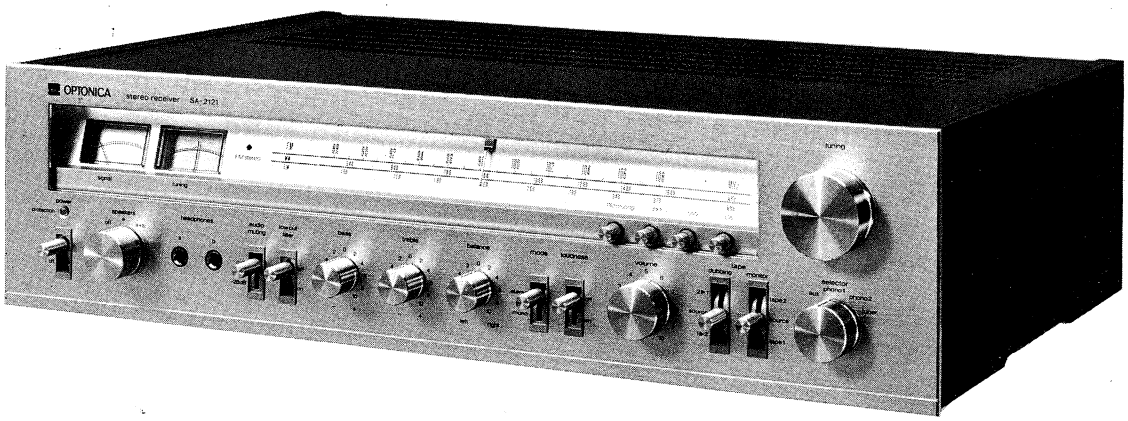
SHARP OPTONICA **SERVICE MANUAL**

SA-2121H



Stereo Receiver

MODEL SA-2121H

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
Power consumption:	460W
Circuit	
Tuner:	Superheterodyne system, LW/MW/FM 3-bands tuner, with P.L.L. stereo demodulation circuit, FM muting 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:	Dual power supply IC amplifier circuit
Semiconductors:	7-IC (Integrated circuit) 28-transistor (1-FET) 31-diode (4-Zener diode) 2-LED
Dimensions:	Width . . . . . 550 mm Height . . . . .142 mm Depth . . . . . 390 mm
Weight:	14.5 kg

● FM SECTION

Tuning range:	87.6 ~ 108 MHz
Intermediate frequency:	10.7 MHz
Sensitivity:	1.8μV (at S/N 26 dB, 40 kHz deviation, antenna terminal voltage)
Distortion (40 kHz deviation)	
Mono:	0.5%
Stereo:	0.8%
Image rejection ratio:	50 dB
I.F. rejection ratio:	70 dB
Spurious frequency rejection ratio:	60 dB
AM suppression ratio:	40 dB (modulated by 30% AM and 75 kHz deviation FM)
Selectivity:	50 dB (IHF at 40 dB)
Capture ratio:	2 dB
Stereo separation:	34 dB (1 kHz)
Antenna input:	75 ohms unbalanced 240 ohms balanced

● AM SECTION

Tuning range:	MW 520 ~ 1620 kHz LW 150 ~ 370 kHz
Intermediate frequency:	MW/LW 455 kHz
Quieting Sensitivity:	MW 400μV/m (at 1000 kHz) LW 400μV/m (at 220 kHz)
Image rejection ratio:	MW 34 dB (at 1400 kHz) LW 30 dB (at 340 kHz)
I.F. rejection ratio:	MW 49 dB (at 600 kHz) 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 45W/4-ohms, both channels driven at 1 kHz, 0.1% distortion 2 x 30W/8-ohms, both channels driven at 1 kHz, 0.1% distortion
Total harmonic distortion:	0.05% at 20W (AUX IN)
Intermodulation distortion:	0.1% at 20W (AUX IN)
Damping factor:	More than 20 (at 1 kHz, 4-ohms)
Power bandwidth:	20 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:	140 mV (R.M.S. 1 kHz, 0.1% T.H.D.)
"RIAA" curve deviation (Phono):	± 1.5 dB (30 Hz ~ 15 kHz)
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:	−3 dB at 30 Hz, 6 dB/oct
Audio muting:	− 20 dB

FEATURES

1) The equalizer amplifier that operates on dual power supply (plus and minus) to allow the maximum 140 mV phono input.
2) 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.
3) 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.
4) Because of the circuit being ITL (Input Transformerless), OTL (Output Transformerless), OCL (Output Capacitorless) and pure-complementary system, low-distortion characteristic is more assured.
5) FET and 3-gang variable capacitor adopted at the FM front-end circuit more improve overall characteristics.
6) 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.

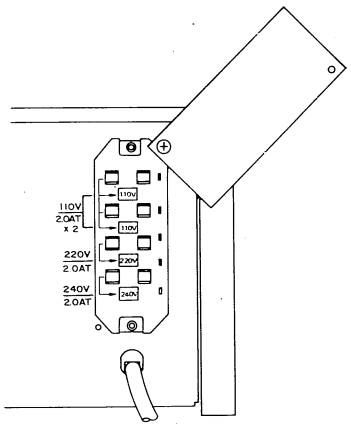


Figure 1

DISASSEMBLY

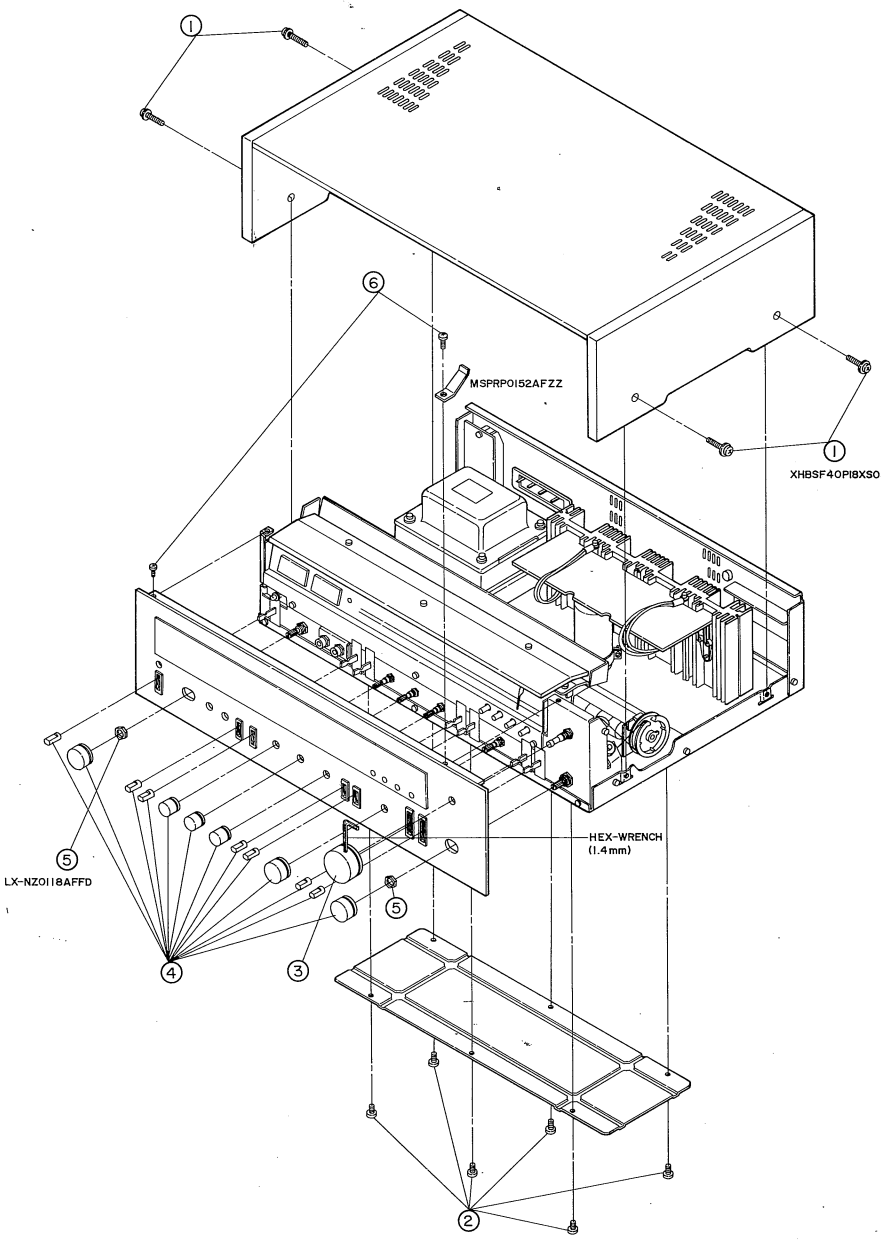


Figure 2 DISASSEMBLY

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.

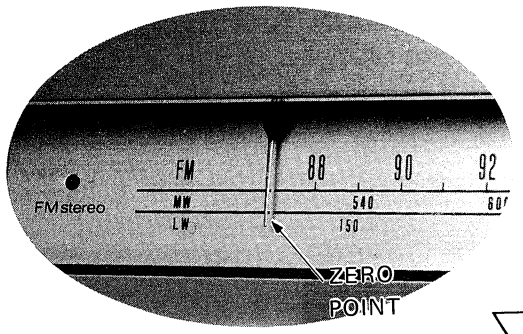
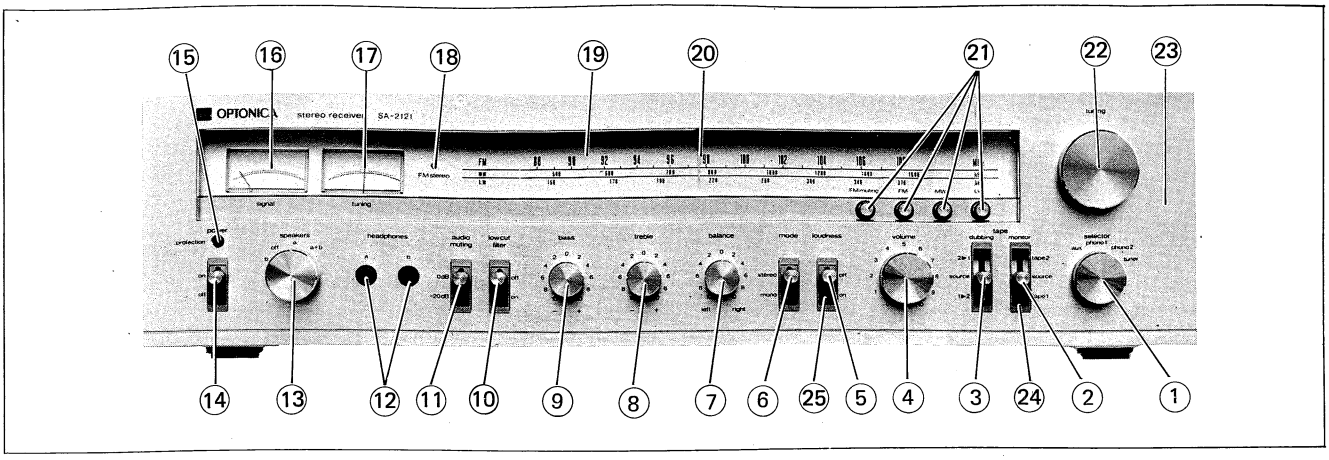


Fig. 3–A

(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.

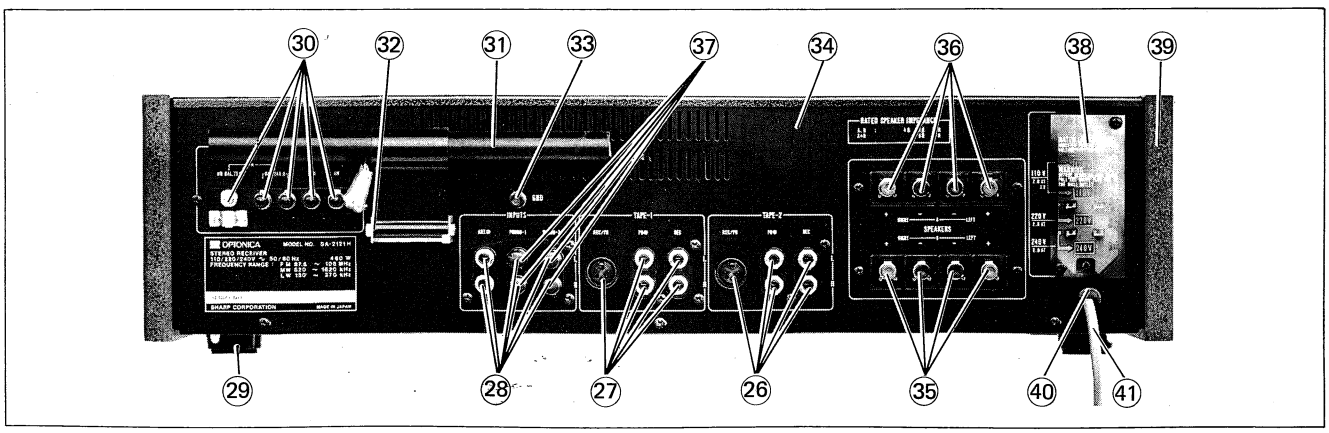
(2) Setting of the pointer
1. Turn the tuning shaft fully counterclockwise (at the lowest frequency position).
2. Align the pointer to the extreme left (where a part of the graduation line is cut) of the dial scale plate. (See Fig. 3-A.)

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 (HDALM0173AFSA)
⑳ Dial pointer (HSSND0230AFSA)
㉑ LW/MW/FM/FM muting knob (JKNBM0248AFSA)
㉒ Tuning control knob (JKNBB0059AFSA)
㉓ Front panel (HPNLC3276AFSA)
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 (LANGQ0508AFSA)
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

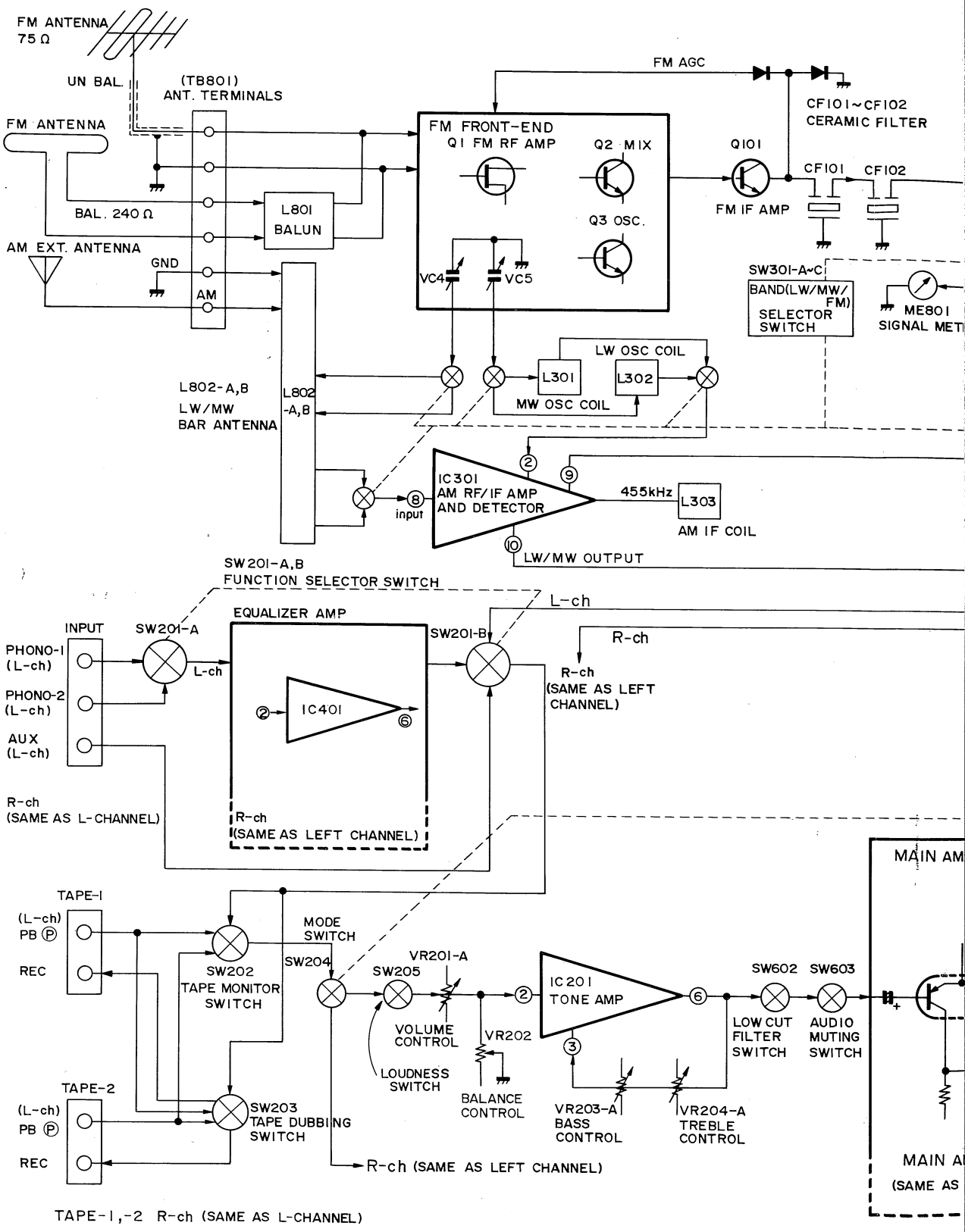
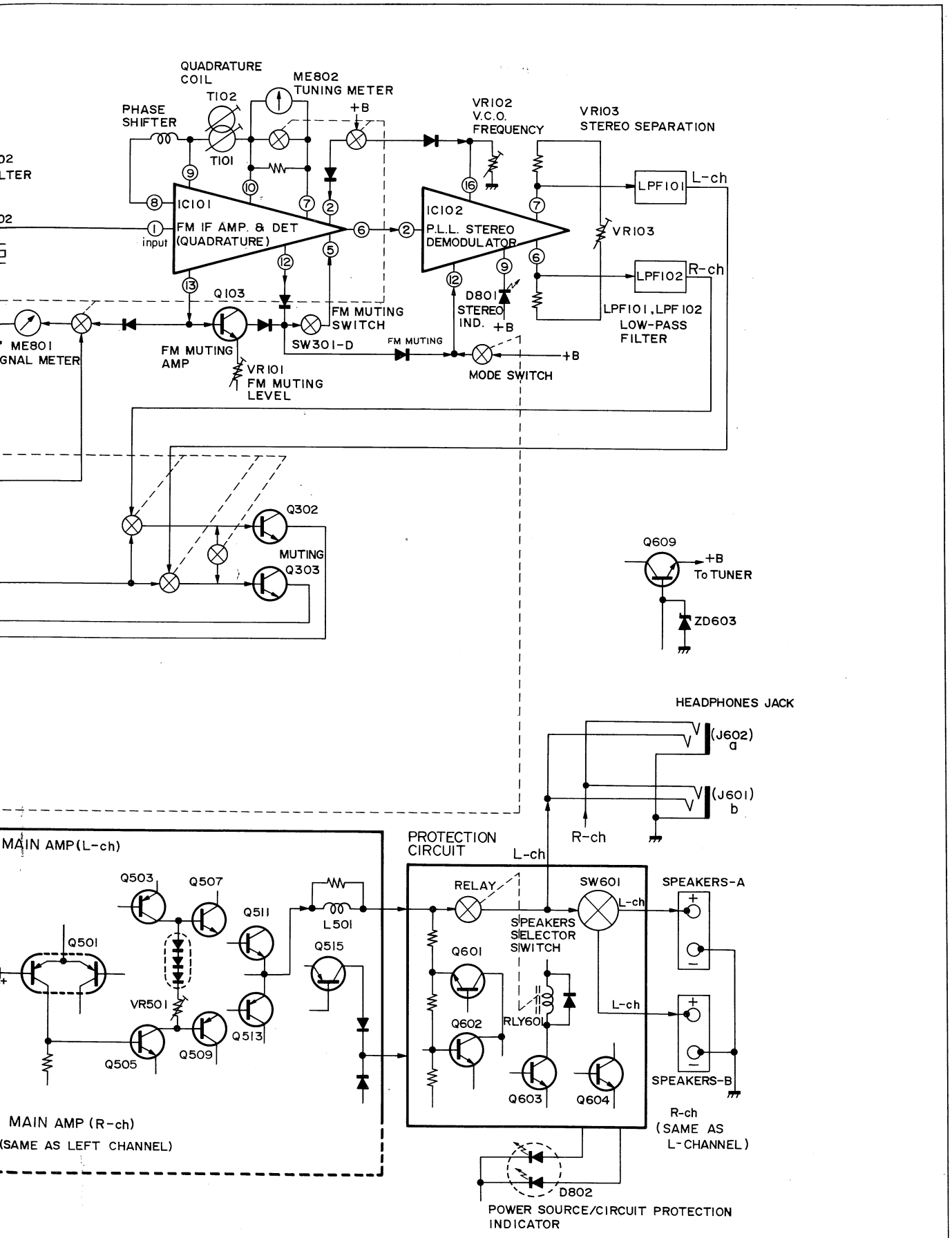


Figure 6 BLOCK DIAG


QUADRATURE COIL
T102
ME802 TUNING METER
PHASE SHIFTER
T101
+B
VR102 V.C.O. FREQUENCY
VR103 STEREO SEPARATION
IC101
FM IF AMP. & DET (QUADRATURE)
input
IC102
P.L.L. STEREO DEMODULATOR
LPF101
L-ch
LPF102
R-ch
VR103
Q103
FM MUTING SWITCH
SW301-D
FM MUTING
D801 STEREO IND.
+B
LPF101, LPF102 LOW-PASS FILTER
ME801
GNAL METER
FM MUTING AMP
VR101 FM MUTING LEVEL
MODE SWITCH
Q302
MUTING
Q303
Q609
+B
To TUNER
ZD603
HEADPHONES JACK
(J602)
a
(J601)
b
R-ch
MAIN AMP(L-ch)
PROTECTION CIRCUIT
L-ch
Q503
Q507
Q511
L501
Q515
RELAY
SW601
L-ch
SPEAKERS-A
SPEAKERS SELECTOR SWITCH
Q501
VR501
Q505
Q509
Q513
Q601
Q602
RLY601
L-ch
SPEAKERS-B
Q603
Q604
MAIN AMP (R-ch)
(SAME AS LEFT CHANNEL)
R-ch
(SAME AS L-CHANNEL)
D802
POWER SOURCE/CIRCUIT PROTECTION INDICATOR

K DIAGRAM

CIRCUIT DESCRIPTION

AM SECTION

(1) Block Diagram of IC301

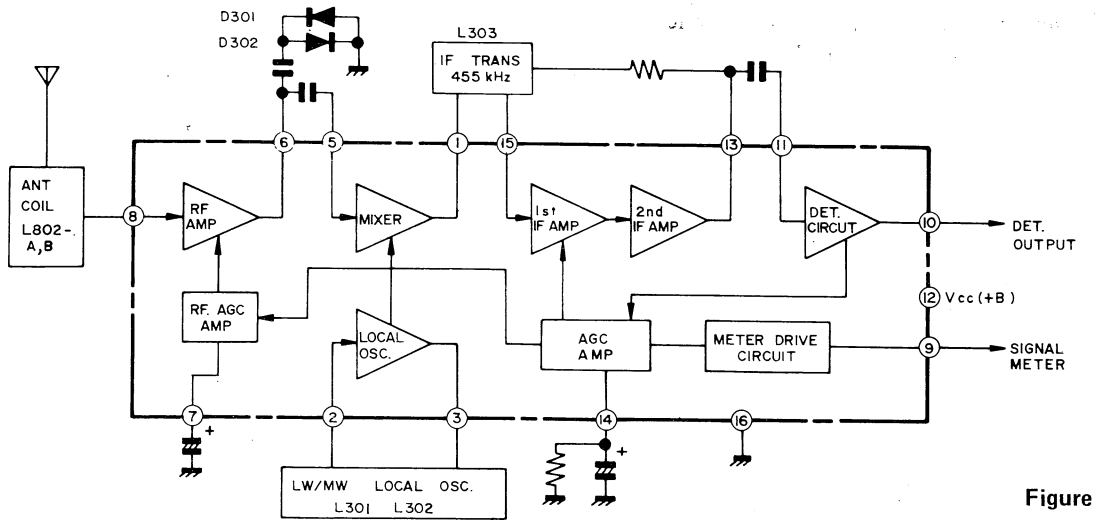


Figure 7

(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 FET and 2 transistors.

