

diytube
Poseidon Driver
for the Dynaco Mark III, IV and DIY

**INSTRUCTIONS
FOR
ASSEMBLY
AND
OPERATION**



TubeZone Assembled Version

© 20063 TubeZone.net Inc and Shannon Parks

Reproduction in whole or part without express written permission prohibited.

READ ME FIRST!

This is a modified version of the usual disclaimer/warning that comes with most transmitting equipment and parts.

Since similar conditions exist in all tube audio amplifiers we believe it be appropriate here. Please note prior to beginning construction that there are high(over 400 volts) DC and AC voltages present in the equipment you are about to work on, and in the right situation these voltages could injure or kill you if you contact them. Normally the worst you can encounter is a nasty shock, however you must remember at all times this possibility of a injurious situation.

Follow the same precautions you would with any electrical appliance,including not working with plugged in equipment (including soldering irons) with bare feet on a wet floor, use only insulated probes & tools when working on live high voltage, and if you are working with one hand taking measurements or working in live equipment, keep the other hand off the chassis or other grounded conductive item. Always use the proper size fuse or circuit breaker in the equipment installed when operating amplifiers or any other electronic gear.

In a work situation you would be required to use eye protection when working with tools, soldering, or testing equipment and we strongly recommend you do so also, and remind you that when you fail to use safety glasses or follow recommendations regarding safety or simply do not practice common sense about safe procedures, you do so completely at your own risk.

Failing or defective components in high voltage tube equipment, particularly elderly equipment, when failing may arc, spark,smoke, spit, sputter, get hot enough to burn flesh, catch on fire, rupture or shatter sending shards of possibly hot glass, metal, or plastic at your face or body and may spew possibly hot and injurious goo or fluid, or cause normally harmless pieces of metal to become electrically charged at dangerous voltages.

If you have no previous experience repairing high voltage equipment, you must have a professional repair person to install this modification for you , or obtain competent third party help and and obtain basic knowledge of electronic components, soldering, safety and construction techniques prior to proceeding.

Disclaimer

Under no circumstances does diytube or Tubezone.net Inc assume liability or responsibility for injury or damages sustained in the assembly, test or operation of this kit or for damages to any other equipment connected to it. As this is a partial kit, proper assembly is buyer's responsibility. diytube reserves the right to make design changes or improvements without the obligation to revise prior versions. All specifications are subject to change without notice.

. WARNING: Lethal voltages (greater than 400VDC) are present in this project.

. Use a Variac or isolation transformer while working on and testing the unit.

. Use a rubber mat to stand on while working on and testing the unit.

. Keep one hand in your back pocket if probing voltages with a DMM.

. Wrap a small piece of electrical tape around the test lead probe shaft to expose just the tip.

. Do not connect or disconnect wires to the board when unit is powered or plugged in.

. Lethal voltages exist in the capacitors even after unit is powered down, so wait at least one hour to after unplugging to allow charge to dissipate.

Warranty and returns

UNINSTALLED and unmodified boards (meaning in identical condition as received from Tubezone.net Inc) may be returned within 30 days for refund or credit, so you have that amount of time to consider your options and decide whether installing this kit is within your capability. Once installed, at my option, within 6 months of purchase, I will either supply repair parts to you to replace any defective components, or repair the board to replace defective components. Repairs due to mis-wiring or other user errors will be billed @ \$50/hour. Defective tubes must be returned to be replaced. Any return postage or shipping is on customer's account.

Parts list for TubeZone assembled version of diytube Poseidon Mark III driver PCB

Voltages and wattages are minimums.

