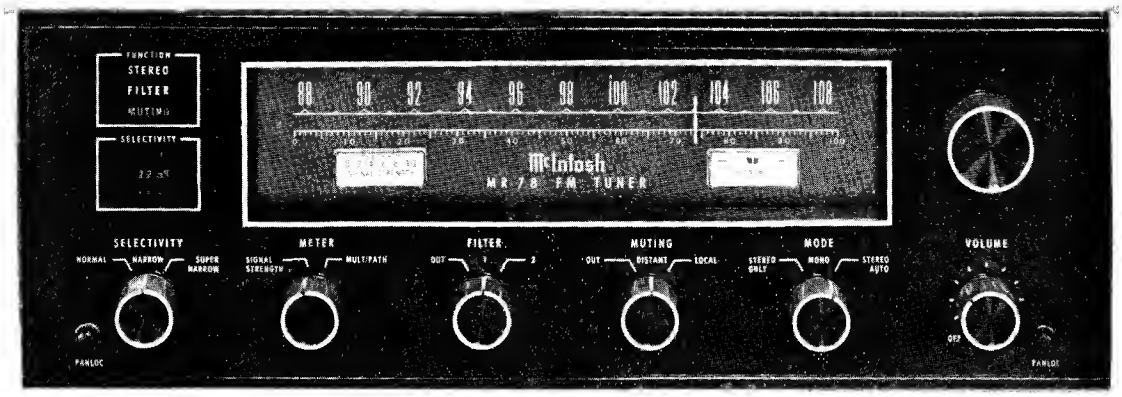
McIntosh

MR 78

FM TUNER



SERVICE INFORMATION

FROM SERIAL NO. AD1001 TO AD5164

McINTOSH LABORATORY INC. 2 CHAMBERS STREET BINGHAMTON, NEW YORK

ELECTRICAL SPECIFICATIONS

SENSITIVITY

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

SELECTIVITY IHF

	ADJECENT CHANNEL	ALTERNATE CHANNEL
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.

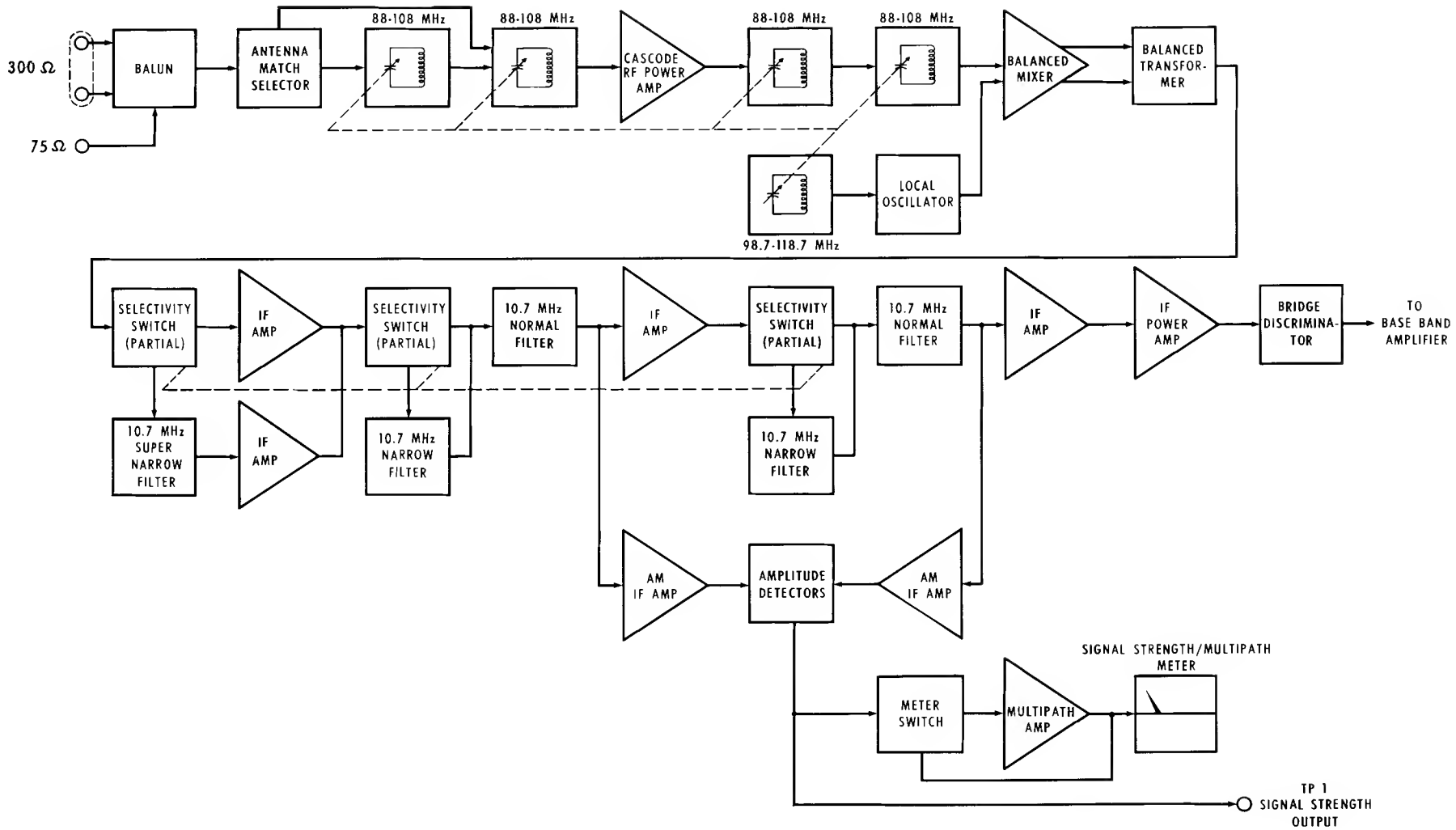
SCA FILTER

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

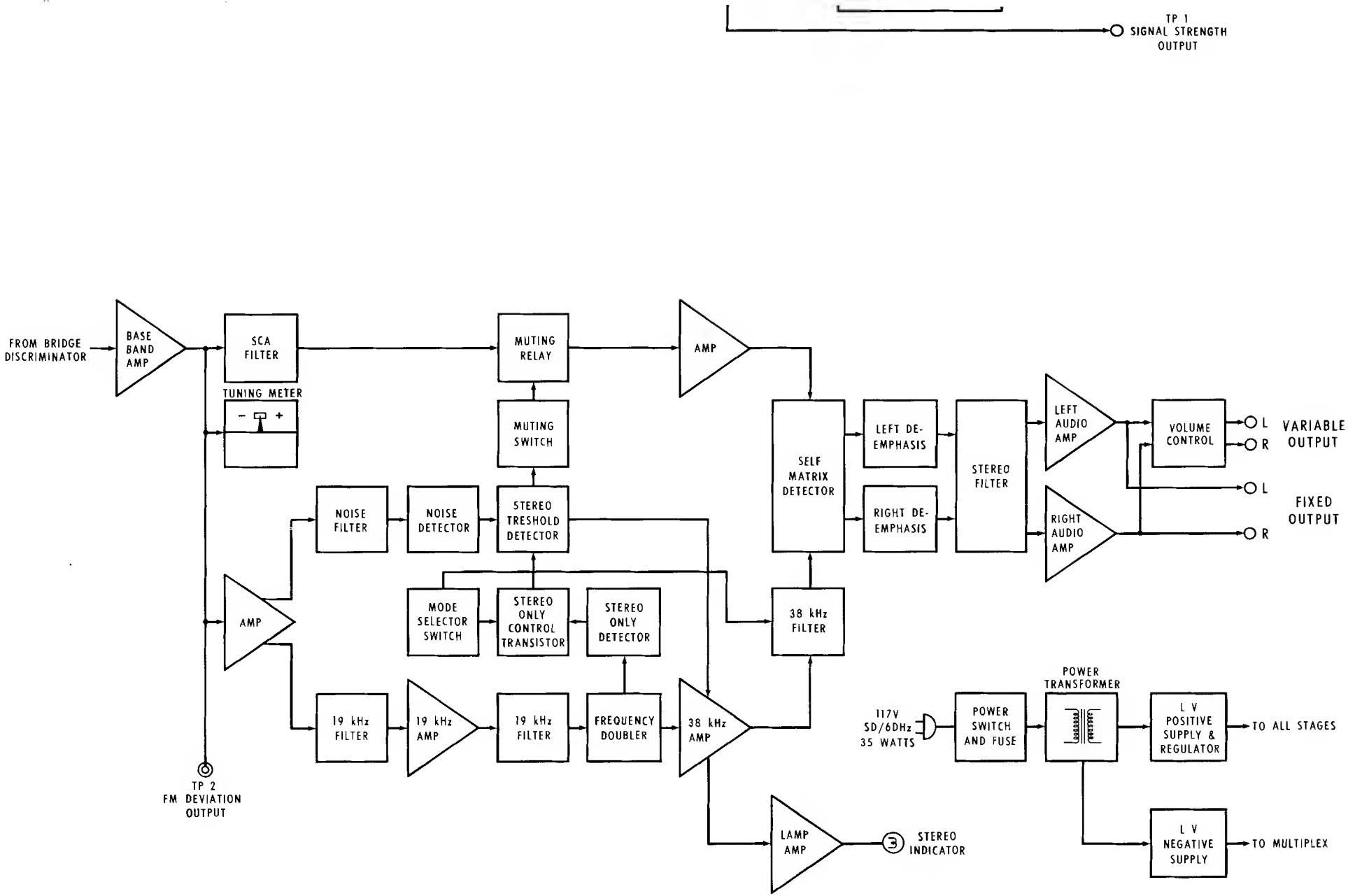
POWER REQUIREMENTS

120VAC, 50 - 60Hz, 35W.

(NORMAL SELECTIVITY UNLESS OTHERWISE STATED)



MR 78 BLOCK DIAGRAM


TP 1
SIGNAL STRENGTH
OUTPUT
FROM BRIDGE
DISCRIMINATOR
BASE
BAND
AMP
SCA
FILTER
TUNING METER
MUTING
RELAY
AMP
MUTING
SWITCH
SELF
MATRIX
DETECTOR
LEFT DE-
EMPHASIS
RIGHT DE-
EMPHASIS
STEREO
FILTER
LEFT
AUDIO
AMP
RIGHT
AUDIO
AMP
VOLUME
CONTROL
L
R
VARIABLE
OUTPUT
L
R
FIXED
OUTPUT
NOISE
FILTER
NOISE
DETECTOR
STEREO
TRESHOLD
DETECTOR
AMP
MODE
SELECTOR
SWITCH
STEREO
ONLY
CONTROL
TRANSISTOR
STEREO
ONLY
DETECTOR
38 kHz
FILTER
19 kHz
FILTER
19 kHz
AMP
19 kHz
FILTER
FREQUENCY
DOUBLER
38 kHz
AMP
TP 2
FM DEVIATION
OUTPUT
LAMP
AMP
3
STEREO
INDICATOR
117V
SD/6DHz
35 WATTS
POWER
SWITCH
AND FUSE
POWER
TRANSFORMER
L V
POSITIVE
SUPPLY &
REGULATOR
TO ALL STAGES
L V
NEGATIVE
SUPPLY
TO MULTIPLEX

SCHEMATIC NOTES

1. Unless otherwise specified: Resistance values are in ohms, 1/4 watt, and 10% tolerance; Capacitance values smaller then 1 are in microfarads (μF); capacitance values greater than 1 are in picofarads (pF); inductors are in microhenries (μH).

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 ±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 AD1501 R612 is 3.3k and R613 is 150k.

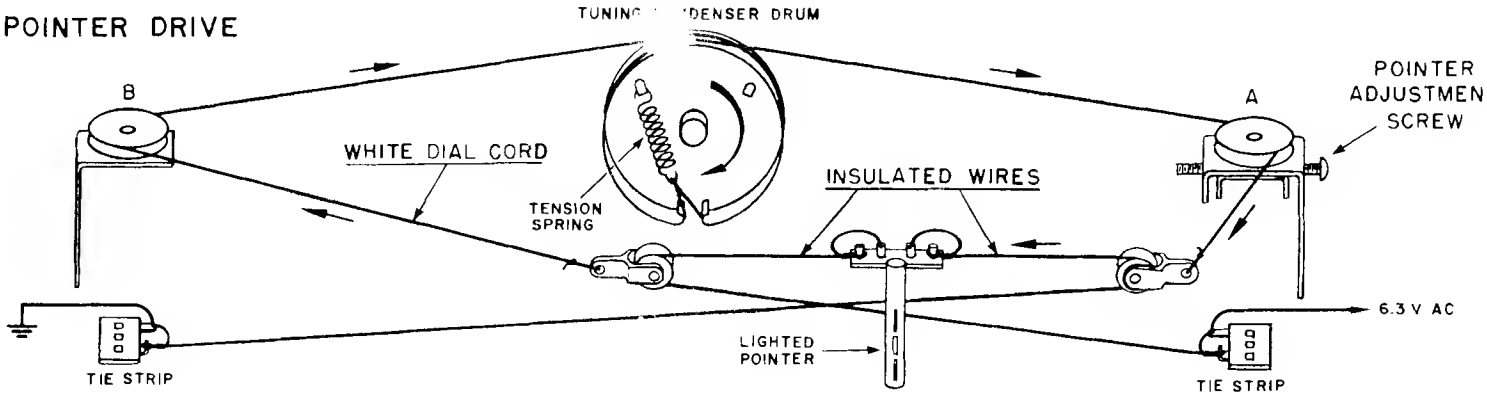
7. In units with Serial No's. below AD1508 C602 and C603 are .01μF.

