

Musical Concepts

PS-200

Thank you for purchasing our Musical Concepts PS-200 high-performance power supply modification circuitry.

The PS-200 is versatile. It facilitates an easy installation to fit a high-performance dual-mono power supply reservoir to your amplifier. It forms the heart of any power amp (or even a preamp) providing the real linear, dynamic power of the circuit. The PS-200 can be used with one rectifier bridge and two filter caps as a “stereo” power supply leaving half of the board blank or you can use the whole dual channel board for a full blown dual-mono power supply with very large amounts of capacitance. It is easy to set up with your original transformer, with dual transformers such as our Musical Concepts TP-500 kit or the Musical Concepts dual-wound TP-200 transformer. Clearly it allows a cost-effective, high-performance power supply upgrade or State-of-the-Art performance with exotic parts.

APPLICATION

Though the intended “home” of the PS-200 was envisioned to be the Hafler DH-200, DH-220 or XL-280. One can see that, room allowing, it will be useful in many power amps where it’s small size would make installation a breeze. Also the PS-200 could be used to fabricate a very robust raw power supply for a tubed preamp or power amp. In fact, voltages up to 550VDC can be supported. Imagine using one side of the PS-200 for the heater voltage and the other for high voltage B+.

DESIGN PROCESS

In many ways the PS-200 is the result of years of listening and experience but the impetus for this particular design is the result of more recent changes in the landscape of high-performance power supply capacitor technology. The PS-200 is adaptable to two types/sizes of capacitors. There is accommodation for caps with directly soldered pins instead of older style mounting screws. The board layout fully exploits super-performance, low ESR/ESL four-pole capacitors such as the Jensens from Denmark. This board makes installation of such capacitors an easy task removing the confusion of hand wiring. This new path to ultra high-performance has never been available in more compact form nor has it been easier to install.

The “inverted” circuit board design of the PS-200 leads to shorter, more direct wiring which is always important in reducing the inherent inductance of a circuit thereby improving the sense of speed and focus. You’ll notice that the copper tracks on the PS-200 board are duplicated on top and bottom of the board. This increases the current that can be handled.

We used superior Hyper-Fred rectifier technology in a new, convenient packaging that facilitates the small size, yet powerful impact of the PS-200. The compact, yet powerful diode bridges use soft-recovery technology and very fast switching. The rectifiers are so efficient that there is very little heat rise even after hours of hard use.

POWER SUPPLY CAPACITORS

The standard capacitor package consists of two (or four) 27,000uF/80V capacitors which replace the standard 10,000uF caps as used in the Hafler DH-200/220. Though we call these “standard” they have been custom designed for Musical Concepts. The Jensen option is a pair (or four) of 10,000 uF/80V (63V for some applications) capacitors for the highest performance. At first you might wonder why the 10,000uF cap is better, but if you trust your ears you’ll understand quickly. The improvements are greatly improved inner detail, wider dynamics at any volume level and greater ambience. The degree of spatial clues and rock-solid image focus is very impressive. The sound is more liquid and delicate, yet at the same time revealing of subtleties in a naturally warm manner. Because of the minimal inductance of the high-performance caps the high end takes on a new power, sweetness and purity that can best be appreciated by hearing the results and not by mere words.

DISCLAIMER

Musical Concepts accepts no responsibility for damages, direct or consequential, resulting from this modification. The user solely determines his or her own ability to properly install this product and understand safe technique. Musical Concepts accepts no responsibility for personal injury or death resulting from electrical shock hazard.