QTY	Reference	Part
2	R1, R4	1K, 1/4W
1	R2	470K 1/4W
1	R3	100 Ohm 1/4W
1	R5	2.7K 1/4W
1	R6	150K, 1/2W
1	R7	5.6K 1/4W
2	R8, R14	1M 1/8W
1	R9	10 Ohm 1/8W
2	R10, R11	47K 2W
2	R12, R13	100K 1/4W
1	R15	500K Pot
1	R16	47K 1/2W
1	C1	0.22uF 600v
1	C2	120pF
1	C3	330pF
2	C4, C5	0.1uF,600v
1	U1	LM334Z Integrated Circuit

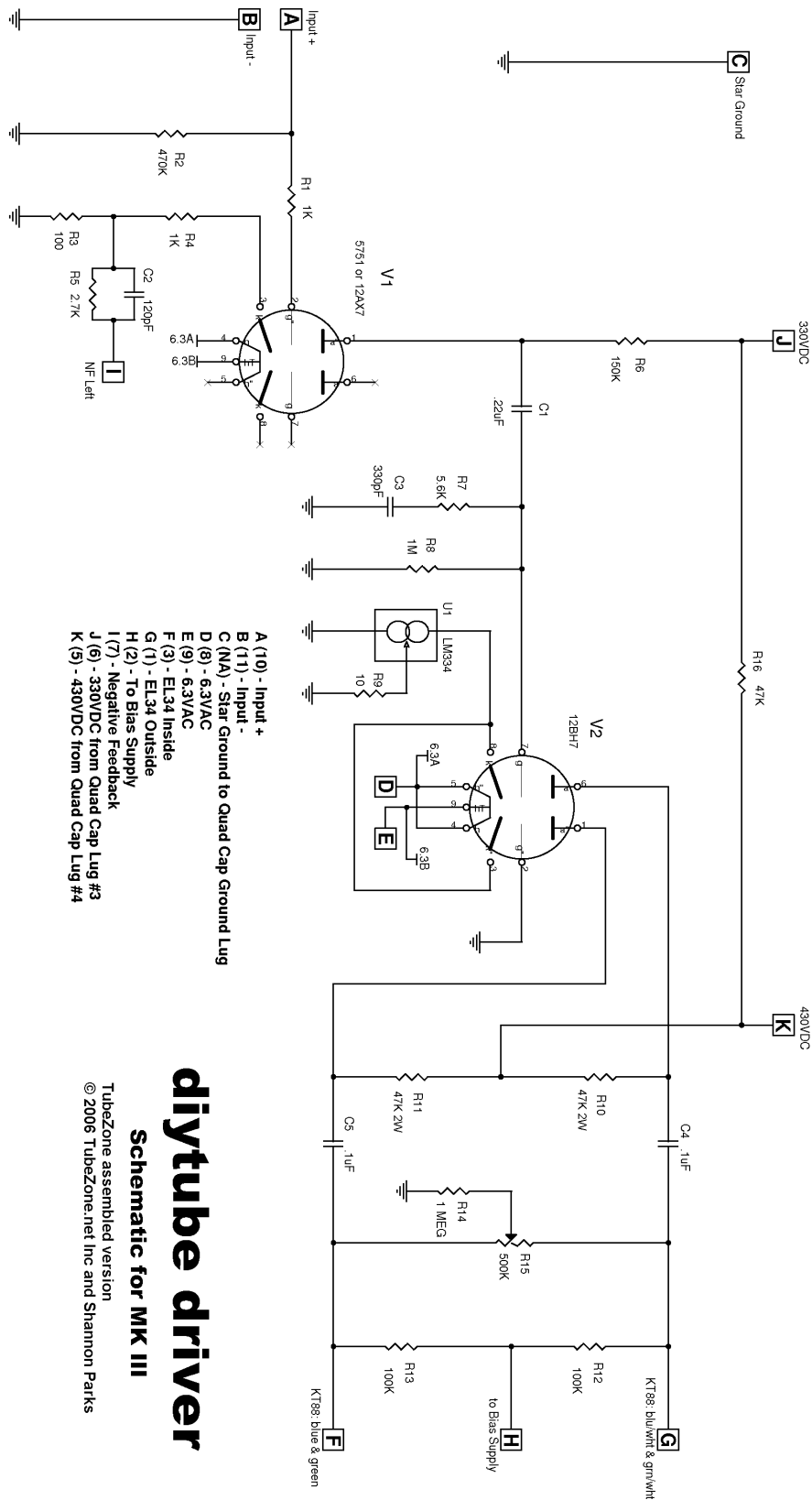
