MCINTOSH

MX 112

FM/AM TUNER PREAMP

SERVICE INFORMATION

STARTING WITH SERIAL NO. 40500

MCINTOSH LABORATORY INC.  2 CHAMBERS STREET  BINGHAMTON, NEW YORK
### ELECTRICAL SPECIFICATIONS

#### FM TUNER SECTION

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Usable Sensitivity</td>
<td>Better than 2.5uF (HF usable sensitivity)</td>
</tr>
<tr>
<td>Signal to Noise Ratio</td>
<td>Better than 65dB</td>
</tr>
<tr>
<td>Harmonic Distortion</td>
<td>Mono: less than 0.2%. Stereo: less than 0.4%</td>
</tr>
<tr>
<td>Frequency Response</td>
<td>Flat from 20Hz to 20kHz with standard deemphasis and 19kHz pilot filter</td>
</tr>
<tr>
<td>Capture Ratio</td>
<td>Better than 1.5dB</td>
</tr>
<tr>
<td>Spurious Rejection</td>
<td>90dB or greater</td>
</tr>
<tr>
<td>Image Rejection</td>
<td>750μV or greater (at 100kHz)</td>
</tr>
<tr>
<td>Stereo Separation</td>
<td>Better than 30dB at 1kHz</td>
</tr>
</tbody>
</table>

#### PREAMPLIFIED SECTION

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Response</td>
<td>±0.5dB, 20Hz to 20,000Hz</td>
</tr>
<tr>
<td>Distortion</td>
<td>Less than 0.1% at 2.5 volts 20Hz to 20kHz</td>
</tr>
<tr>
<td>Input Sensitivity (phono 1 and phono 2)</td>
<td>2 millivolts for 2.5 volts output at 1kHz</td>
</tr>
<tr>
<td>Input Sensitivity (aux, tape)</td>
<td>0.25 volts for 2.5 volts output</td>
</tr>
<tr>
<td>HUM AND NOISE (phono 1 and phono 2)</td>
<td>72dB below 10 millivolt input</td>
</tr>
<tr>
<td>HUM AND NOISE (aux, tape)</td>
<td>85dB below rated output</td>
</tr>
<tr>
<td>Output (main)</td>
<td>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</td>
</tr>
<tr>
<td>Output (tape)</td>
<td>0.25 volts with rated input. Phono input signal of 5 millivolts produces 1.2 volts output. FM and AM will produce 1 volt output at 100% modulation</td>
</tr>
<tr>
<td>Output (center channel)</td>
<td>2 volts with rated input to both channels</td>
</tr>
<tr>
<td>Bass Control</td>
<td>+18dB to +16dB at 20Hz</td>
</tr>
<tr>
<td>Treble Control</td>
<td>-26dB to 20,000Hz</td>
</tr>
<tr>
<td>LF Filter</td>
<td>Flat or roll off below 50Hz, down 12dB at 20kHz</td>
</tr>
<tr>
<td>HF Filter</td>
<td>Flat or roll off above 5000Hz, down 12dB at 20,000Hz</td>
</tr>
</tbody>
</table>

#### AM TUNER SECTION

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>Better than 12μV at 100kHz (using external antenna input)</td>
</tr>
<tr>
<td>Signal to Noise Ratio</td>
<td>Better than 55dB</td>
</tr>
<tr>
<td>Harmonic Distortion</td>
<td>Less than 1% at 30% modulation</td>
</tr>
<tr>
<td>Frequency Response</td>
<td>Down 6dB at 5kHz</td>
</tr>
<tr>
<td>Selectivity</td>
<td>10kHz at +6dB</td>
</tr>
<tr>
<td>Image Rejection</td>
<td>60dB or greater at 100kHz</td>
</tr>
</tbody>
</table>
Step 1: Before stringing unit, move pointer adjustment screw until pointer is at 0 on dial. Move shaft until pointer is at center of scale.

Step 2: Stringing will be easier.

Step 3: After stringing unit, move pointer shaft until pointer is at 0 on dial. Move shaft until pointer is at center of scale.

