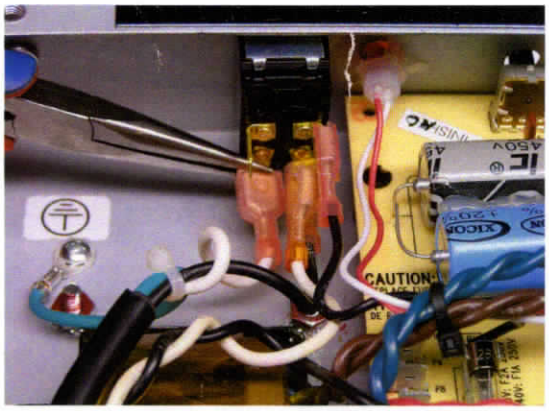
Billm Blues Junior Power Standby Switch Installation

The power standby switch uses a heavy duty Carling progressive switch with two circuits and three positions. The off position is self-explanatory. In the middle position, circuit 1 is on; in the "on" position, circuit 1 and circuit 2 are both on. The kit lets you connect the high voltage output from the power transformer to circuit 2, so in the standby or middle position only the filaments and bias circuit get power.

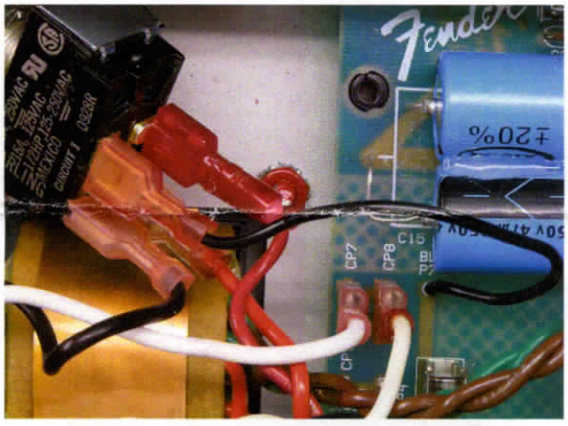
1. Unplug the amplifier. Leave the red jumper wire on the new standby switch to avoid confusion later.



2. Remove the push-on disconnects from the power switch. Long-nose pliers or a slim screwdriver may help get things moving. Then remove the stock power switch with a 9/16" socket wrench or nut driver. Don't use pliers—you'll scratch the faceplate for sure.

3. Plug both white wires onto the male connectors on the circuit board. Use CP7 and CP8 for the green board, P9 and P10 on the cream board. Export (220-240V) amps, see below.

4. Unplug the red transformer wire from P12 (cream board) or CP12 (green board).



5. Plug the above red wire from the transformer onto the lower (angled) terminal on the right side of the new switch.

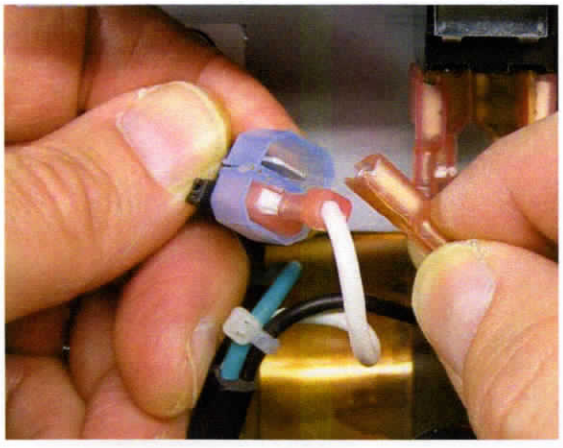
6. Plug the black wire from the line cord onto the lower, angled terminal on the new switch, on the left side. See pic below.

7. Plug the black wire from the circuit board onto the left terminal of the new switch.

8. Plug the provided red wire from the switch onto P12/CP12.

9. Move the nut on the new switch about halfway up the threads. Install the switch and use the nut and washer from the old switch to secure it. Adjust the back nut so the barrel of the switch is flush with the top of the nut. Use the provided wire ties to secure loose wires.

There is no magic about using a standby switch. You do not have to warm up the filaments before playing nor cool down before shutting off. You can skip right over the standby position. It's merely a convenience for muting the amp or for helping it run cooler during long breaks. Because the standby switch cuts off the AC side of the high voltage, muting is not instantaneous. The capacitors will lose their charge through the warm tubes. You can hear the voltage bleed off as the sound fades over 10 seconds or so—this is normal.



