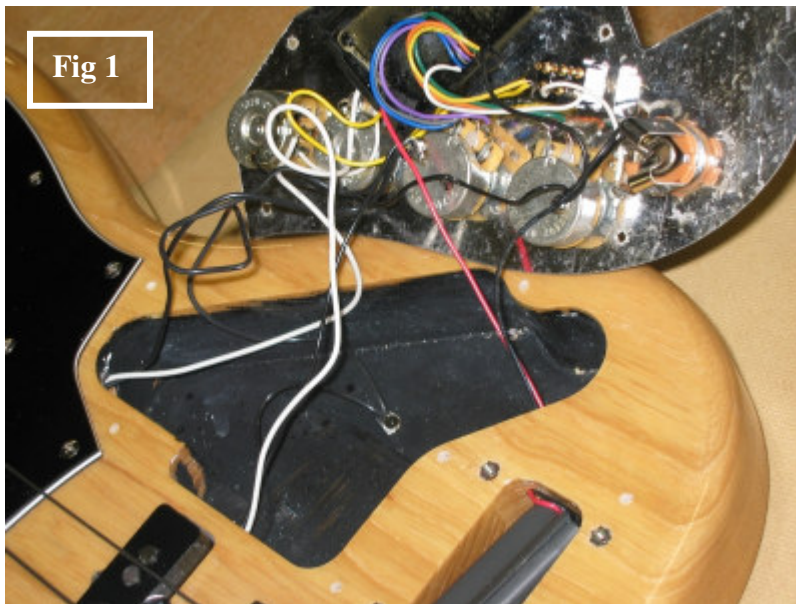


## Silencing the Noise on a Marcus Miller Signature Bass

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I have an older Marcus Miller Signature bass, and it used to be highly susceptible to noise picked up through the vintage single-coil pups (unless they were exactly balanced in volume, and also light buzzing (that would go away when I touched the strings). That's all gone now. It's absolutely silent until I thunder a string - because I re-wired it to remove the ground loops, and I shielded the pups. It was great before – it's unbelievable now.

I opened up the control cavity and what I found in there shocked me, considering the presumed build quality of this bass. It was a textbook case of how NOT to wire and shield a guitar – or any audio device for that matter! So, if your control panel is wired like the picture below, and you are getting noise, I now know you can get rid of it simply by eliminating the ground loops and shielding the pups. (What I can't understand is – why was it built that way?)

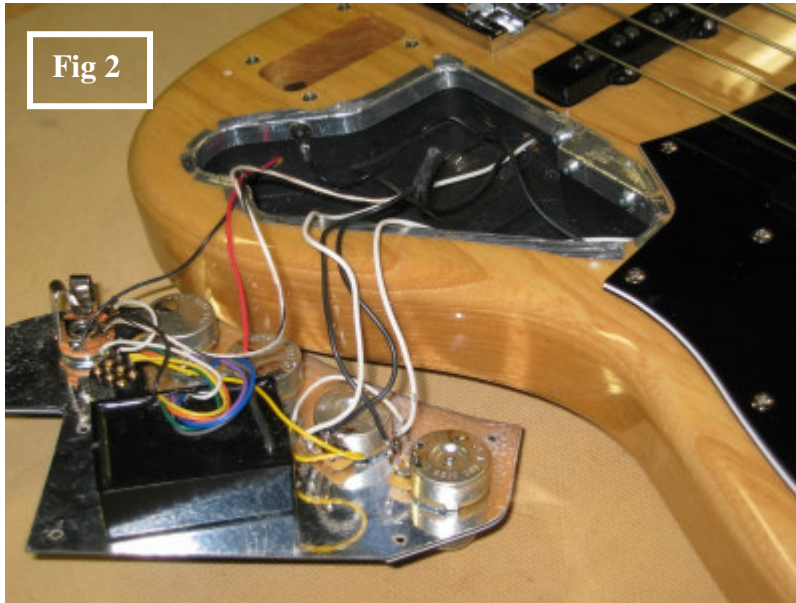


Key things to notice are (1) the short black wires joining the shells of the pots, (2) some of the pot terminals are bent back and soldered to the shell, and (3) the conductive paint coating does not go high enough to make contact with the foil-backed pick-guard.

