

ADA MP-1

Noise Mod

R. Metzger 7/2003
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Introduction:

First of all, I can't possibly take full credit for this mod. The credit belongs to all our members who have experimented on their MP-1s and have posted their experiences. This is simply a compilation of all ideas that have yielded positive results.

With that said, here is a quick overview:

This mod involves replacing the three Tube-Board Filter Caps with higher values, replacing three Op-amps (short for Operational Amplifier) at critical stages in the analog circuitry with lower-noise/higher-temperature rated units and replacing the three 10+ year old Transformer Filter Caps.

One of the Op-amps that is suggested for replacement in this write-up is only functional when the Effects-Loop is switched in. If you do not use the Effects-Loop, you can simply ignore these steps.

Note:
This mod should **ONLY** be done to a fully functional unit if you want to try to reduce the noise even further. This mod will **NOT** affect your base tone and quite possibly you may not even hear a significant difference when the mod is complete.

…and I quote Mark Howell from one of the forum topic threads:

"I have to put my 2 cents in regarding noise mods, more specifically AC hum. These MP-1s didn't leave the factory with hum, so there's a *problem* somewhere. Altering ground schemes and increasing cap values, IMHO, only serves to mask the problem, not cure it."

Well said Mark! If your MP-1 has excessive noise, buzz, hiss, etc., there is most likely a problem somewhere else in your unit. Common sense tells you to do your best to address these problems before attempting the mod.

The nice thing about this mod is:

a) The parts are cheap!
b) It is totally reversible
c) It won't directly affect your tone
d) It can't hurt your unit to try it. …unless of course you inadvertently f*ck something up.

Since this mod requires de-soldering components, I have included an informative write-up with some de-soldering tips.

I have also included a doc I call **"Electrolytic Capacitors 101"** for all you newbies out there! I salute you!

If you have read on the forum about people using the **"Star-Ground"** technique to try reducing ground-loop hum potential, there is section in this write-up detailing my experiences with it. For the record, I do not recommend to anyone anymore taking the time to "star-ground" the tube-board and/or AC power cable.

The Noise-Mod involves 11 steps:

1. Acquiring Parts
2. Removing the Top and Bottom Panel
3. Detaching the Tube-Board Stand-offs
4. De-soldering caps **C1**, **C2**, and **C8**
5. Installing the replacement Filter Caps for **C1**, **C2**, and **C8** and re-attaching the Tube-Board
6. De-soldering Op-amps **U4** and **U9** from the main PCB
7. Soldering IC sockets in **U4** and **U9** PCB area locations and socketing the replacement Op-amps
8. De-soldering the Effects-Loop Buffer Op-amp **U9** on the Rear Jack PCB **(Optional)**
9. Soldering IC sockets in **U9** PCB area location and socketing the replacement Op-amp **(Optional)**
10. De-soldering Transformer Filter Caps **C129**, **C130**, and **C131**
11. Installing the replacement caps for **C129**, **C130**, and **C131**

ROCK ON!

-HB



Step 1: Acquiring Parts

Chances are you will not find suitable replacement parts locally for this mod. Don't even think about heading to your local Radio Shack and asking for them. If you go up to a Rat Shack employee and ask for a "TL072 Bi-Polar Dual Op-amp", the guy will probably call the police on you!

I have put together a parts list from **Mouser Electronics** with tried and true parts. I have done this mod quite a few times and I can guarantee that these parts fit and work great.

Mouser is a great part source. They have a great printed catalog and website, and they also do not charge a per-order minimum. Their prices also blow away **Digi-Key** big time for low quantity items.

Here is their website address if you couldn't have already guessed it:

http://www.mouser.com

Mouser Part Numbers and Quantities:

(1) Nichicon 22uF/450v High-Temperature Radial Electrolytic	**#647-UVZ2W220MHH**
(2) Nichicon 100uF/250v High-Temperature Radial Electrolytic	**#647-UVZ2E101MHH**
(3) TL072IN High-Temperature/Low-Noise Op-amp	**#511-TL072IN**
(3) AMP 8-Pin IC Socket	**#571-26404634**
(2) Xicon 2200uF/35v Axial Electrolytic	**#140-XAL35V2200**
(1) Xicon 3300uF/16v Axial Electrolytic	**#140-XAL16V3300**

If you do not plan on replacing the Effects-Loop Op-amp, you will only need **(2) TL072INs** and **(2) 8-Pin IC Sockets**.

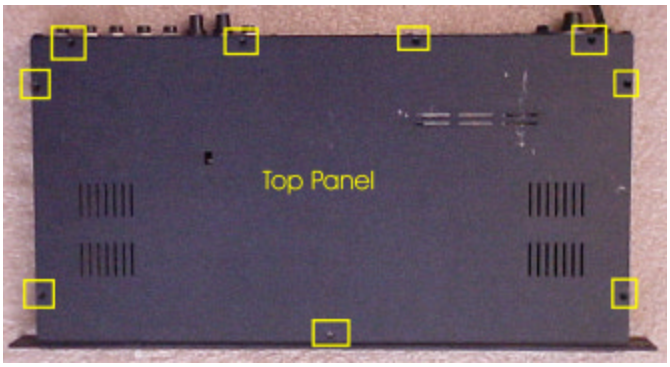
You will also need **(2) plastic wire (zip) ties** to replace the ones that will be clipped in Transformer Cap section. You should be able to find these easily at any hardware store.

Note:
If you do decide to substitute parts, I can not guarantee that they will have the same affect on the final result of this mod, nor can I guarantee that the parts will physically fit as replacements, ***especially*** the Tube-Board Filter Caps.

