

Building my

Steinberger GM-7 P(iezo)



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How it all began...

All began with a short notice from Jon Bondy on the SteinbergerWorld mailing list. He offers piezo saddles fitting on Steinberger TransTremms and S-Tremms. Well, I own a couple of TT equipped Steinies, and have been thinking about a piezo pickup for a long time, so this was my chance to get this feature built into one of my guitars.

I ordered the piezo saddles from Jon, and the GraphTech electronics kit, too. It didn't take very long for the kit to arrive, although it had to make the long journey to Germany.

Buying the components was the easy part, the next step was difficult. I had to decide into which of my Steinies I was going to install the set. This would have consequences:

- I will have to drill at least one hole into one of my original Steinies
- The TransTrem will probably continue to work somehow, but will lose the transposing feature
- Could the use of the trem damage the piezos? Possibly...

This was the moment when I started thinking about a fixed bridge. I knew that such a bridge should soon be available from JCustom. I contacted Headless Research, and some weeks later the bridge was actually available. Of course I ordered it at once, since it was announced as a "drop-in replacement" for the TransTrem. Well, this is only partially true, but this will be an own chapter, later...

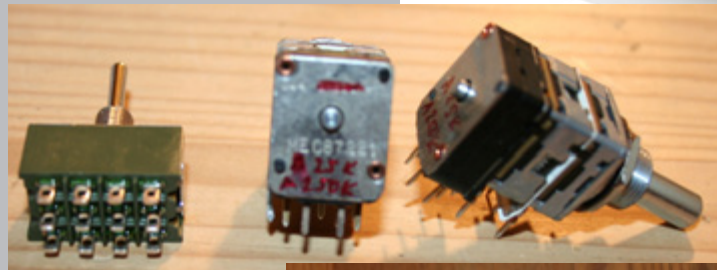
The decision for the bridge was made, but I still had the problem to choose one of my guitars for installation. Whenever I thought "OK, now I know it, it'll be this one", my family told me several reasons not to use this one.



Photo: Jon Bondy

Obviously this was a problem I wouldn't be able to solve, so I started...

Shopping!



The final decision was, not to use one of my existing guitars, but to build a new one from parts.

Now, some parts were quite easy to find (body, neck, pickups), while others were a little bit hard to get. I ordered three battery compartments, until I finally found the one which really is used in Steinberger GM bodies. Another challenge: parts that didn't even exist yet...

There were two areas, which needed additional efforts and thoughts:

- The FX-Bridge would fit into the TransTrem cavity, but there are almost 5 mm of height missing. So I need a shim...
- How to handle all the controls and switches, which are required for the EMGs and the piezo electronics?

The Shim

The FX-Bridge is new, and everybody who wants to use it needs a shim, otherwise it can't be used in a GM. It's that simple. So I thought it would be a good idea to design a shim, that helps me finish my guitar **and** could also be manufactured later. I'm pretty sure that other users of the FX-Bridge will need such a shim, too.

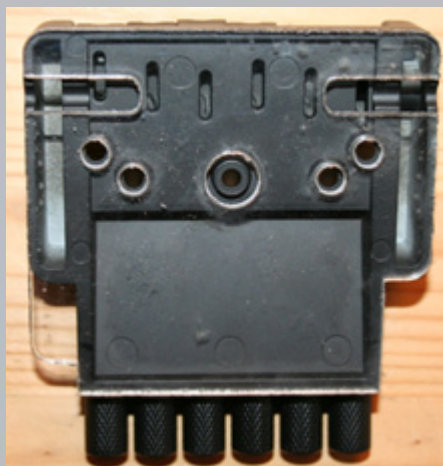
The shim would need to fulfil the following requirements:

- It has to fit into the TT/ST routing
- It has to provide holes for the screws
- It has to support the use of piezo pickups, which need additional wires to be routed
- It must be solid enough to stand the strong forces under a guitar bridge
- It shouldn't have a negative impact on sound and sustain of the guitar

I created several versions, until the final shape was found. Once design was finished, I ordered a prototype, which was (laser)cut from acrylic glass. (This prototype is currently mounted in my guitar).

