

# ML-1C RESTORATION

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## UPPER-MID, TWEETER AND CROSSOVER NETWORK

A new upper-mid and tweeter is only needed if the original ones sound fuzzy and distorted or are not working at all. The upper mid-range and tweeter cannot be repaired and direct replacements are no longer available. Being the original designer of the ML-1C, I have had the opportunity to redesign the system using a more reliable and higher power soft dome upper-mid and soft dome tweeter. A new crossover must be used for the new upper-mid and tweeter to work properly.

The driver sizes are approximately the same as the original drivers. However, some modifications must be made to the cabinet for them to fit properly. This can be a do-it-yourself project and requires mechanical ability, woodworking skills, soldering and being able to read electrical diagrams. I used a saber saw to modify my cabinets and this requires very careful work. If you aren't able to do this yourself, perhaps you know someone who can do this for you.

New materials, high temperature adhesives, etc. allow for a more rugged performance than the original 1970's upper-mid and tweeter. The new soft dome drivers are made by Morel. Here's a few of the driver specs.

MDM 55 mid-range  
Nominal power handling 200 watts  
Voice coil diameter 2-1/8"  
Hexatch aluminum voice coil  
Neodymium magnet  
Gold plated terminals

MDT 40 tweeter  
Nominal power handling 120 watts  
Voice coil diameter 1-1/8"

Hexatch aluminum voice coil  
Neodymium magnet  
Gold plated terminals

You can get a complete list of driver specifications from Madisound.  
You can purchase the Morel drivers from:

Madisound Speaker Components  
8608 University Green  
Middleton, WI 53562  
TEL (608) 831-3433  
<http://www.madisound.com>  
email: [info@madisound.com](mailto:info@madisound.com)

The new drivers cannot be directly substituted. I have designed a new supplementary crossover network and made the high frequency balance as close as possible to the original ML-1C. I have also provided an option for a slight increase in the high frequency output. The crossover has polypropylene capacitors and custom wound low resistance coils having large diameter copper wire. The eleven crossover components are hand wired, wrapped and soldered on the board. I have spare crossover coil forms, iron slugs and #19 wire available to wind your own coils.

The old crossover board remains in place. The original woofer and lower-mid crossover are still used, but the old upper-mid and tweeter crossovers must be disconnected. The new supplementary crossover is designed to fit inside the cabinet in a space between the braces. New connecting wires of the proper length and color-coding are needed.



This is what the finished restoration should look like.

# McIntosh ML-1Ca Update Instructions

## Replacing Upper-mid and Tweeter

The update requires a Morel MDM 55 mid-range, Morel MDT 40 tweeter and the new ML-1Ca crossover designed for these two drivers.

[1]

The easiest way to work on the system is to place it on its back on a table. Remove the main grille. The perforated tweeter cover that came with the ML-1 can be removed. It will not be needed again. Remove the tweeter and dome mid-range. The dome connectors will slide off. The tweeter wires can be cut at the tweeter terminals.

[2]

Some ML-1's have plastic inserts on the inside of the cabinet for the woofer screws. Remove the woofer screws by pushing down moderately on the screws while turning just in case there is an insert that could be pushed out of its mounting hole. There may be lockwashers under the screws. The lockwashers were used to keep the woofer surround from sticking to the screw heads and tearing. After removing the screws, you will probably need to pry the woofer up with a wide blade screwdriver to break the seal of old caulking compound. Remove the woofer and set it on the edge of the woofer hole. Remove the slip-on connectors. A pair of pliers works best. Pull moderately while using a rocking motion. If too much force is used, you could break the woofer connector terminal.

[3]

Before removing the fiberglass acoustic material, note how it is packed so that it can be put back in about the same way. You may want to use rubber gloves to handle the fiberglass. Remove the fiberglass in the lower half of the cabinet.

