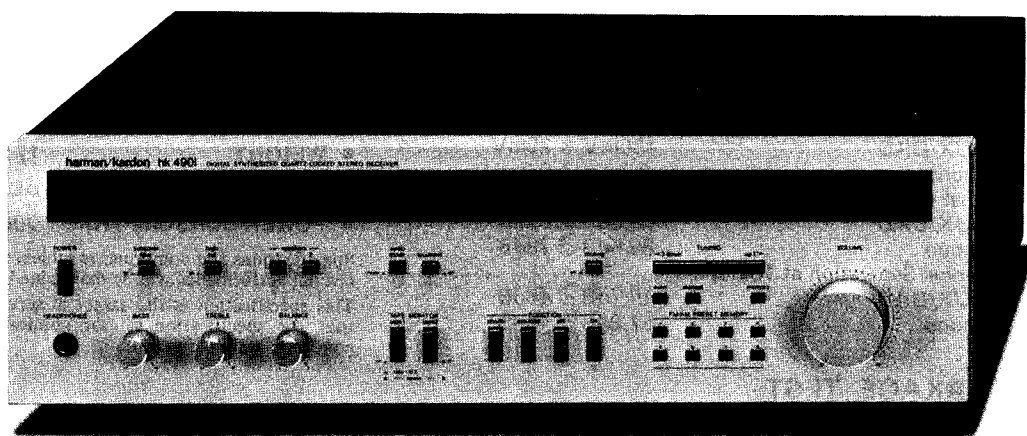


The Harman Kardon Model hk490i

Manual No. 58A

DIGITAL SYNTHESIZED QUARTZ-LOCKED STEREO RECEIVER

Technical Manual



hk490i

harman/kardon

240 CROSSWAYS PARK WEST, WOODBURY, N.Y. 11797
1112-H15258A5 P-08834 1650 PRINTED IN JAPAN

SPECIFICATIONS

• FM SECTION

	Nominal	Limit
Tuning Range	87.5 ~ 108.0MHz	
50dB Quieting Sensitivity		
Mono	15.2dBf	≤ 17dBf
Stereo	36.2dBf	≤ 38dBf
Usable Sensitivity	10.5dBf	≤ 12.5dBf
Image Ratio	79.4dB	≥ 60dB
IF Rejection	76dB	≥ 70dB
Spurious Response Rejection	97.8dB	≥ 80dB
Capture Ratio	1.5dB	≤ 2.5dB
Alternate Channel Selectivity	73.3dB	≥ 50dB
AM Rejection	52.4dB	≥ 45dB
Signal to Noise Ratio		
Mono	82.5dB	≥ 78dB
Stereo	74.5dB	≥ 72dB
Total Harmonic Distortion (65dBf 1kHz Input)		
Mono	0.08%	≤ 0.2%
Stereo	0.1%	≤ 0.3%
Stereo Separation at 1kHz	53.5dB	≥ 45dB

• AM SECTION

Tuning Range	520 ~ 1,710kHz
Usable Sensitivity	17μV
Selectivity	31.3dB ≥ 22dB
Signal to Noise Ratio	53dB ≥ 50dB
Image Rejection	33dB ≥ 28dB
IF Rejection	61dB ≥ 50dB

• AUDIO SECTION

Usable Sensitivity	
AUX/DAD	135mV ± 25mV
Phono	2.2mV ± 0.2mV
Signal to Noise Ratio	
AUX/DAD	83.8dB ≥ 82dB
Phono	80.5dB ≥ 78dB
Channel Separation at 10kHz	
AUX/DAD	49.7dB ≥ 45dB
Phono	52.0dB ≥ 45dB

IM Distortion Ratio	Nominal Limit 0.1% ≤ 0.25%
RMS Output Power	
8Ω, 1kHz, THD 0.09%	36W ≥ 30W
4Ω, 1kHz, THD 0.2%	49.6W ≥ 40W
Damping Factor at 1kHz	65 ≥ 45
Tone Control Characteristics	
Bass at 50Hz	
Boost	10dB ± 2dB
Cut	-10dB ± 2dB
Treble at 10kHz	
Boost	10dB ± 2dB
Cut	-10dB ± 2dB
Loudness Control	
at 10kHz	3dB ± 1dB
at 50Hz	10dB ± 3dB
Subsonic Control	
at 15Hz	3dB ± 1dB
High Cut Control	
at 6kHz	3dB ± 1dB
DC Output Voltage	
L channel	0mV ± 60mV
R channel	0mV ± 60mV
RIAA Equalization at Tape Out (20Hz/20kHz)	
	0.4dB +1.0dB / -0.5dB -0.3dB -0.5dB

• **DIMENSIONS (W x H x D)** 17-3/8" x 5-1/4" x 14-3/8"
(443 x 134 x 365 mm)

• **WEIGHT** 17 lbs. 10 oz. (8.0 kg)

• **POWER SUPPLY** AC120V, 60Hz

• **POWER CONSUMPTION** 200W (220VA)

Specifications and components subject to change without notice. Overall performance will be maintained or improved.

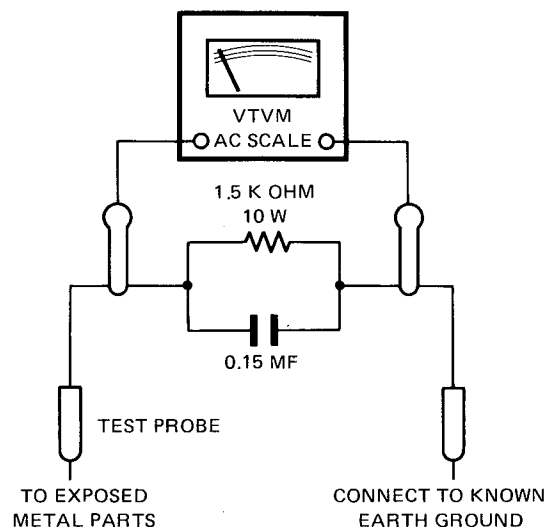
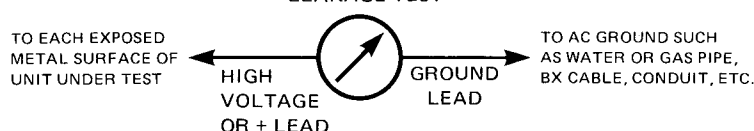
This specification is the target of servicing. But, there is a case that the specification is not applicable to the measurement condition and instrument.

LEAKAGE TEST

Before returning the unit to the user, perform the following safety checks:

1. Inspect all lead dress to make certain that leads are not pinched or that hardware is not lodged between the chassis and other metal parts in the unit.
2. Replace all protective devices such as nonmetallic control knobs, insulating fishpapers, cabinet backs, adjustment and compartment covers or shields, isolation resistor/capacitor networks, mechanical insulators, etc.
3. Be sure that no shock hazard exists; check for leakage current using Simpson Model 229 Leakage Tester, standard equipment item No. 21641, RCA Model WT540A or use alternate method as follows:
Plug the AC line cord directly into a 120-volt AC receptacle (do not use an Isolation Transformer for this test). Using two clip leads, connect a 1500 ohm, 10-watt resistor paralleled by a 0.15mf capacitor, in series with all exposed metal cabinet parts and a known earth ground, such as a water pipe or conduit. Use a VTVM or VOM with 1000 ohms per volt, or higher, sensitivity to measure the AC voltage drop across the resistor. (See Diagram.) Move the resistor connection to each exposed metal part having a return path to the chassis (antenna, metal, cabinet, screw heads, knobs and control shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor. (This test should be performed with the power switch in both the On and Off positions.)
A reading of 0.35 volt RMS or more is excessive and indicates a potential shock hazard which must be corrected before returning the unit to the owner.

SIMPSON MODEL 229 ETC. FOR
LEAKAGE TEST



ALIGNMENT PROCEDURES

■ AMPLIFIER SECTION

● DC balance and idling adjustments

- Conditions: ● Set the function switch to aux/DAD.
 ● Set the volume to minimum.
 ● Set the speaker system switches 1 and 2 to OFF.
 ● Make the adjustment at a room temperature of 25°C.

Step	Item	Connections required	Adjustment location	Correct value
1	DC balance adjustment	Connect the digital voltmeter between TP1 and ground.	VR403 (L channel)	$0 \pm 30\text{mV}$
2		Connect the digital voltmeter between TP2 and ground.	VR404 (R channel)	$0 \pm 30\text{mV}$
3	Idling adjustment	Connect the digital voltmeter to TP3 and TP4.	VR401 (L channel)	33mV
4		Connect the digital voltmeter to TP5 and TP6.	VR402 (R channel)	33mV
5	Repeat steps 1 through 4 after aging for 5 minutes.			

■ TUNER SECTION

1. STANDARD FREQUENCY CHECK

- Condition: ● Set the function switch to FM.

Step	Connections required	Measurement frequency	Station display	Adjustment location	Adjustment method
1	● Connect the frequency counter to TP7 (+) and ground (—).		98.3 MHz		$109\text{MHz} \pm 2\text{kHz}$

2. AM ALIGNMENT

- Conditions: ● Set the function switch to AM.
 ● Set the muting switch to off (—).

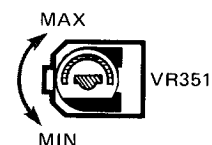
Step	Item	Connections required	Measurement frequency	Station display	Adjustment location	Adjustment method
1	Tuning voltage adjustment	● Connect the DC voltmeter to TP11 (+) and ground (—).		520kHz	L252	$1.5\text{V} \pm 0.05\text{V}$
2				1710kHz	TC252	$23\text{V} \pm 0.5\text{V}$
3	IF adjustment	● Radiate output of AM signal generator (400Hz 30% modulation) to AM loop antenna. ● Connect oscilloscope to TP8 (+) and ground (—).	450kHz	1600kHz	T251 T252	Adjust so that peak and good waveform.
4	Tracking adjustment	● Radiate output of AM signal generator (400Hz 30% modulation) to AM loop antenna. ● Connect oscilloscope and AC voltmeter to TAPE 1 OUT terminal.	600kHz	600kHz	L251	Maximize the output level.
5			1400kHz	1400kHz	TC251	
6			Repeat steps 4 and 5.			
7	Tuned indicator adjustment	● Radiate output of AM signal generator (400Hz 30% modulation) to AM loop antenna.	1000kHz	1000kHz	VR251	Adjust so that the tuned indicator lights at 54dB input.

3. FM ALIGNMENT

- Conditions: ● Set the function switch to FM.
 ● Set the muting switch to off (—).

Step	Item	Connections required	Measurement frequency	Station display	Adjustment location	Adjustment method
1	Discriminator adjustment	● Connect the FM signal generator (1kHz 100% modulation) to FM 300Ω BAL ANT terminals through the 300Ω balanced dummy. ● Connect the oscilloscope and distortion meter to TAPE 1 OUT terminals.	98.14MHz	98.1MHz	T201 (A)	Adjust so that the waveforms in steps 1 and 2 become the same level. At this time tuned indicator lights.
2			98.06MHz	98.1MHz	T201 (A)	
3			98.1MHz	98.1MHz	T201 (B)	Adjust so that the distortion become minimum.
4		Repeat steps 1 through 3.				
5	Tuned indicator adjustment	● Same as above. ● Connect the DC voltmeter to TP9 (+) and ground (—).			VR202	Adjust so that the tuned indicator lights at 10μV input.
6	Signal indicator adjustment				VR201	Adjust so that the DC voltage becomes 12V at 1mV input. And then, confirm the five signal indicator lights.
7	MPX adjustment	● Connect the stereo modulator (L + R = 45.5%, L — R = 45.5%, 19kHz = 9%) to FM signal generator. ● Apply signal generator output to FM 300Ω BAL ANT terminals through the 300Ω balanced dummy. ● Connect the frequency counter to TP10 (+) and ground (—). ● Connect the oscilloscope and AC voltmeter to TAPE 1 OUT terminals.	98.1MHz (unmodulation)	98.1MHz	VR303	$75.95\text{kHz} \pm 0.05\text{kHz}$
8			98.1MHz	98.1MHz	VR351 (MAX)	Confirm the stereo indicator lights at $30\mu\text{V} \pm 3\text{dB}$ input.
9			98.1MHz	98.1MHz	VR301	Set the stereo modulator to 19kHz only. Adjust so that L and R output level becomes minimum.
10			98.1MHz	98.1MHz	VR302	Adjust so that the right channel output becomes minimum when only the left channel of the stereo modulator modulated and so that the left channel output becomes minimum when only the right channel modulated.

NOTE) Adjustment of step 8 should be done after setting the VR351 in the position as shown in the figure.



ALIGNMENT PROCEDURES

■ AMPLIFIER SECTION

● DC balance and idling adjustments

- Conditions:
- Set the function switch to aux/DAD.
 - Set the volume to minimum.
 - Set the speaker system switches 1 and 2 to OFF.
 - Make the adjustment at a room temperature of 25°C.

Step	Item	Connections required	Adjustment location	Correct value
1	DC balance adjustment	Connect the digital voltmeter between TP1 and ground.	VR403 (L channel)	$0 \pm 30\text{mV}$
2		Connect the digital voltmeter between TP2 and ground.	VR404 (R channel)	$0 \pm 30\text{mV}$
3	Idling adjustment	Connect the digital voltmeter to TP3 and TP4.	VR401 (L channel)	33mV
4		Connect the digital voltmeter to TP5 and TP6.	VR402 (R channel)	33mV
5	Repeat steps 1 through 4 after aging for 5 minutes.			

■ TUNER SECTION

1. STANDARD FREQUENCY CHECK

- Condition: ● Set the function switch to FM.

Step	Connections required	Measurement frequency	Station display	Adjustment location	Adjustment method
1	● Connect the frequency counter to TP7 (+) and ground (-).		98.3 MHz		$109\text{MHz} \pm 2\text{kHz}$

2. AM ALIGNMENT

- Conditions:
- Set the function switch to AM.
 - Set the muting switch to off (—).

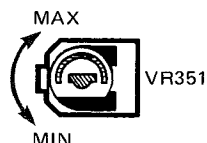
Step	Item	Connections required	Measu- rement frequency	Station display	Adjustment location	Adjustment method
1	Tuning voltage adjustment	● Connect the DC voltmeter to TP11 (+) and ground (–).		520kHz	L252	1.5V ± 0.05V
2				1710kHz	TC252	23V ± 0.5V
3	IF adjustment	● Radiate output of AM signal generator (400Hz 30% modulation) to AM loop antenna. ● Connect oscilloscope to TP8 (+) and ground (–).	450kHz	1600kHz	T251 T252	Adjust so that peak and good waveform.
4	Tracking adjustment	● Radiate output of AM signal generator (400Hz 30% modulation) to AM loop antenna. ● Connect oscilloscope and AC voltmeter to TAPE 1 OUT terminal.	600kHz	600kHz	L251	Maximize the output level.
5			1400kHz	1400kHz	TC251	
6			Repeat steps 4 and 5.			
7	Tuned indicator adjustment	● Radiate output of AM signal generator (400Hz 30% modulation) to AM loop antenna.	1000kHz	1000kHz	VR251	Adjust so that the tuned indicator lights at 54dB input.

3. FM ALIGNMENT

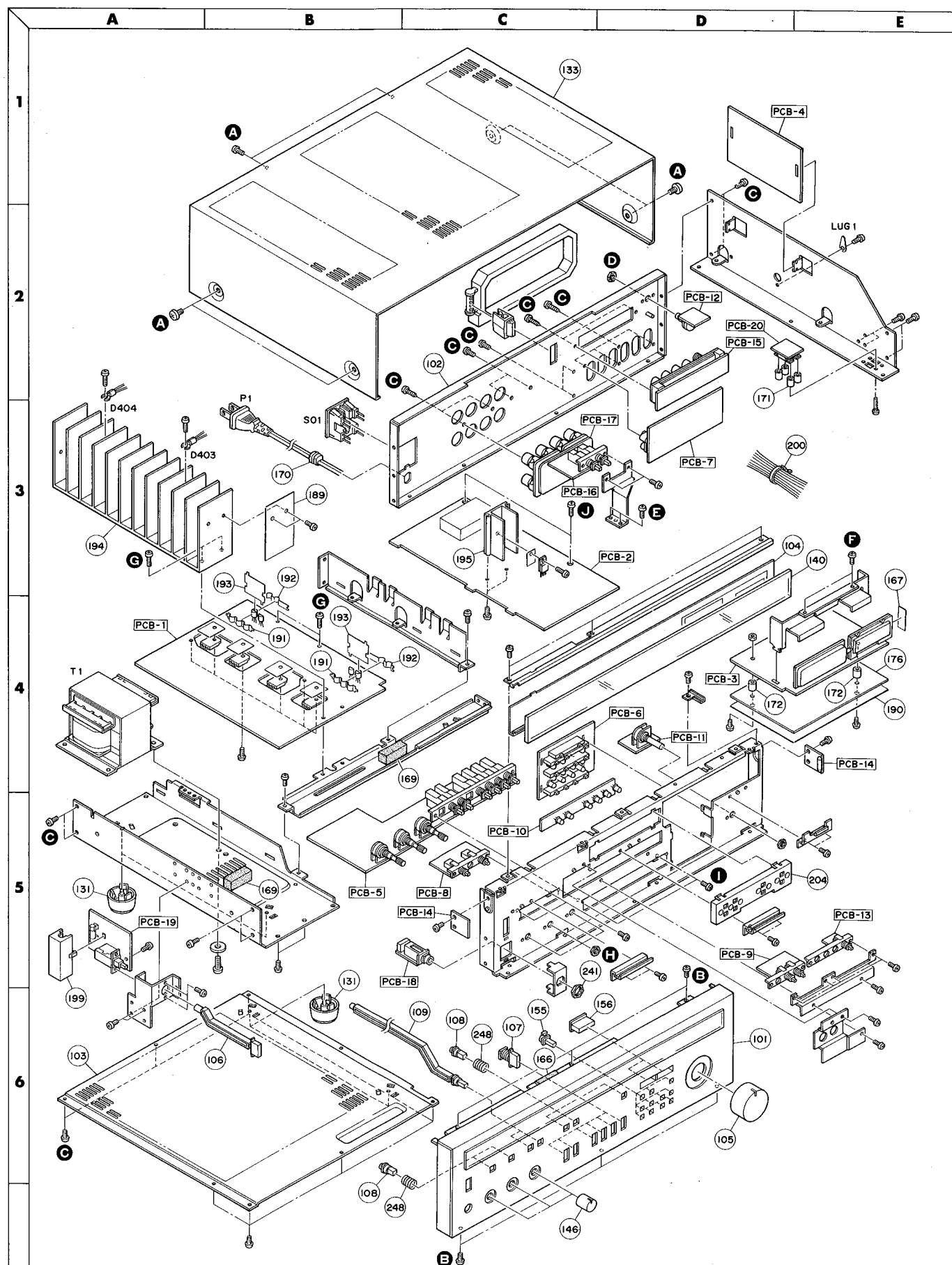
- Conditions: • Set the function switch to FM.
• Set the muting switch to off (—).

