



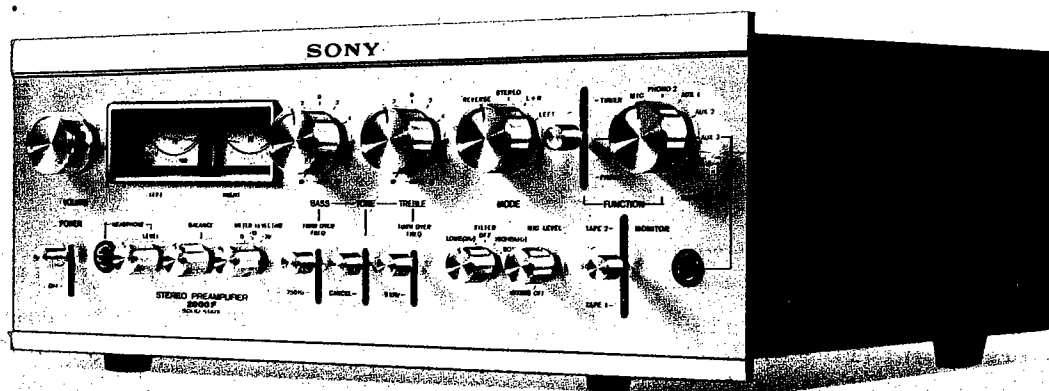
Set using ISO screws

6252

TA-2000F

USA Model

TA2000F



SONY®
SERVICE MANUAL

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SERVICING NOTES

The FET's used in the TA-2000F are selected according to their I_{dss} rank, so use replacement FET's with the exact same I_{dss} rank.

I_{dss} rank is indicated by the identification number, as shown in Fig. A.

On all plug-in type PC boards except the MUTING/POWER SUPPLY board, left- and right-channel conductor-side patterns are designed symmetrically. This makes a trouble check possible through interchange of channels by reinserting the boards upside down.

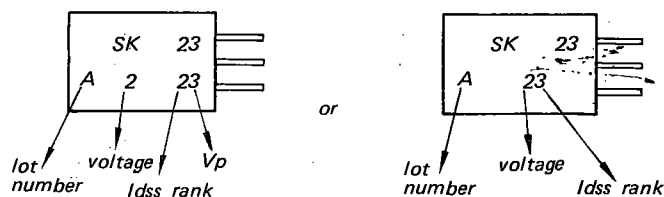


Fig. A Example of I_{dss} rank

SECTION 1 TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the TA-2000F are given in Table 1-1.

TABLE 1-1. SPECIFICATIONS

Frequency response:	PHONO-1, 2 : RIAA curve ± 0.5 dB MIC : 30 Hz to 30 kHz $\pm \frac{0}{2}$ dB TUNER, AUX 1, 2, 3 } TAPE 1, 2 } 10 Hz to 100 kHz $\pm \frac{0}{2}$ dB REC/PB (input)	(LOW LEVEL) : greater than 50 dB (weighting network B) PHONO 2 : greater than 73 dB (weighting network A) MIC : greater than 50 dB (weighting network B) TUNER, AUX 1, 2, 3 } TAPE 1, 2 } greater than 90 dB (weighting network A) REC/PB (input)
Input sensitivity and impedance:	PHONO-1 : 1.2 mV 33k (HIGH LEVEL) 47k 82k (LOW LEVEL) 0.06 mV 10 ohm 30 ohm PHONO-2 : 1.2 mV 47k MIC : 0.5 mV 100k TUNER AUX 1, 2, 3 } TAPE 1, 2 } 110 mV 100k REC/PB (input)	Tone controls: BASS : ± 10 dB at 50 Hz (TURNOVER FREQ. 250 Hz) ± 10 dB at 100 Hz (TURNOVER FREQ. 500 Hz) TREBLE : ± 10 dB at 10 kHz (TURNOVER FREQ. 2.5 kHz) ± 10 dB at 20 kHz (TURNOVER FREQ. 5 kHz)
Maximum input capability:	PHONO-1 (HIGH LEVEL) : 300 mV (LOW LEVEL) : 15 mV PHONO-2 : 300 mV MIC : 1,200 mV	Filters: LOW: 12 dB/oct, below 50 Hz HIGH: 12 dB/oct, above 9 kHz
Signal output level and impedance:	OUTPUT : 1 V 3k 1, 2 : 0.3 V 6k REC OUT : 100 mV 10k 1, 2 (max 30 V) CENTER : 5 V 2.6k HEADPHONE : 0.5 V OUT (8 ohm load) REC/PB : 30 mV 82k (output)	Harmonic distortion: Less than 0.03% at rated output, 1 kHz IM distortion: Less than 0.05% at rated output (60 Hz:7 kHz = 4:1) Power consumption: 23 watts Power requirements: 117 V ac, 50/60 Hz Dimensions: 400 mm (width) x 149 mm (height) x 315 mm (depth) 15 $\frac{3}{4}$ " (width) x 5 $\frac{13}{16}$ " (height) x 12 $\frac{7}{8}$ " (depth)
Signal-to-noise ratio:	PHONO 1 (HIGH LEVEL) : greater than 73 dB (weighting network A)	Net weight: 9 kg (19 lb 12 oz) Shipping weight: 11.2 kg (24 lb 12 oz)

1.2. DETAILED CIRCUIT ANALYSIS

The following text describes the function or operation of all stages and controls. The text sequence follows signal paths. Stages are listed by transistor reference designation at the left margin; major components are also listed in a similar manner. Refer to the block diagram on page 9 and the schematic diagram on pages 35 to 36.

Stage/Control Function

PHONO-1 Equalizer/Head Amp

Head Amplifier
Q101

Amplifies extremely small input signals (as from a moving-coil type cartridge) to the level required at following equalizer amplifier.

A common-gate configuration is suited to this job because it has low input impedance and high voltage gain. Input signal applied to the PHONO-1 terminal is routed to this amplifier only when IMPEDANCE SELECTOR switch S10 is set to the 30 ohm or 10 ohm position.

IMPEDANCE SELECTOR
switch S10

S10 changes the PHONO-1 input impedance to meet the cartridge manufacturer's recommended load impedance because of its effect upon frequency response.

Equalizer Amplifier
Q102, Q103
Q104, Q105
Q106

This newly developed direct-coupled four stage amplifier amplifies the phono cartridge signals to the level required at the input of the following tone-amplifier. Q102 forms a conventional FET amplifier while Q103 and Q104 act as buffer amplifier which has a high input impedance.

This FET-PNP combination amplifier forms a modified source-follower circuit in which Q104 acts not only as constant-current source, but also as a drive amplifier for the negative-going half cycle. This has the advantage of low harmonic distortion and wide dynamic range. In addition, the FET generates less noise than a conventional silicon transistor.

Stage/Control

Function

The FET's used in TA-2000F are selected according to their I_{dss} rank, and care should be taken to use replacement FET's with the exact same I_{dss} . I_{dss} is indicated by the identification number, as illustrated in Fig. 1-1. Note that Q105 and Q104 are newly-developed high-voltage transistors which make the wide linearity (dynamic range) possible. For this purpose, a 150-volt power supply is employed.

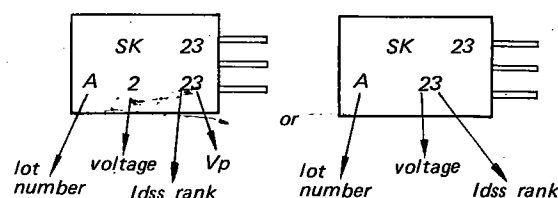


Fig. 1-1. Example of I_{dss} rank

Bias circuit

Dc bias voltage for Q102 is determined by the current flow in source resistor R112, and the dc negative feedback voltage applied to the gate of Q102 from the emitter circuit of Q105 through R110, R107 and R109. This dc negative feedback technique provides stable operation. Dc bias voltage of Q103 is determined by the drain voltage of Q102 and the current flow in the Q103 (which is restricted by its I_{dss}). Current flow in Q103 also determines the bias voltage applied to the Q104 and Q105 as they are directly coupled.

Equalization circuit

RIAA equalization is achieved by the negative-feedback loop containing R117, R118, R119, C110 and C109. Be sure to use replacement components with the exact same values. The equalizer amplifier's output is fed to the FUNCTION-2 switch through R120 (1 k Ω) to prevent interaction between the left and right channels when the MODE switch is set to L + R.

Stage/Control

Function

MIC Amplifier/PHONO-2 Equalizer Amplifier Section

MIC Amplifier
Q301, Q302
Q303, Q304

The MIC amplifier consists of two pairs of FET-NPN amplifiers. They amplify the signals provided by the microphones to the level required at the input of the tone-amplifier.

An FET has high input impedance and generates less noise than conventional silicon transistors. Therefore, FET's are employed in the low-level amplifiers. Note the high-voltage transistor Q302 (Q304) employed in the second-stage amplifier. This eliminates distortion due to strong input signal causing saturation in the low-level amplifier.

Bias circuit

Dc bias voltage for Q301 is determined by the current flow in the source resistor R306, and the dc negative feedback voltage applied to the gate of Q301 from the emitter circuit of Q302 through R304 and R302.

MIC amplifier
Q303, Q304

Q303 and Q304's operation is the same as described in Q302 and Q303. Note that the last stage (Q304) is a conventional transistor since the high-level input signal is sufficiently attenuated by means of MIC

MIC LEVEL
control VR6
mixing switch
S15

LEVEL control VR6 so as not to saturate Q303 and Q304. The MIC LEVEL control and mixing switch S15 are mechanically connected to perform the mixing operation.

PHONO-2
Equalizer
Amplifier
Q305, Q306
Q307, Q308
Q309

Same as described in PHONO-1 equalizer amplifier section except for reference numbers. Note that the output of this amplifier can be controlled by means of VR1, LEVEL ADJUST.

Function switch

Input signals applied to the TAPE-1, TUNER, AUX-1, AUX-2 input terminals are controlled respectively by means of VR5, VR2, VR3 and VR4. All input signals are routed to FUNCTION-1 or FUNCTION-2

Stage/Control

Function

switches. Note that the TAPE-TO-TAPE positions in the FUNCTION-1 switch are provided for tape duplicating as noted in Table 1-2.

TABLE 1-2.

FUNCTION-1 Position	Tape Recorder-1	Tape Recorder-2
TAPE-TO- TAPE 1-2	Playback	Recording
TAPE-TO- TAPE 2-1	Recording	Playback

REC OUT
Buffer Amp
Q01, Q51

All input signals are equalized or controlled by means of equalizer or LEVEL ADJUST resistors, and then fed to the FUNCTION switches.

The signals for REC OUT are extracted from the signal path between the FUNCTION switches and MODE switch, and then fed to each set of REC OUT terminals through buffer amplifier (emitter follower) Q01. Q01 eliminates interaction between the tape recorder and the TA-2000F's signal path. Note that Q01's output is routed through muting relay REL-1.

MONITOR
switch S3

In the TAPE-1 position, input signals connected to either the TAPE-1 terminal or REC/PB connector is selected. In the TAPE-2 position, the input program connected to the TAPE-2 terminal is selected. In the SOURCE position, all other program sources are selected.

MODE switch

Selects the desired mode of operation. This switch may also be used for test purposes. The relation between the positions of the MODE switch and outputs of the set are summarized in Table 1-3.

BALANCE
control VR7

Input signal is routed to the BALANCE control through MODE switch S4. This is done to optimize stereo reproduction. To eliminate insertion loss at

HIGH AND LOW FILTER COMPONENT/ TURNOVER FREQUENCY CHANGE/COMPONENT SECTION



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 μF .
All voltages represent an average
value and should hold within
 $\pm 20\%$.
All voltages are dc measured
with a VOM which has an input
impedance of $20k$ ohms/volt.
No signal in.

Stage/Control

Function

the mechanical center of movement, a special potentiometer having a conductive coating over half its element length is used.

VOLUME
control
VR8

The balanced input signals from BALANCE control VR7 is fed to VOLUME control VR8, which regulates the signal applied to the following tone-control circuit or output circuit.

Tone Amplifier Section

Tone Amplifier
Q501, Q502
Q503

This three-stage amplifier has basically flat response, and provides 20 dB voltage gain to compensate for tone-control insertion loss. It also isolates the volume-control and tone-control circuits to eliminate mutual interference. The input signals are amplified by Q501 and Q502, and then applied to source follower Q503.

Bias circuit

Bias voltage for Q501, Q502 and Q503 is determined by the current flow in their respective source resistors. Negative feedback is applied from the source circuit of Q503 to the source circuit of Q501 through C505, R509, and C506 to obtain a flat and wide response. Tone-amplifier-1's output is fed to an RC-type tone-control circuit through TONE CANCEL switch S5 when S5 is set to "ON".

TONE CANCEL
SW S5

Stage/Control

Function

Tone Control Section

All inputs are applied this circuit when TONE CANCEL switch S5 is set at ON. Fig. 1-2 shows the simplified circuit of tone control incorporated with the treble and bass turnover switches.

TREBLE control
S6

Increases or decreases the amount of high-frequency components by switching the resistors connected to S6 in steps.

TREBLE TURN-
OVER FREQU-
ENCY switch

S8 selects the specified turn over frequencies (2.5 kHz or 5 kHz). Refer to Fig. 1-3.

BASS control
S7

Increases or decreases the amount of low frequency components by switching the resistors connected to S7 in steps.

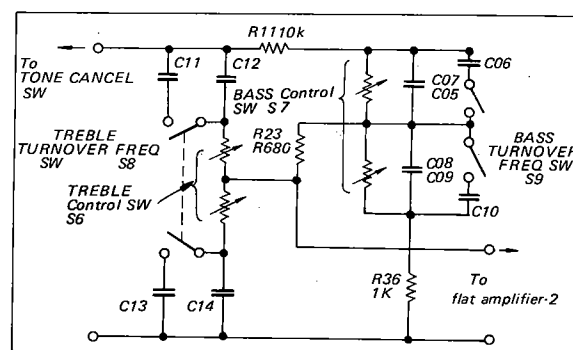


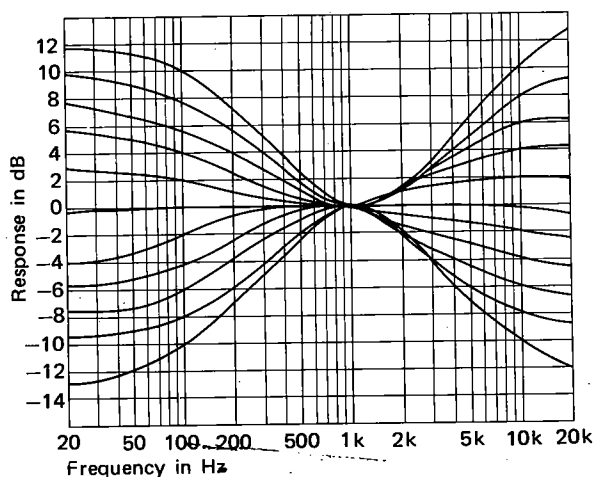
Fig. 1-2. Simplified tone control network

TABLE 1-3. OUTPUTS

MODE SWITCH POSITION	CENTER CHANNEL OUT	HEADPHONE OUT;		RECOUT-1, 2, REC/PB OUT;		OUTPUT	
		L-CH	R-CH	L-CH	R-CH	L-CH	R-CH
CHECK L	L + R	L + R		L + R	L + R	L + R	
CHECK R	L + R		L + R	L + R	L + R		L + R
REVERSE	L + R	R	L	L	R	R	L
STEREO	L + R	L	R	L	R	L	R
L + R	L + R	L + R	L + R	L + R	L + R	L + R	L + R
LEFT	L	L	L	L	R	L	L
RIGHT	R	R	R	L	R	R	R

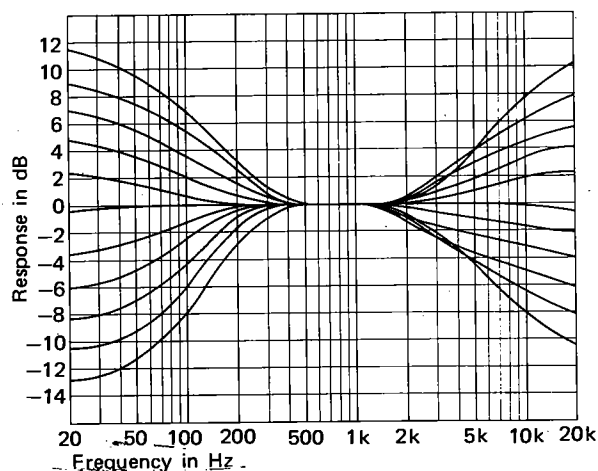
Stage/Control	Function
BASS TURNOVER S9 selects the specified turnover frequencies (500 Hz or 250 Hz). FREQUENCY switch S9	Refer to the Fig. 1-3 (tone control response). When TONE CANCEL switch S5 is set to CANCEL, the line signal is bypassed around the tone-control circuit and is fed directly to the output circuit through FILTER switch S11.
Tone-amplifier-2 Q504, Q505, Q506	Same as tone-amplifier-1 except for reference numbers.
FILTER switch S11	Selects the desired filtering operation. LC filter circuits are employed to eliminate insertion loss.
LOW(50 Hz) position	Low-cut filter (C15, L01) cuts out unwanted low frequency components from the input signals (12 dB/oct below 50 Hz).

Stage/Control	Function
OFF position	These unwanted low frequencies include rumble created by the turntable, record changer, or the record itself. See Fig. 1-4.
HIGH (9 kHz) position	All filter circuits are removed from signal paths and have no effect upon frequency response. High-cut filter (L02, C16) cuts out unwanted high-frequency components from the input signals (12 dB/oct above 9 kHz). These unwanted high frequencies include hiss noise created by tape deck or tape itself. See Fig. 1-4.
BOTH position	Both low- and high-cut filters are effective. See Fig. 1-4. The signal from the FILTER switch is routed to the OUTPUT jacks through OUTPUT LEVEL switch S13.

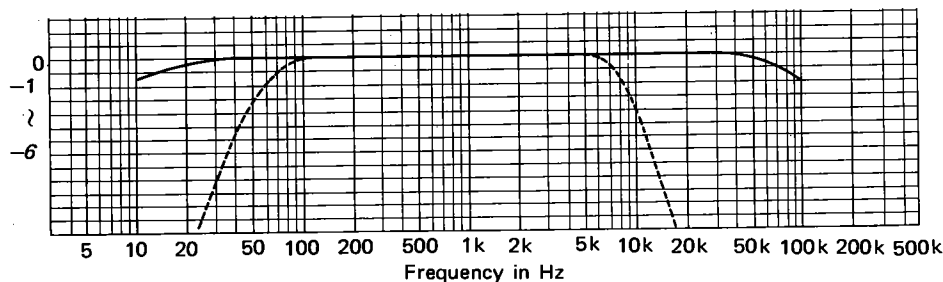


TURNOVER FREQUENCY: BASS 500 Hz
TREBLE 2.5 kHz

Fig. 1-3. Tone control frequency response



TURNOVER FREQUENCY: BASS 250 Hz
TREBLE 5 kHz



Input signal applied to TUNER inputs Output: 1 volt (OUTPUT LEVEL switch set to 1 V)
VOLUME control: maximum clockwise TONE CANCEL switch: CANCEL position
FILTER switch: { OFF position ———
BOTH position - - - - -

Fig. 1-4. Filter response

Stage/Control	Function
OUTPUT LEVEL switch S13	The output voltage can be changed by S11, which has two calibrated positions (0.3V and 1.0V), and should be set according to the requirements of the equipment to be connected. Note that the signal supplied to the OUTPUT-2 terminal is routed through the leaf switch in the HEADPHONE jack. As the result, no signal will appear at the OUTPUT-2 terminal during headphone monitoring.

