

# *The Blue Guitar*

## **Les Paul Wiring Tricks: Revisited**

### **Introduction**

The traditional coil-cut switch on a Les Paul generally does not offer a hum-cancelling linkage when both pickups are selected; the typical coil-cut switch simply grounds out the center-tap of each humbucker, eliminating the coil normally connected to ground. For the linkage to be hum-cancelling, the two coils must be of reverse polarity and wiring direction with respect to each other.

A compass can be used to determine the magnetic polarity of each coil of a humbucker. If the "N" arrow is **attracted** to the top side of a coil, that particular coil would have a "North top". On the other hand if the "N" arrow is **repelled** by the top side of a coil, it would have a "South top". With the construction of a typical PAF-style humbucker, one coil will have a North top and the other coil will have a South top.

Establishing the direction of the windings for a humbucker (CW vs. CCW) can be a bit trickier, since both coils are traditionally wound in the same direction. However, since the coils are hooked up "back-to-back", a humbucking effect could be achieved. To oversimplify things a bit, if you were to follow the path of an audio signal from the volume pot, it would go through the first (inside) coil in one direction while it would pass through the second (outside) coil in the opposite direction. The traditional arrangement of PAF-style humbuckers is as follows: the hot output is connected to the black inner lead from the inside coil (the one without the adjustable pole pieces). The white outer lead from that coil is then connected in a series link to the white outer lead from the outside coil (the one with the adjustable pole pieces) and the black outer lead from the outside coil is connected to ground. If the two humbuckers happened to be out of phase with each other, you could switch the two black leads on one of the pickups to put them in phase.

In combining single coils from two humbuckers in a hum-cancelling arrangement one game plan is to select the "hot" coil from one pickup and the "grounded" coil from the other. (Those terms refer to whether the inner black lead is connected to the "hot" terminal on the volume pot, or to ground.) As mentioned above, the traditional coil-cut switch selects the "hot" coils of both pickups so that the combination would not generally be hum-cancelling (assuming that both pickups were of similar construction).

One other observation concerning the polarity of humbuckers is that with a matched set of pickups from the same vendor, the inside coils are often of the same polarity, which I suspect contributes to magnetic dampening of the strings which could reduce the sustain to some extent. The steel strings tend to inherit the magnetic polarity

of the coil directly beneath them, so with a typical set of Seymour Duncan humbuckers (with both inside coils having a South top) the strings would probably have some tendency to "fight" the magnetic polarity of the inside coils. On the other hand if the inside coils were of opposite polarity the strings would tend to be attracted a bit to the inside coils, which might also reduce the sustain a bit! (For this reason, it is not generally a good idea to keep the pickups so high that they almost touch the strings.) Getting back to the point, my hunch is that the repulsion from the inside coils being of the **same** polarity would be stronger than the attraction from the inside coils being of **opposite** polarity. (You can do this experiment at home: try forcing together the like poles of two strong ceramic magnets. Now flip one of the magnets around to let them stick together and try pulling them apart. Although I have never measured the results quantitatively, it seems to me that it requires a lot more force to push the like poles together than to pull apart the two magnets stuck together.)

For what it is worth, the PRS guitar I checked staggers the magnetic poles between the two humbuckers so that outer coil of the bridge pickup has a South top while the outer coil of the neck pickup has a North top. Other new guitars using staggered magnetic polarities include the Epiphone LP copy and the Washburn BT-8 and BT-10.

In any case, I had already flipped around the magnet and reversed the connections to the leads for the Seymour Duncan Jazz neck pickup inside the control compartment. By doing this I was able to select either both inside coils or both outside coils for hum-cancelling linkages. I had originally tried using the inside coils of my two humbuckers (thinking that the outer coils were just too extreme) but I eventually decided that the inside coils were just too bland. While the outer coil of the bridge pickup tends to be a bit bright, the higher output and fuller sound from the outer coil of the neck pickup was too good to pass up.