Export transformer: Don't remove any of the connections on the circuit board except CP12. Connect the red wires as shown above. Connect the wires (usually blue and white) that were plugged into the left side of the stock switch into the special blue jumper and move both wires that were on the right side to the left side of the new switch. The brown wire from the mains cord goes to the bottom left of the new switch. *If you don't have an export transformer, you don't need or get a blue jumper!*

Billm instructions for tone stack mod

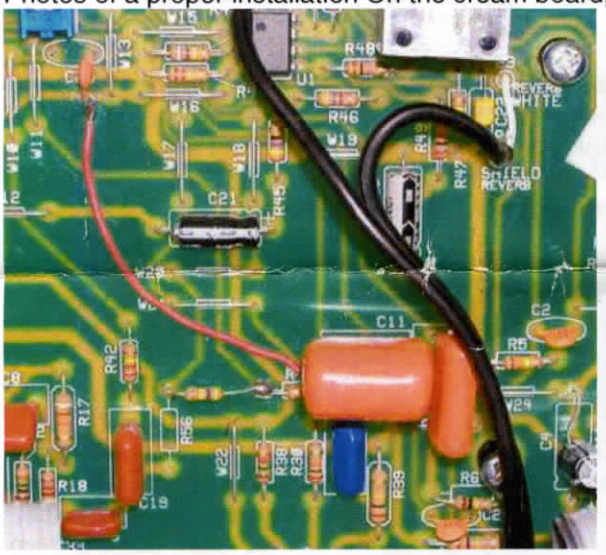
Please refer to www.billmaudio.com for a step-by-step guide to removing the circuit board. It doesn't have to come out entirely to get to the back of the board. The green ground wire on the right and the black wire that connects to the power switch will support the board. Unplug all the push-on connectors before you remove the seven circuit board screws so the board remains firm in the chassis while you're pulling on the connectors.

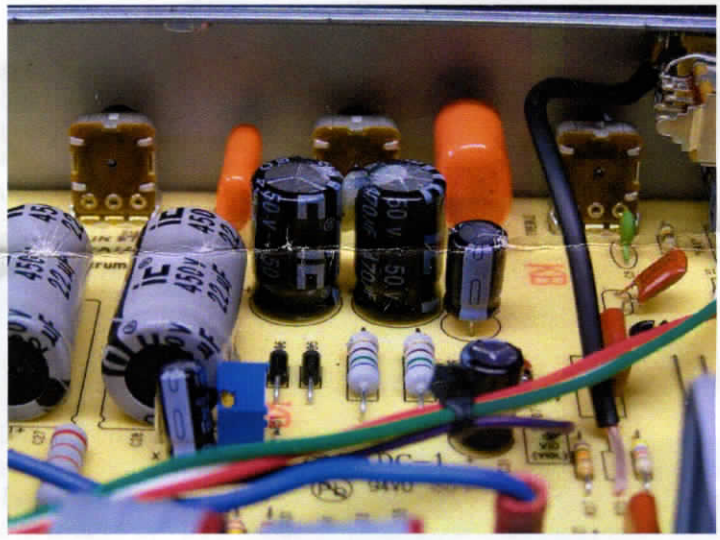
Before you start: Try to minimize bending back and forth. The violet wire from the jack board is very prone to breakage. We reinforce it at the board with a dab of hot melt glue, as Fender does on all of its new amps. The ribbon cables are also fragile where they join the board. Keep bending to a minimum and consider putting a bead of hot melt glue along the ribbons if your glue gun has a small enough nozzle.

As shown on the site, clip the tone stack capacitors with flush-cutting pliers (best) or diagonal pliers. Do not attempt to remove the stock caps intact. Your chances of damaging the circuit board are very high and I guarantee that you won't want to put them back.

The tone stack caps for the cream board are C6 (bass) and C7 (mids). The green board caps are C11 (bass) and C13 (mids). Of the two Orange Drop caps supplied, the large one (marked 104K) is the bass cap, the small one (153K) is mids. Don't confuse it with the coupling caps. Instructions for the coupling caps are below.

Photos of a proper installation On the cream board, you can see the presence control installed:





On the green board, you can also see the reverb mod. I like to put a small dab of hot melt or silicone glue between the tone caps to ensure that they won't vibrate against one another.

Instructions for Billm Coupling Cap Installation

On the cream board, replace C2 and C8 with caps marked 223K (.022uF). On the green, C1 gets a 153K and C16 a 223K. The blue caps typically do not have bent-over leads; you can desolder them and lift straight out. But don't attempt to desolder/install from the top of the board! First, you have no way of knowing whether you have a good solder joint when you install the Orange Drops. Second, you stand an excellent chance of snagging the edge of the trace or some leftover solder and tearing the solder pad off the back of the board.

There is no polarity on the Orange Drops; they go in either way. The leads are long and since they are close to the bottom of the board, they hit the chassis. Trim the leads to about 1 inch before you start, then trim them to normal length after you've soldered. Hold the cap lightly against the board from the component side, so that the crimped/bent part of the lead is against the circuit board, not up in the air. Don't press hard enough to bend the crimp. Note that on the green board C16 may touch the bass cap, C11. This is OK; secure all three caps against vibration with a small amount of hot melt glue.

