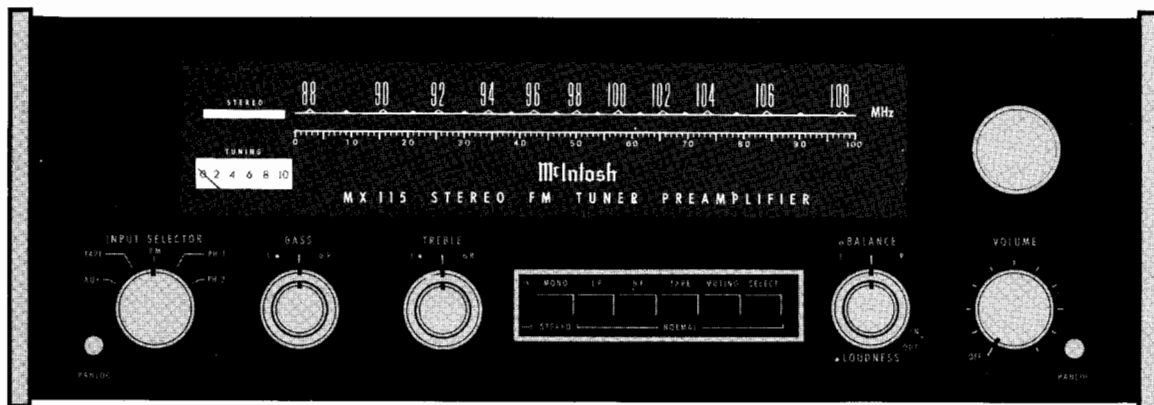


McIntosh

MX 115

FM TUNER PREAMP



SERVICE INFORMATION

STARTING WITH SERIAL NO. AB1001

McINTOSH LABORATORY INC. 2 CHAMBERS STREET BINGHAMTON, NEW YORK

MX 115

ELECTRICAL SPECIFICATIONS

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 minimum.

HARMONIC DISTORTION

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

Stereo: Does not exceed 0.7%.

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

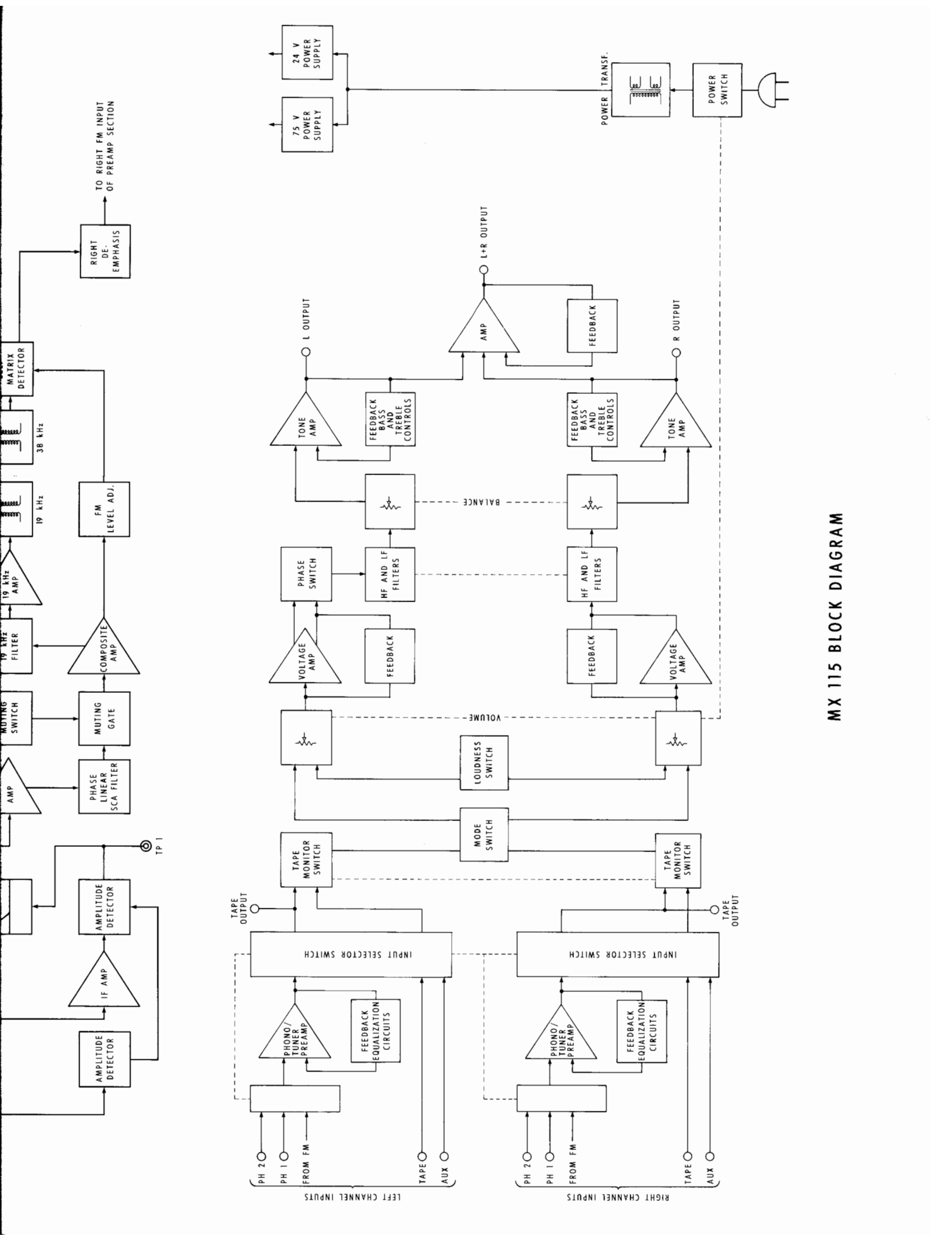
± 20 dB to 20,000 Hz.

LF FILTER

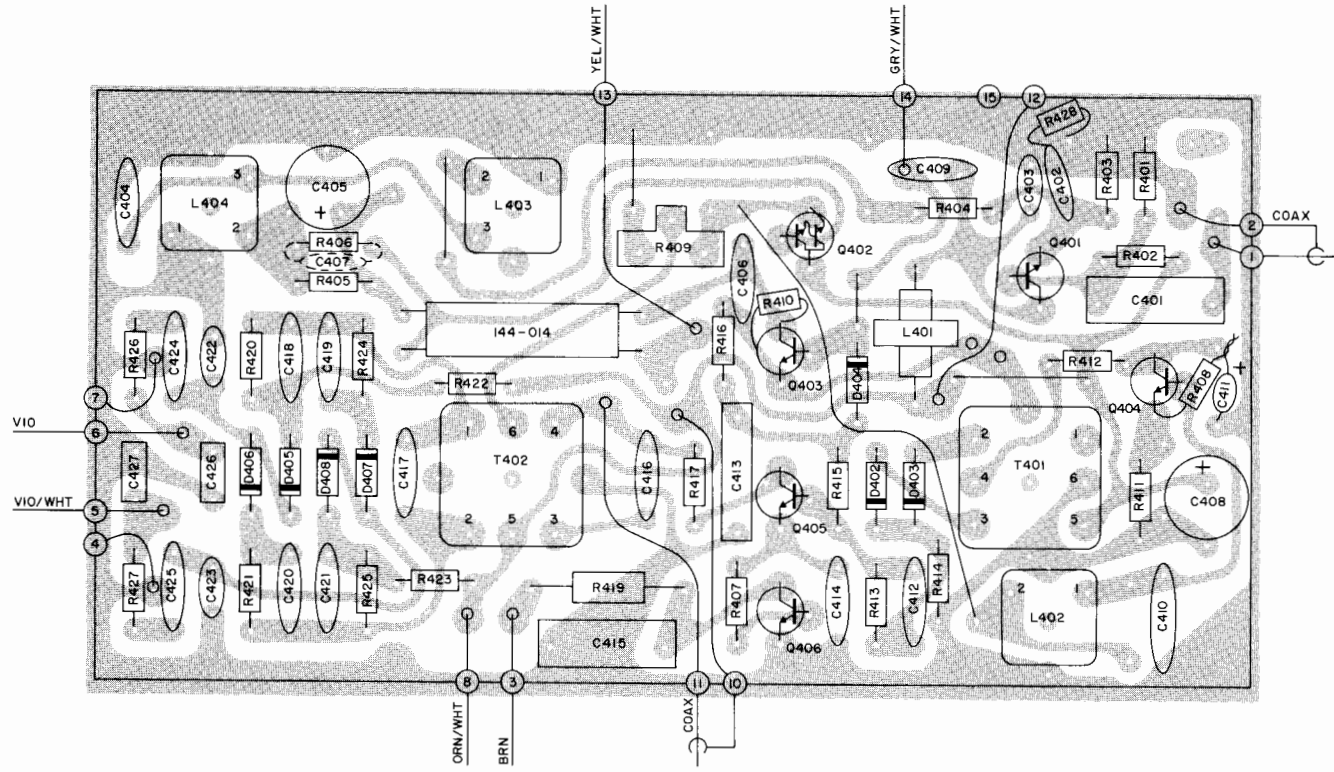
Flat or roll off below 50 Hz, down 12 dB at 20 Hz.

HF FILTER

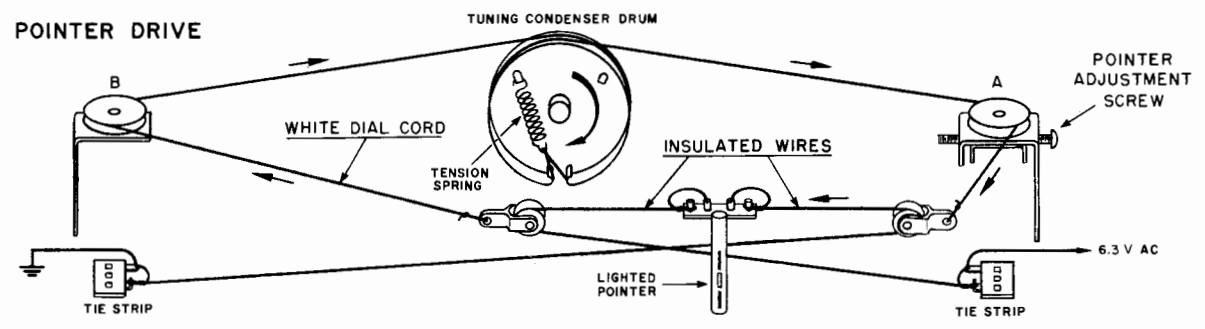
Flat or roll off above 5000 Hz, down 12 dB at 20,000 Hz.



