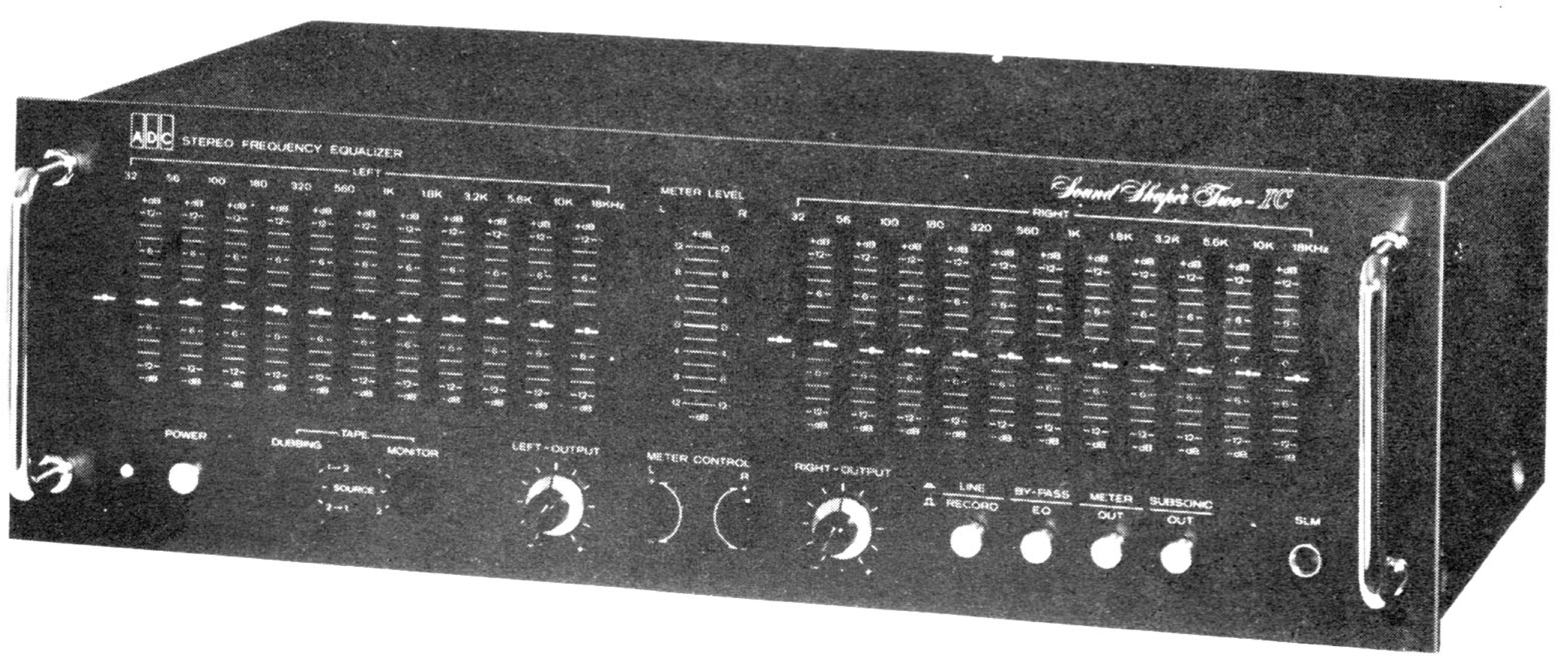
Sound Shaper® Two-IC

ADC

Service Manual



STEREO FREQUENCY EQUALIZER

Audio Dynamics Corporation

CONTENTS

THIS MANUAL COVERS SERVICE INFORMATION FOR FOUR VERSIONS AS FOLLOWS:

(1) USA (UL) VERSION : Supply Voltage is 120 V AC, 60 Hz.
(2) CANADIAN (C.S.A.) VERSION : Supply Voltage is 120 V AC, 60 Hz.
(3) EUROPEAN VERSION : Supply Voltage is 220/240 V AC, 50 Hz.
(4) PX VERSION : Supply Voltage is 100/120/220/240 V AC, 50/60 Hz.

ELECTRICAL PERFORMANCE SPECIFICATIONS

	(Unit)	(Nominal)	(Limit)
Frequency response at flat position, Input level = 0.775 V	(Hz)	5–100 K$^{+0.5}_{-1.0}$ dB	10–100 K$^{+0.5}_{-1.0}$ dB
Control Frequency accuracy at 32 Hz	(%)	±10 %	±15 %
at 56 Hz	(%)	±10 %	±15 %
at 100 Hz	(%)	±10 %	±15 %
at 180 Hz	(%)	±10 %	±15 %
at 320 Hz	(%)	±10 %	±15 %
at 560 Hz	(%)	±10 %	±15 %
at 1 KHz	(%)	±10 %	±15 %
at 1.8 KHz	(%)	± 5 %	±10 %
at 3.2 KHz	(%)	± 5 %	±10 %
at 5.6 KHz	(%)	± 5 %	±10 %
at 10 KHz	(%)	± 5 %	±10 %
at 18 KHz	(%)	± 5 %	±10 %
(Output level = 0.775 V)			
Control Range at 0.775 V input	(dB)	+13.5	$+12^{+3.5}_{-0}$
	(dB)	−13.5	$-12^{+0}_{-3.5}$
Harmonic Distortion at 1 V output from 20 Hz to 20 KHz	(%)	0.015	0.035
Hum and Noise ratio (Input = 1 V, and shorted, output = A weighted)	(dB)	98	88
Dynamic Range into 10 Kohms load (All controls = Flat)	(V/rms)	10	9
Total Gain (All controls = Flat)	(dB)	0	±1.0
Input impedance	(Kohm)	75	—
Output impedance at 1 KHz	(ohm)	100	—
Intermodulation Distortion at 1 V Output, 70 Hz/7 KHz at 4/1 ratio	(%)	0.015	0.035
Meter Tolerance at −12 dB point	(dB)	±0.5	±1.0
at 0 dB point	(dB)	±0.5	±1.0
at +12 dB point	(dB)	±0.5	±1.0
at other points	(dB)	±1.0	±2.0

When each control range is measured, other controls should be centered (0 dB).

SOUND SHAPER TWO CIRCUIT DESCRIPTION

MAIN POWER SUPPLY (Refer to Figure a)

The voltages of the secondary tap of the Power Transformer T601 are approximately +28.9 V/ −28.3 V when the current of the rectifier circuit is +115 mA DC/−160 mA DC.
The Rectifier circuit consists of a Bridge Diode (D227) and Capacitors (C214, C215).
This voltage is applied to the base of TR201/202 via a network which consists of R269/270, C210/211 and D224/225 providing a constant output voltage from the emitter of TR201/202.
This output voltage is regulated by TR201/202 and C208/209.
It supplies +17.8 V DC/−18.2 V DC to the equalizer circuit and meter circuit.
Also through the network of R273, D223 and C207 −5.6 V DC is supplied to both the LED Meter and the Comparator control circuits.

LED METER COMPARATOR CIRCUIT DESCRIPTION

The Power Supply and the bias configuration (Refer to LED Meter circuits)

The power supply for the LED Meter Comparator circuit consists of full-wave rectifiers, which provides plus 15.8 V, minus 9.7 V DC to IC202 through IC208.
LED indication level is provided from the Zener diode D223 (+5.6 V DC).
The +11.6/−15.8 V DC source is applied to LED comparator ICs IC202 through IC208.
The +5.6 V DC source provides a stable voltage to VR201(L) and VR202(R) for LED Meter indicator level.

OPERATIONAL AMPLIFIER FEEDBACK CIRCUIT (Refer to Figure b)

The signal to the (−) input causes a change in output that is inverted in phase relative to the input.
The signal to the (+) input causes a change in output that is in phase with the input.
With no signal to Rin, the (+) input sees 0 Volts through R_B, causing the output to be positive-going. (−) input voltage is equal to (+) input voltage (= 0 V) – known as an Imaginal Short.
When the output reaches 0 V, the (−) input also sees 0 V through resistor R_F (and further output change is inhibited). The output, (+) input and (−) input are now all 0 V.
The (−) input remains at 0 V regardless of the signal into Rin.

Example: An input more positive than 0 V to Rin causes the output to be negative-going. The output continues to drop until the feedback through R_F is lowered by an amount sufficient to equalize the imbalance between the (+) and (−) inputs caused by the input signal. Because of the amplifier's high gain and speed, the imbalance between the (+) and (−) inputs is always small.

Since the voltage at the (−) input is always at 0 Volts, the (−) input is effectively at AC ground. Essentially, therefore, the entire input signal appears across Rin and the entire output signal appears across R_F.

Since the (−) input voltage is always 0 V the current into the amplifier's (−) input is constant. Since this current is supplied by Rin and R_F any change in current due to input signal through Rin is offset by an opposite and equal change of current through R_F.

For AC signal currents, and if we ignore the negative values indicating signal inversion, the gain of the amplifier can be calculated as follows:

$$I\,(R_{in}) = I\,(R_F) \qquad \text{Since } I = \frac{E}{R},\ \frac{E\,(R_{in})}{R_{in}} = \frac{E\,(R_F)}{R_F},\ \frac{R_F}{R_{in}} = \frac{E\,(R_F)}{E\,(R_{in})} = \text{GAIN}$$

NOTE: NJM4560 of this circuit operates from split power supplies. [plus (+) supply at Pin No. 8 and minus (–) supply at Pin No. 4].

PRECISION HALF-WAVE RECTIFIER AND AMPLIFIER CIRCUIT (Refer to Figure c)

The basic fault with diode rectifier circuits is that the diodes do not conduct until a specific voltage is reached. The above circuit eliminates that fault and also amplifies the output.

Referring to the basic circuit, note that: (1) With no input signal D205 is conducting slightly to establish 0 V DC at A (–) input and 0 V DC at A out; (2) When D207 is barely conducting a small amount of feedback exists. Therefore, the gain of the amplifier is very high. Less than one millivolt will cause the output to change by a volt or more. Operation is as follows: A negative input causes a positive-going change in the amplifier output. Since the gain is high until D205 conducts fully, the amplifier output jumps to 0.2 Volts long before the input reaches a millivolt (in a very short time). At this point D205 is fully conducting, has a low impedance compared to R_F (n), and exhibits a 0.2 V drop across it. The rectifier output is now –85 mV DC. Since the feedback loop (R_F) has been completed by D207 any further decrease in input voltage is amplified by the ratio of $\frac{R_F(n)}{R_{in}}$ which is approximately equal to 3 for this circuit.

A positive input causes the output to decrease in a manner similar to that just described except that the feedback is through D207 and R_F (p). The amplifier output is blocked from appearing at the rectifier output by D205 (D205 is reverse biased with respect to the following stages which are returned to the 0 V DC line).

In this manner, appearing at D205 cathode are negative half-wave pulses whose amplitude is directly proportional to the input signal level.

The following refers to the complete schematic:
The negative pulses at D205 cathode are filtered into an average DC voltage by R207 and R203 and this voltage serves as input to the LED meter comparator.

R205 and R207 serve to maintain positive feedback around NJM4560 the positive half-wave excursions of the input signal. As the amplifier's output is positive during this time, D207 is forward biased (D205 is off) and the feedback path now consists of R205 and D207. The amplifier is thus kept out of saturation and free from oscillations throughout the full input cycle.

The IC bias circuit uses a split power supply which provides +15.8 V DC at pin No. 8 and –9.7 V DC at Pin No. 4 on IC201.

COMPARATOR CIRCUIT FOR LED LEVEL METER DESCRIPTION

Comparator circuit operation

The IC comparator circuit consists of seven IC's NJM4558 or TL4558.
The IC comparator operates by comparing the (–) input level to (+) input level, which output voltage is changed from minus to plus DC voltage. Thus DC currents flow to each LED.

With no signal, input level of the (–) input level [No. 2 (L) or No. 6 (R)] is kept to 0 V DC.
(+) input level [Pin No. 3 (L) or Pin No. 5 (R)] of IC208 is kept to minus DC voltage (about –60 mV) by half-wave rectifiers through VR201 (L) [VR202 (R)] and VR203 (L) [VR204 (R)]. Thus, the output voltage of IC208 [Pin No. 1 (L) or No. 7 (R)] is kept at a minus DC voltage.

When minus DC voltage is applied to (–) input, and causes the (–) input voltage to be larger (or equal) than (+) input voltage, output appears as plus DC voltage. ($V3 \leqq V2$)

Thus LED D513 (L) and D514 (R) are lit at –12 dB points. But D501 through D511 (L) and D502 through D512 (R) are not lit because the input voltage is too low.

Each LED conducts with a (–) input level which is determined by VR201(L), VR202(R) (IC202), R217(L), R218(R) (IC203), R225(L), R226(R) (IC204), R233(L), R234(R) (IC205), R241(L), R242(R) (IC206), R249(L), R250(R) (IC207).

With increase in minus DC voltage, which is provided to (–) input, each LED is lit in order from D511 to D501(L)[D512 to D502(R)].

POPPING NOISE PROTECTIVE CIRCUIT

This circuit eliminates the popping noise from the speakers output when the power switch is turned "on" or "off".
This circuit consists of TR203, TR204 and TR109/110.
When power is "on", –27.7 V DC is provided to the gate of TR109/110 through D226, R280 and R277.
Then TR109/110 will turn off. After about 1 second, TR203 will turn on.
And +19.3 V DC at emitter voltage of TR203 will apply to the gate of TR109/110 via R277.
This turns TR109/110 "on", and then the drain and source of TR109/110 will be conducted and signal is present at the OUTPUT terminal.
When the power switch is "off", TR204 is activated and the minus DC voltage will be applied to the gate of TR109/110.
This turns TR109/110 "off". No signal is present at the OUTPUT terminal.

LED METER OPERATING CHART

AC INPUT AT VR101 (Max. CW) mV RMS @ 1 KHz See Note 1.	RECTIFIED DC V AT C207 (–) See Note 2.	LED METER INDICATION	LED METER CURRENT (mA)	VOLTAGE ACROSS EACH LED DC VOLTS See Note 3.
11 mV	–55 mV DC	–12 dB	3.7 mA	1.9 V DC
18 mV	–83 mV DC	–8 dB	3.7 mA	1.9 V DC
29 mV	–126 mV DC	–4 dB	3.7 mA	1.9 V DC
45 mV	–196 mV DC	0 dB	3.7 mA	1.9 V DC
72 mV	–307 mV DC	+4 dB	3.7 mA	1.9 V DC
114 mV	–485 mV DC	+8 dB	3.7 mA	1.9 V DC
180 mV	–775 mV DC	+12 dB	3.7 mA	1.9 V DC

Rectified DC V and various LED Meter data for actual levels (LED is lit) used for LED Meter indication.

NOTE:
1. AC signal applied to INPUT jacks of Equalizer.
   BY-PASS/EQ switch to EQ, METER switch to IN, LINE/REC to REC and MONITOR to OUT.
2. Rectified DC voltages measured from C203 (–).
3. Indicated voltages across each LED indicator are obtained with LED Meters calibrated as specified in the CALIBRATION PROCEDURE section of this manual.
4. All DC voltages are within ±10%, measured with an AC VTVM and DV Voltmeter (over 10 KΩ/V).

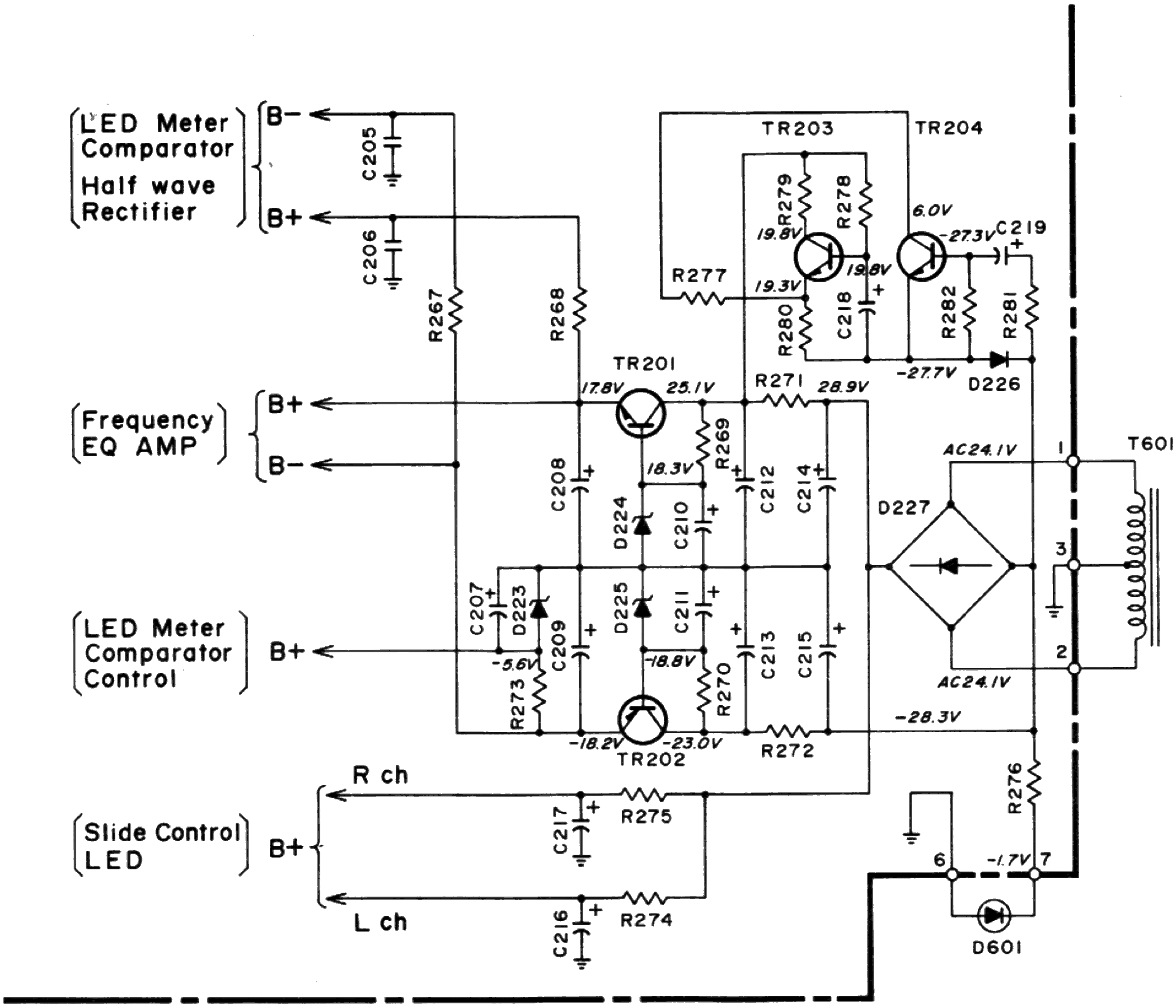
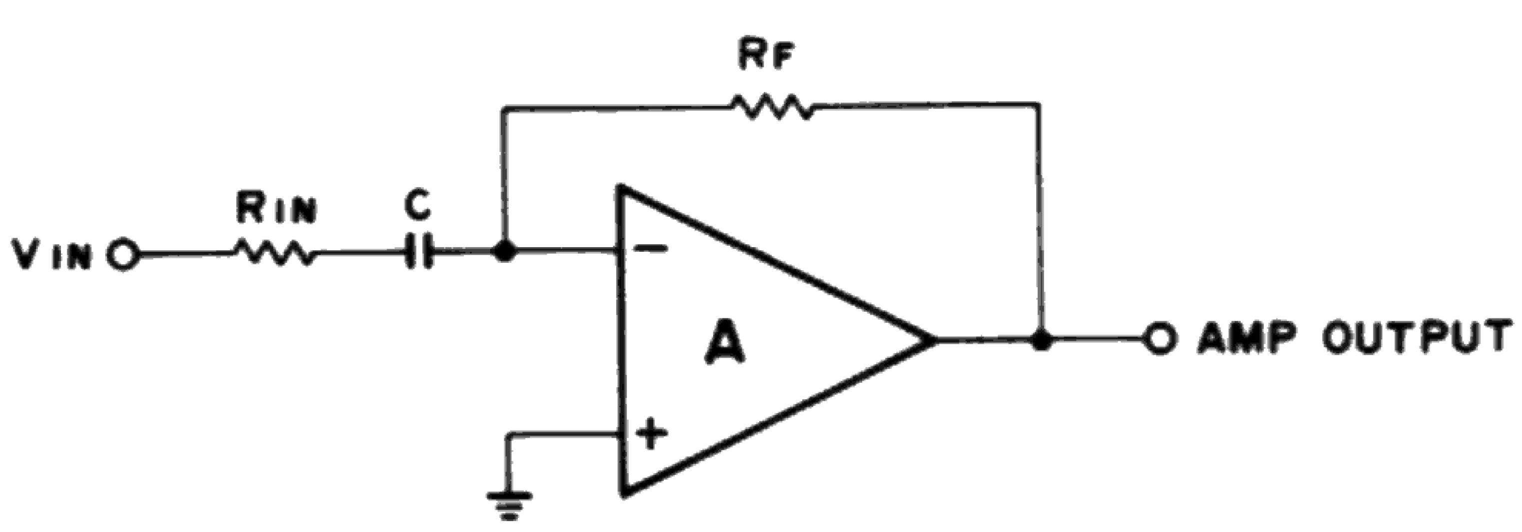
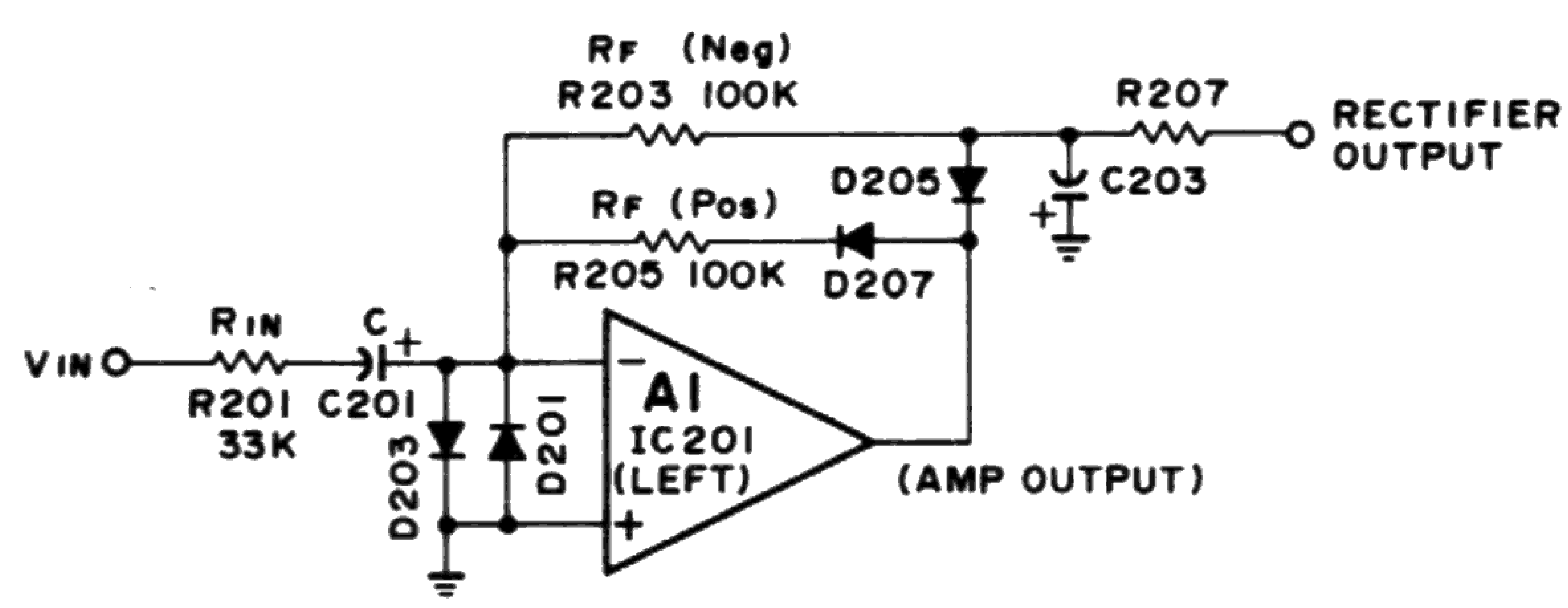


Figure a



BASIC OP. AMP. FEEDBACK CIRCUIT

Figure b



BASIC OP. AMP. RECTIFIER-AMPLIFIER CIRCUIT

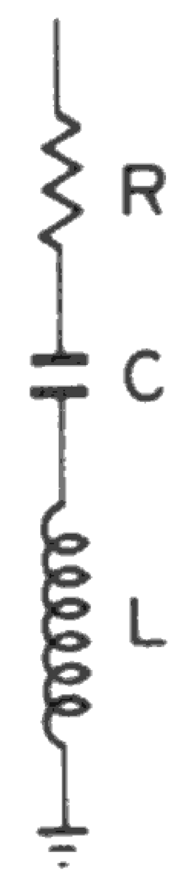
Figure c

FREQUENCY EQUALIZATION ACTIVE FILTER CIRCUIT

The basic equivalent circuit into an Active Filter is formed with an LCR series resonant circuit as shown in Figure 1.

The equation for resonant frequency is

$$F_0 = \frac{1}{2\pi\sqrt{LC}} \quad \cdots\cdots\cdots\cdots \quad (1)$$

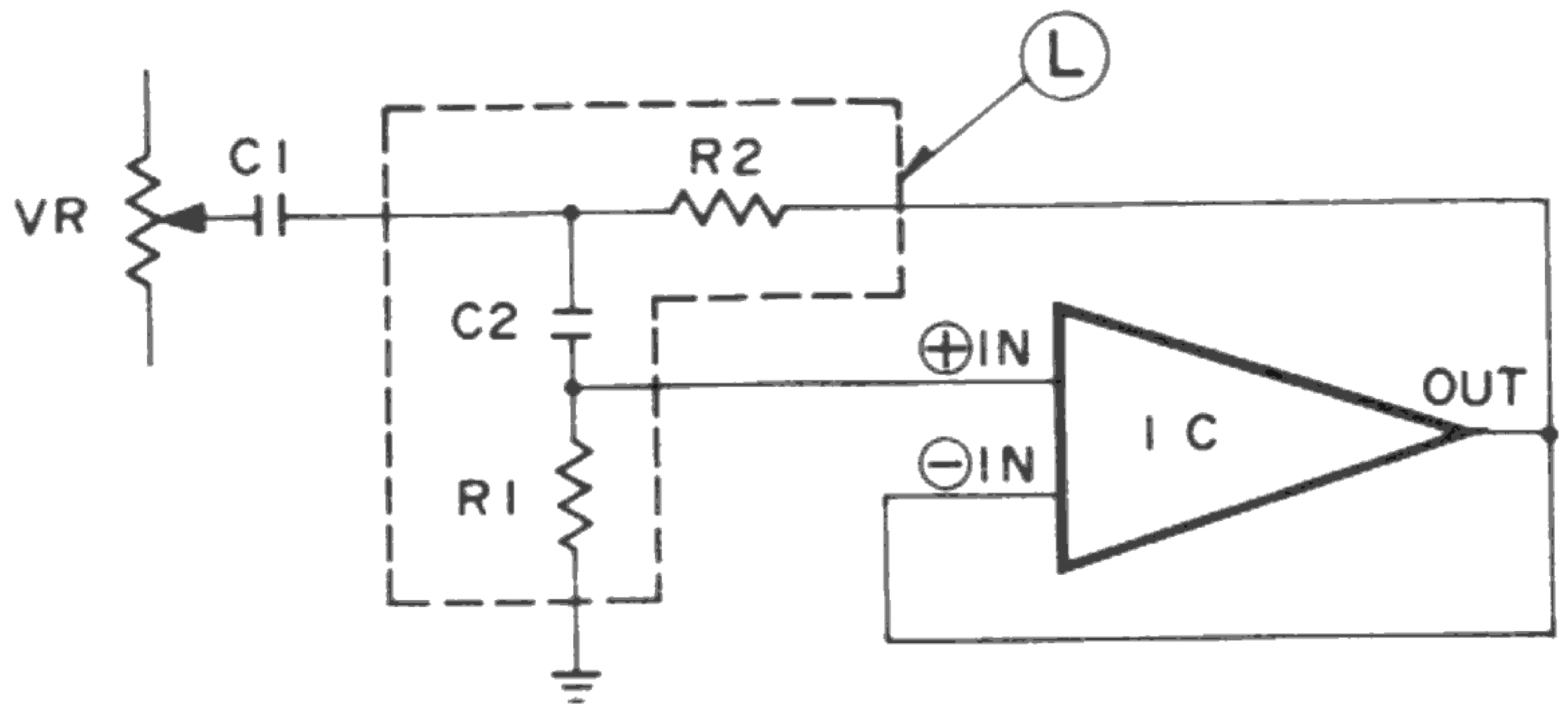


where "F " is a resonant frequency in "Hz", "L" is the inductance in henries "H", and "C" is the capacitance in farad "f".

Figure 1

The Active Filter of this unit consists of IC, Capacitors and Resistors connected to form a resonant circuit at twelve frequencies (32, 56, 100, 180, 320, 560, 1 KHz, 1.8 KHz, 3.2 KHz, 5.6 KHz, 10 KHz and 18 KHz).

Figure 2



A comparison of Figures 1 and 2, with Capacitance (C) and Resistance (R) replacing Inductance (L)

$$L = C_2 \cdot R_1 \cdot R_2 \quad \cdots\cdots\cdots\cdots \quad (2)$$

According to Eq. 1 and 2,

$$F_0 = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{(C_2 \cdot R_1 \cdot R_2) \cdot C_1}} \quad \cdots\cdots\cdots\cdots \quad (3)$$

(F_0 : resonant frequency)

This is the working equation for each resonant frequency.
The resonant circuit is called a "Simulated Inductor (Semicon-Inductor)", as shown in Figure 2.