What I did was this:

- (1) added a foil liner to bridge the gap from the conductive paint in the cavity, up over the edge to make contact with the foil on the back of the pick guard,
- (2) gave all the signal grounds their own wires and ran them all to one point, and
- (3) shielded the pups with copper foil, and grounded the shields.

Here's the end result.



Bloody hell, what a difference! Dead silence now regardless of volume and pickup balance.

### **INSTRUCTIONS:**

**FIRST THING** – Thanks to John Atchley and his Guitar Nuts website that inspired me to do this project. Please visit <http://www.guitarnuts.com/wiring/index.php>. You will notice that John strongly recommends a capacitor to prevent electrocution in the event of amplifier malfunction. My bass didn't have that capacitor, and I haven't added it to mine yet, but I intend to look into it further – I have already bought the capacitor.

**SECOND THING** – These instructions are not step-by-step, but rather they assume you know enough about soldering and simple switch-circuit wiring to provide self guidance and not do damage. Think ahead and apply common sense liberally. If you are unsure, I recommend you ask for help from someone who is more comfortable with these things.

There is no visible difference to the guitar from the outside after this work, but it sounds clean.

#### PART ONE – Shielding the control cavity.

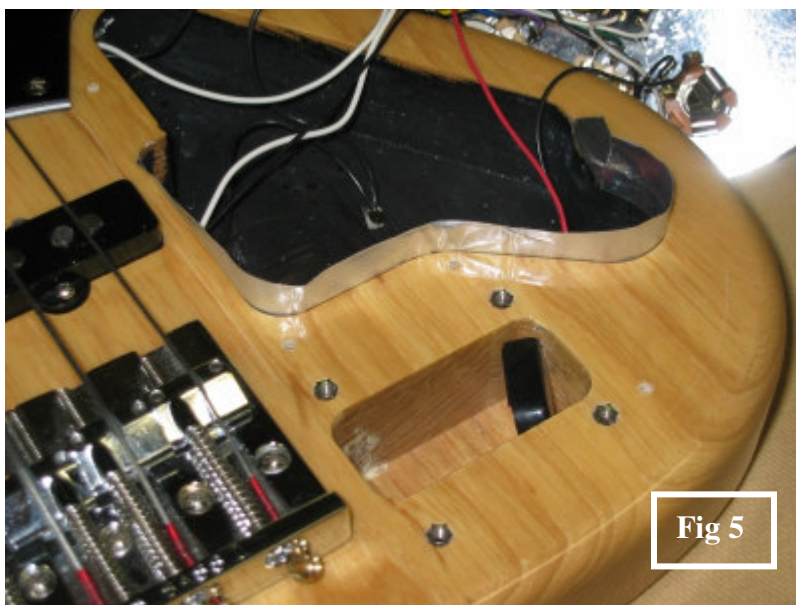
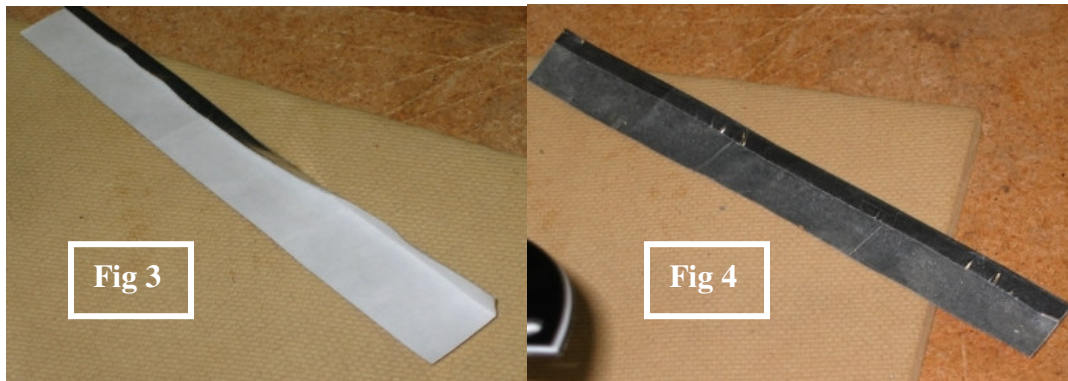
Remove the battery.

