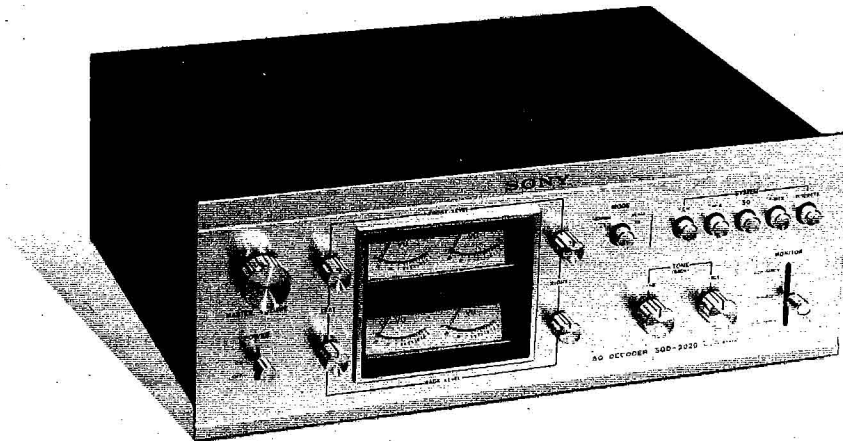


# SQD-2020

*USA, Canada and AEP Model*



## SQ DECODER

### SPECIFICATIONS

<b>Frequency response:</b>	20 Hz to 20 kHz	<b>Harmonic distortion:</b>	less than 0.1% at each channel (Input; 250 mV 2 kHz)
<b>Input sensitivity and impedance:</b>	FRONT PREAMP: 250 mV 100k 2CH TAPE: 750 mV 100k 4CH TAPE: 750 mV 100k REC/PB: 750 mV 100k (input) DISCRETE: 250 mV 100k	<b>Tone controls:</b>	BASS ±10 dB at 100 Hz TREBLE ±10 dB at 10 kHz
<b>Output level and impedance:</b>	FRONT PREAMP: 500 mV 5k OUTPUT { HIGH: 2V 5k LOW: 500 mV 5k 2CH REC OUT: 250 mV 5k 4CH REC OUT: 250 mV 5k REC/PB: 30 mV 82k (output)	<b>General</b>	
<b>Signal-to-noise ratio:</b>	greater than 80 dB (weighting network A)	<b>Semiconductors:</b>	69 transistors and 84 diodes
<b>SQ separation:</b>	Lf-Rf 20 dB or more Lb-Rb 14 dB or more Lf-Lb 20 dB or more Rf-Rb 20 dB or more Lf-Rb 20 dB or more Rf-Lb 20 dB or more Cf-Cb 15 dB or more	<b>Power requirements:</b>	120V 60 Hz, ac (USA and Canada Model) 100, 127, 220, 240V 50/60 Hz, ac (AEP Model)
		<b>Power consumption:</b>	15W
		<b>Dimensions:</b>	400(w) x 149(h) x 327(d) mm 15 <sup>3</sup> / <sub>8</sub> (w) x 5 <sup>7</sup> / <sub>8</sub> (h) x 12 <sup>7</sup> / <sub>8</sub> (d) inches
		<b>Net weight:</b>	Approx. 5.9 kg (13 lb)
		<b>Shipping weight:</b>	Approx. 8.8 kg (19 lb 7 oz)

**SONY**<sup>®</sup>  
**SERVICE MANUAL**

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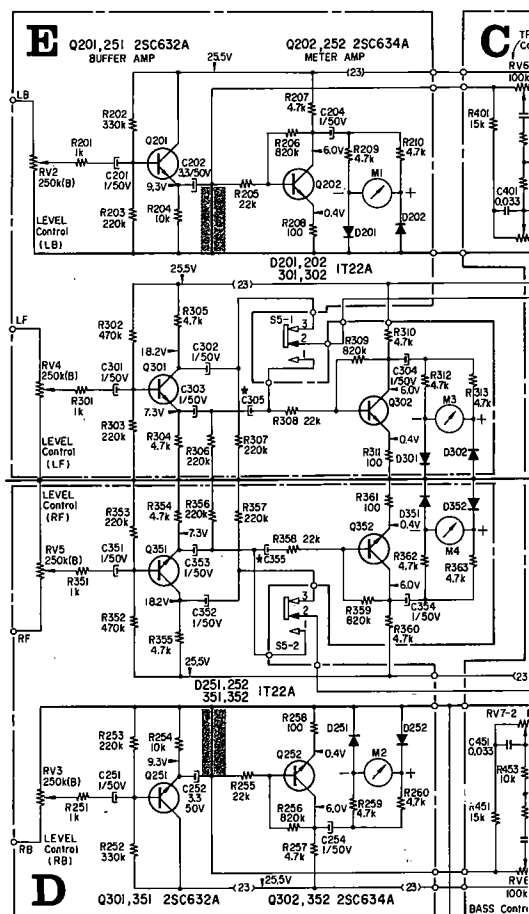
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## CORRECTION

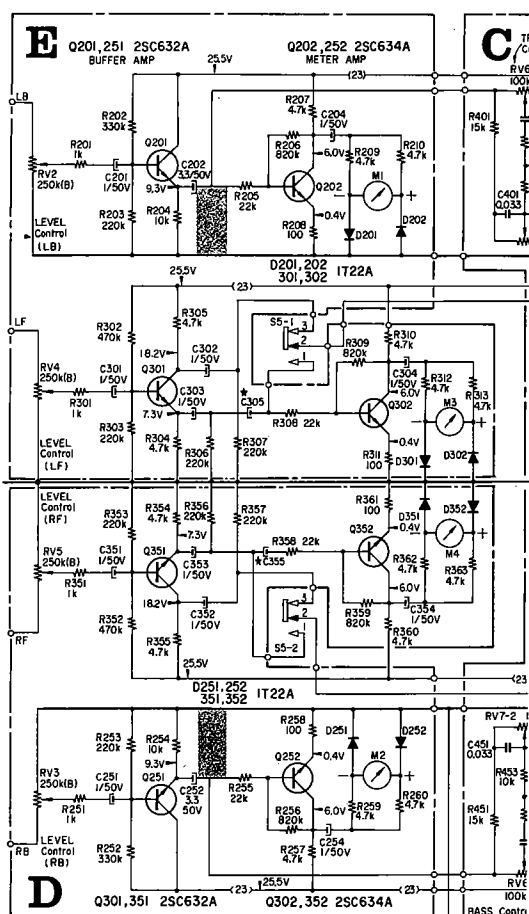
Subject: Errors in the schematic diagram

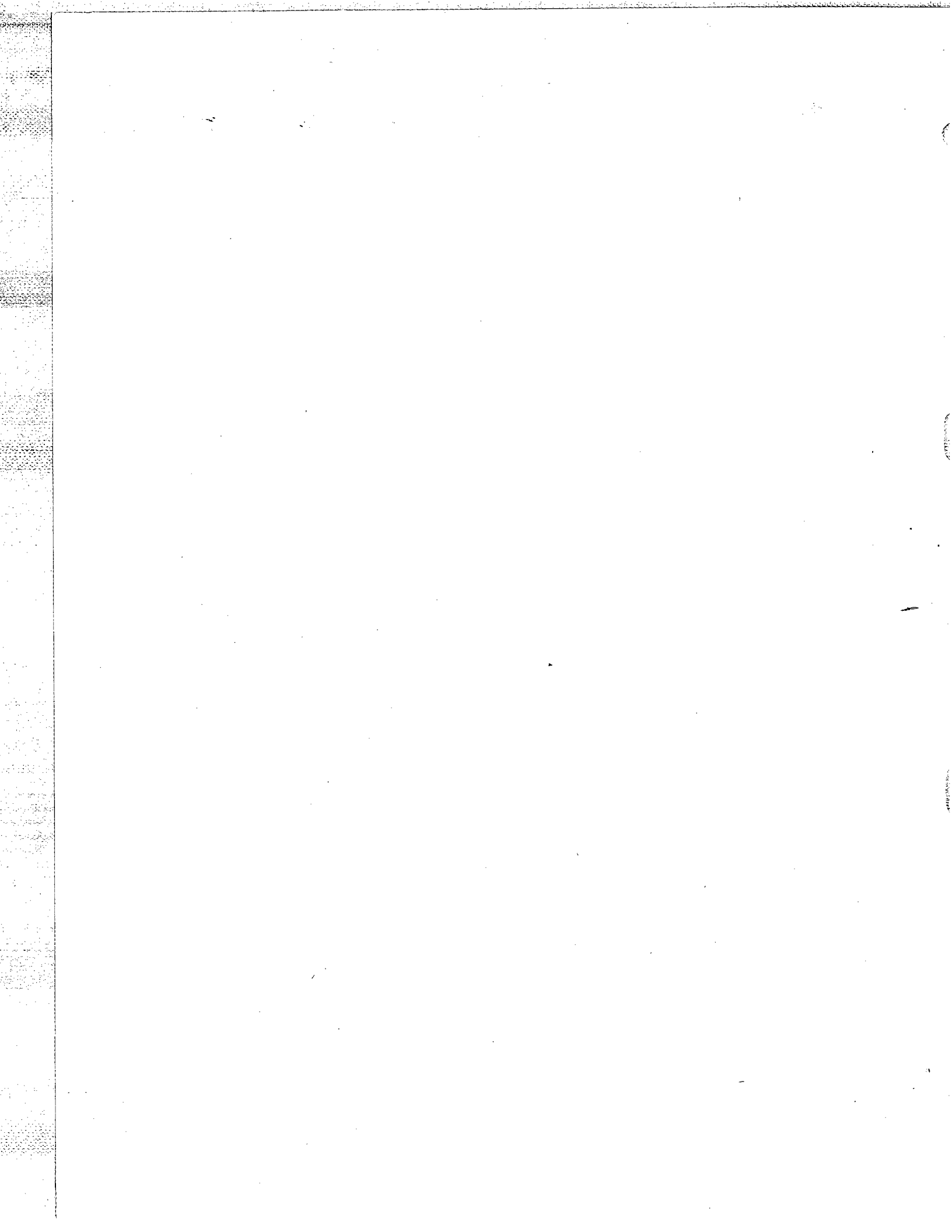
There are two errors in the schematic diagram on pages 31 ~ 32. A section of the schematic diagram with these errors is shown at below left (shaded areas). The correct diagram is shown at below right.

Incorrect



Correct



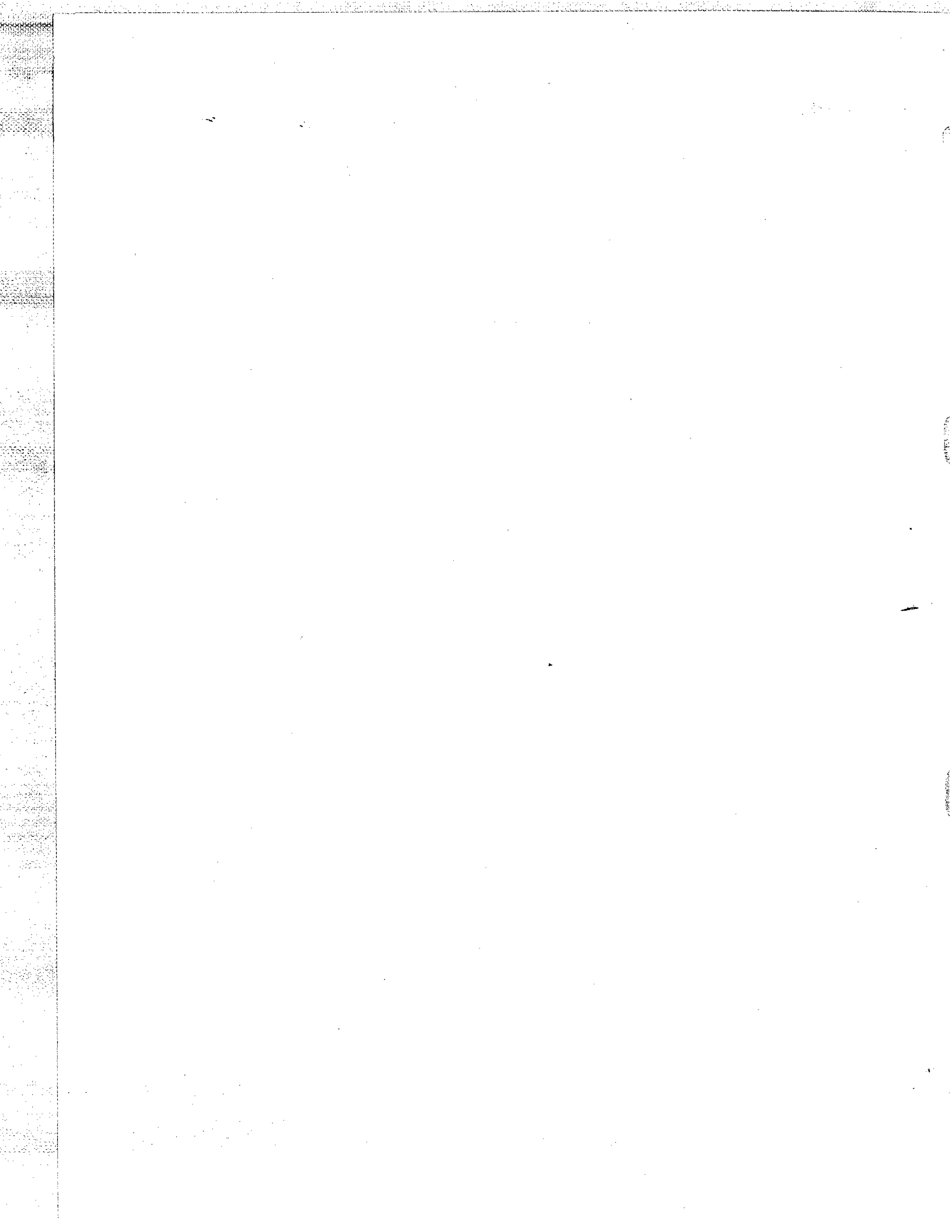


## CORRECTION

There are two printing errors in the service manual. To avoid confusion, correct as follows:

Page 31

	Incorrect	Correct
Emitter Voltage of Q103	9.6V	9.7V
Emitter Voltage of Q104	9.6V	9.7V



## SECTION 1 TECHNICAL DESCRIPTION

### 1-1. FUNCTION OF CONTROLS

Refer to Fig. 1-1 and Block Diagram.

#### 1. MASTER VOLUME Control (RV8-1~4)

Regulates the four-output levels simultaneously. Note that the VU meter indication does not show each output-level but the relative output level between the four-channels.

#### 2. FRONT LEVEL and BACK LEVEL Controls and VU Meters

RV2 ~ RV5 control the individual output levels. Each output level is monitored by the corresponding VU meter and the relative output level is shown by the amount of meter deflection to the right. Note that the MASTER VOLUME control has no effect on the meter deflection.

#### 3. BACK TONE Controls (BASS and TREBLE)

Control the prominence of BACK channel bass and treble notes.

#### 4. MODE Selector (S3)

Determines the mode of the signal appearing at the front and back channel OUTPUT jacks. Those are stenciled FRONT PREAMP (TAPE IN), and OUTPUT (TO BACK AMP; HIGH, LOW), respectively.

This switch is normally kept in the released position (NORMAL). In the MONO position (pushed-in), the OUTPUT (to front preamp and back channel amp) jacks provide monaural signal. Use the MONO position for balancing the four-channel sound level. See Table 1-1.

#### 5. SYSTEM Selector (S1)

Selects the five modes of operations as follows:

2CH ..... For 2-channel program source reproduction.

\*2 → 4 ..... Converts conventional 2-channel programs into quasi-four-channel signals.

\*SQ ..... SQ program reproduction. This also converts the conventional 2-channel program into quasi-four-channel signals.

\*R-MTX ..... For matrix four-channel program of other-type matrix system.

DISCRETE.. For discrete four-channel programs connected to the DISCRETE INPUTS.

\*Note: For conventional stereo program sources, use either the SQ, R-MTX or 2 → 4 for four-channel listening, according to your preference.

#### 6. MONITOR Selector (S2)

Selects the three modes of operations as follows:

4CH TAPE.. For discrete four-channel tape connected to the 4CH TAPE RECORDER TAPE inputs.

\*SOURCE... For conventional program sources connected to the front amplifier.

2CH TAPE.. For two-channel tape connected to the 2CH TAPE RECORDER TAPE inputs. (the DISCRETE switch must be released)

\*Note: LEVEL ADJ (RV1 on the rear panel) controls the input signal level to avoid possible overload.

Table 1-1.

MODE Switch Position	Input or decoded signal	Output	Remarks
NORMAL			
MONO			Useful for balancing four-channel sound level.

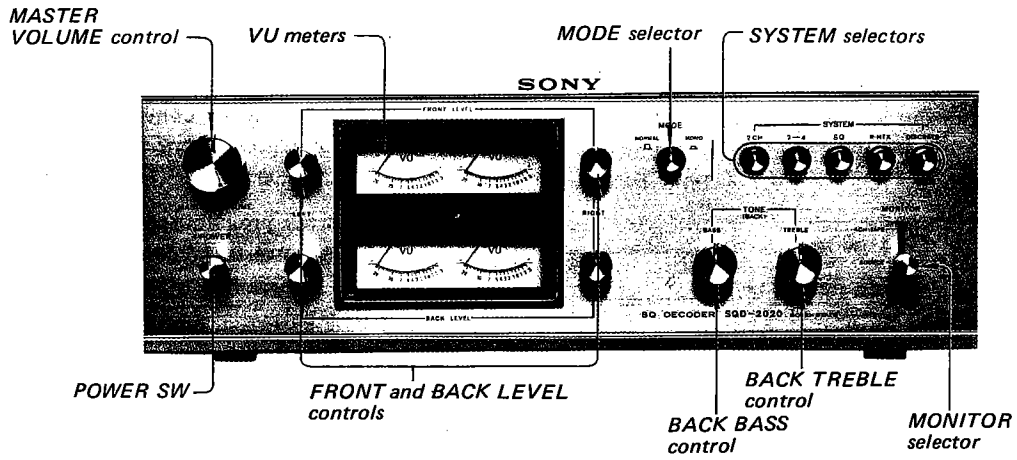


Fig. 1-1 (a). Front view

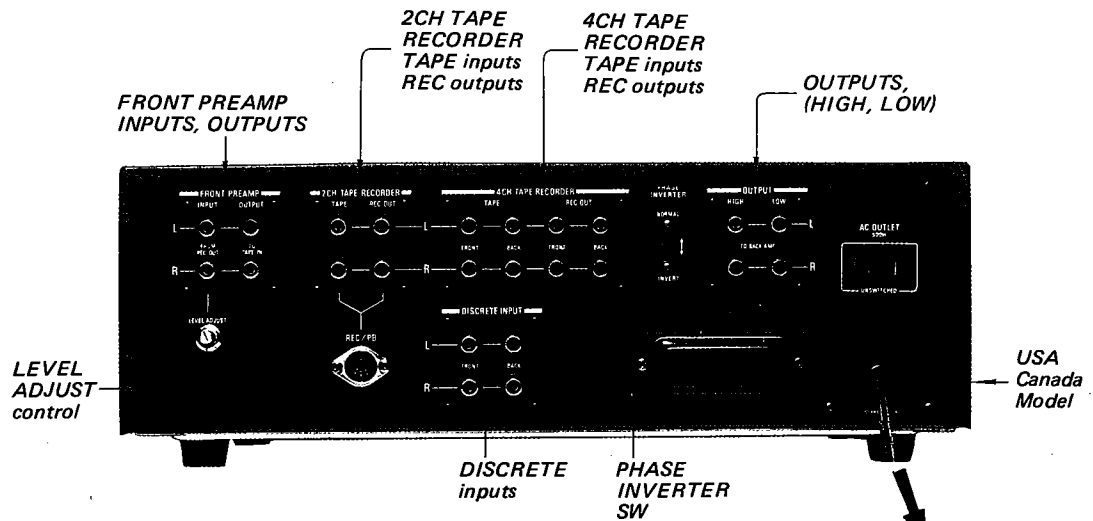


Fig. 1-1 (b). Rear view

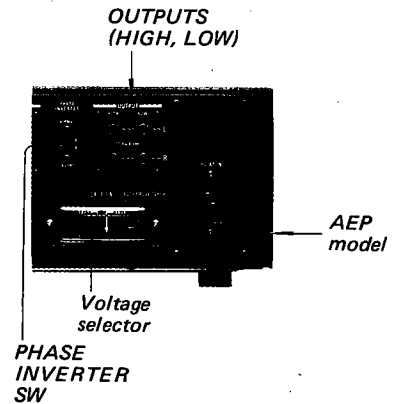


Fig. 1-1 (b). Rear view



**1-2. CIRCUIT DESCRIPTION DIGEST**

The meter circuits, tone control circuits and buffer amplifiers in the SQD-2020 are conventional, so only the SQ Decoder and Logic Sections, and the Muting circuit are described.

The SQ Decoder and Logic Section consists of seven parts; a Basic SQ Decoder, AGC block, Wave Matching Logic, Front Back Logic, Differential Amplifier, Time Control circuit and Gain Control Amplifier. Physically, the "B" board includes the SQ Decoder and Logic Section.

**1. Basic SQ Decoder**

When reproducing SQ records or tapes, encoded  $L_T$  and  $R_T$  signals are applied to the Basic SQ Decoder first. Fig. 1-2 shows the process of SQ encoding system and the relationship between the  $L_T$ ,  $R_T$  signals and the original signals. The basic SQ Decoder produces four output signals;  $L_f$ ,  $R_f$ ,  $L_b$ ,  $R_b$  (See Fig. 1-3) derived from  $L_T$  and  $R_T$  signals, which

have a specific relationship to the original four signals. Referring to Fig. 1-5, the  $L_T$  and  $R_T$  signals are fed to the phase shifters ( $\phi - 0^\circ$  and  $\phi - 90^\circ$ ) designed that they pass all audio frequencies (30 Hz to 20kHz) unattenuated (relative to 1kHz), and maintain their relative phase angles at  $90^\circ$  to each other as shown in Fig. 1-4.

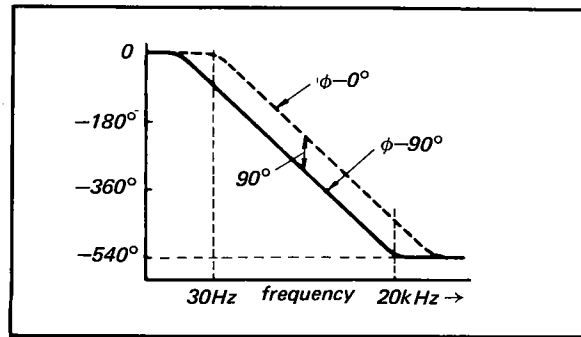


Fig. 1-4. Phase shifter response

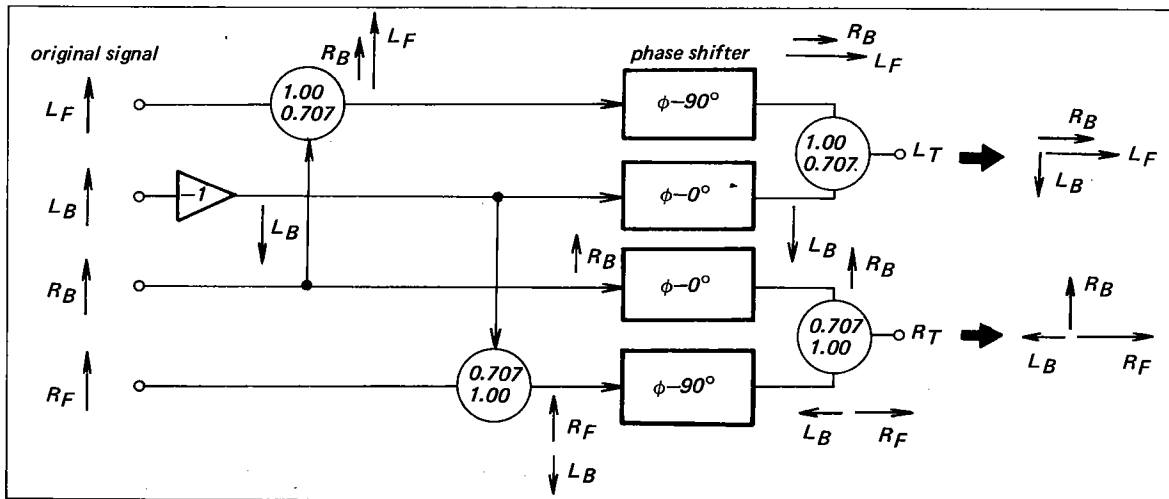


Fig. 1-2. SQ encoding system

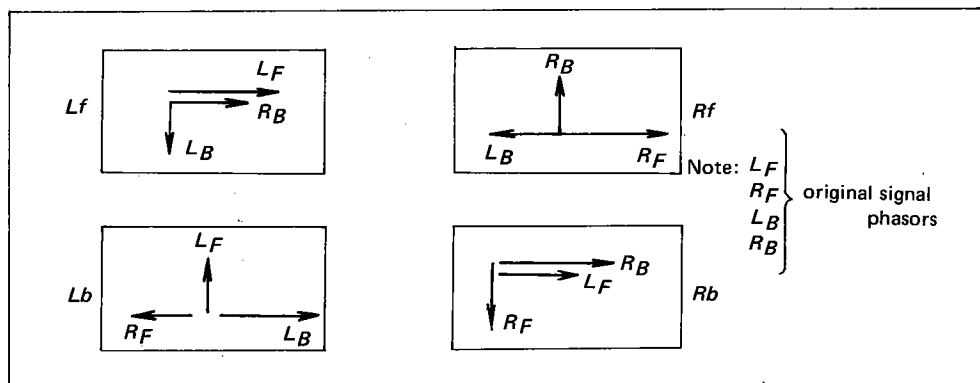


Fig. 1-3. Phasor components of decoded signals

The output of the  $\phi - 0^\circ$  phase shifters are used as the Front signals while the Back signals are composed by mixing the  $\phi - 0^\circ$  and  $\phi - 90^\circ$  phase shifter outputs through R612 and R622 when S4-1a is set to SQ position. Note that phase inversion of the  $\phi - 90^\circ$  phase shifter is performed by utilizing the phase difference between the emitter and collector circuit of a transistor.