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

It is so devised that AGC voltage is applied to the terminal [K3] of FM Front-End circuit ..... this results in that when input signal to FM antenna is strong, amplification degree of transistor Q1 is lowered so as to stabilize FM reception.

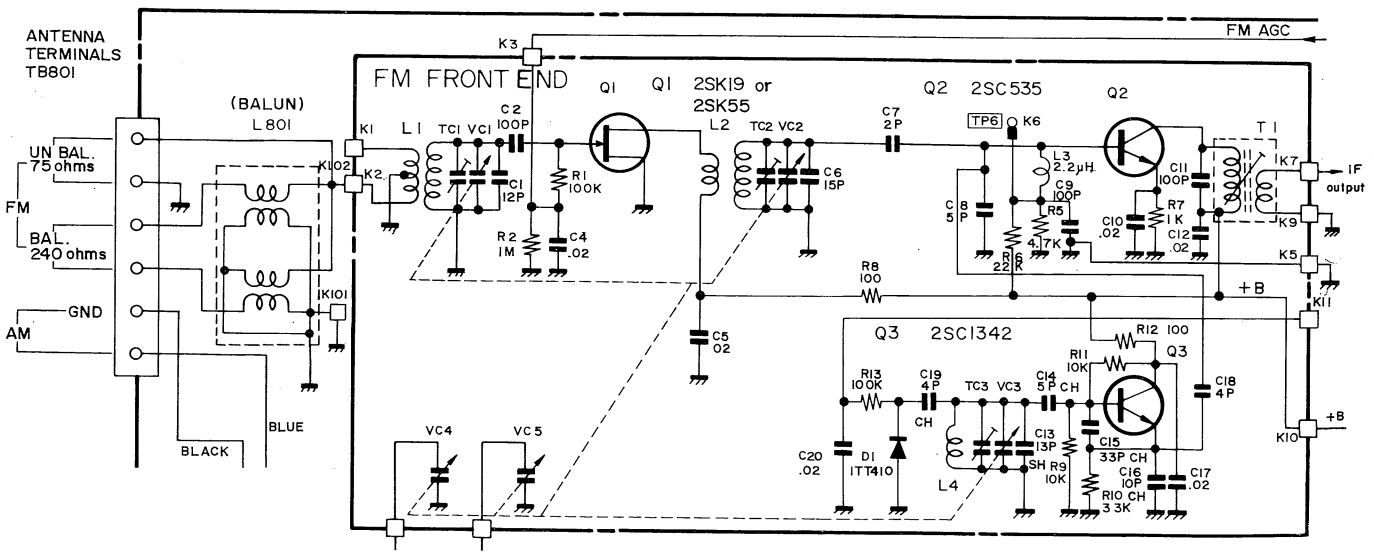


Figure 8 FM FRONT-END CIRCUIT

FET Q1 is FM high frequency amplifier. Transistor Q2 works as frequency mixer, in which high frequency signal coming from the 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 C18 (4pF).
Therefore, coil L1 is for antenna tuning, coil L2 is for FM RF amplification and tuning and coil L4 is for local oscillation.

FM IF SECTION

FM IF section consists of 1 IC (integrated circuit), 1 transistor and 2 ceramic filters. Transistor Q101 is FM IF amplification and AGC 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 and CF102. These filters function to amplify IF (intermediate frequency) signals giving no distortion and to assure a necessary selectivity. The IF signal is further supplied to the terminal ① of IC101, in which the gain of this signal is increased by about 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.

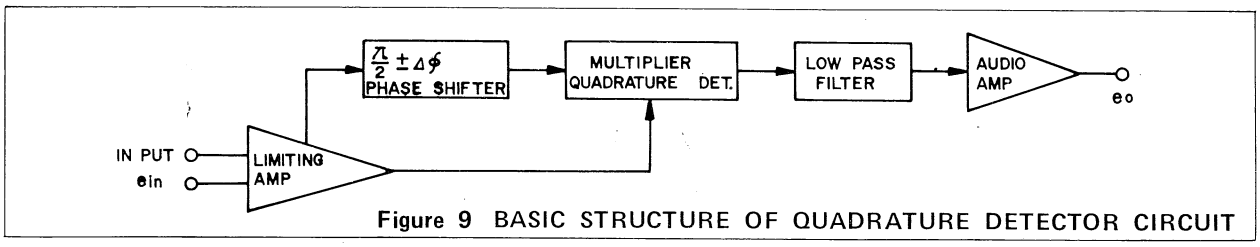
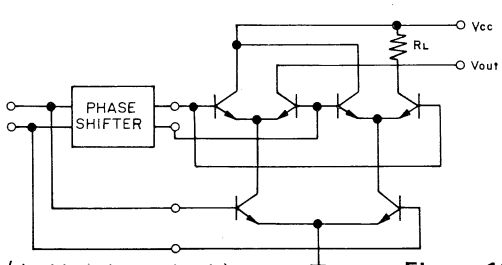


Figure 9 BASIC STRUCTURE OF QUADRATURE DETECTOR CIRCUIT

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-2121H 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.L. multiplex integrated circuit IC102.



(doubly balance circuit) Figure 10

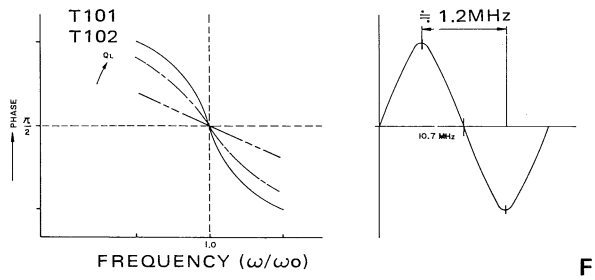


Figure 11

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

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

The PLL system stereo demodulator gives such three merits as:

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-2121H.

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.

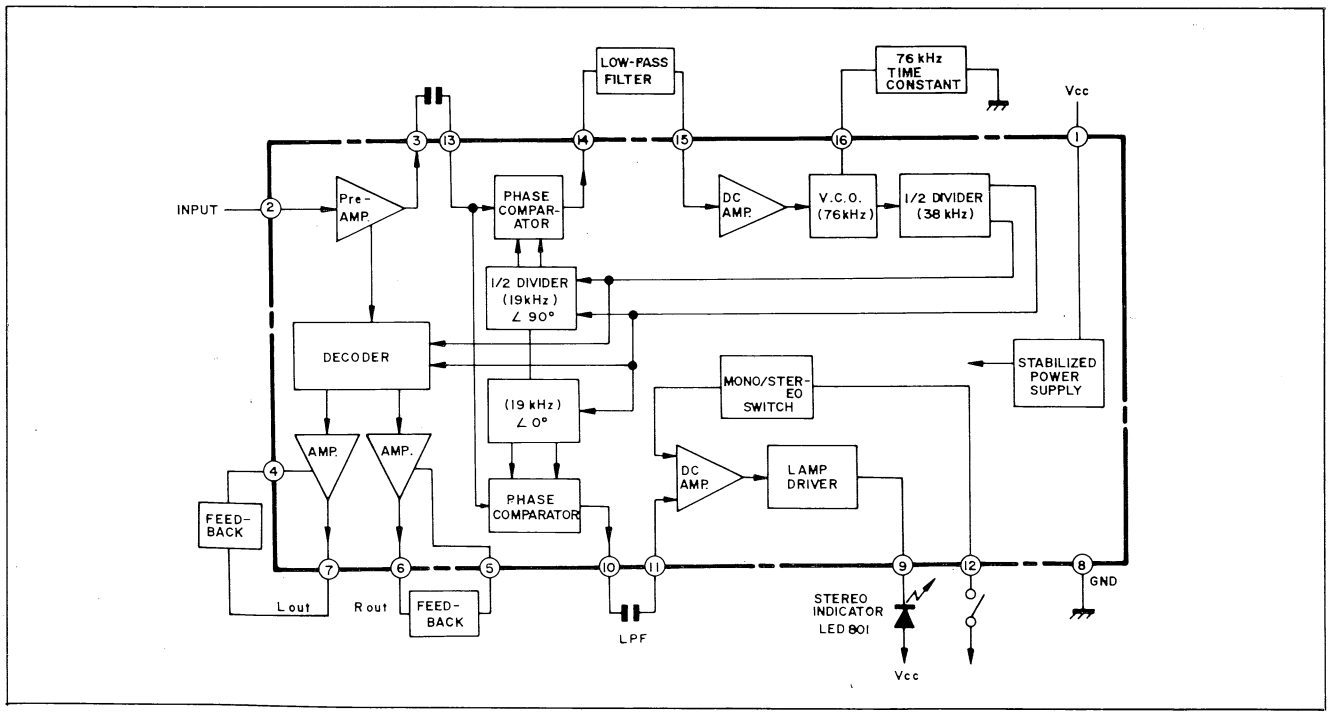


Figure 12

M MUTING CIRCUIT

SA-2121H, IC101 incorporates muting circuit and this circuit is so igned that if FM input signal to the antenna becomes about 20 dB en the muting switch (SW301-D) is kept at "ON", the muting is released the signal appears at the output without undergoing muting. The ting release signal is produced by addition of two signals, one is the put signal at the pin (12) of IC101 and another is signal meter signal at pin (13) which will undergo polarity inversion by the transistor Q103 these two signals are applied to the pin (5) of IC101 via the muting ch (SW301-D).

i-fixed resistor VR101 is adjustable to release the muting when the t signal from the antenna terminal becomes about 20 dB.
13 shows the output voltage of two outputs, one is at the pin (12) C101 and another, at the collector of transistor Q103, to be added ach other.

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

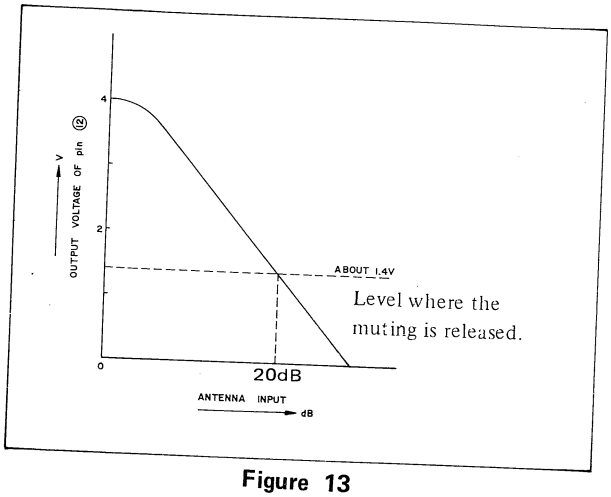


Figure 13

-PASS FILTER

01 and LPF102 are low-pass filters to remove carrier s (19 kHz and 38 kHz) leaking from the stereo plex IC102. The characteristic is as shown in the 14.

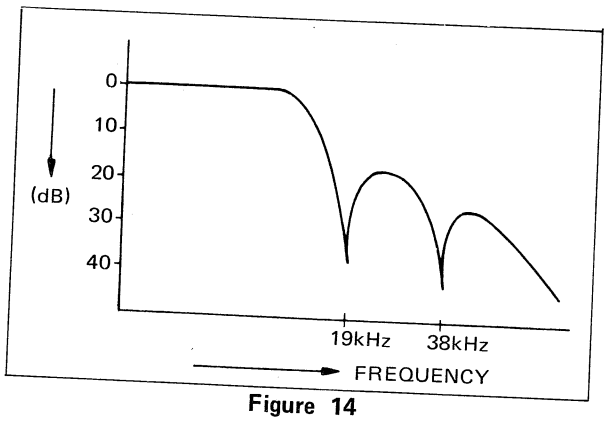


Figure 14

TONE A

The tone differentia both high The power in which designated and outpu reduction to control in particul condition s can be min

EQUALIZER

The equalizer 1-stage and higher gain an The power sup in which the designated to and output sig reduction of r Signal coming the function s capacitor C401 IC401 to be out of the term capacitor C415 switch (SW201- is applied to circuit used for Composed of re which are precis aiming at "RIA deviation to ± Resistor R417 from discharging at the time of Capacitors C407 interference nois

TONE AMPLIFIER CIRCUIT

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

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

Signal coming from the function selector switch is once supplied to the tape monitor switch, mode switch, loudness switch, volume control (VR201-A, B) and balance control (VR202), 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.

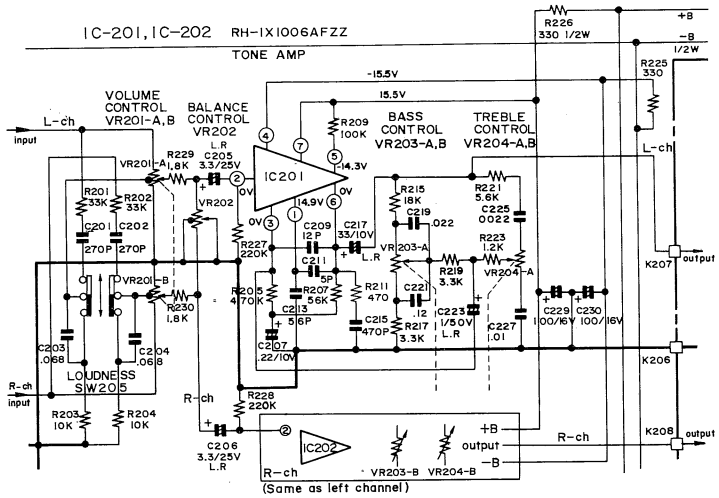


Figure 15

EQUALIZER AMPLIFIER CIRCUIT

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

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

Signal coming from the terminal PHONO is applied, via the function selector switch (SW201-B), resistor R401 and capacitor C401, to the terminal ② of the integrated circuit IC401 to be amplified. The signal thus amplified comes out of the terminal ⑥ of IC401 and it will be applied, via the capacitor C415 and resistor R415, to the function selector switch (SW201-A). By the way, a part of such output signal is applied to the terminal ③ of IC401 through the NF circuit used for increase of "RIAA" characteristic.

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

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

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

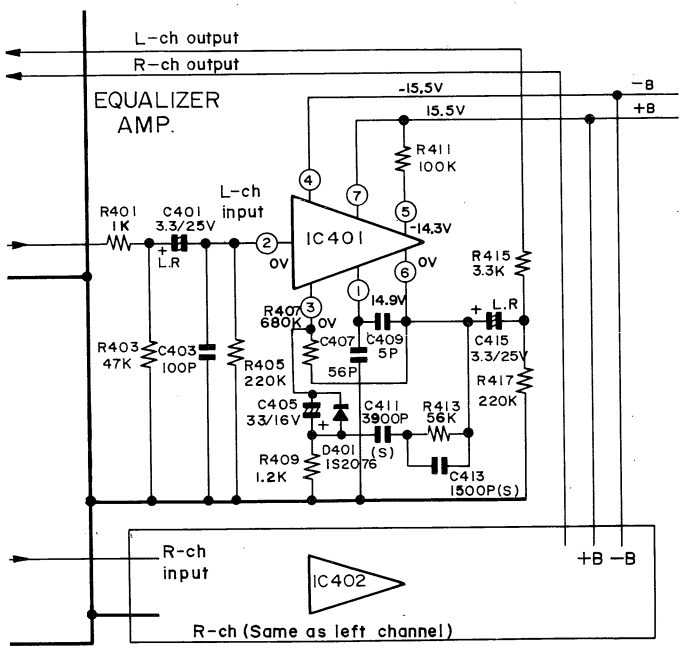


Figure 16

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 (0 V) 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 Q505 (or Q506). Moreover, the signal is amplified for the half cycle at the driver amplifier stage consisting of NPN type transistor Q507 (or Q508) and PNP type transistor Q509 (or Q510). Then, the signal is further amplified for the half cycle at NPN type transistor Q511 (or Q512) and PNP type transistor Q513 (or Q514) to be supplied to the speaker. Transistor Q503 (or Q504) is constant-current circuit and its amperage is determined by D503. Transistor Q503 (or Q504) is constant-current circuit to supply constant current so that the load applied to the class "A" driver Q505 (or Q506) will be reduced thus the gain being increased. As a result of the gain of Q505 (or Q506) being increased by Q503 (or Q504), plenty of NF is produced and so that distortion is lessened. NF factor of NF circuit is determined by resistors R513 (or R514) and R521 (or R522), and the higher NF factor, the higher is the gain. NF factor at the low frequency band is determined by capacitor C507 and resistor R513.
Transistor Q503 (or Q504) 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 R553 (or R554) and capacitor C513 (or C514) are to keep the power amplifier stabilized when given no load. Coil L501 (or L502) functions to prevent of high-frequency oscillation. Transistor Q515 (or Q516) works as protection circuit.