SOLDERING NOTES

We recommend that you have some soldering experience before attempting this modification. We remind the veteran that your solder should be **fresh**. We provide 63/37 eutectic alloyed rosin core solder. **Some so-called audiophile silver solders that we have evaluated will devastate the sweet delicate sound of the PS-200. Make sure you are a total "solder genius" before substituting for the supplied solder.**

TOOLS REQUIRED

- Three prong, grounded, 25 to 45 watt soldering iron which has quick heat recovery ability
- **Fresh 63/37 eutectic rosin core solder--provided (This solder contains lead)**
- Needle nose pliers, diagonal cutting pliers, wire strippers, screwdrivers
- 1/4 inch nutdriver or 1/4" socket with extension
- Multimeter

INVENTORY - WHAT'S IN THE BOX

1 - PS-200 circuit board
2 or 4 - power supply caps[Jensen 10,000uF/80V or 63V four-pole or other provided four-pin caps]
1 or 2 - 5-pin power rectifier
5 - 1/4 inch metal standoffs
5 - #4-40 x 5/8 inch screws with nuts for attaching standoffs to amplifier chassis
5 - star washers to make ground contact to chassis
misc - lengths of flexible wire, stiff black wire, solder

NOTE: Some of you might be confused by the terms "four pole" and "four pin". High performance four-pole capacitors have four different internal connections. Four pin, snap-in capacitors have two active pins with internal connections and two others, not connected into the circuit, that only help to make a stronger mechanical connection to the pc board. .

INSTALLATION INSTRUCTIONS

These instructions pertain to the installation of the PS-200 into Hafler DH-200, DH-220 and XL-280 amplifiers. However you will see that they are adequate to give you an understanding of how to use the board in other installation situations.

We recommend that you read through the instructions before beginning to determine if you'll need the assistance of an experienced friend or professional installation by Musical Concepts. ***Musical Concepts installations include a 1 yearParts and labor warranty. Parts contained in this kit do not have a warranty after being soldered. Kits do not have a labor warranty.***

IMPORTANT: These instructions presume that you are modifying a stock power supply. If yours is modified you still follow the basic procedures. Certain instructions may pertain only to specific amplifiers. These instructions will be proceeded by [DH-200] etc. Unlabeled instructions are for all amps.

IMPORTANT: Read each step completely before starting work for that instruction.

CUSTOM APPLICATIONS: If you are using the PS-200 for special purposes such as a tubed amplifier, doubling up on capacitance, etc. you will want to go directly to page 8 to see special installation notes!

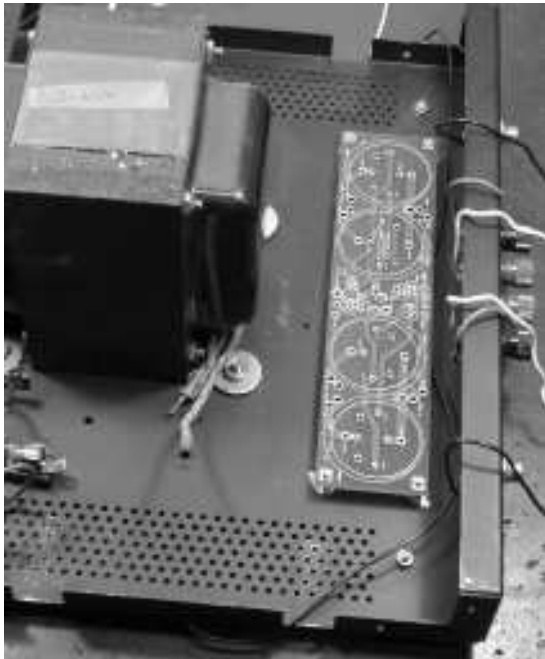
1.() Turn unit off, remove all connecting cords and disconnect AC plug from wall socket.

2.() Remove all screws holding the top cover in place and remove the top cover. A 1/4" nutdriver is the best tool for this on most amps. The screws holding the top cover on the DH-200/220 and XL-280 are between the heatsink fins

You'll need to remove the original power supply caps, their clamps and the bridge rectifier(s), square block with four lugs, before proceeding with installation.