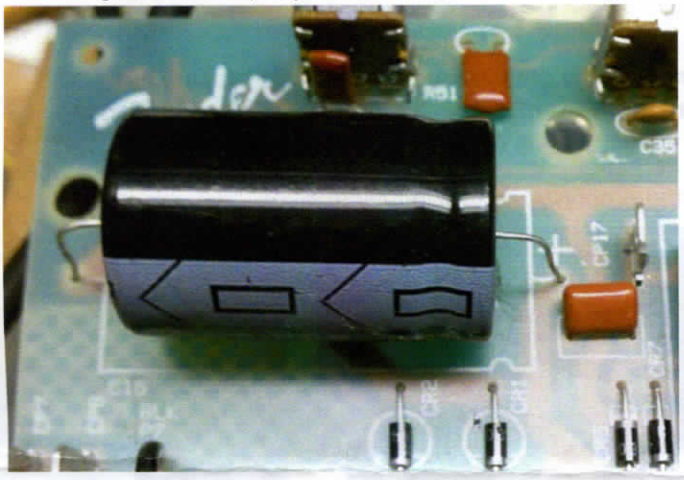
You can replace C10 on the cream board with a jumper. See http://billmaudio.com/wp/?page_id=709. The tone stack and the new coupling caps have by far the most effect on tone; it's not cost-effective nor worth your time to replace other caps. We've tested them, and the change in tone is essentially inaudible.

Billm Power Supply Stiffening

About discharging: If you turn your Blues Junior off while the tubes are warm, it will self-discharge completely. You can hear the sound fade away if you leave your guitar plugged in. It is not necessary to play; it's just a way to know that the caps are empty. If you turn a cold amp on and off quickly, it will hold a dangerous charge. The tubes need to be warm to self-discharge. But always verify with a voltmeter from the positive lead to ground! A residual charge between 6 and 15 volts is common; it's not dangerous; it's caused by chemical action inside the capacitors. After turning off the warm amp, unplug it and you will be safe.

Having twice as much capacitance in the first filter stage provides reserve power for the output tubes, which can be heard in stronger bass tones and sharper, more incisive pick attack. When you hit a guitar string, it sends a very large pulse into the amplifier, but it decays quickly. It actually tries to draw more instantaneous current than the stock power supply can deliver.

On the both the cream board and the green board, we replace the 47uF cap with a special low-ESR 100uFcap Before mounting the new caps, you can scrape off the old glue or just bed the new cap into the old rubber if the old cap comes off cleanly. Note that the rev B green board uses a longer, 500V cap. All other BJrs use a 450V cap, which has plenty of safety margin; the plate voltage is only around 330V.

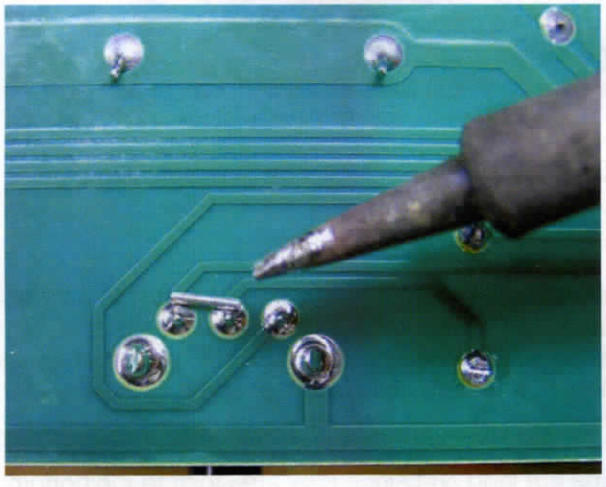


We use clear hot melt glue to secure the caps to the board and prevent vibration. You can also use a small amount of silicone sealer. Put some under the cap; you don't need much.

This is the green board installation, but the cream is the same. The flat black face of the cap goes to the + marking on the board. The shiny side goes to the – or ground side.

Get the polarity right; smoke is not pretty.

Remember to trim the leads before reassembling.



The TwinStack will give you a noticeable improvement on any Blues Junior, but the tone stack mod brings out the best by providing more available bass and mids. With more mids on tap from the tone stack, you have more available when the control is wide open, down to zero when the control is at 1. So you improve on the stock tones at both ends.

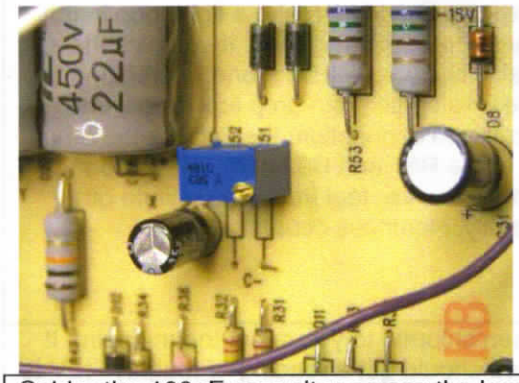
When we do this mod in the shop, we bridge the center and left mids pot terminals on the back of the board. If you're going to be pulling the board to install other mods, plan on doing it from the back; it's faster and easier.

Here's how: First, start with a short scrap of wire that bridges the two left pins of the mids pot. A thicker clipping from the tone caps or power supply stiffening caps is perfect. Heat the jumper, apply a little fresh solder, and you're done. This is a cream board, but the procedure is identical on the green board. Just make sure that you're doing it to the mids pot, not one of the others.

