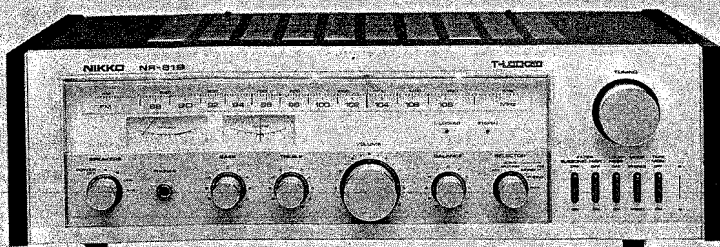


# Nikko

# RECEIVER

# NR-819

## AM/FM STEREO RECEIVER



### TYPE AND VOLTAGE

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

## SERVICE MANUAL

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# SPECIFICATIONS

<W, E & N-TYPE>

## FM TUNER SECTION

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: . . . . . better than 65 dB  
 T. H. Distortion (1 KHz) Mono: . . . . . less than 0.3 %  
 Stereo: . . . . . less than 0.5 %  
 Alternate Channel Selectivity: . . . . . better than 35 dB  
 Spurious Response Rejection: . . . . . better than 70 dB  
 Image Frequency Rejection: . . . . . better than 42 dB  
 IF Rejection: . . . . . better than 70 dB  
 AM Rejection: . . . . . better than 40 dB

## AM TUNER SECTION

Usable Sensitivity: . . . . . better than 42 dB $\mu$  (125.9  $\mu$ V)  
 Signal to Noise Ratio: . . . . . better than 45 dB  
 Image Frequency Rejection (1000 KHz):  
 . . . . . better than 30 dB  
 IF Rejection (1000 KHz): . . . . . better than 30 dB

## AUDIO AMPLIFIER SECTION

Continuous Power Output per channel, 8 ohms:  
 20 Hz ~ 20 KHz . . . . . more than 45 Watts  
 1 KHz . . . . . more than 45 Watts  
 T.H. Distortion, 8 ohms:  
 Continuous Power Output . . . . . less than 0.05 %  
 1 Watt Power Output . . . . . less than 0.05 %  
 I.M. Distortion, 8 ohms:  
 Continuous Power Output . . . . . less than 0.05 %  
 1 Watt Power Output . . . . . less than 0.05 %  
 IHF Power Bandwidth, 8 ohms: . . . . . 20 Hz ~ 20 KHz  
 Damping Factor @ 1 KHz, 8 ohms: . . . . . 40  
 Frequency Response:  
 PHONO  $\rightarrow$  TAPE OUT (RIAA Equalization)  
 . . . . . 30 Hz ~ 15 KHz  $\pm$ 1.5 dB  
 AUX, TAPE IN  $\rightarrow$  SP. TER.  
 . . . . . 20 Hz ~ 20 KHz  $\pm$ 1.5 dB  
 Input Sensitivity for 45 Watts Power Output:  
 PHONO . . . . . 2.5 mV  $\pm$ 2 dB  
 AUX, TAPE IN . . . . . 150 mV  $\pm$ 2 dB  
 Phono Max. Input Capability, @ 1 KHz:  
 . . . . . more than 120 mV

Capture Ratio: . . . . . better than 3 dB  
 Stereo Separation (100 Hz): . . . . . better than 30 dB  
 (1 KHz): . . . . . better than 35 dB  
 (10 KHz): . . . . . better than 30 dB  
 Subcarrier Suppression: . . . . . better than 40 dB  
 Muting Sensitivity: . . . . . 25 dB $\mu$   $\pm$ 8 dB  
 FM Frequency Range: . . . . . 87.9 ~ 108.5 MHz  
 Antenna Impedance:  
 . . . . . 300 ohms balanced & 75 ohms unbalanced  
 Output Level: . . . . . 550 mV  $\pm$ 2 dB

Selectivity ( $\pm$ 10 KHz): . . . . . better than 30 dB  
 AM Frequency Range: . . . . . 530 ~ 1630 KHz  
 Output Level: . . . . . 165 mV  $\pm$ 2 dB

Output Level, @ Continuous Power Output,  
 (Input: PHONO):  
 TAPE OUT . . . . . 150 mV  $\pm$ 2 dB  
 Tone Control:  
 BASS (70 Hz) Cut . . . . . -10 dB  $\pm$ 3 dB  
 Boost . . . . . +10 dB  $\pm$ 3 dB  
 TREBLE (10 KHz) Cut . . . . . -10 dB  $\pm$ 3 dB  
 Boost . . . . . +10 dB  $\pm$ 3 dB  
 Loudness Control (VOLUME: -30 dB):  
 70 Hz . . . . . +9 dB  $\pm$ 3 dB  
 10 KHz . . . . . +5 dB  $\pm$ 3 dB  
 Subsonic Filter, @ 20 Hz: . . . . . -3 dB  $\pm$ 2 dB  
 High Filter, @ 10 KHz: . . . . . -3 dB  $\pm$ 2 dB  
 Signal to Noise Ratio, IHF "A" Network:  
 PHONO . . . . . better than 80 dB  
 AUX, TAPE IN . . . . . better than 95 dB  
 Idling Current: . . . . . 20 mA  $\pm$ 10 mA  
 Midpoint Voltage: . . . . . 0V  $\pm$ 50 mV

< D-TYPE > They were measured according to DIN standard

### FM TUNER SECTION

Usable Sensitivity: . . . . . better than 6 dB $\mu$  (2.0  $\mu$ V)  
 50 dB Quieting Sensitivity:  
 . . . . . better than 15 dB $\mu$  (5.6  $\mu$ V)  
 Signal to Noise Ratio: . . . . . better than 58 dB  
 T.H. Distortion (1 KHz) Mono: . . . . . less than 0.3 %  
 Stereo: . . . . . less than 1.0 %  
 Alternate Channel Selectivity: . . . . . better than 35 dB  
 Spurious Response Rejection: . . . . . better than 70 dB  
 Image Frequency Rejection: . . . . . better than 42 dB  
 IF Rejection: . . . . . better than 70 dB  
 AM Rejection: . . . . . better than 40 dB

### AM TUNER SECTION

Usable Sensitivity: . . . . . better than 42 dB $\mu$  (125.9  $\mu$ V)  
 Signal to Noise Ratio: . . . . . better than 45 dB  
 Image Frequency Rejection (1000 KHz):  
 . . . . . better than 30 dB  
 IF Rejection (1000 KHz): . . . . . better than 30 dB

### AUDIO AMPLIFIER SECTION

Continuous Power Output per channel, 4 ohms:  
 20 Hz ~ 20 KHz . . . . . more than 50 Watts  
 1 KHz . . . . . more than 70 Watts  
 T.H. Distortion, 4 ohms:  
 Continuous Power Output . . . . . less than 0.1 %  
 1 Watt Power Output . . . . . less than 0.1 %  
 I.M. Distortion, 4 ohms:  
 Continuous Power Output . . . . . less than 0.1 %  
 1 Watt Power Output . . . . . less than 0.1 %  
 IHF Power Bandwidth, 4 ohms: . . . . . 20 Hz ~ 20 KHz  
 Damping Factor @ 1 KHz, 4 ohms: . . . . . 45  
 Frequency Response:  
 PHONO  $\rightarrow$  TAPE OUT (RIAA Equalization)  
 . . . . . 30 Hz ~ 15 KHz  $\pm$ 1.5dB  
 AUX, TAPE IN  $\rightarrow$  SP. TER.  
 . . . . . 20 Hz ~ 20 KHz  $\pm$ 1.5 dB  
 Input Sensitivity for 70 Watts Power Output:  
 PHONO: . . . . . 1.9 mV  $\pm$ 2 dB  
 AUX, TAPE IN: . . . . . 140 mV  $\pm$ 2dB  
 Phono Max. Input Capability, @ 1 KHz:  
 . . . . . more than 120 mV  
 Output Level, @ Continuous Power Output,  
 (Input: PHONO):  
 TAPE OUT (DIN): . . . . . 12 mV  $\pm$ 2 dB  
 Tone Control:  
 BASS (70 Hz) Cut: . . . . . -10 dB  $\pm$ 3 dB  
 Boost: . . . . . +10 dB  $\pm$ 3 dB  
 TREBLE (10 KHz) Cut: . . . . . -10 dB  $\pm$ 3 dB  
 Boost: . . . . . +10 dB  $\pm$ 3 dB

Capture Ratio: . . . . . better than 3 dB  
 Stereo Separation (100 Hz): . . . . . better than 30 dB  
 (1 KHz): . . . . . better than 35 dB  
 (10 KHz): . . . . . better than 20 dB  
 Subcarrier Suppression: . . . . . better than 35 dB  
 Muting Sensitivity: . . . . . 20 dB $\mu$   $\pm$ 8 dB  
 FM Frequency Range: . . . . . 87.5 ~ 108.5 MHz  
 Antenna Impedance:  
 . . . . . 300 ohms balanced & 75 ohms unbalanced  
 Output Level: . . . . . 300 mV  $\pm$ 2 dB

Selectivity ( $\pm$ 10 KHz): . . . . . better than 30 dB  
 AM Frequency Range: . . . . . 530 ~ 1630 KHz  
 Output Level: . . . . . 165 mV  $\pm$ 2 dB

Loudness Control (VOLUME: -30 dB):  
 70 Hz: . . . . . +9 dB  $\pm$ 3 dB  
 10 KHz: . . . . . +5 dB  $\pm$ 3 dB  
 Subsonic Filter, @ 20 Hz: . . . . . -3 dB  $\pm$ 2 dB  
 High Filter, @ 10 KHz: . . . . . -3 dB  $\pm$ 2 dB  
 Signal to Noise Ratio, DIN Filter:  
 PHONO: . . . . . better than 60 dB  
 AUX, TAPE IN: . . . . . better than 75 dB  
 Idling Current: . . . . . 20 mA  $\pm$ 10 mA  
 Midpoint Voltage: . . . . . 0V  $\pm$ 50 mV

### GENERAL

Power Requirement:  
 W-TYPE: . . . . . AC 120V, 60 Hz  
 E, N & D-TYPE: . . . . . AC 220/240 V, 50/60 Hz  
 Power Consumption: . . . . . 230 Watts Max.  
 Dimensions,  
 (Width): . . . . . 19 4/5 inches  
 (Height): . . . . . 6 1/5 inches  
 (Depth): . . . . . 12 3/4 inches  
 Weight: . . . . . 10.3 Kg

Specifications subject to change without notice.

# BLOCK DIAGRAM

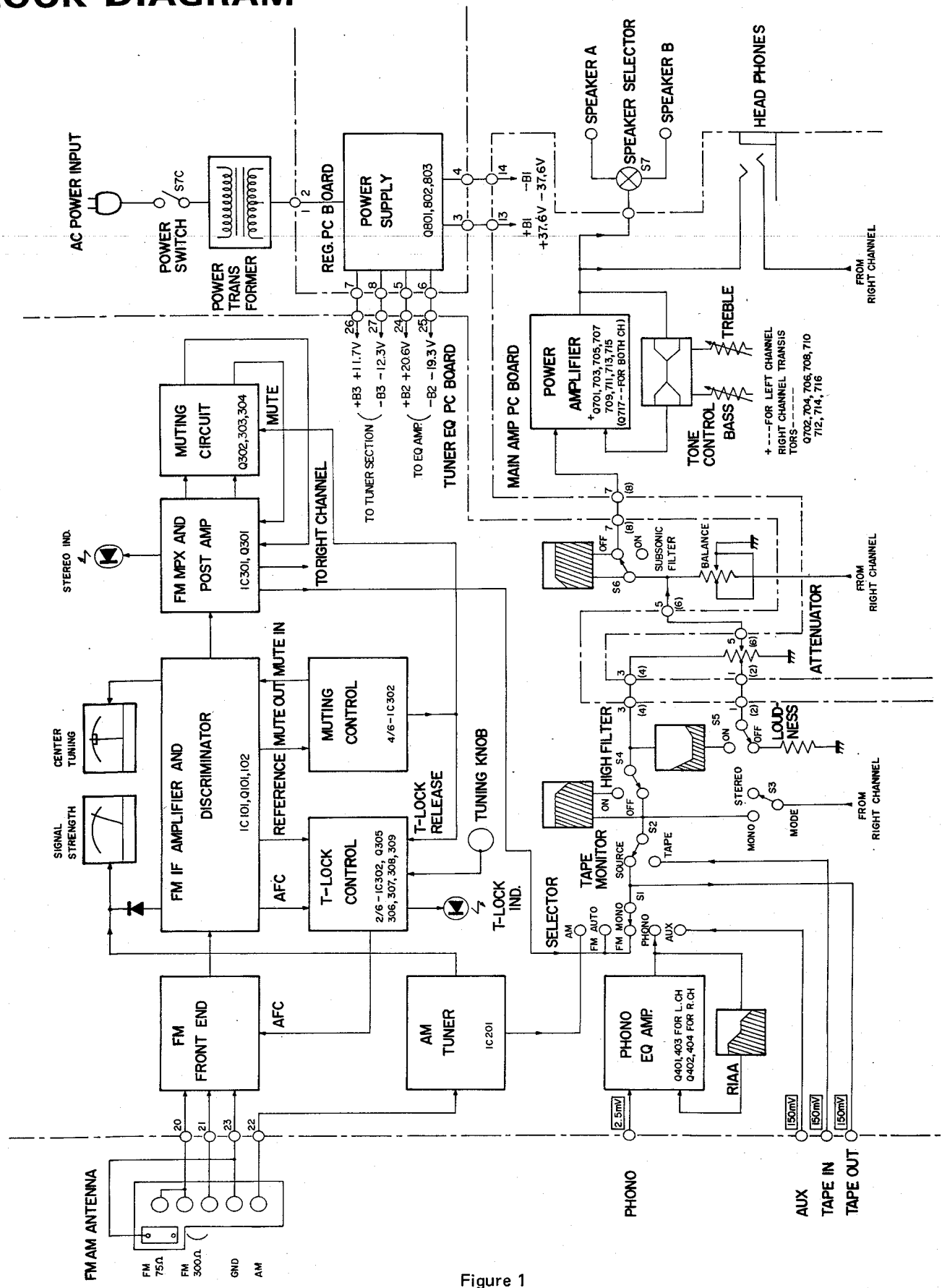


Figure 1

# CIRCUIT DESCRIPTION

## T-LOCKED (TUNE-LOCKED) SYSTEM

### 1. FUNCTION

The T-Locked system detects a frequency drift caused by temperature change or other reason during reception of FM broadcasting, and makes necessary compensation for minimizing the distortion due to such drift, thereby maintaining the optimum receiving state (locked-state). This locked state can be released automatically by touching the tuning knob with a finger. The locked state can also be attained automatically by releasing finger from the tuning knob after selecting a desired station. The locked state is indicated by an illuminated LED.

### 2. OPERATION

#### (a) Releasing of locked state

- When a finger touches the tuning knob, the hum induced in the human body is applied to the IC302 ( $\mu$ PD4069C) pin #3, which operates as a high impedance amplifier and amplifies the hum by about 20 dB. The amplified signal, issued at the pin #4, flows through the resistor R342 and the diodes D304 and D305 where it is rectified to a DC voltage (approx. 3 ~ 6 V). This signal "H" is inverted by the IC302 (pin #5  $\rightarrow$  pin #6), thus a signal "L" (approx. 0 ~ 0.5 V) is obtained.
- This signal cuts off the transistor Q305 (2SC945L), thereby turning off the T-Locked indicator (LED #2). At the same time, the transistor Q306 is also cut off by this signal, so that the transistor Q307 connected to the source of the Q306 is also cut off. The transistors Q308 and Q307 are functioning as a differential amplifier. The reference signal from the IC101 (HA11225) pin #10 is obtained at the collector of Q309, and this reference signal is fed back to

the front end as the AFC signal. However, this signal cannot affect the local oscillation frequency. This means that the locked state has been released.

