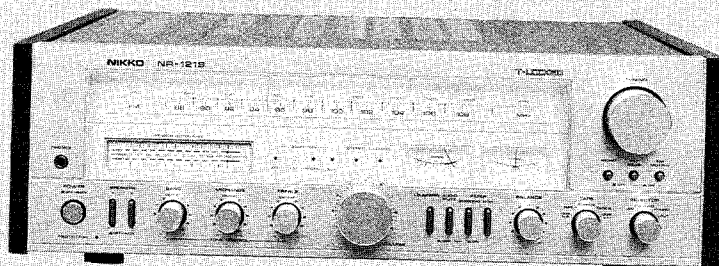


# NIKKO RECEIVER

# NR-1219

AM/FM STEREO RECEIVER



## TYPE AND VOLTAGE

<b>W-TYPE</b>	UL and CSA type	120V AC
<b>E-TYPE</b>	NK-STD type	220/240V AC
<b>N-TYPE</b>	DEMKO and SEMKO type	
<b>D-TYPE</b>	DIN type	

# SERVICE MANUAL

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# SPECIFICATIONS

## FM TUNER SECTION (W, E & N-TYPE)

Usable Sensitivity: . . . . . better than 10 dB $\mu$  (3.16  $\mu$ V)  
 50 dB Quieting Sensitivity:  
 . . . . . better than 15 dB $\mu$  (5.6  $\mu$ V)  
 Signal to Noise Ratio  
 (MONO): . . . . . better than 65 dB  
 (STEREO): . . . . . better than 60 dB  
 T. H. Distortion at 1 kHz  
 (MONO): . . . . . no more than 0.3 %  
 (STEREO): . . . . . no more than 0.8 %  
 Alternate Channel Selectivity: . . . . . better than 60 dB  
 Spurious Rejection Ratio: . . . . . better than 80 dB  
 Image Frequency Rejection Ratio: . . . . . better than 80 dB  
 IF Rejection Ratio: . . . . . better than 80 dB  
 AM Suppression Ratio: . . . . . better than 50 dB

## AM TUNER SECTION

Usable Sensitivity, Ferrite Loopstick Antenna:  
 . . . . . better than 1000  $\mu$ V/m  
 Signal to Noise Ratio: . . . . . better than 38 dB  
 Image Frequency Rejection Ratio: . . . . . better than 30 dB

## AUDIO AMPLIFIER SECTION

Continuous Power Output per channel  
 20 ~ 20000 Hz (8 ohms): . . . more than 100 Watts  
 1000 Hz (8 ohms): . . . . . more than 100 Watts  
 1000 Hz (4 ohms): . . . . . more than 110 Watts  
 T. H. Distortion, 8 ohms  
 at Continuous Power Output:  
 . . . . . no more than 0.03 %  
 at 1 Watt Power Output: . . . . no more than 0.05 %  
 I. M. Distortion, 8 ohms  
 at Continuous Power Output:  
 . . . . . no more than 0.03 %  
 at 1 Watt Power Output: . . . . no more than 0.05 %  
 IHF Power Bandwidth, 8 ohms: . . . . . 20 ~ 30000 Hz  
 Damping Factor, at 1000 Hz, 8 ohms: . . . . . 50  
 Frequency Response  
 PHONO  $\rightarrow$  TAPE OUT (RIAA Equalization):  
 . . . . . 30 ~ 15000 Hz  $\pm$  0.5 dB  
 AUX, TAPE IN  $\rightarrow$  SPEAKER TERMINAL:  
 . . . . . 10 ~ 40000 Hz  $\pm$  2 dB  
 Input Sensitivity for 100 Watts Power Output  
 PHONO . . . . . 2.5 mV  $\pm$  2 dB  
 AUX, TAPE IN . . . . . 150 mV  $\pm$  2 dB  
 MAIN IN . . . . . 1000 mV  $\pm$  2 dB  
 PHONO Maximum Input Capability, at 1000 Hz:  
 . . . . . more than 200 mV

Capture Ratio: . . . . . better than 4 dB  
 Stereo Separation  
 (100 Hz): . . . . . better than 30 dB  
 (1 kHz): . . . . . better than 35 dB  
 (10 kHz): . . . . . better than 30 dB  
 Subcarrier Suppression Ratio: . . . . . better than 58 dB  
 Muting Sensitivity: . . . . . 30 dB $\mu$   $\pm$  8 dB  
 T-LOCKED System  
 (Lock Range): . . . . . 150 kHz  $\pm$  100 kHz  
 (Lock in Range): . . . . . 50 kHz  $\pm$  20 kHz  
 FM Tuning Range: . . . . . 87.9 ~ 108.5 MHz  
 Antenna Impedance  
 . . . . . 300 ohms balanced & 75 ohms unbalanced  
 Output Level: . . . . . 550 mV  $\pm$  2 dB

IF Rejection Ratio: . . . . . better than 25 dB  
 Selectivity ( $\pm$  10 kHz): . . . . . better than 30 dB  
 AM Tuning Range: . . . . . 530 ~ 1630 kHz  
 Output Level: . . . . . 120 mV  $\pm$  3 dB

Output Level at Continuous Power Output,  
 (input: PHONO) TAPE OUT: . . . . . 150 mV  $\pm$  2 dB  
 PRE OUT: . . . . . 1000 mV  $\pm$  2 dB  
 Tone Control  
 BASS (70 Hz) Boost: . . . . . +10 dB  $\pm$  2 dB  
 Cut: . . . . . -10 dB  $\pm$  2 dB  
 MID (1000 Hz) Boost: . . . . . +6 dB  $\pm$  2 dB  
 Cut: . . . . . -6 dB  $\pm$  2 dB  
 TREBLE (10000 Hz) Boost: . . . . . +10 dB  $\pm$  2 dB  
 Cut: . . . . . -10 dB  $\pm$  2 dB  
 Loudness Control (Volume control set at -30 dB position)  
 70 Hz: . . . . . +10 dB  $\pm$  2 dB  
 10000 Hz: . . . . . +6 dB  $\pm$  2 dB  
 Subsonic Filter, at 20 Hz: . . . . . -3 dB  $\pm$  2 dB  
 High Filter, at 10000 Hz: . . . . . -3 dB  $\pm$  2 dB  
 Signal to Noise Ratio, IHF "A" Network  
 PHONO: . . . . . better than 82 dB  
 AUX, TAPE IN: . . . . . better than 90 dB  
 Audio Muting: . . . . . -20 dB  $\pm$  2 dB  
 Output Muting Delay Time: . . . . . 6 Sec.  $\pm$  3 Sec.  
 Residual Hum and Noise, 8 ohms:  
 . . . . . no more than 1.5 mV  
 Idling Current: . . . . . 40 mA  $\pm$  20 mA  
 Midpoint Voltage: . . . . . 0 V  $\pm$  100 mV

**FM TUNER SECTION (D-TYPE)** They were measured according to DIN standard.

Usable Sensitivity: . . . . . better than 3 dB $\mu$  (1.4  $\mu$ V)  
 50 dB Quieting Sensitivity:  
 . . . . . better than 14 dB $\mu$  (5.0  $\mu$ V)  
 Signal to Noise Ratio  
 (MONO): . . . . . better than 55 dB  
 (STEREO): . . . . . better than 55 dB  
 T. H. Distortion at 1 kHz  
 (MONO): . . . . . no more than 0.3 %  
 (STEREO): . . . . . no more than 0.8 %  
 Alternate Channel Selectivity: . . . . . better than 50 dB  
 Spurious Rejection Ratio: . . . . . better than 80 dB  
 Image Frequency Rejection Ratio: . . . . . better than 80 dB  
 IF Rejection Ratio: . . . . . better than 80 dB  
 AM Suppression Ratio: . . . . . better than 50 dB

Capture Ratio: . . . . . better than 4 dB  
 Stereo Separation  
 (100 Hz): . . . . . better than 30 dB  
 (1 kHz): . . . . . better than 35 dB  
 (10 kHz): . . . . . better than 30 dB  
 Subcarrier Suppression Ratio: . . . . . better than 58 dB  
 Muting Sensitivity: . . . . . 8 dB $\mu$   $\pm$  8 dB  
 T-LOCKED System  
 (Lock Range): . . . . . 150 kHz  $\pm$  100 kHz  
 (Lock in Range): . . . . . 50 kHz  $\pm$  20 kHz  
 FM Tuning Range: . . . . . 87.5 ~ 108.5 MHz  
 Antenna Impedance  
 . . . . . 300 ohms balanced & 75 ohms unbalanced  
 Output Level: . . . . . 280 mV  $\pm$  2 dB

**AM TUNER SECTION**

Usable Sensitivity, Ferrite Loopstick Antenna:  
 . . . . . better than 1000  $\mu$ V/m  
 Signal to Noise Ratio: . . . . . better than 38 dB  
 Image Frequency Rejection Ratio: . . . . . better than 30 dB

IF Rejection Ratio: . . . . . better than 25 dB  
 Selectivity ( $\pm$  10 kHz): . . . . . better than 30 dB  
 AM Tuning Range: . . . . . 530 ~ 1630 kHz  
 Output Level: . . . . . 120 mV  $\pm$  3 dB

**AUDIO AMPLIFIER SECTION**

Continuous Power Output per channel  
 20 ~ 20000 Hz (8 ohms): . . . more than 100 Watts  
 1000 Hz (8 ohms): . . . . . more than 100 Watts  
 1000 Hz (4 ohms): . . . . . more than 110 Watts  
 T. H. Distortion, 8 ohms  
 at Continuous Power Output:  
 . . . . . no more than 0.03 %  
 at 1 Watt Power Output: . . . . . no more than 0.05 %  
 I. M. Distortion, 8 ohms  
 at Continuous Power Output:  
 . . . . . no more than 0.03 %  
 at 1 Watt Power Output: . . . . . no more than 0.05 %  
 IHF Power Bandwidth, 8 ohms: . . . . . 20 ~ 30000 Hz  
 Damping Factor, at 1000 Hz, 8 ohms: . . . . . 50  
 Frequency Response  
 PHONO  $\rightarrow$  TAPE OUT (RIAA Equalization):  
 . . . . . 30 ~ 15000 Hz  $\pm$  0.5 dB  
 AUX, TAPE IN  $\rightarrow$  SPEAKER TERMINAL:  
 . . . . . 10 ~ 40000 Hz  $\pm$  2 dB  
 Input Sensitivity for 100 Watts Power Output  
 PHONO . . . . . 2.5 mV  $\pm$  2 dB  
 AUX, TAPE IN . . . . . 150 mV  $\pm$  2 dB  
 MAIN IN . . . . . 1000 mV  $\pm$  2 dB  
 PHONO Maximum Input Capability, at 1000 Hz:  
 . . . . . more than 200 mV

Output Level at Continuous Power Output,  
 (input: PHONO) TAPE OUT: . . . . . 150 mV  $\pm$  2 dB  
 PRE OUT: . . . . . 1000 mV  $\pm$  2 dB

Tone Control  
 BASS (70 Hz) Boost: . . . . . +10 dB  $\pm$  2 dB  
 Cut: . . . . . -10 dB  $\pm$  2 dB  
 MID (1000 Hz) Boost: . . . . . +6 dB  $\pm$  2 dB  
 Cut: . . . . . -6 dB  $\pm$  2 dB  
 TREBLE (10000 Hz) Boost: . . . . . +10 dB  $\pm$  2 dB  
 Cut: . . . . . -10 dB  $\pm$  2 dB

Loudness Control (Volume control set at -30 dB position)  
 70 Hz: . . . . . +10 dB  $\pm$  2 dB  
 10000 Hz: . . . . . +6 dB  $\pm$  2 dB  
 Subsonic Filter, at 20 Hz: . . . . . -3 dB  $\pm$  2 dB  
 High Filter, at 10000 Hz: . . . . . -3 dB  $\pm$  2 dB

Signal to Noise Ratio, IHF "A" Network  
 PHONO: . . . . . better than 82 dB  
 AUX, TAPE IN: . . . . . better than 90 dB  
 Audio Muting: . . . . . -20 dB  $\pm$  2 dB  
 Output Muting Delay Time: . . . . . 6 Sec.  $\pm$  3 Sec.  
 Residual Hum and Noise, 8 ohms:  
 . . . . . no more than 1.5 mV

Idling Current: . . . . . 40 mA  $\pm$  20 mA  
 Midpoint Voltage: . . . . . 0 V  $\pm$  100 mV

**GENERAL**

Power Requirement  
 W-TYPE: . . . . . AC 120V, 60 Hz  
 E, N and D-TYPE: . . . . . AC 220/240V, 50/60 Hz  
 Power Consumption: . . . . . 470 Watts

Dimensions (Width): . . . . . 556 mm (22 inches)  
 (Height): . . . . . 179 mm ( 7 inches)  
 (Depth): . . . . . 380 mm (15 inches)  
 Weight, without package: . . . . . 17.5 Kg

Specifications are subject to change without notice.

## BLOCK DIAGRAM

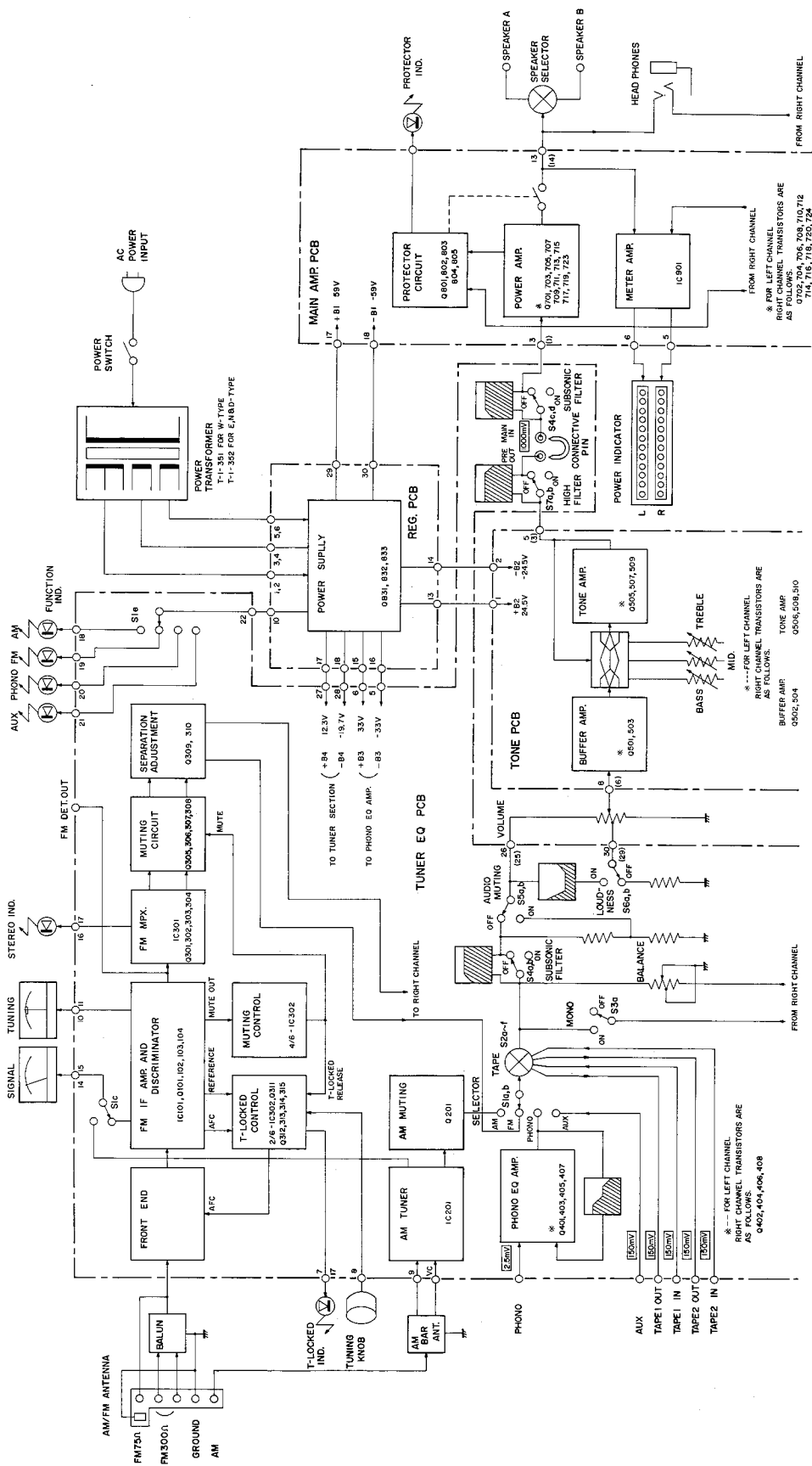


Figure 1

# CIRCUIT DESCRIPTION

## THE T-LOCKED (TUNE-LOCKED) SYSTEM

### 1. FUNCTION

The T-Locked System automatically detects and modifies frequency drifts due to changes in temperature or humidity when FM broadcast is received, controls the increase in the distortion due to drifts and keeps the receiver in the optimum condition. (in the lock condition)

Furthermore, this locked condition is cancelled automatically when the tuning knob is touched. After choosing the broadcasting station, taking finger away from the tuning knob, the circuit reoperates again and returns to the lock condition. The lock condition is shown by the emitting of the green LED.

### 2. ACTION

#### (a) Cancellation of the lock condition

1. On putting a finger on the tuning knob, the hum which induced in the human body is inputted to pin #13 of IC302 ( $\mu$ PD4069C). Here this IC is used as a high impedance amplifier and outputs into pin #12 after an amplification of about 20 dB. This signal goes through the resistor R361 and is rectified by two diodes, D302 and D303, to produce direct current (approx. 3 ~ 6 V). This "H" signal is inverted between the #1 and the #2 pin of IC302 and then becomes the "L" signal.
2. This "L" signal turns off the T-Locked indicator (LED #5) in order to cut off the transistor Q311 (2SC945L). Simultaneously, as this signal also cuts off FET Q312 (2SK104), the transistor Q313 connected to the source of Q312 is also cut off. As the transistors, Q313 and Q314, are used as differential amplifier, only the reference signal from the #10 pin of IC101 (HA11225), which is inputted to the base of Q314 appears in the collector output of the transistor Q315. This signal is fed back to the front end as the AFC signal. However, this signal does not influence the local frequency in any way. Because of this, the lock is cancelled.

**NOTE:** Further, in the case when the input from the antenna is weak or detuned, the mute output from the #12 pin of IC101 triggers the schmidt trigger (which consists of the #3, 4, 5 and 6 pins of IC302 and the resistor R363), cancelling the T-Locked System. Also this signal goes through the diodes, D305 and D314, and is used as the muting signal.

#### (b) Lock action

1. Taking the finger away from the tuning knob, the input to the #13 pin of IC301 goes to zero, turning both Q311 and Q312 on and Q311 excites the T-Locked indicator (LED #5), while Q312 adds the AFC signal outputted from the #7 pin of IC101 to the base of Q313. As mentioned in the section on the lock cancellation, Q313 and Q314 are differential amplifier and after the AFC signal is added to the base of Q313 and the reference signal is added to the base of Q314, the difference of the two signals mentioned above appears at the collector of Q315. This signal is fed back to the Front End as the AFC signal controls. The AFC signal controls the local frequency oscillator in such a way that the difference between the reference signal and the AFC signal is minimized and the circuit becomes stable. Namely, this is the lock condition.

Further, in the actual movement, the LED #5 is not turned on immediately after the finger is taken away from the tuning knob, but its lighting depends on the time constant of C330 and R358 and thus the circuit gets into the lock condition a few seconds after the finger is taken away from it.

## CIRCUIT SUPPLEMENTARY EXPLANATION

For the following explanation, refer to the block diagram on page 3 and the attached schematic diagram.

The electric circuit of this set is constructed of ten PCB (Printed Circuit Board), a power transformer, switches of many kinds, and other components.

There are four main PCB's: Tuner EQ (Equalizer) PCB, Tone PCB, Main Amp PCB and the Reg (Regulator) PCB. The outline of the circuits in each PCB and their action follows.

### 1. TUNER EQ PCB

This PCB contains the following circuit blocks: FM Front End FM IF Block, FM MPX (Multiplex) Block, T-Locked System Block, Muting Control Block, Muting Circuit Block, Separation Adjustment Block, AM Tuner Block, AM Muting Block, and Phono EQ Block.

#### 1. FM Front End

The FM Front End uses four linked variable capacitor in the tuning circuit. In the RF amplifier, a dual gate MOS FET of high PG (Power Gain) low NF (Noise Figure) low feedback capacitance is used. For the local oscillator, a stable Clapp type-oscillating circuit having good stability has been used. The input of the

FM front end is a high stability RF amplifier and the mixer stage, the double-tuned circuit has been inserted. The RF signal which has passed through the double-tuned circuit is added to the base of the transistor, mixer, however, the oscillating output from the local oscillating circuit is also added to the base of this transistor through a small value capacitor and thus conversion of the frequency is performed. A varicap diode has been inserted to the resonance circuit of the local oscillator and by adding the AFC signal from the T-Locked System to this diode, the oscillating frequency can be varied within a small range.

## 2. FM IF Block

The FM IF block consists of four transistors, one IC and three ceramic filters chosen for the selection elements. The transistors, acting as two pairs of differential amplifiers, amplify the IF signal. On the other hand, the IC (HA11225) amplifies the IF signal, restricts the amplitude gain, recovers the quadrature type FM, detects the muting level and also, drives the signal meter and the tuning meter. In the case when the IF signal to the IC is too weak and goes down lower than the level which was set beforehand, the IC releases the mute signal and this is sent to the muting control block.

The three ceramic filters of the selection elements are inserted between each stage. Further, this set has FM DET OUT terminal. Adding an adaptor to this terminal, enables the receiver to receive FM 4 Channels broadcasting, the SCA signal etc.

