McIntosh

MR 78

FM TUNER

SERVICE INFORMATION

STARTING WITH SERIAL NO. AD5165

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

SENSITIVITY
2μV for better than 35dB quieting. 7.5μV HF usable sensitivity.

SELECTIVITY HF

<table>
<thead>
<tr>
<th>Mode</th>
<th>ADJACENT CHANNEL</th>
<th>ALTERNATE CHANNEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>74dB</td>
<td>55dB</td>
</tr>
<tr>
<td>Narrow</td>
<td>22dB</td>
<td>&gt;90dB</td>
</tr>
<tr>
<td>Super-Narrow</td>
<td>55dB</td>
<td>&gt;90dB</td>
</tr>
</tbody>
</table>

SIGNAL TO NOISE RATIO
Better than 75dB below 100% modulation.

HARMONIC DISTORTION
Less than 0.2% mono or stereo at 100% modulation 30Hz to 10kHz.
Typically less than 0.05% at 1kHz.

FREQUENCY RESPONSE
≤ 1dB 20Hz to 10kHz with standard 75μs de-emphasis.

CAPTURE RATIO
Better than 2.5dB HF.

SPURIOUS REJECTION
Greater than 100dB HF.

IMAGE REJECTION
Greater than 100dB 88 to 100kHz HF.

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)
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 VTVVM.
   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:

<table>
<thead>
<tr>
<th>Tuning Indicator</th>
<th>1000kHz (no signal)</th>
<th>Muting</th>
<th>Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>Fully CW</td>
<td>Mode</td>
<td>Auto</td>
</tr>
<tr>
<td>Selectivity</td>
<td>Normal</td>
<td>Meter</td>
<td>Sig. Strength</td>
</tr>
<tr>
<td>Filter</td>
<td>Out</td>
<td>Panel Lights</td>
<td>Bright</td>
</tr>
</tbody>
</table>

6. In units with Serial No's below A05503 C331 and C334 are used.

7. In units with Serial No's below AD5503 C406 and C 407 are 100pF, R406 and R407 are 39k and R407 and R409 are 1.5k.
Step 1: Before stringing unit, turn pointer adjustment screw until pointer "A" is in the center or 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 slowly until pointer rubs with the zero edge of the logging scale.

Step 4: Turn the tuning knob until the pointer moves back and forth from zero to the far left and, if necessary, pre-adjust pointer position.

DIAL CORD SEQUENCE:
10 LEFT SIDE PULLEY A WHITE
10 IDLER PULLEY AND TUNING SHAFT BLACK

POINTER DIAL STRINGING
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.

TEST EQUIPMENT REQUIRED

1. FM Signal Generator (Measurement 188 or Sound Technology 1000A).
2. VTVM (RCA NV96C)
3. Multiplex Generator (Radiometer SMS1) or Sound Technology 1000A.
4. 107 MHz FM Signal Generator (Kenwood 107B or similar)

MR 78 MR 78
**MR 28 ALIGNMENT INSTRUCTIONS**

**TEST EQUIPMENT REQUIRED**

1. FM Signal Generator (measurement 168 or Sound Technics 168).
2. FM Signal Generator (Model 420 or Sound Technics 420).
3. FM Signal Generator (Model 420 or Sound Technics 420).
4. 10.7 Mc sweep Generator (key 396 or equivalent).
5. 10.7 Mc generator (preferably crystal controlled).
6. Oscilloscope (preferably Tektronix 325 or equivalent).
7. Harmonic Distortion Analyzer (Marconi type 333A).
8. 10.7 Mc 25 Mc sweep marker generator.

**FM ALIGNMENT**

1. Align alignment procedure with selectivity switch in normal position, screen filter out.
2. Turn off P.F. and adjust bias to point to be working the alignment (Fig. 4) may be.

