

Tips on installing your “Hoffman” board.

12th January 2005

IMPORTANT: if you do not read anything else, please read the first section.
At least.

1 Before we begin notes, tips, and “you should know” tidbits.

1. **WARNING: DO NOT WORK ON ANY AMPLIFIER WITH THE AC PLUG PLUGGED INTO THE WALL SOCKET! ALWAYS DISCHARGE THE FILTER CAPS BEFORE WORKING ON AN AMPLIFIER!**
2. Before you begin, get your head straight about it, I know you want to play/jam/rip/shred/jazz but taking your time here will save a lot of time later on... remember, I am not there to take a peek at your wiring job if things do not work when you turn it on. Look over the schematic very carefully with the board right there. It sometimes is a BIG help to turn the schematic or the board around so they match. Remember, on the schematic the tubes are at the top... in your amp they are on the bottom. Don't screw the board in the chassis backwards :) If you ever get confused, look at the far left on the schematic, there is a cap with a resistor under it, look for this on the end of the board and turn the board or the paper around to match.
3. I can not stress the importance of #2 above. Consider #3 a nudge to go back to #2 and then look at your board and then look at your schematic. I can not stress how much knowing where things are on the board as per the schematic will help.
4. Before you begin installing, read the Hoffman generic instructions in addition to these :)
5. There is a black wire going from one end of the board to the other. This is the ground wire. Do not leave it as is... after test placing the board in the amp, cut it (where appropriate) and mount each end to a stud. Make SURE there is a good ground connection there. Those two wires should not be at the same physical location on the chassis. They are separate

for a reason (one is where all power on the board is grounded, the other is where all signal lines on the board are grounded... this helps prevent noise, even though they are both grounded to the chassis :)

6. The following is a good order of installing things if you have a bare chassis, transformers, board, etc.: Install the board first, unless you need to install the choke/output tranny first due to the screw holes being covered by the board. Make SURE the screws from ANYTHING else mounted on the back of the chassis do not hit the board. Major disasters have happened from this. Then install the tube sockets, then install the pots, switches, lamp, fuseholder, power tranny. The input jacks can go in last, since they mostly get in the way during install.
7. When mounting the board, choke and transformer in the chassis, use a good thread locking compound (not a lot, but enough to keep it from coming loose), and lockwashers or star washers. This is a double edged sword... if you are making a ground connection make sure not to coat it with the compound...check those connections with a multimeter after you are done. I can not tell you how many amps I have repaired where the culprit was a screw/but that vibrated loose and fell into the circuitry. Minimum protection: use lockwashers!
8. When making connections... it is IMPORTANT to make sure you wrap the wire all the way around the turret lug that you are soldering to on the board. Try your best not to solder to the resistor or capacitor lead wires, but rather to the turret lug. It is generally easier to make an open loop with the end of the wire, and then attach it to the turret lug. If you do not do this, and the solder joint is not perfect, it WILL come off in time due to the huge amount of vibration in the chassis from the speaker(s). If you are using the cloth wire, just push the cloth back a bit, DO NOT strip it, as it will get ugly very fast.
9. When making connections through the chassis (e.g. for the cap-can, etc) USE RUBBER GROMMETS! I can not tell you how many times I have seen a blown cap-can or blown power tranny due to wires running through the chassis without grommets. Your chassis will undergo a lot of vibration which will cause screws to come loose, wires to rub on chassis and pretty much anything not glued down to come apart. Heed this warning: Use thread lock or paint on screws/nuts/bolts in the chassis, use grommets on all wires going through the chassis, make sure your pots/lamp/switches are very secure. They WILL come loose otherwise. While we are ranting, it is a good idea to check them every so often even if you do take precautions. A few minutes of inspection will save a lot of money in repairs.
10. Don't forget to ground that silver wire that grounds all of the pots together. Using a ground pin on one of the input jacks is handy for this.

