

AM/FM STEREO RECEIVER **SX-1250**

<ART-158-0>



PIONEER®

MODEL SX-1250 COMES IN THREE VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Voltage	Remarks
KCU	120V only	CSA (Canada) and UL (U.S.A) approved with de-emphasis selector switch (25 μ s/75 μ s)
HG	220V and 240V (Switchable)	SEMKO (Sweden), NEMKO (Norway), DEMKO (Denmark) and EI (Finland) approved
S	110V, 120V, 220V and 240V (Switchable)	General export model with de-emphasis selector switch (25 μ s/50 μ s/75 μ s)

When repairing S or HG type, please see the manual on page 101.

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1. SPECIFICATIONS

Semiconductors

FETs	5
ICs	6
Transistors	82
Diodes	60

Power Amplifier Section

Continuous Power Output from 20 Hertz to 20,000 Hertz
(Both channels driven) . . 160 watts per channel (8 ohms)
200 watts per channel (4 ohms)

Total Harmonic Distortion (20 Hertz to 20,000 Hertz, from
AUX)

Continuous Rated Power Output. . . No more than 0.1%
80 watts per channel power

output, 8 ohms No more than 0.05%

1 watt per channel power

output, 8 ohms No more than 0.07%

Intermodulation Distortion (50 Hertz : 7,000 Hertz = 4 : 1,
from AUX)

Continuous Rated Power Output. . . No more than 0.1%

80 watts per channel power

output, 8 ohms No more than 0.05%

1 watt per channel power

output, 8 ohms No more than 0.07%

Frequency Response 5Hz to 100,000Hz ± 1 dB

Input Sensitivity/Impedance

POWER AMP IN 1 V/50k ohms

Output

Speaker A, B, C, A+B, B+C, A+C

Headphone Low Impedance

Damping Factor

(20Hz to 20,000Hz, 8 ohms) 30

Hum and Noise (IHF, short-circuited, A Network) . . 100dB

Preamplifier Section

Input Sensitivity/Impedance

PHONO 1 2.5mV/50k ohms

PHONO 2 2.5mV/50k ohms

MIC 6.5mV/50k ohms

AUX 150mV/50k ohms

TAPE PLAY 1 150mV/50k ohms

TAPE PLAY 2 150mV/50k ohms

TAPE PLAY 2 (DIN connector) . . . 150mV/50k ohms

PHONO Overload Level (T.H.D. 0.1%)

PHONO 1 500mV (1kHz)

PHONO 2 500mV (1kHz)

Output Level/Impedance

TAPE REC 1 150mV

TAPE REC 2 150mV

TAPE REC 2 (DIN connector) 30mV/80k ohms

PRE OUT 1V/1k ohms

Total Harmonic Distortion

(20Hz to 20,000Hz, 1V output) . . No more than 0.02%

Frequency Response

PHONO (RIAA equalization) . . 30Hz to 15,000Hz ± 0.2 dB

AUX, TAPE PLAY 10Hz to 50,000Hz ± 1 dB

Tone Control

BASS MAIN ± 10 dB (100Hz)

SUB ± 5 dB (50Hz)

TREBLE MAIN ± 10 dB (10kHz)

SUB ± 5 dB (20kHz)

Filter

LOW 30Hz (12dB/oct.)

HIGH 8kHz (12dB/oct.)

Loudness Contour (Volume control set

at -40dB position) +6dB (100Hz), +3dB (10kHz)

Hum and Noise (IHF, short-circuited, A Network, rated
power)

PHONO 75dB

AUX, TAPE PLAY 90dB

Muting - 20dB

FM Section

Usable Sensitivity. . . MONO . . . 8.7dBf (3.0 μ V/300 Ω)

STEREO . . 14.5dBf (5.8 μ V/300 Ω)

Usable Sensitivity (IHF '58) 1.5 μ V

50dB Quieting Sensitivity

MONO . . . 11.5dBf (4.1 μ V/300 Ω)

STEREO . . 36.0dBf (69 μ V/300 Ω)

Signal-to-Noise Ratio at 65dBf . . MONO 80dB

STEREO 74dB

Distortion at 65dBf 100Hz MONO 0.1%

STEREO 0.25%

1kHz MONO 0.1%

STEREO 0.2%

6kHz MONO 0.3%

STEREO 0.3%

Frequency Response 30Hz to 15,000Hz ± 0.3 dB

Capture Ratio 1.0dB

Alternate Channel Selectivity 83dB

Spurious Response Ratio 110dB

Image Response Ratio 110dB

IF Response Ratio 120dB

AM Suppression Ratio 60dB

Muting Threshold 13dBf (4.9 μ V/300 Ω)

Stereo Separation . . 50dB (1kHz), 35dB (30Hz ~ 15kHz)

Subcarrier Product Ratio 74dB

SCA Rejection Ratio 74dB

Antenna Input 300 ohms balanced

75 ohms unbalanced

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AM Section

Sensitivity (IHF, Ferrite antenna)	300μV/m
(IHF, Ext. antenna)	15μV
Selectivity	40dB
Signal-to-Noise Ratio	55dB
Image Response Ratio	65dB
IF Response Ratio	85dB
Antenna	Built-in Ferrite Loopstick Antenna

Miscellaneous

Power Requirements	120V 60Hz
Power Consumption	650W (UL, CSA) 1200W (max.)
Dimensions	556(W) x 186.5(H) x 464.5(D) mm 21-7/8(W) x 7-3/8(H) x 18-1/4(D) in
Weight Without Package	29.2kg (64 lb 4 oz)
With Package	33.2kg (73 lb 1 oz)

Furnished Parts

FM T-type Antenna	1
Operating Instructions	1
Hex. Wrench	1

NOTE:
Specifications and the design subject to possible modification without notice due to improvements.

HEX WRENCH

The accessory **Hex. wrench** is provided for removing the **VOLUME** and **TUNING** knobs, or for tightening its setscrew in the event it becomes loose.
If required, loosen the setscrew by inserting the wrench into the hole on the side of the knob and turning the wrench counterclockwise. Be particularly careful not to scratch the front panel when employing the wrench.



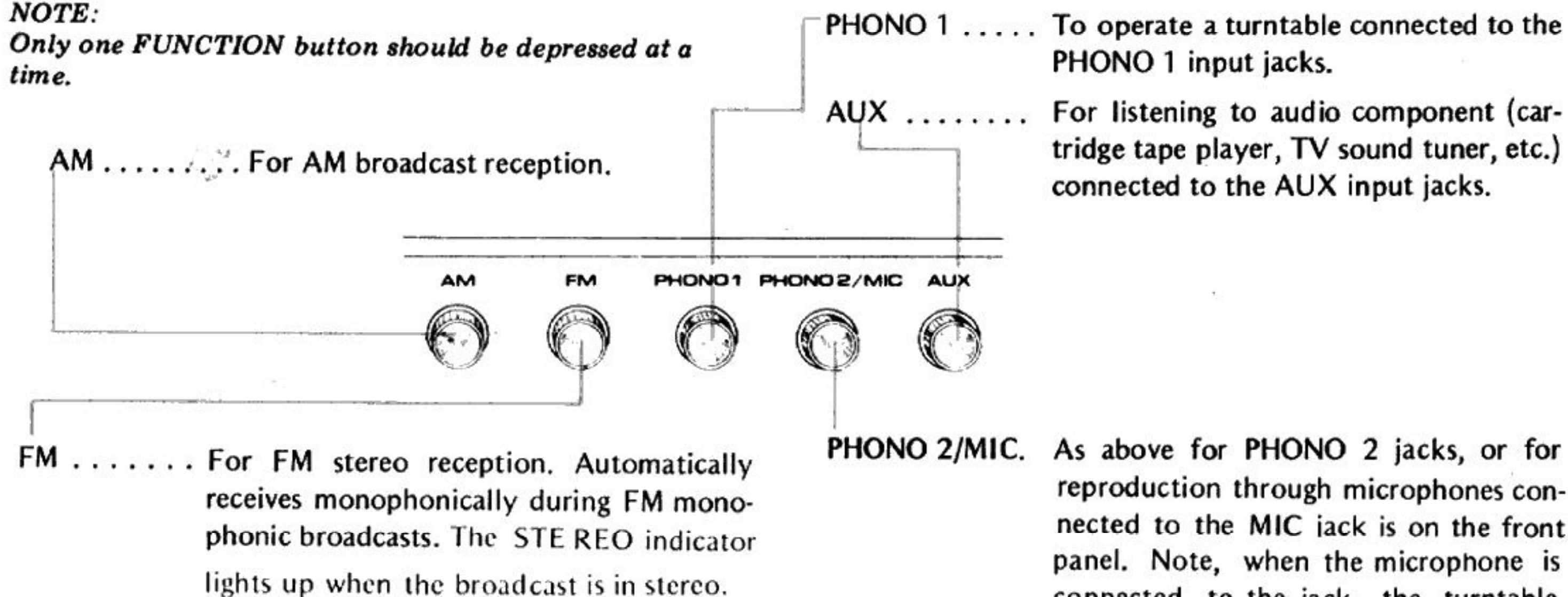
2. FRONT PANEL FACILITIES

FUNCTION SELECTOR BUTTONS

To select the program source, push each button as follows:

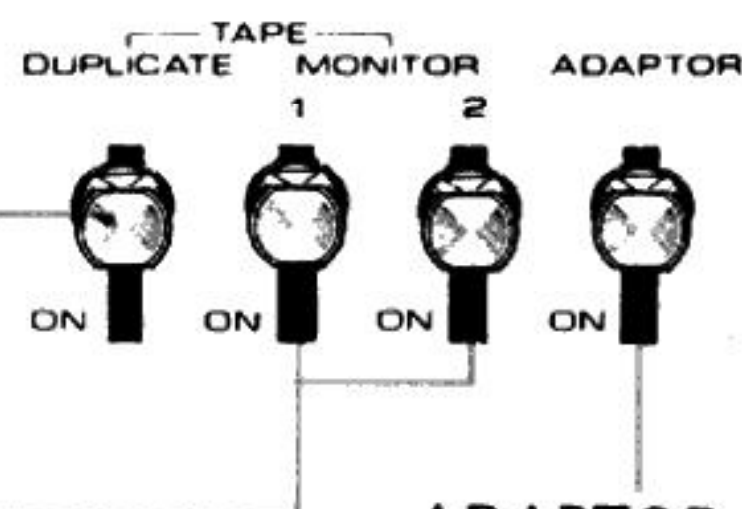
NOTE:

Only one FUNCTION button should be depressed at a time.



TAPE DUPLICATE SWITCH

Set this switch in the ON (down) position to duplicate or edit a recorded tape using two tape decks.



TAPE MONITOR (1, 2) SWITCHES

Set these switch in the ON (down) position as follow:

- 1 With a tape deck connected to the TAPE 1 jacks (REC and PLAY), either playback or monitoring of a recording in progress are possible.
- 2 Same as in 1 above, with a tape deck connected to the TAPE 2 jacks (REC and PLAY).

For normal use, leave in the OFF (up) positions.

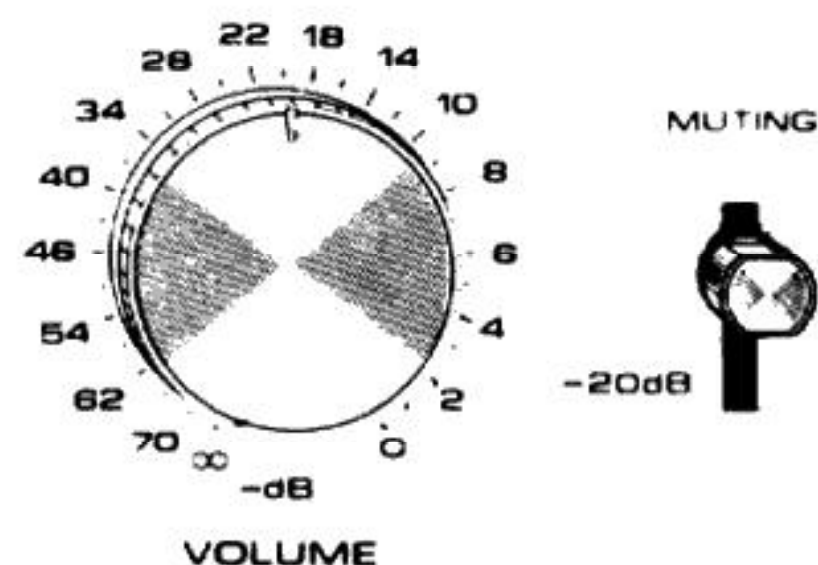
ADAPTOR SWITCH

When employing adaptor components, such as a graphic equalizer adaptor, RG processor, or Dolby NR adaptor, depress this ADAPTOR switch to ON.

VOLUME CONTROL AND AUDIO MUTING SWITCH

The extremely high power output of the SX-1250 can be finely controlled by combining the calibrated **VOLUME** control and the **AUDIO MUTING** switch.

The **AUDIO MUTING** switch can also be used to briefly lower the volume when changing records or tapes.



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SPEAKER BUTTONS

Three sets of speaker terminals, A, B, and C, are provided on the rear panel, and the required speaker systems can be selected by depressing the SPEAKERS buttons as follows:

- A Speaker systems A operate
- B Speaker systems B operate
- C Speaker systems C operate

NOTES:

1. When any two buttons (A+B, B+C, C+A) are depressed simultaneously, the corresponding pairs of speaker systems will come into operation. However, it is not possible to operate all three speaker systems at the same time, even though all the buttons are depressed.
2. For private listening through headphones, return all the SPEAKERS buttons to the OFF (undepressed) position.

FM TUNING METER

With the SIGNAL meter needle deflected to the right, make fine adjustment by centering the FM TUNING meter needle (indicating optimum reception).

SIGNAL METER

For AM and FM station tunings.

AM tuning: Tune for maximum deflection of the SIGNAL meter needle to the right.

FM tuning: Both the SIGNAL and FM TUNING meters work together. The optimum point of the SIGNAL meter needle is the same as in AM tuning. Then use the FM TUNING meters.

SPEAKER SYSTEM INDICATOR FM STEREO INDICATOR

TUNING KNOB

Select the station and tune for optimum reception by observing the SIGNAL meter for AM stations, and both SIGNAL and TUNING meters for FM stations.

FM MUTING BUTTON

Leave this button undepressed (in the ON position) to suppress unpleasant interstation noise while tuning between FM stations. Low-strength signals may also be suppressed by this function, so to pick up a weak station depress this button to the OFF position.

PROGRAM SOURCE INDICATOR

MIC JACKS (L and R)

For connect each channel jacks the left and right channel microphones.

NOTE:

Use the high impedance (above 20k Ω) with 6mm diam. phone plugs.

PHONES JACK

Accepts stereo headphones.

WARNING:

Do not plug a microphone into the PHONES jack as may damage the microphone.

POWER SWITCH

After turning this switch ON there is a delay of some 6 to 8 seconds, during which time the protection circuit operates to eliminate unpleasant noise.

TWIN BASS CONTROLS

Adjust low frequency tone.

- 100Hz: Adjusts frequency band below 400Hz. Control effectiveness at 100Hz is ± 10 dB.
- 50Hz: Provides additional control for the frequency band below 200Hz. Control effectiveness at 50Hz is ± 5 dB.

TONE SWITCH

In the OFF (up) position, this switch causes the amplifier section to operate with a flat frequency response regardless of the tone control setting.

LOW CUT (30Hz) FILTER BUTTON

When low-pitched rumble (from turntable motor or other source) is obtrusive depress this button to provide 12dB/octave, attenuation at frequencies below 30Hz. If no interference is experienced, release this button.

HIGH CUT (8kHz) FILTER BUTTON

When high frequency scratch noise (from worn records or other source) is unpleasant, depress this button to provide 12dB/octave attenuation at frequencies above 8kHz. If there is no interference, release this button.

FM MULTIPATH BUTTON

When selecting the best position for the FM antenna, depress this button so that multipath noise is heard from the speaker systems. To listen to FM broadcasts, release this button.

TWIN TREBLE CONTROLS

Adjusts high frequency tone.

- 10kHz: Adjusts frequency band above 2.5kHz. Control effectiveness at 10kHz is ± 10 dB.
- 20kHz: Provides additional control for the frequency band above 5kHz. Control effectiveness at 20kHz is ± 5 dB.

VOLUME CONTROL

Adjusts output level to speakers and headphones.

Scale is graduated in dB, and when used in conjunction with the MUTING switch, finer and wider range attenuation can be performed. See additional description on page 6.

AUDIO MUTING SWITCH — 20dB

Depress this switch to attenuate the audio output by 20dB. This convenient feature saves having to disturb the VOLUME control, for example when answering the telephone.

LOUDNESS SWITCH

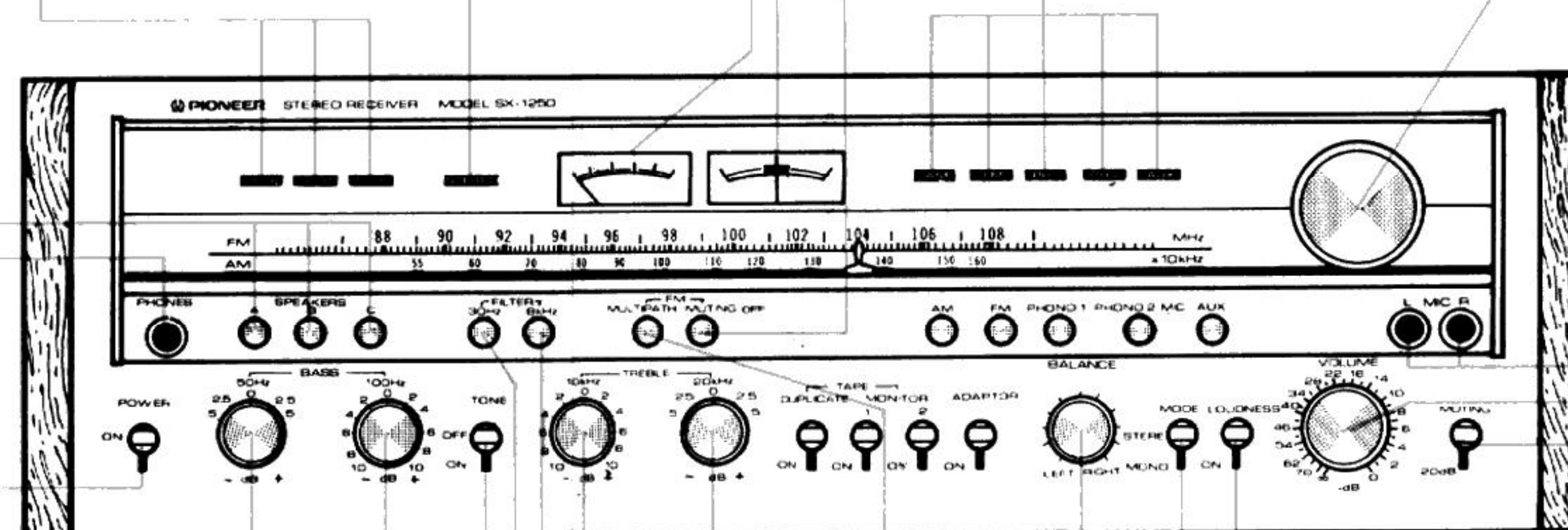
Depress this switch when listening at low volume. The frequency response of the human ear varies according to the listening volume, and the depressed position compensates for hearing response by emphasizing the bass and treble.

MODE SWITCH

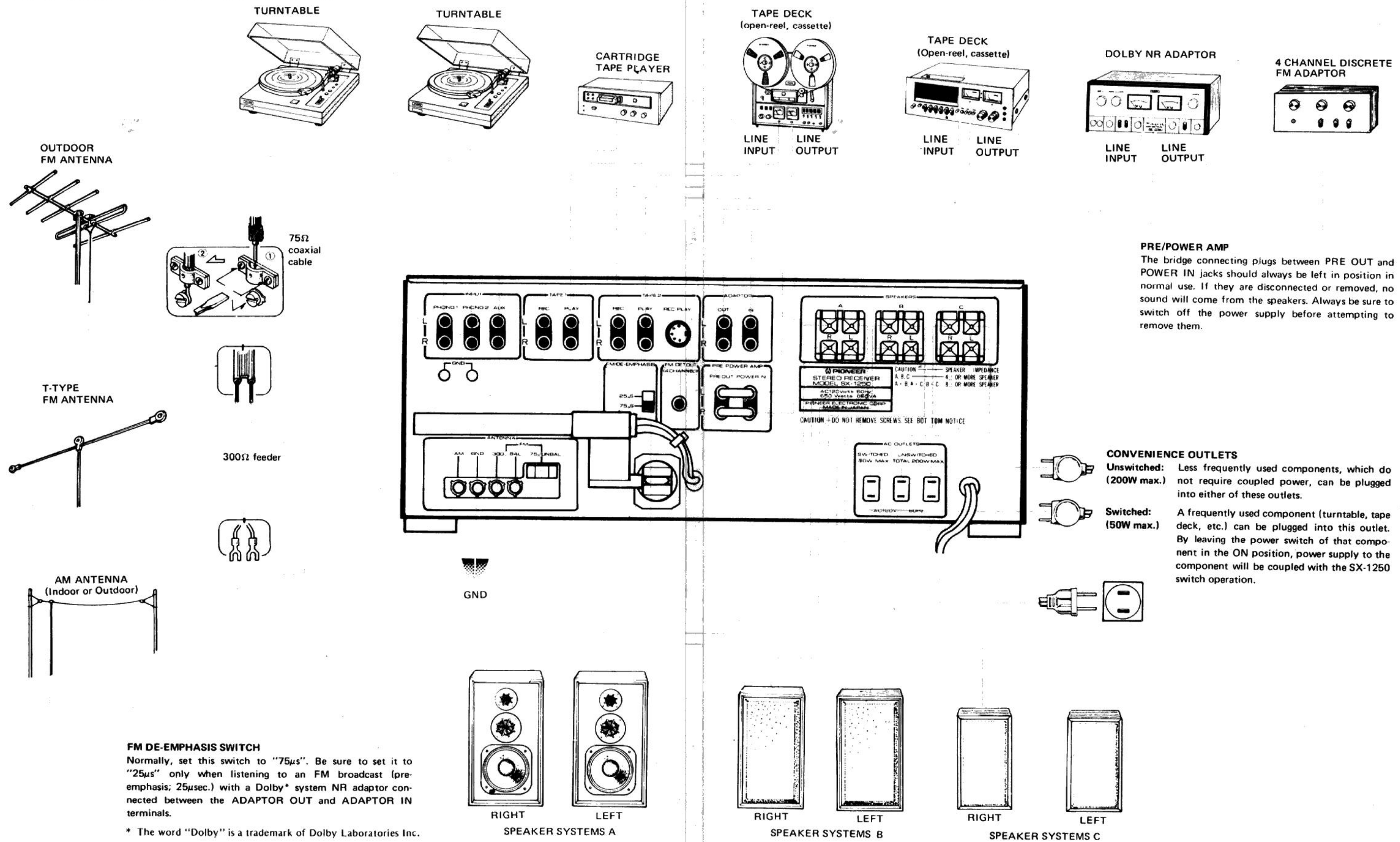
For stereo playback, leave this switch undepressed (or depress to release, if already depressed). When depressed for MONO playback, left and right channel stereo signals will be mixed to produce monophonic sound from both speaker systems.

BALANCE CONTROL

Adjusts the balance between the sound volume from the left and right speaker systems or headphones.



3. CONNECTION DIAGRAM



4. CIRCUIT DESCRIPTIONS

4.1 TUNER SECTION

FM Front End

The FM front end is composed of a tuning circuit employing a 5-gang variable capacitor, a 2-stage RF amplifier and mixer employing dual gate MOS FETs, and a local oscillator with buffer. An equivalent of a cascode amplifier is produced by AC grounding gate-2 of the dual gate MOS FET, allowing stable RF amplification at high gain.

The output signal of the RF amplifier is applied to gate-1 of the mixer stage MOS FET, while the local oscillator output signal is applied to gate-2. This technique minimizes input power from the local oscillator, resulting in low mutual interference even if the received signal input level is high.

A variation of a Clapp circuit forms the local oscillator. Inclusion of a buffer amplifier between local oscillator and mixer reduces local oscillator load, eliminating distortion of the oscillation waveform. Drawing effect of the local oscillator is also eliminated.

FM IF Section

Four integrated circuits (ICs) and four dual element ceramic filters compose this section. HA1201 (diagram on page 56) is a differential amplifier with a constant current source and functions as a current-limiting limiter. HA1137 (diagram on page 55) contains IF limiter amplifier, quadrature detector, meter drive and muting circuits. The detector circuit contained within this IC is not used in the SX-1250 however, and instead the IF signal is taken from the stage prior to the detector and applied to TA7061AP. This latter IC is a 3-stage differential amplifier (diagram on page 56) and its output goes to the ratio detector for FM detection.

