
REPLACING YOUR LES PAUL'S PICKUPS AND CIRCUIT COMPONENTS



WARNING!

Pickup installation requires soldering. The soldering process involves the use of a hot iron that can cause severe burns to the skin.

Solder fumes contain lead. You should work in a well-ventilated area.

Wear safety goggles to protect your eyes when soldering

Completion Time:

Approximately 5 hours (depending on soldering skill level)

Note: This Instruction set gives direct instructions for replacing humbucker style pickups in a Les Paul style guitar. With a little improvising on your part, the techniques and steps identified can be used to change the pickups in many different guitars.

¹ Image source: <http://www.gibson.com/Products/Electric-Guitars/Les-Paul/Gibson-Custom/50th-Anniversary-1959-Les-Paul-Standard.aspx>

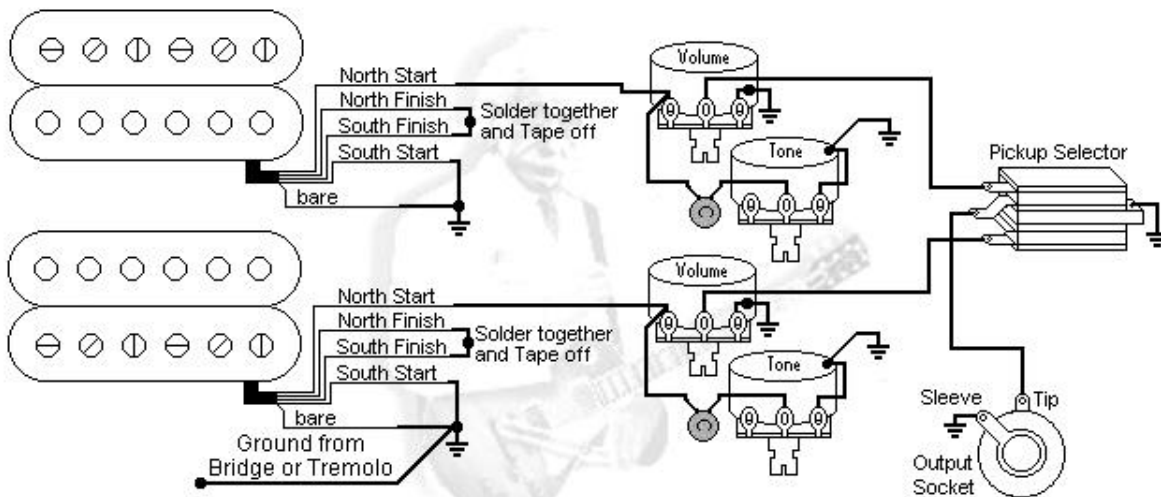
Materials Required

Soldering Iron [1]	Single Strand Wire – 22 gauge [2']
Solder (60/40 rosin-core)	4-Conductor Wire – 22 gauge [4']
Flat wedge soldering tip (Recommended)	Wire Strippers [1]
Humbucker style Bridge pickup [1]	Wire Cutters [1]
Humbucker style Neck pickup [1]	3-Way Toggle Switch [1]
¼ "Input Jack [1]	.022 μ F Ceramic Capacitors [2]
Needle Nose Pliers [1]	500K Potentiometers [4]
Solder Sucker [1]	Volume Knob [2]
Screwdriver (phillips) [1]	Tone Knob [2]

Schematic

2 Humbuckers w/ 2 Volumes & 2 Tones

with 3-way toggle switch



Solder all grounds to back of volume pot



² Schematic source: <http://guitarelectronics.com/2-humbuckers-3-way-toggle-switch-2-volumes-2-tones/>

Preparation

1. Prepare a clean, open work space.

→ You may want to place a towel on the surface of your work space to protect the body of your guitar

2. Place your guitar on your workspace with the pickups facing up and the neck oriented to your left.

→ You will want to place a support under the neck of your guitar. A rolled-up towel or something similar will work. You want to support your guitar's neck without damaging it.



