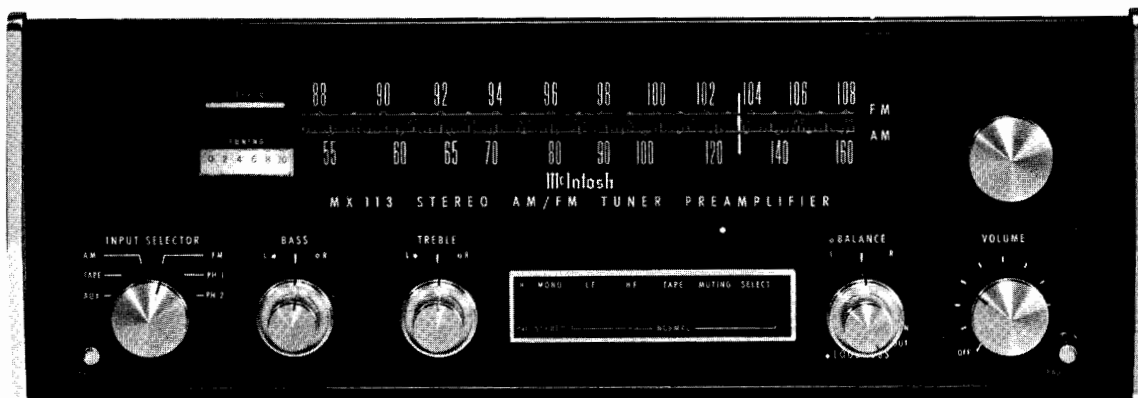


McIntosh

MX 113 *AM / FM TUNER PREAMP*



SERVICE INFORMATION

STARTING WITH SERIAL NO. 100H1

McINTOSH LABORATORY INC. 2 CHAMBERS STREET BINGHAMTON, NEW YORK

MX 113

AM TUNER SECTION

SENSITIVITY

75 μ V IHF (external ant.)

SIGNAL TO NOISE RATIO

45 dB IHF minimum; 55 dB at 100% modulation.

HARMONIC DISTORTION

Does not exceed 1% at 30% modulation.

SELECTIVITY, ADJACENT CHANNEL

35 dB minimum IHF in "NORMAL" Position.
45 dB minimum IHF in "NARROW" Position.

IMAGE REJECTION

65 dB minimum 540 kHz - 1600 kHz.

FREQUENCY RESPONSE

3.5 kHz - 6 dB, "NORMAL" Position.
2.1 kHz - 6 dB, "NARROW" Position.FM TUNER SECTION

USEABLE SENSITIVITY

2.5 microvolts at 100% modulation (± 75 kHz deviation) for 3% total noise and harmonic distortion IHF.

SIGNAL TO NOISE RATIO

70 dB below 100% modulation.

CAPTURE RATIO

1.5 dB

HARMONIC DISTORTION

Mono: Does not exceed 0.3% at 100% modulation ± 75 kHz deviation.

Stereo: Does not exceed 0.5%

AUDIO FREQUENCY RESPONSE

 ± 1 dB 20 Hz to 15,000 Hz with standard de-emphasis (75 μ sec.) and 19,000 Hz pilot filter.

SELECTIVITY

ADJACENT CHANNEL:

6 dB minimum IHF in "NORMAL" Position.
15 dB minimum IHF in "NARROW" Position.

ALTERNATE CHANNEL:

58 dB minimum IHF in "NORMAL" Position.
88 dB minimum IHF in "NARROW" Position.

SPURIOUS REJECTION

90 dB IHF minimum.

IMAGE REJECTION

95 dB minimum, 88 MHz - 108 MHz.

STEREO SEPARATION

35 dB at 1,000 Hz.

SCA FILTER

50 dB rejection from 67 kHz to 74 kHz.
275 dB per octave slope.PREAMPLIFIER SECTION

FREQUENCY RESPONSE

 ± 0.5 dB, 20 Hz to 20,000 Hz.

DISTORTION

Less than 0.1% at 2.5 volts 20Hz to 20 kHz.

INPUT SENSITIVITY (phono 1 and phono 2)

2 millivolts for 2.5 volts output at 1 kHz.

INPUT SENSITIVITY (aux, tape)

0.25 volts for 2.5 volts output.

HUM AND NOISE (phono 1 and phono 2)

72 dB below 10 millivolt input.

HUM AND NOISE (aux, tape)

85 dB below rated output.

OUTPUT (main)

2.5 volts with rated input. Up to 10 volts can be developed without distortion. FM and AM will produce up to 10 volts output at 100% modulation.

OUTPUT (tape)

0.25 volts with rated input. Phono input signal of 10 millivolts produces 1.2 volts output. FM and AM will produce 1.2 volts output at 100% modulation.

OUTPUT (center channel)

2 volts with rated input to both channels.

BASS CONTROL

-18 dB to +16 dB at 20 Hz.

TREBLE CONTROL

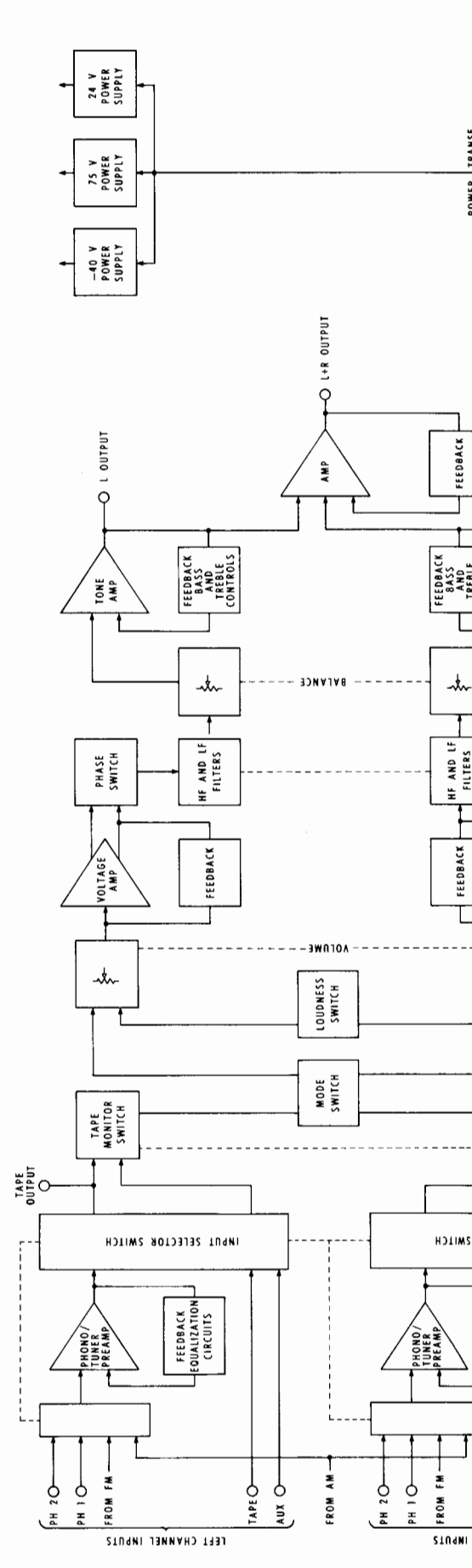
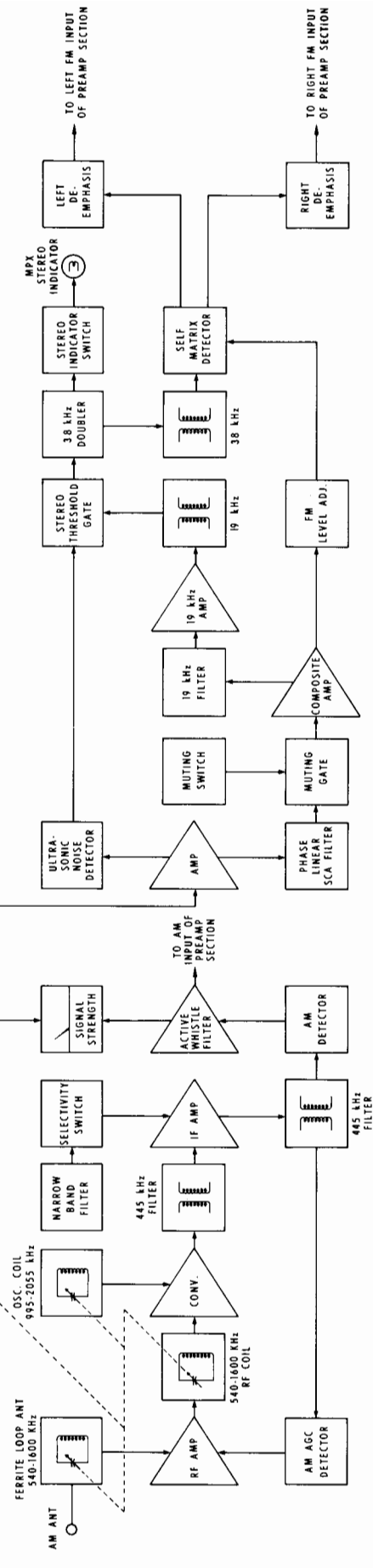
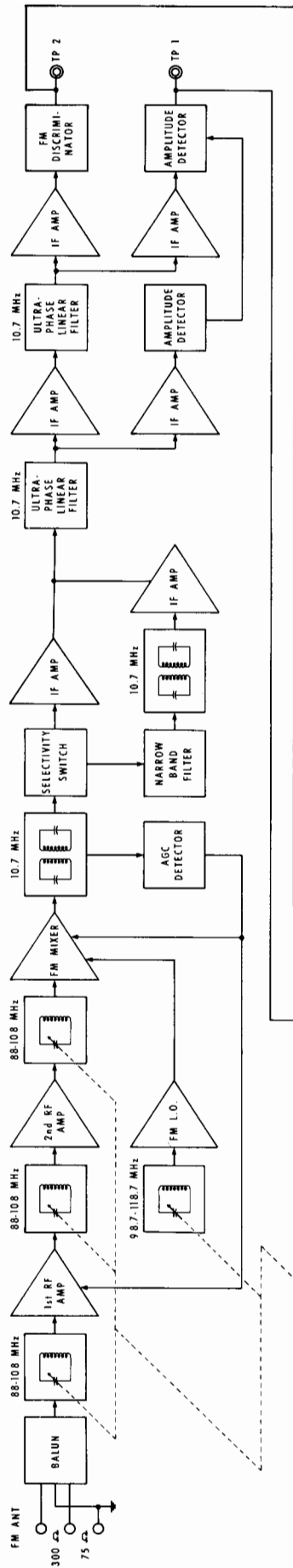
 ± 20 dB to 20,000 Hz.

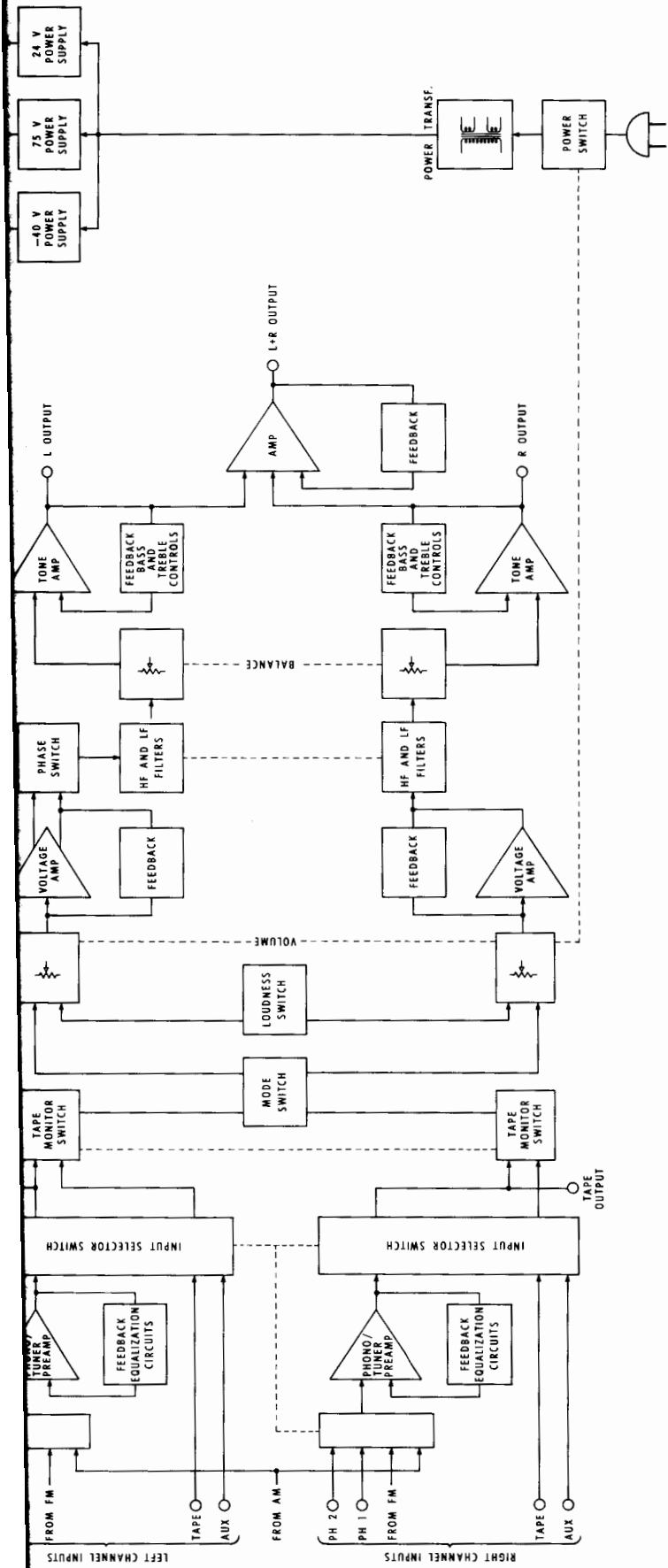
LF FILTER

Flat or roll off below 50 Hz, down 12 dB at 20 Hz.

HF FILTER

Flat or roll off above 5000 Hz, down 12 dB at 20,000 Hz.