**NOTE:** When the FM signal is very weak, or when detuning, the mute output from IC101 pin #12 activates the Schmidt trigger circuit (IC302 pins #8, 9, 10, 11 and 1 meg. ohm) and releases the T-Lock. This signal passes through the diodes D302 and D311, in which it is also used as the muting signal.

#### (b) Locking

- Upon releasing a finger from the tuning knob, the input voltage applied to the IC302 pin #3 becomes zero, and the transistors Q305 and Q306 are turned on. The Q305 causes the T-Locked indicator (LED #2) to illuminate, and the Q306 allows the AFC signal issued from the IC101 #7 pin to be applied to the base of the transistor Q307. As has been mentioned in the paragraph (a) above, the transistors Q308 and Q307 function as a differential amplifier, and the AFC signal is applied to the base of Q307, while the reference signal is applied to the base of Q308. Difference between these two signals is obtained at the collector of Q309, and it is fed back to the front end for controlling the local oscillation frequency in such a manner that the difference between the reference signal and AFC signal can be minimized. As a result, a stabilized state, that is, the locked state is achieved. In actual receiver operation however, the LED #2 will not illuminate immediately after releasing finger from the tuning knob: it will illuminate after a certain period of delay. This because a time constant circuit consisting of a capacitor C328 and a resistor R339 is adopted in the circuit.

## ADDITIONAL DESCRIPTION ON CIRCUIT

Please refer to page 3 on Block Diagram and page 14 on Schematic Diagram. The electric circuit of this unit consists of four PCB (Printed Circuit Board), a power transformer, various switches and so on. The main PCB are altogether, which are respectively called Tuner-EQ (Equalizer) PCB, Main Amp. PCB and REG (Regulator) PCB. The following are the outline of each PCB assembly.

### Tuner-EQ PCB

This PCB incorporates the following circuit block, which are FM Front End, FM IF Block, FM MPX (Multiplex) Block, T-Locked System Block, Muting Control Block, Muting Circuit Block, AM Tuner Block and Phono EQ Block.

### 1. FM Front End

Using three staged variable capacitor, with 300 ohms Balanced Type and 75 ohms Unbalanced Type antenna inputs.

The top stage RF Amplifier incorporates high PG (Power Gain) and low NF (Noise Figure) FET. The clapp oscillator assures stable local oscillation. The resonance circuit of the local oscillator incorporates the varicap diode which enables to change the oscillation frequency by the AFC signal controlled by T-Locked System.

### 2. FM IF Block

It incorporates two transistors, one IC and two ceramic filters. The IC (HA11225) performs amplification, limiting, quadrature FM demodulation, muting level detection and operation of Tuning and Signal meters.

### 3. FM MPX Block

It incorporates one transistor and one IC. The transistor (Q301) suppresses the subsonic noise when de-tuned. The IC (TA7624P) is PLL (Phase Locked Loop) MPX IC. Which assures the high S/N and low distortion, incorporating PLL VCO Circuit, MPX Demodulator, Pilot Auto-cancel Circuit, Stereo/Monaural Automatic Switch Circuit, Stereo Lamp Driver, two Post Amplifiers and Stabilized Power Supply Circuit. In this block, the input signal is once demodulated to stereo and output from the IC, which is then input to the post amplifier of the same IC through the De-emphasis Circuit and Muting Circuit Block.

### 4. T-Locked System

Refer to Circuit Description on page 4.

### 5. Muting Control, Muting Circuit

The Muting Control Block consist of a C-MOS Digital IC ( $\mu$ PD4069C) which incorporates 6 inverters and CR parts. The main feature of this Block is the two Schmidt Trigger Circuits consisting of two inverters, which function is to switch on and off the transistor of the Muting circuit Block mentioned hereafter.

The Muting Circuit Block consists of three transistors and CR parts, of which two transistors (Q303, 304) short the demodulator output of FM MPX Block and ground to perform muting. The other transistor (Q302) shorts the operation signal of Q303 and 304 and ground so as muting is not performed when the switch is set ON. When the FM antenna input becomes weaker than a certain level, the FM IF Block outputs muting signal. This signal triggers one Schmidt Trigger Circuit, which output switches Q303 and 304 on to perform muting. This Schmidt Trigger Circuit output is also connected to the IC of FM IF Block. So muting is performed on the IC output as well. However, when the Selector Switch is set on FM MONO, muting is not performed since Q302 is set ON. Thus FM is still heard when the input signal is weak. The input of the other Schmidt Trigger Circuit is connected the Selector. When the Selector is set at AM, PHONO or AUX, the power supply is connected to the Schmidt Trigger Circuit through Selector, and makes Q303 and 304 on to perform muting over the FM output. When the Selector is set to FM AUTO instead of AM or FM MONO instead of PHONO, the output of the Schmidt Trigger Circuit is set off after certain interval which is determined by the value of the capacitor (C330) and the resistor (R349) connected to its input. Therefore, muting is cancelled from the FM output a little after the Selector is switched. In the reverse operation of the Selector, the FM output immediately receives muting operation since there is little interval and AM or PHONO signal appears in the output stage. These circuits all function in order to eliminate the noise caused by switching the Selector.

### 6. AM Tuner Block

It incorporates two staged variable capacitor, one IC and one dual elements ceramic filter. The IC (IC201, HA1197) incorporates RF Amplifier, Converter, IF Amplifier, Detector and AGC Circuit.

### 7. Phono EQ Block

This is a two stage direct coupling amplifier, incorporating two transistors each in both channels. Carefully selected CR parts assures minimum deviation for the RIAA curve.

### Main Amp PCB

This PCB consists of Power Amplifier and Tone Control Circuit. The Power amplifier has direct coupled pure complementary OCL circuit which incorporates the differential amplifier at the top stage. The dual transistor differential amplifier of the top stage amplifies the input signal and stabilizes the center voltage of the power stage. The next stage constructs Darlington Circuit with Q703 and Q707 (Q704, 708 = R ch.), functioning as a pre-driver and Q705 gives bias to the power stage. The semifixed resistor which is connected to the base determines the idling current. This transistor (Q705) which is thermally connected to the heat sink of the power transistor, also stabilizes the circuit operation. The final stage is the Darlington Pure Complementary OCL Circuit incorporating a mold package power transistor. Tone Control Circuit is incorporated in the Negative Feedback Circuit of the power amplifier and it acquires turn-over and roll-off characteristics respectively in high and low range by varying the negative feedback values of each range by BASS and TREBLE Controls.

### REG PCB

This PCB consists of Rectifier Circuit and its regulation Circuit. The Rectifier Circuit is a bridge type full-wave rectifier circuit and provides direct current of "+" and "-" to the ground. The transistor Q801 and 803 are constant voltage power supply circuit and function also as a ripple filter. The Q802 is ripple filter.

### Antenna Circuit

The coil (L201) and the capacitor (C119) are incorporated within the antenna circuit in order to utilize the signal which is caught by the FM antenna during AM reception. AM signal goes through AM Tuner because the impedance of capacitor is big while the impedance of coil is small. In FM, on the contrary the capacitor's impedance is small whereas the coil's impedance is big, which renders the FM signal go through the Front End. FM antenna, therefore, can be used for AM reception without giving interference to the FM reception.

## DISASSEMBLY

1. SIDE WOODS REMOVAL
  - a. Remove six screws from both sides of the wooden covers.
2. METAL COVER REMOVAL
  - a. Remove wooden covers from both sides.
  - b. Remove six tapping screws from the top of the metal cover.
3. BOTTOM PLATE REMOVAL
  - a. Remove wooden covers from both sides.
  - b. Remove thirteen tapping screws (# 1 ~ # 13) (Photo 1) from the bottom of the unit.
4. FRONT PANEL REMOVAL
  - a. Remove wooden covers and the metal cover.
  - b. Remove two tapping screws (# 1 and #2) shown in Photo 2 and three tapping screws (#14 ~ #16) shown in Photo 1.
  - c. Lift the front panel away from the unit.
5. PANEL WINDOW & SUB PANEL REMOVAL
  - a. Remove the front panel.
  - b. Remove six knobs (SPEAKERS, BASS, TREBLE, VOLUME, BALANCE, SELECTOR) from the front of the unit by pulling them forward.
  - c. Remove four tapping screws (# 1 ~ #4) shown in Photo 3.
6. REFLEX PLATE REMOVAL
  - a. Remove four lamps in accordance with Photo 4.
  - b. Remove two screws (#1 and #2) shown in Photo 4.
7. LED PC BOARD REMOVAL
  - a. Push the center of push rivet (#1 and #2) (Photo 5) by small screw driver as shown Fig. 2.
  - b. Pull the push rivet forward. LED PC board is now free to be pulled off.
8. METERS REMOVAL
  - a. Remove two clamp springs (#3 and #4) and pull two meters (SIGNAL and TUNING) backward shown in Photo 5.
9. DIAL SCALE REMOVAL
  - a. Remove the reflex plate, LED PC board and two meters.
  - b. Remove four tapping screws (#5 ~ #8) shown in Photo 3.
10. POWER TRANSFORMER (WITH BRACKET AND FUSE) REMOVAL
  - a. Disconnect all the power transformer cables.
  - b. Remove three tapping screws (#5 ~ #7) (Photo 5) from the back plate.
  - c. Remove two tapping screws (#8 and #9) (Photo 5) from the side angle.
  - d. Lift the power transformer away from the unit.

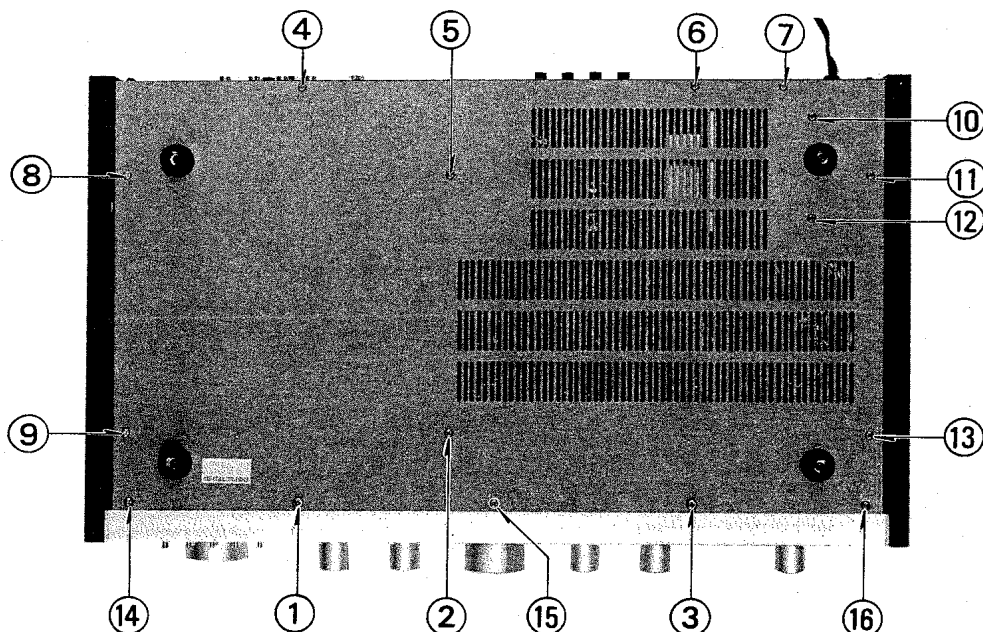


Photo 1

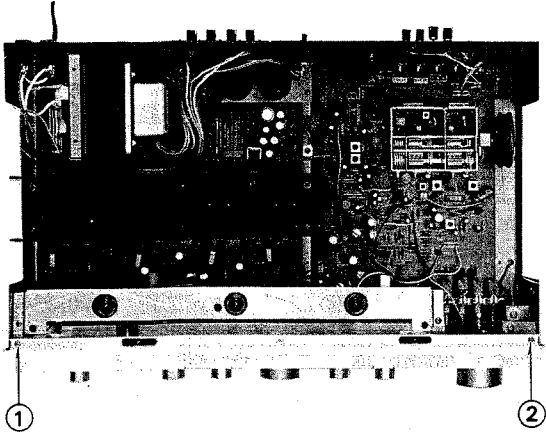


Photo 2

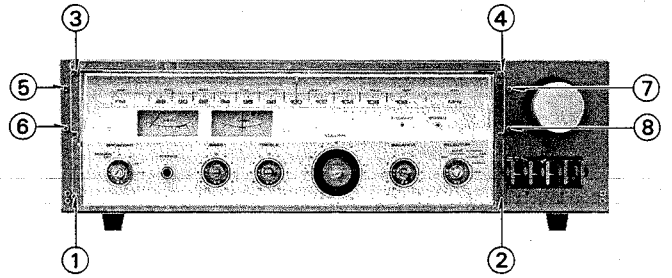


Photo 3

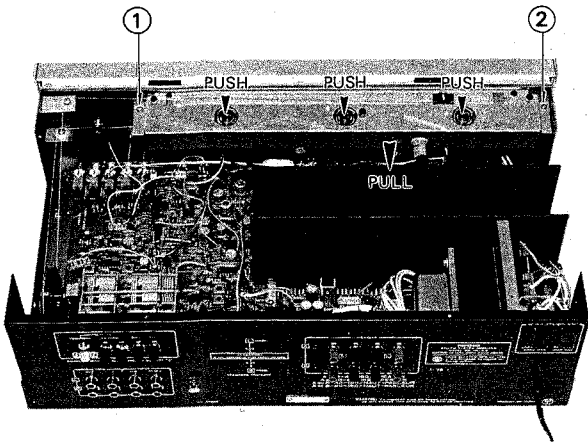


Photo 4

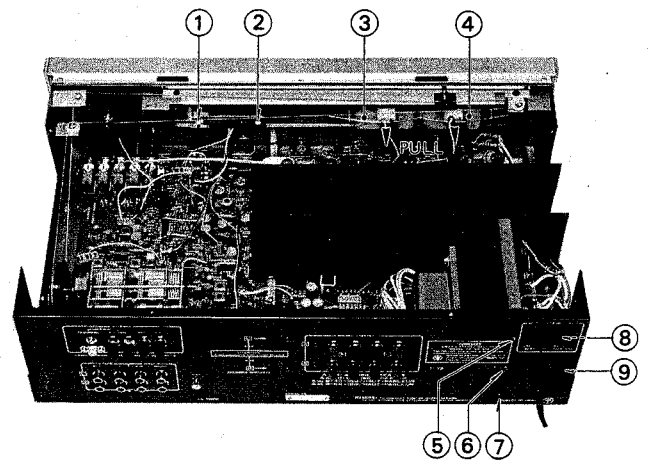


Photo 5



Figure 2 PUSH RIVET



# 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

## 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

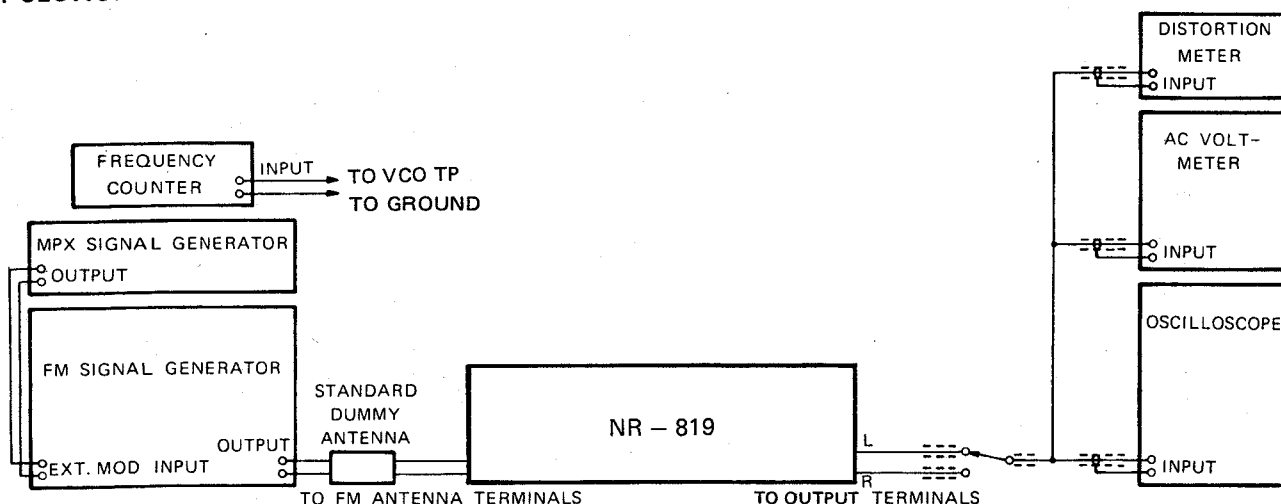


Figure 3. Test Equipment Hook-up

## FM IF Alignment

STEP	FM SG FREQUENCY/CALIBRATION	MODULATING FREQUENCY/DEVIATION	SWITCHES OF THE RECEIVER	DIAL POINTER POSITION	ADJUST-POINT	PROCEDURE	REMARKS
1			A. POWER to "ON". B. SELECTOR to "FM MONO".			Temporarily connect the wiring terminal #18 of the Tuner EQ PCB and the wiring terminal #2 of the REG PCB by clip lead.	This is to prevent operation of T-Locked System.
2				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.