The 100pF capacitor goes across the leads of R30 (leave R30 in place) in the cream board Blues Junior to eliminate phase inverter oscillation. It's optional on the green board, and the equivalent resistor is R19. See: http://billmaudio.com/wp/?page_id=115. If you ordered an output transformer, the capacitor may have been included with the transformer.

Billm Easy Bias Control for Cream Board Blues Junior

The layout of the cream board Blues Junior (mid-2001 to present, including Series III) makes it easy to add a bias adjustment trimpot. Like the stock amp, this method requires that you use matched/balanced output tubes and allows the bias level to be set cooler than the BJr's tube-roasting level. Using the Bourns 50K trimpot, you replace R51 and R52, which form a voltage divider. The voltage divider then becomes adjustable. A 25-turn trimpot is ideal, allowing very accurate adjustment. A single-turn trimpot will be impossible to adjust accurately. With this circuit you can go from full bias voltage (-26V) to zero (red-plating your output tubes). The trimpot is pre-set at the midpoint, which will give you a safe starting voltage. Do NOT run the trimpot past its limit stops. It will go click, click, click in warning, then it will break, break, break.

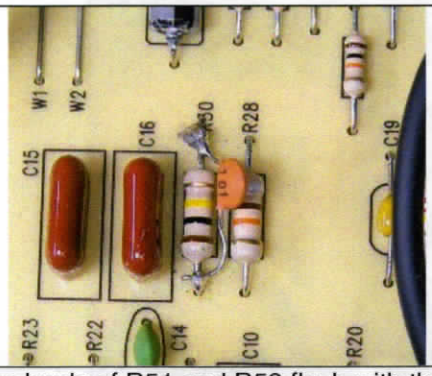


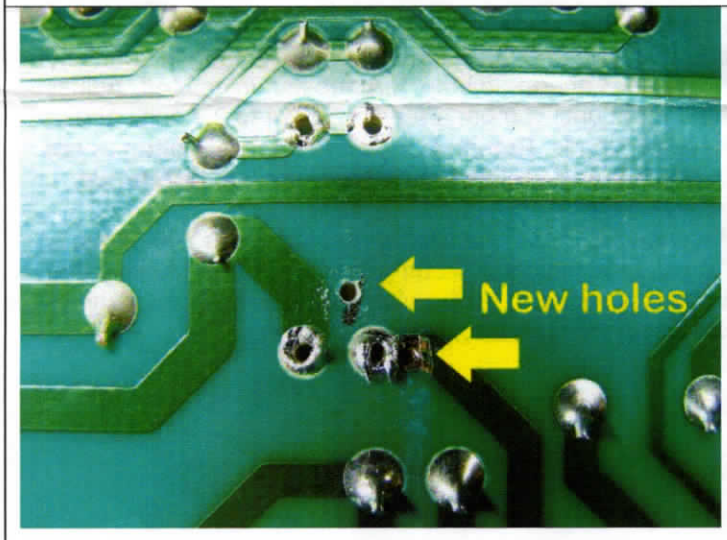
Loosen the circuit board according to the instructions at my site, www.billmaudio.com. The video will help.

Solder the 100pF capacitor across the leads of R30, as shown.

Hook the capacitor leads, route them under the R30 leads, crimp lightly for good contact, and solder. Leave R30 connected and take care not to overheat the leads, so that it remains properly soldered on the back side of the board. Trim the excess leads.

The capacitor prevents phase inverter oscillation, a common problem with cream board Blues Juniors.



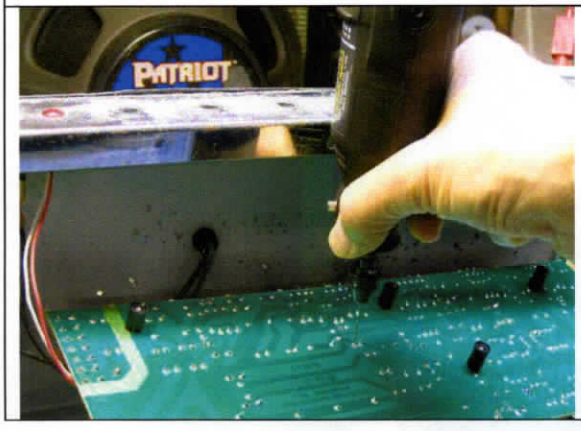


Clip the leads of R51 and R52 flush with the board. The stubs are easier to desolder and thereby prevent damage to the traces. A vacuum plunger desolderer (solder sucker) is highly recommended.

Use the trimpot's legs as a guide and use a fine-point Sharpie to mark out the positions for the holes. The one adjacent to the existing hole is the most critical: place it at the edge of the solder area just to the right of the existing hole. The topmost leg should be centered between the existing hole on the left and the new hole, as shown. It must not touch the thick trace on the left.