For example:

The following shows the resonant frequency at 32 Hz. (Refer to Figure 3.)

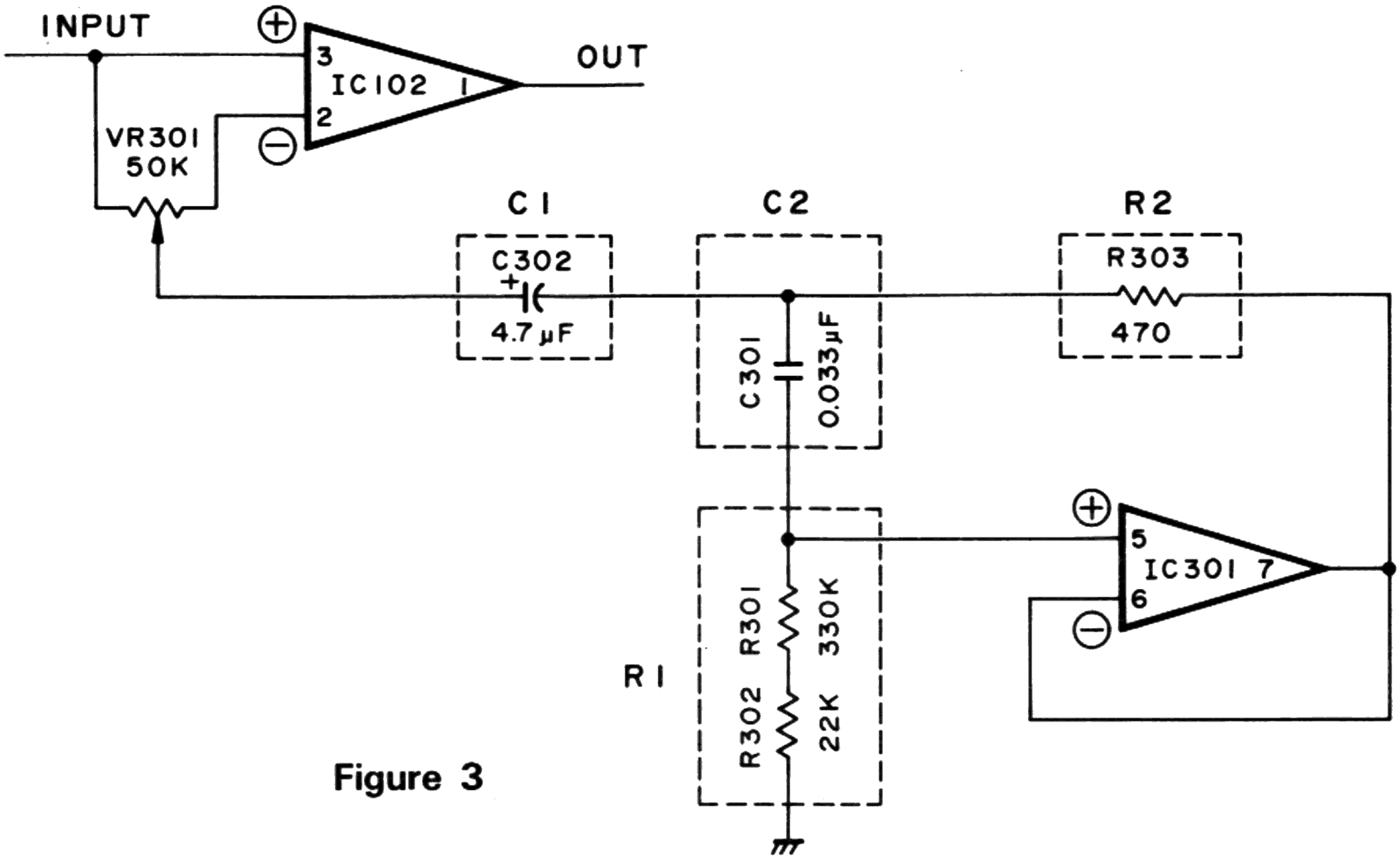


Figure 3

According to Eq. 3,

$$F_0 = \frac{1}{2\pi\sqrt{C_1 \cdot C_2 \cdot R_1 \cdot R_2}}$$

$$F_0 = \frac{1}{2\pi\sqrt{4.7 \times 10^{-6} \cdot 0.033 \times 10^{-6} \cdot 352 \times 10^{3} \cdot 470}}$$

Because: $C_1 = 4.7\ \mu f = 4.7 \times 10^{-6}$ (f)

$C_2 = 0.033\ \mu f = 0.033 \times 10^{-6}$ (f)

$R_1 = 330 \times 10^3 + 22 \times 10^3 = 352 \times 10^3$ (ohm)

$R_2 = 470$ (ohm)

Then, $F_0 = 32$ (Hz)

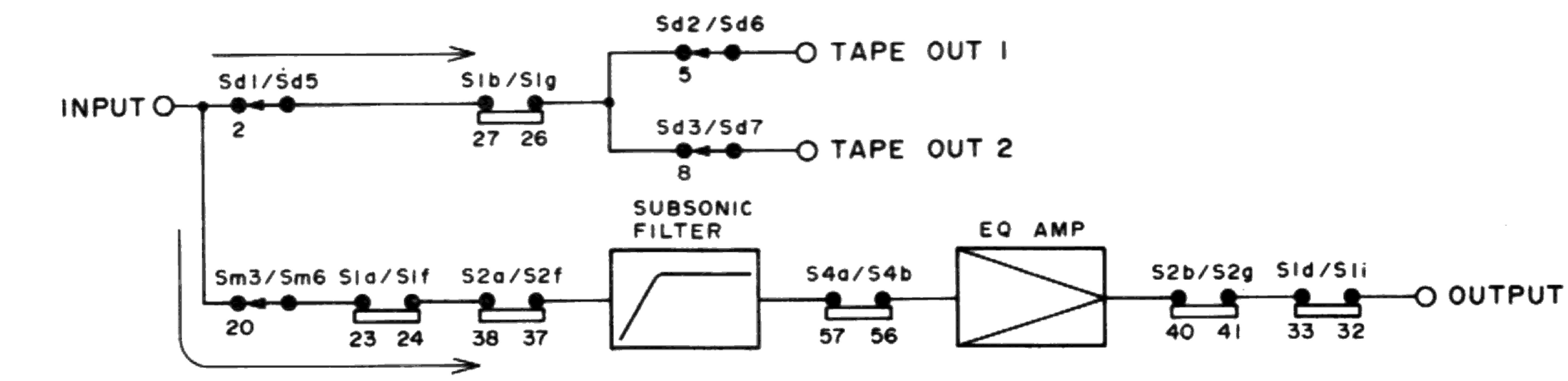
NOTE: When VR301 is in the center position, the (+) INPUT and (–) INPUT voltage are the same; thus the output is the same level as the input level.
When VR301 is moved to either side, the output becomes either higher or lower than the input level.

SWITCH FUNCTIONS

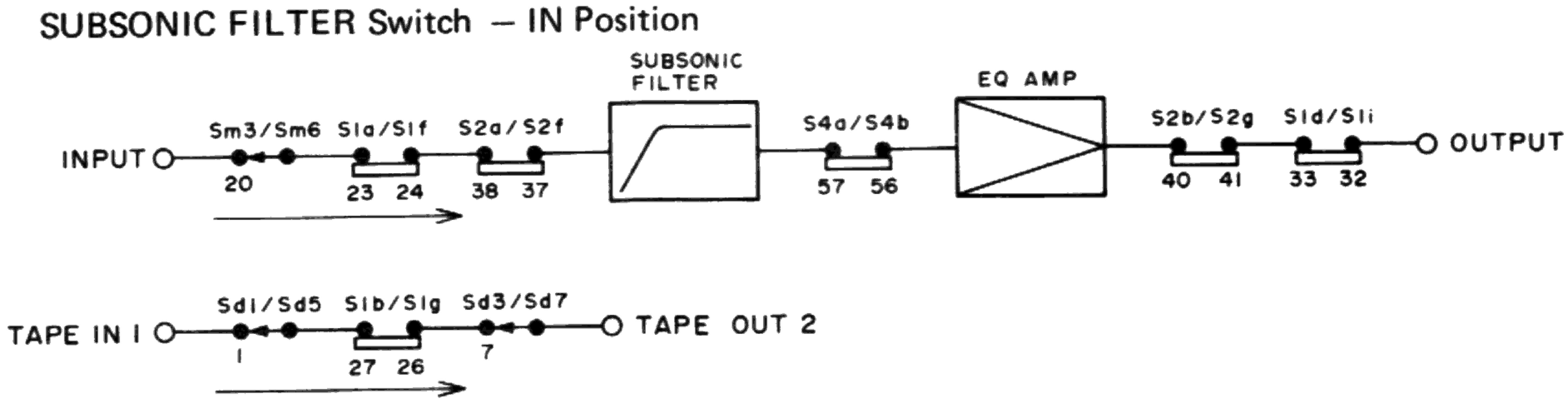
(Applicable to LEFT or RIGHT CHANNEL)

(1) LINE/REC Switch – REC Position
BY-PASS/EQ Switch – EQ Position

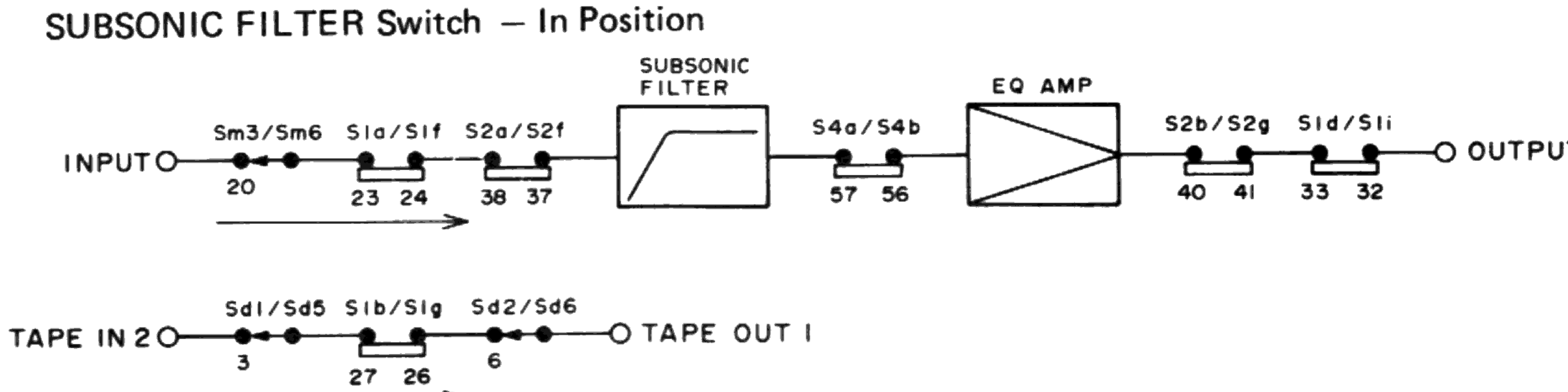
1 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – SOURCE Position
SUBSONIC FILTER Switch – IN Position



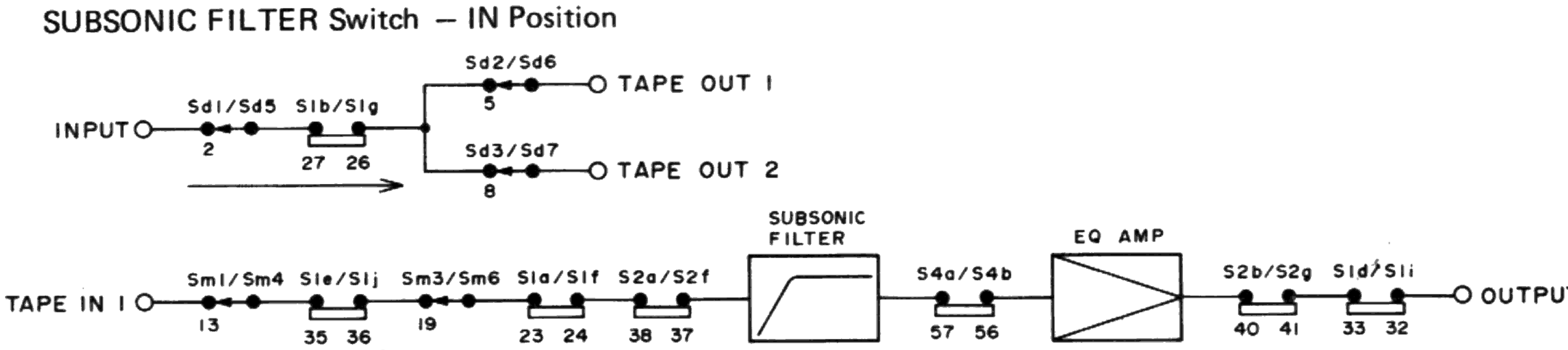
2 TAPE DUBBING Switch – 1 → 2
TAPE MONITOR Switch – SOURCE Position
SUBSONIC FILTER Switch – IN Position



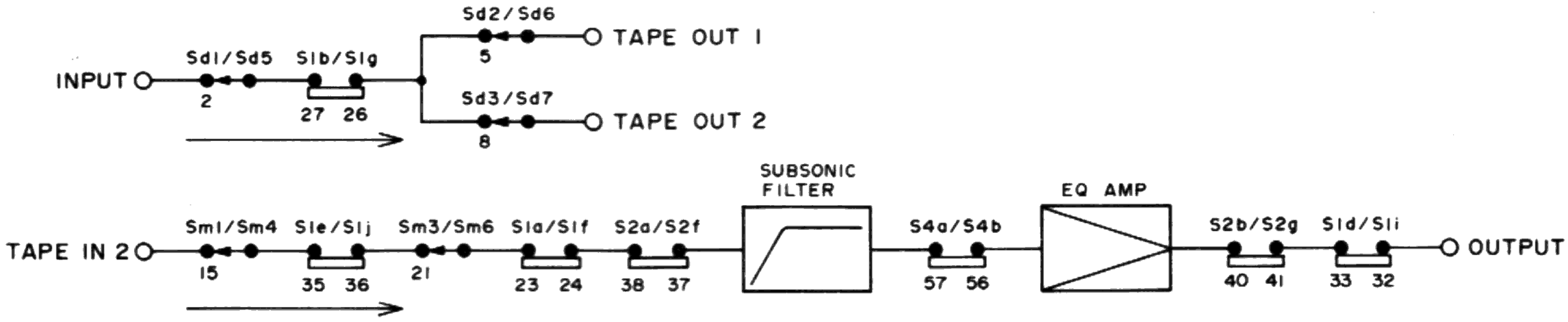
3 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – SOURCE Position
SUBSONIC FILTER Switch – In Position



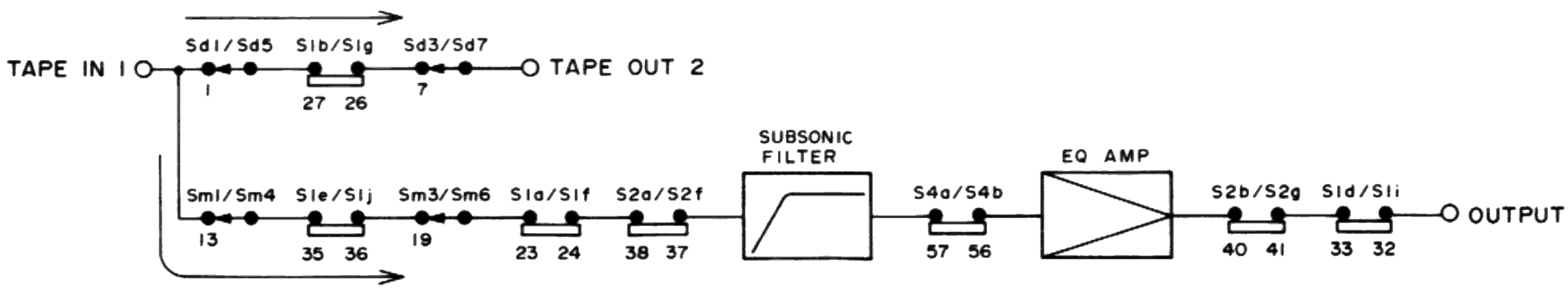
4 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – 1
SUBSONIC FILTER Switch – IN Position



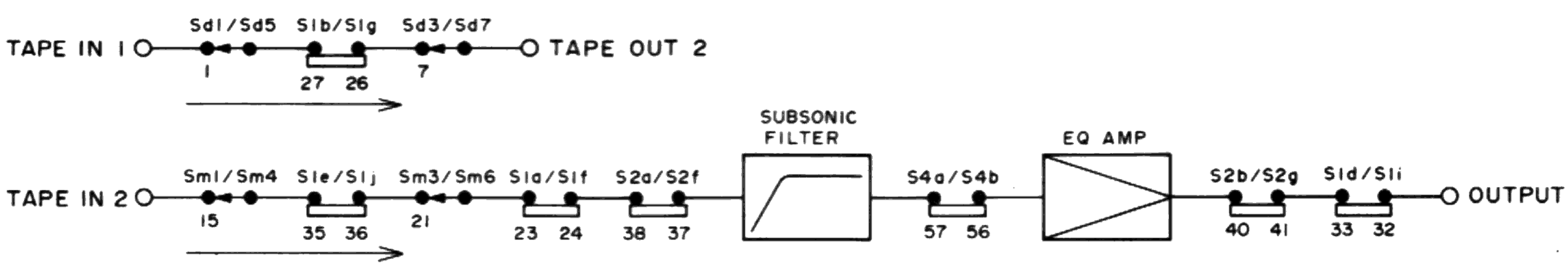
5 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – 2
SUBSONIC FILTER Switch – IN Position



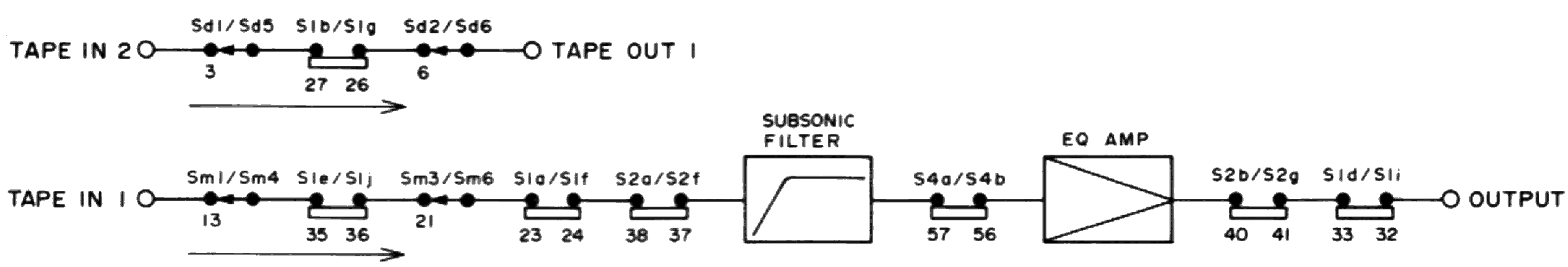
6 TAPE DUBBING Switch – 1 → 2
TAPE MONITOR Switch – 1
SUBSONIC FILTER Switch – IN Position



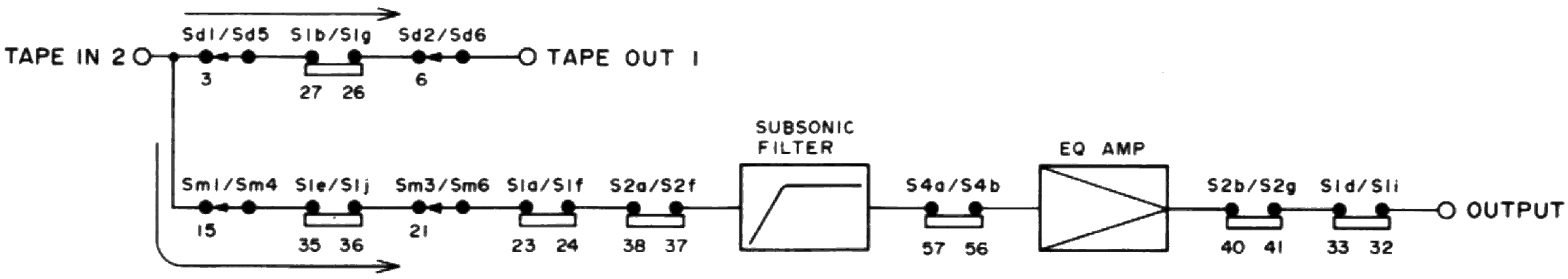
7 TAPE DUBBING Switch – 1 → 2
TAPE MONITOR Switch – 2
SUBSONIC FILTER Switch – IN Position



8 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – 1
SUBSONIC FILTER Switch – IN Position

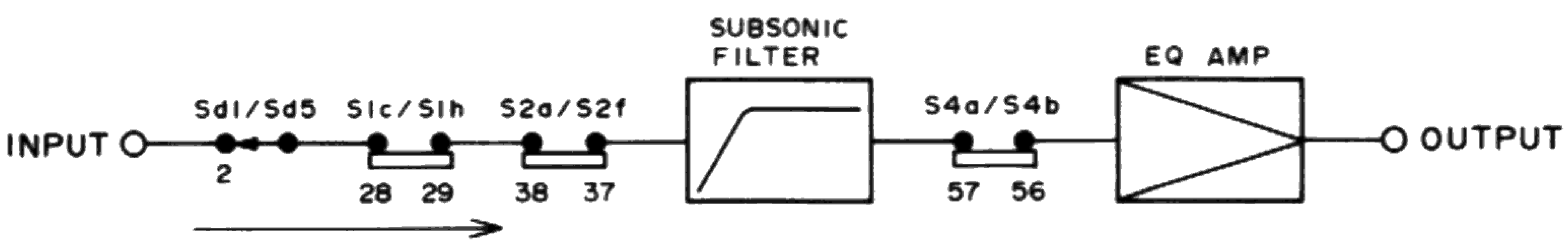


9 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – 2
SUBSONIC FILTER Switch – IN Position

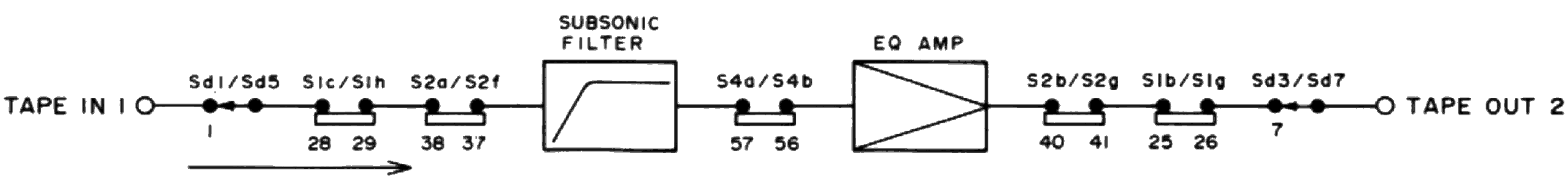


(2) LINE/REC Switch – LINE Position
BY-PASS/EQ Switch – EQ Position

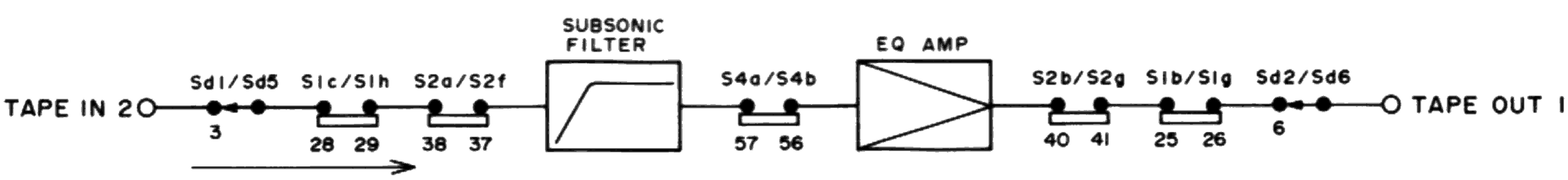
1 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – SOURCE Position
SUBSONIC FILTER Switch – IN Position



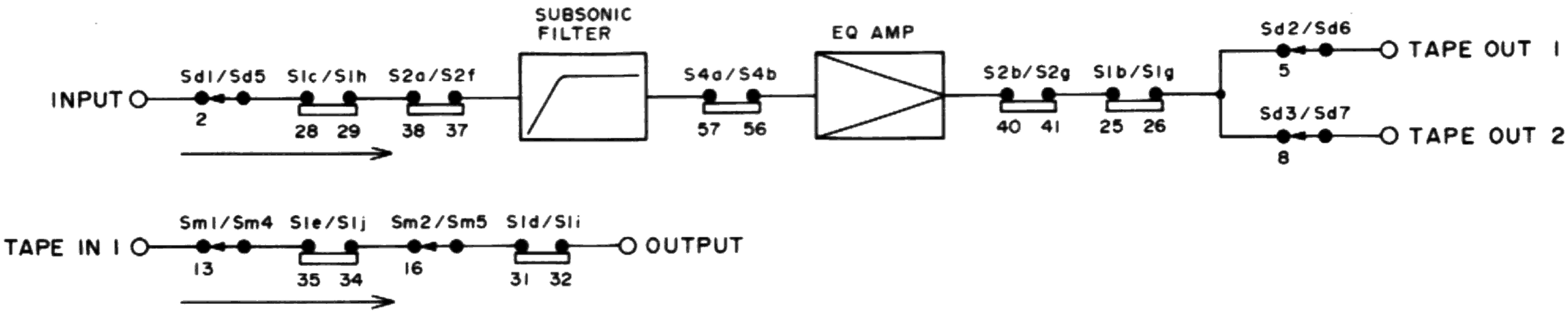
2 TAPE DUBBING Switch – 1 → 2
TAPE MONITOR Switch – SOURCE Position
SUBSONIC FILTER Switch – IN Position



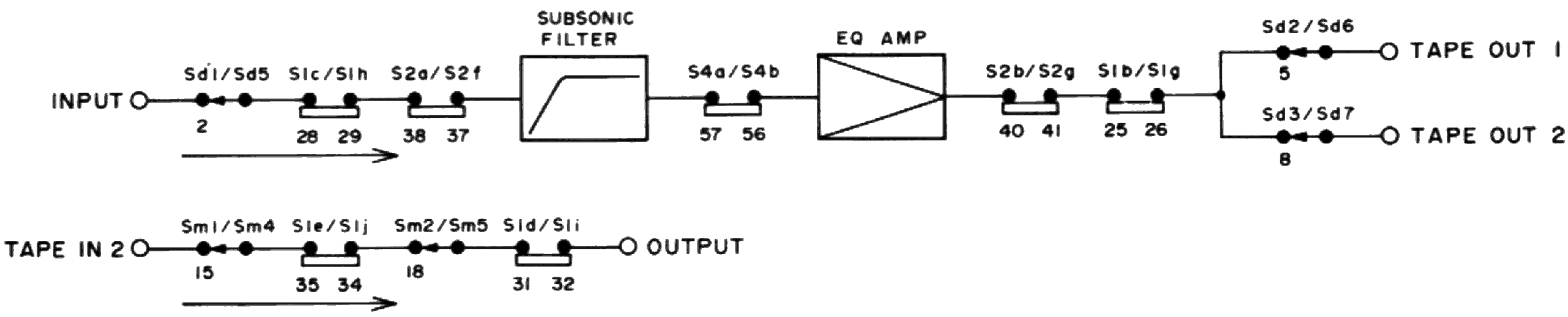
3 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – SOURCE Position
SUBSONIC FILTER Switch – IN Position



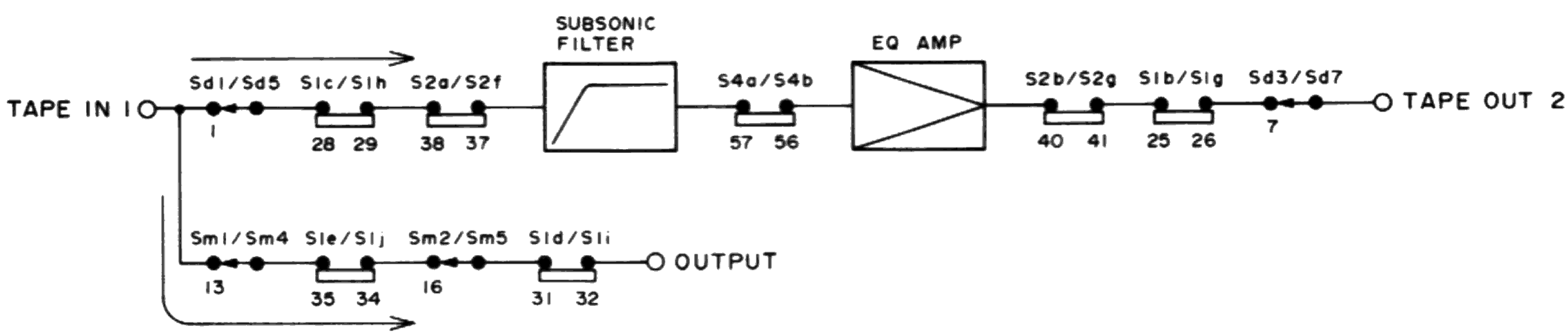
4 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – 1
SUBSONIC FILTER Switch – IN Position



