OPTONICA SERVICE MANUAL



FM/AM

FM stereo receiver

MODEL SA-5151

SIMULATED WALNUT GRAINED VINYL ON WOOD PRODUCT MATERIAL

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SPECIFICATIONS

GENERAL DESCRIPTION

Power source:

120V, 50/60Hz

Power consumption:

270W

Circuit

Tuner:

Superheterodyne system,

AM/FM 2-bands tuner, with P.L.L. stereo demodulation circuit, FM muting circuit,

air check Ext. Dolby FM

calibration circuit

Main amplifier:

Differential amplifier and all

stage direct coupled pure complimentary system, OCL

(Output Capacitor-Less)

Tone amplifier:

"NF" type tone control cir-

cuit

Equalizer:

Dual power supply IC

amplifier circuit

Semiconductors:

1-FET

7-IC (Integrated circuit)

35-Transistor 34-Diode 2-LED

Dimensions:

Width: 550 mm (21-5/8")

Height: 164mm (6-15/32")

Depth: 485mm (19-3/32")

Weight:

19kg (41.91bs.)

• MAIN (POWER) AMPLIFIER

Continuous power

Output:

85 watts per channel, minimum RMS, at 8 ohms, from

20Hz to 20kHz, with no more than 0.09% total har-

monic distortion

Total harmonic distortion:

0.02% at 60W (Aux. in)

Intermodulation distortion:

0.1% at 60W (Aux. in)

Damping factor:

more than 40

(at 1kHz 8ohms)

Hum and noise level

Residual:

1 mV

Maximum volume:

Aux.: 1 mV

Phono: 10mV Tape: 1 mV

Signal to noise ratio (IHF, closed circuit "A" network):

Aux.: 96dB Phono: 73dB

Tape: 96dB

PRE-AMPLIFIER

Input Sensitivity and Input Impedance:

Phono 1 and 2: $2.5 \,\mathrm{mV}/47 \,\mathrm{Kohms}$

Aux.:

150mV/47Kohms

Tape play back 1 and 2:

150mV/47Kohms

Output level:

150mV/47Kohms

REC 1 and 2

Phono overload:

240mV

(RMS. 1kHz 0.09% THD.)

RIAA curve deviation:

 $(30 \sim 20 \, \text{kHz})$

 $\pm 0.9 dB$

Frequency response:

 $10 \text{Hz} \sim 55 \text{kHz} \pm 1.5 \text{dB}$

(Aux., Tape play back)

Tone control

Bass:

± 10dB at 100Hz

Treble:

± 10dB at 10kHz

Low cut filter:

30 Hz (6 dB/oct)7kHz (6dB/oct)

High cut filter:

Audio muting:

 $-20\,\mathrm{dB}$

FM SECTION

Tuning range:

 $87.6 \sim 108 \, \text{MHz}$

Intermediate frequency: 10.7 MHz Sensitivity:

10.3dBf (IHF)

(at 3% THD, 75kHz deviation)

Total harmonic distortion

Mono:

0.2%

Stereo:

0.4%

Image rejection ratio:

81dB

IF rejection ratio: AM suppression ratio:

81dB

Selectivity:

55dB 70dB

Stereo separation:

40dB (1kHz)

AM SECTION

Tuning range:

 $520 \sim 1620 \, \text{kHz}$ 455kHz

Intermediate frequency:

 $400 \,\mu V/m$

Quieting sensitivity:

Image rejection ratio:

40 dB (1400 kHz)

IF rejection ratio:

55dB (600kHz)

Total harmonic distortion:

0.8%

Specifications are subject to change without

prior notice.

Prior to removing the chassis, be sure to draw the power supply plug from a wall outlet. Then, proceed with the removal work in the following order after disconnecting all of the connection cords at the rear of the set.

1) To remove the cabinet:

Remove 6 screws 1 retaining the cabinet (3 screws each for the right and left sides), then the cabinet can be detached.

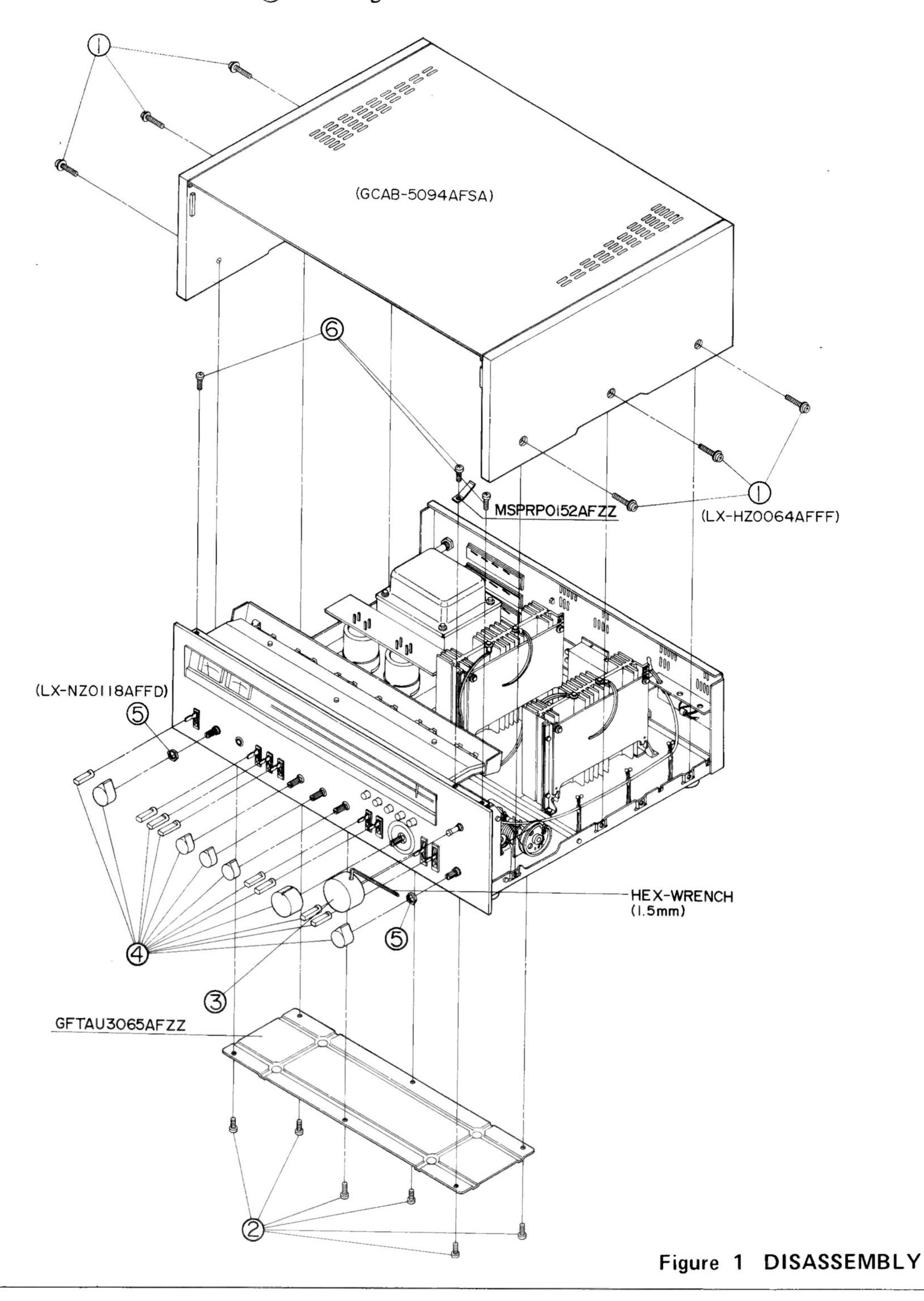
2) To remove the bottom board:

Turn over the set and remove 6 screws 2 retaining

the bottom board, then the bottom board can be detached.

3) To remove the front panel:

- (1) Use a hexagonal wrench (1.5mm) to loosen the screw retaining the tuning knob 3 at the front panel, and pull out the tuning knob.
- (2) Pull out the remaining knobs 4 (14 knobs).
- (3) Remove the nuts (5) retaining the speaker switch shaft and selector switch shaft.
- (4) Finally remove 3 screws 6 retaining the front panel, then the front panel can be detached.



DIAL CORD STRINGING

1) Setting of the dial cord:

- (1) Turn the drum fully counterclockwise (at the highest frequency position).
- (2) Put a hook of the spring on the central hole of the drum.
- (3) Then proceed with stringing in the numerical order from ① to ⑧. At this work, while holding a hand at the position ⑥ to temporarily fix a dial string, wind the string on the drum by 1-½ turns at the position ⑦ (which is an extention of the string wound at the posi-
- tion (6) and bring it through the position
- (8). Then release a hand from the position
- 6 and thus the stringing is completed.

2) Setting of the pointer:

- (1) Turn the tuning shaft fully counterclockwise (at the lowest frequency position).
- (2) Align the pointer to the extreme left (where a part of the graduation line is cut) of the dial scale plate. (See Fig. 2-1.)

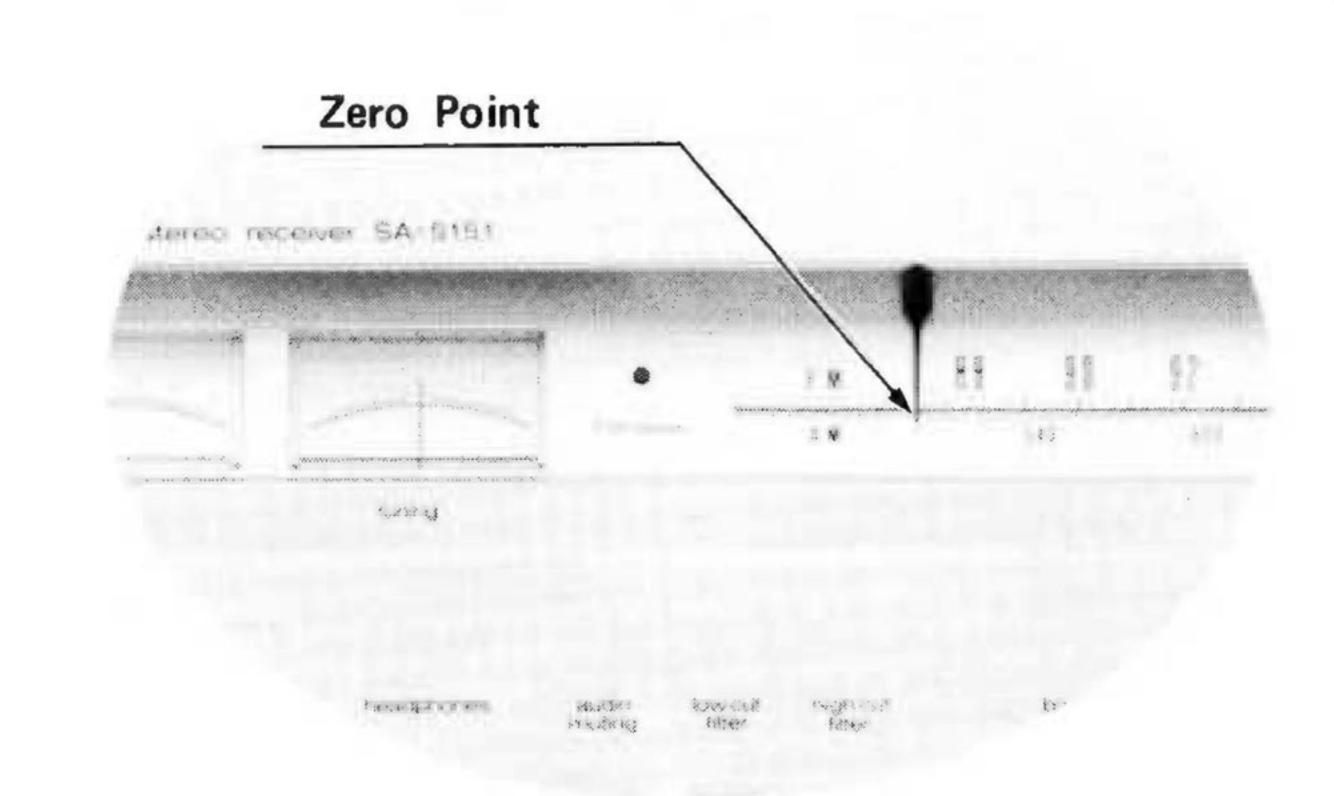


Figure 2-1

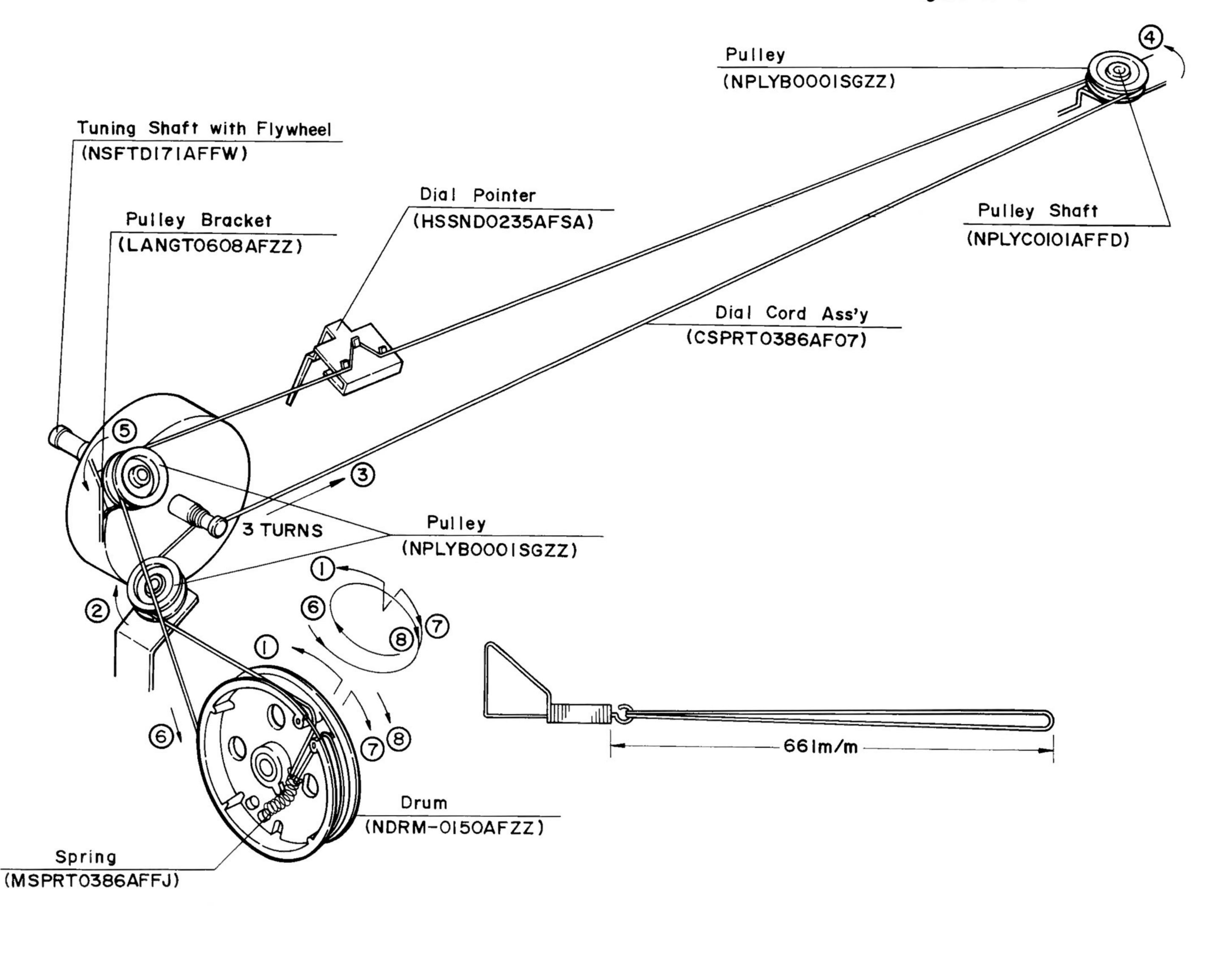


Figure 2 DIAL CORD STRINGING

FRONT PARTS LAYOUT

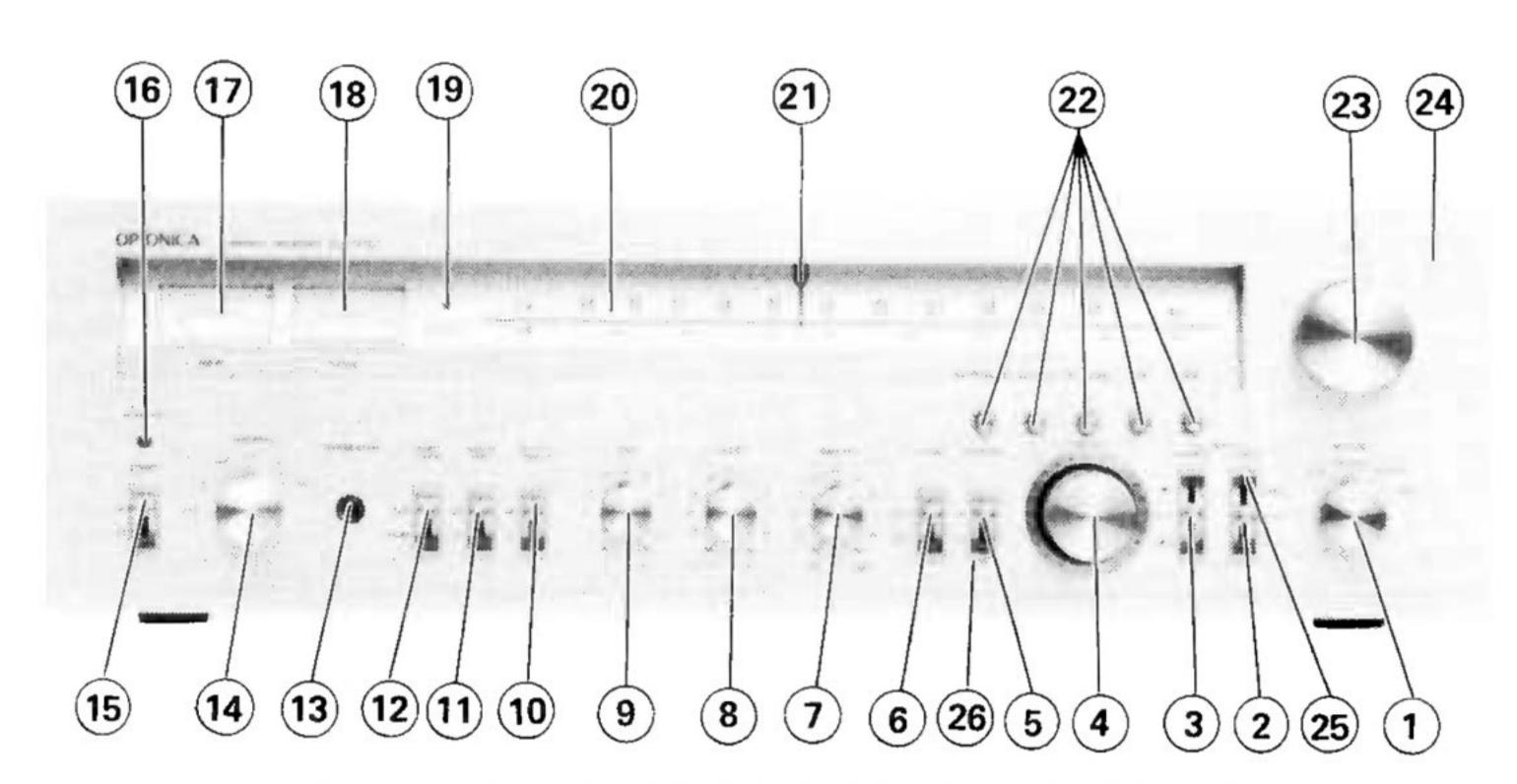
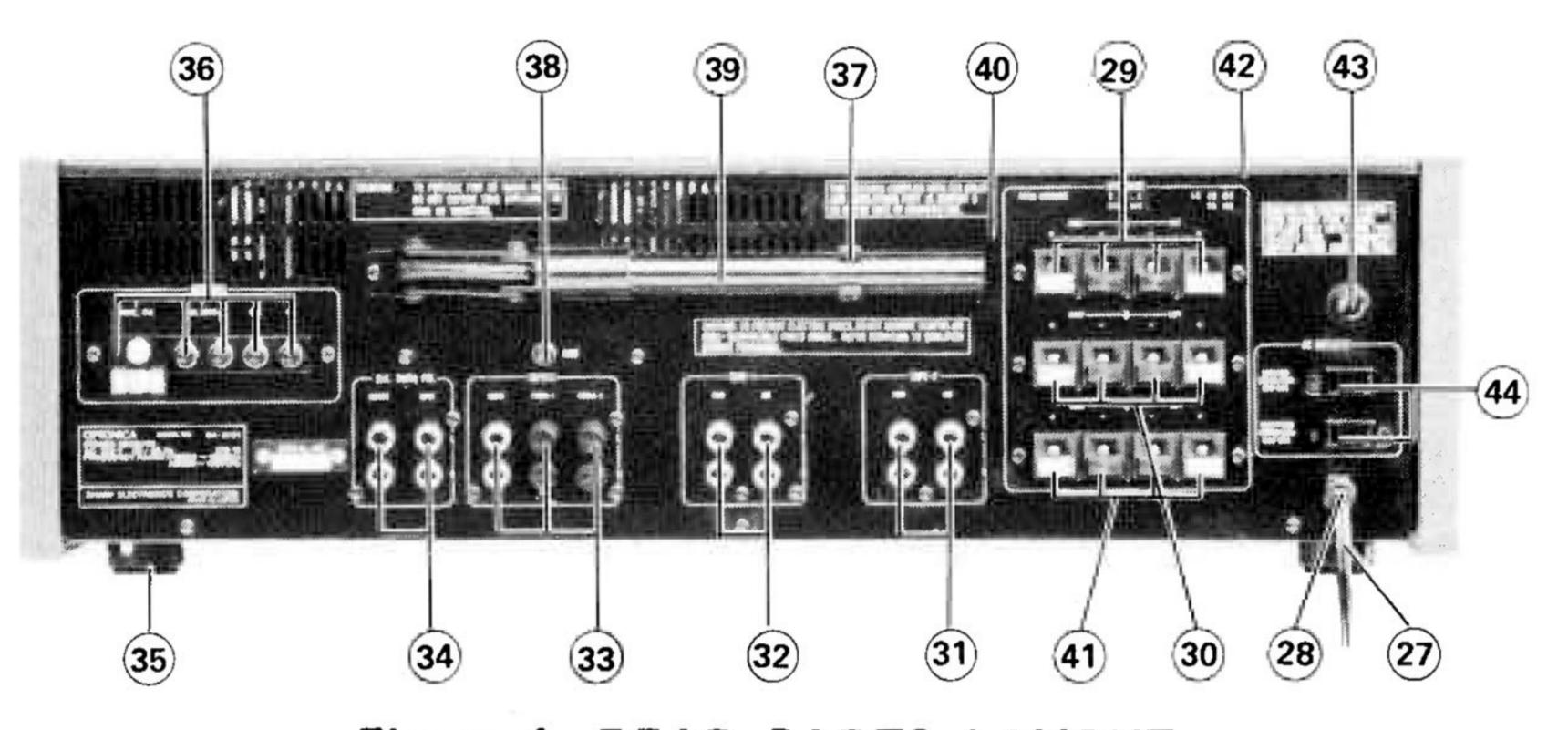


Figure 3 FRONT PARTS LAYOUT

- 1) Function selector knob (JKNBN0340AFSA)
- 2) Tape monitor switch knob (JKNBP0070AFSA)
- 3 Tape dubbing switch knob (JKNBP0070AFSA)
- 4 Volume control knob (JKNBN0342AFSA)
- (5) Loudness switch knob (JKNBP0070AFSA)
- 6 Mode selector knob (JKNBP0070AFSA)
- 7 Balance control knob (JKNBN0338AFSA)
- 8 Treble control knob (JKNBN0338AFSA)
- (9) Bass control knob (JKNBN0338AFSA)
- (10) High cut filter switch knob (JKNBP0070AFSA)
- (11) Low cut filter switch knob (JKNBP0070AFSA)
- (12) Audio muting switch knob (JKNBP0070AFSA)
- (13) Headphones jack (QJAKJ0057AFZZ)
- (14) Speakers selector knob (JKNBN0340AFSA)
- (15) Power switch knob (JKNBP0070AFSA)
- Power source/circuit protection indicator, LED (VHPGL-52RG/1F)

- (17) Signal strength meter, ME801 (RMTRL0142AFSA)
- 18) FM tuning (center) meter, ME802 (RMTRL0134AFSA)
- (19) FM stereo indicator, LED (VHPSR105D//-1)
- 20) Dial (HDALM0182AFSA)
- (21) Dial pointer (HSSND0235AFSA)
- (22) AM/FM/FM muting/Air check/Ext. Dolby FM switch knob (JKNBMO248AFSA)
- 23) Tuning control knob (JKNBB0061AFSA)
- 24) Front panel (HPNLC3294AFSA)
- 25) Guide (Large), lever switch (GCOVA1070AFSC)
- 26) Guide (Small), lever switch (GCOVA1071AFSC)

REAR PARTS LAYOUT



"DOLBY" symbol is trade mark of DOLBY Laboratories.

Figure 4 REAR PARTS LAYOUT

- (27) Power supply cord (QACCU0002AF00)
- 28) Bushing, power supply cord (LBSHC0007AFZZ)
- (29) Speaker output terminals-A (QTANZ0455AFZZ)
- 30 Speaker output terminals-B (QTANZ0455AFZZ)
- (QSOCJ2457AFZZ) (QSOCJ2457AFZZ)
- (QSOCJ2457AFZZ) (QSOCJ2457AFZZ)
- (QSOCJ2660AFZZ) (QSOCJ2660AFZZ)
- 34 Ext. Dolby FM inputs and outputs socket (QSOCJ24594AFZZ)

- (35) Leg (GLEGP0057AF00)
- (36) Antenna terminals (QTANN0453AFZZ)
- (37) Clamper, AM bar antenna (LCRA-0050AFZZ)
- (38) Chassis ground terminal (QTANN0150AFZZ)
- 39) Built-in AM antenna (RCILA0415AFZZ)
- 40 Rear panel (LANGQ0529AFSA)
- (41) Speaker output terminals-C (QTANZ0455AFZZ)
- (42) Cabinet (GCAB-5094AFSA)
- (43) Fuse holder (QFSHZ0002AGZZ)
- (44) AC outlet socket (QSOCA0402SGZZ)

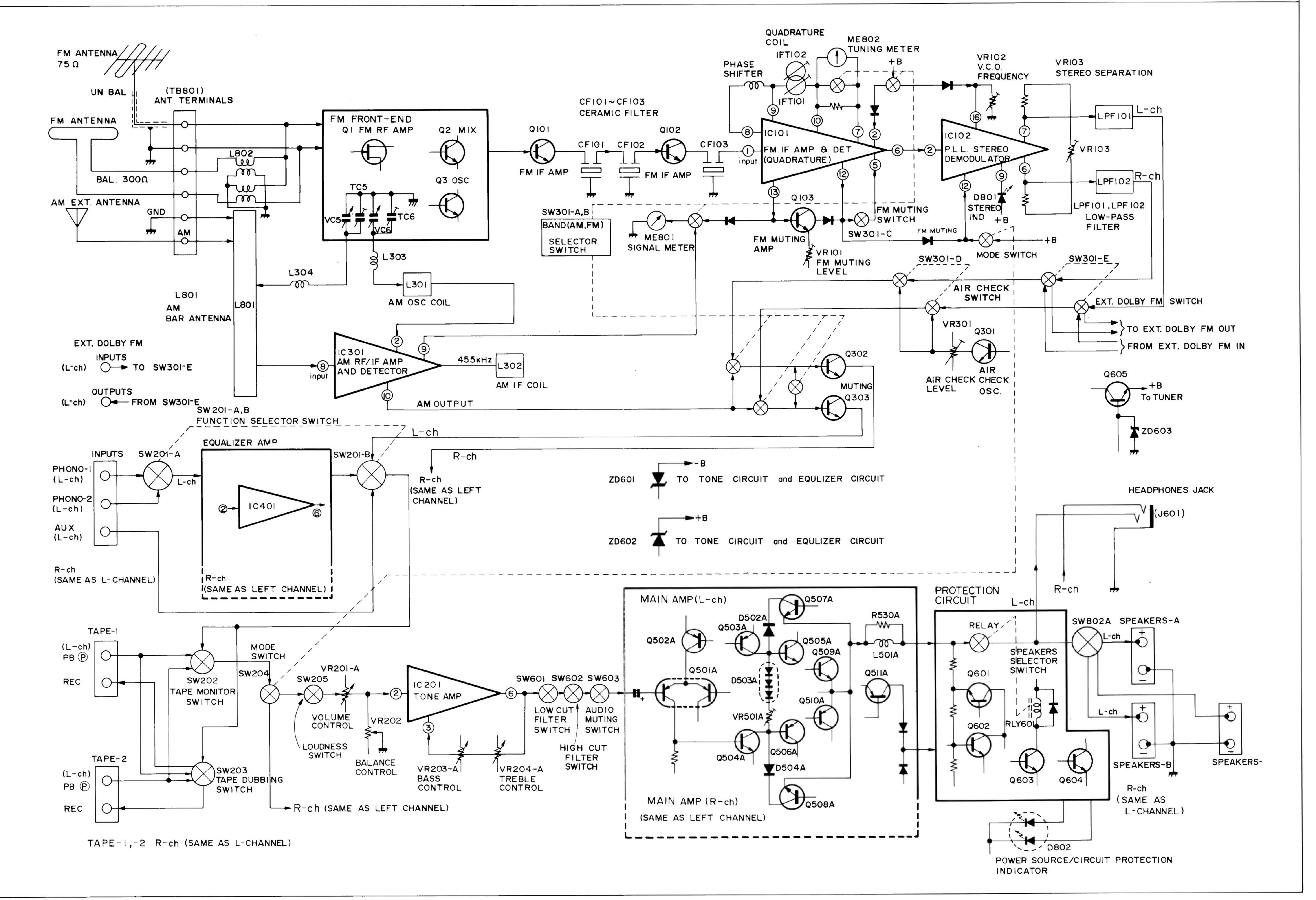


Figure 5 BLOCK DIAGRAM

CIRCUIT DESCRIPTION

FM RF SECTION

FM antenna input circuit has two input terminals (75 ohms and 300 ohms) thanks to impedance converter (balun), coil L801. The 75 ohms input terminal is used when Fm antenna is connected to the unit by using a coaxial cable. The 300 ohms input terminal is used when FM antenna is connected to the unit by using a balanced feeder. Fig. 6 shows FM Front-End circuit. RF amplifying section consists of 1 dual gate MOS-FET and 2 transistors.

Transistor Q1 is dual gate MOS FET and its function is nearly the same as of vacuum tube. Due to the adoption of MOS FET, crossmodulation characteristic and spurious characteristic are remarkably improved compared with conventional transistor type.