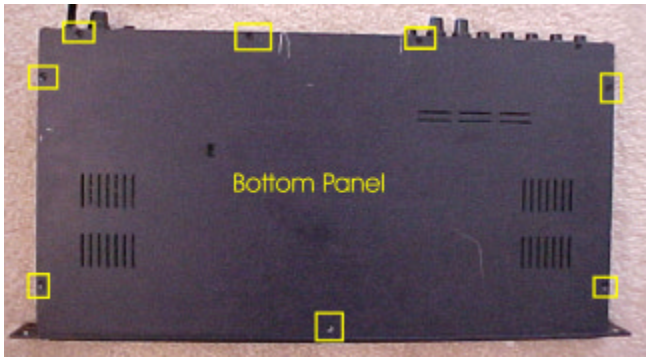
Step 2: Removing the Top and Bottom Panel

There are 9 counter-sunk machine screws on both the top and bottom panels that must be removed.

Top Panel screw locations



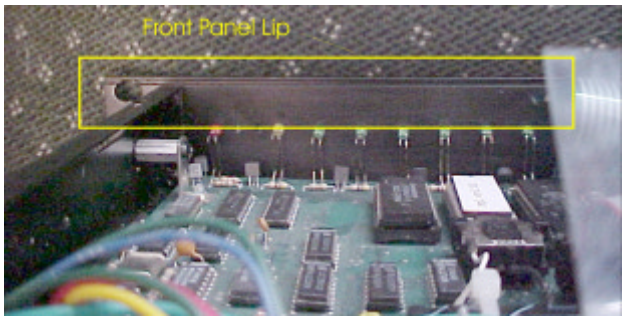
Bottom Panel Screw Locations



Be careful taking the panels off because there is a lip on both the top and bottom of the front panel that helps keep all the panels flush. Pull the panels out from the back of the unit, don't lift them out.

When re-attaching both panels, be sure to slide the panels into the lip and confirm all screw holes are in the correct locations. Be forewarned, these panel screws strip easily, especially if you accidentally cross-thread one.

Here is a pic of the front panel lip



After removing the top panel, **REMOVE THE TUBES!**

This will avoid any incidental damage and will also give you more room to work with.

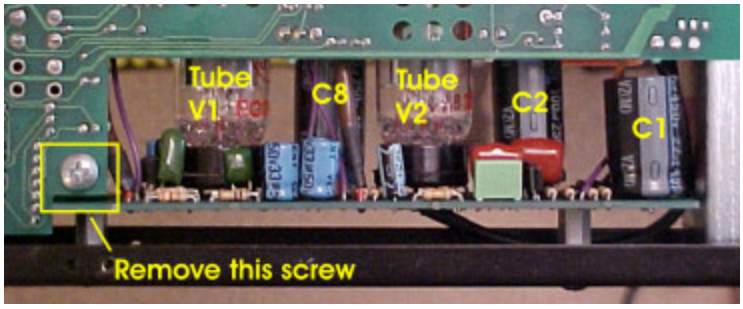
Step 3: Detaching the Tube-Board Stand-offs

Detaching the Tube-Board requires you to remove three screws. Once the Tube-Board is detached, you can flip the board up and work on it from there. You don’t have to worry too much about breaking a wire off from a pad, they are all attached pretty securely.

Remove these screws from the left side of the unit



Remove this screw from the underside of the unit



From here, you should be able to orient the Tube-Board so you can work on it comfortably.

Step 4: De-soldering caps C1, C2, and C8

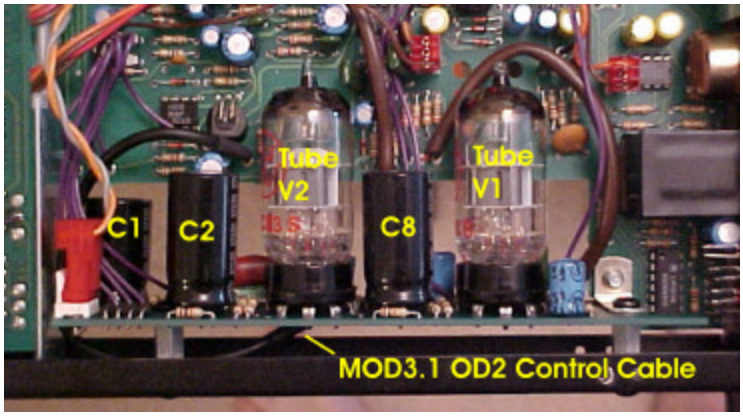
The three Electrolytic Filter Capacitors on the Tube-Board are to be replaced with caps of higher ratings. Generally speaking, the higher the rating the less hum that gets piped through the circuit. There comes a point where raising the values won't help that much and also the higher the value, the bigger the cap.

I believe I have successfully found a good combination of size and rating that will yield the best results. The Nichicon caps I recommend are not only small enough in size to fit properly, they are also rated for high-temperatures. A bonus when you notice the caps are directly positioned next to the tubes.

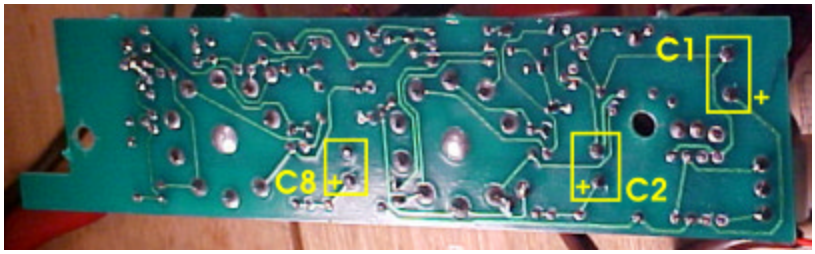
Pic of the Tube-Board from the top with the Filter Caps to be replaced.

The black cable running from the main PCB to the underside of the Tube-Board is not stock if you were wondering. It is a repositioned shielded wire for the **MOD3.1**

Those **JJ/Tesla ECC83S** tubes you see here rock!