Meter Amplifier/Headphone Amplifier Section

METER LEVEL switch S12	Level meter sensitivity can be varied by switching S12. In 0dB position, the reading on the meter shows the actual output value. In the -10 (-20)dB position, the sensitivity of the meter increases 10 (20)dB up from the 0dB position. Output signal is routed to meter amplifier through METER LEVEL switch S12 to permit VU meter monitoring. In the MIC position, only the MIC amplifier's output is fed directly to the meter amplifier.
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Meter amplifier Q701, Q702 Q703	This three-stage direct-coupled amplifier increases the extracted output signals to the level required to drive the level meter. The meter amplifier output is rectified and supplied to the VU meter through bridge rectifier diodes D701 ~ D704.
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Level meter adj. R701	Semifixed resistor R701 in the meter amplifier calibrates the VU meter.
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Headphone amplifier Q704, Q705 Q706, Q707 HEADPHONE LEVEL VR9	Supplies enough power to drive the headphone used for monitoring. The output signal is controlled by means of HEADPHONE LEVEL control VR9. Q704 is a preamplifier which increases the input signal to the level required at the following driver stage.
---	---

Driver Q705	Though this stage is a conventional flat amplifier, it determines the output voltage swings because the following stage is basically in the emitter-follower configuration. The ac load resistor for this stage is R718 in the collector circuit.
Power amplifiers (complementary stage) Q706, Q707	These transistors operate as emitter-followers to provide the current swings required and also perform the necessary phase inversion to drive the load in push-pull. Phase inversion is performed by using PNP and NPN type transistors. Q706 supplies power during the positive-going half cycle, while Q707 supplies power during the negative-going half cycle. The output is fed to the HEADPHONE jack through coupling capacitor C711.
CENTER CHANNEL OUTPUT jack	It also supplied to the CENTER CHANNEL output jack through R729 for use in center-woofer systems. Note that the left- and right-channel signals are mixed at this jack.
Muting circuit Q907, Q908 Q909, Q910	This muting circuit prevents the loud "pop" (due to initial current flow) or click noises from occurring just after turning the power switch to ON. These transients might damage a delicate high-fidelity speaker system. The base of Q909 (Q910) is connected to the collector circuit of Q908 through R914 (R913), while the base of Q908 is connected to an RC network (R910, C902) having a long time constant. Negative bias voltage is produced by D907 and C903, and then fed to the base circuit of Q909 (Q910) through R912. This effectively mutes the input signals up to 20V peak-to-peak. When you first turn ON the power switch, Q908 remains off due to the long time constant of the as-

Stage/Control

Function

sociated bias circuit, while Q909 (Q910) is forward biased by R911. As a result, Q909 (Q910) is ON, shorting the output circuit to ground, and effectively muting the output signals.

As Q908 is gradually turned ON due to the slowly-increasing base current flow, Q908 conducts and cuts off Q909 (Q910), removing the muting. Q907 is employed to discharge C902 quickly when power switch is turned off, preparing it for the next muting operation.

REC OUT
Muting circuit
Q911, Q912

This circuit is employed to mute the REC OUT signals by means of relay REL-1, preventing the loud "pop" or click noises just after turning the power switch to ON. The base of Q911 is connected to the collector circuit of Q912, while the base of Q912 is connected to an RC network (R903, C901) having a long time constant. When you first turn ON the power switch, Q912 remains off due to the long time constant of the associated bias circuit. This keeps open the muting relay, disconnecting the buffer amplifier's (Q01) output from the REC OUT signal path. As Q912 is gradually turned ON due to the slowly-increasing base current flow, Q912 conducts and turns on Q911, energizing the muting relay to deliver the buffer amplifier's output to the REC OUT terminal.

Power Supply Section

Two independent regulated pow-

Stage/Control

Function

er supplies are employed to obtain stable operation. One is a low-voltage supply delivering 37 volts dc, and the other is a high voltage supply delivering 150 volts dc. As both power supplies have the same configuration, only the low-voltage regulator circuit is described here. The high-voltage supply is identical except for reference numbers.

Voltage regulator
Q901, Q902, Q903
(Q904, Q905,
Q906)

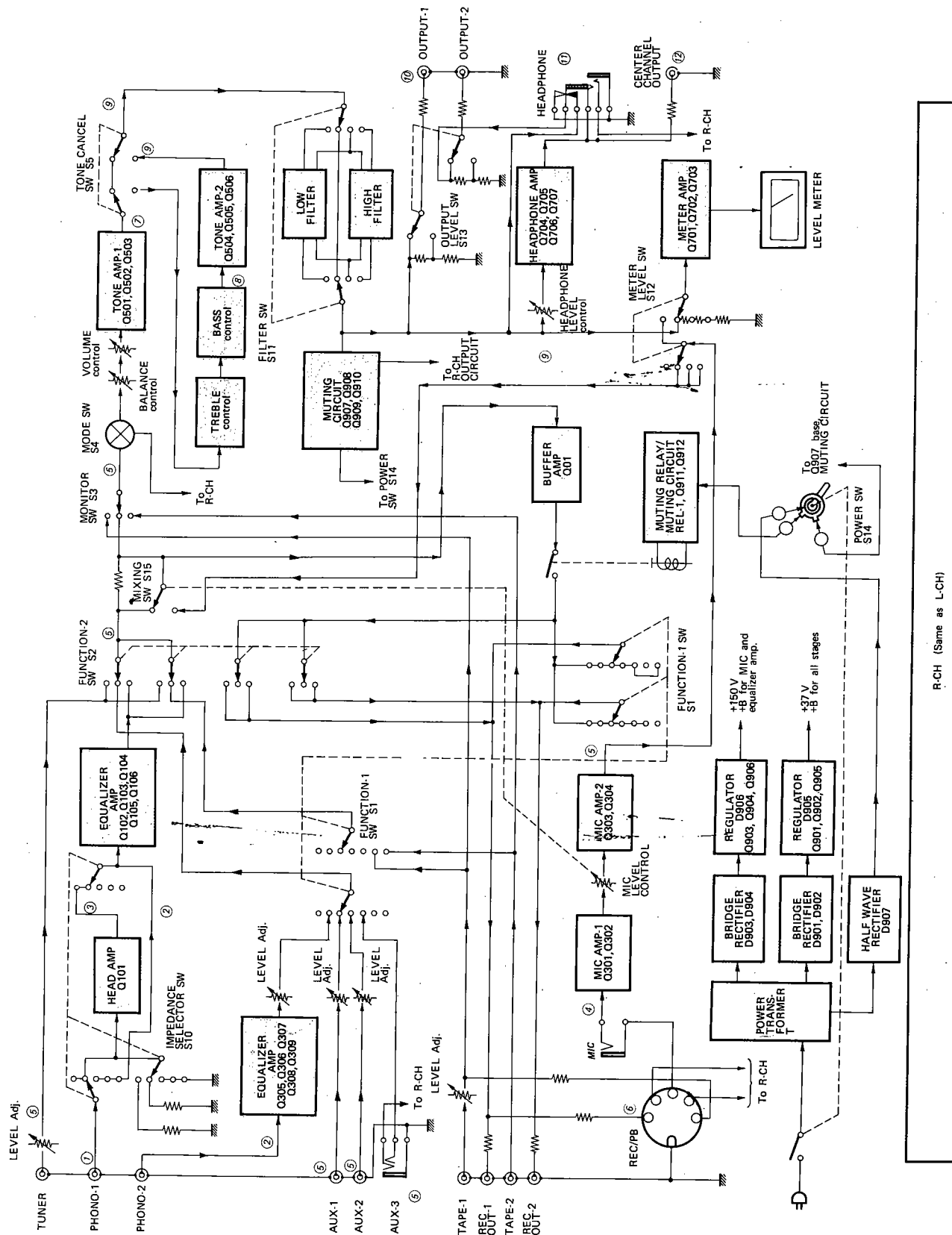
Dc output from bridge rectifier D901 and D902 (D903 and D904) is filtered by C18 (C17) and applied to series regulator Q901 and Q902 (Q904 and Q905).

Q903 (Q906) compares a sample of the output voltage picked off across power supply adjust control R926 (R920), with reference voltage supplied by zener diode D905 (D906).

A change in the output voltage is detected at the base of Q903 (Q906) and therefore alters its collector voltage. Since the collector of Q903 is directly coupled to the base of Q902 (Q905), the change in output voltage alters the conduction of Q901 and Q902 (Q904 and Q905) by the amount necessary to maintain the output voltage constant.

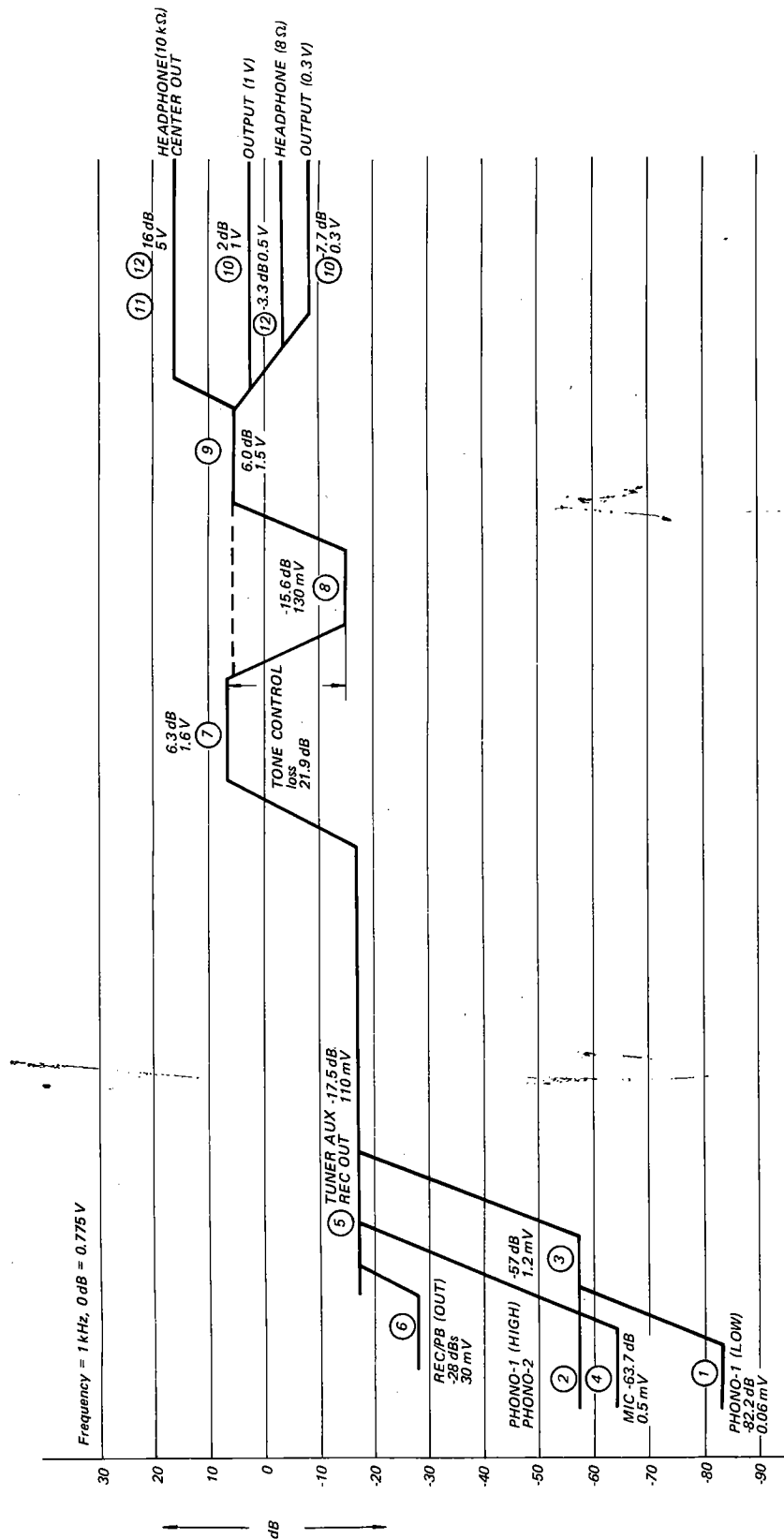
An increase in output voltage causes an increase in the impedance (decrease in conduction) of Q901 and Q902 (Q904 and Q905), and vice-versa. The dc output voltage supplied to the preamplifier section is therefore extremely stable.

1-3. BLOCK DIAGRAM



Note: ① . . . ⑫ signal levels as indicated in level diagram.

14. LEVEL DIAGRAM



SECTION 2

DISASSEMBLY AND REPLACEMENT PROCEDURES

WARNING

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

2-1. TOOLS REQUIRED

The following tools are required to perform disassembly and replacement procedures on the TA-2000F.

1. Screwdriver, Phillips-head
2. Screwdriver, 3 mm (1/8") blade
3. Pliers, long-nose
4. Diagonal cutters
5. Wrench, adjustable
6. Tweezers
7. Soldering iron, 40 to 50 watts
8. Soldering iron, solder-sucker tip
9. Solder, rosin core

2-2. HARDWARE IDENTIFICATION GUIDE

The following chart will help you to decipher the hardware codes given in this service manual.

Note: All screws in this set are manufactured to the specifications of the International Organization for Standardization (ISO). This means that the new and old screws are not interchangeable because ISO screws have a different number of threads per mm compared to the old ones. The ISO screws have an identification mark on their heads as shown in Fig. 2-1.

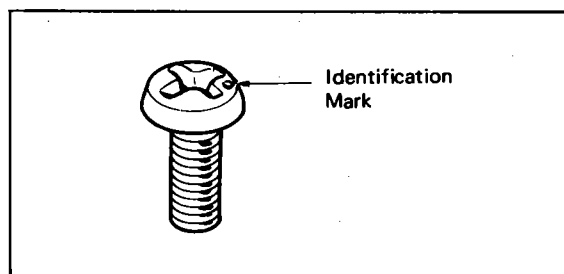
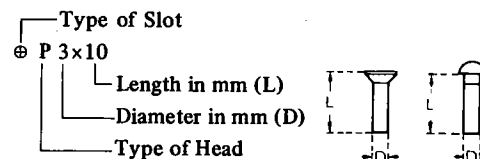


Fig. 2-1. ISO screw

Hardware Nomenclature

P	Pan Head Screw		
PS	Pan Head Screw with Spring Washer		
K	Flat Countersunk Head Screw		
B	Binding Head Screw		
RK	Oval Countersunk Head Screw		
T	Truss Head Screw		
R	Round Head Screw		
F	Flat Fillister Head Screw		
SC	Set Screw		
E	Retaining Ring (E Washer)		
	W - Washer		
	SW - Spring Washer		
	LW - Lock Washer		
	N - Nut		

Example



2-3. TOP COVER AND FRONT PANEL REMOVAL

1. Remove the two machine screws at each side of the case and lift off the top cover.
2. Remove all control knobs and levers. The knobs can be removed by loosening the slotted set screws and pulling the knobs straight out. The levers are simply pulled off.
3. Remove the four self-tapping screws ($\oplus$ B 3x6) securing the front subchassis's top cover and lift off it. See Fig. 2-2.
4. Remove the three screws ($\oplus$ PS 4x5) behind the top edge of the front subchassis as shown in Fig. 2-3.
5. Remove the three self-tapping screws ($\oplus$ B 3x6) at the front bottom of the chassis as shown in Fig. 2-4. This frees the front panel.

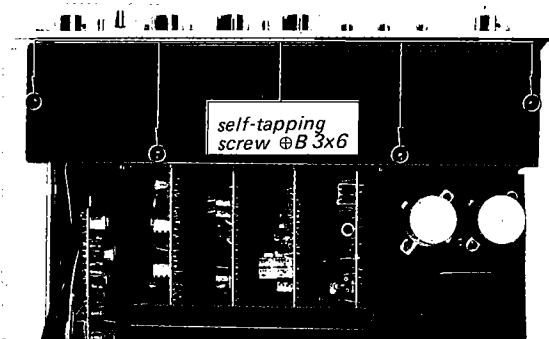


Fig. 2-2. Front subchassis's top cover removal

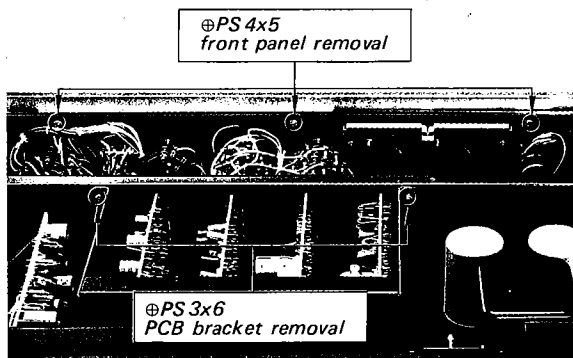


Fig. 2-3. Front panel and PCB bracket removal

2-4. FRONT SUBCHASSIS REMOVAL

The front subchassis is the vertical member on which the controls, switches, and the pilot lamps are attached.

1. Remove the top cover and front panel as described in Procedure 2-3.

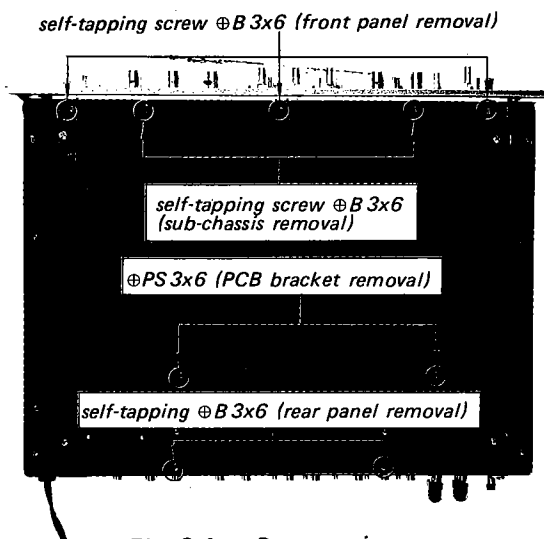


Fig. 2-4. Bottom view

2. Remove the two self-tapping screws (⊕ B 3x6) at each side of the chassis (see Fig. 2-5) and two self-tapping screws (⊕ B 3x6) at the front bottom of the chassis as shown in Fig. 2-4. This frees front subchassis.

