McIntosh

C 28

PREAMPLIFIER

SERVICE INFORMATION

STARTING WITH SERIAL NO. 91X50

McINTOSH LABORATORY INC.  2 CHAMBERS STREET  BINGHAMTON, NEW YORK
FREQUENCY RESPONSE
+0 to 0.5 dB from 20 Hz to 20,000 Hz.

DISTORTION
Less than 0.1% at each output at rated output level, 20 Hz to 20,000 Hz.

INPUT SENSITIVITY AND IMPEDANCE
Phono 1 and Phono 2
2 millivolts at 47k ohms (1,000 Hz)

Aux, Tuner, Tape 1 and Tape 2
0.25 volts at 20k ohms

Microphone
2.5 millivolts at 500k ohms

Tape Head
2 millivolts at 500k ohms (500 Hz)

S/N RATIO AND NOISE
 Aux, Tuner, Tape 1 and Tape 2
78 dB below 10 millivolt input, equivalent to less than 1.2 microvolts at the input terminals.

Phono 1, Phono 2 and Tape Head

Microphone
less than 1.5 microvolts at the input terminals.

OUTPUT LEVEL AND IMPEDANCE
Main Output
2.5 volts with rated input, less than 100 ohms source impedance, to operate into 47k ohm or greater load.

Tape Output
0.25 volts with rated input, less than 150 ohm source impedance, to operate into 47k ohm or greater load.

Headphone/Line Output
0.75 volts into 8 ohm load or 3.0 volts into 600 ohm line. Less than 0.2 ohms source impedance. Level controls provided.

Center Channel
0.3 volts with rated input to both channels. Level control provided.

BASS CONTROL
≥20 dB at 20 Hz.

TREBLE CONTROL
≥18 dB at 20,000 Hz.

L.F. FILTER
Flat or roll off below 50 Hz, active filter 12 dB/octave down 18 dB at 20 Hz.

H.F. FILTER
Flat or roll off above 7,000 Hz, active filter 12 dB/octave down 20 dB at 20,000 Hz.

POWER REQUIREMENT
117 volts, 50/60 Hz, 45 watts.
1. Unless otherwise specified, resistance values are in ohms, 1/2 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 layout.

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 VTM.
   b. All voltages ±10% with respect to chassis ground.
   c. No signal at input terminals.
   d. AC input at 117 volts, 50/60 Hz.
   e. Front panel controls at:
      - Volume: Fully CDW, but with power switch on
      - Mode: Stereo
      - Input selector: Phono 1
      - Loudness: Flat
   All other controls at normal positions.