## 3. FM MPX Block

The FM MPX block consists of four transistors and one IC. The transistor, Q301, works as a low cut filter, suppressing the noise in the very lower frequency bounds involved when the FM station is being chosen. IC (HA11223W) is a PLL (Phase Locked Loop) MPX IC and is an IC with high S/N and a low distortion rate. It contains the PLL VCO, MPX demodulator, pilot cancel circuit, the stereo/mono automatic switching circuit, and the stereo lamp driver.

The transistor Q302 stops the VCO of the IC, when the selector is not in the position of "FM AUTO". Q303 and Q304 do the switching of the stereo indicator. Switching of stereo/monoral is provided in this instrument and in the case of monoral, the stereo indicator does not turn on even though the broadcasting is in stereo. When the MONO switch on the front panel is turned "ON", Q304 is on, the base of Q303 becomes 0 volt, Q303 is cut off, and the stereo indicator is turned off. In the case when the MONO switch is "OFF", it responds according to the signal from the Muting Control Block.

## 4. T-Locked System Block

Refer to page 4.

## 5. Muting Control Block, and Muting Circuit Block

The muting control block consists of the C-MOS Digital IC ( $\mu$ PD4069C) and RC parts. This IC contains six inverters, as shown in the semi-conductor data section at the end of the Service Manual. These inverters are mainly used in the two pairs of schmidt trigger circuits consisting of four out of the six inverters. The output of the schmidt trigger circuit switches "ON" or "OFF" the transistors of the muting circuit block is explained in the following. The muting circuit block contains four transistors. When they are on, they short the output of the FM MPX demodulator to ground and perform muting. In order to make the muting effective, Q307 and Q308 mute after Q305 and Q306 mute. When the FM signal gets weaker, the FM IF block sends the mute signal to the muting control block. This signal triggers one pair of the schmidt trigger circuits (IC302, Pin #3, 4 5 & 6). This output (IC302, Pin #6) goes through the diode, D305, then through the FM muting switch (S 11) and being added to the bases of the transistors, Q305 ~ Q308, mutes the FM output. Also, in the case when the mono switch is in the "OFF" position, this signal is added to the base of the transistor, Q304, and the stereo indicator is turned off because Q304 is on and Q303 is off. In the case when FM muting switch is off, obviously muting does not occur, so we can listen to the broadcasting even though the input of the antenna is weak.

The input (IC302 Pin #11) of the other pair of the schmidt trigger circuits in the Muting Control Block (IC302, Pin #11, 10, 9 & 8) is connected to the selector (S1d).

When the selector is in any position except the "FM AUTO" position, the DC power source is connected and the schmidt trigger circuit produces about 5.9V of output (IC302, Pin #8). This voltage goes through the diode D307 and the resistor R370 and turns on the transistors, Q305 ~ Q308, muting the FM output. When the selector is switched from "AM" to "FM AUTO", or from "PHONO" to "FM AUTO", the electric charge stored in the capacitor (C311) at the input of the schmidt trigger circuit does not discharge at once, but it is discharged slowly at a rate according to the resistor R366. Accordingly, until this voltage comes to the threshold voltage of the schmidt trigger circuit, the schmidt trigger circuit continues outputting, after triggering the output goes to 0 V and so the muting is cancelled a short time after the FM output has been switched in the selector.

In the case when the selector is switched from "FM AUTO" to "AM" or from "FM AUTO" to "PHONO",

the time constant of the charge of the capacitor C311, depends on the value of the capacitor C311 and the value of the resistor R367. As this time constant is small, the FM output is muted nearly immediately in this case.

## 6. Separation Adjustment Block

After the FM MPX demodulator output, the circuit consisting the two transistors, Q309 and Q310, is in the separation adjustment block. Generally the separation after output of the FM MPX demodulator is already enough in itself, however this receiver has this block designed into it to improve the separation. The circuit is a general emitter (grounded) amplifier, and it is connected by semi-fixed resistor between these emitters of the two channels. For example, if the crosstalk level of the left channel input is made to be  $\Delta R$ . (the crosstalk level of the left channel input is the component, which leaks from the right channel). Now, some part of the right channel is added to the emitter of the left channel and the level is controlled to be equal to  $\Delta R$  component become equal and the input signal does not flow to the base.

This means that the  $\Delta R$  component is not amplified, therefore this does not appear in the output, which means further that the separation has improved in the system. The improvement of the separation is performed in the right channel in the same way.

## 7. AM Tuner Block

The kernel of the AM Tuner Block is only one IC. This IC (HA1197) contains a RF amplifier, a frequency converter section, an IF amplifier section, a demodulation circuit and AGC circuit. It also performs all the necessary work of the AM tuner. Further, the antenna circuit incorporates the ferrite loop stick antenna, the tuning circuit equips two linked variable capacitor and the selection element equips two ceramic filters.

## 8. AM Muting Block

The transistor Q201 is this block. In all cases when the position of the selector is not in "AM" position, the power sources of the RF amplifier, and the frequency converter section are cutoff. So, when the selector is changed from "FM AUTO" to "AM", click noise at changing the source might occur. The transistor Q201, avoids this. When the selector is in "FM AUTO" the base of the transistor, Q201, is turned on as its power source is connected through the resistor R214, the output of the AM tuner shorts with ground, and the output is muted. At this time, the capacitor, C214, connected to the base of the transistor, Q201, is charged. When the selector is changed into the "AM" position, the power source

of the base of Q201 is cut off, but still the capacitor connected to the base, Q201, keeps "ON" for a while and then turns "OFF". In this way the click noise of the selector change is eliminated.

## 9. Phono EQ Block

The EQ amplifier is a three-stage direct coupled circuit and also the final stage adopts a SEPP (Single Ended Push-Pull) circuit.

All the transistors used in this block are high breakdown voltage, low noise types in order to get the high ratio of S/N and the wide dynamic range. As the equalizing capacitors and resistors with very small errors have been used in the NF circuit, the deviation to the RIAA curve is very small.

## 2. TONE PCB

This PCB consists of a buffer amplifier and NF type tone control amplifier. The buffer amplifier is a two stage direct coupled circuit with two silicon transistors per channel. Care has been taken to eliminate effects of the impedance of the previous stage on the tone control frequency characteristic. The tone control amplifier is of the NF type. It is made to have the frequency characteristic depending on the resistor and the capacitor inside of the NF loop. This amplifier also adopts a two stage direct coupled circuit, but the first stage is a differential amplifier. The special characteristic of this receiver is the addition of the control of the mid-range which controls ordinary bass as well as the treble control. The flexibility to control the quality of sound is made large by this three system tone control.

## 3. MAIN AMP PCB

This PCB contains the following circuit block: Power Amplifier Block, Protector Block and Meter Amplifier Block.

### 1. Power Amplifier Block

This circuit is a DC amplifier which does not have the coupling capacitor connected at the input section or the NF loop (when the subsonic filter is off) and not only the music signal but also the direct current can be amplified with flat gain. So for this reason the speaker can be damped effectively to the ultra low frequency range.

Also, as it does not have the coupling capacitor, the S/N ratio and the distortion ratio are improved. The circuit is composed of two main sections. They are the voltage amplification section and the power amplification section.

This receiver has three stages of voltage amplification. Also, for the power amplification stage, a Darlington Pure Complementary OCL Circuit is used.

The first stage is a differential amplifier using dual transistors. Generally this transistor (2SA798) is a mold of two low-noise transistors and as a special characteristic, the difference of each  $h_{fe}$  is very small and its thermal condition is balanced.

For this reason the stability of the mid-point of the voltage drift of the power amplifier stage is high. Also, when this transistor does not have any signal, a circuit is equipped inside such that the base current is cancelled and the voltages of the input and the output maintain zero voltage. In the second stage, similar PNP transistors Q703 and Q705 (R ch. = Q704, 706) form the differential amplifier such that it drives the third stage. The transistor, Q707 and Q709 (R ch. = Q708, 710) composed the third stage of the voltage amplification section and drive the power stage. Most of the open loop gain is developed by this third stage.

Q721 (R ch. = Q722) is thermal coupled with the heat sink and makes the idle current of the power stage stable. In the case of no-signal, the idle current is gained by controlling R753 (R ch. = R754).

For the power stage, the Darlington Pure Complementary OCL Circuit is used. For the power transistor, the mold package type transistor is used.

## 2. Protector Circuit Block

The protector circuit block consists of five transistors (Q801 ~ Q805). Also, the transistors Q723 and Q724 which belong to the power amplifier block belong to this block. This can be seen from the examination of their functions. When the circuit is turned on, the excessive current which is output and at the same time occurs due to the shorting of the load circuit and the change of the mid-point voltage occurring due to abnormal inputs are detected. In these cases the speaker is cut off from the power amplifier block and the circuit and speakers are protected.

### (a) The output muting action

Consider when the power source is turned on. The transistors, Q801 ~ Q803, are cut off. The positive voltage through R807 to the base of Q804 and the negative voltage through R807 are added, so these voltages cancel each other, then consequently the voltage becomes about  $-4.3\text{ V}$  and Q804 is cut off. Though the positive voltage is pressed to the base of Q805 through R809, the base current does not flow until the capacitor, C804, is charged, and then it also is cut off. The AC voltage is also added to the collector of Q805 through the diode, D802, but as it does not flow to Q805, this voltage flows to the LED through the diodes, D804 and D805 and the protect indicator is emitted.

As the times goes on, the voltage of the capacitor, C804, rises and after it rises higher than the Zener voltage of the zener diode, the base current flow in Q805 so that it is "ON" and the Relay LY801 starts to work. As the current flows through the collector of Q805 and through the diode D802, the voltage drops due to the resistor R813 and the protect indicator is turned off. Further, at this time, the voltage taken to C804 (zener voltage) +  $(V_{be})$ , is about  $12.6\text{ V} - 13\text{ V}$  and it does not rise more than this value. Also, if it drops even a little less than this value, Q805 is made to cut off.

Inversely, when the power switch is turned off, the negative voltage impressing on Q804 becomes  $0\text{ V}$  immediately since the capacity of the filter capacitor is very small. As the positive voltage does not drop down to  $0\text{ V}$  immediately, the base of Q804 has the positive voltage and Q804 is turned on. Then the voltage charged in to the capacitor C804, is discharged through Q804. Therefore, Q805 is turned off and the relay stops working. This action is rather fast.

### (b) The protect action to the load short

When the load shorts, excessive current flows through the power transistor of the output stage. Even when the circuit and the load are normal, a great amount of current flows in the case when a great amount of output is acting, but in this case the current varies due to the signal, so it is distinct from the case of the load short.

In this receiver, the excessive current is detected by the drops of voltage occurring in the resistors R767 and R781 (R768 and R782 for the right channel) connected to the emitter of the power transistor.

When excessive current flows and the voltage of this section is higher than about  $0.6\text{ V}$ , then Q723 (Q724) is turned on. The current flows from the base of Q803 to the collector through the diode D711 (D712), and Q803 is turned on, so the current flows from the emitter to the collector, then the collector, then the positive voltage of the base of Q803 is raised.

Therefore, as Q804 is turned on and the capacitor C804 is discharged, Q805 is cut off, the relay stops pulling and the protect indicator is turned on. The capacitor C725 (C726) of the base of Q723 (Q724) is a time-constant circuit for the high frequency range signal and the capacitor C803 of the base of Q803 is a time-constant circuit for the lower frequency range signal. These are designed to stop the protect circuit in the case of great amount of output in the normal condition.



- (c) The examination of the direct current and the protect action

When the signal, including the component of the power amplifier the extreme low frequency signal is added, or on the rare occasion when the DC ballance of the amplifier is destroyed, the DC voltage signal and the ultra low frequency signal appear at the output of the amplifier. This is not favorable to the speaker.

Examination of the DC voltage of the output is done by Q801 and Q802, and the protect action is performed when the DC voltage is more than +1.5 V or less than -1.5 V. When more than +1.5 V of DC voltage occurs at the output of the amplifier, this voltage turns on Q801 through R801 (R802). Then as Q801 discharges the capacitor C804, Q805 is cut off the relay stops pulling and the protect indicator is emitted. In the case when less than -1.5 V DC voltage occurs at the output of the amplifier, Q802 is turned on and shorts the negative voltage added to the base of Q804 with the ground. Therefore, the base of Q804 is a positive voltage and Q804 is turned on. Q805 is cut off as the capacitor C804 is discharged through Q804, the relay stops pulling and the protect indicator is emitted. The capacitors, C801 and C802, of the bases of Q801 and Q802 are the time-constants and are designed such as to stop the protect circuit from acting for the AC signal. Therefore, the polarities of these two capacitors are connected oppositely and are used as non-polar capacitors.

### 3. Meter Amplifier Block

The meter amplifier block is a circuit which used only one IC. This IC (TA7318P) has a demodulate circuit,

a 1/4 power compressor and a DC drive amplifier (the hold action is included) for each of the two channels. Due to passing through the 1/4 power compressor the meter can be ranged widely and it is possible to display from a small amount of the output power without changing the range of the meter. The capacitors at pin #3 of the IC and pin #7, C903 and C904, are set for the recovery time of the meter.

### 4. REG PCB

Each block of this instrument works by receiving the supply of DC power source only from the Reg PCB. The kinds of source voltage supplied from the Reg PCB are many, but these sources are very stable, except of course for the supply to the main amplifier PCB, the lamps, and the indicators. The main electric sources are from a large capacity silicon diode bridge type rectifier that gives the positive and the negative voltages. Then they get smoothed going through the large capacity of the filter capacitor and are finally sent to the main amplifier PCB.

The electric source to the tone PCB, the Phono EQ block and the negative voltage source to the tuner section are supplied from this source. The source of the tone PCB is stabilized by a 1 W-type zener diode and the Phono EQ source is sent through both the constant voltage circuit and the ripple filter Q832, Q833. The negative voltage source to the tuner section is stabilized by the zener diode as well. After the positive voltage source to the tuner section is rectified at the bridge-type silicon diode, it is sent, as expected, through the constant voltage circuit and the ripple filter.

The sources for lamp use in used for the lighting of the LED of the mode indicator and for the illumination of the dial; Also it flows to the small capacity of the diode and is used as the negative voltage source of the protector circuit.

## DISASSEMBLY

### 1. SIDE WOODS REMOVAL

- Remove eight screws from both sides of the wooden covers.

### 2. METAL COVER REMOVAL

- Remove wooden covers from both sides.
- Remove three tapping screws (#1 ~ #3) from the back plate as shown in Photo 1.
- Slide the metal cover back slightly and lift it up.

### 3. BOTTOM PLATE REMOVAL

- Remove wooden covers from both sides.
- Remove fourteen tapping screws (#1 ~ #14) (Photo 2) from the bottom of the unit.

### 4. FRONT PANEL REMOVAL

- Remove wooden covers and the metal cover.
- Using the hexagonal wrench, remove the VOLUME knob.
- Disconnect the LED socket connecting to LED as shown in Photo 6.
- Remove five tapping screws (#1, 3, 5, 15 and 16) from the bottom of the unit as shown in Photo 2.
- Remove three tapping screws (#1 ~ #3) from the top of the unit (Photo 3).
- Lift the front panel away from the unit.

### 5. POWER TRANSFORMER REMOVAL

- Disconnect all the wires from the power transformer.
- Remove four screws (#4 ~ #7) as shown in Photo 3.
- Lift the power transformer away from the unit.

### 6. REFLEX PLATE REMOVAL

- Remove three lamps by pushing them downward.
- Push the center of push rivet (#1 and #2) (Photo 4) by small screw driver as shown in Fig. 2.

- Pull the push rivet upward, small printed circuit board (#5) (Photo 4) is now free to be pulled off.
- Similarly, remove two push rivets (#3 and #4) as shown in Photo 4.

### 7. METER REFLEX PLATE REMOVAL

- Remove the lamp by pushing it downward. (Refer to Photo 5).
- Remove two screws (#1 and #2) as shown in Photo 5.

### 8. METER REMOVAL

- Remove the meter bracket by removing two tapping screws (#3 and #4) as shown in Photo 5.
- Remove the meter by pulling it backward.

### 9. POWER INDICATOR REMOVAL

- Pull out the connector (#5) as shown in Photo 5.
- Remove the bracket of the indicator by removing two tapping screws (#6 and #7) (Photo 5).
- Remove the power indicator by pulling it backward.

### 10. LED PC BOARD REMOVAL

- Disconnect all the cables from the LED PC board.
- Remove two tapping screws (#8 and #9) as shown in Photo 5.

### 11. DIAL SCALE REMOVAL

- Remove all the parts from the back of the dial scale according to the paragraph 6 ~ 9.
- Remove the dial cord from the slider of the dial pointer.
- Remove the head phones jack by removing two screws (#1 and #2) as shown in Photo 6.
- Remove five tapping screws (#3 ~ #7) (Photo 6) and lift the dial scale away from the unit.



Figure 2 PUSH RIVET

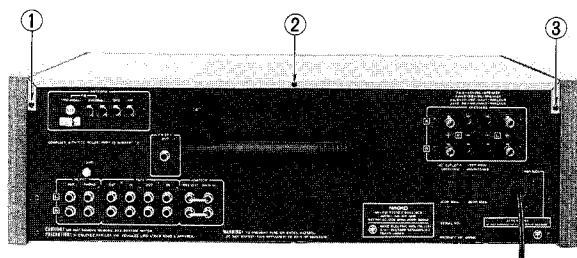


Photo 1

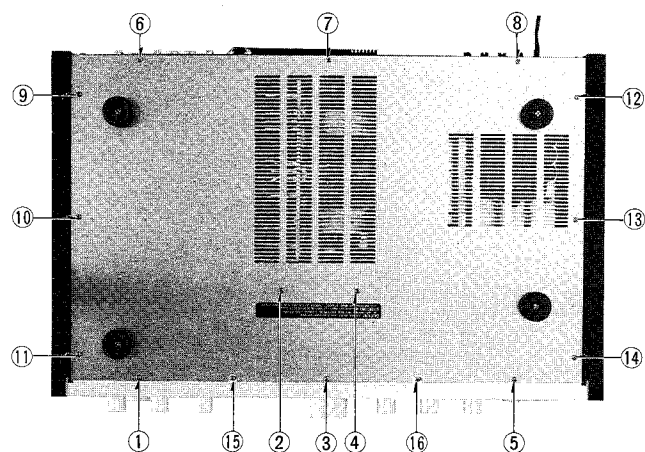


Photo 2

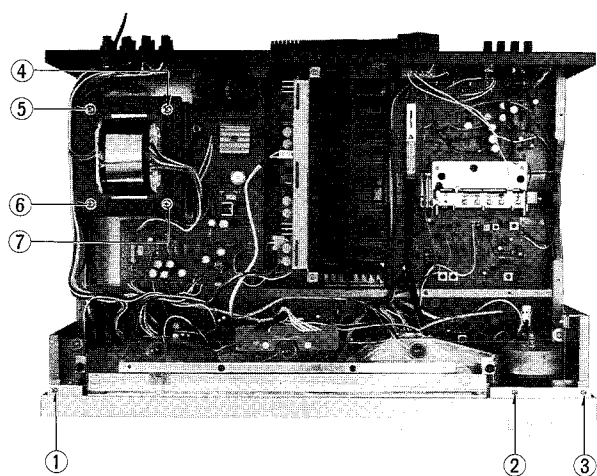


Photo 3

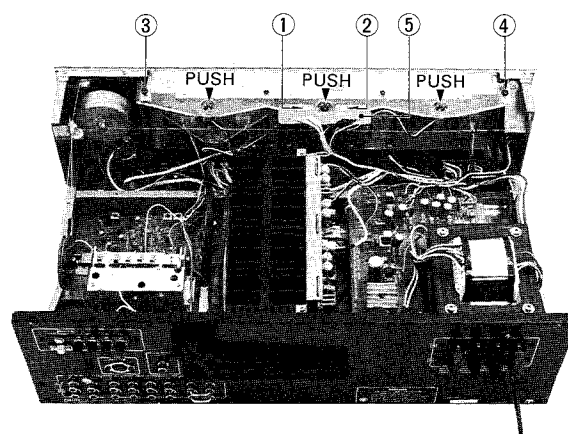


Photo 4

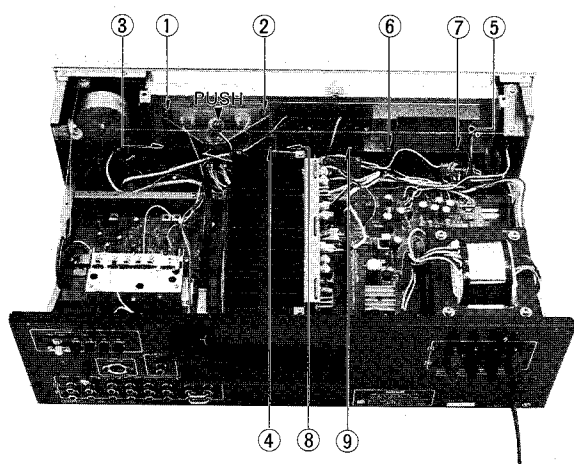


Photo 5

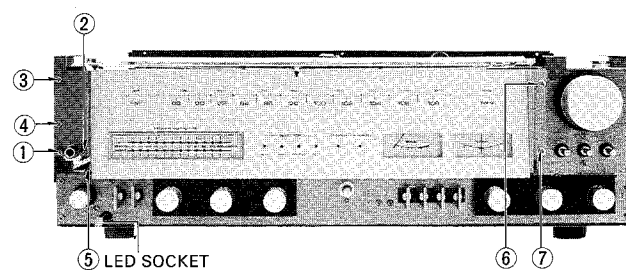


Photo 6

# ALIGNMENT

## TEST EQUIPMENT

Allow a minimum of 10 minutes warm-up for test equipment and the receiver to be tested.  
Maintain rated line voltage.

