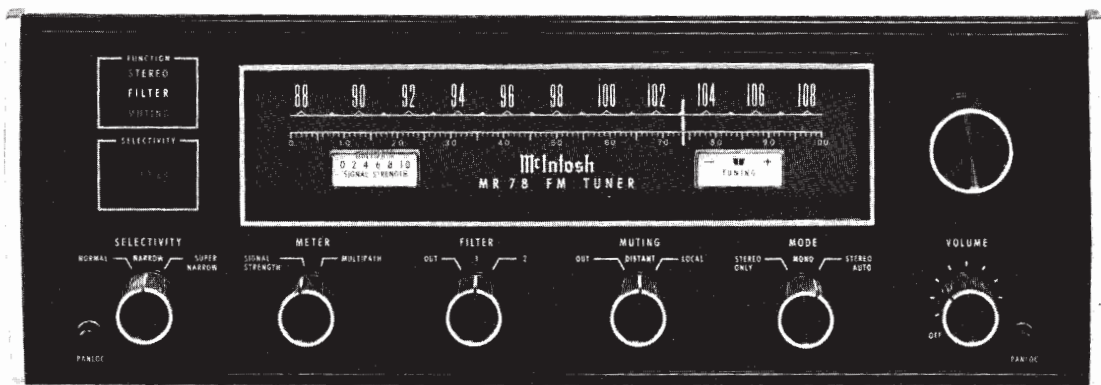


# McIntosh

## MR 78

FM TUNER



## SERVICE INFORMATION

STARTING WITH SERIAL NO. AD5165

McINTOSH LABORATORY INC. 2 CHAMBERS STREET BINGHAMTON, NEW YORK

MR 78

### ELECTRICAL SPECIFICATIONS

SENSITIVITY

2µV for better than 35dB quieting. 2.5µV IHF usable sensitivity  
Max., 1.9µV typical.

SELECTIVITY IHF

	<u>ADJECENT CHANNEL</u>	<u>ALTERNATE CHANNEL</u>
Normal	7dB	55dB
Narrow	22dB	>90dB
Super-Narrow	55dB	>>90dB

SIGNAL TO NOISE RATIO

Better than 75dB below 100% modulation.

HARMONIC DISTORTION

Less than 0.2% mono or stereo at 100% modulation 20Hz to 18kHz.  
Typically less than 0.05% at 1kHz.

FREQUENCY RESPONSE

± 1dB 20Hz to 18kHz with standard 75µs de-emphasis.

CAPTURE RATIO

Better than 2.5dB IHF.

SPURIOUS REJECTION

Greater than 100dB IHF.

IMAGE REJECTION

Greater than 100dB 88 to 108MHz IHF.

STEREO SEPARATION

Better than 40dB at 1kHz.

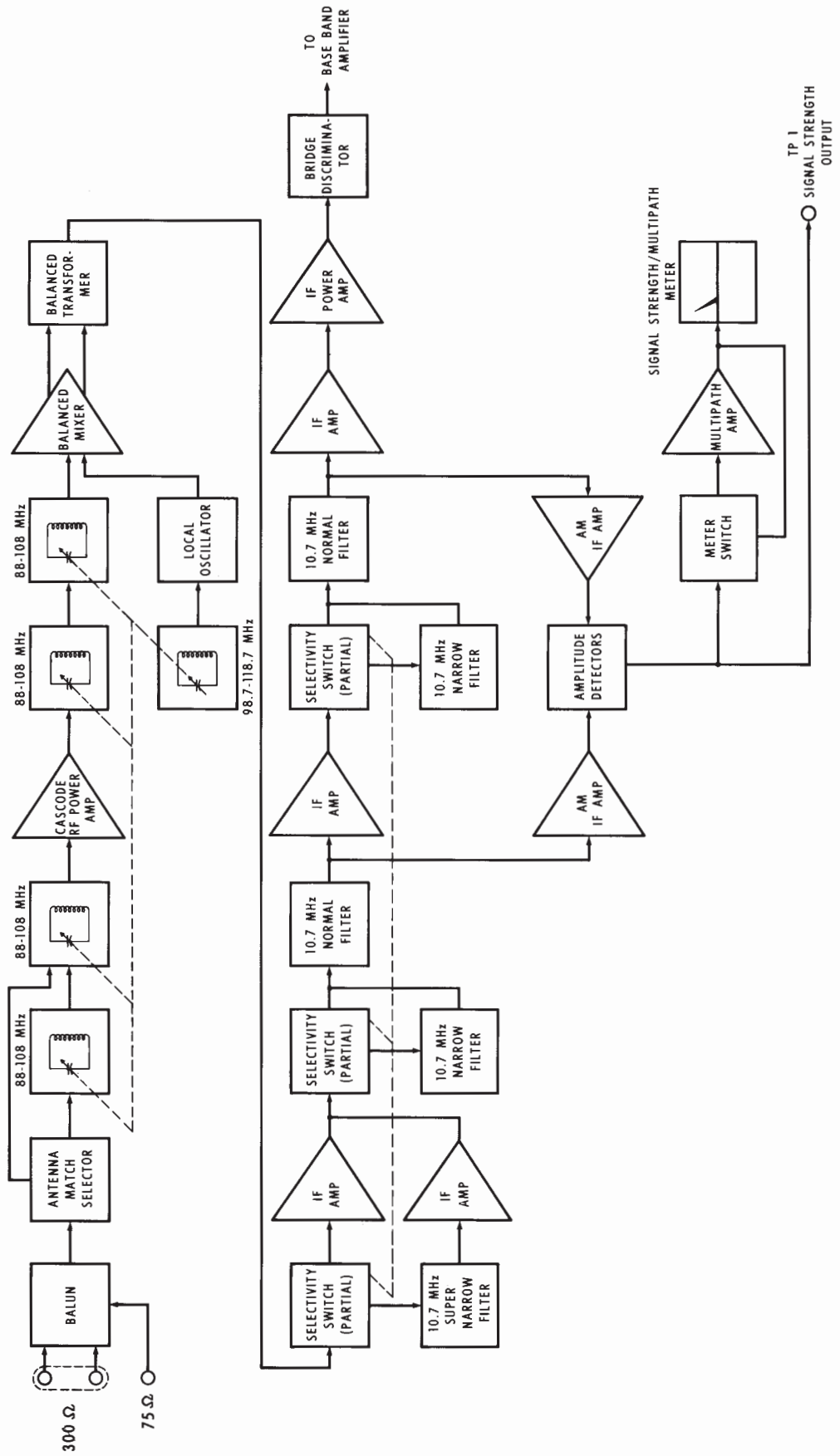
SCA FILTER

50dB down from 67kHz to 74kHz; 275dB per octave slope.

POWER REQUIREMENTS

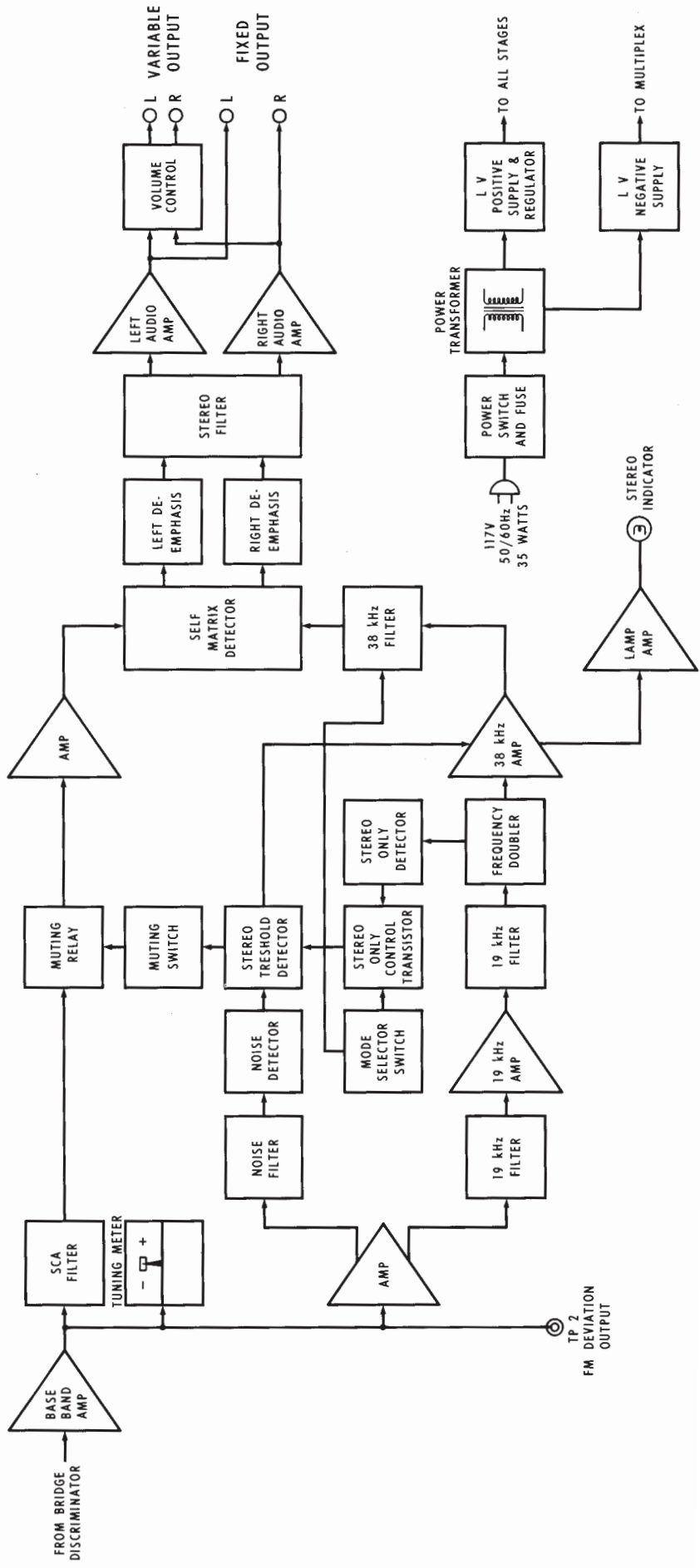
120VAC, 50 - 60Hz, 35W.

(NORMAL SELECTIVITY UNLESS OTHERWISE STATED)