Other Parts

2 Ceramic Gold Plated 9 Pin Sockets

V1 5751 Tube

V2 12BH7 Tube

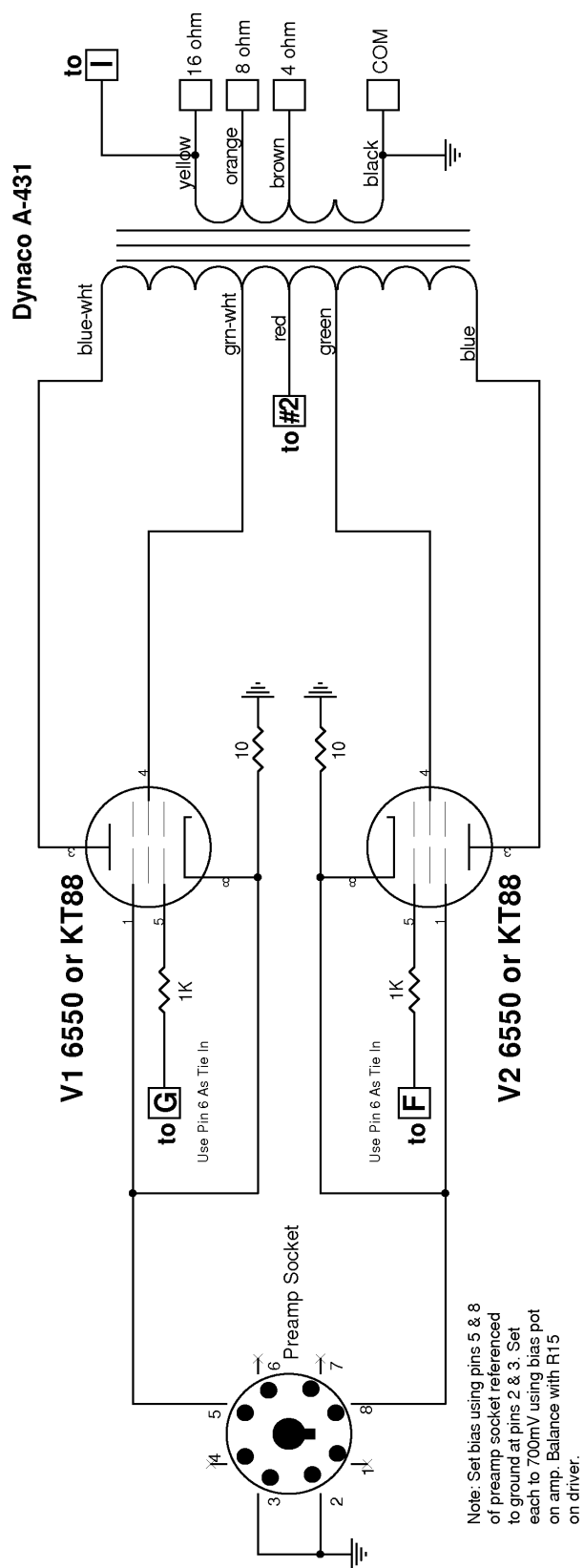
Additional 10 ohm 1% resistors for bias metering (required for implementation of individual tube bias balancing) and resistors for the 6550 sockets (1K 1/4W) are included. These extra items do not go on the board.