8. In units with Serial No's below AD4878 C331 and C334 are .0033.

9. In units with Serial No's below AD5014 C26 is 5pF, C27 is 9pF and C25 is 0.5-3pF.

10. In units with Serial No's below AD5014 R15 and C34 are not used. In the power supply section D508, R512, C508 and C509 are not used.

POINTER DRIVE



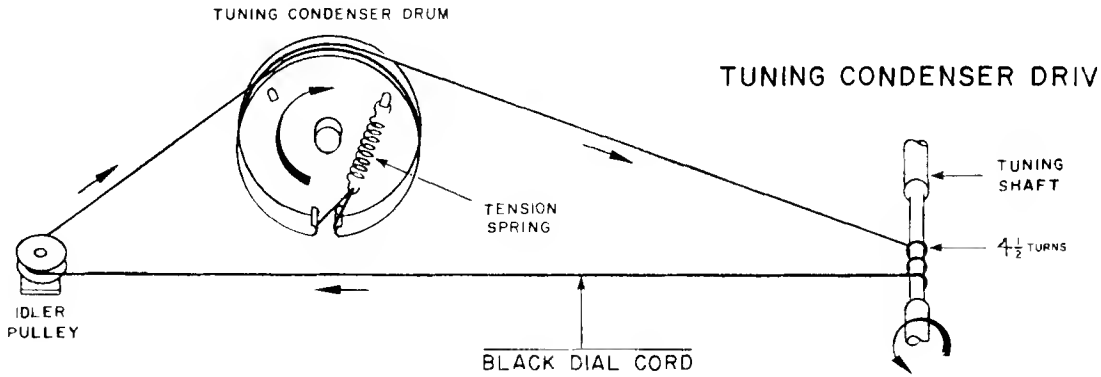
Step 1 Before stringing unit, turn pointer adjustment screw until pulley "A" is in the center of its travel.

Step 2 String unit as shown.

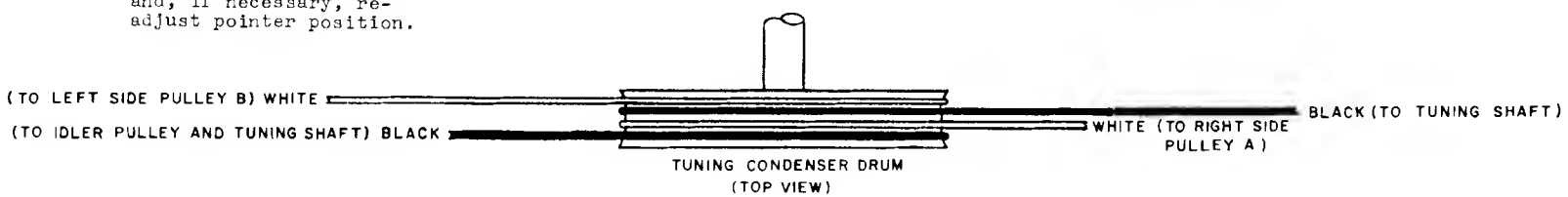
Step 3 After stringing unit, turn tuning shaft until pointer is as far to the left as it will go. Turn the pointer adjustment screw until the pointer coincides with the zero bar of the logging scale.

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.