MR 78 BLOCK DIAGRAM

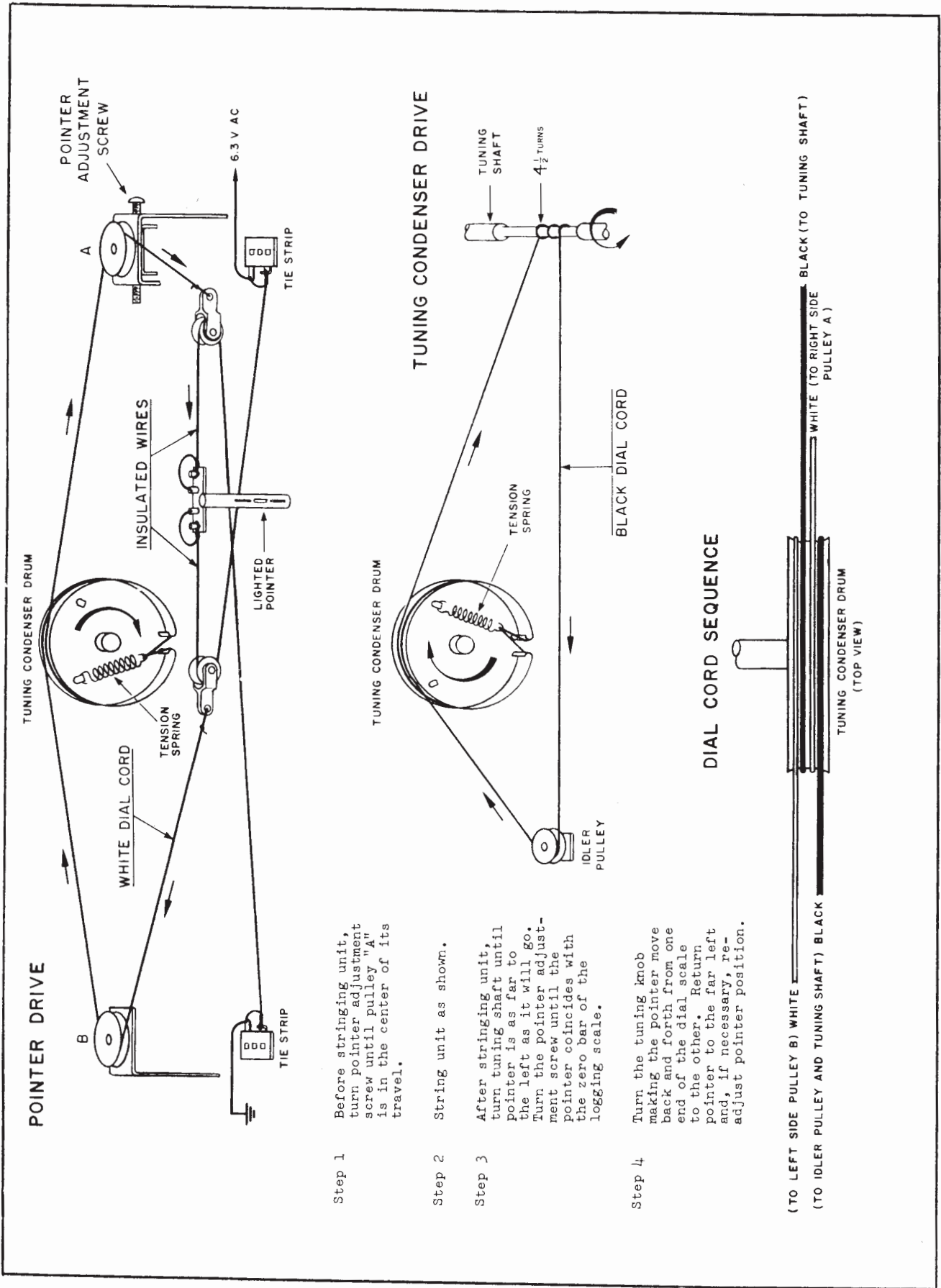
SIGNAL STRENGTH OUTPUT



## SCHEMATIC NOTES

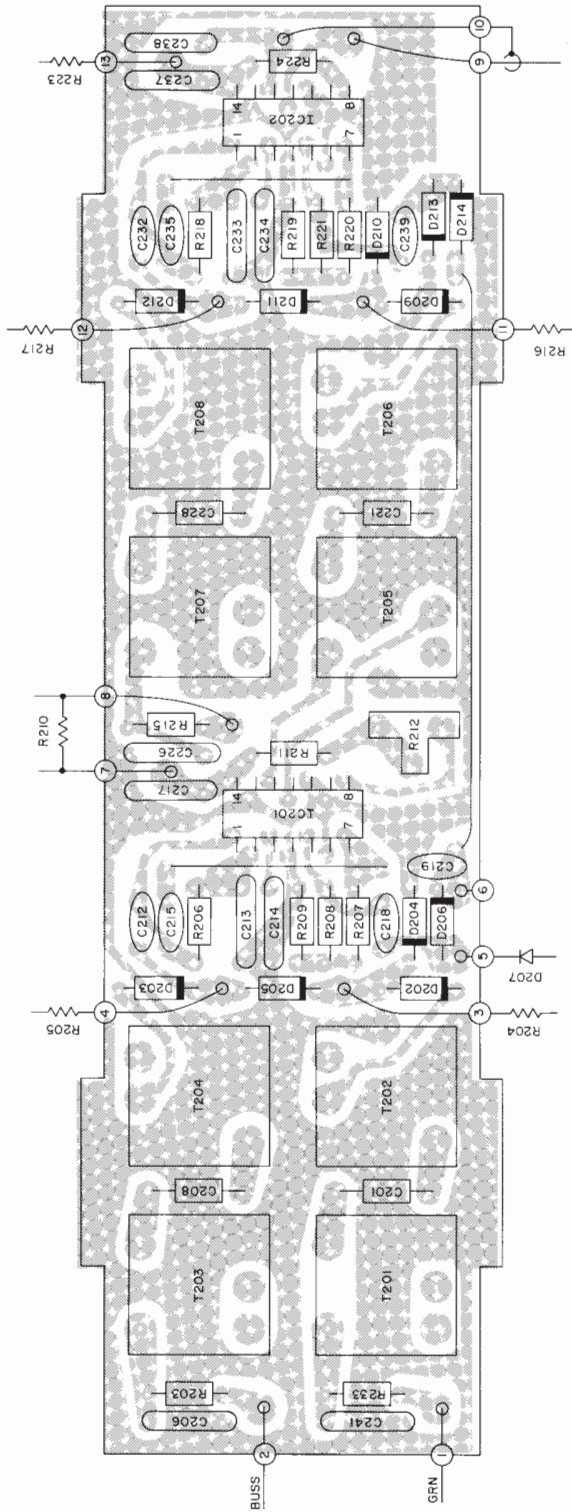
1. Unless otherwise specified: Resistance values are in ohms, 1/4 watt, and 10% tolerance; Capacitance values smaller than 1 are in microfarads ( $\mu\text{F}$ ); capacitance values greater than 1 are in picofarads (pF); inductors are in microhenries ( $\mu\text{H}$ ).
2. Printed circuit board components are outlined on the schematics by dotted lines. The circled numbers around the dotted lines correspond to the numbers on the PC Board layouts.
3. The heavy lines on the schematics denote the primary signal path.
4. The terminal numbering of rotary switches is for reference only.
5. All voltages indicated on the schematics are measured under the following conditions:
  - a. Use of an 11 megohm input impedance VTVM.
  - b. All voltages  $\pm 10\%$  with respect to chassis ground.
  - c. No signal at input or antenna terminals.
  - d. AC input at 120 volts, 50/60 Hz.
  - e. Front panel controls at:
 

Tuning indicator	100MHz (no signal)	Muting	Out
Volume	Fully CW	Mode	Auto
Selectivity	Normal	Meter	Sig. Strength
Filter	Out	Panel Lights	Bright
6. In units with Serial No's below AD5503 C331 and C334 are used.
7. In units with Serial No's below AD5503 C406 and C 407 are 100pF, R406 and R407 are 39K and R407 and R409 are 1.5K.

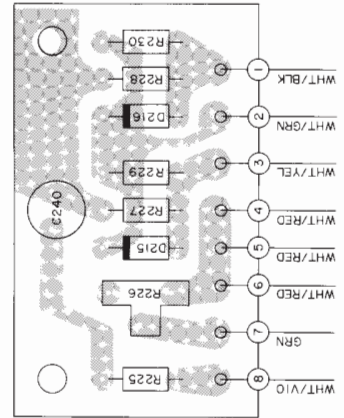


- Step 1 Before stringing unit, turn pointer adjustment screw until pulley "A" is in the center of its travel.
- Step 2 String unit as shown.
- Step 3 After stringing unit, turn tuning shaft until pointer is as far to the left as it will go. Turn the pointer adjustment screw until the pointer coincides with the zero bar of the logging scale.
- Step 4 Turn the tuning knob making the pointer move back and forth from one end of the dial scale to the other. Return pointer to the far left and, if necessary, re-adjust pointer position.

