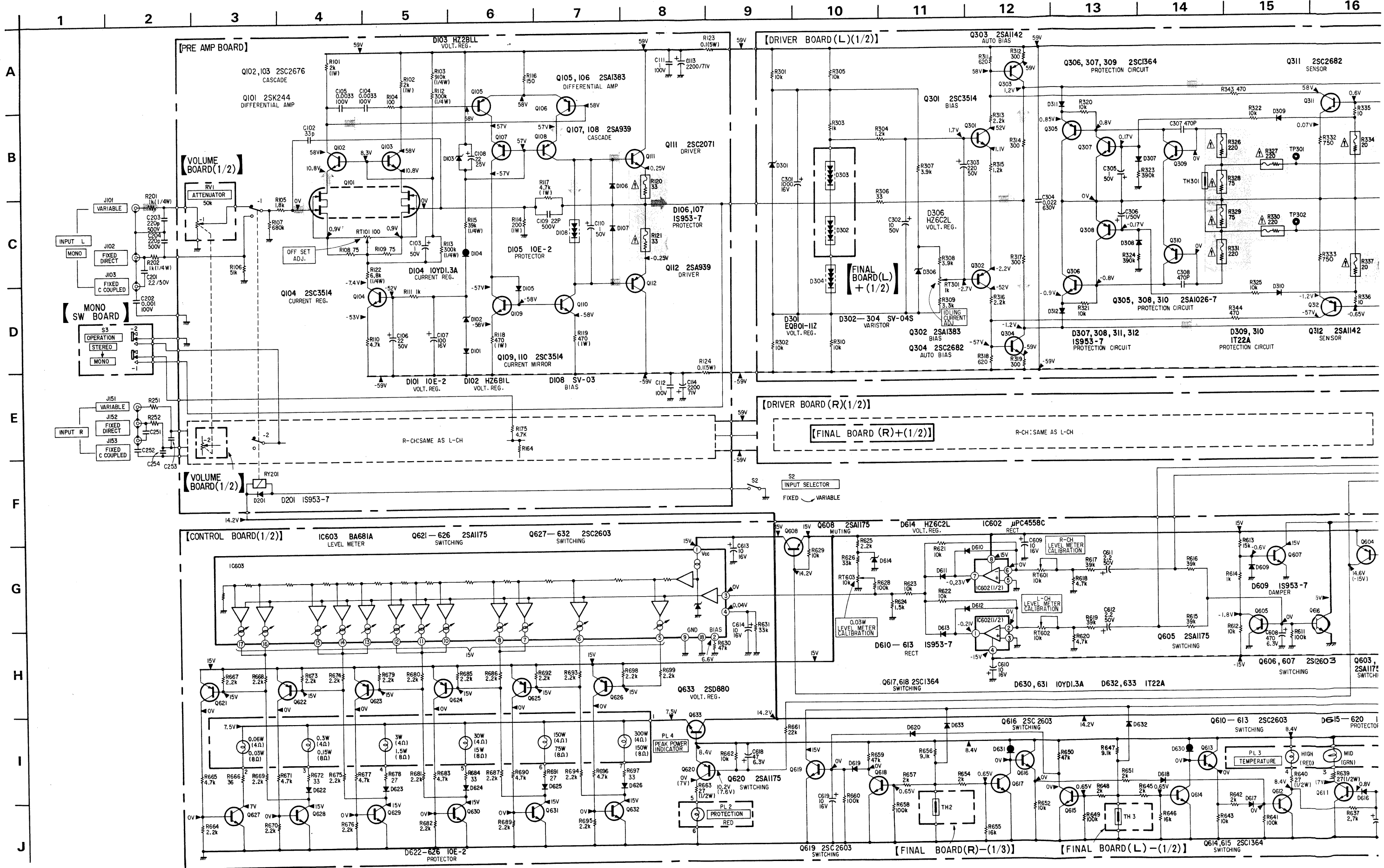
	301	305	309	307	303	311		405	404	403	402	313	401
	302	306	310	308	304	312		410	409	408	407	314	406
	351	355	359	357	353	361		455	454	453	452	363	451
	352	356	360	358	354	362		460	459	458	457	364	456
301	304	308	310	312		313				302	303		
351	354	361	359	357		363				352	353	502	552
356		358	360	362								501	551