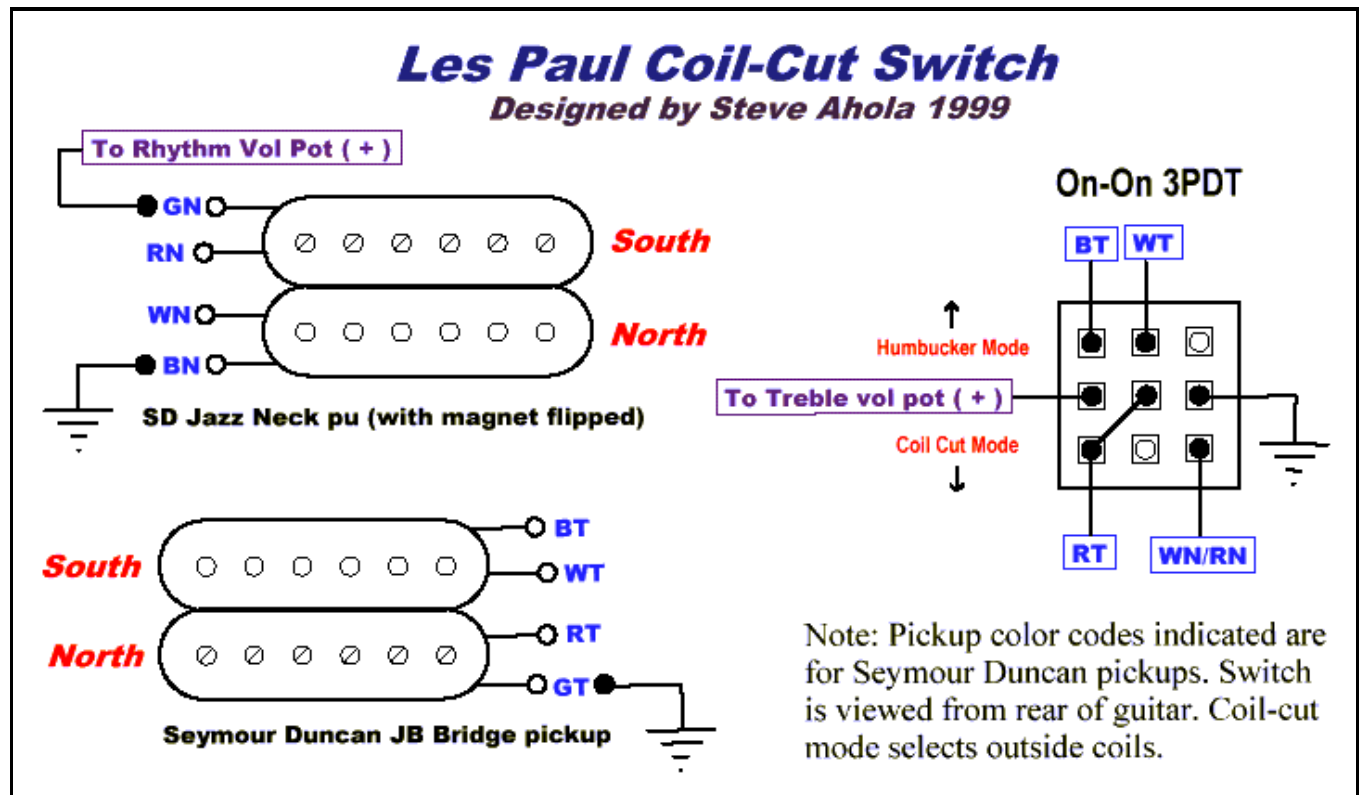
One alternative that you might want to consider would be to forget about reversing the neck pickup (as mentioned above) and use a combination of the inside coil of the bridge pickup along with the outside coil of the neck pickup. Although I have not tested that combination myself yet, it seems like it should work great since you don't get the extreme brightness/harshness of the bridge pickup right next to the bridge, while getting the great sounds from the outside coil of the neck pickup right at the fingerboard. (Refer to the alternate wiring diagram at the end of this article.)

## **Other LP Tricks:**

To retain the full frequency response of the pickups as the volume control is turned down, a small cap can be added between the two ungrounded terminals of each pot. Although Fender uses a "bright" cap as large as a 0.001uF on their Telecasters, PRS uses a 180pF cap on some of their guitars for a more subtle effect. However, some people prefer to use a higher value to alter the frequency response as the volume pot is turned down, so that at full volume the sound is muddy and distorted for leads while the lower positions are cleaner and brighter for rhythm parts. (My own preference is a 180pF mica cap.)