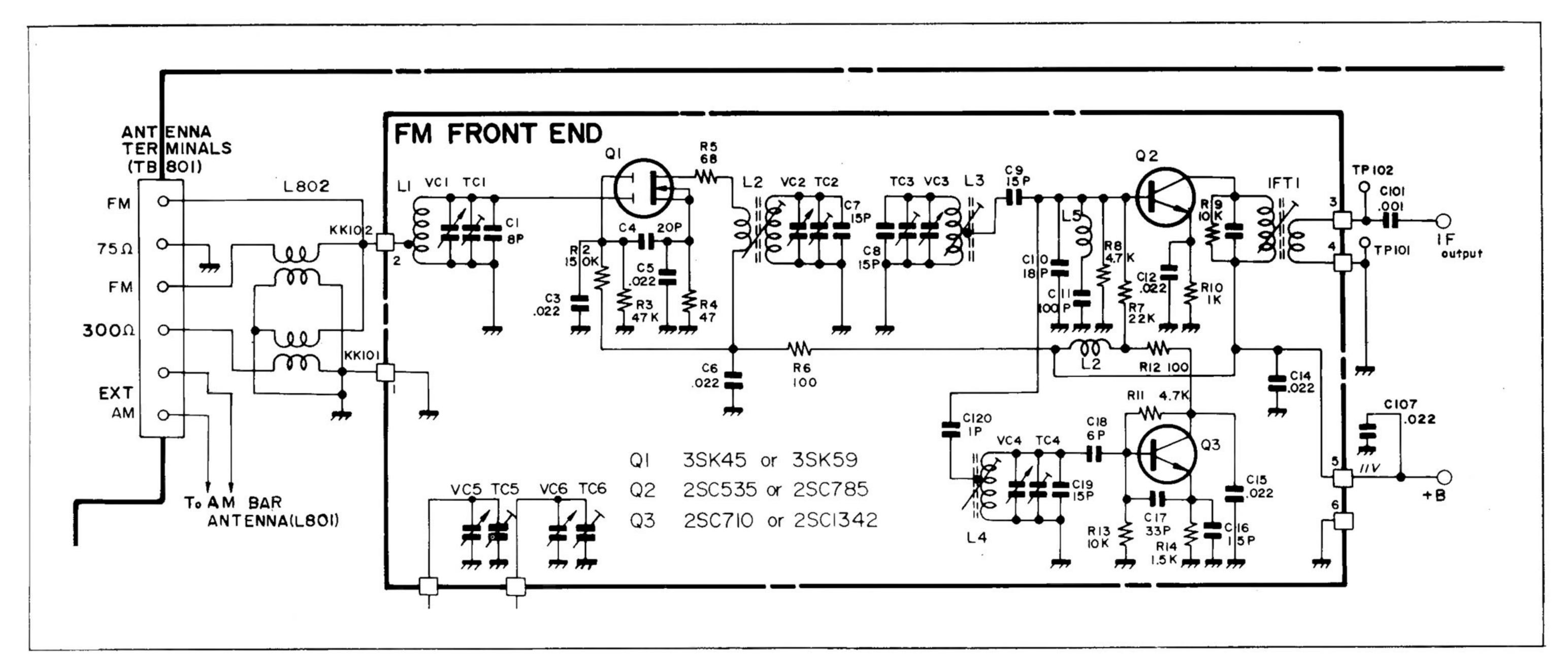


Figure 6 FM FRONT-END CIRCUIT

Dual gate MOS-FET Q1 is FM high frequency amplifier. Transistor Q2 works as frequency mixer, in which high frequency signal coming from the MOS-FET Q1 and local oscillation frequency coming from the transistor Q3 are mixed to produce 10.7MHz IF signal which will enter IF tuning transformer IF T1. The transistor Q3 is for the local oscillation and it applies oscillation voltage to the base of transistor Q2 via capacitor C18 (4pF).

Therefore, coil L1 is for antenna tuning, coil L2 is for FM RF amplification and tuning and coil L4 is for local oscillation.

FM IF SECTION

Fm IF section consists of 1 IC (integrated circuit), 2 transistor and 3 ceramic filters. Transistor Q101 and Q102 are FM IF amplification transistor, which is to amplify IF signal which has been converted into 10.7MHz signal at FM front end section. This 10.7MHz IF signal is given a higher selectivity since it runs through the concentrated selective element, that is, ceramic filters CF101, CF102 and CF103. These filters function to amplify IF (intermediate frequency) signals giving no distortion and to assure a necessary selectivity. The IF signal is further supplied to the terminal ① of IC101, in which the gain of this signal is increased by about 66dB by the three-stage differential amplifier thus being subjected to an appropriate limiter function.

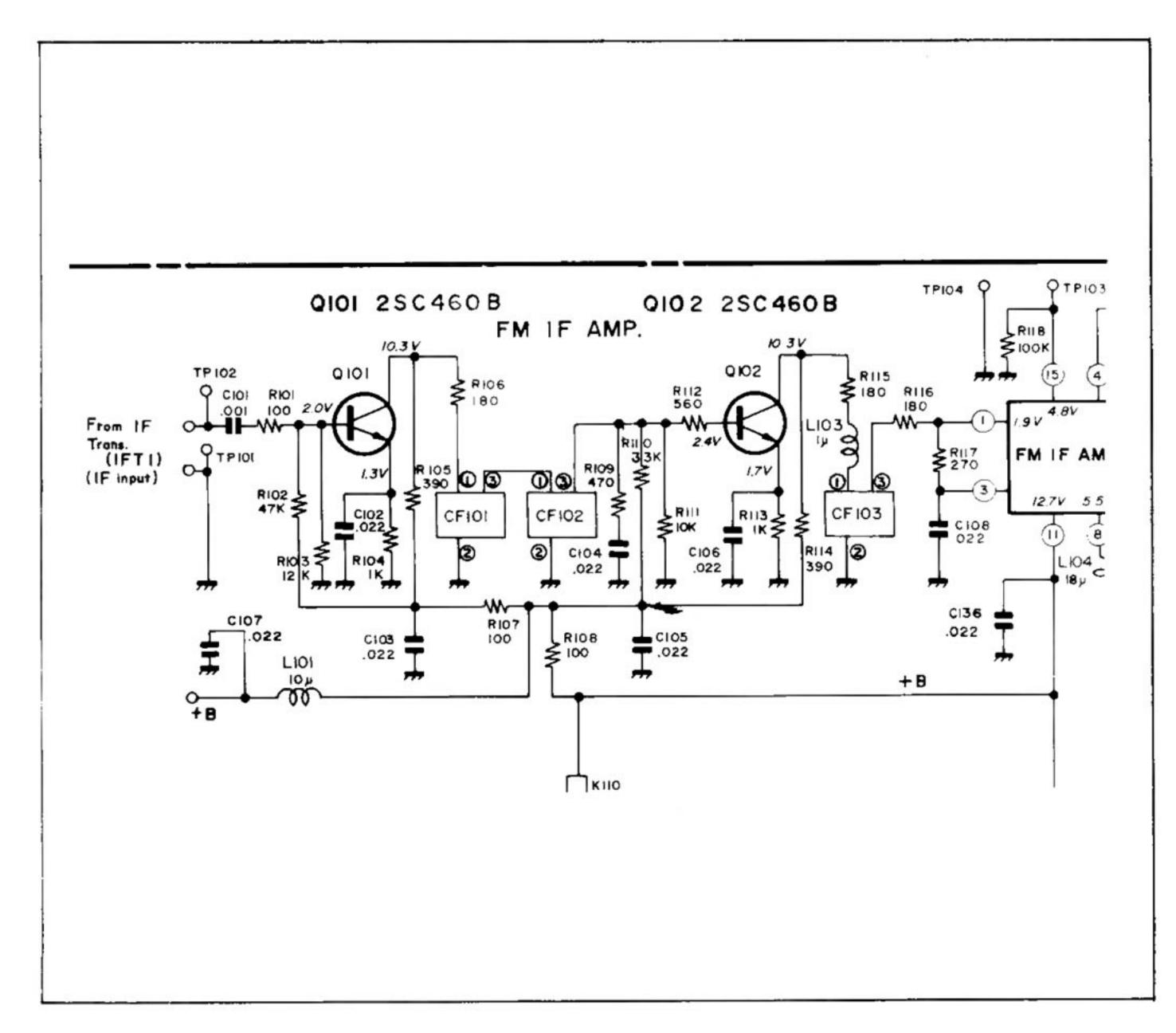


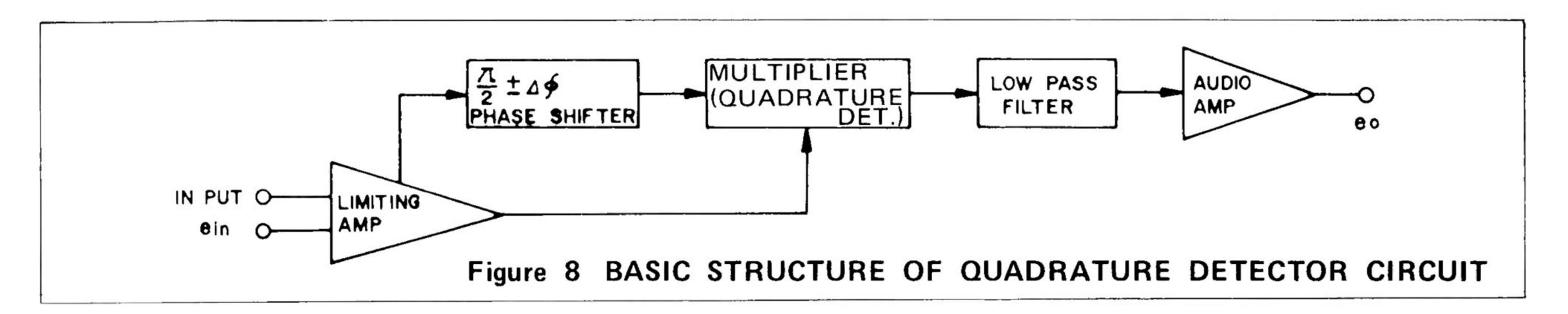
Figure 7 FM IF CIRCUIT

FM DETECTION SECTION

(Quadrature Detector Circuit)

(1) FM Detector Circuit

This unit employs "Quadrature Detector" based on newly developed IC (Integrated Circuit), which is substituted for ratio detector and Foster-Seeley's detector that have been so far used. The basic structure of quadrature detector circuit is as shown in Fig. 8.



With this detection system, the multiplier (quadrature detector) circuit receives two types of input signals, one is the signal which has been amplified by the limiting amplifier and another which has passed through the phase shift circuit. (about $\pi/2$). Thus, the quadrature detector circuit produces demodulation signal.

The term "quadrature" is resulted from that the phase difference between these two signal is $\pi/2$. The multiplier consists of doubly balance circuit as shown in the following circuit drawing. Phase characteristic of the phase shift circuit is as shown in Fig. 10.

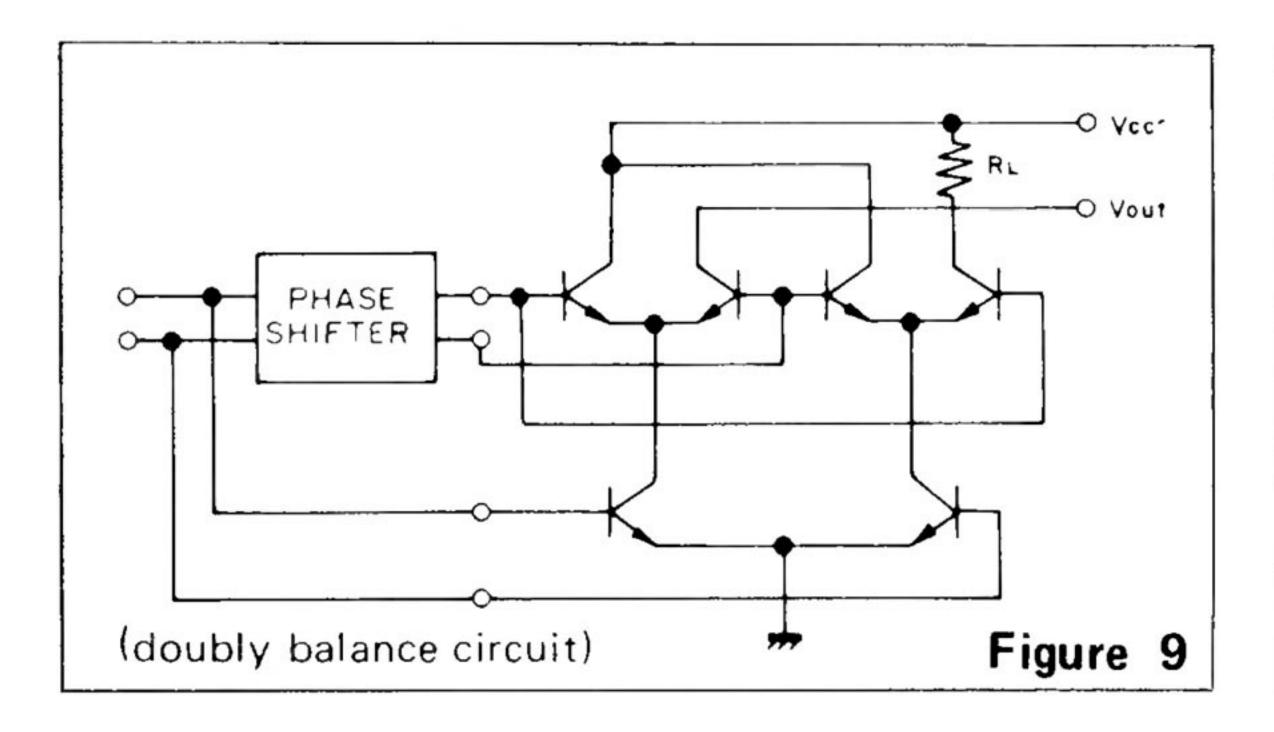
This circuit is featured by:

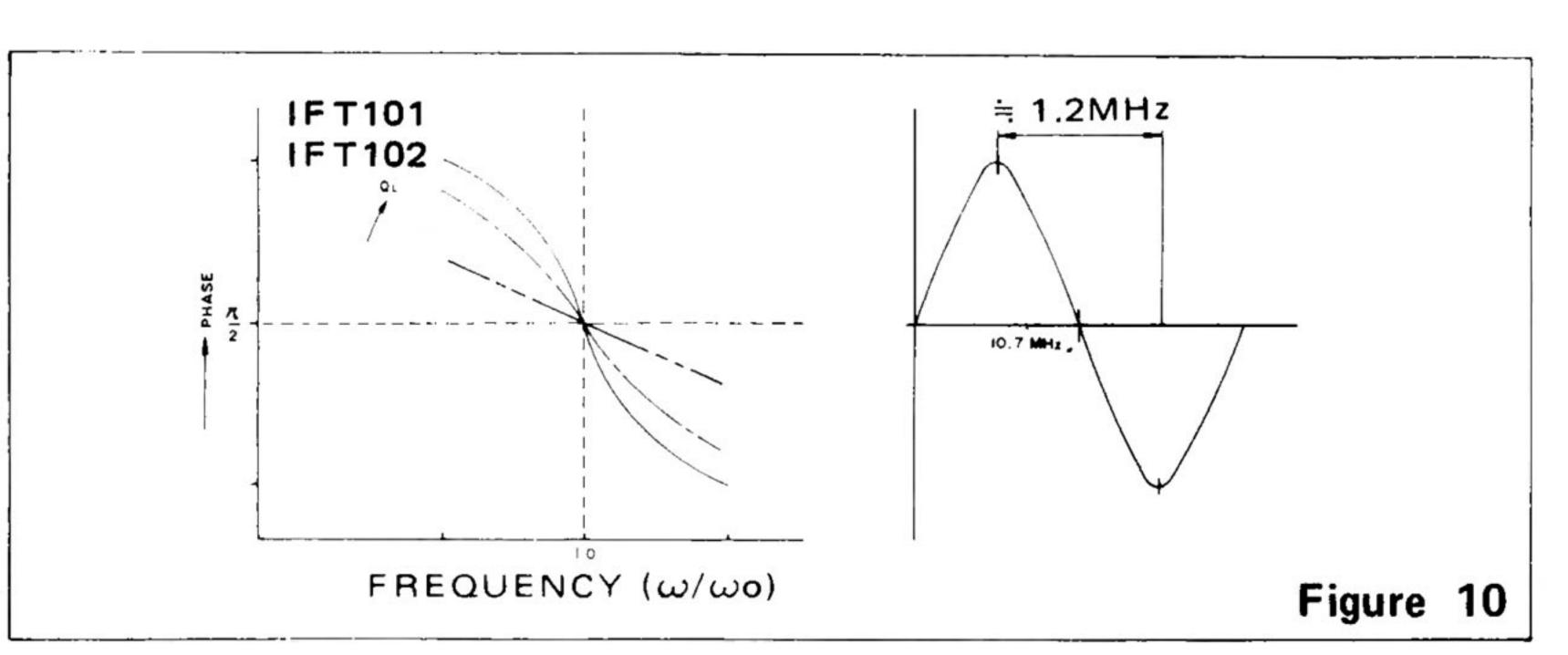
- (1) Good linearity and low distortion.
- (2) Operates on small signal and less higher harmonics.
- (3) Wide-band detection of as much as 1.2MHz.

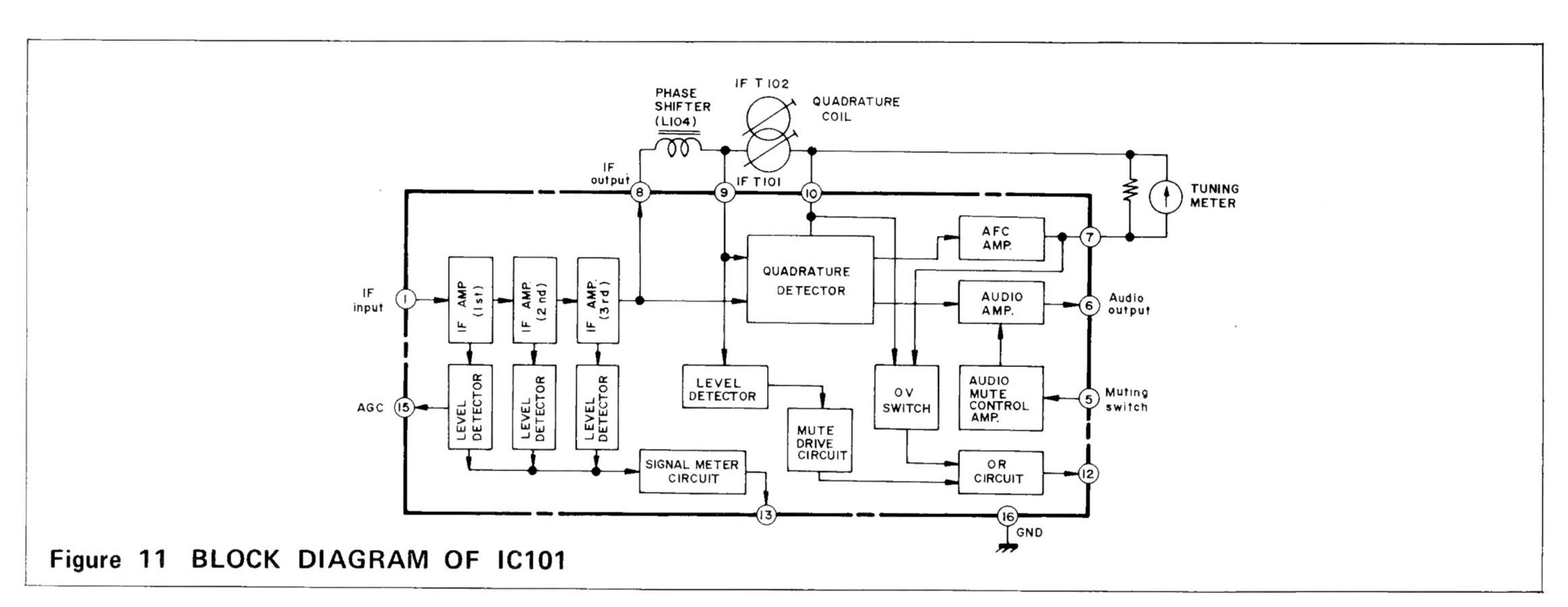
Therefore, this circuit assures low distortion even with the overmodulation of more than 100% thereby reproducing high quality sound.

Actually saying, the detecting circuit SA-5151 uses L104 as phase-shift coil. IFT101 and IFT102 are 10.7MHz tuning quadrature coil.

Detection output appears at the terminal 6 of IC101 and it is supplied to the terminal 2 of P.L.L. multiplex integrated circuit IC102.







1) Features of P.L.L. stereo demodulator circuit.

This set incorporates a stereo demodulator circuit that comprises IC's with the PLL (Phase Locked Loop) system applied. The PLL (Phase Locked Loop) FM demodulator circuit is provided with such characteristics as mentioned below.

In order to demodulate stereo composite signals, it is necessary to take a 19kHz pilot signal out of the stereo composite signals and to make it a 38kHz signal.

Most of the conventional methods to obtain such a 38 kHz signal are frequency doubling ones which utilize a nonlinearity of the elements. Compared with the conventional type, the recently developed IC-ed demodulator provides more sufficient separation effects. However, since it also requires 2 or 3 coils like the conventional one, if even one of them is dislocated from the initially adjusted point due to a secular change the separation effects will be deteriorated. Moreover there is such a contradiction that the more the efficiencies of the coils are increased enough to withstand the outer pulse signals like automobil ignition noises, the more the coils suffer secular changes.

To eliminate such disadvantages as above, PLL (Phase Locked Loop) system is employed in the method to make a 38kHz signal using a 19kHz pilot signal.

The PLL system stereo demodulator gives such three merits as:

to force stereo signals to become monaural ones.

- 1. Since the phases of a pilot signal and a 38kHz signal are automatically made the same with each other, the deterioration of separation effect is strongly minimized.
- 2. Since only one of variable resistor, being newly employed, plays the role of 2 to 3 pieces of conventional coils, troubles of the parts due to secular changes are decreased. In addition, even if this variable resistor is slightly dislocated, the separation effect will never be deteriorated because of the merit as mentioned in 1 by which the automatic phase adjustment is assured.
- 3. Compared with the conventional one, the PLL system demodulator shows a more noise withstanding characteristic since it has such performances as the selection of frequencies and the continuity of oscillation frequencies (short-time memory), thus assuring a stable stereo demodulation.
- IC102 is an integrated circuit for P.L.L. stereo demodulation and its block diagram is as shown in Fig. 12. V.C.O. free-running frequency is to be adjusted to 76kHz by adjusting semi-fixed resistor VR102 (10Kohm). TP107 is the test point for frequency observation. (See the paragraph "Adjustment" described later.) During AM reception, +B voltage is supplied to the terminal 16 of IC102 through diode D106 and resistor R138 so that oscillation frequency of V.C.O. will be stopped. Semi-fixed resistor VR103 (220Kohm) aims at the adjustment of stereo separation and with

this resistor it is possible to minimize crosstalk to the opposite channel. +B voltage is supplied to the terminal (12)

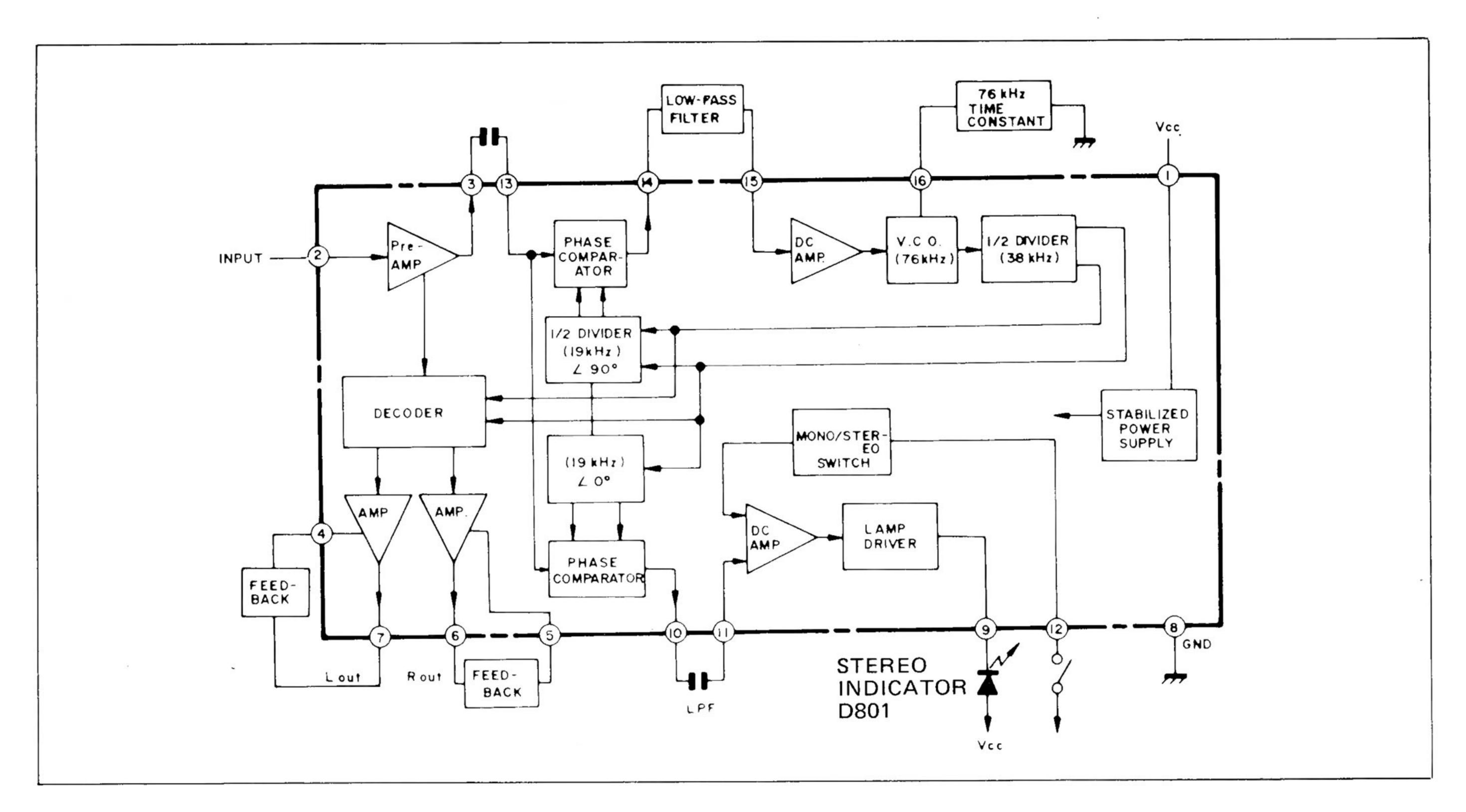


Figure 12 BLOCK DIAGRAM OF IC102

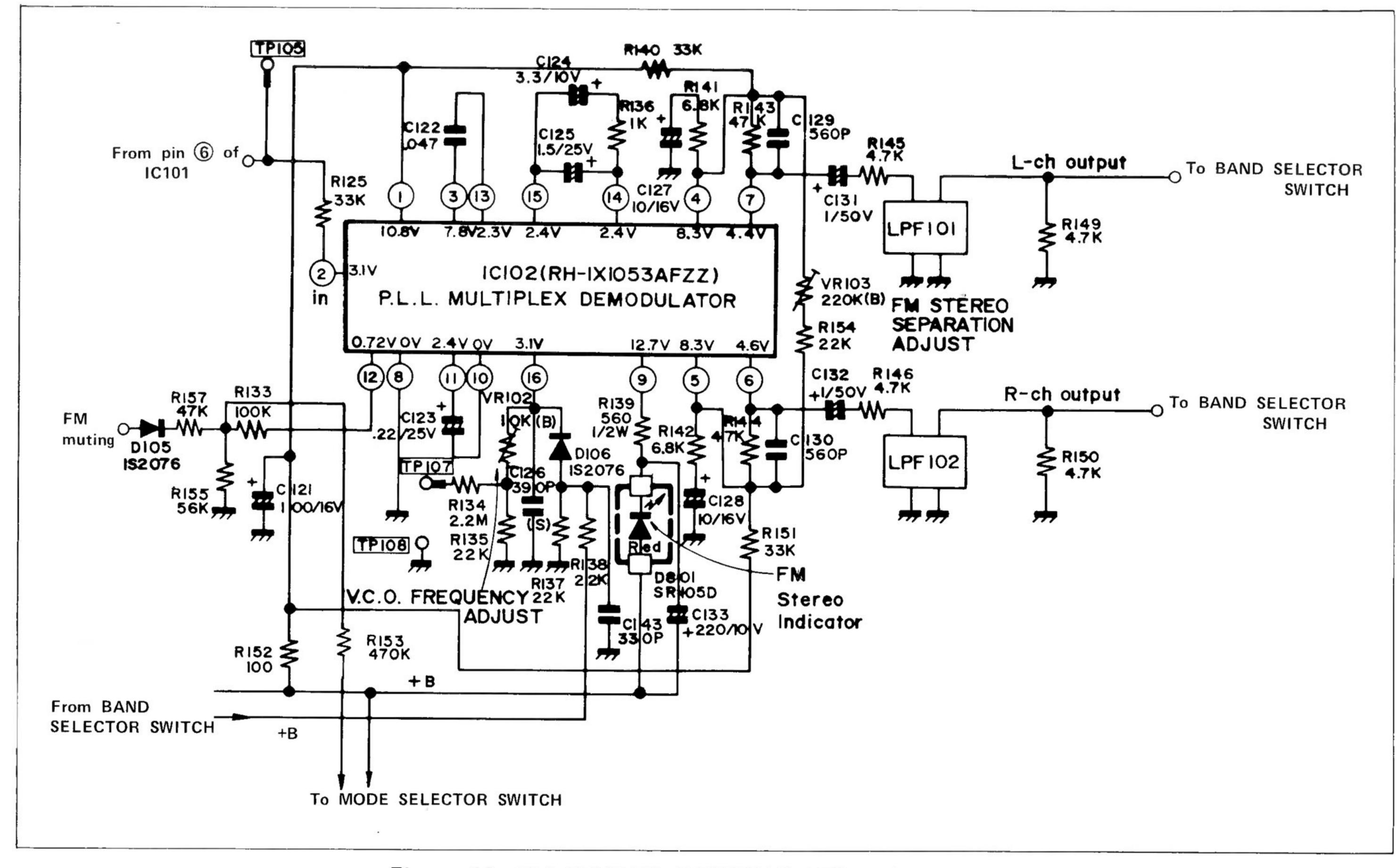


Figure 13 FM STEREO DEMODULATOR CIRCUIT

AIR CHECK CALIBRATION CIRCUIT

This circuit is to make appropriate the recording level in advance when recording FM broadcast into the tape recorder. The circuit shown in Fig. 14 hereof is CR type oscillator circuit to be used for the air check calibration (about 400 Hz). In other words, when the "air check" switch at the front panel is set to "ON" position, (a) and (b) of the air check cal. circuit are connected to each other, oscillator voltage is taken out of (c) and it appears at the output socket at the rear panel being as air check signal level. The air check signal level is set to 60% of the output voltage obtained when the tuner receives FM broadcast signal (modulation 100%, 75kHz deviation) and this level voltage appears at the output terminal of the rear panel through the air check oscillator circuit. VR301 is semifixed resistor to be used for adjusting the air check signal level.

How to record FM broadcast using the air check calibration system is described below.

Set the "air check" switch to "ON" position, put the tape recorder in record mode, apply air check signal to the tape recorder and adjust the record level so that the record level meter of tape recorder indicates "OVU". After that, set the air check switch to "OFF" position and proceed with recording FM broadcast.

NOTE:

In the case of AM reception, in other words, when the band selector switch is kept to the position AM, air check level signal does not appear at the output terminal located at the rear of the set since the air check calibrator is not functioning at the time.

