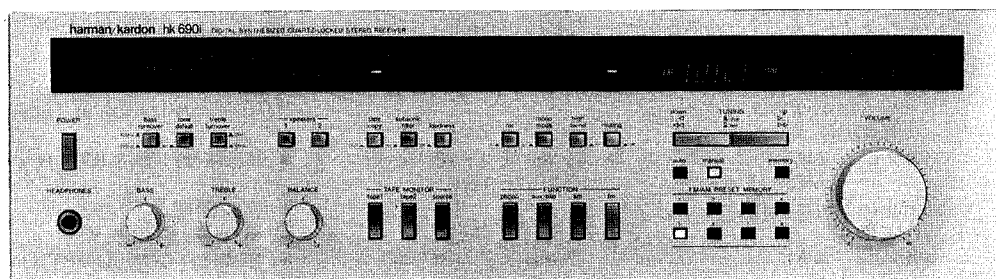


The Harman Kardon Model hk690i

Manual No. 70A

DIGITAL SYNTHESIZED QUARTZ-LOCKED STEREO RECEIVER

Technical Manual



hk690i

harman/kardon

240 CROSSWAYS PARK WEST, WOODBURY, N.Y. 11797
1112-H15270A4 P-088311 1250 PRINTED IN JAPAN

SPECIFICATIONS

● **FM SECTION**

	Nominal	Limit
Tuning Range	87.5 ~ 108.0MHz	
50dB Quieting Sensitivity		
Mono	16.6dBf	≤ 18dBf
Stereo	38.5dBf	≤ 40dBf
Usable Sensitivity	11.5dBf	≤ 14.5dBf
Image Ratio	77dB	≥ 70dB
IF Rejection	95dB	≥ 85dB
Spurious Response Rejection	114dB	≥ 95dB
Capture Ratio	1.0dB	≥ 2.0dB
Alternate Channel Selectivity	63dB	≥ 50dB
AM Rejection	56dB	≥ 45dB
Signal to Noise Ratio		
Mono	82dB	≥ 78dB
Stereo	73dB	≥ 70dB
Total Harmonic Distortion (65dBf 1kHz Input)		
Mono	0.06%	≤ 0.15
Stereo	0.08%	≤ 0.3%
Stereo Separation at 1kHz	58dB	≥ 45dB

● **AM SECTION**

Tuning Range	520 ~ 1,710kHz
Usable Sensitivity	14μV ≤ 20μV
Selectivity	53dB ≥ 35dB
Signal to Noise Ratio	55dB ≥ 50dB
Image Rejection	44dB ≥ 38dB
IF Rejection	60dB ≥ 50dB

● **AUDIO SECTION**

Usable Sensitivity	
AUX/DAD	135mV ± 25mV
Phono MM	2.2mV ± 0.2mV
MC	120μV ± 15μV
Signal to Noise Ratio	
AUX/DAD	79.5dB ≥ 78dB
Phono MM	79dB ≥ 77dB
MC	77dB ≥ 74dB

	Nominal	Limit
Channel Separation at 10kHz		
AUX/DAD	54dB	≥ 45dB
Phono MM	54dB	≥ 45dB
MC	58dB	≥ 45dB
IM Distortion Ratio	0.05%	≤ 0.1%
RMS Output Power		
8Ω, 1kHz, THD 0.08%	68W	≥ 60W
4Ω, 1kHz, THD 0.08%	102W	≥ 90W
Damping Factor at 1kHz	67	≥ 50
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 ± 2dB	
Subsonic Control		
at 15Hz	3dB ± 1dB	
DC Output Voltage		
L channel	0mV ± 60mV	
R channel	0mV ± 60mV	
RIAA Equalization at Tape Out (20Hz/20kHz)	0.2dB ± 0.5dB/0.1dB ± 0.5dB	

- **DIMENSIONS (W x H x D)** 17-7/16" x 5-1/4" x 14-3/8" (443 x 135 x 365 mm)
- **WEIGHT** 24 lbs. 4 oz. (11 kg)
- **POWER SUPPLY** AC120V, 60Hz
- **POWER CONSUMPTION** 400W (440VA)

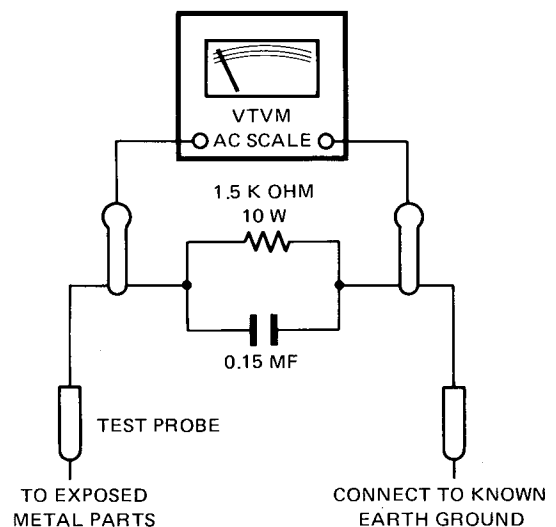
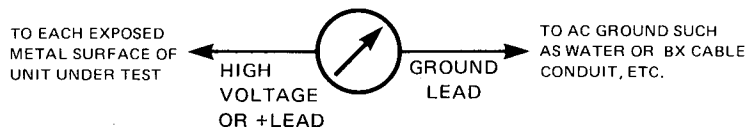
This specification is the target of servicing. But, there is a case that the specification is not applicable to the measurement condition and instrument. Specifications and components subject to change without notice. Overall performance will be maintained or improved.

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.

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 sure that primary supply voltage comes within $120\text{ V} \pm 2\text{V}$.
 - 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.	VR401 (L channel)	$0 \pm 10\text{mV}$
2		Connect the digital voltmeter between TP2 and ground.	VR402 (R channel)	$0 \pm 10\text{mV}$
3	Idling adjustment	Connect the digital voltmeter to TP3 and TP4.	VR403 (L channel)	30mV
4		Connect the digital voltmeter to TP5 and TP6.	VR404 (R channel)	30mV
5	Repeat steps 1 through 4 after aging for 10 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 terminals.	600kHz	600kHz	L251	Maximize the output level.
5			1400kHz	1400kHz	TC251	
6			Repeat steps 4 and 5.			
7	Tuned indicator confirmation	● Radiate output of AM signal generator (400Hz 30% modulation) to AM loop antenna.	1000kHz	1000kHz		Confirm the tuned indicator lights at 60 dB 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 becomes minimum.
4	Repeat steps 1 through 3.					
5	Tuned indicator adjustment	● Same as above. ● Connect the DC voltmeter to TP9 (+) and ground (-).			VR201	Adjust so that the tuned indicator lights at $10\mu\text{V}$ input.
6	Signal indicator adjustment				VR202	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	VR151	$19.00\text{kHz} \pm 0.02\text{kHz}$
8			98.1MHz	98.1MHz	VR351	Confirm the stereo indicator lights at $30\mu\text{V} \pm 2\text{dB}$ input.
9			98.1MHz	98.1MHz	VR152	Set the stereo modulator to 19kHz only. Adjust so that L and R output level becomes minimum.
10			98.1MHz	98.1MHz	VR301	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.

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 sure that primary supply voltage comes within $120\text{ V} \pm 2\text{V}$.
 - 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.	VR401 (L channel)	$0 \pm 10\text{mV}$
2		Connect the digital voltmeter between TP2 and ground.	VR402 (R channel)	$0 \pm 10\text{mV}$
3	Idling adjustment	Connect the digital voltmeter to TP3 and TP4.	VR403 (L channel)	30mV
4		Connect the digital voltmeter to TP5 and TP6.	VR404 (R channel)	30mV
5	Repeat steps 1 through 4 after aging for 10 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 (—).

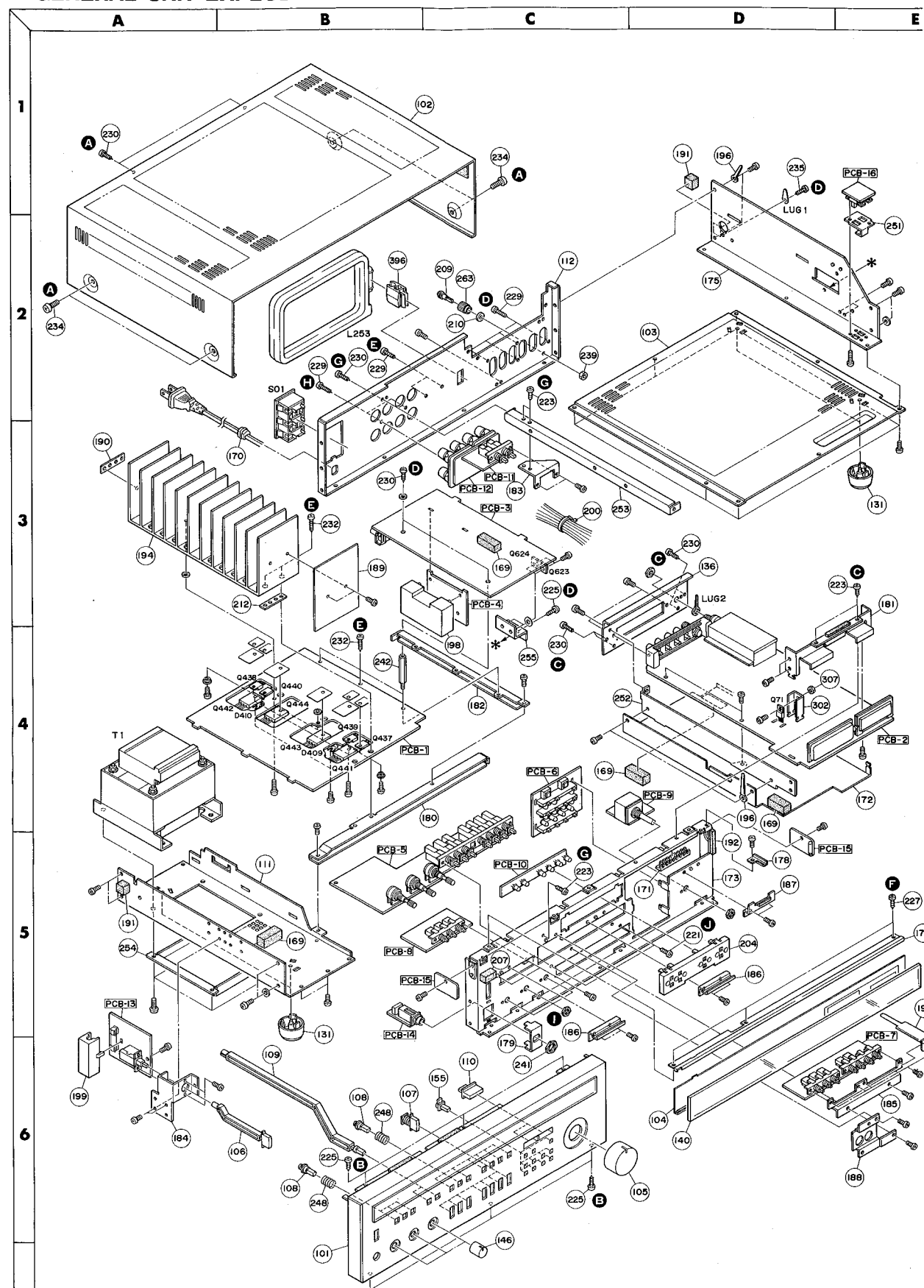
Step	Item	Connections required	Measurement frequency	Station display	Adjustment location	Adjustment method
1	Tuning voltage adjustment	● Connect the DC voltmeter to TP11 (+) and ground (-).		520kHz	L252	$1.5\text{V} \pm 0.05\text{V}$
2				1710kHz	TC252	$23\text{V} \pm 0.5\text{V}$
3	IF adjustment	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● Radiate output of AM signal generator (400Hz 30% modulation) to AM loop antenna. ● Connect oscilloscope and AC voltmeter to TAPE 1 OUT terminals. 	600kHz	600kHz	L251	Maximize the output level.
5			1400kHz	1400kHz	TC251	
6			Repeat steps 4 and 5.			
7	Tuned indicator confirmation	● Radiate output of AM signal generator (400Hz 30% modulation) to AM loop antenna.	1000kHz	1000kHz		Confirm the tuned indicator lights at 60 dB 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	<ul style="list-style-type: none"> • 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 becomes minimum.
4	Repeat steps 1 through 3.					
5	Tuned indicator adjustment	<ul style="list-style-type: none"> • Same as above. • Connect the DC voltmeter to TP9 (+) and ground (-). 			VR201	Adjust so that the tuned indicator lights at 10μV input.
6	Signal indicator adjustment				VR202	Adjust so that the DC voltage becomes 11V at 1mV input. And then, confirm the five signal indicator lights.
7	MPX adjustment	<ul style="list-style-type: none"> • 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	VR151	19.00kHz ± 0.02kHz
8			98.1MHz	98.1MHz	VR351	Confirm the stereo indicator lights at 30μV ±2dB input.
9			98.1MHz	98.1MHz	VR152	Set the stereo modulator to 19kHz only. Adjust so that L and R output level becomes minimum.
10			98.1MHz	98.1MHz	VR301	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.

GENERAL UNIT EXPLODED VIEW



DISASSEMBLY PROCEDURES (REFER TO PAGES 5 AND 18)

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

1. Remove the cabinet top. (Refer to step **1**.)
2. Disconnect J302, J303 and J351 from P302, P303 and P351 on the tuner P.C. board (PCB-2).
3. Open the lid of connectors (P301, P352 and P353) on the tuner P.C. board (PCB-2) and then disconnect the lead wires.
4. Remove 6 screws **C** and then remove the tuner P.C. board (PCB-2) with back plate (136), shield plate (172) and brackets (181 and 252).

4 PHONO EQUALIZER P.C. BOARD (PCB-3) REMOVAL

1. Remove the tuner P.C. board (PCB-2). (Refer to step **3**.)
2. Remove 8 screws **D** and then remove the phono equalizer P.C. board (PCB-3) with MC amp. P.C. board (PCB-4) and holder (198). At this time, open the lid of connectors (P601, P602, P603, P604, P605 and P801) on the phono equalizer P.C. board (PCB-3) and then disconnect the lead wires and unsolder the lead wires from phono equalizer P.C. board (PCB-3).

5 POWER OUTPUT P.C. BOARD (PCB-1) REMOVAL

1. Remove the phono equalizer and MC amp. P.C. boards (PCB-3 and PCB-4). (Refer to step **4**.)
2. Remove 5 screws **E** and 2 shafts (242) and then remove the power output P.C. board (PCB-1). At this time, open the lid of connector (P401) on the power output P.C. board (PCB-1) and then disconnect the lead wires and unsolder the lead wires from power output P.C. board (PCB-1).

6 SPEAKER SWITCH AND SPEAKER TERMINAL P.C. BOARDS (PCB-11 AND PCB-12) REMOVAL

1. Remove the front panel assembly and power output P.C. board (PCB-1). (Refer to steps **2** and **5**.)
2. Remove 3 screws **F** and then remove the panel back assembly (104) and the panel (140).
3. Remove 4 screws **G** and then remove the bracket (253).
4. Pull off the 2 push button assemblies (109).
5. Remove 2 screws **H** and then remove the speaker switch and speaker terminal P.C. boards (PCB-11 and PCB-12) with bracket (183). If necessary, unsolder the lead wires.

7 TONE CONTROL P.C. BOARD (PCB-5) REMOVAL

1. Remove the speaker switch and speaker terminal P.C. boards (PCB-11 and PCB-12). (Refer to step **6**.)
2. Remove 3 hexagon nuts **I** and 2 screws **J** and then remove the tone control P.C. board (PCB-5). At this time, open the lid of connector (P501) on the tone control P.C. board (PCB-5) and then disconnect the lead wires and unsolder the lead wires from tone control P.C. board (PCB-5).

CIRCUIT DESCRIPTION

[1] MUTING CIRCUIT

The muting control voltage is taken out from **12** pin of IC201 and then fed to the base of Q205. At the weak station or detuned point, the **12** pin becomes high level, Q205 becomes low, Q357 is tuned off, NAND IC352 is tuned to low, Q360 is tuned to on, Q361 (left channel) and Q362 (right channel) are tuned 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.

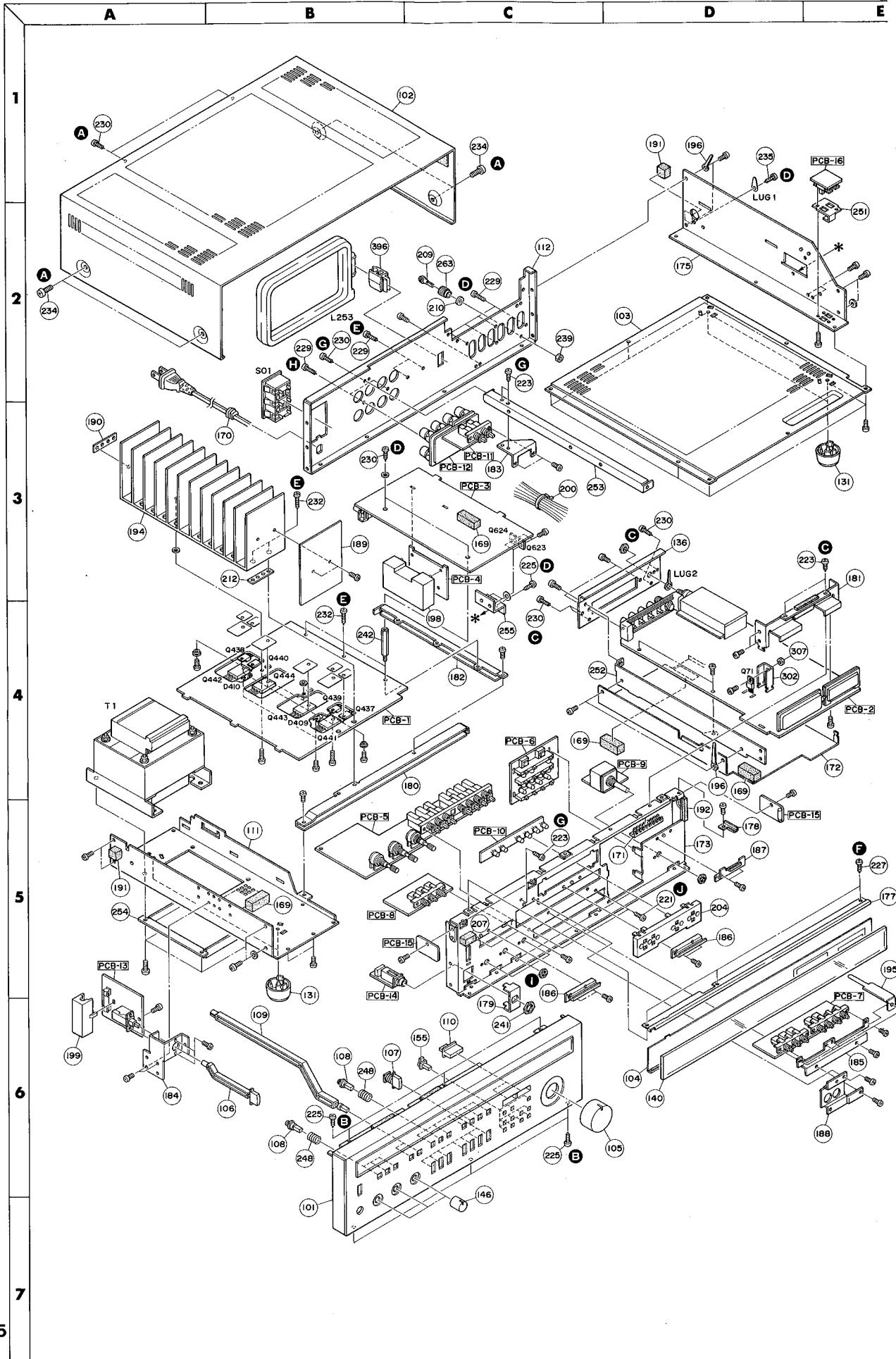
2) When tuning mode switch is set to MANUAL

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

[5] OVERLOAD PROTECTION (LEFT CHANNEL)

As soon as the current over rated power flows, the voltage between both emitters of Q441 and Q443 rises, Q9, Q8 and Q7 are turned on, Q1 is turned off. So Q3 (schmitt trigger circuit) is tuned to off. The gate of Q401 becomes 0V and Q401 is turned on. The input to power amp. is cut and Q417 is turned to off. So the operation of pre-driver, driver and power stages stops and the circuit is protected.

GENERAL UNIT EXPLODED VIEW



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DISASSEMBLY PROCEDURES (REFER TO PAGES 5 AND 18)

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

1. Remove the cabinet top. (Refer to step 1.)
2. Disconnect J302, J303 and J351 from P302, P303 and P351 on the tuner P.C. board (PCB-2).
3. Open the lid of connectors (P301, P352 and P353) on the tuner P.C. board (PCB-2) and then disconnect the lead wires.
4. Remove 6 screws (C) and then remove the tuner P.C. board (PCB-2) with back plate (136), shield plate (172) and brackets (181 and 252).

4 PHONO EQUALIZER P.C. BOARD (PCB-3) REMOVAL

1. Remove the tuner P.C. board (PCB-2). (Refer to step 3.)
2. Remove 8 screws (D) and then remove the phono equalizer P.C. board (PCB-3) with MC amp. P.C. board (PCB-4) and holder (198). At this time, open the lid of connectors (P601, P602, P603, P604, P605 and P801) on the phono equalizer P.C. board (PCB-3) and then disconnect the lead wires and unsolder the lead wires from phono equalizer P.C. board (PCB-3).

5 POWER OUTPUT P.C. BOARD (PCB-1) REMOVAL

1. Remove the phono equalizer and MC amp. P.C. boards (PCB-3 and PCB-4). (Refer to step 4.)
2. Remove 5 screws (E) and 2 shafts (242) and then remove the power output P.C. board (PCB-1). At this time, open the lid of connector (P401) on the power output P.C. board (PCB-1) and then disconnect the lead wires and unsolder the lead wires from power output P.C. board (PCB-1).

6 SPEAKER SWITCH AND SPEAKER TERMINAL P.C. BOARDS (PCB-11 AND PCB-12) REMOVAL

1. Remove the front panel assembly and power output P.C. board (PCB-1). (Refer to steps 2 and 5.)
2. Remove 3 screws (F) and then remove the panel back assembly (104) and the panel (140).
3. Remove 4 screws (G) and then remove the bracket (253).
4. Pull off the 2 push button assemblies (109).
5. Remove 2 screws (H) and then remove the speaker switch and speaker terminal P.C. boards (PCB-11 and PCB-12) with bracket (183). If necessary, unsolder the lead wires.

7 TONE CONTROL P.C. BOARD (PCB-5) REMOVAL

1. Remove the speaker switch and speaker terminal P.C. boards (PCB-11 and PCB-12). (Refer to step 6.)
2. Remove 3 hexagon nuts (I) and 2 screws (J) and then remove the tone control P.C. board (PCB-5). At this time, open the lid of connector (P501) on the tone control P.C. board (PCB-5) and then disconnect the lead wires and unsolder the lead wires from tone control P.C. board (PCB-5).

CIRCUIT DESCRIPTION

[1] MUTING CIRCUIT

The muting control voltage is taken out from (12) pin of IC201 and then fed to the base of Q205. At the weak station or detuned point, the (12) pin becomes high level, Q205 becomes low, Q357 is tuned off, NAND IC352 is tuned to low, Q360 is tuned to on, Q361 (left channel) and Q362 (right channel) are tuned 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.