3a.()[Hafler DH-200 and DH-220] First remove the two screws on top of each large power supply can. There are two screws on the side of the clamps that holds each can into the amp. Loosen those and remove the caps. Then remove the clamps. If those side clamp screws are too hard to get at then remove the caps with the clamps attached. **Note: In the next actions you should record where you removed wires, i.e. one goes to the capacitor ground link and two go to the rectifier block, ground wires go to the center "star ground", etc.** Now it is easy to get to the power rectifier bridge and remove two leads from it which emerge from the power transformer. If these wires are plenty long you can just clip them off, but if they're short, as you see in the amplifier below, we recommend that you desolder them to retain as much usable wire length as possible. There is a third transformer wire which is connected to the wire link which previously connected the two capacitors together. Remove it from the link. While you're at it you can clip all the other wires loose from that link. Finish this step by removing the bridge rectifier and remaining attached wiring.

3b.()[Hafler XL-280] You will need to remove the four power supply caps and power supply pcb from the amp. In addition there are two bridge rectifiers, square four-lug parts, bolted to the chassis which are to be removed. You can follow the advice from step 3a and remove these parts. Another issue is that the power transformer has two extra lead wires(blue). These need to be removed and taped off- completely electrically isolated from each other and the chassis.



4.() Clean out the area where the caps and rectifier were installed and select the PS-200 board. Place it into this area with the silkscreen legend MUSICAL CONCEPTS PS-200 closest to the rear of the amp. With the DH-200 and 220 you will find that the front holes in the PS-200 line up with the outermost holes for the original capacitor clamps. So there you already have two holes that you don't have to drill. Keeping the board in line with these holes take a marker and draw outlines for the two rear holes and the central CH GND hole. Remove the board and drill these out with a 1/8" or 9/64" bit. Deburr the holes by using a larger drill bit, file, Dremel, etc. Use your preferred tool to scrape the paint from the chassis around each of the holes.

5.() The rest of the procedure will be easier for you if you remove the remaining screws from the heatsinks and let them lie down to the side of the amp. A couple of small towels can protect the cosmetics if you wish. You may need to unsolder certain wires for this depending on how the amp was originally built. Just keep track of the original attachment points for reattachment purposes. Take a few pictures with your digital camera for reference.

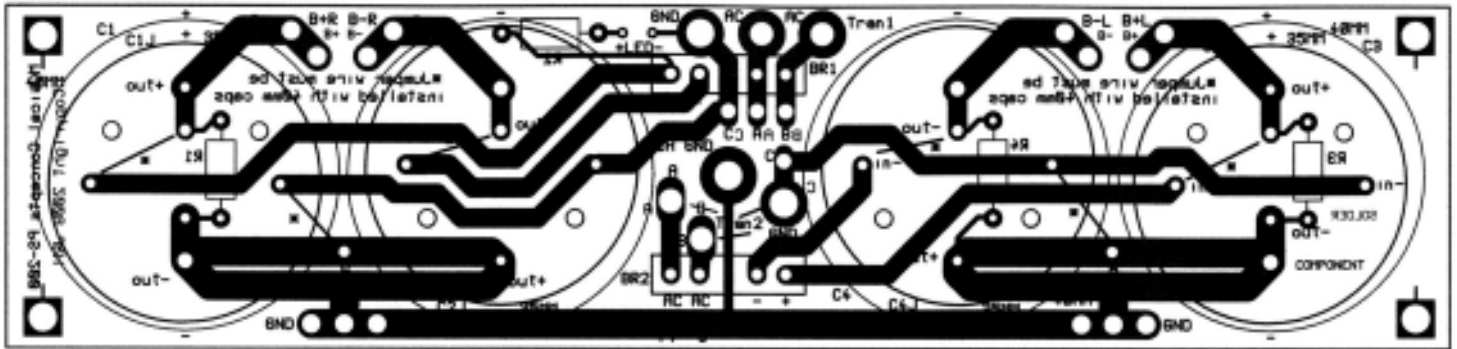
6.() Select the five provided screws, star washers and threaded standoffs. Install the screws from below the chassis. On the inside put the star washer and then the standoff onto the screw. Repeat for the other four. Now temporarily put the PS-200 board over the screws to make sure everything lines up. Keep the PS-200 in place as you tighten each of the five screws. Make them tight but don't get too forceful and strip threads. Hopefully the PS-200 can now be removed easily or maybe you'll have to slightly adjust a few of the screws to make removal easier.