Step	Item	Connections required	Measure- ment frequency	Station display	Adjustment location	Adjustment method
1	Discrimi- nator adjustment	- Connect the FM signal generator (1kHz 100% modulation) to FM 300Ω BAL ANT terminals through the 300Ω balanced dummy. - Connect the oscilloscope and distortion meter to TAPE 1 OUT terminals.	98.14MHz	98.1MHz	T201 (A)	Adjust so that the wave- forms in steps 1 and 2 become the same level. At this time tuned indi- cator lights.
2			98.06MHz	98.1MHz	T201 (A)	
3			98.1MHz	98.1MHz	T201 (B)	Adjust so that the dis- tortion become mini- mum.
4			Repeat steps 1 through 3.			
5	Tuned indicator adjustment	- Same as above. - Connect the DC voltmeter to TP9 (+) and ground (—).			VR202	Adjust so that the tuned indicator lights at 10μV input.
6	Signal indicator adjustment				VR201	Adjust so that the DC voltage becomes 12V at 1mV input. And then, confirm the five signal indicator lights.
7	MPX adjustment	- Connect the stereo modulator (L + R = 45.5%, L — R = 45.5%, 19kHz = 9%) to FM signal generator. - Apply signal generator output to FM 300Ω BAL ANT terminals through the 300Ω balanced dummy. - Connect the frequency counter to TP10 (+) and ground (—). - Connect the oscilloscope and AC voltmeter to TAPE 1 OUT terminals.	98.1MHz (unmo- dulation)	98.1MHz	VR303	75.95kHz ± 0.05kHz
8			98.1MHz	98.1MHz	VR351 (MAX)	Confirm the stereo indi- cator lights at 30μV ± 3dB input.
9			98.1MHz	98.1MHz	VR301	Set the stereo modu- lator to 19kHz only. Adjust so that L and R output level becomes minimum.
10			98.1MHz	98.1MHz	VR302	Adjust so that the right channel output becomes minimum when only the left channel of the stereo modulator modulated and so that the left chan- nel output becomes mini- mum when only the right channel modulated.

NOTE) Adjustment of step 8 should be done after setting the VR351 in the position as shown in the figure.



GENERAL UNIT EXPLODED VIEW



DISASSEMBLY PROCEDURES (REFER TO PAGES 5 AND 16)

1 CABINET TOP REMOVAL

Remove 6 screws **A** and then remove the cabinet top.

2 FRONT PANEL ASSEMBLY REMOVAL

1. Remove the cabinet top. (Refer to step 1.)
2. Pull off Volume, Bass, Treble and Balance knobs (105 and 146).
3. Remove 6 screws **B** and then remove the front panel assembly.

3 SPEAKER SWITCH AND SPEAKER TERMINAL P.C. BOARDS (PCB-16 AND PCB-17) REMOVAL

1. Remove the front panel assembly. (Refer to step 2.)
2. Pull off push button assembly (109).
3. Remove 19 screws **C** and a hexagonal nut **D**, and remove the cabinet back assembly (102) with AC outlet (SO1). If necessary, unsolder the leads.
4. Remove 2 screws **E** and then remove speaker switch and speaker terminal P.C. boards (PCB-16 and PCB-17). If necessary, unsolder the leads.

4 LOGIC CONTROL P.C. BOARD (PCB-3) REMOVAL

1. Remove the front panel assembly. (Refer to step 2.)
2. Disconnect J701 and J706 from P701 and P706 on the logic control P.C. board (PCB-3).
3. Open the lid of connectors (P702, 703, 704, 705, 707, 708) on the logic control P.C. board (PCB-3) and then disconnect the lead wires.
4. Remove 2 screws **F** and then remove the logic control P.C. board (PCB-3).

CIRCUIT DESCRIPTION

[1] MUTING CIRCUIT

The muting control voltage is taken out from ⑫ pin of IC201 and then fed to the base of Q203. At the weak station or detuned point the ⑫ pin becomes high level, Q203 becomes low, Q355 is turned off, Q357 and Q358 are turned to on, Q302 (Lch) and Q303 (Rch) are turned to ON and muting operation is completed.

[2] SYNTHESIZER SECTION**1) FM**

The output of local oscillator in the front-end is fed to ⑤ pin of the pre-scaler IC701 and then divided by 30 or 32 and fed to ② pin of the PLL synthesizer IC702. The standard quartz oscillator output (4.5MHz) is divided by 180 in IC702 and 25kHz standard signal is got. The divided local oscillator output is compared with the 25kHz standard signal in the phase comparator. When the divided local oscillator frequency is higher than standard frequency, ③ pin of IC702 becomes high level but when it is lower, ③ pin of IC702 becomes low level. When the both frequencies are equal, ③ pin becomes floating.

③ pin output of IC702 is fed to the vari-cap diode of the front-end through L.P.F. (Q702, Q703, Q712) and controls the frequency of VCO (local oscillator frequency).

2) AM

The local oscillator output of AM IC251 is fed to ③ pin of the PLL synthesizer IC702 and divided. The standard quartz oscillator output (4.5MHz) is divided by 450 in IC702 and 10kHz standard signal is got. The divided local oscillator output is compared with the 10kHz standard signal in phase comparator.

5 MAIN AMP. P.C. BOARD (PCB-1) REMOVAL

1. Remove the speaker switch and speaker terminal P.C. boards (PCB-16 and PCB-17). (Refer to step 3.)
2. Open the lid of connectors (P101, 102) on the main amp. P.C. board (PCB-1) and then disconnect the lead wires.
3. Open the lid of connector (P301) on the tuner P.C. board (PCB-2) and then disconnect the lead wire.
4. Remove 4 screws **G** and then remove the main P.C. board (PCB-1). If necessary, unsolder the leads.

6 TONE P.C. BOARD (PCB-5) REMOVAL

1. Remove the main P.C. board (PCB-1). (Refer to step 5.)
2. Remove 3 hexagonal nuts **H** and 2 screws **I**, and remove tone P.C. board (PCB-5) backward. If necessary, unsolder the leads.

7 TUNER P.C. BOARD (PCB-2) REMOVAL

1. Remove the logic control P.C. board (PCB-3). (Refer to step 4.)
2. Open the lid of connectors (P301, 351, 352) and then disconnect the lead wires.
3. Remove 2 screws **J** and then remove the tuner P.C. board (PCB-2). If necessary, unsolder the leads.

[3] PRESET MEMORY**1) Memorizing**

When one of the preset keys, M1 to M8 is depressed, one of the ⑫ to ⑲ pins of IC702 becomes high level. The displayed frequency is memorized into the memory (RAM) with correspond to the depressed key.

2) Recalling

When one of the preset keys, M1 to M8 is depressed, the contents of the memory (frequency) is recalled.

[4] FM/AM STATION SCANNING**1) When tuning mode switch is set to AUTO**

When the UP key is depressed, the frequency rises at saw tooth wave mode and when DOWN key is depressed, the frequency falls. When the high level input is fed to stop, terminal (③ pin of IC702), the scanning is stopped.

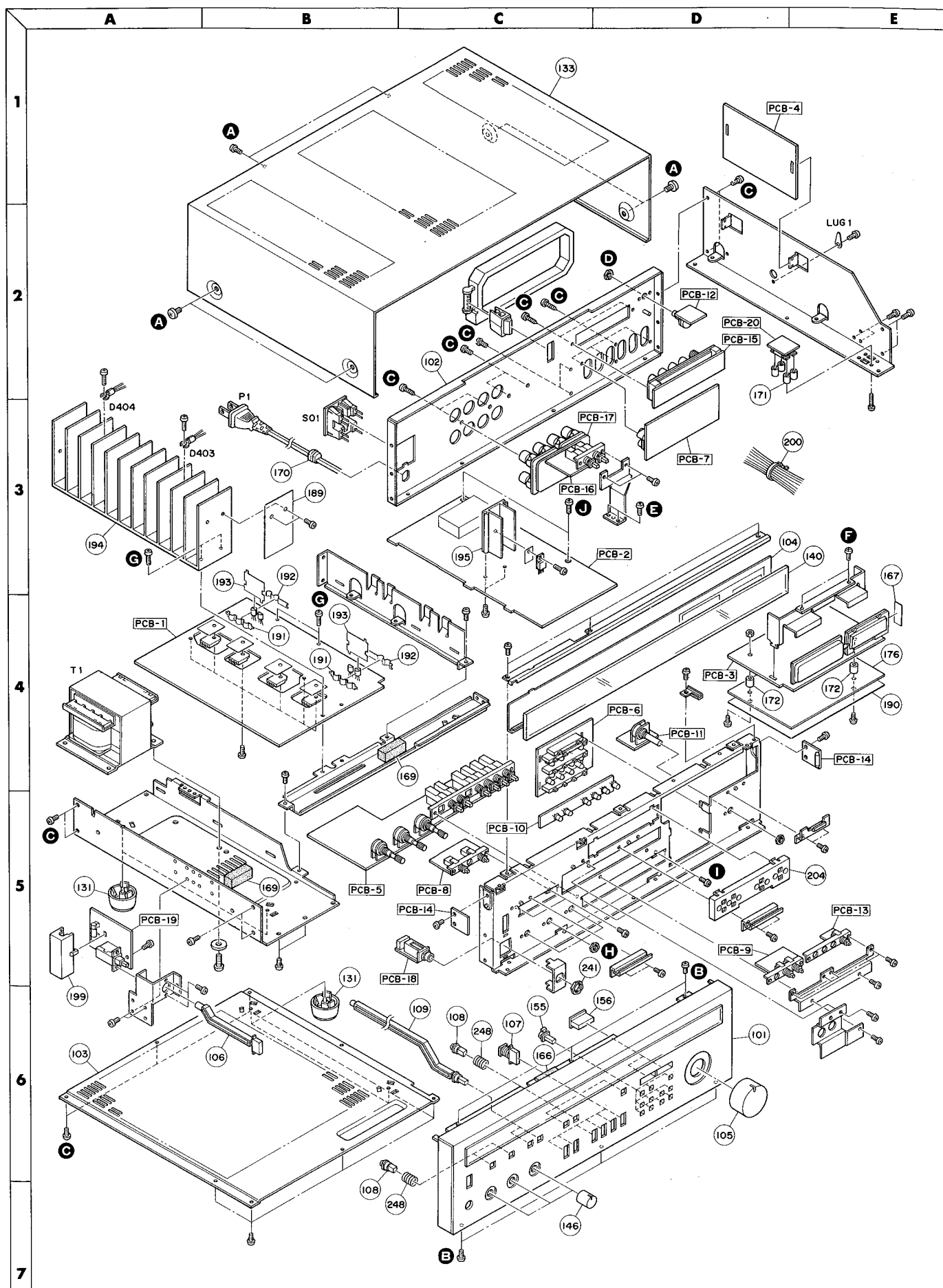
2) When tuning mode switch is set to MANUAL

Whenever UP or DOWN key is depressed once, the frequency rises or falls by one step (channel space).

[5] OVERLOAD PROTECTION

As soon as the current over rated power flows, the voltage between both emitters of Q421 and Q423 (Rch) rises and Q7, Q9 and Q4 are turned ON. So Q1 (Schmitt trigger circuit) is turned ON. The base of Q10 becomes 0V and Q1 is turned off. The operation of power amp. circuit stops and the circuit is protected.

GENERAL UNIT EXPLODED VIEW



DISASSEMBLY PROCEDURES (REFER TO PAGES 5 AND 16)

1 CABINET TOP REMOVAL

Remove 6 screws (A) and then remove the cabinet top.

2 FRONT PANEL ASSEMBLY REMOVAL

1. Remove the cabinet top. (Refer to step 1.)
2. Pull off Volume, Bass, Treble and Balance knobs (105 and 146).
3. Remove 6 screws (B) and then remove the front panel assembly.

3 SPEAKER SWITCH AND SPEAKER TERMINAL P.C. BOARDS (PCB-16 AND PCB-17) REMOVAL

1. Remove the front panel assembly. (Refer to step 2.)
2. Pull off push button assembly (109).
3. Remove 19 screws (C) and a hexagonal nut (D), and remove the cabinet back assembly (102) with AC outlet (SO1). If necessary, unsolder the leads.
4. Remove 2 screws (E) and then remove speaker switch and speaker terminal P.C. boards (PCB-16 and PCB-17). If necessary, unsolder the leads.

4 LOGIC CONTROL P.C. BOARD (PCB-3) REMOVAL

1. Remove the front panel assembly. (Refer to step 2.)
2. Disconnect J701 and J706 from P701 and P706 on the logic control P.C. board (PCB-3).
3. Open the lid of connectors (P702, 703, 704, 705, 707, 708) on the logic control P.C. board (PCB-3) and then disconnect the lead wires.
4. Remove 2 screws (F) and then remove the logic control P.C. board (PCB-3).

5 MAIN AMP. P.C. BOARD (PCB-1) REMOVAL

1. Remove the speaker switch and speaker terminal P.C. boards (PCB-16 and PCB-17). (Refer to step 3.)
2. Open the lid of connectors (P101, 102) on the main amp. P.C. board (PCB-1) and then disconnect the lead wires.
3. Open the lid of connector (P301) on the tuner P.C. board (PCB-2) and then disconnect the lead wire.
4. Remove 4 screws (G) and then remove the main P.C. board (PCB-1). If necessary, unsolder the leads.

6 TONE P.C. BOARD (PCB-5) REMOVAL

1. Remove the main P.C. board (PCB-1). (Refer to step 5.)
2. Remove 3 hexagonal nuts (H) and 2 screws (I), and remove tone P.C. board (PCB-5) backward. If necessary, unsolder the leads.

7 TUNER P.C. BOARD (PCB-2) REMOVAL

1. Remove the logic control P.C. board (PCB-3). (Refer to step 4.)
2. Open the lid of connectors (P301, 351, 352) and then disconnect the lead wires.
3. Remove 2 screws (J) and then remove the tuner P.C. board (PCB-2). If necessary, unsolder the leads.

CIRCUIT DESCRIPTION

[1] MUTING CIRCUIT

The muting control voltage is taken out from (12) pin of IC201 and then fed to the base of Q203. At the weak station or detuned point the (12) pin becomes high level, Q203 becomes low, Q355 is turned off, Q357 and Q358 are turned to on, Q302 (Lch) and Q303 (Rch) are turned to ON and muting operation is completed.

[2] SYNTHESIZER SECTION

1) FM

The output of local oscillator in the front-end is fed to (5) pin of the pre-scaler IC701 and then divided by 30 or 32 and fed to (37) pin of the PLL synthesizer IC702. The standard quartz oscillator output (4.5MHz) is divided by 180 in IC702 and 25kHz standard signal is got. The divided local oscillator output is compared with the 25kHz standard signal in the phase comparator. When the divided local oscillator frequency is higher than standard frequency, (35) pin of IC702 becomes high level but when it is lower, (35) pin of IC702 becomes low level. When the both frequencies are equal, (35) pin becomes floating.

(35) pin output of IC702 is fed to the vari-cap diode of the front-end through L.P.F. (Q702, Q703, Q712) and controls the frequency of VCO (local oscillator frequency).

2) AM

The local oscillator output of AM IC251 is fed to (39) pin of the PLL synthesizer IC702 and divided. The standard quartz oscillator output (4.5MHz) is divided by 450 in IC702 and 10kHz standard signal is got. The divided local oscillator output is compared with the 10kHz standard signal in phase comparator.

[3] PRESET MEMORY

1) Memorizing

When one of the preset keys, M1 to M8 is depressed, one of the (12) to (19) pins of IC702 becomes high level. The displayed frequency is memorized into the memory (RAM) with correspond to the depressed key.

2) Recalling

When one of the preset keys, M1 to M8 is depressed, the contents of the memory (frequency) is recalled.

[4] FM/AM STATION SCANNING

1) When tuning mode switch is set to AUTO

When the UP key is depressed, the frequency rises at saw tooth wave mode and when DOWN key is depressed, the frequency falls. When the high level input is fed to stop, terminal (33) pin of IC702, the scanning is stopped.