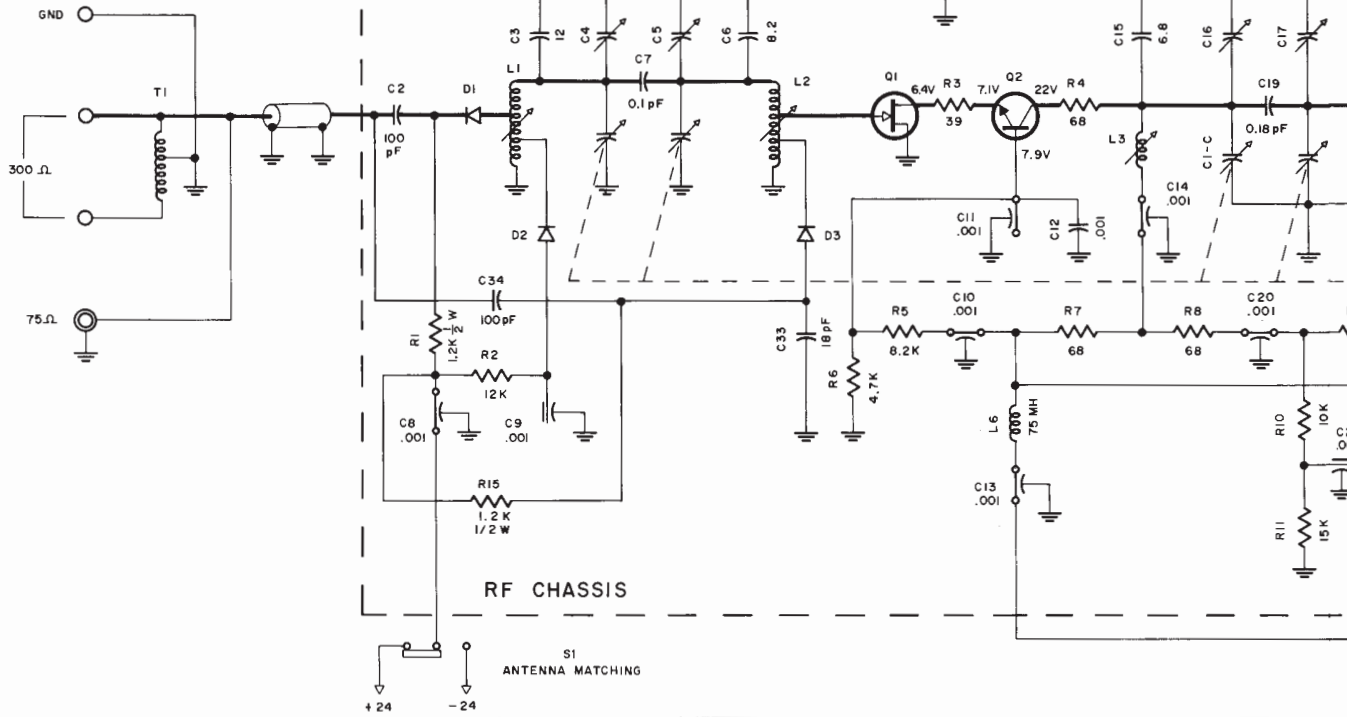
IF PC BOARD 044 - 352



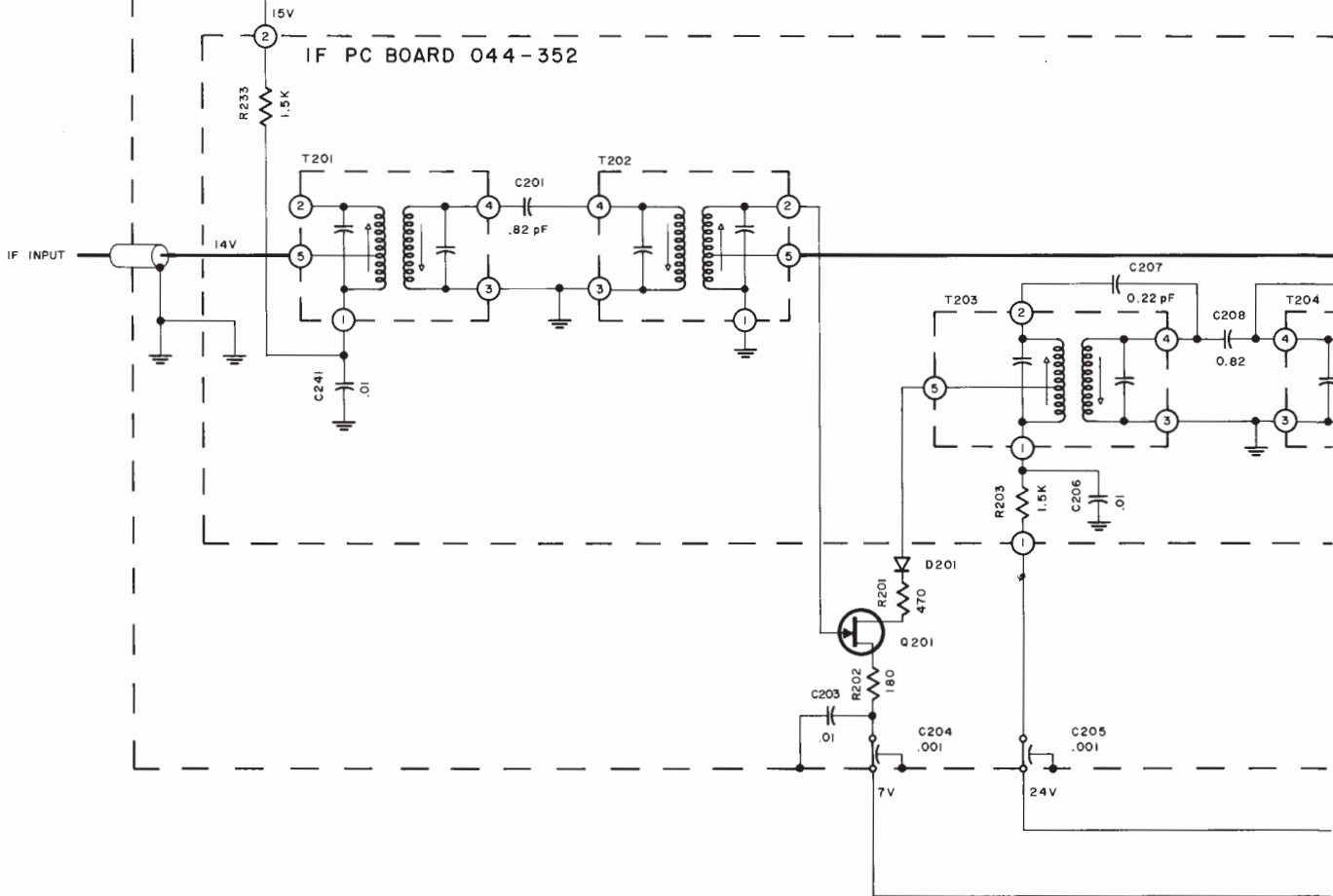
SELECTIVITY JCT. PC BOARD 044-565



# FM ANTENNA

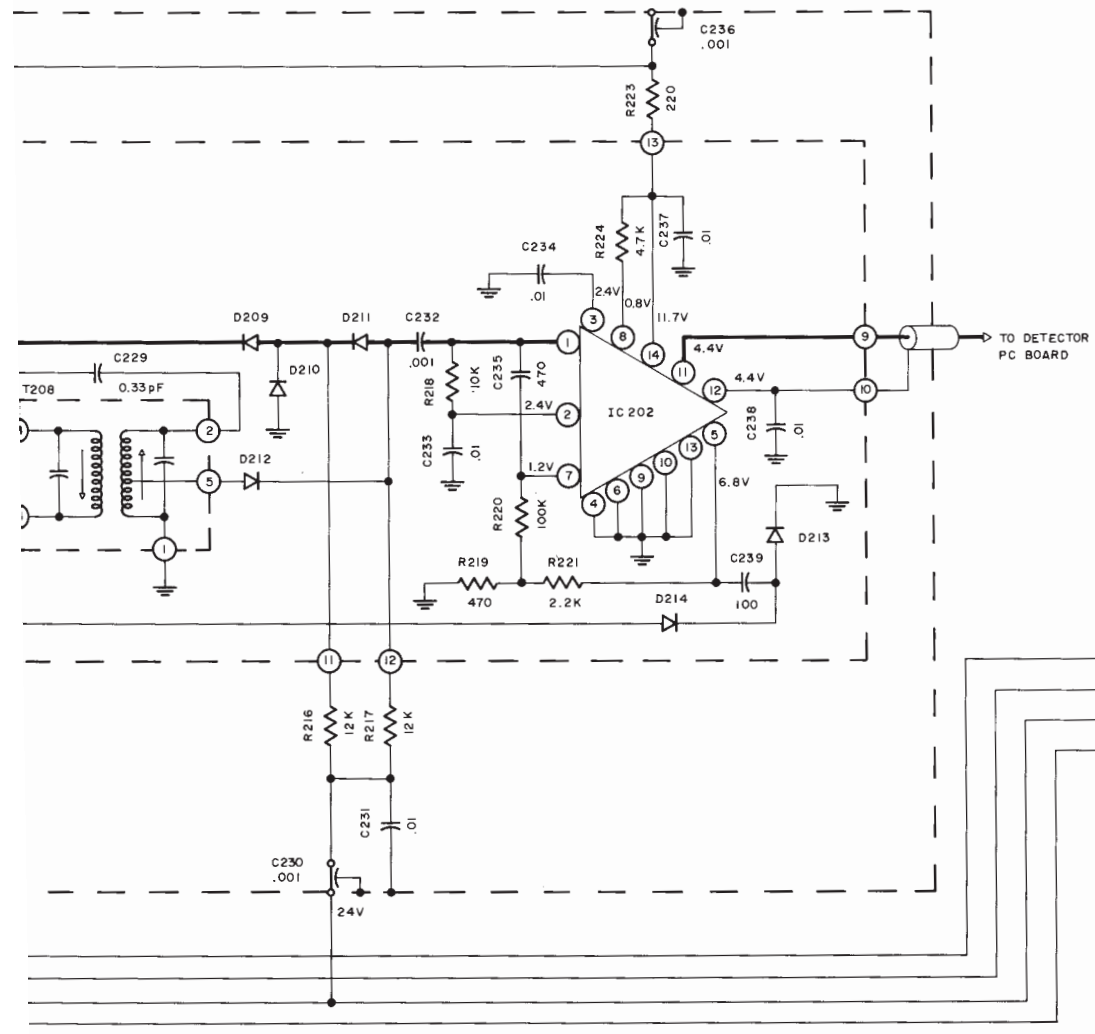
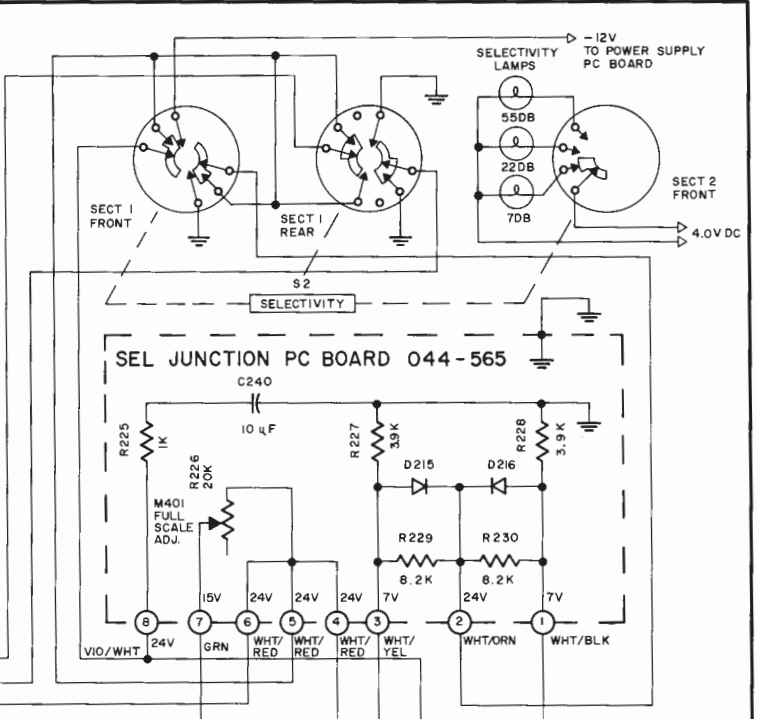
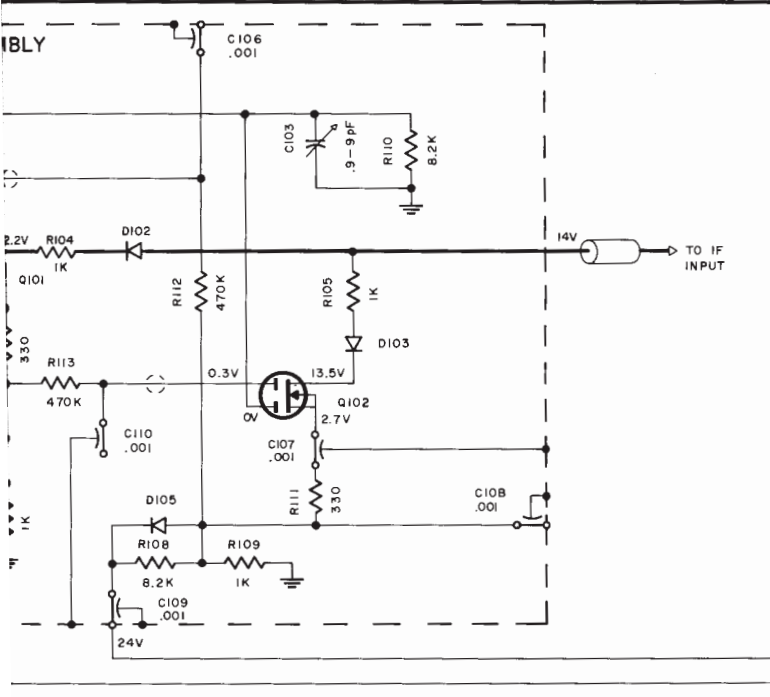