As a result  $0.707 L_T(\phi - 0^\circ)$  and  $R_T(\phi - 0^\circ)$  are added to the  $R_T(\phi - 90^\circ)$  and  $L_T(\phi - 90^\circ)$  signals respectively and are used as Back signals ( $L_b$  and  $R_b$ ).

In the R-MTX mode, the resistor matrix circuit at the phase shifter outputs is disabled and just the  $\phi - 90^\circ$  phase shifter outputs are used as Back signals.

The four decoded signals are fed to each output terminal through the Gain Control Amplifier (described later) and an additional resistor matrix circuit.

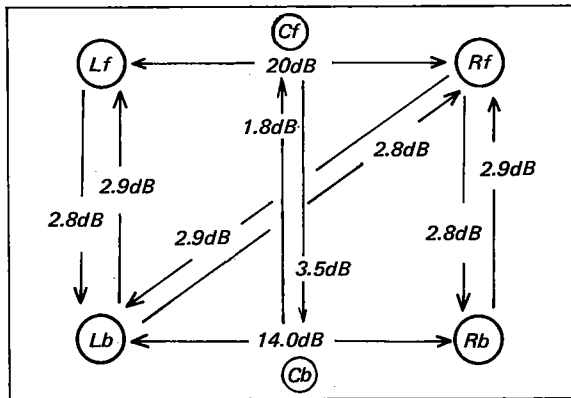


Fig. 1-6. 10-20 matrix SQ decoder separations

To increase the separation between the Center Front and Center Back signals, R728 and R727 are used to mix Front and Back channels respectively. R728 mixes 10% Front and R727 mixes 20% Back respectively. We call this circuit a 10-20 decoder; its separation diagram is shown in Fig. 1-6.

S1-2 and S1-4b changes the amount of mixing between Front and Back channels according to the desired mode.

2. Gain Control Amplifier

The Gain Control Amplifier is operated by the Logic and Variable Impedance circuit, and determines the final output signal level of the SQD-2020. Two pairs of them control the front and back channels simultaneously.

Referring to Fig. 1-7, gain control is performed by changing the impedance of the negative feedback loop at the emitter circuit of the two-stage amplifier. The impedance of diodes (D903 ~ D906) in parallel across Q903 acts as a variable impedance circuit controlled by the Logic circuit.

The effective impedance of a diode changes (from near zero to infinite) according to the current flow through the diode, which is determined by the on or off condition of the transistor.

The control voltage applied to the base circuit of Q903 is generated by the Time Control circuit (described later).

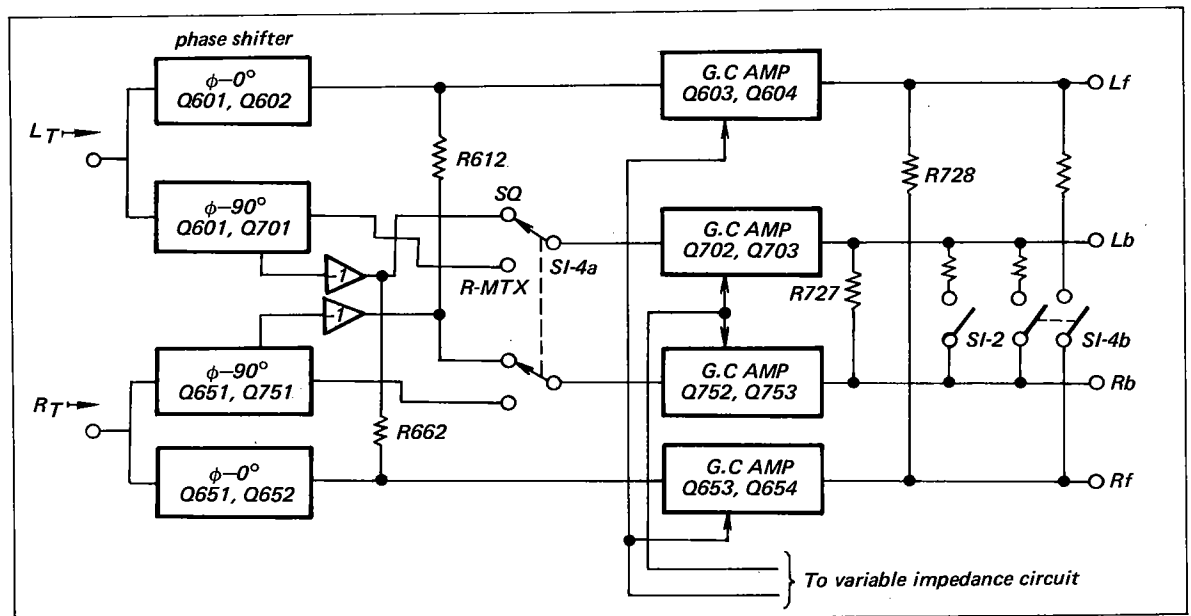


Fig. 1-5. Simplified SQ decoder section

The gain control amplifier response is shown in Fig. 1-8. Notice that the upper limit is 3 dB and the normal operating point is 0 dB. Fig. 1-9 shows the gain changes due to the Logic operation when the input signal contains only Front or Back channel components. This proves that a three dB increase in either pair of Gain Control Amplifiers during Logic operation maintains the overall sound energy constant, thereby preventing unnatural perception of the reproduced sound. Note that the Gain Control amplifiers are designed so the Front and Back channel signal levels change simultaneously but oppositely. When the front-channel level increases, the back-channel level decreases, and vice versa.

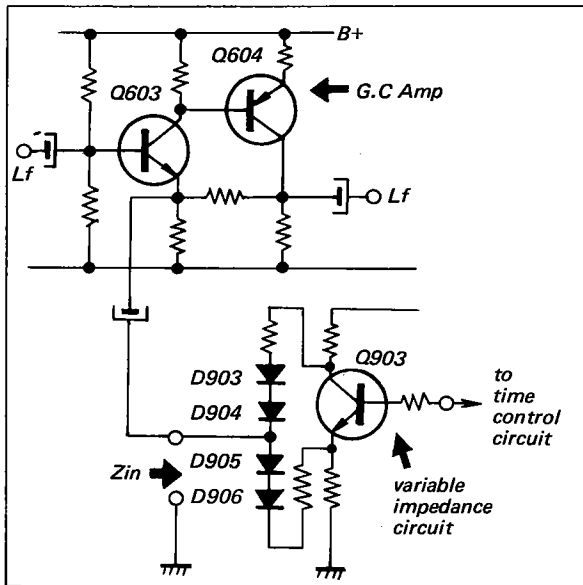


Fig. 1-7. Simplified G.C amp and variable impedance circuit

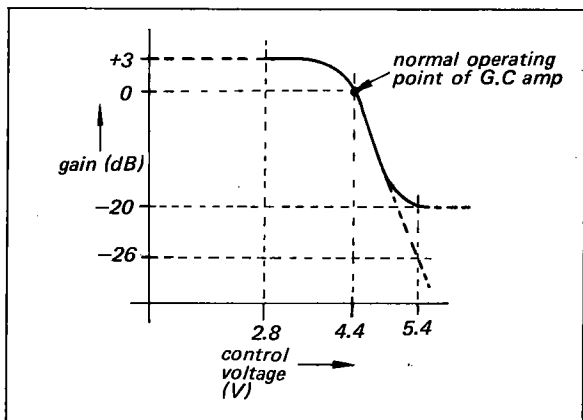


Fig. 1-8. Gain control amplifier response (1)

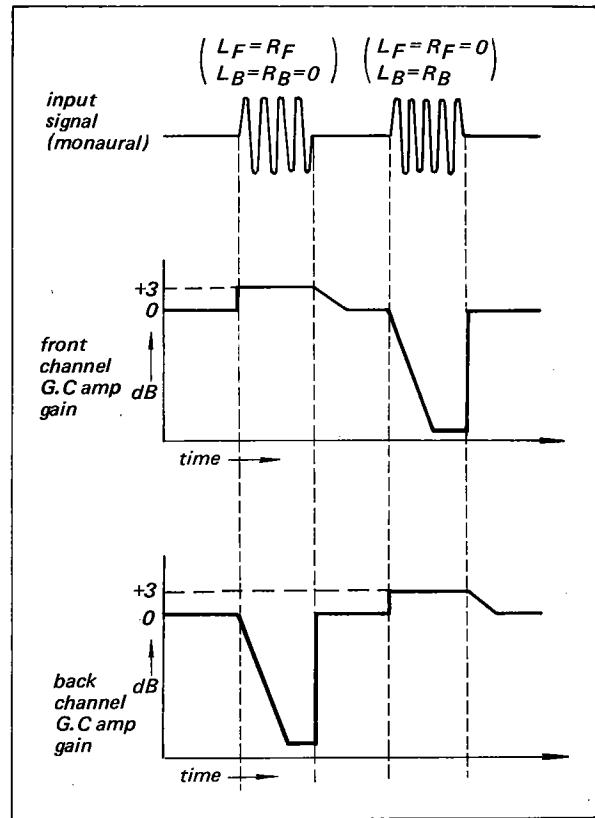


Fig. 1-9. Gain control amplifier response (2)

3. AGC Block

This maintains a constant input signal level to the channel-level detector followed by Wave Matching and Front Back Logics (explained later). The channel-level detector is basically the same as the Basic SQ Decoder and operates properly when the input signal is kept within a certain range.

Referring to Fig. 1-10, notice that the AGC amplifier is basically the same as the Gain Control Amplifier as previously described. It operates as follows:

The equalizer circuit (low-cut filter; C801, C805 and C809) permits the following circuit to operate

only in the frequency range where the human ear is most sensitive. The channel-level detector generates the mean dc voltage related to the each channel component which is also utilized as the control signal for the following Logic circuit. The mean dc voltage related to the total input-signal level appears at point "A", and is then fed back to the AGC Amplifiers through the dc amplifier and variable impedance circuit. Thus the input level applied to the channel-level detector is kept constant. Fig. 1-11 and 1-12 show the AGC amplifier frequency and operational response.

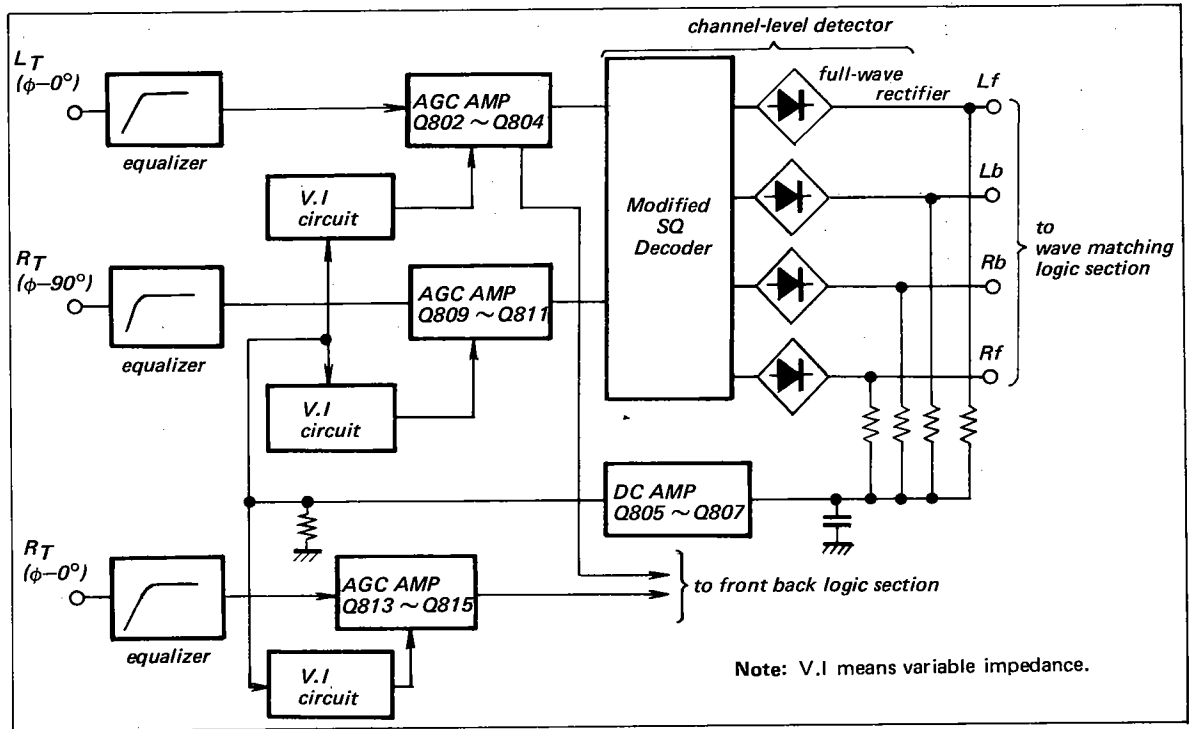


Fig. 1-10. AGC block

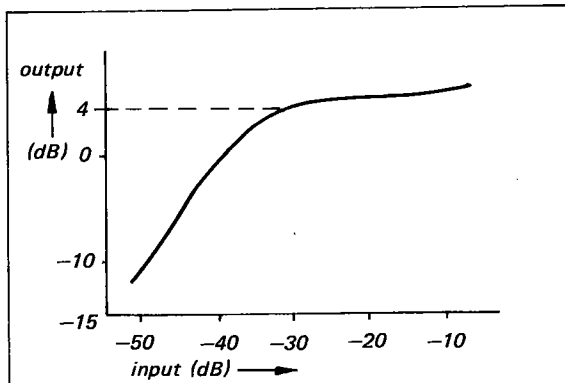


Fig. 1-11. AGC amp response

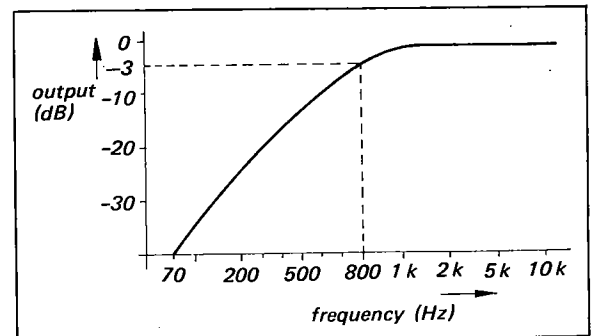


Fig. 1-12. AGC amp frequency response

#### 4. Wave Matching Logic

In the SQ decoding process, side-effect components appear in the front-back and diagonal channels. This causes insufficient overall separation. To correct this situation, Wave Matching and Front Back Logic circuits are used.

This logic contains full wave rectifiers, half-wave rectifiers and a differential amplifier as shown in Fig. 1-13, which have the following functions.

- a. Generates signals at the front and back channels which represent the absolute values of the difference between the left and right original signals.

$$|L_F - R_F| \quad |L_B - R_B|$$

This is performed as follows:

Before explaining the operation, let's review the basic principles of the synthesizer circuit utilizing a full-wave rectifier as shown in Fig. 1-14. The full-wave rectified output of two signals having the same frequency and same level makes zero if they are in fully in-phase or fully out-of-phase. If there is a 90° phase difference, some output appears. Thus, the phasor outputs at point "a" and "b" in Fig. 1-13 represent  $|L_F - R_F|$  and  $|L_B - R_B|$  as shown in Fig. 1-15. These outputs are fed to the differential amplifier through diodes which extract the negative components of the synthesized outputs.

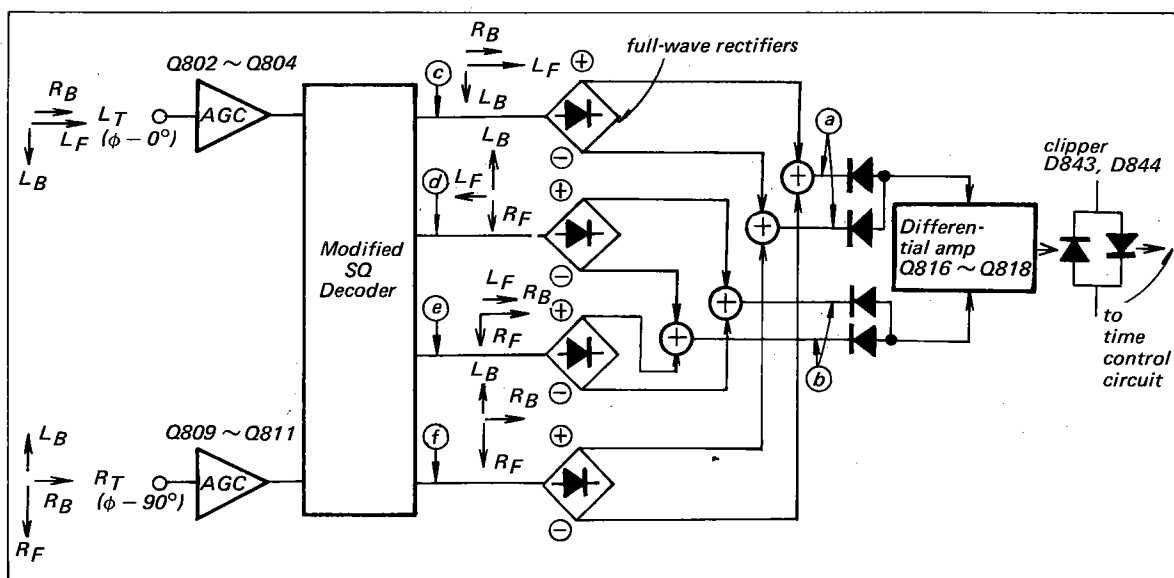


Fig. 1-13. Wave matching logic

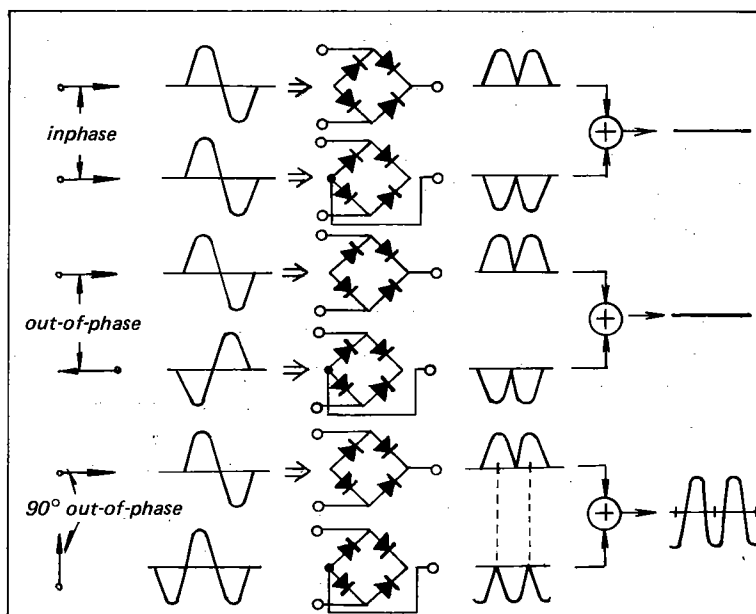


Fig. 1-14. Synthesizer circuit of adding two signals

A differential amplifier having 20 dB gain delivers the instantaneous difference signal between Front and Back channels as determined by original signal components. The output of the differential amplifier is as follows:

- If  $L_F, R_F > L_B, R_B$  . . . . negative going output
- If  $L_F, R_F < L_B, R_B$  . . . . positive going output

Note that D843 and D844 clip the output at low level signals where the AGC circuit does not operate, and stop the Logic operation.

**5. Front Back Logic**

In monophonic component reproduction through the SQ decoder, the original signals are not correctly positioned along the front-back axis (insufficient front-back separation). The front-back logic corrects this situation by reducing either the front channel or back channel signal level in accordance with the monophonic content of the original front and back

signals. It functions as follows:

- a. Generates front and back monaural signals.
- b. Compares front and back monaural signals and generates the absolute difference value.

Referring to Fig. 1-16, signals for Front Back Logic are extracted from the AGC amplifier since optimum control performance is obtained when the input signal is kept within a certain range. From  $L_T$  and  $R_T$  signals, we make  $L_T - R_T$  and  $L_T + R_T$  signals to detect the front and back monaural components. They have the following characteristics:

- Front monaural . . . .  $|L_T + R_T| > |L_T - R_T|$
- Back monaural . . . .  $|L_T + R_T| < |L_T - R_T|$

**Note:**  $C_F$  = Center Front  $C_B$  = Center Back

Fig. 1-17 shows how  $|L_F + R_F|$  and  $|L_B + R_B|$  components are derived from  $L_T$  and  $R_T$  signals.

Inphase outputs of the AGC amplifiers make  $C_F$  signal, and out-of-phase outputs make  $C_B$  signal by means of resistors R885, R884, R886 and R887. The resulting center signals are rectified by voltage

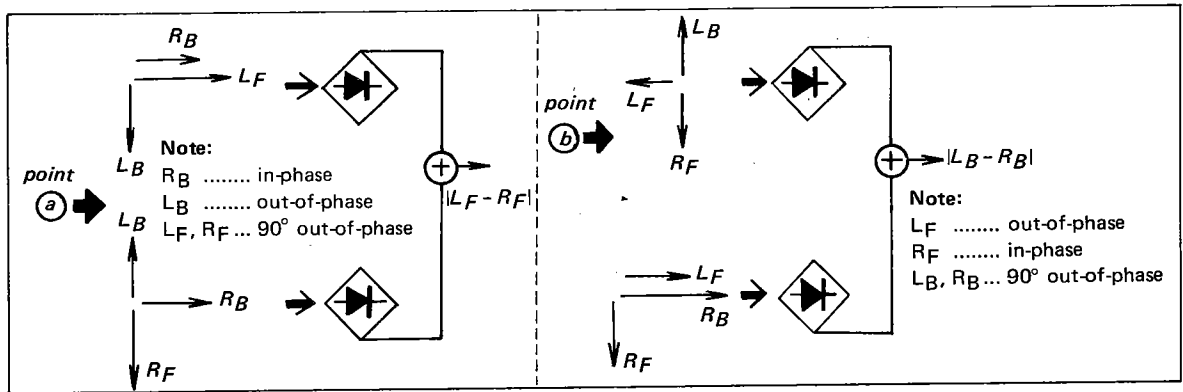


Fig. 1-15. Phasor outputs at point "a" and "b"

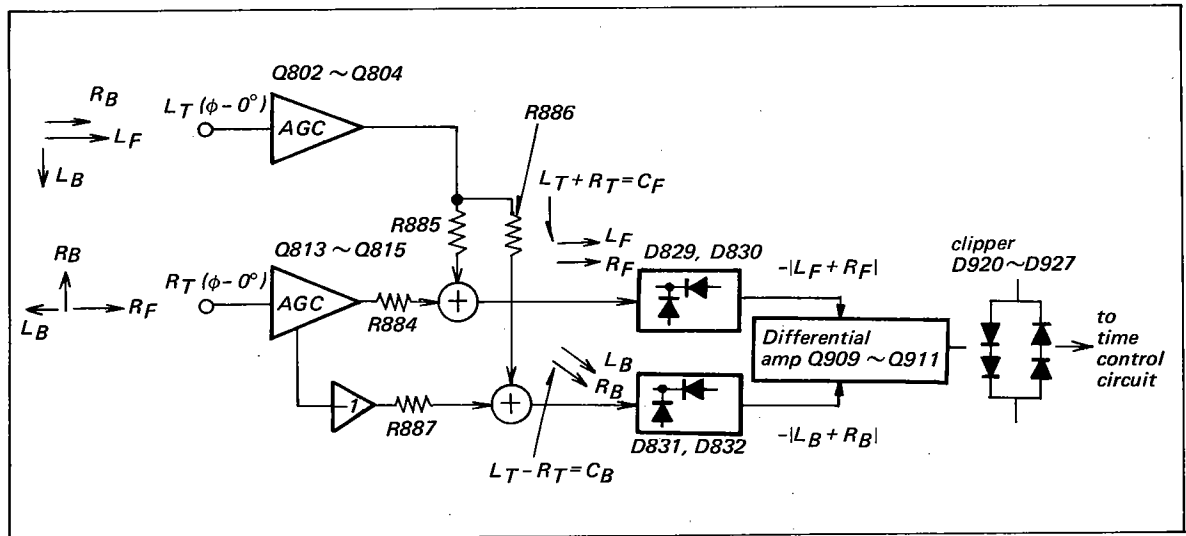


Fig. 1-16. Front back logic

doublers (D829, D830 or D831, D832) and converted to absolute values. The differential amplifier having 20dB gain delivers an output dependent on the difference between the  $C_F$  and  $C_B$  signals. The output of the differential amplifier is as follows:

If  $C_F > C_B$  . . . negative going output referred to no signal in.