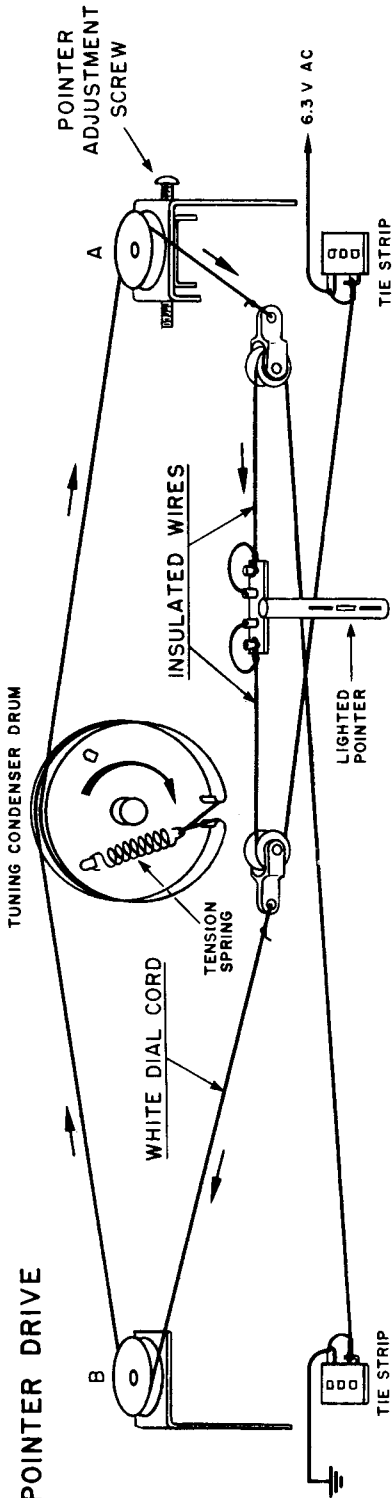
MX 113 BLOCK DIAGRAM

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 (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 $\pm 10\%$ 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	100 MHz (no signal)
Volume	Fully CCW
Mode	Stereo
Muting	Out
Input Selector	AM (to measure AM section)
	FM (to measure FM section)
Panel Lights	Bright
Selectivity	Out
 - f. Voltages shown in rectangles are measured with selectivity switch in the "In" position.
6. In units with serial no.'s below 187H5 R219 and R225 are used.
7. In units with serial no.'s below 190H0 R329 and R330 are 15K; C8 is 12pF R528 is used; D505 and D506 are not used and R530 is connected as shown by dotted line.
8. In units with serial no.'s below 178H9 C38 is 3pF; C527 and C528 are not used and dial glass is McIntosh part no. 044-359.
9. In units with serial no.'s below 189H4 C505 is .02 μF .
10. In units with serial no.'s from 175H0 to 190H0 C527 and D504 are used.
11. In units with serial no.'s below 199H9 C124 is used and C402 is 100pF.
12. In units with serial no.'s from 167H5 to 178H8 C101 and C108 is not used.
13. In units with serial no.'s below 182H5 R408 is 680 Ω ; R411 is 10K; R412 and R418 are used.
14. In units with serial no.'s from 238H2 to 282H6 C213 is used. In units with serial no.'s below 282H6 R203 is used and L201 is not used.
15. In units with serial no.'s below 322H6 R337 and R338 is 1.8k.
16. In units with serial no.'s below 269H6 the MPX Lamp is a #1828 bulb and R419 is used.
17. In units with serial no.'s below 262H1 C214 is not used.
18. In units with serial no.'s below 400H1: R399 and R400 are 1M; C303, C304, C313 & C314 are used; C346, C347, C348, C349, C350, C351, R399-2 and R399-3 are not used and C415 is .22 μF .
19. In units with serial no.'s below 282H6: C413 is .1 μF ; R415 and R416 are used; Q407 is not used and D407 is connected as shown by dotted lines.
20. In units with serial no.'s below 334H9 R530 is 7.5k and D505 is McIntosh Part No. 070047.
21. In early units R526 is not used.
22. In early units C10 and C35 are .001 μF .

POINTER DRIVE



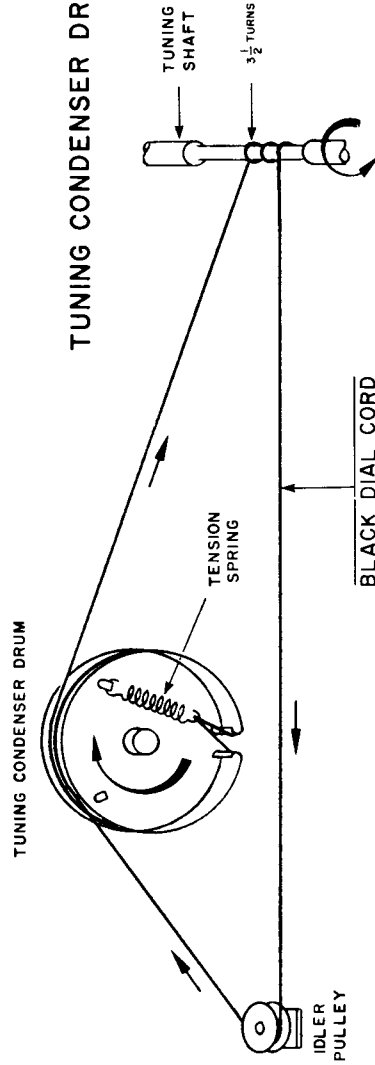
Step 1 Before stringing unit, turn pointer adjustment screw until pulley "A" is in the center of its travel.

Step 2 String unit as shown.

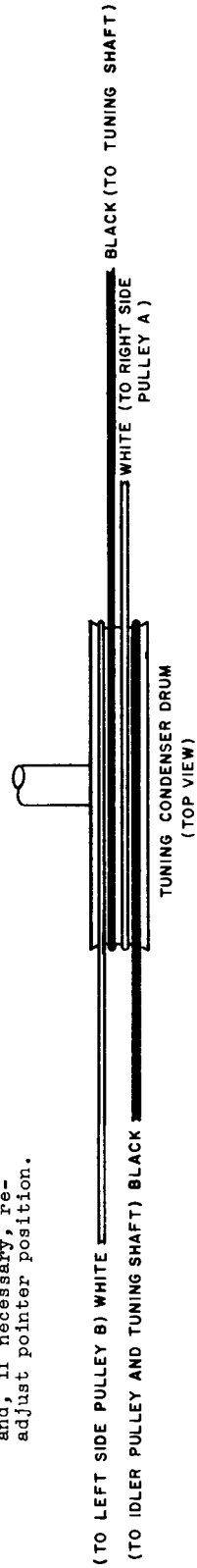
Step 3 After stringing unit, turn tuning shaft until pointer is as far to the left as it will go. Turn the pointer adjustment screw until the pointer coincides with the zero bar of the logging scale.

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.