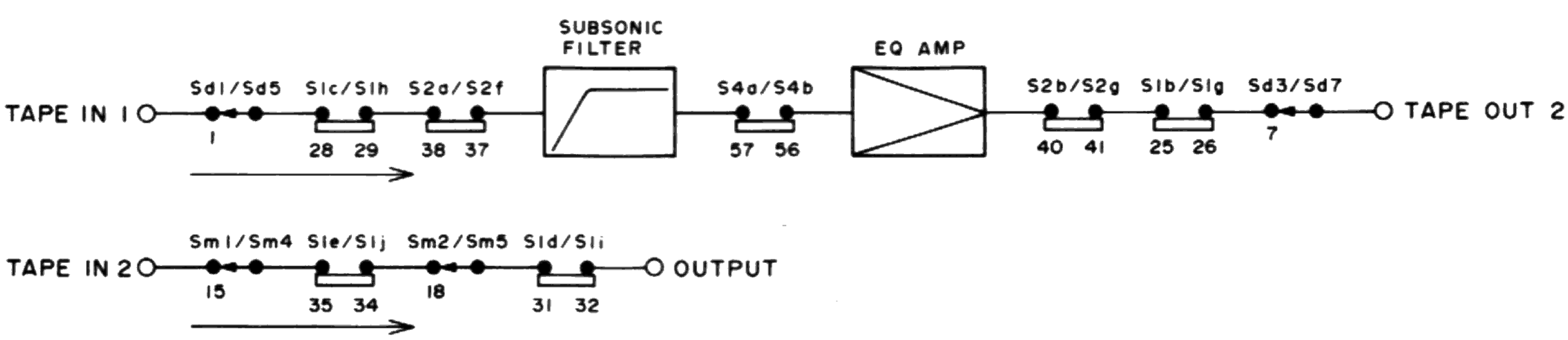
5 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – 2
SUBSONIC FILTER Switch – IN Position



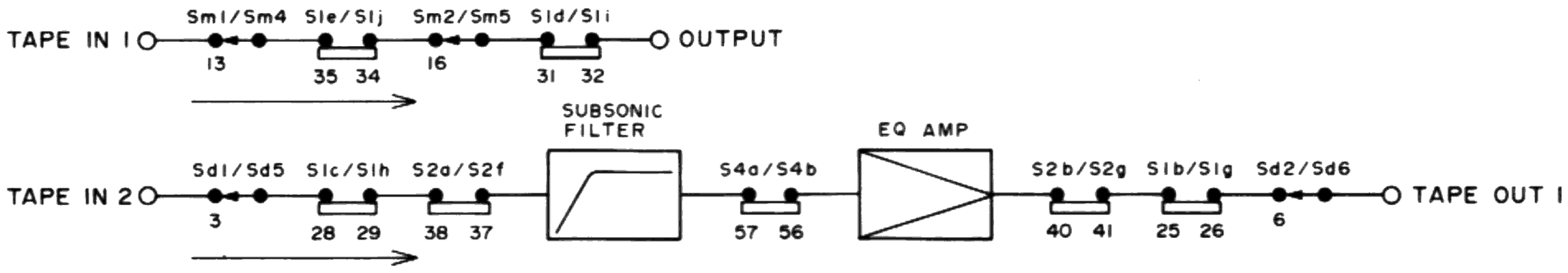
6 TAPE DUBBING Switch – 1 → 2
TAPE MONITOR Switch – 1
SUBSONIC FILTER Switch – IN Position



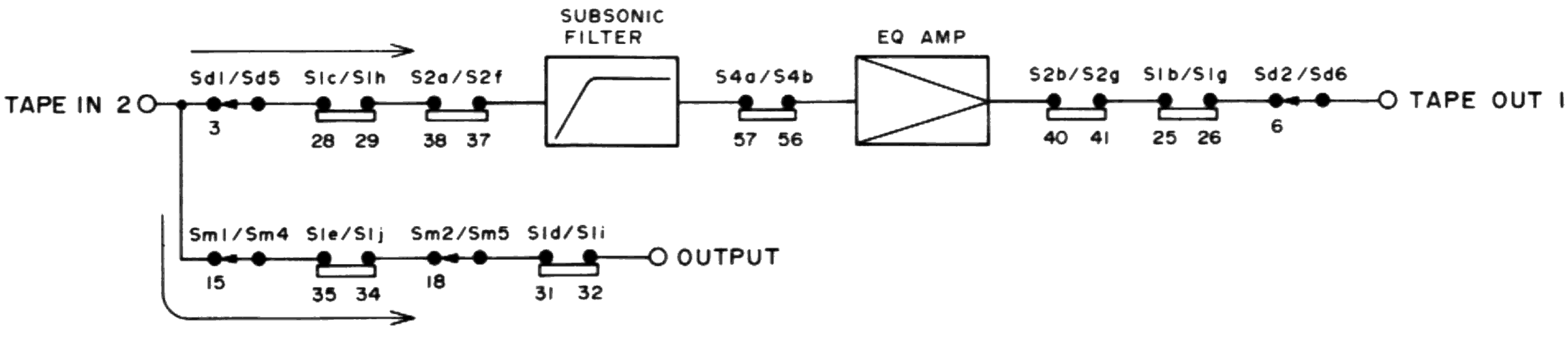
7 TAPE DUBBING Switch – 1 → 2
TAPE MONITOR Switch – 2
SUBSONIC FILTER Switch – IN Position



8 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – 1
SUBSONIC FILTER Switch – IN Position

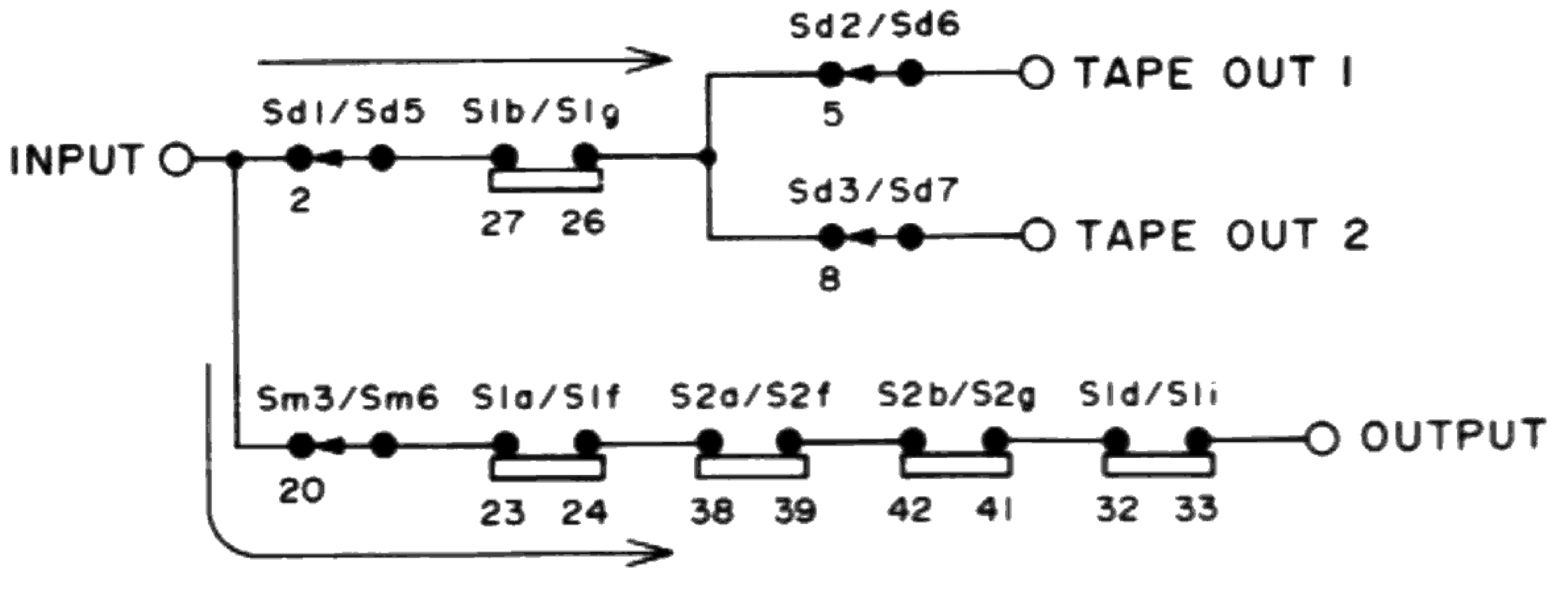


9 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – 2
SUBSONIC FILTER Switch – IN Position



(3) LINE/REC Switch – REC Position
BY-PASS/EQ Switch – BY-PASS Position

1 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – SOURCE Position



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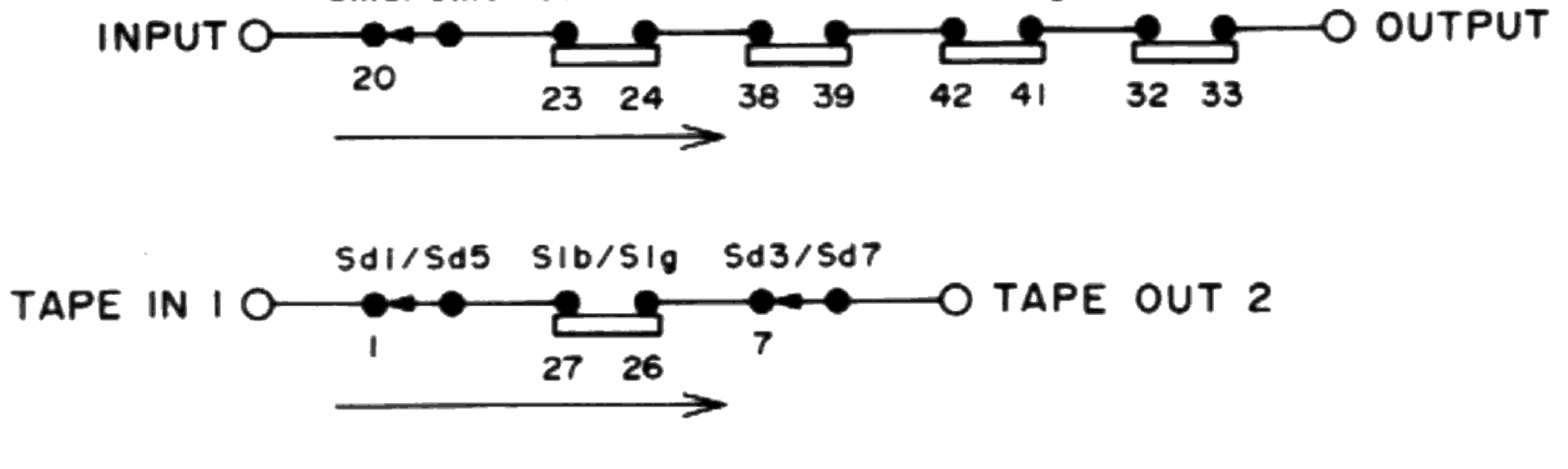
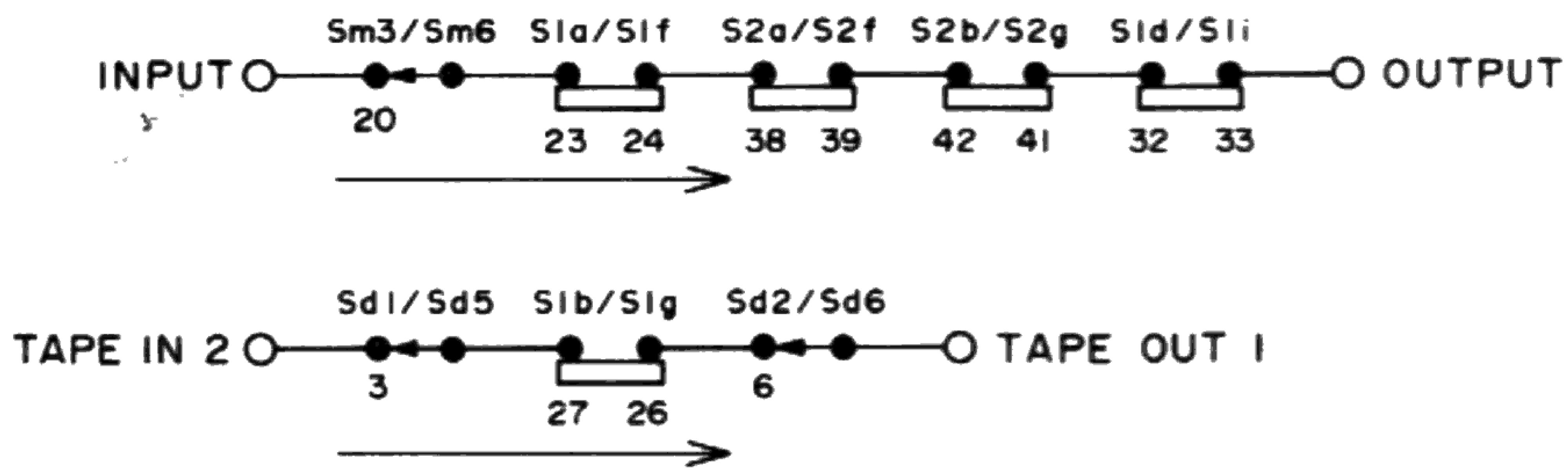
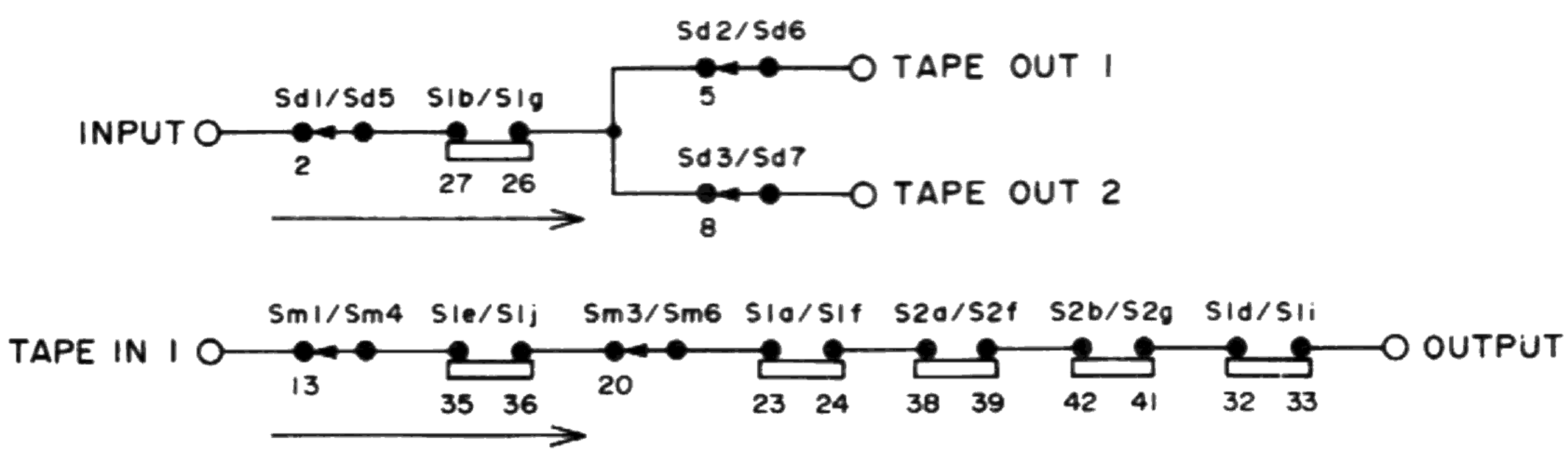
TAPE MONITOR Switch – SOURCE Position



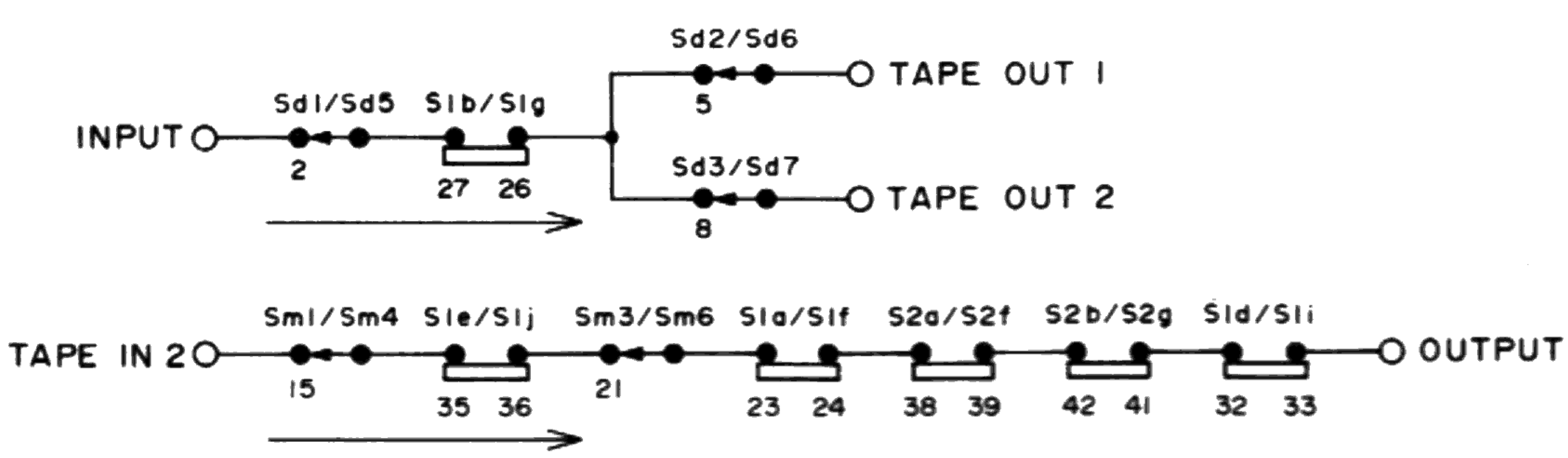
3 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – SOURCE Position



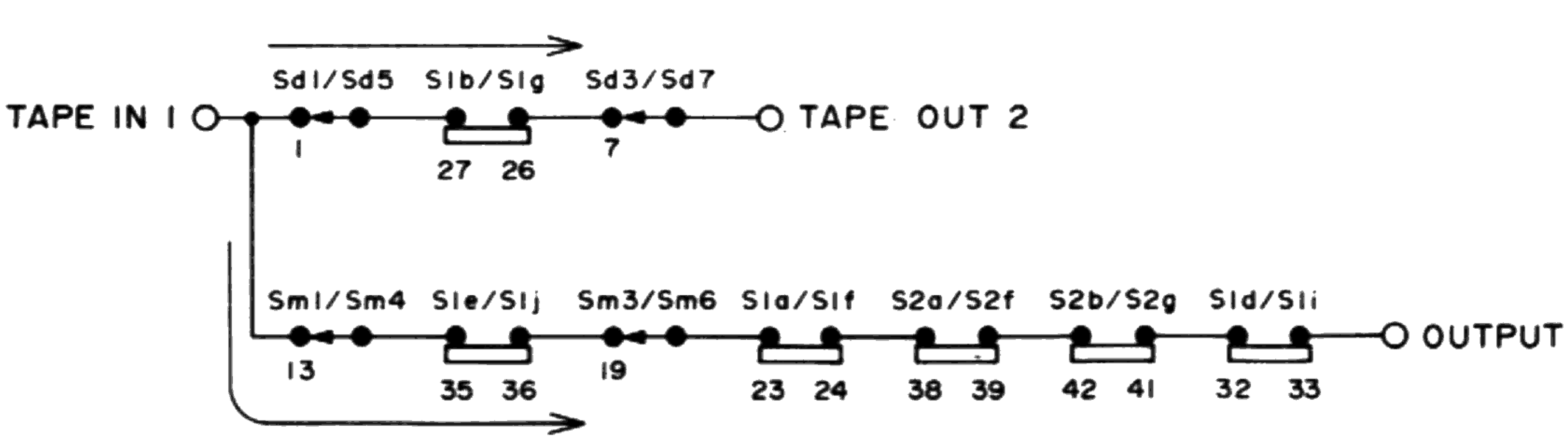
4 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – 1



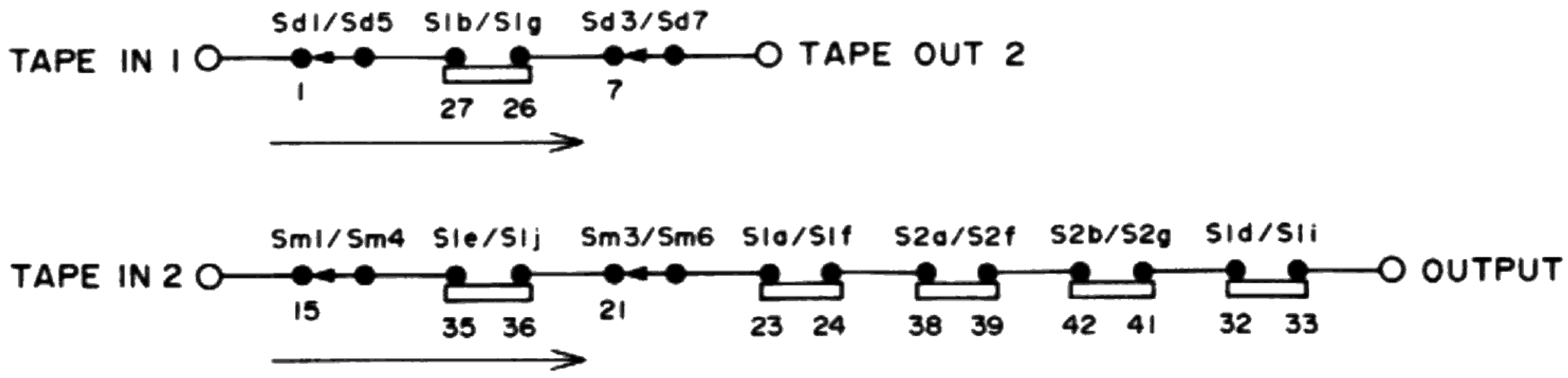
5 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – 2



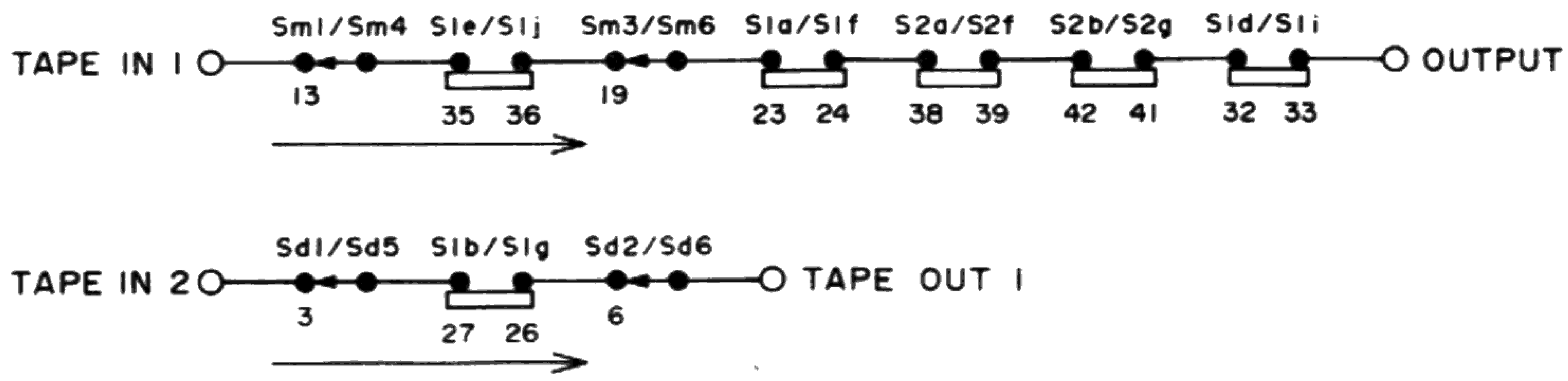
6 T APE DUBBING Switch – 1 → 2
TAPE MONITOR Switch – 1



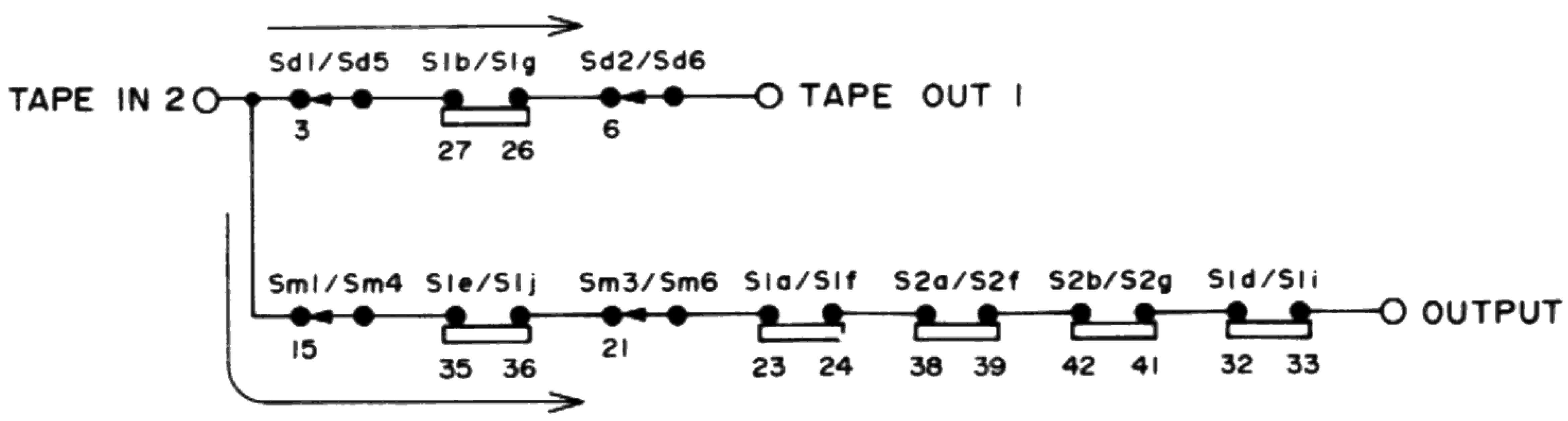
7 TAPE DUBBING Switch – 1 → 2
TAPE MONITOR Switch – 2



8 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – 1

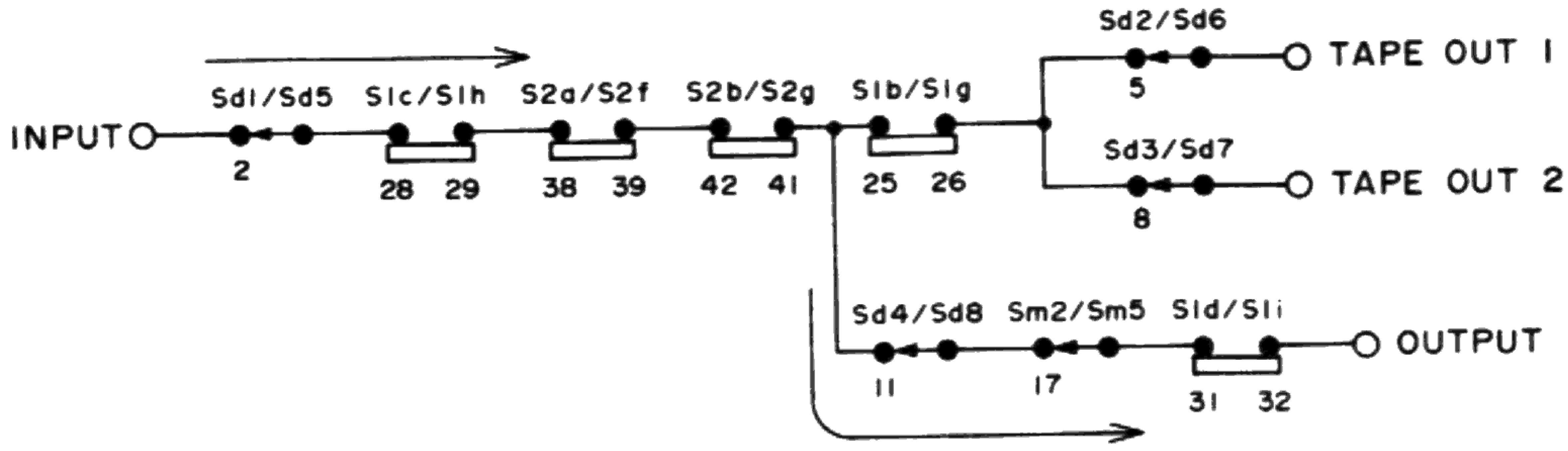


9 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – 2

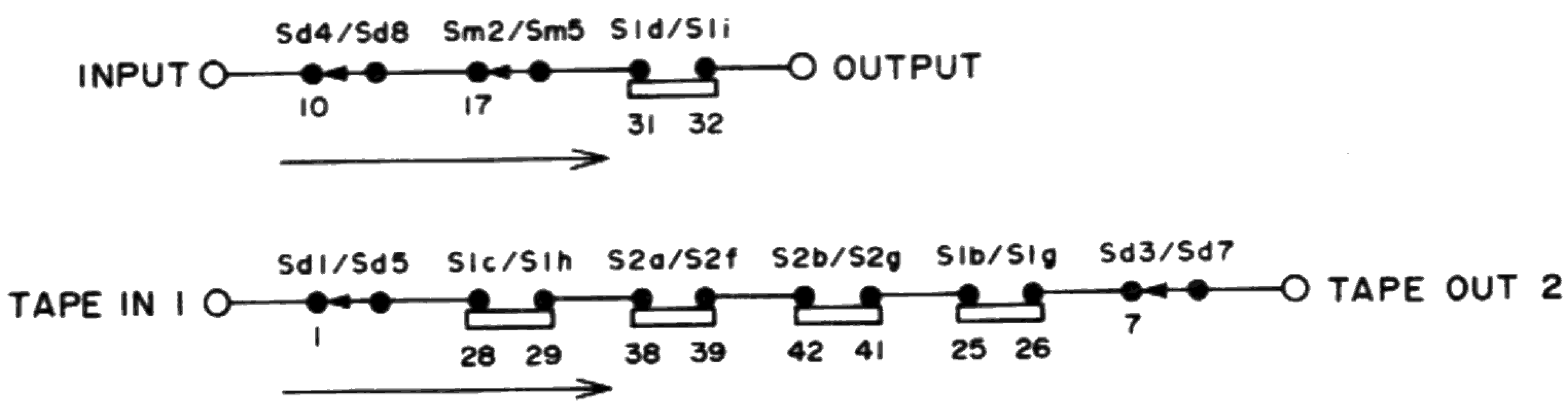


(4) LINE/REC Switch – LINE Position
BY-PASS/EQ Switch – BY-PASS Position

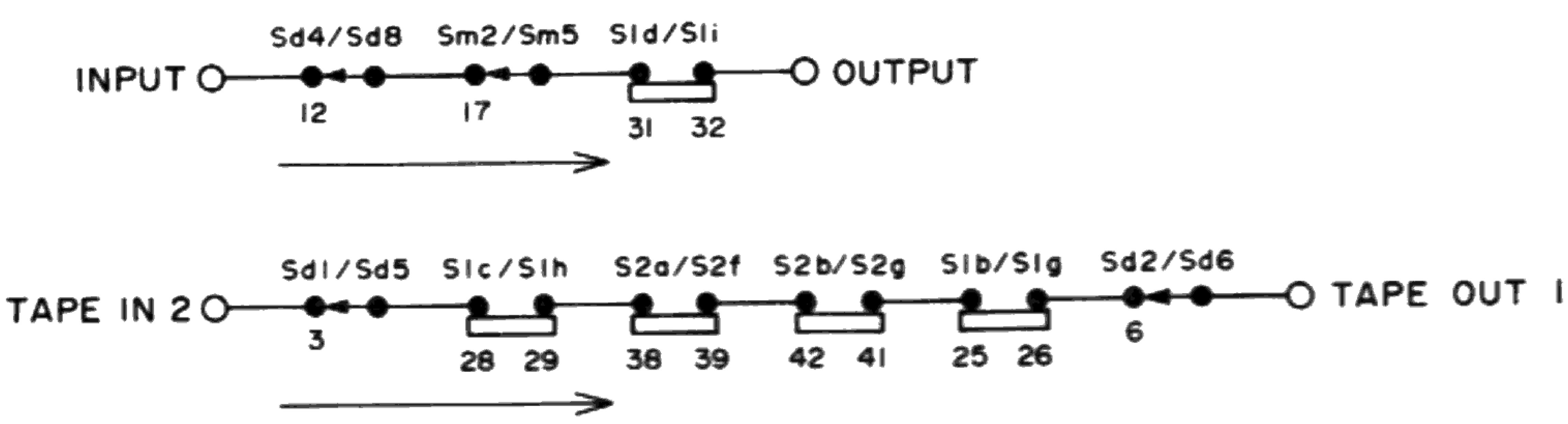
1 TAPE DUBBING Switch – SOURCE Position
TAPE MONITOR Switch – SOURCE Position



