

Musical Concepts

PS-100

Thank you for purchasing our Musical Concepts PS-100 high-performance power supply modification circuitry.

The PS-100 is versatile. It facilitates an easy installation to fit a high-performance stereo 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. It is easy to set up with your original transformer, toroid transformers such as our 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

The PS-100 is envisioned for use in the Hafler DH-200, DH-220 or XL-280. One can see that, room allowing, it would be useful in many power amps where it's small size would make installation a breeze. Also the PS-100 could be used to fabricate a very robust raw power supply for a tube preamp or power amp. In fact, voltages up to $\pm 550\text{VDC}$ can be supported. Imagine using one side of the PS-100 for a negative heater voltage or (B-) and the other for high voltage B+ though this disparate voltage application would require separate off-board rectifiers.

DESIGN PROCESS

In many ways the PS-100 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-100 is adaptable to three types/sizes of capacitors. There is accommodation for caps with directly soldered pins instead of older style mounting screws. Two pin and four pin snap-in caps are accommodated. The board layout fully exploits super-performance, low ESR/ESL four-pole capacitors such as the Jensen Capacitors 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 construct.

The "inverted" circuit board design of the PS-100 leads to shorter, more direct wiring which is always important in reducing the inherent inductance of circuit wiring thereby improving the sense of speed and focus. You'll notice that the copper tracks on the PS-100 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-100. The compact, powerful diode bridges use ultra 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 10,000uF/80V capacitors which replace the original 10,000uF caps as used in the Hafler DH-200/220. If required we can provide the board with two Premium 4-pin 15,000uF/80V caps. 10,000uF/100V caps for the DH-500 are available too. The Jensen option is a pair of 4-pole 10,000 uF/80V (63V for some applications) capacitors for the highest performance. 6800uF/100V Jensen are available too. At first you might wonder why the lower capacitance Jensen cap is better, but if you trust your ears you'll understand quickly. The improvements are greater inner detail, wider dynamics at any volume level and glorious 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. Yes, high frequencies are dynamic and powerful too which often separates the 'real' from the 'reproduced' quality in a system.

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-100. Make sure you are a total "solder genius" before substituting for the supplied solder.**

TOOLS REQUIRED

- Three prong, grounded, 25 to 60 watt soldering iron which has quick heat recovery ability
- Fresh 63/37 eutectic rosin core solder--provided (**Solder contains lead - use in well ventilated area**)
- Needle nose pliers, diagonal cutting pliers, wire strippers, screwdrivers
- 1/4 inch nutdriver or 1/4" socket with extension
- Multi-meter

INVENTORY - WHAT'S IN THE BOX

- 1 - PS-100 circuit board
- 2 - 2 pin snap-in power supply caps[Jensen four-pole caps or four-pin caps provided with other models]
- 1 - 5 pin SIP Hyper-Fred power rectifier
- 4 - 3/8 in. high metal standoffs, one may have a different appearance
- 4 - #4-40 x 3/4 inch screws with nuts for attaching standoffs to amplifier chassis
- 4 - star washers, one of these is a solder lug
- 1 - rectifier clamping clip with hardware(1-#4-40 x 3/8" screw, 1-#4-40 KEP nut(integral lock washer).
- MISC - lengths of hookup 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, Those extra pins only help to make a stronger mechanical connection to the pc board.

INSTALLATION INSTRUCTIONS

These instructions pertain to the installation of the PS-100 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 year Parts and Labor warranty. Parts contained in this kit do not have a warranty after being soldered. Parts contained in the kit cannot be returned for refund or credit 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 preceded by [DH-200] etc. Unlabeled instructions are for all amps.

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

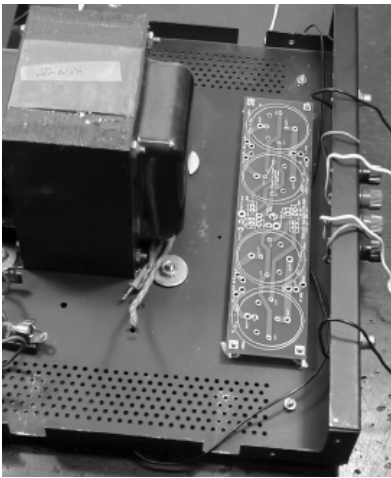
1.() Turn unit off, remove all connecting cords and disconnect AC plug from wall socket.