- FM Signal Generator (FM SG)
- Oscilloscope
- AC Voltmeter
- Distortion Meter
- MPX Signal Generator (MPX SG)
- Frequency Counter
- AM Sweep Generator (AM SG)
- DC Voltmeter
- Audio Frequency Generator
- 2-Dummy Load Resistor, 8 ohms, 250W

## GENERAL ALIGNMENT INSTRUCTION

Always observe response curve on oscilloscope during alignment procedure:

1. Do not apply signal from FM or AM stations. Apply signals only.
2. Use of excessive signal from FM SG or AM SG can cause overloading of the tuner circuits. To properly align the receiver, adjust FM SG or AM SG output level control so that response curve on oscilloscope is not distorted.
3. Turn the volume controls down to the fully counter clockwise when the dummy load resistors or speakers are not connected to the speaker terminal.

## FM SECTION

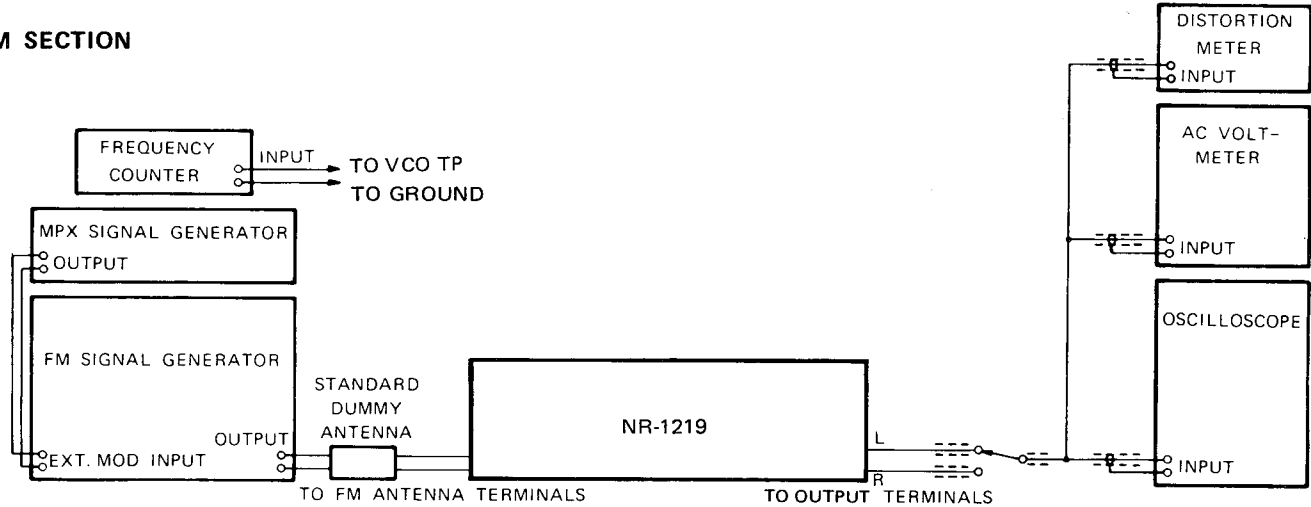


Figure 3. Test Equipment Hook-up

## FM IF Alignment

STEP	FM SG FREQUENCY/ CALIBRATION	MODULATING FREQUENCY/ DEVIATION	SWITCHES OF THE RECEIVER	DIAL POINTER POSITION	ADJUST- MENT POINT	PROCEDURE	REMARKS
1			A. POWER to "ON".  B. SELECTOR to "FM AUTO".			Temporarily connect the wiring terminal #8 of the Tuner EQ PCB and the wiring terminal #8 of the REG PCB by clip lead.	This is to prevent operation of T-Locked System.
2			C. MONO SW. to "ON".	Where no signal is tuned.	T101 (Figure 4)	Adjust until tuning meter indicates mid-scale.	Repeat steps 2 and 3 until distortion can no longer be minimized.
3	98 MHz/60 dBμ	400 Hz/mono [±75 KHz]		98 MHz	T102 (Figure 4)	Adjust for minimum distortion.	
4						Remove the clip lead which was temporarily connected in the step 1. Confirm that T-Locked Indicator is lighted and Tuning Meter indicates mid-scale.	Do not touch the Tuning Knob.

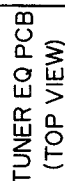


Figure 4. FM AM ADJUSTMENT POINT

## FM Frequency Coverage and FM Tracking Alignments

These adjustments are factory preset and normally need no further adjustment. However, if necessary proceed as follows:

STEP	FM SG FREQUENCY/ CALIBLATION	MODULATING FREQUENCY/ DEVIATION	SWITCHES OF THE RECEIVER	DIAL POINTER POSITION	ADJUST- MENT POINT	PROCEDURE	REMARKS
1			A. POWER			Temporarily connect the wiring terminal #8 of the Tuner EQ PCB and the wiring terminal #8 of the REG PCB by clip lead.	This is to prevent operation of T-Locked System.
2	87.4MHz/10dBμ	400 Hz/mono [±75 kHz]	A. POWER to "ON".	Low frequency end of the dial scale.	TC <sub>0</sub> (Figure 4)	Adjust for maximum AC Voltmeter deflection and for mid-scale tuning meter indication.	
3	108 MHz/ Attenuate for response with 3 % distortion.		B. SELECTOR to "FM AUTO".				
			C. MONO SW. to "ON".	108 MHz	TCA TCR1 TCR2 (Figure 4)	Adjust for maximum output.	
4						Remove the clip lead which was temporarily connected in the step 1.	

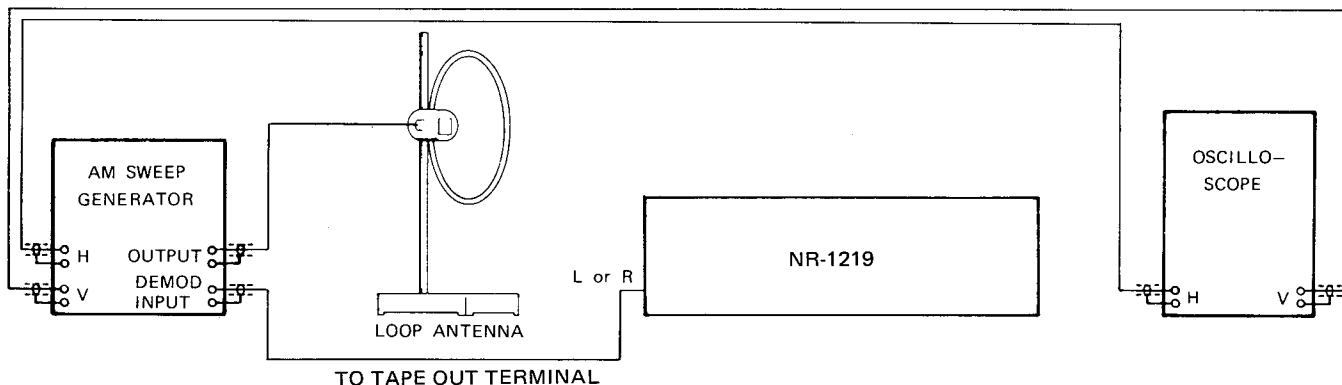
Table 1 — 2

# FM MPX Alignment

STEP	FM SG FREQUENCY/ CALIBRATION	MODULATING FREQUENCY/ DEVIATION	SWITCHES OF THE TUNER	DIAL POINTER POSITION	ADJUST- MENT POINT	PROCEDURE	REMARKS
1	98MHz/60dB $\mu$	(Unmodulated carrier)	A. POWER to "ON". B. SELECTOR to "FM-AUTO". C. MONO SW. to "OFF".	98MHz (Set to that tuning meter indicates mid-scale.)	R309 (Figure 4)	Connect frequency counter to "VCO TP" (Figure 4) and adjust for 76kHz.	
2		Pilot signal only: $\pm 7.5$ kHz			R313 (Figure 4)	Adjust for minimum AC voltmeter deflection. Check that stereo indicator lamp lights up.	Outputs of right and left channel should be equal.
3		1000Hz/stereo [main (L) & sub (L): $\pm 67.5$ kHz/pilot signal: $\pm 7.5$ kHz]			R343 (Figure 4)	Adjust for maximum separation (minimum output of right channel)	Both the separations (both the outputs of right and left channel) should be equal.
4		1000Hz/stereo [main (R) & sub (-R): $\pm 67.5$ kHz/pilot signal: $\pm 7.5$ kHz]				Adjust for maximum separation (minimum output of left channel)	

Table 1 – 3

# AM SECTION



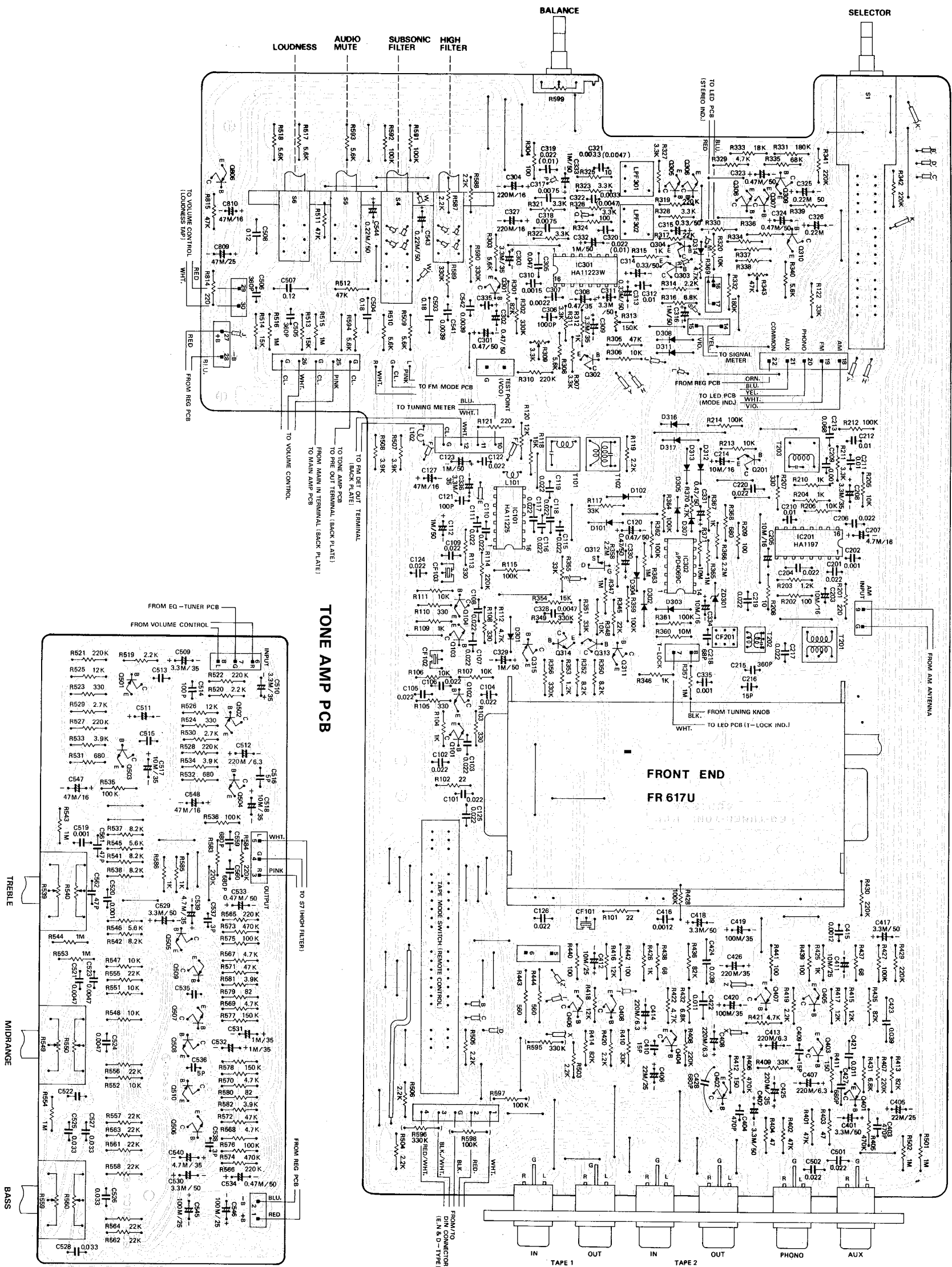
Figures 5 Test Equipment Hook-up

# AM IF Alignment

STEP	AM SG FREQUENCY/ CALIBRATION	MODULATING FREQUENCY/ DEVIATION	SWITCHES OF THE RECEIVER	DIAL POINTER POSITION	ADJUST FOR MAX. SCOPE INDICATION	REMARKS
1	455kHz/ 50dB $\mu$	(Unmodulated carrier)	A. POWER to "ON" B. SELECTOR to "AM"	High frequency end of the dial scale.	T202 (Figure 4)	Repeat steps 1 and 2 until response curve on oscilloscope indicates maximum waveform. (See Figure 6)
2					T203 (Figure 4)	

Table 2 – 1

# P. C. BOARD (BOTTOM VIEW) EQ-TUNER PCB



AM Frequency Coverage and AM Tracking Alignment

STEP	AM SG FREQUENCY/ CALIBRATION	MODULATING FREQUENCY/ DEVIATION	SWITCHES OF THE RECEIVER	DIAL POINTER POSITION	ADJUST FOR MAX. SCOPE INDICATION	REMARKS
1	520 kHz/ 50 dBμ	400 Hz/30%	A. POWER to "ON" B. SELECTOR to "AM"	Low fre- quency end of the dial scale.	T201 (Figure 4, Figure 7)	Repeat steps 1 and 2 several times.
2	1650kHz/ 50 dBμ			High fre- quency end of the dial scale.	TC104 (Figure 4, Figure 7)	To check tracking errors, use an apparatus made of ferrite rod and copper wire (Figure 6). Move it toward the AM loopstick antenna gradually, while checking for the response curve on oscilloscope becoming smaller. If the response curve becomes larger, re- peat steps 3 and 4. (Figure 7).
3	600 kHz/ 50 dBμ			600 kHz	AM loopstick antenna core	
4	1400kHz/ 50 dBμ			1400 kHz	TC105 (Figure 4)	

Table 2 - 2

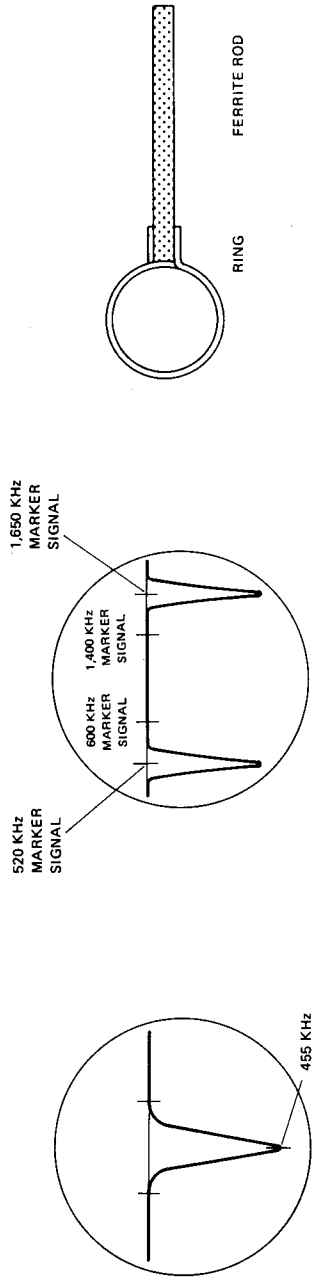


Figure 6 AM IF

Figure 7 AM Frequency Coverage

Figure 8 Apparatus

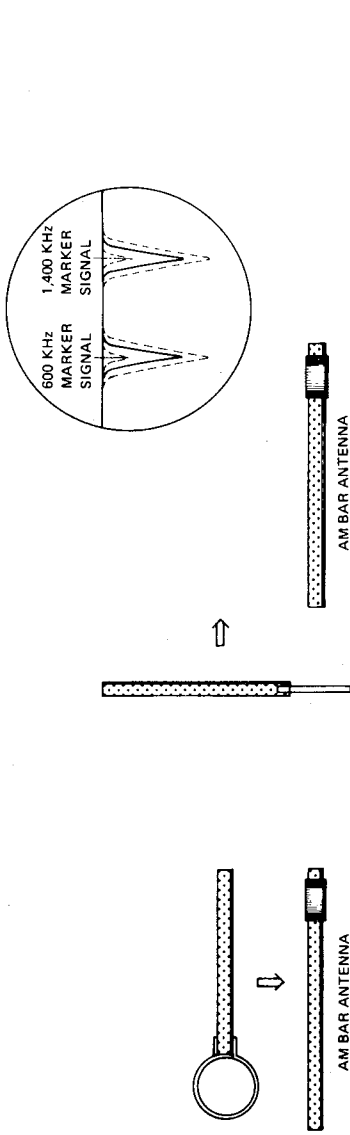


Figure 9 Tracking Errors

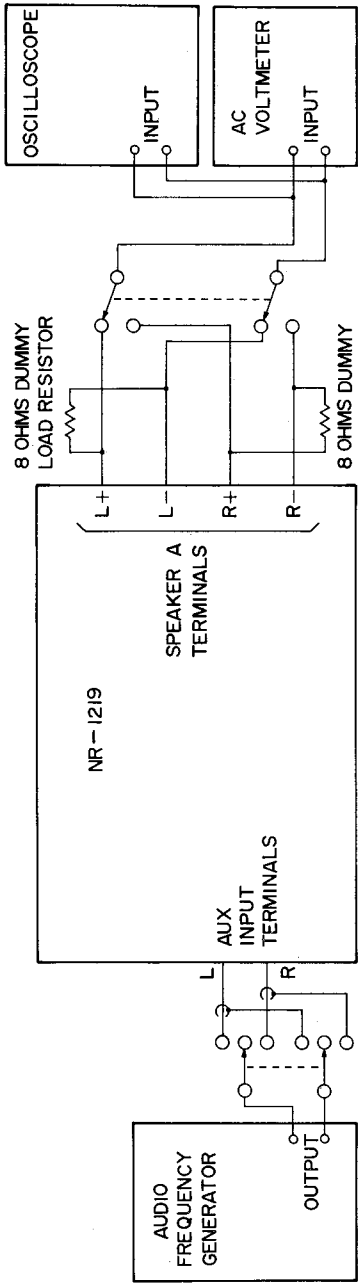


Figure 10 AMP SECTION TEST EQUIPMENT HOOK-UP

AUDIO SECTION

DC Balance Adjustment

See illustration, Figure 11, for test equipment hook-up.

1. Remove connective pin from PRE OUT and MAIN IN terminals.
2. Connect shorting pin plug to MAIN IN terminals. (Short MAIN IN terminals to chassis ground.)
3. Set the SUBSONIC FILTER switch to "ON" position. Adjust potentiometer R707 (left channel) R708 (right channel) on the MAIN AMP PC Board, for a 0 ± 20 mV DC voltmeter reading.
4. Set the SUBSONIC FILTER switch to "OFF" position. Adjust potentiometer R709 (left channel) R710 (right channel) on the MAIN AMP PC Board, for a 0 ± 20 mV DC voltmeter reading.
5. Repeat steps 3 and 4 until both the reading become 0 ± 10 mV.
6. Remove shorting pin plug.
7. Insert connective pin to PRE OUT and MAIN IN terminals.

Idling Current Adjustment

See illustration, Figure 11, for test equipment hook-up.

1. Turn the VOLUME controls down to the fully counter clockwise. (No signal applied to the MAIN AMP circuit)
2. Adjust potentiometer R753 (left channel) R754 (right channel) on the MAIN AMP PC Board, for a 20 ~ 26 mV DC voltmeter reading.
3. Remove DC voltmeter.

Power Display Circuit Adjustment

See illustration, Figure 10, for test equipment hook-up.

1. Connect AC voltmeter and oscilloscope to left (right) speaker terminals. Connect generator to left (right) AUX input terminals.
2. Turn the VOLUME controls up to the fully clockwise. Set generator frequency to 1 kHz. Set generator output for a 28 V AC voltmeter reading.
3. Remove AC voltmeter, oscilloscope and generator.

Output Mute Time Check

Relay must operate five to twelve second later after AC power is turned on.

Protection Circuit Check

See illustration, Figure 10, for test equipment hook-up.

1. Connect AC voltmeter to left (right) speaker terminals. Connect generator to left (right) AUX input terminal.
2. Turn the VOLUME controls up to the fully clockwise. Set generator frequency to 20 kHz. Set generator output for a 3 V AC voltmeter reading.
3. Short left (right) speaker terminals; Relay's contacts should open.
4. Remove all test equipment.