Step 4: Test the tuned loop. Make sure the shaft moves back and returns from the end of the dial. Move shaft until pointer is at 90 on dial. Make sure the shaft returns to the far left side of the scale. Adjust pointer position.

DIAL CORR. SEQUENCE:

170 LEFT SIDE PULLEY WHITE
170 LEFT SIDE PULLEY AND TUNING SHAFT BLACK
170 LEFT SIDE PULLEY AND TUNING SHAFT BLACK

POINTER DIAL STRINGING

EXHIBIT 112

MPX PRINTED CIRCUIT BOARD 043-974
SCHEMATIC NOTES

Unless otherwise specified, resistance values are in ohms, 1/4 watt, and 1% 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 11-30vdc input voltage.
b. All voltages ±10% with respect to chassis ground.
c. No signal at input or antenna terminals.
d. AC input at 117 volts, 50/60Hz.

a. FM panel controls:
   - Tuning Indicator: 100MHz (no signal)
   - Volume: Fully CW
   - Mode: Stereo
   - Muting: Off
   - Input Selector: AM (to measure AM section)
   - FM (to measure FM section)
   - Panel Lights: Bright
## 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>Point of no Interference or signal</td>
<td>150kHz</td>
<td>Through external .01µF capacitor to variable trimmer or C7 and T10 pin 2.</td>
<td>CV</td>
<td>VTVM</td>
<td>Junction of 430 and sliding arm of AM level pot.</td>
</tr>
<tr>
<td>2</td>
<td>600kHz</td>
<td>600kHz</td>
<td>Through a 22µF capacitor to external terminals.</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>3</td>
<td>1100kHz</td>
<td>1100kHz</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>4</td>
<td>600kHz</td>
<td>600kHz</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>5</td>
<td>1100kHz</td>
<td>1100kHz</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>6</td>
<td>1000kHz</td>
<td>1000kHz</td>
<td>Same</td>
<td>3Ω &amp; 400Ω</td>
<td>Distortion Analyzer</td>
<td>L or M output</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>Point of no Interference or signal</td>
<td>10.7MHz</td>
<td>VG TP-1</td>
<td>PM 520kHz at PMB rate</td>
<td>Oscilloscope</td>
<td>Top (secondary) and bottom (primary) curves of T7, T8, T9, T10, T11, T12 &amp; T13.</td>
</tr>
<tr>
<td>MULTIPLEX DECODER ALIGNMENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>STEP</strong></td>
<td><strong>TUNER DIAL SETTING</strong></td>
<td><strong>SIGNAL GENERATOR</strong></td>
<td><strong>INDICATOR</strong></td>
<td><strong>ADJUST</strong></td>
<td><strong>TEST LIMITS</strong></td>
<td><strong>REMARKS</strong></td>
</tr>
<tr>
<td>1</td>
<td>100MHz</td>
<td>200pF antenna terminals W/matching network</td>
<td>75MHz Deviation &amp; 47kHz</td>
<td>AC-VTVM</td>
<td>L10S (SEA adj.)</td>
<td>Minimum output @ L R output jack</td>
</tr>
<tr>
<td>2</td>
<td>100MHz</td>
<td>20MHz pilot</td>
<td>AC-VTVM or oscilloscope W/very low cap.</td>
<td>710S, pin 2 or 3</td>
<td>L10S (sea adj.)</td>
<td>Minimum output @ L R output jack</td>
</tr>
</tbody>
</table>

**NOTES**:
- Step 6 is an overall sensitivity check. Adjust muting control (B106) by reducing the signal input to 2 microvolts for a 20dB drop in audio output. Push in cutting button (B302B) for this adjustment.
- Arrow point to the left.
- Move or adjust to the right.
**MULTIPLEX DECODER ALIGNMENT**