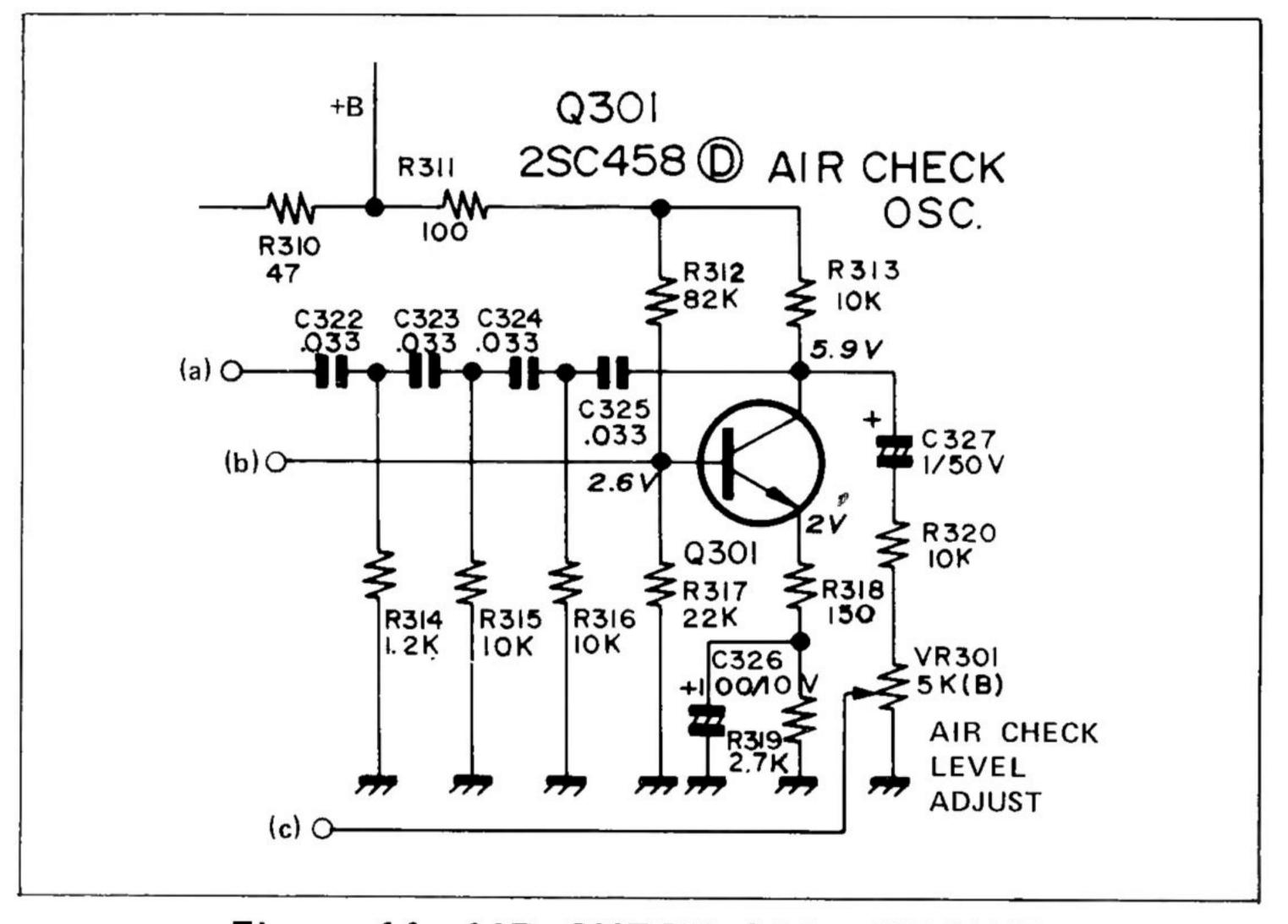


Figure 14 AIR CHECK CAL. CIRCUIT

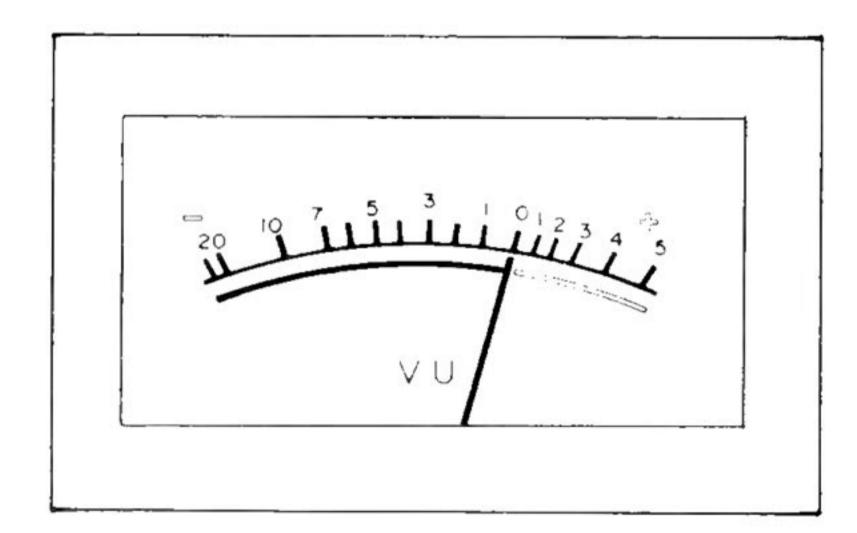


Figure 15 "0VU"

FM MUTING CIRCUIT

In SA-5151, IC101 incorporates muting circuit and this circuit is so designed that if FM input signal to the antenna becomes about 20dB when the muting switch (SW301-D) is kept at "ON", the muting is released and the signal appears at the output without undergoing muting. The muting release signal is produced by addition of two signals, one is the output signal at the pin (12) of IC101 and another is signal meter signal at the pin (13) which will undergo polarity inversion by the transistor Q103 and these two signals are applied to the pin (5) of IC101 via the muting switch (SW301-D). Semi-fixed resistor VR101 is adjustable to release the muting when the input signal from the antenna terminal becomes about 20dB.

Fig. 16 shows the output voltage of two outputs, one is at the pin (12) of IC101 and another, at the collector of transistor Q103, to be added to each other.

This signal (to release the muting) is then supplied to the terminal 12 of P.L.L. stereo multiplex demodulator integrated circuit IC102 to make stereo signal be forced to monaural signal.

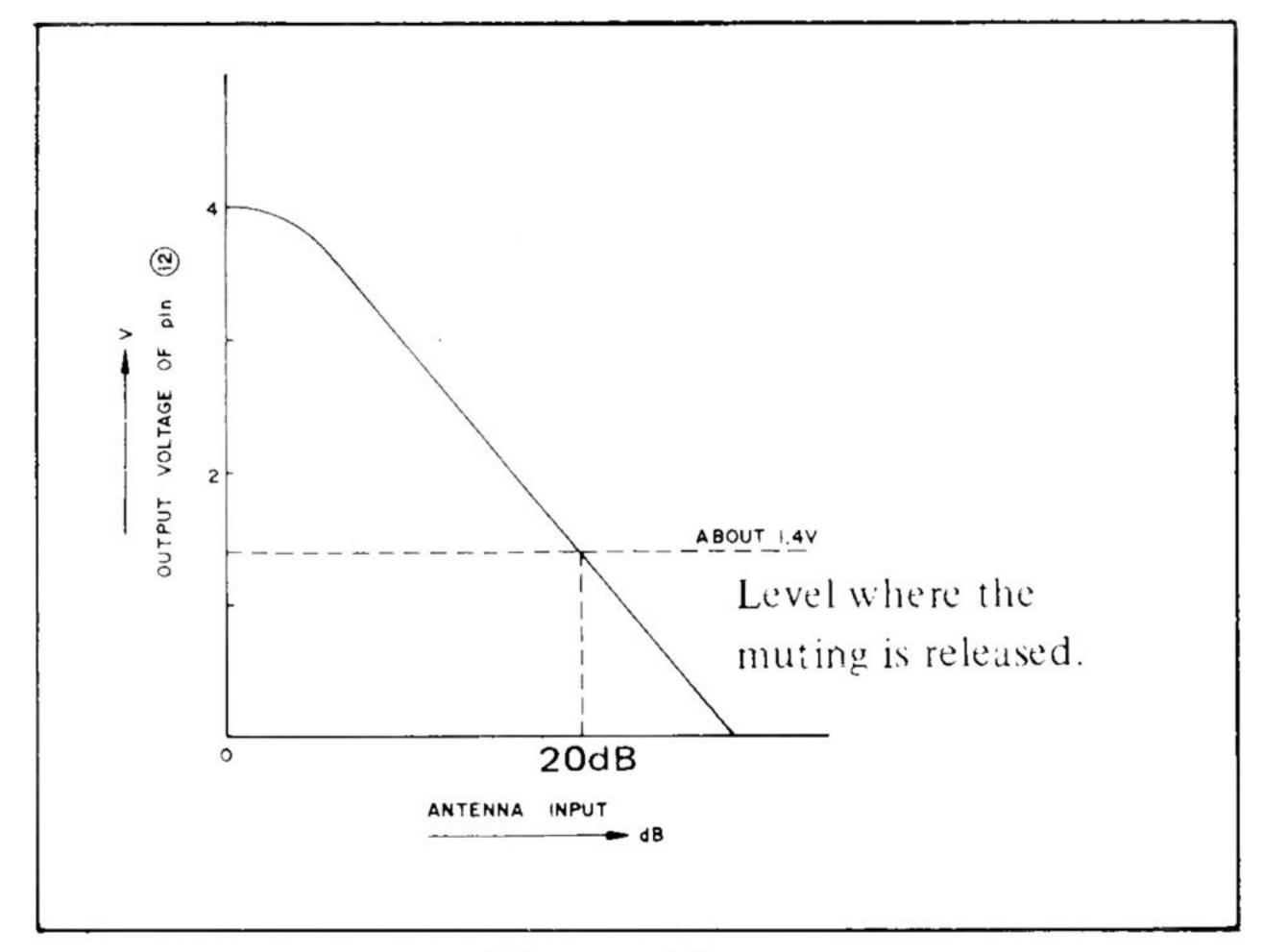


Figure 16

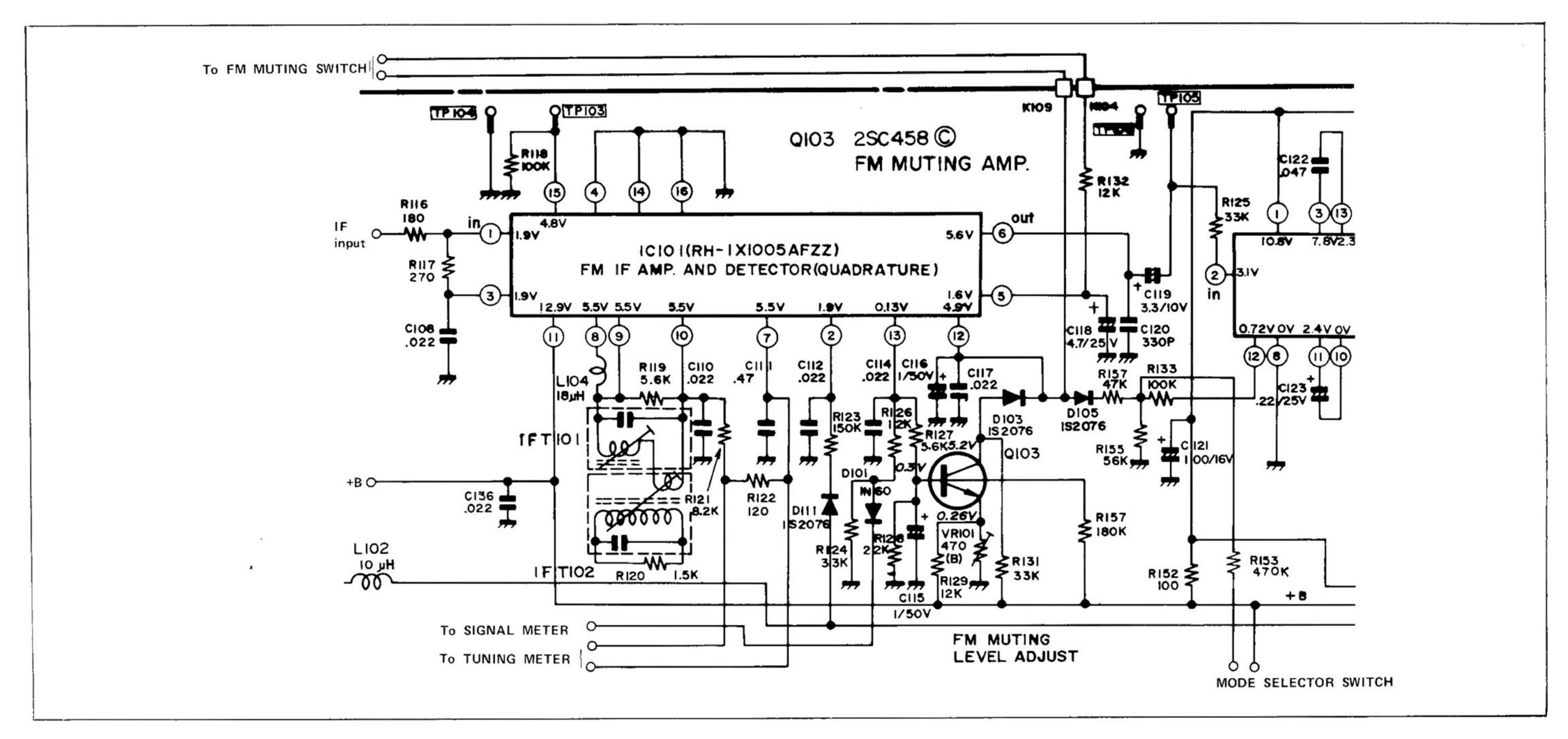


Figure 17 FM MUTING CIRCUIT

LOW-PASS FILTER

LPF101 and LPF102 are low-pass filters to remove carrier signals (19kHz and 38kHz) leaking from the stereo multiplex IC102. The characteristic is as shown in the Figure 18.

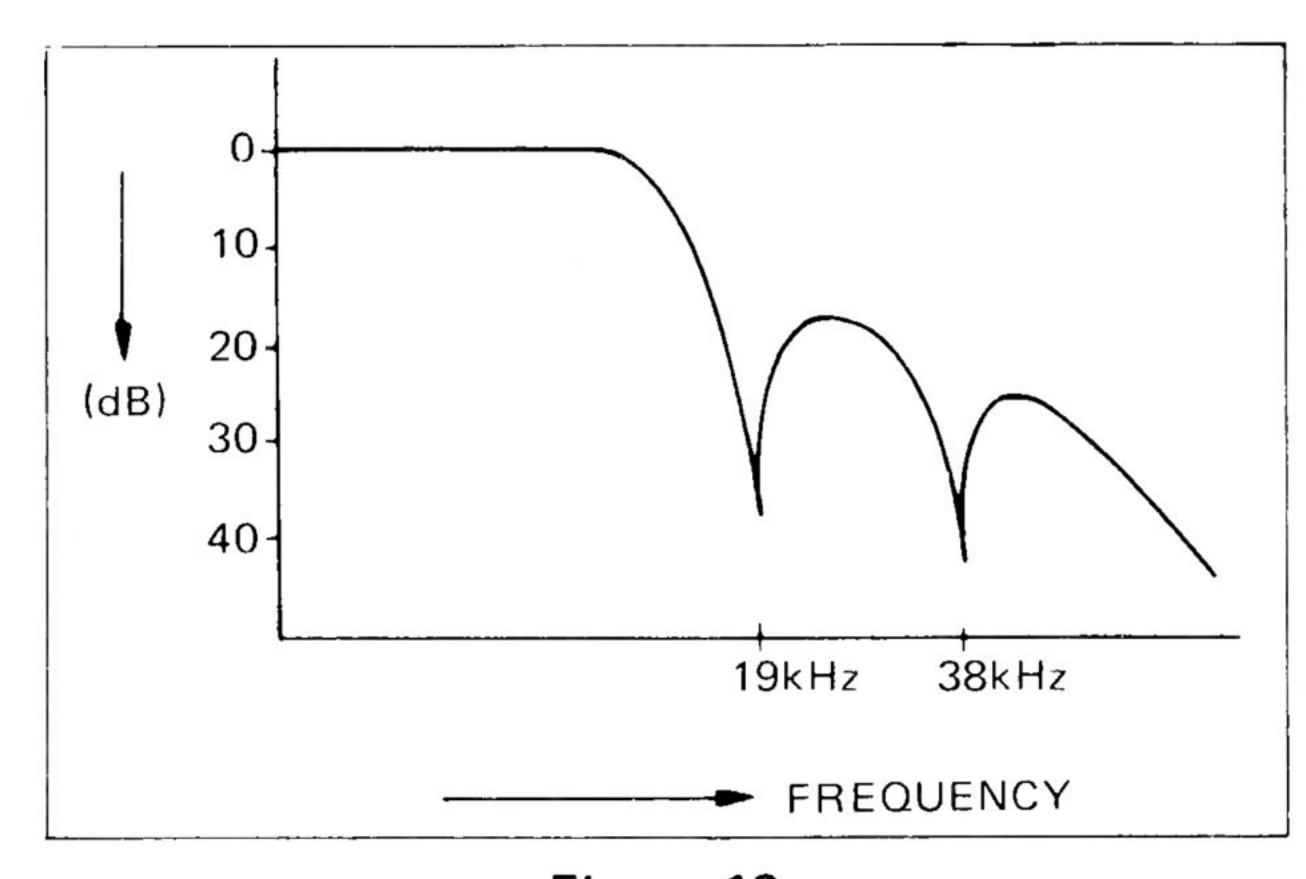
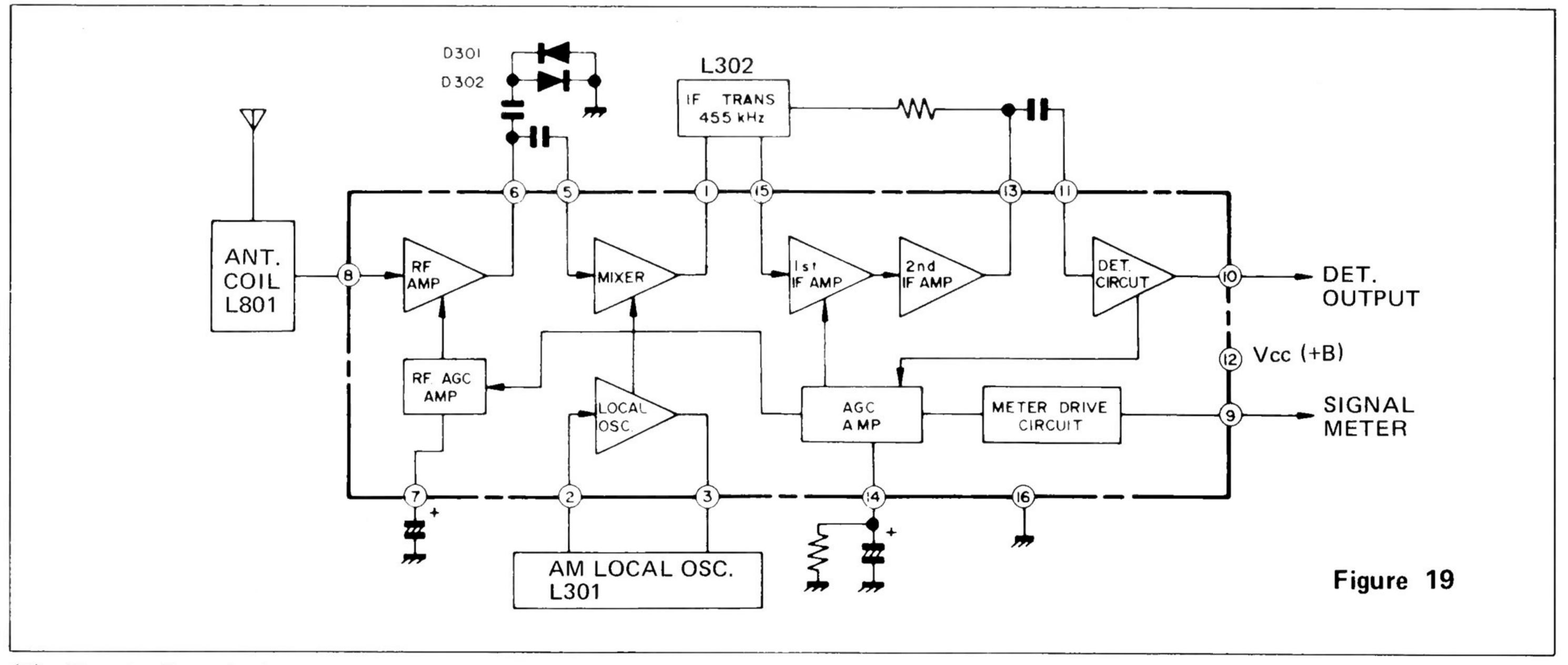


Figure 18

AM SECTION

(1) Block Diagram of IC301



(2) Circuit Description

The block diagram of IC301 is indicated as above. AM broadcast signal caught by the antenna coil L801 enter the pin (8) of IC301 and is amplified by RF amplifier to be supplied to the mixer via the overload diodes D301 and D302. Intermediate frequency selection element making use of the ceramic filter L302 is employed as the load for the mixer. AM signal, after being amplified by 1st IF amplifier and 2nd IF amplifier, is detected by the detector circuit. Besides, this IC circuit IC301 incorporates signal meter drive circuit to facilitate the tuning and the output at the pin (9) of IC301 is connected to the signal meter (ME801).

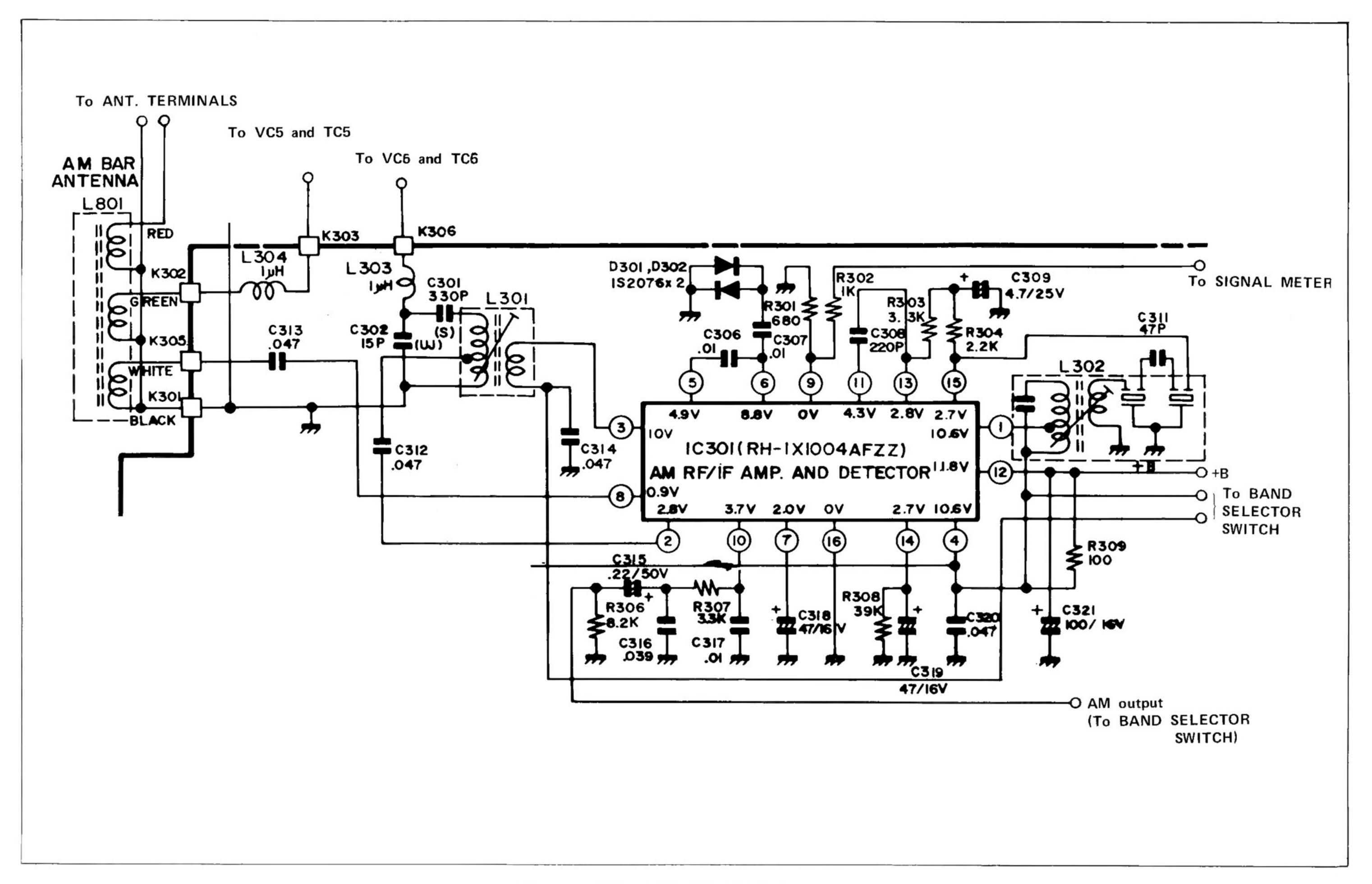


Figure 20 AM CIRCUIT

TONE AMPLIFIER CIRCUIT

The tone amplifier circuit is an integrated circuit (IC) of differential 1-stage and directly-coupled 3-stage, which assures both higher gain and lower distortion factor.

The power supply is of 2-power (positive and negative) system, in which the voltage at the input and output terminals is designated to be 0V. The coupling capacitor used for input and output signals is of the low leak type which enables reduction of residual noises. The variable resistor aimed to control bass and treble is able to control the resistance in particular when the set is kept in "mechanical center" condition so that beat characteristic at the tone flat mode can be minimized.

Signal coming from the function selector switch is once supplied to the tape monitor switch, mode switch, loudness switch, volume control (VR201-A, B) and balance control (VR202A,B), and then to the terminal 6 of IC201 via the capacitor C205. The signal is amplified in the IC201 to come out of the terminal 1 and it is applied to the filter circuit via the capacitor C213.

A part of the output signal of the coupling capacitor C213 is applied to the terminal 7 of IC201 through the tone NF circuit. The tone NF circuit consists of the bass control (VR203-A, B) and the treble control (VR204-A, B) which are to carry out intensification or attenuation respectively of bass and treble ranges.

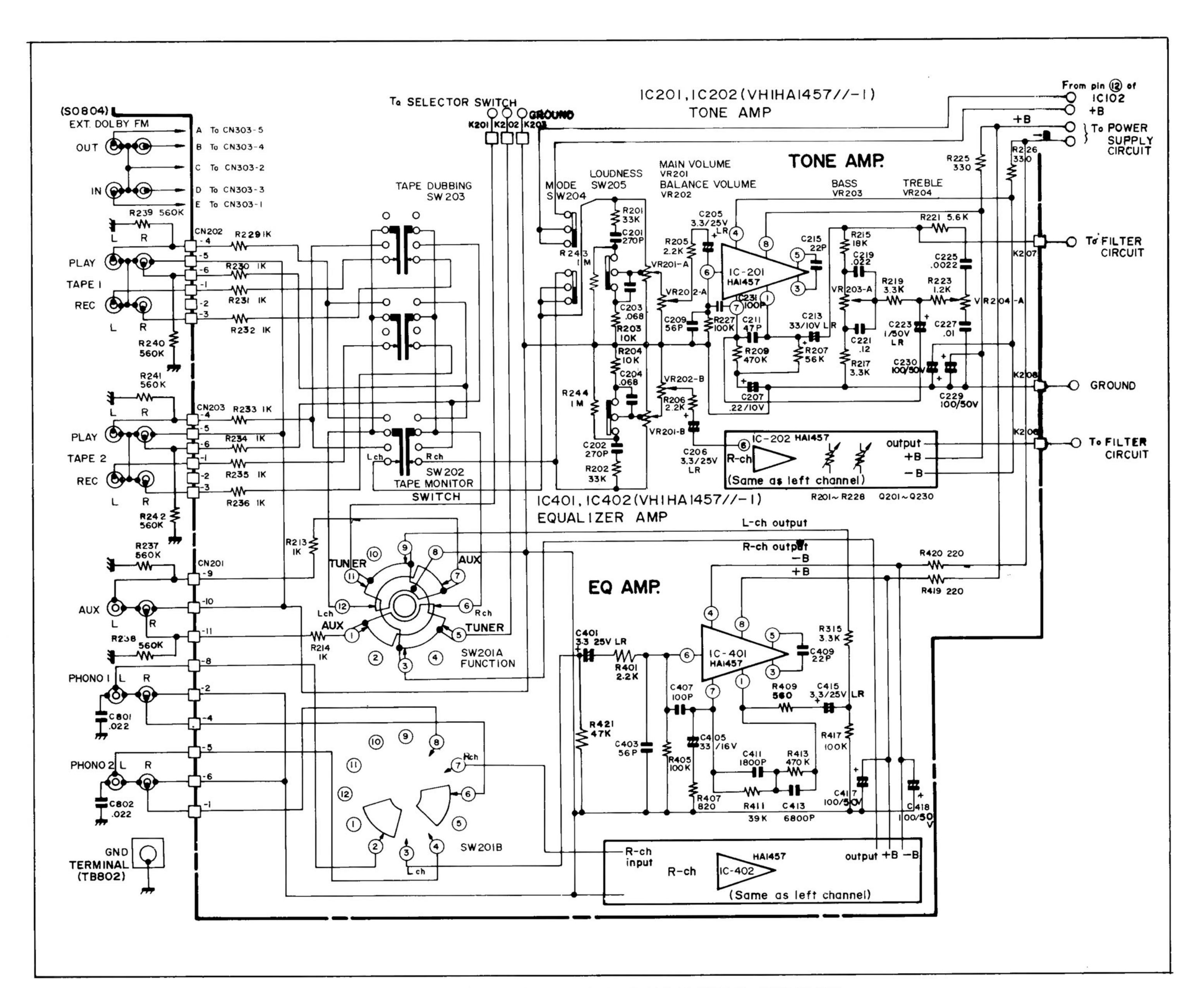


Figure 21 TONE AND EQUALIZER CIRCUIT

EQUALIZER AMPLIFIER CIRCUIT

The equalizer circuit is an integrated circuit of differential 1-stage and directly-coupled 3-stage, which assures both higher gain and lower distortion factor.

The power supply is of 2-power (positive and negative) system, in which the voltage at the input and output terminals is designated to be 0V. The coupling capacitor used for input and output signals is of the low leak type which enables reduction of residual noises.

Signal coming from the terminal PHONO is applied, via the function selector switch (SW201-B), resistor R401 and capacitor C401, to the terminal 6 of the integrated circuit IC401 to be amplified. The signal thus amplified comes out of the terminal 1 of IC401 and it will be applied, via the capacitor C415 and resistor R415, to the function selector switch (SW201-A). By the way, a part of such output signal is applied to the terminal 7 of IC401 through the NF circuit used for increase of "RIAA" characteristic.

Composed of resistor R413 and R411 and capacitors C411 and C413 which are precision parts having too small error. NF element aiming at "RIAA" characteristic is able to restrict "RIAA" deviation to ±1.5dB.

Resistor R417 is respectively to prevent capacitor C415 from discharging and to eliminate noise generation caused at the time of selecting the switches.

Capacitors C407 and C409 are for the purpose to prevent interference noises due to SW broadcasts, etc.

MAIN (POWER) AMPLIFIER SECTION

The main amplifier consists of all-stage direct-coupled pure complementary output capacitorless circuit.

This main amplifier is designed to operate on the 2-power (positive and negative) supply system and so the speaker terminal output voltage becomes earth potential (0V) in terms of DC component. Therefore, with this amplifier it is not necessary to use a coupling capacitor for cutting off DC component although it has so far been required when the speaker is connected to the amplifier. Besides, it enables the amplification in a wider range from lower frequency to higher frequency. This is an origin of the term OCL (Output Capacitor-Less).

FEAUTURE OF PURE COMPLEMENTARY OCL CIRCUIT

Since this circuit is not using output capacitor, the frequency characteristic is kept uniform even at very low frequency band and the output impedance is low in any of frequency bands resulting in that the value of damping factor is made larger so that the braking efficiency of speaker is increased. With this circuit, since a 100 percent NF is assured when the frequency of signal is zero and the value of NF is determined at only one place when the frequency of signal is at low band, the function of circuit is stabilized.

MAIN AMPLIFIER

The main amplifier is OCL (Output Capacitor-Less) circuit in which the class "A" drive circuit consists of 1-stage differential amplifier circuit.

The signal coming from the filter circuit is amplified by differential amplifier Q501A (or Q501B) via resistor R502A (or R502B) and capacitor C501A (or C501B). The transistor used in this differential amplifier is a PNP type low noise dual transistor (2 SA 798 ©) the characteristic of which is almost not affected by fluctuations of temperature so that the voltage resulted in the speaker terminal is protected against such fluctuations and it is kept always to minimized.

