

The Blue Guitar

P100 Mod for Epiphone Paul Jr.

Overview

I bought one of the \$179 Guitar Center exclusive guitars (an Epi Paul Jr) figuring I'd slap in a Gibson "dog-ear" P90 pickup and be done with it. Well, they were out of the P90's and only had the nefarious P100's (a stacked, hum-cancelling version of the P90 that sounds very thin and whiny). Guess what- everything I'd heard about the P100 was true! But with 2 coils, I figured I'd experiment around with different combinations to see if I could come up with some better sounds.

The P100 stock wiring links both coils in parallel, with the two black leads connected to the HOT center conductor of the shielded cable and the two white leads soldered to the cable shield. The most usable alternate sound I found was to eliminate the bottom coil and just use the top coil. With a dc resistance of approximately 12.5k the top coil is hotter than a stock Gibson P90. Linking the two coils in series results in a dc resistance of 25k and a muddier and more distorted sound (not necessarily bad). I devised 2 switching circuits to access all 3 wirings, one using a special trick "on-on-on" DPDT mini-toggle switch and the other using two push-pull pots for the volume and tone controls on the Paul Jr. Not wanting to alter the classic good looks of the Paul Jr, I opted to use the two push-pull pots (500kA for volume and 250kA for tone).

Speaking of "classic good looks", when I had the guitar apart I discovered that the beautiful sunburst finish appears to be something like contact paper on top of plywood! I'll generally avoid solid color guitars because you never know what might be hiding underneath the paint, but this one really fooled me! Consider yourself warned- even if you can see the natural grain of the wood it still might be a plastic veneer!

While I had the guitar apart I went ahead and shielded the pickup and control cavities with copper foil tape and revised the grounding arrangement using the recommendations from John Atcheley's defunct site. The drawing with the push-pull pots shows the Atcheley grounding scheme, with the various grounds and cable shields isolated from the signal returns with a 2.2uF cap. The cable from the input jack goes to the ccw terminal of the volume pot; all of the other grounds are soldered to the pot case where the 2.2uF cap is terminated. All of the signal returns from the pickup coils and tone control are soldered to the ccw terminal of the volume pot. By isolating the signal returns from the grounds and shields there is some reduction in hum and noise.

The Details

If you want to skip the switching circuitry you can easily "hot rod" the P100 pickup by just clipping the black lead from the bottom coil at the solder joint. This can be done without taking the pickup apart. If you have a two pickup guitar with P100's this may be

the best approach, but with the single pickup on the Paul Jr I liked the idea of being able to select from 3 different tones. The stock sound is fairly thin and wimpy, but it IS hum-cancelling so it does have some uses. I added a 68pf cap from the bottom coil black lead to ground to shave off some of the highs when the stock sound is selected. The series sound was a bit muddy so I added a 68pF cap from the white leads to ground to give it a bit more brightness and definition. (The white leads are connected to ground in both the stock and tapped mode, so the 68pF cap only has an effect in the series mode.) The 68pF cap bypassing the second coil allows more of the high frequencies through from the primary coil. I had first tried resistors here instead of the cap, and bypassing the 12.5k coil with a 12k resistor sounded pretty good- but it wasn't that much different from the tapped sound (since it was passing all frequencies equally). You could try different caps here- like a 47pF or a 100pF for a slightly different sound. (A large cap seems to create a bandpass filter in conjunction with the inductance of the second coil; the resulting resonant peaks will make some notes really boom out at you.)

Not indicated on the drawing are the modifications I generally add to volume pots to smooth out their response and retain the high frequencies at lower settings. A 220k resistor added between the two non-grounded terminals of a 500k audio pot alters the taper a bit so that the volume doesn't drop as much when you back it off to 7 or 8 (which gives you more control if you are trying to clean up the sound of your amp). I also add an 180pF mica "bright cap" in parallel with the 220k resistor; if you only have ceramic caps, you might try 200pF or 220pF instead. While Fender uses a 0.001uF cap on their Telecasters, I find that value to be very drastic: the high frequencies are emphasized when you back off the volume pot. PRS uses 180pF bright caps on many of their guitars and I tend to agree with their choice. You might also note the 0.015uF/630v polyester film cap used on the tone control; this is the value used for the Eric Clapton "woman" tone.

The Switching Arrangements

If you use the special On-On-On DPDT mini-toggle switch refer to the drawings below for the terminals which are linked in the center position. Some switches may be different so check continuity with an ohmmeter and revise the drawing if necessary. Remembering that the lever position is opposite from the switching contacts, when the switch lever is up both coils are linked in series for the muddier, higher distortion sound. When the switch lever is in the center position the tapped mode is selected (which is like a P90 only a bit hotter). When the switch lever is down the stock hum-cancelling sound is selected. The two 68pF caps modify the sounds a bit; the upper 68pF cap adds some high frequencies to the otherwise too-muddy sound of both coils in series. The lower 68pF cap shaves off some of the high frequencies from the too-bright stock linkage. If you use the two push-pull pots, with both knobs down the tapped mode is selected (a hot-rodded P90 sound). With the volume knob pulled up, the stock hum-cancelling mode is selected (very bright). With the tone knob pulled up (and the volume knob pushed down) the fuller sound of both coils in series is selected.

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Since writing this article in 1998 I have learned that Gibson makes two different versions of their P-100 pickup, one for the neck and one for the bridge. The DC resistances of the two pickups are approximately 6.2k and 9.0k, respectively.

The aftermarket P-100 I purchased in 1998 was the neck model, which explained its very poor performance in the bridge position on my Epi Paul Junior. So my recommendation to split the coil on the P-100 refers specifically to a 6.2k neck model mounted in the bridge position. By disconnecting the lower coil, the remaining coil measures around 12.4k ohms, which is similar to some of the hot rodded P-90's available from Seymour Duncan and other pickup manufacturers.

I'm not sure if the bridge model P-100 is available as a sales item from Gibson, but they do use them on their guitars that come with two P-100's. Splitting the 9.0k bridge pickup leaves the top coil with a DC resistance of 18k, which is essentially unusable. And splitting the neck pickup does not work well in the neck position because there is much more energy in the guitar strings at that position. For my LP Junior Special with two P-100's I blended in some of the sound from the lower coil using resistors and capacitors to increase the bass response of the P-100's, as written up in the following article:

http://www.blueguitar.org/new/articles/blue_gtr/gtr/lp_jr_spec_mod.pdf

In any case, my opinion of the P-100's has changed substantially: forget the resemblance to P-90's- they are a low output humbucker with a sound and response somewhere between a Fender single coil pickup and a Gibson PAF-style humbucker. There is not a lot of bass response which is why I came up with the mod to make the sound a little bit fuller.

Here is a tune I recorded with just the stock P-100 pickups in my LP Special Jr:

http://www.blueguitar.org/new/mp3/blue_gtr/gospel_blues.mp3

--Good luck!

Steve Ahola

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