3. Remove your guitar's strings, bridge, and tailpiece.

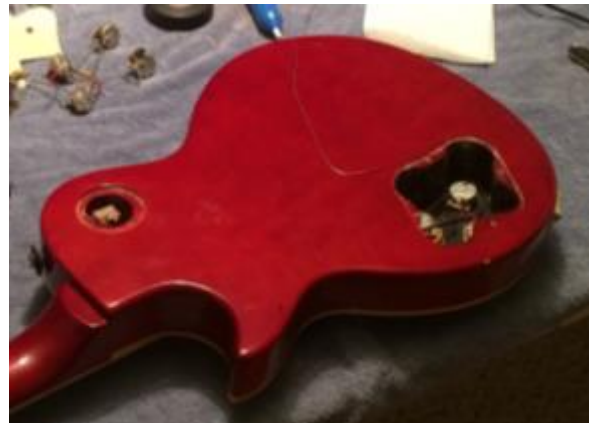
→ The bridge and tail piece for a tune-o-matic style bridge can be easily lifted off after the strings are removed. If your guitar has a different style bridge without any loose parts, you can simply leave the bridge attached

→ If your guitar has a pickguard, you can remove it for convenience but it is not required.

4. Flip your guitar over and remove both of the plastic back plates using a phillips head screwdriver

5. Heat up your soldering iron.

→ You want the iron hot enough to sufficiently heat the surface you are soldering to. 720°F should be sufficient, however when you are soldering to the back of potentiometers you may need to increase the temperature to ensure a solid contact.



6. Using your wire cutters, remove the wires from the potentiometers.

→ If you would like to reuse the potentiometers already in your guitar, you should use the soldering iron to heat up the solder connections. After heating the connections for a few seconds, the wires should pull free with little effort.

→ If you are reusing the potentiometers, you will want to clean all of the solder off the back and the lugs using the iron and the solder sucker.

7. Flip your guitar over. Remove the 4 screws from the corners of the plastic pickup mounting rings on each pickup.

→ **Do not** remove the screws centered on either side of the mounting rings. These are the mounting screws and will be removed later when switching out the pickups.



8. You should now be able to gently pull each pickup and its casing away from the body of your guitar.

→ Slowly pull each pickup away from your guitar. If you feel resistance, flip your guitar over and make sure the wires from the pickup are not caught on anything or still soldered to any other wires.

→ Set the pickups aside, out of the way. You will come back to them.

Note: If you are reusing your guitar's original potentiometers, you can skip steps 9, 10 and 11.

9. Remove the plastic "volume" and "tone" knobs from the potentiometers.

→ You should be able to pull the knobs off with little effort, however they are snug so you will have to use some force. Be careful not to damage the surface of your guitar.

→ Set the knobs aside. If you are reusing the potentiometers, you can also reuse the knobs.

10. Use your needle nose pliers to loosen and remove the mounting nut around the body of each potentiometer.

→ There should be a mounting nut and a washer on each potentiometer, remove both and set them aside.

11. The potentiometers should now be loose. Flip your guitar over and remove each potentiometer.

→ make sure there are no wires still attached to the potentiometers when you remove them.

12. Remove the 4 screws from the jack plate located on the bottom edge of your guitar and set the screws aside. Loosen the mounting nut with your needle nose pliers and remove the output jack from the jack plate. Pull the jack through your guitar into the potentiometer cavity.



13. After pulling the output jack back through into the potentiometer cavity, use your wire cutters to remove the wires from the jack.

→ if you wish to reuse your output jack, use your soldering iron to completely remove the wires from the jack and clean up any stray solder with your solder sucker.

14. Flip your guitar over and loosen the 3-way toggle switch.

→ Similar to the potentiometers, the toggle switch will have a mounting nut that you should remove with your needle nose pliers. Again, be careful not to damage the body of your guitar.

15. Once the toggle switch is loose, flip your guitar back over. Remove the toggle switch, pulling the attached wires out with it.



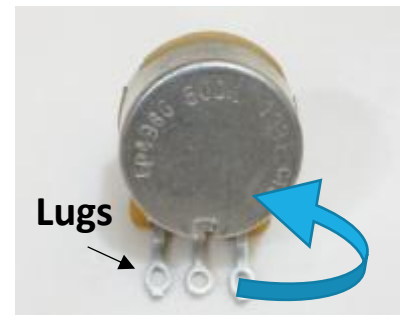
Note: There is a ground wire (typically black) that will be coming out of a small hole in the wood on the upper wall of the potentiometer cavity. This is the bridge ground wire. Locate this wire and bent it up to the side, you will use it later.

Installation

16. Locate a new 500k potentiometer. With the neck oriented away from you, bend the right most lug toward the body of the pot. Solder the lug to the back of the pot, making sure to secure a good connection.