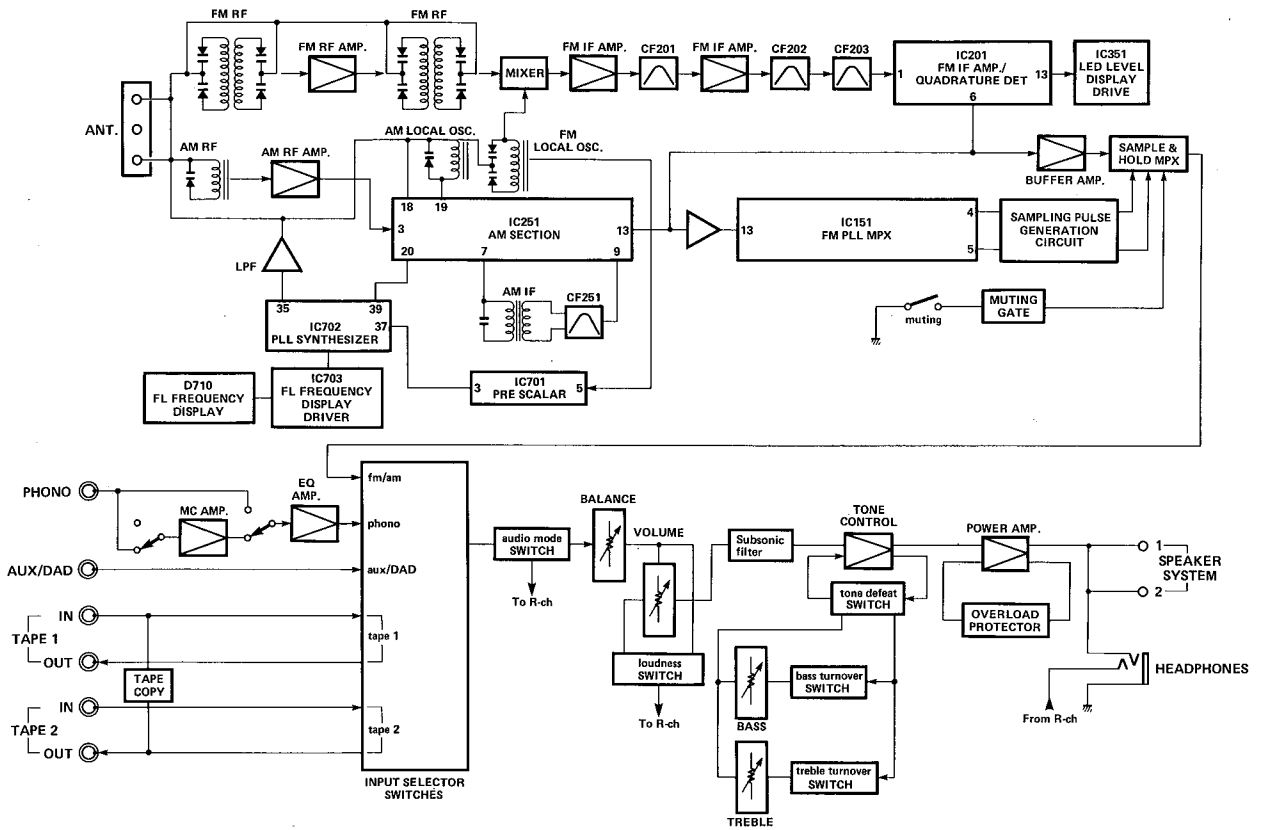
2) When tuning mode switch is set to MANUAL

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

[5] OVERLOAD PROTECTION (LEFT CHANNEL)

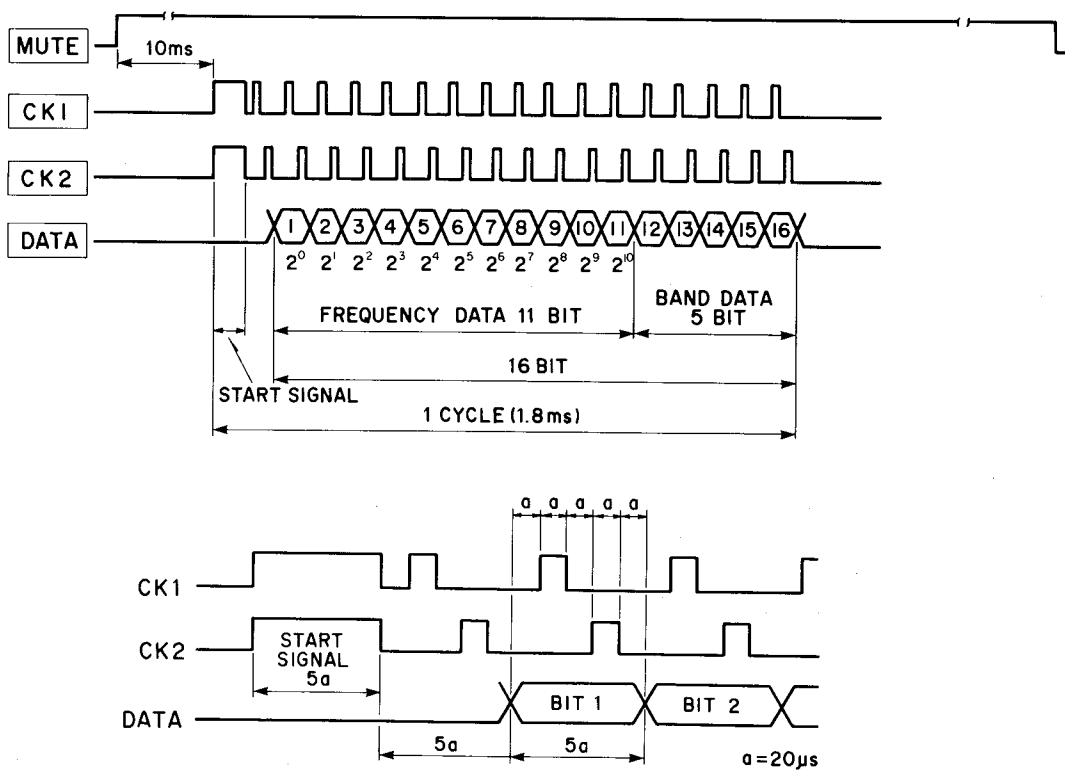
As soon as the current over rated power flows, the voltage between both emitters of Q441 and Q443 rises, Q9, Q8 and Q7 are turned to on, Q1 is turned to off. So Q3 (schmit trigger circuit) is tuned to off. The gate of Q401 becomes 0V and Q401 is turned to on. The input to power amp. is cut and Q417 is turned to off. So the operation of pre-driver, driver and power stages 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-HK690A	Front Panel Assembly
102	A414-HK690A	Cabinet Top Assembly
103	A424-HK690A	Cabinet Bottom Assembly
104	A554-HK690A	Panel Back Assembly
105	A630-HK690A	Knob Assembly, Volume
106	A662-HK690A	Push Button Assembly, Power
107	A662-HK690B	Push Button Assembly, Tape Monitor, Function (x 7)
108	A662-HK690C	Push Button Assembly, Bass Turnover, Tone Defeat, Treble Turnover, Tape Copy, Subsonic Filter, Loudness, MC, Mono Mode, High Blend, Muting (x 10)
109	A662-HK690D	Push Button Assembly, Speakers (x 2)
110	A662-HK690E	Push Button Assembly, Tuning (x 2)
111	B211-HK690A	Chassis Assembly, T1
112	A424-HK690B	Cabinet Back Assembly (for Canada model)
112	1424-11601	Cabinet Back
131	1319-0139	Foot
136	1514-14501	Plate
140	1541-02302	Panel
146	1630-02501	Knob, Bass, Treble, Balance
155	1662-12701	Push Button, Auto, Manual, Memory, FM/AM Preset Memory (x 11)
169	2112-11769	Sponge
170	2114-415027	Bushing
171	2114-71283	Bushing
172	2216-7146	Shield Plate
173	2211-7250	Chassis, Front
175	2211-7253	Chassis, Right
177	2219-7645	Bracket
178	2219-7671	Bracket
179	2219-7879	Bracket
180	2219-7954	Bracket
181	2219-7914	Bracket
182	2219-7955	Bracket
183	2219-7958	Bracket
184	2219-7917	Bracket
185	2219-7919	Bracket
186	2219-7920	Bracket
187	2219-7921	Bracket
188	2219-7946	Bracket
189	2224-7089	Insulator
190	2224-7090	Insulator
191	2112-11755	Sponge
192	2112-11736	Sponge
194	2222-7154	Heat Sink
195	2218-7011	Holding Bracket
196	2218-7001	Holding Bracket
198	2240-7183	Holder
199	2240-7176	Holder
200	2240-7120	Holder
204	2240-7206	Holder
207	2112-11231	Sponge
209	2310-7015	Special Screw
210	2410-7005	Special Washer
212	2224-7069	Insulator

Ref. No.	Part No.	Description
221	2347-300627	Self-Tapping Screw (+) (3 x 6 mm)
223	2347-300627	Self-Tapping Screw (+) (3 x 6 mm)
225	2347-300627	Self-Tapping Screw (+) (3 x 6 mm)
227	2347-300627	Self-Tapping Screw (+) (3 x 6 mm)
229	2347-301041	Self-Tapping Screw (+) (3 x 10 mm)
230	2347-300847	Self-Tapping Screw (+) (3 x 8 mm)
232	2347-301027	Self-Tapping Screw (+) (3 x 10 mm)
234	2347-400647	Self-Tapping Screw (+) (4 x 6 mm)
235	2347-300627	Self-Tapping Screw (+) (3 x 6 mm)
239	2440-7016	Special Nut
241	2440-61	Special Nut
242	2601-7126	Shaft
248	2651-210189	Spring
251	2219-7964	Bracket
252	2219-7953	Bracket
253	2219-7956	Bracket
254	2219-7957	Bracket
255	2219-7959	Bracket
263	2440-7011	Special Nut
302	2222-7081	Heat Sink, PCB-2
307	2446-30129	Hexagon Nut
396	2240-7218	Holder, Antenna
	1111-J30162	Owner Guide
	1111-J30163	Owner Guide (for Canada model)
	1222-7264	Packing Cushion, Left
	1222-7265	Packing Cushion, Right
	1221-737167	Packing Box

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
CHASSIS MISCELLANEOUS		
△P1	4161-71151	Power Cord
△T1	5584-701452	Power Transformer
△SO1	4474-156	AC Outlet, Switched, Unswitched
△R1	5135-335J50P	Resistor, 3.3MΩ, ±5%, 1/2W, Carbon
L253	5911-239	AM Loop Antenna
J302	4163-043003	Connector with Lead Wire, 4 Pos.
J303	4163-033503	Connector with Lead Wire, 3 Pos.
LUG1	4211-4	Lug Terminal
LUG2	4211-21	Lug Terminal
	1397-6	Dipole Antenna (Accessory)
	4442-14	Pin Plug (for Tape 1 IN Jacks) (Accessory)
PCB-1 POWER OUTPUT P.C. BOARD		
RESISTORS		
R423, 424	5174-621381	620Ω, ±1%, 1/4W, Metal
R425, 426	5174-330381	33Ω, ±1%, 1/4W, Metal
R433, 434	5174-243381	24kΩ, ±1%, 1/4W, Metal
△R443, 444, 445, 446, 451, 452, 453, 454	5102-1514713	150Ω, ±2%, 1/4W, Fuse
R447, 448, 449, 450	5174-123381	12kΩ, ±1%, 1/4W, Metal
R459, 460	5174-131381	130Ω, ±1%, 1/4W, Metal
△R461, 462, 463, 464	5102-2205711	22Ω, ±5%, 1W, Fuse
△R465, 466, 467, 468	5102-1014713	100Ω, ±2%, 1/4W, Fuse
△R469, 470, 471, 472	5102-2R2579	2.2Ω, ±5%, 1/4W, Fuse
R483/485, 484/486	5275-R22671	0.22Ω, ±10%, 5Wx2, Cement
R487, 488	5175-150571	15Ω, ±5%, 3W, Metal
R489, 490	5171-220572	22Ω, ±5%, 1W, Metal
R491, 492	5171-1R5572	1.5Ω, ±5%, 1W, Metal
R731 ~ 737, 738 ~ 744, 745 ~ 751	5212-3	Resistor Composite, 47kΩ
CONTROLS		
VR401, 402	5101-50301923	50kΩ
VR403, 404	5101-20101923	200Ω
CAPACITORS		
C2, 3, 4, 5	5352-1041957	0.1μF, ±10%, 250V, Metalized Polyester
△C6, 7, 8, 9	5341-478F0955	4700μF, ±20%, 50V, Electrolytic
C10	5345-475F0952	4.7μF, ±20%, 50V, Electrolytic
C11	5345-336B0952	33μF, ±20%, 10V, Electrolytic
C15	5353-330534	33pF, ±5%, 500V, Mica
C401, 402	5345-107B0951	100μF, ±20%, 10V, Electrolytic
C403, 404	5359-4715851	470pF, ±5%, 100V, Polypropylene
C405, 406	5345-476D041	47μF, ±20%, 25V, Electrolytic
C407, 408	5353-020934	2pF, ±0.5pF, 500V, Mica
C409, 410	5353-680534	68pF, ±5%, 500V, Mica
C411, 412, 417, 418	5345-106C041	10μF, ±20%, 16V, Electrolytic
△C413, 414, 415, 416	5345-228F0962	2200μF, ±20%, 50V, Electrolytic
TRANSISTORS		
Q1, 3	5613-2603(E)	2SC2603(E) or 2SC2603(F)
Q2, 4, 7	5611-1115(E)	2SA1115(E) or 2SA1115(F)
Q8, 403, 404, 405, 406, 413, 414, 419, 420	5613-2240(BL)	2SC2240(BL)
Q9, 10, 411, 412, 415, 416, 417, 418	5611-970(BL)	2SA970(BL)
Q401, 402	5616-2SK364(V)	F.E.T., 2SK364(V) or 2SK364(BL)
Q407, 408, 409, 410	5613-2603(F)	2SC2603(F) or 2SC2603(E)
Q421, 422, 425, 426	5612-646A(C)	2SB646A(C)
Q423, 424, 427, 428	5614-666A(C)	2SD666A(C)
Q429, 430	5613-945(K)	2SC945(K)
Q433, 434	5614-667A(C)	2SD667A(C)
Q435, 436	5612-647A(C)	2SB647A(C)
Q437, 438	5611-1111(Q)	2SA1111(Q), 2SA1111(R) or 2SA1111(S) (w/Insulator & Bushing)

Ref. No.	Part No.	Description
Q439, 440	5613-2591(O)	2SC2591(O), 2SC2591(R) or 2SC2591(S) (w/Insulator & Bushing)
Q441, 442	5613-3281(O)	2SC3281(O) or 2SC3281(R) (w/Insulator)
Q443, 444	5611-1302(O)	2SA1302(O) or 2SA1302(R) (w/Insulator)
DIODES		
△D1, 2	5685-D5FB20F1	Bridge Silicon, D5FB20
D3	5636-1S2471	1S2471
D4	5635-RD5R6EB2	Zener, RD5.6EB2
D5, 401, 402	5631-1S2473	1S2473
D403, 404	5635-HZ15-1L	Zener, HZ15-1L
D405, 406, 407, 408	5632-10DF2	10DF2
D409, 410	5641-MV12YM	Varistor, MV12YM
COILS		
L1, 2, 3, 4	5597-35502	Ferrite Bead
L5, 6	5991-7165	
MISCELLANEOUS		
P401	4443-030185	Connector, 3 Pos.

PCB-2 TUNER P.C. BOARD

RESISTORS		
△R71	5102-2205716	22Ω, ±5%, 1W, Fuse
△R82	5102-1014715	100Ω, ±2%, 1/4W, Fuse
R158	5174-183381	18kΩ, ±1%, 1/4W, Metal
△R159, 268	5102-1004715	10Ω, ±2%, 1/4W, Fuse
△R225	5102-3304715	33Ω, ±2%, 1/4W, Fuse
R712	5171-221581	220Ω, ±5%, 1W, Metal
CONTROLS		
VR151	5101-4727173	4.7kΩ
VR152, 201, 202, 351	5101-50371920	50kΩB
VR301	5101-50271920	5kΩB
VR352	5113-50372136	50kΩ, Mute Adj. (w/Hexagon Nut)
CAPACITORS		
△C72	5345-338D0962	3300μF, ±20%, 25V, Electrolytic
C73, 217	5345-108-16	1000μF, ±20%, 16V, Electrolytic
C74	5345-336-35	33μF, ±20%, 35V, Electrolytic
C151	5345-226C0952	22μF, ±20%, 16V, Electrolytic
C152	5359-2725851	2700pF, ±5%, 100V, Polypropylene
C153	5359-6815851	680pF, ±5%, 100V, Polypropylene
C154, 210, 271, 351, 352, 353, 354	5345-106-16	10μF, ±20%, 16V, Electrolytic
C155	5345-475D0952	4.7μF, ±20%, 25V, Electrolytic
C156, 251, 716, 717	5345-225F0952	2.2μF, ±20%, 50V, Electrolytic
C158, 273	5345-105F0952	1μF, ±20%, 50V, Electrolytic
C159, 160, 209	5359-1015851	100pF, ±5%, 100V, Polypropylene
C161, 164, 166, 260	5359-4715851	470pF, ±5%, 100V, Polypropylene
C162, 167	5359-2215851	220pF, ±5%, 100V, Polypropylene
C163	5359-1515851	150pF, ±5%, 100V, Polypropylene
C165	5359-8215851	820pF, ±5%, 100V, Polypropylene
C168, 169	5345-106C0952	10μF, ±20%, 16V, Electrolytic
C170	5345-227-16	220μF, ±20%, 16V, Electrolytic
C171, 172, 305, 306	5359-1025851	1000pF, ±5%, 100V, Polypropylene
C173	5359-1215851	120pF, ±5%, 100V, Polypropylene
C215	5345-104F0952	0.1μF, ±20%, 50V, Electrolytic
C216	5345-105-50	1μF, ±20%, 50V, Electrolytic
C262	5345-475-25	4.7μF, ±20%, 25V, Electrolytic
C263	5345-335-50	3.3μF, ±20%, 50V, Electrolytic
C265	5345-225-50	2.2μF, ±20%, 50V, Electrolytic
C270	5345-107-16	100μF, ±20%, 16V, Electrolytic
C301, 302, 303, 304	5359-1525851	1500pF, ±5%, 100V, Polypropylene
C307, 308	5345-226C0951	22μF, ±20%, 16V, Electrolytic
C309, 310	5359-7525851	7500pF, ±5%, 100V, Polypropylene

Ref. No.	Part No.	Description
C311, 312	5345-225F0951	2.2 μ F, \pm 20%, 50V, Electrolytic
C315, 316	5359-3025851	3000pF, \pm 5%, 100V, Polypropylene
C355	5345-226-16	22 μ F, \pm 20%, 16V, Electrolytic
C703	5345-476-10	47 μ F, \pm 20%, 10V, Electrolytic
C709	5345-334F0951	0.33 μ F, \pm 20%, 50V, Electrolytic
C711	5343-2260653	22 μ F, \pm 20%, 6.3V, Tantalum Electrolytic
C712	5350-4730H651	0.047 μ F, +80% -20%, 5V, Special
C715	5345-227-10	220 μ F, \pm 20%, 10V, Electrolytic
TC251, 252	5371-93	Trimmer Capacitor
INTEGRATED CIRCUITS		
IC151	5652-BA1330	BA1330
IC152	5654-TC4049BP	TC4049BP
IC153	5654-TC4066BP	TC4066BP
IC201	5652-HA11225	HA11225
IC251	5652-LA1245	LA1245
IC351	5652-AN6875	AN6875
IC352	5654-TC4011BP	TC4011BP
IC701	5654-TD6104P	TD6104P
IC702	5654-TC9147AP	TC9147AP
IC703	5654-TD6301AP	TD6301AP
TRANSISTORS		
Q71	5612-834(GR)	2SB834(GR)
Q72, 151, 152, 153, 155, 157, 159, 205, 252, 307, 308, 309, 310, 352, 355, 357, 359, 704, 705, 706, 708, 709, 710, 711	5613-2603(F)	2SC2603(F) or 2SC2603(E)
Q73	5611-965(O)	2SA965(O) or 2SA965(Y)
Q74, 75, 76, 154, 156, 158, 303, 304, 305, 306, 351, 353, 354, 356, 358, 360, 707, 712	5611-1115(F)	2SA1115(F) or 2SA1115(E)
Q201, 202, 203, 204	5613-2058(N)	2SC2058(N) or 2SC2058(P)
Q251	5616-2SK241(Y)	F.E.T., 2SK241(Y) or 2SK241(GR1)
Q301, 302	5616-2SK381(D)	F.E.T., 2SK381(D)
Q311, 312	5615-2SJ103(G)	F.E.T., 2SJ103(G)
Q361, 362	5613-2878(B)	2SC2878(B)
Q702	5616-2SK117(Y)	F.E.T., 2SK117(Y)
Q703	5613-2320L(F)	2SC2320L(F) or 2SC2320L(G)
DIODES		
Δ D71	5685-1F	Bridge Silicon, SIRBA10
D72, 151, 152, 153, 201, 202, 351, 352, 361, 362, 702, 703, 704, 705, 706, 722, 723	5631-1S2473	1S2473
D73, 74	5635-HZ7B2L	Zener, HZ7B2L
D75	5635-HZ27-3L	Zener, HZ27-3L
D251, 252	5633-1SV102	1SV102
D354/355/356/357/358/ 359/360	5623-LS007S	LED Display, Signal Strength, Tuned, Stereo
D707	5635-RD5R6EB2	Zener, RD5.6EB2
D708	5635-RD10EB1	Zener, RD10EB1
D709	5635-RD8R2EB1	Zener, RD8.2EB1
COILS		
L101	5995-704027	
L102, 201, 702	5995-2R2269	
L251	5933-70128	
L252	5923-70133	
TRANSFORMERS		
Δ T71	5584-701345	
T201	5574-7024	

Ref. No.	Part No.	Description
T251	5552-70113	
T252	5932-70123	
MISCELLANEOUS		
	6114-7130	FM Tuner Assembly
	5722-10	Station Display, FIP7B85
X701	5691-00720019	Crystal Osc.
CF201, 202, 203	5671-7119A	Ceramic Filter, SFE10.7ML
CF251	5671-7139G	Ceramic Filter, SFP450G
CF252	5671-7137C	Ceramic Filter
TE1	4214-144	External Antenna Terminals
P301	4443-070185	Connector, 7 Pos.
P302	4443-047114	Connector, 4 Pos.
P303	4443-037114	Connector, 3 Pos.
P351	4443-167114	Connector, 16 Pos.
P352	4443-030185	Connector, 3 Pos.
P353	4443-050185	Connector, 5 Pos.