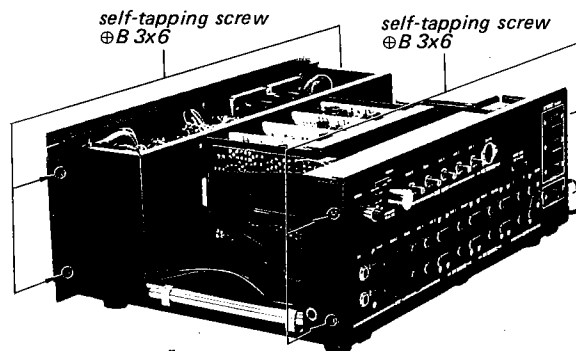


Fig. 2-5. Front-subchassis and rear panel removal

2-5. LEVEL METER AND METER LAMP REPLACEMENT

1. Remove the front subchassis as described in Procedure 2-4.
2. Remove the four screws (⊕ PS 3x6) securing the meter bracket to the front subchassis as shown in Fig. 2-6. This frees the meter bracket.
3. Remove the defective level meter or meter lamp by loosening the hex nut or prying out the defective lamp, and then install the new one.

2-6. PC BOARD REMOVAL

Prepare for removing or replacing any of the PC boards by removing the top cover as described in Procedure 2-3.

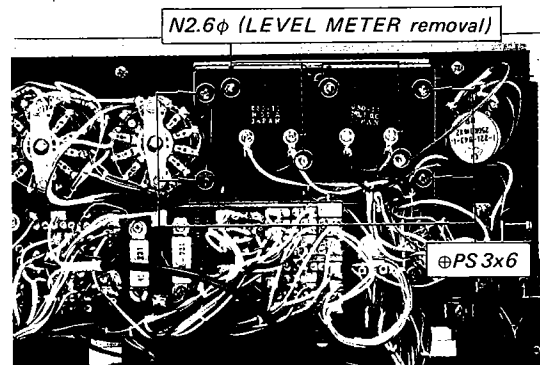


Fig. 2-6. Meter bracket removal

PHONO-1 Equalizer Amplifier/Head Amplifier Board

1. Remove the IMPEDANCE SELECTOR knob by loosening the set screw.
2. Remove the hex nut securing the IMPEDANCE SELECTOR switch to the rear panel.
3. Remove the three screws ($\oplus$ PS 3 $\times$ 6) securing the PCB bracket to the rear panel cover. This frees the PCB.

Plug-in Type PCB

1. Remove the two screws ($\oplus$ PS 3 $\times$ 6) securing the PCB bracket to the PCB mounting bracket as shown in Fig. 2-3.
2. Remove the two screws ($\oplus$ PS 3 $\times$ 6) securing the PCB mounting bracket to the chassis from the bottom as shown in Fig. 2-4. This frees the bracket, and now the PCB's can be simply pulled out.

REC OUT Buffer/High and Low Filter Component/Turnover Frequency Changeover Component Board

1. Remove the front subchassis as described in Procedure 2-4.
2. Remove the two screws ($\oplus$ PSW 3 $\times$ 6) securing the PCB to the front subchassis as shown in Fig. 2-7.

OUTPUT LEVEL Changeover Switch Board

1. Remove the rear panel as described in Procedure 2-7.
2. Remove the two screws ($\oplus$ B 2.6 $\times$ 4) securing the OUTPUT LEVEL changeover switch to the rear panel as shown in Fig. 2-8.

Note: This board is directly soldered to the OUTPUT LEVEL changeover switch.

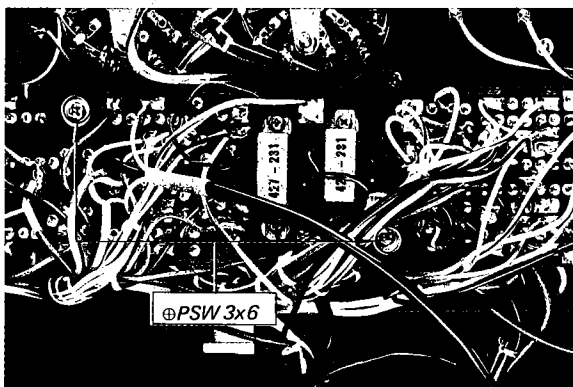


Fig. 2-7. PC board removal

2-7. REAR PANEL REMOVAL

1. Remove the PHONO-1 Equalizer Amplifier/Head Amplifier Board as described in Procedure 2-6.
2. Remove the two self-tapping screws ($\oplus$ B 3 $\times$ 6) at each side of the rear panel as shown in Fig. 2-5.
3. Remove the two self-tapping screws ($\oplus$ B 3 $\times$ 6) at rear edge of the bottom as shown in Fig. 2-4. This frees the rear panel.

2-8. CONTROL AND SWITCH REPLACEMENT

Prepare for replacing any of the controls or switches by removing the front panel and front subchassis or rear panel as described in Procedures 2-4 and 2-7.

POWER, FUNCTION-2, MONITOR, TURNOVER FREQ. and TONE CANCEL Switches

1. Remove the two screws securing switches to the front subchassis as shown in Fig. 2-9.
2. Unsolder the lead wires from the defective switch, and then install the replacement switch. Note that the PCB mounted at the back of the front subchassis should be removed when replacing the TURNOVER FREQ. or TONE CANCEL switch.

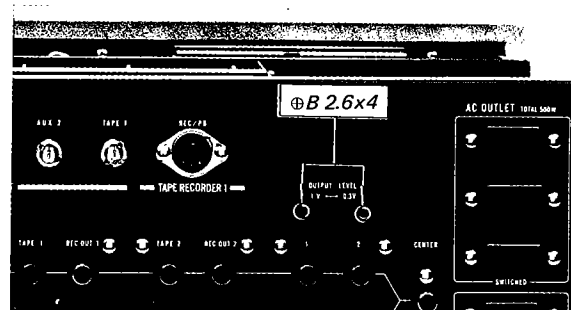


Fig. 2-8. Rear view

FUNCTION-1, MODE, FILTER, METER LEVEL Switches and VOLUME, HEADPHONE LEVEL, BALANCE, BASS, TREBLE and MIC LEVEL Controls

1. Remove the hex nut that secures the defective switch or control to the front subchassis as shown in Fig. 2-9.
2. Unsolder the lead wires from the defective switch or control and then install the new one.

HEADPHONE, AUX-3 jacks

1. Remove the two screws (⊕ PS 3x6) securing the jack escutcheon to the front subchassis.
2. Unsolder the lead wires from the defective jack, and then install the new one.

LEVEL ADJUST Controls and MIC Jack

1. Remove the ornamental nut securing the controls or jack to the rear panel. Use pliers covered with a soft cloth. Take care not to mar the rear panel.
2. Unsolder the lead wires from the defective control or jack, and then install the new one.

IMPEDANCE SELECTOR Switch

1. Remove the PHONO-1 Equalizer Amplifier/Head Amplifier Board as described in Procedure 2-6.

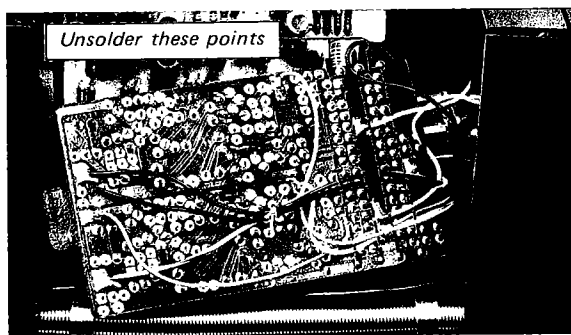


Fig. 2-10. IMPEDANCE selector switch removal

2. With a soldering-iron having a solder-sucking tip, clean the solder from each lug of the defective switch and the printed board as shown in Fig. 2-10. This frees the switch.
3. Install the replacement switch.

2-9. REPLACEMENT OF COMPONENTS SECURED TO THE REAR PANEL BY RIVETS

1. Remove the rear panel as described in Procedure 2-7.
2. Bore out the rivets using a drill bit slightly larger in diameter than the rivet. See Fig. 2-11.
3. Punch out the remainder of the rivet with a nail set or prick punch.
4. Remove the defective component, and then install a new one.
5. Secure the new component with a suitable screw and nut, or a repair rivet screw (part number 3-701-402).

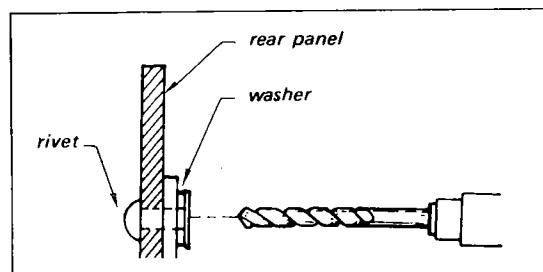


Fig. 2-11. Rivet replacement

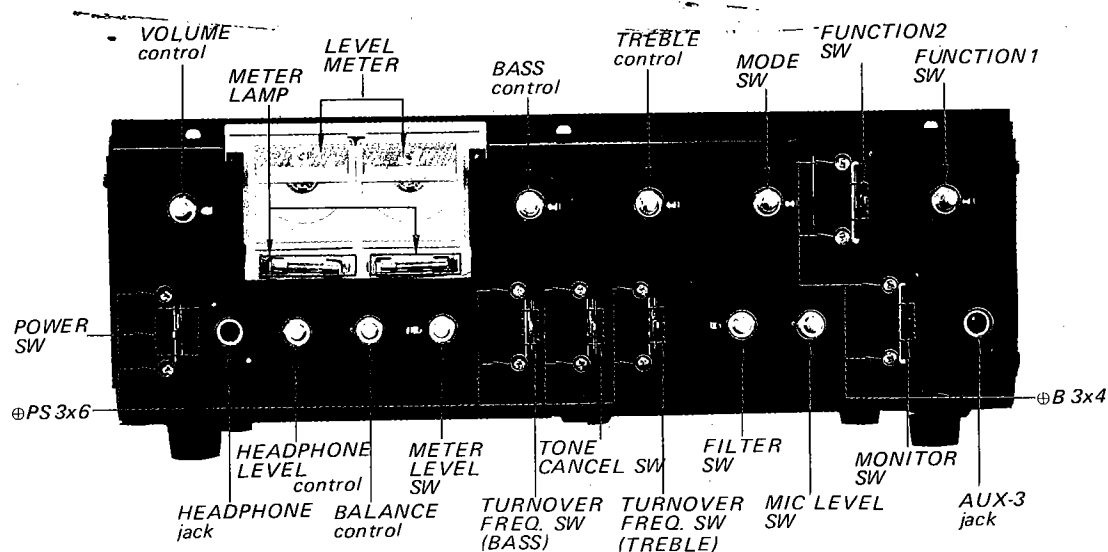
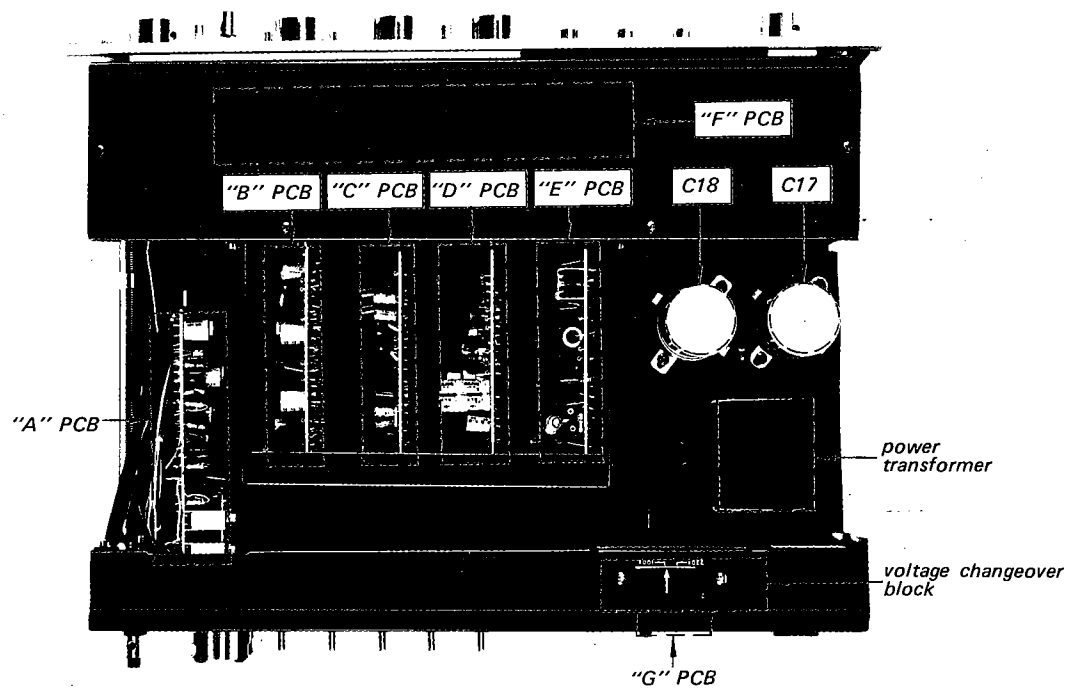


Fig. 2-9. Control and switch replacement

2-10. CHASSIS LAYOUT

**Note:**

- "A" PCB: PHONO-1 Equalizer Amplifier/Head Amplifier Circuit Board
- "B" PCB: MIC Amplifier/PHONO-2 Equalizer Amplifier Circuit Board
- "C" PCB: Flat Amplifier-1/Flat Amplifier-2 Circuit Board
- "D" PCB: Meter Amplifier/Headphone Amplifier Circuit Board
- "E" PCB: Muting/Power Supply Circuit Board
- "F" PCB: REC OUT Buffer/High and Low Filter Component/Turnover Frequency Changeover Component Circuit Board
- "G" PCB: OUTPUT LEVEL Changeover Switch Circuit Board

SECTION 3

ALIGNMENT AND ADJUSTMENT PROCEDURES

3-1. TEST EQUIPMENT REQUIRED

1. Audio Oscillator
Frequency range 10 Hz to 100 kHz
Distortion 0.03% or less at 1 kHz
2. Distortion Meter
Capable of measuring of 0.015% distortion or less at 1 kHz
Frequency range 20 Hz to 100 kHz
Input impedance 1 megohm or more
3. Ac VTVM
Capable of measuring rms voltage of 100 mV or less with a frequency range from 10 Hz to 100 kHz.
Input impedance 500k ohms or more
4. Attenuator
Capable of attenuating signals 60 dB or more.
Characteristic impedance 600 ohms unbalanced
5. Oscilloscope
Bandwidth 1 MHz or more
6. Dc Voltmeter
Capable of measuring dc voltage of 150 V and 50 V or less.
7. Resistors 600 ohm ($\frac{1}{4}$ W)
 3 ohm ($\frac{1}{4}$ W)

Note: 1. When measuring the sensitivity of the PHONO-1 LOW LEVEL input, insert a 46 dB pad (shown in Fig. 3-1.) between the attenuator and input terminal. The input sensitivity may be regarded as the reading on the attenuator plus the pad loss.
2. 0 dB = 0.775 V (r.m.s.)

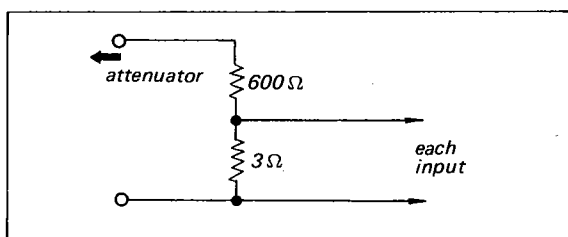


Fig. 3-1. 46 dB pad

3-2. POWER SUPPLY VOLTAGE ADJUSTMENT

Check the power supply voltages before starting any measurements and readjust them if necessary.

Preparation

1. Remove the top cover as described in Procedure 2-3 and connect the dc voltmeter to the test points as shown in Fig. 3-2.

Procedure

1. Set the variable transformer for minimum output.
2. Turn the POWER switch to ON, and then increase the line voltage up to the rated value.
3. Adjust semifixed resistor R920 (high-voltage regulator) and R926 (low-voltage regulator) to obtain 150 V and 37 V readings respectively on the meter.

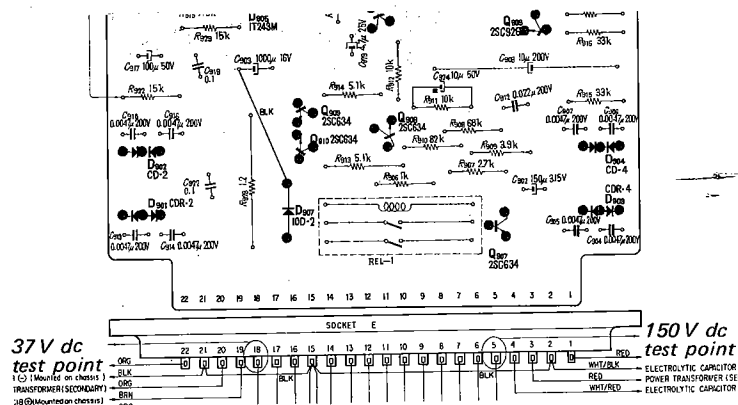


Fig. 3-2. Dc voltmeter connections

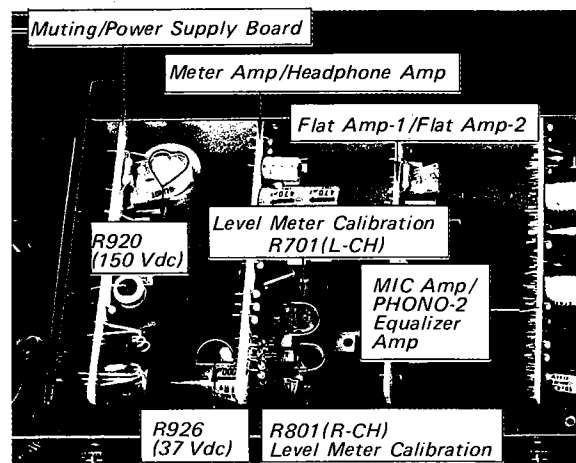


Fig. 3-3. Parts location

3-3. OVERALL CHECK PREPARATION

Unless otherwise specified, set all controls and switches as follows to prepare for the following checks:

VOLUME control maximum position
 MODE switch STEREO
 MONITOR switch SOURCE
 MIC LEVEL control MIXING OFF
 FILTER switch OFF
 TREBLE control 0 (dB)
 BASS control 0 (dB)
 TONE switch CANCEL
 TREBLE TURNOVER
 FREQ. switch 2.5 kHz
 BASS TURNOVER
 FREQ. switch 500 Hz
 METER LEVEL switch 0 (dB)
 HEADPHONE LEVEL
 control minimum level
 BALANCE control mid position
 LEVEL ADJUST control .. maximum level
 (rear panel)
 OUTPUT LEVEL switch ... 1V
 (rear panel)
 IMPEDANCE
 SELECTOR switch 47 k
 (rear panel)

- Set the BALANCE control to fully counter-clockwise (left-channel measurement) or fully clockwise (right-channel measurement) position.