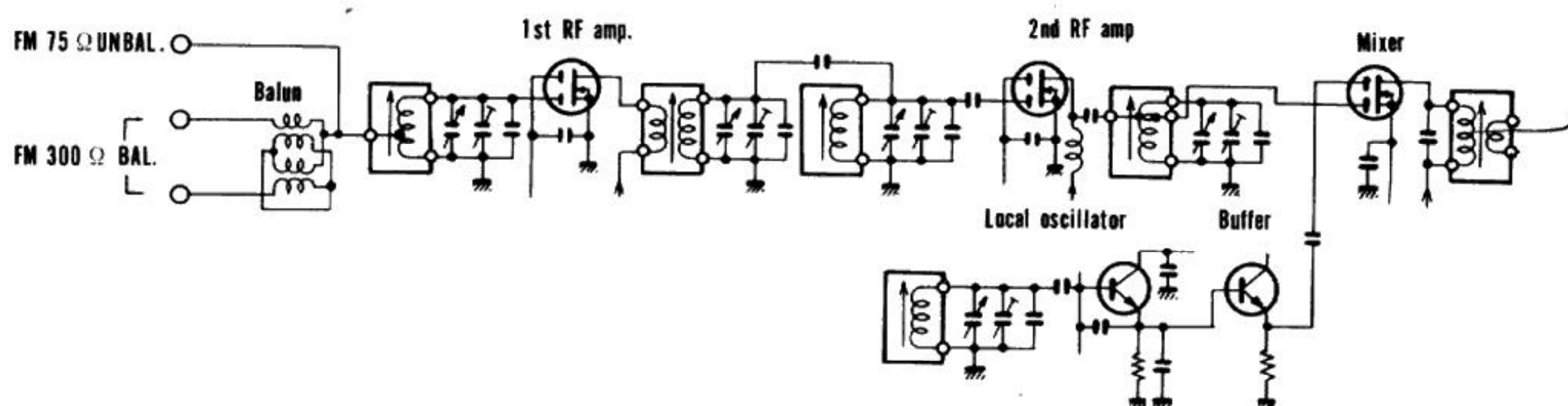


Fig. 1. Circuitry of FM front end

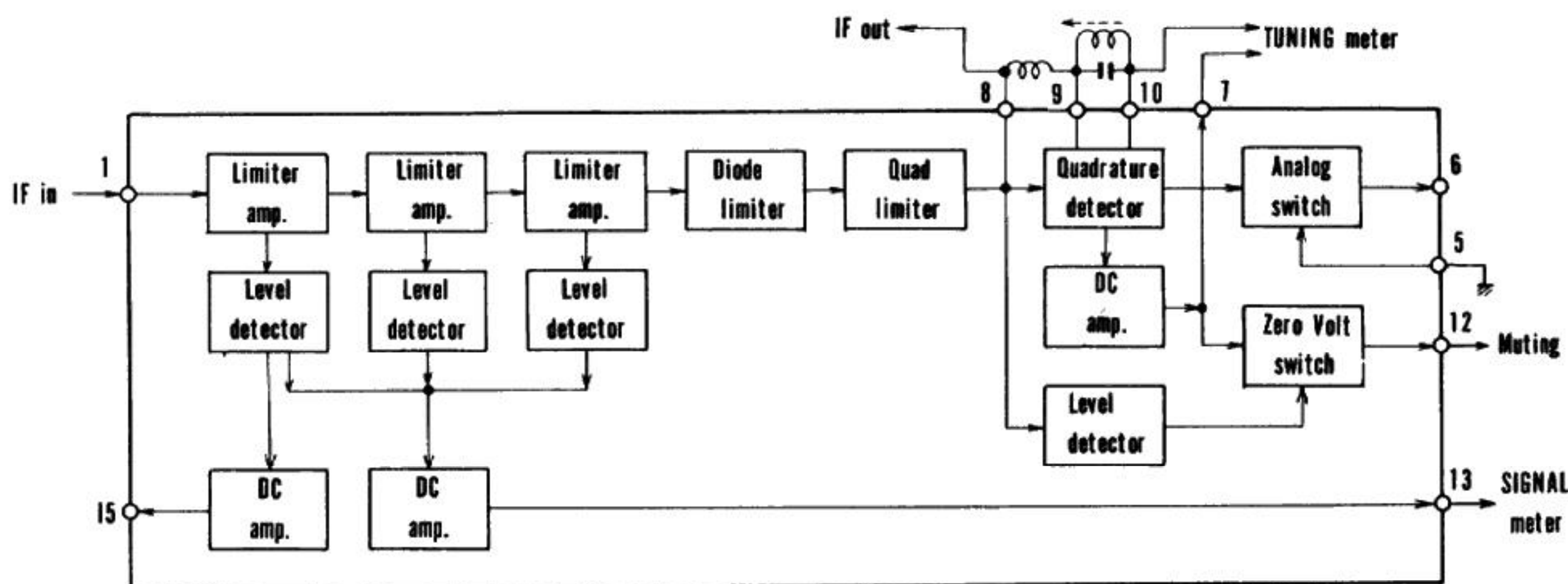


Fig. 2. Block diagram for HA1137

Multiplex Decoder

The multiplex decoder contains three sections and employs an IC (HA1196) with a block diagram as shown in Fig. 3 (see page 55 for circuit).

1. Switching Signal Generator

A PLL (phase locked loop) system is employed. 76kHz is generated by the VCO (voltage controlled oscillator: an oscillator in which frequency is controlled by a voltage) and converted into 38kHz by a frequency divider, then divided again to become 19kHz. This signal and the stereo pilot component (19kHz) of the detected signal are applied to a phase comparator where the difference between them is converted into a voltage. By feedback this voltage is applied to the VCO. And the oscillator signal is locked to the pilot signal. This loop is termed PLL and a 38kHz switching signal synchronized to the pilot signal is obtained and employed as a switching signal.

2. Automatic stereo detector

With the PLL locked to the pilot signal, the pilot signal and a 19kHz signal of the same phase are produced. A voltage is then obtained at the phase comparator that is proportional to the pilot signal amplitude. As it increases, the lamp lights and the switch becomes on. The switching signal is applied to the demodulator.

However, if the FM muting signal is also applied to pin 12, the detector circuit becomes disabled (grounded). Therefore a switching signal to the demodulator is not supplied and mono reproduction is obtained.

3. Demodulator

Two differential amplifiers are employed in a switching circuit (Fig. 4). The composite signal is applied to the base of Q3. Q1 and Q2 are alternately switched ON and OFF by the switching signal. The composite signal amplified at Q3 is demodulated by the switching of Q1 and Q2. Q6 and Q3 are loosely coupled at their emitters by R1, R2 and R3. Q6 is driven in opposite phase to Q3 and its low level composite signal output is demodulated by switching of Q4 and Q5. The demodulated signals in opposite phase are combined at the collectors of Q1 and Q2, cancelling crosstalk. Adequate current flow is required in Q3 and Q6 for low distortion. However, if the base bias voltage is raised, the voltage range available at the collector is reduced and clipping occurs (power supply voltage is limited by IC voltage requirement). For this reason, current from an external source is inserted at Q3 and Q6 collectors and become I1 and I2 in Fig. 4. The same amount of current is removed at the emitters of Q3 and Q6 to become I3 and I4 in Fig. 4. Q3 and Q6 therefore operate with adequate current and distortion in this stage is remarkably reduced. A feedback amplifier amplifies the demodulated signal to produce the IC outputs.

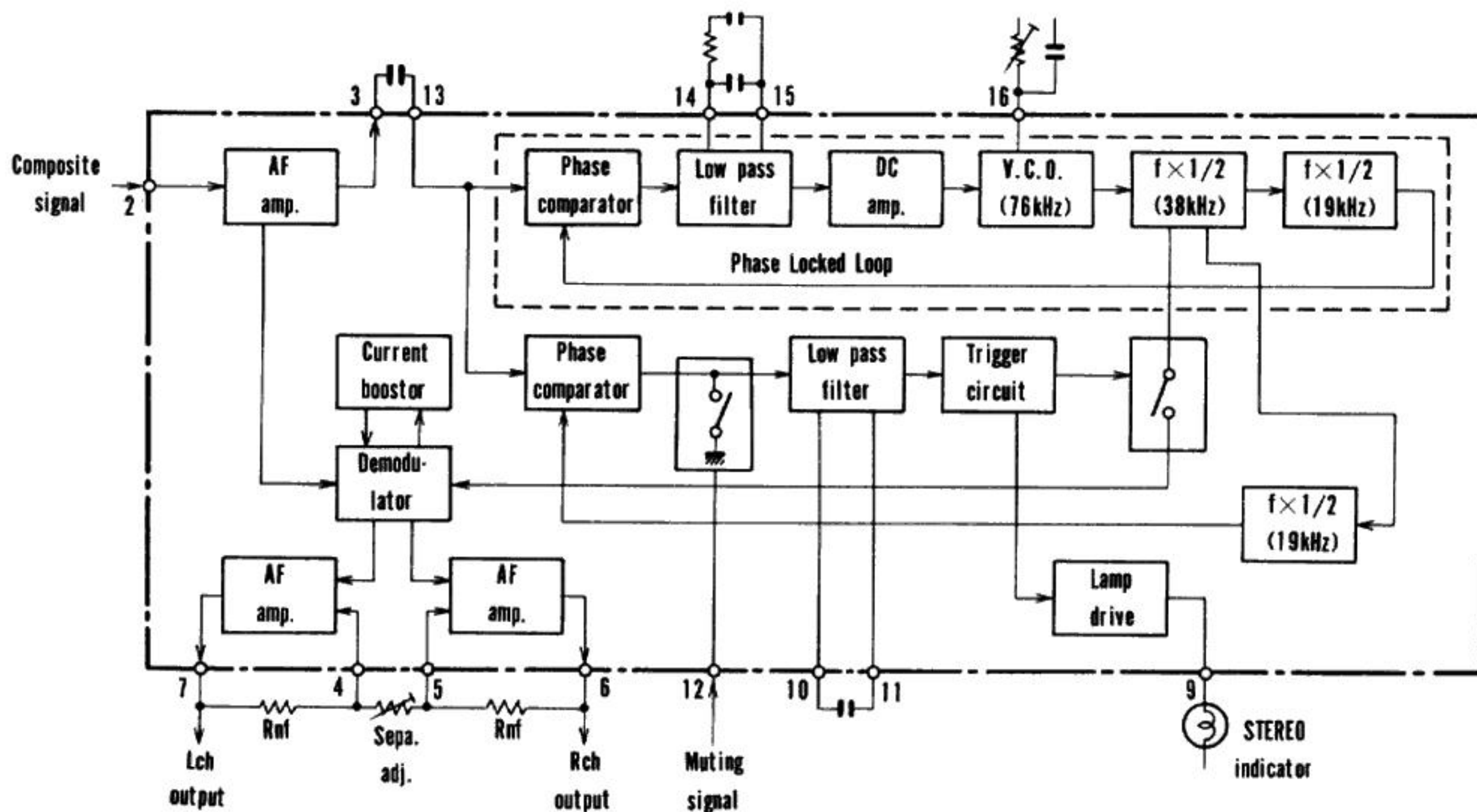


Fig. 3. Block diagram for HA1196

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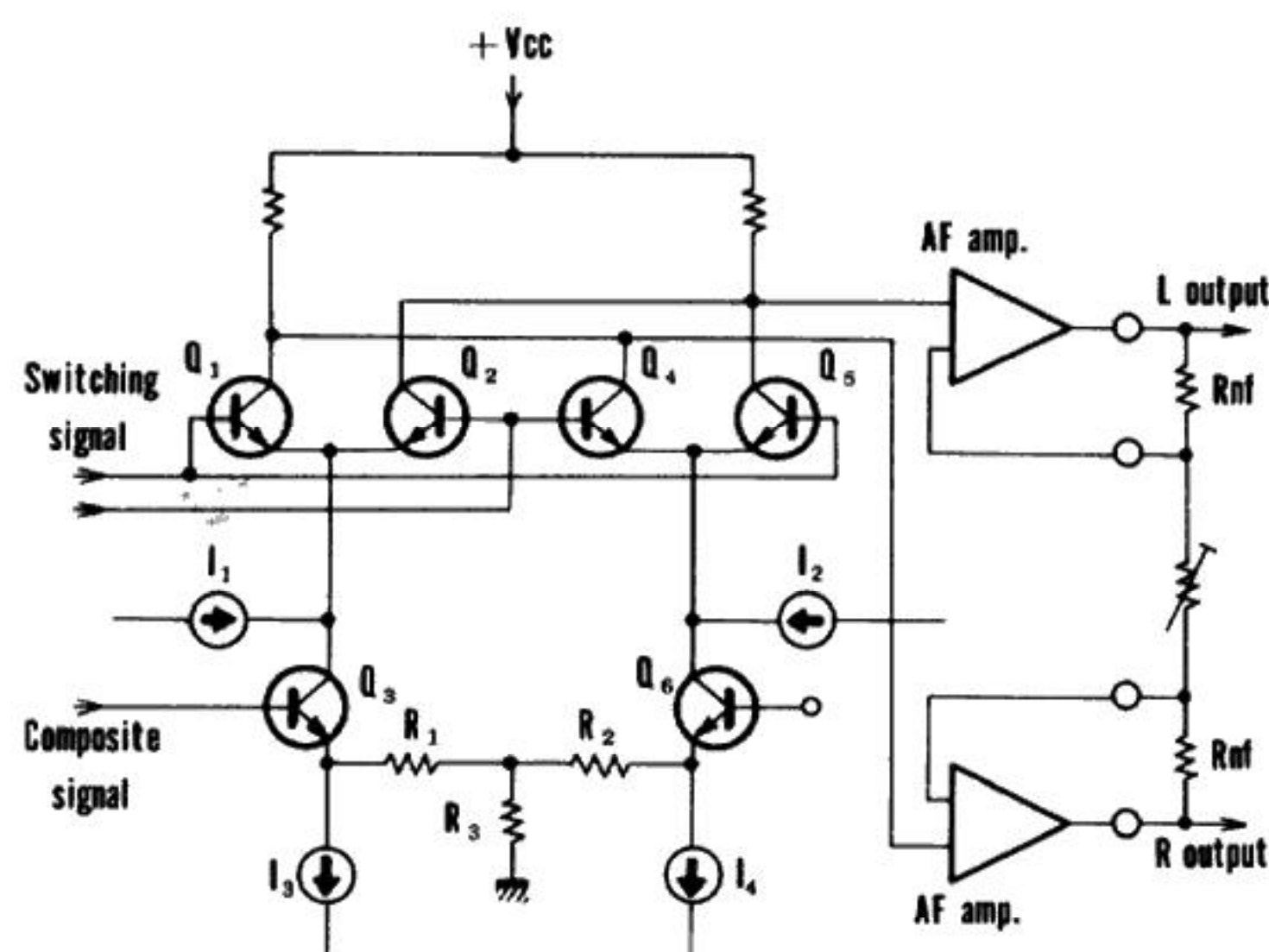


Fig. 4. Basic circuitry of demodulator

FM Muting Circuit (Fig. 5)

DC voltage emerges from pin 12 of IC (HA1137) in the event of more than $\pm 70\text{kHz}$ detuning or low input level (less than $4.9\mu\text{V}$ antenna input conversion). This is employed for shorting the AF output circuit to perform muting by the reed relay.

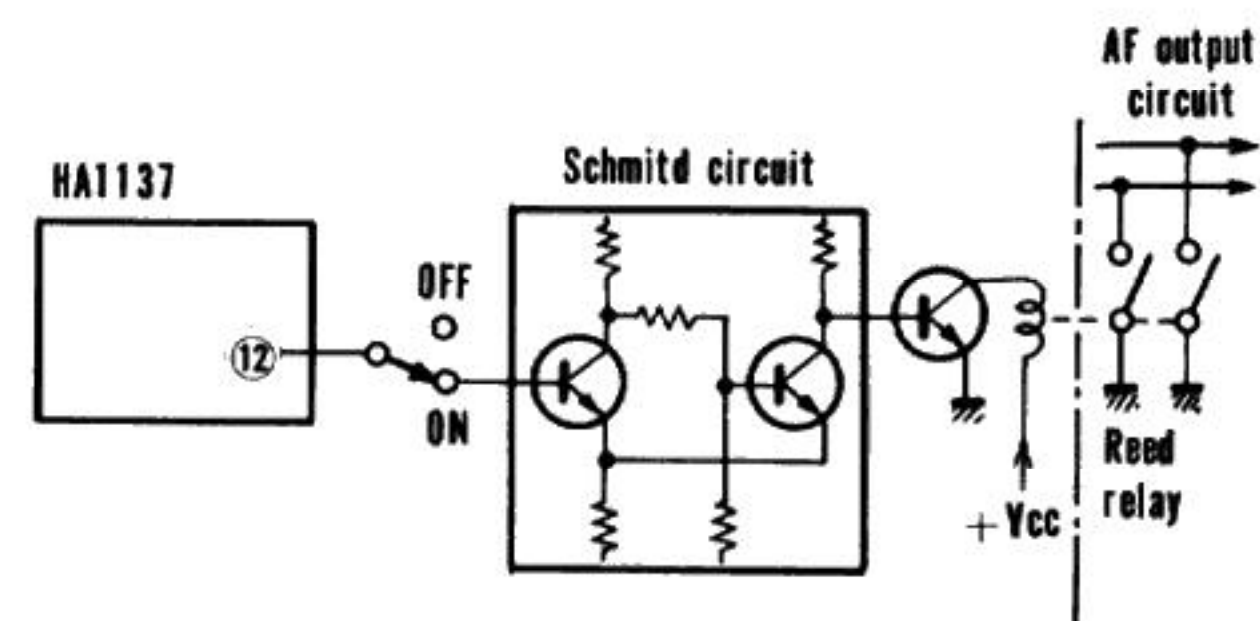


Fig. 5. Circuitry of FM muting

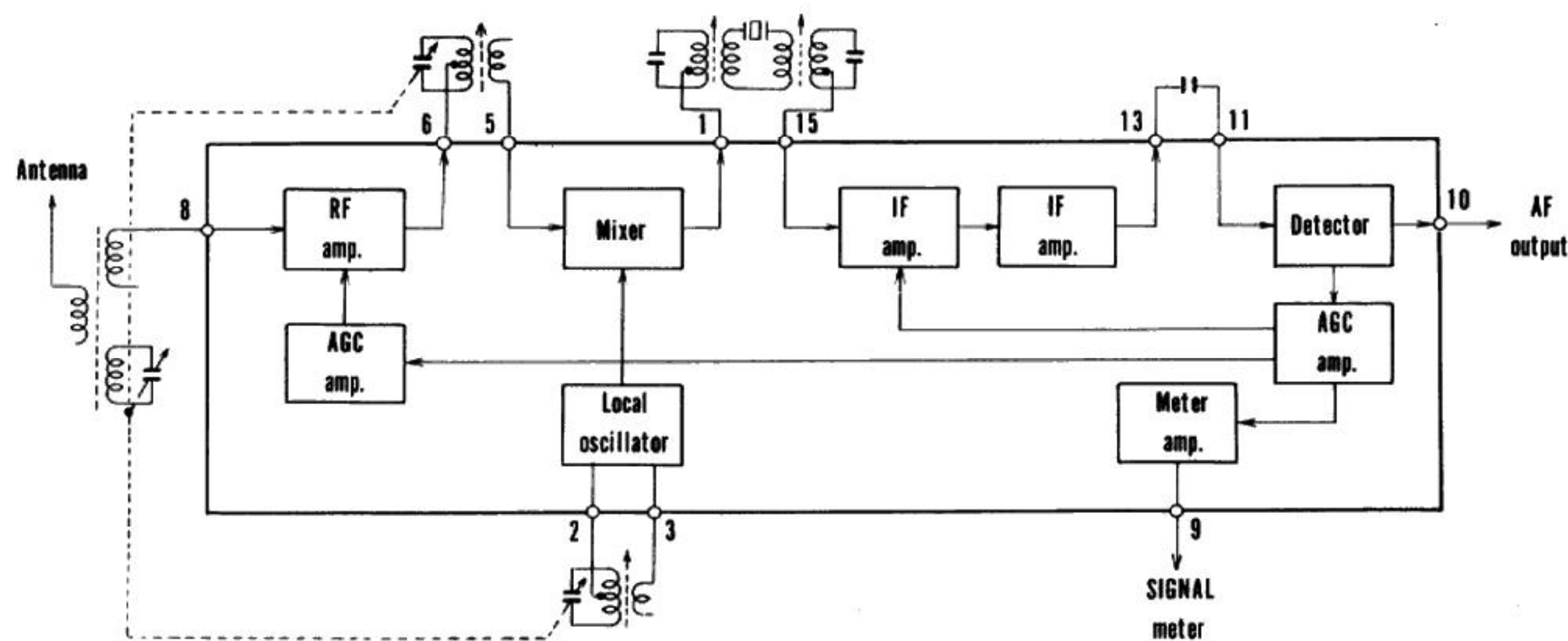


Fig. 6. Block diagram for HA1138

Multipath Monitor Circuit

When multipath reflections exist in the received signal, the signal is converted into AM and PM (amplitude modulation and phase modulation) forms. Since the amplitude of the actual FM signal is fixed, by converting this AM component into a sound and listening to it, the existence (and amount) of multipath reflection can be determined. Short term level variations (audio frequency) are taken as a signal from HA1137 SIGNAL meter drive terminal (pin 13). By setting the FM MULTIPATH switch to ON during FM reception, this signal becomes connected to the audio amplifier and can be heard as a sound which indicates conditions of multipath reflection.

AM Tuner

The AM tuner employs a 3-gang variable capacitor and an IC (HA1138) with 1-stage of RF and 2-stage of IF amplification. Fig. 6 shows the HA1138 block diagram (see page 55 for circuit).

4.2 AUDIO SECTION

Equalizer Amplifier

The equalizer amplifier is shown in Fig. 7. The first stage (Q1 & Q2) is a PNP transistor unbalanced differential amplifier. High voltage gain is provided in the following stage (Q3) by a bootstrap circuit (C1 & R1). The output stage (Q4 & Q5) is a complementary symmetrical SEPP circuit. The high voltage utility factor of the SEPP circuit provides a high maximum output voltage. Dynamic range of the equalizer amplifier is therefore wide and overload input level at 0.1% distortion is 500mV (rms at 1kHz).

Equalizer elements (C2, C3, R2, R3) are polystyrene film capacitors with tolerances within $\pm 1\%$ and metal film resistors with tolerances better than $\pm 1\%$. These lead to a deviation with respect to the RIAA playback standard within $\pm 0.2\text{dB}$. Due to the balanced plus and minus power supply, the input and the output points become essentially 0V, reducing click noise during FUNCTION switch operation.

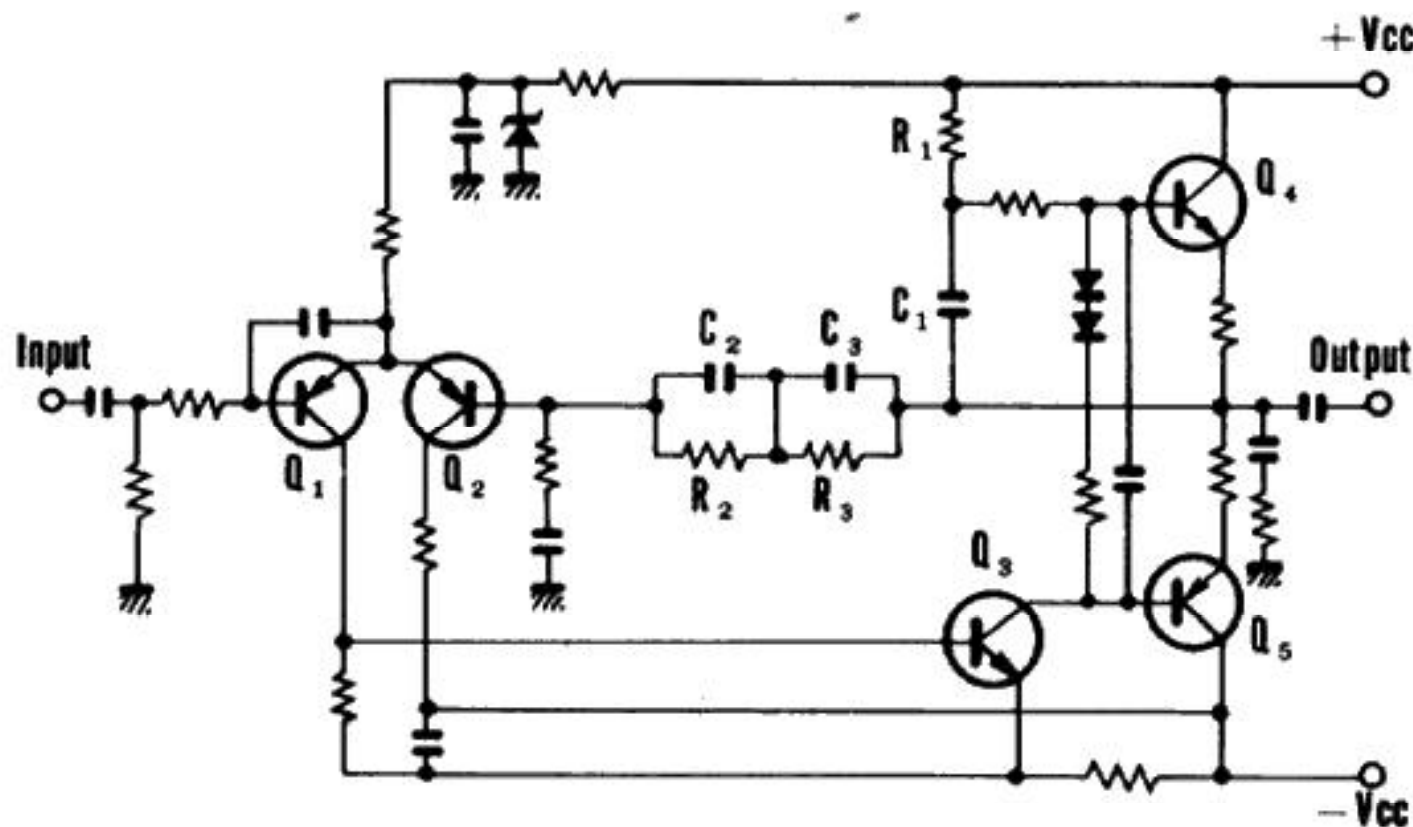


Fig. 7. Schematic diagram for Equalizer amplifier

Tape and Adaptor Circuits

With the DUPLICATE switch OFF, the program source selected by the function switches are obtained at the TAPE REC jacks (Fig. 8).