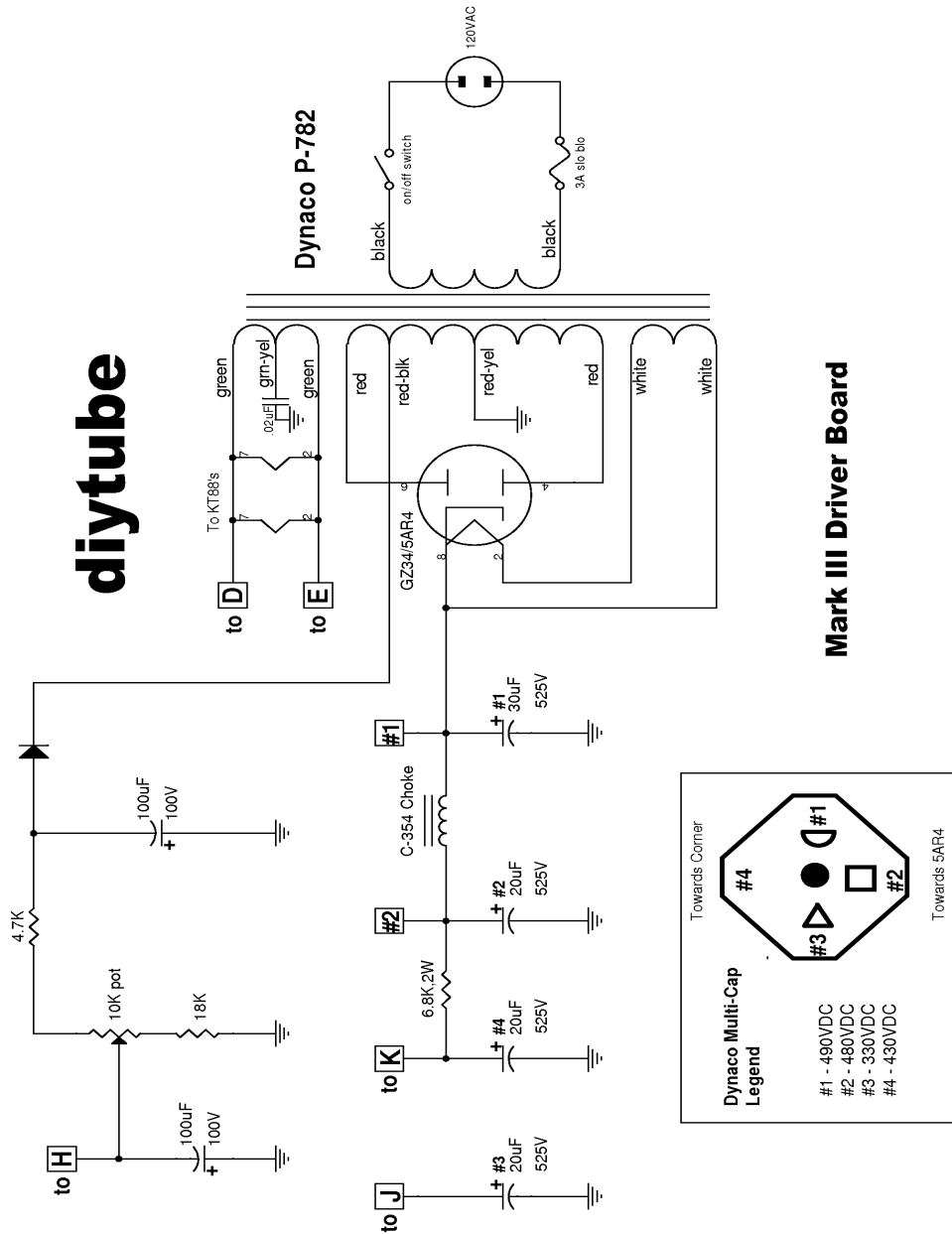


diytube driver
Schematic for MK III
TubeZone assembled version
© 2006 TubeZone.net Inc and Shannon Parks