If  $C_F < C_B$  . . . positive going output referred to no signal in.

Note that D920 ~ D927 inhibit the output at low signal levels where the AGC circuit does not operate, and thus stop the Logic operation. Front-Back Logic output is then applied to the Time Control circuit together with the Wave Matching Logic outputs. Table 1-2 is a summary of Wave Matching and Front Back Logic operations and the

corresponding output at typical input signals. Fig. 1-18 shows overall separation with Logic operation. Note the difference in separation between it and the 10-20 Decoder shown in Fig. 1-6.

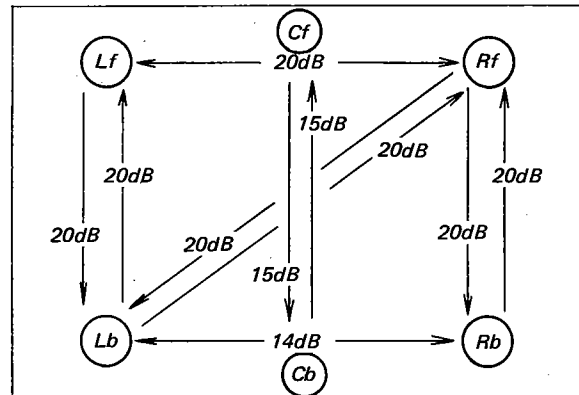


Fig. 1-18. Overall separation diagram

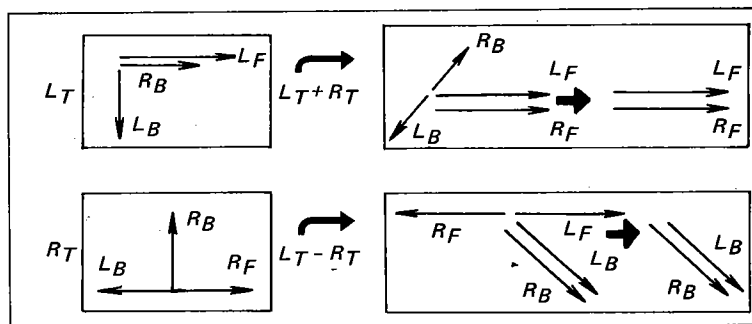


Fig. 1-17.  $L_T + R_T$  and  $L_T - R_T$  phasors

Table 1-2. Overall Logic Operation Summary

Input Signals	Logic Operation	Output			
		Lf	Lf	Lb	Rb
$L_F > R_F$ $L_F < R_F$ $L_B = 0$ $R_B = 0$	Wave Matching	Increases by 3dB	Increases by 3dB	Decreases	Decreases
$L_F = R_F$ $L_B = 0$ $R_B = 0$	Front Back	Increases by 3dB	Increases by 3dB	Decreases	Decreases
$L_B > R_B$ $L_B < R_B$ $L_F = 0$ $R_F = 0$	Wave Matching	Decreases	Decreases	Increases by 3dB	Increases by 3dB
$L_B = R_B$ $L_F = 0$ $R_F = 0$	Front Back	Decreases	Decreases	Increases by 3dB	Increases by 3dB
$L_F = R_F = L_B = R_B$	-----	Not controlled			

Note:  $L_F, L_B$  ..... original left front or back signal  
 $R_F, R_B$  ..... original right front or back signal  
 $L_f, L_b$  ..... left front or back signal decoded by SQD-2020  
 $R_f, R_b$  ..... right front or back signal decoded by SQD-2020

6. Time Control Circuit

Fig. 1-19 shows the typical input to the Time Control circuit which is a composite signal consisting of the Wave Matching and Front Back Logic outputs.

The discrimination between positive going and negative going signal is performed by utilizing a complementary pair (n-p-n and p-n-p transistors). If the input signal is positive going, Q901 is ON and Q905 is OFF. If the input signal is negative going, Q901 is OFF and Q905 is ON. Since the Front and Back channel Time Control circuits are identical except for polarity, only the Front channel circuit is described. Referring to Fig. 1-20, the Time Control circuit produces different attack and decay times for the Variable Impedance circuit which controls the Gain Control Amplifier. Attack and Decay times are as follows:

- Attack time.....C R1 (approx 3msec)
- Decay time .....C (R1 + R2) (approx 50msec).

Diode D is responsible for the difference by taking R2 in and out of the circuit.

Note that the decay time changes according to the applied signal level; the smaller the level, greater the decay time becomes. FET Q902 supplies the Time Control circuit output to Q903 (Variable Impedance circuit), hence it eventually controls the Gain Control Amplifier.

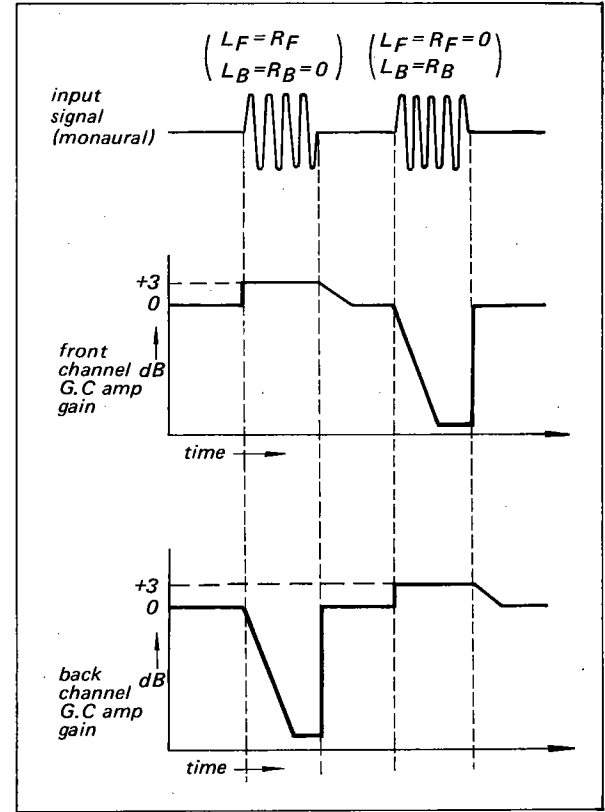


Fig. 1-21. Gain control amplifier response

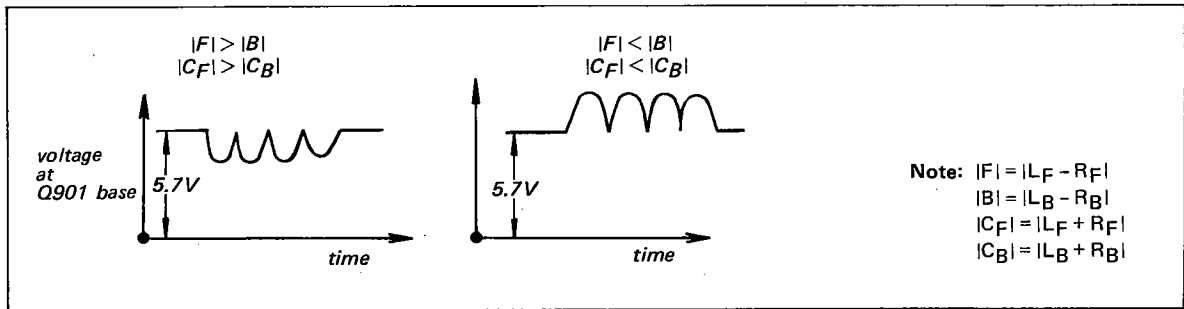


Fig. 1-19. Typical input signal at time control circuit

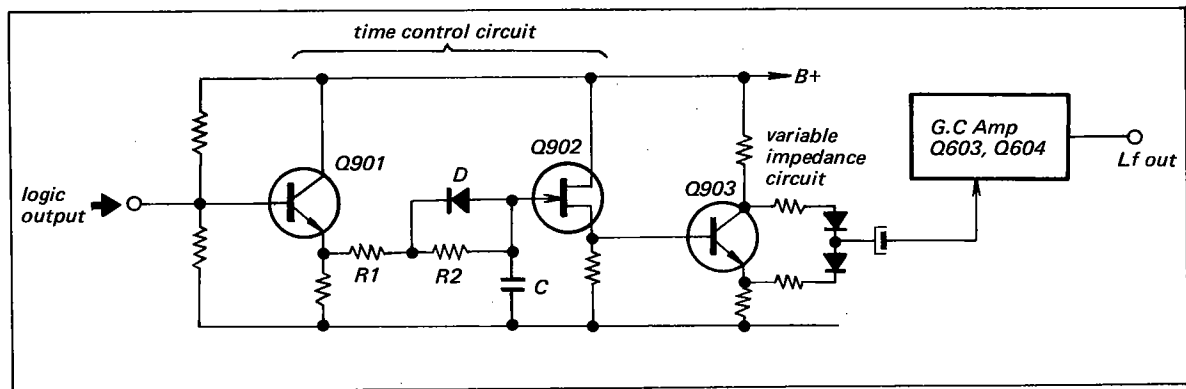


Fig. 1-20. Time control circuit



For example, if Front monaural signal is applied, Q901 ~ Q903 operate as follows:

Q901 is OFF → C discharges → Q902 is OFF → Q903 is OFF → Impedance decreases → G.C Amp gain increase.

Fig. 1-21 shows the gain changes due to the operation of the Logic and Time Control circuit when the input signal contains only Front or Back channel components.

### 7. Muting Circuit

The SQD-2020 is equipped with a high-speed electronic muting circuit which eliminates the "pop" noise generated by on-off operation of the power switch. Fig. 1-22 shows the simplified muting circuit, which operates as follows:

When the power switch is first turned on, Q106 is on and Q105 is off, since Q106 is biased through R112 while Q105 has a long time constant circuit (R111 and C112) of about 4 seconds. This makes point "A" positive enough to turn on transistors Q505 ~ Q555, shorting the outputs in about 4 seconds. 4 seconds later, C112 is fully charged. This makes Q105 turn on and point "A" is shorted to ground. As a result, positive bias is removed from Q505 ~ Q555 disabling muting.

When the power switch is turned off, Q106 is quickly turned off. Point "A" becomes positive since C113 cannot discharged quickly due to diode D104. This turns on transistors Q505 ~ Q555 shorting the outputs.

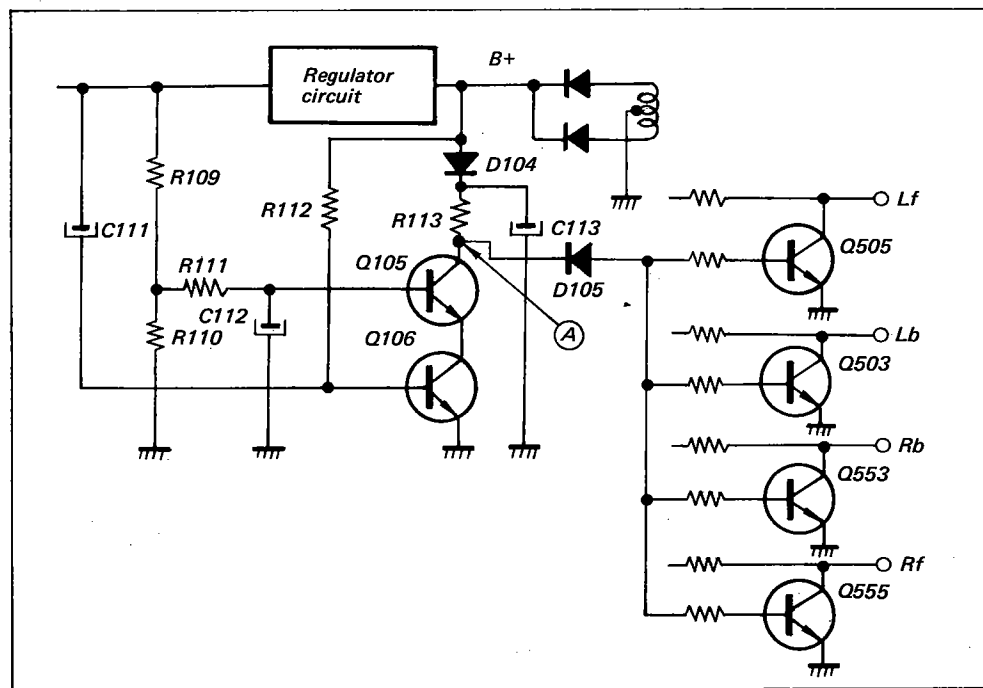
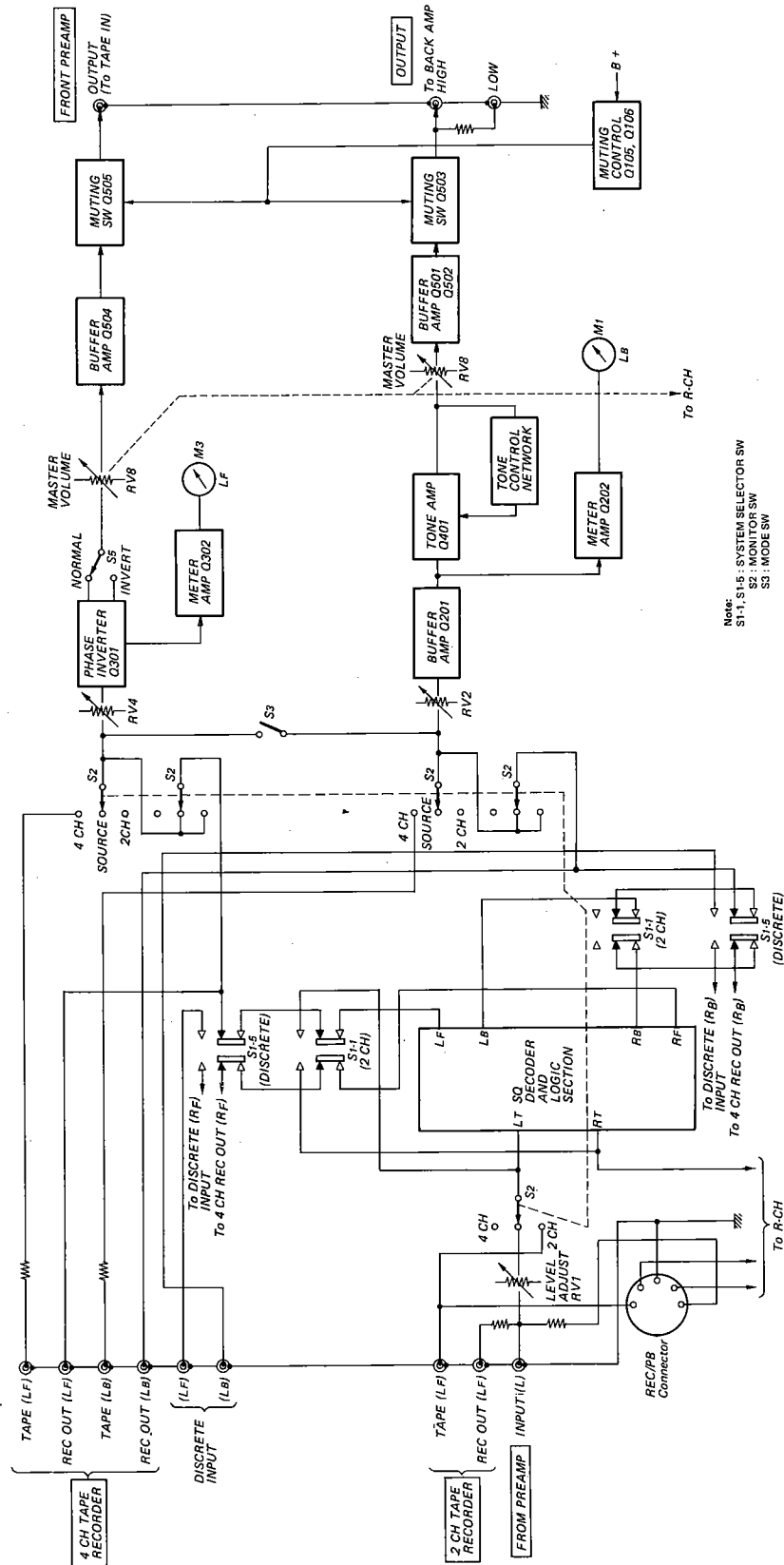
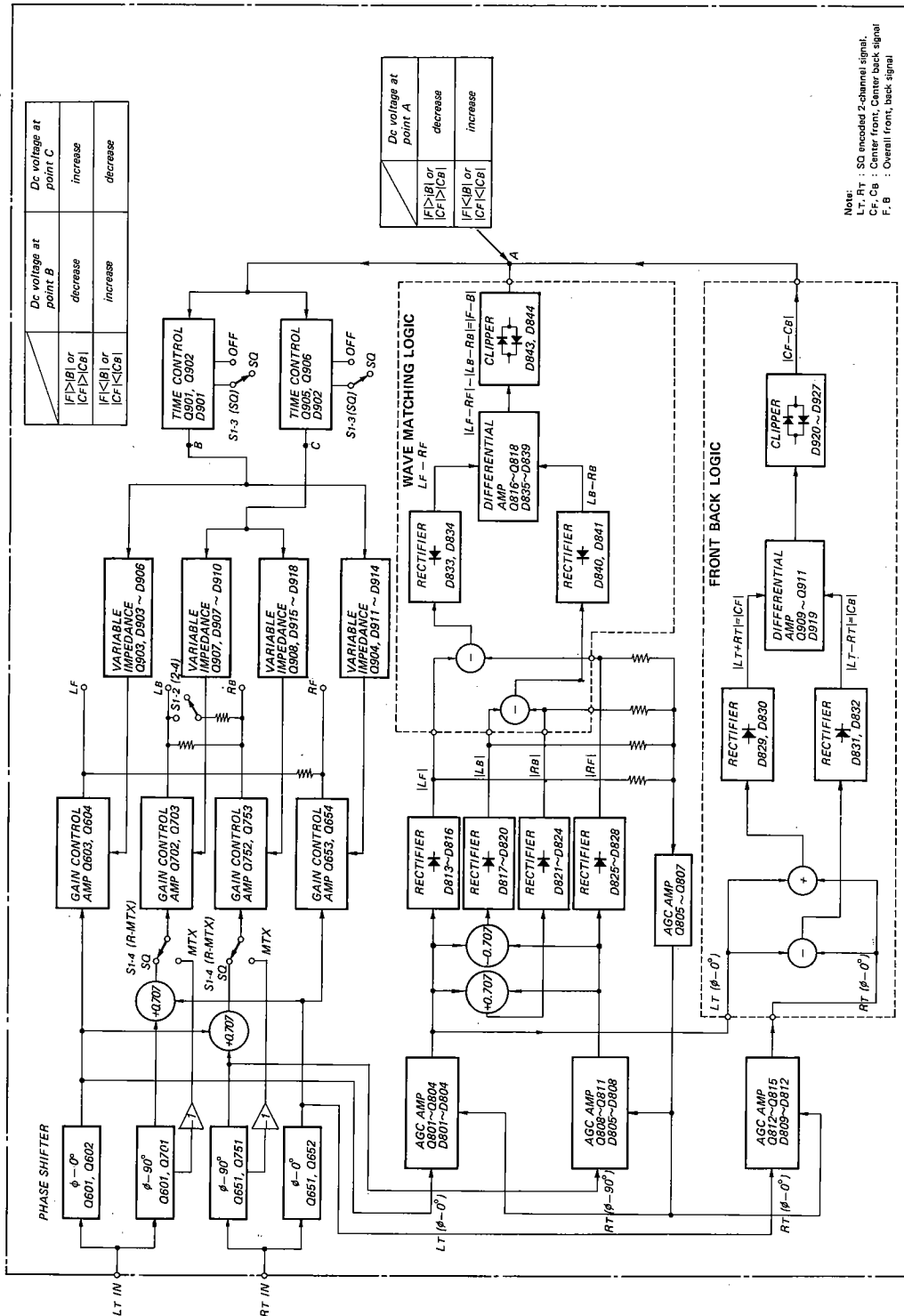


Fig. 1-22. Simplified muting circuit

## 1-3. BLOCK DIAGRAM (1) Overall



(2) SQ Decoder and Logic Section



Dc voltage at point B	Dc voltage at point C
$ F  >  B $ or $ C  >  C_B $	$ F  >  B $ or $ C  >  C_B $
decrease	increase
$ F  <  B $ or $ C  <  C_B $	$ F  <  B $ or $ C  <  C_B $
increase	decrease

Dc voltage at point A
$ F  >  B $ or $ C  >  C_B $
decrease
$ F  <  B $ or $ C  <  C_B $
increase

Note:  
 L.T., R.T. : SQ encoded 2-channel signal.  
 C.F., C.B. : Center front, Center back signal.  
 F., B. : Overall front, back signal.

**MEMO**

A series of horizontal dotted lines providing a template for writing a memo.

## SECTION 2 DISASSEMBLY AND REPLACEMENT

### WARNING

Unplug the ac power cord before starting any disassembly or replacement procedures.

**Note:** All screws in this service manual are phillips type (cross recess type) unless otherwise indicated.

### 2-1. FRONT PANEL REMOVAL

1. Remove all knobs and the top cover.
2. Remove the three screws at front top and bottom of the chassis as shown in Figs. 2-1 and 2-2.
3. This frees the front panel along with the VU meters.

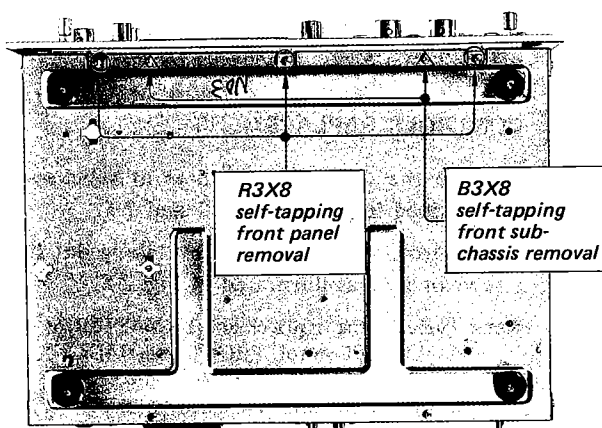


Fig. 2-1. Bottom view

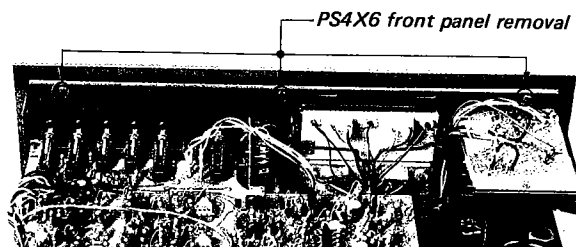


Fig. 2-2. Front panel removal

### 2-2. VU METER REMOVAL

1. Remove the front panel as described in Procedure 2-1, then pry out the VU meter clamp with a screwdriver as shown in Fig. 2-3.