TUNING CONDENSER DRIVE

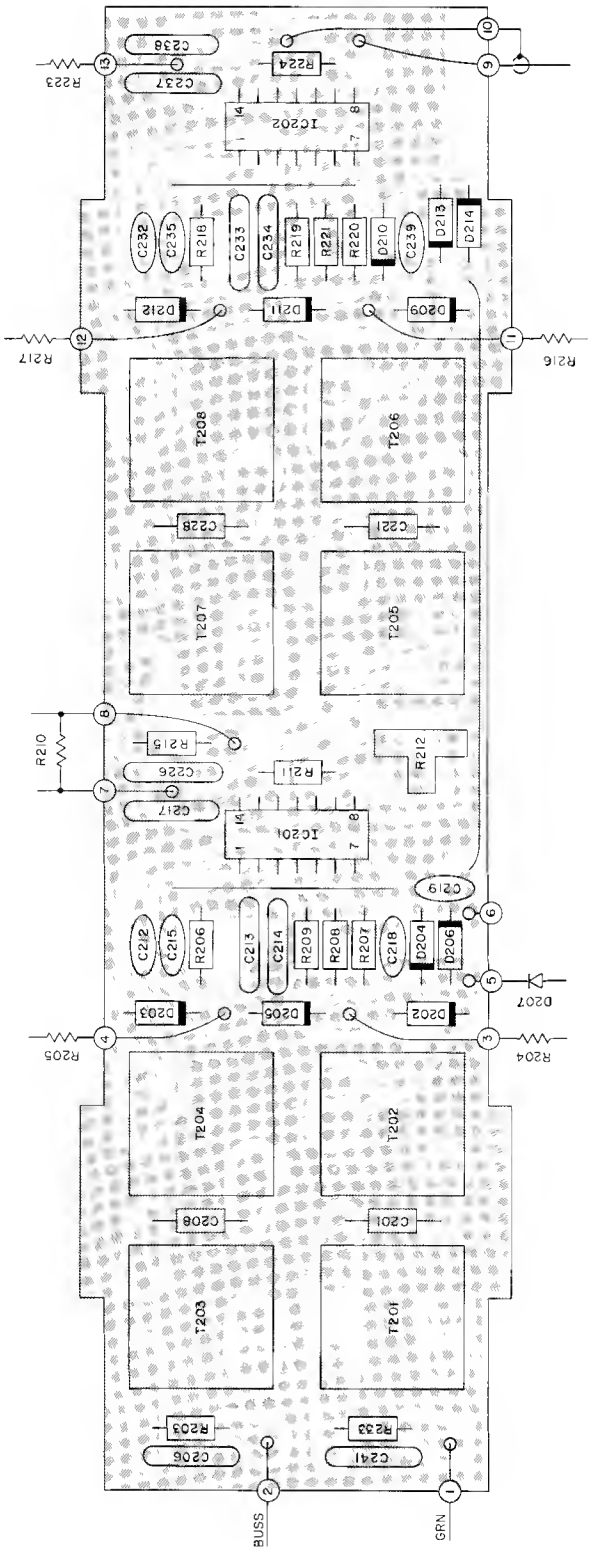


DIAL CORD SEQUENCE

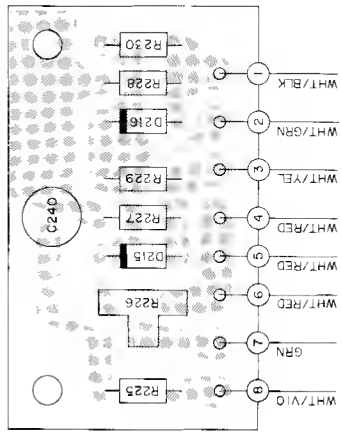


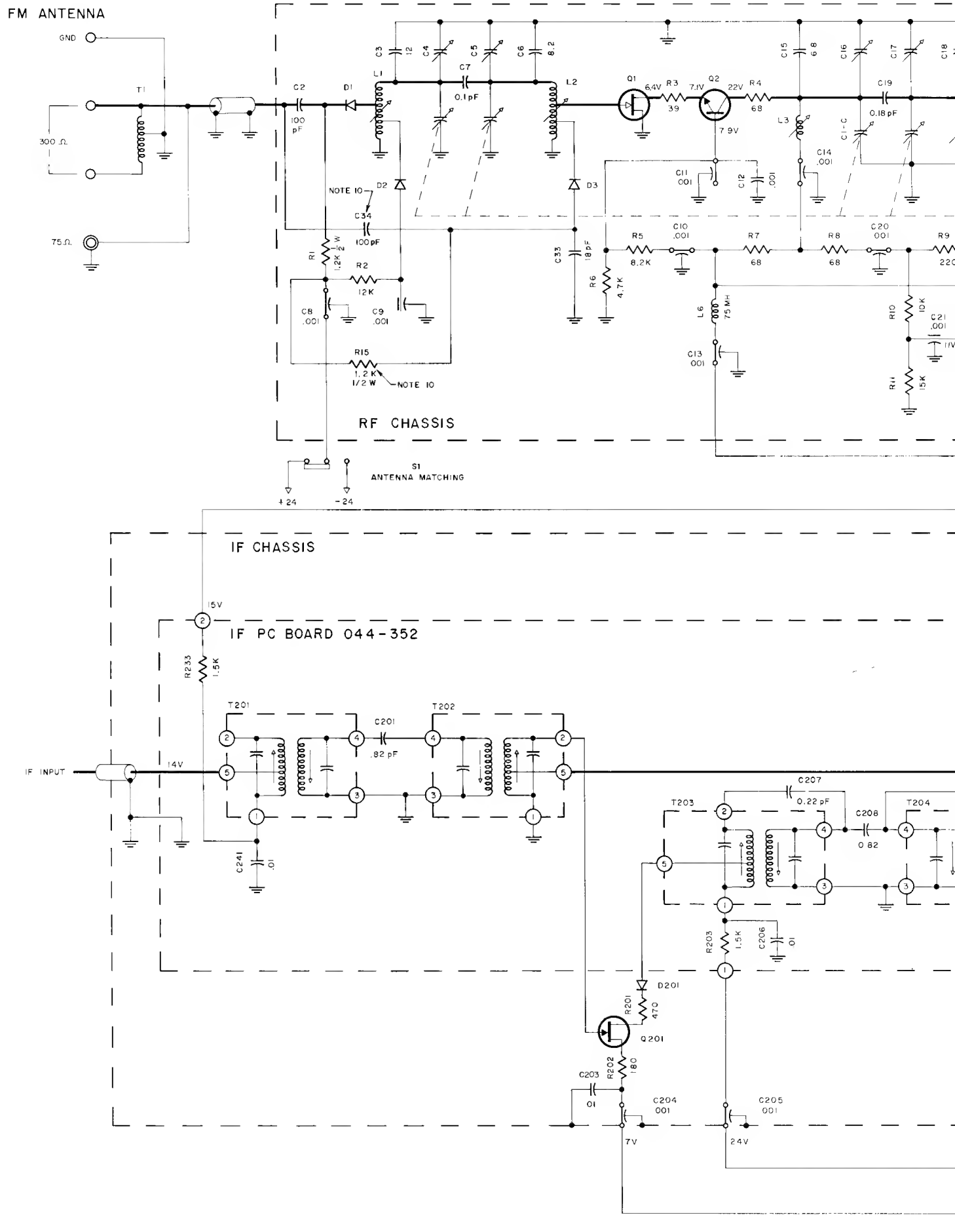
POINTER DIAL STRINGING

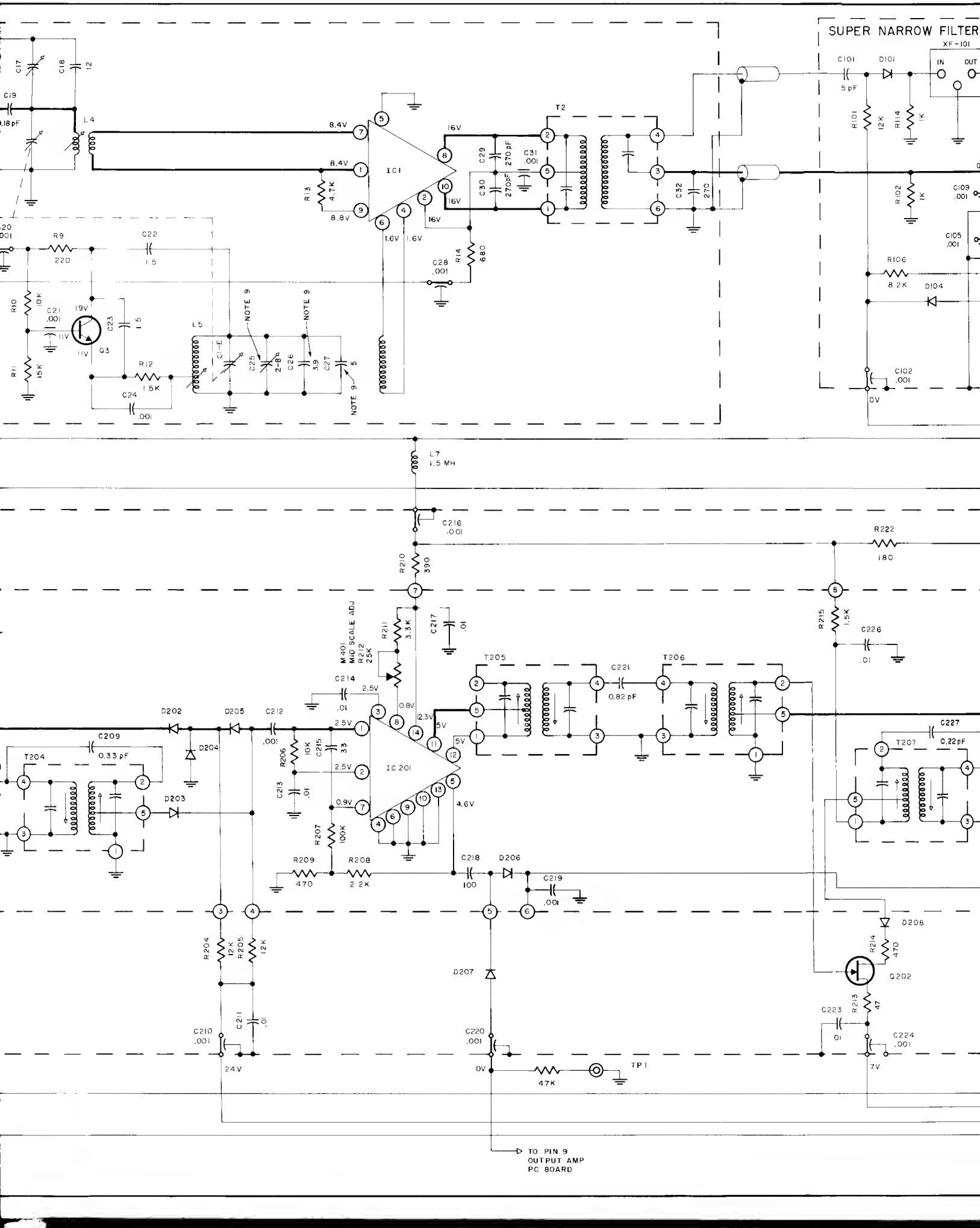
IF PC BOARD 044-352

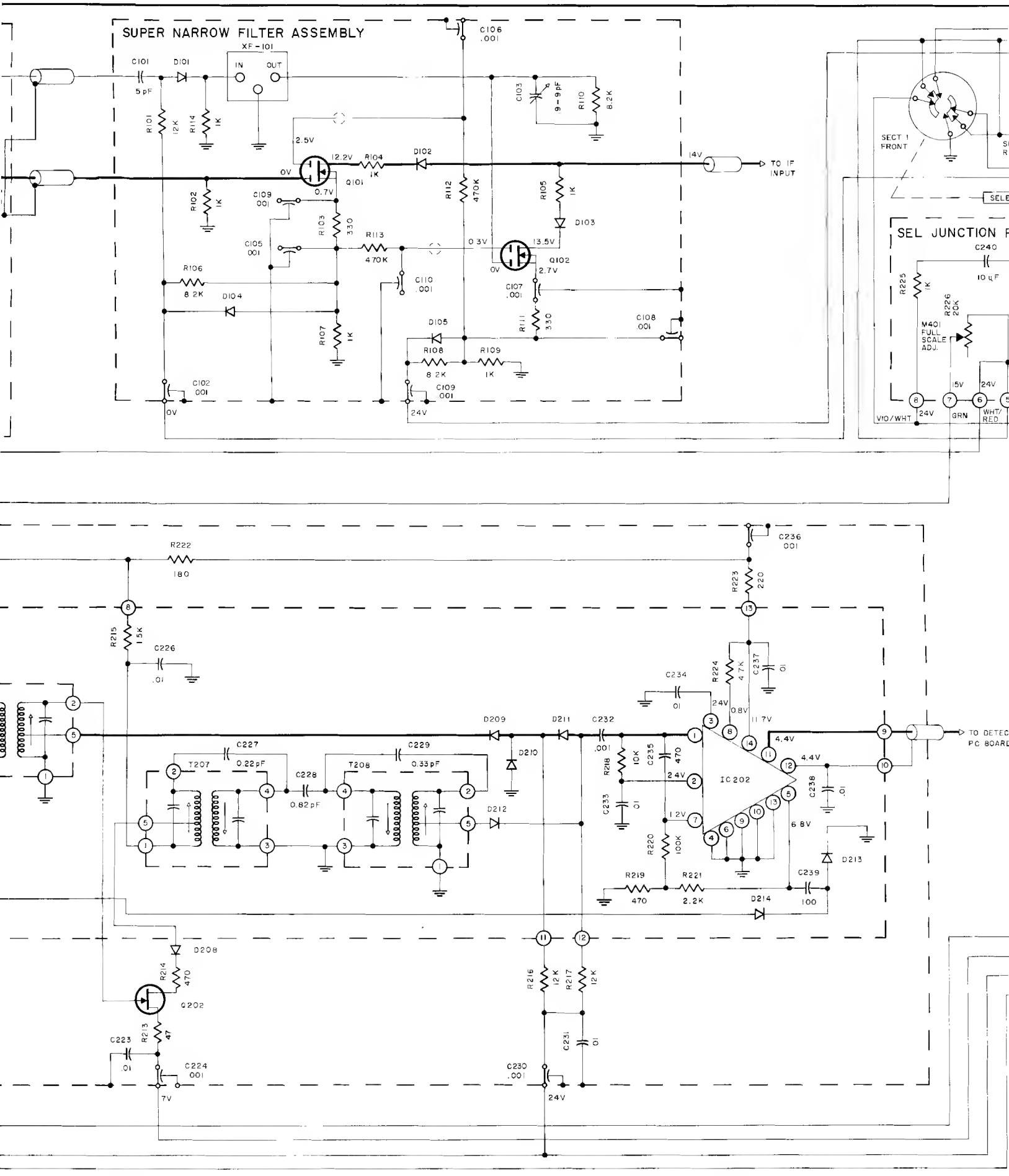


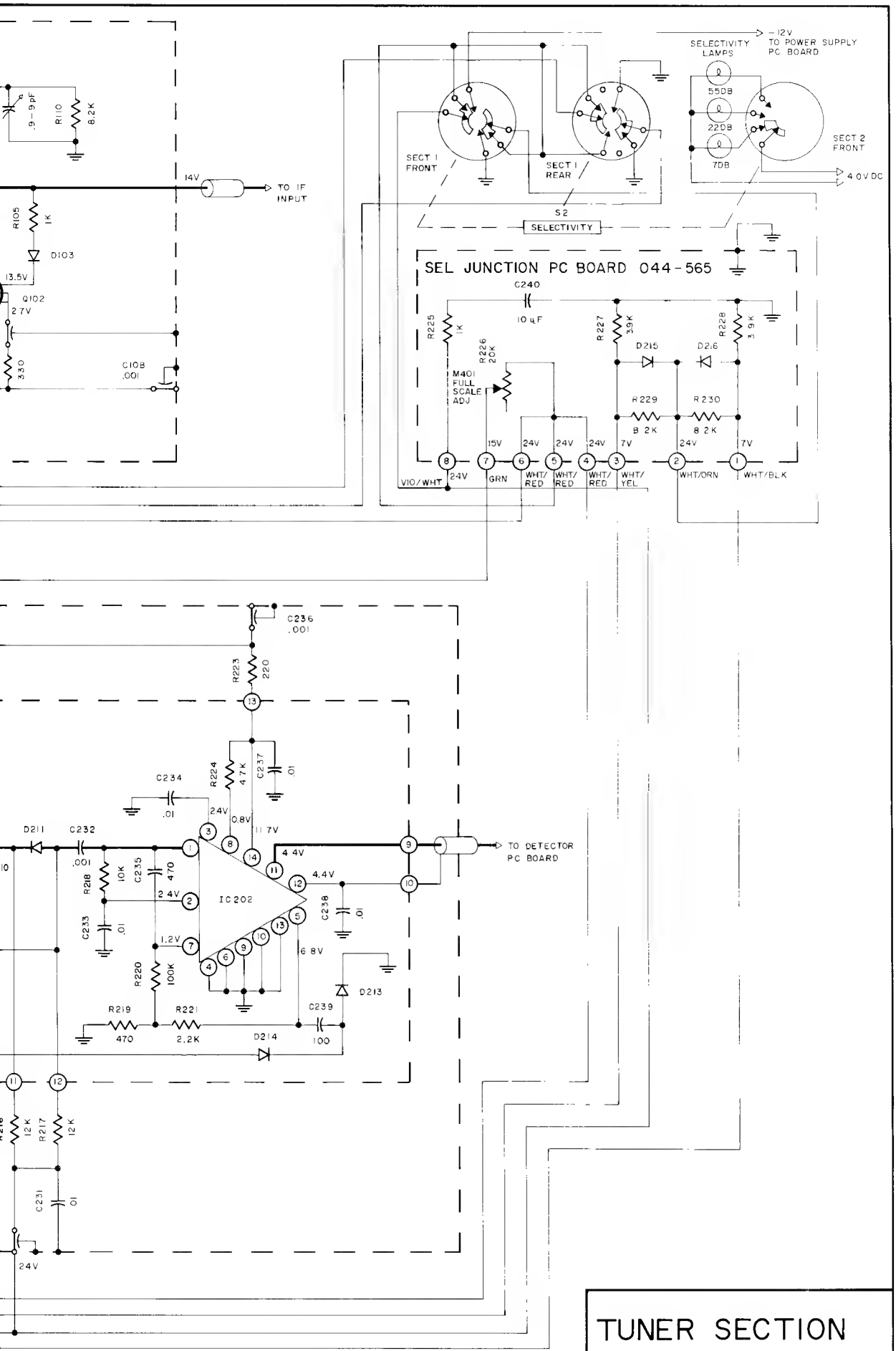
SELECTIVITY JCT. PC BOARD 044-565




FM ANTENNA
GND
T1
300 Ω
75 Ω
C2
100 pF
D1
L1
C3 12
C4
C5
C6 8.2
C7 0.1pF
L2
Q1 6.4V
R3 39
Q2 7.1V 22V
R4 68
7.9V
C15 6.8
C16
C17
C18
C19
0.18pF
L3
C1-C
C14 .001
C11 .001
C12 .001
NOTE 10
D2
D3
C34 100pF
R1 1.2K 1/2W
R2 12K
C8 .001
C9 .001
R15 1.2K 1/2W
NOTE 10
C33 18pF
R6 4.7K
R5 8.2K
C10 .001
R7 68
R8 68
C20 001
R9
L6 75 MH
C13 001
R10 10K
C21 .001
R11 15K
RF CHASSIS
S1
ANTENNA MATCHING
+24
-24
IF CHASSIS
15V
IF PC BOARD 044-352
R233 1.5K
T201
T202
C201 .82 pF
IF INPUT
14V
C241 .01
T203
C207 0.22 pF
T204
C208 0.82
R203 1.5K
C206 01
D201
R201 470
Q201
R202 180
C203 01
C204 001
C205 001
7V
24V


SUPER NARROW FILTER
XF-101
IN
OUT
C101
5 pF
D101
R101
12K
R114
1K
R102
1K
C109
.001
C105
.001
R106
8.2K
D104
C102
.001
0V
T2
IC1
8.4V
8.4V
8.8V
16V
16V
16V
1.6V
1.6V
R13
4.7K
R14
680
C28
.001
C29
270 pF
C30
270pF
C31
.001
C32
270
L4
C17
C18
12
C19
.18pF
C20
.001
R9
220
C22
15
R10
10K
C21
.001
19V
11V
11V
Q3
C23
15
R11
15K
R12
1.5K
C24
.001
L5
NOTE 9
NOTE 9
NOTE 9
C25
2-8
C26
3.9
C27
5
L7
1.5 MH
C216
.001
R210
390
R222
180
R215
1.5K
C226
.01
M401
MID SCALE ADJ
R212
25K
R211
3.3K
C217
.01
C214
.01
2.5V
0.8V
12.3V
5V
5V
4.6V
IC 201
T205
T206
C221
0.82 pF
C227
0.22pF
T207
D202
D205
C212
.001
2.5V
2.5V
0.9V
R206
10K
C215
33
C213
.01
R207
100K
R209
470
R208
2.2K
C218
100
D206
C219
.001
C209
0.33 pF
T204
D204
D203
R204
12K
R205
12K
C210
.001
C211
.01
24V
D207
C220
.001
0V
47K
TP1
D208
R214
470
Q202
R213
47
C223
.01
C224
.001
7V
TO PIN 9
OUTPUT AMP
PC BOARD