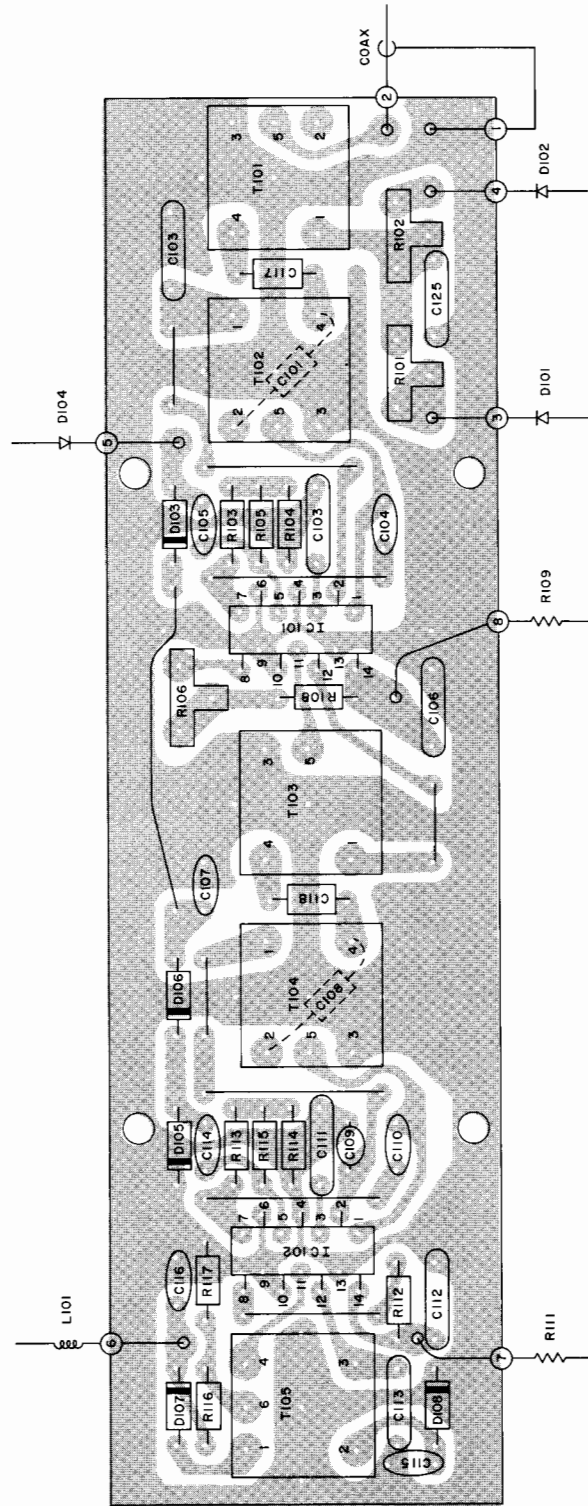
TUNING CONDENSER DRIVE



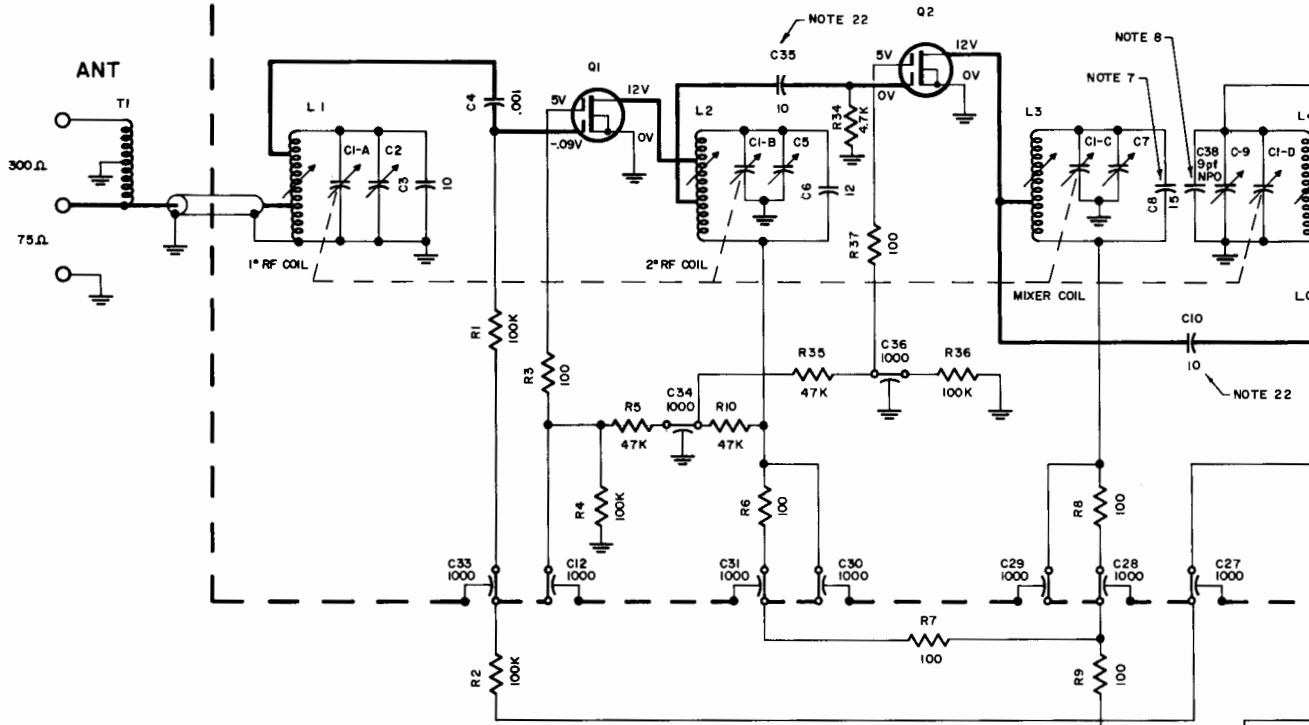
DIAL CORD SEQUENCE



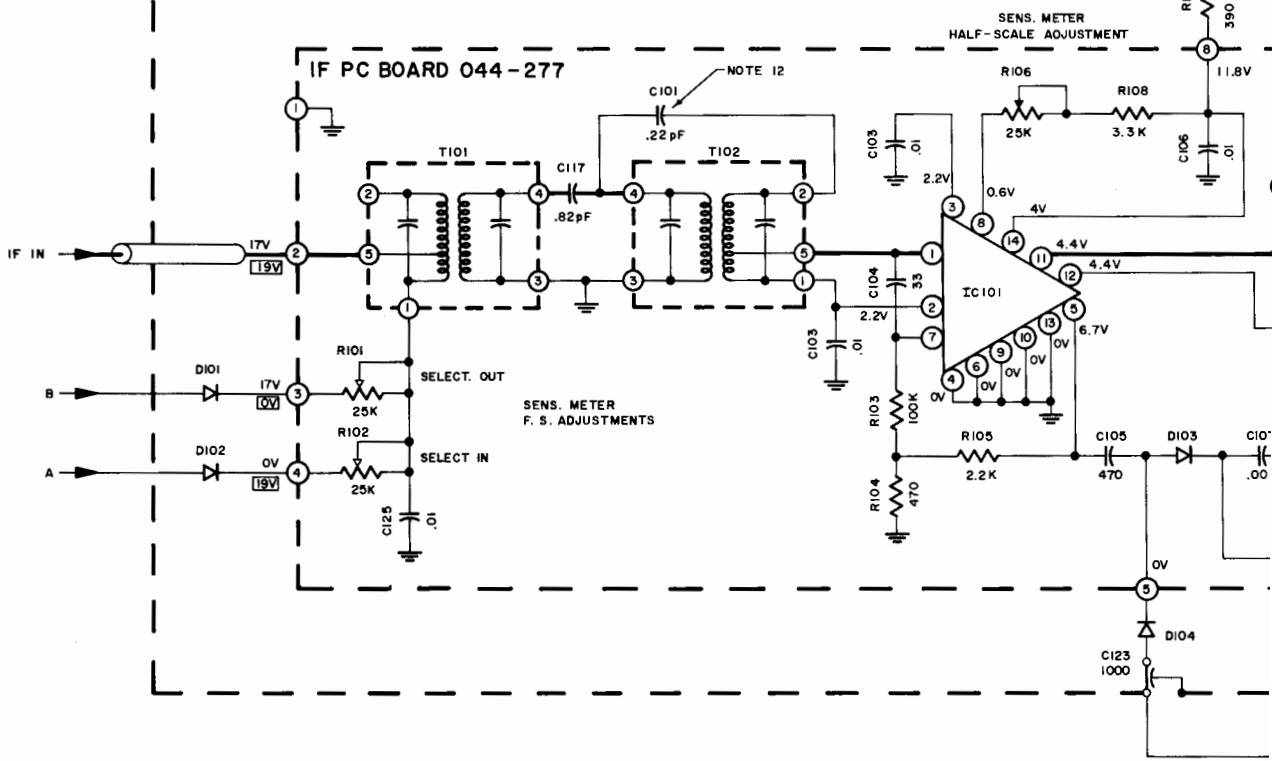
IF PC BOARD 044-277



RF CHASSIS

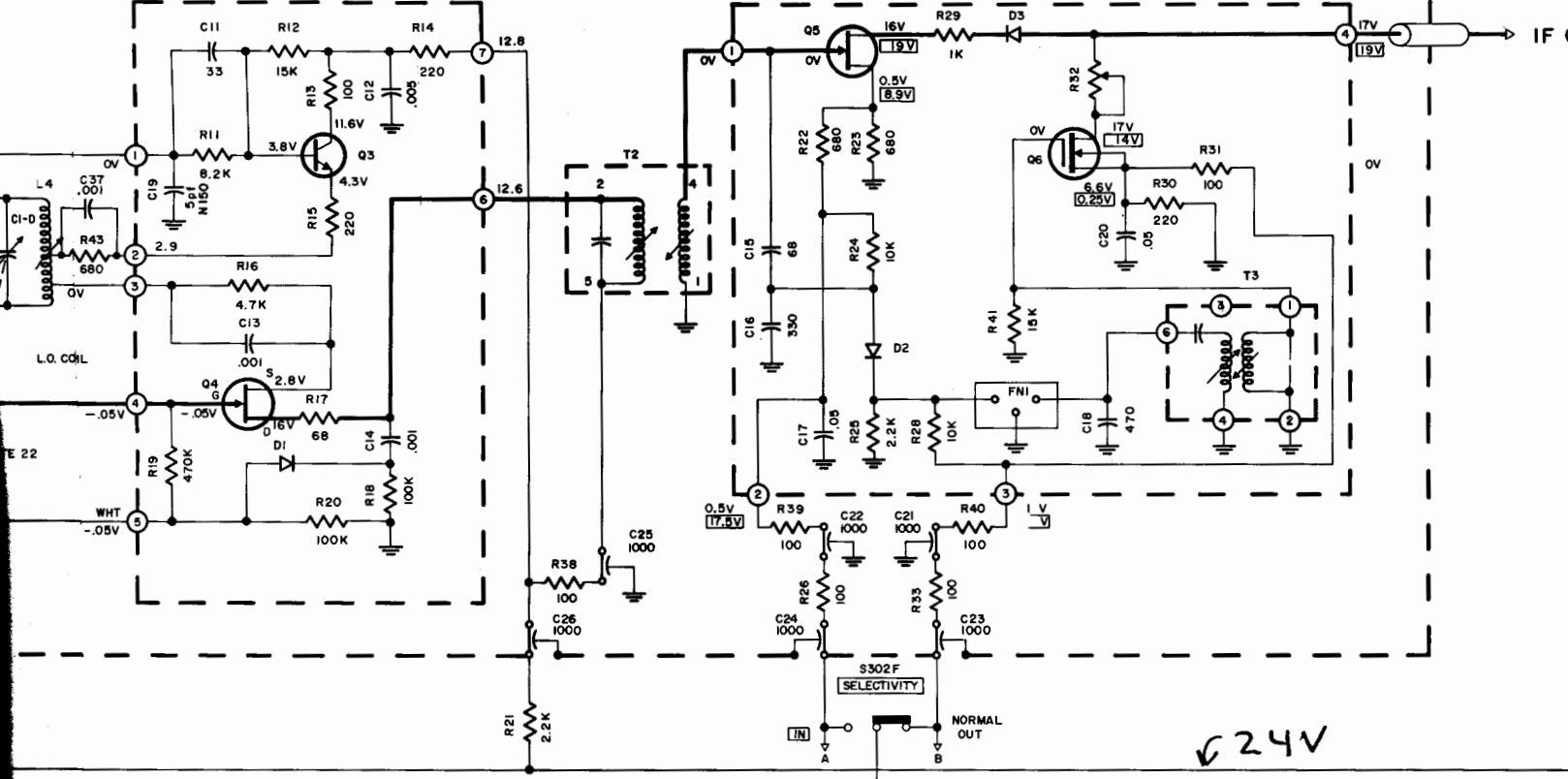


IF CHASSIS

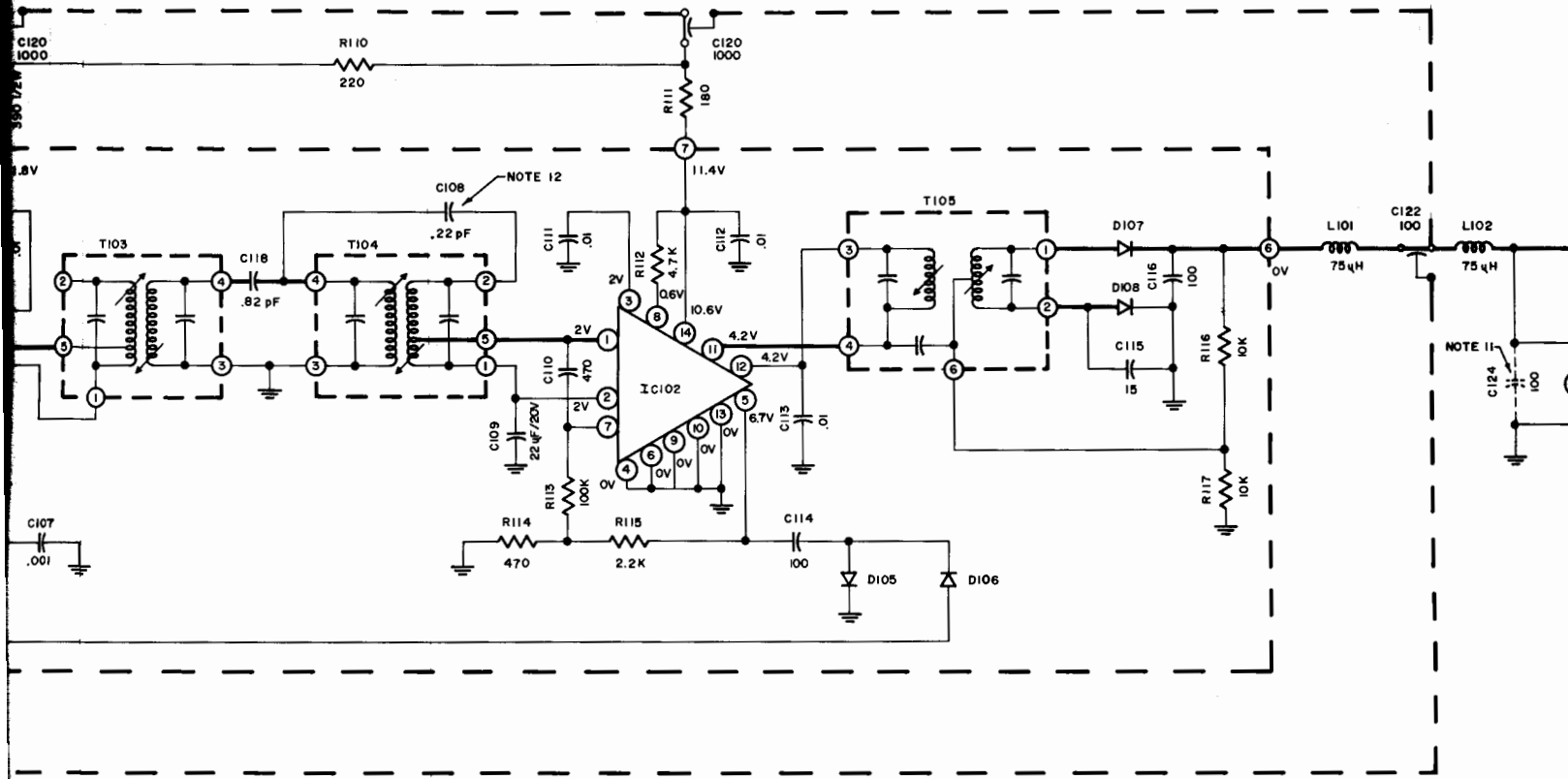


LO & MIXER PC BOARD 044-292

VARIABLE SELECT PC BOARD 044-290

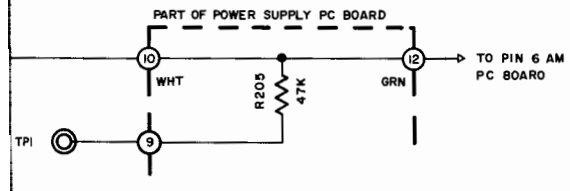


24V



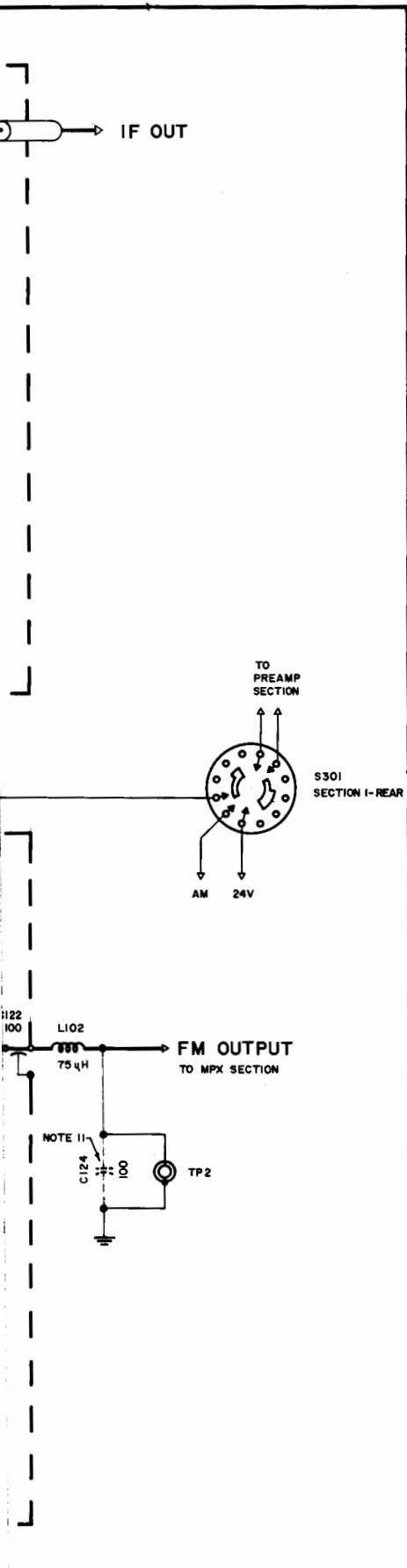
NOTE 11

NOTE 12



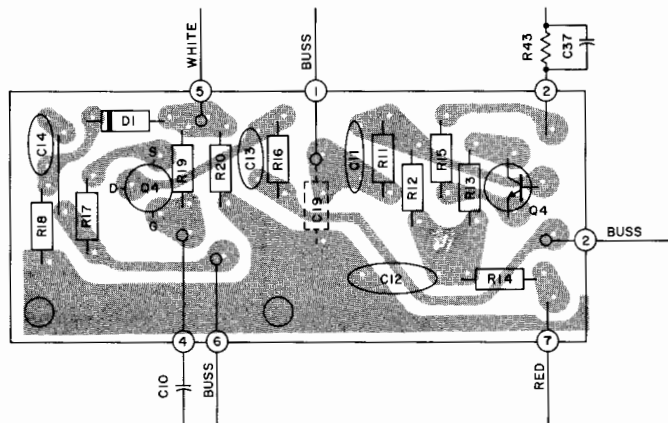
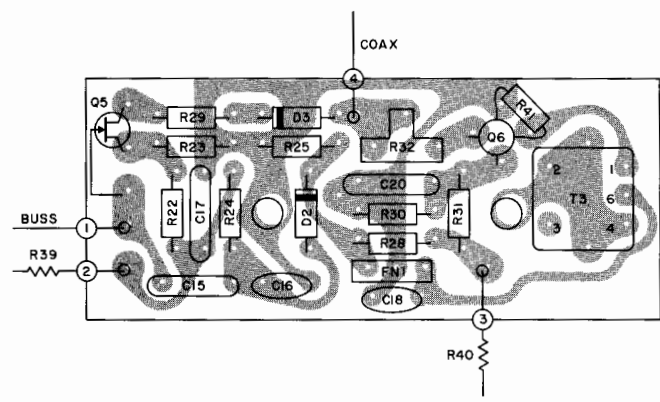
FM TUNER

