

The Blue Guitar

P100 Mod for Les Paul Jr. Special

Overview

The Gibson Les Paul Junior Special with two P-100 pickups is a great blues guitar with its own unique voice. The guitar itself is really nice for the price: you get a real American-made Gibson LP but without the carved top and the bindings. Its acoustic voice is a bit brighter than a regular LP and the weight is considerably less. In my opinion with the P-100 pickups they produce some of the clearest blues tones of any Gibson guitar being made today. They are well-suited for blues, roughly half-way between vintage-style single coil pickups on Fender guitars and the PAF-style humbuckers on Gibson guitars.

One characteristic of the P-100's is that they do not have a lot of bass response, which can be an advantage when playing lead but a disadvantage when playing rhythm. I decided to wire up two push-pull pots for the tone controls to provide an alternative to the stock sounds from the P-100's, much as I had done previously with the P-100 pickup I installed on my Epi Paul Jr. Simply cutting out the bottom coil resulted in a sound that was very much "over the top" so I ended up experimenting with RC networks across the switch terminals which would mix in some of the bottom coil through a tuned filter. My final results were much like the stock P-100 sounds, but with a stronger bass response. You can experiment with different values if you are looking for a different effect (like an "over the top" boosted setting for leads) but I decided instead to complement the stock sounds of the guitar

I used All Parts stock # EP4486 SPST push-pull pots for the two tone controls to switch between the stock and the split-coil sounds. Rewiring the guitar with the push-pull pots expands the versatility of the guitar by offering more tonal choices.

The Details

Part One: Modifying the pickups

You need to remove both P-100's to rewire them for these mods. Desolder the braided cable from the volume pots inside the control compartment, labeling the pots so that you don't get them mixed up later. You will be using the existing shielded cable to connect the top coil hot leads to the volume pots.

The P-100's are held in place by two phillips head screws with two conical springs on the bottom. The screws are threaded into brass inserts at the bottom of the pickup cavity. Be sure to label the direction that each pickup is oriented.

To get a hum-cancelling blend position between the two pickups in split-coil mode, you will need to reverse the leads and flip the magnets on one of the pickups. With the

pickups out you need to decide which pickup you want to reverse. I chose to reverse the neck pickup since I had a spare neck pickup in my Epi Paul Jr in case I managed to screw it up. I would recommend that you start with the pickup that isn't being reversed since it is a much simpler operation.

My P-100's were wrapped with a black adhesive tape that tore very easily, almost like masking tape. The shielded cable went to the bottom coil, with a piece of copper foil tape used to ground the magnets and center piece; be careful not to tear the copper foil tape. The two white leads from the coils are soldered directly to the shield of the cable; leave them both alone for the first pickup. There are two black leads from the coils which are soldered to the center conductor; you want to remove the black lead that goes to the bottom coil (this is the wire that does not go through the holes in the bobbin). Be very careful handling the black and white wires from the coils; to strip off the insulation I suggest that you just burn it with a lighter rather than use pliers.

The black coil wire that you just removed will be connected to a piece of shielded cable that you will be adding; I recommend RG-174U because it is readily available at most parts supply houses. The shield will be connected to ground inside the control compartment so it will not be connected to anything on the pickup end. I used 1/16" heat shrink tubing around the center conductor and 3/32" tubing around the cable. The added cable for the bridge pickup should be around 16" long; the cable for the neck pickup should be around 24" long. Solder the black lead from the bottom coil to the center conductor and add a short length of heat shrink tubing to insulate the solder joint. There should be enough room in the bottom bobbin for both cables. If you wish to secure the new cable in place you might want to drip some melted paraffin over it before rewrapping it with the black adhesive tape.

You are now ready to move to the second P-100, which is more complicated because you will be flipping the two magnets around. After disassembling the pickup as outlined above, you will want to desolder all 4 of the coil wires. Now you are ready to take the two coils apart by unscrewing the 6 flat-head pole pieces which are threaded into the bobbins and not the metal bar between the two magnets. When the screws are backed out to the surface of the metal bar, the bottom coil can be pryed off (use care when doing this).