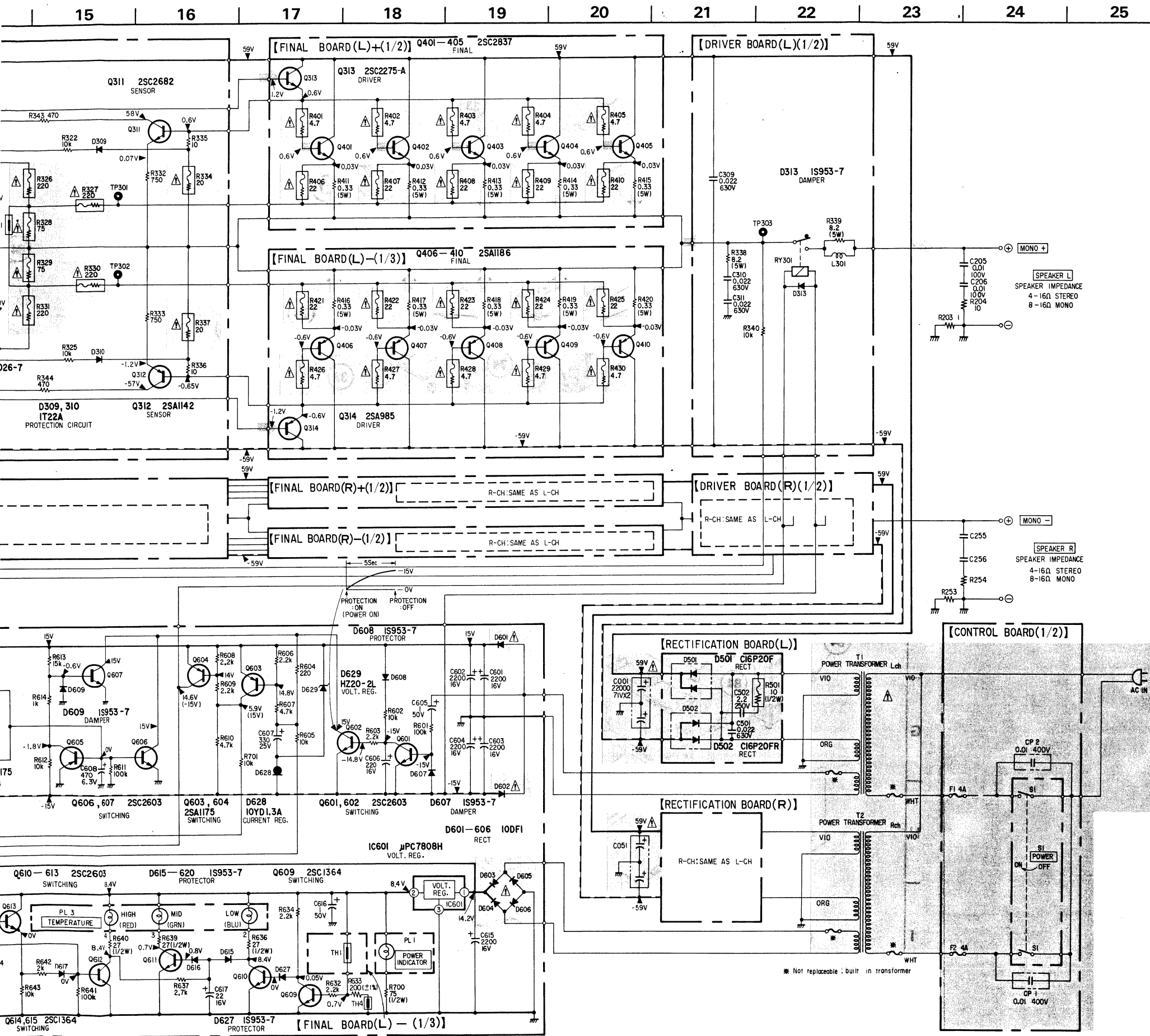


404		403		402	313	401		IC601	633		IC602	620	608		626	625	632	631	Q	
409		408		407	314	406					616	612	611		IC603				IC	
454		453		452	363	451					617	610	613		624	623	630	629		
459		458		457	364	456					601	602	603	604	610	609	622	621	628	627
		302	303							604	603			614						
				502						630		620	619		615	627				
		352	353		501		552	551		601	602			631	617	618				625
										602				607	608		629	628		624
																				623
																				622



4.2. SCHEMATIC DIAGRAM





Note: The components identified by shading and mark Δ are critical for safety. Replace only with part number specified.

- Components for right channel have same values as for left channel.
- All capacitors are in μF unless otherwise noted. pF : μpF 50VV or less are not indicated except for electrolytics and tantalums.
- All resistors are in ohms, $\frac{1}{2}\text{W}$ ($\frac{1}{4}\text{W}$): Reference numbers are coded from 600.) unless otherwise noted.
- Δ : fusible resistor.
- \square : panel designation.
- \square : adjustment for repair.
- --- : B+ bus.
- --- : B- bus.
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken under no-signal.
nomark: Measured with TEMPERATURE turned to GREEN after POWER is set to ON.
(): Measured with PROTECTION turned on within 5 sec after POWER is set to ON.
- Voltage variations may be noted due to normal production tolerances.