Now is the time to partially populate your PS-200 board.

7.() This step is for those who have purchased the board with the “standard” caps. **If you have Jensen caps move on to step 8.** When used with standard two pole, four pin caps it is necessary to connect six jumper wires on the “bottom side” of the board. You’ll see these six jumpers indicated by straight white lines denoted with an asterisk. Select the stiff black wire, cut to length as needed and install in the appropriate holes. Some of the wires will cross other foils. Make sure you can see a bit of space between the bare wire and the other foils. Now solder solidly in place. Turn the board over and using a side cutter plier trim the wires nearly flush to the component side of the board. Refer to provided diagrams.

8.() On the underside of the board, side with the least silkscreen labeling, you’ll see that there is provision for four resistors. These are designed to “bleed down” energy from the power supply capacitors if you were to have a fuse fail on the voltage rails. It can be a nasty surprise to see a big flash when you install a new fuse even though your amp may have been turned off all night or even days. Most of you will never need the resistors, but better safe than sorry as they say. Install the four included resistors from beneath the board while making sure that there is a bit of space, about 1/16”, between the board and the resistors. This will help to minimize any heat build-up. Remember, you don’t want these to hit the amp chassis when you permanently install the board. Solder in place and trim flush to the top side of the board.

Below you see the PS-200, from the top/capacitor side, as if the board were transparent or you have x-ray vision. Note the four resistors with reversed lettering denoting their bottom side position.



9.() Near the middle and top you see two empty holes with the legend “LED” under them. These eyelets are provided in case the PS-200 is to be used with other amps or even custom projects. An LED can be provided with operating current from those eyelets. For those who don’t need the LED(all Haflers) it is important to select one of the wires clipped during the resistor installation and install it as a jumper wire from the + and - holes. Install from either side of the board, solder and clip wires.

10.() **NOTE: If you are building a dual-mono version go to step 11. This step is for a stereo power supply.**

Now select the two main filter capacitors whether they be the four-pole or four-pin type. You will install them at C1 and C2. The filter caps can be easily installed because each type has a distinctive pin pattern so that they cannot be confused. One board hole for each cap is shared for both type of caps. Put the cap on a table with the pins pointing upward. Now fit the PS-200 board to the cap with the outline drawing facing against the bottom of the cap. Find the right holes for the cap and push the board onto the pins. Straighten any pins that require it. While holding the board as perpendicular as you can, solder at least two of the pins. Now inspect the assembly and see if the position needs any adjustment. Now solder the last two pins. Repeat for other cap putting the cap on the same end of the board with the other. As you install the caps look them over carefully and adjust for best appearance and geometric position. You know, make it look nice. We will put off installation of the rectifier until a later step.

11.() We tricked ya! Actually what you are doing in this step is just a repeat of the above step, only you are installing four capacitors.

Now it's time to decide how to install the board. Some of you may want to proceed in your own way. We have left the rectifier bridge(s) off until now, because we freely admit that this board is very small, working room is tight especially in the dual-mono version and you may want to install the rectifier(s) after you have connected the wires from the power transformer.