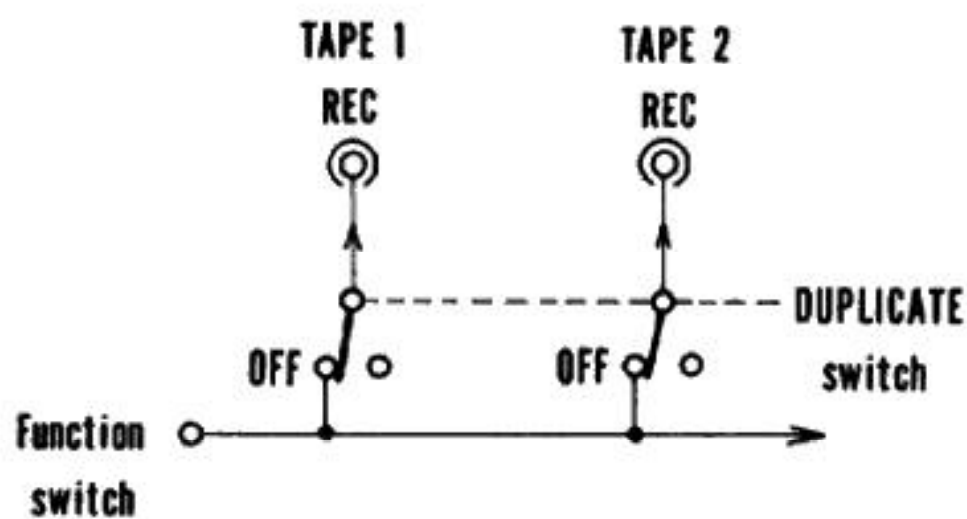


Fig. 8. TAPE REC jacks

The TAPE MONITOR 1 switch selects between the program source selected by the function switch and the input at the TAPE 1 PLAY jacks (Fig. 9). The TAPE MONITOR 2 switch selects between the signal selected by the TAPE MONITOR 1 switch and the input at the TAPE 2 PLAY jacks (Fig. 9).

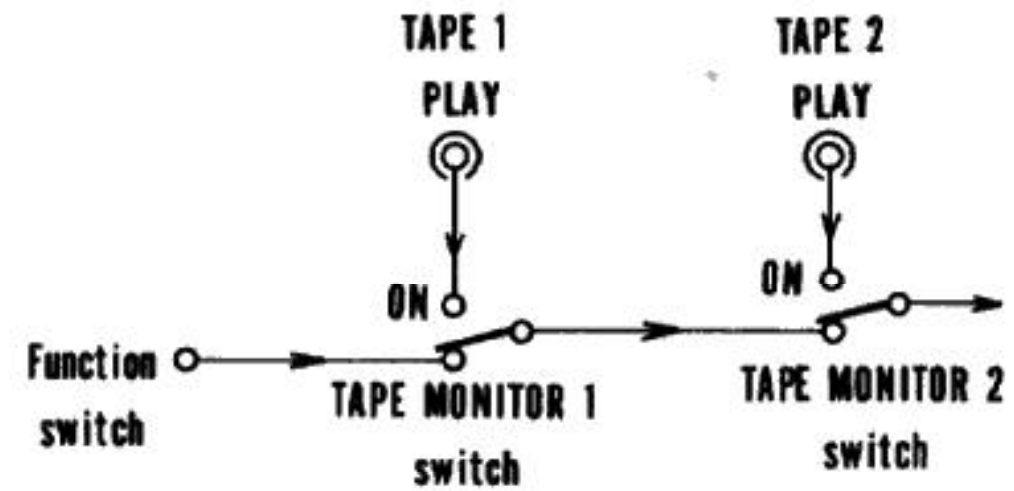


Fig. 9. Tape monitor circuit

When the DUPLICATE switch is set to ON, the TAPE 1 REC jacks are connected to the TAPE 2 PLAY jacks, and the TAPE 2 REC jacks to the TAPE 1 PLAY jacks (Fig. 10).

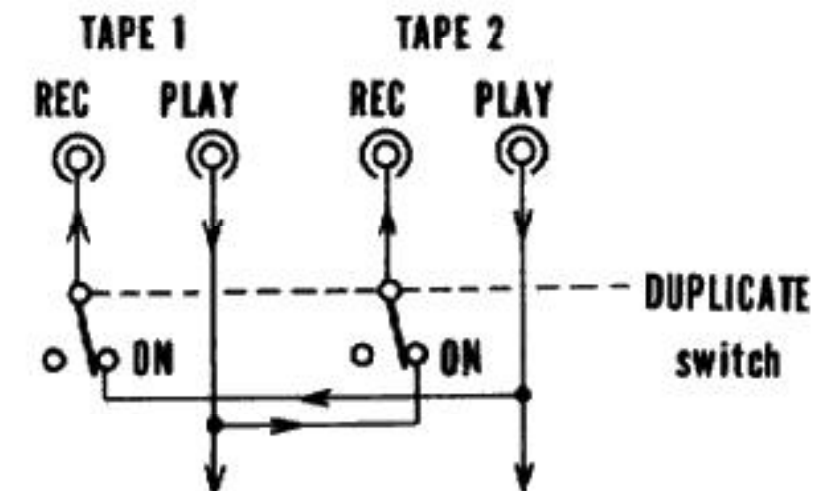


Fig. 10. Tape duplicate circuit

The signal selected by the TAPE MONITOR 2 switch appears at the ADAPTOR OUT jacks (Fig. 11). The ADAPTOR switch selects between the signal selected by the TAPE MONITOR 2 switch and the input at the ADAPTOR IN jacks (Fig. 11).

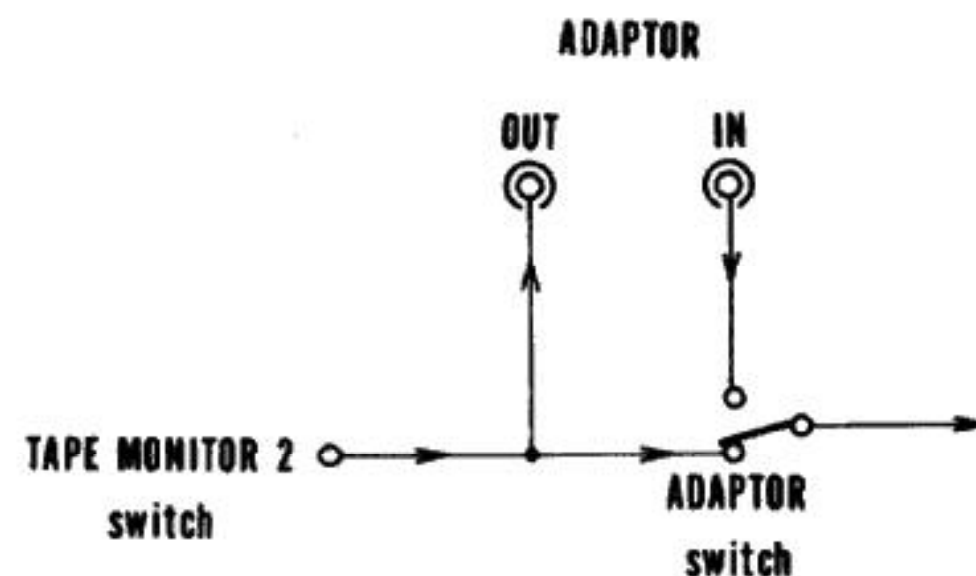


Fig. 11. ADAPTOR jacks

MODE Switch

When the MODE switch is set to the MONO position, the left and right channels are shorted in the stage following the tape and adaptor circuits.

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BALANCE Control

A no-loss HB type variable resistor at center position is employed. An SEPP circuit is inserted as a buffer in the following stage.

Muting Circuit

When the MUTING switch is set to the -20dB position, the signal is attenuated by 20dB.

Loudness Circuit

This circuit is operated ON or OFF by the LOUDNESS switch and is intended to compensate for audibility characteristics of the human ear at low volumes. The VOLUME control variable resistor is tapped. Connecting a CR network at this point enhances low and high frequencies at low volumes.

Tone Controls

Twin tone controls are employed with the SX-1250. These consist of ultra-low and ultra-high (sub) controls in addition to the conventional BASS and TREBLE (main) controls.

The signal is amplified to required level by a 2-stage FET and transistor direct coupled amplifier, after which a 2-stage NFB type tone control circuit is provided. The sub controls form the first stage and the main controls form the second stage of this circuit. With NFB type tone controls, C-B feedback is applied to a single transistor amplifier. Frequency response becomes variable by providing selectivity in the feedback circuit. The basic circuit of this stage is shown in Fig. 12.

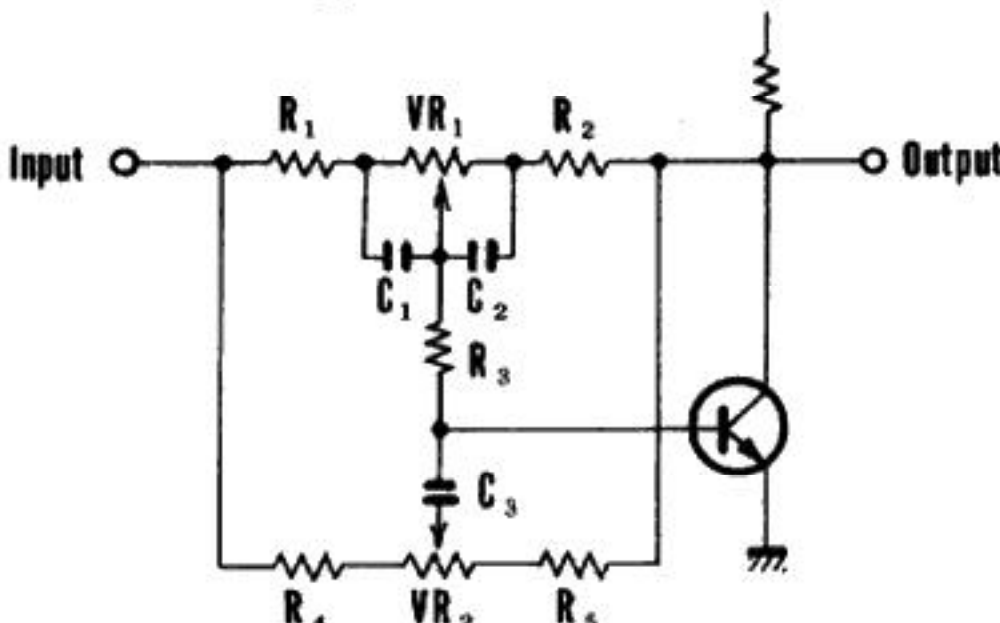


Fig. 12. Basic circuitry of NFB type tone control circuit

Midrange Operation

The C1 and C2 reactances are considerably smaller than VR1 at frequencies above midrange, effectively shorting VR1. At frequencies below midrange, C3 reactance becomes large and in effect, opens the circuit. Consequently, the circuit becomes equivalent to that shown in Fig. 13 with respect to the midrange. In this figure, the circuit parameters are not changed by any change in position of the VR1 and VR2 sliders. The NFB amount is therefore fixed and the circuit gain is also fixed without regard to VR1 and VR2 slider positions.

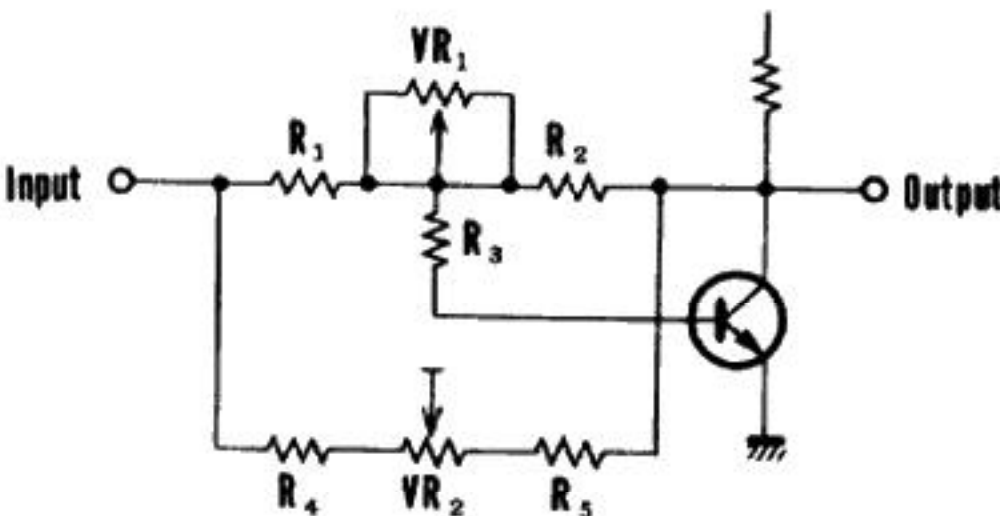


Fig. 13. Midrange operation of NFB type tone control circuit

Low Frequency Operation

The reactance of C1 and C2 increases at low frequency to form a circuit as shown in Fig. 14. This reactance increases in proportion to the frequency declines. Also, the NFB amount varies greatly according to VR1 slider position. The circuit gain at low frequencies can therefore be varied by VR1.

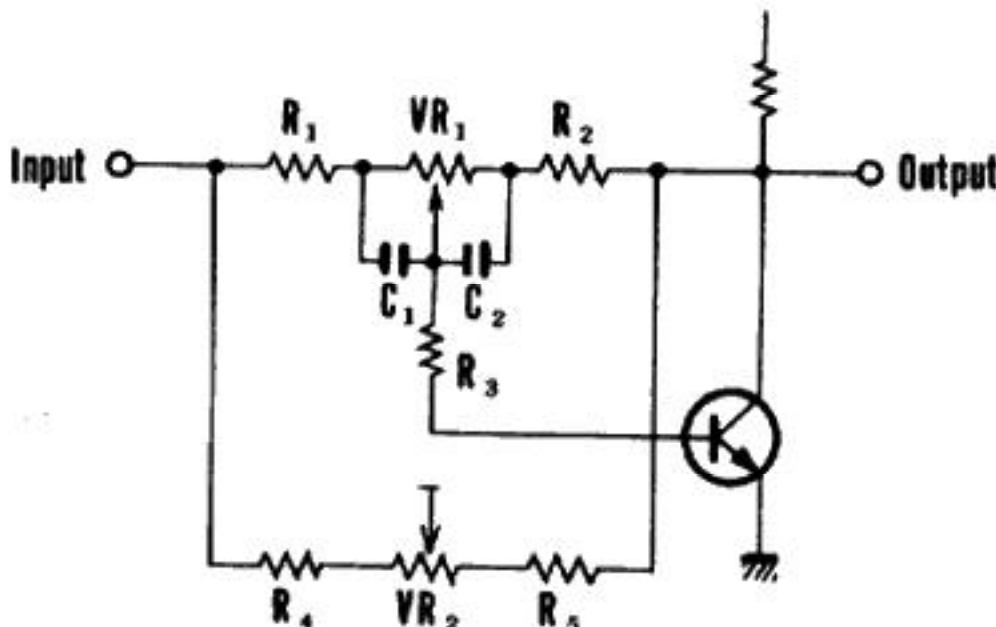


Fig. 14. Low frequency operation of NFB type tone control circuit

High Frequency Operation

The considerably smaller reactance of C1 and C2 at high frequency in comparison with VR1 effectively shorts VR1 to form an equivalent circuit such as that shown in Fig. 15. C3 reactance decreases in the same degree that the frequency increases and the NFB amount is now mainly controlled by the VR2 slider position. Consequently, the gain at high frequencies can be varied by VR2.

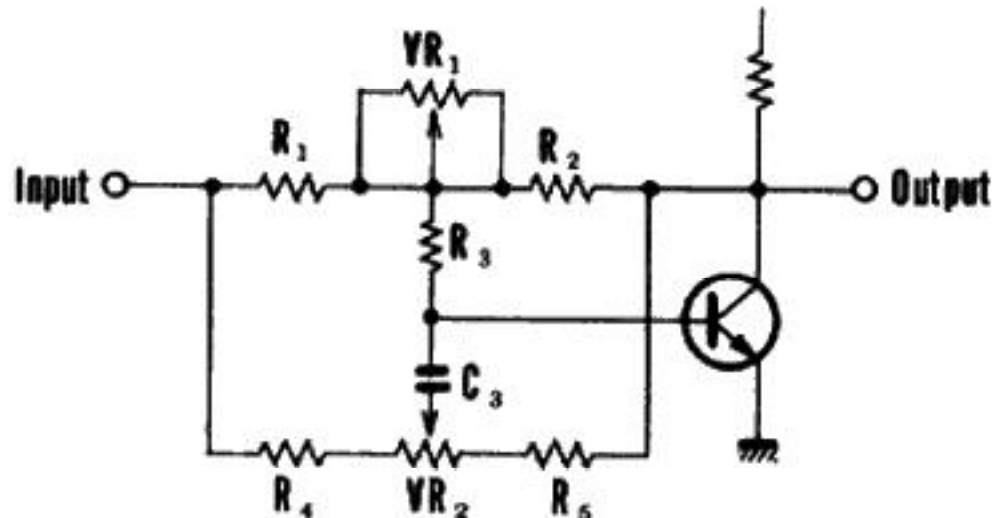


Fig. 15. High frequency operation of NFB type tone control circuit

Tone Defeat Circuit

By setting the TONE switch to OFF, the above described tone control circuit becomes bypassed.

Filter Circuits (Fig. 16)

These are NFB type active filters with -12dB/octave slopes. The circuit combines a 2-stage CR element and emitter follower. Normal function of the emitter follower is provided in the passband and by 100% NFB, gain becomes essentially "1". NFB is cancelled in the area of the cutoff frequency, composing a peak in the frequency response. This leads to improved and sharper CR filter response. In the actual circuit, CR elements for low and high filters both employ the same emitter follower and each can be selected ON-OFF.

Power Amplifier

Fig. 17 shows the power amplifier section. The input stage is composed of Q1 & Q2 differential amplifier, with the input signal applied to Q1. Q3 & Q4 differential amplifier comprise the second stage, with Q3 output composed at Q4 by Q5 & Q6 current mirror. Connecting collector and base of Q5 produces the equivalent of a diode. Q3 collector current produces a forward voltage between Q5 base and emitter, biasing Q6. R1 and R2 in this circuit are equal, while Q5 and Q6 are the same type transistors. Consequently, when voltages between bases and emitters of Q5 & Q6 are equal, current flows in these transistors also become equal. This results in equal current flows in Q3 and Q6. Mutually opposite phase signals drive Q3 and Q4, resulting in mutually opposite phase collector currents. Q4 and Q6 therefore operate as push-pull.

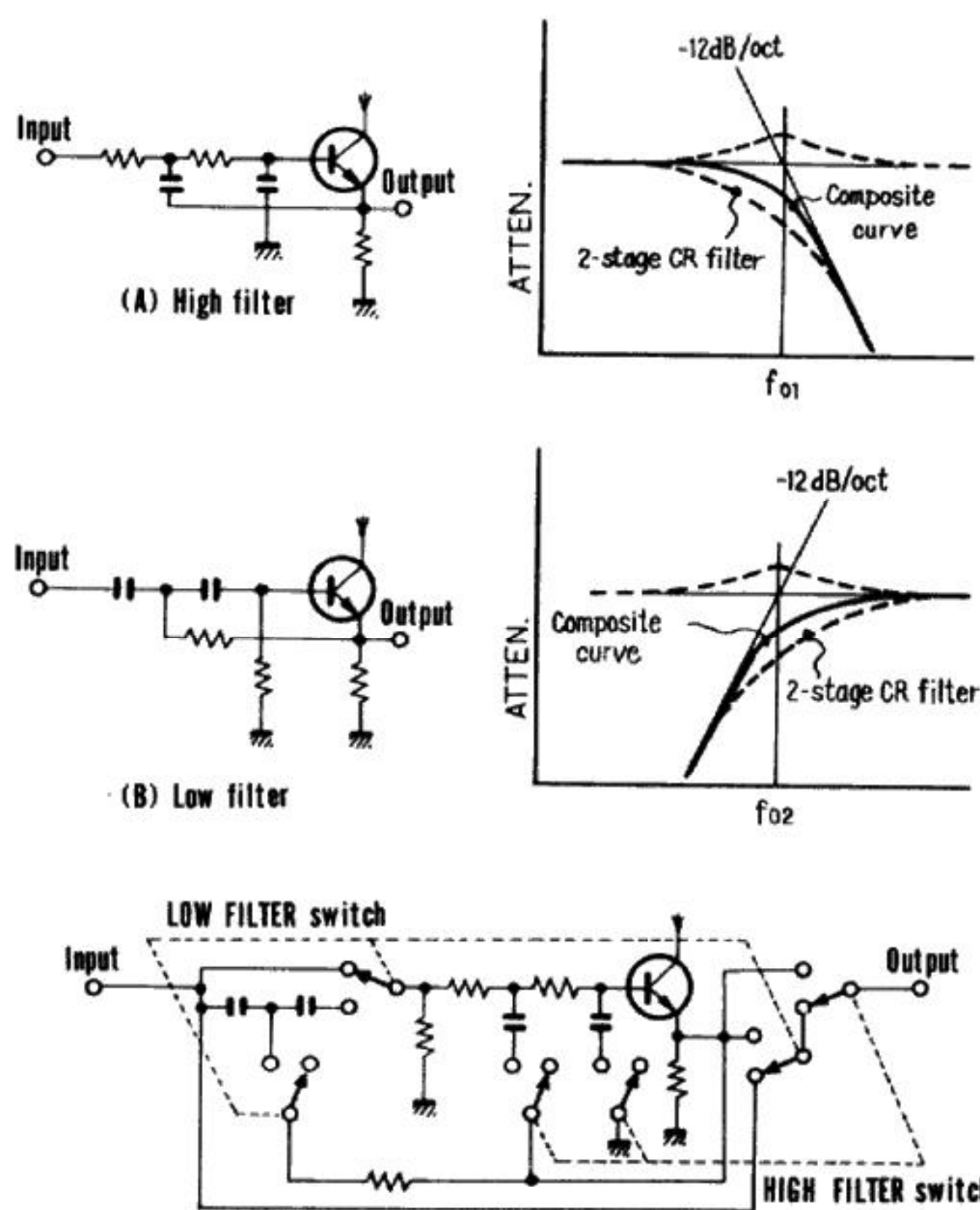


Fig. 16. Basic circuitry of filters

Power stage bias voltage is supplied by the voltage drop across D1, D2 and VR2. VR2 is a semi-fixed resistor for power stage bias adjustment, while D1 and D2 are Varistors for temperature compensation.