2. Remove the clamp, then take out the VU meter.

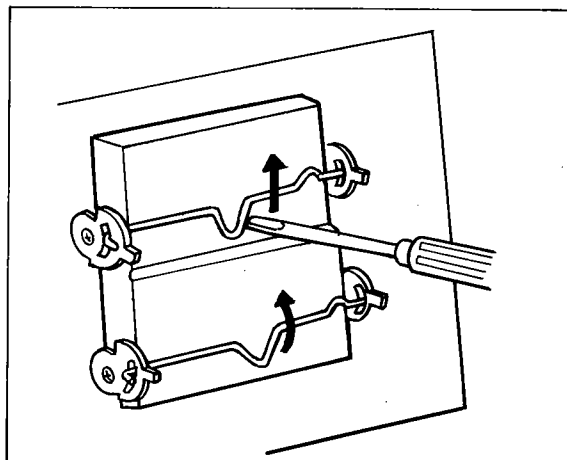


Fig. 2-3. VU meter removal

### 2-3. VU METER ESCUTCHEON REMOVAL

1. Remove the VU meters, then loosen the four screws securing the retainer shown in Fig. 2-4.
2. Turn the tab of retainer in the direction shown by the arrows in Fig. 2-4.
3. Remove the four retainers, then press the escutcheon from the back.

**Note:** Always install the retainer correctly as shown in Fig. 2-5, otherwise the escutcheon does not fit properly. Always fix the escutcheon in place by turning the retainer as shown in Fig. 2-6, when performing reinstallation.

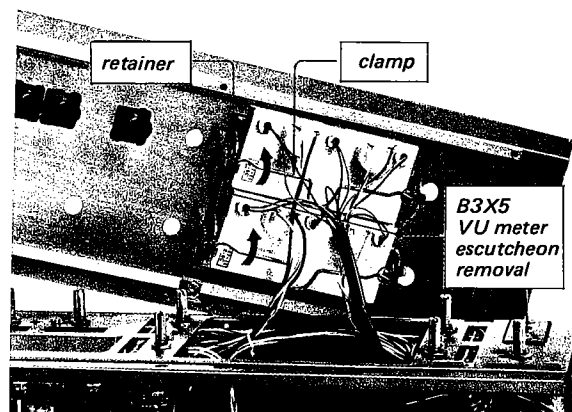


Fig. 2-4. VU meter escutcheon removal

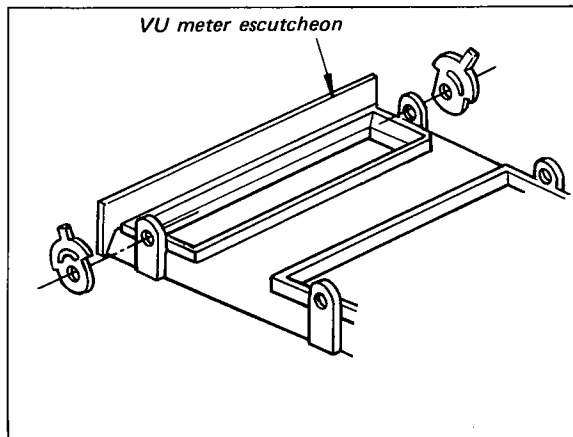


Fig. 2-5. Retainer reinstallation

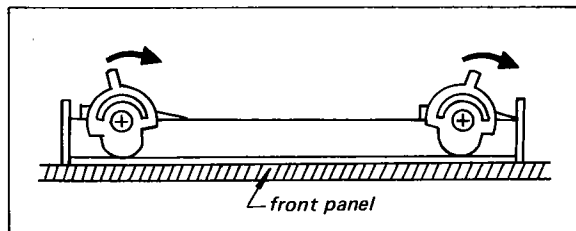


Fig. 2-6. Fixing the escutcheon

2-4. FRONT PANEL REPLACEMENT

1. Remove the VU meter escutcheon as described in Procedure 2-3, then install the new one.

2-5. FRONT SUBCHASSIS REMOVAL

Front subchassis is a vertical member on which all controls are mounted.

1. Remove the two screws at front bottom (See Fig. 2-1), and two screws at each side of the chassis as shown in Fig. 2-7.

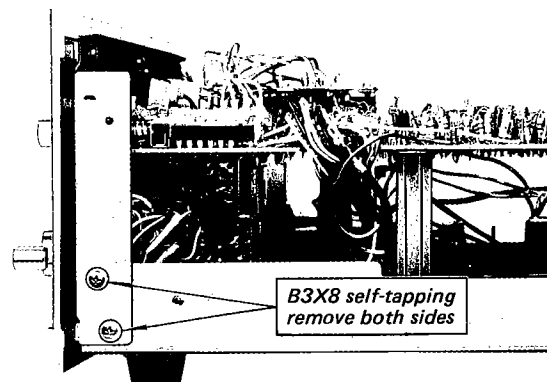


Fig. 2-7. Front subchassis removal

2-6. CONTROLS REPLACEMENT

1. Remove the front panel and front subchassis as described in Procedures 2-1 and 2-5.
2. All controls can be removed by taking out the screws or nuts as illustrated in Fig. 2-8.

**Note:** Perform the replacement of MASTER VOLUME Control, FRONT and BACK Level Control, and TONE Control by using a soldering iron having a solder-sucking tip.

3. To replace System or Mode switch, remove the B board, then unsolder 6-key pushbutton switch.

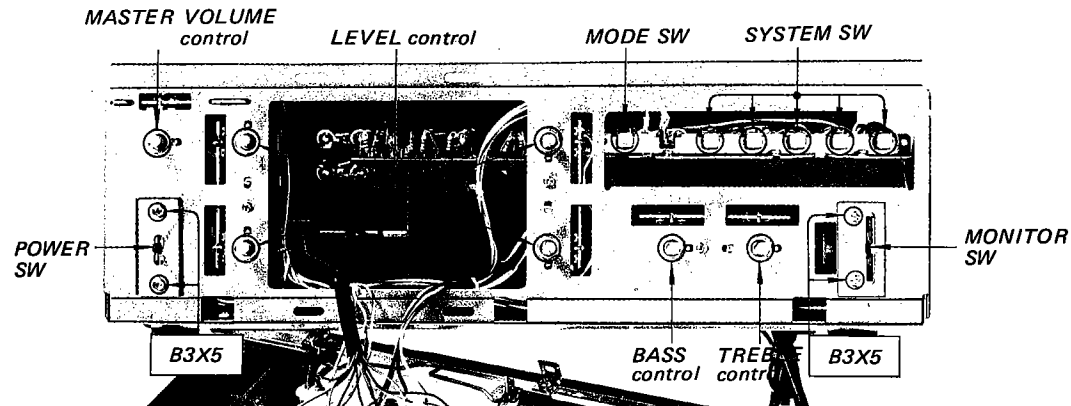


Fig. 2-8. Control replacement

**2-7. REPLACEMENT OF COMPONENTS SECURED TO THE REAR PANEL BY NYLON RIVETS**

1. Remove the nylon rivets securing the defective components by pushing its end with tweezers as shown in Fig. 2-9.

**Note:** For installation, insert the flared portion of the rivet into the opening first, then push the head as far as it will go.

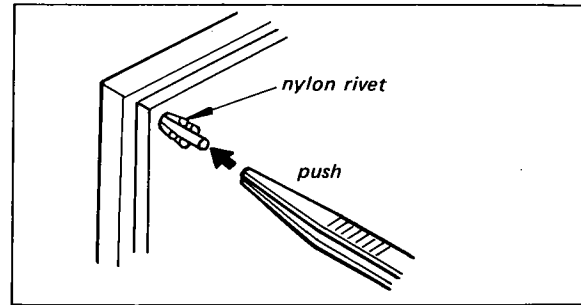
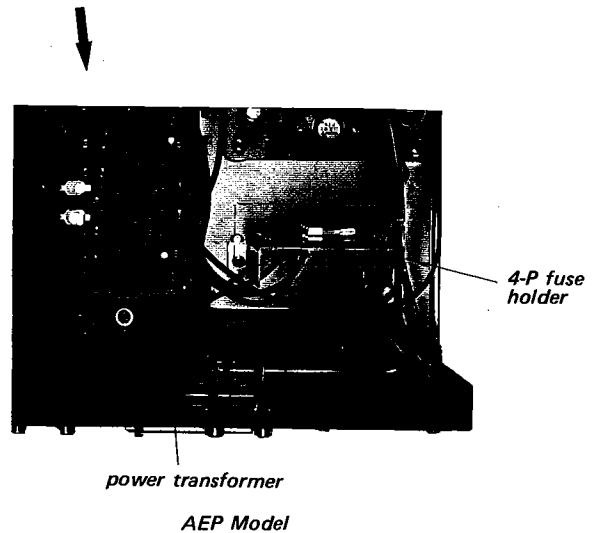
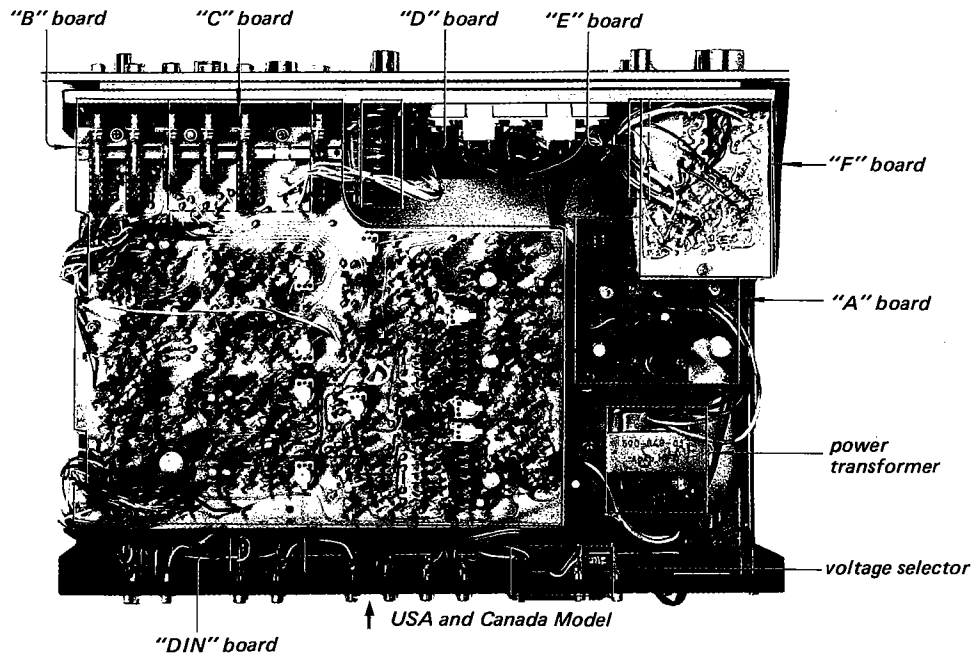


Fig. 2-9. Nylon rivet removal

**2-8. CHASSIS LAYOUT**



## SECTION 3 CHECKS AND ADJUSTMENTS

### INTRODUCTION

To perform the checks and adjustments in this section, you must have a signal source capable of simulating the various components of an SQ signal. The required signal components and their phase relationships are summarized in Table 3-1.

The required signal modes can be produced by either of two methods. The first is via the SONY

SQ CHECKER Model 0005, available at each SONY Factory Service Center. The other method is by using an accurate audio oscillator and the Signal Mode Selector shown in Fig. 3-1. For accurate results with the latter method, the oscillator frequency must be set to 2 kHz  $\pm$  1%, and precision components used where indicated on the Signal Mode Selector schematic.

Table 3-1.

Output	Mode					
	L <sub>F</sub>	R <sub>F</sub>	L <sub>F</sub> ·R <sub>F</sub>	L <sub>B</sub> ·R <sub>B</sub>	L <sub>B</sub>	R <sub>B</sub>
L-CH OUT	1	0	1	1	1	1
R-CH OUT	0	1	1	1	1	1
Phase difference between L-CH and R-CH output	-	-	0°	180°	90°	-90°

**Note:** L<sub>F</sub> ..... Left front  
 R<sub>F</sub> ..... Right front  
 L<sub>F</sub>·R<sub>F</sub> ..... Center front  
 L<sub>B</sub>·R<sub>B</sub> ..... Center back  
 L<sub>B</sub> ..... Left back  
 R<sub>B</sub> ..... Right back

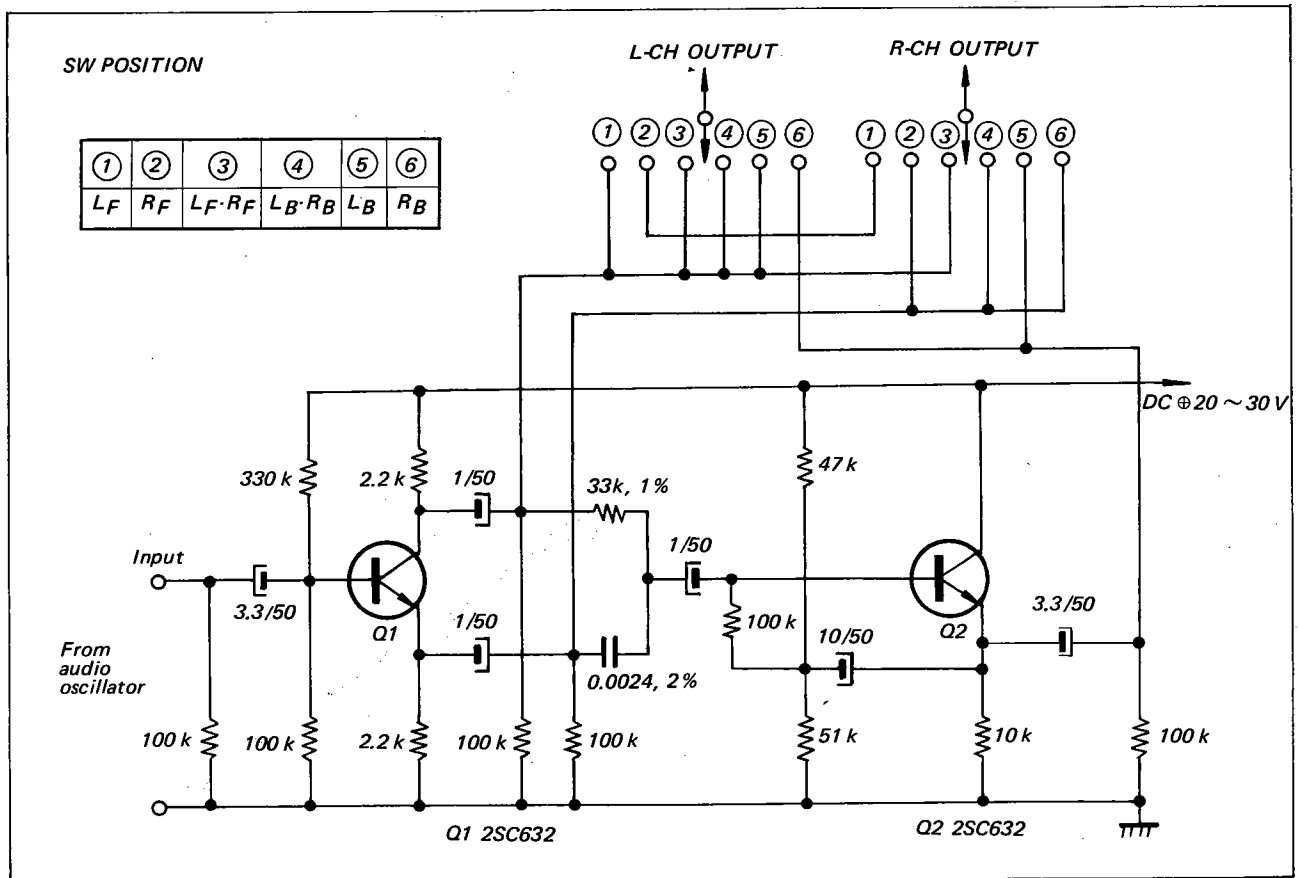


Fig. 3-1. Signal mode selector schematic diagram



**Note:** dB units are used in all the following procedures to refer to signal level.  
0 dB = 0.775V rms.

**3-1. TEST EQUIPMENT REQUIRED**

1. SQ CHECKER Model 0005 (SONY) or Audio Oscillator and Signal Mode Selector.
- (See Fig. 3-1)
2. Ac VTVM
3. Dc voltmeter

**3-2. POWER SUPPLY VOLTAGE CHECK**

**Note:** Before starting and check or adjustment procedures, perform B1+ and B2+ check.

Preliminary check.... Power line voltage should be as specified.

*B1+ and B2+ Check*

1. Connect the dc voltmeter across B1+ or B2+ and ground on the A board as shown in Fig. 3-2.  
They should be as follows:  
B1+ = 26 ~ 30V  
B2+ = 9 ~ 11V
2. If necessary, check the A board (regulator circuit).

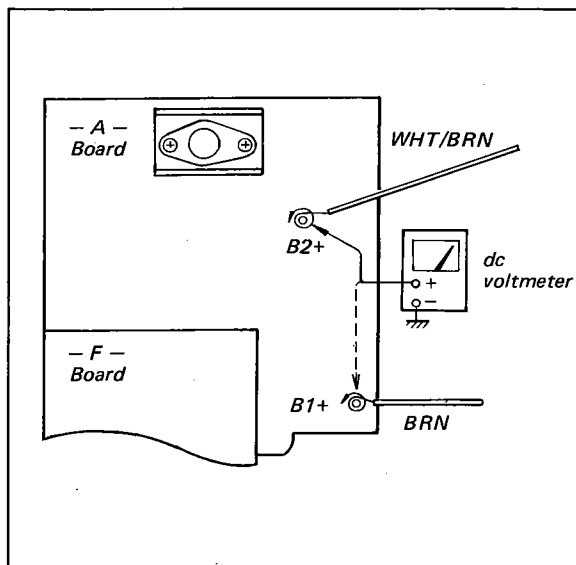


Fig. 3-2. Power supply voltage check

**3-3. TEST EQUIPMENT CONNECTIONS AND SQD-2020 CONTROL SETTINGS FOR CHECKS**

1. Fig. 3-3 shows the test equipment connections.
2. Set SQD-2020 controls as follows unless otherwise specified.

- MASTER VOLUME ..... max.
- FRONT and BACK  
LEVEL control ..... max.
- MODE switch ..... NORMAL
- TONE control ..... mid position  
(mechanical)
- SYSTEM switch ..... SQ
- MONITOR switch ..... SOURCE
- LEVEL Adj. (rear panel)..... max.

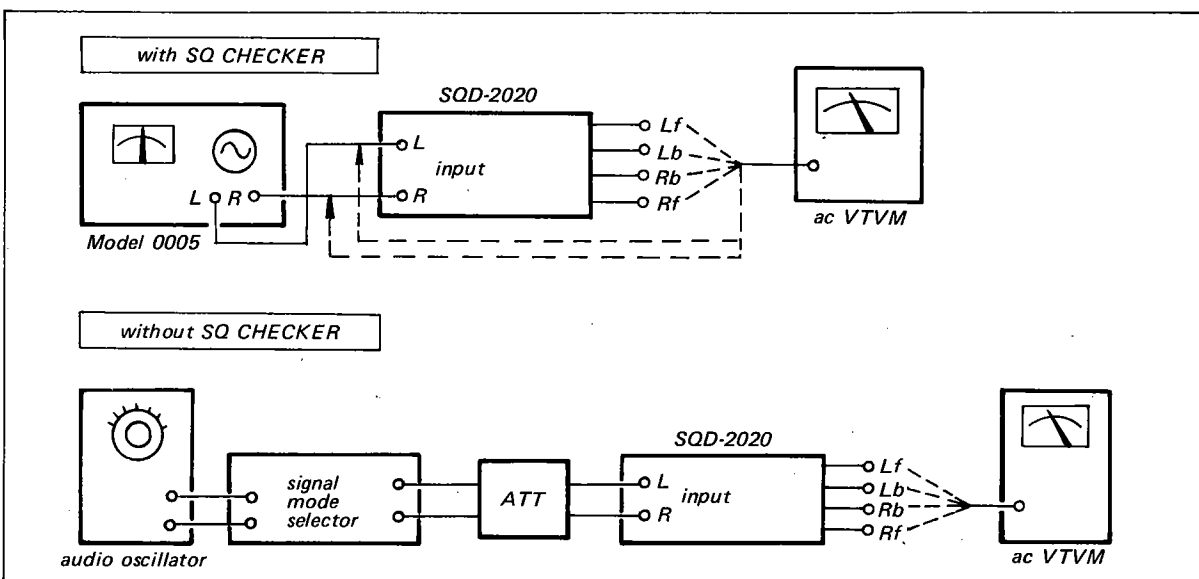


Fig. 3-3. SQD-2020 check and adjustment test setup

**3-4. LEVEL CHECK EXCEPT FOR SQ DECODER SECTION**

1. Set the SYSTEM switch to DISCRETE.
2. With the equipment connected as shown in Fig. 3-3, feed a 2 kHz, -10 dB signal to

the each DISCRETE ( $L_f$ ,  $L_b$ ,  $R_f$  and  $R_b$ ) input terminal.

3. In each case, measure the corresponding "TO TAPE IN" or "TO BACK AMP" output jack. They should be as given in Table 3-2. If necessary, check the C, D, E or F board.

**Table 3-2.**

Input (2 kHz, -10 dB)		Output		
DIS- CRETE INPUT	$L_f$	"TO TAPE IN" (L-CH)	$-4.2 \pm 1$ dB	
	$R_f$	"TO TAPE IN" (R-CH)	$-4.2 \pm 1$ dB	
	$L_b$	"TO BACK AMP" (L-CH)	HIGH	$7.5 \pm 1$ dB
			LOW	$-4.2 \pm 1$ dB
	$R_b$	"TO BACK AMP" (R-CH)	HIGH	$7.5 \pm 1$ dB
			LOW	$-4.2 \pm 1$ dB

**3-5. LEVEL CHECK FOR SQ DECODER SECTION**

1. Set the SYSTEM switch to SQ.
2. With the equipment connected as shown in Fig. 3-3, feed a 2 kHz, -10 dB signal to the "FROM REC OUT" jacks (L and R channels).

3. Change the input signal mode from  $L_F$  to  $R_B$  and measure the signal level at the 4CH REC OUT terminal corresponding to the input signal mode. They should be as given in Table 3-3. If necessary, check the B board.

**Table 3-3.**

Input signal mode	4CH REC OUT	Output
$L_F$	$L_f$	$-9 \pm 1$ dB
$R_F$	$R_f$	$-9 \pm 1$ dB
$L_B$	$L_b$	$-8 \pm 1$ dB
$R_B$	$R_b$	$-8 \pm 1$ dB

**3-6. MATRIX OPERATION CHECK**

1. With the equipment connected as shown in Fig. 3-3, set the SYSTEM switch to R-MTX.
2. Feed a 2 kHz, -10 dB signal to the L-CH or R-CH of the "FROM REC OUT" jack (any

mode of signal is acceptable). Measure the output level at the 4-CH TAPE RECORDER REC OUT terminals. They should be as given in the Table 3-4.

**Table 3-4.**

Input signal (applied to "FROM REC OUT")	Output (at 4CH TAPE RECORDER REC OUT)			
	$L_f$	$R_f$	$L_b$	$R_b$
L-CH only	-10 dB	-25 ~ -27 dB	$-9 \pm 2$ dB	-19 ~ -20 dB
R-CH only	-25 ~ -27 dB	-10 dB	-19 ~ -20 dB	$-9 \pm 2$ dB

**Note:** Do not apply test signal to L and R channels simultaneously when performing these checks.

**3-7. 2 → 4 OPERATION CHECK**

1. Set the SYSTEM switch to 2 → 4.
2. With equipment connected as shown in Fig. 3-3, feed a 2 kHz, -10 dB signal to the L-CH or

R-CH of the "FROM REC OUT" terminal. Measure the output level at the 4CH TAPE RECORDER REC OUT jacks. They should be as given in the Table 3-5.

**Table 3-5.**

Input signal (applied to "FROM REC OUT")	Output (at 4CH TAPE RECORDER REC OUT)			
	Lf	Rf	Lb	Rb
L-CH only	-10 dB	-29 ~ -33 dB	-12 ~ -16 dB	-12 ~ -16 dB
R-CH only	-29 ~ -33 dB	-10 dB	-12 ~ -16 dB	-12 ~ -16 dB

**Note:** Do not apply test signal to L and R channels simultaneously when performing these checks.

**3-8. SQ SEPARATION CHECK**

1. With the equipment connected as shown in Fig. 3-3, set the SYSTEM switch to SQ.
2. Apply a 2 kHz, -10 dB signal to the "FROM REC OUT", L and R channels simultaneously.
3. Measure the level at the 4CH TAPE RECORDER REC OUT jacks corresponding to the input

signal mode. They should be as given in Table 3-6. Note that the output level difference represents the separation. If the values in the table are not obtained, perform the following procedures.