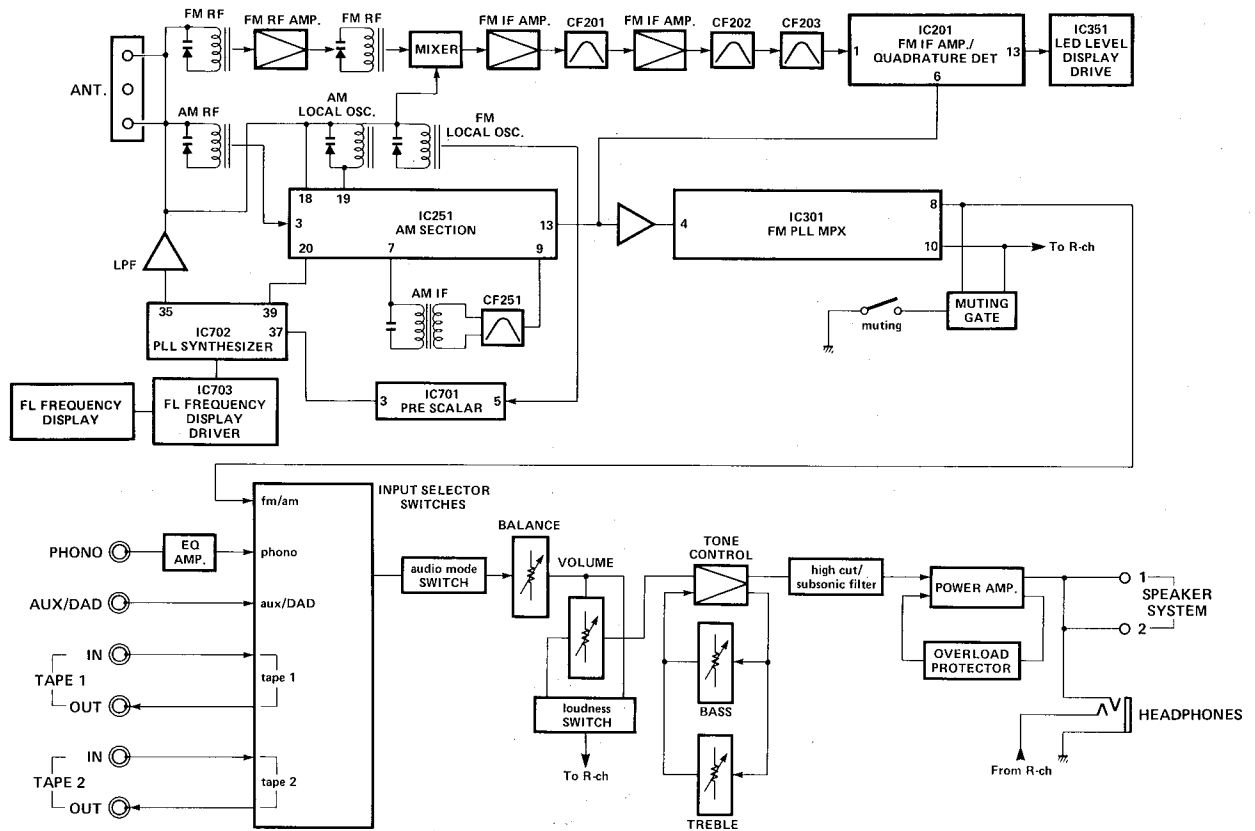
2) When tuning mode switch is set to MANUAL

Whenever UP or DOWN key is depressed once, the frequency rises or falls by one step (channel space).

[5] OVERLOAD PROTECTION

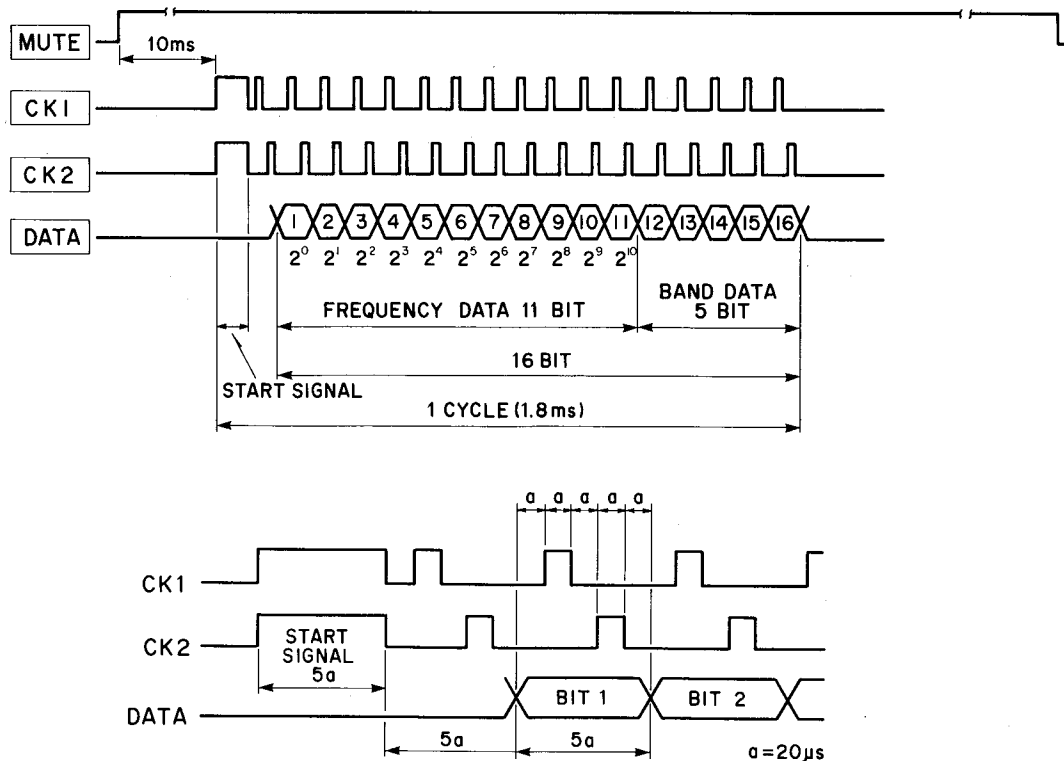
As soon as the current over rated power flows, the voltage between both emitters of Q421 and Q423 (Rch) rises and Q7, Q9 and Q4 are turned ON. So Q1 (Schmitt trigger circuit) is turned ON. The base of Q10 becomes 0V and Q1 is turned off. The operation of power amp. circuit stops and the circuit is protected.

BLOCK DIAGRAM



TIMING CHART

Frequency display timing chart of IC702 (TC9147AP)



GENERAL UNIT PARTS LIST

Ref. No.	Part No.	Description
101	A443-HK490A	Front Panel Assembly
102	A424-HK490A	Cabinet Back Assembly
103	A424-HK490B	Cabinet Bottom Assembly
104	A554-HK490A	Dial Back Assembly
105	A630-HK490A	Knob Assembly, Volume
106	A662-HK490A	Push Button Assembly, Power
107	A662-HK490B	Push Button Assembly, Tape Monitor, Function
108	A662-HK490C	Push Button Assembly, Subsonic Filter, High Cut, Audio Mode, Loudness, Muting
109	A662-HK490D	Push Button Assembly, Speakers
131	1319-0139	Foot
133	1414-03901	Cabinet Top
140	1541-02301	Dial Panel
146	1630-02501	Knob, Bass, Treble, Balance
155	1662-12701	Push Button, Auto, Manual, Memory, FM/AM Preset Memory
156	1662-12801VN	Push Button, Tuning
166	2112-11762	Sponge
167	2111-11738	Felt
169	2112-11769	Sponge
170	2114-415027	Bushing
171	2132-01401	Spacer
172	2132-5052	Spacer
176	2216-7142	Shield Plate
189	2224-7083	Insulator
190	2216-7143	Shield Plate
191	2222-7100	Heat Sink
192	2222-7101	Heat Sink
193	2222-7103	Heat Sink
194	2222-7148	Heat Sink
195	2222-7149	Heat Sink
199	2240-7176	Holder
200	2240-7120	Holder
204	2240-7206	Holder
241	2440-61	Special Nut
248	2651-210189	Spring
	2211-7240	Chassis, Front
	2211-7241	Chassis, T1
	2211-7242	Chassis, Right
	2219-7645	Bracket, Dial Back Upper Side
	2219-7671	Bracket, Dial Panel Right Side
	2219-7879	Bracket, PCB-18
	2219-7913	Bracket, Transverse Direction
	2219-7914	Bracket, PCB-3
	2219-7915	Bracket, Vertical Direction
	2219-7916	Bracket, Speakers Switch
	2219-7917	Bracket, Power Switch
	2219-7919	Bracket, Tape Monitor & Function Switches
	2219-7920	Bracket, Dial Back Hold (Left, Center)
	2219-7921	Bracket, Dial Back Hold (Right)
	2219-7946	Bracket, Speakers Switch Shaft
	1111-J30130	Owner's Guide
	1222-7263	Cushion (2 Used)
	1221-717167	Carton Box

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
CHASSIS MISCELLANEOUS		
P1	4161-71151	AC Line Cord
T1	5584-701426	Power Transformer
SO1	4474-157	AC Outlet, Switched, Unswitched
R1	5135-335J50P	Resistor, 3.3M Ω , $\pm 5\%$, 1/2W, Carbon
J701	4163-70196	Connector with Lead Wire, 5Pos.
J706	4163-023503	Connector with Lead Wire, 2Pos.
Lug 1	4211-4	Lug Terminal
PCB-1 MAIN AMP. P.C. BOARD		
RESISTORS		
R61, 423, 424, 425, 426, 427, 428, 429, 430	5102-2214713	220 Ω , $\pm 2\%$, 1/4W, Fuse
R417, 418	5174-222381	2.2k Ω , $\pm 1\%$, 1/4W, Metal
R437, 438, 439, 440	5102-6804713	68 Ω , $\pm 2\%$, 1/4W, Fuse
R455, 456, 457, 458	5102-1004713	10 Ω , $\pm 2\%$, 1/4W, Fuse
R459, 460	5174-820381	82 Ω , $\pm 1\%$, 1/4W, Metal
R461, 462	5273-R22672	0.22 Ω , $\pm 10\%$, 3Wx2, Cement
R467, 468	5173-100571	10 Ω , $\pm 5\%$, 2W, Metal
R475, 476	5171-471572	470 Ω , $\pm 5\%$, 1W, Metal
R479, 480	5102-3314713	330 Ω , $\pm 2\%$, 1/4W, Fuse
CONTROLS		
VR401, 402	5101-20171920	200 Ω B
VR403, 404	5101-10471920	100k Ω B
CAPACITORS		
C4, 12	5345-476F041	47 μ F, $\pm 20\%$, 50V, Electrolytic
C5, 6, 7, 8	5341-478F0955	4700 μ F, $\pm 20\%$, 50V, Electrolytic
C9	5345-107C041	100 μ F, $\pm 20\%$, 16V, Electrolytic
C10	5345-476C041	47 μ F, $\pm 20\%$, 16V, Electrolytic
C11	5345-106C041	10 μ F, $\pm 20\%$, 16V, Electrolytic
C13	5345-477G041	470 μ F, $\pm 20\%$, 63V, Electrolytic
C401, 402	5345-107B0951	100 μ F, $\pm 20\%$, 10V, Electrolytic
C403, 404	5359-2215851	220pF, $\pm 5\%$, 100V, Polypropylene
C405, 406	5345-106D041	10 μ F, $\pm 20\%$, 25V, Electrolytic
C407, 408, 409, 410	5345-227F041	220 μ F, $\pm 20\%$, 50V, Electrolytic
C415, 416	5353-050934	5pF, ± 0.5 pF, 500V, Mica
C417, 418	5345-106F041	10 μ F, $\pm 20\%$, 50V, Electrolytic
TRANSISTORS		
Q1, 2, 4, 10	5611-1115(E)	2SA1115(E) or 2SA1115(F)
Q7, 8	5611-872(E)	2SA872(E)
Q9, 405, 406	5613-2603(E)	2SC2603(E) or 2SC2603(F)
Q401, 402, 403, 404	5613-2240(BL)	2SC2240(BL)
Q407, 408, 409, 410, 411, 412	5611-1145(Y)	2SA1145(Y)
Q413, 414	5613-2705(Y)	2SC2705(Y)
Q415, 416	5613-945(K)	2SC945(K) or 2SC945(P)
Q417, 418	5613-2235(Y)	2SC2235(Y)
Q419, 420	5611-965(Y)	2SA965(Y)
Q421, 422	5613-3181(O)	2SC3181(O)
Q423, 424	5611-1264(O)	2SA1264(O)
DIODES		
D1, 2, 3, 4	5632-ERC102FL	ERC102FL
D5, 6, 11, 12	5636-1S2471	1S2471
D7	5635-HZ11B2L	Zener, HZ11B2L
D8, 13, 14, 401, 402, 409, 410	5636-1S2473	1S2473
D403, 404	5641-MV12YM	Varistor, MV12YM
D405, 406, 407, 408	5632-DS135E	DS135E
D411, 412	5635-HZ12C3L	Zener, HZ12C3L

Ref. No.	Part No.	Description
COILS		
L401, 402	5991-7165	
MISCELLANEOUS		
P101, 102	4443-030185	Connector, 3Pos.
PCB-2 TUNER P.C. BOARD		
RESISTORS		
R51	5102-3R3579	3.3 Ω , $\pm 5\%$, 1/4W, Fuse
R305	5102-2204713	22 Ω , $\pm 2\%$, 1/4W, Fuse
R323	5174-183381	18k Ω , $\pm 1\%$, 1/4W, Metal
CONTROLS		
VR201, 251	5101-50371920	50k Ω B
VR202	5101-20371920	20k Ω B
VR301, 302, 351	5101-10471920	100k Ω B
VR303	5101-1037187	10k Ω
CAPACITORS		
C51	5345-337-16	330 μ F, +50%–10%, 16V, Electrolytic
C52, 220	5345-108-16	1000 μ F, +50%–10%, 16V, Electrolytic
C201, 304	5345-476-16	47 μ F, +50%–10%, 16V, Electrolytic
C208, 217, 257, 351, 352	5345-106-16	10 μ F, +50%–10%, 16V, Electrolytic
C214	5359-1015851	100pF, $\pm 5\%$, 100V, Polypropylene
C215	5345-105-50	1 μ F, +75%–10%, 50V, Electrolytic
C216	5345-226C0952	22 μ F, $\pm 20\%$, 16V, Electrolytic
C218, 260	5345-L104M50	0.1 μ F, $\pm 20\%$, 50V, Electrolytic
C263	5345-107-16	100 μ F, +50%–10%, 16V, Electrolytic
C266	5345-335-50	3.3 μ F, +75%–10%, 50V, Electrolytic
C267	5345-475-25	4.7 μ F, +75%–10%, 25V, Electrolytic
C269	5359-5115851	510pF, $\pm 5\%$, 100V, Polypropylene
C271	5345-225-50	2.2 μ F, +75%–10%, 50V, Electrolytic
C301, 303	5345-L226M16	22 μ F, $\pm 20\%$, 16V, Electrolytic
C302	5345-L107M10	100 μ F, $\pm 20\%$, 10V, Electrolytic
C305	5345-227-16	220 μ F, +50%–10%, 16V, Electrolytic
C309, 310	5359-6815851	680pF, $\pm 5\%$, 100V, Polypropylene
C311, 312	5345-L225M50	2.2 μ F, $\pm 20\%$, 50V, Electrolytic
C315	5345-L106M16	10 μ F, $\pm 20\%$, 16V, Electrolytic
C316	5345-L475M25	4.7 μ F, $\pm 20\%$, 25V, Electrolytic
C317	5345-L474M50	0.47 μ F, $\pm 20\%$, 50V, Electrolytic
C320	5359-8215851	820pF, $\pm 5\%$, 100V, Polypropylene
C353	5345-474-50	0.47 μ F, +75%–10%, 50V, Electrolytic
C354	5345-226-16	22 μ F, +50%–10%, 16V, Electrolytic
TC251, 252	5371-93	Trimmer Capacitor
INTEGRATED CIRCUIT		
IC201	5652-HA11225	HA11225
IC251	5652-LA1245	LA1245
IC301	5652- μ PC1223C	μ PC1223C
IC352	5654-TC4049BP	TC4049BP
TRANSISTORS		
Q51	5614-880(GR)	2SD880(GR)
Q201, 202	5613-2058(N)	2SC2058(N) or 2SC2058(P)
Q203, 251, 252, 301, 302, 303, 352, 355, 356, 357	5613-2603(F)	2SC2603(F) or 2SC2603(E)
Q351, 353, 354, 358, 359, 360	5611-1115(F)	2SA1115(F) or 2SA1115(E)
DIODES		
D51	5635-HZ15-1L	Zener, HZ15-1L or RD15JB2
D201, 202, 203, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364	5636-1SS53	1SS53
D251, 252	5633-1SV102	Capacitor Diode, 1SV102
D351	5635-RD5R1EB2	Zener, RD5.1EB2