Table 1 - 1

Figure 4 Adjustment point  
TUNER EQ PCB  
(Top view)

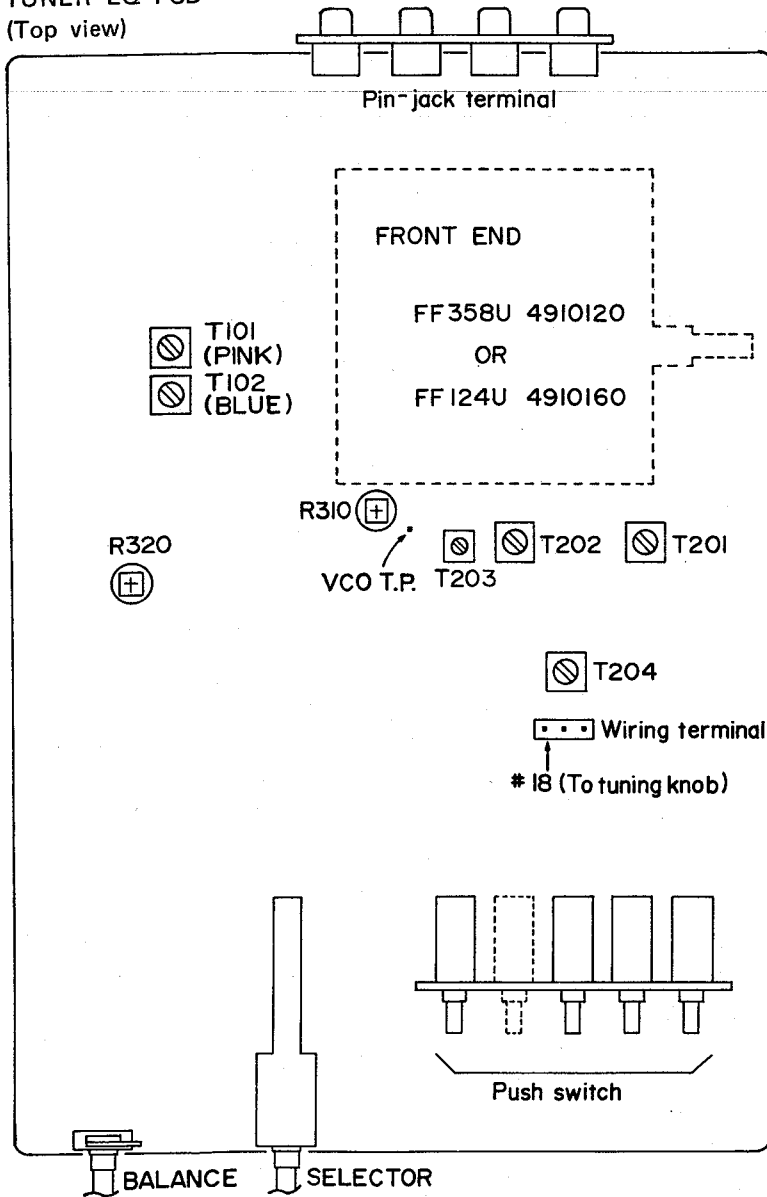


Figure 5-a  
FRONT END FF358U P#4910120

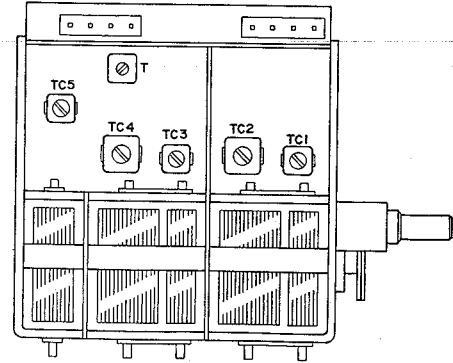
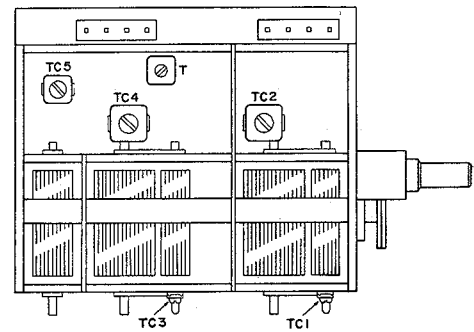


Figure 5-b  
FRONT END FF124U P#4910160



**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/ CALIBRATION	MODULATING FREQUENCY/ DEVIATION	SWITCHES OF THE TUNER	DIAL POINTER POSITION	ADJUST-EMNT POINT	PROCEDURE	REMARKS	
1			A. POWER to "ON".  B. SELECTOR to "FM MONO".			Temporarily connect the wiring terminal #18 of the Tuner EQ PCB and the wiring terminal #2 of the REG PCB by clip lead.	This is to prevent operation of T-Locked System.	
	108 MHz/10 dBμ	400 Hz/mono [±75 KHz]		108 MHz	TC5 (Figure 5)	Adjust for maximum AC Voltmeter deflection and for mid-scale tuning meter indication.		
3	87.4 MHz ±500 KHz/10 dBμ			Low frequency end of the Dial Scale.		Make sure that FM SG signal can be received at this dial pointer position. (Change the FM SG frequency and confirm that it indicates 87.4 MHz ±500 KHz when the signal is received.)	Do not move the Dial pointer.	
4	108 MHz/ Attenuate for response with 3% distortion.				108 MHz	TC1 TC3 (Figure 5)	Adjust for maximum output.	
5							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-EMNT POINT	PROCEDURE	REMARKS
1		(Unmodulated carrier)			R310 (Figure 4)	Adjust for 76 ± 0.2 kHz.	
2	98 MHz/60 dBμ	1000 Hz/stereo [main (L) & sub (L): ±67.5 kHz/ pilot signal: ±7.5 kHz]	A. POWER to "ON" B. SELECTOR to "FM AUTO"	98 MHz (Set so that tuning meter indicates mid-scale)	R320 (Figure 4)	Adjust for maximum separation (or minimum output of right channel).	Both the separations (both the outputs of right and left channel) should be equal.
3		1000 Hz/stereo [main (R) & sub (-R): ±67.5 kHz/ pilot signal: ±7.5 kHz]				Adjust for maximum separation (or minimum output of left channel).	

Table 1 - 3

AM SECTION

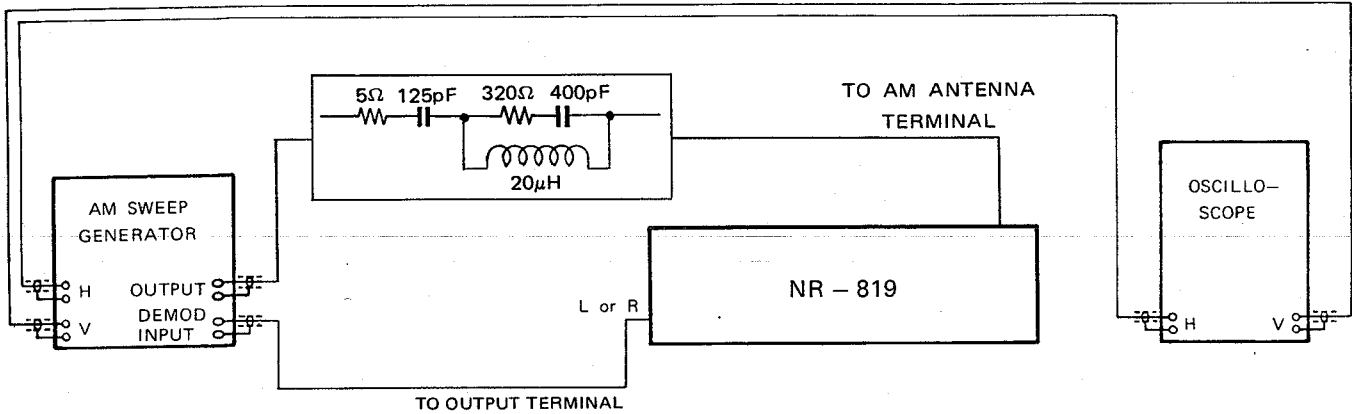


Figure 6. Test Equipment Hook-up

AM IF Alignment

STEP	AM SG FREQUENCY/ CALIBRATION	MODULATING FREQUENCY/ DEVIATION	SWITCHES OF THE TUNER	DIAL POINTER POSITION	ADJUST FOR MAX. SCOPE INDICATION	REMARKS
1	50 dBμ	(Unmodulated carrier)	A. POWER to "ON" B. SELECTOR to "AM"	High frequency end of the dial scale.	T203 (Figure 4, 7)	Repeat steps 1 and 2 until response curve on oscilloscope indicates maximum waveform.
2					T204 (Figure 4, 7)	

Table 2 - 1


AM Frequency Coverage and AM Tracking Alignment

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

STEP	AM SG FREQUENCY/ CALIBRATION	MODULATING FREQUENCY/ DEVIATION	SWITCHES OF THE TUNER	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 frequency end of the dial scale.	T202 (Figure 4, 8)	Repeat steps 1 and 2 several times.
2	1650kHz/ 50 dBμ			High frequency end of the dial scale.	TC4 (Figure 4, 8)	
3	600 kHz/ 50 dBμ			600 kHz	TC2 (Figure 4)	
4	1400kHz/ 50 dBμ			1400 kHz	T201 (Figure 4)	

Table 2 - 2

# PARTS LOCATION

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

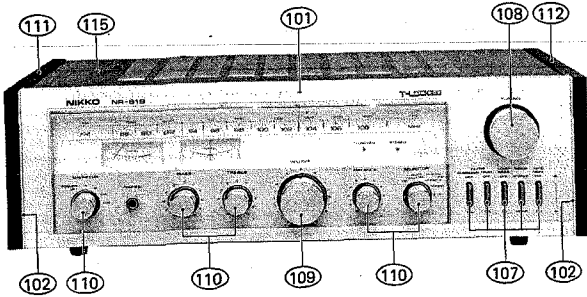


Photo 6

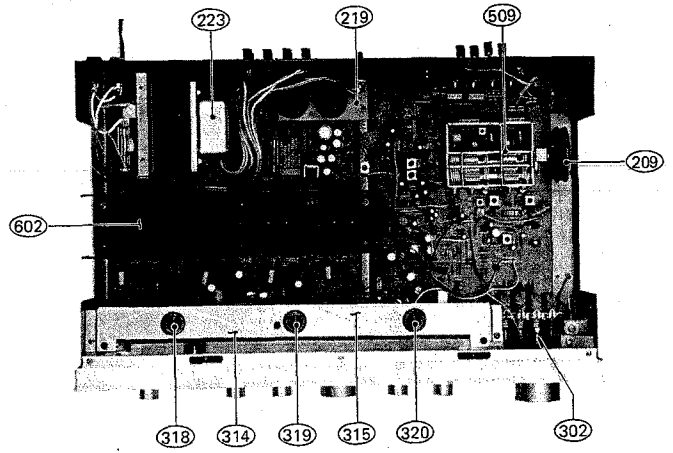


Photo 9

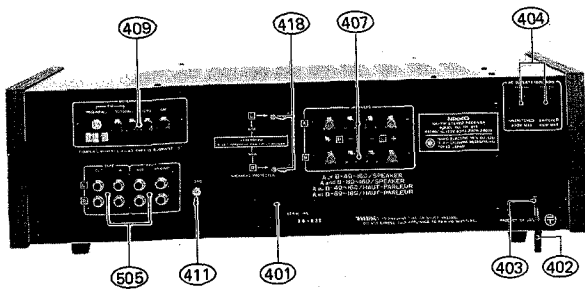


Photo 7

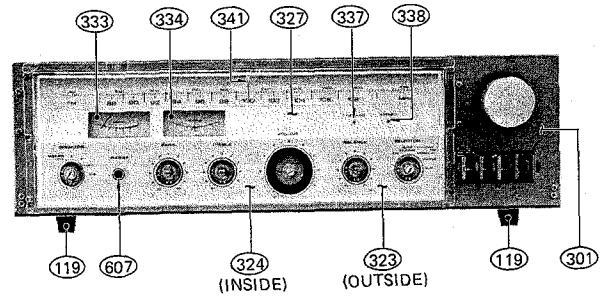


Photo 10

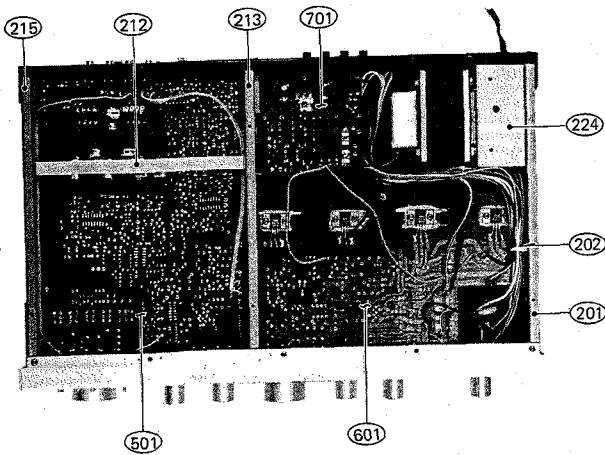


Photo 8

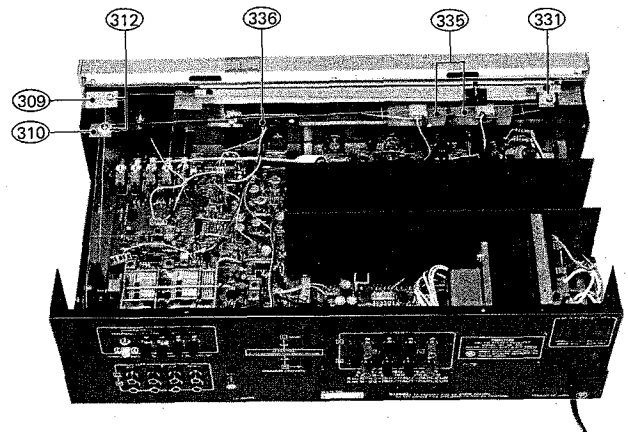


Photo 11

# PARTS LIST

**NOTES:**

1. \* The KEY NUMBER (#) marked with a (\*) on parts list relate to number of three digits with a (○). (Photo 6 ~ 11)
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 : Aluminium electrolytic capacitor  
M-CAP : Polyester film capacitor  
S-CAP : Polystyrene film capacitor