Singal thus amplified by the differential amplifier is further amplified by the class "A" audio amplifier Q504A (or Q504B). Moreover, the signal is amplified for the half cycle at the driver amplifier stage consisting of NPN type transistor Q505A (or Q505B) and PNP type transistor Q506A (or Q506B). Then, the signal is further amplified for the half cycle at NPN type transistor Q509A (or Q509B) and PNP type transistor Q510A (or Q510B) to be supplied to the speaker. Transistors Q502A (or Q502B) and Q503A (or Q503B) are constant-current circuit and its amperage is determined by D503A. Transistor Q502A (or Q502B) functions to protect the differential amplifier Q501A (or Q501B) against fluctuations of temperature and voltage resulting in that the center voltage (speaker terminal voltage) is kept constant. Transistor Q503A (or Q503B) is constant-current circuit to supply constant current so that the load applied to the class "A" driver Q504A (or Q504B) will be reduced thus the gain being increased. As a result of the gain of Q504A (or Q504B) being increased by Q503A (or Q503B), plenty of NF is produced and so that distortion is lessened. NF factor of NF circuit is determined by resistors R510A (or R510B) and R504A (or R504B), and the higher NF factor, the higher is the gain. NF factor at the low frequency band is determined by capacitor C504A and resistor R504A. Transistor Q503A (or Q503B) and Diode D503A (or D503B) are to cause the bias of class "B" drive stage and to produce idling current of 33 ~ 100mA so that cross-over distortion due to class "B" operation is eliminated. The idling current is to be adjusted by semi-variable resistor VR501A (or VR501B).

Resistor R532A (or R532B) and capacitor C509A (or C509B) are to keep the power amplifier stabilized when given no load. Coil L501A (or L501B) functions to prevent of high-frequency oscillation. Transistor Q511A (or Q511B) works as protection circuit.

Q507A (or Q507B), Q508A (or 508B), D502A (or D502B) and D504A (or D504B) are short circuit, etc. at the output section and they detect voltage which will be caused at R522A (or R522B) and R523A (or R523B) (emitter resistor) if current runs excessibely-if the detected voltage is higher than as roted, the collector-emitter of Q507A (or Q507B) and Q508A (or Q508B) becomes conductive. D502A (or D502B) and Q507A (or Q508B) are being located between the base of Q505A (or 505B), Q506A (or Q506B) and the center (speaker output) and serve as constant-current circuit, and this results in that the power transistor (Q509A, Q510A or Q509B, Q510B) is assured of a rating current.

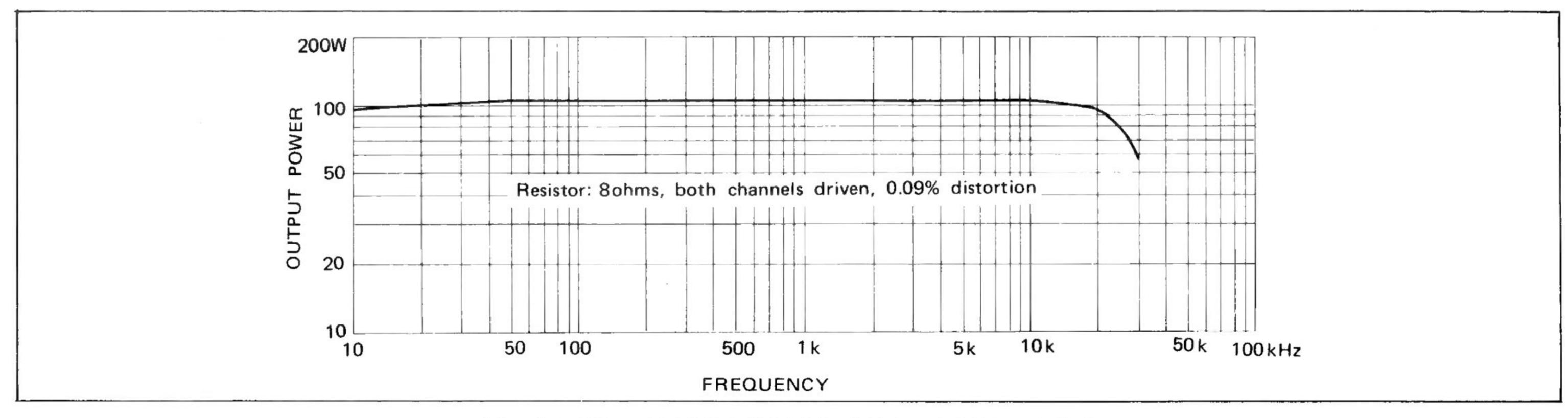


Figure 22 POWER BANDWIDTH CHARACTERISTIC

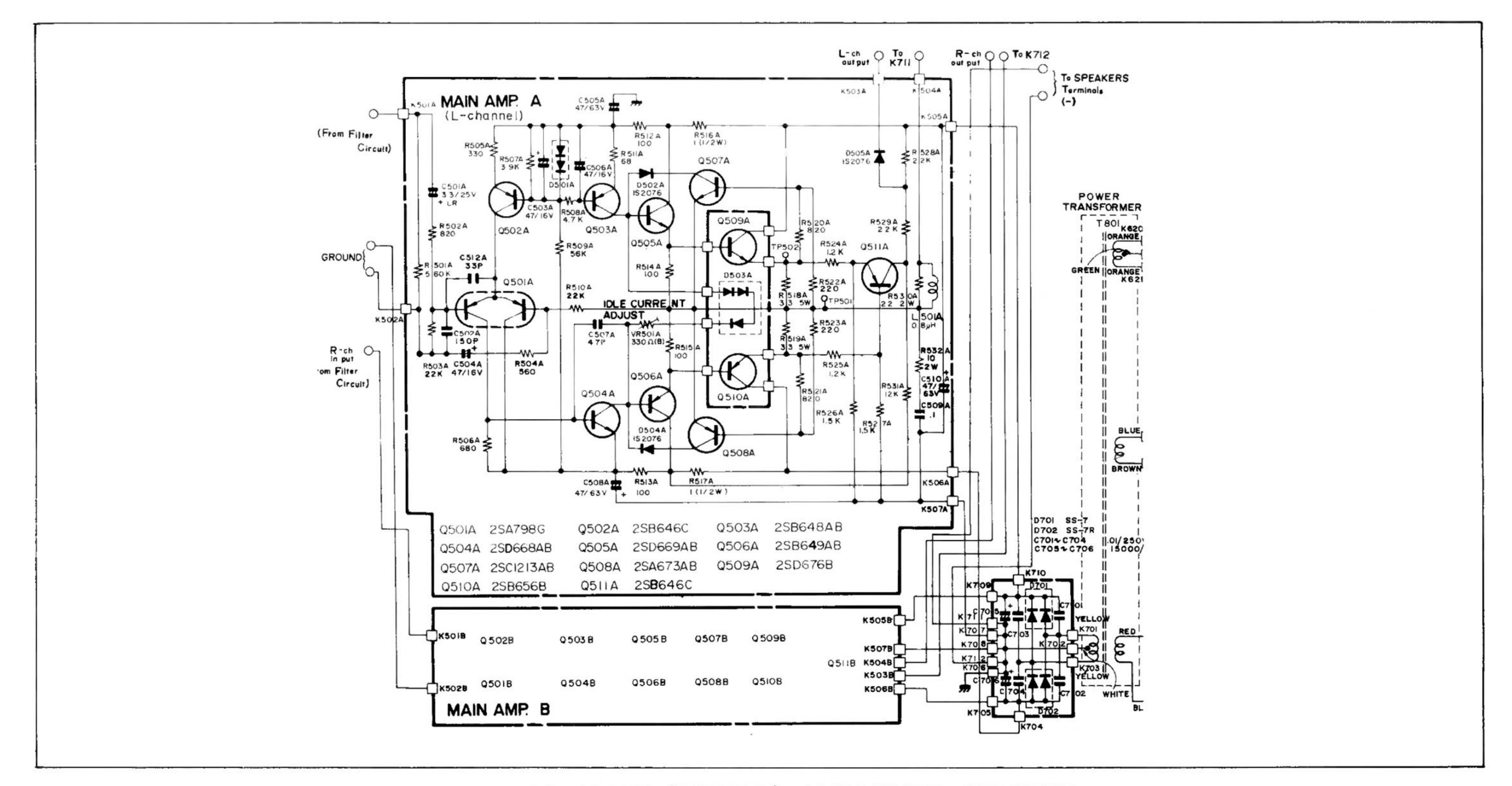


Figure 23 MAIN (POWER) AMPLIFIER CIRCUIT

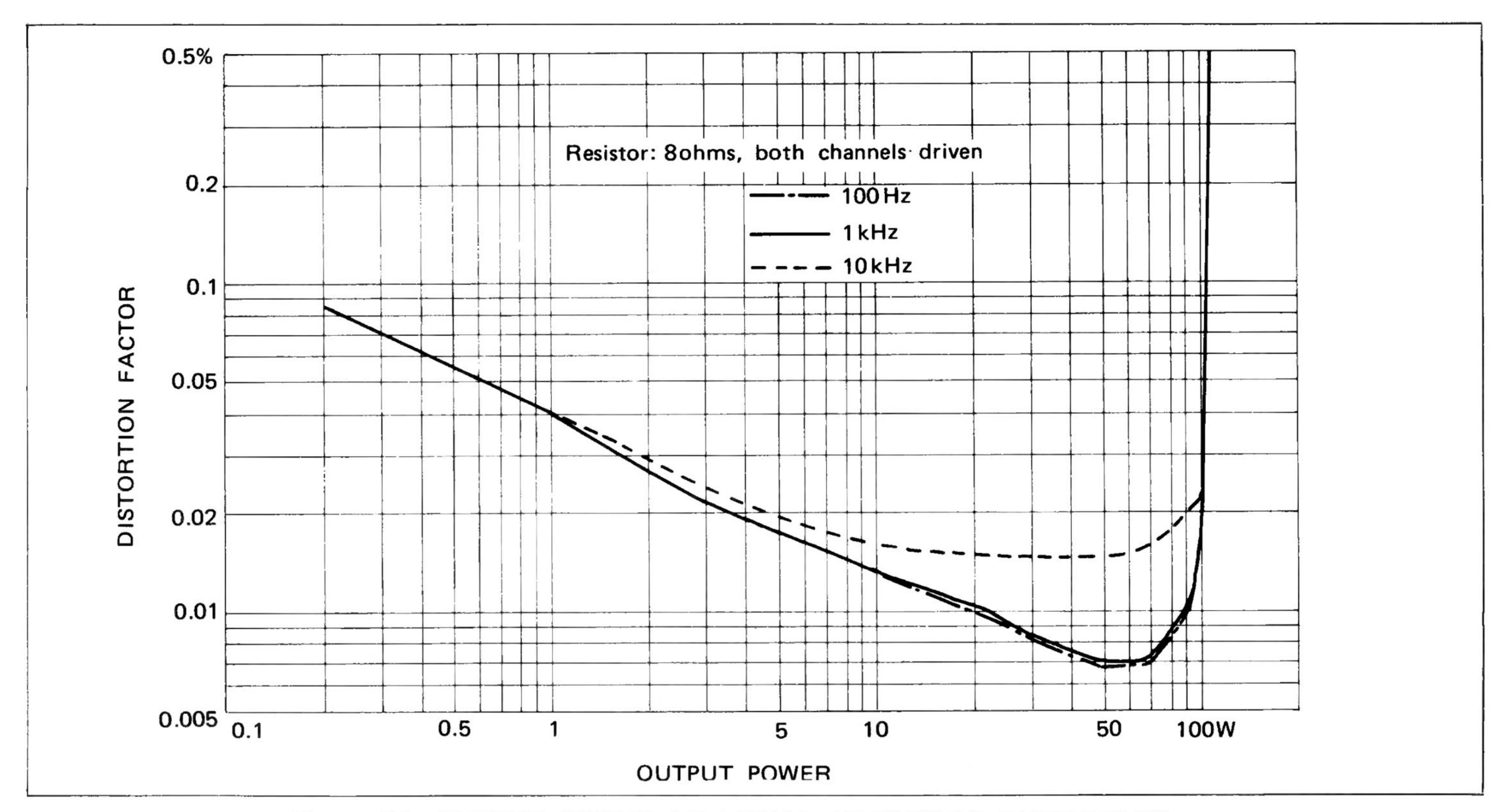


Figure 24 OUTPUT POWER VS TOTAL HARMONIC DISTORTION

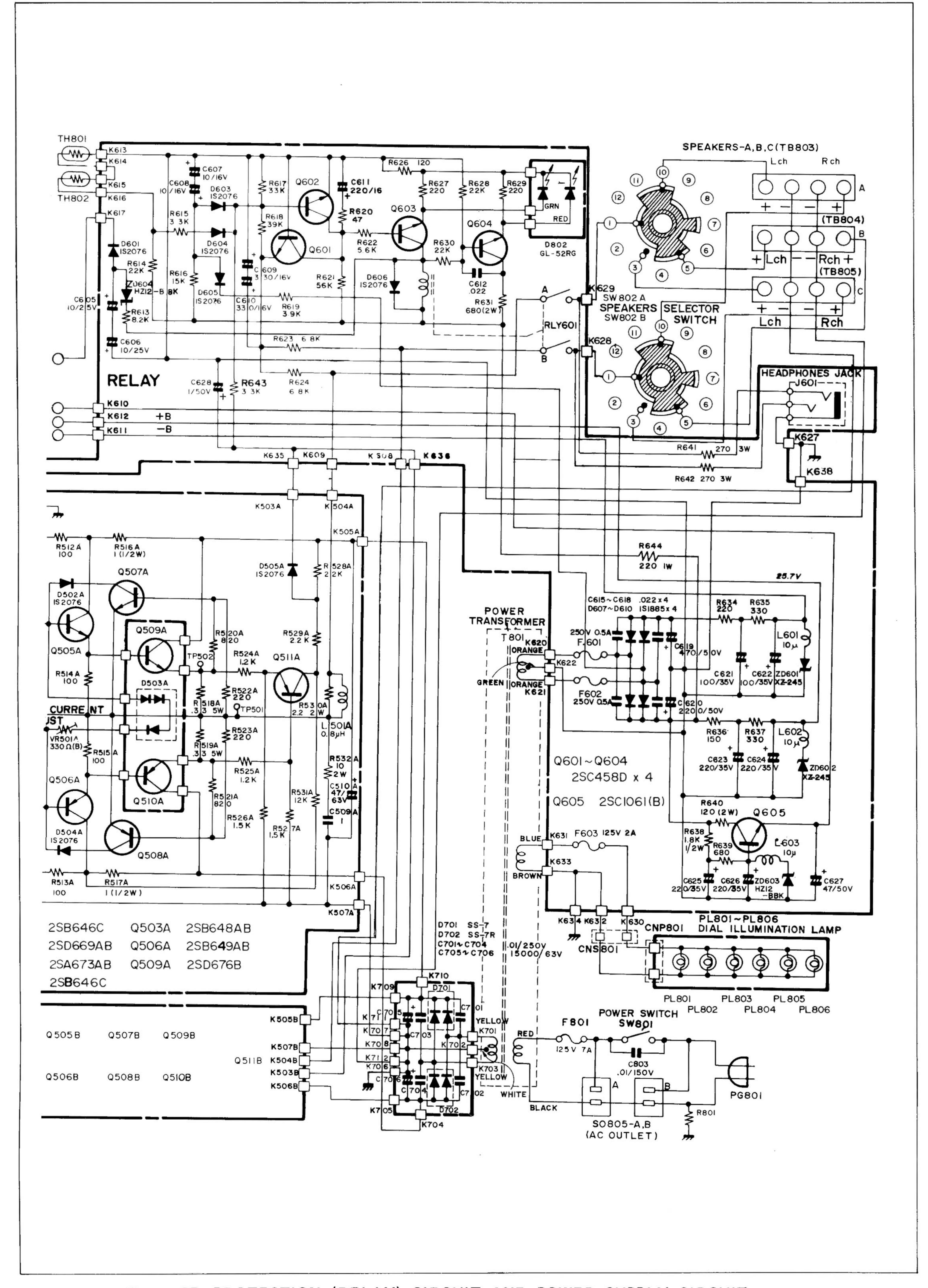


Figure 25 PROTECTION (RELAY) CIRCUIT AND POWER SUPPLY CIRCUIT

PROTECTION CIRCUIT (RELAY CIRCUIT)

The protection circuit used in this set is so designed as to function in the following instances:

- (1) It protects the speaker against possible shock noise caused when the power switch is turned on.
- (2) It protects the speaker against possible shock noise caused when the power switch is turned off.
- (3) It functions when DC voltage is generated at the speaker terminal (for instance, when DC voltage gets unbalanced due to a trouble inside the amplifier).
- (4) It functions when the speaker terminals are shorted and the load impedance is lowered (for instance, when several speakers are connected in parallel to the amplifier).
- (5) In the case of the temperature of heat sink increasing abnormally.

Next, we will explain the basic operations of the protection circuit.

The protection circuit is made of two circuits, namely.

Schmitt trigger circuit consisting of transistors Q603 and Q604 and abnormality detection circuit consisting of transistors Q601, Q602, Q511A and Q511B.

As to Schmitt trigger circuit, when the base voltage of the transistor Q603 is lower, the transistor Q603 does not function; in other words, the relay does not function since it is given no current so that the speaker circuit is shut off.

D802 is 2-color LED (Light Emitting Diode) and it is so designed that it will light up green when the relay is turned on and red when the it is turned off.

Transistors Q601 and Q602 are detection circuits respectively of negative signal and positive signal and each of the two is turned on when given the signal to discharge the potential charged in the capacitor C611, so that the base voltage of the transistor Q603 is decreased and the relay is turned off.

Capacitors C609 and C610 and resistors R623 and R624 are a low-pass filter which prevents mis-operation of the relay due to sound signal. And diode D606 is to absorb the voltage possibly induced when the relay turns on or off.

The above will be further described in detail:

- (1) When the power switch SW801 is set to "on" position, the base voltage of Schmitt trigger transistor Q603 is increased by means of resistors R621 and R622 to have the transistor Q603 be turned on, and thus the relay starts to function. During this process, it is so designed that: since capacitor C611 is being inserted to the base of the transistor Q603, the base voltage of Q603 is kept lower than its emitter voltage until the power supply voltage to the protection circuit will become stabilized and so, during that time, the transistor Q603 is kept off so that the relay does not function since it is given no current. Thus time constant of the relay is determined so that the relay begins to function about 4 to 6 seconds after the power switch is turned on --- in a while the circuits are stabilized to make alive the speakers' connection.
 - Simultanecously with the above operation, another Schmitt trigger transistor Q604 is turned on and a current runs in the direction which makes the light emitting diode D802 be lit in red.
 - When the power supply voltage is thus stabilized, voltage is charged in the capacitor C611 via resistors R621 and R620 to make the base voltage of the transistor Q603 reach the working point so that the transistor Q603 becomes turned on (at the time, the transistor Q604 is turned off). A current runs in the relay and the relay begins the operation so that amplifier output will be connected to the speaker terminal. At the time, a current coming from the transistor Q603 runs in the direction which makes the light emitting diode D802 be lit in green.
- (2) The protection circuit is so designed that when the power switch is kept at "on" position, the transistor Q602 is unable to be turned on because a negative voltage coming from the negative rectifier circuit composed of diode D605 and resistor R619 is balanced to a positive voltage coming from the resistor R616. Contrary to the above, when the power switch is set to "off" position, the protection circuit is so designed that: a negative voltage is attenuated faster than a positive one as result of the determination of time constant and so the positive voltage is supplied to the base of transistor Q602 and thus the transistor Q602 is turned on. Then the capacitor C611 begins to discharge so that the base voltage of transistor Q603 is decreased and the transistor Q603 is turned off --- no current runs in the relay and connection of the amplifier output to the speaker terminal is cut off. In short, the protection circuit functions to cut off connection between the amplifier output and the speaker terminal as soon as the power switch is switched off.
- (3) If there appears DC voltage (positive or negative) at the speaker terminal, positive or negative voltage is applied to the transistors Q601 and Q602 through the resistors R623 and R624. As to the positive voltage, it is applied to the base of transistor Q602 via the resistor R618 to have the transistor Q602 be turned on. As to the negative voltage, the emitter voltage of transistor Q601 becomes lower than its base voltage to make the transistor Q601 be turned on. This results in that no current runs in the relay so that connection of the amplifier output to the speaker terminal will be cut off.
- (4) If the speaker terminals are shorted or the load impedance is lowered (for instance, due to connection of the speakers of less than 40hms), this can cause a large current to run through the power transistor to be damaged. This trouble can also be avoided by the protection circuit.
 - If it is supposed that a current of more than the rated value runs in the power transistor, the protection circuit tends to detect abnormal voltage cused at the emitter resistors R518A and R519A (R518B andR519B) of the power transistor so that the transistor Q511A (or Q511B) is turned on. The voltage thus produced is applied to the base of transistor Q602 via the diode D505 (or D506) and resistor R643 and so the tansistor Q602 is turned on. In this way, the protection circuit provides the same effect as said hereinbefore.

(5) In the case of the temperature of heat sink increasing abnormally. (110°C)

When the temperature of heat sink increases abnormally, the resistance value of the positive-characteristic thermistor (TH801, TH802) will be increased. As a result, the voltage of the resistor (R614) is applied to the transistor (Q602) through the resistor (R615) and diode (D604). At the time the potential of the base of the transistor (Q602) is increased due to an increase of the resistance value of the positive characteristic thermistor (TH801, TH802) so that the transistor (Q602) will be turned "ON" (closed). As a result, the electrolytic capacitor (C611) starts to discharge so that the transistor (Q603) will eventually be turned "OFF" (opened) while the transistor (Q604) be turned "ON" (closed). Accordingly, the relay (RLY601-A, B) is stopped to operate so that no signal will be applied to the speaker terminals A or B.

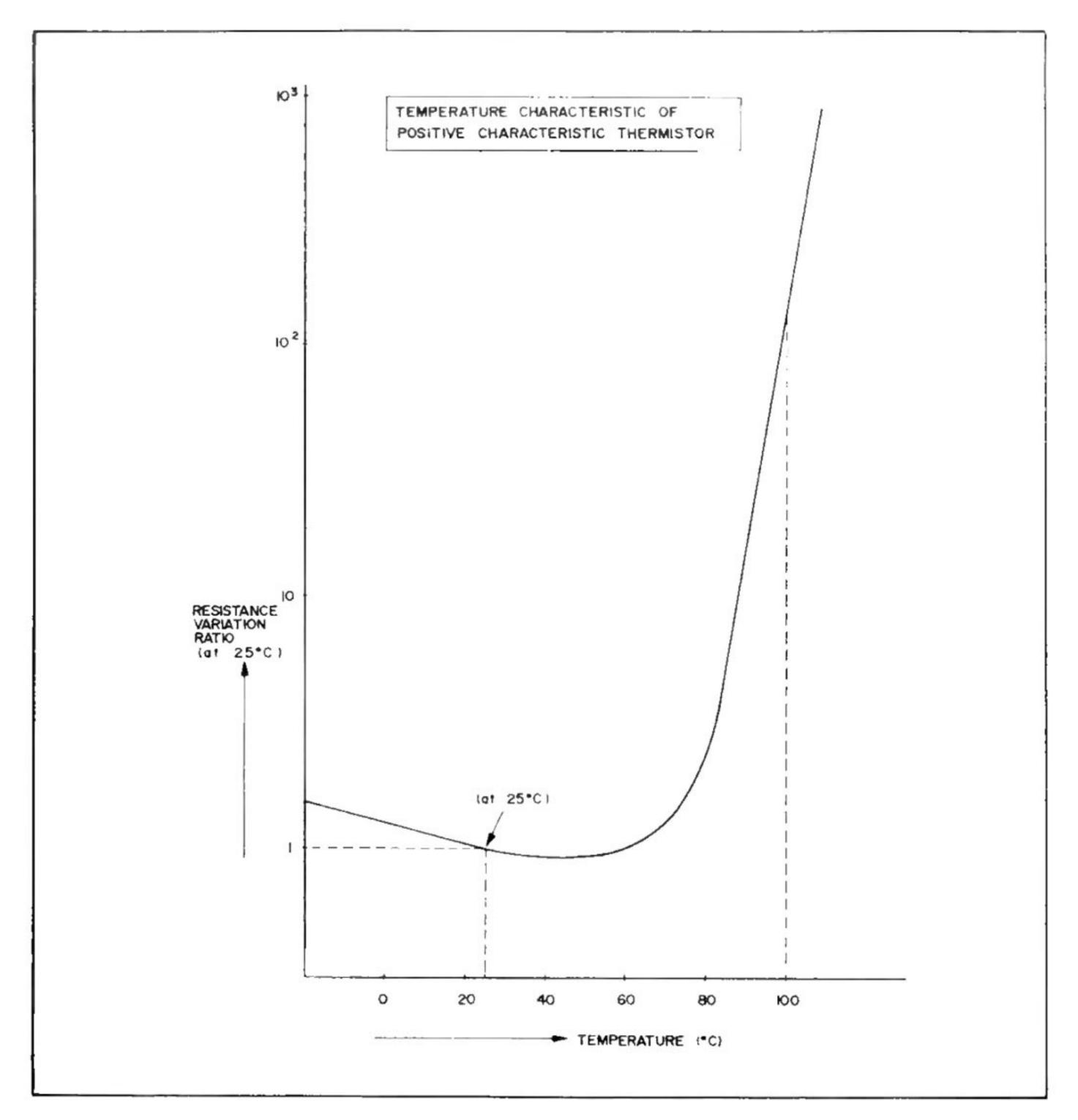


Figure 26

POWER SUPPLY CIRCUIT

Power supply to the power (main) amplifier section is depended upon the 2-power supply system. With this 2-power supply system, AC voltage coming from the power transformer T801 is subjected to rectification by the bridge full-wave rectifier circuit consisting of diodes D701 and D702 and then be smoothed by the low imedance dual-capacitor C705 and C706 to become DC voltage to finally be supplied to teh main amplifier circuit section. Capacitors C701, C702, C703 and C704 are for the purpose to eliminate switching noises due to diodes D701 and D702 and further to remove noises coming from the power supply primary side. Power supply voltage to the tone circuit, equalizer amplifier circuit and tuner circuit is depended upon the fact that: AC voltage coming from the power transformer is rectified by the bridge type full-wave rectifier circuit composed of diodes D607 to D610 to become DC voltage and it is further smoothed by the capacitors C619 and C620. DC voltage thus rectified is available in two types, positive one and negative one. As to the tone circuit and equalizer amplifier circuit, the supply voltage is regulated through the CR ripple filter circuit and zener diode ZD601 (for the negative potential) and the CR ripple filter circuit and zener diode ZD602 (for the positive potential), while as to the tuner circuit (FM circuit section and AM circuit section) the supply voltage (positive) is regulated through the ripple filter circuit (transistor Q605).

These regulator circuits all function to effectively suppress fluctuations of the power supply voltage.

ALIGNMENT INSTRUCTIONS

Alignment is an exacting procedure and should be undertaken only when necessary. If alignment of AM and FM is required, either section may be done first. The FM stereo section, however, should be done only if the FM monaural section is properly adjusted.

REQUIRED EQUIPMENT

- 1. Signal generator with a frequency range of 515 kHz to 1650 kHz; AM
- 2. Signal generator with a frequency range of 86.1 MHz to 109.2 MHz; FM
- 3. Signal generator with a frequency output of 10.7 MHz ±0.5 MHz; FM
- 4. Vacuum tube voltmeter (AC-VTVM)
- 5. Sweep signal generator with a sweep range of at least 500 kHz and center frequency of 10.7 MHz with at least a 10.7 MHz marker may be used.
- 6. Oscilloscope with a wide range amplifier of approximately 100 kHz.
- 7. Test loops, a coil of any size wire, one turn or more; AM
- 8. Vacuum tube voltmeter (DC-VTVM)
- 9. FM stereo signal generator.
- 10. Audio signal generator with a frequency range of 20 Hz to 100 kHz.
- 11. Frequency counter with a frequency range of approximately 100 kHz.

Notes: Allow the set at least five minutes to warm up before attempting alignment. During alignment keep the signal generator output at the lowest level that will maintain a usable output from the set.

For the adjustment of stereo separation, the FM stereo generator output is usually $1,000\mu V$. Incorrect grounding to the metal chassis may pick up an unwanted 10.7 MHz signal from the final IF stage, which will cause a regenerative sweep response on the sweep curve and result in misalignment.

Therefore always connect a ground to point.

Ground connection of signal generator

Generator modulation (AM)

Generator modulation (FM)

Chassis ground
30%, 400 Hz
75 kHz, 400 Hz

Generator modulation (FM stereo) Ch. L. or Ch. R. 75 kHz, 1,000 Hz Mod.