- a. AGC AMP Adjustment.
- b. Wave Matching and Front Back Logic Dc Adjustments.

**Table 3-6.**

Input signal mode	4CH TAPE RECORDER REC OUT			
	Lf	Rf	Lb	Rb
L <sub>F</sub>	-10 dB	-29 ~ 31 dB	-27 ~ -33 dB	-27 ~ -33 dB
R <sub>F</sub>	-29 ~ -31 dB	-10 dB	-27 ~ -33 dB	-27 ~ -33 dB
L <sub>B</sub>	-27 ~ -33 dB	-27 ~ -33 dB	-10 dB	-23 ~ -28 dB
R <sub>B</sub>	-27 ~ -33 dB	-27 ~ -33 dB	-23 ~ -28 dB	-10 dB
L <sub>F</sub> •R <sub>F</sub>	-10 dB	-10 dB	-22 ~ -26 dB	-22 ~ -26 dB
L <sub>B</sub> •R <sub>B</sub>	-22 ~ -26 dB	-22 ~ -26 dB	-10 dB	-10 dB

**3-9. GAIN CONTROL AMPLIFIER ADJUSTMENT**

**Note:** Use SQ checker or signal mode selector.

1. Disconnect a jumper lead wire at test point on the B board shown in Fig. 3-4.
2. With the equipment connected as shown in

Fig. 3-3, feed a 2 kHz, 0 dB signal to the "FROM REC OUT" jack.

3. Measure the each output level at "4CH TAPE RECORDER REC OUT" jack and adjust adjustable resistors corresponding to the input signal Mode as given in Table 3-7.
4. Reconnect the jumper lead wire in Step 1.

**Table 3-7.**

Input signal mode	Adjustment parts	4CH TAPE RECORDER REC OUT
L <sub>F</sub>	RV902	L <sub>f</sub> -1 dB
R <sub>F</sub>	RV901	R <sub>f</sub> -1 dB
L <sub>B</sub>	RV904	L <sub>b</sub> -2 dB
R <sub>B</sub>	RV903	R <sub>b</sub> -2 dB

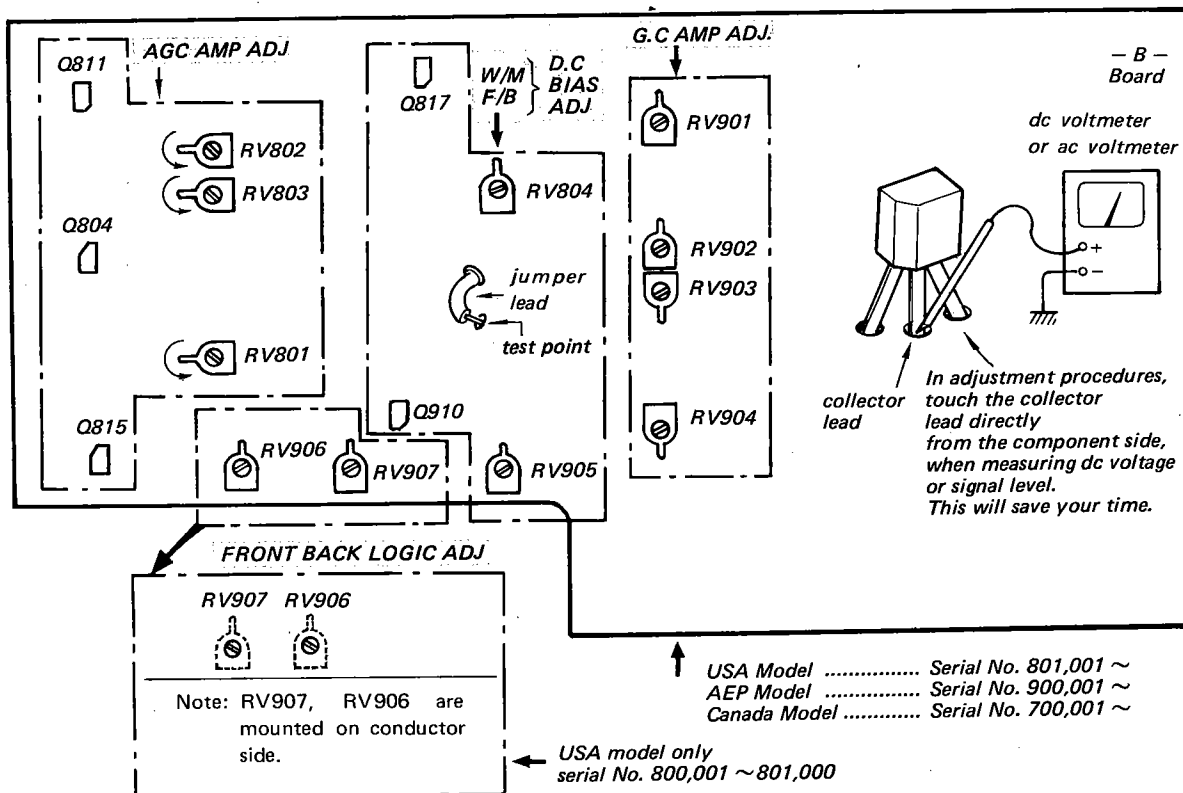
**Note:** Adjustment parts are mounted on the B board shown in Fig. 3-4.

**3-10. WAVE MATCHING AND FRONT BACK LOGIC DC ADJUSTMENTS**

**Note:** Use dc VTVM or high-input-impedance voltmeter for correct adjustment.

1. Disconnect a jumper lead wire at test point on the B board shown in Fig. 3-4.

2. With no signal in, measure the dc voltage at Test Point on the B board shown in Fig. 3-4. It should be 5.2 ~ 5.8 V. Record the reading.
3. Adjust RV804 and RV905 for the same dc voltage obtained in Step 2 at Q817 and Q910 collector respectively. Touch the collector lead directly as shown in Fig. 3-4.



**Fig. 3-4. Adjustment parts location**

**3-11. AGC AMP ADJUSTMENT**

**Note:** Perform the Front-Back Logic Adjustment after completing this adjustment or vice versa. Adjustment parts are mounted on the B board as shown in Fig. 3-4.

**Preparation:**

1. Disconnect a jumper lead wire at test point on the B board shown in Fig. 3-4. This stops logic operation.
2. Turn RV801, RV802 and RV803 fully in the direction shown by the arrow in Fig. 3-4.

**Procedure:**

1. With the equipment connected as shown in Fig. 3-3, feed a 2 kHz, -10 dB signal to the "FROM REC OUT" jack L channel only ( $L_F$  mode).
2. Measure the output level at Q804 collector (see Fig. 3-4) and adjust RV803 for 4 to 5 dB reading. Record the reading.
3. Feed a test signal to R channel only ( $R_F$  mode).
4. Measure the output level at Q811 and Q815 collector (see Fig. 3-4) and adjust RV801 and RV802 for the same reading obtained in the step 2.
5. Reconnect the jumper lead wire in step 1 of the preparation.

**3-12. FRONT BACK LOGIC ADJUSTMENT**

**Note:** Use SQ checker or signal mode selector. Perform AGC Amp Adjustment after completing this adjustment or vice versa. Adjustment parts are mounted on the B board as shown in Fig. 3-4.

1. With the equipment connected as shown in Fig. 3-3, feed a 2 kHz, -10 dB signal to the "FROM REC OUT" jacks, L and R Channels simultaneously.
2. Set the input signal Mode to  $L_F \cdot R_F$  (center front), then adjust RV906 for 14 to 16 dB separation between  $L_F$  and  $L_B$  or  $R_F$  and  $R_B$  at "4CH TAPE RECORDER REC OUT" jacks. (Back signal should be less than Front signal),

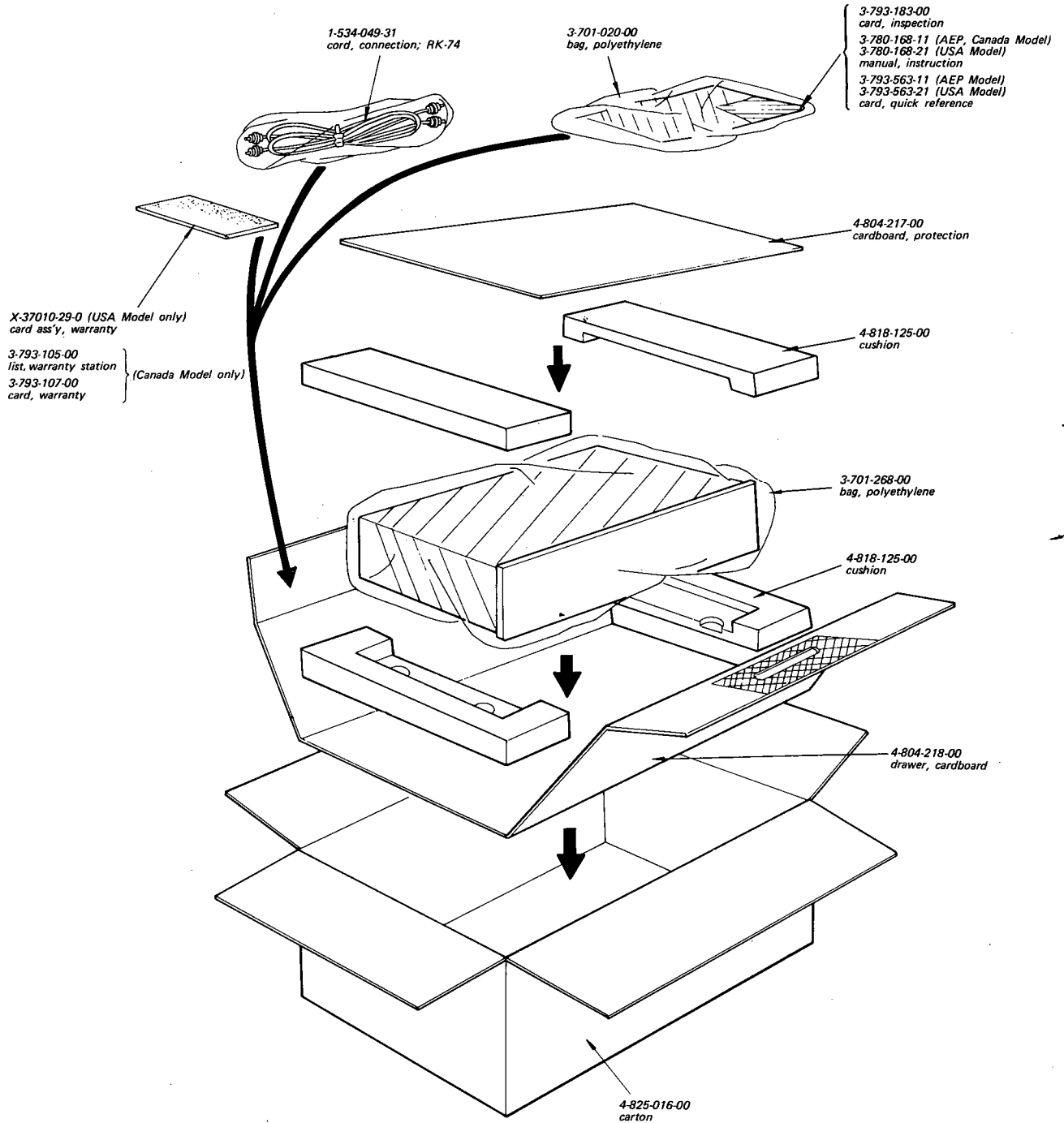
**Note:** Output level difference (in dB) represents the separation.

3. Set the input signal Mode to  $L_B \cdot R_B$  (center back) then adjust RV907 for 14 to 16 dB separation between  $L_B$  and  $L_F$  or  $R_B$  and  $R_F$  at "4CH TAPE RECORDER REC OUT" jacks. (Front signal should be less than Back signal).

**SECTION 4  
REPACKING**

The SQD-2020's original shipping carton and packing materials are the ideal container for shipping the unit. However to secure the maximum

protection, the SQD-2020 must be repacked in these materials precisely as before. The proper repacking procedures are shown in Fig. 4-1.

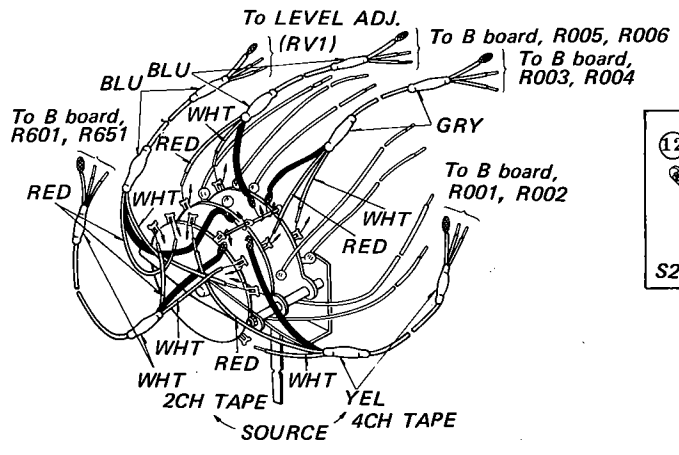


**Note:** USA Model ..... Serial No. 800,001 and later  
AEP Model ..... Serial No. 900,001 and later  
Canada Model ..... Serial No. 700,001 and later

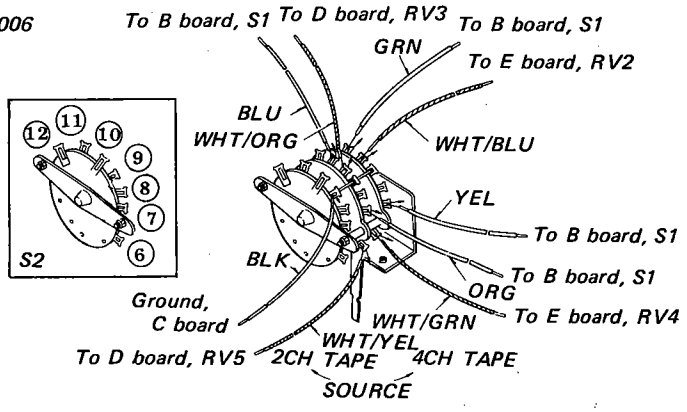
**Fig. 4-1. Repacking**

## SECTION 5 DIAGRAMS

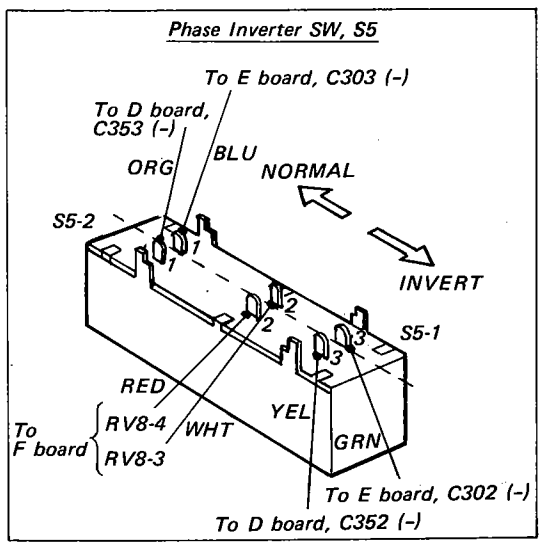
**5-1. WIRING DIAGRAM**  
**(1) MONITOR Switch S2**



**(2) MONITOR Switch S2**

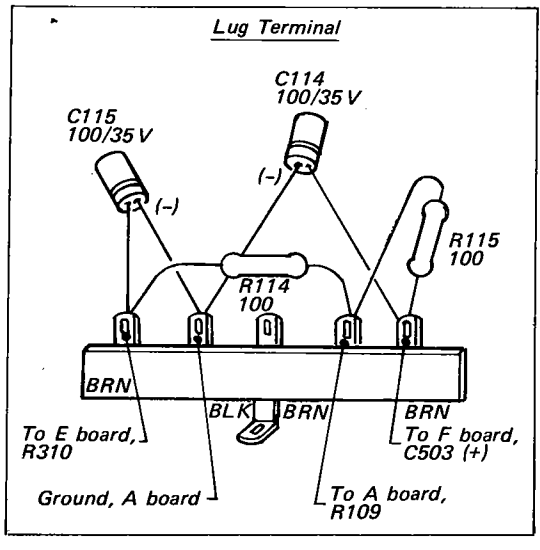


**(3) PHASE INVERTER Switch S5**



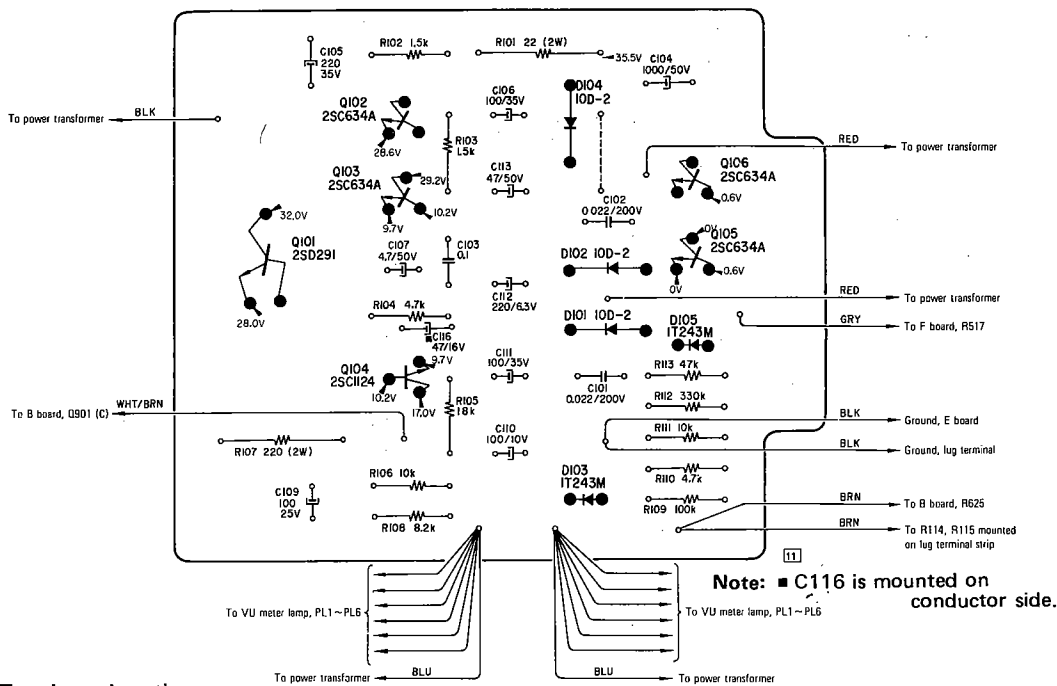
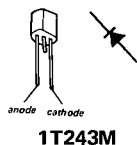
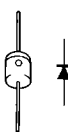
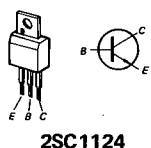
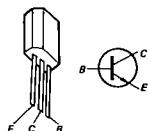
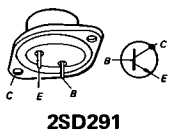
**(4) Lug Terminal**

USA Model only (Serial No. up to 801,000)



## 5-2. MOUNTING DIAGRAM – A Board – – Conductor Side –

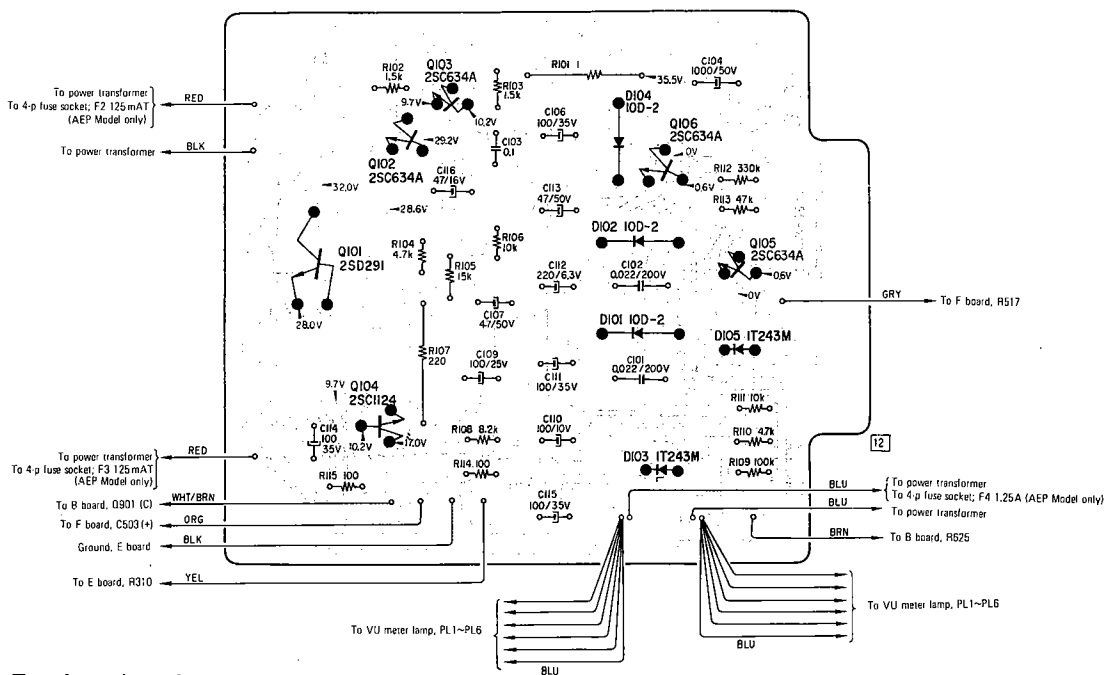
Serial No. up to 801,000  
(USA Model only)



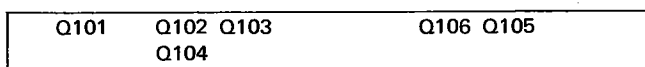
Transistors Location



Serial No. 801,001 and later (USA Model)  
Serial No. 900,001 and later (AEP Model)  
Serial No. 700,001 and later (Canada Model)



Transistors Location

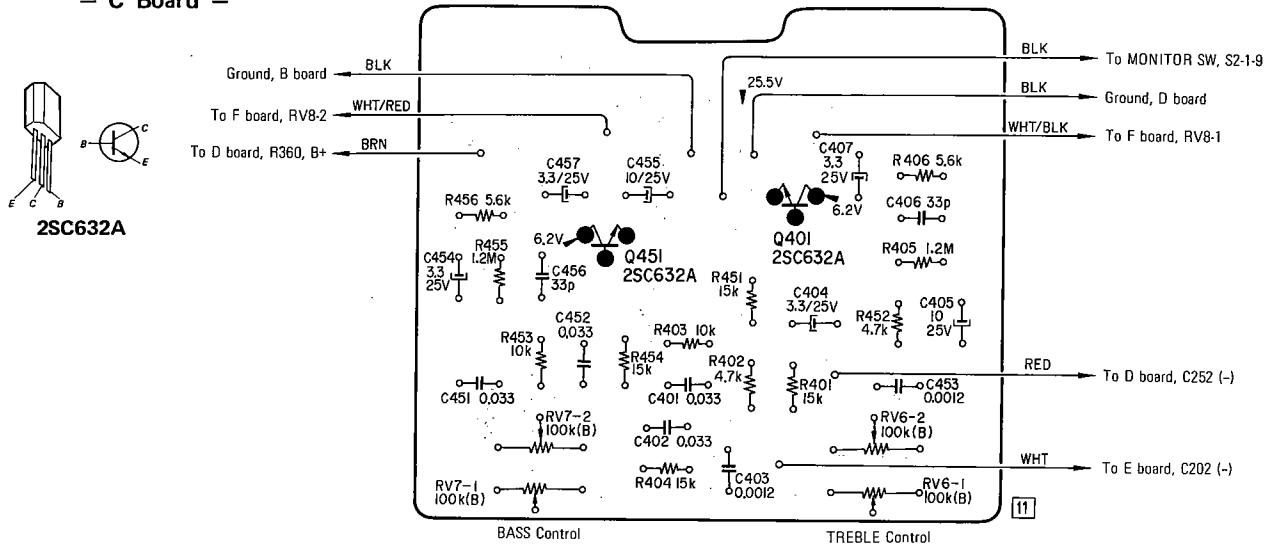




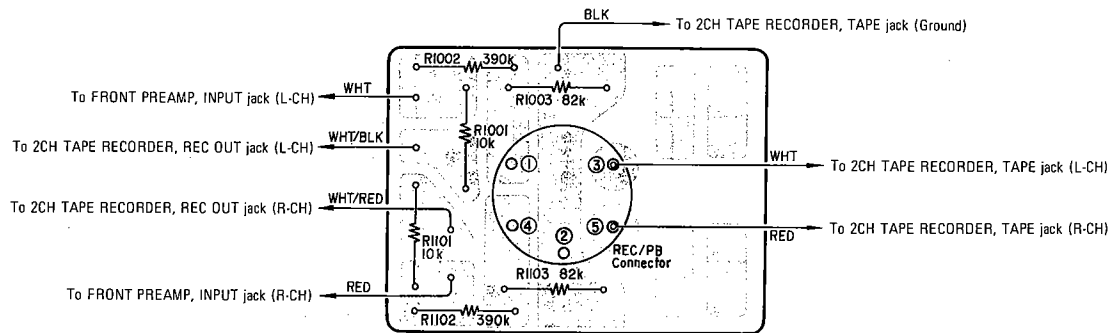
5.3. MOUNTING DIAGRAM – C Board and DIN Board –