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

4. Assemblies and parts are subject to charge 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 NO.	SYMBOL NO.	TYPE <sup>+</sup> WEND	DESCRIPTION <sup>++</sup>	PART NO.
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**PACKING MATERIALS & ACCESSORIES**

001	1 1 1	1	Carton box	9825510
002	2 2 2	2	Pad	9840800
003	1 1 1	1	Sack, polyethylen cloth	9640600
004	1 1 1	1	Cloth, polishing	9690040
005	1 1 1	1	Sack, polyethylen cloth - #13	9640320
006	---	1	Envelope - G	9690170
007a	1 ---	1	Manual, instruction - E	960270E
007b	1 ---	1	Manual, instruction - F, CANADA only	960293F
007c	- 1 1 -	1	Manual, instruction - K	960271K
007d	---	1	Manual, instruction - G	960288G
008	1 ---	1	List, service stations	9690180
009a	1 ---	1	Card, warranty	967007A
009b	1 ---	1	Card, warranty - CANADA only	967028E
010	1 ---	1	Post card	967008A
011	1 1 1	1	Drier - Silica gel	9690010
012	1 1 1	1	Antenna, FM - Q-MATCH	4581360

**CABINET ASSEMBLY**

*101	1 1 1	1	Panel, front	7884380
*102	2 2 2	2	Panel, both sides	7870370
103	2 2 2	2	Guide - P1320BK, for push buttons	7401670
104	1 1 1	1	Guide - P3320BK, for push buttons	7401680
105	2 2 2	2	Spacer, panel - P630	7401660
106	5 5 5	5	Screw - PTS 3φx6	814306S
*107	5 5 5	5	Button, push - P320GL - subsonic/ hi-filter/loudness/mode/tape monitor	7852020
*108	1 1 1	1	Knob - 19SL-42R - tuning	7841230
*109	1 1 1	1	Knob - 19SL-38DR - volume	7841240
*110	5 5 5	5	Knob - 19SL-19DR - others	7841250
*111a	1 1 1	1	Side wood - L	7831470
*112a	1 1 1	1	Side wood - R	7831480
*111b	---	1	Side wood - L, black	7831530
*112b	---	1	Side wood - R, black	7831540
113	8 8 8	8	Screw - TPTS 4φx16	887416W
114	8 8 8	8	Washer - 5φ	893105W
*115a	1 1 1	1	Cover, metal	7820920
*115b	---	1	Cover, metal, black	7820980
116	4 4 4	4	Screw - PTS 3φx6	814306W
117	2 2 2	2	Screw - PTS 3φx8	814308W
118	1 1 1	1	Plate, bottom	7325420
*119	4 4 4	4	Foot, polyethylen	7901170
120	4 4 4	4	Screw - PTS WH3φx6	7121130
121	1111111	1	Screw - PTS 3φx6	814306S

KEY NO.	SYMBOL NO.	TYPE <sup>+</sup> WEND	DESCRIPTION <sup>++</sup>	PART NO.
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**CHASSIS ASSEMBLY**

*201	3 3 3	3	Angle	7226790
*202	1 1 1	1	Clip, wire	7401340
203	1 1 1	1	(FRONT PLATE ASSEMBLY)	
204	6 6 6	6	Screw - PTS 3φx6	814306S
205	1 1 1	1	(BACK PLATE ASSEMBLY)	
206	6 6 6	6	Screw - PTS 3φx6	814306S
207	1 1 1	1	(TUNER-EQ PCB ASSEMBLY)	
208	4 4 4	4	Screw - PTS 3φx6	814306S
*209	1 1 1	1	Dial drum - 50φ	7401020
210	1 1 1	1	Spring, dial drum - (J)	7440290
211	1 1 1	1	Cord, dial	4581870
*212	1 1 1	1	Angle, for variable capacitor	7032690
*213	1 1 1	1	Bracket, for PCB	7032310
214	5 5 5	5	Screw - PTS 3φx6	814306S
*215	1 1 1	1	Bracket, for PCB - R	7226870
216	1 1 1	1	(MAIN AMP PCB ASSEMBLY)	
217	4 4 4	4	Screw - PTS 3φx6	814306S
218	1 1 1	1	(REGULATOR PCB ASSEMBLY)	
*219	1 1 1	1	Holder, for regulator PCB	7032470
220	3 3 3	3	Screw - PTS 3φx6	814306S
221	1 1 1	1	Washer - TW(I) 3φ	893403U
222	1 1 1	1	Lug, ground - 4P WP	4400100
*223a	1 ---	1	Transformer, power - T-1-341 - 120V only	1103410
*223b	- 1 1 1	1	Transformer, power - T-1-342 - 220/240V class II	1103420
*224	1 1 1	1	Holder, power transformer	7226800
225	4 4 4	4	Washer - 1N 4φ	892014S
226	4 4 4	4	Washer - TW(I) 4φ	893404U
227	2 2 2	2	Screw - PTS 3φx6	814306S
228a	1 ---	1	Fuse - 4A 250V MGC	4700550
229a	1 ---	1	Holder, fuse - 1P	4581840
230	1 ---	1	Screw - PTS 3φx8	814308S
228b	- 1 1 1	1	Midget fuse - (S) 2AT 250V	4720370
229b	- 1 1 1	1	Holder, midget fuse - 1P	4581430
231	- 1 1 1	1	Screw - PTS 3φx6	814306S
232	1 1 1	1	Tye, nylon	7401880
			<b>FRONT PLATE ASSEMBLY</b>	
*301	1 1 1	1	Plate, front	7325410
*302	1 1 1	1	Dial shaft, with fly wheel	7152410
303	1 1 1	1	Holder, dial shaft	7401700
304	3 3 3	3	Screw - PTS 3φx6	814306S

PART ORDERING PROCEDURE ----- Do NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only.) 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 NO.	SYMBOL NO.	TYPE <sup>+</sup> WEND	DESCRIPTION <sup>++</sup>	PART NO.	KEY NO.	SYMBOL NO.	TYPE <sup>+</sup> WEND	DESCRIPTION <sup>++</sup>	PART NO.
305		1 1 1 1	Washer - SN 9φ	892249S	*401b		- 1 1 1	Plate, back - E	7325520
306		1 1 1 1	Washer - TW(I) 9φ	893409U	*402a		1 ---	Plug/Cord - DP-70	606007A
307		1 1 1 1	Washer - 9φ	893109S	*402b		- 1 1 1	Plug/Cord - CEE-2T	600510A
308		1 1 1 1	Lug - 9S	7032320	*403a		1 ---	Stopper, cord - SR-3P-4	7400620
*309		1 1 1 1	Bracket, pulley - (T)	7032440	*403b		- 1 1 1	Stopper, cord - SR-4N-4	7400690
*310		1 1 1 1	Bracket, pulley - (B)	7032450	*404		2 ---	Socket, AC outlet	4500150
311		2 2 2 2	Screw - PTS 3φx6	814306S	405	R1	1 ---	RES 2.2 meg. ohm 5% 1/2W	325225K
*312		2 2 2 2	Pulley - 9φ	7400790	406		1 ---	Lug, ground	4400000
313		2 2 2 2	Shaft, pulley - 4L	7120980	*407		2 2 2 2	Terminal, speaker - screw type - HB	4450470
*314		1 1 1 1	Reflex plate	7870330	408		4 4 4 4	Screw - PTS 3φx8	814308W
*315		1 1 1 1	Holder, reflex plate	7227010	*409a		1 1 1 -	Terminal, antenna	4450520
316		3 3 3 3	Rivet, push - 3φx6.5	7401850	*409b		---1	Terminal, antenna	4450560
317		2 2 2 2	Screw - PTS 3φx6	814306S	410		2 2 2 2	Screw - PMS 3φx6	810306W
*318		2 2 2 2	Lamp - 8V 0.3A 200L	5808140	*411		1 1 1 1	Nut, GND terminal	4400050
*319		1 1 1 1	Lamp - 8V 0.3A 300L	5808120	412		1 1 1 1	Screw - PMS 3φx12	810312S
*320		1 1 1 1	Lamp - 8V 0.3A 400L	5808150	413		1 1 1 1	Washer - IN 3φ	892013S
321		2 2 2 2	Tye, nylon	7401880	414		2 2 2 2	Washer - TW(I) 3φ	893403U
322		1 1 1 1	Spacer, panel window	7870390	415		1 1 1 1	Lug, ground	4400000
*323		1 1 1 1	Window, panel	7870390	416		- 1 1 1	Connector, DIN type 5P	4530220
*324		1 1 1 1	Panel, sub	7802390	417		- 2 2 2	Screw - PTS 3φx6	814306S
325		4 4 4 4	Screw - BLTS 3φx6	874306S	*418		2 ---	Circuit breaker - NW-2S(N) 4.0A	4900880
326		2 2 2 2	Cushion, sub panel	7002140	419		1 ---	Bracket, circuit breaker	7032480
*327a		1 ---	Dial scale (OLD)	7802400	<p>CAUTION: Dial scale and Front End are related to each other. Each production lot has different Front End for this model. The units of the following serial numbers incorporate the old type Front End, FF358U and also the old type Dial Scale.</p> <p>Serial # D8910001 --- D8913000</p> <p>Serial # A8913001 --- A8913700</p> <p>The rest of the units all have the new type Front End, FF124U and the new type Dial Scale. Pay good attention when changing parts.</p>				
*327b		1 1 1 1	Dial scale (NEW)	7802450					
328		1 1 1 1	Holder, dial scale	7226880	<p>TUNER-EQUALIZER PC BOARD ASSEMBLY</p>				
329		2 2 2 2	Rivet, push - 3φx3.5	7401190	*501a		1 ---	TUNER-EQ PCB ASSEMBLY - FM de-emphasis 75us	9460090
330		4 4 4 4	Screw - PTS 3φx6	814306S	*501b		- 1 1 -	TUNER-EQ PCB ASSEMBLY - FM de-emphasis 50us	9460100
*331		1 1 1 1	Pulley - 9φ	7400790	*501c		---1	TUNER-EQ PCB ASSEMBLY - D-type only	9460150
332		1 1 1 1	Shaft, pulley - 4L	7120980	502	S1	1 1 1 1	Switch, rotary slide - SRZ-W45 - selector	4055170
*333		1 1 1 1	Meter, signal	4582490	503	S2~S6	1 1 1 1	Switch, penta push - tape monitor/mode/loudness/subsonic/hi-filter	4041060
*334		1 1 1 1	Meter, tuning	4582500	504	R511	1 1 1 1	VR VM10E093C - 250kohm - balance	4310560
*335		2 2 2 2	Clamp spring, for meter	7440410	505		2 2 2 2	Terminal, RCA phono pin jack - 2Px2	4444070
*336		1 1 1 1	(LED PCB SUB ASSEMBLY)		506		1 1 1 1	Flat cable - 9-60	606212E
337		1 1 1 1	LED GL-2PG1 - green - T-Lock indicator	5060080	507		3 3 3 3	Lug, ground	4400000
338		1 1 1 1	LED GL-2AR1 - red - STEREO indicator	5060090	508		1 1 1 1	Screw - PMS 3φx6	810306W
339		2 2 2 2	Spacer, LED	7903140	*509a		1 1 1 1	Front end - FF124U	4910160
340		2 2 2 2	Rivet, push - 3φx4.5	7401240	*509b		1 ---	Front end - FF358U	4910120
*341		1 1 1 1	Needle - dial pointer	7050510	<p>CAUTION: Dial scale and Front End are related to each other. Each production lot has different Front End for this model. The units of the following serial numbers incorporate the old type Front End, FF358U and also the old type Dial Scale.</p> <p>Serial # D8910001 --- D8913000</p> <p>Serial # A8913001 --- A8913700</p> <p>The rest of the units all have the new type Front End, FF124U and the new type Dial Scale. Pay good attention when changing parts.</p>				
342		1 1 1 1	Slider, needle	7401630	<p>(FM IF SECTION)</p>				
343a	S1	1 ---	Switch, rotary - SR26FN 2-4-5 20KC TV-5 - power/speaker	4051230	T101		1 1 1 1	Transformer, FM discriminator - (1)	1240340
343b	S1	- 1 1 1	Switch, rotary - SRY2054 class II - power/speaker	4051250	T102		1 1 1 1	Transformer, FM discriminator - (2)	1240350
344a	C1	1 ---	C-CAP 0.0047uf AC125V	239472C	L101		1 1 1 1	Inductor - 22uh	1210930
344b	C1,C2	- 2 2 2	C-CAP 0.0047uf AC250V	239472E	L102		1 1 1 1	Inductor - 2.2uh	1210880
345	R2,R3	2 2 2 2	MO-RES 10ohm 5% 2W	362100F	CF101,102		2 2 2 2	Celamic filter - CFM-107S-12H	128053A
BACK PLATE ASSEMBLY					CF101		---1	Celamic filter - CFM-107S-12C	128056A
*401a		1 ---	Plate, back - W	7325430					

PART ORDERING PROCEDURE ----- Do NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only.) 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 NO.	SYMBOL NO.	TYPE <sup>+</sup> WEND	DESCRIPTION <sup>++</sup>	PART NO.
	CF102,103	---- 2	Celamic filter - CFM-107M-12C	128057A
	IC101	1 1 1 1	IC HA11225	518070S
	Q101,102	2 2 2 2	TR 2SC1675 (L or M)	515082S
	D101	1 1 1 1	Diode 1SS53	501023S
	C101			
	~ C107	7 7 7 6	C-CAP 0.022uf +80, -20% 50V YG	231223Z
	C108	1 1 1 1	C-CAP 100pf 10% 50V SL	232101K
	C109	1 1 1 1	E-CAP 4.7uf 25V	211315Q
	C110			
	~ C115	6 6 6 6	C-CAP 0.022uf +80, -20% 50V YG	231223Z
	C116	1 1 1 1	E-CAP 10uf 16V	211220Q
	C117	1 1 1 1	C-CAP 0.022uf +80, -20% 50V YG	231223Z
	C118	1 1 1 1	E-CAP 1uf 50V	211510Q
	C119	1 1 1 1	C-CAP 220pf 10% 50V SL	232221K
	C120	1 1 1 1	E-CAP 10uf 16V	211220Q
	C121			
	~ C124	4 4 4 4	C-CAP 0.022uf +80, -20% 50V YG	231223Z
	R101	1 1 1 1	RES 33ohm 5% 1/4W	328330J
	R102,103	2 2 2 2	RES 330ohm 5% 1/4W	328331J
	R104		- DELETED -	
	R105	1 1 1 1	RES 330ohm 5% 1/4W	328331J
	R106,107	2 2 2 2	RES 5.6kohm 5% 1/4W	328562J
	R108	1 1 1 1	RES 470ohm 5% 1/4W	328471J
	R109	1 1 1 1	RES 47kohm 5% 1/4W	328473J
	R110	1 1 1 1	RES 10kohm 5% 1/4W	328103J
	R111		- DELETED -	
	R112	1 1 1 1	RES 15kohm 5% 1/4W	328153J
	R113	1 1 1 1	RES 2.2kohm 5% 1/4W	328222J
	R114	1 1 1 1	RES 220ohm 5% 1/4W	328221J
	R115	1 1 1 1	RES 12kohm 5% 1/4W	328123J
	R116	1 1 1 1	RES 18kohm 5% 1/4W	328183J
	R117	1 1 1 1	RES 4.7kohm 5% 1/4W	328472J
			(MPX SECTION)	
	L301,302	2 2 2 2	Inductor - 39mh	1260130
	IC301	1 1 1 1	IC TA-7624P (Y or G or W)	518071S
	IC302	1 1 1 1	IC uPD4069C	518072S
	Q301			
	~ Q305	5 5 5 5	TR 2SC945L (P or Q)	515077S
	Q306	1 1 1 1	FET 2SK104 (F)	516026S
	Q307,308	2 2 2 2	TR 2SC945L (P or Q)	515077S
	Q309	1 1 1 1	TR 2SA733 (P or Q)	514074S
	D301			
	~ D313	1 1 1 1	Diode 1SS53	501023S
	ZD301	1 1 1 1	Zener diode RD2.2EC	502056S
	ZD302	1 1 1 1	Zener diode RD6.2EB1	502048S
	C301,302	2 2 2 2	E-CAP 0.47uf 50V	211505Q
	C303,304	2 2 2 2	E-CAP 10uf 16V	211220Q
	C305,306	2 ----	M-CAP 0.027uf 5% 50V	222273J
	C305,306	-2 2 2	M-CAP 0.018uf 5% 50V	222183J
	C307	1 1 1 1	M-CAP 0.0047uf 5% 50V	222472J
	C308	1 1 1 1	E-CAP 10uf 16V	211220Q
	C309,310	2 2 2 2	E-CAP 1uf 50V	211510Q
	C311,312	2 2 2 2	S-CAP 470pf 5% 50V	223471J
	C313,314	2 2 2 2	M-CAP 0.001uf 5% 50V	222102J
	C315,316	2 2 2 2	E-CAP 1uf 50V	211510Q
	C317	1 1 1 1	S-CAP 470pf 5% 50V	223471J
	C318	1 1 1 1	M-CAP 0.01uf 5% 50V	222103J
	C319	1 1 1 1	M-CAP 0.033uf 5% 50V	222333J
	C320	1 1 1 1	E-CAP 4.7uf 25V	211315Q
	C321	1 1 1 1	LC-CAP 0.47uf 50V	211505L
	C322	1 1 1 1	E-CAP 10uf 16V	211220Q

