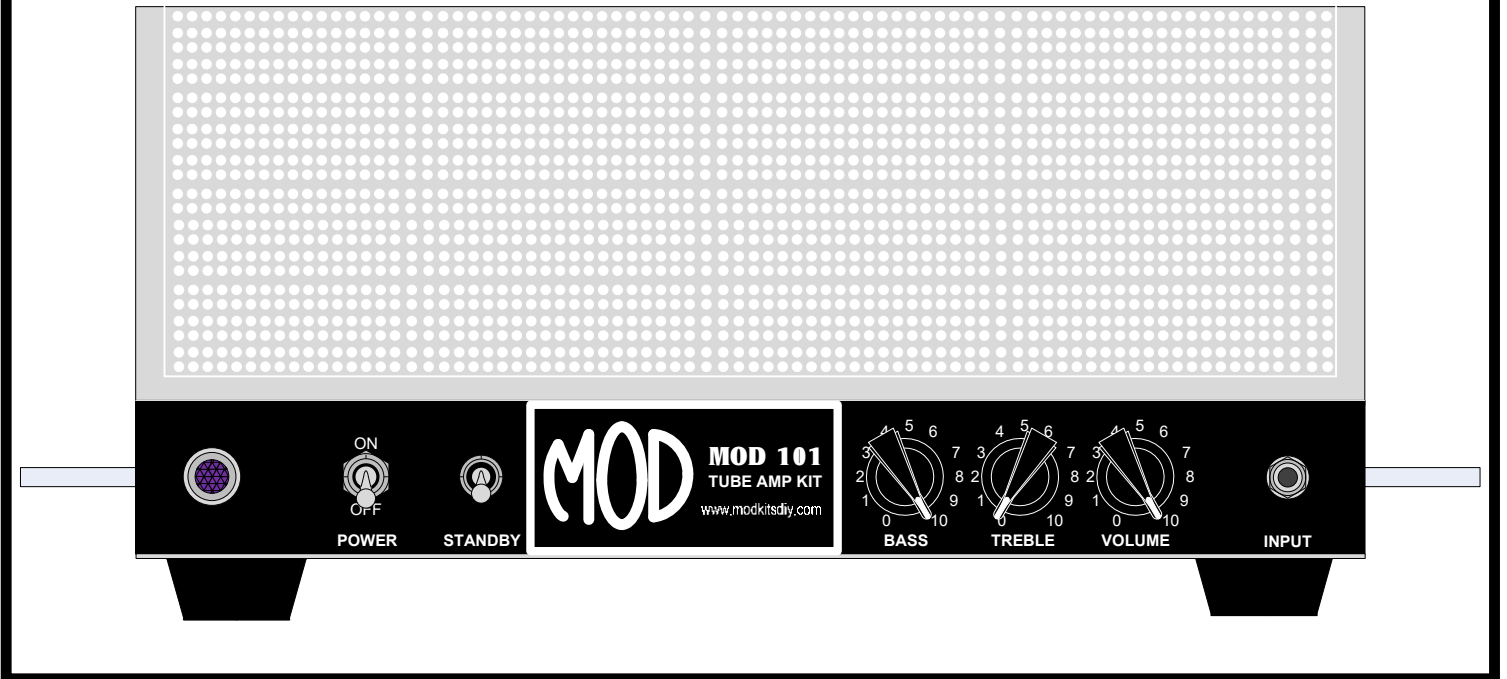


# MOD 101 GUITAR AMP KIT (K-MOD101)



## Use these instructions to learn:

- How to build a tube amp.
- How to bias a tube amp for 6L6GC or EL34 power tubes.
- Some modifications for altering the tone of a tube amp.

This tube guitar amplifier circuit is basic and classic. It can produce warm clean tone at low volume and rich overdrive distortion at higher volume.

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### **PARTS LIST DRAWINGS** (4)

There are four parts list drawings separated from these instructions to help you find each part and identify it.

### **ASSEMBLY DRAWINGS** (25)

There are 25 assembly drawings separated from these instructions to help you with each step of the assembly.

## **MOD 101 GUITAR AMP KIT – BACKGROUND**

The MOD 101 Guitar Amp Kit was designed for anyone who is interested in building their own tube guitar amplifier head and learning some simple circuit modifications that can be used to tailor the sound to better suit their tonal preference. The modifications are instructions and supplied parts that allow you to build 32 variations of the amp circuit.

The amp is meant for concert stage volume (up to 60 Watts). It is equipped with an impedance selector switch, giving you the flexibility to use it with the speaker cabinet of your choice. (We recommend using it with a speaker cabinet that has an overall wattage of at least 100W). Use 16 AWG speaker cable to connect from the amplifier to your speaker cabinet. Set the amplifier switch to match the overall impedance of the speaker cabinet.

The web-site [www.modkitsdiy.com](http://www.modkitsdiy.com) has been set up to help answer your questions after you have thoroughly read through the entire set of instructions.

## **TOOL LIST**

- Wire Strippers
- Needle Nose Pliers
- Cutting Pliers
- Desoldering Pump
- Solder (60/40 rosin core)
- Soldering Station
- Phillips Head Screwdrivers
- Slotted tip screwdrivers (3mm tip)
- Digital Multimeter (DMM)
- Alligator Clip Test Leads (to fit DMM)
- Channellock Pliers (or similar type)
- Miniature Round File (fine cut)

## PARTS LIST

Please see the parts list drawings for help with finding and identifying each part along with corresponding part numbers.

### **RESISTORS:**

<u>Description</u>		<u>Quantity</u>
1 $\Omega$	1/2W	2
1 $\Omega$	5W	1
47 $\Omega$	1/2W	1
360 $\Omega$	10W	1
470 $\Omega$	1/2W	3
820 $\Omega$	1/2W	2
1k $\Omega$	1W	1
1k $\Omega$	5W	2
1.5k $\Omega$	1/2W	2
2.4k $\Omega$	1/2W	1
2.7k $\Omega$	1/2W	1
4.7k $\Omega$	1W	1
5k $\Omega$	5W	1
6.8k $\Omega$	1/2W	2
20k $\Omega$	1/2W	1
22k $\Omega$	1/2W	1
68k $\Omega$	1/2W	2
82k $\Omega$	1W	1
100k $\Omega$	1/2W	1
100k $\Omega$	1W	3
220k $\Omega$	1/2W	2
220k $\Omega$	1W	2
1M $\Omega$	1/2W	4

### **TERMINAL STRIPS:**

<u>Description</u>	<u>Quantity</u>
3 lug terminal strip (vertical)	5
3 lug terminal strip (2 <sup>nd</sup> lug common)	1
4 lug terminal strip	2
5 lug terminal strip	1
6 lug terminal strip (no common)	2
6 lug terminal strip (2 <sup>nd</sup> lug common)	3
8 lug terminal strip	1

### **TRANSFORMERS:**

<u>Description</u>	<u>Quantity</u>
Power Transformer 374BX	1
Output Transformer 1650P	1

### **CAPACITORS:**

<u>Description</u>		<u>Quantity</u>
250pF	500V	1
500pF	500V	1
.001 $\mu$ F	630V	1
.022 $\mu$ F	630V	2
.047 $\mu$ F	630V	1
.1 $\mu$ F	630V	4
22 $\mu$ F	50V	2
22 $\mu$ F	500V	4
80 $\mu$ F	450V	2
220 $\mu$ F	50V	1

### **HARDWARE:**

<u>Description</u>	<u>Quantity</u>
#10 screws	8
#10 lock washers	6
#10 hex nuts	8
#8 screw	4
#8 self-tap screws	8
#8 hex nuts	4
#6 screws	22
#6 lock washers	20
#6 locking lugs	4
#6 hex nuts	22
#4 screws	4
#4 lock washers	4
#4 hex nut	4

### **TUBES:**

<u>Description</u>	<u>Quantity</u>
12AX7/ECC83	1
12AT7/ECC81	1
6L6GC	2
EL34	2

**MISCELLANEOUS PARTS:**

<u>Description</u>	<u>Quantity</u>
Solid state diode 1N4007	3
250k $\Omega$ audio pot	2
1M $\Omega$ audio pot	1
25k $\Omega$ linear pot	1
Chicken head knob	4
Impedance switch & output jack	1
9 pin miniature tube socket	2
Octal tube socket	2
Tube clip	2
Rubber Grommet	5
Strain Relief	1
Input jack	1
Purple jewel	1
Power switch (DPDT)	1
Standby switch (SPST)	1
2A fuse	1
Fuse holder	1
Light bulb	1
Lamp holder	1
Handle with mounting hardware	2
Rubber feet	4
Power cord	1
Steel chassis box and cover	1/each
Steel cage	1
Labels	1 set
Green 20 AWG wire	10 feet
Red 22 AWG wire	20 feet

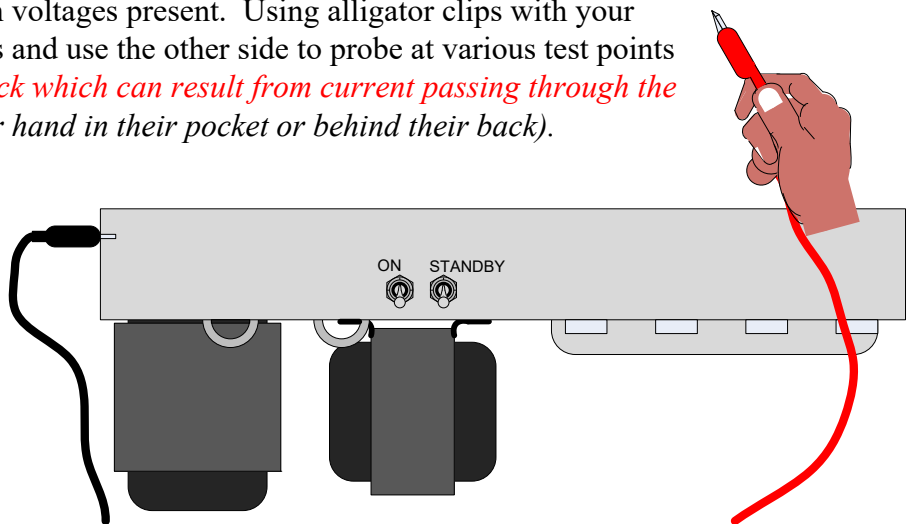
Visit [www.modkitsdiy.com](http://www.modkitsdiy.com) if you have any problems when first turning on your amp for troubleshooting help. If you smell or see smoke, hear something pop, or the chassis becomes too hot to touch, turn off power and unplug immediately.

## SAFETY

Tube amps operate at high voltages that have the potential to injure and kill. Please remember the following when working on this project.

- Only work on the amp when you are wide awake and sober.
- Do not plug the amp in until you have gone through all of the instructions, checking and re-checking each step.
- Do not turn the amp on until you have connected it to a speaker cabinet.
- Be aware that tubes become very hot when the amp is on and can take up to 10 minutes to cool down after power is turned off.
- Work in a ventilated area when soldering.
- Always follow the one hand rule when working with an amp that is connected to power or may have voltage present. *(Any amp that has been plugged in at one time, may have high voltage present).*

**The one hand rule** (pictured below): is a safety precaution for working on an amp that is plugged in or could potentially have high voltages present. Using alligator clips with your DMM, clip the ground side to the chassis and use the other side to probe at various test points with one hand. *This prevents a fatal shock which can result from current passing through the heart.* *(Many people even put their other hand in their pocket or behind their back).*



Always probe the amp for dangerous voltages at several test points before working on it, even if it has been turned off and unplugged for months.