– Conductor Side –

– C Board –



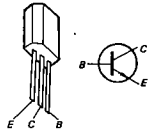
– DIN Board –



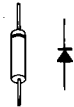
## 5-4. MOUNTING DIAGRAM – D Board –

– Conductor Side –

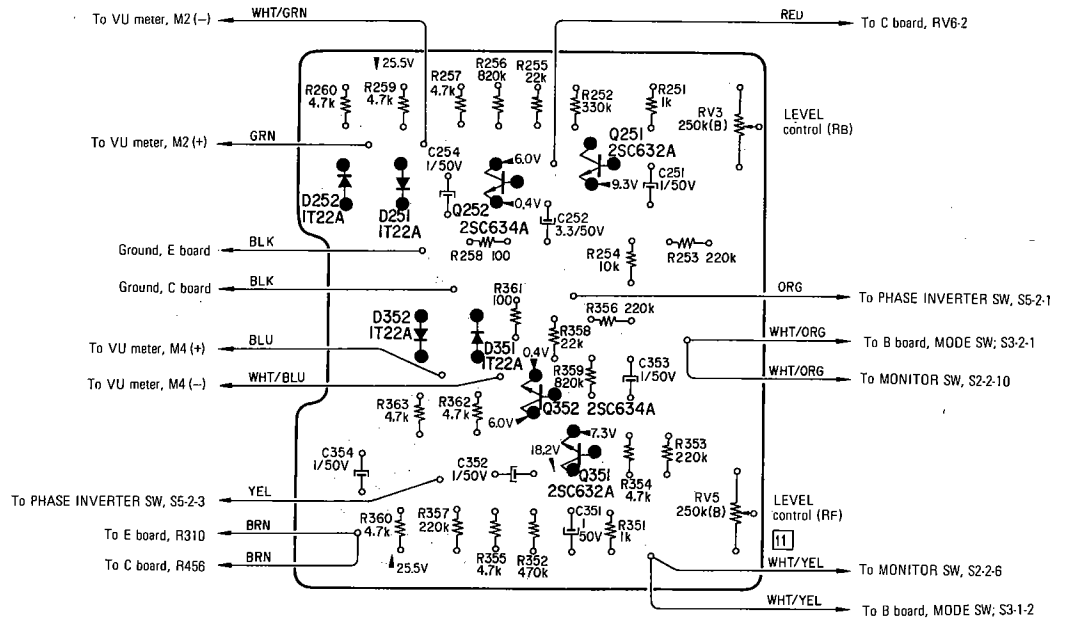
Serial No. up to 801,000  
(USA Model only)



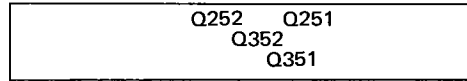
2SC632A  
2SC634A



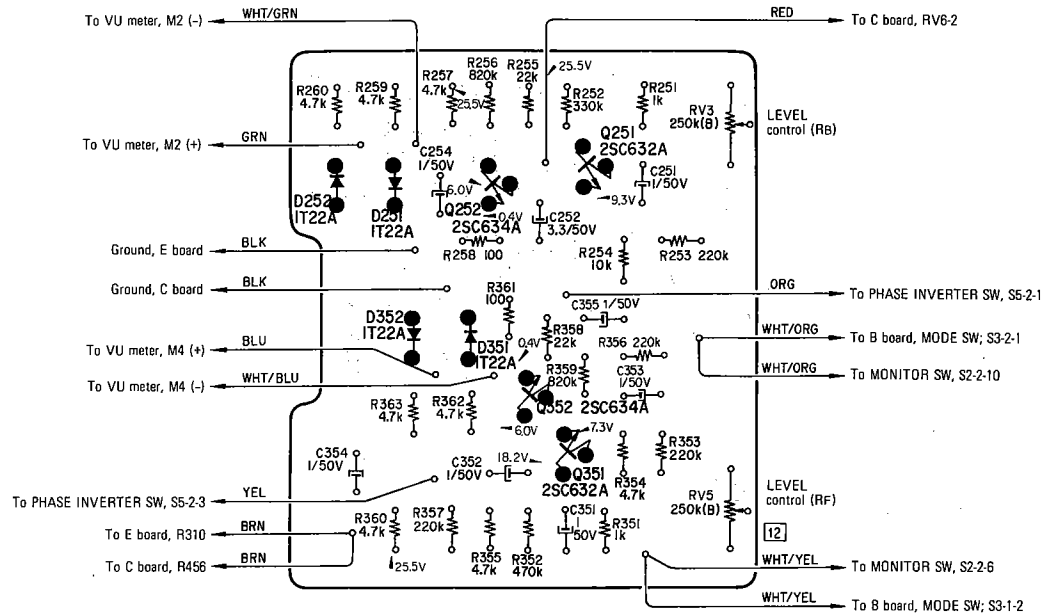
1T22A



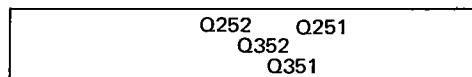
### Transistors Location



Serial No. 801,001 and later (USA Model)  
Serial No. 900,001 and later (AEP Model)  
Serial No. 700,001 and later (Canada Model)



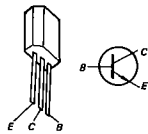
### Transistors Location



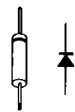
5-5. MOUNTING DIAGRAM — E Board —

— Conductor Side —

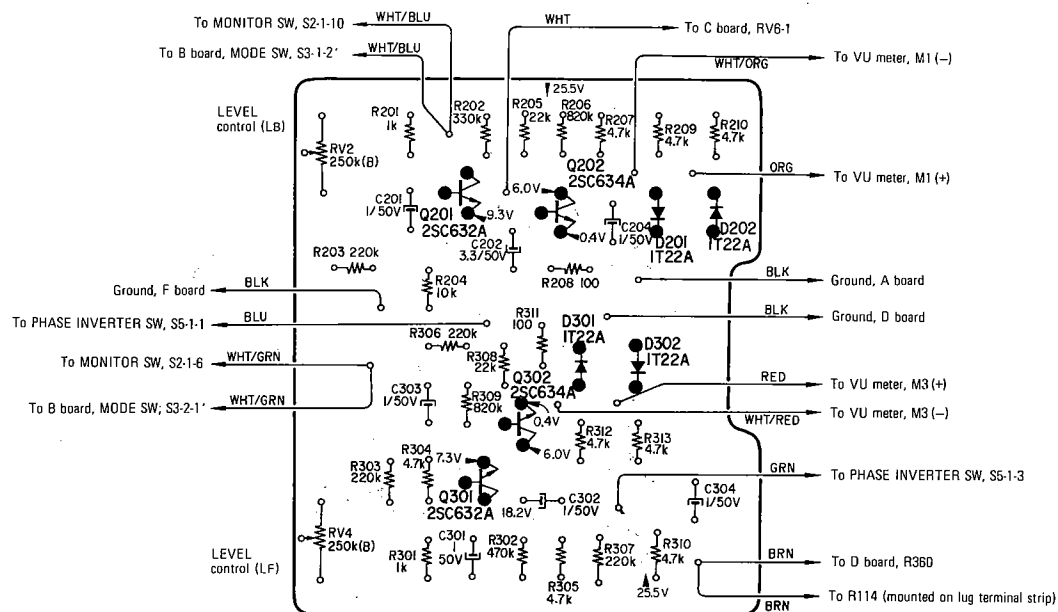
Serial No. up to 801,000 (USA Model only)



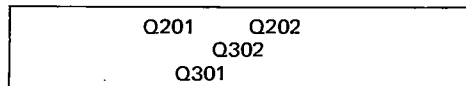
2SC632A  
2SC634A



IT22A



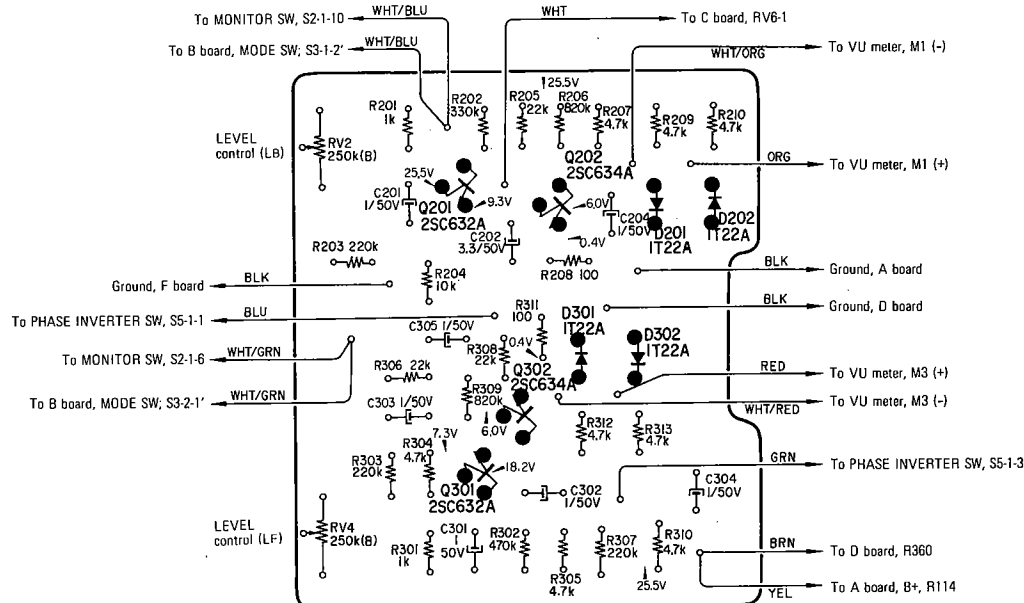
Transistors Location



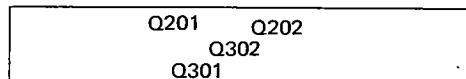
Serial No. 801,001 and later (USA Model)

Serial No. 900,001 and later (AEP Model)

Serial No. 700,001 and later (Canada Model)

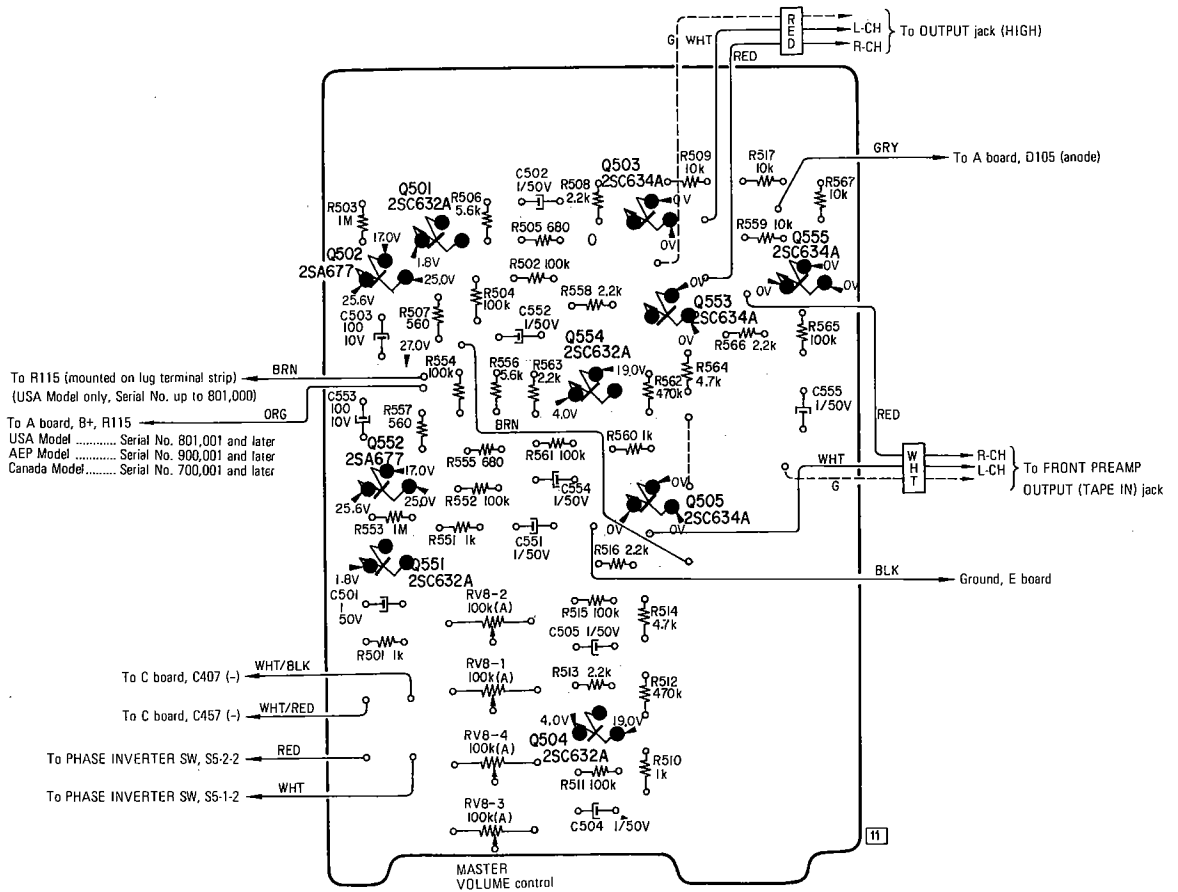


Transistors Location



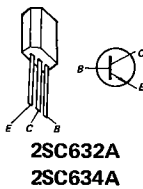
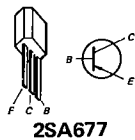
## 5-6. MOUNTING DIAGRAM -- F Board --

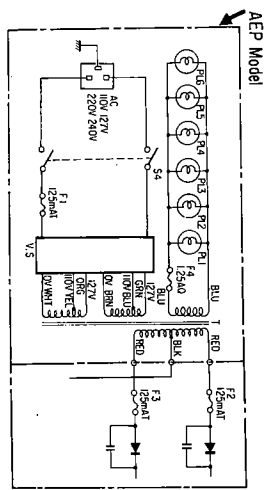
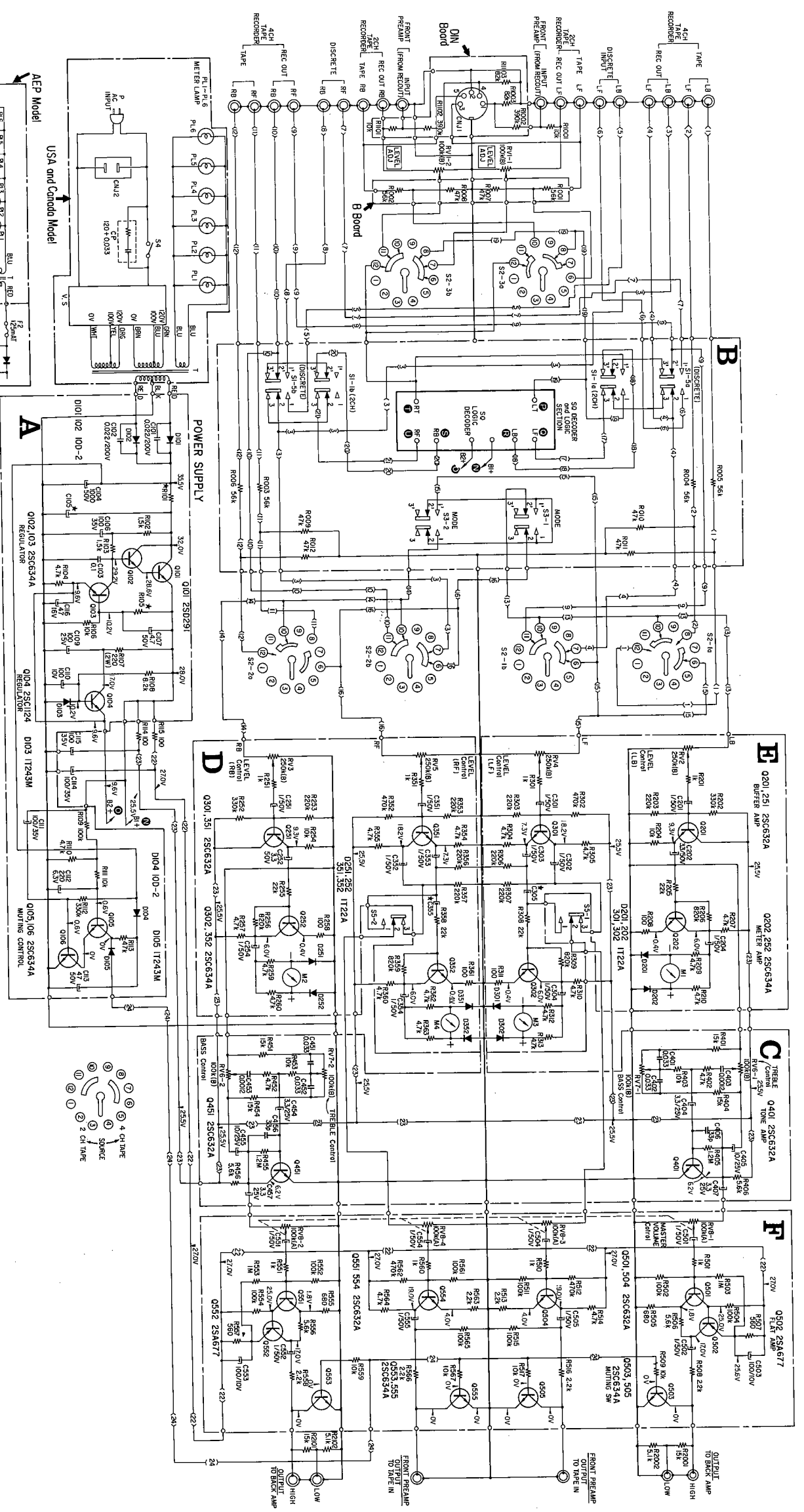
-- Conductor Side --



### Transistors Location

Q502	Q501	Q554	Q503	Q555
Q552			Q553	
Q551		Q504	Q505	





value	USA Model (Serial No. up to 801,000)	USA Model (Serial No. 801,001 and later)	Canada Model AEP Model
R101	22Ω	1Ω	
R105	18k	15k	
C105	220µF/35V	deleted	
C305	-----	1µF/50V (added)	

Note: Ref. No. Description Position

S1-1~5 SYSTEM Selector SO

(2 CH, 2 + 4, SO, R-MTX, DISCRETE) MONITOR Selector SOURCE

S2 (4 CH TAPE-SOURCE-2CH TAPE)

Note: All resistance values are in ohms. k=1,000, M=1,000k. All capacitance values are in µF except as indicated with p, which means pF. All voltages are measured with a VOM having 20 k ohms/volt input impedance. No signal in. Voltage variations may be noted due to normal production tolerances.

8. SCHEMATIC DIAGRAM (2) — SQ Decoder and Logic Section —

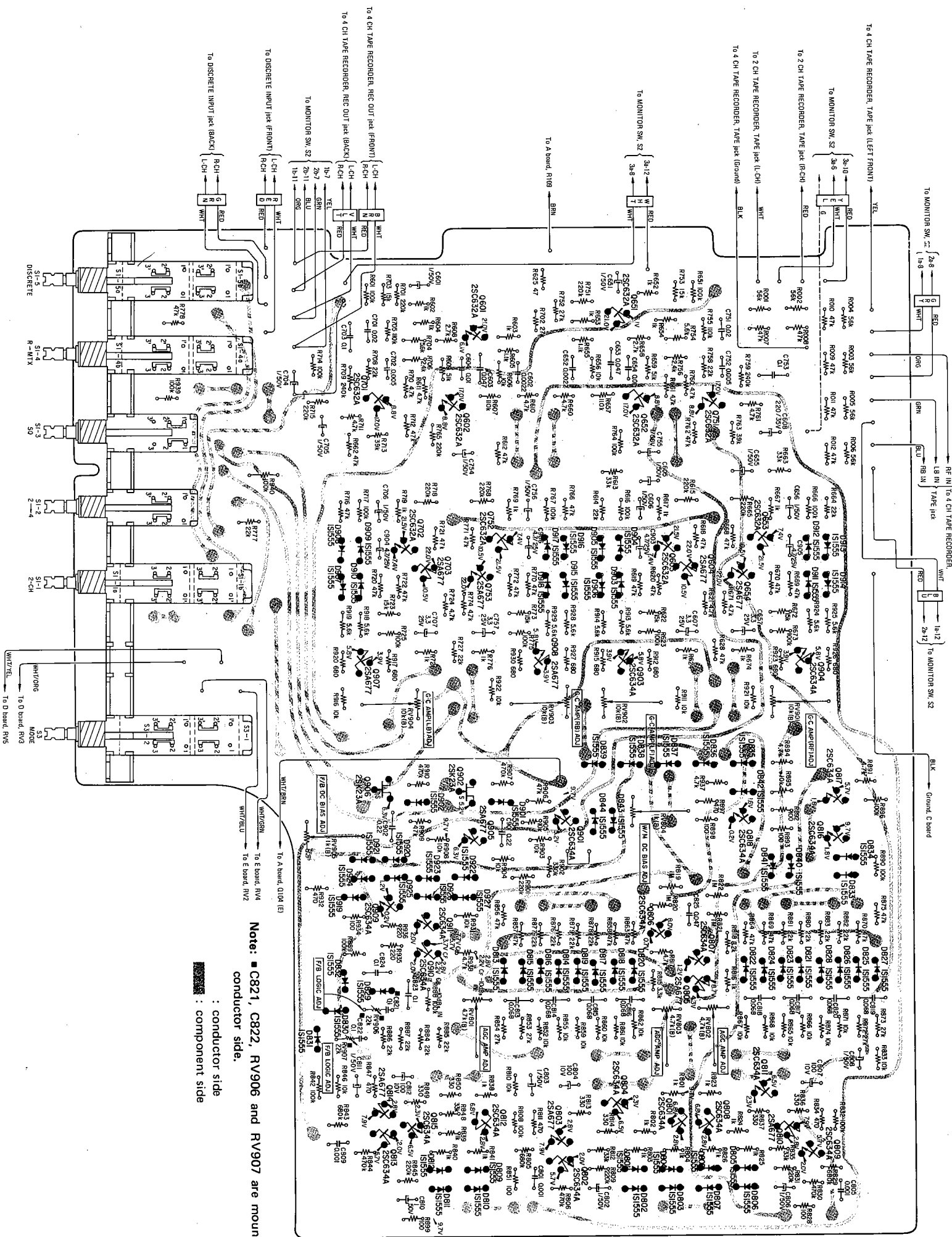


Ref. No.	Description	Position
S1-1~5	SYSTEM Selector (2CH, 2+4, SQ, R-MTX, DISCRETE)	SQ
S2	MONITOR Selector (4CH TAPE-SOURCE-2CH TAPE)	SOURCE

Note: \*C907 and C908 are added for the set with Serial No. 801,001 and later ..... USA Model only  
In AEP and Canada Model C907 and C908 are originally installed.

