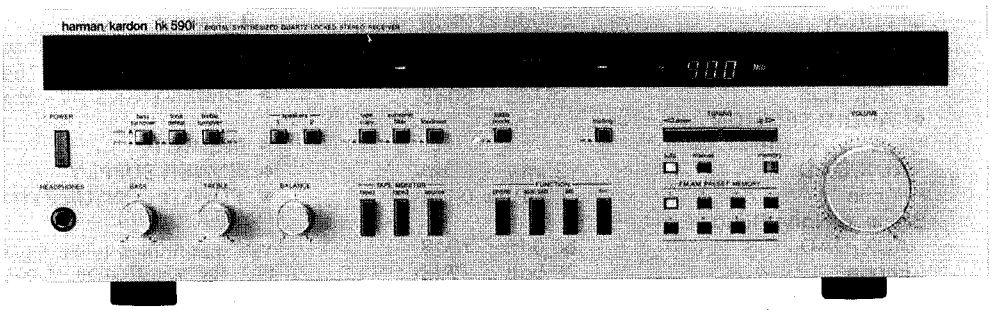
The Harman Kardon Model hk590i

Manual No. 67A

DIGITAL SYNTHESIZED QUARTZ-LOCKED STEREO RECEIVER

Technical Manual



harman/kardon
240 CROSSWAYS PARK WEST, WOODBURY, N.Y. 11797
1112-H15267A2 P-08836 1650 PRINTED IN JAPAN

SPECIFICATIONS

	Nominal	Limit
• FM SECTION		
Tuning Range	87.5 ~ 108.0MHz	
50dB Quieting Sensitivity		
Mono	14.9dBf	≦ 17dBf
Stereo	36.9dBf	≦ 38dBf
Usable Sensitivity	10.5dBf	≦ 12.5dBf
Image Ratio	76.5dB	≧ 60dB
IF Rejection	76dB	≧ 70dB
Spurious Response Rejection	101dB	≧ 80dB
Capture Ratio	1.5dB	≦ 2.5dB
Alternate Channel Selectivity	78dB	≧ 50dB
AM Rejection	54.5dB	≧ 45dB
Signal to Noise Ratio		
Mono	82dB	≧ 78dB
Stereo	74.5dB	≧ 72dB
Total Harmonic Distortion (65dBf 1kHz Input)		
Mono	0.09%	≦ 0.2%
Stereo	0.12%	≦ 0.3%
Stereo Separation at 1kHz	52.9dB	≧ 45dB
• AM SECTION		
Tuning Range	520 ~ 1,710kHz	
Usable Sensitivity	14μVm	≦ 20μVm
Selectivity	30dB	≧ 22dB
Signal to Noise Ratio	53dB	≧ 50dB
Image Rejection	34dB	≧ 28dB
IF Rejection	61dB	≧ 50dB
• AUDIO SECTION		
Usable Sensitivity		
AUX/DAD	135mV ± 25mV	
Phono	2.2mV ± 0.2mV	
Signal to Noise Ratio		
AUX/DAD	80.6dB	≧ 78dB
Phono	79.5dB	≧ 77dB
Channel Separation at 10kHz		
AUX/DAD	66dB	≧ 45dB
Phono	57.5dB	≧ 45dB

	Nominal	Limit
IM Distortion Ratio	0.13%	≦ 0.25%
RMS Output Power		
8Ω, 1kHz, THD 0.08%	50.9W	≧ 45W
4Ω, 1kHz, THD 0.08%	76.5W	≧ 60W
Damping Factor at 1kHz	44	≧ 40
Tone Control Characteristics		
Bass Turnover Frequency	400Hz/200Hz	
Treble Turnover Frequency	2kHz/6kHz	
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	
DC Output Voltage		
L channel	5.6mV ± 60mV	
R channel	6.2mV ± 60mV	
RIAA Equalization at Tape Out (20Hz/20kHz)	0.15dB ± 0.5dB/0.15dB ± 0.5dB	
• DIMENTIONS (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	310W (330VA)	

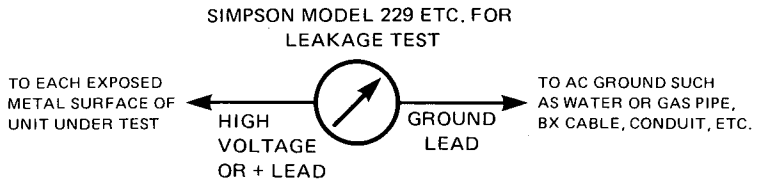
This specification is the target of servicing. But, there is a case that the specification is not applicable to the measurement condition and instrument.

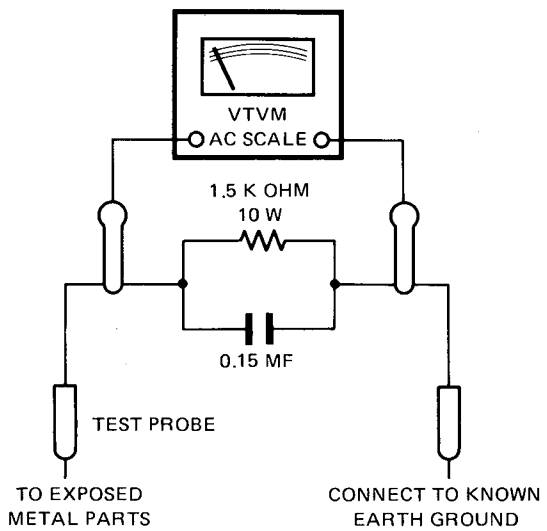
Specifications and components subject to change without notice. Overall performance will be maintained or improved.

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. Be sure that any protective devices such as nonmetallic control knobs, insulating fishpapers, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacity networks, mechanical insulators, etc. which were removed for servicing are properly reinstalled.
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.





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 ± 10mV
2		Connect the digital voltmeter between TP2 and ground.	VR404 (R channel)	0 ± 10mV
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		109MHz ± 2kHz

2. AM ALIGNMENT

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

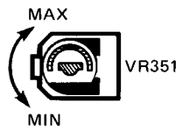
Step	Item	Connections required	Measurement frequency	Station display	Adjustment location	Adjustment method
1	Tuning voltage adjustment	• Connect the DC voltmeter to TP11 (+) and ground (—).		520kHz	L252	1.5V ± 0.05V
2				1710kHz	TC252	23V ± 0.5V
3	IF adjustment	• Radiate output of AM signal generator (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	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 11V 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	75.95kHz ± 0.05kHz
8			98.1MHz	98.1MHz	VR351 (MAX)	Confirm the stereo indicator lights at 30μV ± 2dB 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 ± 10mV
2		Connect the digital voltmeter between TP2 and ground.	VR404 (R channel)	0 ± 10mV
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		109MHz ± 2kHz

2. AM ALIGNMENT

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

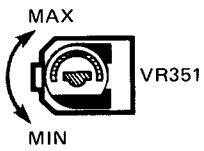
Step	Item	Connections required	Measurement frequency	Station display	Adjustment location	Adjustment method
1	Tuning voltage adjustment	• Connect the DC voltmeter to TP11 (+) and ground (−).		520kHz	L252	1.5V ± 0.05V
2				1710kHz	TC252	23V ± 0.5V
3	IF adjustment	• Radiate output of AM signal generator (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

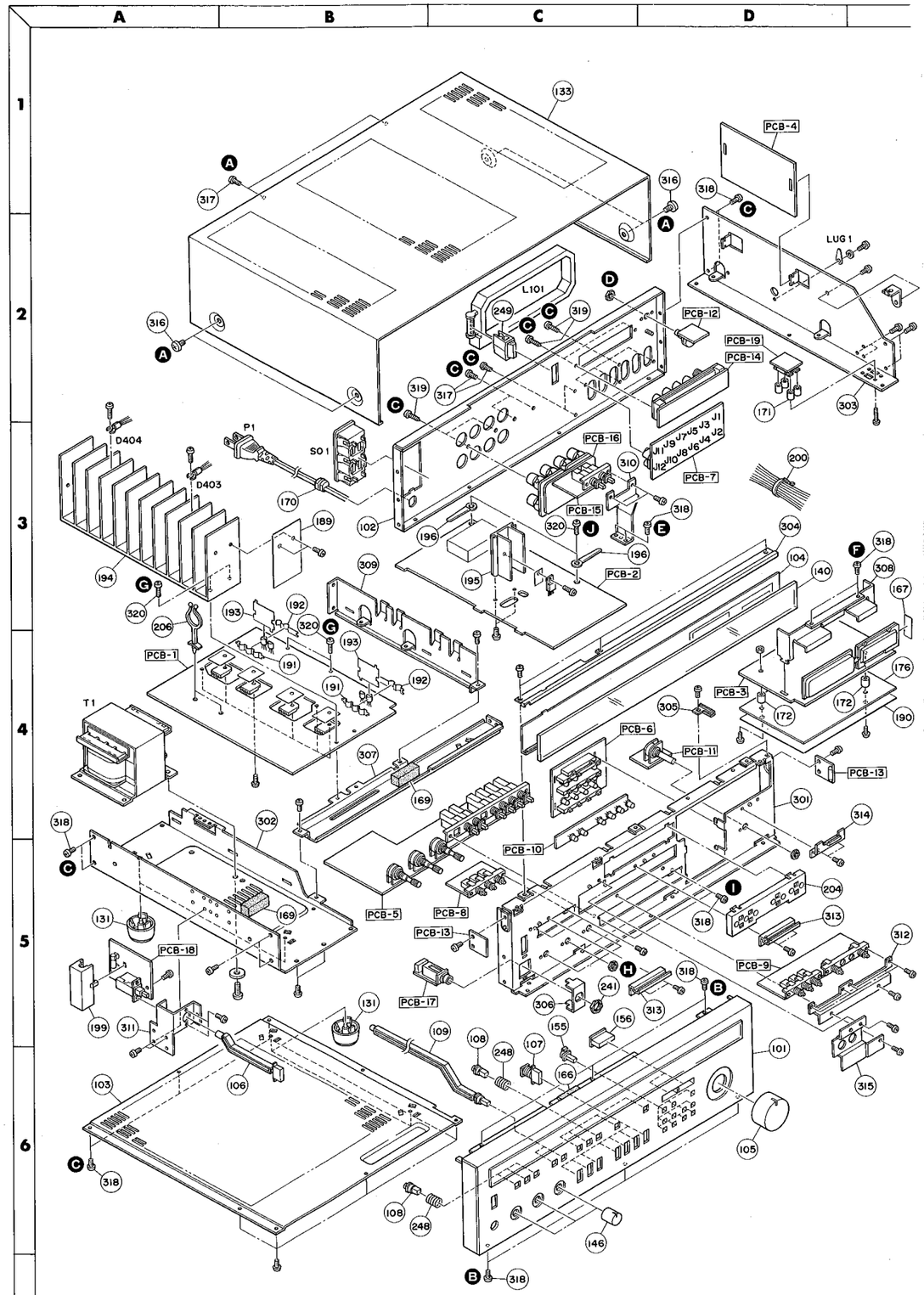
Conditions: • Set the function switch to FM.
• Set the muting switch to off (▬).

Step	Item	Connections required	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 11V 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	75.95kHz ± 0.05kHz
8			98.1MHz	98.1MHz	VR351 (MAX)	Confirm the stereo indicator lights at 30μV ± 2dB 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.



GENERAL UNIT EXPLODED VIEW



DISASSEMBLY PROCEDURES (REFER TO PAGES 5 AND 16)

1 CABINET TOP REMOVAL
Remove 6 screws Ⓐ 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 Ⓑ and then remove the front panel assembly.

3 SPEAKER SWITCH AND SPEAKER TERMINAL P.C. BOARDS (PCB-15 AND PCB-16) REMOVAL
1. Remove the front panel assembly. (Refer to step 2 .)
2. Pull off push button assembly (109).
3. Remove 19 screws Ⓒ and a hexagonal nut Ⓓ , and remove the cabinet back assembly (102) with AC outlet (SO1). If necessary, unsolder the leads.
4. Remove 2 screws Ⓔ and then remove speaker switch and speaker terminal P.C. boards (PCB-15 and PCB-16). 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 Ⓕ 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-15 and PCB-16). (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 Ⓖ 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 Ⓗ and 2 screws Ⓘ , 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 Ⓙ 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.

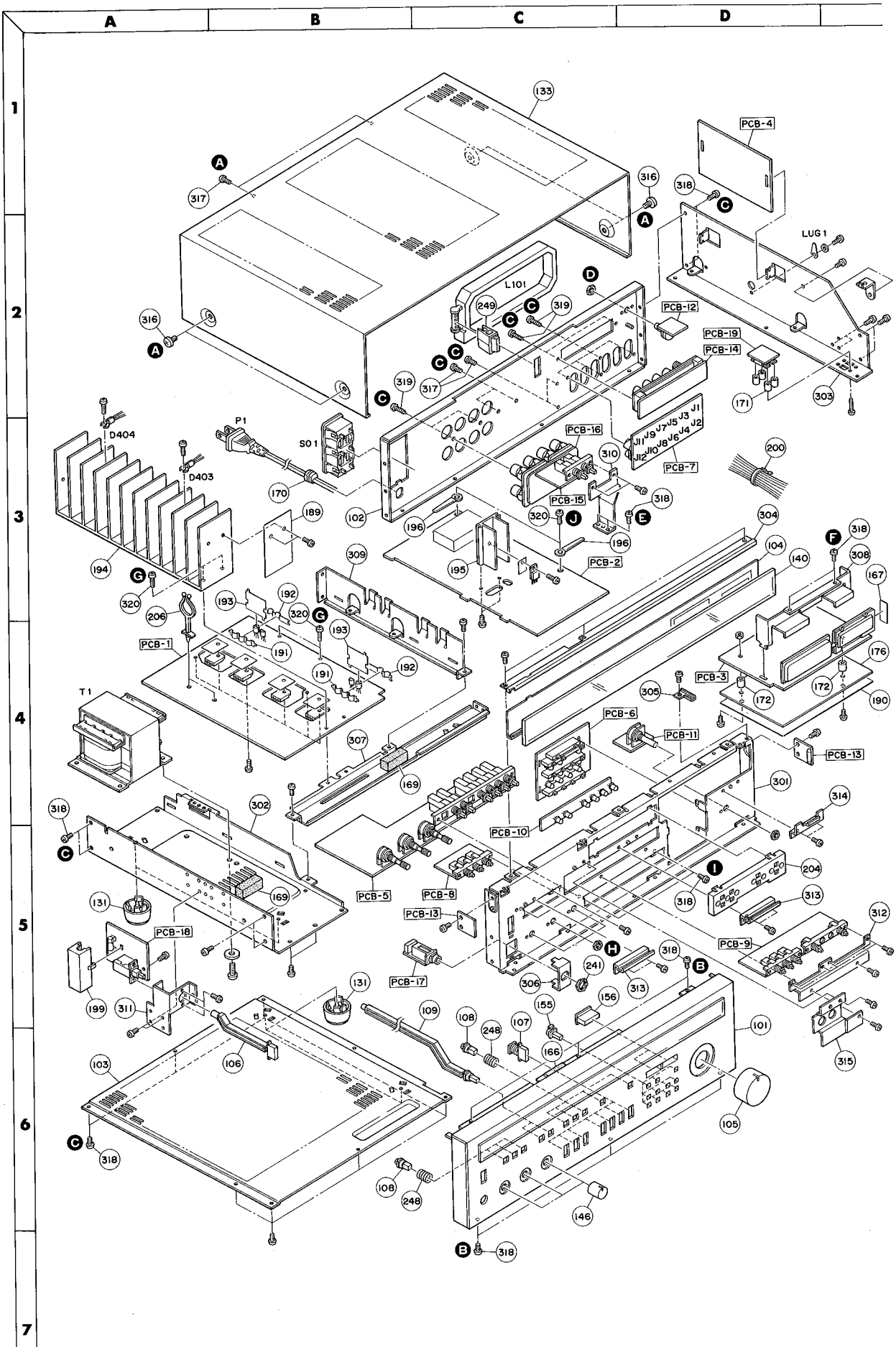
[2] SYNTHESIZER SECTION
1) FM
The output of local oscillator in the front-end is fed to ⑤ pin of the pre-scaler IC701 and then divided by 30 or 32 and fed to ㊲ pin of the PLL synthesizer IC702. The standard quartz oscillator output (4.5MHz) is divided by 180 in IC702 and 25kHz standard signal is got. 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 (Schmit trigger circuit) is turned ON. The base of Q10 becomes 0V and Q405 is turned off. The operation of power amp. circuit stops and the circuit is protected.