→ Repeat this step for all potentiometers

→ If you are replacing the potentiometers, this will be easy to do before placing the pots into your guitar. If you are reusing your guitar's original pots, you can remove them to complete this step or carefully complete it with the pots still in your guitar.



Note: You do not have to use 500K pots, you can use 250K if you wish. Different values of pots produce different tones. The typical choice for humbuckers is 500K, however, if you want to do a little research you can pick the potentiometer that will give you the sound you're looking for.

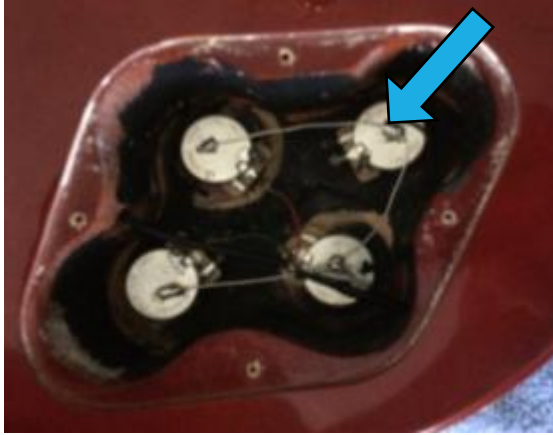
17. Install the potentiometers in your guitar in the same fashion that you removed them. Orient each pot so that its lugs are facing inward towards the other pots.

→ Be sure to tighten the mounting nuts so they are snug, however be careful not to overtighten them.

18. Use the wire strippers to expose a piece of bare wire long enough to attach to each potentiometer, as depicted on the left.

→ This will serve as a ground connection between the potentiometers

³ Image source: <http://www.crazyparts.de/electronics/cts-tvt-custom-pots/cts-custom-500l-longshaft.php>



19. Shape the wire to match the image on the left. Place the wire on the potentiometers and solder the upper right corner the back of the pot along with the bridge ground wire described earlier.

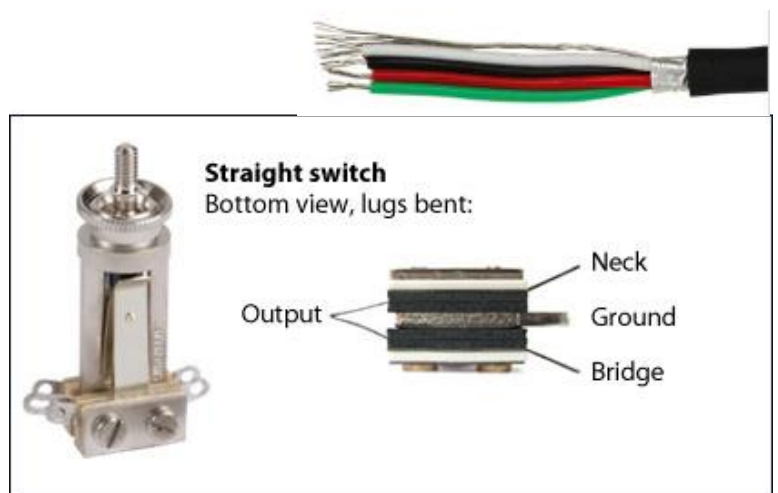
→ Heat up the back of the potentiometer with the soldering iron, allow the solder to pool up around the wires. Hold the wires in place as the solder hardens to ensure a good connection.

Note: If you are reusing your guitar's original 3-way toggle switch, you can skip step 20.

20. Locate the new 3-way toggle switch and 4-conductor wire. Strip off the outer shielding to expose a small portion of the 4-conductor wire. In addition, strip off a small portion of each of the 4 wires.

→ Make the following connections:

- Twist the black wire together with the bare wire and solder them to the ground terminal depicted to the right.
- Bend the two output lugs as depicted above together and solder the red wire to them.
- Solder the white wire to the neck lug depicted above.
- Solder the green wire to the bridge lug depicted above.



→ Depending on the 4-conductor wire you purchase, the colors may vary. The important thing is to remember which color you soldered to which lead, so you can make the correct connection later.

21. Cut the 4-conductor wire with sufficient length to reach from the toggle switch cavity to the output jack with plenty to spare, you can always shorten it.