### Test points include:

- Both Standby Switch Terminals
- Each positive end of polarized filter caps

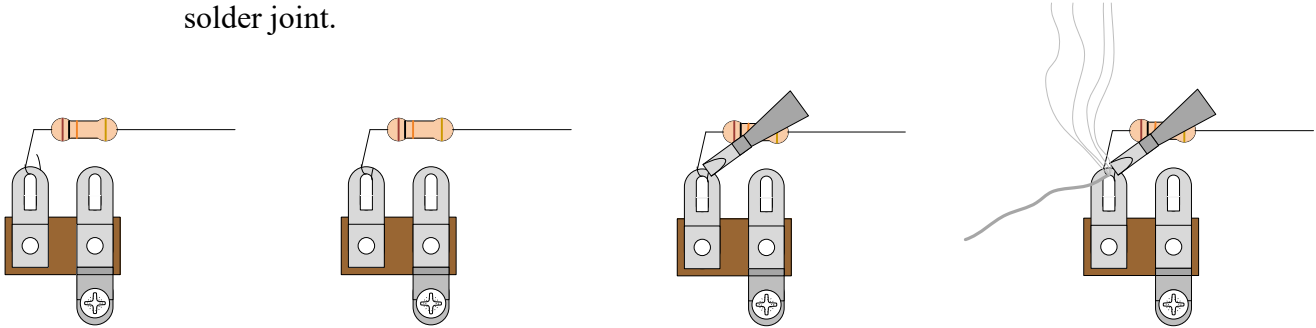


## SOLDERING TIPS

It is important to make a good solder joint at each connection point. A cold solder joint is a connection that may look connected but is actually disconnected or intermittently connected. (A cold solder joint can keep your project from working.)

Follow these tips to make a good solder joint. *Take your time with each connection and make sure that all components are connected and will remain connected if your project is bumped or shaken.*

1. Bend the component lead or wire ending and wrap it around the connection point.
  - Make sure it is not too close to a neighboring component which could cause an unintended connection.
2. Wrap the component lead so that it can hold itself to the connection point.
3. Touch the soldering iron to both the component lead and the connection point allowing both to warm up just before applying the solder to them.
4. Be sure to adequately cover both component lead and connection point with melted solder.
  - Remove the soldering iron from your work and allow the solder joint to cool. (The solder joint should be shiny and smooth after solidifying.)
  - Cut off any excess wire or component leads with cutting pliers.
  - Clean the soldering iron's tip by wiping it across the wet sponge again after making the solder joint.



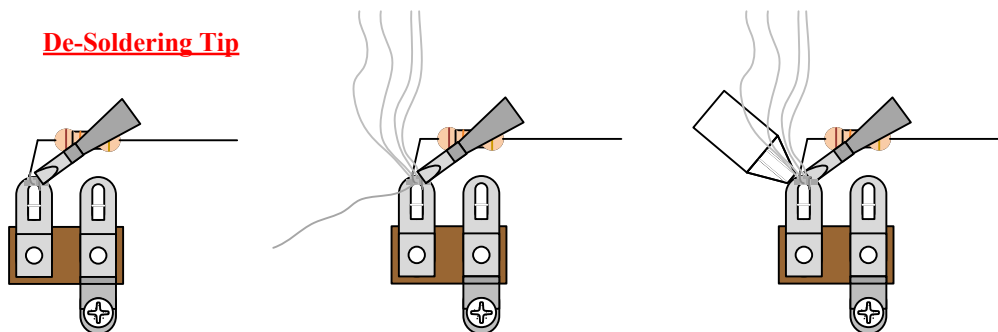
1. Bend the component lead and wrap it around the connection point.

2. Wrap the component lead so that it can hold itself to the connection point.

3. Heat up both component lead and connection point with the soldering iron.

4. Apply solder to both component lead and connection point.

### De-Soldering Tip



1. Heat up old solder joint with the soldering iron.

2. Apply fresh solder to mix in with old solder joint

3. Use a de-soldering tool to remove the old solder joint while it is heated.

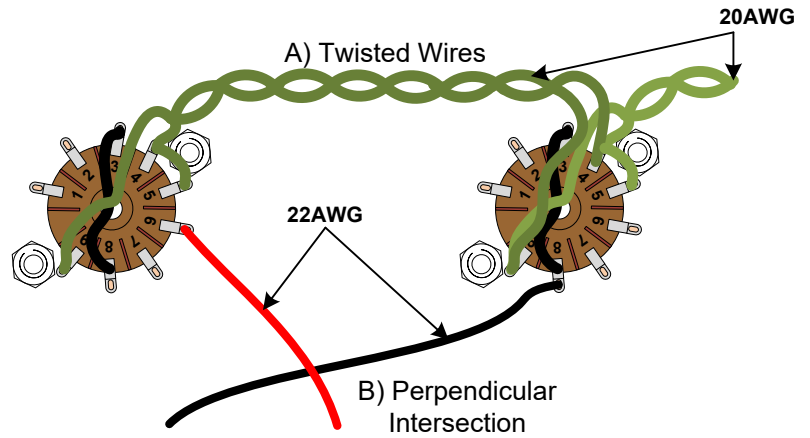
## WIRING TIPS

There are two different gauges of stranded wire included with the kit. Use 22 AWG wire unless noted otherwise in the instructions. The lower AWG (American Wire Gauge) number signifies a thicker gauge of wire, which can handle more current. (*It is important to use the thicker gauge wire where specified in the instructions.*)

- Because of the electro-magnetic properties of current traveling through a wire, there are wiring conventions used when making wire connections.

A) Twist the wires together where indicated in the instructions.

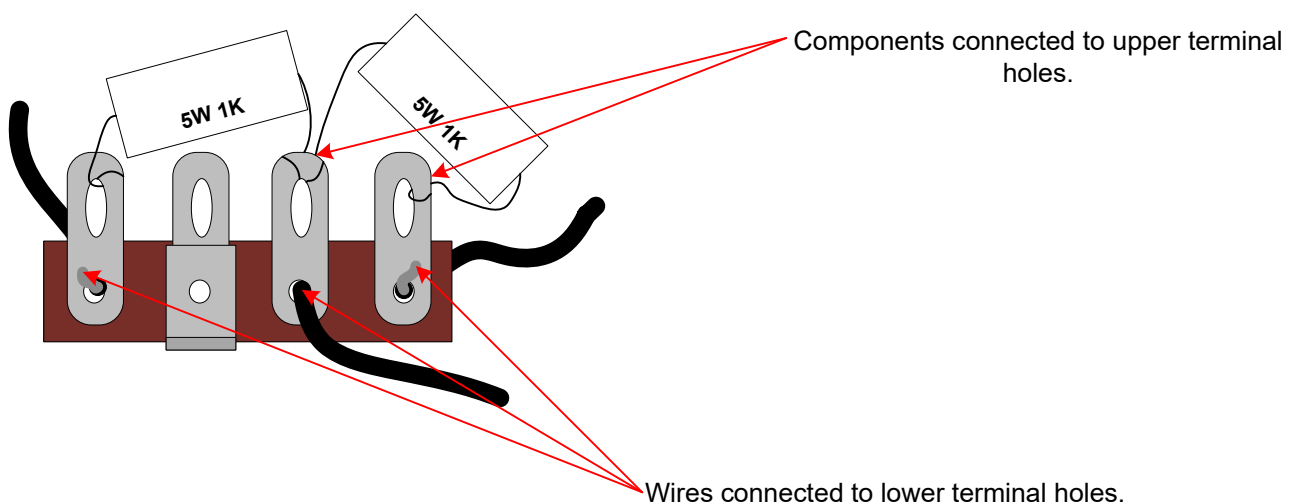
B) If two wire paths intersect, try to have them cross over each other as perpendicular as possible. (You should follow the path of the wires shown in the instructions).



- Measure the wire by running it along its actual path (shown in the drawings) and then cutting it with your wire cutters at a length that will give it a little bit of slack after stripping off the insulation and soldering.

*It is important not to make the wires too long.*

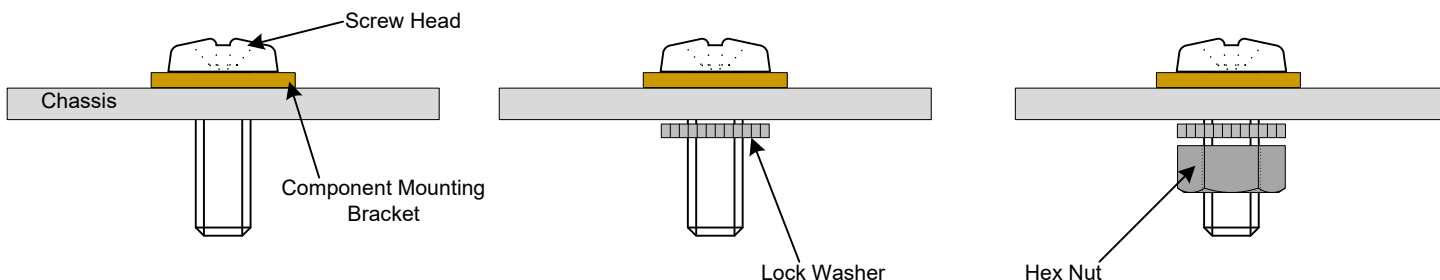
- Be careful not to strip away strands of wire when you remove the insulation at the end of wires.
- Be careful not to burn the insulation of nearby wires with the soldering iron.
- With the terminal strips used in this kit, you might want to connect the wires to the lower holes and components to the upper holes. (Doing this can make it easier to change components for modification).





## HARDWARE FASTENING TIP

When fastening components with mounting hardware (screws, lock washers, and hex nuts), the lock washer and hex nuts should be fastened on the other side of the chassis from the head of the screw in the order pictured below.

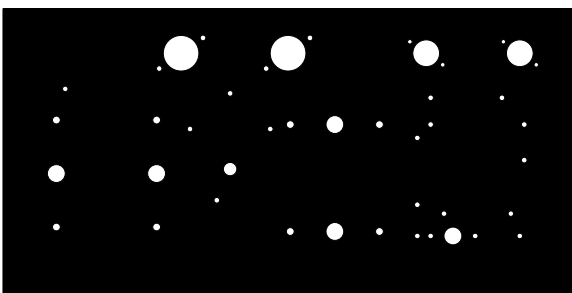


## STEP BY STEP ASSEMBLY

Please refer to the respective drawings for each section. *We recommend browsing over the instructions and looking at all drawings once before actually beginning to assemble the kit.*

### SECTION 1 – Mounting of Top Components

Please refer to **Drawings 1 – 6**.

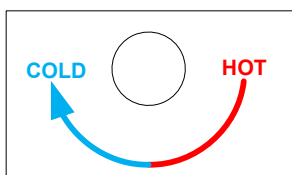


Find your chassis box. **Drawing 1** identifies the names of components that you will be mounting to the top of the chassis box.