GENERAL UNIT EXPLODED VIEW



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DISASSEMBLY PROCEDURES (REFER TO PAGES 5 AND 16)

1 CABINET TOP REMOVAL
Remove 6 screws Ⓐ 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 Ⓑ and then remove the front panel assembly.

3 SPEAKER SWITCH AND SPEAKER TERMINAL P.C. BOARDS (PCB-15 AND PCB-16) REMOVAL
1. Remove the front panel assembly. (Refer to step 2 .)
2. Pull off push button assembly (109).
3. Remove 19 screws Ⓒ and a hexagonal nut Ⓓ , and remove the cabinet back assembly (102) with AC outlet (SO1). If necessary, unsolder the leads.
4. Remove 2 screws Ⓔ and then remove speaker switch and speaker terminal P.C. boards (PCB-15 and PCB-16). 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 Ⓕ 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-15 and PCB-16). (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 Ⓖ 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 Ⓗ and 2 screws Ⓘ , 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 Ⓙ 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.

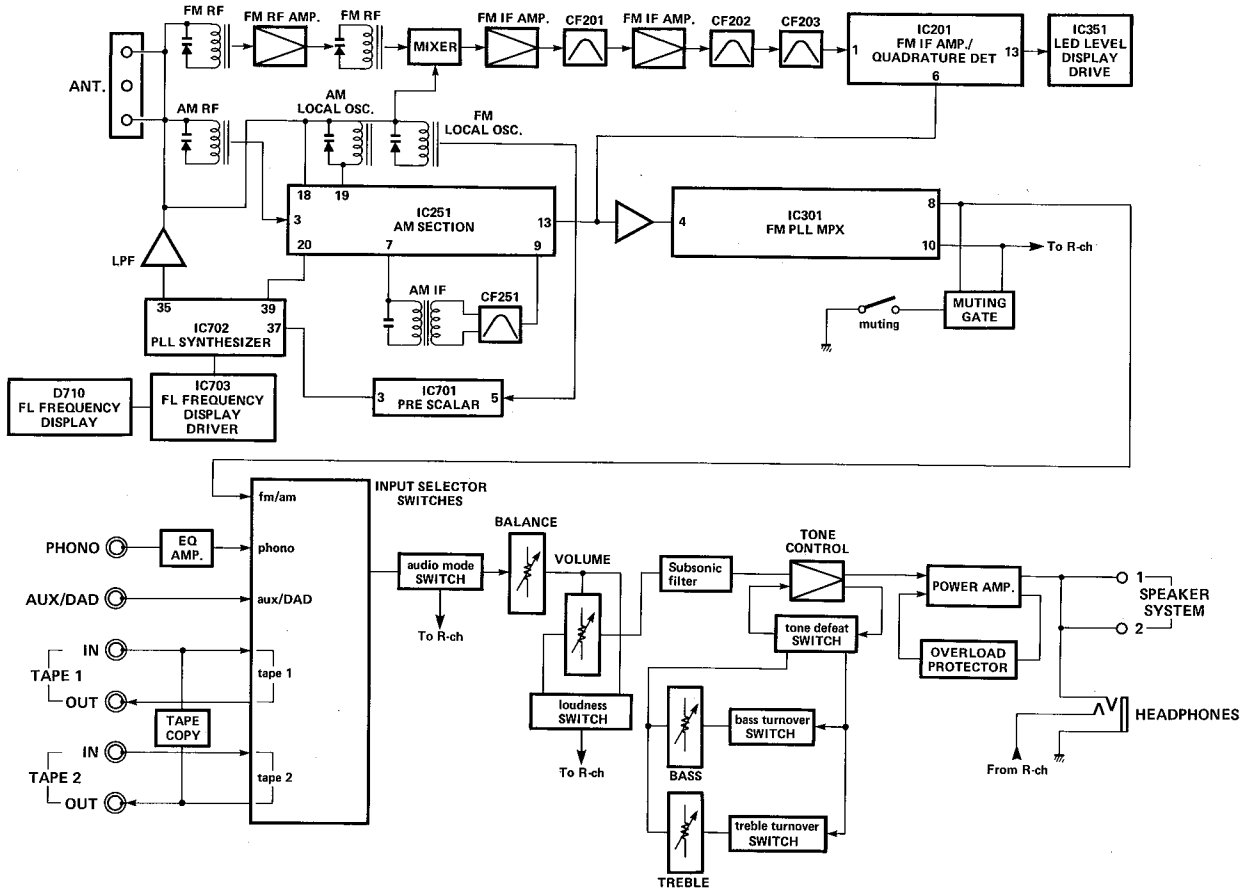
[2] SYNTHESIZER SECTION
1) FM
The output of local oscillator in the front-end is fed to ⑤ pin of the pre-scaler IC701 and then divided by 30 or 32 and fed to ㊲ pin of the PLL synthesizer IC702. The standard quartz oscillator output (4.5MHz) is divided by 180 in IC702 and 25kHz standard signal is got. 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).

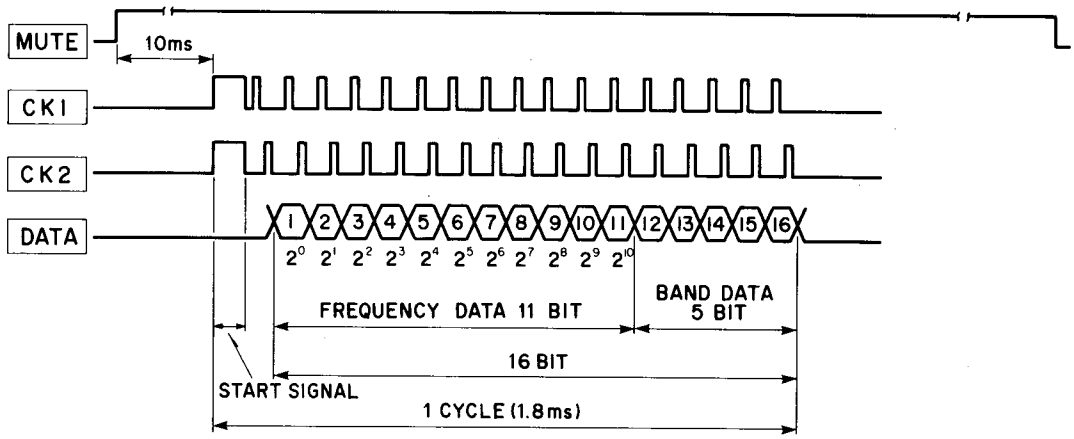
[5] OVERLOAD PROTECTION
As soon as the current over rated power flows, the voltage between both emitters of Q421 and Q423 (Rch) rises and Q7, Q9 and Q4 are turned ON. So Q1 (Schmit trigger circuit) is turned ON. The base of Q10 becomes 0V and Q405 is turned off. The operation of power amp. circuit stops and the circuit is protected.

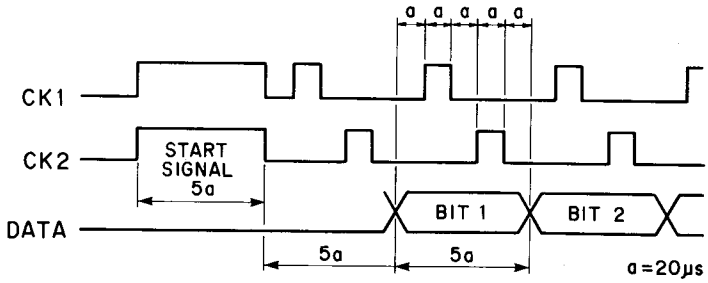
BLOCK DIAGRAM



TIMING CHART

Frequency display timing chart of IC702 (TC9147AP)





GENERAL UNIT PARTS LIST

Ref. No.	Part No.	Description
101	A443-HK590A	Front Panel Assembly
102	A424-HK590A	Cabinet Back Assembly
"	A424-HK590C	Cabinet Back Assembly (for Canada model)
103	A424-HK590B	Cabinet Bottom Assembly
104	A554-HK590A	Dial Back Assembly
105	A630-HK590A	Knob Assembly, Volume
106	A662-HK590A	Push Button Assembly, Power
107	A662-HK590B	Push Button Assembly, Tape Monitor, Function
108	A662-HK590C	Push Button Assembly, Bass Turnover, Tone Defeat, Treble Turnover, Tape Copy, Subsonic Filter, Loudness, Audio Mode, Muting
109	A662-HK590D	Push Button Assembly, Speakers
110	B211-HK590A	Chassis Assembly, T1
131	1319-0139	Foot
133	1414-03901	Cabinet Top
140	1541-02302	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
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	2224-7085	Insulator
190	2216-7143	Shield Plate
191	2222-7100	Heat Sink
192	2222-7101	Heat Sink
193	2222-7103	Heat Sink
194	2222-7152	Heat Sink
195	2222-7149	Heat Sink
196	2218-7001	Holding Bracket
199	2240-7176	Holder
200	2240-7120	Holder
204	2240-7206	Holder
206	2240-7050	Holder
241	2440-61	Special Nut
248	2651-210189	Spring
249	2240-7208	Holder
301	2211-7250	Chassis, Front
302	2211-7241	Chassis, T1
303	2211-7242	Chassis, Right
304	2219-7645	Bracket, Dial Back Upper Side
305	2219-7671	Bracket, Dial Panel Right Side
306	2219-7879	Bracket, PCB-17
307	2219-7913	Bracket, Transverse Direction
308	2219-7914	Bracket, PCB-3
309	2219-7915	Bracket, Vertical Direction
310	2219-7916	Bracket, Speakers Switch
311	2219-7917	Bracket, Power Switch
312	2219-7919	Bracket, PCB-9
313	2219-7920	Bracket, Dial Back Hold (Left, Center)
314	2219-7921	Bracket, Dial Back Hold (Right)
315	2219-7946	Bracket, Speakers Switch Shaft
316	2347-400647	Bind Head Tapping Screw
317	2347-300647	Bind Head Tapping Screw
318	2347-300627	Bind Head Tapping Screw
319	2347-301041	Bind Head Tapping Screw
320	2347-300827	Bind Head Tapping Screw
	1111-J30137	Owner Guide
	1111-J30138	Owner Guide (for Canada model)
	1222-7263	Packing Cushion (2 Used)
	1221-727167	Packing Box
	1397-6	Dipole Antenna (Accessary)

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
	CHASSIS MISCELLANEOUS	
P1	4161-71151	Power Cord
T1	5584-701435	Power Transformer
SO1	4474-156	AC Outlet, Switched, Unswitched
R1	5135-335J50P	Resistor, 3.3MΩ, ±5%, 1/2W, Carbon
L101	5911-235	AM Loop Antenna
LUG1	4211-4	Lug Terminal
	PCB-1 MAIN AMP. P.C. BOARD	
	RESISTORS	
R61	5102-2214715	220Ω, ±2%, 1/4W, Fuse
R417, 418	5174-562381	5.6kΩ, ±1%, 1/4W, Metal
R423, 424, 427, 428, 479, 480	5102-3314713	330Ω, ±2%, 1/4W, Fuse
R425, 426, 429, 430	5102-3314715	330Ω, ±2%, 1/4W, Fuse
R437, 438, 439, 440, 469, 470, 489, 490	5102-1014713	100Ω, ±2%, 1/4W, Fuse
R455, 456, 457, 458	5102-1004713	10Ω, ±2%, 1/4W, Fuse
R459, 460	5174-820381	82Ω, ±1%, 1/4W, Metal
R461, 462	5273-R22672	0.22Ω, ±10%, 3W x 2, Cement
R467, 468	5173-100571	10Ω, ±5%, 2W, Metal
R477, 478, 483, 484	5102-2R2579	2.2Ω, ±5%, 1/4W, Fuse
R485, 486	5102-2R25711	2.2Ω, ±5%, 1W, Fuse
	CONTROLS	
VR401, 402	5101-20271920	2kΩB
VR403, 404	5101-10471920	100kΩB
	CAPACITORS	
C4, 12	5345-476F041	47μF, ±20%, 50V, Electrolytic
C5, 6, 7, 8	5341-478F0955	4700μF, ±20%, 50V, Electrolytic
C9	5345-107C041	100μF, ±20%, 16V, Electrolytic
C10	5345-476C041	47μF, ±20%, 16V, Electrolytic
C11	5345-106C041	10μF, ±20%, 16V, Electrolytic
C13	5345-477G041	470μF, ±20%, 63V, Electrolytic
C401, 402	5345-107B0951	100μF, ±20%, 10V, Electrolytic
C403, 404	5359-2215851	220pF, ±5%, 100V, Polypropylene
C405, 406	5345-106D041	10μF, ±20%, 25V, Electrolytic
C407, 408, 409, 410	5345-227F041	220μF, ±20%, 50V, Electrolytic
C411, 412	5359-1015851	100pF, ±5%, 100V, Polypropylene
C415, 416	5353-050934	5pF, ±0.5pF, 500V, Mica
C417, 418	5345-106F041	10μF, ±20%, 50V, Electrolytic
C423, 424	5345-475F041	4.7μF, ±20%, 50V, Electrolytic
	TRANSISTORS	
Q1, 2, 4, 10	5611-1115(E)	2SA1115(E) or 2SA1115(F)
Q7, 8	5611-872A(E)	2SA872A(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	5612-646A(C)	2SB646A(C)
Q413, 414	5614-666A(C)	2SD666A(C)
Q415, 416	5613-945(K)	2SC945(K) or 2SC945(P)
Q417, 418	5613-1627(Y)	2SC1627(Y)
Q419, 420	5611-817(Y)	2SA817(Y)
Q421, 422	5613-3182(O)	2SC3182(O) or 2SC3182(R)
Q423, 424	5611-1265(O)	2SA1265(O) or 2SA1265(R)
Q425, 426	5611-965(Y)	2SA965(Y)
Q427, 428	5613-2235(Y)	2SC2235(Y)
	DIODES	
D1, 2, 3, 4, 17, 18, 19, 20	5632-ERC402FL	ERC402FL
D5, 6	5636-1S2471	1S2471
D7	5635-HZ11B2L	Zener, HZ11B2L
D8, 13, 14, 401, 402, 409, 410	5631-1S2473	1S2473