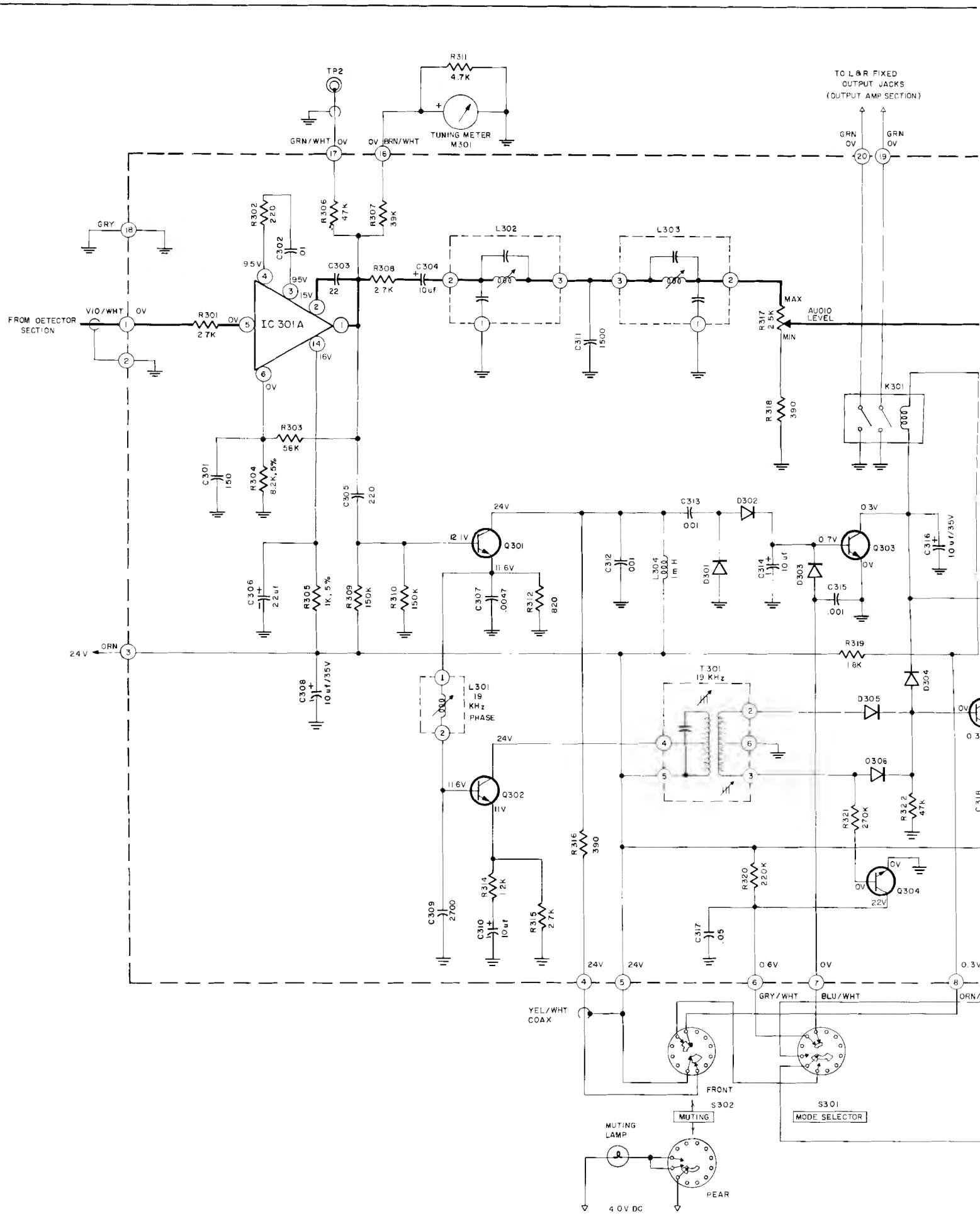

SUPER NARROW FILTER ASSEMBLY
XF-101
IN
OUT
C101
5pF
D101
R101
12K
R114
1K
C106
.001
C103
9-9pF
R110
8.2K
2.5V
12.2V
R104
1K
D102
14V
TO IF INPUT
0V
Q101
0.7V
R102
1K
C109
.001
R103
330
R112
470K
R105
1K
D103
C105
.001
R113
470K
0.3V
13.5V
Q102
2.7V
R106
8.2K
D104
C110
.001
C107
.001
R111
330
C108
.001
R107
1K
D105
R108
8.2K
R109
1K
C102
.001
0V
C109
.001
24V
SECT 1 FRONT
SEL JUNCTION
C240
10μF
R225
1K
R226
20K
M401 FULL SCALE ADJ.
15V
24V
VIO/WHT
24V
GRN
WHT/RED
R222
180
C236
.001
R223
220
R215
1.5K
C226
.01
C234
.01
R224
47K
C237
.01
D209
D211
C232
.001
24V
0.8V
11.7V
4.4V
4.4V
TO DETEC
PC BOARD
C227
0.22pF
T207
C228
0.82pF
T208
C229
0.33pF
D210
D212
R218
10K
C235
470
2.4V
IC 202
C238
.01
C233
.01
1.2V
6.8V
R220
100K
D213
R219
470
R221
2.2K
D214
C239
100
D208
R214
470
Q202
R213
47
C223
.01
C224
.001
7V
R216
12K
R217
12K
C231
.01
C230
.001
24V

