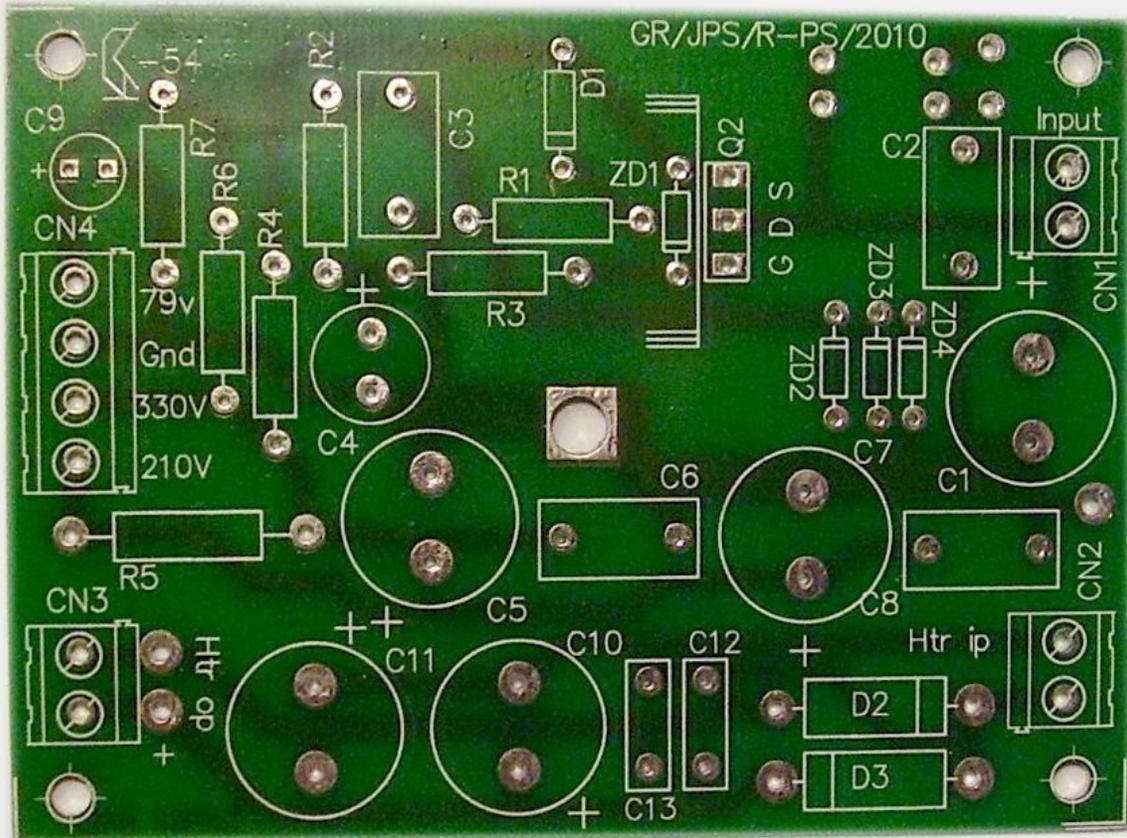


# Regulator Board

for the  
**Dynaco® PAS2, PAS3, PAS3X**

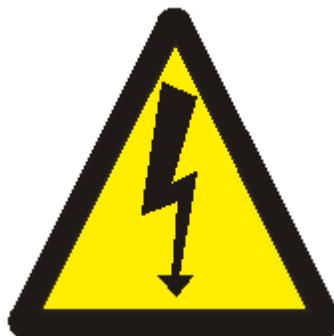


*Classic Valve Design*



Classic Valve Design assumes no responsibility for circuit or user damage from the use or misuse of these boards or any other product. We simply provide these on an AS-IS basis with workmanship quality as the only thing guaranteed at this time.

This product is designed for and use around **LETHAL VOLTAGES**. We assume the user has a reasonably competent grasp of line operated electronics at the time of sale.



The Dynaco PAS series of pre-amplifiers has been one of the most successful and popular pre-amplifiers in history. They are reliable, hold their resale value and are incredibly popular “blank slates” to modify.