Ref. No.	Part No.	Description
D11, 12, 405, 406, 407, 408	5632-DS135E	DS135E
D403, 404	5641-MV12YM	Varistor, MV12YM
D411, 412	5635-HZ12C3L	Zener, HZ12C3L
	COILS	
L401, 402	5991-7165	
	MISCELLANEOUS	
P101, 102	4443-030185	Connector, 3 Pos.
	PCB-2 TUNER P.C. BOARD	
	RESISTORS	
R51	5102-3R3579	3.3Ω, ±5%, 1/4W, Fuse
R305	5102-2204713	22Ω, ±2%, 1/4W, Fuse
R323	5174-183381	18kΩ, ±1%, 1/4W, Metal
	CONTROLS	
VR201, 202, 251	5101-50371920	50kΩB
VR301, 302, 351	5101-10471920	100kΩB
VR303	5101-1037187	10kΩ
	CAPACITORS	
C51	5345-337-16	330μF, +50%–10%, 16V, Electrolytic
C52, 220	5345-108-16	1000μF, +50%–10%, 16V, Electrolytic
C201, 304	5345-476-16	47μF, +50%–10%, 16V, Electrolytic
C208, 217, 257, 351, 352	5345-106-16	10μF, +50%–10%, 16V, Electrolytic
C214	5359-1015851	100pF, ±5%, 100V, Polypropylene
C215	5345-105-50	1μF, +75%–10%, 50V, Electrolytic
C216	5345-226C0952	22μF, ±20%, 16V, Electrolytic
C218, 260	5345-L104M50	0.1μF, ±20%, 50V, Electrolytic
C263	5345-107-16	100μF, +50%–10%, 16V, Electrolytic
C266	5345-335-50	3.3μF, +75%–10%, 50V, Electrolytic
C267	5345-475-25	4.7μF, +75%–10%, 25V, Electrolytic
C269	5359-5115851	510pF, ±5%, 100V, Polypropylene
C271	5345-225-50	2.2μF, +75%–10%, 50V, Electrolytic
C301, 303	5345-L226M16	22μF, ±20%, 16V, Electrolytic
C302	5345-L107M10	100μF, ±20%, 10V, Electrolytic
C305	5345-227-16	220μF, +50%–10%, 16V, Electrolytic
C309, 310	5359-6815851	680pF, ±5%, 100V, Polypropylene
C311, 312	5345-L225M50	2.2μF, ±20%, 50V, Electrolytic
C315	5345-L106M16	10μF, ±20%, 16V, Electrolytic
C316	5345-L475M25	4.7μF, ±20%, 25V, Electrolytic
C317	5345-L474M50	0.47μF, ±20%, 50V, Electrolytic
C320	5359-8215851	820pF, ±5%, 100V, Polypropylene
C353	5345-474-50	0.47μF, +75%–10%, 50V, Electrolytic
C354	5345-226-16	22μF, +50%–10%, 16V, Electrolytic
TC251, 252	5371-93	Trimmer Capacitor
	INTEGRATED CIRCUIT	
IC201	5652-HA11225	HA11225
IC251	5652-LA1245	LA1245
IC301	5652-μPC1223C	μPC1223C
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
D201, 202, 203, 253, 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	2.2μH
L251	5933-70127	
L252	5923-70133	
	TRANSFORMERS	
T201	5574-7024	
T251	5552-70113	
T252	5932-70123	
	MISCELLANEOUS	
	6114-7128	FM Tuner Assembly
CF201, 202, 203	5671-7117A	Ceramic Filter, MA8
CF251	5671-7138F	Ceramic Filter, SFZ450F
CF252	5671-7137C	Ceramic Filter, BFU450C4N
J701	4163-70196	Connector with Lead Wire, 5 Pos.
P301	4443-040185	Connector, 4 Pos.
P351	4443-030185	Connector, 3 Pos.
P352	4443-070185	Connector, 7 Pos.
	PCB-3 LOGIC CONTROL P.C. BOARD	
	RESISTORS	
R712	5171-221581	220Ω, ±5%, 1W, Metal
R752, 753	5171-680581	68Ω, ±5%, 1W, Metal
	CAPACITORS	
C355	5345-106-16	10μF, +50%—10%, 16V, Electrolytic
C703	5345-476-10	47μF, +50%—10%, 10V, Electrolytic
C708	5345-336-35	33μF, +50%—10%, 35V, Electrolytic
C709	5345-334F0951	0.33μF, ±20%, 50V, Electrolytic
C712	5350-4730H651	47000μF, +80%—20%, 5V, Special
C715	5345-227-10	220μF, +50%—10%, 10V, Electrolytic
C716, 717	5345-L225M50	2.2μF, ±20%, 50V, Electrolytic
C721, 722	5345-225-50	2.2μF, +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	2.2μH
	MISCELLANEOUS	
	5722-10	Station Display, FIP7B8S
X701	5691-00720019	Crystal Osc.
F701, 702, 703	5212-3	R Components
P701	4443-057114	Connector, 5 Pos.
P702	4443-030185	Connector, 3 Pos.
P703	4443-080185	Connector, 8 Pos.
P704	4443-070185	Connector, 7 Pos.
P705, 707, 708	4443-050185	Connector, 5 Pos.
P706	4443-027114	Connector, 2 Pos.

Ref. No.	Part No.	Description
	PCB-4 EQUALIZER P.C. BOARD	
	RESISTORS	
R37, 38, 41, 42, 63, 64, 65, 66	5102-5604715	56Ω, ±2%, 1/4W, Fuse
R649, 650	5174-Z549328	549kΩ, ±0.5%, 1/4W, Metal
R651, 652	5174-Z412228	41.2kΩ, ±1%, 1/4W, Metal
	CAPACITORS	
C23, 24	5345-476D041	47μF, ±20%, 25V, Electrolytic
C27, 28	5345-227D041	220μF, ±20%, 25V, Electrolytic
C601, 602	5345-476B0951	47μF, ±20%, 10V, Electrolytic
C603, 604	5359-1215851	120pF, ±5%, 100V, Polypropylene
C605, 606	5345-337A0952	330μF, ±20%, 6.3V, Electrolytic
C607, 608	5359-2025851	2000pF, ±5%, 100V, Polypropylene
C609, 610	5359-5625851	5600pF, ±5%, 100V, Polypropylene
C611, 612, 613, 614	5345-226D0951	22μF, ±20%, 25V, Electrolytic
C615, 616	5359-8225851	8200pF, ±5%, 100V, Polypropylene
C617, 618	5345-226E041	22μF, ±20%, 35V, Electrolytic
C619, 620	5359-1015851	100pF, ±5%, 100V, Polypropylene
C625, 626	5359-1525851	1500pF, ±5%, 100V, Polypropylene
C627	5345-104F041	0.1μF, ±20%, 50V, Electrolytic
	TRANSISTORS	
Q11	5613-2235(O)	2SC2235(O) or 2SC2235(Y)
Q12	5611-965(O)	2SA965(O) or 2SA965(Y)
Q601, 602, 603, 604, 605, 606, 609, 610, 615, 616	5613-2240(BL)	2SC2240(BL)
Q607, 608, 611, 612, 613, 614	5611-970(BL)	2SA970(BL)
Q617, 618	5613-2705(O)	2SC2705(O) or 2SC2705(Y)
Q619, 620	5611-1145(O)	2SA1145(O) or 2SA1145(Y)
Q621, 622	5616-2SK364(V	F.E.T., 2SK364(V) or 2SK364 (BL)
Q623, 624, 629	5613-2603(E)	2SC2603(E) or 2SC2603(F)
Q627, 628	5611-1115(F)	2SA1115(F) or 2SA1115(E)
	DIODES	
D15, 16	5635-HZ20-2L	Zener, HZ20-2L
D601, 603, 604	5631-1S2473	1S2473
	MISCELLANEOUS	
P801, 802	4443-040185	Connector, 4 Pos.
	PCB-5 TONE P.C. BOARD	
	RESISTORS	
R19, 20, 21, 22	5174-181381	180Ω, ±1%, 1/4W, Metal
	CONTROLS	
VR501/502	5113-50385122	50kΩMN, Balance
VR505/506	5113-50371148	50kΩC, Treble
VR507/508	5113-10472148	100kΩC, Bass
	CAPACITORS	
C17, 18	5345-476C041	47μF, ±20%, 16V, Electrolytic
C21, 22	5345-227C041	220μF, ±20%, 16V, Electrolytic
C509, 510	5345-685D0951	6.8μF, ±20%, 25V, Electrolytic
C511, 512	5353-010934	1pF, ±0.5pF, 500V, Mica
C513, 514	5345-226D0951	22μF, ±20%, 25V, Electrolytic
C515, 516, 517, 518	5353-680534	68pF, ±0.5pF, 500V, Mica
C519, 520	5345-476C0951	47μF, ±20%, 16V, Electrolytic
C521, 522	5359-1015851	100pF, ±5%, 100V, Polypropylene
	TRANSISTORS	
Q5	5613-2235(O)	2SC2235(O) or 2SC2235(Y)
Q6	5611-965(O)	2SA965(O) or 2SA965(Y)
Q14, 509, 510, 513, 514, 515, 516	5611-1115(E)	2SA1115(E) or 2SA1115(F)
Q501, 502, 503, 504	5613-2320L(F)	2SC2320L(F)

Ref. No.	Part No.	Description
Q505, 506, 507, 508, 511, 512, 517, 518	5613-2603(E)	2SC2603(E) or 2SC2603(F)
Q519, 520	5616-2SK381(B	F.E.T., 2SK381(B) or 2SK381(C)
	DIODES	
D9, 10	5635-HZ15-2L	Zener, HZ15-2L
D501, 502, 503, 504	5631-1S2473	1S2473
	MISCELLANEOUS	
SW501, 502, 503, 504, 505, 506, 507	4431-0728714	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
	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 TONE SELECTOR P.C. BOARD	
SW508, 509, 510	4431-03127253	Push Switch, Bass Turnover, Tone Defeat, Treble Turnover
	PCB-9 PUSH SWITCHES P.C. BOARD	
C503, 504	5359-1815851	Capacitor, 180pF, ±5%, 100V, Polypropylene
SW511, 512, 513	4431-03127253	Push Switch, Tape Copy, Subsonic Filter, Loudness
SW514, 515	4431-02047365	Push Switch, Audio Mode, Muting
	PCB-10 TAPE MONITOR & FUNCTION INDICATORS P.C. BOARD	
D21, 22	5637-GL5PR6	L.E.D., GL5PR6, Red, Tape Monitor
D25, 26, 27, 28	5637-GL5NG6	L.E.D., GL5NG6, Green, Function
	PCB-11 VOLUME P.C. BOARD	
VR503/504	5113-10471147	Control, 100kΩB, Volume
	PCB-12 MUTE ADJ. VR P.C. BOARD	
VR352	5113-50372136	Control, 50kΩB, Mute Adjust
P301	4443-030185	Connector, 3 Pos.
	PCB-13 LAMP P.C. BOARD	
LP1, 2	5731-1507245	Lamp, 15V, 100mA, Illuminator
J706	4163-023503	Connector with Lead Wire, 2 Pos.
	PCB-14 ANTENNA TERMINAL P.C. BOARD	
TE1	4214-95	External Antenna Terminal
	PCB-15 SPEAKER SWITCHES P.B. BOARD	
R475, 476	5171-471572	Resistor, 470Ω, ±5%, 1W, Metal
SW401, 402	4431-02047166	Push Switch, Speaker 1, Speaker 2
	PCB-16 SPEAKER TERMINAL P.C. BOARD	
TE2	4214-121	Terminal, Speaker System 1/2
	PCB-17 HEADPHONE JACK P.C. BOARD	
J401	4451-00139	Jack, Headphones
P401	4443-030185	Connector, 3 Pos.

Ref. No.	Part No.	Description
	PCB-18 POWER SWITCH P.C. BOARD	
	CAPACITORS	
C1	5352-1030959	0.01μF, ±20%, AC125V, Metalized Polyester
C30	5345-105F041	1μF, ±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	5732-402031	Fuse, 4A, 125V
	4472-7122	Fuse Holder (x 2)
	PCB-19 FREQUENCY STEP CONTROL SWITCHES P.C. BOARD	
SW714, 715	4421-012413	Slide Switch, AM 9kHz/10kHz, FM 50kHz/100kHz

SCHEMATIC DIAGRAM

FM FRONT END

FM IF AMP.

FM IF AMP. QUADRATURE DET

PRE SCALER

L.P.F.

FREQUENCY DISPLAY

LED LEVEL DISPLAY

PLL SYNTHESIZER

LED DISPLAY DRIVER

FM PLL MPX

AM SECTION

EQUALIZER

TONE CONTROL

POWER AMP.