A 3-stage Darlington connection is employed in the power stage (Q7–Q14), with output transistors Q11–Q14 in a complementary symmetrical parallel

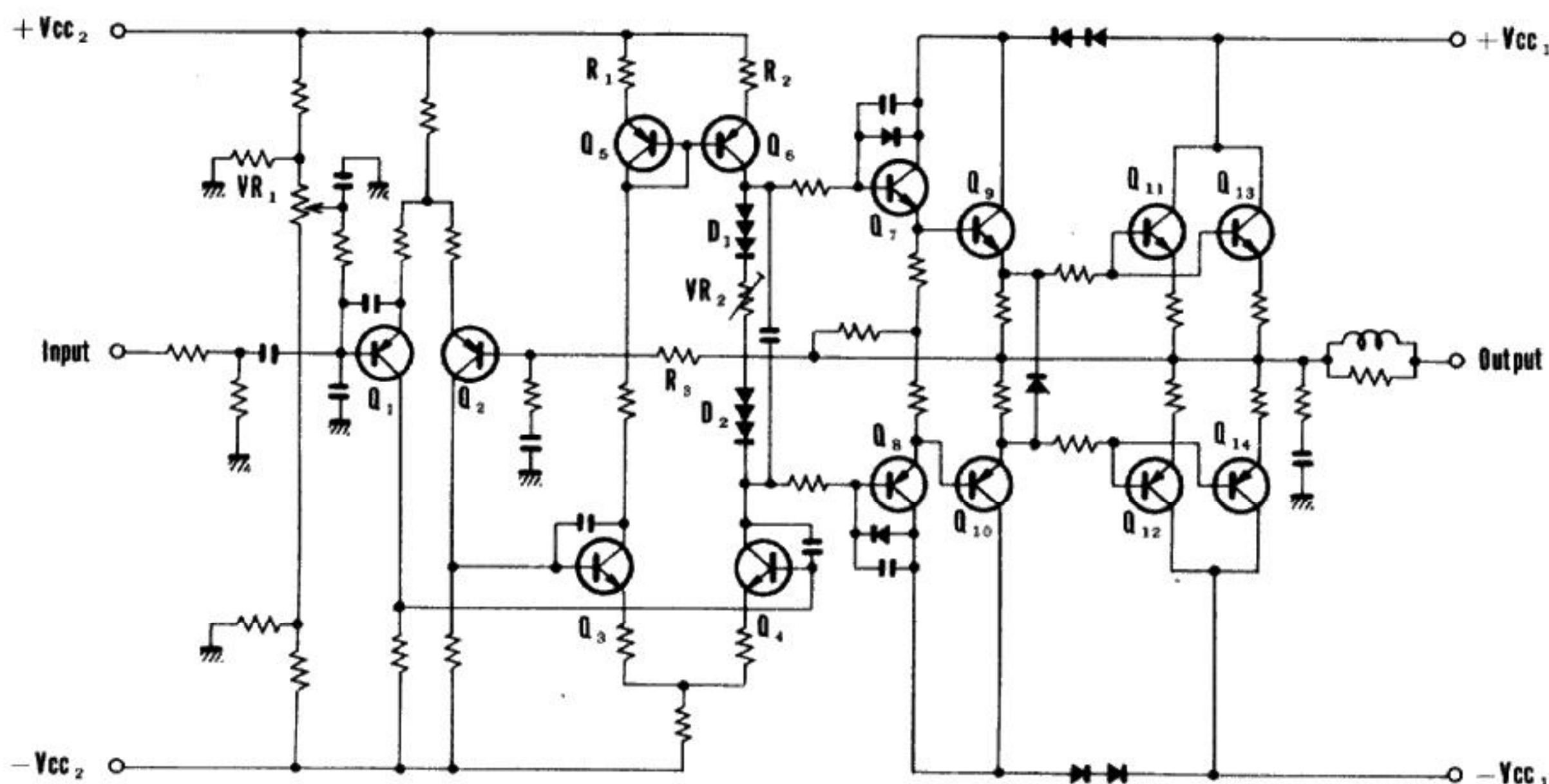


Fig. 17. Schematic diagram for power amplifier

SX-1250

connection. The output center point is at 0V from the balanced plus and minus power supply, while 100% DC NFB is applied to Q2 through R3. Because of this, circuit DC gain becomes 0dB and DC voltage of the output center point is determined by Q1 base voltage. VR1 is a semi-fixed resistor for fine adjustment of the center point voltage to compensate for irregularities in circuit elements.

SPEAKERS Switches

The SX-1250 is provided with 3 sets of speaker terminals (A, B, C). Since the power amplifier can become overloaded if all three sets are used simultaneously, when all 3 SPEAKERS switches are set to ON, the circuit functions as if all switches were OFF and the indicator lamps extinguish.

4.3 PROTECTION CIRCUIT

This circuit protects the power transistors in case of overload, the speakers in case of power amplifier malfunction, and also performs a muting function when the power supply is turned ON or OFF. The protection circuit is composed of three sections (Fig. 18).

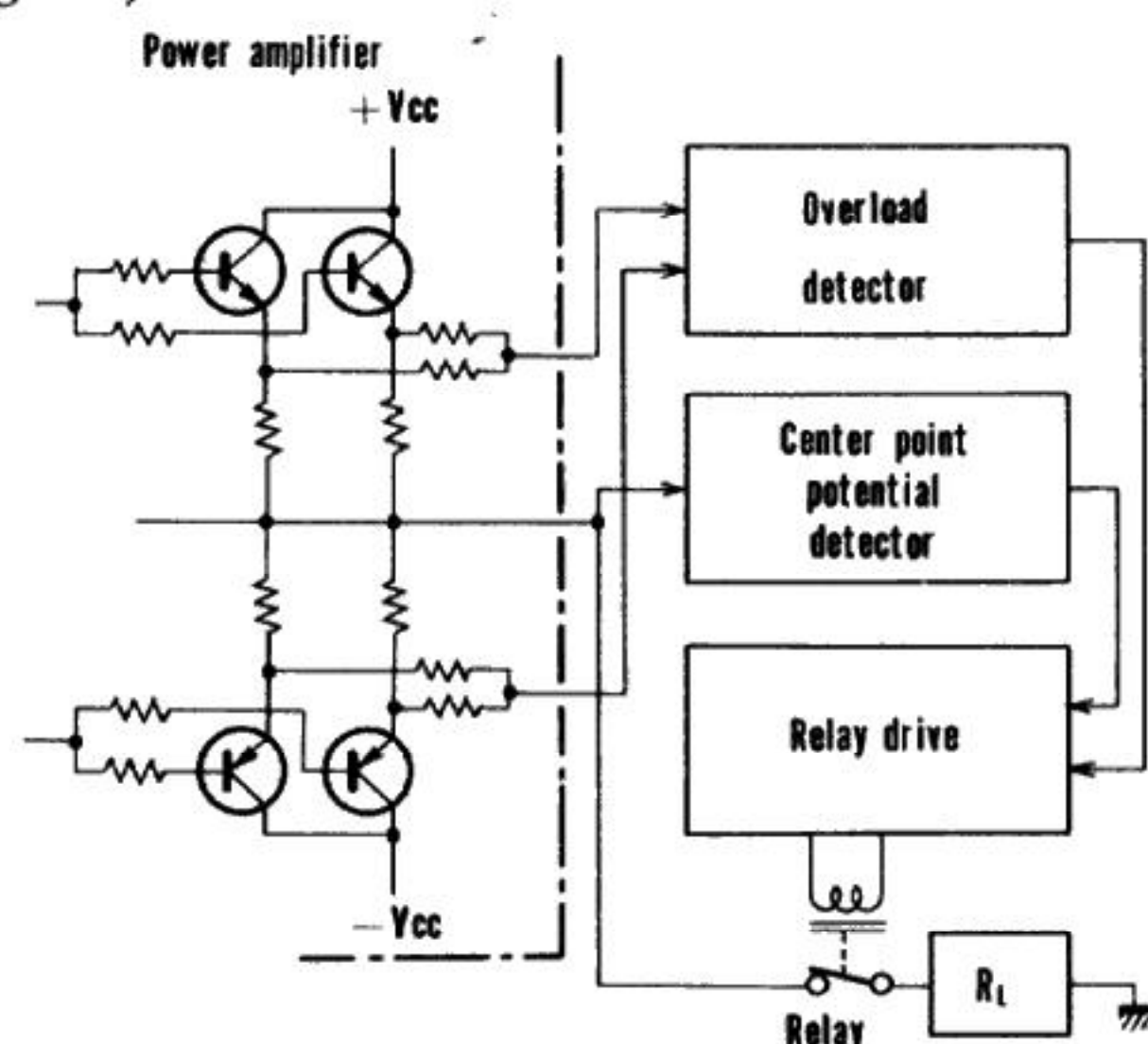


Fig. 18. Block diagram of protection circuit

1. Relay Driver Circuit (Fig. 19)

The relay which connects the output circuits is driven by this circuit. It also performs a muting function to prevent unpleasant noise during ON-OFF operation of the power supply as well as opening the output circuit on command from the detector circuits.

Muting Operation

When the power supply is turned ON, Q6 base is reverse biased through D6 and R19—R21, turning Q6 OFF. Q7 base potential rises as C4 charges through R22 & R23, and Q7 turns ON several seconds later. The collector current of Q7 then

flows through the relay coil, operating the relay to turn on the power amplifier output circuit. The reverse bias of Q6 base from D6 & R19—R21 disappears when the power supply is set from ON to OFF. Q6 remains ON however, due to the residual power supply voltage. C4 very rapidly discharges, Q7 base potential drops and Q7 turns OFF. The relay releases and the power amplifier output circuit turns OFF.

Note:

Q5 is normally OFF due to base bias and does not participate in the muting operation.

Operation by Detector Circuit Command

Command from the detector circuits pass through one of D3, D4 or D5 and are applied in the form of a current flow. Q5 is normally reverse biased through R14, but when a large current flows through one of these diodes, Q5 base potential declines according to the voltage drop at R14. Q5 then becomes ON, Q6 base potential rises and Q6 becomes ON. C4 rapidly discharges and Q7 base potential drops, turning Q7 OFF. The relay releases and the power amplifier output circuit becomes cut off.

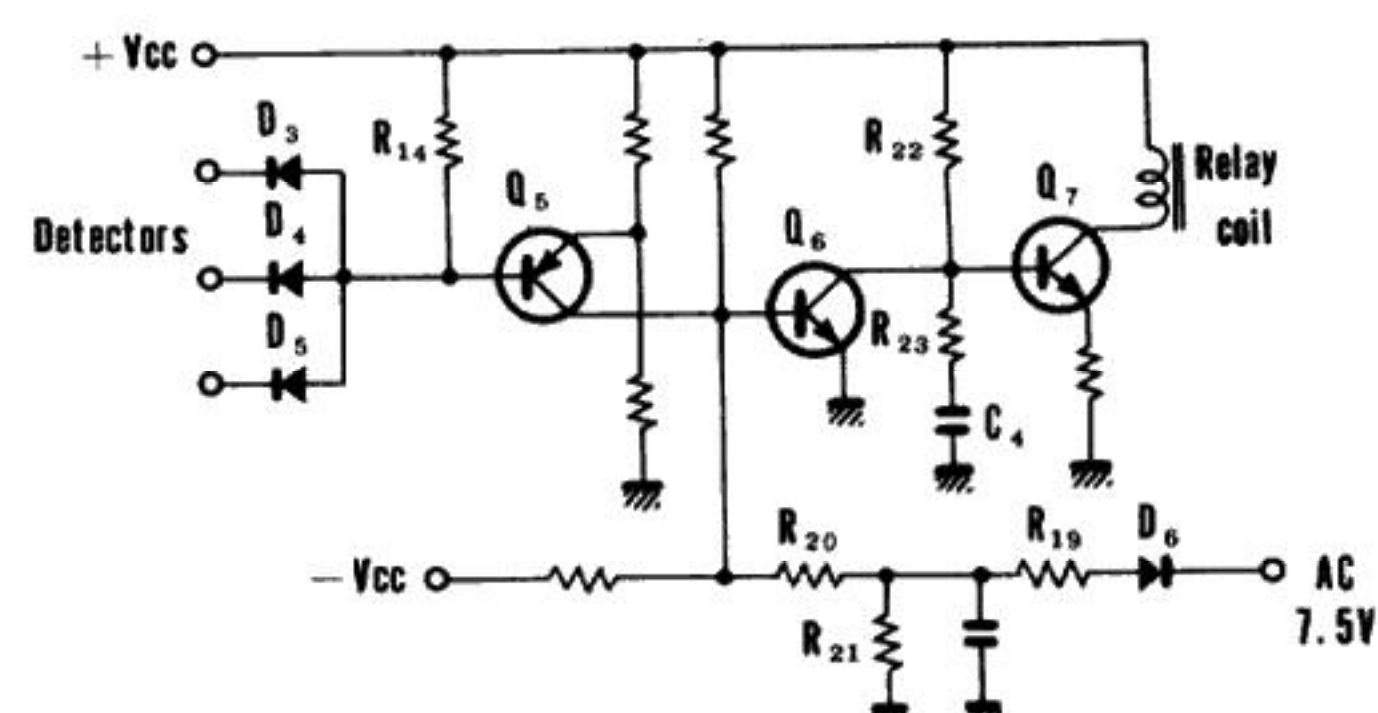


Fig. 19. Schematic diagram of relay driver circuit

2. Overload Detector Circuit

Shorting of the power amplifier load or a load impedance below the specified value causes a command to be sent to the relay drive circuit. This is illustrated in Fig. 20.

With the output stage in class B operation, when Qa is operating in the positive half cycle, Qb becomes cut off and the signal current flows as indicated by the solid arrows in Fig. 20. Point D potential at this time is the point A potential divided by R1 and R3. Also, point C potential is the point A potential divided by RE1 and RL (load). Point D is connected to Q1 base and point C to Q1 emitter through R2 and RE2. When RL is extremely small, the point C potential becomes considerably lower than point D. This potential difference forward biases Q1. Q1 turns ON and current flows in D3.

Qb operates in the negative half cycle and Qa becomes cut off. The signal flows is indicated by the broken line arrows in the center of Fig. 20. Q1 is biased by the potential difference between point C and point E. If R_L is extremely small, the point C potential becomes considerably higher than that of point E. Q1 turns ON and current flows in D3.

If large current flows in Qa and Qb, Q1 becomes ON due to the RE_1 and RE_2 voltage drops, and current flows in D3. C1 prevents faulty operation due to external noise.

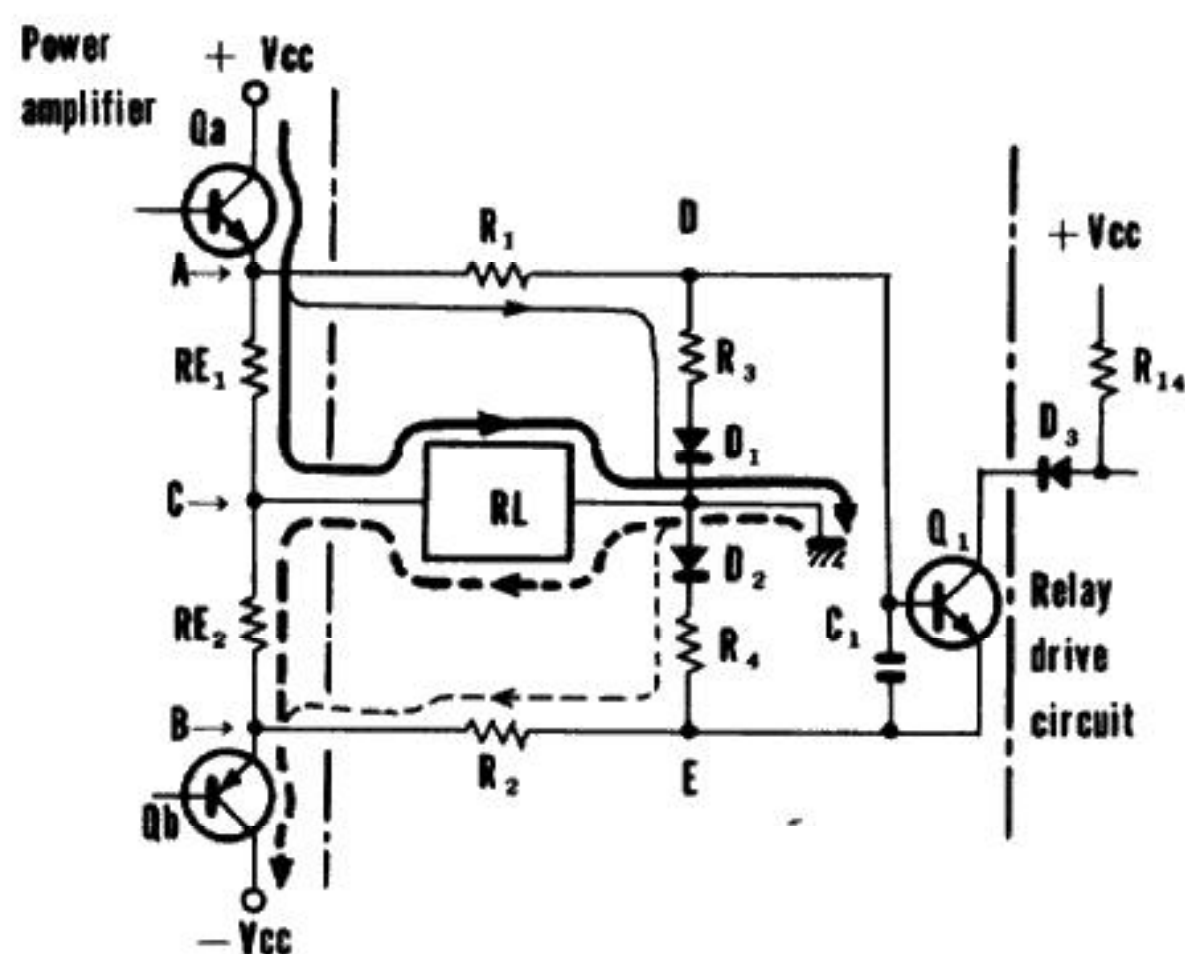


Fig. 20. Basic circuitry for overload detector

3. Center Point Potential Detector Circuit

If a DC potential is produced at the junction point of the power amplifier, a command is sent to the relay drive circuit. Fig. 21 shows this operating principle.

Q3 and Q4 compose a differential amplifier. When the same input is applied to both input terminals (Q3 and Q4 bases), no output is present. However, if there is a difference between the terminal inputs, the difference is amplified and becomes the output between the two collectors. During normal operation, an AC signal only is present at the junction point. As C_2 reactance is sufficiently low, the same signal is applied to Q3 and Q4 bases, resulting in an absence of output at the collector sides.

When a DC potential is produced at the junction point, it becomes the input of Q3 only. If the voltage is negative, Q3 collector current declines and at Q4 the collector current increases and the potential drops, causing current to flow through D4.

If the DC voltage is positive, Q3 collector current increases and the potential drops, while at Q4 the collector current decreases and the potential rises. Current therefore flows through D5.

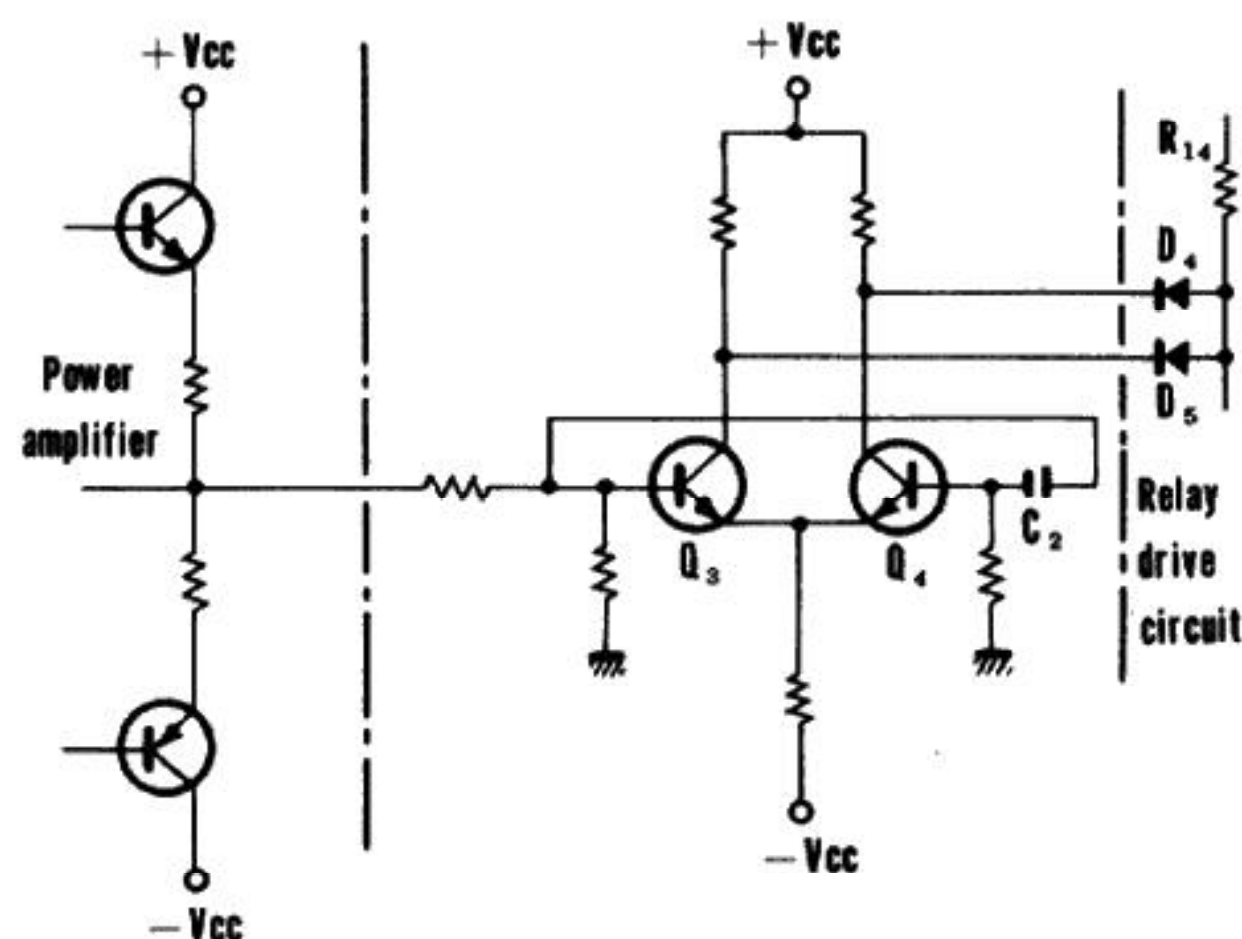


Fig. 21. Basic circuitry for center point potential detector

4.4 POWER SUPPLY CIRCUIT

All power supplied are regulated up to the power amplifier predriver stage. Independent power transformer secondary windings are employed for left and right channels in the power stage. Each channel is also supplied from an independent bridge rectifier and two 22,000 μ F capacitors. Position lamps are lighted by DC from a regulated power supply for stable illumination.

Inrush Current Suppressor Circuit

Ordinarily, power transformer inrush current when the power supply is turned on is opposed by DC resistance of the winding and instantaneous inductance of the air core. In the toroidal power transformer used in the SX-1250, both these factors are very low. Combined with the high charging current of the four 22,000 μ F capacitors in the secondary, inrush current can reach several hundred amperes. A resistor is therefore provided in series with the primary coil to suppress this inrush current to several tens of amperes. This resistor becomes shorted after power transformer excitation.

The inrush suppressor circuit is shown in Fig. 22. S1 is the POWER switch and S2 a relay contact. The Microtemp is a temperature responding fuse. S2 is open before power is turned on, connecting the power transformer primary coil in series with R1 and the Microtemp. After power has been turned on, the relay operates when DC current is obtained from the rectifier, closing S2. If S2 fails to close, due to power supply or relay malfunction, R1 heating opens the Microtemp (109°C operating temperature), thus opening the primary circuit.