#### Step 1

Use a fine cut miniature round file to very lightly file away the paint coating only from the inside edge of each chassis hole.

*(The chassis provides the ground connection for many components so it is important that the inner edge of these holes are not insulated by the paint coating).*



#### Step 2

**Drawing 2** shows where to stick the bias label. Make sure to line up the hole in the sticker with the hole in the chassis box.



Chassis Front

Bent back mounting tab

#### Step 3 – Mount the bias pot

**Drawing 3** shows where to mount the bias pot. Bend down the tab on the top of the pot for a better fit against the chassis top. Make sure the solder lugs of the pot are directed toward the front of the chassis. (Turn the shaft all the way to cold).



#### Step 4 – Mount the rubber grommets

**Drawing 3** shows where to mount the five rubber grommets. Squeeze the grommet into the hole and push it into place with your fingers.

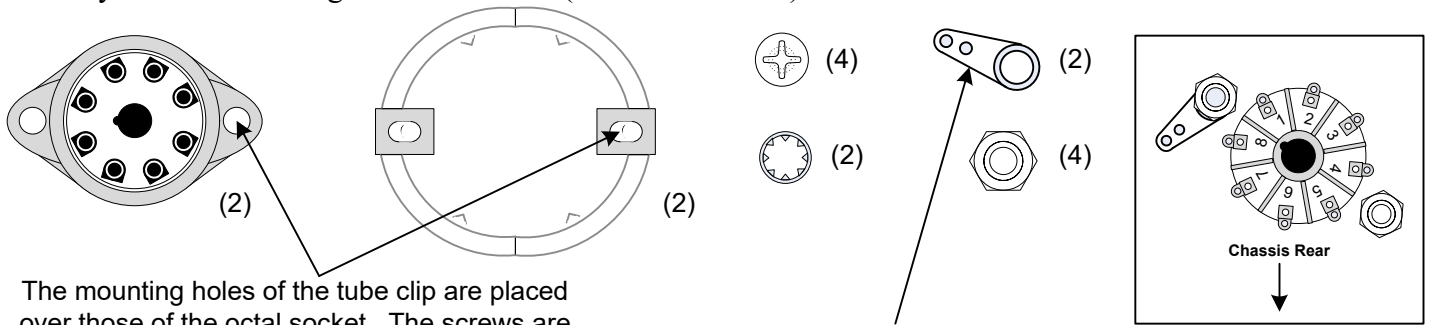
**Step 5 – Mount the 9 pin miniature tube sockets**

**Drawing 3** shows where to mount the two 9 pin miniature sockets. Make sure that pins 1 & 9 face away from the rear edge of the chassis. (Use #4 hardware).



**Step 6 – Mount the octal tube sockets and tube clips**

**Drawing 3** shows where to mount the two octal sockets along with their tube clips. Make sure that pins 1 & 8 face away from the rear edge of the chassis. (Use #6 hardware)

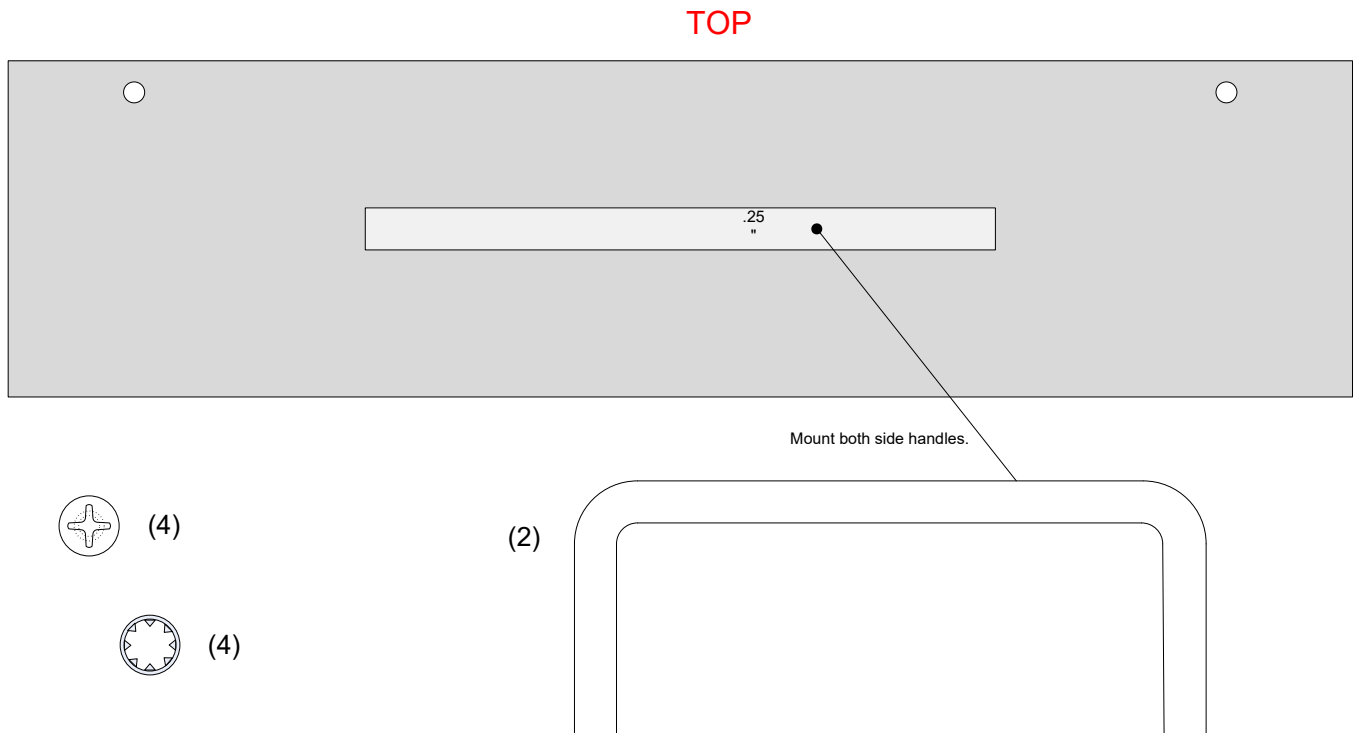


The mounting holes of the tube clip are placed over those of the octal socket. The screws are then placed through both sets of mounting holes.

Use locking lugs in place of lock washers for the mounting screws which face away from the rear chassis edge.

**Step 7 – Mount both side handles**

Mount both handles to the sides of the chassis box using their supplied #8 hardware. (Doing this step will help you flip the chassis when mounting the two heavy transformers).



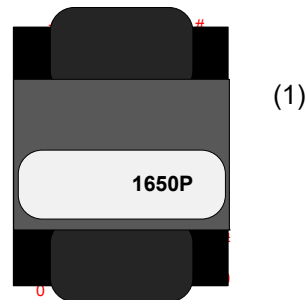
### Step 8 – Mount the Output Transformer

Remove the 1650P output transformer from its packaging. **Drawings 4 and 5** show where to mount the output transformer.

- A) Cut off the **blu/yel** and **brn/yel** wires as described on the drawing.
- B) Place the transformer on its side and push the wires (one at a time) through their respective grommet holes as indicated on the drawing.
- C) Slowly tilt the transformer upright so that the mounting holes line up with the transformer feet, while continuing to push each bundle of wires through the grommet holes. (Be careful not to dislodge the rubber grommets).



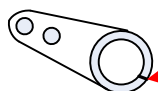
Use #10 mounting hardware.



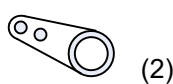
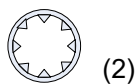
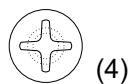
### Step 9 – Mount the Power Transformer

Remove the 374BX power transformer from its packaging. **Drawings 5 and 6** show where to mount the power transformer.

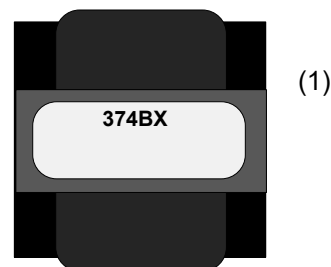
- A) Cut off the **blu/yel, wht/blk, blk/red, brn/yel, yel, yel, and yel/blk** wires as described on the drawing.
- B) Place the transformer on its side and push the wires (one at a time) through their respective grommet holes as indicated on the drawing.
- C) Slowly tilt the transformer upright so that the mounting holes line up with the transformer feet, while continuing to push each bundle of wires through the grommet holes. (Be careful not to dislodge the rubber grommets).
- D) Use #10 mounting hardware and two #6 locking lugs in place of regular lock washers on the two inside screws. (You can cut a slot in the rings of both locking lugs and stretch them slightly to fit the #10 screws).



Cut a slit in the locking lugs in order to fit the #10 screws



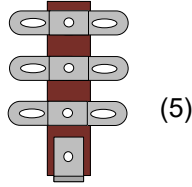
Use #10 mounting hardware and two #6 locking lugs.



Step 10 – Mount the Filter Cap Terminal Strips

**Drawing 6** shows where to mount the 5 terminal strips which will be used for mounting the filter capacitors.

Use #6 hardware.



Step 11 – Mount the Danger Label

**Drawing 6** shows where to mount the danger label. This sticker is mainly used to scare people away from the amp if you have the steel cage removed. (When playing the amp, keep the steel cage fastened for safety).



**SECTION 2 – Mounting of Front Components**

Please refer to **Drawing 7**.

Step 1 – Mount Faceplate Label

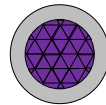
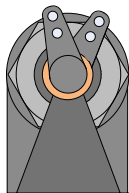
**Drawing 7** shows the faceplate label. Make sure and line up each hole in the sticker with each hole in the chassis front and carefully stick it to the chassis.

*Take your time and line this up properly because the sticker cannot be removed again without damaging it.*



Step 2 – Mount the Lamp Holder

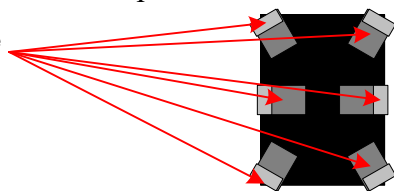
**Drawing 7** shows where to mount the lamp holder. Be sure to mount it so that its solder lugs point towards the bottom opening of the chassis box. (Once the lamp holder is mounted you may screw in the bulb and then the jewel).



Step 3 – Mount the Power Switch and Standby Switch

**Drawing 7** shows where to mount the power switch and standby switch. Be sure to mount the standby switch with its solder lugs directed toward the chassis top.

Remove all 6 screws from the terminals. You will not need them for this project.