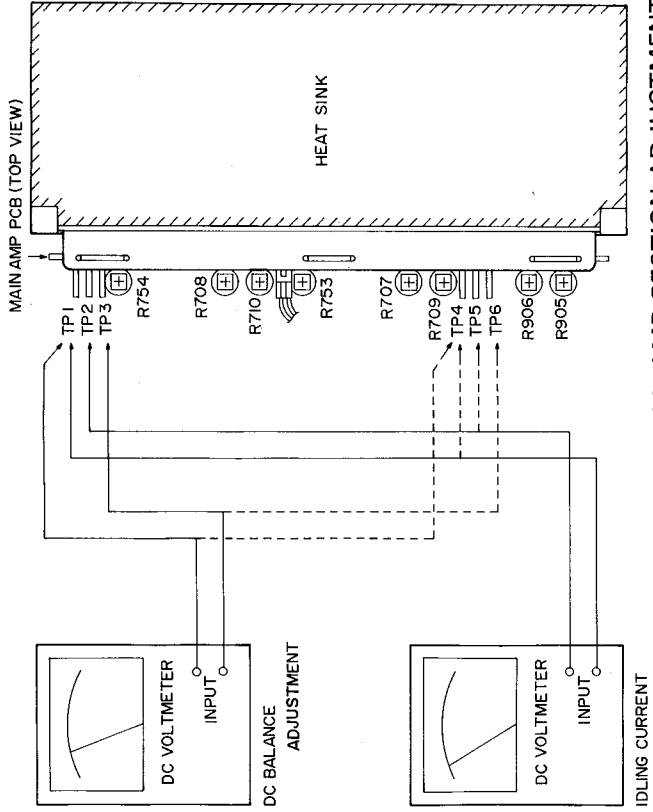
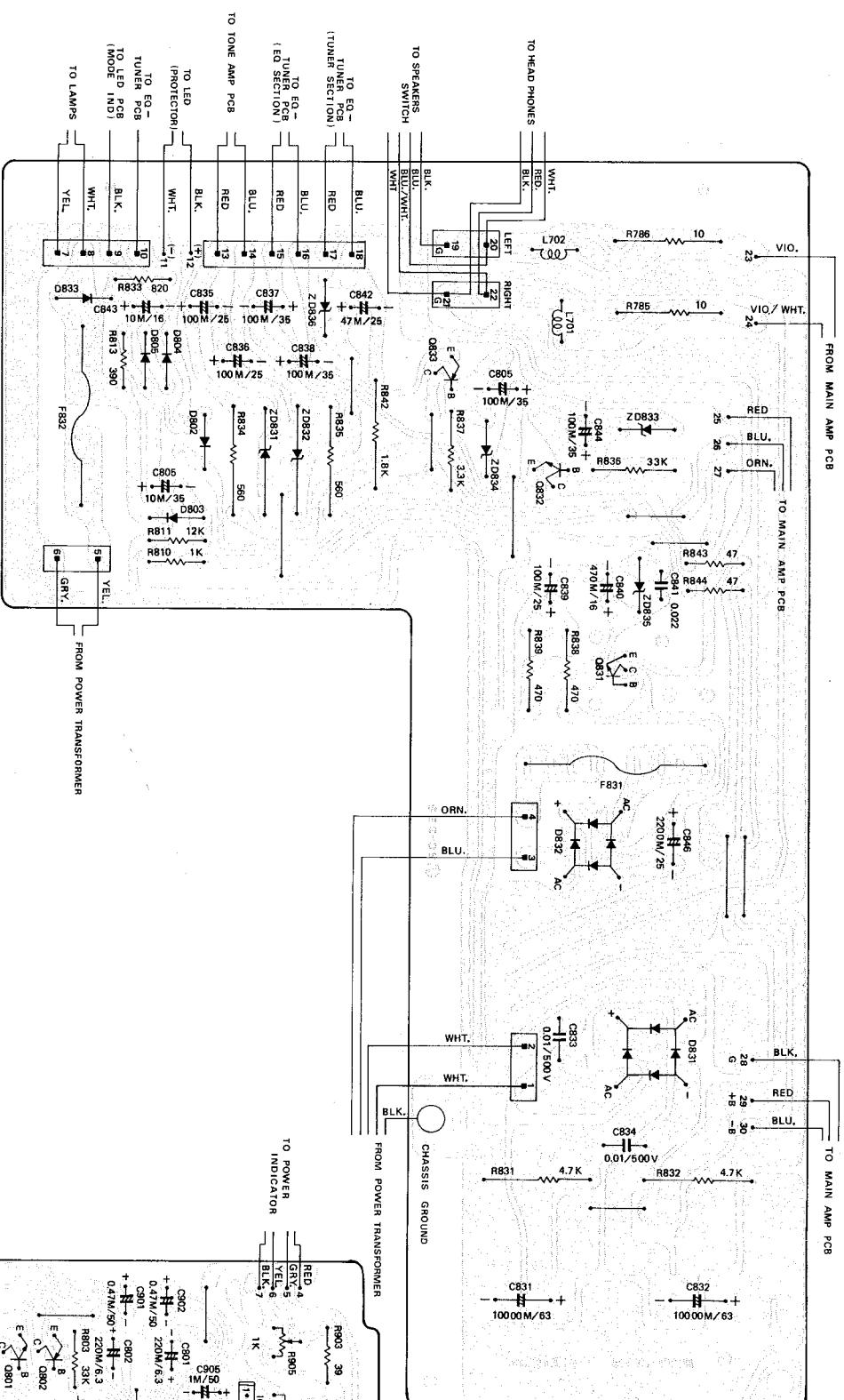


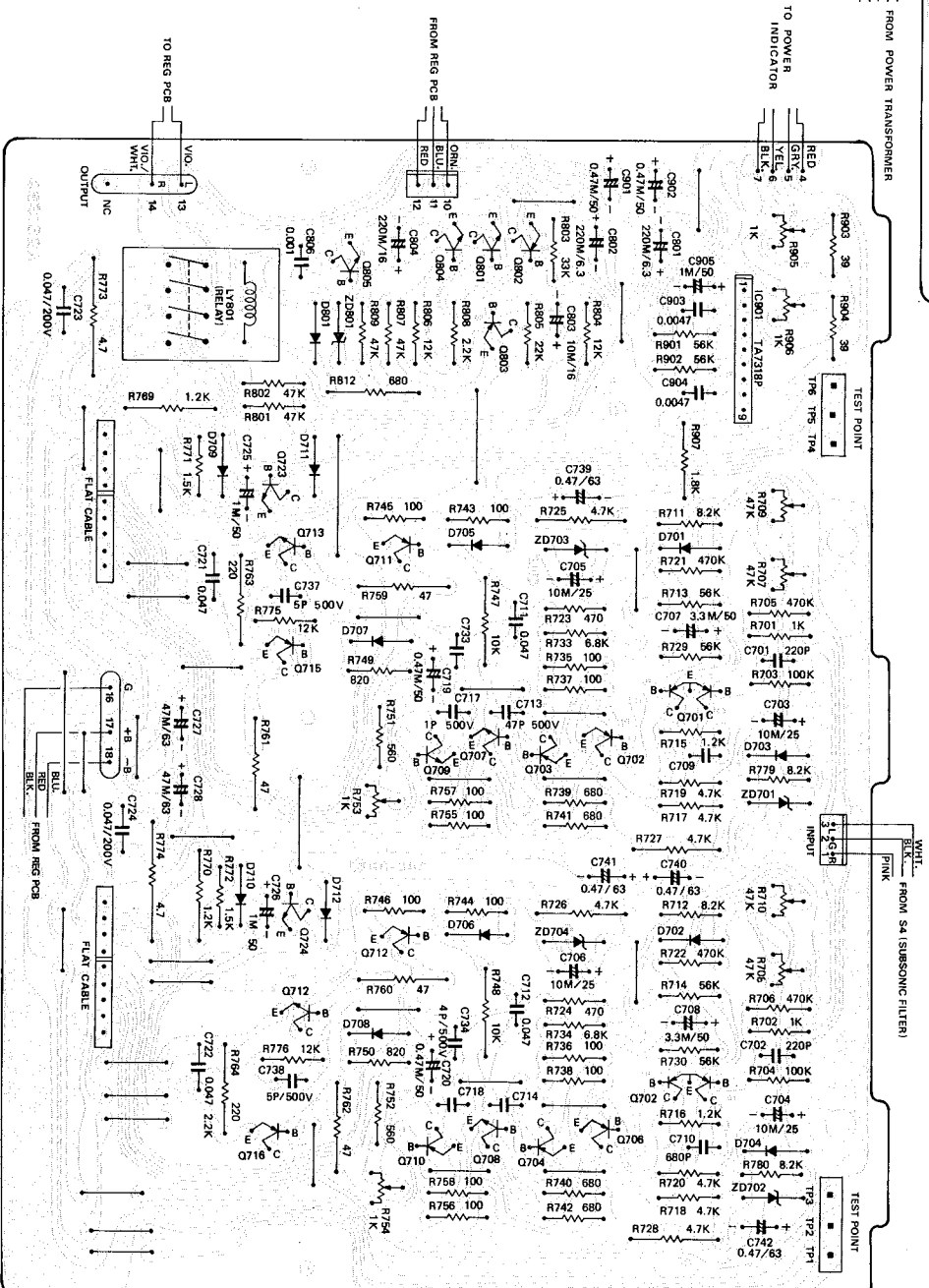
Figure 11 AMP SECTION ADJUSTMENT POINT



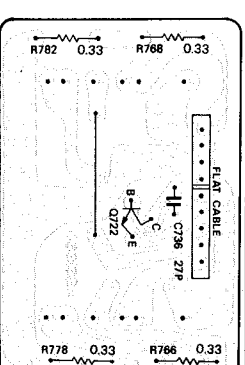
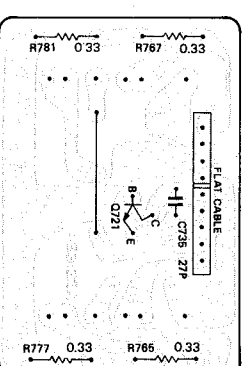
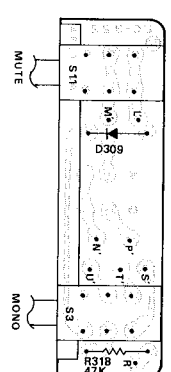
## REGULATOR PCB



## MAIN AMP PCB



## FM MODE PCB



## POWER TRANSISTORS MOUNTING ASSEMBLY

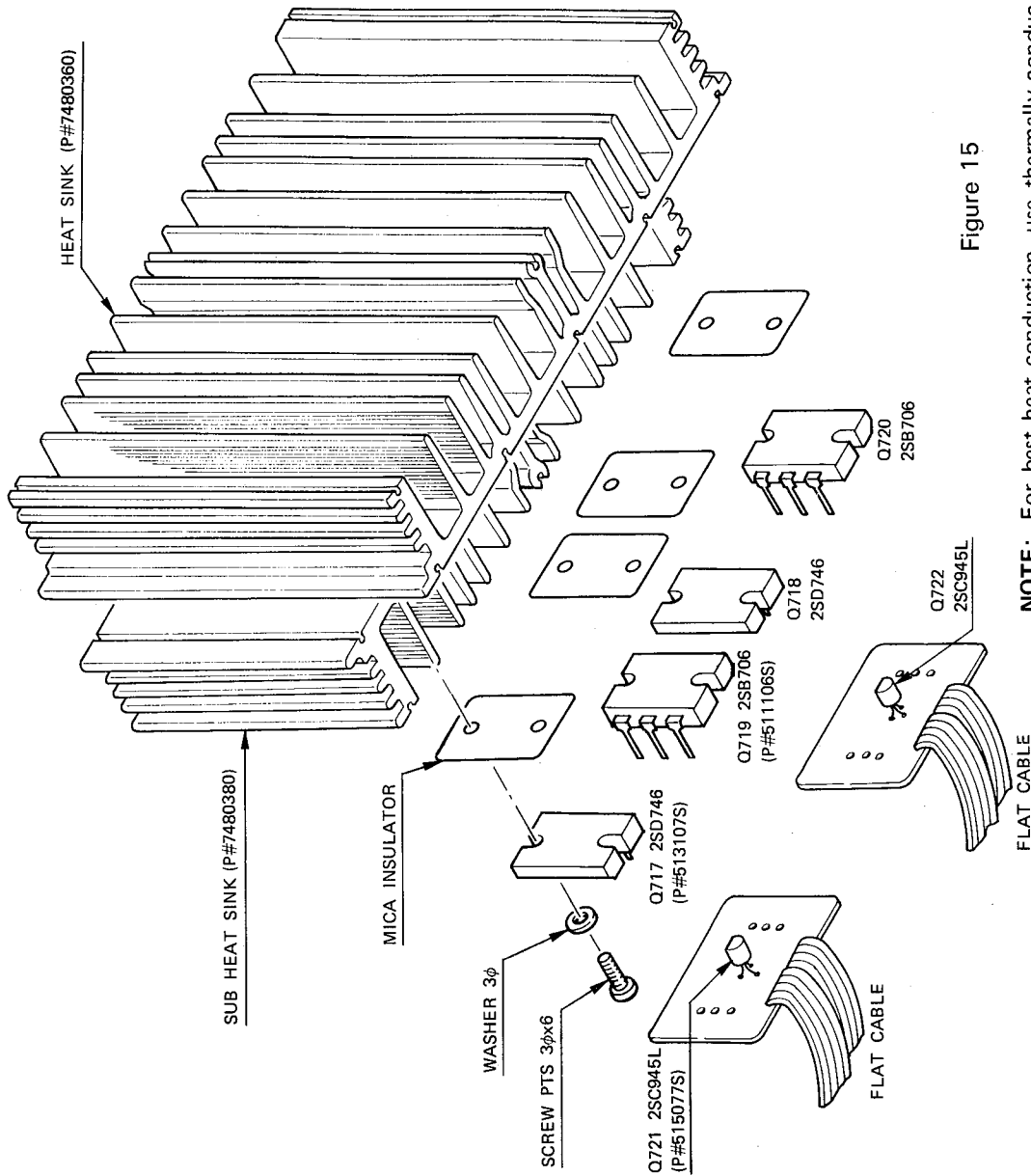


Figure 15

**NOTE:** For best heat conduction, use thermally conductive silicon grease between the power transistor and the mica insulator and between the insulator and the heat sink.

### PRECAUTIONS FOR REPAIR SERVICE

Many of these items are included just as a reminder — they are normal procedures for experienced technicians. Short-cuts can be taken: but, often they cause additional damage to transistors, circuit components or the printed circuit board.

1. **Do not** bridge electrolytic capacitors with AC power. The resultant surges may damage solid state devices.
2. **Do not** bias the base of any transistor while voltage is being applied to its collector.
3. Replacements for output and driver transistors, if necessary, must be made from the same hfe group as the original type. Be sure to include this information when ordering replacement transistors.

## DIAL CORD INSTALLATION

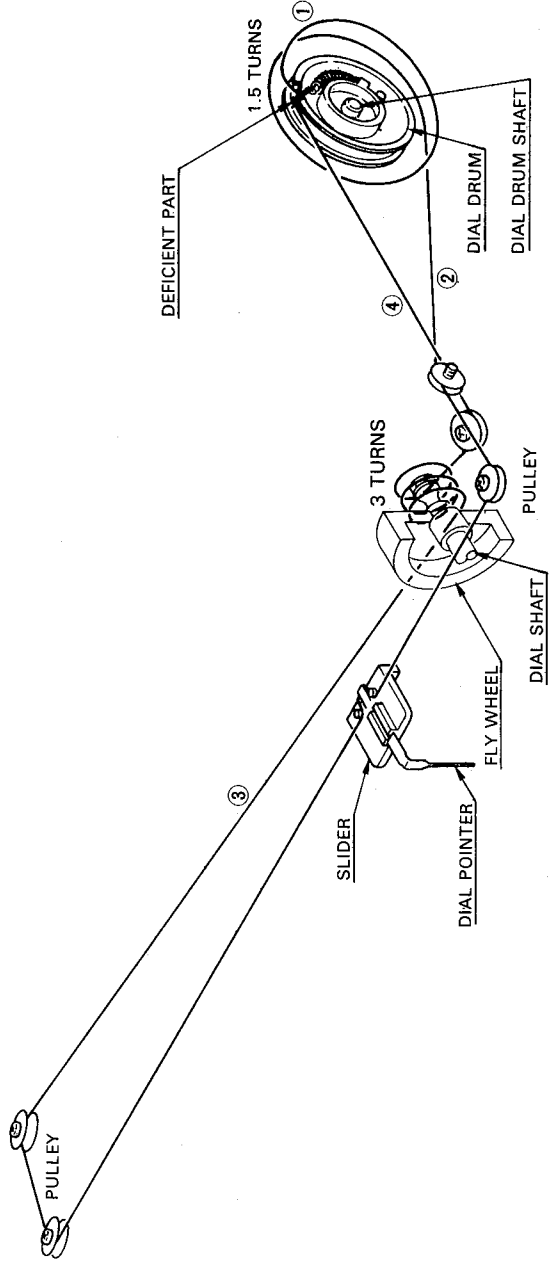


Figure 16

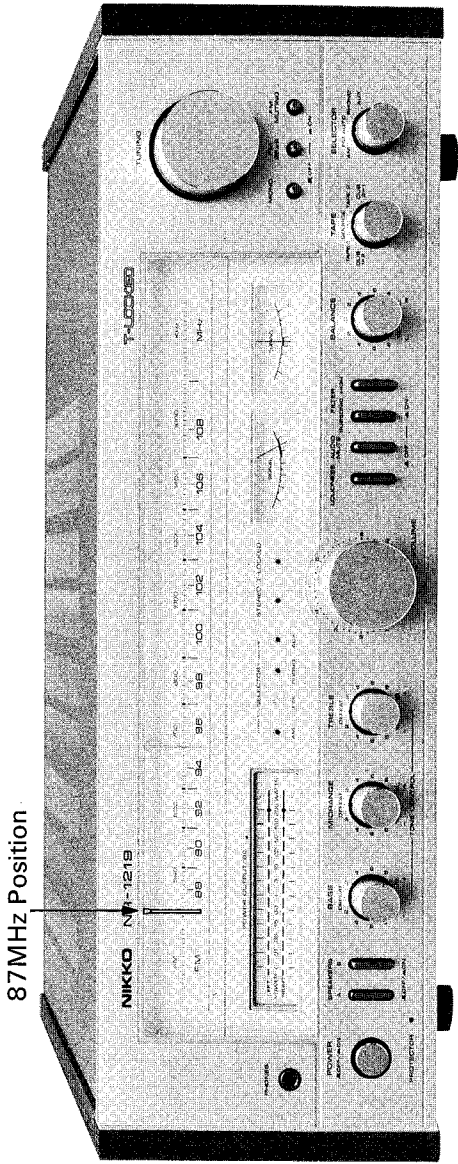



Photo 7

1. Remove an old dial cord.
2. Turn the dial drum shaft counter-clockwise until the rotor of the variable capacitor is completely out of the stator. If the deficient part of the dial drum is not in a straight line with the dial drum shaft (vertically), loosen the dial drum drive screws and adjust the dial drum to be placed on the top portion. Then re-tighten the dial drum screws.
3. String the dial drum and pulleys with a new dial cord in accordance with Fig. 16 (in circled numbered order).
4. Turn the dial shaft (Tuning knob) counter-clockwise until the rotor of the variable capacitor is fully rotated in the stator. Then fix the dial pointer to the string at a reading of 87 MHz on the dial scale. (See Photo 7)

# PARTS LOCATION

**NOTE:** Numbers of three digits with a  are related to the KEY NUMBERS on parts list.

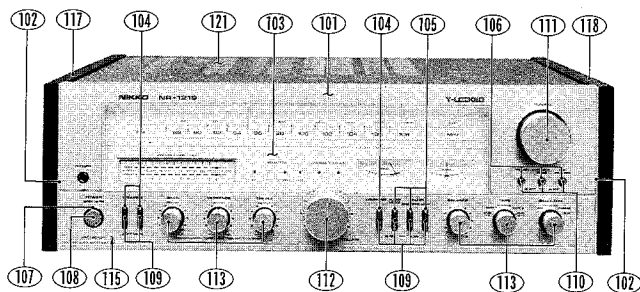


Photo 8

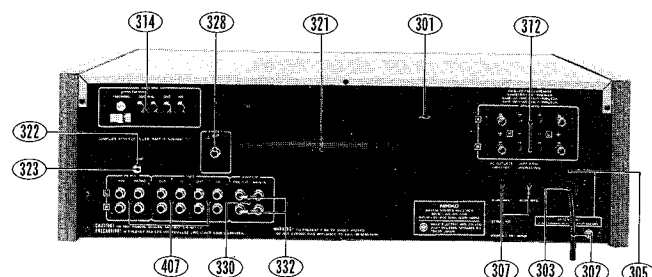


Photo 9

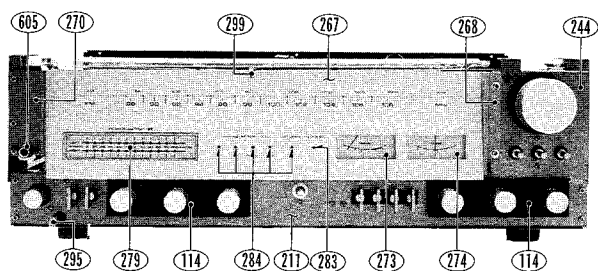


Photo 10

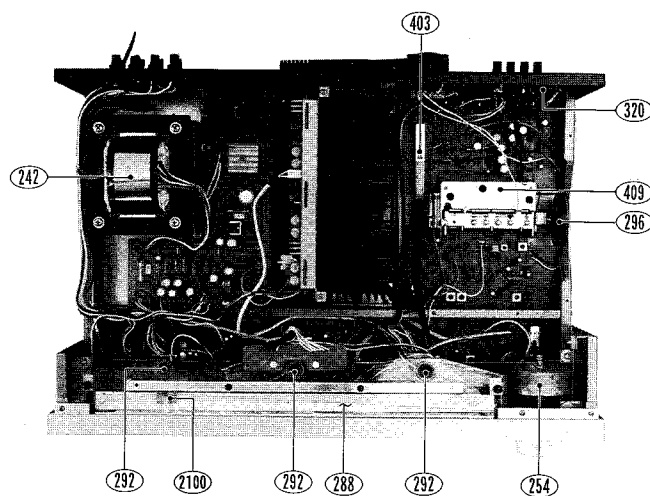


Photo 11

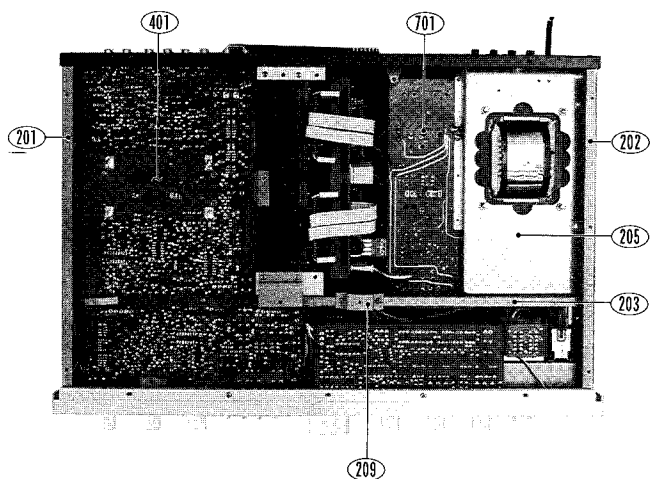


Photo 12

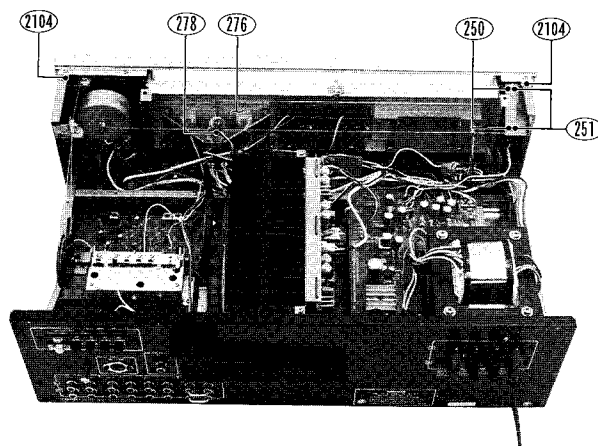


Photo 13

## PARTS LIST

## NOTES:

1. ★ The KEY NUMBER (#) marked with a (★) on parts list relate number of three digits with a (○). (Photo 8-13)
2. + Numerals in file indicate the quantity of parts used in one type.
3. ++ TR: Transistor  
FET: Field effect transistor  
VR: Volume control (Variable resistor),  
RES: Carbon film fixed resistor  
MO-RES: Metal oxide film fixed resistor  
CEM-RES: Cemented wirewound fixed resistor  
FP: Flame proof  
C-CAP: Ceramic capacitor  
E-CAP: Aluminum electrolytic capacitor  
M-CAP: Polyester film capacitor  
S-CAP: Polystyrene film capacitor

T-CAP: Tantalum electrolytic capacitor  
BP-CAP: Bipolar electrolytic capacitor  
LC-CAP: Low current leakage electrolytic capacitor.