# IF CHASSIS



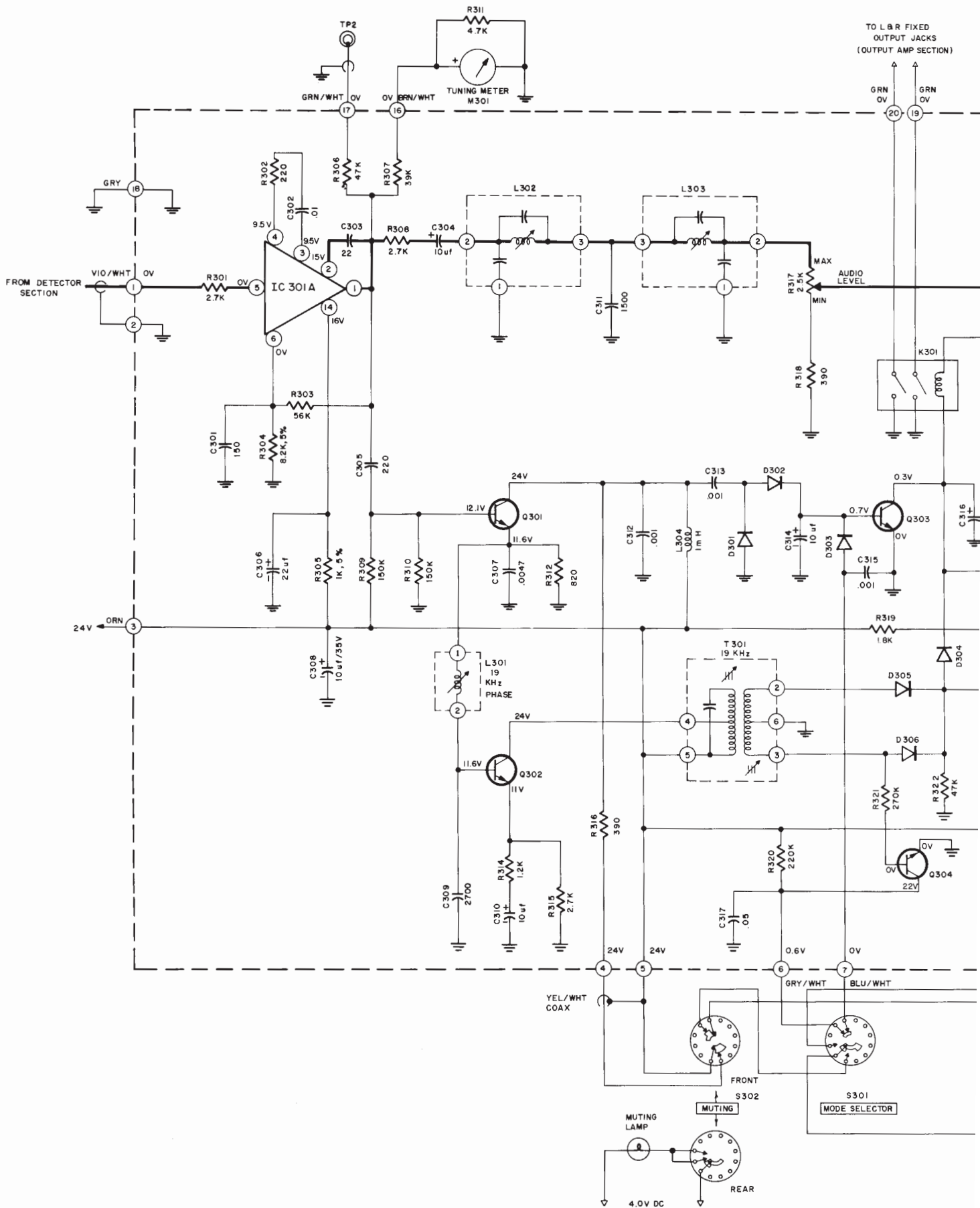


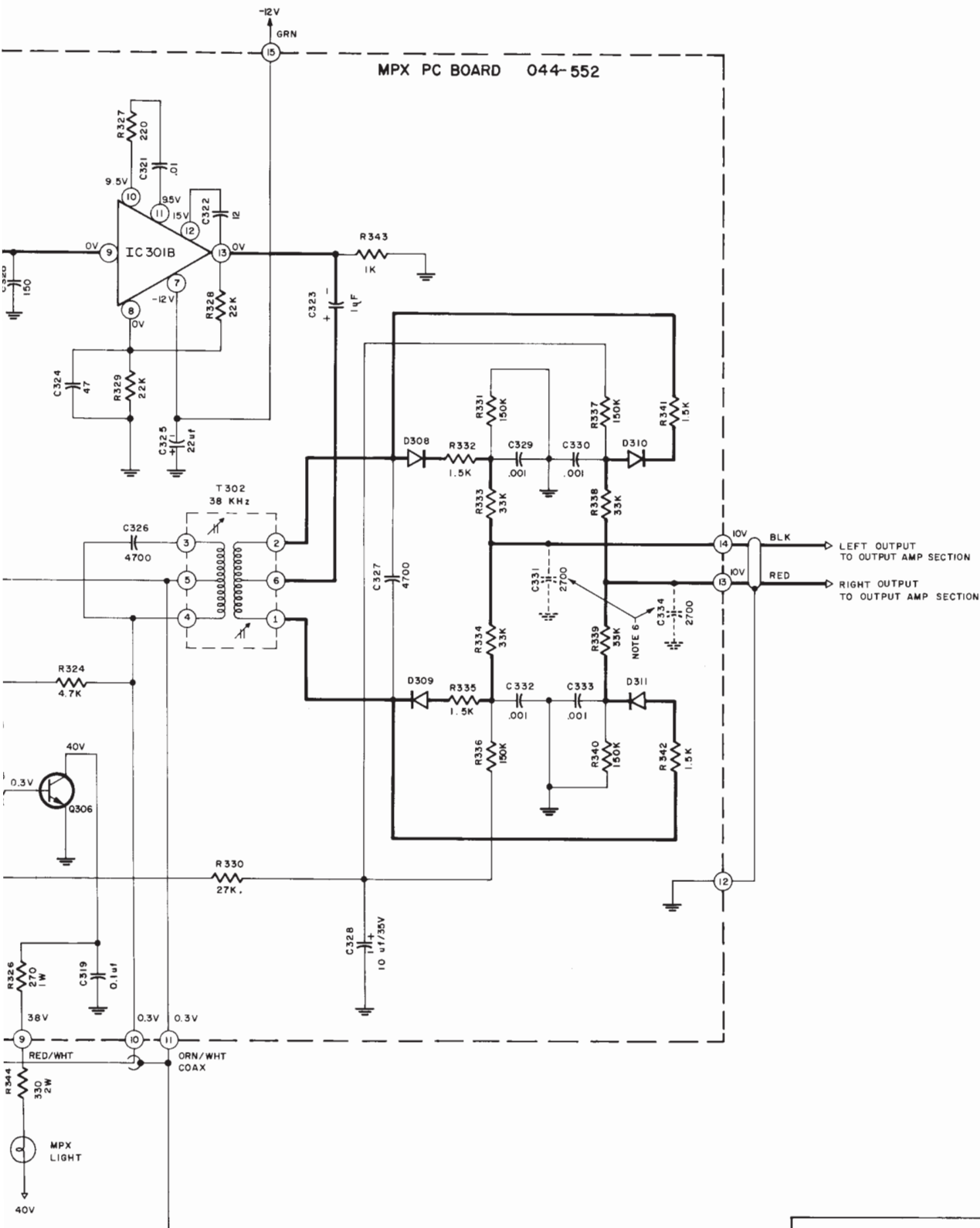




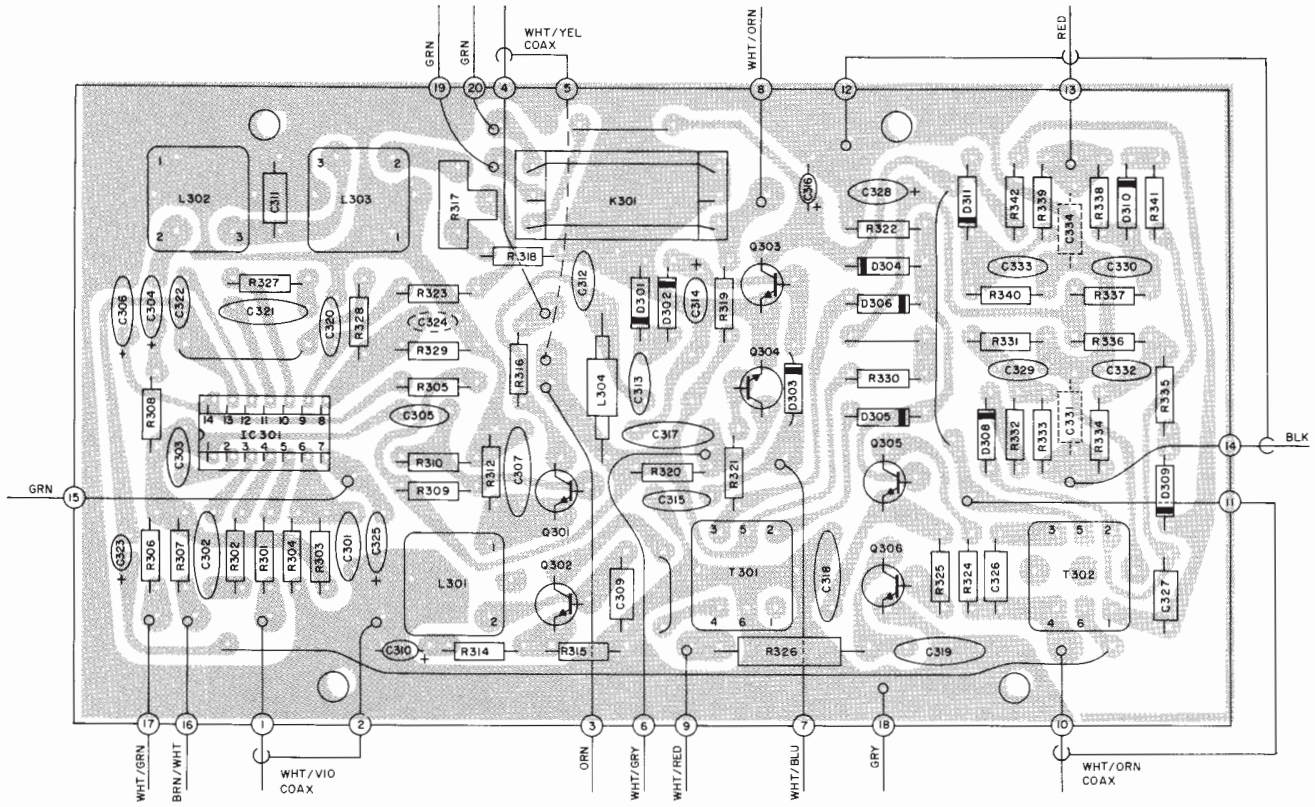
**TUNER SECTION**

MR 78 154-700



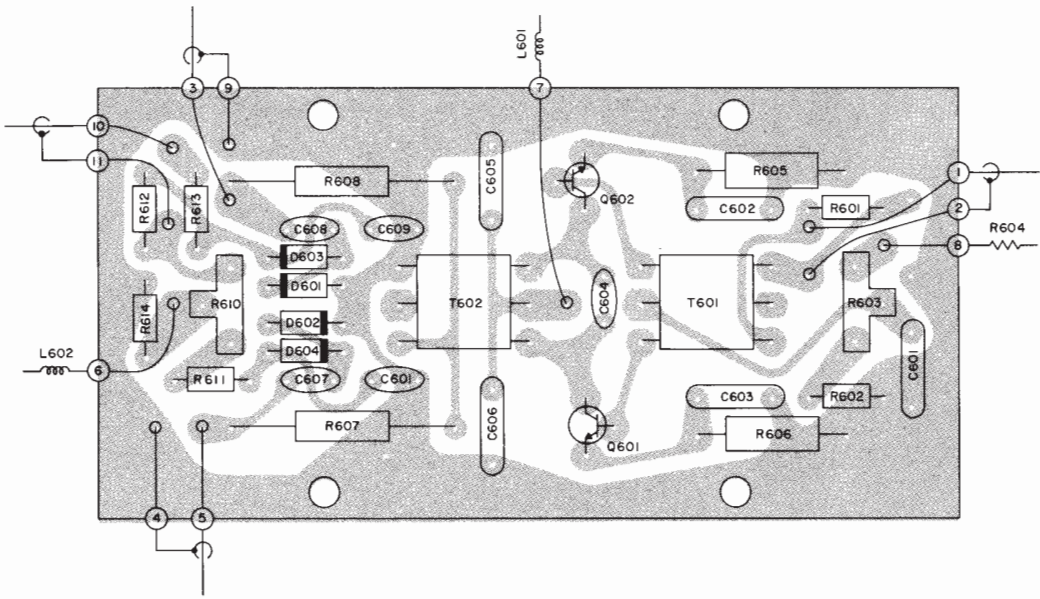


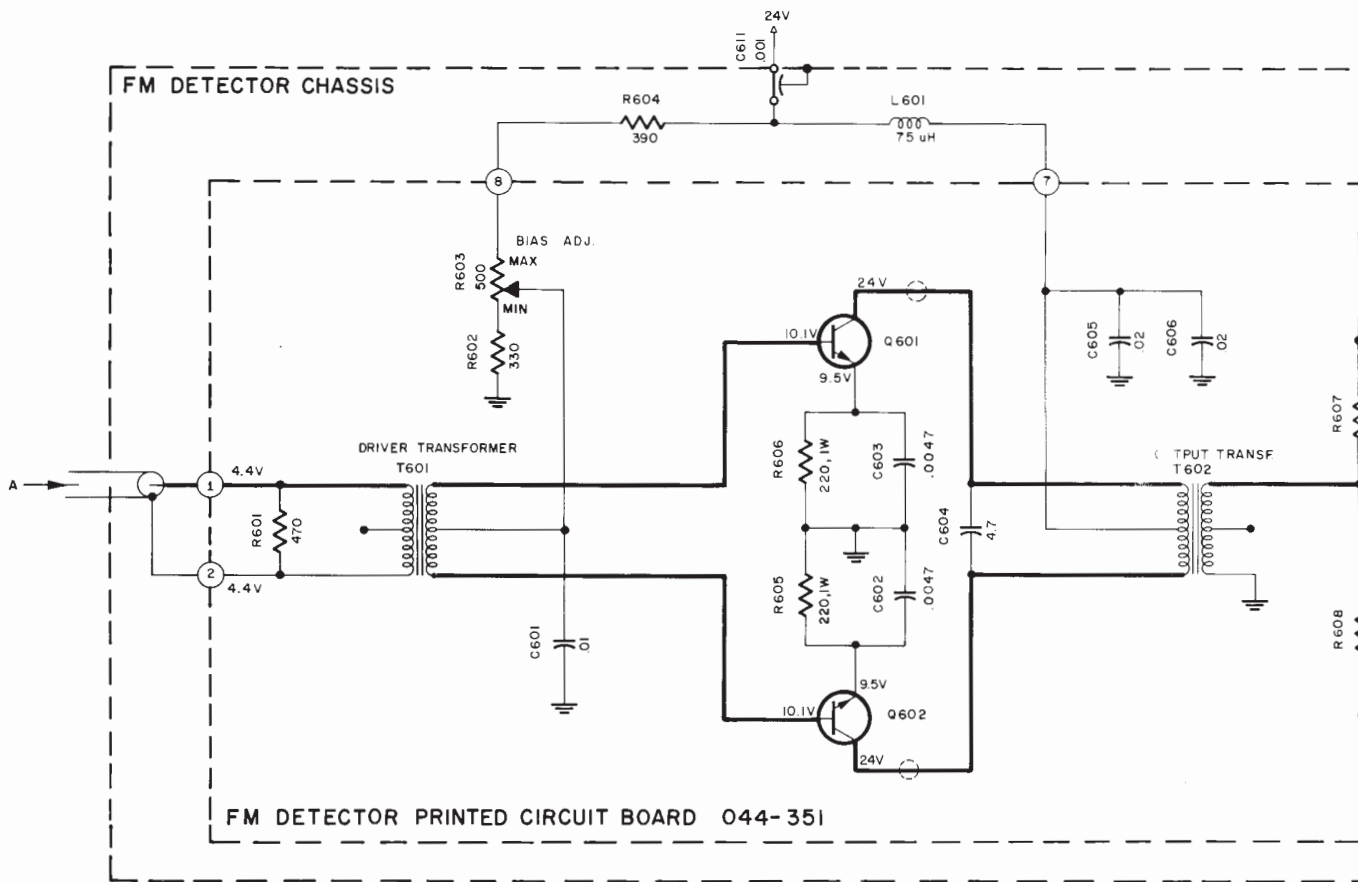
MPX SECTION  