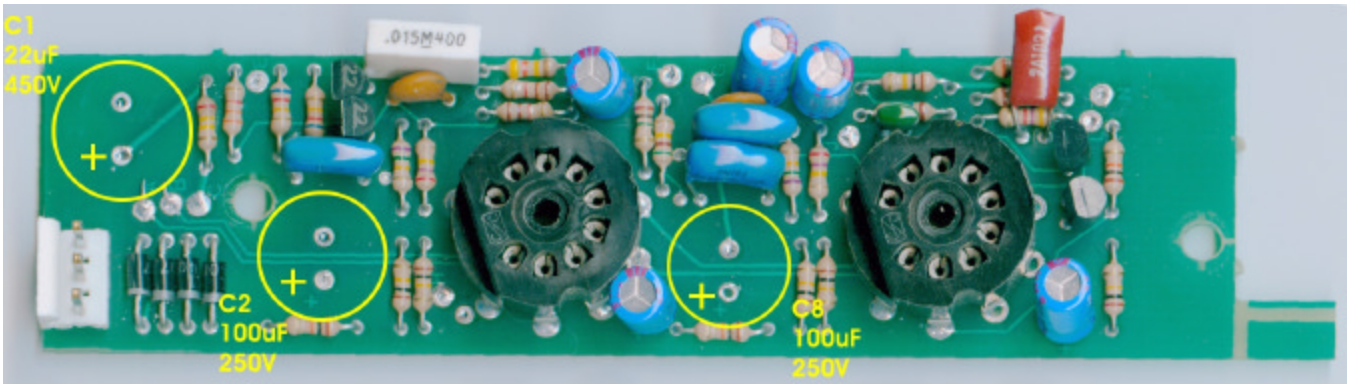


The underside of the Tube-Board with the Filter Cap solder pad locations labeled.



Step 5: Installing the replacement Filter Caps for C1, C2, and C8 and re-attaching the Tube-Board

Here is a more detailed pic of a stock Tube-Board with all the connecting wires and Filter Caps removed. Cool pic, huh?



Keep in mind since these caps are Aluminum Electrolytic, they are polarized. This means they HAVE to be oriented correctly. Just a reminder that the obnoxious stripe on the side of the cap will always point towards the cathode lead (-), NOT the anode (+)

When you are done soldering the caps onto the board, clean up the excess solder flux on the underside of the PCB with a toothbrush and some Zippo Lighter Fluid (naptha).

Go ahead and re-attach the Tube-Board stand-offs to the chassis. Do NOT reinstall the tubes just yet.

Step 6: De-soldering Op-Amps U4 and U9 from the main PCB

Op-amp U4 is the critical input-stage buffer positioned directly after the FET buffer in the preamp circuit. Must of the excess external noise is amplified here. It makes sense to replace it with a higher quality component. However, Op-amp U9 is NOT in one of the critical stages. I am only recommending it's replacement from experience and after reading this snip-it from one of Jur's troubleshooting docs from 1992:

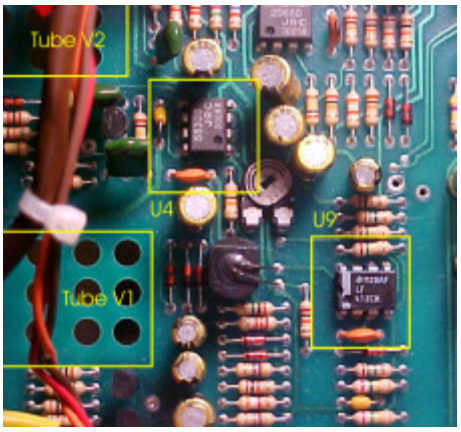
```
- Low gain in the first signal section before OD-1... thoroughly clean the PCB
   in the area near the LF412.  This problem is thermal.
```

Believe it or not I actually had this problem on one of my MP-1s and for the life of me couldn't figure it out for the longest time. Replacing the LF412 Op-amp (U9) with another Op-amp that was less susceptible to heat completely cured the problem. Go figure. That is why I suggest replacing this component along with the others. While you are at it, be sure to completely clean the two Op-amp areas after you remove the ICs from the PCB with naptha to remove any excess soldering flux and/or gunk that has accumulated over the years. Squirting an old toothbrush with **Zippo Lighter Fluid** (contains mostly naptha), and thoroughly saturating the area by brushing works wonders. Don't worry about the lighter fluid chemically melting or hurting any of the surrounding components, it evaporates too quickly for that to happen. Also, common sense says stay far away from your hot soldering iron while doing this. Trust your common sense. Duh.

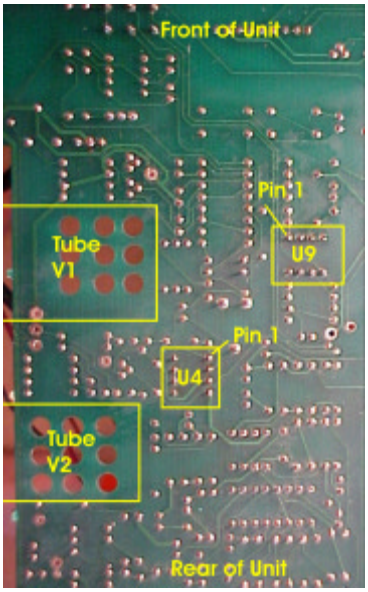
BE SURE TO PUT OUT THE CANCER STICK BEFORE ATTEMPING THIS! YOU HAVE BEEN WARNED!

Pic of Op-amps to be replaced and socketed.

Please note the tubes on this unit have been removed for clarity.