2.() Remove all screws securing the top cover and remove the it. 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 with their clamps. Also remove 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 many amplifiers, 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 the area where the caps and rectifier were installed and select the PS-100 board. Place it into this area with the silkscreen legend MUSICAL CONCEPTS PS-100 closest to the rear of the amp. You do have some leeway in how you position the PS-100. Clearly you should position it centered from side to side but the front to back location can be your choice. We recommend installing it more toward the rear as it would allow cleaner installation of an alternative power transformer like our TP-200. When you resolve the location mark out the four required holes. 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. Scrape the paint off the inside of the chassis at the right rear hole of the PS-100 for a clean ground point.

5.() Select the four provided 3/4" screws, star washers and threaded standoffs. You will install the screws from below the chassis. If one of the standoffs is heavier than the other three use it for the right rear position. On the inside put the star washer (lug at right rear hole) over the screw and then spin the standoff onto the screw. Slightly tighten the screw with the solder lug pointing toward the right (nearest side of amp). Repeat for the other three standoffs with the standard (round) inside star washers. Now temporarily put the PS-100 board over the screws to make sure everything lines up. Keep the PS-100 in place as you tighten each of the four screws. Make them tight but don't get too forceful and strip threads. Hopefully the PS-100 can now be removed easily or maybe you'll have to slightly adjust a few of the screws to make removal easier.

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 or a cell phone for reference if you like.

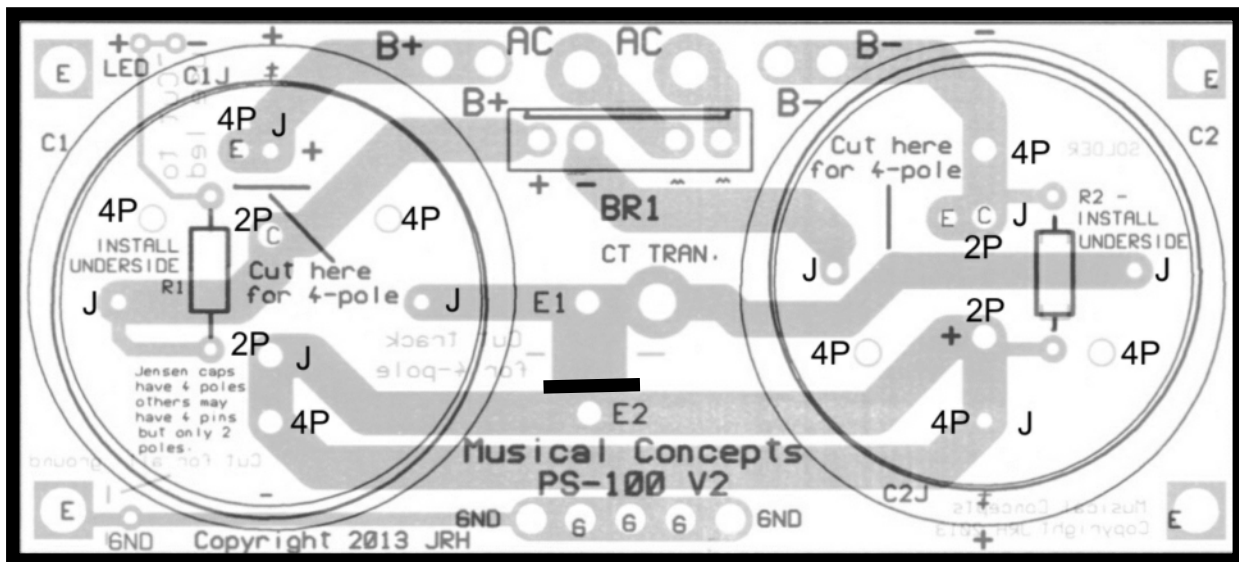
6.() **IMPORTANT NOTE:** You just installed a ground lug on the right rear hole for the PS-100. This is a tie off point for input grounding. With our PA-XX driver boards there is an eyelet (typically 13) which is grounded back to chassis ground, not the RCA jack ground tabs. Sometimes it ties to a chassis ground, other times to the star ground. These wires can be now relocated to connect to the new ground lug. This is the time to reestablish these connections.

Now is the time to partially populate your PS-100 board.