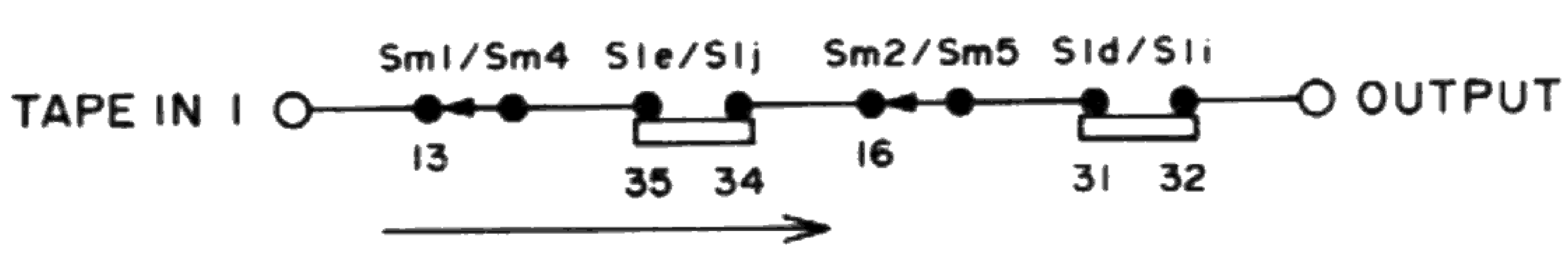
2 TAPE DUBBING Switch – 1 → 2
TAPE MONITOR Switch – SOURCE Position



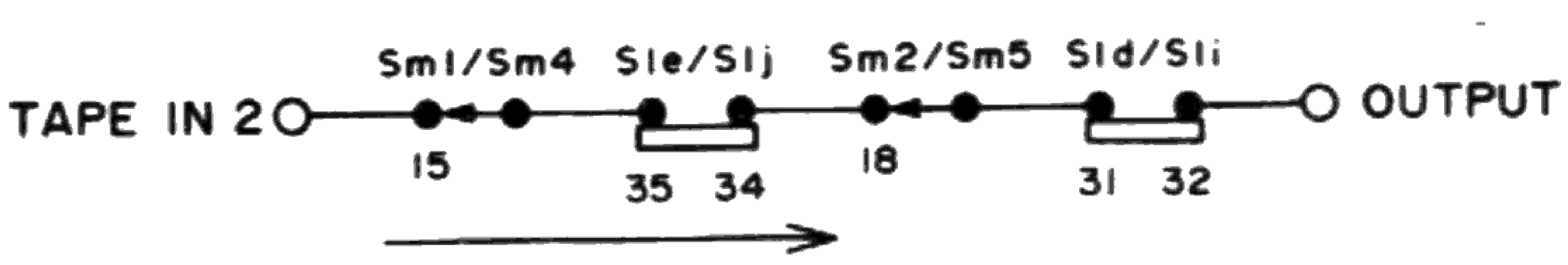
3 TAPE DUBBING Switch – 2 → 1
TAPE MONITOR Switch – SOURCE Position



4 TAPE DUBBING Switch – SOURCE Position, 1 → 2 or 2 → 1
TAPE MONITOR Switch – 1

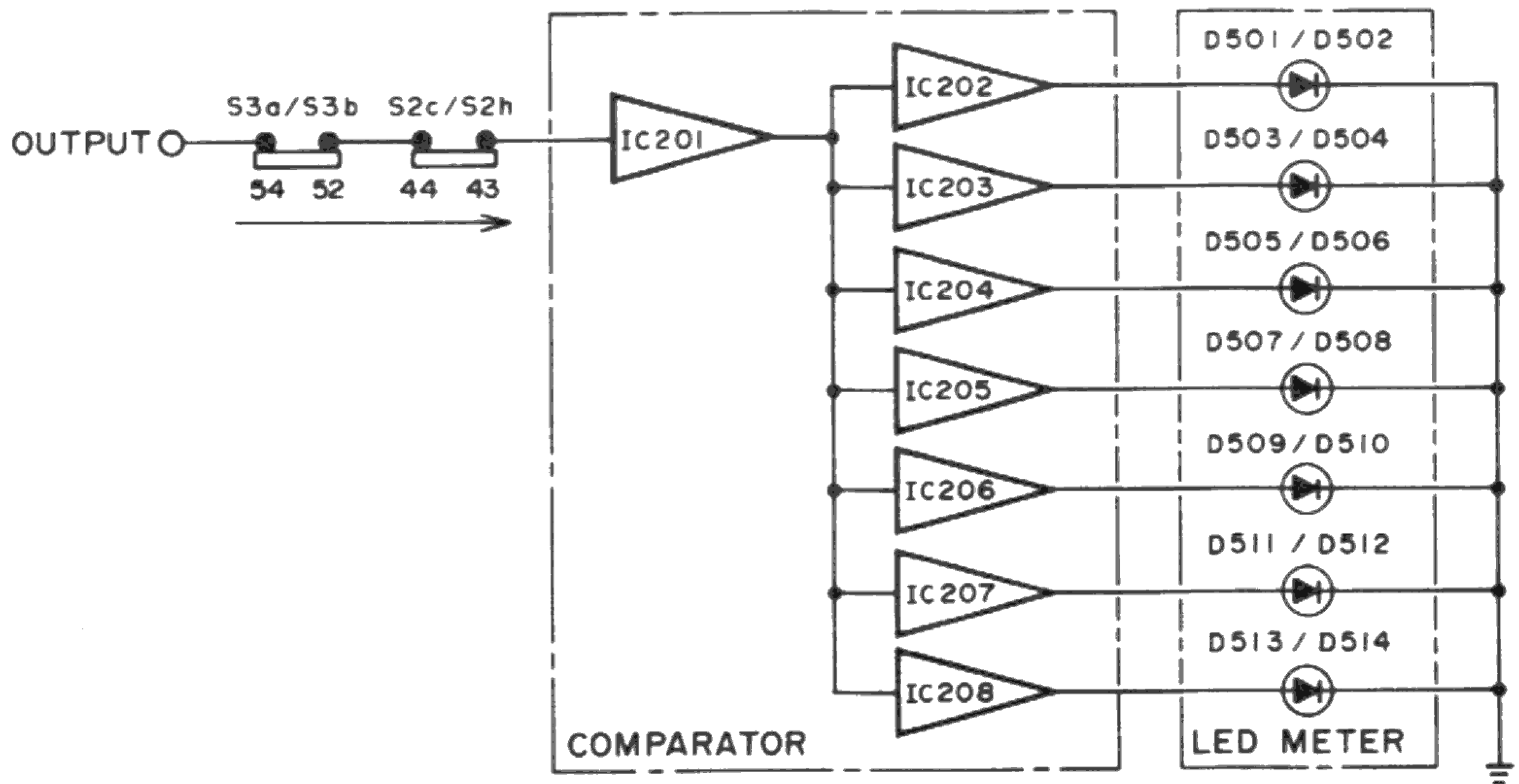


5 TAPE DUBBING Switch – SOURCE Position, 1 → 2 or 2 → 1
TAPE MONITOR Switch – 2



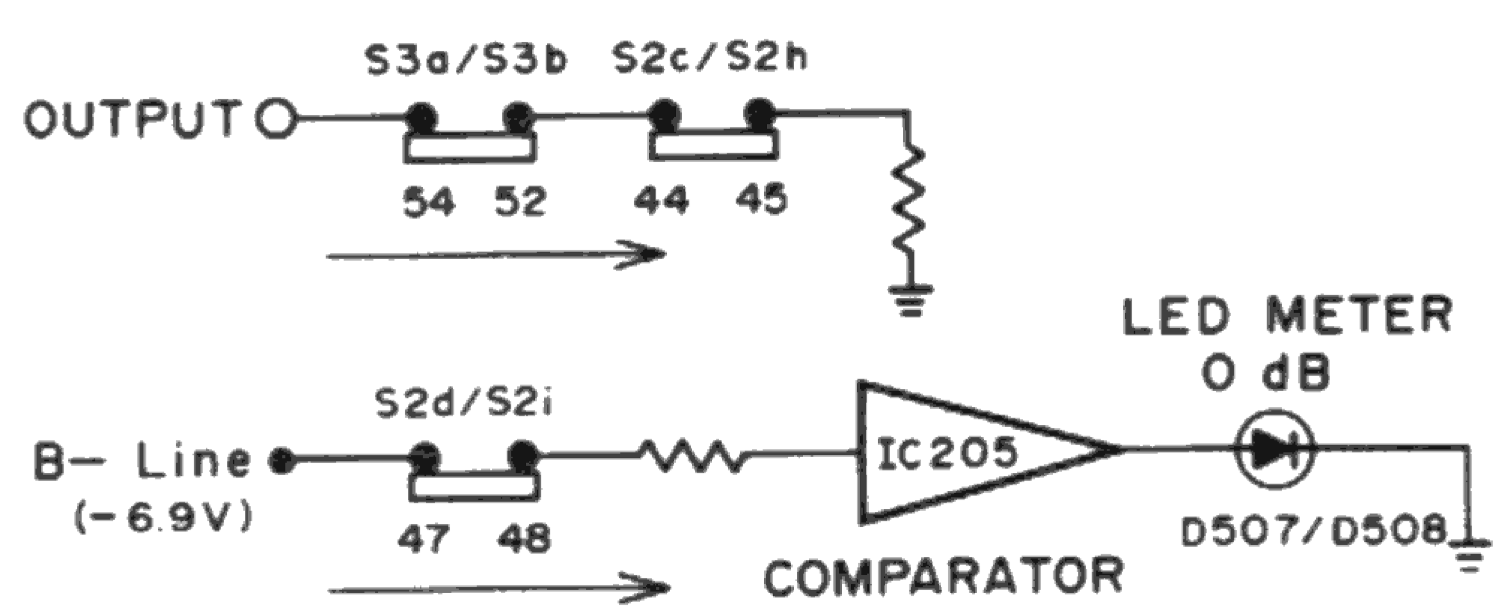
(5)

1 METER/OUT Switch . . . METER Position
BY-PASS/EQ Switch . . . EQ Position



LED Meter indicates signal at Output jack when Meter switch is "in".

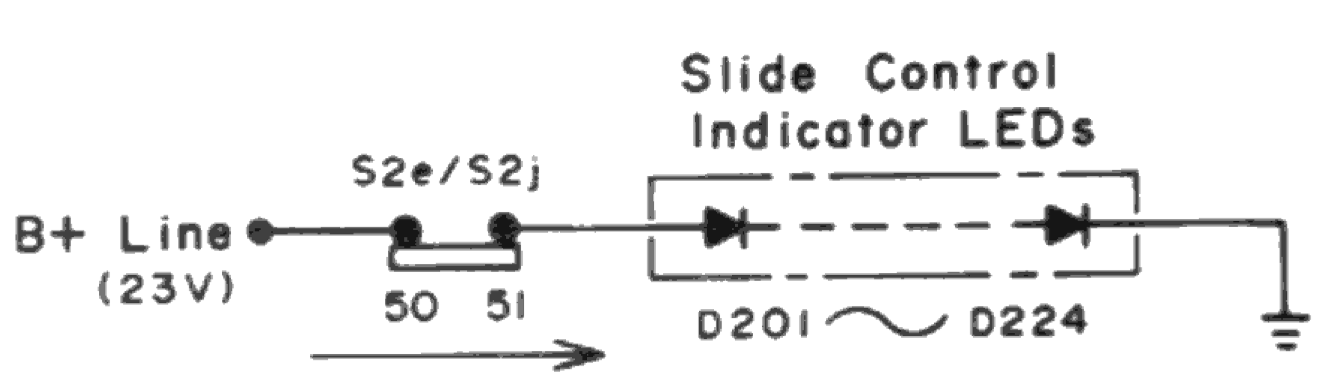
2 METER/OUT Switch - - - METER Position
BY-PASS/EQ Switch - - - BY-PASS Position



When the BY-PASS/EQ Switch is in the "BY-PASS" position, LED Meters indicate at 0 dB points only, regardless of output signal.

NOTE: Right channel LED Meter indicates output of Sound Level Meter when connected to SLM jack. (Meter Switch in either position.)

3 BY-PASS/EQ Switch - - - EQ Position



NOTE: When the BY-PASS/EQ Switch is in the "BY-PASS" position,
Slide Control Indicator LEDs do not light.
(Slide Control LEDs Switch in either position.)

DISASSEMBLY INSTRUCTIONS

1) To remove the chassis from the metal cabinet

a) Remove three screws that fasten the rear panel to the metal cabinet. (See Figure A)
b) Remove six screws — three from each side of cabinet as shown in Figure B.

2) To remove the bottom plate from the chassis

Remove twelve screws from the bottom as shown in Figure C.

3) To remove the Front Panel

a) Remove the chassis from the metal cabinet as described in 1).
b) Remove the three screws from the top (see Figure D) and three screws from the bottom (see Figure E) of the Front Panel.
c) Remove the knobs and pull the panel off.

4) To remove the Rear Panel

Remove six screws from the Rear Panel. (See Figure F)