MR 78 154-702

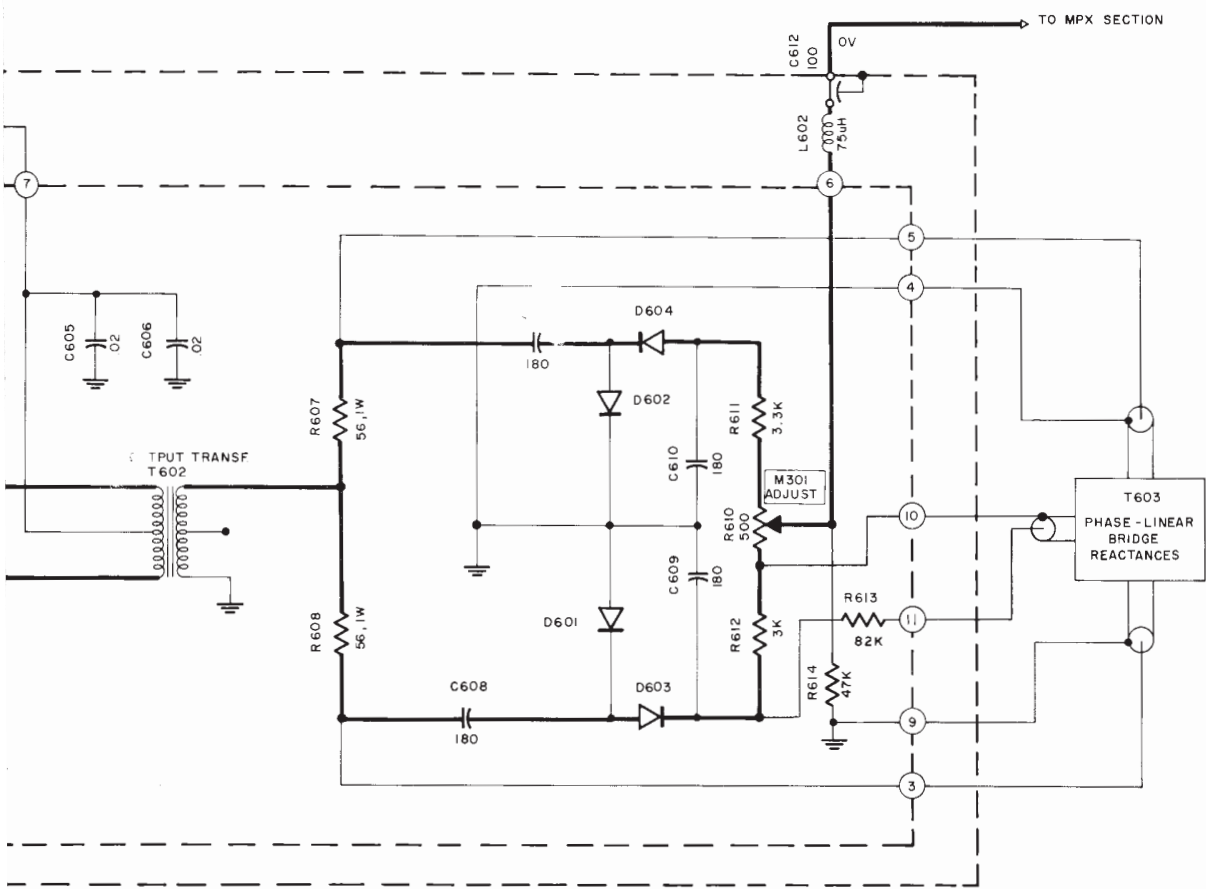


MPX PRINTED CIRCUIT BOARD O44-552

DETECTOR PC BOARD 044-351





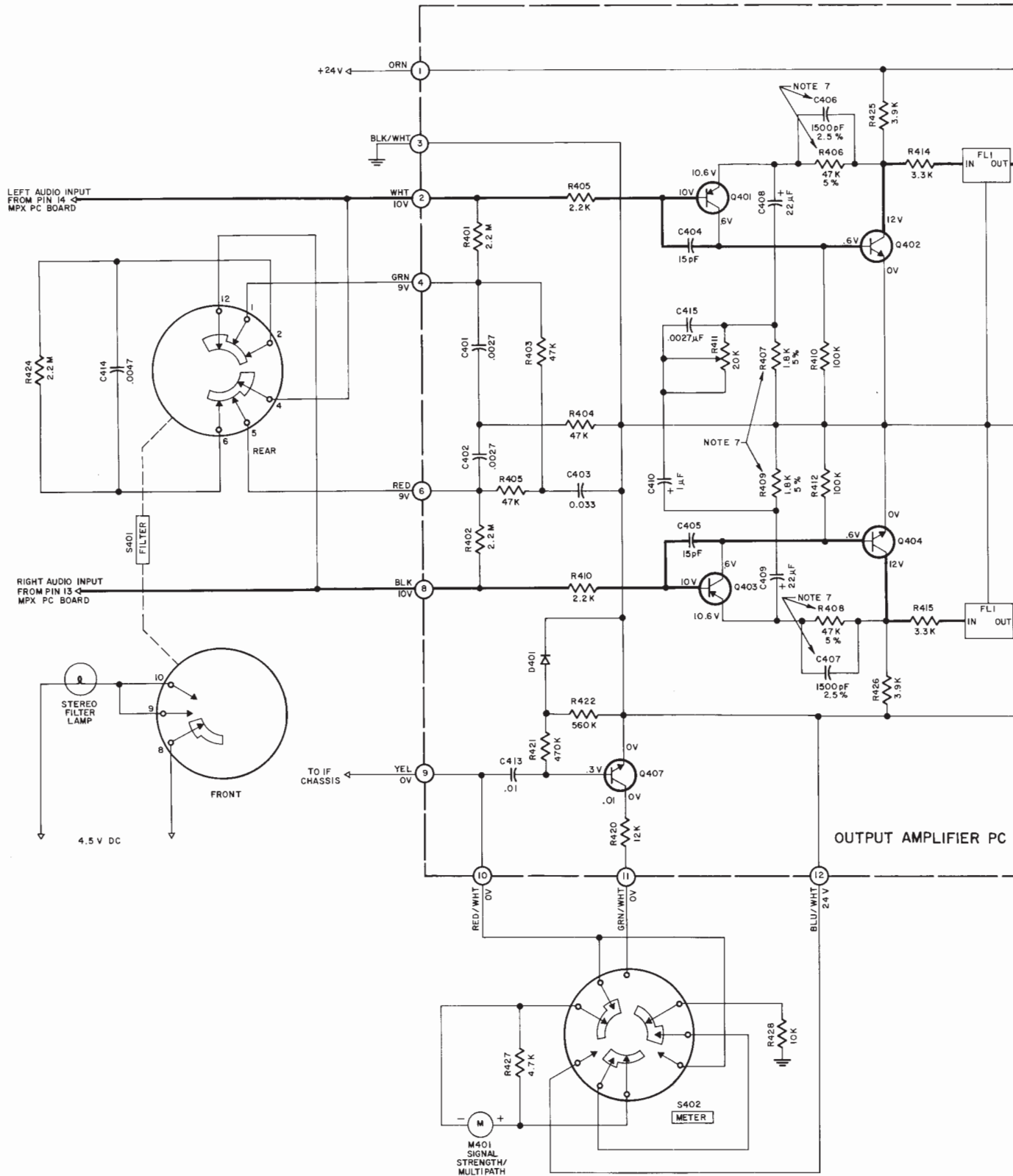


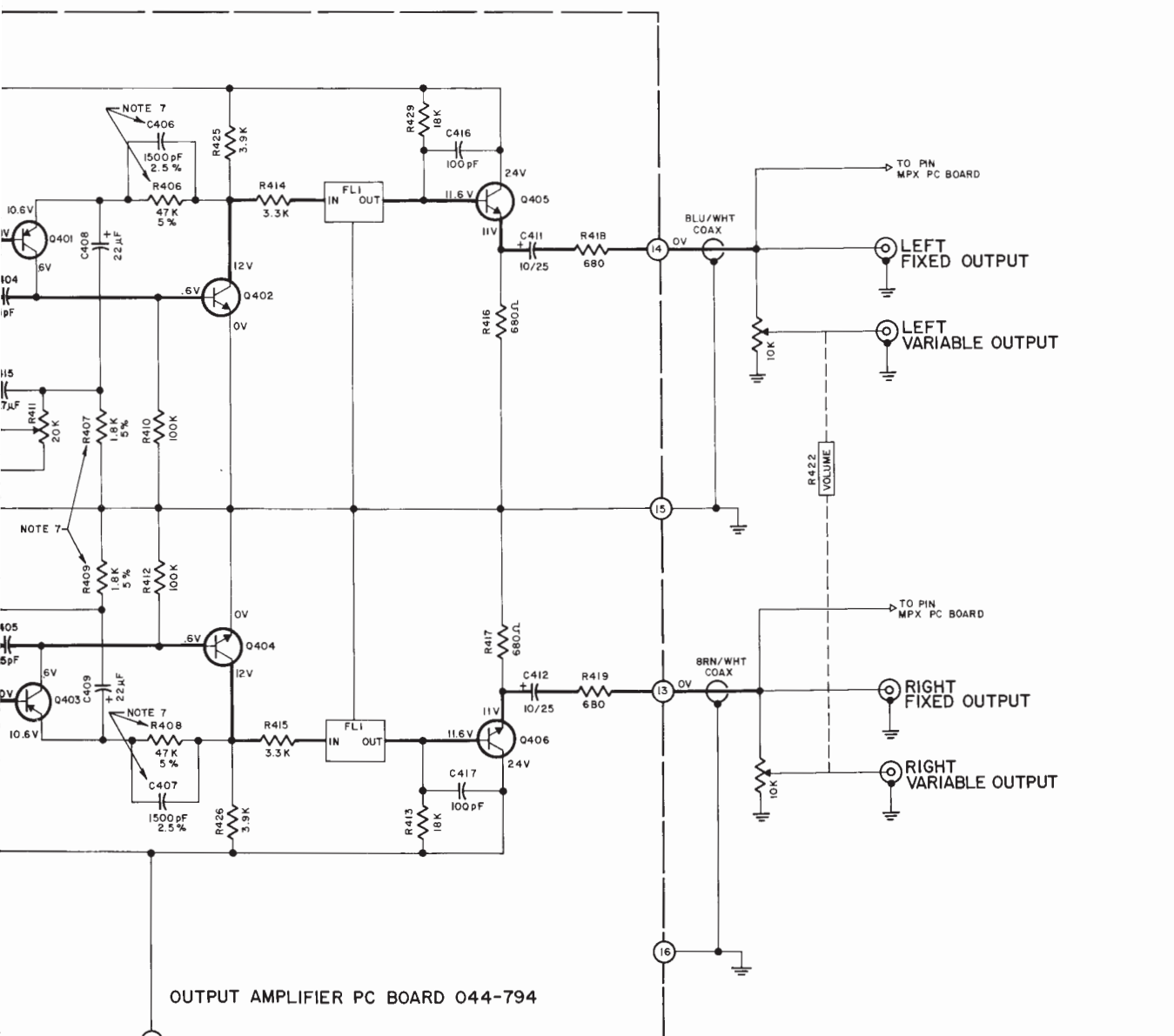
## DETECTOR SECTION

MR 78

154-620



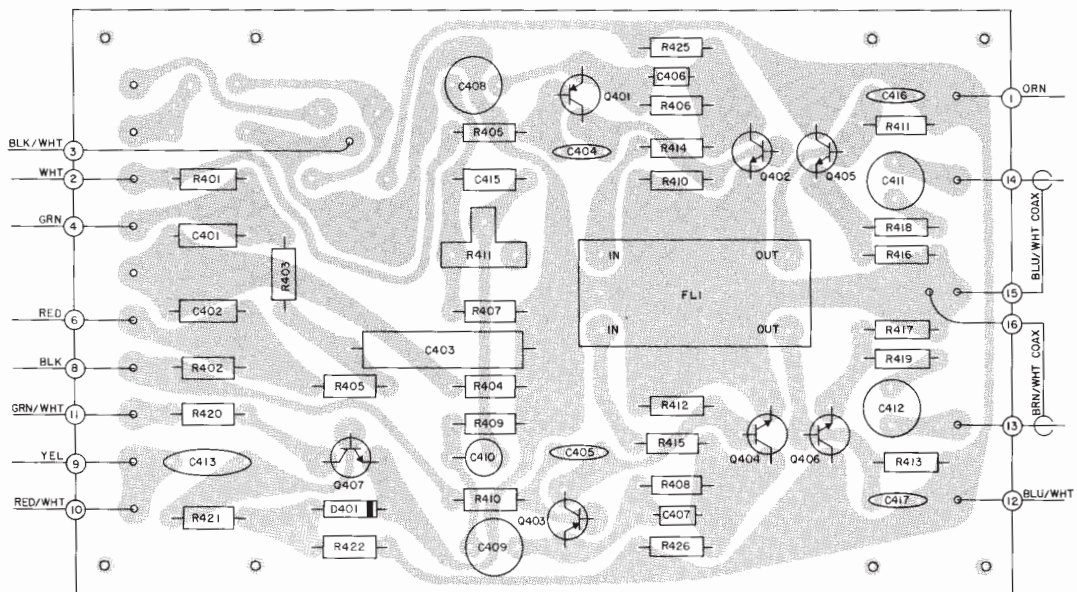