MX113

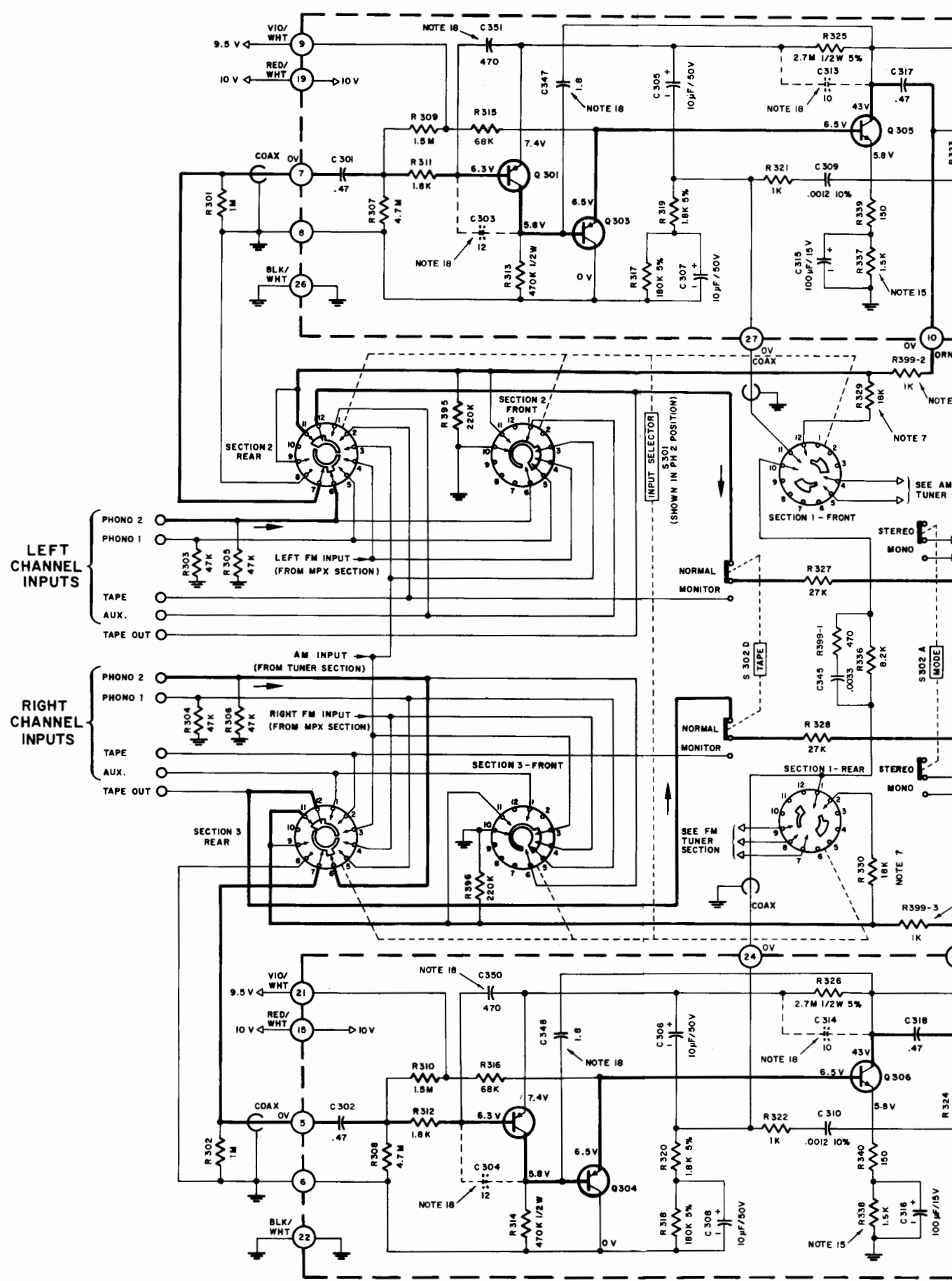


FM TUNER SECTION

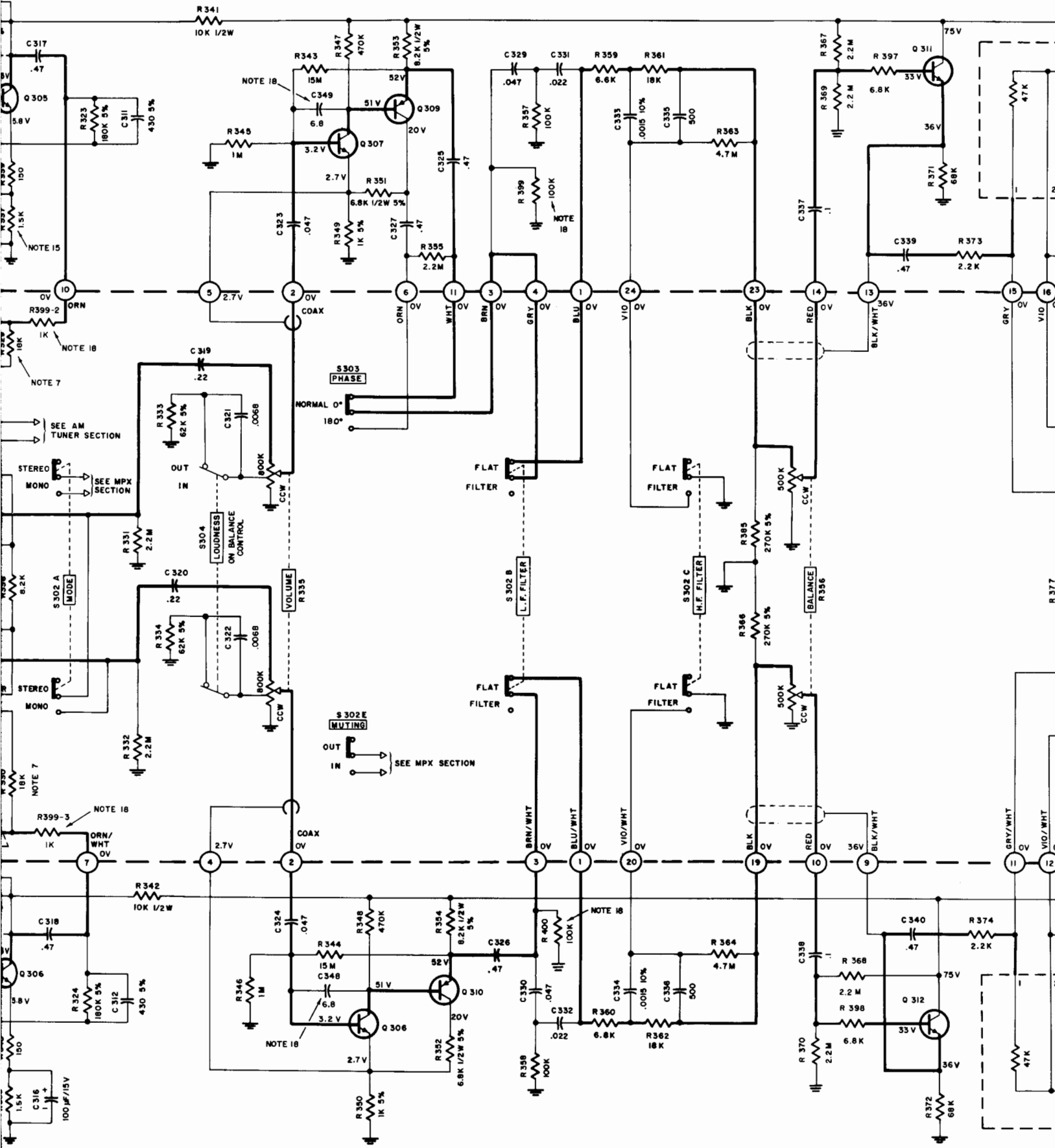
SELECTIVITY PC BOARD 044-290



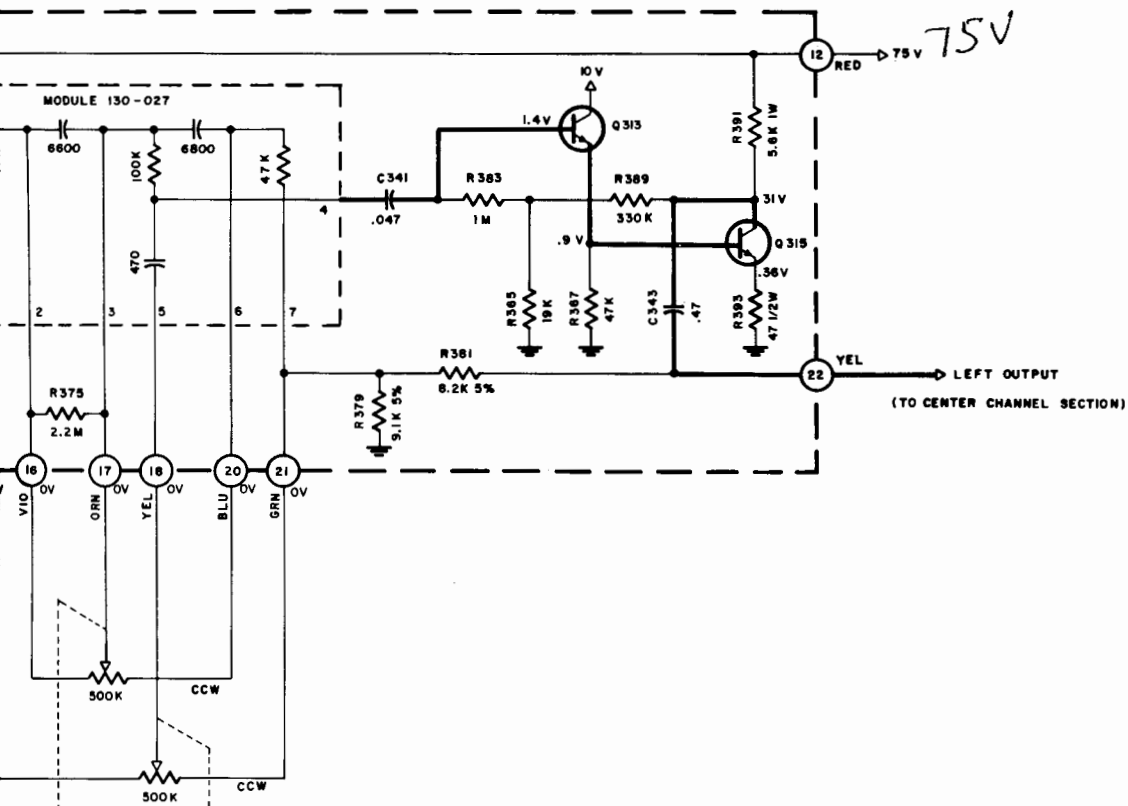
MIXER & LOCAL OSCILLATOR PC BOARD 044-292



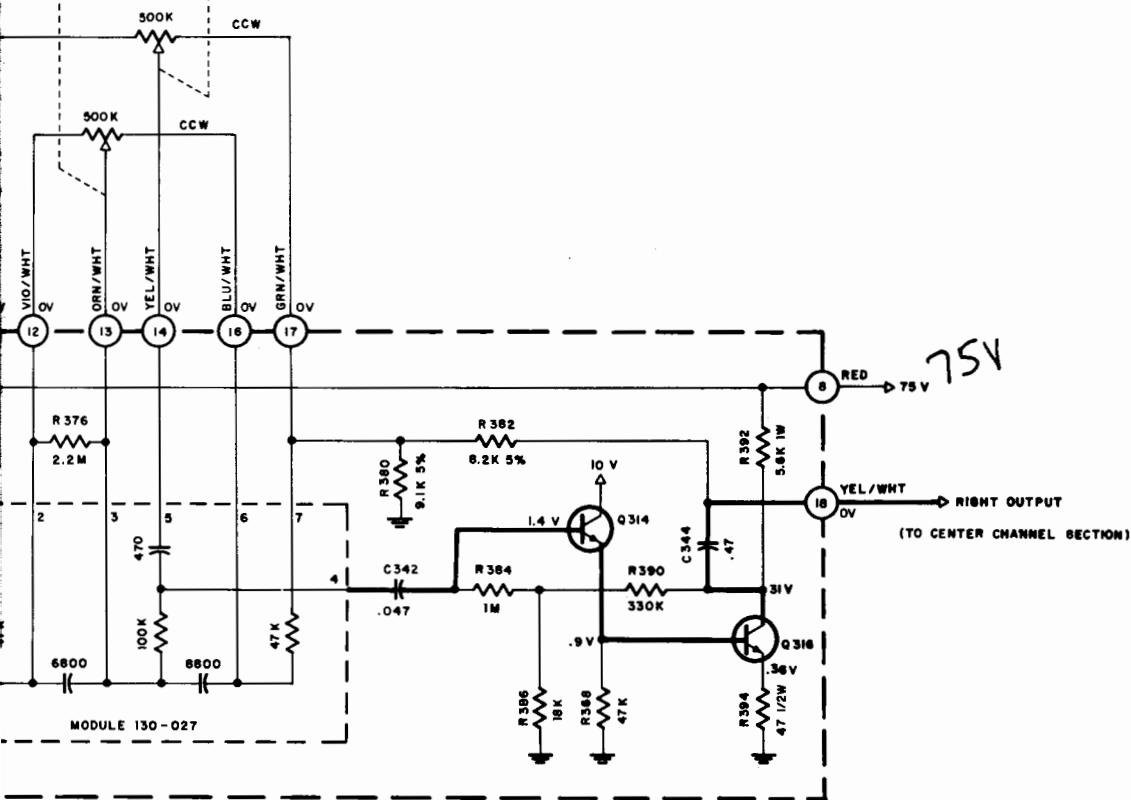
LEFT CHANNEL PREAMP. PRINTED CIRCUIT BOARD 044-554