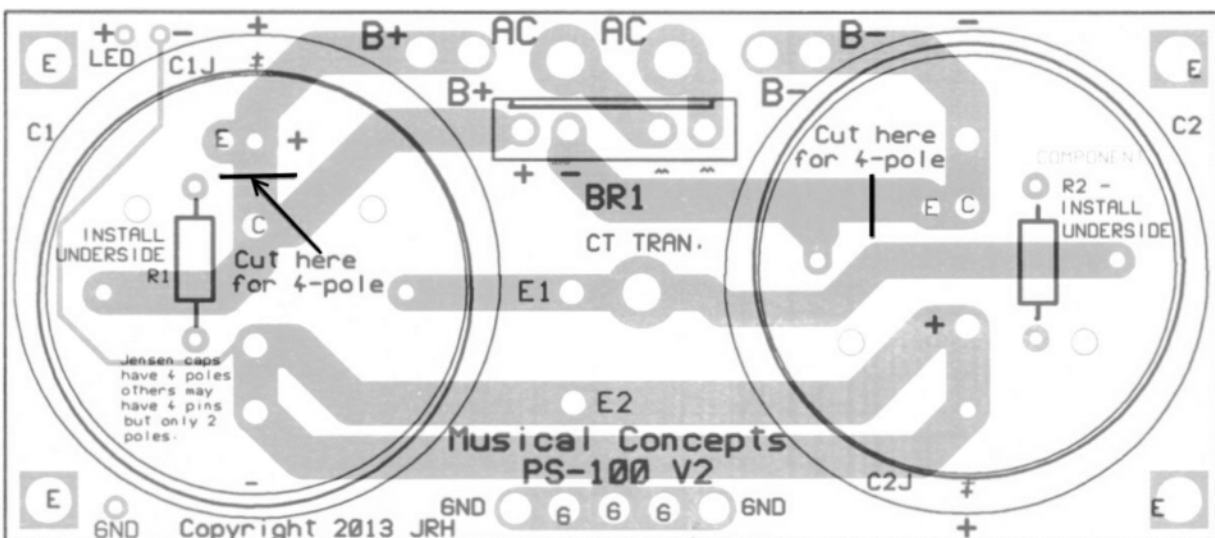
7. () This step is for those who have purchased the board with the Jensen four-pole caps. **If you have standard caps move on to step 8.** When used with the Jensen 4-pole caps it's necessary to make cuts in two spots on the "top/component side" of the board plus one cut on the bottom side. You'll see these three cuts indicated by straight lines with descriptive text. Cut with a Dremel tool, razor knife, etc right where the silkscreen indicates on the top side in two spots. Then cut foil on bottom side in a single spot indicated by heavy line in image below. Make sure you can see a bit of space between the foils you've severed. Refer to provided images.

8. () On the underside of the board, side with the least silkscreen labeling, you'll see that there is provision for two resistors, R1 and R2. These are designed to "bleed down" energy from the power supply capacitors if you were to have a fuse failure on a voltage rail. It can be a nasty surprise to see a big damaging flash when you install a new fuse even though your amp may have been off all night or even days. Most of you will never need the resistors, but better safe than sorry as they say. Install the two included resistors from beneath the board while making sure that there is a bit of space, about 1/8", between the board and the resistors. This will help to minimize any heat build-up. **IMPORTANT** >> you don't want these to hit the amp chassis when you permanently install the board. Solder in place and trim the lead wires flush to the top side of the board.

Below you see the PS-100, from the top or capacitor side, as if the board were transparent or you have x-ray vision. Note the two resistors with reversed lettering denoting their bottom side position.



The two cuts for the topside are indicated below.