PCB-3 PHONO EQUALIZER P.C. BOARD

RESISTORS		
R621, 622	5174-Z634038	634 Ω , \pm 1%, 1/4W, Metal
R627, 628	5174-102381	1k Ω , \pm 1%, 1/4W, Metal
R645, 646	5174-Z549338	549k Ω , \pm 1%, 1/4W, Metal
R647, 648	5174-Z412238	41.2k Ω , \pm 1%, 1/4W, Metal
Δ R657, 658	5102-2704715	27 Ω , \pm 2%, 1/4W, Fuse
R661, 662	5174-Z169338	169k Ω , \pm 1%, 1/4W, Metal
CAPACITORS		
C601, 602	5345-476B0951	47 μ F, \pm 20%, 10V, Electrolytic
C603, 604	5359-1215851	120pF, \pm 5%, 100V, Polypropylene
C605, 606	5359-1015851	100pF, \pm 5%, 100V, Polypropylene
C607, 608	5345-477B0952	470 μ F, \pm 20%, 10V, Electrolytic
C609, 610	5345-226C041	22 μ F, \pm 20%, 16V, Electrolytic
C617, 618, 619, 620,	5359-2025851	2000pF, \pm 5%, 100V, Polypropylene
C621, 622, 623, 624	5345-226D0226	22 μ F, \pm 20%, 25V, Electrolytic
Δ C625, 626	5345-477D041	470 μ F, \pm 20%, 25V, Electrolytic
C627, 628	5345-107D041	100 μ F, \pm 20%, 25V, Electrolytic
C805	5345-105F0952	1 μ F, \pm 20%, 50V, Electrolytic
Δ C809	5345-338D0962	3300 μ F, \pm 20%, 25V, Electrolytic
C810	5345-106C041	10 μ F, \pm 20%, 16V, Electrolytic
C907, 908	5345-107C041	100 μ F, \pm 20%, 16V, Electrolytic
TRANSISTORS		
Q601, 602, 603, 604, 611, 612	5613-2240(BL)	2SC2240(BL)
Q605, 606, 607, 608, 803, 805, 910	5613-2603(E)	2SC2603(E) or 2SC2603(F)
Q609, 610, 613, 614	5611-970(BL)	2SA970(BL)
Q615, 616	5612-646(C)	2SB646(C)
Q617, 618	5614-666(C)	2SD666(C)
Q619, 620	5614-667(C)	2SD667(C)
Q621, 622	5612-647(C)	2SB647(C)
Q623	5614-669(C)	2SD669(C) (w/Insulator)
Q624	5612-649(C)	2SB649(C) (w/Insulator)
Q801, 802, 804, 806, 813, 814, 815, 909	5611-1115(E)	2SA1115(E) or 2SA1115(F)
Q807, 808	5612-1034	2SB1034
Q811, 812	5616-2SK364(V)	F.E.T., 2SK364(V) or 2SK364(BL)
DIODES		
D601, 602, 803, 804, 805, 806, 807	5631-1S2473	1S2473
D603, 604	5641-MV103	Varistor, MV103
D605, 606	5635-HZ24-1L	Zener, HZ24-1L
D808, 901, 902	5635-RD3R0EB1	Zener, RD3.0EB1

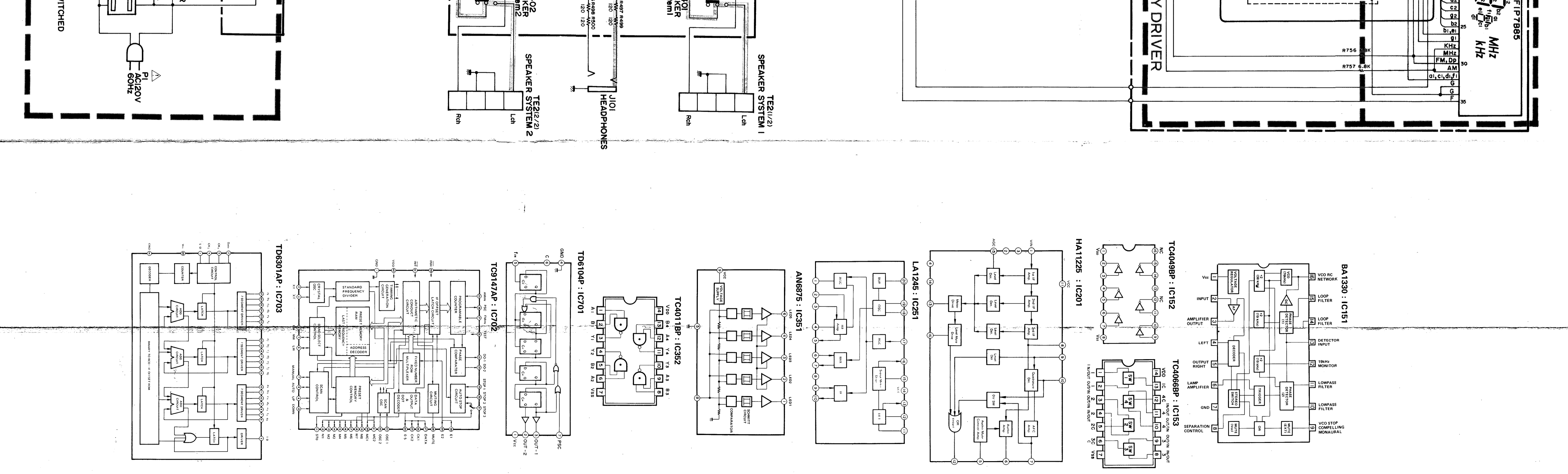
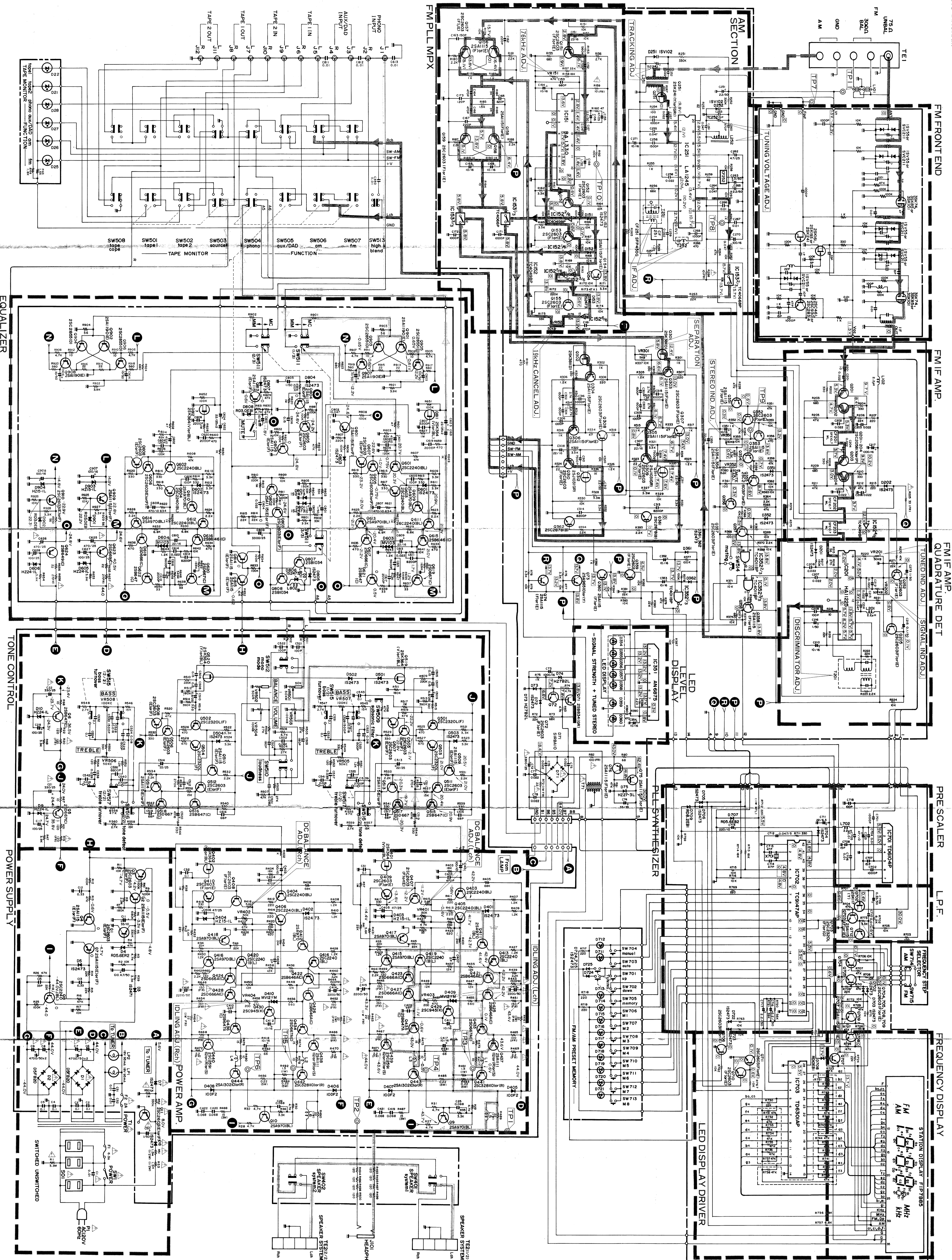
Ref. No.	Part No.	Description
	MISCELLANEOUS	
L801/802 J1/2/3/4/5/6, 7/8/9/10/11/12	4331-40207215 4486-9	Relay, DC 6-Pin Jack, Phono, Aux/DAD, Tape 1, Tape 2
P601, 602	4443-040185	Connector, 4 Pos.
P603	4443-030185	Connector, 3 Pos.
P604	4443-050185	Connector, 5 Pos.
P605, 801	4443-070185	Connector, 7 Pos.
PCB-4 MC AMP. P.C. BOARD		
	RESISTORS	
R917, 918, 919, 920	5174-561381	560 Ω , \pm 1%, 1/4W, Metal
	CAPACITORS	
C903, 904, 905, 906	5345-106F0226	10 μ F, \pm 20%, 50V, Electrolytic
	TRANSISTORS	
Q901, 902, 907, 908	5611-1190(E)	2SA1190(E)
Q903, 904, 905, 906	5613-2855(D)	2SC2855(D)
	DIODES	
D903, 904	5635-HZ15-1L	Zener, HZ15-1L
	MISCELLANEOUS	
P802	4443-09418	Connector, 9 Pos.
PCB-5 TONE CONTROL P.C. BOARD		
	RESISTORS	
Δ R19, 20	5102-1214715	120 Ω , \pm 2%, 1/4W, Fuse
	CONTROLS	
VR501/502	5113-50385122	50k Ω MN, Balance (w/Hexagon Nut)
VR505/506	5113-50371148	50k Ω C, Treble (w/Hexagon Nut)
VR507/508	5113-10472148	100k Ω C, Bass (w/Hexagon Nut)
	CAPACITORS	
C17, 18	5345-107D041	100 μ F, \pm 20%, 25V, Electrolytic
Δ C21, 22	5345-337D041	330 μ F, \pm 20%, 25V, Electrolytic
C509, 510	5345-685D0951	6.8 μ F, \pm 20%, 25V, Electrolytic
C511, 512	5353-010934	1pF, \pm 0.5pF, 500V, Mica
C513, 514	5345-226D0951	22 μ F, \pm 20%, 25V, Electrolytic
C515, 516, 517, 518	5353-680534	68pF, \pm 5%, 500V, Mica
C519, 520	5345-476C0951	47 μ F, \pm 20%, 16V, Electrolytic
C521, 522	5359-1015851	100pF, \pm 5%, 100V, Polypropylene
	TRANSISTORS	
Q5, 517, 518	5614-667(C)	2SD667(C)
Q6, 515, 516	5612-647(C)	2SB647(C)
Q501, 502, 503, 504	5613-2320L(F)	2SC2320L(F)
Q505, 506, 507, 508, 511, 512	5613-2603(E)	2SC2603(E) or 2SC2603(F)
Q509, 510, 513, 514	5611-1115(E)	2SA1115(E) or 2SA1115(F)
Q519, 520	5616-2SK364(V)	F.E.T., 2SK364(V) or 2SK364(BL)
	DIODES	
D9, 10	5635-HZ24-1L	Zener, HZ24-1L
D501, 502, 503, 504	5631-1S2473	1S2473
	MISCELLANEOUS	
SW501/502/503/504/505/ 506/507	4431-0728724	Push Switch, Tape Monitor, Function
P501	4443-030185	Connector, 3 Pos.

Ref. No.	Part No.	Description
PCB-6 TUNING 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
D724, 725	5631-1S2473	1S2473
MISCELLANEOUS		
SW701, 702	4431-A020145	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
J351	4163-70896	Connector with Lead Wire, 16 Pos.
PCB-7 PUSH SWITCHES P.C. BOARD		
CAPACITORS		
C503, 504	5359-1815851	180pF, $\pm 5\%$, 100V, Polypropylene
C801, 802	5345-105F0952	1 μ F, $\pm 20\%$, 50V, Electrolytic
DIODES		
D801, 802	5631-1S2473	1S2473
MISCELLANEOUS		
SW508/509/510	4431-03127353	Push Switch, Tape Copy, Subsonic Filter, Loudness
SW511/512/513/514	4431-04127167	Push Switch, MC, Mono Mode, High Blend, Muting
PCB-8 TONE SWITCHES P.C. BOARD		
SW515/516/517	4431-03127253	Push Switch, Bass Turnover, Tone Defeat, Treble Turnover
PCB-9 VOLUME CONTROL P.C. BOARD		
VR503/504	5113-10471147	Control, 100k Ω B, Volume (w/Hexagon Nut)
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 SPEAKER SWITCHES P.C. BOARD		
SW401/402	4431-02087266	Push Switch, Speakers 1/2
P451	4443-030185	Connector, 3 Pos.
PCB-12 SPEAKER TERMINAL P.C. BOARD		
TE2	4214-121	Terminal, Speaker System 1/2
PCB-13 POWER SWITCH P.C. BOARD		
RESISTORS		
Δ R50	5134-105J25P	1M Ω , $\pm 5\%$, 1/4W, Carbon
Δ R51, 53	5135-155J50P	1.5M Ω , $\pm 5\%$, 1/2W, Carbon
Δ R52	5134-334J25P	330k Ω , $\pm 5\%$, 1/4W, Carbon
CAPACITORS		
Δ C1	5352-1030959	0.01 μ F, $\pm 20\%$, AC125V, Metalized Polyester
Δ C50	5345-105F041	1 μ F, $\pm 20\%$, 50V, Electrolytic
TRANSISTOR		
Δ Q11	5613-2603(E)	2SC2603(E) or 2SC2603(F)
DIODES		
Δ D7, 8	5631-1S2473	1S2473

Ref. No.	Part No.	Description
MISCELLANEOUS		
△SW1	4431-A01716	Push Switch, Power
△F1	5732-632029	Fuse, 6.3A, 125V
△F2	5732-202031	Fuse, 2A, 125V
	4472-7113	Fuse Holder, F1 (x 2)
	4472-7122	Fuse Holder, F2 (x 2)
PCB-14 HEADPHONE JACK P.C. BOARD		
J101	4451-00139	Jack, Headphones
PCB-15 LAMP P.C. BOARDS		
LP1, 2	5731-1807163	Lamp, 18V 95mA
PCB-16 FREQUENCY STEP SELECTOR P.C. BOARD		
SW714, 715	4421-012413	Slide Switch, AM 9 kHz/10 kHz, FM 50 kHz/100 kHz



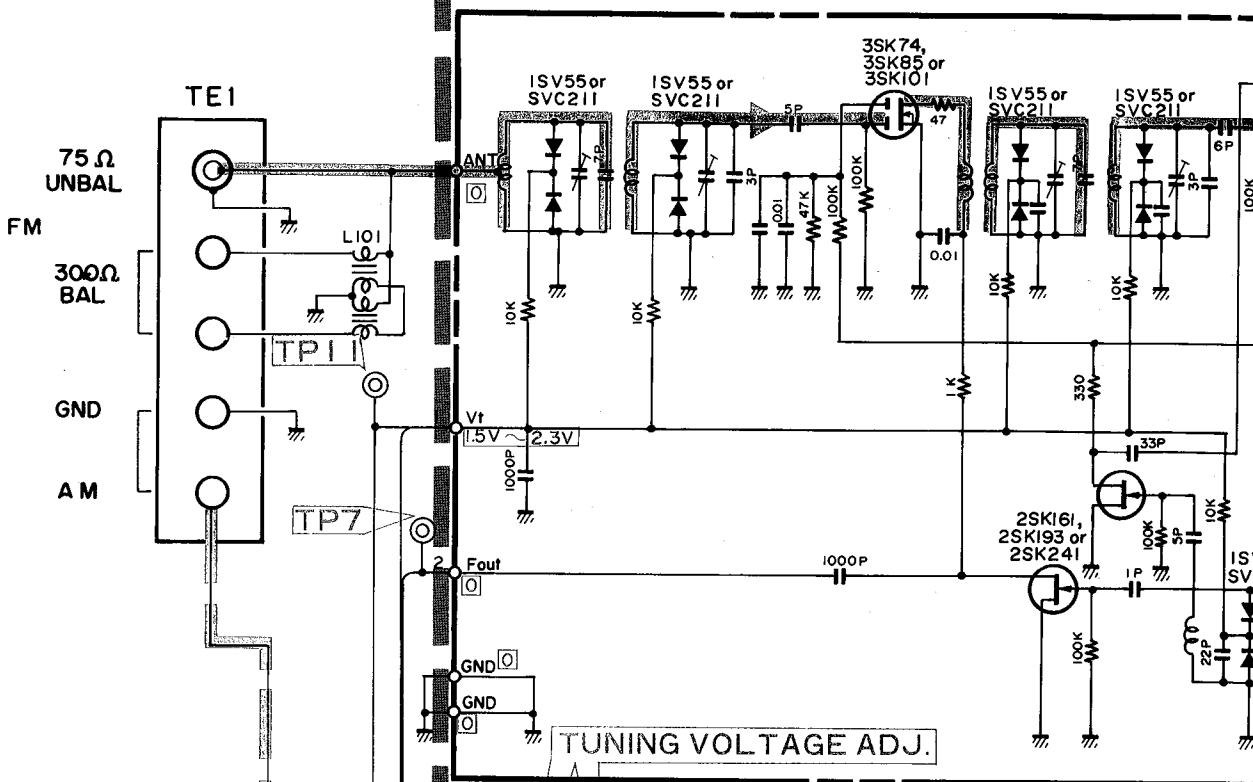
SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS, THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.



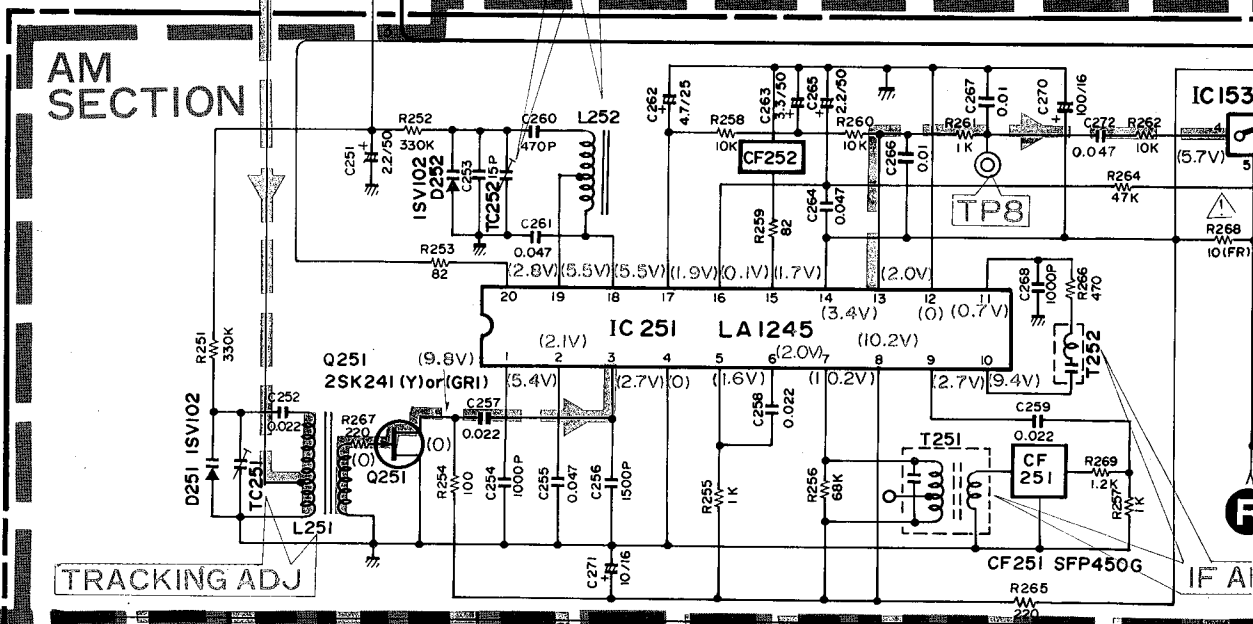
1. ALL RESISTANCE VALUES ARE IN OHMS.
2. ALL CAPACITANCE VALUES ARE IN P.F.
3. ALL CAPACITANCE VALUES ARE IN P.F. UNLESS OTHERWISE NOTED.
4. VOLTAGE IS IN VOLTS UNLESS OTHERWISE NOTED.
5. VOLTAGE IS IN VOLTS UNLESS OTHERWISE NOTED.
6. REGULATOR IS THREE COMPARISON TYPE.

SCHEMATIC DIAGRAM

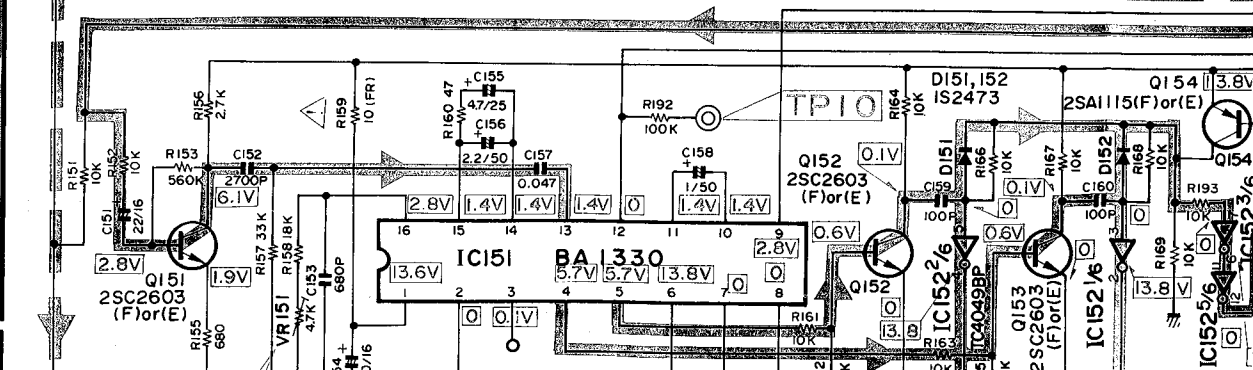
FM FRONT END



AM SECTION



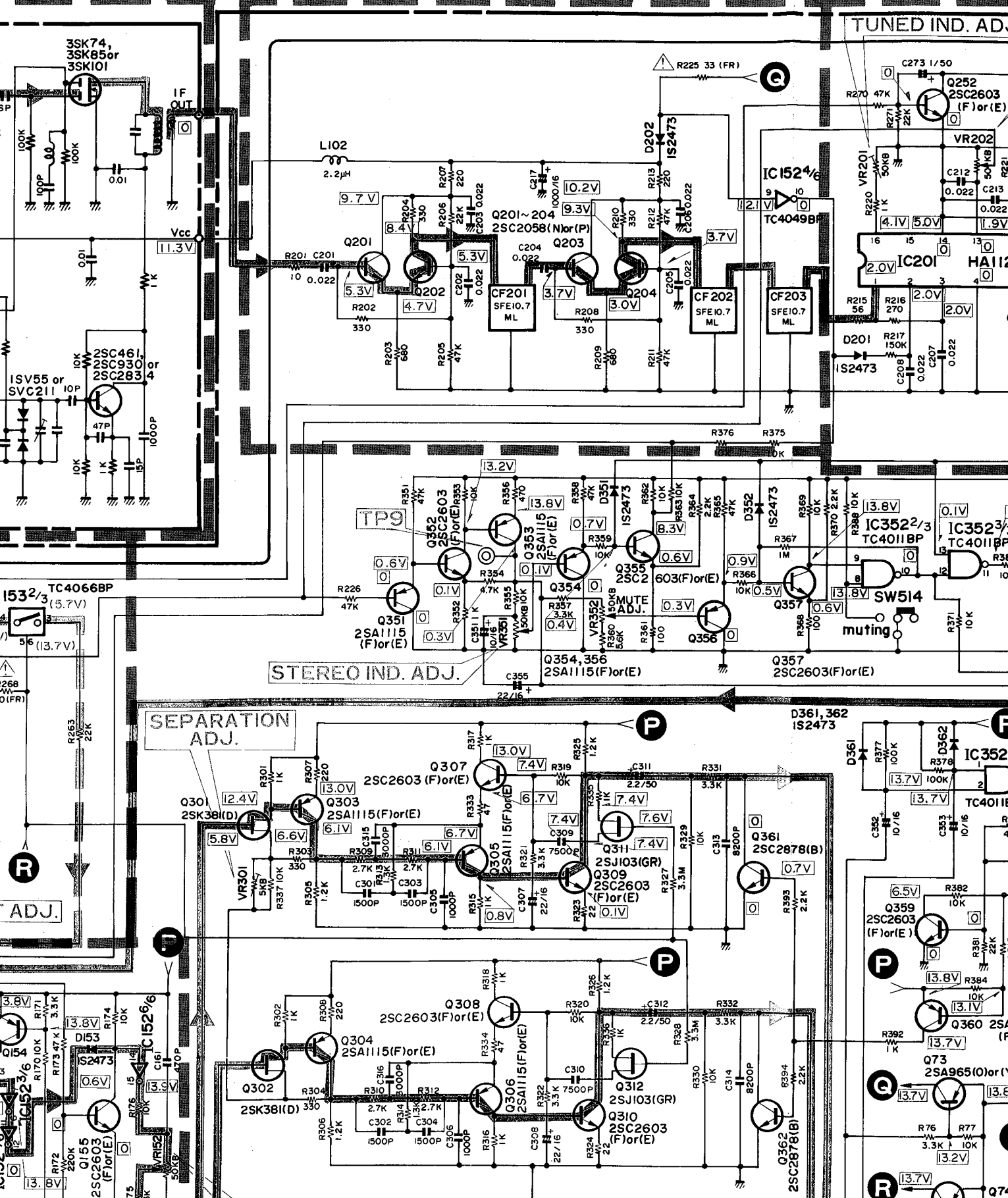
TRACKING ADJ



FM IF AMP.