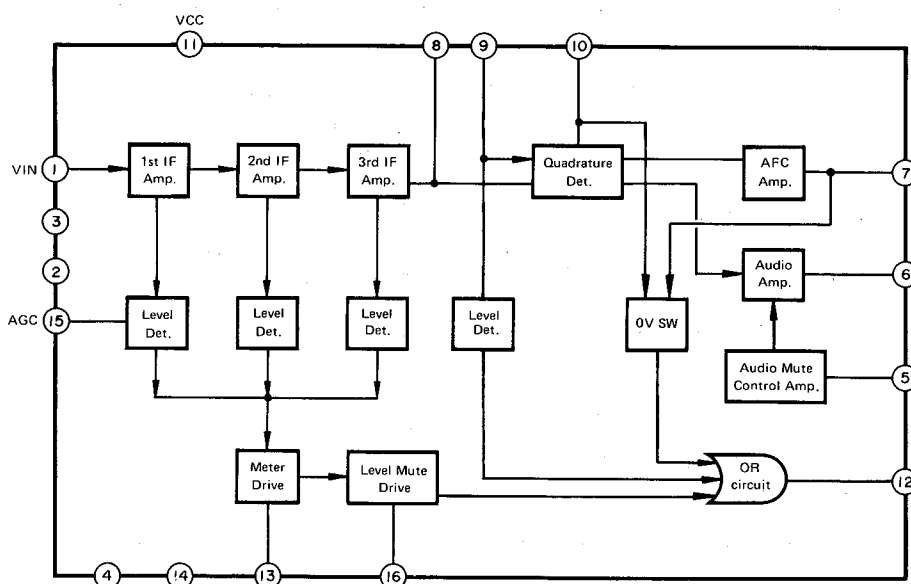
Ref. No.	Part No.	Description
	COILS	
L202	5995-2R2269	2.2 μ H
L251	5933-70127	
L252	5923-70133	
	TRANSFORMERS	
T201	5574-7024	
T251	5552-70113	
T252	5932-70123	
	MISCELLANEOUS	
CF201, 202, 203	6114-7128	FM Tuner Assembly
CF251	5671-7117A	Ceramic Filter, MA8
CF252	5671-7138F	Ceramic Filter, SFZ450F
P301, 351	5671-7137C	Ceramic Filter, BFU450C4N
P352	4443-040185	Connector, 4Pos.
	4443-010185	Connector, 7Pos.
PCB-3 LOGIC CONTROL P.C. BOARD		
	RESISTORS	
R712	5171-221581	220 Ω , $\pm$ 5%, 1W, Metal
R752, 753	5171-680581	68 Ω , $\pm$ 5%, 1W, Metal
	CAPACITORS	
C355	5345-106-16	10 μ F, +50%–10%, 16V, Electrolytic
C703	5345-476-10	47 μ F, +50%–10%, 10V, Electrolytic
C708	5345-336-35	33 μ F, +50%–10%, 35V, Electrolytic
C709	5345-334F0951	0.33 μ F, $\pm$ 20%, 50V, Electrolytic
C712	5350-4730H651	47000 μ F, +80%–20%, 5V, Special
C715	5345-227-10	220 μ F, +50%–10%, 10V, Electrolytic
C716, 717	5345-L225M50	2.2 μ F, $\pm$ 20%, 50V, Electrolytic
C721, 722	5345-225-50	2.2 μ F, +75%–10%, 50V, Electrolytic
	INTEGRATED CIRCUIT	
IC351	5652-AN6875	AN6875
IC701	5654-TD6104P	TD6104P
IC702	5654-TC9147AP	TC9147AP
IC703	5654-TD6301AP	TD6301AP
	TRANSISTORS	
Q701	5616-2SK362GR	F.E.T., 2SK362(GR)
Q702	5616-2SK117(Y)	F.E.T., 2SK117(Y)
Q703	5613-2320L(F)	2SC2320L(F) or 2SC2320L(G)
Q704, 705, 708, 709, 710, 711	5613-2603(F)	2SC2603(F) or 2SC2603(E)
Q707, 712	5611-1115(F)	2SA1115(F) or 2SA1115(E)
	DIODES	
D371, 372, 373, 374, 375, 376, 377	5623-LS007S	LED Display
D701	5635-HZ27-3L	Zener, HZ27-3L
D702, 703, 704, 705, 706	5636-1SS53	1SS53
D707	5635-RD5R6EB2	Zener, RD5.6EB2
D708	5635-RD10EB3	Zener, RD10EB3
D709	5635-RD9R1EB1	Zener, RD9.1EB1
D722, 723	5631-1S2473	1S2473
	COILS	
L701, 702	5995-2R2269	2.2 μ H
	MISCELLANEOUS	
X701	5722-10	Tube Display
F701, 702, 703	5691-00720019	Crystal Osc.
P701	5212-3	R Components
P702	4443-057114	Connector, 5Pos.
P703	4443-030185	Connector, 3Pos.
P704	4443-080185	Connector, 8Pos.
P705, 707, 708	4443-070185	Connector, 7Pos.
P706	4443-050185	Connector, 5Pos.
	4443-027114	Connector, 2Pos.

Ref. No.	Part No.	Description
PCB-4 EQUALIZER P.C. BOARD		
RESISTORS		
R37, 38	5102-1014713	100 Ω , $\pm$ 2%, 1/4W, Fuse
R623, 624	5174-Z412228	41k Ω , $\pm$ 1%, 1/4W, Metal
CAPACITORS		
C23, 24	5345-476D041	47 μ F, $\pm$ 20%, 25V, Electrolytic
C27, 28	5345-227D041	220 μ F, $\pm$ 20%, 25V, Electrolytic
C601, 602	5345-336B0951	33 μ F, $\pm$ 20%, 10V, Electrolytic
C603, 604	5359-1215851	120pF, $\pm$ 5%, 100V, Polypropylene
C605, 606	5345-337A0952	330 μ F, $\pm$ 20%, 6.3V, Electrolytic
C607, 608	5359-2025851	2000pF, $\pm$ 5%, 100V, Polypropylene
C609, 610	5359-5625851	5600pF, $\pm$ 5%, 100V, Polypropylene
C611, 612, 613, 614	5345-106C0951	10 μ F, $\pm$ 20%, 16V, Electrolytic
C617, 618	5345-336E041	33 μ F, $\pm$ 20%, 35V, Electrolytic
TRANSISTORS		
Q11	5613-1627(Y)	2SC1627(Y)
Q12	5611-817(Y)	2SA817(Y)
Q601, 602	5613-2320L(F)	2SC2320L(F)
Q603, 604	5611-999L(F)	2SA999L(F)
Q605, 606, 609, 610	5611-1115(E)	2SA1115(E) or 2SA1115(F)
Q607, 608	5613-2603(E)	2SC2603(E) or 2SC2603(F)
DIODES		
D15, 16	5635-HZ15-2L	Zener, HZ15-2L or RD15EB2
D601, 602	5635-HZ20-2L	Zener, HZ20-2L
MISCELLANEOUS		
P801	4443-040185	Connector, 4Pos.
PCB-5 TONE P.C. BOARD		
RESISTORS		
R19, 20	5102-3314713	330 Ω , $\pm$ 2%, 1/4W, Fuse
CONTROLS		
VR501/502	5113-50385122	50k Ω MN, Balance
VR505/506	5113-50371148	50k Ω C, Treble
VR507/508	5113-10472148	100k Ω C, Bass
CAPACITORS		
C17, 18	5345-476C041	47 μ F, $\pm$ 20%, 16V, Electrolytic
C21, 22	5345-227C041	220 μ F, $\pm$ 20%, 16V, Electrolytic
C505, 506	5345-106C0951	10 μ F, $\pm$ 20%, 16V, Electrolytic
C507, 508	5345-226C0951	22 μ F, $\pm$ 20%, 16V, Electrolytic
C509, 510	5345-476B0951	47 μ F, $\pm$ 20%, 10V, Electrolytic
C525, 526	5359-1015851	100pF, $\pm$ 5%, 100V, Polypropylene
TRANSISTORS		
Q5	5613-1627(Y)	2SC1627(Y)
Q6	5611-817(Y)	2SA817(Y)
Q501, 502, 503, 504	5613-2320L(F)	2SC2320L(F)
Q505, 506	5611-1115(E)	2SA1115(E) or 2SA1115(F)
DIODES		
D9, 10	5635-HZ15-2L	Zener, HZ15-2L
MISCELLANEOUS		
SW501, 502, 503, 504, 505, 506	4431-06247157	Push Switch, Tape Monitor, Function
PCB-6 LOGIC CONTROL SWITCHES P.C. BOARD		
DIODES		
D711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721	5637-GL5NG6	L.E.D., GL5NG6, Green, Auto, Manual, Memory, FM/AM Preset Memory
MISCELLANEOUS		
SW701, 702	4431-02027167	Push Switch, Tuning
SW703, 704, 705	4431-03037155	Push Switch, Auto, Manual, Memory
SW706, 707, 708, 709, 710, 711, 712, 713	4431-04047165	Push Switch, FM/AM Preset Memory

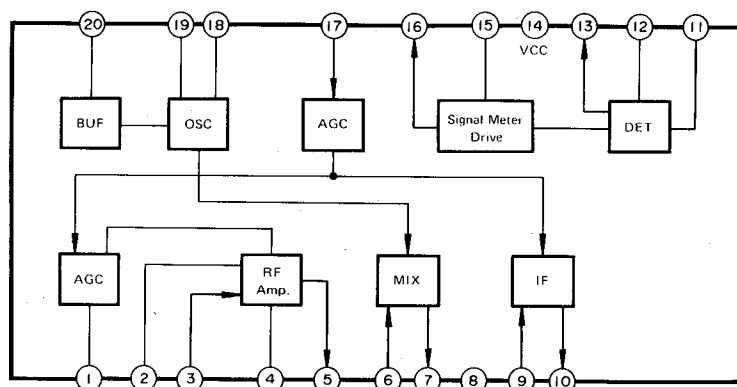
Ref. No.	Part No.	Description
PCB-7 PIN JACK P.C. BOARD		
J1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12	4486-8	6-Pin Jack, Phono, Aux/DAD, Tape 1, Tape 2
PCB-8 SUBSONIC FILTER & HIGH CUT SWITCHES P.C. BOARD		
C523, 524	5345-474F041	Capacitor, 0.47 μ F, $\pm$ 20%, 50V, Electrolytic
SW507, 508	4431-02087265	Push Switch, Subsonic Filter, High Cut
PCB-9 AUDIO MODE & LOUDNESS SWITCHES P.C. BOARD		
C503, 504	5359-1815851	Capacitor, 180pF, $\pm$ 5%, 100V, Polypropylene
SW509, 510	4431-02047165	Push Switch, Audio Mode, Loudness
PCB-10 TAPE MONITOR & FUNCTION INDICATORS P.C. BOARD		
D17, 18, 19, 20	5637-GL5NG6	L.E.D., GL5NG6, Green, Function
D21, 22	5637-GL5PR6	L.E.D., GL5PR6, Red, Tape Monitor
PCB-11 VOLUME P.C. BOARD		
VR503, 504	5113-10476122	Control, 100k Ω B, Volume
PCB-12 MUTE ADJ. VR P.C. BOARD		
VR352	5113-50372136	Control, 50k Ω B, Mute Adjust
P301	4443-030185	Connector, 3Pos.
PCB-13 MUTING SWITCH P.C. BOARD		
SW301	4431-A027137	Push Switch, Muting
PCB-14 LAMP P.C. BOARD		
LP1, 2	5731-1507245	Lamp, 15V, 100mA, Illuminator
PCB-15 ANTENNA TERMINAL P.C. BOARD		
TE1	4214-95	External Antenna Terminal
PCB-16 SPEAKER SWITCH P.C. BOARD		
R475, 476	5171-471572	Resistor, 470 Ω , $\pm$ 5%, 1W, Metal
SW401, 402	4431-02047166	Push Switch, Speaker 1, Speaker 2
PCB-17 SPEAKER TERMINAL P.C. BOARD		
TE2	4214-121	Terminal, Speaker System 1/2
PCB-18 HEADPHONE JACK P.C. BOARD		
J401	4451-00139	Jack, Headphones
P401	4443-030185	Connector, 3Pos.
PCB-19 POWER SWITCH P.C. BOARD		
CAPACITORS		
C1	5352-1030959	0.01 μ F, $\pm$ 20%, AC125V, Metalized Polyester
C30	5345-105F041	1 μ F, $\pm$ 20%, 50V, Electrolytic
TRANSISTOR		
Q13	5613-2603(E)	2SC2603(E) or 2SC2603(F)
DIODES		
D23	5636-1S2472	1S2472
D24	5631-1S2473	1S2473
MISCELLANEOUS		
SW1	4431-A01716	Push Switch, Power
F1	5732-312031	Fuse, 3.15A, 125V
	4472-7122	Fuse Holder (x 2)
PCB-20 FREQUENCY STEP CONTROL SWITCHES P.C. BOARD		
SW714, 715	4421-012413	Slide Switch, AM 9kHz/10kHz, FM 50kHz/100kHz