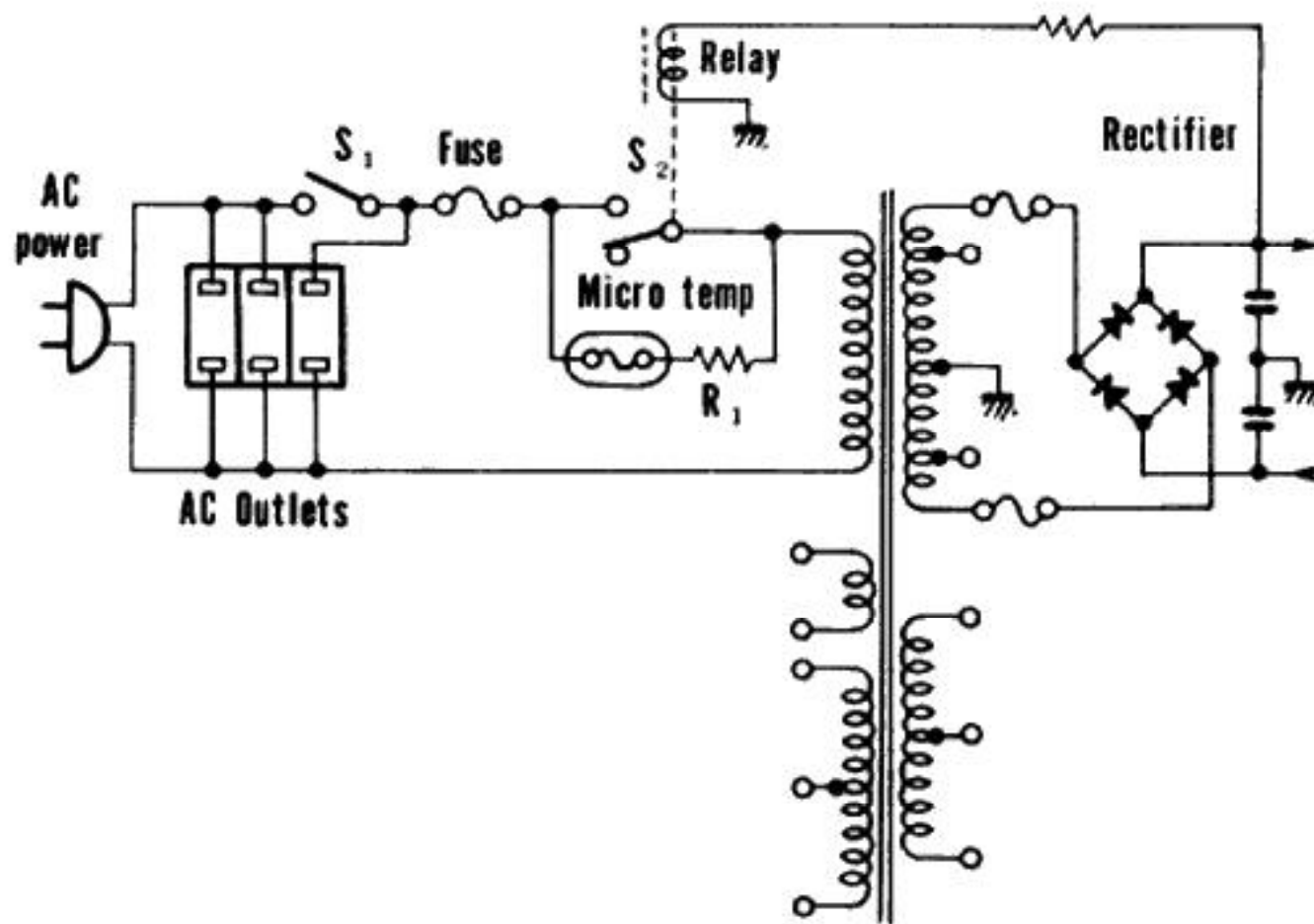
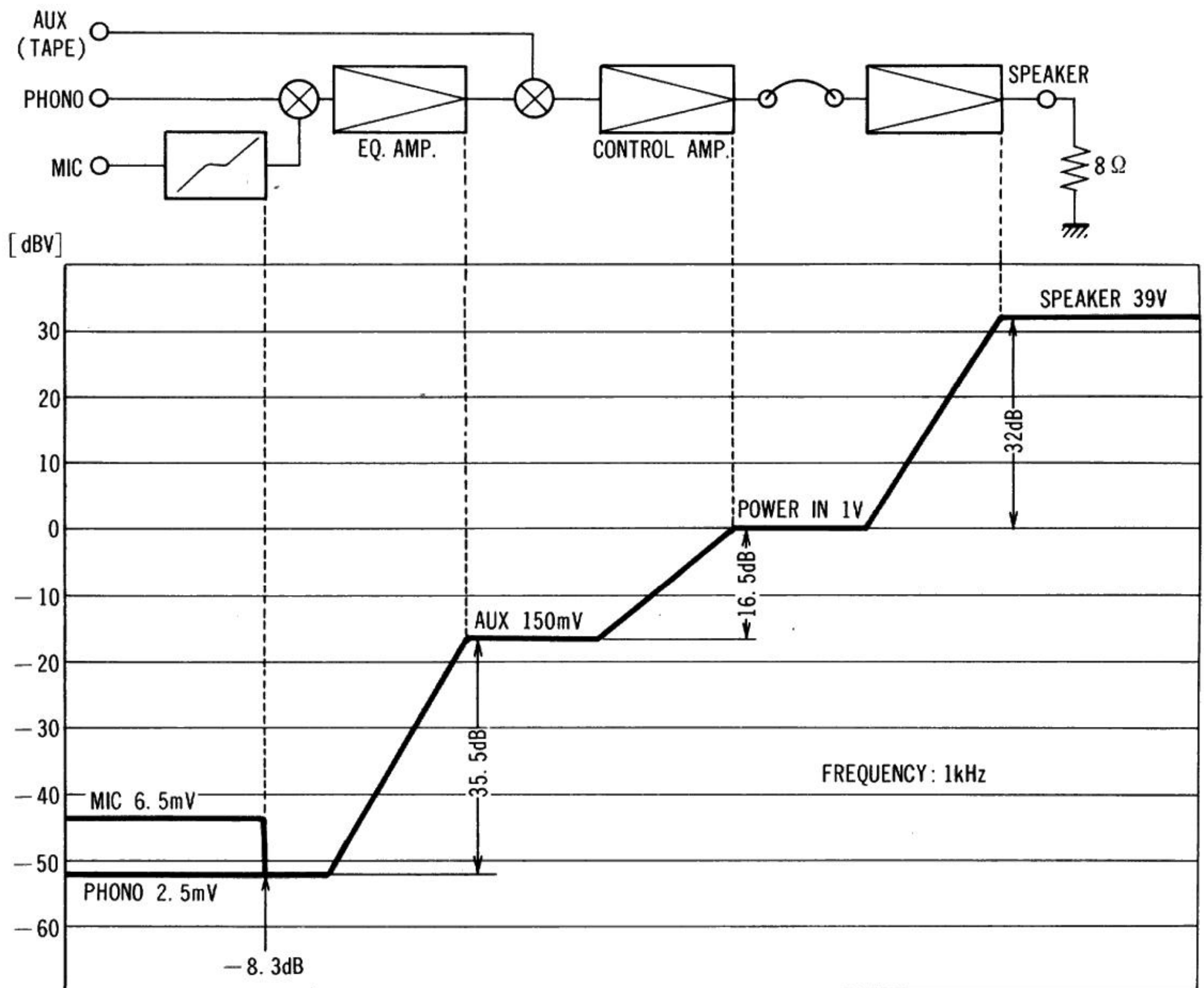
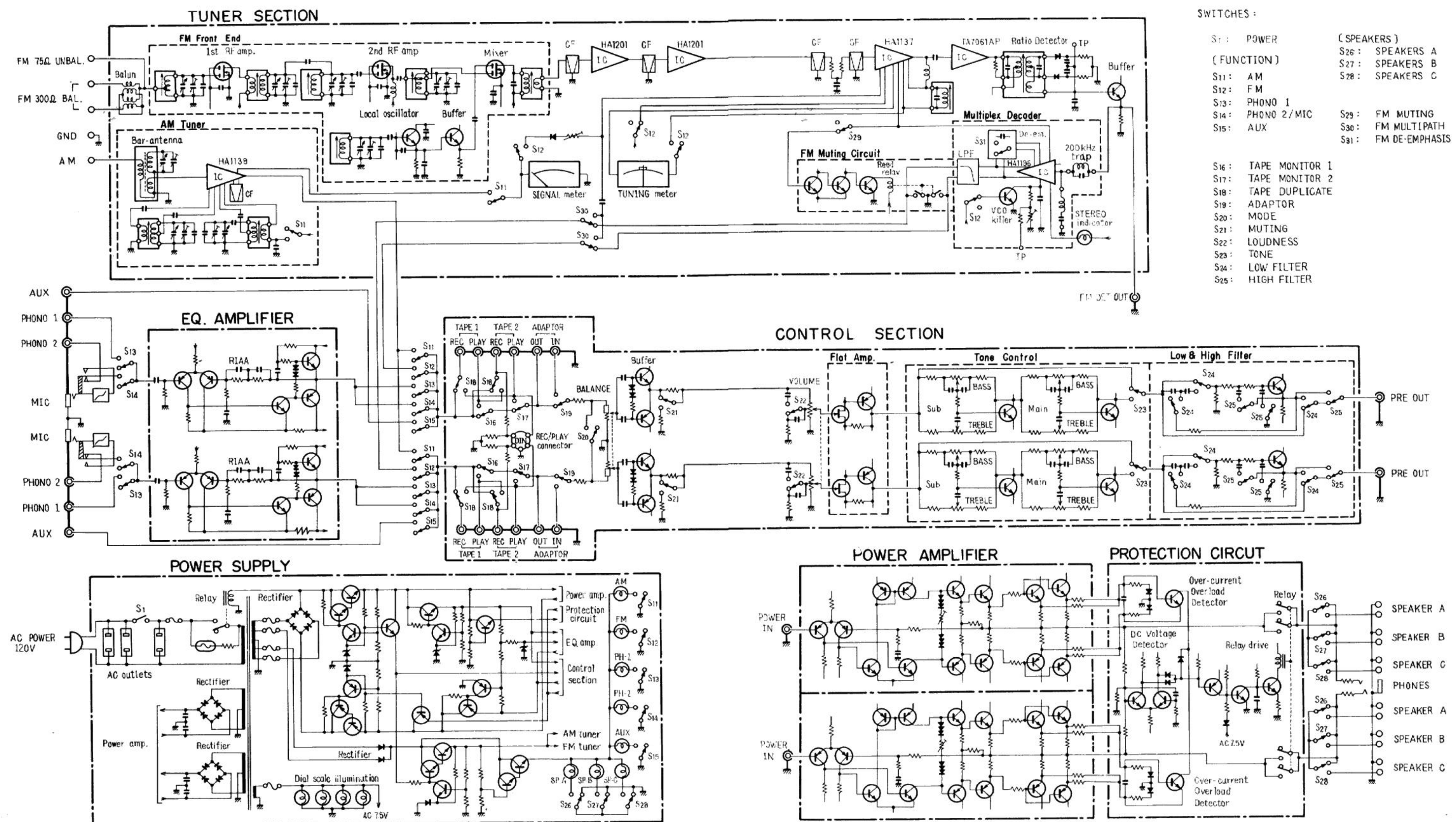


Fig. 22. Basic circuitry for inrush current suppressor

5. LEVEL DIAGRAM



6. BLOCK DIAGRAM



7. DISASSEMBLY

Top Plate

Remove the six screws (A) to detach the top plate.

Wooden Cover

Remove the two screws (B) on each side of the wooden cover.

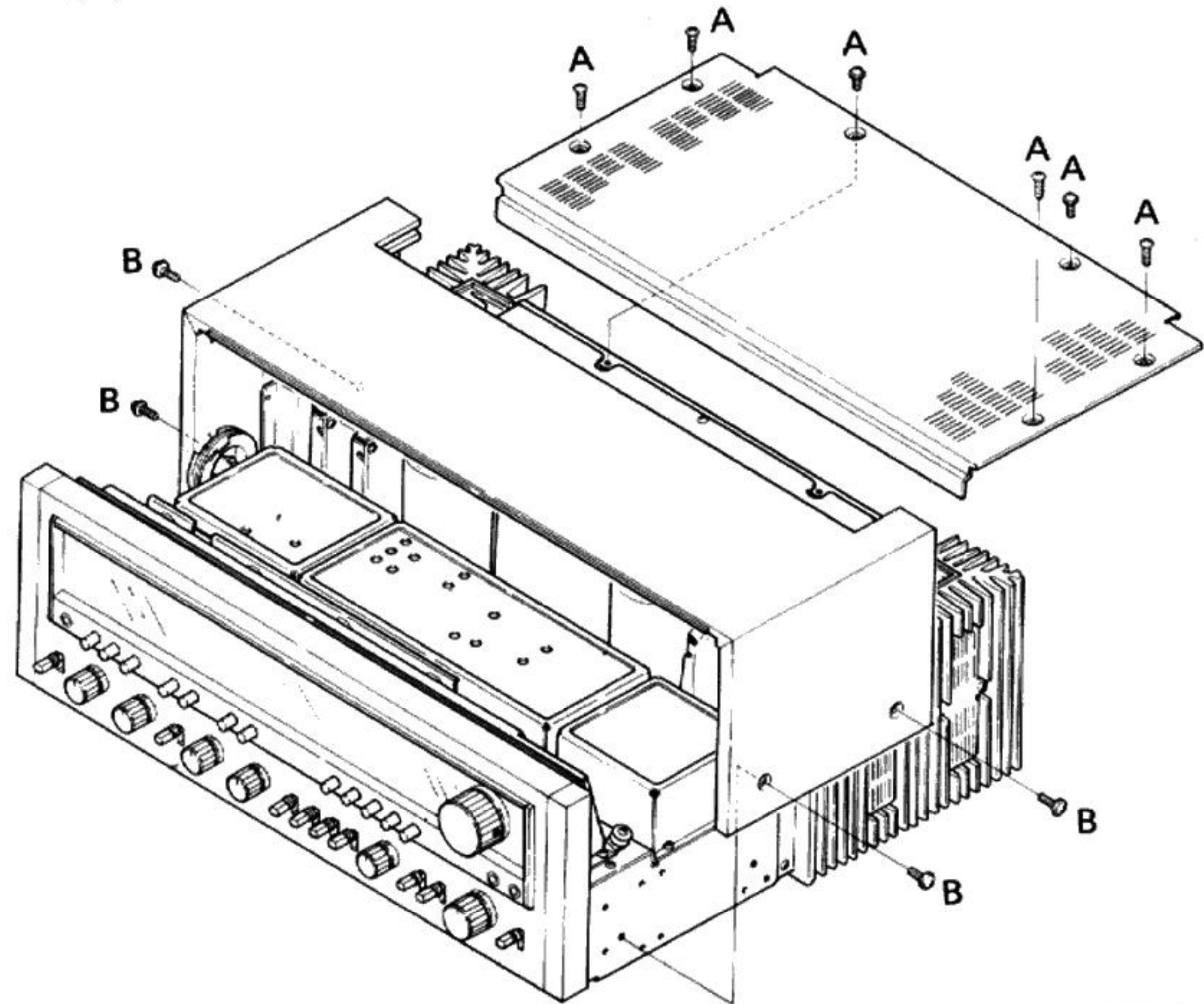


Fig. 25

Bottom Plate

Remove the fifteen screws to detach the bottom plate.

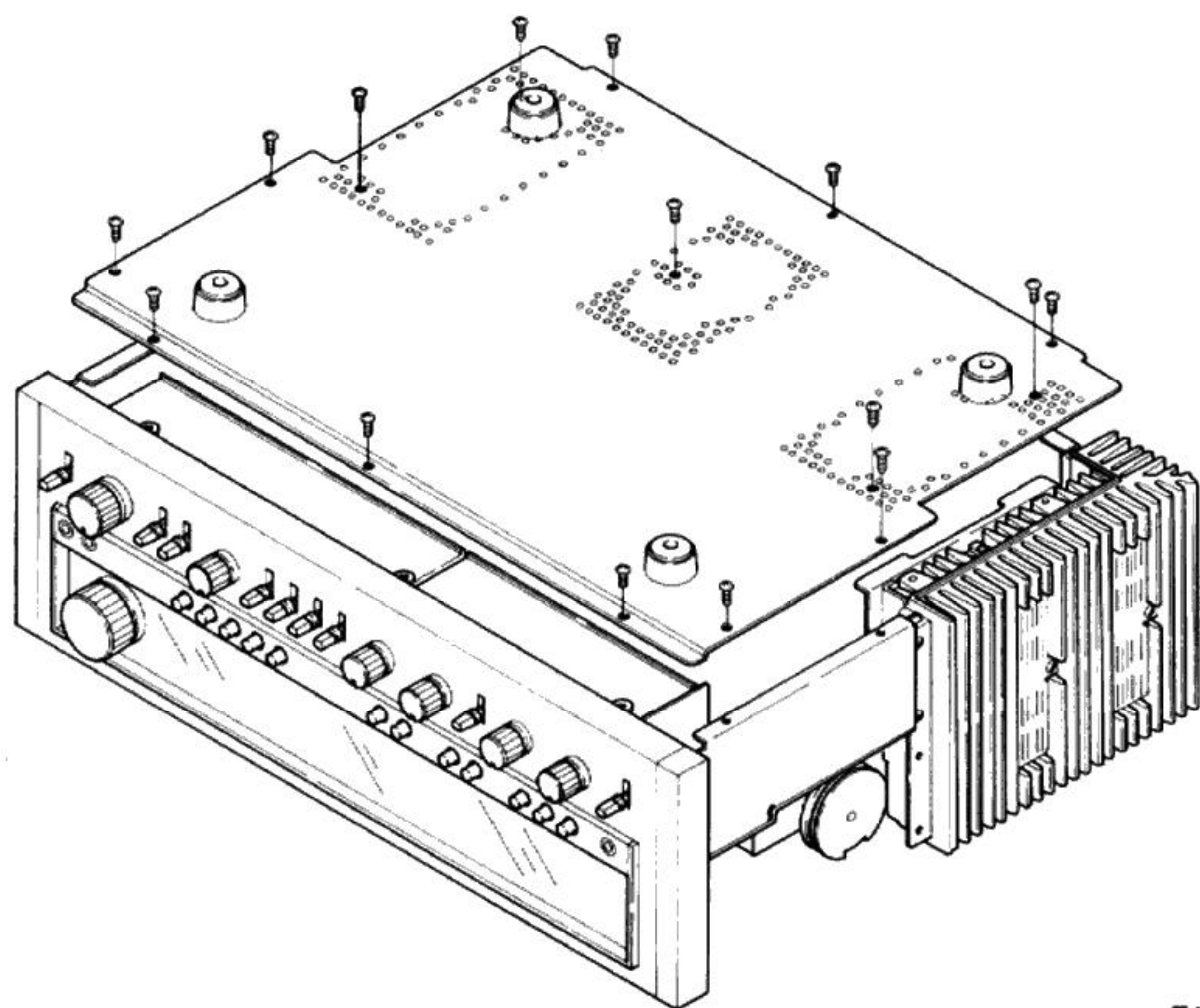


Fig. 26

SX-1250

Front Panel

Loosen the setscrews of TUNING and VOLUME knobs with a hexagonal wrench. Remove all the knobs by pulling. Remove the two screws from the top edge of the front panel. Remove the three nuts from the sub-tone and volume control shafts.

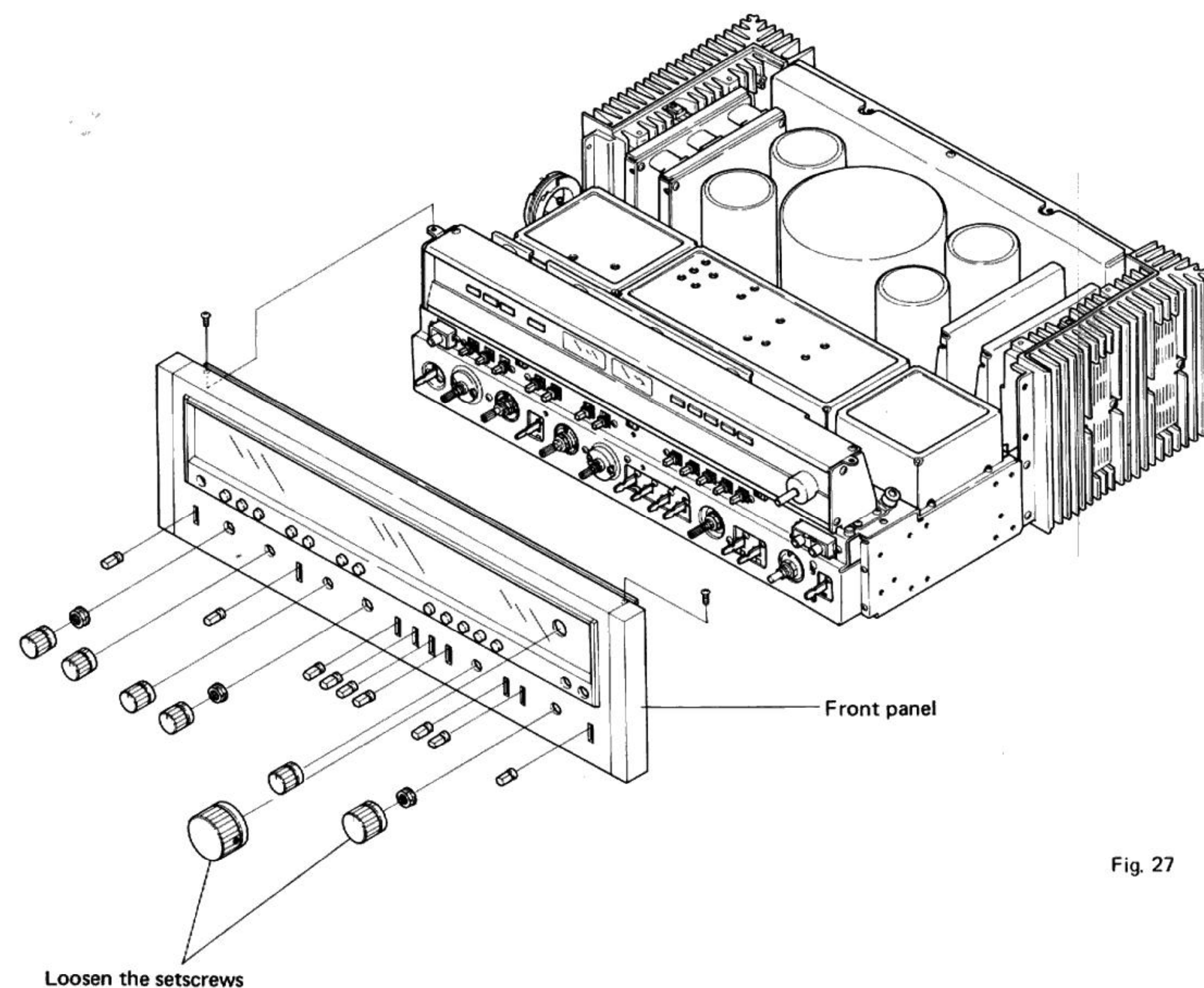


Fig. 27

Tone Amplifier Assembly
Remove the three screws (C).

Flat Amplifier Assembly
Remove the three screws (D).

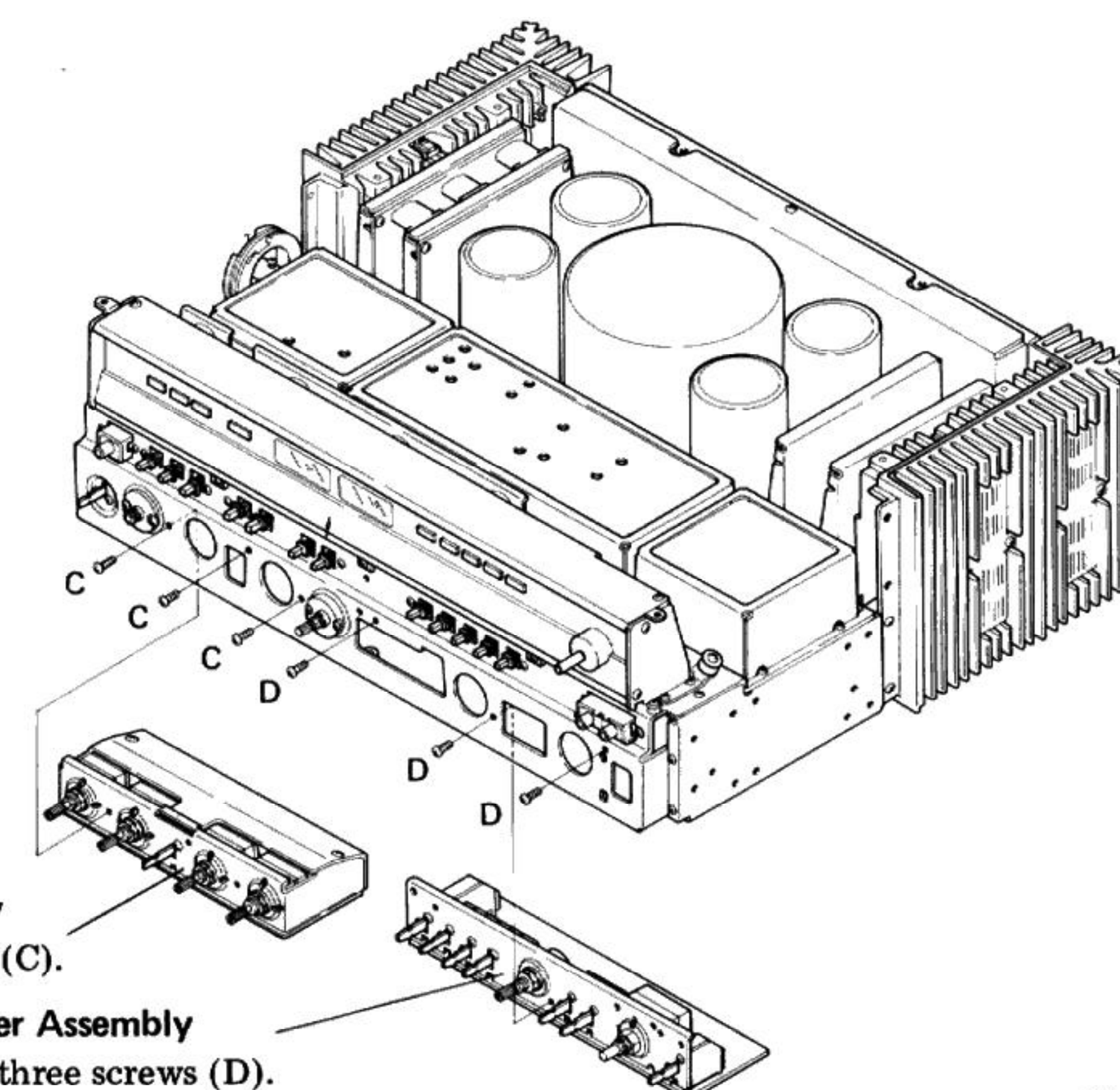


Fig. 28

Speakers Switch Assembly
Remove the four screws (E).

Filter Amplifier Assembly
Remove the two screws (F).

Function Switch Assembly
Remove the two screws (G).

Microphone Jack Assembly
Remove the two screws (H).

