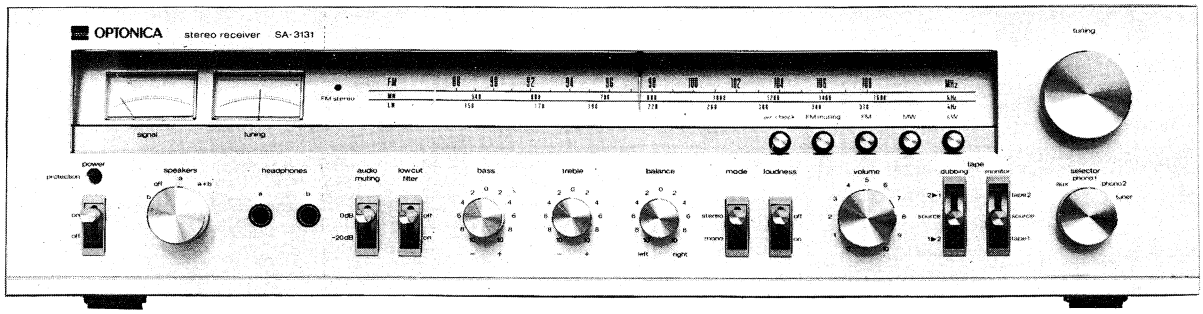
SHARP OPTONICA **SERVICE MANUAL**

SA-3131H




**Stereo Receiver**

# MODEL SA-3131H

In the interests of user-safety the set should be restored to its original condition and only parts identical to those specified be used.

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**SHARP CORPORATION OSAKA, JAPAN**

# SPECIFICATIONS

## ● GENERAL DESCRIPTION

| | |
|---|---|
| Power source: | AC 110/220/240V, 50/60Hz |
| Circuit | |
| Tuner: | Superheterodyne system, LW/MW/FM 3-bands tuner, with P.L.L. stereo demodulation circuit, FM muting circuit, air check calibration circuit. |
| Main amplifier: | Differential amplifier and all stage direct coupled pure complimentary O.C.L. (Output Capacitor-Less) circuitry. |
| Tone amplifier: | "NF" type tone control circuit. |
| Equalizer: | Two-stage direct coupled equalizer circuit |
| Semiconductors: | 6-IC (Integrated circuit)<br>42-transistor (7-FET)<br>40-diode (4-Zener diode)<br>2-LED |
| Dimensions: | Width . . . . . 550 mm<br>Height . . . . .142 mm<br>Depth . . . . .390 mm |
| Weight: | 16 kg |

## ● FM SECTION

| | |
|---|---|
| Tuning range: | 87.6 ~ 108 MHz |
| Intermediate frequency: | 10.7 MHz |
| Sensitivity: | 1.4μV (at S/N 26 dB, 40 kHz deviation, antenna terminal voltage) |
| Distortion (40 kHz deviation) | |
| Mono: | 0.5% |
| Stereo: | 0.8% |
| Image rejection ratio: | 71 dB |
| I.F. rejection ratio: | 76 dB |
| Spurious frequency rejection ratio: | 80 dB |
| AM suppression ratio: | 45 dB (modulated by 30% AM and 75 kHz deviation FM) |
| Selectivity: | 64 dB (IHF) |
| Capture ratio: | 2 dB |
| Stereo separation: | 34 dB (1 kHz) |
| Antenna input: | 75 ohms unbalanced<br>240 ohms balanced |

## ● AM SECTION

| | |
|---|---|
| Tuning range: | MW 520 ~ 1620 kHz<br>LW 150 ~ 370 kHz |
| Intermediate frequency: | MW/LW 455 kHz |
| Quieting Sensitivity: | MW 400μV/m (at 1000 kHz)<br>LW 400μV/m (at 220 kHz) |
| Image rejection ratio: | MW 34 dB (at 1400 kHz)<br>LW 30 dB (at 340 kHz) |
| I.F. rejection ratio: | MW 49 dB (at 600 kHz)<br>LW 40 dB (at 340 kHz) |
| Distortion: | LW/MW 1.6% |
| Antenna: | Built-in ferrite bar antenna and external antenna terminal |

## ● MAIN (POWER) AMPLIFIER

| | |
|---|---|
| Continuous power output: | 2 x 65W/4-ohms, both channels driven at 1 kHz, 0.1% distortion<br>2 x 40W/8-ohms, both channels driven at 1 kHz, 0.1% distortion |
| Total harmonic distortion: | 0.05% at 40W (AUX IN) |
| Intermodulation distortion: | 0.1% at 40W (AUX IN) |
| Damping factor: | More than 20 (at 1 kHz, 4-ohms) |
| Power bandwidth: | 10 Hz ~ 20 kHz |

## ● PRE-AMPLIFIER

| | |
|---|---|
| Input sensitivity and input impedance | |
| PHONO 1: | 2.5 mV/50K ohms |
| PHONO 2: | 2.5 mV/50K ohms |
| AUX: | 150 mV/50K ohms |
| TAPE playback 1 and 2: | 150 mV/50K ohms |
| Output level and loaded impedance | |
| REC 1 and 2: | 150 mV/50K ohms |
| REC 1 and 2 (DIN socket): | 30 mV/80K ohms |
| Phono overload: | 220 mV (R.M.S. 1 kHz, 0.1% T.H.D.) |
| "RIAA" curve deviation (Phono): | ± 0.5 dB |
| Frequency response: | 10 Hz ~ 50 kHz ± 1.5 dB (AUX., TAPE playback) |
| Tone control | |
| Bass: | ± 10 dB at 100 Hz |
| Treble: | ± 10 dB at 10 kHz |
| Low cut filter: | 30 Hz, 6 dB/oct |
| Audio muting: | – 20 dB |

# FEATURES

1) The power supply circuits for right channel and left channel are independent from each other, and either of them includes two dual-capacitors. each of 6800μF x 2 (thus amounting to 27200μF = 6800μF x 4 in total).
2) Being composed of FET's (Field Effect Transistors) as a whole, the equalizer circuit further improves signal-to-noise ratio.
3) With a built-in protection circuit, the loudspeaker remains always safe even if the amplifier circuit gets in trouble and reversely the amplifier is protected against a possible short-circuit of the loudspeaker cord.
4) Power source/circuit protection indicator making use of 2-color LED element, which will light up in red if there is something abnormal in the internal circuitry. In a normal condition, it is lit green.
5) Because of the circuit being ITL (Input Transformerless), OTL (Output Transformerless), OCL (Output Capacitorless) and pure-complementary system, low-distortion characteristic is more assured.
6) Dual gate MOS FET and 4-gang variable capacitor adopted at the FM front-end circuit more improve overall characteristics.
7) The PLL (Phase Locked Loop) demodulator circuit assures a stabilized characteristic.

## PREPARATION FOR USE

### AC VOLTAGE SELECTION (Refer to Figure 1)

Check the preset voltage selector before inserting the mains plug to an mains outlet. If the voltage is different from your local voltage, change it in the following manner:

1. Disconnect the AC cord plug from the wall outlet in order to prevent an electric shock.
2. Loosen a screw and slide the cover as illustrated in Fig. 1.
3. Put a fuse in the fuse holder which has an indication of your local voltage.
   In case the local voltage is 110V, two pieces of fuses should be used.
4. Replace the cover in its original position.

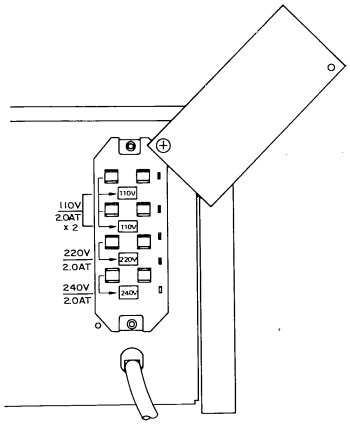



Figure 1

## DISASSEMBLY

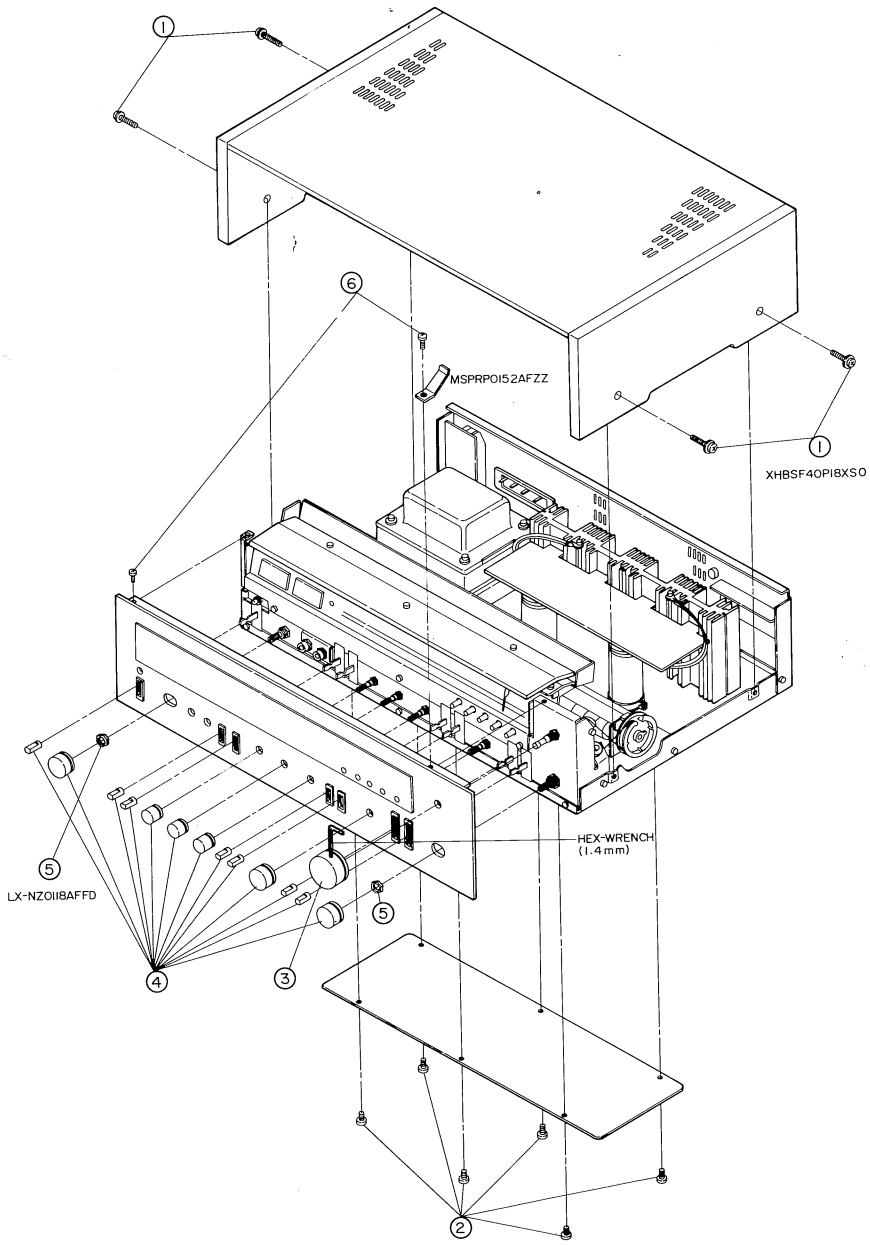



Figure 2 DISASSEMBLY

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 4 screws ① retaining the cabinet (2 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 (1.4 mm) 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 (13 knobs).
   (3) Remove the nuts ⑤ retaining the speaker switch shaft and selector switch shaft.
   (4) Finally remove 2 screws ⑥ retaining the front panel, then the front panel can be detached.

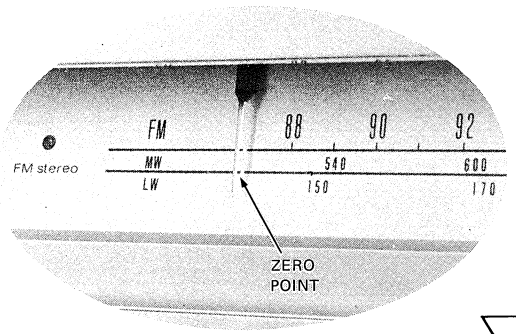


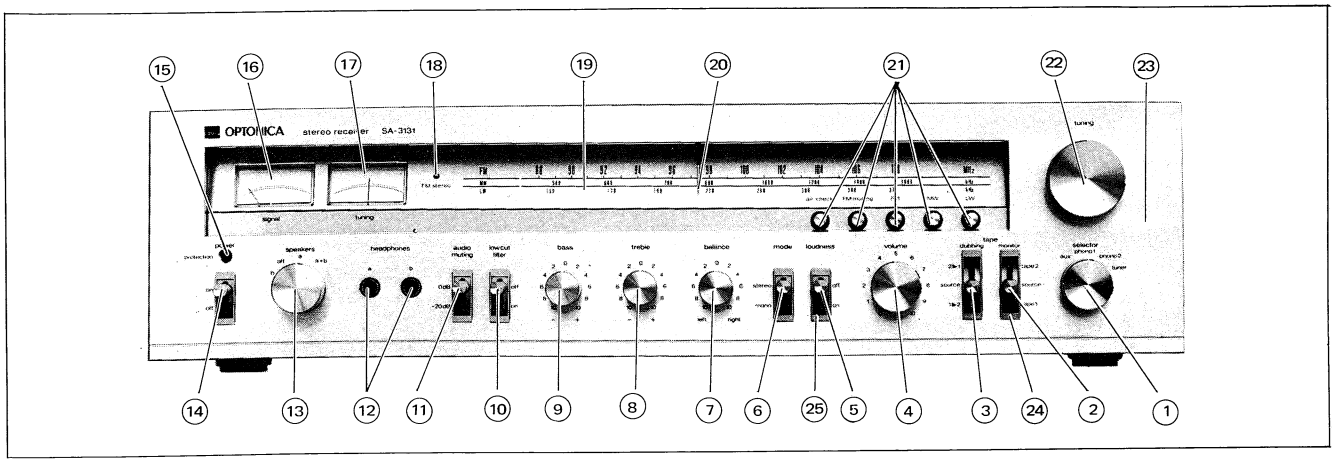

Fig. 3–A




(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 1-1/2 turns at the position ⑦ (which is an extention of the string wound at the position ⑥ ) and bring it through the position ⑧ . Then release a hand from the position ⑥ and thus the stringing is completed.

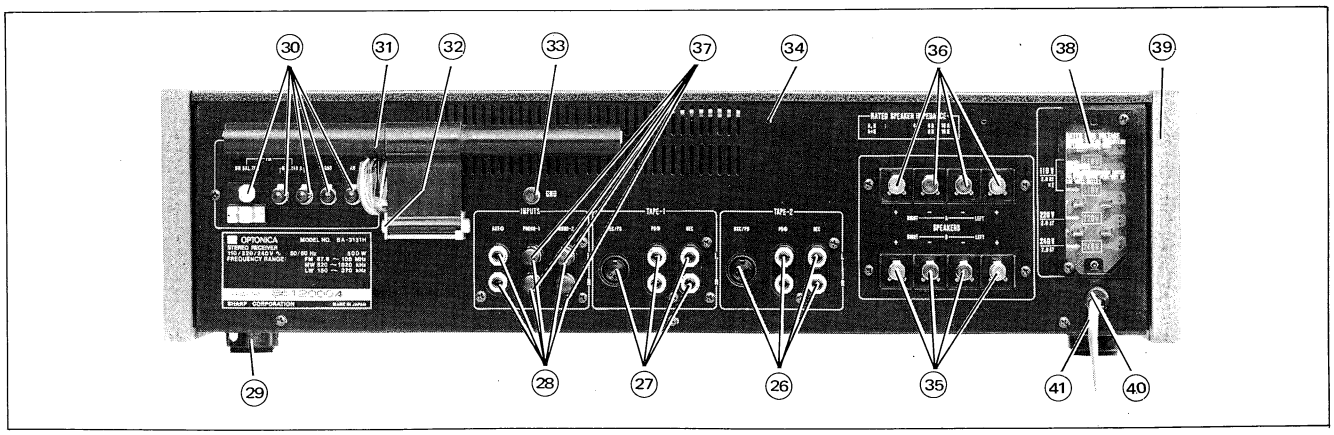
(2) Setting of the pointer
1. Turn the tuning shaft fully counterclockwise (at the lowest frequency position).
2. Align the pointer to the extreme left (where a part of the graduation line is cut) of the dial scale plate. (See Fig. 3-A.)

Figure 3 DIAL CORD STRINGING




① Function selector knob (JKNBN0333AFSA)
② Tape monitor switch knob (JKNBP0070AFSA)
③ Tape dubbing switch knob (JKNBP0070AFSA)
④ Volume control knob (JKNBN0333AFSA)
⑤ Loudness switch knob (JKNBP0070AFSA)
⑥ Mode selector knob (JKNBP0070AFSA)
⑦ Balance control knob (JKNBN0334AFSA)
⑧ Treble control knob (JKNBN0334AFSA)
⑨ Bass control knob (JKNBN0334AFSA)
⑩ Low cut filter switch knob (JKNBP0070AFSA)
⑪ Audio muting switch knob (JKNBP0070AFSA)
⑫ Headphone jacks (a, b) (QJAKJ0057AFZZ)
⑬ Speakers selector knob (JKNBN0333AFSA)
⑭ Power switch knob (JKNBP0070AFSA)
⑮ Power source/circuit protection indicator, LED (VHPGL-52RG/1F)
⑯ Signal strength meter, ME801 (RMTRL0135AFSA)
⑰ FM tuning (center) meter, ME802 (RMTRL0134AFSA)
⑱ FM stereo indicator, LED (VHPSR105D //-1)
⑲ Dial (HDALM0170AFSA)
⑳ Dial pointer (HSSND0230AFSA)
㉑ LW/MW/FM/FM muting/Air check knob (JKNBM0248AFSA)
㉒ Tuning control knob (JKNBB0059AFSA)
㉓ Front panel (HPNLC3273AFSA)
㉔ Guide (Large), lever switch (GCOVA1070AFSC)
㉕ Guide (Small), lever switch (GCOVA1071AFSC)

**Figure 4 FRONT PARTS LAYOUT**

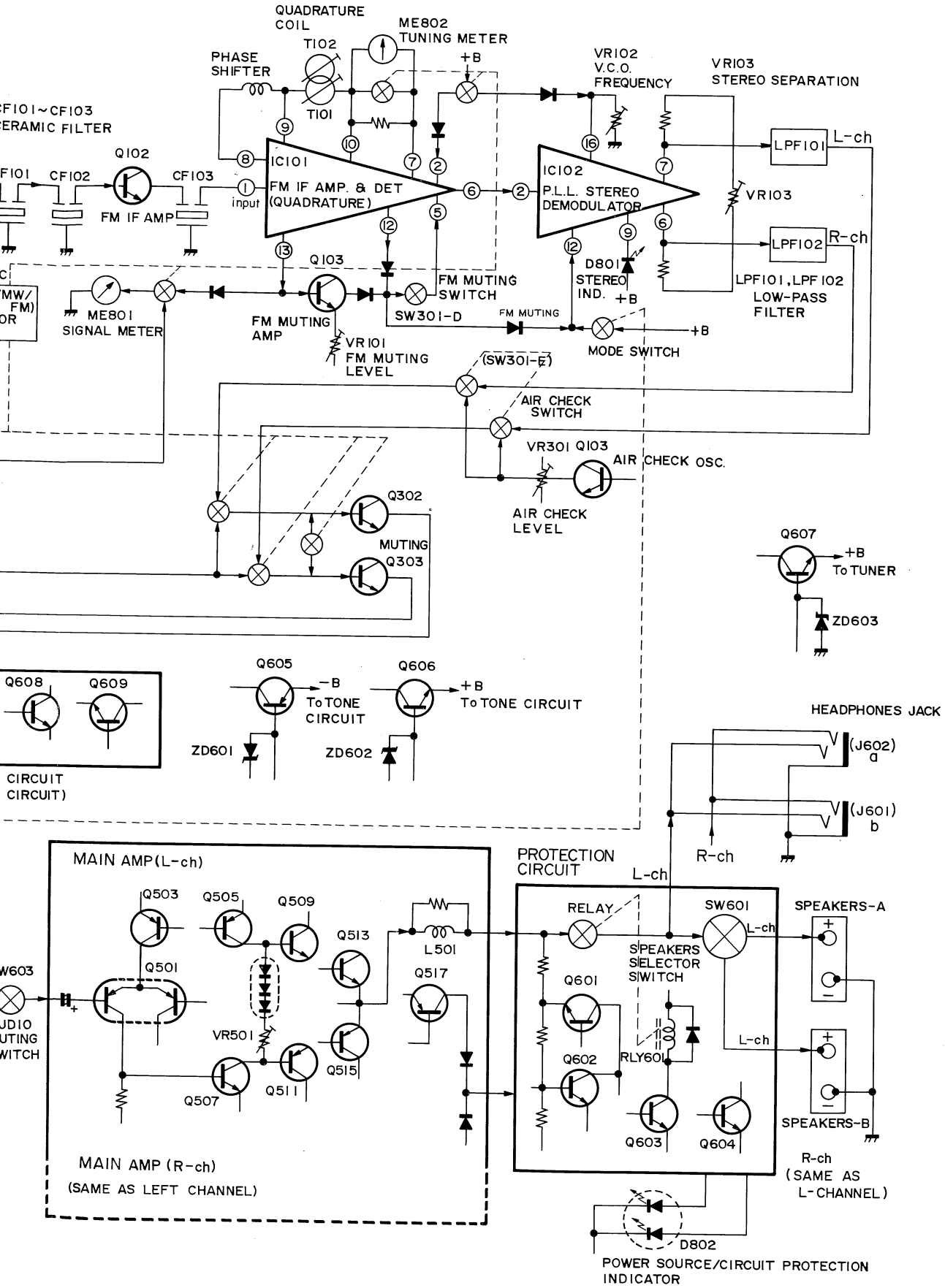



㉖ Tape-2 (REC/PB Ⓟ) sockets and DIN (REC/PB) (QSOCZ2450AFZZ)
㉗ Tape-1 (REC/PB Ⓟ) sockets and DIN (REC/PB) (QSOCZ2450AFZZ)
㉘ Aux./Phono1/Phono2 input sockets (QSOCJ2660AFZZ)
㉙ Leg (GLEGP0002SG00)
㉚ Antenna terminals (QTANN0453AFZZ)
㉛ LW/MW bar antenna (RCILA0403AFZZ)
㉜ Bracket of bar antenna (LANGQ0423AFZZ)
㉝ Grounding (Earth) terminal (QTANN0150AFZZ)
㉞ Rear panel (LANGQ0505AFSA)
㉟ Speaker terminals–B (QTANN0454AFZZ)
㊱ Speaker terminals–A (QTANN0454AFZZ)
*㊲ Short plug (QPLGS0102AGZZ)
㊳ Fuse cover (PCOVP1158AFZZ)
㊴ Cabinet (GCAB-5090AFSA)
㊵ Bushing, power supply cord
㊶ Power supply cord

* Short plug
For noise prevention, be sure to insert a furnished short plug into the socket PHONO when not in use.

**Figure 5 REAR PARTS LAYOUT**

Figure 3 DIAL CORD STRINGING




## 6 BLOCK DIAGRAM

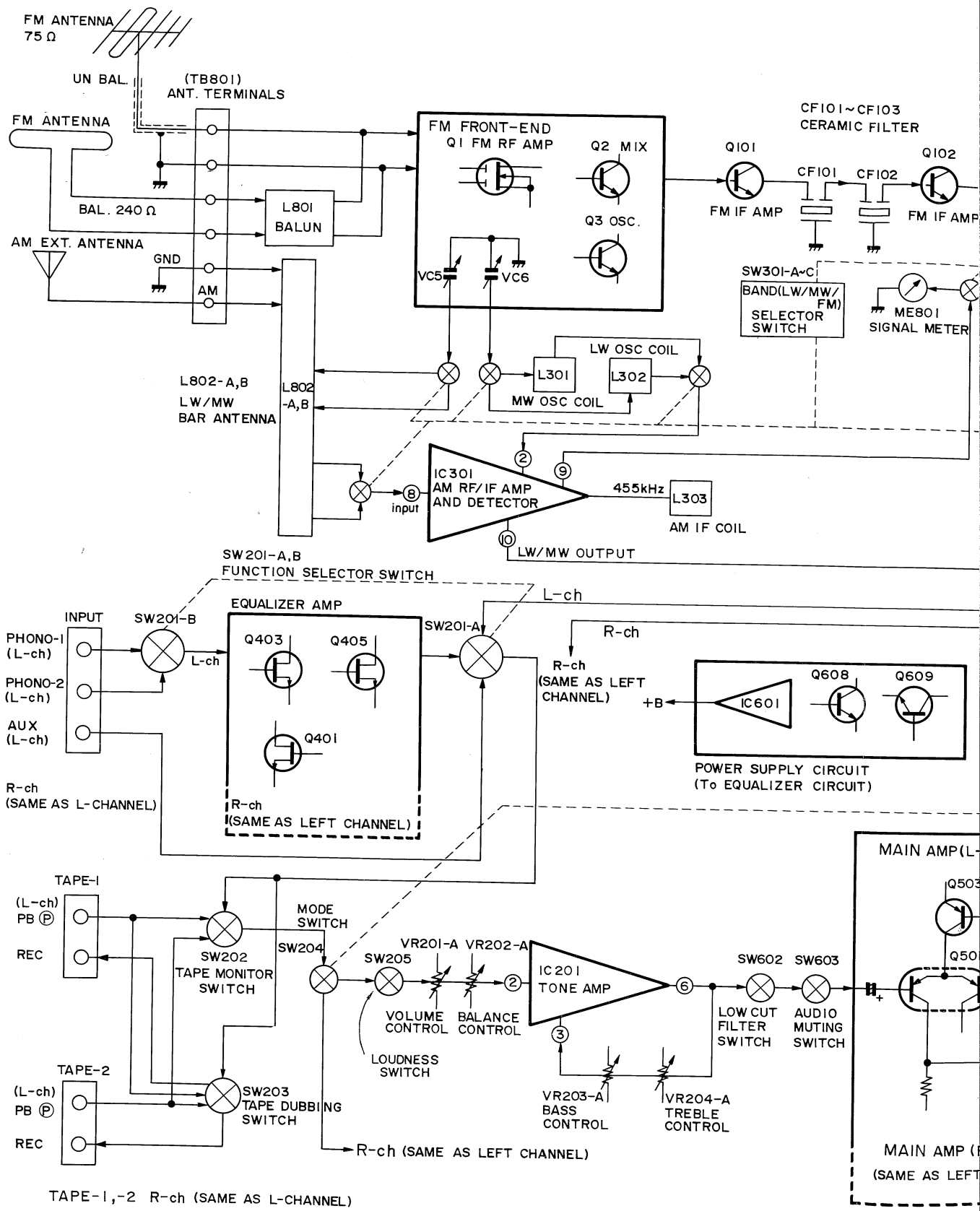



Figure 6 BLOCK DIAGRAM

## AM SECTION

(1) Block Diagram of IC301

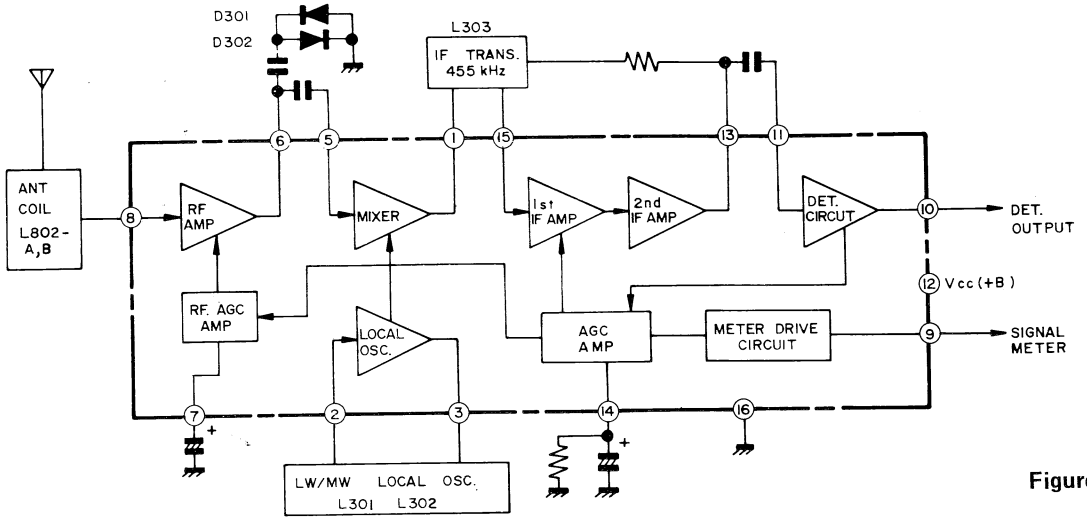



Figure 7

(2) Circuit Description

The block diagram of IC301 is indicated as above. AM broadcast signal caught by the antenna coil L802 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 L303 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).

## FM RF SECTION

FM antenna input circuit has two input terminals (75 ohms and 240 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 240 ohms input terminal is used when FM antenna is connected to the unit by using a balanced feeder. Fig. 8 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.

