Sound Shaper® Two

ADC

mark II

Service Manual

STEREO FREQUENCY EQUALIZER

Audio Dynamics Corporation

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THIS MANUAL APPLIES TO FOUR VERSIONS OF THE SOUND SHAPER TWO MARK II, PRODUCED FOR U.S.A., CANADA, EUROPE AND PX.

THE SOUND SHAPER TWO MARK II HAS BEEN MANUFACTURED IN BOTH TAIWAN AND JAPAN. REFER TO THE LABEL ON THE REAR PANEL FOR THE COUNTRY OF ORIGIN.

FOR PRODUCTION DIFFERENCES, REFER TO NOTES PERTAINING TO EACH SECTION.

PRODUCTION UNITS FROM JAPAN SHIPPED TO U.S.A. HAVE LEVEL CONTROLS LOCATED ON REAR PANEL.
ALL OTHER UNITS (MANUFACTURED IN TAIWAN AND JAPAN) HAVE LEVEL CONTROLS LOCATED ON FRONT PANEL. ANY OTHER CHANGES ARE COVERED IN THE APPROPRIATE SECTIONS OF THIS MANUAL.

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 30 Hz	(%)	±10%	±15%
	at 50 Hz	(%)	±10%	±15%
	at 90 Hz	(%)	±10%	±15%
	at 160 Hz	(%)	±10%	±15%
	at 300 Hz	(%)	±10%	±15%
	at 500 Hz	(%)	±10%	±15%
	at 900 Hz	(%)	±10%	±15%
	at 1.6 KHz	(%)	± 5%	±10%
	at 3.0 KHz	(%)	± 5%	±10%
	at 5.0 KHz	(%)	± 5%	±10%
	at 9.0 KHz	(%)	± 5%	±10%
	at 16.0 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		(%)	0.02	0.05
Hum and Noise ratio (Input = 1 V, and shorted)		(dB)	85	80
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)	10	–
Intermodulation Distortion at 1 V Output, 70 Hz/7 KHz at 4/1 ratio		(%)	0.02	0.05
Meter Tolerance	at −6 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

Power Transformer T301 provides two tapped secondary windings, one delivers +13.5/−12.5 VDC at 100 mA (nominal) from a full-wave bridge rectifier – capacitor circuit consisting of a bridge rectifier D221 and C213, 214. This voltage supplies the LED Meter comparator, IC202 through IC208; The other delivers 61 VDC at 100 mA (nominal) from full-wave rectifier – capacitor circuit consisting of rectifiers D219, D220 and C209.

Voltage divider network R270 and R271 provides approximately 41.5 VDC which is filtered further by C210, R272 and feeds this voltage to the base of divider transistor TR201 which is connected to TR202 in a Darlington emitter-follower configuration. The emitter of TR202, decoupled by C211, provides approximately 40 VDC to the equalizer and meter circuits. The collectors of TR201 and TR202 are returned to 43 VDC through R269 which limits the transistor collector circuit.

The Darlington connection of TR201 and TR202 provides a low output impedance. The base of TR201 presents negigible loading on the voltage divider network, hence the ripple voltage at TR202 emitter is small. Except for the small base current into TR201, the full load current flows through R269.

LED METER COMPARATOR CIRCUIT DESCRIPTION

Power Supply and bias configuration (Refer to LED METER circuits)

The power supply for the LED Meter Comparator circuit consists of full-wave rectifiers, which provides plus(+) and minus(−) +13.5/−12.5 VDC to each of IC202 through IC208.
LED indication level is provided from the Zener diode D202 (+5.6 VDC).
The +13.5/−12.5 VDC source is applied to LED comparator ICs IC202 through IC208.
The +5.6 VDC source provides a stable voltage to VR203(L) and VR204(R) for LED Meter indicator level.

OPERATIONAL AMPLIFIER FEEDBACK CIRCUIT (refer to Figure a)

Signal to the (−) input causes a change in output that is inverted in phase relative to the input.
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 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 causes 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 calcultated as follows:

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

NOTE: RC4709 of this circuit operates from split power supplies. [plus (+) supply at Pin No. 14 and minus (–) supply at Pin No. 7].

PRECISION HALF-WAVE RECTIFIER AND AMPLIFIER CIRCUIT (refer to Figure b)

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 D201 is conducting slightly to establish 0 V DC at **A** (–) input and 0 V DC at **A** out; (2) When D 202 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 D201 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 D201 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 D201 any further decrease in input voltage is amplified by the ratio of $\frac{R_F(n)}{Rin}$ which is approximately equal to 5 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 D203 and $R_F(p)$. The amplifier output is blocked from appearing at the rectifier output by D201 (D201 is reverse biased with respect to the following stages which are returned to the 0 V DC line).

In this manner, appearing at D201 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 D201 cathode are filtered into an average DC voltage by R209 and C207, and this voltage serves as input to the LED meter comparator.

R279 and D203 serve to maintain positive feedback around RC4709 during the positive half-wave excursions of the input signal. As the amplifier's output is positive during this time, D203 is forward biased (D201 is off) and the feedback path now consists of R279 and D203. The amplifier is thus kept out of saturation and free from oscillations throughout the full input cycle.

Bias circuit uses split power supply which provides +10.3 V DC at Pin No. 14 and –9.3 V DC at Pin No. 7 on IC201.

COMPARATOR CIRCUIT FOR LED LEVEL METER DESCRIPTION

Comparator circuit operation

Comparator circuit consists of seven IC's MJM-4558.
Comparator operates by comparing the (–) input level to (+) input level, which output voltage is changed from minus to plus DC voltage. Thus DC currents flows to each LED.

With no signal, input level of (–) 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 VR203(L) [VR204(R)] and VR205(L) [VR206(R)].
Thus, the output voltage of IC208 [Pin No. 1(L) or No. 7(R)] is kept with 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 D407(L) and D414(R) are lit at –12 dB points. But D401 through D406(L) and D408 through D413(R) are not lit because the input voltage is too low.

Each LED conducts with a (–) input level which is determined by VR203(L), VR204(R) (IC202), R227(L), R228(R) (IC203), R229(L), R230(R) (IC204), R231(L), R232(R) (IC205), R233(L), R234(R) (IC206), R235(L), R236(R) (IC207).

With increase in minus DC voltage, which is provided to (–) input, each LED is lit in order from D406 to D401(L) [D413 to D408(R)].

CIRCUIT DESCRIPTION

FREQUENCY EQUALIZATION

The input signal is fed into TR101 base. TR101, an emitter follower, provides the high input impedance required by the signal source. The low output impedance of TR101 is required to drive a voltage divider formed by R111 and the sections of the frequency control pots between the cut end of each control and its wiper. The wiper of each control effectively grounds only those frequencies resonated by the series traps (coil, capacitor and resistor from wiper to common). Thus, the voltage division which occurs can be different for each frequency and depends on the frequency control settings.

TR103, TR105 and TR107 are connected so that the voltage at TR105 base always follows the voltage at TR103 base. For example: An increase in voltage at TR103 base causes the conduction of TR103 and TR107 to increase, and feedback base drive of TR105 to increase, until the voltage at TR105 base is equal to that at TR103 base. Conduction cannot increase beyond this point since the emitter voltage supplied by TR105 then tends to make TR103 conduct less. Conversely, a decrease in voltage at TR103 base causes a corresponding change at TR105 base.

The output voltage is taken from TR107 collector and is also fed back to TR105 base through the voltage divider formed by R115 and the sections of the frequency control pots between the boost end of each control and its wiper.

For each frequency, moving the control pot off center towards boost causes an increase in the amplitude of the signal presented to TR103 base and a decrease in the negative feedback to TR105 base. The gain is thus increased. Since the signal amplitudes at the bases of TR103 and TR105 are always equal, the output signal divided by the feedback attenuation (R115 and boost sections) is approximately equal to the input signal amplitude divided by the input attenuation (R111 and "CUT" sections). By following a similar line of thought, it will be seen that when the controls are centered the gain is unity; and when the controls are towards cut, the gain is less than one.

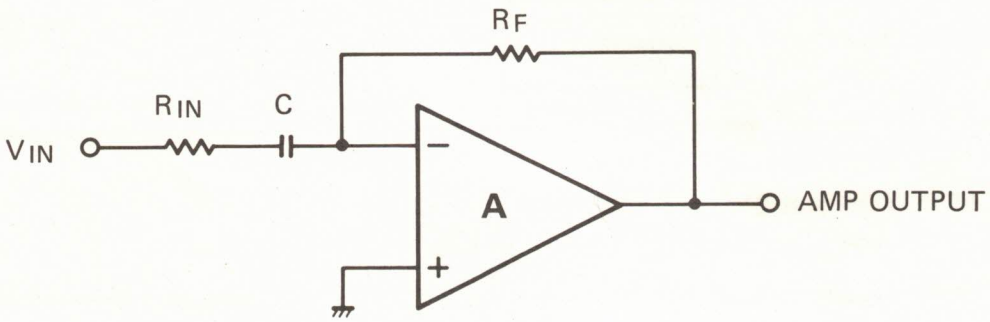
The resistors in series with the series resonant circuits are used to increase the bandwidth or lower the "Q", of each circuit so that the effect of controls of adjacent frequencies overlap, thus providing a smooth overall response. The resistors are of different values so that the total series resistance of each circuit (coil and resistor) is approximately the same. The ratio of the total series resistance of the resonant circuit to the base resistors of TR103 and TR105 determines the maximum boost or cut obtainable.

AC INPUT AT VR201 (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.
10 mV	–73 mV DC	–12 dB	3.6 mA	1.86 V DC
16 mV	–117 mV DC	–8 dB	3.6 mA	1.86 V DC
25 mV	–181 mV DC	–4 dB	3.6 mA	1.86 V DC
39 mV	–283 mV DC	0 dB	3.6 mA	1.86 V DC
63 mV	–460 mV DC	+4 dB	3.6 mA	1.86 V DC
100 mV	–730 mV DC	+8 dB	3.6 mA	1.86 V DC
158 mV	–1.2 V DC	+12 dB	3.6 mA	1.86 V DC

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

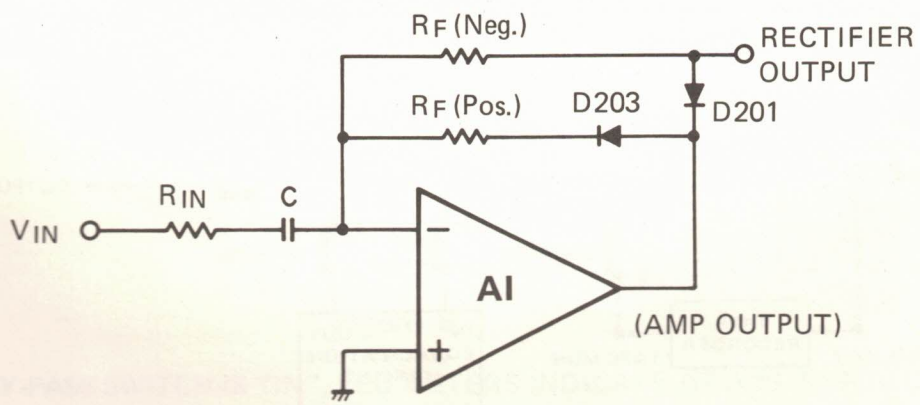
NOTE:

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 C207 (–).
3. Indicated voltages across each LED indicator is obtained with LED Meters calibrated as specified in the CALIBRATION PROCEDURE section of this manual.
4. All DC voltages are within ± 10 %, measured with AC VTVM and DC Voltmeter (over 10 KΩ/V).



BASIC OP. AMP. FEEDBACK CIRCUIT

Figure a



BASIC OP. AMP. RECTIFIER–AMPLIFIER CIRCUIT

Figure b

SWITCH FUNCTIONS
(Applicable to LEFT or RIGHT CHANNEL)

LINE-REC and MONITOR SWITCHES "IN"

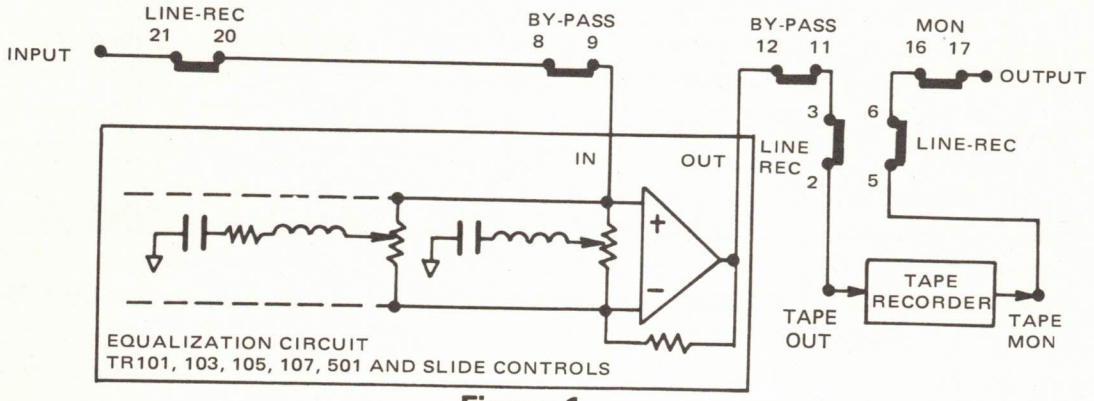


Figure 1

LINE-REC SWITCH "IN"

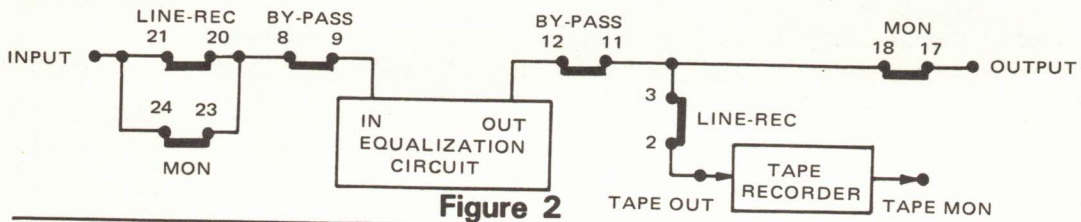


Figure 2

LINE-REC, MONITOR and BY-PASS SWITCHES "OUT"

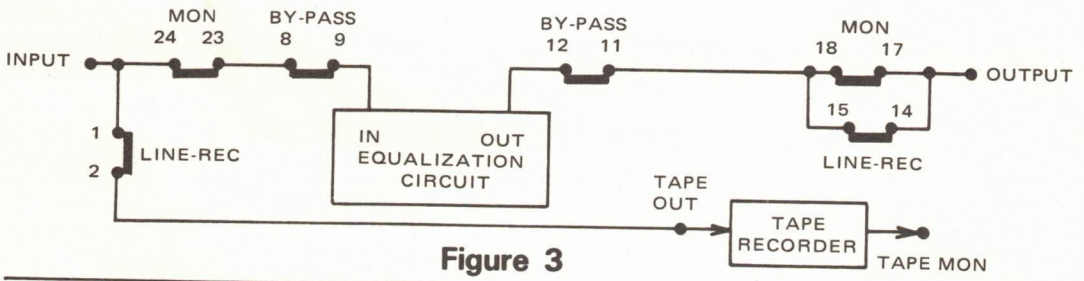


Figure 3

MONITOR SWITCH "IN"