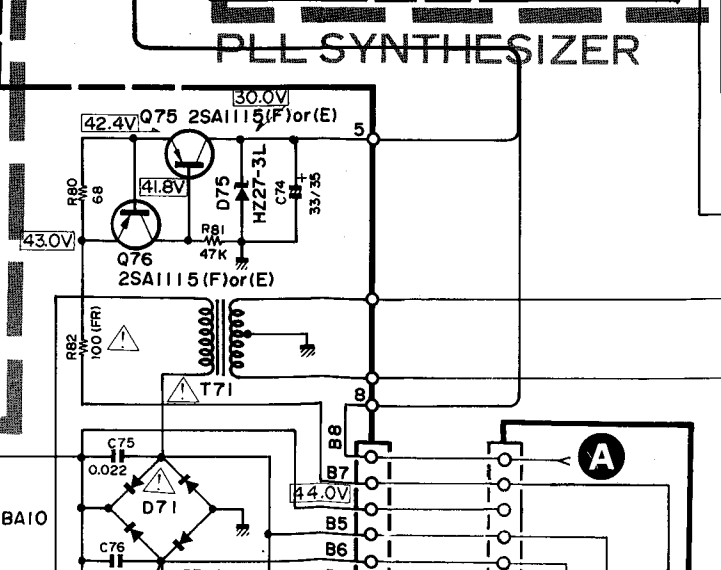
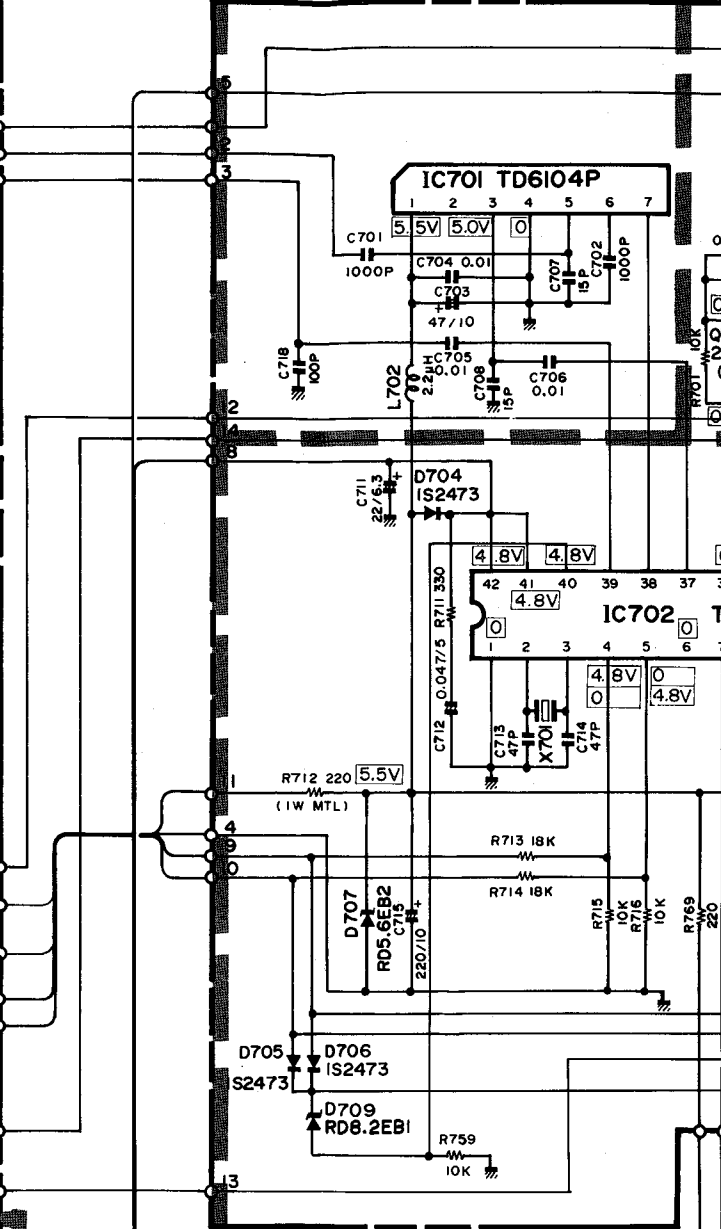
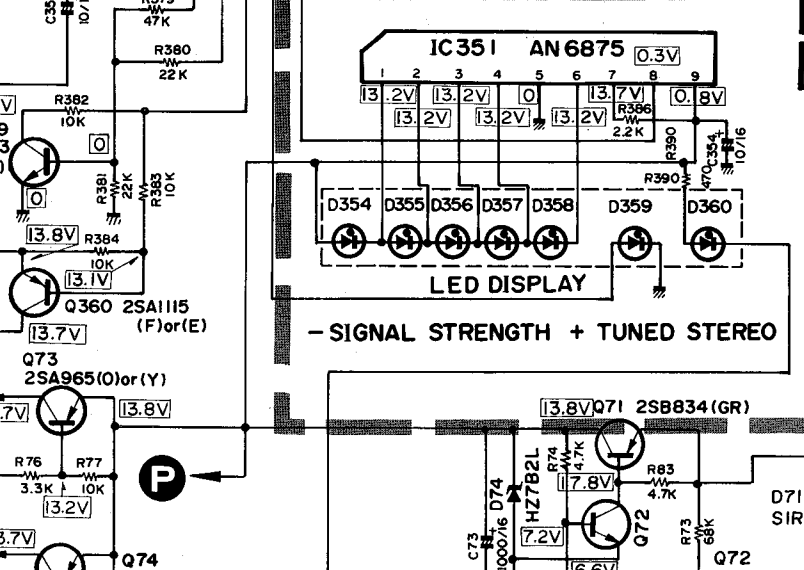
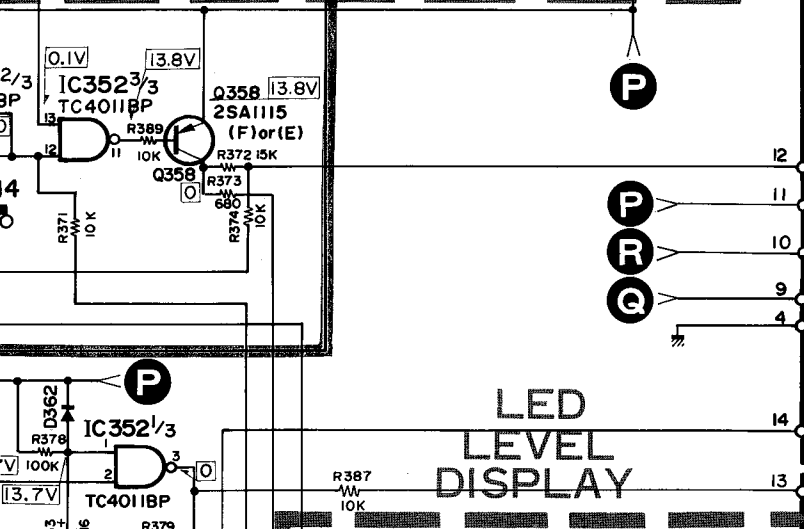
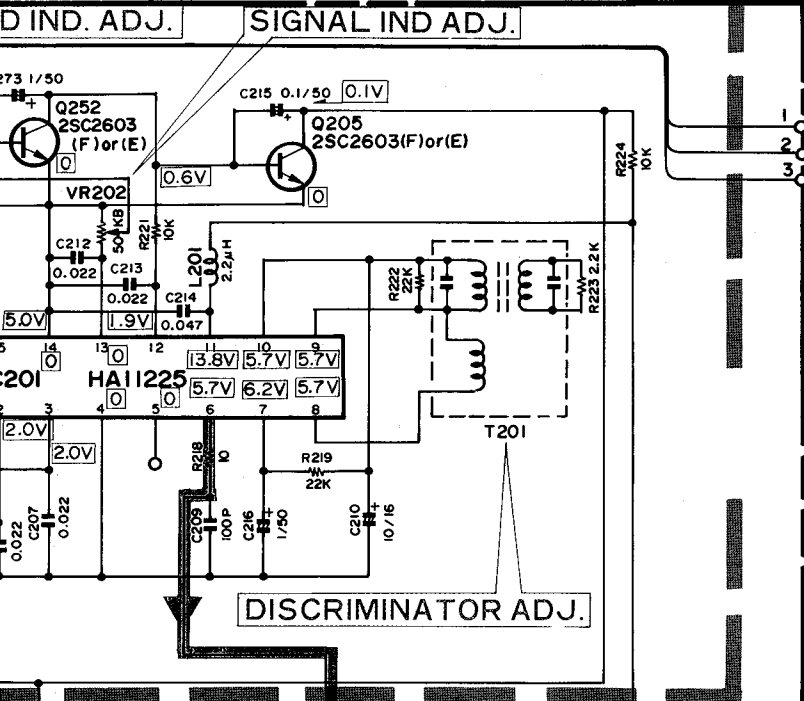
FM IF AMP. QUADRATURE

TUNED IND. ADJ.



AMP.
TEMPERATURE DET

PRE SCALER



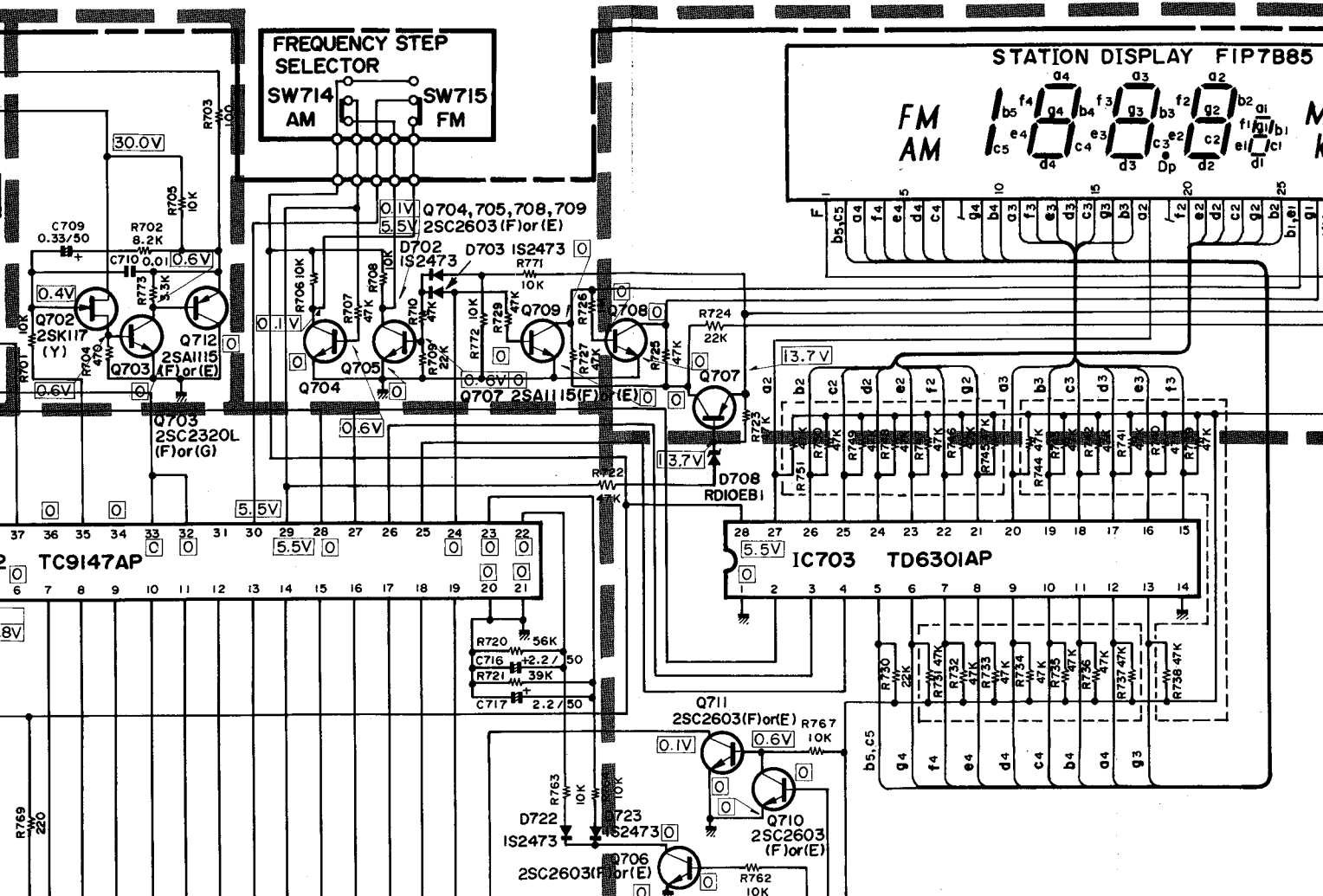
L.P.F.

FREQUENCY DISPLAY

FREQUENCY STEP SELECTOR
 SW714 AM
 SW715 FM

STATION DISPLAY FIP7B85

FM
AM



LED DISPLAY DRIVE

FM/AM PRESET MEMORY

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

D712
 D713
 D714
 D715
 D716
 D717
 D718
 D719
 D720
 D721

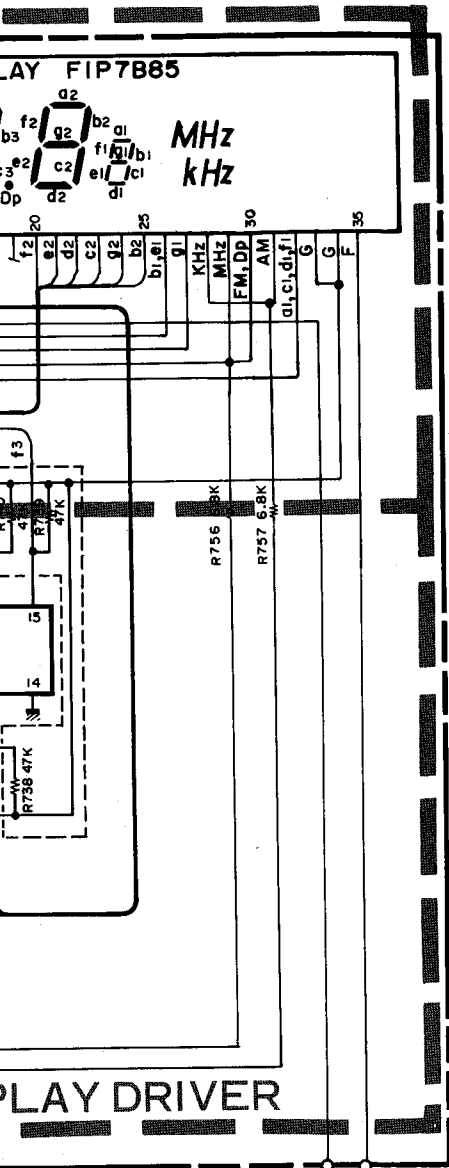
D724, 725 IS2473

Q

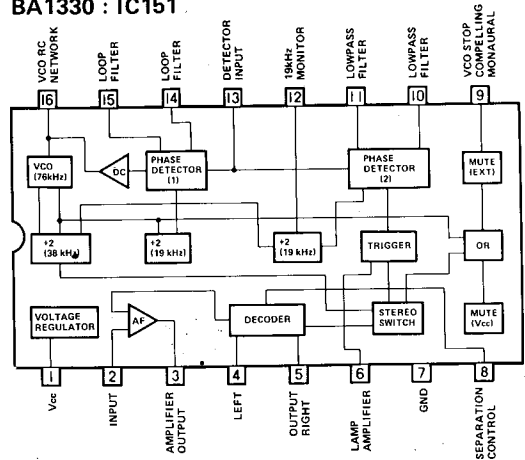
R

S

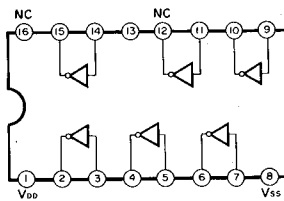
T



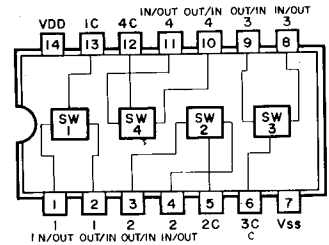
BA1330 : IC151



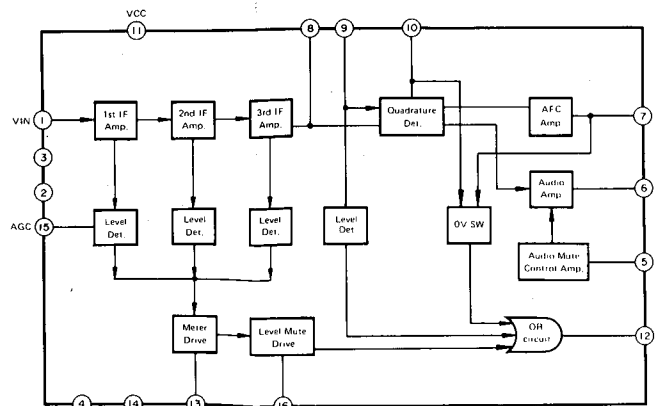
TC4049BP : IC152



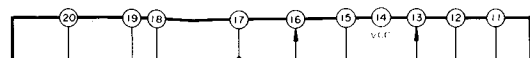
TC4066BP : IC153



HA11225 : IC201



LA1245 : IC251



5

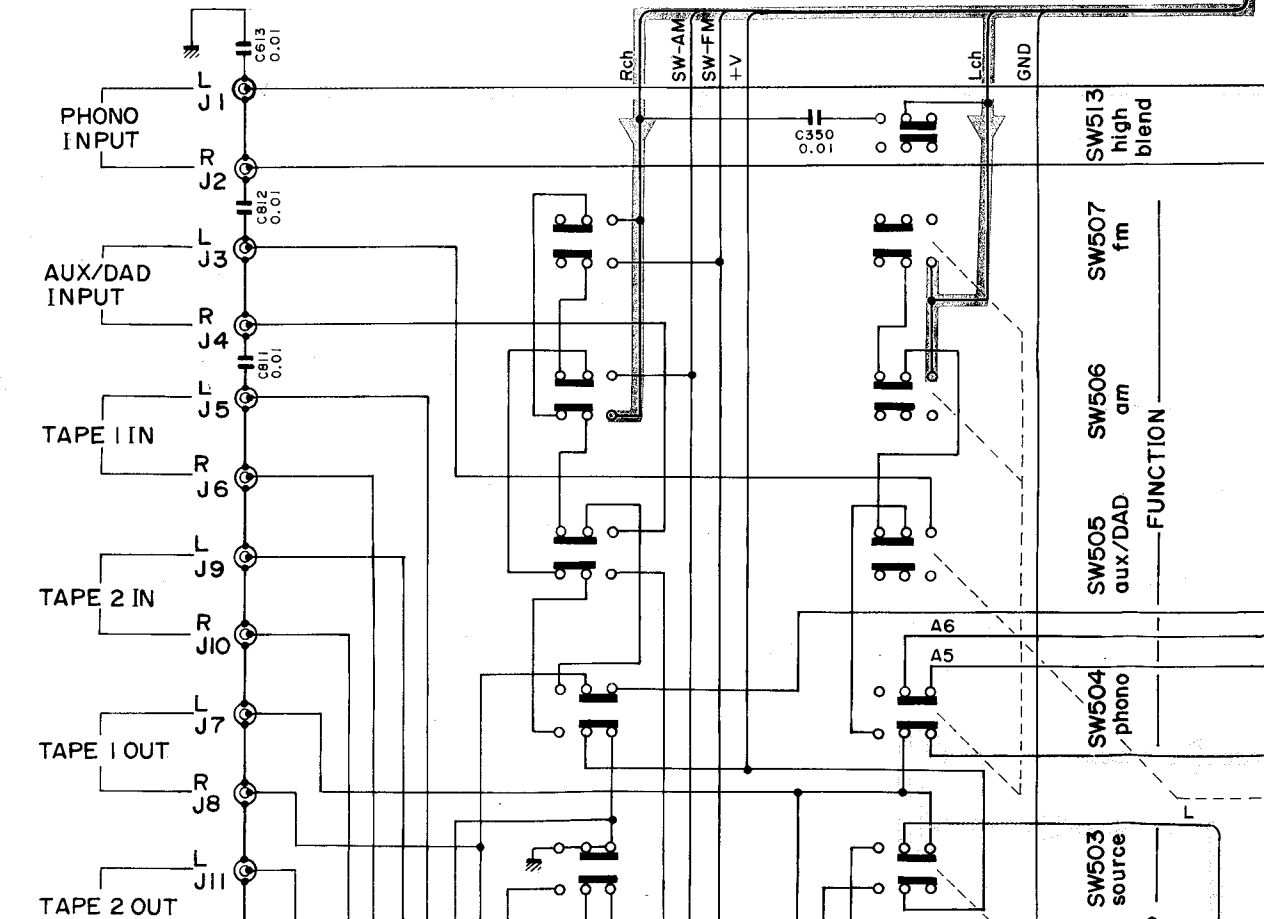
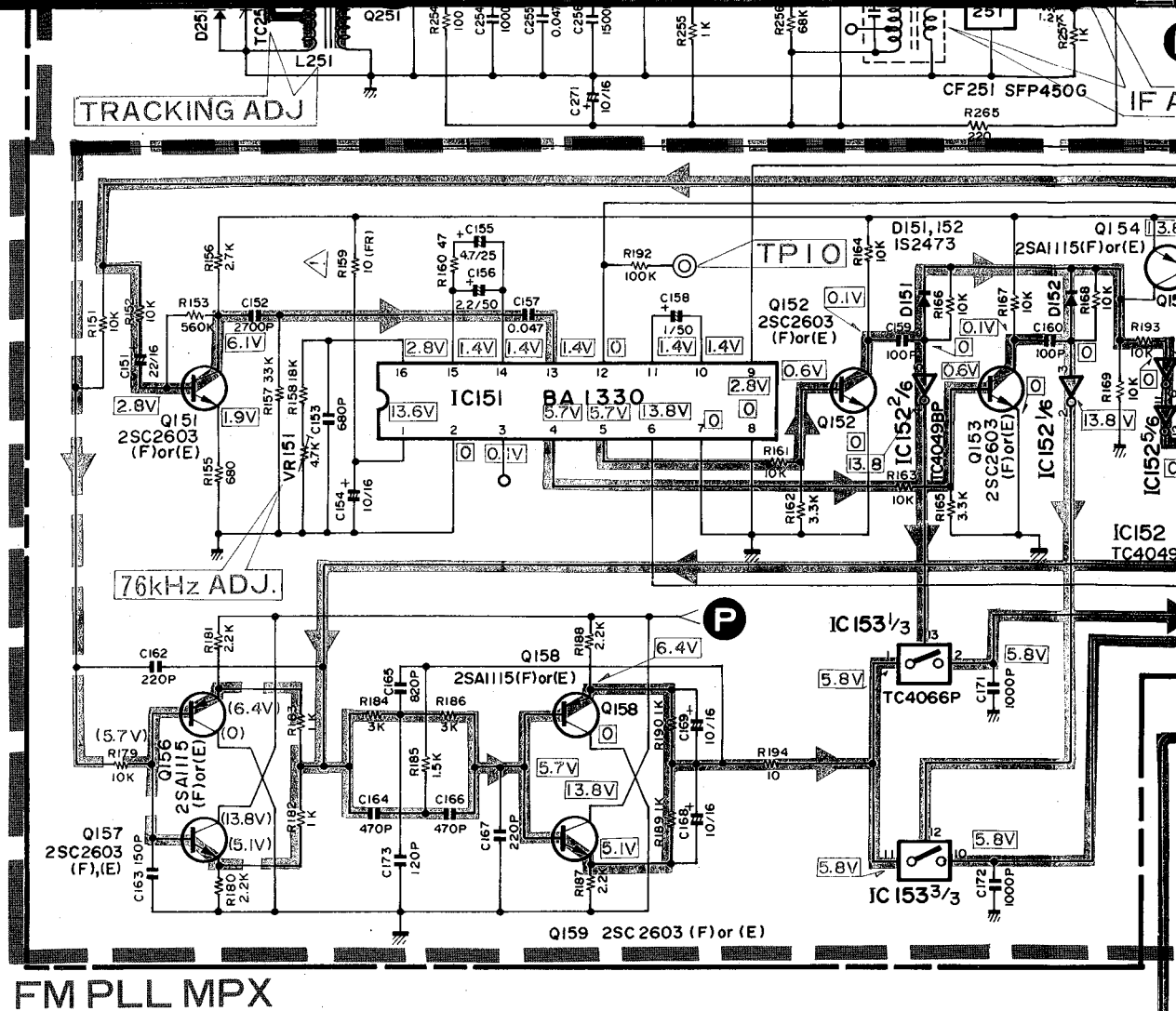
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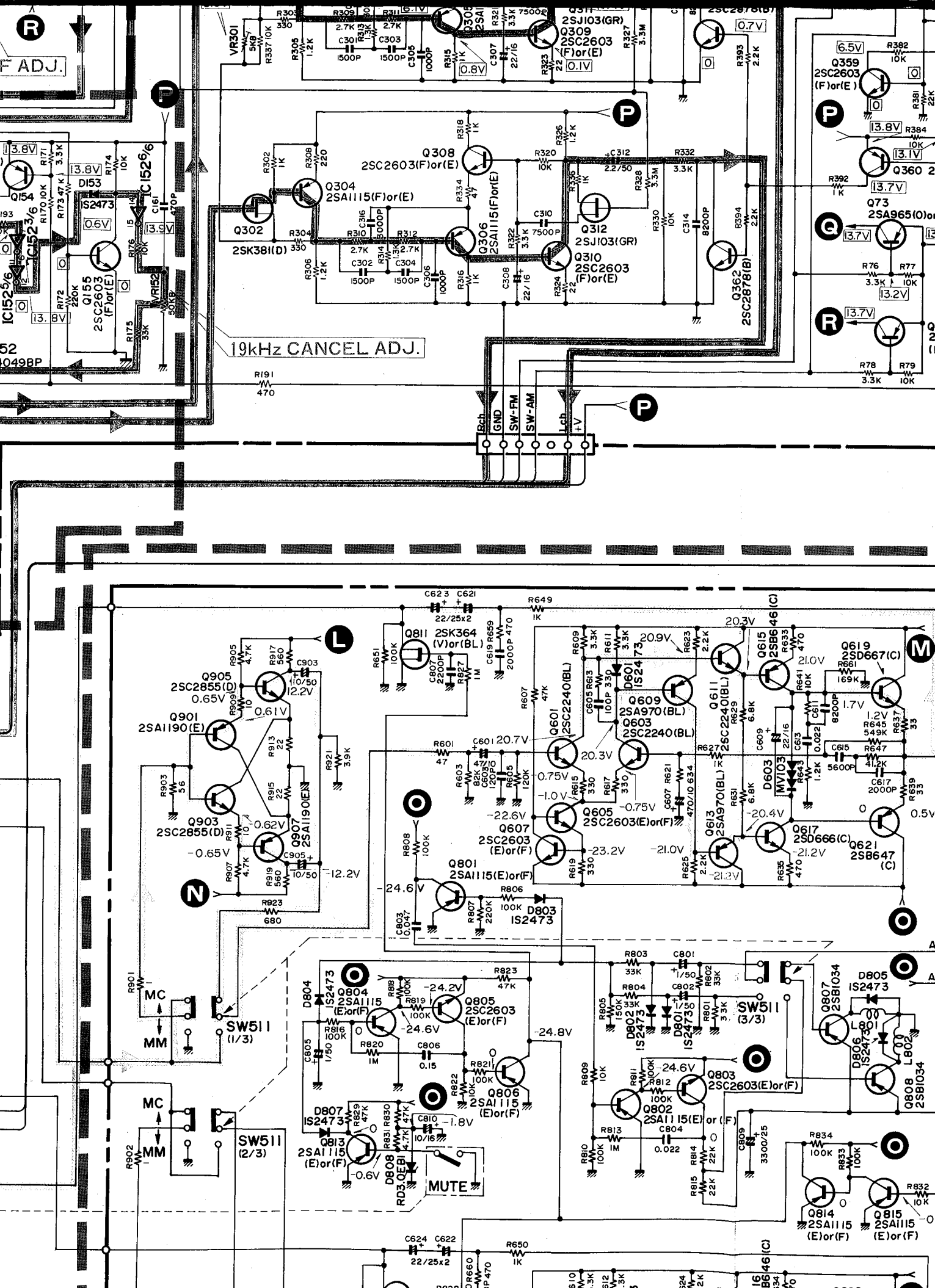
7

8

9

10





F ADJ.