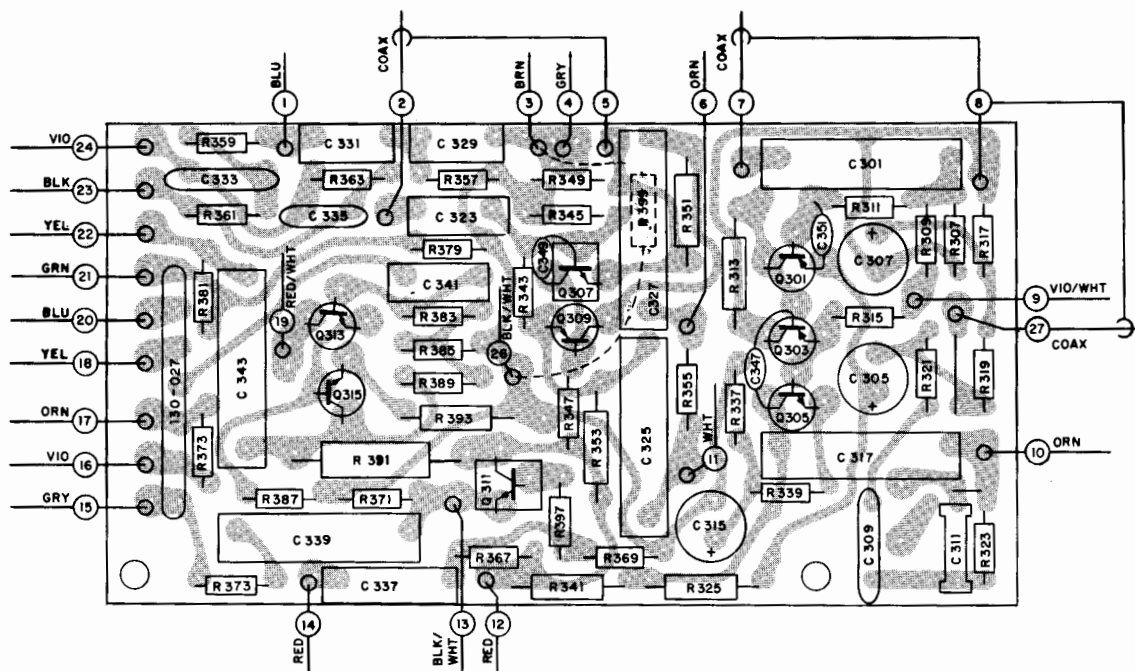


RIGHT CHANNEL PREAMP. PRINTED CIRCUIT BOARD 044-554

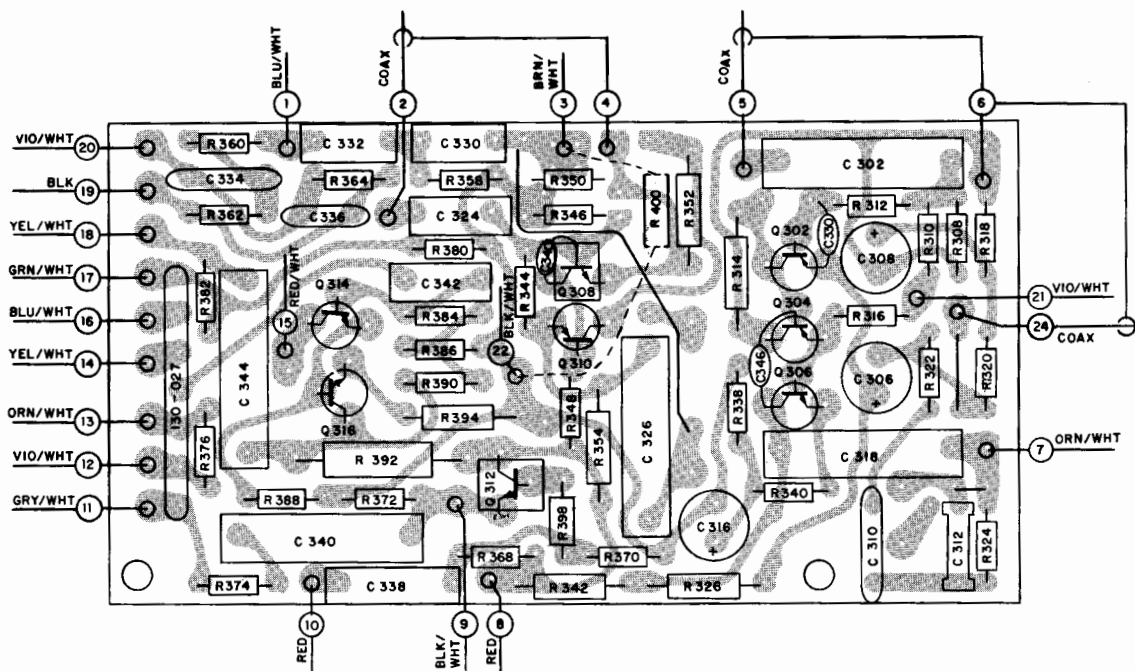


PREAMP. SECTION
MX113 154-648

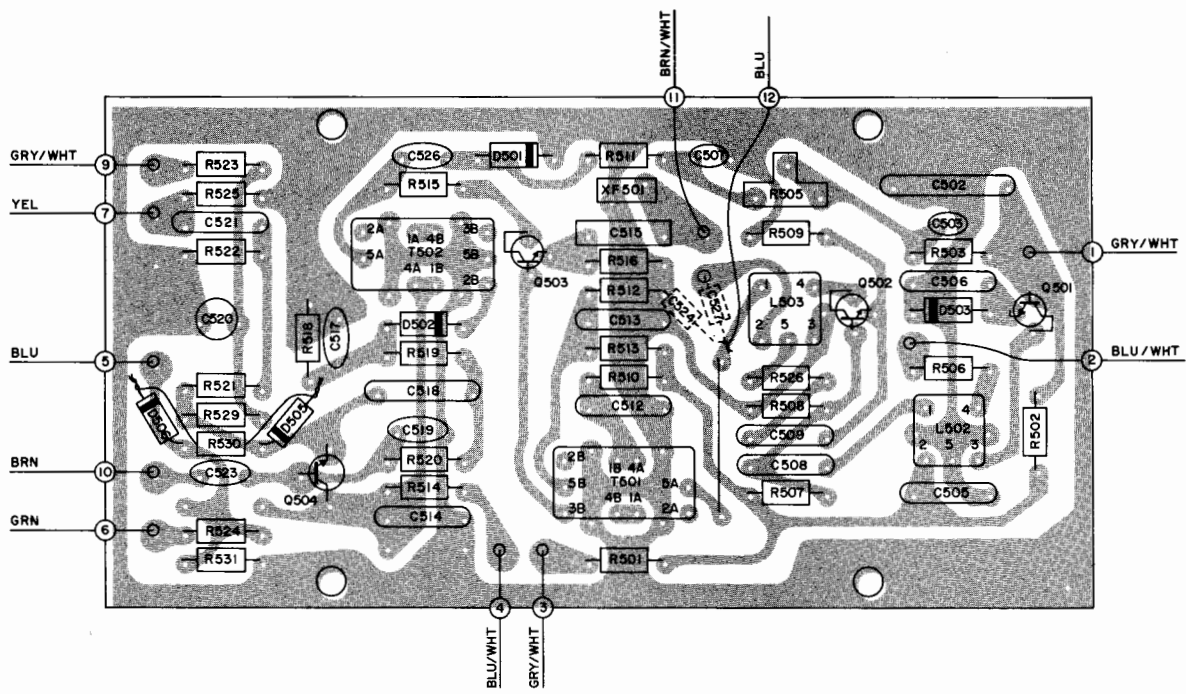




LEFT CHANNEL PREAMP PRINTED CIRCUIT BOARD O44-554

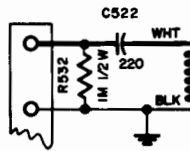


RIGHT CHANNEL PREAMP. PRINTED CIRCUIT BOARD O44-554

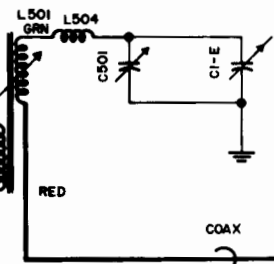


AM PC BOARD 044-452