4. Assemblies and parts are subject to change without notice.
5. Parts ordering procedure:
  - A. DO NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only)
  - B. Include in any order
    - a. Part number.
    - b. Part description.
    - c. Model number.
 (any of the above lacking from an order may delay shipment of that order.)

KEY	SYMBOL	TYPE +	DESCRIPTION ++	PART
NO.	NO.	WEND		NO.

## PACKING MATERIALS &amp; ACCESSORIES

001	1 1 1	1	Carton box	9825530
002	2 2 2	2	Pad	9840820
003	1 1 1	1	Sack, polyethylene cloth	9640670
004	1 1 1	1	Sack, polyethylene cloth - #13	9640320
005	---	1	Envelope - G	9690170
006a	1	---	Manual, instruction - E	960274E
006b	1	---	Manual, instruction - F, CANADA only	960310F
006c	1	1 1	Manual, instruction - H	960313H
007	1	---	List, service stations	9690180
008a	1	---	Card, warranty	967007A
008b	1	---	Card, warranty - CANADA only	967028E
009	1	---	Post card	967008A
010	1 1 1	1	Drier - Silica gel	969001A
011	1 1 1	1	Antenna, FM - Q-MATCH	4581360

## CABINET ASSEMBLY

★101	1 1 1	1	Panel, front	7884450
★102	2 2 2	2	Panel, both sides	7870400
★103	1 1 1	1	Window, panel	7802430
★004	3 3 3	3	Guide - P1320BK, for push button	7401670
★105	1 1 1	1	Guide - P3320BK, for push buttons	7401680
★106	3 3 3	3	Guide - 1P5, for push button	7401710
★107	1 1 1	1	Guide - 1P16, for push button	7401720
★108	1 1 1	1	Button, push - M16SL - power	7852050
★109	6 6 6	6	Button, push - P320GL - speakers/loudness/ audio mute/filter	7852020
★110	3 3 3	3	Button, push - P5x15 SLII - FM muting/mono/25us	7852080
★111	1 1 1	1	Knob - 19SL-47R - tuning	7841260
★112	1 1 1	1	Knob - 19SL-42DR - volume	7841270
★113	6 6 6	6	Knob - 19SL-19DR - others	7841250
★114	2 2 2	2	Dust cover, for knob	7002120
★115	1 1 1	1	LED GL-2PR1 - red - protector	5060210
116	1 1 1	1	Spacer, LED	7002130
★117a	1 1 1	1	Side wood - L	7831490
★118a	1 1 1	1	Side wood - R	7831520
★117b	---	1	Side wood - L, black	7831570
★118b	---	1	Side wood - R, black	7831580
119	8 8 8	8	Screw - TFTS 4φx16	887416W
120	8 8 8	8	Washer - 5φ	893105W
★121a	1 1 1	1	Cover, metal	7820940
★121b	---	1	Cover, metal, black	7821040
122	3 3 3	3	Screw - PTS 3φx6	814306W
123	1 1 1	1	Plate, bottom	7325590
124	4 4 4	4	Foot, polyethylene - 30φx14	7400780
125	4 4 4	4	Screw - PMS 5φx16	810516S
126	11 11 11	11	Screw - PTS 3φx6	814306S
127	3 3 3	3	Screw - PTS 3φx8	814308S

KEY	SYMBOL	TYPE +	DESCRIPTION ++	PART
NO.	NO.	WEND		NO.

## CHASSIS ASSEMBLY

★201	1 1 1	1	Angle, right side	7226920
★202	1 1 1	1	Angle, left side	7226930
★203	1 1 1	1	Angle, center	7226940
204	5 5 5	5	Screw - PTS 3φx6	814306S
★205	1 1 1	1	Chasis, for power transformer	7226950
206	6 6 6	6	Screw - PTS 3φx6	814306S
207	1 1 1	1	Bracket, for heat sink	7032510
208	2 2 2	2	Screw - PTS 3φx8	814308S
★209	1 1 1	1	Stud, for chassis	7031270
210	2 2 2	2	Screw - PTS 3φx6	814306S
★211	1 1 1	1	Angle, front	7226960
212	4 4 4	4	Screw - PTS 3φx6	814306S
213	1 1 1	1	Holder, tuner PCB	7031140
214	1 1 1	1	(TONE AMP PCB ASSEMBLY)	
215a	1	---	Switch, push - SDV1P TV-5 - power	4041140
215b	1	1 1	Switch, push - SDG5P class II - power	4040980
216a	1	---	C-CAP 0.01uf AC125V	239103C
216b	2	2 2	C-CAP 0.0047uf AC250V	239472E
217	2	2 2	Cover, C-CAP - (M)	7400980
218	1 1 1	1	(PUSH SWITCH PCB ASSEMBLY)	
219	1 1 1	1	Holder, push switch PCB	7032710
220	4 4 4	4	Screw - PMS 3φx6	810306S
221	2 2 2	2	Screw - PTS 3φx6	814306S
222	1 1 1	1	VR GJ70A 100kohm Bx2	4320950
223	1 1 1	1	Switch, rotary ESA-33427B - tape, remote control	4051240
224	1 1 1	1	(EQ/TUNER-TONE PCB ASSEMBLY)	
225	2 2 2	2	Screw - PTS 3φx6	814306S
226	5 5 5	5	Screw - PTS 3φx8	814308S
227	1 1 1	1	Bracket, for front end	7032540
228	3 3 3	3	Screw - PTS 3φx6	814306S
229	1 1 1	1	Holder, PCB	7032550
230	3 3 3	3	Screw - PTS 3φx8	814308S
231	1 1 1	1	(BACK PLATE ASSEMBLY)	
232	7 7 7	7	Screw - PTS 3φx6	814306W
233	6 6 6	6	Screw - PTS 3φx8	814308W
234	1 1 1	1	(MAIN AMP ASSEMBLY)	
235	4 4 4	4	Screw - PTS 3φx8	814308S
236	1 1 1	1	Bracket, ground	7032870
237	1 1 1	1	(REGULATOR PCB ASSEMBLY)	
238	4 4 4	4	Screw - PTS 3φx8	
239	1 1 1	1	Lug, ground - 2P	4400070
240	2 2 2	2	Washer - TW (I) 3φ	893403U

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KEY	SYMBOL	TYPE +	DESCRIPTION ++	PART	KEY	SYMBOL	TYPE +	DESCRIPTION ++	PART
NO.	NO.	W E N D		NO.	NO.	W E N D			NO.
241		1 1 1 1	Screw — PTS 3φx10	814310S					
*242a		1 - - - -	Transformer, power — T-1-351 — 120V only	1103510	*299		1 1 1 1	Needle — dial pointer	7050520
*242b		- 1 1 1	Transformer, power — T-1-352 — 220/240V class II	1103520	*2100		1 1 1 1	Slider, needle	7401780
243		4 4 4 4	Flange nut — 5φ	7121150	2101		- 1 1 1	Midget fuse — (S) 4AT 250V	4720400
*244		1 1 1 1	Bracket, front	7226970	2102		- 1 1 1	Holder, midget fuse — 1P	4581430
245		4 4 4 4	Screw — PTS 3φx6	814306S	2103		- 1 1 1	Screw — PTS 3φx8	814308S
246		1 1 1 1	Bracket, pulley — A	7032560	*2104		2 2 2 2	Spacer, panel	7002220
247		2 2 2 2	Screw — PTS 3φx6	814306S					
248		1 1 1 1	Bracket, pulley — B	7032570				BACK PLATE ASSEMBLY	
249		2 2 2 2	Screw — PTS 3φx6	814306S	*301a		1 - - -	Plate, back — W	7325600
*250		3 3 3 3	Pulley — 9φ	7400790	*301b		- 1 1 1	Plate, back — E	7325620
*251		3 3 3 3	Shaft, pulley — 4L	7120980	*302a		1 - - -	Plug/Cord — DP-70	606007A
252		1 1 1 1	Holder, dial shaft	7401820	*302b		- 1 1 1	Plug/Cord — CEE-2T	600510A
253		3 3 3 3	Screw — PTS 3φx8	814308W	*303a		1 - - -	Stopper, cord — SR-3P-4	7400620
*254		1 1 1 1	Dial shaft, with fly wheel	7152310	*303b		- 1 1 1	Stopper, cord — SR-4N-4	7400690
255		1 1 1 1	Plate, ground	7032630	*304a		1 - - -	Bracket, cord	7031010
256		1 1 1 1	Washer — SN9φ	892249S	*304b		- 1 1 1	Bracket, cord — EH	7029800
257		1 1 1 1	Washer — TW (I) 9φ	893409U	*305		1 - - -	Circuit breaker — NW-2S (N) 8.0A	4900910
258		1 1 1 1	Washer — 9φ	893109S	306		2 - - -	Screw — PTS 3φx6	814306W
259		1 1 1 1	Holder, push switch	7032620	*307		2 - - -	Socket, AC outlet	4500150
260		2 2 2 2	Screw — PMS 3φx6	810306S	308		1 - - -	RES 2.2meg-ohm 10% ½W	325225K
261		1 1 1 1	Plate, side	7032580	309		1 - - -	Lug, ground	440000D
262		2 2 2 2	Screw — PTS 3φx6	814306S	310		1 - - -	Screw — PTS 3φx6	814306S
263		1 1 1 1	Bracket, pulley — C	7032590	311		1 - - -	Washer — TW (I) 3φ	893403U
264		2 2 2 2	Screw — PTS 3φx6	814306S	*312		2 2 2 2	Terminal, speaker — screw type — 4P (NK)	4450480
265		2 2 2 2	Pulley — 9φ	7400790	313		4 4 4 4	Screw — PTS 3φx8	814308W
266		2 2 2 2	Shaft, pulley — 4L	7120980	*314		1 1 1 1	Terminal, antenna	4450520
*267		1 1 1 1	Dial scale	7884470	315		2 2 2 2	Screw — PMS 3φx6	810306W
*268		1 1 1 1	Blind, dial — right	7401740	316		1 1 1 1	Lug, ground	440000D
269		1 1 1 1	Plate, dial blind	7002100	317		1 1 1 1	Screw — PMS 3φx6	810306W
*270		1 1 1 1	Bracket, dial scale	7226980	318		1 1 1 1	Washer — IN 3φ	892013S
271		1 1 1 1	(HEAD PHONES PCB ASSEMBLY)		319		1 1 1 1	Washer — TW (I) 3φ	893403U
272		2 2 2 2	Screw — PMS 3φx6	810306S	*320		1 1 1 1	Balun	1210420
*273		1 1 1 1	Meter, signal	4582490	*321		1 1 1 1	Bar antenna, AM	1200400
*274		1 1 1 1	Meter, tuning	4582500	*322		1 1 1 1	Nut, GND terminal — MK2	7152060
275		1 1 1 1	Bracket, meter	7032600	*323		1 1 1 1	Shaft, GND terminal — MK3	7152050
*276		1 1 1 1	Reflex plate, meter	7401580	324		1 1 1 1	Washer — 3φ	893203D
277		2 2 2 2	Screw — PTS 3φx10	814310S	325		1 1 1 1	Washer — IN 3φ	892013S
*278		1 1 1 1	Lamp — 8V 0.3A 300L	5808120	326		1 1 1 1	Washer — TW (I) 3φ	893403U
*279		1 1 1 1	Power indicator	4582540	327		1 1 1 1	Lug, ground	440000D
280		1 1 1 1	Bracket, power indicator	7032680	*328		1 1 1 1	Terminal, RCA phono pin jack — 1P — FM DET. OUT	4440190
281		4 4 4 4	Screw — PTS 3φx8	814308S	329		2 2 2 2	Screw — PTS 3φx8	814308W
282		1 1 1 1	(LED PCB ASSEMBLY)		*330		1 1 1 1	Terminal, RCA phono pin jack — 2Px2 — ADAPTOR	4444010
*283		1 1 1 1	LED GL-2PG1 — green — T-Lock indicator	5060080	331		2 2 2 2	Screw — PTS 3φx8	814308W
*284		5 5 5 5	LED GL-2PR1 — red — function/stereo indicator	5060210	*332		2 2 2 2	Connective pin	4581660
285		6 6 6 6	Spacer, LED	7903140	333		- 1 1 1	Connector, DIN type 5P	4530220
286		1 1 1 1	Bracket, LED PCB	7032610	334		- 2 2 2	Screw — PTS 3φx6	814306W
287		2 2 2 2	Rivet, push — 3φx4.5	7401240	335		1 1 1 1	Bracket, heat sink	7032510
*288		1 1 1 1	Reflex plate	7401620	336		2 2 2 2	Screw — PTS 3φx8	814308W
289		1 1 1 1	Stay, reflex plate	7227020	337		2 2 2 2	Washer — TW (I) 3φ	893403U
290		2 2 2 2	Rivet, push — 4φx7	7401840					
291		2 2 2 2	Rivet, push — 3φx6.5	7401850					
*292		3 3 3 3	Lamp — 8V 0.3A 300L	5808120					
293		1 1 1 1	(LAMP PCB ASSEMBLY)						
294		2 2 2 2	Rivet, push — 3φx8	7401430					
*295		1 1 1 1	Socket, LED — 3021-N-2	4510090					
*296		1 1 1 1	Dial drum — 54φ	7401570					
297		1 1 1 1	Spring, dial drum — (J)	7440290					
298		1 1 1 1	Cord, dial	4581870					

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KEY	SYMBOL	TYPE +	DESCRIPTION	PART	KEY	SYMBOL	TYPE +	DESCRIPTION	PART
NO.	NO.	WEND		NO.	NO.	WEND			NO.
EQUALIZER-TUNER-TONE PC BOARD ASSEMBLY					(MPX SECTION)				
*401a		1 ---	EQ-TUNER-TONE PCB ASSEMBLY — FM de-emphasis 75us	9492780	LPF301,				
*401b		-1 1 1	EQ-TUNER-TONE PCB ASSEMBLY — FM de-emphasis 50us	9492790	LPF302	2 2 2 2	Low pass filter — KM10DB 3803		1270140
402	S1	1 1 1 1	Switch, rotary slide — SRZW-V — selector	4055190	IC301	1 1 1 1	IC HA11223W		518054S
*403	S2	1 1 1 1	Switch, rotary slide — ESA-2634 — tape	4020540	IC302	1 1 1 1	IC uPD4069C		518072S
404	S4 ~ S7	1 1 1 1	Switch, tetra push — SUE-42	4041300	Q301				
405	S3,10,11	1 1 1 1	Switch, tri push — SUE-34 — FM mono/25us/muting	4041100	~ Q306	6 6 6 6	TR 2SC945L (P or Q)		515077S
					Q307,308	2 2 2 2	TR 2SD655 (E or F)		513115S
					Q309				
					~ Q311	3 3 3 3	TR 2SC945L (P or Q)		515077S
406		1 1 1 1	VR VM10E 250kohm — balance	4320930	Q312	1 1 1 1	FET 2SK104 (F)		516026S
*407		3 3 3 3	Terminal, RCA phono pin jack — 2Px2 — input/tape	4444070	Q313,314	2 2 2 2	TR 2SC945L (P or Q)		515077S
408		1 ---	Connector, with wires — 3 pin female — MC-3PF	4570280	D301				
*409		1 1 1 1	Front end — FR-617U	4910140	~ D316	<del>1 1 1 1</del>	Diode 1SS53		501023S
			(FM IF SECTION)		ZD301	1 1 1 1	Zener Diode RD6.2EBI		502048S
T101		1 1 1 1	Transformer, FM discriminator — (1)	1240340	C301,302	2 2 2 2	E-CAP 0.47uf 50V		211505Q
T102		1 1 1 1	Transformer, FM discriminator — (2)	1240350	C303	1 1 1 1	E-CAP 3.3uf 35V		211413Q
L101		1 1 1 1	Inductor — 22uh	1210930	C304	1 1 1 1	E-CAP 220uf 16V		211232Q
L102		1 1 1 1	Inductor — 2.2uh	1210860	C305	1 1 1 1	M-CAP 0.047uf 5% 50V		222473J
CF101,102	2 2 2 2		Celamic filter — SFE 10.7MM	128033A	C306	1 1 1 1	S-CAP 1000pf 5% 50V		223102V
CF103	1 1 1 1		Celamic filter — SFE 10.7ML	128032A	C307	1 1 1 1	M-CAP 0.0022uf 5% 50V		222222J
IC101	1 1 1 1		IC HA11225	518070S	C308	1 1 1 1	T-CAP 0.47uf 35V		252405M
Q101					C309	1 1 1 1	T-CAP 3.3uf 10V		252113M
~ Q104	4 4 4 4	TR	2SC1675 (L or M)	515082S	C310	1 1 1 1	M-CAP 0.0015uf 5% 50V		222152J
D101,102	2 2 2 2		Diode 1SS53	501023S	C311	1 1 1 1	E-CAP 3.3uf 35V		211413Q
C101					C312	1 1 1 1	M-CAP 0.01uf 5% 50V		222103J
~ C111	<del>1 1 1 1 1 1</del>	C-CAP	0.022uf +80, -20% 50V YG	231223Z	C313,314	2 2 2 2	E-CAP 0.33uf 50V		211503S
C112	1 1 1 1	E-CAP	1uf 50V	211510Q	C315,316	2 2 2 2	E-CAP 1uf 50V		211510Q
C113,114			— DELETED —		C317,318	2 2 2 2	M-CAP 0.0075uf 5% 100V		228752J
C115					C319,320	2 ---	M-CAP 0.022uf 5% 50V		222223J
~ C119	5 5 5 5	C-CAP	0.022uf +80, -20% 50V YG	231223Z	C319,320	-2 2 2	M-CAP 0.01uf 5% 50V		222103J
C120	1 1 1 1	E-CAP	0.47uf 50V	211505Q	C321,322	2 ---	M-CAP 0.0033uf 5% 50V		222332J
C121	1 1 1 1	C-CAP	100pf 10% 50V SL	232101K	C321,322	-2 2 2	M-CAP 0.0047uf 5% 50V		222472J
C122	1 1 1 1	C-CAP	0.022uf +80, -20% 50V YG	231223Z	C323,324	2 2 2 2	E-CAP 0.47uf 50V		211505Q
C123	1 1 1 1	E-CAP	1uf 50V	211510Q	C325,326	2 2 2 2	E-CAP 0.22uf 50V		211502S
C124					C327	1 1 1 1	E-CAP 220uf 16V		211232Q
~ C126	3 3 3 3	C-CAP	0.022uf +80, -20% 50V YG	231223Z	C328	1 1 1 1	M-CAP 0.01uf 5% 50V		222103J
C127	1 1 1 1	E-CAP	47uf 16V	211225Q	C329	1 1 1 1	E-CAP 1uf 50V		211510Q
C128	1 1 1 1	C-CAP	0.022uf +80, -20% 50V YG	231223Z	C330,331	2 2 2 2	E-CAP 0.47uf 50V		211505Q
R101,102	2 2 2 2	RES	22ohm 5% 1/4W	328220J	C332,333	2 2 2 2	E-CAP 1uf 50V		211510Q
R103	1 1 1 1	RES	330ohm 5% 1/4W	328331J	C334	1 1 1 1	E-CAP 10uf 16V		211220Q
R104	1 1 1 1	RES	1kohm 5% 1/4W	328102J	C335		— DELETED —		
R105	1 1 1 1	RES	330ohm 5% 1/4W	328331J	C336	1 1 1 1	E-CAP 3.3uf 35V		211413Q
R106,107	2 2 2 2	RES	10kohm 5% 1/4W	328103J	R309	1 1 1 1	Potentiometer — RG10B 3.3kohm		4300820
R108	1 1 1 1	RES	330ohm 5% 1/4W	328331J	R313	1 1 1 1	Potentiometer — SR19R B150kohm		4300520
R109	1 1 1 1	RES	1kohm 5% 1/4W	328102J	R343	1 1 1 1	Potentiometer — SR19R B47kohm		4300730
R110	1 1 1 1	RES	330ohm 5% 1/4W	328331J	R301	1 1 1 1	RES 82kohm 5% 1/4W		328823J
R111	1 1 1 1	RES	10kohm 5% 1/4W	328103J	R302	1 1 1 1	RES 330kohm 5% 1/4W		328334J
R112	1 1 1 1	RES	4.7kohm 5% 1/4W	328472J	R303	1 1 1 1	RES 5.6kohm 5% 1/4W		328562J
R113	1 1 1 1	RES	330ohm 5% 1/4W	328331J	R304	1 1 1 1	RES 100ohm 5% 1/4W		328101J
R114	1 1 1 1	RES	220kohm 5% 1/4W	328224J	R305	1 1 1 1	RES 47kohm 5% 1/4W		328473J
R115	1 1 1 1	RES	100kohm 5% 1/4W	328104J	R306	1 1 1 1	RES 10kohm 5% 1/4W		328103J
R116			— DELETED —		R307	1 1 1 1	RES 3.3kohm 5% 1/4W		328332J
R117	1 1 1 1	RES	33kohm 5% 1/4W	328333J	R308	1 1 1 1	RES 5.6kohm 5% 1/4W		328562J
R118	1 1 1 1	RES	15kohm 5% 1/4W	328153J	R309		(Potentiometer)		
R119	1 1 1 1	RES	2.2kohm 5% 1/4W	328222J	R310	1 1 1 1	RES 220kohm 5% 1/4W		328224J
R120	1 1 1 1	RES	12kohm 5% 1/4W	328123J	R311	1 1 1 1	RES 33kohm 5% 1/4W		328333J
R121	1 1 1 1	RES	220ohm 5% 1/4W	328221J	R312	1 1 1 1	RES 1kohm 5% 1/4W		328102J
R122	1 1 1 1	RES	33kohm 5% 1/4W	328333J	R313		(Potentiometer)		
					R314	1 1 1 1	RES 2.2kohm 5% 1/4W		328222J
					R315	1 1 1 1	RES 1kohm 5% 1/4W		328102J
					R316	1 1 1 1	RES 6.8kohm 5% 1/4W		328682J
					R317	1 1 1 1	RES 22kohm 5% 1/4W		328223J
					R318	1 1 1 1	RES 47kohm 5% 1/4W		328473J
					R319	1 1 1 1	RES 220kohm 5% 1/4W		328224J
					R320	1 1 1 1	RES 10kohm 5% 1/4W		328103J
					R321,322	2 2 2 2	RES 3.3kohm 5% 1/4W		328332J
					R323,324	2 2 2 2	RES 100ohm 5% 1/4W		328101J