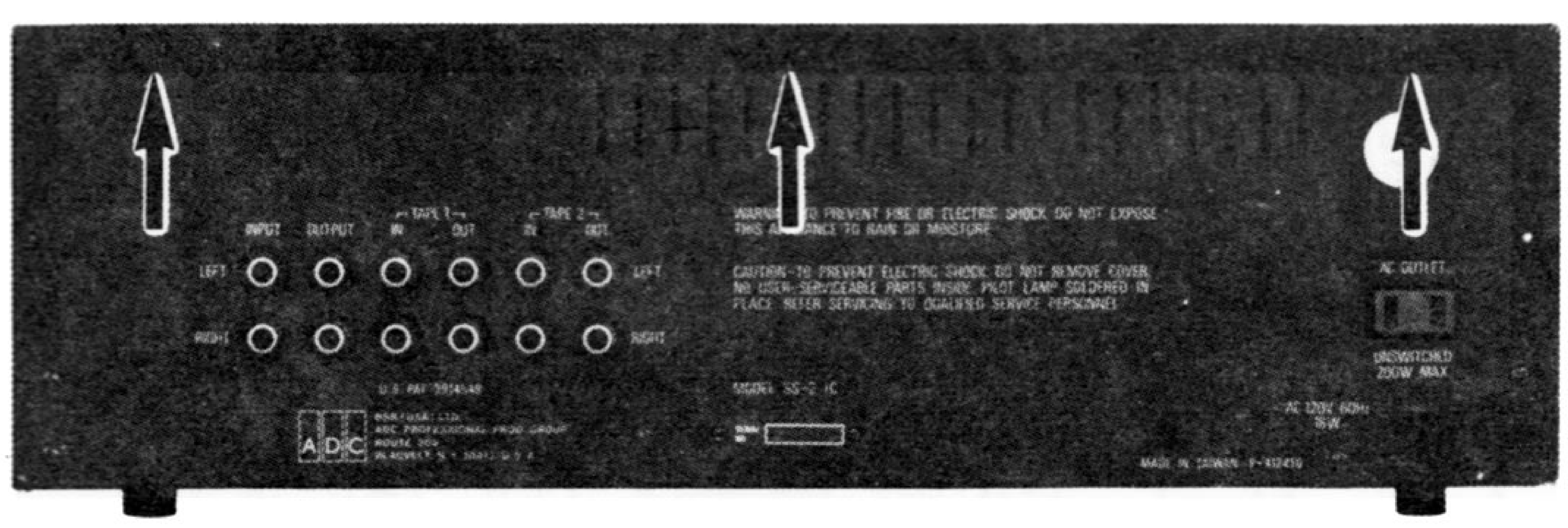


Figure A

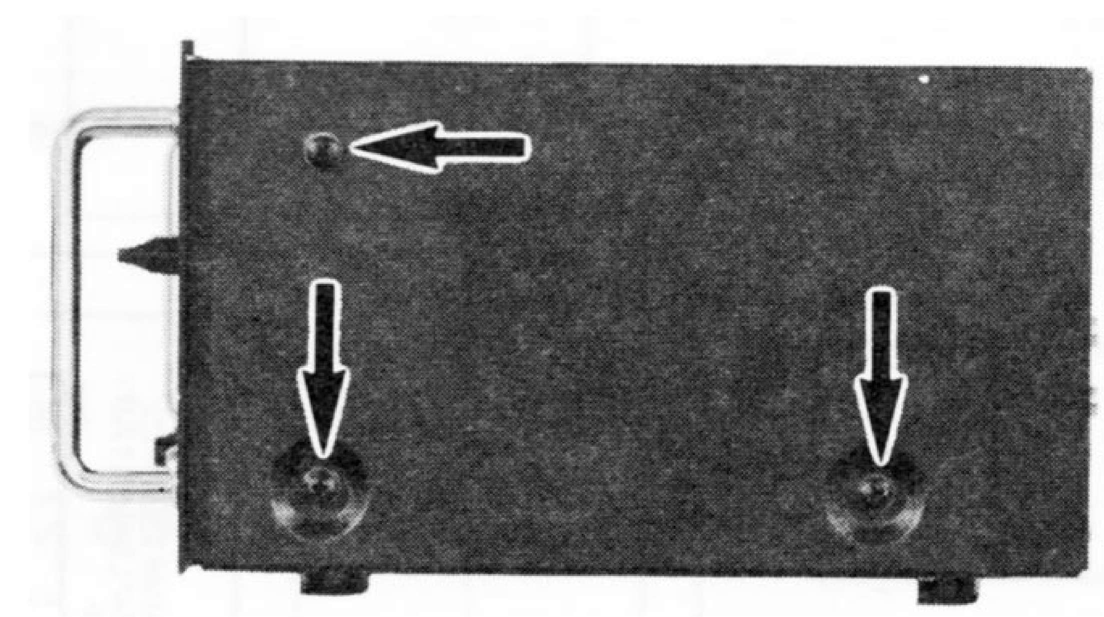


Figure B

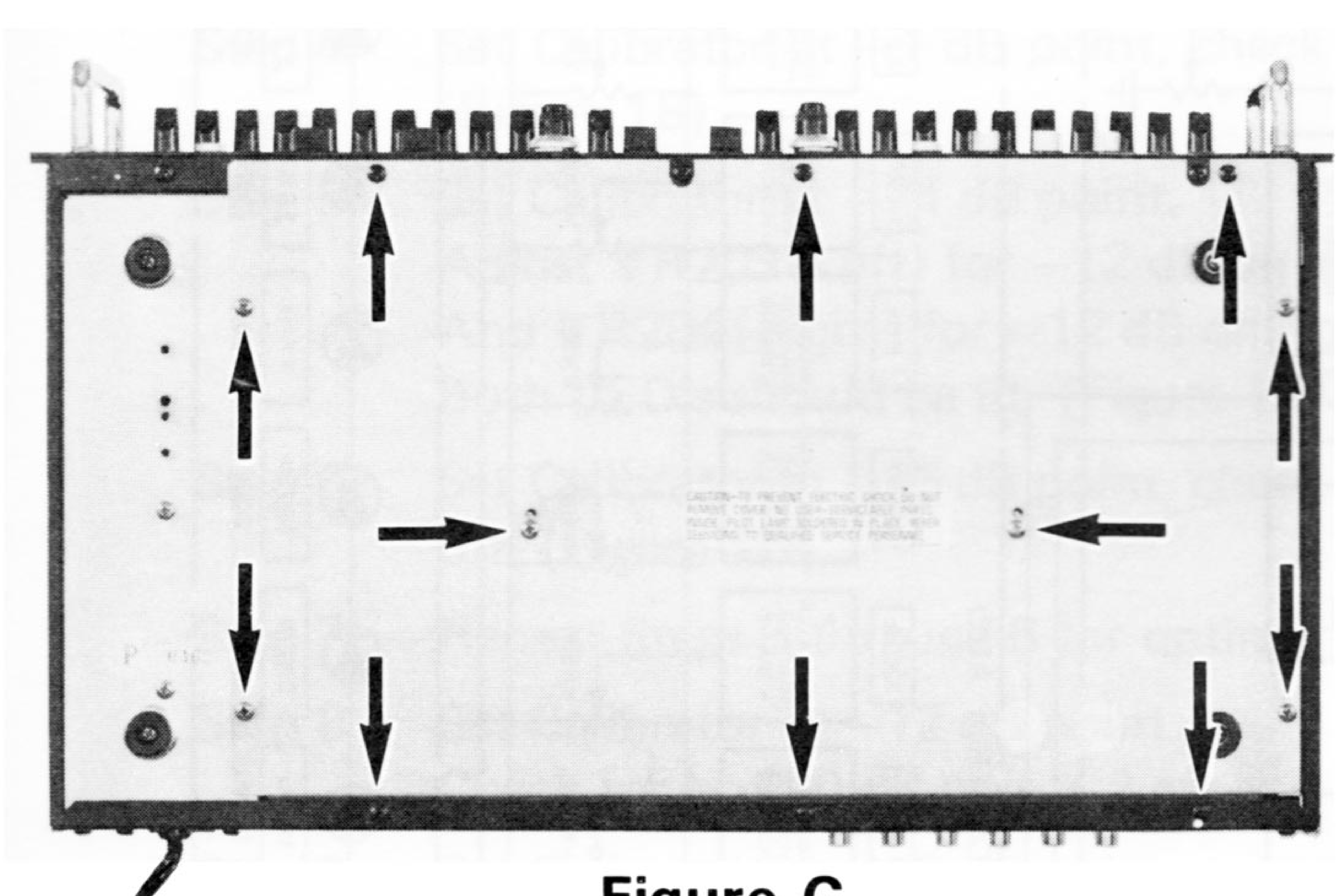


Figure C

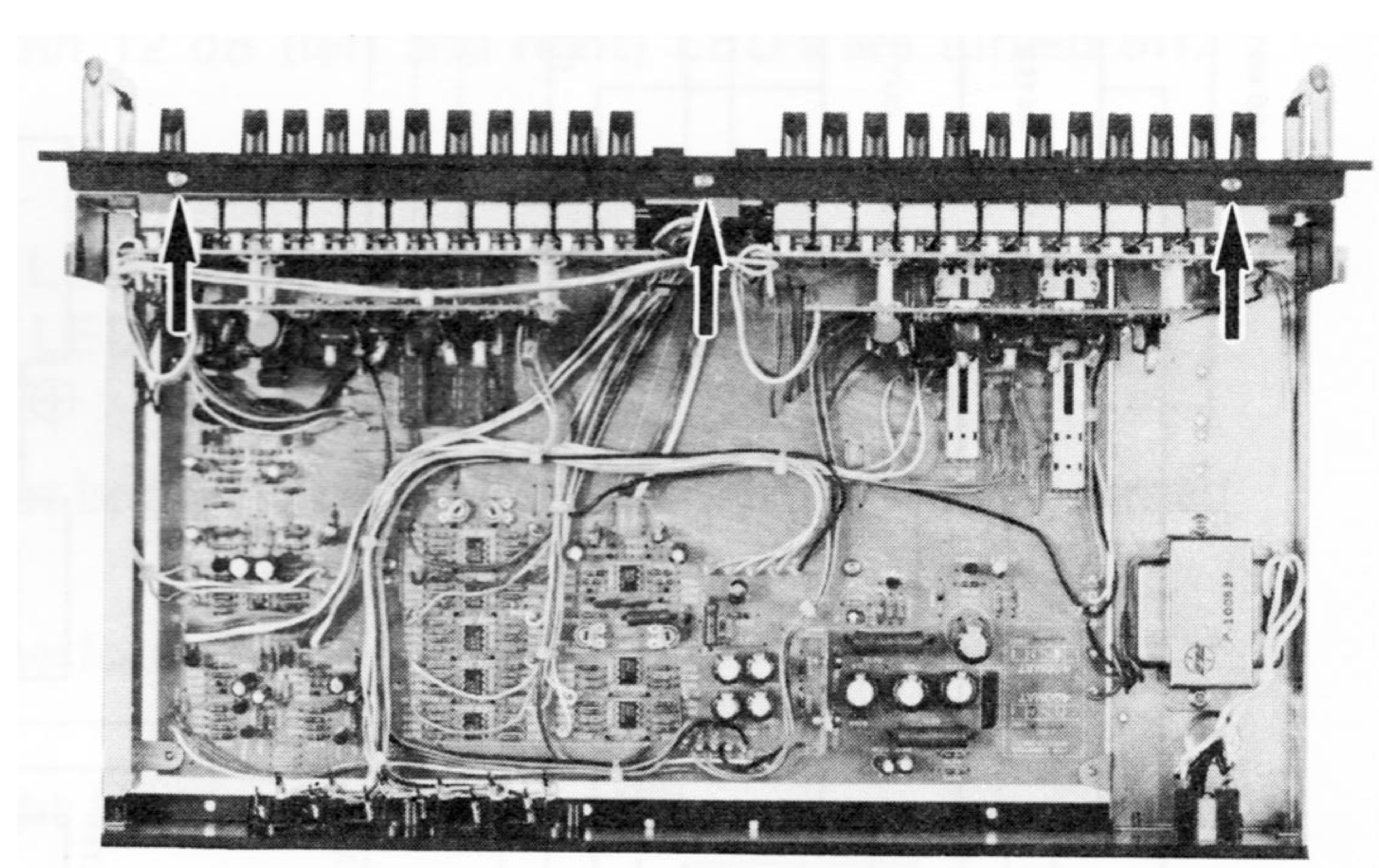


Figure D

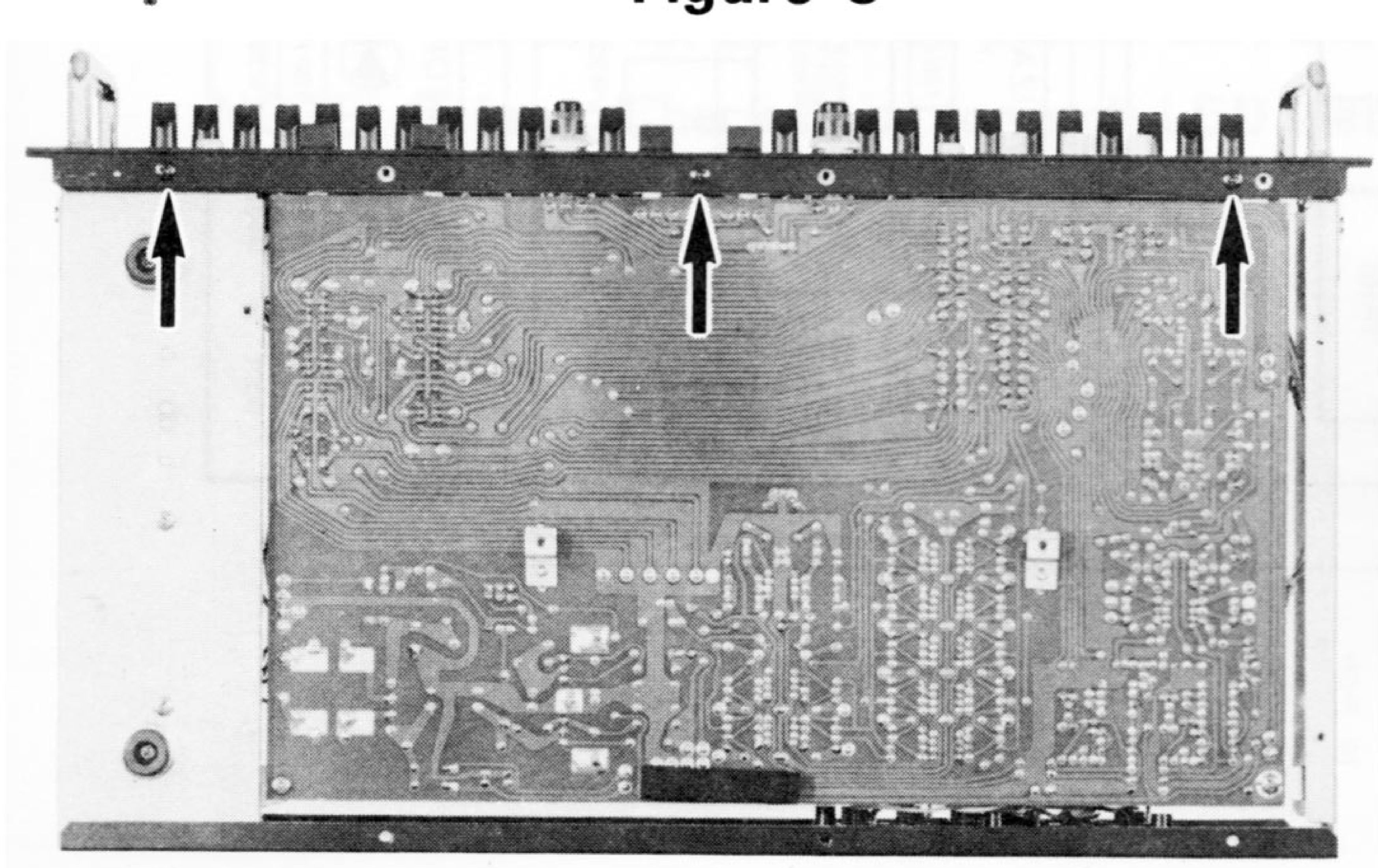


Figure E

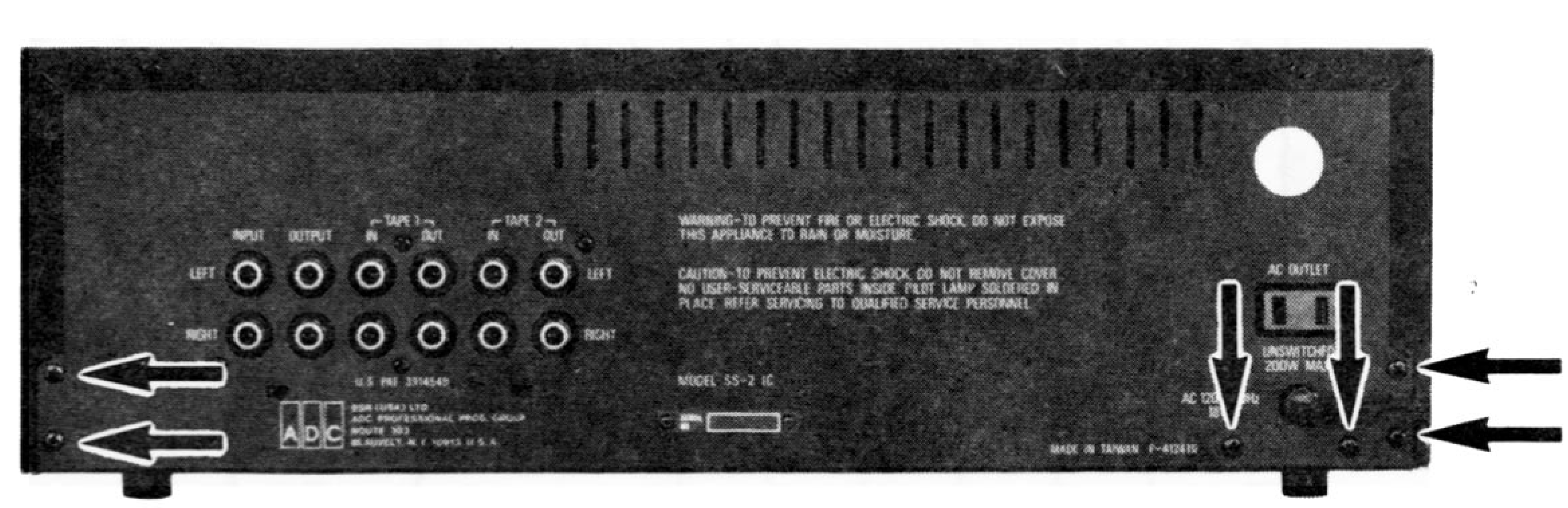
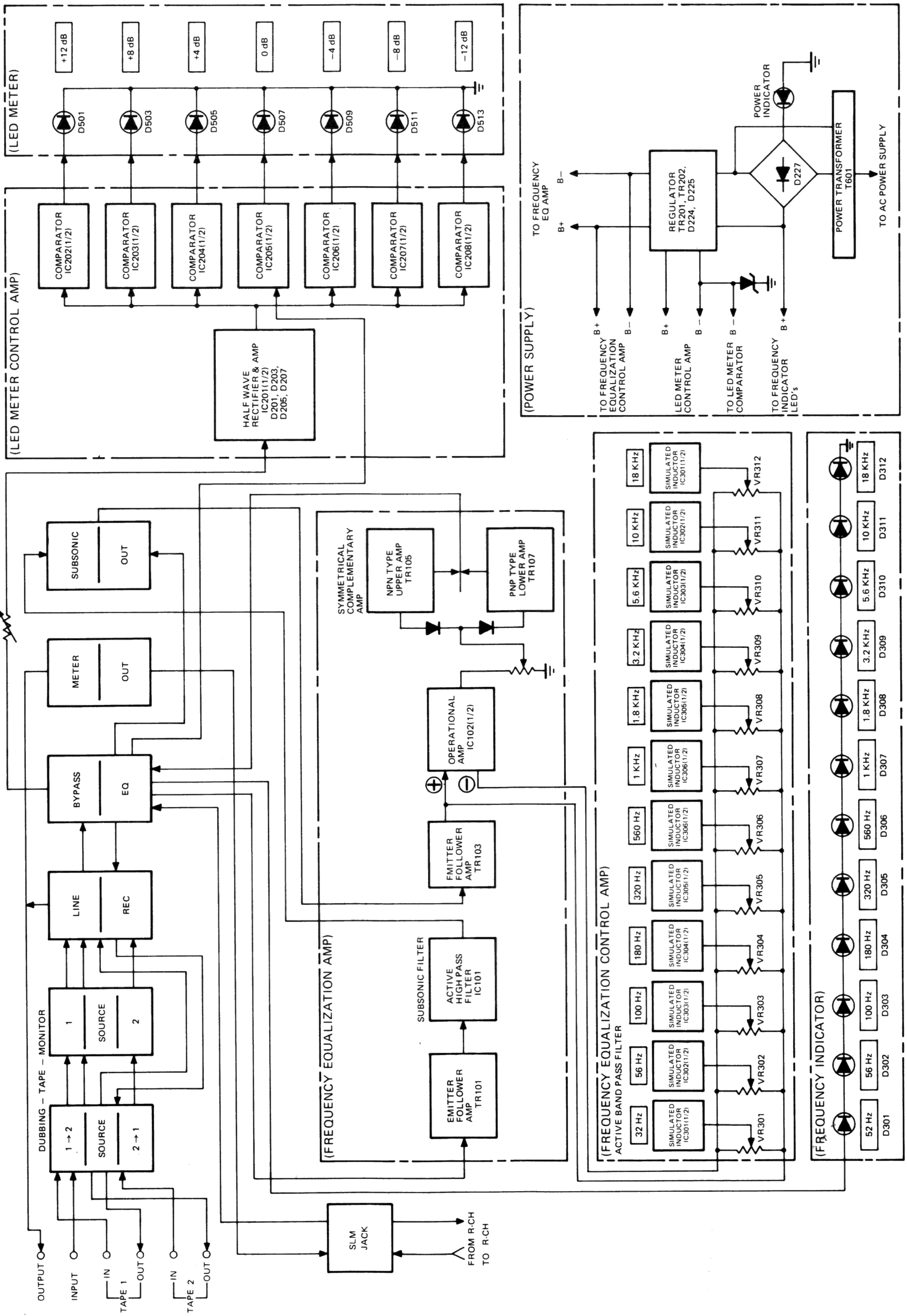


Figure F

BLOCK DIAGRAM



LED METER CALIBRATION PROCEDURE

Connect LED meter calibration set-up as shown in Figure 1.

CALIBRATOR:	OFF
AC VOLTMETER:	0.3 V Range
AUDIO GENERATOR:	Frequency – 1 KHz OUTPUT – 1.5 V min. into ext. 600 Ω load. INT/EXT LOAD SWITCH (if any) – EXT. (Calibrator box provides approximately 600 Ω load to generator).
FREQUENCY EQUALIZER:	Frequency Control – Flat position METER switch – IN BY-PASS/EQ – EQ TAPE MONITOR/DUBBING Switch: SOURCE LINE/REC – REC
METER CONTROL:	Left (VR101) – Max. counterclockwise Right (VR102) – Max. clockwise
LEVEL CONTROL:	VR103, 104 – Max. toward (+)

CALIBRATION PROCEDURE

Step 1. Set Trimmer Resistors on PCB as indicated below:
VR201(L), VR202(R) : at 12 o'clock position
VR203(L), VR204(R) : at 12 o'clock position

Step 2. Adjust audio generator output for 180 mV as read on AC voltmeter.

Step 3. Set Calibrator at 0 dB. Adjust VR201 (left) for 12 dB on left LED Meter.
And VR202 (right) for 12 dB on right LED Meter.
(All LED's are lit.) (Figure 1A)

Step 4. Set Calibrator at –1 dB point, check both 12 dB (left and right) LED's are turned off. (Figure 1B)

Step 5. Set Calibrator at –24 dB point.
Adjust VR203 (Left) for –12 dB on left LED Meter.
And VR204 (Right) for –12 dB on right LED Meter.
Both LED's should be lit. (Figure 1C)

Step 6. Set Calibrator at –25 dB point, check that both –12 dB on left and right LED have turned off. (Figure 1D)

Step 7. Repeat Steps 3 through 6 for optimum performance.

Step 8. Set Calibrator at –12 dB point.
Check for both 0 dB points. Left and right LEDs are lit. (Figure 1E)

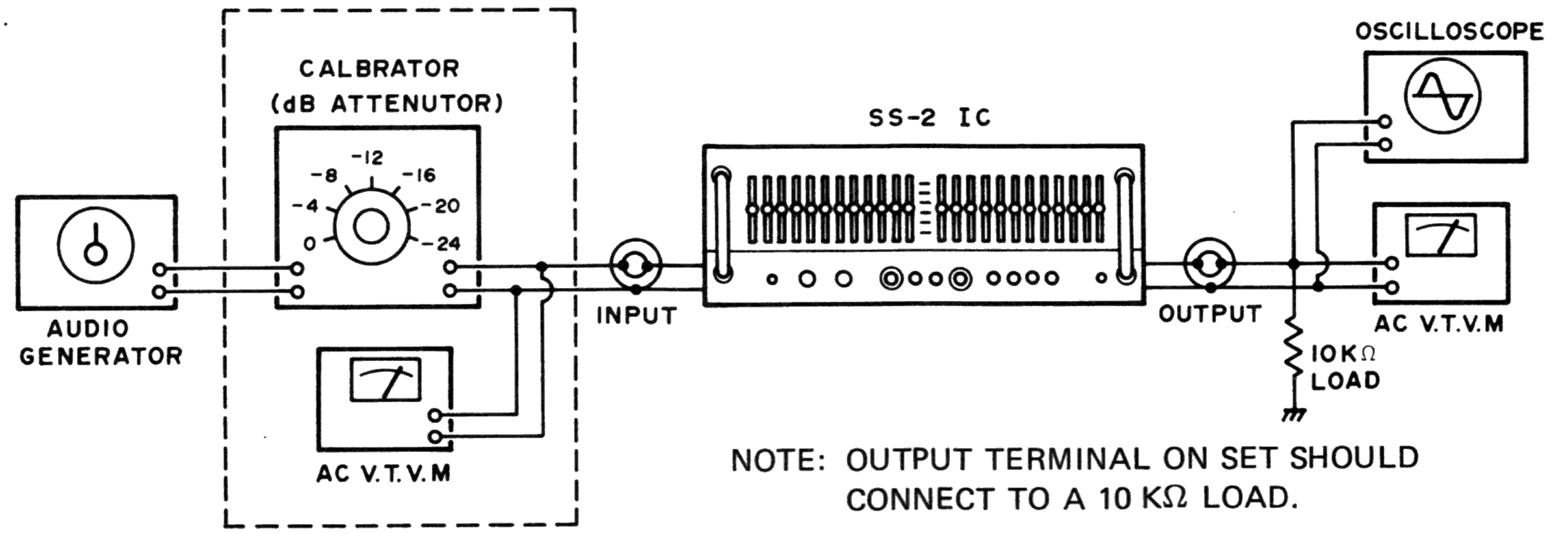
Step 9. Set Calibrator at –13 dB point.
Check for both 0 dB points. Left and right LEDs have turned off. (Figure 1F)

NOTE: Refer to Check Point for each LED Meter below:

CHECK POINT FOR EACH LED METERS

(See Figure 2 and Figure 2A through 2F.)

LED meter point	–12 dB	–8 dB	–4 dB	0 dB	+4 dB	+8 dB	+12 dB
Calibrator position for each LED that is lit.	–24 dB	–20 dB	–16 dB	–12 dB	–8 dB	–4 dB	0 dB
Calibrator position for each LED that is not lit.	–25 dB	–21 dB	–17 dB	–13 dB	–9 dB	–5 dB	–1 dB



NOTE: OUTPUT TERMINAL ON SET SHOULD CONNECT TO A 10 KΩ LOAD.