Note:  
All resistance values are in ohms. k=1,000, M=1,000k.  
All capacitance values are in  $\mu\text{F}$  except as indicated with p, which means  $\mu\text{F}$ .  
All voltages are measured with a VOM having 20k ohms/volt input impedance. No signal in.  
Voltage variations may be noted due to normal production tolerances.  
C-... Center Front signal  
Cb-... Center Back signal

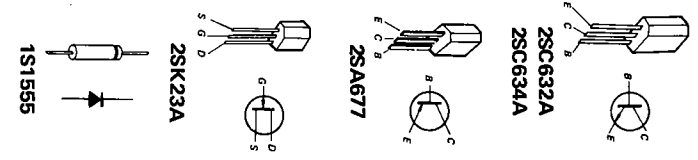
Serial No. up to 801,000 (USA Model only)



Note: ■ C821, C822, RV906 and RV907 are mounted on conductor side  
□ : component side

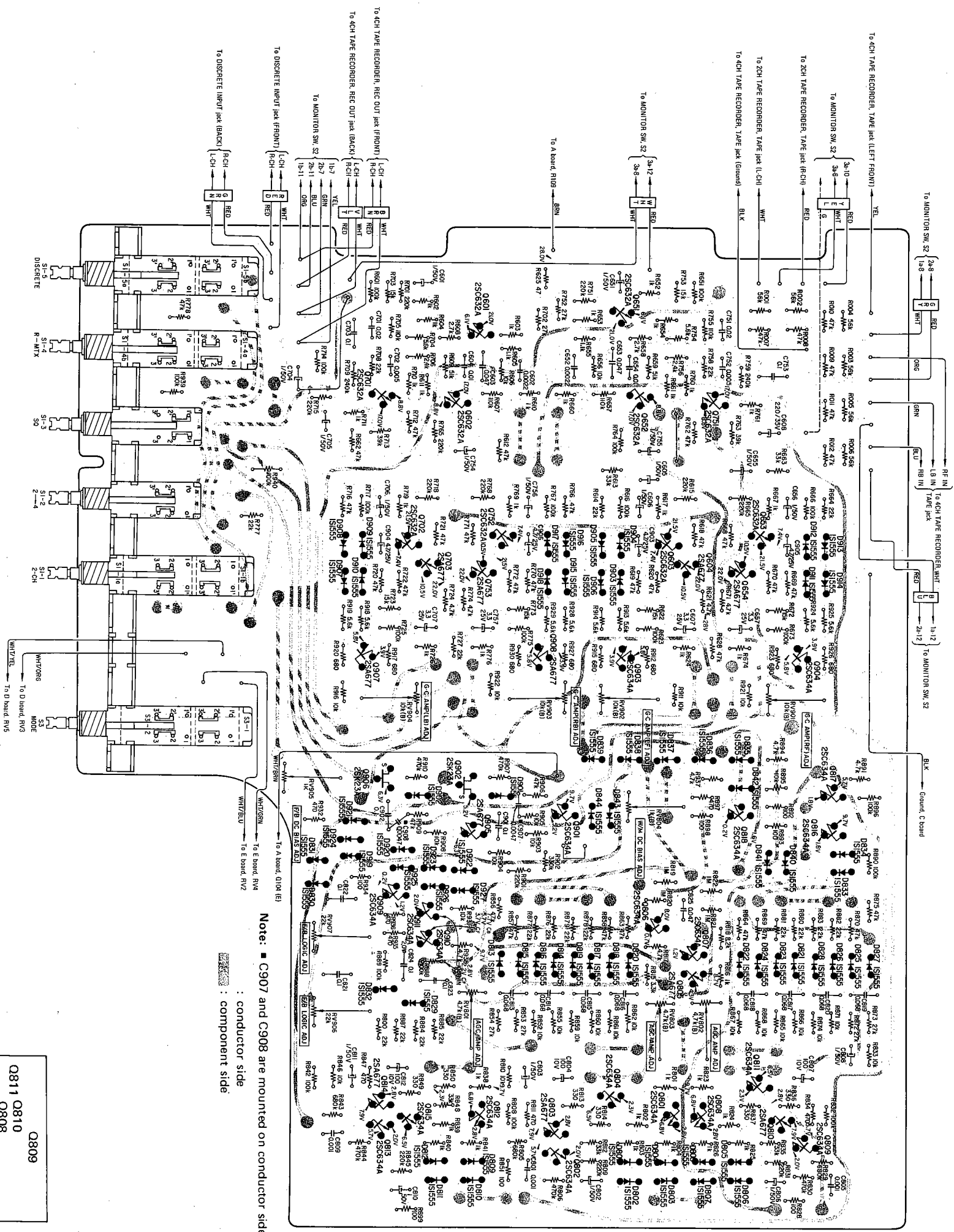
Transistors and Adjustment Parts Location

Q651	Q653	Q654	Q904 RV901	Q817	Q816	RV802	Q811	Q810	Q809
Q751	Q652	Q654	Q903 RV902	Q818	Q806	RV803	Q807	Q808	Q808
Q601	Q602	Q752	Q908 RV903	Q804	Q806	RV803	Q804	Q801	Q802
	Q701	Q703	RV904	Q902	Q905	RV801	Q911	Q814	Q812
		Q702	Q907	Q906	Q909	RV906	Q815	Q815	Q813



SQD-2020 SQD-2020

Serial No. 801,001 and later (USA Model)  
Serial No. 900,001 and later (AEP Model)  
Serial No. 700,001 and later (Canada Model)



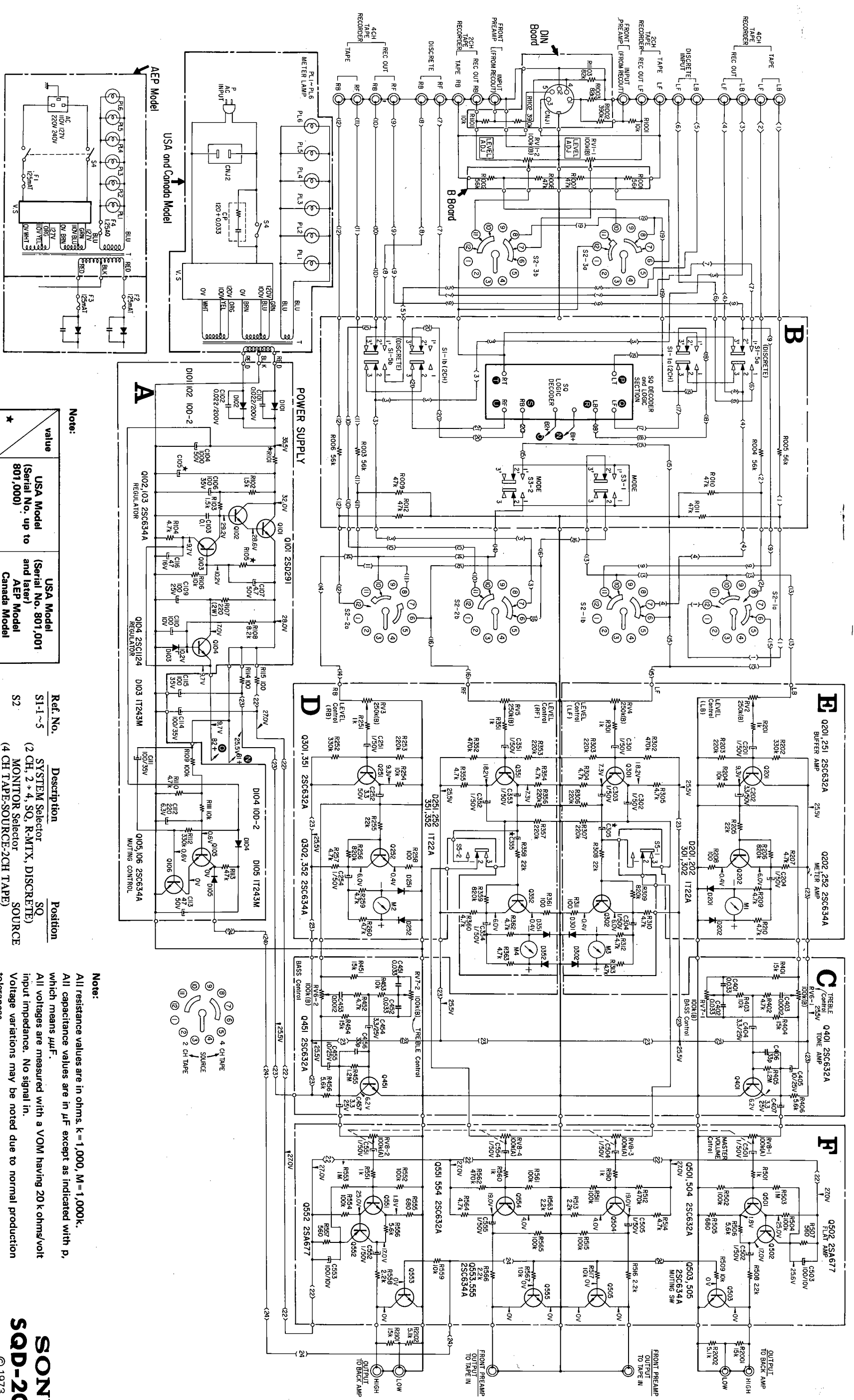
Note: ■ C907 and C908 are mounted on conductor side.

■ : conductor side  
□ : component side

Transistors and Adjustment Parts Location

Q651	Q652	Q653	Q654	Q663	Q664	Q675	Q676	Q677	Q678	Q679	Q680	Q681	Q682	Q683	Q684	Q685	Q686	Q687	Q688	Q689	Q690	Q691	Q692	Q693	Q694	Q695	Q696	Q697	Q698	Q699	Q700	Q701	Q702	Q703	Q704	Q705	Q706	Q707	Q708	Q709	Q710	Q711	Q712	Q713	Q714	Q715	Q716	Q717	Q718	Q719	Q720	Q721	Q722	Q723	Q724	Q725	Q726	Q727	Q728	Q729	Q730	Q731	Q732	Q733	Q734	Q735	Q736	Q737	Q738	Q739	Q740	Q741	Q742	Q743	Q744	Q745	Q746	Q747	Q748	Q749	Q750	Q751	Q752	Q753	Q754	Q755	Q756	Q757	Q758	Q759	Q760	Q761	Q762	Q763	Q764	Q765	Q766	Q767	Q768	Q769	Q770	Q771	Q772	Q773	Q774	Q775	Q776	Q777	Q778	Q779	Q780	Q781	Q782	Q783	Q784	Q785	Q786	Q787	Q788	Q789	Q790	Q791	Q792	Q793	Q794	Q795	Q796	Q797	Q798	Q799	Q800	Q801	Q802	Q803	Q804	Q805	Q806	Q807	Q808	Q809	Q810	Q811	Q812	Q813	Q814	Q815	Q816	Q817	Q818	Q819	Q820	Q821	Q822	Q823	Q824	Q825	Q826	Q827	Q828	Q829	Q830	Q831	Q832	Q833	Q834	Q835	Q836	Q837	Q838	Q839	Q840	Q841	Q842	Q843	Q844	Q845	Q846	Q847	Q848	Q849	Q850	Q851	Q852	Q853	Q854	Q855	Q856	Q857	Q858	Q859	Q860	Q861	Q862	Q863	Q864	Q865	Q866	Q867	Q868	Q869	Q870	Q871	Q872	Q873	Q874	Q875	Q876	Q877	Q878	Q879	Q880	Q881	Q882	Q883	Q884	Q885	Q886	Q887	Q888	Q889	Q890	Q891	Q892	Q893	Q894	Q895	Q896	Q897	Q898	Q899	Q900	Q901	Q902	Q903	Q904	Q905	Q906	Q907	Q908	Q909	Q910	Q911	Q912	Q913	Q914	Q915	Q916	Q917	Q918	Q919	Q920	Q921	Q922	Q923	Q924	Q925	Q926	Q927	Q928	Q929	Q930	Q931	Q932	Q933	Q934	Q935	Q936	Q937	Q938	Q939	Q940	Q941	Q942	Q943	Q944	Q945	Q946	Q947	Q948	Q949	Q950	Q951	Q952	Q953	Q954	Q955	Q956	Q957	Q958	Q959	Q960	Q961	Q962	Q963	Q964	Q965	Q966	Q967	Q968	Q969	Q970	Q971	Q972	Q973	Q974	Q975	Q976	Q977	Q978	Q979	Q980	Q981	Q982	Q983	Q984	Q985	Q986	Q987	Q988	Q989	Q990	Q991	Q992	Q993	Q994	Q995	Q996	Q997	Q998	Q999
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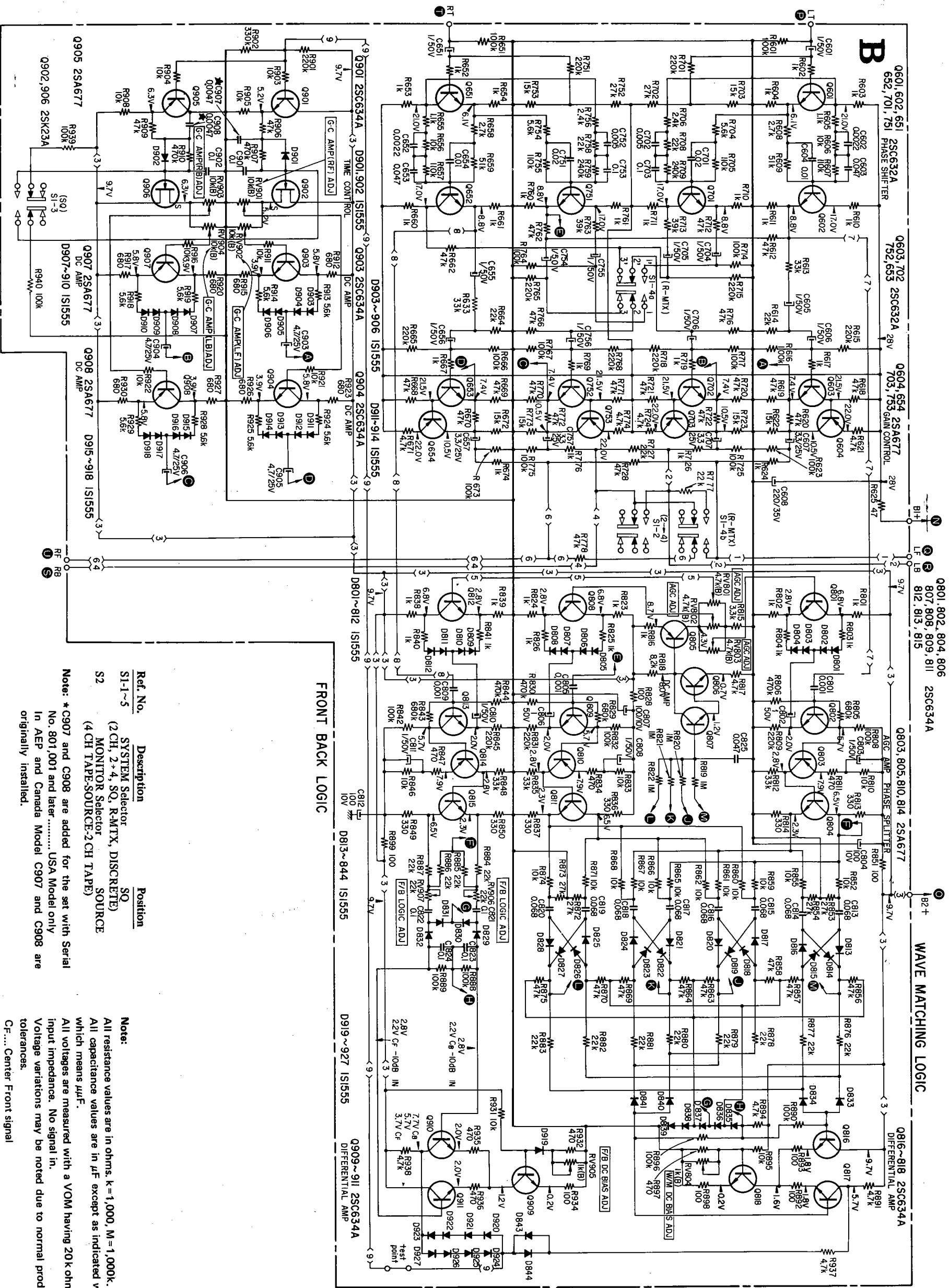


value	USA Model (Serial No. up to 801,000)	USA Model (Serial No. 801,001 and later) and later) AEP Model Canada Model
R101	22Ω	1Ω
R105	18k	15k
C105	220μ/35V	deleted
C305 (C355)	.....	1μ/50V (added)

Ref. No.	Description	Position
SI-1~5	SYSTEM Selector	SO
S2	(2 CH, 2 * 4, SQ, R-MTX, DISCRETE) MONITOR Selector	SOURCE
	(4 CH TAPE-SOURCE-2CH TAPE)	

**Note:**  
 All resistance values are in ohms, k=1,000, M=1,000k.  
 All capacitance values are in μF except as indicated with p, which means pF.  
 All voltages are measured with a VOM having 20 k ohms/volt input impedance. No signal in.  
 Voltage variations may be noted due to normal production tolerances.

**SONY**  
**SQD-2020**  
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Ref. No.	Description	Position
SI-1~5	SYSTEM Selector (2 CH, 2+4, SQ, R-MTX, DISCRETE)	SO
S2	MONITOR Selector (4 CH TAPE-SOURCE-2 CH TAPE)	SOURCE

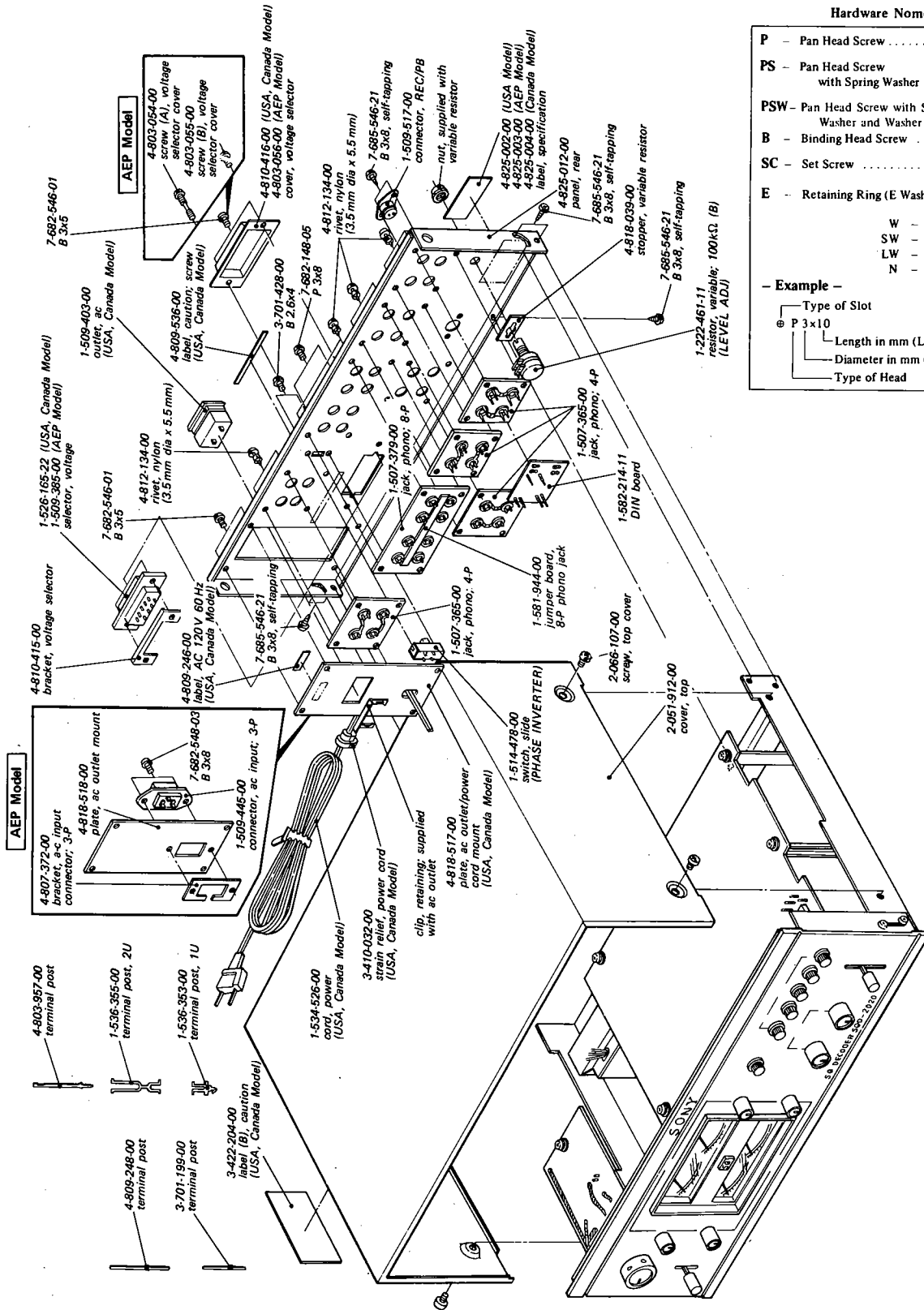
Note: \*C907 and C908 are added for the set with Serial No. 801,001 and later..... USA Model only  
In AEP and Canada Model C907 and C908 are originally installed.