Procedure – Perform this for each input

- With the equipment connected as shown in Fig. 3-4, feed a 1 kHz signal to the input jack. Adjust the attenuator to obtain a 1 volt reading on the ac VTVM. Note that the audio oscillator's output should always be kept at 0.775 volts (0 dB).
- The reading of the attenuator represents the input sensitivity and should within the limits given in Table 3-1.

TABLE 3-1. INPUT SENSITIVITY

INPUTS	SPECIFIED SENSITIVITY AT 1 kHz
PHONO-1 (HIGH LEVEL) *(LOW LEVEL)	-57 ±1 dB -82.2 ±1.5 dB
PHONO-2	-57 ±1 dB
MIC	-63.7 ±1.5 dB
TUNER, AUX-1, -2, -3	-17.5 ±0.5 dB

* The PHONO-1 IMPEDANCE SELECTOR switch should be set to 30 Ω and an additional attenuator pad (See Fig. 3-1.) used between the main attenuator and input jack.

3-4. SENSITIVITY MEASUREMENT

Preparation

- Set all the controls as described in Procedure 3-3.
- Set the FUNCTION-1, IMPEDANCE SELECTOR, and FUNCTION-2 switches to the position where the measurement should be performed.

3-5. LEVEL METER (VU meter) CALIBRATION

Preparation

- Set the FUNCTION-2 switch to TUNER.
- Set the BALANCE control fully counterclockwise (left-channel calibration) or fully clockwise (right-channel calibration).
- Set the METER LEVEL switch to 0 dB.

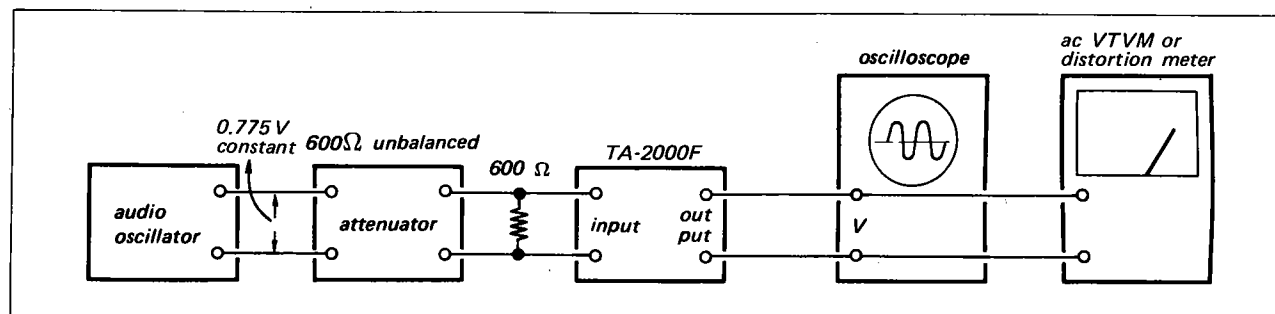


Fig. 3-4. Level check test setup

Procedure

1. With the equipment connected as shown in Fig. 3-4, feed a 1 kHz to the TUNER input jack. Adjust the attenuator to obtain a 1 volt reading on the ac VTVM.
2. Turn the semifixed resistor R701 (R801), see Fig. 3-3, mounted on the Meter Amplifier/Headphone Amplifier board to obtain a 0 reading on the level meter.
3. Decrease the input signal level 10 dB (20 dB), and then set the METER LEVEL switch to -10 dB (-20 dB) position.
4. Confirm that the reading on the level meter is 0 ± 0.5 VU.
5. Confirm that the reading of the meter changes with variations in attenuator settings.

3-6. RATED OUTPUT MEASUREMENT

Preparation

1. Set the FUNCTION-2 switch to TUNER.
2. Set the BALANCE control fully counterclockwise (left-channel calibration) or fully clockwise (right-channel calibration).
3. Set the OUTPUT LEVEL switch to 1V.
4. Set the HEADPHONE LEVEL control to maximum level position.

Procedure

1. With the equipment connected as shown in Fig. 3-4, feed a 1 kHz to the TUNER input jack. Adjust the attenuator to obtain a 1 volt reading on the ac VTVM.
2. Each output level should be within the limits given in Table 3-2.

TABLE 3-2. OUTPUT LEVEL

Outputs	Output Level
CENTER OUTPUT	16.0 ± 1 dB
HEADPHONE OUT (open)	16.0 ± 1 dB
REC OUT	-17.5 ± 1 dB
REC/PB OUT 1 or 4 to ground see Fig. 3-5.	-32 ± 3 dB

3-7. HARMONIC-DISTORTION MEASUREMENT

Preparation

Same as described in Procedure 3-3, except the TONE switch should be set to ON.

Procedure

1. With the equipment connected as shown in Fig. 3-4, feed in the signal specified in Table 3-3 and then adjust the VOLUME control to obtain a 1 volt (r.m.s.) output.
2. Measure the harmonic distortion. The harmonic distortion should be within the limits given in Table 3-3.

TABLE 3-3. HARMONIC DISTORTION

Inputs	Input Signal Level and Freq.	Harmonic Distortion
PHONO-1 (HIGH LEVEL) or PHONO-2	-18 dB, 1 kHz -8 dB, 1 kHz	0.05% or less 0.1% or less (at 3 volts output)
*MIC	3 dB, 1 kHz	0.7% or less (at 3 volts output)
TUNER, AUX-1, 2, 3	-17.5 ± 0.5 dB, 1 kHz	0.03% or less

*Note: In this measurement, adjust the output level by means of the MIC LEVEL control.

3-8. FREQUENCY RESPONSE MEASUREMENT

Preparation

Same as Procedure 3-4.

Procedure — Perform this for each input.

1. With the equipment connected as shown in Fig. 3-4, feed a 1 kHz signal to the input jack. Vary the attenuator to obtain a 1 volt reading on the ac VTVM.
2. Check the frequency response by varying the input signal frequency while keeping the oscillator's output constant. Frequency response should be within the limits as given in Table 3-4.

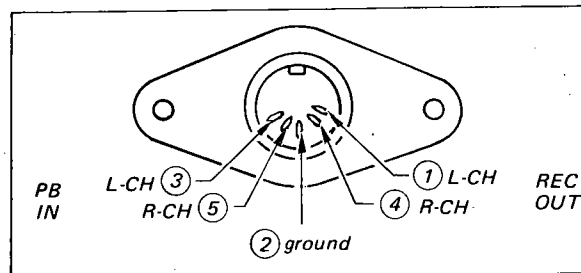


Fig. 3-5. REC/PB (DIN) connector

TABLE 3-4. FREQUENCY RESPONSE

Inputs	*Specified Frequency Response
TUNER	$\pm \frac{0}{2}$ dB at 10 Hz $\pm \frac{0}{2}$ dB at 100 kHz
PHONO-1 (HIGH LEVEL) (47k) or (LOW LEVEL) (30 ohm)	13.1 $\pm$ 0.5 dB at 100 Hz -13.7 $\pm$ 0.5 dB at 10 kHz
MIC (MIC LEVEL control: maximum)	$\pm \frac{0}{2}$ dB at 30 Hz $\pm \frac{0}{2}$ dB at 30 kHz
TUNER	CENTER OUTPUT $\pm \frac{0}{2}$ dB at 20 Hz $\pm \frac{0}{2}$ dB at 20 kHz

* referred to 1 kHz 1 volt output

3-9. NOISE LEVEL MEASUREMENT

Preparation

1. Same as described in Procedure 3-3 except set the FILTER switch to LOW and the TONE switch to ON.
2. Turn the VOLUME control fully clockwise.

Procedure

1. With the equipment connected as shown in Fig. 3-6, measure the output noise level at each FUNCTION switch position, with the corresponding input terminals shorted.

TABLE 3-5. NOISE LEVEL SPECIFICATIONS

Inputs	Noise Level
TUNER	-70 dB or less
PHONO-1 (HIGH LEVEL) (47k ohm)	-57 dB or less
PHONO-1 (LOW LEVEL) (30 ohm)	-40 dB or less
PHONO-2	-57 dB or less
MIC	-35 dB or less

Note: The difference between left and right channel noise levels should be 4 dB or less. The average noise levels are given in Table 3-5.

3-10. TONE CONTROL CHECK

Preparation

1. Set all controls as described in Procedure 3-3, except set the TONE switch to ON.
2. Set the FUNCTION-2 switch to TUNER.

Procedure

1. With the equipment connected as shown in Fig. 3-4, feed a 1 kHz signal to the TUNER input jack. Vary the attenuator to obtain a 1 volt reading on the ac VTVM.
2. Check the frequency response by varying the BASS, TREBLE controls and the input signal frequency while keeping the oscillator's output constant. TONE control response should be as given in Table 3-6.

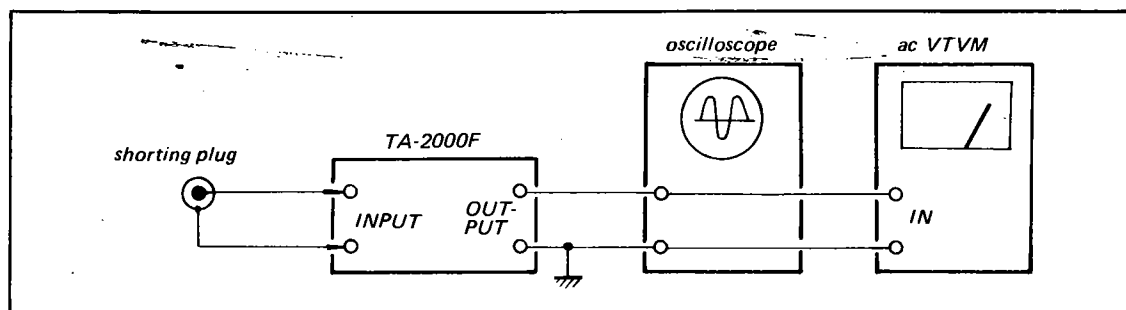


Fig. 3-6. Noise level check test setup

TABLE 3-6. TONE CONTROL CHECK

Inputs	Controls	Specified Frequency Response
TUNER	BASS (Turnover Freq. 500 Hz)	± 10 dB* maximum, 2 dB step at 100 Hz
	TREBLE (Turnover Freq. 2.5 kHz)	± 10 dB* maximum, 2 dB step at 10 kHz
Same as above	BASS (Turnover Freq. 250 Hz)	± 10 dB* maximum, 2 dB step at 50 Hz
	TREBLE (Turnover Freq. 5 kHz)	± 10 dB* maximum, 2 dB step at 20 kHz

* referred to 1 volt at 1 kHz.

3-11. FILTER RESPONSE CHECK

Preparation

1. Set all controls as described in Procedure 3-3.
2. Set the FUNCTION-2 switch to TUNER.

Procedure

1. With the equipment connected as shown in Fig. 3-3, feed a 1 kHz signal to the TUNER input jack. Vary the attenuator to obtain a 1 volt reading on the ac VTVM.
2. Check the frequency response by operating the FILTER switch and varying the input signal frequency. Keep the oscillator's output constant. Filter response should be within the limits given in Table 3-7.

TABLE 3-7. FILTER RESPONSE CHECK

FILTER SW Position	Specified Frequency Response
LOW or BOTH	* -3 ± 1.5 dB at 50 Hz
HIGH or BOTH	* -3 ± 1 dB at 9 kHz

* referred to 1 kHz 1 volt output.

3-12. CROSSTALK MEASUREMENT

Preparation

1. Set all the controls as described in Procedure 3-3, except set the TONE switch to ON position.
2. Set the FUNCTION-2 switch to TUNER.

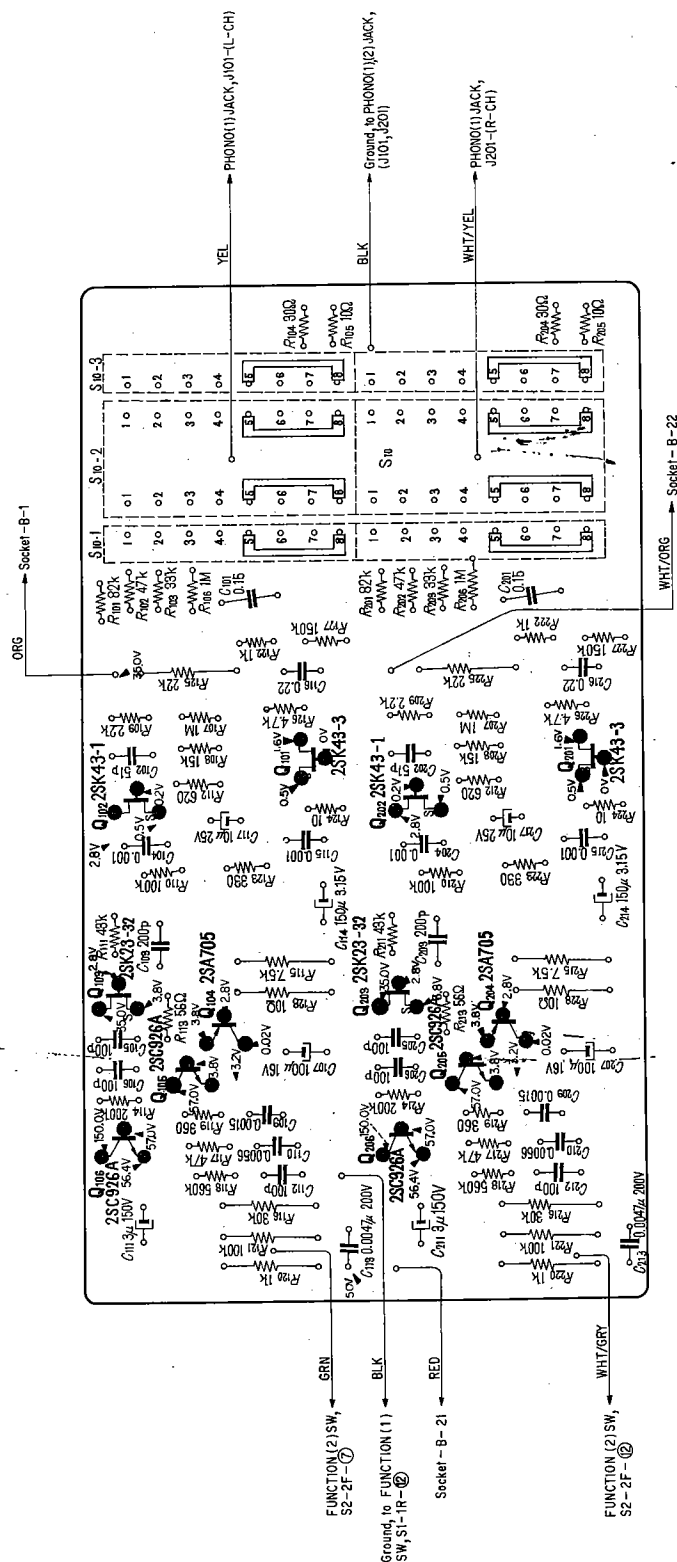
Procedure

1. With equipment connected as shown in Fig. 3-3, feed a 1 kHz signal to the TUNER input jack (left channel). Vary the attenuator to obtain a 1 volt reading on the ac VTVM.
2. Switch the signal to the right-channel input jack while shorting the left-channel input.
3. Read the residual signal level in the left-channel output. The 1 volt output-level to residual-level ratio represents the channel crosstalk. The left-to-right and right-to-left crosstalk should be 60 dB or more.

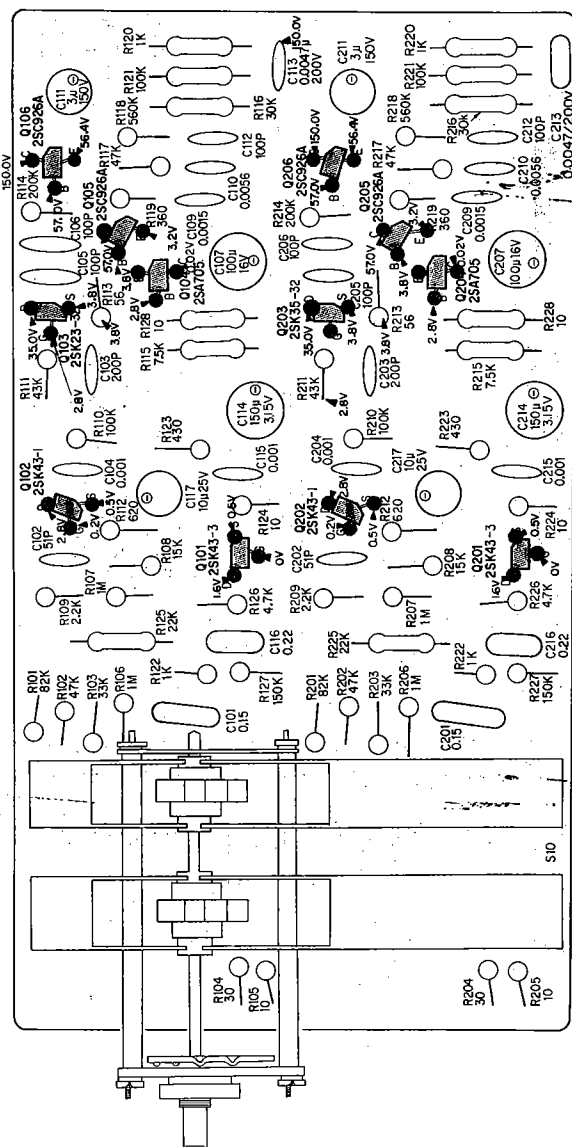
MEMO

SECTIONS 4 DIAGRAMS

4-1. MOUNTING DIAGRAM – "A" PCB: PHONO-1 Equalizer Amplifier/Head Amplifier Board – Conductor Side –