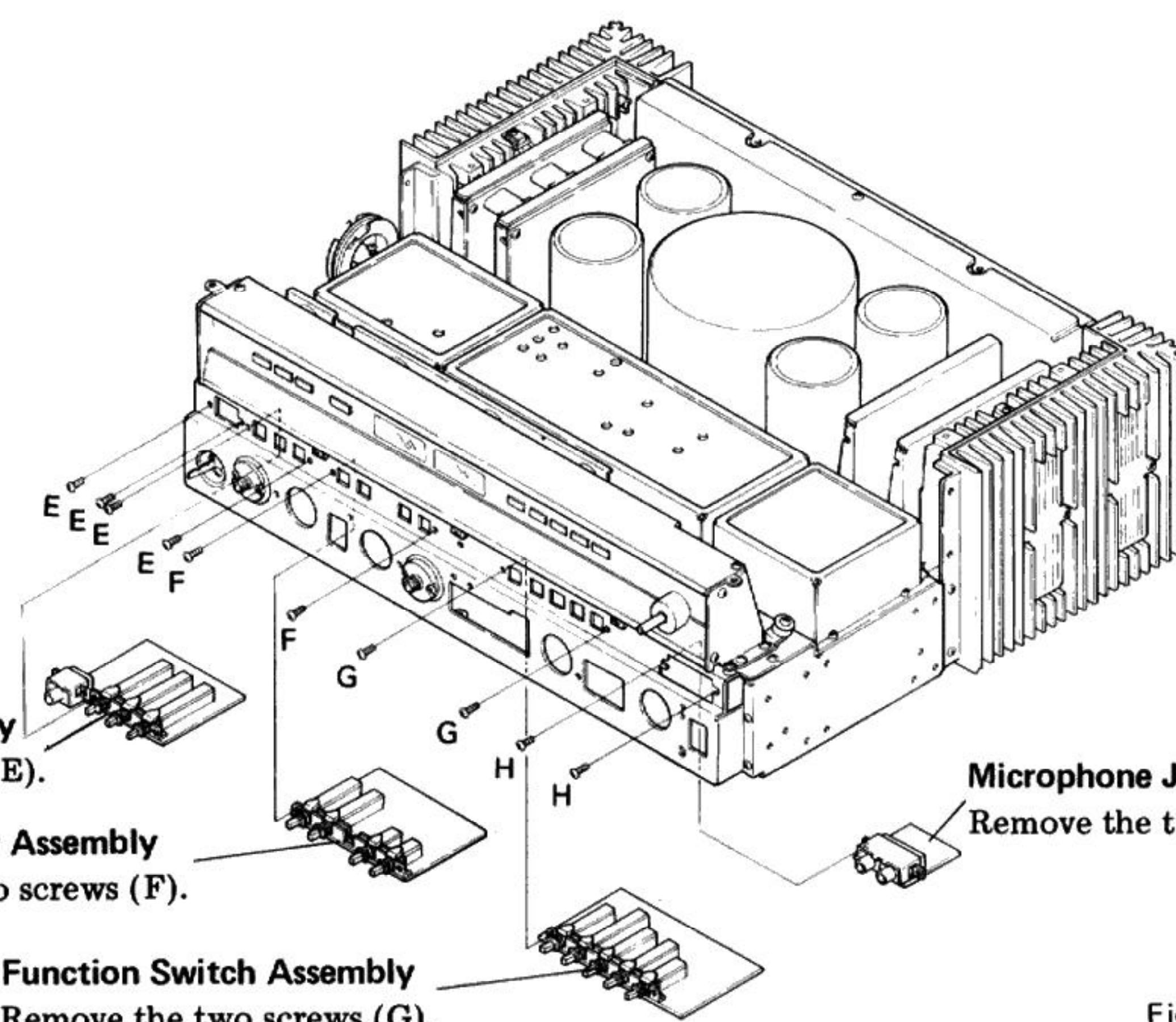
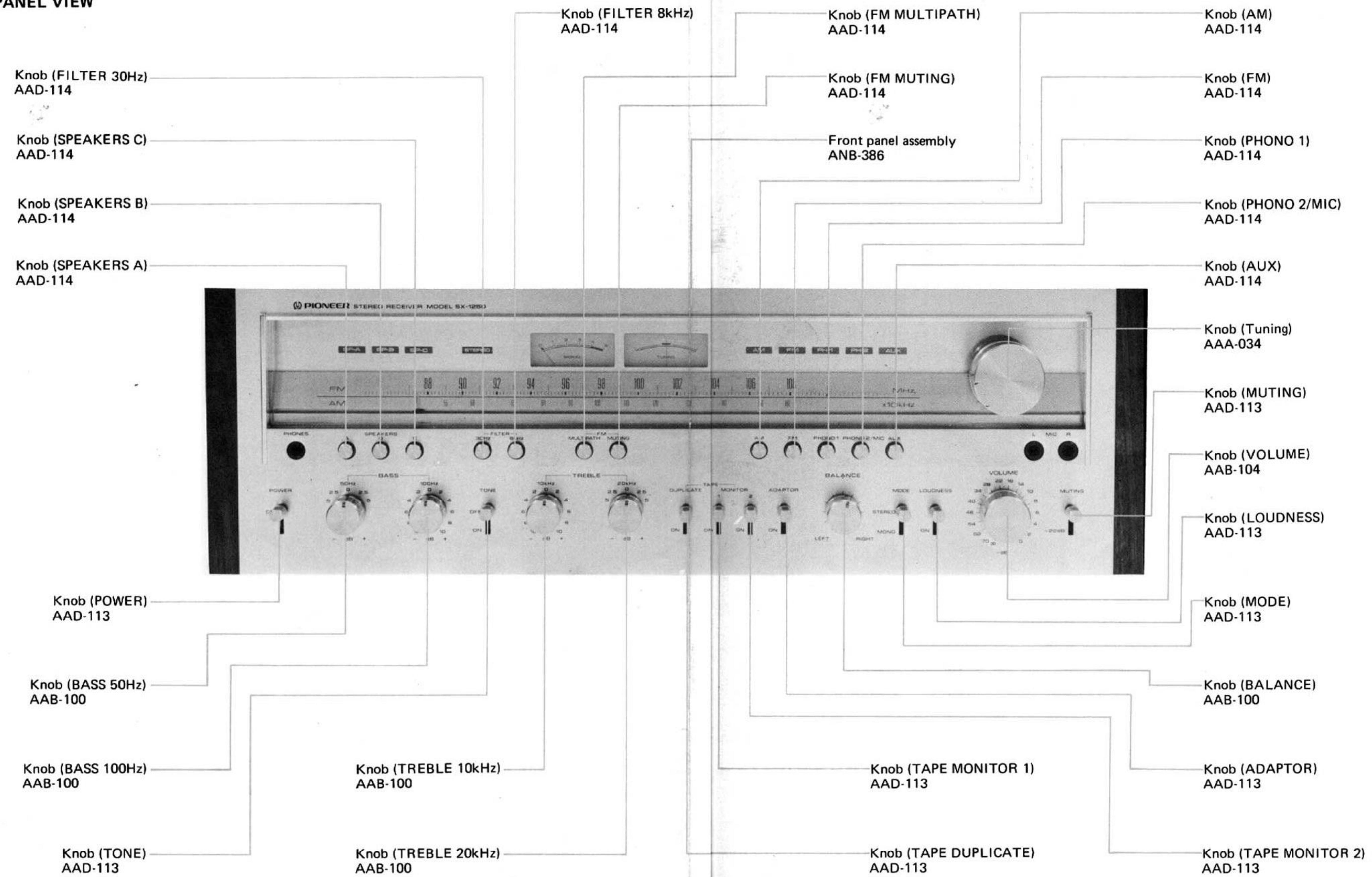


Fig. 29

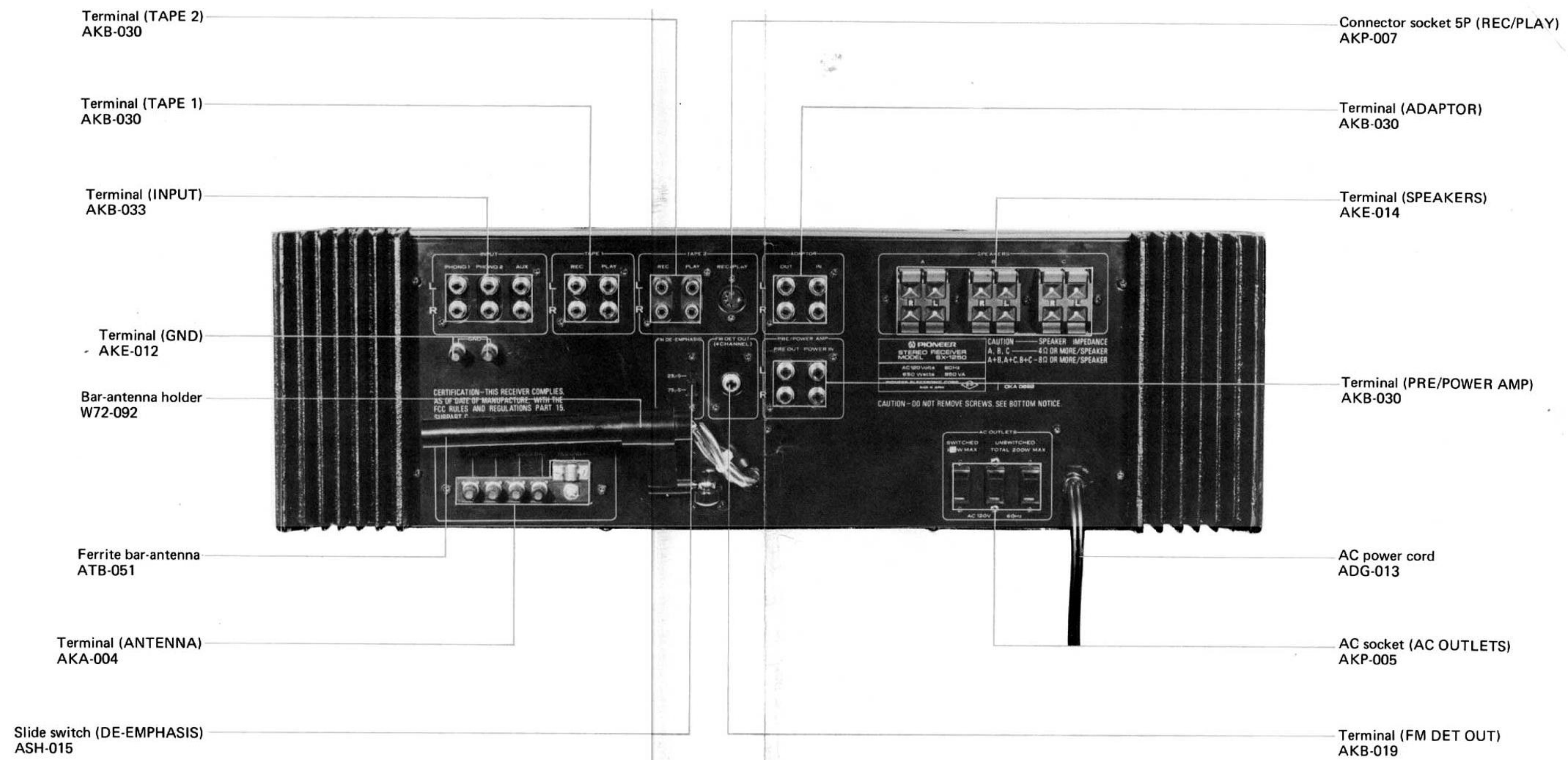
8. PARTS LOCATION

8.1 FRONT PANEL VIEW

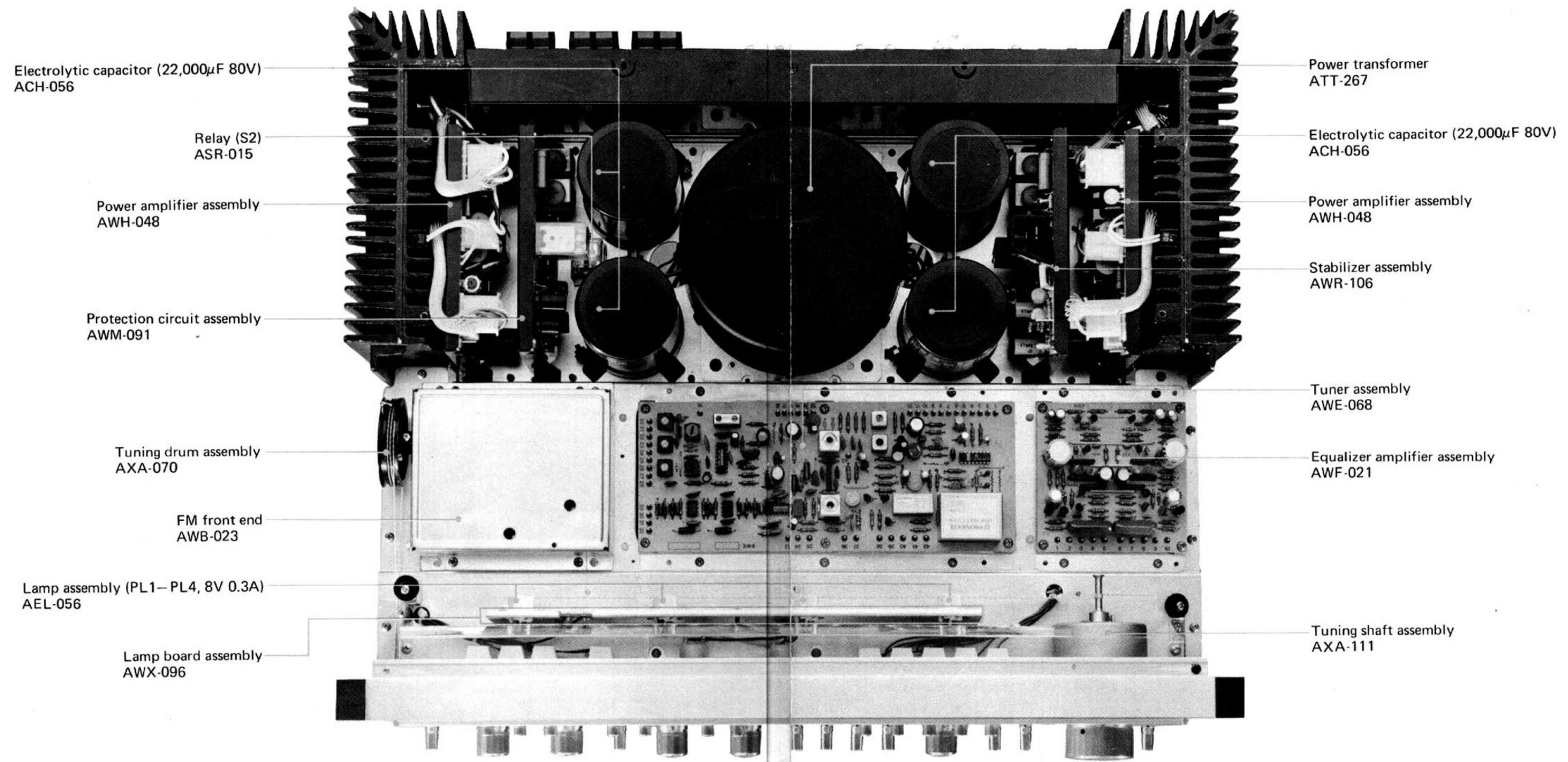


SX-1250

8.2 REAR PANEL VIEW

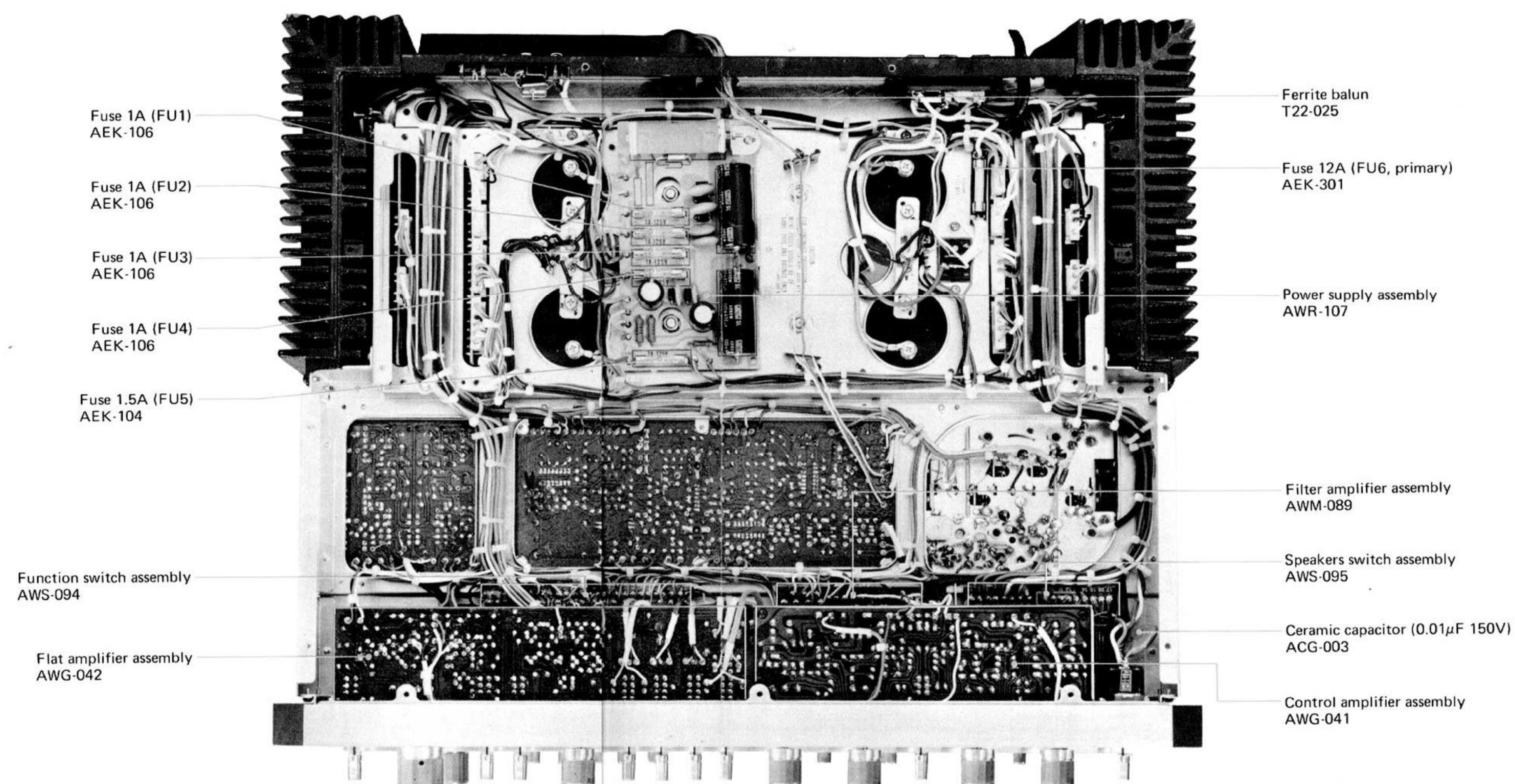


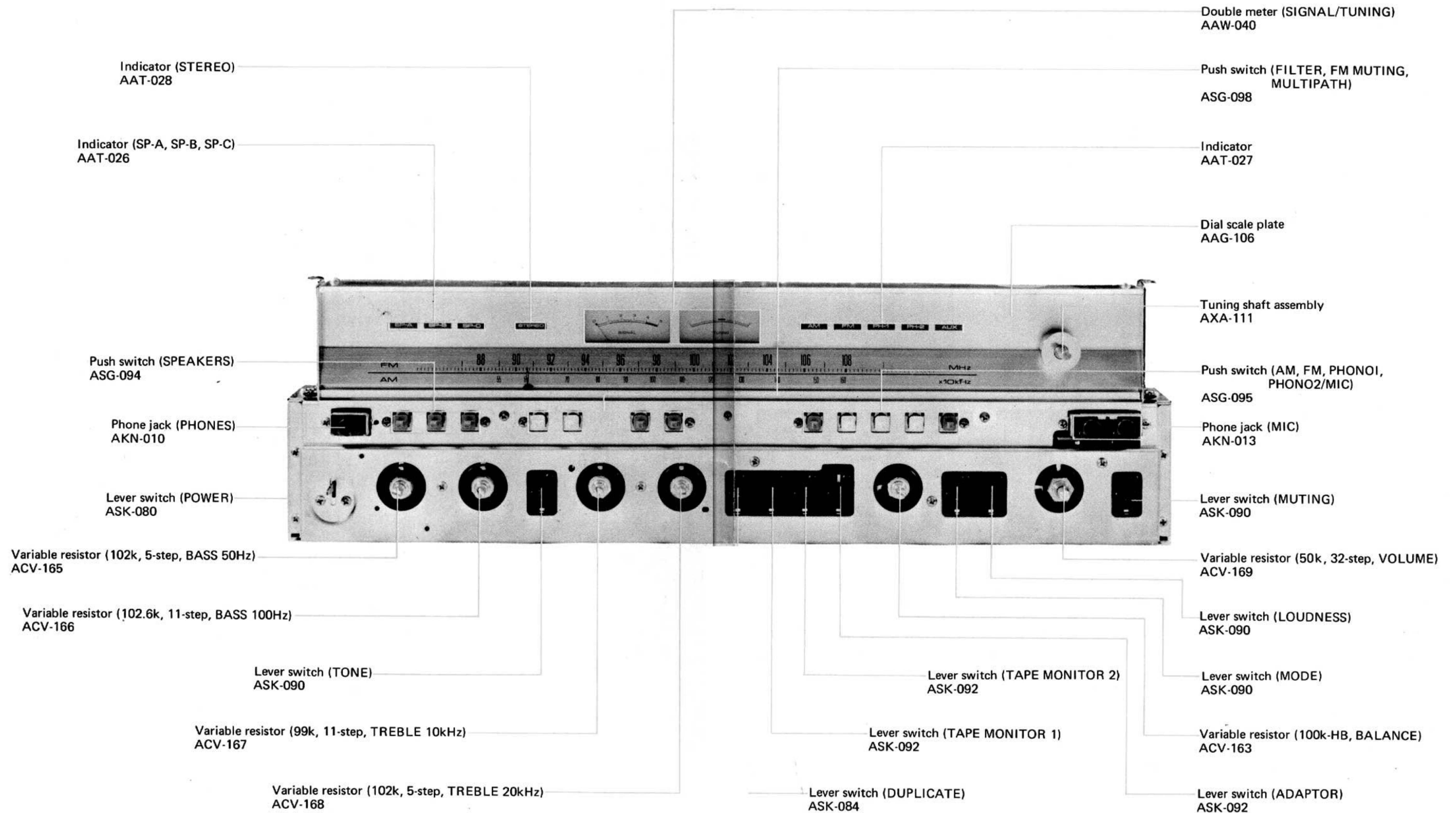
8.3 TOP VIEW



SX-1250

8.4 BOTTOM VIEW





9. ADJUSTMENTS

9.1 AM TUNER

1. Set function switch to AM.
2. Connect AM signal generator through 1k-ohm resistor to AM antenna terminal.
3. Set DUPLICATE switch to OFF and connect an AC voltmeter to TAPE 1 REC jacks.
4. Set AM SG for 400Hz 30% modulation 100dB output.
5. Set SX-1250 dial indication and AM SG frequency for 600kHz.
6. Adjust T3 core for maximum reading on AC voltmeter.
7. Set SX-1250 dial indication and AM SG frequency for 1,400kHz.
8. Adjust TC1 for maximum reading on AC voltmeter.
9. Set AM SG for 30dB output.
10. Set SX-1250 dial indication and AM SG frequency for 600kHz.
11. Adjust T3, T4 and bar antenna core for maximum reading on AC voltmeter.
12. Set SX-1250 dial indication and AM SG frequency for 1,400kHz.
13. Adjust TC1, TC2 and TC3 for maximum reading on AC voltmeter.
14. Repeat steps 10~13 to eliminate variations in AC voltmeter readings.