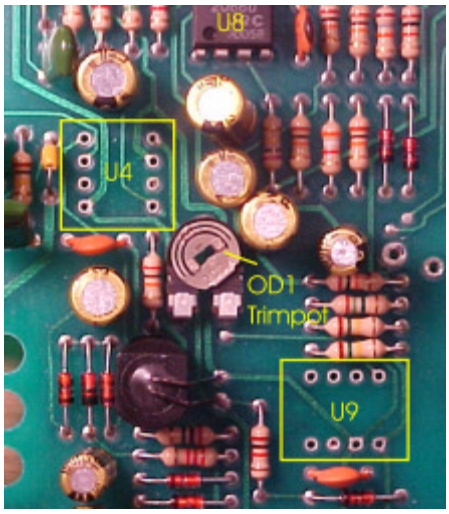
Here is a pic of the solder-side of the PCB with the Op-amp solder pad locations.



After a good clean de-soldering of all 8 pins on both Op-amps, you should be able to lift the components off the PCB with little or no effort. Keep using the de-soldering wick (braid) on all 8 pins one after another until it literally falls out. Be careful not to melt or score the surrounding PCB area. Also watch for pads lifting off the PCB. If you see a pad starting to lift, STOP! Your iron has too high of wattage for this application. Buy or borrow another one. Patience is a virtue here. If you continue with lifted pads, you risk breaking traces. If this does happen to you I have included some repair tips in the **"Good Desoldering Practices"** section.

Pic of the de-soldered Op-amp locations, ready for the sockets to be installed.

Please note that Op-amp U8 and the OD1 Trimpot (T2) are only labeled here for reference.



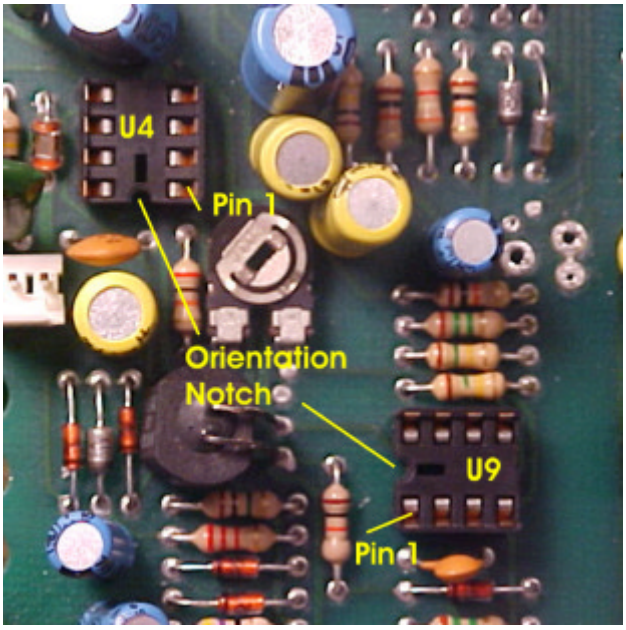
After the Op-amps are removed from the main PCB, continue using the solder-sucker and de-soldering braid to completely open and clean-up the through-holes of any excess solder. Do this on both the component side and the solder side of the main PCB and you will get great results.

Step 7: Soldering IC sockets in U4 and U9 PCB area locations and socketing the replacement Op-Amps

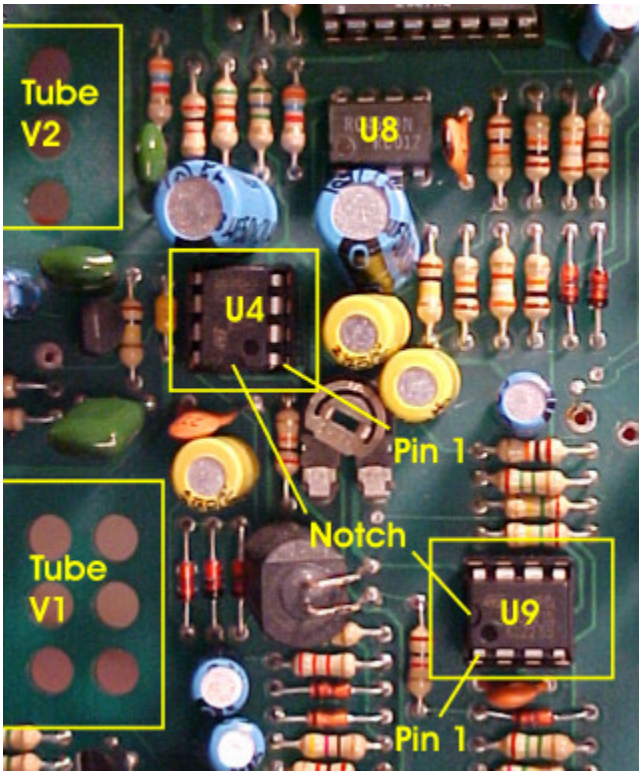
A Note on IC Sockets:

Obviously IC sockets are not required but you would be a fool not to take advantage of using them at this stage. Besides costing next to nothing, sockets allow you to replace ICs at a moment's notice with the use of a simple tool. Sockets also protect the component from the conductive heat of the soldering iron directly on the IC pins.

IC sockets also have an orientation notch similar to Op-amps that tell you where pin 1 is. With a socket's (or Op-amp's) notch pointing up, pin 1 will always be on the top left.



Pic of Op-amp area with IC sockets installed and orientated correctly

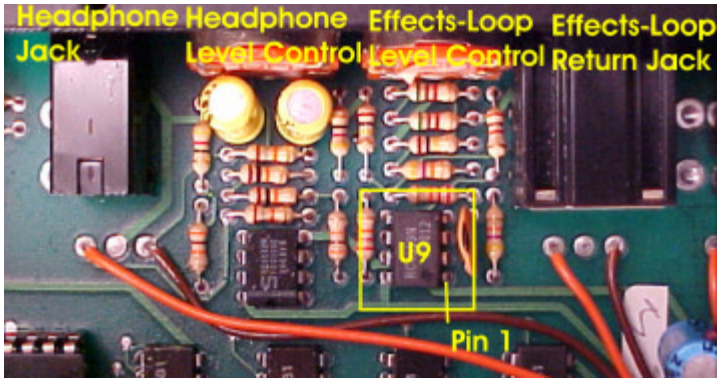


Finished job with the Op-amps installed into the corresponding sockets and oriented properly.