KEY NO.	SYMBOL NO.	TYPE <sup>+</sup> WEND	DESCRIPTION <sup>++</sup>	PART NO.
	C323	1 1 1 1	LC-CAP 0.47uf 50V	211505L
	C324,325	2 2 2 2	M-CAP 0.001uf 5% 50V	222102J
	C326	1 1 1 1	E-CAP 10uf 16V	211220Q
	C327	1 1 1 1	M-CAP 0.047uf 10% 50V	222473K
	C328	1 1 1 1	E-CAP 0.47uf 50V	211505Q
	C329	1 1 1 1	C-CAP 0.001uf +80, -20% 50V YG	231102Z
	C330	1 1 1 1	E-CAP 0.47uf 50V	211505Q
	C331	1 1 1 1	M-CAP 0.01uf 5% 50V	222103J
	C332	1 1 1 1	LC-CAP 1uf 50V	211510L
	C333	1 1 1 1	E-CAP 3.3uf 35V	211413Q
	C334	1 1 1 1	C-CAP 0.022uf +80, -20% 50V YG	231223Z
	C335,336	2 2 2 2	E-CAP 220uf 16V	211332Q
	R310	1 1 1 1	Potentiometer - SR19R B10kohm	4300510
	R320	1 1 1 1	Potentiometer - SR19R B22kohm	4301170
	R301	1 1 1 1	RES 82kohm 5% 1/4W	328823J
	R302	1 1 1 1	RES 330kohm 5% 1/4W	328334J
	R303	1 1 1 1	RES 5.6kohm 5% 1/4W	328562J
			NOTE: R304 is related to the rank of IC301 (TA-7624P). (See schematic diagram.)	
	R304	1 1 1 1	RES 220kohm 5% 1/4W	328224J
	R304	1 1 1 1	RES 330kohm 5% 1/4W	328334J
	R304	1 1 1 1	RES 680kohm 5% 1/4W	328684J
	R305,306	2 2 2 2	RES 3.3kohm 5% 1/4W	328332J
	R307		- DELETED -	
	R308	1 1 1 1	RES 100kohm 5% 1/4W	328104J
	R309	1 1 1 1	RES 47kohm 5% 1/4W	328473J
	R310		(Potentiometer)	
	R311	1 1 1 1	RES 18kohm 5% 1/4W	328183J
	R312	1 1 1 1	RES 12kohm 5% 1/4W	328123J
	R313	1 1 1 1	RES 6.8kohm 5% 1/4W	328682J
	R314	1 1 1 1	RES 2.2kohm 5% 1/4W	328222J
	R315	1 1 1 1	RES 3.3kohm 5% 1/4W	328332J
	R316	1 1 1 1	RES 1.5kohm 5% 1/4W	328152J
	R317,318	2 2 2 2	RES 47kohm 5% 1/4W	328473J
	R319	1 1 1 1	RES 10kohm 5% 1/4W	328103J
	R320		(Potentiometer)	
	R321	1 1 1 1	RES 470ohm 5% 1/4W	328471J
	R322	1 1 1 1	RES 2.2kohm 5% 1/4W	328222J
	R323	1 1 1 1	RES 3.3kohm 5% 1/4W	328332J
	R324,325	1 1 1 1	RES 15kohm 5% 1/4W	328153J
	R326,327	1 1 1 1	RES 4.7kohm 5% 1/4W	328472J
	R328	1 1 1 1	RES 10kohm 5% 1/4W	328103J
	R329	1 1 1 1	RES 22kohm 5% 1/4W	328223J
	R330	1 1 1 1	RES 100kohm 5% 1/4W	328104J
	R331	1 1 1 1	RES 470ohm 5% 1/4W	328471J
	R332	1 1 1 1	RES 2.2kohm 5% 1/4W	328222J
	R333,334	2 2 2 2	RES 10kohm 5% 1/4W	328103J
	R335,336	2 2 2 2	RES 100kohm 5% 1/4W	328104J
	R337	1 1 1 1	RES 1 meg. ohm 5% 1/4W	328105J
	R338	1 1 1 1	RES 10kohm 5% 1/4W	328103J
	R339	1 1 1 1	RES 2.2meg. ohm 5% 1/4W	328225J
	R340	1 1 1 1	RES 1kohm 5% 1/4W	328102J
	R341	1 1 1 1	RES 100kohm 5% 1/4W	328104J
	R342	1 1 1 1	RES 1kohm 5% 1/4W	328102J
	R343	1 1 1 1	RES 10meg. ohm 5% 1/4W	328106J
	R344	1 1 1 1	RES 1 meg. ohm 5% 1/4W	328105J
	R345	1 1 1 1	RES 22kohm 5% 1/4W	328223J
	R346	1 1 1 1	RES 1 meg. ohm 5% 1/4W	328105J
	R347	1 1 1 1	RES 10kohm 5% 1/4W	328103J
	R348,349	2 2 2 2	RES 2.2meg. ohm 5% 1/4W	328225J
	R350,351	2 2 2 2	RES 1kohm 5% 1/4W	328102J
	R352	1 1 1 1	RES 1.5kohm 5% 1/4W	328152J
	R353	1 1 1 1	RES 330kohm 5% 1/4W	328334J
	R354,355	2 2 2 2	RES 8.2kohm 5% 1/4W	328822J
	R356	1 1 1 1	RES 33kohm 5% 1/4W	328333J
	R357	1 1 1 1	RES 1.2kohm 5% 1/4W	328122J
	R358	1 1 1 1	RES 15kohm 5% 1/4W	328153J
	R359	1 1 1 1	RES 33kohm 5% 1/4W	328333J
	R360	1 1 1 1	RES 330ohm 5% 1/4W	328334J
	R361	1 1 1 1	RES 100kohm 5% 1/4W	328104J



PART ORDERING PROCEDURE ----- Do NOT USE THE "KEY" NUMBER AND "SYMBOL" NUMBER. (these are control # for the factory only.) 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 NO.	SYMBOL NO.	TYPE <sup>+</sup> WEND	DESCRIPTION <sup>++</sup>	PART NO.	KEY NO.	SYMBOL NO.	TYPE <sup>+</sup> WEND	DESCRIPTION <sup>++</sup>	PART NO.
R362,363	2 2 2 2	RES	47kohm 5% 1/4W	328473J	(PUSH SWITCH SECTION)				
R364,365	2 2 2 2	RES	1kohm 5% 1/4W	328102J					
R366	1 1 1 1	RES	10meg.ohm 5% 1/4W	328106J					
(AM SECTION)									
T201	1 1 1 1	Coil, AM antenna		1200390	C501,502	2 2 2 2	C-CAP	470pf 10% 50V SL	232471K
T202	1 1 1 1	Coil, AM oscillator		1220060	C503,504	2 2 2 2	M-CAP	0.0022uf 10% 50V	222222K
T203	1 1 1 1	Transformer, AM IF		1230160	C505,506	2 2 2 2	C-CAP	150pf 10% 50V SL	232151K
T204	1 1 1 1	Coil, AM discriminator		1230110	C507,508	2 2 2 2	M-CAP	0.047uf 10% 50V	222473K
L201	1 1 1 1	Inductor - 2.2uh		1210860	C509,510	2 2 2 2	M-CAP	0.056uf 10% 50V	222563K
CF201	1 1 1 1	Celamic filter - SFZ455A		1280310	R501,502	2 2 2 2	RES	3.3kohm 5% 1/4W	328332J
IC201	1 1 1 1	IC HA1197		518044S	R503,504	2 2 2 2	RES	2.2kohm 5% 1/4W	328222J
C201	1 1 1 1	C-CAP	10pf 10% 50V SL	232100K	R505,506	2 2 2 2	RES	1 megohm 5% 1/4W	328105J
C202	1 1 1 1	C-CAP	15pf 10% 50V SL	232150K	R507,508	2 2 2 2	RES	15kohm 5% 1/4W	328153J
C203	1 1 1 1	S-CAP	380pf 2% 50V	223361G	R509,510	2 2 2 2	RES	12kohm 5% 1/4W	328123J
C204	1 1 1 1	C-CAP	0.001uf +80, -20% 50V YG	231102Z	R511,512	2 2 2 2	RES	2.2kohm 5% 1/4W	328222J
C205	~ C207	3 3 3 3	C-CAP	0.022uf +80, -20% 50V YG	231223Z	R513,514	- 2 2 2	RES	330kohm 5% 1/4W
C208	1 1 1 1	C-CAP	68pf 10% 50V SL	232680K	R515,516	- 2 2 2	RES	100kohm 5% 1/4W	328104J
C209,210	2 2 2 2	C-CAP	0.022uf +80, -20% 50V YG	231223Z	MAIN AMP PCB ASSEMBLY				
C211	1 1 1 1	E-CAP	4.7uf 25V	211315Q					
C212	1 1 1 1	E-CAP	3.3uf 35V	211413Q					
C213	1 1 1 1	C-CAP	0.001uf +80, -20% 50V YG	231102Z	*601a	1 ---	MAIN AMP PCB ASSEMBLY		9430730
C214	1 1 1 1	C-CAP	0.022uf +80, -20% 50V YG	231223Z	*601b	- 1 1 1	MAIN AMP PCB ASSEMBLY		9430740
C215	1 1 1 1	E-CAP	100uf 16V	211230Q	*602	1 1 1 1	Heat sink		7280340
C216	1 1 1 1	E-CAP	220uf 16V	211232Q	603	1 1 1 1	Washer - TW(I) 3φ		893403U
C217	1 1 1 1	M-CAP	0.022uf 10% 50V	222223K	604	1 1 1 1	Screw - PTS 3φx6		810306S
C218	1 1 1 1	LC-CAP	0.47uf 50V	211505L	605	3 3 3 3	Screw - PTS 3φx8		814308S
R201	1 1 1 1	RES	1.5kohm 5% 1/4W	328152J	606	1 1 1 1	Lug, ground		4400000
R202,203	2 2 2 2	RES	10kohm 5% 1/4W	328103J	*607	1 1 1 1	Jack, head phones		4550260
R204	1 1 1 1	RES	330ohm 5% 1/4W	328331J	608	R521,522	2 2 2 2	VR GM80E722A - 250kohm Bx2 - volume	4320960
R205	1 1 1 1	FP-MO-RES	47ohm 5% 1/4W	360470L	609	R531,532	1 1 1 1	VR GM70E533C - 100kohm x2 - bass	4320900
R206	1 1 1 1	RES	1.5kohm 5% 1/4W	328152J	610	R537,538	1 1 1 1	VR GM70E533C - 100kohm x2 - treble	4320900
R207	1 1 1 1	FP-MO-RES	150ohm 5% 1/4W	360151L	611	F701,702	- 2 2 2	Midget fuse - (S) 4AT 250V	4720400
R208	1 1 1 1	RES	1kohm 5% 1/4W	328102J		- 4 4 4	Holder, midget fuse		7050430
R209	1 1 1 1	RES	10kohm 5% 1/4W	328103J	(MAIN AMP SECTION)				
(EQ AMP SECTION)									
Q401,402	2 2 2 2	TR 2SA991 (E or F)		510104S					
Q403,404	2 2 2 2	TR 2SC945L (P or Q)		515077S	Q703				
C401,402	2 2 2 2	LC-CAP	0.47uf 50V	211505L	~ Q706	4 4 4 4	TR 2SC945L (P or Q)		515077S
C403,404	2 2 2 2	C-CAP	100pf 10% 50V SL	232101K	Q707,708	2 2 2 2	TR 2SD666A (C or D)		511020S
C405,406	2 2 2 2	E-CAP	10uf 16V	211220Q	Q709,710	2 2 2 2	TR 2SD667A (B or C)		511022S
C407,408	2 2 2 2	E-CAP	220uf 6.3V	211032Q	Q711,712	2 2 2 2	TR 2SB647A (B or C)		510046S
C409,410	2 2 2 2	M-CAP	0.0068uf 5% 50V	222682J	Q713,714	2 2 2 2	TR 2SD588 (Q or R)		513109S
C411,412	2 2 2 2	M-CAP	0.022uf 5% 50V	222223J	Q715,716	2 2 2 2	TR 2SB618 (Q or R)		511109S
C413,414	2 2 2 2	C-CAP	10pf 10% 50V SL	232100K	Q717	1 1 1 1	TR 2SC1827 (Q or Y)		511017S
C415,416	2 2 2 2	E-CAP	220uf 6.3V	211032Q	ZD 701	1 1 1 1	Zener diode RD13EB3		502063S
C417,418	2 2 2 2	LC-CAP	0.47uf 50V	211505L	L701,702	2 2 2 2	Coil, choke		1210830
C419	1 1 1 1	E-CAP	47uf 25V	211325Q	C701,702	2 2 2 2	LC-CAP	0.47uf 50V	211505L
C420	1 1 1 1	C-CAP	0.01uf +80, -20% 50V YG	231103Z	C703,704	2 2 2 2	C-CAP	68pf 10% 50V SL	232680K
R401,402	2 2 2 2	RES	100kohm 5% 1/4W	328104J	C705,706	2 2 2 2	C-CAP	15pf 10% 50V SL	232150K
R403,404	2 2 2 2	RES	150ohm 5% 1/4W	328150J	C707,708	2 2 2 2	E-CAP	100uf 6.3V	211030Q
R405,406	2 2 2 2	RES	10kohm 5% 1/4W	328104J	C709,710	2 2 2 2	E-CAP	47uf 50V	211525Q
R407,408	2 2 2 2	RES	10kohm 5% 1/4W	328103J	C711,712	2 2 2 2	C-CAP	22pf 10% 50V SL	232220K
R409,410	2 2 2 2	RES	15kohm 5% 1/4W	328153J	C713,714	2 2 2 2	C-CAP	0.022uf +80, -20% 50V YG	231223Z
R411,412	2 2 2 2	RES	100kohm 5% 1/4W	328104J	C715,716	2 2 2 2	C-CAP	220pf 10% 50V SL	232221K
R413,414	2 2 2 2	RES	220ohm 5% 1/4W	328221J	C717,718	2 2 2 2	M-CAP	0.1uf 10% 50V	222104K
R415,416	2 2 2 2	RES	12kohm 5% 1/4W	328123J	C719,720	2 2 2 2	E-CAP	47uf 50V	211525Q
R417,418	2 2 2 2	RES	220kohm 5% 1/4W	328224J	C721,722	2 2 2 2	E-CAP	47uf 50V	211525Q
R419,420	2 2 2 2	FP-MO-RES	3.3kohm 5% 1/4W	360332L	C723,724	2 2 2 2	C-CAP	220pf 10% 50V SL	232221K
R421,422	2 2 2 2	RES	330ohm 5% 1/4W	328331J	C725,726	2 2 2 2	M-CAP	0.01uf 10% 50V	222103K
R423,424	2 2 2 2	RES	470ohm 5% 1/4W	328471J	R727,728	2 2 2 2	Potentiometer - SR19R B470ohm		4300640
R425,426	2 2 2 2	RES	100kohm 5% 1/4W	328104J	R701,702	2 2 2 2	RES	1kohm 5% 1/4W	328102J
					R703,704	2 2 2 2	RES	150kohm 5% 1/4W	328154J
					R705,706	2 2 2 2	RES	22kohm 5% 1/4W	328223J
					R707,708	2 2 2 2	RES	2.2kohm 5% 1/4W	328222J
					R709,710	2 2 2 2	RES	1kohm 5% 1/4W	328102J
					R711,712	2 2 2 2	RES	820ohm 5% 1/4W	328821J
					R713,714	2 2 2 2	RES	150kohm 5% 1/4W	328154J