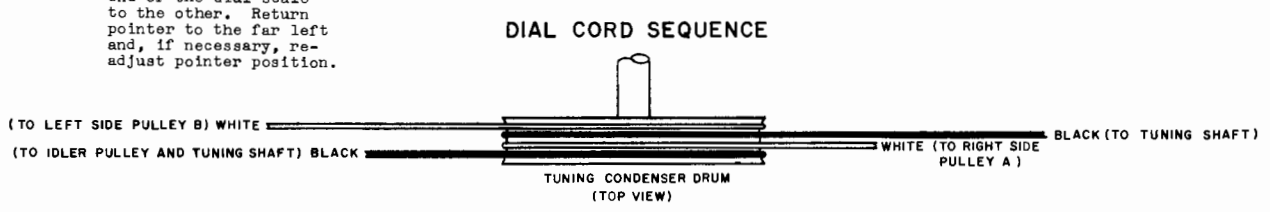
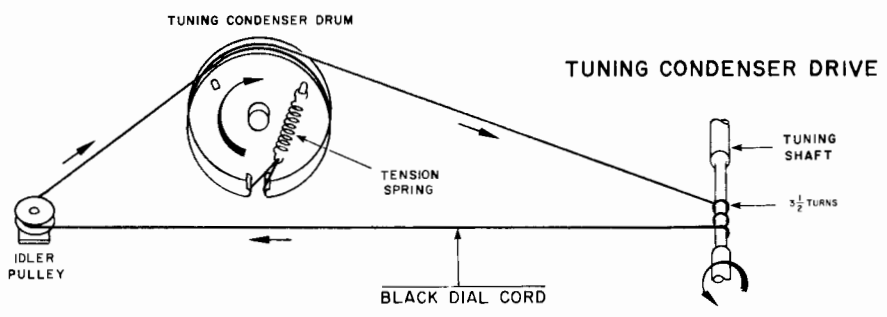
MX 115 BLOCK DIAGRAM



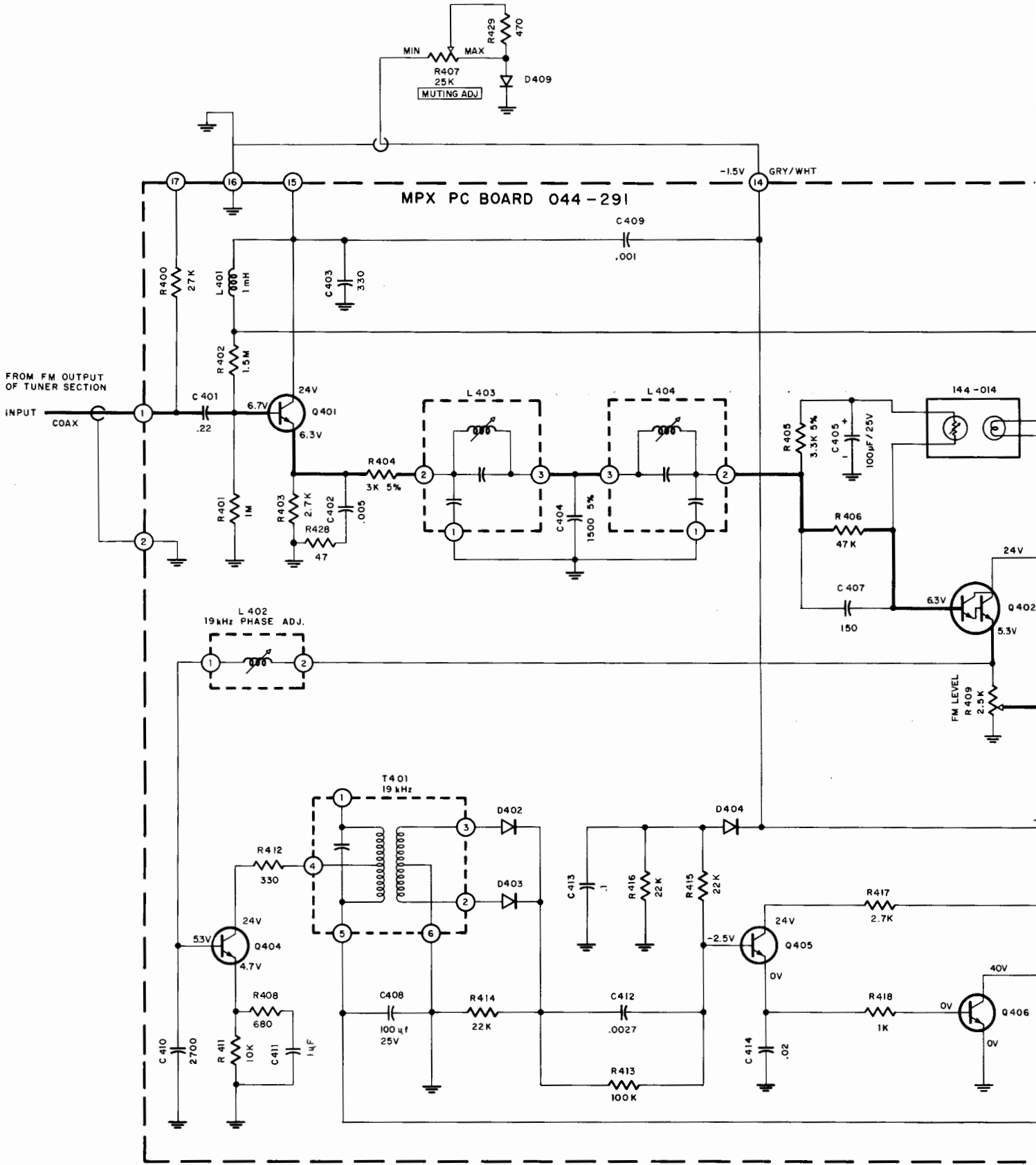
MPX PRINTED CIRCUIT BOARD 044-291



- 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.



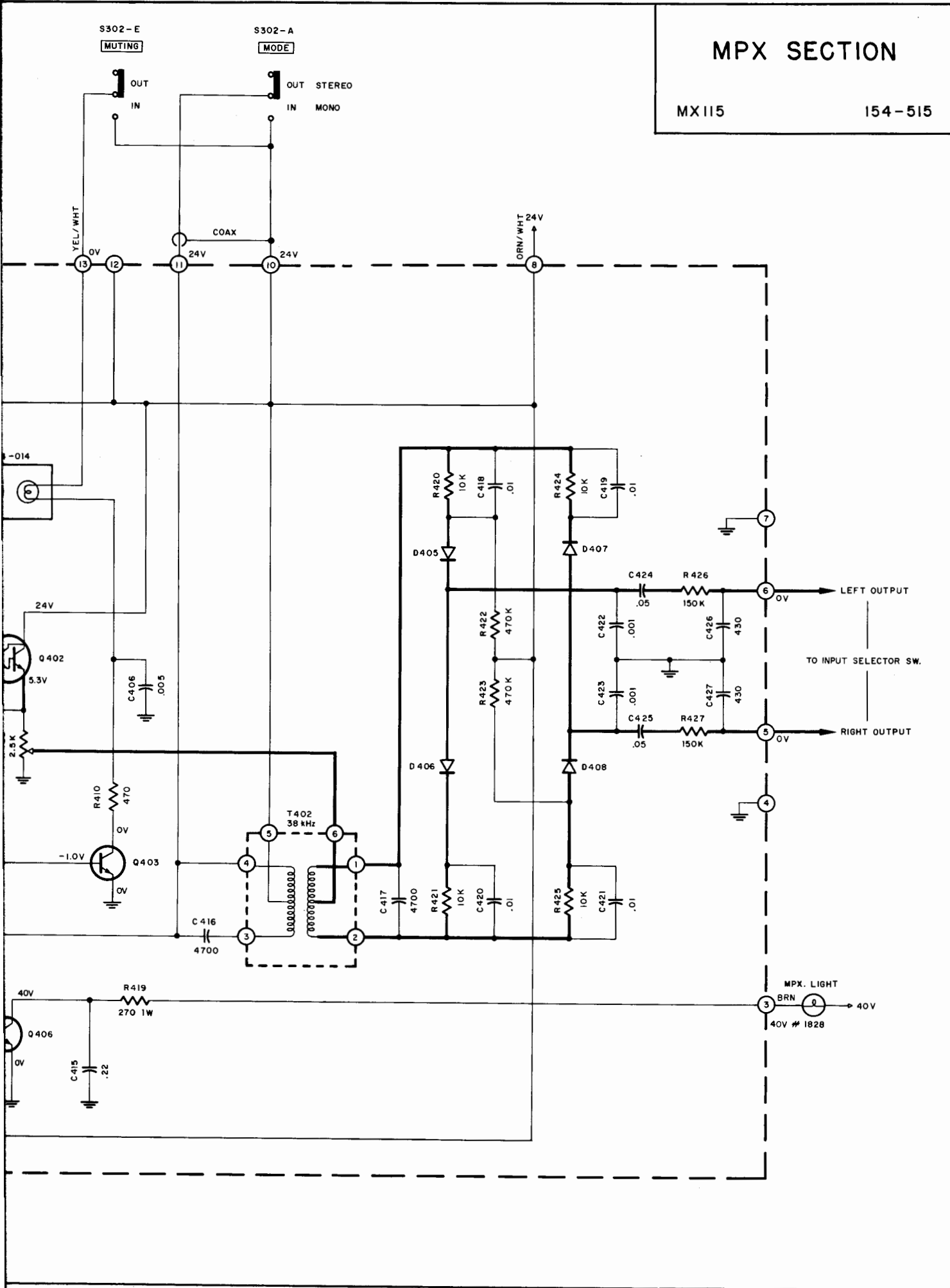
POINTER DIAL STRINGING



MPX SECTION

MX115

154-515



SCHEMATIC NOTES

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).

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.

The heavy lines on the schematics denote the primary signal path.

The terminal numbering of rotary switches is for reference only.