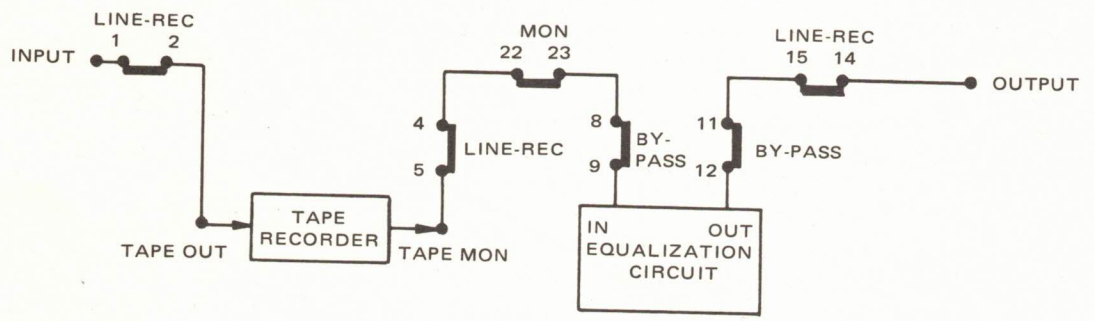


Figure 4

BY-PASS SWITCH "IN"

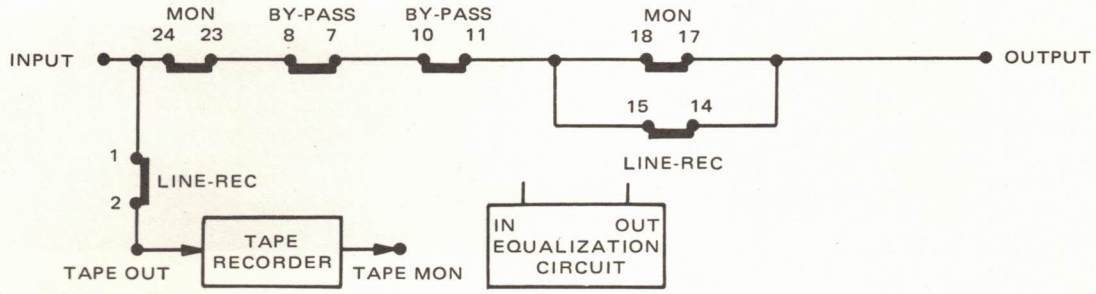


Figure 5

BY-PASS and MONITOR SWITCHES "IN" MON

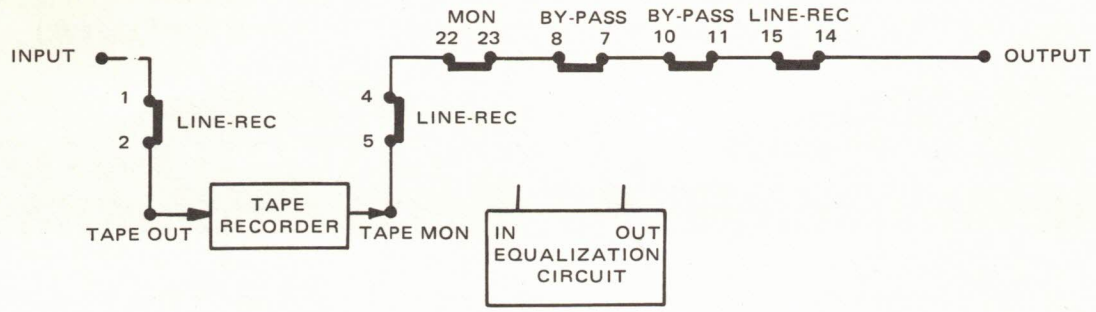


Figure 6

METER SWITCH "IN"
BY-PASS/EQ SWITCH TO "EQ"

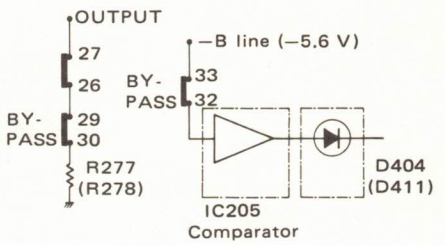


Figure 7

LED METER INDICATES SIGNAL AT OUTPUT JACK WHEN METER SWITCH IS "IN".

METER SWITCH "IN"
BY-PASS/EQ SWITCH TO "BY-PASS"

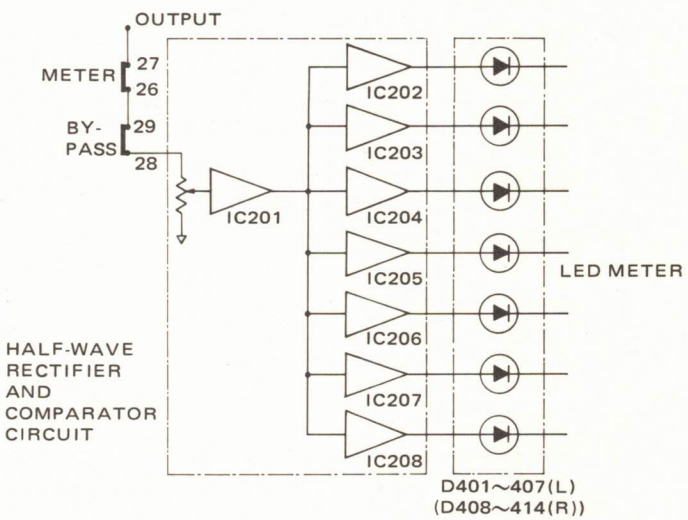


Figure 8

WHEN BY-PASS SWITCH IS "IN", 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)

DISASSEMBLY INSTRUCTIONS

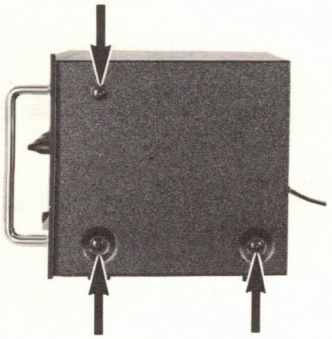


Figure A

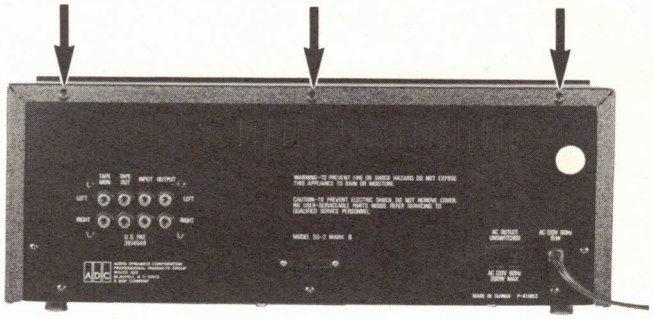


Figure B

1) To remove chassis from metal cabinet

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

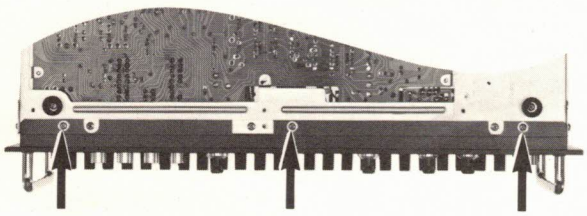


Figure C

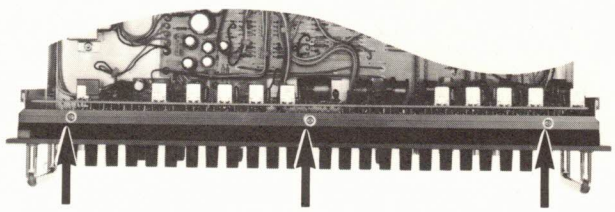
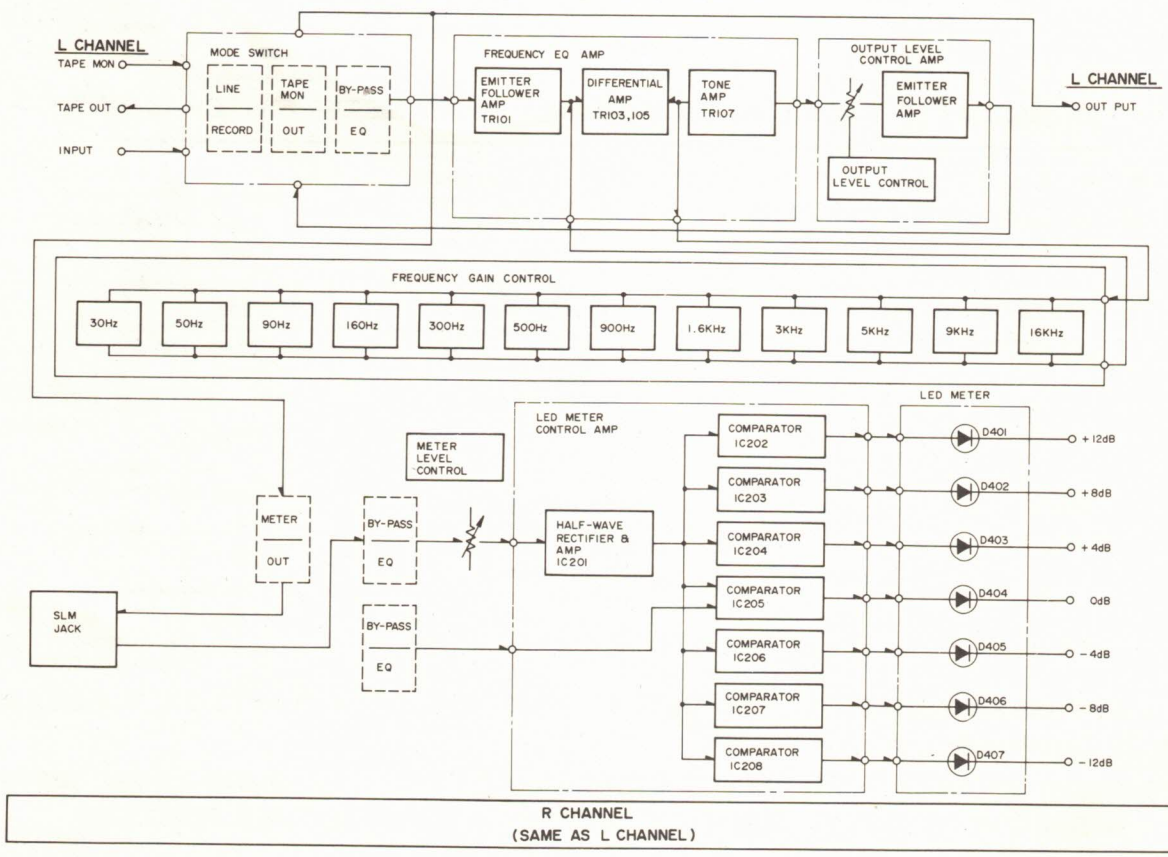


Figure D

2) Removal of Front Panel

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

BLOCK DIAGRAM



ADJUSTMENT PROCEDURES

(1) Frequency Gain Control Adjustment/Check

Note: Maintain voltage at 120 volts (UL, C.S.A. and PX)
(Use 220/240 V AC for European models)
Input – MAIN IN Jack
Output – MAIN OUT Jack
Set TAPE MONitor Switch to "OUT".
Output Level – 0.775 V

STEP	ADJUSTMENT	EQUIPMENT	CONNEC-TION	AUDIO FREQ.	SETTING	LEVEL	ADJUSTMENT
1	Check the Gain Controls of 30 Hz Range (Boost/Cut)	Audio Osc. VTVM Oscilloscope	Fig. 9	30 Hz	All other controls at "0"dB	Output level of Boost & Cut ±12 dB	Select values of R601/602 (R201/202)
2	Check the Gain Controls of 50 Hz Range (Boost/Cut)	Same	Same	50 Hz	Same	Same	——
3	Check the Gain Controls of 90 Hz Range (Boost/Cut)	Same	Same	90 Hz	Same	Same	Select values of R605/606 (R205/206)
4	Check the Gain Controls of 160 Hz Range (Boost/Cut)	Same	Same	160 Hz	Same	Same	Select values of R607/608 (R207/208)
5	Check the Gain Controls of 300 Hz Range (Boost/Cut)	Same	Same	300 Hz	Same	Same	Select values of R609/610 (R209/210)
6	Check the Gain Controls of 500 Hz Range (Boost/Cut)	Same	Same	500 Hz	Same	Same	Select values of R611/612 (R211/212)
7	Check the Gain Controls of 900 Hz Range (Boost/Cut)	Same	Same	900 Hz	Same	Same	Select values of R613/614 (R213/214)
8	Check the Gain Controls of 1600 Hz Range (Boost/Cut)	Same	Same	1,600 Hz	Same	Same	Select values of R615/616 (R215/216)
9	Check the Gain Controls of 3000 Hz Range (Boost/Cut)	Same	Same	3,000 Hz	Same	Same	Select values of R617/618 (R217/218)
10	Check the Gain Controls of 5000 Hz Range (Boost/Cut)	Same	Same	5,000 Hz	Same	Same	Select values of R619/620 (R219/220)
11	Check the Gain Controls of 9000 Hz Range (Boost/Cut)	Same	Same	9,000 Hz	Same	Same	Select values of R621/622 (R221/222)
12	Check the Gain Controls of 16,000 Hz Range (Boost/Cut)	Same	Same	16,000 Hz	Same	Same	Select values of R623/624 (R223/224)

NOTE: Reference Number inside parenthesis (R201/202 etc.) is used for U.S.A. Version in production at Serial No. 1 through 10000 only.

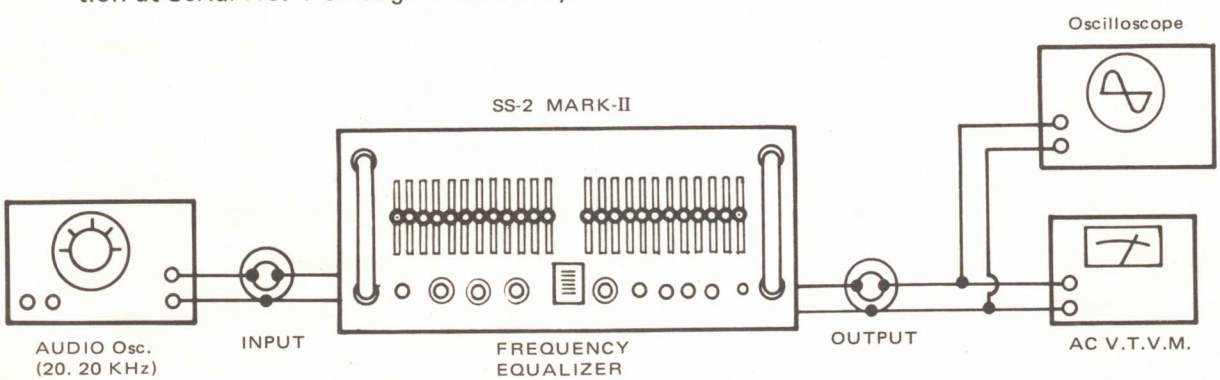


Figure 9

(2) Frequency Control Adjustment (1.6 K – 16 KHz only)

Same equipment as shown in Figure 9.

