McIntosh

MX 113
AM/FM TUNER PREAMP

SERVICE INFORMATION
STARTING WITH SERIAL NO. 1001

McINTOSH LABORATORY INC. 2 CHAMBERS STREET BINGHAMTON, NEW YORK
SENSITIVITY
75uV HF (external ant.)

SIGNAL TO NOISE RATIO
45 dB HF minimum, 55 dB at 100% modulation.

HARMONIC DISTORTION
Does not exceed 1% at 30% modulation.

USEABLE SENSITIVITY
1.5 microvolts at 100% modulation (±75 kHz deviation) for 3X total noise and harmonic distortion HF.

SIGNAL TO NOISE RATIO
70 dB below 100% modulation.

CAPTURE RANGE
1.5 dB

HARMONIC DISTORTION
Mono: Does not exceed 0.3% at ±30% modulation.
Stereo: Does not exceed 0.5%

AUDIO FREQUENCY RESPONSE
21 dB at 20 Hz to 15,000 Hz with standard deemphasis (75 micros.) and 19,000 Hz pilot filter.

FREQUENCY RESPONSE
20.5 dB, 20 Hz to 20,000 Hz.

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

INPUT SENSITIVITY (phone 1 and phone 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 (phone 1 and phone 2)
71 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.

SELECTIVITY, ADJACENT CHANNEL
35 dB minimum HF in "NORMAL" Position.
45 dB minimum HF 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

SELECTIVITY
ADJACENT CHANNEL:
6 dB minimum HF in "NORMAL" Position.
15 dB minimum HF in "NARROW" Position.

ALTERNATE CHANNEL:
58 dB minimum HF in "NORMAL" Position.
88 dB minimum HF in "NARROW" Position.

SPurious REJECTION
90 dB HF 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

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.
SCHEMATIC NOTES

1. Unless otherwise specified: Resistance values are in ohms, 1/4 watt, and 10% tolerance; capacitance values smaller than 1 are in picofarads (pF); capacitance values greater than 1 are in microfarads (μF). 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 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 187HS R219 and R225 are used.

7. In units with serial no.'s below 190MD R229 and R330 are 15k; C8 is 12pF. R228 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 178HS C38 is 3pF; C527 and C528 are not used and disk glass is McIntosh part no. D44-319.

9. In units with serial no.'s below 189M C505 is .02μF.

10. In units with serial no.'s from 175MD to 190MD C537 and D504 are used.

11. In units with serial no.'s below 199HS C124 is used and C401 is 10μF.

12. In units with serial no.'s from 167HS to 178HS C101 and C108 is not used.

13. In units with serial no.'s below 182HS R408 is 6800; R411 is 10k; R412 and R418 are not used.

14. In units with serial no.'s from 238MD to 282HS C113 is used. In units with serial no.'s below 182HS R203 is used and C201 is not used.

15. In units with serial no.'s below 322HS R327 and R328 is 1.8k.

16. In units with serial no.'s below 269HS the MPX lamp is a #182 bulb and R416 is used.

17. In units with serial no.'s below 262HS C214 is not used.

18. In units with serial no.'s below 400HS R399 and K404 are 1μF; C303, C304, C311 & C314 are used; C346, C347, C348, C349, C350, C351, R399-2 and R399-3 are not used and D415 is .22μF.

19. In units with serial no.'s below 282HS, C113 is 1μF; R415 and R416 are used; D407 is not used and D407 is connected as shown by dotted lines.

20. In units with serial no.'s below 334HS R530 is 7.5k and D505 is McIntosh Part No. D70047.

21. In early units R526 is not used.

22. In early units C10 and C35 are .001μF.
Step 1 Before stringing unit, turn pointer adjustment screw until pointer is in the center of its travel.

Step 2 String unit as shown.

Step 3 After stringing unit, turn tuning shaft until pointer moves from 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 shaft 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, readjust pointer position.