Power Switch

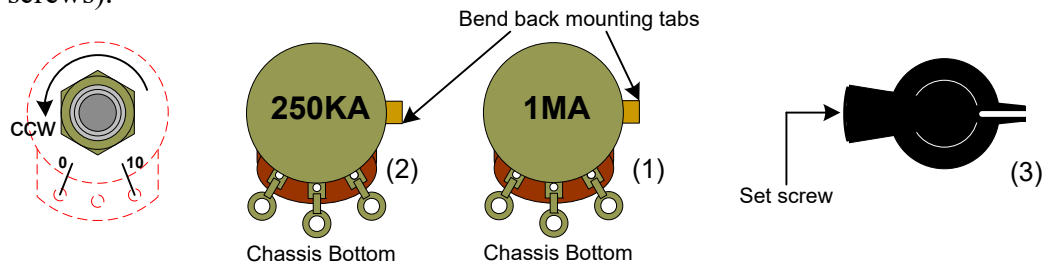


Standby Switch

#### Step 4 – Mount the Bass, Treble, and Volume Pots

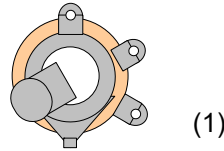
**Drawing 7** shows where to mount the bass, treble, and volume pots. When they are mounted, turn their shafts all the way counter-clockwise. (Once you have done this, you can mount the chicken head knobs while pointing to “0” and tightening their set screws).

*It is good idea to use a contact cleaner on each pot before mounting.*



#### Step 5 – Mount the Input Jack

**Drawing 7** shows where to mount the input jack.



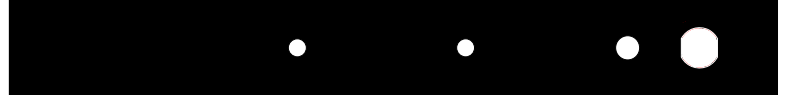
### SECTION 3 – Mounting of Rear Components

Please refer to **Drawing 8**.

#### Step 1 – Mount the Rear-plate Label

**Drawing 8** shows where to mount the rear-plate label. Make sure and line up each hole in the sticker with each hole in the chassis rear.

*Take your time and line this up properly because the sticker cannot be removed again without damaging it.*



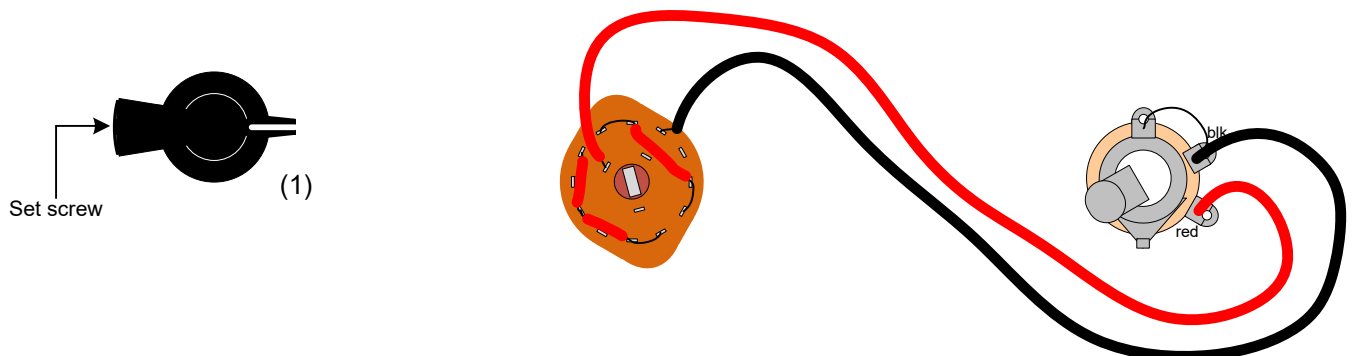
#### Step 2 – Mount the Impedance Selector Switch and Output Jack

**Drawing 8** shows where to mount the impedance switch and output jack. (Once you have done this, you can mount the remaining chicken head knob to the switch).

There are 4 positions to the switch.

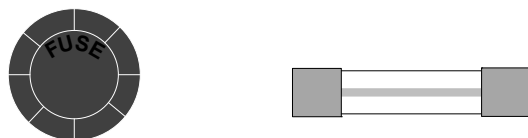
A) Mount the chicken head knob to the switch and gently click it over to the furthest counter-clockwise position. (This position should be 4 ohms).

B) Re-adjust the knob so that it points at the “4” and tighten the set screw. Make sure that you can click over to three more positions going in the clockwise direction.



Step 3 – Mount the Fuse Holder

**Drawing 8** shows where to mount the Fuse holder. You can also insert the 2A slow blow fuse at this time.



**SECTION 4 – Mounting Internal Terminal Strips and Passive Components**

Please refer to **Drawings 9 - 11**.

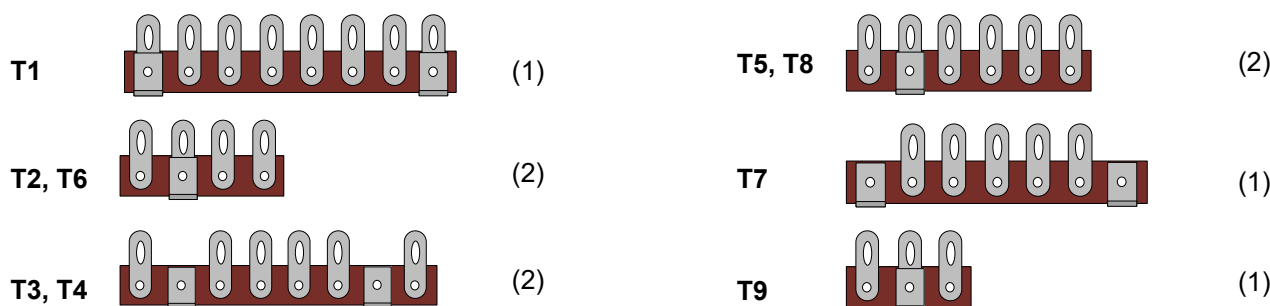
Step 1 – Mount the Terminal Strips

**Drawing 9** shows what you should see when you flip the chassis box over so that you are looking inside and viewing from the rear side. The terminal strip mounting holes are labeled T1 – T9. (You will be mounting 9 terminal strips in this step)

Use #6 hardware and **Drawing 10** to mount the 9 terminal strips in the same orientation as in the drawing.



Note: Terminal strip terminals are numbered from left to right with mounting bracket directed towards the viewer.



Step 2 – Solder Components to Their Terminal Strip Locations

Please see page 7 “Soldering Tips” if you are new to making solder connections.

**Drawing 11** shows each passive circuit component and its respective location on the terminal strip. Be sure to follow the same orientation of polarity as shown in the drawing for diodes and polarized electrolytic capacitors.

T1 Components

Resistors

Capacitors

47Ω	1/2W	1	.1μF	630V	1
22kΩ	1/2W	1	.001μF	630V	1
1MΩ	1/2W	2			
470Ω	1/2W	1			

T2 Components

Resistors

820Ω	1/2W	1
68kΩ	1/2W	1

Capacitors

22μF	50V	1
------	-----	---

(Copy the orientation of polarity used in the drawing).

T3 Components

Resistors

20kΩ	1/2W	1
------	------	---

Capacitors

.1μF	630V	2
------	------	---

T4 Components

Resistors

100kΩ	1W	3
82kΩ	1W	1

T5 Components

Resistors

6.8kΩ	1/2W	1
68kΩ	1/2W	1

Capacitors

.022μF	630V	2
500pF	500V	1

T6 Components

At this point, you need to decide between 6L6GC or EL34 power tubes and solder the appropriate resistors.

Resistors

470Ω	1/2W	2	<b>(6L6GC)</b>
------	------	---	----------------

**OR**

1kΩ	5W	2	<b>(EL34)</b>
-----	----	---	---------------

T7 Components

Resistors

1.5kΩ	1/2W	2
220kΩ	1/2W	2

T8 Components

Resistors

2.7kΩ	1/2W	1
2.4kΩ	1/2W	1

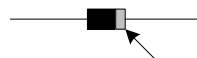
Capacitors

22μF	50V	1
------	-----	---

(Copy the orientation of polarity used in the drawing).

Diodes

1N4007	3
--------	---



(Copy the orientation of polarity used in the drawing).

### Step 3 – Connect the Bias Check Resistors

**Drawing 11** shows where to connect these resistors. (These resistors will help us when biasing the power tubes at the end of the instructions).

#### V3 Components

##### Resistors

1Ω                    1/2W                    1

One lead of this resistor must be connected to both V3 pins 8 and 1. The other lead must be connected to the locking lug nearby.  
(\*Measure this resistor with your DMM and take note that it most likely does not measure exactly 1.0 Ω)

#### V4 Components

##### Resistors

1Ω                    1/2W                    1

One lead of this resistor must be connected to both V4 pins 8 and 1. The other lead must be connected to the locking lug nearby.  
(\*Measure this resistor with your DMM and take note that it most likely does not measure exactly 1.0 Ω)

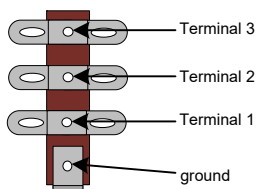
### SECTION 5 – Solder the Filter Components

Please refer to **Drawing 12**.

#### Step 1 – Mount the Filter Components to Their Terminal Strips

**Drawing 12** shows where to mount the filter caps from above and from the side.

(The labels: “HV, B, C, D, E, and V3 cathode” are used to identify the points where you will connect wires to be fed through the grommet hole).



#### T10 Components

##### Resistors

220kΩ                    1W                    1

##### Capacitors

80μF                    450V                    2

- Negative side of bottom cap is connected to ground terminal
- Positive side of top cap is connected to terminal 3

#### T11 Components

##### Resistors

220kΩ                    1W                    1

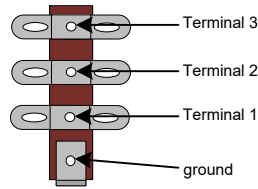
##### Capacitors

80μF                    450V                    2

- Positive side of bottom cap is connected to terminal 1
- Negative side of top cap is connected to terminal 1

Refers to the same two caps





## T12 Components

### Resistors

5kΩ	5W	1
1kΩ	1W	1

- One end only of 1k connects to this terminal from T13

### Capacitors

22μF	500V	2
------	------	---

- Positive side of bottom cap is connected to terminal 1
- Positive side of top cap is connected to terminal 3

## T13 Components

### Resistors

1kΩ	1W	1
4.7kΩ	1W	1

- One end only of 1k connects to this terminal from T12

### Capacitors

22μF	500V	2
------	------	---

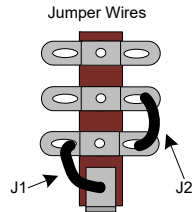
- Positive side of bottom cap is connected to terminal 1
- Positive side of top cap is connected to terminal 3

## T14 Components

### Jumpers

Add 2 jumper wires (22 AWG) to T14 in order to ground terminals 1 and 2.

- J1 connects ground to terminal 1
- J2 connects terminal 1 to terminal 2



### Capacitors

22μF	500V	4
------	------	---

- Negative sides of two 22μF@500V caps are connected to terminal 1 (grounded)
- Negative sides of the other two 22μF@500V caps are connected to terminal 2 (grounded)

## Step 2 – Connect Wires to Filter Section

**Drawing 12** shows where to connect these wires on each terminal strip. Use 22 AWG wire.

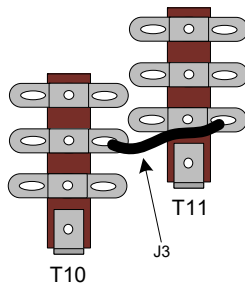
*(Drawing 14 can help you see where the other end of these wires will eventually be connected).*

## T10 Wires

### Jumper

Add 1 jumper wire.