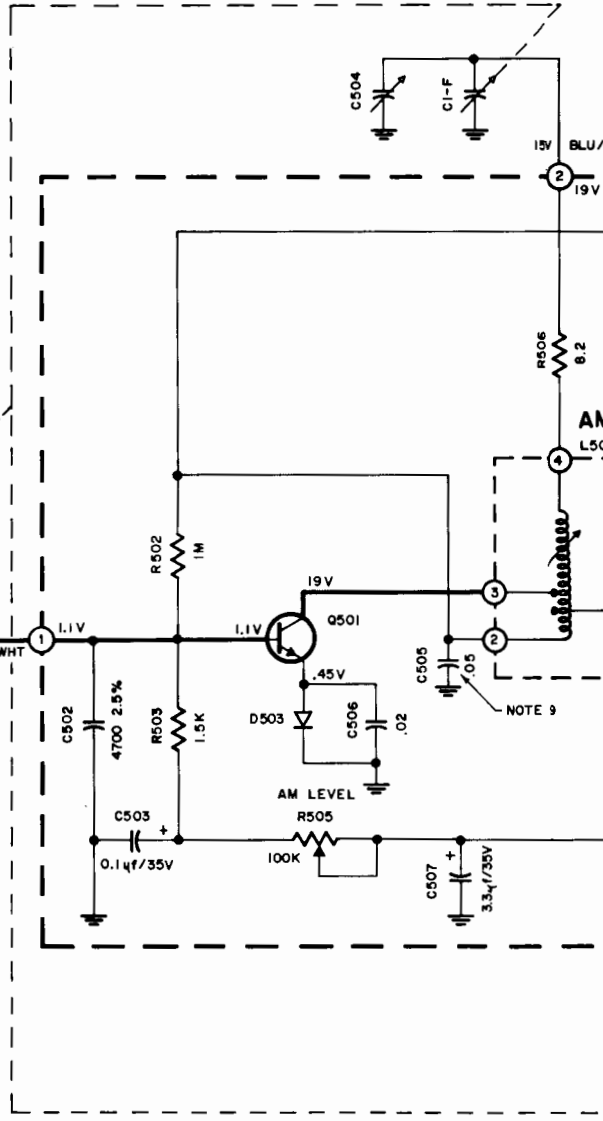
EXT
AM ANT

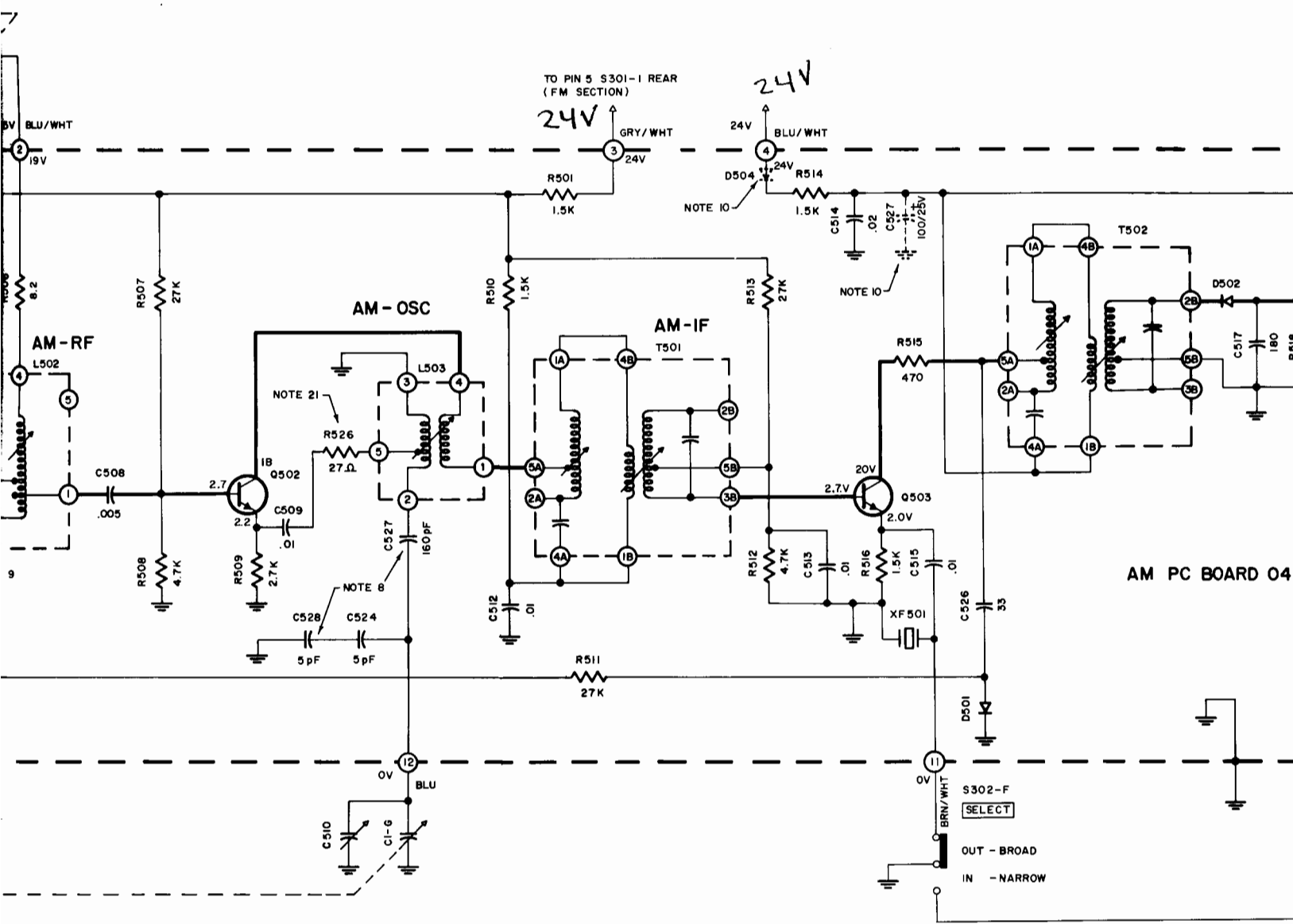


AM ANT

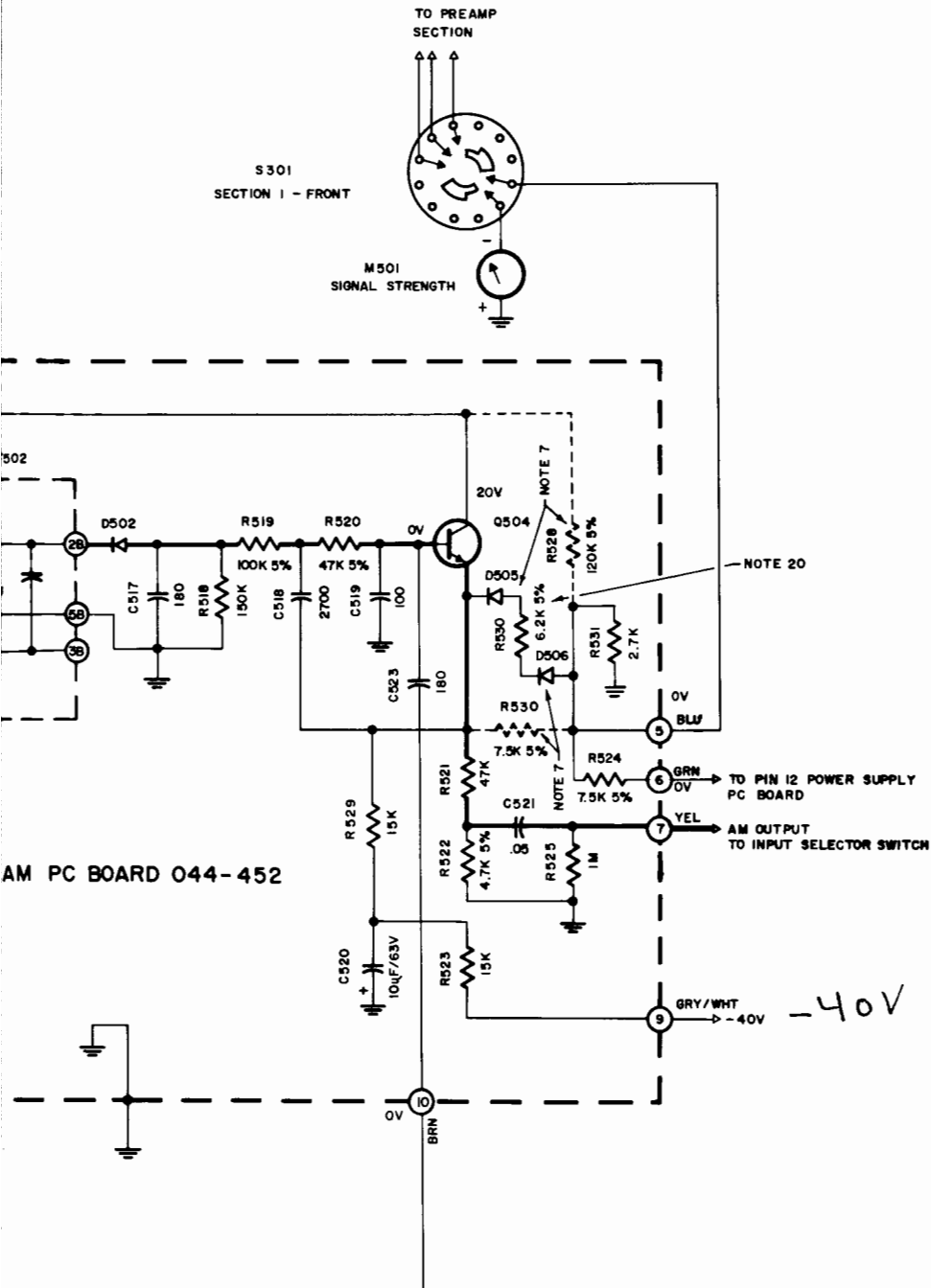


COAX
GRY/WHT



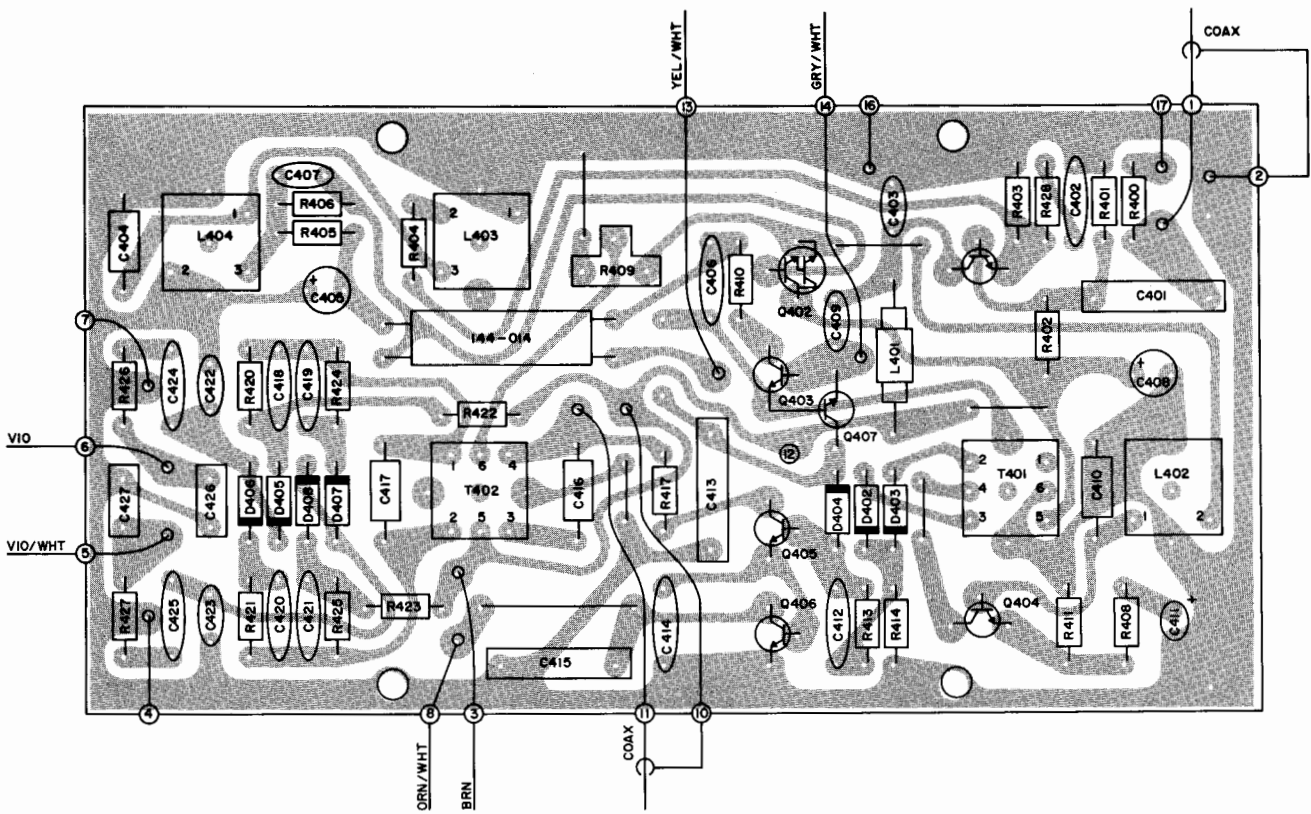


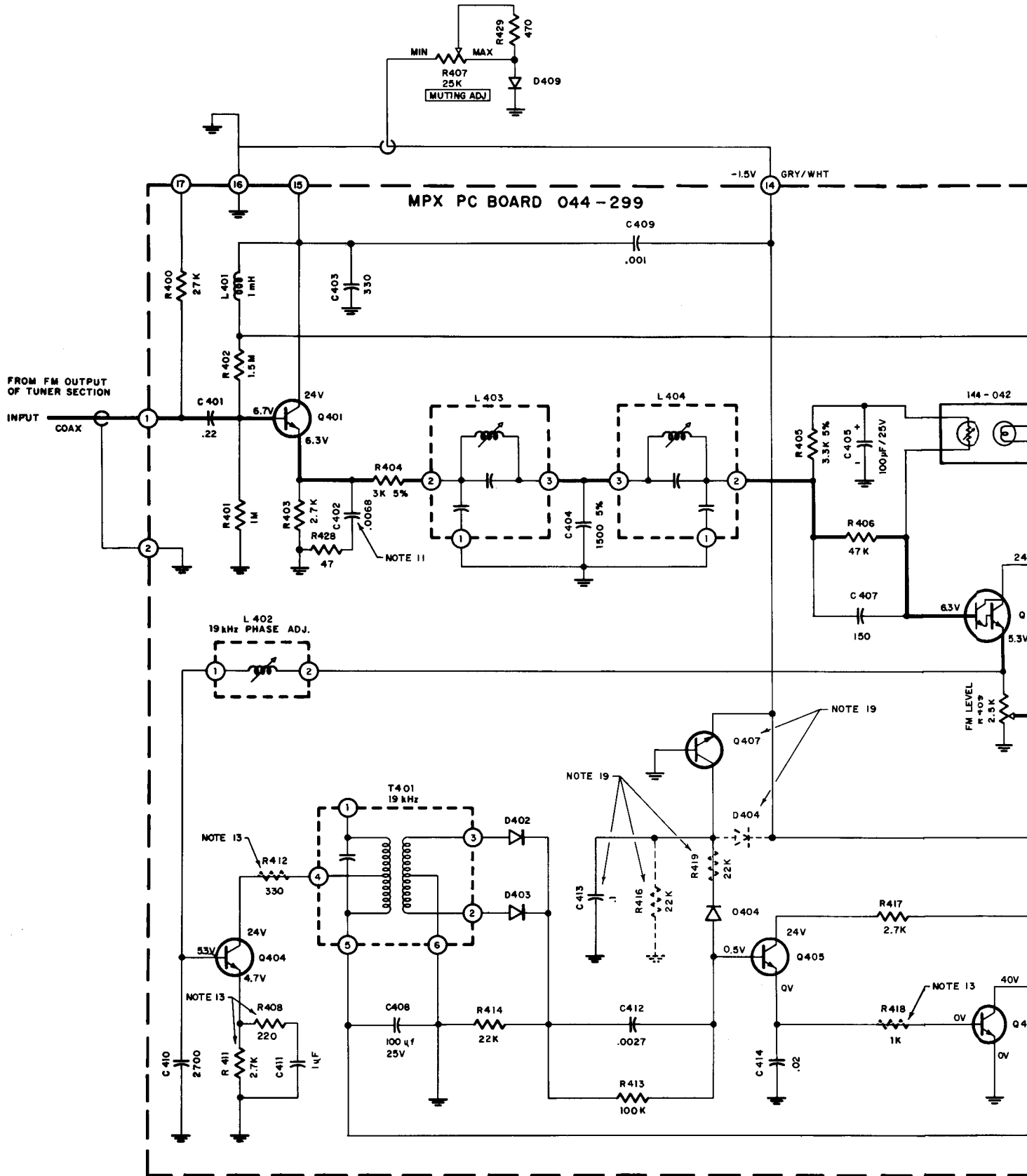
AM PC BOARD 04



AM SECTION

MPX PC BOARD 044-299

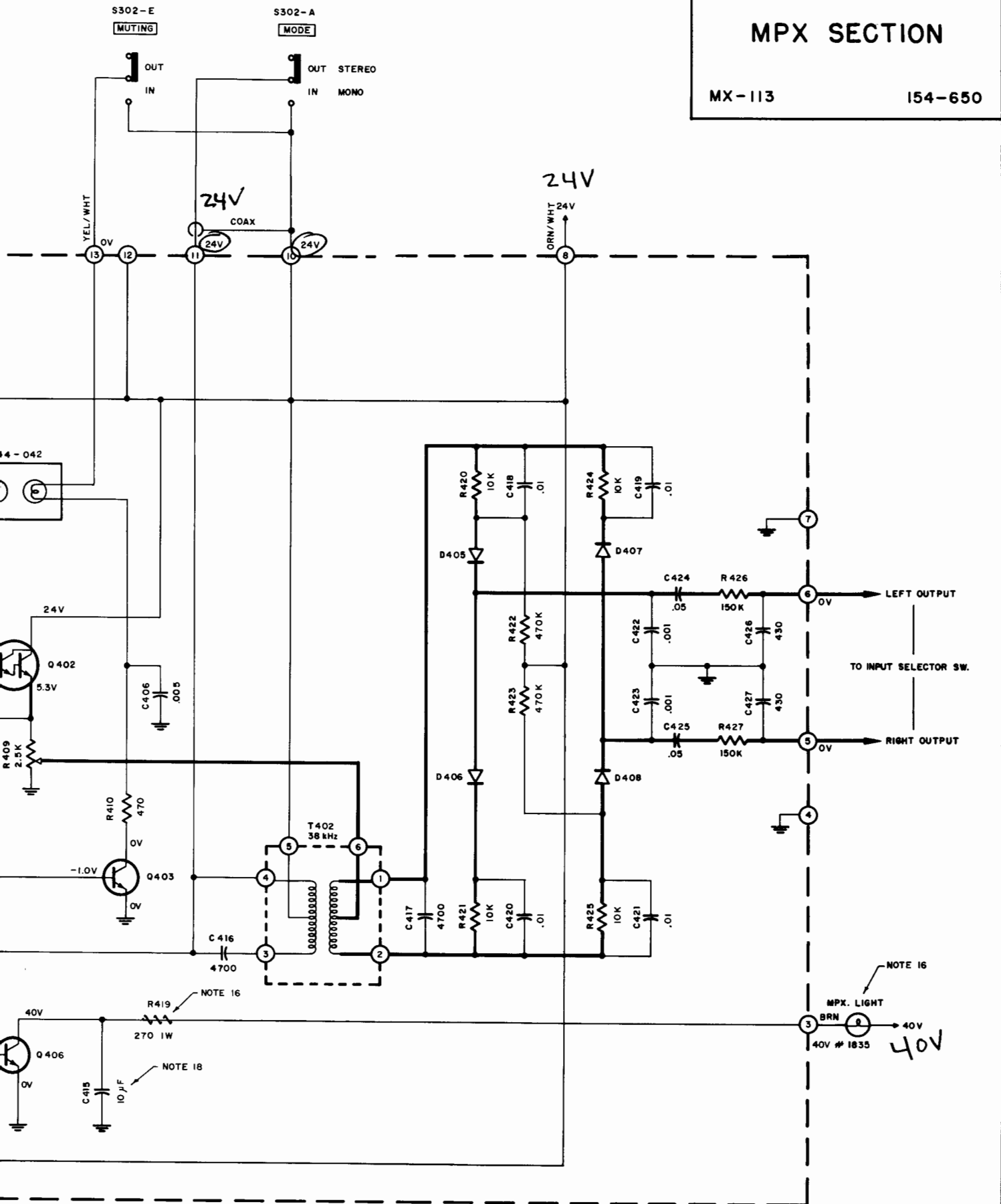




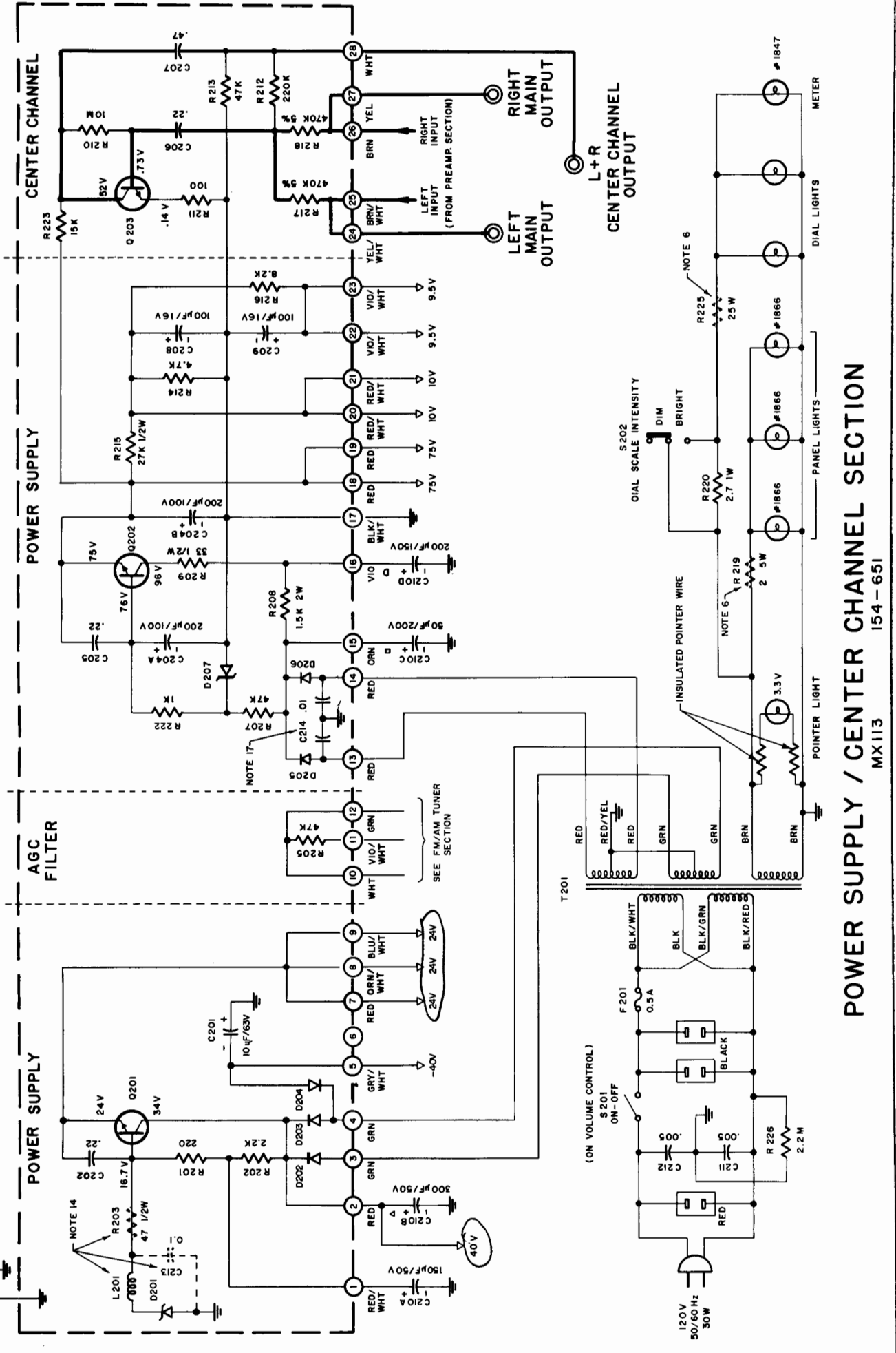
MPX SECTION

MX-113