<table>
<thead>
<tr>
<th>STEP</th>
<th>SENDER</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>Same</td>
<td>VTVM connected to TV #1 and scope connected to L or R audio output.</td>
<td>Connect distortion analyzer to L or R output and reduce signal at antenna. For -20dB total distortion and noise. Input signal required is VTVM usable sensitivity of the tuner (2.5 microvolts).</td>
<td>110Ω (R444A)</td>
<td>Minimum output at L or R audio output jack 110Ω (R444A)</td>
<td>Connected signal analyzer may be inserted at L or R audio output jack. Adjust as required. 110Ω (R444A) adjusted for minimum output with 672Ω modulation.</td>
</tr>
<tr>
<td>2</td>
<td>Same</td>
<td>19kHz pilot</td>
<td>AC-VTVK</td>
<td>L or R output jack</td>
<td>110Ω (R444A)</td>
<td>Minimum output at L or R audio output jack 110Ω (R444A)</td>
</tr>
<tr>
<td>3</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>710Ω (R15) &amp; 9kHz doubler</td>
<td>Adj. for minimum AC voltage</td>
</tr>
<tr>
<td>4</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>710Ω (R15) &amp; 9kHz doubler</td>
<td>Adj. for minimum AC voltage</td>
</tr>
<tr>
<td>5</td>
<td>Same</td>
<td>19kHz (100Ω modulation)</td>
<td>L or R output jack</td>
<td>Less than 100V volts or real-time</td>
<td>Adjust PM-Level control (P107) for 1 volt of audio output at tape-outputs. Then, turn off the modulation and measure the residual of the 19kHz and 9kHz frequencies.</td>
<td></td>
</tr>
</tbody>
</table>

**ANTENNA MATCHING NETWORK**

- FM SIGNAL GENERATOR
- LENS-5027412
- 100Ω (Note 1)
- 5000 OHM ANT. TERMINALS
- END ON CHASSIS

**NOTE:** If signal generator has other than 50 ohm internal impedance, use a resistor of 150 ohms less internal generator impedance.
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>C56</td>
<td>Mlyar .22uF 250V 066-068</td>
<td></td>
</tr>
<tr>
<td>C59.59</td>
<td>Elect. 100uF 15V 066-127</td>
<td></td>
</tr>
<tr>
<td>C101</td>
<td>Mlyar .22uF 250V 066-068</td>
<td></td>
</tr>
<tr>
<td>C107</td>
<td>Elect. 100uF 15V 066-127</td>
<td></td>
</tr>
<tr>
<td>C111</td>
<td>Mlyar .1uF 250V 066-067</td>
<td></td>
</tr>
<tr>
<td>C113</td>
<td>Mlyar .22uF 250V 066-068</td>
<td></td>
</tr>
<tr>
<td>C127</td>
<td>Elect. 100uF 15V 066-127</td>
<td></td>
</tr>
<tr>
<td>C201</td>
<td>Elect. 100uF 25V 066-124</td>
<td></td>
</tr>
<tr>
<td>C202</td>
<td>Mlyar .22uF 250V 066-068</td>
<td></td>
</tr>
<tr>
<td>C204</td>
<td>Elect. 200/220uF 100V 066-129</td>
<td></td>
</tr>
<tr>
<td>C205.206</td>
<td>Mlyar .22uF 250V 066-068</td>
<td></td>
</tr>
<tr>
<td>C207</td>
<td>Mlyar .47uF 250V 066-069</td>
<td></td>
</tr>
<tr>
<td>C208.209</td>
<td>Elect. 500/1500uF 15V 066-127</td>
<td></td>
</tr>
<tr>
<td>C210</td>
<td>Elect. 50/150/1000uF 150V 200/150/100V 066-218</td>
<td></td>
</tr>
<tr>
<td>C301.302</td>
<td>Mlyar .22uF 250V 066-069</td>
<td></td>
</tr>
<tr>
<td>C305.306</td>
<td>Elect. 10uF 20V 066-140</td>
<td></td>
</tr>
<tr>
<td>C307.308</td>
<td>Elect. 10uF 20V 066-141</td>
<td></td>
</tr>
<tr>
<td>C315.316</td>
<td>Elect. 100uF 15V 066-127</td>
<td></td>
</tr>
<tr>
<td>C317.318</td>
<td>Mlyar .22uF 250V 066-069</td>
<td></td>
</tr>
<tr>
<td>C319.320</td>
<td>Mlyar .22uF 200V 066-087</td>
<td></td>
</tr>
<tr>
<td>C323.324</td>
<td>Mlyar .047uF 250V 066-066</td>
<td></td>
</tr>
<tr>
<td>C325.326</td>
<td>Mlyar .047uF 250V 066-069</td>
<td></td>
</tr>
<tr>
<td>C327</td>
<td>Mlyar .47uF 250V 066-069</td>
<td></td>
</tr>
<tr>
<td>C329.330</td>
<td>Mlyar .047uF 250V 066-066</td>
<td></td>
</tr>
<tr>
<td>C331.332</td>
<td>Mlyar .022uF 250V 066-065</td>
<td></td>
</tr>
<tr>
<td>C337.338</td>
<td>Mlyar .1uF 250V 066-067</td>
<td></td>
</tr>
<tr>
<td>C339.340</td>
<td>Mlyar .22uF 250V 066-069</td>
<td></td>
</tr>
<tr>
<td>C341.342</td>
<td>Mlyar .047uF 250V 066-066</td>
<td></td>
</tr>
<tr>
<td>C343.344</td>
<td>Mlyar .047uF 250V 066-069</td>
<td></td>
</tr>
</tbody>
</table>