IC FUNCTIONAL BLOCK DIAGRAM

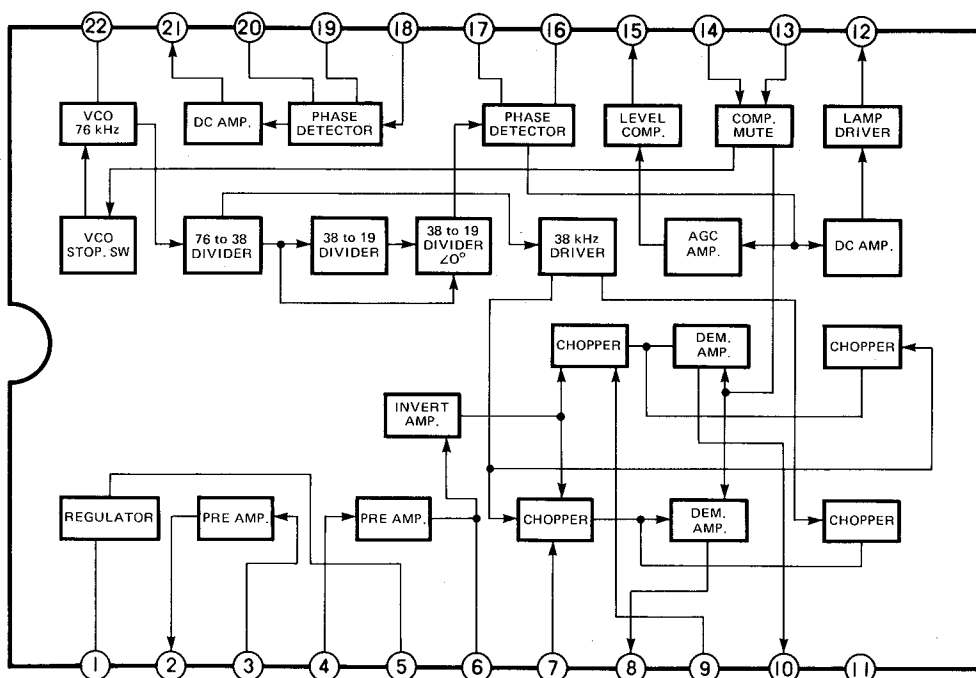
HA11225: IC201



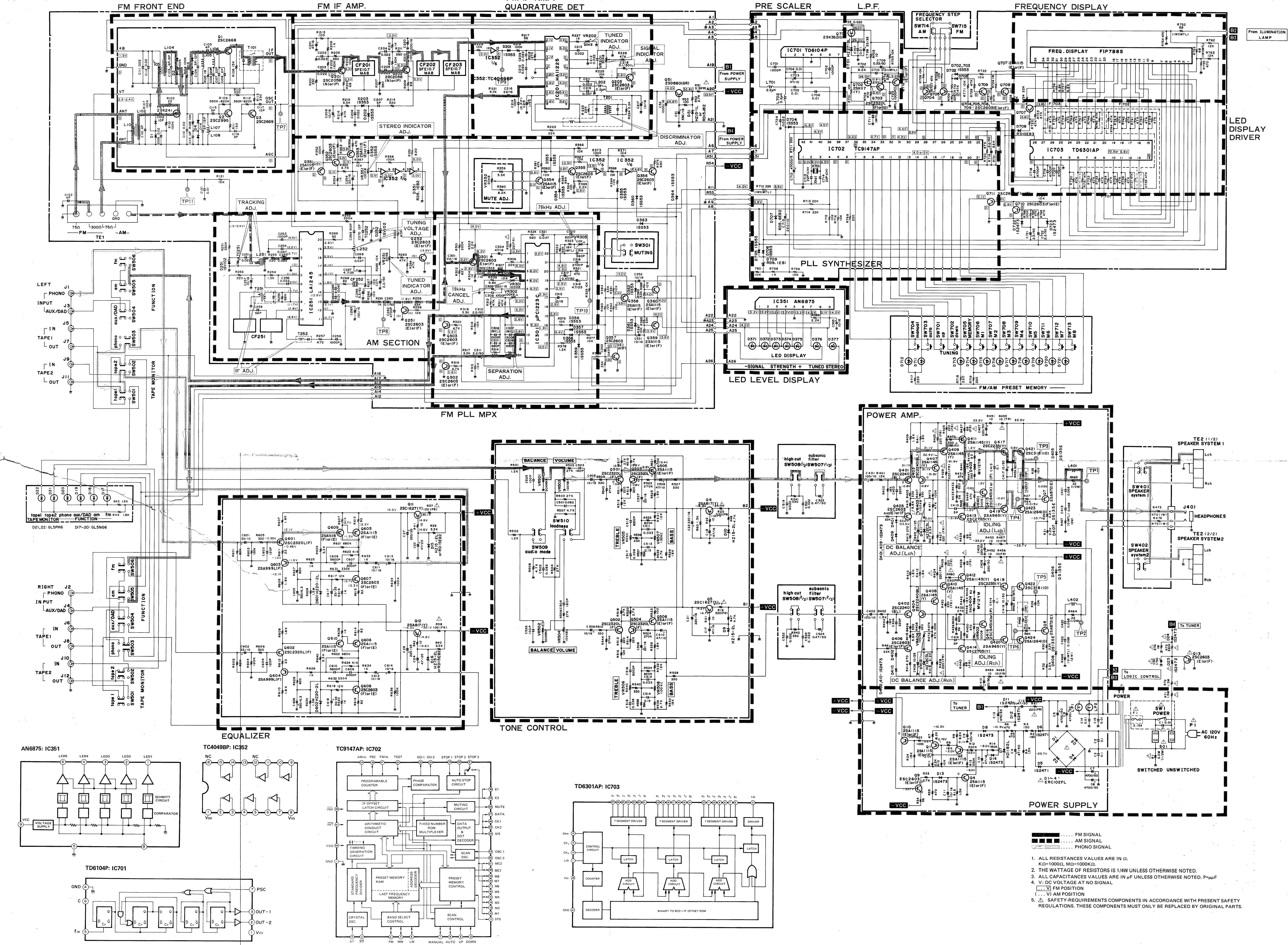
LA1245: IC251



μPC1223C: IC301



SCHEMATIC DIAGRAM

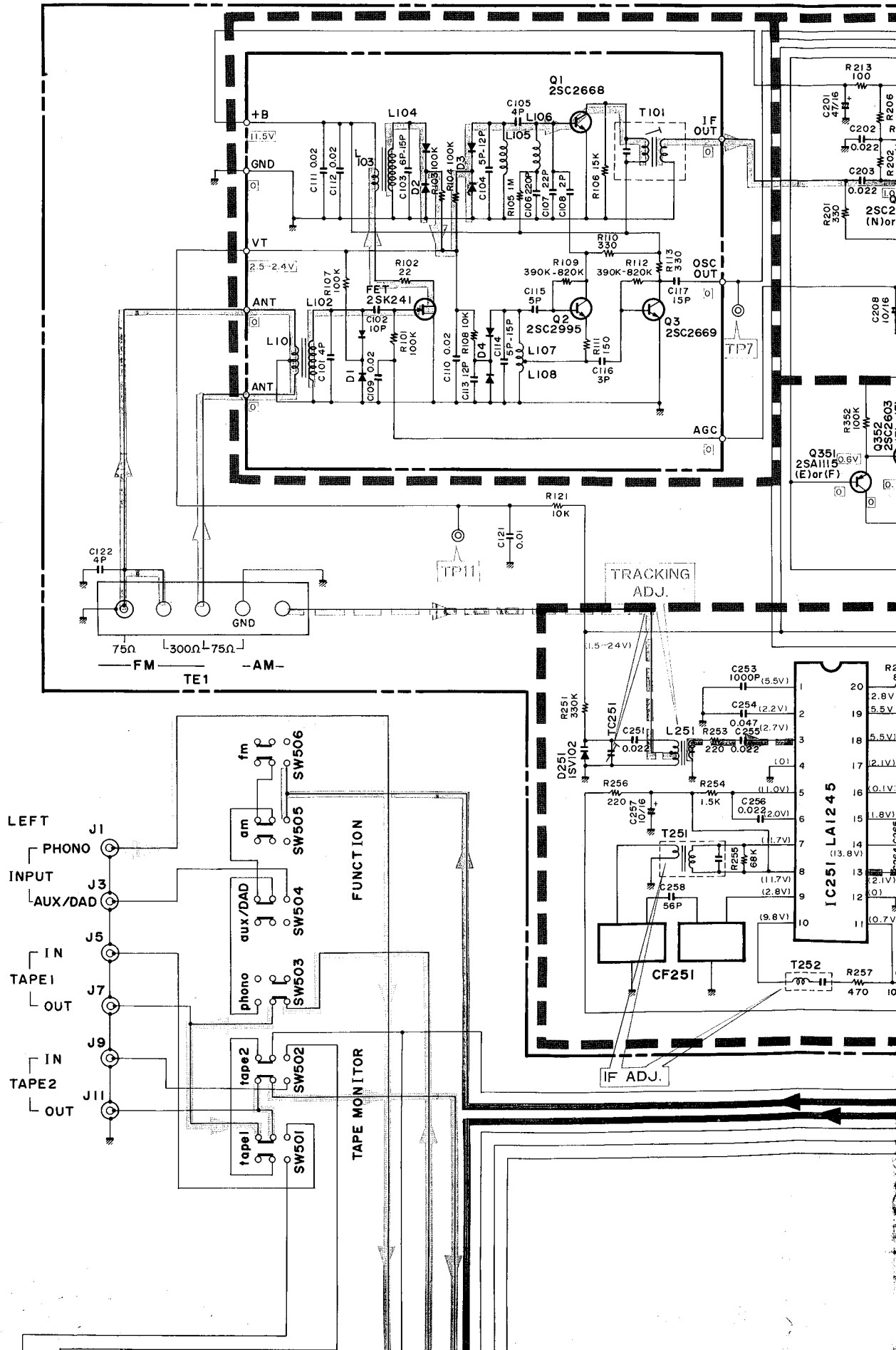


1. ALL RESISTANCE VALUES ARE IN Ω .
K Ω =1000 Ω , M Ω =1000K Ω .
2. THE VOLTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCE VALUES ARE IN μ F UNLESS OTHERWISE NOTED. P μ F=100pF.
4. V: DC VOLTAGE AT NO SIGNAL.
5. V: FM POSITION.
6. S: SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

SCHEMATIC DIAGRAM

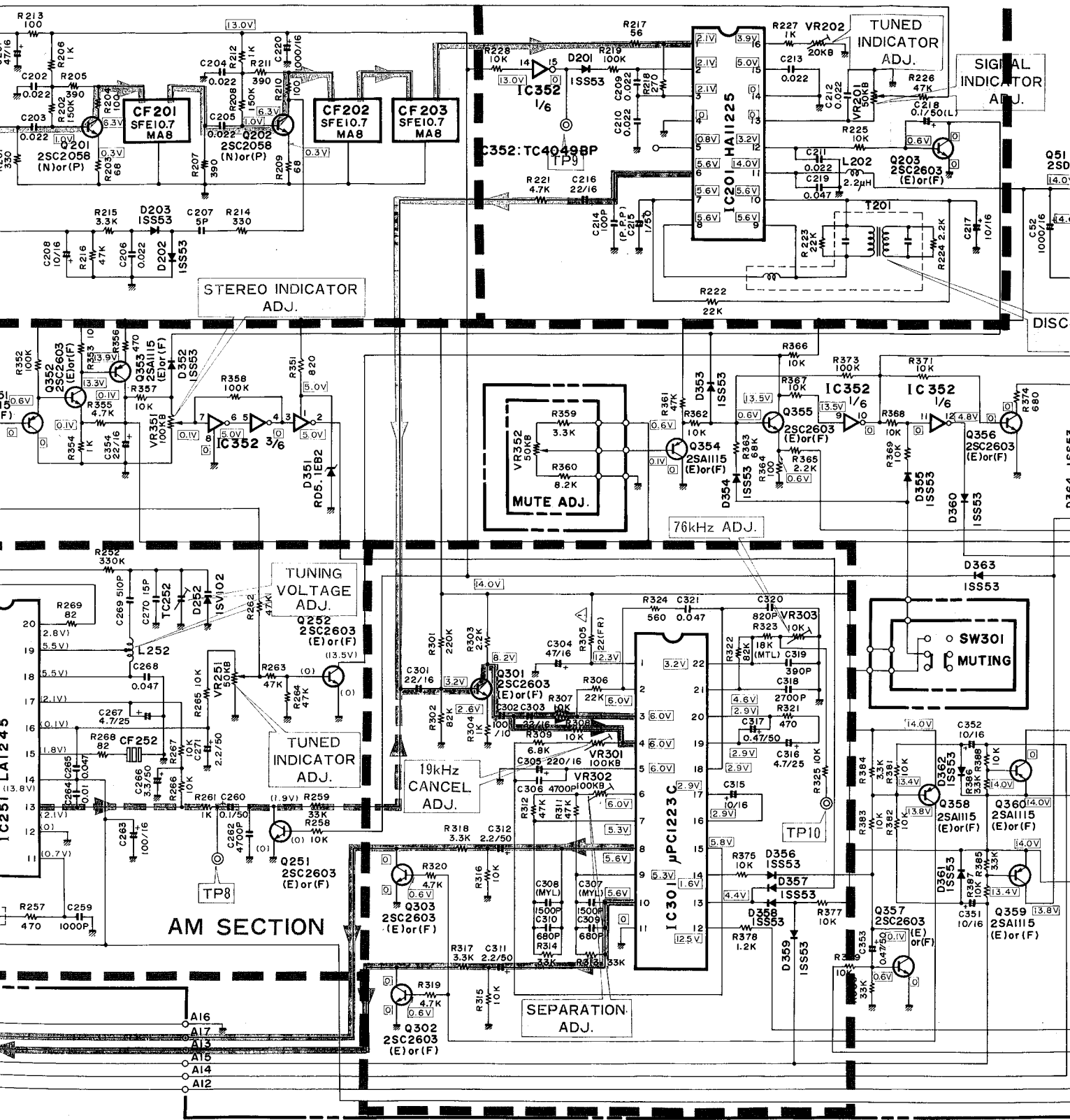
FM FRONT END

FM



FM IF AMP.

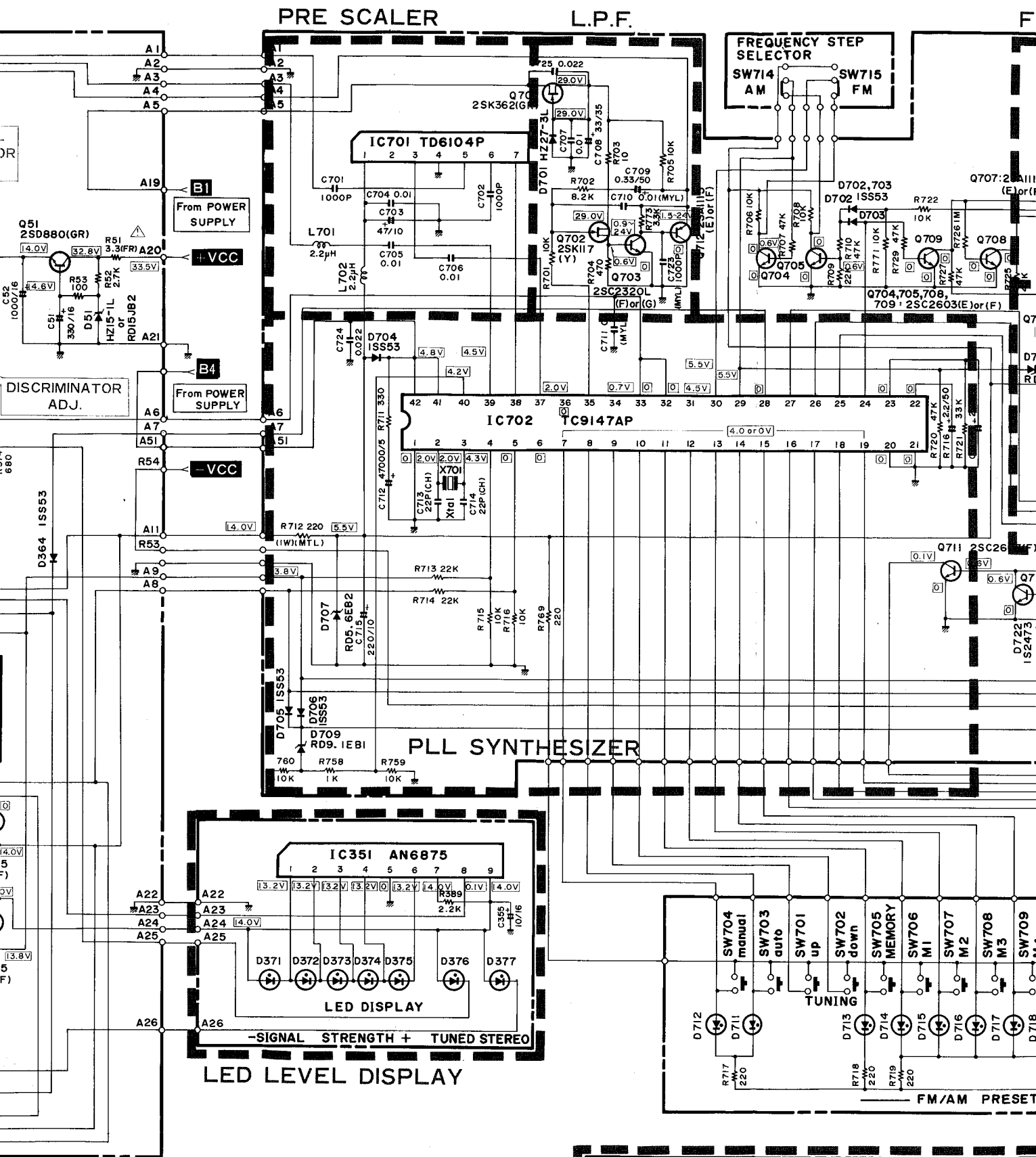
FM IF AMP.
QUADRATURE DET



FM PLL MPX

BAI ANCE

VOLUME



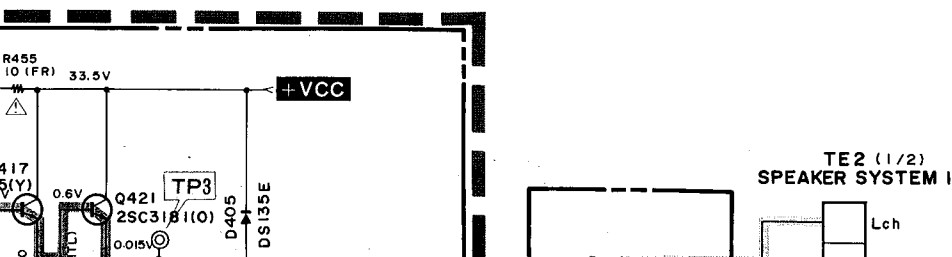
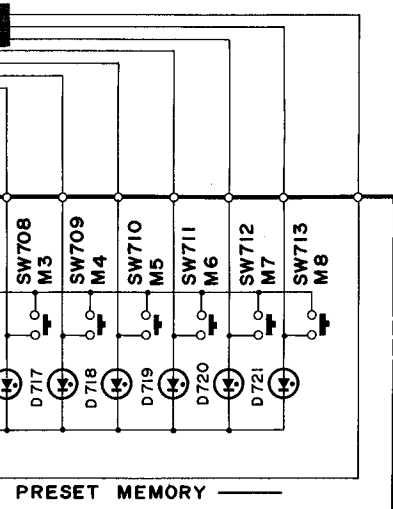
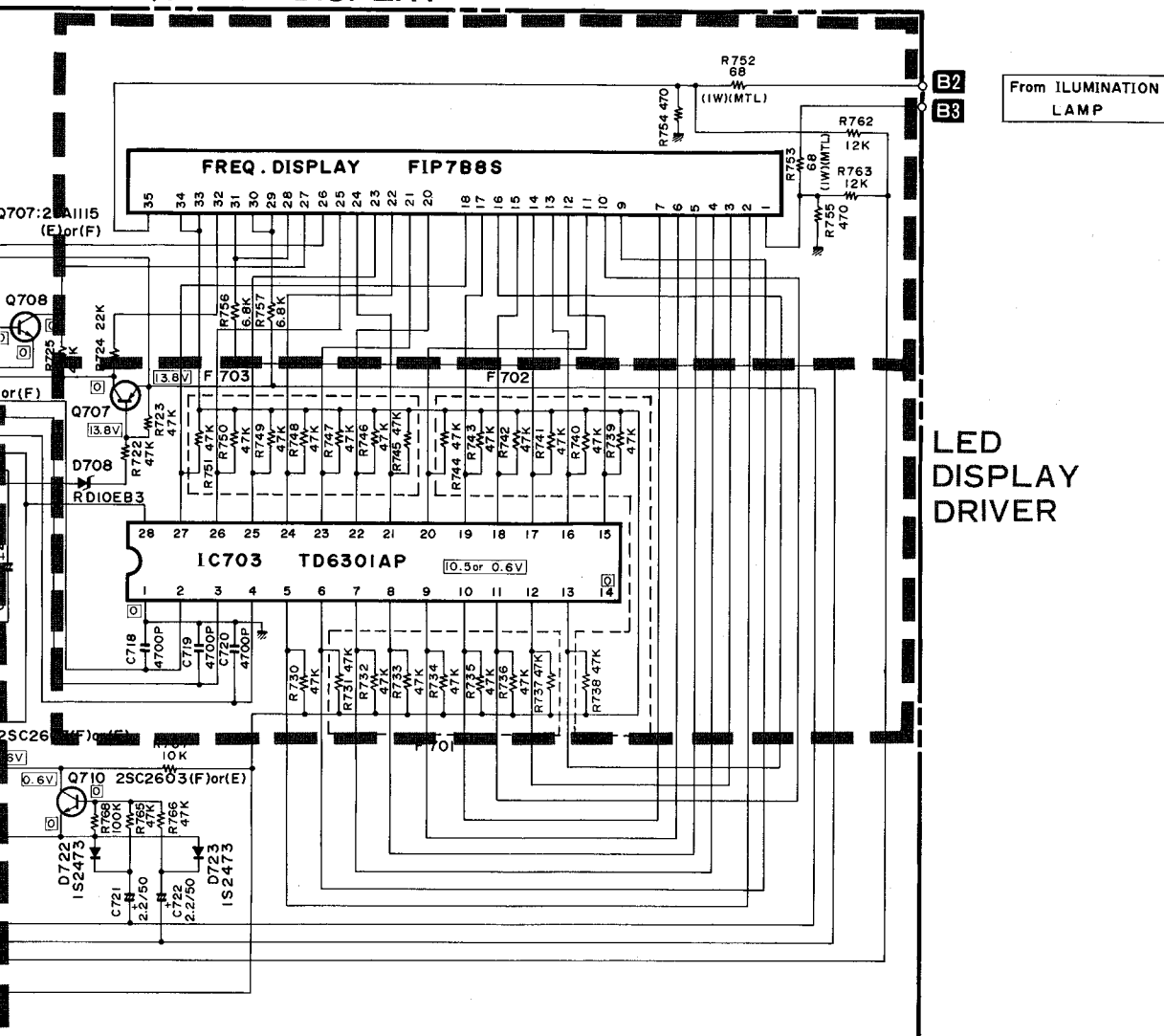
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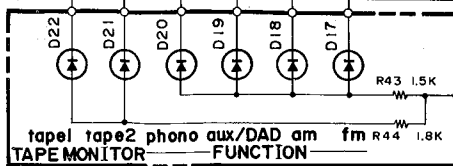
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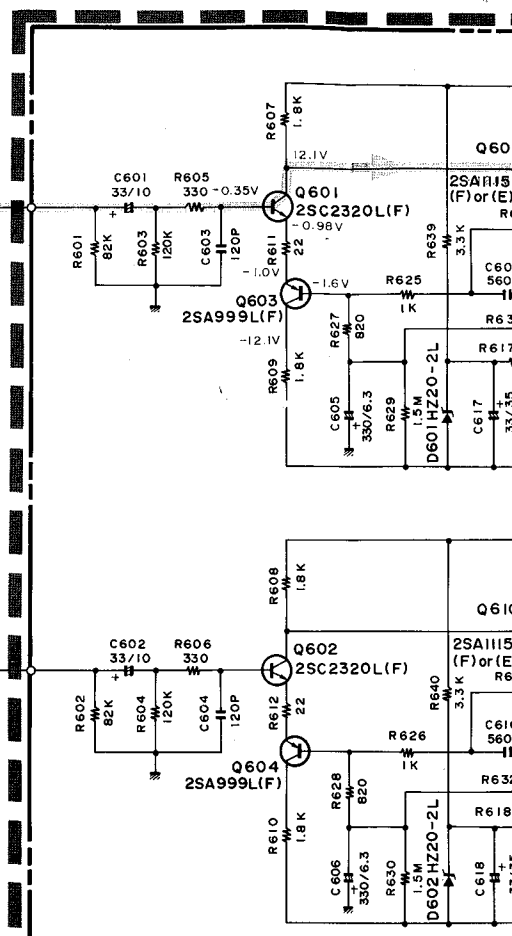
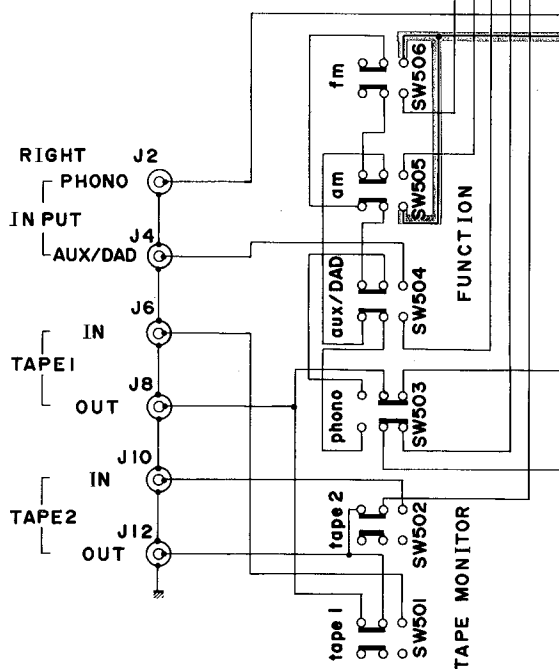
P