All voltages indicated on the schematics are measured under the following conditions:

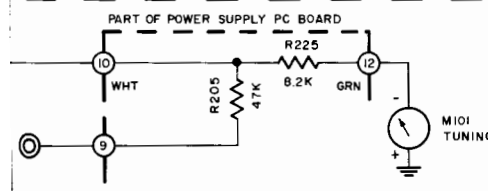
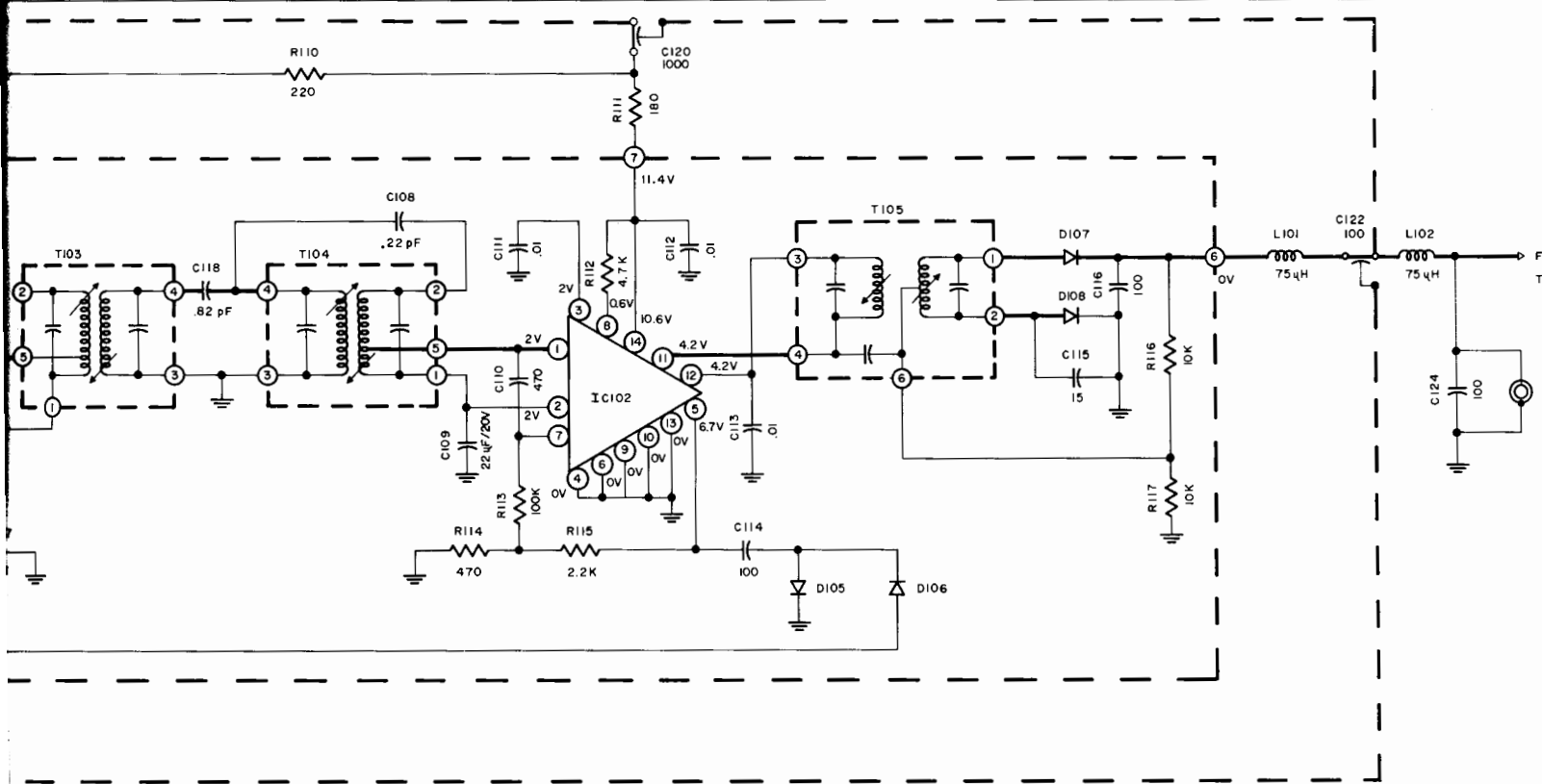
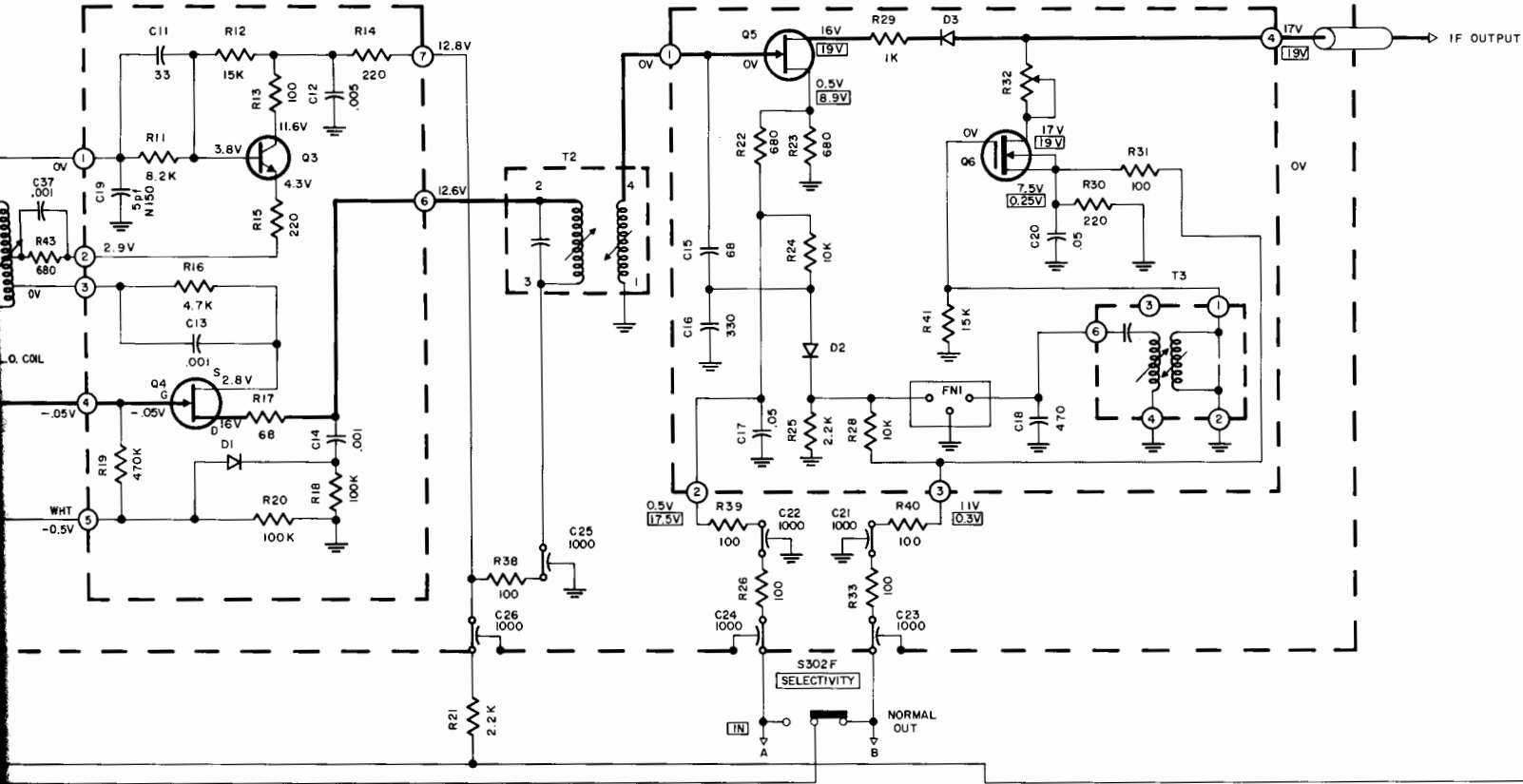
- a. Use of an 11 megohm input impedance VTVM.
- b. All voltages $\pm 10\%$ with respect to chassis ground.
- c. No signal at input or antenna terminals.
- d. AC input at 120 volts, 50/60 Hz.
- e. Front panel controls at:

Tuning indicator	100 MHz (no signal)
Volume	Fully CCW
Mode	Stereo
Muting	Out
Input Selector	FM
Panel Lights	Bright
Selectivity	Out

- f. Voltages shown in rectangles are measured with selectivity switch in the "In" position.