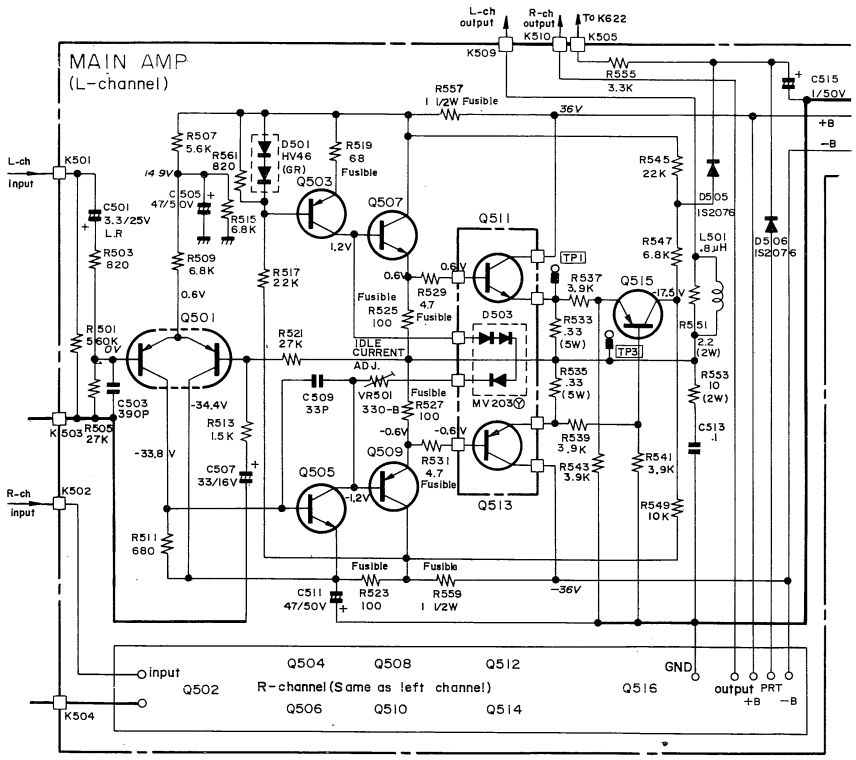


Figure 17 MAIN AMPLIFIER CIRCUIT

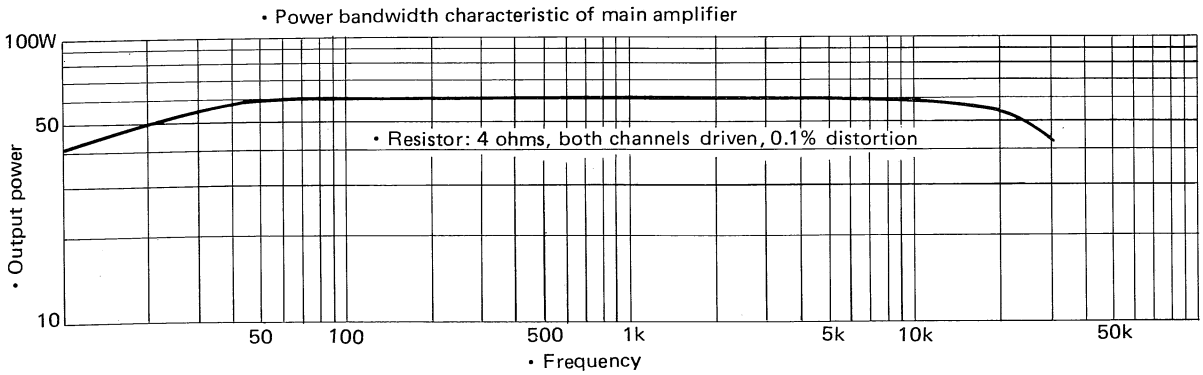


Figure 18

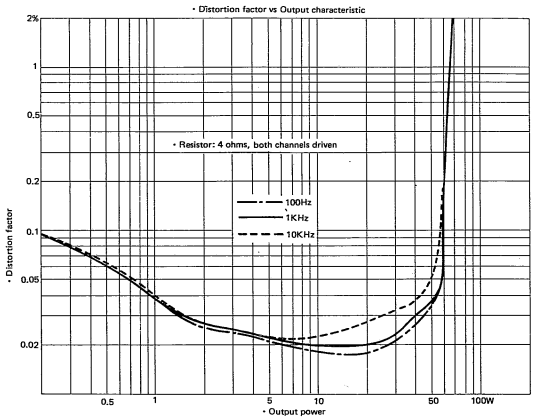


Figure 19

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, Q515 and Q516.

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 R533 and R535 (R534 and R536) of the power transistor so that the transistor Q515 (or Q516) 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.

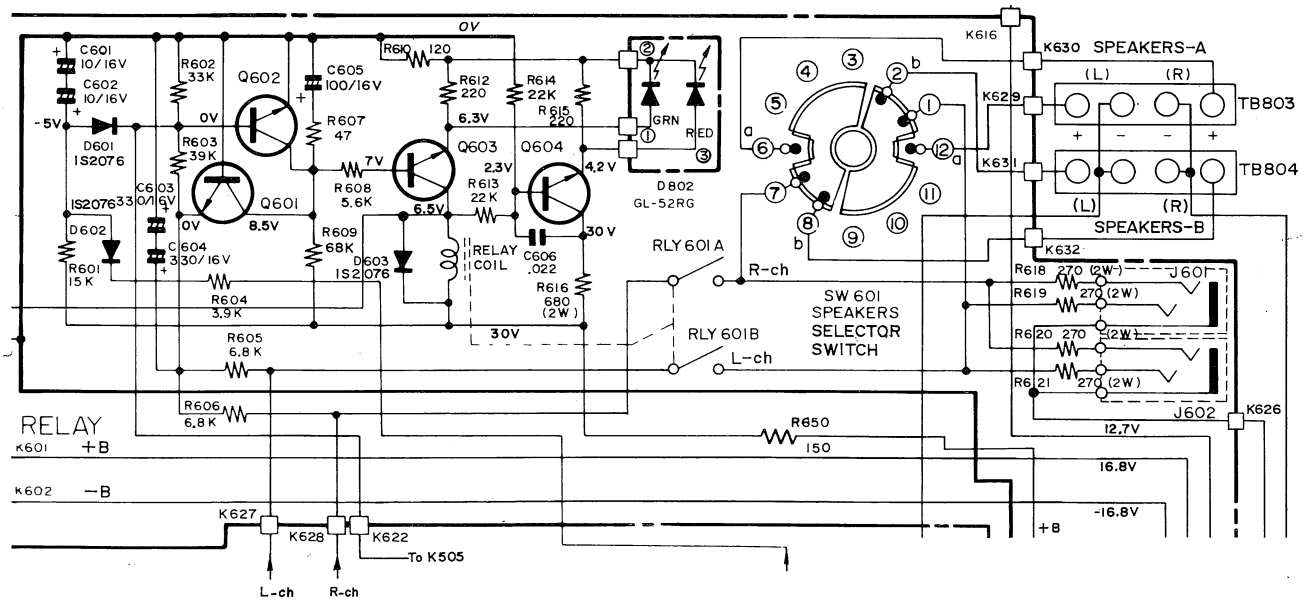


Figure 20 PROTECTION CIRCUIT (RELAY CIRCUIT)

POWER SUPPLY CIRCUIT

Power supply to the main amplifier section is depended upon the 2-power supply system. With this 2-power supply system, AC voltage coming from the power transformer T801 is subjected to rectification by the bridge full-wave rectifier circuit consisting of diodes D507, D508, D509 and D510 and then be smoothed by the low impedance dual-capacitor C520 and C521 to become DC voltage to finally be supplied to the main amplifier circuit section. The DC voltage thus smoothed is further applied to the ripple filter circuit to become stabilized so that it will be supplied to the tone circuit and equalizer circuit.
Besides, to both the FM circuit section and AM circuit section is also supplied the power voltage thus smoothed after it has been stabilized by the ripple filter circuit (transistor Q609).
Capacitors C516 to C519 are for the purpose to eliminate noise possibly caused with switching of the diodes D507 to D510 and that arising from the power transformer primary side.

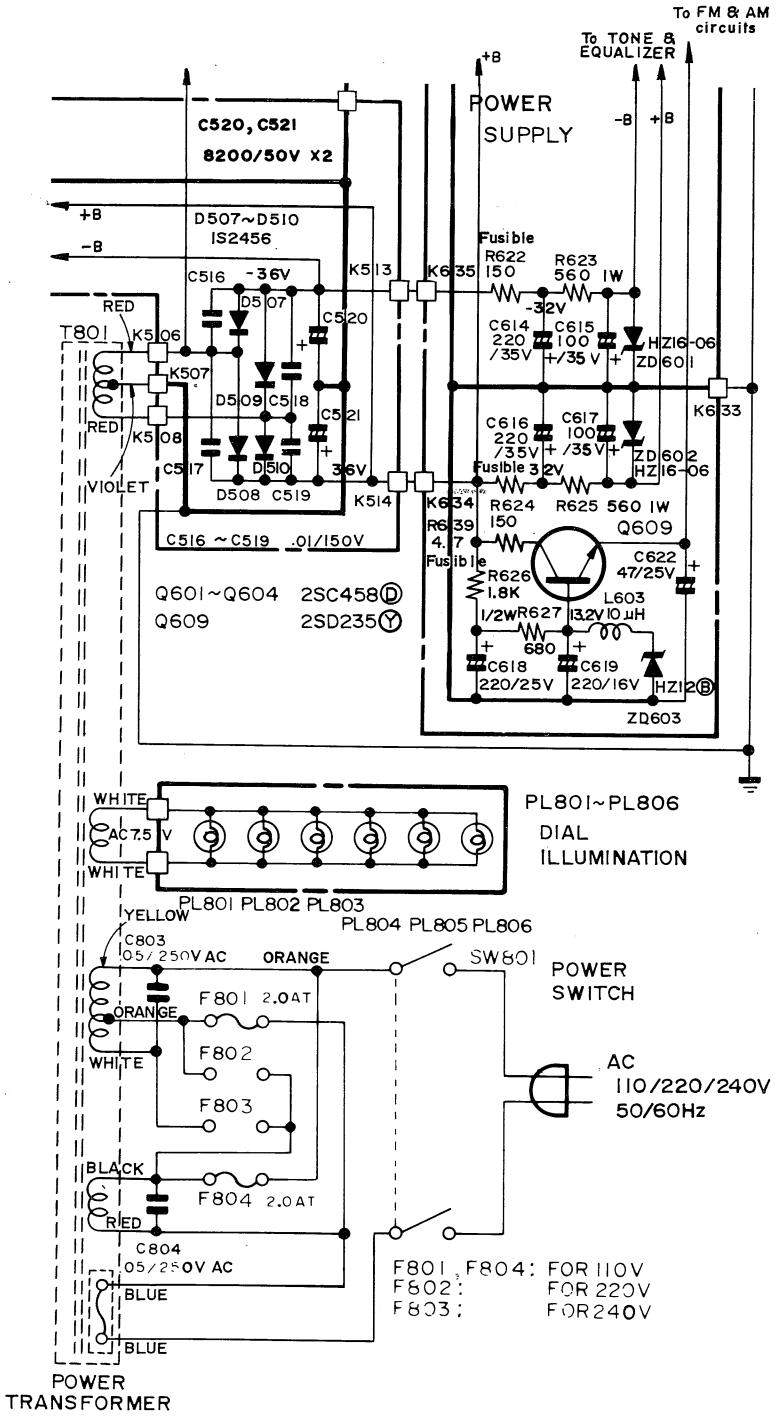


Figure 21 POWER SUPPLY CIRCUIT

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 1,000μV. 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 (TC3), repectively, as illustrated in Figure 22.

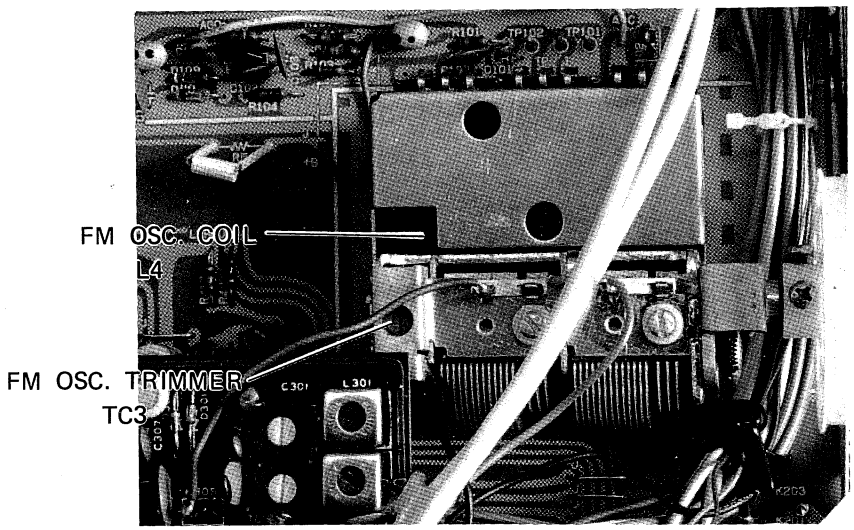


Figure 22 FM FRONT-END

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.
3) Use DC VTVM to make sure that the voltage between TP3 and K515 (ground) and that between TP4 and K515 (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 TP1 (TP2) and TP3 (TP4)	Volume is minimum position. Other knobs are normal position	VR501 (VR502)	15 mV

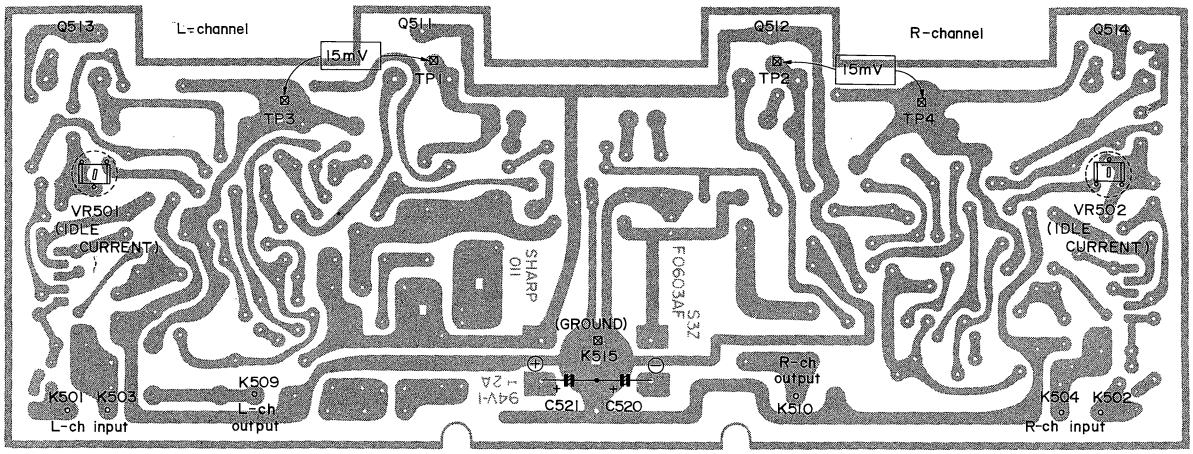


Figure 23 ALIGNMENT POINTS OF POWER AMP. BOARD

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 TP303 (VC4) 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.