DIAL CORD SEQUENCE

(TO LEFT SIDE PULLEY) WHITE (TO IDLER PULLEY AND TUNING SHAFT) BLACK

(TO IDLER PULLEY) WHITE (TO TUNING CONDENSER DRUM) BLACK (TO TUNING SHAFT)

POINTER DIAL STRINGING
SELECTIVITY PC BOARD 044-290

FM OUTPUT TO MIXER SECTION

FLX

TUNER SECTION

113

154-647

MMXER B LOCAL OSCILLATOR PC BOARD 044-292
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 13901 (Telephone 607-723-3013).

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 W628C).
4. Multifunction Generator (Radiover 5352) 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 1200B or equivalent).
8. Harmonic Distortion Analyzer (Hewlett-Packard 333A or equivalent).
9. 10.7 MHz 275 kHz Sweep Marker Generator.
**AM ALIGNMENT**

<table>
<thead>
<tr>
<th>STEP</th>
<th>TUNER DIAL SETTING</th>
<th>SIGNAL GENERATOR</th>
<th>INDICATOR</th>
<th>ADJUST</th>
<th>TEST LIMITS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Points of no interference or signal</td>
<td>455kHz through external 0.1nF capacitor to Pin 3 on AM circuit board</td>
<td>CW</td>
<td>Signal strength meter</td>
<td>Normal</td>
<td>Pri. &amp; Sec. cores of 750k &amp; T505</td>
</tr>
<tr>
<td>2</td>
<td>600kHz 600kHz</td>
<td>Through a 100pF cap to ant. terminals</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>L503 (oscilo-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>scope) &amp; L504 (oscil-</td>
</tr>
<tr>
<td>3</td>
<td>1400kHz 1400kHz</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>L510 (oscil-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>lator trim)</td>
</tr>
<tr>
<td>4</td>
<td>600kHz 600kHz</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>L501 (AM -6db) &amp; L502 (AM-RF)</td>
</tr>
<tr>
<td>5</td>
<td>1400kHz 1400kHz</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>L501 (AM &amp; 460kHz trim) &amp; L502 (AM-RF trim)</td>
</tr>
<tr>
<td>6</td>
<td>1000kHz 1000kHz</td>
<td>Same</td>
<td>30% @ 400Hz Distortion Analyzer</td>
<td>L or R tape output</td>
<td>L501 (460kHz trim) &amp; L502 (AM-RF trim)</td>
<td>With a distortion analyzer, the following measurements can be performed: 1. With a 10mW input signal adjust &quot;AM Level&quot; control for 0.35 volts of audio output at tape output. This will correspond to 1.2 volts audio output for a 100% modulated signal. 2. With a 1mW input signal, harmonic distortion, whistle filter attenuation at 10kHz modulating frequency and signal to noise ratio may be measured. 3. HF bandwidth sensitivity of 75 microvolts for 20dB signal to noise ratio. This measurement is only possible in the absence of harmonics interference, at fluorescent lamps, etc.</td>
</tr>
</tbody>
</table>

**FM ALIGNMENT**

<table>
<thead>
<tr>
<th>STEP</th>
<th>TUNER DIAL SETTING</th>
<th>SIGNAL GENERATOR</th>
<th>INDICATOR</th>
<th>ADJUST</th>
<th>TEST LIMITS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Points of no interference</td>
<td>10.7MHz through external 0.1nF capacitor to Q gate</td>
<td>CW</td>
<td>Modulation scope</td>
<td>Primary</td>
<td>Tune (primary) and Boston</td>
</tr>
<tr>
<td>Point of no interference</td>
<td>10.7MHz</td>
<td>Through external 0.01uF capacitor to QH gate.</td>
<td>FM ±200kHz sweep = 50Hz rate.</td>
<td>Oscilloscope</td>
<td>TPI</td>
<td>Maximum height of 10.7MHz marker and most symmetry of 10.7MHz markers.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>2</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>C.W.</td>
<td>VTVM</td>
<td>TP2</td>
</tr>
<tr>
<td>3</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>4</td>
<td>105MHz</td>
<td>105MHz</td>
<td>300Ω antenna terminals w/ matching network.</td>
<td>100/ = 400kHz VTVM connected to TPI and oscilloscope connected to L or R arm output.</td>
<td>Oscillator trimmer C9.</td>
<td>Maximum negative voltage at TPI. As TPI voltage increases reduce output of signal generator to keep TPI voltage as low as possible.</td>
</tr>
<tr>
<td>5</td>
<td>90MHz</td>
<td>90MHz</td>
<td>Same</td>
<td>Same</td>
<td>Save</td>
<td>Oscillator coil L4.</td>
</tr>
<tr>
<td>6</td>
<td>105MHz</td>
<td>105MHz</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Mixer R42, RFI trimmers E7±5%</td>
</tr>
<tr>
<td>7</td>
<td>90MHz</td>
<td>90MHz</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Mixer R42, RFI coils L3±2%</td>
</tr>
<tr>
<td>8</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>VTVM connected to TPI and a harmonic distortion trimmer to L or R output.</td>
<td>Same</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>R101, R102, 10k</td>
</tr>
</tbody>
</table>
## Multiplex Decoder Alignment