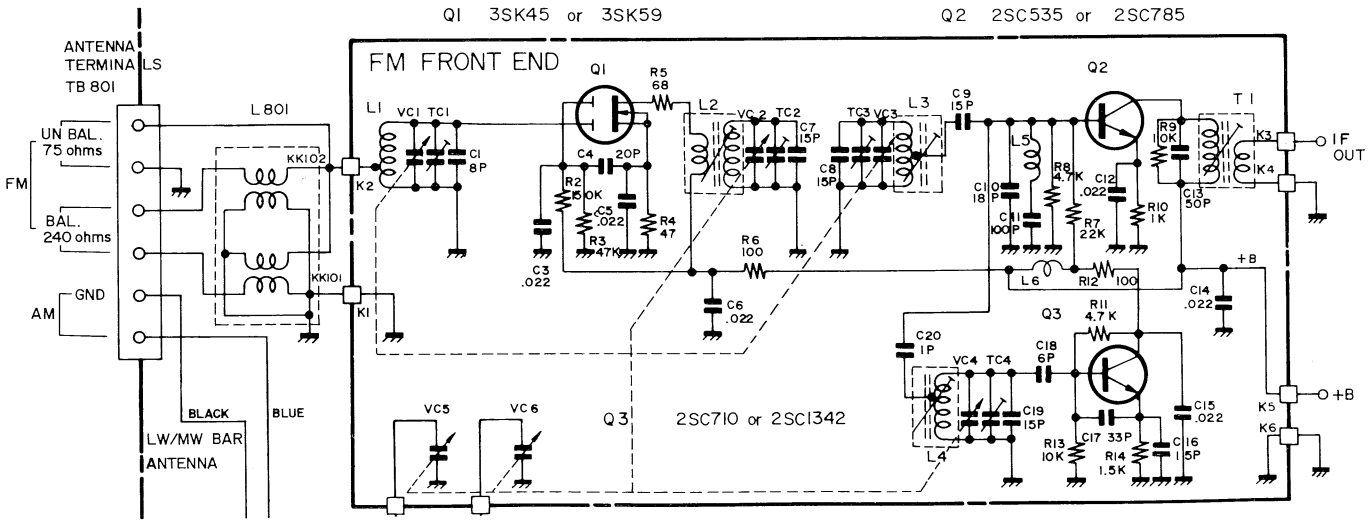



Figure 8 FM FRONT-END CIRCUIT

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 10.7 MHz IF signal which will enter IF tuning transformer T1. The transistor Q3 is for the local oscillation and it applies oscillation voltage to the base of transistor Q2 via capacitor C20 (1pF).
Therefore, coil L1 is for antenna tuning, coils L2 and L3 are 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 transistors and 3 ceramic filters. Transistors Q101 and Q102 are FM IF amplification transistor, which is to amplify IF signal which has been converted into 10.7 MHz signal at FM front end section. This 10.7 MHz IF signal is given a higher selectivity since it runs through the concentrated selective elements, 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 IC 101, in which the gain of this signal is increased by about 66 dB by the three-stage differential amplifier thus being subjected to an appropriate limiter function.

## FM DETECTION SECTIONS (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. 9.

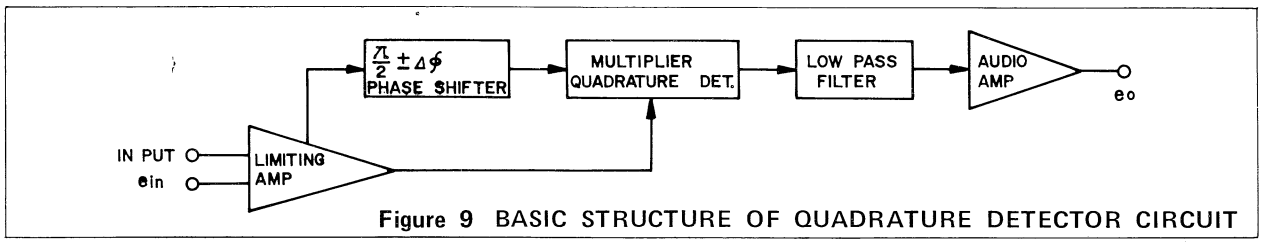
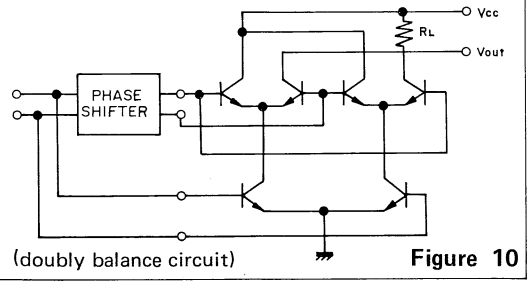


Figure 9 BASIC STRUCTURE OF QUADRATURE DETECTOR CIRCUIT

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. 11.
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 1.2 MHz.
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-3131H uses L104 as phase-shift coil. T101 and T102 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.P. multiplex integrated circuit IC102.



(doubly balance circuit) Figure 10

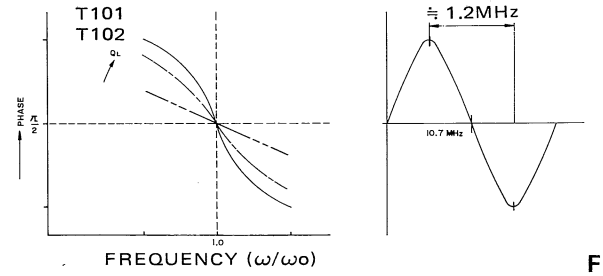


Figure 11

## FM STEREO DEMODULATOR SECTION

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 38kHz 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:

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.

2) FM stereo demodulator circuit of SA-3131H.

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 76 kHz by adjusting semi-fixed resistor VR102 (10K ohm). TP107 is the test point for frequency observation. (See the paragraph "Adjustment" described later.) During LW/MW 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 (220K ohm) 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) to force stereo signals to become monaural ones.

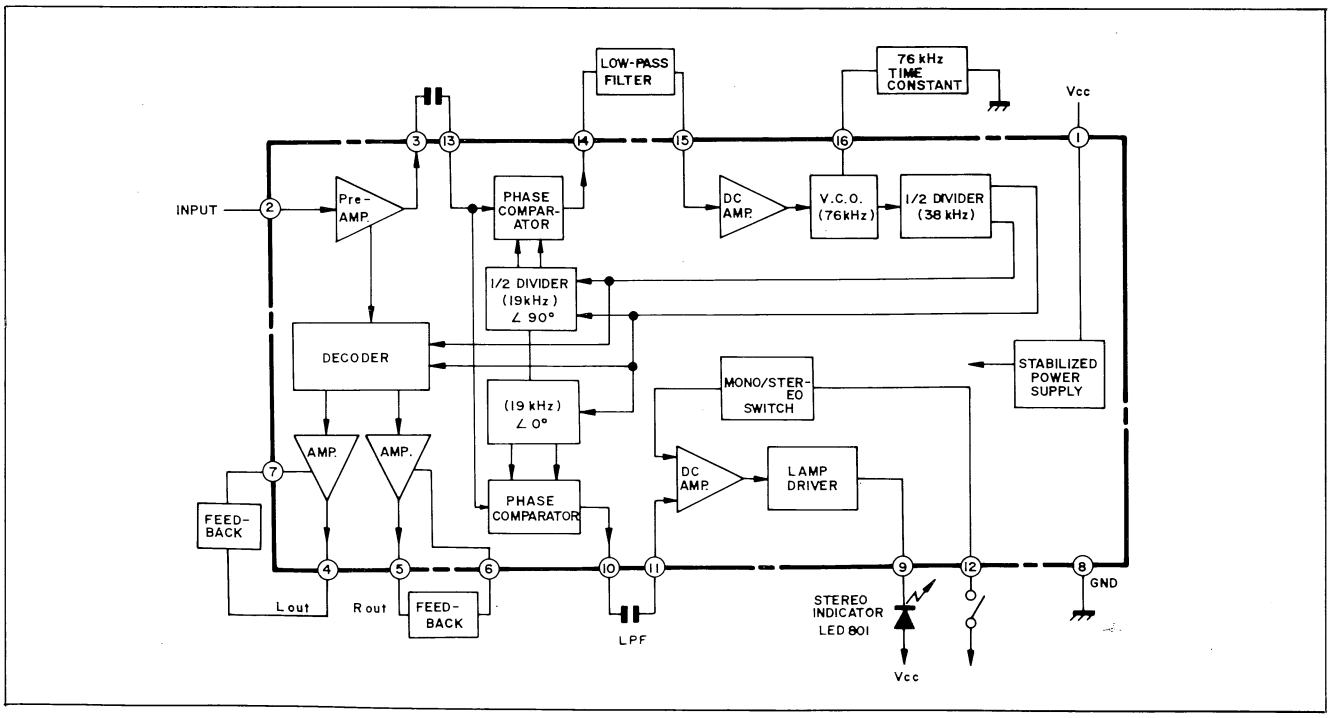



**Figure 12**

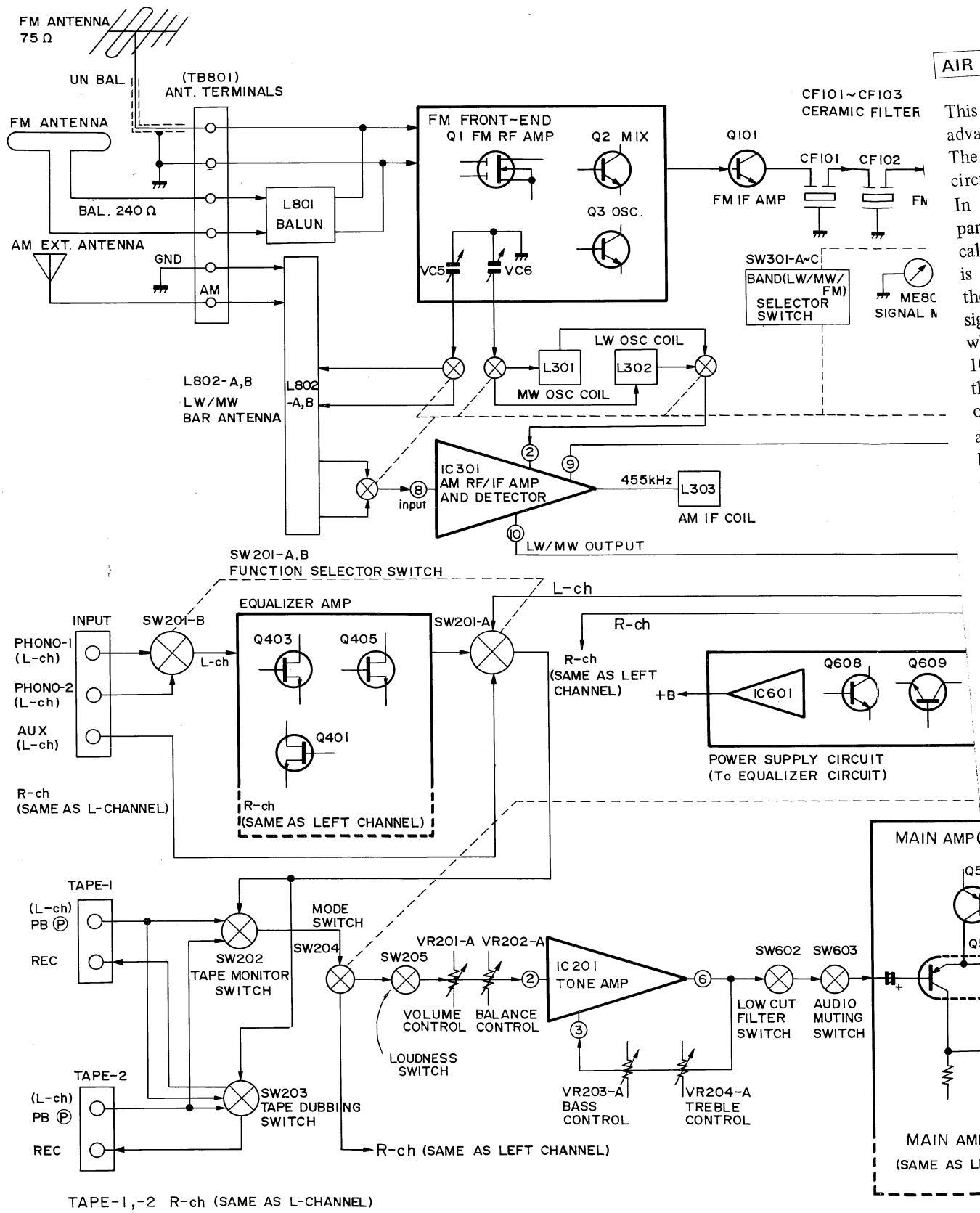



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**Figure 6 BLOCK DIAGRAM**

## TONE AMPLIFIER CIRCUIT

The tone amplifier circuit adopts the integrated circuit (IC) which is of high gain, differential 1-stage and directly-coupled 3-stage type, thus generation of distortion being limited. 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 (VR202-A, B), and then to the terminal ② of IC201 via the capacitor C205. The signal is amplified in the IC201 to come out of the terminal ⑥ and it is applied to the filter circuit via the capacitor C217.

A part of the output signal of the coupling capacitor C217 is applied to the terminal ③ 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. Each of the controls is adjustable every 2 dB.

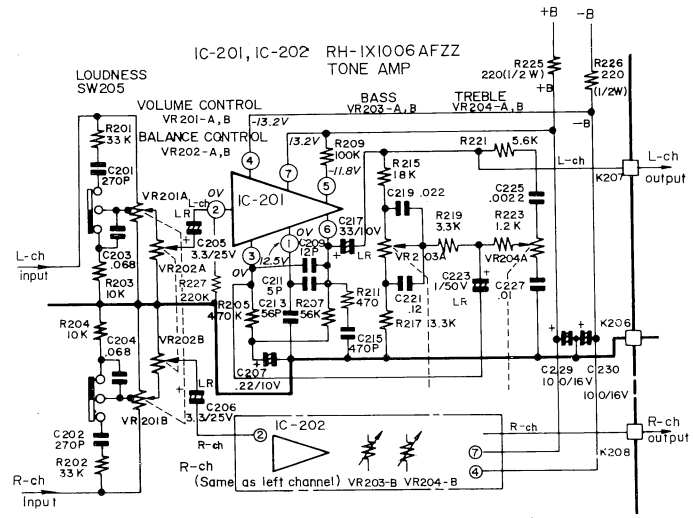



Figure 17

## EQUALIZER AMPLIFIER CIRCUIT

This equalizer circuit is designed to operate on high voltage so that it can obtain higher allowable input level. As a result of the entire adoption of FET (Field Effect Transistor), the circuit also achieves better S/N ratio.

Signal entering the terminal PHONO is, via the resistor R402, applied to FET Q401 to be amplified. To the FET Q401 is connected resistor R405 and FET Q403 as load, and this connection can provide an effect equivalent to that of a special larger resistor so that the amplification factor of FET Q401 is too much assured --- thus the characteristic of FET Q401 is compensated for, say, the distortion characteristic becomes improved. The signal thus amplified in the FET Q401 is applied to FET Q405 to be further amplified. This FET Q405 is of V-FET (Vertical type) which has the same characteristic as the high-voltage withstand triode and it can be said an optional one when used in the equalizer circuit since its output impedance is lower and it is not so much affected by NF element and other loads.

Composed of resistors R415 and R413 and capacitors C415 and C413 which are precision parts having too small error. NF element aiming at "RIAA" characteristic is able to restrict "RIAA" deviation to ± 0.5 dB.

The semi-fixed resistor VR401 (or VR402) is to set the working point of FET Q401 and FET Q403 and with this resistor it is posible to adjust positive and negative clips so that they become symmetrical. In other words, the resistor VR401 (or VR402) is used to adjust so that the drain voltage of FET Q405 (at test point TP401 or TP402) becomes + 30.6 ± 0.2V when power supply voltage of the equalizer circuit is being + 64V.

Resistors R417 and R419 are respectively to prevent capacitors C417 and C419 from discharging and to eliminate noise generation caused at the time of selecting the switches.

Capacitors C401, C403 and C409 are for the purpose to prevent interference noises due to SW broadcasts, etc.

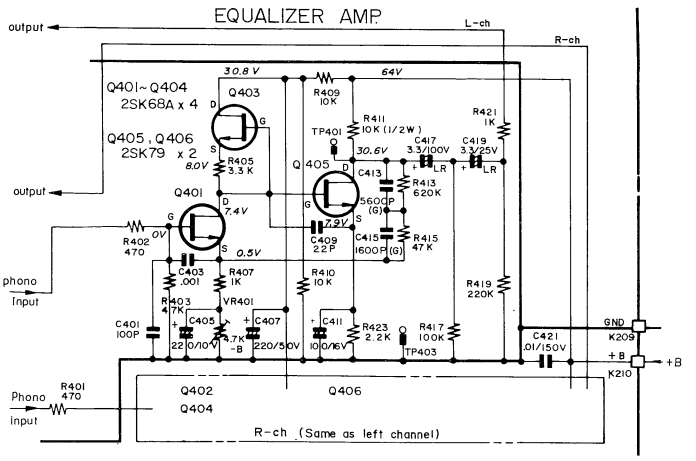



Figure 18

## 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. 13 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 38 ± 8% of the output voltage obtained when the tuner receives FM broadcast signal (modulation 100% , 75 kHz 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 "0 VU". After that, set the air check switch to "OFF" position and proceed with recording FM broadcast.

NOTE:

In the case of LW/MW reception, in other words, when the band selector switch is kept to the position LW/MW, 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.

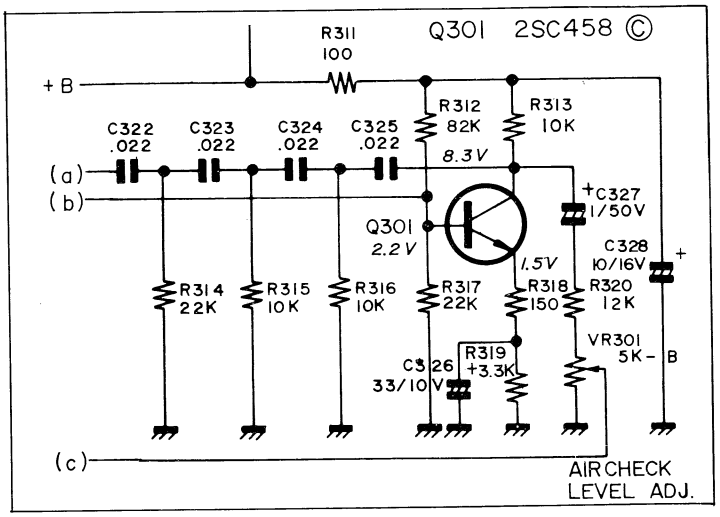



Figure 13 AIR CHECK CAL. CIRCUIT

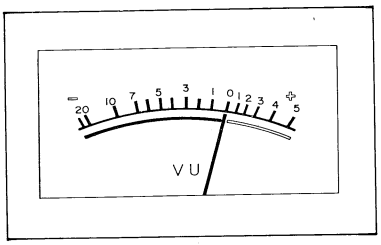



Figure 14 "0 VU"

## FM MUTING CIRCUIT

In SA-3131H, IC101 incorporates muting circuit and this circuit is so designed that if FM input signal to the antenna becomes about 20 dB 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 20 dB.

Fig. 15 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.

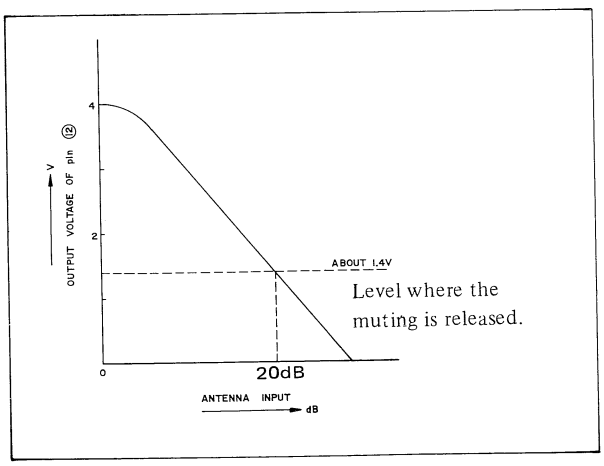



Figure 15

## LOW-PASS FILTER

LPF101 and LPF102 are low-pass filters to remove carrier signals (19 kHz and 38 kHz) leaking from the stereo multiplex IC102. The characteristic is as shown in the figure 16.

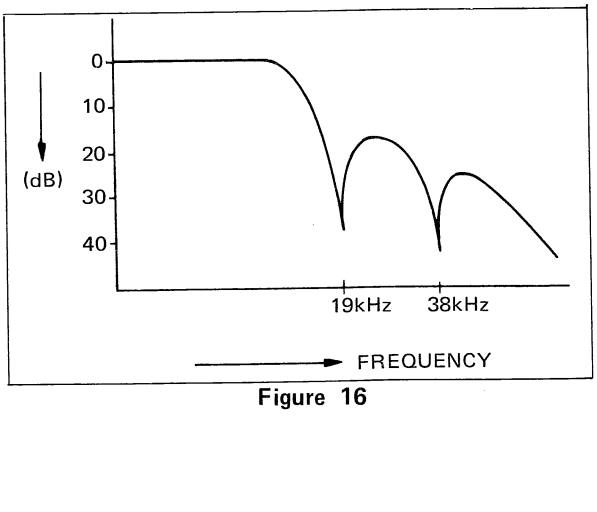



Figure 16

## MAIN 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 Q501 (or Q502) via resistor R503 (or R504) and capacitor C501 (or C502). The transistor used in this differential amplifier is a PNP type low noise dual transistor (2SA798 Ⓖ) 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.
Signal thus amplified by the differential amplifier is further amplified by the class "A" audio amplifier Q507 (or Q508). Moreover, the signal is amplified for the half cycle at the driver amplifier stage consisting of NPN type transistor Q509 (or Q510) and PNP type transistor Q511 (or Q512). Then, the signal is further amplified for the half cycle at NPN type transistor Q513 (or Q514) and PNP type transistor Q515 (or Q516) to be supplied to the speaker. Transistors Q503 (or Q504) and Q505 (or Q506) are constant-current circuit and its amperage is determined by D503. Transistor Q503 (or Q504) functions to protect the differential amplifier Q501 (or Q502) against fluctuations of temperature and voltage resulting in that the center voltage (speaker terminal voltage) is kept constant. Transistor Q505 (or Q506) is constant-current circuit to supply constant current so that the load applied to the class "A" driver Q507 (or Q508) will be reduced thus the gain being increased. As a result of the gain of Q507 (or Q508) being increased by Q505 (or Q506), plenty of NF is produced and so that distortion is lessened. NF factor of NF circuit is determined by resistors R515 (or R516) and R511 (or R512), and the higher NF factor, the higher is the gain. NF factor at the low frequency band is determined by capacitor C505 and resistor R511.
Transistor Q505 (or Q506) and Diode D503 (or D504) are to cause the bias of class "B" drive stage and to produce idling current of 33 ~ 100 mA so that cross-over distortion due to class "B" operation is eliminated. The idling current is to be adjusted by semi-variable resistor VR501 (or VR502).
Resistor R549 (or R550) and capacitor C511 (or C512) are to keep the power amplifier stabilized when given no load. Coil L501 (or L502) functions to prevent of high-frequency oscillation. Transistor Q517 (or Q518) works as protection circuit.

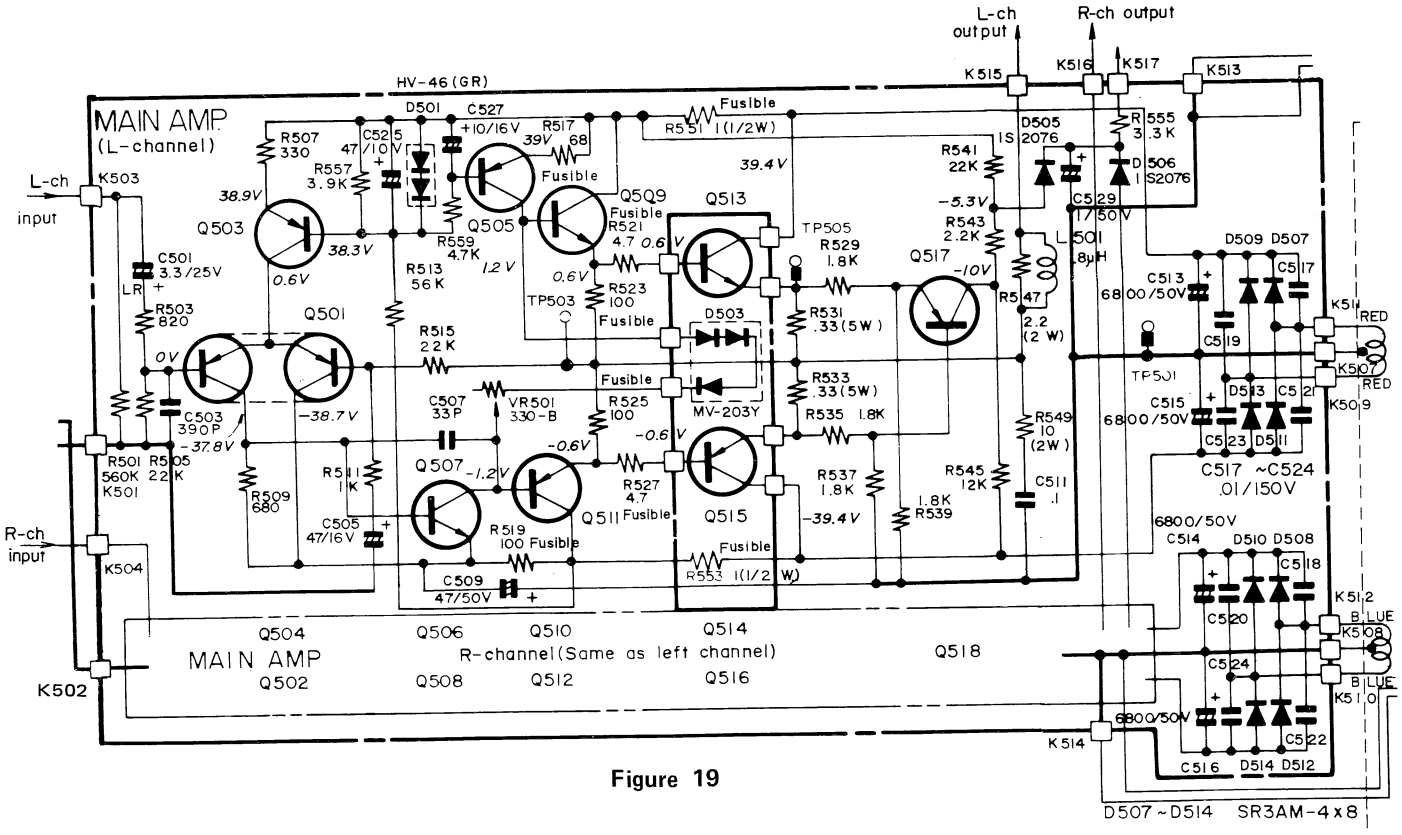



Figure 19

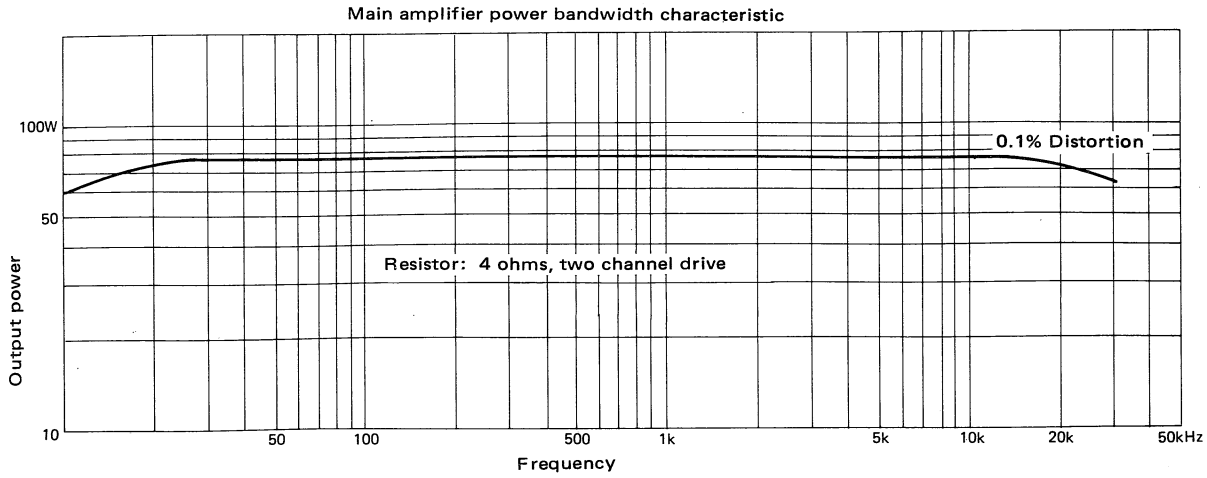



**Figure 20**

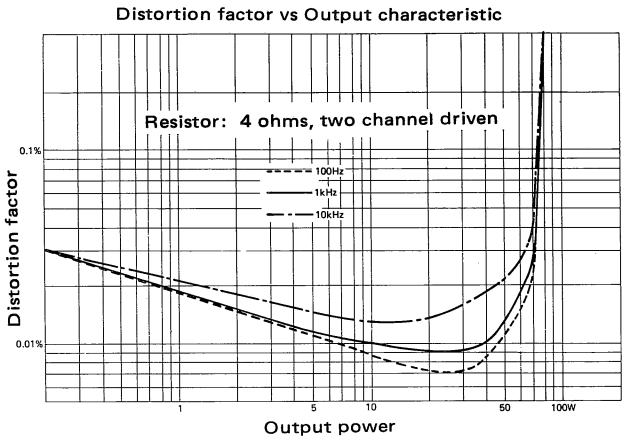



**Figure 21**

## 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.)

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, Q517 and Q518.