STEP	CHECKING	SETTING	ADJUSTMENT
1	Check the frequency control of 1.6 KHz should fall within ± 8%.	All other control at 0 dB.	Set 1.6 KHz Controls to boost position (12 dB). Adjust L615 (L), L616 (R) for maximum reading on VTVM.
2	Check the frequency control of 3 KHz should fall within ± 8%.	"	Set 3 KHz Controls to boost position (12 dB). Adjust L617 (L), L618 (R) for maximum reading on VTVM.
3	Check the frequency control of 5 KHz should fall within ± 8%.	"	Set 5 KHz Controls to boost position (12 dB). Adjust L619 (L), L620 (R) for maximum reading on VTVM.
4	Check the frequency control of 9 KHz are fall within ± 8%.	"	Set 9 KHz Controls to boost position (12 dB). Adjust L621 (L), L622 (R) for maximum reading on VTVM.
5	Check the frequency control of 16 KHz should fall within ± 8%.	"	Set 16 KHz Controls to boost position (12 dB). Adjust L623 (L), L624 (R) for maximum reading on VTVM.

LED METER CALIBRATION PROCEDURE

Connect LED meter calibration set-up as shown in Figure 10.

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 – OUT
LINE/REC – REC

METER CONTROL: Left (VR201) – Max. counterclockwise
Right (VR202) – Max. clockwise

LEVEL CONTROL: VR501, 502 – Max. toward (+)

CALIBRATION PROCEDURE

Step 1. Set Trimmer Resistors on PCB as indicated below:
VR203(L), VR204(R): at 12 o'clock position
VR205(L), VR206(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 VR203 (left) for 12 dB on left LED Meter.
And VR204 (right) for 12 dB on right LED Meter.
(All LED's are lit.) (Figure 10A)

Step 4. Set Calibrator at −1 dB point, check both 12 dB (left and right) LED's are turned off.(Figure 10B)

Step 5. Set Calibrator at −24 dB point.
Adjust VR205 (left) for −12 dB on left LED Meter.
And VR206 (right) for −12 dB on right LED.
Both LED's should be lit. (Figure 10C)

Step 6. Set Calibrator at −25 dB point, check that both −12 dB on left and right LED have turned off. (Figure 10D)

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 LED are lit. (Figure 10E)

Step 9. Set Calibrator at −13 dB point.
Check for both 0 dB points. Left and right LED have turned off. (Figure 10F)

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

CHECK POINT FOR EACH LED METERS (See Figure 10 and Figure 10A through 10F.)

LED meter point	−12 dB	−8 dB	−4 dB	0 dB	+4 dB	+8 dB	+12 dB
Calibrator position for each LED are light up.	−24 dB	−20 dB	−16 dB	−12 dB	−8 dB	−4 dB	0 dB
Calibrator position for each LED are turned off.	−25 dB	−21 dB	−17 dB	−13 dB	−9 dB	−5 dB	−1 dB

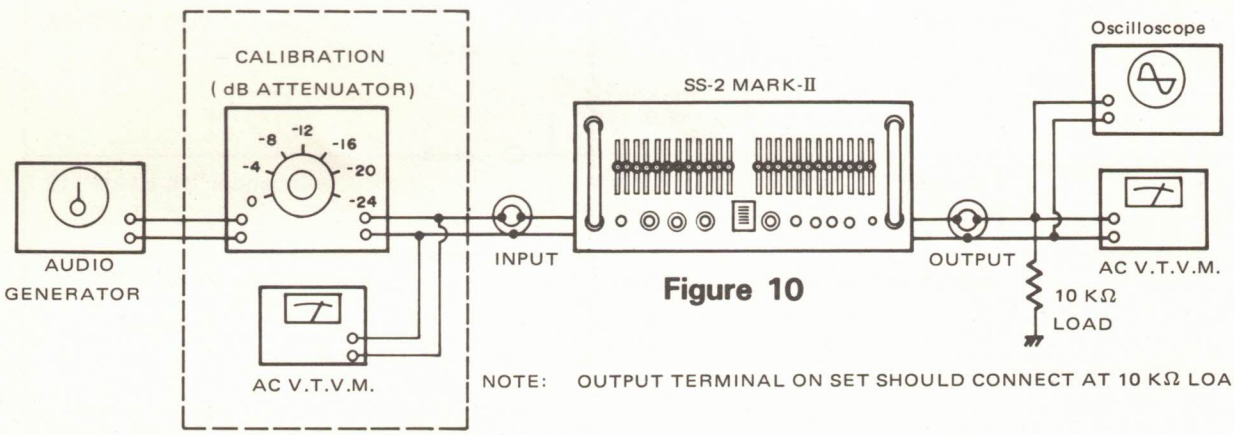


Figure 10

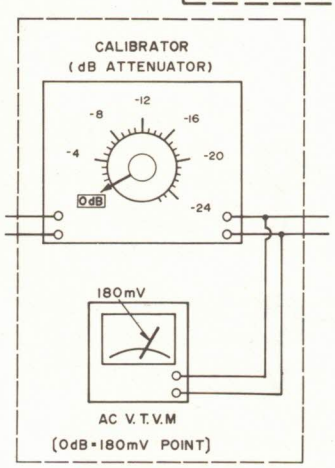


Figure 10 A

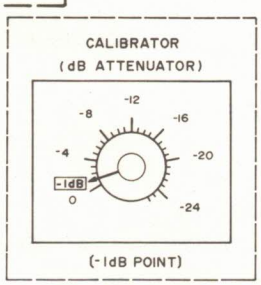


Figure 10 B

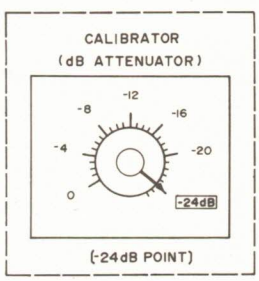


Figure 10 C

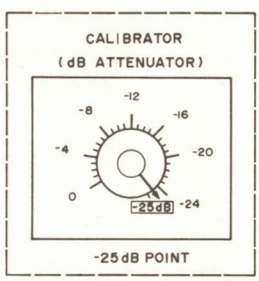


Figure 10 D

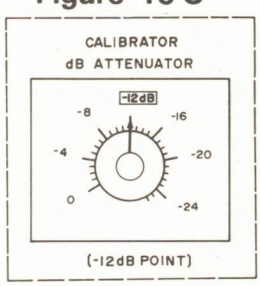


Figure 10 E

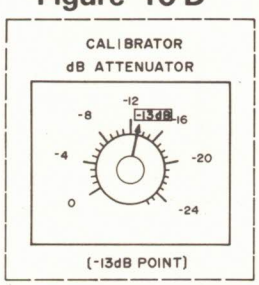
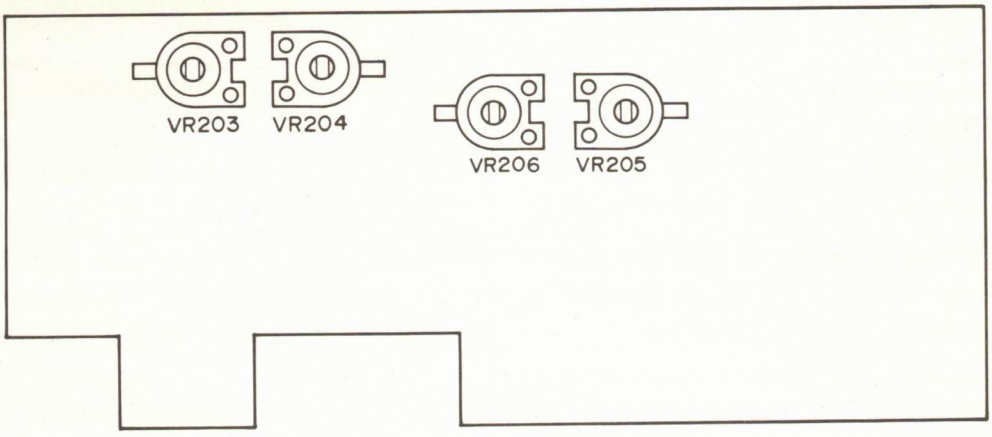
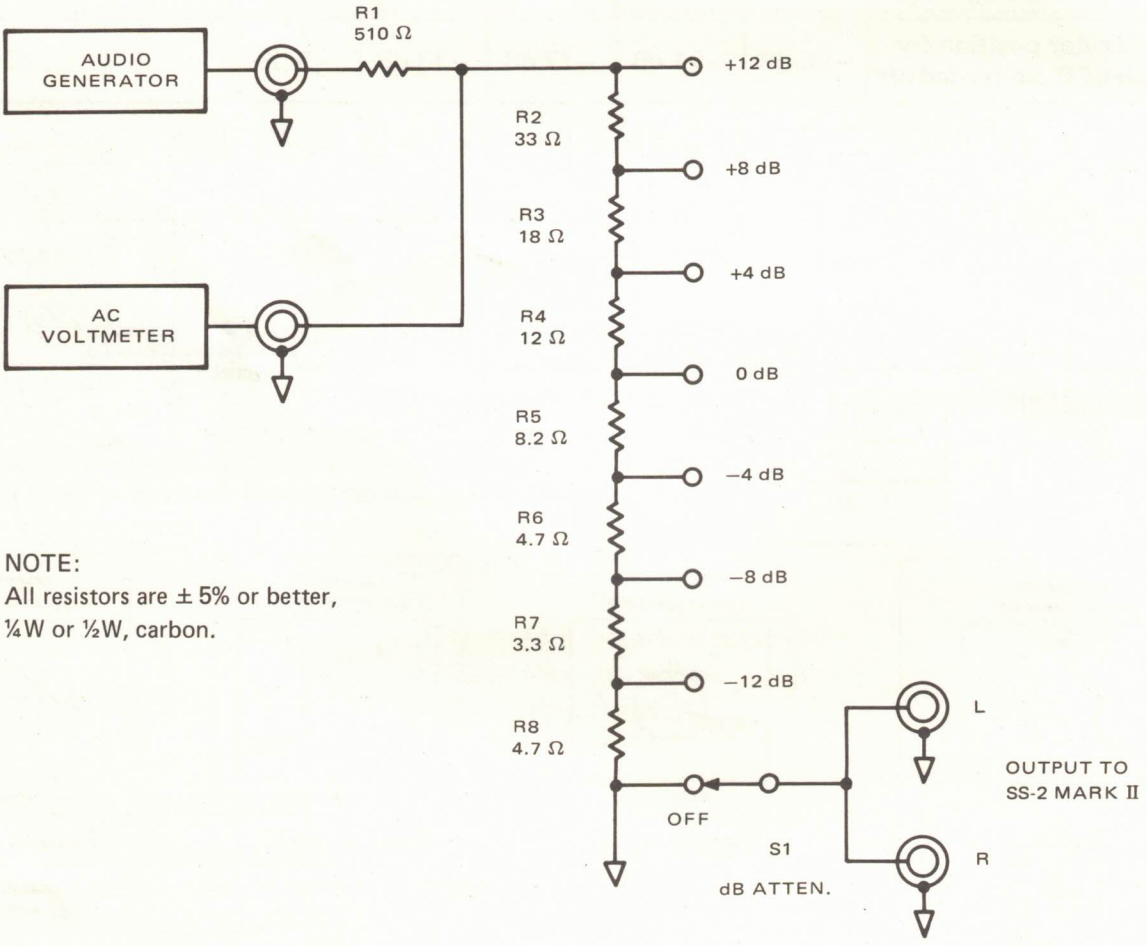


Figure 10 F

MAIN AMP AND POWER SUPPLY P.C.B. (LED METER POT LOCATIONS)



CALIBRATION SCHEMATIC



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

TROUBLESHOOTING

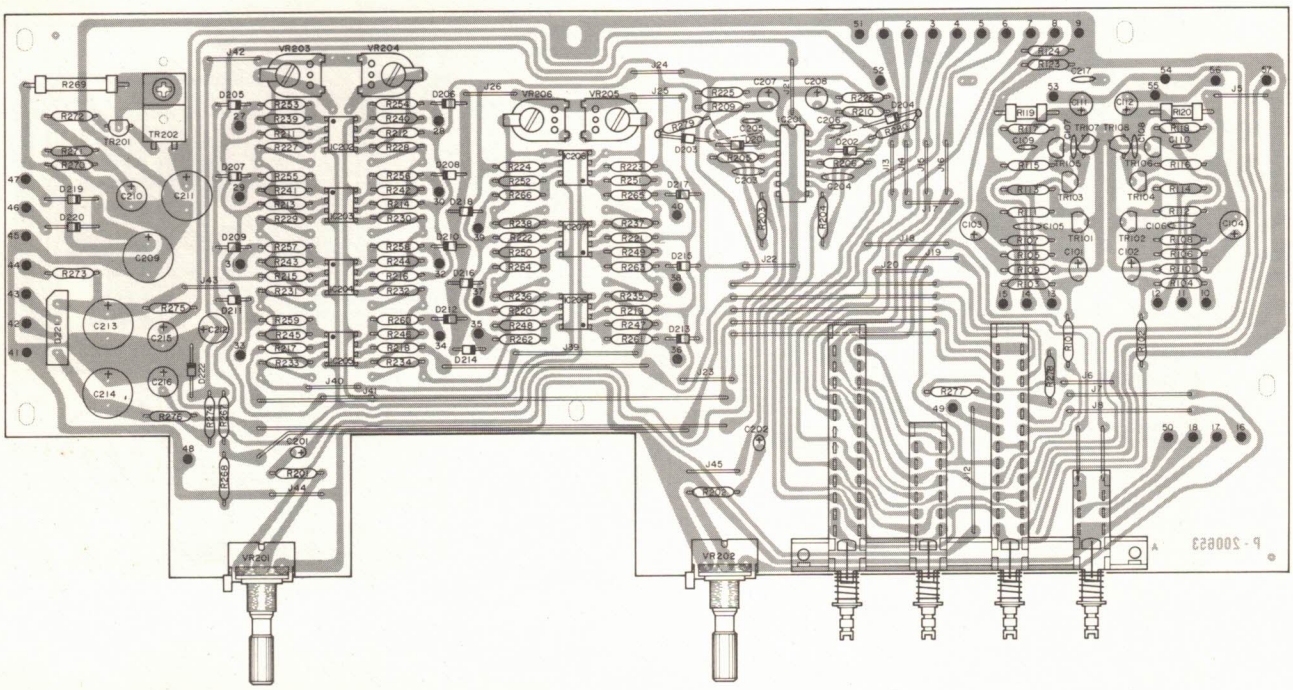
Symptom	Cause/Remedy
1) No output	1) Faulty AC power cord * Replace the cord. 2) Defective power switch * Replace the switch. 3) Broken wire in the power transformer * Replace the transformer. 4) Check Fuse European and PX only.
2) Power indicator LED does not light.	1) Defective LED D301 * Replace the 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 D219 and/or D220 * 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 TR101–108 and/or TR501, 502 * Replace the defective transistor(s). 2) Defective resistor or capacitor of MAIN AMP board * Replace the defective part(s).
5) "TAPE OUT" inoperative	1) Poor contact in "TAPE OUT" input jacks * Repair or replace the jack. 2) Faulty TAPE MONitor switch * Repair or replace the switch.
6) "MAIN IN" inoperative	1) Poor contact in "MAIN IN" input jacks * Repair or replace the jack.
7) "TAPE MONITOR" inoperative	1) Poor contact in TAPE MONitor" input jack * Repair or replace the jack. 2) Faulty "TAPE MONitor" switch * Repair or replace the switch.
8) Frequency control "30 Hz" has no effect.	1) Faulty VR601/602 * Repair or replace. 2) Defective R601/602, C601/602 or L601/602 * Replace the defective part(s).
9) Frequency control "50 Hz" has no effect.	1) Faulty VR603/604 * Repair or replace. 2) Defect C603/604 or L603/604 * Replace the defective part(s).
10) Frequency control "90 Hz" has no effect.	1) Faulty VR605/606 * Repair or replace. 2) Defective R605/606, C605/606 or L605/606 * Replace the defective part(s).