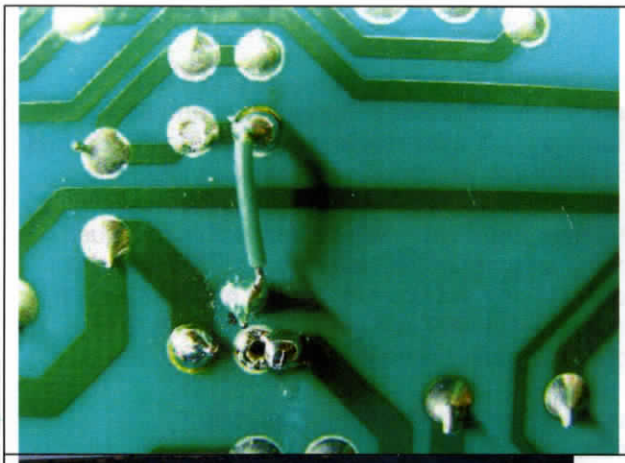
Don't be tempted to "cheat" and use the existing right hole! Bent leads on the trimpot will be wobbly on the circuit board and may break.

Use a sharp, pointed object to make a starting hole so the drill bit won't wander.



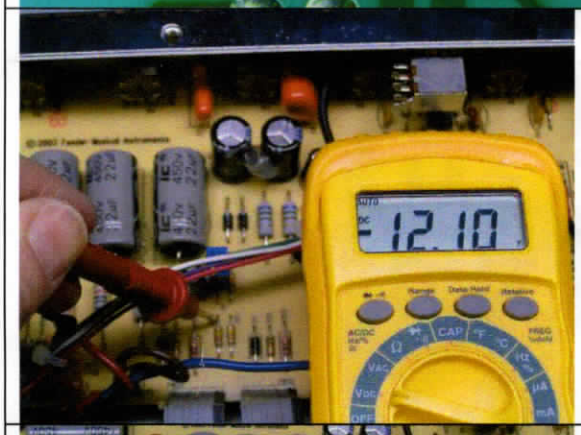
Drill the holes with the provided drill bit. A Dremel tool with an inexpensive accessory chuck works well, but even a hand-powered "egg beater" drill will do the job. Some have had success with the Fiskars hand-cranked craft drill or a craft push drill. It's a #60 drill, so use a very light hand. You bend it, you break it!

Scrape the green coating off the trace next to the right hole. Take care not to remove the copper, just the coating.



Place the trimpot through the holes from the other side. Solder one lead into the existing hole, the other into the new hole you made.

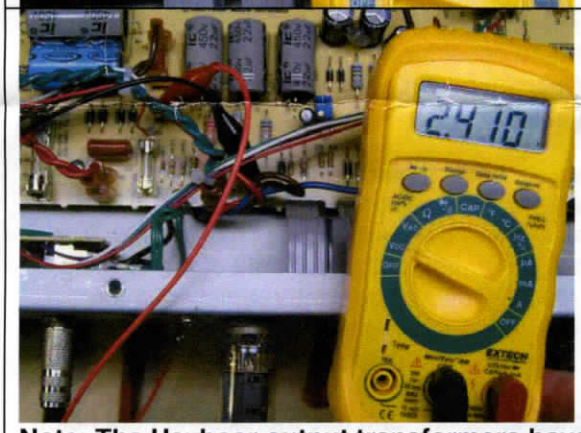
Strip one end of the wire provided, make a tight loop in the end, and crimp it onto the remaining lead. If you nick the wire, start over again. The wire will be prone to breaking at nicks. Pre-form the wire so you can drop just drop it into place. Solder the crimped connection, then solder the other end into the either of the R51 and R52 holes. If you don't like working with this thin wire, feel free to substitute other wire, but work carefully. Neatness counts!



The trimpot has been shipped to you set at the midpoint. If you didn't turn it, you should get a reading of roughly -12V to -13V between the top of either R31 or R32 and ground. This is a safe bias voltage that won't red-plate your tubes.

Remember that if you do this test without the tubes inserted, the filter caps will hold a charge. Warm tubes will self-discharge the amp when you turn it off. I suggest you leave the preamp tubes in place.

See the bias setting video at http://billmaudio.com/wp/?page_id=1155



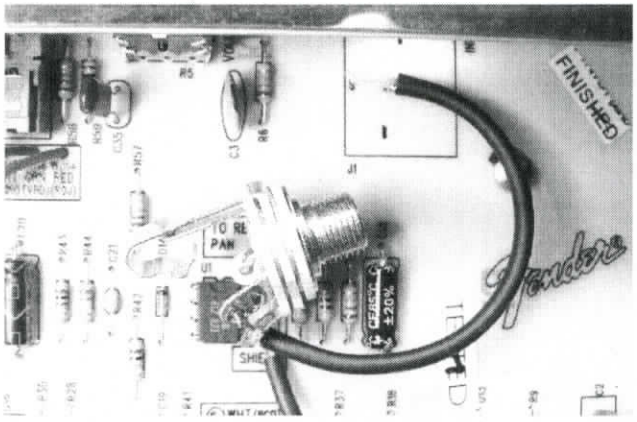
To adjust the bias: Put a jumper clip on the red transformer lead (P2) and another on the brown (P3). Plug in speaker, insert tubes, warm up amp, turn master volume off. Adjust the trimpot until you get a reading of 2.4 to 2.7 volts across these two leads. **Remember that the actual voltages are over 330V and you're only measuring the difference between them!**
Because the output transformer resistance is 100 ohms, a 2.4 volt drop indicates 24 mA of plate current. Multiply that times roughly 335V on the plate, and you've got 8 watts of idle dissipation per tube, a good number.