→ The 4-conductor wire must be fed through the body of your guitar, so it is not a straight path. Make sure you have plenty of wire to reach the output jack without need to stretch the wire.

22. Feed the 4-conductor wire through the body of your guitar and Install the 3-way toggle switch in the same manner as you removed the old one.

→ Be sure to tighten the mounting nuts so it is snug, however be careful not to overtighten it.

⁴ Image source: http://www.stewmac.com/How-To/Online_Resources/Learn_About_Guitar_Pickups_and_Electronics_and_Wiring/Switchcraft_3-way_Toggle_Switch.html

23. After installing the toggle switch, make your final length cut for the 4-conductor wire. Strip about 3" of the outer shielding and strip the ends of all 4 wires.

→ Making the following connections:

- Solder the red wire from the 4-conductor wire to the "tip" lug on the output jack indicated in the image to the right.
- Cut a 3" piece of single strand wire and strip both ends. Solder one end of the wire to the "sleeve" lug of the output jack indicated in the image on the right. This is the ground wire.



24. Install the output jack in the same fashion as you removed it.

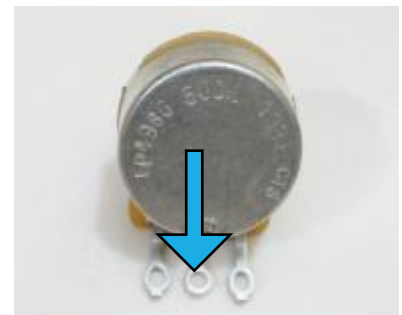
→ Tighten the mounting nut and reinsert the 4 screws in the corners of the jack plate.

25. Attach the white and green wires to the "volume" potentiometers.

→ When looking down on the back of the potentiometers, the 2 on the left are the "volume" and the 2 on the right are the "tone".

→ Make the following connections:

- Solder the white (neck) wire to middle lug of the top "volume" potentiometer. (upper left when looking down on the pots)
- Solder the green (bridge) wire to the middle lug of the bottom "volume" potentiometer. (lower right when looking down on the pots)



26. Twist the black and bare wires from the 4-conductor wire together and solder them to the lower right "tone" potentiometer along with the shot wire you soldered to "sleeve" lug of the output jack.

→ Connect the above wires to the bare ground wire you created earlier and solder everything to the back to the potentiometer. Allow the solder to pool and coat all the wires to ensure a good connection to the back of the pot.

27. Solder one of the .022 μ F capacitors to the middle lug of the lower right "tone" potentiometer.

→ Cut the capacitor leads to a length long enough reach between the lower "tone" and "volume" pot and solder one lead to the "tone" pot. Let the other lead free for right now.

Note: You can use other capacitor values if you wish. Similar to pots, different caps can produce different tones. There are numerous sources online that explain the differences between values.

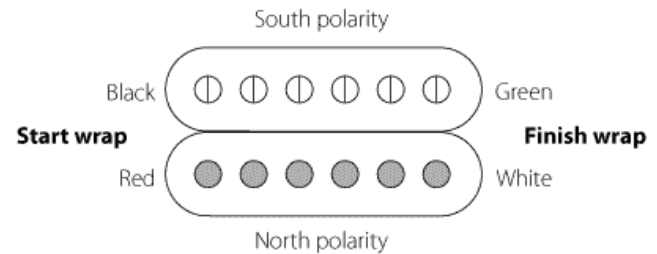
⁵ http://www.synthrotek.com/wp-content/uploads/2014/06/quater_metal_wiring.jpg

28. Repeat step 27 and solder the other .022 μ F capacitor to the upper right “tone” potentiometer.

29. Locate your new pickups. The wire colors referred to in later steps are the typical Gibson wire designations.

→ Wire color can vary depending on the brand of pickups, however there should be documentation included with your pickups that will tell you what the different wires are for.

→ The important thing to remember when using pickups other than Gibson is to use the correct wire colors for your particular pickups. Make the same connections indicated, however, use the corresponding color for your pickups.



Standard Humbucker

Red=Hot (\oplus)

Green & White= Solder together and tape

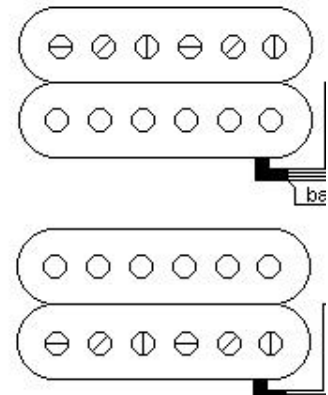
Black=Ground (\ominus) with bare wire

30. Remove the old pickups from the pickup mounting rings by removing the two middle screws and replace them with your new pickups.