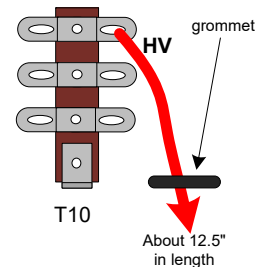
- J3 connects T10 terminal 2 to T11 terminal 1



### HV

HV will connect to the standby switch.

*(Make sure this wire has enough length to get to the lamp holder on the inside of the chassis).*

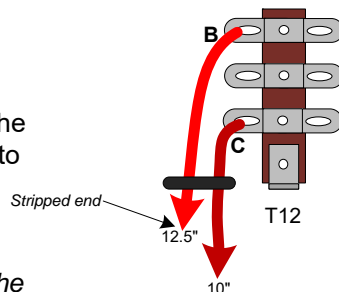


## T12 Wires

### B

B will connect to the power switch.  
(Strip a little bit of the insulation on the end that goes through the grommet to help you identify it later).

*(Make sure this wire has enough length to get to the lamp holder on the inside of the chassis).*



### C

C will connect to T6.

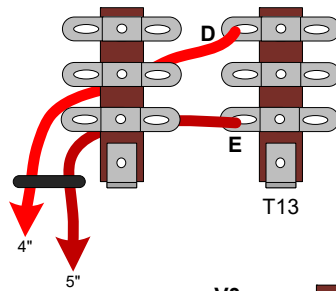
*(Make sure this wire has enough length to get to V4).*

## T13 Wires

D

D will connect to T4.

*(Make sure this wire has enough length to get to about an inch past T4).*



E

E will connect to T4.

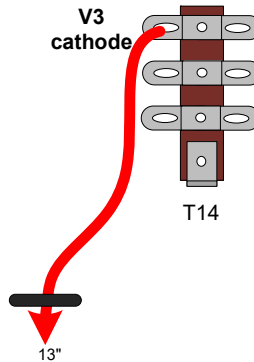
*(Make sure this wire has enough length to get to about an inch past T4).*

## T14 Wires

V3 cathode

V3 cathode will connect to V3.

*(Make sure this wire has enough length to get to about V4).*



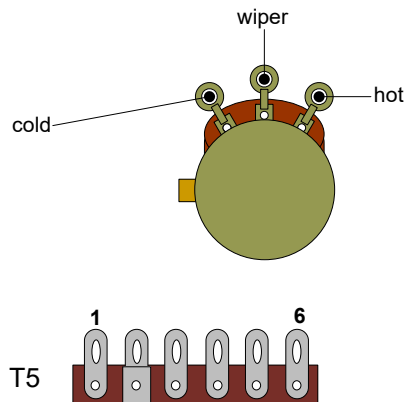
## SECTION 6 – Connect the Front Mounted Components

Please refer to **Drawings 13 - 17**.

Step 1 – Connect the Potentiometers and Input Jack

**Drawing 13** shows where to connect each pot.

*Notice the following sub-step letters (A, B, C, etc.) are shown on the Assembly drawings in parenthesis.*



A) Connect the cold lug of the Bass pot to T5 terminal 1.

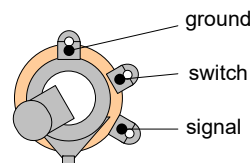
B) Connect Bass wiper to the Treble cold (do not solder the treble cold side, yet).

C) Connect Treble cold to T5 terminal 4 (now solder the treble cold side).

D) Connect Treble wiper to Volume hot.

E) Connect Treble hot to T5 terminal 6.

F) Connect Volume cold to Input Jack ground pin (do not solder the jack ground side, yet).

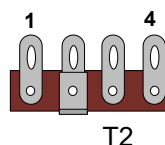


G) Connect Volume wiper to V1 pin 7.

H) Mount but do not solder a 1M $\Omega$ , 1/2 W resistor from Input Jack switch pin to signal pin.

I) Connect a jumper wire from Input Jack ground pin to switch pin and solder this connection.

J) Connect Input Jack signal pin to T2 terminal 4.



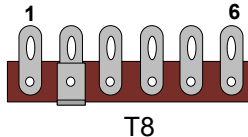
## Step 2 – Connect the Power and Standby Switches

**Drawing 13** shows some of these connections.

A) Connect the TR2 (red) to Pole B (do not solder this connection, yet).

B) Connect the 1Ω, 5W resistor from Throw B Off to the nearby locking lug.

C) Connect T8 terminal 5 to Pole.



D) Connect one end of the 360Ω, 10W resistor to Throw (do not solder this connection, yet).

*(Leave enough room for this resistor to be able to connect to the power switch without its leads accidentally touching a neighboring connection point).*

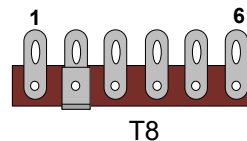
E) Twist and connect the two green TR1 wires to the lamp holder solder lugs (leave the top holes open for a future connection).

*(It does not matter which wire goes to which lug, but make sure not to connect the wires to the same lug).*

F) Twist and connect the TR1 grn/yel & red/yel wires to the nearby locking lug.

G) Twist and connect the two TR1 red wires to T8 terminals 4 & 6.

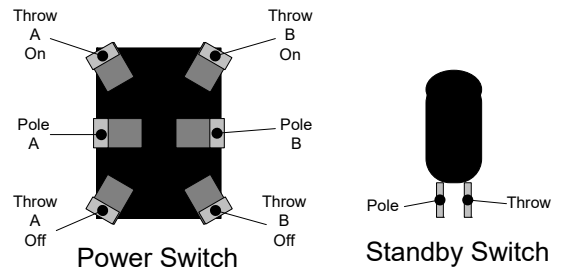
*(It does not matter which wire goes to which terminal, but make sure not to connect the wires to the same terminal).*



H) Connect the TR1 violet wire to T8 terminal 1.

I) Twist and connect TR2 brown & blue wires to V3 pin 3 and V4 pin 3, respectively.

- V3 pin 3 – brown wire
- V4 pin 3 – blue wire



*Take your time when wiring these switches and be careful not to unintentionally short any neighboring connections. Make sure the Standby Switch connections do not touch the chassis.*

## Step 3 – Connect the Filter Section Wires

**Drawing 14** shows some of these connections.

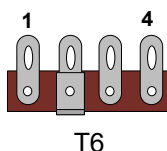
**Be careful not to confuse the sub-step letters on Drawing 14 with the wire names.**

*For example, the first part of Step 3 here is sub-step (A) and involves twisting wires “B” and “HV” together.*

A) Twist and connect wires “B” (w/ stripped end) and “HV” to their respective locations.

- B connects to Pole B (do not solder, yet)
- HV connects to Throw (now solder this connection leaving enough room for the resistor to swing over to the power switch).

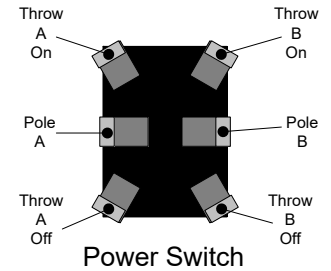
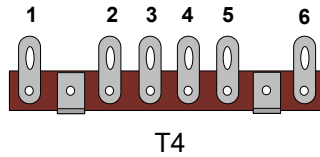
B) Connect wire “C” to T6 terminal 3.



C) Connect wire “V3 cathode” to V3 pin 1.

D) Connect wire “D” to T4 terminal 2.

E) Connect wire “E” to T4 terminal 5.



**Step 4 – Connect the Remaining Front Mount Components**

**Drawing 15** shows these connections.

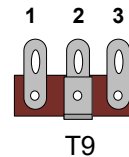
A) Connect the other end of the 360Ω, 10W resistor to Pole B and now solder this connection.

*(Because this resistor will get hot, make sure to prop it up so that its body does not lean against any wires).*

B) Twist and connect two 20AWG green wires from the top lamp holder solder lugs to V4 pins 2 & 7 (do not solder the V4 ends, yet).

*(It does not matter which wire goes to which lug, but make sure not to connect the wires to the same lug).*

C) Twist and connect TR1 brown & white wires to T9 terminal 3 (do not solder this connection, yet).



Note: Terminals are numbered from left to right with mounting bracket directed towards the viewer.

D) Twist and connect two 20AWG green wires to the power switch “Throw A On” and “Pole A” lugs and give them enough length to reach the rear panel of the chassis (about 10”).

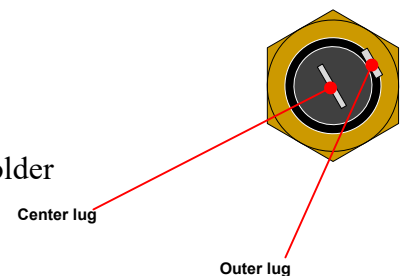
E) Connect the “Pole A” wire to T9 terminal 1 (do not solder this connection, yet).

**Step 5 – Connect the Fuse Holder**

**Drawing 16** shows these connections.

A) Connect the “Throw A On” wire to the center lug of the Fuse Holder.

B) Twist and connect TR1 black & blue wires to the outer lug of the Fuse Holder

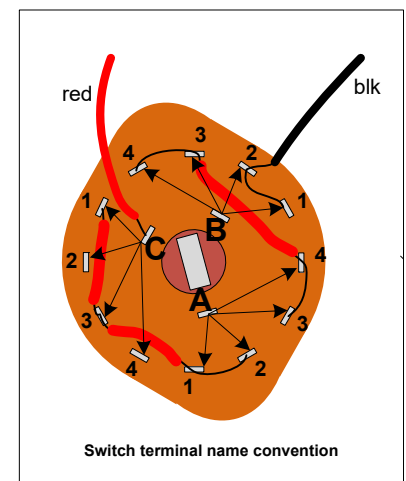
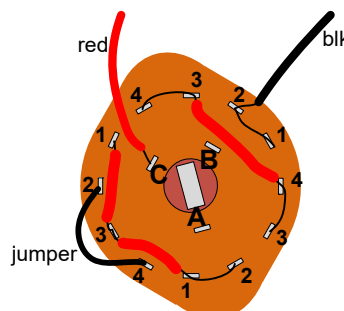


**SECTION 7 – Connect TR2 to the Impedance Selector Switch**

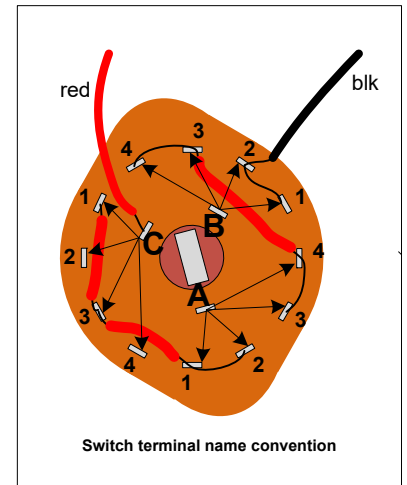
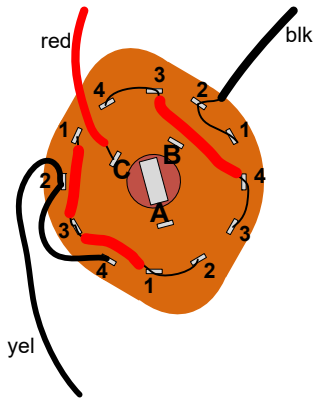
Please refer to **Drawing 17**.