Note:  
All resistance values are in ohms. k=1,000, M=1,000k.  
All capacitance values are in  $\mu$ F except as indicated with p, which means pF.  
All voltages are measured with a VOM having 20k ohms/volt input impedance. No signal in.  
Voltage variations may be noted due to normal production tolerances.  
CF..... Center Front signal  
CB..... Center Back signal

SECTION 6  
EXPLODED VIEWS

Note: USA Model ..... Serial No. 800,001 and later  
Canada Model ... Serial No. 700,001 and later  
AEP Model ..... Serial No. 900,001 and later

(1)



Hardware Nomenclature

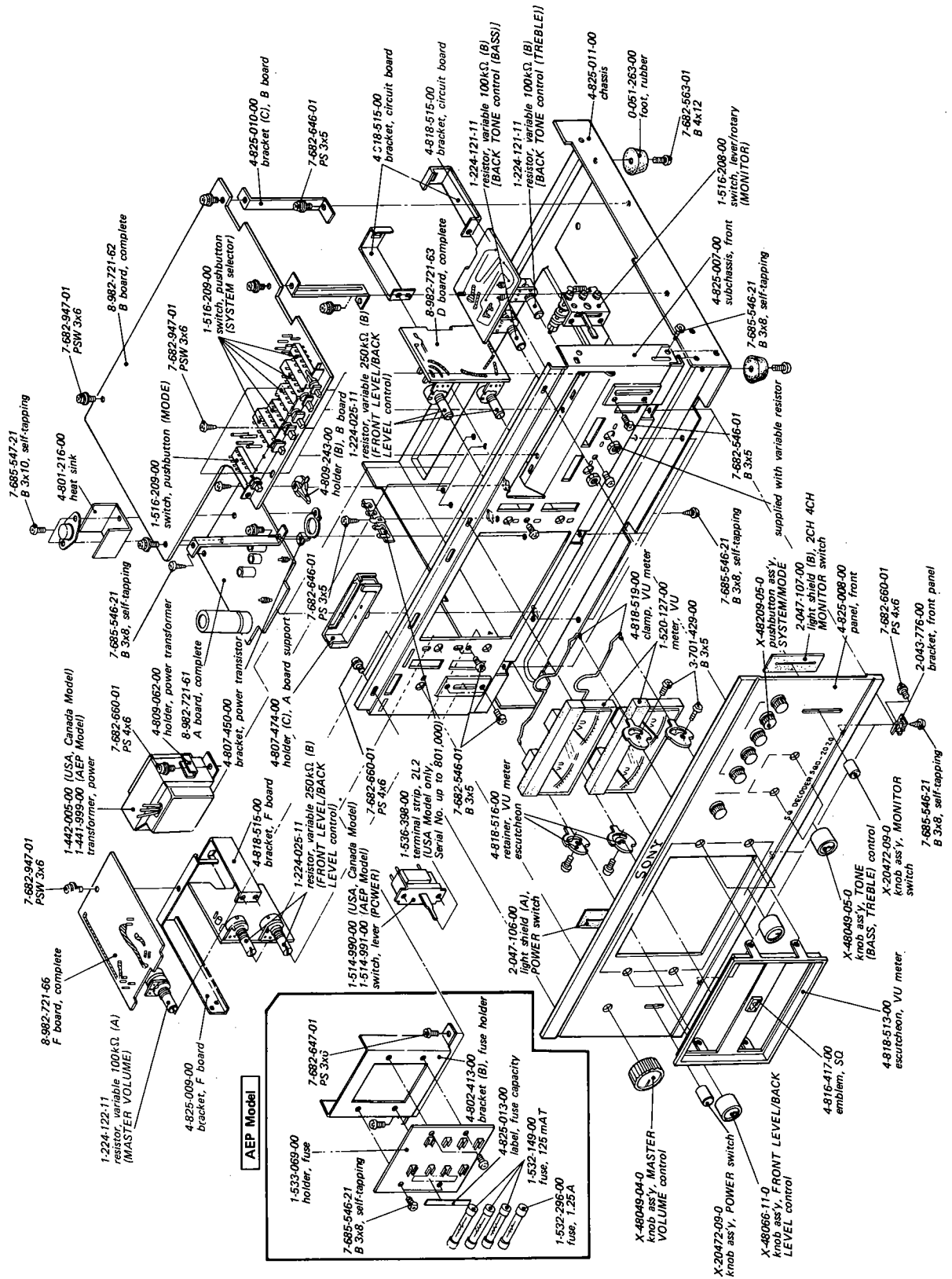
P	- Pan Head Screw	
PS	- Pan Head Screw with Spring Washer	
PSW	- Pan Head Screw with Spring Washer and Washer	
B	- Binding Head Screw	
SC	- Set Screw	
E	- Retaining Ring (E Washer)	
	W - Washer	
	SW - Spring Washer	
	LW - Lock Washer	
	N - Nut	

- Example -

Type of Slot

(2)

**Note:** USA Model ..... Serial No. 800,001 and later  
 Canada Model ... Serial No. 700,001 and later  
 AEP Model ..... Serial No. 900,001 and later



**SECTION 7  
ELECTRICAL PARTS LIST**

**Note:** USA Model ..... Serial No. 800,001 and later  
Canada Model ... Serial No. 700,001 and later  
AEP Model ..... Serial No. 900,001 and later

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
<b>COMPLETE CIRCUIT BOARDS</b>					
<p align="center"><b>NOTE</b></p> <p>In USA Model, two kinds of circuit boards exist for A, B, D and E boards though the circuit itself is the same.</p> <p>Listed part number is for only the new one since it is interchangeable with old one. However, when installing new A board to the prior serial number unit, B+ wiring should be changed as the parts mounted on terminal strip (filter circuit) are included in the new A board (power supply). Refer to the mounting diagram on page 5.</p>					
8-982-721-61	A board		Q501(Q551)	transistor	2SC632A
8-982-721-62	B board		Q502(Q552)	transistor	2SA677
8-982-721-67	C board		Q503(Q553)	transistor	2SC634A
8-982-721-64	D board		Q504(Q554)	transistor	2SC632A
8-982-721-65	E board		Q505(Q555)	transistor	2SC634A
8-982-721-66	F board		Q601(Q651)	transistor	2SC632A
1-582-214-11	DIN board		Q602(Q652)	transistor	2SC632A
			Q603(Q653)	transistor	2SC632A
			Q604(Q654)	transistor	2SA677
			Q701(Q751)	transistor	2SC632A
			Q702(Q752)	transistor	2SC632A
			Q703(Q753)	transistor	2SA677
			Q801	transistor	2SC634A
			Q802	transistor	2SC634A
			Q803	transistor	2SA677
			Q804	transistor	2SC634A
			Q805	transistor	2SA677
			Q806	transistor	2SC634A
			Q807	transistor	2SC634A
			Q808	transistor	2SC634A
			Q809	transistor	2SC634A
			Q810	transistor	2SA677
			Q811	transistor	2SC634A
			Q812	transistor	2SC634A
			Q813	transistor	2SC634A
			Q814	transistor	2SA677
			Q815	transistor	2SC634A
			Q816	transistor	2SC634A
			Q817	transistor	2SC634A
			Q818	transistor	2SC634A
			Q901	transistor	2SC634A
			Q902	FET	2SK23A
			Q903	transistor	2SC634A
			Q904	transistor	2SC634A
			Q905	transistor	2SA677
			Q906	FET	2SK23A
			Q907	transistor	2SA677
			Q908	transistor	2SA677
			Q909	transistor	2SC634A
			Q910	transistor	2SC634A
			Q911	transistor	2SC634A
<b>SEMICONDUCTORS</b>					
D101	diode	10D-2			
D102	diode	10D-2			
D103	diode	1T243M			
D104	diode	10D-2			
D105	diode	1T243M			
D201(D301)	diode	1T22A			
D251(D351)					
D202(D302)					
D252(D352)					
D801~844	diode	1S1555			
D901~927	diode	1S1555			
Q101	transistor	2SD291			
Q102	transistor	2SC634A			
Q103	transistor	2SC634A			
Q104	transistor	2SC1124			
Q105	transistor	2SC634A			
Q106	transistor	2SC634A			
Q201(Q301)	transistor	2SC632A			
Q251(Q351)					
Q202(Q302)					
Q252(Q352)					
Q401(Q451)	transistor	2SC632A			
			<b>TRANSFORMERS</b>		
T	{	1-441-999-00	transformer, power (AEP Model)		
		1-442-005-00	transformer, power (USA and Canada Model)		

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>			<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		
<b>CAPACITORS</b>									
All capacitance values are in $\mu\text{F}$ except as indicated with P, which means $\mu\text{M}$ F.									
C101	1-105-757-12	0.022	$\pm 10\%$	200V mylar	C601(C651)	1-121-391-11	1	50V	electrolytic
C102	1-105-757-12	0.022	$\pm 10\%$	200V mylar	C602(C652)	1-106-009-12	0.0022	$\pm 5\%$	50V mylar
C103	1-105-685-12	0.1	$\pm 10\%$	50V mylar	C603(C653)	1-106-041-12	0.047	$\pm 5\%$	50V mylar
C104	1-123-046-11	1,000		50V electrolytic	C604(C654)	1-106-025-12	0.01	$\pm 5\%$	50V mylar
C105	1-123-063-11	220		35V electrolytic	C605(C655)	1-121-391-11	1	50V	electrolytic
(USA Model only Serial No. up to 801000)									
C106	1-123-062-11	100		35V electrolytic	C606(C656)	1-121-391-11	1	50V	electrolytic
C107	1-121-396-11	4.7		50V electrolytic	C607(C657)	1-121-392-11	3.3	25V	electrolytic
C108					C608	1-121-261-11	220	35V	electrolytic
C109	1-123-935-11	100		25V electrolytic	C701(C751)	1-106-032-12	0.02	$\pm 5\%$	50V mylar
C110	1-121-414-11	100		10V electrolytic	C702(C752)	1-106-018-12	0.005	$\pm 5\%$	50V mylar
C111	1-123-062-11	100		35V electrolytic	C703(C753)	1-105-685-12	0.1	$\pm 10\%$	50V mylar
C112	1-121-419-11	220		6.3V electrolytic	C704(C754)	1-121-391-11	1	50V	electrolytic
C113	1-123-058-11	47		50V electrolytic	C705(C755)	1-121-391-11	1	50V	electrolytic
C114	1-123-062-11	100		35V electrolytic	C706(C756)	1-121-391-11	1	50V	electrolytic
C115	1-123-062-11	100		35V electrolytic	C707(C757)	1-121-392-11	3.3	25V	electrolytic
C116	1-121-409-11	47		16V electrolytic					
C201(C251)	1-121-391-11	1		50V electrolytic	C801	1-105-661-12	0.001	$\pm 10\%$	50V mylar
C202(C252)	1-121-393-11	3.3		50V electrolytic	C802	1-121-391-11	1	50V	electrolytic
C203(C253)					C803	1-121-391-11	1	50V	electrolytic
C204(C254)	1-121-391-11	1		50V electrolytic	C804	1-121-414-11	100	10V	electrolytic
C301(C351)	1-121-391-11	1		50V electrolytic	C805	1-105-661-12	0.001	$\pm 10\%$	50V mylar
C302(C352)	1-121-391-11	1		50V electrolytic	C806	1-121-391-11	1	50V	electrolytic
C303(C353)	1-121-391-11	1		50V electrolytic	C807	1-121-414-11	100	10V	electrolytic
C304(C354)	1-121-391-11	1		50V electrolytic	C808	1-121-391-11	1	50V	electrolytic
C305(C355)	1-121-391-11	1		50V electrolytic	C809	1-105-661-12	0.001	$\pm 10\%$	50V mylar
(USA Model Serial No. 801,001 and later)									
C401(C451)	1-105-679-12	0.033	$\pm 10\%$	50V mylar	C810	1-121-391-11	1	50V	electrolytic
C402(C452)	1-105-679-12	0.033	$\pm 10\%$	50V mylar	C811	1-121-391-11	1	50V	electrolytic
C403(C453)	1-105-662-12	0.0012	$\pm 10\%$	50V mylar	C812	1-121-414-11	100	10V	electrolytic
C404(C454)	1-121-392-11	3.3		25V electrolytic	C813	1-105-683-12	0.068	$\pm 10\%$	50V mylar
C405(C455)	1-121-398-11	10		25V electrolytic	C814	1-105-683-12	0.068	$\pm 10\%$	50V mylar
C406(C456)	1-102-963-11	33p	$\pm 5\%$	50V ceramic	C815	1-105-683-12	0.068	$\pm 10\%$	50V mylar
C407(C457)	1-121-392-11	3.3		25V electrolytic	C816	1-105-683-12	0.068	$\pm 10\%$	50V mylar
C501(C551)	1-121-391-11	1		50V electrolytic	C817	1-105-683-12	0.068	$\pm 10\%$	50V mylar
C502(C552)	1-121-391-11	1		50V electrolytic	C818	1-105-683-12	0.068	$\pm 10\%$	50V mylar
C503(C553)	1-121-414-11	100		10V electrolytic	C819	1-105-683-12	0.068	$\pm 10\%$	50V mylar
C504(C554)	1-121-391-11	1		50V electrolytic	C820	1-105-683-12	0.068	$\pm 10\%$	50V mylar
C505(C555)	1-121-391-11	1		50V electrolytic	C821	1-105-685-12	0.1	$\pm 10\%$	50V mylar
					C822	1-105-685-12	0.1	$\pm 10\%$	50V mylar
					C823	1-105-685-12	0.1	$\pm 10\%$	50V mylar
					C824	1-105-685-12	0.1	$\pm 10\%$	50V mylar
					C825	1-105-681-12	0.047	$\pm 10\%$	50V mylar
					C901	1-105-685-12	0.1	$\pm 10\%$	50V mylar
					C902	1-105-685-12	0.1	$\pm 10\%$	50V mylar
					C903	1-121-395-11	4.7	25V	electrolytic

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
C904	1-121-395-11	4.7 25V electrolytic	R203(R253)	1-242-729-11	220k
C905	1-121-395-11	4.7 25V electrolytic	R204(R254)	1-242-697-11	10k
C906	1-121-395-11	4.7 25V electrolytic	R205(R255)	1-242-705-11	22k
C907	1-105-669-12	0.0047 ±10% 50V mylar (USA Model, Serial No. 801,001 and later) (AEP and Canada Model, originally installed)	R206(R256)	1-242-743-11	820k
C908	1-105-669-12	0.0047 ±10% 50V mylar (USA Model, Serial No. 801,001 and later) (AEP and Canada Model, originally installed)	R207(R257)	1-242-689-11	4.7k
			R208(R258)	1-242-649-11	100
			R209(R259)	1-242-689-11	4.7k
			R210(R260)	1-242-689-11	4.7k
			R301(R351)	1-242-673-11	1k
			R302(R352)	1-242-737-11	470k
			R303(R353)	1-242-729-11	220k
			R304(R354)	1-242-689-11	4.7k
			R305(R355)	1-242-689-11	4.7k
			R306(R356)	1-242-729-11	220k
			R307(R357)	1-242-729-11	220k
			R308(R358)	1-242-705-11	22k
			R309(R359)	1-242-743-11	820k
			R310(R360)	1-242-689-11	4.7k
			R311(R361)	1-242-649-11	100
			R312(R362)	1-242-689-11	4.7k
			R313(R363)	1-242-689-11	4.7k
			R401(R451)	1-242-701-11	15k
			R402(R452)	1-242-689-11	4.7k
			R403(R453)	1-242-697-11	10k
			R404(R454)	1-242-701-11	15k
			R405(R455)	1-202-457-11	1.2M ±5% ¼W composition
			R406(R456)	1-242-691-11	5.6k
			R501(R551)	1-242-673-11	1k
			R502(R552)	1-242-721-11	100k
			R503(R553)	1-242-745-11	1M
			R504(R554)	1-242-721-11	100k
			R505(R555)	1-242-669-11	680
			R506(R556)	1-242-691-11	5.6k
			R507(R557)	1-242-667-11	560
			R508(R558)	1-242-681-11	2.2k
			R509(R559)	1-242-697-11	10k
			R510(R560)	1-242-673-11	1k
			R511(R561)	1-242-721-11	100k
			R512(R562)	1-242-737-11	470k
			R513(R563)	1-242-681-11	2.2k
			R514(R564)	1-242-689-11	4.7k
			R515(R565)	1-242-721-11	100k
			R516(R566)	1-242-681-11	2.2k
			R517(R567)	1-242-697-11	10k
R201(R251)	1-242-673-11	1k			
R202(R252)	1-242-733-11	330k			

**RESISTORS**

All resistance values are in Ω, ±5%, ¼W and carbon type unless otherwise indicated.

R001	1-242-715-11	56k
R002	1-242-715-11	56k
R003	1-242-715-11	56k
R004	1-242-715-11	56k
R005	1-242-715-11	56k
R006	1-242-715-11	56k
R007	1-242-713-11	47k
R008	1-242-713-11	47k
R009	1-242-713-11	47k
R010	1-242-713-11	47k
R012	1-242-713-11	47k
R101	1-207-630-11	22 ±10% 2W wire-wound (USA Model only Serial No. up to 801,000)
	1-207-620-11	1 ±10% 2W wire-wound (USA Model Serial No. 801,001 and later)
R102	1-244-677-11	1.5k
R103	1-244-677-11	1.5k
R104	1-244-689-11	4.7k
R105	1-244-703-11	18k (USA Model only Serial No. up to 801,000)
	1-242-701-11	15k (USA Model Serial No. 801,001 and later)
R106	1-244-697-11	10k
R107	1-207-638-11	220 ±10% 2W wire-wound
R108	1-244-695-11	8.2k
R109	1-244-721-11	100k
R110	1-244-689-11	4.7k
R111	1-244-697-11	10k
R112	1-244-733-11	330k
R113	1-244-713-11	47k
R114	1-244-649-11	100
R115	1-244-649-11	100

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R601(R651)	1-242-721-11	100k	R726(R776)	1-242-673-11	1k
R602(R652)	1-242-673-11	1k	R727(R777)	1-242-705-11	22k
R603(R653)	1-242-673-11	1k	R728(R778)	1-242-713-11	47k
R604(R654)	1-242-673-11	1k			
R605(R655)	1-242-674-11	1.1k	R801	1-242-673-11	1k
R606(R656)	1-242-697-11	10k	R802	1-242-673-11	1k
R607(R657)	1-242-722-11	110k	R803	1-242-673-11	1k
R608(R658)	1-242-683-11	2.7k	R804	1-242-673-11	1k
R609(R659)	1-242-714-11	51k	R805	1-242-741-11	680k
R610(R660)	1-242-673-11	1k	R806	1-242-737-11	470k
R611(R661)	1-242-673-11	1k	R807		-----
R612(R662)	1-242-713-11	47k	R808	1-242-721-11	100k
R613(R663)	1-242-709-11	33k	R809	1-242-729-11	220k
R614(R664)	1-242-705-11	22k	R810	1-242-697-11	10k
R615(R665)	1-242-729-11	220k	R811	1-242-665-11	470
R616(R666)	1-242-721-11	100k	R812	1-242-709-11	33k
R617(R667)	1-242-673-11	1k	R813	1-242-661-11	330
R618(R668)	1-242-713-11	47k	R814	1-242-661-11	330
R619(R669)	1-242-713-11	47k	R815	1-242-685-11	3.3k
R620(R670)	1-242-713-11	47k	R816	1-242-673-11	1k
R621(R671)	1-242-689-11	4.7k	R817	1-242-689-11	4.7k
R622(R672)	1-242-701-11	15k	R818	1-242-697-11	10k
R623(R673)	1-242-721-11	100k	R819	1-242-745-11	1M
R624(R674)	1-242-673-11	1k	R820	1-242-745-11	1M
R625	1-242-641-11	47	R821	1-242-745-11	1M
			R822	1-242-745-11	1M
R701(R751)	1-242-729-11	220k	R823	1-242-673-11	1k
R702(R752)	1-242-707-11	27k	R824	1-242-673-11	1k
R703(R753)	1-242-701-11	15k	R825	1-242-673-11	1k
R704(R754)	1-242-691-11	5.6k	R826	1-242-673-11	1k
R705(R755)	1-242-722-11	110k	R827		-----
R706(R756)	1-242-682-11	2.4k	R828	1-242-649-11	100
R707(R757)		-----	R829	1-242-741-11	680k
R708(R758)	1-242-705-11	22k	R830	1-242-737-11	470k
R709(R759)	1-242-730-11	240k	R831	1-242-729-11	220k
R710(R760)	1-242-673-11	1k	R832	1-242-721-11	100k
R711(R761)	1-242-673-11	1k	R833	1-242-697-11	10k
R712(R762)	1-242-713-11	47k	R834	1-242-665-11	470
R713(R763)	1-242-711-11	39k	R835	1-242-709-11	33k.
R714(R764)	1-242-721-11	100k	R836	1-242-661-11	330
R715(R765)	1-242-729-11	220k	R837	1-242-661-11	330
R716(R766)	1-242-713-11	47k	R838	1-242-673-11	1k
R717(R767)	1-242-721-11	100k	R839	1-242-673-11	1k
R718(R768)	1-242-729-11	220k	R840	1-242-673-11	1k
R719(R769)	1-242-673-11	1k	R841	1-242-673-11	1k
R720(R770)	1-242-713-11	47k	R842	1-242-721-11	100k
R721(R771)	1-242-713-11	47k	R843	1-242-741-11	680k
R722(R772)	1-242-713-11	47k	R844	1-242-737-11	470k
R723(R773)	1-242-701-11	15k	R845	1-242-729-11	220k
R724(R774)	1-242-689-11	4.7k	R846	1-242-697-11	10k
R725(R775)	1-242-721-11	100k	R847	1-242-665-11	470



<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R848	1-242-709-11	33k	R901	1-242-729-11	220k
R849	1-242-661-11	330	R902	1-242-733-11	330k
R850	1-242-661-11	330	R903	1-242-697-11	10k
R851	1-242-649-11	100	R904	1-242-697-11	10k
R852	1-242-697-11	10k	R905	1-242-697-11	10k
R853	1-242-707-11	27k	R906	1-242-713-11	47k
R854	1-242-707-11	27k	R907	1-242-737-11	470k
R855	1-242-697-11	10k	R908	1-242-697-11	10k
R856	1-242-713-11	47k	R909	1-242-713-11	47k
R857	1-242-713-11	47k	R910	1-242-737-11	470k
R858	1-242-713-11	47k	R911	1-242-697-11	10k
R859	1-242-697-11	10k	R912	1-242-669-11	680
R860	1-242-697-11	10k	R913	1-242-691-11	5.6k
R861	1-242-697-11	10k	R914	1-242-691-11	5.6k
R862	1-242-697-11	10k	R915	1-242-669-11	680
R863	1-242-713-11	47k	R916	1-242-697-11	10k
R864	1-242-713-11	47k	R917	1-242-669-11	680
R865	1-242-697-11	10k	R918	1-242-691-11	5.6k
R866	1-242-697-11	10k	R919	1-242-691-11	5.6k
R867	1-242-697-11	10k	R920	1-242-669-11	680
R868	1-242-697-11	10k	R921	1-242-697-11	10k
R869	1-242-713-11	47k	R922	1-242-697-11	10k
R870	1-242-713-11	47k	R923	1-242-669-11	680
R871	1-242-697-11	10k	R924	1-242-691-11	5.6k
R872	1-242-707-11	27k	R925	1-242-691-11	5.6k
R873	1-242-707-11	27k	R926	1-242-669-11	680
R874	1-242-697-11	10k	R927	1-242-669-11	680
R875	1-242-713-11	47k	R928	1-242-691-11	5.6k
R876	1-242-705-11	22k	R929	1-242-691-11	5.6k
R877	1-242-705-11	22k	R930	1-242-669-11	680
R878	1-242-705-11	22k	R931	1-242-697-11	10k
R879	1-242-705-11	22k	R932	1-242-665-11	470
R880	1-242-705-11	22k	R933		-----
R881	1-242-705-11	22k	R934	1-242-649-11	100
R882	1-242-705-11	22k	R935	1-242-665-11	470
R883	1-242-705-11	22k	R936	1-242-665-11	470
R884	1-242-705-11	22k	R937	1-242-689-11	4.7k
R885	1-242-705-11	22k	R938	1-242-689-11	4.7k
R886	1-242-705-11	22k	R939	1-242-721-11	100k
R887	1-242-705-11	22k	R940	1-242-721-11	100k
R888	1-242-721-11	100k			
R889	1-242-721-11	100k			
R890	1-242-721-11	100k	R1001(R1101)	1-244-697-11	10k
R891	1-242-689-11	4.7k	R1002(R1102)	1-244-735-11	390k
R892	1-242-649-11	100	R1003(R1103)	1-244-719-11	82k
R893	1-242-649-11	100			
R894	1-242-689-11	4.7k			
R895	1-242-697-11	10k	R2001(R2101)	1-244-701-11	15k
R896	1-242-721-11	100k	R2002(R2102)	1-244-690-11	5.1k
R897	1-242-665-11	470			
R898	1-242-649-11	100			
R899	1-242-649-11	100	RV1	1-222-461-11	100k (B) variable (LEVEL ADJ)

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
RV2	1-224-025-11	250 k (B)	variable (LEVEL control, L-CH (BACK))	S2	1-516-208-00	switch, lever/rotary (TAPE MONITOR)
RV3	1-224-025-11	250 k (B)	variable (LEVEL control, R-CH (BACK))	S4	1-514-911-00	switch, seesaw (POWER) (AEP Model)
RV4	1-224-025-11	250 k (B)	variable (LEVEL control, L-CH (FRONT))	S5	1-514-990-00	switch, seesaw (POWER) (USA and Canada Model)
RV5	1-224-025-11	250 k (B)	variable (LEVEL control, R-CH (FRONT))		1-514-478-00	switch, slide (PHASE INVERTER)
RV6	1-224-121-11	100 k (B)	variable (TREBLE)	<b>MISCELLANEOUS</b>		
RV7	1-224-121-11	100 k (B)	variable (BASS)			
RV8	1-224-122-11	100 k (A)	variable (MASTER VOLUME)			
RV801	1-222-763-11	4.7 k (B)	adjustable			
RV802	1-222-763-11	4.7 k (B)	adjustable			
RV803	1-222-763-11	4.7 k (B)	adjustable			
RV804	1-222-761-11	1 k (B)	adjustable			
RV901	1-222-752-11	10 k (B)	adjustable			
RV902	1-222-752-11	10 k (B)	adjustable	CP	1-231-057-00	encapsulated component, 120Ω+0.033μF
RV903	1-222-752-11	10 k (B)	adjustable	CNJ1	1-509-517-00	connector, REC/PB
RV904	1-222-752-11	10 k (B)	adjustable	CNJ2	1-509-403-00	outlet, ac (USA and Canada Model)
RV905	1-222-761-11	1 k (B)	adjustable		1-509-445-00	connector, ac input; 3-p (AEP Model)
RV906	1-222-764-11	22 k (B)	adjustable	F1,2,3	1-532-149-00	fuse, 125 mA T (AEP Model only)
RV907	1-222-764-11	22 k (B)	adjustable	F4	1-532-296-00	fuse, 1.25 A (AEP Model only)
<b>SWITCHES</b>				M1,2,3,4	1-520-127-00	meter, VU
S1, 3	1-516-209-00	switch, 6-key (SYSTEM, MODE)		P	1-534-526-00	cord, power (USA and Canada Model only)
				PL1 ~6	1-518-142-00	lamp, meter 8 V/0.05 A
				VS	1-509-385-00	selector, voltage (AEP Model)
					1-526-165-22	selector, voltage (USA and Canada Model only)
					1-507-365-00	jack, phono; 4-p
					1-507-379-00	jack, phono; 8-p
					1-533-069-00	socket, fuse; 4-p (AEP Model only)
					1-536-398-00	terminal strip, 2L2
					1-536-353-00	terminal post, U-shaped (single)
					1-536-355-00	terminal post, U-shaped (double)
					1-536-354-00	terminal post
					3-701-199-00	terminal post
					4-803-957-00	terminal post
					4-809-248-00	terminal post
					1-581-944-00	jumper board, 8-p phono jack