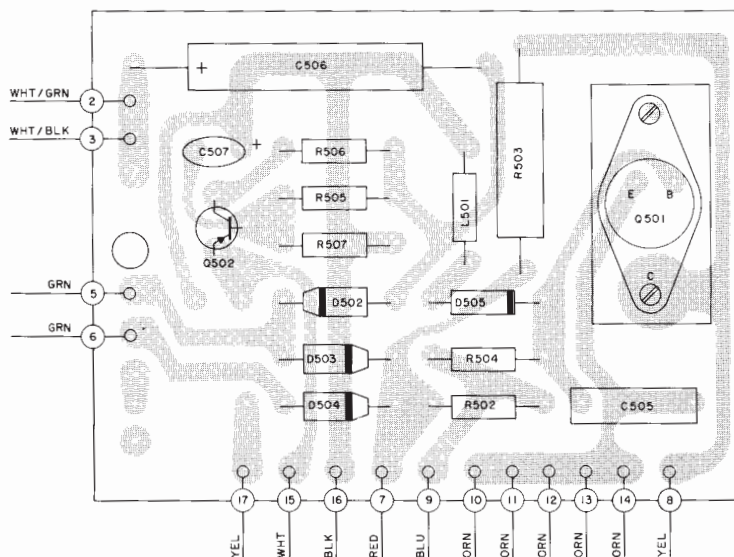
OUTPUT AMPLIFIER PC BOARD 044-794

# OUTPUT AMP SECTION

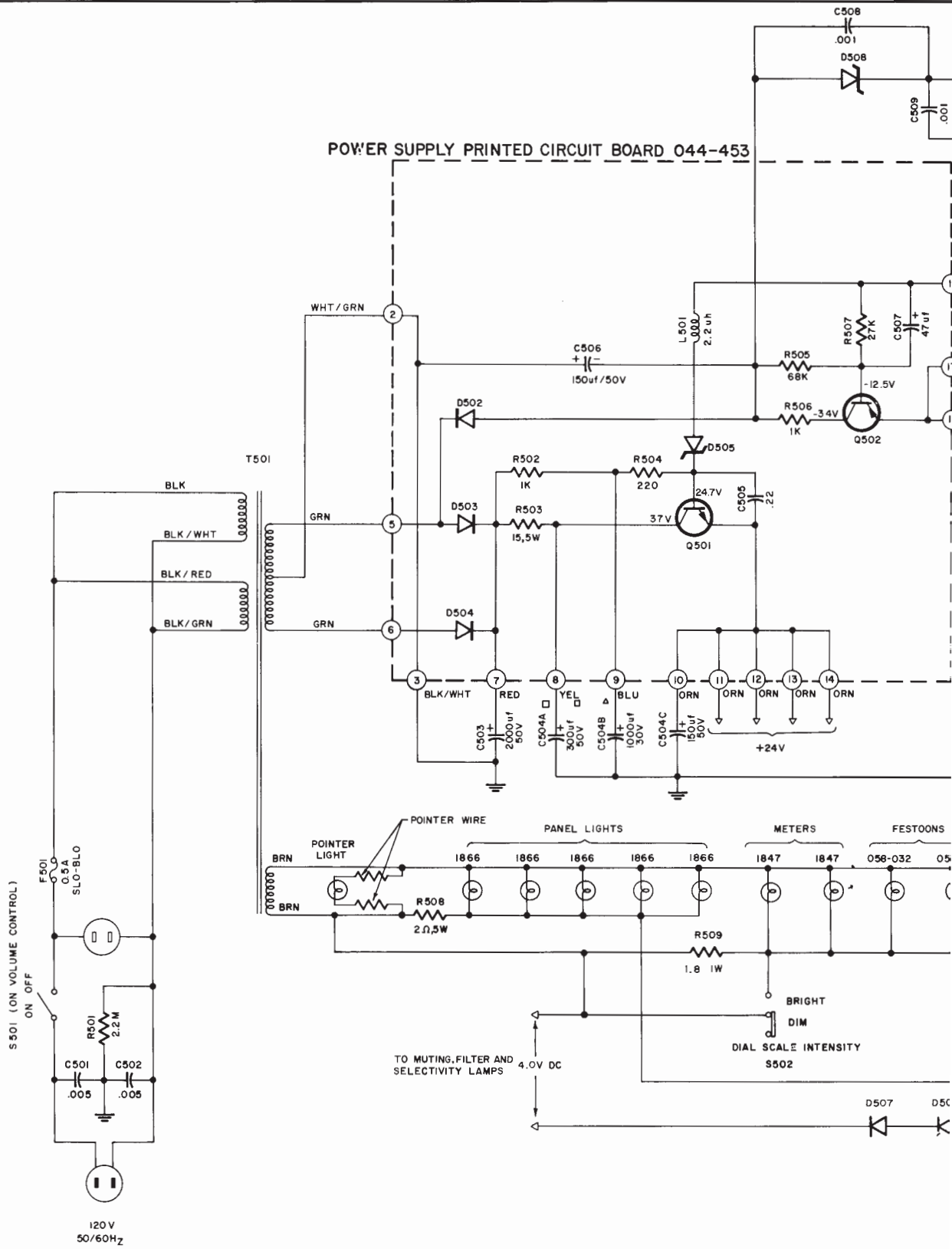
OUTPUT AMP PC BOARD 044-794



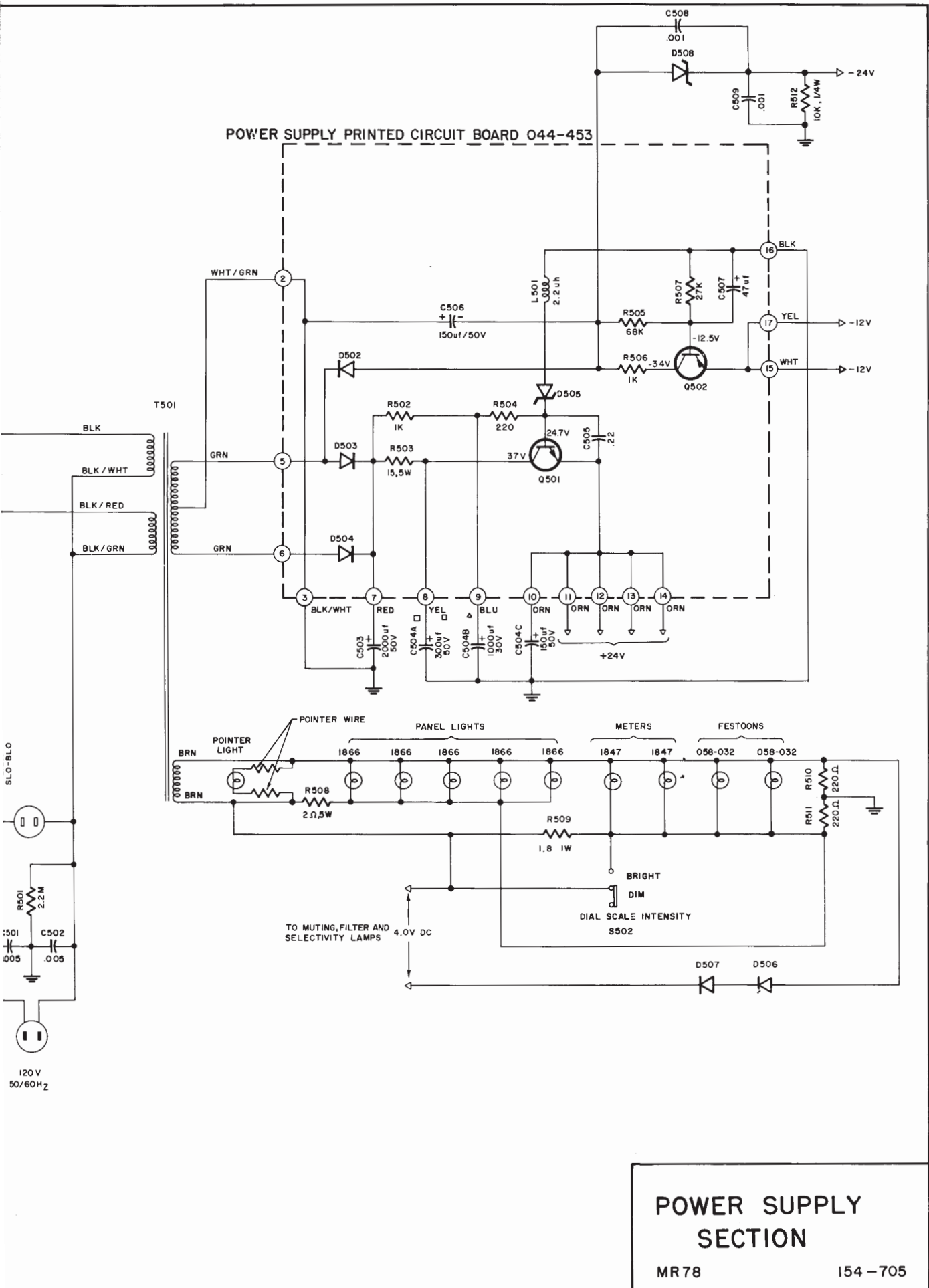
POWER SUPPLY PRINTED CIRCUIT BOARD 044-453