**Diodes**
- D1,2: Si, signal diode 070-022
- D3,4: Si, signal diode 070-022

**F201**: Fuse .5 amp Slo-blo 089-020

**Chokes**
- L1: Choke 1.2uH 122-013
- L2: FM antenna coil 122-069
- L3: FM RF coil 122-070
- L4: FM mixer coil 122-071
- L5: FM local oscillator coil 122-072
- L6: AM loop antenna 122-074
- L7: AM antenna coil 122-073
- L10: Choke 75uH 122-013
- L12: AM oscillator coil 122-066
- L13: Choke 100uH 122-004
- L14: Choke 1.2uH 122-011
- L101: Choke 5mH 122-065
- L102: Filter coil (19kHz phase) 122-067
- L103,104: Filter coil (lo pass) 122-015
- L105: Filter coil (SCA adjust) 122-068

**Transistors**
- Q1: Si, junction FET. 132-049
- Q2,3: Si, junction FET. 132-049
- Q4: M.O.S. F.E.T. 132-064
- Q5,6: Si, NPN transistor 132-015
- Q7: Si, junction FET. 132-049
- Q8: M.O.S. F.E.T. 132-064
- Q9,10: M.O.S. F.E.T. 132-061
- Q11: Si, NPN transistor 132-041
- Q101: Si, NPN transistor 132-057
- Q102: Si, NPN transistor 132-052
- Q103: Si, NPN transistor 132-041

There are additional items listed that are not visible in the image.
Q104,105 Si. NPN transistor 132-057
Q106 Si. NPN transistor 132-042
Q201 Si. NPN transistor 132-072
Q202 Si. NPN transistor 132-116
Q203 Si. NPN transistor 132-069
Q301,302 Si. NPN transistor 132-056
Q303,304 Si. NPN 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

POTENTIOMETERS
R49 AM level 134-137
R101 Muting adjust 134-216
R107 FM level 134-197
R335 Volume control 134-202
R356 Balance control 134-201
R377,378 Tone control 134-203

RESISTORS
R219 Wire wound 2,000 SW 139-005
R230 Wire wound 2,700 SW 139-002
R231 Wire wound 1,200 SW 139-001

SWITCHES
S1 AM sensitivity 148-003
S102 Dial scale intensity 148-003
S301 Input selector 146-125
S302 Pushbutton 150-004
S303 Phase 148-023