This bass already came with aluminum foil on the back of the pick guard, a very nice coat of conductive paint inside the cavity. If you need to add these things to your bass, the instructions are on the Guitar Nuts website above.

But unfortunately on this bass, the conductive paint did not come up and over the edge, and therefore the pick guard foil couldn't make contact. All I needed to do here was to complete the shielding all around the edge by adding a foil strip around the lip of the cavity such it makes electrical connection with the pick guard. On the inside, the new foil touches the conductive paint; on the top side, the pick guard sits on the foil when installed.

I chose to use aluminum foil tape for this - the shiny thin metal aluminum tape that you get at a hardware store for dryer duct taping (NOT fabric-based duct tape!). This tape is about 2 inches wide, so I cut it in half length-wise into 1-inch strips. A box cutter or exacto knife is all you need to work with this.

You need to make good contact with the conductive paint, and the adhesive side of the tape is not conductive. So, to get the shiny conductive side up against the paint, I folded over about 1/4" onto itself (Fig 3 - start) (Fig 4 - ready), and stuck the strip on the side of the cavity such that the folded shiny foil was in contact with the conductive paint (Fig 5). Apply it in strips of convenient length to work with, but apply pieces to go all around the cavity lip. Make sure the edges butt together or overlap.



I have three tips when it comes to bending the foil over on to the top surface of the guitar:

- (1) Slit the upstanding foil vertically at the bends – once at each side of the bend, and one or more times in the bend, as you see fit. Folding back the straight sections is easy now, because you have slit the foil before the bend. And slitting the bends will let you approximate several straight sections.

- (2) Focus on getting the foil flat, because wrinkles will end up raising the pick guard and reducing its overall contact. Don't worry about gaps on the top side – it is the inside that matters most. And don't worry about overlapping the foil sections – you will easily cut out the overlaps in the next step.

- (3) Where possible, cover over a screw hole, because that will provide the tightest electrical contact when the pick guard is installed.

I then made secure electrical contact between the folded foil and the conductive paint on the side of the cavity by winding tiny short screws into it. Tips on the screws:

- (1) Put the screw through the folded part of the foil. That's where the shiny foil is on the other side up against the paint – which is the whole point of this.

- (2) Use the tiniest screws you can find. I used #4 x 1/2".

- (3) Avoid twisting the foil under the screw head by putting a washer under the screw, or at least don't over-tighten – all you need is contact.

- (4) Make a starter hole with a needle-shaped scratch awl or something.

- (5) Don't put screws where the heads will interfere with the pot shell when the pick guard is installed.

- (6) You don't need many screws – maybe even none at all - but I used one per foil strip.

Next, remove the overlaps in the foil. Simply slit down one side of the overlap and peel off the top layer that you just freed with the slit.

Finally, trim off the excess foil. I laid the pick guard in place and traced around it with a sharp pencil. Then I lifted off the pick guard and used the knife lightly to trim off the foil to within about 1/4" of that line so it's not visible when the pick guard is installed.

See Fig 2 for the end result.

## PART TWO - Fixing the ground loops

The basic goal here is really simple: Separate the “signal ground” wires from the equipment grounds, join them together at a single point, and wire that point to the low side of the output jack. We are NOT going to touch any of the other (signal “hot”) wires.

“Signal grounds” are the (typically) black wires coming from the pickups and anything wired to the arms of a pot that presently goes directly to ground or the shell of a pot – including those pot terminals bent back and soldered to the shell. “Equipment grounds” are the bridge ground, shield grounds, and the minus side circuit of the battery.

FYI: The minus side of the battery runs to the ring terminal of the output jack, which acts as an on-off switch when you plug in a cable. This works because the shaft of the mono jack on the cable shorts the ring terminal to the body of the jack, thereby connecting the battery terminal to ground, and to the black (minus) power input wire for the pre-amp.

On the output jack, find the solder lug connected to the body of the jack (the part with the nut on it). It will likely have wires that you can trace to the battery (-) terminal and to the pre-amp (-) power input, usually a black wire. Leave those wires where they are.