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 C605, so that the base voltage of the transistor Q603 is decreased and the relay is turned off.

Capacitors C603 and C604 and resistors R606 and R605 are a low-pass filter which prevents mis-operation of the relay due to sound signal. And diode D603 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 R609 and R608 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 C605 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 3 to 5 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 C605 via resistors R609 and R607 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 D602 and resistor R604 is balanced to a positive voltage coming from the resistor R601. 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 C605 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 R605 and R606. As to the positive voltage, it is applied to the base of transistor Q602 via the resistor R603 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 4 ohms), 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 caused at the emitter resistors R531 and R533 (R532 and R534) of the power transistor so that the transistor Q517 (or Q518) is turned on. The voltage thus produced is applied to the base of transistor Q602 via the diode D505 (or D506) and resistor R555 and so the transistor Q602 is turned on. In this way, the protection circuit provides the same effect as said hereinbefore.

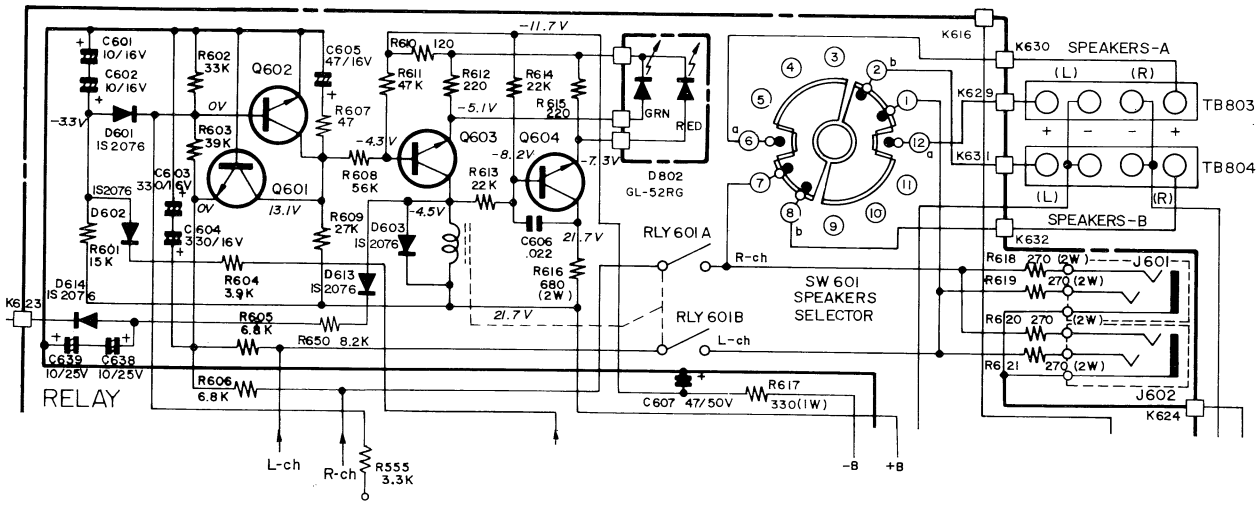



Figure 22

## POWER SUPPLY CIRCUIT

In the power supply circuit, the secondary of power transformer T801 consists of five windings and 8-power system and this helps to reduce crossmodulation distortion caused due to the power supply circuit impedance as well as dynamic cross-talk between the right and left channels.

As to the power amplifier which requires a larger power, the power supply to it is of 4-power supply system with the right and left windings independent from each other so that mutual interference between the right and left channels is minimized. AC voltage coming from the transformer T801 is rectified by the bridge type full-wave rectifier circuit composed of diodes D507, D509, D511 and D513 (or D508, D510, D512 and D514) and then smoothed by the low impedance dual capacitors C513 and C515 (or C514 and C516) to become DC voltage and it finally is supplied to the power amplifier circuit.

Capacitors C517, C519, C521 and C523 (or C518, C520, C522 and C524) are for the purpose to eliminate switching noises due to diodes D507, D509, D511 and D513 (or D508, D510, D512 and D514) and further to remove noises coming from the power supply primary side.

As to the equalizer amplifier circuit which is liable to greatly affect signal to noise (S/N) characteristic, its power supply is depended upon the voltage regulator circuit formed by transistors Q608 and Q609 and integrated circuit IC601 which achieves a larger loop gain so that noises possibly caused when the function switch is changed over and other noises will be reduced. AC voltage from the power transformer is rectified by the bridge type full-wave rectifier circuit made of diodes D609 to D612 to become DC voltage. This DC voltage thus produced is further smoothed by the capacitors C630 and C631 and resistor R639. Transistors Q609 and Q608 are respectively for voltage regulation and amplification. And integrated circuit IC601 is to carry out error detection. As to DC voltage coming from the resistor R639, its hum and noise components are suppressed by the transistor Q609 and it will be used as power supply to the equalizer amplifier circuit. This output voltage is potential-divided by the resistors R630 and R631 and then applied to the terminal (2) of IC601. As to the reference voltage (25V), its noise components are removed by the resistor R634 and capacitor C626 and it is then supplied to the terminal (3) of IC601.

This reference voltage is compared to the said voltage divided by the resistors, R630 and R631 and the resulted difference will be amplified by IC601 to be fed back to the transistor Q609 via the transistor Q608.

If a larger voltage is supposed to be caused, there appears a larger control voltage at the terminal (6) of IC601 so that a current more runs in the transistor Q608 --- this results in that the base voltage of transistor Q609 is lowered since there has been more current running in the transistor Q608 and thus the emitter voltage of transistor Q609 becomes lowered. In this way, the output voltage is regulated so that it is lowered and the voltage fluctuation is cancelled and in other words, the power supply circuit can be said a highly regulated one which scarcely causes ripples and noises.

Thus we have explained the case where a larger output voltage is given. The functions contrary to the above will be carried out when a lower output voltage is given. Diode D608 is a speed-up diode which tends to operate when the power switch is turned on.

Power supply voltage to the tone 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 D604 to D607 to become DC voltage and it is further somoothed by the capacitors C612 and C613. DC voltage thus rectified is available in two types, positive one and negative one. As to the tone circuit, the supply voltage is regulated through the ripple filter circuit Q605 (for the negative potential) and the ripple filter circuit Q606 (for the positive potential), while as to the tuner circuit, the supply voltage (positive) is regulated through the ripple filter circuit (transistor Q607).

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

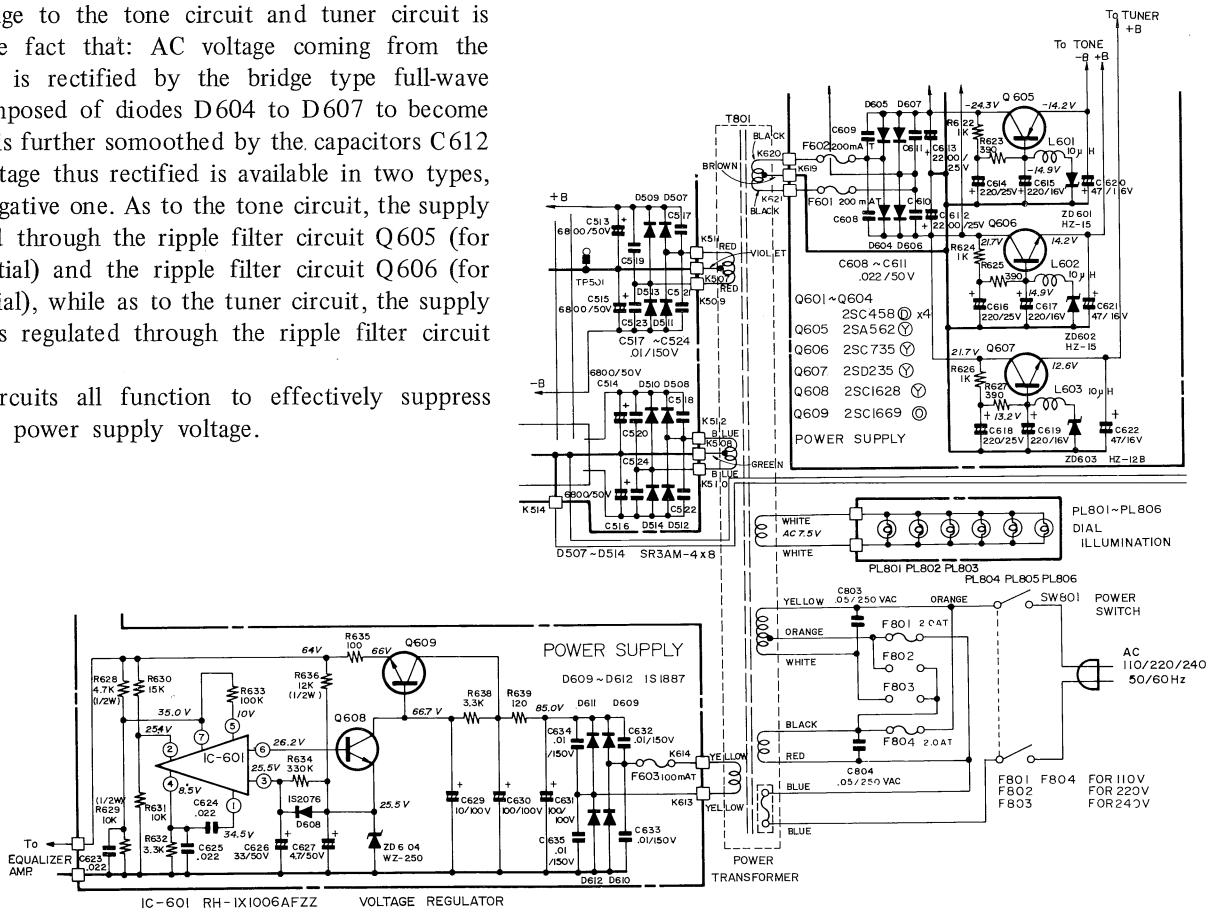



**Figure 23 POWER SUPPLY CIRCUIT**

## ALIGNMENT INSTRUCTIONS

Alignment is an exacting procedure and should be undertaken only when necessary. If alignment of AM (LW, MW) 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 145 kHz to 1650 kHz; AM (MW, LW)
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 (MW, LW)
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 | Chassis ground |
| Generator modulation (AM) | 30%, 400 Hz |
| Generator modulation (FM) | 40 kHz, 400 Hz |
| Generator modulation (FM stereo) | Ch. L. or Ch. R. 40 kHz, 1,000 Hz Mod. |

## THE INSTRUCTION OF FM FREQUENCY ADJUSTMENT

In order to comply with FTZ rule: Nr. 358 S757, please fix the low end of dial frequency (87.5 MHz) and high end of dial frequency (107.9 MHz) on FM band, by adjusting oscillation coil (L4) and oscillation trimmer (TC4), repectively, as illustrated in Figure 24.

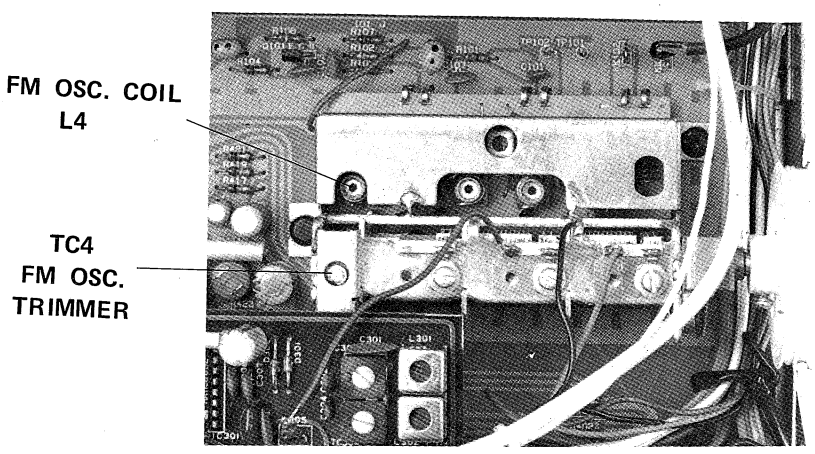



**Figure 24 FM FRONT-END**

## AF ALIGNMENT

1) Set the volume control to the position "minimum" and other switches to the position "normal".
2) Turn on the power switch of the set and make sure the voltage in each section is in accordance with the descriptions in Fig. 25.
3) Use DC VTVM to make sure that the voltage between K515 and K505 (ground) and that between K516 and K505 (ground) are within the range of ± 30mV.
4) 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 connected between K515(K516) and TP505(TP506) | Volume is minimum position. Other knobs are normal position | VR501 (VR502) | 12 mV |
| 2 | Equalizer circuit | Same as above. | DC V.T.V.M. is connected between TP401 (TP402) and earth(ground) | Same as above | VR401 (VR402) (Refer to Fig. 27) | 30.4 ~ 30.8V |

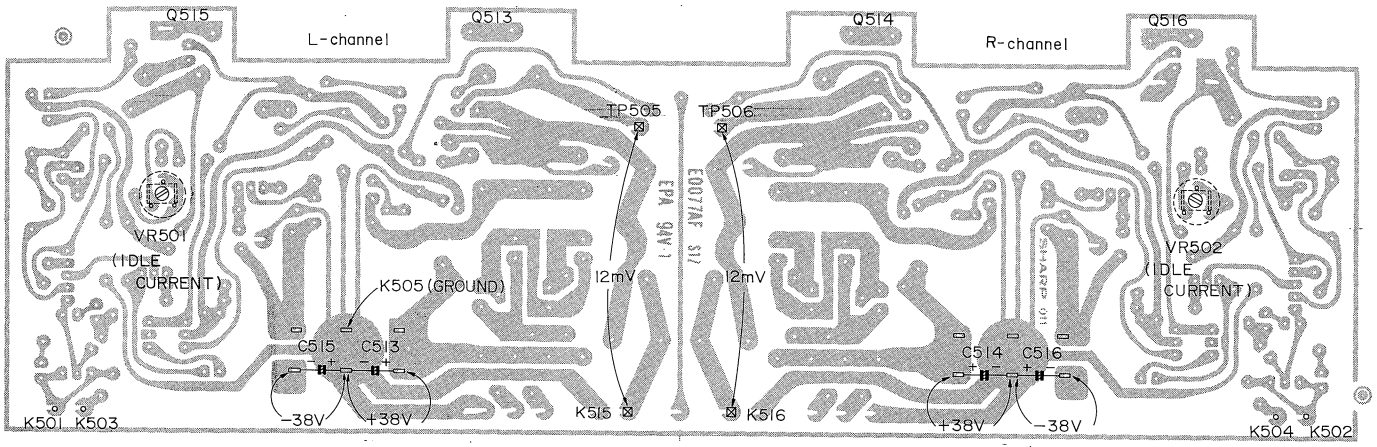



**Figure 25 ALIGNMENT POINTS OF POWER AMP. BOARD**

## AM IF ALIGNMENT (MW,LW)

| PROCEDURE NUMBER | SWEEP GENERATOR | | DIAL POINTER SETTING | SELECTOR SETTING | SCOPE CONNECTION | ADJUSTMENT | REMARKS |
|---|---|---|---|---|---|---|---|
| | CONNECTION | FREQUENCY | | | | | |
| 1 | Connect AM sweep generator to the test point TP1 (VC5) and variable capacitor case (ground). Keep the input be closed as much as possible. | 455 kHz | High end of Dial | Band Selector (MW) | Oscilloscope is connected between TP301 and TP302 (ground) | L303 | Maximum response at 455 kHz Repeat 2 or 3 times. |

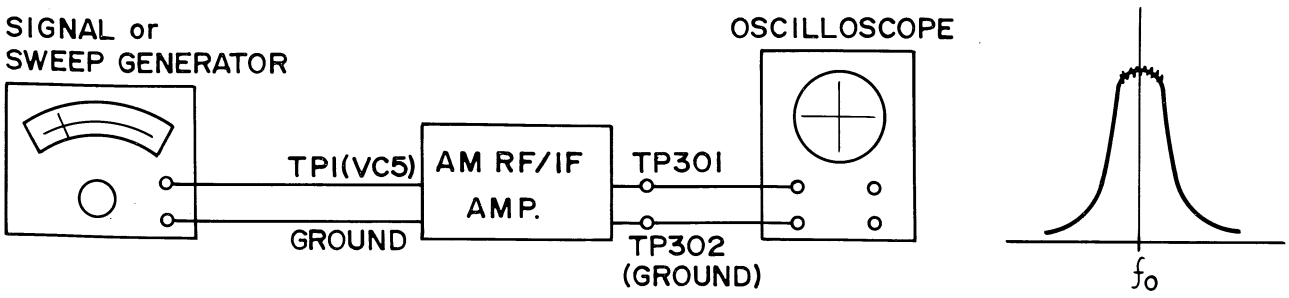



**Figure 26 AM IF ALIGNMENT EQUIPMENT CONNECTIONS**

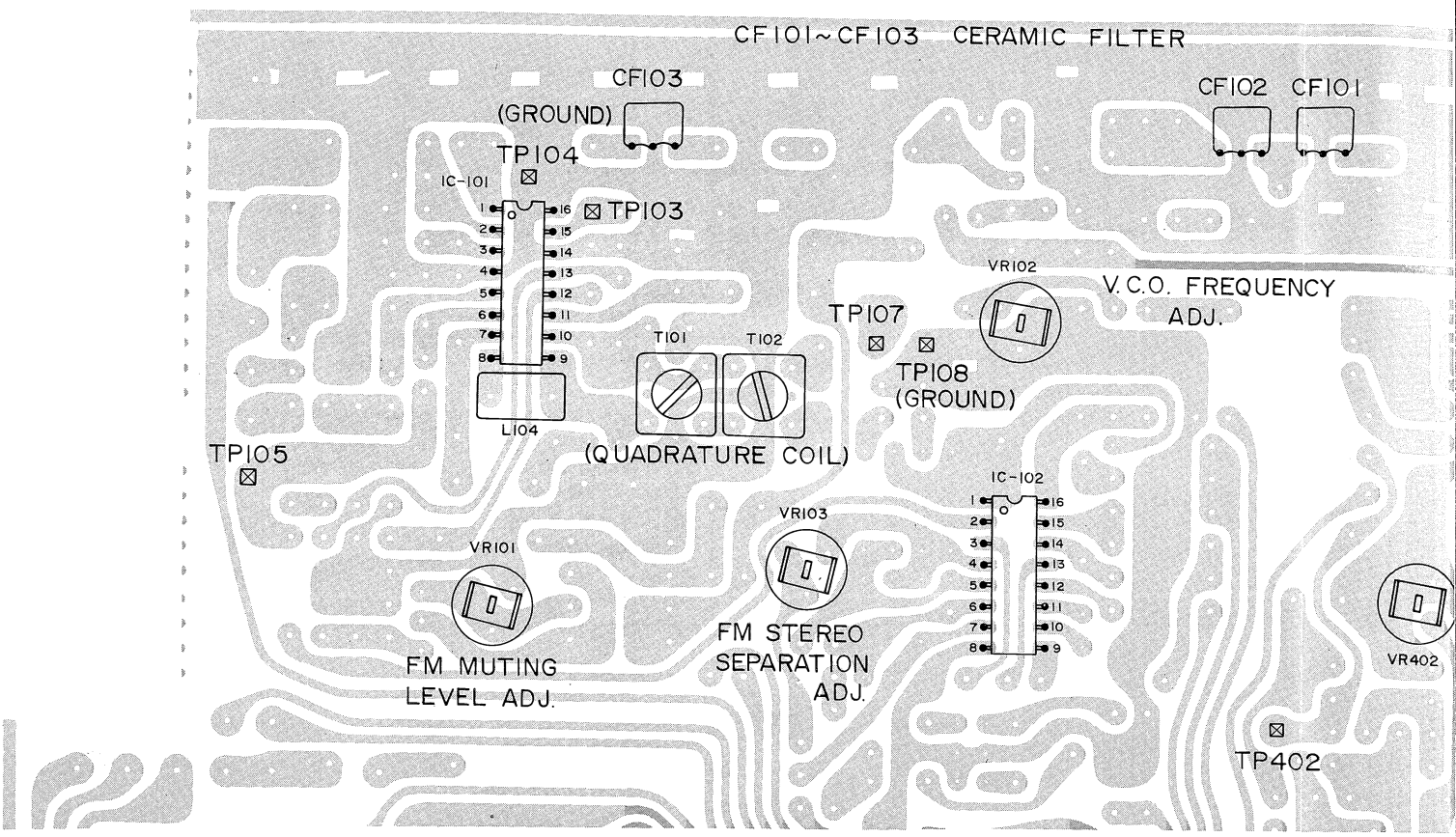



Figure 27 ALIGNMENT POINTS OF FM RF/

Rotate

| PROCE-DURE NUMBE |
|---|
| 1 |
| 2 |
| 3 |
| 4 |

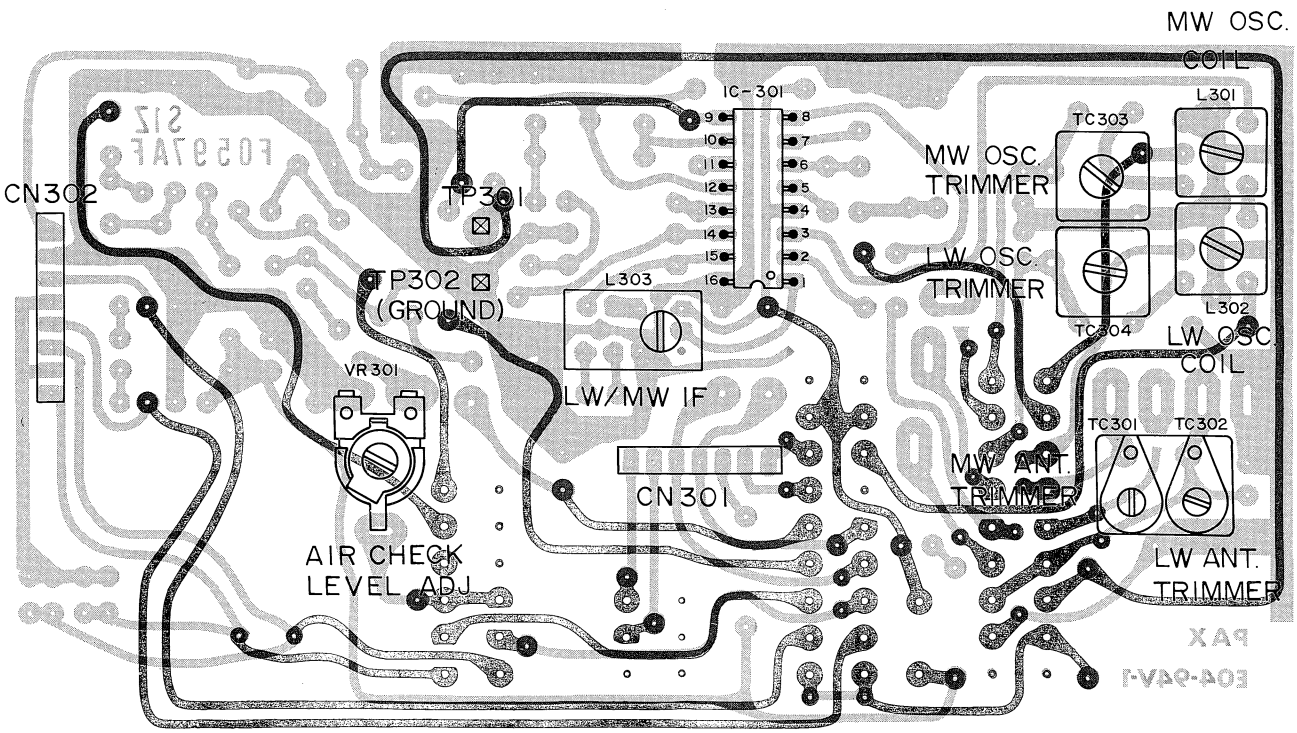
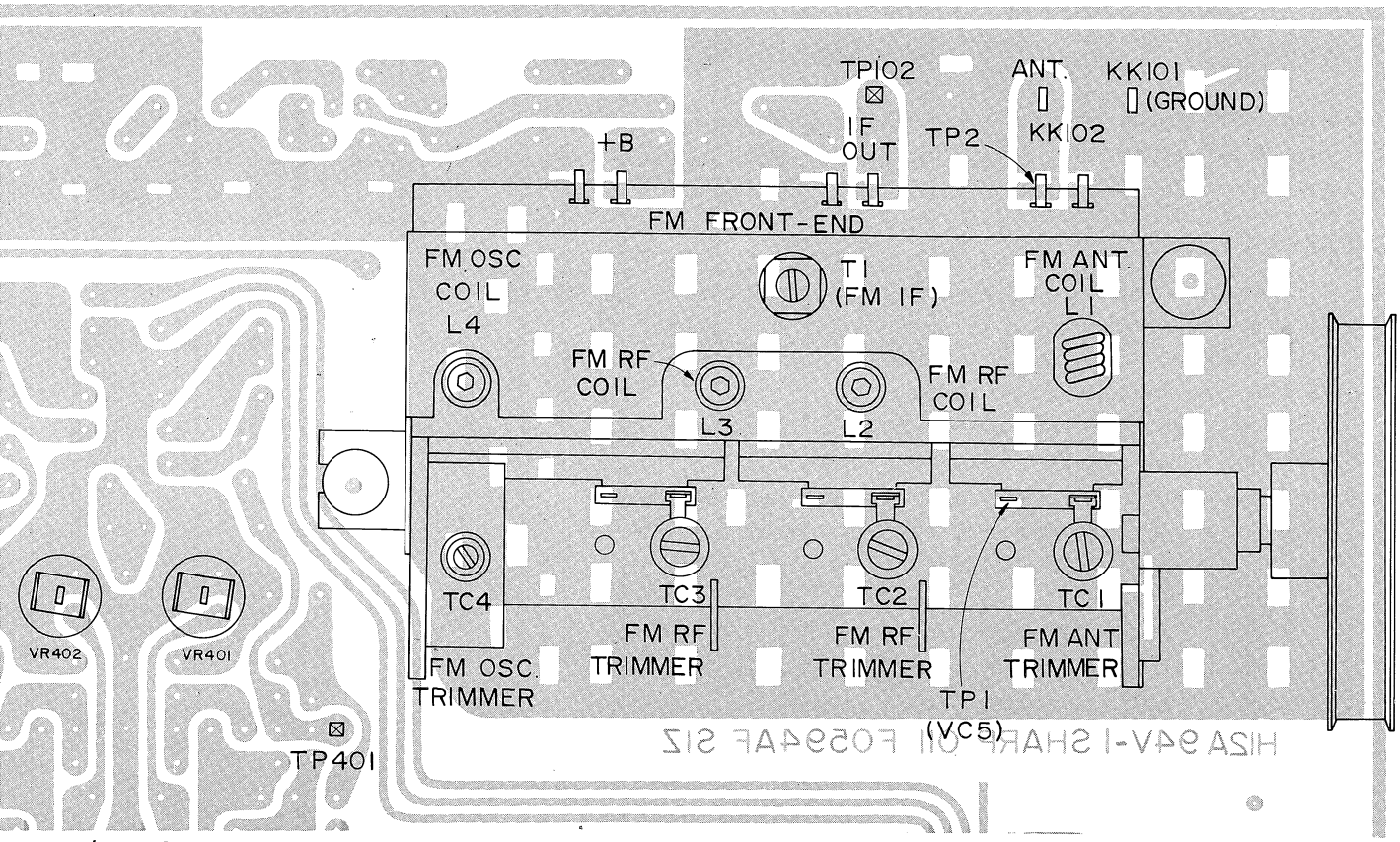



Figure 28 ALIGNMENT POINTS OF AM RF/IF BOARD




FM RF/IF, EQUALIZER BOARD

## MW RF ALIGNMENT

Rotate the core of LW oscillation coil L302 fully clockwise.