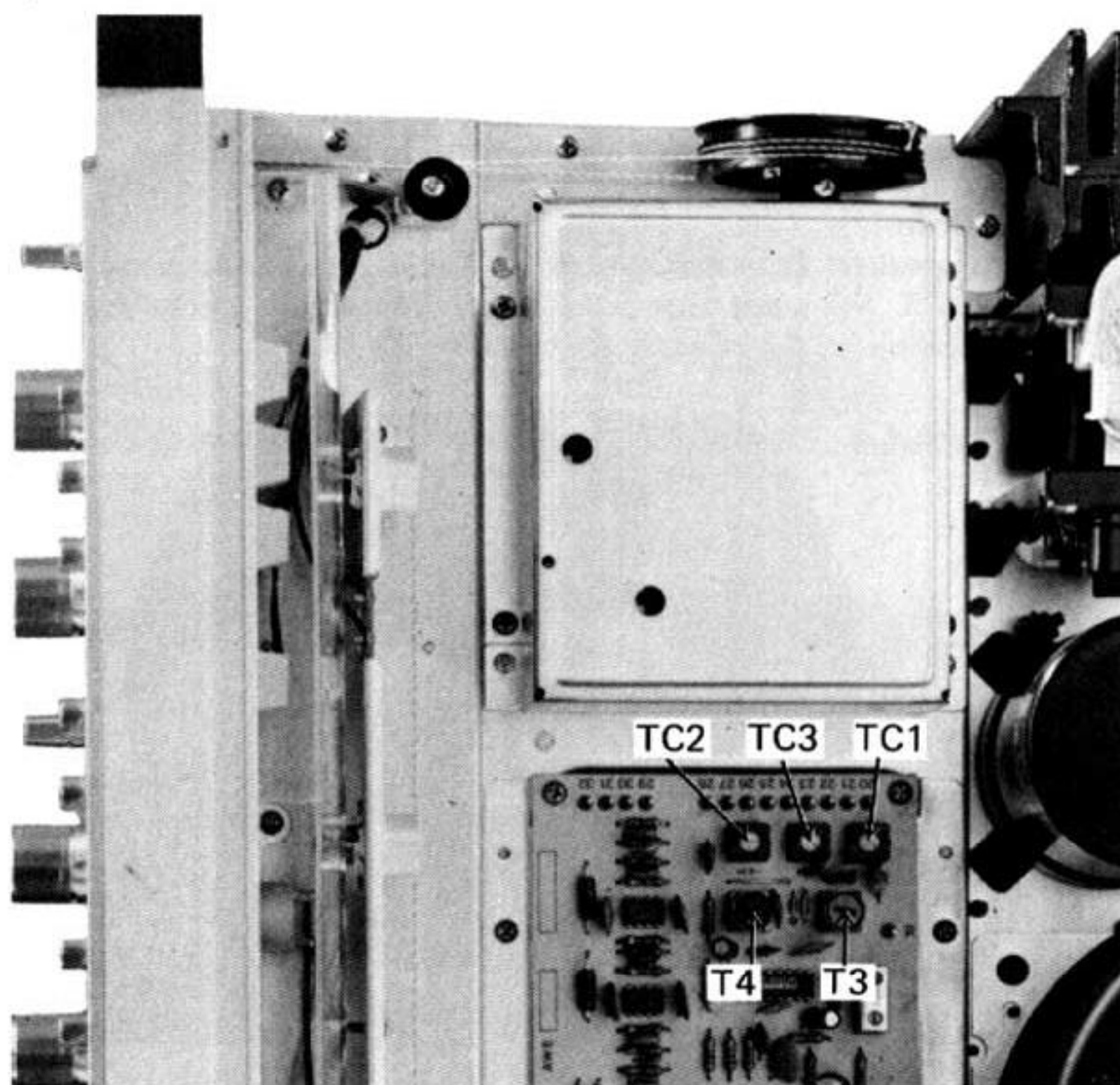
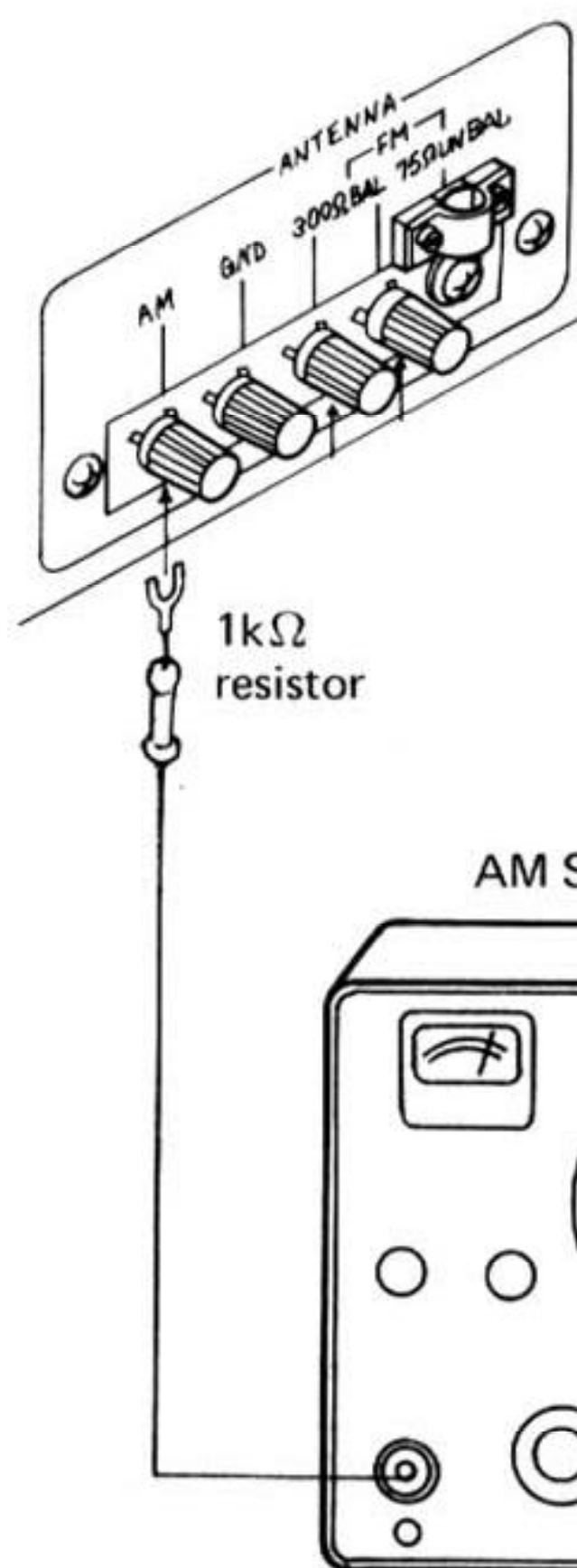
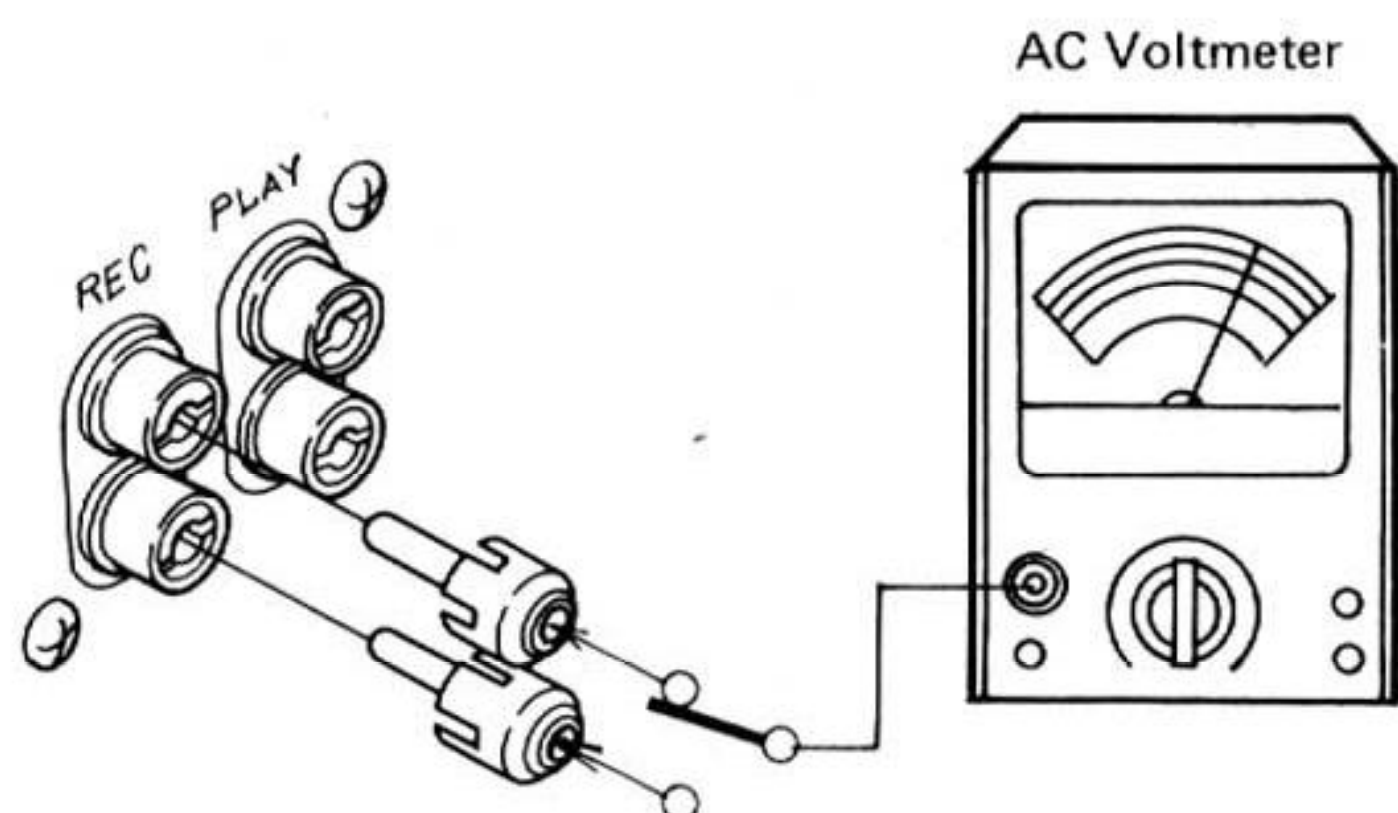


Fig. 30

9.2 FM TUNER

FM Front End

1. Set function switch to FM.
2. Set FM MUTING switch to OFF.
3. Connect FM signal generator through 300-ohm dummy load to 300 ohm FM antenna terminals.
4. Set DUPLICATE switch to OFF and connect AC voltmeter to TAPE 1 REC jacks.
5. Set FM SG for 100dB output at 400Hz and 100% modulation.
6. Set SX-1250 dial indication and FM SG frequency for 87.4MHz.
7. Adjust T5 core for maximum indication on SIGNAL meter.
8. Set FM SG for 8dB output and adjust cores of T1, T2, T3 and T4 for maximum reading on AC voltmeter.
9. Set FM SG for 100dB output.
10. Set SX-1250 dial indication and FM SG frequency for 106MHz.
11. Adjust TC5 for maximum indication on SIGNAL meter.
12. Set FM SG for 8dB output and adjust TC1, TC2, TC3 and TC4 for maximum reading on AC voltmeter.
13. Repeat steps 5~12 to eliminate variations in AC voltmeter readings.
14. After completing above adjustments, adjust T6 core for maximum reading on AC voltmeter.

Bottom View of FM Front End

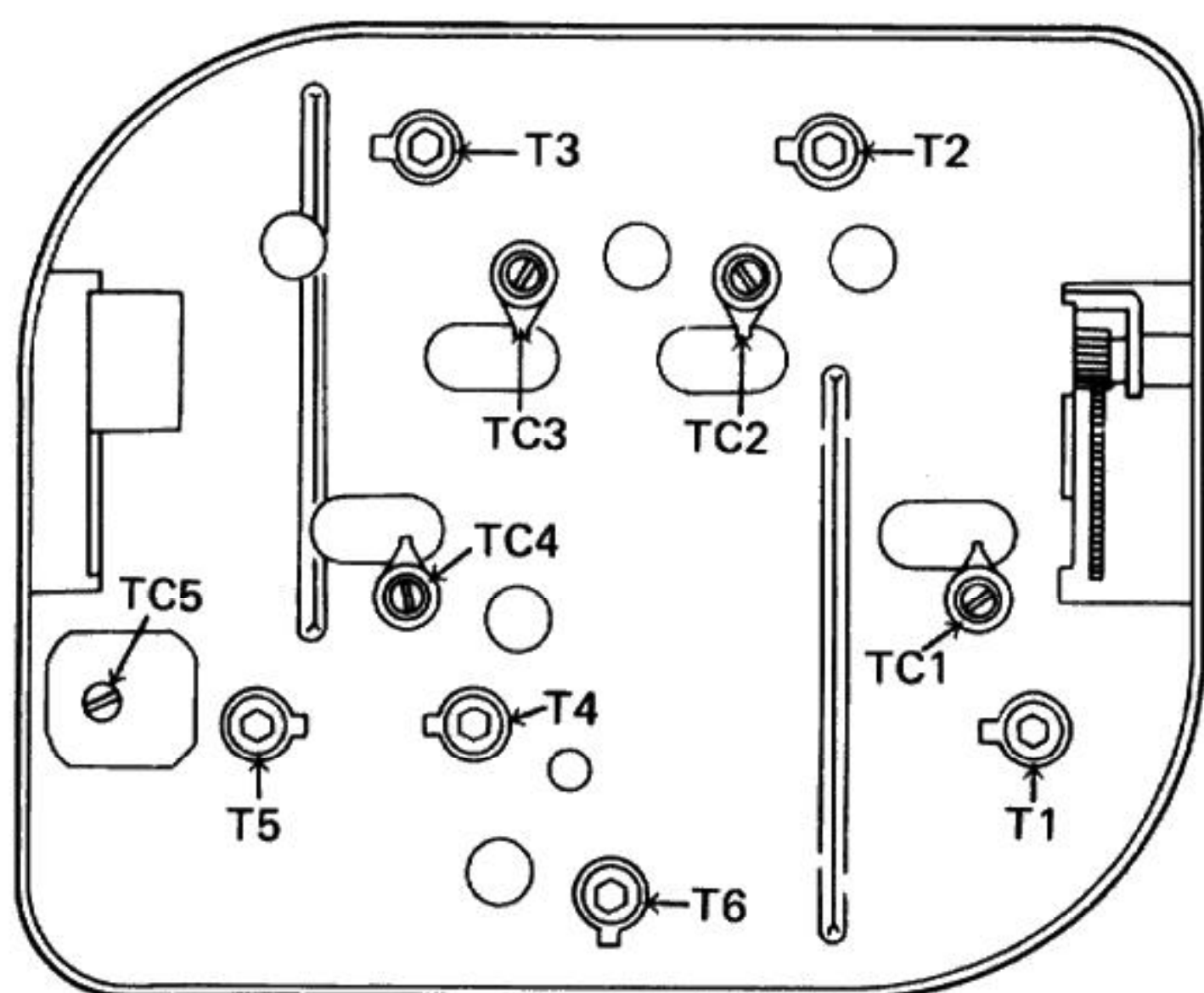


Fig. 31

Tuner Assembly

15. Connect DC voltmeter to terminal No.43.
16. Turn VR1 and VR3 fully counter-clockwise.
17. Detune SX-1250 to where only noise is received and adjust T1 core for center of scale indication on TUNING meter.
18. Set FM SG for 98MHz 60dB output.
19. Tune SX-1250 for exact center of scale indication on TUNING meter.
20. Adjust T2 upper core for 0V ($\pm 10\text{mV}$) between terminal No.43 and ground.
21. Adjust T2 lower core for minimum distortion.
22. Repeat steps 20 — 21 several times.
23. Set FM SG for 100dB output and adjust VR1 so that SIGNAL meter indicates 4.7 on the scale.

Multiplex Decoder

24. Connect MPX SG (multiplex signal generator) to the external modulator terminals of the FM SG and set the FM SG for external modulation.
25. Connect PILOT OUT terminal of MPX SG to horizontal input terminal of oscilloscope.
26. Using a probe, connect oscilloscope vertical input terminal to terminal No. 9.
27. Set FM SG for 98MHz 60dB output unmodulated.
28. Tune SX-1250 for exact center of scale indication on TUNING meter.
29. Adjust VR2 so that 4 : 1 frequency ratio Lissajous' (see note below) figure becomes stationary.
30. Set FM SG for 1kHz (L or R), $\pm 67.5\text{kHz}$ deviation, 19kHz (pilot signal) and $\pm 7.5\text{kHz}$ modulation.
31. Adjust VR3 for minimum L-R crosstalk.

Note:

Signal at terminal No. 9 is 76kHz sawtooth wave and MPX SG pilot out is a 19kHz sinewave. These form a Lissajous' figure such as shown in Fig. 32.

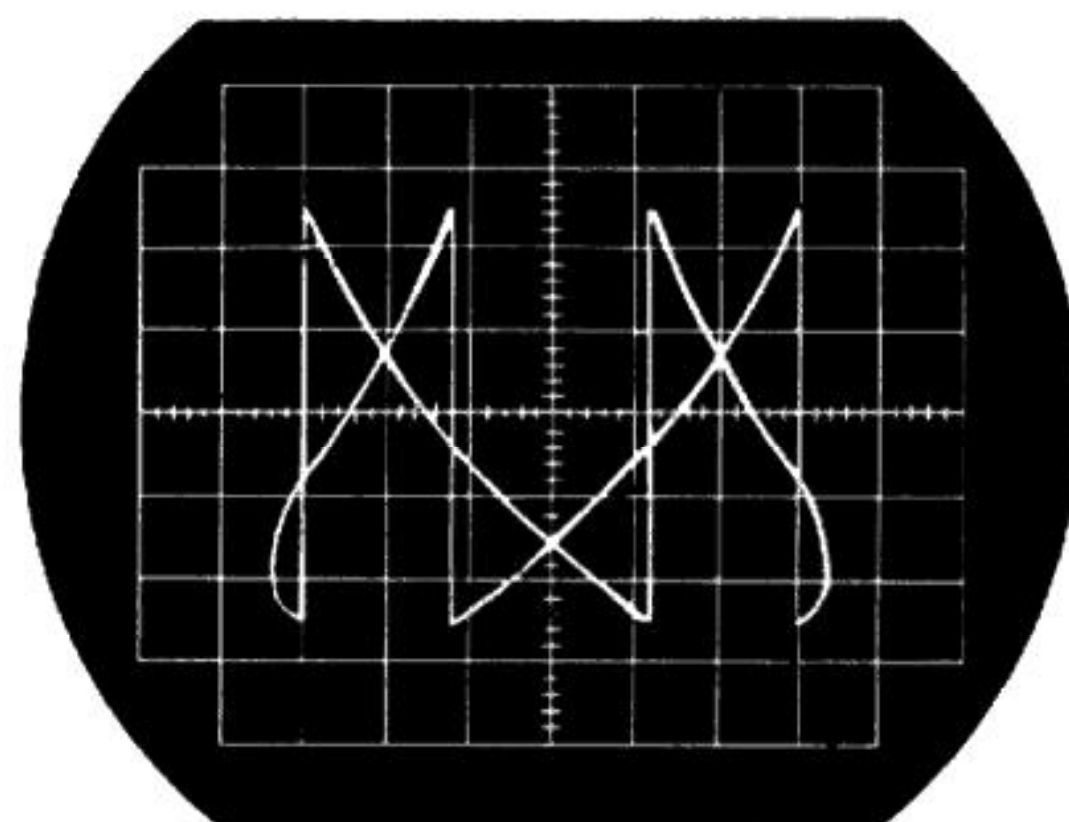


Fig. 32

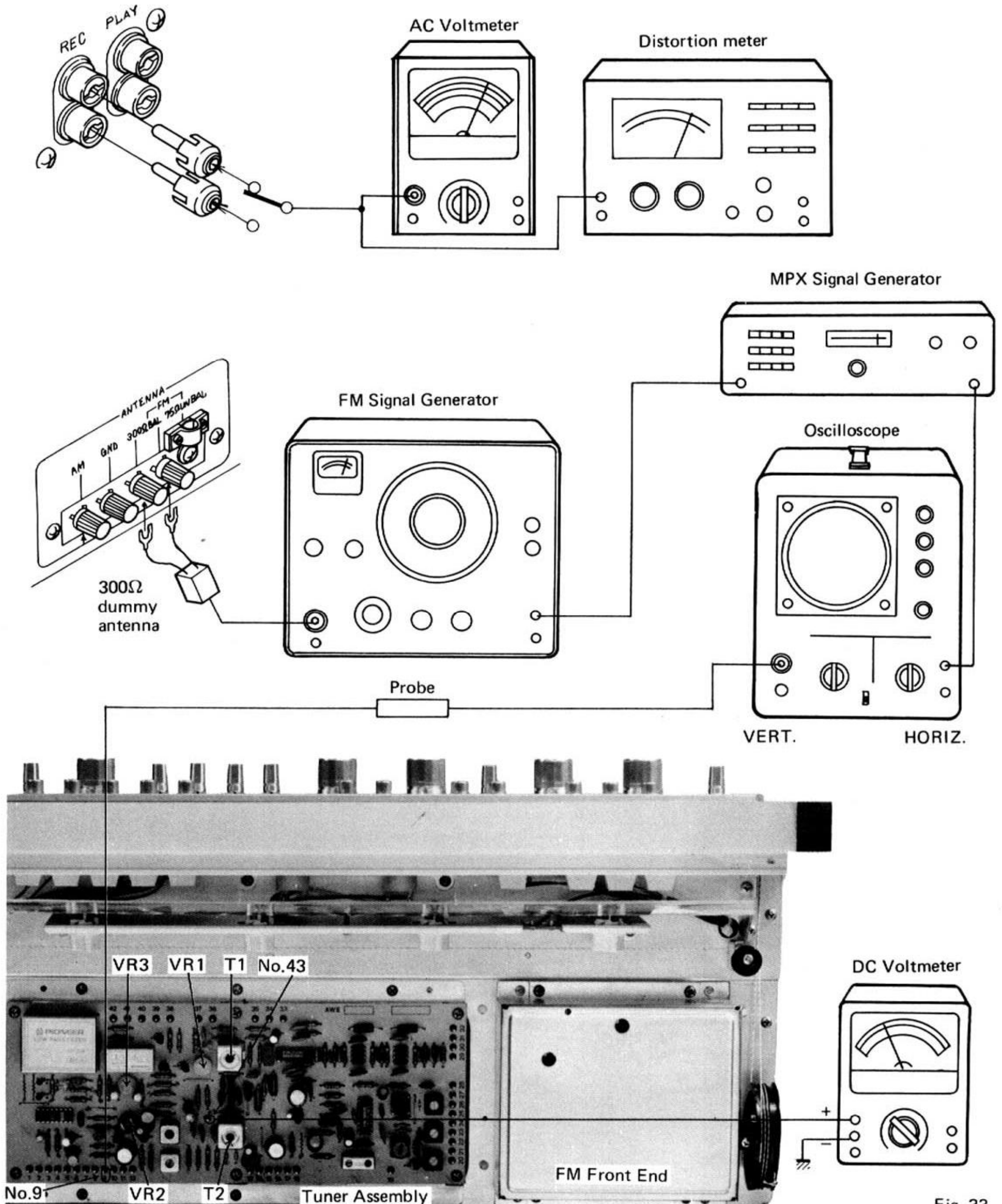


Fig. 33

9.3 POWER AMPLIFIER

1. Turn VR2 fully counter-clockwise before turning on the power.
2. Remove jumper plugs connecting POWER IN and PRE OUT jacks.
3. Connect 5.1 k-ohm resistor to POWER IN jacks.
4. Set power amplifier for no load.
5. Set POWER switch to ON.
6. Adjust VR1 for 0V between terminal No. 9 and ground.
7. Adjust VR2 for 100mV between terminals No. 7 (+) and No. 19 (-).
8. Allow set to warm up for at least 10 minutes, then readjust.

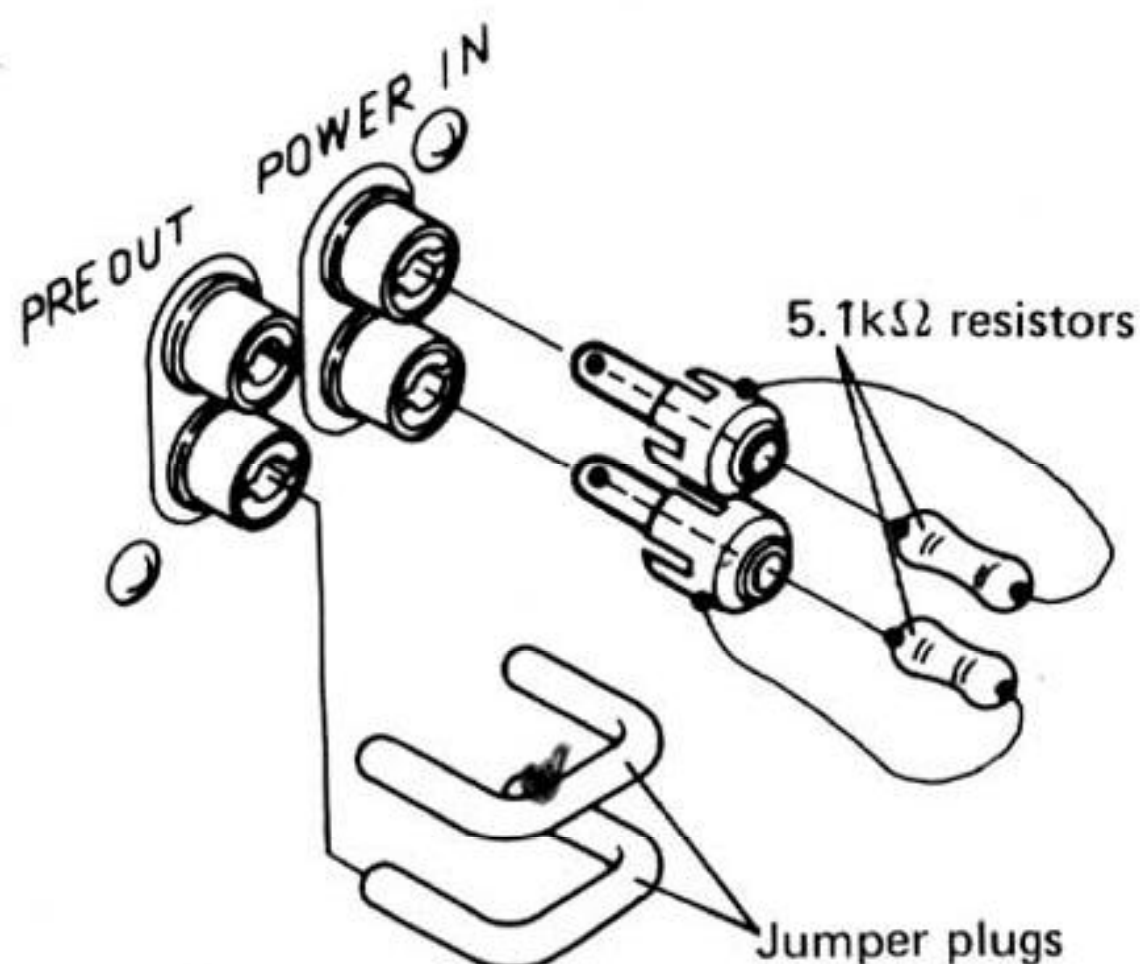


Fig. 34

9.4 STABILIZER

1. Adjust VR1 for 65V between terminals No.17 (+) and No.12 (ground).
2. Adjust VR2 for 65V between terminals No.12 (ground) and No.16 (-).