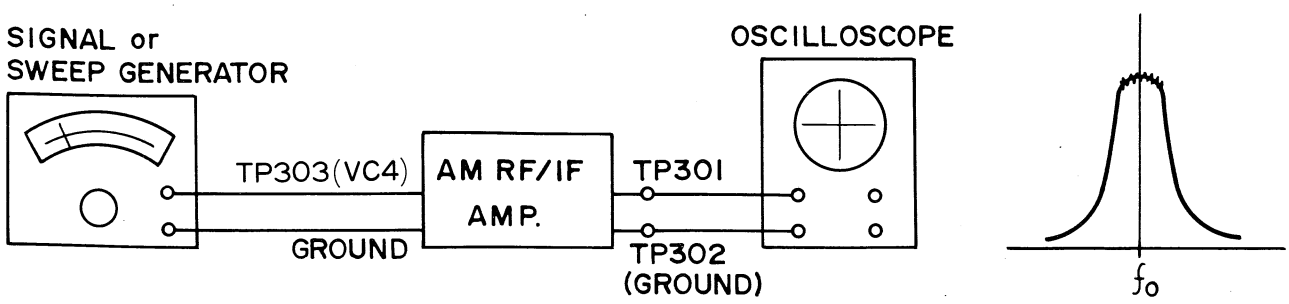


Figure 24 AM IF ALIGNMENT EQUIPMENT CONNECTIONS

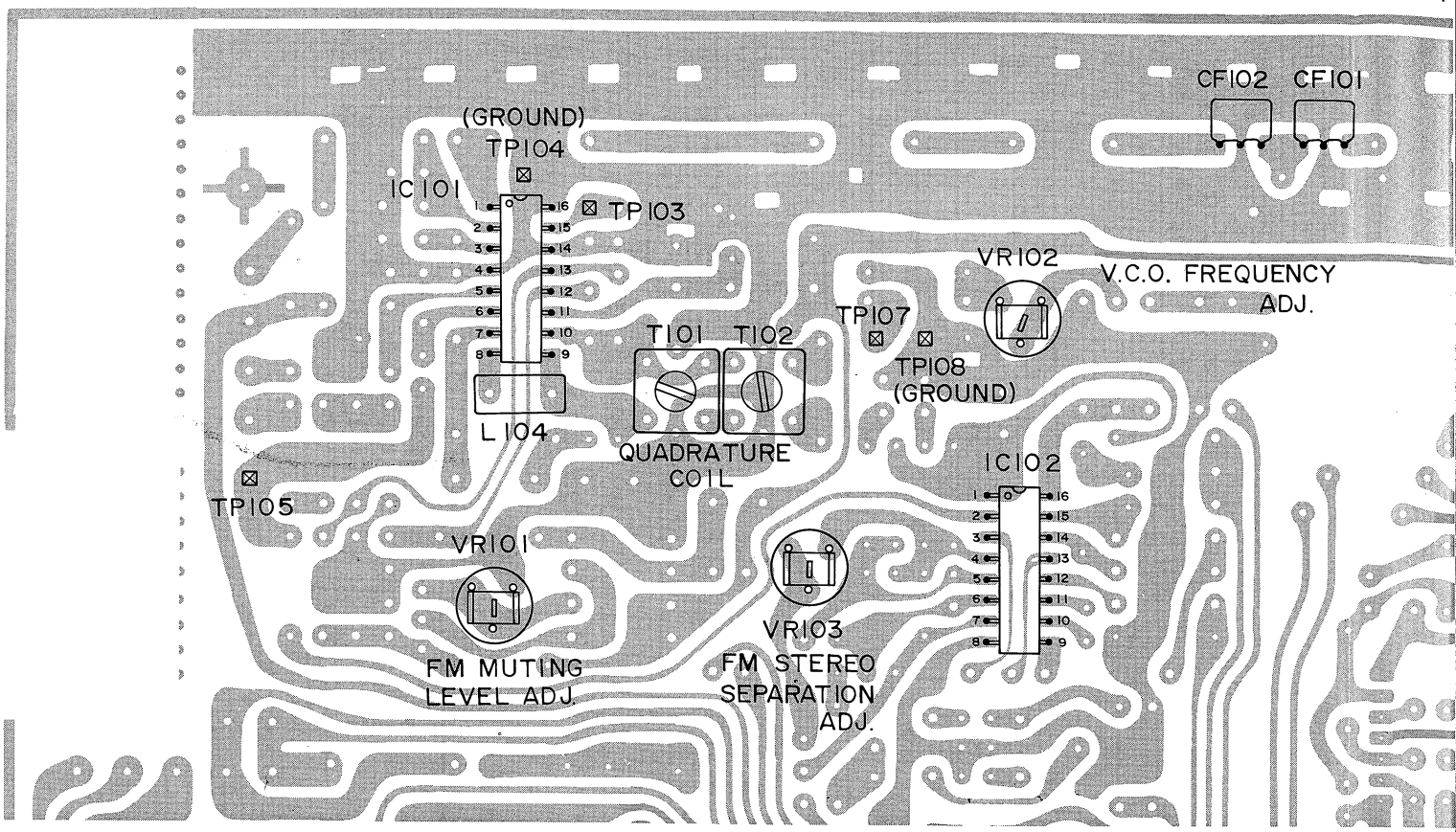


Figure 25 ALIGNMENT POINTS OF FM RF/I

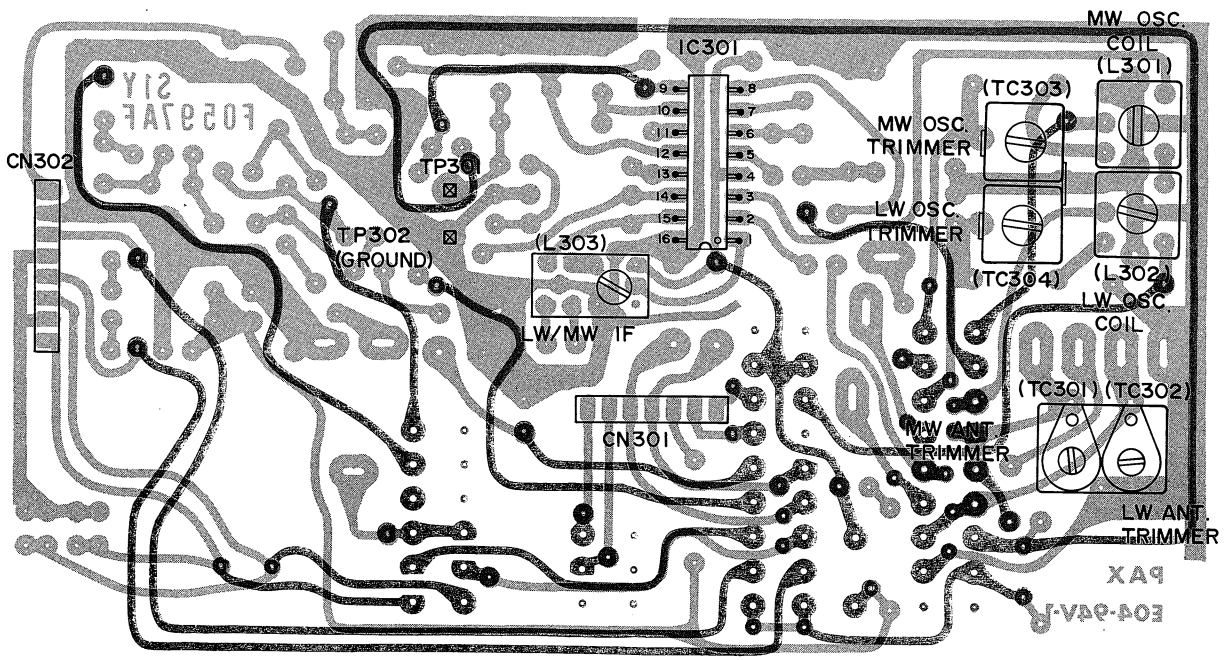
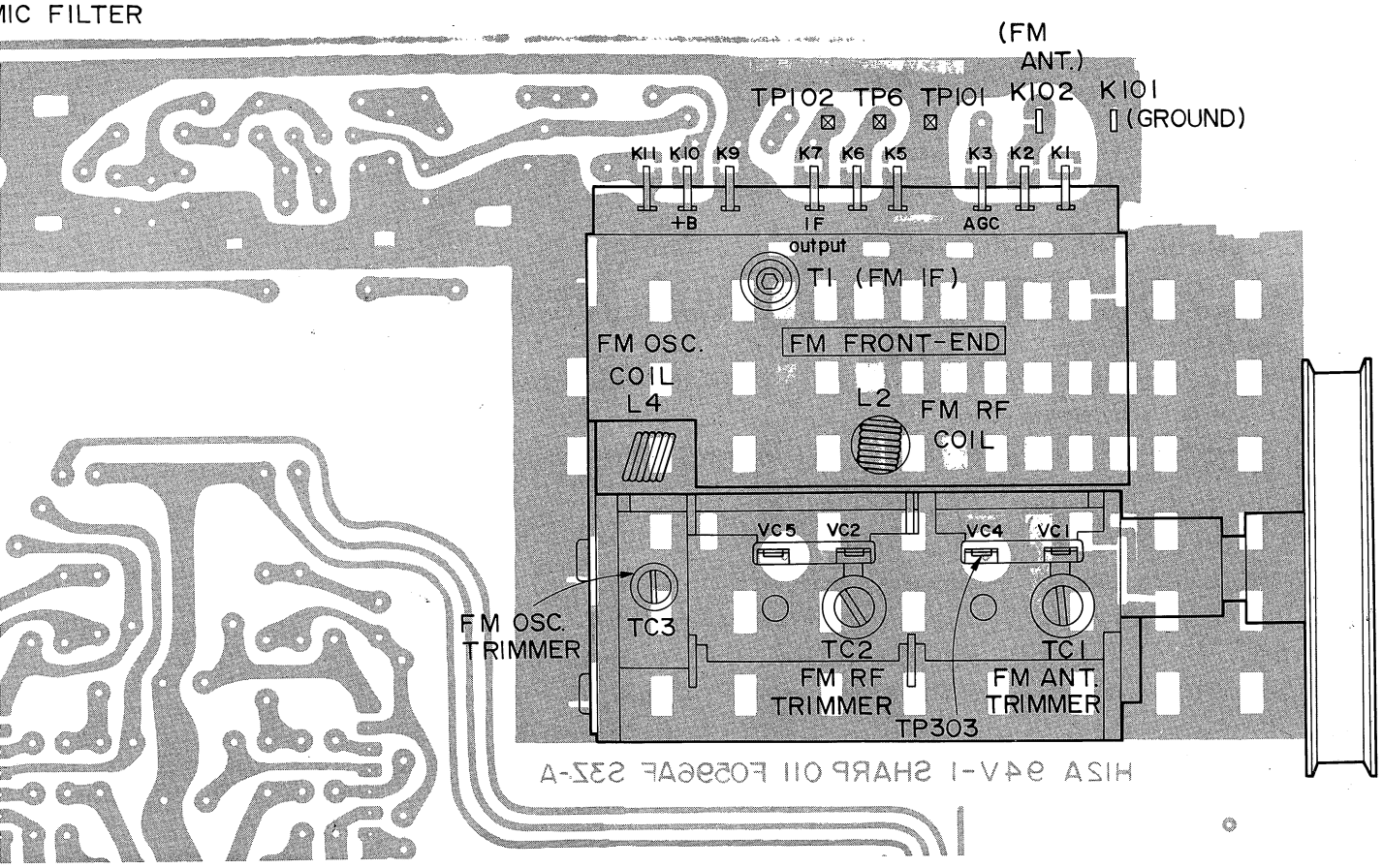


Figure 26 ALIGNMENT POINTS OF AM RF/IF BOARD



M 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.

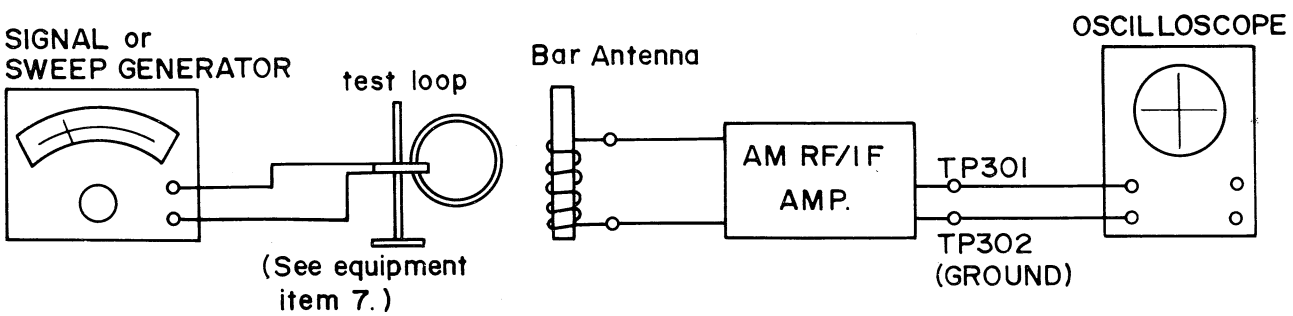


Figure 27 MW/LW RF ALIGNMENT EQUIPMENT CONNECTIONS

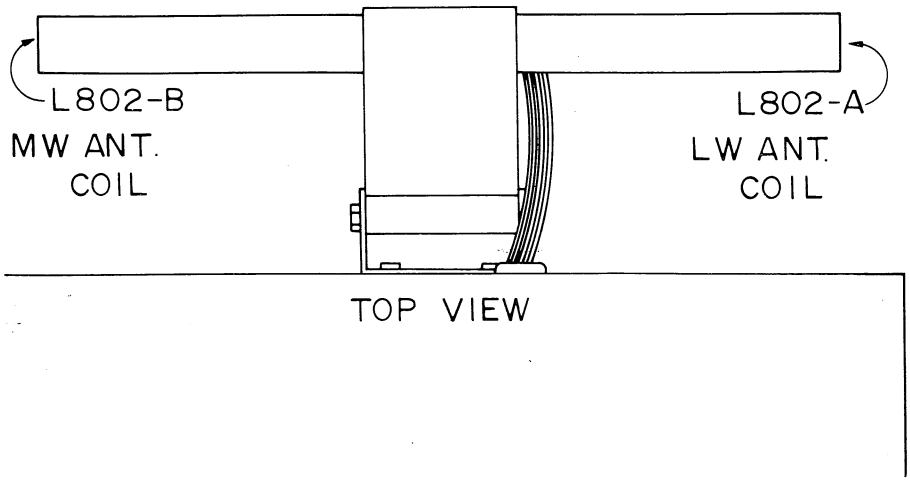


Figure 28 LW/MW BAR ANTENNA

LW RF ALIGNMENT

PROCEDURE 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 above

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 TP6. Connect the ground to the test point TP101.	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 test point TP101.	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. 31)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 TC3.	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	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	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.

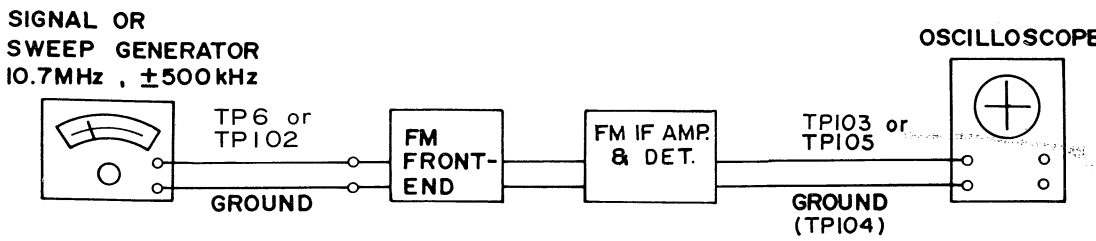


Figure 30 "IF" curve

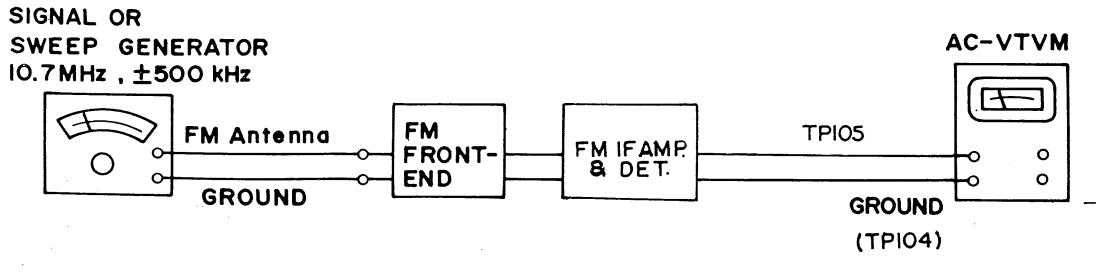


Figure 29 FM ALIGNMENT EQUIPMENT CONNECTIONS

Figure 31 "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 2 ceramic filters of the same type (the same color) as a pair to put them in the set. When other ceramic filters than that given a red color indication (with the central frequency of 10.7 MHz) are used, note that with such filters the marker (10.7 MHz) of FM sweep generator will be deviated; therefore be sure to cut off the marker at the time of the adjustment.

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

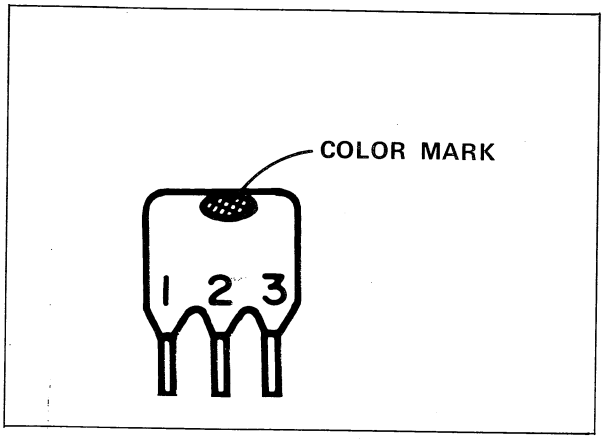


Figure 32

FM TUNING METER ADJUSTMENT AND DISTORTION FACTOR ADJUSTMENT

1) Set the frequency of FM signal generator 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, FM muting–off]
4) Keeping the output of FM signal generator be fully closed (that is, with no signal given), rotate the core of T101 to have the pointer of the tuning meter indicate the center (around "98 MHz" position.)
5) Adjust the output of FM signal generator 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 generator and make sure the pointer of the tuning meter is at the center.
7) Repeat the steps 1) to 6) until the best point will be found.

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

1) Connect FM signal generator, 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 ADJUSTMENT".
3) Set the frequency of FM signal generator 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 generator being 20 dB.
5) Set the output of FM signal generator 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 generator. 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 generator 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.

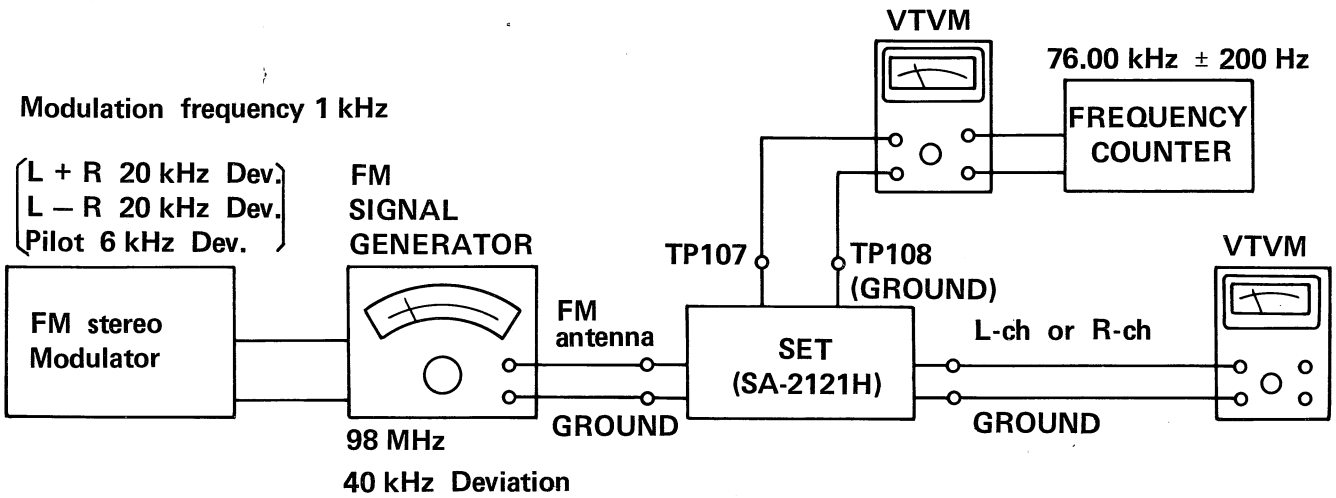
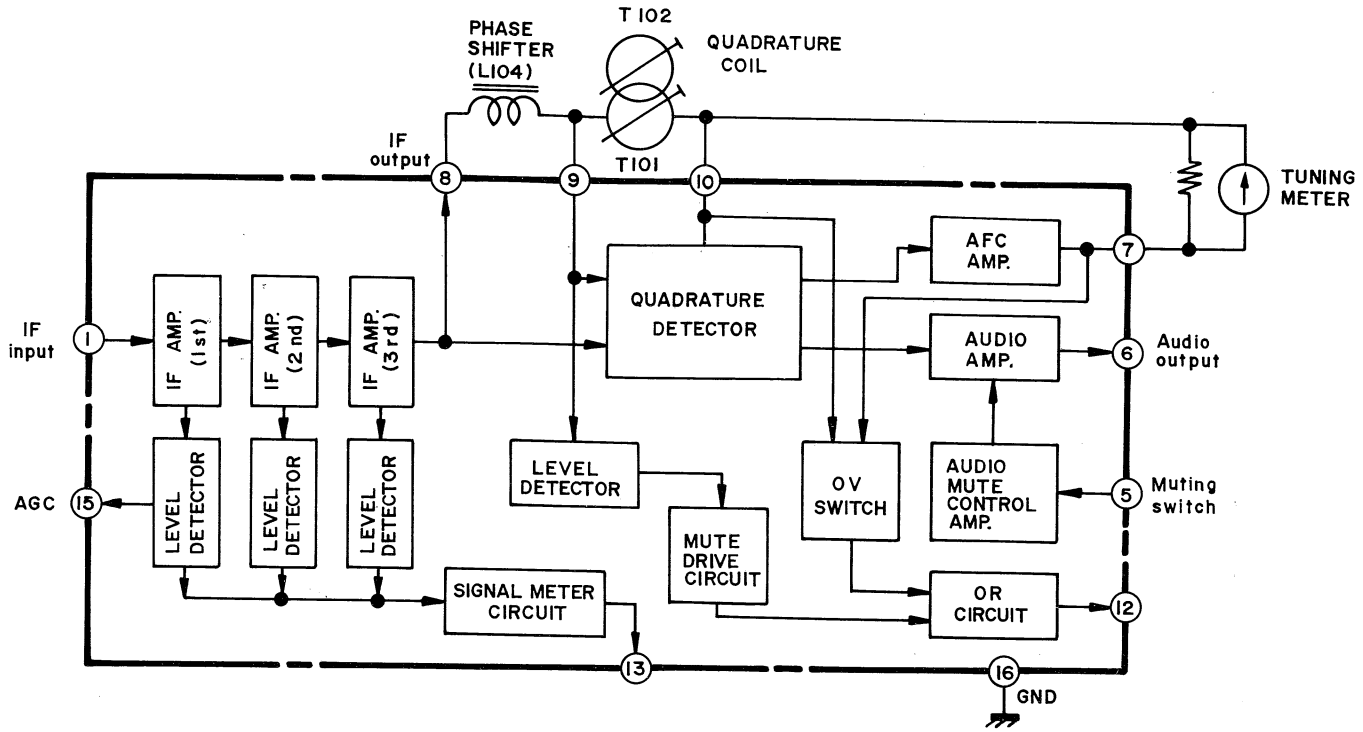


Figure 33 FM STEREO ALIGNMENT EQUIPMENT CONNECTIONS



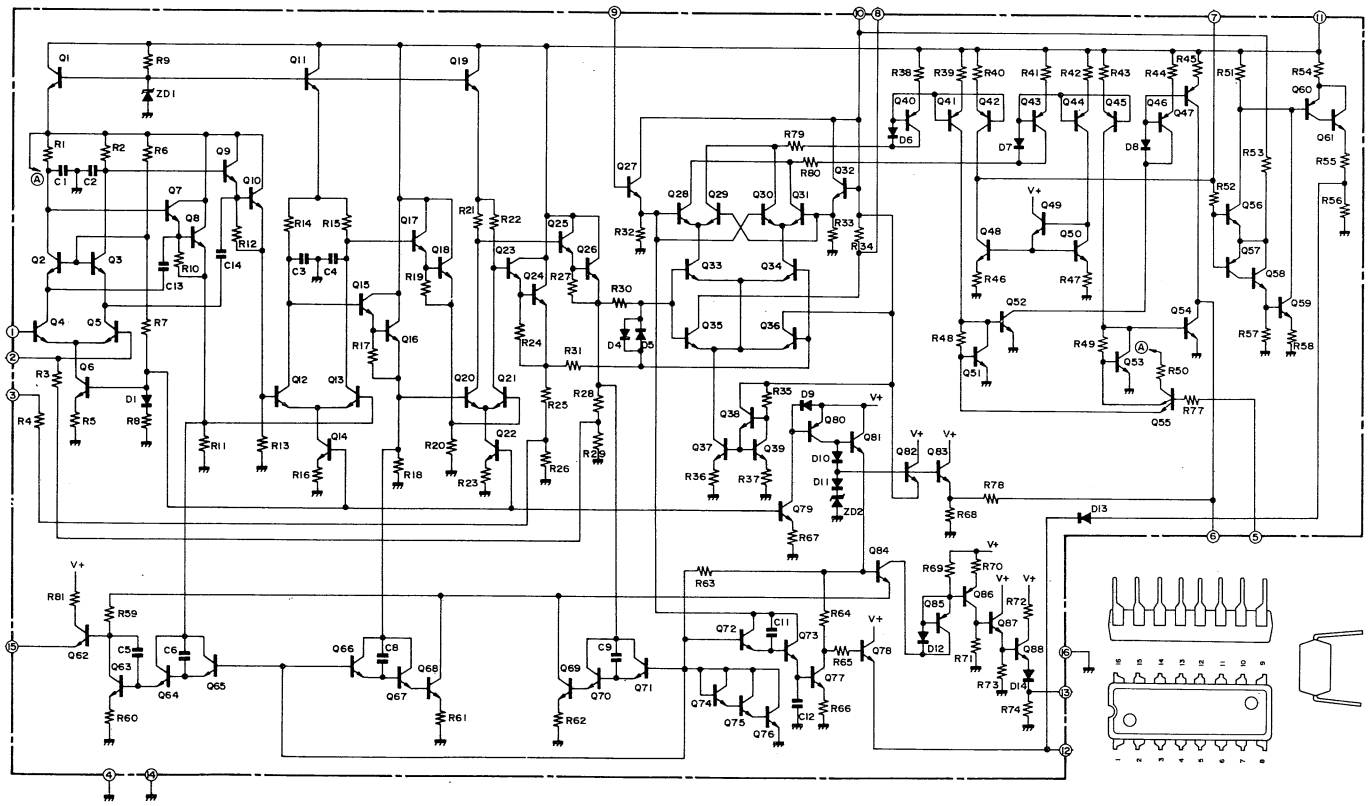
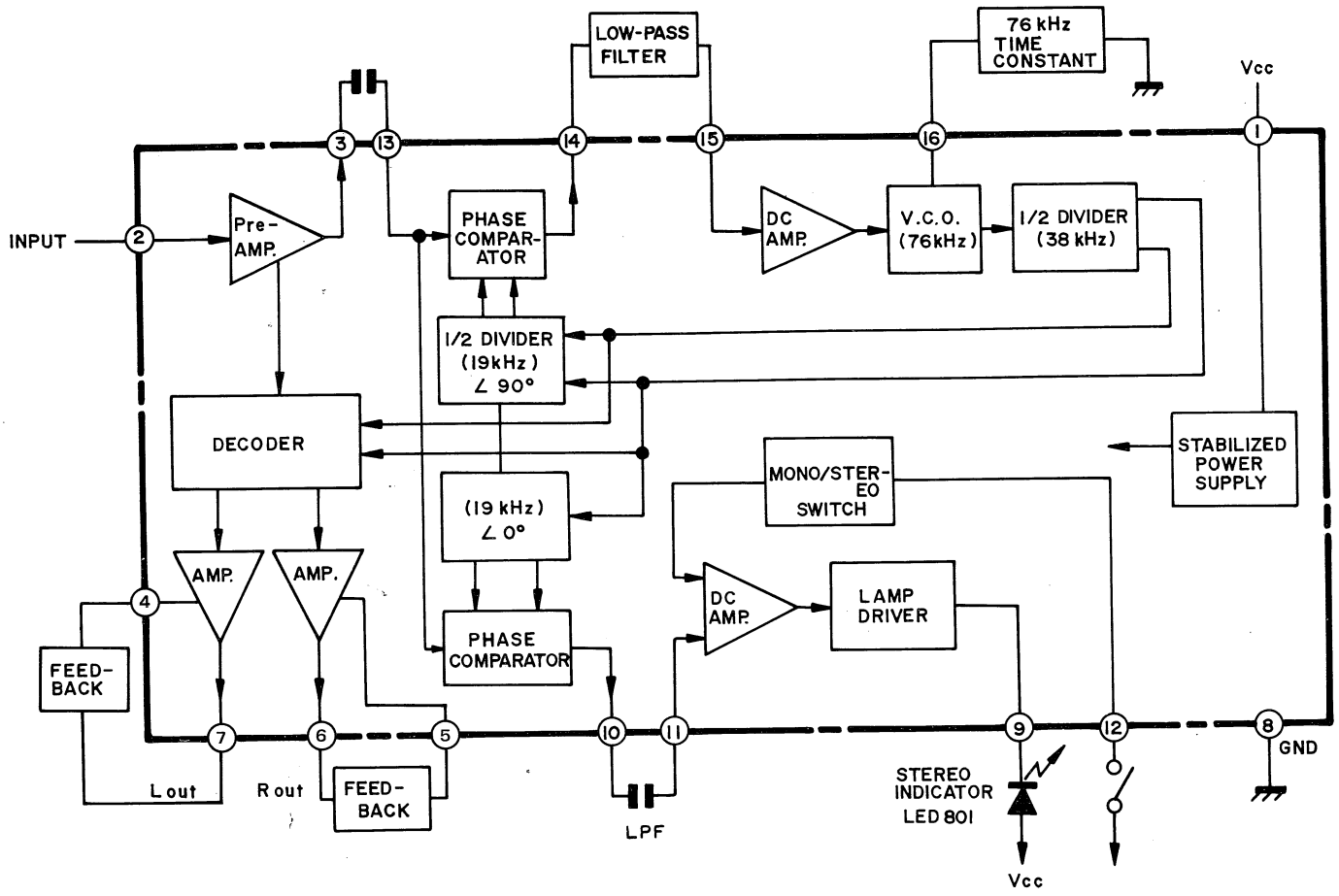