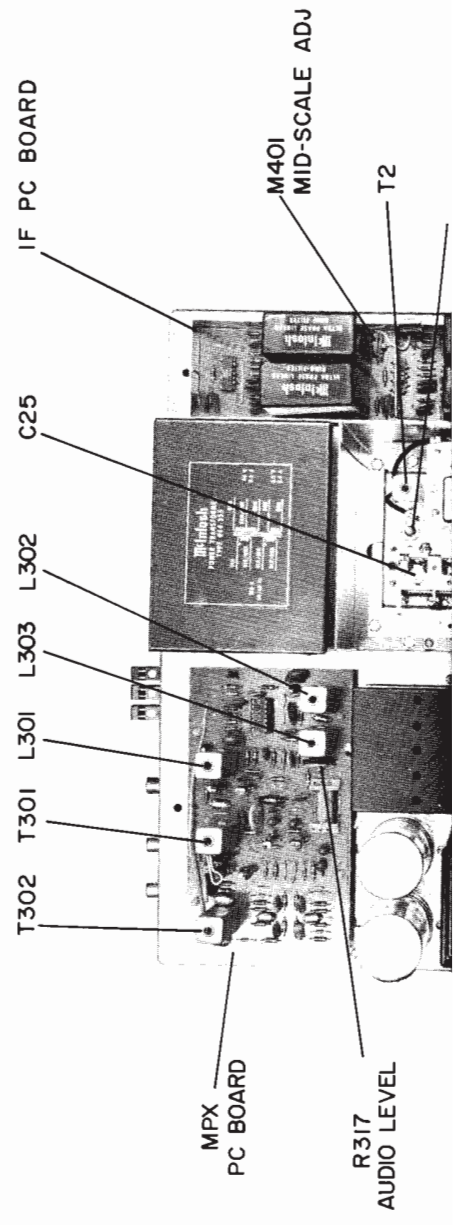
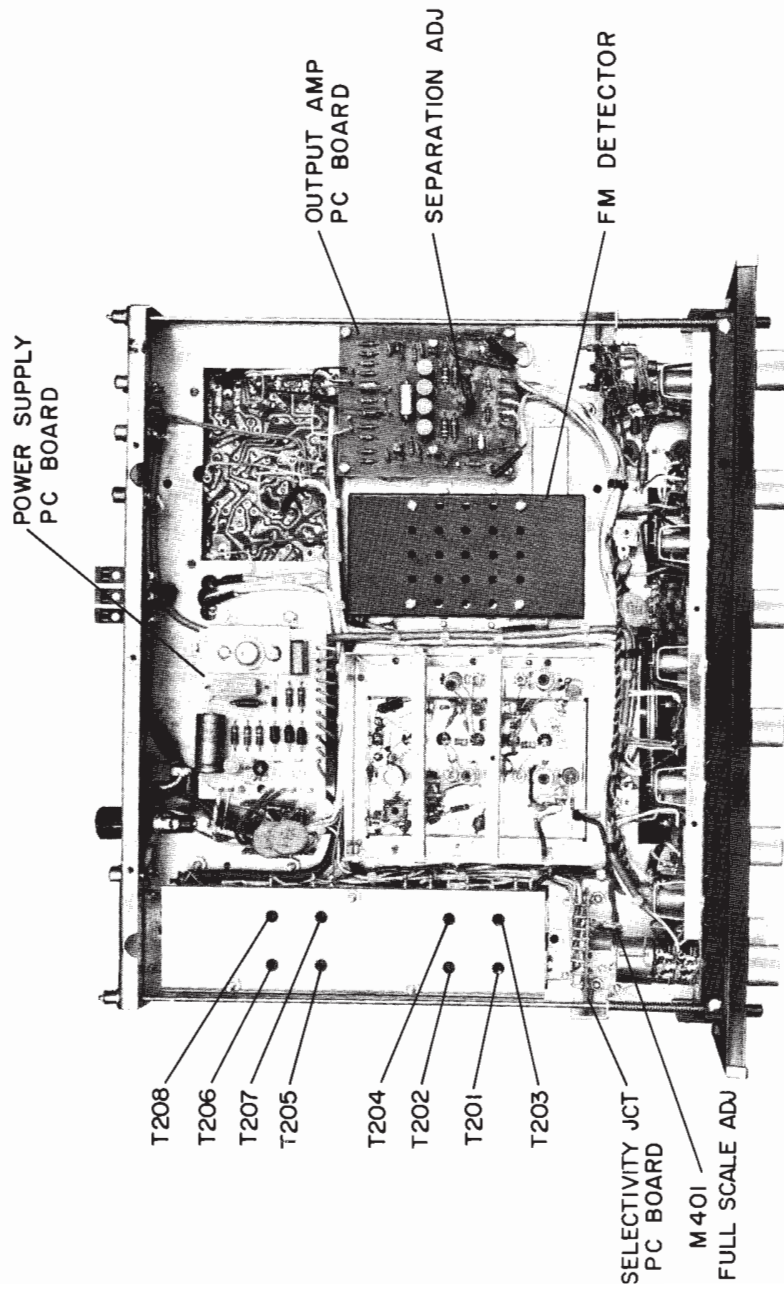


POWER SUPPLY PRINTED CIRCUIT BOARD 044-453

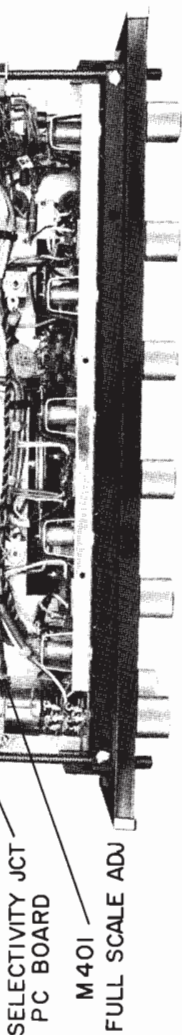


POWER S  
SECTION  
MR78

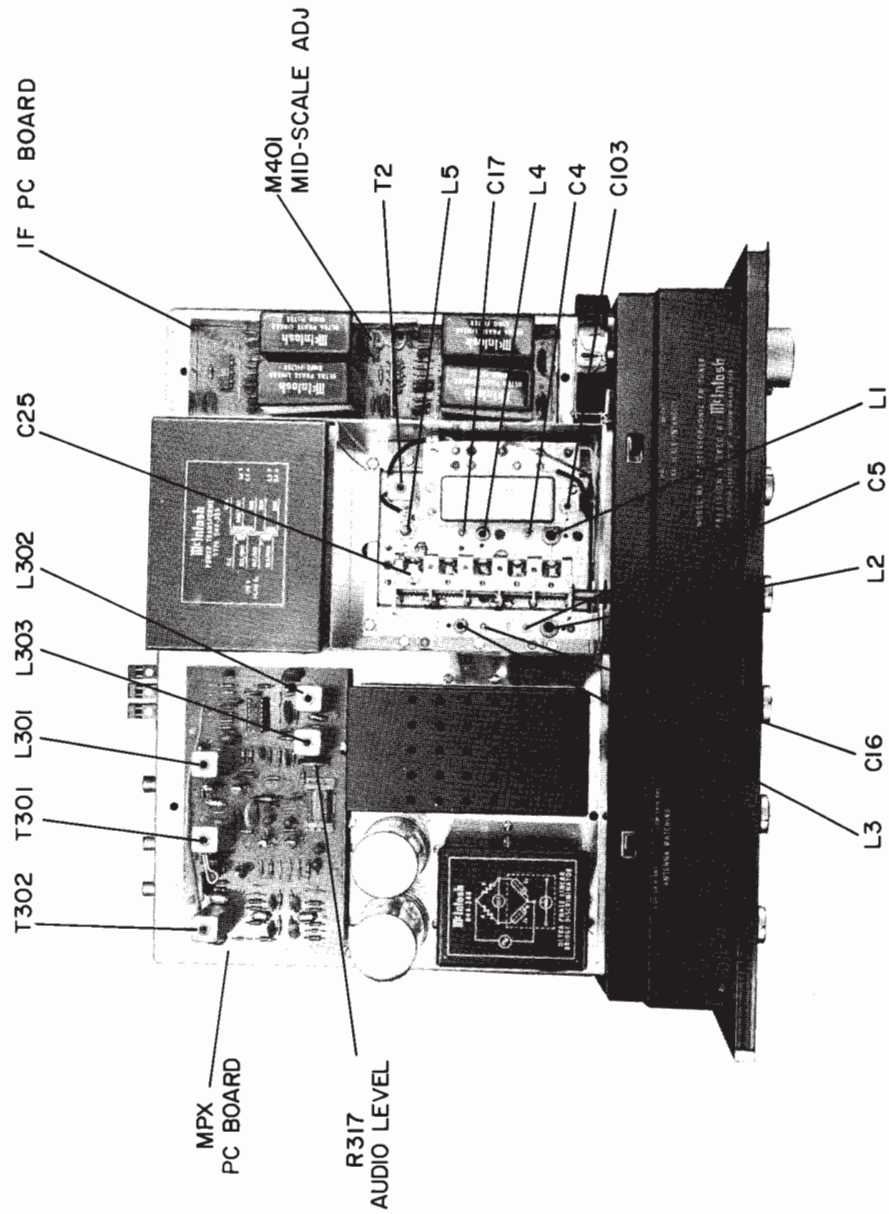




FM DETECTOR



SELECTIVITY JCT  
PC BOARD  
M401  
FULL SCALE ADJ



**MR 78 ALIGNMENT INSTRUCTIONS**

All McIntosh tuners are carefully aligned and tested at the factory using the finest available test equipment. All McIntosh tuners will meet their published specifications when shipped from the factory.

After extensive operation, or servicing, it may be desirable to realign the tuner circuits for best performance. The charts below give complete information on the circuit realignment procedure for the MR 78.

The test equipment listed (or its equivalent) is necessary to properly align an MR 78.

**TEST EQUIPMENT REQUIRED**

1. FM Signal Generator (Measurement 188 or Sound Technology 1000A).
2. VTVM (RCA WV96C)
3. Multiplex Generator (Radiometer SMG1) or Sound Technology 1000A.

10.7 MHz FM Sweep Generator (K...

### MR 78 ALIGNMENT INSTRUCTIONS

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The test equipment listed (or its equivalent) is necessary to properly align an MR 78. The accuracy of the alignment will be directly related to the accuracy and calibration of the test equipment used.

If the necessary test equipment is not available, alignment should not be attempted. For additional information, contact Customer Service Department, McIntosh Laboratory, Inc., 2 Chambers Street, Binghamton, New York 13903 (telephone 607-723-3512)

Alignment should be done in the following order: FM-MPX.

### TEST EQUIPMENT REQUIRED

1. FM Signal Generator (Measurement 188 or Sound Technology 1000A).
2. VTVM (RCA WV96C)
3. Multiplex Generator (Radiometer SMG1) or Sound Technology 1000A.
4. 10.7 MHz FM Sweep Generator (Kay 385 or equivalent). (Not needed if Measurement 275 IF converter is available.)
5. 10.7 MHz Generator (preferably crystal controlled).
6. Oscilloscope (Hewlett-Packard 120B or equivalent).
7. Harmonic Distortion Analyzér (Hewlett-Packard 333A or equivalent).
8. 10.7 MHz  $\pm$ 75 kHz Sweep Marker Generator.

### FM ALIGNMENT

#### NOTES:

1. Begin alignment procedure with selectivity switch in normal position, stereo filter out, muting off, mode on mono, and meter on signal strength.
2. If tuner's RF circuits are known to be working, the IF alignment (Steps 1 - 4) may be performed using an 88 - 108 MHz generator (such as Sound Technology 1000A).

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
1	Point of no interference.	10.7 MHz or point of no interference between 88-108 MHz.	Inject 10.7 MHz near IF Chassis or 88-108 MHz to tuner antenna terminals.	FM $\pm$ 200 kHz sweep @60 Hz rate.	Oscilloscope.	TP 1	Top (primary) and bottom (secondary) of T2.	Maximum height of 10.7 MHz marker and best symmetry of 10.7 MHz $\pm$ 75kHz markers.	Keep signal generator output low to prevent limiting. TP 1 voltage should not exceed 0.5 volts. Rimo filters do not have a flat-topped response. See typical response curve (Fig. 2). If proper response cannot be obtained go to Step 2. Otherwise go to Step 3. Bottom covers must be on front end and discriminator chassis. Regeneration will distort sweep if either cover is removed.
2	Same	Same	Same	Same	Same	Same	Use standard insulated hex tool. Top and bottom cores of Rimo filters accessible thru bottom of IF Chassis	Same	Carefully peak top and bottom cores of T201, T202, T205, and T206 for maximum gain at 10.7 MHz (center of IF bandpass), and then touch up all cores for best symmetry to obtain bandpass on opposite page. Do not stagger tune. Do not touch any other IF tuned circuits. Be sure selectivity switch is in normal position.



Move selectivity switch to Narrow Position.

3	Same	Same	Same	Same	Same	Same	Same	Same	Same	Carefully peak top and bottom cores of T203, T204, T207, and T208 for maximum gain at 10.7 MHz (center of IF bandpass), and then touch up all cores for best symmetry to obtain bandpass in Fig. 3 below. Do not stagger tune. Do not touch any adjustments done in Step 2 above.
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Move selectivity switch to Super Narrow Position.

4	Same	Same	Same	Same	Same	Same	Same	Same	Use Insulated screw driver.	Adjust C103 on top of Super Narrow IF Chassis for maximum symmetrical bandpass. Do not touch any adjustments made in Step 2 or 3 above.
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Move selectivity switch to Normal Position.