6. In units with serial numbers below 94462, R59 and R60 were 8.2K.

7. In units with serial numbers below AK2085, C308 was 680µF.

8. In units with Serial No's below AK5994 R87 and R88 are not used.

9. In units with Serial No's below AK7377 C305 is 100µF 40v.

10. In units with Serial No's below AK6250 Fuse F402 is not used.
LOCATION OF TRANSISTORS NOT ON PRINTED CIRCUIT BOARDS
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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Number</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5, 6</td>
<td>Mylar</td>
<td>1µF 250V</td>
<td>064-088</td>
</tr>
<tr>
<td>C7, 8</td>
<td>Elect.</td>
<td>1µF 50V</td>
<td>066-242</td>
</tr>
<tr>
<td>C11, 12</td>
<td>Elect.</td>
<td>10µF 35V</td>
<td>066-239</td>
</tr>
<tr>
<td>C13, 14</td>
<td>Elect.</td>
<td>22µF 6V</td>
<td>066-241</td>
</tr>
<tr>
<td>C17, 18</td>
<td>Elect.</td>
<td>100µF 16V</td>
<td>066-226</td>
</tr>
<tr>
<td>C19, 20</td>
<td>Mylar</td>
<td>.47µF 250V</td>
<td>064-069</td>
</tr>
<tr>
<td>C21, 22</td>
<td>Mylar</td>
<td>.47µF 250V</td>
<td>064-069</td>
</tr>
<tr>
<td>C23, 24</td>
<td>Elect.</td>
<td>100µF 16V</td>
<td>066-226</td>
</tr>
<tr>
<td>C29, 30</td>
<td>Mylar</td>
<td>.47µF 250V</td>
<td>064-069</td>
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<tr>
<td>C201, 202</td>
<td>Elect.</td>
<td>1µF 50V</td>
<td>066-242</td>
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<tr>
<td>C203, 204</td>
<td>Mylar</td>
<td>.047µF 250V</td>
<td>064-085</td>
</tr>
<tr>
<td>C205, 206</td>
<td>Mylar</td>
<td>.01µF 250V</td>
<td>064-040</td>
</tr>
<tr>
<td>C207, 208</td>
<td>Mylar</td>
<td>.01µF 250V</td>
<td>064-040</td>
</tr>
<tr>
<td>C209, 210</td>
<td>Mylar</td>
<td>.01µF 250V</td>
<td>064-040</td>
</tr>
<tr>
<td>C211, 212</td>
<td>Mylar</td>
<td>.12µF 250V</td>
<td>064-068</td>
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<tr>
<td>C211, 222</td>
<td>Mylar</td>
<td>1µF 250V</td>
<td>064-088</td>
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<tr>
<td>C223</td>
<td>Elect.</td>
<td>100µF 16V</td>
<td>066-226</td>
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<tr>
<td>C225, 226</td>
<td>Mylar</td>
<td>1µF 250V</td>
<td>064-088</td>
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<tr>
<td>C231, 232</td>
<td>Elect.</td>
<td>300µF 20V</td>
<td>066-130</td>
</tr>
<tr>
<td>C235, 236</td>
<td>Elect.</td>
<td>22µF 25V</td>
<td>066-240</td>
</tr>
<tr>
<td>C301</td>
<td>Elect.</td>
<td>.002/200µ/2500µF 200/25/100 µF</td>
<td>066-132</td>
</tr>
<tr>
<td>C302</td>
<td>Elect.</td>
<td>500/200/50/60/80/100µF</td>
<td>066-131</td>
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<tr>
<td>C303</td>
<td>Mylar</td>
<td>1µF 250V</td>
<td>064-104</td>
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<tr>
<td>C304</td>
<td>Mylar</td>
<td>.22µF 250V</td>
<td>064-043</td>
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<td>C305</td>
<td>Elect.</td>
<td>100µF 60V</td>
<td>066-206</td>
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<tr>
<td>C308</td>
<td>Elect.</td>
<td>.47µF 25V</td>
<td>066-228</td>
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</table>

Diodes

- P1, 2 Si, signal Diode 070-047
- P301 Full Wave Bridge 400V 070-044
- P302 Full Wave Bridge 50V 070-045
- P303 Si, Rectifier 070-331
- P304 Zener Diode 75V 070-015
- P305 Bias Diode 700-044

FUSES

- F301 Fuse, 1 ampere 089-002
- F302 Fuse, 1.5 ampere 089-033

TRANSISTORS

- Q1, 2 Si, NPN transistor 132-105
- Q3, 4 Si, NPN transistor 132-093
- Q6, 6 Si, NPN transistor 132-093
- Q7, 8 Si, NPN transistor 132-095
- Q9, 0 Si, NPN transistor 132-095
- Q11, 12 NPN transistor 132-092
- Q13, 14 Si, NPN transistor 132-105
- Q201, 202 Si, PNP transistor 132-096
- Q203, 204 Si, NPN transistor 132-095
- Q205, 206 Si, PNP transistor 132-096
- Q207, 208 Si, NPN transistor 132-090
- Q209, 210 Si, NPN transistor 132-066
- Q301 Si, NPN transistor 132-028
- Q302 Si, NPN transistor 132-065

IONOMETERS

- R15, 16 Phono level control 134-219
- R17, 18 Phono level control 134-219
- R69 Volume control 134-210
- R70 Balance control 134-209
- R75, 76 Bass trim control 134-186
- R201, 202 Output level control 134-186
- R233, 234 Headphone level control 134-186
- R259 Center channel level 134-186