POWER SUPPLY

TD6104P: IC701

TC9147AP: IC702

TD6301AP: IC703

HA11225: IC201

μPC1223C: IC301

AN6875: IC351

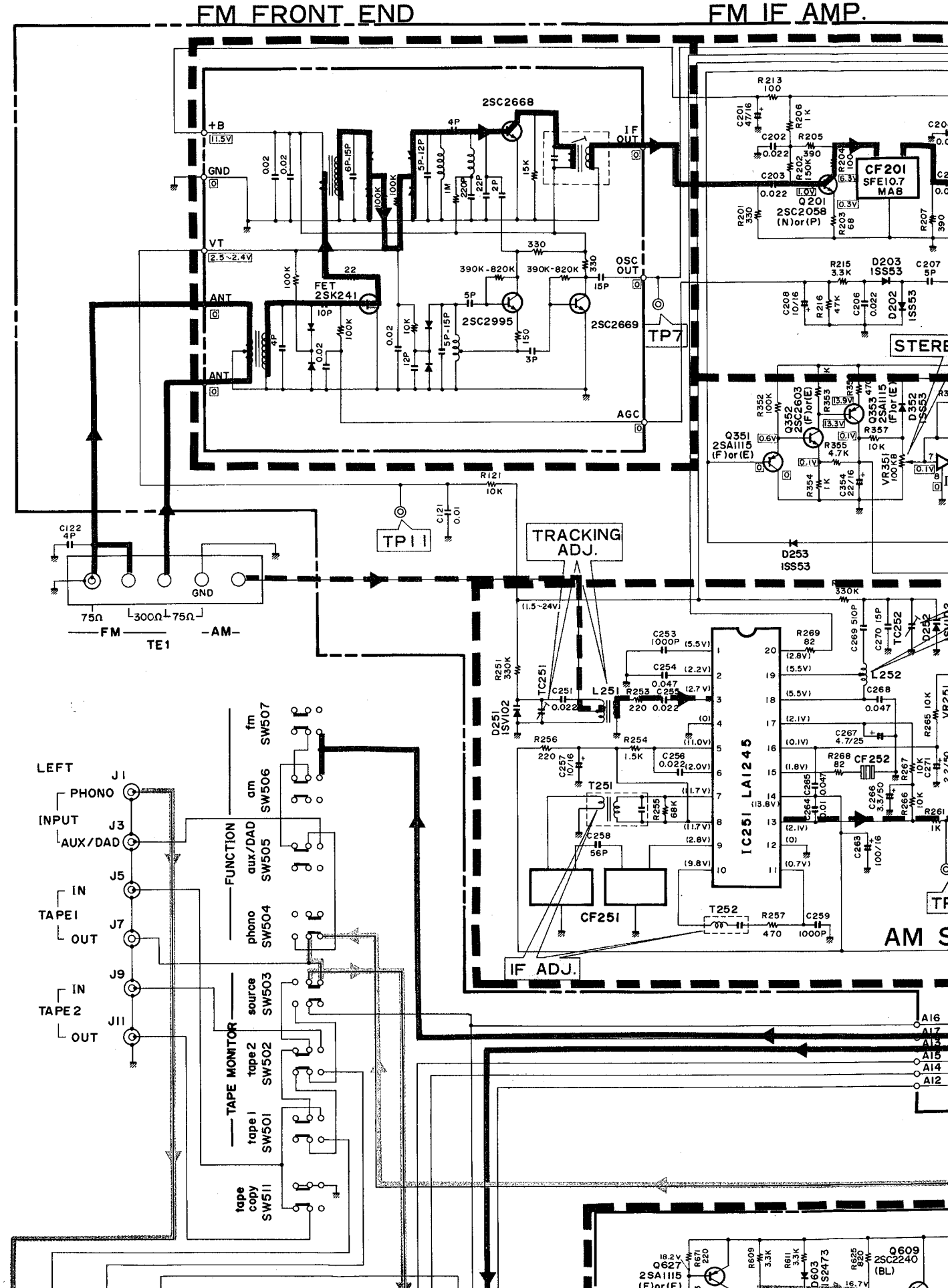
TC4049BP: IC352

LA1245: IC251

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

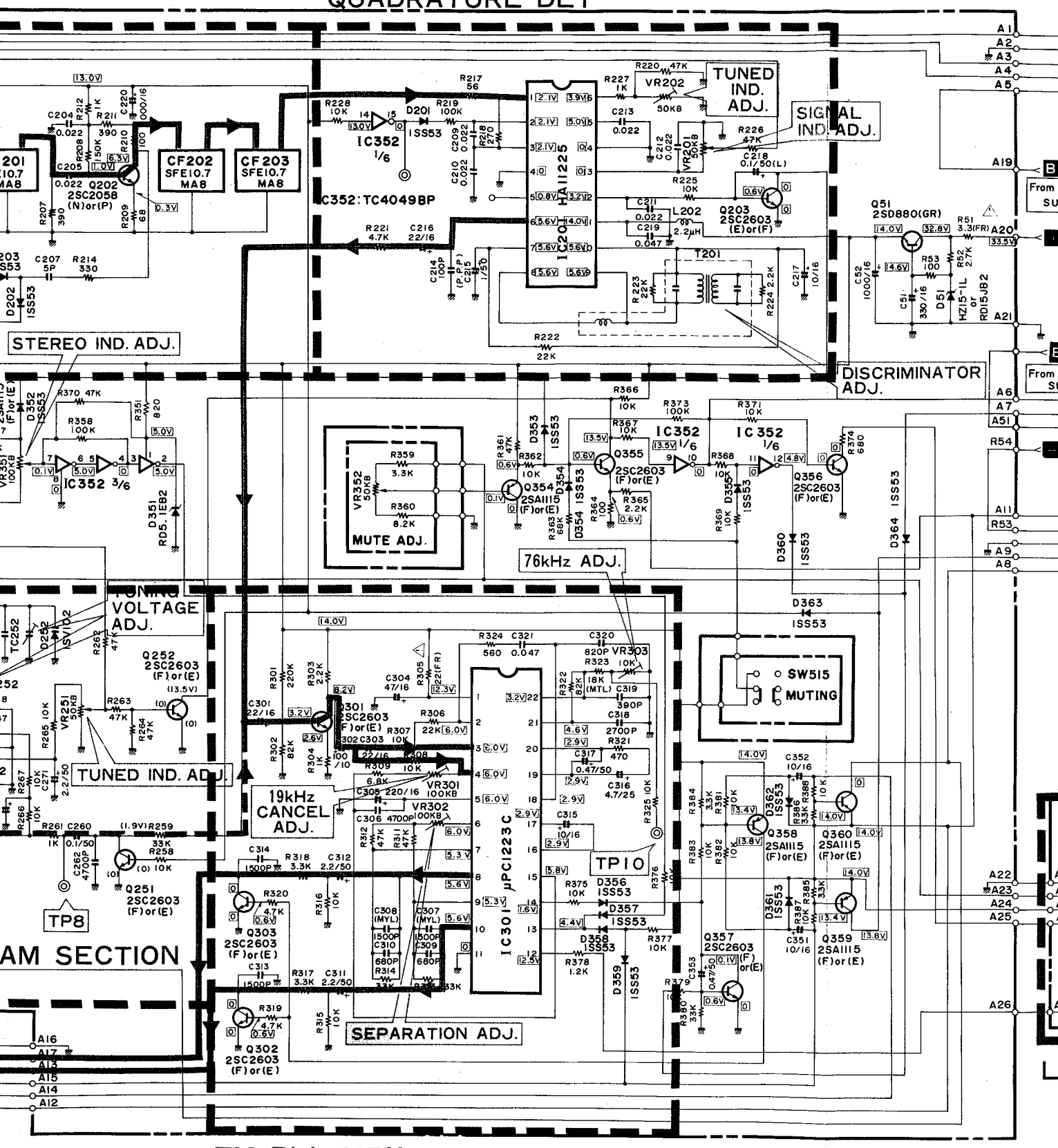
..... FM SIGNAL
..... AM SIGNAL
..... PHONO SIGNAL