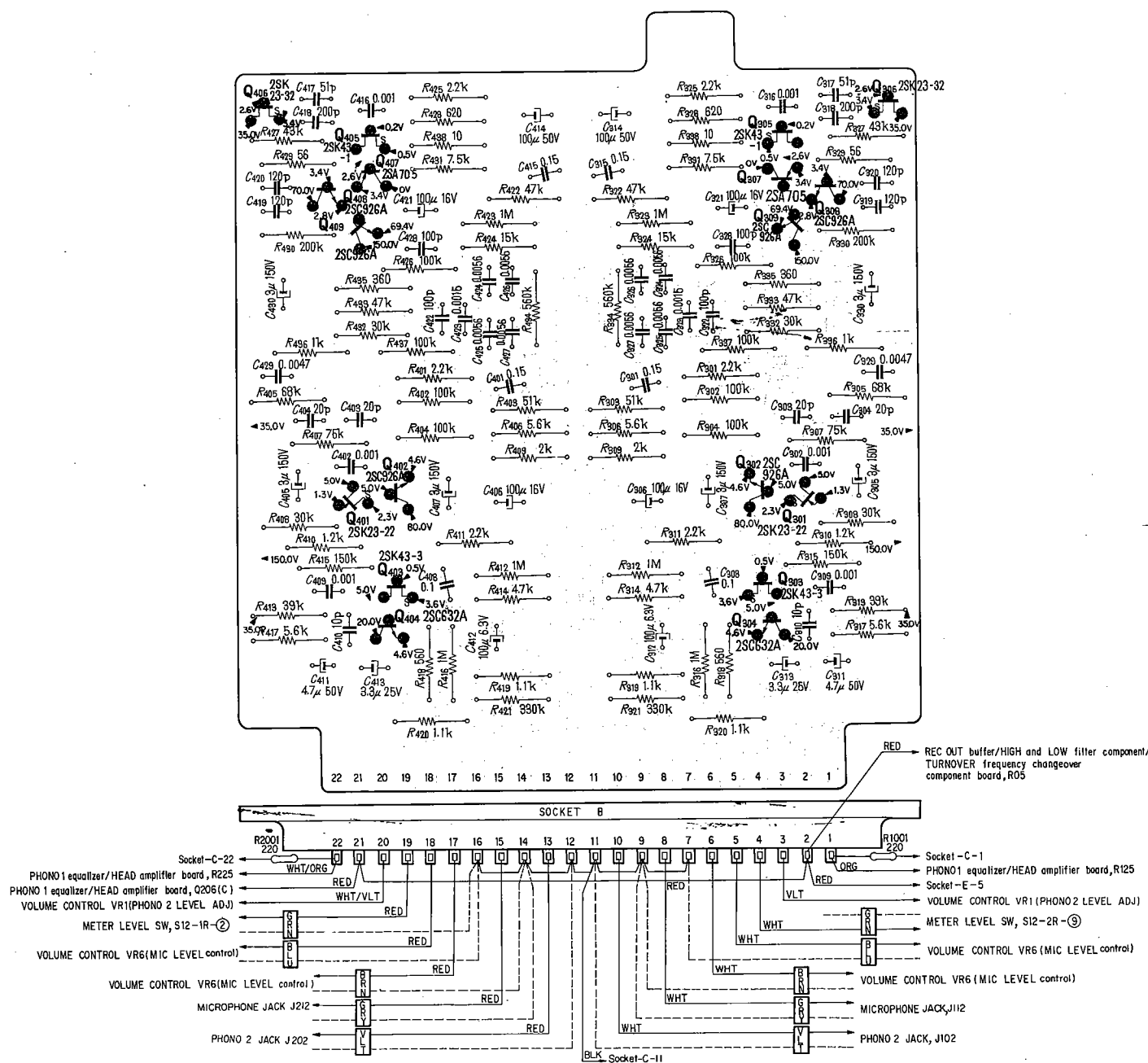


- Component Side -

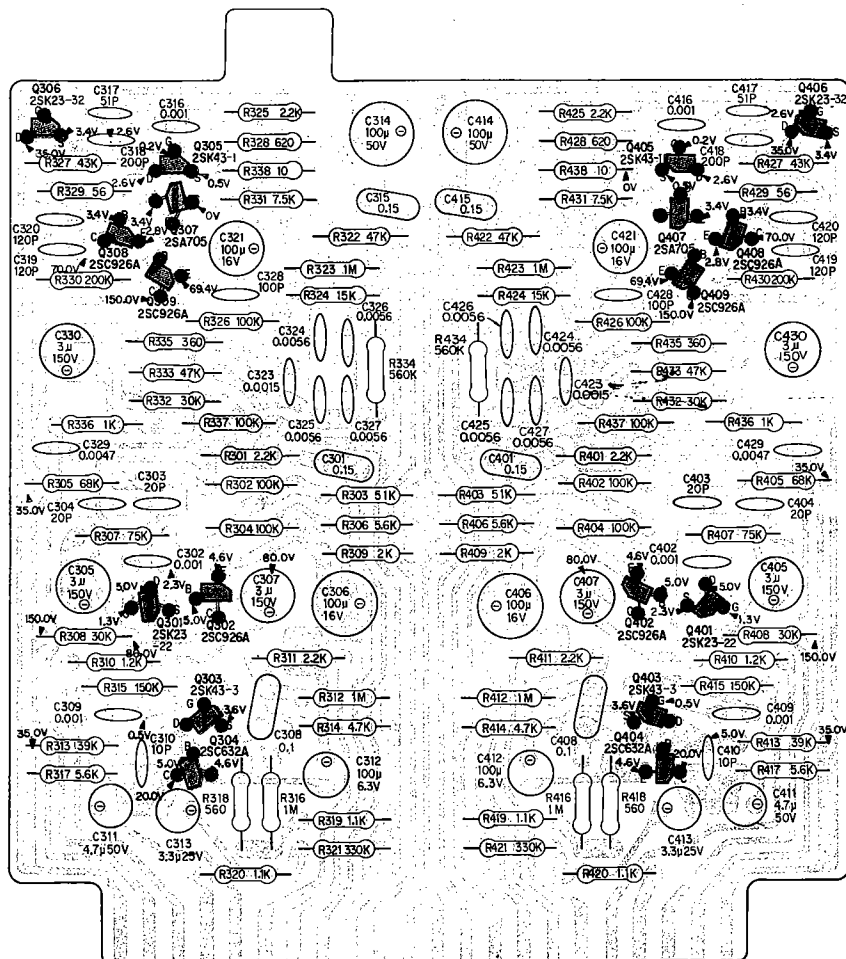


4-2. MOUNTING DIAGRAM – "B" PCB: MIC Amplifier/PHONO-2 Equalizer Amplifier Board

– Conductor Side –



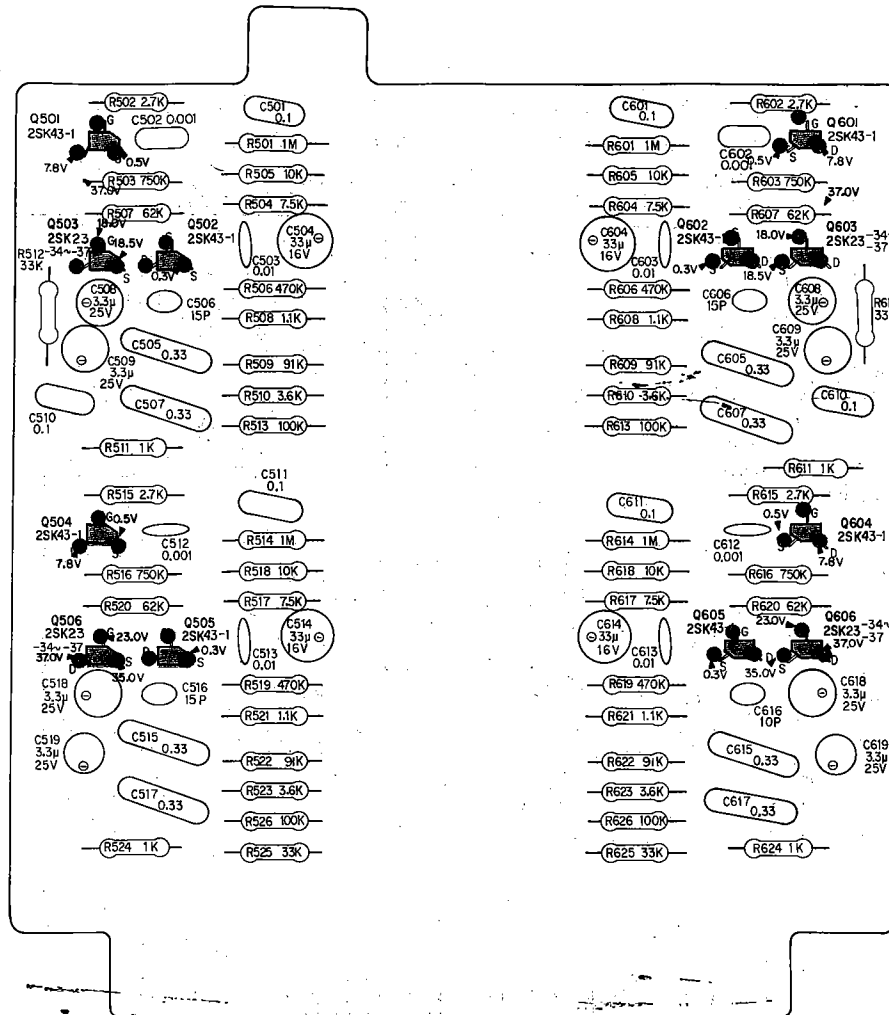
- Component Side -



4-3. MOUNTING DIAGRAM — "C" PCB: Flat Amplifier-1/Flat Amplifier-2 Board — Conductor Side —