FREQUENCY DISPLAY

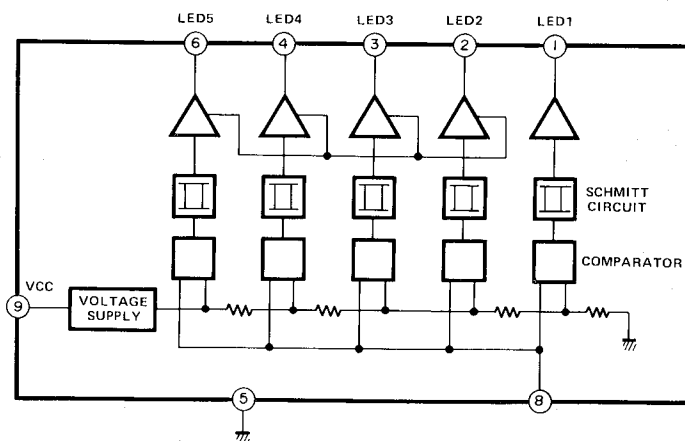




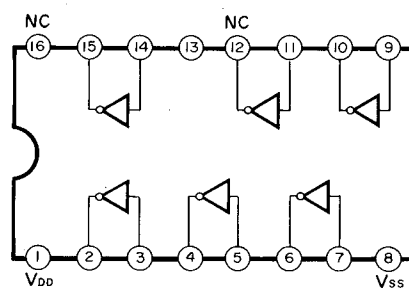
D21,22: GL5PR6 D17~20: GL5NG6



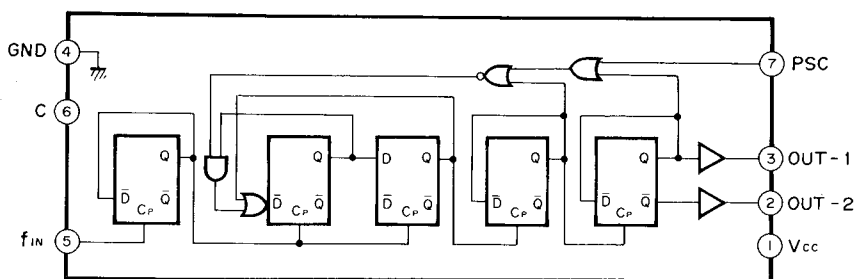
AN6875: IC351

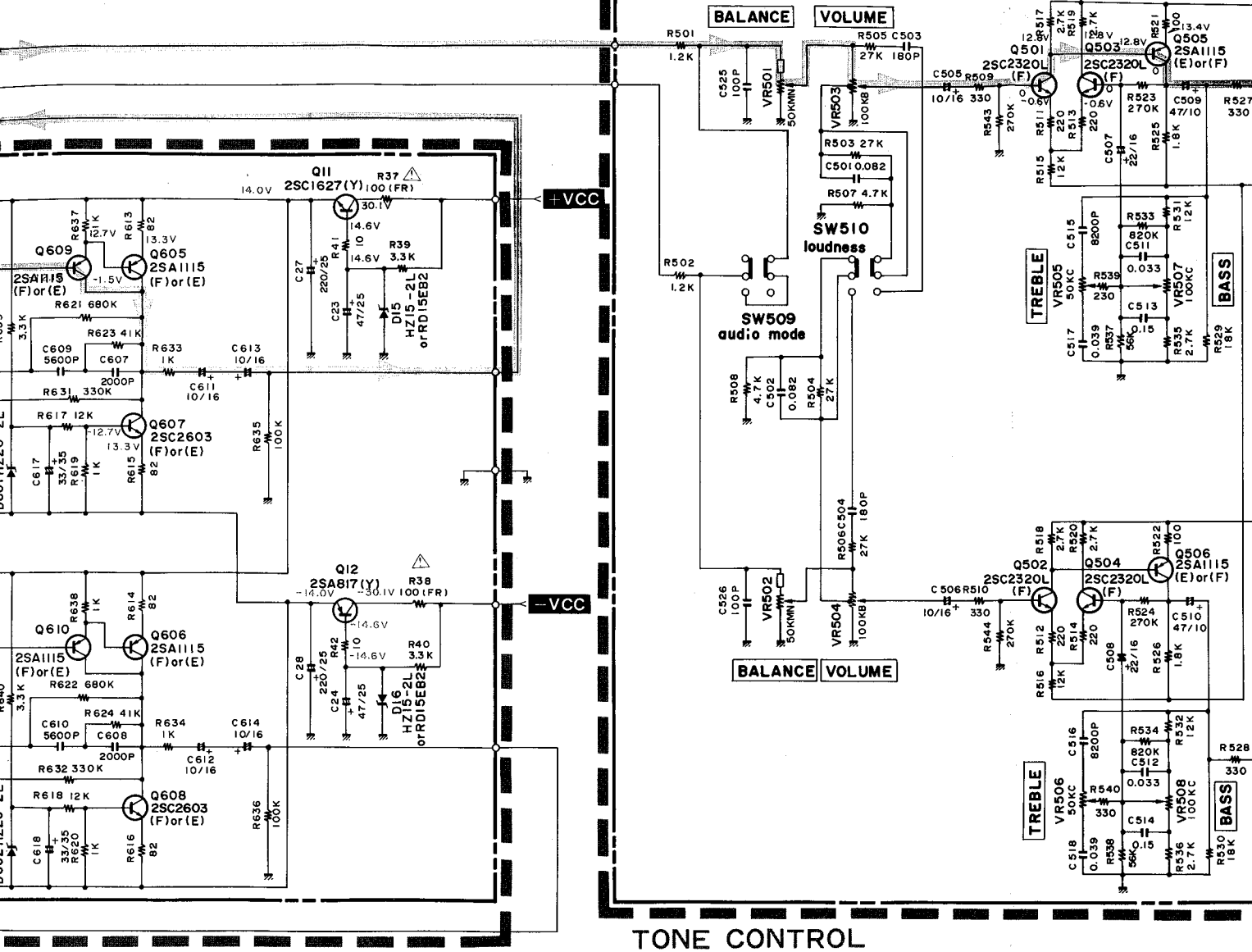


TC4049BP: IC352

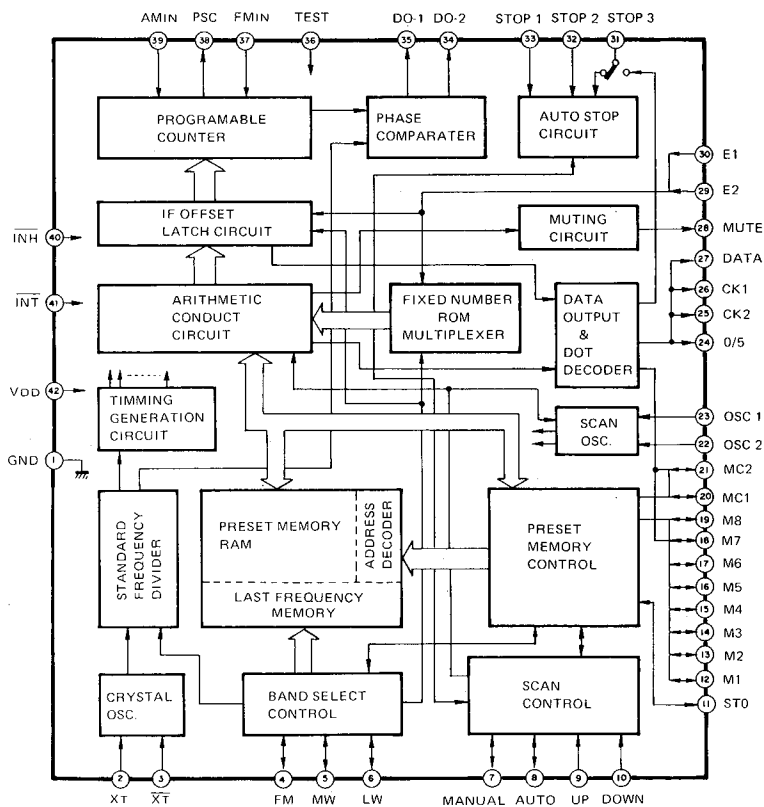


TD6104P: IC701

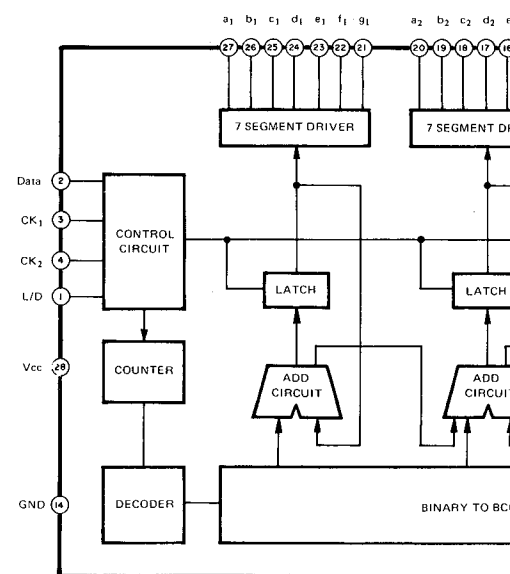


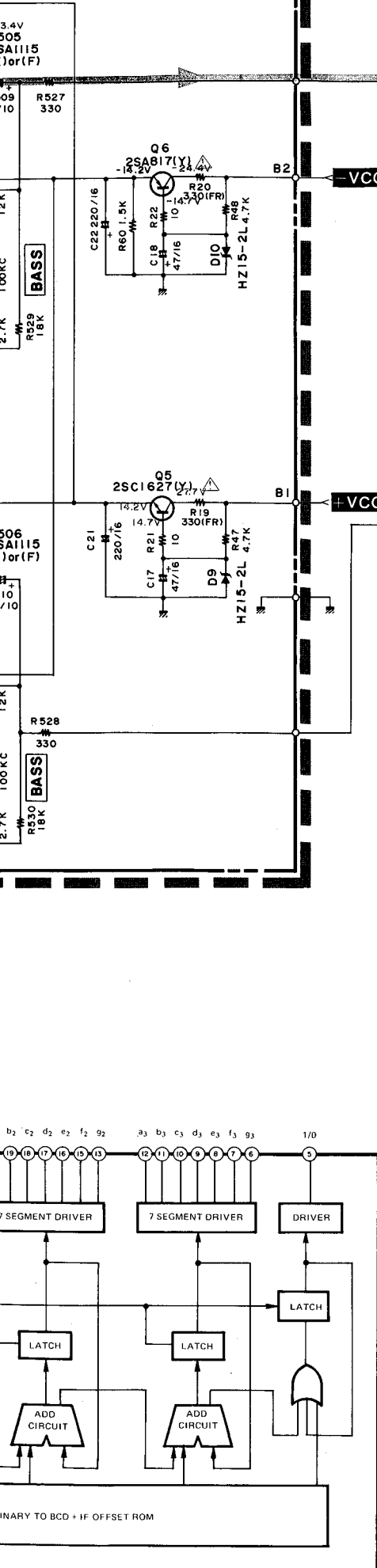


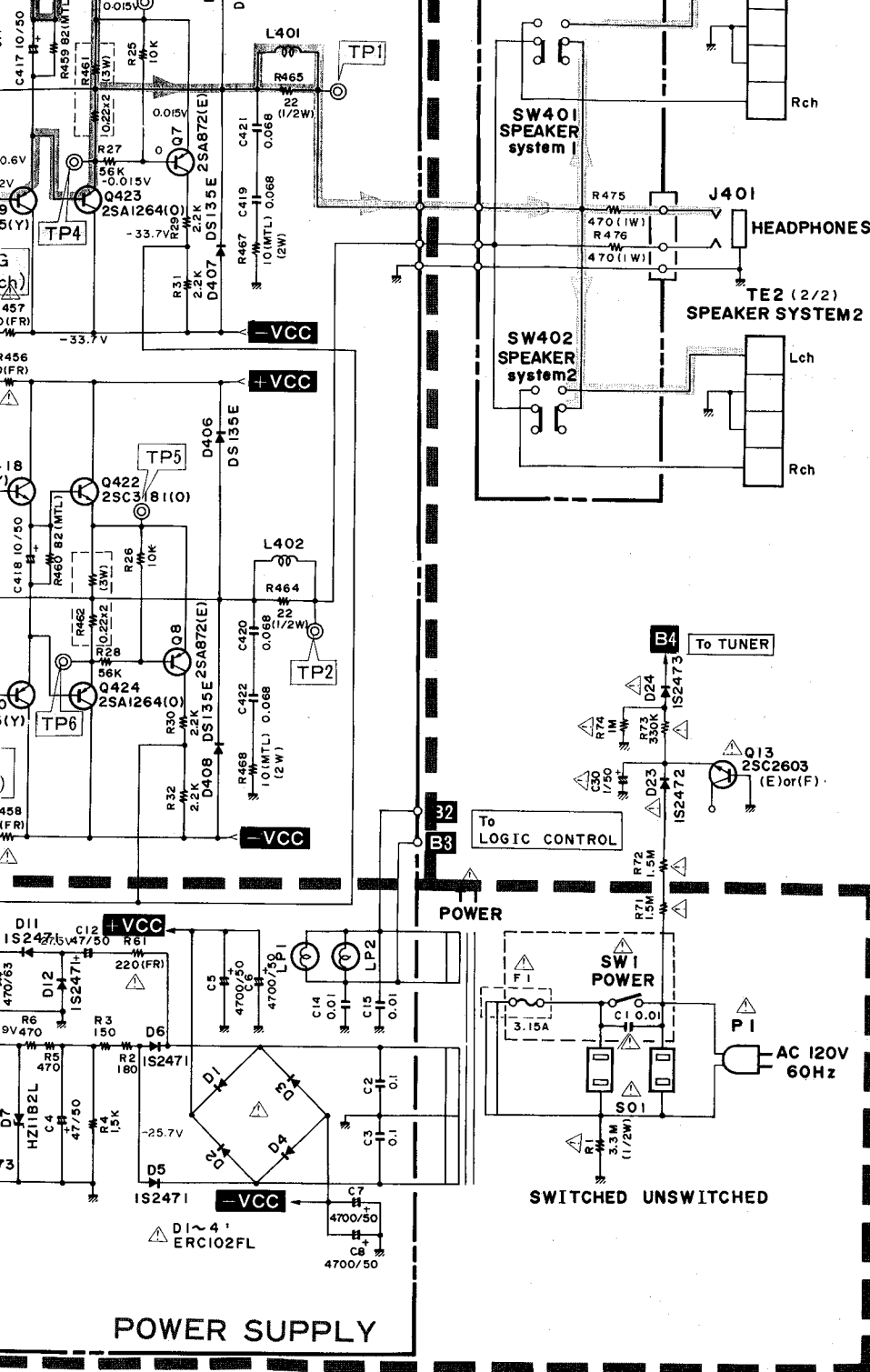
TC9147AP: IC702



TD6301AP: IC703





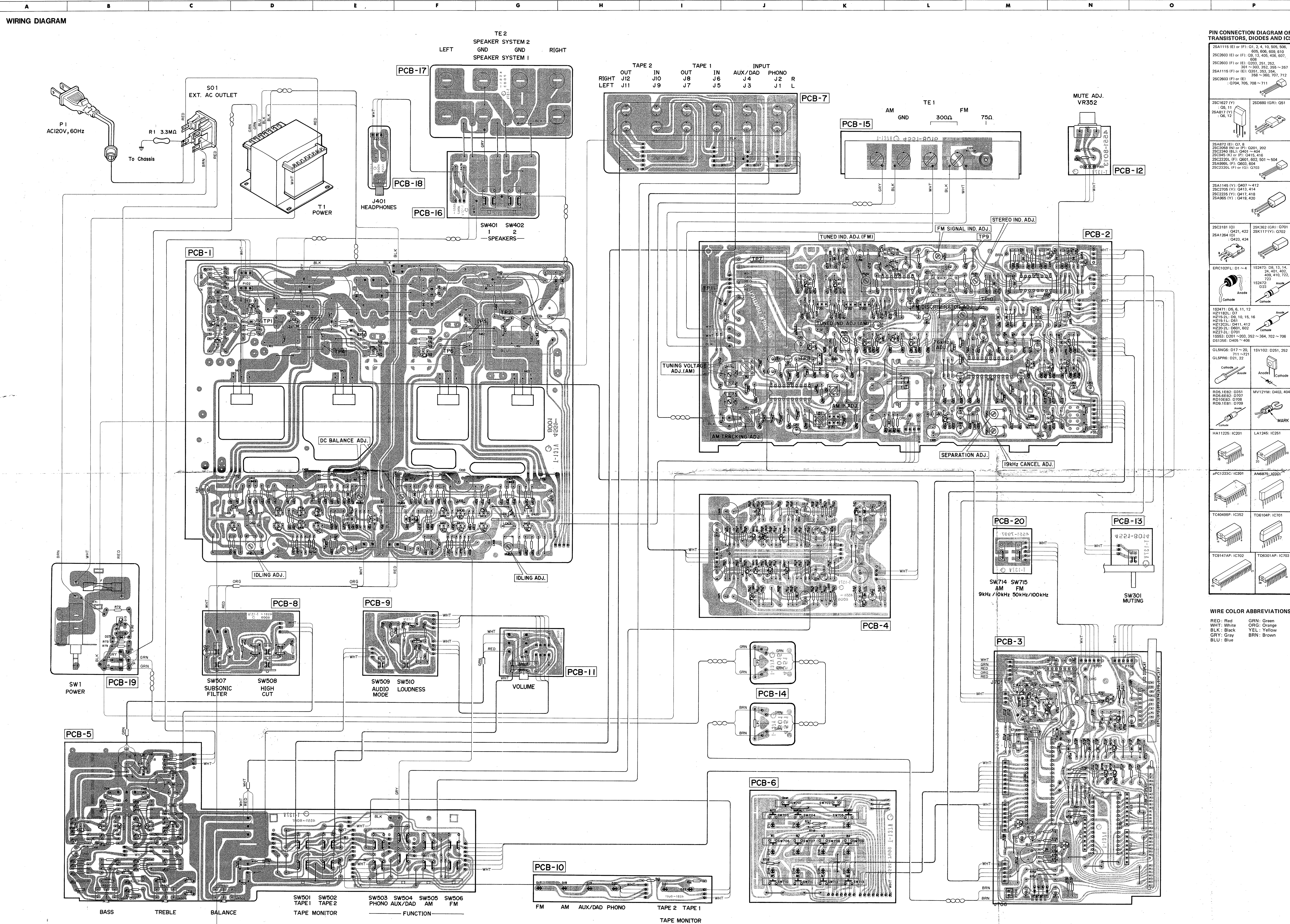


..... FM SIGNAL
 AM SIGNAL
 PHONO SIGNAL

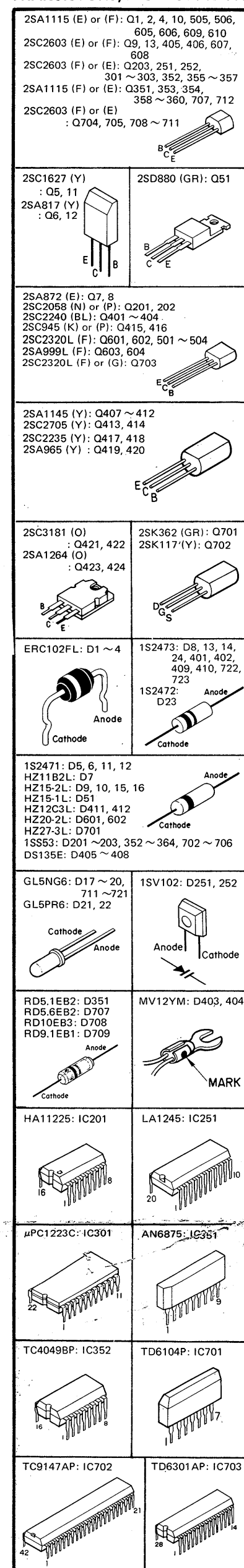
1. ALL RESISTANCES VALUES ARE IN Ω .
 $K\Omega=1000\Omega$, $M\Omega=1000K\Omega$.
2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. $P=\mu\mu F$
4. V: DC VOLTAGE AT NO SIGNAL
 ... V FM POSITION