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KEY NO.	SYMBOL NO.	TYPE <sup>+</sup> WEN D	DESCRIPTION <sup>++</sup>	PART NO.	KEY NO.	SYMBOL NO.	TYPE <sup>+</sup> WEN D	DESCRIPTION <sup>++</sup>	PART NO.
R715,716	2 2 2 2		FP-MO-RES 3.9kohm 5% 1/4W	360392L	REGULATOR PC BOARD ASSEMBLY				
R717,718	2 2 2 2		RES 680ohm 5% 1/4W	328681J	*701a		1 ---	REGULATOR PCB ASSEMBLY	9450860
R719	1 1 1 1		FP-MO-RES 3.3kohm 5% 1/4W	360332L	*701b		-1 1 1	REGULATOR PCB ASSEMBLY	9450870
R720	1 1 1 1		RES 33kohm 5% 1/4W	328333J	702		1 1 1 1	Heat sink - S10, for Q803	7081820
R721,722	2 2 2 2		FP-MO-RES 2.2kohm 5% 1/4W	360222L	703		1 1 1 1	Screw - PMS 3φx6	810306S
R723,724	2 2 2 2		FP-MO-RES 3.3kohm 5% 1/4W	360332L	704a	F801	1 ---	Fuse - 2A 250V MGC	4700620
R725,726	2 2 2 2		RES 2.7kohm 5% 1/4W	328272J	705		2 ---	Holder, fuse	7050420
R727,728			(Potentiometer)		704b	F801	-1 1 1	Midget fuse - (S) 2AT 250V	4720370
R729,730	2 2 2 2		RES 1kohm 5% 1/4W	328102J	706		-2 2 2	Holder, midget fuse	7050430
R731,732	2 2 2 2		FP-MO-RES 220ohm 5% 1/4W	360221L		Q801	1 1 1 1	TR 2SC2002 (L or M)	512113S
R733,734	2 2 2 2		FP-MO-RES 220ohm 5% 1/4W	360221L		Q802	1 1 1 1	TR 2SA953 (L or M)	510109S
R735,736	2 2 2 2		CEM-RES 0.47ohm 5% 5W	384479W		Q803	1 1 1 1	TR 2SD288 (L or M)	513036S
R737,738	2 2 2 2		CEM-RES 0.47ohm 5% 5W	384479W		D801			
R739,740	2 2 2 2		FP-MO-RES 10ohm 5% 2W	362100L		~ D804	4 4 4 4	Diode GP30D	560059S
R741,742	2 2 2 2		FP-MO-RES 10ohm 5% 2W	362100L		ZD801,			
R743,744	2 2 2 2		FP-MO-RES 330ohm 5% 2W	362331L		ZD802	2 2 2 2	Zener diode RD13EB3	502063S
R745	1 1 1 1		FP-MO-RES 47ohm 5% 1/4W	360470L		ZD803	1 1 1 1	Zener diode RD22EB4	502059S
R746			- DELETED -			C801,802	2 2 2 2	E-CAP 6800uf 50V	217547Q
R747,748	2 2 2 2		RES 1kohm 5% 1/4W	328102J		C803	1 1 1 1	E-CAP 470uf 25V	211335S
			(TONE SECTION)			C804	1 1 1 1	E-CAP 47uf 25V	211325Q
C521,522	2 2 2 2		E-CAP 10uf 16V	211220Q		C805,806	2 2 2 2	E-CAP 47uf 25V	211325Q
C523,524	2 2 2 2		E-CAP 10uf 16V	211220Q		C807,808	2 2 2 2	E-CAP 100uf 16V	211230Q
C525,526	2 2 2 2		M-CAP 0.027uf 10% 50V	222273K		C809	1 1 1 1	E-CAP 220uf 16V	211232Q
C527,528	2 2 2 2		M-CAP 0.22uf 10% 50V	222224K		C810	1 1 1 1	C-CAP 0.01uf +80, -20% 500V YG	238103P
C529,530	2 2 2 2		M-CAP 0.0027uf 10% 50V	222273K		R801	1 1 1 1	FP-MO-RES 4.7kohm 5% 1/4W	360472L
C530,532	2 2 2 2		M-CAP 0.033uf 10% 50V	222333K		R802	1 1 1 1	RES 18kohm 5% 1/4W	328183J
R523,524	2 2 2 2		RES 6.8kohm 5% 1/4W	328682J		R803		- DELETED -	
R525,526	2 2 2 2		RES 6.8kohm 5% 1/4W	328682J		R804	1 1 1 1	RES 22kohm 5% 1/4W	328223J
R527,528	2 2 2 2		RES 12kohm 5% 1/4W	328123J		R805	1 1 1 1	FP-MO-RES 150ohm 5% 3W	363151L
R529,530	2 2 2 2		RES 120kohm 5% 1/4W	328124J		R806	1 1 1 1	RES 6.8kohm 5% 1/4W	328682J
R531,532			(TONE VR - bass)			R807	1 1 1 1	FP-MO-RES 1.5kohm 5% 1W	361152L
R533,534	2 2 2 2		RES 1.8kohm 5% 1/4W	328182J		R808	1 1 1 1	FP-MO-RES 4.7kohm 5% 1W	361472L
R535,536	2 2 2 2		RES 2.2kohm 5% 1/4W	328222J					
R537,538			(TONE VR - treble)						
R539,540	2 2 2 2		RES 820ohm 5% 1/4W	328821J					
R541,542	2 2 2 2		RES 1 meg.ohm 5% 1/4W	328105J					

# 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	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (TA = 25°C unless otherwise specified)					ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25°C unless otherwise specified)													MANUFACTURER			
			Collector-to-Base Voltage VCB0 (V)	Emitter-to-Base Voltage VEB0 (V)	Collector Current Ic (mA)	Collector Dissipation Pc (mW)	Junction Temperature Tj (°C)	Collector Cutoff Current ICBO (uA)	VCE (V)	hFE	VCE (V)	Ic (mA)	VCE(sat) (V)	Ic (mA)	IB (mA)	fT (MHz)	VCE* (V)	IE (mA)	Output Capacitance Cob (pF)	Base Spreading Resistance $\gamma_{bb'}$ (res) (Ω)		VCE* (V)	IE (mA)	
2SA733A (P, Q)	AF	PNP Si-E	-60	-5	-100	250	125	-0.1	-60	135 ~ 400	-6	-1	-0.3	-100	-10	180	-6	-10	6					NEC
2SA798 (F, G)	AF: Low noise differential amp.	PNP Dual Si-EP	-70	-5	-100	200	125	-0.1	-50	250 ~ 800	-8	-1	-0.6 max.	-10	-1	100	-6	-1	3					MITSUBISHI
2SA953 (L, M)	AF: Driver	PNP Si-E	-60	-5	-300	600	150	-0.18	-60	90 ~ 270	-1	-50	-0.6 max.	-300	-30	100	-6	-10	25 max.					NEC
2SA991 (E, F)	AF: Low noise	PNP Si-E	-60	-5	-100	500	125	-0.05	-60	300 ~ 600	-6	-1	-0.5	-100	-10	90	-6	-1	10 max.					NEC
2SB618 (Q, R)	AF: Power amp.	PNP Si-Td	-150	-5	-7A	80W (Tc=25°C)	150	-50	-120	60 ~ 200	-5	-1A	-2 max.	-5A	-0.5A	14	-5	-0.2A*	340	Complementary to 2SD588				NEC
2SB647A (B, C)	AF	PNP Si-E	-120	-5	-1A	0.9W	150	-10	-100	60 ~ 200	-5	-150	-1	-500	-50	140	-5	-150*	20	Complementary to 2SD667A				HITACHI
2SC945L (P, Q)	AF	NPN Si-E	60	5	100	250	125	0.1	120	135 ~ 400	6	1	0.15	100	10	250	6	-10	3.5					NEC
2SC1627 (O, Y)	AF: Driver	NPN Si-E	80	5	300	600	150	0.1	50	70 ~ 240	2	50	0.5	200	10	100	10	10	2					TOSHIBA
2SC1675 (L, M)	RF, Mixer, Osc. (in FM/AM radio)	NPN Si-E	50	5	30	250	125	0.1	50	40 ~ 180	6	1	0.08	10	1	250	6	1	2	Cc, $\gamma_{bb'}$ = 10 pS	6*	-10		NEC
2SC2002 (L, M)	AF: Driver	NPN Si-E	60	5	300	600	150	0.1	60	90 ~ 270	1	50	0.6 max.	300	30	140	6	10	15 max.					NEC
2SD288 (L, M)	AF: Power amp.	NPN Si-Td	80	5	2A	20W (Tc=25°C)	150	10	50	40 ~ 120	5	0.5A	1	1A	0.1A									NEC
2SD588 (Q, R)	AF: Power amp.	NPN Si-Td	150	5	7A	80W (Tc=25°C)	150	50	120	60 ~ 200	5	1A	2 max.	5A	0.5A	15	5	0.2A*	190	Complementary to 2SB618				NEC
2SD666A (B, C)	AF	NPN Si-E	120	5	50	0.9W	150	10	100	60 ~ 200	5	10	2	30	3	140	10	10*	3					HITACHI
2SD667A (B, C)	AF	NPN Si-E	120	5	1A	0.9W	150	10	100	60 ~ 200	5	150	1	500	50	140	5	150*	12	Complementary to 2SB647A				HITACHI

## FIELD EFFECT TRANSISTORS

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (TA = 25°C unless otherwise specified)							ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25°C unless otherwise specified)													MANUFACTURER			
			Gate-to-Drain Voltage VGD0 (V)	Gate-to-Source Voltage VGS0 (V)	Gate Current Ig (mA)	Drain Current ID (mA)	Total Dissipation Pd (mW)	Channel Temperature Tch (°C)	Gate Leak Current IGS (nA)	Gate to Drain Breakdown Voltage VBRD0 (V)	Drain Current IDSS (mA)	Gate to Source Cutoff Voltage VGS(off) (V)	Forward Transfer Admittance  Yf  (mg)	Feed Back Capacitance Coss (pF)	Power Gain Gps (dB)	Noise Figure NF (dB)										
2SK104 (F)	AF, RF General	Si N-channel junction	-30	-30	10	20	250	125	VGS = -30V	10			VDS = 5V	1 ~ 3	VDS = 5V ID = 10mA	-1.1	VDS = 5V VGS = 0 f = 1KHz	4.1	VDS = 10V VGS = 0 f = 1KHz	0.9						NEC

## DIODES, LED'S

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (TA = 25°C unless otherwise specified)							ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25°C unless otherwise specified)							MANUFACTURER					
			Reverse Surge Voltage VR (V)	Peak Reverse Voltage VRM (V)	Reverse Voltage VR (V)	Peak Forward Voltage VFM (V)	Peak Forward Current IFM (mA)	Average Rectified Current IO (mA)	Forward Surge Current IF surge (A)	Junction Temperature Tj (°C)	Total Power Dissipation Pd (mW)	Forward Current IF (mA)	Forward Voltage VF (V)	Reverse Current IR (uA)	Others							
1SS53	Detector, Medium Speed switching	Si-EP		35	30		300	100	2	200	500		0.8	1	0.1	30						NEC
GP30D	Rectifier	Si-DJ		200				3A	125	150		1.1	3A	5								GENERAL INSTRUMENT
GL-2PG1	Lamp (green)	GaP			5			IF = 30mA		85	85		2.8	20	10	4	IV = 0.3mcd (IF = 20mA)					SHARP
GL-2AR1	Lamp (red)	GaAsP			4		200	IF = 40mA		85	80		1.9	20	100	3	IV = 0.6mcd (IF = 20mA)					SHARP

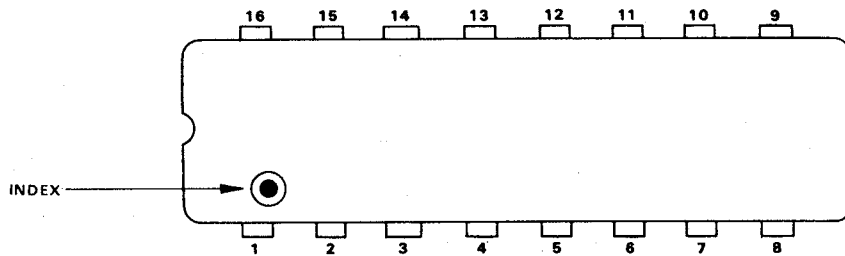
## ZENER DIODES

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (TA = 25°C unless otherwise specified)			ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25°C unless otherwise specified)										MANUFACTURER		
			Total Power Dissipation Pd (mW)	Zener Current Iz (A)	Junction Temperature Tj (°C)	Zener Voltage Vz			Differential Resistance rz (Ω)	Temperature Coefficient Tz		Reverse Current IR		Others				
						MIN (V)	TYP (V)	MAX (V)		TYP (%/°C)	MAX (%/°C)	Iz (mA)	VR (V)					
RD2.2 EC		Si junction	400		175	2.2	2.45	20	120	20			120	0.7				NEC
RD6.2 EB1		Si junction	400		175	5.96	6.27	20	20	20			5	1.5				NEC
RD 13 EB1		Si junction	400		175	12.99	13.66	10	25	10			2	10				NEC
RD 22 EB4		Si junction	400		175	21.52	22.63	5	60	5			2	17				NEC