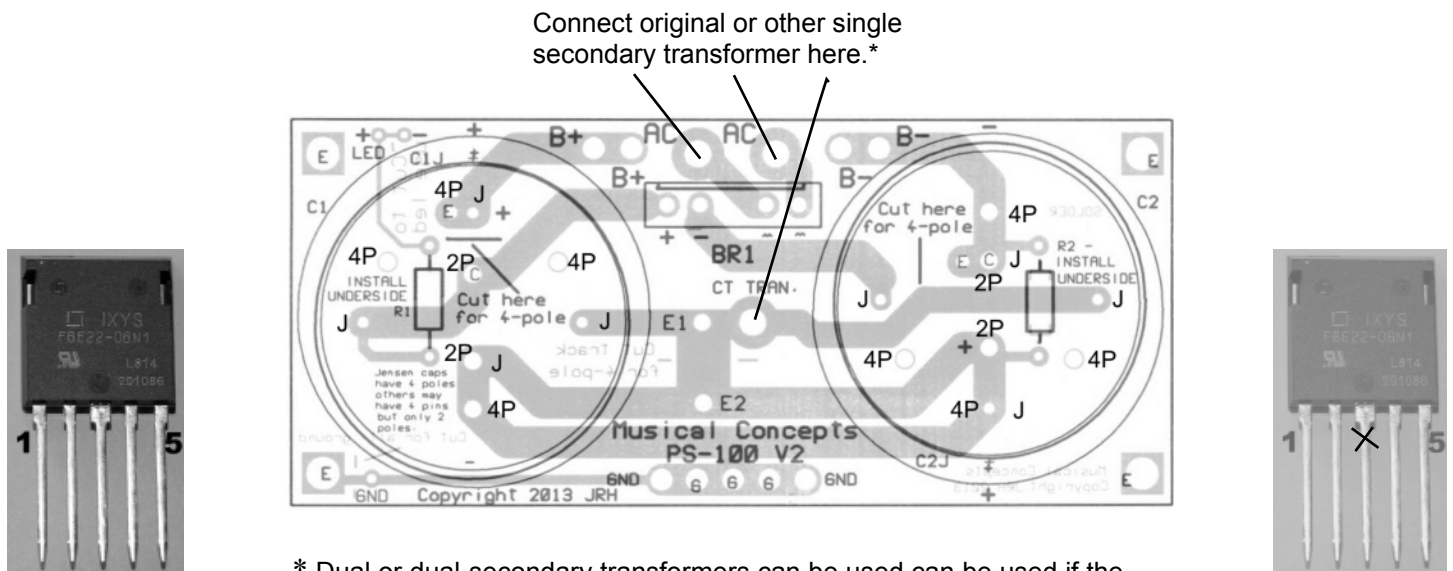
9. () Near the upper left above, front-right installed, of the board you see two empty holes with the legend “LED” near them. These eyelets are provided in case the PS-100 is used with other amps or even custom projects. An LED can draw operating current from those eyelets. For those who don’t need the LED(all Haflers) do nothing. If you want to power an LED cut the tiny foil connecting LED + and -. Wire your LED with anode terminal to +.

10. () Now select the two main filter capacitors whether they are the four-pole, four-pin or two-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. The board is labeled to indicate the holes for each type. J is for Jensen, 4P is for 4-pin(not 4-pole) and 2P is for standard snap-in 2-pin caps, In the case of two pin caps they have a distinctive “-”(minus or ground) sign. One board hole for each cap is shared for different type of caps. Fit the caps to the PS-100 board with the outline drawing facing against the bottom of the cap. Find the right holes for the cap and push the pins into the board. Straighten any pins that require it. While holding the board as perpendicular as you can, solder at least one of the pins. Now inspect the assembly and see if the position needs any adjustment. Now solder the remaining pins. Repeat for other cap which will be “reversed” compared 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.

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 off until now, because this board is small, working room is tight and you may want to install the rectifier after you have connected the wires from the power transformer. If you prefer to install it first then just reverse the following two steps.

Special note: You have probably looked over the PS-100 board by now and wonder why the transformer connection holes are so big. Some transformers may have two wires twisted together for some connections, especially the Center Tap, CT ground wire. The PS-100 was designed with custom installations in mind. If your wiring is smaller than the holes just solder as best as you can. You need not fill the entire hole with solder.

11. () If you have a single secondary transformer, like the stock Hafler, its three secondary wires will be connected from the **top** of the board to eyelets labeled “AC”, “AC” and “CT TRAN”. You could lay the PS-100 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 transformer you will connect the other winding in parallel to the first winding to the larger eyelets labeled “A”, “B” and the other “CT TRAN” nearest to BR1. Make sure you have the proper wires in each eyelet!!! For the stock Hafler transformers you have two red wires for “AC” and a red/yellow for ground(CT TRAN). 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 CT TRAN. On the TP-200 these are ‘grouped’ nearby to each other. You’d put two reds in one AC hole, two oranges in the other AC hole and two large yellows in CT TRAN.