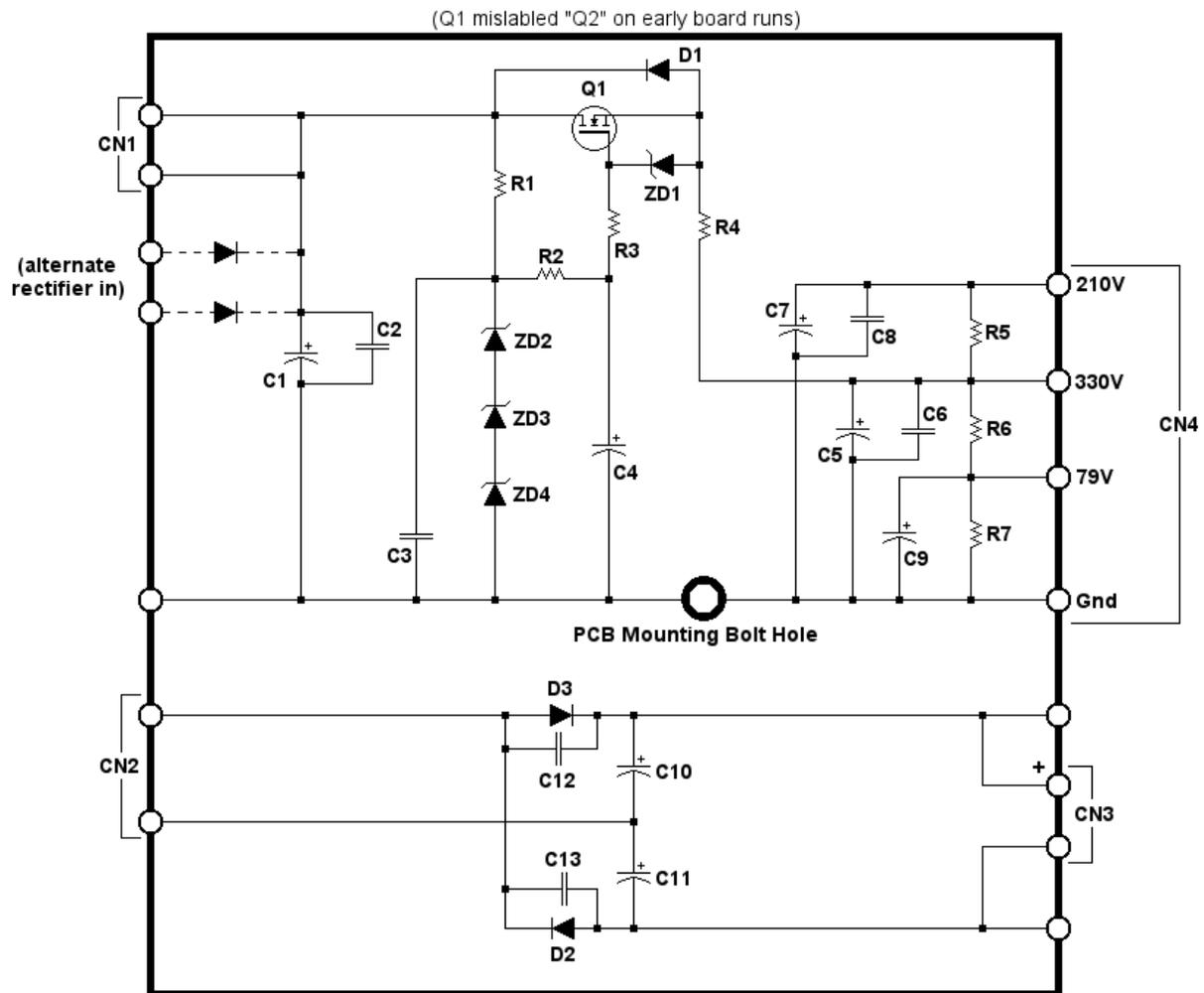
While there are plenty of upgrades for the PAS, there are far fewer options when it comes to the power supply. We offer here a what we think is the best solution to replacement of the old can cap and resistor string – a regulator.