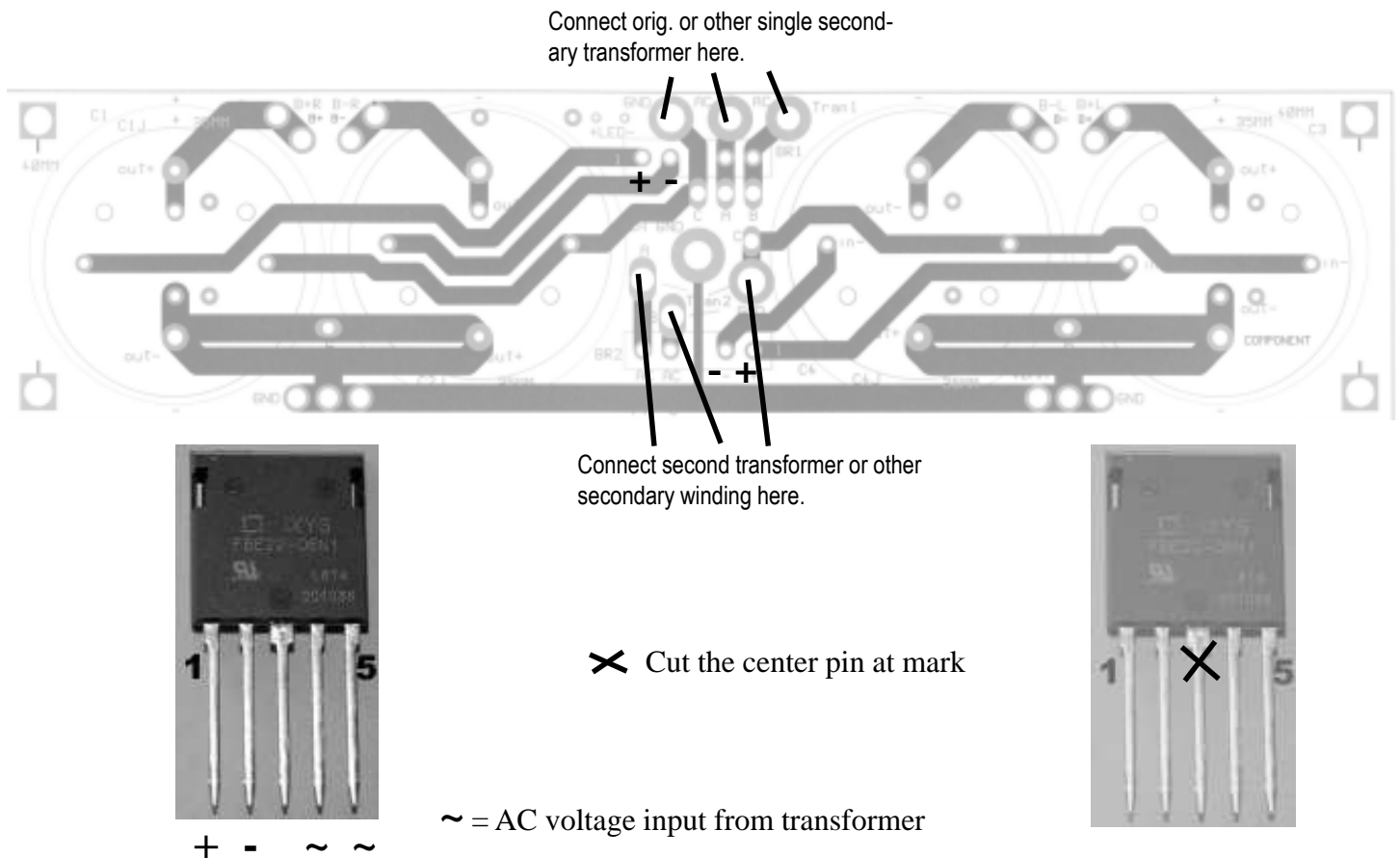
Here's how we proceed:

If you have the standard Hafler transformer or another transformer with only a single secondary winding it is necessary to install three jumper wires on the bottom of the board if you are configuring for a dual-mono version. This might include a transformer with two separate secondary windings where you combine two of the wires to make a "center tap". Dual transformers or dual secondary transformers like our TP-200 do not require jumpers.

12.() **If you have a dual secondary transformer, twin transformers or you're only stuffing one side of the PS-200 you must skip this step.** Select the stiff black wire, cut lengths to connect eyelet A to eyelet A, B to B and C to C. Install these on the bottom of the board while remembering that there will be a standoff in the middle underside of the board that you need to avoid. Solder the wires into place and trim the wires on the top.