[4]

On the old crossover, cut one lead of the 1 uf tweeter capacitor and 6 uf upper-mid capacitor as shown in Fig. 1. This will disable the old mid and tweeter crossovers. Bend the wire back on each capacitor so it won't touch any other wire. Pull the yellow, violet and two black wires from the

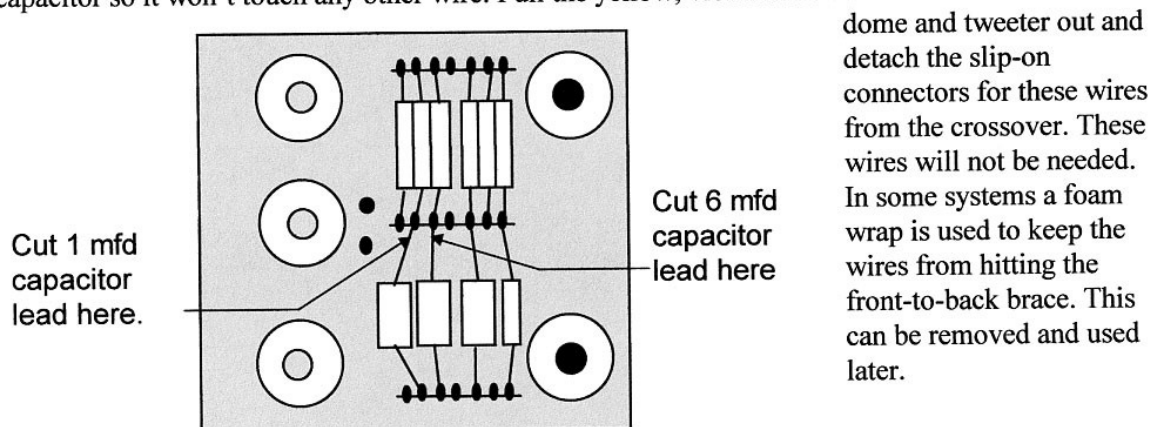


Figure 1

[5]

Carefully file or cut either side of the upper- mid through hole until the new mid fits into it. See Fig. 2. If your 8" mid has a black "sticky" surround, you can keep sawdust from sticking to it by covering it with wax paper and taping the paper around the edges.

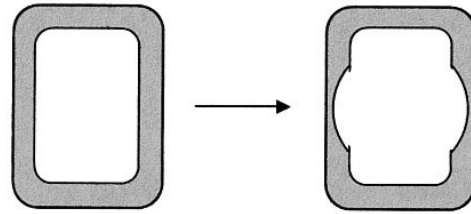


Figure 2

[6]

Put the drivers in their respective mounting holes and mark the location of the screw holes. Drill the holes with a 3/32" drill. Be careful when drilling the holes for the tweeter, as there is very little material between the new screw holes and the original tweeter through hole.

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### Mid and Tweeter Output Option

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Provisions on the new crossover board allow you to preset the upper-mid and tweeter levels. **The board is supplied with the crossover adjusted for normal mids and highs.**

If you liked the high frequency balance of the original ML-1C and listen to mainly classical music, you may want to leave the crossover as it is supplied. If you want more highs, you can use the treble control on your preamp. Alternately, if you want a more general increase for all listening, you can make the following changes on the new crossover:

Cutting one lead of the upper-mid shunt resistor increases the mid output by 2 dB from 800Hz to 6kHz.

Cutting one lead of the tweeter shunt resistor increases tweeter output by 2dB from 6kHz to 20kHz.

Although you can select either or both changes for this option, I normally recommend selecting both. You can always adjust this later.