Symptom	Cause/Remedy
11) Frequency control 160 Hz has no effect.	1) Faulty VR607/608 * Repair or replace. 2) Defective R607/608, C607/608 or L607/608 * Replace the defective part(s).
12) Frequency control "300 Hz" has no effect.	1) Faulty VR609/610 * Repair or replace. 2) Defective R609/610, C609/610 or L609/610 * Replace the defective part(s).
13) Frequency control "500 Hz" has no effect.	1) Faulty VR611/612 * Repair or replace. 2) Defective R611/612, C611/612 or L611/612 * Replace defective part(s).
14) Frequency control "900 Hz" has no effect.	1) Faulty VR613/614 * Repair or replace. 2) Defective R613/614, C613/614 or L613/614 * Repair defective part(s).
15) Frequency control "1600 Hz" has no effect.	1) Faulty VR615/616 * Repair or replace. 2) Defective R615/616, C615/616 or L615/616 * Replace defective part(s).
16) Frequency control "3 kHz" has no effect.	1) Faulty VR617/618 * Repair or replace. 2) Defective R617/618, C617/618 or L617/618 * Replace defective part(s).
17) Frequency control "5 kHz" has no effect.	1) Faulty VR619/620 * Repair or replace. 2) Defective R619/620, C619/620 or L619/620 * Replace defective part(s).
18) Frequency control "9 kHz" has no effect.	1) Faulty VR621/622 * Repair or replace. 2) Defective R621/622, C621/622 or L621/622 * Replace defective part(s).
19) Frequency control "16 kHz" has no effect.	1) Faulty VR623/624 * Repair or replace. 2) Defective R623/624, C623/624 or L623/624 * Replace defective part(s).
20) All controls have no effect.	1) Defective Resistor R111/112 or R115/116 * Replace the defective resistor(s). 2) Defective Transistor TR103–106 * Replace the defective transistor(s).
21) LED Meter does not light up.	1) Defective IC201 * Replace the IC. 2) Defective IC202–208 * Replace the IC(s). 3) Defective LED D401–414 * Replace the LED(s).

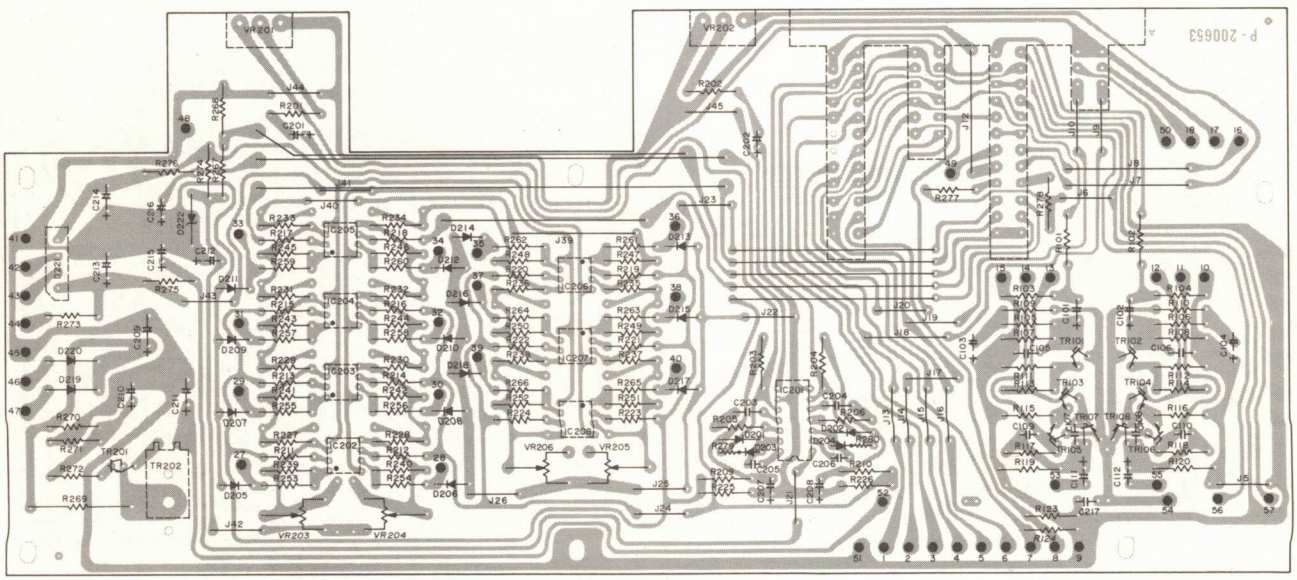
AMP & POWER SUPPLY P.C.B.

(1)PRODUCED IN TAIWAN

TOP VIEW



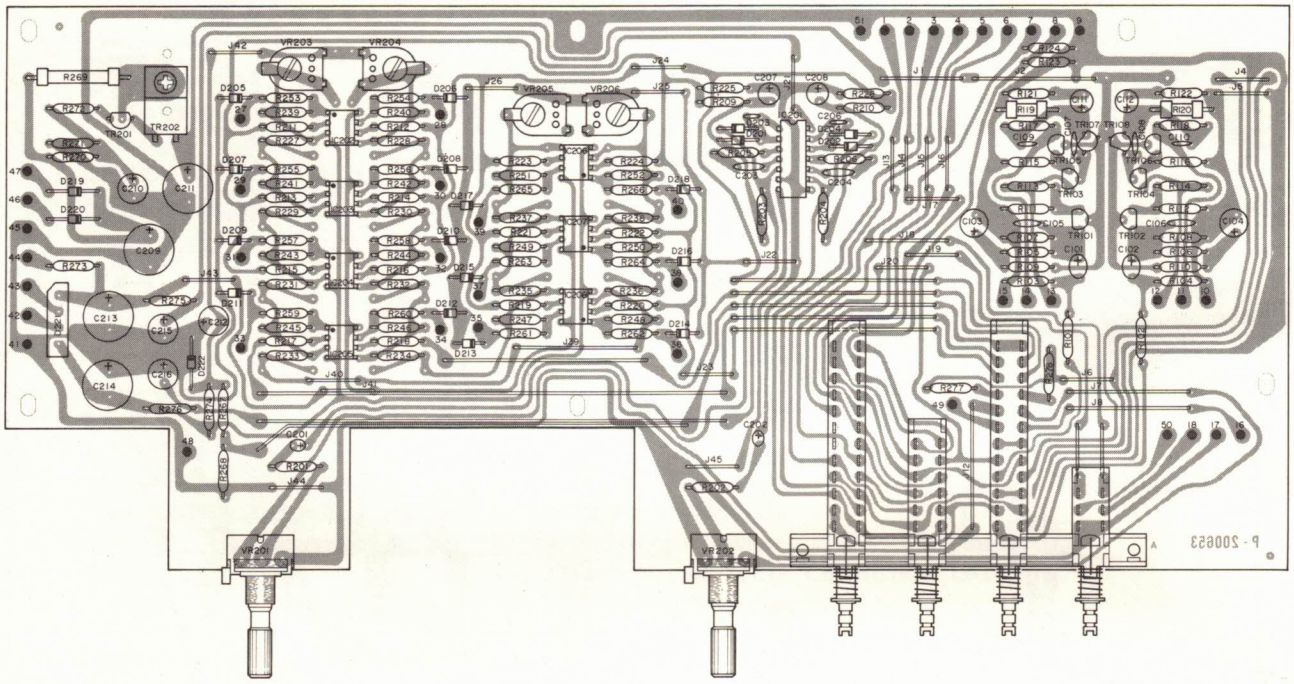
BOTTOM VIEW



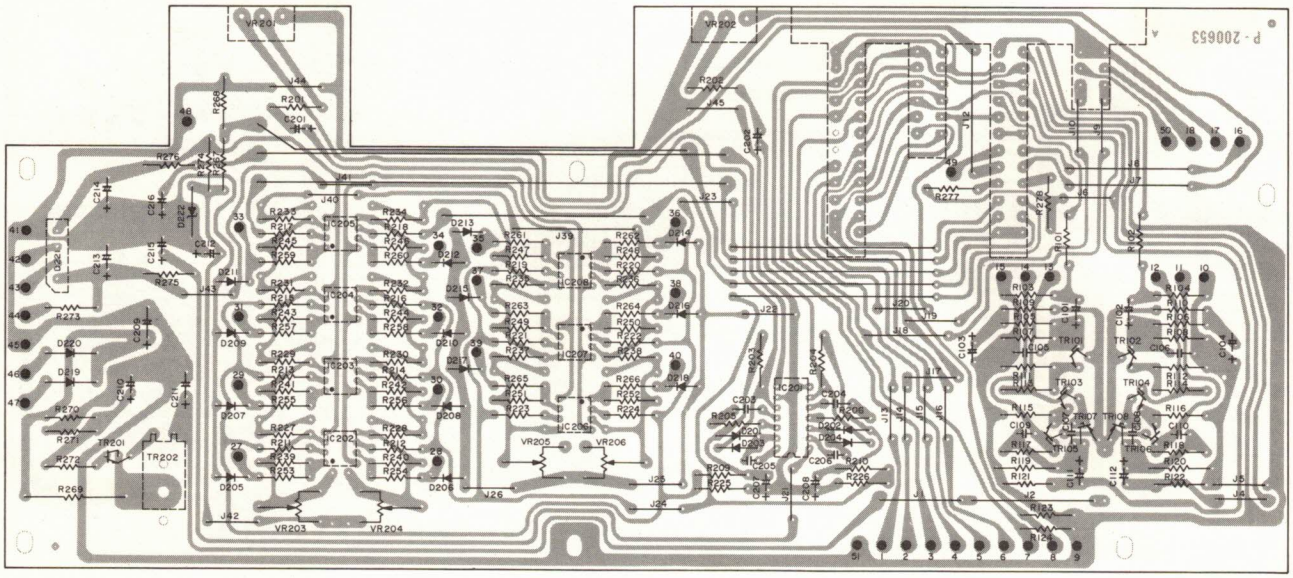
AMP & POWER SUPPLY P.C.B.

(2)PRODUCED IN JAPAN(U.S.A. VERSION)

TOP VIEW



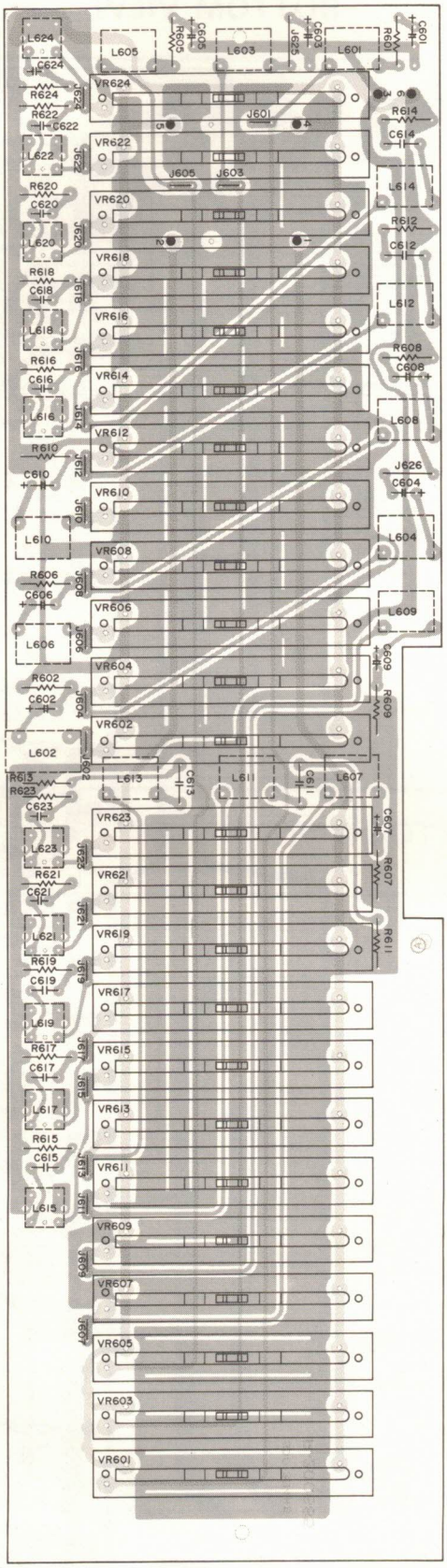
BOTTOM VIEW



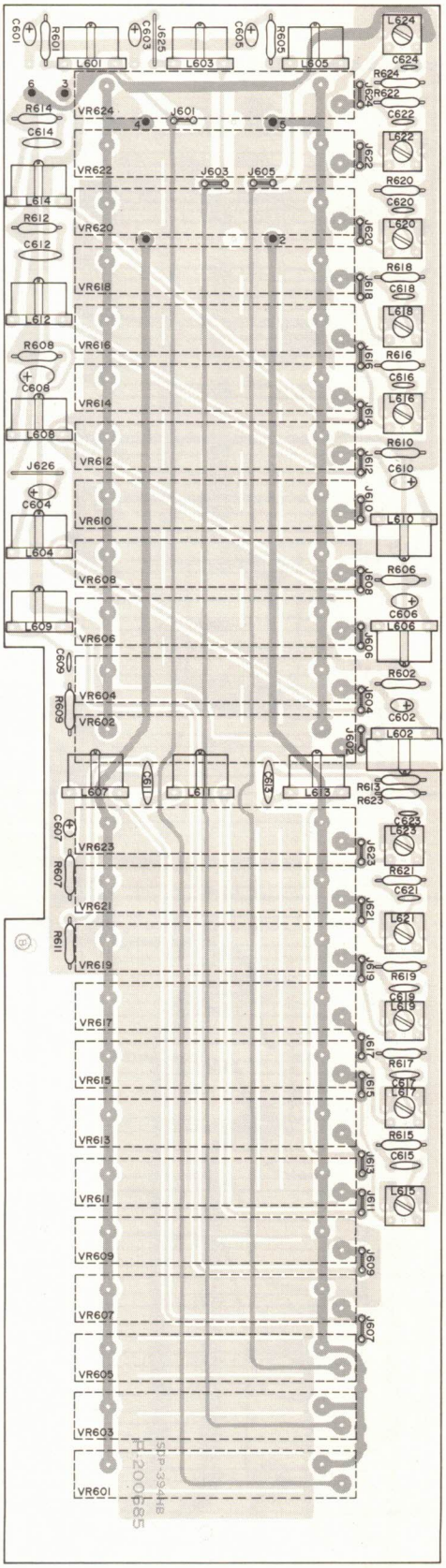
TONE CONTROL P.C.B.