| PROCEDURE NUMBER | TEST STAGE | SIGNAL GENERATOR CONNECTION | SIGNAL GENERATOR FREQUENCY | DIAL POINTER SETTING | SELECTOR SETTING | SCOPE CONNECTION | ADJUSTMENT | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 1 | Band Coverage | Radiated signal as small as possible | 515 kHz Modulated | Low end of Dial | Band Selector (MW) | Oscilloscope is connected between TP301 and TP302 (ground) | Oscillator Coil L301 | Adjust for maximum output |
| 2 | | Radiated signal as small as possible | 1650 kHz Modulated | High end of Dial | Same as above | Same as above | Oscillator Trimmer TC303 | Same as above Repeat steps 1 and 2,2 or 3 times. |
| 3 | Tracking | Radiated signal as small as possible | 1400 kHz Modulated | 1400 kHz | Same as above | Same as step 1 | Antenna Trimmer TC301 | Same as step 1 |
| 4 | | Radiated signal as small as possible | 600 kHz Modulated | 600 kHz | Same as above | Same as step 1 | Antenna Coil L802-B | Same as above Repeat steps 3 and 4, 2 or 3 times. |

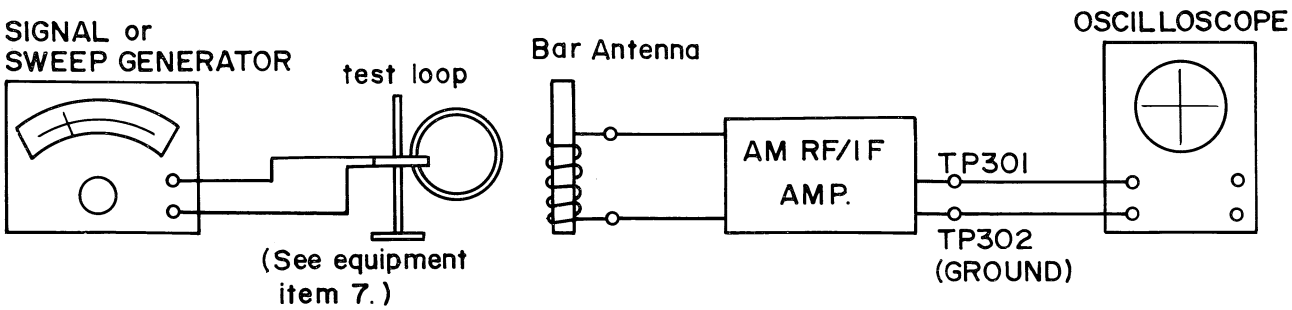



Figure 29 MW/LW RF ALIGNMENT EQUIPMENT CONNECTIONS

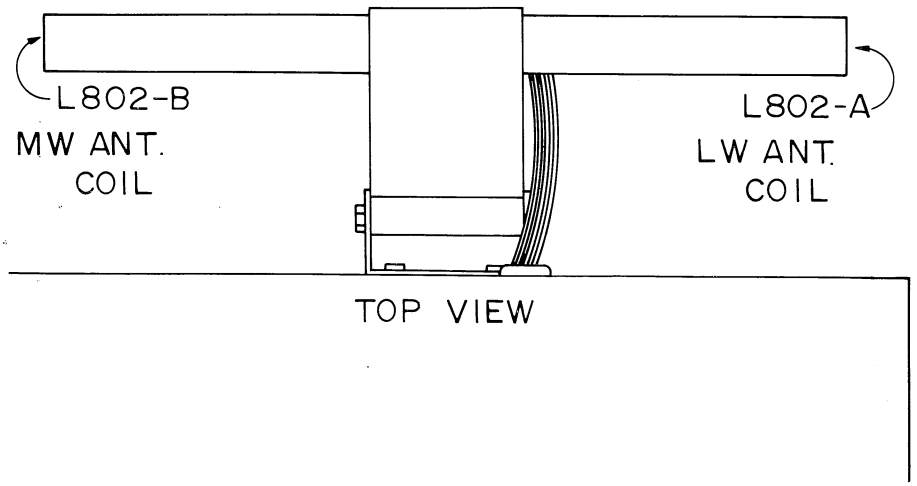



**Figure 30 LW/MW BAR ANTENNA**

## LW RF ALIGNMENT

| PROCE-DURE NUMBER | TEST STAGE | SIGNAL GENERATOR | | DIAL POINTER SETTING | SELECTOR SETTING | SCOPE CONNECTION | ADJUSTMENT | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | | CONNECTION | FREQUENCY | | | | | |
| 1 | Band Coverage | Radiated signal as small as possible | 145 kHz Modulated | Low end of Dial | Band Selector (LW) | Oscilloscope is connected between TP301 and TP302 (ground) | Oscillator Coil L302. | Adjust for maximum output |
| 2 | | Radiated signal as small as possible | 385 kHz Modulated | High end of Dial | Same as above | Same as above | Oscillator Trimmer TC304 | Same as above Repeat steps 1 and 2,2 or 3 times. |
| 3 | Tracking | Radiated signal as small as possible | 340 kHz Modulated | 340 kHz | Same as above | Same as step 1 | Antenna Trimmer TC302 | Same as step 1 |
| 4 | | Radiated signal as small as possible | 170 kHz Modulated | 170 kHz | Same as above | Same as step 1 | Antenna Coil L802-A | Same as above Repeat steps 3 and 4, 2 or 3 times. |
| 5 | | Same as above | 145 kHz Modulated | 145 kHz | Same as above | Same as step 1 | Same as above | Same as step 1 |

## FM ALIGNMENT

Set the FM Muting switch (SW301-D) at "OFF" position.

| PROCEDURE NUMBER | TEST STAGE | SIGNAL GENERATOR CONNECTION | SIGNAL GENERATOR FREQUENCY | DIAL POINTER SETTING | SELECTOR SETTING | METER CONNECTION | ADJUSTMENT | REMARKS |
|---|---|---|---|---|---|---|---|---|
| 1 | IF (NOTE 1 and 2) | Connect FM sweep generator, through 6PF capacitor, to the test point TP2. Connect the ground to the terminal KK101. | 10.7MHz±500 kHz as small as possible. | High end of dial | Band Selector(FM), and mono | Connect an oscilloscope to the test points TP103 and TP104 (ground). | T1 | Rotate the core of T1 to adjust so that the waveform 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 terminal KK101. | Same as above | Same as above. | Band Selector(FM) and mono | Connect an oscilloscope to the test points TP105 and TP104 (ground). | T101, T102 | Rotate the core to adjust so that the waveform (Fig.33) becomes symmetrical in the upper and lower with the best linearity. |
| 3 | Band Coverage (NOTE 1) | FM Antenna | 88MHz as small as possible (Modulated) | Low end of dial. | Band Selector(FM) and mono | Connect VTVM to the test points TP105 and TP104 (ground) | Oscillator coil L4 | Adjust for maximum output. |
| 4 | | FM Antenna | 108MHz (Modulated) as small as possible | High end of dial. | Band Selector(FM) and mono | Same as above | Oscillator trimmer TC4. | Same as above 3~4. Repeat 2 or 3 times. |
| 5 | Tracking (NOTE 1) | FM Antenna | 90MHz (Modulated) as small as possible | 90MHz | Band Selector(FM) and mono | Same as step 3 | Antenna coil L1 and RF coil L2, L3 | Same as step 3 |
| 6 | | FM Antenna | 106MHz (Modulated) as small as possible | 106MHz | Band Selector(FM) and mono | Same as step 3 | Antenna trimmer TC1 and RF trimmer TC2, TC3. | Same as above 5~6. Repeat 2 or 3 times. |

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.

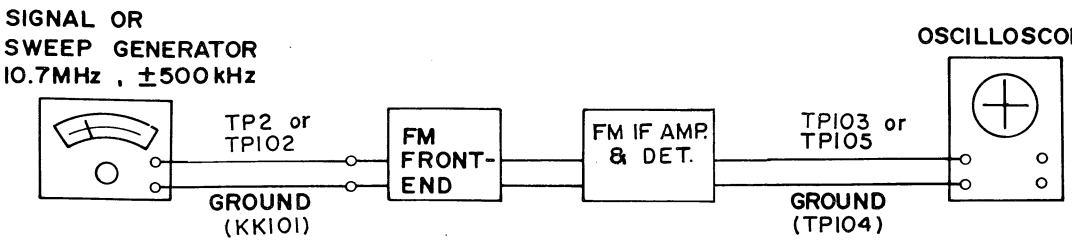



Figure 32 "IF" curve

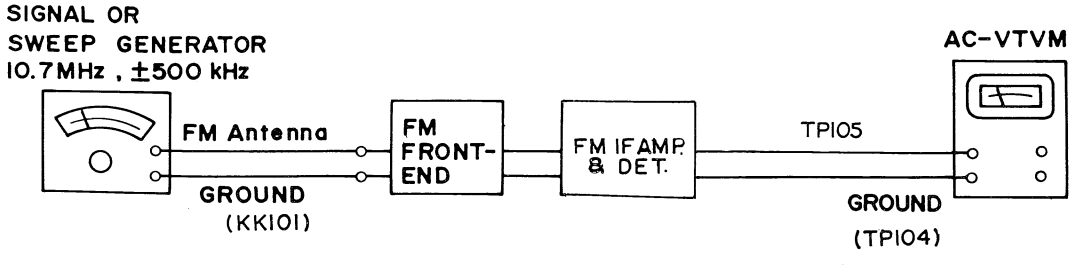



Figure 31 FM ALIGNMENT EQUIPMENT CONNECTIONS

Figure 33 "S" curve

Note 2

The ceramic filter used for this set is available in 5 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 3 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.

| | | |
|---|---|---|
| Central Frequency (fo) | Green | 10.60 MHz ± 30 kHz |
| | Black | 10.65 MHz ± 30 kHz |
| | Red | 10.70 MHz ± 30 kHz |
| | White | 10.75 MHz ± 30 kHz |
| | Yellow | 10.80 MHz ± 30 kHz |

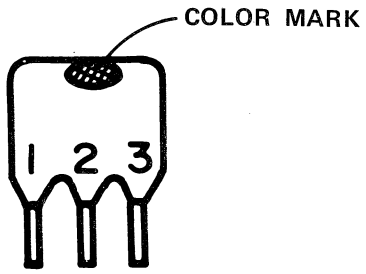



Figure 34

## FM TUNING METER ADJUSTMENT AND DISTORTION FACTOR ADJUSTMENT

1) Set the frequency of FM signal oscillator to 98 MHz (75 kHz deviation), fully close the output and connect such signal to the FM antenna terminal of the set through a dummy resistor of 240 ohms.
2) Connect a dummy resistor of 4 ohms 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–0dB, Low 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]
4) Keeping the output of FM signal oscillator 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 "98 MHz" position.)
5) Adjust the output of FM signal oscillator to 60 dB, 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 oscillator 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.

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

1) Connect FM signal oscillator, through a dummy resistor of 240 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 AND DISTORTION FACTOR CONTROL".
3) Set the frequency of FM signal oscillator to 98 MHz (40 kHz deviation, 400 Hz) and the output to 20 dB.
4) Have the set be tuned in 98 MHz 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 oscillator being 20 dB.
5) Set the output of FM signal oscillator to 60 dB (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 76.00 kHz ± 200 Hz. (After the adjustment; reset the connection between the test points TP105 and TP104.)
7) Connect FM stereo modulator to FM signal oscillator. At the time, the following should be set: modulation frequency; 1kHz (L + R; 20kHz, L–R; 20kHz, pilot (19kHz); 6kHz deviation).
8) Set the frequency of FM signal oscillator to 98 MHz and its output to 60 dB, 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 0 dB. 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.

[If without the frequency counter, proceed with the alignment as follows. While receiving a FM stereo signal, turn the VR102 until the P.L.L. will be locked (when it is locked, the stereo indicator will be lit). Then, reversely turn the VR102 halfway and fix it.]

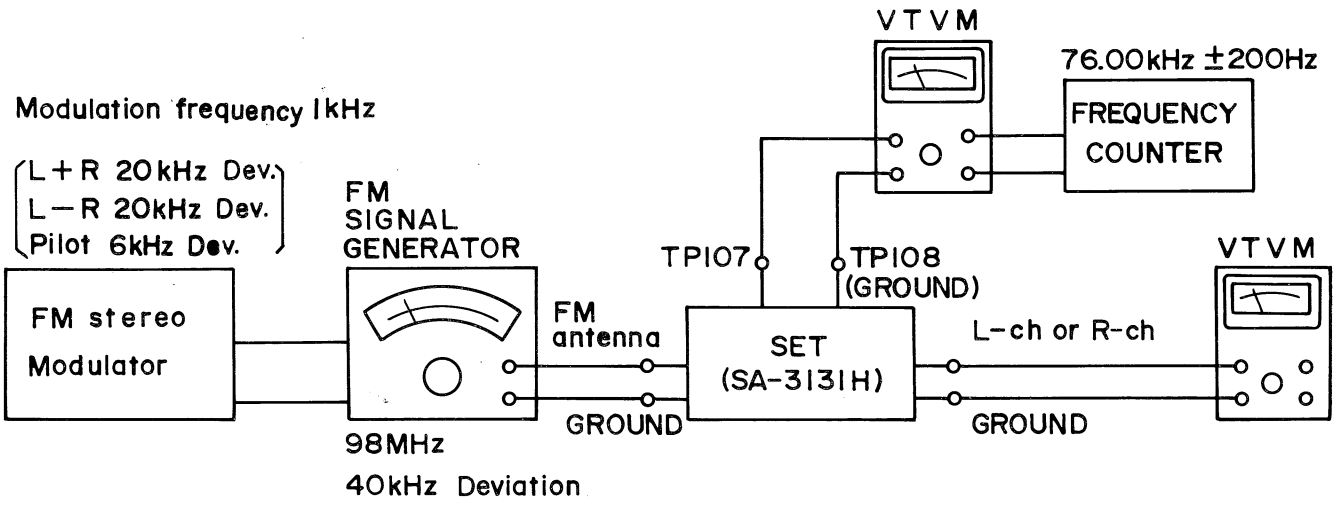
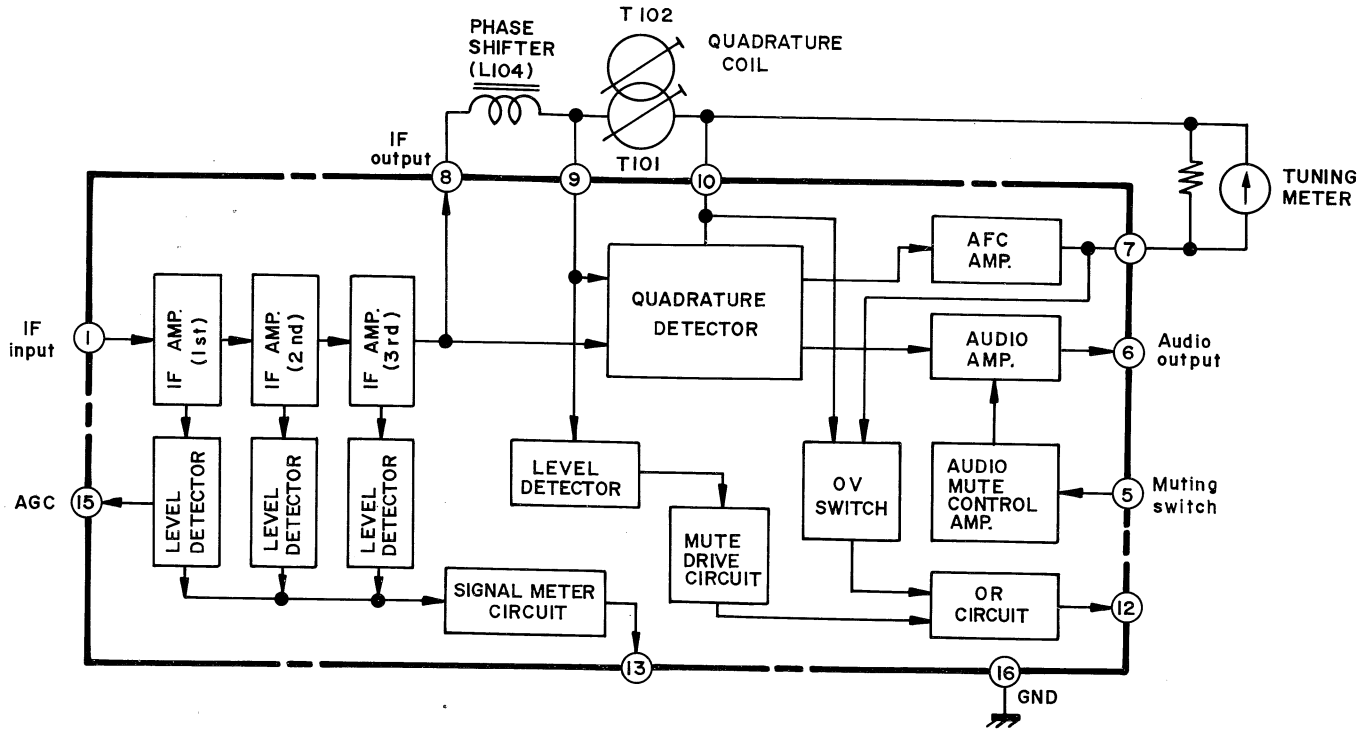



Figure 35 FM STEREO ALIGNMENT EQUIPMENT CONNECTIONS

## ADJUSTMENT OF AIR CHECK CAL.

Produce 98 MHz, 60 dB FM mono signal (modulation 100%, 400 Hz) 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 38%, of that with AIR CHECK switch kept at "OFF".



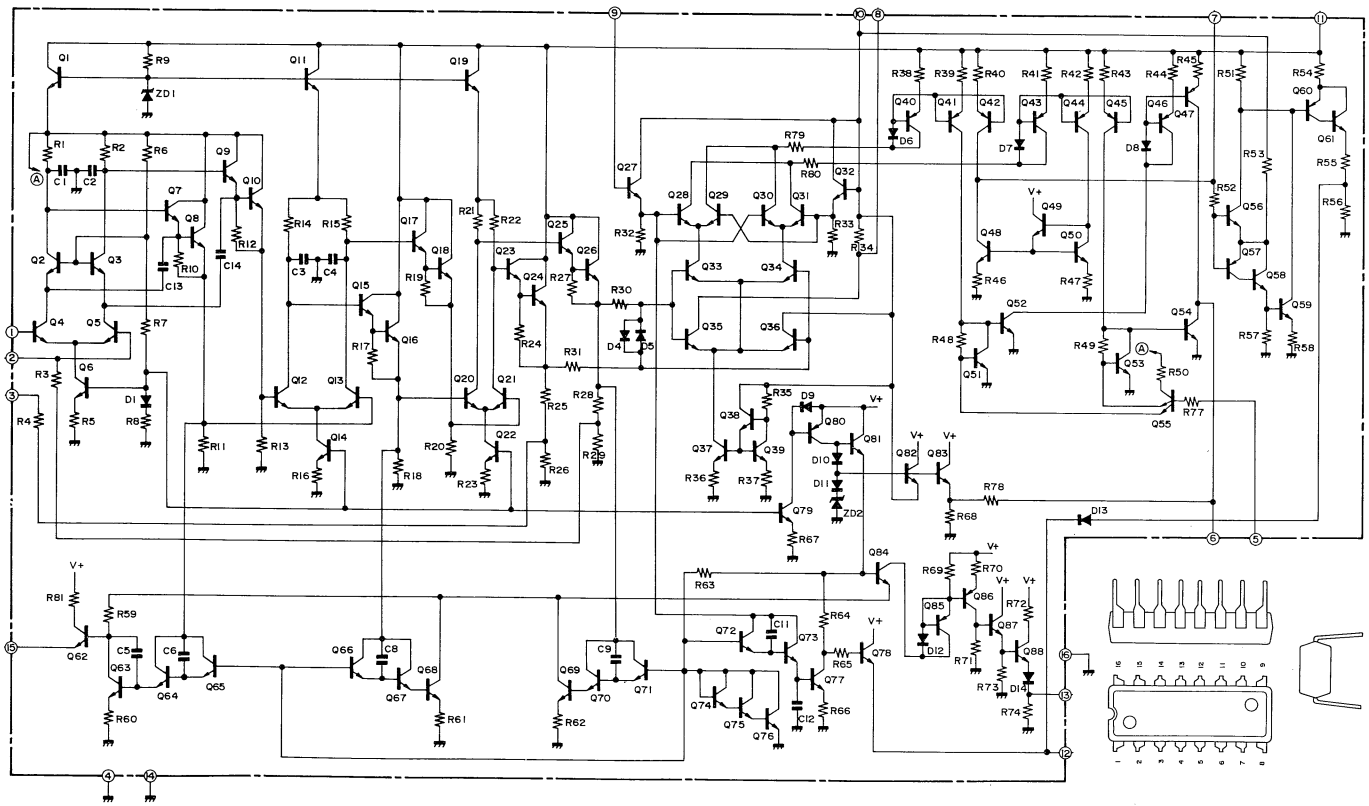
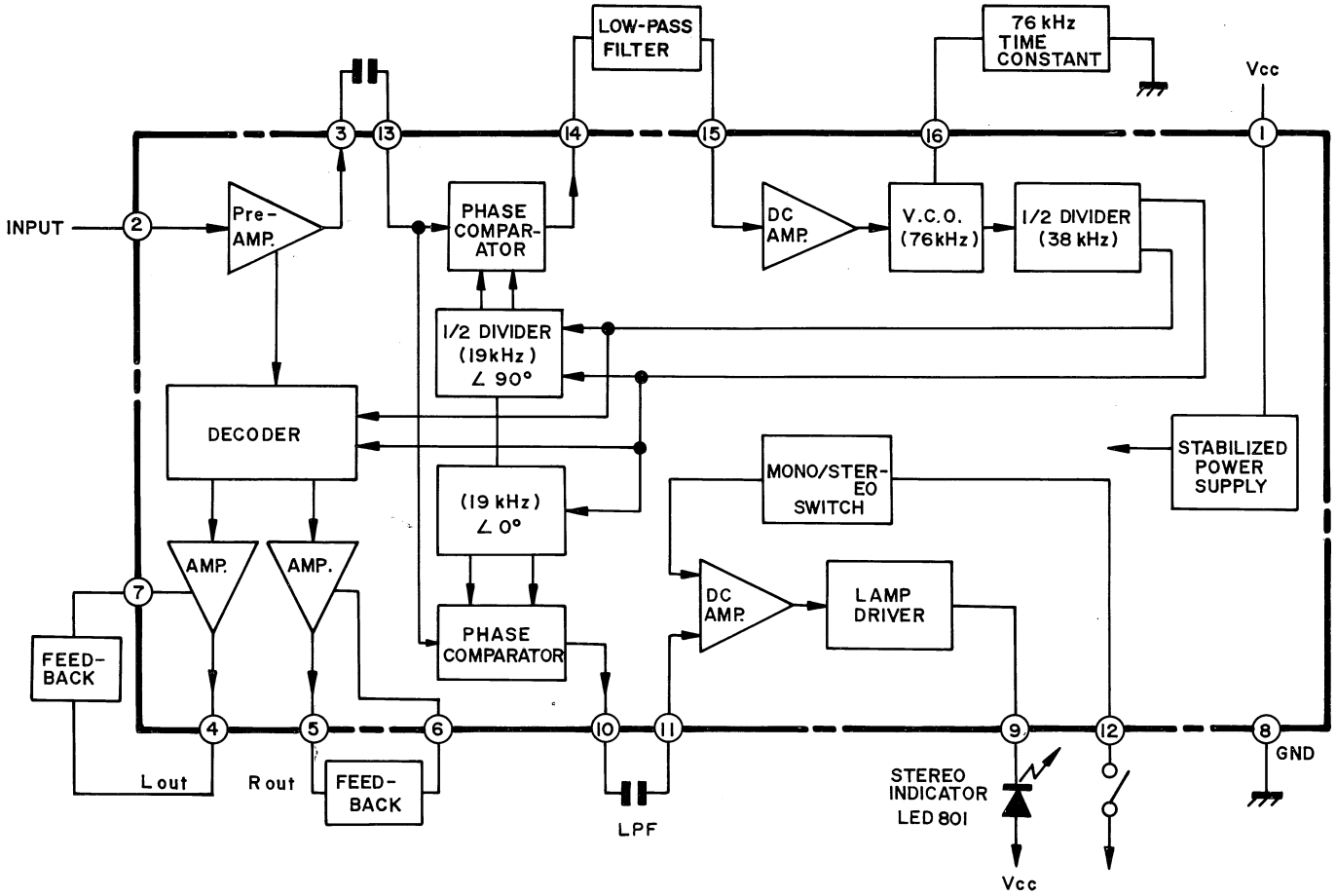



Figure 36 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC101)



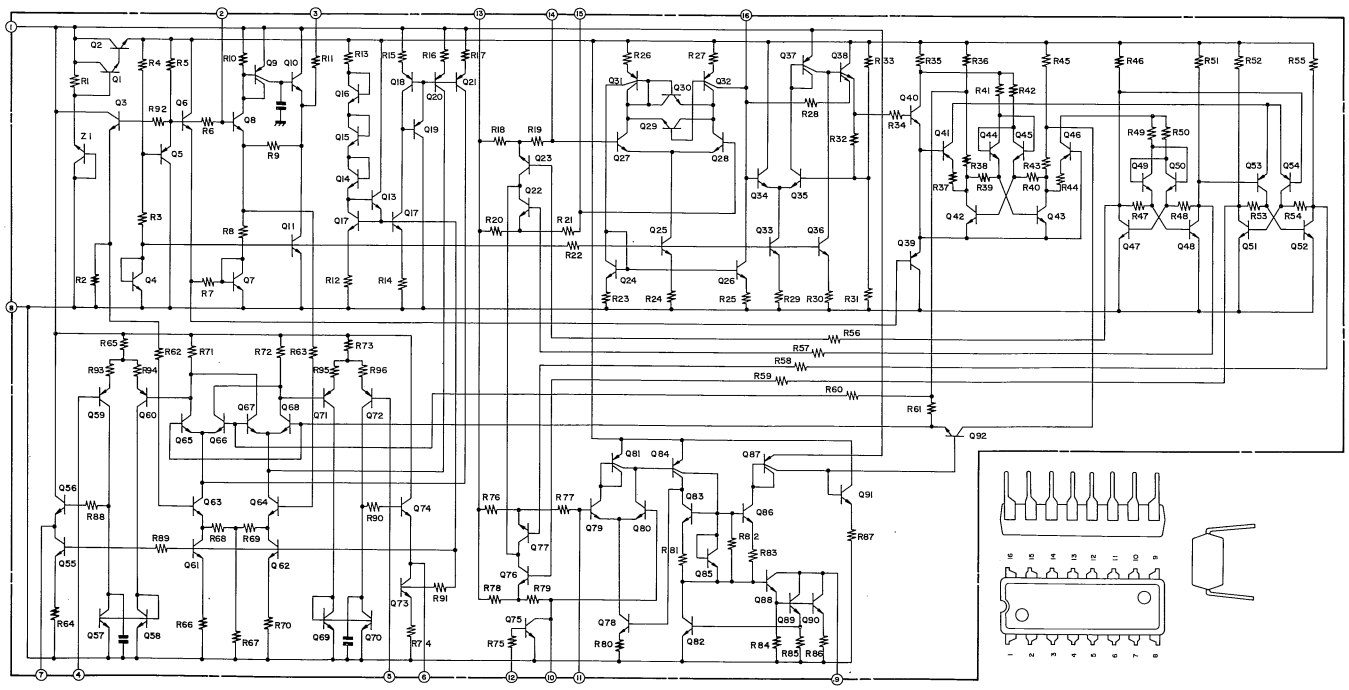
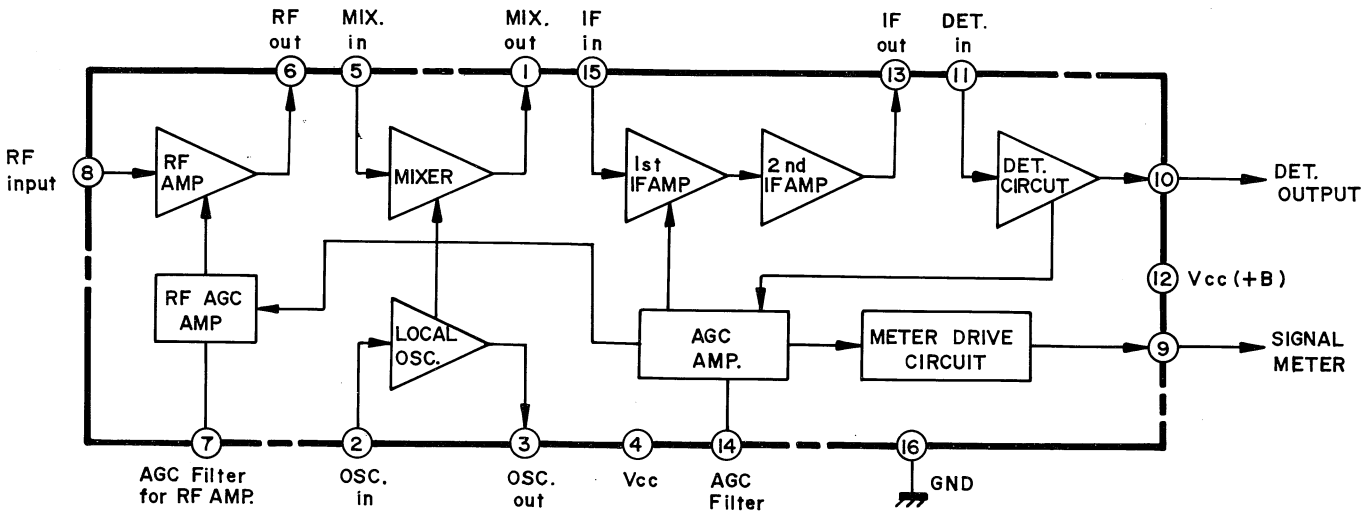
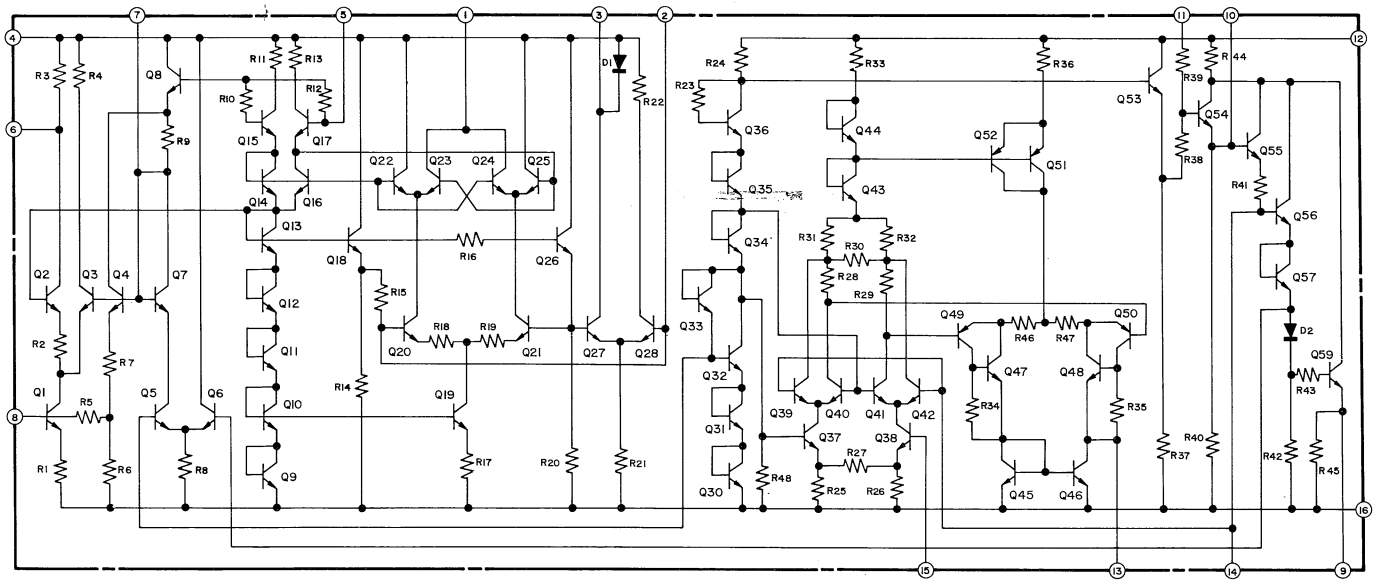