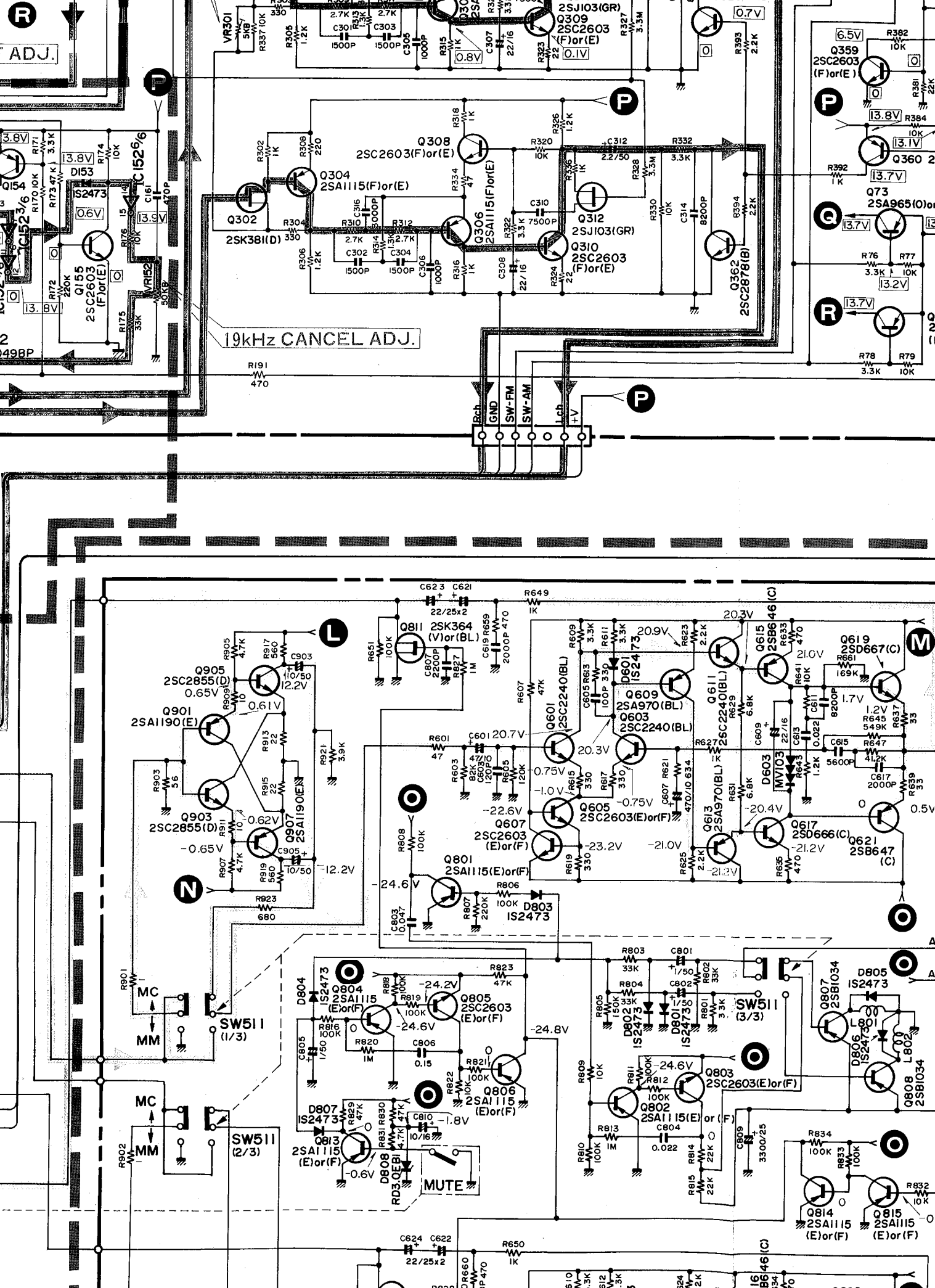
19kHz CANCEL ADJ.

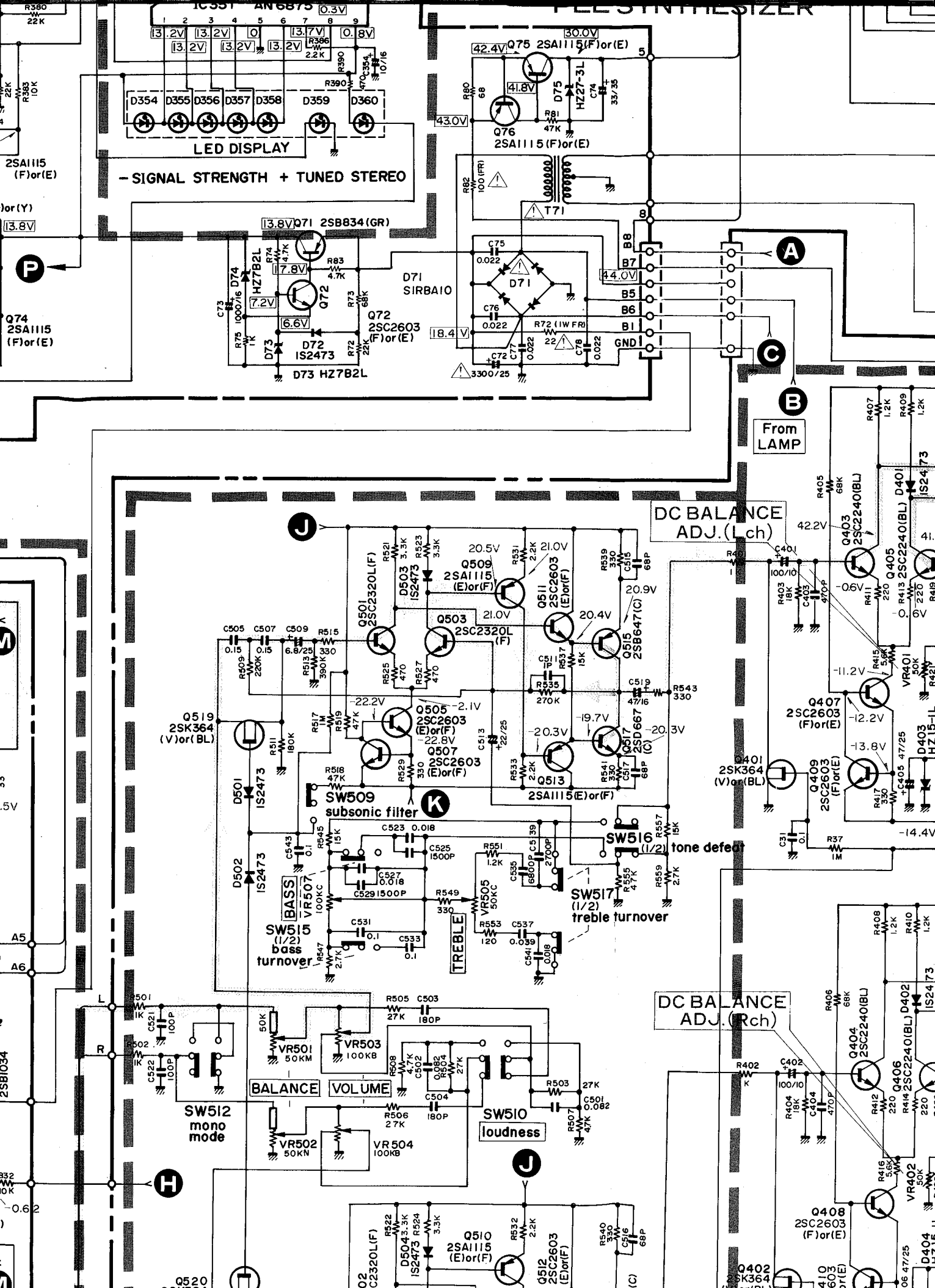
MUTE

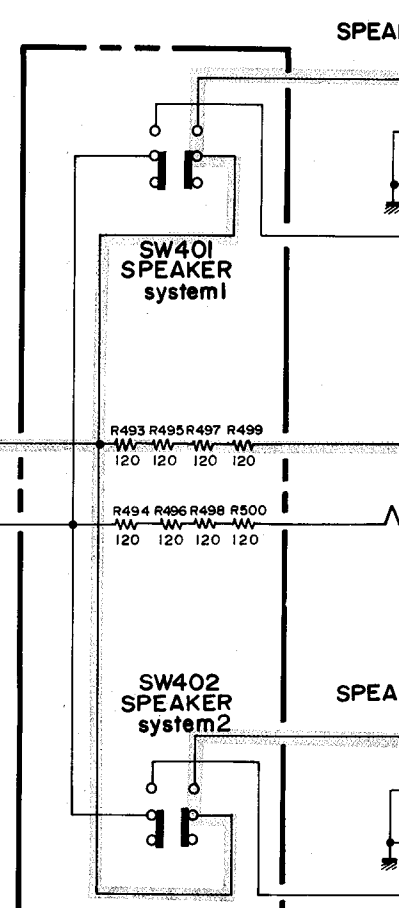
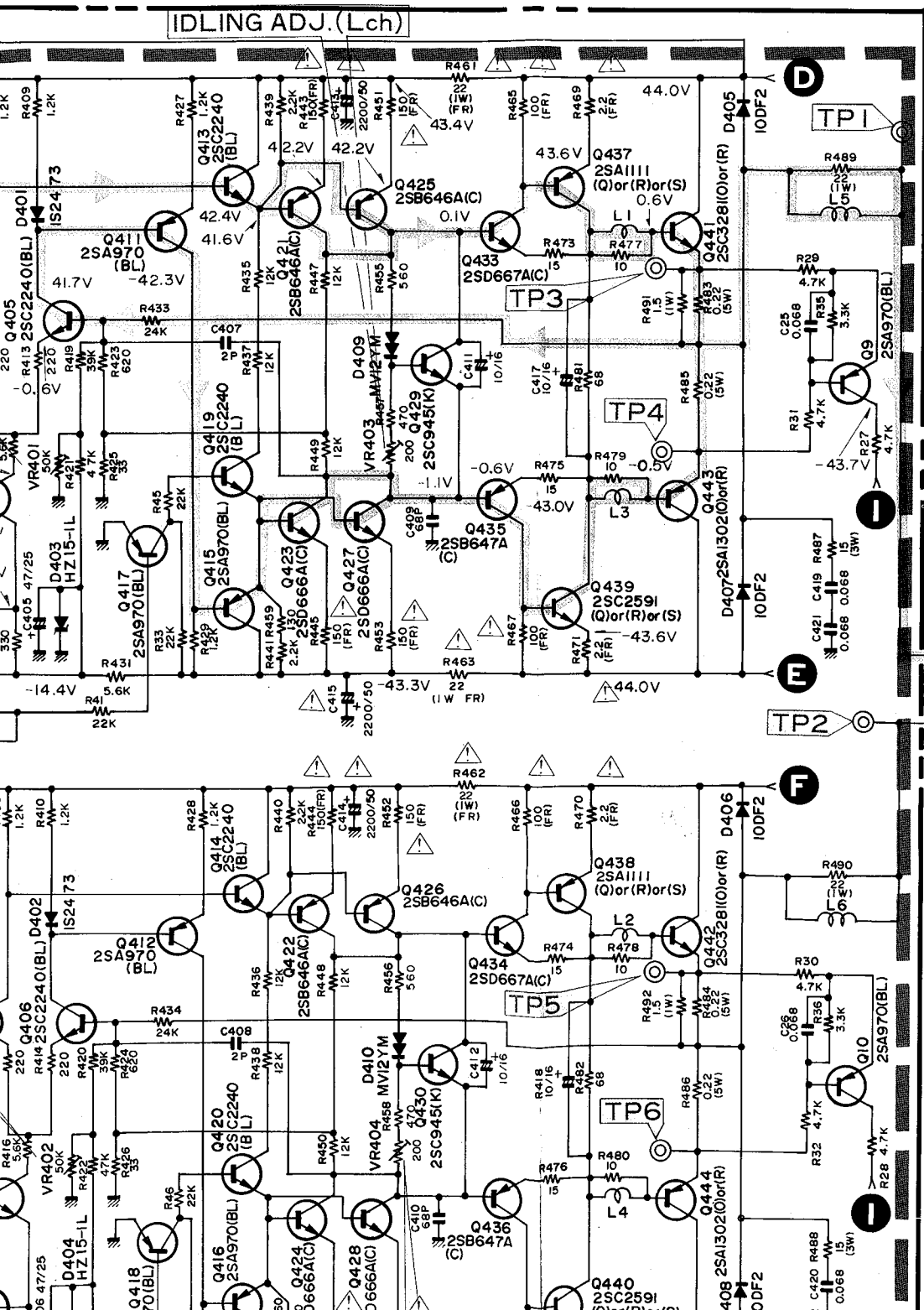
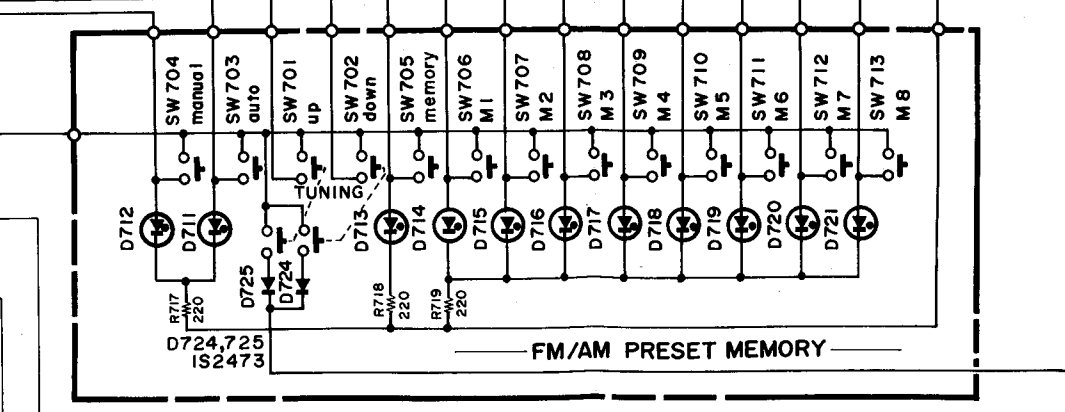
SW511 (1/3)

SW511 (2/3)

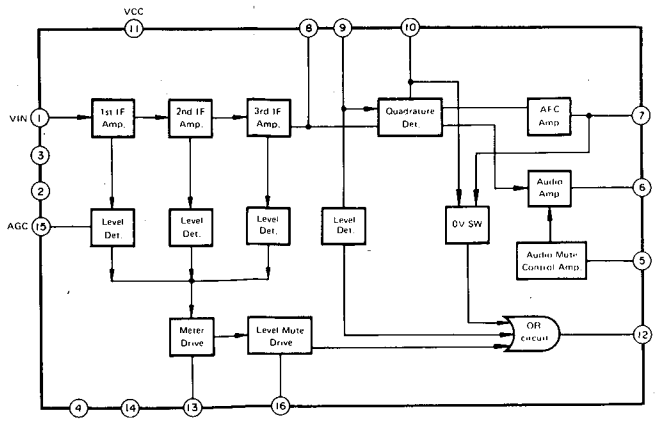
SW511 (3/3)



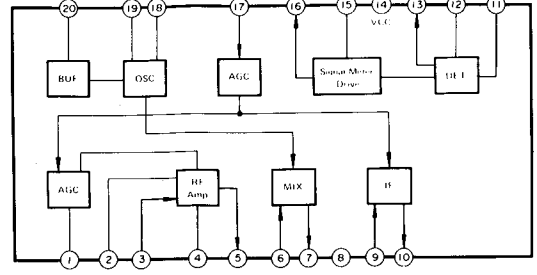




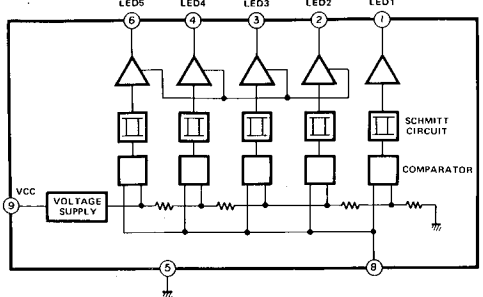
HAT1225 : IC201



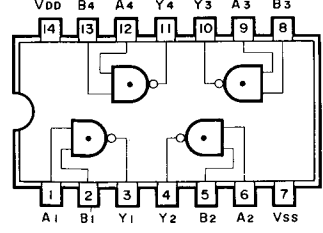
LA1245 : IC251



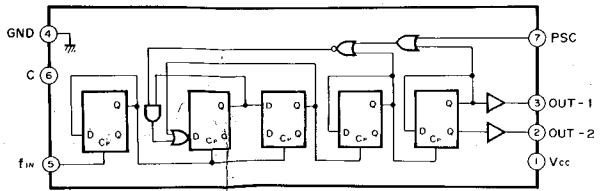
AN6875 : IC351



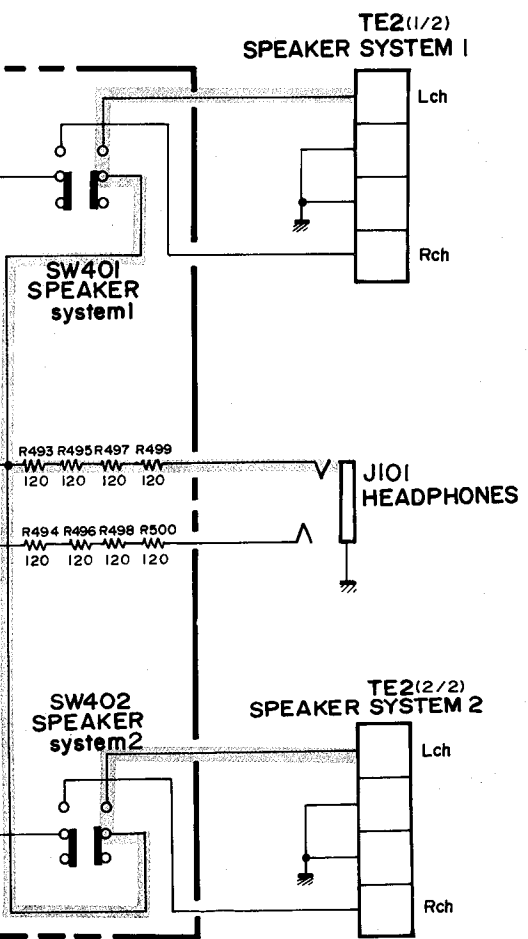
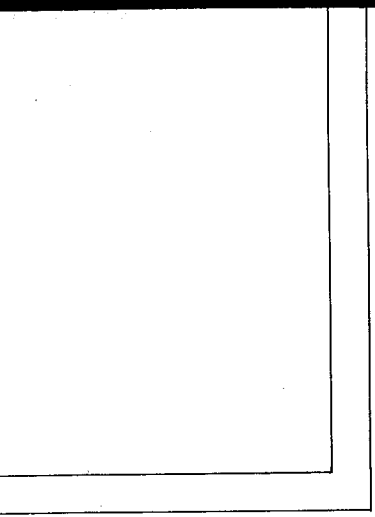
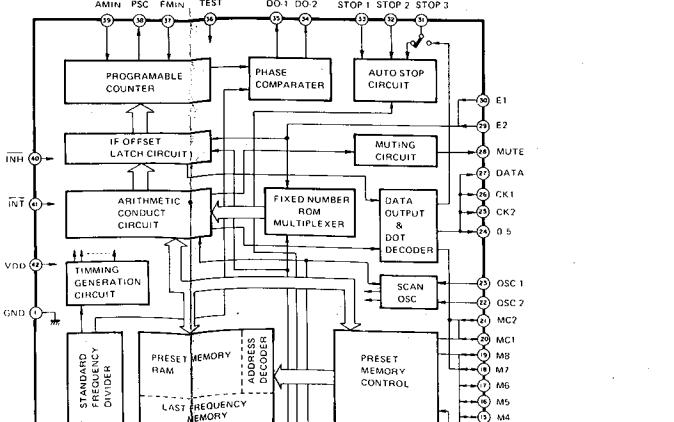
TC4011BP : IC352