Figure 1

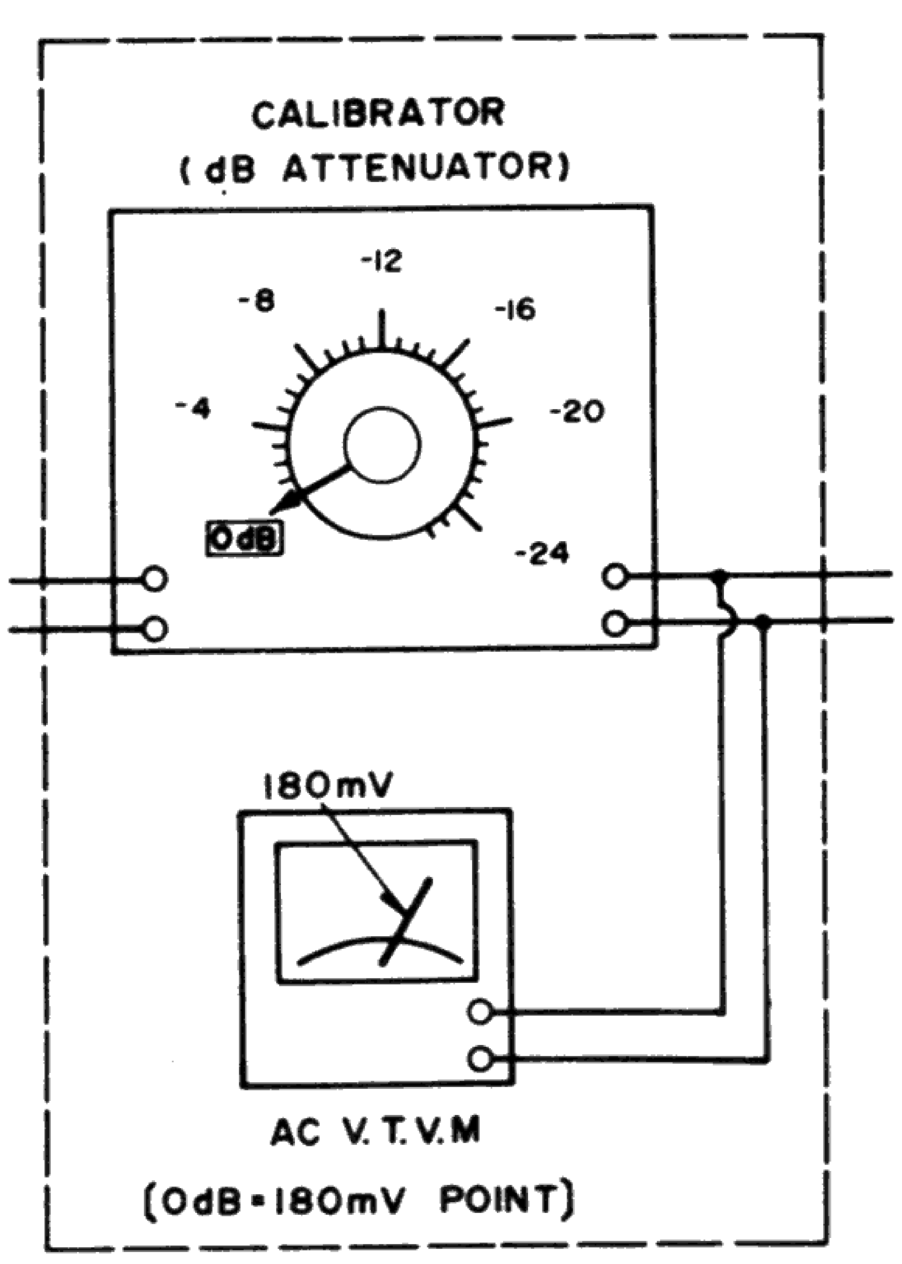


Figure 1A

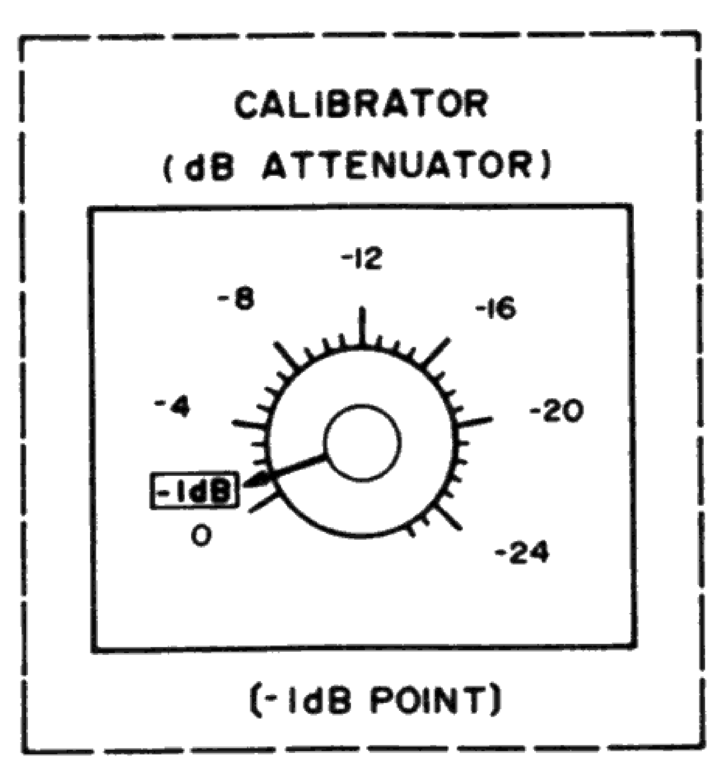


Figure 1B

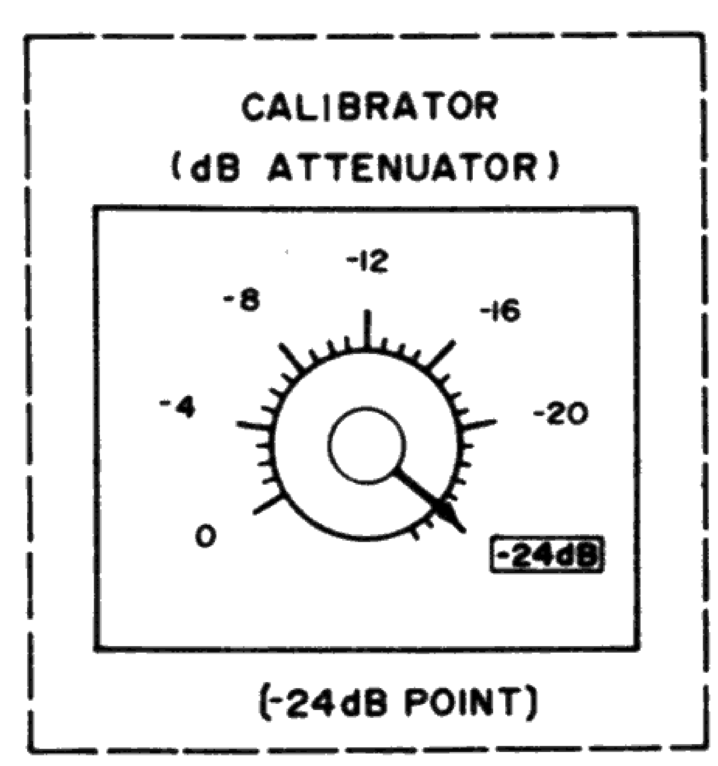


Figure 1C

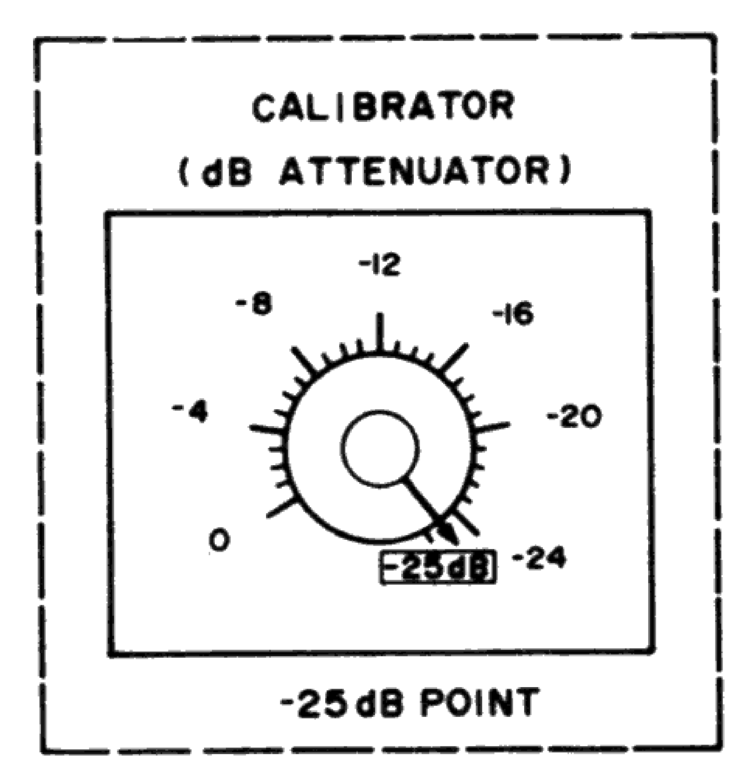


Figure 1D

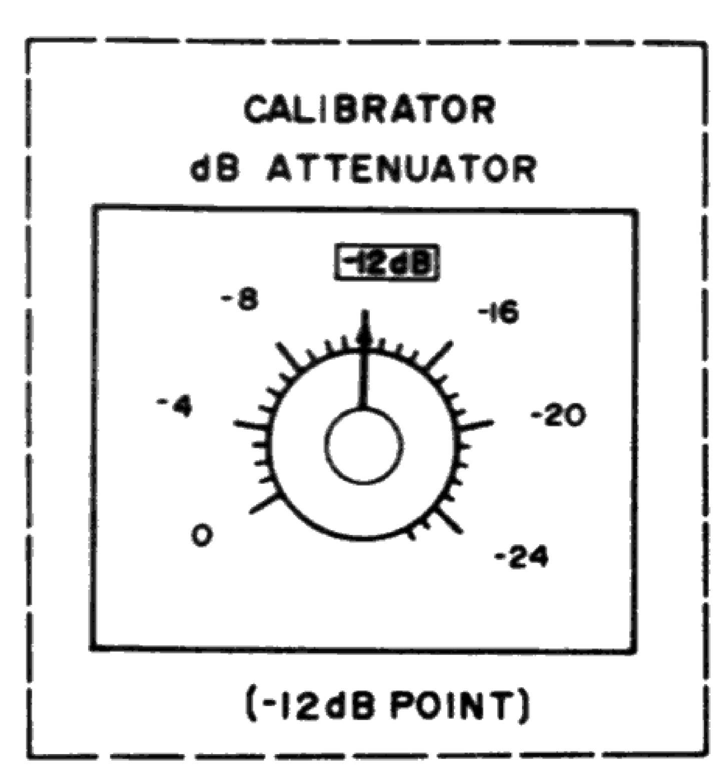


Figure 1E

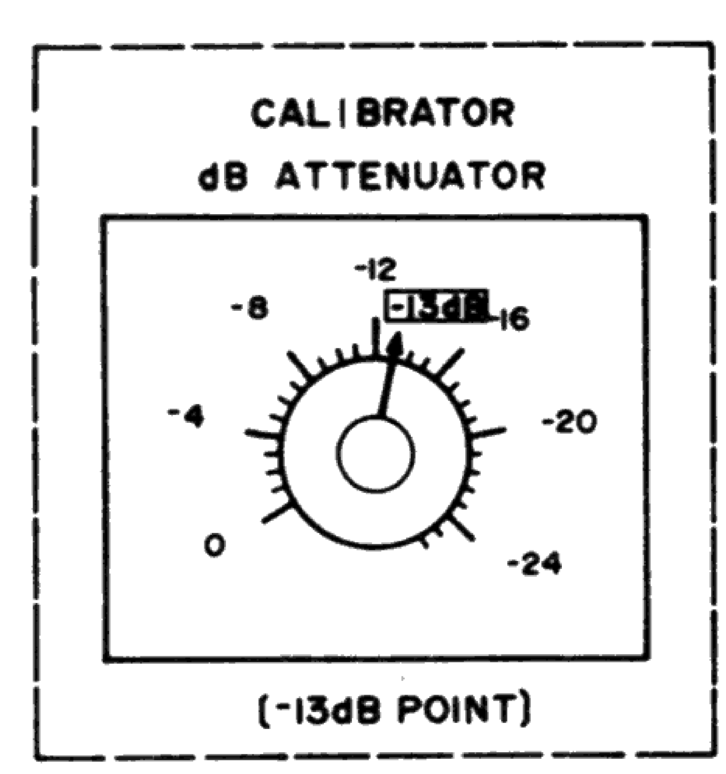
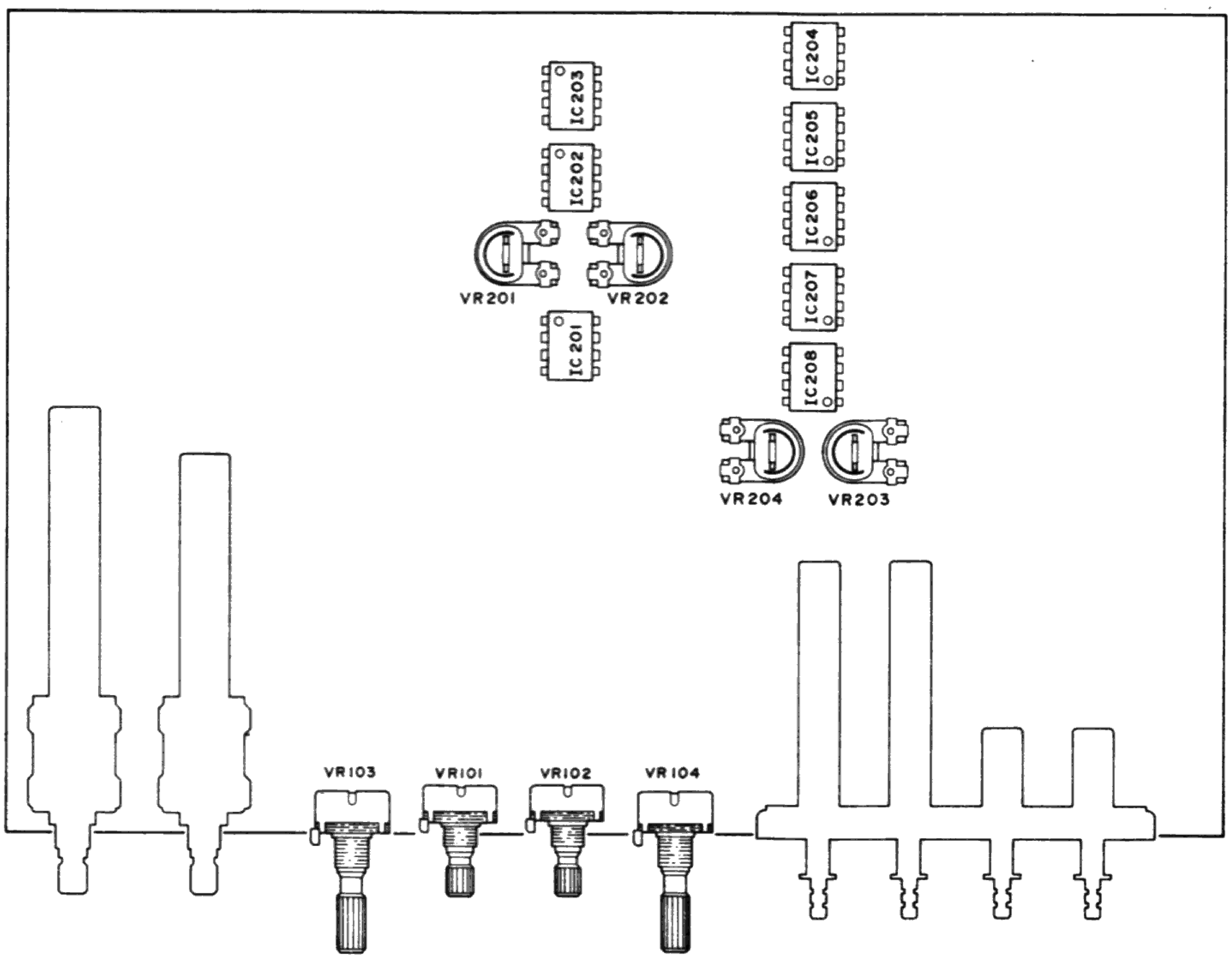
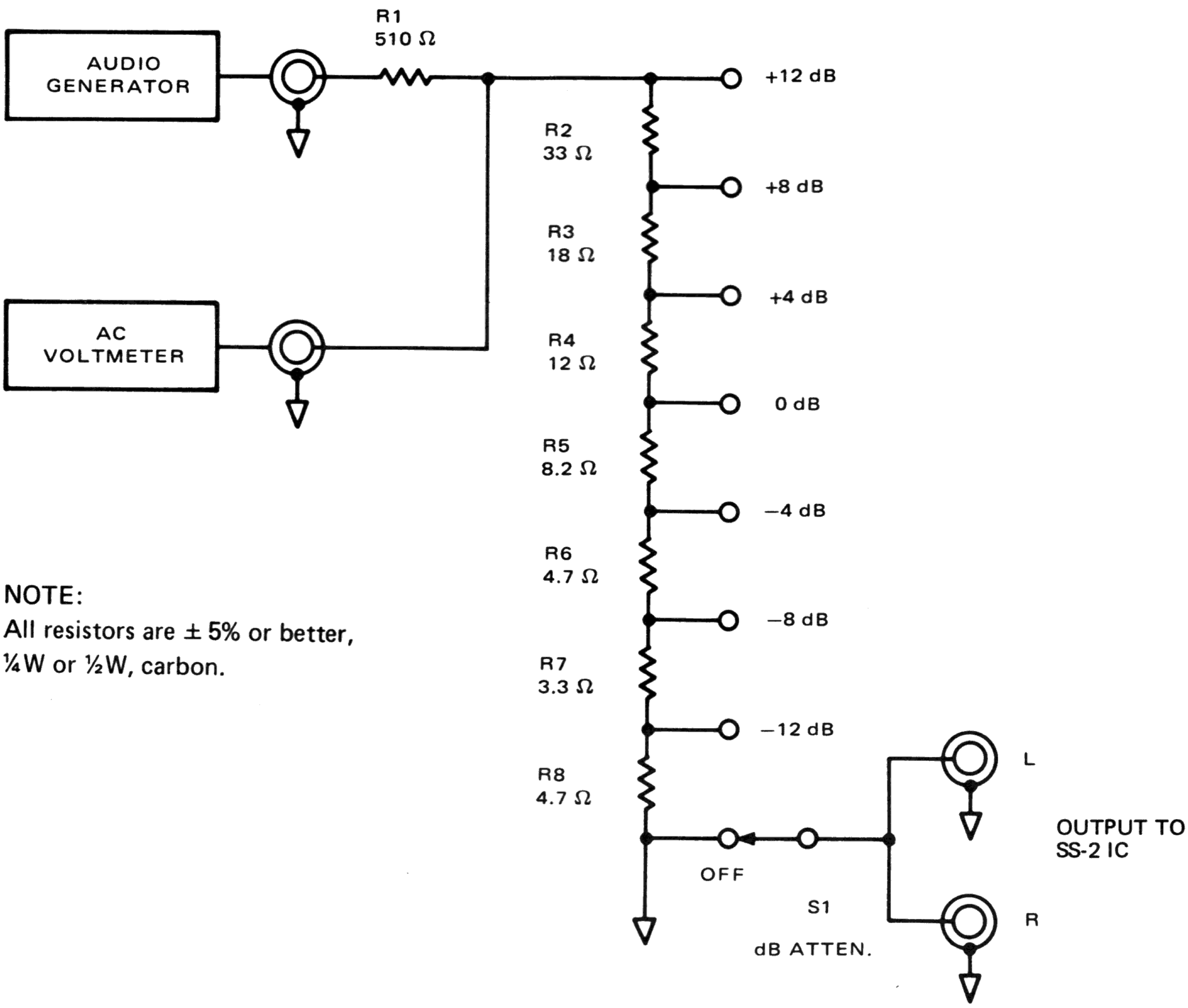


Figure 1F

METER POWER SUPPLY



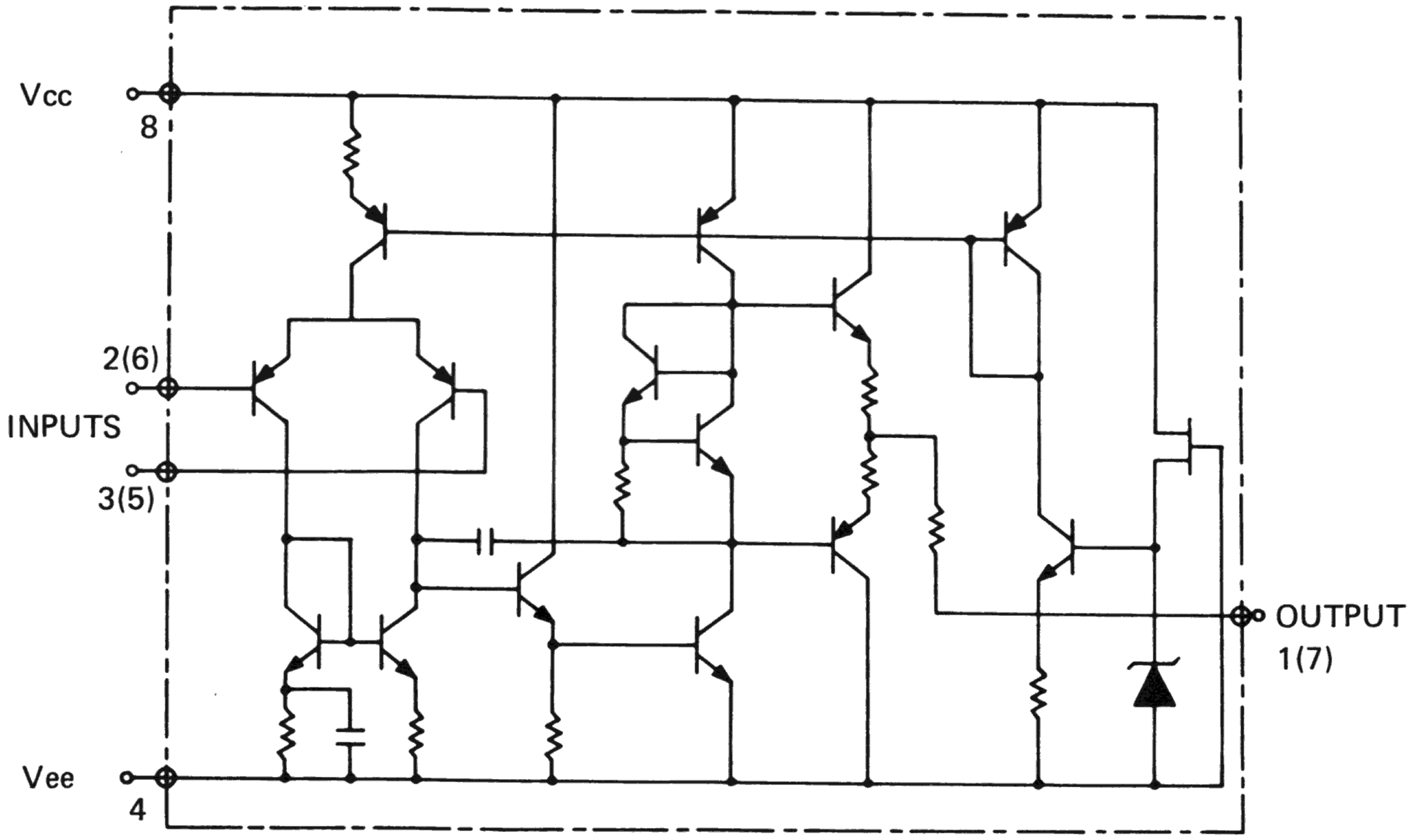
CALIBRATION SCHEMATIC



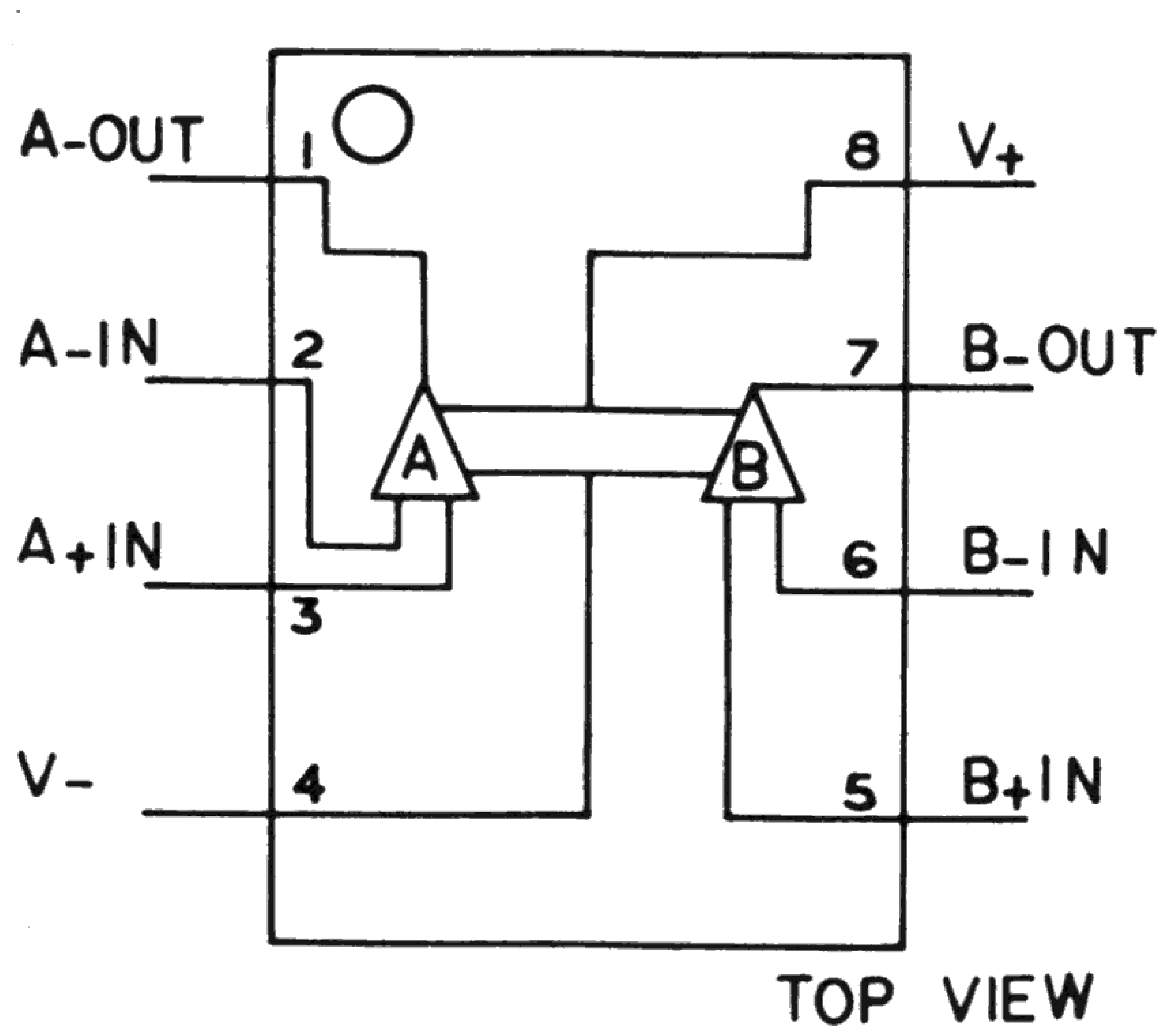
NOTE:
All resistors are ± 5% or better, ¼W or ½W, carbon.

IC INTERNAL DIAGRAM

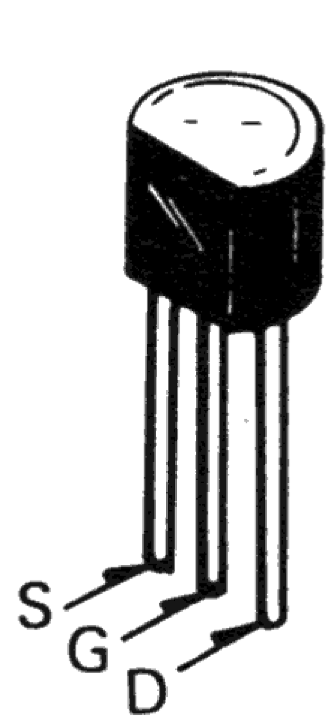
NJM-4558
NJM-4560
TL-4558



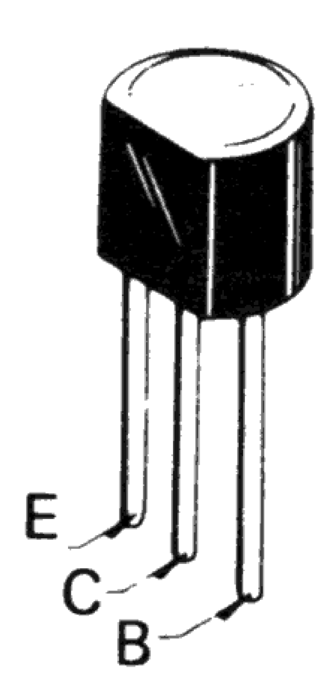
NJM-4558 BLOCK DIAGRAM
NJM-4560
TL-4558



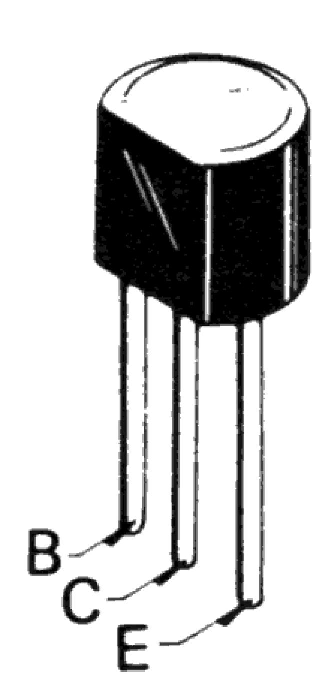
IC & TRANSISTOR LEAD IDENTIFICATIONS



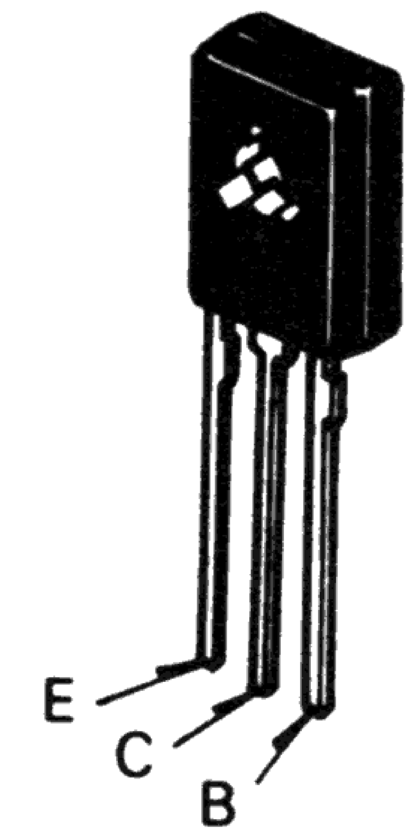
2SK30A
2SK246



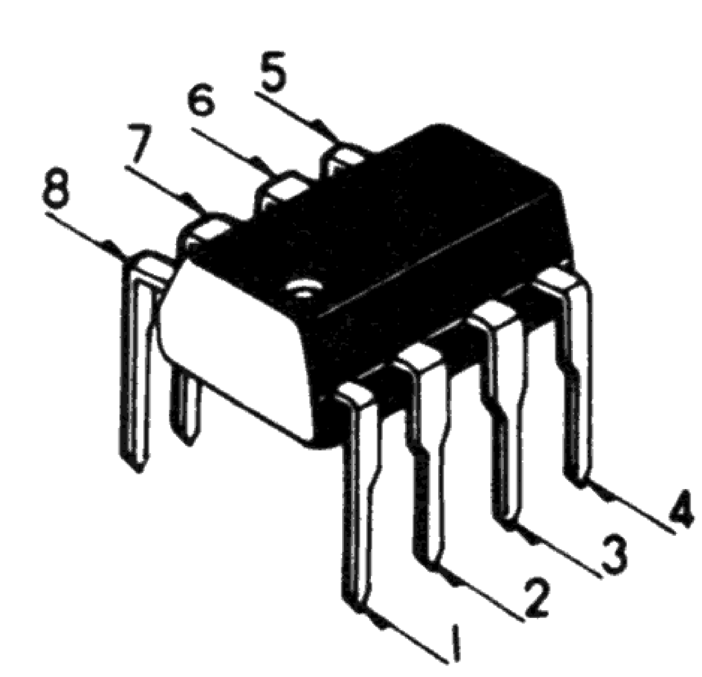
2SC1222
2SC1843
2SA990



2SC1313



2SD600
2SB631



NJM4558
NJM4560
TL4558

TROUBLESHOOTING

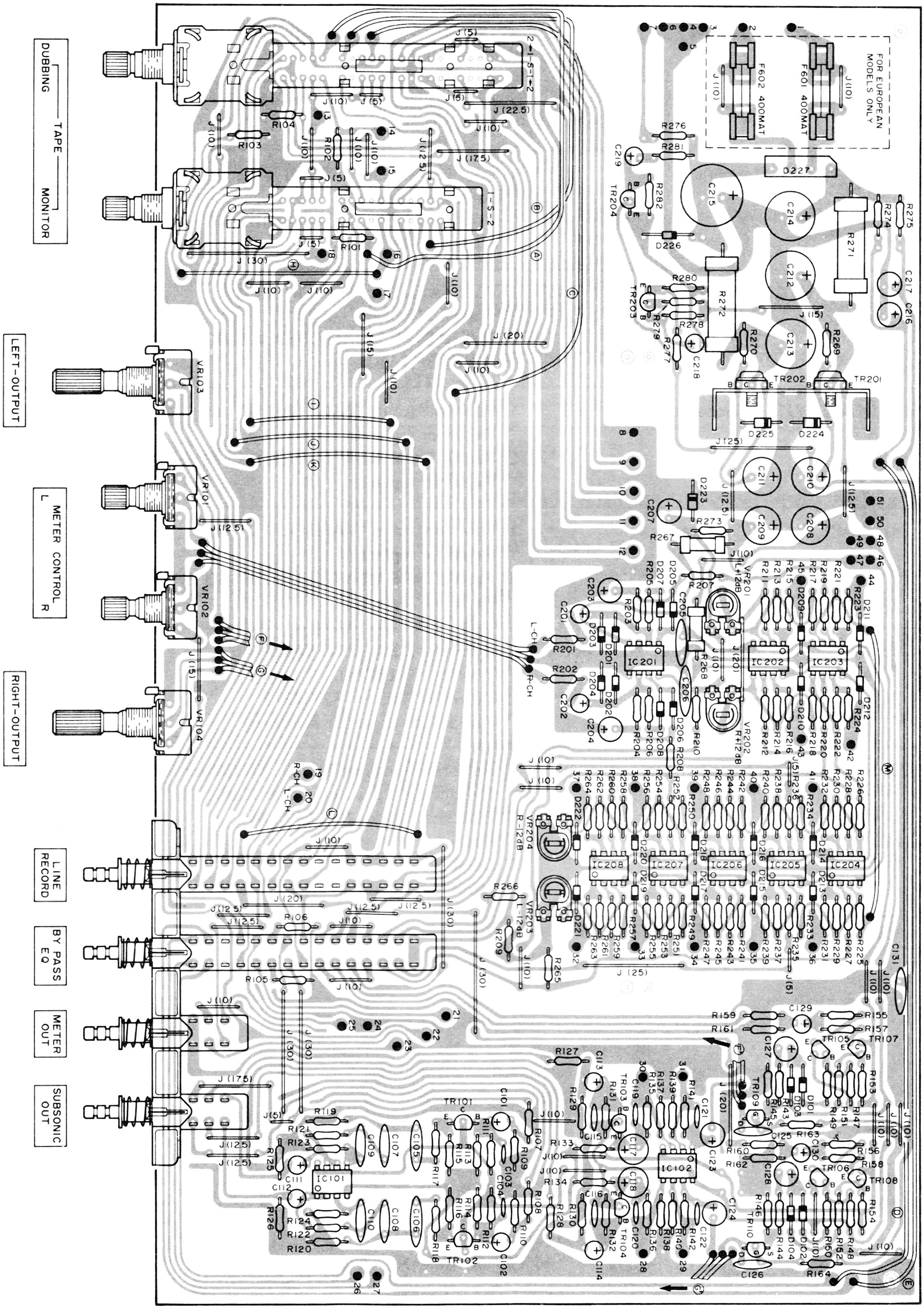
Symptom	Cause/Remedy
1) No output	1) Faulty AC power cord * Replace the cord. 2) Defective power switch * Replace the switch. 3) Broken wire in the power transformer * Replace the transformer. 4) Check Fuse European and PX only.
2) Power indicator LED does not light.	1) Defective LED D601 * Replace the LED. 2) Open in the power transformer secondary winding * Replace the transformer. 3) Check Fuse European and PX only.
3) Power indicator LED lights but no output.	1) Defective Diode D227 * Replace the defective diode. 2) Defective transistor TR201 and/or TR202 * Replace the defective transistor(s).
4) No output with test signal applied to the input terminals.	1) Defective transistor TR101–110 * Replace the defective transistor(s). 2) Defective resistor or capacitor of MAIN AMP board * Replace the defective part(s).
5) Frequency control "32 Hz" has no effect.	1) Faulty VR301/401 * Repair or replace. 2) Defective IC301/401, R301/401, R302/402, R303/403, C301/401 or C302/402 * Replace the defective part(s).
6) Frequency control "56 Hz" has no effect.	1) Faulty VR302/402 * Repair or replace. 2) Defective IC302/402, R304/404, R305/405, C303/403, C304/404, C305/405 * Replace the defective part(s).
7) Frequency control "100 Hz" has no effect.	1) Faulty VR303/403 * Repair or replace. 2) Defective IC303/403, R306/406, R307/407, R308/408, C306/406, C307/407 * Replace the defective part(s).
8) Frequency control "180 Hz" has no effect.	1) Faulty VR304/404 * Repair or replace. 2) Defective IC304/404, R309/409, R310/410, C308/408, C309/409, C310/410 * Replace the defective part(s).
9) Frequency control "320 Hz" has no effect.	1) Faulty VR305/405 * Repair or replace. 2) Defective IC305/405, R311/411, R312/412, C311/411, C312/412 * Replace the defective part(s).

Symptom	Cause/Remedy
10) Frequency control "560 Hz" has no effect.	1) Faulty VR306/406 * Repair or replace. 2) Defective IC306/406, R313/413, R314/414, C313/413, C314/414 * Replace defective part(s).
11) Frequency control "1 KHz" has no effect.	1) Faulty VR307/407 * Repair or replace. 2) Defective IC306/406, R315/415, R316/416, R317/417, R318/418, C315/415, C316/416 * Repair defective part(s).
12) Frequency control "1.8 KHz" has no effect.	1) Faulty VR308/408 * Repair or replace. 2) Defective IC305/405, R319/419, R320/420, R321/421, R322/422 * Replace the defective part(s).
13) Frequency control "3.2 KHz" has no effect.	1) Faulty VR309/409 * Repair or replace. 2) Defective IC304/404, R323/423, R324/424, R325/425, C319/419, C320/420 * Replace defective part(s).
14) Frequency control "5.6 KHz" has no effect.	1) Faulty VR310/410 * Repair or replace. 2) Defective IC303/403, R326/426, R327/427, R328/428, C321/421, C322/422 * Replace defective part(s).
15) Frequency control "10 KHz" has no effect.	1) Faulty VR311/411 * Repair or replace. 2) Defective IC302/402, R329/429, R330/430, R331/431, C323/423, C324/424 * Replace defective part(s).
16) Frequency control "18 KHz" has no effect.	1) Faulty VR312/412 * Repair or replace. 2) Defective IC301/401, R332/432, R333/433, R334/434, C325/425, C326/426 * Replace defective part(s).
17) All controls have no effect.	1) Defective Resistor R135/136 or R141/142 * Replace the defective resistor(s). 2) Defective IC(s) IC102 and Transistor(s) TR103–110 * Replace the defective transistor(s).
18) LED Meter does not light up.	1) Defective IC201 * Replace the IC. 2) Defective IC202–208 * Replace the IC(s). 3) Defective LED D501–514 * Replace the LED(s).

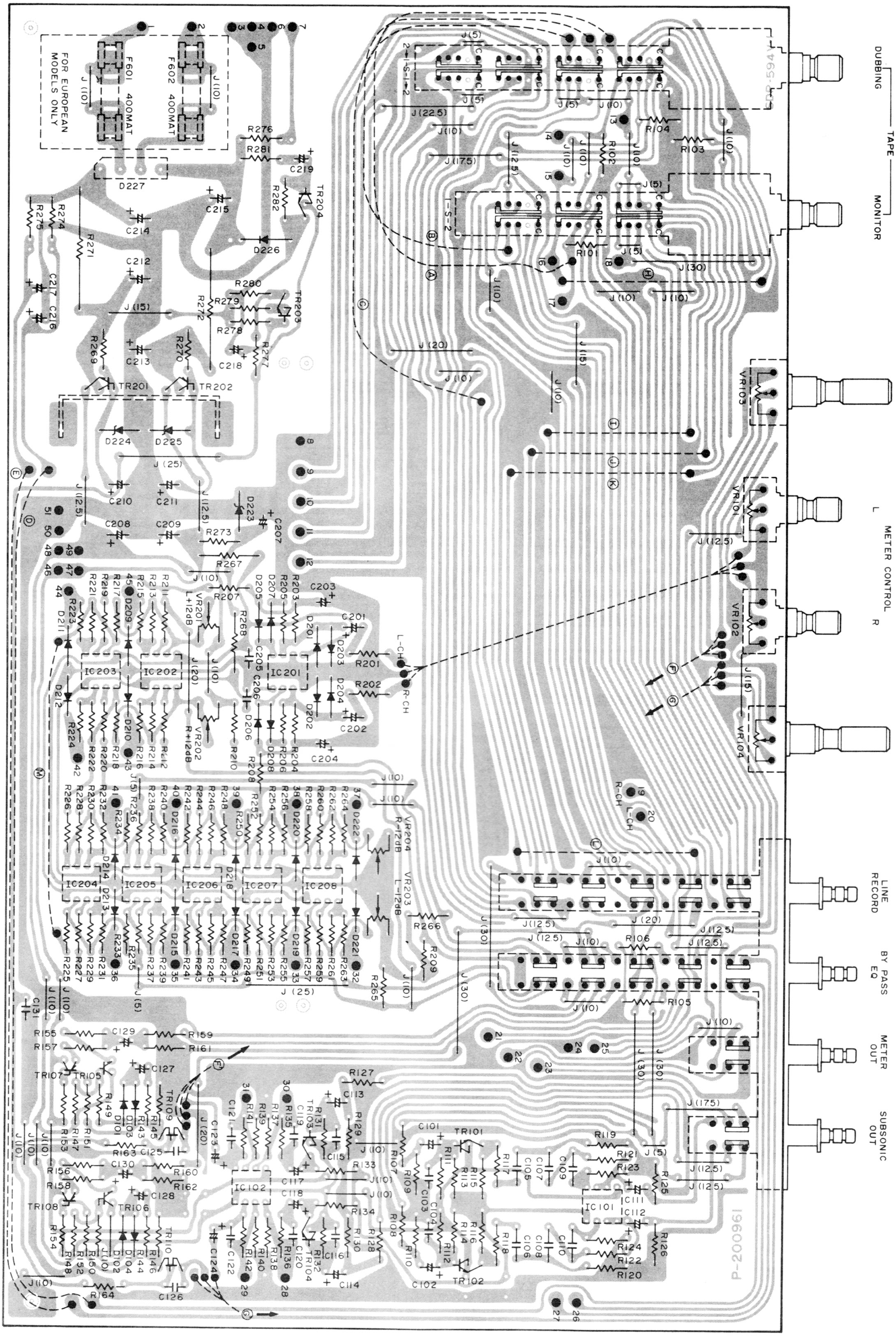
Symptom	Cause/Remedy
19) "OUTPUT" inoperative	1) Poor contact in "OUTPUT" jack * Repair or replace.
20) "INPUT" inoperative	1) Poor contact in "INPUT" jack * Repair or replace.
21) "TAPE IN 1" inoperative	1) Poor contact in "TAPE IN 1" jack * Repair or replace. 2) Faulty TAPE MONITOR/DUBBING switch * Repair or replace.
22) "TAPE IN 2" inoperative	1) Poor contact in "TAPE IN 2" jack * Repair or replace. 2) Faulty TAPE MONITOR/DUBBING switch * Repair or replace.
23) "TAPE OUT 1" inoperative	1) Poor contact in "TAPE OUT 1" jack * Repair or replace. 2) Faulty TAPE MONITOR/DUBBING switch * Repair or replace.
24) "TAPE OUT 2" inoperative	1) Poor contact in "TAPE OUT 2" jack * Repair or replace. 2) Faulty TAPE MONITOR/DUBBING switch * Repair or replace.
25) Slide Control indicator (LED) does not light up.	1) Defective D301–312, (D401–402) * Replace the LED(s). 2) Defective Resistor R274/275 * Replace the defective resistor(s).
26) Subsonic Filter has no effect.	1) Defective transistor TR101, TR102 and/or IC101, IC102 * Replace the transistor and/or IC(s). 2) Defective resistor R117–R124 * Replace the resistor(s). 3) Defective capacitor C105–110 * Replace the capacitor(s).