The magnets and metal bar appear to be secured to the bobbins with wax (paraffin); you will probably have to add some fresh wax to hold the pickup together when you reassemble it. Once the magnets are free, you need to flip them so that the edge that was facing the center is now facing the outside. I checked the polarity of the pole pieces with a small magnet before starting and then again after flipping the magnets to make sure that I did flip them correctly. I used a butane hot air tool to melt the wax on the bobbins and to add a little bit more wax when reassembling the bobbins and pickups. You might try using a hair dryer if you don't have a hot air gun.

With the magnets reversed and pickup reassembled you can now wire up the shielded cable. Since the winding direction is to be reversed you want to solder both

black wires to the cable shield and the white wire from the top coil to the center conductor of the existing cable. You will be adding a new length of shielded cable to the white wire from the lower coil. (These steps are basically the same as with the first pickup, but you are reversing the white and black wires.) With both pickups successfully prepared for this mod you are now ready to wire up the controls.

The Details

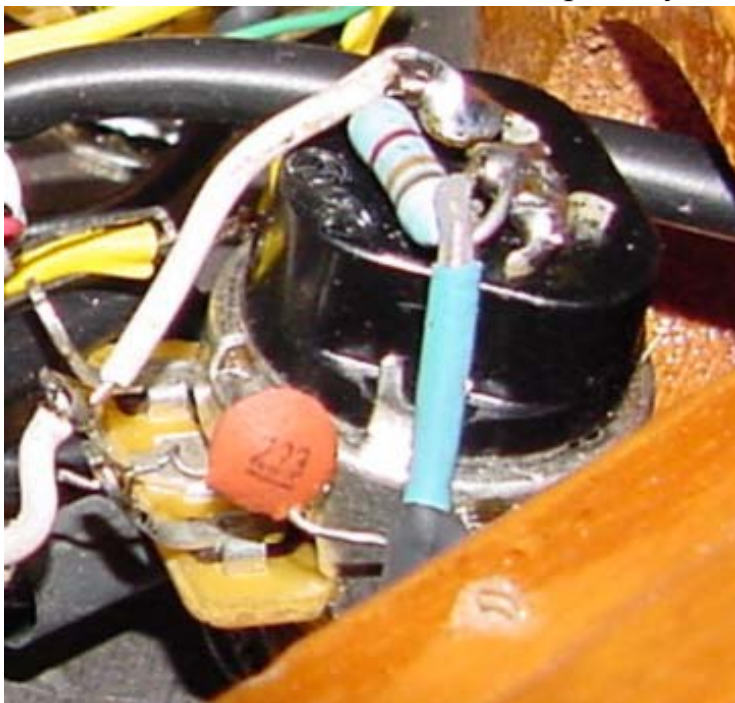
Part Two: Rewiring the control compartment

Be particularly careful in removing the tone control knobs from the knurled shafts so that you don't damage the knobs or the top of the guitar. If you can't remove them by pulling up with your fingers, you can try something like a butter knife placed against a thin piece of soft wood protecting the top of the guitar. Stewart MacDonald sells a special tool for removing knobs but it's not cheap.

I recommend using a 1/2" nutdriver to remove the nuts from the tone pots..An adjustable wrench can slip or otherwise mar the top of the guitar. Alternately you could use a deep socket but be sure to use a socket handle that locks the socket on securely.

With the tone pots loose, I would recommend doing one tone control at a time so that you don't get the wires all tangled up. There are fewer ground wires going to the neck tone pot so I'd suggest that you replace that pot first. There is a 0.22uF ceramic cap going from the CW terminal of the neck volume pot to the center terminal of the neck tone pot. Carefully remove this cap as you will be reusing it. Remove the excess solder from the CW terminal of the volume pot as you will be reconnecting the pickup lead to it

later along with a wire going to the new tone pot.