Figure 37 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC102)



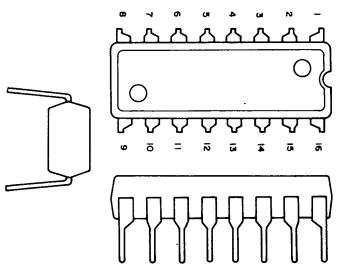


Figure 38 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC301)

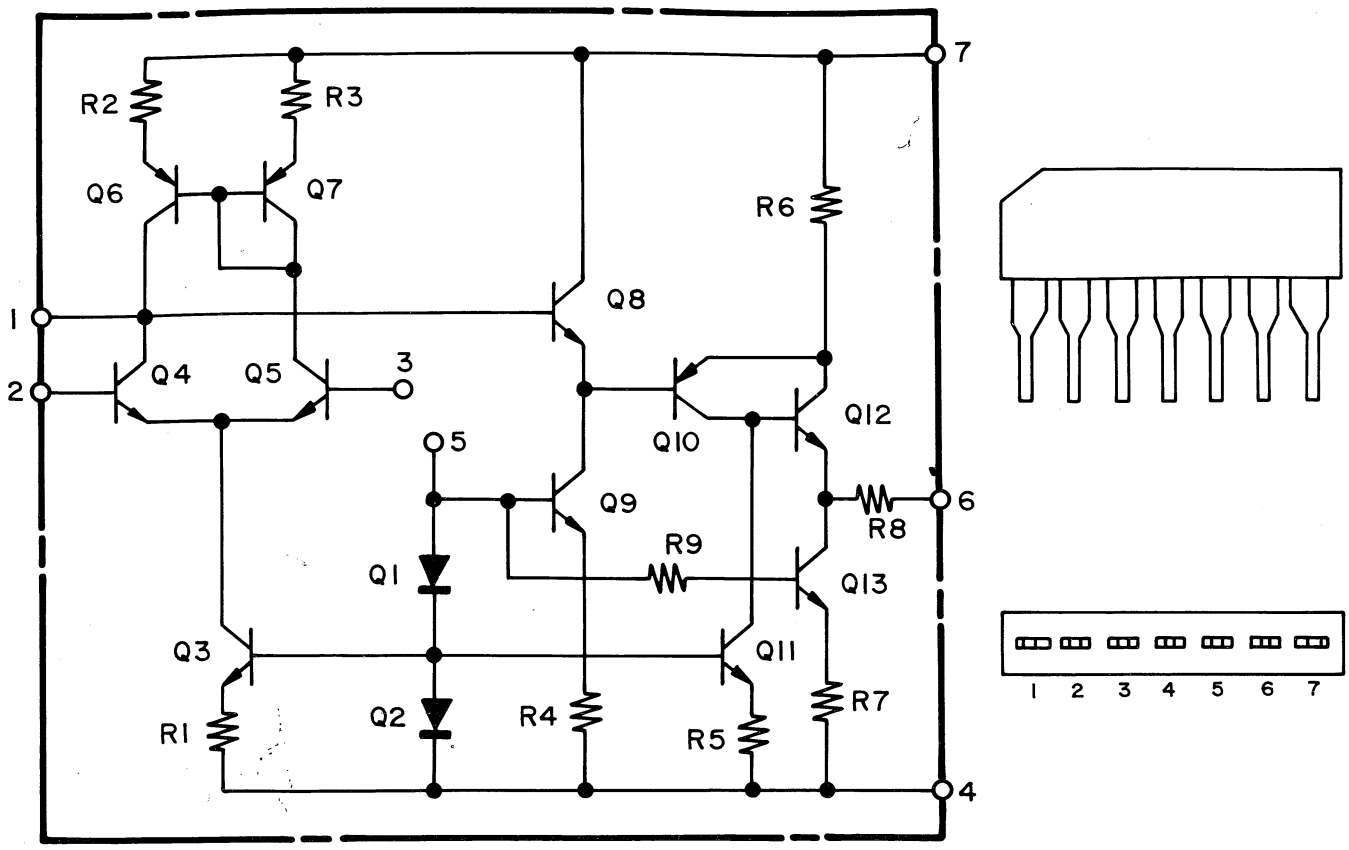
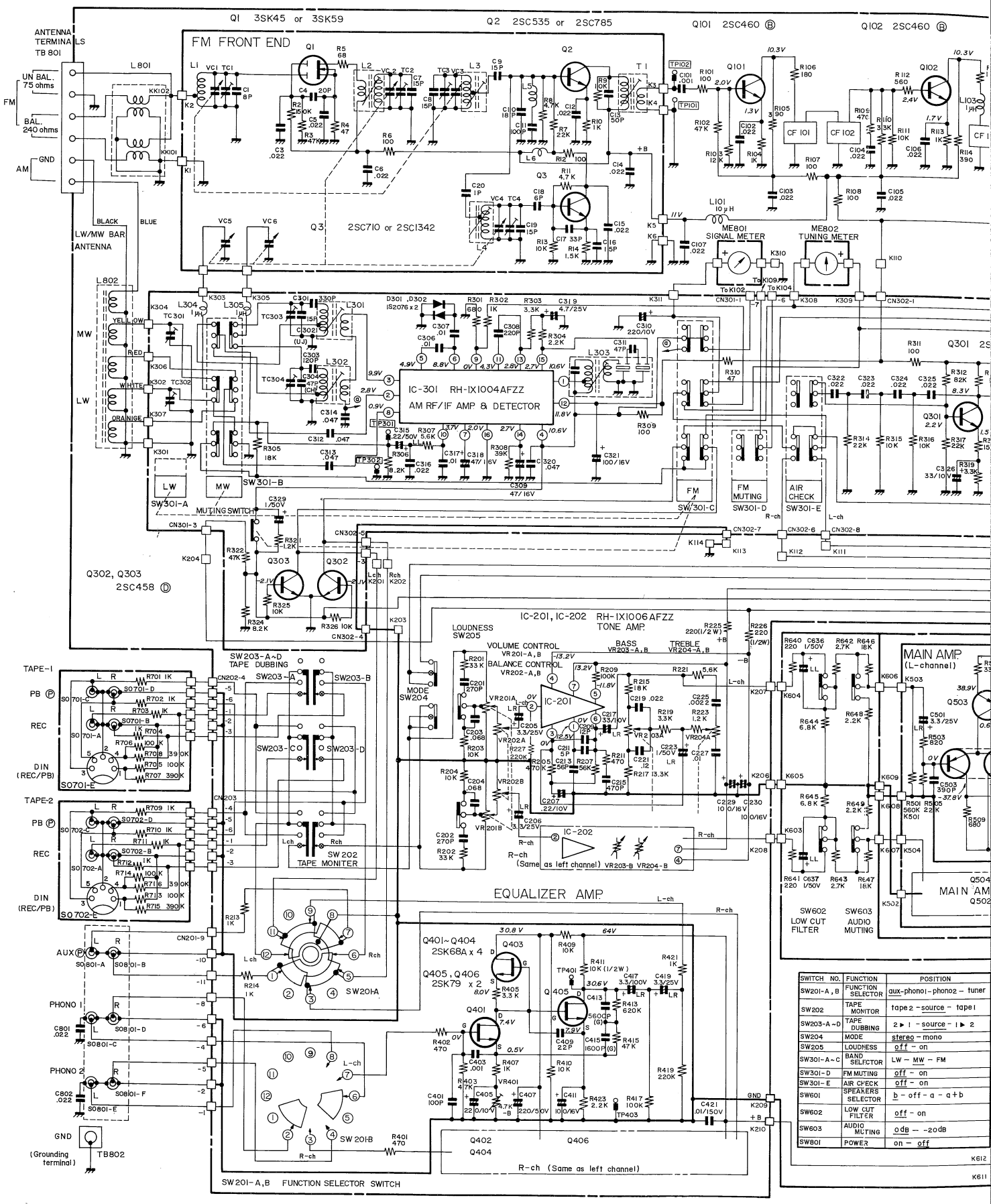



**Figure 39 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC 201, IC 202 and IC 601)**

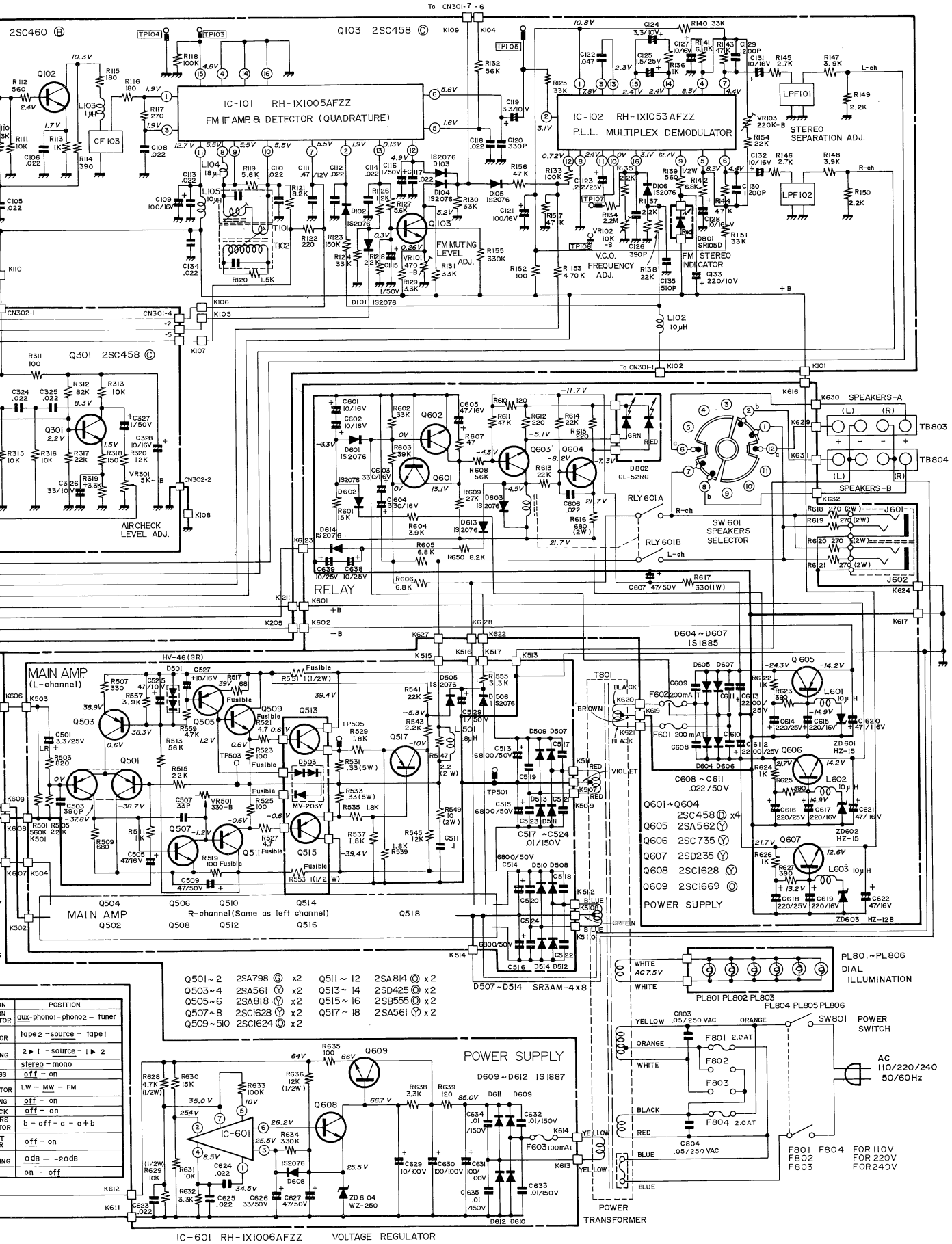
## NOTES ON SCHEMATIC DIAGRAM

1. Frequency range: FM; 76.5 to 108 MHz
   MW; 520 to 1620 kHz
   LW; 150 to 370 kHz
2. IF: FM 10.7 MHz, MW/LW 455 kHz
3. Resistor: To differentiate the units of resistors, such symbols as K and M are used: the symbol K means KΩ and the symbol M means MΩ 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. SW 301-A ~ C (interlocked): It is Band selector (LW/MW/FM) switch ("MW" position)
    SW 301-D: It is FM muting switch ("off" position)
    SW 301-E: It is Air check switch ("off" position)
11. SW 601: It is Speakers selector (b/off/a/a+b) switch ("b" position)
12. SW 602: It is Low cut filter (off/on) switch ("off" position)
13. SW 603: It is Audio muting (0 dB/–20 dB) switch ("0dB" position)
14. SW 801: It is Power (on/off) switch ("off" position)
15. The indicated voltage in each section is the one measured by VTVM between such a section and the chassis with no signal being given.




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

Figure 40 SCHEMATIC DIAGR




| | POSITION |
|---|---|
| ON | aux-phono1-phono2-tuner |
| DR | tape2-source-tape1 |
| NG | 2▶1-source-1▶2 |
| SS | stereo-mono |
| TOR | off-on |
| NG | LW-MW-FM |
| CK | off-on |
| RS | off-on |
| TOR | b-off-a-a+b |
| T R | off-on |
| ING | 0dB-20dB |
| | on-off |

prior notice.)

IEMATIC DIAGRAM

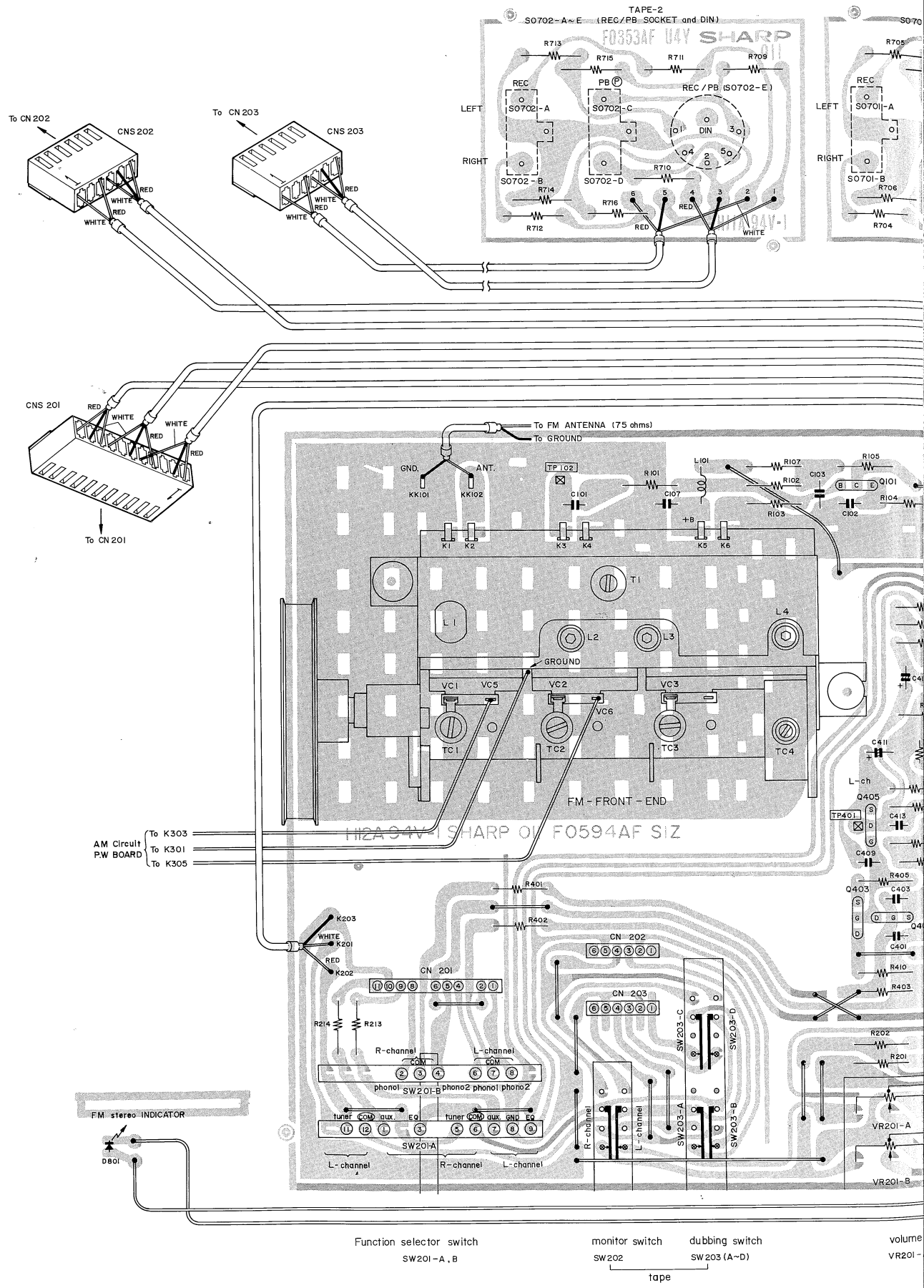
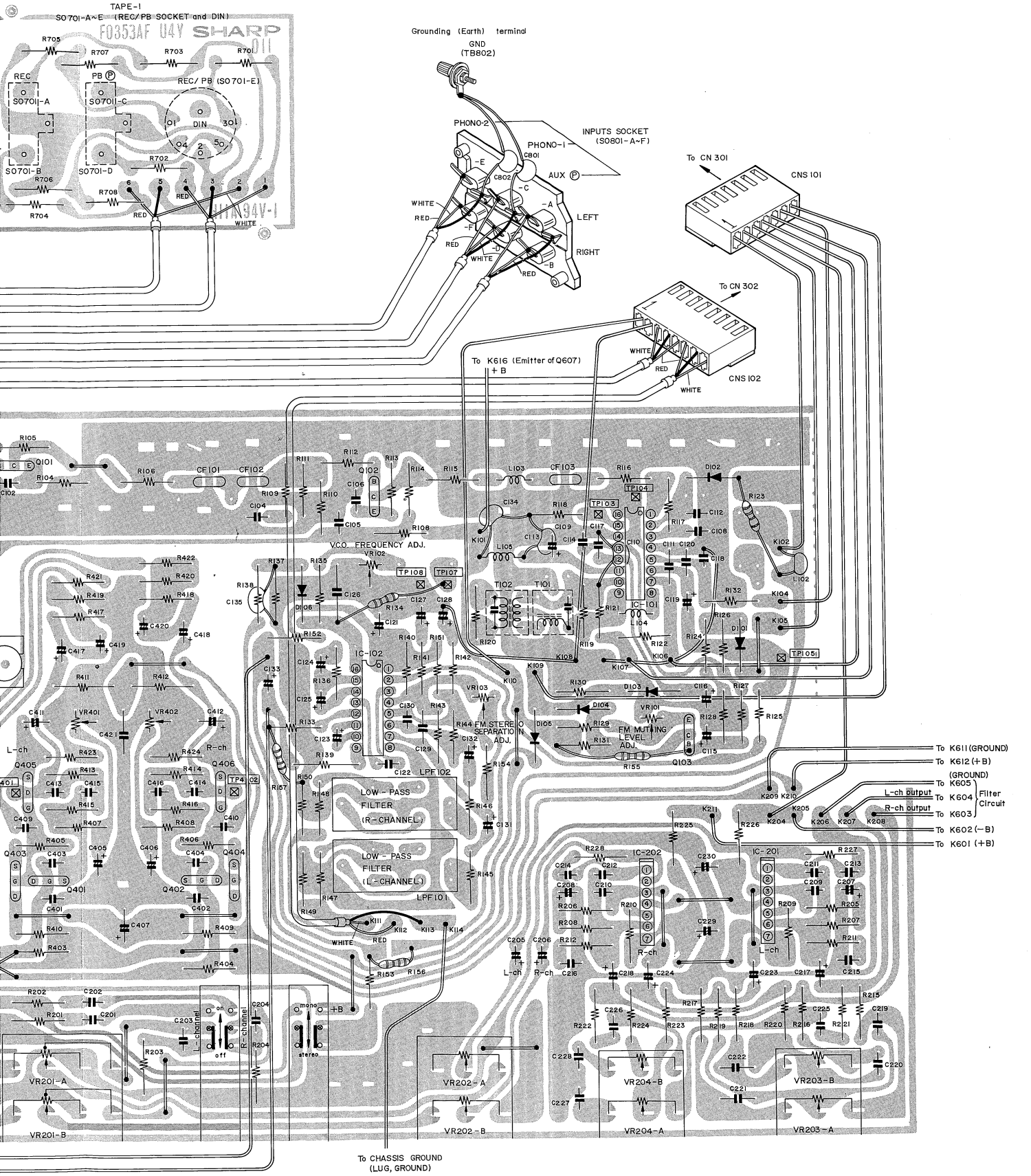



**Figure 41 WIRING SIDE OF FM RF/IF CIRCUIT, E**




volume control VR201-A,B

loudness switch SW205

mode switch SW204

balance control VR202-A,B

treble control VR204-A,B

bass control VR203-A,B

## IRCUIT, EQUALIZER CIRCUIT, TONE CIRCUIT AND TAPE BOARDS

| POWER SUPPLY CORD | BUSHING |
|---|---|
| QACCN0001AGZZ | LBSHC0004AGZZ |
| QACCS9001SE00 (QPLGA0205AGZZ) | LBSHC0007AFZZ |
| QACCV0001AGZZ | LBSHC0004AGZZ |
| QACCZ0002TA0F | LBSHC0007AFZZ |
| QACCZ0002AG08 (QPLGA0201AGZZ) | LBSHC0007AFZZ |

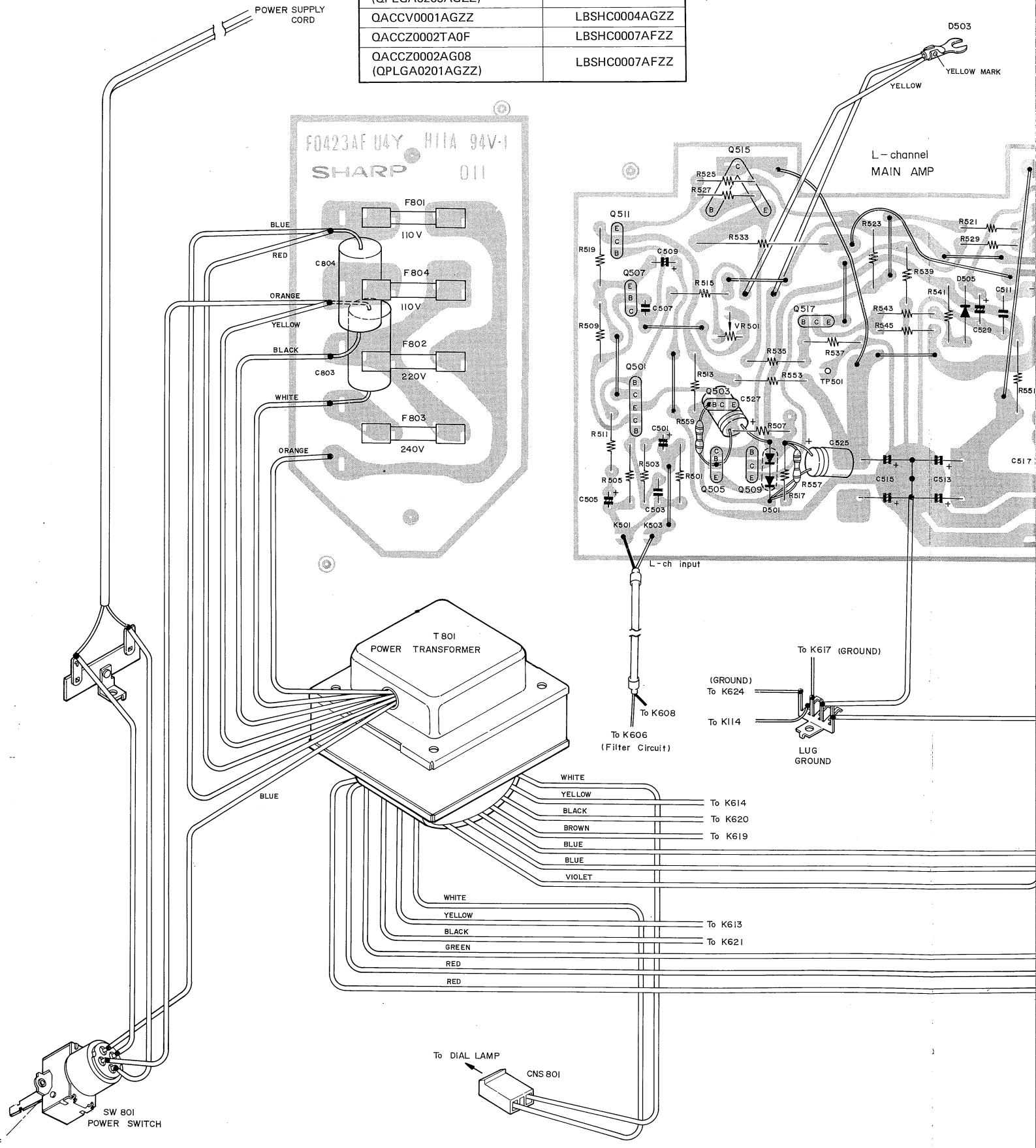
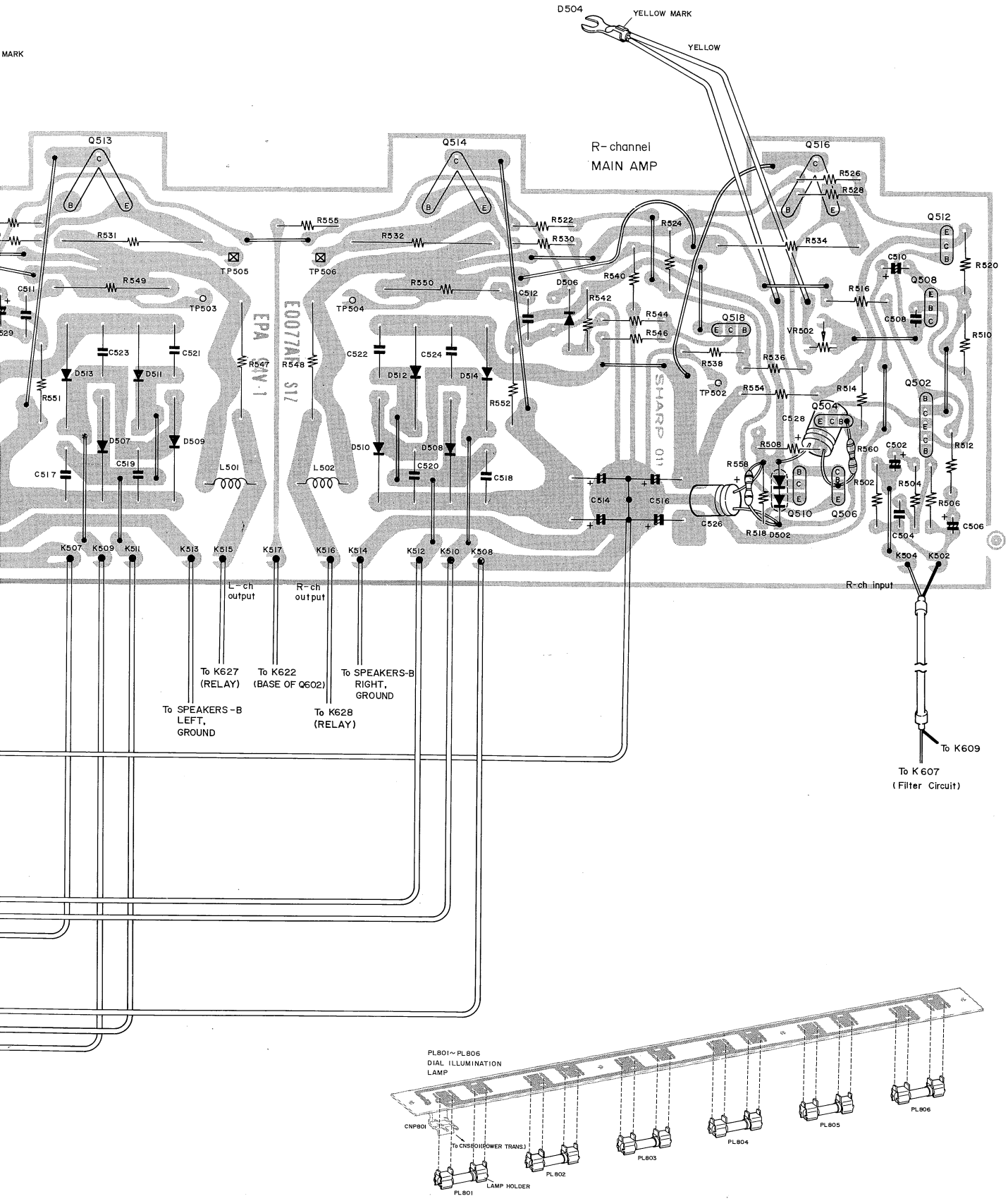