11. On the schematic, there are numbers on the wires leading out of the control pots... these correspond to numbers in the schematic that you need to solder wires from the pots to the respective numbered location(s) on the board. The pots are drawn as if you are looking down on them, with the connection studs facing up, and the shaft facing you, if you are looking at the schematic right side up.
12. Dotted lines on the schematic correspond to wires which are under the board. They are already there and soldered in place.
13. If you have not seen this before, the convention used in the schematics is that if two wires cross, but there is no dot, then they are not connected. However, on the tubes, if a wire goes through the circle, it is connected to that pin. (e.g. on V1, V2, V3 pins 4 and 5 are connected to each other).
14. NOTE on the tranny, if you have two green heater wires and another green and white (or green and stripe) wire, that green and white (or green and stripe) wire is the center tap for the heaters. Do not get the other light green wire (earth ground) confused in this discussion. If you are going to use the two 100 ohm resistors on the board (marked H,H or shown tied to the heaters) then DO NOT ground the center tap of the heaters (the green and white or striped wire) Tape it off but do not ground it. If, on the other hand you do NOT use the two 100 ohm resistors, you need to ground the center tap of the heaters. This is very important.
15. On the 9 pin tubes (12ax7, 12ay7) the heaters are pin 9 and pins 4 and 5 (which are connected together). On the 8 pin tubes (6L6) the heaters are pins 2 and 7. There are no heater connections to the rectifier. If you are doing a retro-fit, the heaters are already connected.
16. For the input connections, use the mini-shielded cable. Put the resistors on the input jacks and solder the shielded cable there (inner wire to the ends of the two 68k resistors) and ground the shield at the input jacks. The shield is left alone (stripped back) at the tube socket. Cover the end at the tube socket with heat shrink tubing to prevent it from shorting out since that wire is very flexible. For the super-paranoid, or if you have a large chassis where the cable must be very long, put the resistors (the 68k's) on the tube socket directly. For normal installs (bassman, plexi, etc) this is not an issue.
17. Speaking of shields, when you make the chassis cover (on the back of the amp cabinet) make sure to cover it with some electrically conducting material (e.g. a copper foil tape, copper shield, even an aluminum shield) and make sure that it touches the amp chassis. This will help prevent the amp from picking up outside noise. Make sure that shield can NOT come off of the back panel, however, as you can imagine what would happen.
18. Some people still use the "ground lift" switch on the old chassis in these old amps. We strongly advise against its use. Use a three wire power

chord and ground the chassis to earth ground. Never plug the amp into an ungrounded (ground lifted) outlet. This can be life threatening to you and to your amplifier.

19. When you are finished and have triple checked your wiring (at least) use the “I am scared” startup method, that is to say, make sure it is off, all tools, wire, etc have been removed from the area, only plug in the rectifier, no other tubes should be in the amp at this point, stand back, plug it in the wall, and while wearing a nice insulated glove or with an insulated tool (or a block of wood) turn the power switch on. Check (very carefully) voltages at the tubes (plate, bias, with respect to ground) and see if they are reasonable. They will be a little high as there is no load on the power supply, but the bias should be “close”. Turn it off, stick the preamp/power tubes in and again, stand back, turn it on with a stick or something insulated and watch for smoke. Check to make sure all filaments are on, then after about a min or two, turn the standby switch on (again, standing back, and using something insulated to throw the standby switch on). Look for smoke, sparks, etc. If everything is ok, watch it for about 2-5 mins and see if the bias is going crazy (output tubes glowing red hot or getting very hot, etc). If everything is ok, turn it off, cover the back, and plug in a guitar.

2 These are the Hoffman “generic” notes for any board kit that he makes. I find them to be informative and a good read, even though some things may be different depending on the board you purchased. All of the information below is from Hoffman, and the original can be seen at his website (www.hoffmanamps.com) under the library of information.

The board kits should contain, depending on the kit.

- 1- Set of instructions (You are reading them now).
- 1 - Layout diagram.
- 4 - #12A $\frac{1}{4}$ input jacks. (Depends on the kit)
- 4 - 68k input jack resistors. (Depends on the kit)
- 2 - 1meg input jack resistors. (Depends on the kit)
- 1 - Circuit board with all mounting hardware (standoffs, screws, nuts)
- 1 - Pot harness assembly.
- 2 - 1.5k Fender or 2 - 5.6k Marshall or 4 - 1.5k Vox grid resistors. (Depends on the kit)
- 2- 6.8k mid control resistors on AB763 kit

- 1 ? 220k reverb jack resistor on AB763 and Reverb unit kits.
- 4 - Round terminal lugs for chassis ground connections.
- Assorted green, red, black and white wire. Shielded cable for input jacks.

WARNING: DO NOT WORK ON ANY AMPLIFIER WITH THE AC PLUG PLUGGED INTO THE WALL SOCKET! ALWAYS DISCHARGE THE FILTER CAPS BEFORE WORKING ON AN AMPLIFIER! IF YOU ARE UNSURE OF HOW TO DO SOMETHING PLEASE TAKE IT TO A TECHNICIAN!

Notes:

When you see something like 820/20 on the layout diagram it means there is a 820ohm resistor with a 20uf capacitor in parallel across that resistor.

The numbers on the pots go to the same number on the board (numbers on the tube socket diagrams are there for reference to the pin on the pot, not to numbers elsewhere on the layout diagram).

Installation instructions for add on boards.