→ Replacing the pickups can be a little tricky due to the mounting spring that keeps the pickup in place. Carefully

→ Make sure you put the correct pickup in the correct mounting ring. The pickup you have chosen for your “neck” slot will go the thinner ring and the pickup you have chosen for your “bridge” slot will go in the thicker mounting ring.

→ It is also important to orient the pickups correctly. When installed, the pickups should resemble the image to the right. The portion of the pickup with the flat head screws should be oriented outward.



31. Take one of your new pickups and strip off the outer shielding of the wire to expose the four inner wires. Strip the ends of each of these wires. Twist the green and white (North Finish and South Finish) wires together. Coat the connection with solder and cover with tape.

→ Twist the black and bare (South Start and bare) wires together, do not solder them yet.

32. Repeat step 31 with your other new pickup.

33. Feed the wires from each pickup through the body of your guitar and into the potentiometer cavity. After feeding the wires through, install your pickups into your guitar in the same manner you removed them. **See note on next page →**

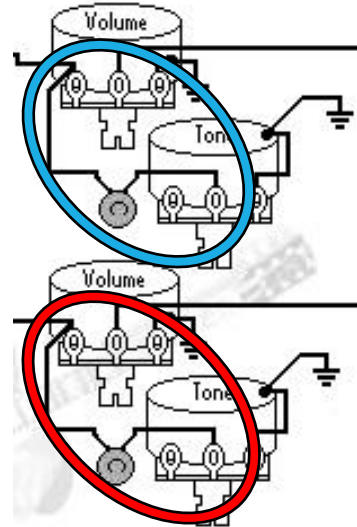
⁶ Image source: http://www.stewmac.com/How-To/Online_Resources/Learn_About_Guitar_Pickups_and_Electronics_and_Wiring/Gibson_Humbucking_Pickups.html

Note: It may be a good idea to mark which wires are from which pickup so you don't get confused when you are connecting them later.

34. Solder the wires from the pickups and the other capacitor leads to the "volume" pots.

→ Make the following connections:

- Solder the red (North Start) wire from the "neck" pickup and the unused capacitor lead from the upper "tone" pot to the left most lug of the upper "volume" pot. Indicated by the blue circle on the image to the right
- Solder the red (North Start) wire from the "bridge" pickup and the unused capacitor lead from the lower "tone" pot to the left most lug of the lower "volume" pot. Indicated by the red circle on the image to the right



35. Solder the black and bare (South Start and bare) to the back of the "volume" pots along with the tip of the bare ground wire.

→ Solder the black and bare wires to the back of the pickup that the corresponding red wire is soldered to.

→ be sure to allow the solder to pool up on the back of the pots to ensure a good connection. After this step, the bare ground wire should now be soldered to the back of all 4 potentiometers.

Finishing Touches

36. Look over all of your solder points to ensure a you have good connections.

37. Once you are satisfied with you solder connections, you can now reattach the plastic back plates that you removed in step 4.

38. Flip your guitar over and install the "volume" and Tone" knobs on the potentiometers by gently pushing them on to the shaft of the pots.

→ When looking down on the top your guitar with the pots in the bottom left corner, the 2 "volume" knobs will go on the right and the 2 "tone" knob will go on the left.

→ Some knobs have level indicating numbers on them, the orientation of the knobs be changed to correctly indicate the volume or tone level by removing the knob and rotation the neck of the pot completely in one direction and placing the knob back on accordingly.



39. You can now reinsert your guitar's bridge and tailpiece. Once you have reinstalled the bridge hardware, you can put new strings on your guitar.

40. Tune your guitar and test it out.

→ If you hear any buzz or hum, you may want to recheck all of your ground connections.

→ Switch through the 3 different toggle switch positions to verify that you are getting sound from both pickups.

→ Use the volume and tone knobs for each pickup to ensure they are working as they should.

41. Enjoy spending hours playing your newly upgraded guitar!



⁷ Image source: <http://www.gibson.com/Products/Electric-Guitars/2014/Les-Paul-Standard.aspx>