**Figure 42 WIRING SIDE OF POWER AMP. AND LAMP B**


D504
YELLOW MARK
YELLOW
R-channel
MAIN AMP
Q513
Q514
Q516
Q512
Q508
Q518
Q502
Q504
Q506
Q510
TP505
TP506
TP503
TP504
TP502
R555
R531
R532
R522
R530
R524
R534
R526
R528
R520
R549
R550
R540
R542
R544
R546
R538
R536
R554
R514
R516
R510
R547
R548
R552
R551
C523
C521
C522
C524
C512
C510
C508
C528
C502
C504
C506
C526
C514
C516
C517
C519
C518
C520
D513
D511
D512
D514
D506
D507
D509
D510
D508
D502
R558
R508
R560
R502
R504
R506
R512
R518
L501
L502
EPA SW-1
E0077A
SHARP 011
K507
K509
K511
K513
K515
K517
K516
K514
K512
K510
K508
L-ch output
R-ch output
To K627 (RELAY)
To K622 (BASE OF Q602)
To SPEAKERS-B RIGHT, GROUND
To SPEAKERS-B LEFT, GROUND
To K628 (RELAY)
R-ch input
To K609
To K607 (Filter Circuit)
PL801~PL806 DIAL ILLUMINATION LAMP
CNPB01
To CNSB01(POWER TRANS.)
PL801
PL802
PL803
PL804
PL805
PL806
LAMP HOLDER

## AMP BOARDS

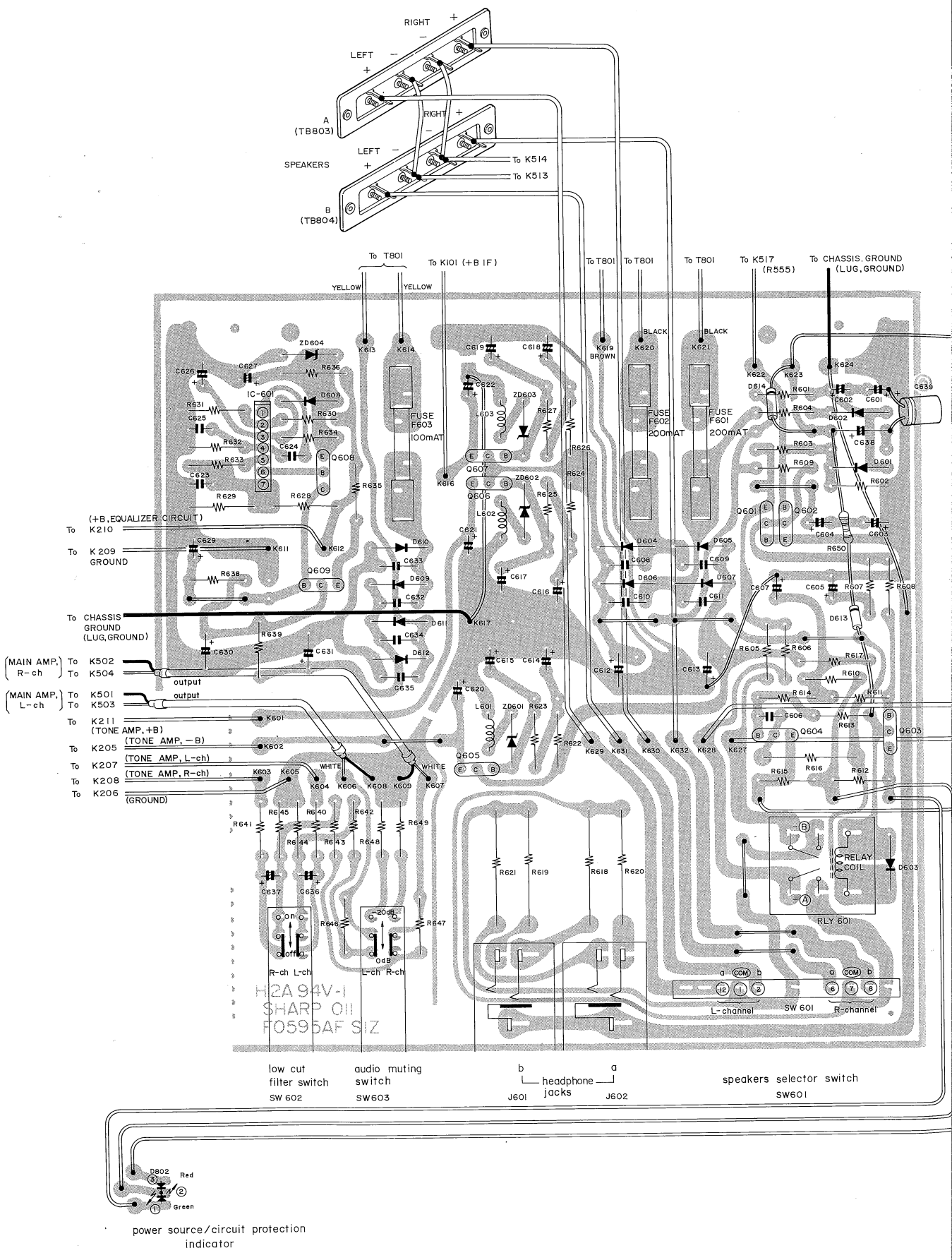
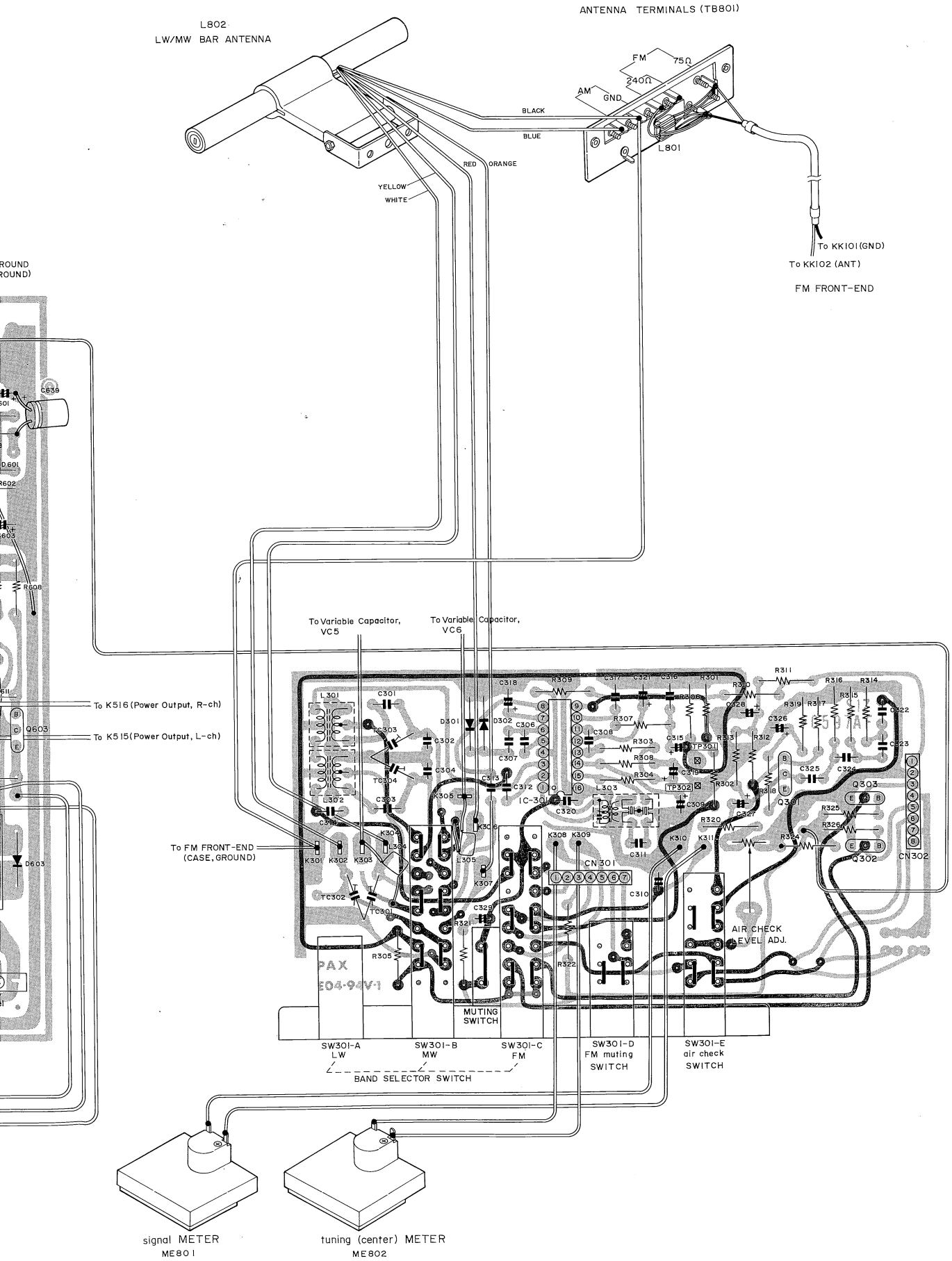



**Figure 43 WIRING SIDE OF A**




**IDE OF AM RF/IF CIRCUIT AND POWER SUPPLY BOARDS**

## 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 VS2SB555-O/-1 and VS2SD425-O/-1 are almost similar in the shape. So pay attention to the mark of transistor when replacing the power transistor.

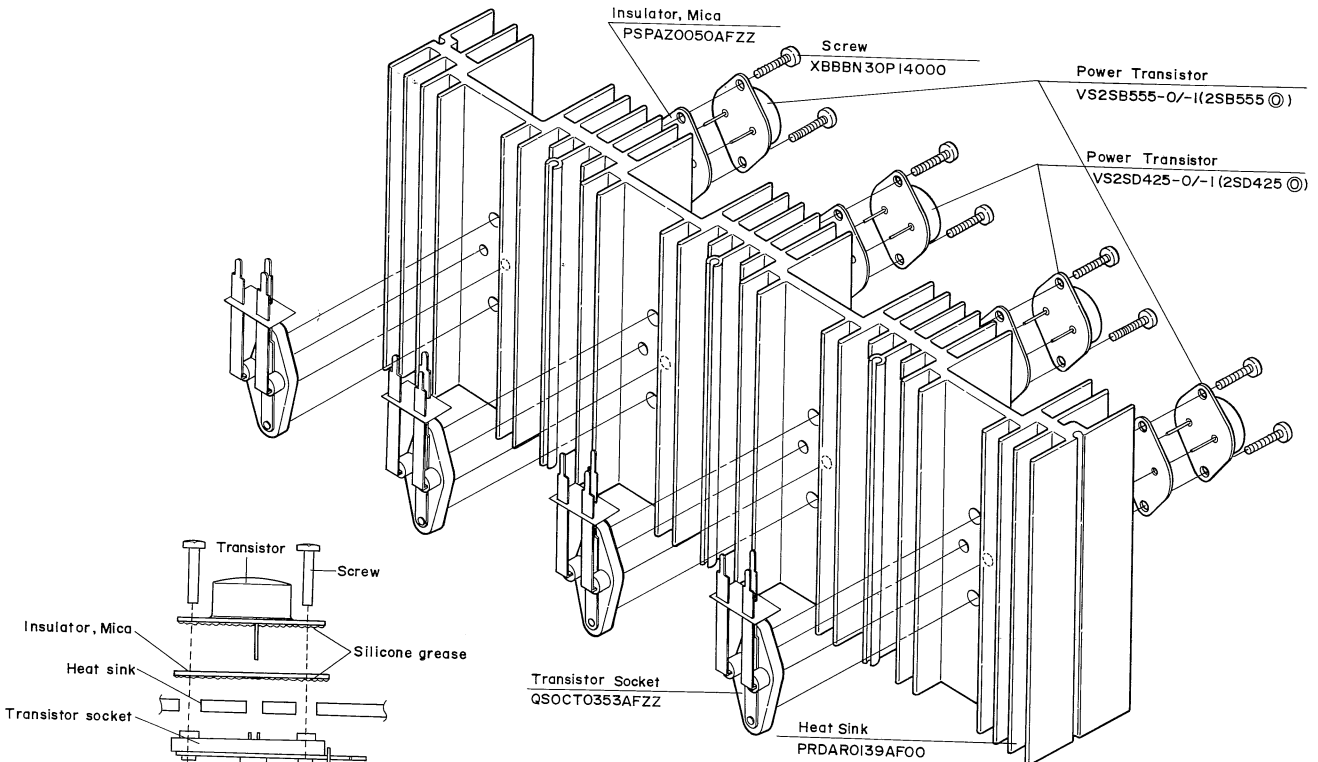
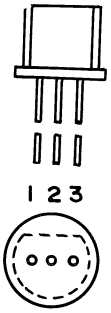
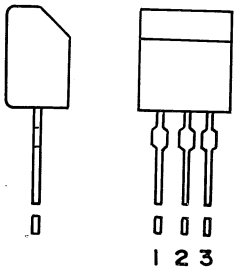



Figure 44 POWER TRANSISTOR REPLACEMENT



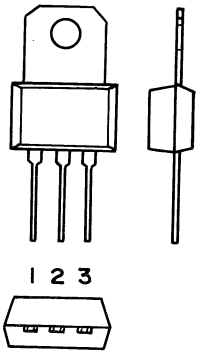

1. EMITTER
2. COLLECTOR
3. BASE

2SA562
2SC735
2SA561
2SC785



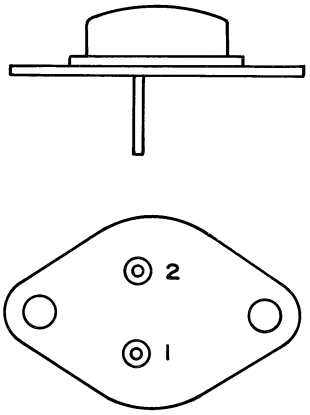

1. EMITTER
2. COLLECTOR
3. BASE

2SC460
2SC458
2SC535
2SC1342



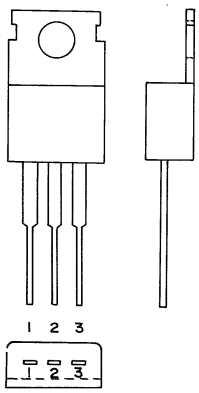

1. EMITTER
2. BASE
3. COLLECTOR

2SC1628
2SA818



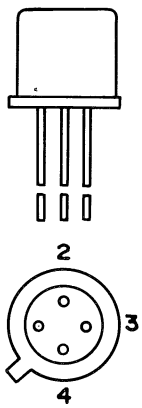

1. BASE
2. EMITTER
COLLECTOR(CASE)

2SD425
2SB555




1. BASE
2. COLLECTOR (HEAT SINK)
3. EMITTER

2SC1624
2SA814
2SD235
2SC1669

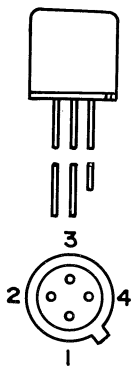



1. DRAIN
2. GATE 2
3. GATE 1
4. SOURCE (CASE)

3SK59

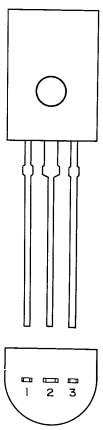

1. DRAIN
2. GATE
3. SOURCE

2SK68A



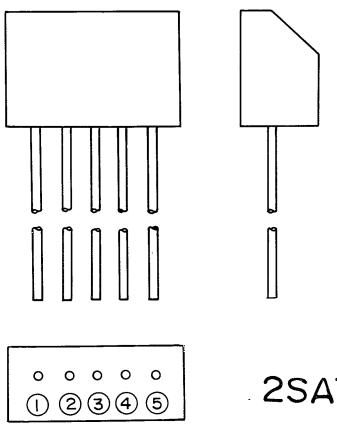

1. DRAIN
2. GATE 2
3. GATE 1
4. SOURCE
(CASE)

2SK45




1. SOURCE
2. DRAIN
3. GATE

2SK79




2SA798

① BASE 1
② COLLECTOR 1
③ EMITTER
④ COLLECTOR 2
⑤ BASE 2

Figure 45 TRANSISTOR TYPES

# TROUBLE SHOOTING GUIDE

## ALL OPERATIONAL MODES (1)

| SYMPTOM | | PROBABLE CAUSE | TROUBLE SHOOTING HINT |
|---|---|---|---|
| No sound all modes | AC Power OK | Broken or shorted speaker cord network or voice coil | Check continuity of speaker cord, and voice coil<br>Repair broken cord or replace speaker |
| | Normal at DC detected | Not operate relay | Check relay circuit (Q601 ~ Q604) and voltage at Q603(base) |
| | Defective DC detected | Defective power supply circuit | Refer to next |
| | No AC power, power indicator is off | No power at wall socket | |
| | | Defective power switch or line cord | |
| | | Loose AC plug contact | |
| | | Blown fuse | If the fuse blows as soon as it is replaced |
| | | Shorted power transformer<br>Shorted capacitor | T801<br>C803, C804 |
| | | Shorted power amplifier transistor | Q513 ~ Q516<br>Check continuity between the collector and emitter, if it is 0 ohm or close to 0 ohm, it is defective |
| | | Broken primary winding of power transformer | Check continuity of transformer |
| | Power indicator is on, but no sound | Defective power supply circuit | Divergence of voltage specified in "SCHEMATIC DIAGRAM" |
| | | Defective or shorted power transistor | Q513 ~ Q516 |
| | | Defective or shorted device at output | Speaker system, headphone |
| | | Defective audio amplifier | Divergence of voltage specified in "SCHEMATIC DIAGRAM" |
| | | Defective transistor | Q501 ~ Q518 |
| Weak sound all modes | | Low AC supply voltage | Check the voltage selector (Rear) |
| | | Defective power supply circuit | Divergence of voltage specified in "SCHEMATIC DIAGRAM" |
| No sound at one mode | At AUX | Defective function switch, tape monitor switch or socket | SW201-A, SW202, SO801-A, B |
| | At phono-1 or phono-2 | Defective equalizer amplifier | Divergence of voltage specified in "SCHEMATIC DIAGRAM" |
| | | Defective constant voltage circuit | Q608, Q609, IC601, C629 ~ C631 |
| | | Defective function switch, tape monitor switch or socket | SW201-A, B, SW202, SO801-C ~ F |
| | At tape mode | Defective tape monitor switch, tape dubbing switch or socket | SW202, SW203, SO701, SO702 |
| | At tuner | Defective function switch and tape monitor switch | SW201-A, SW202 |
| | | Defective tuner | Refer to next |

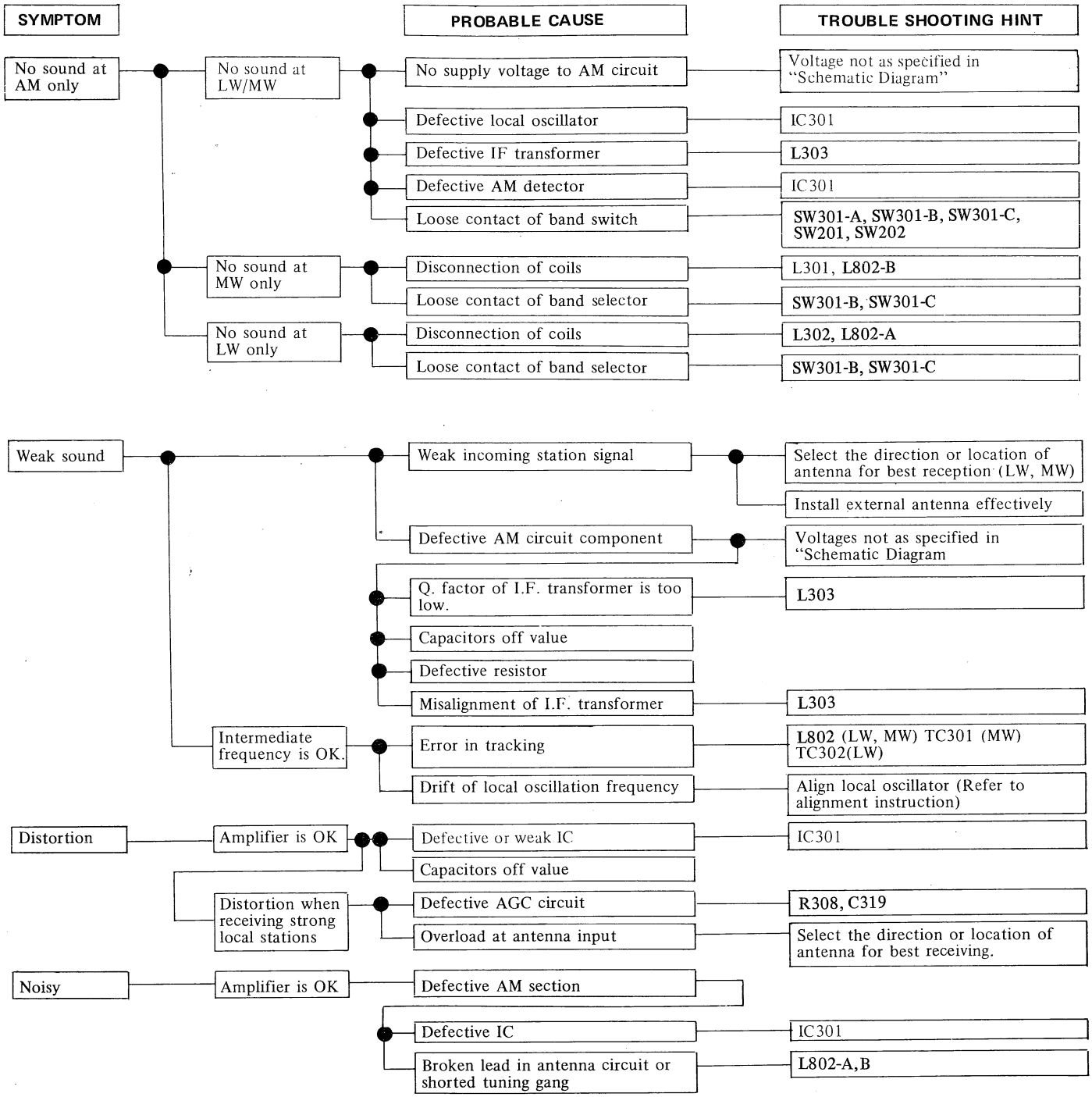
# TROUBLE SHOOTING GUIDE

## ALL OPERATIONAL MODES (2)

| SYMPTOM | | PROBABLE CAUSE | TROUBLE SHOOTING HINT |
|---|---|---|---|
| Distortion in all modes of operation | Replace speaker and OK | Defective voice coil, cone or damper of speaker | Replace speaker |
| | | Insufficient voltage of power circuit | Voltages not as specified |
| | One channel is OK, other is distorted | Defective audio frequency circuit | |
| | | Aging or weak IC or transistor | IC201, IC202, Q501 ~ Q516 |
| | | Open or shorts in negative feedback circuit | R515, R516, R511, R512, C505, C506, tone circuit |
| Hum in all modes | High level of ripple in DC source | Defective constant voltage circuit | L601, L602, ZD601, ZD602 |
| | Ripple in power supply circuit of preamplifier | Defective constant voltage circuit | C612, C613, C513 ~ C516, Q605, Q606 |
| | | Short circuit of earth of power amplifier or other audio unit to chassis, especially headphone jack to chassis | AF unit to chassis, J601 and J602 to chassis |
| Hum at PHONO | | Defective constant voltage circuit | IC601, Q608, Q609, C629 ~ C631 |
| Loudness contour switch does not work at all | | Volume control is in over revolution | Normal |
| | | Defective loudness switch or circuit | SW205, C201 ~ C204, R201 ~ R204 |
| Control does not work | Bass control | Defective VR203A (B) or circuit | |
| | Treble control | Defective VR204A (B) or circuit | |
| | Balance control | Defective VR202A (B) or circuit | |
| | Volume control | Defective VR201A (B) or circuit | |

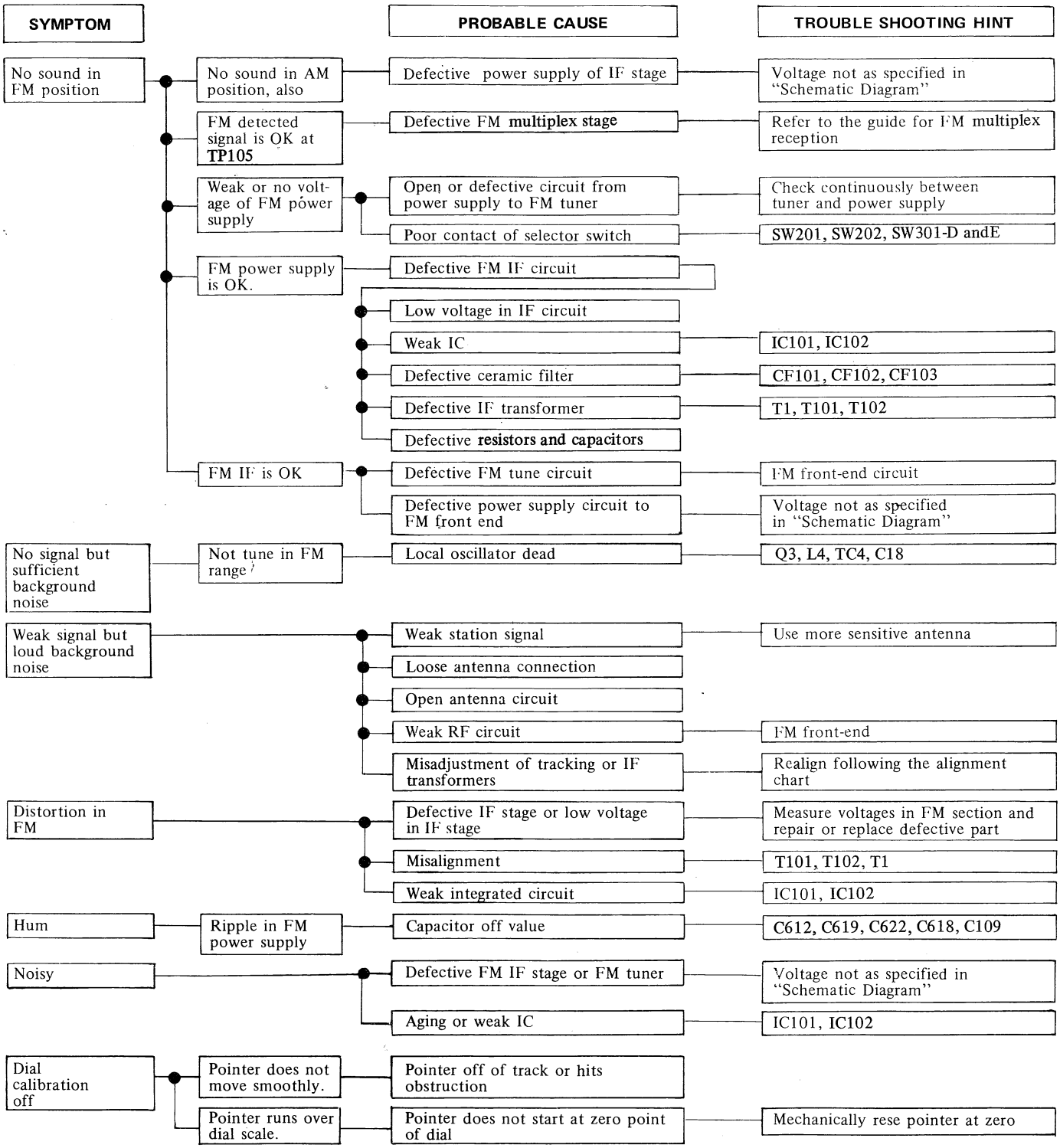
# TROUBLE SHOOTING GUIDE

## AM RECEPTION



# TROUBLE SHOOTING GUIDE

## FM RECEPTION



# TROUBLE SHOOTING GUIDE

## FM MULTIPLEX RECEPTION

| SYMPTOM | | PROBABLE CAUSE | TROUBLE SHOOTING HINT |
|---|---|---|---|
| No stereo separation | Stereo light operates normally. | Components in one channel physically touching parts for other channel in tone circuit, main amp. or multiplex circuit | SW301-C and E, SW201, SW202, SW204, SW602, SW603, SW601 |
| | Stereo light does not light when receiving stereo signal. | Aging or weak IC | IC102 |
| | | Aging or weak semi-fixed resistor | VR103 |
| | | Defective resistors and capacitors | |
| Distortion | | Weak or Defective IC | IC102 |
| Poor separation | Stereo light does not operate. | Defective IC | IC102 |
| | Stereo light operates normally. | Drift of VCO frequency | Realign following the alignment chart VR102 |
| Stereo light does not operate | Multiplex amplifier checks OK | Defective indicator lamp | D801 |
| | | Defective power circuit to stereo light | R139 |