 (... V) AM POSITION
5. $\triangle$ SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

WIRING DIAGRAM

1
2
3
4
5
6
7
8
9
10
11

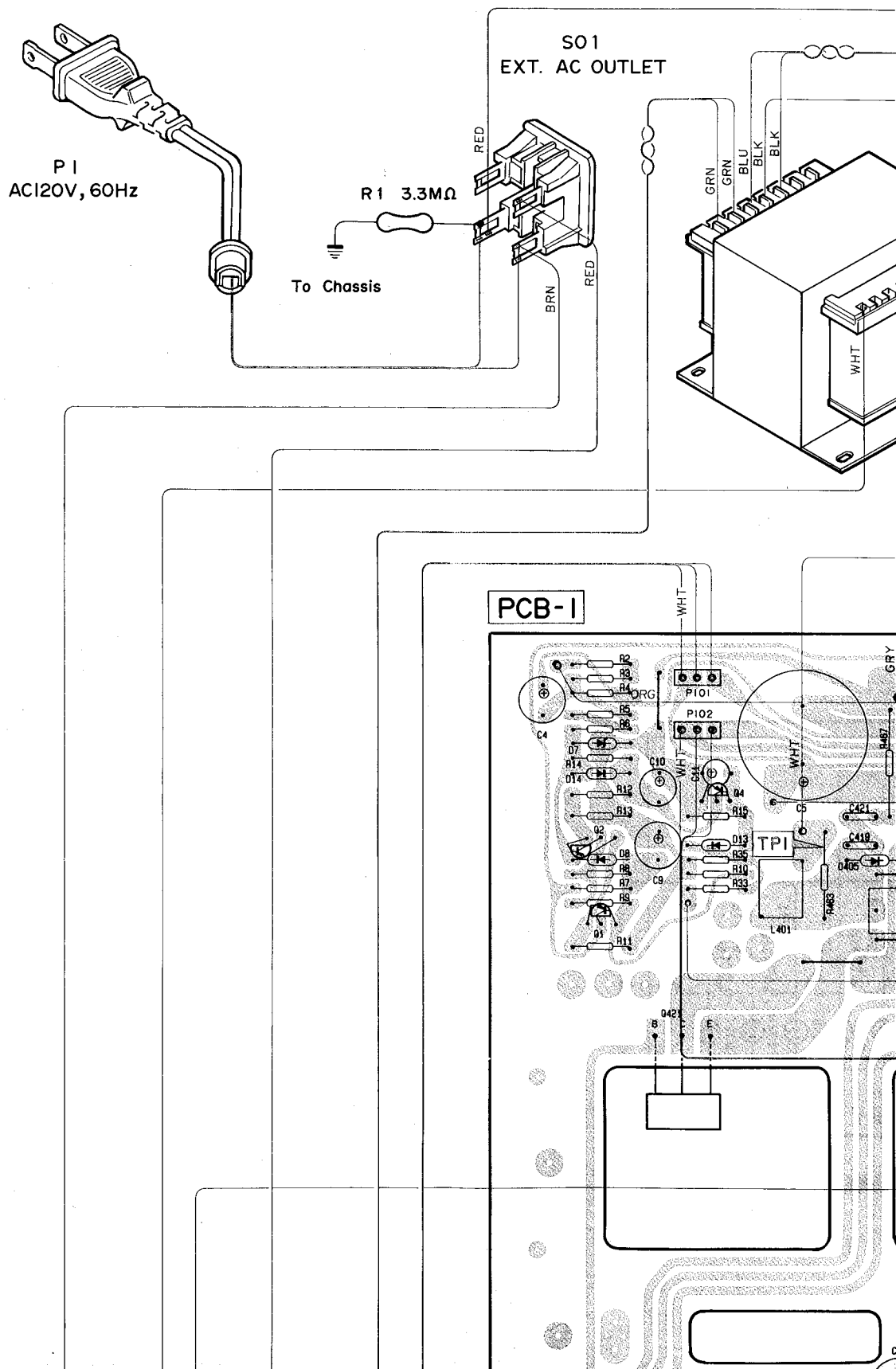


PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICs.



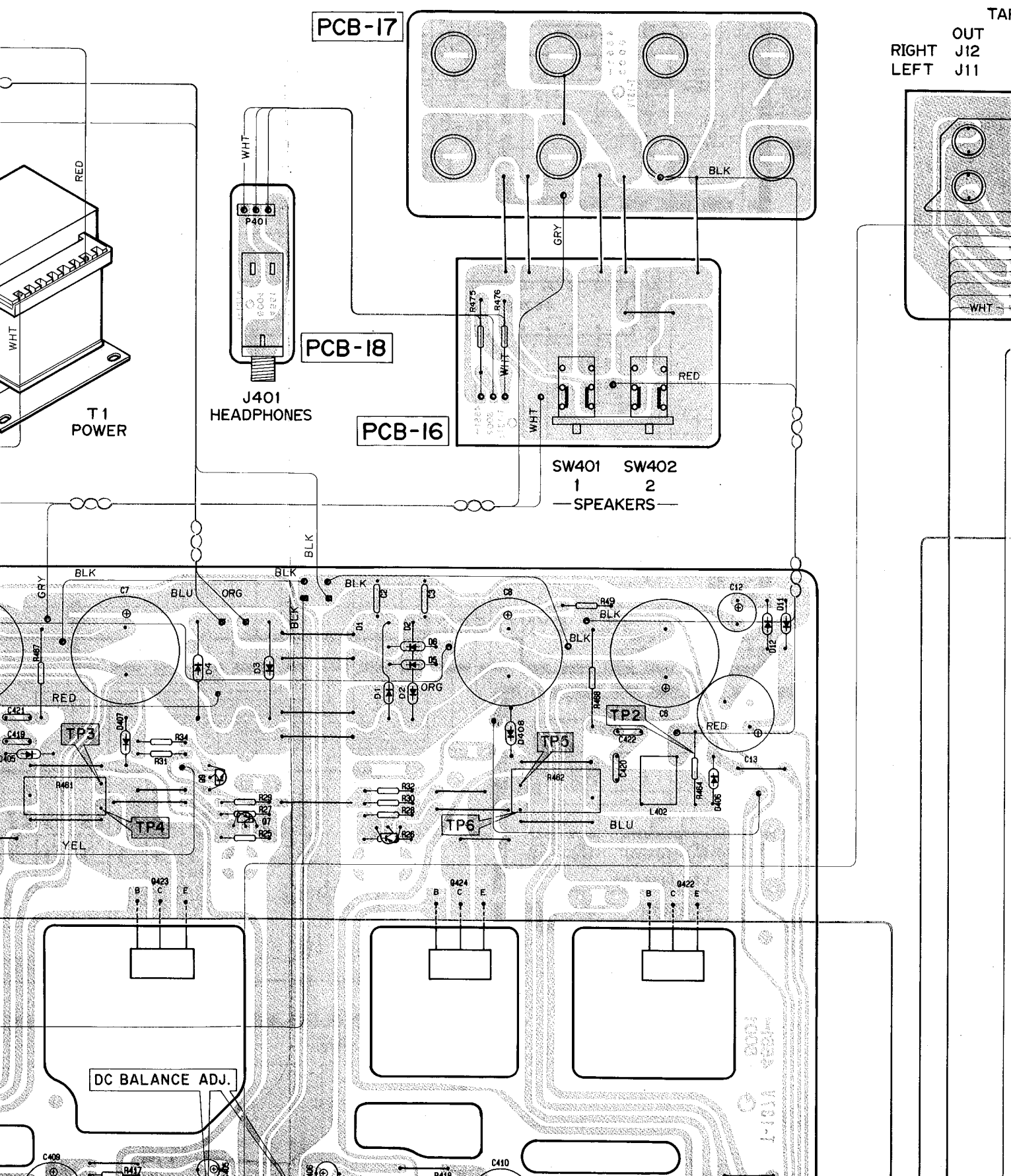
WIRE COLOR ABBREVIATIONS
RED: Red
WHT: White
BLK: Black
GRY: Gray
BLU: Blue
GRN: Green
ORG: Orange
YEL: Yellow
BRN: Brown

WIRING DIAGRAM

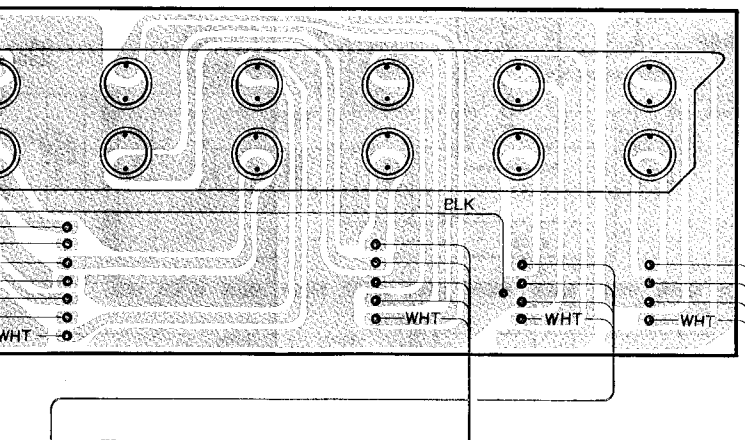


RIGHT

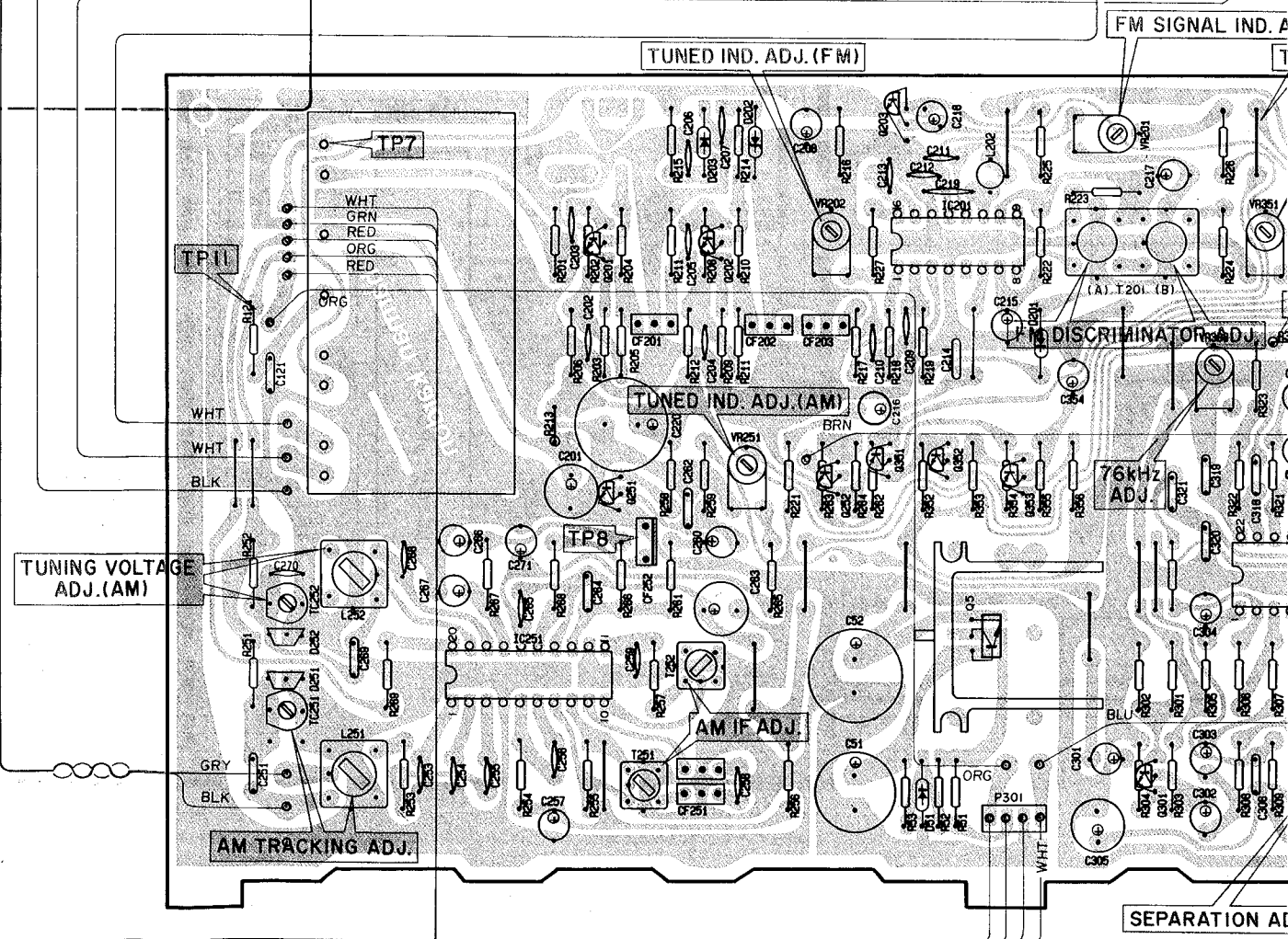
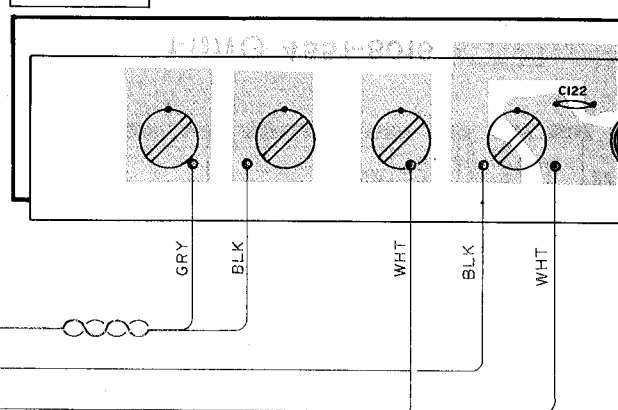
T1
POWER



TAPE 2		TAPE 1		INPUT		
IN	J10	OUT	J8	AUX/DAD	PHONO	
J9	J7	J5	J4	J2	R	
			J3	J1	L	



PCB-15



M

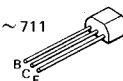
N

O

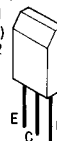
P

PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICs.