*Take your time and be careful not to break any pins on the switch or unintentionally short neighboring connections that should not be connected.*

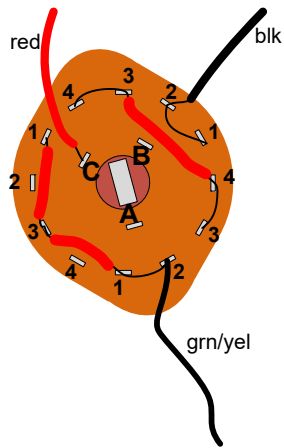
A) Connect jumper wire from C2 to C4 (do not solder the connection at C2, yet).



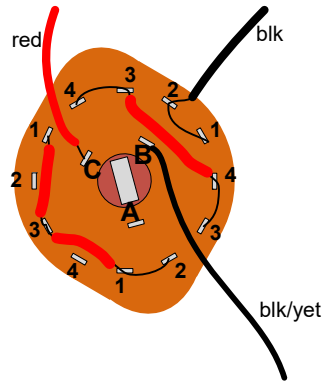
B) Connect TR2 yellow wire to C2 and now solder the connection.



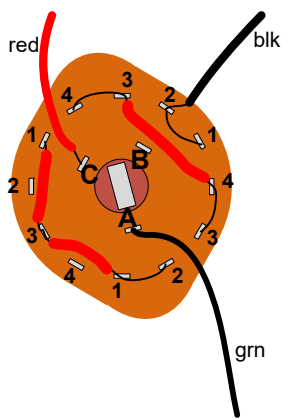
C) Connect TR2 grn/yel wire to A2.



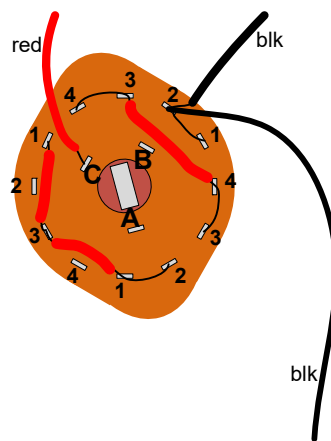
D) Connect TR2 blk/yel wire to B.



E) Connect TR2 grn wire to A.



F) Connect TR2 blk wire to B2.



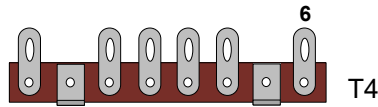
## SECTION 8 – Connect the Tube Sockets

Please refer to **Drawing 18**.

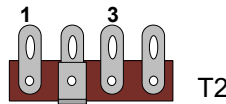
### Step 1 – Connect V1

**Drawing 18** shows these connections.

A) Connect V1 pin 1 to T4 terminal 6.



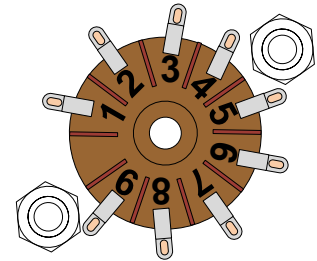
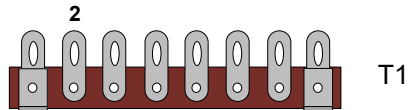
B) Connect V1 pin 2 to T2 terminal 3.



C) Connect V1 pin 3 to V1 pin 8 (do not solder the pin 8 side, yet).

D) Connect V1 pin 8 to T2 terminal 1 (now solder this connection).

E) Connect V1 pin 6 to T1 terminal 2.



### Step 2 – Connect V2

**Drawing 18** shows these connections.

A) Connect V2 pin 1 to T3 terminal 3.

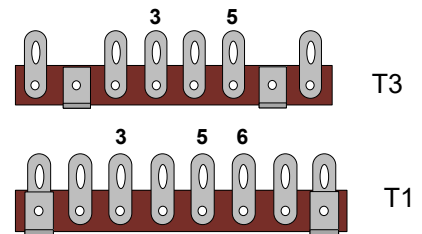
B) Connect V2 pin 2 to T1 terminal 3.

C) Connect V2 pin 3 to V2 pin 8 (do not solder the pin 8 side, yet).

D) Connect V2 pin 8 to T1 terminal 5 (now solder this connection).

E) Connect V2 pin 6 to T3 terminal 5.

F) Connect V2 pin 7 to T1 terminal 6.



### Step 3 – Connect V3 & V4

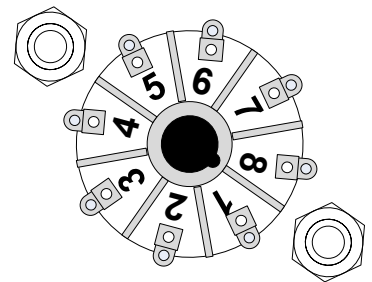
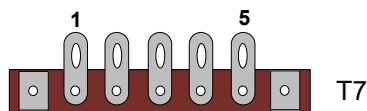
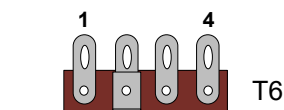
**Drawing 18** shows these connections.

A) Connect V3 pin 4 to T6 terminal 4.

B) Connect V3 pin 5 to T7 terminal 5.

C) Connect V4 pin 4 to T6 terminal 1.

D) Connect V4 pin 5 to T7 terminal 1.

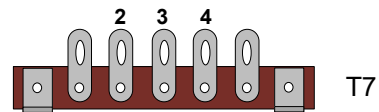
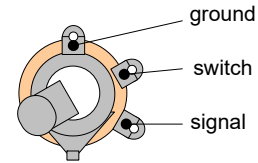
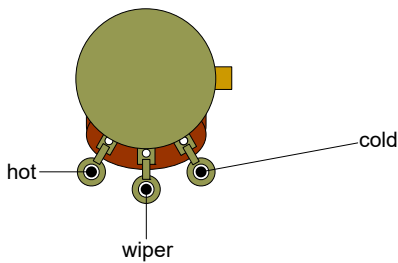
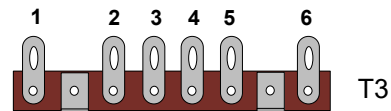
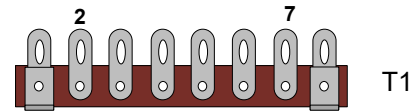
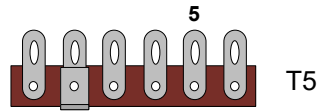
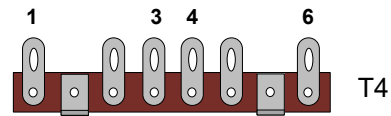


## SECTION 9 – Connect the Terminal Strip Interconnects

Please refer to **Drawing 19**.

Note: Terminals are numbered from left to right with mounting bracket directed towards the viewer.

- A) Connect T4 terminal 6 to T5 terminal 5.
- B) Connect T1 terminal 2 to T4 terminal 4.
- C) Connect T4 terminal 3 to T3 terminal 3.
- D) Connect T4 terminal 1 to T3 terminal 5.
- E) Connect T1 terminal 7 to T3 terminal 1.
- F) Connect T3 terminal 2 to Output Jack signal lug.
- G) Connect T3 terminal 4 to T7 terminal 4.
- H) Connect T3 terminal 6 to T7 terminal 2.
- I) Connect the Bias Pot wiper lug to T7 terminal 3.

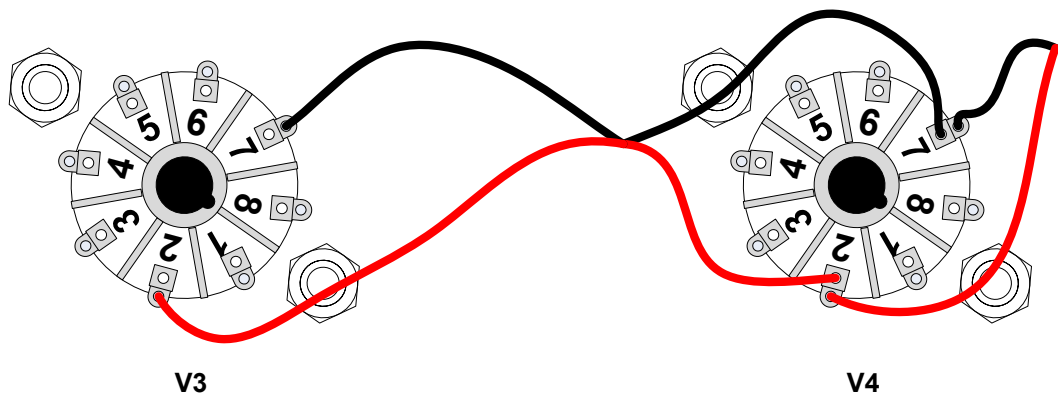


## SECTION 10 – Connect the Tube Filaments

Please refer to **Drawing 20**.

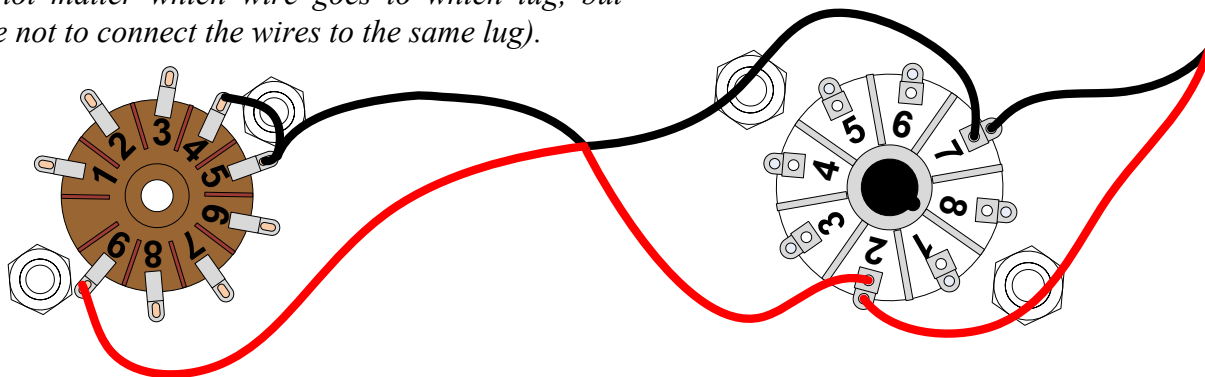
- A) Twist and connect two 20AWG green wires from V4 pins 2 & 7 to V3 pins 2 & 7. (Only solder the connection at V4).