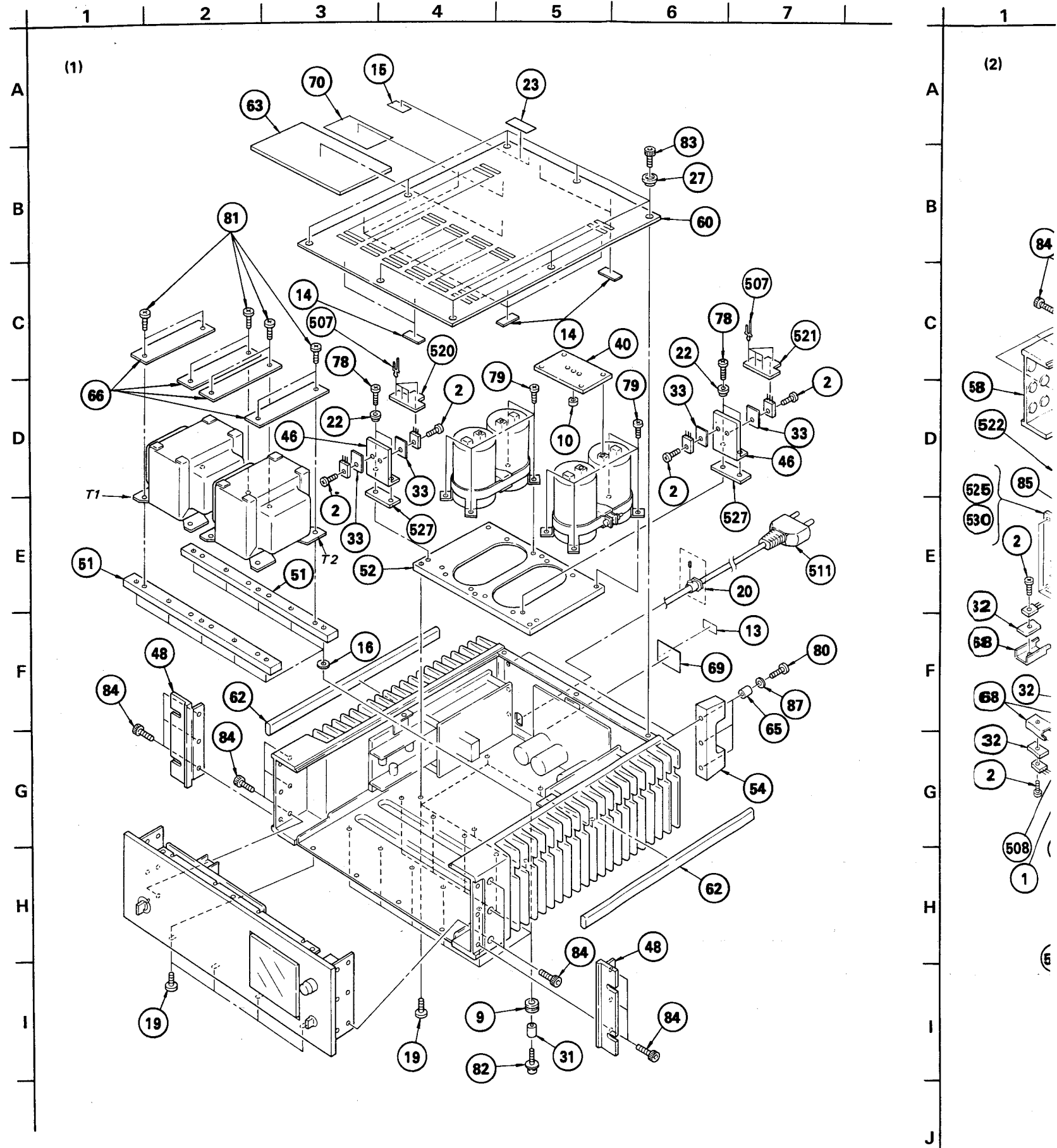
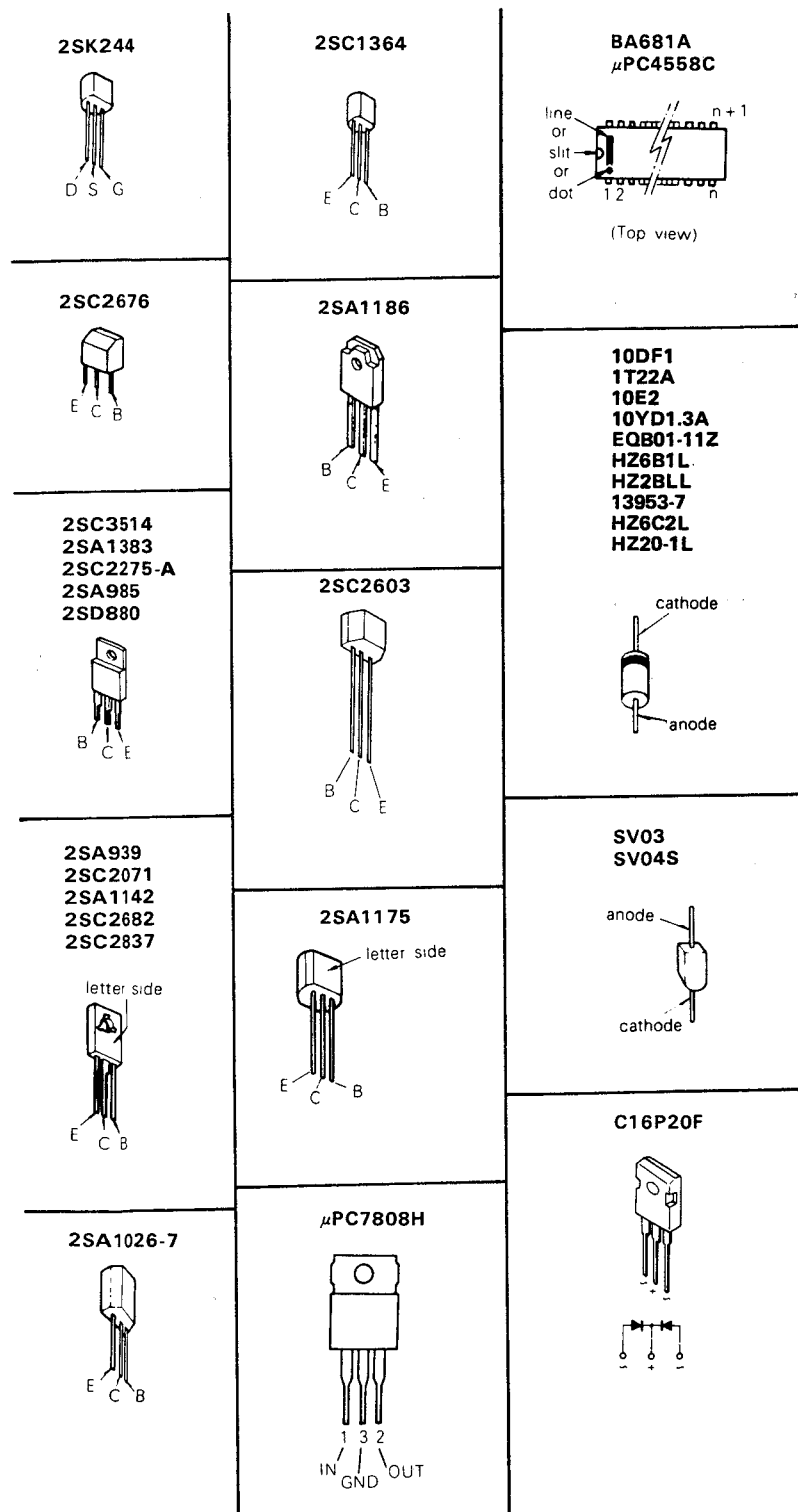
Ref. No.	Switch	Position
S1	POWER	OFF
S2	INPUT SELECTOR	FIXED
S3	OPERATION	STEREO