(1)PRODUCED IN TAIWAN

TOP VIEW



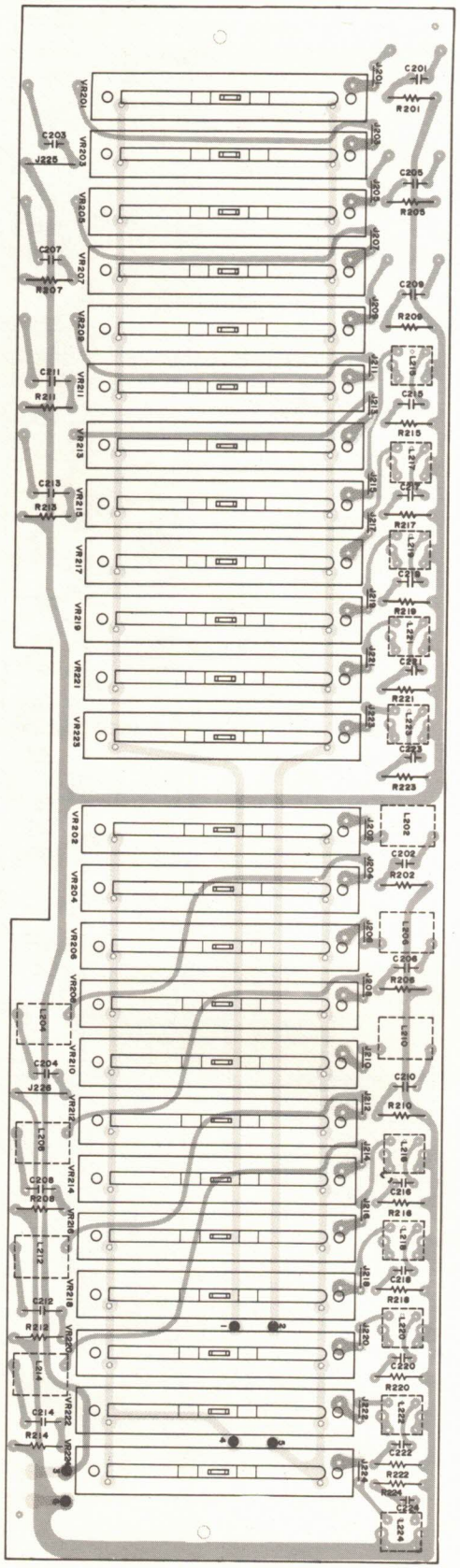
BOTTOM VIEW



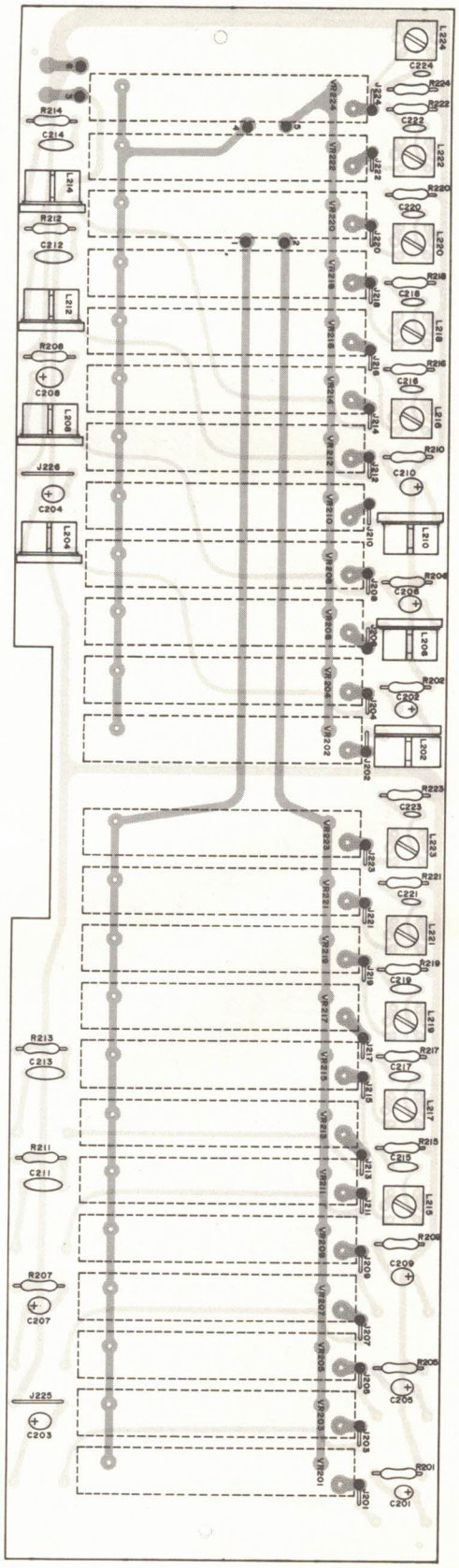
TONE CONTROL (A) P.C.B.

(2-1)PRODUCED IN JAPAN(U.S.A. VERSION)

TOP VIEW



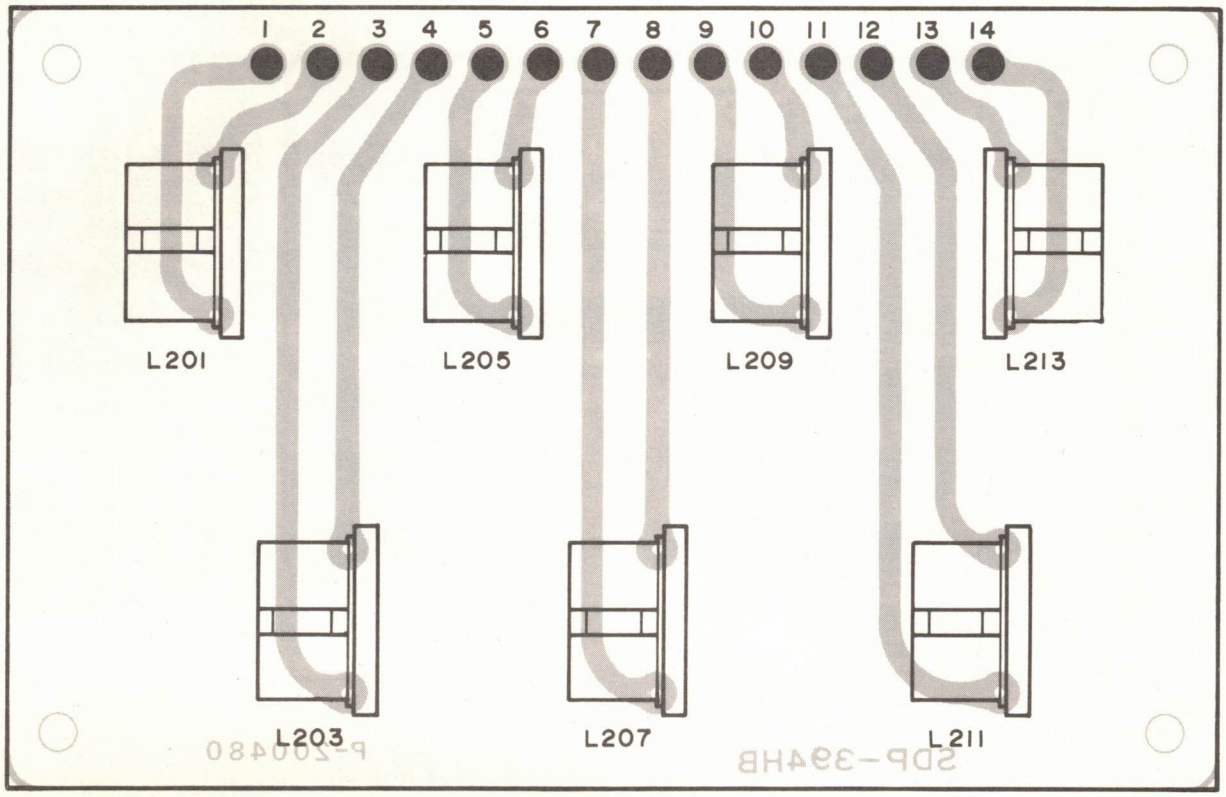
BOTTOM VIEW



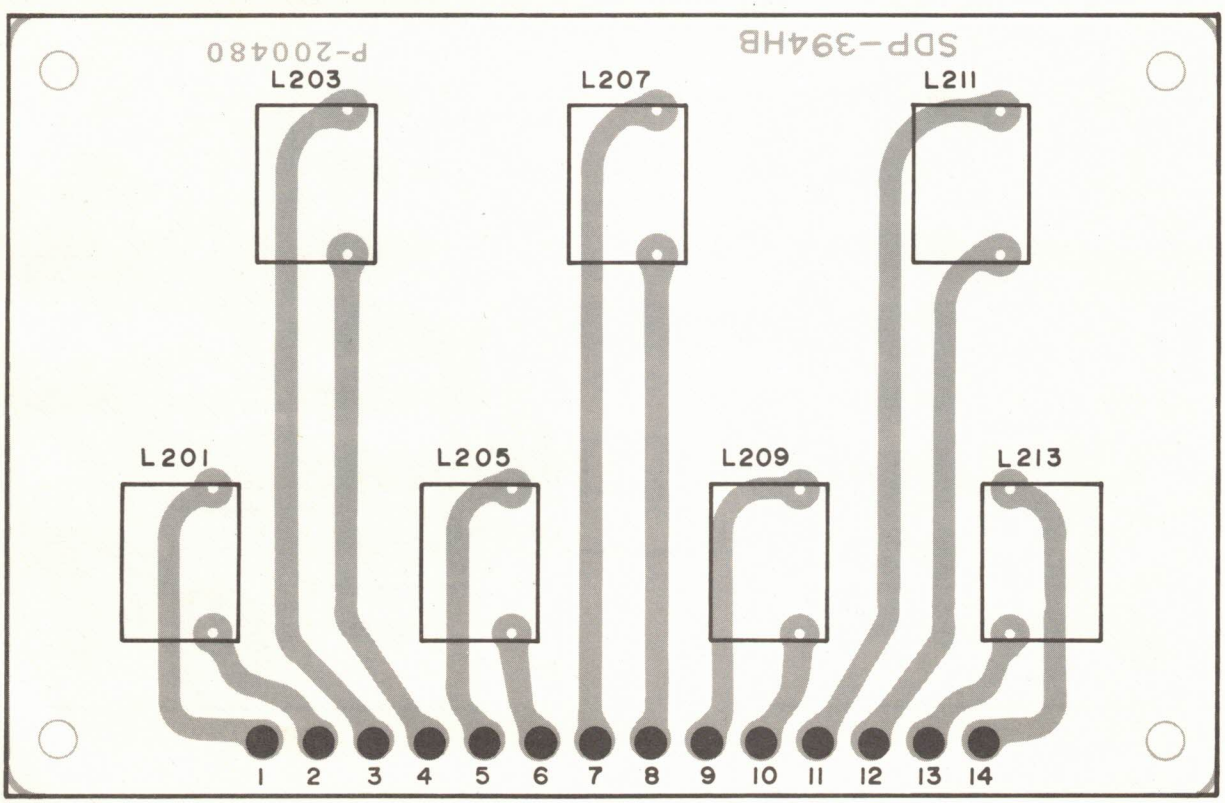
TONE CONTROL (B) P.C.B.

(2-2)PRODUCED IN JAPAN(U.S.A. VERSION)

TOP VIEW

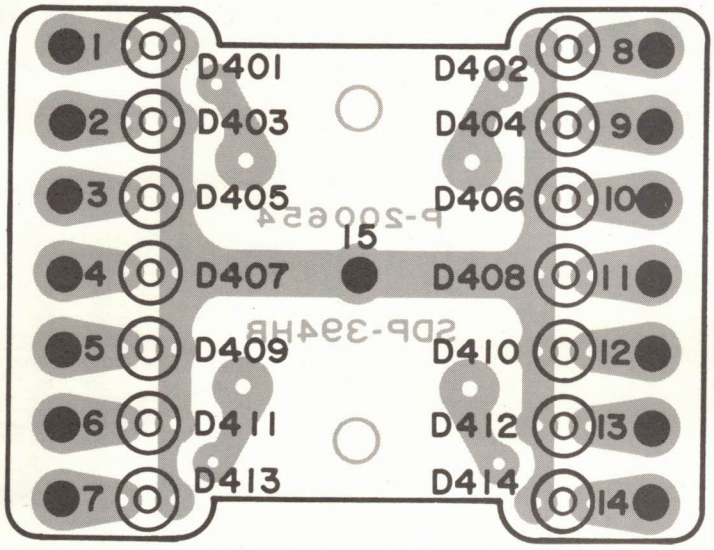


BOTTOM VIEW

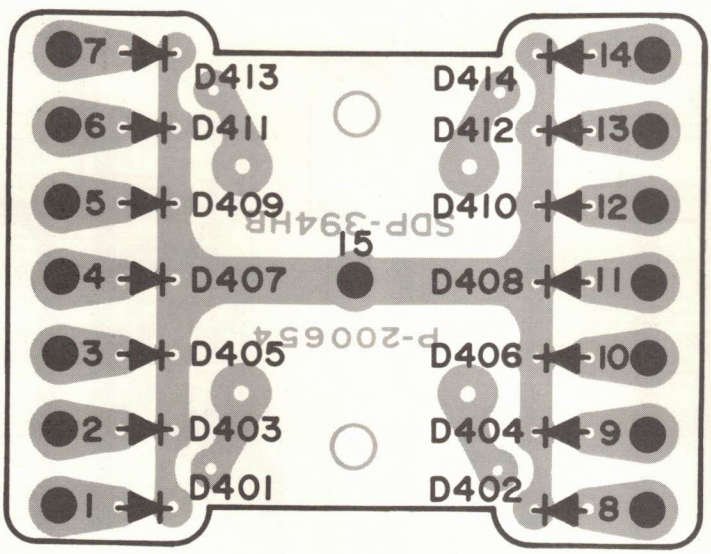


LED P.C.B.

TOP VIEW



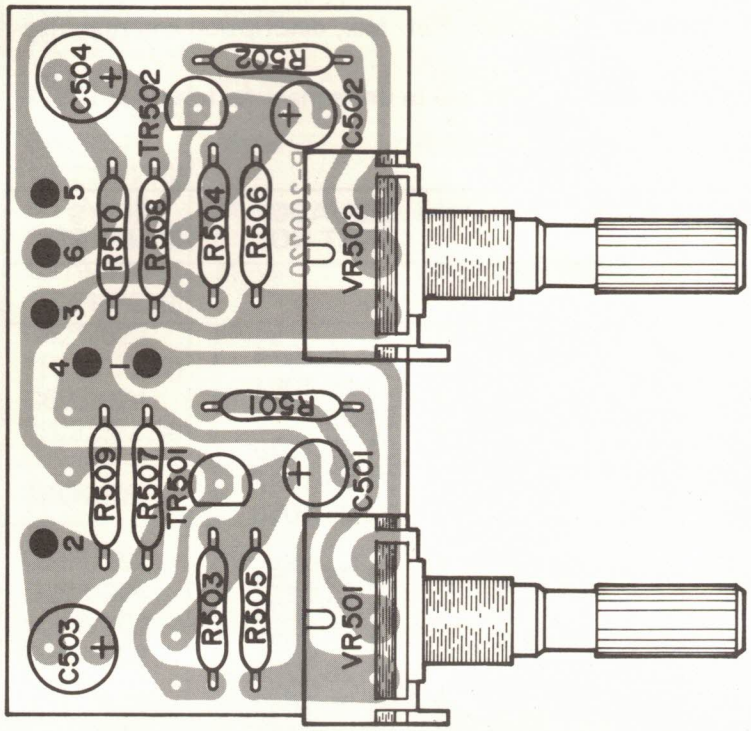
BOTTOM VIEW



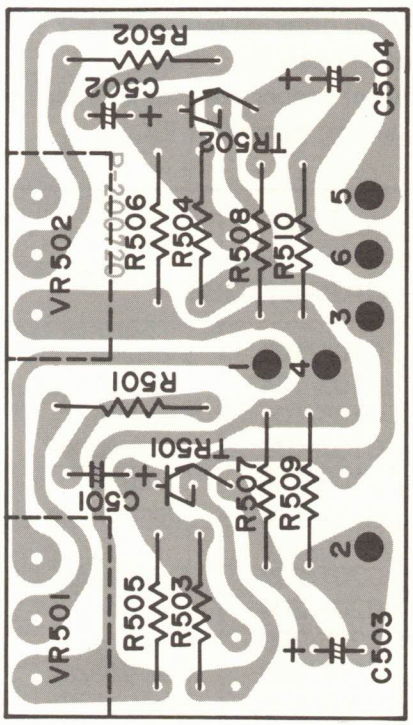
LEVEL CONTROL P.C.B.