<table>
<thead>
<tr>
<th>STEP</th>
<th>SIGNAL GENERATOR FREQUENCY</th>
<th>MODULATION TYPE</th>
<th>CONNECTED TO</th>
<th>INDEXER</th>
<th>TEST TONE</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.7 Mc</td>
<td>FM 300 Hz</td>
<td>TP-1</td>
<td>TR-1</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>2</td>
<td>10.7 Mc</td>
<td>FM 300 Hz</td>
<td>TP-1</td>
<td>TR-1</td>
<td>Same</td>
<td>Some</td>
</tr>
</tbody>
</table>
Move selectivity switch to **Narrow Position**.

| 3 | Same | Same | Same | Same | Same | Same | Same | Carefully peak top and bottom cores of T203, T204, 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 as in Fig. 3 below. Do not stagger same. 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 screwdriver. | Same | Adjust C103 on top of Super Narrow IF Chassis for optimum 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 | UTVM | TPZ | M201 adjust R610. | Zero DC at TP 2. | With tuner horizontal and right side up, M201 should be centered. 10.7 MHz frequency must be accurate for this adjustment. |

| 6 | 10.7 MHz | 10 MHz or 108 MHz | Inject Signal near IF CH 1 or tuner antenna terminals. | FM ±25 kHz ± 60 Hz rate. | Oscilloscope. | 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 | 106 MHz | 3000 antenna terminals thru matching network or balun. | IF ±25 kHz ± 750 Hz deviation (Fig. 1) | UTVM to TP 1 and scope to L or R audio output. | Oscillator trimmer C15 | 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 | Oscillator Coll LS. | 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 | 10 kHz | 10 kHz | Same | Same | Add for C6, C16, and C17. | Same | Same | Same. Keep TP 1 voltage below one volt. Reduce signal input as circuits align. |

| 10 | 9 kHz | 9 kHz | Same | Same | L2, L3, L4. | Same | Same | Same |

| 11 | 10 kHz | 10 kHz | Same | Same | Harmonic distortion analyzer to L or R output. | CH | Adjust for minimal noise and distortion at SW input. | CH | Noise and distortion should be more than 3dB down. Noise with no modulation should be more than 40dB down. Touch up C5, C16, and C17 IF necessary. |
### 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>12</td>
<td>92 MHz 92 MHz Same Same Same L1 Same</td>
<td>Touch up L2, L3, and L4 only if necessary.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Repeat Steps 9 and 10 until no further improvement is possible. Always adjust for minimum noise and distortion.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>92 MHz 92 MHz Same</td>
<td>Harmonic distortion analyzer to L or R output or Sound Technology Dual Sweep</td>
<td>R603 Minimum distortion allowable is recommended. Typical FM 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 this harmonic distortion.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Same Same Same</td>
<td>Oscilloscope connected to L or R output.</td>
<td>R610 Reduce signal strength until noise appears on tips of signal. If necessary, adjust R610 so that tuning meter is centered.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Same Same Same</td>
<td>Harmonic distortion analyzer to L or R output.</td>
<td>Set generator for 2.5kV output in 300Ω. Total noise and distortion should be more than 30dB below. Noise with no modulation should be more than 40dB down.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>104 MHz Same Same Same Same</td>
<td>Some IF distortion and noise are out of spec., repeat Steps 11 thru 13. Be sure selectivity switch is in normal.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**IF Gain Check With Selectivity Switch.** Feed a 100Ω modulated 1 kHz mono signal to the tuner and set signal generator RF level to low. 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 100,000µW. The signal strength meter should not vary more than one 1-unit when selectivity switch is moved. If it does, there is a gain variation in the IF amplifier due to misalignment. Adjust R601 for 1-unit peak. Alignment with selectivity on broad, MG1 should read 60m on a 500µV signal and 10m on a 200µV signal. If not, adjust R212 to read 6 on a 500µV signal and R226 to read 10 on a 30,000µV signal. (Antenna selector should be in low gain position.)
<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>Same or point of no interference</td>
<td>3000 kHz antenna terminals with approximately 1000uV signal thru matching network or balun</td>
<td>Mono (R-W) 1 kHz 100% modulation</td>
<td>Oscilloscope and AC-VTM connected to either fixed audio output jacks</td>
<td>N317</td>
<td>2.5V rms at fixed output jacks</td>
</tr>
<tr>
<td>2</td>
<td>Same</td>
<td>Same</td>
<td>67kHz and 53kHz at 15kHz oscillation</td>
<td>Oscilloscope</td>
<td>Pin 13 of Ic on stereo decoder board</td>
<td>L302 and L303</td>
</tr>
<tr>
<td>3</td>
<td>Same</td>
<td>Same</td>
<td>19 kHz pilot tone</td>
<td>Oscilloscope</td>
<td>Base of Q305</td>
<td>L301 and T301</td>
</tr>
<tr>
<td>4</td>
<td>Same</td>
<td>Same</td>
<td>Same</td>
<td>Oscilloscope</td>
<td>T302 Pin 1 or 2</td>
<td>T302 top and bottom</td>
</tr>
<tr>
<td>5</td>
<td>Same</td>
<td>Same</td>
<td>Stereo 1 kHz (100% modulation), only pilot level normal and on</td>
<td>AC-VTM</td>
<td>Right fixed output jack</td>
<td>T302 bottom (sec) and 4kHz</td>
</tr>
<tr>
<td>6</td>
<td>Same</td>
<td>Same</td>
<td>Stereo pilot, 1kHz modulation only</td>
<td>AC-VTM</td>
<td>L or R output jack</td>
<td>Less than 20mV of residual</td>
</tr>
</tbody>
</table>