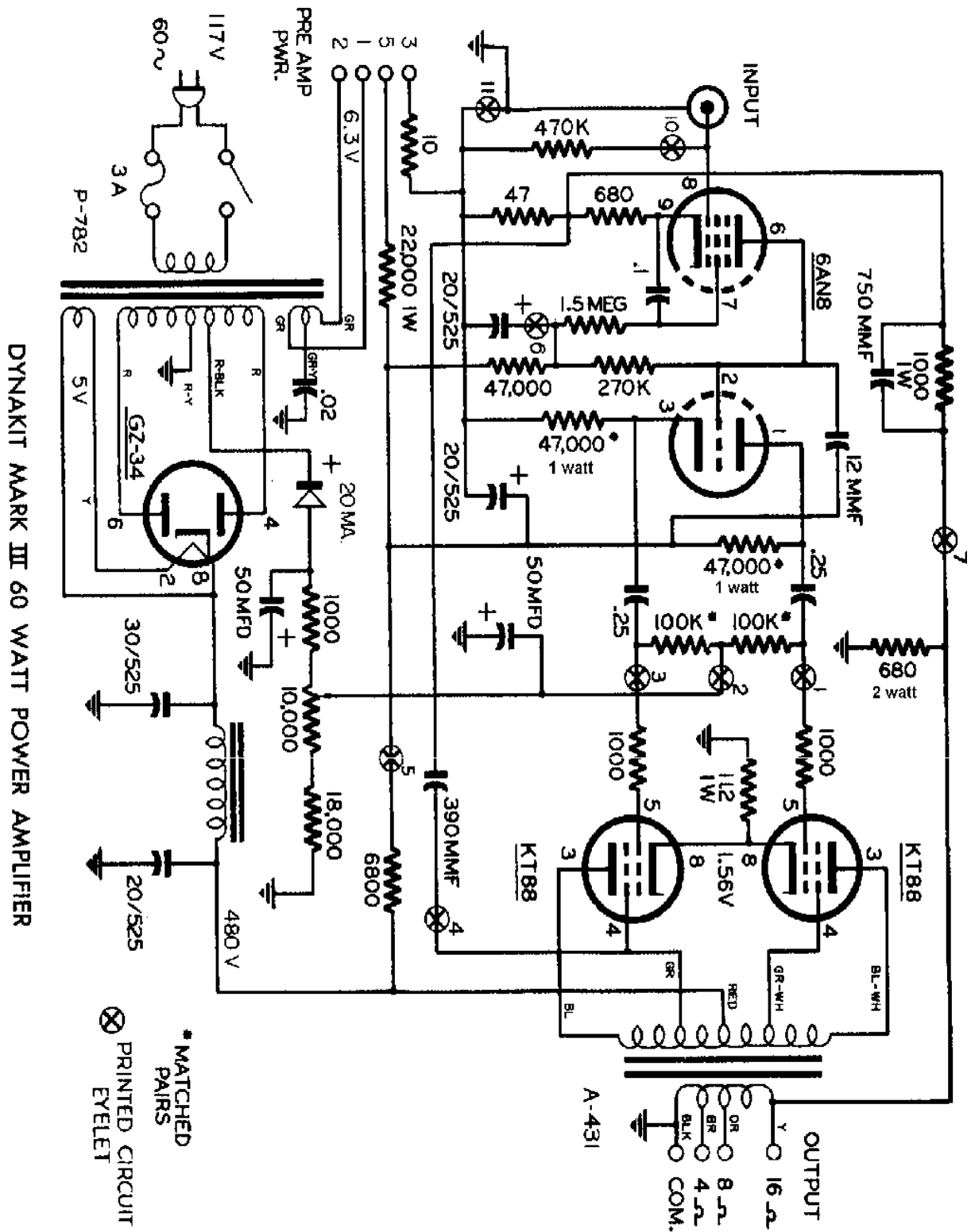
diytube

Mark III Driver Board





Note: This diagram shows the original twist-lock can capacitor. If you have the SDS Labs capacitor board or other power supply upgrade, please refer to documentation for your board or upgrade.