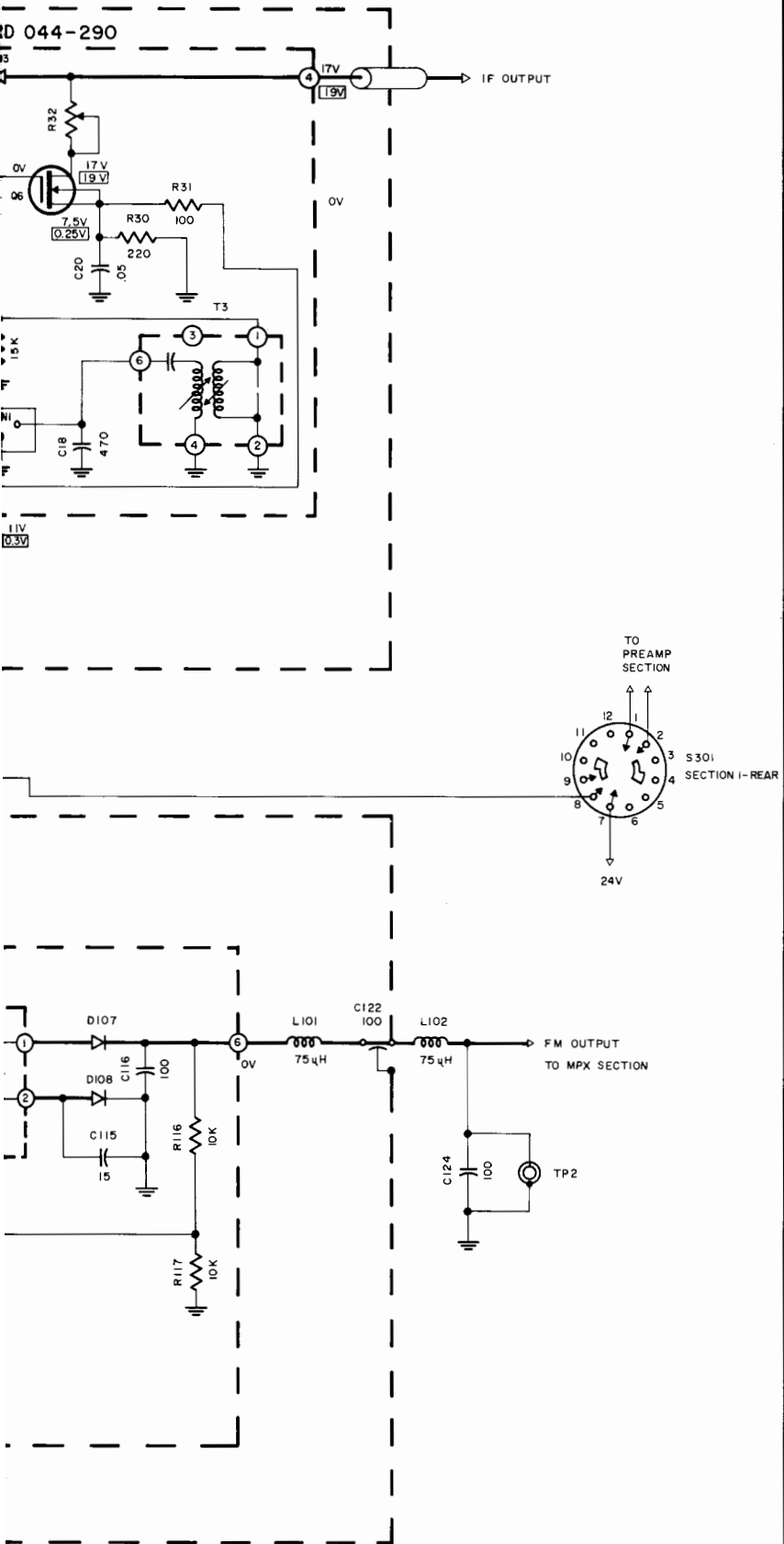
LO & MIXER PC BOARD 044-292

VARIABLE SELECT PC BOARD 044-290



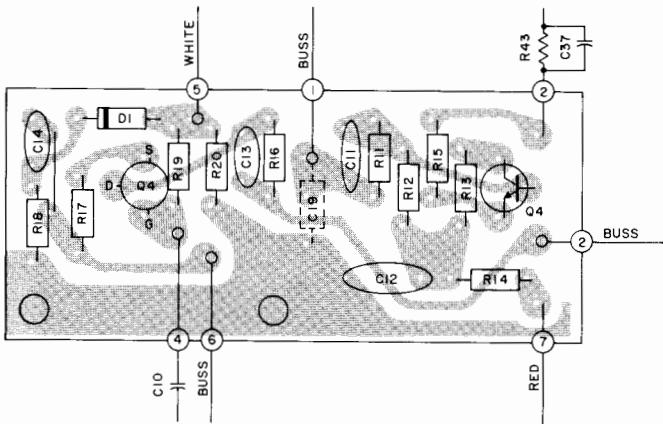
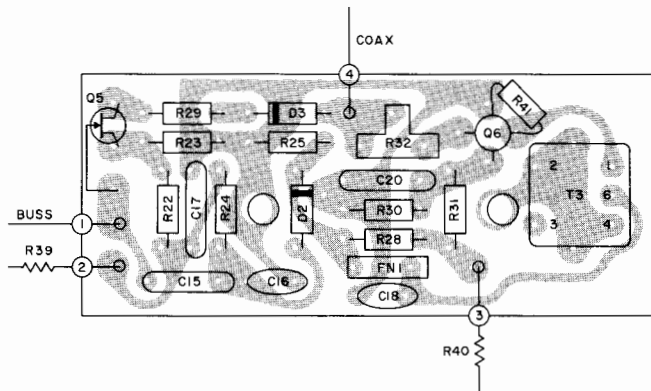
FM TUNER S

MX115



FM TUNER SECTION

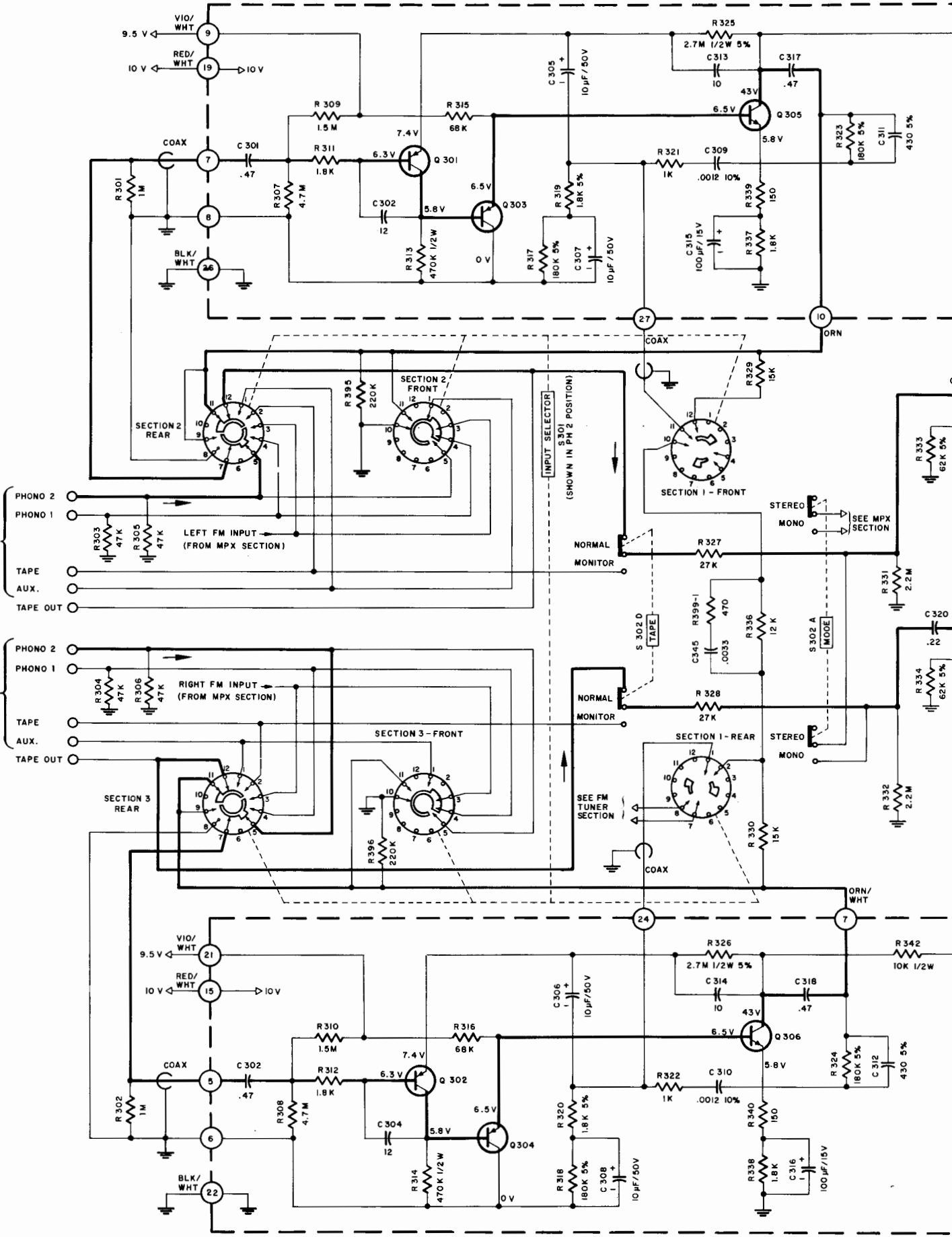
SELECTIVITY PC BOARD 044-290



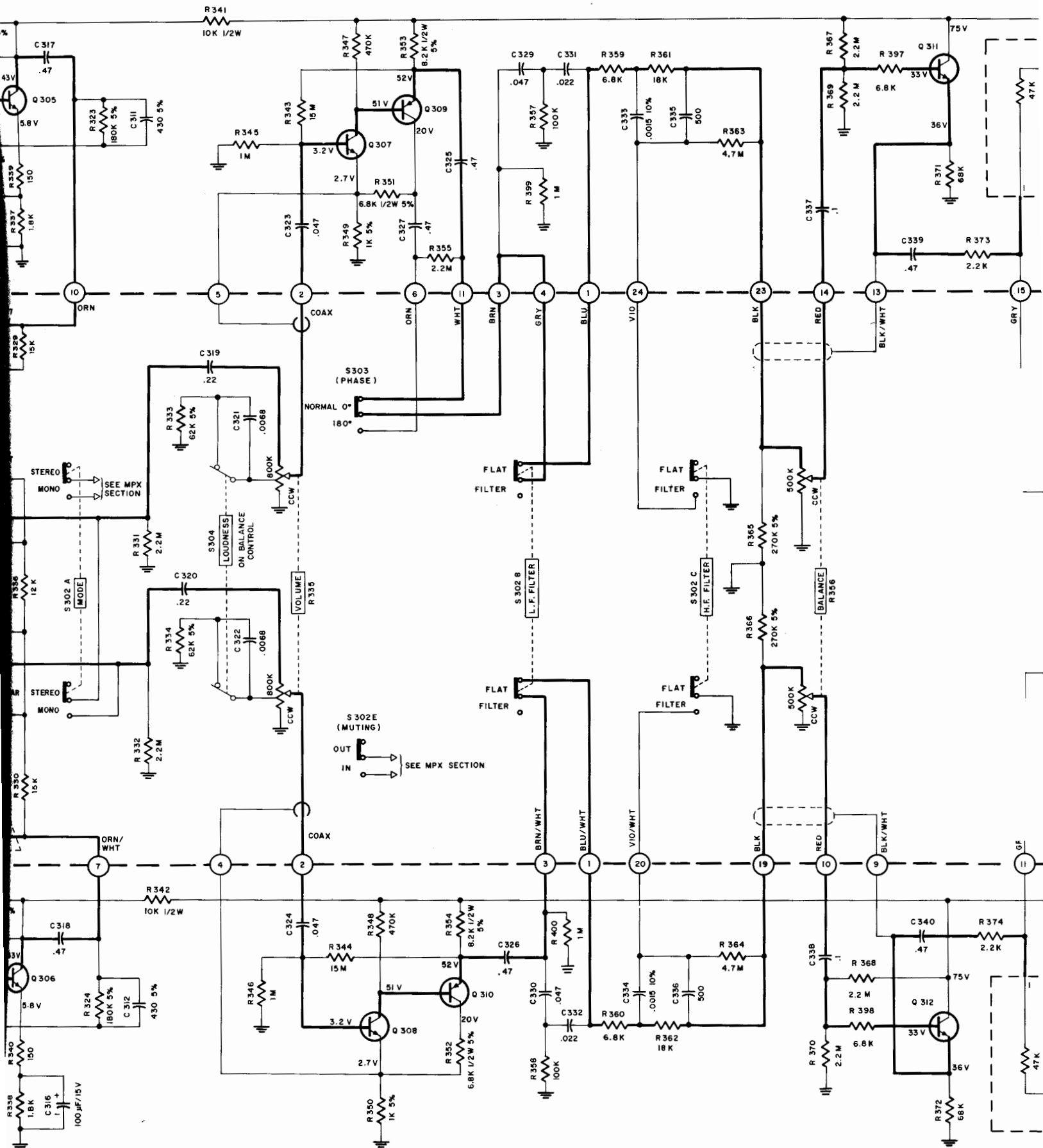
MIXER & LOCAL OSCILLATOR PC BOARD 044-292