<table>
<thead>
<tr>
<th>STEP</th>
<th>Tuner Dial Setting</th>
<th>Signal Generator</th>
<th>Indicator</th>
<th>Adjust</th>
<th>Test Limits</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100kHz</td>
<td>100kHz</td>
<td>AC-VTM</td>
<td>L or R output jack.</td>
<td>Minimum output &amp; Impedance.</td>
<td>Adjust for minimum output with 67kHz modulation.</td>
</tr>
<tr>
<td>2</td>
<td>100kHz</td>
<td>Same</td>
<td>1kHz stereo pilot.</td>
<td>AC-VTM or oscilloscope w/v very low cap. probe.</td>
<td>L402 (19kHz phase adj.) &amp; TA01 (39 kHz doubler)</td>
<td>Decrease pilot level, if necessary, so that 19kHz circuits do not limit or saturate.</td>
</tr>
<tr>
<td>3</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>T402, Pin 1 or 2.</td>
<td>TA02 (F11) bottom (Sec.: tuning slug) &amp; 35dB separation or more.</td>
<td>Decrease pilot level so that 19kHz and 38kHz circuits do not limit. Made switch must be in stereo position.</td>
</tr>
<tr>
<td>4</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>L or R output jack.</td>
<td>TA02, Bottom (Sec.: tuning slug)</td>
<td>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 in T402.</td>
</tr>
<tr>
<td>5</td>
<td>100kHz</td>
<td>100kHz</td>
<td>AC-VTM</td>
<td>L or R output jack.</td>
<td>Less than 120V of residual.</td>
<td>Adjust &quot;PM-level&quot; control (RA00) 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.</td>
</tr>
</tbody>
</table>

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

**FIG. 1** Antenna Matching Network

**FIG. 2** Typical IF Response Curve

![Antenna Matching Network](image)

![IF Response Curve](image)
REPLACEMENT PARTS

All parts not listed are standard 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

C100 Ta. Elect. 22uF 20V 066-148
C201 Elect. 10uF 50V 066-221
C204 Elect. 200/200uF 100V 066-159
C202 Mylar +22uF 250V 064-068
C205,206 Mylar +22uF 500V 064-068
C207 Mylar +47uF 250V 064-069
C208,209 Elect. 100uF 16V 066-177
C210 Elect. 50/200/100/150uF 066-128
200/150/50/50V
C301,302 Mylar +47uF 250V 064-069
C305,306 Ta. Elect. 10uF 20V 066-149
C307,308 Ta. Elect. 10uF 20V 066-149
C315,316 Elect. 100uF 15V 066-216
C317,318 Mylar +47uF 250V 064-069
C319,320 Mylar +22uF 200V 064-087
C321,322 Polypropylene .0068uF 064-103
C323,324 Mylar +0.047uF 250V 064-066
C325,326 Mylar +47uF 250V 064-069
C327 Mylar +47uF 250V 064-069
C328,330 Mylar +0.047uF 250V 064-066
C331,332 Mylar +0.022uF 250V 064-065
C337,338 Mylar +1uF 250V 064-067
C339,340 Mylar +47uF 250V 064-069
C341,342 Mylar +0.047uF 250V 064-066
C343,344 Mylar +47uF 250V 064-069
C401 Mylar +0.022uF 250V 064-068
C405 Elect. 100uF 25V 066-161
C408 Elect. 100uF 25V 066-161
C411 Ta. Elect. 1.0uF 35V 066-147
C415 Mylar 10uF 63V 064-178
C502 Poly styrene 4700pF 064-091
C503 Ta. Elect. +47uF 35V 066-167
C507 Ta. Elect. 3.3uF 35V 066-170
C515 Poly styrene 0.01uF 064-101
C518 Poly styrene 2700pF 064-093