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KEY	SYMBOL	TYPE +	DESCRIPTION			PART
NO.	NO.	W E N D				NO.
	R325					
	~ R328	4 4 4 4	RES	3.3kohm	5% 1/4W	328332J
	R329,330	2 2 2 2	RES	4.7kohm	5% 1/4W	328472J
	R331,332	2 2 2 2	RES	180kohm	5% 1/4W	328184J
	R333,334	2 2 2 2	RES	18kohm	5% 1/4W	328183J
	R335,336	2 2 2 2	RES	68kohm	5% 1/4W	328683J
	R337,338	2 2 2 2	RES	680ohm	5% 1/4W	328681J
	R339,340	2 2 2 2	RES	5.6kohm	5% 1/4W	328562J
	R341,342	2 2 2 2	RES	220kohm	5% 1/4W	328224J
	R343		(Potentiometer)			
	R345	1 1 1 1	RES	22kohm	5% 1/4W	328223J
	R346	1 1 1 1	RES	1kohm	5% 1/4W	328102J
	R347	1 1 1 1	RES	1meg-ohm	5% 1/4W	328105J
	R348	1 1 1 1	RES	10kohm	5% 1/4W	328103J
	R349	1 1 1 1	RES	330kohm	5% 1/4W	328334J
	R350	1 1 1 1	RES	8.2kohm	5% 1/4W	328822J
	R351	1 1 1 1	RES	33kohm	5% 1/4W	328333J
	R352	1 1 1 1	RES	8.2kohm	5% 1/4W	328822J
	R353	1 1 1 1	RES	1.2kohm	5% 1/4W	328122J
	R354	1 1 1 1	RES	15kohm	5% 1/4W	328153J
	R355	1 1 1 1	RES	3.3kohm	5% 1/4W	328332J
	R356	1 1 1 1	RES	330kohm	5% 1/4W	328334J
	R357	1 1 1 1	RES	1meg-ohm	5% 1/4W	328105J
	R358	1 1 1 1	RES	2.2meg-ohm	5% 1/4W	328225J
	R359	1 1 1 1	RES	100kohm	5% 1/4W	328104J
	R360	1 1 1 1	RES	10meg-ohm	5% 1/4W	328106J
	R361,362	2 2 2 2	RES	100kohm	5% 1/4W	328104J
	R363	1 1 1 1	RES	1meg-ohm	5% 1/4W	328105J
	R364	1 1 1 1	RES	100kohm	5% 1/4W	328104J
	R365	1 1 1 1	RES	1meg-ohm	5% 1/4W	328105J
	R366	1 1 1 1	RES	2.2meg-ohm	5% 1/4W	328225J
	R367	1 1 1 1	RES	1kohm	5% 1/4W	328102J
	R368	1 1 1 1	RES	680ohm	5% 1/4W	328681J
	R369,370	2 2 2 2	RES	4.7kohm	5% 1/4W	328472J
	R371	1 1 1 1	RES	10meg-ohm	5% 1/4W	328106J
			(AM SECTION)			
	T201	1 1 1 1	Coil, AM oscillator			1220060
	T202	1 1 1 1	Transformer, AM IF			1230160
	T203	1 1 1 1	Coil, AM discriminator			1230110
	CF201	1 1 1 1	Celamic filter - SFZ455A			1280310
	IC201	1 1 1 1	IC HA1197			518044S
	Q201	1 1 1 1	TR 2SC945L (P or Q)			515077S
	C201	1 1 1 1	C-CAP 0.022uf +80, -20% 50V YG			231223Z
	C202	1 1 1 1	C-CAP 0.001uf +80, -20% 50V YG			231102Z
	C203	1 1 1 1	E-CAP 10uf 16V			211220Q
	C204	1 1 1 1	C-CAP 0.022uf +80, -20% 50V YG			231223Z
	C205	1 1 1 1	E-CAP 10uf 26V			211220Q
	C206	1 1 1 1	C-CAP 0.022uf +80, -20% 50V YG			231223Z
	C207	1 1 1 1	E-CAP 4.7uf 25V			211315Q
	C208	1 1 1 1	E-CAP 3.3uf 35V			211413Q
	C209	1 1 1 1	C-CAP 0.001uf +80, -20% 50V YG			231102Z
	C210					
	~ C212	3 3 3 3	M-CAP 0.01uf 5% 50V			222103J
	C213	1 1 1 1	M-CAP 0.068uf 5% 50V			222683J
	C214	1 1 1 1	E-CAP 10uf 16V			211220Q
	C215	1 1 1 1	S-CAP 360pf 2% 50V			223361G
	C216	1 1 1 1	C-CAP 15pf 50V N750			232150U
	C217	1 1 1 1	C-CAP 0.022uf +80, -20% 50V YG			231223Z
	C218	1 1 1 1	C-CAP 68pf 10% 50V SL			232680K
	C219,220	2 2 2 2	C-CAP 0.022uf +80, -20% 50V YG			231223Z
	R201	1 1 1 1	RES 220ohm 5% 1/4W			328221J
	R202	1 1 1 1	RES 100ohm 5% 1/4W			328101J
	R203	1 1 1 1	RES 1.5kohm 5% 1/4W			328152J
	R204	1 1 1 1	RES 1kohm 5% 1/4W			328102J
	R205,206	2 2 2 2	RES 10kohm 5% 1/4W			328103J
	R207	1 1 1 1	RES 330ohm 5% 1/4W			328331J
	R208	1 1 1 1	RES 10ohm 5% 1/4W			328100J
	R209	1 1 1 1	RES 100ohm 5% 1/4W			328101J
	R210	1 1 1 1	RES 1kohm 5% 1/4W			328102J
			(EQ AMP SECTION)			
	R211	1 1 1 1	RES 3.3kohm 5% 1/4W			328332J
	R212	1 1 1 1	RES 100kohm 5% 1/4W			328104J
	R213	1 1 1 1	RES 10kohm 5% 1/4W			328103J
	R214	1 1 1 1	RES 100kohm 5% 1/4W			328104J
	Q401,402	2 2 2 2	TR 2SA991 (E or F)			510104S
	Q403					
	~ Q406	4 4 4 4	TR 2SC1845 (E or F)			512115S
	Q407,408	2 2 2 2	TR 2SA992 (E or F)			510110S
	C401,402	2 2 2 2	E-CAP 3.3uf 50V			211513Q
	C403,404	2 2 2 2	C-CAP 470pf 10% 50V SL			232150K
	C411,412	2 2 2 2	E-CAP 10uf 25V			211320Q
	C413,414	2 2 2 2	E-CAP 220uf 6.3V			211032Q
	C415,416	2 2 2 2	M-CAP 0.0012uf 10% 50V			222122K
	C417,418	2 2 2 2	E-CAP 3.3uf 50V			211513Q
	C419,420	2 2 2 2	E-CAP 100uf 35V			211430Q
	C421,422	2 2 2 2	M-CAP 0.011uf 2% 50V			228113G
	C423,424	2 2 2 2	M-CAP 0.039uf 2% 50V			228393G
	C425,426	2 2 2 2	E-CAP 220uf 35V			211432S
	C427,428	2 2 2 2	C-CAP 680pf 10% 50V SL			232681K
	R401,402	2 2 2 2	RES 47kohm 5% 1/4W			328473J
	R403,404	2 2 2 2	RES 47ohm 5% 1/4W			328470J
	R405,406	2 2 2 2	RES 470kohm 5% 1/4W			328474J
	R409,410	2 2 2 2	RES 33koym 5% 1/4W			328333J
	R411,412	2 2 2 2	RES 150ohm 5% 1/4W			328151J
	R413,414	2 2 2 2	RES 82kohm 5% 1/4W			328823J
	R415					
	~ R418	4 4 4 4	RES 12kohm 5% 1/4W			328123J
	R419,420	2 2 2 2	RES 2.2kohm 5% 1/4W			328222J
	R421,422	2 2 2 2	RES 4.7kohm 5% 1/4W			328472J
	R423,424		- DELETED -			
	R425,426	2 2 2 2	RES 1kohm 5% 1/4W			328102J
	R427,428	2 2 2 2	RES 100kohm 5% 1/4W			328104J
	R429,430	2 2 2 2	RES 220kohm 5% 1/4W			328224J
	R431,432	2 2 2 2	RES, metal film 6.8kohm 2% 1/4W			304682G
	R433,434		- DELETED -			
	R435,436	2 2 2 2	RES, metal film 82kohm 2% 1/4W			304823G
	R437,438	2 2 2 2	RES 68ohm 5% 1/4W			328680J
	R439					
	~ R442	4 4 4 4	RES10 100ohm 5% 1/4W			328101J
	R443,444	2 2 2 2	FP-MO-RES 560ohm 5% 1/4W			360561L
			(PUSH SWITCH SECTION & OTHERS)			
	Q806	1 1 1 1	TR 2SA733A (P or Q)			514074S
	C501,502	2 2 2 2	C-CAP 0.022uf +80, -20% 50V YG			231223Z
	C503,504	2 2 2 2	M-CAP 0.18uf 5% 50V			222184J
	C505,506	2 2 2 2	S-CAP 360pf 10% 50V			223361V
	C507,508	2 2 2 2	M-CAP 0.12uf 5% 50V			222124J
	C541,542	2 2 2 2	M-CAP 0.0039uf 5% 50V			222392J
	C543,544	2 2 2 2	E-CAP 0.22uf 10% 50V			211502W
	C809	1 1 1 1	E-CAP 47uf 25V			211325Q
	C810	1 1 1 1	E-CAP 47uf 16V			211225Q
	R501,502	2 2 2 2	RES 1meg-ohm 5% 1/4W			328105J
	R503					
	~ R506	4 4 4 4	RES 2.2kohm 5% 1/4W			328222J
	R507,508	2 2 2 2	RES 3.9kohm 5% 1/4W			328392J
	R509,510	2 2 2 2	RES 5.6kohm 5% 1/4W			328562J
	R511,512	2 2 2 2	RES 47kohm 5% 1/4W			328473J
	R513,514	2 2 2 2	RES 15kohm 5% 1/4W			328153J
	R515,516	2 2 2 2	RES 1meg-ohm 5% 1/4W			328105J
	R517,518	2 2 2 2	RES 5.6kohm 5% 1/4W			328562J
	R595,596	- 2 2 2	RES 330kohm 5% 1/4W			328334J
	R597,598	- 2 2 2	RES 100kohm 5% 1/4W			328104J
	R815	2 2 2 2	RES 47kohm 5% 1/4W			328473J

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KEY	SYMBOL	TYPE +	DESCRIPTION ++	PART
NO.	NO.	W E N D		NO.
(TONE AMP SECTION)				
410	R559,560	1 1 1 1	VR V25L5G4 B100kohmx2 — bass	4320630
411	R549,550	1 1 1 1	VR V25L5G4 B100kohmx2 — mid range	4320940
412	R539,540	1 1 1 1	VR V24L5G4 B100kohmx2 — treble	4320640
	Q501,502	2 2 2 2	TR 2SA992 (E or F)	510110S
	Q503			
	~ Q508	6 6 6 6	TR 2SC1845 (E or F)	512115S
	Q509,510	2 2 2 2	TR 2SA992 (E or F)	510110S
	C509,510	2 2 2 2	E-CAP 3.3uf 50V	211513Q
	C511,512	2 2 2 2	E-CAP 220uf 6.3V	211032Q
	C513,514	2 2 2 2	C-CAP 100pf 10% 50V SL	232101K
	C515,516	2 2 2 2	C-CAP 5pf ±0.5pf 50V SL	232509D
	C517,518	2 2 2 2	E-CAP 10uf 35V	211420Q
	C519,520	2 2 2 2	M-CAP 0.001uf 5% 50V	222102J
	C521			
	~ C524	4 4 4 4	M-CAP 0.0047uf 5% 50V	222472J
	C525			
	~ C528	4 4 4 4	M-CAP 0.033uf 5% 50V	222333J
	C529,530	2 2 2 2	E-CAP 3.3uf 50V	211513Q
	C531,532	2 2 2 2	E-CAP 1uf 50V	211510Q
	C533,534	2 2 2 2	E-CAP 0.47uf 50V	211505Q
	C535,536	2 2 2 2	C-CAP 5pf ±0.5pf 50V SL	232509D
	C537,538	2 2 2 2	C-CAP 3pf ±0.5pf 50V SL	232309D
	C539,540	2 2 2 2	E-CAP 4.7uf 35V	211415Q
	C545,546	2 2 2 2	E-CAP 100uf 25V	211330Q
	C547,548	2 2 2 2	E-CAP 47uf 16V	211225Q
	C559,560	2 2 2 2	S-CAP 680pf 10% 50V	223681V
	C561,562	2 2 2 2	C-CAP 47pf 10% 50V SL	232470K
	R519,520	2 2 2 2	RES 2.2kohm 5% ¼W	328222J
	R521,522	2 2 2 2	RES 220kohm 5% ¼W	328224J
	R523,524	2 2 2 2	RES 330ohm 5% ¼W	328331J
	R525,526	2 2 2 2	RES 22kohm 5% ¼W	328223J
	R527,528	2 2 2 2	RES 120kohm 5% ¼W	328124J
	R529,530	2 2 2 2	RES 2.7kohm 5% ¼W	328272J
	R531,532	2 2 2 2	RES 680ohm 5% ¼W	328681J
	R533,534	2 2 2 2	RES 3.9kohm 5% ¼W	328392J
	R535,536	2 2 2 2	RES 100kohm 5% ¼W	328104J
	R537,538	2 2 2 2	RES 8.2kohm 5% ¼W	328822J
	R539,540		(TONE VR — treble)	
	R541,542	2 2 2 2	RES 8.2kohm 5% ¼W	328822J
	R543,544	2 2 2 2	RES 1meg-ohm 5% ¼W	328105J
	R545,546	2 2 2 2	RES 5.6kohm 5% ¼W	328562J
	R547,548	2 2 2 2	RES 10kohm 5% ¼W	328103J
	R549,550		(TONE VR — mid range)	
	R551,552	2 2 2 2	RES 10kohm 5% ¼W	328103J
	R553,554	2 2 2 2	RES 1meg-ohm 5% ¼W	328105J
	R555			
	~ R558	4 4 4 4	RES 22kohm 5% ¼W	328223J
	R559,560		(TONE VR — bass)	
	R561			
	~ R564	4 4 4 4	RES 22kohm 5% ¼W	328223J
	R565,566	2 2 2 2	RES 220kohm 5% ¼W	328224J
	R567			
	~ R570	4 4 4 4	RES 4.7kohm 5% ¼W	328472J
	R571,572	2 2 2 2	RES 47kohm 5% ¼W	328473J
	R573,574	2 2 2 2	RES 470kohm 5% ¼W	328474J
	R575,576	2 2 2 2	RES 100kohm 5% ¼W	328104J
	R577,578	2 2 2 2	RES 150kohm 5% ¼W	328154J
	R579,580	2 2 2 2	RES 82ohm 5% ¼W	328820J
	R581,582	2 2 2 2	RES 3.9kohm 5% ¼W	328392J
	R583,584	2 2 2 2	RES 220kohm 5% ¼W	328224J
	R585,586	2 2 2 2	RES 1kohm 5% ¼W	328102J
	R587,588	2 2 2 2	RES 2.2kohm 5% ¼W	328222J
	R589,590	2 2 2 2	RES 330kohm 5% ¼W	328334J
(SPEAKERS SWITCH SECTION)				
*413	S8, 9	1 1 1 1	Switch, twin push — SUE-22	4041170

KEY	SYMBOL	TYPE +	DESCRIPTION ++	PART
NO.	NO.	W E N D		NO.
MAIN AMP ASSEMBLY				
*501		1 1 1 1	Heat sink	7480360
*502		1 1 1 1	Heat sink, sub	7480380
503		6 6 6 6	Screw — PTS 3φx12	814312S
	Q717,718	2 2 2 2	TR 2SD746 (Q or R)	513107S
	Q719,720	2 2 2 2	TR 2SB706 (Q or R)	511106S
504		1 1 1 1	Holder, main amp PCB	7226990
505		1 1 1 1	Stay, main amp PCB	7032640
506		4 4 4 4	Screw — PTS 3φx8	814308S
MAIN AMP PC BOARD ASSEMBLY				
601		1 1 1 1	MAIN AMP PCB ASSEMBLY	9430880
602		2 2 2 2	Connector, 3 pin male — MC-3PM	4570250
603		1 1 1 1	Connector, with wires — 4 pin female — MC-4PF	4570270
(MAIN AMP SECTION)				
	Q701,702	2 2 2 2	TR 2SA798 (F or G)	514086S
	Q703			
	~ Q706	4 4 4 4	TR 2SA733A (P or Q)	514074S
	Q707			
	~ Q710	4 4 4 4	TR 2SC1941 (L or K)	512112S
	Q711,712	2 2 2 2	TR 2SA916 (L or K)	510108S
	Q713,714	2 2 2 2	TR 2SD669A (B or C)	513112S
	Q715,716	2 2 2 2	TR 2SB649A (B or C)	511111S
	Q721,722	2 2 2 2	TR 2SC945L (P or Q)	515077S
	Q723,724	2 2 2 2	TR 2SC1845 (E or F)	512115S
	D701			
	~ D706	6 6 6 6	Diode 1SS53	501023S
	D707,708	2 2 2 2	Diode VD1212	505016S
	D709,710	2 2 2 2	Diode 1SS55	501024S
	D711,712	2 2 2 2	Diode 1SS53	501023S
	ZD701			
	~ ZD704	4 4 4 4	Zener Diode RD24EB4	502057S
	C701,702	2 2 2 2	C-CAP 220pf 10% 50V SL	232221K
	C703			
	~ C706	4 4 4 4	E-CAP 10uf 25V	211320Q
	C707,708	2 2 2 2	E-CAP 3.3uf 50V	211513Q
	C709,710	2 2 2 2	C-CAP 680pf 10% 50V SL	232681K
	C711,712	2 2 2 2	M-CAP 0.047uf 10% 50V	222473K
	C713,714	2 2 2 2	C-CAP 47pf 10% 500V SL	234470K
	C715,716		— DELETED —	
	C717,718	2 2 2 2	C-CAP 1pf ±0.5pf 500V SL	234109D
	C719,720	2 2 2 2	E-CAP 0.47uf 50V	211505Q
	C721,722	2 2 2 2	M-CAP 0.047uf 10% 50V	222473K
	C723,724	2 2 2 2	M-CAP 0.047uf 10% 200V	227473K
	C725,726	2 2 2 2	E-CAP 1uf 50V	211510Q
	C727,728	2 2 2 2	E-CAP 47uf 63V	211625Q
	C733,734	2 2 2 2	C-CAP 4pf ±0.5pf 500V SL	234409D
	C735,736	2 2 2 2	C-CAP 27pf 10% 50V SL	232270K
	C737,738	2 2 2 2	C-CAP 5pf ±0.5pf 500V SL	234509D
	C741			
	~ C744	4 4 4 4	E-CAP 0.47uf 63V	211605S
	R707			
	~ R710	4 4 4 4	Potentiometer — SR29R 207 B47kohm	4301190
	R753,754	2 2 2 2	Potentiometer — SR29R 207 B1kohm	4300620
	R701,702	2 2 2 2	RES 1kohm 5% ¼W	328102J
	R703,704	2 2 2 2	RES 100kohm 5% ¼W	328104J
	R705,706	2 2 2 2	RES 470kohm 5% ¼W	328474J
	R707			
	~ R710		(Potentiometer)	
	R711,712	2 2 2 2	RES 8.2kohm 5% ¼W	328822J
	R713,714	2 2 2 2	RES 56kohm 5% ¼W	328563J
	R715,716	2 2 2 2	RES 1.2kohm 5% ¼W	328122J