LEFT CHANNEL INPUTS

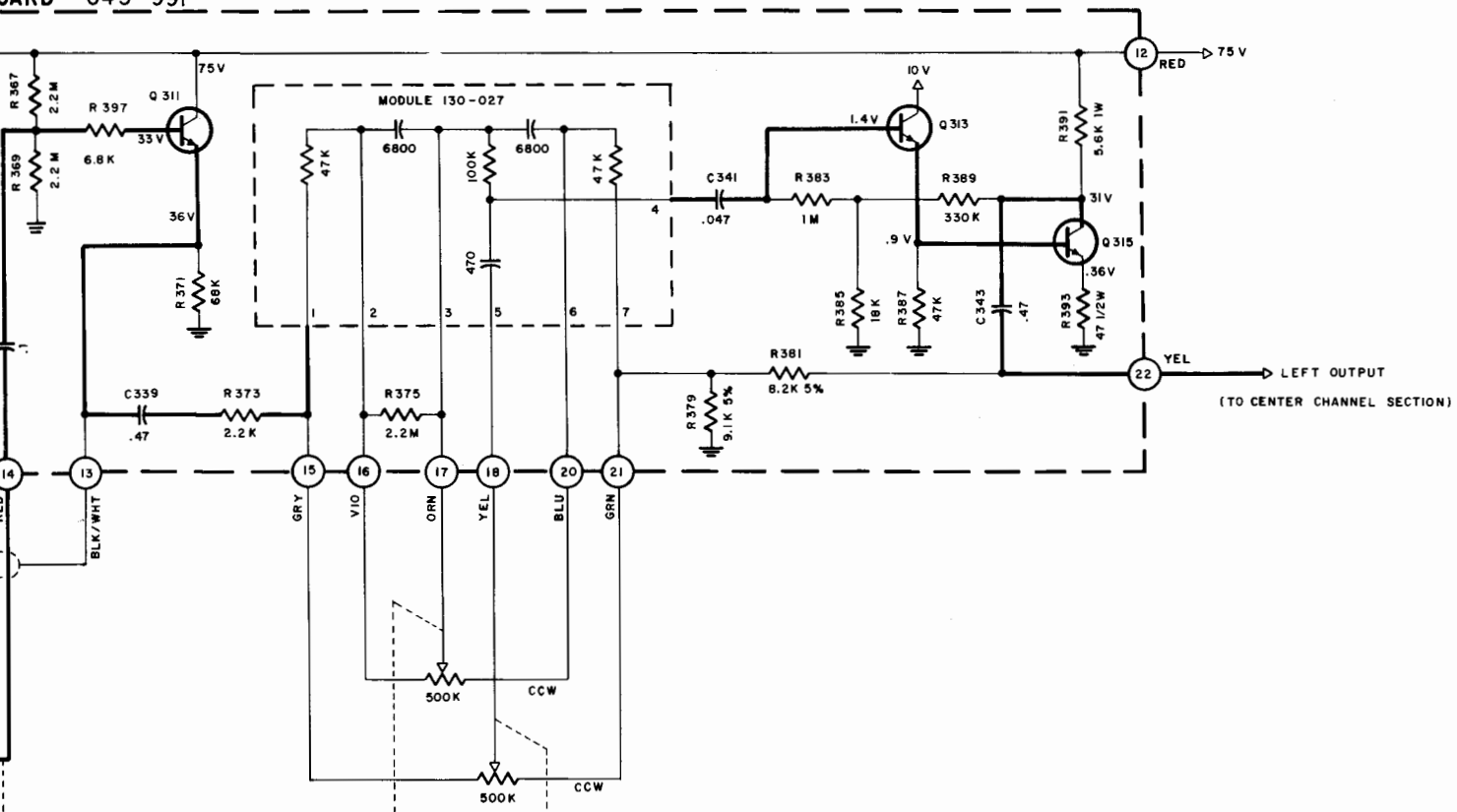
RIGHT CHANNEL INPUTS



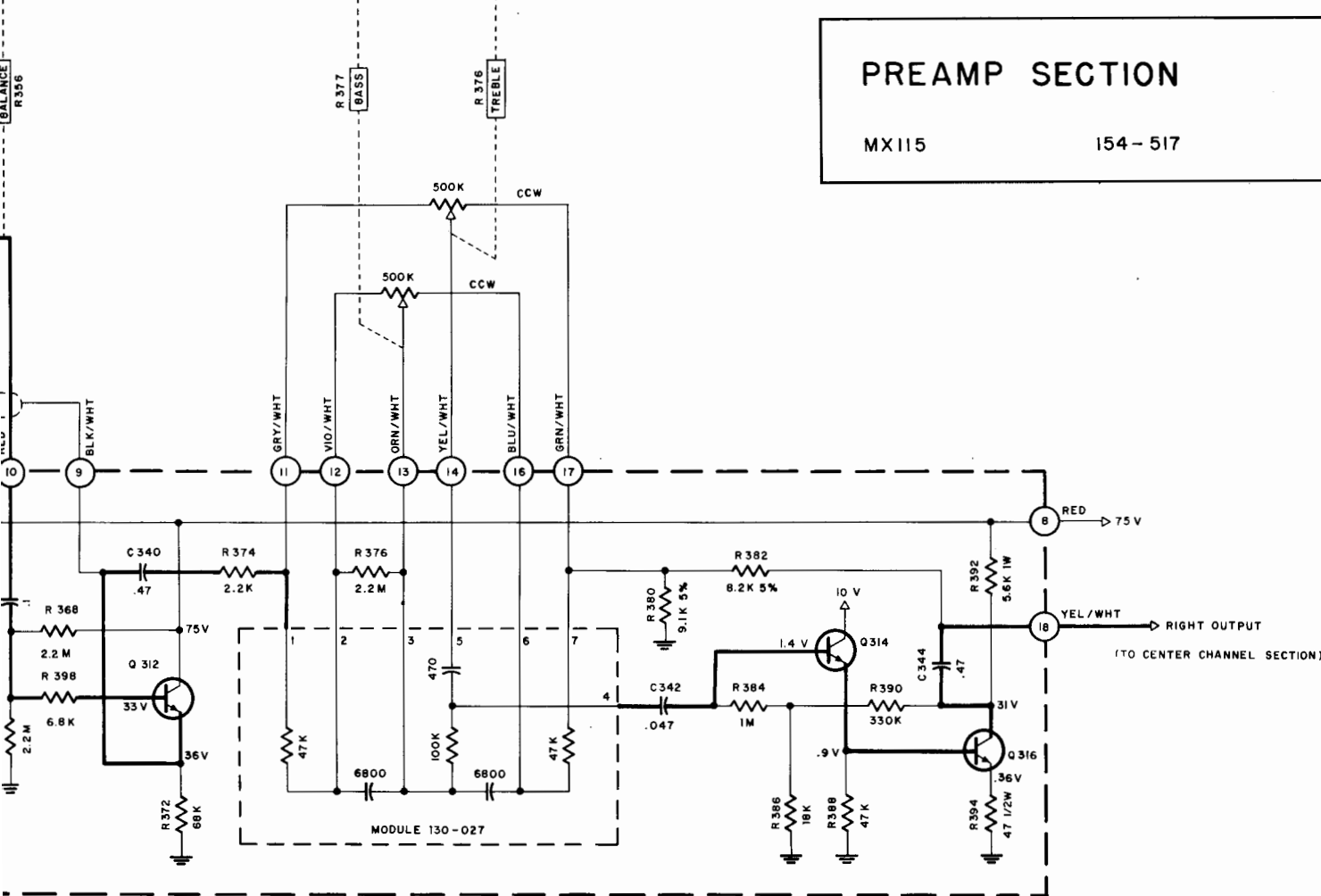
LEFT CHANNEL PREAMP. PRINTED CIRCUIT BOARD 043-991