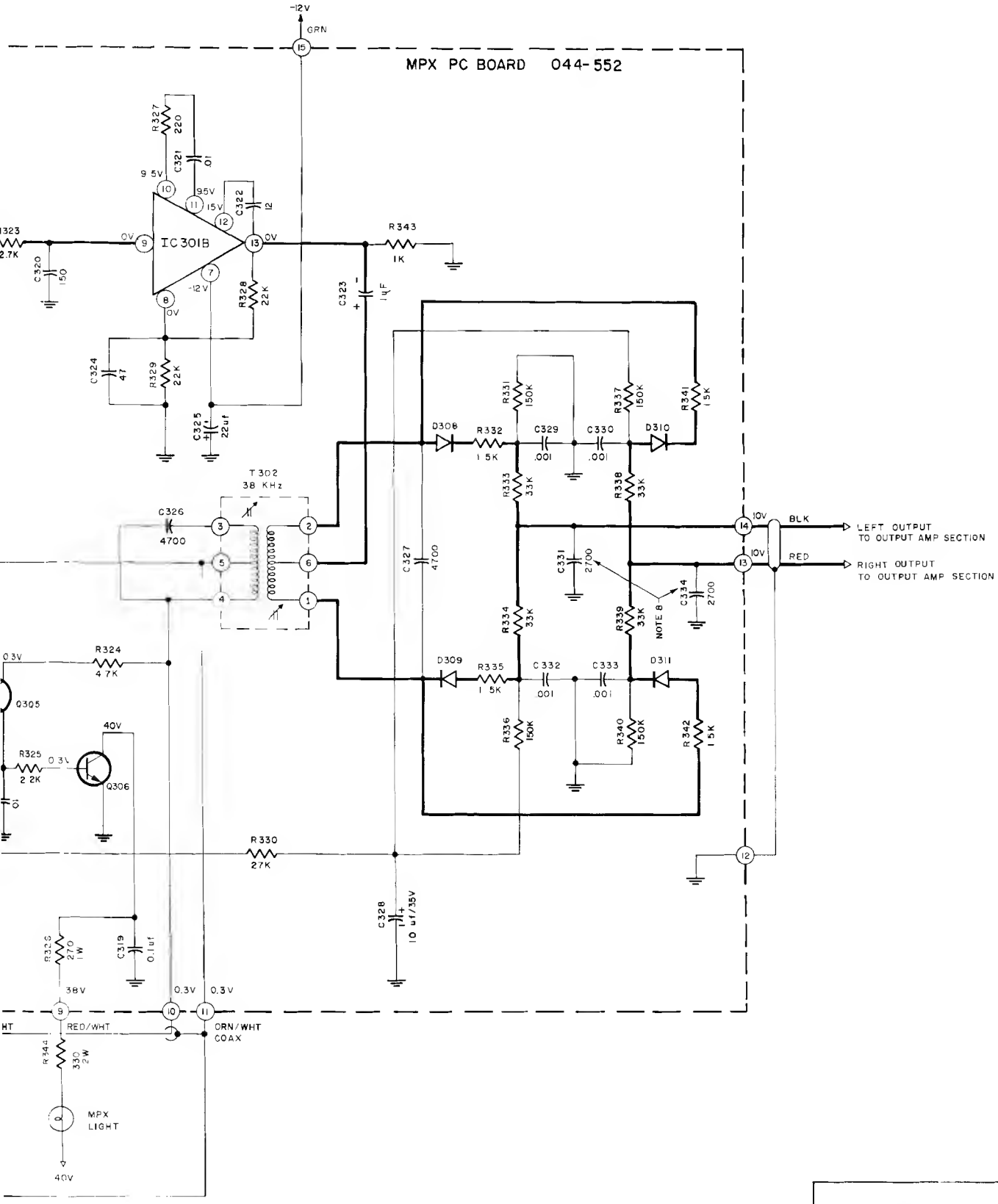


TUNER SECTION

MR 78

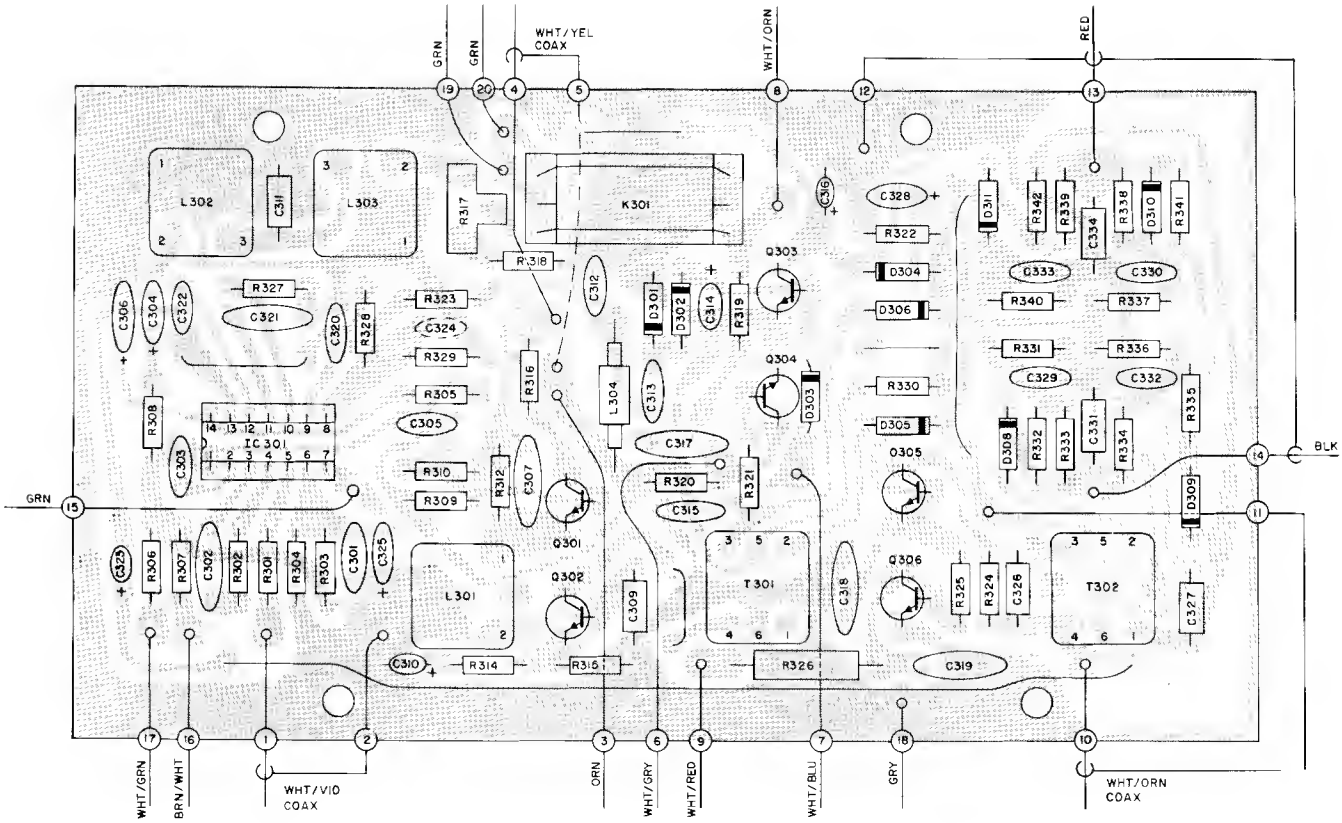
154-699


TP2
R311
4.7K
TUNING METER
M301
GRN/WHT
OV
BRN/WHT
TO L & R FIXED
OUTPUT JACKS
(OUTPUT AMP SECTION)
GRN
OV
GRY
R302
220
C302
01
R306
47K
R307
39K
L302
L303
9.5V
C303
22
R308
2.7K
C304
10uf
FROM DETECTOR
SECTION
VIO/WHT
R301
2.7K
IC 301A
15V
16V
C311
1500
R317
2.5K
MAX
AUDIO
LEVEL
MIN
R318
390
K301
R303
56K
C301
150
R304
8.2K, 5%
C305
220
24V
12.1V
Q301
11.6V
C313
001
D302
0.3V
0.7V
Q303
C316
10 uf/35V
C312
001
L304
1m H
D301
C314
10 uf
D303
C315
001
C306
22uf
R305
1K, 5%
R309
150K
R310
150K
C307
0047
R312
820
R319
1.8K
D304
ORN
C308
10uf/35V
L301
19
KHz
PHASE
T301
19 KHz
D305
D306
R321
270K
R322
47K
Q302
11V
R316
390
R320
220K
Q304
22V
C309
2700
R314
1.2K
C310
10uf
R315
2.7K
C317
05
0.6V
GRY/WHT
BLU/WHT
YEL/WHT
COAX
FRONT
S302
MUTING
S301
MODE SELECTOR
MUTING
LAMP
REAR
4.0V DC