Special note: You have probably looked over the PS-200 board by now and wonder why the transformer connection holes are so big. Well some transformers may have two wires twisted together for some connections, especially the ground wire. Remember that the PS-200 was designed with custom installations in mind too. If your wiring is much smaller than the holes just solder as best as you can. You need not fill the entire hole with solder.

13.() If you have a single secondary transformer, like the stock Hafler, it's three secondary wires will be connected from the top of the board to eyelets labeled "AC", "AC" and "GND" nearest to the transformer. You might be able to lay the PA-200 assembly on top of the transformer while you make the solder connections and trim excess wire length from the solder joints. If you have dual-wound or separate transformers you will connect the other winding to the larger eyelets labeled "A", "B" and the other "GND" nearest to BR2. Make sure you have the proper wires in each eyelet!!! For the stock Hafler transformers you have two reds for AC and a red/yellow for ground(GND). For our TP-200 transformer there are two separate windings with red and orange as the AC wires and the twin conductor yellow wire as the GND. On the TP-200 these are 'grouped' nearby to each other



14.() Okay, now you have the transformer connected so it is time to install the bridge rectifier(s). Select a rectifier. The pinout is shown above with Pin 1(left) proceeding in order to rightmost Pin 5. You've probably figured out that the center pin must be clipped off since there is no hole in the board for it. Clip it off at the "shoulder" just about 1/4" off the body of the device as shown. You'll see that the silk screen outlines on the PS-200 board indicate Pin 1. Install the rectifier, Pin 1 on rectifier to Pin 1 on the board, with the cut center pin sitting about 1/8 - 1/4" off(above - not touching) the board. Solder in place and trim the wires. If your installation requires twin rectifiers then install the second one just like the first. The labeled sides will face each other.

Okay here is where you evaluate your options and make a decision. You can install the board and solder wires to it while it is in place or presolder new wires to it and simply remove and replace the original power supply connecting wiring. No doubt some will prefer the latter since all the soldering, at least to the PS-200, is done while you can move the board around. We'll loosely define these approaches in the following steps. Refer to diagrams for more information.

15.() Now carefully install the PS-200 over the mounting screws/standoffs and put a few nuts in place to hold it. It is a little tight to get the wires soldered to the ground posts at the rear of the board. Be careful to keep from burning the insulation on the filter caps while soldering. We want them pretty, right! While we could go on step by step here concerning the wiring, it seems that the info below is what you'll need to get the job done.

Note: With the DH-200 and DH-220 you leave the chassis mounted twin fuses in place and connect the wiring from the PS-200 to the input side of the individual fuses. You could just shorten the original wires and solder them appropriately.

Important: If you have stuffed only half of the board and you have caps at C1 and C2 of the PS-200 then it is necessary to connect the PS-200 B+ and B- right and left voltages to each driver board - dual eyelets are provided for this. Alternately you can run a wire from a B+ right eyelet to B+ left and same for the B- as shown on the "Custom" page. Then you can connect the boards as shown below.

16.() Fit remaining nuts to the PS-200 board and tighten them securely.

B+ right ch. - connect to:
PA-XX = eyelet 3

For stock front-end boards -
DH-200 = eyelet 4, via fuse
DH-220 = eyelet 3, via fuse
XL-280* = eyelet 4