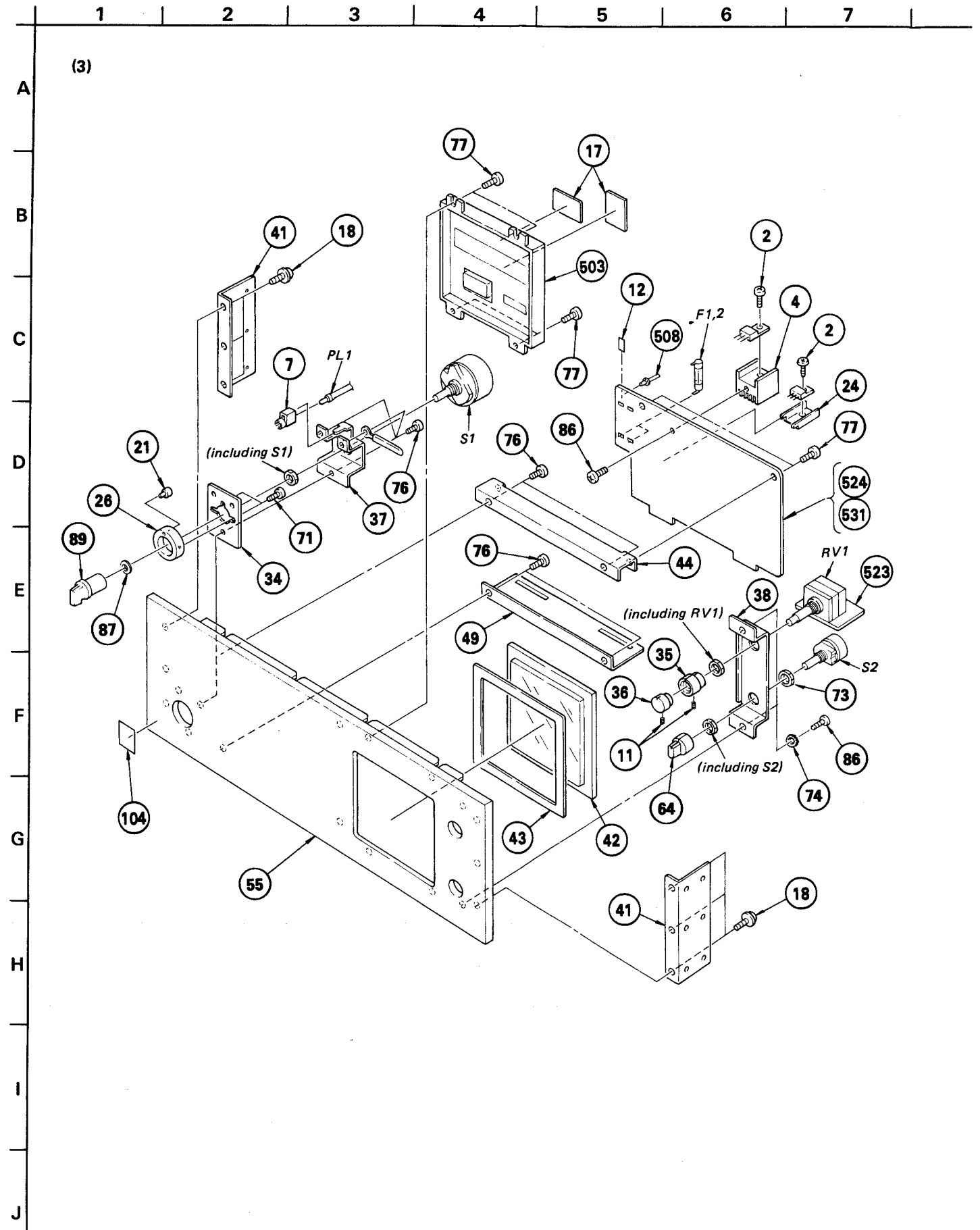
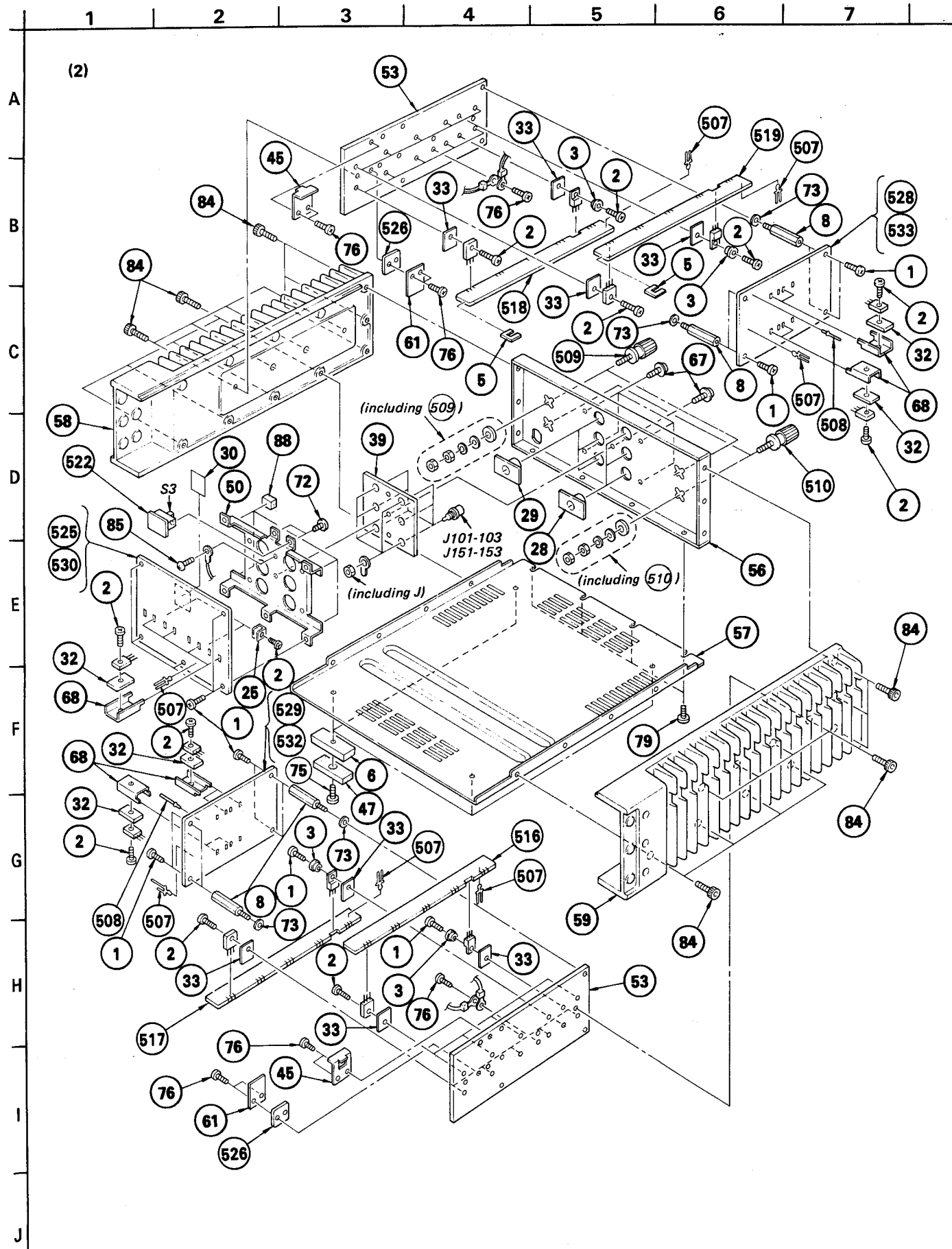
• --- : Signal path