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KEY	SYMBOL	TYPE <sup>+</sup>		DESCRIPTION <sup>++</sup>				PART
NO.	NO.	W	E	N	D			NO.
	R717							
	~ R720	4 4 4 4	RES	4.7kohm	5%	1/4W		328472J
	R721,722	2 2 2 2	RES	470kohm	5%	1/4W		328474J
	R723,724	2 2 2 2	RES	470ohm	5%	1/4W		328471J
	R725							
	~ R728	4 4 4 4	FP-MO-RES	4.7kohm	5%	1/4W		360472L
	R729,730	2 2 2 2	RES	56kohm	5%	1/4W		328563J
	R731,732		—	DELETED —				
	R733,734	2 2 2 2	RES	6.8kohm	5%	1/4W		328682J
	R735							
	~ R738	4 4 4 4	RES	100ohm	5%	1/4W		328101J
	R739							
	~ R742	4 4 4 4	RES	680ohm	5%	1/4W		328681J
	R743							
	~ R746	4 4 4 4	RES	100ohm	5%	1/4W		328101J
	R747,748	2 2 2 2	FP-MO-RES	10kohm	5%	1/4W		360103L
	R749,750	2 2 2 2	RES	820ohm	5%	1/4W		328821J
	R751,752	2 2 2 2	RES	560ohm	5%	1/4W		328561J
	R753,754			(Potentiometer)				
	R755							
	~ R758	4 4 4 4	RES	100ohm	5%	1/4W		328101J
	R759							
	~ R762	4 4 4 4	FP-MO-RES	47ohm	5%	1/4W		360470L
	R763,764	2 2 2 2	FP-MO-RES	220ohm	5%	1/4W		360221L
	R765							
	~ R768	4 4 4 4	CEM-RES	0.33ohm	10%	5W		384339W
	R769,770	2 2 2 2	FP-MO-RES	1.2kohm	5%	1/4W		360122L
	R771,772	2 2 2 2	RES	1.5kohm	5%	1/4W		328152J
	R773,774	2 2 2 2	FP-MO-RES	4.7ohm	5%	2W		362478L
	R775,776	2 2 2 2	RES	12kohm	5%	1/4W		328123J
	R777,778	2 2 2 2	CEM-RES	0.33ohm	10%	5W		384339W
	R779,780			— DELETED —				
	R781,782	2 2 2 2	CEM-RES	0.33ohm	10%	5W		384339W
				(PROTECTOR SECTION)				
604	LY801	1 1 1 1	Relay	MY4-02-US-40L				1700220
	Q801	1 1 1 1	TR	2SC945L (P or Q)				515077S
	Q802	1 1 1 1	TR	2SA733A (P or Q)				514074S
	Q803	1 1 1 1	TR	2SA992 (E or F)				510110S
	Q804	1 1 1 1	TR	2SC945L (P or Q)				515077S
	Q805	1 1 1 1	TR	2SC2003 (L or M)				512114S
	D801	1 1 1 1	Diode	1SS55				501024S
	ZD801	1 1 1 1	Zener Diode	RD12EB3				502058S
	C801,802	2 2 2 2	E-CAP	220uf 6.3V				211032Q
	C803	1 1 1 1	E-CAP	01uf 16V				211220Q
	C804	1 1 1 1	E-CAP	220uf 16V				211232Q
	C806	1 1 1 1	M-CAP	0.001uf 10% 50V				222102K
	R801,802	2 2 2 2	RES	47kohm	5%	1/4W		328473J
	R803	1 1 1 1	RES	33kohm	5%	1/4W		328333J
	R804	1 1 1 1	RES	12kohm	5%	1/4W		328123J
	R805	1 1 1 1	RES	22kohm	5%	1/4W		328223J
	R806	1 1 1 1	RES	12kohm	5%	1/4W		328123J
	R807	1 1 1 1	RES	47kohm	5%	1/4W		328473J
	R808	1 1 1 1	RES	2.2kohm	5%	1/4W		328222J
	R809	1 1 1 1	RES	47kohm	5%	1/4W		328473J
	R812	1 1 1 1	FP-MO-RES	680ohm	5%	2W		362681L
				(POWER INDICATOR DRIVER SECTION)				
	IC901	1 1 1 1	IC	TA7318P				518067S
	C901,902	2 2 2 2	E-CAP	0.47uf 50V				211505Q
	C903,904	2 2 2 2	M-CAP	0.047uf 10% 50V				222472K
	C905	1 1 1 1	E-CAP	1uf 50V				211510Q
	R905,906	2 2 2 2	Potentiometers —	SR29R 207 — B1kohm				4300620
	R901,902	2 2 2 2	RES	56kohm 5	5%	1/4W		328563J
	R903,904	2 2 2 2	RES	39ohm	5%	1/4W		328390J
	R905,906			(Potentiometer)				

KEY SYMBOL		TYPE <sup>+</sup>	DESCRIPTION <sup>++</sup>				PART
NO.	NO.	WEND					NO.
	R907	1 1 1 1	FP-MO-RES	1.8kohm	5%	1/4W	360182L
			(HEAD PHONES SECTION)				
		1 1 1 1	Jack, head phones — JL3A				4550260
*605	R783,784	2 2 2 2	FP-MO-RES	330ohm	5%	2W	362331L
			REGULATOR PCB ASSEMBLY				
*701a		1 — — —	REGULATOR PCB ASSEMBLY				9450920
*701b		— 1 1 1	REGULATOR PCB ASSEMBLY				9450930
702		1 1 1 1	Connector assembly — 3 pin				4570210
703		1 1 1 1	Connector assembly — 3pin x 2				4570290
704		1 1 1 1	Connector, 3pin female — MC-3PF				4570230
705a	F831	1 — — —	Fuse — 1A 250V				4700590
706a	F832	1 — — —	Fuse — 3A 250V				4700630
707a		4 — — —	Holder, fuse				7050420
705b	F831	— 1 1 1	Midget fuse — (S) 1AT 250V				4720330
706b	F832	— 1 1 1	Midget fuse — (S) 3.15AT 250V				4720390
707b		— 4 4 4	Holder, midget fuse				7050430
708		1 1 1 1	Heat sink, for Q831				7081820
709		1 1 1 1	Screw — PMS3φx6				810306S
	Q831	1 1 1 1	TR 2SD880 (Y or GR)				513106S
	Q832	1 1 1 1	TR 2SD667 (B or C)				511021S
	Q833	1 1 1 1	TR 2SB647 (B or C)				510045S
	D802	1 1 1 1	Diode 1SS55				501024S
	D803						
	~ D805	3 3 3 3	Diode 1SS53				501023S
	D831	1 1 1 1	Diode S10VB20				560058S
	D832	1 1 1 1	Diode W02				560061S
	D833	1 1 1 1	Diode 1SS53				501023S
	ZD831,832	2 2 2 2	Zener Diode RD22FC				502070S
	ZD833,834	2 2 2 2	Zener Diode RD33EB3				502067S
	ZD835	1 1 1 1	Zener Diode RD13EB1				502049S
	ZD836	1 1 1 1	Zener Diode RD20EB3				502069S
	L701,702	1 1 1 1	Coil, choke				1210830
	C805	1 1 1 1	E-CAP 10uf 35V				211420Q
	C831,832	2 2 2 2	E-CAP 10000uf 63V				2100020
	C833,834	2 2 2 2	C-CAP 0.01uf 500V				238103P
	C835,836	2 2 2 2	E-CAP 100uf 25V				211330Q
	C837,838	2 2 2 2	E-CAP 100uf 35V				211430Q
	C839	1 1 1 1	E-CAP 100uf 25V				211330Q
	C840	1 1 1 1	E-CAP 470uf 16V				211235S
	C841	1 1 1 1	C-CAP 0.022uf +80,—20% 50V YG				231223Z
	C842	1 1 1 1	E-CAP 47uf 25V				211325Q
	C843	1 1 1 1	E-CAP 10uf 16V				211220Q
	C844,845	2 2 2 2	E-CAP 100uf 35V				211430Q
	C846	1 1 1 1	E-CAP 2200uf 25V				211342S
	R785,786	2 2 2 2	FP-MO-RES	10ohm	5%	2W	362100L
	R810	1 1 1 1	RES	1kohm	5%	1/4W	328102J
	R811	1 1 1 1	RES	12kohm	5%	1/4W	328123J
	R813	1 1 1 1	RES	390ohm	5%	1/4W	328391J
	R831,832	2 2 2 2	FP-MO-RES	4.7kohm	5%	2W	362472L
	R833	1 1 1 1	RES	820ohm	5%	1/4W	328821J
	R834,835	2 2 2 2	FP-MO-RES	560ohm	5%	2W	362561J
	R836,837	2 2 2 2	FP-MO-RES	3.3kohm	5%	1/4W	360332L
	R838,839	2 2 2 2	FP-MO-RES	470ohm	5%	1/4W	360471L
	R842	1 1 1 1	FP-MO-RES	1.8kohm	5%	2W	362182L
	R843,844	2 2 2 2	FP-MO-RES	47ohm	5%	1/4W	360470L

# SEMICONDUCTOR DATA

## TRANSISTORS

## † NOTES

Ge: Germanium  
Si: Silicon

A: Alloy  
B: Base  
D: Diffused  
Dd: Double-diffused

Df: Drift-field  
E: Epitaxial  
G: Grown  
J: Junction

M: Mesa  
P: Planar  
Pc: Point-contact  
Td: Triple-diffused

DEVICE TYPE	APPLICATIONS	STRUC- TURE†	MAXIMUM RATINGS Absolute-Maximum Values: (T <sub>A</sub> = 25°C unless otherwise specified)					ELECTRICAL CHARACTERISTICS Typical Values: (T <sub>A</sub> = 25°C unless otherwise specified)														MANU- FACTURER
			Collector- to-Base Voltage V <sub>CB0</sub> (V)	Emitter- to-Base Voltage V <sub>EB0</sub> (V)	Collector Current I <sub>C</sub> (mA)	Collector Dissipa- tion P <sub>C</sub> (mW)	Junction Temperature T <sub>J</sub> (°C)	Collector Cutoff Current I <sub>CB0</sub> (μA)	V <sub>CE</sub> (V)	Static Forward-Current Transfer Ratio			Collector-Emitter Saturation Voltage			Gain-Bandwidth Product			Output Capacitance C <sub>ob</sub> (pF)	Others		
										h <sub>FE</sub>	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)	V <sub>CE(sat)</sub> (V)	I <sub>C</sub> (mA)	I <sub>B</sub> (mA)	f <sub>T</sub> f <sub>bd</sub> * (MHz)	V <sub>CE</sub> V <sub>CEB</sub> * (V)	I <sub>E</sub> I <sub>C</sub> * (mA)				
2SA733A (P, Q)	AF	PNP Si-E	-60	-5	-100	250	125	-0.1 max.	-60	135 ~ 400	-6	-1	-0.3 max.	-100	-10	450 max.	-6	10	6 max.		NEC	
2SA798 (F, G)	AF, Low noise differential amp.	PNP, Dual Si-EP	-70	-5	-100	200	125	-0.1 max.	-50	250 ~ 800	-6	-1	-0.6 max.	-10	-1	100	-6	1	3		MITSUBISHI	
2SA916 (L, K)	AF	PNP Si-E	-160	-5	-50	800	150	-0.1 max.	-160	135 ~ 400	-10	-10	-0.6 max.	-20	-2	80	-10	10	3.5 max.	Complementary to 2SC 1941	NEC	
2SA991 (E, F)	AF, Low noise	PNP Si-E	-60	-5	-100	500	125	-0.05 max.	-60	300 ~ 800	-6	-1	-0.5 max.	-100	-10	90	-6	1	10 max.		NEC	
2SA992 (E, F)	AF, Low noise	PNP Si-E	-120	-5	-50	500	125	-0.05 max.	-120	300 ~ 800	-6	-1	-0.3 max.	-10	-1	100	-6	1	3 max.	Complementary to 2SC 1845	NEC	
2SB647 (B, C)	AF	PNP Si-E	-120	-5	-1A	0.9W	150	-10 max.	-100	60 ~ 200	-5	-150	-1 max.	-500	-50	140	-5	-150*	20	Complementary to 2SD 667	HITACHI	
2SB649A (B, C)	AF, Driver	PNP Si-E	-180	-5	-1.5A	20W (T <sub>C</sub> =25°C)	150	-10 max.	-160	60 ~ 200	-5	-150	-1 max.	-500	-50	140	-5	-150*	27	Complementary to 2SD 669A	HITACHI	
2SB706 (Q, R)	AF, Power amp.	PNP Si-Td	-180	-5	-10A	200W (T <sub>C</sub> =25°C)	150	-50 max.	-180	60 ~ 200	-5	-2A	-3 max.	-10A	-1A	14	-5	-0.2A*	450	Complementary to 2SD 746	NEC	
2SC945L (P, Q)	AF	NPN Si-E	60	5	100	250	125	0.1 max.	60	135 ~ 400	6	1	0.3 max.	100	10	450 max.	6	-10	5 max.		NEC	
2SC1675 (L, M)	RF, Mixer, Osc. (in FM/AM radio)	NPN Si-E	50	5	30	250	125	0.1 max.	50	40 ~ 120	6	1	0.3 max.	10	1	250	6	-1	2.2 max.		NEC	
2SC1845 (E, F)	AF, Low noise	NPN Si-E	120	5	50	500	125	0.05 max.	120	300 ~ 800	6	1	0.3 max.	10	1	110	6	-1	2.5 max.	Complementary to 2SA992	NEC	
2SC1941 (L, K)	AF	NPN Si-E	160	5	50	800	150	0.1 max.	160	135 ~ 400	10	10	0.6 max.	20	2	120	10	-10	3 max.	Complementary to 2SA916	NEC	
2SC2003 (L, M)	AF	NPN Si-E	80	5	300	600	150	0.1 max.	80	90 ~ 270	1	50	0.6 max.	300	30	140	6	-10	15 max.		NEC	
2SD655 (E, F)	AF	NPN Si-E	30	5	700	500	150	1	20	400 ~ 1200	1	150	0.5 max.	500	50	250	1	150*			HITACHI	
2SD667 (B, C)	AF	NPN Si-E	120	5	1A	0.9W	150	10 max.	100	60 ~ 200	5	150	1 max.	500	50	140	5	150*	12	Complementary to 2SB647	HITACHI	
2SD669A (B, C)	AF, Driver	NPN Si-E	180	5	1.5A	20W (T <sub>C</sub> =25°C)	150	10 max.	160	60 ~ 200	5	150	1 max.	500	50	140	5	150*	14	Complementary to 2SB649A	HITACHI	
2SD746 (Q, R)	AF, Power amp.	NPN Si-Td	180	5	10A	200W (T <sub>C</sub> =25°C)	150	50 max.	180	60 ~ 200	5	2A	3 max.	10A	1A	15	5	0.2A*	300	Complementary to 2SB706	NEC	
2SD880 (Y, GR)	AF, Power amp.	NPN Si-Td	60	7	3A	30W (T <sub>C</sub> =25°C)	150	100 max.	60	100 ~ 300	5	0.5A	1 max.	3A	0.3A	3	5	-0.5A	70		TOSHIBA	

## FIELD EFFECT TRANSISTORS

DEVICE TYPE	APPLICA- TIONS	STRUC- TURE †	MAXIMUM RATINGS Absolute-Maximum Values: (T <sub>A</sub> = 25° C unless otherwise specified)						ELECTRICAL CHARACTERISTICS Typical Values: (T <sub>A</sub> = 25° C unless otherwise specified)														MANU- FACTURER			
			Gate-to- Drain Voltage V <sub>GD0</sub> (V)	Gate-to- Source Voltage V <sub>GS0</sub> (V)	Drain Current I <sub>G</sub> (mA)	Drain Current I <sub>D</sub> (mA)	Total Dissipa- tion P <sub>D</sub> (mW)	Channel Tempera- ture T <sub>ch</sub> (°C)	Gate Leak Current		Gate to Drain Breakdown Voltage		Drain Current		Gate to Source Cutoff Voltage		Forward Transfer Admittance		Feed Back Capacitance		Power Gain (Common Source)			Noise Figure		
									Test Conditions	IGSS (nA)	Test Conditions	V <sub>GR</sub> GDO (V)	Test Conditions	IDSS (mA)	Test Conditions	V <sub>GS</sub> (off) (V)	Test Conditions	Y <sub>fs</sub>   (mT)	Test Conditions	C <sub>rss</sub> (pF)	Test Conditions	G <sub>PS</sub> (dB)		Test Conditions	NF (dB)	
2SK104 (F)	AF, RF General	Si N-channel junction	-30	-30	10	20	250	125	V <sub>GS</sub> = -30V	10			V <sub>DS</sub> = 5V	1~3		V <sub>GS</sub> = 5V V <sub>DS</sub> = 5V I <sub>D</sub> = 10mA	-1.1	4.1	V <sub>GS</sub> = 5V V <sub>DS</sub> = 0V f = 1 kHz	0.9						NEC

## DIODES, LED'S

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute - Maximum Values: (T <sub>A</sub> = 25°C unless otherwise specified)										ELECTRICAL CHARACTERISTICS Typical Values: (T <sub>A</sub> = 25°C unless otherwise specified)								MANU- FACTURER
			Reverse Surge Voltage V <sub>RS</sub> (V)	Peak Reverse Voltage V <sub>RM</sub> (V)	Reverse Voltage V <sub>R</sub> (V)	Peak Forward Voltage V <sub>FM</sub> (V)	Peak Forward Current I <sub>FM</sub> (mA)	Average Rectified Current I <sub>O</sub> (mA)	Forward Surge Current I <sub>F surge</sub> (A)	Junction Temperature T <sub>J</sub> (°C)	Total Power Dissipation P <sub>D</sub> (mW)	Forward Current I <sub>Fmin</sub> (mA)	Test Condition V <sub>F</sub> (V)	Forward Voltage V <sub>Fmax</sub> (V)	Test Condition I <sub>F</sub> (mA)	Reverse Current		Others			
																I <sub>Rmax</sub> (μA)	Test Condition V <sub>R</sub> (V)				
S10VB20	Rectifier	Si-DJ Bridge		200			10A		150									SHINDENGEN			
W02	Rectifier	Si-DJ Bridge		200			1.5A	50	125				1.0	1A	10			GENERAL INSTRUMENT			
1SS55	Detector, Medium speed switching	Si-EP		100	75		300	100	2	200	500		0.8 1.0	1.0 30	0.1	75		NEC			
1SS53	Detector, Medium speed switching	Si-EP		35	30		300	100	2	200	500		0.8 1.0	1.0 30	0.1	30		NEC			
GL-2PG1	Lamp (green)	GaP			5			I <sub>F</sub> = 30 mA		85	85		2.8	20	10	4	I <sub>V</sub> = 0.3 mcd (I <sub>F</sub> = 20 mA)	SHARP			
GL-2PR1	Lamp (red)	GaP			5			I <sub>F</sub> = 10 mA		85	23		2.3	5	10	4	I <sub>V</sub> = 0.3 mcd (I <sub>F</sub> = 5 mA)	SHARP			

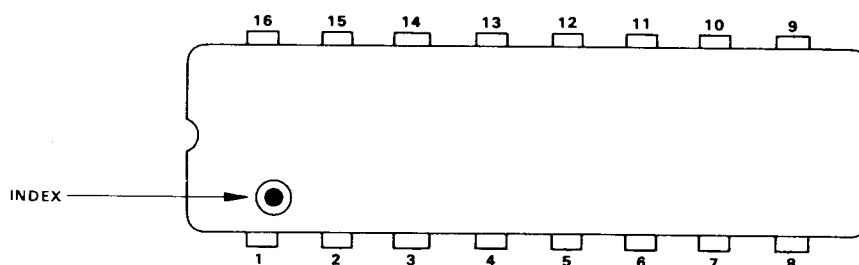
## ZENER DIODES

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute - Maximum Values: (T <sub>A</sub> = 25°C unless otherwise specified)			ELECTRICAL CHARACTERISTICS Typical Values: (T <sub>A</sub> = 25°C unless otherwise specified)													MANUFACTURER
			Total Power Dissipation  P <sub>D</sub> (mW)	Zener Current  I <sub>Z</sub> (A)	Junction Temperature  T <sub>J</sub> (°C)	Zener Voltage  V <sub>Z</sub>			Differential Resistance  f <sub>Z</sub>		Temperature Coefficient  γ <sub>Z</sub>		Reverse Current  I <sub>Z</sub>		Others				
						MIN (V)	TYP (V)	MAX (V)	Test Conditions  I <sub>Z</sub> (mA)	TYP (Ω)	MAX (Ω)	I <sub>Z</sub> (mA)	TYP (%/°C)	MAX (%/°C)		I <sub>Z</sub> (mA)	MAX (μA)	V <sub>R</sub> (V)	
RD6.2-EB1	Regulator	Si-J	400			5.78		6.09	20		20	20				5	1.5		NEC
RD12-EB3	Regulator	Si-J	400			11.74		12.35	10		20	10				2	9		NEC
RD13-EB1	Regulator	Si-J	400			12.99		13.66	10		25	10				2	10		NEC
RD20-EB3	Regulator	Si-J	400			19.23		20.22	10		55	10				2	15		NEC
RD24-EB4	Regulator	Si-J	400			23.63		24.85	5		95	5				2	19		NEC
RD33-EB3	Regulator	Si-J	400			30.9		32.5	5		160	5				2	25		NEC
RD22-FC	Regulator	Si-J	1000			22.0		24.5	10		14	10				10	17		NEC