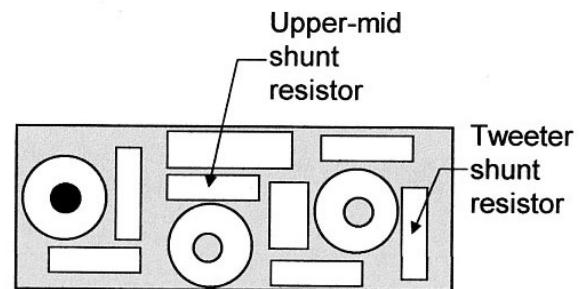


Figure 3

[7]

Turn the cabinet on it's right side so it will be easier to work on. Install the new crossover board along the right inside of the ML-1 cabinet as shown in Figure 4. Locate the board towards the front of the cabinet with the coil that has the iron core towards the bottom. Mark the holes with a pencil using the crossover board as a template and drill 3/32" pilot holes for the screws. Be careful to drill the five holes no deeper than 3/8", otherwise the drill could accidentally go through the side of the cabinet. Use the #6 X 5/8" sheet metal screws. Place two thin strands of caulking material under the board before final installation. This will keep the board from vibrating against the cabinet.

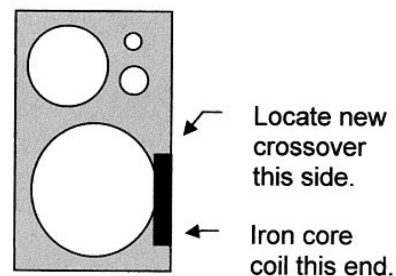
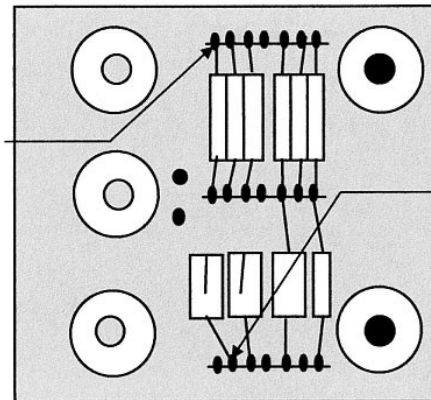


Figure 4

[8]

From the new crossover, run the black wire and the white wire to the back of the cabinet and over to the old crossover. The black wire comes from the terminal having the single black wire. Solder the black wire to the first terminal at the left of the top strip. Solder the white wire to the second terminal from the left of the bottom strip. See Figure 5.

Connect  
black lead  
from new  
network  
here.



Connect  
white lead  
from new  
network  
here.

Figure 5

[9]

Run the white/black wire and the longest black wire up inside the cabinet and out of the tweeter hole. Run the white/yellow and remaining short black wire up inside the cabinet inside and out of the upper mid-range hole.

[10]

Solder the white/black wire to the + or red marked terminal of the tweeter. Be careful not to overheat the connection. Solder the black wire to the other terminal. Solder the white/yellow wire to the mid + or red marked terminal. Solder the black wire to the other terminal.

[11]

The new tweeter doesn't completely cover the old tweeter through hole. To ensure a good air tight seal, place caulking compound on four sides of the hole, as shown in Figure 6, and let it protrude slightly beyond the front surface. Insert the tweeter and secure with the #4 X 1/2" sheet metal screws. The extra caulking can be smoothed out.

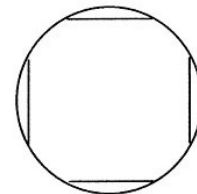
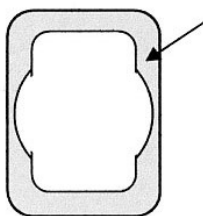


Figure 6

[12]



The new mid will not seal around the old counterbore. Add caulking compound around the perimeter of the old mid through hole. Add enough to completely fill in the counterbore to form a good airtight seal with the new mid. Insert the mid and secure with the #4 X 1/2 sheet metal screws. The extra caulking can be smoothed out.

Figure 7

[13]

If a foam wrap was used to gather the six wires that go to the front of the cabinet, wrap it around the wires so they don't touch the front-to-back cabinet brace. Otherwise, you can wrap the wires with some tape or a wire tie to keep them in place.