SCHEMATIC DIAGRAM



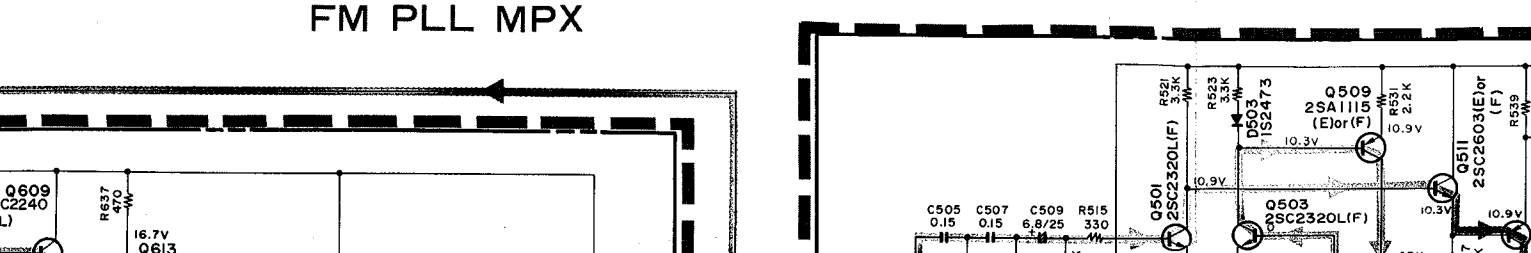
E F G H

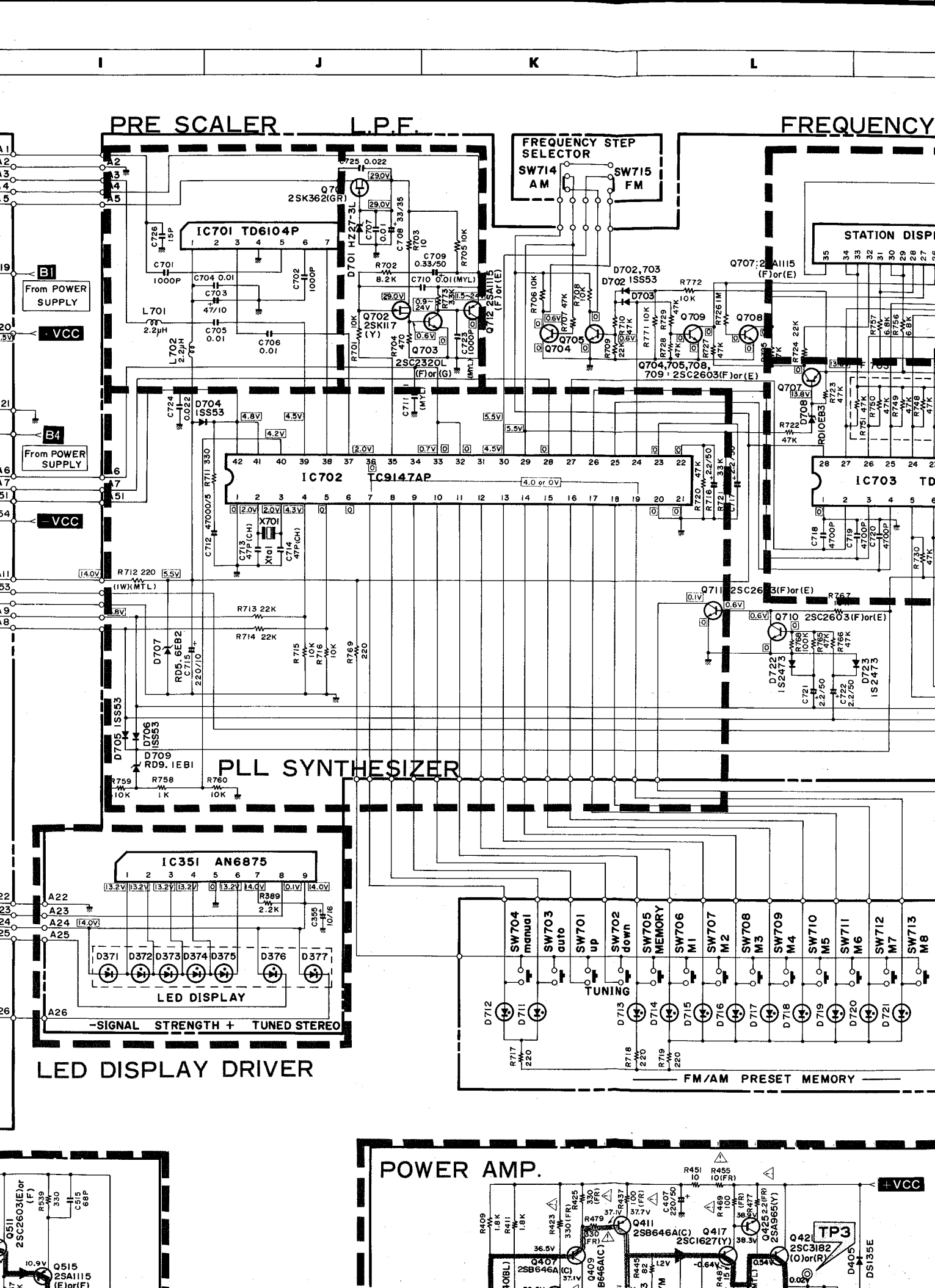
FM IF AMP. QUADRATURE DET



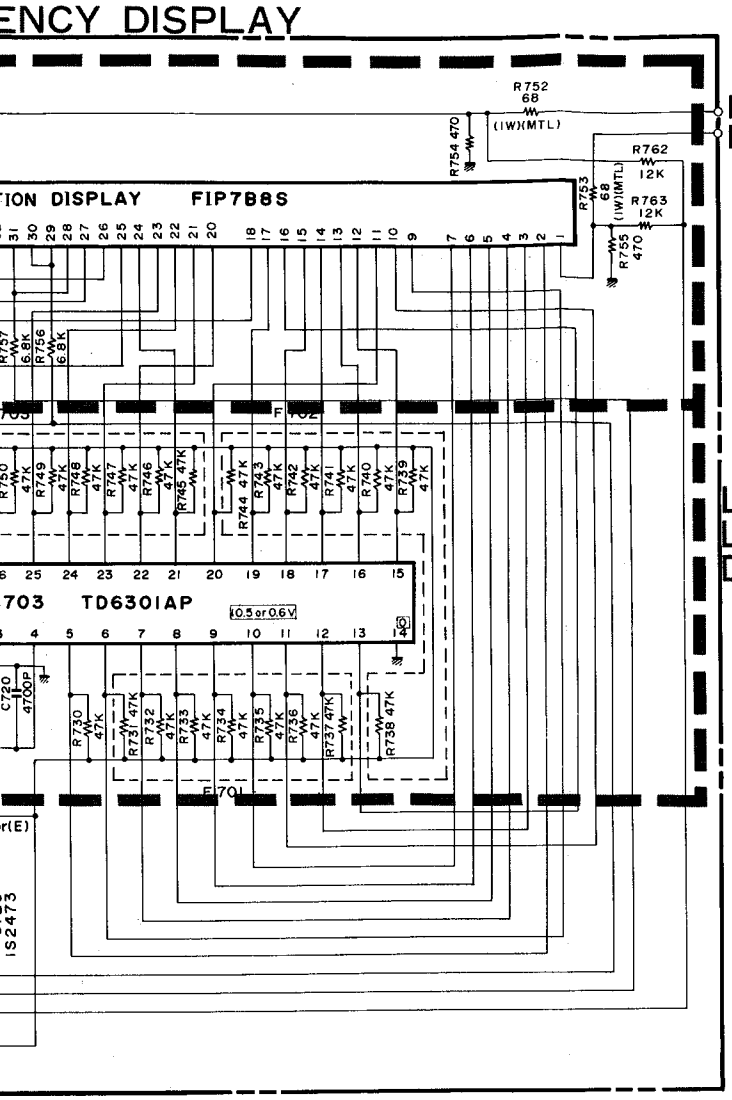
AM SECTION

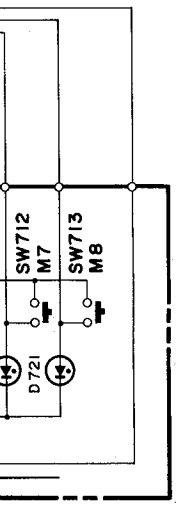
FM PLL MPX

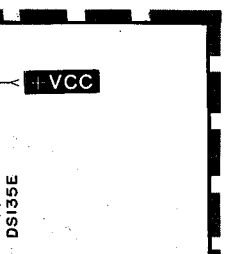


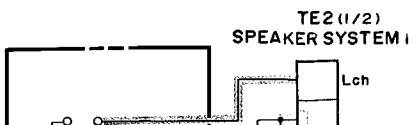

PRE SCALER
L.P.F.
FREQUENCY
FREQUENCY STEP SELECTOR
SW714 AM
SW715 FM
IC701 TD6104P
IC702 LC9147AP
IC703
STATION DISP
Q701 2SK362(GR)
Q702 2SK117 (Y)
Q703 2SC2320L (F)or(G)
Q704,705,708, 709 : 2SC2603(F)or(E)
Q707 2SA1115 (F)or(E)
Q710 2SC2603(F)or(E)
Q711 2SC2603(F)or(E)
Q712 2SA1115 (F)or(E)
D701 HZ27-3L
D702,703 D702 1SS53
D703
D704 1SS53
D705 1SS53
D706 1SS53
D707 RD5.6EB2
D709 RD9.1EB1
D722 1S2473
D723 1S2473
X701 Xtal
From POWER SUPPLY
B1
B4
VCC
-VCC
PLL SYNTHESIZER
IC351 AN6875
LED DISPLAY
-SIGNAL STRENGTH + TUNED STEREO
LED DISPLAY DRIVER
SW704 manual
SW703 auto
SW701 up
SW702 down
SW705 MEMORY
SW706 M1
SW707 M2
SW708 M3
SW709 M4
SW710 M5
SW711 M6
SW712 M7
SW713 M8
TUNING
FM/AM PRESET MEMORY
POWER AMP.
+VCC
TP3
Q411 2SB646A(C)
Q417 2SC1627(Y)
Q421 2SC3182 (O)or(R)
Q425 2SA965(Y)
Q407 2SB646A(C)
Q409 B646A(C)
Q511 2SC2603(E)or (F)
Q515 2SA1115 (E)or(F)
D405 DS135E