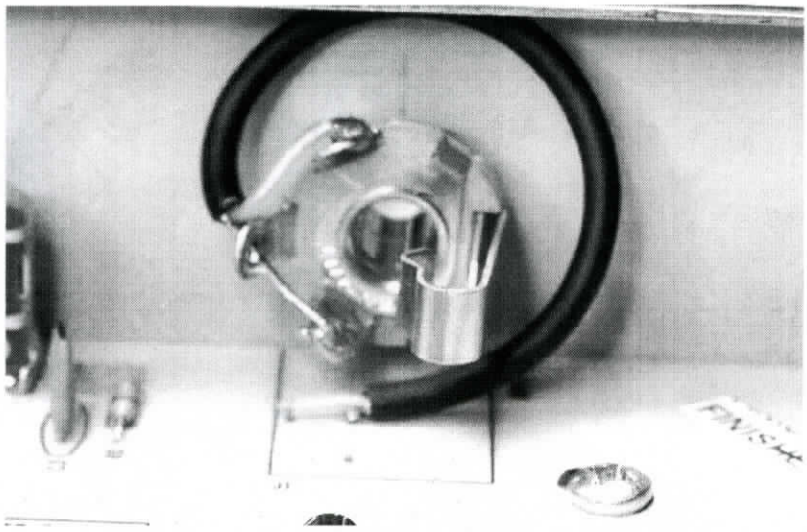
Note: The Heyboer output transformers have a different resistance. Use 3.2 to 3.4V for the TO20; 4.2 volts for the TO22. If you are converting to 6V6 tubes, follow the guidelines on the Octal Conversion instruction sheet.

Billm Switchcraft Replacement Input Jack

Remove the old input jack with a solder sucker or desoldering braid. Wiggle the jack while heating each lug in turn to prevent the solder from reattaching after you've removed all that you can.

The stock jack has four slots for lugs, but you need only two of them for the cream board, none for the green board. Orient the wires as shown below. Connect the signal lead to the left, the shield to the right, as shown.

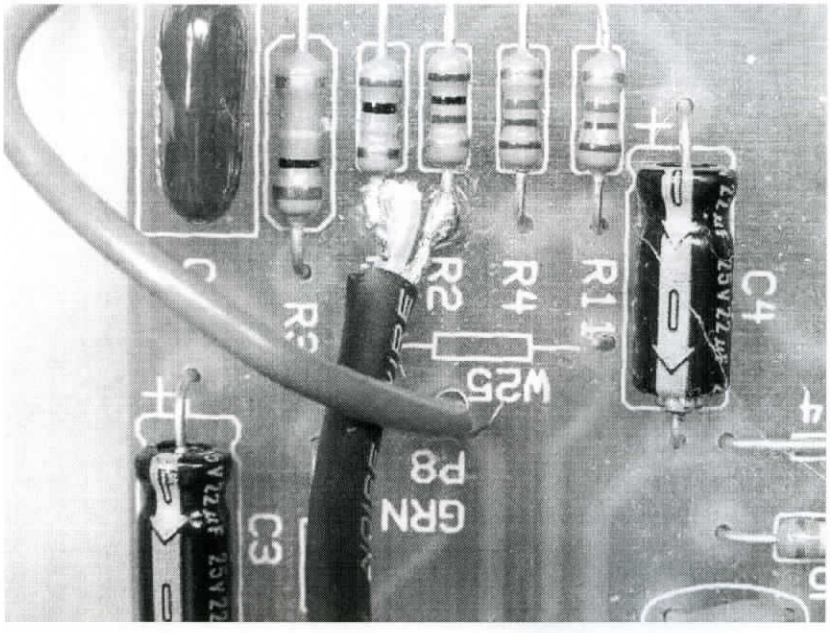




On the green board, clip jumper W25 and solder the center lead to R1 and the shield to R2, as shown. The green board has no shielding on the board, so running directly to the input resistor makes the amp quieter and prevents internal feedback from the treble control.