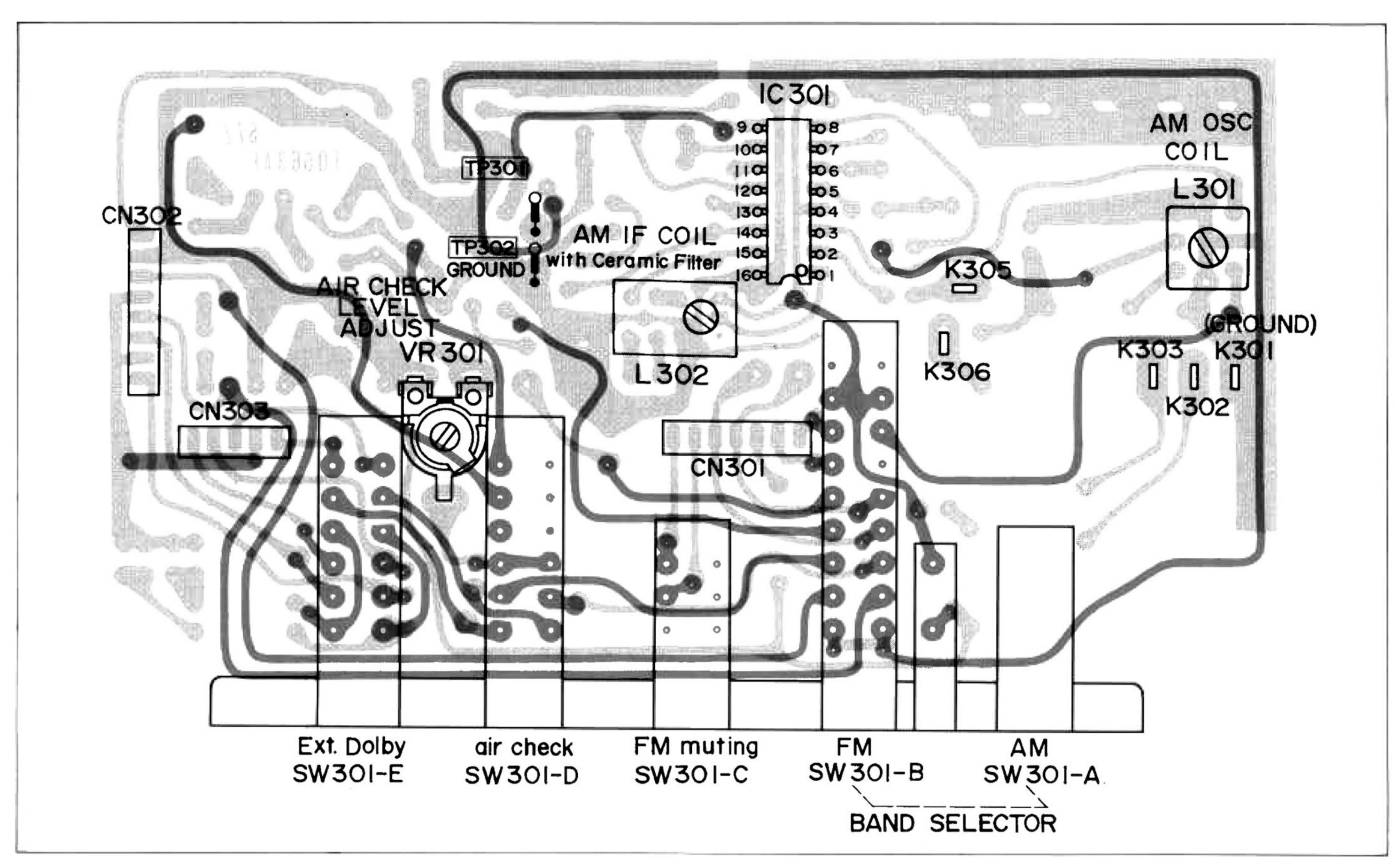


Figure 27 ALIGNMENT POINTS OF AM RF/IF BOARD

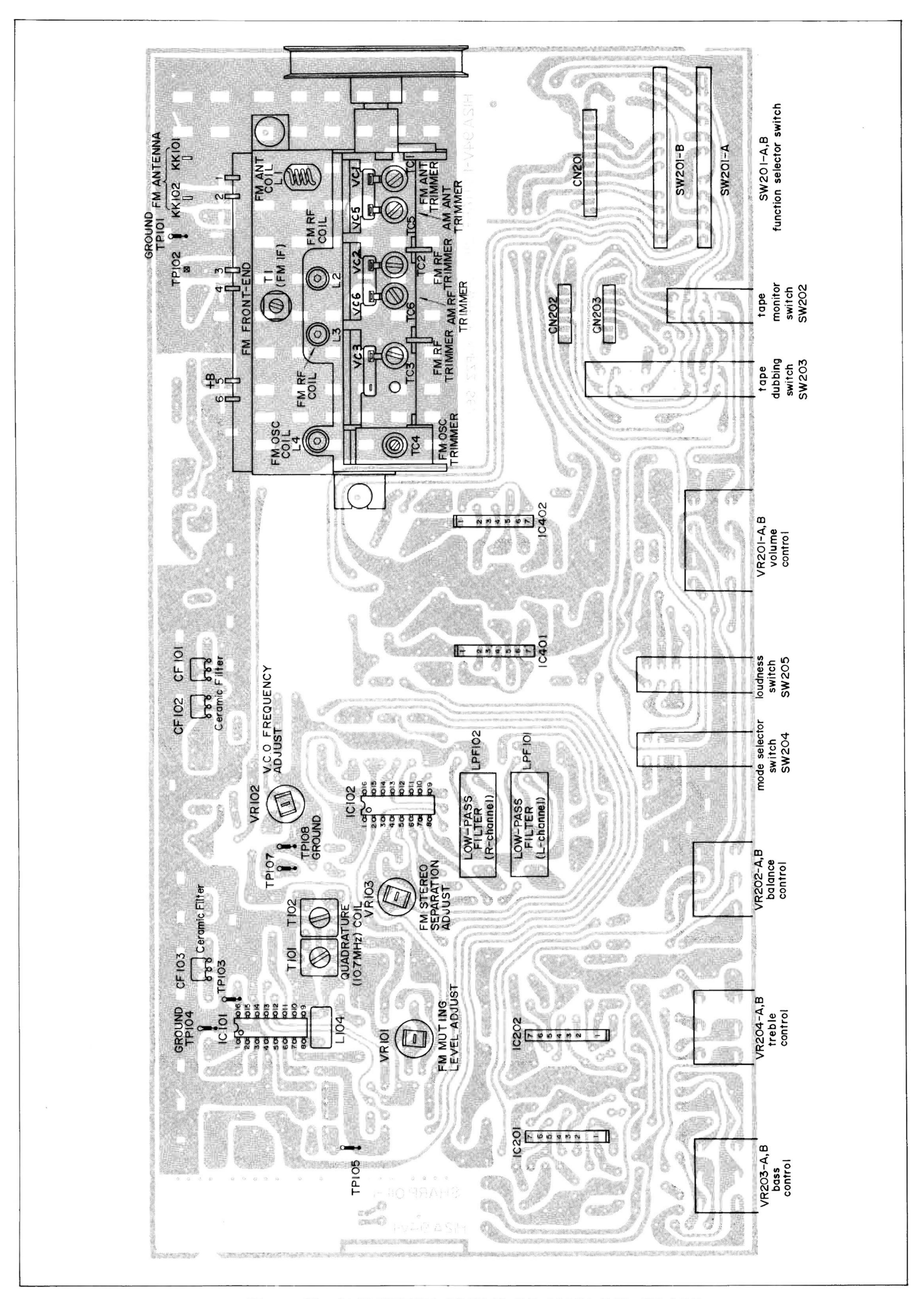


Figure 28 ALIGNMENT POINTS OF MAIN P.W. BOARD

AM IF ALIGNMENT

PROCEDURE	SWEEP GEN	DIAL	SELECTOR		ADJUSTMENT	DENANDIC	
NUMBER	CONNECTION	NECTION FREQUENCY SETTING SETTING CONNECTION SETTING	ADJUSTMENT	REMARKS			
1	Connect AM sweep generator to the test point TP303 (VC4) and variable capacitor case (ground). Keep the input be closed as much as possible.	455kHz (400Hz, 30%, AM modulated)	High end of Dial	Band Selector (AM)	Oscilloscope is connected between TP301 and TP302 (ground)	(A marker position can be neglected since the transformer used is provided with ceramic filter)	Maximum response at 455kHz Repeat 2 or 3 times

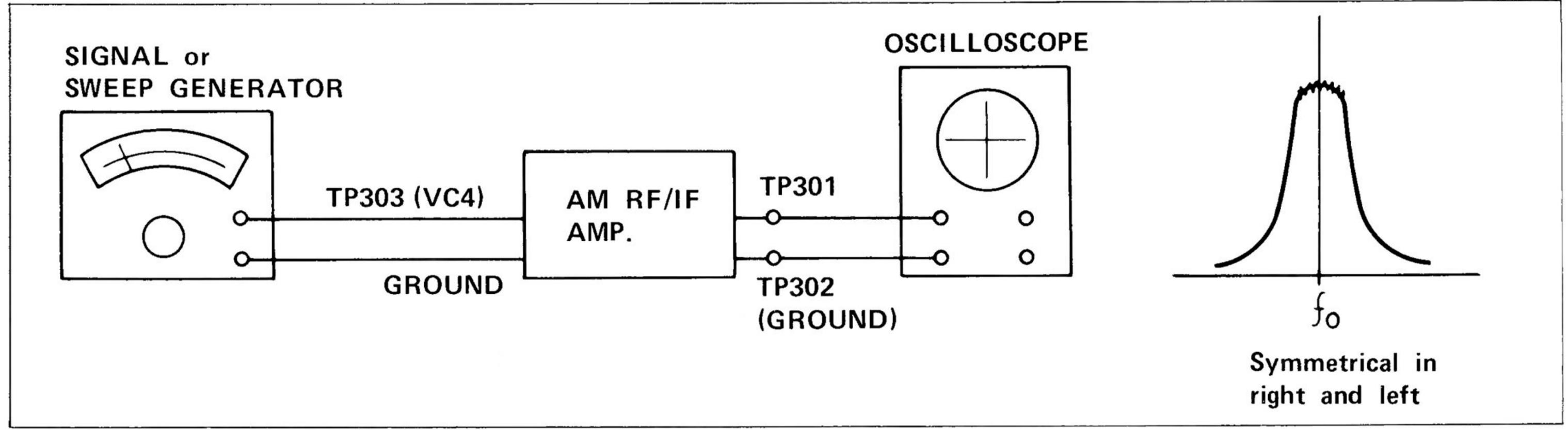


Figure 29 AM IF ALIGNMENT EQUIPMENT CONNECTIONS

AM RF ALIGNMENT

PROCE-	TECT	SIGNAL GENERAT	TOR	DIAL	SELECTOR	SCOPE			
DURE NUMBER	STAGE	CONNECTION	FREQUENCY	POINTER	SETTING	CONNECTION	ADJUSTMENT	REMARKS	
1	Band Coverage	Connect AM signal generator to the loop antenna and place this assembly at near the bar antenna coil (L801) (Keep the input be closed as much as possible).	515kHz Modulated	Low end of Dial	Band Selector (AM)	Oscilloscope is connected between TP301 and TP302 (ground)	Oscillator Coil L301	Adjust for maximum output	
2		Same as above	1650kHz Modulated	High end of Dial	Same as above	Same as above	Oscillator Trimmer TC6	Same as above. Repeat steps 1 and 2, 2 or 3 times.	
3		Same as above	1400kHz Modulated	Tuning in 1400kHz	Same as above	Same as step 1	Antenna Trimmer TC5	Same as step 1	
4	Tracking	Same as above	600kHz Modulated	Tuning in 600kHz	Same as above	Same as step 1	Antenna Coil L801	Same as above. Repeat steps 3 and 4, 2 or 3 times.	

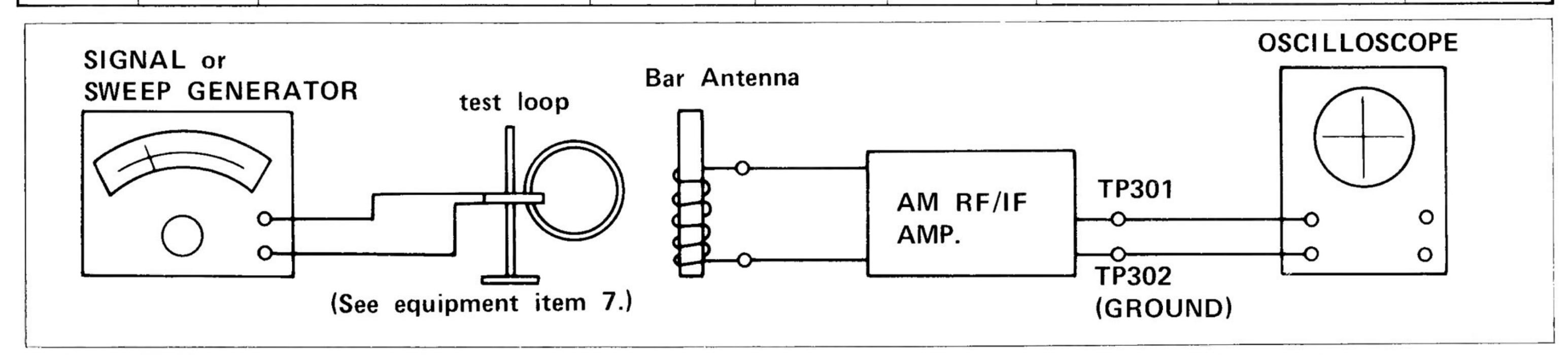


Figure 30 AM RF ALIGNMENT EQUIPMENT CONNECTIONS

FM ALIGNMENT

Set the FM Muting switch (SW301-C) at "OFF" position and MODE switch (SW204) at "mono" position.

PROCE-	TECT	SIGNAL GENER	ATOR	DIAL	SELECTOR	METER	A D 11 10 T 1 T 1 T	DEM
DURE NUMBER	STAGE	CONNECTION	FREQUENCY	POINTER SETTING	SETTING	CONNECTION	ADJUSTMENT	REMARKS
1	IF (Note 1 and 2)	Connect FM sweep generator, through 6PF capacitor. Connect the ground to the test point TP101.	Central frequency of ceramic filter		Band Selector (FM)	Connect an oscilloscope to the test points TP103 and TP104 (ground)	T1	Rotate the core of T1 to adjust so that the wave-form becomes symmetrical in right and left and attains the maximum in height and width
2	Detector	Connect FM sweep generator, through 6PF capacitor, to the test point TP102. Connect the ground to the test point TP101.	Same as above	Same as above	Band Selector (FM)	Connect an oscilloscope to the test points TP105 and TP104 (ground)	IFT101, IFT102	Rotate the core to adjust so that the waveform (Fig. 33) becomes symmetrical in the upper and lower with the best linearity.
3	Repeat th	ne steps 1 and 2 until no f	urther improven	ent can be i	nade.			
4	Band	Connect FM signal generator to the FM antenna terminals. (Keep the input be closed as much as possible)	87.4 MHz as small as possible (Modulated)	Low end of Dial	Band Selector (FM)	Connect VTVM to the test points TP105 and TP104 (ground)	Oscillator coil L4	Adjust for maximum output
5	(Note 1)	Same as above	109 MHz (Modulated) as small as possible	High end of Dial	Band Selector (FM)	Same as above	Oscillator trimmer TC4	Same as above
6	Tracking	Same as above	90MHz (Modulated) as small as possible	Tuning in 90 MHz	Band Selector (FM)	Same as step 4	Antenna coil L1 and RF coil L2	Same as step 4
7	(Note 1)	Same as above	106 MHz (Modulated) as small as possible	Tuning in 106 MHz	9-15-20-7 13-720 NO	Same as step 4	Antenna trimmer TC1 and RF trimmer TC2	Same as above
8	Repeat t	he steps 4 to 7 until no fu	rther improveme	nt can be m	ade.			

Note 1

As to FM high frequency section (front-end section), there is no need to readjust the coil and trimmer since it has been factory-adjusted. It is allowed to readjust them only when there occurs a significant deviation about the preadjustment.

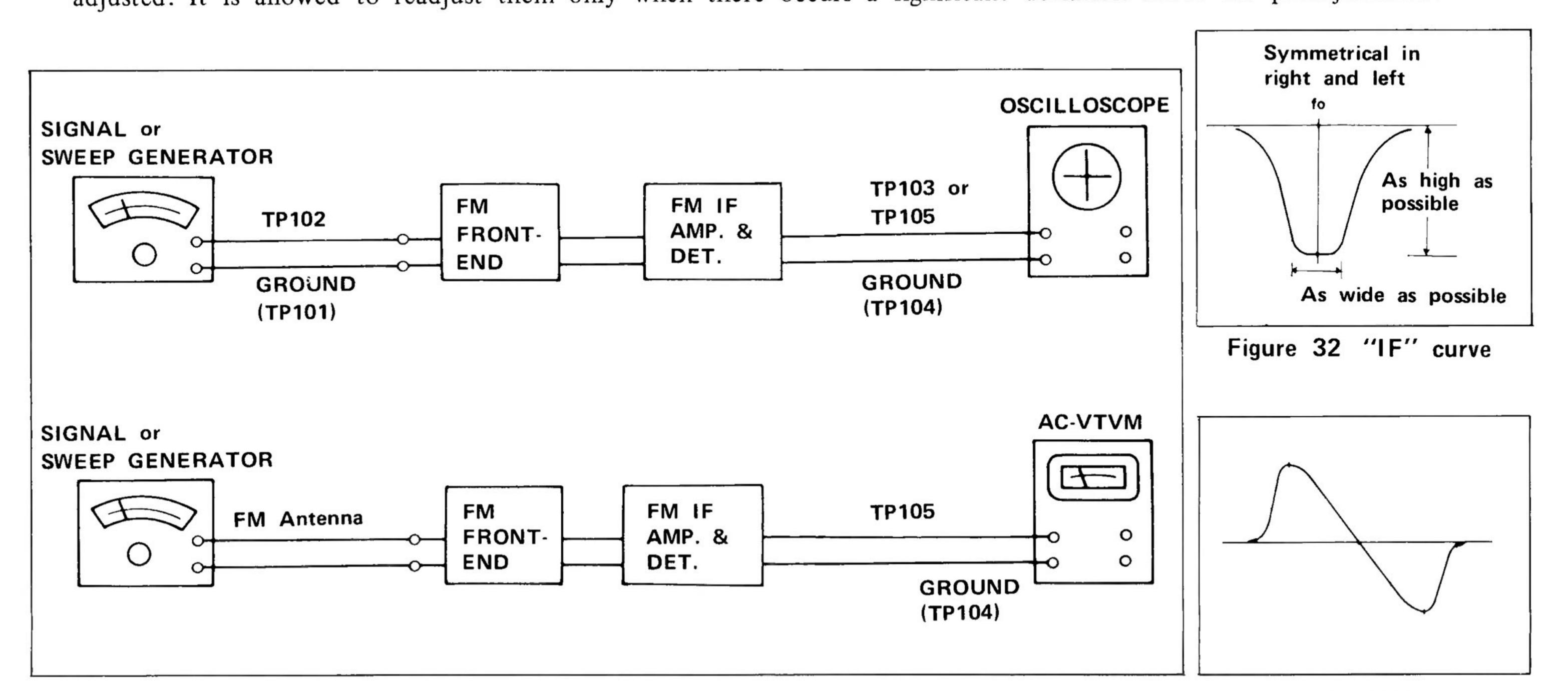


Figure 31 FM ALIGNMENT EQUIPMENT CONNECTIONS

Figure 33 "S" curve

Note 2

The ceramic filter used for this set is available in 3 types and each of them is given a color indication to differentiate the central frequency from that of the others, as described below. In the actual use, be sure to make 2 ceramic filters of the same type (the same color) as a pair to put them in the set. When other ceramic filters than that given a red color indication (with the central frequency of 10.7 MHz) are used, note that with such filters the marker (10.7 MHz) of FM sweep generator will be deviated; therefore be sure to cut off the marker at the time of the adjustment.

	В	Blue	$10.67\mathrm{MHz}\pm0.03\mathrm{MHz}$
Central frequency	A	Red	$10.70 \mathrm{MHz} \pm 0.03 \mathrm{MHz}$
(fo)	C	Orange	$10.73\mathrm{MHz}\pm0.03\mathrm{MHz}$

2 ceramic filters to be used in a set as a pair should be of the same type (the same color)

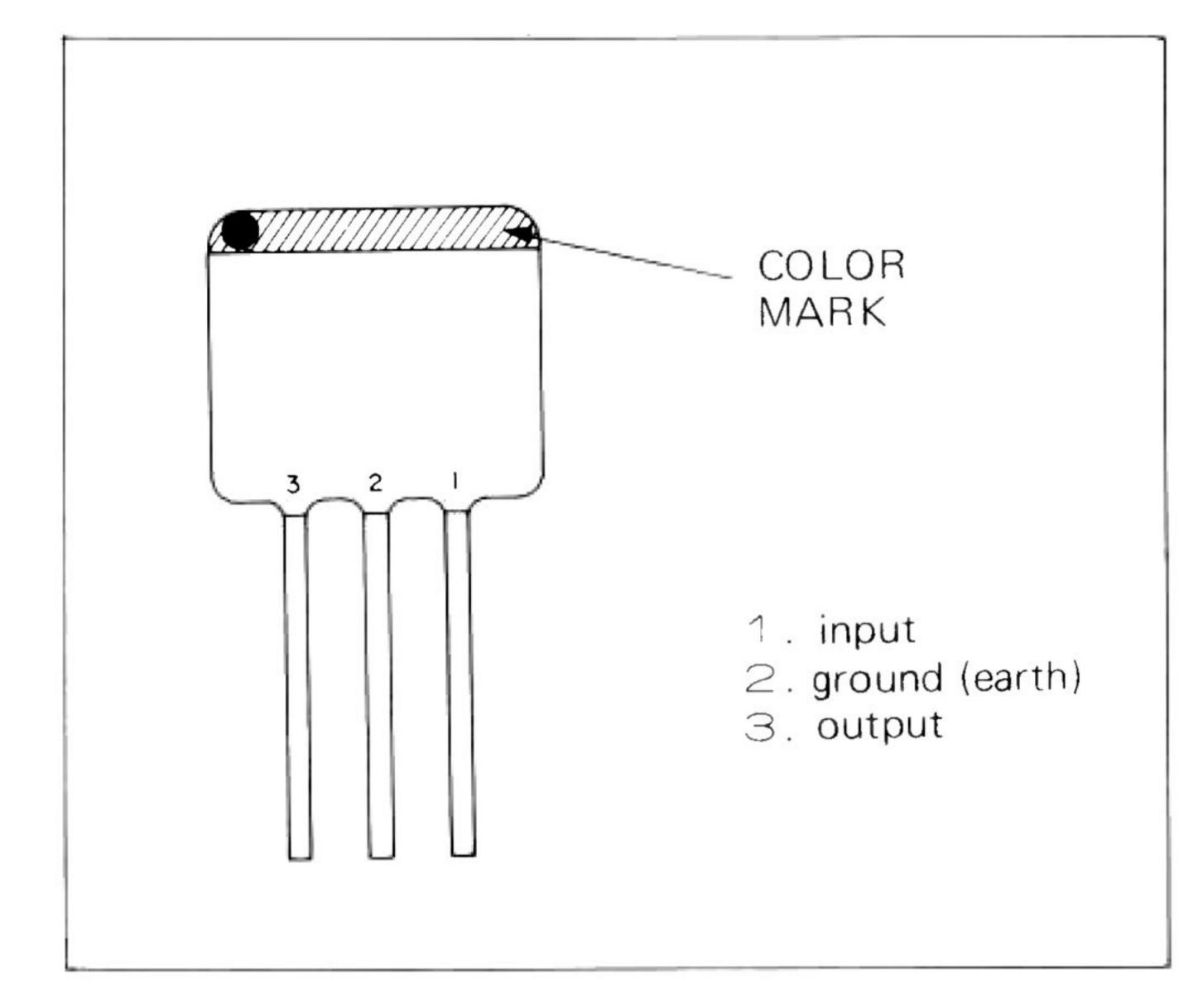


Figure 34

FM TUNING METER ADJUSTMENT AND DISTORTION FACTOR ADJUSTMENT

- 1) Set the frequency of FM signal generator to 98MHz (75kHz deviation, 400Hz), fully close the output and connect such signal to the FM antenna terminal of the set through a dummy resistor of 300 ohms.
- 2) Connect a dummy resistor of 80hms to the speaker terminal of the set.
- 3) Set the switches and controls of the set to the respective positions shown below and turn on the power switch. [Audio muting—OdB, Low cut filter—off, High cut filter—off, Bass, Treble and Balance controls—center (zero), Mode—mono, Loudness—off, Volume control—min., Tape (monitor/dubbing)—source, Function selector—tuner, Band selector—FM, FM muting—off, air check—off, Ext. Dolby FM—off]
- 4) Keeping the output of FM signal generator be fully closed (that is, with no signal given), rotate the core of T101 to have the pointer of the tuning meter indicate the center (around "98MHz" position).
- 5) Adjust the output of FM signal generator to 60dB, make the set be tuned to this signal so that the tuning meter indicates its center and under the condition, adjust the core of T102 so that the distortion will be minimized.
- 6) Fully close the output of FM signal generator and make sure the pointer of the tuning meter is at the center.
- 7) Repeat the steps 1) to 6) until the best point will be found.

ADJUSTMENT OF AIR CHECK CAL.

Produce 98MHz, 60dB FM mono signal (modulation 100%, 400Hz) by a signal generator to apply it to the antenna of the unit and read the output voltage.

Next, set AIR CHECK switch to "ON" position, then the

output voltage will vary. Adjust semi-fixed resistor VR301 so that the output voltage with AIR CHECK switch set to "ON" becomes about 60% (-4.4dB), of that with AIR CHECK switch kept at "OFF".

FM MUTING ADJUSTMENT AND FM STEREO V.C.O., SEPARATION ADJUSTMENT

- 1) Connect FM signal generator, through a dummy resistor of 300 ohms, to the FM antenna terminal of the set.
- 2) As to setting of the switches and controls, take the same procedures as in the step 3 "FM TUNING METER ADJUSTMENT".
- 3) Set the frequency of FM signal generator to 98MHz (75kHz deviation, 400Hz) and the output to 20dB.
- 4) Have the set be tuned in 98MHz signal, turn on FM muting switch, rotate the semi-fixed resistor VR101 to adjust so that the muting is able to be cleared with the output of FM signal generator being 20dB.
- 5) Set the output of FM signal generator to 60dB (mono signal), place the mode switch of the set to the position "stereo" and let the set be exactly tuned to such signal. (FM muting switch is kept to the position "muting off".)
- 6) Connect VTVM between the test points TP107 and TP108 (ground) and further connect a frequency counter to output terminal of the said VTVM.
 - Make the test points TP105 and TP104 (ground) of the set be connected (shorted). Rotate the semi-fixed resistor VR102 to adjust so that the frequency counter will read 76.00kHz ± 200Hz. (After the adjustment; reset the connection between the test points TP105 and TP104.)
- 7) Connect FM stereo modulator to FM signal generator. At the time, the following should be set: modulation frequency; 1 kHz (L + R; 33.75kHz, L-R; 33.75kHz, pilot (19kHz); 7.5kHz deviation).
- 8) Set the frequency of FM signal generator to 98MHz and its output to 60dB, tune the set in such signal so that the tuning meter will indicate the position "center". Set the modulator so as to cause modulation only in L-channel and consider the output of L-channel as 0dB. Connect VTVM to the output terminal (R-channel side only) of the set and adjust semi-fixed resistor VR103 so that the separation becomes maximum (the output leaking to the opposite channel is minimized.)

Take the above procedures also for checking the separation of R-channel, then, adjust so that the separations of both channels will be equal to each other.

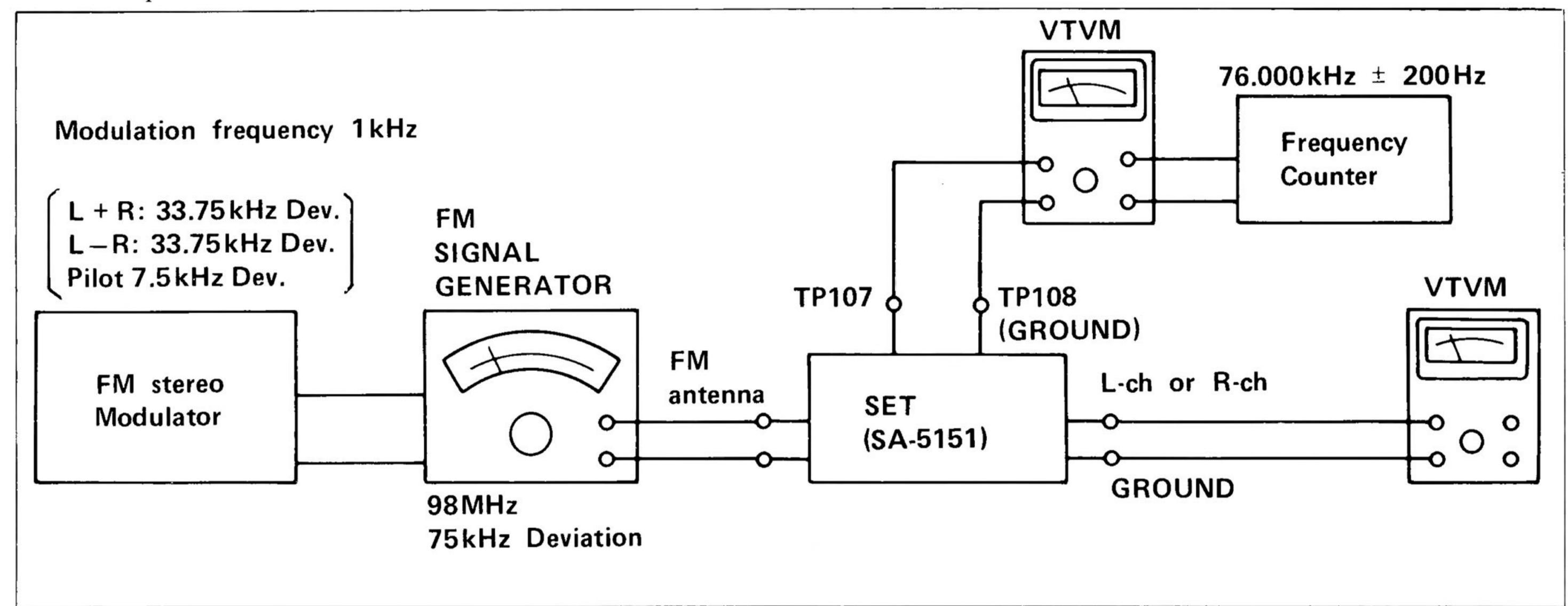


Figure 35 FM STEREO ALIGNMENT EQUIPMENT CONNECTIONS

AF ALIGNMENT

- 1) Set the volume control to the position "minimum" and other switches to the position "normal".
- 2) Rotate the semi-fixed resistors VR501A and VR501B fully counterclockwise.
- 3) Turn on the power switch of the set.
- 4) Use DC VTVM to make sure that the voltage between R518A and that between R518B are within the range of ± 30mV.
- 5) Only after the above check, it is possible to proceed with the next adjustments.