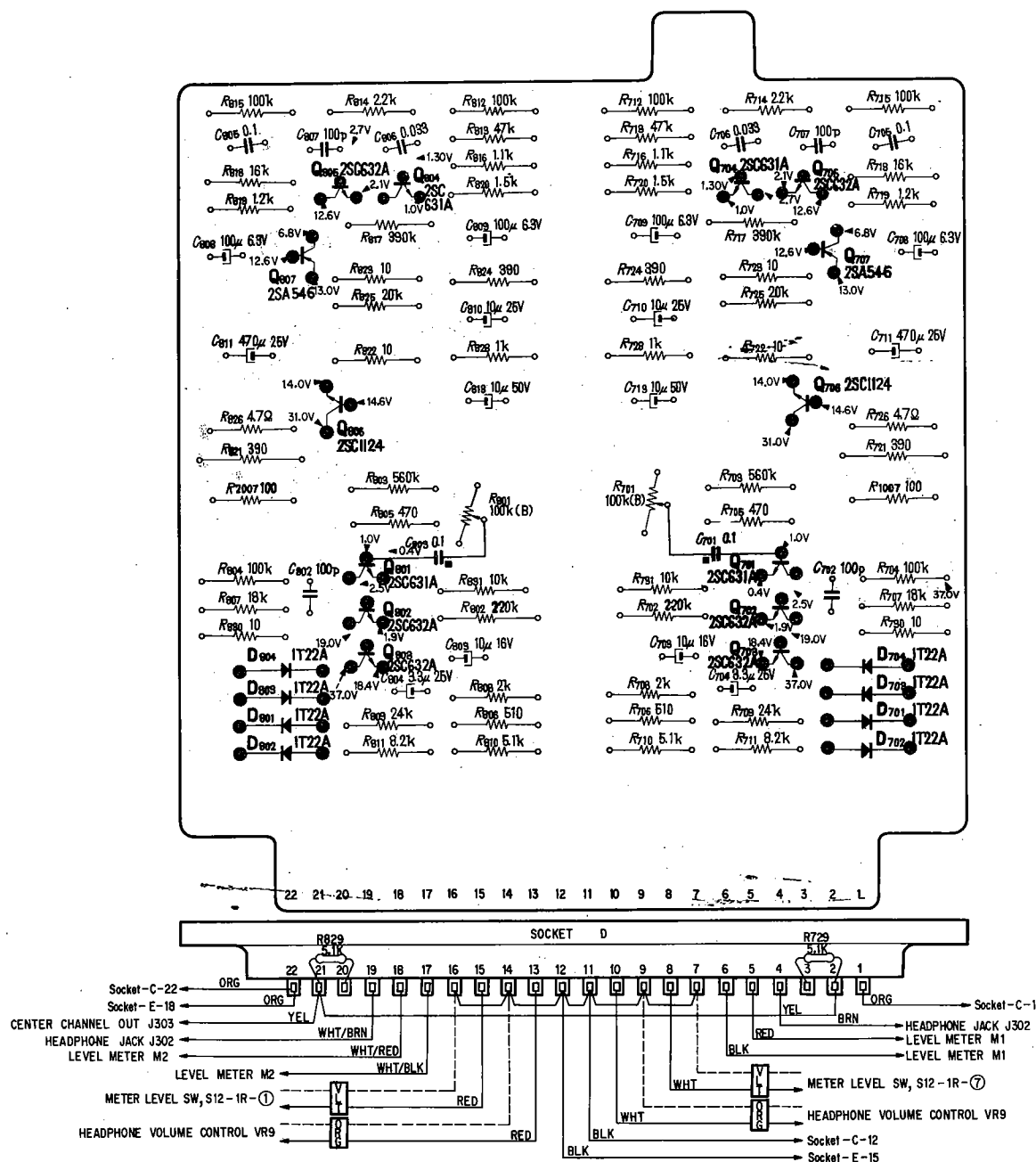


— Component Side —

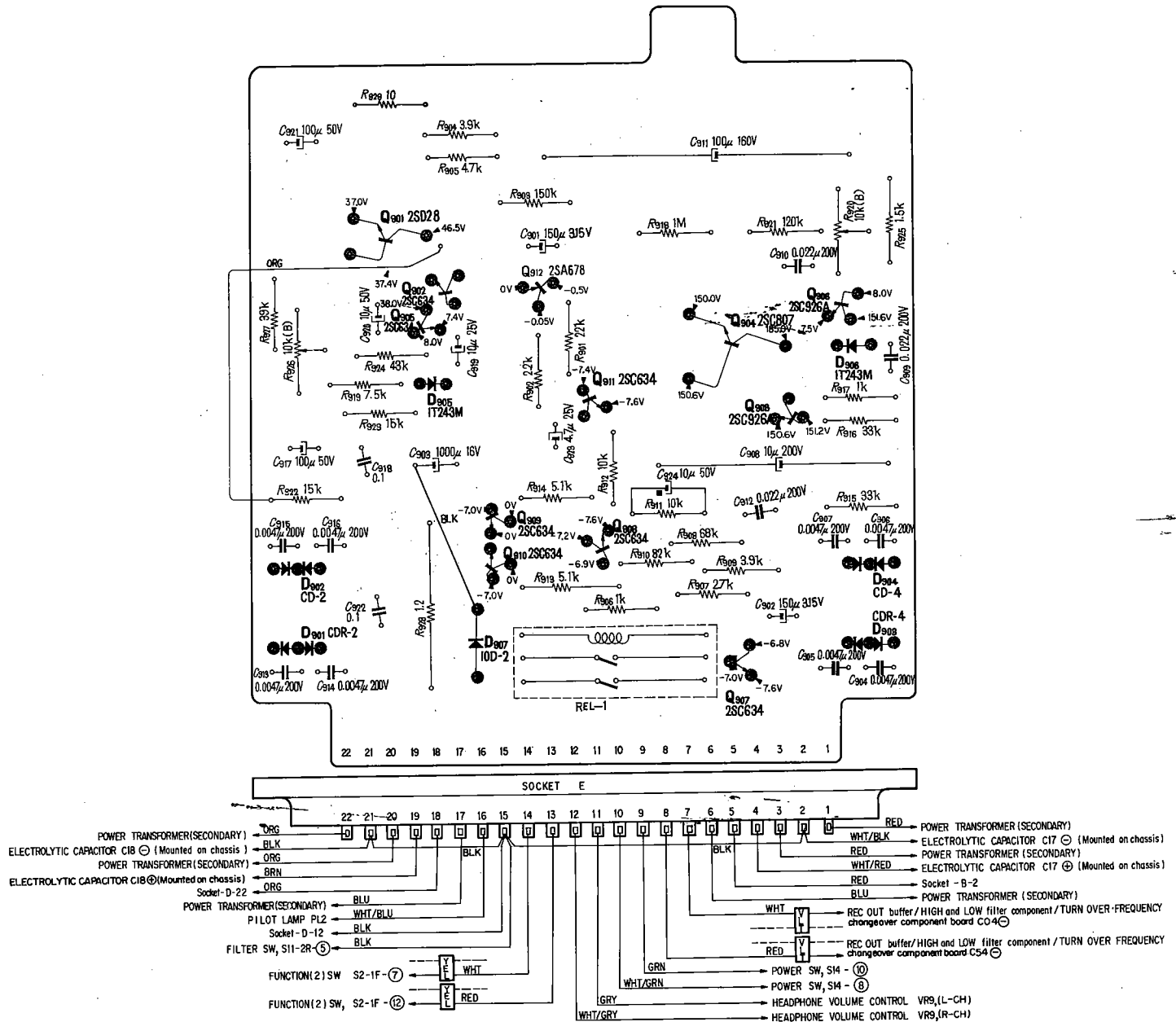


4.4. MOUNTING DIAGRAM – “D” PCB: Meter Amplifier/Headphone Amplifier Board

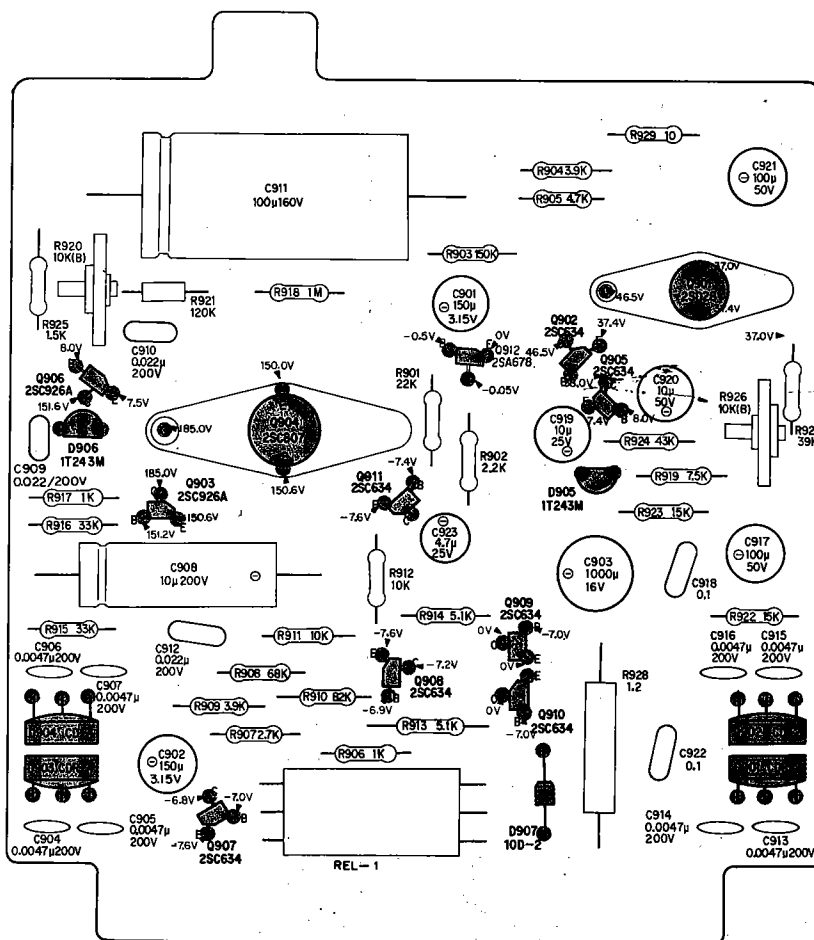
– Conductor Side –



4-5. MOUNTING DIAGRAM – "E" PCB: Muting/Power Supply Board – Conductor Side –

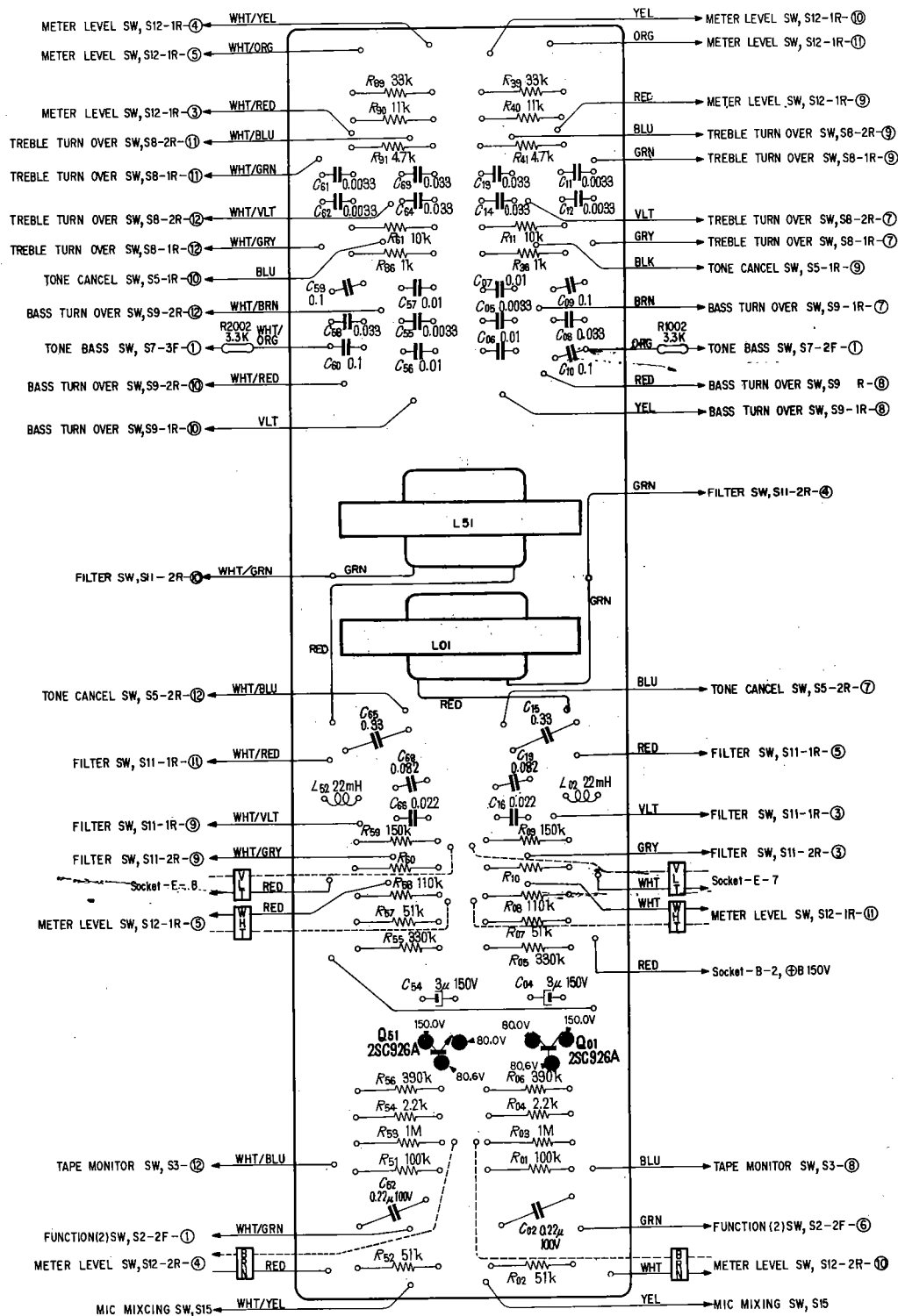


— Component Side —

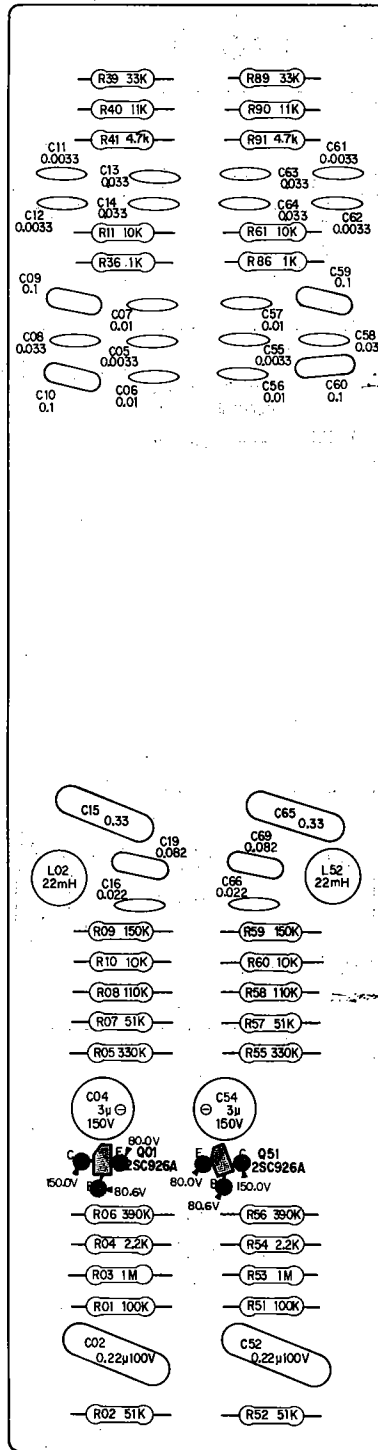


4-6. MOUNTING DIAGRAM — "F" PCB: REC OUT Amplifier/High and Low Filter Component/Turnover Frequency Changeover Component Board

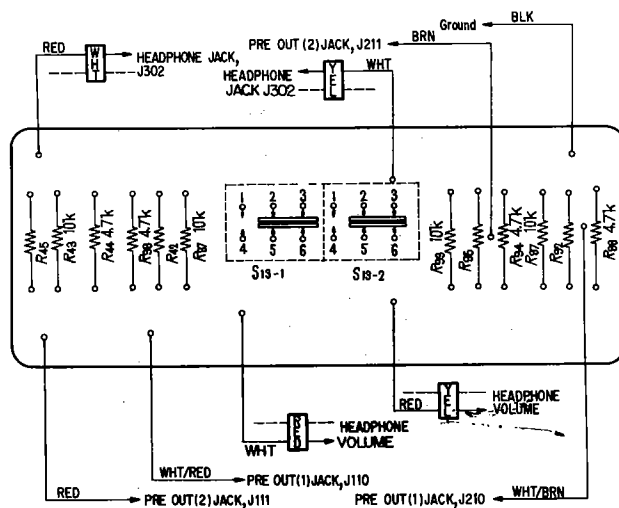
– Conductor Side –



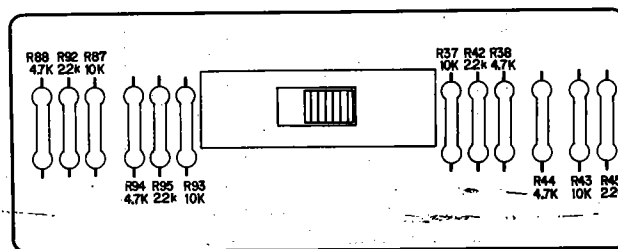
— Component Side —



4-7. MOUNTING DIAGRAM – "G" PCB: OUTPUT LEVEL Changeover Switch Board
– Conductor Side –



– Component Side –

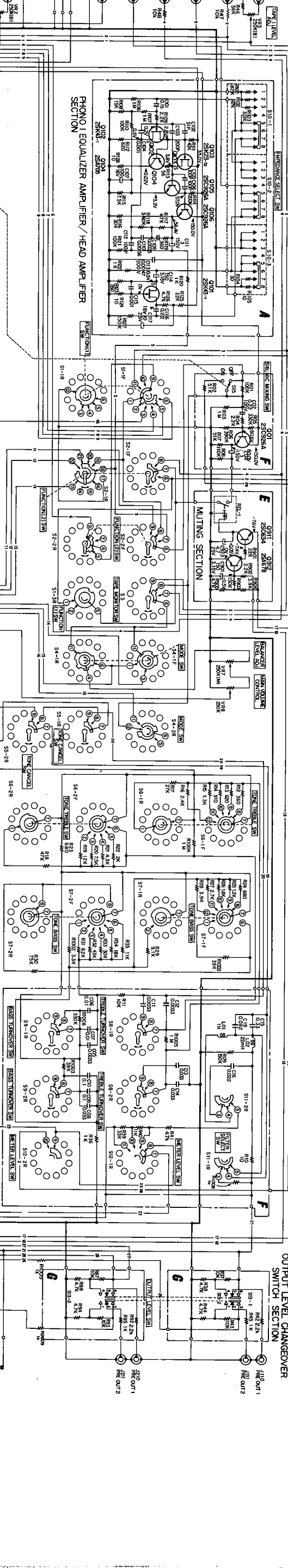


SCHEMATIC DIAGRAM

REC OUT BUFFER SECTION

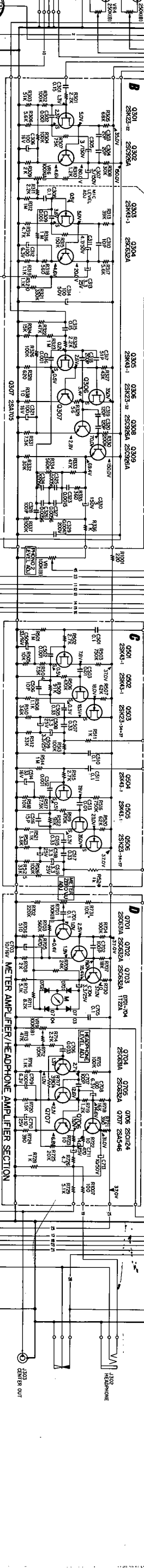
HIGH AND LOW FILTER COMPONENT/
TURNOVER FREQUENCY CHANGEOVER SECTION

OUTPUT LEVEL CHANGEOVER
SWITCH SECTION

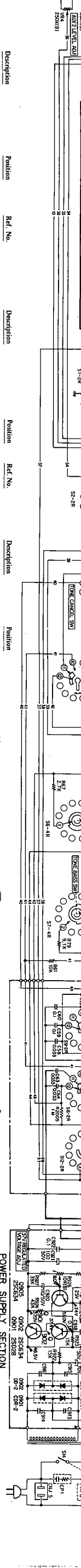
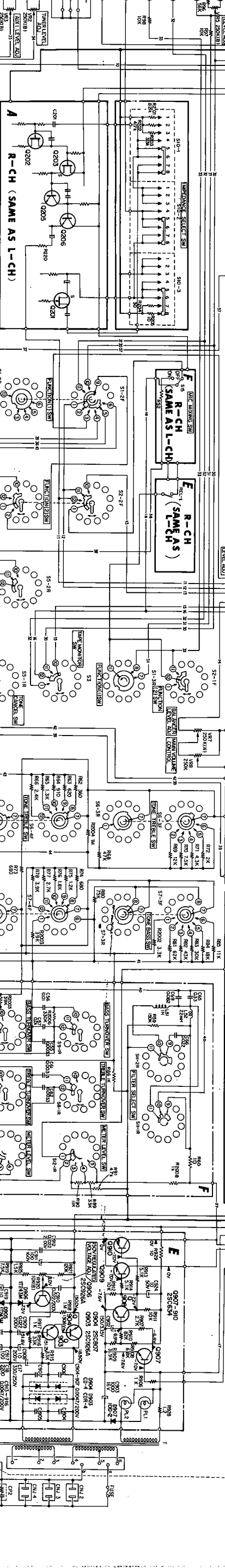
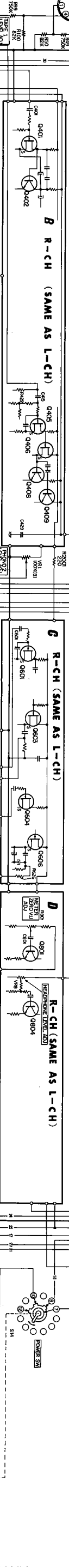


PHONO 1 EQUALIZER AMPLIFIER / HEAD AMPLIFIER
SECTION

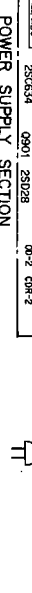
MIC AMPLIFIER / PHONO 2 EQUALIZER AMPLIFIER SECTION



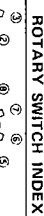
FLAT AMPLIFIER 1 / FLAT AMPLIFIER 2 SECTION



POWER SUPPLY SECTION



ROTARY SWITCH INDEX



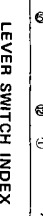
LEVER SWITCH INDEX



MODE SW



CHECK "L" - CHECK "R" - REVERSE



STEREO - L-R - LEFT - RIGHT



TONE ON - CANCEL SW



TONE ON - CANCEL SW



Note:

All resistance values are in ohms.
k = 1,000. M = 1,000k.
All capacitance values are in μ F
except as indicated with p,
which means pF.
All voltages represent an average
value and should hold within
 $\pm 20\%$.

All voltages are dc measured
with a VOM which has an input
impedance of 20k ohms/volt.
No signal in.

TA-2000F

TA-2000F

TA-2000F

TA-2000F

TA-2000F

TA-2000F

SECTION 5 REPACKING

he TA-2000F's original shipping carton and g materials are the ideal container for shipping it. However to secure the maximum protec-

tion, the TA-2000F must be repacked in these materials precisely as before. The proper repacking procedures are shown in Fig. 5-1.