**FIG. 1. ANTENNA MATCHING NETWORK**

**FIG. 2. TYPICAL I RESPONSE OVER NORMAL**

**FIG. 3. TYPICAL I RESPONSE OVER 5500**
REPLACEMENT PARTS

All parts not listed are common items obtainable from radio parts jobbers.

Replacement parts may be obtained when ordered by PART NUMBER ONLY.

Mcintosh Laboratory, Inc.
Customer Service Department
2 Chambers Street
Binghamton, New York 13903
(Telephone 607-723-3519)

CAPACITORS
C29,30 Silver Mica 270pF 063-0100
C204 Elect. 10μF 35V 066-173
C304 Tant.Elect. 10μF 20V 066-229
C306 Tant.Elect. 22μF 25V 066-248
C308 Tant.Elect. 6.8μF 35V 066-146
C309 Polystyrene 270pF 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. 1μF 50V 066-242
C325 Tant.Elect. 22μF 25V 066-240
C326,327 Polystyrene 470pF 064-091
C328 Tant.Elect. 6.8μF 35V 066-146
C331 Polystyrene .0033μF 064-090
C334 Polystyrene .0033μF 064-090
C301,402 Polystyrene 270pF 064-093
C403 Polystyrene .0033μF 064-089
C404,407 Elect.Cap. 22μF 35V 044-179
C411 Elect.Cap. 10μF 50V 066-221
C412 Polystyrene 270pF 064-093
C413 Tant.Elect. 1μF 50V 066-242
C414 Elect. 10μF 50V 066-221
C503 Elect. 200μF 50V 066-154
C504 Elect. 5/16/15/100/1000μF 066-155
0001/500/500/300V
C506 Elect. 15μF 63V 066-205
C507 Elect. 47μF 16V 066-235

DIODES
D1 Pin diode 070-005
D2 Si. signal diode 070-047
D3 Pin diode 070-015
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 070-001
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 122-179
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 TMK 122-092
L305 Choke 2.2μH 122-001

TRANSISTORS
Q1 Si. N Channel J.FET. 132-097
Q2 Si. NPN transistor 132-066
Q3 Si. NPN transistor 132-087
Q101,103 M.O.S. F.E.T. 132-088
Q201,203 Si. Junction FET 132-068
Q301 Si. NPN transistor 132-097
Q302 Si. NPN transistor 132-097
Q303 Si. NPN transistor 132-097
Q304,305 Si. NPN transistor 132-094