(1)PRODUCED IN TAIWAN

TOP VIEW



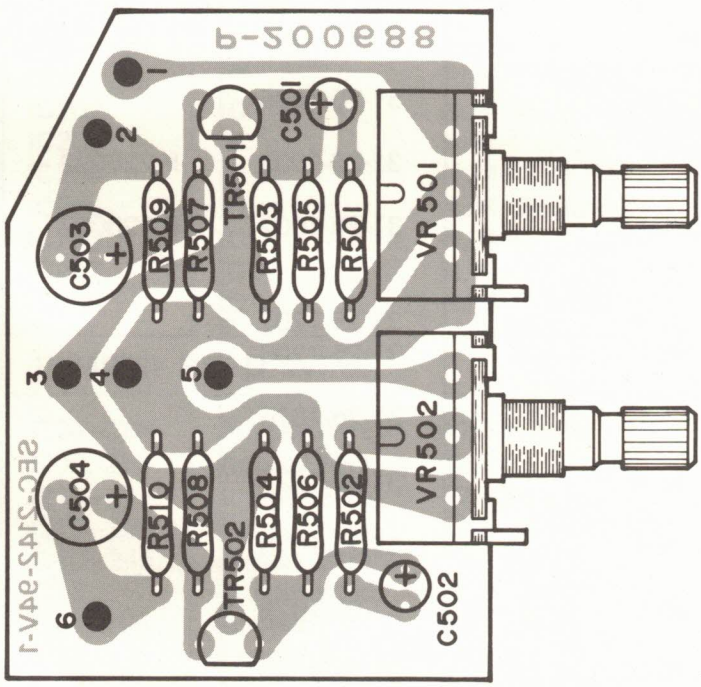
BOTTOM VIEW



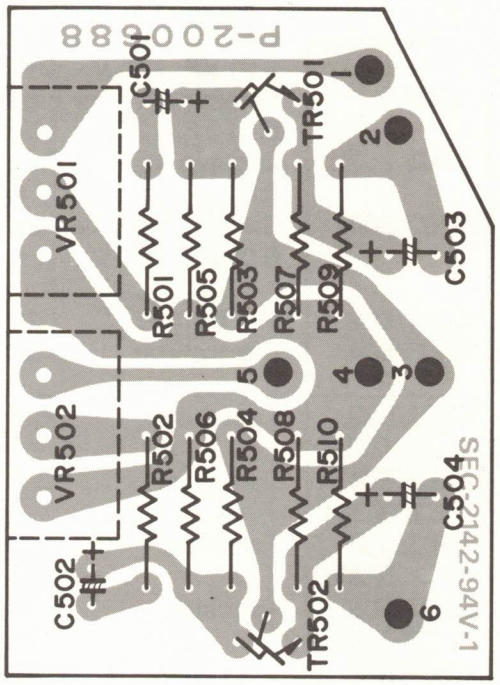
LEVEL CONTROL P.C.B.

(2)PRODUCED IN JAPAN(U.S.A. VERSION)

TOP VIEW



BOTTOM VIEW



ELECTRICAL PARTS LIST

All asterisked (*) or (**) items listed below reference units produced in Japan.
(*) for U.S.A., (**) for Europe.
All other items reference units produced in Taiwan.
When ordering replacement parts, refer to BSR/ADC part No., Ref. No., description and manufacturer's part No., if any.
Select proper replacement part when specifically identified for use in units manufactured for U.S.A., Canada, Europe or PX.

REF. NO.	DESCRIPTION				BSR/ADC PART NO.	MFR'S PART NO.
CAPACITORS						
C101/102	Tantalum	2.2 μF	35 V	±20 %	31-25-1074	
C103/104	Electrolytic	47 μF	50 V		31-25-1061	
C105/106	Ceramic	100 pF	50 V	±5 %	31-25-1028	
C107/108	Ceramic	10 pF	50 V	±5 %	31-25-1026	
C109/110	Ceramic	30 pF	50 V	±5 %	31-25-1027	
C111/112	Electrolytic	33 μF	35 V		31-25-1060	
C201/202	Tantalum	4.7 μF	35 V	±10 %	31-25-1054	
C203/204	Ceramic	330 pF	50 V	±5 %	31-25-1029	
C205/206	Ceramic	30 pF	50 V	±5 %	31-25-1027	
C207/208	Electrolytic	10 μF	25 V		31-25-1208	
C209	Electrolytic	330 μF	80 V		31-25-1063	
C210	Electrolytic	47 μF	50 V		31-25-1061	
C211	Electrolytic	220 μF	50 V		31-25-1071	
C212	Electrolytic	47 μF	16 V		31-25-1093	
C213/214	Electrolytic	220 μF	16 V		31-25-1095	
C215/216	Electrolytic	100 μF	16 V		31-25-1094	
C217	Ceramic	0.0047 μF	50 V		31-25-1030	
C301/302	Ceramic	0.01 μF	50 V		31-25-1096	
C303	Ceramic for Line Pass (U.S.A.) 0.01 μF 125 V UK type or LB type				31-25-1064	
C303	Ceramic for Line Pass (Canadian) 0.01 μF 125 V MS type				31-25-1025	
C303	Ceramic for Line Pass (PX) 0.01 μF 250 V X type				31-25-1002	P-220022
C303/304	Ceramic for Line Pass (European) 0.01 μF 250 V X type				31-25-1002	P-220022
C501/502	Electrolytic	10 μF	35 V		31-25-1207	
C503/504	Electrolytic	33 μF	35 V		31-25-1206	
C601/602 *(C201/202)	Tantalum	6.8 μF	35 V	±10 %	31-25-1076	
C603/604 *(C203/204)	Tantalum	3.3 μF	35 V	±10 %	31-25-1077	
C605/606 *(C205/206)	Tantalum	1.5 μF	35 V	±10 %	31-25-1078	
C607/608 *(C207/208)	Tantalum	1 μF	35 V	±10 %	31-25-1079	
C609/610 *(C209/210)	Tantalum	0.47 μF	35 V	±10 %	31-25-1080	

REF. NO.	DESCRIPTION				BSR/ADC PART NO.	MFR'S PART NO.
C611/612 *(C211/212)	Mylar	0.27 μF	50 V	±5 %	31-25-1081	
C613/614 *(C213/214)	Mylar	0.15 μF	50 V	±5 %	31-25-1082	
C615/616 *(C215/216)	Mylar	0.082 μF	50 V	±5 %	31-25-1083	
C617/618 *(C217/218)	Mylar	0.047 μF	50 V	±5 %	31-25-1084	
C619/620 *(C219/220)	Mylar	0.027 μF	50 V	±5 %	31-25-1085	
C621/622 *(C221/222)	Mylar	0.015 μF	50 V	±5 %	31-25-1086	
C623/624 *(C223/224)	Mylar	0.0082 μF	50 V	±5 %	31-25-1087	
DIODES						
D201/202	Si Diode	ITT-73N			31-53-1057	
D203/204	Si Diode	ITT-73N			31-53-1057	
D205/206	Si Diode	ITT-73N			31-53-1057	
D207/208	Si Diode	ITT-73N			31-53-1057	
D209/210	Si Diode	ITT-73N			31-53-1057	
D211/212	Si Diode	ITT-73N			31-53-1057	
D213/214	Si Diode	ITT-73N			31-53-1057	
D215/216	Si Diode	ITT-73N			31-53-1057	
D217/218	Si Diode	ITT-73N			31-53-1057	
D219/220	Si Diode	10E-1 or SR-1K-2			31-53-1053	
D221	Bridge Diode	SVB10-200			31-53-1063	
D222	Zener Diode	HZ-6B1 or WZ-056			31-53-1064	
INTEGRATED CIRCUIT						
IC201	IC	RC4709			31-54-1451	
IC202	IC	NJM-4558DM			31-54-1453	
IC203	IC	NJM-4558DM			31-54-1453	
IC204	IC	NJM-4558DM			31-54-1453	
IC205	IC	NJM-4558DM			31-54-1453	
IC206	IC	NJM-4558DM			31-54-1453	
IC207	IC	NJM-4558DM			31-54-1453	
IC208	IC	NJM-4558DM			31-54-1453	
JUMPER READ WIRE						
J204–206	Jumper Wire	12.5 m/m				P-320128
J209, 210	Jumper Wire	12.5 m/m				P-320128
J213–217	Jumper Wire	12.5 m/m				P-320128
J219–226	Jumper Wire	12.5 m/m				P-320128
J240–245	Jumper Wire	12.5 m/m				P-320128
J218	Jumper Wire	20 m/m				P-320213
J207, 208	Jumper Wire	30 m/m				P-320200
J212	Jumper Wire	30 m/m				P-320200
J239	Jumper Wire	30 m/m				P-320200

REF. NO.	DESCRIPTION		BSR/ADC PART NO.	MFR'S PART NO.
J601, 602	Jumper Wire	12.5 m/m		P-320128
J603–626	Jumper Wire	5 m/m		P-320125
INDUCTORS				
L601/602 *(L201/202)	Inductor	3.8 H ± 5 %	31-36-1827	P-370016
L603/604 *(L203/204)	Inductor	2.8 H ± 5 %	31-36-1839	P-370017
L605/606 *(L205/206)	Inductor	2.05 H ± 5 %	31-36-1840	P-370018
L607/608 *(L207/208)	Inductor	1.0 H ± 5 %	31-36-1830	P-370019
L609/610 *(L209/210)	Inductor	0.6 H ± 5 %	31-36-1831	P-370020
L611/612 *(L211/212)	Inductor	0.37 H ± 5 %	31-36-1832	P-370021
L613/614 *(L213/214)	Inductor	0.21 H ± 5 %	31-36-1833	P-370022
L615/616 *(L215/216)	Inductor	0.12 H ± 5 %	31-36-1834	P-370023
L617/618 *(L217/218)	Inductor	0.06 H ± 5 %	31-36-1835	P-370024
L619/620 *(L219/220)	Inductor	0.037 H ± 5 %	31-36-1836	P-370025
L621/622 *(L221/222)	Inductor	0.021 H ± 5 %	31-36-1837	P-370026
L623/624 *(L223/224)	Inductor	0.012 H ± 5 %	31-36-1838	P-370027
LED				
D301	LED	LT-201 (red)	31-53-1066	
*D301	LED	GL 3AR1 (red)	31-53-1054	
D401–414	LED	SLP-144B (red)	31-53-1068	
RESISTORS	PZ = Axial type J = ± 5 %			
R101/102	Carbon	¼ W PZ 1 KΩ J	31-23-1001-102	
R103/104	Carbon	¼ W PZ 220 KΩ J	31-23-1001-224	
R105/106	Carbon	¼ W PZ 120 KΩ J	31-23-1001-124	
R107/108	Carbon	¼ W PZ 270 KΩ J	31-23-1001-274	
R109/110	Carbon	¼ W PZ 3.3 KΩ J	31-23-1001-332	
R111/112	Carbon	½ W PZ 3.3 KΩ J	31-23-1002-332	
*R111/112	Carbon	¼ W PZ 3.3 KΩ J	31-23-1001-332	
R113/114	Carbon	¼ W PZ 3.3 KΩ J	31-23-1001-332	
R115/116	Carbon	¼ W PZ 22 KΩ J	31-23-1001-223	
R117/118	Carbon	¼ W PZ 3.3 KΩ J	31-23-1001-332	
R119/120	Metal Oxide	1 W 2.2 KΩ J	31-23-1003-222	
R121/122	Not used			
R123/124	Carbon	¼ W PZ 470 KΩ J	31-23-1001-474	

REF. NO.	DESCRIPTION			BSR/ADC PART NO.	MFR'S PART NO.
R201/202	Carbon	¼ W PZ	22 KΩ J	31-23-1001-223	
R203/204	Carbon	¼ W PZ	100 KΩ J	31-23-1001-104	
R205/206	Carbon	¼ W PZ	1.5 KΩ J	31-23-1001-152	
R207/208	Not used				
R209/210	Carbon	¼ W PZ	10 KΩ J	31-23-1001-103	
R211/212	Carbon	¼ W PZ	1 KΩ J	31-23-1001-102	
R213/214	Carbon	¼ W PZ	1 KΩ J	31-23-1001-102	
R215/216	Carbon	¼ W PZ	1 KΩ J	31-23-1001-102	
R217/218	Carbon	¼ W PZ	1 KΩ J	31-23-1001-102	
R219/220	Carbon	¼ W PZ	1 KΩ J	31-23-1001-102	
R221/222	Carbon	¼ W PZ	1 KΩ J	31-23-1001-102	
R223/224	Carbon	¼ W PZ	1 KΩ J	31-23-1001-102	
R225/226	Carbon	¼ W PZ	47 KΩ J	31-23-1001-473	
R227/228	Carbon	¼ W PZ	3 KΩ J	31-23-1001-302	
R229/230	Carbon	¼ W PZ	1.8 KΩ J	31-23-1001-182	
R231/232	Carbon	¼ W PZ	1 KΩ J	31-23-1001-102	
R233/234	Carbon	¼ W PZ	680 Ω J	31-23-1001-681	
R235/236	Carbon	¼ W PZ	390 Ω J	31-23-1001-391	
R237/238	Carbon	¼ W PZ	220 Ω J	31-23-1001-221	
R239/240	Carbon	¼ W PZ	2.2 MΩ J	31-23-1001-222	
R241/242	Carbon	¼ W PZ	2.2 MΩ J	31-23-1001-222	
R243/244	Carbon	¼ W PZ	2.2 MΩ J	31-23-1001-222	
R245/246	Carbon	¼ W PZ	2.2 MΩ J	31-23-1001-222	
R247/248	Carbon	¼ W PZ	2.2 MΩ J	31-23-1001-222	
R249/250	Carbon	¼ W PZ	2.2 MΩ J	31-23-1001-222	
R251/252	Carbon	¼ W PZ	2.2 MΩ J	31-23-1001-222	
R253/254	Carbon	¼ W PZ	2.7 KΩ J	31-23-1001-272	
R255/256	Carbon	¼ W PZ	2.7 KΩ J	31-23-1001-272	
R257/258	Carbon	¼ W PZ	2.7 KΩ J	31-23-1001-272	
R259/260	Carbon	¼ W PZ	2.7 KΩ J	31-23-1001-272	
R261/262	Carbon	¼ W PZ	2.7 KΩ J	31-23-1001-272	
R263/264	Carbon	¼ W PZ	2.7 KΩ J	31-23-1001-272	
R265/266	Carbon	¼ W PZ	2.7 KΩ J	31-23-1001-272	
R267	Carbon	¼ W PZ	47 KΩ J	31-23-1001-473	
R268	Carbon	¼ W PZ	3.3 KΩ J	31-23-1001-332	
R269	Metal Oxide	3 W	270 Ω J	31-23-1003-271	
R270	Carbon	¼ W PZ	100 KΩ J	31-23-1001-104	
R271	Carbon	¼ W PZ	220 KΩ J	31-23-1001-224	
R272	Carbon	¼ W PZ	3.3 KΩ J	31-23-1001-332	
R273	Carbon	¼ W PZ	2.7 KΩ J	31-23-1001-272	
R274	Carbon	¼ W PZ	470 Ω J	31-23-1001-471	
R275/276	Carbon	¼ W PZ	1 KΩ J	31-23-1001-102	
R277/278	Carbon	¼ W PZ	47 KΩ J	31-23-1001-473	
R279/280	Carbon	¼ W PZ	100 KΩ J	31-23-1001-104	
R501/502	Carbon	¼ W PZ	560 Ω J	31-23-1001-561	
R503/504	Carbon	¼ W PZ	120 KΩ J	31-23-1001-124	
R505/506	Carbon	¼ W PZ	220 KΩ J	31-23-1001-224	
R507/508	Carbon	½ W PZ	2.2 KΩ J	31-23-1002-222	
R509/510	Carbon	¼ W PZ	10 KΩ J	31-23-1001-103	
R601/602 *(R201/202)	Carbon	¼ W PZ	220 Ω J	31-23-1001-221	
R603/604 *(R203/204)	Not used				
R605/606 *(R205/206)	Carbon	¼ W PZ	56 Ω J	31-23-1001-560	