M	N	O	P

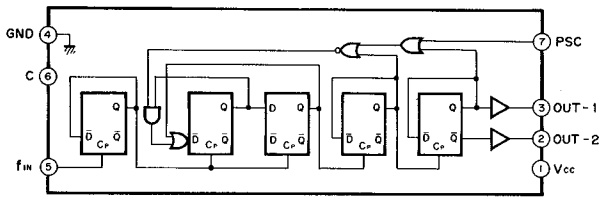




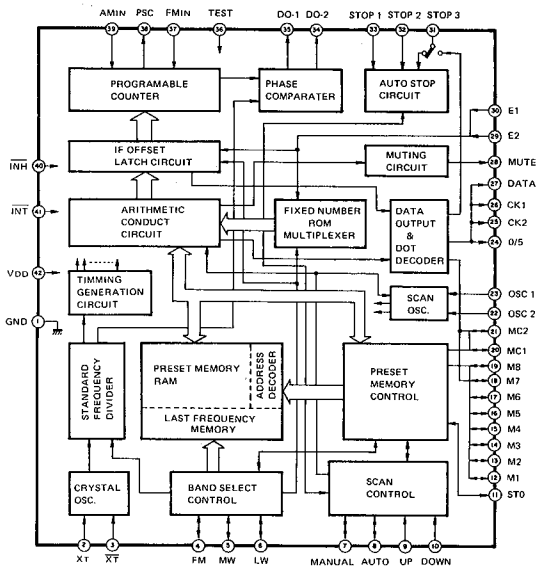




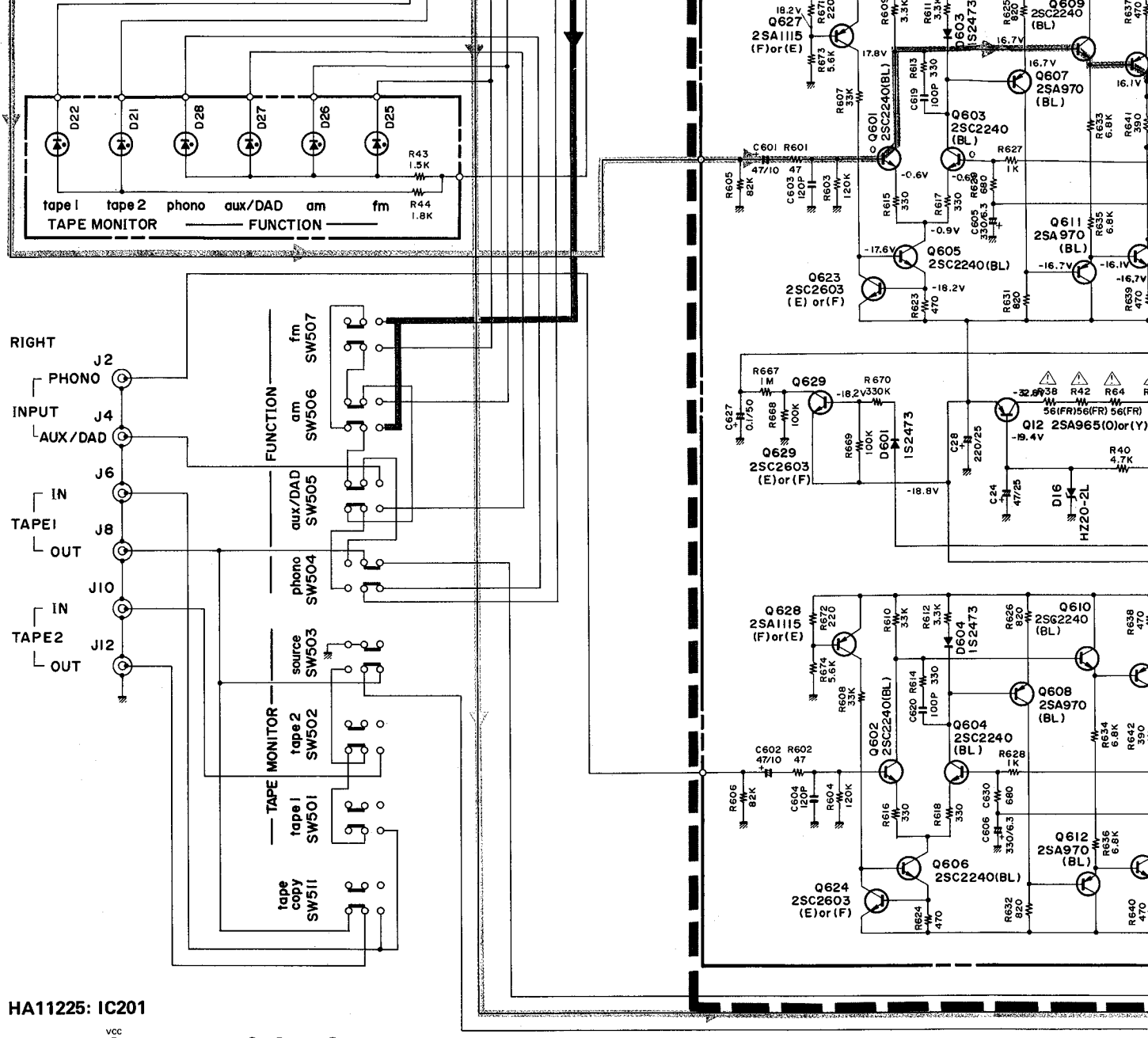
TD6104P: IC701



TC9147AP: IC702

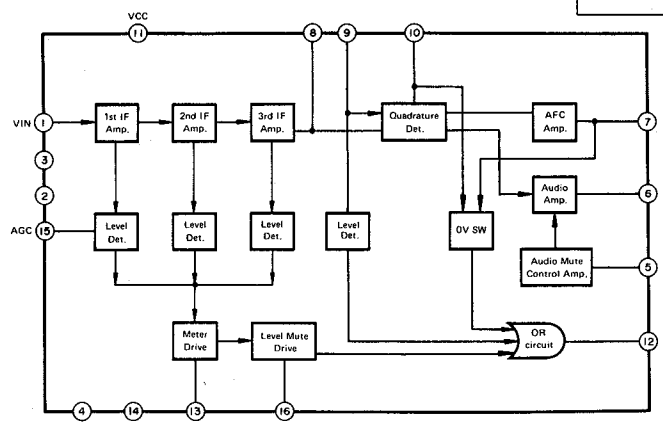


TD6301AP: IC703

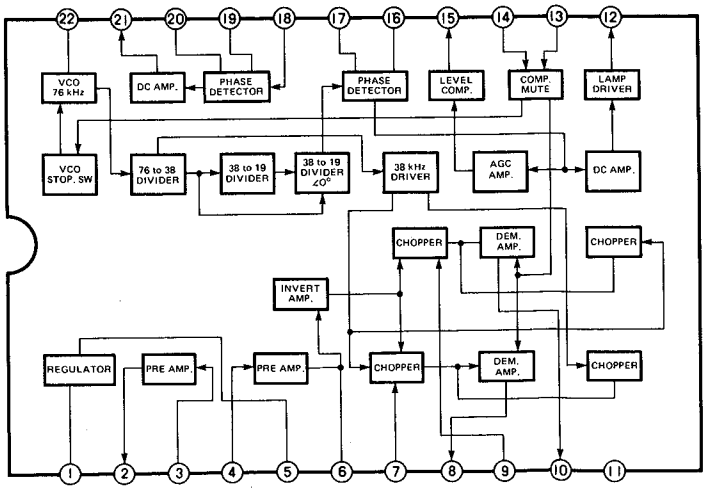


EQUALIZER

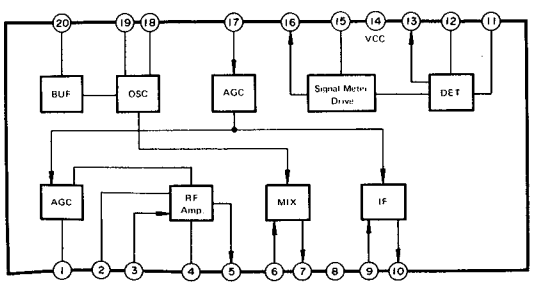
HA11225: IC201

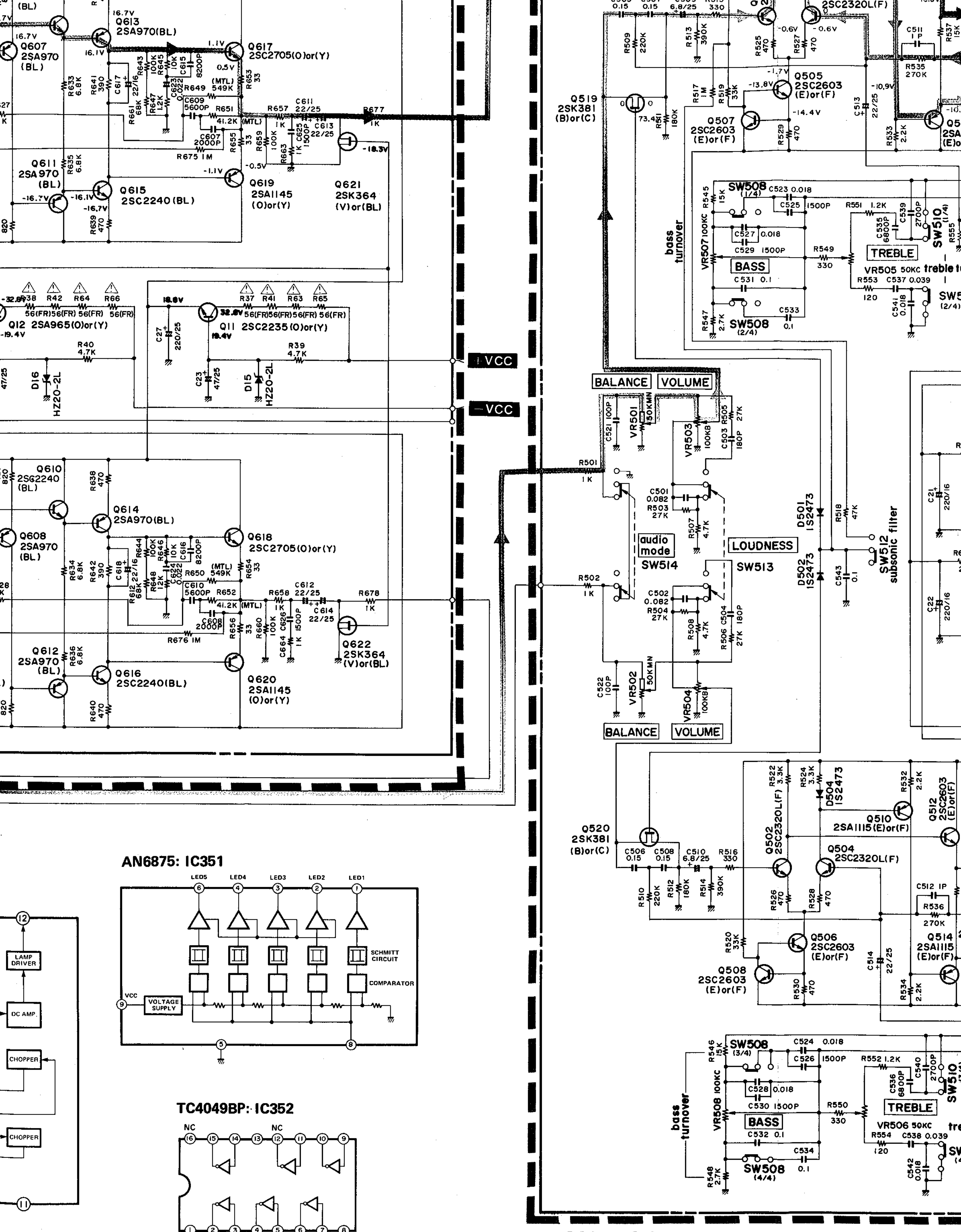


μPC1223C: IC301

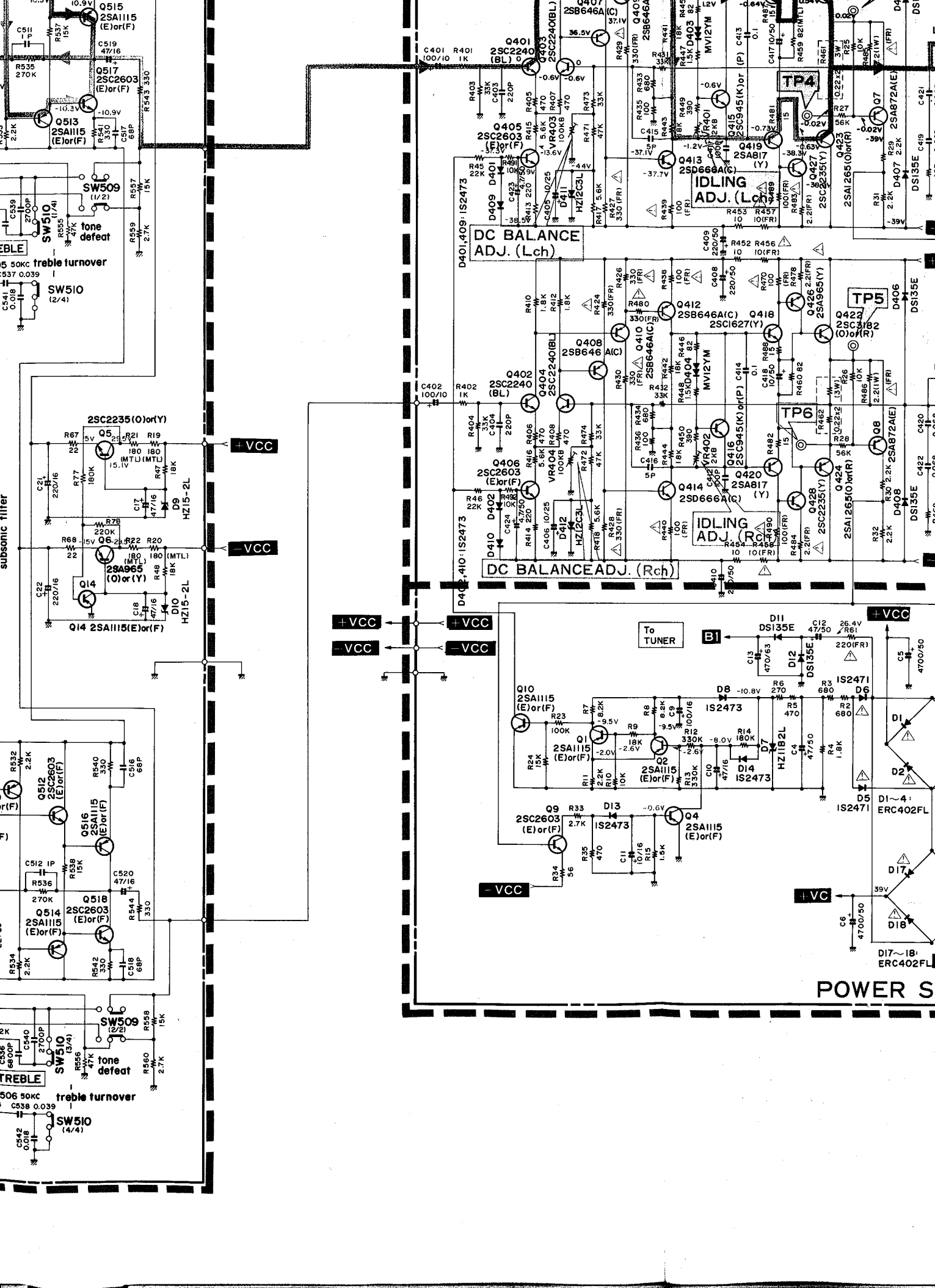


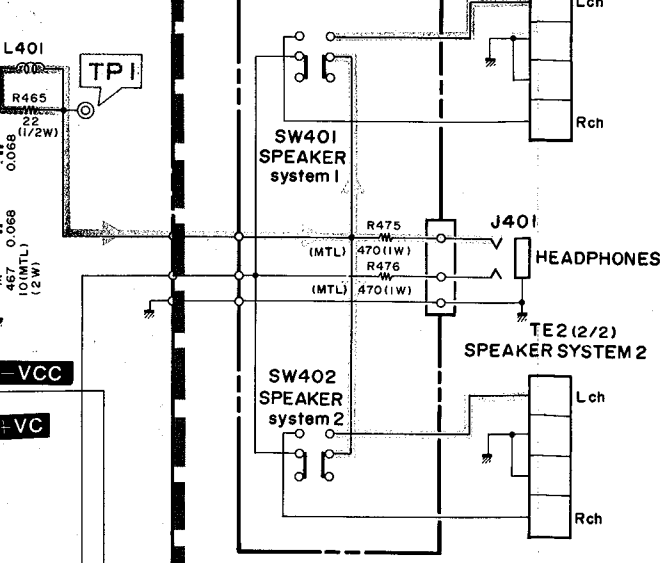
LA1245: IC251



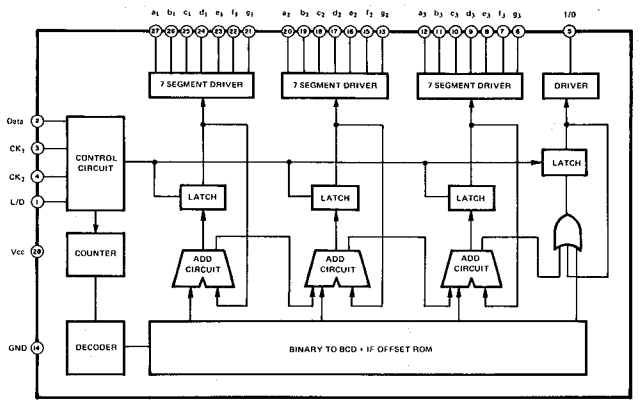


TONE CONTROL


Q515 2SA1115 (E)or(F)
Q517 2SC2603 (E)or(F)
Q513 2SA1115 (E)or(F)
SW509 (1/2)
SW510 (1/4)
tone defeat
treble turnover
SW510 (2/4)
Q401 2SC2240 (BL)
Q403 2SC2240(BL)
Q405 2SC2603 (E)or(F)
Q407 2SB646A(C)
Q415 2SC945(K)or
Q419 2SA817 (Y)
Q413 2SD666A(C)
Q423 2SC2235(Y)
Q427 2SA1265(O)or(R)
Q7 2SA872A(E)
TP4
IDLING ADJ. (Lch)
DC BALANCE ADJ. (Lch)
D401,409: IS2473
Q402 2SC2240 (BL)
Q404 2SC2240(BL)
Q406 2SC2603 (E)or(F)
Q408 2SB646 A(C)
Q410 2SB646A(C)
Q412 2SB646A(C)
Q416 2SC945(K) or(P)
Q420 2SA817 (Y)
Q414 2SD666A(C)
Q418 2SC1627(Y)
Q422 2SC3182 (O)or(R)
Q426 2SA965(Y)
Q424 2SC2235(Y)
Q428 2SC2235(Y)
Q8 2SA872A(E)
TP5
TP6
IDLING ADJ. (Rch)
DC BALANCE ADJ. (Rch)
D402,410: IS2473
2SC2235(O)or(Y)
Q5
Q6
2SA965 (O)or(Y)
Q14
Q14 2SA1115(E)or(F)
subsonic filter
+VCC
-VCC
To TUNER
B1
D11 DS135E
D12 DS135E
Q10 2SA1115 (E)or(F)
Q1 2SA1115 (E)or(F)
Q2 2SA1115 (E)or(F)
Q9 2SC2603 (E)or(F)
Q4 2SA1115 (E)or(F)
D8 IS2473
D14 IS2473
D13 IS2473
D7 HZ11B2L
D1
D2
D5 IS2471
D6 IS2471
D1~4: ERC402FL
D17
D18
D17~18: ERC402FL
Q512 2SC2603 (E)or(F)
Q516 2SA1115 (E)or(F)
Q514 2SA1115 (E)or(F)
Q518 2SC2603 (E)or(F)
SW509 (2/2)
SW510 (3/4)
tone defeat
treble turnover
SW510 (4/4)
TREBLE
POWER S



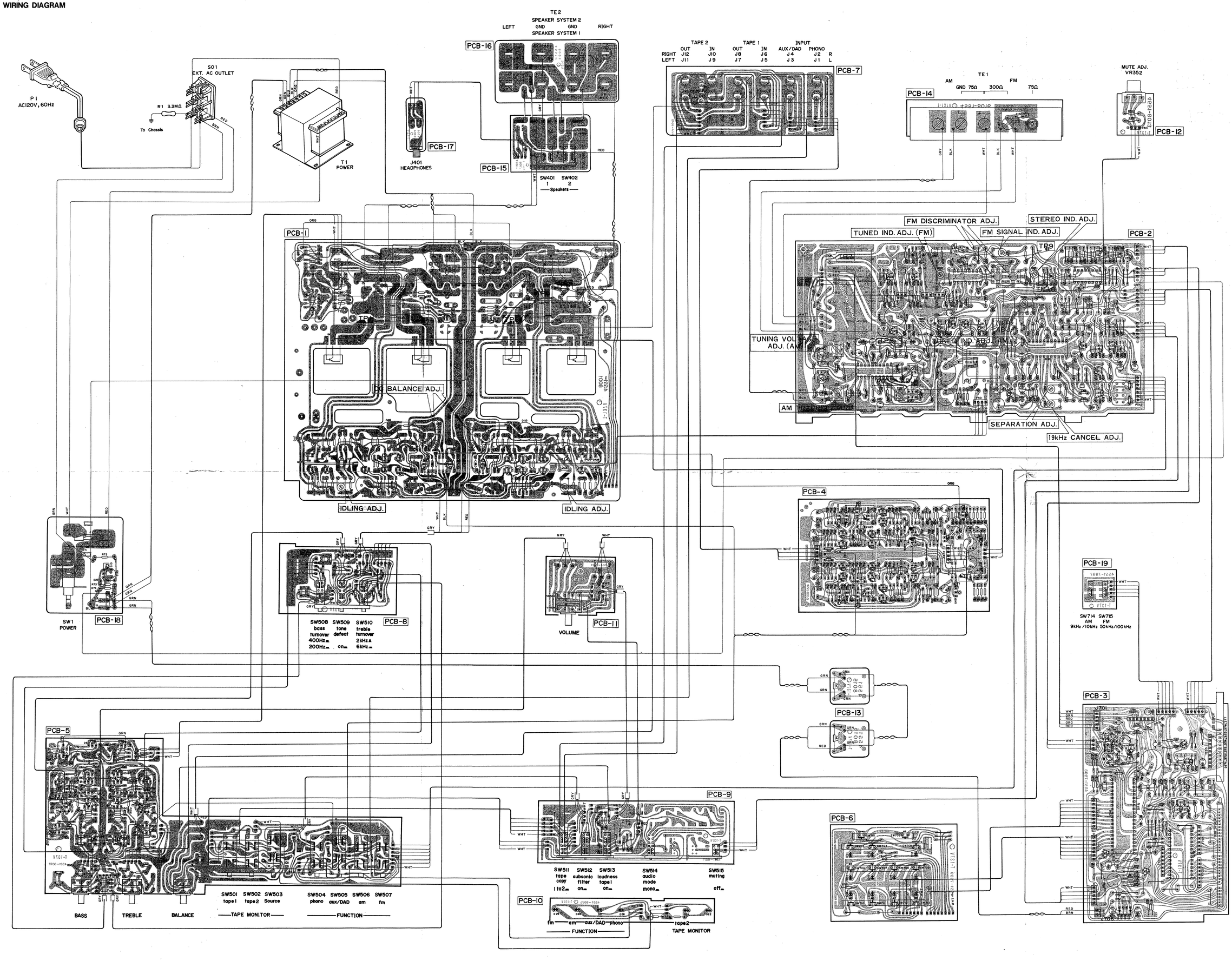
TD6301AP: IC703



..... FM SIGNAL
..... AM SIGNAL
..... PHONO SIGNAL

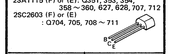
1. ALL RESISTANCES VALUES ARE IN Ω.
   KΩ=1000Ω, MΩ=1000KΩ.
2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.
3. ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. P=μμF
4. V: DC VOLTAGE AT NO SIGNAL
   [...V] FM POSITION
   (...V) AM POSITION
5. ⚠ SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE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

WIRING DIAGRAM

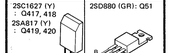


PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

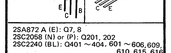
2SA1115 (E) or (F): Q1, 2, 4, 10, 14, 509, 510, 513 ~ 516, 623, 624
2SC2603 (E) or (F): Q9, 13, 405, 406, 505 ~ 508, 511, 512, 517, 518
2SC2603 (F) or (E): Q202, 251, 252, 301 ~ 303, 352, 355 ~ 357
2SA1115 (F) or (E): Q351, 353, 354, 358 ~ 360, 627, 628, 707, 712
2SC2603 (F) or (E): Q704, 705, 708 ~ 711



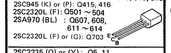
2SC1627 (Y): Q417, 418
2SA817 (Y): Q419, 420
2SD880 (GR): Q51



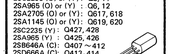
2SA872 A (E): Q7, 8
2SC2058 (N) or (P): Q201, 202
2SC2240 (BL): Q401 ~ 404, 601 ~ 606, 609, 610, 615, 616
2SC945 (K) or (P): Q415, 416
2SC2320L (F): Q501 ~ 504
2SA970 (BL): Q607, 608, 611 ~ 614
2SC2320L (F) or (G): Q703



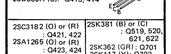
2SC2225 (O) or (Y): Q5, 11
2SA965 (O) or (Y): Q6, 12
2SA2705 (O) or (Y): Q617, 618
2SA1145 (O) or (Y): Q619, 620
2SC2235 (Y): Q427, 428
2SA965 (Y): Q425, 426
2SB646A (C): Q407 ~ 412
2SD666A (C): Q413, 414