154-650

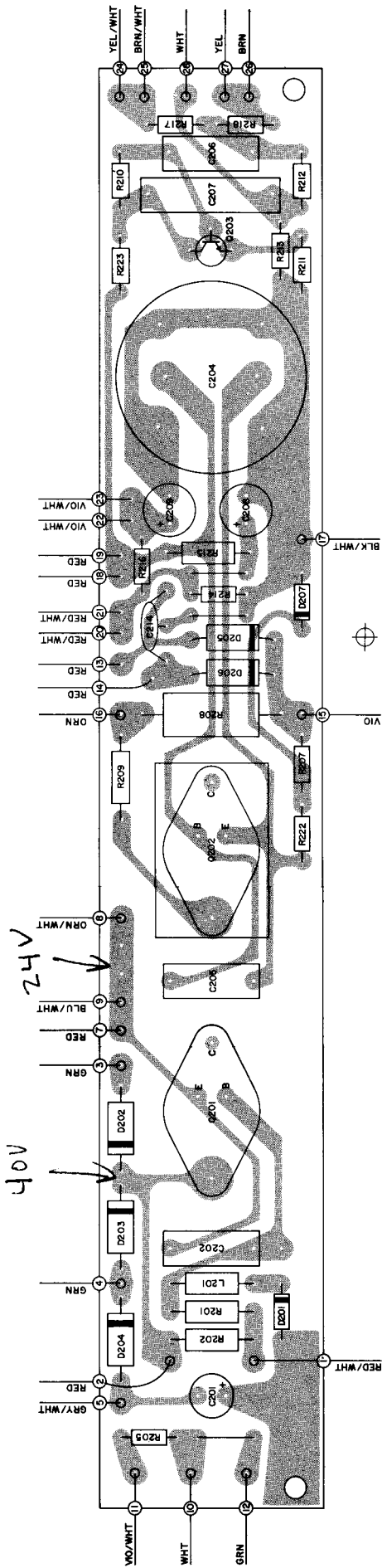


PRINTED CIRCUIT BOARD 044-576



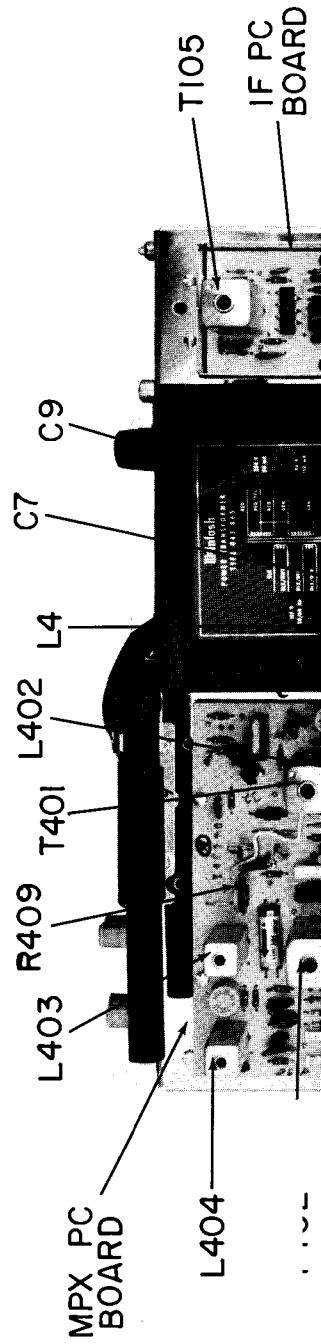
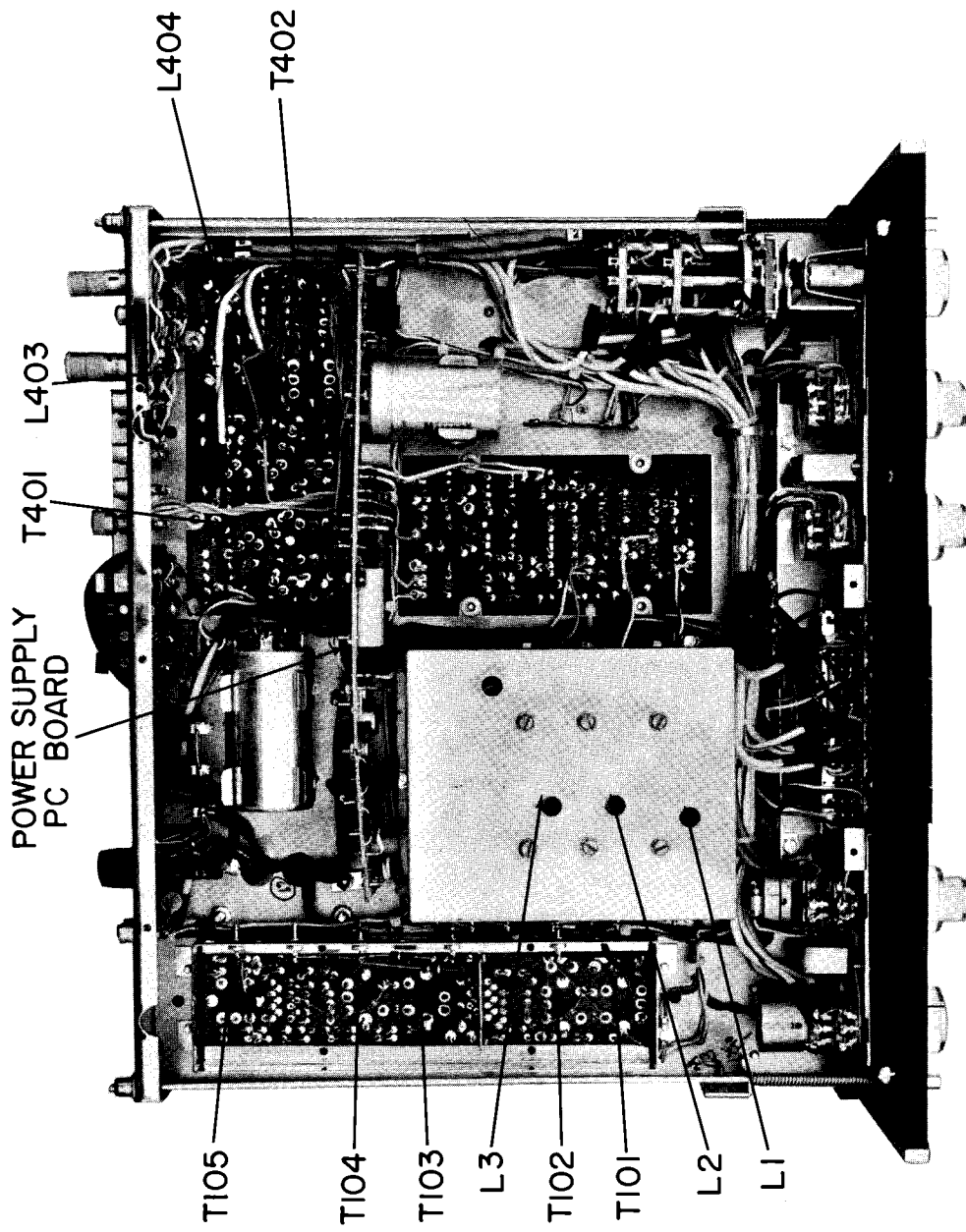
POWER SUPPLY / CENTER CHANNEL SECTION

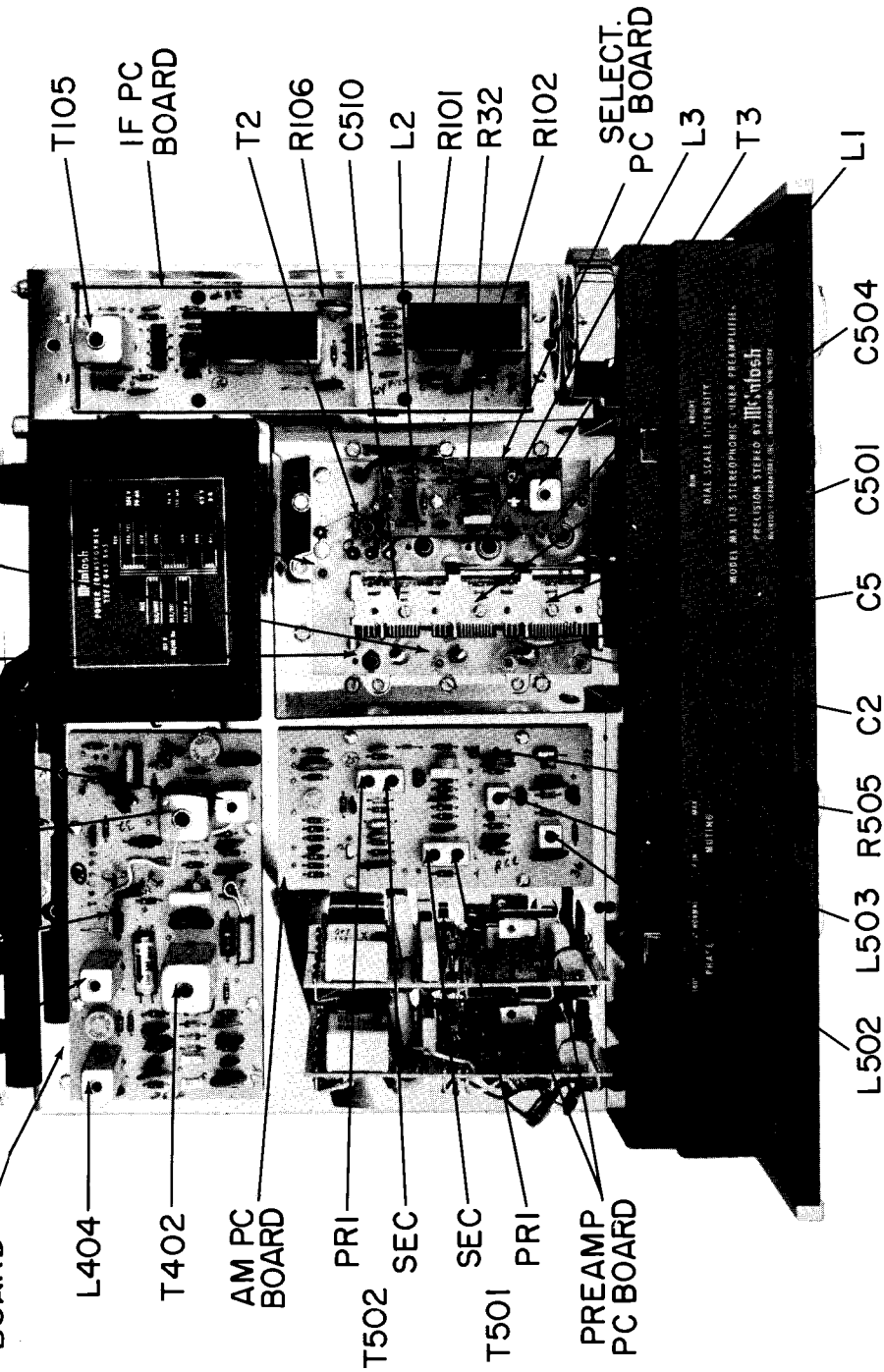
MX113 154-651



POWER SUPPLY/CENTER CHANNEL PC BOARD 044 - 576

MULTIPLEX DECODER ALIGNMENT





MX 113 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 MX 113.