PROCEDURE NUMBER	ALIGNMENT	METER	OUTPUT INDICATOR	SETTING	ADJUSTMENT	REMARKS
1	Idle Current	DC V.T.V.M.	DC V.T.V.M. is con- nected between R518A and R518B	Volume is minimum position. Other knobs are normal position	VR501A (VR501B)	30 mV

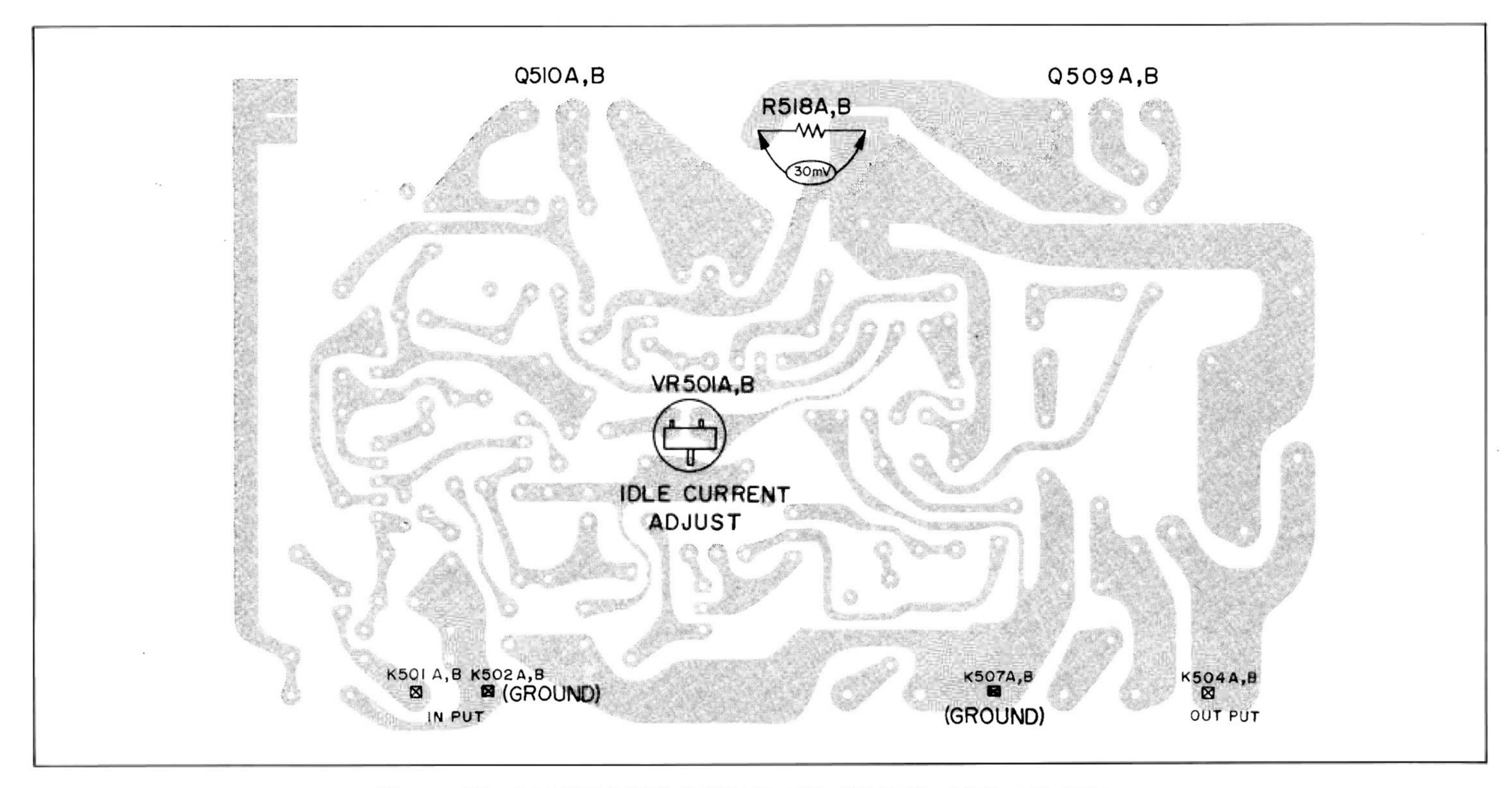


Figure 36 ALIGNMENT POINTS OF POWER AMP. BOARD

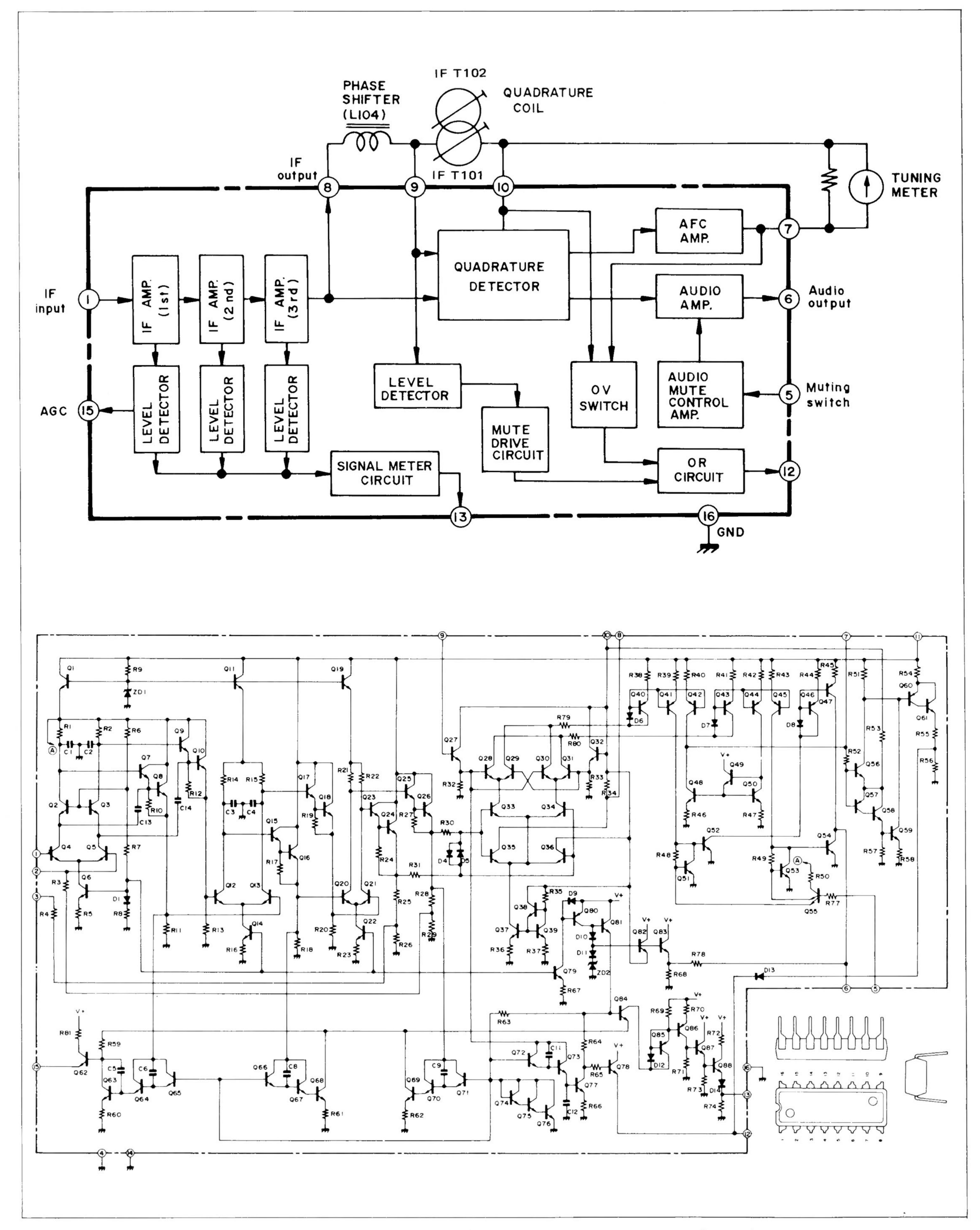


Figure 37 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC101)

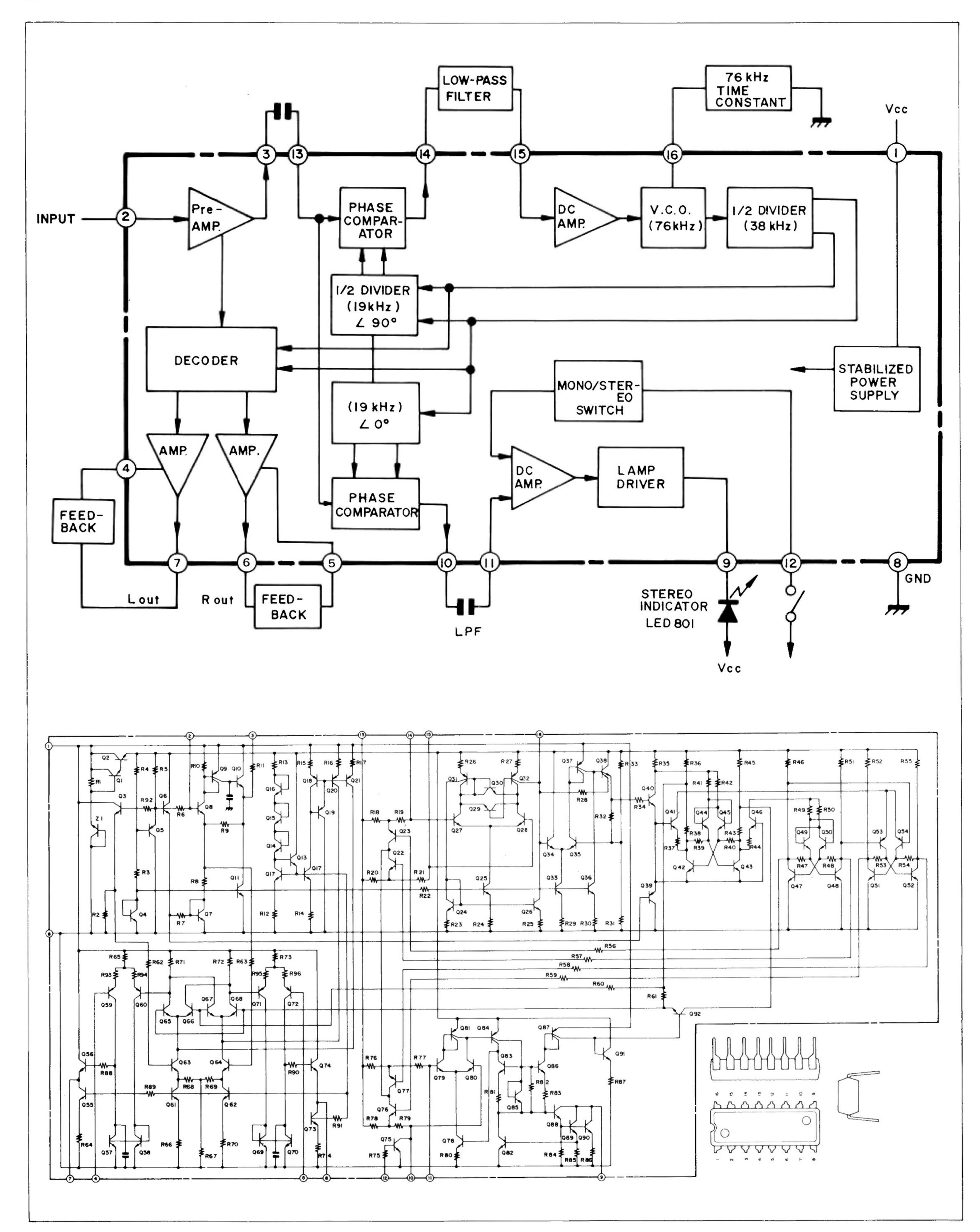


Figure 38 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC102)

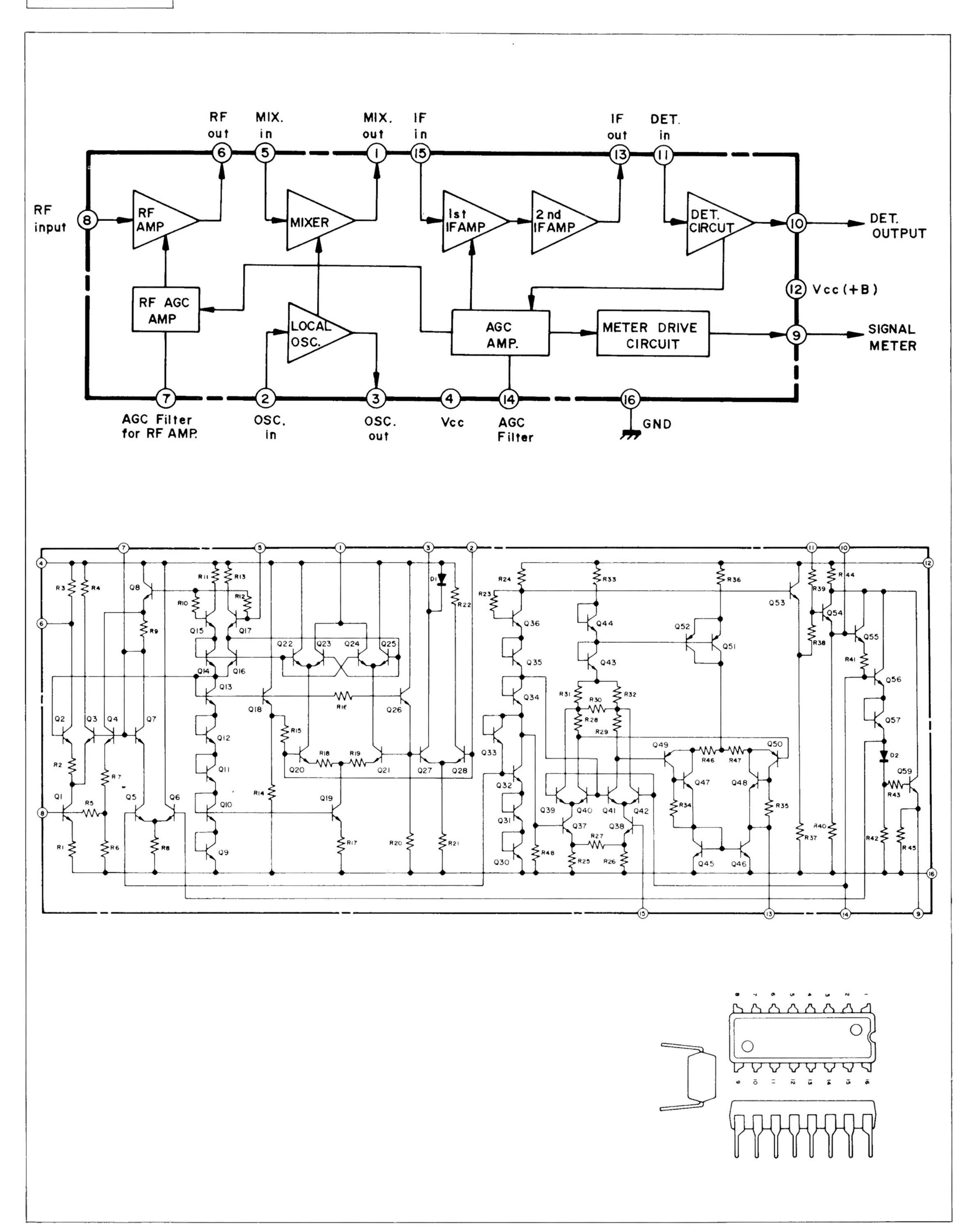


Figure 39 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC301)

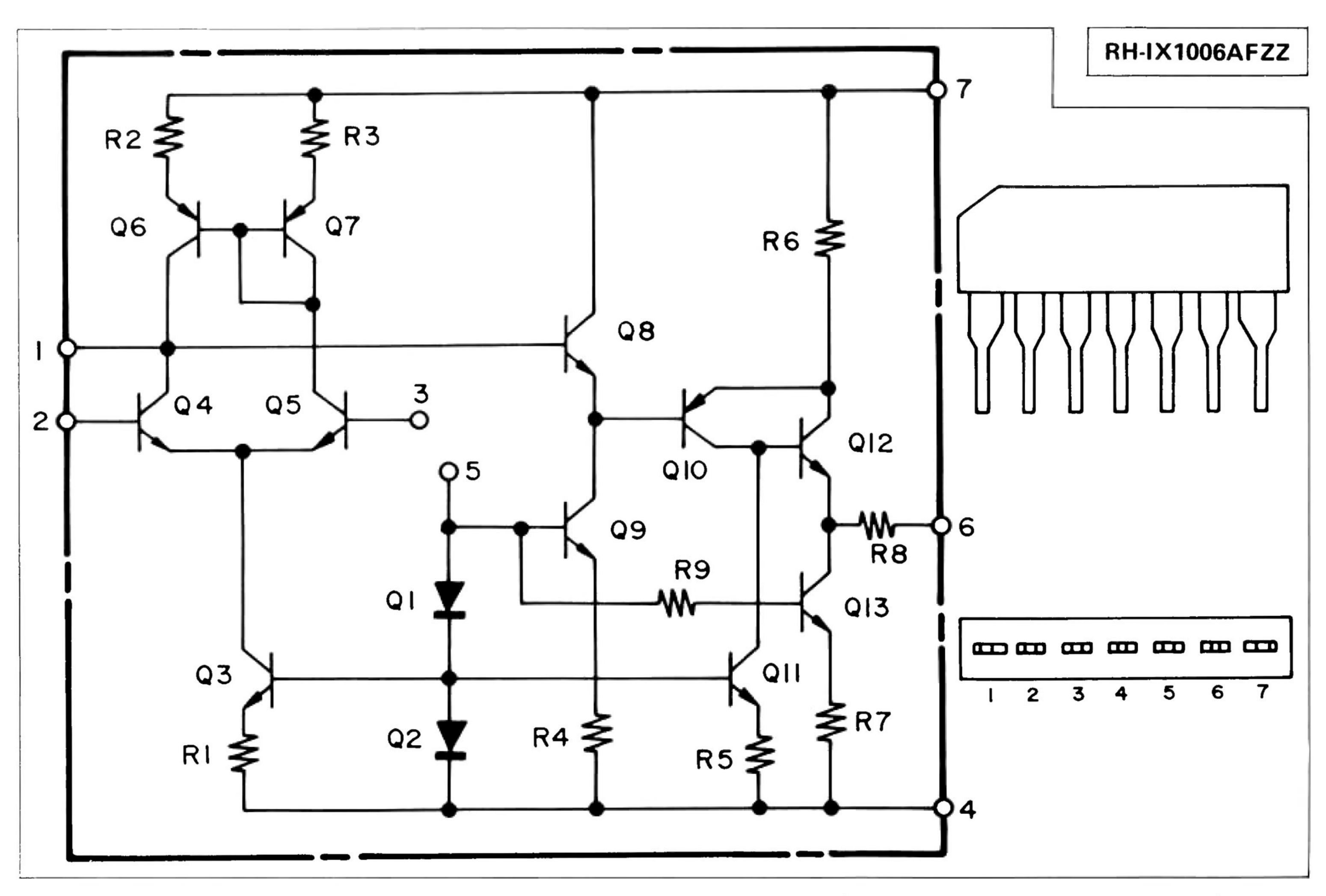


Figure 40 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC 201, IC 202, IC 401 and IC 402)

NOTES ON SCHEMATIC DIAGRAM

1. Frequency range: FM; 87.6 to 108MHz

AM; 520 to 1620kHz

2. IF: FM 10.7MHz, AM 455kHz

Resistor: To differentiate the units of resistors, such symbols as K and M are used: the symbol K means

 $K\Omega$ and the symbol M means $M\Omega$ and the resistor without any symbol is Ω -type resistor.

Besides, the one with "Fusible" is a fuse type.

4. Capacitor: To indicate the unit of capacitor, a symbol P is used; this symbol P means pF and the unit of

the capacitor without such symbol is μF . As to electrolytic capacitor, the expression "capacitance/withstand voltage" is used. The symbols LL and LR for the electrolytic capacitor respectively

mean low-leak type.

5. SW 201: It is Function selector (aux./phono-1/phono-2/tuner) switch ("aux." position)

6. SW 202: It is Tape monitor (tape 2/source/tape 1) switch ("source" position)

7. SW 203: It is Tape dubbing (2 > 1/source/1 > 2) switch ("source" position)

8. SW 204: It is Mode (stereo/mono) switch ("stereo" position)

9. SW 205: It is Loudness (off/on) switch ("off" position)

10. SW301-A, B

(interlocked): It is Band selector (AM/FM) switch ("AM" position)

SW301-C: It is FM muting switch ("off" position)
SW301-D: It is Air check switch ("off" position)
SW301-E: It is Ext. Dolby FM switch ("off" position)

11. SW601: It is Low cut filter (off/on) switch ("off" position)

12. SW602: It is High cut filter (off/on) switch ("off" position)

13. SW603: It is Audio muting (0dB/-20dB) switch ("0dB" position)

14. SW801: It is Power (on/off) switch ("off" position)

15. SW802-A,B: It is Speakers selector (b/off/a/a + b) switch ("b" position)

16. The indicated voltage in each section is the one measured by VTVM between such a section and the chassis with no signal being given.

17. Specifications or wiring diagrams of this model are subject to change for the improvement without prior notice.

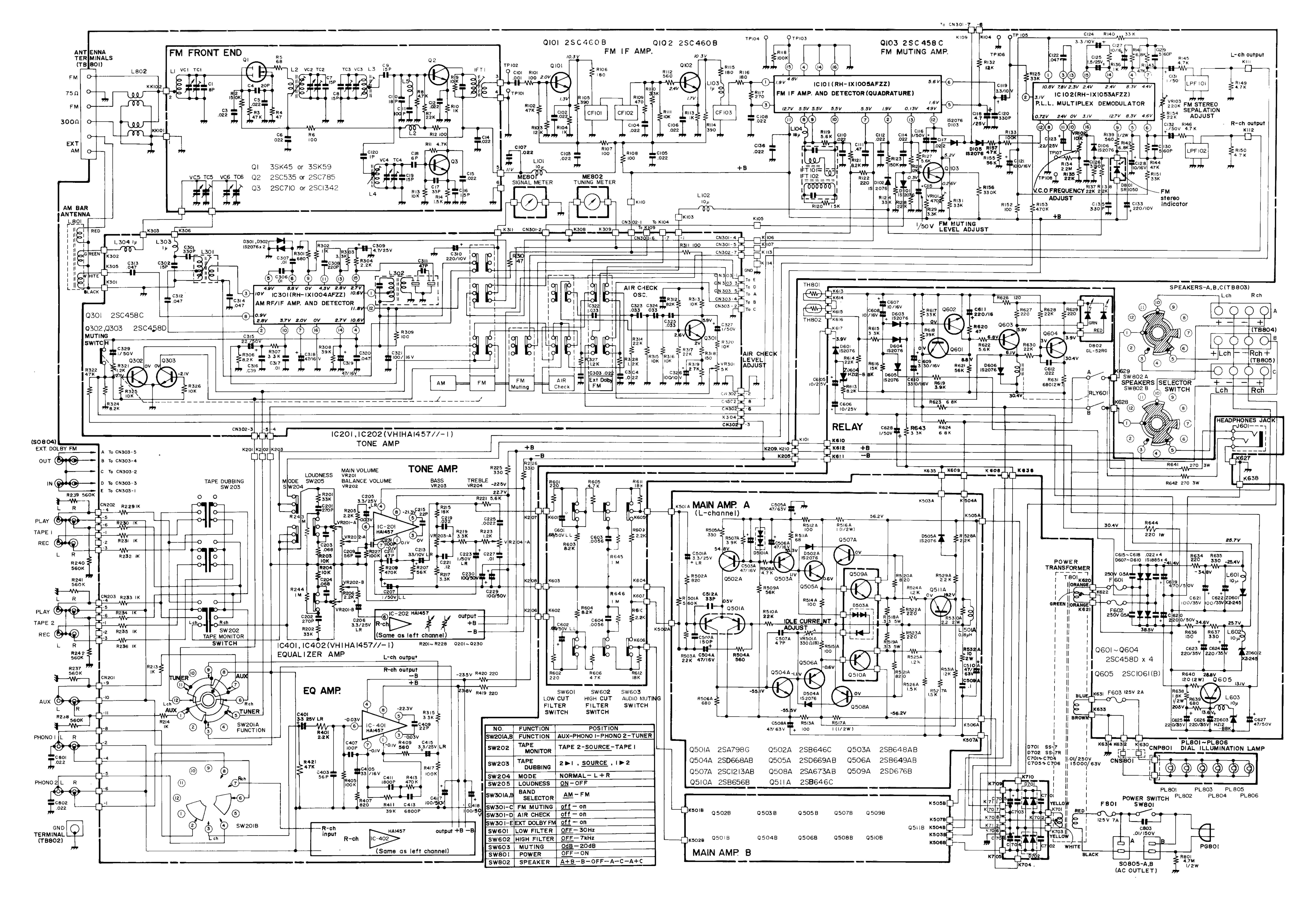


Figure 41 SCHEMATIC DIAGRAM

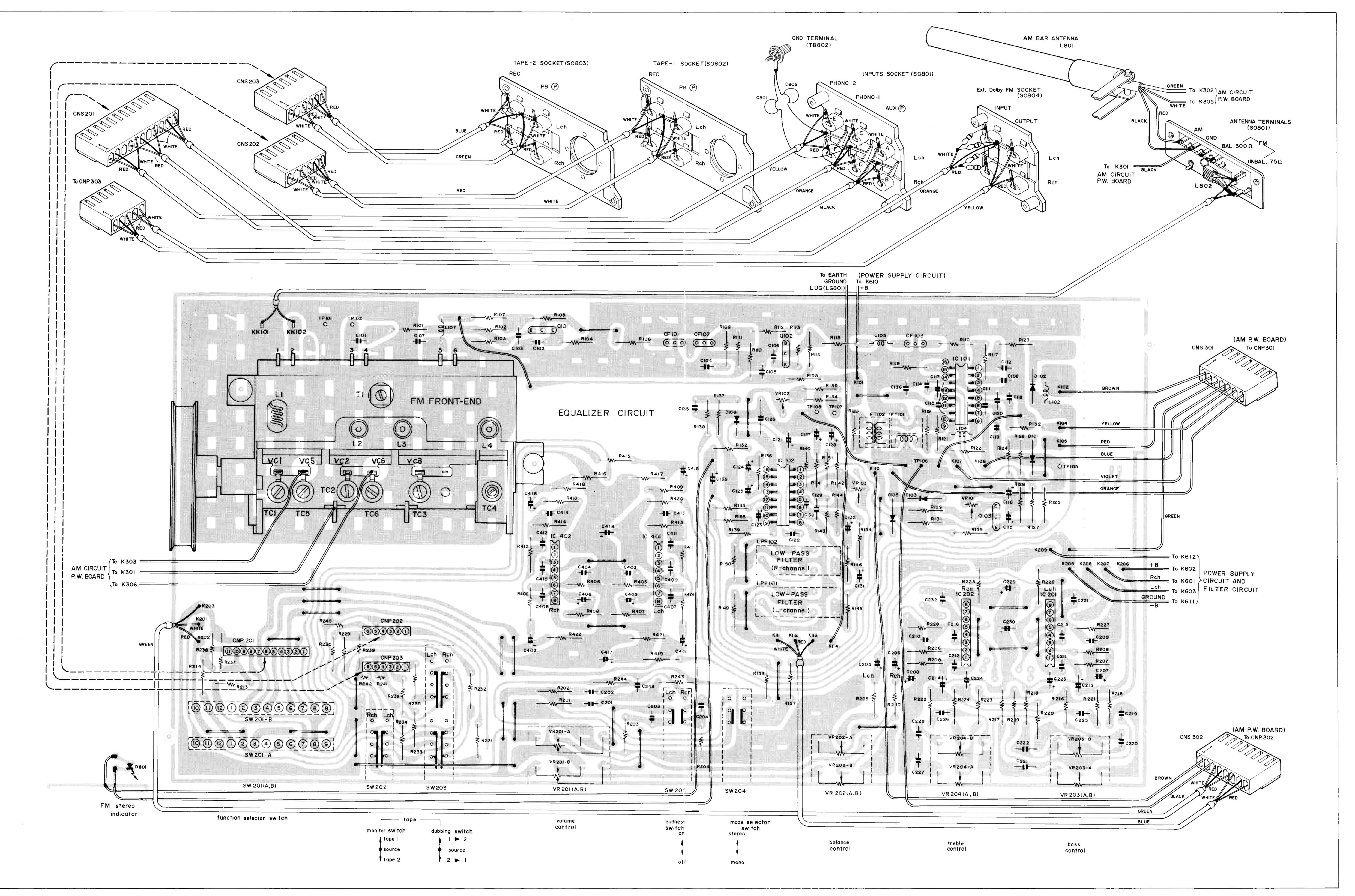


Figure 42 WIRING SIDE OF FM RF/IF CIRCUIT, EQUALIZER CIRCUIT, TONE CIRCUIT BOARD

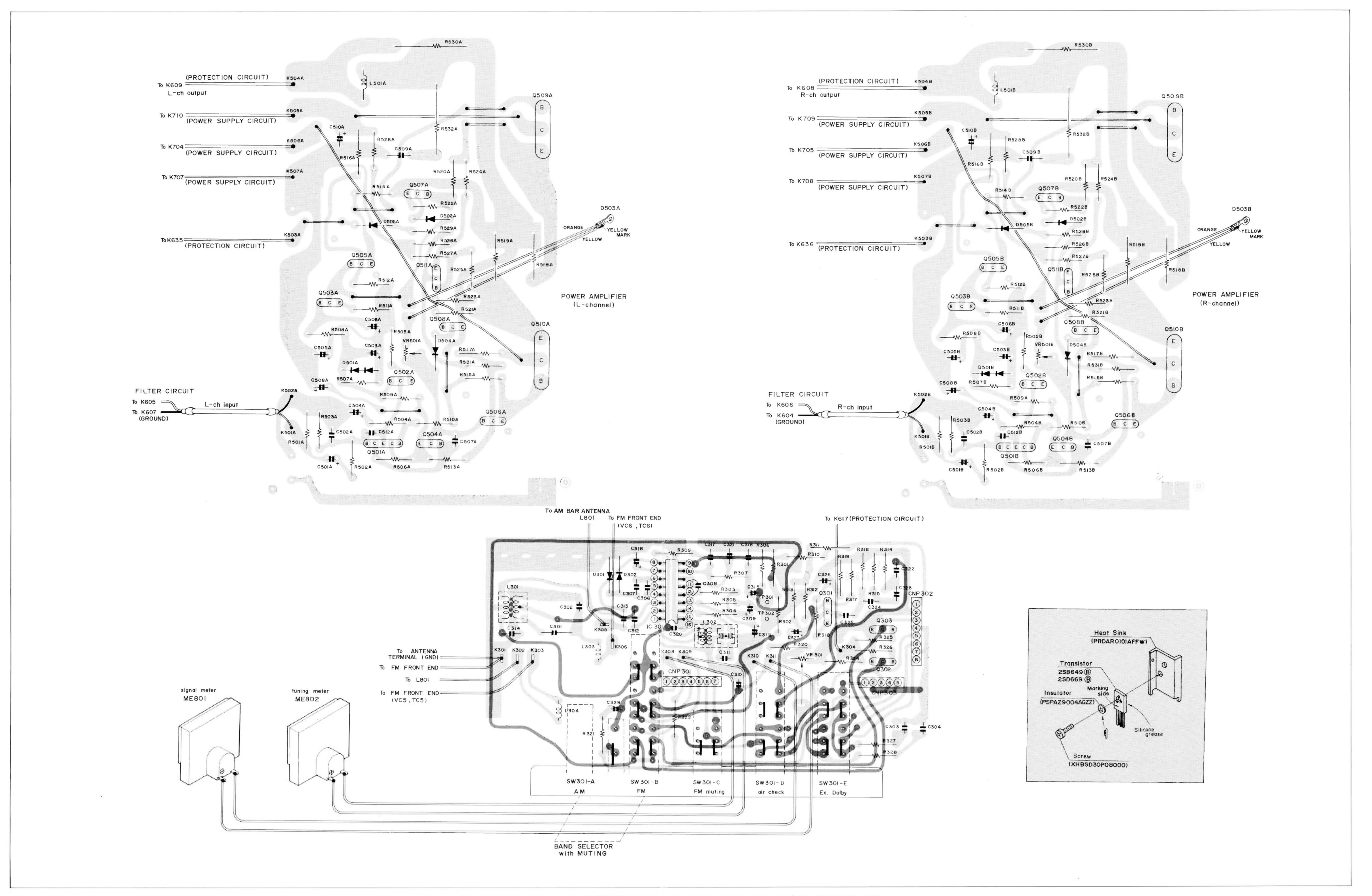


Figure 43 WIRING SIDE OF POWER AMP. BOARD AND AM RF/IF CIRCUIT BOARD

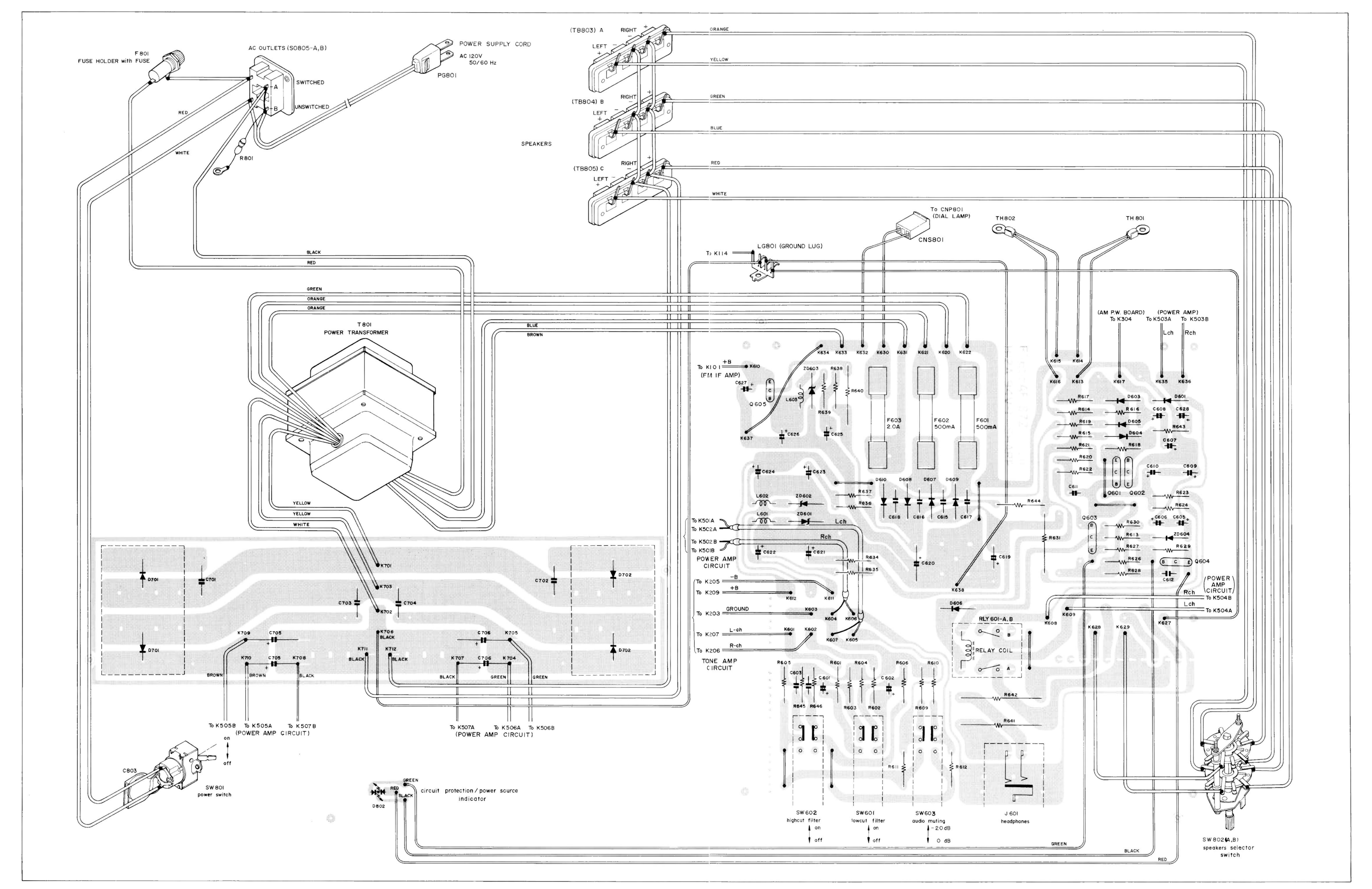
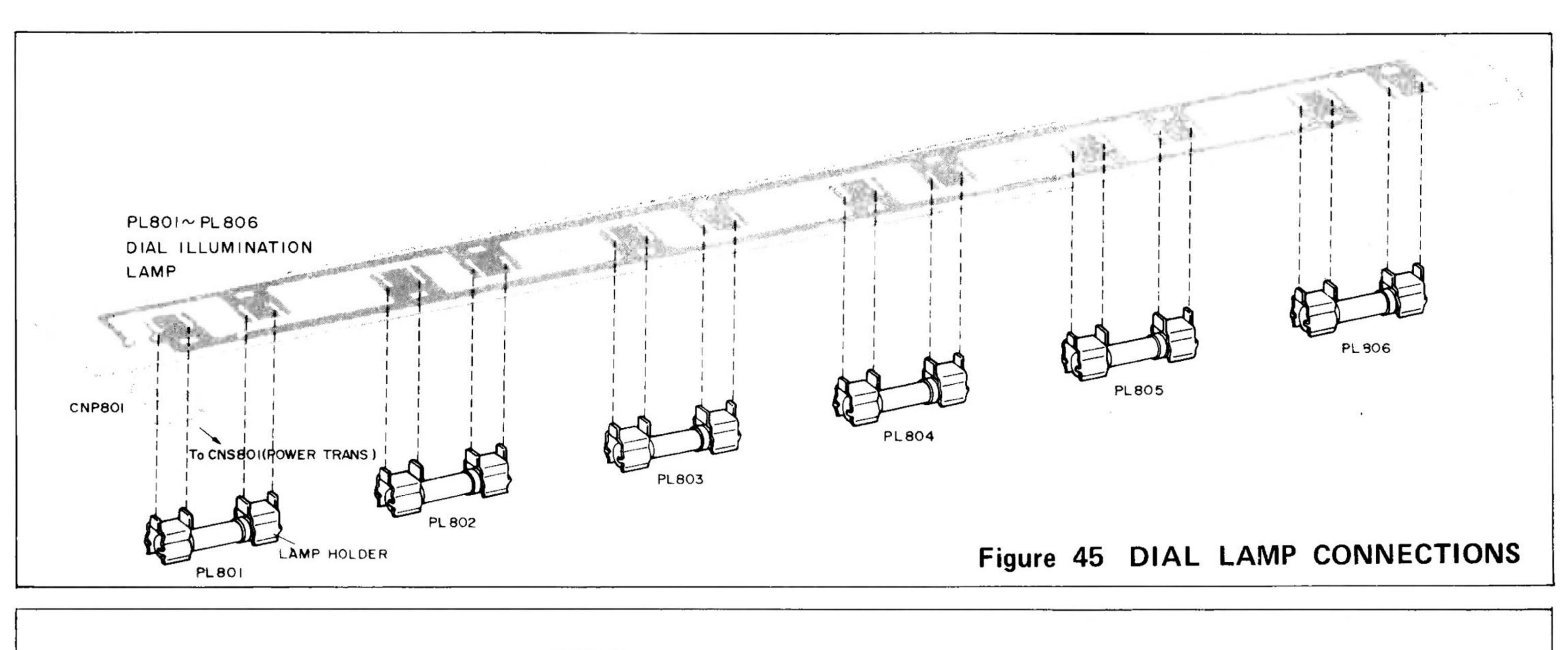