*(It does not matter which wire goes to which lug, but make sure not to connect the wires to the same lug).*



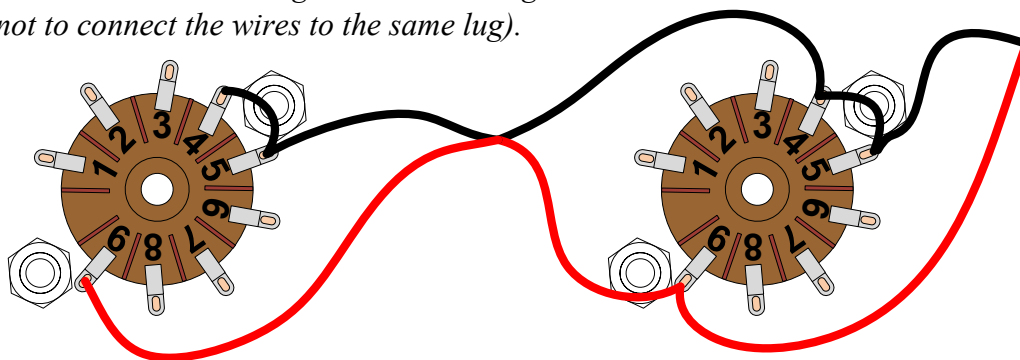
B) Twist and connect two 20AWG green wires from V3 pins 2 & 7 to V2 pins 4, 5 & 9. At V2 one wire connects to both pins 4 & 5, while the other wire only connects to pin 9. (Only solder the connection at V3).

*(It does not matter which wire goes to which lug, but make sure not to connect the wires to the same lug).*



C) Twist and connect two 20AWG green wires from V2 pins 4, 5 & 9 to V1 pins 4, 5 & 9. At V1 one wire connects to both pins 4 & 5, while the other wire only connects to pin 9.

*(It does not matter which wire goes to which lug, but make sure not to connect the wires to the same lug).*



## **SECTION 11 – Insert the Strain Relief and Connect the Power Cord**

Please refer to **Drawings 21 & 22**.

### **Step 1 – Insert the Strain Relief and Power Cord**

**Drawing 21** shows where and how to do this.

- A) Put the strain relief around the power cord at a point about 1 inch up from where the outer insulation of the cord ends.
- B) Close the strain relief over the power cord.
- C) Use your pliers to simultaneously:
  - Tightly squeeze the strain relief into the power cord.
  - Push the strain relief and power cord into the chassis hole.

You will have to squeeze very tightly with the pliers to fit the strain relief and power cord into the chassis hole. This is what gives the cord a secure fit.

*(When the strain relief is inserted properly, you should not be able to pull the cord out with your hand).*



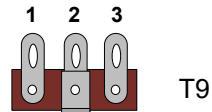
## Step 2 – Connect the Power Cord Wires

**Drawing 22** shows where to connect the wires.

A) Connect the Power Cord black wire to T9 terminal 1 (now solder this connection).

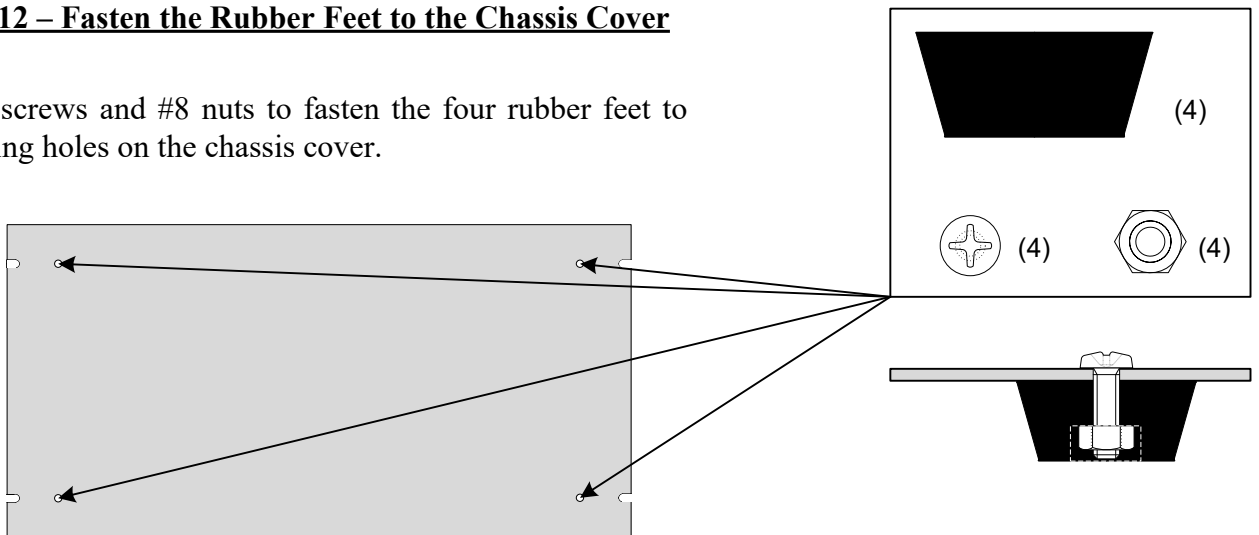
B) Connect the Power Cord green wire to T9 terminal 2.

C) Connect the Power Cord white wire to T9 terminal 3 (now solder this connection).



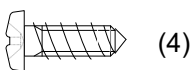
## **SECTION 12 – Fasten the Rubber Feet to the Chassis Cover**

Use the #8 screws and #8 nuts to fasten the four rubber feet to their mounting holes on the chassis cover.

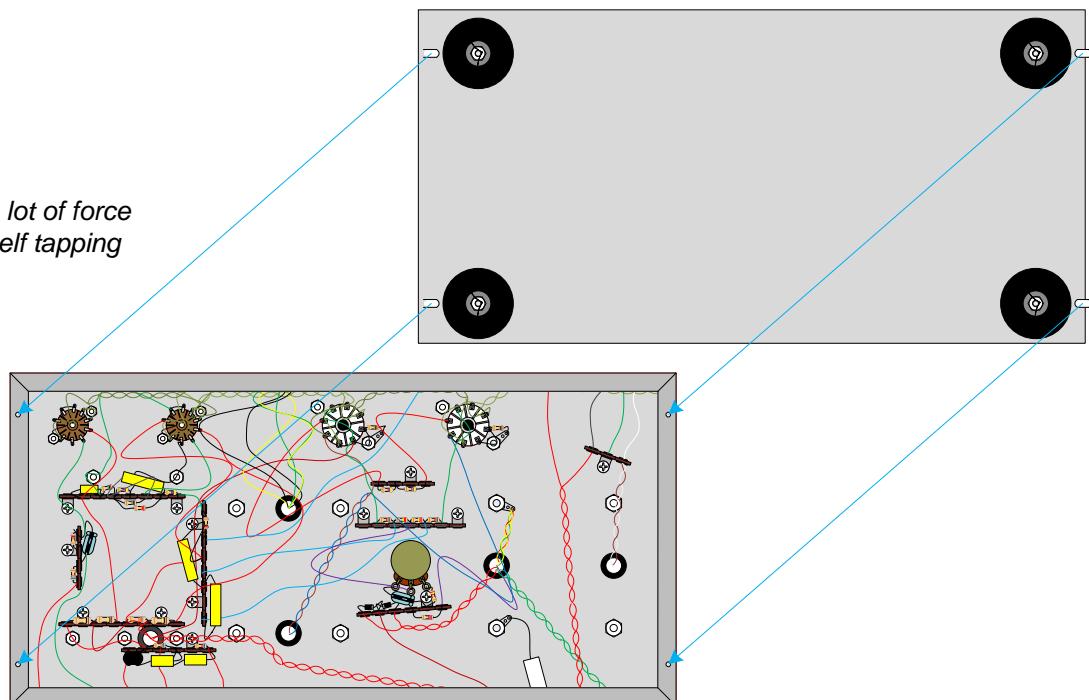


## **SECTION 13 – Fasten the Chassis Cover to the Chassis Box**

Use the #8 self-tapping screws to fasten the chassis cover to the chassis box.

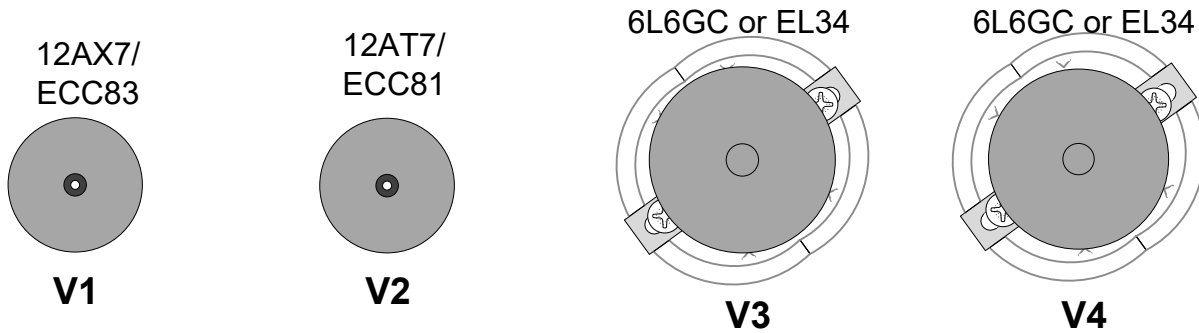


*You will have to use a lot of force to initially insert the self tapping screws.*



## SECTION 14 – Set the Bias of the Power Tubes

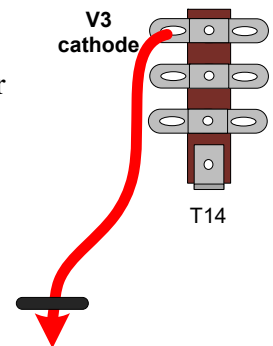
Please refer to **Drawings 23 - 25**. You should insert all vacuum tubes into their respective sockets at this point.



Step 1 – Measure the resistance of the cathode resistor that will help us bias the amp

**Drawing 23** shows this being done.

- A) Make sure the amplifier is turned off and unplugged.
- B) Connect the DMM alligator clips to the two points indicated in the drawing.
  - DMM “COM” connects to the negative lead of any one of the 22 $\mu$ F @ 500V filter capacitors (or any other ground point).
  - DMM “ $\Omega$ ” connects to V3 cathode.
- C) Use your DMM to measure the resistance here and take note of it for the next step.



$$R = \underline{\hspace{2cm}} \Omega$$

Step 2 – Set the Bias Point of the Power Tubes

**Drawing 24** should be used for biasing 6L6GC's.

**Drawing 25** should be used for biasing EL34's.

Keep the DMM alligator clips connected to same points as in step 1, but now set it to measure “V”.

Visit [www.modkitsdiy.com](http://www.modkitsdiy.com) if you have any problems when first turning on your amp for troubleshooting help. If you smell or see smoke, hear something pop, or the chassis becomes too hot to touch, turn off power and unplug immediately.

- A) Do all of the following:
  - Connect the amp output to a matching load for the impedance selected.
  - Turn the Bass, Treble, and Volume controls to zero.
  - Turn the bias pot all the way to cold.
  - Plug the amp in.
  - Turn power on, and wait a minute before turning the standby switch on.
- B) Use your DMM to measure the voltage in milli-volts here after about 10 minutes and take note of it.

$$V(\text{cold}) = \underline{\hspace{2cm}} \text{ mV}$$

C) Determine the bias range for your power tubes.

### 6L6GC's

For 6L6GC you want to stay in the current range of 10 mA – 50 mA.