The test equipment listed (or its equivalent) is necessary to properly align an MX 113. 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: AM-FM-MPX.

TEST EQUIPMENT REQUIRED

1. AM Signal Generator (Measurement 65B or equivalent).
2. FM Signal Generator (Measurement 188 or Sound Technology 1000A).
3. VTVM (RCA WV98C).
4. Multiplex Generator (Radiometer SMG1) or Sound Technology 1000A.
5. 10.7 MHz FM Sweep Generator (Kay 385 or equivalent). (Not needed if Measurement 275 IF converter is available.)
6. 10.7 MHz Generator (preferably crystal controlled).
7. Oscilloscope (Hewlett-Packard 120B or equivalent).
8. Harmonic Distortion Analyzer (Hewlett-Packard 333A or equivalent).
9. 10.7 MHz ± 75 kHz Sweep Marker Generator.

AM ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
1	Point of no interference or signal	455kHz	Through external .01μF capacitor to pin 2 on AM circuit board	CW	Signal strength meter.	Normal	Pri. & Sec. cores of T501 & T502	Maximum possible indication	As the tuner output increases, attenuate generator output to keep meter indication below 4. Selectivity switch remains in narrow position.
2	600kHz	600kHz	Through a 200pF capacitor to ant. terminals.	Same	Same	Same	L503 (oscillator coil.)	Same	Same as Step 1.
3	1400kHz	1400kHz	Same	Same	Same	Same	C510 (oscillator trimmer)	Same	Repeat Steps 2 & 3 until dial calibration is accurate.
4	600kHz	600kHz	Same	Same	Same	Same	L501 (AM antenna rod) & L502 (AM-RF)	Same	Same as Step 1 except adjust generator so that output signal is just above the noise level. Position antenna rod away from chassis and nearby objects.
5	1400kHz	1400kHz	Same	Same	Same	Same	C501 (AM antenna trimmer) & C504 (AM-RF trimmer).	Same	Repeat Steps 4 & 5 until output is as high as possible.
	1000kHz	1000kHz	Same	30% @ 400Hz	Distortion Analyzer	L or R tape output.			With a distortion analyzer, the following measurements can be performed: 1. With a 10mV input signal adjust "AM Level" control for 0.35 volts of audio output at tape-outputs. This will correspond to 1.2 volts audio output for a 100% modulated signal. 2. With a 1mV input signal, harmonic distortion, whistle filter attenuation at 10kHz modulating frequency and signal to noise ratio may be measured. 3. IHFM sensitivity of 75 microvolts for 20dB signal to noise ratio. (This measurement is only possible in the absence of man-made interference, as fluorescent lamps, etc.)

FM ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
	Point of no interference.	10.7MHz	Through external .01μF capacitor to Q4 gate.	FM ±200kHz sweep @ 60Hz rate.	Oscilloscope	TPI	Top (Primary) and Bottom (Secondary) of T2.	Maximum height of 10.7MHz marker and best sym-	Selectivity switch must be in the normal position. Turn muting off for alignment tests. Keep signal generator output low to prevent limiting.

1	Point of no interference.	10.7MHz	Through external .01µF capacitor to Q4 gate.	FM ±200kHz sweep w. 60Hz rate.	Oscilloscope	TPI	Top (Primary) and Bottom (Secondary) of T2.	Maximum height of 10.7MHz marker and best symmetry of 10.7MHz ±75kHz markers.	Selectivity switch must be in the normal position. Turn muting off for alignment tests. Keep signal generator output low to prevent limiting.
									Selectivity switch must be in the "select" position. All further test and alignment steps selectivity switch in "normal" position. Adjust R32 for equal height of markers in both positions of "select" switch.
2	Same	Same	Same	Same	Same	Same	Top and Bottom cores of IF filters.	Same	The linear phase filters as employed in the IF do not have a flat-topped response. See typical response curve - Fig. 2. Do not stagger tune.
3	Same	Same	Same	C.W.	VTVM	TP2	Top (sec) core of T105.	Zero DC at TP2.	
4	Same	Same	Same	Same	Same	Pin 6 of T105	Bottom (Pri.) core of T105.	Maximum possible negative voltage.	If a distortion analyzer is available, omit this step. Adjust T105 (Pri.) after Step 6. At that time use a 1mV signal from an FM generator. Modulate 100% w. 400Hz. Adjust primary of T105 for minimum distortion. Should be less than 0.3%.
5	105MHz	105MHz	300Ω antenna terminals w/** matching network.	100% w. 400Hz	VTVM connected to TPI and oscilloscope connected to L or R main output.		Oscillator trimmer C9.	Maximum negative voltage at TPI.	As TPI voltage increases reduce output of signal generator to keep TPI voltage as low as possible.
6	90MHz	90MHz	Same	Same	Same		Oscillator coil L4.	Same	Repeat steps 5 & 6 until dial calibration is accurate.
7	105MHz	105MHz	Same	Same	Same		Mixer RF2, RFI trimmers C7-5+2	Same	Same as step 5.
8	90MHz	90MHz	Same	Same	Same		Mixer RF2, RFI coils L3-2-1.	Same	Same as step 5. Then repeat steps 7 & 8 until TPI voltage is as high as possible for the least signal input at both alignment frequencies.
9	Same	Same	Same	Same	VTVM connected to TPI and a harmonic distortion analyzer to L or R output.				This step is an overall sensitivity check. Reduce input signal to the point where total noise and distortion reads 3% (-30dB). The input signal will then be the usable sensitivity and should be less than 2.5µV.
10	Same	Same	Same	Same			R101, 102, 106		With generator output at 200µV, adjust R106 for sensitivity meter reading of 6. With generator output at 100µV, adjust R101 for full scale of sensitivity meter ("select" switch "Out"). Adjust R102 for full scale of sensitivity meter ("select" switch "In").

MULTIPLEX DECODER ALIGNMENT

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
1	100MHz	100MHz	300Ω antenna terminals w/ approx. 1000 microvolts signal w/* matching network.	75kHz Deviation @ 67kHz	AC-VTVM	L or R output jack.	L403 and L404 (SCA adj.)	Minimum output @ L or R output jack.	Adjust for minimum output with 67kHz modulation.
2	100MHz	100MHz	Same	19kHz stereo pilot.	AC-VTVM or oscilloscope w/very low cap. probe.	T401, Pin 2 or 3.	L402 (19kHz phase adj.) & T401 (19 kHz doubler)	Adjust for maximum AC voltage.	Decrease pilot level, if necessary, so that 19kHz circuits do not limit or saturate.
3	Same	Same	Same	Same	Same	T402, Pin 1 or 2.	T402 (Pri) & bottom (Sec) tuning slugs	Adj. for maximum AC voltage.	Decrease pilot level so that 19kHz and 38kHz circuits do not limit. Mode switch must be in stereo position.
4	Same	Same	Same	1kHz (100% modulation) L or R only, pilot level normal and on.	Same	L or R output jack.	T402, Bottom (Sec.) tuning slug.	35dB separation or more.	Modulate left channel and measure right channel output. Adjust T402 bottom - tuning slug (Sec.) for minimum right channel output (maximum separation). Then, reverse channels and measure left channel separation. For this adjustment and measurement, no test lead should be connected to TP#2.
5	100MHz	100MHz	Same	1kHz (100% modulation) L or R only, pilot on.	AC-VTVM	L or R output jack.		Less than 12mV of residual.	Adjust "FM-Level" control (R409) for 1.2 volts of audio output at fixed output jacks. Then, turn off the modulation and measure the residual of the 19kHz and 38kHz frequencies.

Note 1: If signal generator has other than 50 ohm internal impedance, use a resistor of 150 ohms less internal generator impedance.

FIG. 1 ANTENNA MATCHING NETWORK

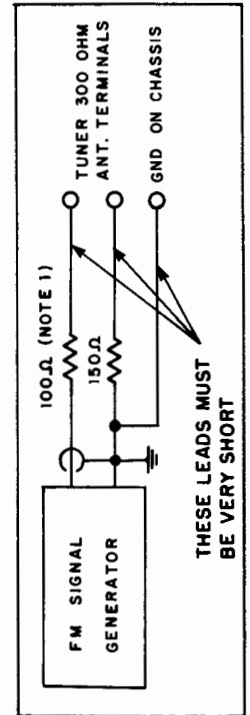
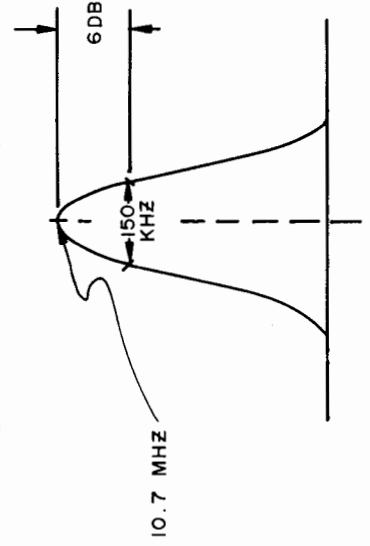


FIG. 2 TYPICAL IF RESPONSE CURVE



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

C109	Ta. Elect.	22 μ F	20V	066-148
C201	Elect.	10 μ F	50V	066-221
C204	Elect.	200/200 μ F	100V	066-159
C202	Mylar	.22 μ F	250V	064-068
C205,206	Mylar	.22 μ F	250V	064-068
C207	Mylar	.47 μ F	250V	064-069
C208,209	Elect.	100 μ F	16V	066-177
C210	Elect.	50/200/300/150 μ F 200/150/50/50V		066-128
C301,302	Mylar	.47 μ F	250V	064-069
C305,306	Ta. Elect.	10 μ F	20V	066-149
C307,308	Ta. Elect.	10 μ F	20V	066-149
C315,316	Elect.	100 μ F	15V	066-226
C317,318	Mylar	.47 μ F	250V	064-069
C319,320	Mylar	.22 μ F	200V	064-087
C321,322	Polypropylene	.0068 μ F		064-103
C323,324	Mylar	.047 μ F	250V	064-066
C325,326	Mylar	.47 μ F	250V	064-069
C327	Mylar	.47 μ F	250V	064-069
C329,330	Mylar	.047 μ F	250V	064-066
C331,332	Mylar	.022 μ F	250V	064-065
C337,338	Mylar	.1 μ F	250V	064-067
C339,340	Mylar	.47 μ F	250V	064-069
C341,342	Mylar	.047 μ F	250V	064-066
C343,344	Mylar	.47 μ F	250V	064-069
C401	Mylar	.22 μ F	250V	064-068
C405	Elect.	100 μ F	25V	066-161
C408	Elect.	100 μ F	25V	066-161
C411	Ta. Elect.	1.0 μ F	35V	066-147
C415	Mylar	10 μ F	63V	064-178
C502	Polystyrene	4700pF		064-091
C503	Ta. Elect.	.47 μ F	35V	066-167
C507	Ta. Elect.	3.3 μ F	35V	066-170
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D204,205	Si. diode	070-031
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D402,403	Si. diode	070-047
D404	Si. diode	070-022
D405,406	Ge. signal diode	070-003
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L402	Filter coil (19kHz)	122-094
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Q307

Q309

Q311

Q313

Q315

Q401

Q402

Q403

Q405

Q406

Q501

Q503

Q504

F201

R335

R356

R377

R378

R407

R219

R220

R225

S301

S302

S304

T1

T2

T3

T101

T102

T103

T104

T105

T201

T401

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Q309,310	Si. PNP transistor	132-096
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Q313,314	Si. NPN transistor	132-092
Q315,316	Si. NPN transistor	132-042
Q401	Si. NPN transistor	132-092
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Q405	Si. NPN transistor	132-092
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	#1866 (Front panel)	058-014
	#1835 (MPX)	058-037
	Festoon lamp	058-032
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	Front panel end caps	018-120
	Volume knob	044-372
	Input selector knob	044-372
	Tuning knob	043-272
	Bass knob (rear)	090-009
	Bass knob (front)	044-374
	Treble knob (rear)	090-009
	Treble knob (front)	044-374
	Loudness knob	044-374
	Balance knob	090-009
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McIntosh SERVICE BULLETIN

REDUCE RF INTERFERENCE

MODEL: MX 113 AM/FM Tuner-Preamp

PURPOSE OF MODIFICATION: To reduce sensitivity to RF-interference.

WHAT UNITS ARE AFFECTED: All units with Serial Numbers below 400H1

WHEN MODIFICATION SHOULD BE MADE: Whenever a customer complains of undesired reception of CB and HAM- apparatus, when the unit is operating in the Phono Mode- Also when interference from man-made noise is encountered, such as: Refridgerators, passing cars, etc.

PARTS REQUIRED:

QUANTITY	PART NUMBER	DESCRIPTION
2	136301	Res. = 100K, 1/4W, 10% R399, 400
2	061002	Disc. Cap. = 1.8pF, \pm .25pF NPO
2	061008	Disc. Cap. = 6.8pF, 20% NPO
2	061032	Disc. Cap. = 470pF, 20%
2	136296	Res. = 1K, 1/4W, 10%

PROCEDURE: This change has to be made on both left and right PC board 043091 and 043092.

- Discard: C302, 304 = 061010 = Disc. Cap. 12pF
C313, 314 = 061009 = Disc. Cap. 10pF
R399, 400 = 136303 = Comp. Res. 1M
- Connect a 061032 = 470pF capacitor between the base and the emitter of transistor Q301, 302.

(OVER)

3. Connect a 061002 = 1.8pF capacitor from the collector of transistor Q301, 302 to the collector of transistor Q305, 306.
4. Connect a 061008 = 6.8pF capacitor from the base of transistor Q307, 308 to the collector of transistor Q307, 308.
5. Replace R399 (R400) with a 136301 = 100K resistor.
6. Add a 1000 ohm resistor (136296) in series with the orange lead that connects to pin #10 on the left preamp board. This resistor should connect directly to pin #10 and the end of the orange lead. Using leads no longer than necessary, do the same for the orange/white lead connecting to pin #7 on the right preamp board.