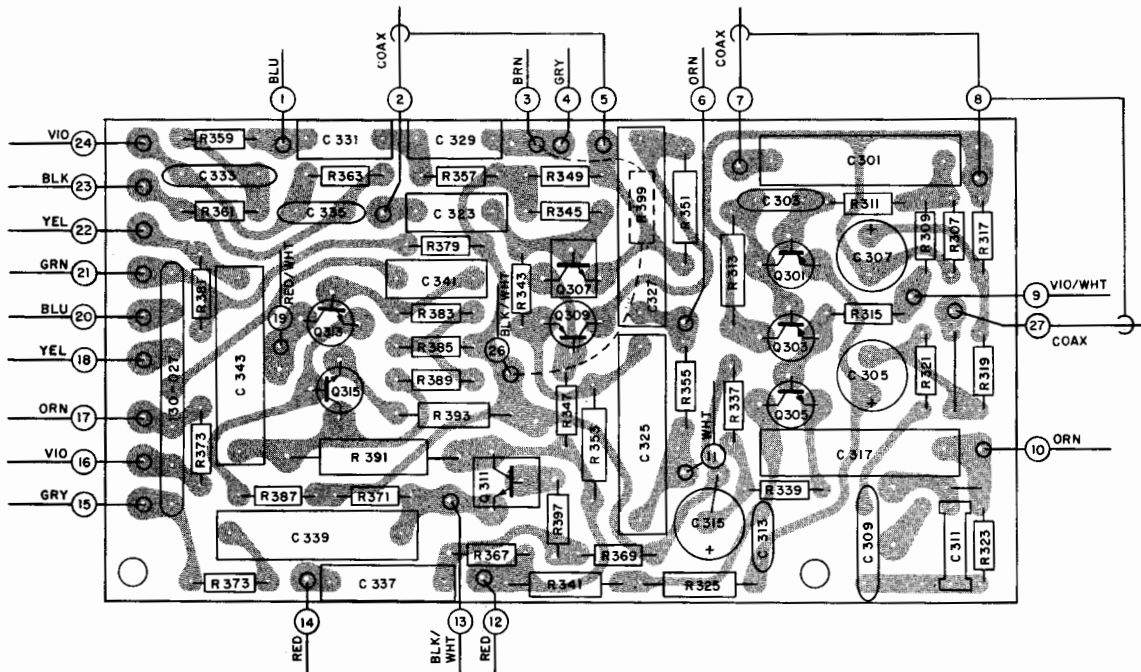


RIGHT CHANNEL PREAMP. PRINTED CIRCUIT BOARD 043-992

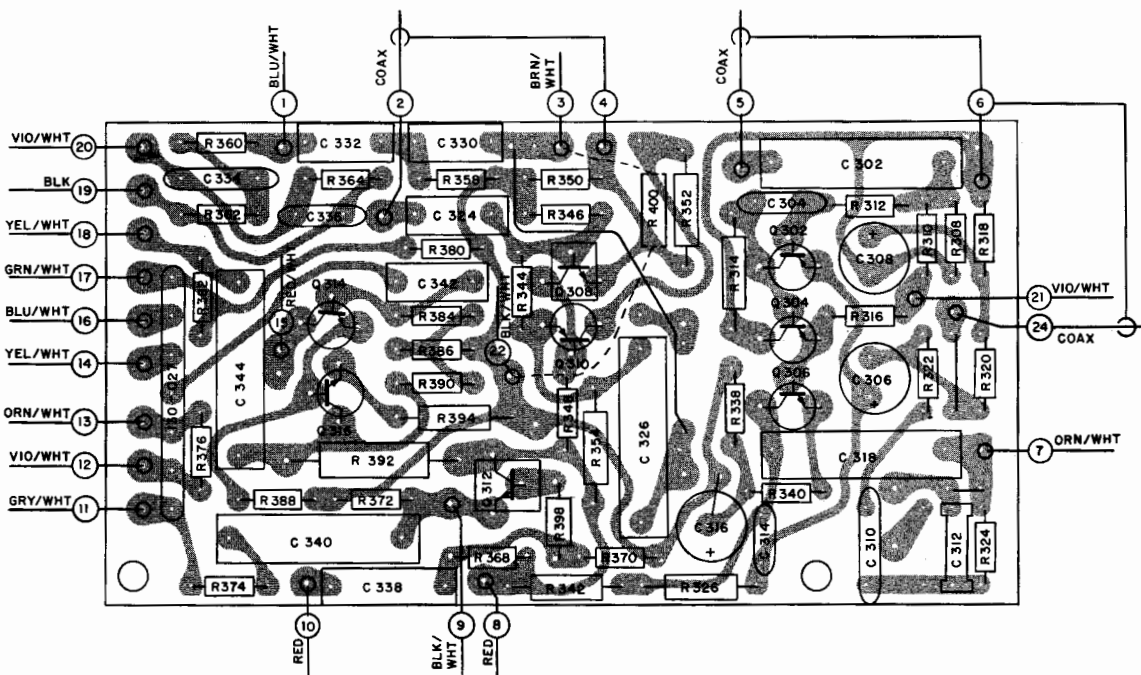


PREAMP SECTION
MX115 154-517

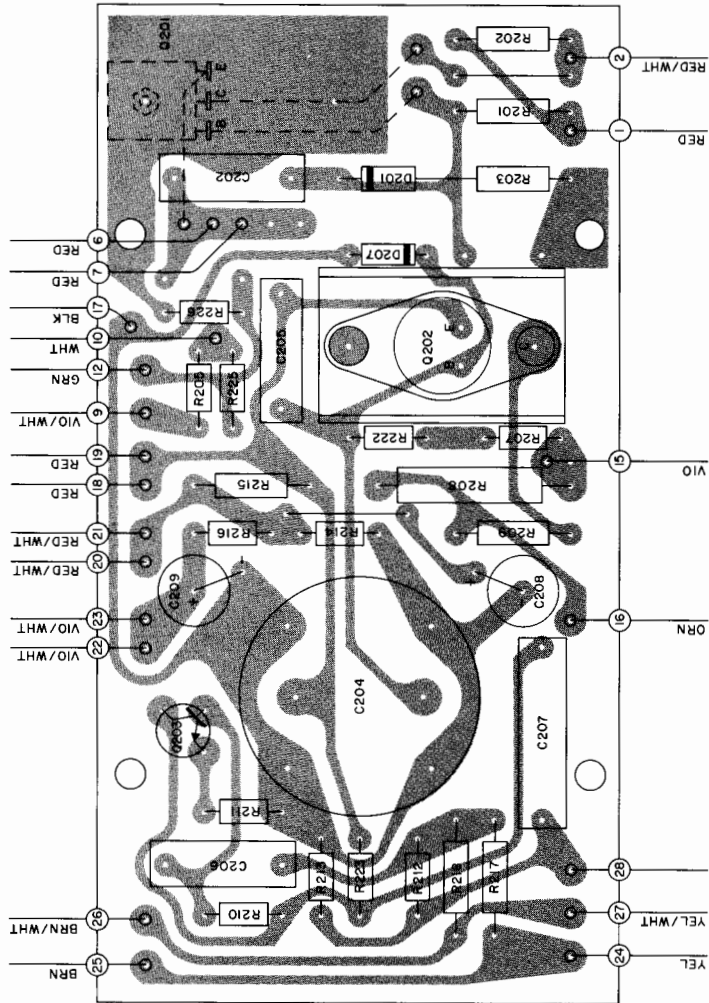




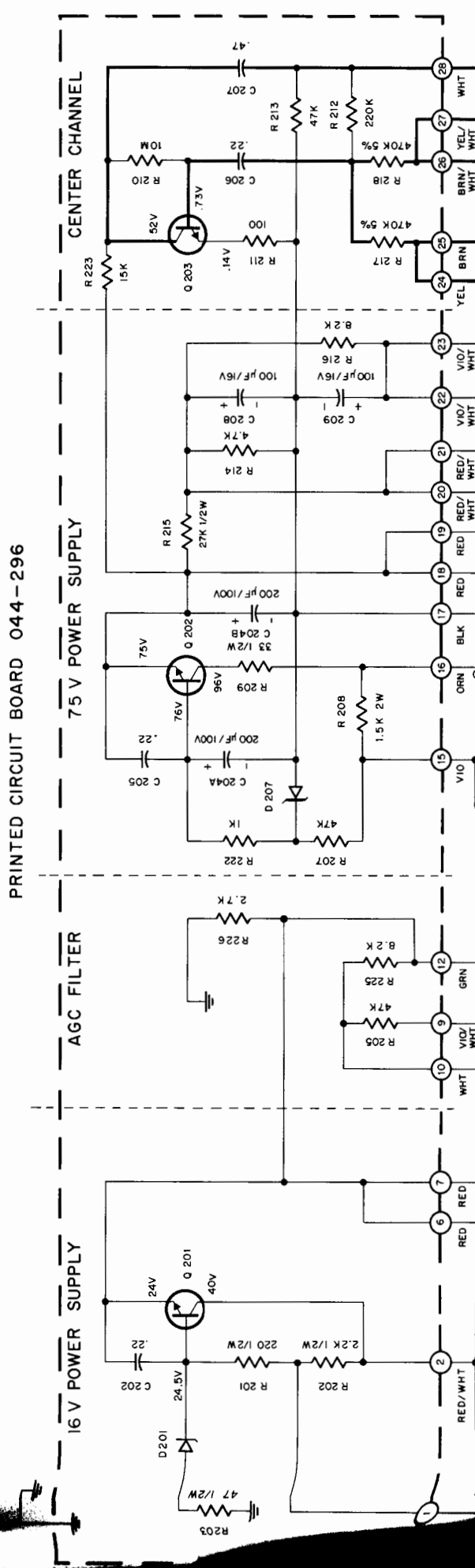
LEFT CHANNEL PREAMP PRINTED CIRCUIT BOARD 043-991