The capacitance of the regulator board is similar to the can cap it replaces. Three reasons for this are 1) extended life of the 12X4 rectifier tube compared to just 'piling on the microfarads' and 2) letting a regulator do the work and 3) inexpensive to find components.

This regulator board also has the feature of having a low current, +79V source for “lifting” tube heaters above ground for even further reducing the chance of heater noise seeping into the circuit (use of this requires a simple modification of the stock PC5/PC6 boards).

Physical installation of this board is very simple and requires no special tools.

# The Circuit



## Parts List

**C1, C5:** 22uF, 450V electrolytic

**C2, C3, C6, C8:** 47n, 630V film

**C4:** 4.7uF, 450V electrolytic

**C7:** 47uF, 450V electrolytic

**C9:** 4.7uF, 100V electrolytic

**C10, C11:** 2200uF, 25V electrolytic

**C12, C13:** 10n ceramic disc (not required if using fast recovery diodes for D2, D3)

**R1, R2, R7:** 150K, ½W

**R3:** 1K, ½W

**R4:** 47 ohm, ½W

**R5:** 39K, 1W (use 6.8K, ½W for Norman Koren phono board)

**R6:** 470K, ½W

**D1:** 1N4007

**D2, D3:** MBR3100 100V, 3A fast recovery (1N5408 alternate. Use C12, C13)

**Alternate HV rectifiers:** UF4007 (optional – use of the 12X4 is preferred in the PAS)

**ZD1:** 1N4739A, 9.1V

**ZD2:** 1N4752, 33V

**ZD3, ZD4:** 1N5953B, 150V

**Q1:** IRF710

**Heatsink:** Aavid Thermalloy 504222B00000G or equiv.

**Hardware:** Heatsink pad, #4-40 screw, nut, lock washer and insulating shoulder washer for the heatsink, plus appropriate #8 hardware for installation (see “Installation”)

**Board Connectors:** 5 Terminal blocks, 5.08mm, 2 position PCB.

This board will have size constraints on the capacitors and a few other components, due to the small nature of the PCB and the installation height allowance. The following were the capacitors we used on our own prototype for exact fitting:

**C1, C5:** Digikey # 565-1249-ND

**C2, C3, C6, C8:** Digikey # EF6473-ND

**C4:** Digikey # 565-1420-ND

**C7:** Digikey # 565-1253-ND

**C9:** Digikey # 565-1363-ND

**C10, C11:** Digikey # 565-1064

**C12, C13:** Digikey # 1460PH-ND

**Heatsink:** Digikey # HS104-2-ND

Note the heatsink is actually designed for two TO-220 devices. The extra fin area is used to keep the single MOSFET cool in the poorly ventilated chassis of the PAS.

It should be noted that when choosing a capacitor for C10 and C11, high ripple current rating will be very important here, as these work as a voltage doubler.

## **Using the 79V Heater Lifting Supply**

This is an optional feature of our regulator that allows you to lift the heaters of the tubes you are using (most likely 12AX7) off of ground for further reduction in noise.

The PAS already uses DC heaters and “floats” them for noise isolation. Sometimes on the main board, PC-5, a ground wire is connected to eyelet #20 for a DC return path to ground.

If you have upgrade boards in your PAS that have completely isolated from ground heater traces, all that is needed to use the heater lift feature is a small jumper from “79V” to any pin on CN3, the DC heater outputs.

For the stock Dynaco PC-5 and PC-6 boards, remove any wire that is connected to eyelet #20 on the PC-5 board and a small modification is needed to the PC-6 board as follows on the next page.

After performing this modification, add the small jumper from “79V” to any pin on CN3, the DC heater outputs.