## USING WITH EXTERNAL INPUTS OR OUTPUTS (TAPE, ETC.)

| SYMPTOM | | PROBABLE CAUSE | TROUBLE SHOOTING HINT |
|---|---|---|---|
| No sound | Unit operates properly on AM or FM | Input source defective | Switch input sources to check |
| | | Loose contacts of input socket | SO701, SO702 |
| | | Broken lead between printed wiring board and terminals | Check and repair |
| Tape play does not work | Amplifier is OK | Tape recorder defective | |
| | | Loose contacts of output socket | SO701 |

## OTHER TROUBLES

| | | | |
|---|---|---|---|
| Signal meter does not operate | At FM and AM | Meter open | |
| | | Weak or defective IC and diodes | IC102, IC301, D101, SW301-C |
| | At only AM | Defective AM circuit | Refer to AM reception |
| Tuning meter does not operate | At FM | Meter open | |
| | | Weak or defective IC | IC101, SW301-C |
| Air check circuit does not operate<br>The air check circuit does not function. | At FM | Defective air check/multipath switch | SW301-E |
| | | Defective air check oscillator circuit | Q301, R314, R315, R316, C322, C323, C324, C325 |

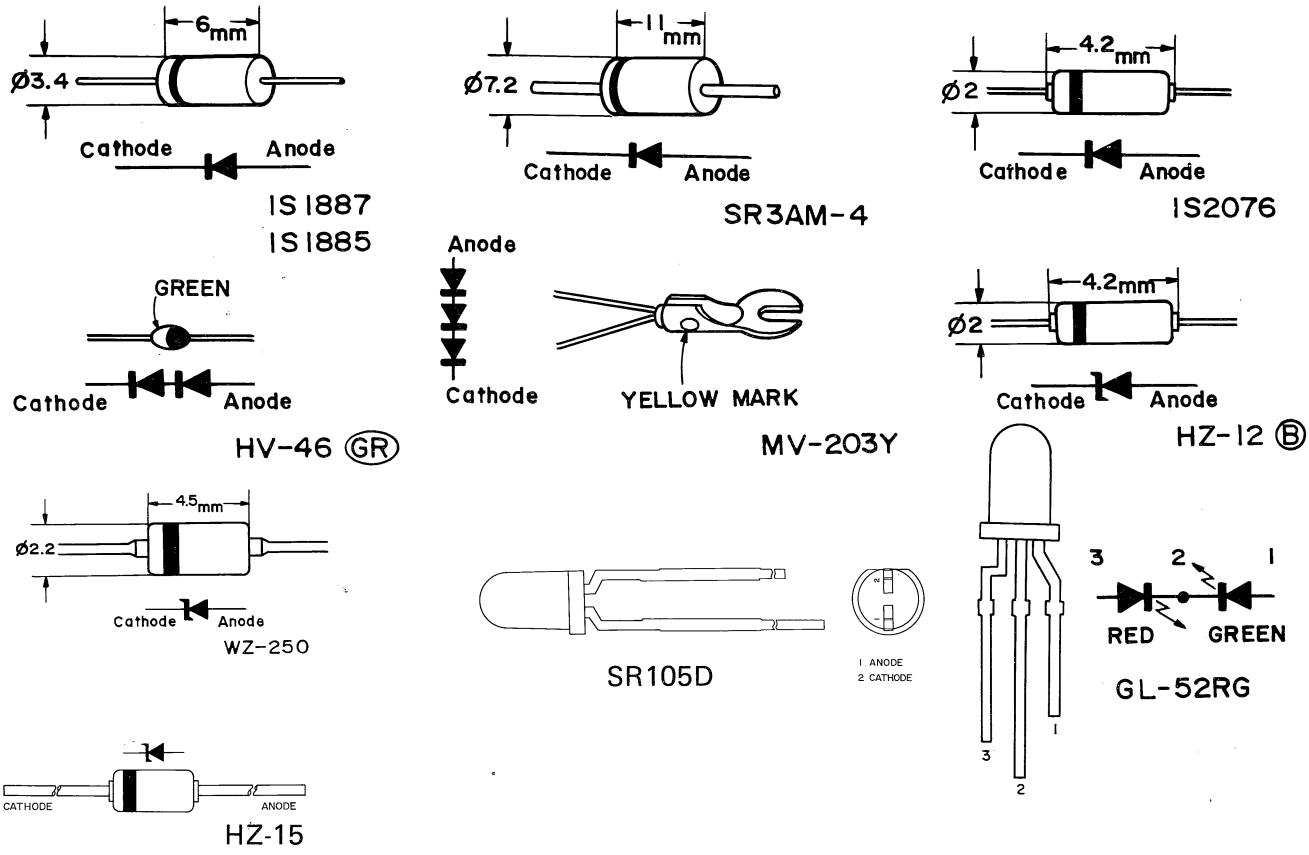
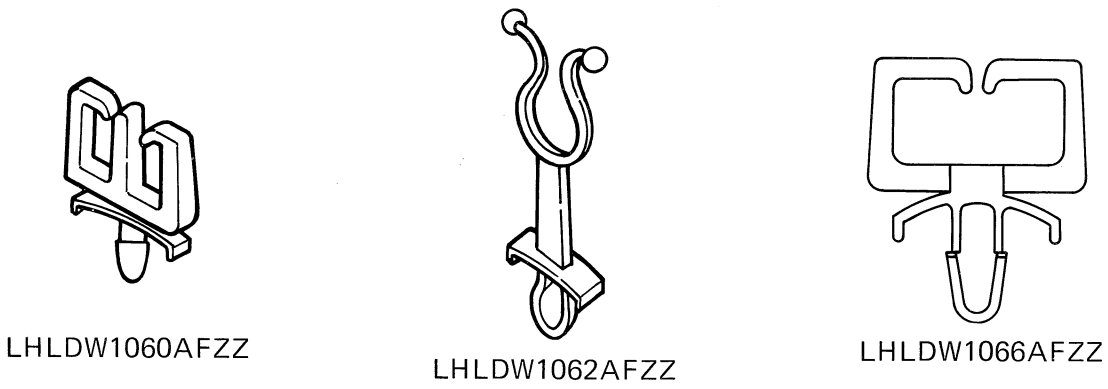


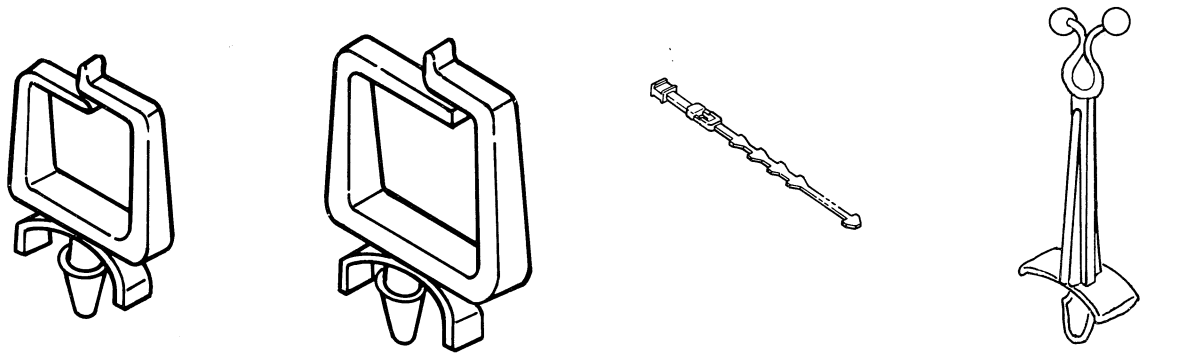

Figure 46 DIODE TYPES



LHLDW1060AFZZ

LHLDW1062AFZZ

LHLDW1066AFZZ



LHLDW1050AFZZ

LHLDW1051AFZZ

LHLDW1052AFZZ

LHLDW1053AFZZ

Figure 47 WIRE CLIP

# REPLACEMENT PARTS LIST

"HOW TO ORDER REPLACEMENT PARTS"

To have your order filled promptly and correctly, please furnish the following informations.

1. MODEL NUMBER
2. REF. NO.
3. PART NO.
4. DESCRIPTION

| REF. NO. | PART NO. | DESCRIPTION | CODE |
|---|---|---|---|
| | **INTEGRATED CIRCUITS** | | |
| IC101 | RH-IX1005AFZZ | FM IF Amplifier and Detector (Quadrature) (HA1137W) | AT |
| IC102 | RH-IX1053AFZZ | P.L.L. Multiplex Stereo Demodulator (HA1196) | AP |
| IC201, IC202 | RH-IX1006AFZZ | Tone Amplifier (TA7136P) | AH |
| IC301 | RH-IX1004AFZZ | AM RF/IF Amplifier and Detector (HA1138) | AS |
| IC601 | RH-IX1006AFZZ | Voltage Regulator, Equalizer Circuit (TA7136P) | AH |
| | **TRANSISTORS** | | |
| Q101 | VS2SC460-B/-1 | FM IF Amplifier (2SC460 Ⓑ) | AE |
| Q102 | VS2SC460-B/-1 | FM IF Amplifier (2SC460 Ⓑ) | AE |
| Q103 | VS2SC458-C/-1 | FM Muting Amplifier (2SC458 Ⓒ) | AE |
| Q301 | VS2SC458-C/-1 | Air Check Oscillation (2SC458 Ⓒ) | AE |
| Q302 | VS2SC458-D/-1 | Muting (2SC458 Ⓓ) | AE |
| Q303 | VS2SC458-D/-1 | Muting (2SC458 Ⓓ) | AE |
| Q401, Q402 | VS2SK68A///1F | FET, Equalizer Amplifier (2SK68A) | AF |
| Q403, Q404 | VS2SK68A///1F | FET, Equalizer Amplifier (2SK68A) | AF |
| Q405, Q406 | VS2SK79////1F | V-FET, Equalizer Amplifier (2SK79) | AM |
| Q501, Q502 | VS2SA798-G/-1 | Dual Transistor, Differential Amplifier (2SA798 Ⓖ) | AF |
| Q503, Q504 | VS2SA561-Y/-1 | Constant Current Circuit (2SA561 Ⓨ) | AF |
| Q505, Q506 | VS2SA818-Y/-1 | Constant Current Circuit (2SA818 Ⓨ) | AH |
| Q507, Q508 | VS2SC1628-Y-1 | Audio Amplifier, Class "A" (2SC1628 Ⓨ) | AH |
| Q509, Q510 | VS2SC1624-O-1 | Drive Amplifier (2SC1624 Ⓞ) | |
| Q511, Q512 | VS2SA814-O/-1 | Drive Amplifier (2SA814 Ⓞ) | |
| Q513, Q514 | VS2SD425-O/-1 | Power Amplifier (2SD425 Ⓞ) | |
| Q515, Q516 | VS2SB555-O/-1 | Power Amplifier (2SB555 Ⓞ) | |
| Q517, Q518 | VS2SA561-Y/-1 | Voltage Detector, Protection Circuit (2SA561 Ⓨ) | AF |
| Q601 | VS2SC458-D/-1 | Protection Circuit, Voltage Detector (2SC458 Ⓓ) | AE |
| Q602 | VS2SC458-D/-1 | Protection Circuit, Voltage Detector (2SC458 Ⓓ) | AE |
| Q603 | VS2SC458-D/-1 | Protection Circuit, Switching (2SC458 Ⓓ) | AE |
| Q604 | VS2SC458-D/-1 | Protection Circuit, Switching (2SC458 Ⓓ) | AE |
| Q605 | VS2SA562-Y/-1 | Voltage Regulator, Ripple Filter (2SA562 Ⓨ) | AF |
| Q606 | VS2SC735-Y/-1 | Voltage Regulator Ripple Filter (2SC735 Ⓨ) | AF |
| Q607 | VS2SD235-Y/-1 | Voltage Regulator, Ripple Filter (2SD235 Ⓨ) | AG |
| Q608 | VS2SC1628-Y-1 | Voltage Regulator, Equalizer Circuit (2SC1628 Ⓨ) | AH |
| Q609 | VS2SC1669-O-1 | Voltage Regulator, Equalizer Circuit (2SC1669 Ⓞ) | AL |
| | **DIODES** | | |
| D101 | VHD1S2076//-1 | Signal Meter (1S2076) | AB |
| D102 | VHD1S2076//-1 | Voltage Detector (1S2076) | AB |
| D103 | VHD1S2076//-1 | FM Muting (1S2076) | AB |
| D104 | VHD1S2076//-1 | FM Muting (1S2076) | AB |
| D105 | VHD1S2076//-1 | FM Muting (1S2076) | AB |
| D106 | VHD1S2076//-1 | V.C.O. Stop (1S2076) | AB |
| D301 | VHD1S2076//-1 | Overload (1S2076) | AB |
| D302 | VHD1S2076//-1 | Overload (1S2076) | AB |
| D501, D502 | VHVHV46-G//-1 | Varistor, Bias Stabilizer (HV-46 Ⓖⓡ) | AD |
| D503, D504 | VHVMV203Y//-1 | Varistor, Bias Circuit (Idle Current) (MV-203 Ⓨ) | AD |
| D505, D506 | VHD1S2076//-1 | Voltage Detector (1S2076) | AB |
| D507, D508, D509, D510, D511, D512, D513, D514 | VHDSR3AM-4/-1 | Power Rectifier, Main Amplifier (SR3AM-4) | AF |
| D601 | VHD1S2076//-1 | Voltage Detector, Protection Circuit (1S2076) | AB |
| D602 | VHD1S2076//-1 | Rectifier (1S2076) | AB |
| D603 | VHD1S2076//-1 | Surge Current Provention (1S2076) | AB |
| D604, D605, D606, D607 | VHD1S1885//-1 | Power Rectifier (1S1885) | AC |
| D608 | VHD1S2076//-1 | Voltage Detector (1S2076) | AB |
| D609, D610, D611, D612 | VHD1S1887//-1 | Power Rectifier, Equalizer Circuit (1S1887) | AC |
| D613 | VHD1S2076//-1 | Noise Prevention (1S2076) | AB |
| D614 | VHD1S2076//-1 | Noise Prevention (1S2076) | AB |

# PARTS LIST

| REF. NO. | PART NO. | DESCRIPTION | CODE |
|---|---|---|---|
| ZD601 | VHEHZ15////-1 | Zener Diode, Voltage Regulator (13.9 ~ 15.6V) (HZ-15) | AC |
| ZD602 | VHEHZ15////-1 | Zener Diode, Voltage Regulator (13.9 ~ 15.6V) (HZ-15) | AC |
| ZD603 | VHEHZ12-BBK-1 | Zener Diode, Voltage Regulator (12.7 ~ 13.5V) (HZ-12 Ⓑ) | AD |
| ZD604 | VHEWZ250///-1 | Zener Diode, Voltage Regulator (23.8 ~ 26.2V) (WZ-250) | AD |
| D801 | VHPSR105D//-1 | Light Emitting Diode, Stereo Indicator (SR105D) | AD |
| D802 | VHPGL-52RG/1F | Light Emitting Diode, Power Source/Circuit Protection Indicator (GL-52RG) | AH |
| | | **COILS** | |
| L101 | VP-LH100M0000 | 10μH, +B Choke | AB |
| L102 | VP-LH100M0000 | 10μH, +B Choke | |
| L103 | VP-LH1R0M0000 | 1μH, Phase Compensation | |
| L104 | RCILZ0052AFZZ | 18μH, Phase Shifter | |
| L105 | VP-LH100M0000 | 10μH, +B Choke | |
| L301 | RCILB0395AFZZ | MW Oscillator | AD |
| L302 | RCILB0411AFZZ | LW Oscillator | AD |
| L303 | RCILI0209AFZZ | AM IF with Ceramic Filter | AH |
| L304 | VP-LH1R0M0000 | 1μH, Choke | AB |
| L305 | VP-LH1R0M0000 | 1μH, Choke | AB |
| L501, L502 | RCILZ0050AFZZ | .8μH, Oscillation Prevention | AC |
| L601, L602, L603 | VP-LH100M0000 | 10μH, Choke | AB |
| L801 | RCILA0231AFZZ | Balun (Antenna Matching) | AC |
| L802-A, B | RCILA0403AFZZ | LW/MW Bar Antenna | AS |
| | | **TRANSFORMERS** | |
| T101 | RCILD0053AFZZ | Quadrature (10.7MHz) | AE |
| T102 | RCILD0054AFZZ | Quadrature (10.7MHz) | AE |
| T801, CNS801 | RTRNP0474AFZZ | Power with Connecting Socket | BR |
| | | **FILTERS** | |
| CF101, CF102, CF103 | RFILF0001AGZZ | FM IF, Ceramic | AF |
| LPF101, LPF102 | RFILL0050AFZZ | Low Pass Filter | AK |
| | | **CONTROLS** | |
| TC301, TC302 | RTO-H2033AGZZ | Trimmer Capacitors<br>TC301: MW Antenna Trimmer<br>TC302: LW Antenna Trimmer | AD |
| TC303, TC304 | RTO-H2051AFZZ | Trimmer Capacitors<br>TC303: MW Oscillator Trimmer<br>TC304: LW Oscillator Trimmer | AE |
| VR101 | RVR-M0140AFZZ | 470(B) ohm, FM Muting Level Adjust | AD |
| VR102 | RVR-M0078AGZZ | 10K(B) ohm, V.C.O. Frequency Adjust | AF |
| VR103 | RVR-M0145AFZZ | 220K(B) ohm, Stereo Seperation Adjust | AD |
| VR201-A, B | RVR-B0148AFZZ | 100K ohm, Volume Control | AM |
| VR202-A, B | RVR-G0052AFZZ | 100K ohm, Balance Control | AK |
| VR203-A, B | RVR-C0066AFZZ | 100K ohm, Bass Control | AL |
| VR204-A, B | RVR-C0066AFZZ | 100K ohm, Treble Control | AL |
| VR301 | RVR-M0126AFZZ | 5K(B) ohm, Air Check Level Adjust | AC |
| VR401, VR402 | RVR-M0065AGZZ | 4.7K(B) ohm, Equalizer Circuit | AF |
| VR501, VR502 | RVR-M0139AFZZ | 330(B) ohm, Idle Current Adjust | AD |
| | | **ELECTROLYTIC CAPACITORS** | |
| C109 | VCEAAU1CW107Y | 100μF, 16V, +50 −10% | AC |
| C115 | VCEAAU1HW105A | 1μF, 50V, +75 −10% | AB |
| C116 | VCEAAU1HW105A | 1μF, 50V, +75 −10% | AB |
| C119 | VCAAAU1AB335M | 3.3μF, 10V, ±20%, Aluminum | AD |
| C121 | VCEAAU1CW107Y | 100μF, 16V, +50 −10% | AC |
| C123 | VCAAAU1EB224K | .22μF, 25V, ±10%, Aluminum | AC |
| C124 | VCAAAU1AB335M | 3.3μF, 10V, ±20%, Aluminum | AD |
| C125 | VCAAAU1EB155K | 1.5μF, 25V, ±10%, Aluminum | AC |
| C127 | VCEAAU1CW106Y | 10μF, 16V, +50 −10% | AB |
| C128 | VCEAAU1CW106Y | 10μF, 16V, +50 −10% | AB |
| C131, C132 | VCEAAU1CW106Y | 10μF, 16V, +50 −10% | AB |
| C133 | VCEAAU1AW227Y | 220μF, 10V, +50 −10% | AC |
| C205, C206 | VCEALU1EC335A | 3.3μF, 25V, +75 −10%, LR (Orange) | AC |
| C207, C208 | VCAAAU1AB224M | .22μF, 10V, ±20%, Aluminum | AC |
| C217, C218 | VCEALU1AC336Y | 33μF, 10V, +50 −10%, LR (Orange) | AC |
| C223, C224 | VCEALU1HC105A | 1μF, 50V, +75 −10%, LR (Orange) | AC |
| C229, C230 | VCEAAU1CW107Y | 100μF, 16V, +50 −10% | AC |
| C309 | VCEAAU1CW476Y | 47μF, 16V +50 −10% | AB |
| C310 | VCEAAU1AW227Y | 220μF, 10V, +50 −10% | AC |
| C315 | VCEALU1HW224M | .22μF, 50V, ±20%, LL (Yellow) | AB |
| C318 | VCEAAU1CW476Y | 47μF, 16V, +50 −10% | AB |
| C319 | VCEAAU1EW475A | 4.7μF, 25V, +75 −10% | AB |
| C321 | VCEAAU1CW107Y | 100μF, 16V, +50 −10% | AC |
| C326 | VCEAAU1AW336Y | 33μF, 10V, +50 −10% | AB |
| C327 | VCEAAU1HW105A | 1μF, 50V, +75 −10% | AB |
| C328 | VCEAAU1CW106Y | 10μF, 16V, +50 −10% | AB |
| C329 | VCEAAU1HW105A | 1μF, 50V, +75 −10% | AB |
| C405, C406 | VCEAAU1AW227Y | 220μF, 10V, +50 −10% | AC |
| C407 | VCEAAU1HW227Y | 220μF, 50V, +50 −10% | AD |
| C411, C412 | VCEAAU1CW107Y | 100μF, 16V, +50 −10% | AC |
| C417, C418 | VCEALU2AC335A | 3.3μF, 100V, +75 −10%, LR (Orange) | AD |
| C419, C420 | VCEALU1EC335A | 3.3μF, 25V +75 −10%, LR (Orange) | AC |

# PARTS LIST

| REF. NO. | PART NO. | DESCRIPTION | CODE |
|---|---|---|---|
| C501, C502 | VCEALU1EC335A | 3.3μF, 25V, +75 −10%, LR (Orange) | AC |
| C505, C506 | VCEAAU1CW476Y | 47μF, 16V, +50 −10% | AB |
| C509, C510 | VCEAAU1HW476Y | 47μF, 50V, +50 −10% | AC |
| C513, C515 | RC-EZ1008AFZZ | 6800μF x 2, 50V, +50 −10% (Dual Capacitor) | AZ |
| C514, C516 | RC-EZ1008AFZZ | 6800μF x 2, 50V, +50 −10% (Dual Capacitor) | AZ |
| C525, C526 | VCEAAU1AW476Y | 47μF, 10V, +50 −10% | AB |
| C527, C528 | VCEAAU1CW106Y | 10μF, 16V, +50 −10% | AB |
| C529 | VCEAAU1HW105A | 1μF, 50V, +75 −10% | AB |
| C601 | VCEAAU1CW106Y | 10μF, 16V, +50 −10% | AB |
| C602 | VCEAAU1CW106Y | 10μF, 16V, +50 −10% | AB |
| C603 | VCEAAU1CW337Y | 330μF, 16V, +50 −10% | AD |
| C604 | VCEAAU1CW337Y | 330μF, 16V, +50 −10% | AD |
| C605 | VCEAAU1CW476Y | 47μF, 16V +50 −10% | AB |
| C607 | VCEAAU1HW476Y | 47μF, 50V, +50 −10% | AC |
| C612 | VCEAAU1EW228Y | 2200μF, 25V, +50 −10% | AH |
| C613 | VCEAAU1EW228Y | 2200μF, 25V, +50 −10% | AH |
| C614 | VCEAAU1EW227Y | 220μF, 25V, +50 −10% | AC |
| C615 | VCEAAU1CW227Y | 220μF, 16V, +50 −10% | AC |
| C616 | VCEAAU1EW227Y | 220μF, 25V, +50 −10% | AC |
| C617 | VCEAAU1CW227Y | 220μF, 16V, +50 −10% | AC |
| C618 | VCEAAU1EW227Y | 220μF, 25V, +50 −10% | AC |
| C619 | VCEAAU1CW227Y | 220μF, 16V, +50 −10% | AC |
| C620 | VCEAAU1CW476Y | 47μF, 16V, +50 −10% | AB |
| C621 | VCEAAU1CW476Y | 47μF, 16V, +50 −10% | AB |
| C622 | VCEAAU1CW476Y | 47μF, 16V, +50 −10% | AB |
| C626 | VCEAAU1HW336Y | 33μF, 50V, +50 −10% | AC |
| C627 | VCEAAU1HW475A | 4.7μF, 50V, +75 −10% | AB |
| C629 | VCEAAU2AW106Y | 10μF, 100V, +50 −10% | AC |
| C630 | VCEAAU2AW107Y | 100μF, 100V, +50 −10% | AF |
| C631 | VCEAAU2AW107Y | 100μF, 100V, +50 −10% | AF |
| C636, C637 | VCEALU1HW105M | 1μF, 50V, ±20%, LL (Yellow) | AD |
| C638 | VCEAAU1EW106Y | 10μF, 25V, +50 −10% | AB |
| C639 | VCEAAU1EW106Y | 10μF, 25V, +50 −10% | AB |