Figure 34 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC101)



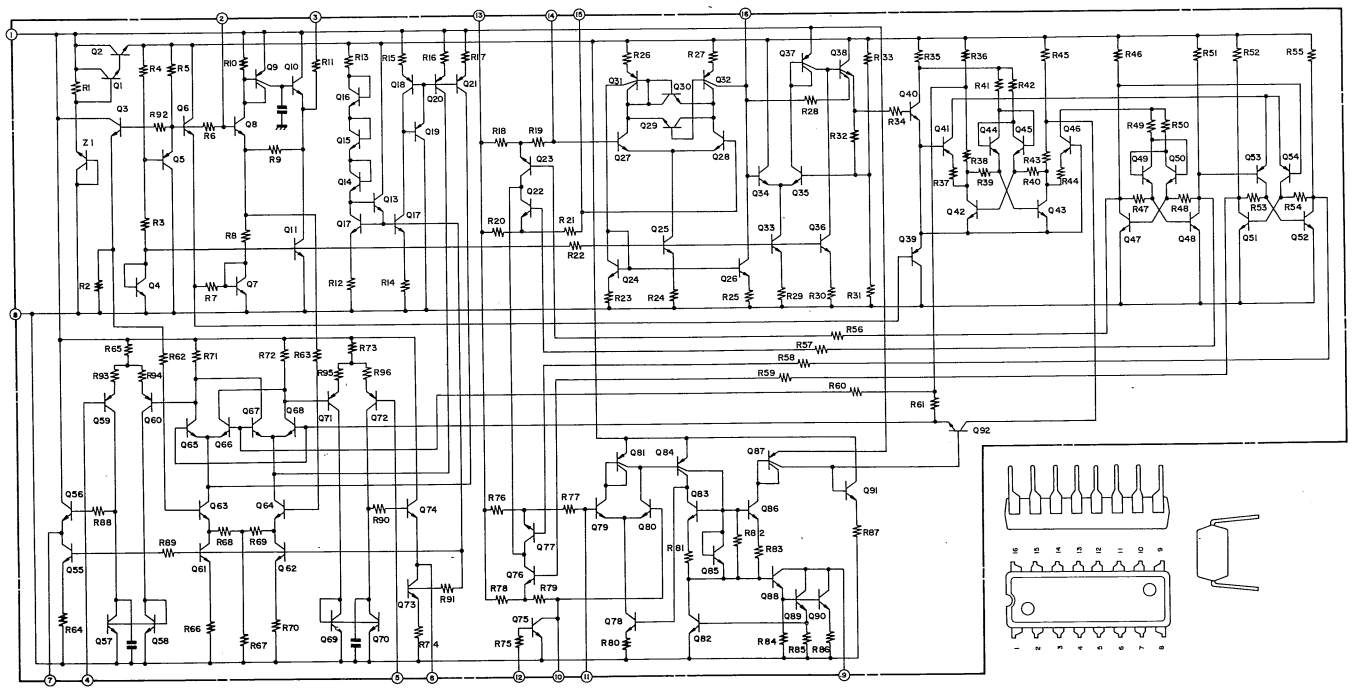
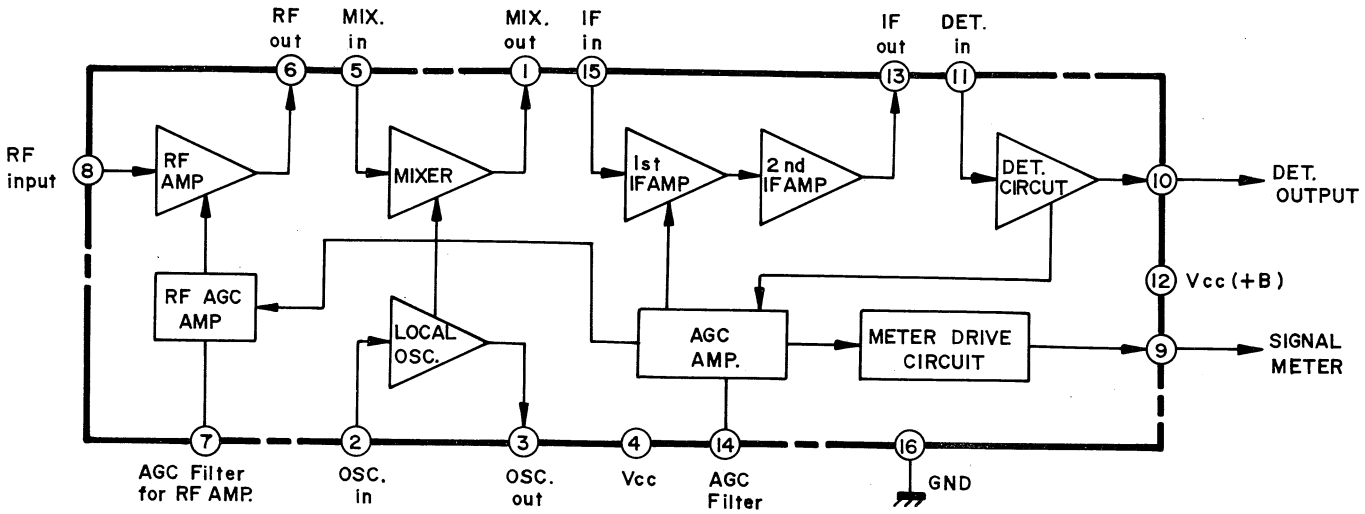
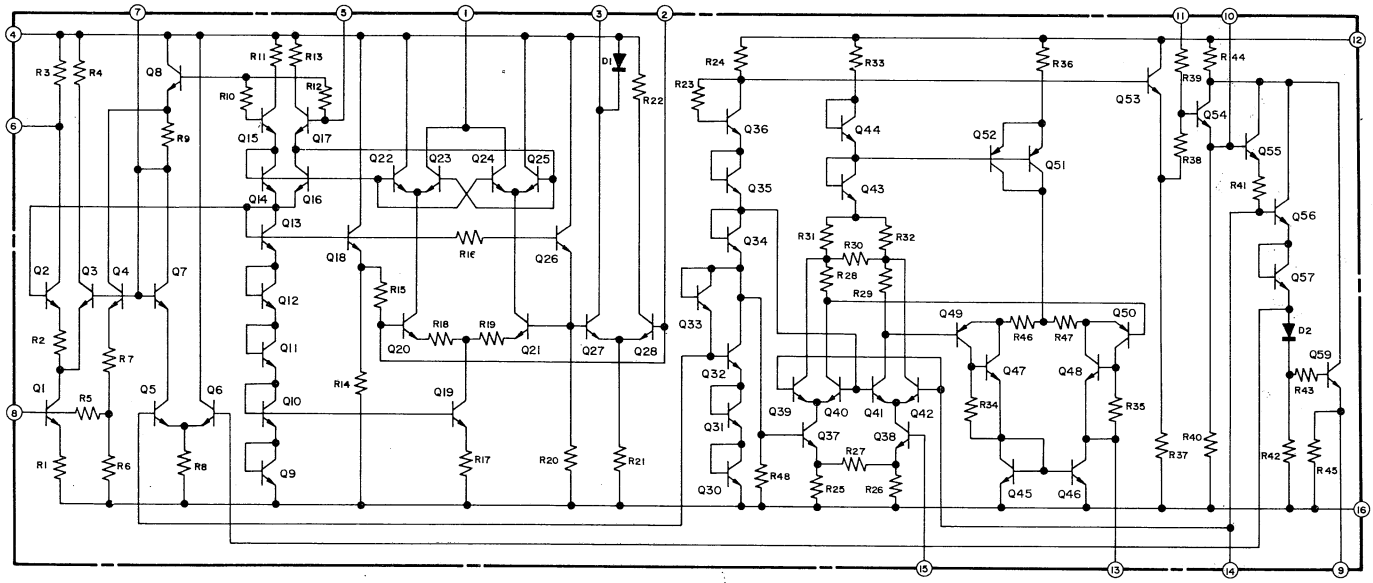


Figure 35 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC102)





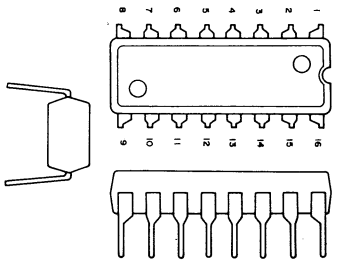


Figure 36 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC301)

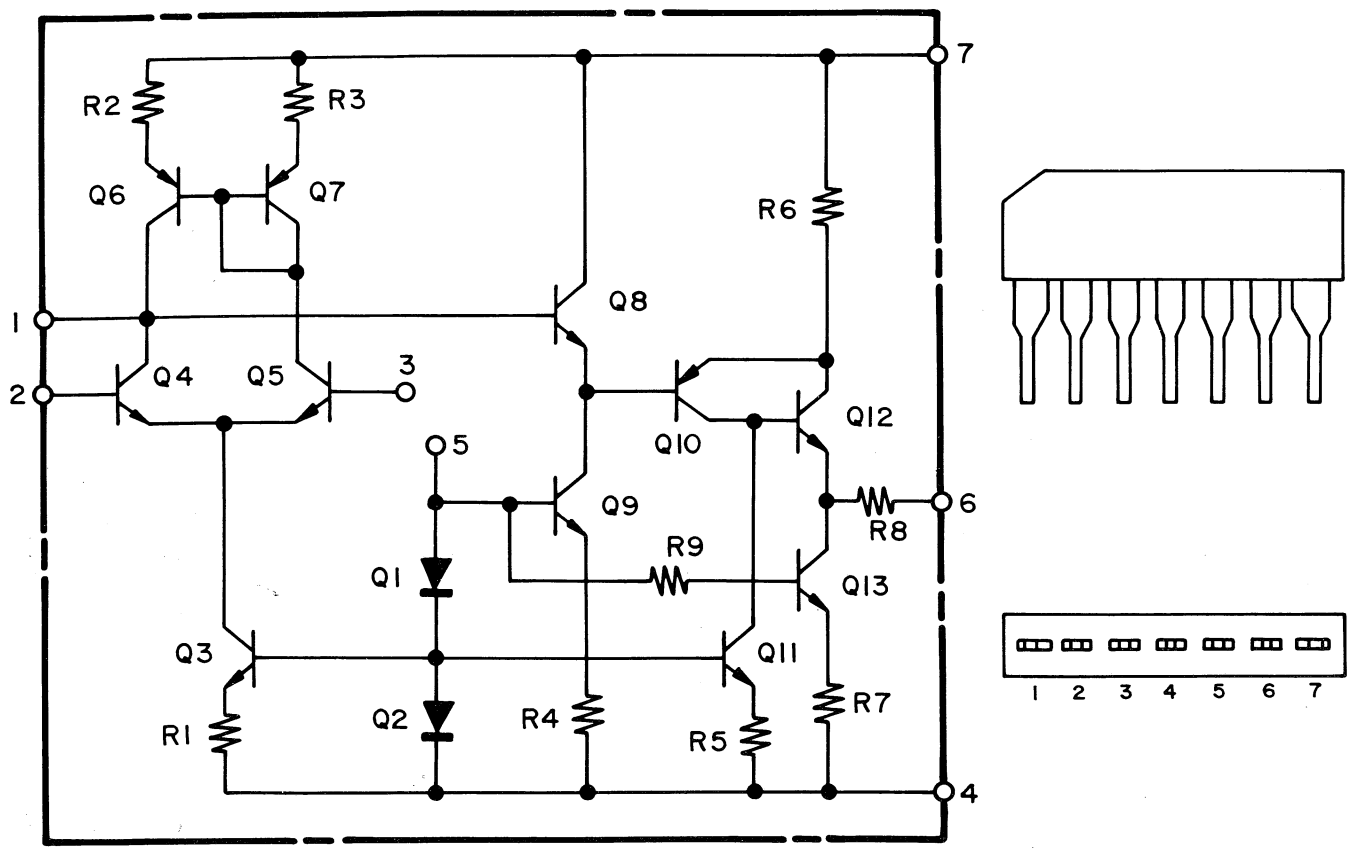
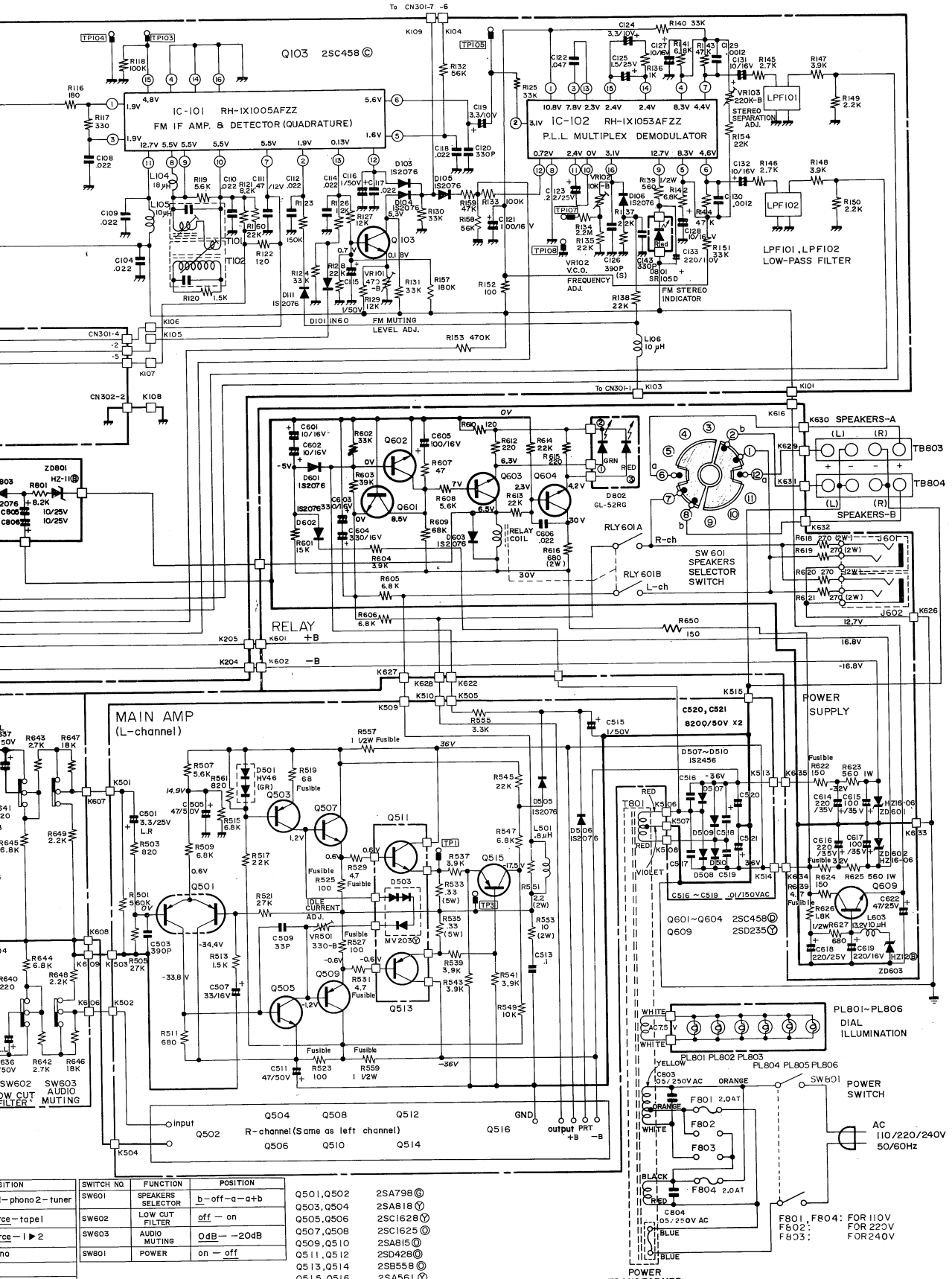


Figure 37 EQUIVALENT CIRCUIT OF INTEGRATED CIRCUIT (IC 201, IC 202, IC401 and IC402)

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)
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.

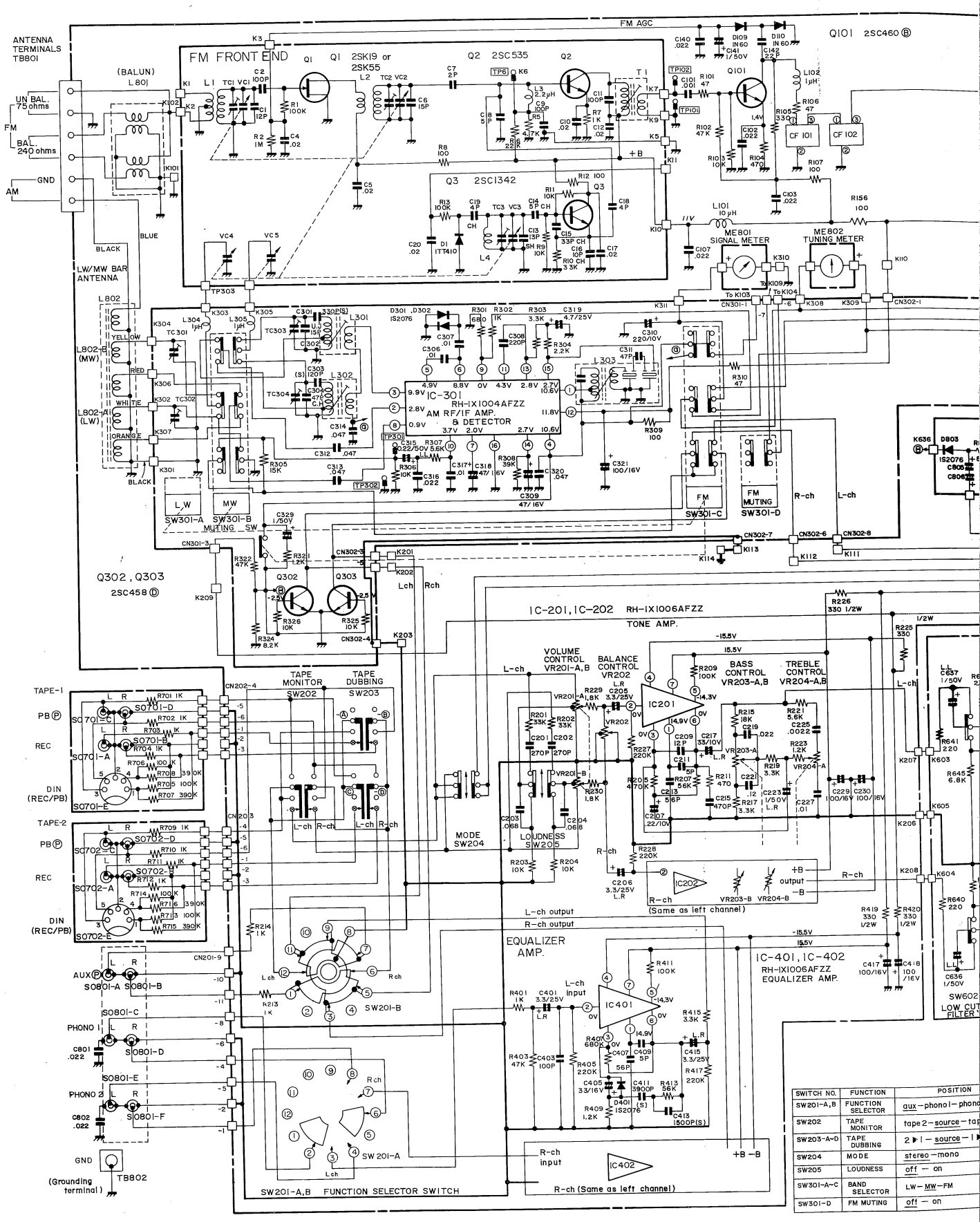


SWITCH NO.	FUNCTION	POSITION
SW601	SPEAKERS SELECTOR	b−off−a−a+b
SW602	LOW CUT FILTER	off − on
SW603	AUDIO MUTING	0dB − −20dB
SW801	POWER	on − off

Q501, Q502	2SA798Ⓖ
Q503, Q504	2SA818Ⓨ
Q505, Q506	2SC1628Ⓨ
Q507, Q508	2SC1625Ⓞ
Q509, Q510	2SA815Ⓞ
Q511, Q512	2SD428Ⓞ
Q513, Q514	2SB558Ⓞ
Q515, Q516	2SA561Ⓨ

notice.)