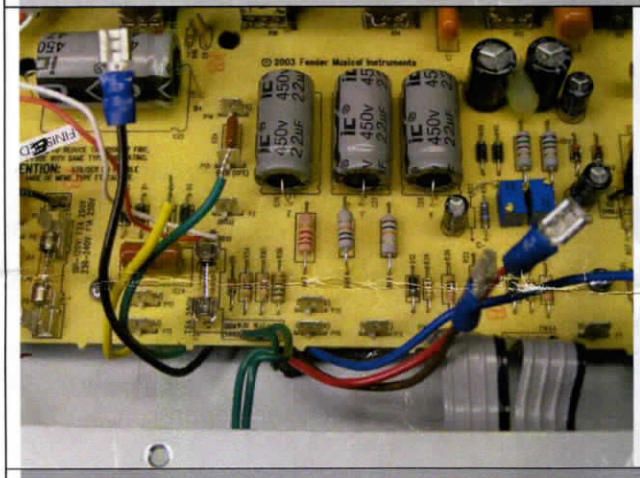
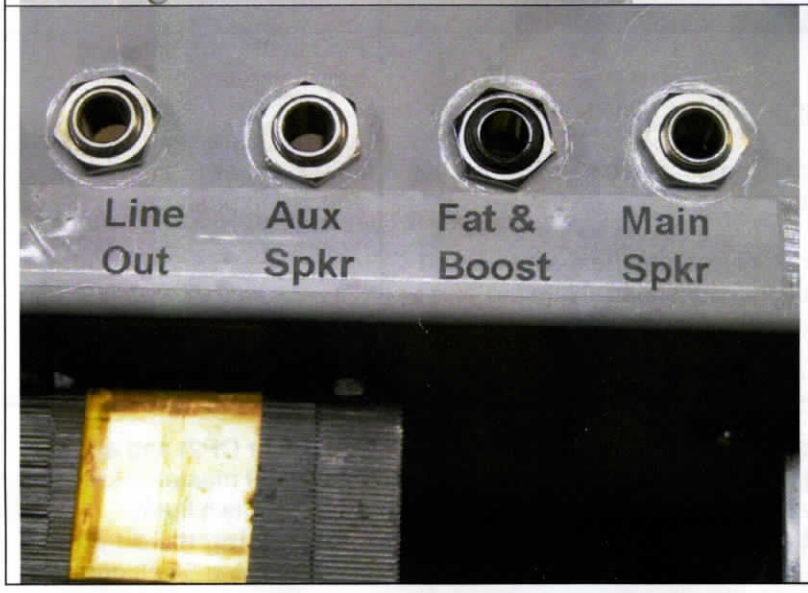
You can also desolder the stub from W25 and solder the center lead in the hole. It runs directly to R1. You must clip or remove W25 or you will get feedback from the treble circuit, which runs alongside the input trace. Install the jack on the green board as shown above, with the contact spring away from the volume control.

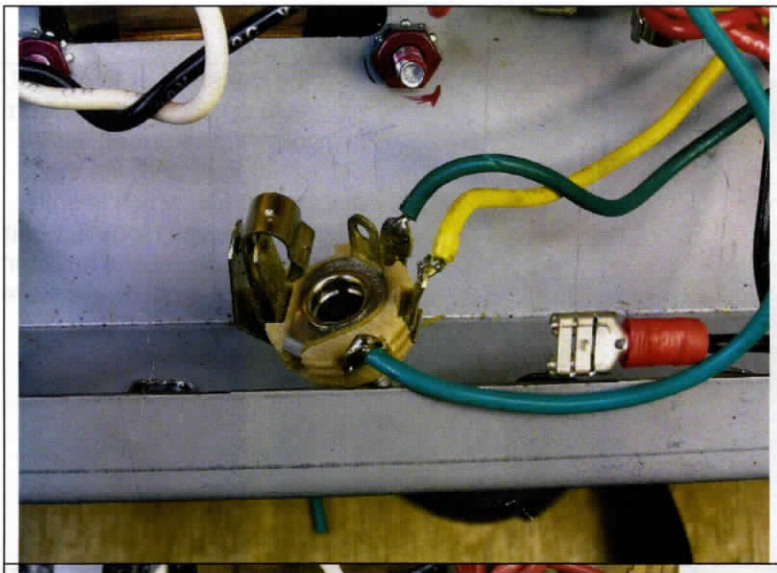
This is the crude way to do it on the green board.—solder right to the input resistor and ground. When we do these in the shop, we drill a hole in the trace that runs to R2 from the green ground wire. The shield lead goes in there and the center lead goes into the vacant W25 hole that leads to the input resistor.

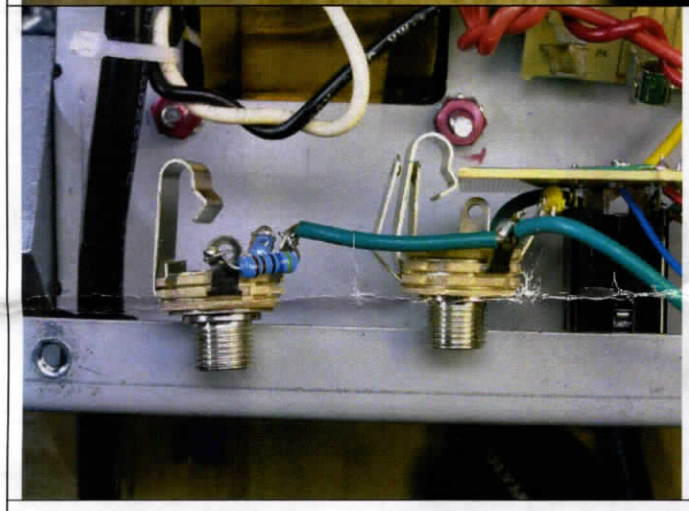


The black isolating washer goes on the inside, with the ridge preventing the jack from touching the faceplate. The fiber washer goes on the outside, then the metal washer, and finally the nut.