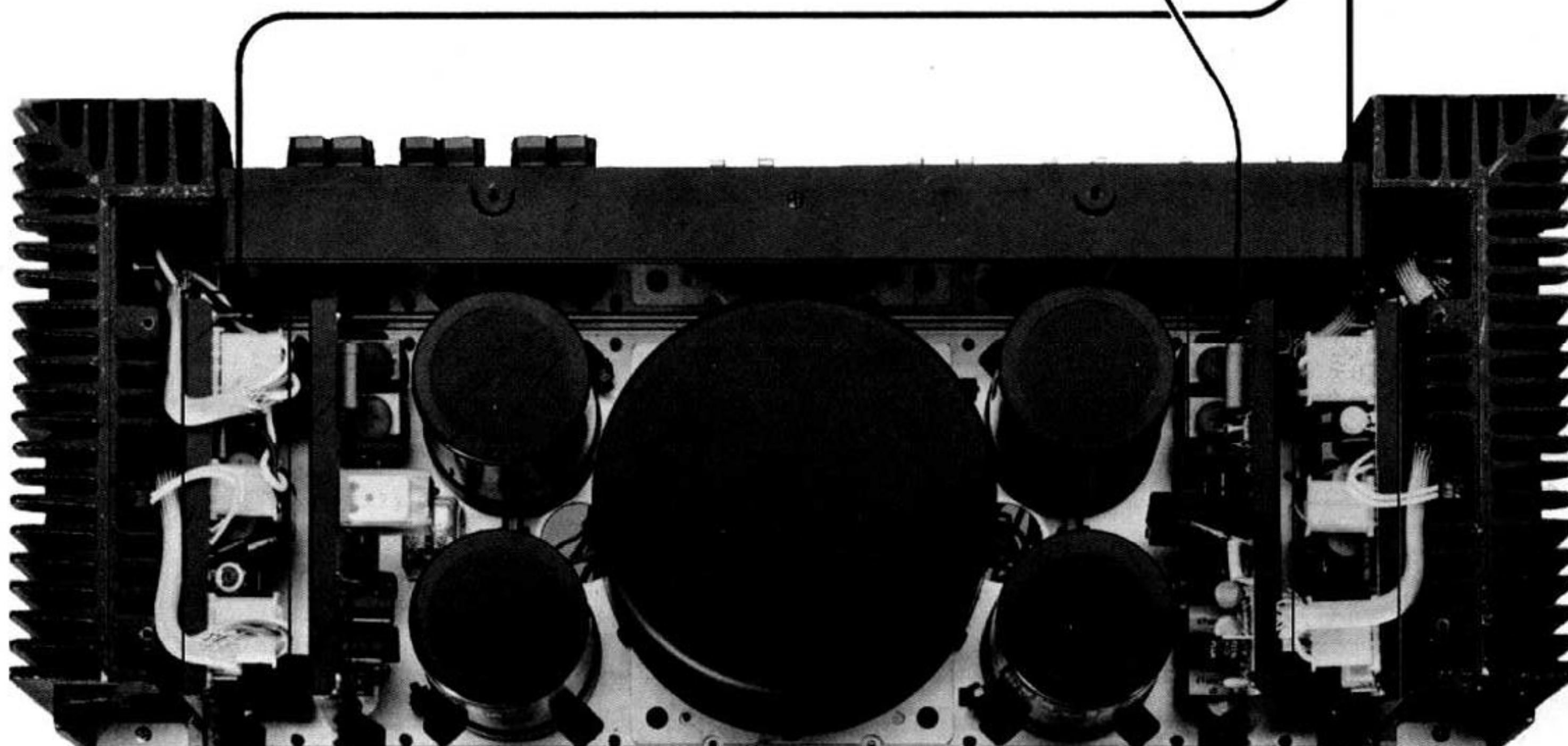
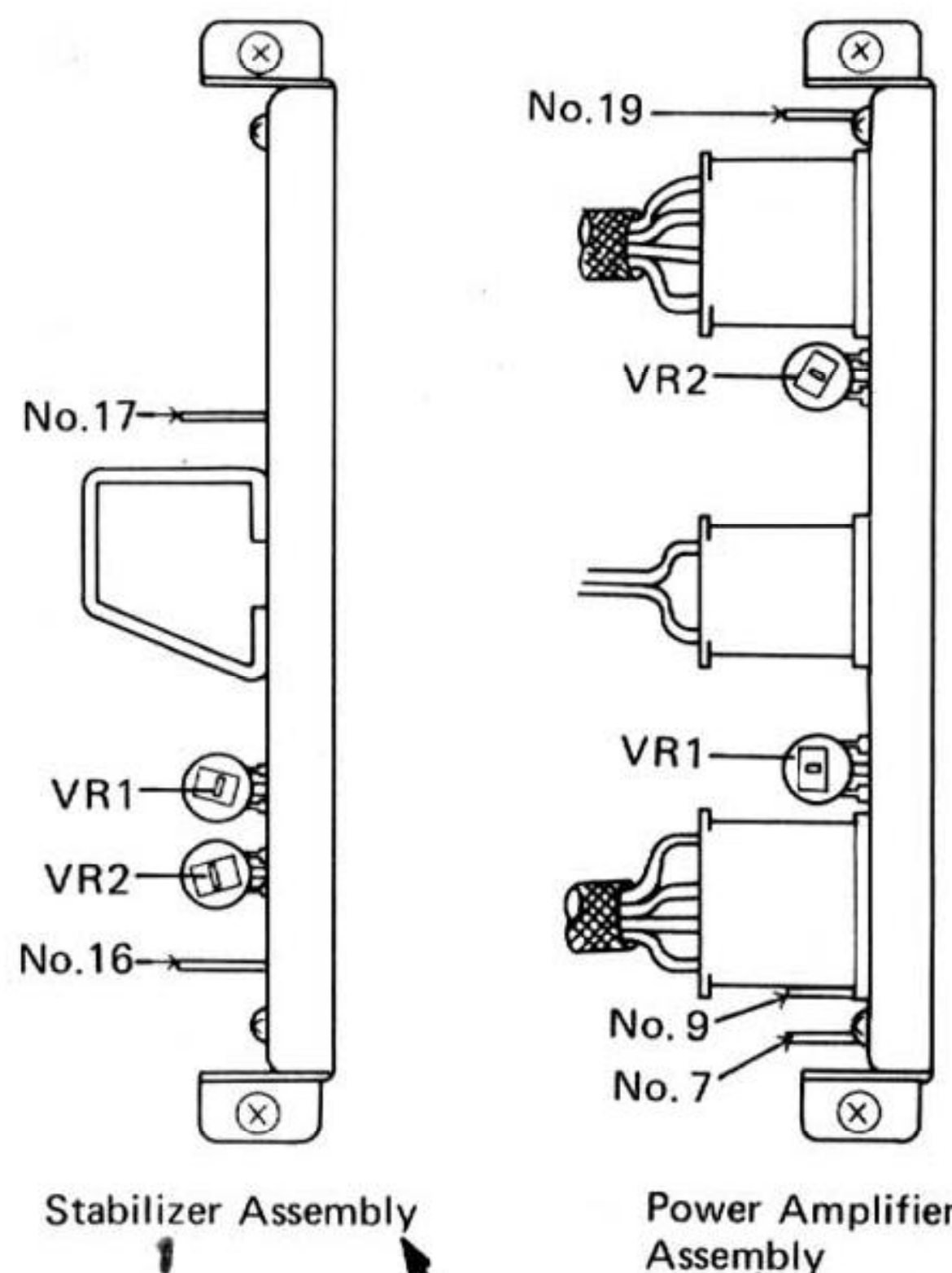


Fig. 35

10. DIAL CORD STRINGING

1. Remove the wooden cover and the front panel.
2. Remove the three screws to detach the blind sash (Fig. 36).
3. Turn tuning drum fully clockwise (as viewed from X direction in Fig. 37).
4. Tie one end of cord to stud on inner section of tuning drum (more easily performed by loosening setscrew and temporarily removing tuning drum from shaft).
5. Route cord through tuning drum cutout, make a half turn around the drum, then route in sequence to pulley A.
6. Wind cord 3 turns clockwise (as viewed from rear panel) around tuning shaft, then route to pulley B—pulley C—pulley D.
7. Wind cord two turns around tuning drum and tie to spring hook so that tension is applied to the cord.
8. Turn TUNING knob and confirm normal cord motion, then trim off excess cord.
9. Turn the tuning knob fully counterclockwise and fix the dial pointer to cord so that it indicates 87.4MHz on the dial scale.

Dial Pointer Installation Caution

Metal portion of dial pointer is plated. If this section is touched directly by hand or fingerprints and other impurities, it is difficult to remove dirt from aventurine finish. As this is not desirable in terms of both appearance and anticorrosion, take extreme care not to touch the metal section when handling the dial pointer.

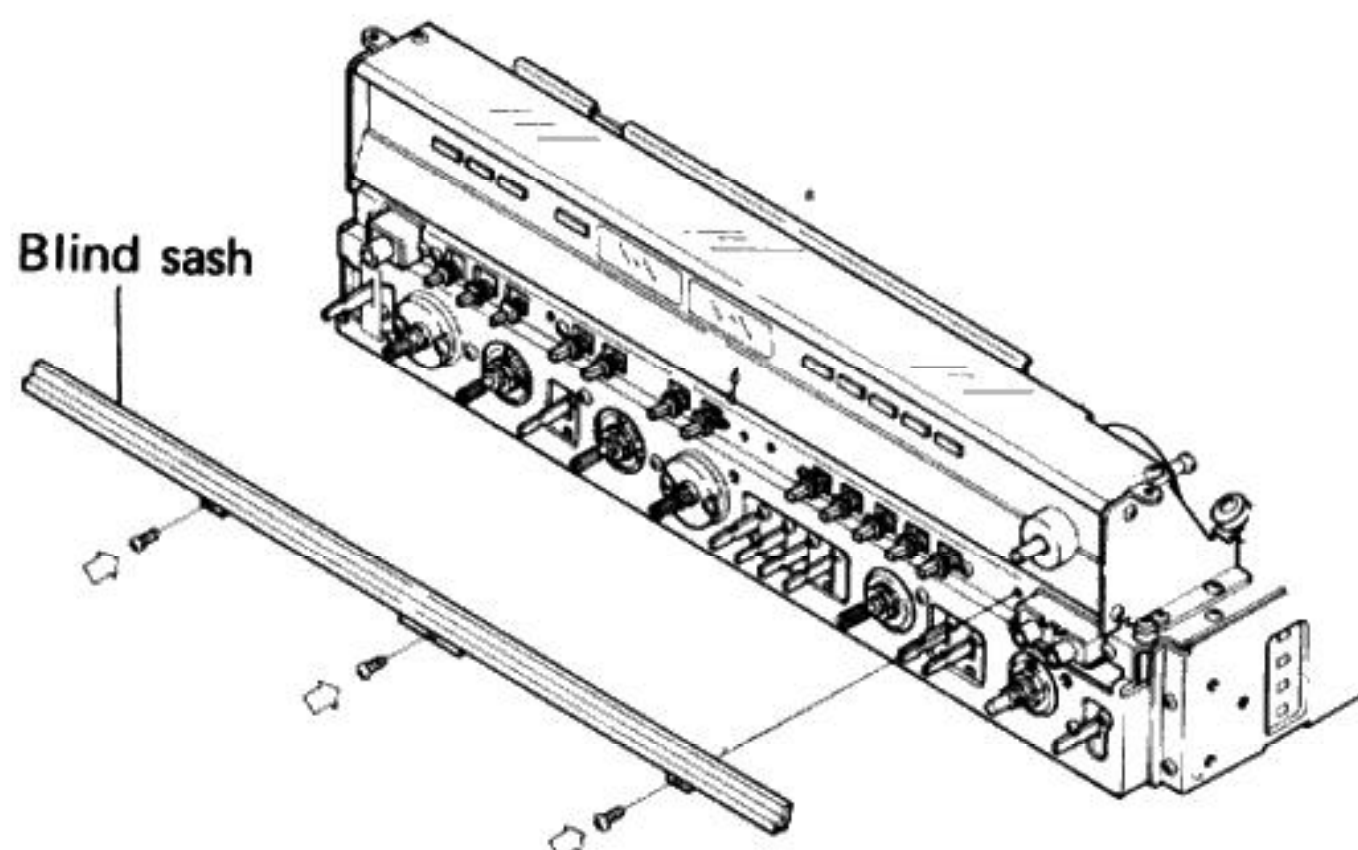


Fig. 36

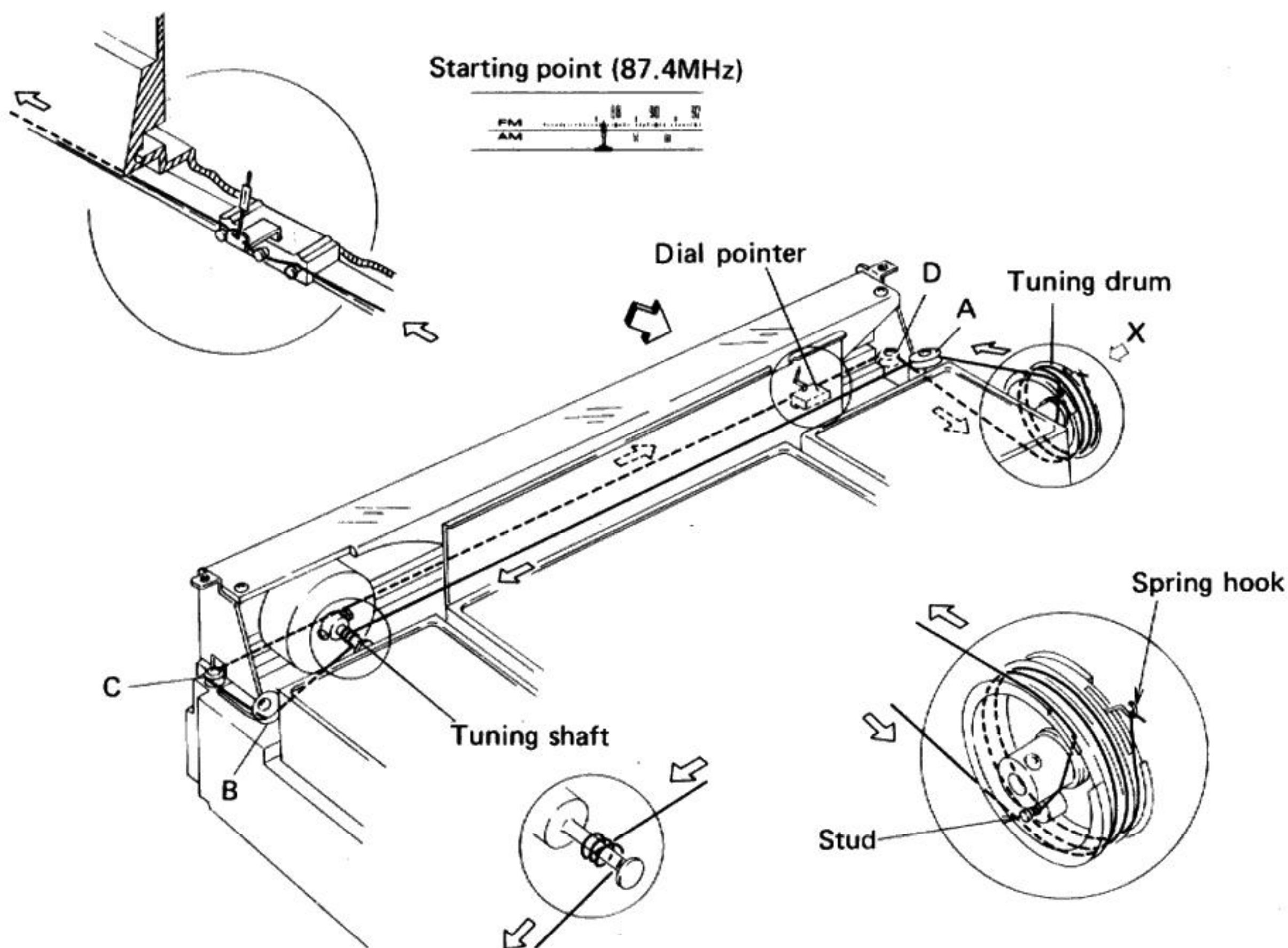
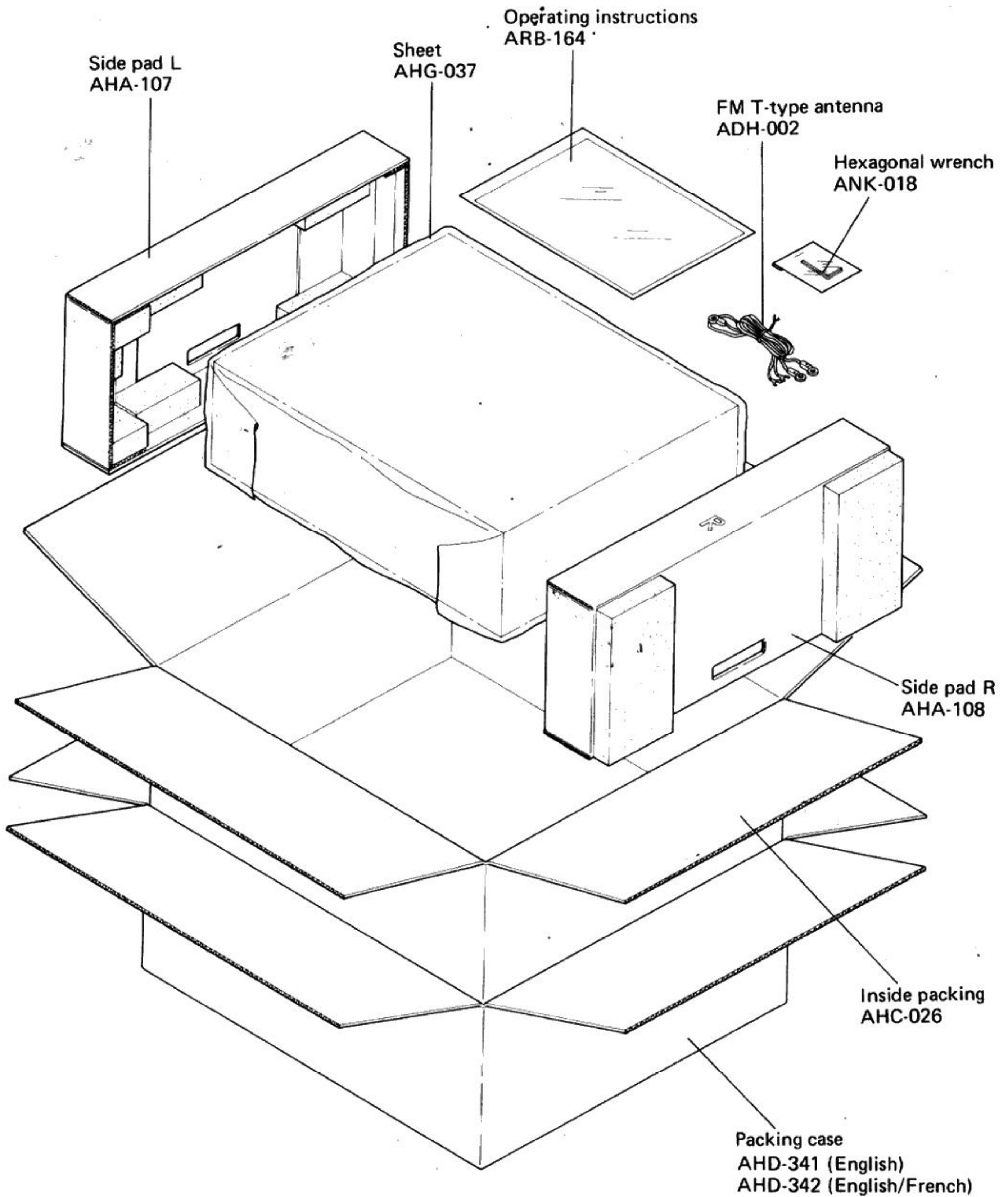


Fig. 37

13. PACKING



14. PARTS LIST OF EXPLODED VIEWS

Parts No.	Parts Name	Parts No.	Parts Name
AAA-034	Knob	ADX-038	Cable Housing
AAB-100	Knob	ADX-039	Cable Housing
AAB-104	Knob	AEB-085	Rubber Bracket A
AAD-113	Knob	AEB-086	Rubber Bracket B
AAD-114	Knob	AEB-087	Rubber Spacer
AAF-051	Dial Pointer	AEC-076	Insulator Wafer
AAG-106	Dial Scale Plate	AEC-079	Strain Relief
AAP-037	Blind Sash	AEC-101	Pulley
AAT-025	Shaft Cover	AEC-151	Wire Supporter
AAT-026	Indicator	AEC-178	Foot
AAT-027	Indicator	AEC-256	Pulley
AAT-028	Indicator	AEC-258	Spacer
AAW-040	Double Meter	AEC-272	Acrylic Board
ABA-002	Screw	AED-018	Mask
ABA-012	Screw	AEK-104	Fuse (1.5A) (KCU, S)
ABA-081	Screw	AEK-106	Fuse (1A) (KCU, S)
ABA-087	Screw	AEK-109	Fuse (6A) (S)
ABA-113	Screw	AEK-301	Fuse (12A) (KCU, S)
ABA-114	Pulley Shaft	AEK-402	Fuse (1A) (HG)
ABA-116	Screw	AEK-404	Fuse (6.3A) (HG)
ABA-123	Screw	AEK-405	Fuse (1.6A) (HG)
ABA-129	Screw	AEL-056	Lamp Ass
ABE-006	Washer	AEL-069	Lamp
ABE-018	Washer	AEL-072	Lamp
ABH-022	Coil Spring	AEL-073	Lamp
ABN-021	Nut	AEL-074	Lamp
ABN-022	Panel Base	AEL-075	Lamp
ABN-023	Washer Faced Nut	AEL-076	Lamp
ABN-024	Washer Faced Nut	AHA-107	Side Pad L
ACG-001	Capacitor (HG, S)	AHA-108	Side Pad R
ACG-003	Capacitor (KCU)	AHC-026	Inner Packing
ACH-056	Capacitor	AHD-341	Packing Case (KU, S, HG)
ACV-163	Variable Resistor	AHD-342	Packing Case (KC)
ACV-165	Variable Resistor	AHG-037	Sheet
ACV-166	Variable Resistor	AKA-004	Terminal
ACV-167	Variable Resistor	AKB-019	Terminal
ACV-168	Variable Resistor	AKB-030	Terminal
ACV-169	Variable Resistor	AKB-033	Terminal
ADG-013	AC Power Cord (KCU)	AKC-030	Terminal Strip 2P
ADG-015	AC Power Cord (S)	AKC-038	Terminal Strip 2P
ADH-002	FM Antenna	AKE-012	Terminal
ADX-029	Cable Housing	AKE-014	Terminal
ADX-030	Cable Housing	AKF-053	Connecting Plate
ADX-031	Cable Housing	AKH-001	Transistor Socket
ADX-032	Cable Housing	AKN-010	Phone Jack
ADX-033	Cable Housing	AKN-013	Phone Jack
ADX-034	Cable Housing	AKP-005	AC Socket (KCU, S)
ADX-035	Cable Housing	AKP-007	5P Connector Socket
ADX-036	Cable Housing	AKP-008	AC Socket (HG)
ADX-037	Cable Housing	AKR-028	Fuse Holder 1P

Parts No.	Parts Name
AKR-031	Plug in Selector
AKX-031	Plug in Selector
AMM-049	Wooden Cover
ANB-386	Front Panel Ass
ANE-105	Top Panel
ANK-018	Hexagonal Wrench
ARB-164	Operating Instruction
ARB-168	Operating Instruction
ARB-171	Operating Instruction
ARD-089	Operating Instruction
ASG-094	Push Switch
ASG-095	Push Switch
ASG-098	Push Switch
ASH-015	Slide Switch
ASK-080	Power Switch (KCU)
ASK-084	Lever Switch
ASK-090	Lever Switch
ASK-092	Lever Switch
ASK-099	Power Switch (S)
ASK-105	Power Switch (HG)
ASR-015	Relay
ATB-051	Ferrite Bar Antenna
ATT-267	Power Trans (KCU)
ATT-291	Power Trans (S)
ATT-295	Power Trans (HF)
AWB-023	FM Front End
AWE-068	Tuner Ass
AWF-021	EQ Amp Ass
AWG-041	Control Amp Ass
AWG-042	Flat Amp Ass
AWH-048	Power Amp Ass
AWM-089	Filter Amp Ass
AWM-091	Protection Ass
AWR-106	Stabilizer Ass
AWR-107	Power Supply Ass
AWR-108	Power Supply Ass
AWS-094	Function Switch Ass
AWS-095	Speaker Switch Ass
AWS-098	Speaker Switch Ass
AWX-062	5P Connector Ass
AWX-096	Lamp Board Ass
AWX-097	Mic Jack Ass
AWX-099	Switch Ass (KCU)
AWX-100	Switch Ass (S)
AXA-070	Tuning Drum Ass
AXA-111	Tuning Shaft Ass
B71-004	Nut
B71-010	Nut
M45-086	Washer
T22-025	Ferrite Balun

Parts No.	Parts Name
W72-092	Bar Antenna Holder
2SD555-R	Transistor
2SB600R	Transistor