As you can see, the shim gives access to all existing mounting holes (although the upper two aren't used for the FX-Bridge). Wires can be guided through the large hole in the middle, and also through the cutouts on the left and the right side. The cutouts are in the same position as the small "channels" on the FX-Bridge. Later you will see pictures of the piezo wires, guided through the shim and the body.

Although the acrylic glass version works perfectly in my guitar, the final "production" version of the shim will be made of steel, adding the missing mass (compared to a TransTrem) to the bridge.



Control vs. Simplicity

Building all the standard GM-7 pickups and the piezo electronics (AcoustiPhonic Ghost) into the guitar, requires a good plan regarding the control elements that come with the sets, as there are

Standard Pickups: EMG 89-SA-89

- a 5 position pickup selector switch
- a toggle switch for the EMG89 coil switching (single coil/humbucker)
- a volume pot (25k)
- a tone pot (25k)

Piezo Pickups with electronics

- a switch to select either the EMGs or the piezos (I didn't want a "blend" version with both systems active)
- a volume pot (250k)
- a mid boost switch
- an optional tone pot (250k)

All together these are three (or four) pots and four switches. I remember some guitars from the '70ies, which had a whole lot of knobs and switches, and this is definitely not what I wanted. An ideal solution would mean not to drill any additional hole and not to install any additional element. At least not visibly.

Pots and Switches...

This led to the conclusion to use stacked pots. These are available, but usually only with the same values for both levels. So I could use a 25k/25k stacked pot for controlling the EMG's volume and tone, and another 250k/250k stacked pot to control the piezos.

Hmmmmm...

Not an ideal solution, because I like volume (often used) and tone (rarely used) controls to be separate, on the usual positions.

Next thought: If I had a 25k/250k stacked pot, I could control both volumes separately, and both tone settings separately. There's only one little problem: such pots don't exist.

Too bad, but:

Lucky as I am, I found an MEC ad (a German company) in a guitar magazine. Producing pots for the industry for years, they just started selling custom pots. Custom pots? Exactly what I needed. I contacted them, and got all the answers I wanted to hear. Yes, I can order custom pots, although I needed a "Gewerbeanmeldung", which means a "registration of business". No problem, I have that.

So I planned to get two 25k/250k stacked pots, each with an additional DPDT push-pull switch, solving the switch problem, too. One switch (volume) would be used to switch between EMG and piezo output, the other switch (tone) would activate the piezo mid boost.

Perfect... almost.

Thinking a little further I wasn't sure if I would really need to set the volumes separately. Why? When playing guitar, I don't want to think about which knob to turn, I want it as simple as possible. And there are very few situations where separate volume settings (when switching between sounds) would make any sense. So I made my final decision:

I don't need stacked pots, I need tandem pots. I rotate one knob, and either volume setting follows, no matter, which pickup is selected.

Perfect... really :-)

So I ordered my 25k/250k tandem pots with switches, and received them in less than two weeks.



Finally... building the guitar

Now that all the material was available, it was time to put things together. The first steps were quite easy. Drilling four holes into the neck, inserting the threads, and mounting the neck to the body. Already looks like a guitar now ;-)

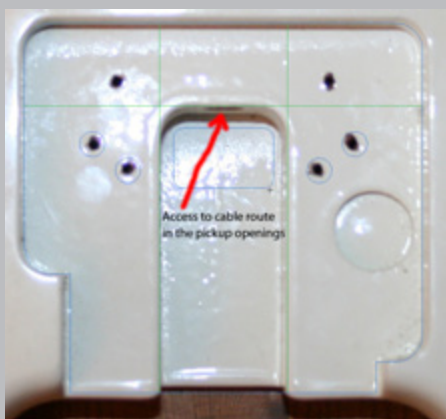
In order to control if the neck is fixed in the right position, I mounted the shim and the FX-Bridge and put the two outmost strings (E/E) on the guitar. If both strings have about the same distance to the neck edges (especially visible on the higher fret positions), the neck is correctly positioned. Just a little correction was necessary, then the neck could be fixed in the final position.

Afterwards I removed the FX-Bridge again, because now I had to decide where the piezo wires should be guided.

Preparing the Piezo Installation

The FX-Bridge has little slots in the base plate, allowing wires to be guided underneath the bridge. Now I had two possibilities:

I could leave the body as is, and guide the wires through a hole that MusicYo GM bodies have. This hole directly leads from the spring cavity (which is empty without a trem) to the bridge pickup cavity.