You can also add a resistor between the ungrounded terminals of the volume pots to smooth out the volume curve a bit. A 220k resistor added to a 500k pot has the effect of making the change in volume less abrupt as you turn down the control. For example, when the modified control is set to 8 the volume level is roughly the same as an unmodified control set to 9. Many Les Pauls use 300k volume pots, in which case I would add in a 180k resistor instead of a 220k resistor.

## Wiring Diagram:



This wiring diagram assumes that both pickups are of similar construction (with both coils of each humbucker wound in the same direction and the polarity of the outer coils being the same). If that is not the case (for example, you have humbuckers from two different companies) you may need to revise this diagram accordingly.

Good luck!

**Steve Ahola**

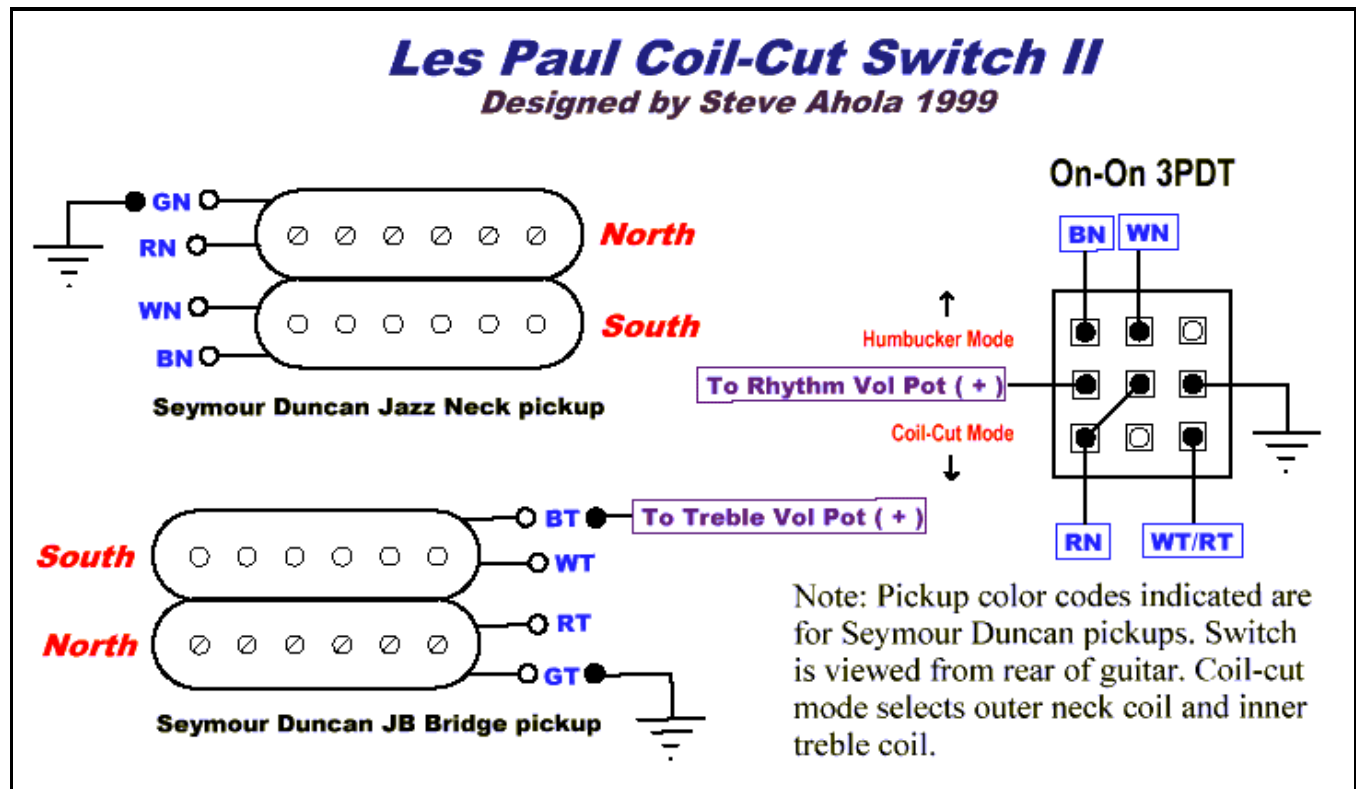
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## Alternate Wiring Diagram:



With this alternate wiring diagram, it is not necessary to flip the magnet for the neck pickup.