Schematic of original Mk3

Assembled Board Installation Instructions

The same instructions apply for both Mk2 and Mk3

- 1. Remove bottom cover of amplifier and all tubes.
- 2. Turn Amplifier upside down. Before removing the original Dynaco PC board, it's a good idea is to tag a number on each wire that goes to an eyelet or pad with the corresponding number. This will help prevent errors in reassembly. Also at this time, check any of the original wiring that is going to be used, over the years, the wiring may have become unusable. Replace wiring where necessary.
- 3. Unsolder all wires from board, also resistor(s) connecting ground side of input jack(s) to board.
- 4. Unscrew bolts (or drill out rivets in factory-wired unit), remove old PC board.
- 5. Bolt in the new board. Use 6-32 screws and nuts if old ones not available, these are available at neighborhood hardware stores like Ace and True Value.
- 6. Note that all terminal numbers on the conversion board correspond to the original Dyna eyelet numbers, except where the eyelet numbers are not used on the new board.
- 7. Remove any 15.6 ohm resistors found between the pin 8 or pin 1 of the 6550's and chassis ground. Remove wires connecting between pins 8 of the pairs of 6550's if present. Install 10 ohm 1/4 watt resistors between pin 8 of each 6550 and chassis ground (or star ground if you are using star grounding). The small resistors serve a dual function, besides metering cathode current for bias setting, they serve as a fusible link to disconnect the tube in the event of a tube short or failure. **Please avoid the temptation to replace with larger parts.** (and try to politely ignore any well-meaning advice you may hear to the contrary). Wires may be installed from pin 8 of each 6550 socket to empty lugs on the power takeoff socket (as shown on the diagram) or a pin jack, for outboard bias measurements.
- 8. There should be jumpers soldered between pins 1 and 8 on each 6550 or EL34 socket. **EL34's will not bias or operate properly without these jumpers installed.** On 6550, pin one grounds the metal base collar.
- 9. Reconnect and solder all other wires (not resistors) to terminals as numbered. **See list on next page to double-check your connections.**
- **IMPORTANT: A 1K resistor goes from Pin 6 to Pin 5 on each 6550 or EL34 socket - the amp won't work without these installed. No other connections should be made to pin 6 or 5 on these sockets.**

Using the schematic as a map, the following list of connections to terminals on the new PC board will help if you have any doubts about which wire goes where

Please Note The Following:

There is no specific terminal for power for PAM preamps. If you need a power-takeoff for a PAM-1 preamp, you'll need to attach a 22K 1 W resistor from Terminal K to pin 5 on the power take-off socket.

There is no equivalent of terminal 4. The original wire to pin 4 of the 6550 or EL34 tube may be removed.

- **A** : To left channel RCA input jack.
- **B** : To outside (ground) case lug of RCA input jack, 10 Ohm ground isolation resistor to pin 3 of left channel power takeoff socket, if used, other ground connections if needed.
- **C**: Other ground connections, connect this to one of the ground lugs on the can capacitor or to the ground connection on the power supply capacitor board (such as the SDS Labs board).
- **D and E**: To pins 1 & 2 of left power takeoff socket, or pins 2 & 7 on one of the 6550 or EL34 tube sockets. This is filament line for the board.
- **F**: To pin 6 of inboard 6550 or EL34 tube
- **G**:To pin 6 of outboard 6550 or EL34 tube (Tube the striped wires from output transformer connect to)
- **H**: To center lug of bias control. (Bias supply connection)
- **I**:To 16 Ohm tap of speaker terminals.
- **J**: To lug 3, quad section filter cap, or corresponding lug/pad on capacitor board. (330 volt source)
- **K**: To lug 4, quad section filter cap or corresponding lug/pad on capacitor board. (430 volt source)

Before going onto the biasing step, get a large dummy load or a pair of cheap speakers (meaning ones that you won't miss if they are damaged) and hook them up to the proper impedance outputs. Avoid running the amplifier with no output load (even shorted is preferable to open) Note that even if all the voltages check out properly, oscillation (audible, subsonic or ultrasonic) and or intermittent connections can damage speakers. Always check out repaired amplifiers on dummy loads or expendable speakers first. **Dummy loads can get hot, watch out!**

Biasing Instructions:

Note: Always use test loads on your speaker terminals, e.g. an 8 ohm power resistor. Be sure to have the RCA inputs loaded or shorted.