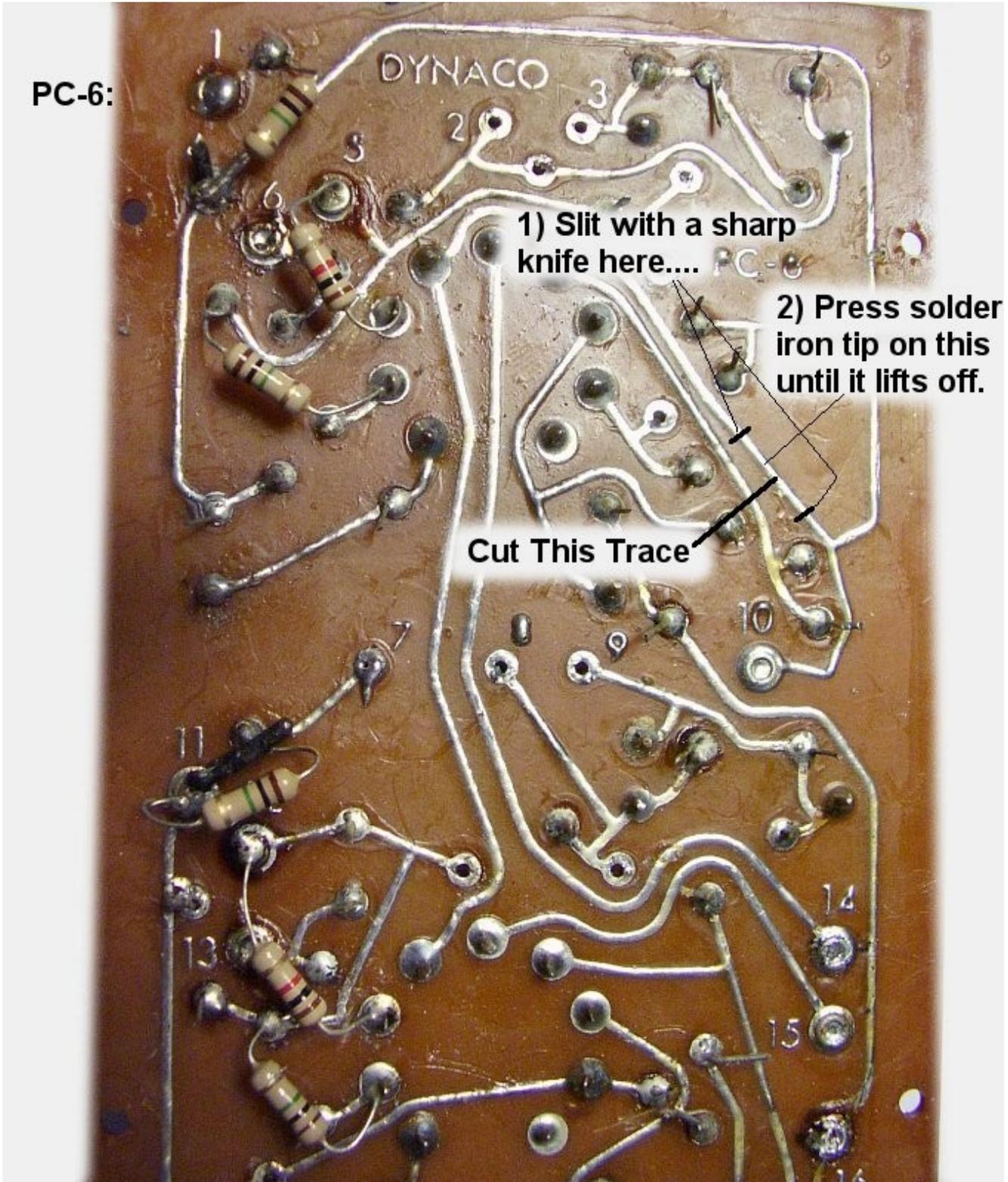
PC-6:

DYNACO

1) Slit with a sharp knife here....

2) Press solder iron tip on this until it lifts off.

Cut This Trace



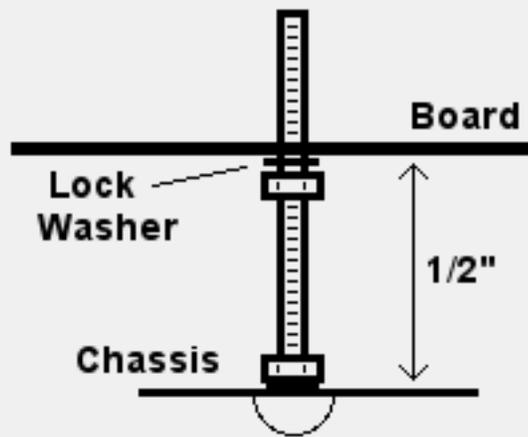
## Installation

Installation of the board is simple and only requires simple hand tools found on any electronics bench.