RESISTORS

- R51, 252 Wirewound 150 5% 7W 139-073
- R301 Wirewound 1.5K 5% 5W 139-074

SWITCHES

- S1 Pushbutton switch 150-005
- S2 Input selector switch 146-131
- S4 Mode selector switch 146-134
- S101, 102 Treble control switch 146-133
- S103, 104 Bass control switch 146-132
- S302 Power amp. switch 148-028

TRANSFORMERS

- T301 Power transformer 046-062

MODULES

- Tone control (treble) 130-016
Tone control (treble) 130-017
Tone control (bass) 130-018
Tone control (bass) 130-019

LAMPS
#1866 (Front Panel) 058-014
#1847 (Pushbutton Lamps) 058-008
Indicator Lamp 058-041

FRONT PANEL & TRIM
Front panel 044-067
Front panel end caps 018-120
Volume control knob 044-372
Mode selector knob 044-372
Input selector knob 044-372
Left bass knob 044-371
Right bass knob 044-371
Left treble knob 044-371
Right treble knob 044-371
Balance knob 090-100
Comp. knob 044-375
Pushbutton 017-128
Bass trim knob 090-010
Phono level knob 090-010
Headphone level knob 090-010
Output level knob 090-010
Center channel knob 090-010

MOUNTING SYSTEM
Shelf Bracket (right) 043-592
Shelf Bracket (left) 043-593
Mounting Template #100 038-179
Hardware Package 043-792

MISCELLANEOUS ITEMS
Line Cord 170-021
Fuseholder 178-001
Shipping carton 044-082
Plastic feet 017-041
Shorting plug 127-001
Audio cable (6') 170-015
Owners manual 038-850

REPLACEMENT PARTS FOR SCR 1
K1,2 Relay DPT 087-011
Terminal Block 074-003
Interconnecting Cable 170-062

REPLACEMENT PARTS FOR SCR 2
K1,2 Relay DPT 087-011
K3 Relay DPT 087-009
Terminal Block 074-003
AC Power Cord 170-081
Interconnecting Cable 170-067

C 28 SCHEMATIC PART NO. 038-933
ELIMINATION OF TURN-ON AND TURN-OFF NOISE

MODEL: C 28 Preamplifier

PURPOSE OF MODIFICATION: To eliminate the "shhhh" type of noise when initially turned-on, or a second or two after being turned off.

WHAT UNITS ARE AFFECTED: Serial No. 10X01 to 17X01 only.

WHEN MODIFICATION SHOULD BE MADE: When the customer specifically complains of the noise.

MCINTOSH MODIFICATION KIT NUMBER: No kit available.

PARTS REQUIRED:

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>070-022</td>
<td>Diode</td>
</tr>
<tr>
<td>2</td>
<td>136-121</td>
<td>1.8k 1/2W 10% resistor</td>
</tr>
</tbody>
</table>

PROCEDURE: (Refer to diagram on reverse side)

Step 1: Remove top cover.
Step 2: Remove R65 and R66 (4.7k resistors).
Step 3: Install the new diode and resistor as shown.
ASSURE GROUND CONNECTION TO LOW LEVEL INPUTS

MODEL: C 28 Preamplifier

PURPOSE OF MODIFICATION: To assure that the high and low level amp. PC board 044-309 will always have a positive ground return.

WHAT UNITS ARE AFFECTED: All units with Serial No's. below AS 1660

WHEN MODIFICATION SHOULD BE MADE: When intermittent or complete loss of a channel is experienced in any of the low-input-level modes- or when units are being serviced for any other reason.