*Ohm's Law allows us to measure voltage across a resistor and know how much current is flowing through it.*

- Use Ohm's Law and the resistance measured in step 1 to convert the current range to a voltage range.

OHM'S LAW
$I \times R = V$

$$V(\text{low}) = 10 \times R = \underline{\hspace{2cm}} \text{ mV}$$

$$V(\text{high}) = 50 \times R = \underline{\hspace{2cm}} \text{ mV}$$

### EL34'S

For EL34 you want to stay in the current range of 10 mA – 75 mA.

*Ohm's Law allows us to measure voltage across a resistor and know how much current is flowing through it.*

- Use Ohm's Law and the resistance measured in step 1 to convert the current range to a voltage range.

$$V(\text{low}) = 10 \times R = \underline{\hspace{2cm}} \text{ mV}$$

$$V(\text{high}) = 75 \times R = \underline{\hspace{2cm}} \text{ mV}$$

D) Change the bias pot to set a more suitable bias point.

For 6L6GC it is common to use about 35 mA as a bias point.

$$V(\text{standard}) = 35 \times R = \underline{\hspace{2cm}} \text{ mV}$$

- Slowly turn the bias pot towards hot until you measure a more standard value.

For EL34 it is common to use about 45 mA as a bias point.

$$V(\text{standard}) = 45 \times R = \underline{\hspace{2cm}} \text{ mV}$$

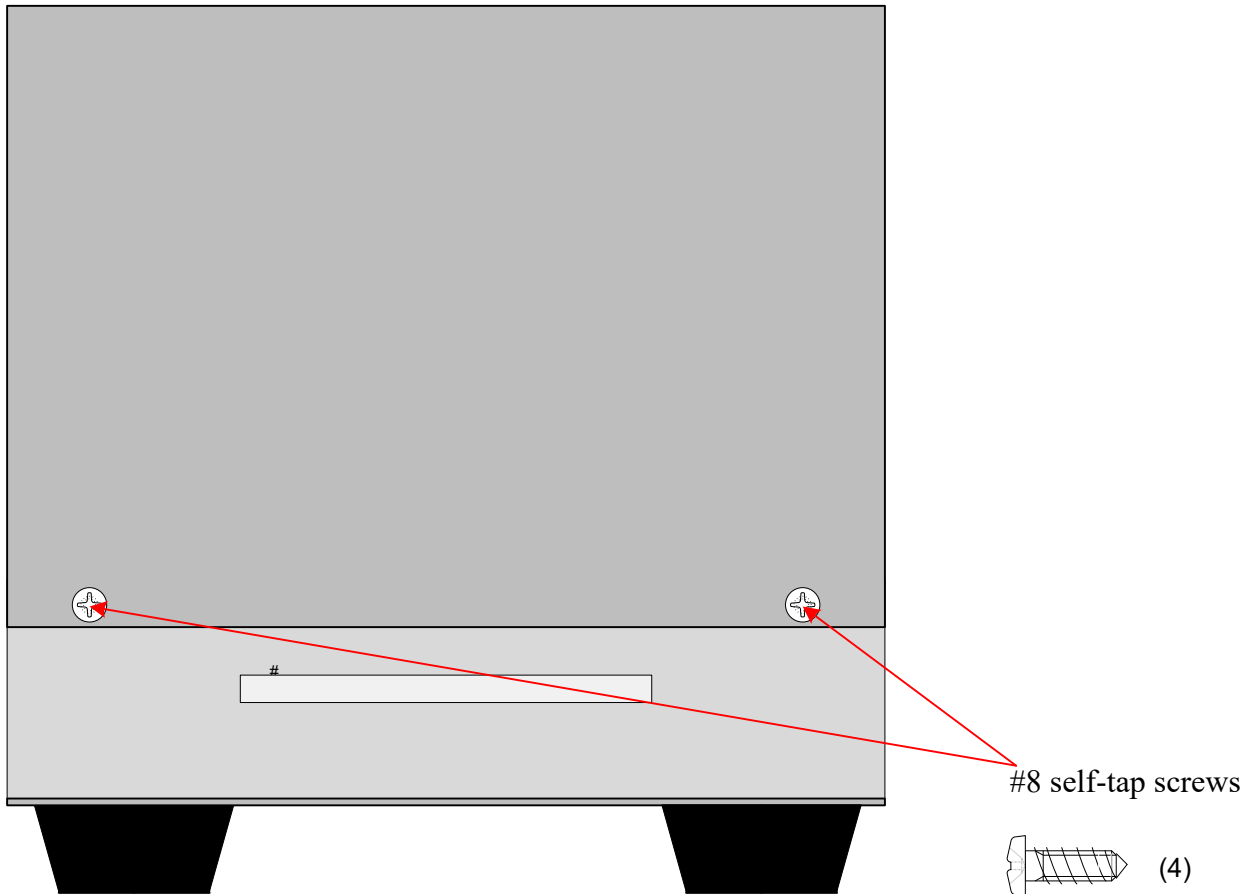
- Slowly turn the bias pot towards hot until you measure a more standard value.

D) Plug in your guitar and play. You can change the bias pot hotter or colder to see where it sounds best to you.

*Be careful not to bias the tubes too hot. When this happens you will see the entire tube filament, in the center of the tube glowing through the outer plate structure.*

## **SECTION 15 – Fasten the Steel Cage to the Chassis Box**

Turn off and unplug the amp. Use the #8 self-tapping screws to fasten the cage on to the chassis box on both sides.



*You will have to use a lot of force to initially insert the self tapping screws.*

## SECTION 16 – Modifications

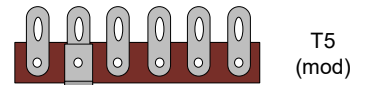
After you have gotten used to the sound of the standard setup described in the instructions, you might want to experiment with these modifications to change up the tone.

We have supplied you with the parts to implement 5 different modifications.

### 1. Tone Stack Mod

This mod allows you to change the tone stack for a vintage Fender style. It should add brightness and clarity to the overall tone. (Because this mod has the most components, we have supplied an extra terminal strip so that you can swap out tone stacks easier).

- Carefully desolder the wires from T5 and remove the whole terminal strip with its components intact.
- Fasten the new terminal strip and solder the components as in T5 MOD below. (Reconnect the wires from where you removed them).



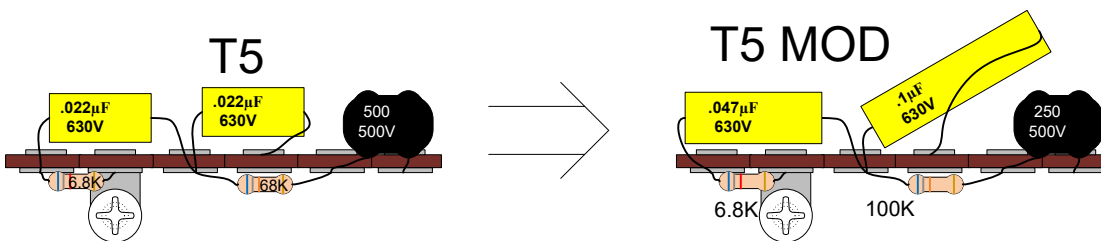
#### T5 Modified Components

##### Resistors

6.8k $\Omega$	1/2W	1
100k $\Omega$	1/2W	1

##### Capacitors

.1 $\mu$ F	630V	1
.047 $\mu$ F	630V	1
250pF	500V	1



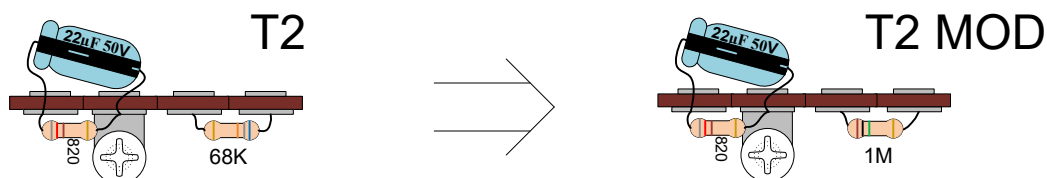
### 2. Input Voltage Divider Mod

This mod is very simple. It will make the lower volume settings more mid heavy and really tighten up the overdrive distortion.

- Remove the 68K resistor from T2 and replace it with a 1M.

##### Resistors

1M $\Omega$	1/2W	1
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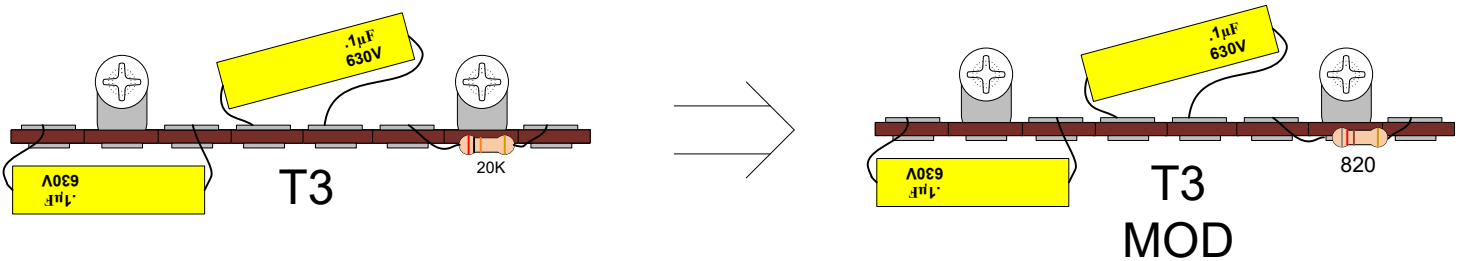
### 3. Negative Feedback Mod

This mod is very simple. More negative feedback increases clean headroom and frequency response bandwidth, while decreasing gain. Lowering the resistor value increases the amount of negative feedback.

- Remove the 20K resistor from T3 and replace it with an 820.

#### Resistors

820Ω      1/2W      1



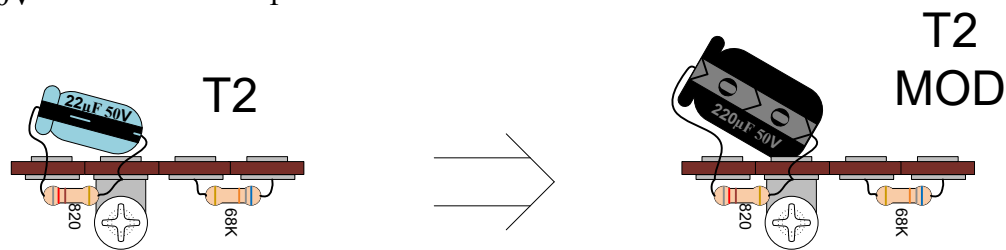
### 4. Bypass Cap Mod

This Mod is very simple. Changing this capacitor should make the highs a little smoother.

- Remove the 25µF cap from T2 and replace it with a 220µF cap.

#### Caps

220µF      50V      1



### 5. Power Tube Mod

Change the power tubes to 6L6GC's or EL34's and re-bias the amp following section 14. Generally, the 6L6GC's will give you more bass in a clean setting, while the EL34's will enter overdrive distortion sooner.