C DIAGRAM



SWITCH NO.	FUNCTION	POSITION
SW201-A,B	FUNCTION SELECTOR	aux—phono I—phono
SW202	TAPE MONITOR	tape 2—source—tap
SW203-A~D	TAPE DUBBING	2 ▶ I — source — I ▶
SW204	MODE	stereo—mono
SW205	LOUDNESS	off — on
SW301-A~C	BAND SELECTOR	LW—MW—FM
SW301-D	FM MUTING	off — on

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

Figure 38 SCHEMATIC D

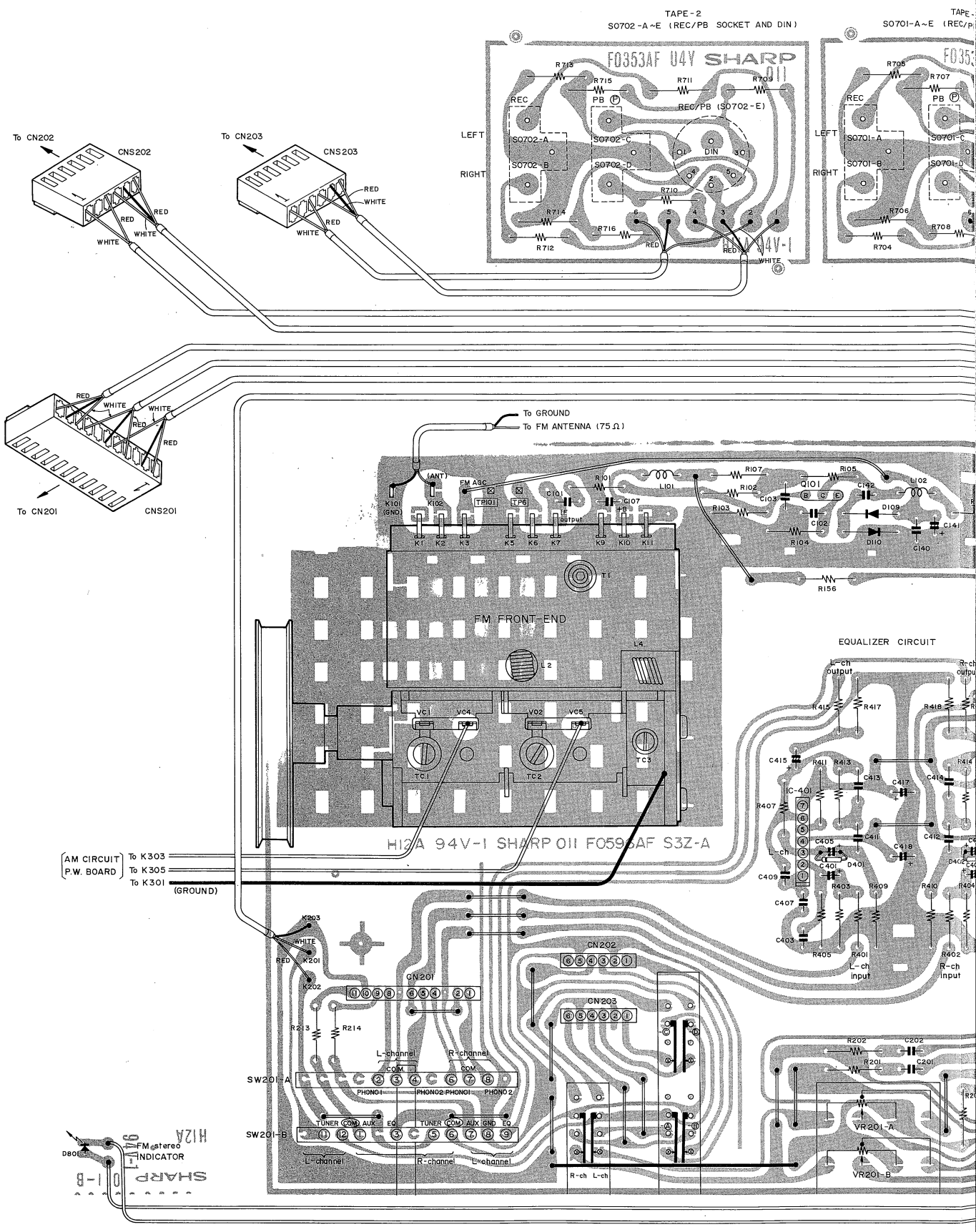
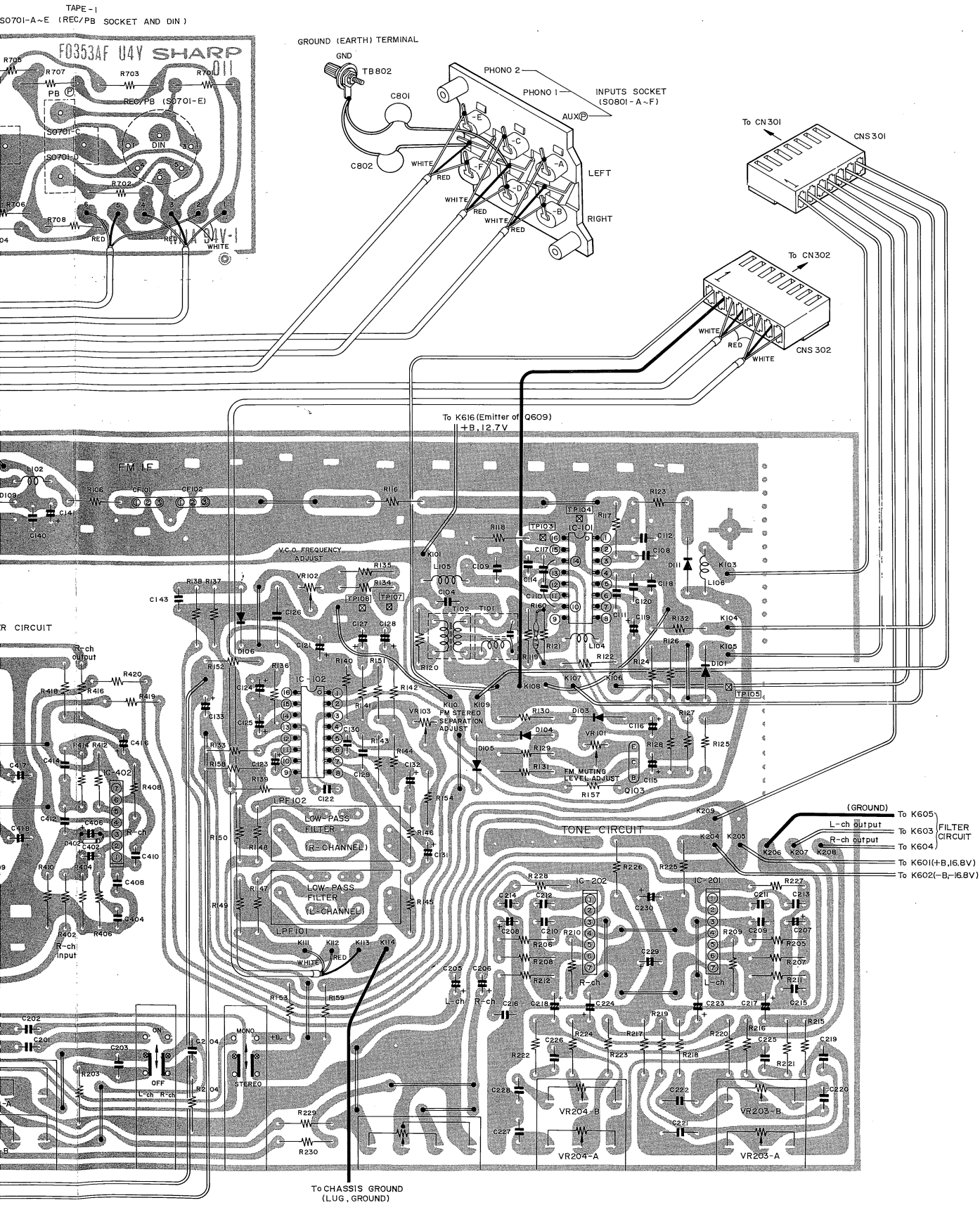


Figure 39 WIRING SIDE OF FM RF/IF CIRCUIT, EC



ontrol	loudness switch	mode switch	balance control	treble control	bass control
B	SW205	SW204	VR202	VR204-A, B	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

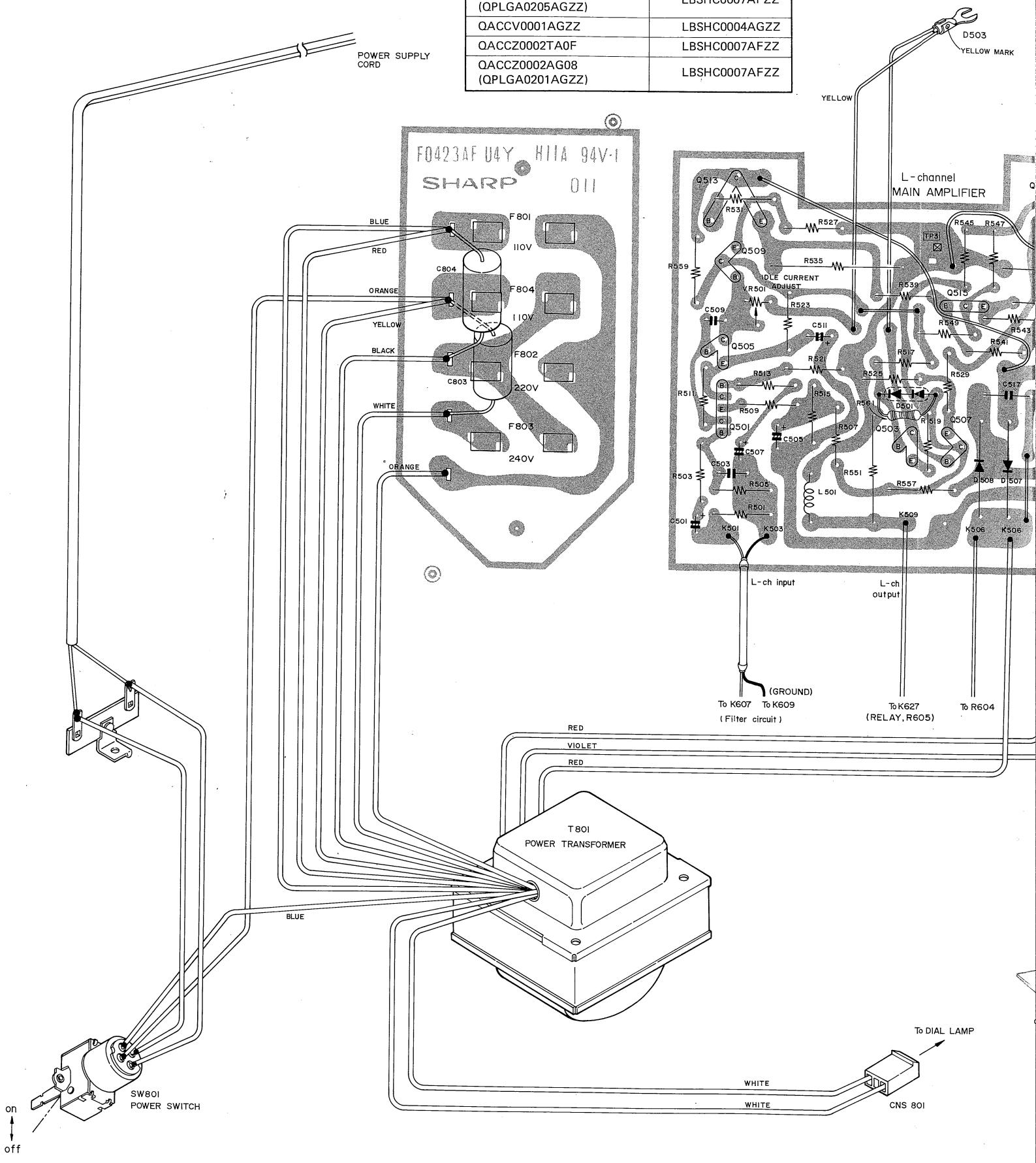
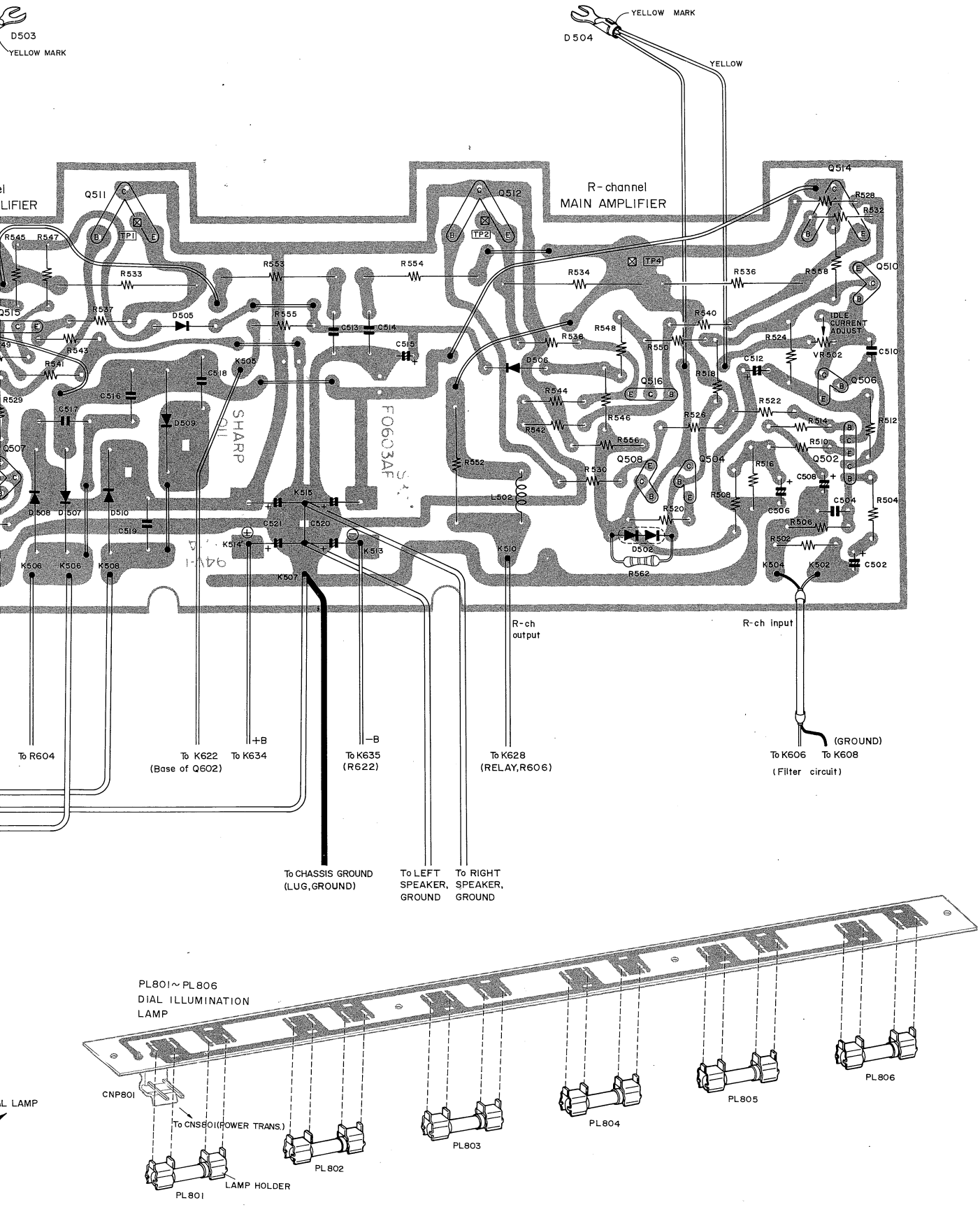


Figure 40 WIRING SIDE OF POWER AMP. AND L



AMP. AND LAMP BOARDS

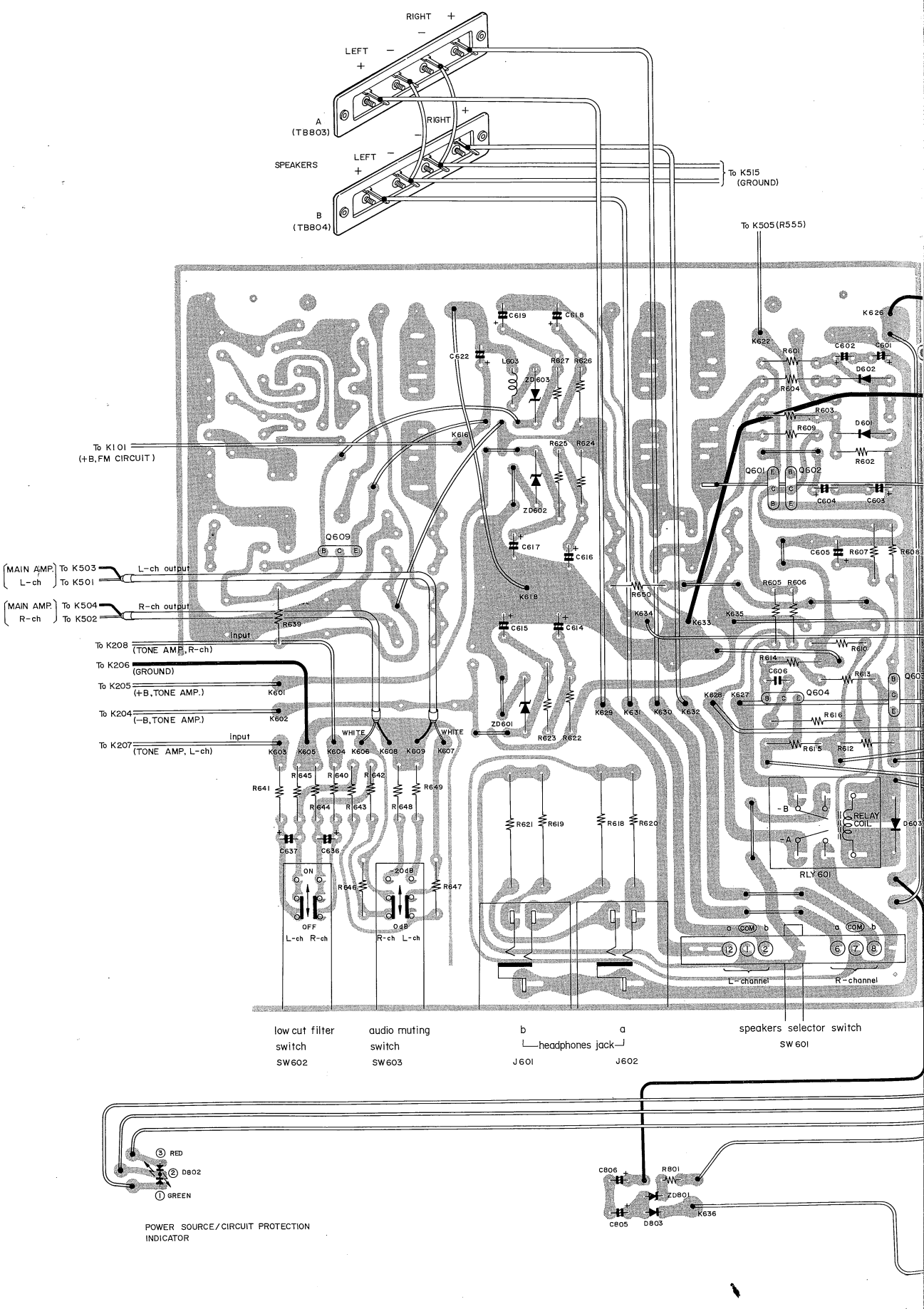
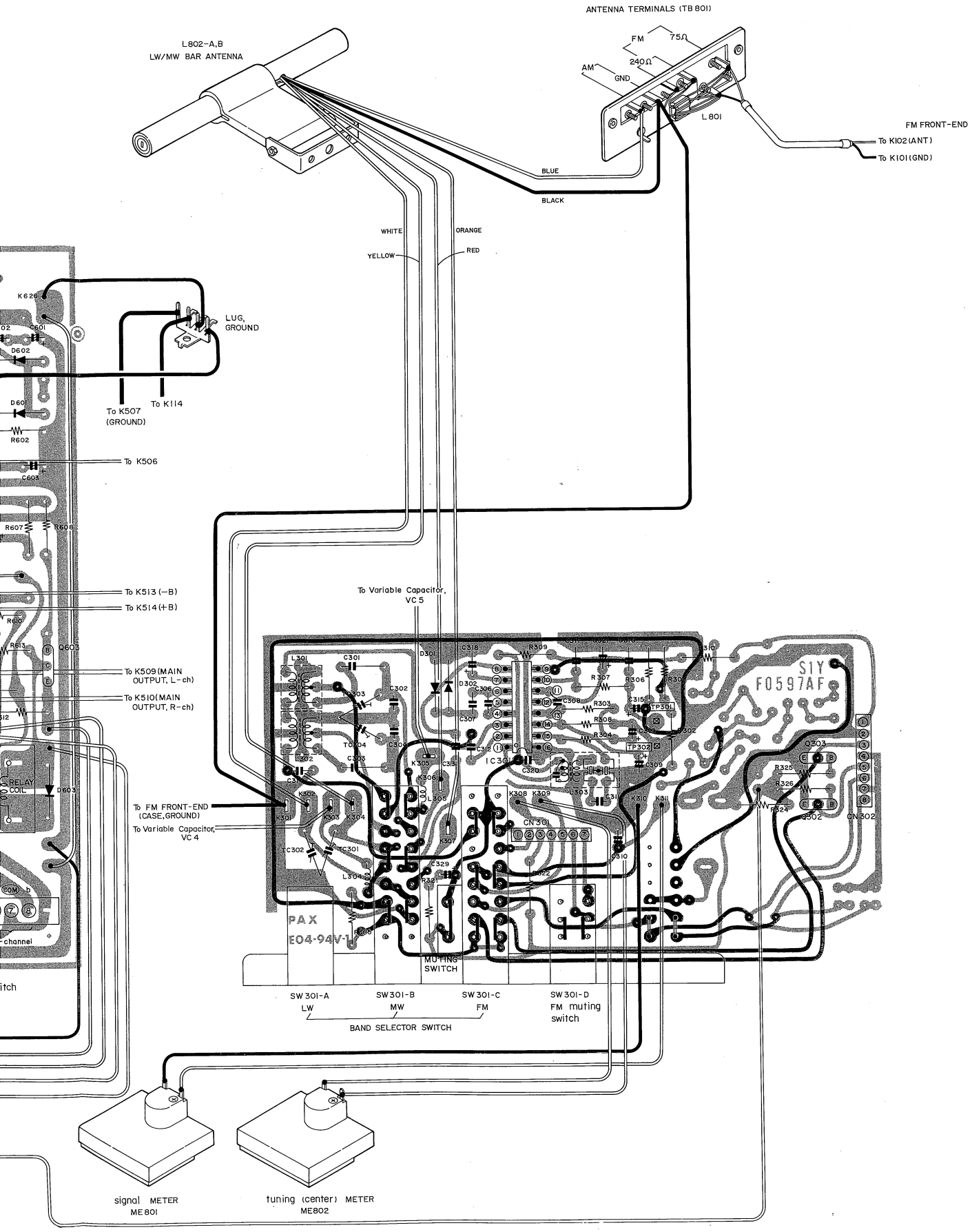


Figure 41 WIRING SIDE OF AM RF/IF



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 VS2SB558-O/-1 and VS2SD428-O/-1 are almost similar in the shape. So pay attention to the mark of transistor when replacing the power transistor.