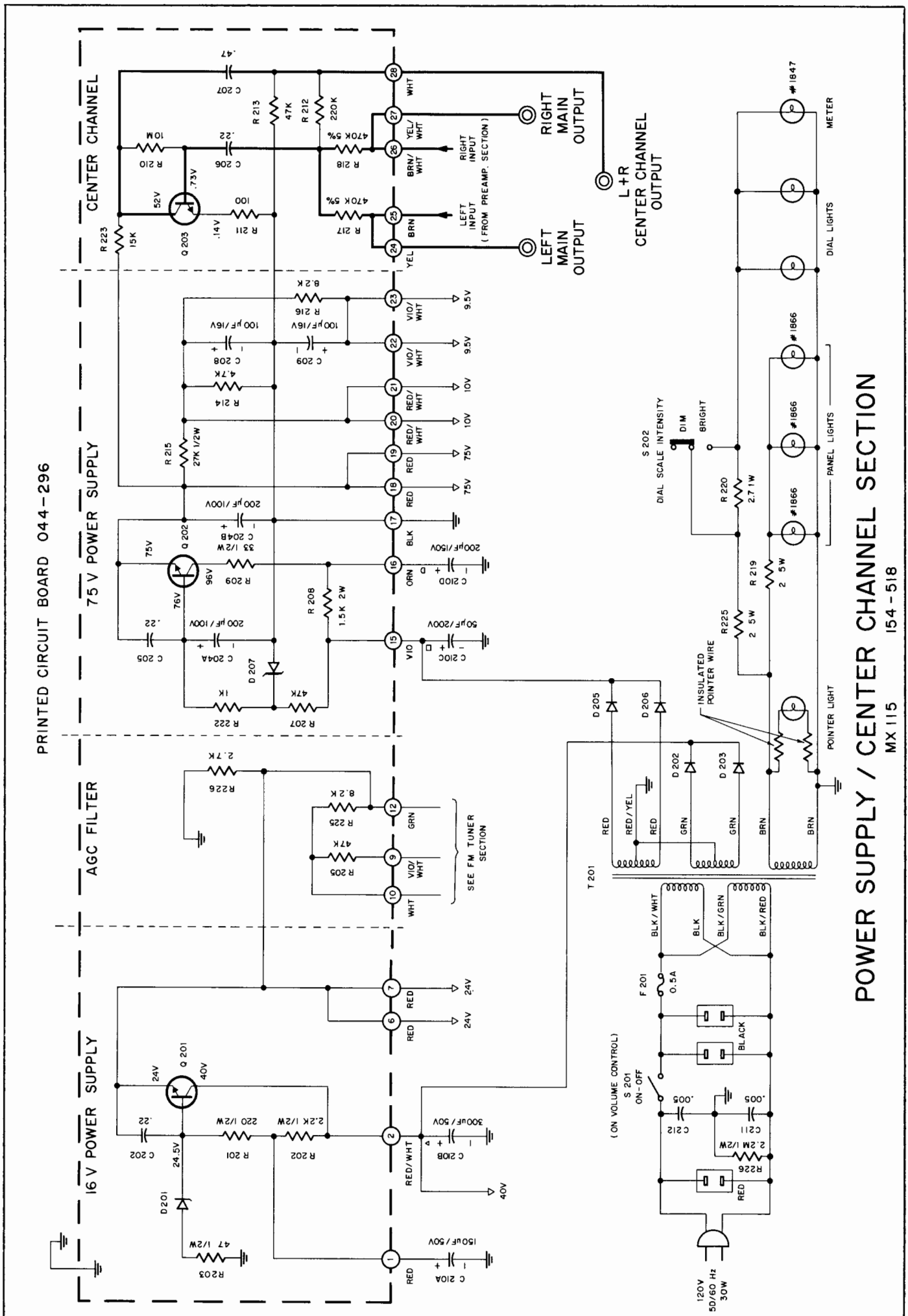


RIGHT CHANNEL PREAMP. PRINTED CIRCUIT BOARD 043-992



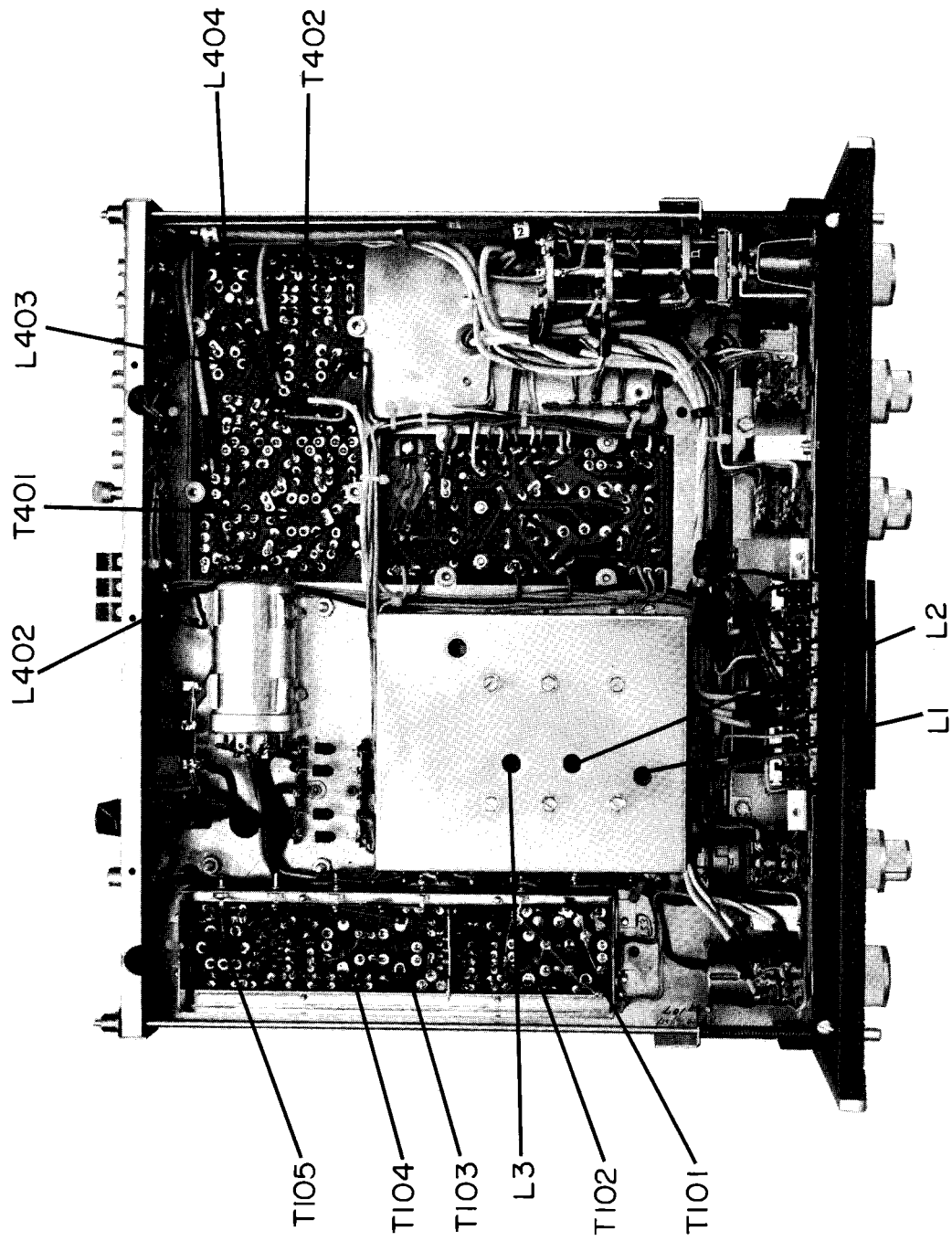
POWER SUPPLY / CENTER CHANNEL PRINTED CIRCUIT BOARD 044-296