This solution has two disadvantages:

- Obviously earlier GMs don't have this hole, so this isn't an universal solution
- I will have open wires hanging around under the bridge. Not beautiful.

So I decided to choose a way that can be used with every GM body. This means drilling a hole, but this hole won't be seen from outside, and the guitar could easily be reverted to its original state (with a trem) without visible traces.



This hole directly leads into the control cavity. Make sure you've got the right angle (not too steep), otherwise the hole ends outside the cavity.

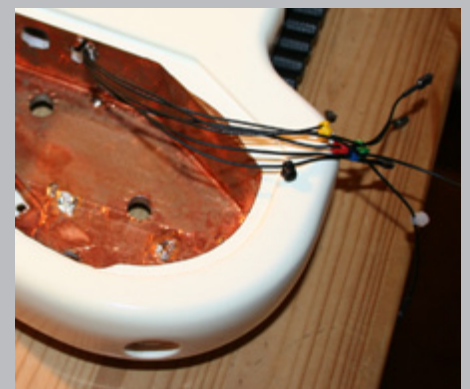
As you can see, the hole is drilled right where the cutouts of the shim and the openings on the sides of the FX-Bridge are.

Installing the Piezo Saddles

Now I installed the saddles and the bridge. It was a little bit difficult to get the little plugs through the slots in the base of the bridge, but – with a little pressure – they all went through. Be careful not to damage or rip of the plugs, the teflon wires are very thin.



I color-coded the single piezo wires afterwards, using different cable ties. This is not necessary, but helps finding the right wire, if a single piezo doesn't work.



Soldering many, many wires...

The rest of the building process was quite straightforward. Installing the pickups and the battery compartment, soldering all the wires to where they belong, nothing too special, although...

Wiring the EMGs is standard. The EMG89 humbuckers are wired to the toggle switch (for single coil/humbucker switching), from the toggle switch output to the pickup selector, and from there to the volume pot. I added two 22k resistors to the humbucker outputs, in order to get a better balance between the single coil/humbucking levels.

There's just one little difference to a "standard" passive GM wiring: the output from the volume pot is not connected to the output jack, but to one of the wires of the piezo electronics.

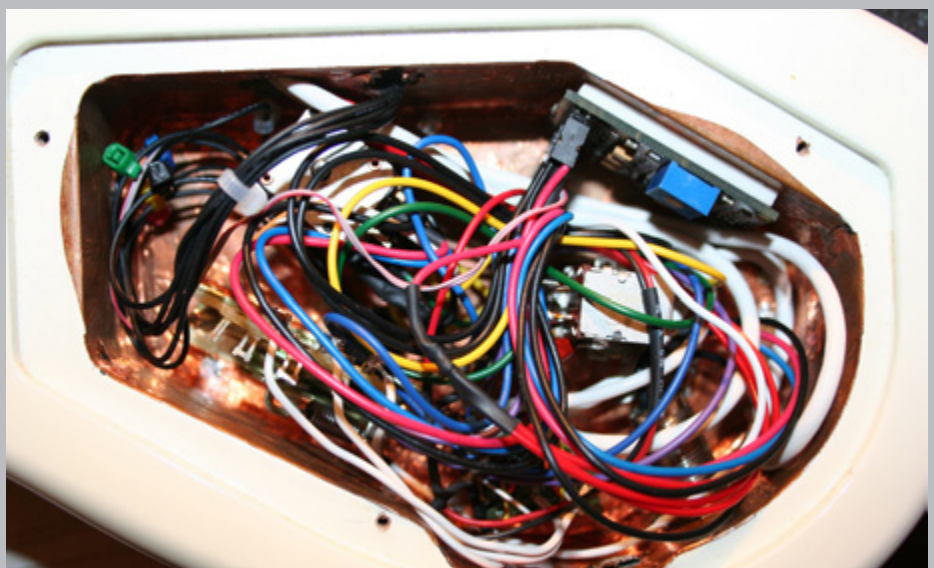
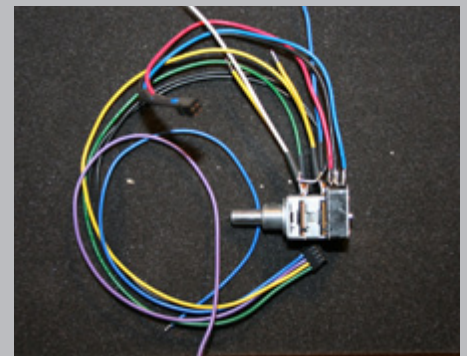
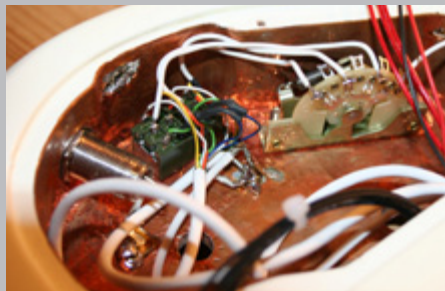
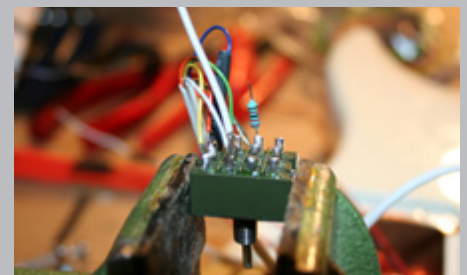
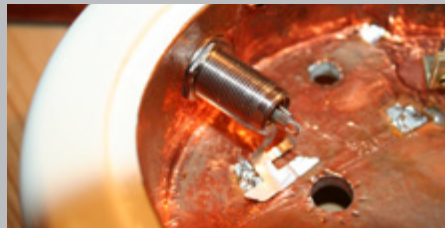
This board acts as a "master mixer", all switching between EMGs and piezos happens there. Combining the EMG and piezo electronics means to break a lot of pre-wired connectors, switches and pots, and to get those pieces together in the right way. This was not too difficult, both products come with clear instructions.