Note: Voltages are measured with a VOM (50k Ω /V).

SECTION 5
EXPLODED VIEWS AND PARTS LIST

SEMICONDUCTOR LEAD LAYOUTS





GENERAL SECTION

No.	Part No.	Description
1	2-259-121-00	SCREW, TR
2	2-259-121-11	SCREW, TR
3	2-371-561-00	BUSHING (P), INSULATING
4	♣;3-309-144-01	HEAT SINK
5	♣;3-310-864-11	STOPPER, H.B
6	3-534-186-00	BRACKET, RUBBER FOTT
7	3-534-276-11	HOLDER, LAMP
8	3-534-816-00	SUPPORT
9	♣;3-630-837-00	BUSHING, STAND BY LAMP
10	♣;3-651-390-00	SPACER, (2)
11	3-701-510-00	SET SCREW, DOUBLE POINT 4X4
12	♣;3-701-948-20	LABEL, FUSE
13	♣;3-703-591-01	LABEL (23585S) (SMALL), FTZ
14	3-831-441-11	PLATE, LIGHT INTERCEPTION
15	3-831-441-XX	CUSHION, SPEAKER
16	3-837-352-11	SPACER
17	3-844-685-00	NET, (B) DUST PROTECTING
18	4-820-330-31	SCREW, BW, PLUS MINUS
19	4-847-802-21	SCREW, TOP COVER
20	4-849-786-00	STOPPER, CORD
21	4-852-925-00	LENS, POWER LAMP
22	4-857-425-00	BUSHING, O3P INSULATING
23	4-861-045-00	LABEL, CAUTION
24	♣;4-863-132-00	HEAT SINK (SMALL)
25	♣;4-866-080-11	HEAT SINK
26	4-870-204-00	ORNAMENT, SWITCH (B)
27	4-870-210-00	RING, PANEL RETAINER
28	4-870-214-00	ORNAMENTAL, JACK
29	4-870-214-11	ORNAMENTAL, JACK
30	♣;4-870-274-00	INSULATOR (B)
31	♣;4-879-132-00	SPACER, TRANSFORMER
32	♣;4-879-920-00	SPACER, HEAT SINK
33	4-879-937-00	SHEET, MICA
34	♣;4-902-301-00	BRACKET, SWITCH ORNAMENT
35	4-902-302-00	KNOB (A), CONTROL
36	4-902-303-00	KNOB (B), CONTROL
37	♣;4-902-304-00	BRACKET, POWER SWITCH
38	♣;4-902-305-00	BRACKET, ATT
39	♣;4-902-306-00	TERMINAL, INPUT
40	♣;4-902-307-00	PLATE, GROUND
41	♣;4-902-308-00	BRACKET, PANEL
42	4-902-309-00	WINDOW, DISPLAY
43	♣;4-902-310-00	ORNAMENT, DISPLAY WINDOW
44	♣;4-902-311-00	BRACKET, C PC BOARD
45	♣;4-902-312-00	RETAINER, TOP PLATE

GENERAL SECTION

No.	Part No.	Description
46	♣;4-902-313-00	BRACKET, DIODE
47	4-902-314-00	FOOT, RUBBER
48	4-902-315-00	PANEL, SIDE
49	♣;4-902-316-00	RETAINER, C PC BOARD
50	♣;4-902-317-00	BRACKET, INPUT
51	♣;4-902-318-00	RETAINER, TRANSFORMER
52	♣;4-902-320-00	BRACKET, ELECT CAPACITOR
53	♣;4-902-321-00	BASE, POWER
54	4-902-322-00	FOOT, PROTECTOR
55	4-902-323-00	PANEL, FRONT
56	4-902-324-21	PLATE, JACK
57	♣;4-902-325-00	PLATE, BOTTOM
58	♣;4-902-326-01	HEAT SINK
59	♣;4-902-326-11	HEAT SINK
60	4-902-327-00	COVER, TOP
61	♣;4-902-328-00	RETAINER
62	4-902-329-00	BELT, VIBRATION PROOF
63	4-902-330-00	SHEET, VIBRATION PROOF
64	4-902-332-01	KNOB, F
65	4-902-333-01	SPACER
66	♣;4-902-340-01	RETAINER, TRANSFORMER
67	4-902-342-01	SCREW (+B)(3X10)(CLAW)
68	♣;4-902-345-01	HEAT SINK
69	♣;4-902-347-01	LABEL, MODEL NUMBER (AE4)
70	4-902-348-01	SHEET, LAYOUT
71	7-621-284-00	SCREW +P 2.6X4
72	7-621-775-10	SCREW +B 2.6X4
73	7-623-108-21	W 3, LARGE
74	7-623-422-07	LW 3, TYPE B
75	7-682-163-09	SCREW +P 4X12
76	7-682-546-09	SCREW +B 3X5
77	7-682-547-09	SCREW +B 3X6
78	7-682-548-09	SCREW +B 3X8
79	7-682-560-09	SCREW +B 4X6
80	7-682-563-09	SCREW +B 4X12
81	7-682-577-09	SCREW +B 5X14
82	7-682-965-09	SCREW +PSW 4X16
83	7-683-402-04	BOLT, HEXAGON SOCKET 3X5
84	7-683-421-04	BOLT, HEXAGON SOCKET 4X12
85	7-685-751-09	SCREW +BVTT 3X6 (S)
86	7-685-871-01	SCREW +BVTT 3X6 (S)
87	7-688-004-12	W 4, MIDDLE
88	9-911-843-XX	CUSHION, RUBBER
89	X-4870-208-0	KNOB ASSY

NOTE:

- The mechanical parts with no reference number in the exploded views are not supplied.
- Items marked "♣" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- Due to standardization, parts with part numbers (Δ-ΔΔΔ-ΔΔΔ-XX or Δ-ΔΔΔΔ-ΔΔΔ-X) may be different from those used in the set.
- If there are two or more same circuits in a set such as a stereophonic machine, only typical circuit parts may be indicated and capacitors and resistors in other same circuits may be omitted.

CAPACITORS:

MF:μF, PF:μμF.

RESISTORS

- All resistors are in ohms.
- F : nonflammable

COILS

MMH : mH, UH : μH

SEMICONDUCTORS

In each case, U : μ, for example:
 UA.... : μA...., UPA.... : μPA...., UPC.... : μPC,
 UPD.... : μPD....