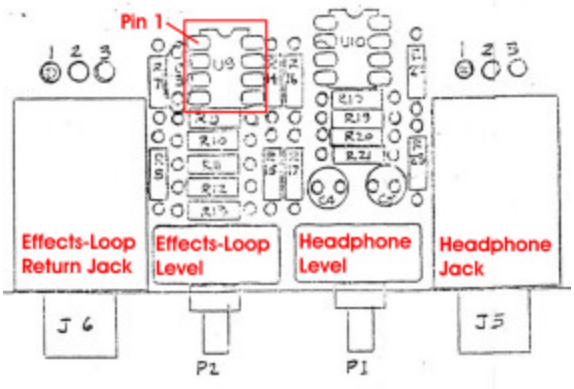
Step 8: De-soldering the Effects-Loop Buffer Op-Amp U9 on the Rear Jack PCB (Optional)

If you do not use the Effects-Loop on your MP-1 you may safely skip the next two steps. However, if you have a later model MP-1 (v2.xx), I have found that replacing the crappy 2068 Op-amp with a TL072 not only lowered the hiss but it's superior **slew rate** keeps the infamous **"Tone Sucking"** to a minimum. Earlier models had an RC4559 on them. Why ADA decided to change this is beyond me. The RC4559 has similar characteristics to the TL072 but it is still considered a bit noisier even though I can't hear a difference. If you have a RC4559 in place for U9, it is your call to replace it or not. Keep in mind socketing and replacing this Op-amp is not going to hurt anything.

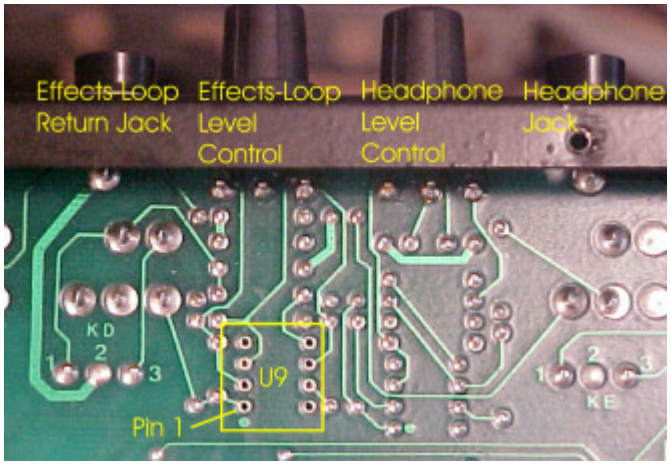
Location of Op-amp U9 on Rear Jack PCB as seen from the bottom of the unit.



Component layout drawing of Op-amp U9 location

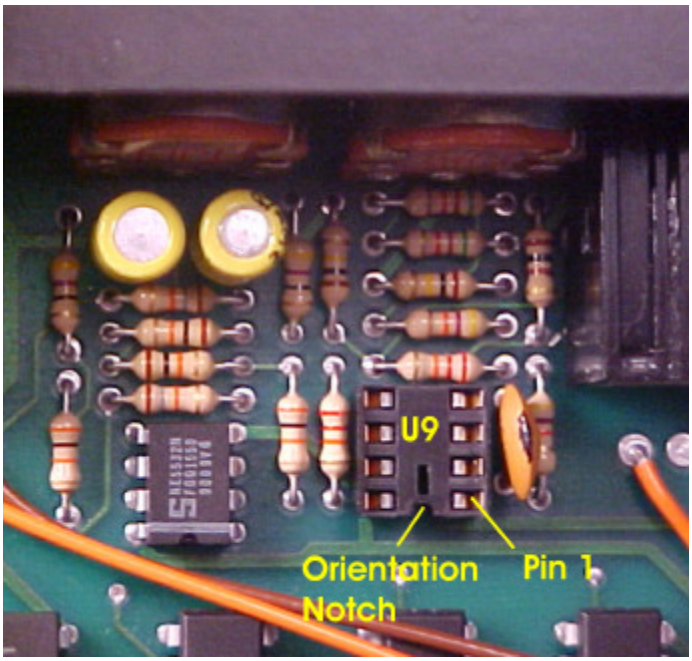


De-soldered location of U9 as seen from the top of the unit.



Step 9: Soldering IC sockets in U9 PCB area location and socketing the replacement Op-Amp (Optional)

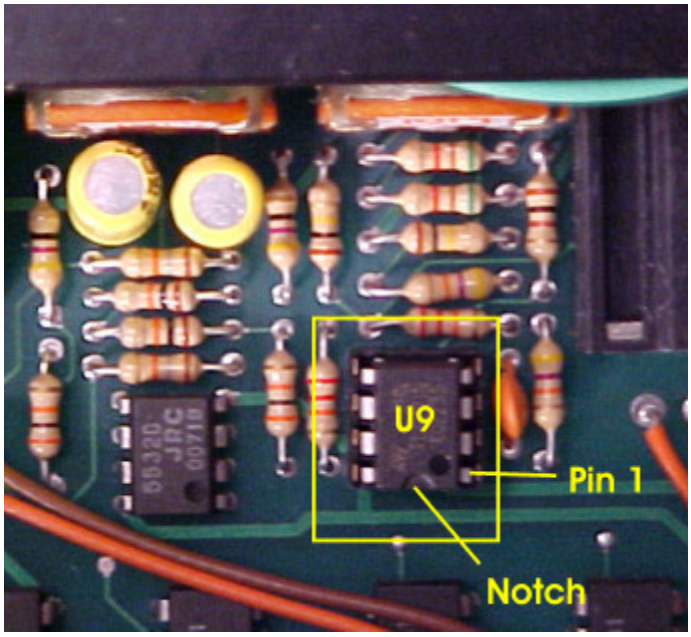
Pic of properly mounted and oriented IC socket for Op-amp U9



Pic of finished job with the Op-amp socketed in the correct orientation. NICE!