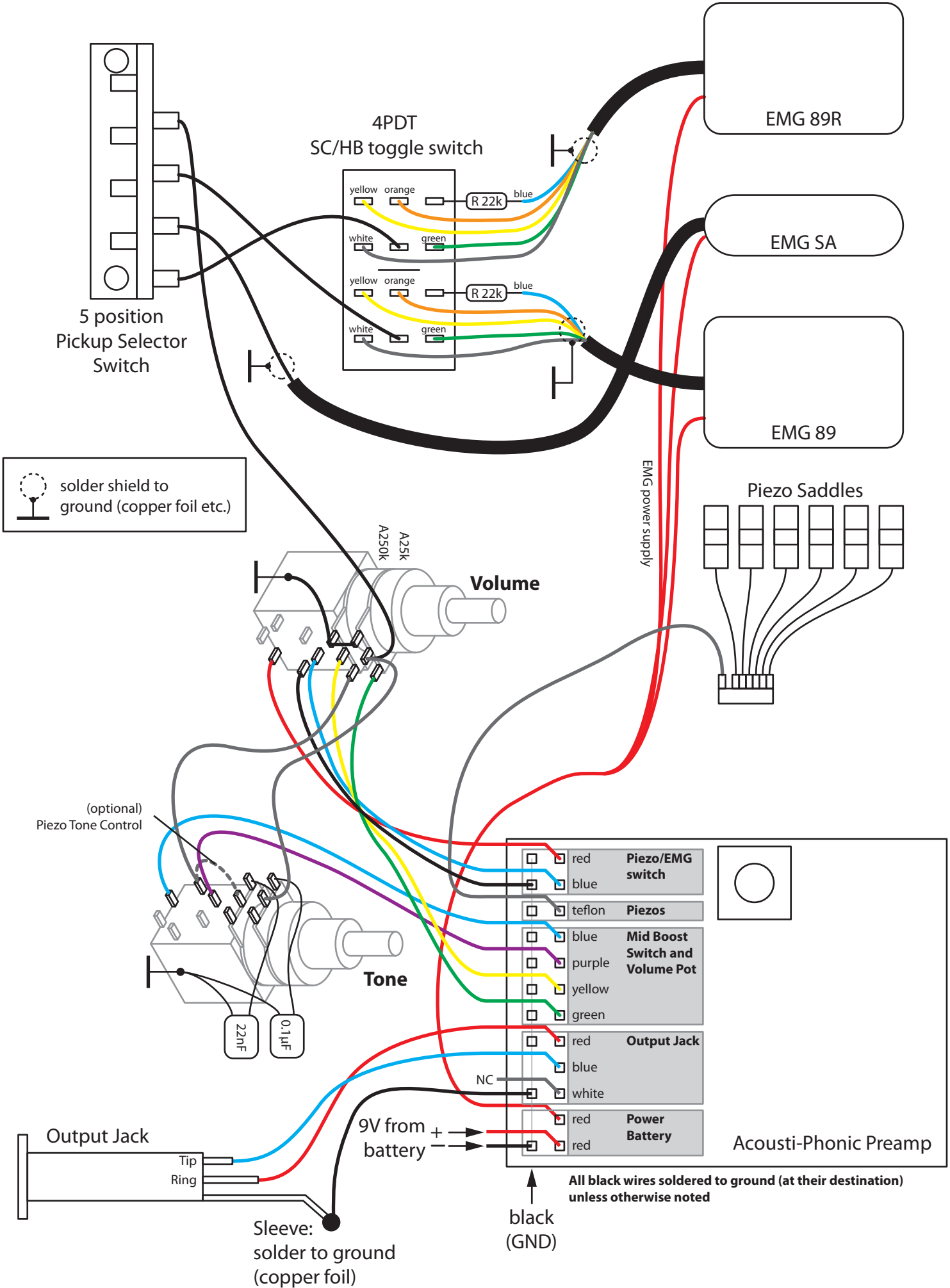
The only thing I made wrong on my first attempt was when connecting the push-pull switches. The AcoustiPhonic documentation doesn't clearly state which switch position (and therefore wire colors) mean which function. I connected both switches wrong at first, but exchanging the wires to fix this has been a 60 seconds job.