Billm instructions for installing Heyboer TO22 or TO26 output transformer

	Use the transformer to mark a new hole position farthest from the power transformer. Either drill a #38 hole and use the existing screw, which is self-tapping (it doesn't look it, but it is), or drill a clearance hole for 8-32 and use a hardware store screw and locknut. If you use a different screw, ensure that it will not hit the circuit board.
	Position the wires accordingly. Twist the red, blue and brown wires together tightly (not shown here) and unwind a sufficient amount of the red and brown wires to reach their push-ons. (Ignore the bias setup in this picture.)
	Drill a 3/8 inch hole in the chassis, one inch to the left of the footswitch jack, at the same level. Clean up the burrs. I recommend a Uni-bit step drill bit for smooth cuts. A twist drill bit has a strong tendency to pull into sheet metal, and can do serious damage, so be careful. If you ordered the line out jack, drill another hole, 1 inch farther to the left. I used a label maker to identify the jacks.

<table>
<tr><td>  </td><td>The aux jack switches the load to 4 ohms when you plug in a second speaker. Attach the yellow and green wires from the TO22/TO26 as shown. Take care with the attached green wire with the push-on connector. Moving it back and forth too much will fatigue the wire and break it. The center lug (ground) is left empty. The jack is grounded through the chassis.

Attach the green and black push-on connectors to the jack daughterboard.</td></tr>
<tr><td>  </td><td>If you ordered the line out jack, it is attached by a short green wire. Don't over-handle or over-bend the wires.

Install the lockwashers on the inside of the chassis, the nut on the outside, for a neat installation and good grounding.

The main jack must be grounded to the chassis for testing and operation.</td></tr>
<tr><td>Instructions for use:
Always have one speaker plugged into the main speaker jack.

Never plug only into the aux jack. The main speaker and the aux speaker should each be 8 ohms.

If you want to run a 4 ohm cabinet, plug it into the main jack and insert a dummy plug (no connections, not shorted) into the aux jack. This will switch the transformer to 4 ohms. Do not use guitar cable for aux speakers.</td><td>Plug in the red, blue and brown wires.

Install the speaker/footswitch board and attach the black and green push-ons.</td></tr>
</table>

To adjust the bias for 6V6: Put a jumper clip on the red transformer lead (P2 or CP2) and another on the brown (P1 or CP1). Plug in speaker, insert tubes, warm up amp, turn off master volume. Adjust the trimpot until you get a reading of approximately 5 volts across these two leads. **Remember that the actual voltages are over 330V and you're only measuring the difference between them!** Because the output transformer resistance is around 170 ohms, a 5 volt drop indicates 30 mA of plate current. Multiply that times roughly 330V on the plate, and you've got 10 watts of idle dissipation per tube, a good number for 6V6s. If you have the TP24, please refer to the chart on my site: http://billmaudio.com/wp/?page_id=1155

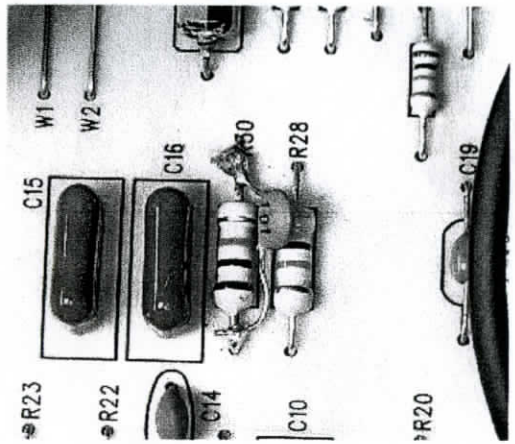
Installation: TO20 Compact Output Transformer

Partially remove the circuit board as shown on the Billm Audio site:

http://billmaudio.com/wp/?page_id=17

On the Blues Junior, position the included spacer washers under the new transformer so that the core laminations clear the plastic feed-through bushings where the wires go.

As with the stock transformer, the black and green wires go towards the top of the amp, the red, blue and brown wires towards the tubes. The cream board is marked for blue and brown; on the green board, blue goes to CP3, red to CP2, brown to CP1. Solder the 100pF capacitor across the leads of R30 (R19, green board), as shown, to prevent phase inverter oscillation.



To remove the black and green leads from the jack daughterboard, use pliers and a gentle side-to-side rocking motion as you pull. Take care not to bend the male quick-connect tabs that are soldered to the board or you may crack the solder joints. They can be resoldered easily, but it's best not to weaken them so that the printed circuit traces on the other side are not damaged.

It's a good idea to twist the red, brown, and blue wires together and then untwist as much of the brown and red you need to make the connections. Position the wires away from the ribbon cables. If you have adjustable bias, the voltage drop from brown to red should be around 3.4 volts for EL84s, 4.2 volts for 6V6s.