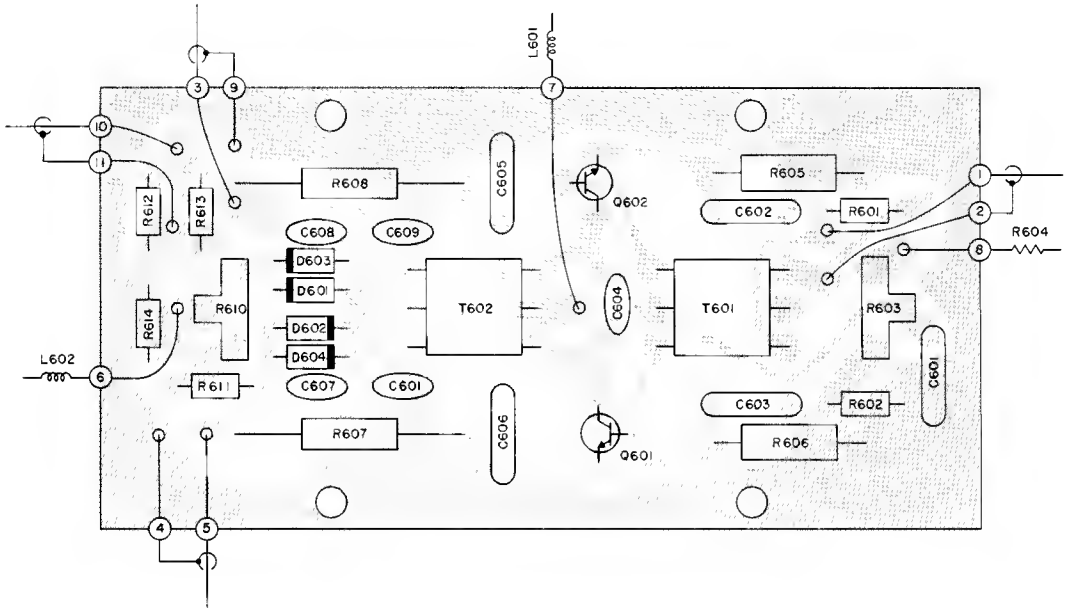
MPX SECTION

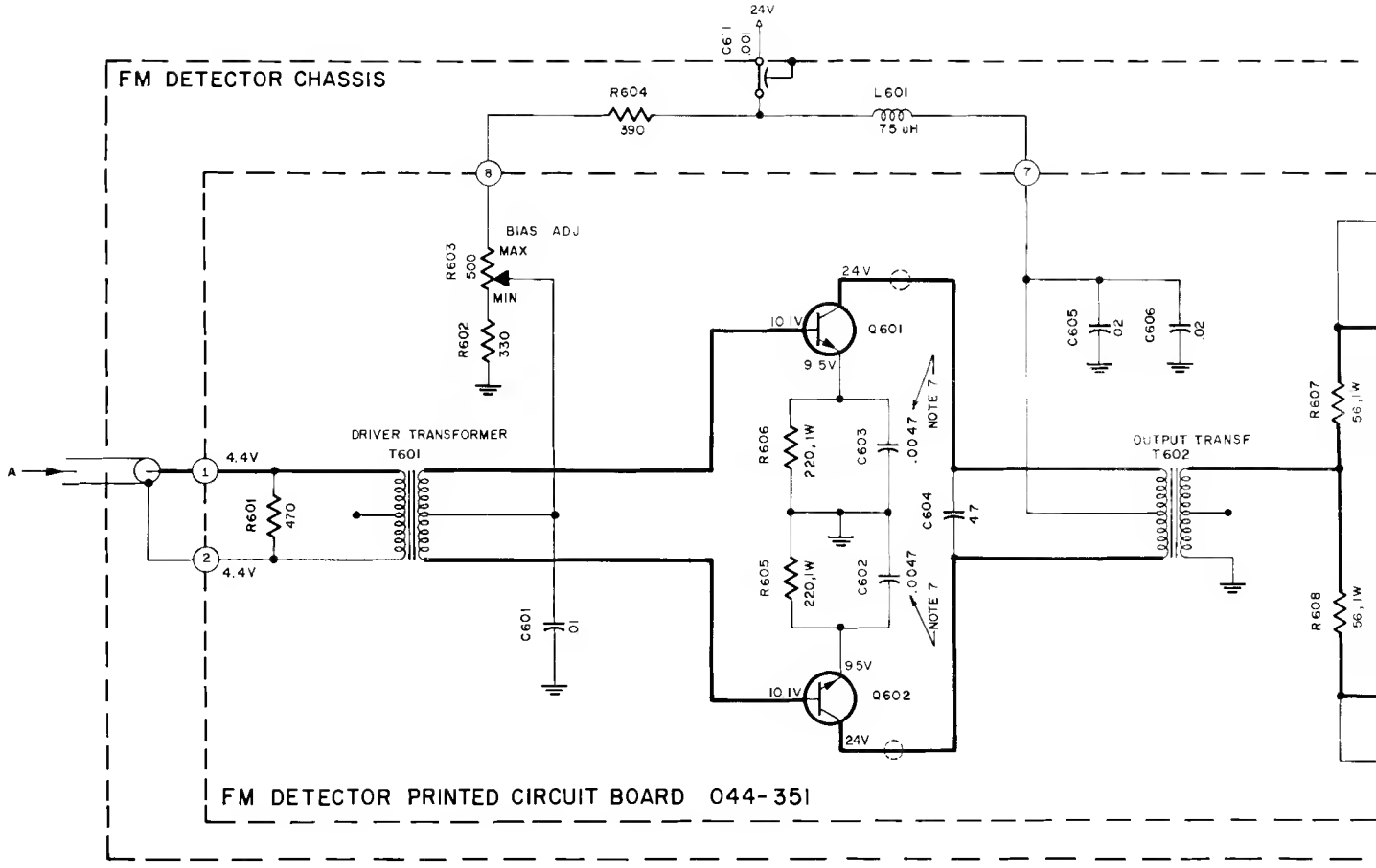
MR 78 154-701

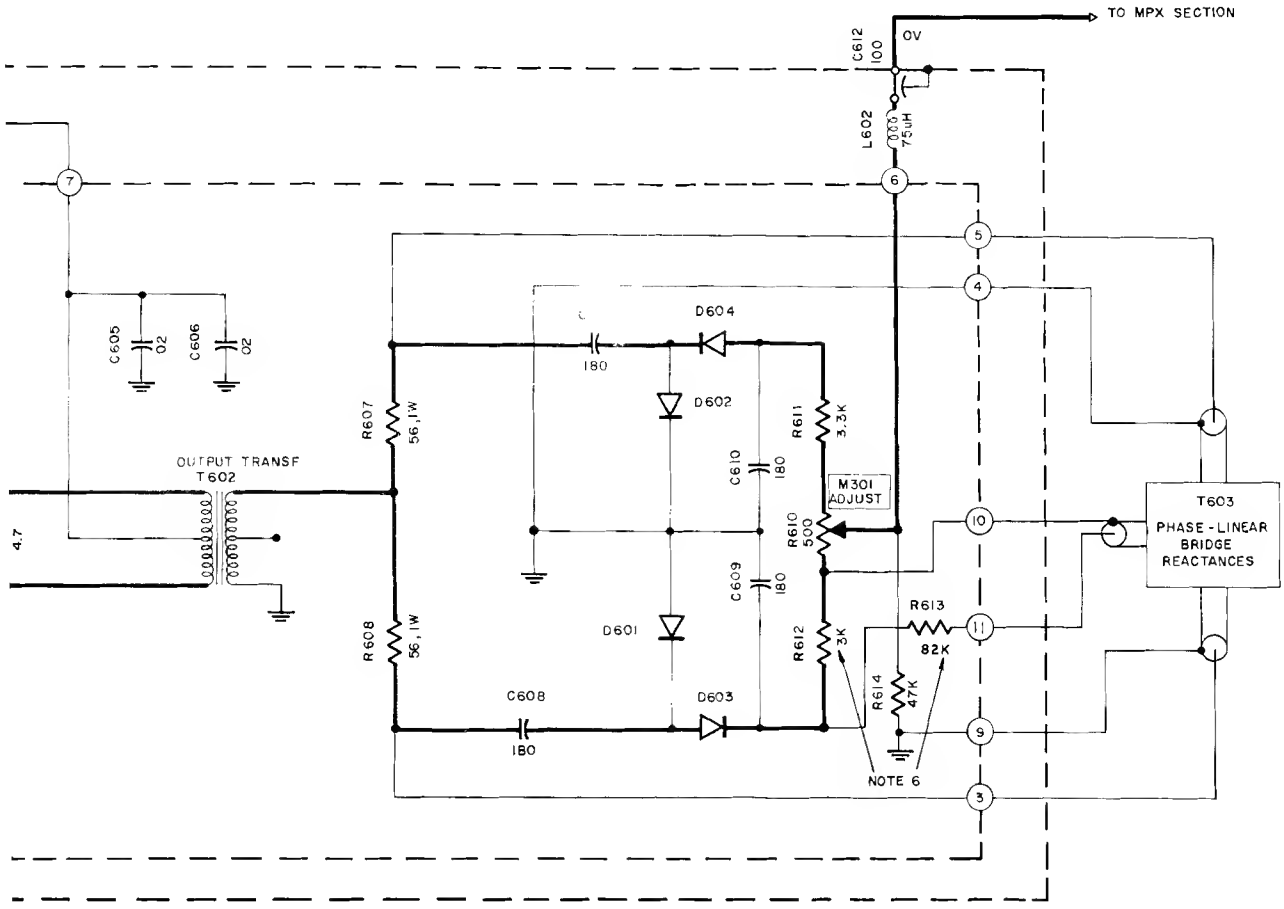


MPX PRINTED CIRCUIT BOARD 044-552

DETECTOR PC BOARD 044-351



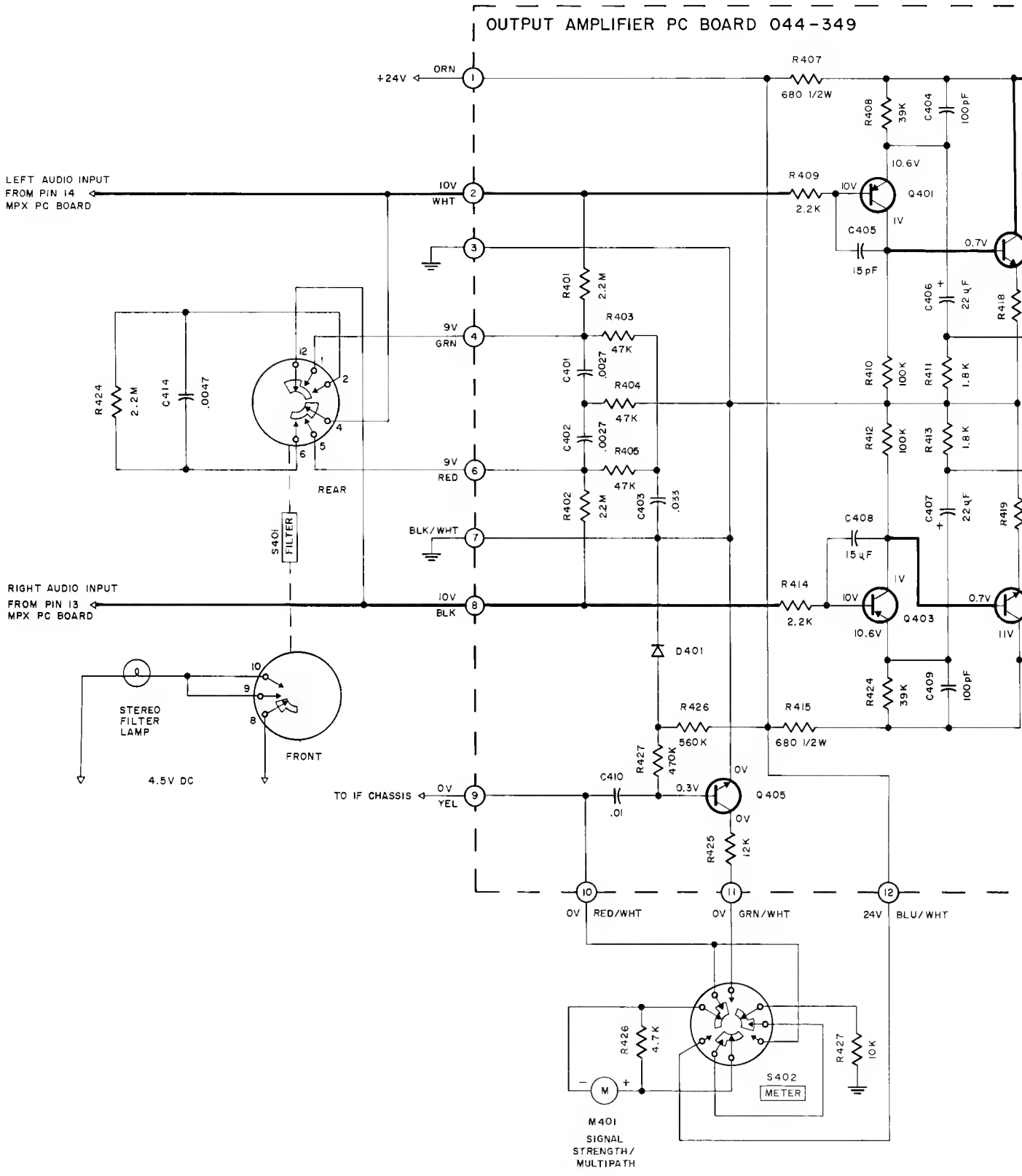

FM DETECTOR CHASSIS
24V
C611
.001
R604
390
L601
75 uH
8
7
BIAS ADJ
MAX
MIN
R603
500
R602
330
24V
10.1V
Q601
9.5V
C605
.02
C606
.02
R607
56, 1W
R608
56, 1W
DRIVER TRANSFORMER
T601
OUTPUT TRANSF
T602
A
1
2
4.4V
4.4V
R601
470
R606
220, 1W
C603
.0047
NOTE 7
C604
47
R605
220, 1W
C602
.0047
NOTE 7
C601
.01
9.5V
10.1V
Q602
24V
FM DETECTOR PRINTED CIRCUIT BOARD 044-351

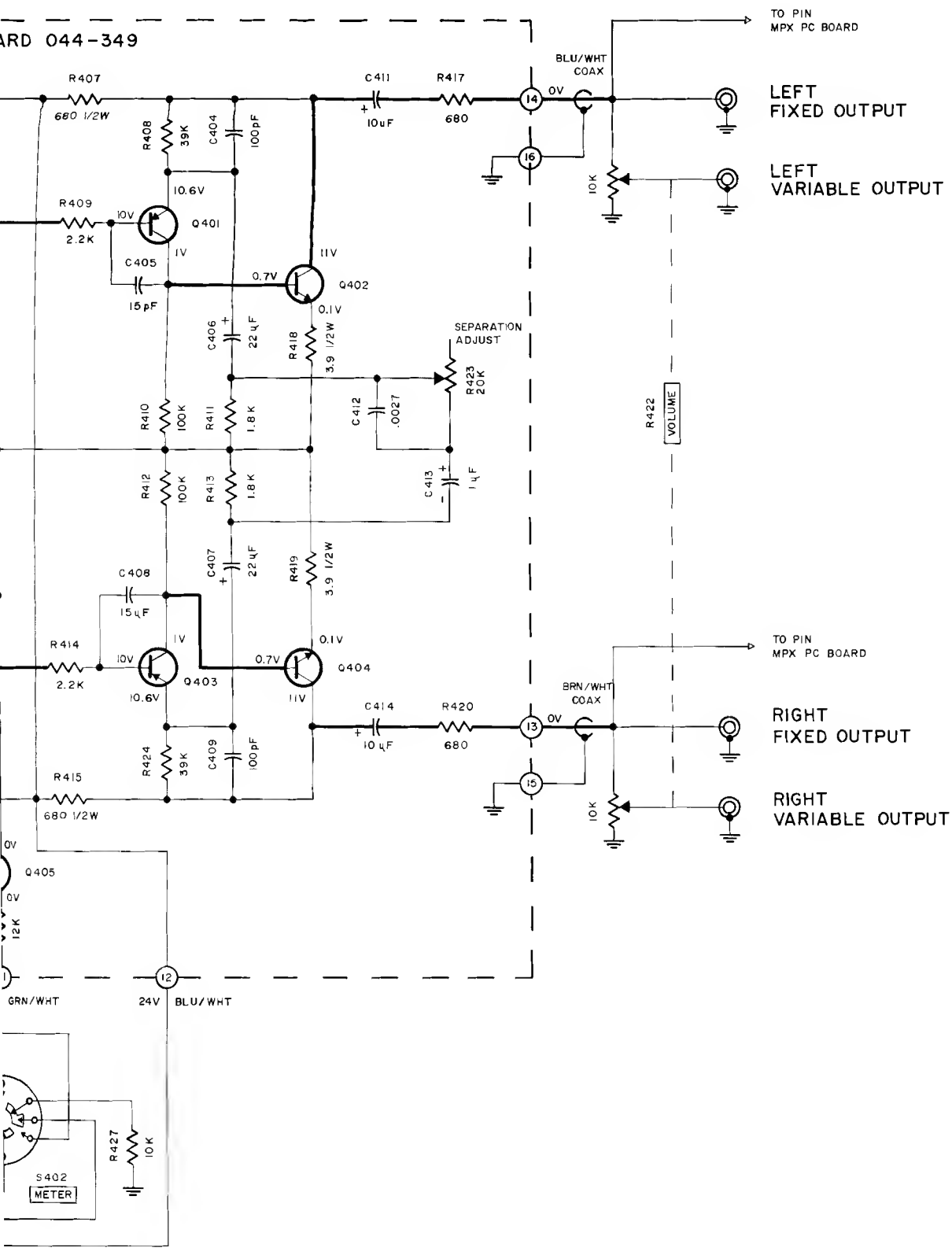


DETECTOR SECTION

MR 78

154-620

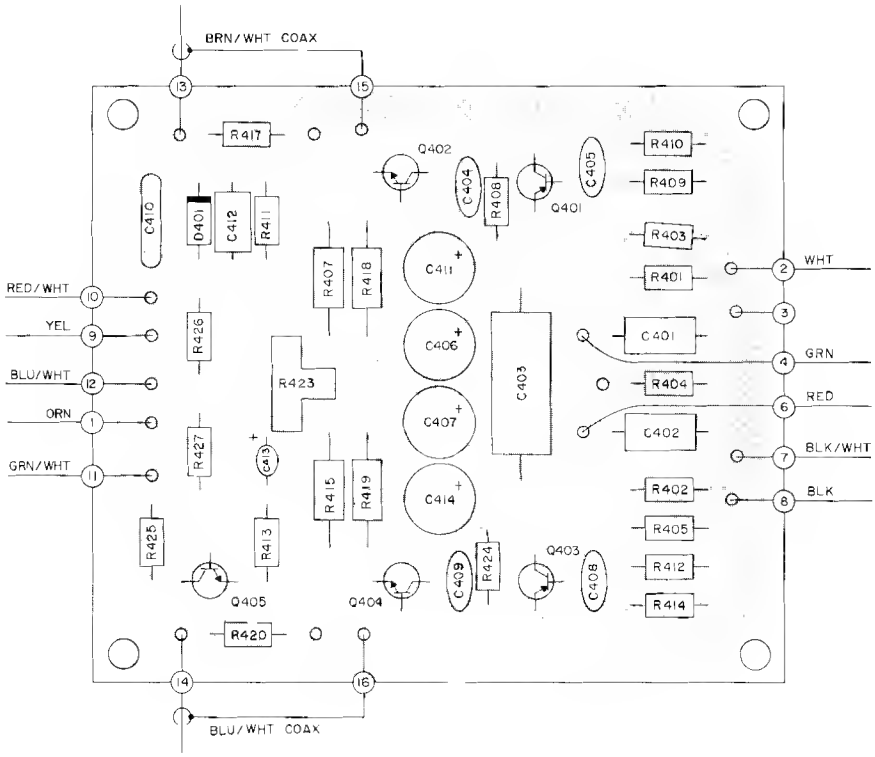

OUTPUT AMPLIFIER PC BOARD 044-349
+24V
ORN
1
R407
680 1/2W
R408
39K
C404
100pF
10.6V
LEFT AUDIO INPUT
FROM PIN 14
MPX PC BOARD
10V
WHT
2
R409
2.2K
10V
Q401
1V
C405
15pF
0.7V
3
R401
2.2M
C406
22 µF
R418
9V
GRN
4
R403
47K
C401
.0027
R410
100K
R411
1.8K
R404
47K
C402
.0027
R412
100K
R413
1.8K
R424
2.2M
C414
.0047
12
1
2
4
5
6
REAR
9V
RED
6
R405
47K
R402
2.2M
C403
.033
C407
22 µF
R419
S401
FILTER
BLK/WHT
7
C408
15 µF
1V
RIGHT AUDIO INPUT
FROM PIN 13
MPX PC BOARD
10V
BLK
8
R414
2.2K
10V
Q403
10.6V
0.7V
11V
D401
10
9
8
STEREO
FILTER
LAMP
FRONT
4.5V DC
R424
39K
C409
100pF
R426
560K
R415
680 1/2W
R427
470K
0V
0.3V
Q405
C410
.01
TO IF CHASSIS
0V
YEL
9
0V
R425
12K
10
11
12
0V
RED/WHT
0V
GRN/WHT
24V
BLU/WHT
R426
4.7K
R427
10K
S402
METER
M
M401
SIGNAL
STRENGTH/
MULTIPATH