Notice how the half-moon notch on the Op-amp corresponds with the notch in the IC socket.

Also, notice how the notch corresponds with the location of pin 1 on the Op-amp.



Step 10: De-soldering Transformer Filter Caps C129, C130, and C131

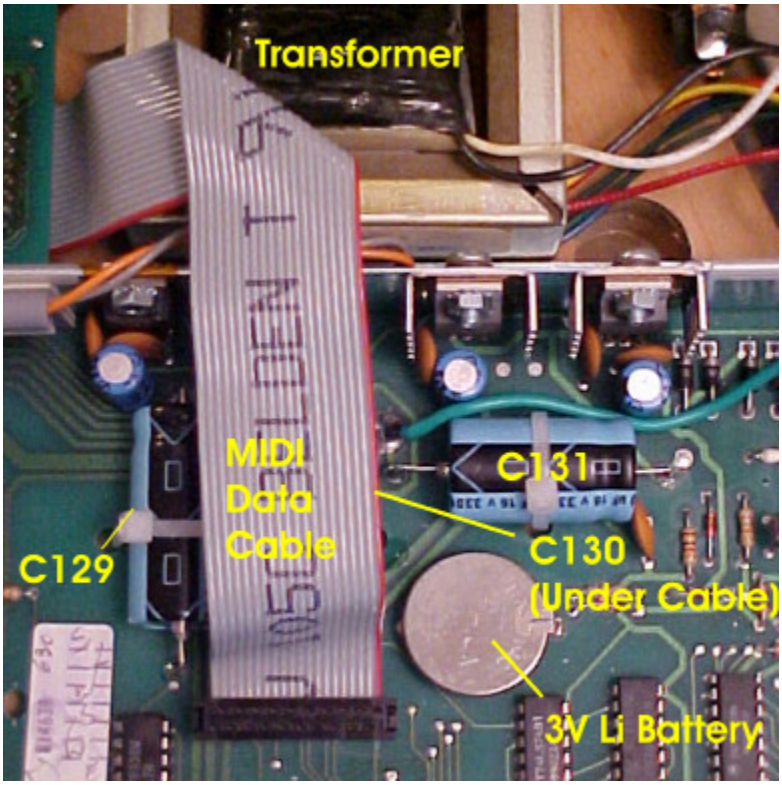
The transformer filter caps are located (yes, you guessed it) near the transformer and AC power cord at the back right of the unit.

To me, this is the most important part of the mod. How many times have you played in a bar where the power is uh, let's just say, not up to par? Even with a power conditioner, this can still wreak havoc on the filter caps. Couple this with the fact that the caps are 10+ years old = Time to replace!

This part of the mod involves simply *replacing* the caps with the same ratings. Replacing these caps with higher ratings won't really yield any noticeable difference. The rating on both sets of caps are already sickly high. The 16V cap is rated at 3300uF and the 35V caps are rated at 2200uF.

First of all, you will have to unplug the MIDI Signal Ribbon Cable from the PCB board to get to the caps safely. Next, go ahead and snip the plastic retainer strips from around the caps with a wire cutter.

Since we will most likely be throwing these caps away (although they DO make great cat toys), go ahead and snip the leads of both ends of each cap and remove them from the unit. This makes the de-soldering of the leads from the PCB pretty easy.

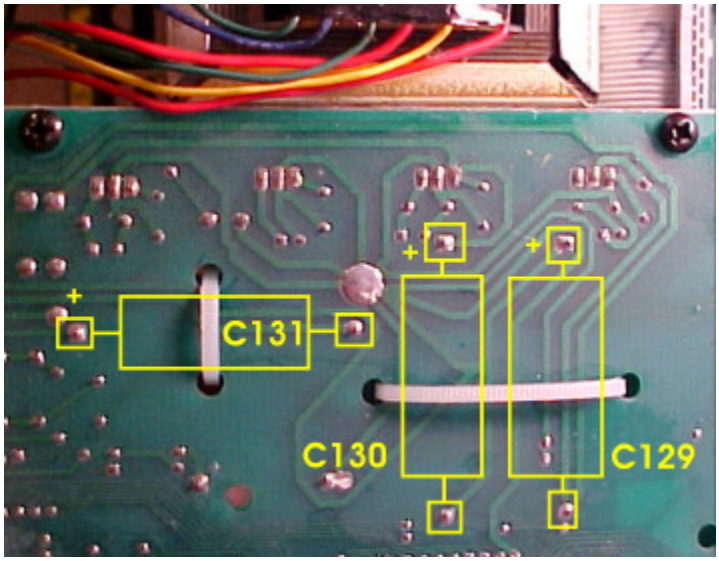


Location of transformer filter caps and surrounding components.

Pic of the underside of the unit showing the location and orientation of the Electrolytic Caps.

Notice the shape of the solder pads for the anode (+) poles of the caps, THEY'RE SQUARE! COOL! No thinking involved here.

If you get the orientation of one of these caps wrong, you are truly a moron and should be saving up for a TriAxis in your spare time.



When you are finished removing the caps and the leftover leads from the board, go ahead and start in with the de-soldering wick to clean up the excess solder from the pads. Again, do this on both sides of the PCB.