AMP & POWER SUPPLY P.C.B.

TOP VIEW



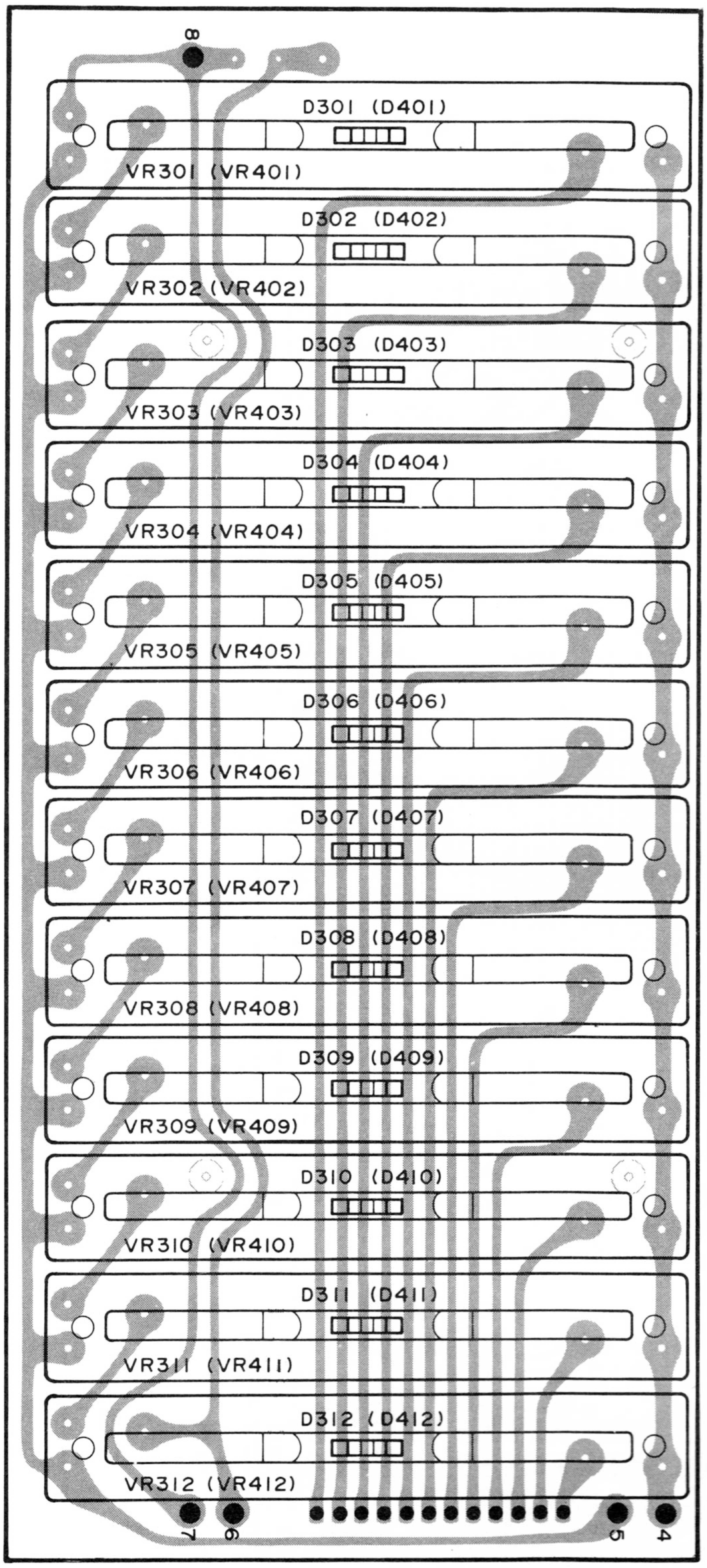
BOTTOM VIEW



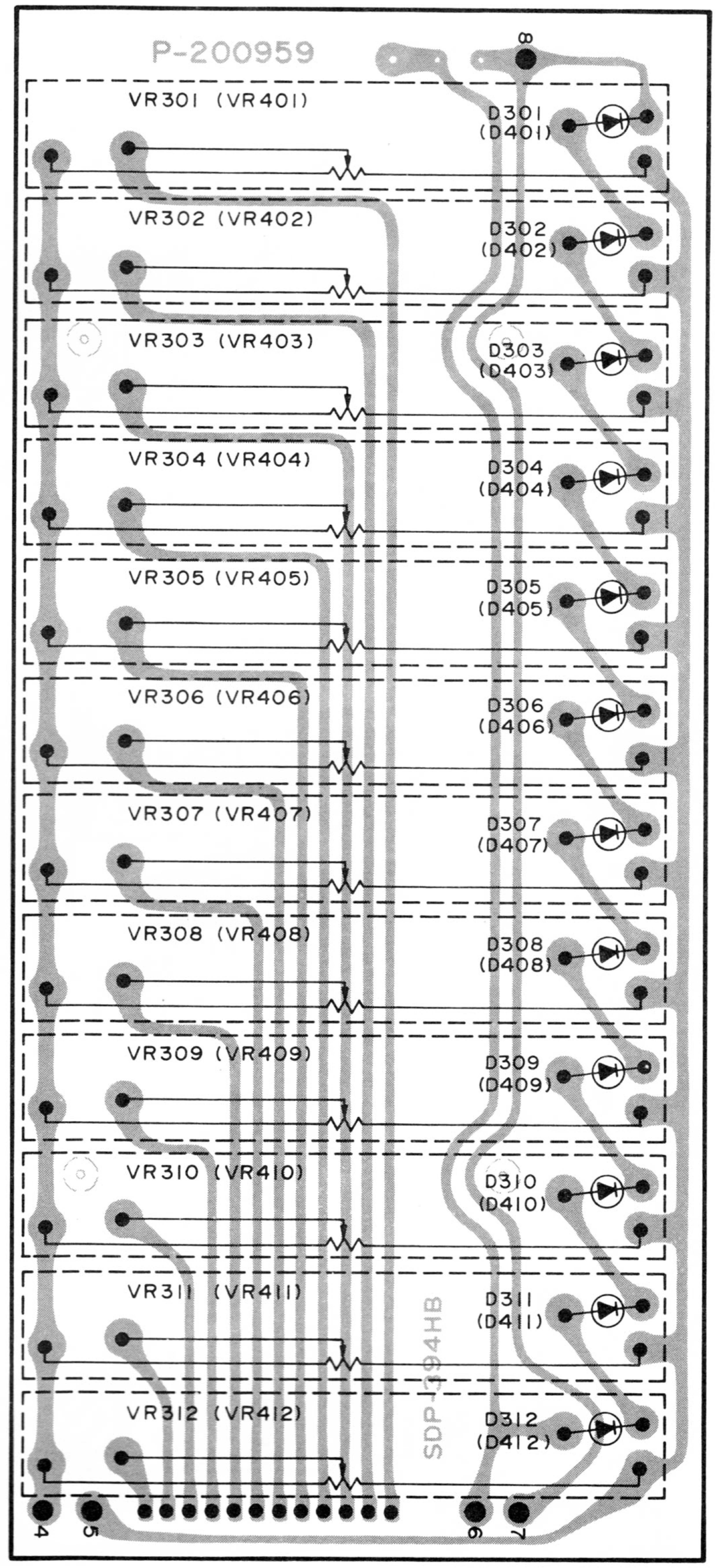
DUBBING
TAPE
MONITOR
LEFT-OUTPUT
L
METER CONTROL
R
RIGHT-OUTPUT
LINE RECORD
BY PASS EQ
METER OUT
SUBSONIC OUT
FOR EUROPEAN MODELS ONLY
F601 400MAT
F602 400MAT
L-CH
R-CH
P-200961

VOLUME P.C.B.

TOP VIEW

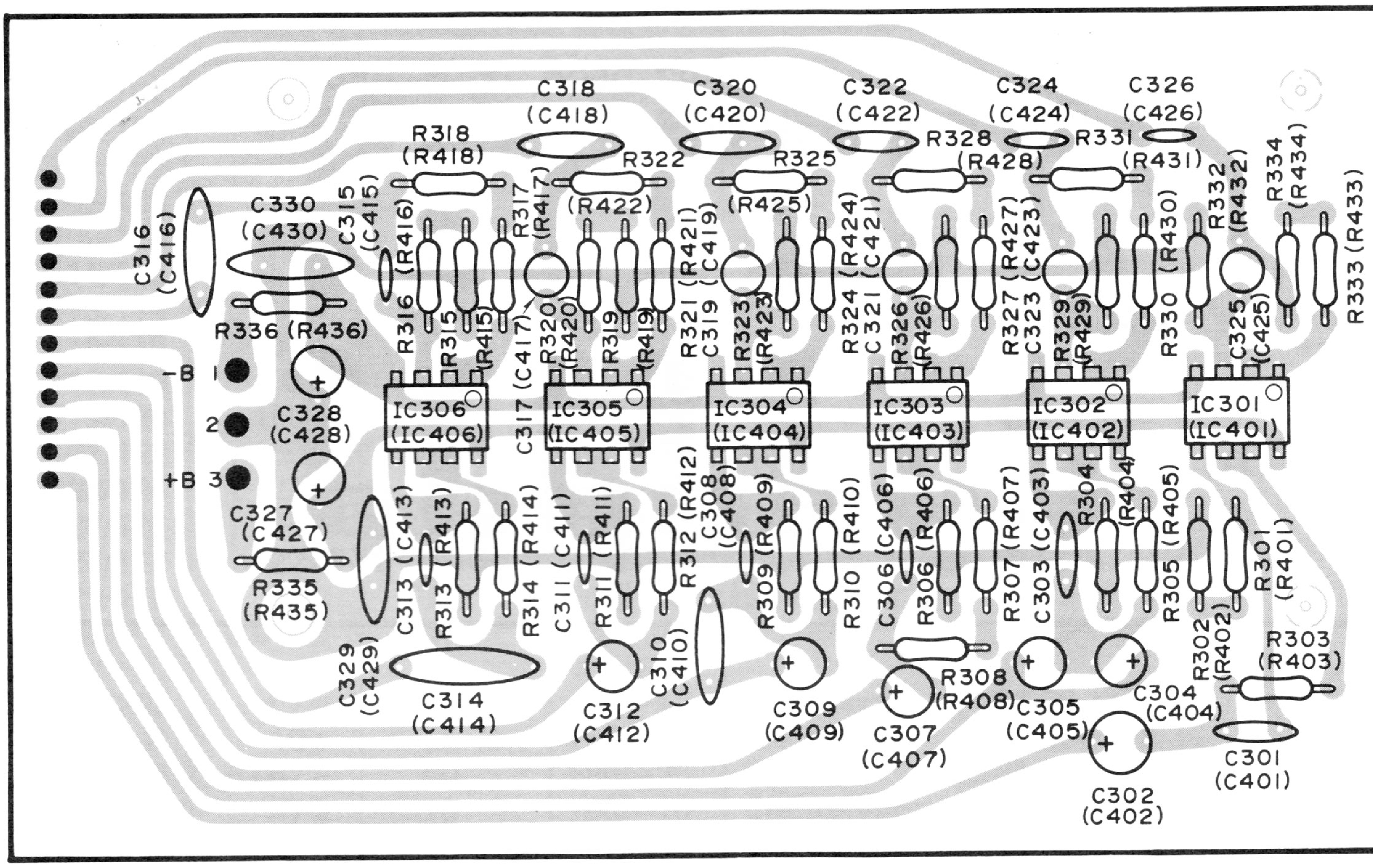


BOTTOM VIEW

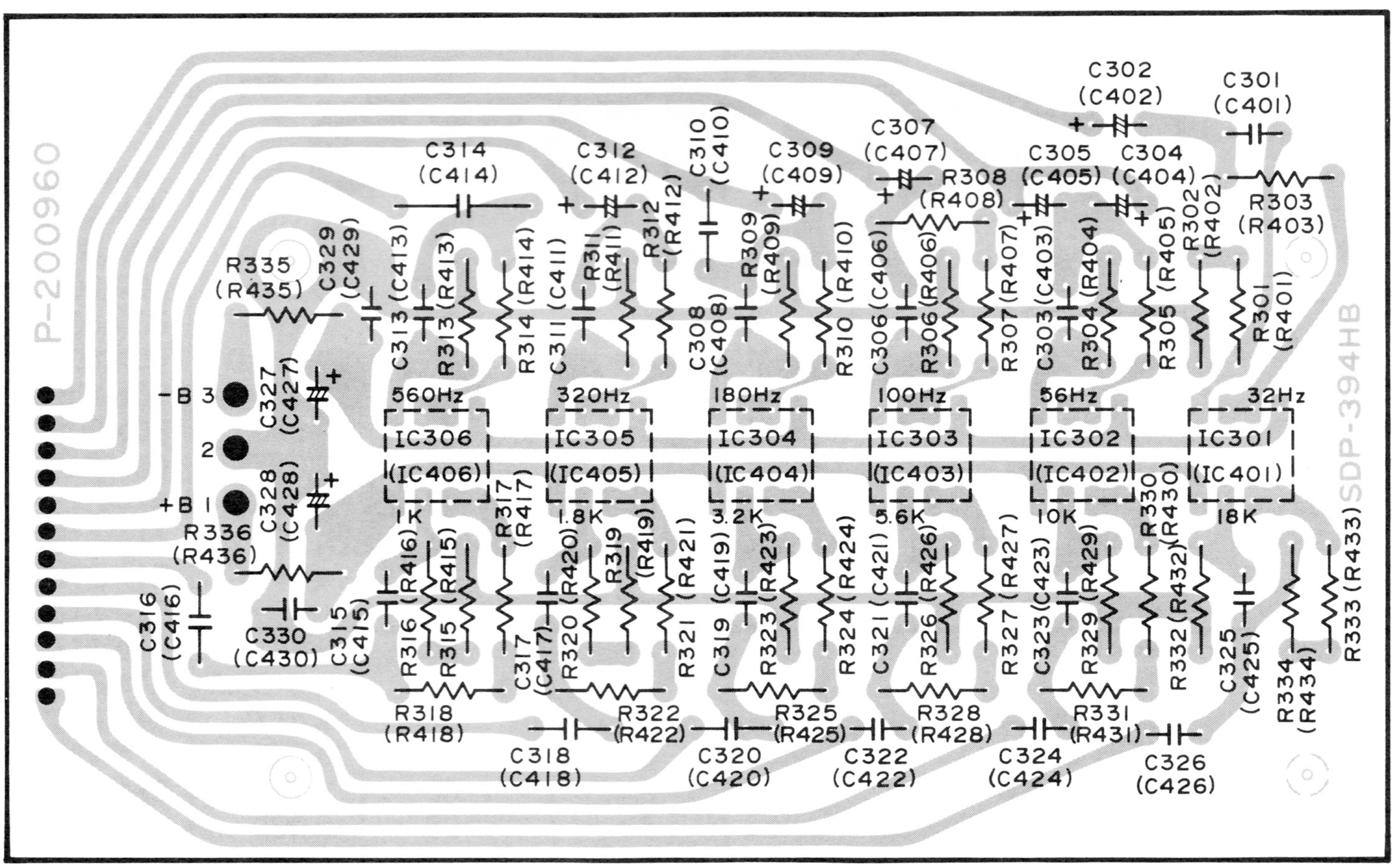


FILTER P.C.B.

TOP VIEW

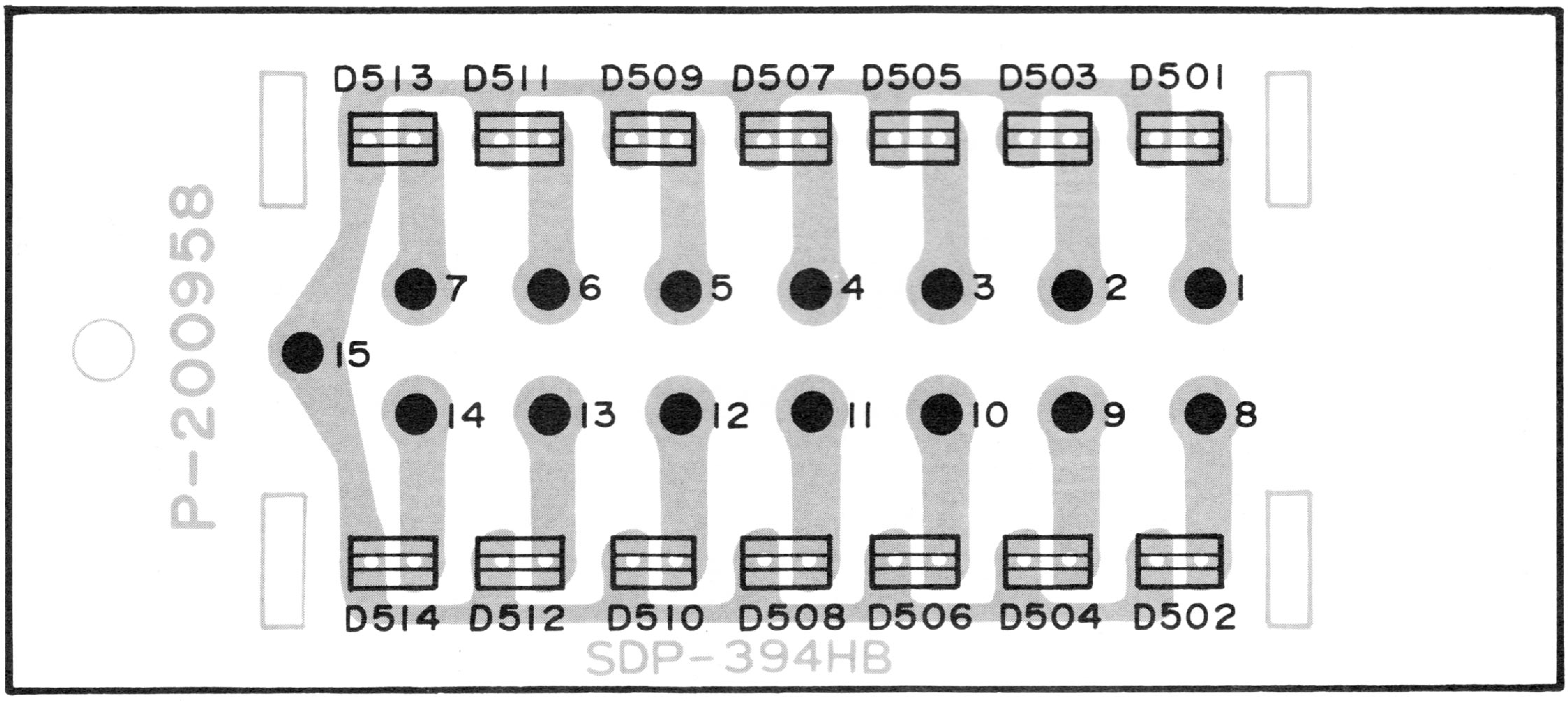


BOTTOM VIEW

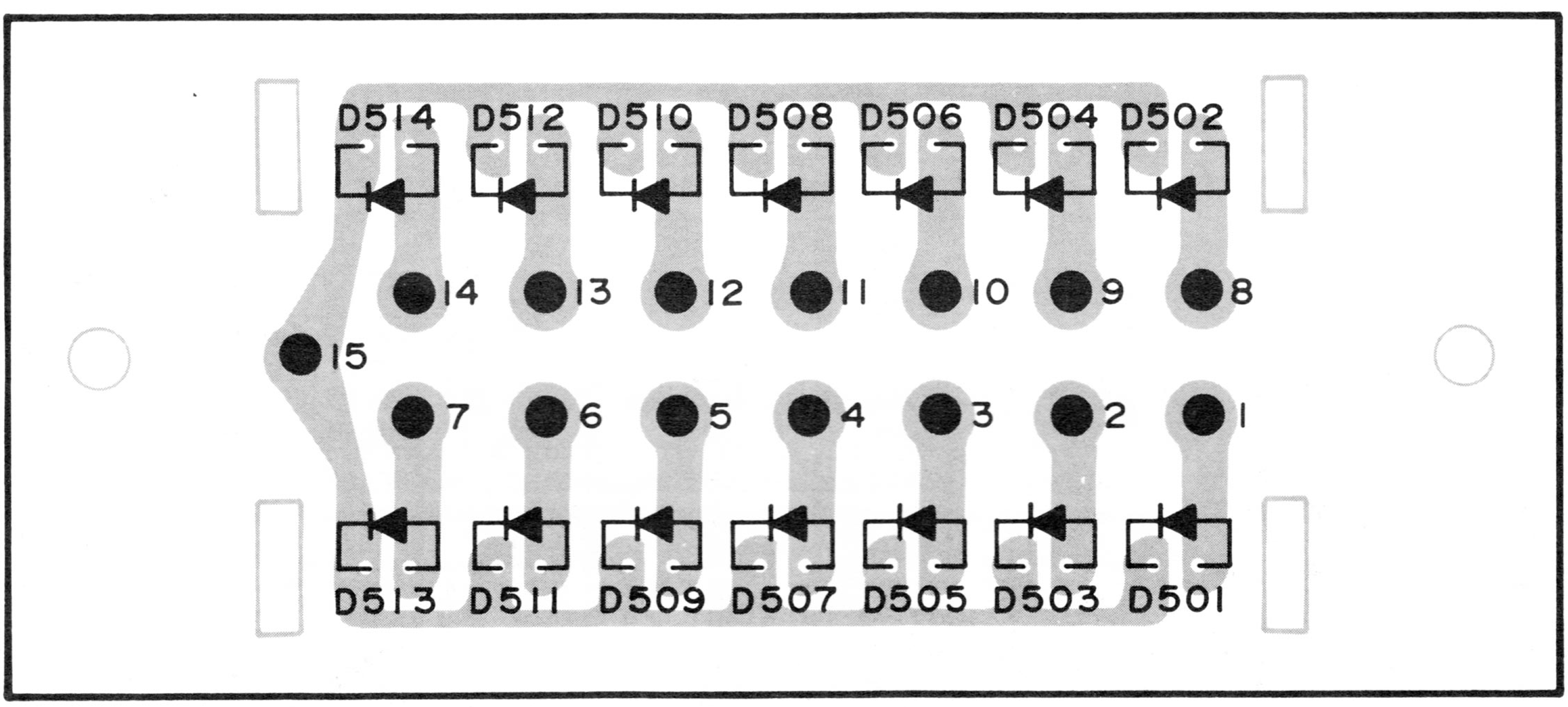


LED P.C.B.

TOP VIEW



BOTTOM VIEW



ELECTRICAL PARTS LIST

CAPACITORS

REF. NO.	Value (F)	Voltage (V)	Tolerance (%)	Material	BSR/ADC PART NO.	MFR'S PART NO.
C101/102	2.2 μ	50/35	±10	Electrolytic	31-25-1202	
C103/104	100 p	50	±5	Ceramic	31-25-1069	
C105/106	0.15 μ	50	±10	Mylar	31-25-1082	
C107/108	0.1 μ	50	±10	Mylar	31-25-1099	
C109/110	0.1 μ	50	±10	Mylar	31-25-1099	
C111/112	2.2 μ	50/35	±10	Electrolytic	31-25-1202	
C113/114	2.2 μ	50/35	±10	Electrolytic	31-25-1202	
C115/116	330 p	50	±5	Ceramic	31-25-1367	
C117/118	33 μ	25	+50/−10	Electrolytic	31-25-1060	
C119/120	150 p	50	±5	Ceramic	31-25-1368	
C121/122	150 p	50	±5	Ceramic	31-25-1368	
C123/124	22 μ	16	+50/−10	Electrolytic	31-25-1372	
C125/126	470 p	50	±5	Ceramic	31-25-1302	
C127/128	22 μ	16	+50/−10	Electrolytic	31-25-1372	
C129/130	33 μ	16	+50/−10	Electrolytic	31-25-1373	
C131	0.047 μ	50	+80/−20	Ceramic	31-25-1366	
C201/202	4.7 μ	35	+50/−10	Electrolytic	31-25-1363	
C203/204	10 μ	25	+50/−10	Electrolytic	31-25-1208	
C205/206	0.047 μ	50	+80/−20	Ceramic	31-25-1366	
C207	47 μ	10	+50/−10	Electrolytic	31-25-1073	
C208/209	220 μ	25	+50/−10	Electrolytic	31-25-1221	
C210/211	220 μ	25	+50/−10	Electrolytic	31-25-1221	
C212/213	220 μ	35	+50/−10	Electrolytic	31-25-1221	
C214	220 μ	35	+50/−10	Electrolytic	31-25-1221	
C215	470 μ	35	+50/−10	Electrolytic	31-25-1359	
C216/217	10 μ	35	+50/−10	Electrolytic	31-25-1207	
C218	4.7 μ	50	+50/−10	Electrolytic	31-25-1363	
C219	3.3 μ	50	+75/−10	Electrolytic	31-25-1374	
C301/401	0.033 μ	50	±5	Mylar	31-25-1389	
C302/402	4.7 μ	50	±10	Electrolytic	31-25-1363	
C303/403	0.022 μ	50	±5	Mylar	31-25-1387	
C304/404	2.2 μ	50	±10	Electrolytic	31-25-1202	
C305/405	0.47 μ	50	±10	Electrolytic	31-25-1080	
C306/406	0.012 μ	50	±5	Mylar	31-25-1392	
C307/407	1.5 μ	50	±10	Electrolytic	31-25-1339	
C308/408	0.0068 μ	50	±5	Mylar	31-25-1397	
C309/409	0.68 μ	50	±10	Electrolytic	31-25-1201	
C310/410	0.12 μ	50	±5	Mylar	31-25-1100	
C311/411	0.0039 μ	50	±5	Mylar	31-25-1386	
C312/412	0.47 μ	50	±10	Electrolytic	31-25-1080	
C313/413	0.0022 μ	50	±5	Mylar	31-25-1456	
C314/414	0.27 μ	50	±5	Mylar	31-25-1393	
C315/415	0.0012 μ	50	±5	Mylar	31-25-1081	
C316/416	0.15 μ	50	±5	Mylar	31-25-1082	
C317/417	680 p	50	±5	Polystyrene	31-25-1576	
C318/418	0.082 μ	50	±5	Mylar	31-25-1378	
C319/419	390 p	50	±5	Polystyrene	31-25-1578	
C320/420	0.047 μ	50	±5	Mylar	31-25-1084	
C321/421	220 p	50	±5	Polystyrene	31-25-1338	

REF. NO.	Value (F)	Voltage (V)	Tolerance (%)	Material	BSR/ADC PART NO.	MFR'S PART NO.
C322/422	0.027 μ	50	±5	Mylar	31-25-1385	
C323/423	120 p	50	±5	Polystyrene	31-25-1579	
C324/424	0.015 μ	50	±5	Mylar	31-25-1086	
C325/425	100 p	50	±5	Polystyrene	31-25-1580	
C326/426	0.0082 μ	50	±5	Mylar	31-25-1087	
C327/427	22 μ	25	+50/−10	Electrolytic	31-25-1219	
C328/428	22 μ	25	+50/−10	Electrolytic	31-25-1219	
C329/429	0.047 μ	50	+80/−20	Ceramic	31-25-1366	
C330/430	0.047 μ	50	+80/−20	Ceramic	31-25-1366	
C601	0.01 μ (MY type)	125 (USA, Canadian)	+80/−20	Ceramic	31-25-1066	P-220044 or P-220092
	0.01 μ (X type)	250 (PX)	+80/−20	Ceramic	31-25-1002	P-220022
	0.01 μ (PME 265 type)	250 (European)	+80/−20	Ceramic	31-25-1066	P-220068
	0.01 μ	50	+80/−20	Ceramic	31-25-1096	

DIODES

REF. NO.	DESCRIPTION		BSR/ADC PART NO.	MANUFACTURER
D101/102	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D103/104	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D201/202	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D203/204	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D205/206	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D207/208	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D209/210	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D211/212	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D213/214	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D215/216	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D217/218	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D219/220	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D221/222	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS
D223	Zener Diode	WZ-056 or HZ-6B1	31-53-1064	JRC or HITACHI
D224/225	Zener Diode	WZ-182	31-53-1134	JRC
D226	Si Diode	ITT-73N or 1N-4148	31-53-1080 or 31-53-1057	ITT or PHILIPS

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MANUFACTURER
D227	Si Diode SVB-10-200 (Bridge type)	31-53-1063	UNIZON

IC's

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MANUFACTURER
IC101/102	IC NJM4558DX or TL4558PB	31-54-1455	JRC or TI
IC201	IC NJM4560D	31-54-1454	JRC
IC202/203	IC NJM4558DM or TL4558PB	31-54-1453	JRC or TI
IC204/205	IC NJM4558DM or TL4558PB	31-54-1453	JRC or TI
IC206/207	IC NJM4558DM or TL4558PB	31-54-1453	JRC or TI
IC208	IC NJM4558DM or TL4558PB	31-54-1453	JRC or TI
IC301/401	IC NJM4558D or TL4558PA	31-54-1452	JRC or TI
IC302/402	IC NJM4558D or TL4558PA	31-54-1452	JRC or TI
IC303/403	IC NJM4558D or TL4558PA	31-54-1452	JRC or TI
IC304/404	IC NJM4558D or TL4558PA	31-54-1452	JRC or TI
IC305/405	IC NJM4558D or TL4558PA	31-54-1452	JRC or TI
IC306/406	IC NJM4558D or TL4558PA	31-54-1452	JRC or TI