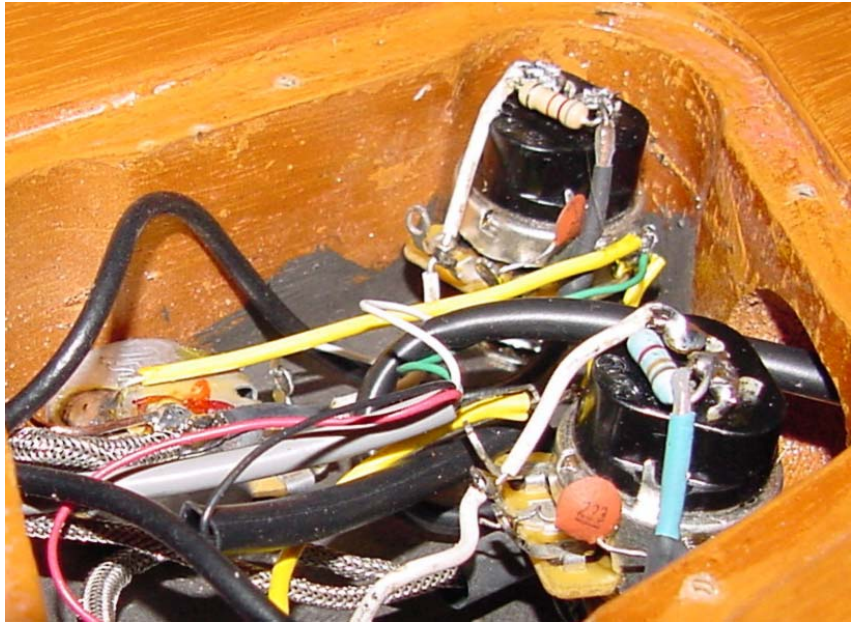


A picture is worth a thousand words so here is what the All Parts EP 4486 will look like when it is wired up. The switch terminals on the All Parts pot would not clear the control compartment cover so I had to bend them over carefully with needle nose pliers. I ran a single wire from the CW terminal of the volume pot to the middle terminal of the p-p tone pot and then on up to the left switch terminal. I then ran the tone cap between the CCW terminal of the tone pot and the case

of the pot (along with the shield from the added pickup cable). The center conductor from the added pickup cable goes to the right switch terminal of the p-p tone pot. You

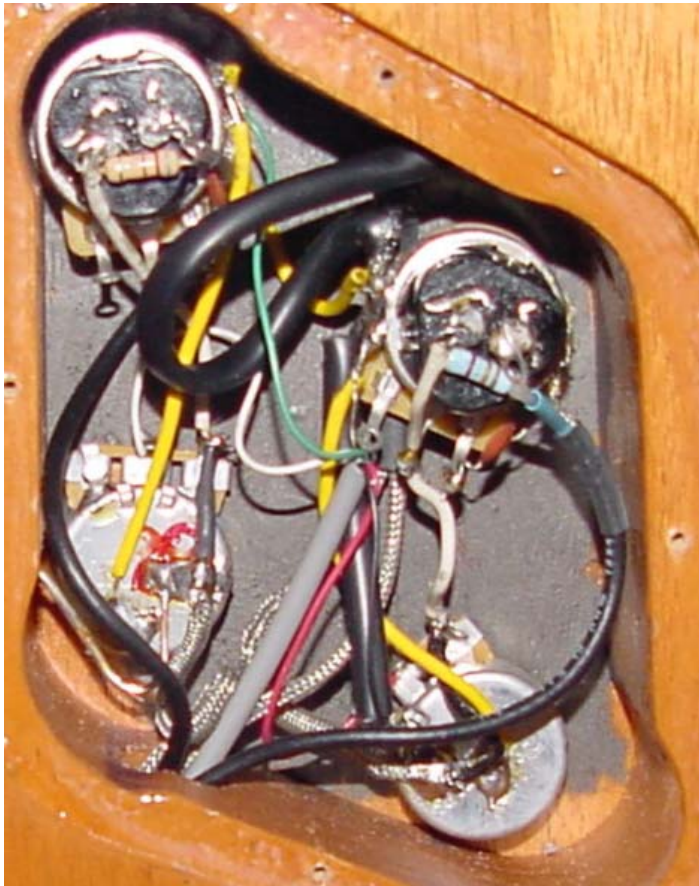
now need to resolder the ground wires that you removed from the case of the stock tone pot.

As you can see, there is a resistor that I added between the two switch terminals. I found the split coil sound to be too extreme so I experimented with different resistors and caps between the switch terminals to lessen the effect. In split coil mode there is some of the bottom coil mixed in with the top coil.



To figure out which value resistors and capacitors to use I temporarily soldered two short jumper cables to the two switch terminals on each p-p pot and patched in different combinations after first setting the height of the pickups for the best sound in the stock P-100 mode. I ended up using an 18k resistor in series

with a 0.015uF cap with both of those in parallel with a 180k resistor for the bridge pickup, and an 18k resistor in series with a 0.022uF cap with both of those in parallel with a 56k resistor for the neck pickup.