TD6104P : IC701



TC9147AP : IC702



9

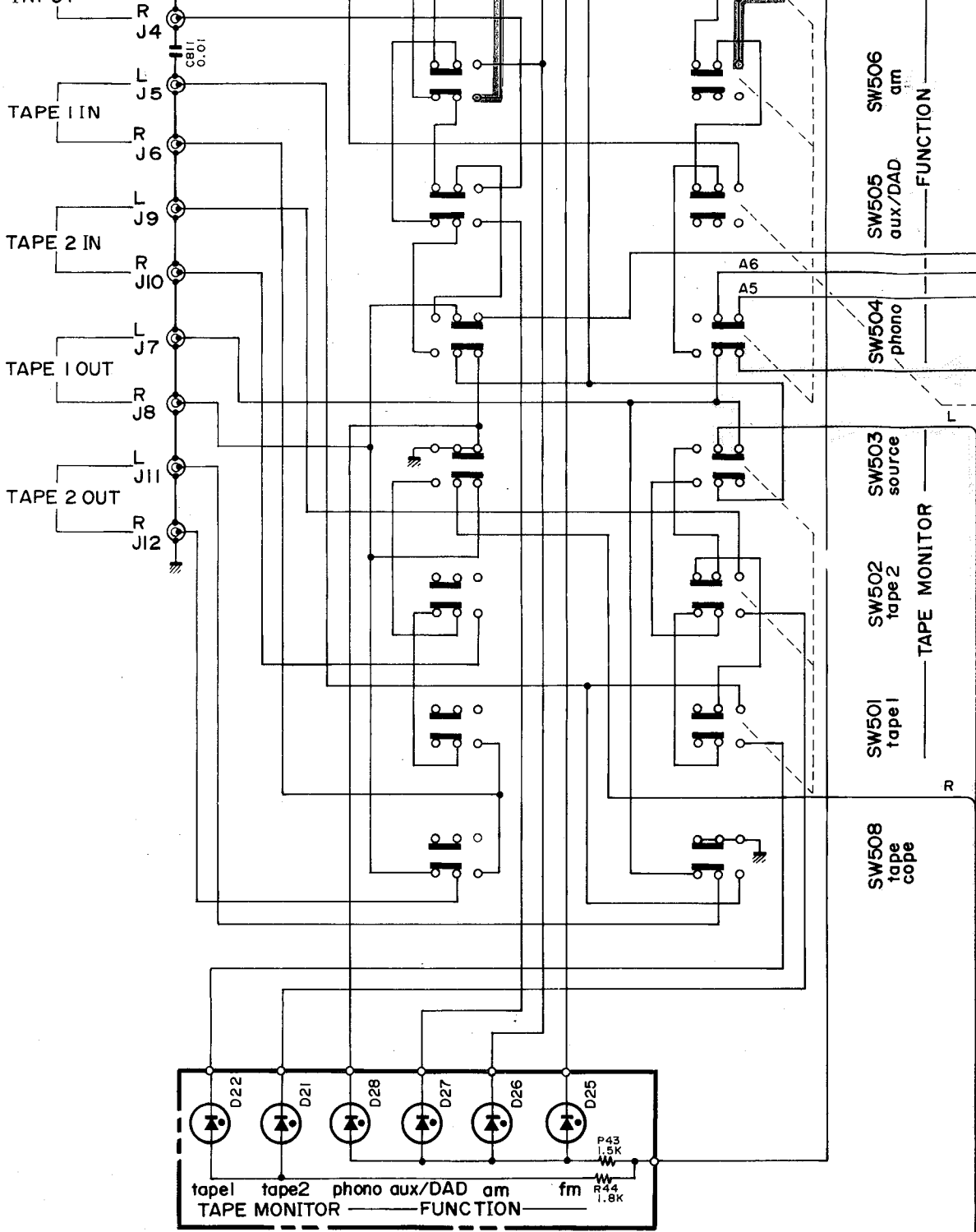
10

11

12

13

14



SW506
am
FUNCTION

SW505
aux/DAD

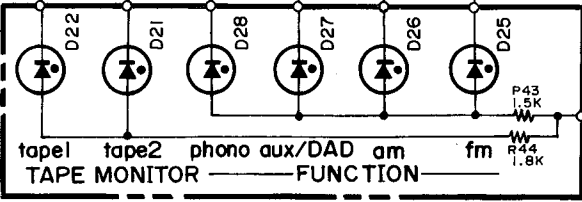
SW504
phono

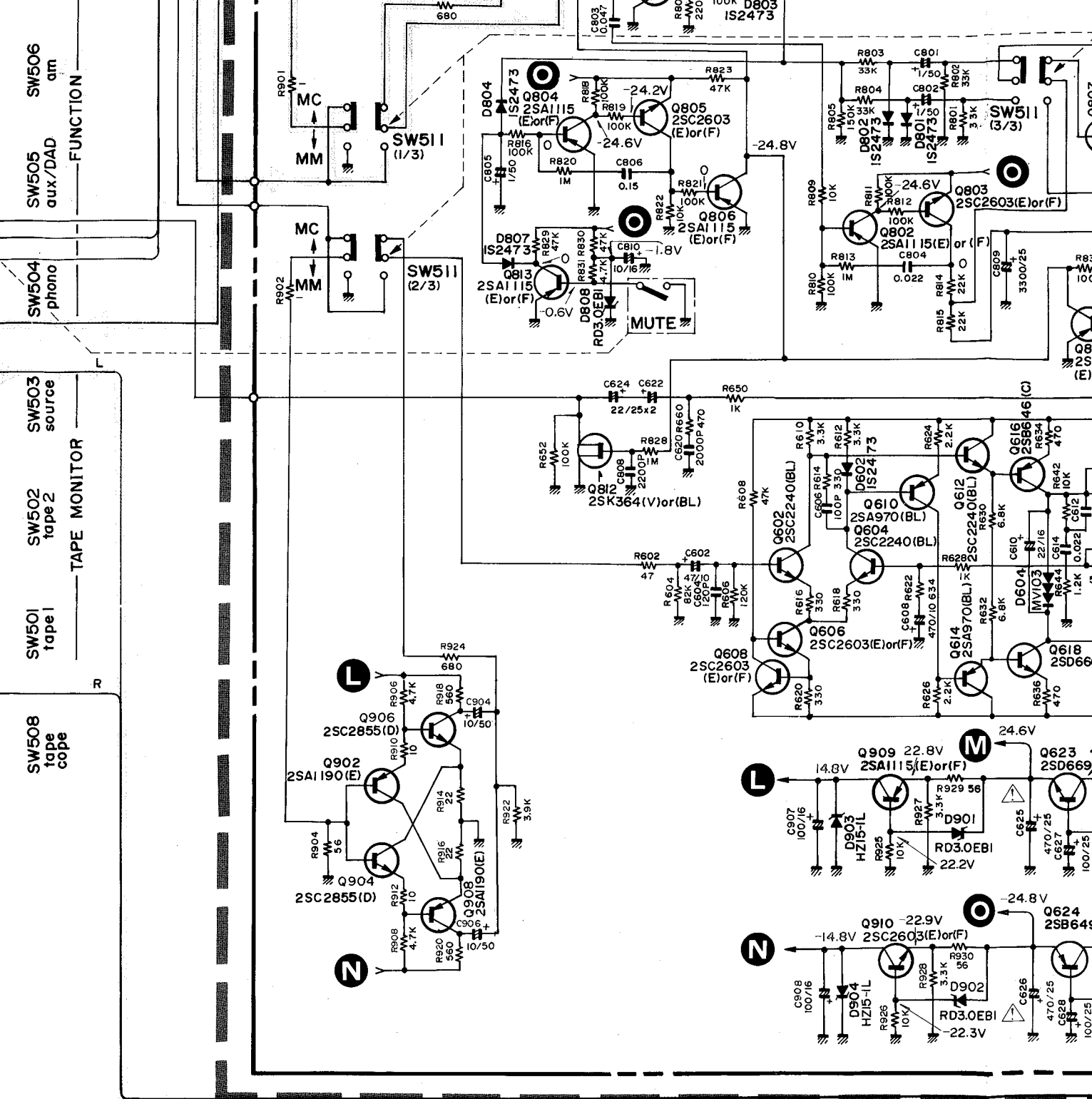
SW503
source

SW502
tape 2

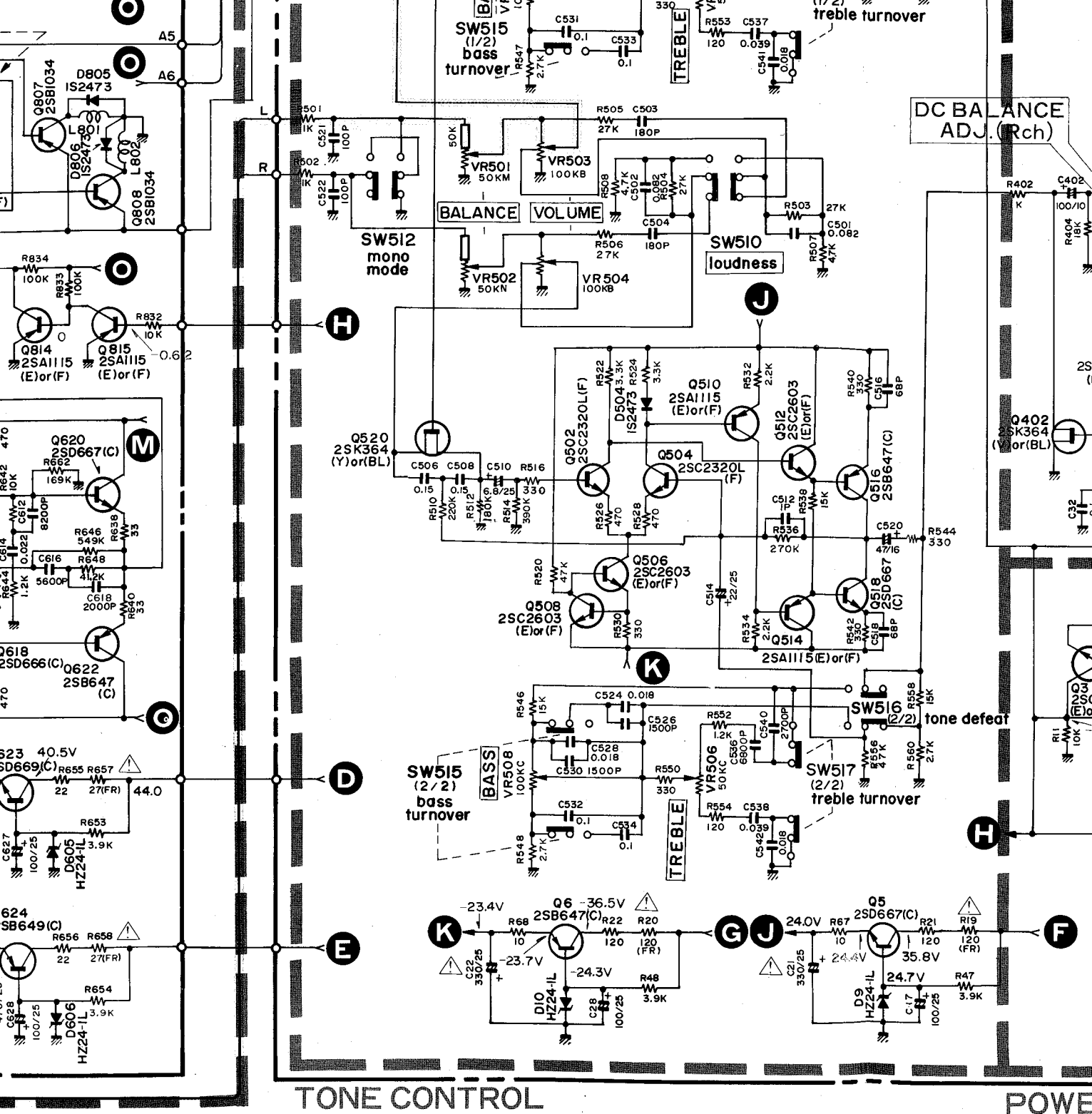
SW501
tape 1

SW508
tape
cope



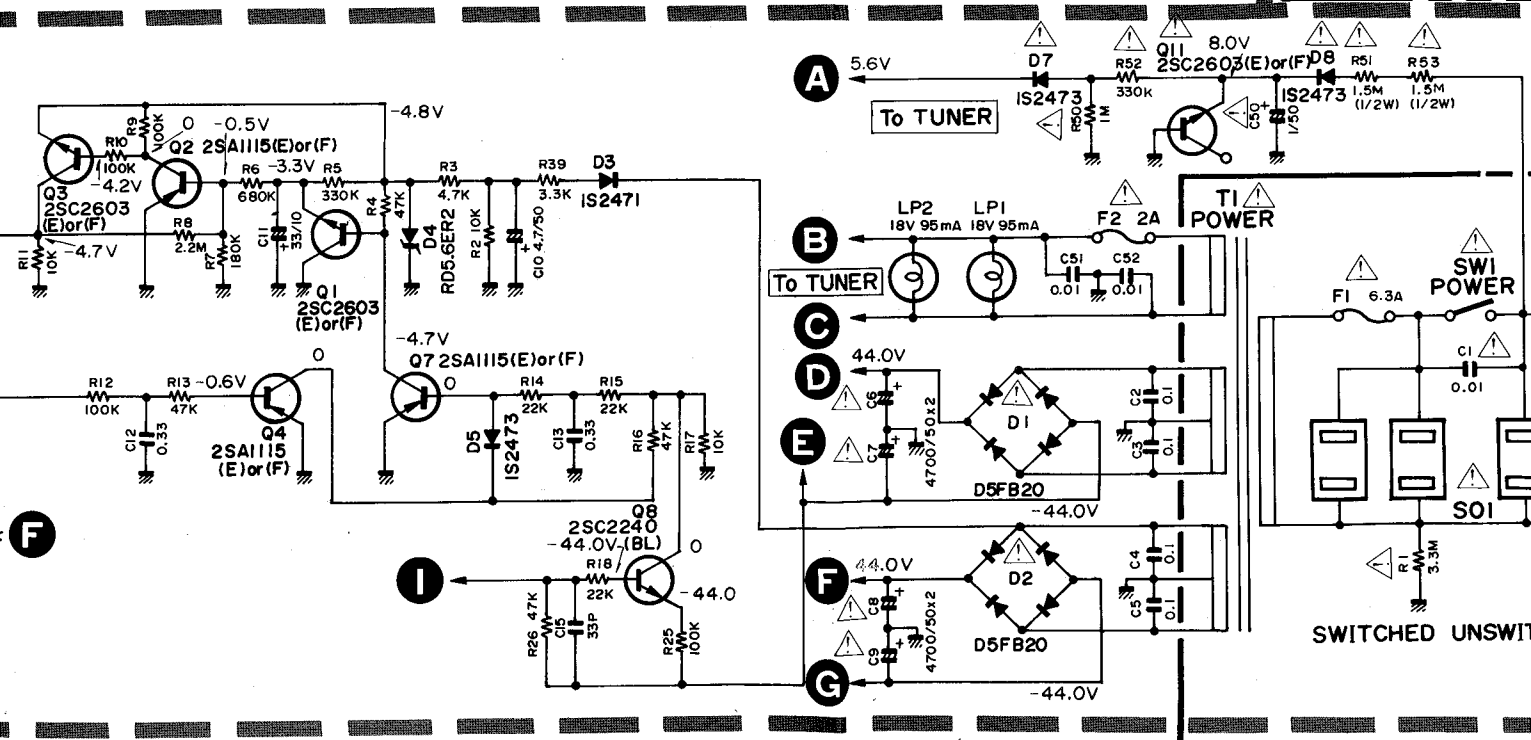
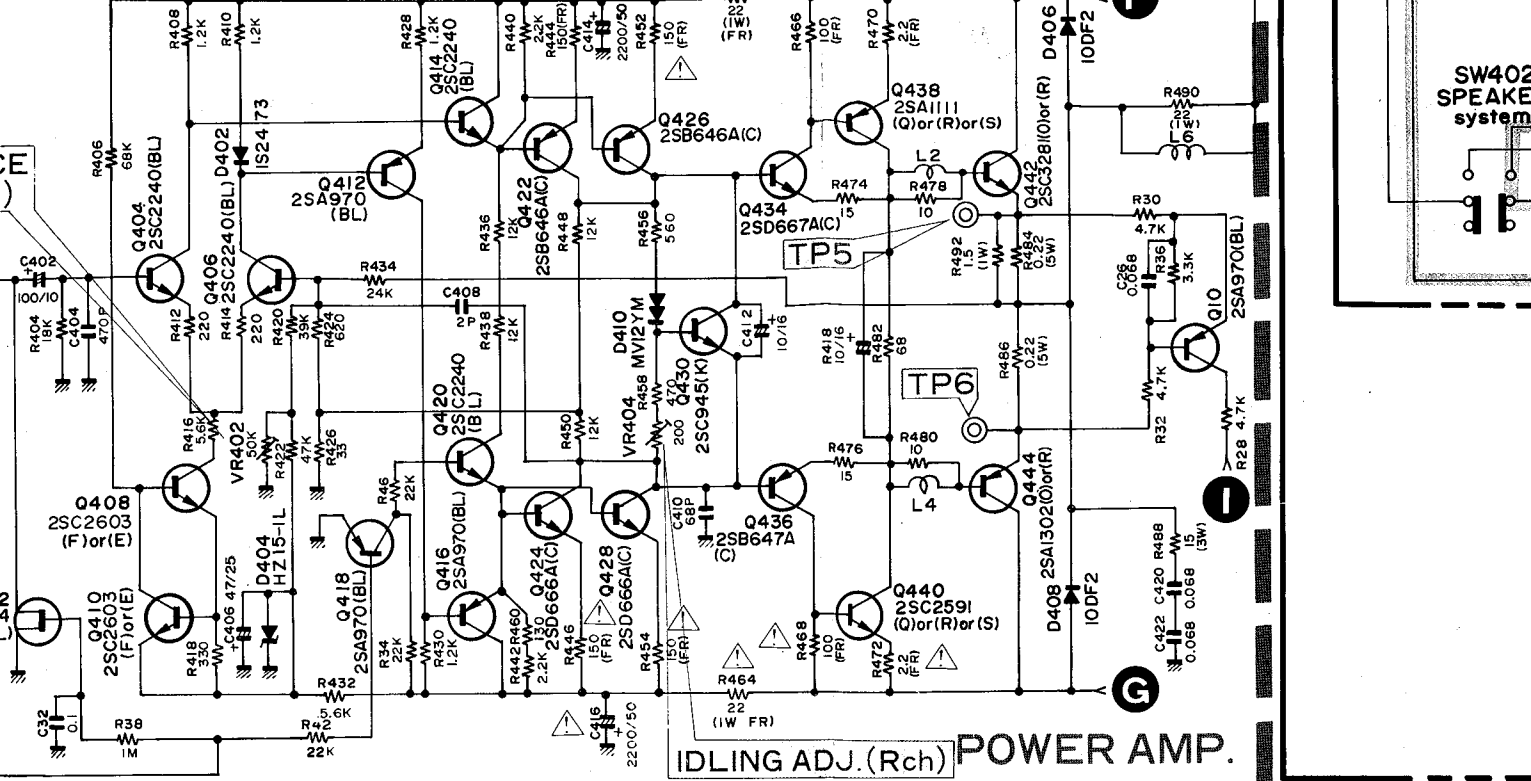


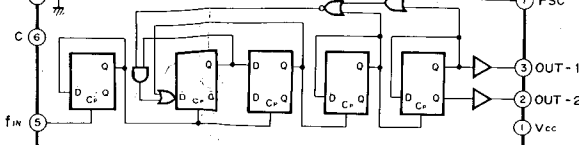
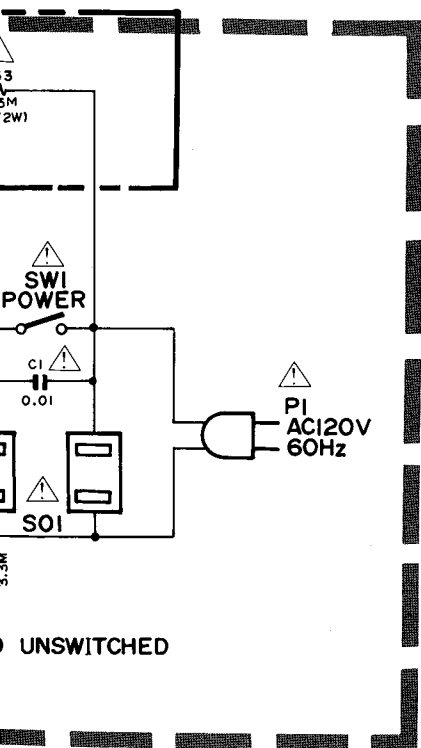
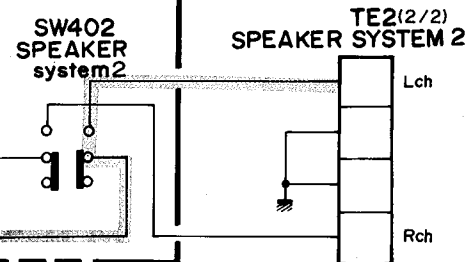
EQUALIZER



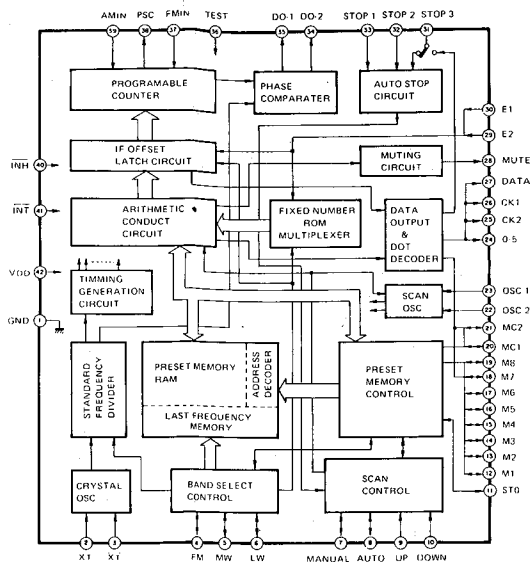
TONE CONTROL

POWER

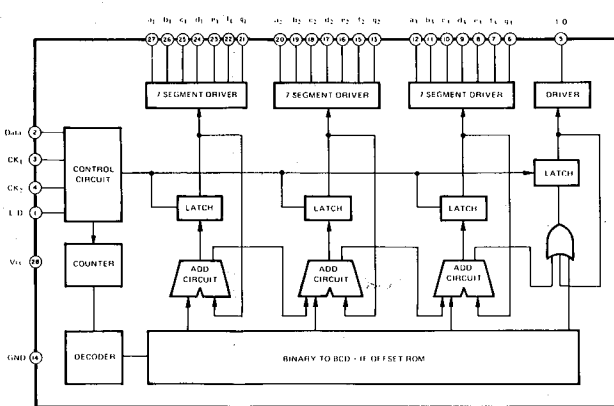




TC9147AP : IC702

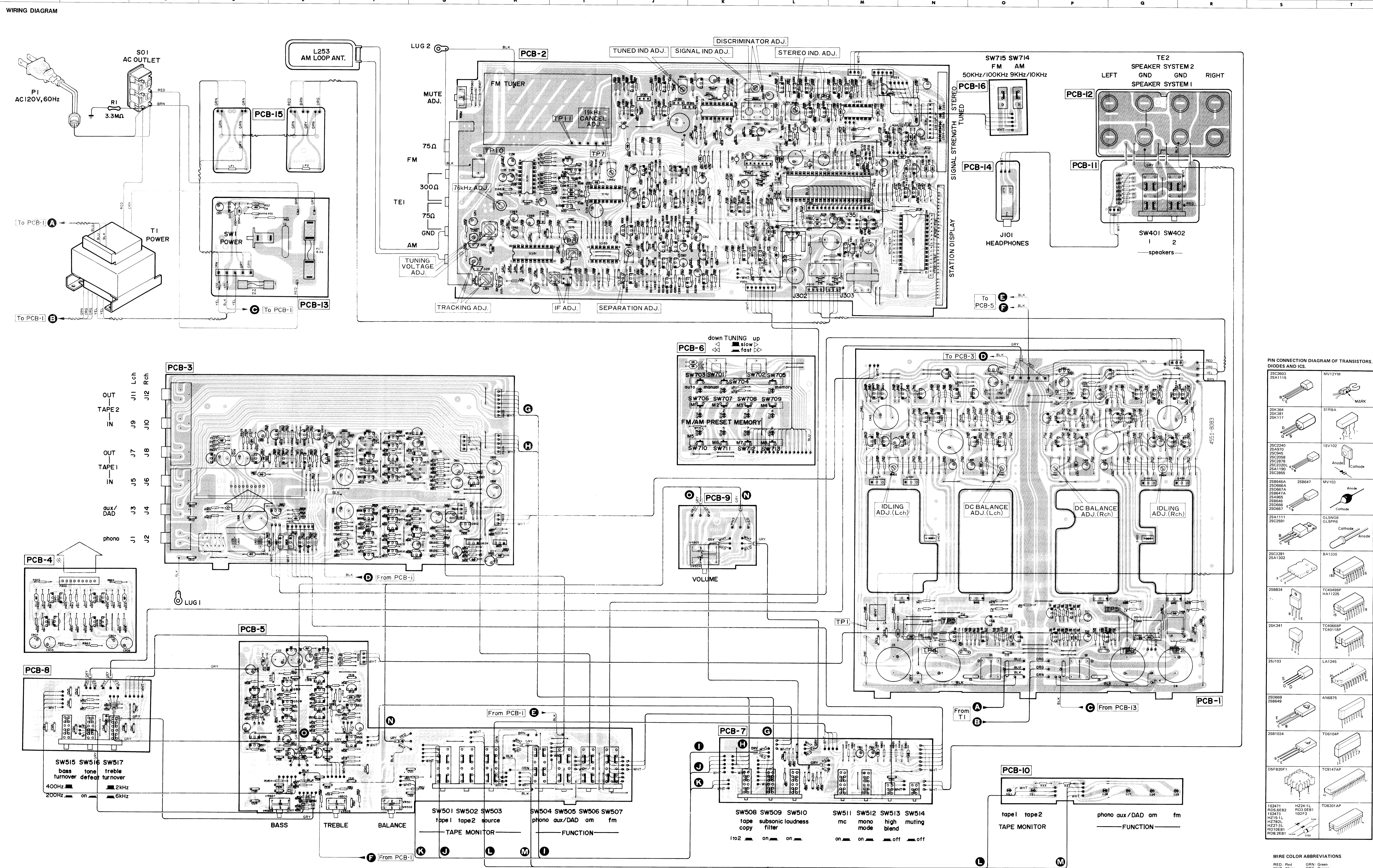


TD6301AP : IC703



..... 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
 FM POSITION
 AM POSITION
5. SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.



PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICs.