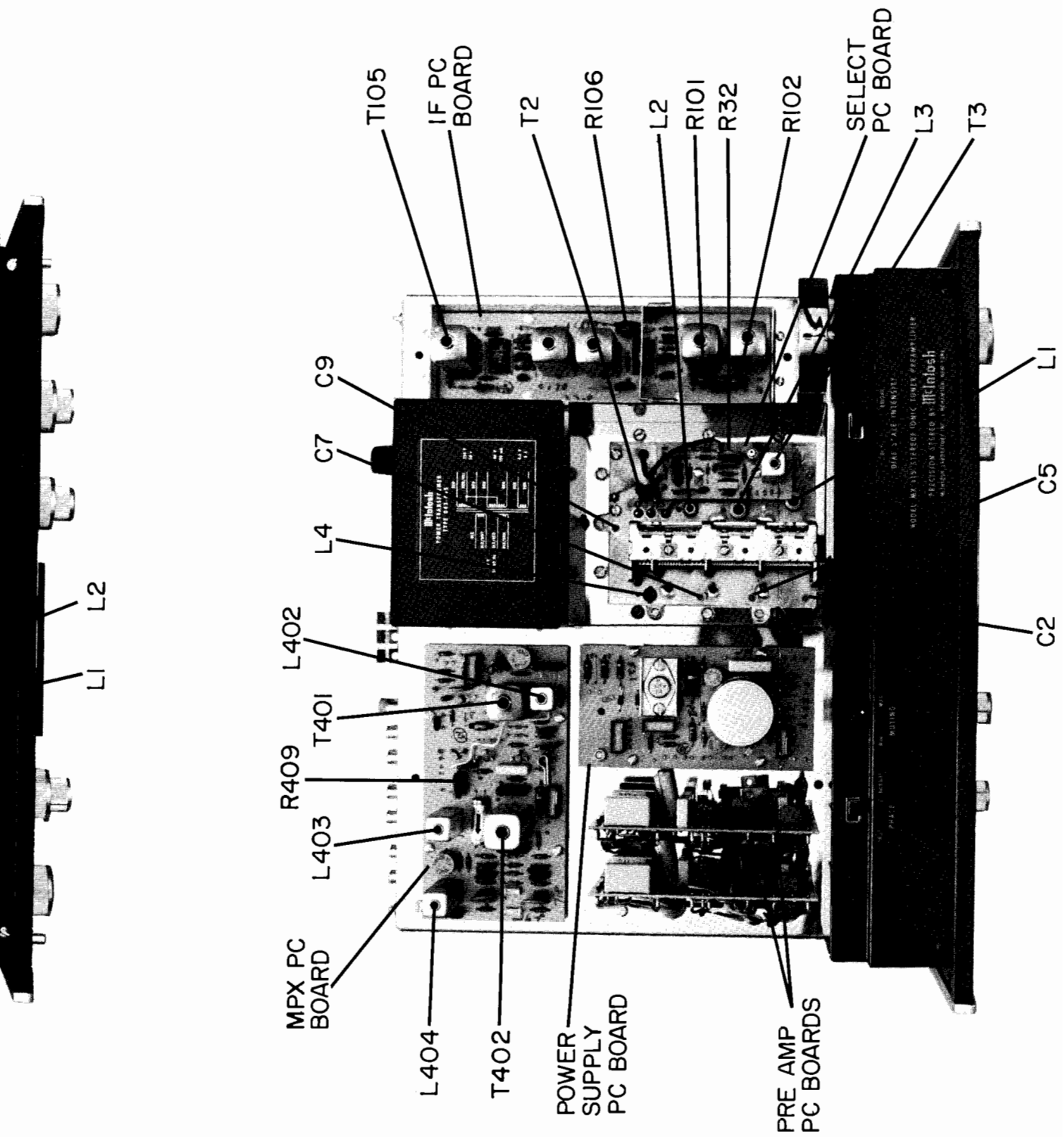




POWER SUPPLY / CENTER CHANNEL SECTION

MX 115 154-518





MPX PC BOARD

L404

T402

POWER SUPPLY PC BOARD

PRE AMP PC BOARDS

R409

L403

T401

L402

L4

C7

C9

IF PC BOARD

T105

T2

R106

L2

R101

R32

R102

SELECT PC BOARD

L3

T3

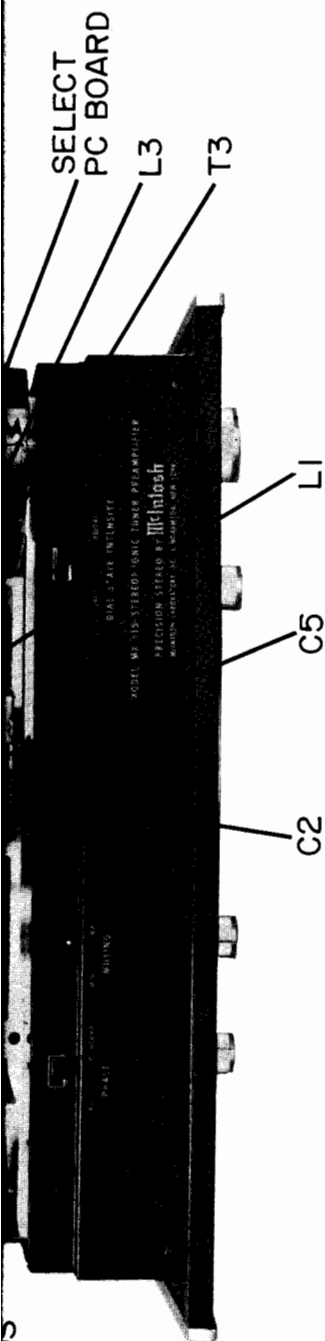
C2

C5

L1

L2

L1



MX 115 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 115.

The test equipment listed (or its equivalent) is necessary to properly align an MX 115. 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 WV98C).
3. Multiplex Generator (Radiometer SMGI) 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

STEP	TUNER DIAL SETTING	SIGNAL GENERATOR			INDICATOR		ADJUST	TEST LIMITS	REMARKS
		FREQ.	COUPLING	MODULATION	TYPE	CONNECTED TO			
1	Point of no interference.	10.7MHz	Through external .01µF capacitor to Q4 gate.	FM ±200kHz sweep w. 60Hz rate.	Oscilloscope	TPI	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.	
									Top (Primary) and Bottom (Secondary) of T2.
2	Same	Same	Same	Same	Same	Same	Same	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. Rimo filters do not have a flat-topped re See typical response curve - Fig. 2. Do not stagger tune.	
									Top (Primary) and Bottom (Secondary) of T3.
3	Same	Same	Same	C.W.	VTVM	TP2	Zero DC at TP2.	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.	
									Top (sec) core of T105.
4	Same	Same	Same	Same	Same	Pin 6 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%.	
									Bottom (Pri.) core of T105.
5	105MHz	300Ω antenna terminals w/* matching network.	Same	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.	
									Top and Bottom cores of IF filters.
6	90MHz	Same	Same	Same	Same	Oscillator coil L4.	Same	Repeat steps 5 & 6 until dial calibration is accurate.	
									Top (Primary) and Bottom (Secondary) of T3.
7	105MHz	Same	Same	Same	Same	Mixer RF2, RFI trimmers C7-5-2	Same	Same as step 5.	
									Top (Primary) and Bottom (Secondary) of T3.
8	90MHz	Same	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.	
									Top (Primary) and Bottom (Secondary) of T3.
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.	
									Top (Primary) and Bottom (Secondary) of T3.
	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	

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 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

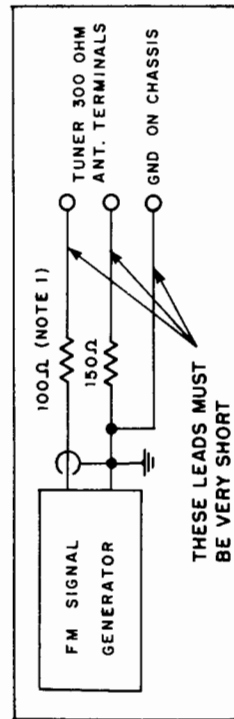
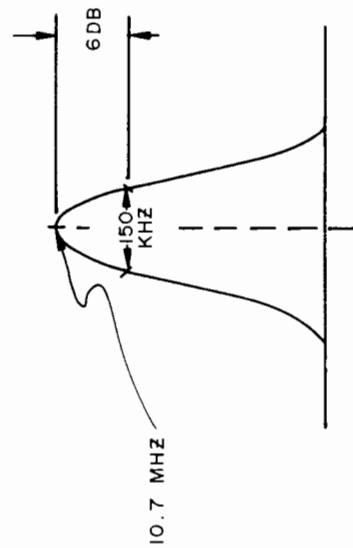


FIG. 2 TYPICAL IF RESPONSE CURVE



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

Symbol Number	Description	Part Number
C109	Ta. Elect. 22 μ F 20V	066-148
C202	Mylar .22 μ F 250V	064-068
C204	Elect. 200/200 μ F 100V	066-129
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	066-127
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 .22 μ F 250V	064-068

DIODES

D1	Ge. signal diode	070-003
D2,3	Si. diode	070-022
D101,102	Si. diode	070-022
D103,104	Ge. signal diode	070-003

D105,106	Ge. signal diode	070-003
D107,108	Si. diode	070-022
D201	Zener diode 24V	070-049
D202,203	Si. diode	070-031
D205	Si. diode	070-031
D206	Si. diode	070-031
D207	Zener diode 75V	070-025
D402,403	Si. diode	070-022
D404	Si. diode	070-022
D405,406	Ge. signal diode	070-003
D407,408	Ge. signal diode	070-003
D409	Ge. signal diode	070-003

CHOKES & COILS

L1	1st RF coil	122-115
L2	2nd RF coil	122-114
L3	Mixer coil	122-113
L4	Oscillator coil	122-112
L101,102	Choke 75 μ H	122-013
L401	Choke 1MH	122-092
L402	Filter coil (19kHz)	122-080
L403,404	Filter coil (SCA)	122-079

TRANSISTORS

Q1,2	Si. M.O.S. F.E.T.	132-088
Q3	Si. NPN transistor	132-015
Q4	Si. Junction F.E.T.	132-084
Q5	Si. Junction F.E.T.	132-068
Q6	Si. M.O.S. F.E.T.	132-086
Q201	Si. NPN transistor	132-065
Q202	Si. NPN transistor	132-028
Q203	Si. NPN transistor	132-069
Q301,302	Si. PNP transistor	132-056
Q303,304	Si. PNP transistor	132-056
Q305,306	Si. NPN transistor	132-069
Q307,308	Si. NPN transistor	132-054
Q309,310	Si. PNP transistor	132-056
Q311,312	Si. NPN transistor	132-054
Q313,314	Si. NPN transistor	132-057
Q315,316	Si. NPN transistor	132-042
Q401	Si. NPN transistor	132-057
Q402	Si. NPN transistor	132-090
Q403,404	Si. NPN transistor	132-057
Q405	Si. NPN transistor	132-057
Q406	Si. NPN transistor	132-042

D105,106	.Ge. signal diode	070-003
D107,108	Si. diode	070-022
D201	Zener diode 24V	070-049
D202,203	Si. diode	070-031
D205	Si. diode	070-031
D206	Si. diode	070-031
D207	Zener diode 75V	070-025
D402,403	Si. diode	070-022
D404	Si. diode	070-022
D405,406	Ge. signal diode	070-003
D407,408	Ge. signal diode	070-003
D409	Ge. signal diode	070-003

CHOKES & COILS

L1	1st RF coil	122-115
L2	2nd RF coil	122-114
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L4	Oscillator coil	122-112
L101,102	Choke 75 μ H	122-013
L401	Choke 1MH	122-092
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Q202	Si. NPN transistor	132-028
Q203	Si. NPN transistor	132-069
Q301,302	Si. PNP transistor	132-056
Q303,304	Si. PNP transistor	132-056
Q305,306	Si. NPN transistor	132-069
Q307,308	Si. NPN transistor	132-054
Q309,310	Si. PNP transistor	132-056
Q311,312	Si. NPN transistor	132-054
Q313,314	Si. NPN transistor	132-057
Q315,316	Si. NPN transistor	132-042
Q401	Si. NPN transistor	132-057
Q402	Si. NPN transistor	132-090
Q403,404	Si. NPN transistor	132-057
Q405	Si. NPN transistor	132-057
Q406	Si. NPN transistor	132-042

FUSES

F201	Fuse .5A slo-blo	089-020
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POTENTIOMETERS

R335	Volume control	134-202
R356	Loudness/Balance control	134-236
R377	Bass control	134-203
R378	Treble control	134-203
R407	Muting control	134-216

RESISTORS

R219	Wirewound 2 Ω	5W	139-005
R220	Wirewound 2.7 Ω	1W	139-002
R225	Wirewound 2 Ω	5W	139-005

SWITCHES

S301	Input selector switch	146-130
S302	Mode selector switch	150-004
S304	Loudness/Balance control	134-236

TRANSFORMERS

T1	Balun	043-226
T2	FM IF transformer	162-059
T3	FM IF transformer	162-042
T101	FM IF filter input	162-053
T102	FM IF filter output	162-052
T103	FM IF filter input	162-053
T104	FM IF filter output	162-052
T105	FM discriminator	162-036
T201	Power transformer	043-865
T401	FM RF transformer (19kHz)	162-031
T402	FM RF transformer (38kHz)	162-039

MODULES

	Tone control module	130-027
	LDR network	144-013

METERS

M101	Tuning meter	124-005
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INTEGRATED CIRCUIT

IC101,102	Integrated circuit	133-002
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FILTERS

FN1	FM filter	180-009
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LAMPS

#1847 (Meter)	058-008
#1866 (Front Panel)	058-014

#1828 (MPX)	058-027
Festoon lamp	058-032
FRONT PANEL & TRIM	
Front panel	044-297
Front panel end caps	018-120
Volume knob	043-253
Input selector knob	043-253
Tuning knob	043-272
Bass knob (rear)	090-009
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Loudness knob	043-625
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MOUNTING SYSTEM	
Shelf bracket (right)	043-622
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MISCELLANEOUS ITEMS	
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