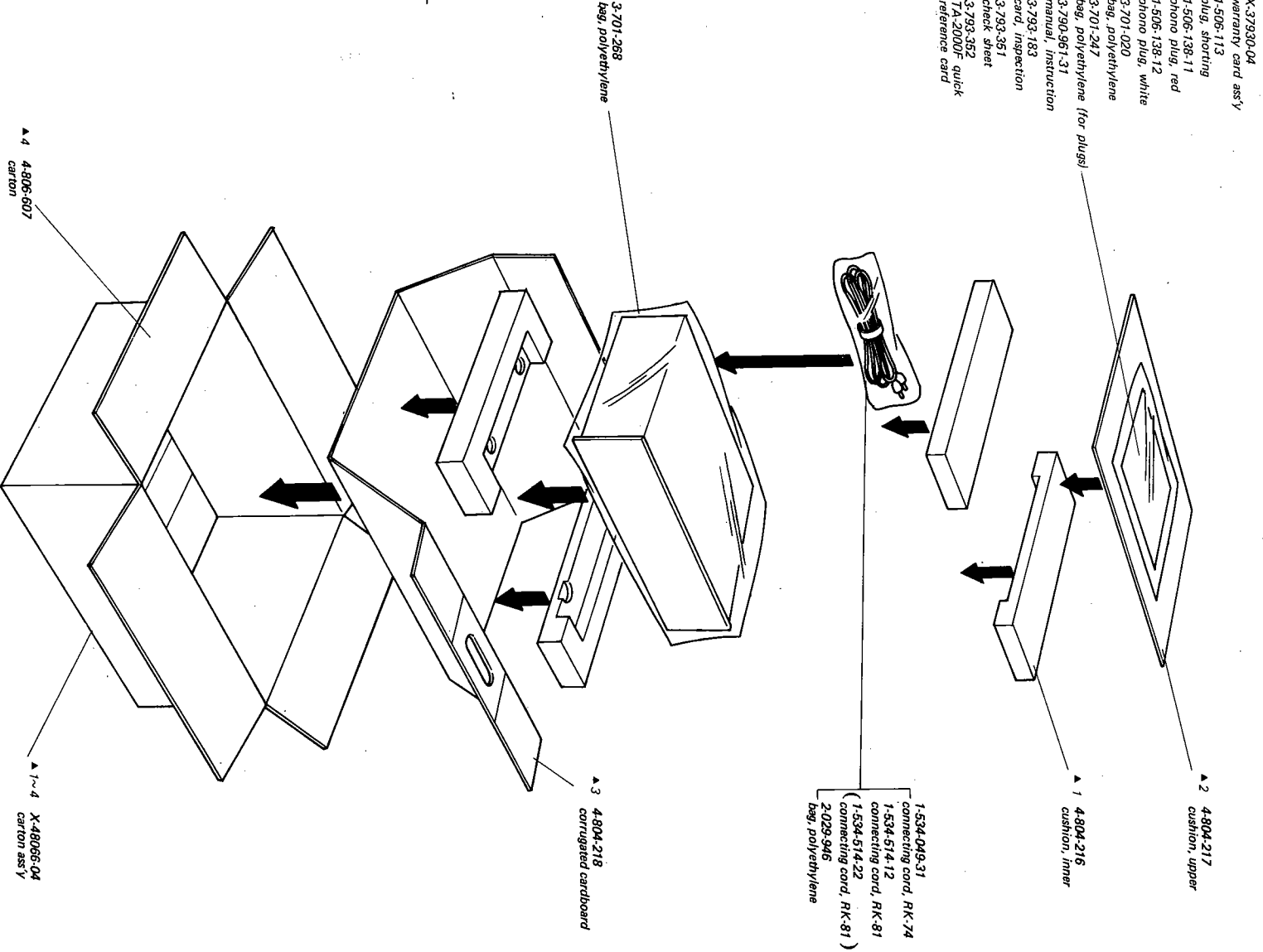
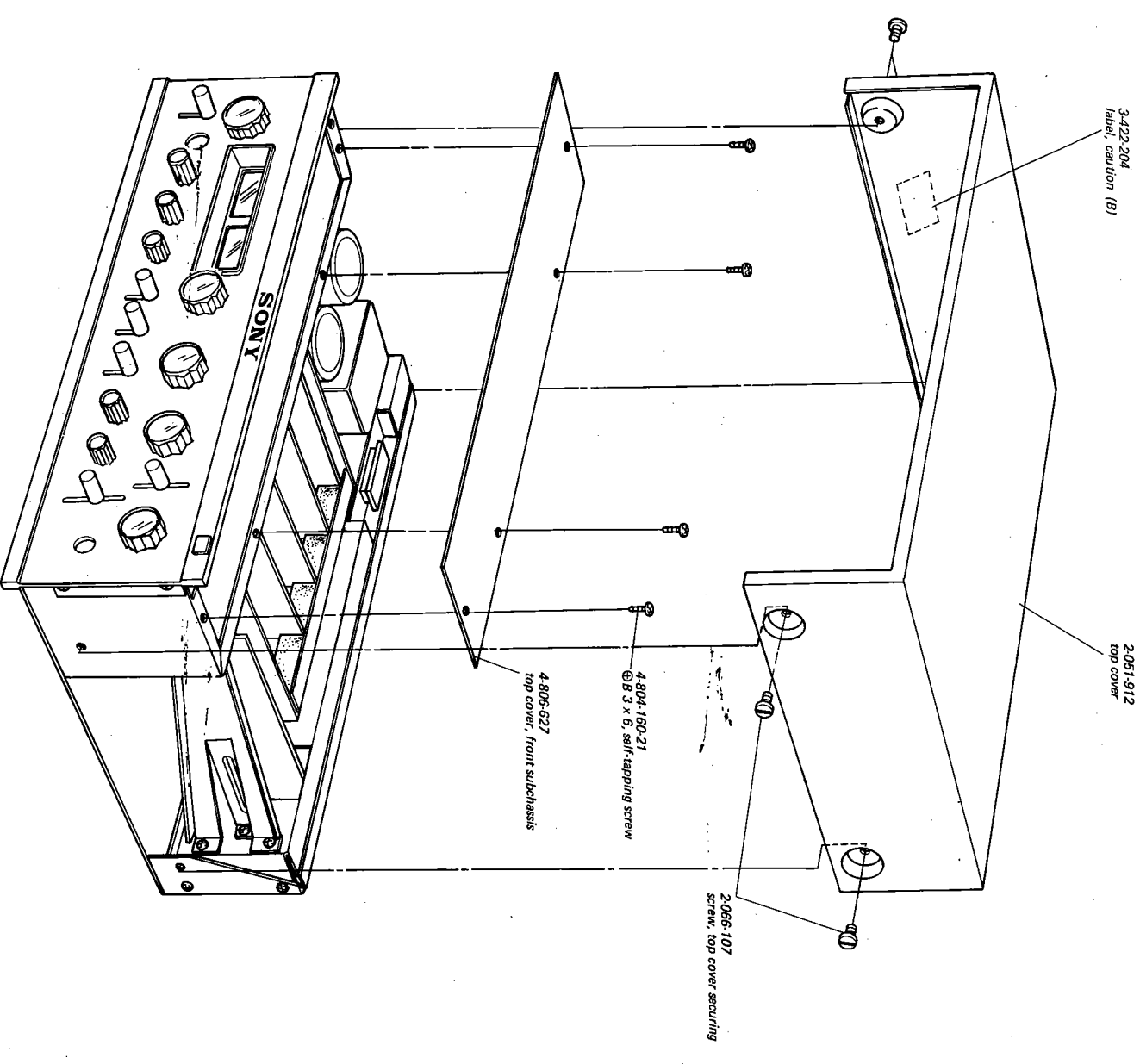
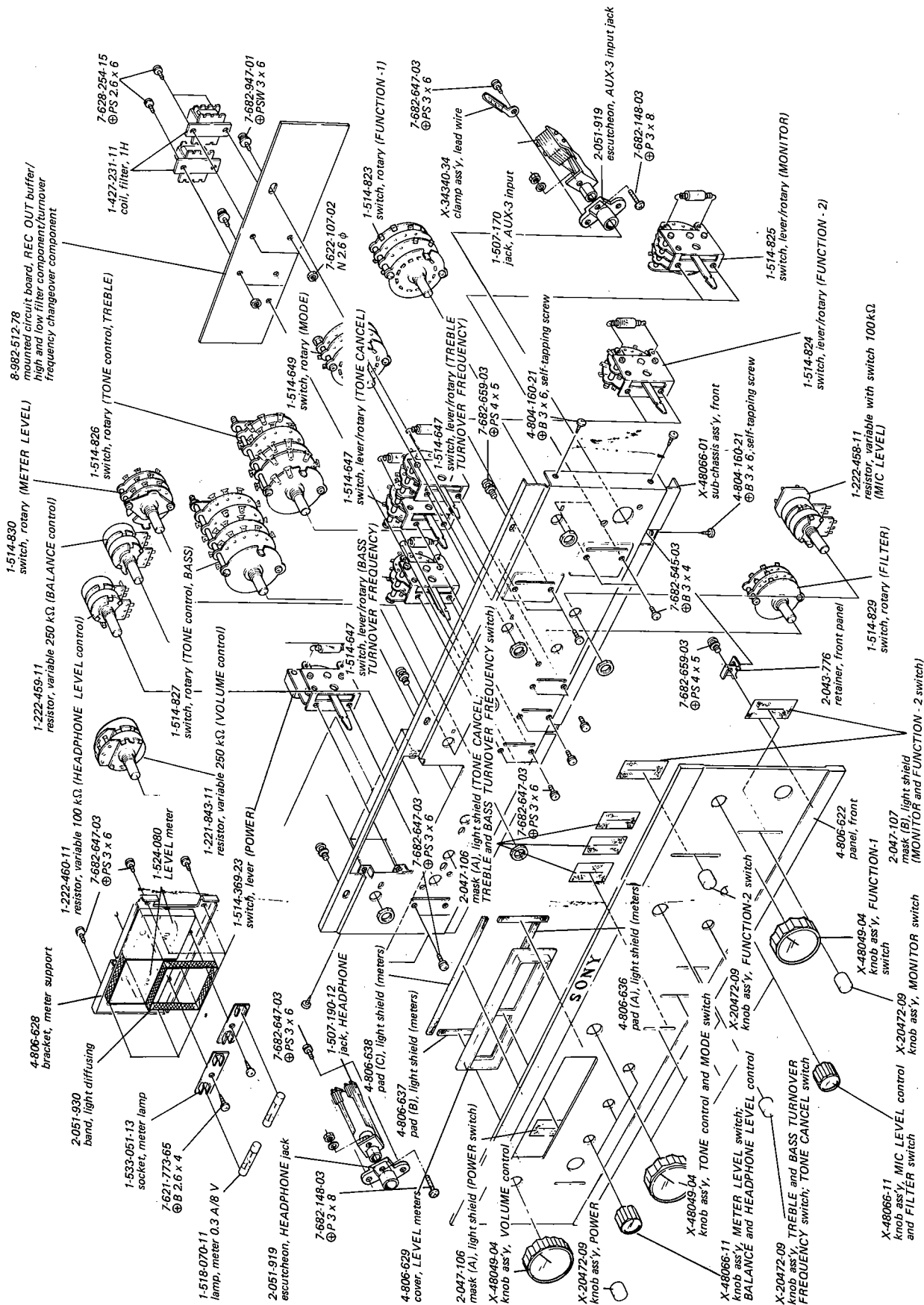


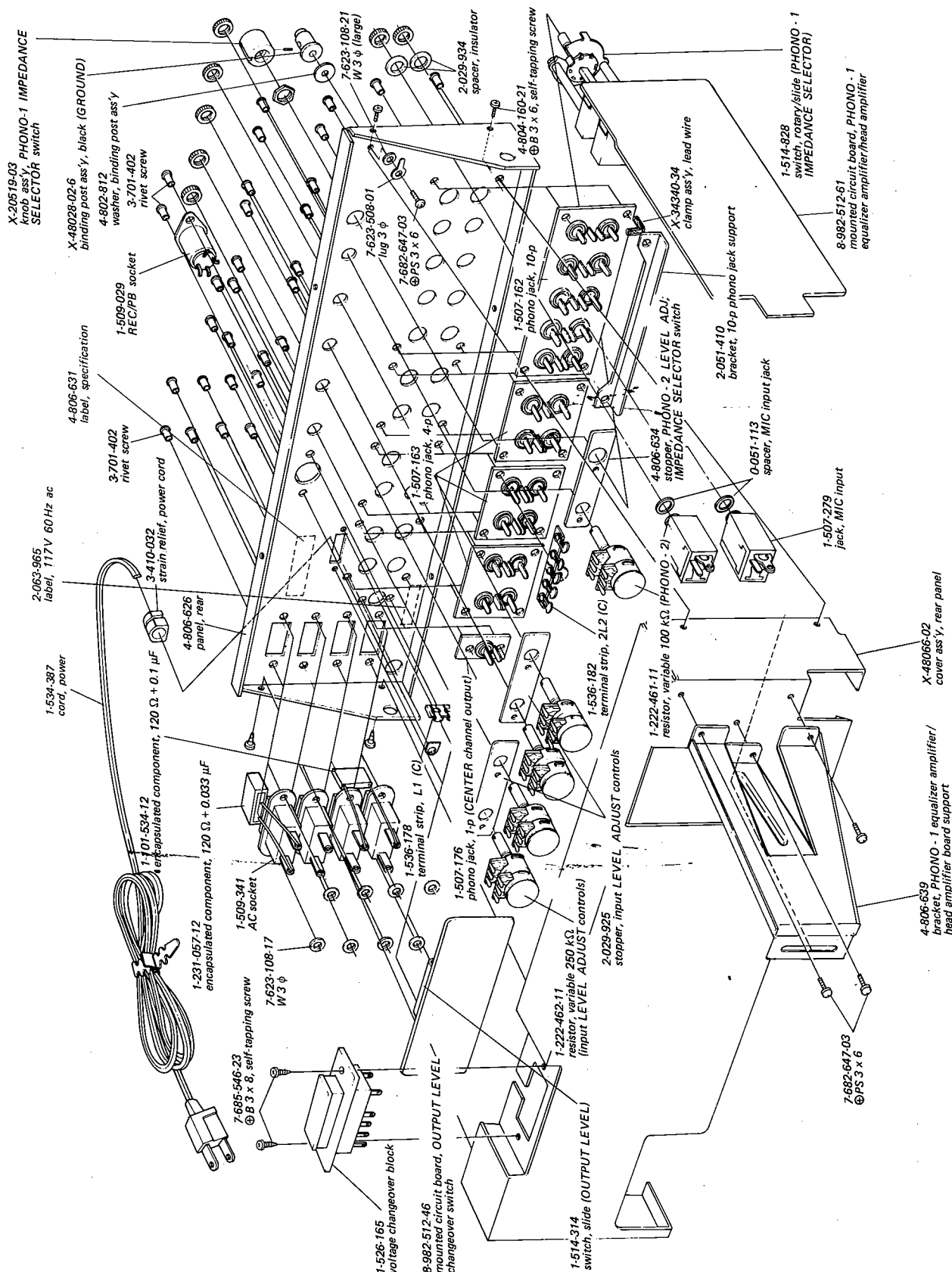
Fig. 5-1. Repacking

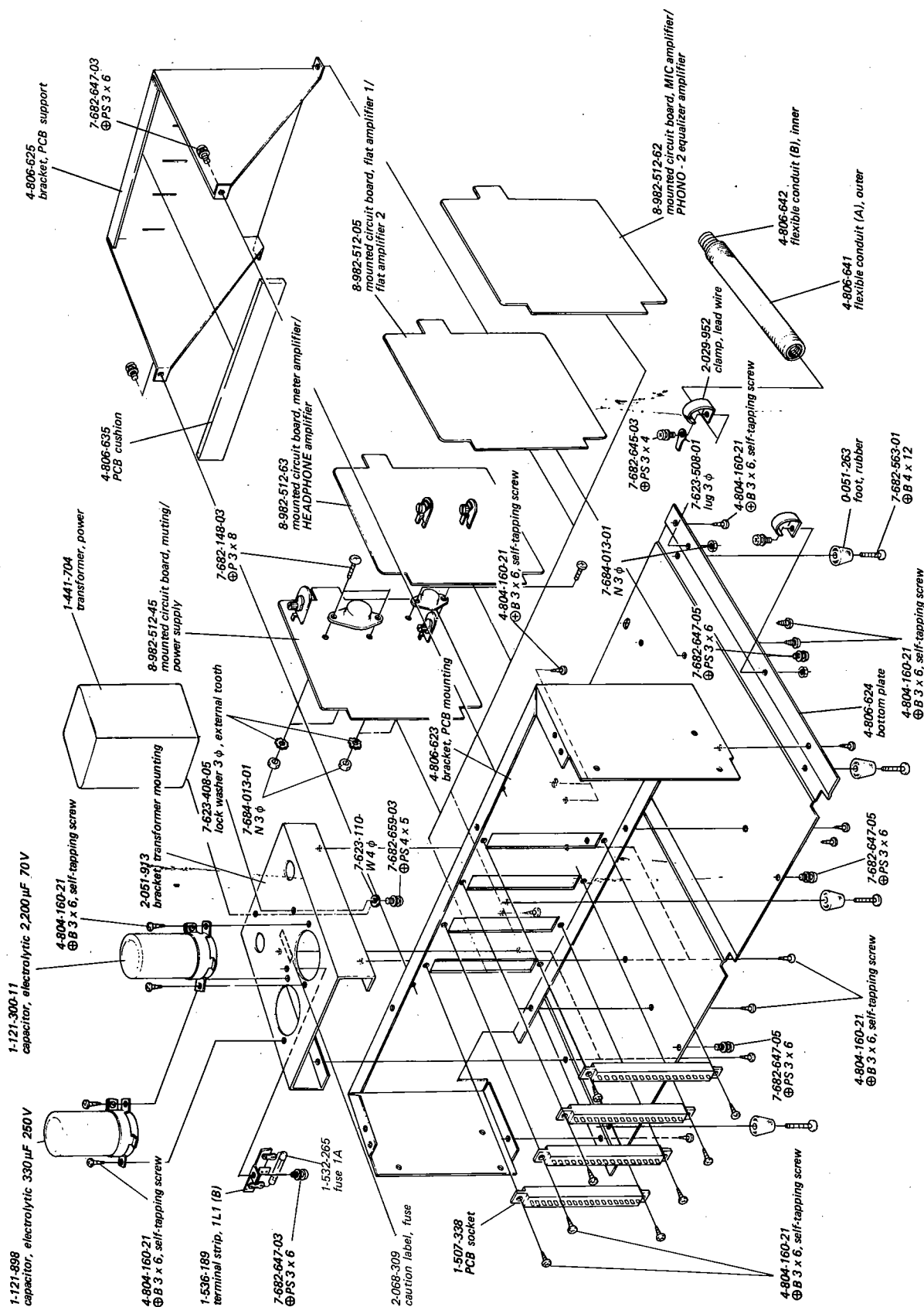
Note: Carton ass'y includes all the parts marked ▲

SECTION 6 EXPLODED VIEW









SECTION 7

ELECTRICAL PARTS LIST

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
MOUNTED CIRCUIT BOARDS					
8-982-512-05		flat amplifier 1/flat amplifier 2 circuit board	Q501 (Q601)		FET, 2SK43-1
8-982-512-45		muting/power supply circuit board	Q502 (Q602)		FET, 2SK43-1
8-982-512-46		OUTPUT LEVEL changeover switch circuit board	Q503 (Q603)		FET, 2SK23-34, -35, -36 or -37
8-982-512-61		PHONO-1 equalizer amplifier/head amplifier circuit board	Q504 (Q604)		FET, 2SK43-1
8-982-512-62		MIC amplifier/PHONO-2 equalizer amplifier circuit board	Q505 (Q605)		FET, 2SK43-1
8-982-512-63		meter amplifier/HEADPHONE amplifier circuit board	Q506 (Q606)		FET, 2SK23-34, -35, -36 or -37
8-982-512-78		REC OUT buffer/high and low filter component/turnover frequency changeover component circuit board	Q701 (Q801)		transistor, 2SC631A
			Q702 (Q802)		transistor, 2SC632A
			Q703 (Q803)		transistor, 2SC632A
			Q704 (Q804)		transistor, 2SC631A
			Q705 (Q805)		transistor, 2SC632A
			Q706 (Q806)		transistor, 2SC1124
			Q707 (Q807)		transistor, 2SA546
			Q901		transistor, 2SD28
			Q902		transistor, 2SC634
			Q903		transistor, 2SC926A
			Q904		transistor, 2SC807
			Q905		transistor, 2SC634
			Q906		transistor, 2SC926A
			Q907		transistor, 2SC634
			Q908		transistor, 2SC634
			Q909		transistor, 2SC634
			Q910		transistor, 2SC634
			Q911		transistor, 2SC634
			Q912		transistor, 2SA678
			Q01 (Q51)		transistor, 2SC926A
			TRANSFORMERS AND COILS		
			L01 (L51)	1-427-231-11	coil, filter; 1H
			L02 (L52)	1-407-408-11	coil, choke; 22 mH
			T	1-441-704	transformer, power
			CAPACITORS		
			All capacitance values are in μF except as indicated with p, which means μF .		
			C101 (C201)	1-105-687-12	0.15 $\pm 10\%$ 50V mylar
			C102 (C202)	1-101-882	51 p $\pm 5\%$ 50V ceramic
			C103 (C203)	1-101-916	200p $\pm 5\%$ 50V ceramic
			C104 (C204)	1-105-821-12	0.001 $\pm 20\%$ 50V mylar
			C105 (C205)	1-107-169	100p $\pm 5\%$ 500V silvered mica