2SC2603 2SA1115	MV12Y16
2SK364 2SK381 2SK117	STRBA
2SC240 2SA10 2SC345 2SC2588 2SC2876 2SC2300 2SA1190 2SC2865	15V102 Anode Cathode
2SB646A 2SD666A 2SD667A 2SB647A 2SA805 2SB646 2SD666 2SD667	MV103 Anode Cathode
2SA1111 2SC2591	GL5N06 GL5P06 Cathode Anode
2SC3281 2SA1392	BA1330
2SB834	TC4098P HA11225
2SK241	TC4066P TC4011P
2S1103	LA1245
2SD669 2SB649	AN8375
2SB1034	TD6104P
DSF820F1	TC9147AP
132471 RD56E82 132473 H276-L H276-L H277-3L R010E81 R082E81	H24-1L RD30E81 100F2 TD6301AP

WIRE COLOR ABBREVIATIONS

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

WIRING DIAGRAM

1

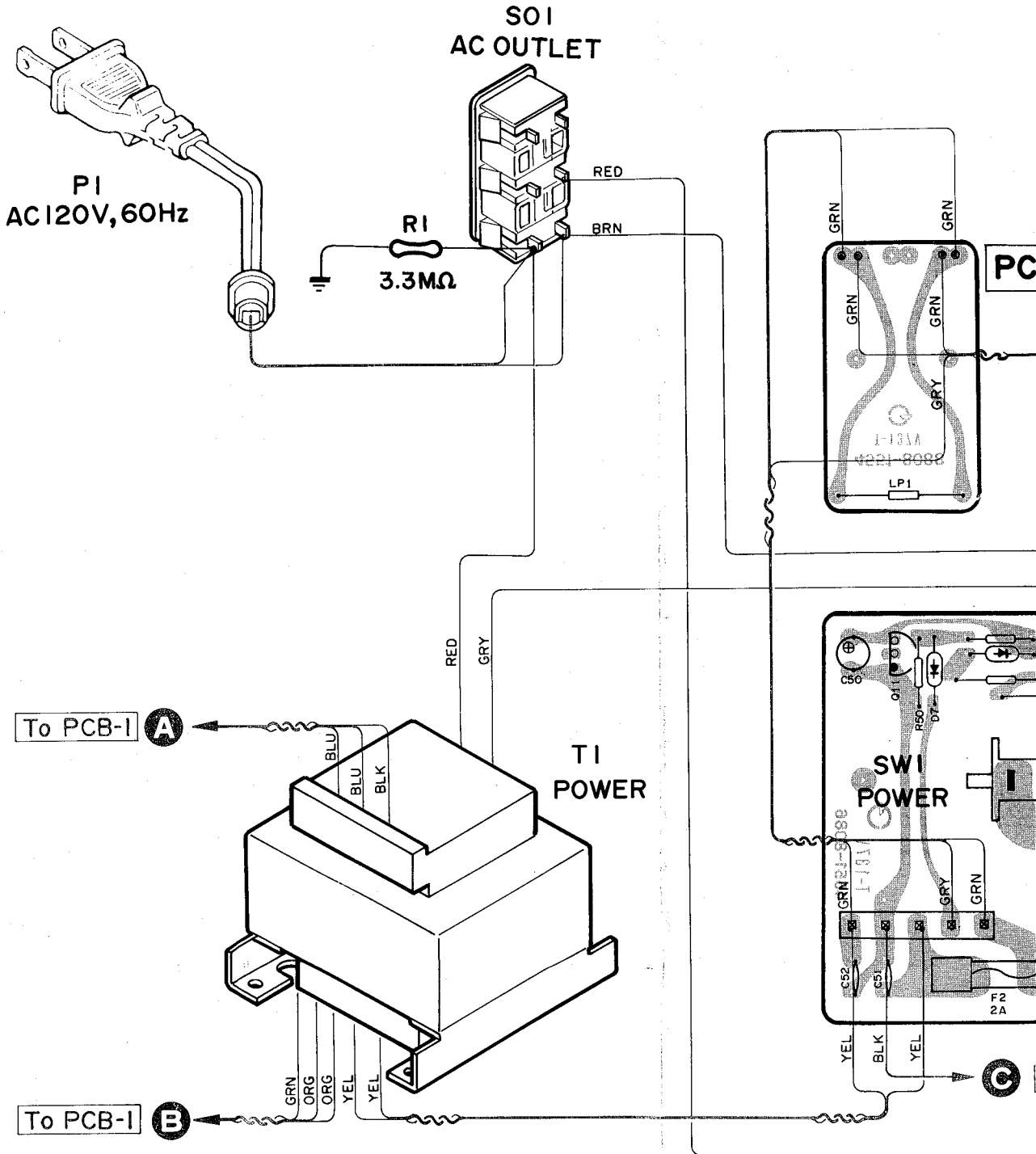
2

3

4

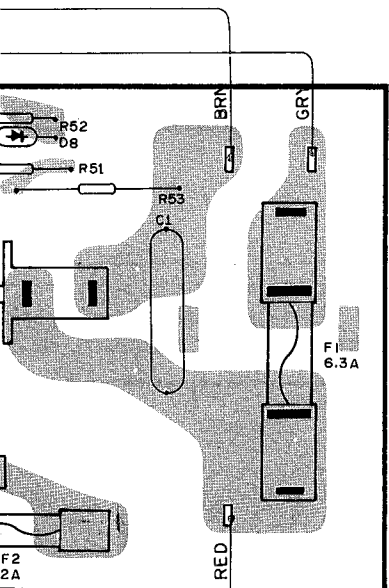
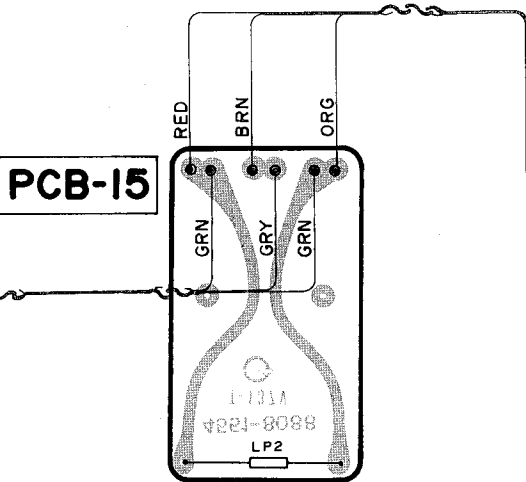
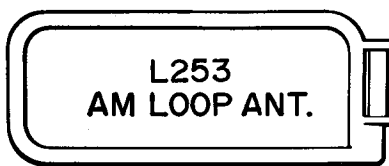
5

6



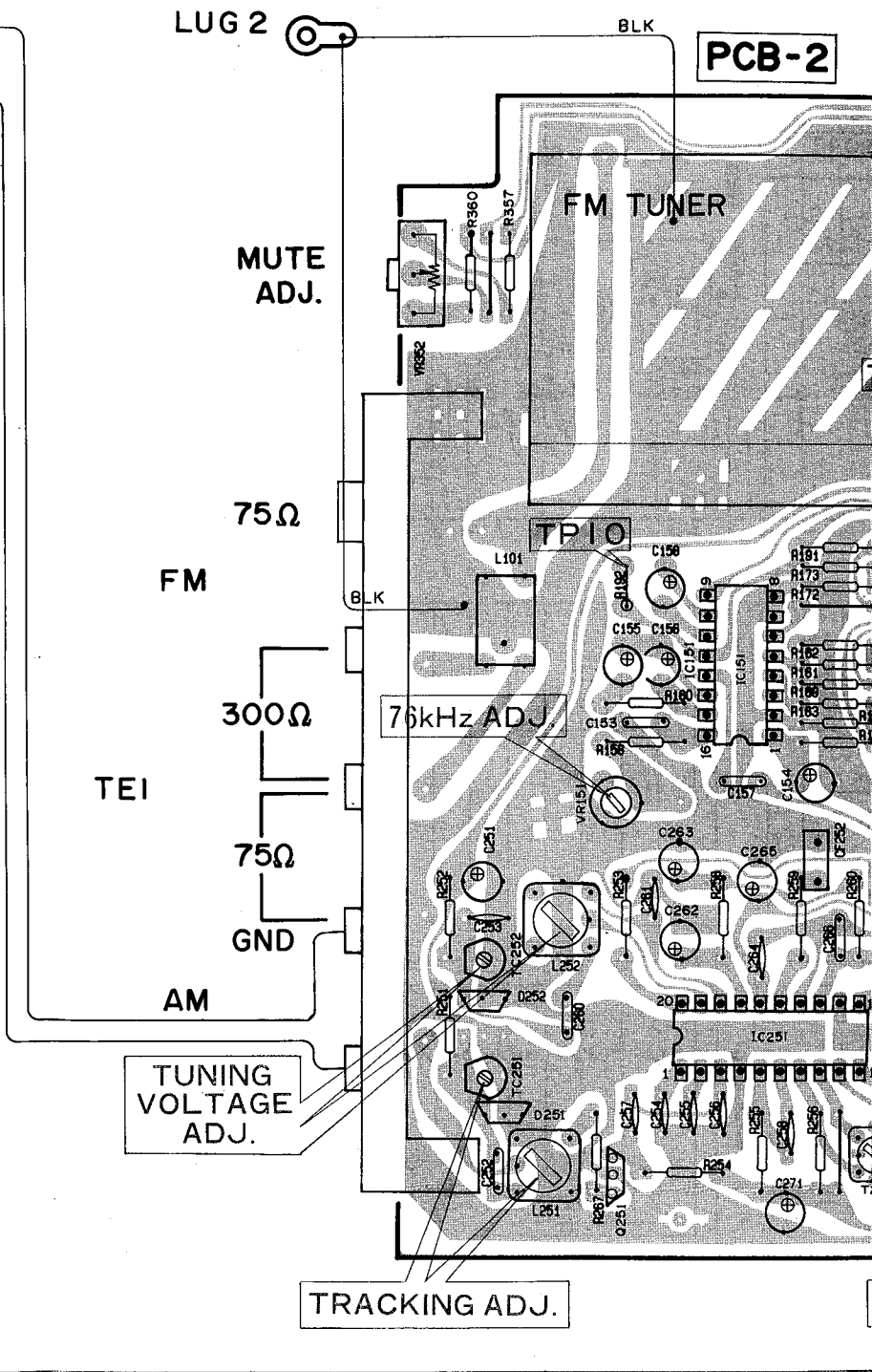
PCB-3

Lch
Rch



To PCB-1

PCB-13



3-2

DISCRIMINATOR ADJ.

TUNED IND ADJ.

SIGNAL IND ADJ.

STEREO IND ADJ.

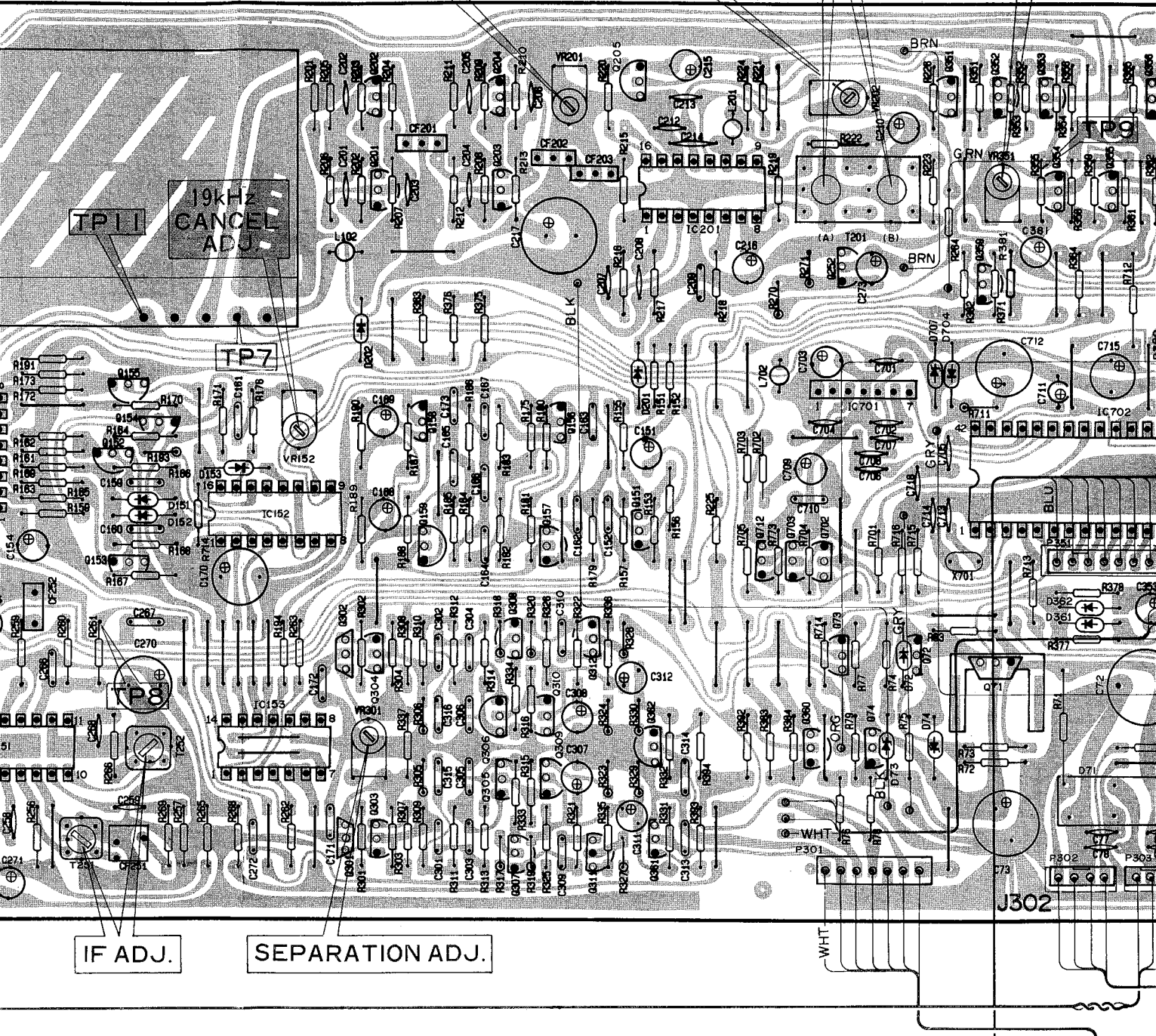
19kHz CANCEL ADJ.

TP11

TP7

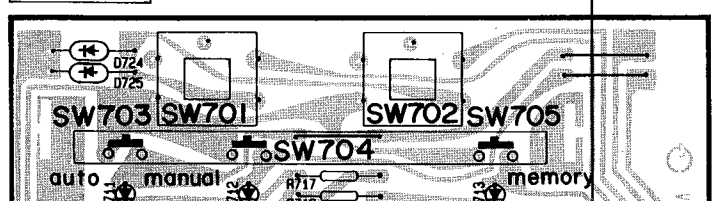
IF ADJ.

SEPARATION ADJ.

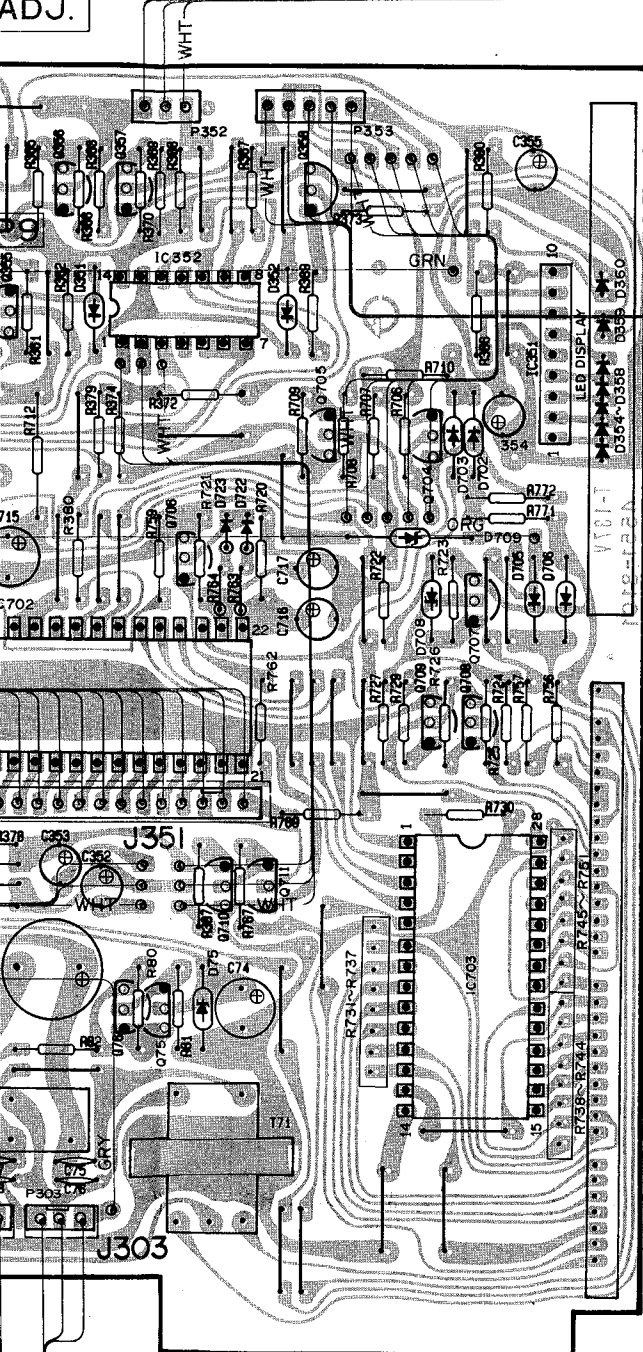


down TUNING up

PCB-6



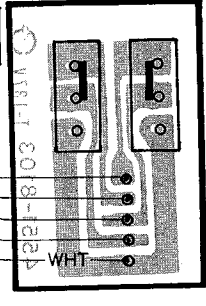
ADJ.



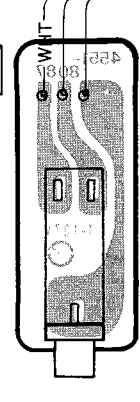
STATION DISPLAY
 SIGNAL STRENGTH
 TUNED
 STEREO
 TUNED

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

PCB-16

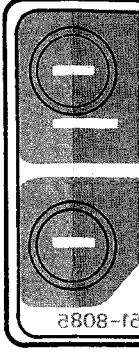


PCB-14



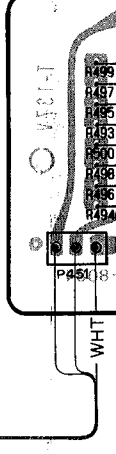
J101 HEADPHONES

PCB-12



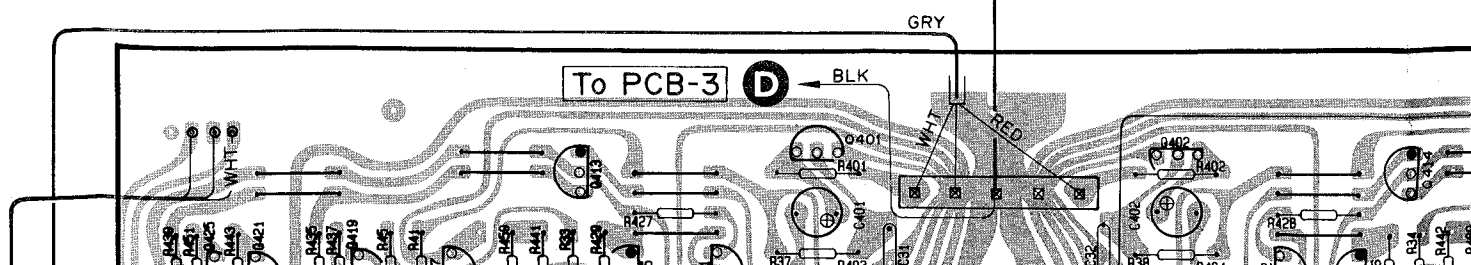
LEFT

PCB-11



To PCB-5
 E ← BLK
 F ← BLK

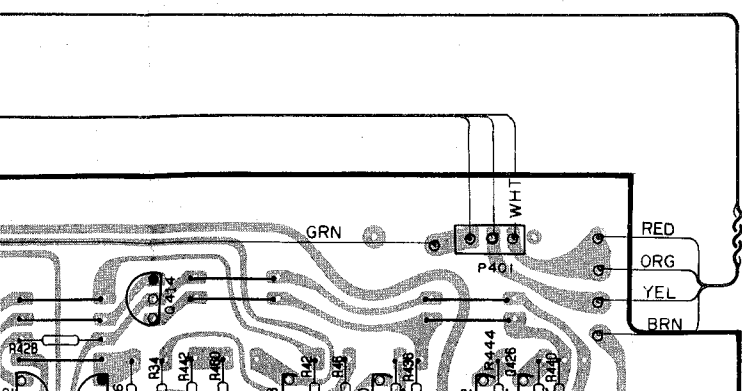
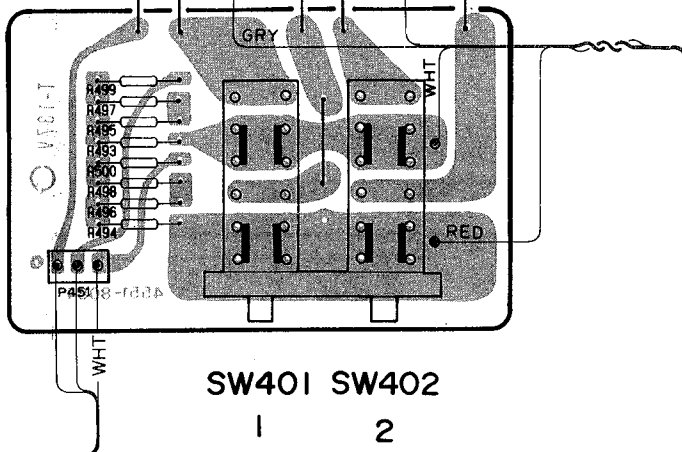
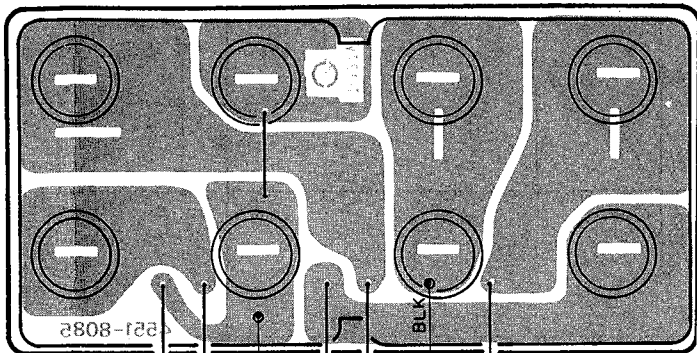
To PCB-3
 D ← BLK