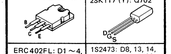
2SC3182 (O) or (R): Q421, 422
2SA1265 (O) or (R): Q423, 424
2SK381 (B) or (C): Q519, 520, 621, 622
2SK362 (GR): Q701
2SK117 (Y): Q702



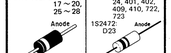
ERC402FL: D1 ~ 4, 17 ~ 20, 25 ~ 28
152473: D8, 13, 14, 24, 401, 402, 409, 410, 722, 723
152472: D23



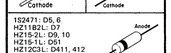
152471: D5, 6
HZ11BZL: D7
HZ15-2L: D9, 10
HZ15-1L: D51
HZ12C3L: D411, 412
HZ20-2L: D15, 16
HZ27-3L: D701
1SS53: D201 ~ 203, 352 ~ 364, 702 ~ 706
DS135E: D11, 12, 405 ~ 408



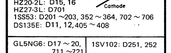
GL5NG6: D17 ~ 20, 711 ~ 721
GL5PR6: D21, 22
1SV102: D251, 252



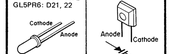
RD5.1EB2: D351
RD6.6EB2: D707
RD10EB3: D708
RD9.1EB1: D709
MV12YM: D403, 404



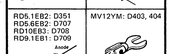
HA11225: IC201
LA1245: IC251



μPC1223C: IC301
AN6875: IC351



TC4049BP: IC352
TD6104P: IC701

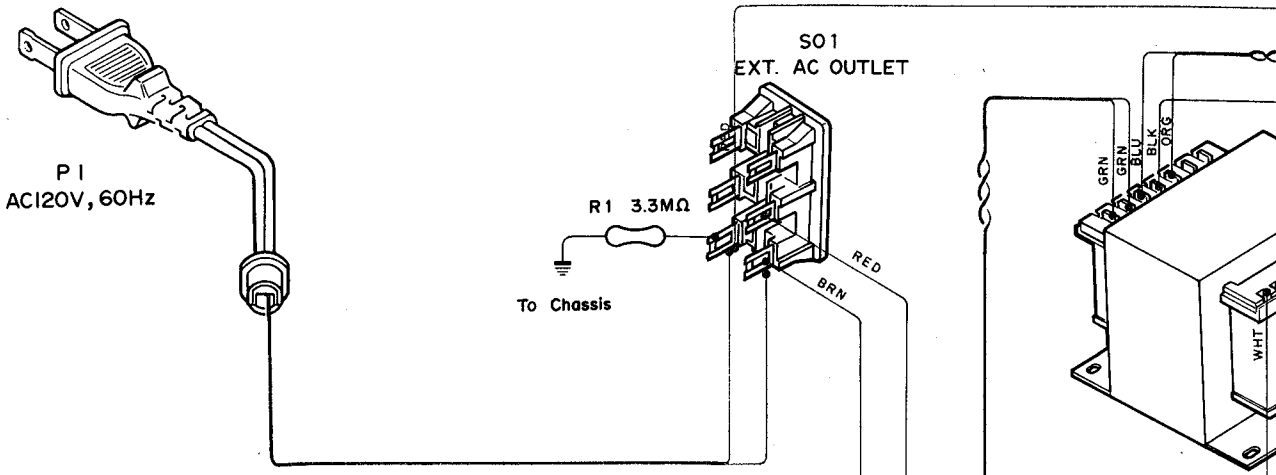


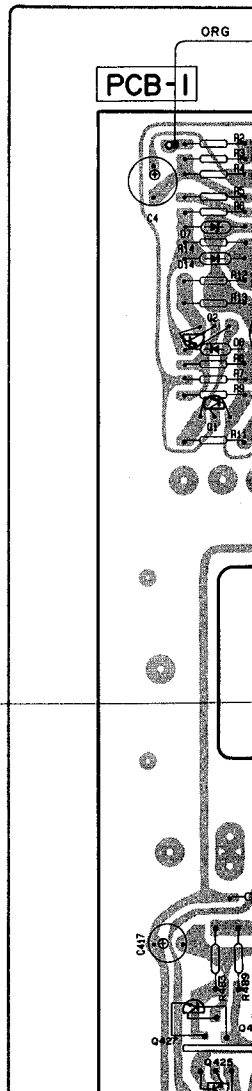
TC9147AP: IC702
TD6301AP: IC703

WIRE COLOR ABBREVIATIONS

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

WIRING DIAGRAM





E F G H

TE 2
SPEAKER SYSTEM 2
LEFT GND GND RIGHT
SPEAKER SYSTEM 1

PCB-16

PCB-17

J401
HEADPHONES

T1
POWER

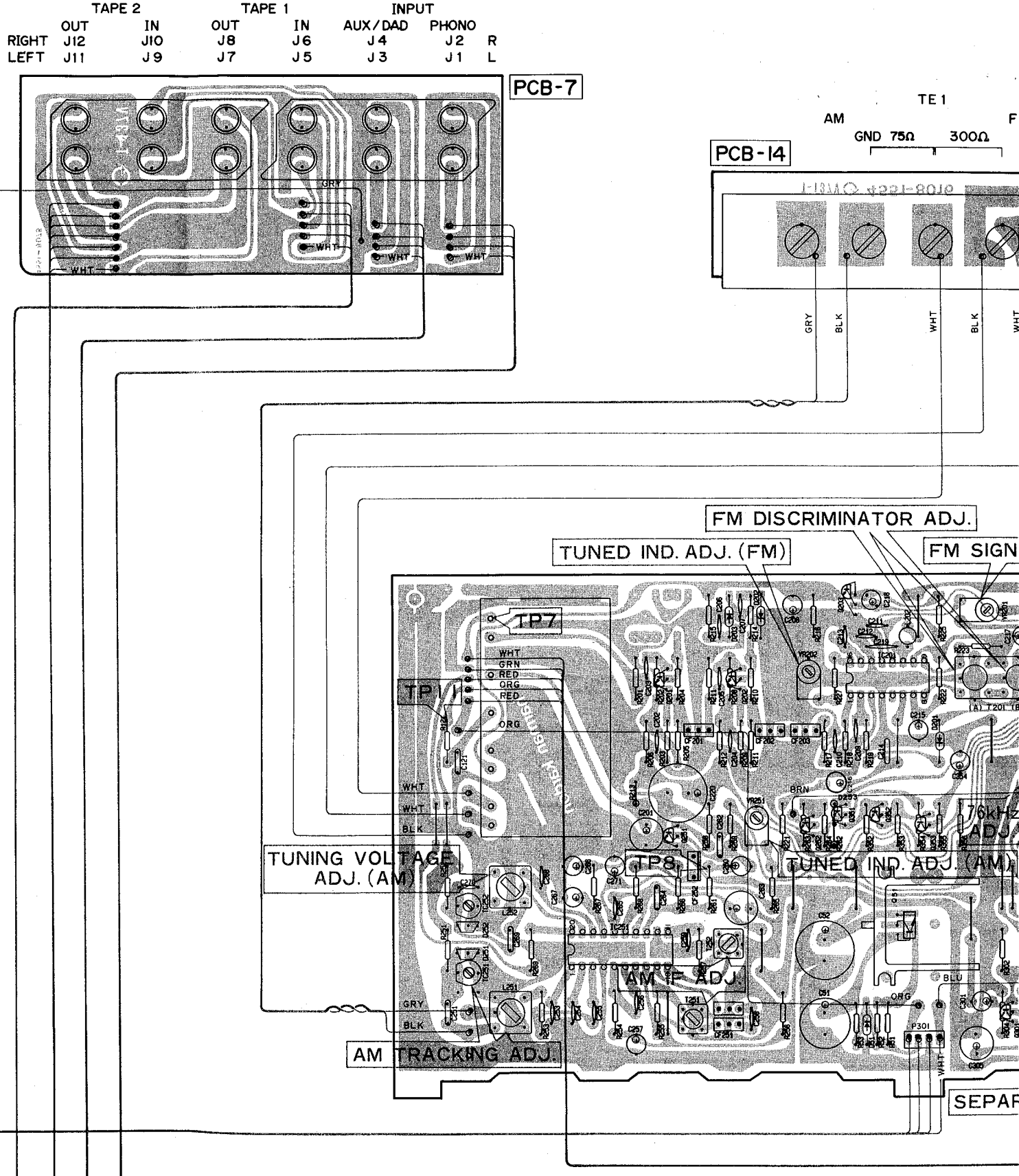
PCB-15

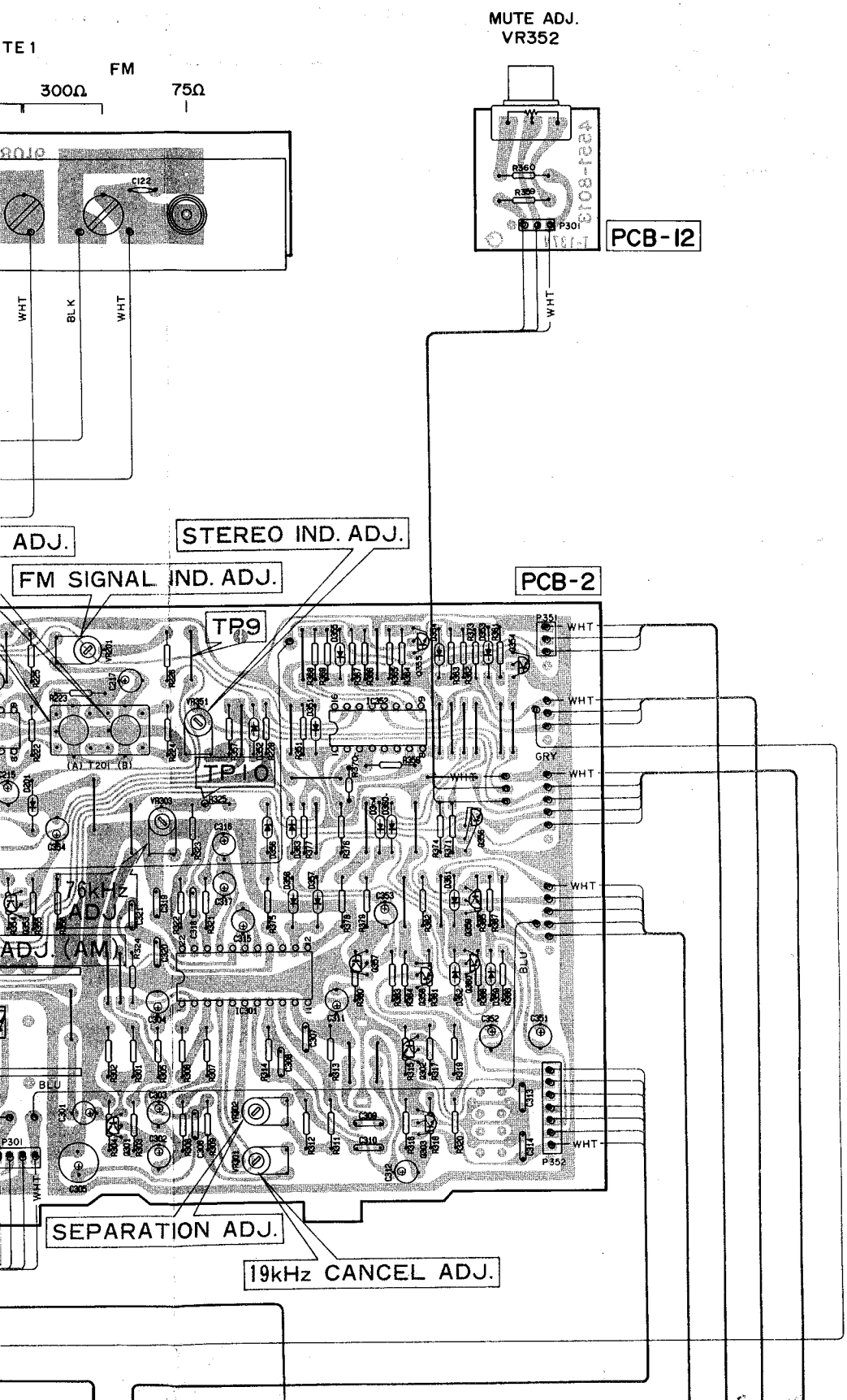
SW401 SW402
1 2
Speakers

DC BALANCE ADJ.

TP1 TP2 TP3 TP4 TP5 TP6

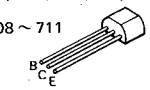
RED
WHT
BLK
GRY
ORG
BLU
YEL


TAPE 2
OUT
IN
TAPE 1
OUT
IN
INPUT
AUX/DAD
PHONO
RIGHT J12 J10 J8 J6 J4 J2 R
LEFT J11 J9 J7 J5 J3 J1 L
PCB-7
PCB-14
TE 1
AM
GND 75Ω
300Ω
GRY
BLK
WHT
FM DISCRIMINATOR ADJ.
TUNED IND. ADJ. (FM)
FM SIGN
TP7
TP1
TP8
WHT
GRN
RED
ORG
BLK
BRN
BLU
TUNING VOLTAGE ADJ. (AM)
AM IF ADJ.
TUNED IND. ADJ. (AM)
76kHZ ADJ
AM TRACKING ADJ.
SEPAR



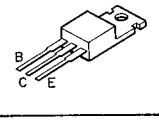
PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

2SA1115 (E) or (F): Q1, 2, 4, 10, 14, 509, 510, 513 ~ 516, 623, 624
2SC2603 (E) or (F): Q9, 13, 405, 406, 505 ~ 508, 511, 512, 517, 518
2SC2603 (F) or (E): Q203, 251, 252, 301 ~ 303, 352, 355 ~ 357
2SA1115 (F) or (E): Q351, 353, 354, 358 ~ 360, 627, 628, 707, 712
2SC2603 (F) or (E) : Q704, 705, 708 ~ 711

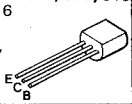


2SC1627 (Y) : Q417, 418
2SA817 (Y) : Q419, 420

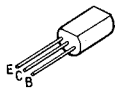
2SD880 (GR): Q51



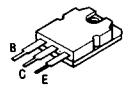
2SA872 A (E): Q7, 8
2SC2058 (N) or (P): Q201, 202
2SC2240 (BL): Q401 ~ 404, 601 ~ 606, 609, 610, 615, 616
2SC945 (K) or (P): Q415, 416
2SC2320L (F): Q501 ~ 504
2SA970 (BL) : Q607, 608, 611 ~ 614
2SC2320L (F) or (G): Q703



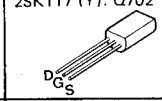
2SC2235 (O) or (Y): Q5, 11
2SA965 (O) or (Y) : Q6, 12
2SA2705 (O) or (Y): Q617, 618
2SA1145 (O) or (Y): Q619, 620
2SC2235 (Y): Q427, 428
2SA965 (Y) : Q425, 426
2SB646A (C): Q407 ~ 412
2SD666A (C): Q413, 414