With those values, the split-coil mode of the each pickup adds some bass frequencies missing from the stock P-100's. In each case, there is a subtle boost in volume when you switch to split-coil mode. The blend position between the two pickups in split-coil mode is pretty slick, but there is an added bonus: the blend positions with only one of the pickups in split-coil mode works fairly well, too.

As you can see in the picture to the left the bottom surface of the control compartment is coated with a conductive paint instead of the metal plates and covers used in some of the more expensive Les Pauls. I plan to paint the rest of the cavity and then shield the black plastic cover with metal foil to keep the guitar as

quiet as possible. In any case, even without added shielding the guitar is fairly quiet even in split coil mode.

Conclusions

The Gibson Les Paul Junior Special is a great guitar for blues and these mods make it even more versatile, adding 5 distinct new sounds to the 3 basic sounds of the stock model. While some guitarists just replace the P-100's with decent-sounding P-90's, they do lose the unique character of this guitar, which I think is similar to the run of Melody Makers Gibson made in the 60's that used the narrow single coil pickups.

I had complained about the P-100 pickups previously but it turns out that my problem was using a neck pickup at the bridge position. With a properly calibrated set (as supplied with the guitars from Gibson) these pickups have their own sound, which is different from humbuckers, P-90's or single coil pickups. They can be a bit on the thin side so doing the mods spelled out in this article will give you the option to thicken the sound a bit.

Revisions

Sure enough as soon as I completed this article I decided to experiment with different sounds from the split-coil switches. So while the pictures show a single resistor soldered between the contacts of the push-pull switches there are now two resistors and a cap mounted on each switch. For some reason 18k worked out to be a good value for the series resistor in each RC network; I would first solder this resistor to the left leg of the 630vdc poly cap (looking at the printed side of the cap with the radial leads down). For the bridge pickup I then soldered a 180k resistor in parallel with the cap and the 18k resistor. For the neck pickup I soldered a 56k resistor in parallel with the cap and 18k resistor. I also ended up replacing the two 0.022uF ceramic tone caps with 0.015uF/630vdc poly caps.

I experimented with a lot of different values before ending up with these combinations which were selected with a specific goal in mind: I wanted to enhance the stock sounds of the two P-100 pickups with a fuller bass response. With my earlier experiments my goal was to provide a strong boosted alternative to the stock sounds, and I accomplished this by putting a 78k resistor across the terminals of the neck push-pull switch and a 90k resistor for the bridge pickup. With this combination, you would get a very strong boost on the neck pickup which was very similar to a Gibson P-90. The boost on the bridge pickup was not quite as strong and it added a lot of mids but not much bass. If someone is looking for a nice passive boost for each pickup, they ought to check out this arrangement.

My second "keeper" had a different goal in mind: I wanted to duplicate the sound of P-90's as much as possible. To accomplish this, I rewired the bridge pickup as spelled out above: an 18k resistor in series with a 0.015uF cap, with both of them in parallel with a 180k resistor. For the neck pickup, I added a 1M resistor in parallel with the 78k

resistor used originally to bring the net resistance down to 72k. With this combination you got fairly authentic P-90 sounds with the neck pickup and the blend position, but the bridge pickup was quite different from a real P-90. The drawback with this combination is that you do get a very strong boost when you put the neck pickup in split-coil mode, although some people might find that to be an advantage in adding a boosted setting for lead. Unfortunately it did not help much with rhythm sounds, unless you were looking for a very crunchy rhythm tone. So I ended up scrapping the very cool P-90 emulation and went with a bass-enhanced version of the stock P-100 at the neck. Not an easy decision to make but the overall tone palette of the guitar is much more balanced now.

As for getting real P-90 sounds from the Les Paul Junior Special I will probably buy another one and replace the pickups with Lindy Fralin P-90's for the vibe of a vintage Gold Top at a fraction of the price. To heck with carved tops... I really prefer a flat top with the pickguard mounted right on the top; the carved top and suspended pickguard of the more expensive Les Pauls seems to be a throwback to the days of archtop acoustics.

Enjoy!

Steve Ahola

March 21, 2003

(Revised 3/27/03)

<http://www.blueguitar.org/>

Sound samples:

Look for lp_jr_spec.mp3 (to be added later):

<http://www.blueguitar.org/new/mp3/samples/>