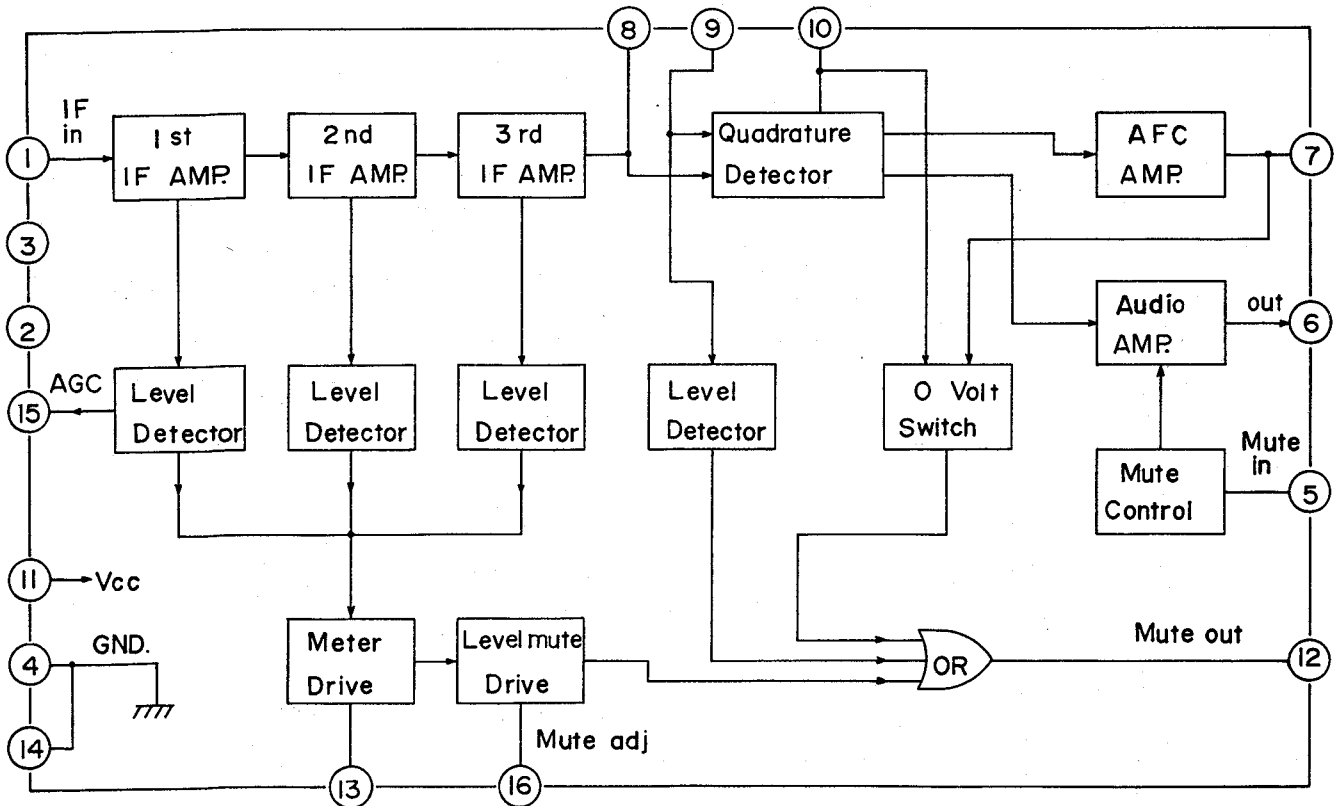
INTEGRATED CIRCUITS HA11225

DEVICE TYPE	APPLICATION	ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25°C)				ELECTRICAL CHARACTERISTICS (T <sub>A</sub> = 25°C) Typical Values							MANUFACTURER
		Supply Voltage V <sub>CC</sub> (V)	Power Dissipation P <sub>T</sub> (mW)	Operating Temperature Range T <sub>opr</sub> (°C)	Storage Temperature Range T <sub>sig</sub> (°C)	Supply Current (mA)	Input Limiting Sensitivity V <sub>in</sub> (lim) (μV)	AF Voltage (mVrms)	Total Harmonic Distortion (%)	Signal to Noise Ratio (dB)	AM Rejection (dB)	Muting Sensitivity (μV)	
HA11225	FM IF Amplifier, Quadrature Detector	14	590 (T <sub>a</sub> =60°C)	-20 ~ +70	-55 ~ +125	33 max.	35 (-3dB point)	380	0.1 max.	84	54	158	HITACHI

TERMINAL GUIDE (TOP VIEW)



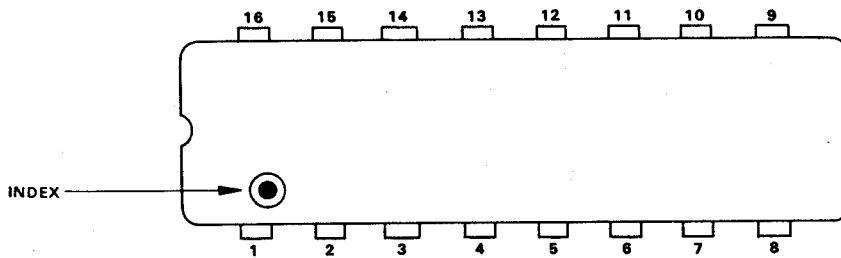
BLOCK DIAGRAM



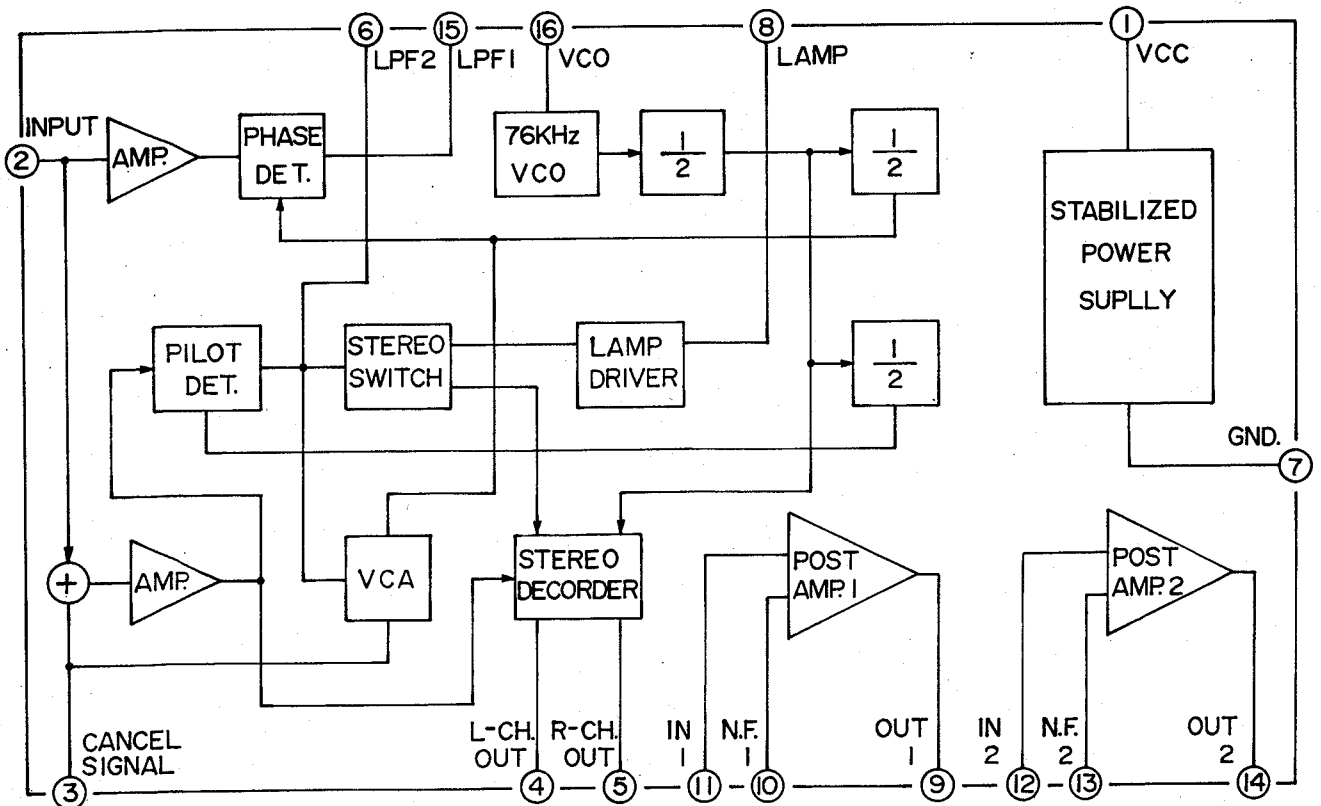
INTEGRATED CIRCUITS TA7624P

DEVICE TYPE	APPLICATION	MAXIMUM RATINGS Absolute - Maximum Values: (T <sub>A</sub> = 25°C)				ELECTRICAL CHARACTERISTICS Typical Values: (T <sub>A</sub> = 25°C)								MANUFACTURER
		Supply Voltage (V)	Power Dissipation (mW)	Operating Temperature Range (°C)	Lamp Current (mA)	Supply Current (mA)	Stereo Separation (dB)	Voltage Gain (dB)	Channel Balance (dB)	T. H. D. (mono) (%)	T. H. D. (stereo) (%)	Signal to Noise Ratio (dB)	Lamp ON Sensitivity (mV)	
TA7624P	FM Stereo Demodulator	16	750	-30 ~ +75	45	21 max.	55 (f = 1 kHz)	11	1.5 max.	0.01	0.02	86	25 max. Pilot Input	TOSHIBA

TERMINAL GUIDE (TOP VIEW)



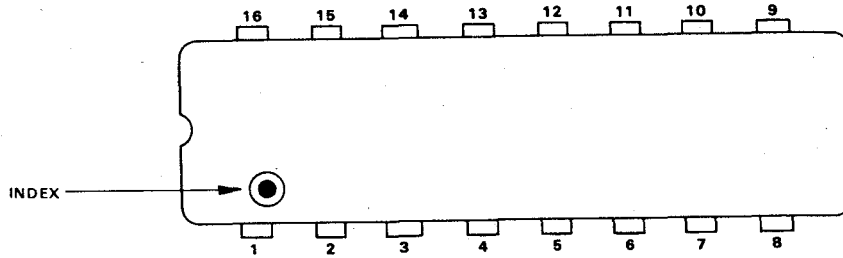
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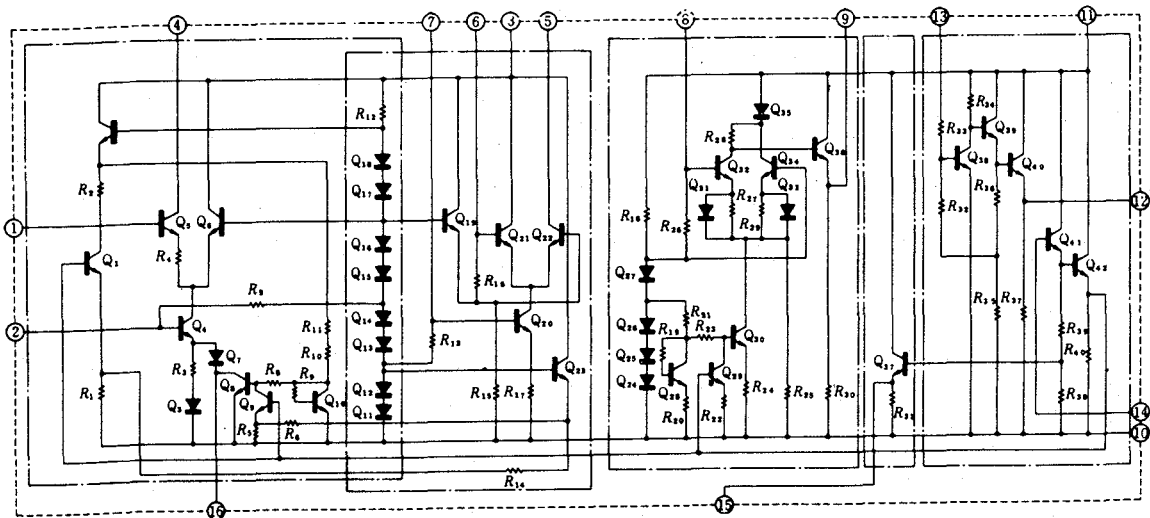
INTEGRATED CIRCUITS HA1197

DEVICE TYPE	APPLICATION	ABSOLUTE MAXIMUM RATING (T <sub>A</sub> = 25°C)				ELECTRICAL CHARACTERISTICS (TYPICAL VALUES) T <sub>A</sub> = 25°C				MANUFACTURER
		Voltage Supply V <sub>cc</sub> (V)	Power Dissipation P <sub>d</sub> (mW) (T <sub>a</sub> = 70°C)	Operating Temp Range T <sub>opt</sub> (°C)	Storage Temp Range T <sub>stg</sub> (°C)	Signal to Noise Ratio Input = 74dBμ Mod = 30% (dB)	Distortion Input = 100dBμ Mod = 30% (%)	Output Voltage Input = 74dBμ Mod = 30% (mV)	Quiescent Current (mA)	
HA1197	AM Radio	15	450	-20 ~ +70	-55 ~ +125	53	0.4	212	14.5	HITACHI

TERMINAL GUIDE (TOP VIEW)



SCHEMATIC DIAGRAM



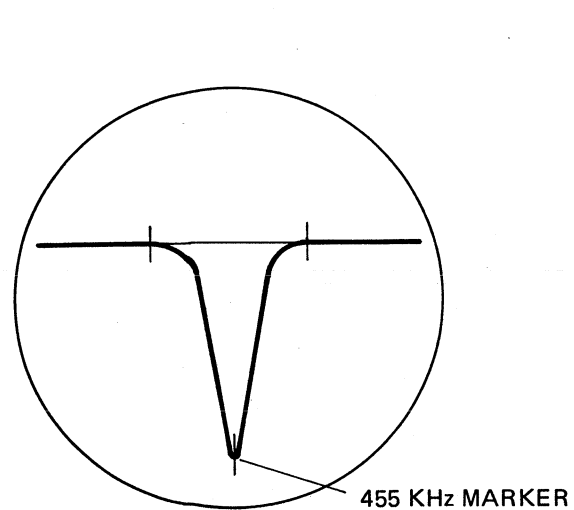


Figure 7. AM IF

**MAIN AMP SECTION ADJUSTMENT**

**Idling Current Adjust**

Connect 8 ohms dummy load to speaker terminals. Set volume controls to minimum (fully counterclockwise). Using high sensitivity DC voltmeter, adjust R727 so that the voltage difference between T. P. (near by Q713;