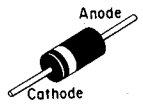
2SC3182 (O) or (R) : Q421, 422
2SA1265 (O) or (R) : Q423, 424



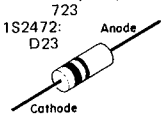
2SK381 (B) or (C) : Q519, 520, 621, 622
2SK362 (GR) : Q701
2SK117 (Y): Q702



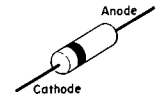
ERC402FL: D1 ~ 4, 17 ~ 20, 25 ~ 28



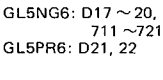
1S2473: D8, 13, 14, 24, 401, 402, 409, 410, 722, 723
1S2472: D23



1S2471: D5, 6
HZ11B2L: D7
HZ15-2L: D9, 10
HZ15-1L: D51
HZ12C3L: D411, 412
HZ20-2L: D15, 16
HZ27-3L: D701
1SS53: D201 ~ 203, 352 ~ 364, 702 ~ 706
DS135E: D11, 12, 405 ~ 408

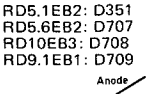


GL5NG6: D17 ~ 20, 711 ~ 721
GL5PR6: D21, 22



1SV102: D251, 252

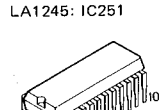
RD5.1EB2: D351
RD5.6EB2: D707
RD10EB3: D708
RD9.1EB1: D709

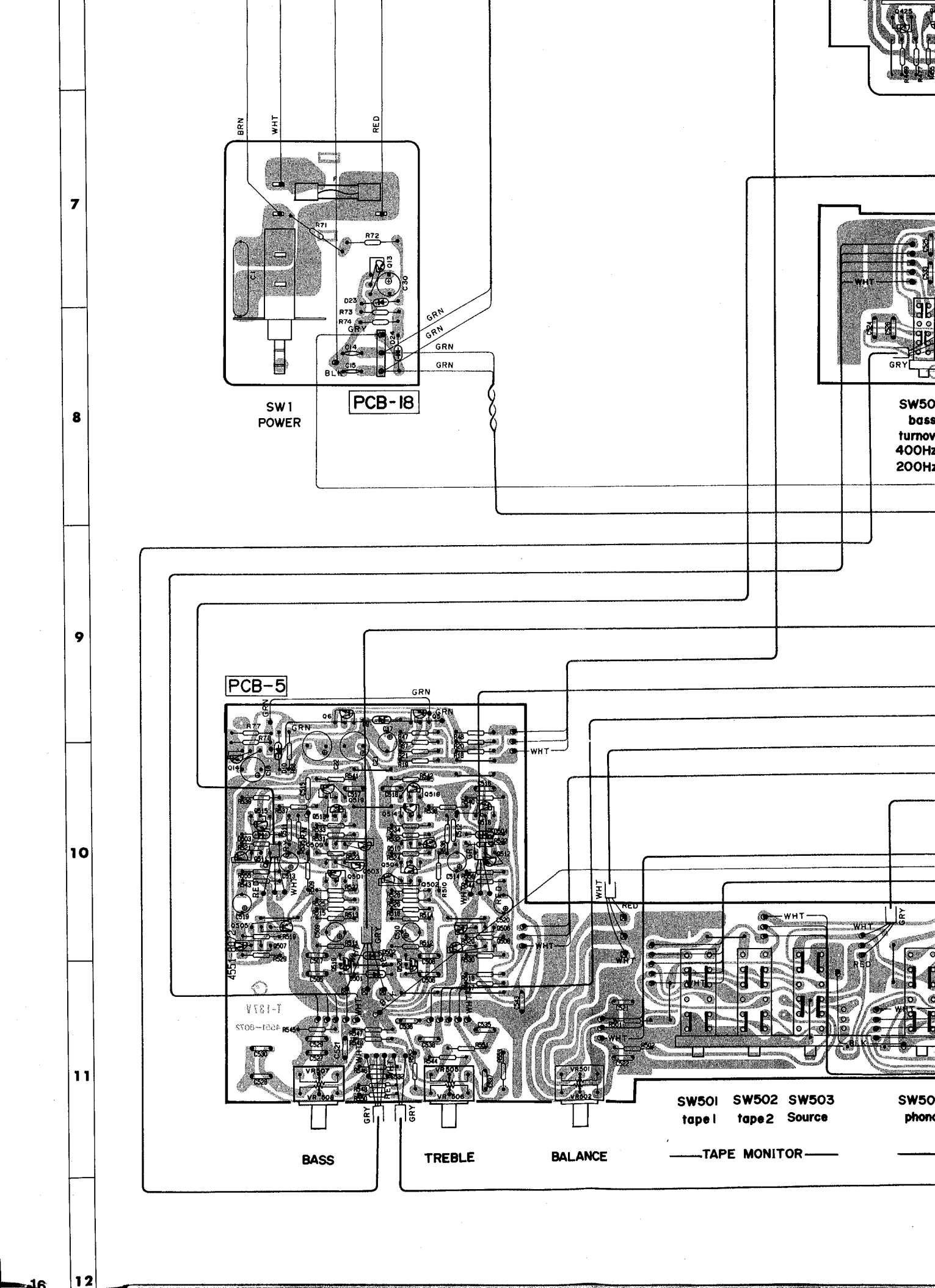


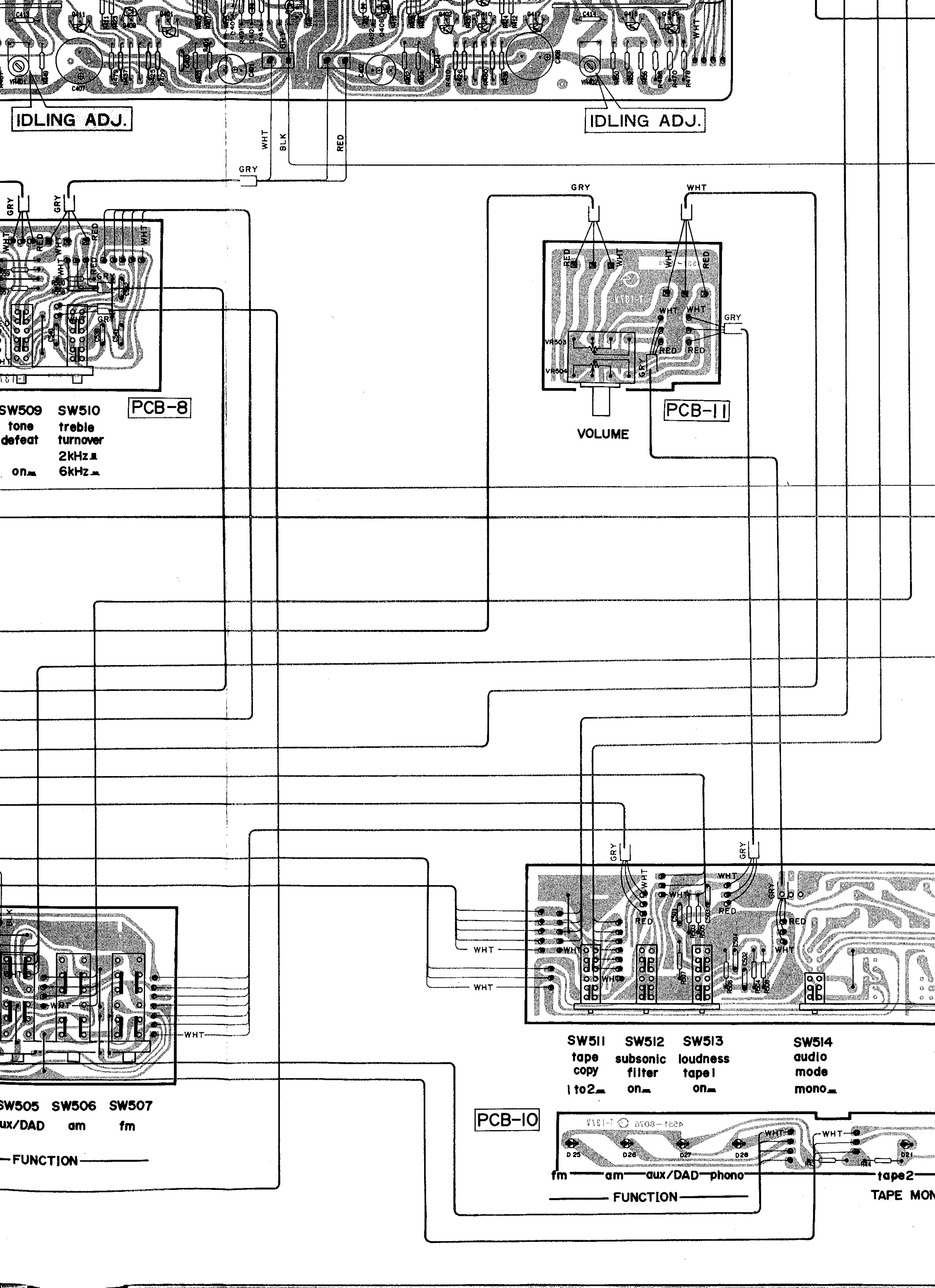
MV12YM: D403, 404

HA11225: IC201

LA1245: IC251

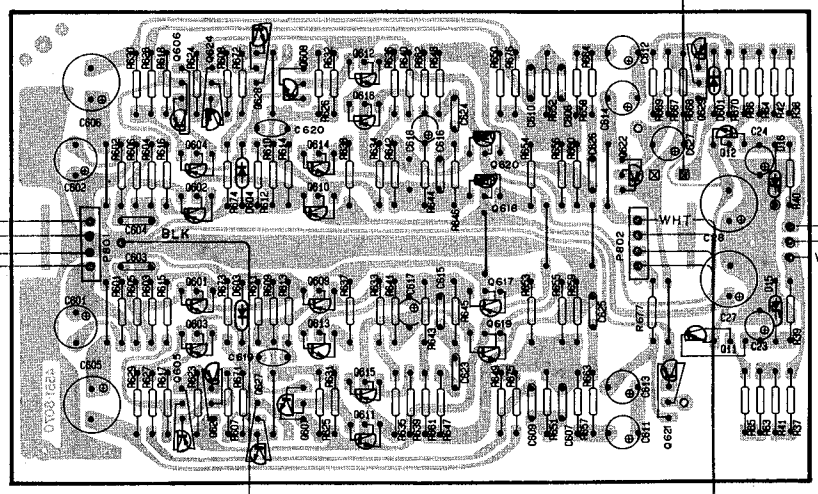


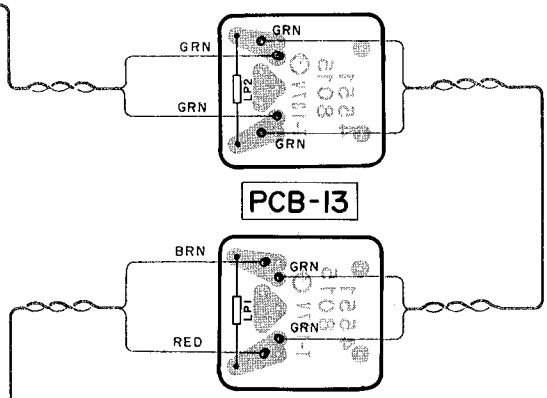

BRN
WHT
RED
R71
R72
C30
D23
R73
R74
GRN
GRY
C14
C15
BLK
SW1
POWER
PCB-18
WHT
GRY
SW50
bass
turnov
400Hz
200Hz
PCB-5
GRN
WHT
RED
BLK
VR507
VR508
VR505
VR506
VR501
VR502
SW501 SW502 SW503
tape1 tape2 Source
SW50
phono
BASS
TREBLE
BALANCE
TAPE MONITOR



IDLING ADJ.
IDLING ADJ.
WHT
BLK
RED
GRY
PCB-8
SW509
tone
defeat
on
SW510
treble
turnover
2kHz
6kHz
PCB-11
VOLUME
VR503
VR504
SW505
aux/DAD
SW506
am
SW507
fm
FUNCTION
SW511
tape
copy
1 to 2
SW512
subsonic
filter
on
SW513
loudness
tape 1
on
SW514
audio
mode
mono
PCB-10
fm
am
aux/DAD
phono
FUNCTION
tape2
TAPE MON
D25
D26
D27
D28
D21

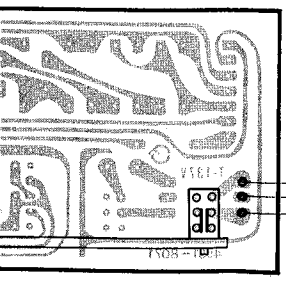
PCB-4





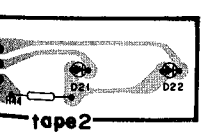
PCB-13

PCB-9



SW515
muting

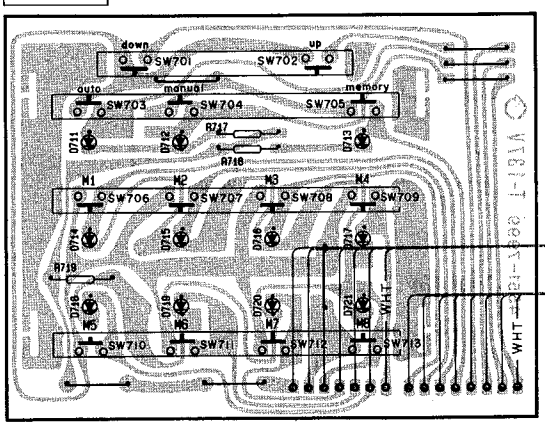
off

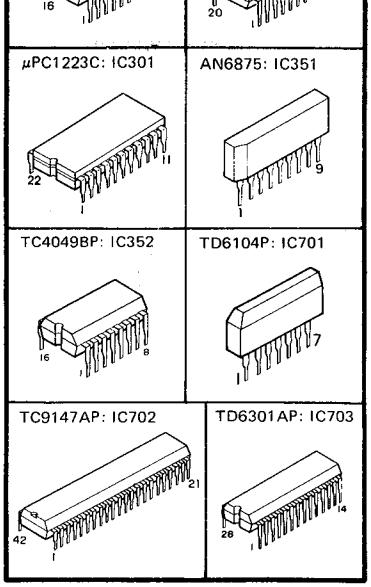


tape2

TAPE MONITOR

PCB-6

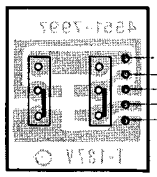




WIRE COLOR ABBREVIATIONS

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

PCB-19



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

PCB-3