The first steps make sure your bias supply is working, is semi-balanced, and won't cause a melt down on first power up. Maintenance biasing can go directly to step #5.

1) Remove your 5AR4 and power the amp. The bias voltage will appear immediately at J6 and J21 on the diytube PCB. Adjust the control on the amplifier chassis so that these voltages go as negative as possible (eg -55VDC), but adjust to have the voltage the same on both test points. You can use the preamp socket pins 2 or 3 as your DMM ground.

2) Turn the unit off. Replace your 5AR4 rectifier. Turn on unit.

3) Because adjusting one side usually changes the bias on the other side, you will now start ping-ponging between the sides adjusting the wire wound pot and measuring one of the bias points on that side until you near 500mV.

4) Now that you are around 500mV on all the tubes, stick your DMM probes in pins 5 & 8 of the preamp socket. You are measuring the small voltage difference between the biasing of the 6550 or EL34 pair. Now adjust the R15 balance control until the voltage you read is zero or near zero difference. You might end up changing the scale of your DMM to the 300mV region.

5) Now repeat step #3, but adjust chassis control to produce to 700mV (for 6550 or KT88) or 600 mv (for EL34) across the 10 ohm resistor.

PS: Please note that the multi-turn trim control (R15) used on the board does not have end stops. If turning the control one direction does not seem to have any effect, try turning the control the other direction. Before shipment the controls are set by me at roughly mid-point.

Simple Bias Troubleshooting:

- **1. One set of tubes draws excessive bias current (biaset too high).** Swap the offending pair of tubes with the tubes from the other side/amp. If the problem follows the tubes to the other side indicates probable bad tube. If the problem remains on the side where it was originally, possible bad tube socket or bad connection in grid bias circuit (often open bias control) on that side.
- **2. All tubes (both banks) draw excessive current (biaset too high).** Check voltages in bias circuit. If they appear normal (usually will create negative voltage of 30 to 40 volts at eyelets # 6 and 21 on ST70, 50-60 volts on eyelet 3 on Mk3), then check for excessive voltage drop (use a high impedance voltmeter to check this such as a VTVM) across the 100K (Mk2/Mk3) or 270K (ST70) grid resistors. If a drop of more than a few volts is found on only one, or on one of each pair, indicates severe tube unbalance or possible defective tubes. If found on all tubes indicates that amplifier must be modified for lower DC grid circuit resistance (reduce value of the grid resistors) to accommodate the tubes you have chosen. If no excessive voltage drops found across these resistors, and other bias circuit voltages appear normal, indicates type or brand of tube used requires modification to bias circuit to be used in this amplifier. (ie: 10K or 1K resistor between control & bias diode must be made a smaller value)
- **3. One tube glows red or orange.** Swap the offender with another tube on either side (keep track of which one you swapped!) If condition follows tube, this indicates a probable defective tube or possibly bad solder joint inside the tube pins (which may be fixed by heating the pins/terminals with soldering iron). If condition appears in the same socket with a different tube indicates either a bad or wrong connection to that socket or a bad socket. Try re-soldering connections to socket terminals.
- **4. Biaset won't go high enough.** Generally either means output tubes are worn out, 5AR4 rectifier tube is worn out (or you are using another tube in place of a 5AR4) or the 10K resistor from the bias controls to ground is either defective, not connected or out of tolerance (value too high). This could also be caused by a bad or internally cracked/damaged bias control. Occasionally even new tubes do not draw sufficient current, in this case, either replace the 10K bias controls with a higher value, or reduce the value of the 10K or 18K resistor going to ground from the bias controls (try a 5K or similar in ST70, 10K in Mk3).

For further help, you can contact Uncle Ned at TubeZone by phone at 773-782-6145, by email at <http://www.tubezone.net/contact/index.html> , or research answers or post a message on the DIYtube Mk3 Poseidon discussion board at: <http://www.diytube.com>