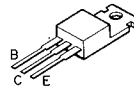
2SA1115 (E) or (F): Q1, 2, 4, 10, 505, 506,
605, 606, 609, 610
2SC2603 (E) or (F): Q9, 13, 405, 406, 607,
608
2SC2603 (F) or (E): Q203, 251, 252,
301 ~ 303, 352, 355 ~ 357
2SA1115 (F) or (E): Q351, 353, 354,
358 ~ 360, 707, 712
2SC2603 (F) or (E)
: Q704, 705, 708 ~ 711



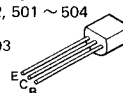
2SC1627 (Y)
: Q5, 11
2SA817 (Y)
: Q6, 12



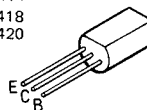
2SD880 (GR): Q51



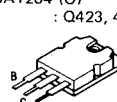
2SA872 (E): Q7, 8
2SC2058 (N) or (P): Q201, 202
2SC2240 (BL): Q401 ~ 404
2SC945 (K) or (P): Q415, 416
2SC2320L (F): Q601, 602, 501 ~ 504
2SA999L (F): Q603, 604
2SC2320L (F) or (G): Q703



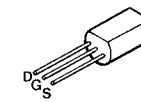
2SA1145 (Y): Q407 ~ 412
2SC2705 (Y): Q413, 414
2SC2235 (Y): Q417, 418
2SA965 (Y): Q419, 420



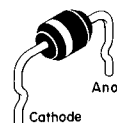
2SC3181 (O)
: Q421, 422
2SA1264 (O)
: Q423, 424



2SK362 (GR): Q701
2SK117 (Y): Q702



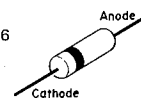
ERC102FL: D1 ~ 4



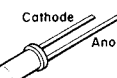
1S2473: D8, 13, 14,
24, 401, 402,
409, 410, 722,
723
1S2472:
D23



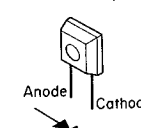
1S2471: D5, 6, 11, 12
HZ11B2L: D7
HZ15-2L: D9, 10, 15, 16
HZ15-1L: D51
HZ12C3L: D411, 412
HZ20-2L: D601, 602
HZ27-3L: D701
1SS53: D201 ~ 203, 352 ~ 364, 702 ~ 706
DS135E: D405 ~ 408



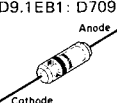
GL5NG6: D17 ~ 20,
711 ~ 721
GL5PR6: D21, 22



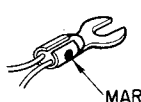
1SV102: D251, 252



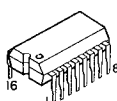
RD5.1EB2: D351
RD5.6EB2: D707
RD10EB3: D708
RD9.1EB1: D709



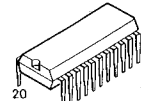
MV12YM: D403, 404



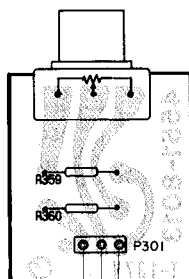
HA11225: IC201



LA1245: IC251



MUTE ADJ.
VR352



PCB-12

STEREO IND. ADJ.

TP9

PCB-2

IGNAL IND. ADJ.

TOR ADJ.

ARATION ADJ.

19kHz CANCEL ADJ.

FM
75Ω

7

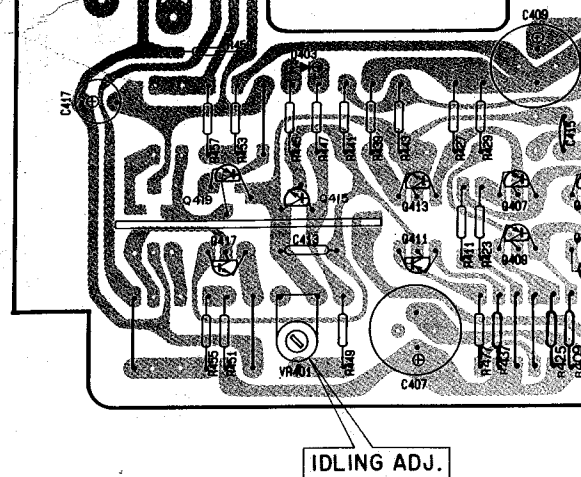
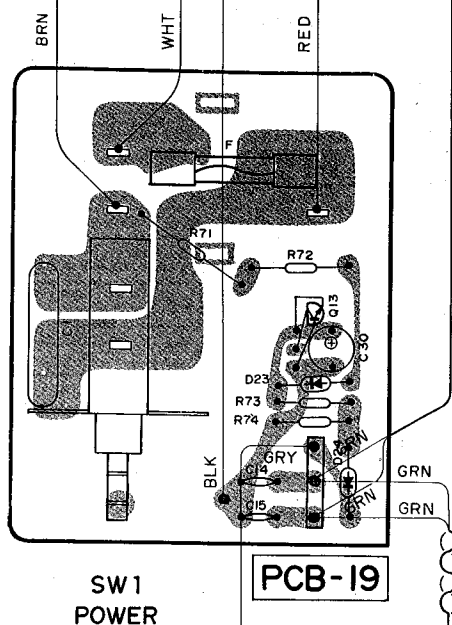
8

9

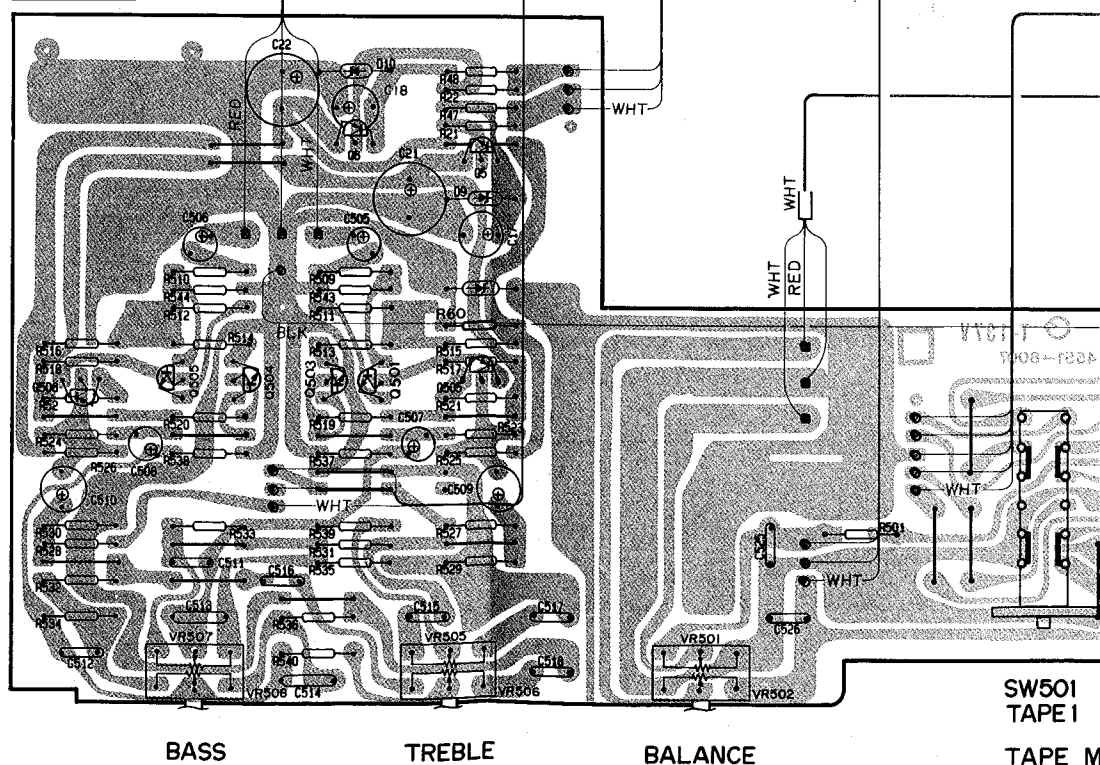
10

11

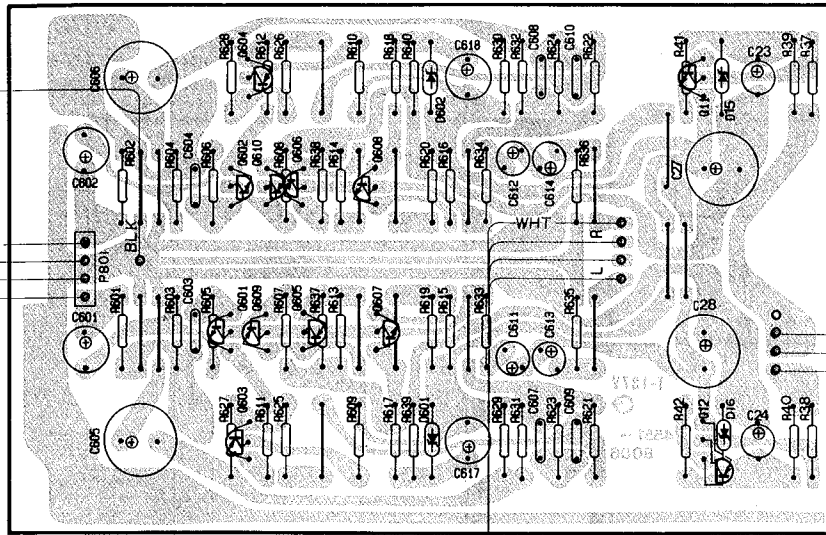
12



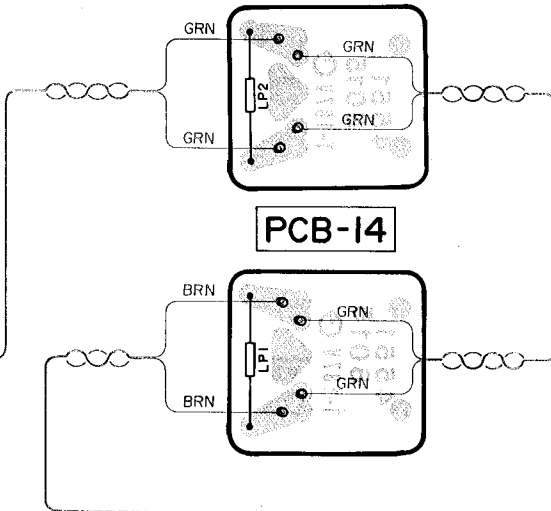
PCB-5



501	SW502	SW503	SW504	SW505	SW506
PE1	TAPE 2	PHONO	AUX/DAD	AM	FM
PE MONITOR	FUNCTION				

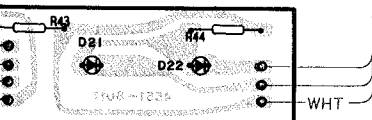
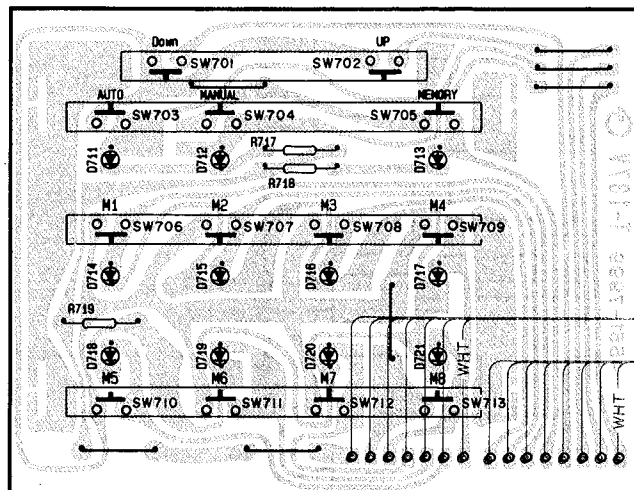


PCB-4



PCB-14

PCB-6



TAPE 2 TAPE 1

TAPE MONITOR

SW
A
9kHz / I

WHT
GRN
RED
ORG
RED

WHT

WHT

WHT

WHT

WHT

WHT

WHT

WHT

WHT

WHT

WHT

WHT

WHT

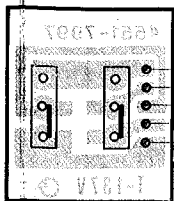
WHT

WHT

WHT

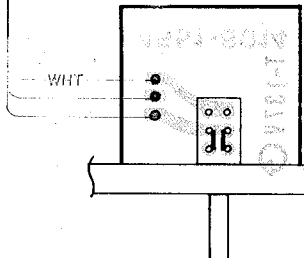
WHT

PCB-20



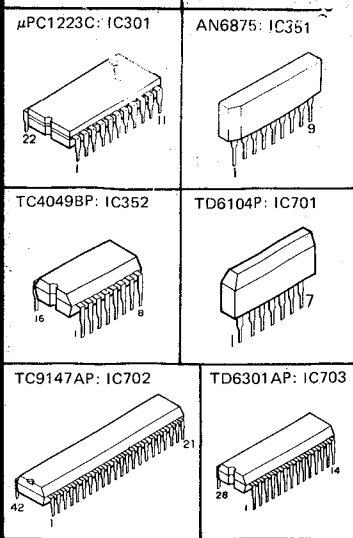
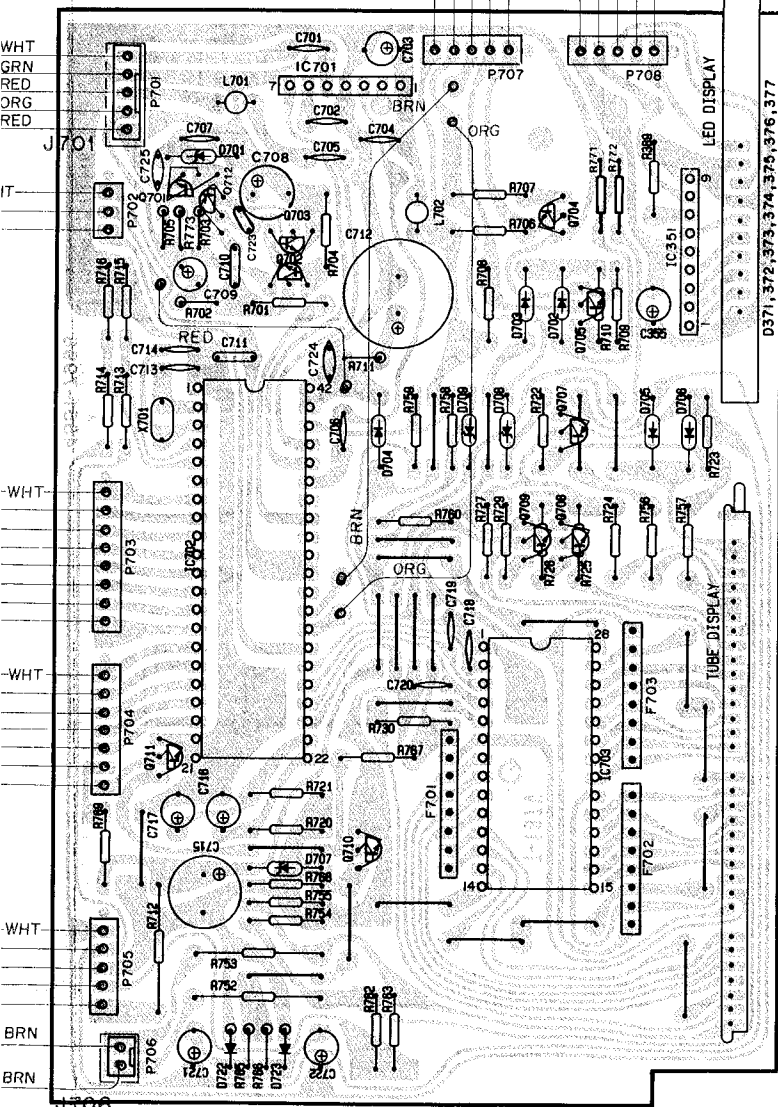
SW714 SW715
AM FM
9kHz / 10kHz 50kHz/100kHz

PCB-13



SW301
MUTING

PCB-3



WIRE COLOR ABBREVIATIONS

RED: Red	GRN: Green
WHT: White	ORG: Orange
BLK: Black	YEL: Yellow
GRY: Gray	BRN: Brown
BLU: Blue	