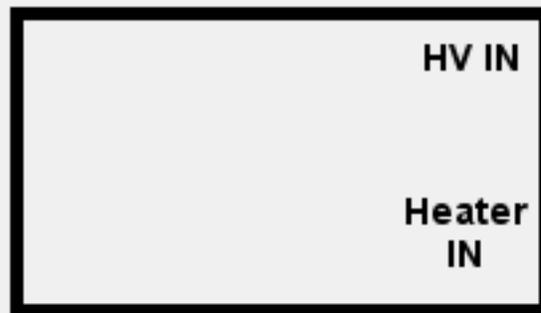
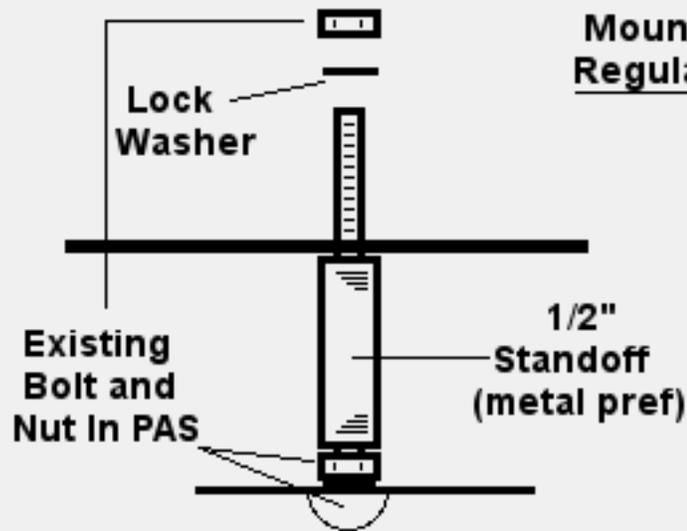
For a stock Dynaco PAS:

- 1) Remove the retaining nut clamping down the rectifier and large capacitors used for the DC heater.
- 2) Remove the wires attached to the capacitors and rectifier and pay special attention to:
  - The twisted pair that go to the 12X4 heater
  - The heater supply wires out of the PA-211 power transformer
  - The black wires that sends the DC heater voltage to the circuit boards
- 3) Remove the rectifiers and clamp on the capacitors as well as the capacitors.
- 4) If the bolt to the chassis is loose, tighten it.
- 5) Orient and install the board as per the diagram on the next page, using one of the mounting methods shown.
- 6) Strip the ends off the heater wires for the 12X4 and the heater supply wires from the PA-211. Twist one wire onto each other securely (or solder).
- 7) Place the two sets of wires into CN2 and tighten.
- 8) Strip the ends off of the heater supply wires to the circuit boards and place them into CN3 appropriately. If using the 79V heater lift option, do not forget to do the board modification mentioned above *first*.
- 9) Locate the rectified output of the 12X4 (socket pin 7) and remove the wire that goes from there to the can capacitor. Run a wire capable of at least 500V insulation from the 12X4 socket pin 7 to CN1.
- 10) Remove the wire at the capacitor that goes from the can capacitor to PC-5 eyelet #16. Strip the end off and insert it to CN4, 330V position and tighten.
- 11) Remove the wire at the capacitor that goes from the can capacitor to PC-6 eyelet #16. Strip the end off and insert it to CN4, 210V position and tighten.