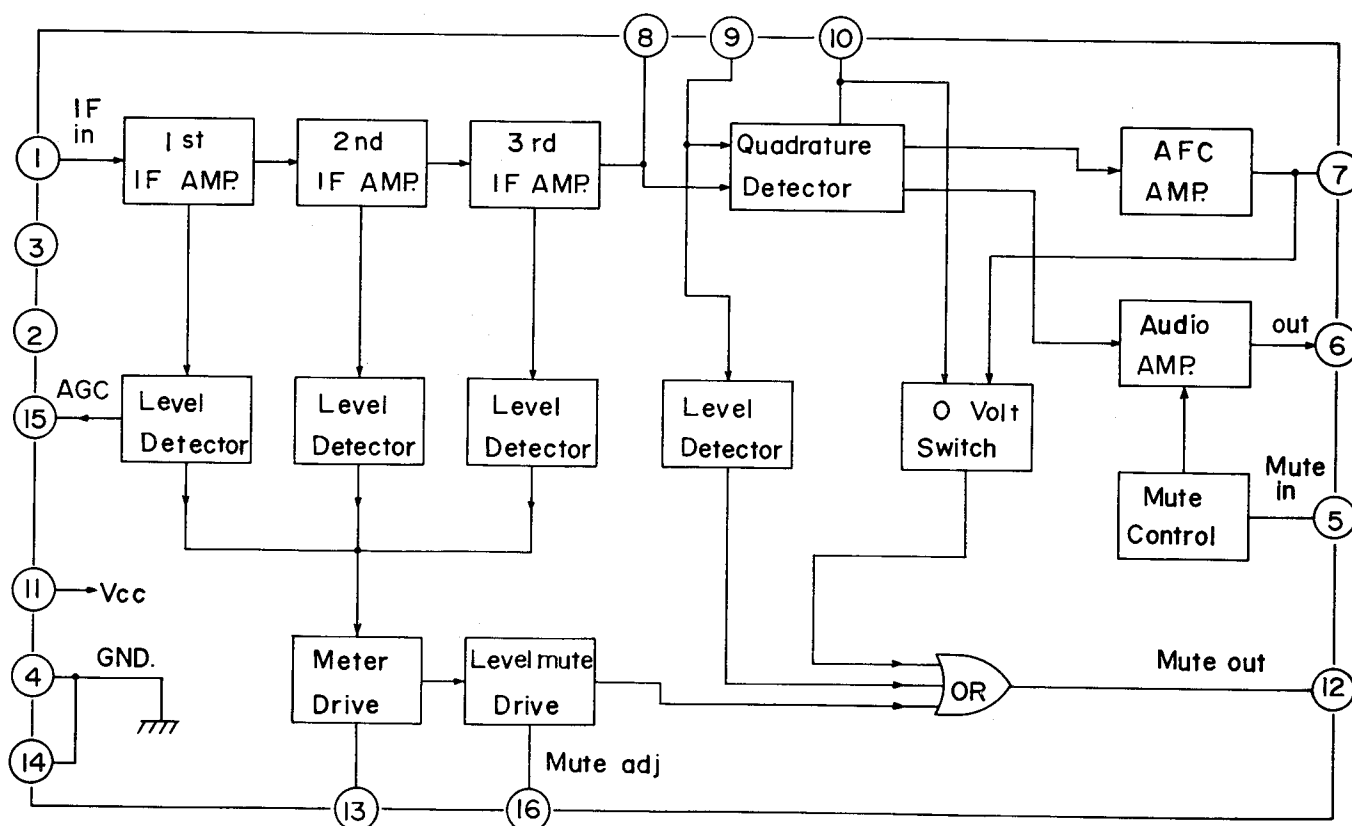
## INTEGRATED CIRCUITS HA11225

DEVICE TYPE	APPLICATION	ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )				ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ ) Typical Values							MANUFACTURER
		Supply Voltage $V_{CC}$ (V)	Power Dissipation $P_T$ (mW)	Operating Temperature Range $T_{opr}$ ( $^\circ\text{C}$ )	Storage Temperature Range $T_{sig}$ ( $^\circ\text{C}$ )	Supply Current (mA)	Input Limiting Sensitivity $V_{in}$ (lim) ( $\mu\text{V}$ )	AF Voltage (mVrms)	Total Harmonic Distortion (%)	Signal to Noise Ratio (dB)	AM Rejection (dB)	Muting Sensitivity ( $\mu\text{V}$ )	
HA11225	FM IF Amplifier, Quadrature Detector	14	590 ( $T_A=60^\circ\text{C}$ )	$-20 \sim +70$	$-55 \sim +125$	33 max.	35 (-3dB point)	380	0.1 max.	84	54	158	HITACHI

## TERMINAL GUIDE (TOP VIEW)



## BLOCK DIAGRAM



**INTEGRATED CIRCUIT HA11223W**

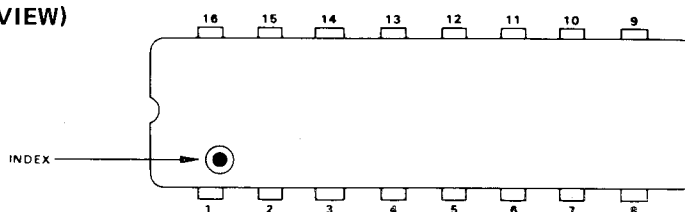
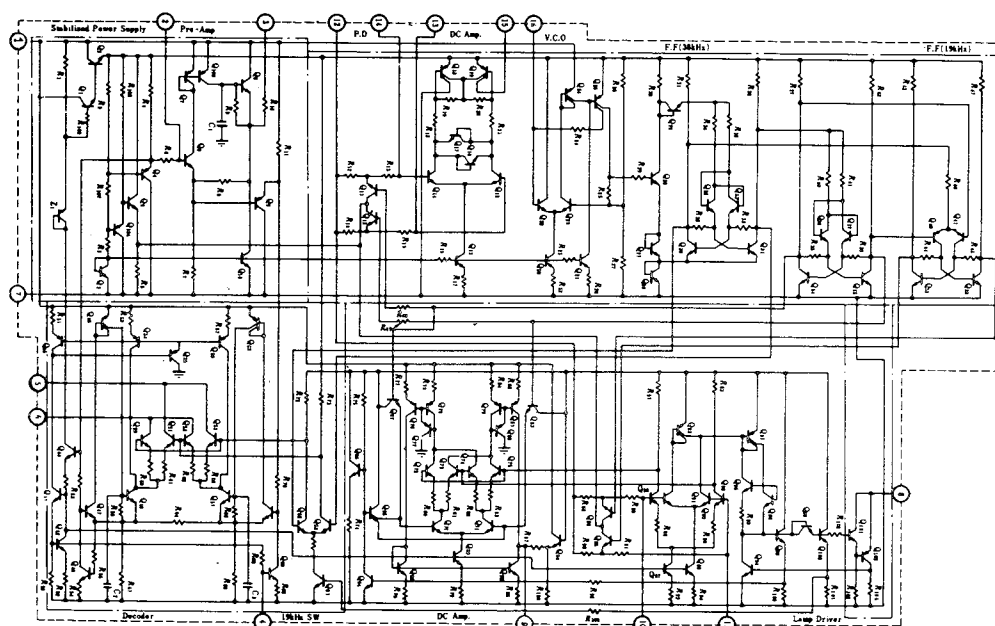
APPLICATION/MANUFACTURER:

**ABSOLUTE MAXIMUM RATINGS** ( $T_a = 25^\circ\text{C}$ )**FM STEREO DEMODULATOR/HITACHI**

Item	Symbol	Rating	Unit
Supply Voltage	$V_{CC}$	16	V
Power Dissipation*	$P_T$	500	mW
Operating Temperature	$T_{opr}$	-20 to +75	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +125	$^\circ\text{C}$
Lamp Drive Current	Continuos	75	mA
	Peak	100	

\* Value at  $T_a = 75^\circ\text{C}$ **ELECTRICAL CHARACTERISTICS** ( $V_{CC} = 13\text{V}$ ,  $f = 1\text{kHz}$ ,  $T_a = 25^\circ\text{C}$  unless otherwise noted)

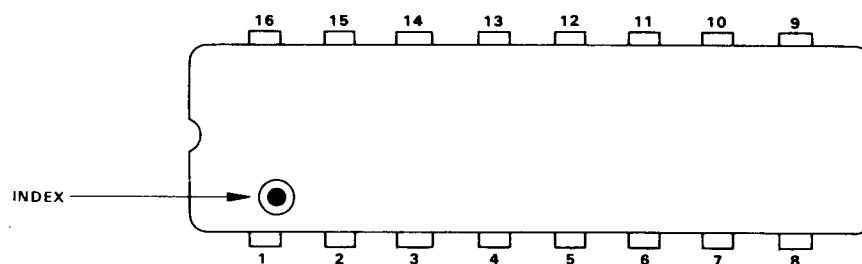
Item	Symbol	Test Condition	min	typ	max	Unit
Input Impedance	$Z_{in}$		30	75	—	$\text{k}\Omega$
Channel Separation	Sep	$P = 30\text{mV}$ , $L + R = 270\text{mV}$	100Hz	—	40	dB
			1kHz	35	45	
			10kHz	—	40	
Stereo Total Harmonic Distortion	ST, T.H.D	$P = 30\text{mV}$ , $L + R = 270\text{mV}$	100Hz	—	0.04	%
			1kHz	—	0.02	
			10kHz	—	0.05	
Output Voltage	$V_{out}$	$V_{in} = 300\text{mV}$	185	240	310	mV
Channel Balance	C.B	$V_{in} = 300\text{mV}$	—	0	—	dB
Monaural Total Harmonic Distortion	$Mono, T.H.D$	$V_{in} = 300\text{mV}$	—	0.01	0.08	%
Pilot Level for Lamp ON	$L_{LON}$		8	11.5	15	mV
Stereo Lamp Hysteresis			—	4	—	dB
Carrier Leak	C.L	$P = 30\text{mV}$ , $L + R = 270\text{mV}$	19kHz	55	60	dB
			38kHz	—	35	
SCA Rejection Ratio	SCA $R_{ei}$	$P = 30\text{mV}$ , $L + R = 270\text{mV}$ ; $SCA = 30\text{mV}$ , $f_{SCA} = 67\text{kHz}$	—	80	—	dB
Signal-to-noise Ratio	S/N	$V_{in} = 300\text{mV}$ , $R_g = 4.7\text{k}\Omega$	80	86	—	dB
Capture Range	C.R	$P = 30\text{mV}$	—	$\pm 3.5$	—	%
Max Input Signal	$V_{in}$	$P = 10\%$ , $L + R = 90\%$ , $T.H.D \leq 0.5\%$	—	1.2	—	V
Total Current Drain	$I_T$		—	17	—	mA

**TERMINAL GUIDE (TOP VIEW)****SCHEMATIC DIAGRAM**

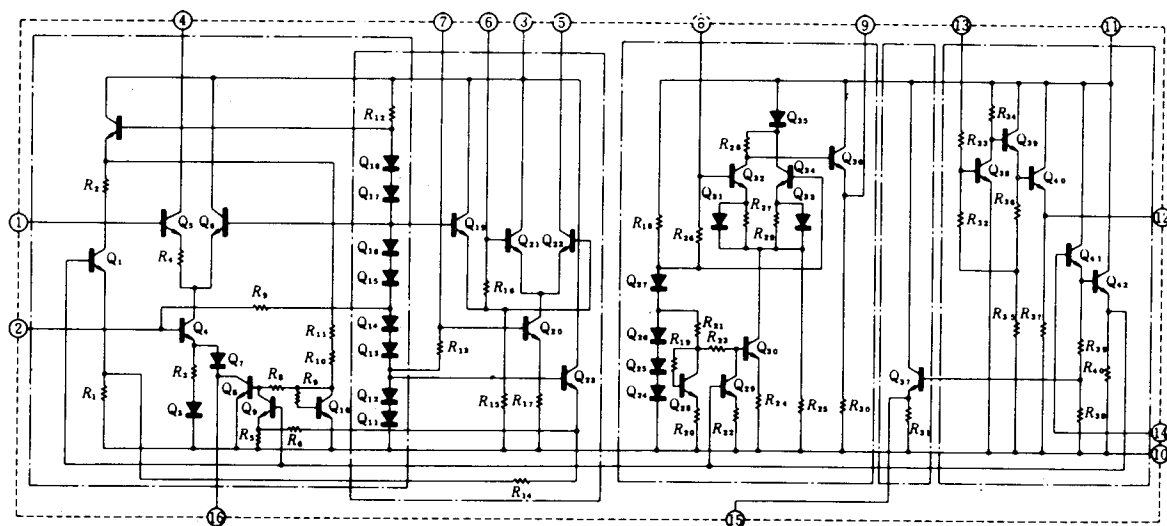
## INTEGRATED CIRCUITS HA1197

DEVICE TYPE	APPLICATION	ABSOLUTE MAXIMUM RATING ( $T_A = 25^\circ\text{C}$ )				ELECTRICAL CHARACTERISTICS (TYPICAL VALUES) $T_A = 25^\circ\text{C}$				MANUFACTURER
		Voltage Supply $V_{CC}$ (V)	Power Dissipation $P_d$ (mW)	Operating Temp Range $T_{opt}$ ( $^\circ\text{C}$ )	Storage Temp Range $T_{stg}$ ( $^\circ\text{C}$ )	Signal to Noise Ratio Input=74dB $\mu$ Mod = 30% (dB)	Distortion Input=100dB $\mu$ Mod = 30% (%)	Output Voltage Input=74dB $\mu$ Mod = 30% (mV)	Quiescent Current (mA)	
HA1197	AM Radio	15	450 ( $T_A = 70^\circ\text{C}$ )	$-20 \sim +70$	$-55 \sim +125$	53	0.4	212	14.5	HITACHI

## TERMINAL GUIDE (TOP VIEW)



## SCHEMATIC DIAGRAM

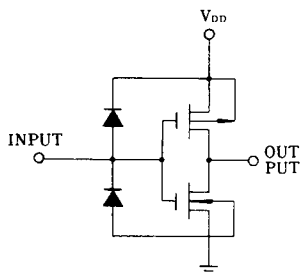


# INTERGRATED CIRCUITS $\mu$ PD4069C

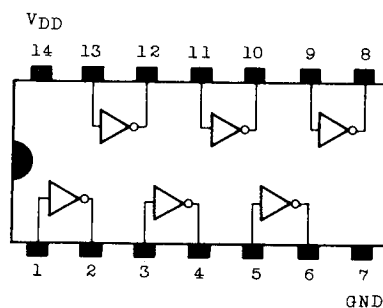
## FUNCTION/MANUFACTURER

- Hex Inverter/NEC

## EQUIVALENT CIRCUIT AND CONNECTION INFORMATION



(1/6 CIRCUIT SHOWN)



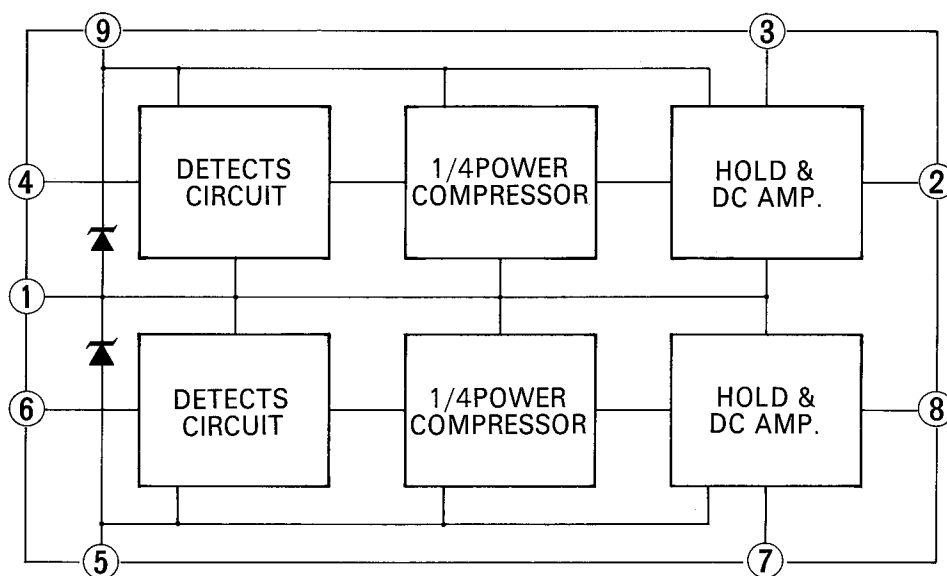
TOP VIEW

# INTERGRATED CIRCUITS TA-7318P

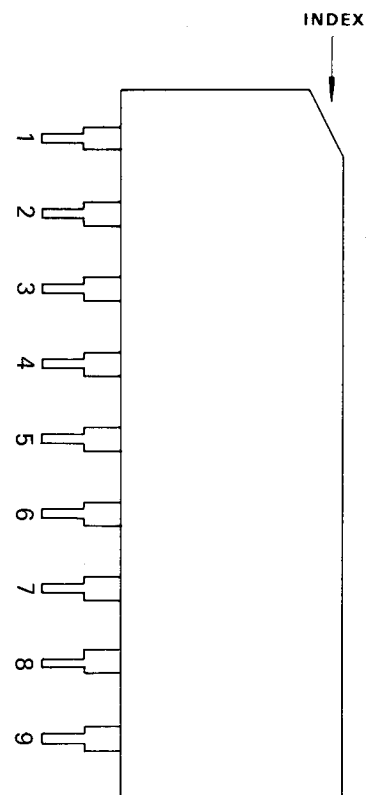
## FUNCTION/MANUFACTURER

- Dual Linear-to-Log Converter for Peak Power Meter/Toshiba

## BLOCK DIAGRAM AND CONNECTION INFORMATION



BLOCK DIAGRAM



TERMINAL GUIDE (SIDE VIEW)

**MEMO**

[illegible]

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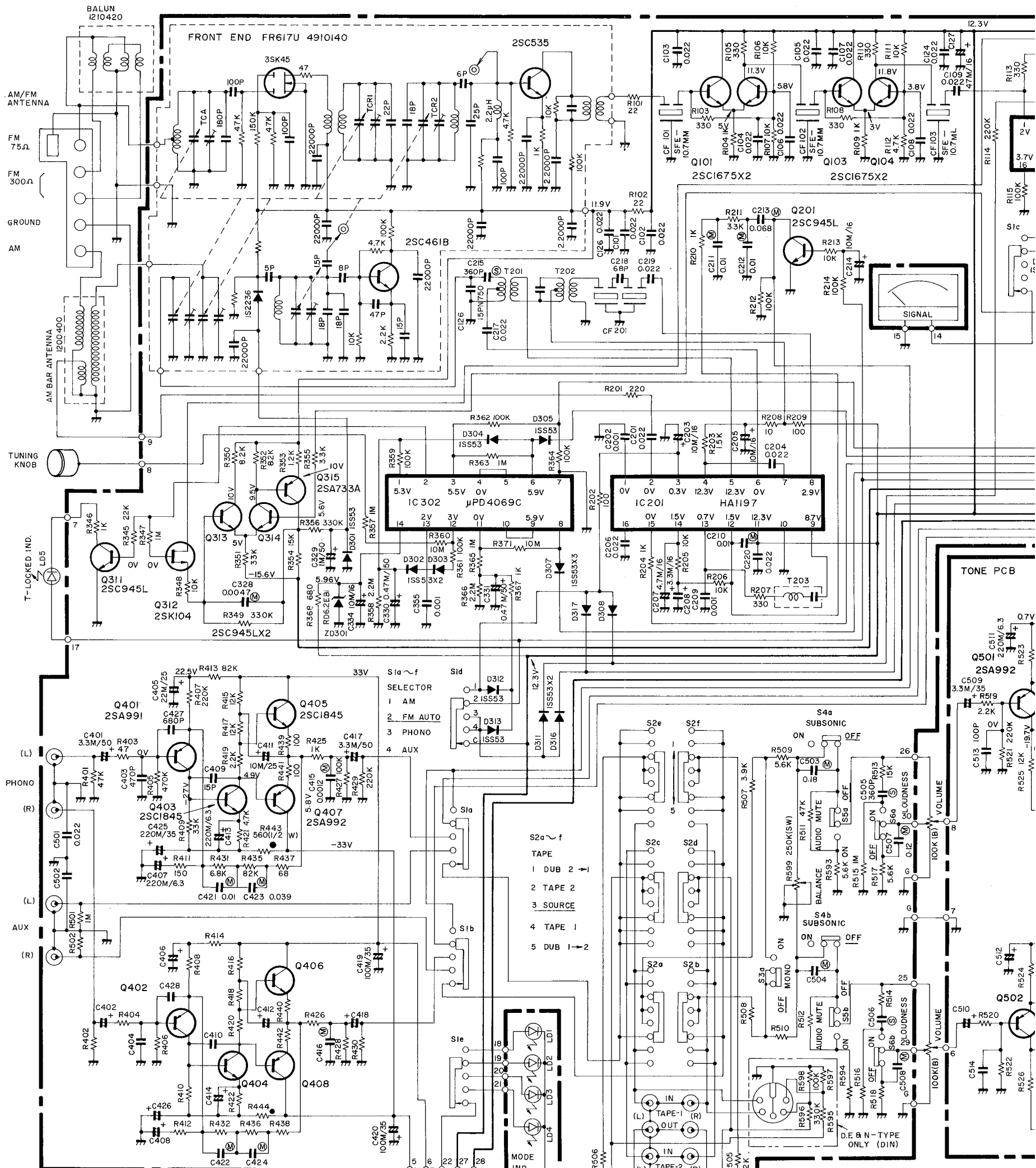
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# **SCHEMATIC DIAGRAM** **NIKKO NR-1219** AM/FM STEREO RECEIVER