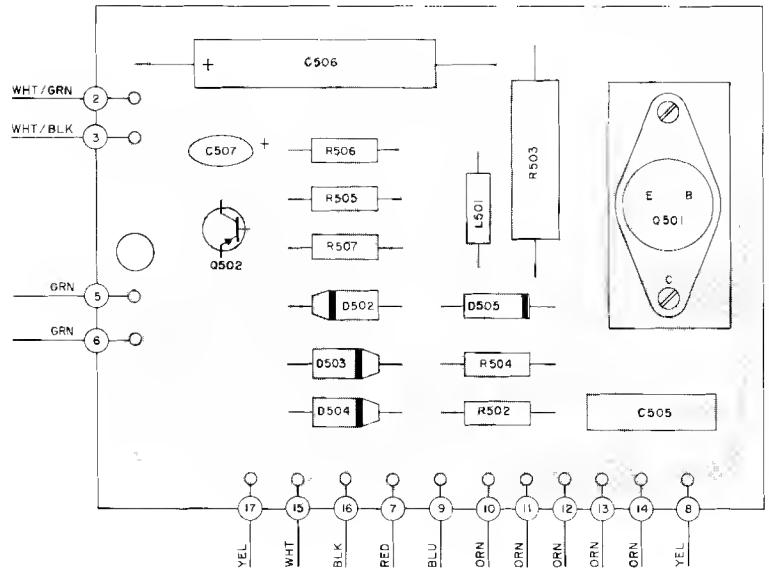
OUTPUT AMP SECTION

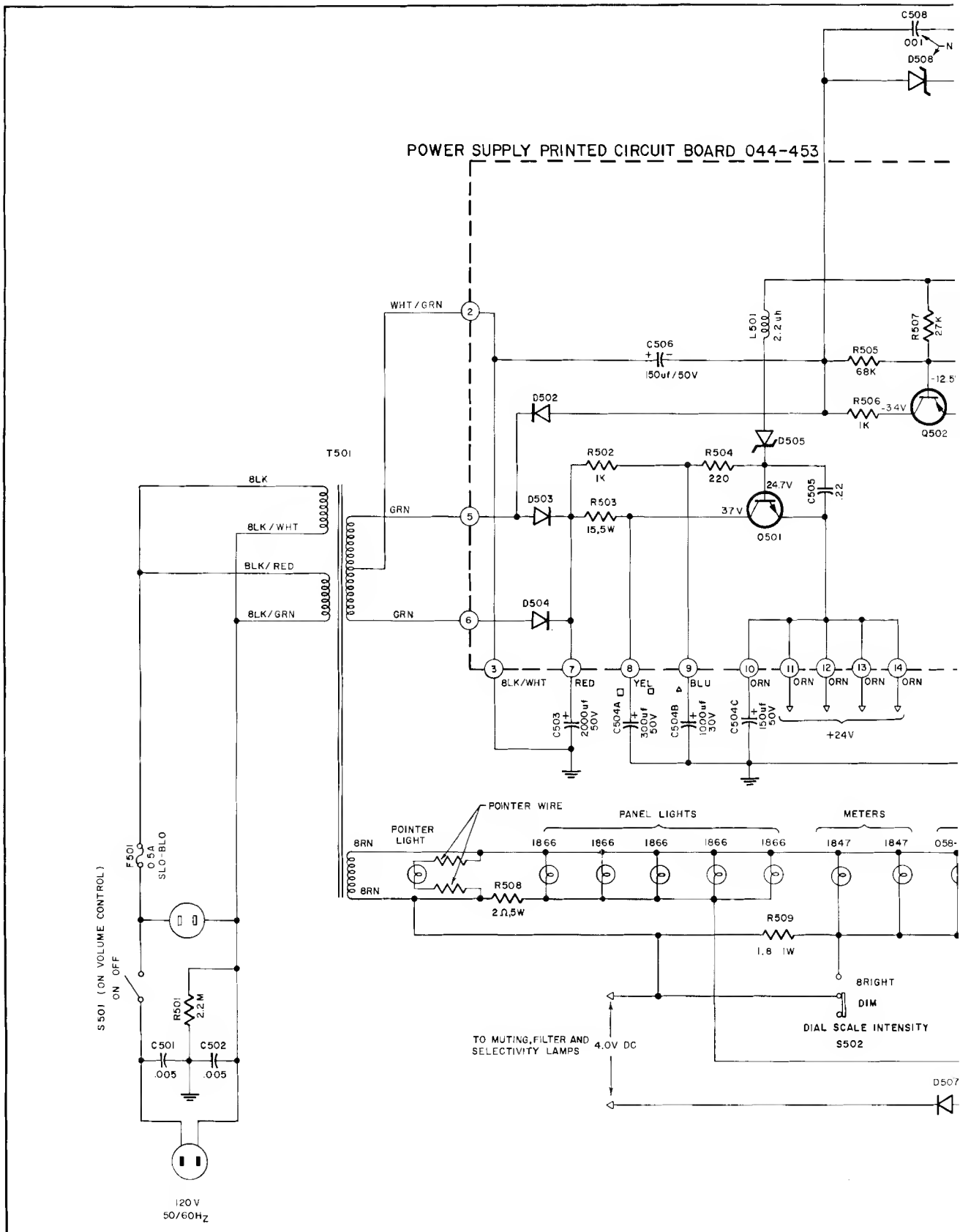
MR78 154-546

OUTPUT AMP PC BOARD 044-349



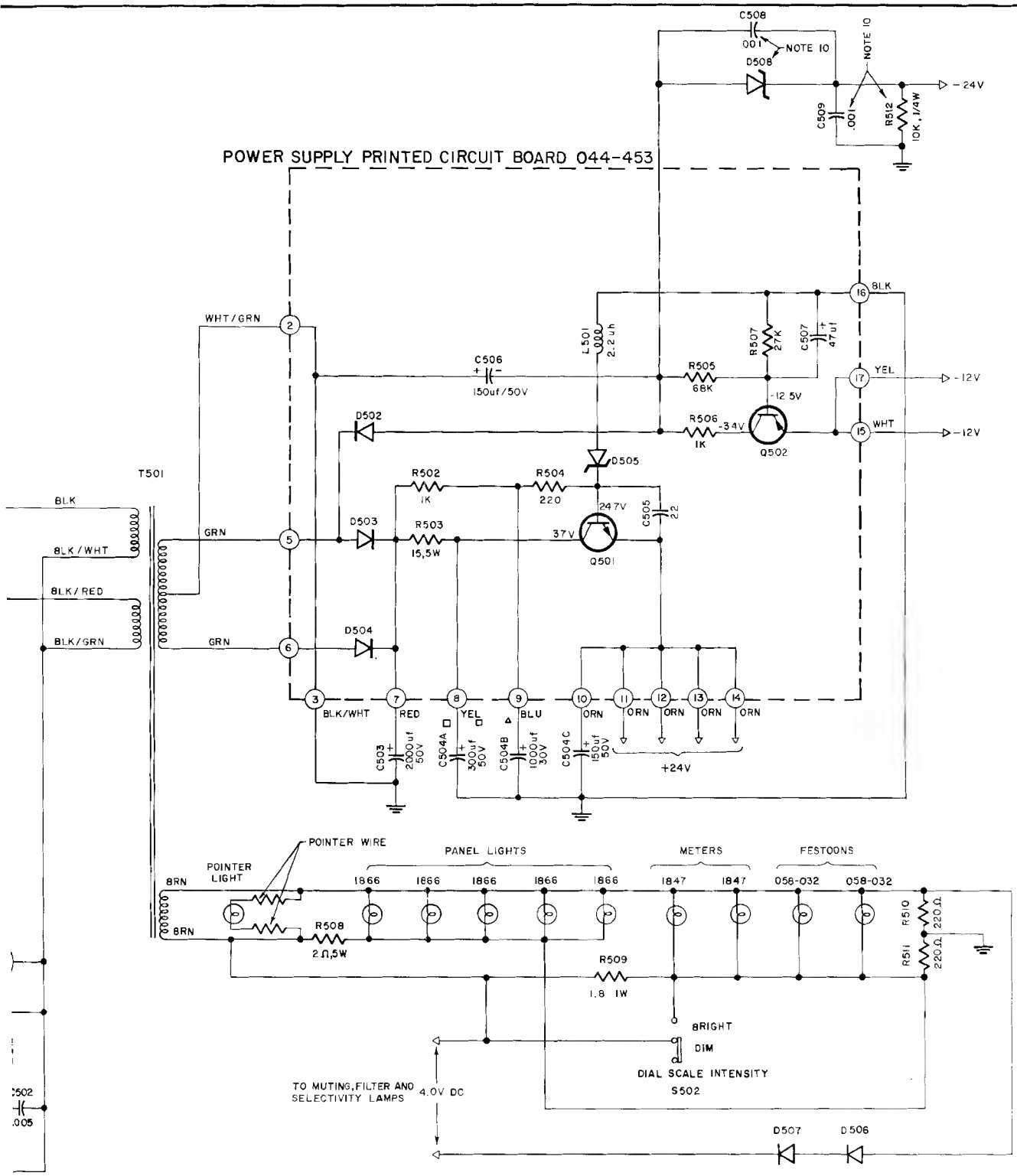
POWER SUPPLY PRINTED CIRCUIT BOARD 044-453




POWER SUPPLY PRINTED CIRCUIT BOARD 044-453
C508
.001
N
D508
WHT/GRN
2
L501
2.2 uh
R507
27K
C506
150uf/50V
R505
68K
-12.5
D502
R506
1K
-34V
Q502
D505
T501
R502
1K
R504
220
24.7V
C505
.22
8LK
D503
R503
15,5W
37V
Q501
GRN
5
8LK/WHT
BLK/RED
8LK/GRN
D504
GRN
6
3
7
8
9
10
11
12
13
14
8LK/WHT
RED
YEL
BLU
ORN
ORN
ORN
ORN
ORN
C503
2000uf
50V
C504A
300uf
50V
C504B
1000uf
30V
C504C
150uf
50V
+24V
POINTER WIRE
PANEL LIGHTS
METERS
POINTER LIGHT
8RN
1866
1866
1866
1866
1866
1847
1847
058-
8RN
R508
2Ω,5W
R509
1.8 1W
F501
0.5A
SLO-BLO
S501 (ON VOLUME CONTROL)
ON OFF
R501
2.2M
C501
.005
C502
.005
120 V
50/60Hz
8RIGHT
DIM
DIAL SCALE INTENSITY
S502
TO MUTING, FILTER AND
SELECTIVITY LAMPS
4.0V DC
D507