## CAPACITORS

Unless otherwise specified capacitors are 50V, +80 −20%, Ceramic Type

| | | | |
|---|---|---|---|
| C101 | VCKZPU1HF102Z | .001μF | AA |
| C102 | VCKZPU1HF223Z | .022μF | AA |
| C103 | VCKZPU1HF223Z | .022μF | AA |
| C104 | VCKZPU1HF223Z | .022μF | AA |
| C105 | VCKZPU1HF223Z | .022μF | AA |
| C106 | VCKZPU1HF223Z | .022μF | AA |
| C107 | VCKZPU1HF223Z | .022μF | AA |
| C108 | VCKZPU1HF223Z | .022μF | AA |
| C110 | VCKZPU1HF223Z | .022μF | AA |
| C111 | VCKZPU1ND474M | .47μF, 12V, ±20%, Ceramic | AD |
| C112 | VCKZPU1HF223Z | .022μF | AA |
| C113 | VCKZPU1HF223Z | .022μF | AA |
| C114 | VCKZPU1HF223Z | .022μF | AA |
| C117 | VCKZPU1HF223Z | .022μF | AA |
| C118 | VCKZPU1HF223Z | .022μF | AA |
| C120 | VCCSPU1HL331K | 330pF, 50V, ±10%, Ceramic | AB |
| C122 | VCQYKU1HM473K | .047μF, 50V, ±10%, Mylar | AC |
| C126 | VCQSMT1HS391K | 390pF, 50V, ±10%, Styrol | AB |
| C129 | VCQSMT1HS122J | 1200pF, 50V, ±5%, Styrol | AB |
| C130 | VCQSMT1HS122J | 1200pF, 50V, ±5%, Styrol | AB |
| C134 | VCKZPU1HF223Z | .022μF | AA |
| C135 | VCCSPU1HL511J | 510pF, 50V, ±5%, Ceramic | AA |
| C201, C202 | VCCSPU1HL271K | 270pF, 50V, ±10%, Ceramic | AB |
| C203, C204 | VCQYKU1HM683J | .068μF, 50V, ±5%, Mylar | AC |
| C209, C210 | VCCSPU1HL120K | 12pF, 50V, ±10%, Ceramic | AA |
| C211, C212 | VCCSPU1HL5R0C | 5pF, 50V, ±0.25pF, Ceramic | AA |
| C213, C214 | VCCSPU1HL560K | 56pF, 50V, ±10%, Ceramic | AA |
| C215, C216 | VCCSPU1HL471K | 470pF, 50V, ±10%, Ceramic | AB |
| C219, C220 | VCQYKU1HM223J | .022μF, 50V, ±5%, Mylar | AB |
| C221, C222 | VCQYKU1HM124J | .12μF, 50V, ±5%, Mylar | AE |
| C225, C226 | VCQYKU1HM222J | .0022μF, 50V, ±5%, Mylar | AB |
| C227, C228 | VCQYKU1HM103J | .01μF, 50V, ±5%, Mylar | AB |
| C301 | VCQSMT1HS331J | 330pF, 50V, ±5%, Styrol | AB |
| C302 | VCCUPU1HJ150K | 15pF (UJ), 50V, ±10%, Ceramic | AB |
| C303 | VCQSMT1HS121J | 120pF, 50V, ±5%, Styrol | AB |
| C304 | VCCCPU1HH470J | 47pF(CH), 50V, ±5%, Ceramic | AB |
| C306 | VCKZPU1HF103P | .01μF, 50V, +100 −0%, Ceramic | AE |
| C307 | VCKZPU1HF103P | .01μF, 50V, +100 −0%, Ceramic | AE |
| C308 | VCCSPU1HL221K | 220pF, 50V, ±10%, Ceramic | AB |
| C311 | VCCSPU1HL470K | 47pF, 50V, ±10%, Ceramic | AA |
| C312 | VCQYKU1HM473K | .047μF, 50V, ±10%, Mylar | AC |
| C313 | VCKZPU1HF473Z | .047μF | AB |
| C314 | VCKZPU1HF473Z | .047μF | AB |
| C316 | VCQYKU1HM223K | .022μF, 50V, ±10%, Mylar | AB |
| C317 | VCQYKU1HM103K | .01μF, 50V, ±10%, Mylar | AB |
| C320 | VCKZPU1HF473Z | .047μF | AB |
| C322, C323, C324, C325 | VCQYKU1HM223J | .022μF, 50V, ±5%, Mylar | AB |
| C401, C402 | VCCSPU1HL101K | 100pF, 50V, ±10%, Ceramic | AA |
| C403, C404 | VCKZPU1HF102Z | .001μF | AA |
| C409, C410 | VCCSPU1HL220K | 22pF, 50V, ±10%, Ceramic | AA |
| C413, C414 | VCQSMU1HD562G | 5600pF, 50V, ±2%, Styrol | AD |
| C415, C416 | VCQSMU1HD162G | 1600pF, 50V, ±2%, Styrol | AD |
| C421 | VCKZPU2TE103Z | .01μF, 150VAC, +80 −20%, Ceramic | AB |
| C503, C504 | VCCSPU1HL391K | 390pF, 50V, ±10%, Ceramic | AB |
| C507, C508 | VCCSPU1HL330K | 33pF, 50V, ±10%, Ceramic | AA |
| C511, C512 | VCQYKU1HM104K | .1μF, 50V, ±10%, Mylar | AC |
| C517, C518, C519, C520 | VCKZPU2TE103Z | .01μF, 150VAC, +80 −20%, Ceramic | AB |

# PARTS LIST

| REF. NO. | PART NO. | DESCRIPTION | CODE |
|---|---|---|---|
| C521, C522, C523, C524 | VCKZPU2TE103Z | .01μF, 150VAC, +80 −20%, Ceramic | AB |
| C606 | VCKZPU1HF223Z | .022μF | AA |
| C608, C609, C610, C611 | VCKZPU1HF223Z | .022μF | AA |
| C623, C624, C625 | VCKZPU1HF223Z | .022μF | AA |
| C632, C633, C634, C635 | VCKZPU2TE103Z | .01μF, 150VAC, +80 −20%, Ceramic | AB |
| C801, C802 | VCKZPU1HF223Z | .022μF | AA |
| C803, C804 | RC-PZ061CAFZZ | .05μF, 250VAC, ±20%, Oil | AF |

## RESISTORS

Unless otherwise specified resistors are 1/4W, ±5%, Carbon Type.

| | | | |
|---|---|---|---|
| R101 | VRD-ST2EE101J | 100 ohm | AA |
| R102 | VRD-ST2EE473J | 47K ohm | AA |
| R103 | VRD-ST2EE123J | 12K ohm | AA |
| R104 | VRD-ST2EE102J | 1K ohm | AA |
| R105 | VRD-ST2EE391J | 390 ohm | AA |
| R106 | VRD-ST2EE181J | 180 ohm | AA |
| R107 | VRD-ST2EE101J | 100 ohm | AA |
| R108 | VRD-ST2EE101J | 100 ohm | AA |
| R109 | VRD-ST2EE471J | 470 ohm | AA |
| R110 | VRD-ST2EE333J | 33K ohm | AA |
| R111 | VRD-ST2EE103J | 10K ohm | AA |
| R112 | VRD-ST2EE561J | 560 ohm | AA |
| R113 | VRD-ST2EE102J | 1K ohm | AA |
| R114 | VRD-ST2EE391J | 390 ohm | AA |
| R115 | VRD-ST2EE181J | 180 ohm | AA |
| R116 | VRD-ST2EE181J | 180 ohm | AA |
| R117 | VRD-ST2EE271J | 270 ohm | AA |
| R118 | VRD-ST2EE104J | 100K ohm | AA |
| R119 | VRD-ST2EE562J | 5.6K ohm | AA |
| R120 | VRD-ST2EE152J | 1.5K ohm | AA |
| R121 | VRD-ST2EE822J | 8.2K ohm | AA |
| R122 | VRD-ST2EE221J | 220 ohm | AA |
| R123 | VRD-ST2EE154J | 150K ohm | AA |
| R124 | VRD-ST2EE333J | 33K ohm | AA |
| R125 | VRD-ST2EE333J | 33K ohm | AA |
| R126 | VRD-ST2EE123J | 12K ohm | AA |
| R127 | VRD-ST2EE562J | 5.6K ohm | AA |
| R128 | VRD-ST2EE223J | 22K ohm | AA |
| R129 | VRD-ST2EE332J | 3.3K ohm | AA |
| R130 | VRD-ST2EE333J | 33K ohm | AA |
| R131 | VRD-ST2EE333J | 33K ohm | AA |
| R132 | VRD-ST2EE563J | 56K ohm | AA |
| R133 | VRD-ST2EE104J | 100K ohm | AA |
| R134 | VRD-ST2EE225J | 2.2 Meg ohm | AA |
| R135 | VRD-ST2EE223J | 22K ohm | AA |
| R136 | VRD-ST2EE102J | 1K ohm | AA |
| R137 | VRD-ST2EE223J | 22K ohm | AA |
| R138 | VRD-ST2EE223J | 22K ohm | AA |
| R139 | VRD-ST2HD561J | 560 ohm, 1/2W, ±5%, Carbon | AA |
| R140 | VRD-ST2EE333J | 33K ohm | AA |
| R141, R142 | VRD-ST2EE682J | 6.8K ohm | AA |
| R143, R144 | VRD-ST2EE473J | 47K ohm | AA |
| R145, R146 | VRD-ST2EE272J | 2.7K ohm | AA |
| R147, R148 | VRD-ST2EE392J | 3.9K ohm | AA |
| R149, R150 | VRD-ST2EE222J | 2.2K ohm | AA |
| R151 | VRD-ST2EE333J | 33K ohm | AA |
| R152 | VRD-ST2EE101J | 100 ohm | AA |
| R153 | VRD-ST2EE474J | 470K ohm | AA |
| R154 | VRD-ST2EE223J | 22K ohm | AA |
| R155 | VRD-ST2EE334J | 330K ohm | AA |
| R156 | VRD-ST2EE473J | 47K ohm | AA |
| R157 | VRD-ST2EE473J | 47K ohm | AA |
| R201, R202 | VRD-ST2EE333J | 33K ohm | AA |
| R203, R204 | VRD-ST2EE103J | 10K ohm | AA |
| R205, R206 | VRD-ST2EE474J | 470K ohm | AA |
| R207, R208 | VRD-ST2EE563J | 56K ohm | AA |
| R209, R210 | VRD-ST2EE104J | 100K ohm | AA |
| R211, R212 | VRD-ST2EE471J | 470 ohm | AA |
| R213, R214 | VRD-ST2EE102J | 1K ohm | AA |
| R215, R216 | VRD-ST2EE183J | 18K ohm | AA |
| R217, R218 | VRD-ST2EE332J | 3.3K ohm | AA |
| R219, R220 | VRD-ST2EE332J | 3.3K ohm | AA |
| R221, R222 | VRD-ST2EE562J | 5.6K ohm | AA |
| R223, R224 | VRD-ST2EE122J | 1.2K ohm | AA |
| R225, R226 | VRD-ST2HD221J | 220 ohm, 1/2W, ±5%, Carbon | AA |
| R227, R228 | VRD-ST2EE224J | 220K ohm | AA |
| R301 | VRD-ST2EE681J | 680 ohm | AA |
| R302 | VRD-ST2EE102J | 1K ohm | AA |
| R303 | VRD-ST2EE332J | 3.3K ohm | AA |
| R304 | VRD-ST2EE222J | 2.2K ohm | AA |
| R305 | VRD-ST2EE183J | 18K ohm | AA |
| R306 | VRD-ST2EE822J | 8.2K ohm | AA |
| R307 | VRD-ST2EE562J | 5.6K ohm | AA |
| R308 | VRD-ST2EE393J | 39K ohm | AA |
| R309 | VRD-ST2EE101J | 100 ohm | AA |
| R310 | VRD-ST2EE470J | 47 ohm | AA |
| R311 | VRD-ST2EE101J | 100 ohm | AA |
| R312 | VRD-ST2EE823J | 82K ohm | AA |
| R313 | VRD-ST2EE103J | 10K ohm | AA |
| R314 | VRD-ST2EE223J | 22K ohm | AA |
| R315 | VRD-ST2EE103J | 10K ohm | AA |
| R316 | VRD-ST2EE103J | 10K ohm | AA |
| R317 | VRD-ST2EE223J | 22K ohm | AA |
| R318 | VRD-ST2EE151J | 150 ohm | AA |
| R319 | VRD-ST2EE332J | 3.3K ohm | AA |
| R320 | VRD-ST2EE123J | 12K ohm | AA |

# PARTS LIST

| REF. NO. | PART NO. | DESCRIPTION | CODE |
|---|---|---|---|
| R321 | VRD-ST2EE122J | 1.2K ohm | AA |
| R322 | VRD-ST2EE473J | 47K ohm | AA |
| R324 | VRD-ST2EE822J | 8.2 K ohm | AA |
| R325 | VRD-ST2EE103J | 10K ohm | AA |
| R326 | VRD-ST2EE103J | 10K ohm | AA |
| R401, R402 | VRD-ST2EE471J | 470 ohm | AA |
| R403, R404 | VRD-ST2EE473J | 47K ohm | AA |
| R405, R406 | VRD-ST2EE332J | 3.3K ohm | AA |
| R407, R408 | VRD-ST2EE102J | 1K ohm | AA |
| R409, R410 | VRD-ST2EE103J | 10K ohm | AA |
| R411, R412 | VRD-ST2HD103J | 10K ohm, 1/2W, ±5%, Carbon | AA |
| R413, R414 | VRD-ST2EE624J | 620K ohm | AA |
| R415, R416 | VRD-ST2EE473J | 47K ohm | AA |
| R417, R418 | VRD-ST2EE104J | 100K ohm | AA |
| R419, R420 | VRD-ST2EE224J | 220K ohm | AA |
| R421, R422 | VRD-ST2EE102J | 1K ohm | AA |
| R423, R424 | VRD-ST2EE222J | 2.2K ohm | AA |
| R501, R502 | VRD-ST2EE564J | 560K ohm | AA |
| R503, R504 | VRD-ST2EE821J | 820 ohm | AA |
| R505, R506 | VRD-ST2EE223J | 22K ohm | AA |
| R507, R508 | VRD-ST2EE331J | 330 ohm | AA |
| R509, R510 | VRD-ST2EE681J | 680 ohm | AA |
| R511, R512 | VRD-ST2EE102J | 1K ohm | AA |
| R513, R514 | VRD-ST2EE563J | 56K ohm | AA |
| R515, R516 | VRD-ST2EE223J | 22K ohm | AA |
| R517, R518 | VRG-ST2EA680J | 68 ohm, 1/4W, Fusible | AB |
| R519, R520 | VRG-ST2EA101J | 100 ohm, 1/4W, Fusible | AB |
| R521, R522 | VRG-ST2EA4R7J | 4.7 ohm, 1/4W, Fusible | AB |
| R523, R524 | VRG-ST2EA101J | 100 ohm, 1/4W, Fusible | AB |
| R525, R526 | VRG-ST2EA101J | 100 ohm, 1/4W, Fusible | AB |
| R527, R528 | VRG-ST2EA4R7J | 4.7 ohm, 1/4W, Fusible | AB |
| R529, R530 | VRD-ST2EE182J | 1.8K ohm | AA |
| R531, R532 | VRW-KT3HDR33K | .33 ohm, 5W, ±10%, Wire Wound | AD |
| R533, R534 | VRW-KT3HDR33K | .33 ohm, 5W, ±10%, Wire Wound | AD |
| R535, R536 | VRD-ST2EE182J | 1.8K ohm | AA |
| R537, R538 | VRD-ST2EE182J | 1.8K ohm | AA |
| R539, R540 | VRD-ST2EE182J | 1.8K ohm | AA |
| R541, R542 | VRD-ST2EE223J | 22K ohm | AA |
| R543, R544 | VRD-ST2EE222J | 2.2K ohm | AA |
| R545, R546 | VRD-ST2EE123J | 12K ohm | AA |
| R547, R548 | VRW-KT3DD2R2K | 2.2 ohm, 2W, ±10%, Wire Wound | AC |
| R549, R550 | VRW-KT3DD100K | 10 ohm, 2W, ±10%, Wire Wound | AC |
| R551, R552 | VRG-ST2HA1R0J | 1 ohm, 1/2W, Fusible | AC |
| R553, R554 | VRG-ST2HA1R0J | 1 ohm, 1/2W, Fusible | AC |
| R555 | VRD-ST2EE332J | 3.3K ohm | AA |
| R557, R558 | VRD-ST2EE392J | 3.9K ohm | AA |
| R559, R560 | VRD-ST2EE472J | 4.7K ohm | AA |
| R601 | VRD-ST2EE153J | 15K ohm | AA |
| R602 | VRD-ST2EE333J | 33K ohm | AA |
| R603 | VRD-ST2EE393J | 39K ohm | AA |
| R604 | VRD-ST2EE392J | 3.9K ohm | AA |
| R605 | VRD-ST2EE682J | 6.8K ohm | AA |
| R606 | VRD-ST2EE682J | 6.8K ohm | AA |
| R607 | VRD-ST2EE470J | 47 ohm | AA |
| R608 | VRD-ST2EE563J | 56K ohm | AA |
| R609 | VRD-ST2EE273J | 27K ohm | AA |
| R610 | VRD-ST2EE121J | 120 ohm | AA |
| R611 | VRD-ST2EE473J | 47K ohm | AA |
| R612 | VRD-ST2EE221J | 220 ohm | AA |
| R613 | VRD-ST2EE223J | 22K ohm | AA |
| R614 | VRD-ST2EE223J | 22K ohm | AA |
| R615 | VRD-ST2EE221J | 220 ohm | AA |
| R616 | VRS-PT3DB681K | 680 ohm, 2W, ±10%, Oxide Film | AB |
| R617 | VRS-PT3AB331K | 330 ohm, 1W, ±10%, Oxide Film | AB |
| R618, R619, R620, R621 | VRS-PT3DB271K | 270 ohm, 2W, ±10%, Oxide Film | AB |
| R622 | VRD-ST2EE102J | 1K ohm | AA |
| R623 | VRD-ST2EE391J | 390 ohm | AA |
| R624 | VRD-ST2EE102J | 1K ohm | AA |
| R625 | VRD-ST2EE391J | 390 ohm | AA |
| R626 | VRD-ST2EE102J | 1K ohm | AA |
| R627 | VRD-ST2EE391J | 390 ohm | AA |
| R628 | VRD-ST2HD472J | 4.7K ohm, 1/2W, ±5%, Carbon | AA |
| R629 | VRD-ST2HD103J | 10K ohm, 1/2W, ±5%, Carbon | AA |
| R630 | VRD-ST2EE153J | 15K ohm | AA |
| R631 | VRD-ST2EE103J | 10K ohm | AA |
| R632 | VRD-ST2EE332J | 3.3K ohm | AA |
| R633 | VRD-ST2EE104J | 100K ohm | AA |
| R634 | VRD-ST2EE334J | 330K ohm | AA |
| R635 | VRD-ST2EE101J | 100 ohm | AA |

# PARTS LIST

| REF. NO. | PART NO. | DESCRIPTION | CODE |
|---|---|---|---|
| R636 | VRD-ST2HD123J | 12K ohm, 1/2W, ±5%, Carbon | AA |
| R638 | VRD-ST2EE332J | 3.3K ohm | AA |
| R639 | VRD-ST2EE121J | 120 ohm | AA |
| R640, R641 | VRD-ST2EE221J | 220 ohm | AA |
| R642, R643 | VRD-ST2EE272J | 2.7K ohm | AA |
| R644, R645 | VRD-ST2EE682J | 6.8K ohm | AA |
| R646, R647 | VRD-ST2EE183J | 18K ohm | AA |
| R648, R649 | VRD-ST2EE222J | 2.2K ohm | AA |
| R650 | VRD-ST2EY822J | 8.2K ohm | AA |
| R701, R702, R703, R704 | VRD-ST2EY102J | 1K ohm | AA |
| R705, R706 | VRD-ST2EY104J | 100K ohm | AA |
| R707, R708 | VRD-ST2EY394J | 390K ohm | AA |
| R709, R710, R711, R712 | VRD-ST2EY102J | 1K ohm | AA |
| R713, R714 | VRD-ST2EY104J | 100K ohm | AA |
| R715, R716 | VRD-ST2EY394J | 390K ohm | AA |

## MISCELLANEOUS

| PART NO. | DESCRIPTION | CODE |
|---|---|---|
| CSPRT0304AF13 | Dial Cord Assembly | — |
| GCAB-5090AFSA | Cabinet | BF |
| GCOVA1070AFSC | Guide (Large), Lever Switch | AD |
| GCOVA1071AFSC | Guide (Small), Lever Switch | AD |
| GFTAU3065AFZZ | Plate, Bottom (Part of LCHSM0257AFZZ) | — |
| GLEGP0002SG00 | Leg | AC |
| HDALM0170AFSA | Dial | AY |
| HPNLC3273AFSA | Front Panel | BG |
| HSSND0230AFSA | Dial Pointer | AF |
| JKNBB0059AFSA | Knob, Tuning Control | AP |
| JKNBM0248AFSA | Knob, LW/MW/FM/FM Muting/Air Check Calibrator | AF |
| JKNBN0334AFSA | Knob, Bass, Treble, Balance | AG |
| JKNBN0333AFSA | Knob, Speakers Selector, Volume Control, Function Selector | AH |
| JKNBP0070AFSA | Knob, Power Switch, Audio Muting Switch, Low Cut Filter Switch, Mode Selector, Loudness Switch, Tape Dubbing Switch, Tape Monitor Switch | AH |
| LANGQ0423AFZZ | Bracket, LW/MW Bar Antenna | AB |
| LANGQ0505AFSA | Rear Panel | AT |
| LANGQ0504AFZZ | Bracket, Dial Lamp P.W. Board (Part of PREFL0061AFZZ) | — |
| LANGR0414AFZZ | Bracket, Front Panel | AP |
| LANGR0413AFZZ | Bracket, Power Transformer | AH |
| LANGT0607AFZZ | Bracket, Dial | AF |
| LANGT0608AFZZ | Bracket, Pulley | AB |
| LANGT0622AFZZ | Bracket, Heat Sink | — |
| LBSHC0002AGZZ | Bushing, LW/MW Bar Antenna Wire | AB |
| LBSHC0004AGZZ | Bushing, Power Supply Cord (SEMKO, KEMA) | AC |
| LBSHC0007AFZZ | Bushing, Power Supply Cord (SEV, A-club) | AB |
| LCHSM0257AFZZ | Chassis Assembly | AW |
| LHLDP3055AFZZ | Holder, Dial Lamp (Part of PREFL0061AFZZ) | — |
| LHLDW1050AFZZ | Wire Clip (Refer to Figure 47) | AA |
| LHLDW1051AFZZ | Wire Clip (Refer to Figure 47) | AA |
| LHLDW1052AFZZ | Wire Clip (Refer to Figure 47) | AA |
| LHLDW1053AFZZ | Wire Clip (Refer to Figure 47) | AB |
| LHLDW1060AFZZ | Wire Clip (Refer to Figure 47) | AA |
| LHLDW1062AFZZ | Wire Clip (Refer to Figure 47) | AA |
| LHLDW1066AFZZ | Wire Clip (Refer to Figure 47) | AA |
| LHLDW9050AFZZ | Wire Holder, AM Antenna Wire | AD |
| LPLTP0053AFZZ | Acryl, Dial Illumination (Part of PREFL0061AFZZ) | — |
| LX-HZ0053AFFD | Flange Head Screw, P.W. Board | AA |
| LX-LZ0055AF00 | Plastics Rivet, FM Tuner Ass'y, 4$\phi$ | AA |
| LX-NZ0001SGFD | Flange Nut, Antenna Terminals | AA |
| LX-NZ0118AFFD | Nut, Speaker Selector Switch Shaft, Function Selector Switch Shaft and Headphone Jacks | AA |
| LX-NZ0119AFFW | Hexagon Head Cap Screw, Speaker Selector Switch and Function Selector Switch | AD |
| LX-NZ0120AFFD | Flange Nut (5$\phi$), Power Transformer | AA |
| MSPRP0152AFZZ | Plate Spring, Grounding (Earth) | AA |
| MSPRT0304AFFJ | Spring, Dial Cord | AA |
| NDRM-0150AFZZ | Drum | AF |
| NPLYB0001SGZZ | Pulley, Dial Cord | AB |
| NPLYC0101AFFD | Shaft, Pulley | AA |
| NSFTD0171AFFW | Tunning Shaft with Flywheel | AN |
| PCOVP1158AFZZ | Cover, Fuse, Rear Panel | AF |
| PRDAR0139AF00 | Heat Sink, Power Transistor | BA |
| PREFL0061AFZZ | Dial Illumination Assembly | BA |
| PSHEF0110AFZZ | Felt (Long), Lever Switch | AA |
| PSHEF0114AF00 | Felt (Short), Power Switch | — |
| PSLDM3126AFZZ | Shield Plate | AA |
| PSPAS0053AFSA | Spacer, Push Knob | AB |
| PSPAS0054AFZZ | Spacer, Headphone Jack | AC |
| PSPAZ0050AFZZ | Insulator, Mica, Power Transistor | AB |
| PSPAZ0060AFZZ | Spacer, LED (D801) | AA |
| PZETF0128AFZZ | Insulator, Fuse P.W. Board | — |
| QACCN0001AGZZ | Power Supply Cord with Plug (SEMKO) | AP |
| QACCS9001SE00 | Power Supply Cord (SEV) | AF |
| QPLGA0205AGZZ | Plug, Power Supply Cord (SEV) | AH |
| QACCV0001AGZZ | Power Supply Cord with Plug (KEMA) | AN |
| QACCZ0002TA0F | Power Supply Cord with Plug (USA type Plug) | AF |
| QACCZ0002AG08 | Power Supply Cord | AF |

# PARTS LIST

| REF. NO. | PART NO. | DESCRIPTION | CODE |
|---|---|---|---|
| | QPLGA0201AGZZ | Plug, Power Supply Cord | AE |
| | QANTW0055AFZZ | FM Indoor Antenna, T-Shape | AH |
| CN201 | QCNCM135LAFZZ | Connecting Plug, 11-Pin | AE |
| CN202 | QCNCM132FAFZZ | Connecting Plug, 6-Pin | AD |
| CN203 | QCNCM132FAFZZ | Connecting Plug, 6-Pin | AD |
| CN301 | QCNCM133GAFZZ | Connecting Plug, 7-Pin | AD |
| CN302 | QCNCM134HAFZZ | Connecting Plug, 8-Pin | AD |
| CNP801 | QCNCW108CAFZZ | Connecting Plug, 2-Pin (Part of PREFL0061AFZZ) | — |
| CNS101 | QCNCW104GAFZZ | Connecting Socket, 7-Pin | AB |
| CNS102 | QCNCW105HAFZZ | Connecting Socket, 8-Pin | AB |
| CNS201 | QCNCW106LAFZZ | Connecting Socket, 11-Pin | AC |
| CNS202 | QCNCW103FAFZZ | Connecting Socket, 6-Pin | AB |
| CNS203 | QCNCW103FAFZZ | Connecting Socket, 6-Pin | AB |
| | QFS-C101CAGNI | Fuse, 100mAT (250V) | AE |
| | QFS-C201CAGNI | Fuse, 200mAT (250V) | AE |
| | QFS-C202CAGNI | Fuse, 2.0AT (250V) | AE |
| | QFSHD1001AGZZ | Holder, Fuse | AA |
| J601 | QJAKJ0057AFZZ | Jack, Headphone-b | AG |
| J602 | QJAKJ0057AFZZ | Jack, Headphone-a | AG |
| | QLUGL0250AFZZ | Terminal Strip, 2-Lug | AC |
| | QLUGZ011AAFZZ | Lug, Ground (Earth) | AA |
| | QPLGS0102AGZZ | Plug, Short | AD |
| | QPWBE0077AFZZ | Printed Wiring Board, Power Amplifier Circuit | AQ |
| | QPWBF0353AFZZ | Printed Wiring Board, Tape Circuit | AD |
| | QPWBF0423AFZZ | Printed Wiring Board, Fuse Circuit | AE |
| | QPWBF0593AFZZ | Printed Wiring Board, Dial Lamp Circuit (Part of PREFL0061AFZZ) | — |
| | QPWBF0594AFZZ | Printed Wiring Board, FM RF/IF, Equalizer and Tone Circuits | AS |
| | QPWBF0595AFZZ | Printed Wiring Board, Power Supply and Relay Circuits | AM |
| | QPWBF0597AFZZ | Printed Wiring Board, AM RF/IF Circuit | AU |
| | QSOCT0353AFZZ | Socket, Power Transistor | AD |
| SO701-A～E | QSOCZ2450AFZZ | TAPE-1 Socket, REC (SO701-A, B), PB Ⓟ (SO701-C, D), DIN (SO701-E) | AK |
| SO702-A～E | QSOCZ2450AFZZ | TAPE-2 Socket, REC (SO702-A, B), PB Ⓟ (SO702-C, D), DIN (SO702-E) | AK |
| SO801-A～F | QSOCJ2660AFZZ | Socket, Auxiliary Input (SO801-A, B), PHONO-1 Input (SO801-C, D), PHONO-2 Input (SO801-E, F) | AG |
| SW201-A, B | QSW-R0141AFZZ | Switch, Function Selector | AR |
| SW202 | QSW-B0073AFZZ | Switch, Tape Monitor | AH |
| SW203-A～D | QSW-B0054AFZZ | Switch, Tape Dubbing | AK |
| SW204 | QSW-B0051AFZZ | Switch, Mode Selector | AH |
| SW205 | QSW-B0051AFZZ | Switch, Loudness | AH |
| SW301-A～E | QSW-P0142AFZZ | Switch, Band (LW/MW/FM) Selector (SW301-A～C), FM Muting (SW301-D), Air Check Calibrator (SW301-E) | AS |
| SW601 | QSW-R0140AFZZ | Switch, Speakers Selector | AN |
| SW602 | QSW-B0051AFZZ | Switch, Low Cut Filter | AH |
| SW603 | QSW-B0051AFZZ | Switch, Audio Muting | AH |
| SW801 | QSW-B9059AFZZ | Switch, Power | AQ |
| TB801 | QTANN0453AFZZ | Antenna Terminals, FM (75 ohms and 240 ohms) and AM | AH |
| TB802 | QTANN0150AFZZ | Terminal, Grounding (Earth) | AD |
| TB803 | QTANN0454AFZZ | Speaker Terminals-A | AG |
| TB804 | QTANN0454AFZZ | Speaker Terminals-B | AG |
| ME801 | RMTRL0135AFSA | Meter, Signal (Strength) | AU |
| ME802 | RMTRL0134AFSA | Meter, Tuning (Center) | AU |
| RLY601-A, B | RRLYZ0050AFZZ | Relay, DC24V, Protection Circuit | AW |
| | RTUNF0060AFZZ | FM Tuner (Front-end) Assembly | BF |
| PL801, PL802, PL803, PL804, PL805, PL806 | RLMPP0057AFZZ | Dial Illumination Lamp (8V, 0.3A) (Part of PREFL0061AFZZ) | — |
| | XBBSD40P45000 | Screw, Bar Antenna Bracket | AA |
| | XHBSF40P18XSO | Screw, Cabinet | |
| | XHBSD40P12000 | Screw, Leg | |
| | XNESD40-32000 | Nut, Bar Antenna Bracket | AA |
| | XWHSD91-10140 | Washer, Function Selector Switch | |
| | XWUSE84-08000 | Shakeproof Lockwasher Internal Type, Grounding (Earth) Terminal | AA |