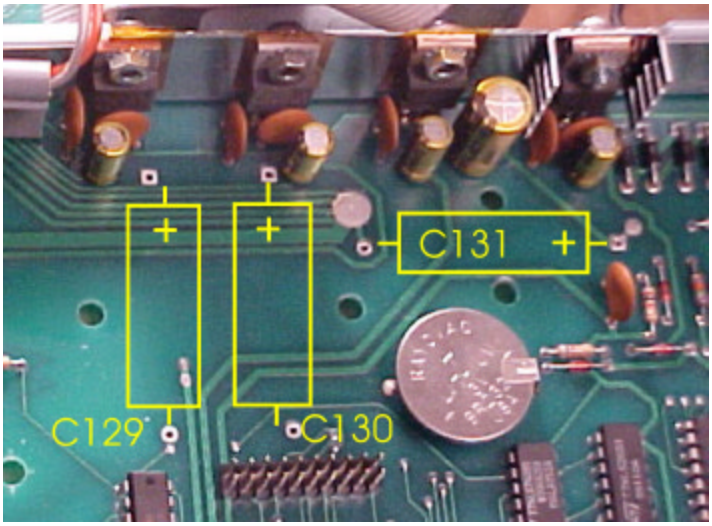
Step 11: Installing the replacement caps for C129, C130, and C131

Installing these caps are pretty easy because they are Axial.

Measure out the approximately how long the leads have to be and then bend them at right angles into the through holes on the PCB as shown in the pic. After the caps are all set in place, use the two plastic zip ties to fasten them to the board just like in the pic. As you saw when you removed the ties in the previous step, there are specially placed holes for these ties.

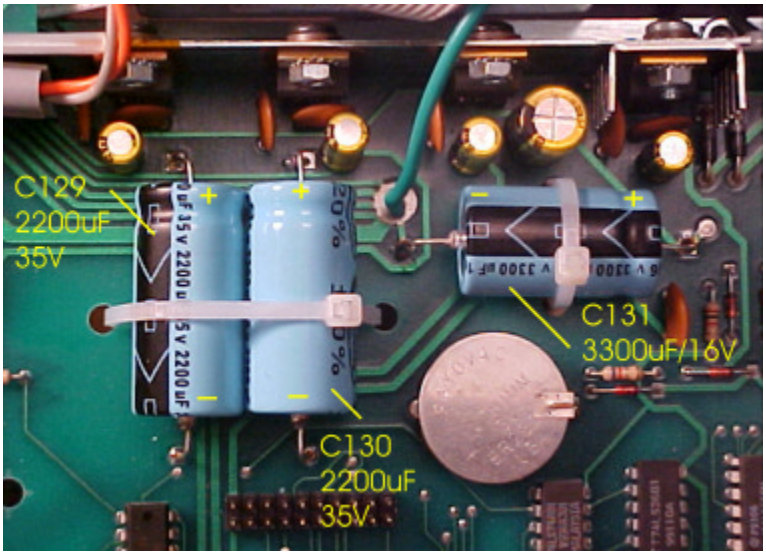
Pic of the location and orientation of the transformer filter caps looking down from the top of the unit.

Ignore the fact that there is no wire terminated at the Kelvin Ground point. These pics were taken from two different units.



Pic of the finished job detailing the location and orientation of the caps.

Notice the right-angle bends of the leads just above the through-holes.



When you are finished here, use the toothbrush/naptha technique to clean off the solder flux from the bottom of the PCB. Don't forget to re-attach the MIDI Signal Cable to the board.

YOU ARE DONE! CONGRATULATIONS! Re-install your tubes as well as the top and bottom panel and you're ready to rock!

-HB

“Electrolytic Capacitors 101”

If this mod is the first time you have ever seen a polarized capacitor, this section is for you.

Generally speaking, any capacitor over the rating of a 1uF (1 Micro-Farad) is usually polarized. This means it has an anode (+) and a cathode (-) lead. In order for this type of capacitor to function properly it’s poles must be orientated properly in the circuit. Sounds like an easy concept? Well, it is, actually. The problem herein lies with “How do you tell which lead is the cathode and which is the anode?”

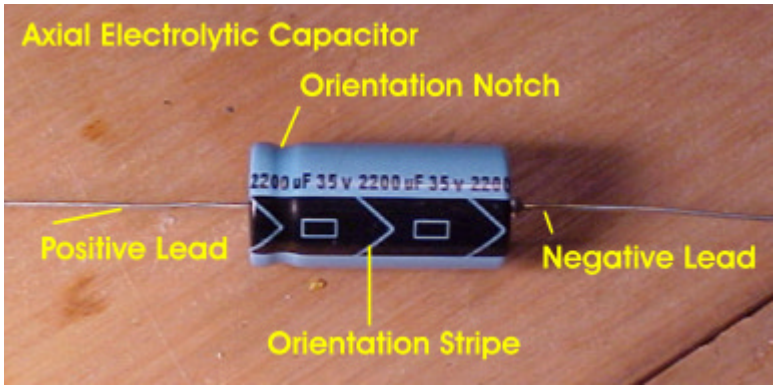
As you are probably aware, capacitors come in two different footprints, Axial and Radial. Simply put, Axial Caps have leads coming out of both ends where Radial Caps have both leads coming out of one end.

Polarized caps use two schemes to designate which lead is which: An “Orientation Stripe” or “Polarity Stripe” as some like to call it and an “Orientation Notch” (“Polarity Notch”).

On Axial Caps the Notch is always on the positive side where on Radial Caps the Stripe is always closest to the negative lead.