In the end, the control cavity looks a little bit crowded, but hey... that's why it has a cover :-)

Well, that's it. When I reached the state of the last image, I put the strings on the guitar, tuned it, and then plugged into the amp. You guessed it:

Great sounding EMGs, and equally great sounding piezos. Everything worked as expected, and the piezo sound is even better than I thought :-)





Wiring of my Steinberger GM-7

EMG 89R – SA – 89 • Jon Bondy Piezo Saddles • GraphTech Ghost System/Acousti-Phonic Preamp
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Wiring

I wish I've had such a wiring diagram before :-)

Parts

For many parts there are several sources, but I simply list where I've found them. All over the world:

Item	Type	Source
Body	Steinberger GM-7 (MY)	ebay
Neck	Moses MB-27	ebay
Magnetic Pickups	EMG 89R, SA, 89	http://www.thomann.de/de/emg_tonabnehmer_fuer_egitarre.html
Piezo Pickups	Jon Bondy, based on Graphtech Ghost system	http://www.jonbondy.com/Piezo.htm
Piezo Preamp	Graphtech Acousti-Phonic	http://www.jonbondy.com/Piezo.htm
Fixed Bridge	JCustom FX-Bridge	http://stores.ebay.com/CUSTOM-HEADLESS
Shim for FX-Bridge	Selfmade, will soon be available here:	http://web.me.com/be_em/Bernds_Guitar_Pages/Shim_for_FX-Bridge.html
Volume/Tone Pots	MEC custom made (25k/250k/DPDT switch)	http://www.mec-pickups.de
Pickup Selector Switch	Kluson, Standard 5-position switch	http://www.thomann.de/de/goeldo_5weg_schalter.htm
SC/HB Coil Split Switch	4PDT toggle switch	http://www.allparts.com/12-Pole-On-On-Switch-p/ep-4370-010.htm http://www.conrad.de/ce/de/product/703171/MINIATUR-KIPPSCHALTER-4PDT/SHOP_AREA_17385
Output Jack	Switchcraft EP 0152	http://www.thomann.de/de/allparts_switchcraft_ep0152_buchse.htm
Battery Compartment	EP-BOX-SM	http://www.guitarpartsresource.com/electrical_other.htm



I hope this story has been encouraging enough to try it for yourself :-)

If you have questions, just send me an e-mail to:

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Bernd Meissner