 - #8-32 Nut



Two Methods of Mounting The Regulator Board



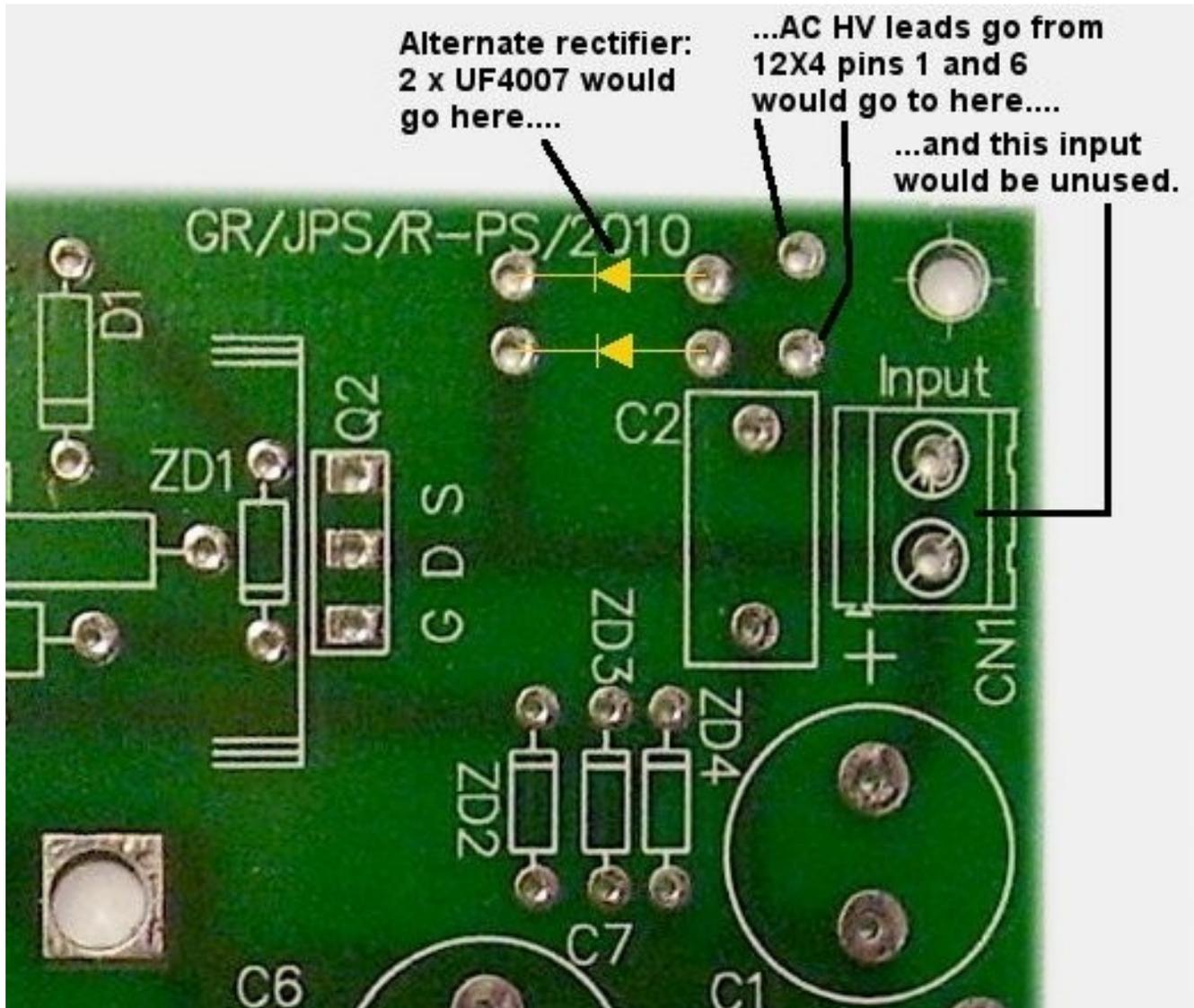
PA-211

PC-5

Proper Board Orientation In The PAS Chassis

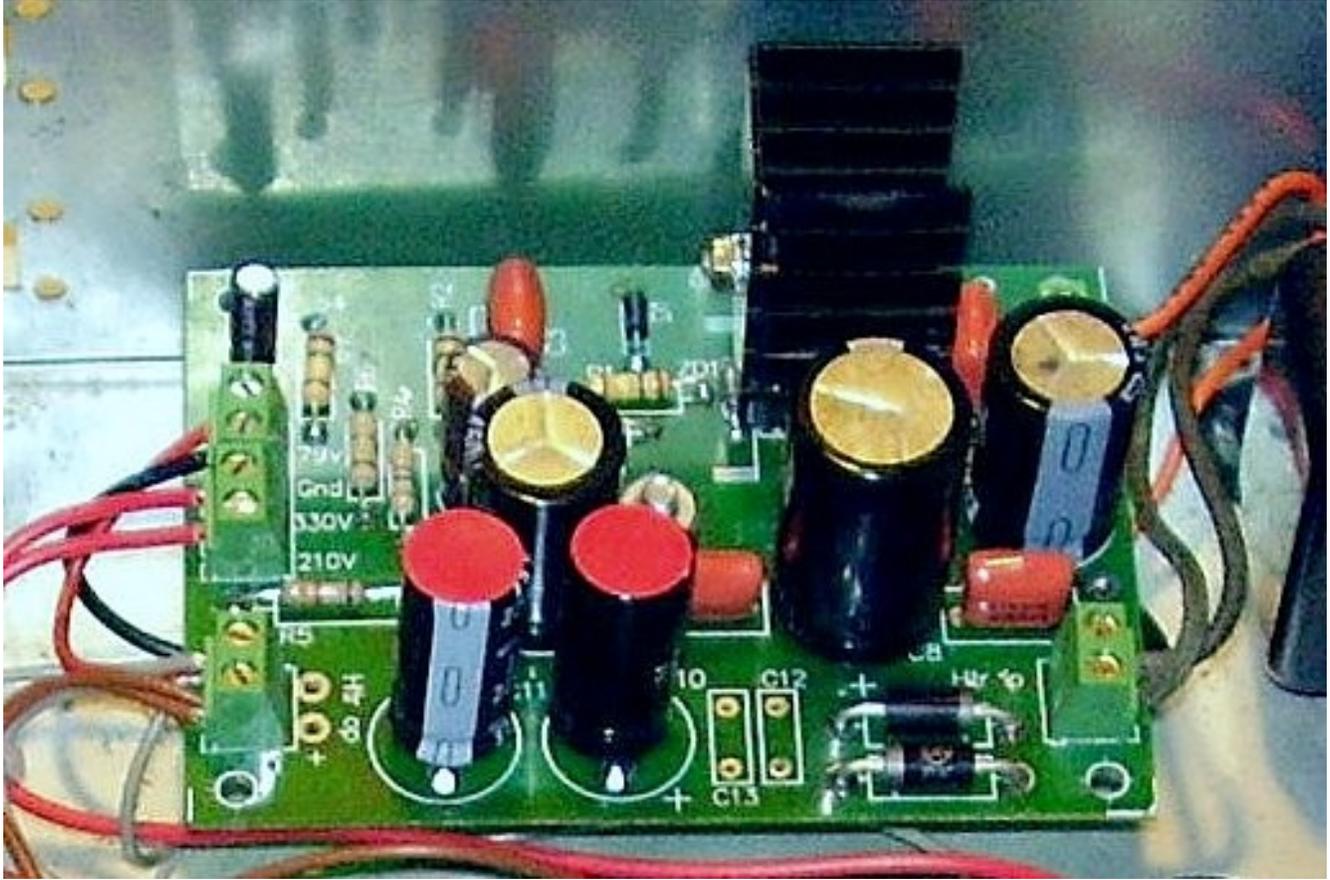
## Use of the Alternate Rectifier

Pads on the regulator PCB are available for solid state rectification should you chose to convert your PAS away from the current tube rectifier.



It should be noted that if you use other than the PA-211 transformer, capacitor C1 could see a large surge voltage before the tubes warm up and current is drawn to lower the peak value of the rectified voltage.

During this surge time, the 450V rating of C1 may be dangerously exceeded. It is therefore recommended that the conversion to the solid state rectifiers be done only by experienced users.



### **A Completed and Installed Regulator**

The paper “sticky dots” on top of the heater supply caps were to keep the exposed metal from “tingling” an unwary finger (the 79V lift supply was used in this installation).



All designs are Copyleft 2010 Gregg van der Sluys, Classic Valve Design and is licensed under Creative Commons: <http://creativecommons.org/licenses/by-nc-sa/2.5/ca/>

Please enquire for commercial interests in this design or derivatives.

**www.CLASSICVALVE.ca**