DIODES

D01 Ge. signal diode 070-002
D02,3 Si. diode 070-047
D101,102 Si. diode 070-022
D103,104 Ge. signal diode 070-047
D105,106 Ge. signal diode 032-003
D107,108 Si. diode 070-027
D201 Zener diode 3.7V 070-049
D202,203 Si. diode 070-031
D204,205 Si. diode 070-031
D206 Si. diode 070-024
D207 Zener diode 7.5V 070-026
D402,403 Si. diode 070-047
D404 Si. diode 070-027
D405,406 Ge. signal diode 070-003
D407,408 Ge. signal diode 070-003
D409 Ge. signal diode 070-003
D501 Si. diode 070-022
D502,503 Ge. signal diode 070-003
D505 Si. diode 070-046
D506 Si. diode 070-047

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 5uH 122-013
L401 Choke 1mH 122-092
L402 Filter coil (1kHz) 122-094
L403,404 Filter coil (2kHz) 122-093
L501 AM antenna 122-110
L502 AM RF coil 122-086
L503 AM oscillator coil 122-085

TRANSISTORS

Q1,2 Si. M.D.S. F.E.T. 132-088
Q3 Si. NPN transistor 132-087
Q4 Si. Junction F.E.T. 132-097
Q5 Si. Junction F.E.T. 132-097
Q6 Si. M.D.S. F.E.T. 132-086
Q80128K924 Si. NPN transistor 132-065
Q802 Si. NPN transistor 132-028
Q803 Si. NPN transistor 132-095
Q801,802 Si. PNP transistor 132-096
Q803,804 Si. PNP transistor 132-096
Q805,806 Si. NPN transistor 132-095
<table>
<thead>
<tr>
<th>Item</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owners manual</td>
<td>038-667</td>
</tr>
<tr>
<td>Dial cord</td>
<td>044-276</td>
</tr>
<tr>
<td>Dial pointer</td>
<td>043-876</td>
</tr>
<tr>
<td>Shorting plug</td>
<td>127-021</td>
</tr>
<tr>
<td>AC line cord</td>
<td>170-021</td>
</tr>
<tr>
<td>FM dipole antenna</td>
<td>170-013</td>
</tr>
<tr>
<td>Fuseholder</td>
<td>178-001</td>
</tr>
<tr>
<td>Dial glass (note B)</td>
<td></td>
</tr>
</tbody>
</table>
REDUCE RF INTERFERENCE

MODEL: MX 113 AM/FM Tuner-Preampl

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: Refrigerators, passing cars, etc.

PARTS REQUIRED:

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>136301</td>
<td>Res. = 100K, 1/4W, 10% R399, 400</td>
</tr>
<tr>
<td>2</td>
<td>061002</td>
<td>Disc. Cap. = 1.8pF, ±25pF NPO</td>
</tr>
<tr>
<td>2</td>
<td>061008</td>
<td>Disc. Cap. = 6.8pF, 20% NPO</td>
</tr>
<tr>
<td>2</td>
<td>061032</td>
<td>Disc. Cap. = 470pF, 20%</td>
</tr>
<tr>
<td>2</td>
<td>136296</td>
<td>Res. = 1K, 1/4W, 10%</td>
</tr>
</tbody>
</table>

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


2. Connect a 061032 = 470pF capacitor between the base and the emitter of transistor Q301, 302.

(OVER)

McIntosh Laboratory Incorporated
2 Chambers Street
Binghamton, New York 13903
Phone: Area Code 607-723-3512
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 135301 = 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.