B- right ch. - connect to:
PA-XX = eyelet 12

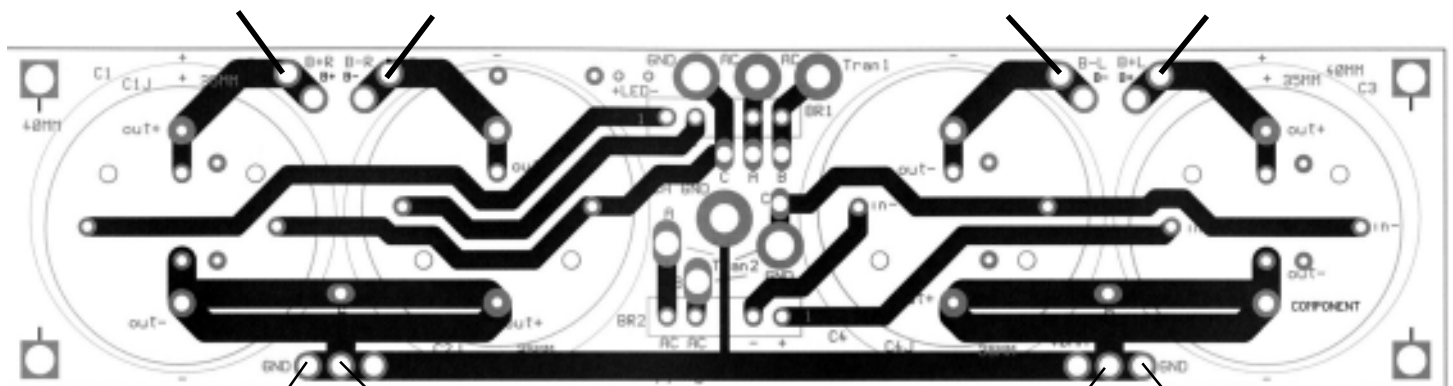
For stock front-end boards -
DH-200 = eyelet 13, via fuse
DH-220 = eyelet 10, via fuse
XL-280* = eyelet 11

B- left ch. - connect to:
PA-XX = eyelet 12

For stock front-end boards -
DH-200 = eyelet 13, via fuse
DH-220 = eyelet 10, via fuse
XL-280* = eyelet 11

B+ left ch. - connect to:
PA-XX = eyelet 3

For stock front-end boards -
DH-200 = eyelet 4, via fuse
DH-220 = eyelet 3, via fuse
XL-280* = eyelet 4



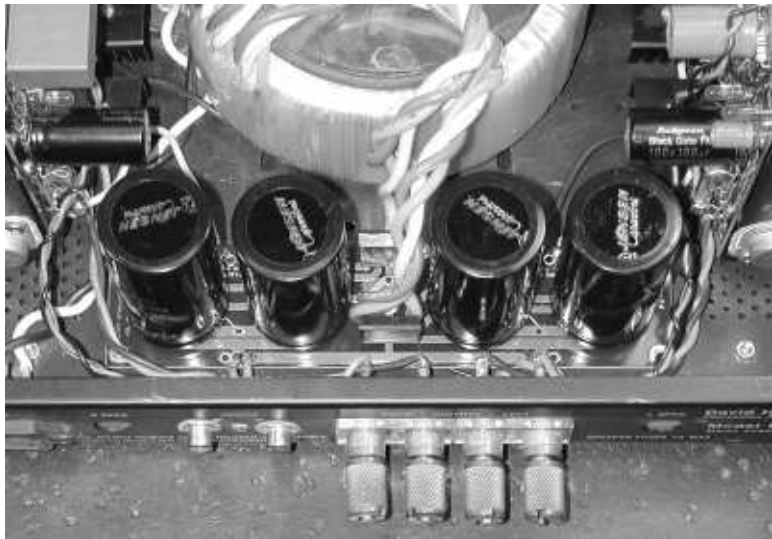
To eyelet 7(ground) of right ch. driver board PA-3(X) we hope. **If you have the stock front-end boards -**
DH-200 = eyelet 5
DH-220 = eyelet 7
XL-280 = eyelet 8

To right ch. speaker ground binding post(black post)

***Due to the B++ and B-- power supplies of the XL-280 it is required to clip the wires off eyelet 5 and 10 at each driver board and leave them off.**

To left ch. speaker ground binding post(black post)