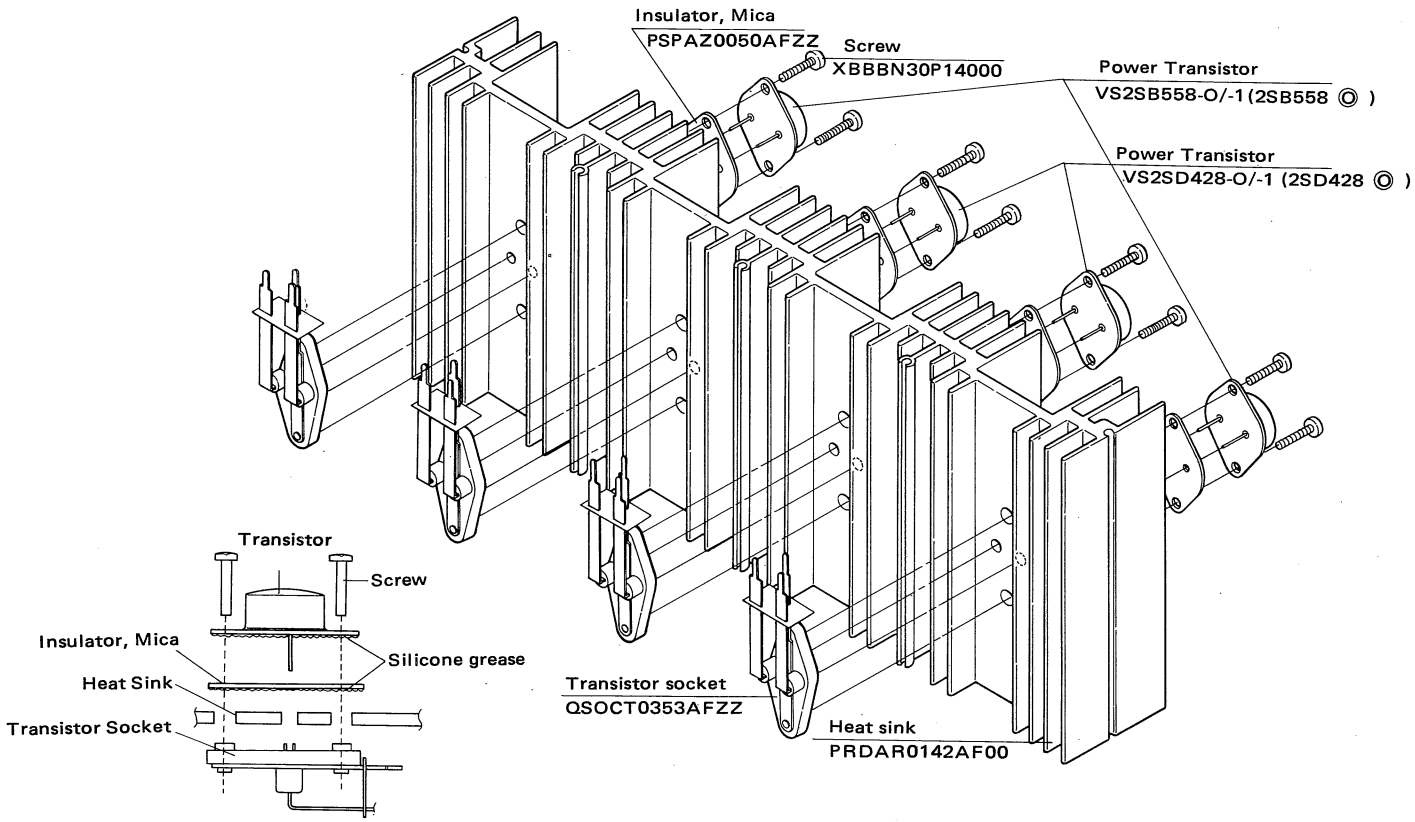
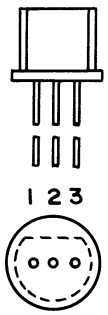
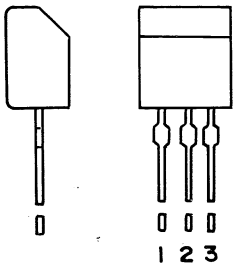


Figure 42 POWER TRANSISTOR REPLACEMENT



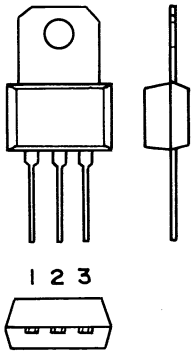
1. EMITTER
2. COLLECTOR
3. BASE

2SA561



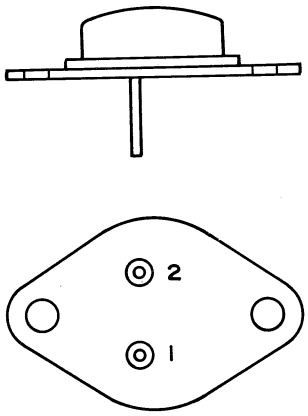
1. EMITTER
2. COLLECTOR
3. BASE

2SC460
2SC458
2SC535
2SC1342



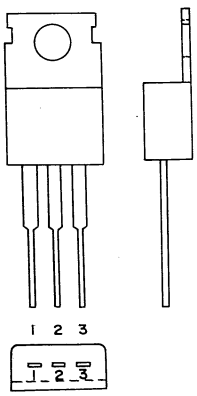
1. EMITTER
2. BASE
3. COLLECTOR

2SC1628
2SA818



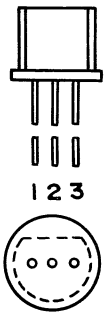
1. BASE
2. EMITTER
COLLECTOR(CASE)

2SD428
2SB558



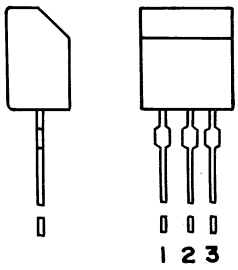
1. BASE
2. COLLECTOR (HEAT SINK)
3. EMITTER

2SC1625
2SA815
2SD235



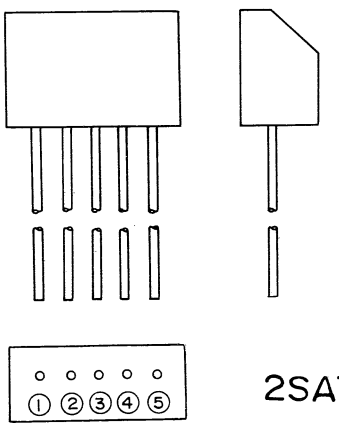
1. DRAIN
2. SOURCE
3. GATE

2SK19



1. DRAIN
2. SOURCE
3. GATE

2SK55



2SA798

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

Figure 43 TRANSISTOR TYPES

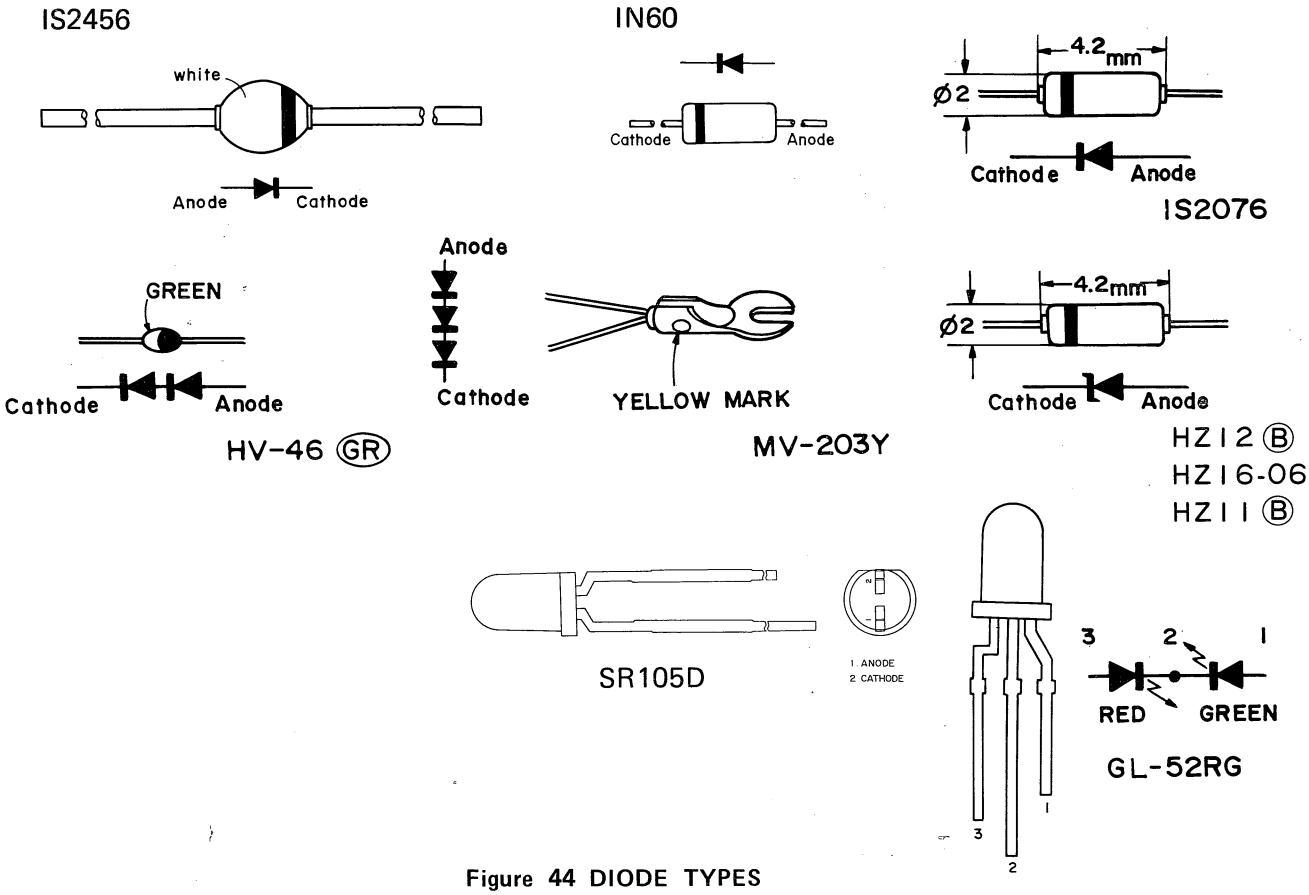
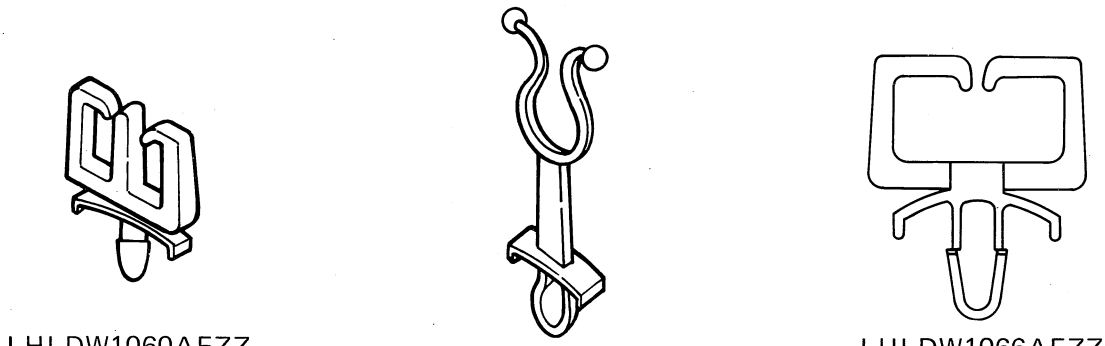


Figure 44 DIODE TYPES



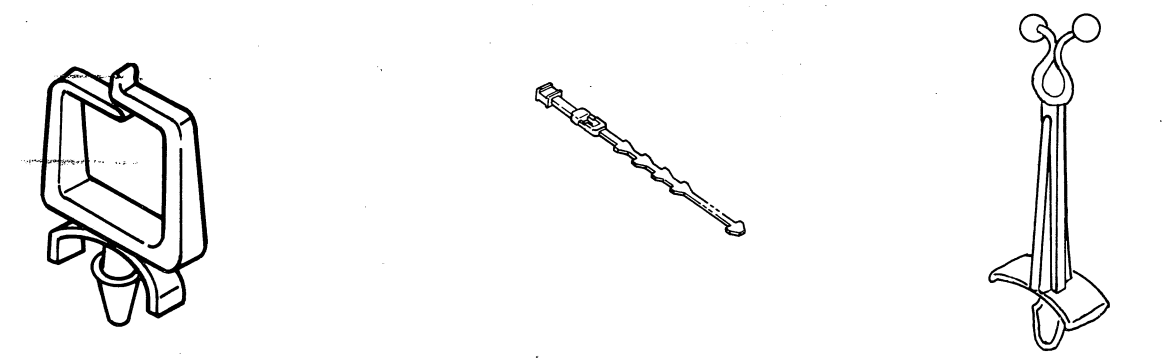


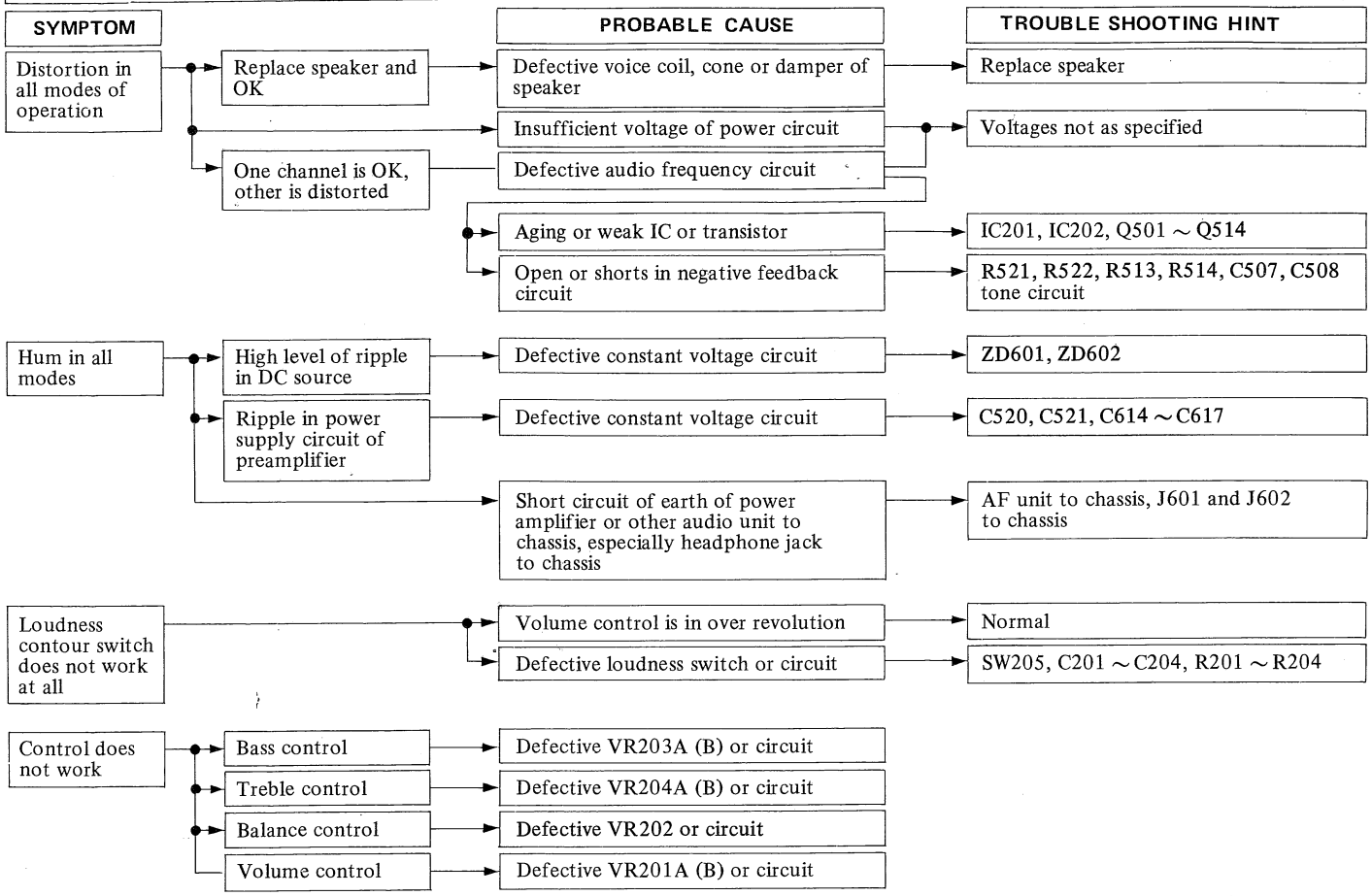
Figure 45 WIRE CLIP

TROUBLE SHOOTING GUIDE

ALL OPERATIONAL MODES (1)

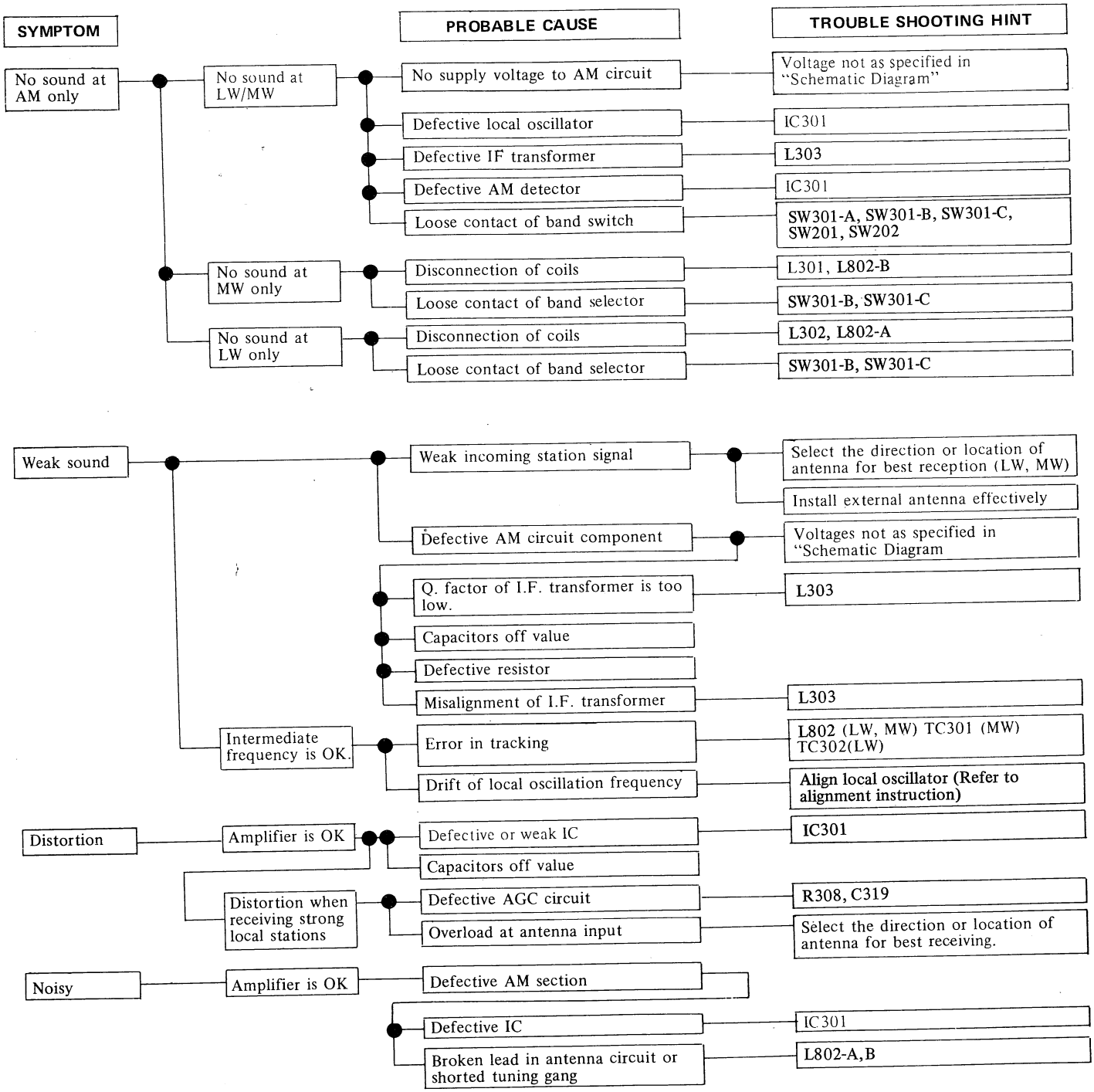
SYMPTOM		PROBABLE CAUSE	TROUBLE SHOOTING HINT
No sound all modes	AC Power OK	Broken or shorted speaker cord network or voice coil	Check continuity of speaker cord, and voice coil Repair broken cord or replace speaker.
	Normal at DC detected	Not operate relay	Check relay circuit (Q601 ~ Q604) and voltage 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 Shorted capacitor	T801 C803, C804
		Shorted power amplifier transistor	Q511 ~Q514 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	Q511 ~ Q514
		Defective or shorted device at output	Speaker system, headphone
		Defective audio amplifier	Divergence of voltage specified in "SCHEMATIC DIAGRAM"
		Defective transistor	Q501 ~ Q516
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 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