LED's

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MANUFACTURER
D501/502	LED SLP151B (red)	31-53-1096	SANYO
D503/504	LED SLP151B (red)	31-53-1096	SANYO
D505/506	LED SLP151B (red)	31-53-1096	SANYO
D507/508	LED SLP151B (red)	31-53-1096	SANYO
D509/510	LED SLP151B (red)	31-53-1096	SANYO
D511/512	LED SLP151B (red)	31-53-1096	SANYO
D513/514	LED SLP151B (red)	31-53-1096	SANYO
D301/401	LED PR503K-5 (red)	31-53-1077	STANLEY
D302/402	LED PR503K-5 (red)	31-53-1077	STANLEY
D303/403	LED PR503K-5 (red)	31-53-1077	STANLEY
D304/404	LED PR503K-5 (red)	31-53-1077	STANLEY
D305/405	LED PR503K-5 (red)	31-53-1077	STANLEY
D306/406	LED PR503K-5 (red)	31-53-1077	STANLEY
D307/407	LED PR503K-5 (red)	31-53-1077	STANLEY
D308/408	LED PR503K-5 (red)	31-53-1077	STANLEY
D309/409	LED PR503K-5 (red)	31-53-1077	STANLEY
D310/410	LED PR503K-5 (red)	31-53-1077	STANLEY
D311/411	LED PR503K-5 (red)	31-53-1077	STANLEY
D312/412	LED PR503K-5 (red)	31-53-1077	STANLEY
D601	LED LT-201 (red)	31-53-1066	LITON

FUSES

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
	Midget Fuse 400 mAT, 250 V (European)	31-22-1421	P-250085

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
	Fuse 0.5 A, 250 V (PX)	31-22-1410	P-250081

TRANSFORMERS

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
T601	Power Transformer 120 V, 60 Hz (USA, Canadian)	31-27-1048	P-100839 or P-100842
T601	Power Transformer 230 V, 50 Hz (European)	31-27-1049	P-100840 or P-100843
T601	Power Transformer 100/120/220/240 V, 50/60 Hz (PX)	31-27-1050	P-100841 or P-100844

RESISTORS

REF. NO.	Value (Ω)	Wattage (W)	Tolerance (%)	Material	BSR/ADC PART NO.	MFR'S PART NO.
R101/102	470 K	¼	±5	Carbon	31-23-1001-474	
R103/104	470 K	¼	±5	Carbon	31-23-1001-474	
R105/106	47 K	¼	±5	Carbon	31-23-1001-473	
R107/108	1 K	¼	±5	Carbon	31-23-1001-102	
R109/110	220 K	¼	±5	Carbon	31-23-1001-224	
R111/112	220 K	¼	±5	Carbon	31-23-1001-224	
R113/114	270 K	¼	±5	Carbon	31-23-1001-274	
R115/116	3.3 K	¼	±5	Carbon	31-23-1001-332	
R117/118	220	¼	±5	Carbon	31-23-1001-221	
R119/120	47 K	¼	±5	Carbon	31-23-1001-473	
R121/122	24 K	¼	±5	Carbon	31-23-1001-243	
R123/124	560 K	¼	±5	Carbon	31-23-1001-564	
R125/126	10 K	¼	±5	Carbon	31-23-1001-103	
R127/128	1 K	¼	±5	Carbon	31-23-1001-102	
R129/130	220 K	¼	±5	Carbon	31-23-1001-224	
R131/132	470 K	¼	±5	Carbon	31-23-1001-474	
R133/134	1.8 K	¼	±5	Carbon	31-23-1001-182	
R135/136	3 K	¼	±5	Carbon	31-23-1001-302	
R137/138	470 K	¼	±5	Carbon	31-23-1001-474	
R139/140	470 K	¼	±5	Carbon	31-23-1001-474	
R141/142	3 K	¼	±5	Carbon	31-23-1001-302	
R143/144	560	¼	±5	Carbon	31-23-1001-561	
R145/146	100 K	¼	±5	Carbon	31-23-1001-104	
R147/148	100 K	¼	±5	Carbon	31-23-1001-104	
R149/150	680	¼	±5	Carbon	31-23-1001-681	
R151/152	680	¼	±5	Carbon	31-23-1001-681	
R153/154	100 K	¼	±5	Carbon	31-23-1001-104	
R155/156	22	¼	±5	Carbon	31-23-1001-220	
R157/158	22	¼	±5	Carbon	31-23-1001-220	
R159/160	82	¼	±5	Carbon	31-23-1001-820	
R161/162	10 K	¼	±5	Carbon	31-23-1001-103	
R163/164	3.3 M	¼	±5	Carbon	31-23-1001-335	
R201/202	33 K	¼	±5	Carbon	31-23-1001-333	
R203/204	100 K	¼	±5	Carbon	31-23-1001-104	
R205/206	100 K	¼	±5	Carbon	31-23-1001-104	

REF. NO.	Value (Ω)	Wattage (W)	Tolerance (%)	Material	BSR/ADC PART NO.	MFR'S PART NO.
R207/208	10 K	¼	±5	Carbon	31-23-1001-103	
R209	3.3 K	¼	±5	Carbon	31-23-1001-332	
R210	47 K	¼	±5	Carbon	31-23-1001-473	
R211/212	1 K	¼	±5	Carbon	31-23-1001-102	
R213/214	3.3 M	¼	±5	Carbon	31-23-1001-335	
R215/216	2.7 K	¼	±5	Carbon	31-23-1001-272	
R217/218	3 K	¼	±5	Carbon	31-23-1001-302	
R219/220	1 K	¼	±5	Carbon	31-23-1001-102	
R221/222	3.3 M	¼	±5	Carbon	31-23-1001-335	
R223/224	2.7 K	¼	±5	Carbon	31-23-1001-272	
R225/226	1.8 K	¼	±5	Carbon	31-23-1001-182	
R227/228	1 K	¼	±5	Carbon	31-23-1001-102	
R229/230	3.3 M	¼	±5	Carbon	31-23-1001-335	
R231/232	2.7 K	¼	±5	Carbon	31-23-1001-272	
R233/234	1 K	¼	±5	Carbon	31-23-1001-102	
R235/236	1 K	¼	±5	Carbon	31-23-1001-102	
R237/238	3.3 M	¼	±5	Carbon	31-23-1001-335	
R239/240	2.7 K	¼	±5	Carbon	31-23-1001-272	
R241/242	680	¼	±5	Carbon	31-23-1001-681	
R243/244	1 K	¼	±5	Carbon	31-23-1001-102	
R245/246	3.3 M	¼	±5	Carbon	31-23-1001-335	
R247/248	2.7 K	¼	±5	Carbon	31-23-1001-272	
R249/250	390	¼	±5	Carbon	31-23-1001-391	
R251/252	1 K	¼	±5	Carbon	31-23-1001-102	
R253/254	3.3 M	¼	±5	Carbon	31-23-1001-335	
R255/256	2.7 K	¼	±5	Carbon	31-23-1001-272	
R257/258	220	¼	±5	Carbon	31-23-1001-221	
R259/260	1 K	¼	±5	Carbon	31-23-1001-102	
R261/262	3.3 M	¼	±5	Carbon	31-23-1001-335	
R263/264	2.7 K	¼	±5	Carbon	31-23-1001-272	
R265/266	47 K	¼	±5	Carbon	31-23-1001-473	
R267	150	2	±5	Metal Oxide	31-23-1004-151	
R268	100	2	±5	Metal Oxide	31-23-1004-101	
R269/270	1.2 K	¼	±5	Carbon	31-23-1001-122	
R271/272	33	3	±5	Metal Oxide	31-23-1005-330	
R273	1.2 K	¼	±5	Carbon	31-23-1001-122	
R274/275	390	¼	±5	Carbon	31-23-1001-391	
R276	8.2 K	¼	±5	Carbon	31-23-1001-822	
R277	3.3 M	¼	±5	Carbon	31-23-1001-335	
R278	220 K	¼	±5	Carbon	31-23-1001-224	
R279	4.7 K	¼	±5	Carbon	31-23-1001-472	
R280/281	47 K	¼	±5	Carbon	31-23-1001-473	
R282	100 K	¼	±5	Carbon	31-23-1001-104	
R301/401	330 K	¼	±2	Carbon	31-23-1006-334	
R302/402	22 K	¼	±5	Carbon	31-23-1001-223	
R303/403	470	¼	±2	Carbon	31-23-1006-471	
R304/404	330 K	¼	±2	Carbon	31-23-1006-334	
R305/405	430	¼	±2	Carbon	31-23-1006-431	
R306/406	300 K	¼	±2	Carbon	31-23-1006-304	
R307/407	390	¼	±2	Carbon	31-23-1006-391	
R308/408	15	¼	±5	Carbon	31-23-1001-150	
R309/409	360 K	¼	±2	Carbon	31-23-1006-364	
R310/410	390	¼	±2	Carbon	31-23-1006-391	

REF. NO.	Value (Ω)	Wattage (W)	Tolerance (%)	Material	BSR/ADC PART NO.	MFR'S PART NO.
R311/411	390 K	¼	±2	Carbon	31-23-1006-394	
R312/412	360	¼	±2	Carbon	31-23-1006-361	
R313/413	300 K	¼	±2	Carbon	31-23-1006-304	
R314/414	430	¼	±2	Carbon	31-23-1006-431	
R315/415	330 K	¼	±2	Carbon	31-23-1006-334	
R316/416	22 K	¼	±5	Carbon	31-23-1001-223	
R317/417	390	¼	±2	Carbon	31-23-1006-391	
R318/418	24	¼	±5	Carbon	31-23-1001-240	
R319/419	330 K	¼	±2	Carbon	31-23-1006-334	
R320/420	22 K	¼	±5	Carbon	31-23-1001-223	
R321/421	390	¼	±2	Carbon	31-23-1006-391	
R322/422	22	¼	±5	Carbon	31-23-1001-220	
R323/423	330 K	¼	±2	Carbon	31-23-1006-334	
R324/424	390	¼	±2	Carbon	31-23-1006-391	
R325/425	33	¼	±5	Carbon	31-23-1001-330	
R326/426	330 K	¼	±2	Carbon	31-23-1006-334	
R327/427	390	¼	±2	Carbon	31-23-1006-391	
R328/428	33	¼	±5	Carbon	31-23-1001-330	
R329/429	330 K	¼	±2	Carbon	31-23-1006-334	
R330/430	390	¼	±2	Carbon	31-23-1006-391	
R331/431	33	¼	±5	Carbon	31-23-1001-330	
R332/432	240 K	¼	±2	Carbon	31-23-1006-244	
R333/433	390	¼	±2	Carbon	31-23-1006-391	
R334/434	22	¼	±5	Carbon	31-23-1001-220	
R335/435	56	¼	±5	Carbon	31-23-1001-560	
R336/436	56	¼	±5	Carbon	31-23-1001-560	

SWITCHES

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
Sd1–Sd8	Tape Dubbing Switch	31-16-1062	P-180539
Sm1–Sm6	Tape Monitor Switch	31-16-1063	P-180540
S1a–S1j	LINE/REC Switch	31-16-1061	P-180538
S2a–S2j	EQ/BY-PASS Switch	31-16-1061	P-180538
S3a–S3b	METER/OUT Switch	31-16-1061	P-180538
S4a–S4b	SUBSONIC Filter IN/OUT Switch	31-16-1061	P-180538
S601	Power Switch (USA, Canadian PX)	31-16-1005	P-180382
S601	Power Switch (European)	31-16-1006	P-180383
	Voltage Selector Switch (PX)	31-16-1046	P-180537

TRANSFORMERS

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MANUFACTURER
TR101/102	2SC1313G, 2SC1222(E,F) or 2SC1843(E,F)	31-53-1083	MITSUBISHI or NEC
TR103/104	2SC1313G, 2SC1222(E,F) or 2SC1843(E,F)	31-53-1083	MITSUBISHI or NEC
TR105/106	2SC1313G, 2SC1222(E) or 2SC1843(E)	31-53-1083	MITSUBISHI or NEC
TR107/108	2SA750(E) or 2SA990(E) or 2SA992(F)	31-53-1073	NEC
TR109/110	FET 2SK30A(GR) or 2SK246(GR)	31-53-1091	TOSHIBA

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MANUFACTURER
TR201 TR202 TR202/204	2SD600(D,E) 2SB631(D,E) 2SC1313G, 2SC1222(E,F) or 2SC1843(E,F)	31-53-1072 31-53-1074 31-53-1083	SANYO SANYO MITSUBISHI or NEC

VARIABLE RESISTORS

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
VR101/102 VR103/104	Potentiometer 50 KΩ B Potentiometer 10 KΩ 3B	31-16-1064 31-16-1013	P-171446 P-170481
VR201/202 VR203/204	Trimmer 100 KΩ B Trimmer 1 KΩ B	31-16-1054 31-16-1055	P-170516 P-170510
VR301– VR312	Potentiometer (Gain Control) 50 KΩ 5B or 50 KΩ SW	31-21-1007	P-171326 or P-171327
VR401–	Potentiometer (Gain Control) 50 KΩ 5B or 50 KΩ SW	31-21-1007	P-171326 or P-171327

EXPLODED VIEW PARTS LIST

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
1	AMP Assembled P.C.B.	31-17-1449	U-23188
2	CONTROL Assembled P.C.B.	31-17-1450	U-23189
3	P.C.B. Holder	31-13-1094	P-610885
4	LED Assembled P.C.B.	31-17-1826	U-25206
5	Front Chassis Ass'y	31-13-1266	P-400334
	Consisting of Front Chassis	31-13-1268	P-400333
	Headphone Holder	31-13-1099	P-412419
6	Side Chassis (L)	31-14-1263	P-400336
7	Side Chassis (R)	31-14-1264	P-400335
8	Spacer	31-14-1265	P-680305
9	Back Panel (U.S.A.)	31-14-1259	P-412410
	Back Panel (Canadian)	31-14-1260	P-412411
	Back Panel (European)	31-14-1261	P-412412
	Back Panel (PX)	31-14-1262	P-412413
10	6P RCA Jack	31-18-1011	P-320151
11	AC Outlet (U.S.A., PX)	31-18-1005	P-190157 or P-190098
	AC Outlet (Canadian)	31-18-1006	P-190157 or P-190324
12	Voltage Selector Switch (PX)	31-16-1046	P-180537
13	AC Cord (U.S.A., Canadian)	31-46-1020	P-310115
	AC Cord (European)	31-46-1018	P-310105
	AC Cord (PX)	31-46-1019	P-310106
14	AC Cord Strain Relief (U.S.A., PX, Canadian)	31-13-1251	P-480010
	AC Cord Strain Relief (European)	31-13-1066	P-480080
15	Fuse Holder (PX)	31-18-1954	P-260016
16	Fuse 250 V 0.2 A Quick (PX)	31-22-1410	P-250081
17	Midget Fuse (European)	31-22-1421	P-250085
18	Line Pass Capacitor (MY Type) (U.S.A., Canadian)	31-25-1025	P-220044 or P-220092
	Line Pass Capacitor (PME265) (European)	31-25-1371	P-220068
	Line Pass Capacitor (PME271) (PX)	31-25-1002	P-220022
19	Capacitor Cover (PX)	31-40-1009	P-610466
20	Switch Cover (European)	31-40-1007	P-480145
21	Power Transformer (U.S.A.)	31-27-1048	P-100839 or P-100842
	Power Transformer (Canadian)		P-100842
	Power Transformer (European)	31-27-1049	P-100840 or P-100843
	Power Transformer (PX)	31-27-1050	P-100841 or P-100844
22	Power Switch (U.S.A., PX, Canadian)	31-16-1005	P-180382
	Power Switch (European)	31-16-1006	P-180383
23	Block Terminal (European)	31-18-1008	P-320251
24	Insulation Sheet (European)	31-40-1023	P-690251
25	LED		
26	LED Holder (Rubber)	31-13-1261	P-680199
27	Headphone Jack	31-20-1010	P-190155
28	Insulation Cap (European)	31-40-1030	P-480379
29	Front Panel	31-14-1269	P-700531
30	Blind Sheet	31-40-1036	P-480371
31	Knob Guide	31-14-1223	P-610707
32	Cushion	31-14-1096	P-680298
33	Handle	31-14-1218	P-170235

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
34	Slide Control Knob (530)	31-14-1011	P-650530
35	Knob Lens	31-18-1010	P-610772
36	Push Knob (496)	31-14-1162	P-650496
37	LED Meter Knob (400)	31-14-1138	P-650400
38	Lever Knob (454)	31-14-1012	P-650454
39	Blind Sheet	31-14-1037	P-480394
40	Cabinet	31-14-1270	P-412414
41	Bottom Plate	31-14-1271	P-412415
42	Foot (A) (ABS)	31-13-1140	P-610461
43	Foot (B) (Rubber)	31-13-1141	P-680145
44	Number Plate (B)	31-59-1224	P-730184
45	P.C.B. Holder (SPCC)	31-13-1104	P-412416
46	LED Holder (ABS)	31-13-1105	P-610862
47	Heat Sink	31-13-1106	P-412418

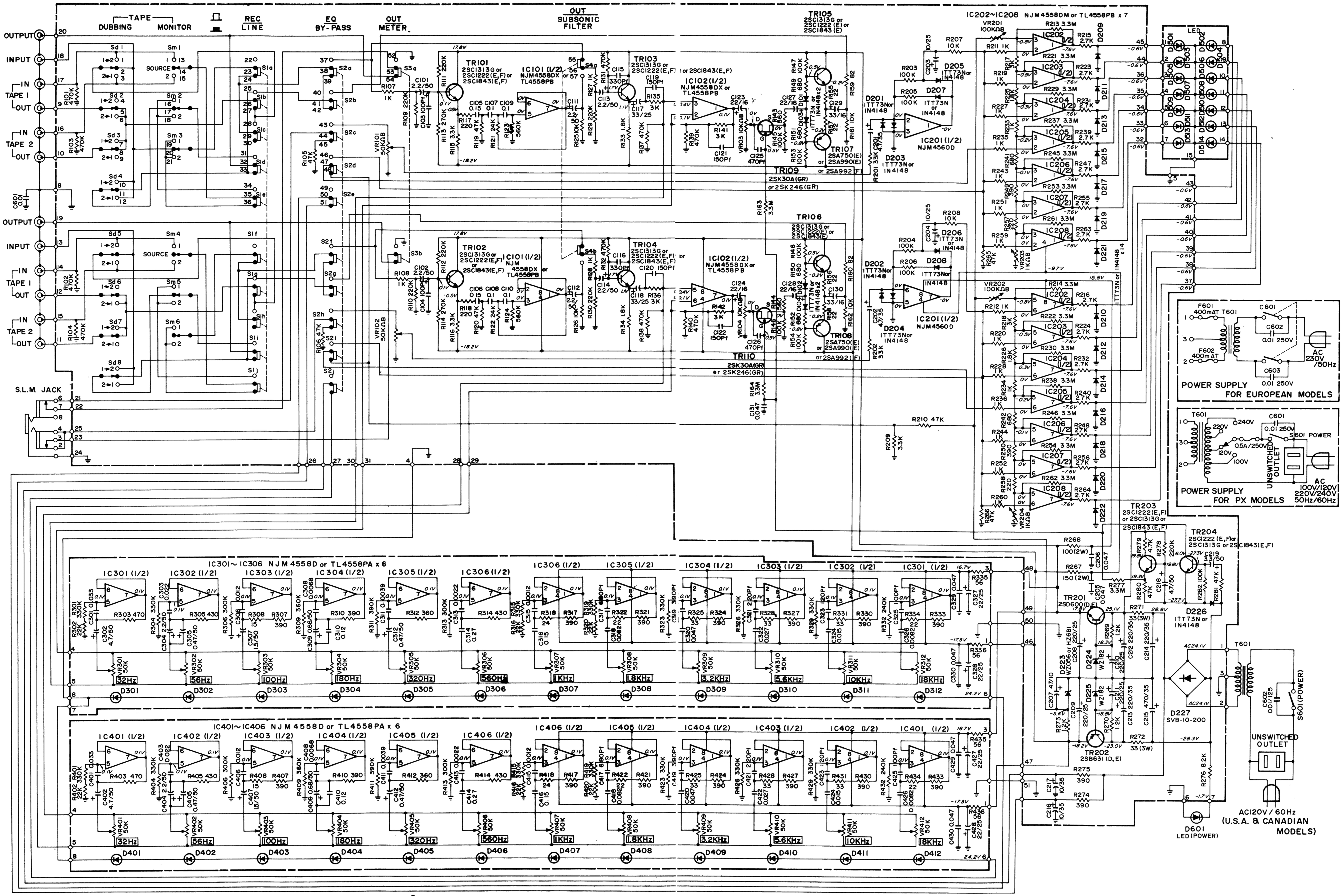
HARDWARE

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
S1	Tapping Screw 3 x 6BT-II		
S2	F-Lock Screw 3 x 5FL		
S3	Tapping Screw 3 x 8TNL-II		
S4	PLAX Screw 3 x 8PT		
S5	F-Lock Screw 3 x 8FL		
S6	Tapping Screw 3 x 8BT-III		
S7	Tapping Screw 3 x 20BT-III		
S8	Tapping Screw 3 x 8BT-II		
S9	Tapping Screw 4 x 10BT-III		
S10	Screw 3 x 6B		
N1	Nut 3N		
N2	Frange Nut 3FN		
N3	Nut 4N		
W1	Washer 3W		
W2	Washer SS-41		
W3	Washer 4W		
SW1	Spring Washer 4SW		
R1	Nylon Rivet (BLACK) 3 x 4.5BLK		
R2	Blind Rivet (BLACK) YB-420		
	Blind Rivet (BLACK) YB-423 (PX)		
R3	Blind Rivet (BLACK) YB-320		

MISCELLANEOUS PART LIST

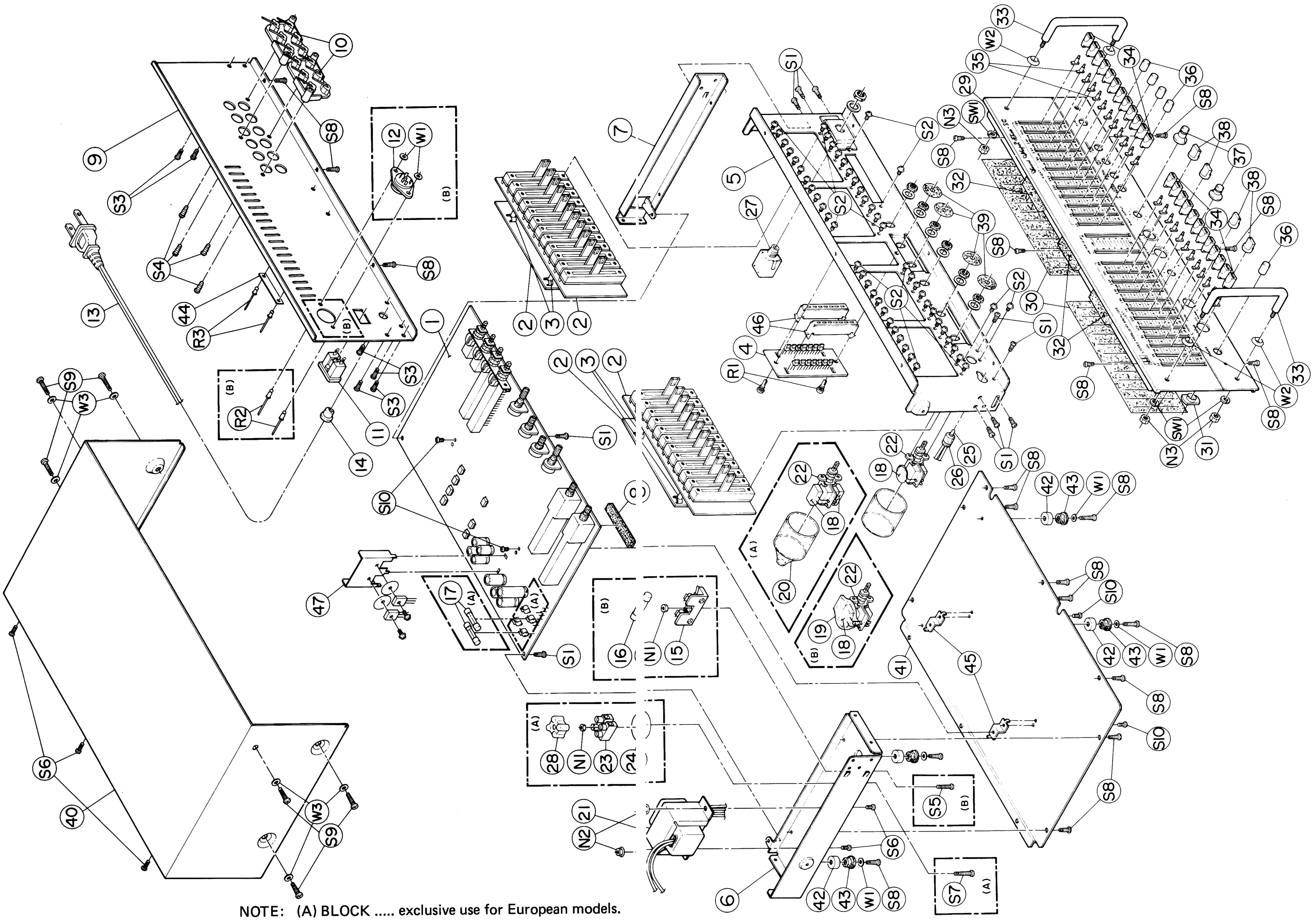
DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
Fuse Label (PX)	31-59-1695	P-811195
Sheet	31-40-1011	P-480181
Master Carton (U.S.A., Canadian, European)	31-59-1716	P-801083
Master Carton (PX)	31-59-1717	P-801084
Double Master Carbon (PX)	31-59-1718	P-801085
Gift Box (U.S.A., European, PX)	31-59-1719	P-801086
Gift Box (Canadian)	31-59-1720	P-801087
Snow Box	31-59-1721	P-820743
Poly Bag for Set	31-59-1463	P-820454
Poly Bag for AC Cord	31-59-1252	P-820418
Patch Cord	31-46-1008	P-190124
Warranty Card (2 years) (U.S.A.)	31-59-2231	813010030A
Warranty Card (2 years) (Canadian)	31-59-1670	P-811174
Warranty Card (1 year) (European, PX)	31-59-1475	P-810782
Caution Label (U.S.A., European, PX)	31-59-1665	P-811301
Caution Label (Canadian)	31-59-1666	P-811038
QC Label	31-59-1227	P-810019
UL Label J (U.S.A.)	31-59-1229	P-810100
C.S.A. Label (Canadian)	31-59-1269	P-810024
Pass Label	31-59-1230	P-810183
〶 Mark Label (PX)	31-59-1621	P-810902
IHF Tag (U.S.A.)	30-853-0463	P-810770
AC Cord Tag (European)	31-59-1239	P-810698
Owner's Manual (U.S.A., European, PX)	31-59-1678	P-811182
Service Manual	31-59-1713	
Pin Terminal 314	31-13-1092	P-320314
Fuse Terminal (European)	31-18-1015	P-190332
Flat Wire	31-47-1034	P-320384 or P-320404
Flat Wire	31-47-1035	P-320386 or P-320405
Flat Wire	31-47-1036	P-320387 or P-320406
Flat Wire	31-47-1037	P-320321 or P-320407
Pin Terminal 245	31-13-1065	P-320245

SCHEMATIC DIAGRAM



NOTE (1) ALL RESISTANCE VALUES ARE INDICATED IN "OHM" ($K=10^3$ OHM).
(2) ALL CAPACITANCE VALUES ARE INDICATED IN "μF" ($Pf=10^{-6}\mu F$).
(3) Sd1 - Sd8 : TAPE DUBBING SWITCH.
(4) Sm1 - Sm6 : TAPE MONITOR SWITCH.
(5) S1a - S1j : LINE/REC SWITCH.
(6) S2a - S2j : EQ/BY-PASS SWITCH.
(7) S3a - S3b : METER/OUT SWITCH.
(8) S4a - S4b : NOMAL/SUBSONIC FILTER SWITCH.
(9) S601 : POWER SWITCH.

EXPLODED VIEW



NOTE: (A) BLOCK ..... exclusive use for European models.
(B) BLOCK ..... exclusive use for PX models.

AUSTRALIA	BSR (A'ASIA) PTY. LTD. Monarch Works P.O.Box 272, Anne Street St. Mary's, NSW 2760, Australia
CANADA	BSR (CANADA) LTD. P.O.Box 7003, Station 'B' 26 Clairville Drive Rexdale, ONT. M9V 4B3, Canada
EUROPE	BSR LTD. Powke Lane, Cradley Heath Warley, West Midlands B64 5QH England
	ADC(EUROPE) Am Boksberg 4 3203 Sarstedt/Hannover West Germany
JAPAN	BSR (JAPAN) LTD. No. 7 Azuma Building 1-9 Kanda Sakuma-cho Chiyoda-ku, Tokyo 101 Japan
NEW ZEALAND	BSR (NEW ZEALAND) LTD. G.P.O. Box 26-30 271 Victoria St. W. Auckland 1, New Zealand

ADC Audio Dynamics

BSR (USA) LTD.
ADC PROFESSIONAL PROD. GROUP
ROUTE 303
BLAUVELT, N.Y. 10913, U.S.A.

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