5	Same	10.7 MHz	Inject Signal near IF Chassis.	CW	VTVM	TP2	M301 adjust R610.	Zero DC at TP 2.	With tuner horizontal and right side up, M301 should be centered. 10.7 MHz frequency must be precise for this adjustment.
6		10.7 MHz or 88-108 MHz.	Inject Signal near IF Chassis or tuner antenna terminals.	FM $\pm 75$ kHz @ 60 Hz rate.	Oscilloscope.	Fixed audio output jacks.	Bias pot R603.	Maximum audio output.	If output is clipped, reduce audio output by adjusting R317; muting off, stereo filter out.
7	106 MHz.	106MHz	300 $\Omega$ antenna terminals thru matching network or balun.	400Hz; 75KHz deviation (Fig. 1)	VTVM to TP 1 and scope to L or R audio output.		Oscillator trimmer C25	Maximum negative voltage at TP 1.	Keep TP 1 voltage below one volt. Observe signal on scope for reference.
8	90 MHz	90 MHz	Same	Same	Same		Oscillator Coil L5.	Same	Same. Repeat Steps 5 and 6 until dial is accurate.

Antenna selector switch should be in the High Gain Position for the following:

9	104 MHz	104 MHz	Same	Same	Same		Adjust C5, C16, and C17.	Same	Keep TP 1 voltage below one volt. Reduce signal input as circuits align.
10	92 MHz	92 MHz	Same	Same	Same		L2, L3, L4.	Same	Same
11	104 MHz	104 MHz	Same	Same	Harmonic distortion analyzer to L or R output.		C4	Adjust for minimum noise and distortion at 5 $\mu$ V input.	Noise and distortion should be more than 30dB down. Noise with no modulation should be more than 40dB down. Touch up C5, C16, and C17 if necessary.



STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
1	100 MHz or point of no interference	Same as tuner dial	300Ω antenna terminals with approximately 1000μW signal thru matching network or balun	Mono (R = L) 1 kHz 100% modulation	Oscilloscope and AC-VTVM connected to either fixed audio output jack.	R317	2.5V RMS at fixed output jacks	Make sure tuning meter is at zero center. Maximum indication on signal strength meter and center indication on tuning meter should coincide.	
2	Same	Same	Same	67kHz and 53kHz at +75kHz deviation	Oscilloscope	L302 and L303	Adjust L302 for maximum 53kHz, L303 for minimum 67kHz. Do not attempt to detect 67kHz at tuner output jacks. Ground scope probe close to multiplex board. Repeat adjustments of L302 and L303 until optimum condition is reached.		
3	Same	Same	Same	19 kHz pilot	Oscilloscope	L301 and T301	For maximum amplitude	Decrease pilot level, if necessary, so that 19 kHz circuits do not limit or saturate.	
4	Same	Same	Same	Same	Oscilloscope	T302 top and bottom	Maximum amplitude	Use normal (9%) pilot level. Remove scope probe before going to Step 5.	
5	Same	Same	Same	Stereo 1 kHz (100% modulation) left only pilot level normal and on	AC-VTVM	T302 bottom (sec) and R423	40dB separation or more	First set R401 to maximum resistance. (Fully clockwise looking from front of tuner.) Adjust T302 bottom tuning slug (sec) for minimum output on right (undesired) channel. Then adjust R401 for maximum separation. Repeat the adjustment of T302 bottom and R401 until maximum separation is obtained. Then reverse channels and measure left channel separation.	
6	Same	Same	Same	Stereo pilot carrier modulation only	AC-VTVM	L or R output jack	Less than 50mV of residual	With modulation off but pilot on. (NOTE: Stereo generator must have low spurious output.)	

FIG. 2 TYPICAL IF RESPONSE CURVE NORMAL

FIG. 3 TYPICAL IF RESPONSE CURVE NARROW

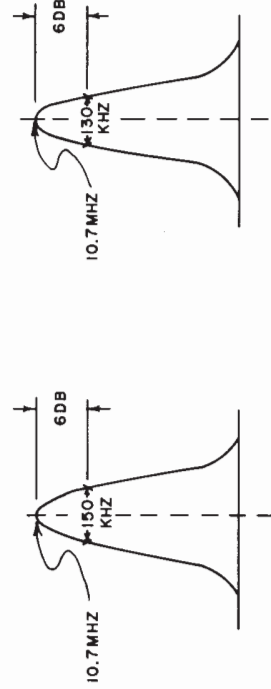
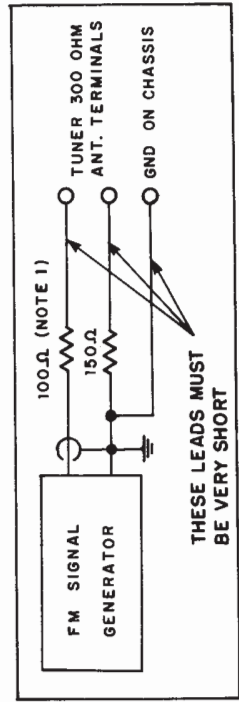


FIG. 1 ANTENNA MATCHING NETWORK



## REPLACEMENT PARTS

All parts not listed are common items obtainable from radio parts jobbers.

Replacement parts may be obtained when ordered by PART NUMBER from:

McIntosh Laboratory, Inc.  
Customer Service Department  
2 Chambers Street  
Binghamton, New York 13903  
(telephone 607-723-3512)

## CAPACITORS

C29, 30	Silver Mica	270pF		063-010
C204	Elect.	10 $\mu$ F	35V	066-173
C304	Tant.Elect.	10 $\mu$ F	20V	066-239
C306	Tant.Elect.	22 $\mu$ F	25V	066-240
C308	Tant.Elect.	6.8 $\mu$ F	35V	066-146
C309	Polystyrene	2700pF		064-093
C310	Tant.Elect.	10 $\mu$ F	20V	066-239
C311	Polystyrene	1500pF		064-092
C314	Tant.Elect.	6.8 $\mu$ F	35V	066-146
C316	Tant.Elect.	6.8 $\mu$ F	35V	066-146
C323	Tant.Elect.	1 $\mu$ F	50V	066-242
C325	Tant.Elect.	22 $\mu$ F	25V	066-240
C326, 327	Polystyrene	4700pF		064-091
C328	Tant.Elect.	6.8 $\mu$ F	35V	066-146
C331	Polystyrene	.0033 $\mu$ F		064-090
C334	Polystyrene	.0033 $\mu$ F		064-090
C401, 402	Polystyrene	2700pF		064-093
C403	Polystyrene	.033 $\mu$ F		064-089
C406, 407	Elect.Cap.	22 $\mu$ F	35V	066-179
C411	Elect.Cap.	10 $\mu$ F	50V	066-221
C412	Polystyrene	2700pF		064-093
C413	Tant.Elect.	1 $\mu$ F	50V	066-242
C414	Elect.	10 $\mu$ F	50V	066-221
C503	Elect.	2000 $\mu$ F	50V	066-154
C504	Elect.	5/300/150/1000 $\mu$ F		066-155
		200/50/50/30V		
C506	Elect.	150 $\mu$ F	63V	066-205
C507	Elect.	47 $\mu$ F	16V	066-215

## DIODES

D1	Pin diode			070-055
D2	Si. signal diode			070-047
D3	Pin diode			070-055
D101, 102	Si. signal diode			070-047
D103	Si. signal diode			070-047
D104, 105	Ge. signal diode			070-003

D201, 202	Si. signal diode			070-047
D203	Si. signal diode			070-047
D204	Ge. signal diode			070-003
D205	Si. signal diode			070-047
D206, 207	Ge. signal diode			070-003
D208, 209	Si. signal diode			070-047
D210	Ge. signal diode			070-003
D211, 212	Si. signal diode			070-047
D213, 214	Ge. signal diode			070-003
D215, 216	Ge. signal diode			070-003
D301, 302	Si. signal diode			070-047
D303, 304	Si. signal diode			070-047
D305, 306	Si. signal diode			070-047
D308, 309	Si. signal diode			070-047
D310, 311	Si. signal diode			070-047
D401	Si. signal diode			070-047
D502, 503	Si. signal diode			070-031
D504	Si. signal diode			070-031
D505	Zener diode	24V		070-065
D506	Si. signal diode			070-031
D601, 602	Si. signal diode			070-081
D603, 604	Si. signal diode			070-081

## CHOKES

L1	Antenna Coil			122-133
L2	RF input Coil			122-132
L3	RF output Coil			122-131
L4	Mixer Coil			122-130
L5	Oscillator Coil			122-129
L6	Choke 75 $\mu$ H			122-013
L7	Choke 1.7 $\mu$ H			122-032
L301	Filter Coil (19kHz)			122-094
L302, 303	Filter Coil (SCA)			122-093
L304	Choke 1MH			122-092
L501	Choke 2.2 $\mu$ H			122-001

## TRANSISTORS

Q1	Si. N Channel J.F.E.T.			132-097
Q2	Si. NPN transistor			132-066
Q3	Si. NPN transistor			132-087
Q101, 102	M.O.S. F.E.T.			132-088
Q201, 202	Si. Junction FET			132-068
Q301	Si. NPN transistor			132-092
Q302	Si. NPN transistor			132-094
Q303	Si. NPN transistor			132-092
Q304, 305	Si. NPN transistor			132-094

Q306	Si. NPN transistor	132-095
Q401	Si. PNP transistor	132-096
Q402	Si. NPN transistor	132-094
Q403	Si. PNP transistor	132-096
Q404,405	Si. NPN transistor	132-094
Q406,407	Si. NPN transistor	132-094
Q501	Si. NPN transistor	132-065
Q502	Si. PNP transistor	132-032
Q601,602	Si. NPN transistor	132-066

## FUSES

F501	Fuse .5A slo-blo	089-020
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## POTENTIOMETERS

R212	M401 mid scale adv.	134-260
R226	M401 full scale adv.	134-260
R317	Audio level	134-258
R422	Volume control	134-217
R423	Separation adv.	134-260
R603	Bias adv.	134-256
R610	M301 adv.	134-256

## RESISTORS

R10	wire	220 $\Omega$	5%	1W	139-076
R333,334	film	33K	1%	1W	144-015
R338,339	film	33K	1%	1W	144-015
R503	wire	15 $\Omega$	10%	5W	139-041
R508	wire	2.0 $\Omega$	10%	5W	139-005
R509	wire	1.8 $\Omega$	10%	1W	139-077
R605,606	wire	220 $\Omega$	5%	1W	139-076
R607,608	film	56.2 $\Omega$	1%	1W	144-014

## SWITCHES

S2.	Selectivity switch	146-156
S301	Mode selector	146-160
S302	Muting switch	146-159
S401	Stereo filter switch	146-158
S402	Meter function switch	146-157

## TRANSFORMERS

T1	Balun	043-226
T2	FM mixer	162-062
T201	FM IF filter input	162-053
T202	FM IF filter output	162-052
T203	FM IF filter input	162-053
T204	FM IF filter output	162-052
T205	FM IF filter input	162-053
T206	FM IF filter output	162-052
T207	FM IF filter input	162-053

T208	FM IF filter output	162-052
T301	RF transformer (19kHz)	162-055
T302	RF transformer (38kHz)	162-054

## INTEGRATED CIRCUITS

IC1	Integrated circuit	133-006
IC101,102	Integrated circuit	133-002
IC301A,13	Integrated circuit	133-004

## METERS

M301	Tuning meter	124-020
M401	Signal strength meter	124-019

## RELAY

K301	Reed relay	087-008
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## LAMPS

Function lamp	058-043
Stereo lamp	058-042
#1847 (Meter lamp)	058-008
#1866 (Front panel)	058-014
Festoon lamp (Dial glass)	058-032

## FRONT PANEL &amp; TRIM

Front panel	044-345
Front panel end caps	018-154
Tuning knob	044-357
Selectivity knob	090-175
Meter knob	090-175
Filter knob	090-175
Muting knob	090-175
Mode knob	090-175
Volume knob	090-175

## MOUNTING SYSTEM

Shelf brkt (right)	043-592
Shelf brkt (left)	043-593
Mounting temp #100	038-179
Hardware Package	044-454

## MISCELLANEOUS ITEMS

FM dipole antenna	170-033
Dial glass	044-474
Pointer	044-387
Dial cord (complete)	044-475
Fuseholder	178-001
AC power cord	170-021
Shipping carton	044-473
Owners manual	038-868
Plastic feet	017-041
Push terminal (antenna)	074-033
Audio cable 6'	170-015

**FLI-Audio Filter**  
150-019