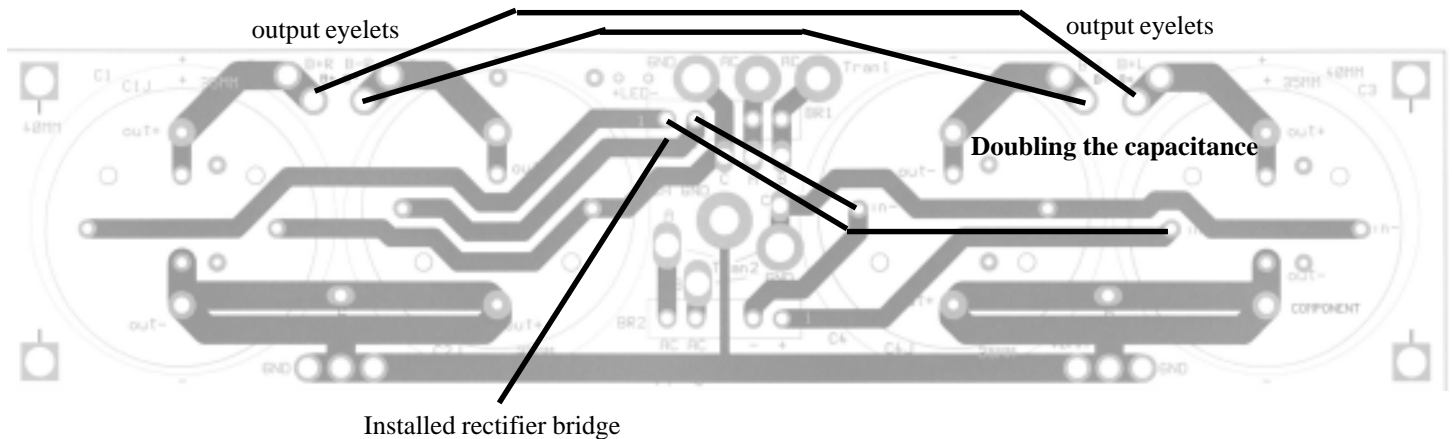
To eyelet 7(ground) of left ch. driver board - PA-3(X) we hope. **If you have the stock front-end boards -**
DH-200 = eyelet 5
DH-220 = eyelet 7
XL-280 = eyelet 8



Musical Concepts PS-200 custom installation information

The PS-200 lends itself to several custom scenarios. Here are guide lines, not perfectly specific instructions, but it should be adequate for those willing to go “custom”.

“I want more capacitance. Can I double up the amount?” ----- Not to worry, YES! Here is how you would do that. Install only one rectifier in the PS-200. Stuff all four capacitors - connect a wire on the underside from pin one of the installed rectifier to the pin one hole for the uninstalled rectifier bridge. Repeat for pin 2. See suggestion below. Now run two more wires beneath the board as shown between B+(L&R) and B-(L&R) eyelets. You can tuck these neatly beneath the PS-200. Done! Now you can get your B+ and B- voltages at either side of the PS-200 output eyelets. We have already tried this and it works beautifully!



“I want to use the PS-200 for my tubed preamp and amp projects.” ----- We’ve got you covered. This is something only experienced builders may want to try. You will need to install both rectifiers if you want to derive B+(-) and “heater” voltages too. Since few tube products use a negative voltage power supply I recommend that you install one cap, say the B+ high voltage part, at C1. If your application does require a negative voltage, then install a cap at C2. A four-pole cap is sonically superior. A good four-pin part is okay, but make sure C1 and C2 are identical capacitors unless you’ve “engineered” the values. You will take your high voltage B+ and B- voltages at the output eyelets between C1 and C2.

Now install the “heater” capacitor at C3. A four-pin cap, large value / low voltage, standard performance, is all you need for this application. Take your output voltage from the B+ output eyelet near C3.

While there are other ways to connect the rectifiers to accommodate various transformers, we will leave this to the intrepid experimenter. At some date we will have a web page at www.musicalconcepts.com/ps200custom.htm to show off custom installations and provide information on customized connections.

This information is provided for those that know how to work with high voltages. Novice builders should understand that working with electronic components can be dangerous. Be careful. High voltage shocks hurt or kill!!!!!!!!!!