* Dual or dual-secondary transformers can be used can be used if the windings are connected in parallel or only one winding is used.

+ - ~ ~
~ = AC voltage

X - cut at mark

12. () **Read step completely before beginning work.** Select the 5-pin rectifier. The pin-out is shown on previous page with Pin 1(left) proceeding in order to rightmost Pin 5. The center pin is clipped off since there is no hole in the board for it. Clip off at the “shoulder” just about 1/4” off the device body of as shown on previous page. Silk screen outlines on the PS-100 board indicate Pin 1 or a + sign. Install rectifier, Pin 1 on rectifier to + 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. The labeled sides will face toward the center of the board.

Important installation note: You can install the rectifier against the chassis with wires bent upward and entering the PS-100 from beneath. If you believe that your application requires heatsinking of the rectifier this makes it very convenient. The metal side of the rectifier has no internal electrical connections so you can install it directly against metal surfaces or with silicon heatsink compound to aid heat transfer. If you are using the PS-100 for a Class-A amp, heater supply or other continuous high-current application then heatsinking to the chassis is essential. You have the clip to firmly hold the rectifier against the chassis. You can get the idea of how to install it by checking the pictures on the last page. Clip can be installed to one side to make a fit easier.

Okay here is where you evaluate your options and make a decision. You can install the board and solder wires to it 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-100, 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.

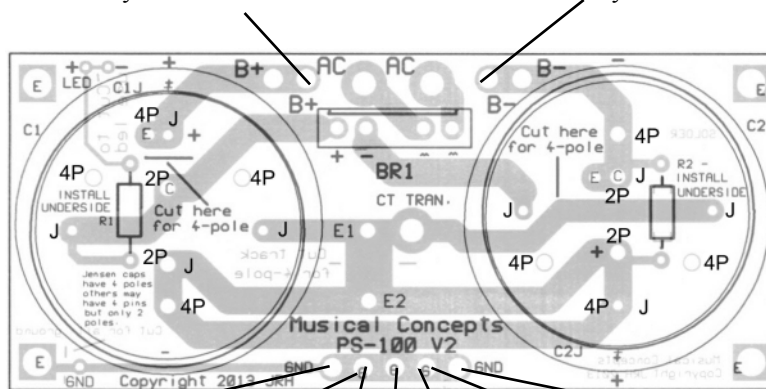
13. () Install the PS-100 over the mounting screws/standoffs. We can leave the nuts off for now so you can move it about a bit if needed. It is a little tight to get the wires soldered to the ground posts at the rear of the board. Be careful to keep from burning the insulation on the filter caps while 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 stock DH-200/220 you leave the chassis mounted twin fuseholders installed and connect the wiring from the PS-100 to the input side of the individual fuses. Just shorten the original wires and solder.

14. () Select 4 - #4-40 KEP nuts, spin them onto the screws of the PS-100 board and tighten them securely.

B+ both channels - 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- both channels - 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



To eyelet 7(ground) of right ch. driver board PA-3(X). **If you have the stock front-end boards -**

DH-200 = eyelet 6
 DH-220 = eyelet 7
 XL-280 = eyelet 8

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

If 'doubling' the caps with (2) PS-100 boards use these eyelets for appropriate channel.

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

To eyelet 7(ground) of left ch. driver board - PA-3(X). **If you have the stock front-end boards -**

DH-200 = eyelet 6
 DH-220 = eyelet 7
 XL-280 = eyelet 8

***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.**

15. () You might wish to do some testing before you connect your loudspeakers. You can measure +60 to +68VDC at the B+ eyelets and -60 to -68VDC at the B- eyelets with Hafler DH-200/220/XL-280. Those voltages are approximately 90 with the larger Hafler amps. You should always measure nearly 0VDC across the speaker terminals from each positive output to each ground. Minor variations can be adjusted out with our PA-3&4 series driver boards, the DH-220 stock boards

16. () If you've done it all correctly you should be able to turn on the amp just like you've done it previously and the only difference will be better sound and added life span for your amp. Congratulations!

Here are a few pictures of the installed PS-100 just for a visual reference. The photos have an earlier version of the board. The point is just the overall look - not as a technical connection reference.