Figure 44 WIRING SIDE OF POWER SUPPLY BOARD



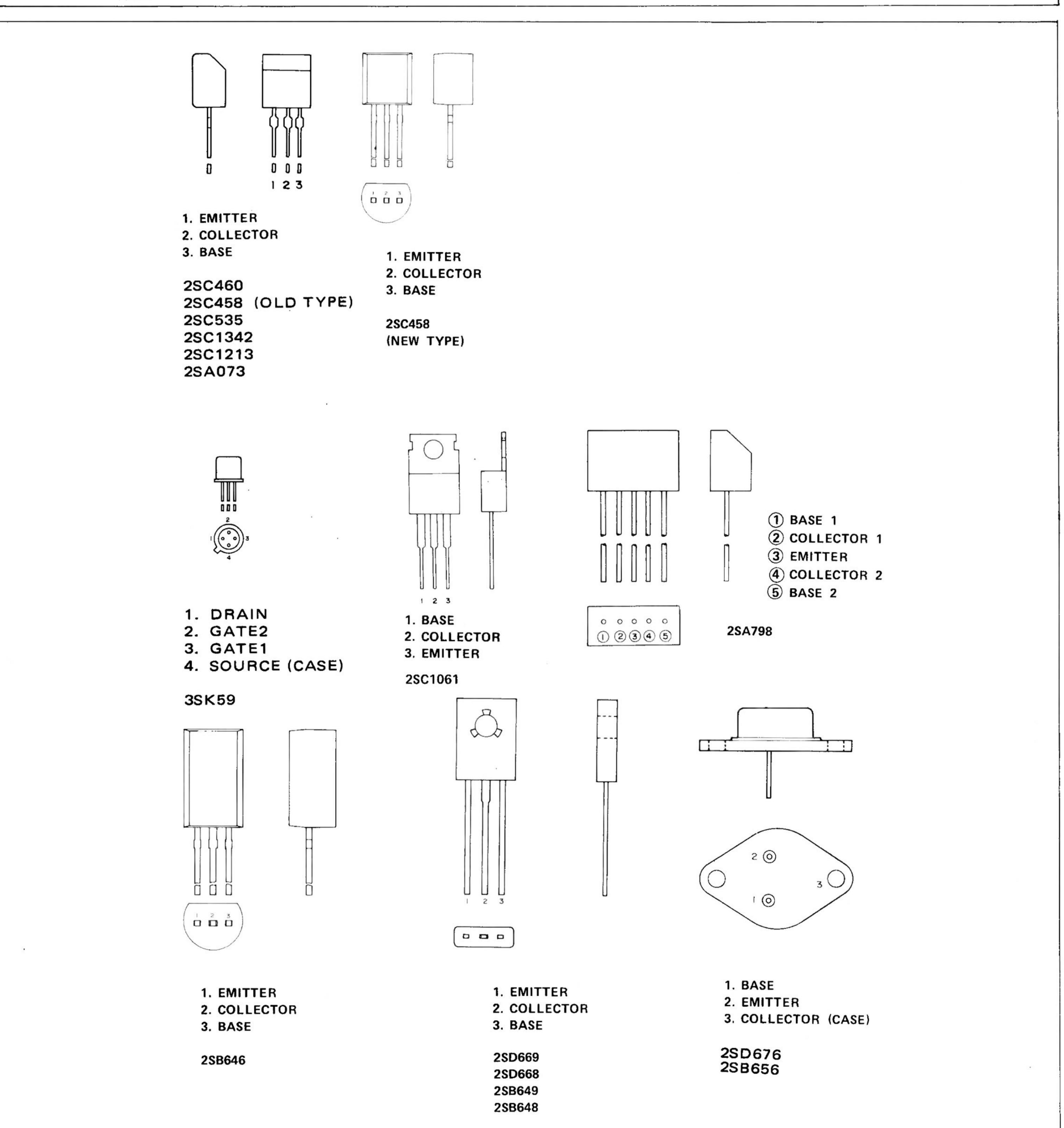


Figure 46 TRANSISTOR TYPES

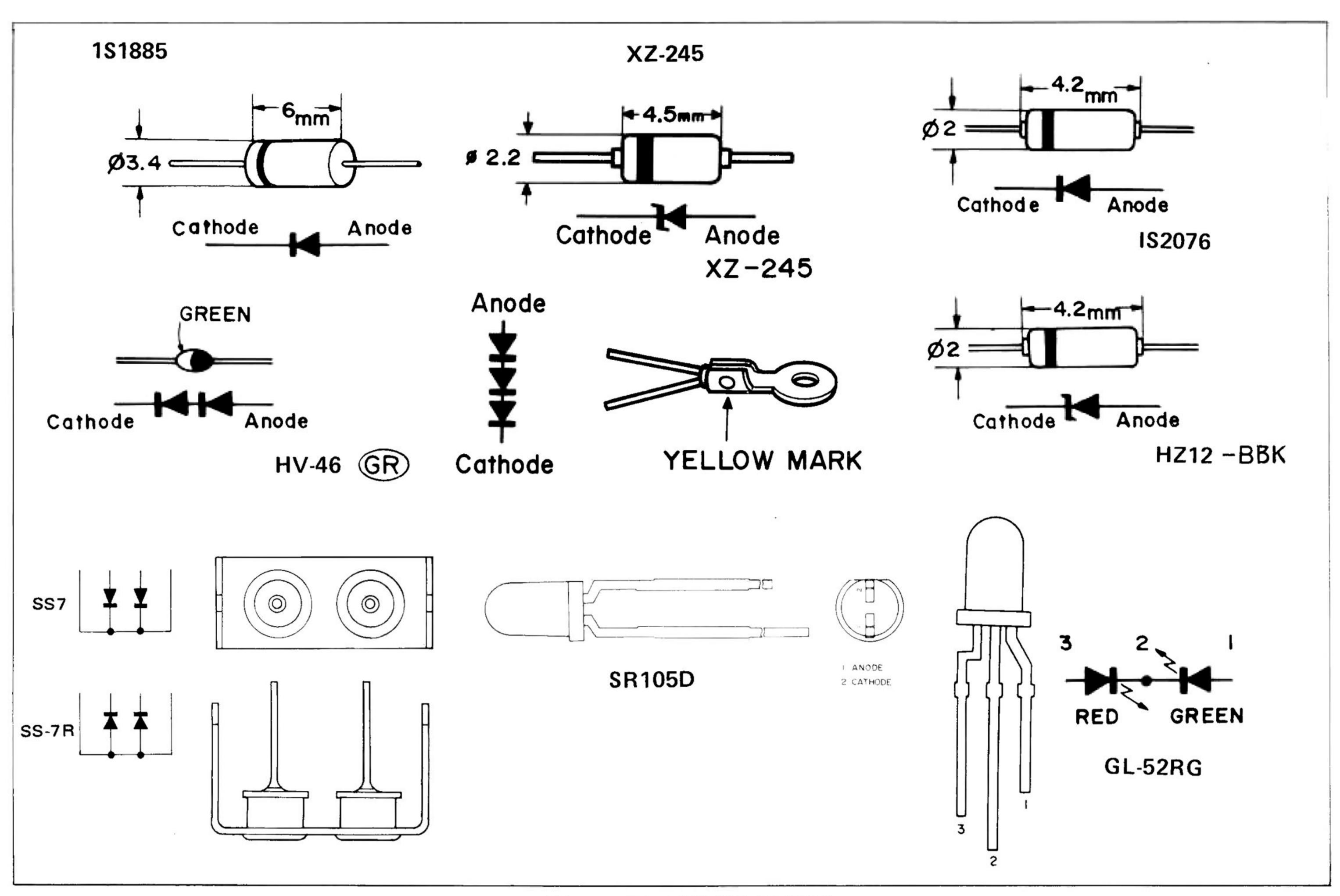


Figure 47 DIODE TYPES

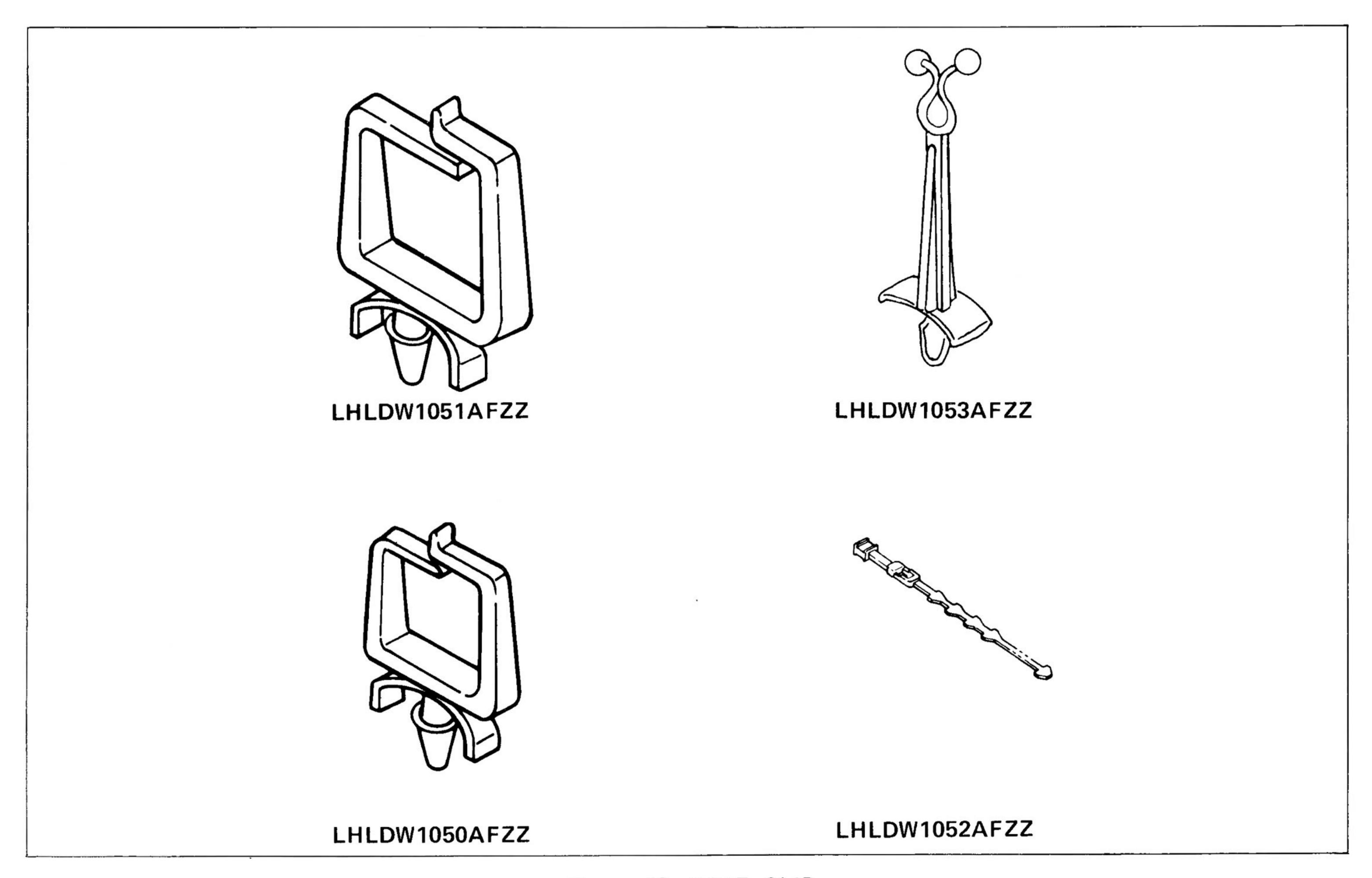


Figure 48 WIRE CLIP

POWER TRANSISTOR REPLACEMENT

If it is necessary to replace audio output transistors, then follow these procedures to prevent reoccurrence of transistor failure.

- 1. Carefully remove transistor and mica insulator and clean all the silicone grease off the mica and the mounting area on the chassis. If the mica is damaged, then it must be replaced.
- 2. Remove the defective transistor and clean out the transistor mounting hole.
- 3. Put new silicone grease on the transistor mounting area of the chassis and on both side of the mica insulator. Mount the new transistor, being careful to tighten each transistor mounting screw evenly.

 Driving one screw tightly and then the other is likely-to-cause metal filings which may damage the mica or prevent necessary heat dissipation on chassis.
- 4. Before applying power to the new transistor, with an ohm meter check to see that there is no short between the transistor case and chassis.
- 5. As transistor VS2SB656-B/-1 and VS2SD676-B/-1 are almost similar in the shape. So pay attention to the mark of transistor when replacing the power transistor.

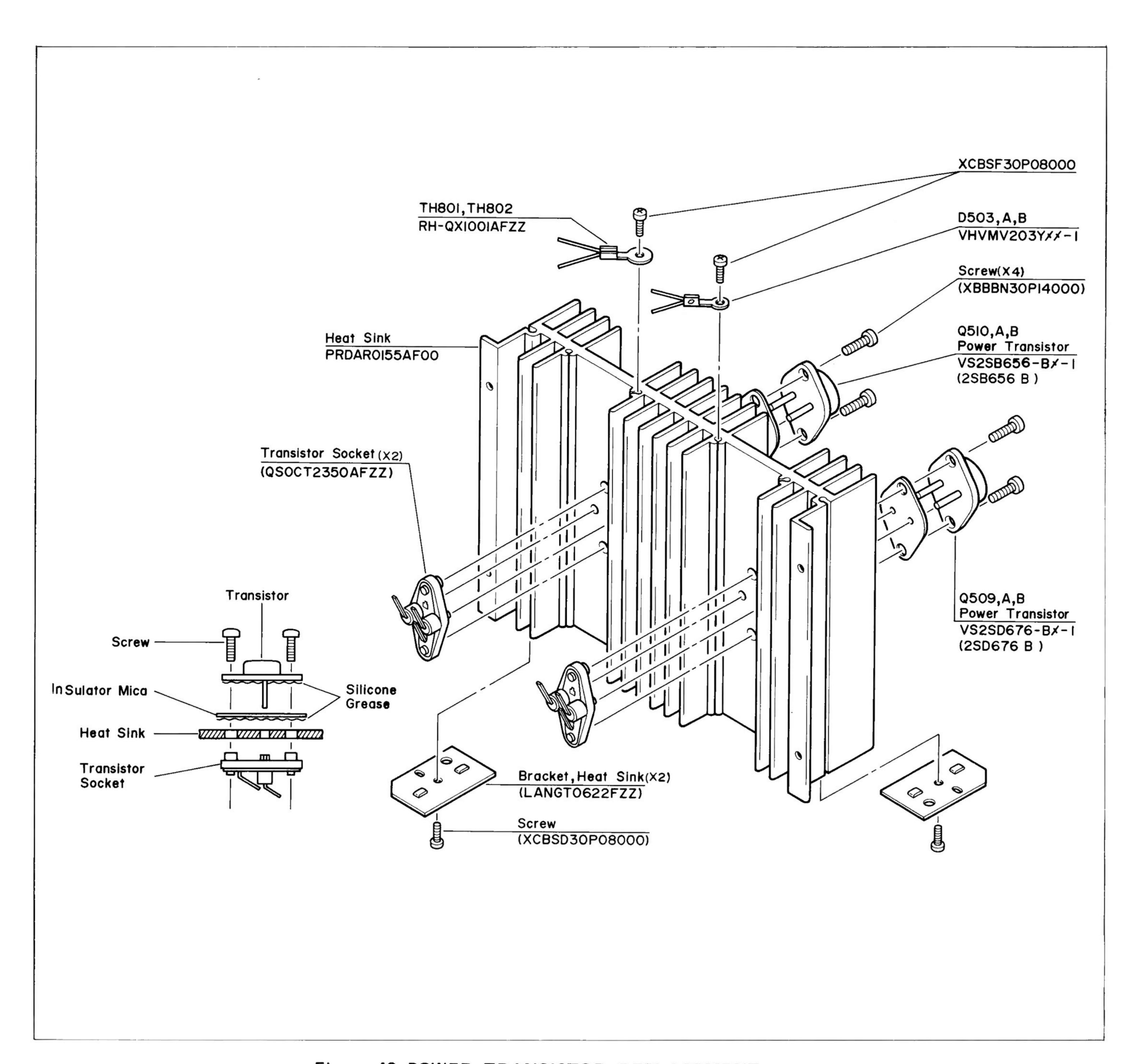


Figure 49 POWER TRANSISTOR REPLACEMENT

REPLACEMENT PARTS LIST

"HOW TO ORDER REPLACEMENT PARTS"

To have your order filled promptly and correctly, Order to: Parts Center please furnish the following informations.

1. MODEL NUMBER 2. REF. NO.

3. PART NO. 4. DESCRIPTION

P.O. Box 664 Paramus, New Jersey 07652 (201) 265-5600

P.O. Box 20394 Long Beach, Calif. 90801 (213) 830-4470

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
	INTEGRA	ATED CIRCUITS	Q605	VS2SC1061-B-1	Voltage Regulator, Ripple Filter (2SC1061®)
IC101	RH-IX1005AFZZ	FM IF Amplifier and Detector (Quadrature) (HA1137W)			DIODES
IC102	RH-IX1053AFZZ	P.L.L. Multiplex Stereo Demodulator (HA1196)	D101	VHD1S2076//-1	Signal Meter, FM (1S2076)
IC201, } IC202	VHIHA1457//-1	Tone Amplifier (HA1457)	D102 D103	VHD1S2076//-1 VHD1S2076//-1	FM Kill (1S2076) FM Muting (1S2076)
IC301	RH-IX1004AFZZ	AM RF/IF Amplifier and Detector (HA1138)	D105 D106	VHD1S2076//-1 VHD1S2076//-1	FM Muting (1S2076) V.C.O. Kill (1S2076)
IC401, } IC402	VHIHA1457//-1	Equalizer Amplifier (HA1457)	D301 D302	VHD1S2076//-1 VHD1S2076//-1	Overload (1S2076) Overload (1S2076)
		NOIOTODO	(A, B)	VHVHV46-G//-1	Varistor, Bias Stabilizer (HV-46 GR)
	IKA	NSISTORS	D502 (A, B)	VHD1S2076//-1	Voltage Detector (1S2076)
Q101, Q102	VS2SC460-B/-1	FM IF Amplifier (2SC460(B))	D503 (A, B)	VHVMV203Y//-1	Varistor, Bias Circuit (Idle Current) (MV-203(Y))
Q103	VS2SC458-C/-1	FM Muting Amplifier (2SC458©)	D504 (A, B)	VHD1S2076//-1	Voltage Detector (1S2076)
Q301	VS2SC458-D/-1	Air Check Oscillation (2SC458®)	D505 (A, B)	VHD1S2076//-1	Voltage Detector, Protection Circuit (1S2076)
Q302, \\Q303	VS2SC458-C/-1	Muting (2SC458©)	D601 D603	VHD1S2076//-1 VHD1S2076//-1	Noise Prevention (1S2076) Voltage Detector Protection
Q501 (A, B)	VS2SA798-G/-1	Dual Transistor, Differential Amplifier (2SA798©)	D604	VHD1S2076//-1	Circuit (1S2076) Protection, Temperature of Heat Sink increasing abnor-
$ \left.\begin{array}{c} Q502\\ (A, B) \end{array}\right\} $	VS2SB646-C/-1	Constant Current Circuit (2SB646©)	D(05	VIID1020761/ 1	mally (1S2076)
$ \left.\begin{array}{c} Q503 \\ (A, B) \end{array}\right\} $	VS2SB648A-B-1	Constant Current Circuit (2SB648AB)	D605	VHD1S2076//-1	Rectifier, Protection Circuit (1S2076)
Q504 (A, B)	VS2SD668A-B-1	Audio Amplifier, Class "A" (2SD668AB)	D606	VHD1S2076//-1	Surge Current Prevention (1S2076)
Q505 (A, B)	VS2SD669A-B-1	Drive Amplifier (2SD669AB)	D607 D608	VHD1S1885//-1 VHD1S1885//-1	Power Rectifier (1S1885) Power Rectifier (1S1885)
$ \left.\begin{array}{c} Q506 \\ (A, B) \end{array}\right\} $	VS2SB649A-B-1	Drive Amplifier (2SB649AB)	D609 D610	VHD1S1885//-1 VHD1S1885//-1	Power Rectifier (1S1885) Power Rectifier (1S1885)
Q507 (A, B)	VS2SC1213AB-1	Power Amplifier, Voltage Detector (2SC1213AB)	D701 D702	VHDSS-7///-1 VHDSS-7R///-1	Power Rectifier (SS-7) Power Rectifier (SS-7R) Light Emitting Diede Stores
Q508 (A, B)	VS2SA673AB/-1	Power Amplifier, Voltage Detector (2SA673AB)	D801	VHPSR105D//-1	Light Emitting Diode, Stereo Indicator (SR105D)
Q509 (A, B)	VS2SD676-B/-1	Audio Power Amplifier (2SD676B)	D802	VHPGL-52RG/1F	Light Emitting Diode, Power Source/Circuit Protection
Q510 (A, B)	VS2SB656-B/-1	Audio Power Amplifier (2SB656B)	ZD601	VHEXZ245///-1	Indicator (GL-52RG) Zener Diode, Voltage Regulator (22.765 25.225V) (V.7245)
Q511 (A, B)	VS2SB646-C/-1	Voltage Detector, Protection Circuit (2SB646©)	ZD602	VHEXZ245///-1	(23.765~25.235V) (XZ245) Zener Diode, Voltage Regulator
Q601	VS2SC458-D/-1	Protection Circuit, Voltage Detector (2SC458®)	ZD603	VHEHZ12-BBK-1	(23.765 ~ 25.235V) (XZ245) Zener Diode, Voltage Regulator (12.7 - 13.5V) (HZ12-RRK)
Q602	VS2SC458-D/-1	Protection Circuit, Voltage Detector (2SC458®)	ZD604	VHEHZ12-BBK-1	(12.7 ~ 13.5V) (HZ12-BBK) Zener Diode, Voltage Regulator
Q603	VS2SC458-D/-1	Protection Circuit, Switching (2SC458®)			$(12.7 \sim 13.5 \text{V}) \text{ (HZ12-BBK)}$
Q604	VS2SC458-D/-1	Protection Circuit, Switching (2SC458®)			

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
	THE	RMISTORS		ELECTROLY	TIC CAPACITORS
TH801	RH-QX1001AFZZ	Positive Characteristic	C115	VCEAAU1HW105A	1MFD, 50V, +75 - 10%
		Thermistor	C116	VCEAAU1HW105A	1MFD, 50V, +75 -10%
TH802	RH-QX1001AFZZ	Positive Characteristic	C119	VCAAAU1AB335M	3.3MFD, 10V, ±20%,
		Thermistor			Aluminum
			C121	VCEAAU1CW107Y	100MFD, 16V, +50 –10%
		COILS	C123	VCAAAU1EB224K	.22MFD, 25V, ±20%, Aluminum
		COILS	C124	VCAAAU1AB335M	3.3MFD, 10V, ±20%,
L101	VP-LH100M0000	10μH, +B Choke		VOIMINIONINI	Aluminum
L102	VP-LH100M0000	10μH, +B Choke	C125	VCAAAU1EB155K	1.5MFD, 25V, ±10%,
L103	VP-LH1R0M0000	1μH, Phase Compensation			Aluminum
L104	RCILZ0052AFZZ	18µH, Phase Shifter	C127	VCEAAU1CW106Y	10MFD, 16V, +50 -10%
L301	RCILB0395AFZZ	AM Oscillator	C128	VCEAAU1CW106Y	10MFD, 16V, +50 -10%
L302	RCILI0209AFZZ	AF IF with Ceramic Filter	C131, C132	VCEAAU1HW105A	1MFD, 50V, +75 -10%
L303 L304	VP-LH1R0M0000 VP-LH1R0M0000	1μH, Choke 1μH, Choke	C132	VCEAAU1AW227Y	220MFD, 10V, +50 -10%
L501			C205, }		3.3MFD, $25V$, $+75 - 10\%$
(A, B)	RCILZ0050AFZZ	.8µH, Oscillation Prevention	C206	VCEALU1EC335A	(Orange)
L601	VP-LH100M0000	10μH, Choke	C207,	VCEALU1HW105M	1MFD, 50V, ±20%, (Yellow)
L602	VP-LH100M0000	10μH, Choke	C208	VCEALUIIIWIUJWI	
L603	VP-LH100M0000	10μH, Choke	C213, }	VCEALU1AC336Y	33MFD, $10V$, $+50 - 10\%$,
L801	RCILA0415AFZZ	AM Bar Antenna	C214		(Orange)
L802	RCILA0231AFZZ	FM Balun	C223, C224	VCEALU1HC105A	1MFD, 50V, +75 -10%, (Orange)
	TRAN	ISFORMERS	C229,		
			C230	VCEAAU1HW107Y	100MFD, 50V, +50 -10%
IFT101	RCILD0053AFZZ	Quadrature (10.7MHz)	C309	VCEAAU1CW476Y	47MFD, $16V$, $+50 - 10\%$
IFT102	RCILD0054AFZZ	Quadrature (10.7MHz)	C310	VCEAAU1AW227Y	220MFD, 10V, +50 -10%
T801	RTRNP0513AFZZ	Power	C315	VCEALU1HW224M	.22MFD, 50V, ±20%, (Yellow)
			C318	VCEAAU1CW476Y	47MFD, 16V, +50 –10%
		HTEDC	C319	VCEAAU1EW475A	4.7MFD, 25V, +75 –10%
		ILTERS	C321 C326	VCEAAU1CW107Y VCEAAU1AW107Y	100 MFD, 16V, +50 -10% 100 MFD, 10V, +50 -10%
CF101,			C327	VCEAAU1HW107A	1MFD, 50V, +75 - 10%
CF102,	RFILF0059AFZZ	FM IF, Ceramic	C329	VCEAAU1HW105A	1MFD, 50V, +75 - 10%
CF103			C401,		3.3MFD, 25V, +75 -10%,
LPF101,	RFILL0050AFZZ	Low Pass Filter	C402	VCEALU1EC335A	(Orange)
LPF102	KI ILLOUSUMI ZZ	Low rass rater	C405,	VCEAAU1CW336Y	33MFD, $16V$, $+50 - 10\%$
			C406		
	CO	NTROLS	C415, C416	VCEALU1EC335A	3.3MFD, $25V$, $+75 - 10\%$, (Orange)
		INTROLS	C410)	VCEAAU1HW107Y	100MFD, 50V, +50 –10%
VR101	RVR-M0140AFZZ	470 (B) ohm, FM Muting Level	C418	VCEAAU1HW107Y	100MFD, 50V, +50 - 10%
		Adjust	C501		3.3MFD, 25V, +75 -10%,
VR102	RVR-M0078AGZZ	10K (B) ohm, V.C.O. Frequ-	(A, B)	VCEALU1EC335A	(Orange)
		ency Adjust	C503	RC-EZ1038AFZZ	47MFD, 16V, +50 -10%
VR103	RVR-M0145AFZZ	220K (B) ohm, Stereo Separa-	(A, B)		
VR201		tion Adjust	$ \begin{array}{c} C504 \\ (A, B) \end{array} $	RC-EZ1038AFZZ	47MFD, 16V, $+50 - 10\%$
(A, B)	RVR-B0150AFZZ	100K ohm, Volume Control	C505		
VR202	D***D @00***	10077 1 7 1	(A, B)	RC-EZ1040AFZZ	47MFD, 63V, $+50 - 10\%$
(A, B)	RVR-G0052AFZZ	100K ohm, Balance Control	C506	DO 071020 A 077	47MED 1637 160 100
VR203	RVR-C0066AFZZ	100K ohm, Bass Control	(A, B)	RC-EZ1038AFZZ	47MFD, 16V, +50 -10%
(A, B)	K V K-COUOUAT LL	TOOK OIIII, Dass Collifor	C508	RC-EZ1040AFZZ	47MFD, 63V, +50 -10%
VR204	RVR-C0066AFZZ	100K ohm, Treble Control	(A, B)	LIU LLLU IUILI LLL	
(A, B)			C510	RC-EZ1040AFZZ	47MFD, 63V, +50 -10%
VR301	RVR-M0126AFZZ	5K (B) ohm, Air Check Level Adjust	(A, B) C601	VCEALU1HW684M	.68MFD, 50V, ±20% (Yellow)
			1780 100 100 100 100 100 100 100 100 100 1	VCEALUIHW684M VCEALUIHW684M	$.68MFD, 50V, \pm 20\%$ (Yellow)
VR501		33() (B) ohm. Idle Current	CDUZ	V (. 1 . /)	OOMED, NOV. EXILEST FEBRUAR
VR501 (A, B)	RVR-M0150AFZZ	330 (B) ohm, Idle Current Adjust	C602 C605	VCEAAU1EW106Y	$10MFD$, $30V$, $\pm 20\%$ (16HoW)