-12

CB-11

TE2
 SPEAKER SYSTEM 2
 LEFT GND GND RIGHT
 SPEAKER SYSTEM 1



PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

2SC2603
 2SA1115



MV12YM



5

To PCB-1



GRN
ORG
ORG
YEL
YEL

YEL
BLK
YEL

F2
2A

To P

6

OUT
—
TAPE 2
—
IN

J11 Lch

J12 Rch

7

OUT
—
TAPE 1
—
IN

J7

J8

8

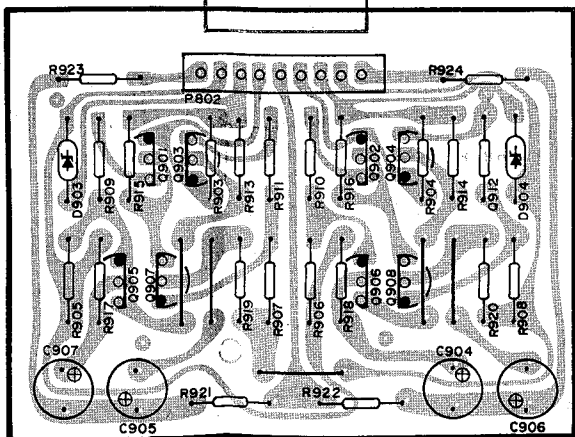
aux/
DAD

J3

J4

9

PCB-4

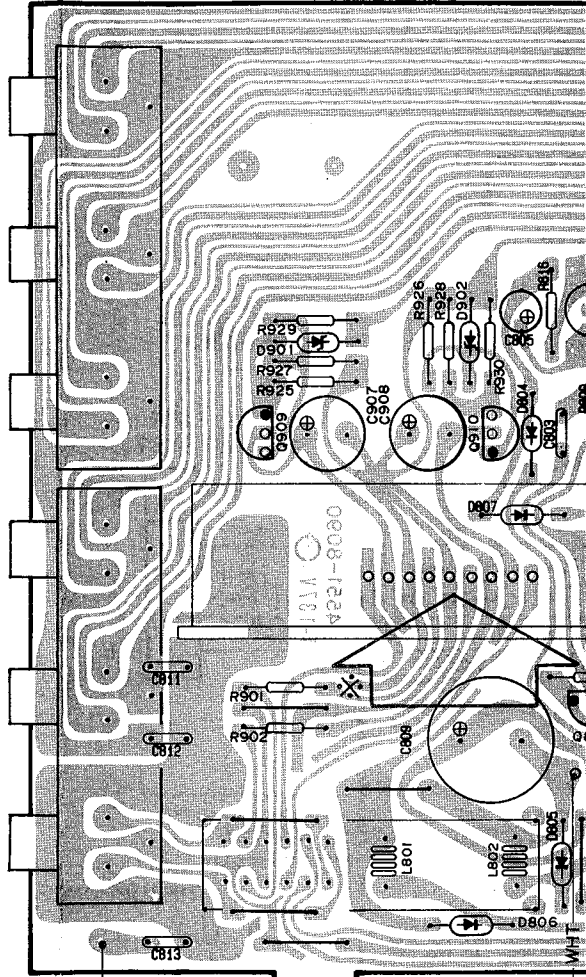


10

PCB-8



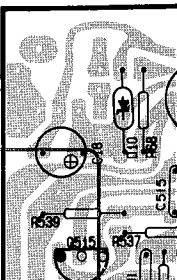
PCB-3



BLK



PCB-5



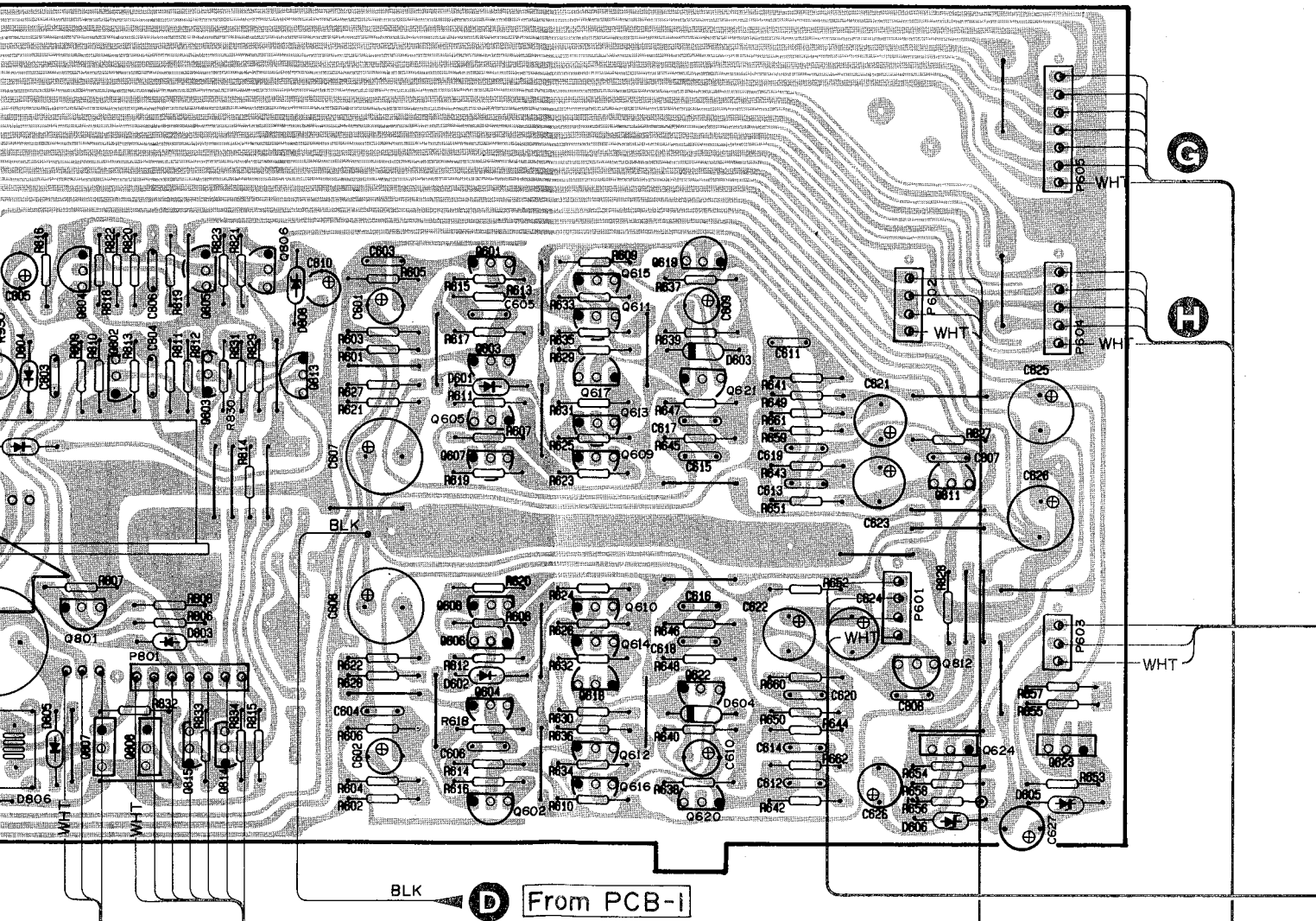
GRY

RED

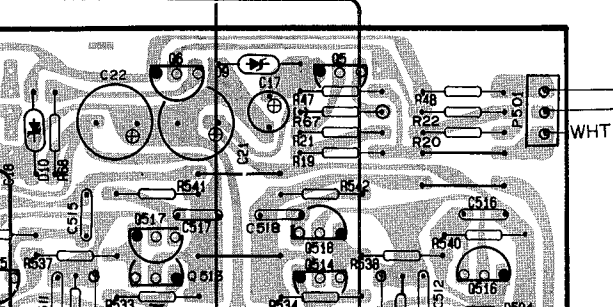
PCB-13

To PCB-1

TRACKING ADJ.



-5



IF ADJ.

SEPARATION ADJ.

J302

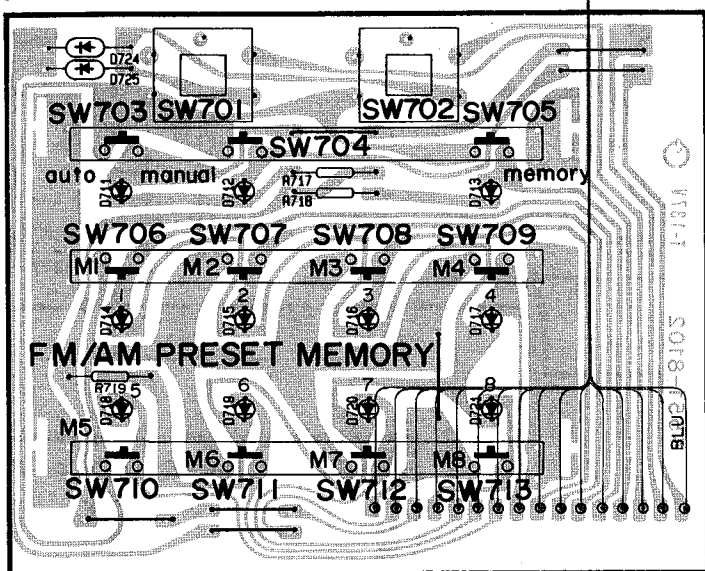
J30

WHT

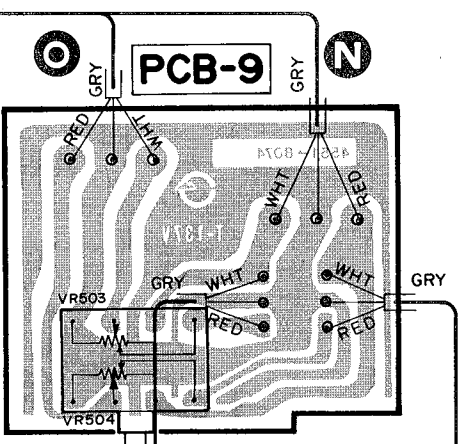
down TUNING up

PCB-6

slow fast



PCB-9



VOLUME

TP1

J303

To PCB-5
E BLK
F BLK

To PCB-3
D BLK

GRY

WHT RED

IDLING
ADJ.(Lch)

DC BALANCE
ADJ.(Lch)

DC BALANCE
ADJ.(Rch)

TPI

TP3

TP4

TP6

VTCT-1

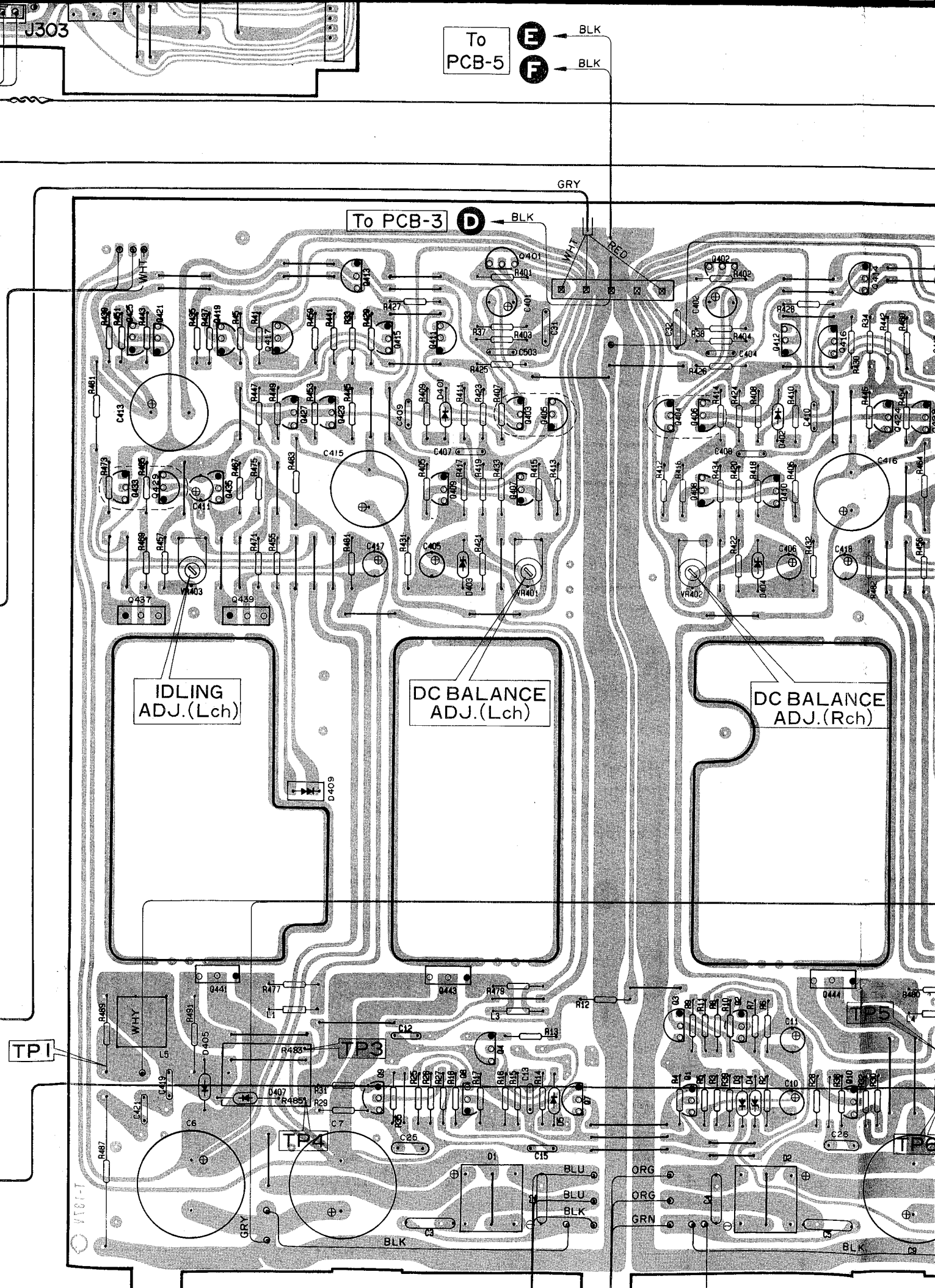
GRY

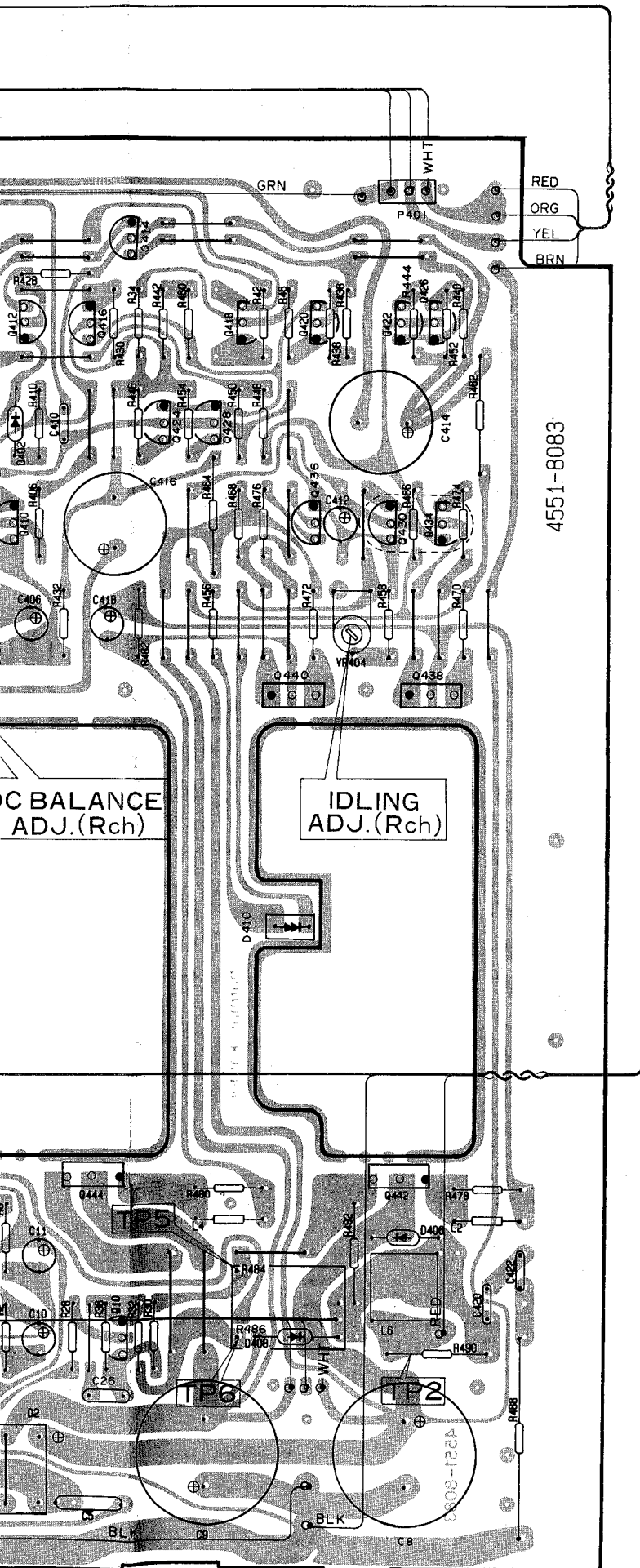
BLK

BLU
BLU
BLK

ORG
ORG
GRN

BLK



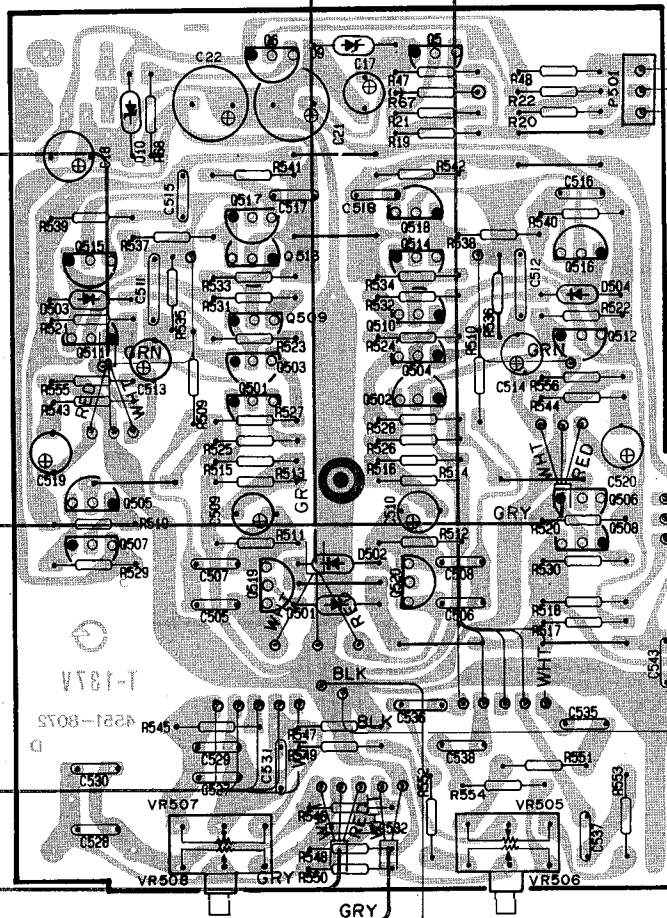


PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

2SC2603 2SA1115 	MV12YM
2SK364 2SK381 2SK117 	1SRBA
2SC2240 2SA970 2SC945 2SC2058 2SC2878 2SC2320L 2SA1190 2SC2855 	1SV102
2SB646A 2SD666A 2SD667A 2SB647A 2SA965 2SB646 2SD666 2SD667 2SB647 	MV103
2SA1111 2SC2591 	GL5NG6 GL5PR6
2SC3281 2SA1302 	BA1330
2SB834 	TC4049BP HA11225
2SK241 	TC4066BP TC4011BP
2SJ103 	LA1245
2SD669 	AN9255

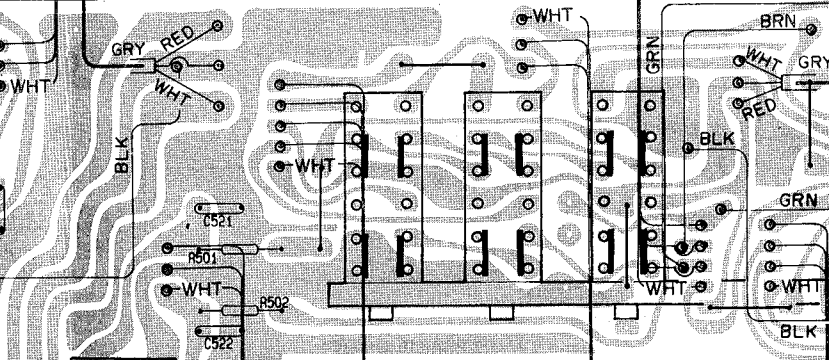
BLK **D** From PCB-1

PCB-5



From PCB-1

N



BASS

TREBLE

BALANCE

SW501 SW502 SW503
tape 1 tape 2 source

TAPE MONITOR

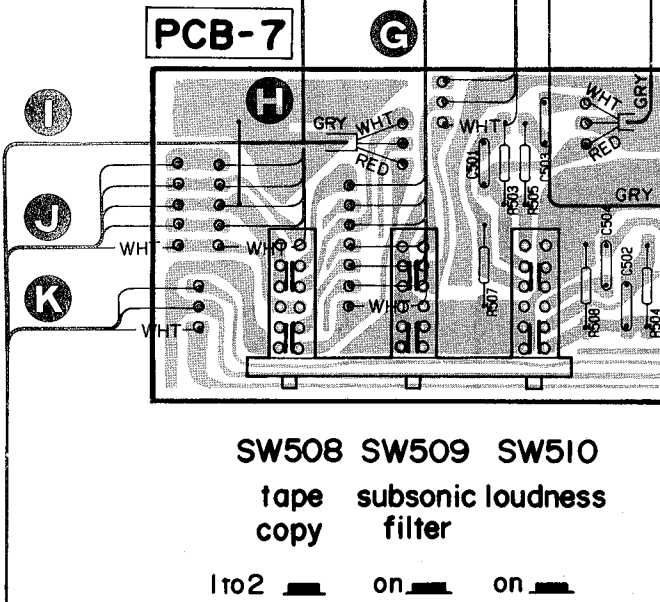
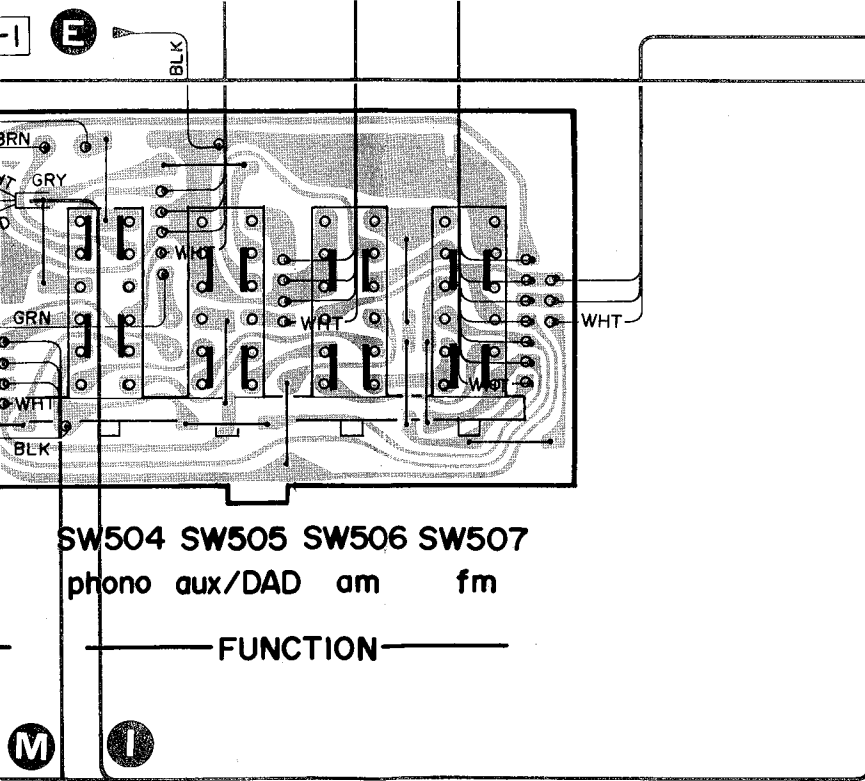
K

J

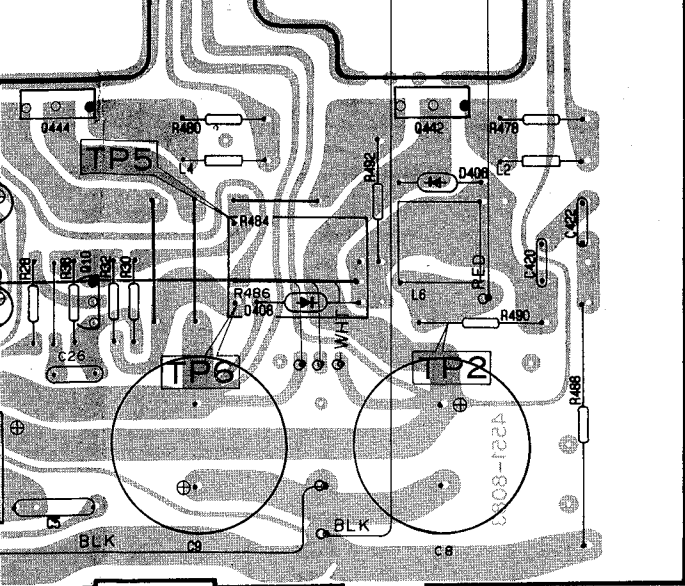
L

M

F From PCB-1

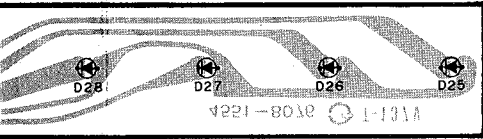


1 to 2 on on



PCB-1

From PCB-13



phono aux / DAD am fm
 ——— FUNCTION ———

<p>2SB834</p>	<p>TC4049BP HA11225</p>
<p>2SK241</p>	<p>TC4066BP TC4011BP</p>
<p>2SJ103</p>	<p>LA1245</p>
<p>2SD669 2SB649</p>	<p>AN6875</p>
<p>2SB1034</p>	<p>TD6104P</p>
<p>D5FB20F1</p>	<p>TC9147AP</p>
<p>1S2471 RD5.6EB2 1S2473 HZ15-1L HZ7B2L HZ27-3L RD10EB1 RD8.2EB1</p>	<p>HZ24-1L RD3.0EB1 10DF2</p> <p>TD6301AP</p>

WIRE COLOR ABBREVIATIONS

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