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
R607/608 *(R207/208)	Carbon ¼ W PZ 220 Ω J	31-23-1001-221	
R609/610 *(R209/210)	Carbon ¼ W PZ 220 Ω J	31-23-1001-221	
R611/612 *(R211/212)	Carbon ¼ W PZ 330 Ω J	31-23-1001-331	
R613/613 *(R213/214)	Carbon ¼ W PZ 390 Ω J	31-23-1001-391	
R615/616 *(R215/216)	Carbon ¼ W PZ 270 Ω J	31-23-1001-271	
R617/618 *(R217/218)	Carbon ¼ W PZ 330 Ω J	31-23-1001-331	
R619/620 *(R219/220)	Carbon ¼ W PZ 390 Ω J	31-23-1001-391	
R621/622 *(R221/222)	Carbon ¼ W PZ 470 Ω J	31-23-1001-471	
R623/624 *(R223/224)	Carbon ¼ W PZ 560 Ω J	31-23-1001-561	
SWITCHES			
S1	LINE/RECORD Switch Push type 4 gang	31-16-1010	P-180367
S2	TAPE MON/OUT Switch Push type 4 gang	31-16-1010	P-180367
S3	BY-PASS/EQ Switch Push type 4 gang	31-16-1010	P-180367
S4	METER/OUT Switch Push type 4 gang	31-16-1010	P-180367
S5	Power Switch ESB-70224T TV-3 (U.S.A., Canadian, PX)	31-16-1005	P-180382
S5	Power Switch ESB-70244 (European)	31-16-1006	P-180383
*S5	Power Switch SDG-1P TV-3	31-16-1024	P-180247
	AC Voltage Selector Switch (PX)	31-16-1021	P-180333
TRANSFORMERS			
T301	Power Transformer 120 V AC 60 Hz (U.S.A., Canadian)	31-27-1024	P-100622
T301	Power Transformer 230 V AC 50 Hz (European)	31-27-1026	P-100623
T301	Power Transformer 100/120/220/240 V AC 50/60 Hz (PX)	31-27-1025	P-100624
*T301	Power Transformer 120 V AC 60 Hz	31-27-1019	P-100555
TRANSISTORS			
TR101/102	2SC1313(G) or 2SC1222(2)(F)	31-53-1051	
TR103/104	2SC1313(G) or 2SC1222(2)(F)	31-53-1051	
TR105/106	2SC1313(G) or 2SC1222(2)(F)	31-53-1051	
TR107/108	2SA953(L)	31-53-1062	
TR201	2SC945A(P)	31-53-1055	
TR202	2SD314(E)	31-53-1056	
TR501/502	2SC1313(H) or 2SC1222(2)(U)	31-53-1067	
VARIABLE RESISTORS			
VR201/202	Potentiometer (METER Control) 50 KΩ B Rotary type	31-16-1015	P-170274
VR203/204	Trimmer Resistor 100 KΩ B	31-16-1026	P-170444
VR205/206	Trimmer Resistor 1 KΩ B	31-16-1027	P-170433
VR501/502	Potentiometer (LEVEL Control) 10 KΩ 3B Rotary type	31-16-1013	P-170481
*VR501/502	Potentiometer (LEVEL Control) 10 KΩ 3B Rotary type	31-16-1012	P-170479
VR601–624 *(VR201–224)	Potentiometer (Gain Control) 50 KΩ SpW Slide type	31-21-1015	P-170275
FUSES			
	Fuse 0.25 A/250 V (PX)	31-22-1404	P-250112
	Midget Fuse 160 mAT/250 V (European)	31-22-1413	P-250046
	Midget Fuse 200 mAT/250 V (European)	31-22-1414	P-250083

EXPLODED VIEW PARTS LIST

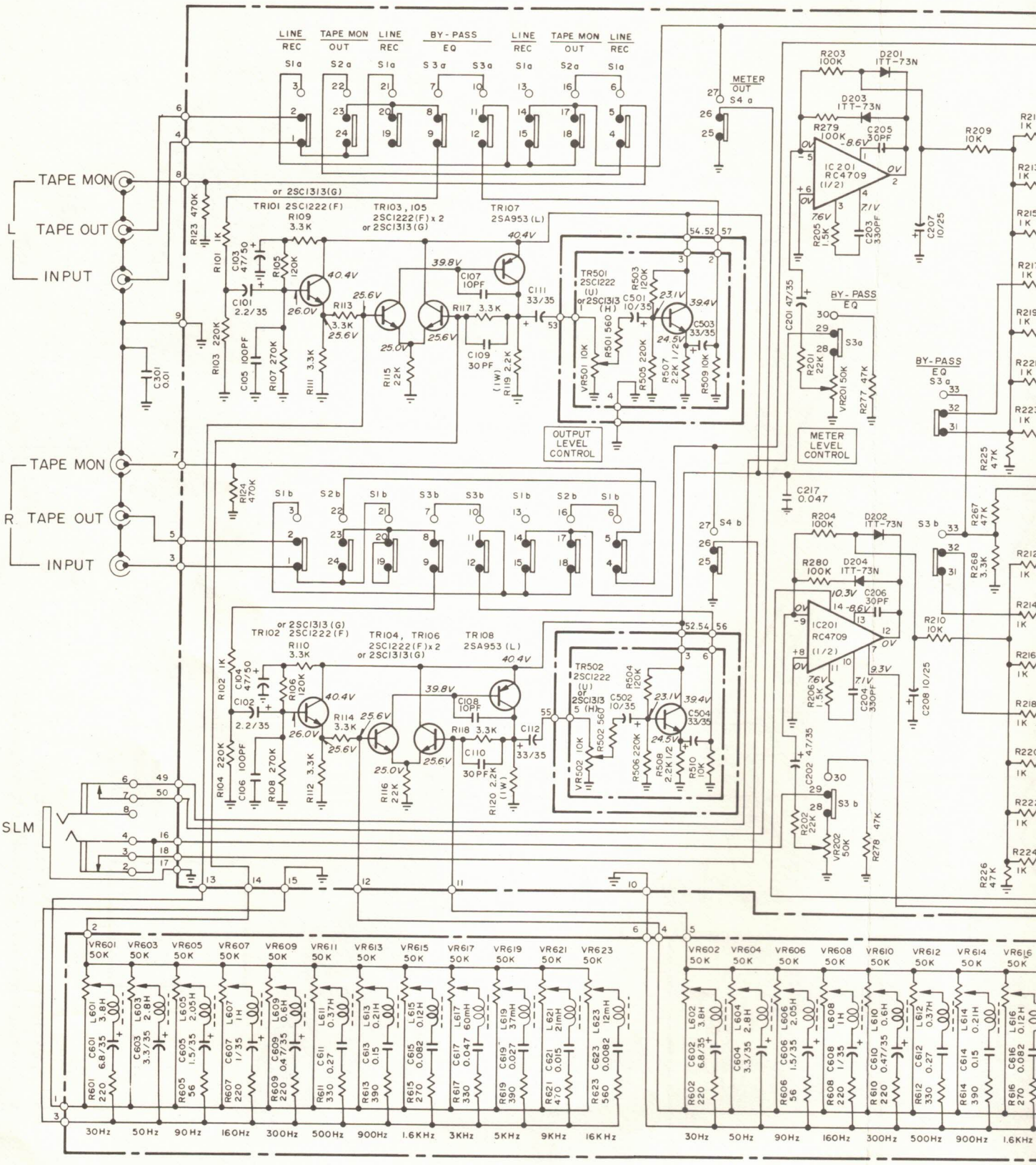
REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
1	Main Chassis	31-14-1082	P-400170
2	Amp & Power Supply P.C.B.	31-17-1509	U-23121
3	Power Transformer (U.S.A., Canadian)	31-27-1024	P-100622
3	Power Transformer (European)	31-27-1026	P-100623
3	Power Transformer (PX)	31-27-1025	P-100624
*3	Power Transformer	31-27-1019	P-100555
4	Power Indicator LED (D301)	31-53-1066	
*4	Power Indicator LED (D301)	31-53-1054	
5	LED Holder	31-18-1018	P-680199
6	Front Chassis	31-14-1105	P-400242
*6	Front Chassis	31-14-1127	P-400233
7	Power Switch (U.S.A., Canadian, PX)	31-16-1005	P-180382
7	Power Switch (European)	31-16-1006	P-180383
*7	Power Switch	31-16-1024	P-180247
8	Headphone Bracket	31-13-1063	P-411779
9	Headphone Jack	31-20-1010	P-190155
10	Control P.C.B.	31-17-1517	U-23133
*10	Control P.C.B.	31-17-1510	U-23122
11	Line Pass Capacitor (U.S.A.)	31-25-1064	
11	Line Pass Capacitor (Canadian)	31-25-1025	
11	Line Pass Capacitor (European)	31-25-1002	P-220022
11	Line Pass Capacitor (PX)	31-25-1002	P-220022
12	Power Switch Cover (European, PX)	31-40-1020	P-480145
13	Cover for Line Pass Capacitor (U.S.A., PX)	31-40-1009	P-610466
13	Cover for Line Pass Capacitor (European)	31-40-1010	P-610467
14	Back Panel (U.S.A.)	31-14-1099	P-411853
14	Back Panel (Canadian)	31-14-1100	P-411854
14	Back Panel (European)	31-14-1106	P-411855
14	Back Panel (PX)	31-14-1107	P-411856
*14	Back Panel	31-14-1101	P-411716
**14	Back Panel	31-14-1128	P-411765
15	Level Control P.C.B.	31-17-1518	U-23136
*15	Level Control P.C.B.	31-17-1519	U-23134
16	Supporter for Level Control P.C.B.	31-14-1098	P-820593
*16	Supporter for Level Control P.C.B.	31-14-1129	P-820582
17	8P Pin Jack	31-20-1003	P-320001
18	AC Cord (U.S.A., Canadian)	31-46-1011	P-310093
18	AC Cord (European)	31-46-1018	P-310105
18	AC Cord (PX)	31-46-1014	P-310056
19	AC Cord Strain Relief 3P-4 (U.S.A., Canadian, PX)	31-13-1251	P-480010
19	AC Cord Strain Relief 4N-4 (European)	31-13-1064	P-480080
20	AC Outlet (U.S.A., Canadian, PX)	31-18-1005	P-190098
21	LED P.C.B.	31-17-1511	U-25135
22	AC Voltage Selector Switch (PX)	31-16-1021	P-180333
23	Block Terminal (European)	31-18-1008	P-320251
24	Insulation Cap (European)	31-40-1013	P-690284
25	Insulation Sheet (European)	31-40-1023	P-690251
26	Fuse Bracket (European)	31-14-1136	P-411917
27	Fuse Holder (European)	31-18-1953	P-260008
28	Midget Fuse (160 mAT/250 V) (European)	31-22-1413	P-250046
29	Midget Fuse (200 mAT/250 V) (European)	31-22-1414	P-250083
30	Front Panel Ass'y	31-14-1126	P-700443
	(Consists of Front Panel	31-14-1130	P-700438

REF. NO.	DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
	Knob Guide	31-14-1114	P-610447
	Blind Sheet	31-40-1014	P-480180
*30	Front Panel Ass'y	31-14-1112	P-700374
	(Consists of Front Panel	31-14-1113	P-700367
	Knob Guide	31-14-1114	P-610447
	Blind Sheet	31-40-1014	P-480180
31	Sheet for Front Panel	31-40-1011	P-480181
32	Cover for LED P.C.B.	31-13-1062	P-610619
33	Handle	31-14-1085	P-720012
34	Handle Washer	31-13-1100	P-420299
35	Knob 248	31-14-1123	P-650248
36	Knob 263	31-14-1110	P-650263
37	Knob 400	31-14-1138	P-650400
*37	Knob 261	31-14-1111	P-650261
38	Cabinet	31-14-1571	P-411666
39	Bottom Plate	31-14-1561	P-411319
40	Foot (A)	31-13-1140	P-610461
41	Foot (B)	31-13-1141	P-680145
42	Number Plate	31-59-1224	P-730184
HARDWARE			
S1	Bind Tapping Screw 3 x 6BT-2		
S2	Pan Screw 3 x 8P		
S3	Bind Tapping Screw 3 x 8BT-3		
S4	Pan Screw with Flange Lock Washer 3 x 5PFL		
S5	Bind Tapping Screw 3 x 8BT-2		
S6	Pan Screw with Poly-wave Lock Washer 3x6PT-2 PW		
S7	Bind Tapping Screw with Tooth 3 x 8BT-2		
S8	Pan Screw with Flange Lock Washer 3 x 8P FL		
S9	Bind Tapping Screw 3 x 20BT-3		
W1	Outer Tooth Washer 3W		
W2	Washer 3W		
W3	Washer 4W		
N1	Nut 3N		
N2	Flange Nut 3N F		
N3	Nut 4N		
SW1	Spring Washer 3SW		
SW2	Spring Washer 4SW		
R1	Rivet (Black) YB-429		
R2	Rivet (Black) YB-320		