ALL OPERATIONAL MODES (2)



TROUBLE SHOOTING GUIDE

AM RECEPTION



TROUBLE SHOOTING GUIDE

FM RECEPTION

SYMPTOM		PROBABLE CAUSE	TROUBLE SHOOTING HINT
No sound in FM position	No sound in AM position, also	Defective power supply of IF stage	Voltage not as specified in "Schematic Diagram"
	FM detected signal is OK at TP105	Defective FM multiplex stage	Refer to the guide for FM multiplex reception
	Weak or no voltage of FM power supply	Open or defective circuit from power supply to FM tuner	Check continuously between tuner and power supply
		Poor contact of selector switch	SW201, SW202, SW301-D
	FM power supply is OK.	Defective FM IF circuit	
		Low voltage in IF circuit	
		Weak IC	IC101, IC102
		Defective ceramic filter	CF101, CF102
		Defective IF transformer	T1, T101, T102
		Defective resistors and capacitors	
	FM IF is OK	Defective FM tune circuit	FM front-end circuit
		Defective power supply circuit to FM front end	Voltage not as specified in "Schematic Diagram"
No signal but sufficient background noise	Not tune in FM range	Local oscillator dead	Q3, L4, TC3, C14
Weak signal but loud background noise		Weak station signal	Use more sensitive antenna
		Loose antenna connection	
		Open antenna circuit	
		Weak RF circuit	FM front-end
		Misadjustment of tracking or IF transformers	Realign following the alignment chart
Distortion in FM		Defective IF stage or low voltage in IF stage	Measure voltages in FM section and repair or replace defective part
		Misalignment	T101, T102, T1
		Weak integrated circuit	IC101, IC102
Hum	Ripple in FM power supply	Capacitor off value	C618, C619
Noisy		Defective FM IF stage or FM tuner	Voltage not as specified in "Schematic Diagram"
		Aging or weak IC	IC101, IC102
Dial calibration off	Pointer does not move smoothly.	Pointer off of track or hits obstruction	
	Pointer runs over dial scale.	Pointer does not start at zero point of dial	Mechanically rese pointer at zero

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

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
IC401, IC402	RH-IX1006AFZZ	Equalizer Amplifier (TA7136P)	AH
		TRANSISTORS	
Q101	VS2SC460-B/-1	FM IF Amplifier (2SC460 Ⓑ)	AE
Q103	VS2SC458-C/-1	FM Muting Amplifier (2SC458 Ⓒ)	AE
Q302	VS2SC458-D/-1	Muting (2SC458 Ⓓ)	AE
Q303	VS2SC458-D/-1	Muting (2SC458 Ⓓ)	AE
Q501, Q502	VS2SA798-G/-1	Dual Transistor, Differential Amplifier (2SA798 Ⓖ)	AF
Q503, Q504	VS2SA818-Y/-1	Constant Current Circuit (2SA818 Ⓨ)	AH
Q505, Q506	VS2SC1628-Y-1	Audio Amplifier, Class "A" (2SC1628 Ⓨ)	AH
Q507, Q508	VS2SC1625-O-1	Drive Amplifier (2SC1625 Ⓞ)	AH
Q509, Q510	VS2SA815-O/-1	Drive Amplifier (2SA815 Ⓞ)	AH
Q511, Q512	VS2SD428-O/-1	Power Amplifier (2SD428 Ⓞ)	AP
Q513, Q514	VS2SB558-O/-1	Power Amplifier (2SB558 Ⓞ)	AR
Q515, Q516	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
Q609	VS2SD235-Y/-1	Voltage Regulator, Ripple Filter (2SD235 Ⓨ)	AG
		DIODES	
D101	VHD1N60////-1	Signal Meter, FM (1N60)	AC
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
D109	VHD1N60////-1	FM AGC (1N60)	AC
D110	VHD1N60////-1	FM AGC (1N60)	AC
D111	VHD1S2076//-1	Voltage Detector (1S2076)	AB
D301	VHD1S2076//-1	Overload (1S2076)	AB
D302	VHD1S2076//-1	Overload (1S2076)	AB
D401, D402	VHD1S2076//-1	Speed-up	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	VHD1S2456//1D	Power Rectifier (1S2456)	AG
D601	VHD1S2076//-1	Voltage Detector, Protection Circuit (1S2076)	AB
D602	VHD1S2076//-1	Rectifier (1S2076)	AB
D603	VHD1S2076//-1	Surge Current Provention (1S2076)	AB
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
D803	VHD1S2076//-1	Noise Prevention (1S2076)	AB
ZD601	VHEHZ16-06/1F	Zener Diode, Voltage Regulator (16.1 ~ 17.1V) (HZ16-06)	
ZD602	VHEHZ16-06/1F	Zener Diode, Voltage Regulator (16.1 ~ 17.1V) (HZ16-06)	
ZD603	VHEHZ12-BBK-1	Zener Diode, Voltage Regulator (12.7 ~ 13.5V) (HZ12 Ⓑ)	AD
ZD801	VHEHZ11B///-1	Zener Diode, Noise Prevention (10.1 ~ 11.2V) (HZ11 Ⓑ)	AD
		COILS	
L101	VP-LH100M0000	10μH, +B Choke	AB
L102	VP-LH1R0M0000	1μH, Phase Compensation	AB
L104	RCILZ0052AFZZ	18μH, Phase Shifter	AB
L105	VP-LH100M0000	10μH, +B Choke	AB
L106	VP-LH100M0000	10μH, +B Choke	AB
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
L603	VP-LH100M0000	10μH, Choke	AB
L801	RCILA0231AFZZ	Balun (Antenna Matching)	AC

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
L802-A, B	RCILA0403AFZZ	LW/MW Bar Antenna	AS
		TRANSFORMERS	
T101	RCILD0053AFZZ	Quadrature (10.7MHz)	AE
T102	RCILD0054AFZZ	Quadrature (10.7MHz)	AE
T801, CNS801	RTRNP0478AFZZ	Power with Connecting Socket	
		FILTERS	
CF101, CF102	RFILF0001AGZZ	FM IF, Ceramic	AF
LPF101, LPF102	RFILL0050AFZZ	Low Pass Filter	AK
		CONTROLS	
TC301, TC302	RTO-H2033AGZZ	Trimmer Capacitors TC301 : MW Antenna Trimmer TC302 : LW Antenna Trimmer	AD
TC303, TC304	RTO-H2051AFZZ	Trimmer Capacitors TC303 : MW Oscillator Trimmer 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 Separation Adjust	AD
VR201-A, B	RVR-B0148AFZZ	100K ohm, Volume Control	AM
VR202	RVR-Z0061AFZZ	100K ohm, Balance Control	
VR203-A, B	RVR-C0066AFZZ	100K ohm, Bass Control	AL
VR204-A, B	RVR-C0066AFZZ	100K ohm, Treble Control	AL
VR501, VR502	RVR-M0139AFZZ	330(B) ohm, Idle Current Adjust	AD
		ELECTROLYTIC CAPACITORS	
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
C141	VCEAAU1HW105A	1μF, 50V, +75 −10%	AB
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
C329	VCEAAU1HW105A	1μF, 50V, +75 −10%	AB
C401, C402	VCEALU1EC335A	3.3μF, 25V, +75 −10%, LR (Orange)	AC
C405, C406	VCEAAU1CW336Y	33μF, 16V, +50 −10%	AC
C415, C416	VCEALU1EC335A	3.3μF, 25V, +75 −10%, LR (Orange)	AC
C417, C418	VCEAAU1CW107Y	100μF, 16V, +50 −10%	AC
C501, C502	VCEALU1EC335A	3.3μF, 25V, +75 −10%, LR (Orange)	AC
C505, C506	VCEAAU1HW476Y	47μF, 50V, +50 −10%	AC
C507, C508	VCEAAU1CW336Y	33μF, 16V, +50 −10%	AC
C511, C512	VCEAAU1HW476Y	47μF, 50V, +50 −10%	AC
C515	VCEAAU1HW105A	1μF, 50V, +75 −10%	AB
C520, C521	RC-EZ1009AFZZ	8200μF x 2 (Dual Capacitor), 50V, +50 −10%	
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	VCEAAU1CW107Y	100μF, 16V, +50 −10%	AC
C614	VCEAAU1VW227Y	220μF, 35V, +50 −10%	AD
C615	VCEAAU1VW107Y	100μF, 35V, +50 −10%	AD
C616	VCEAAU1VW227Y	220μF, 35V, +50 −10%	AD
C617	VCEAAU1VW107Y	100μF, 35V, +50 −10%	AD
C618	VCEAAU1EW227Y	220μF, 25V, +50 −10%	AC
C619	VCEAAU1CW227Y	220μF, 16V, +50 −10%	AC
C622	VCEAAU1EW476Y	47μF, 25V, +50 −10%	AC
C636, C637	VCEALU1HW105M	1μF, 50V, ±20%, LL (Yellow)	AD
C805	VCEAAU1EW106Y	10μF, 25V, +50 −10%	AB
C806	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
C107	VCKZPU1HF223Z	.022μF	AA
C108	VCKZPU1HF223Z	.022μF	AA
C109	VCKZPU1HF223Z	.022μF	AA
C110	VCKZPU1HF223Z	.022μF	AA
C111	VCKZPU1ND474M	.47μF, 12V, ±20%, Ceramic	AD
C112	VCKZPU1HF223Z	.022μF	AA

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
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	VCQSMT1HS391J	390pF, 50V, ±5%, Styrol	AB
C129	VCQYKU1HM122J	.0012μF, 50V, ±5%, Mylar	AB
C130	VCQYKU1HM122J	.0012μF, 50V, ±5%, Mylar	AB
C140	VCKZPU1HF223Z	.022μF	AA
C142	VCCSPU1HL220K	22pF, 50V, ±10%, Ceramic	AA
C143	VCCSPU1HL331K	330pF, 50V, ±10%, Ceramic	AB
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
C403, C404	VCCSPU1HL101K	100pF, 50V, ±10%, Ceramic	AA
C407, C408	VCCSPU1HL560K	56pF, 50V, ±10%, Ceramic	AA
C409, C410	VCCSPU1HL5R0C	5pF, 50V, ±0.25pF, Ceramic	AA
C411, C412	VCQSMU1HS392J	3900pF, 50V, ±5%, Styrol	AC
C413, C414	VCQSMU1HS152J	1500pF, 50V, ±5%, Styrol	AB
C503, C504	VCCSPU1HL391J	390pF, 50V, ±5%, Ceramic	AB
C509, C510	VCCSPU1HL330K	33pF, 50V, ±10%, Ceramic	AA
C513, C514	VCQYKU1HM104K	.1μF, 50V, ±10%, Mylar	AC
C516, C517, C518, C519	VCKZPU2TE103Z	.01μF, 150VAC, +80 −20%, Ceramic	AB
C606	VCKZPU1HF223Z	.022μF	AA
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-ST2EE470J	47 ohm	AA
R102	VRD-ST2EE473J	47K ohm	AA
R103	VRD-ST2EE103J	10K ohm	AA
R104	VRD-ST2EE471J	470 ohm	AA
R105	VRD-ST2EE331J	330 ohm	AA
R106	VRD-ST2EE470J	47 ohm	AA
R107	VRD-ST2EE101J	100 ohm	AA
R116	VRD-ST2EE181J	180 ohm	AA
R117	VRD-ST2EE331J	330 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-ST2EE121J	120 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-ST2EE123J	12K ohm	AA
R128	VRD-ST2EE223J	22K ohm	AA
R129	VRD-ST2EE123J	12K 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-ST2EY101J	100 ohm	AA
R153	VRD-ST2EE474J	470K ohm	AA
R154	VRD-ST2EE223J	22K ohm	AA
R156	VRD-ST2EY101J	100 ohm	AA
R157	VRD-ST2EE184J	180K ohm	AA
R158	VRD-ST2EE563J	56K ohm	AA
R159	VRD-ST2EE473J	47K ohm	AA
R160	VRD-ST2EE223J	22K ohm	AA

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
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-ST2HD331J	330 ohm, 1/2W, ±5%, Carbon	AA
R227, R228	VRD-ST2EE224J	220K ohm	AA
R229, R230	VRD-ST2EE182J	1.8K 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-ST2EE153J	15K ohm	AA
R306	VRD-ST2EE103J	10K ohm	AA
R307	VRD-ST2EE562J	5.6K ohm	AA
R308	VRD-ST2EE393J	39K ohm	AA
R309	VRD-ST2EY101J	100 ohm	AA
R310	VRD-ST2EY470J	47 ohm	AA
R321	VRD-ST2EE122J	1.2K ohm	AA
R322	VRD-ST2EE473J	47K ohm	AA
R324	VRD-ST2EE822J	8.2K ohm	AA
R325	VRD-ST2EE103J	10K ohm	AA
R326	VRD-ST2EE103J	10K ohm	AA
R401, R402	VRD-ST2EE102J	1K ohm	AA
R403, R404	VRD-ST2EE473J	47K ohm	AA
R405, R406	VRD-ST2EE224J	220K ohm	AA
R407, R408	VRD-ST2EE684J	680K ohm	AA
R409, R410	VRD-ST2EE122J	1.2K ohm	AA
R411, R412	VRD-ST2EE104J	100K ohm	AA
R413, R414	VRD-ST2EE563J	56K ohm	AA
R415, R416	VRD-ST2EE332J	3.3K ohm	AA
R417, R418	VRD-ST2EE224J	220K ohm	AA
R419, R420	VRD-ST2HD331J	330 ohm, 1/2W, ±5%, Carbon	AA
R501, R502	VRD-ST2EE564J	560K ohm	AA
R503	VRD-ST2EE821J	820 ohm	AA
R504	VRD-ST2EY821J	820 ohm	AA
R505, R506	VRD-ST2EE273J	27K ohm	AA
R507, R508	VRD-ST2EE562J	5.6K ohm	AA
R509, R510	VRD-ST2EE682J	6.8K ohm	AA
R511, R512	VRD-ST2EY681J	680 ohm	AA
R513, R514	VRD-ST2EE152J	1.5K ohm	AA
R515, R516	VRD-ST2EE682J	6.8K ohm	AA
R517, R518	VRD-ST2EE223J	22K ohm	AA
R519, R520	VRG-ST2EA680J	68 ohm, 1/4W, ±5%, Fusible	AB
R521, R522	VRD-ST2EE273J	27K ohm	AA
R523, R524	VRG-ST2EA101J	100 ohm, 1/4W, ±5%, Fusible	AB
R525, R526	VRG-ST2EA101J	100 ohm, 1/4W, ±5%, Fusible	AB
R527, R528	VRG-ST2EA101J	100 ohm, 1/4W, ±5%, Fusible	AB
R529, R530	VRG-ST2EA4R7J	4.7 ohm, 1/4W, ±5%, Fusible	AB
R531, R532	VRG-ST2EA4R7J	4.7 ohm, 1/4W, ±5%, Fusible	AB
R533, R534	VRW-KT3HDR33K	.33 ohm, 5W, ±10%, Wire Wound	AD
R535, R536	VRW-KT3HDR33K	.33 ohm, 5W, ±10%, Wire Wound	AD
R537, R538	VRD-ST2EE392J	3.9K ohm	AA
R539, R540	VRD-ST2EE392J	3.9K ohm	AA
R541, R542	VRD-ST2EE392J	3.9K ohm	AA
R543, R544	VRD-ST2EE392J	3.9K ohm	AA
R545, R546	VRD-ST2EE223J	22K ohm	AA
R547, R548	VRD-ST2EE682J	6.8K ohm	AA
R549, R550	VRD-ST2EE103J	10K ohm	AA
R551, R552	VRW-KT3DD2R2K	2.2 ohm, 2W, ±10%, Wire Wound	AC
R553, R554	VRW-KT3DD100K	10 ohm, 2W, ±10%, Wire Wound	AC
R555	VRD-ST2EE332J	3.3K ohm	AA
R556, R557, R558, R559	VRG-ST2HA1R0J	1 ohm, 1/2W, ±5%, Fusible	AC
R561, R562	VRD-ST2EE821J	820 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

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
R605	VRD-ST2EE682J	6.8K ohm	AA
R606	VRD-ST2EE682J	6.8K ohm	
R607	VRD-ST2EE470J	47 ohm	
R608	VRD-ST2EE562J	5.6K ohm	
R609	VRD-ST2EE683J	68K ohm	
R610	VRD-ST2EY121J	120 ohm	
R612	VRD-ST2EY221J	220 ohm	
R613	VRD-ST2EE223J	22K ohm	
R614	VRD-ST2EE223J	22K ohm	
R615	VRD-ST2EY221J	220 ohm	
R616	VRS-PT3DB681K	680 ohm, 2W, ±10%, Oxide Film	AB
R618, R619, R620, R621	VRS-PT3DB271K	270 ohm, 2W, ±10%, Oxide Film	AB
R622	VRG-ST2EA151J	150 ohm, 1/4W, ±5%, Fusible	AB
R623	VRS-PT3AB561K	560 ohm, 1W, ±10%, Oxide Film	AB
R624	VRG-ST2EA151J	150 ohm, 1/4W, ±5%, Fusible	AB
R625	VRS-PT3AB561K	560 ohm, 1W, ±10%, Oxide Film	AB
R626	VRD-ST2HD182J	1.8K ohm, 1/2W, ±5%, Carbon	AA
R627	VRD-ST2EE681J	680 ohm	AA
R639	VRG-ST2EA4R7J	4.7 ohm, 1/4W, ±5%, Fusible	AB
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-ST2EY151J	150 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
R801	VRD-SU2EY822J	8.2K ohm	AA

MISCELLANEOUS

CSPRT0304AF16	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
HDALM0173AFSA	Dial	AY
HPNLC3276AFSA	Front Panel	BG
HSSND0230AFSA	Dial Pointer	AF
JKNBB0059AFSA	Knob, Tuning Control	AP
JKNBM0248AFSA	Knob, LW/MW/FM/FM Muting	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
LANGQ0508AFSA	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 45)	AA
LHLDW1052AFZZ	Wire Clip	AA
LHLDW1053AFZZ	Wire Clip	AB
LHLDW1060AFZZ	Wire Clip	AA
LHLDW1062AFZZ	Wire Clip	AA
LHLDW1066AFZZ	Wire Clip	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-NZ0006SGFD	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 (5ϕ), 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	Tuning Shaft with Flywheel	AN
PCOVP1158AFZZ	Cover, Fuse, Rear Panel	AF
PCUSG0077AF00	Cushion, AM P.W. Board	—
PRDAR0142AF00	Heat Sink, Power Transistor	BA

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
	PRDAR0101AFFW	Heat Sink, Transistor Q609	AB
	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
	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)	—
CNS201	QCNCW106LAFZZ	Connecting Socket, 11-Pin	AC
CNS202	QCNCW103FAFZZ	Connecting Socket, 6-Pin	AB
CNS203	QCNCW103FAFZZ	Connecting Socket, 6-Pin	AB
CNS301	QCNCW104GAFZZ	Connecting Socket, 7-Pin	AB
CNS302	QCNCW105HAFZZ	Connecting Socket, 8-Pin	AB
	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
	QPWBF0603AFZZ	Printed Wiring Board, Main 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)	—
	QPWBF0596AFZZ	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～D	QSW-P0143AFZZ	Switch, Band (LW/MW/FM) Selector (SW301-A～C), FM Muting (SW301-D)	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
	RTUNF0061AFZZ	FM Tuner (Front-end) Assembly	BC
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