ACCESSORY & PACKING MATERIAL

No.	Part No.	Description
101	3-701-616-00	BAG, POLYETHYLENE
102	3-701-623-00	BAG, POLYETHYLENE
103	3-701-630-00	BAG, POLYETHYLENE
104	3-703-710-41	STICKER, SONY SYMBOL (12)
105	3-773-030-11	MANUAL, INSTRUCTION
106	3-795-874-11	MANUAL, TECHNICAL
107	4-882-132-00	SHEET, PROTECTION
108	4-882-133-00	BAG, PROTECTION
109	4-902-334-01	INDIVIDUAL CARTON
110	4-902-335-01	FRAME, REINFORCEMENT
111	4-902-336-01	CUSHION (FRONT), LOWER
112	4-902-337-01	CUSHION (REAR), LOWER
113	4-902-338-01	CUSHION (LEFT), UPPER
114	4-902-339-01	CUSHION (RIGHT), UPPER
115	4-902-341-01	LABEL, INDIVIDUAL CARTON
116	7-721-140-60	WRENCH, L (3.0MM)

ELECTRICAL PARTS

Ref.No.	Part No.	Description
501	♣;1-508-809-00	BASE POST (14MM) 2P
502	♣;1-508-810-00	14MM BASE POST
503	1-518-549-00	INDICATOR
504	1-533-131-00	HOLDER, FUSE
505	♣;1-535-115-00	TERMINAL
506	♣;1-535-117-00	TERMINAL
507	1-535-416-00	TERMINAL
508	♣;1-535-492-00	PIN, GT
509	1-536-694-11	TERMINAL
510	1-536-694-21	TERMINAL
511	♣;1-555-795-00	CORD, POWER
512	♣;1-560-061-00	PIN, CONNECTOR 3P
513	♣;1-560-064-00	PIN, CONNECTOR 6P
514	♣;1-560-242-41	BUS BAR 11P
515	♣;1-560-338-00	PIN, CONNECTOR 7P
516	♣;1-611-504-00	PC BOARD, FINAL R (-)
517	♣;1-611-505-11	PC BOARD, FINAL R (+)
518	♣;1-611-506-00	PC BOARD, FINAL L (-)
519	♣;1-611-507-00	PC BOARD, FINAL L (+)
520	♣;1-611-508-11	PC BOARD, RECTIFICATION (L)
521	♣;1-611-509-00	PC BOARD, RECTIFICATION (R)
522	♣;1-611-510-00	PC BOARD, MONO SW
523	♣;1-611-511-00	PC BOARD, VOLUME
524	♣;1-611-512-00	PC BOARD, CONTROL
525	♣;1-611-513-00	PC BOARD, PRE AMPLIFIER
526	♣;1-611-514-00	PC BOARD, THERMISTOR
527	♣;1-611-515-00	PC BOARD, SPACER
528	♣;1-611-516-00	PC BOARD, DRIVER (L)
529	♣;1-611-517-00	PC BOARD, DRIVER (R)
530	♣;A-4358-123-A	MOUNTED PCB, PRE AMPLIFIER
531	♣;A-4375-194-A	MOUNTED PCB, CONTROL
532	♣;A-4388-364-A	MOUNTED PCB, DRIVER (R)
533	♣;A-4388-367-A	MOUNTED PCB, DRIVER (L)
C001	♣;1-125-357-11	ELECT 22000MFx2 20% 71V
C051	♣;1-125-357-11	ELECT 22000MFx2 20% 71V
C102	1-107-317-11	MICA 33PF 5% 500V
C103	1-123-709-00	ELECT 1MF 20% 50V
C104	1-130-285-00	FILM 0.0033MF 5% 100V
C105	1-130-285-00	FILM 0.0033MF 5% 100V
C106	1-123-357-00	ELECT 22MF 20% 50V
C107	1-123-333-00	ELECT 100MF 20% 16V
C108	1-123-690-00	ELECT 22MF 20% 25V
C109	1-107-322-00	MICA 22PF 5% 500V
C110	1-123-709-00	ELECT 1MF 20% 50V
C111	1-130-083-00	MYLAR 1MF 10% 100V

NOTE:

- The mechanical parts with no reference number in the exploded views are not supplied.
- Items marked "♣" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- Due to standardization, parts with part numbers (Δ-ΔΔΔ-ΔΔΔ-XX or Δ-ΔΔΔΔ-ΔΔΔ-X) may be different from those used in the set.
- If there are two or more same circuits in a set such as a stereophonic machine, only typical circuit parts may be indicated and capacitors and resistors in other same circuits may be omitted.

CAPACITORS:

MF:μF, PF:μF.

RESISTORS

- All resistors are in ohms.
- F : nonflammable

COILS

- MMH : mH, UH : μH

SEMICONDUCTORS

In each case, U : μ, for example:
 UA...: μA..., UPA...: μPA..., UPC...: μPC,
 UPD...: μPD...

The components identified by shading and mark ♣ are critical for safety. Replace only with part number specified.

ELECTRICAL PARTS

Table with columns: Ref.No., Part No., Description, and columns for electrical characteristics (10, 1%, 1/2W, 5%, 1/2W F, etc.). Rows include parts R336 through R389.

ELECTRICAL PARTS

Table with columns: Ref.No., Part No., Description, and columns for electrical characteristics (10K, 5%, 1/2W, 470, 1%, 1/2W, etc.). Rows include parts R390 through R463.

ELECTRICAL PARTS

Table with columns: Ref.No., Part No., Description, and columns for electrical characteristics (0.33, 5%, 5W, 0.33, 5%, 5W, etc.). Rows include parts R464 through R628.