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>			<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>		
C106 (C206)	1-107-169	100p	±5%	500 V silvered mica	C505 (C605)	1-105-691-12	0.33	±10%	50 V mylar
C107 (C207)	1-121-415	100	±100%	16 V electrolytic	C506 (C606)	1-101-861	15p	±5%	50 V ceramic
C108 (C208)		- deleted -			C507 (C607)	1-105-691-12	0.33	±10%	50 V mylar
C109 (C209)	1-105-503-12	0.0015	±5%	50 V mylar	C508 (C608)	1-121-344	3.3	±150%	25 V electrolytic
C110 (C210)	1-105-510-12	0.0056	±20%	50 V mylar	C509 (C609)	1-121-344	3.3	±150%	25 V electrolytic
C111 (C211)	1-121-707	3	±150%	150 V electrolytic	C510 (C610)	1-105-685-12	0.1	±10%	50 V mylar
C112 (C212)	1-107-169	100p	±5%	500 V silvered mica	C511 (C611)	1-105-685-12	0.1	±10%	50 V mylar
C113 (C213)	1-105-909-12	0.0047	±20%	200 V mylar	C512 (C612)	1-105-821-12	0.001	±20%	50 V mylar
C114 (C214)	1-121-741	150	±20%	3.15 V electrolytic	C513 (C613)	1-105-673-12	0.01	±10%	50 V mylar
C115 (C215)	1-105-821-12	0.001	±20%	50 V mylar	C514 (C614)	1-121-403	33	±100%	16 V electrolytic
C116 (C216)	1-105-689-12	0.22	±10%	50 V mylar	C515 (C615)	1-105-691-12	0.33	±10%	50 V mylar
C117 (C217)	1-121-748	10	±100%	25 V electrolytic	C516 (C616)	1-101-861	15p	±5%	50 V ceramic
C301 (C401)	1-105-687-12	0.15	±10%	50 V mylar	C517 (C617)	1-105-691-12	0.33	±10%	50 V mylar
C302 (C402)	1-105-821-12	0.001	±20%	50 V mylar	C518 (C618)	1-121-344	3.3	±150%	25 V electrolytic
C303 (C403)	1-101-864	20p	±5%	50 V ceramic	C519 (C619)	1-121-344	3.3	±150%	25 V electrolytic
C304 (C404)	1-101-864	20p	±5%	50 V ceramic	C701 (C801)	1-105-685-12	0.1	±10%	50 V mylar
C305 (C405)	1-121-707	3	±150%	150 V electrolytic	C702 (C802)	1-101-896	100p	±5%	50 V ceramic
C306 (C406)	1-121-415	100	±100%	16 V electrolytic	C703 (C803)	1-121-347	10	±100%	16 V electrolytic
C307 (C407)	1-121-707	3	±150%	150 V electrolytic	C704 (C804)	1-121-344	3.3	±150%	25 V electrolytic
C308 (C408)	1-105-685-12	0.1	±10%	50 V mylar	C705 (C805)	1-105-685-12	0.1	±10%	50 V mylar
C309 (C409)	1-105-821-12	0.001	±20%	50 V mylar	C706 (C806)	1-105-679-12	0.033	±10%	50 V mylar
C310 (C410)	1-101-959	10p	±5%	50 V ceramic	C707 (C807)	1-101-896	100p	±5%	50 V ceramic
C311 (C411)	1-121-396	4.7	±150%	50 V electrolytic	C708 (C808)	1-121-413	100	±100%	6.3 V electrolytic
C312 (C412)	1-121-413	100	±100%	6.3 V electrolytic	C709 (C809)	1-121-413	100	±100%	6.3 V electrolytic
C313 (C413)	1-121-344	3.3	±150%	25 V electrolytic	C710 (C810)	1-121-283	10	±100%	25 V electrolytic
C314 (C414)	1-121-417	100	±100%	50 V electrolytic	C711 (C811)	1-121-733	470	±100%	25 V electrolytic
C315 (C415)	1-105-687-12	0.15	±10%	50 V mylar	C713 (C813)	1-121-348	10	±100%	50 V electrolytic
C316 (C416)	1-105-821-12	0.001	±20%	50 V mylar	C901	1-121-741	150	±20%	3.15 V electrolytic
C317 (C417)	1-101-882	51p	±5%	50 V ceramic	C902	1-121-741	150	±20%	3.15 V electrolytic
C318 (C418)	1-101-916	200p	±5%	50 V ceramic	C903	1-121-245	1,000	±100%	16 V electrolytic
C319 (C419)	1-101-819	120p	±5%	50 V ceramic	C904	1-105-909-12	0.0047	±20%	200 V mylar
C320 (C420)	1-101-819	120p	±5%	50 V ceramic	C905	1-105-909-12	0.0047	±20%	200 V mylar
C321 (C421)	1-121-415	100	±100%	16 V electrolytic	C906	1-105-909-12	0.0047	±20%	200 V mylar
C322 (C422)		- deleted -			C907	1-105-909-12	0.0047	±20%	200 V mylar
C323 (C423)	1-106-005-12	0.0015	±5%	50 V mylar	C908	1-119-313	10	±100%	200 V electrolytic
C324 (C424)	1-106-019-12	0.0056	±5%	50 V mylar	C909	1-105-917-12	0.022	±20%	200 V mylar
C325 (C425)	1-106-019-12	0.0056	±5%	50 V mylar	C910	1-105-917-12	0.022	±20%	200 V mylar
C326 (C426)	1-106-019-12	0.0056	±5%	50 V mylar	C911	1-119-314	100	±100%	160 V electrolytic
C327 (C427)	1-106-019-12	0.0056	±5%	50 V mylar	C912	1-105-917-12	0.022	±20%	200 V mylar
C328 (C428)	1-101-896	100p	±5%	50 V ceramic	C913	1-105-909-12	0.0047	±20%	200 V mylar
C329 (C429)	1-105-909-12	0.0047	±20%	200 V mylar	C914	1-105-909-12	0.0047	±20%	200 V mylar
C330 (C430)	1-121-707	3	±150%	150 V electrolytic	C915	1-105-909-12	0.0047	±20%	200 V mylar
C501 (C601)	1-105-685-12	0.1	±10%	50 V mylar	C916	1-105-909-12	0.0047	±20%	200 V mylar
C502 (C602)	1-105-821-12	0.001	±20%	50 V mylar	C917	1-121-417	100	±100%	50 V electrolytic
C503 (C603)	1-105-673-12	0.01	±10%	50 V mylar	C918	1-105-685-12	0.1	±10%	50 V mylar
C504 (C604)	1-121-403	33	±100%	16 V electrolytic	C919	1-121-398	10	±100%	25 V electrolytic

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	
C920	1-121-738	10	$\pm 100\%$ 50V electrolytic
C921	1-121-417	100	$\pm 100\%$ 50V electrolytic
C922	1-105-685-12	0.1	$\pm 10\%$ 50V mylar
C923	1-121-395	4.7	$\pm 150\%$ 25V electrolytic
C924	1-121-738	10	$\pm 100\%$ 50V electrolytic
C02 (C52)	1-105-729-12	0.22	$\pm 10\%$ 100V mylar
C04 (C54)	1-121-707	3	$\pm 150\%$ 150V electrolytic
C05 (C55)	1-106-013-12	0.0033	$\pm 5\%$ 50V mylar
C06 (C56)	1-106-025-12	0.01	$\pm 5\%$ 50V mylar
C07 (C57)	1-106-025-12	0.01	$\pm 5\%$ 50V mylar
C08 (C58)	1-106-037-12	0.033	$\pm 5\%$ 50V mylar
C09 (C59)	1-106-049-12	0.1	$\pm 5\%$ 50V mylar
C10 (C60)	1-106-049-12	0.1	$\pm 5\%$ 50V mylar
C11 (C61)	1-106-013-12	0.0033	$\pm 5\%$ 50V mylar
C12 (C62)	1-106-013-12	0.0033	$\pm 5\%$ 50V mylar
C13 (C63)	1-106-037-12	0.033	$\pm 5\%$ 50V mylar
C14 (C64)	1-106-037-12	0.033	$\pm 5\%$ 50V mylar
C15 (C65)	1-105-691-12	0.33	$\pm 5\%$ 50V mylar
C16 (C66)	1-106-033-12	0.022	$\pm 5\%$ 50V mylar
C17	1-121-898	330	250V electrolytic
C18	1-121-300	2,200	$\pm 100\%$ 70V electrolytic
C19 (C69)	1-106-047-12	0.082	$\pm 5\%$ 50V mylar

RESISTORS

All resistance values are in ohms, $\pm 5\%$, $\frac{1}{4}$ watts and carbon type unless otherwise indicated.

Note that the suffix "09" in the Parts Numbers indicates noiseless type.

R101 (R201)	1-242-719-09	82 k
R102 (R202)	1-242-713	47 k
R103 (R203)	1-242-709-09	33 k
R104 (R204)	1-242-636	30
R105 (R205)	1-242-625	10
R106 (R206)	1-242-745-09	1M
R107 (R207)	1-242-745-09	1M
R108 (R208)	1-242-701-09	15 k
R109 (R209)	1-242-681-09	2.2 k
R110 (R210)	1-242-721-09	100 k
R111 (R211)	1-242-712-09	43 k
R112 (R212)	1-211-912	620 $\pm 1\%$
R113 (R213)	1-242-643	56
R114 (R214)	1-242-728-09	200 k
R115 (R215)	1-244-694-09	7.5 k
R116 (R216)	1-244-708-09	30 k

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	
R117 (R217)	1-242-713	47 k	
R118 (R218)	1-242-739-09	560 k	
R119 (R219)	1-242-662	360	
R120 (R220)	1-244-673-09	1 k	
R121 (R221)	1-244-721-09	100 k	
R122 (R222)	1-242-673-09	1 k	
R123 (R223)	1-242-664	330	
R124 (R224)	1-242-625	10	
R125 (R225)	1-244-705-09	22 k	
R126 (R226)	1-242-689	4.7 k	
R127 (R227)	1-242-725-09	150 k	
R128 (R228)	1-244-625	10	
R301 (R401)	1-244-681-09	2.2 k	
R302 (R402)	1-244-721-09	100 k	
R303 (R403)	1-244-714-09	51 k	
R304 (R404)	1-244-721-09	100 k	
R305 (R405)	1-244-717-09	68 k	
R306 (R406)	1-244-691	5.6 k	
R307 (R407)	1-211-922	75 k	$\pm 1\%$
R308 (R408)	1-244-708-09	30 k	
R309 (R409)	1-244-675-09	1.2 k	
R310 (R410)	1-244-675-09	1.2 k	
R311 (R411)	1-244-681-09	2.2 k	
R312 (R412)	1-244-745	1M	
R313 (R413)	1-244-711-09	39 k	
R314 (R414)	1-210-505	4.7 k	$\pm 1\%$
R315 (R415)	1-211-925-09	150 k	$\pm 1\%$
R316 (R416)	1-244-745	1M	
R317 (R417)	1-244-691-09	5.6 k	
R318 (R418)	1-244-667	560	
R319 (R419)	1-244-674-09	1.1 k	
R320 (R420)	1-244-674	1.1 k	
R321 (R421)	1-244-733	330 k	
R322 (R422)	1-244-713	47 k	
R323 (R423)	1-244-745	1M	
R324 (R424)	1-244-701	15 k	
R325 (R425)	1-244-681	2.2 k	
R326 (R426)	1-244-721	100 k	
R327 (R427)	1-244-712-09	43 k	
R328 (R428)	1-244-668	620	
R329 (R429)	1-244-643	56	
R330 (R430)	1-244-728-09	200 k	
R331 (R431)	1-244-694-09	7.5 k	
R332 (R432)	1-244-708-09	30 k	
R333 (R433)	1-244-713	47 k	
R334 (R434)	1-244-739-09	560 k	
R335 (R435)	1-244-662	360	

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R336 (R436)	1-244-673-09	1 k	R718 (R818)	1-244-702-09	16 k
R337 (R437)	1-244-721-09	100 k	R719 (R819)	1-244-675-09	1.2 k
R338 (R438)	1-244-625	10	R720 (R820)	1-244-677-09	1.5 k
R501 (R601)	1-244-745-09	1 M	R721 (R821)	1-202-563	390 $\pm 10\%$ $\frac{1}{2}W$ composition
R502 (R602)	1-244-683-09	2.7 k	R722 (R822)	1-244-625	10
R503 (R603)	1-244-742-09	750 k	R723 (R823)	1-244-625	10
R504 (R604)	1-211-916	7.5 k $\pm 1\%$	R724 (R824)	1-202-563	390 $\pm 10\%$ $\frac{1}{2}W$ composition
R505 (R605)	1-244-697-09	10 k	R725 (R825)	1-211-919	20 k $\pm 1\%$
R506 (R606)	1-244-737-09	470 k	R726 (R826)	1-244-617	4.7
R507 (R607)	1-244-716-09	62 k	R728 (R828)	1-244-673-09	1 k
R508 (R608)	1-244-674-09	1.1 k	R729 (R829)	1-244-690-09	5.1 k
R509 (R609)	1-211-923	91 k $\pm 1\%$	R730 (R830)	1-244-625	10
R510 (R610)	1-244-686-09	3.6 k	R731 (R831)	1-244-697-09	10 k
R511 (R611)	1-244-673-09	1 k	R901	1-244-705	22 k
R512 (R612)	1-244-709-09	33 k	R902	1-244-681	2.2 k
R513 (R613)	1-244-721-09	100 k	R903	1-244-725	150 k
R514 (R614)	1-244-745-09	1 M	R904	1-244-687	3.9 k
R515 (R615)	1-244-683-09	2.7 k	R905	1-244-689	4.7 k
R516 (R616)	1-244-742-09	750 k	R906	1-244-673	1 k
R517 (R617)	1-211-916	7.5 k $\pm 1\%$	R907	1-244-683	2.7 k
R518 (R618)	1-244-697-09	10 k	R908	1-244-717	68 k
R519 (R619)	1-244-737-09	470 k	R909	1-244-687	3.9 k
R520 (R620)	1-244-716-09	62 k	R910	1-244-719	82 k
R521 (R621)	1-244-674-09	1.1 k	R911	1-244-697	10 k
R522 (R622)	1-211-923	91 k $\pm 1\%$	R912	1-244-697	10 k
R523 (R623)	1-244-686-09	3.6 k	R913	1-244-690	5.1 k
R524 (R624)	1-244-673-09	1 k	R914	1-244-690	5.1 k
R525 (R625)	1-244-709-09	33 k	R915	1-244-709	33 k
R526 (R626)	1-244-721-09	100 k	R916	1-244-709	33 k
R701 (R801)	1-222-987	100 k (B), semi-fixed	R917	1-244-673	1 k
R702 (R802)	1-244-729-09	220 k	R918	1-244-745	1 M
R703 (R803)	1-244-739-09	560 k	R919	1-244-694	7.5 k
R704 (R804)	1-244-721-09	100 k	R920	1-221-967	10 k (B), semi-fixed
R705 (R805)	1-244-665	470	R921	1-202-623	120 k $\frac{1}{2}W$ composition
R706 (R806)	1-211-911	510 $\pm 1\%$	R922	1-244-701	15 k
R707 (R807)	1-244-703-09	18 k	R923	1-244-701	15 k
R708 (R808)	1-244-680-09	2 k	R924	1-244-712	43 k
R709 (R809)	1-211-920	24 k $\pm 1\%$	R925	1-244-677	1.5 k
R710 (R810)	1-244-690-09	5.1 k	R926	1-221-967	10 k (B), semi-fixed
R711 (R811)	1-211-917	8.2 k $\pm 1\%$	R927	1-244-711	39 k
R712 (R812)	1-244-721-09	100 k	R928	1-217-008	1.2 3W wire-wound
R713 (R813)	1-244-713-09	47 k	R929	1-244-625	10
R714 (R814)	1-244-681-09	2.2 k	R01 (R51)	1-244-721-09	100 k
R715 (R815)	1-244-721-09	100 k	R02 (R52)	1-244-714-09	51 k
R716 (R816)	1-211-914	1.1 k $\pm 1\%$	R03 (R53)	1-244-725-09	1 M
R717 (R817)	1-244-735-09	390 k	R04 (R54)	1-244-681-09	2.2 k

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R05 (R55)	1-244-733-09	330 k
R06 (R56)	1-244-735-09	390 k
R07 (R57)	1-244-714-09	51 k
R08 (R58)	1-244-722-09	110 k
R09 (R59)	1-244-725-09	150 k
R10 (R60)	1-244-625-09	10
R11 (R61)	1-210-506	10 k $\pm 1\%$
R12 (R62)	1-244-662	360
R13 (R63)	1-244-668	620
R14 (R64)	1-244-672	910
R15 (R65)	1-244-676-09	1.3 k
R16 (R66)	1-244-682-09	2.4 k
R17 (R67)	1-244-683-09	2.7 k
R18 (R68)	1-244-713-09	47 k
R19 (R69)	1-244-699-09	12 k
R20 (R70)	1-244-694-09	7.5 k
R21 (R71)	1-244-688-09	4.3 k
R22 (R72)	1-244-680-09	2 k
R23 (R73)	1-244-669	680
R24 (R74)	1-244-669	680
R25 (R75)	1-244-675-09	1.2 k
R26 (R76)	1-244-679-09	1.8 k
R27 (R77)	1-244-683-09	2.7 k
R28 (R78)	1-244-687-09	3.9 k
R29 (R79)	1-244-696-09	9.1 k
R30 (R80)	1-244-718-09	75 k
R31 (R81)	1-244-716-09	62 k
R32 (R82)	1-244-712-09	43 k
R33 (R83)	1-244-708-09	30 k
R34 (R84)	1-244-703-09	18 k
R35 (R85)	1-244-698-09	11 k
R36 (R86)	1-211-913	1 k $\pm 1\%$
R37 (R87)	1-210-506	10 k
R38 (R88)	1-210-505	4.7 k $\pm 1\%$
R39 (R89)	1-210-509	33 k
R40 (R90)	1-244-698-09	11 k
R41 (R91)	1-244-689-09	4.7 k
R42 (R92)	1-210-502	2.2 k
R43 (R93)	1-210-506	10 k $\pm 1\%$
R44 (R94)	1-210-505	4.7 k
R45 (R95)	1-210-502	2.2 k
R46 (R96)	1-244-715-09	56 k
R47 (R97)	1-244-697-09	10 k
R48 (R98)	1-244-697-09	10 k
R49 (R99)	1-244-742-09	750 k
R50 (R100)	1-244-719-09	82 k
R1001(R2001)	1-244-657	220

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R1002(R2002)	1-244-685-09	3.3 k
R1003(R2003)	1-244-711	39 k
R1004(R2004)	1-244-745	1M
R1005(R2005)	1-244-745	1M
R1006(R2006)	1-244-733	330 k
R1007(R2007)	1-244-649-09	100
R1008(R2008)	1-211-913	1 k $\pm 1\%$
R1009(R2009)	1-211-913	1 k $\pm 1\%$
VR1	1-222-461	resistor, variable 100 k (B)/100 k (B) (PHONO-2 LEVEL Adj.)
VR2	1-222-462	resistor, variable 250 k (B)/250 k (B) (TUNER LEVEL Adj.)
VR3	1-222-462	resistor, variable 250 k (B)/250 k (B) (AUX-1 LEVEL Adj.)
VR4	1-222-462	resistor, variable 250 k (B)/250 k (B) (AUX-2 LEVEL Adj.)
VR5	1-222-462	resistor, variable 250 k (B)/250 k (B) (TAPE-1 LEVEL Adj.)
VR6	1-222-458	resistor, variable 100 k (A)/100 k (A) (MIC LEVEL control with switch S15)
VR7	1-222-459	resistor, variable 250 k (M)/250 k (N) (BALANCE control)
VR8	1-221-843	resistor, variable 250 k/250 k (VOLUME control)
VR9	1-222-460	resistor, variable 100 k (B)/100 k (B) (HEADPHONE LEVEL control)

SWITCHES

S1	1-514-823	switch, rotary (FUNCTION 1)
S2	1-514-824	switch, lever/rotary (FUNCTION 2)
S3	1-514-825	switch, lever/rotary (MONITOR)
S4	1-514-649	switch, rotary (MODE)
S5	1-514-647	switch, lever/rotary (TONE CANCEL)
S6	1-514-826	switch, rotary (TONE control, TREBLE)
S7	1-514-827	switch, rotary (TONE control, BASS)
S8	1-514-647	switch, lever/rotary (TURNOVER FREQUENCY, TREBLE)
S9	1-514-647	switch, lever/rotary (TURNOVER: FREQUENCY, BASS)
S10	1-514-828	switch, rotary/slide (IMPEDANCE SELECT)
S11	1-514-829	switch, rotary (FILTER)
S12	1-514-830	switch, rotary (METER LEVEL)
S13	1-514-314	switch, slide (OUTPUT LEVEL)
S14	1-514-369-23	switch, lever (POWER)

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
MISCELLANEOUS			1-509-341		AC socket
CP1	1-101-534	encapsulated component, $120\Omega + 0.1\mu\text{F}$	1-515-156		relay, REL-1
CP2	1-231-057	encapsulated component, $120\Omega + 0.033\mu\text{F}$	1-518-070		lamp, meter 8V 0.3A
	1-507-162	phono jack, 10-P	1-524-080		LEVEL meter
	1-507-163	phono jack, 4-P	1-526-165		voltage changeover block
	1-507-170	jack, AUX 3 input	1-532-265		fuse, 1A
	1-507-176	phono jack, 1-P	1-533-051-13		socket, meter lamp
	1-507-190-12	jack, HEADPHONE	1-534-526		cord, power
	1-507-279	jack, MIC input	1-536-178		terminal strip, 1L(C)
	1-507-338	PCB socket	1-536-182		terminal strip, 2L2(C)
	1-509-029	REC/PB socket	1-536-189		terminal strip, 1L(B)

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