1. Place the circuit board inside the amplifier where it will be installed and use a sharp object or a pencil to mark the location of the mounting holes. Make sure to look under the chassis to make sure that you are not going to be drilling into an object such as a transformer on the other side of the chassis. If the mounting holes happen to be where a transformer is, then you can either move the transformer or shim up the transformer using washers so that transformer is not setting on the screw heads of the circuit board mounting screws. You can also make a new mounting hole in the circuit board and move the mounting point.

2. Remove the board and use a punch to mark where the holes will be drilled. Drill the mounting holes using a 11/64 drill bit. The bit should be just slightly larger than the mounting screws, so it will be easier to position the board.

3. Mount the board into the amplifier using the supplied circuit board standoffs between the chassis and the board. If possible keep the heads of the screws on the chassis side and the nuts and washers on the inside of the chassis. If you are also installing transformers, you may want to install them first if any screw heads are going to be under the board.

4. Face the front of the amp towards you just like the wiring diagram and start with the first pre-amp tube. On the pre-amp tubes you should do each pin in a counter-clockwise logical sequence. Use the following wire colors when wiring the amp: (9 pin sockets):

- Pin 1 (plate 1) red
- Pin 2 (grid 1) white
- Pin 3 (cathode 1) black
- Pin 6 (plate 2) red

Pin 7 (grid 2) white
Pin 8 (cathode 2) black

HEATER NOTES:

Pins 4 and 5 are connected together and are one side of the 6.3 volt ac heaters. Pin 9 is the other side if the heaters. The heater wires should already be wired up on your amp. If you are building from scratch you will have to run your heater wires in a serial twisted pair manner to each tube socket. Use green 18 gauge stranded wire for the power tubes and 20 gauge solid for the pre-amp tubes. Run the twisted pair heater wires about an inch over the top of the tube sockets and come straight down to the pins. Some amp builders like to keep the pins the same, socket to socket. For example, pin 9 on the first pre-amp tube would continue on to pin 9 of the next tube and so on down the line. The power tube heater pins are 2 and 7, and you can do the same thing when you wire them.

5. Attach each wire to a turret lug first and then to the tube socket pin last. Starting with PIN 3 of the first pre-amp tube, strip enough of the black hook up wire so that it can wrap around the base of the turret lug. If you make a half loop around a piece of tubing or something roughly the same size as the lug it is easier to form the wire around the base of the lug. Solder the wire to the turret lug with enough heat to solder the wire correctly, but not so much heat that you unsolder the components from the lugs. Then lay the wire out and run it up to the pin on the tube socket. The wires should not be over the top of the tube socket. They should go around the socket on their way to the pin they will be connected to. The heater wires going to PINS 4, 5 and 9 usually are suspended in the air above the socket and you do not want to be close to those wires. Cut the wire to the correct length. The wires should not be too long or too short. They should be as short as possible with just a little curve for flexibility. Strip the wire and solder it to the correct tube socket pin. Check the lay out diagram often to see if you are connecting everything correctly. You may want to keep the red wires, going to PINS 1 and 6, away from the black and white wires. You can suspend the red wires above the other wires or the other way around but they should not be laid next to or parallel to the black and white wires. The red plate wires contain the high voltage and may induce noise into the other wires. Solder all the pre-amp tubes first and then go on to the power tubes. (TIP: If the solder on the top of the turret lug gets sucked down into the lug, wait until the lug has cooled down and then return to the lug to add a little bit of solder around the hole in the lug where the components are inserted. Never keep adding solder to a hot lug that keeps sucking it in. First, you are probably heating up the component too much and secondly the lug may be dripping solder out the bottom. This may lead to a solder blob that could touch the metal chassis and short out the board. Solder all the wires to the tube sockets and then come back and resolder the tops of the lugs all at once after everything has cooled down.)

POWER TUBE NOTES:

The power tubes cathode, PIN 8 and PIN 1 (BLACK) are connected together and then soldered to the 1 ohm resistors on the board. The current of each power tube can now be checked across each 1 ohm resistor. Also with PIN 1 and 8 tied together you could use EL34 or 6550 power tubes if your power transformer can handle it. PIN 3, the plate, should already be connected to the output transformer. PIN 4 is the screen (red wire) and it is connected to the (1K/5W or 470 ohm/3W) screen grid resistors on the board. PIN 5 is the grid (white wire) and it is connected to a (5.6K or 1.5K) resistor that is soldered to PIN 6. PIN 6 is then connected to the junction of the 220K resistor and the .022 capacitor on the board. PINS 2 and 7 are the heaters.