MISCELLANEOUS PARTS LIST

DESCRIPTION	BSR/ADC PART NO.	MFR'S PART NO.
Terminal for P.C.B.		P-320245
* Heat Sink for Transistor (one of Amp & Power Supply P.C.B.)	31-49-1003	P-411332
* Cable Tie (A)	31-59-1249	P-610147
Fuse Label 160 mAT/250 V (European)	31-59-1100	P-810720
Fuse Label 200 mAT/250 V (European)	31-59-1231	P-810721
Master Carton (U.S.A., Canadian, European)	31-59-1299	P-800774
Master Carton (PX)	31-59-1298	P-800775
* Master Carton	31-59-1248	P-800700
**Master Carton	31-59-1491	P-800795
Double Master Carton (PX)	31-59-1278	P-800779
Gift Box (U.S.A., PX)	31-59-1468	P-800776
Gift Box (Canadian)	31-59-1469	P-800777
Gift Box (European)	31-59-1470	P-800778
* Gift Box	31-59-1282	P-800697
**Gift Box	31-59-1492	P-800796
Snow Box	31-59-1471	P-820581
* Snow Box	31-59-1274	P-820449
**Snow Box	31-59-1274	P-820449
Owner's Manual (U.S.A., European, PX)	31-59-1487	P-810826 or P-810843
Owner's Manual (Canadian)	31-59-1927	P-810825
* Owner's Manual	31-59-1482	P-810771
Address & BSR No. Label for Canadian Owner's Manual (Canadian)	31-59-1900	P-810856
Warranty Card (2 years) (U.S.A.)	31-854-2231	P-810762
Warranty Card (1 year) (European, PX)	31-59-1475	P-810782
IHF Tag (U.S.A.)	30-853-0463	P-810770
Caution Label (U.S.A., European, PX)	31-59-1495	P-810009
C.S.A. Caution Label (Canadian)	31-59-1268	P-810511
QC Label	31-59-1928	P-810019
UL Label (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	31-59-1453	P-690253
Poly Bag for Set	31-59-1273	P-820454
Poly Bag for AC Cord	31-59-1233	P-820418
AC Cord Tag (European)	31-59-1483	P-810698
Patch Cord	31-46-1008	P-190124
Service Manual	31-59-1490	

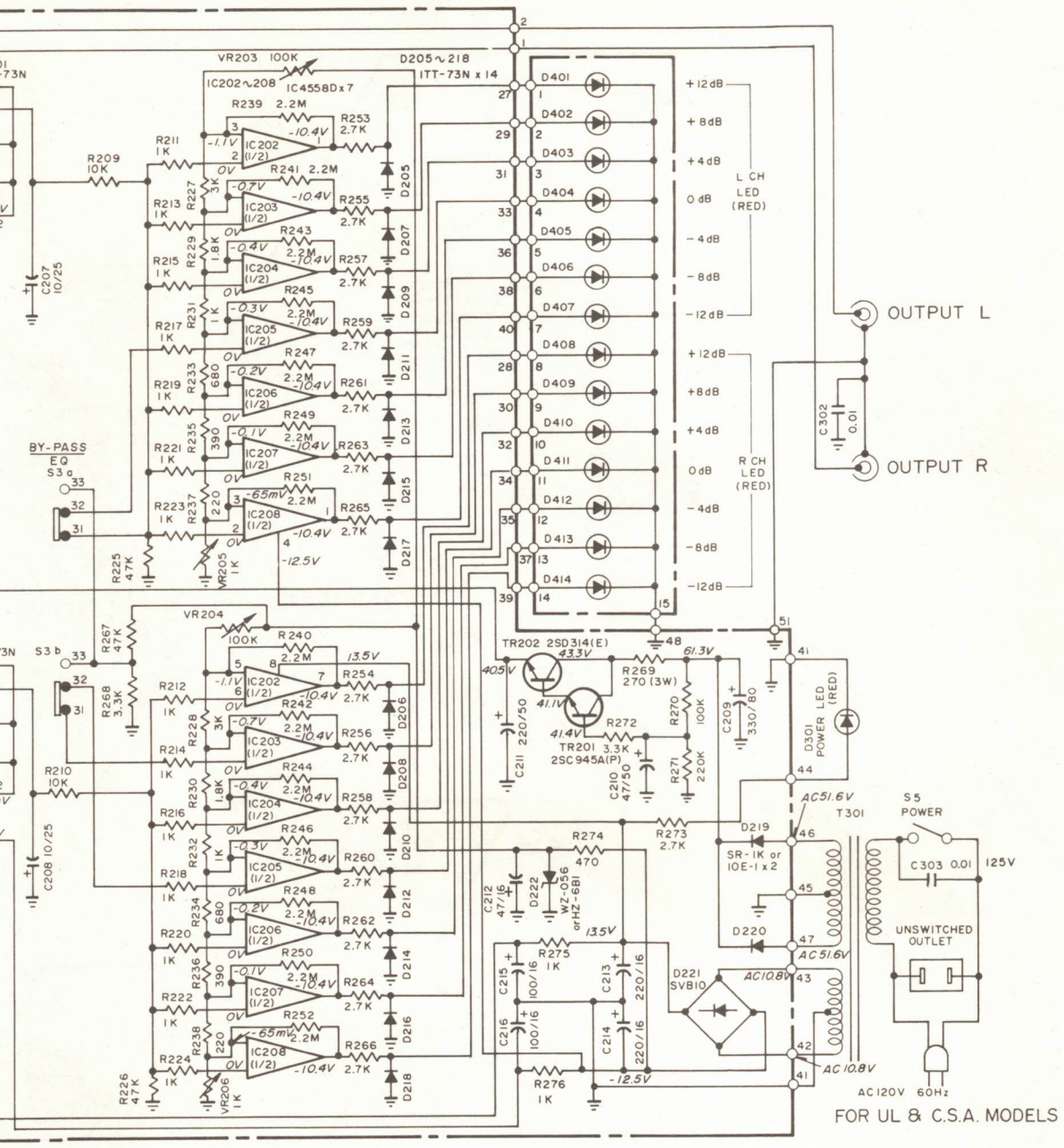
SCHEMATIC DIAGRA

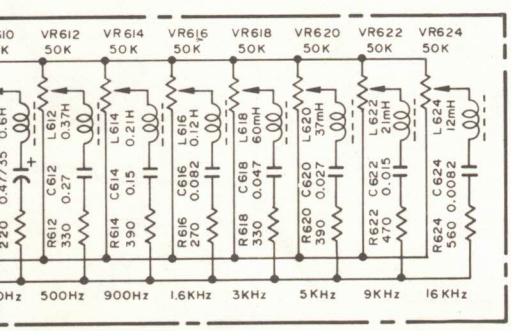


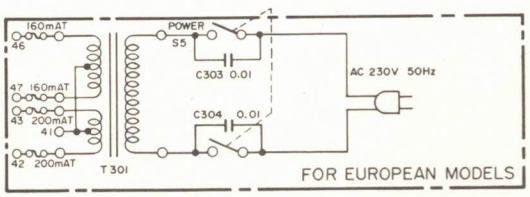
NOTE: (1) ALL RESISTANCE VALUES ARE INDICATED IN "OHM" ($K=10^3$ OHM)

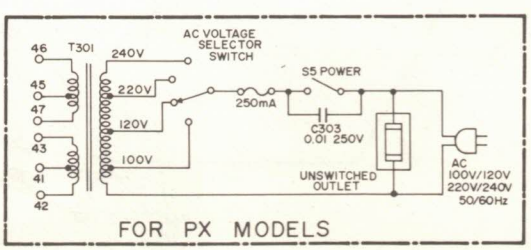
(2) ALL CAPACITANCE VALUES ARE INDICATED IN "μF" ($Pf=10^{-6}$ μF)

DIAGRAM







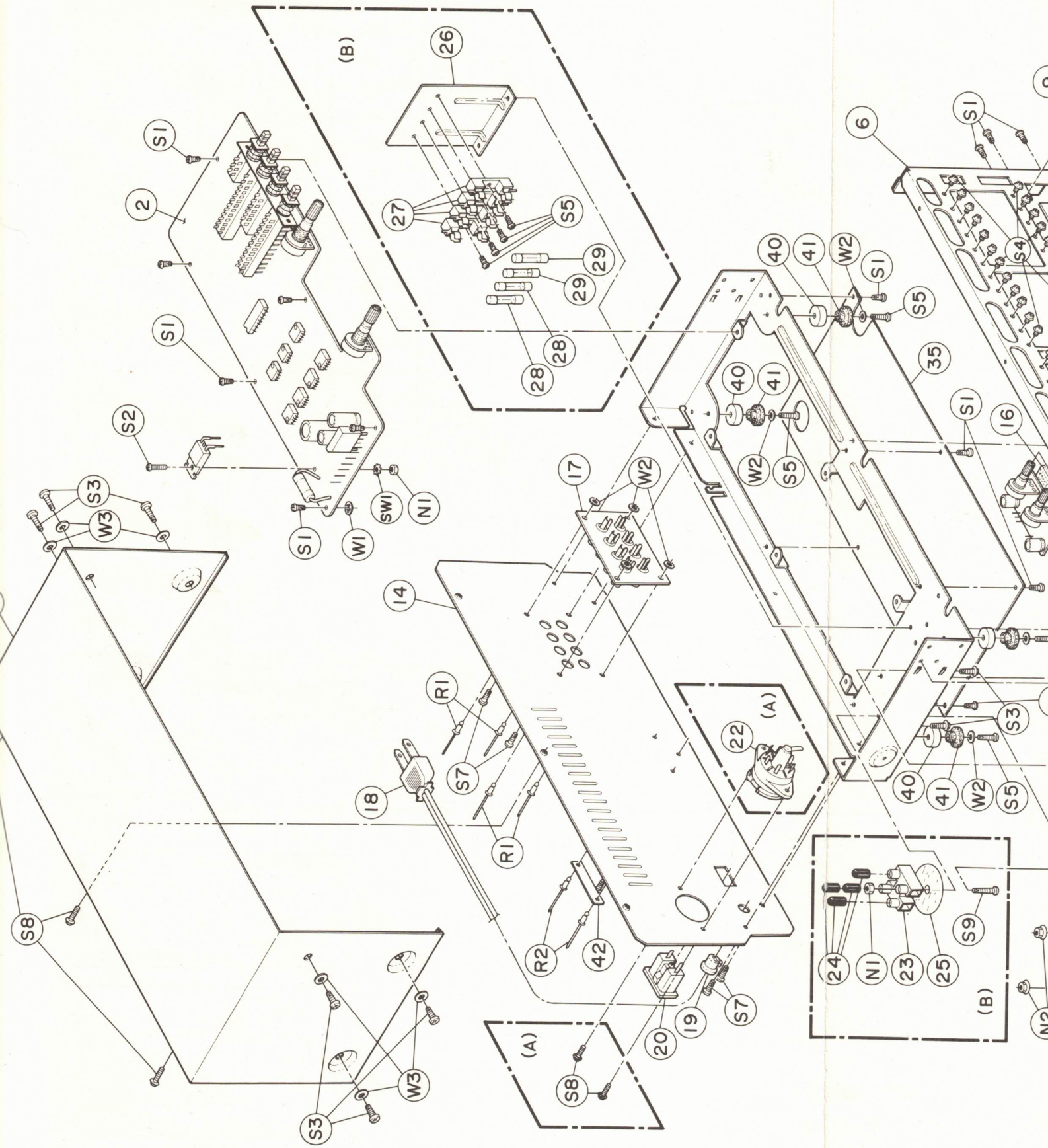


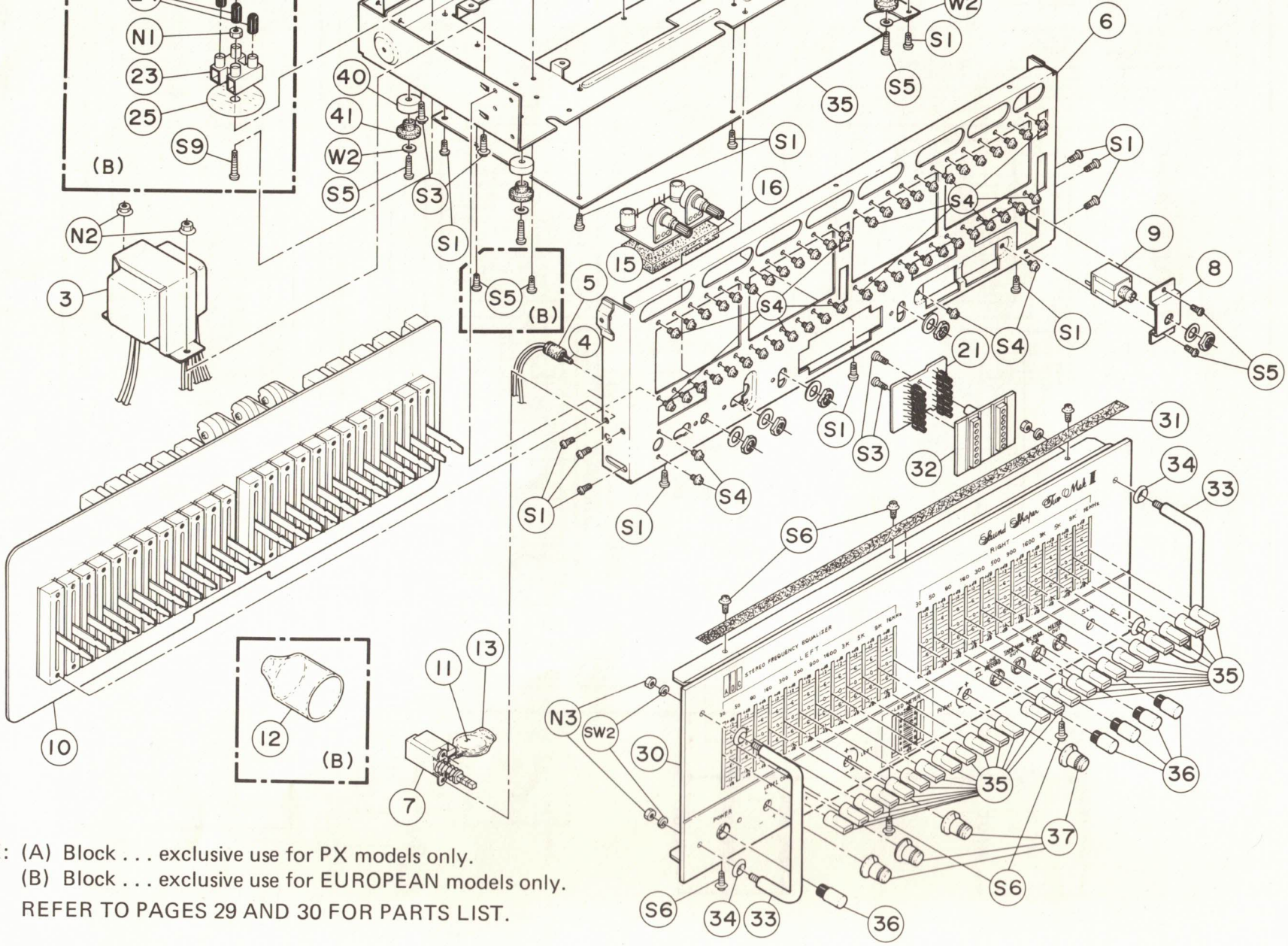
HM)

uF)

A

EXPLODED VIEW





NOTE: (A) Block . . . exclusive use for PX models only.
(B) Block . . . exclusive use for EUROPEAN models only.
REFER TO PAGES 29 AND 30 FOR PARTS LIST.

ADC Audio Dynamics

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