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
C607	VCEAAU1CW106Y	10MFD, 16V, +50 −10%	C303	VCQYKU1HM223K	$.022$ MFD, 50 V, $\pm 10\%$, Mylar
C608	VCEAAU1CW106Y	10MFD, 16V, +50 –10%	C304	VCQYKU1HM223K	.022MFD, 50V, ±10%, Mylar
C609	VCEAAU1CW337Y	330MFD, 16V, +50 –10%	C306	VCKZPU1HF103P	.01MFD, 50 V, $+100 -0%$,
C610	VCEAAU1CW337Y	330MFD, $16V$, $+50 - 10\%$			Ceramic
C611	VCEAAU1CW227Y	220MFD' 16V, +50 –10%	C307	VCKZPU1HF103P	.01MFD, 50 V, $+100-0$ %,
C619	VCEAAU1HW477Y	470MFD, 50V, +50 –10%	G200	************	Ceramic
C620	VCEASU1HW228Y	2200MFD, 50V, +50 –10%	C308	VCCSPU1HL221K	220PFD, 50V, ±10%, Ceramic
C621	VCEAAU1VW107Y	100MFD' 35V, +50 -10%	C311	VCCSPU1HL470K	47PFD, 50V, ±10%, Ceramic
C622	VCEAAU1VW107Y	100MFD, 35V, +50 –10%	C312	VCQYKU1HM473K	.047MFD, 50V, ±10%, Mylar
C623	VCEAAUIVW227Y	220MFD, 35V, +50 –10%	C313	VCKZPU1HF473Z	.047MFD
C624	VCEAAUIVW227Y	220MFD, 35V, +50 –10%	C314 C316	VCCVVIII HM202V	.047MFD
C625	VCEAAUIVW227Y	220MFD, 35V, +50 -10%	C310	VCQYKU1HM393K VCQYKU1HM103K	.039MFD, 50V, ±10%, Mylar .01MFD, 50V, ±10%, Mylar
C626 C627	VCEAAU1UW476V	220MFD, 35V, +50 –10%	C317	VCCTRUTHMT03K VCKZPU1HF473Z	.01MFD, 30 V, ±10%, Mylar .047MFD
C628	VCEAAU1HW476Y VCEAAU1HW105A	47MFD, 50V, +50 –10% 1MFD, 50V, +75 –10%	C322,	VCKZPUIHF4/3Z	.04/MITD
C705	RC-EZ1039AFZZ	15000MFD, 63V, +20 -20%	C322,		
C706	RC-EZ1039AFZZ RC-EZ1039AFZZ	15000MFD, 63V, +20 -20%	C324,	VCQYKU1HM333J	.033MFD, 50V, ±5%, Mylar
C700	RC LZ1037AI ZZ	13000M1 D, 03 V, 120 -2070	C325		
			C403, i		
	САР	ACITORS	C404	VCCSPU1HL560K	56PFD, 50V, ±10%, Ceramic
(Unless		citors are $50V$, +80 -20% , Ceramic ty			
(0111055	o the wise specifica capa		C408	VCCSPU1HL101K	100PFD, 50V, ±10%, Ceramic
C101	VCKZPU1HF102Z	.001MFD	C409,	***********	
C102	VCKZPU1HF223Z	.022MFD	C410	VCCSPU1HL220K	22PFD, 50V, ±10%, Ceramic
C103	VCKZPU1HF223Z	.022MFD	C411,)	MOOCNITITICAGO	10000000 5077 1507 61
C104	VCKZPU1HF223Z	.022MFD	C412	VCQSMU1HS182J	1800PFD, 50V, ±5%, Styrol
C105	VCKZPU1HF223Z	.022MFD	C413,)	VCOCMTITICCOM	(0000DED 5017 1507 01 1
C106	VCKZPU1HF223Z	.022MFD	C414	VCQSMT1HS682J	6800PFD, 50V, ±5%, Styrol
C107	VCKZPU1HF223Z	.022MFD	C502	VCCSPU1HL151J	150DED 50W +50/ Coromic
C108	VCKZPU1HF223Z	.022MFD	(A, B)	VCCSFUITILISIJ	150PFD, 50V, ±5%, Ceramic
C110	VCKZPU1HF223Z	.022MFD	C507	VCCSPU1HL470K	47PFD, 50V, ±10%, Ceramic
C111	VCKZPU1ND474M	.47MFD, 12V, ±20%, Ceramic	(A, B)	VCCSPUTIL4/UK	4777D, 30 V, ±10%, Ceramic
C112	VCKZPU1HF223Z	.022MFD	C509	VCQYKU1HM104K	.1MFD, 50V, ±10%, Mylar
C114	VCKZPU1HF223Z	.022MFD	(A, B)	VCQIROIIMIIOAK	.1 MIT D, 50 V, -10/0, Mylai
C117	VCKZPU1HF223Z	.022MFD	C512	VCCSPU1HL330K	33PFD, 50V, ±10%, Ceramic
C118	VCKZPU1HF223Z	.022MFD	(A, B)	V CCSI OTTLSSOR	3311 D, 30 V, -10 /0, Colainic
C120	VCCSPU1HL331K	330PFD, 50V, ±10%, Ceramic	C603	VCQYKU1HM562K	.0056MFD, 50V, ±10%, Mylar
C122	VCQYKU1HM473K	.047MFD, 50V, ±10%, Mylar	C604	VCQYKU1HM562K	.0056MFD, 50V, ±10%, Mylar
C126	VCQSMT1HS391J	390PFD, 50V, ±5%, Styrol	C612	VCKZPU1HF223Z	.022MFD
C129	VCQSMT1HS561J	560PFD, 50V, ±5%, Styrol	C615	VCKZPU1HF223Z	.022MFD
C130	VCQSMT1HS561J	560PFD, 50V, ±5%, Styrol	C616	VCKZPU1HF223Z	.022MFD
C135	VCCSPU1HL331K	330PFD, 50V, ±10%, Ceramic	C617	VCKZPU1HF223Z	.022MFD
C136	VCKZPU1HF223Z	.022MFD	C618	VCKZPU1HF223Z	.022MFD
C201,	VCCSPU1HL271K	270PFD, 50V, ±10%, Ceramic	C701	VCKZPU2EE103Z	.01MFD, 250V, +80 -20%,
C202			0703	MOLONIA DE 1000	Ceramic
C203,	VCQYKU1HM683J	.068MFD, 50V, ±5%, Mylar	C702	VCKZPU2EE103Z	.01MFD, 250V, +80 –20%,
C204			C702	VOLZDIJA DE 1027	Ceramic
C209,	VCCSPU1HL560K	56PFD, 50V, ±10%, Ceramic	C703	VCKZPU2EE103Z	.01MFD, 250V, +80 –20%,
C210		1933 5	C704	VCV7DU2EE1027	Ceramic
C211,	VCCSPU1HL470K	47PFD, 50V, ±10%, Ceramic	C704	VCKZPU2EE103Z	.01MFD, 250V, +80 –20%,
C212			C801	VCV7DH1HE2227	Ceramic
C215, C216	VCCSPU1HL220K	22PFD, 50V, ±10%, Ceramic	C801	VCKZPU1HF223Z VCKZPU1HF223Z	.022MFD
C219,]			C802	RC-KZ020UAFZZ	.022MFD 01MED AC 150W Coromic
C219, $C220$	VCQYKU1HM223J	.022MFD, 50V, ±5%, Mylar	C803	KC-KZUZUUAFZZ	.01MFD, AC 150V, Ceramic
C221,					
C222	VCQYKU1HM124J	.12MFD, 50V, ±5%, Mylar		R	ESISTORS
C225,			(Unle		esistor are 1/4W, ±5%, Carbon type.)
C226	VCQYKU1HM222J	.0022MFD, 50V, ±5%, Mylar		200 Other wise specificul 10	caroon type.)
C227,	************	0434777	R101	VRD-ST2EE101J	100 ohm
C228	VCQYKU1HM103J	.01MFD, 50V, ±5%, Mylar	R102	VRD-ST2EE473J	47K ohm
C301	VCQSMT1HS331J	330PFD, 50V, ±5%, Styrol	R103	VRD-ST2EE123J	12K ohm
C302	VCCUPU1HJ150K	15PFD (UJ), 50V, ±10%,	R104	VRD-ST2EE102J	1K ohm
		Ceramic, Violet	R105	VRD-ST2EE391J	390 ohm
					•

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
R106	VRD-ST2EE181J	180 ohm	R218	VRD-ST2EE332J	3.3K ohm
R107	VRD-ST2EE101J	100 ohm	R219,	VRD-ST2EE332J	3.3K ohm
R108	VRD-ST2EE101J	100 ohm	R220	V KD-S1ZEE33ZJ	J.JK OIIII
R109	VRD-ST2EE471J	470 ohm	R221, }	VRD-ST2EE562J	5.6K ohm
R110	VRD-ST2EE333J	33K ohm	R222	THE STEEDOOL	
R111	VRD-ST2EE103J	10K ohm	R223,	VRD-ST2EE122J	1.2K ohm
R112	VRD-ST2EE561J	560 ohm	R224	MDD CTORE 221 I	220 - 1
R113	VRD-ST2EE102J	1K ohm	R225	VRD-ST2EE331J	330 ohm
R114 R115	VRD-ST2EE391J VRD-ST2EE181J	390 ohm 180 ohm	R226 R227,	VRD-ST2EE331J	330 ohm
R116	VRD-STZEE181J	180 ohm	R228	VRD-ST2EE104J	100K ohm
R117	VRD-ST2EE1013 VRD-ST2EE271J	270 ohm	R229,		
R118	VRD-ST2EE104J	100K ohm	R230	VRD-ST2EE102J	1K ohm
R119	VRD-ST2EE562J	5.6K ohm	R231,	~~~	
R120	VRD-ST2EE152J	1.5K ohm	R232	VRD-ST2EE102J	1K ohm
R121	VRD-ST2EE822J	8.2K ohm	R233,	TIDD COORDIAGA	172 1
R122	VRD-ST2EE221J	220 ohm	R234	VRD-ST2EE102J	1K ohm
R123	VRD-ST2EE154J	150K ohm	R235,	VDD CTARRIONI	1 77 - 1
R124	VRD-ST2EE333J	33K ohm	R236	VRD-ST2EE102J	1K ohm
R125	VRD-ST2EE333J	33K ohm	R237,	VDD CTOEFFAI	560K ohm
R126	VRD-ST2EE123J	12K ohm	R238	VRD-ST2EE564J	560K ohm
R127	VRD-ST2EE562J	5.6K ohm	R239,]	VRD-ST2EE564J	560K ohm
R128	VRD-ST2EE223J	22K ohm	R240	VKD-312EE304J	SOOK OHIII
R129	VRD-ST2EE332J	3.3K ohm	R241,	VRD-ST2EE564J	560K ohm
R131	VRD-ST2EE333J	33K ohm	R242	V KD-312EE3043	JOOK OIIII
R132	VRD-ST2EE123J	12K ohm	R243,	VRD-ST2EE105J	1 Meg ohm
R133	VRD-ST2EE104J	100K ohm	R244		
R134	VRD-ST2EE225J	2.2 Meg ohm	R301	VRD-ST2EE681J	680 ohm
R135	VRD-ST2EE223J	22K ohm	R302	VRD-ST2EE102J	1 K ohm
R136	VRD-ST2EE102J	1 K ohm	R303	VRD-ST2EE332J	3.3K ohm
R137	VRD-ST2EE223J	22K ohm	R304	VRD-ST2EE222J	2.2K ohm
R138	VRD-ST2EE223J	22K ohm	R306	VRD-ST2EE822J	8.2K ohm
R139	VRD-ST2HD561J	560 ohm, 1/2W, ±5%, Carbon	R307	VRD-ST2EE332J	3.3K ohm
R140	VRD-ST2EE333J	33K ohm	R308 R309	VRD-ST2EE393J VRD-ST2EE101J	39K ohm 100 ohm
R141, R142	VRD-ST2EE682J	6.8K ohm	R310	VRD-S12EE1013 VRD-ST2EE470J	47 ohm
R142			R311	VRD-STZEE4703 VRD-ST2EE102J	1K ohm
R144	VRD-ST2EE473J	47K ohm	R312	VRD-ST2EE1023 VRD-ST2EE823J	82K ohm
R145,			R313	VRD-ST2EE152J	1.5K ohm
R146	VRD-ST2EE472J	4.7K ohm	R314	VRD-ST2EE223J	22K ohm
R149,	****	4	R315	VRD-ST2EE103J	10K ohm
R150	VRD-ST2EE472J	4.7K ohm	R316	VRD-ST2EE103J	10K ohm
R151	VRD-ST2EE333J	33K ohm	R317	VRD-ST2EE223J	22K ohm
R152	VRD-ST2EE101J	100 ohm	R318	VRD-ST2EE270J	27 ohm
R153	VRD-ST2EE474J	470K ohm	R319	VRD-ST2EE471J	470 ohm
R154	VRD-ST2EE223J	22K ohm	R320	VRD-ST2EE472J	4.7K ohm
R155	VRD-ST2EE563J	56K ohm	R321	VRD-ST2EE122J	1.2K ohm
R156	VRD-ST2EE334J	330K ohm	R322	VRD-ST2EE473J	47K ohm
R157	VRD-ST2EE473J	47K ohm	R324	VRD-ST2EE822J	8.2K ohm
R201,]	VRD-ST2EE333J	33K ohm	R325	VRD-ST2EE103J	10K ohm
R202	TRU DIZEEJJJ		R326	VRD-ST2EE103J	10K ohm
R203,	VRD-ST2EE103J	10K ohm	R327	VRD-ST2EE122J	1.2K ohm
R204	, ILL DIELET		R328	VRD-ST2EE122J	1.2K ohm
R205,	VRD-ST2EE222J	2.2K ohm	R401,	VRD-ST2EE222J	2.2K ohm
R206			R402		
R207,	VRD-ST2EE563J	56K ohm	R405,	VRD-ST2EE104J	100K ohm
R208			R406		
R109,	VRD-ST2EE474J	470K ohm	R407,	VRD-ST2EE821J	820 ohm
R210			R408		
R213,	VRD-ST2EE102J	1K ohm	R409,	VRD-ST2EE561J	560 ohm
R214			R410		
R215, R216	VRD-ST2EE183J	18K ohm	R411,	VRD-ST2EE393J	39K ohm
R216 1	VRD-ST2EE332J	3.3K ohm	R412	VDD CTOEFATAI	470K ohm
1721/	V KD-SIZEESSZJ	J.JK OIIII	R413	VRD-ST2EE474J	T/UK OHIII

REF. NO.	PART NO.	DESCRIPTION		REF. NO.	PART NO.	DESCRIPTION
R414	VRD-ST2EE474J	470K ohm		R529	TIDD CHAPPAGAI	A A T 1
R415,	VRD-ST2EE332J	3.3K ohm		(A, B)	VRD-ST2EE222J	2.2K ohm
R416	V KD-STZEEJJZJ	J.JK OIIII		R530	VRS-PT3DB2R2K	2.2 ohm, 2W, ±10%, Oxide
R417, } R418	VRD-ST2EE104J	100K ohm		(A, B)		
R419,				R531 (A, B)	VRD-ST2EE123J	12K ohm
R420	VRD-ST2EE221J	220 ohm		R532	VDC DT2DD100V	10 1 20 +100 0 : 1 - 1:1
R421, }	VRD-ST2EE473J	47K ohm		(A, B)	VRS-PT3DB100K	10 ohm, 2W, ±10%, Oxide Film
R422	TRD STEEL TOS	· / IL OIIII		R601	VRD-ST2EE221J	220 ohm
$ \begin{array}{c} R501 \\ (A, B) \end{array} $	VRD-ST2EE564J	560K ohm		R602 R603	VRD-ST2EE221J VRD-ST2EE822J	220 ohm 8.2K ohm
R502	VDD CEARCOALI	0.00		R604	VRD-ST2EE822J	8.2K ohm
(A, B)	VRD-ST2EE821J	820 ohm		R605	VRD-ST2EE472J	4.7K ohm
R503	VRD-ST2EE223J	22K ohm		R606	VRD-ST2EE472J	4.7K ohm
(A, B)	, 112 0112211			R609	VRD-ST2EE222J	2.2K ohm
$ \begin{array}{c} R504 \\ (A, B) \end{array} $	VRD-ST2EE561J	560 ohm		R610 R611	VRD-ST2EE222J VRD-ST2EE183J	2.2K ohm 18K ohm
R505	AND CTARRAGIA	220 1		R612	VRD-ST2EE183J	18K ohm
(A, B)	VRD-ST2EE331J	330 ohm		R613	VRD-ST2EE822J	8.2K ohm
R506	VRD-ST2EE681J	680 ohm		R614	VRD-ST2EE223J	22K ohm
(A, B)				R615	VRD-ST2EE332J	3.3K, ohm
$\begin{bmatrix} R507 \\ (A, B) \end{bmatrix}$	VRD-ST2EE392J	3.9K ohm		R616 R617	VRD-ST2EE153J VRD-ST2EE333J	15K ohm 33K ohm
R508	*****	4 6 77		R618	VRD-ST2EE393J	39K ohm
(A, B)	VRD-ST2EE472J	4.7K oym		R619	VRD-ST2EE392J	3.9K ohm
R509	VRD-ST2EE563J	56K ohm		R620	VRD-ST2EE470J	47 ohm
(A, B)	VICE STEELSUSS			R621	VRD-ST2EE563J	56K ohm
R510	VRD-ST2EE223J	22K ohm		R622	VRD-ST2EE562J	5.6K ohm
(A, B) R511				R623 R624	VRD-ST2EE682J VRD-ST2EE682J	6.8K ohm 6.8K ohm
(A, B)	VRD-ST2EE680J	68 ohm	(*)	R626	VRD-ST2EE121J	120 ohm
R512	VRG-ST2EA101J	100 ohm, 1/4W, ±5%, Fusible		R627	VRD-ST2EE221J	220 ohm
(A, B)	VKG-S1ZEA1UIJ	100 01111, 1/4 w, ±3%, Fusible		R628	VRD-ST2EE223J	22K ohm
R513	VRG-ST2EA101J	100 ohm, 1/4W, ±5%, Fusible		R629	VRD-ST2EE221J	220 ohm
(A, B) R514				R630 R631	VRD-ST2EE223J VRS-PT3DB681K	22K ohm 680 ohm, 2W, ±10%, Oxide
(A, B)	VRG-ST2EA101J	100 ohm, 1/4W, ±5%, Fusible		K031	V K3-F I 3D BOOLK	Film
R515	NEC CESEA 101 I	100 -1 1/4W +50/ F:1-1-		R634	VRD-ST2EE221J	220 ohm
(A, B)	VRG-ST2EA101J	100 ohm, 1/4W, ±5%, Fusible		R635	VRD-ST2EE331J	330 ohm
R516	VRG-ST2HA1R0J	1 ohm, 1/2W, ±5%, Fusible		R636	VRD-ST2EE151J	150 ohm
(A, B)				R637	VRD-ST2EE331J	330 ohm
R517 (A, B)	VRG-ST2HA1R0J	1 ohm, 1/2W, ±5%, Fusible		R638 R639	VRC-MT2HG182K VRD-ST2EE681J	1.8K ohm, 1/2W, ±10%, Carbon 680 ohm
R518	DD WG1001 A EGG	22 1 5777 6		R640	VRS-PT3DB121K	120 ohm, 2W, ±10%, Oxide
(A, B)	RR-WZ1001AFZZ	.33 ohm, 5W, Cement				Film
R519	RR-WZ1001AFZZ	.33ohm, 5W, Cement		R641	VRS-PT3LB271J	270 ohm, 3W, ±5%, Oxide Film
(A, B)	THE WEIGHT EE			R642	VRS-PT3LB271J	270 ohm, 3W, ±5%, Oxide Film
R520 (A, B)	VRD-ST2EE821J	820 ohm		R643 R644	VRD-ST2EE332J VRS-PT3AB221K	3.3K ohm 220 ohm 1W +10% Ovido
R521				N044	V KS-F I SABZZIK	220 ohm, 1W, ±10%, Oxide Film
(A, B)	VRD-ST2EE821J	820 ohm		R645	VRD-ST2EE105J	1 Meg ohm
R522	VRD-ST2EE221J	220 ohm		R646	VRD-ST2EE105J	1 Meg ohm
(A, B)	V KD-STZEEZZIJ	220 01111		R801	VRD-ST2HD475J	4.7 Meg ohm, 1/2W, ±5%,
R523	VRD-ST2EE221J	220 ohm				Carbon
(A, B) R524						
(A, B)	VRD-ST2EE122J	1.2K ohm			MISCELL	ANEOUS
R525	VRD-ST2EE122J	1.2K ohm				
(A, B)	VKD-SIZEEIZZJ	1.2K Onn			CPNLC3294AF01	Front Panel Assembly
R526	VRD-ST2EE152J	1.5K ohm			CSPRT0386AF07	Dial Cord Assembly
(A, B) R527					GCOVA1070AESC	Cabinet
(A, B)	VRD-ST2EE152J	1.5K ohm			GCOVA1070AFSC GCOVA1071AFSC	Guide (Large), Lever Switch Guide (Small), Lever Switch
R528	VDD CTAPPAAAI	22V ohm			GFTAU3065AFZZ	Bottom Plate, Large (Part of
(A, B)	VRD-ST2EE223J	22K ohm				LCHSM0274AFZZ)

REF.

NO.

PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
GLEGP0057AF00	Leg		NDRM-0150AFZZ	Drum
GMADD0056AFSA	Window, Transparent		NPLYB0001SGZZ	Pulley, Dial Cord
HDALM0185AFSA	Dial Scale		NPLYC0101AFFD	Shaft, Pulley
HPNLC3294AFSA	Front Panel		NSFTD0171AFFW	Tuning Shaft with Flywheel
HSSND0235AFSA			PCUSU0223AF00	Cushion, Push Switch Knob
JKNBB0061AFSA	Dial Pointer		I COSCOZZSKI OO	
JKNBM0248AFSA	Knob, Tuning Control		PCOVP1155AFZZ	Spacer Committee COO2
JKNDWU240AF5A	Knob, AM, FM, FM Muting,			Cover, Capacitor C803
TTT	Air Check, Ext. Dolby FM		PRDAR0101AFFW	Heat Sink, Transistor (See Fig
JKNBN0338AFSA	Knob, Bass Control, Treble			43-1)
	Control, Balance Control		PRDAR0155AF00	Heat Sink, Power Transistor
JKNBN0340AFSA	Knob, Speaker Selector Switch,		PREFL0061AFZZ	Dial Illumination Lamp
	Function Selector Switch			Assembly
JKNBN0342AFSA	Knob, Volume Control		PSHEF0110AFZZ	Felt, Lever Switch
JKNBP0070AFSA	Knob, Power Switch, Audio		PSPAS0054AFZZ	Spacer, Headphone Jack
	Muting Switch, Low Cut Fil-		PSPAS0059AFSA	Spacer, Push Switch Knob
			PSPAZ0050AFZZ	Insulator, Mica, Power Tran-
	ter Switch, High Cut Filter		I DI II ZOODOI II ZZ	sistor
	Switch, Mode Selector Switch,		PSPAZ0060AFZZ	
	Loudness Switch, Tape Dub-		ALEXANDER SE COMMENT SE	Spacer, LED (D801)
	bing Switch, Tape Monitor		PSPAZ9004AGZZ	Insulator, Transistor (See Fig
	Switch	DOGGA	O 1 COTTO CO C 1	43-1)
LANGQ0504AFZZ	Bracket, Dial Lamp P.W. Board	PG801	QACCU0002AF00	Power Supply Cord with Plug
	(Part of PREFL0061AFZZ)		QANTW0055AFZZ	FM Indoor Antenna, T-Shape
LANGQ0529AFZZ	Rear Panel	CN201	QCNCM135LAFZZ	Connecting Plug, 11-Pin
LANGR0420AFZZ	Bracket, Front Panel	CN202	QCNCM132FAFZZ	Connecting Plug, 6-Pin
LANGR0426AFZZ	Bracket, Power Transformer	CN203	QCNCM132FAFZZ	Connecting Plug, 6-Pin
	Dual Capacitor (C705, 706)	CN301	QCNCM133GAFZZ	Connecting Plug, 7-Pin
	Retaining	CN302	QCNCM134HAFZZ	Connecting Plug, 8-Pin
LANGT0607AFZZ	Bracket, Dial Retaining	CN303	QCNCM184EAFZZ	Connecting Plug, 5-Pin
LANGT0608AFZZ		CNP801		Connecting Plug, 2-Pin
	Bracket, Pulley	CNS201		Connecting Flug, 2-Fin Connecting Socket, 11-Pin
LANGTO622AFZZ	Bracket, Heat Sink	CNS202		
LBSHC0002SGZZ	Bushing, AM Bar Antenna Wire		C	Connecting Socket, 6-Pin
LBSHC0007AFZZ	Bushing, Power Supply Cord	CNS203		Connecting Socket, 6-Pin
LCHSM0274AFZZ	Chassis Assembly	CNS301		Connecting Socket, 7-Pin
LCRA-0050AFZZ	Clamper, AM Bar Antenna	CNS302	~	Connecting Socket, 8-Pin
LHLDP3055AFZZ	Holder, Dial Lamp (Part of	CNS303	QCNCM155EAFZZ	Connecting Socket, 5-Pin
	PREFL0061AFZZ)	CNS801	QCNW-0277AFZZ	Connecting Socket, Dial Lam
LHLDW1050AFZZ	Wire Clip			3-Pin
LHLDW1051AFZZ	Wire Clip	F601,	OEC DEGLA A END	E 500 4 25037
LHLDW1052AFZZ	Wire Clip Refer to Fig. 48	F602	QFS-B501AAFNB	Fuse, 500mA 250V
LHLDW1053AFZZ	Wire Clip	F603	QFS-B202AAFNB	Fuse, 2A 125V
LHLDW9001CE02	Wire Holder	F801	QFS-B702AAFNB	Fuse, 7A 125V
LHLDW9002CEZZ	Wire Holder		QFSHD1001SEZZ	Holder, Fuse F601 ~ F603
			QFSHZ0002AGZZ	Fuse Holder, F801
LHLDW9003CEZZ	Wire Holder	J601	QJAKJ0057AFZZ	Will disper week to accompany to the control of the
LPLTP0053AFZZ	Acryl Plate, Dial Illumination			Jack, Headphone
T TZ D T O O O O O	(Part of PREFL0061AFZZ)	LG801	QLUGZ011AAFZZ	Lug, Ground 4-Pin
LX-BZ0220AFFF	Screw, AC Outlets		QPLGS0102AGZZ	Short Plug
LX-HZ0053AFFD	Flange Head Screw, P.W. Board		QPWBE0081AFZZ	Printed Circuit Board, Power
	Retaining, Dual Capacitor			Amplifier Circuit
	(C705, 706), Dual Capacitor		QPWBE0082AFZZ	Printed Circuit Board, Power
	Bracket			Supply Circuit
LX-HZ0064AFFF	Screw with Washer, Cabinet		QPWBF0593AFZZ	Printed Circuit Board, Dial
LX-NZ0006AGFD	Flange, Nut, Antenna Termi-			Lamp (Part of PREFL0061
	nals			AFZZ)
LX-NZ0118AFFD	Nut, Speakers Selector Switch		QPWBF0655AFZZ	Printed Circuit Board, Power
Dirit Doring D	Shaft, Function Selector			Supply and Relay Circuit
	Switch Shaft, Headphones		QPWBF0663AFZZ	Printed Circuit Board, AM RI
			QI WDI OOOSAI ZZ	
IV NIZO110 A DEST	Jack Hayagan Hand Con Sanara			IF and Air Check Oscillation
LX-NZ0119AFFW	Hexagon Head Cap Screw,		ODWDEOGAAFGG	Circuit Drinted Circuit Deced EM DE
	Speaker Selector Switch,		QPWBF0674AFZZ	Printed Circuit Board, FM RF
	Function Selector Switch			IF and P.L.L. Multiplex, To
LX-NZ0120AFFD	Flange Nut, Power Transformer			and Equalizer Circuit
LX-WZ3017CEFN	Shakeproof Lockwasher Outer-		QSOCT2350AFZZ	Socket, Power Transistor
	nal Type, Resistor R801	SO801	QSOCJ2660AFZZ	Socket, INPUTS, AUX P
MSPRP0152AFZZ	Plate Spring, Grounding	$(A \sim F)$	QBOCJ2000AFZZ	(SO801-A, B), PHONO-1
	Spring, Dial Cord			(SO801-C, D), PHONO-2
MSPRT0386AFFJ	Spring, Diai Com	1		(COOL CIDIII

REF. NO.	PART NO.	DESCRIPTION		REF. NO.	PART NO.	DESCRIPTION
SO802	QSOCJ2457AFZZ	Socket, TAPE-1 (REC/PB (P))		TB803	QTANZ0455AFZZ	Speakers Terminals-A
SO803	QSOCJ2457AFZZ	Socket, TAPE-2 (REC/PB P)		TB804	QTANZ0455AFZZ	Speaker Terminals-B
SO804	QSOCJ2459AFZZ	Socket, Ext. Dolby FM		TB805	QTANZ0455AFZZ	Speaker Terminals-C
SO805 (A, B)	QSOCJ0402SGZZ	Socket, AC Outlet		ME801 ME802	RMTRL0142AFSA RMTRL0134AFSA	Meter, Signal (Strength) Meter, Tuning (Center)
SW201 (A, B)	QSW-R0141AFZZ	Switch, Function Selector		RLY601 (A, B)	RRLYZ0050AFZZ	Relay, DC24V, Protection Circuit
SW202	QSW-B0073AFZZ	Switch, Tape Monitor			RTUNF0060AFZZ	FM Tuner (Front-end)
SW203	QSW-B0054AFZZ	Switch, Tape Dubbing				Assembly
SW204	QSW-B0051AFZZ	Switch, Mode Selector		PL801,		
SW205	QSW-B0051AFZZ	Switch, Loudness	PL80	PL802,		Dial Illumination Lamp
SW301	QSW-P0157AFZZ	Switch, Band (AM/FM) Selec-		PL803, RIMPPO057AFZZ (8V.0)	(8V, 0.3A)	
$(A \sim E)$	QSW-TOIS/AI ZZ	tor (SW301-A, B) with Muting	,	PL804,		(Part of PREFL0061AFZZ)
		FM Muting (SW301-C), Air		PL805,		
		Check (SW301-D), Ext. Dolby		PL806	OD A 17 A O 40 C A E 77	D 1:
		(SW301-E)			SPAKA0485AFZZ	Packing Add.
SW601	QSW-B0051AFZZ	Switch, Low Cut Filter			SPAKC1045AFZZ	Packing Case
SW602	QSW-B0051AFZZ	Switch, High Cut Filter			SSAKZ0056AFZZ	Dust Cover, Set
SW603	QSW-B0051AFZZ	Switch, Audio Muting			TINSE0524AFZZ	Owner's Manual
SW801	QSW-B9062AFZZ	Switch, Power			XHBSD40P14000	Screw, Leg
SW802	QSW-R0105AFZZ	Switch, Speakers Selector			XWHSD91-10140	Washer, Function Selector
TB801	QTANN0453AFZZ	Antenna Terminals, FM (75				Switch
		ohms and 300 ohms) and AM			XWUSE84-08000	Shakeproof Lockwasher Inter-
TB802	QTANN0150AFZZ	Grounding Terminal				nal Type, Grounding Terminal