PARTS REQUIRED:

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1/2&quot;</td>
<td>-</td>
<td>#22 Bare hook up wire</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>Solder lug, lockwasher type</td>
</tr>
<tr>
<td>1&quot;</td>
<td>-</td>
<td>Sleeving</td>
</tr>
</tbody>
</table>

PROCEDURE: 1. Remove top and bottom covers.
  2. Unscrew screw and nut and place solder lug between plate and rear panel. Tighten screw.
  3. Solder bare wire between ground terminal lug on rear panel to newly mounted lug, then another piece of bare wire to riveted solder lug at Phono 2 left.
  4. Then solder sleeved bare wire between phono 2 left solder lug and phono 2 Right solder lug.
  5. Replace top and bottom covers.
BACKSIDE OF LOW LEVEL INPUT PLATE

EXISTING LEADS

RIVETED GROUNDING LUGS THAT CAUSE INTERMITTENT OPERATION IF THEY LOSE GROUND.

GROUND TERMINAL ON REAR PANEL

GROUNDED TO CHASSIS WITH SCREW AND NUT

T HEAD
MIC
PHONO 1
PHONO 2
ELIMINATION OF RADIO FREQUENCY INTERFERENCE

Model: C 28

Purpose of Modification: To eliminate radio interference caused by Citizens Band Transceivers and other transmitters.

When Modification Should Be Made: When customer complains of this type of interference.

Parts Required:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>136296</td>
<td>Resistor: 1kΩ, 1/4W, 10%</td>
</tr>
<tr>
<td>6</td>
<td>061128</td>
<td>Capacitor, disc: 470pF</td>
</tr>
<tr>
<td>2</td>
<td>061023</td>
<td>Capacitor, disc: 100pF</td>
</tr>
</tbody>
</table>

Procedure:

1. Remove top and bottom covers.

2. Remove the screws holding the level set panel in place.

3. Referring to diagram 1 and with the C 28 upside down, locate the four coaxial cables that connect to push button switches S1-B and S1-D. Insert the 1kΩ resistors in series with each coaxial cable right at the switch terminal.

4. Referring to diagram 1 and with the C 28 upside down, replace each of the two wires (Blue and Blue/White) that connect the front panel "Tape-Output" jack with push button switch S1-B, with 1kΩ resistor. Provide sleeving on both resistor leads.

5. Referring to diagram 2 and with the C 28 right side up, locate Section 3 - wafer (front and rear) of the input selector switch. Locate the coaxial cables connected to lugs 9-rear and 3-front. Insert a 1kΩ resistor in series with each cable right at the switch lugs.

6. Referring to diagram 3 and with the C 28 right side up, locate the volume control underneath the level set panel. Locate the coaxial cables connected to the center lugs of the volume control. Insert a 1kΩ resistor in series with each cable right at the control lugs. Use sleeving to prevent shorting to panel.

7. Referring to diagram 4 and 5 and with the C 28 upside down, locate the 044309 high and low level PC board. Connect a 100pF and a 470pF capacitor for each channel as indicated on the PC board diagram 4 and schematic diagram 5. Capacitor leads should not exceed 1/4 inch.

(DOVER)
8. Referring to diagram 6 and with the C 28 upside down, locate the filter and headphone PC board- 044509. Insert a 1kΩ resistor in series with the blue wire connected to pin 24 and the blue/white wire connected to pin 13. Both resistors to be inserted right at the pins.

9. Referring to diagram 6 and with the C 28 upside down, locate the filter and headphone PC board- 044509. Connect 2 each 470pF for each channel as indicated on the diagrams. Capacitor leads should not exceed 1/4 inch.

10. Referring to diagram 7 and with the C 28 right side up, locate the blue/white and green/white coaxial cables that connects to the right and left output level controls on the level set panel. Disconnect the blue shield - wire of the blue/white coaxial cable from the terminal strip and reconnect it to an adjacent lug of the same terminal strip. This lug is already occupied by a yellow wire. Disconnect the green shield - wire of the green/white coaxial cable from the terminal strip and reconnect it to an adjacent lug of the same terminal strip, already occupied by a yellow wire. The net effect of this would be as shown on diagram 7.

11. Replace level set panel and top and bottom covers. Test for proper function of all inputs and outputs. Check specifications.