Isolate the signal grounds:

- (1) I took the black (grounded) wires from the pickups and cut them free at the far end, leaving the longest length of wire possible. (To identify the black wire from the low side of the pickup, versus a the black wire coming through the same hole that is the bridge ground wire, you can lift the ends of the wires and measure continuity. The pickup signal ground wire should measure thousands of ohms between the end of that wire and end of the other wire (typically white) that is the hot side of the pickup.)
- (2) Where ever the terminal of a pot was soldered to the shell, I de-soldered it, moved it back away from the shell, and added a length of black wire.
- (3) At the output jack, the signal grounds and equipment grounds come together. We want this to be the ONLY place they come together. Figure out which is the signal ground – that is the wire you are going to replace. On my bass, I followed the signal ground wire that was currently connected to the jack and followed it back to its source at the pot shell. Remove it and replace it with a wire. In Fig 2, that is the white wire with a black stripe.
- (4) Bring all these wires together, trim them to a neat length, and solder them together. Insulate this connection – you don't want it touching ground or you could get the ground loop buzzing back.

Then, connect the bridge grounding wire to the foil. You will find it coming through a passage hole near the bridge, possibly running through the bridge pickup cavity, and most likely soldered at the other end to a pot shell. To identify it, remove it at the pot shell end, and you should measure continuity (0 ohms, roughly) between the end of the wire and the bridge body. Solder that wire to a ring terminal, and put the ring terminal under one of the screws that you used to anchor the aluminum foil in Part One.

### PART THREE – Shielding the pickups

This is simply a matter of getting access to the pickups, wrapping them in copper foil, and grounding the foil inside the control cavity.

Loosen the strings, lift out the pickups, and lift off the plastic covers.

I wrapped a little strip of electrical tape around the terminals where the leads connect to the coil. This is a precaution against the copper foil touching the terminals after being

wrapped and the cover crammed back on. But be very careful not to disturb the coil winding wire because it can break off very easily.

Cut a length of adhesive copper foil that will wrap around the coil in the same direction as the windings (obviously) with about an inch overlap. (I used a strip of 1" copper foil - available at many guitar parts supply stores.) Peel off the backing and wrap it carefully around the coil with a little bit bent over the top of the coil form, as seen in Fig 6.

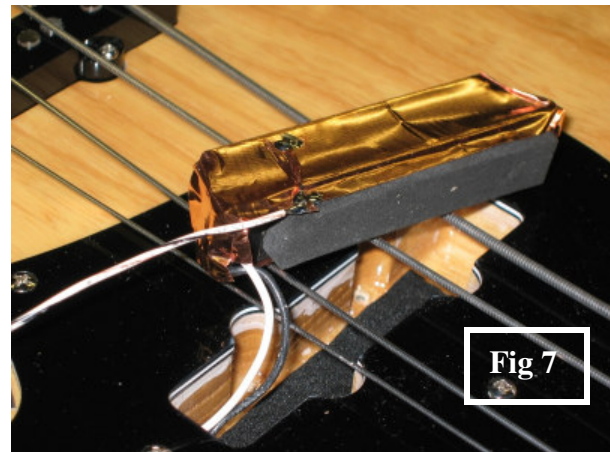
Press **ONLY** on the plastic coil spool form, and **NOT** on the coil windings. In fact try to avoid the copper touching the coil winding wire anywhere, even though it is insulated and should not be a big deal if it does touch.

Tack-solder the foil ends using not too much heat. For each pickup, cut a wire long enough to reach easily into the control cavity from its pickup cavity, and solder one end to the foil. This is shown in Fig 7.

Carefully put the plastic covers back on the pickups. Then put the new wire through the hole where the pickup leads run, and fish them into the control cavity. Reposition the pickups in their cavities, screw them in place, and re-tension the strings.

There should now be only the two new shield wires that are loose. Solder them together on a ring terminal, and secure the ring terminal under one of the screws that you used to anchor the aluminum foil in Part One.

Clean up all loose debris, check it over, and re-attach the pick guard over the control cavity being careful to avoid pinching wires or any unnecessary binding contact between the pots. If you have trouble fitting the pick guard back in, be sure to check that you are not pressing up against one of those little screws in the foil. Remove it if you are.



Re-attach the battery and the cover.  
Tune up - the usual stuff.

**You're done. Now you can get out there and play the spaces between the notes with REAL silence!**