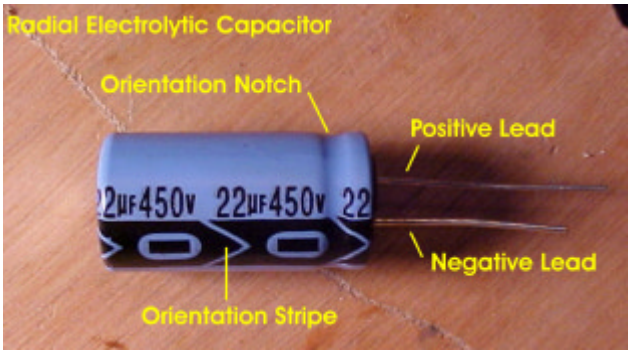
Let’s take a look at this run-of-the-mill Xicon Axial Electrolytic Capacitor:

The Stripe doesn’t help us much because it’s the same distance from both leads, but with the Notch, it is definitely obvious where the positive lead is.



…another run-of-the-mill Xicon Electrolytic Capacitor. This time it’s a Radial Cap:

In this example, the Notch sux as far as showing us which is the positive lead for obvious reasons, but with the Stripe even a monkey could figure it out.



That’s it!

Consider yourself an expert now on the subject of spotting Electrolytic Capacitor Polarity.

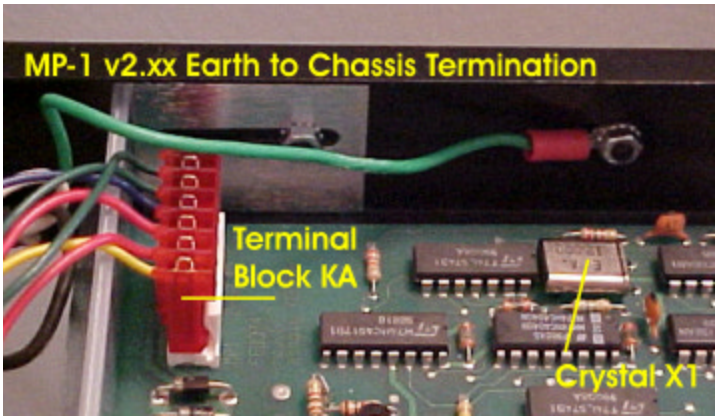
“Star-Grounding”

"Star-Grounding" simply means taking various ground points in a circuit and terminating them at one physical point. This will reduce any or all potential for ground-loop hum in a single circuit.

A "Kelvin Ground" is a separate and/or isolated ground where all circuit ground connections meet. Using a Kelvin Ground point in a circuit is supposed to minimize conducted power noise (60 cycle hum).

On newer (2.xx) MP-1s, the ground/earth (green wire) coming from the AC power cord is terminated on the chassis. What some people have suggested doing is lifting this wire and terminating it at the PCB Kelvin Ground point like on the v1.xx models.





Another idea that has been floating around is actually Star-grounding the tube board. This involved removing the ground wire from the Tube-Board (Pad N), replacing it with a thicker gauge cable and running it along the chassis perimeter and finally terminating it at the Kelvin Ground point.

Although these are great ideas, they don’t yield any real-world results for the MP-1.

I have tried both techniques on two different MP-1s and come to the same conclusion that "Star-Grounding" is just not necessary.

The whole idea of Star-grounding is to reduce the potential of ground-loop hum. This can be better accomplished addressing these three issues:

1) Be sure both the front and rear input jacks are properly insolated from the chassis (they should be).

2) The chassis itself is isolated from the steel rack rails with nylon shoulder washers.

3) The MP-1 power cord is plugged into a properly grounded and filtered power distributor (like a Furman Power Conditioner).

If these conditions are met, your MP-1 should be as quiet as it gets (as far as Ground Loop hum is concerned).

Good Desoldering Practices:

Just as soldering requires practice to get right, so does desoldering. If you have never desoldered before (or have never been that successful at it), I have included some tips for you here that may help you along the way.

There are two types of desoldering tools I use:

The ***"desoldering pump"***  and the ***"desoldering braid"*** 

I use the desoldering (vacuum) pump initially to suck up all the excess solder and then use the soldering braid to thoroughly clean the pads. This method will produce excellent results if you do it right. No broken traces, no lifted pads, and a clean surface to be resoldered. You should also be able to lift desoldered components out with little or no effort if it is done right.

Notes on the Desoldering Braid:



Desoldering Braids remove the solder by ***capillary action***. Simple to use.

1. Place the desoldering braid on the solder joint.
2. Apply the hot soldering iron to the desoldering braid for a second.
3. Remove the desoldering braid and the iron at the same time. The solder will be drawn up into the desoldering braid. Use a wire cutter to clip off the used portion of the braid when you are finished.

Soldering Irons:

I personally use a pencil tip iron with a switchable heat setting (I think I got it at Radio Shack). The heat setting let's you switch from 15W to 30W. For standard PCB soldering I use the 15W setting. For desoldering purposes I use the 30W setting. It seems to work pretty well.

Lifted Traces and/or Pads:

For soldering and desoldering purposes here I would not use over a 30W iron. Anything more than this and you risk lifting PCB traces or pads. If this happens, you must clean the surrounding area thoroughly with acetone or naptha, and use clear epoxy to re-attach the pad/trace to the PCB. After letting the epoxy fully cure, use an X-Acto knife with a small blade (#11) and ***carefully*** scrape the epoxy from the top of the pad. This will allow you to re-tin the pad so that the solder will stick. You may also need to re-drill the through-hole if the epoxy has plugged it. Use a high-speed Dremel tool with a 1/32" (very small) drill bit to ream the hole. Any bit thicker than a 1/32" and you'll risk lifting the pad again.

Broken Traces: DON'T PANIC! It happens to the best of us!

Scrape the two broken edges of the trace ***carefully*** to reveal the copper. Tin, then use bus jumper wire to make a "bridge". If the broken part of the trace is longer then 1", you may want run a line of epoxy along the jumper wire after it has been soldered to keep it from lifting the trace further.

Radio Shack carries this jumper wire, it is catalog #278-1341.