[14]

Replace the fiberglass in the cabinet and arrange it approximately as you found it. Put fiberglass between wires and cabinet surfaces to prevent vibration. Make a fist sized tunnel in the fiberglass that goes from the woofer compartment to the upper portion of the cabinet. Leave the two wires out for the woofer.

[15]

Scrape off the old dried caulking compound from the underside of the rim of the woofer basket and put a new bead of compound on it.

[16]

Connect the red wire slip-on to the red or dot marked terminal of the woofer. Connect the black wire to the other terminal. Install the screws and washers previously removed. Push down moderately if plastic inserts are used for the woofer screws

[17]

Replace the main grille and the system is ready to play.

If you need to check to polarity of a driver, this can be done by momentarily connecting a 1-1/2 volt battery to the driver terminals. When the dome or cone moves out away from the magnet, the positive terminal is the terminal connected to the positive end of the battery.

### **An Equalizer is required for the ML-1C**

Remember, ML-1C and the equalizer together make a complete system. This is what the design and my patent are all about. The equalizer is a necessary part of the system. The ML-1C is bass deficient without it. By using the equalizer, low frequency response is restored and is flat within 1 dB down to 20Hz. No subwoofer is ever needed.

You can use a McIntosh MQ101, MQ102, MQ104 or MQ107 equalizer with the ML-1C. Any other speaker equalizer or use of tone controls will not provide the correct contour. Used McIntosh equalizers can often be found at McIntosh dealers.

## Schematic and Parts List

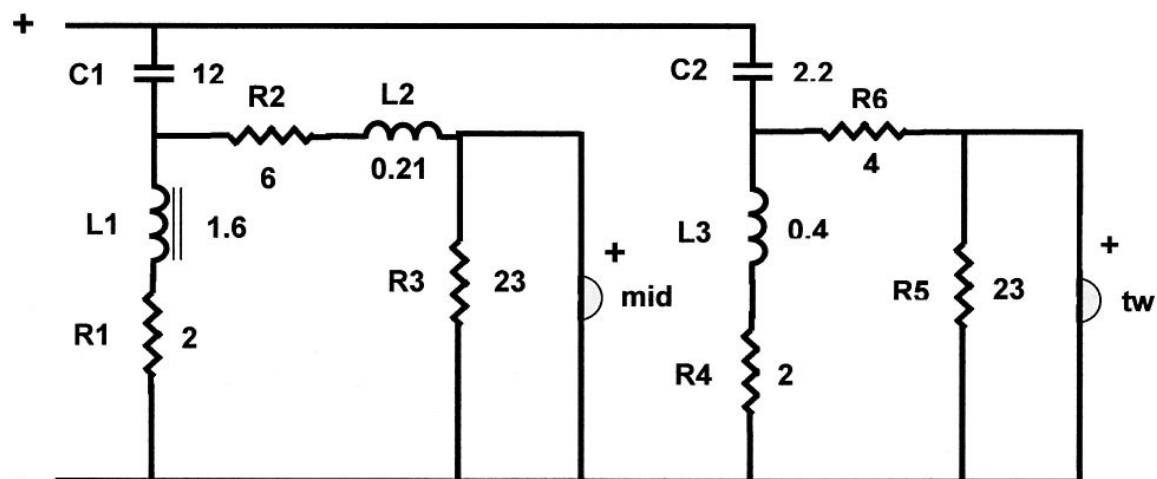


Figure 8

## Parts List

L1	Coil 1.6 mH 2% #19 wire
L2	Coil 0.21 mH 2% #19 wire
L3	Coil 0.4 mH 2% #19 wire
C1	12 uf 160VAC polypropylene 5%
C2	2.2 uf 160VAC polypropylene 5%
R1, R4	2 ohms 15 watt 5%
R2	6 ohms 15 watt 5%
R3, R5	23 Ohms 15 watt 5%
R6	4 ohms 15 watt 5%
mid	Morel MDM-55
tweeter	Morel MDT-40

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