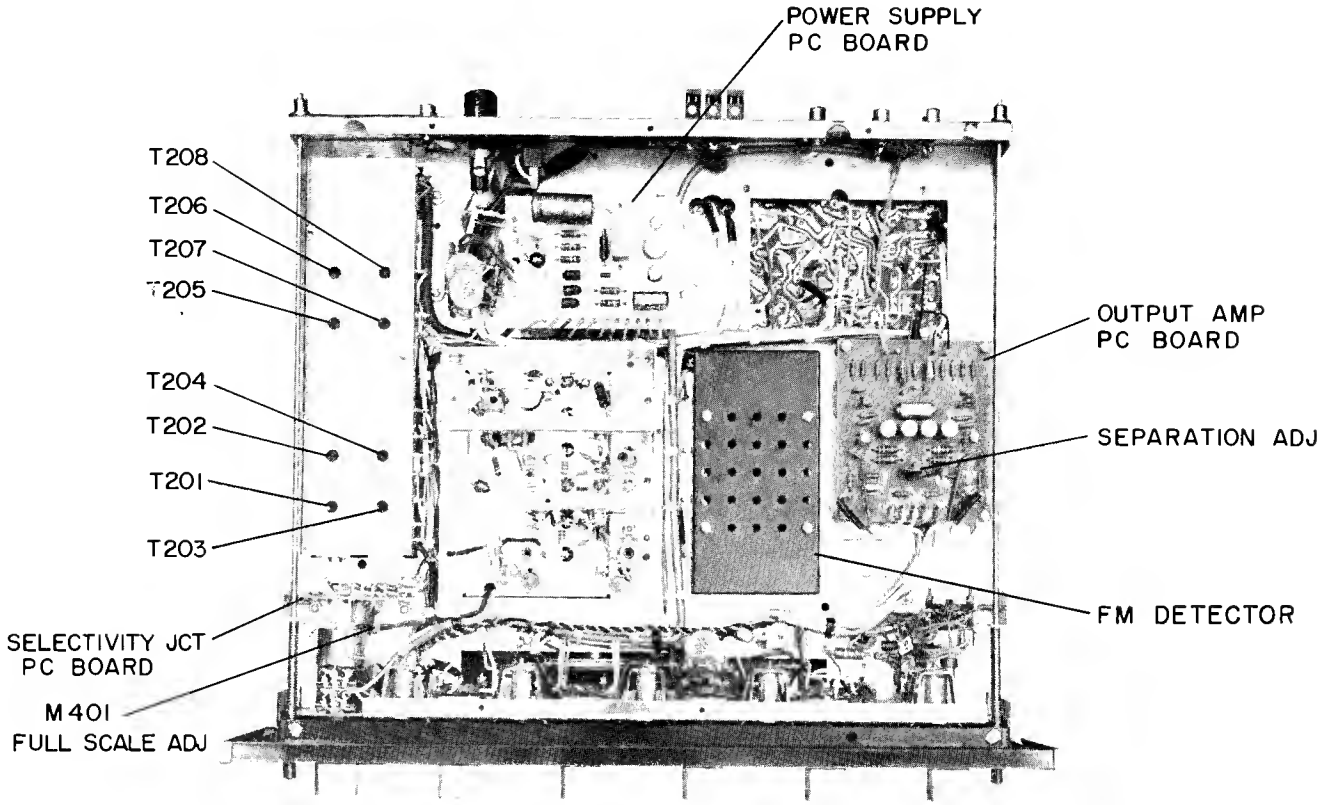
POWE
SE

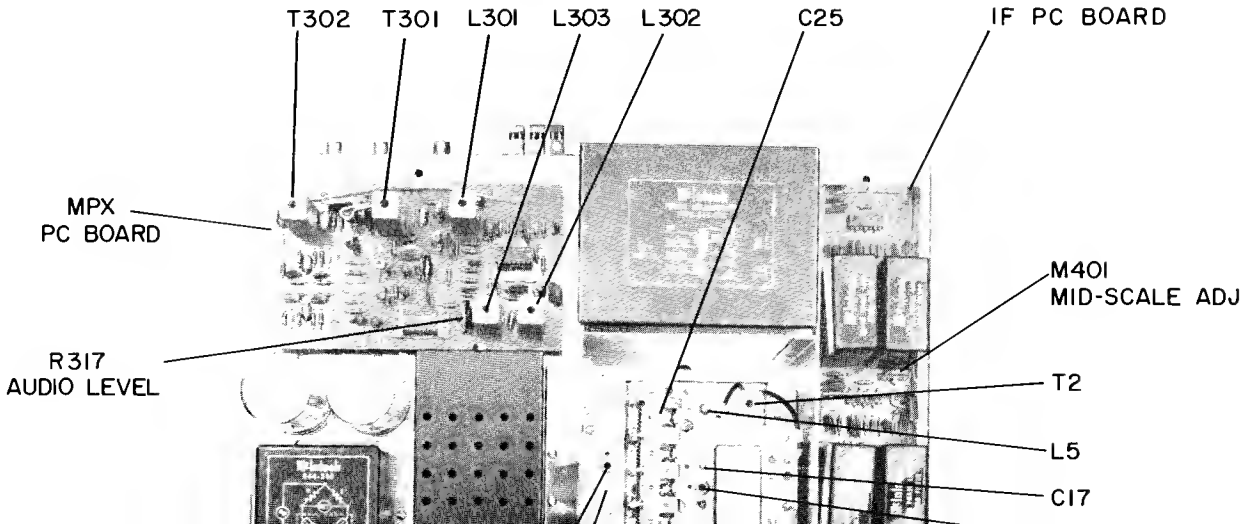
MR78

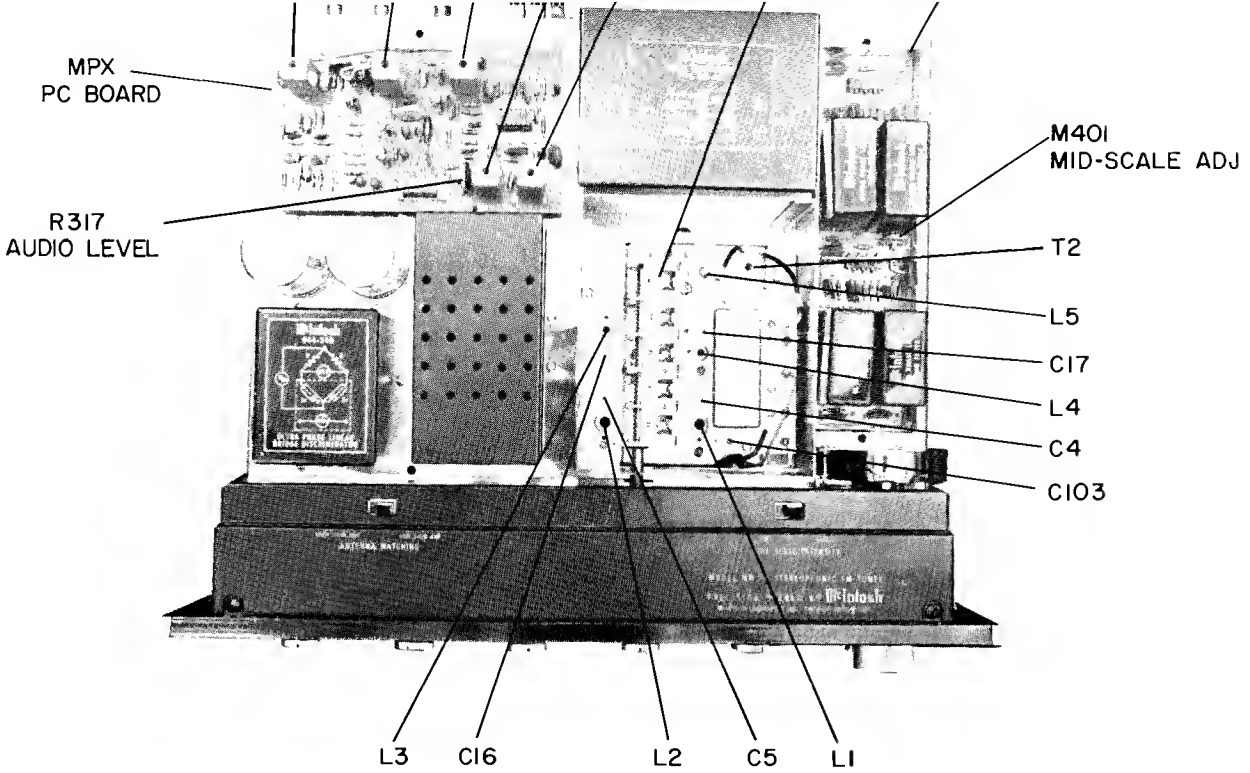


POWER SUPPLY SECTION

MR78 154-704


POWER SUPPLY
PC BOARD
T208
T206
T207
T205
T204
T202
T201
T203
SELECTIVITY JCT
PC BOARD
M401
FULL SCALE ADJ
OUTPUT AMP
PC BOARD
SEPARATION ADJ
FM DETECTOR


T302
T301
L301
L303
L302
C25
IF PC BOARD
MPX
PC BOARD
R317
AUDIO LEVEL
M401
MID-SCALE ADJ
T2
L5
C17



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. 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 Analyzer (Hewlett-Packard 333A or equivalent).
8. 10.7 MHz ±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 curcuits are known to be working, the IF alignment (Steps 1 - 4) may be performed using an 88 - 108 MHz generator (such as Sound Technonogy 1000A).

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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 ±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 ±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	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.
				Move selectivity switch to Super Narrow Position.					
4	Same	Same	Same	Same	Same	Same	Use insulated screw driver.	Same	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.
				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 ±75 kHz @ 60 Hz rate.	Oscillo-scope.	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	300Ω 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 5μV input.	Noise and distortion should be more than 30dB down. Noise with no modulation should be more than 40dB sown. Touch up C5, C16, and C17 if necessary.

							at 5μV input.	
12	92 MHz	92 MHz	Same	Same	Same	L1	Same	Touch up L2, L3, And L4 only if necessary.
13	Repeat Steps 9 and 10 until no further improvement is possible. Always adjust for minimum noise and distortion.							
14	92 MHz	92 MHz	Same	1 kHz at ±75 kHz deviation or Sound Technology Dual Sweep	Harmonic distortion analyzer to L or R output or Sound Technology to L or R output.	R603	Minimum distortion should be less than 0.2%.	A very low distortion FM generator is necessary. Sound Technology 1000A is recommended. Typical MR 78 distortion is 0.05% in this test. Minimum distortion should correspond closely to maximum audio output. If Sound Technology 1000A is used, adjust R603 for smoothest horizontal dual-sweep pattern. Refer to Sound Technology manual. Check 1kHz harmonic distortion.
15	Same	Same	Same	1 kHz at ±75 kHz deviation.	Oscilloscope connected to L or R output.	R610	Reduce signal strength until noise appears on tips of signal. If necessary, adjust R610 so that tuning meter is centered.	
	Move antenna selector switch to Low Gain Position.							
16	Same	Same	Same	Same	Harmonic distortion analyzer to L or R output.		Set generator for 2.5μV output in 300Ω.	Total noise and distortion should be more than 30dB sown. Noise with no modulation should be more than 40dB down.
17	104 MHz	Same	Same	Same	Same		Same	Same IF distortion and noise are out of spec., repeat Steps 11 thru 13. Be sure selectivity switch is in normal.
18	IF Gain Check With Selectivity Switch. Feed a 100% modulated 1 kHz mono signal to the tuner and set signal generator RF level to 10μV. Move selectivity switch to all three positions and observe signal strength. meter. (Meter switch should be on signal strength.) Repeat with RF levels of 100, 300, 1000, 10,000, and 100,000μV. The signal strength meter should not very more than one S-unit when selectivity switch is moved. If it does, there is a ga variation in the IF amplifier due to malfunction or misalignment. Recheck alignment Steps 1 thru heck M401 calibration. With selectivity on broad, M401 should read 6 on a 500μV signal and 10 on a 00μV signal. If not, adjust R212 to read 6 on a 500μV signal and R226 to read 10 on a 30,000μF signal. (Antenna selector should be in low gain position.)							

MULTIPLEX DECODER ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
	100 MHz	Same as	300Ω	Mono (R = L)	Oscilloscope and AC-		R317	2.5V RMS	Make sure tuning meter is at zero center.

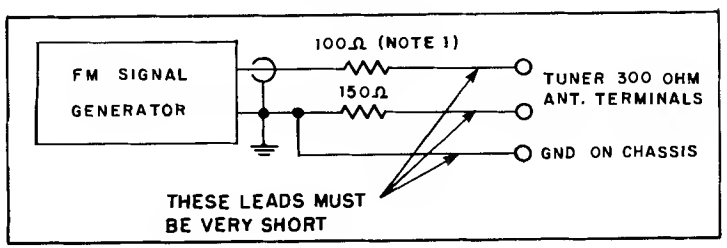
Move selectivity swi. to Narrow Position.

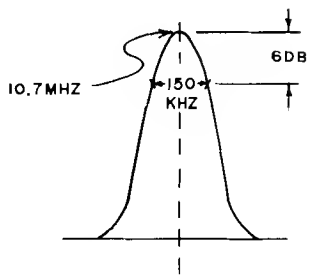
1	100 MHz or point of no interference	Same as tuner dial	300Ω antenna terminals with approximately 1000μV signal thru matching network or balun	Mono (R = L) 1 kHz 100% modulation	Oscilloscope and AC-VTVM connected to either fixed audio output jack.		R317	2.5V RMS at fixed output jacks	Make sure tuning 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	Pin 13 of I_C on stereo decoder board	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	Base of Q305	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 Pin 1 or 2	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	Right fixed output jack	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.)

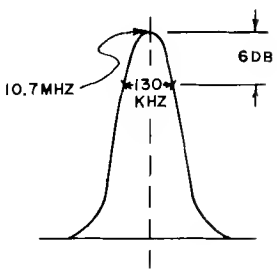
FIG. 2 TYPICAL IF RESPONSE CURVE NORMAL

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.	10µF	35V	066-173
C304	Tant.Elect.	10µF	20V	066-239
C306	Tant.Elect.	22µF	25V	066-240
C308	Tant.Elect.	6.8µF	35V	066-146
C309	Polystyrene	2700pF		064-093
C310	Tant.Elect.	10µF	20V	066-239
C311	Polystyrene	1500pF		064-092
C314	Tant.Elect.	6.8µF	35V	066-146
C316	Tant.Elect.	6.8µF	35V	066-146
C323	Tant.Elect.	1uF	50V	066-242
C325	Tant.Elect.	22µF	25V	066-240
C326,327	Polystyrene	4700pF		064-091
C328	Tant.Elect.	6.8µF	35V	066-146
C331	Polystyrene	.0033µF		064-090
C334	Polystyrene	.0033µF		064-090
C401,402	Polystyrene	2700pF		064-093
C403	Polystyrene	.033µF		064-089
C406,407	Elect.Cap.	22µF	35V	066-179
C411	Elect.Cap.	10µF	50V	066-221
C412	Polystyrene	2700pF		064-093
C413	Tant.Elect.	1µF	50V	066-242
C414	Elect.	10µF	50V	066-221
C503	Elect.	2000µF	50V	066-154
C504	Elect.	5/300/150/1000µF 200/50/50/30V		066-155
C506	Elect.	150µF	63V	066-205
C507	Elect.	47µF	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 75µH	122-013
L7	Choke 1.7µH	122-032
L301	Filter Coil (19kHz)	122-094
L302,303	Filter Coil (SCA)	122-093
L304	Choke 1MH	122-092
L501	Choke 2.2µH	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			132-090
Q403		Si. PNP transistor			132-096
Q404		Si. NPN transistor			132-090
Q405		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
		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	220Ω	5%	1W	139-076
R333,334	film	33K	1%	1W	144-015
R338,339	film	33K	1%	1W	144-015
R503	wire	15Ω	10%	5W	139-041
R508	wire	2.0Ω	10%	5W	139-005
R509	wire	1.8Ω	10%	1W	139-077
R605,606	wire	220Ω	5%	1W	139-076
R607,608	film	56.2Ω	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
		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 & 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