6. Install the pots into the front panel. Install the jacks into the front panel. Connect the bare ground buss wire from the pots to the ground of the jacks. Connect the black ground wire from the left end of the circuit board to the bare ground buss that runs along the backs of the pots and goes to the jacks. Install the two 68K and one 1M resistors on each set of jacks. The shielded cable should be soldered to the input jacks and then go to the first tube to pins 2 and 7. Cut the cable to the correct length by routing it directly from the two 68K resistors to the tube socket. Leave just a little slack in the shielded cable. Strip the cable and connect the center wire to the junction of the two 68K resistors. Connect the shield of the cable to the ground buss on one of the jacks. Strip the tube socket end and remove the outer shield. You will only connect the center wire to the tube socket pin. Use some heat shrink to cover the outer shield on the tube socket end so it does not touch anything and cause problems. Shrink the heat shrink with the barrel of your soldering iron.

7. Connect each pot connection using the white wire. Strip one end of the white hook up wire and solder it to the pot tab and then find the location on the board where the wire will be attached. Cut the wire as short as possible leaving just a little play in the wire. Strip the end of the wire and insert it into the hole in the top of the lug. The wire will be in the hole with the component. Solder the top of the lug carefully using just enough heat. A sharp soldering iron tip is a big help when doing fine soldering like this.

8. Hook up the feedback wire. Soldered a white wire to one end of the FEEDBACK RESISTOR and solder the other end to the speaker tap you are going to use. (8 ohm in MARSHALL'S)

9. Find the black ground wire at the right end of the board and connect this wire to the chassis ground. If the amp has a center tap, connect the ground wire to the chassis where the center tap of the power transformer is connected.

10. Connect each filter cap positive end to the correct location along the power supply rail. This rail is along the front edge of the board closest to the pots. Look at the layout diagram to see where each filter cap should be connected. Wrap the wire around each turret lug and solder it. The filter cap grounds should technically be connected as close as possible to the cathode of the tube that they go to, but this is usually not possible. In FENDER style amps the filter caps are in a can on the back of the amp and you can use the

stock method of filter cap grounding. In MARSHALL style amps each cap is grounded to the chassis and flows through the chassis back to the center tap.

11. If your power transformer doesn't have a heater center tap then solder a green wire from each heater wire on the first power tube (PINS 2 AND 7) and connect the two wires to the two 100 ohm resistors on the right end of the circuit board. If you are running your own heater wires, then solder the heater wires from the power transformer to the two 100 ohm resistor lugs and then connect all the heaters starting from the circuit board. The two 100 ohm resistors make an artificial ground to prevent hum.

12. Connect the bias tap from the transformer to the bias range resistor on the board. This resistor may have to be changed up or down in value to get a correct bias range.

13. Connect the high voltage wires from the power transformer to the two diodes on the board if your board has an on the board rectifier. If you have a tube rectifier, pin 8 of the rectifier tube should go to the standby switch first and then from the standby switch to the B+ point on the power rail. The MARSHALL board is set up to use a half wave rectifier like the original amps. Some MARSHALL'S and other amps use a bridge rectifier instead. If your power transformer uses a bridge rectifier we can supply you with a separate bridge that you can bolt down on the chassis, or on the board.

14. Connect the choke from the B+ to the next lug on the power rail to bridge the gap between B+ and the screens.

15. After all connections have been made and double checked, (please take the time to double check all connections). Power up the amp with no tubes in the sockets. Using a multi-meter set on DC volts, check to see if pins 1 and 6 on the pre-amp tubes have high voltage. Check pins 3 and 4 on the power tubes to see if they have high voltage. Check pins 5 on the power tubes to see if they have negative voltage. Turn the bias pot so that pin 5 has the most negative voltage that the bias circuit can produce. This is done so that the power tubes will be over biased when you first turn on the amp with the tubes inserted. You should have at least negative 50 or -50 volts available in the bias circuit. If not, the bias range resistor in the bias circuit cuts down the AC voltage coming from the power transformer and you will have to raise or lower the value to get a correct bias range. Switch your meter to AC volts and make sure you have roughly 6.3 volts of heater voltage across the tube sockets. If all the voltages look correct, turn off the amplifier.

16. Insert all tubes into their sockets. Power up the amp and let it warm up for 30 seconds. Connect your multi meter across one of the 1 ohm power tube cathode resistors. (positive closest to the tubes, negative closest to the front of the amp.) Set your meter on DC millivolts. You are going to watch the power tube current as you turn on the standby switch. Be prepared to quickly turn the standby switch off if the current is too high on the power tubes. Turn on the standby switch and watch the meter. If the current is below 50 milliamps (millivolts converts directly to milliamps) then you can bias the amp to where ever you are going to bias it. Between 30 and 40 milliamps is good. If the current rushes up to above 50 milliamps you may not have enough bias voltage

and the bias range resistor in the bias circuit may have to be lowered in value.