TRANSFORMERS
T1 Balun 043-216
T2 FM IF transformer 162-034
T3 FM IF transformer 162-035
T4 FM IF transformer 162-034
T5 FM IF transformer 162-035
T6 FM discriminator 161-010
T7,8 AM IF transformer 160-038
T9 AM IF transformer 160-038
T10 AM RF transformer 162-033
T101 RF transformer (1954MC) 162-031

T102 RF transformer (3kHz) 162-0
T201 Power transformer 043-0

TUBES
V1 6H6 165-0

INTEGRATED CIRCUITS
IC1,2 Integrated circuit 133-0

MODULES
Tone control module 130-0

LAMPS
#1828 (MX lamp) 058-0
#1866 (front panel) 058-0
Festoon lamp (dial glass) 058-0

FRONT PANEL & TRIM
Front panel 045-0
Front panel end caps 018-0
Tuning knob 045-2
Volume control knob 043-2
Balance knob 043-2
Input selector knob 043-2
Bass knob (rear) 090-0
Bass knob (front) 043-0
Treble knob (rear) 090-0
Treble knob (front) 043-0
Muting knob 090-0

MOUNTING SYSTEM
Shelf bracket (right) 043-0
Shelf bracket (left) 043-0
Mounting template #100 038-0
Hardware package 043-0

HISOCENESSAGEOUS ITEMS
FM dupole antenna 170-0
Dial glass 043-0
Pointer 043-0
Dial cord (complete) 053-0
Fuseholder 178-0
AC power cord 170-0
Shipping carton 043-0
Owners manual 018-0
Plastic feet 017-0
Push terminal (antenna) 074-0
T102 RF transformer (38kHz) 162-039
T201 Power transformer 043-865

TUBES
V1 6HJ6 165-025

INTEGRATED CIRCUITS
IC1,2 Integrated circuit 133-001

MODULES
Tone control module 130-027

LAMPS
01828 (MPX lamp) 058-027
01866 (front panel) 058-011
Festoon lamp (dial glass) 058-012

FRONT PANEL & TRIM
Front panel 043-320
Front panel end caps 018-120
Tuning knob 043-272
Volume control knob 043-253
Balance knob 013-253
Input selector knob 043-253
Bass knob (rear) 090-009
Bass knob (front) 043-625
Treble knob (rear) 090-009
Treble knob (front) 043-625
Muting knob 090-010

MOUNTING SYSTEM
Shelf bracket (right) 043-592
Shelf bracket (left) 043-593
Mounting template #101 038-179
Hardware package 043-444

MISCELLANEOUS ITEMS
FM dipole antenna 170-033
Dial glass 043-897
Pointer 043-876
Dial cord (complete) 043-891
Fuseholder 178-001
AC power cord 170-021
Shipping carton 043-969
Owners manual 038-147
Plastic feet 017-041
Push terminal (antenna) 074-032
AM NOISE REDUCTION MODIFICATION

MODEL: MX 112 FM/AM Tuner-Preamp

PURPOSE OF MODIFICATION: To improve AM signal to noise ratio.

WHAT UNITS ARE AFFECTED: Serial No. 10501 to 43590 Only.

WHEN MODIFICATION SHOULD BE MADE: When customer complains that AM is noisy on local stations or that sensitivity is poor.

MCINTOSH MODIFICATION KIT NO.: No kit.

PARTS REQUIRED:

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>061-043</td>
<td>.01µF ±80-20% Disc capacitor</td>
</tr>
</tbody>
</table>

PROCEDURE:

Step 1 Remove bottom cover, Multiplex-AM top cover, and RF front end bottom cover. Remove capacitors C204 and C208 on AM PC board. See service manual for exact location. Replace top cover.

Step 2 Locate Q4, AM RF amplifier in RF front end chassis. Connect the .01µF disc capacitor between the source terminal of Q4 and the ground lug of the terminal strip as shown in the accompanying sketch. Replace bottom covers.

Step 3 Check performance. If dial calibration is off at high end of the band, perform AM alignment steps 3 and 5 in service manual. The top cover of the RF front end is removed for access to the alignment trimmers.

(over)