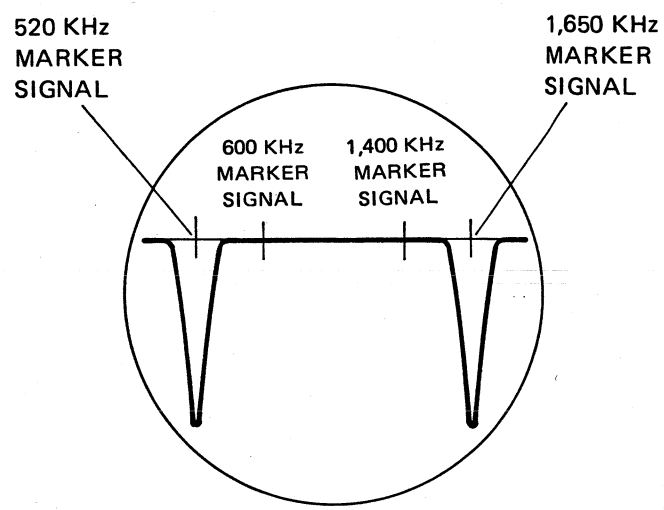
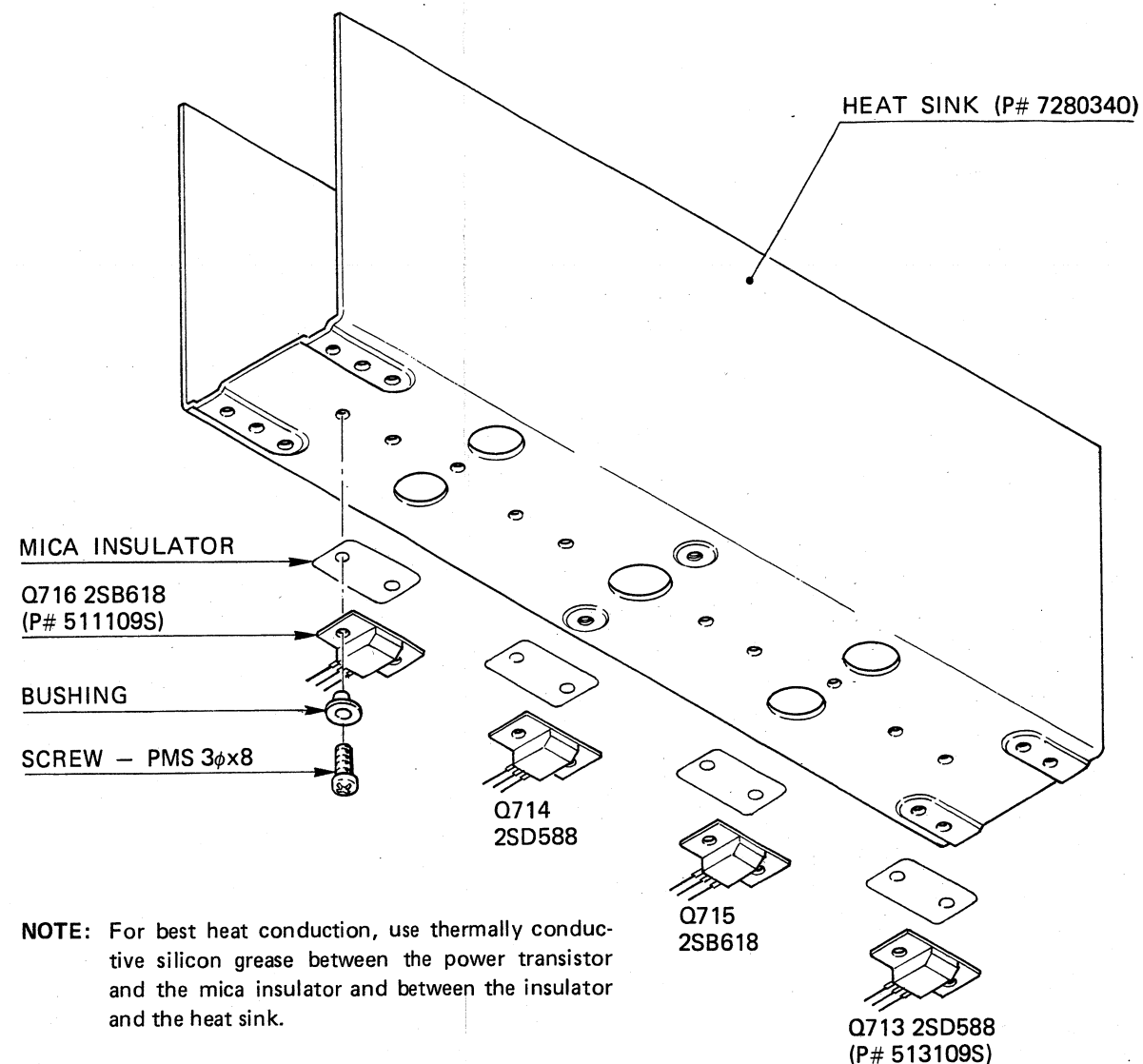


Figure 8. AM Frequency Coverage

2SD588) and speaker terminal (left channel, + side) is 4.7 to 14.1 milivolts, or 9.4 milivolts average. Similarly, adjust R728 so that the voltage difference between T. P. (near by Q716; 2SB618) and speaker terminal (right channel, + side) is above value.

**POWER TRANSISTORS MOUNTING ASSEMBLY**



**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.

4. If one output transistor burns out (open or shorts), always remove all output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohmmeter before inserting a new transistor. All output transistors in one channel will be destroyed if the base biasing circuit is open in the emitter end.
5. Replacement of transistors and components in the front-end, IF stage and multiplex decoder will not normally require realignment of these circuits, unless absolutely necessary. Do not attempt a realignment unless the required test equipment is available and the alignment procedure is thoroughly understood.

# SCHEMATIC DIAGRAM

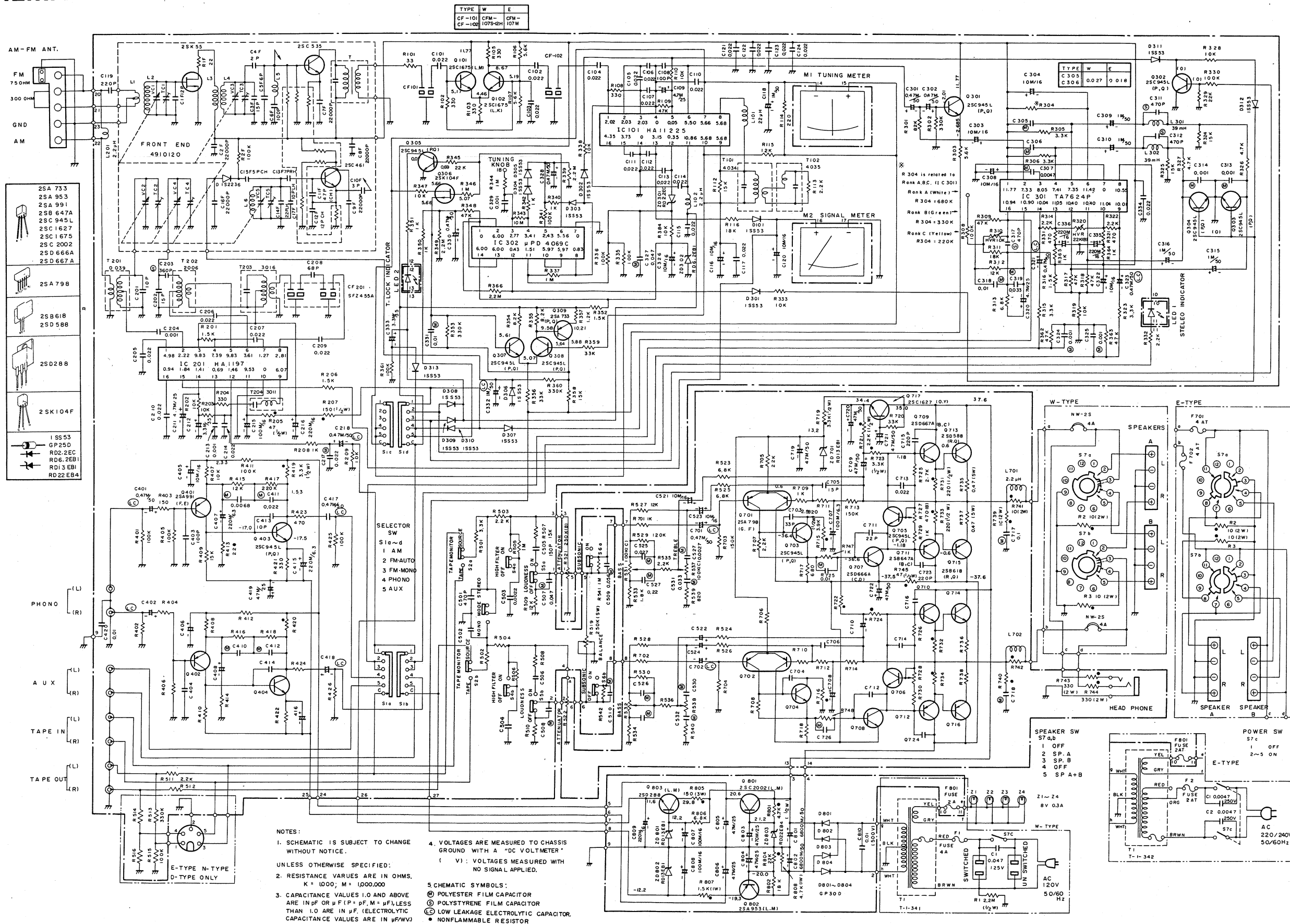


Figure 10





# NOTICE

## FRONT END

The circuit of new type front end, as follows.

FF124U

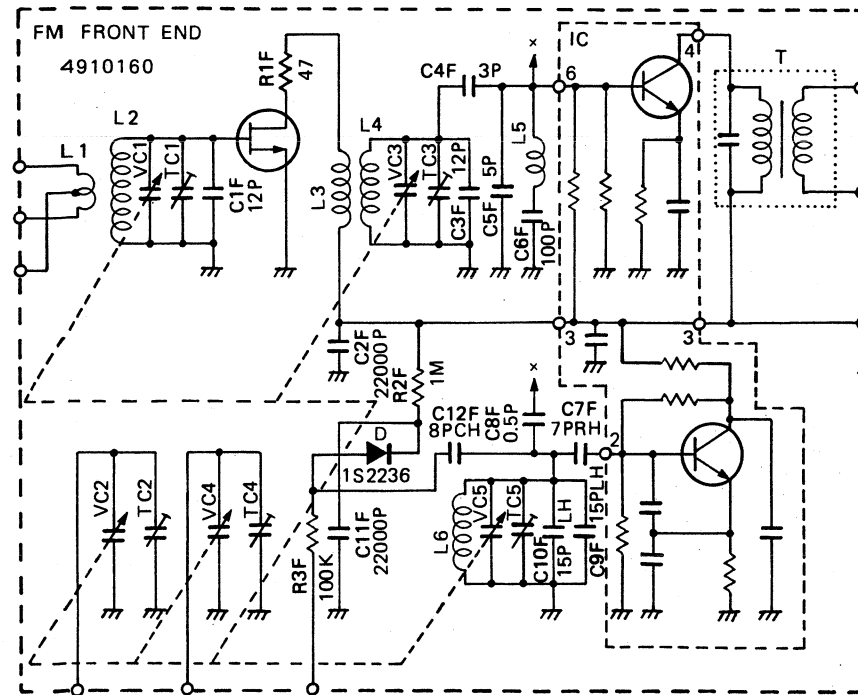


Figure 12

## D-TYPE

The circuit and the parts of D-type are to be changed as follows.

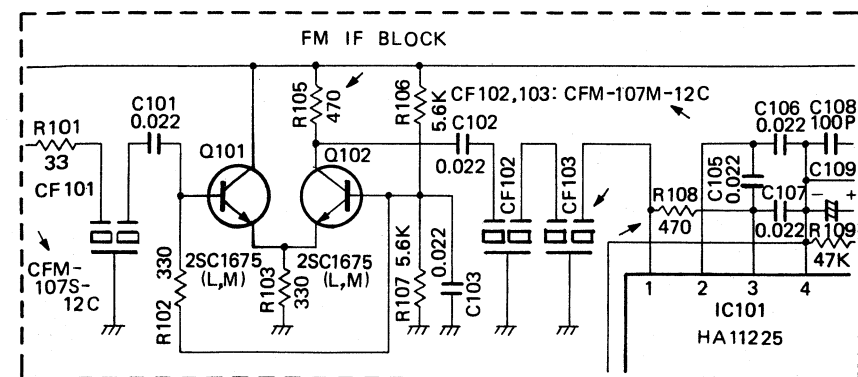


Figure 13

	SYMBOL No.	D - TYPE	W, E & N - TYPE
CERAMIC FILTER	CF 101	CFM - 107S - 12C	CFM - 107S - 12H
	CF 102		NONE
	CF 103		NONE
CAPACITOR	C 104	NONE	C-CAP. 0.022
RESISTOR	R 105	470 OHMS	330 OHMS
	R 108		

# DIAL CORD INSTALLATION

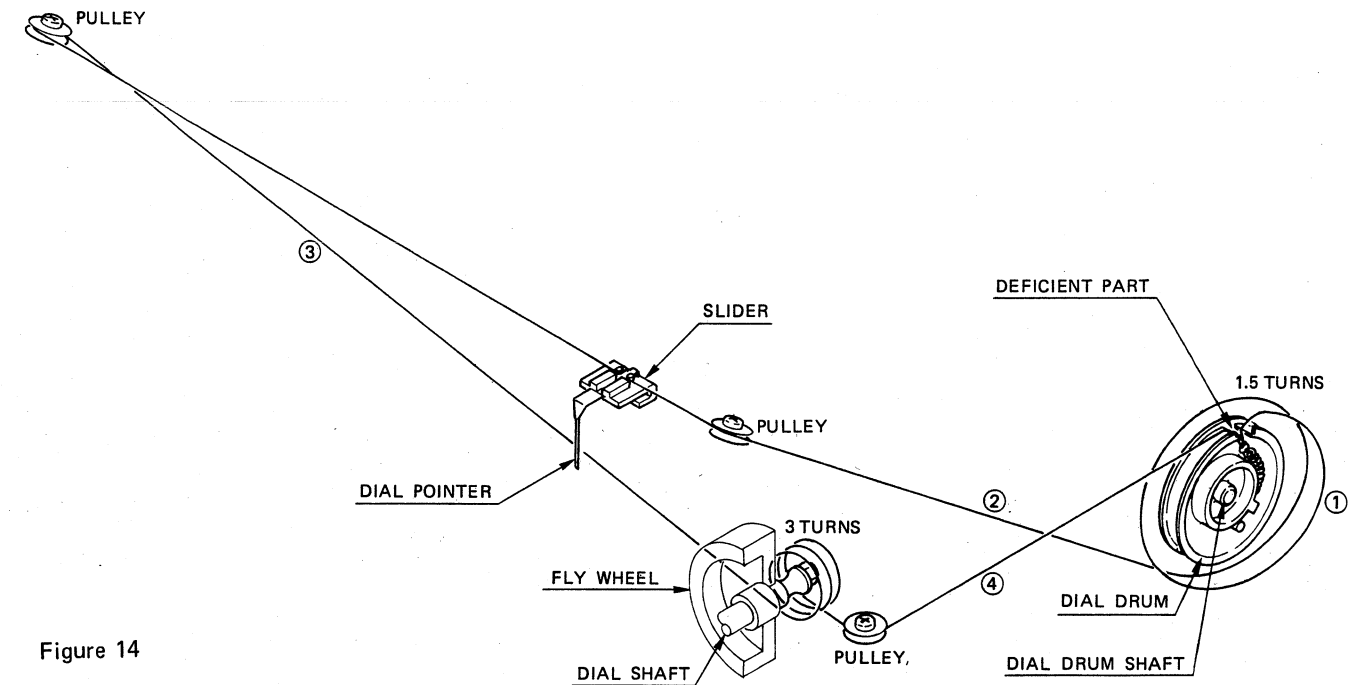


Figure 14

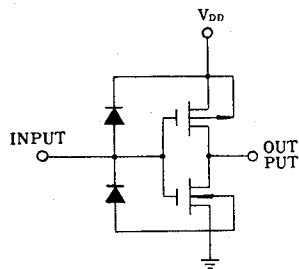
1. Remove an old dial cord.
2. Turn the dial drum shaft counter-clockwise until the rotor of the variable capacitor is completely out of the stator. If the deficient part of the dial drum is not in a straight line with the dial drum shaft (vertically), loosen the dial drum drive screws and adjust the 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. 14 (in circled numbered order).
4. Fix the dial pointer to the string and adjust to high frequency end (approx. 109.65 MHz) position when the rotor of the variable capacitor is completely out of the stator.

**INTERGRATED CIRCUITS  $\mu$ PD4069C**

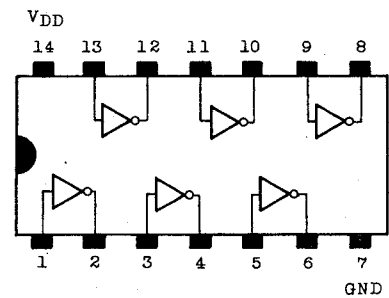
**FUNCTION/MANUFACTURER**

- Hex Inverter/NEC

**EQUIVALENT CIRCUIT AND CONNECTION INFORMATION**



(1/6 CIRCUIT SHOWN)



TOP VIEW



***MEMO***

A series of horizontal dotted lines for taking notes.