ELECTRICAL PARTS

Table with columns: Ref.No., Part No., Description, and columns for electrical characteristics (10K, 5%, 1/4W, 47K, 5%, 1/4W, etc.). Rows include parts R629 through R788.

NOTE:

- The mechanical parts with no reference number in the exploded views are not supplied.
Items marked "▲" are not stocked since they are seldom required for routine service.
Due to standardization, parts with part numbers (Δ-ΔΔΔ-ΔΔΔ-XX or Δ-ΔΔΔΔ-ΔΔΔ-X) may be different from those used in the set.
If there are two or more same circuits in a set such as a stereophonic machine, only typical circuit parts may be indicated and capacitors and resistors in other same circuits may be omitted.

CAPACITORS:

MF:μF, PF:μF.

RESISTORS

- All resistors are in ohms.
F : nonflammable

COILS

MMH : mH, UH : μH

SEMICONDUCTORS

In each case, U : μ, for example:
UA.... : μA..., UPA.... : μPA..., UPC.... : μPC,
UPD.... : μPD...

The components identified by shading and mark ▲ are critical for safety. Replace only with part number specified.

NOTE:

- The mechanical parts with no reference number in the exploded views are not supplied.
Items marked "▲" are not stocked since they are seldom required for routine service.
Due to standardization, parts with part numbers (Δ-ΔΔΔ-ΔΔΔ-XX or Δ-ΔΔΔΔ-ΔΔΔ-X) may be different from those used in the set.
If there are two or more same circuits in a set such as a stereophonic machine, only typical circuit parts may be indicated and capacitors and resistors in other same circuits may be omitted.

CAPACITORS:

MF:μF, PF:μF.

RESISTORS

- All resistors are in ohms.
F : nonflammable

COILS

MMH : mH, UH : μH

SEMICONDUCTORS

In each case, U : μ, for example:
UA.... : μA..., UPA.... : μPA..., UPC.... : μPC,
UPD.... : μPD...

The components identified by shading and mark ▲ are critical for safety. Replace only with part number specified.

ELECTRICAL PARTS

ELECTRICAL PARTS

Ref.No.	Part No.	Description			
R679	1-247-139-00	CARBON	2.2K	5%	1/4W
R680	1-247-139-00	CARBON	2.2K	5%	1/4W
R681	1-247-139-00	CARBON	2.2K	5%	1/4W
R682	1-247-139-00	CARBON	2.2K	5%	1/4W
R683	1-247-147-00	CARBON	4.7K	5%	1/4W
R684	1-247-095-00	CARBON	33	5%	1/4W
R685	1-247-139-00	CARBON	2.2K	5%	1/4W
R686	1-247-139-00	CARBON	2.2K	5%	1/4W
R687	1-247-139-00	CARBON	2.2K	5%	1/4W
R689	1-247-139-00	CARBON	2.2K	5%	1/4W
R690	1-247-147-00	CARBON	4.7K	5%	1/4W
R691	1-246-435-00	CARBON	27	5%	1/4W
R692	1-247-139-00	CARBON	2.2K	5%	1/4W
R693	1-247-139-00	CARBON	2.2K	5%	1/4W
R694	1-247-139-00	CARBON	2.2K	5%	1/4W
R695	1-247-139-00	CARBON	2.2K	5%	1/4W
R696	1-247-147-00	CARBON	4.7K	5%	1/4W
R697	1-247-095-00	CARBON	33	5%	1/4W
R698	1-247-139-00	CARBON	2.2K	5%	1/4W
R699	1-247-139-00	CARBON	2.2K	5%	1/4W
R700	1-244-846-00	CARBON	75	5%	1/2W
R701	1-247-155-00	CARBON	10K	5%	1/4W

Ref.No.	Part No.	Description
RT101	1-224-486-XX	RES, ADJ, METAL FILM 100
RT151	1-224-486-XX	RES, ADJ, METAL FILM 100
RT301	1-224-660-00	RES, ADJ, METAL FILM 1K
RT351	1-224-660-00	RES, ADJ, METAL FILM 1K
RT601	1-224-493-00	RES, ADJ, METAL FILM 10K
RT602	1-224-493-00	RES, ADJ, METAL FILM 10K
RT603	1-224-493-00	RES, ADJ, METAL FILM 10K
RV1	1-230-282-00	RES, VAR, CARBON 50K/50K
RY201	1-515-323-00	RELAY
RY301	1-515-356-00	RELAY
RY351	1-515-356-00	RELAY
S1	1-552-975-00	SWITCH, AC (POWER)
S2	1-552-719-00	SWITCH, AC (INPUTSELECTOR)
S3	1-553-164-00	SWITCH, SLIDE (OPERATION)
T1	1-447-874-11	TRANSFORMER, POWER
T2	1-447-874-11	TRANSFORMER, POWER
TH1	1-800-202-XX	THERMISTOR S-10K
TH2	1-800-202-XX	THERMISTOR S-10K
TH3	1-800-202-XX	THERMISTOR S-10K
TH4	1-800-197-00	THERMISTOR S-400
TH301	1-800-193-00	THERMISTOR (DIRECT-HEATING DISK)
TH351	1-800-193-00	THERMISTOR (DIRECT-HEATING DISK)

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 UPD...: μPD...

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Sony Corporation

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